BACKUP
Service Manual

GALANT

1989-1990-1991-1992-1993
Volume 1
Chassis & Mechanical

FOREWORD

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

This BACKUP DSM manual is to be used DNLY as a BACKUP. Please DO NOT REDISTRIBUTE WHOLE SECTIONS. This BACKUP was sold to you under the fact that you do indeed DWN a GENUINE DSM MANUAL. It CANNOT BE considered a REPLACEMENT (Unless your original manual was lost or destroyed.)

Please See README.TXT or README.HTML for additional information.

Thank you. - Gimmiemymanual@h nail.com

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

GENERAL

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HOW TO USE THIS MANUAL

M00BAATa

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. Unless otherwise specified, each service procedure covers all models. Procedures covering specific models are identified by the model codes, or similar designation (engine type, transaxle type, etc.). A description of these designations is covered in this unit under "VEHICLE IDENTIFICATION".

SERVICE ADJUSTMENT PROCEDURES

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

SERVICE PROCEDURES

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

TROUBLESHOOTING

Troubleshootinqs are classified into master troubleshooting and group troubleshooting and located as follows:

The master troubleshooting is prepared when the trouble symptom relates to two or more groups and given in MASTER TROUBLESHOOTING.

The group troubleshooting guide is prepared for causes of problems related to that individual group only; a troubleshooting guide is prepared for each appropriate group.

DEFINITION OF TERMS

STANDARD VALUE

Indicates the value used as the standard for judging the quality of a part or assembly on inspectian 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.

MODEL INDICATIONS

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

M/T . Indicates the manual transaxle, or models equipped with the manual transaxle.
A/T: indicates the automatic transaxle, or models equipped with the automatic transaxle.
MFI: Indicates the multiport fuel injection, or engines equipped with the multiport fuel injection.
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.
Turbo: Indicates an engine with turbocharger, or a model equipped with such an engine.
Non-Turbo: Indicates an engine without turbocharger, or a model equipped with such an engine.
FWD: Indicates the front wheel drive vehicles.
AWD: Indicates the all wheel drive vehicles.
ABS: Indicates the anti-lock braking system or models equipped with the anti-lock braking system.

EXPLANATION OF MANUAL CONTENTS

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

Maintenance and Servicing Procedures

(1) 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.
(2) The numbers provided within the diagram indicate the sequence for maintenance and servicing procedures; the symbol N indicates a non-reusable part; the tightening torque is provided where applicable.

- 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.

◆■: Indicates that there are essential points for removal or disassembly.
■◆: Indicates that there are essential points for installation or reassembly.

Indicates (by symbols) where lubrication is necessary. In this example, sealant is applied (where indicated) *to* the steering gear box.

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. automatic transmission fluid or air conditioner compressor oil
. . . . . Engine oil or gear oil
. . . Adhesive tape or butyl rubber tape

Indicates the group number.

Indicates the page number.

Indicates the group title.

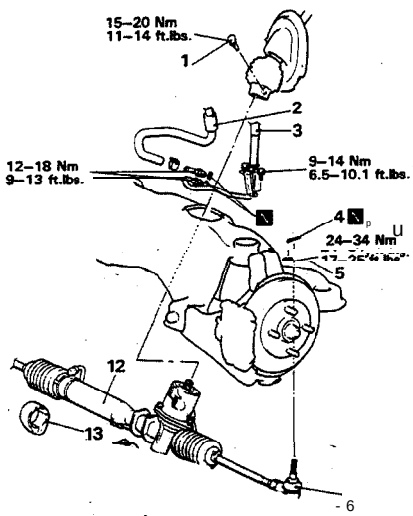
Indicates the section title.

37A-28 STEERING – Power Steering Gear Box

Denotes tightening torque.

POWER STEERING GEAR BOX

REMOVAL AND INSTALLATION

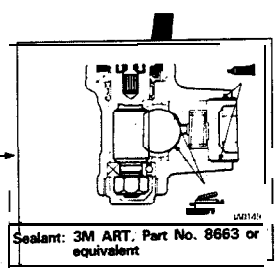


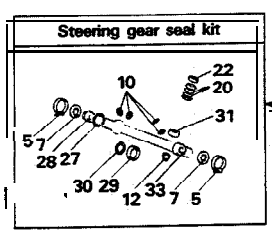
Denotes non-reusable part.

Pre-removal and Post-installation Operation
- Draining and Supplying of the Power Steering Fluid

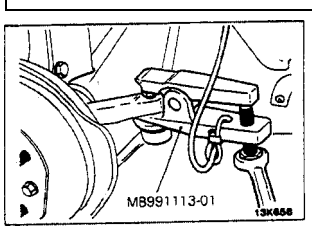
Removal steps
1. Joint assembly and gear box connecting bolt
2. Connection for return tube
3. Connection for pressure hose
4. cotter pin
5. Tie-rod end and knuckle connecting
9. Front roll stopper rear [illegible]
10. Center member rear mounting bolt
11. Front exhaust pipe
12. Gear box assembly
13. Mounting rubber

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.



SERVICE POINTS OF REMOVAL M37P8A8

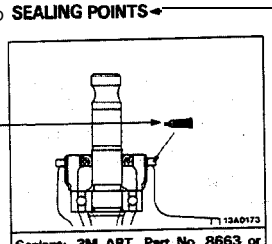
6. **DISCONNECTION OF TIE-ROD END**
Using the special tool, disconnect the tie rod from the knuckle.
Caution
1. **Be sure to tie the cord of the special tool to the nearby part.**
2. **Loosen the nut but do not remove it.**

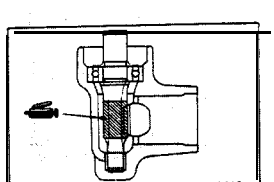
12. REMOVAL OF GEAR BOX **ASSEMBLY**

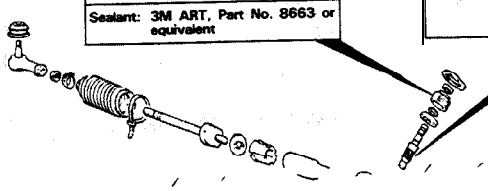
This number corresponds to the number appearing in "Removal steps", "Disassembly steps", "Installation steps" or "Reassembly steps".

37A-24 STEERING – Manual Steering Gear Box

LUBRICATION AND SEALING POINTS





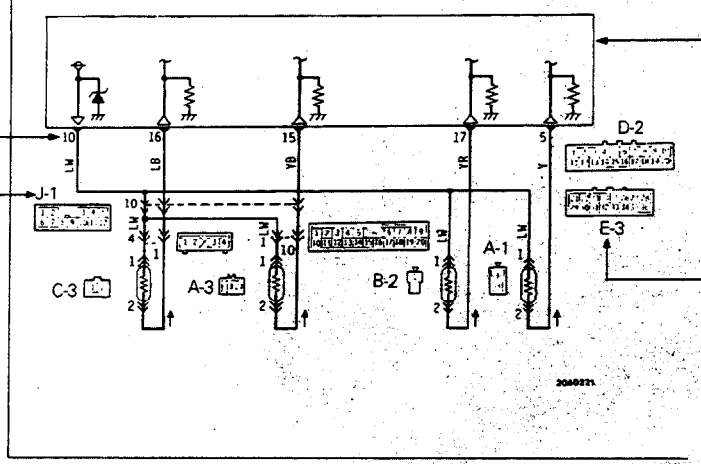


The title of the page (following the page on which the diagram of component parts is presented) indicating the locations of lubrication and sealing procedures.

EXPLANATION OF THE TROUBLESHOOTING GUIDE

Indicates connector's terminal number.

3. Checking **the passenger compartment-temperature sensor, outside-air sensor, air-thermostat sensor and refrigerant-temperature sensor circuits**



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

Indicates the connector number. Numbers are used in the operation descriptions only as necessary, and these numbers correspond to the numbers used in harness and component layout diagrams.

Provides the necessary description of circurt operation for basic under-(standing.

Operation description

A negative-characteristic thermistor is employed for each sensor in order to convert the ambient temperature of the sensor part to resistance
The sensor power-supply (2.5V) of The air-conditioner control unit is applied to each sensor, and the voltages of terminals (16), (15), (17) and (5) are divided by the resistance values of each sensor, and resistance R

Troubleshooting hints

Diagnosis

NO 11 The passenger compartment-temperature sensor input signal is held to 25°C (77°F).
NO 12: The outside-air sensor input signal is held to 15°C (59°F).
No 13 The air-thermostat sensor input signal is held to 4°C (39°F)

Indicates the check to be made.

Air conditioner control unit terminal voltage

Terminal No	Signal	Conditions	Terminal voltage
5	Outside-air sensor	Sensor part temperature 25°C (77°F) 4 kΩ	1.0–1.6V
10	Sensor power supply	At all times	2.45–2.55V
15	Refrigerant-temperature sensor	Sensor part temperature 25°C (77°F) when air conditioner is OFF. 80 Ω	0.15V
16	Passenger compartment-temperature sensor	Sensor part temperature 25°C (77°F) 4 kΩ	1.0–1.6V
17	Air-thermostat sensor	Sensor part temperature 25°C (77°F) when air conditioner is OFF 4 kΩ	0–1.6V

Provides hints (including standards for judgement) when trouble-shooting procedures are followed.

Indicates the on-board diagnostic output code No. and the system conditions during output.

Indicates the terminals to be checked.

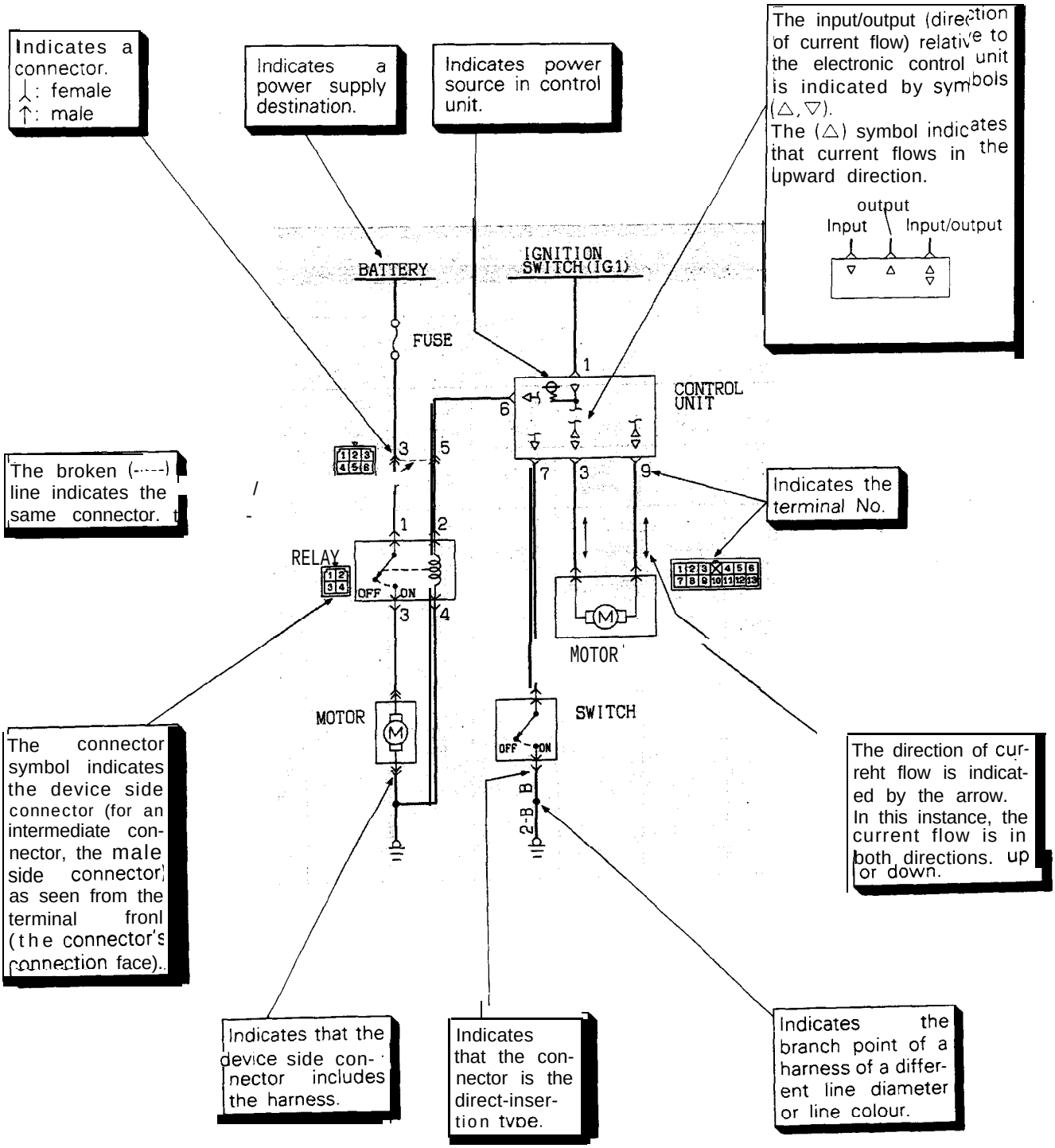
Indicates the conditions under which the check should be made.

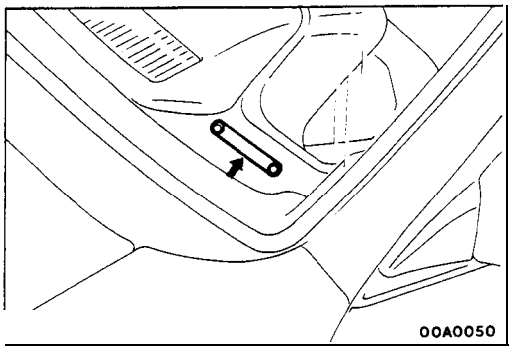
Indicates the specification to be used for judgement of the check results.
If there is no particular mention of conditions in the "Conditions" column, the column shows the specification under normal conditions.

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 GROUP 54–Circuit Diagrams.





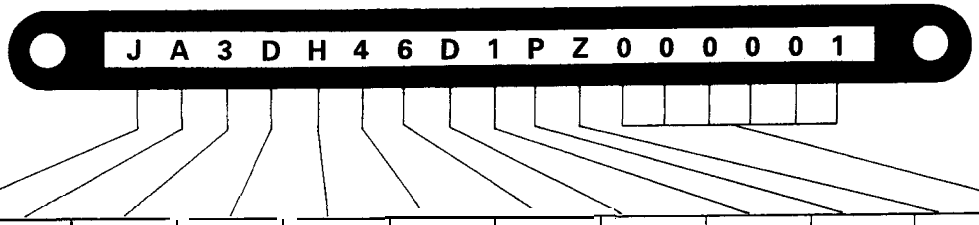
VEHICLE IDENTIFICATION M00CA--

VEHICLE IDENTIFICATION NUMBER LOCATION

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

VEHICLE IDENTIFICATION CODE CHART PLATE M00CB--

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



1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th Digit	9th Digit	10th Digit	11th Digit	12th to 17th Digits
Country	Make	Vehicle type	Others	Line	Price class	Body	Engine	Check digits*	Model year	Plant	Serial number
J- Japan	A- Mitsu-bishi	3- Passen-ger Car	C- Auto-matic Seat Belt D- Manual Seat Belt	H- Galant FWD	4- High 5- Premium	6- 4 door Sedan	D- 2.0 dm³ (122 cu.in.) [SOHC-MFI] E- 2.0 dm³ (122 cu.in.) [DOHC-MFI]	1 2 3 · · · · 9 x	K- 1989 Year L- 1990 Year M- 1991 Year N- 1992 Year P- 1993 Year	U- Mizushima-1 Plant Z- Okazaki Plant	000001 to 999999

NOTE • "Check digit" means a single number or letter x used to verify the accuracy of transcription of vehicle identification number.

VEHICLE IDENTIFICATION NUMBER LIST <1989 MODELS> M00CC--

VEHICLES FOR FEDERAL

V.I.N. (except sequence number)	Brand	Engine Displacement	Models Code
JA3BR46V□KZ	Mitsubishi Galant	2.0 dm³ (122 cu.in.) [SOHC-MFI]	E33ASNHEL2M/RHEL2M
JA3BR56V□KZ			E33ASNXEL2M/RXEL2M
JA3BR56R□KZ		2.0 dm³ (7 22 cu.in.) [DOHC-MFI]	E33ASNGML2M

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VEHICLES FOR CALIFORNIA

V.I.N. (except sequence number)	Brand	Engine Displacement	Models Code
JA3BR46V□KZ	Mitsubishi Galant	2.0 dm³ (122 cu.in.) [SOHC-MFI]	E33ASNHEL7M/RHEL7M
JA3BR56V□KZ			E33ASNXEL7M/RXEL7M
JA3BR56R□KZ		2.0 dm³ (122 cu.in.) [DOHC-MFI]	E33ASNGML7M

<1990 MODELS>

VEHICLES FOR FEDERAL

V.I.N. (except sequence number)	Brand	Engine Displacement	Models Code
JA3CR46V□LZ	Mitsubishi Galant <FWD>	2.0 dm³ (122 cu.in.) [SOHC-MFI]	E33ASNHEL2M/RHEL2M
JA3CR56V□LZ			E33ASNXEL2M/RXEL2M
JA3CR56R□LZ		2.0 dm³ (122 cu.in.) [DOHC-MFI]	E33ASNGML2M
JA3CX56R□LZ	Mitsubishi Galant <AWD>		E38ASNGML2M

VEHICLES FOR CALIFORNIA

V.I.N. (except sequence number)	Brand	Engine Displacement	Models Code
JA3CR46V□LZ	Mitsubishi Galant <FWD>	2.0 dm³ (122 cu.in.) [SOHC-MFI]	E33ASNHEL7M/RHEL7M
JA3CR56V□LZ			E33ASNXEL7M/RXEL7M
JA3CR56R□LZ		2.0 dm³ (122 cu.in.) [DOHC-MFI]	E33ASNGML7M
JA3CX56R□LZ	Mitsubishi Galant <AWD>		E38ASNGML7M

<1991 MODELS>

VEHICLES FOR FEDERAL

V.I.N. (except sequence number)	Brand	Engine Displacement	Models Code
JA3CR46V□MZ	Mitsubishi Galant <FWD>	2.0 dm³ (122 cu.in.) [SOHC-MFI]	E33ASNHEL2M/RHEL2M
JA3CR56V□MZ			E33ASRXEL2M
JA3CR56R□MZ		2.0 dm³ (122 cu.in.) [DOHC-MFI]	E33ASNGML2M/RGML2M/ NXML2M
JA3CX56R□MZ	Mitsubishi Galant <AWD>		E38ASNGML2M/RGML2M
JA3CX56U□MZ		2.0 dm³ (122 cu.in.) [DOHC-MFI-Turbo]	E39ASNPFL2M

TSB Revision

VEHICLES FOR CALIFORNIA

V.I.N. (except sequence number)	Brand	Engine Displacement	Models Code
JA3CR46V□MZ	Mitsubishi Galant <FWD>	2.0 dm³ (122 cu.in.) [SOHC-MFI]	E33ASNHEL7M/RHEL7M
JA3CR56V□MZ			E33ASRXEL7M
JA3CR56R□MZ		2.0 dm³ (122 cu.in.) [DOHC-MFI].	E33ASNGML7M/RGML7M/ NXML7M
JA3CX56R□MZ	Mitsubishi Galant <AWD>		E38ASNGML7M/RGML7M
JA3CX56U□MZ		2.0 dm³ (122 cu.in.) [DOHC-MFI-Turbo]	E39ASNPFL7M

<1992 MODELS>

VEHICLES FOR FEDERAL

V.I.N. (except sequence number)	Brand	Engine Displacement	Models Code
JA3CR46V□NZ	Mitsubishi Galant <FWD>	2.0 dm³ (122 cu.in.) [SOHC-MFI]	E33ASNHEL2M/RHEL2M
JA3CR56V□NZ			E33ASRXEL2M
JA3CR56R□NZ		2.0 dm³ (122 cu.in.) [DOHC-MFI]	E33ASNGML2M/RGML2M/ NXML2M
JA3CX56R□NZ	Mitsubishi Galant <AWD>		E38ASNGML2M/RGML2M
JA3CX56U□NZ		2.0 dm³ (122 cu.in.) [DOHC-MFI-Turbo]	E39ASNPFL2M

VEHICLES FOR CALIFORNIA

V.I.N. (except sequence number)	Brand	Engine Displacement	Models Code
JA3CR46V□NZ	Mitsubishi Galant <FWD>	2.0 dm³ (122 cu.in.) [SOHC-MFI]	E33ASNHEL7M/RHEL7M
JA3CR56V□NZ			E33ASRXEL7M
JA3CR56R□NZ		2.0 dm³ (122 cu.in.) [DOHC-MFI]	E33ASNGML7M/RGML7M/ NXML7M
JA3CX56R□NZ	Mitsubishi Galant <AWD>		E38ASNGML7M/RGML7M
JA3CX56U□NZ		2.0 dm³ (122 cu.in.) [DOHC-MFI-Turbo]	E39ASNPFL7M

< 1993 MODELS>

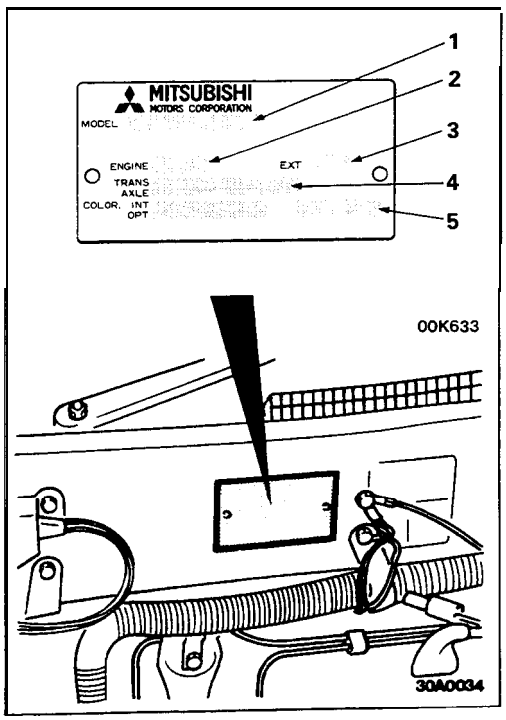
VEHICLES FOR FEDERAL

V.I.N. (except sequence number)	Brand	Engine Displacement	Models Code
JA3DH46D□PZ	Mitsubishi Galant <FWD>	2.0 dm³ (122 cu.in.) [SOHC-MFI]	E33ASNHEL2M/RHEL2M
JA3DH56D□PZ			E33ASRXEL2M/NGEL2M/ RGEL2M
JA3DH56E□PZ		2.0 dm³ (122 cu.in.) [DOHC-MFI]	E33ASNXML2M

TSB Revision

VEHICLES FOR CALIFORNIA

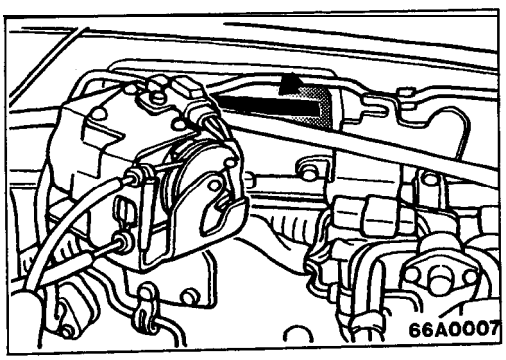
V.I.N. (except sequence number)	Brand	Engine Displacement	Models Code
JA3DH46D□PZ	Mitsubishi Galant <FWD>	2.0 dm³ (122 cu.in.) [SOHC-MFI]	E33ASNHEL7M/RHEL7M
JA3DH56D□PZ			E33ASRXEL7M/NGEL7M/ RGEL7M
JA3DH56E□PZ		2.0 dm³ (122 cu.in.) [DOHC-MFI]	E33ASNXML7M



VEHICLE INFORMATION CODE PLATE M00CD--

Vehicle information code plate is riveted onto the bulkhead in the engine compartment.
The plate shows model code, engine model, transaxle model, and body color code.

1. MODEL **E33AS RGEL2M**
   - RGEL2M — Model series
   - E33AS — Vehicle model
2. ENGINE **4G63** — Engine model
3. EXT **CA6** — Exterior code
4. TRANSAXLE **F5M22** — Transaxle model
5. COLOR, INT OPT **R82 87V 03V**
   - 03V — Equipment code
   - 87V — Interior code
   - R82 — Body color code



CHASSIS NUMBER M00CE--

STAMPING LOCATION

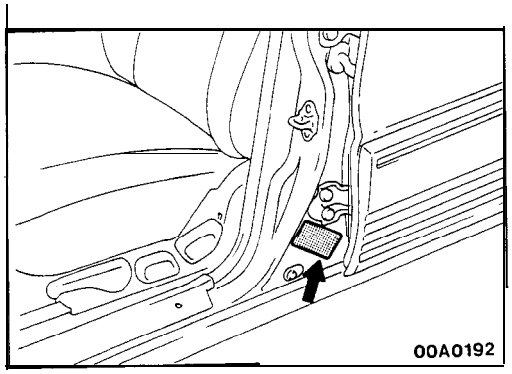
The chassis number is stamped on the top Center of the firewall located in the engine compartment.

CHASSIS NUMBER CODE CHART

E 33 A KZ00001
1 2 3 4

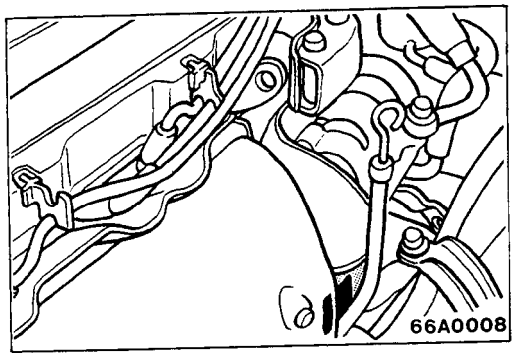
1. Vehicule line
   E–GALANT
2. Engine displacement
   33– **2.0** dm³ (122 cu.in.) engine
3. Body type
   A–4-door Sedan
4. Refer to 10th thru 17th digits of V.I.N. plate.
   K- 1989 models
   L– 1990 models
   M–1991 models
   N–1992 models
   p-l 993 models

TSB Revision



VEHICLE SAFETY CERTIFICATION LABEL M00CF--

1. The vehicle safety certification label is attached to face of left door pillar.
2. This label indicates Gross Vehicle Weight Rating (G.V. W.R.), Gross Axle Weight Rating (G.A.W.R.) front, rear and Vehicle Identification Number (V.I.N.).



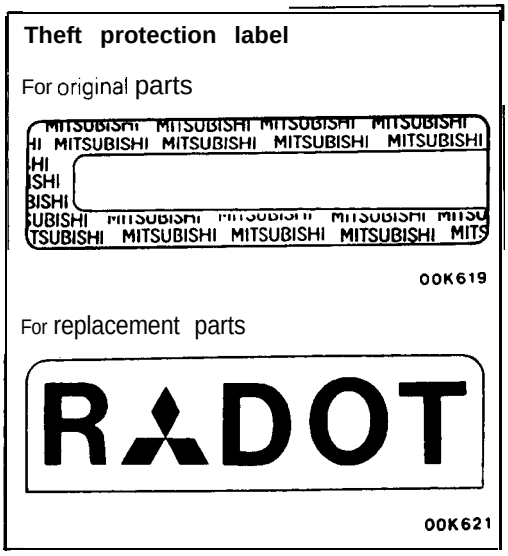
ENGINE MODEL STAMPING M00CG--

1. The engine model number is stamped at the front side on the top edge of the cylinder block as shown in the following.

Engine model	Engine displacement
4G63	**2.0** dm^3 (122 cu.in.)

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

Engine serial number	Number cycling
AA0201 to YY9999	— AA0201 ····► AA9999 ┐ └AB0001 ····► AY9999 ┐ └BA0001 ····► YY9999



THEFT PROTECTION M00CIAB

In order to protect against theft, a Vehicle Identification Number (VIN) is stamped in, or attached as a label to, the following major parts of the engine and transaxle. as well as main outer panels:

Engine cylinder block, Transaxle housing, Fender, Door, Quarter panel, Hood, Trunk lid, Bumpers

In addition, a theft-protection label is attached to replacement parts for the body outer panel main components, and the same data are stamped into replacement parts for the engine and the transaxle.

Cautions regarding panel repairs

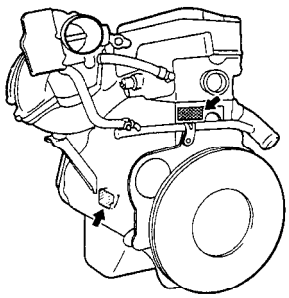
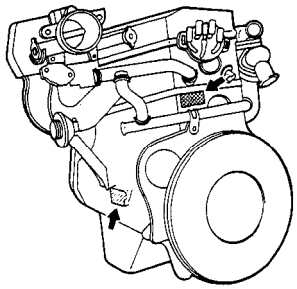
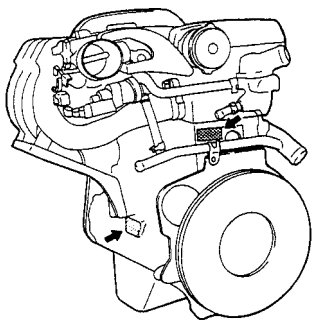
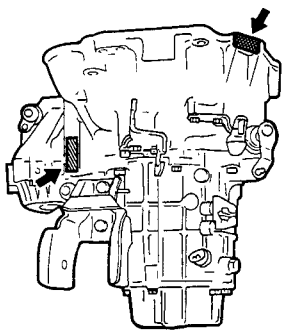
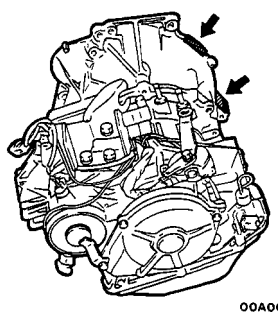
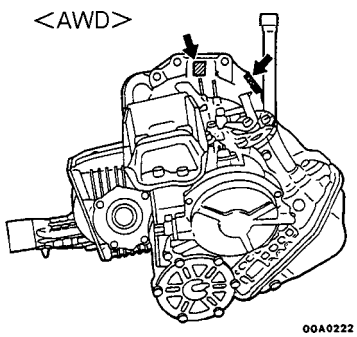
1. When repainting original parts, do so after first masking the theft-protection label, and, after painting, be sure to peel off the masking tape.

2. The theft-protection label for replacement parts is covered by masking tape, so such parts can be painted as is. The masking tape should be removed after painting is finished.

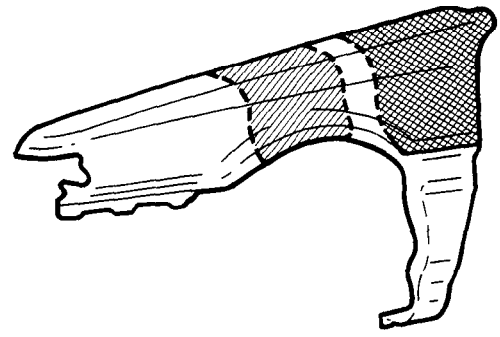
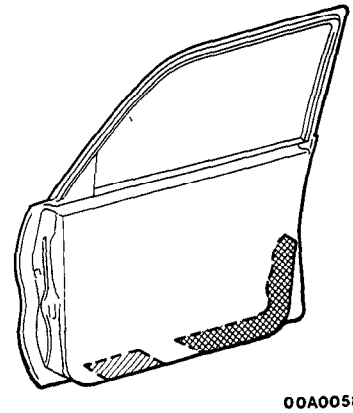
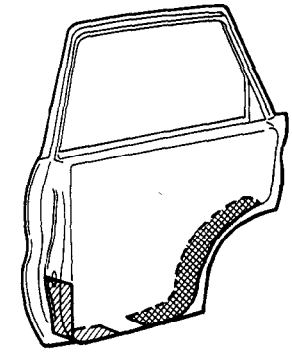
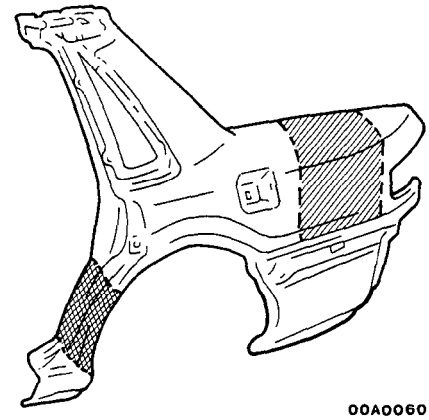
3. The theft-protection label should not be removed from *original parts* or replacement *parts.*

TSB Revision

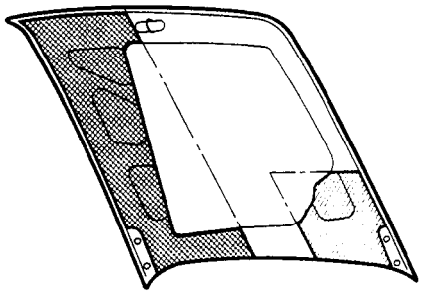
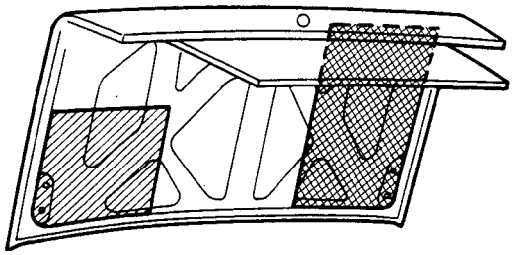
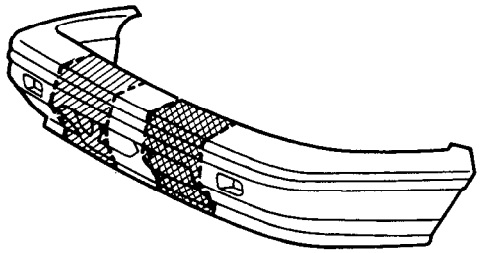
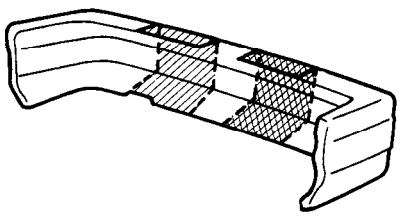
LOCATIONS

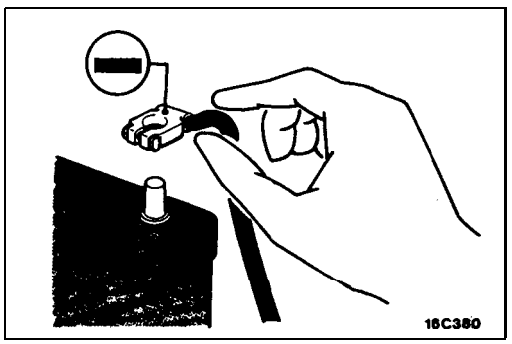
Part	Target area
Engine	: for original equipment parts : for replacement parts SOHC-Up to 1992 models  00A0056 SOHC-I 993 models  00A0231 DOHC  00A0055
ransaxle	Manual transaxle  00A0061 Automatic transaxle <FWD>  00A0062 <AWD>  00A0222

TSB Revision

Part	Target area ▩ : for original equipment parts ▨ : for replacement parts
Fender	 00A0065 The illustration indicates left hand side, outer. Right hand side is symmetrically opposite. The label is attached at the inner side of the parts shown in the figure.
Door	Front  00A0058 Rear  00A0059 The label is attached at the inner side of the parts shown in the figure.
Quarter panel	 00A0060 The illustration indicates left hand side, outer. Right hand side is symmetrically opposite. The label is attached at the inner side of the parts shown in the figure.

TSB Revision

Part	Target area ■ : for original equipment parts ▨ : for replacement parts
Hood	 00A0063 The label is attached at the inner side of the parts shown in the figure.
Trunk lid	 00A0064 The label is attached at the inner side of the parts shown in the figure.
Bumpers	Front bumper  Rear bumper  00A0066 The label is attached at the inner side of the parts shown in the figure.



PRECAUTIONS BEFORE SERVICE M00DAAL

SERVICING ELECTRICAL SYSTEM

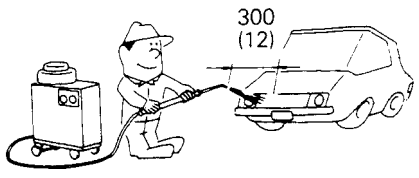
1. Note the following before proceeding with work on the electrical system.
   Note that the following must never be done:
   Unauthorized modifications of any electrical device or wiring, because such modifications might lead to a vehicle malfunction, over-capacity or short-circuit that could result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

TSB Revision

Caution

1. **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.)
2. **For MFI-equipped models, after completion of the work steps [when the battery's negative (–) terminal is connected], warm up the engine and allow it to idle for approximately five minutes under the conditions described below, in order to stabilize engine control conditions, and then check to be sure that the idling is satisfactory.**

   Engine coolant temperature: 85–95°C (185–203°F)
   Lights, electric fans, accessories: OFF
   Transaxle: neutral position
   (A/T models: "N" or "P")
   Steering wheel: neutral (center) position

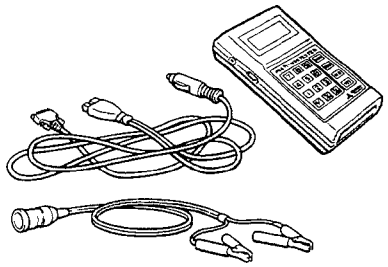


m m (in.) S00059

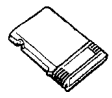
VEHICLE WASHING

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

Scan Tool
(Multi-use tester<MUT>)



ROM pack



SCAN TOOL

(1) To operate the scan tool, refer to the "Scan Tool Operation Instructions".

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

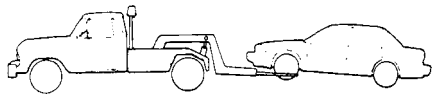
(2) Always use a ROM pack that is appropriate for the vehicle.

ROM pack	Applicable models
MB991307	1989 models
MB991327	1990 models
MB991359	1991 models
MB991423	1992 models
MB991466	1993 models

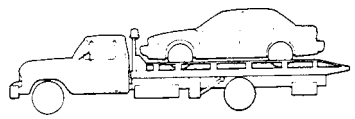
TSB Revision

Sling type

Wheel lift type



Flat bed type



00A0049

TOWING AND HOISTING

M00GAABb

WRECKER TOWING RECOMMENDATION <FWD>

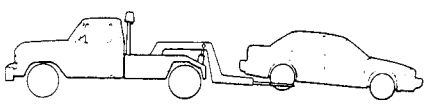
FRONT TOWING PICKUP

Caution
This vehicle cannot be towed by a wrecker using sling-type equipment to prevent the bumper from deformation. If this vehicle is towed, use wheel lift or flat bed equipment.

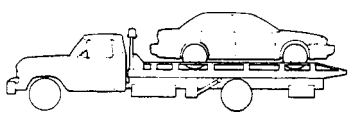
The vehicle may be towed on its rear wheels for extended distances provided the parking brake is released. It is recommended that vehicles be towed using the front pickup whenever possible.

Sling type

Wheel lift type



Flat bed type



00A0048

REAR TOWING PICKUP

Caution
This vehicle cannot be towed by a wrecker using sling-type equipment to prevent the axle beam from deformation. If this vehicle is towed, use wheel lift or flat bed equipment.

Manual transaxle vehicles may be towed on the front wheels, provided the transaxle is in neutral and the drive-line has not been damaged. The steering wheel must be clamped in the straight-ahead position with a steering wheel clamping device designed for towing service use.

Caution
Do not use steering column lock to secure front wheel position for towing.

Automatic transaxle vehicle may be towed on the front wheels at speeds not to exceed 50 km/h (30 mph) for a distances not to exceed 30 km (18 miles).

Caution
If these limits cannot be met, the front wheels must be placed on a tow dolly.

TOWING WHEN KEYS ARE NOT AVAILABLE

When a locked vehicle must be towed and keys are not available, the vehicle may be lifted and towed from the front. provided the parking brake is released. If not released, the rear wheels should be placed on a tow dolly.

TSB Revision

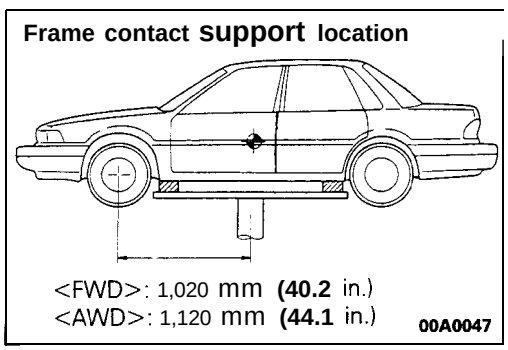
SAFETY PRECAUTIONS

The following precautions should be taken when towing the vehicle.

1. DO NOT LIFT OR TOW THE VEHICLE BY ATTACHING TO OR WRAPPING AROUND THE BUMPER.
2. Any loose or protruding parts of damaged vehicle such as hoods, doors, fenders, trim, etc., should be secured prior to moving the vehicle.
3. Operator should refrain from going under a vehicle while it is lifted by the towing equipment, unless the vehicle in adequately supported by satefy stands.
4. Never allow passengers to ride in a towed vehicle.
5. State and local rules and regulations must be followed when towing a vehicle.

<AWD>

Refer to the section “Special Handling Instructions for AWD Models”.

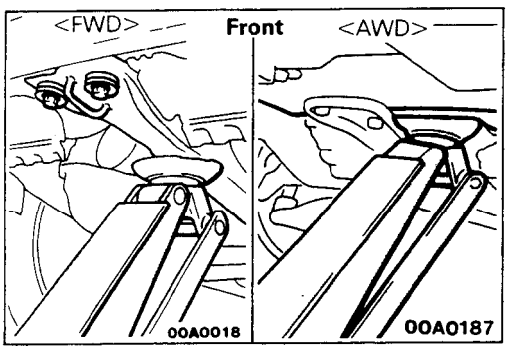


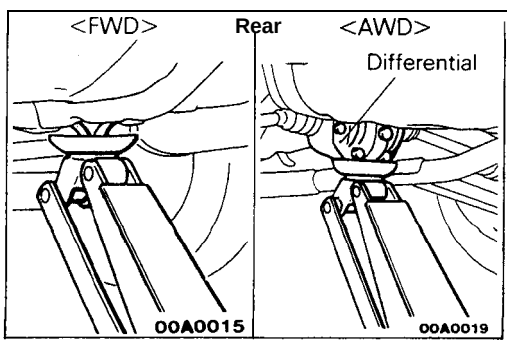
HOISTING

POST TYPE

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

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





FLOOR JACK

The usual type of floor jack is used at the following locations.

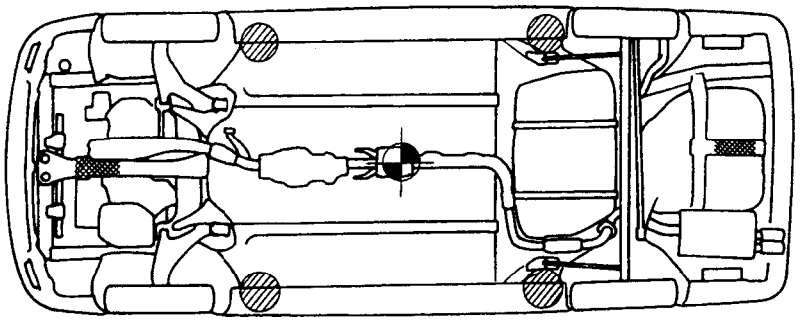
Front:
- <FWD> Under the mid point of centermember
- <AWD> **Under the mid point of crossmember**

Rear:
- <FWD> Under the jack up bracket of rear floor pan
- <AWD> Under the rear differential

Cautions
1. **Never use a jack at the lateral rod or rear suspension assembly. <FWD>**
2. **In order to prevent scarring the centermember <FWD> or crossmember <AWD>, place a piece of cloth on the jack’s contact surface (to prevent corrosion caused by damage to the coating).**
3. **A floor jack must never be used on any part of the underbody.**
4. **Do not attempt to raise one entire side of the vehicle by placing a jack midway between front and rear wheels. This practice may result in permanent damage to the body.**

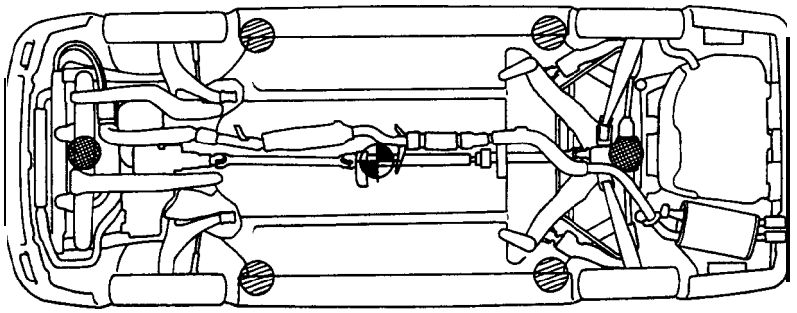
LIFTING, JACKING SUPPORT LOCATION

<FWD>



00A0020

<AWD>



00A0021

Floor jack locations

Approximate center of gravity

Frame contact hoist, twin post hoist or scissors jack (emergency) locations

EMERGENCY JACKING

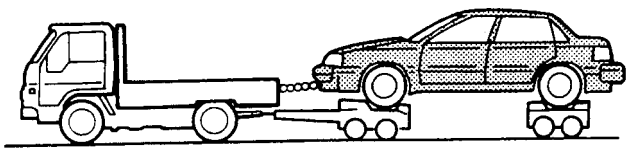
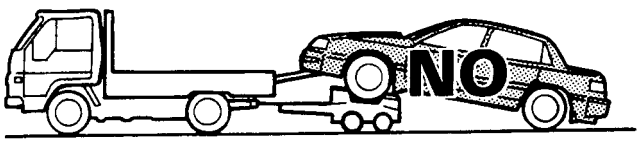
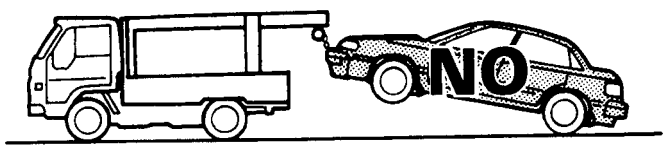
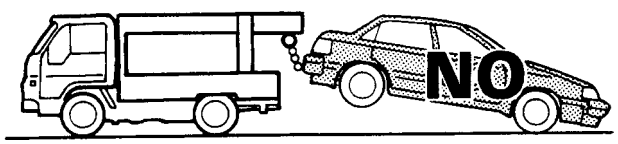
Jack receptacles are located at the body sills to accept the scissors jack supplied with the vehicle for emergency road service. Always block opposite wheels and jack on level surface.

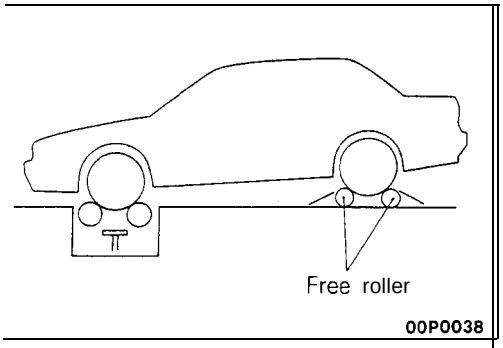
TSB Revision

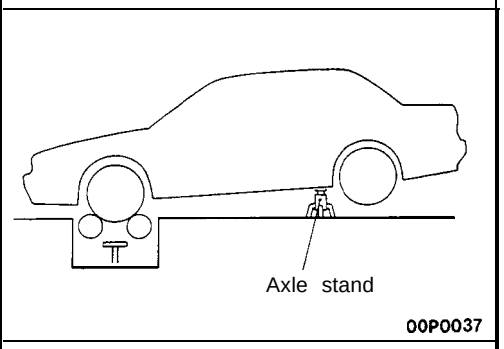
SPECIAL HANDLING INSTRUCTIONS FOR AWD MODELS

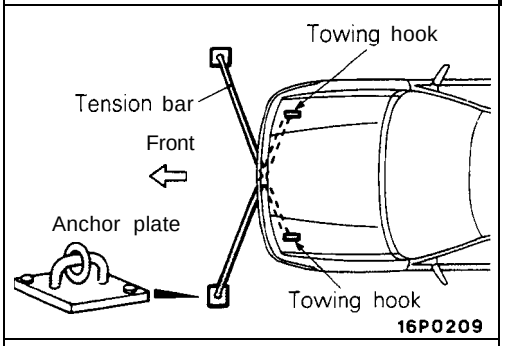
M00UAAB

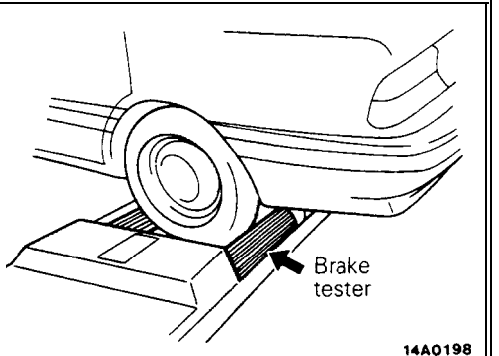
TOWING

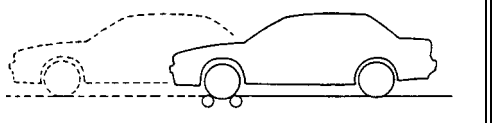
Towing methods	Remarks
If a tow truck is used Lifting method for 4 wheels-Good  00A0032	• For AWD models, the basic principle is that all four wheels are to be raised before towing. • The shift lever should be set to 1 st gear and the parking brake should be applied. <M/T> • The selector lever should be set to "P" position and the parking brake should be applied. <A/T>
Front wheels lifted-No good  00A0034	• 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 and result in the viscous coupling causing the vehicle to jump forward suddenly.
Front wheels lifted-No good  11A0060	• 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  00A0033	











SPEEDOMETER TEST

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 of 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 of 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

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

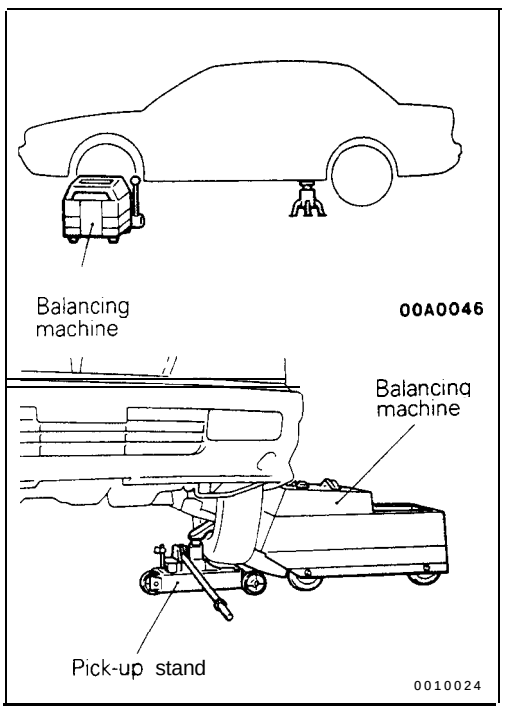
FRONT WHEEL MEASUREMENTS

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.

WHEEL BALANCE

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 tires, 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.

GENERAL DATA AND SPECIFICATIONS

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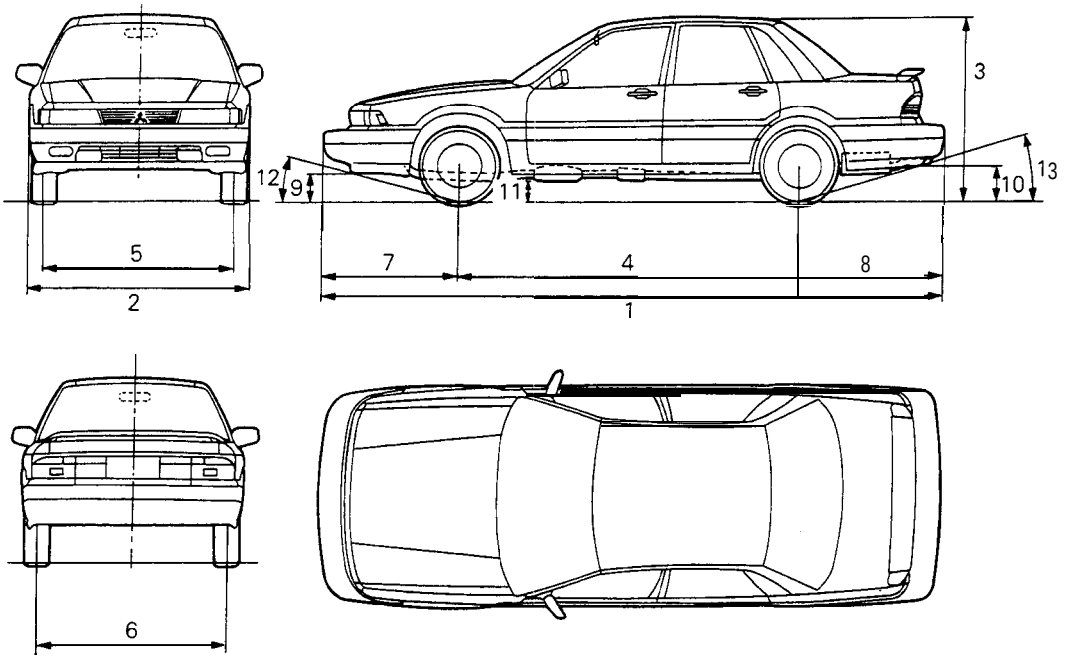

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GENERAL SPECIFICATIONS

<Up to 1992 models>

Items			FWD		AWD	
			SOHC Engine	DOHC Engine	DOHC Engine (Non-Turbo)	DOHC Engine (Turbo)
Vehicle dimensions		mm (in.)				
Overall length		1	4,670 (183.9)	4,670 (183.9)	4,670 (183.9)	4,670 (183.9)
Overall width		2	1,695 (66.7)	1,695 (66.7)	1,695 (66.7)	1,695 (66.7)
Overall height		3	1,425 (56.1)	1.425 (56.1) 1,410 (55.5)"	1,435 (56.5)	1,435 (56.5)
Wheel base		4	2,600 (102.4)	2,600 (102.4)	2,600 (102.4)	2,600 (102.4)
Tread	Front	5	1,460 (57.5)	1,460 (57.5)	1,460 (57.5)	1,460 (57.5)
	Rear	6	1,450 (57.1)	1,450 (57.1)	1,450 (57.1)	1,450 (57.1)
Overhang	Front	7	980 (38.6)	980 (38.6)	980 (38.6)	980 (38.6)
	Rear	8	1,090 (42.9)	1,090 (42.9)	1,090 (42.9)	1,090 (42.9)
Height at curb mass (wt.)						
Front bumper to ground		9	240 (9.4)	250 (9.8)	255 (10.0)	255 (10.0)
Rear bumper to ground		10	215 (8.5)	290 (11.4)	230 (9.1)	230 (9.1)
Minimum running ground clearance		11	115 (4.5)	155 (6.1)	100 (4.0)	100 (4.0)
Angle of approach		12	18.5"	19"	21"	21"
Angle of departure		13	12"	17"	12.5"	12.5"

NOTE
• ':E33ASNXML2M/L7M

TSB Revision

Items	FWD		AWD	
	SOHC Engine	DOHC Engine	DOHC Engine (Non-Turbo)	DOHC Engine (Turbo)
Vehicle weight kg (lbs.)				
Curb weights				
M/T	1.2 10 (2.668)	1,290 (2,844) or 1.3 10 (2,888)*2	1,405 (3,097)	1,495 (3.296)
A/T	1,230 (2.7 12) or 1,270 (2,800)*1	1,300 (2,866)	1,425 (3,142)	
Gross vehicle weight rating	1,700 (3,747)	1,780 (3,923)	1,900 (4,189)	1,900 (4,189)
Gross axle weight rating Front	900 (1,984)	960 (2,116)	960 (2,116)	980 (2.161)
Rear	800 (1.763)	820 (1,807)	940 (2,072)	920 (2,028)
Seating capacity	5	5	5	5
Engine				
Model No.	4G63	4G63	4G63	4G63
Transaxle				
Model No.				
Manual transaxle	F5M22	F5M31	W5M31	W5M33
Automatic transaxle	F4A22	F4A22	W4A32	–
Clutch				
Type	Dry-single disc & diaphragm spring	Dry-single disc & diaphragm spring	Dry-single disc & diaphragm spring	Dry-single disc & diaphragm spring
Chassis				
Tire	185/70R14 87S	195/60R15 86H or 195/65R14 89H	195/60R15 86H	195/60R15 86H
Front suspension				
Type	Independent strut	Independent strut	Independent strut	Independent strut
Rear suspension				
Type	3-Link Torsion axle	3-Link Torsion axle	Double-wishbone	Double-wishbone
Brake				
Type Front	Disc	Disc	Disc	Disc
Rear	Drum	Disc	Disc	Disc
Steering				
Gear type	Rack and pinion	Rack and pinion	Rack and pinion	Rack and pinion
Gear ratio	∞	∞	∞	∞
Fuel tank				
Capacity dm³ (gals.)	6 0 (16)	60 (16)	62 (16.3)	62 (16.3)

NOTE
*1 : E33ASRXEL2M/7M *2: E33ASNXML2M/7M

<1993 models>

Items			FWD	
			SOHC Engine	DOHC Engine
Vehicle dimensions		mm (in.)		
Overall length		1	4,670 (183.9)	4,670 (183.9)
Overall width		2	1,695 (66.7)	1,695 (66.7)
Overall height		3	1,425 (56.1)	1,425 (56.1) 1,410 (55.5)*1
Wheel base		4	2,600 (102.4)	2,600 (102.4)
Tread	Front	5	1,460 (57.5)	1,460 (57.5)
	Rear	6	1,450 (57.1)	1,450 (57.1)
Overhang	Front	7	980 (38.6)	980 (38.6)
	Rear	8	1,090 (42.9)	1,090 (42.9)
Height at curb mass (wt.)				
Front bumper to ground		9	240 (9.4)	250 (9.8)
Rear bumper to ground		10	215 (8.5)	290 (11.4)
Minimum running ground clearance		11	115 (4.5)	155 (6.1)
Angle of approach		12	18.5”	19”
Angle of departure		13	12”	17”
Vehicle weight		kg (tbs.)		
Curb weights				
M/T			1,230 (2,712) or 1,250 (2,755)*2	1,310 (2,888)
A/T			1,250 (2,755) or 1,285 (2,833)*3 or 1,270 (2,800)*4	
Gross vehicle weight rating			1,700 (3,747)	1,780 (3,923)
Gross axle weight rating	Front		900 (1,984)	960 (2,116)
	Rear		800 (1,763)	820 (1,807)
Seating capacity			5	5
Engine				
Model No.			4G63	4G63
Transaxle				
Model No.				
Manual transaxle			F5M22	F5M22
Automatic transaxle			F4A22	
Clutch				
Type			Dry-single disc & diaphragm spring	Dry-single disc & diaphragm spring

NOTE
*1 : E33ASNXML2M/L7M
*2 : E33ASNGEL2M/7M
*3 : E33ASRXEL2M/7M
*4 : E33ASRGEL2M/7M

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ems		FWD	
		SOHC Engine	DOHC Engine
hassis			
Tire		185/70R14 87S	195/60R15 86H
Front suspension			
Type		Independent strut	independent strut
Rear suspension			
Type		3-Link Torsion axle	3-Link Torsion axle
Brake			
Type	Front	Disc	Disc
	Rear	Drum	Disc
Steering			
Gear type		Rack and pinion	Rack and pinion
Gear ratio		∞	∞
Fuel tank			
Capacity	dm^3 (gals.)	60 (16)	60 (16)

ENGINE SPECIFICATIONS

Items		4G63-SOHC	4G63-DOHC (Non-Turbo)	4G63-DOHC (Turbo)
Type		In line, Front Transverse	In line, Front Transverse	In line, Front Transverse
Number of cylinders		4	4	4
Bore	mm (in.)	85 (3.35)	85 (3.35)	85 (3.35)
Stroke	mm (in.)	88 (3.46)	88 (3.46)	88 (3.46)
Piston displacement	cm^3 (cu.in.)	1,997 (122)	1,997 (122)	1,997 (122)
Compression ratio		8.5	9.0	7.8
Firing order		1–3–4–2	1–3–4–2	1–3–4–2

TRANSAXLE SPECIFICATIONS

Items	F5M22	F5M31	W5M31	W5M33	F4A22	W4A32
Type	5-speed M/T	5-speed M/T	5-speed M/T	5-speed M/T	4-speed A/T	4-speed A/T
Gear ratio						
1st	3.363	2.846	2.846	2.846	2.846	2.846
2nd	1.947	1.833	1.684	1.684	1.581	1.581
3rd	1.285	1.217	1.115	1.115	1.000	1.000
4th	0.939	0.888	0.833	0.833	0.685	0.685
5th	0.756	0.731	0.690	0.666	—	—
Reverse	3.083	3.166	3.166	3.166	2.176	2.176
Transaxle						
Primary reduction ratio	4.021	4.913	1.680	1.275	4.007	1.228
Secondary reduction ratio	—	—	3.100	3.866	—	3.600
Transfer	—	—	1.090	1.090	—	1.090

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TIGHTENING TORQUE

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

(1) Bolts, nuts and washers are all mode 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 (ft.lbs.)		
		Head mark ④	Head mark ⑦	Head mark ⑧
M5	0.8	2-3 (1.4-2.2)	4-6 (2.9-4.3)	5-7 (3.6–5.1)
M6	1.0	4-6 (2.9–4.3)	7-11 (5.1–8.0)	8-12 (5.8–8.7)
M8	1.25	9-14 (6.5–10)	17-26 (12-19)	20–30 (14–22)
M10	1.25	19-28 (14–20)	35-55 (25–40)	45–60 (33-43)
M12	1.25	34–50 (25–36)	70–95 (51–69)	85–110 (61–80)
M14	1.5	60–85 (43-61)	120–160 (87-116)	130–180 (94–130)
M16	1.5	95–130 (69–94)	180–240 (130–174)	200–270 (145–195)
M18	1.5	140–190 (101–137)	260–350 (188–253)	300–400 (217–289)
M20	1.5	190–260 (137–188)	360–480 (260–347)	410–560 (297–405)
M22	1.5	260–350 (188–253)	480–650 (347–470)	560–750 (405–542)
M24	1.5	340–460 (246–333)	630–860 (456-622)	740–1,000 (535–723)

Flange bolt and nut tightening torque

Bolt nominal diameter (mm)	Pitch (mm)	Torque Nm (ft.lbs.)		
		Head mark ④	Head mark ⑦	Head mark ⑧
M6	1.0	4-6 (2.9–4.3)	8–12 (5.8–8.7)	9-14 (6.5–10)
M8	1.25	10–15 (7.2-11)	19-28 (14–20)	22-33 (16–24)
M10	1.25	21-31 (15-22)	39–60 (28–43)	50–65 (36–47)
M10	1.5	19-29 (14-21)	36-54 (26–39)	45-65 (33–47)
M12	1.25	38-55 (27–40)	80–110 (58–80)	90–120 (65–87)
M12	1.75	34-52 (25–38)	70–95 (51-69)	85–110 (61–80)

Taper thread tightening torque

Thread size	Torque Nm (ft.lbs.)	
	Female thread material: Light alloy	Female thread material: Steel
NPTF 1/6	5 - 8 (3.6–5.8)	8– 12 (5.8-8.7)
PT 118	8– 12 (5.8–8.7)	16–20 (12–14)
PT 114, NPTF 114	20–30 (14-22)	35-45 (25-33)
PT 3/8	40–55 (29–40)	60–75 (43–54)

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

MASTER TROUBLESHOOTING

M00KAAB

ENGINE OVERHEATS

Symptom	Probable cause	Reference page
Engine overheats	Cooling system faulty	14-5
	Incorrect ignition timing	16-39, 40

ENGINE WILL NOT CRANK OR CRANKS SLOWLY

Symptom	Probable cause	Reference page
Engine will not crank or cranks slowly	Starting system faulty	16-14

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

Symptom	Probable cause	Reference page
Engine will not start or hard to start (Cranks OK)	No fuel supply to injector	13-90, 181, 295
	Injection system problems	13-90, 181, 295
	Ignition system problems	16-32
	Vacuum leaks • Purge control valve hose • Vacuum hoses • intake manifold • Intake manifold plenum • Throttle body • EGR valve	17-3
	Compression too low	11-6

ROUGH IDLE OR ENGINE STALL

Symptom	Probable cause	Reference page or remedy
Rough idle or engine stalls	Vacuum leaks • Purge control valve hose • Vacuum hoses • Intake manifold • Intake manifold plenum • Throttle body • EGR valve	17-3
	Ignition system problems	16-32
	Idle speed set too low	Check idle speed control system
	Idle mixture too lean or too rich	–
	Fuel injection system problems	13-8, 119, 205
	Exhaust gas recirculation (EGR) system problems	17-22
	Engine overheats	14-5
	Compression too low	11-6

ENGINE HESITATES OR POOR ACCELERATION

Symptom	Probable cause	Reference page
Engine hesitates or poor acceleration	Ignition system problem	16-32
	Vacuum leaks • Purge control valve hose • Vacuum hoses • Intake manifold • Intake manifold plenum • Throttle body • EGR valve	17-3
	Air cleaner clogged	–
	Fuel line clogged	
	Fuel injection system problem	13-8, 119, 205
	Emission control system problem • EGR system always on	17-22
	Engine overheats	14-5
	Compression too low	11-6

ENGINE DIESELING

Symptom	Probable cause	Reference page
Engine dieseling (runs after ignition switch is turned off)	Incorrect ignition timing	16-39, 40

EXCESSIVE OIL CONSUMPTION

Symptom	Probable cause	Reference page or remedy
Excessive oil consumption	Oil leak	Repair as necessary.
	Valve stem seal worn or damaged.	Repair as necessary.
	Valve stem worn.	Repair as necessary.
	Piston ring worn or damaged.	Repair as necessary.

POOR FUEL MILEAGE

Symptom	Probable cause	Reference page or remedy
Poor fuel mileage	Fuel leak	Repair as necessary.
	Air cleaner clogged.	–
	Ignition system problems.	16-32
	Fuel injection system problems.	13-8, 119, 205
	Compression too low.	11-6
	Tires improperly inflated.	31-3
	Clutch slips.	21-4
	Brakes drag.	35-13

NOISE

Symptom	Probable cause	Reference page or remedy
Noise	Loose bolts and nuts.	Retighten as necessary.
	Engine noise	Repair as necessary.

HARD STEERING

Symptom	Probable cause	Reference page or remedy
Hard steering	Loose power steering oil pump belt	37A-21
	Low fluid level	Replenish
	Air in power steering system	37A-22
	Low tire pressure	31-3
	Excessive turning resistance of lower arm ball joint	33A-11
	Excessively tightened of steering gear box rack support cover	37A-33
	Improper front wheel alignment	33A-5
	Excessive turning resistance of tie-rod ball joint	37A-15, 33
	Malfunctioning electronic controlled power steering system	37A-9
	Sticky flow control valve	37A-50, 51
	Bent rack in steering gear box	37A-42

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POOR RETURN OF STEERING WHEEL TO CENTER

Symptom	Probable cause	Reference page
Poor return of steering wheel to center	Improper front wheel alignment	33A-5
	Improper tire pressure	31-3
	Excessive tightened rack support cover	37A-35, 36, 37
	Damaged front wheel bearing	26-9

POOR RIDING

Symptom	Probable cause	Reference page or remedy
Poor riding	Improper tire pressure	31-3
	Imbalanced wheels	Repair
	Improper front or rear wheel alignment	33A-5 34-5, 11, 23, 35
	Malfunctioning shock absorber	
	Malfunctioning electronic control suspension system	33B-90
	Broken or worn stabilizer	33A-6, 13, 17 34-11, 35, 37
	Broken or worn coil spring	
	Loose suspension securing bolt(s)	Retighten
	Worn lower arm bushing	33A-10
	Worn suspension arm bushing	33A-10

ABNORMAL TIRE WEAR

Symptom	Probable cause	Reference page
Abnormal tire wear	Improper front or rear wheel alignment	33A-5 34-5, 23
	Improper tire pressure	31-3
	Imbalanced wheels	
	Loose wheel bearings	27-3, 15
	Malfunctioning shock absorber	33A-6 34-11, 35

ROAD WANDER

Symptom	Probable cause	Reference page
Road wander	Improper front or rear wheel alignment	33A-5 34-5, 23
	Excessive play of steering wheel	37A-15
	Poor turning resistance of lower arm ball joint	33A-11
	Improper tire pressure	31-3
	Loose or worn lower arm bushing	33A-10 26-9
	Loose or worn wheel bearings	
	Loose rack support cover in steering gear box	37A-35, 36, 37

VEHICLE PULLS TO ONE SIDE

Symptom	Probable cause	Reference page
Vehicle pulls to one side	Improper front or rear wheel alignment	33A-5 34-5, 23
	Imbalanced or worn tires	31-3
	Uneven tire pressure	
	Excessive turning resistance of lower arm ball joint	33A-11
	Wheel bearing seizure	Replace
	Broken or weak coil spring	33A-7
	Bent front *axle* drive shaft	26-13
	Deformed lower arm	33A-10

STEERING WHEEL SHIMMY

Symptom	Probable cause	Reference page or remedy
Steering wheel shimmy	Improper front or rear wheel alignment	33A-5 34-5, 23
	Improper tire pressure	31-3
	Imbalanced wheels	Replace
	Poor turning resistance of lower arm ball joint	33A-11
	Excessive play of steering wheel	37A-15
	Broken or weak front stabilizer	33A-13, 17
	Worn lower arm bushing	33A-10
	Malfunctioning shock absorber	33A-6 34-11, 3 5
	Broken or weak coil spring	
	Wear, play, or seizure of wheel bearing	Replace
	Wear, play, or seizure of drive shaft ball joint	26-12

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BOTTOMING

Symptom	Probable cause	Reference page or remedy
Bottoming	Overloaded vehicle	Correct
	Broken or weak coil spring	33A-6 34-11, 35
	Malfunctioning , shock absorber	

WHEEL BEARING TROUBLESHOOTING

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

LUBRICATION AND MAINTENANCE

M00PA--

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

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

MAINTENANCE SCHEDULES

Information for service maintenance is provided under "SCHEDULED MAINTENANCE TABLE".

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

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

SEVERE SERVICE

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

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

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

ENGINE OIL

The SAE grade number indicates the viscosity of engine oils, for example, SAE 30, which is a single grade oil. Engine oils are also identified by a dual number, for example, SAE 1 0W-30, which indicates a multigrade oil.

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

Caution

Test results submitted to EPA have shown that laboratory animals develop skin cancer after prolonged contact with used engine oil. Accordingly, the potential exists for humans to develop a number of skin disorders, including cancer, from such exposure to used engine oil. Care should be taken, therefore, when changing engine oil, to minimize the amount and length of exposure time to used engine oil on your skin. Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.

GEAR LUBRICANTS

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

The API classfication system defines gear lubricants in terms of usage. Typically gear lubricants conforming to API GL-4 or GL-5 with a viscosity of SAE 75W-85W are recommended for manual transaxle.

LUBRICANTS – GREASES

Semi-solid lubricants, bear the NLGI designation and are further classified as grades 0, 1, 2, 3 etc. Whenever "Chassis Lubricant" is specified, Multi-Purpose Grease, NLGI grade 2 should be used.

FUEL USAGE STATEMENT

Your vehicle must use unleaded gasoline only.

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

Caution

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

All vehicles except those with DOHC engines

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

Vehicles equipped with DOHC engines

Your vehicle is designed to operate on premium unleaded gasoline having a minimum octane rating of 91 or 95 RON (Research Octane Number).

If premium unleaded gasoline is not available, unleaded gasoline having a octane rating of 87 or 91 RON (Research Octane Number) may be used. In this case, the performance and fuel consumption will suffer a little degradation.

Gasolines containing alcohol

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

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

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

Gasolines containing MTBE (Methyl Tertiary Butyl Ether)

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

MATERIALS ADDED TO FUEL

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

RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE

M00RA--

RECOMMENDED LUBRICANTS

Items	Recommended lubricants
Engine Oil	API classification SG or SG/CD (For further details, refer to SAE viscosity number)
Manual Transaxle, Transfer <AWD>	API classification GL-4 or higher, SAE 75W–85W
Rear Axle <AWD>	Refer to P.00-37.
Automatic Transaxle	DIAMOND ATF SP or equivalent
Power Steering	Automatic transmission fluid “DEXRON II”
Brake and Clutch	Conforming to DOT3 or DOT4
Engine Coolant	DIA-QUEEN LONG-LIFE COOLANT (Part No. 0103044) or High quality ethylene-glycol antifreeze coolant
Door Hinges	Engine oil

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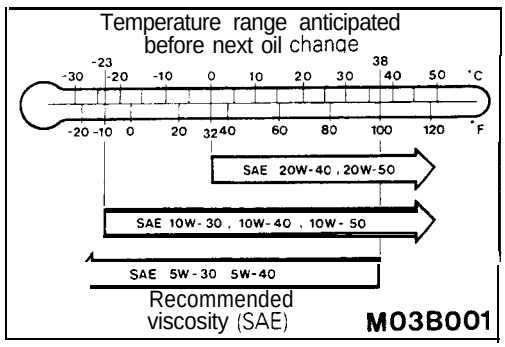
LUBRICANT CAPACITIES TABLE

Description	Metric measure	U.S. measure
Engine Oil		
Crankcase		
Models built up to April 1992		
<SOHC>	3.5 dm^3	3.7 qts.
<DOHC>	4.0 dm^3	4.2 qts.
Models built from May 1992	4.0 dm^3	4.2 qts.
Oil filter	0.3 dm^3	1/2 qt.
Oil cooler <Turbo>	0.3 dm^3	1/2 qt.
Cooling System (including heater and coolant reserve system)	7.2 dm^3	7.6 qts.
Manual Transaxle		
<FWD> F5M22	1.8 dm^3	1.9 qts.
F5M31	2.3 dm^3	2.4 qts.
<AWD>	2.3 dm^3	2.4 qts.
Transfer <AWD>	0.6 dm^3	0.6 qt.
Rear Axle <AWD>	0.7 dm^3	0.7 qt.
Automatic Transaxle		
<FWD>	6.1 dm^3	5.4 qts.
<AWD>	6.5 dm^3	6.9 qts.
Power Steering	0.9 dm^3	0.9 qt.
Fuel Tank		
<FWD>	60 dm^3	15.9 gals.
<AWD>	62 dm^3	16.4 gals.



SELECTION OF LUBRICANTS

ENGINE OIL

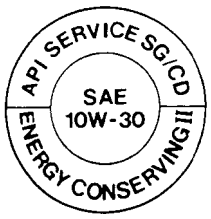
Engine oil should be used which conform to the requirements of the API classification "For Service SG" or "For Service SG/CD", and have the proper SAE grade number for the expected temperature range.

Caution

Nondetergent or straight mineral oil must never be used.

Energy Conserving Oil

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



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Oil Identification Symbol

A standard symbol appears on the top of oil containers and has three district areas for identifying various aspects of the oil. The top portion will indicate the quality of the oil. The center portion will show the SAE viscosity grade, such as SAE 10W-30. "Energy Conserving" shown in the lower portion, indicates that the oil has fuel-saving capabilities.

REAR AXLE

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

SELECTION OF COOLANT

COOLANT

Relation between Antifreeze Concentration and Specific Gravity

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

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

Cautions

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

2. Do not use a mixture of different brands of anti-freeze.

SCHEDULED MAINTENANCE TABLE

M00QA--

SCHEDULED MAINTENANCE SERVICES FOR EMISSION CONTROL AND PROPER VEHICLE PERFORMANCE

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

No.	Emission Control System Maintenance	Service Intervals	Kilometers in Thousands	24	48	72	80	96
			Mileage in Thousands	15	30	45	50	60
1	Check Fuel System (Tank, Line and Connections and Fuel Tank Filler Tube Cap) for Leaks Every 5 Years	or						X
2	Check Fuel Hoses Every 2 Years for leaks or damage	or			X			X
3	Replace Air Cleaner Element	at			X			X
4	Replace Spark Plugs	at			X			X

GENERAL MAINTENANCE SERVICE FOR PROPER VEHICLE PERFORMANCE

No.	General Maintenance		Service Intervals	Kilometers in Thousands	24	48	72	80	96
				Mileage in Thousands	15	30	45	50	60
5	Timing Belt (Including the Balancer Belt)		Replace	at					X
6	Drive Belt (for Water Pump and Generator)		Inspect for tension	at		X			X
7	Engine Oil	Non-Turbo	Change Every Year	or	Every 12,000 km (7,500 miles)				
		Turbo	Change Every 6 Months	or	Every 8,000 km (5,000 miles)				
8	Engine Oil Filter	Non-Turbo	Change Every Year	or		X	X	X	X
		Turbo	Change Every Year	or	Every 16,000 km (10,000 miles)				
9	Manual Transaxle Oil		Inspect Oil Level	at		X			X
10	Automatic Transaxle Fluid		Inspect Fluid Level Every Year	or		X	X	X	X
			Change Fluid	at		X			X
11	Engine Coolant		Replace Every 2 Years	or		X			X
12	Disc Brake Pads		inspect for Wear Every Year	or	X	X	X		X
13	Drum Brake Linings and Rear Wheel Cylinders		Inspect for Wear and Leaks Every 2 Years	or		X			X
14	Brake Hoses		Check for Deterioration or Leaks Every Year	or		X	X	X	X
15	Ball Joint and Steering Linkage Seals		Inspect for Grease Leaks and Damage Every 2 Years	or		X			X
16	Drive Shaft Boots		Inspect for Grease Leaks and Damage Every Year	or	X	X	X		X
17	Rear Axle <AWD>		Change Oil	at		X			X
18	Exhaust System (Connection Portion of Muffler, Pipings and Converter Heat Shields)		Check and Service as Required Every 2 Years	or		X			X

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SCHEDULED MAINTENANCE UNDER SEVERE USAGE CONDITIONS

The maintenance items should be performed according to the following table:

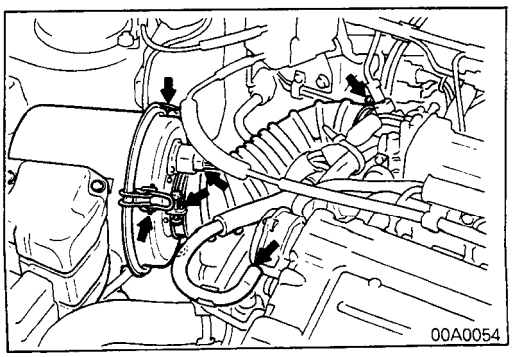
Maintenance Item	Service to be Performed	Mileage Intervals Kilometers in Thousands (Miles in Thousands)									Severe Usage Conditions						
		12 (7.5)	24 (15)	36 (22.5)	48 (30)	60 (37.5)	72 (45)	80 (50)	84 (52.5)	96 (60)	A	B	C	D	E	F	G
Air Cleaner Element	Replace	More Frequently									X				X		
Spark Plugs	Replace		X		X		X			X		X		X			
Engine Oil	Change Every 3 Months or	Every 4,800 km (3,000 miles)									X	X	X	X			X
Engine Oil Filter	Replace Every 6 Months or	Every 9,600 km (6,000 miles)									X	X	X	X			X
Disc Brake Pads	Inspect for Wear	More Frequently									X				X		
Rear Drum Brake Linings and Rear Wheel Cylinders	Inspect for Wear and Leaks	More Frequently									X				X		

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

MAINTENANCE SERVICE

1. FUEL SYSTEM (Tank, Lines, Connections and Fuel Tank Filler Tube Cap) (Check for leaks)/2. FUEL HOSES (Check for leaks or damage) M00SAGBa

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



3. AIR CLEANER ELEMENT (Replace) M00SAKH

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

<Non-Turbo>

(1) Loosen the clamp coupling the air intake hose and the air cleaner cover, and separate the hose.
(2) Disconnect the volume air flow sensor connectors.
(3) Unclamp the air cleaner cover clip.
(4) Lifting **the air intake** hose, remove the air cleaner cover.

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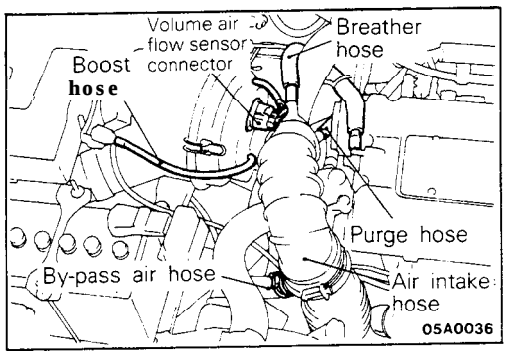
Caution
The air cleaner cover should be removed carefully, because it includes the volume air flow sensor.

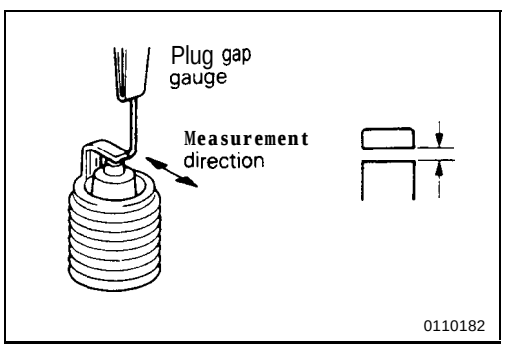
(5) Remove the air cleaner element.
(6) Set a new air cleaner element and install the air cleaner cover.



<Turbo>
(1) Disconnect the volume air flow sensor connector.
(2) Disconnect the breather hose, purge hose, by-pass air hose and boost hose connections.
(3) Remove the air intake hose on the air cleaner cover side and then move the air intake hose to the front of the air cleaner body.
(4) Unclamp the air cleaner cover.

Caution
Care must be taken when removing the air cleaner cover, because the volume air flow sensor is attached.

(5) Take out the air cleaner element.
(6) Check the air cleaner element for dirt or clogging; if necessary, clean by using compressed air.
(7) Replace the air cleaner element if the dirt or clogging is serious.
(8) Insert the element into the air cleaner body and install the air cleaner cover.
(9) Install the air intake hose.
(10) Connect the breather hose, purge hose, by-pass air hose and boost hose.
(11) Connect the volume air flow sensor connector.



4. SPARK PLUGS (Replace) M00SAOFa

1. Spark plugs must spark properly to assure proper engine performance and reduce exhaust emission level.
   Therefore, they should be replaced periodically with new ones.
2. The new plugs should be checked for the proper gap.

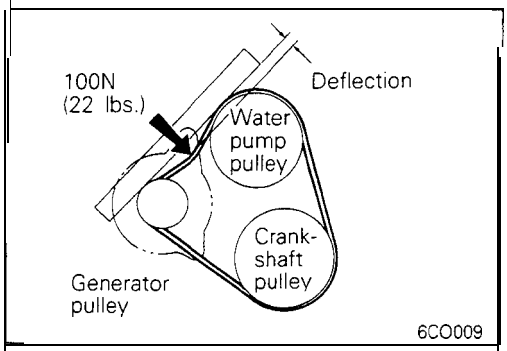
Spark plug gap:

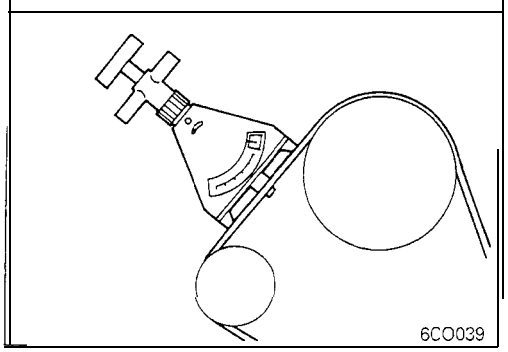
<Non-Turbo>	**1.0–1.1 mm (.039–.043 in.)**
<Turbo>	**0.7–0.8 mm (.028–.031 in.)**

3. Install the spark plug and tighten to 20–30 Nm (15-21 ft.lbs.).

5. TIMING BELT (Replace) M00SBABa

Replace the belt with a new one periodically to assure proper engine performance.
For disassembly and reassembly procedures, refer to GROUP 11 -Service Adjustment Procedures.





6. DRIVE BELT (For Water Pump and Generator) (Inspect for tension) M00SBBN

(1) Place straight edge as shown in the illustration.
(2) Measure the deflection with a force of 100 N (22 lbs.) applied to belt mid-point between water pump pulley and generator pulley. If the standard value is not obtained, make adjustment.

Standard value: 9.0–11.5 mm (.354–.453 in.)

(3) Use a tension gauge to check the belt tension. If the standard value is not obtained, make adjustment. When tension gauge is used, the tension may be measured between any two pulleys.

Standard value: 250–500 N (55–110 lbs.)

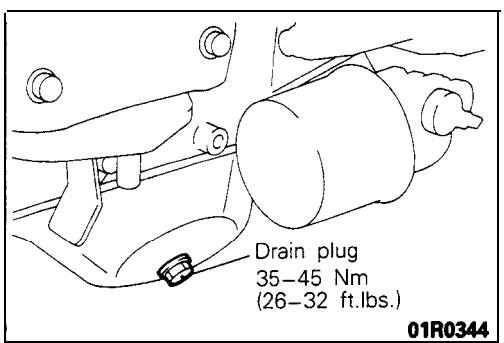
7. ENGINE OIL (Change) M00SAABc

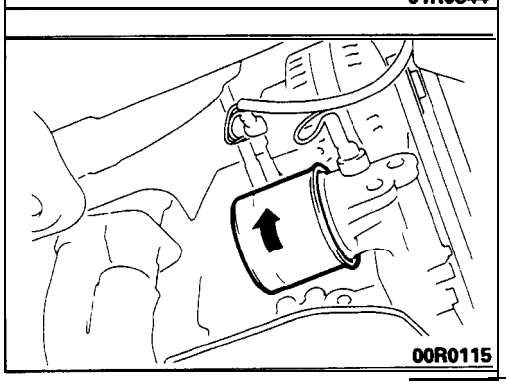
Always use lubricants which conform to the requirements of the API classification "For Service SG" or "For Service SG/CD" when available, and have the proper SAE grade number for the expected temperature range.
Never use nondetergent or straight mineral oil.
(1) After warming up the engine, remove the oil filler cap.
(2) Remove the drain plug to drain the engine oil.
(3) Replace the drain plug gasket with a new one and tighten the drain plug.
(4) Supply new engine oil through the oil filler.

Engiine oil capacity:

Items			Engine oil capacity
Oil pan	Models built up to April 1992	SOHC	3.5 dm^3 (3.7 qts.)
		DOHC	4.0 dm^3 (4.2 qts.)
	Models built from May 1992		4.0 dm^3 (4.2 qts.)
Oil filter			0.3 dm^3 (1/2 qt.)
Oil cooler (only models with turbo)			0.3 dm^3 (1/2 qt.)

(5) Start and run the engine a few minutes.
(6) Stop the engine and check the engine oil level.





8. ENGINE OIL FILTER (Change) M00SABG

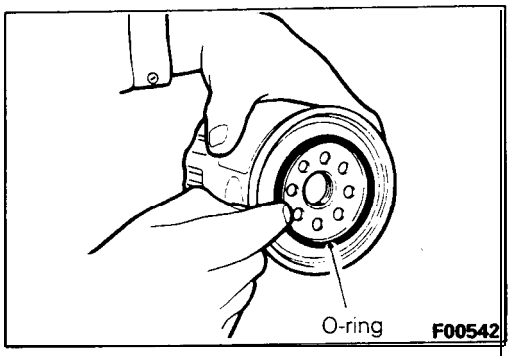
The quality of replacement filters varies considerably. Only high quality filters should be used to assure most efficient service.
Genuine oil filters require that the filter is capable of withstanding a pressure of 256 psi are high quality filters and are recommended as follows:

Oil Filter Part No.
Mitsubishi Genuine Parts: MD135737, MD136466

ENGINE OIL FILTER SELECTION

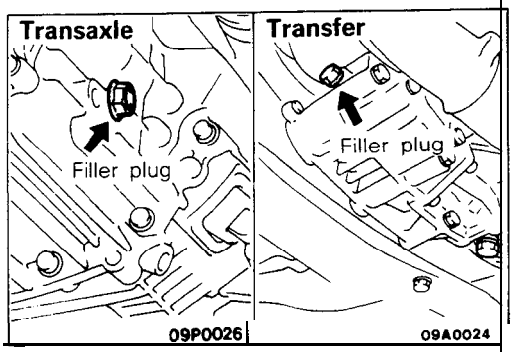
This vehicle is equipped with a full-flow, throw-away oil filter.
The same type of replacement filter is recommended as a replacement filter for this vehicle. It is possible, particularily in cold weather, that this vehicle may develop high oil pressure for a short duration. You should be sure that any replacement filter used on this vehicle is a high-quality filter and is capable of withstanding a pressure of 256 psi (manufacturer's specifications) to avoid filter and engine damage. The following is a high-quality filter and is strongly recommended for use on this vehicle : Mitsubishi Engine Oil Filter Part No. MD1 35737 or MD1 36466.

Any replacement oil filter should be installed in accordance with the oil filter manufacturer's installation instructions.
(1) Remove the engine oil filler cap.
(2) Remove the engine oil drain plug, and drain out the engine oil.
(3) Remove the engine oil filter by using the oil filter wrench.
(4) Clean the oil filter mounting surface of the oil filter bracket.



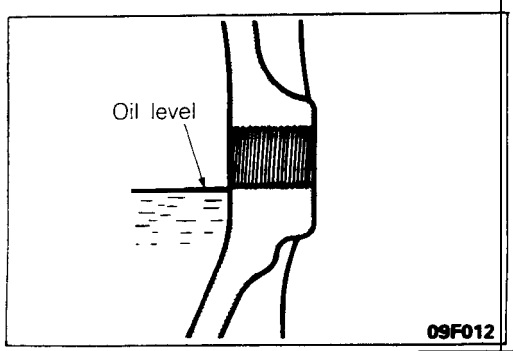
(5) Coat engine oil to the O-ring of new oil filter.
(6) Screw in the oil filter with hand until it touches the surface of the flange and then tighten it with the filter wrench, etc.
- For MD135737: One full turn or 14 Nm (10ft. lbs.)
- For MD136466: 3/4 turn or 17 Nm (12 ft. lbs.)

(7) Supply engine oil.
(8) Start and run engine and check for engine oil leaks.
(9) After stopping engine, check oil level and replenish as necessary.



9. MANUAL TRANSAXLE (Inspect oil level) M00SBCE

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. With the vehicle parked at a level place, remove the filler plug and check to be sure that the oil level is up to the lower edge of the filler plug hole.
2. Check to be sure that the transmission oil is not noticeably dirty, and that it has a suitable viscosity.

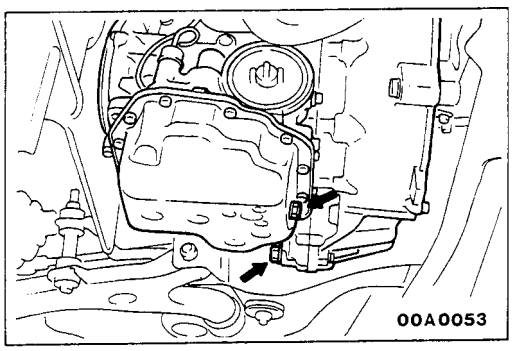


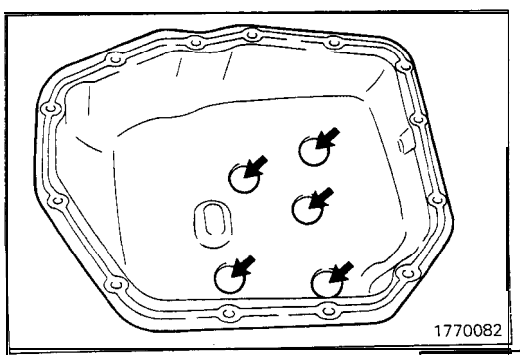
10.AUTOMATIC TRANSAXLE M00SBDA

Inspect fluid level

1. Drive until the fluid temperature reaches the usual ternperature [70–80°C (160–180°F)].
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. This operation is necessary to be sure that fluid level check is accurate.
4. Before removing dipstick, wipe all dirt from area around dipstick. Then take out the dipstick and check the condition of the fluid.
   The transaxle should be overhauled under the following conditions.
   - If there is a "burning" odor.
   - If the fluid color 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 dipstick. If fluid level is low, add ATF until level reaches "HOT" range.
   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.
   Improper filling can also raise fluid level too high. When transaxle has too much fluid, gears churn up foam and cause same conditions which occur with low fluid level, resulting in accelerated deterioration of ATF.
   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 transaxle vent where it may be mistaken for a leak.
6. Be sure to examine fluid on dipstick closely.

Change fluid





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) Rernove drain plugs to let fluid drain.
(2) Rernove the oil pan.
(3) Check the oil filter for clogging and damage and replace if necessary.
(4) Clean the inside of oil pan and 5 magnets.
(5) Attach the five magnets to the concave part of the oil pan.
(6) Clean both gasket surfaces of transaxle case and oil pan.
(7) Install oil pan with new gasket and tighten oil pan bolts to 10–1 2 Nm (7.5-8.5 ft.lbs.)
(8) Tighten drain plug with gasket to 30–35 Nm (22-25 ft.lbs.).
(9) Supply 4 dm^3 (4.23 qts.) of specified ATF into case through dipstick hole. [Total quantity of ATF required is 6.1 dm^3 (6.45 qts.).
Actually however, approx. 4.5 dm^3 (4.76 qts.) of fluid can be replaced because rest of fluid remains in torque converter.]

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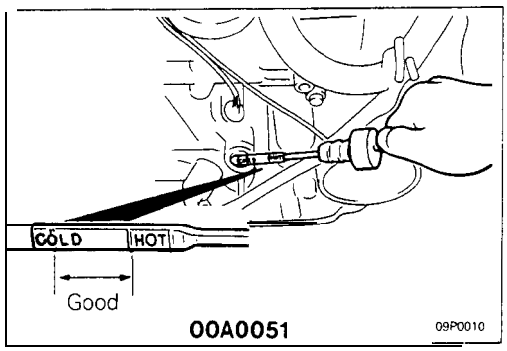


(10) Start engine and allow to idle for at least two minutes. Then, with parking brake on, move selector lever momentarily to each position, ending in "N" Neutral position.

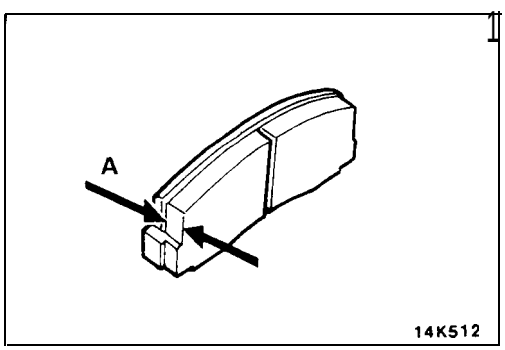
(11) Add sufficient ATF to bring fluid level to lower mark. Recheck fluid level after transaxle is at normal **Operating** temperature.
Fluid level should be between upper and lower marks of "HOT" range, Insert dipstick fully to prevent dirt from entering transaxle.

11 .ENGINE COOLANT (Change) M00SBEAc

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

CHANGE COOLANT

1. Remove the radiator cap.
2. Loosen the drain plug to drain the coolant.
3. Drain the coolant from the reserve tank.
4. After draining the coolant, tighten the drain plug securely.
5. Supply the coolant into the radiator until it is filled up to its filler neck.
6. Supply the coolant into the reserve tank.
7. After warming the engine until the thermostat opens, remove the radiator cap and check the coolant level.
8. Supply the coolant into the radiator until it is filled up to its filler neck, and install the radiator cap securely.
9. Fill the reserve tank with coolant up to the "FULL" line.



12.DISC BRAKE PADS (Inspect for wear) M00SBFA

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

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

Thickness of lining (A)
Limit: 2.0 mm (.08 in.)

13.REAR DRUM BRAKE LININGS AND REAR WHEEL CYLINDERS (Inspect for wear and leaks) M00SBGB

1. Remove the brake drum and check the thickness of brake shoe lining for wear. Check the automatic brake adjusting system by hand to see if it operates smoothly. Also see if the gears are in proper mesh with each other. To assure smooth functioning, apply a very thin coat of multipurpose grease to the friction surface of adjuster and link shaft.

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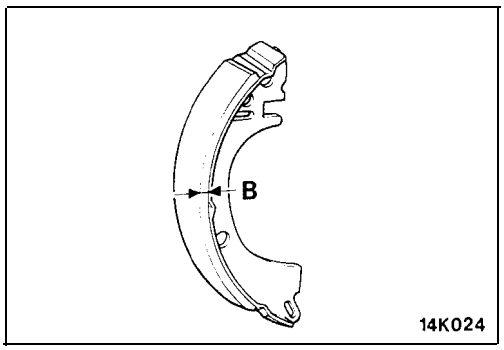


2. Inspect the wheel cylinder boots for evidence of a brake fluid leak. Visually check the boots for cuts, tears or heat cracks. (A slight amount of fluid on the boot may not be a leak, but may be preservative fluid used at assembly.)

Checking the Brake Shoes for Wear.

Thickness of lining (B)
Limit: 1.0 mm (.04 in.)

14. BRAKE HOSES (Check for deterioration or leaks) MOOSBHA

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

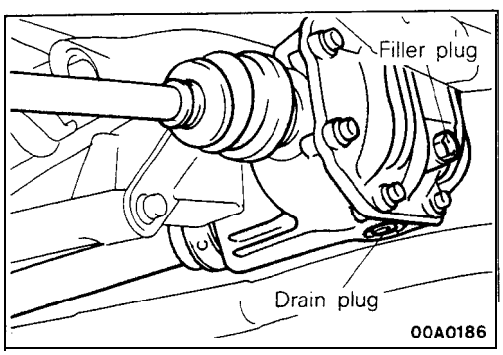
The hoses should be checked for:

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

15. BALL JOINT AND STEERING LINKAGE SEALS (Inspect for grease leaks and damage) M00SBJAa

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

16. DRIVE SHAFT BOOTS (Inspect for grease leaks and damage) M00SBJAb



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

17. REAR AXLE (Inspect oil level)-AWD M00SBPCa

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

18. EXHAUST SYSTEM (CONNECTION PORTION OF MUFFLER, PIPING AND CONVERTER HEAT SHIELDS) (Check and service as required) M00SBLA

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

TABLE OF MAIN SEALANTS AND ADHESIVES

MONA--

Application	Recommended brand
1. Sealing for engine accessory parts (1) Sealing for semi-circular packing of rocker cover and cylinder head	3M ATD Part No. 8660 or equivalent
(2) • Sealing for semi-circular packing and rocker cover, cylinder head • Oil pressure switch	3M ATD Part No. 8660 or equivalent
(3) • Engine coolant temperature switch • Engine coolant temperature sensor • Thermal vacuum valve • Thermo switch • Engine coolant temperature gauge unit • Joint	3M Nut Locking Part No. 4171 or equivalent
(4) Oil pan	MITSUBISHI GENUINE Part No. MD997110 or equivalent
2. Sealing for weatherstrip (1) • Sealing of tempered glass and weatherstrip	3M ATD Part No. 8513 or equivalent
• Sealing of body flange and weatherstrip	3M ATD Part No. 8509 or equivalent
(2) Sealing of laminated glass and weatherstrip	3M ATD Part No. 8509 or equivalent
3. Gluing with ribbon sealer • Door waterproof film • Fender panel • Splash shield • Mud guard • Rear combination light	3M ATD Part No. 8625 or equivalent

TSB Revision

Application	Recommended brand
4. Interior adhesive (1) Gluing of vinyl chloride leather cloth	3M Part No. EC-I 368 or equivalent
(2) Gluing of door weatherstrip and body	3M ATD Part No. 8001 or 3M ATD Part No. 8011 o equivalent
(3) Sealing of grommets, packing and metal	3M ATD Part No. 8513 or equivalent
(4) • Gluing of headlining, interior materials • Gluing of fuel tank and pad	3M Part No. EC-1368 or 3M ATD Part No. 8080 or equivalent
5. Body sealant • Sealing of sheet metal joints such as sheet metal, drip rail, floor, body side panel, trunk, front panel, etc. • Sealing of tailgate hinge	3M ATD Part No. 8531 or 3M ATD Part No. 8646 or equivalent
Chassis sealant (1) • Sealing of flanges and screws • Fuel gauge unit packing	3M ATD Part No. 8659 or equivalent
(2) Sealing of flange surfaces, screws, packing and dust cover • Differential carrier packing • Dust cover for ball joint and linkage • Packing for steering gear box, shims • Rack support cover and top cover for steering gear housing • Joints, etc. of knuckle arm flanges	3M ATD Part No. 8663 or equivalent
(3) Sealing of accelerator arm bracket and firewall	Drying sealant

Application	Recommended brand
(4) Sealant for drum brake shoe hold-down pin, wheel cylinder	3M ATD Part No.8513 or equivalent
7. Instant super-strong adhesive • Gluing of all kinds of material <Exceptions are plyethylene, polypropylene, fluororesin and other surface absorbent materials>	3M ATD Part No.8155 or equivalent
3. Anaerobic super-strong adhesive (1) Fixing of screws, bolts, etc. • Tightening parts for drive gear and differential case • Tilt steering upper, lower column joint bolt (2) Fixing of joints of bearings, fan, pulley, gear, etc. (3) Sealing of small gaps and flange surface	3M Stud locking Part No.4170 or equivalent
(4) Steering angle stopper bolt (Jeep)	3M Nut locking Part No.4171 or equivalent
). Undercoating	3M ATD Part No.8864 or equivalent

ENGINE

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  - Timing Belt Noise

ENGINE <SOHC>

SPECIFICATIONS

GENERAL SPECIFICATIONS

M11CA-A

Items		Specifications
Type		In-line Single Over Head Camshaft
Number of cylinders		4
Bore	mm (in.)	85 (3.35)
Stroke	mm (in.)	88 (3.46)
Piston displacement	cm^3 (cu.in.)	1,997 (121.9)
Compression ratio		8.5 <8 VALVE>, 9.5 < 16 VALVE>
Firing order		1–3–4–2
Silent shaft		Equipped
Valve timing		
Intake valve		
Opens (BTDC)		19° <8 VALVE>, 11° <16 VALVE>
Closes (ABDC)		57" <8 VALUE>, 53" <16 VALUE>
Exhaust valve		
Opens (BBDC)		57" <8 VALVE>, 63" <16 VALVE>
Closes (ATDC)		19°<8 VALVE>, 21" <16 VALVE>
Lubrication		Pressure feed-full flow filtration

SERVICE SPECIFICATIONS

M11CB-A

Items		Standard Value	Limit
Engine adjustments			
Engine compression pressure	kPa (psi)/rpm	1,250 (178)/250–400 <8 VALVE> 1,300 (185)/250–400 < 16 VALUE>	min. 880 (125)/250–400 <8 VALVE> min. 980 (139)/250–400 < 16 VALUE>
Engine compression pressure difference between each cylinder	kPa (psi)	–	max. 100 (14)
Intake manifold vacuum-at idle	mmHg (in.Hg)	Approx. 500 (20) <8 VALVE> Approx. 510 (20) <16 VALVE>	
Timing belt "B" tension	mm (in.)	5 – 7 (.20–.28)	
Cylinder head bolt < 16 VALUE>	mm (in.)	–	max. 99.4 (3.91)

TSB Revision

Items	Standard Value	Limit
Drive belt		
For generator		
Deflection mm (in.)		
Inspection	9.0–11.5 (.354–.453)	
New belt	7.5–9.0 (.295–.354)	
Used belt	10 (.394)	
Tension N (lbs.)		
Inspection	250–500 (55–110)	
New belt	500–700 (110–154)	
Used belt	400 (88)	
For air conditioning compressor		
Deflection mm (in.)		
Inspection	Approx. 8 (.315)	
New belt	5.0–5.5 (.197–.217)	
Used belt	6.0–7.0 (.236–.276)	
Tension N (lbs.)		
Inspection	250–500 (55–110)	
New belt	470–570 (104–126)	
Used belt	320–400 (71-88)	
For power steering pump		
Deflection mm (in.)		
Inspection	6.0–9.0 (.236–.354)	
iming belt tension <8 VALVE> mm (in.)	14 (.55)	

NOTE
O.D.: Outer Diameter
I.D.: Inner Diameter
O.S.: Oversize Diameter
U.S.: Undersize Diameter

TORQUE SPECIFICATIONS

M11CC--

Items	Nm	ft.lbs.
Engine mount insulator nut (large)	60–80	43-58
Engine mount insulator nut (small)	30–40	22-29
Engine mount bracket nut and bolt	50–65	36-47
Front roll stopper insulator nut	50–65	36-47
Front roll stopper bracket to center member	40–50	29-36
Rear roll stopper insulator nut	40–50	29-36
Rear roll stopper bracket to crossmember	40–50	29-36
Transaxle mount insulator nut	60–80	43-58
Transaxle mount bracket to body	40–50	29-36
Fuel high pressure hose to fuel rail	4 - 6	3 - 4
Accelerator cable adjusting bolt	4 - 6	3 - 4
Front exhaust pipe clamp bolt	30–40	22-29
Front exhaust pipe to exhaust manifold	40 – 50	29-36
Power steering oil pump to bracket	35-45	25-33
Air conditioning compressor to bracket	23-27	17–20
Oil pan drain plug	35-45	26-33
Oil pan	6 - 8	4 - 6
Oil screen	15-22	11-16
Timing belt cover	10–12	7 - 9
Cylinder head bolt (Cold engine)	90– 100	65-72
Camshaft sprocket	80–100	58-72
Water pump pulley bolt	8–10	6 - 7
Crankshaft pulley bolt	20–30	14-22
Crankshaft sprocket bolt	110–130	80–94
Timing belt B tensioner bolt	15-22	11–16
Tension pulley bracket bolt	23-27	17–20
Right silent shaft sprocket bolt	34–40*1 [43–49]*2	25–29*1 [31–35]*
Oil pump sprocket nut	50–60	36-43
Control wiring harness and intake manifold plenum or air intake manifold	4 - 6	3 - 4
Front roll stopper bracket bolt	55-75	40–54
Front engine support bracket bolt	50–70	36-51
Exhaust pipe support bracket bolt	30–42	22–30
Left engine support bracket bolt	30–42	22–30
Rear roll stopper bracket bolt	110–130	80–94
Front case bolt	20–27	14–20
Bear cover bolt	5 - 7	4 - 5
Distributor nut	10–13	7 - 9
Rocker arm and shaft assembly bolt (large)	19-21	14-15
Rocker arm and shaft assembly bolt (small)	20–27	14–20
Intake manifold stay bolt	18-25	13-18
Timing belt tensioner spacer and bolt	43-55	31–40

NOTE
*1: When a 2.0 mm (.08 in.) thick washer is used.
*2: When a 2.6 mm (.10 in.) thick washer is used.

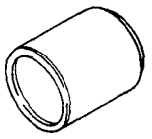
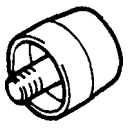
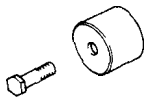
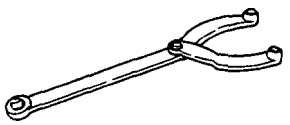
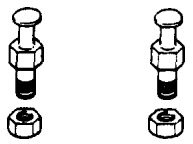
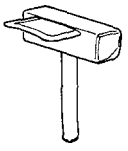
SEALANTS AND ADHESIVES

M11CE-A

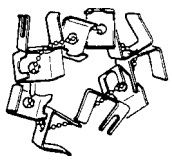
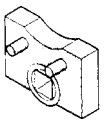
Items	Specified sealant
Semi-circular packing Engine support bracket bolt <16 VALVE>	3M ATD Part No.8660 or equivalent
Oil pan Thermostat case	MITSUBISHI GENUINE PART No.MD970389 or equivalent

SPECIAL TOOLS

M11 DA-A

Tool	Number	Name	Use
	MD998306-01	INSTALLER, camshaft oil seal Use with MD998307-01	Installation of camshaft oil seal <8 VALVE>
	MD998307-01	GUIDE, camshaft oil seal Use with MD998306-01	
	MD998713-01	Camshaft oil seal installer	Installation of camshaft oil seal <16 VALVE>
	MB990767-01	End yoke holder	Supporting camshaft pulley Supporting crankshaft pulley <16 VALVE>
	MD998754	Crankshaft pulley **holder pin**	
	MD998051-01 OPTIONAL: AVAILABLE FROM O.T.C.	WRENCH, cylinder head bolt	Tightening of cylinder head to block <8 VALVE>
	GENERAL SERVICE TOOL	Oil pan gasket cutter	Removal of the oil pan

TSB Revision

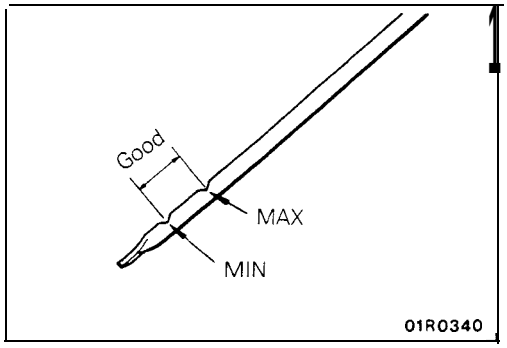
Tool	Number	Name	Use
	MD998443-01	HOLDER, lash adjuster	Supporting of the lash adjuster to prevent it from falling when rocker shaft assembly IS removed or installed
	MD998752-01	Tension pulley wrench	Adjustment of timing belt tension <16 VALVE>

TROUBLESHOOTING

M11EAAK

Symptom	Probable cause	Remedy
Compression too low	Cylinder head gasket blown	Replace gasket
	Piston ring worn or damage	Replace rings
	Piston or cylinder worn	Repair or replace piston and/or cylinder block
	Valve seat worn or damage	Repair or replace valve and/or seat ring
Oil pressure drop	Engine oil level too low	Check engine oil level
	Oil pressure switch faulty	Replace oil pressure switch
	Oil filter clogged	Install new filter
	Oil pump gears or cover worn	Replace gears and/or cover
	Thin or diluted engine oil	Change engine oil to correct viscosity
	Oil relief valve stuck (opened)	Repair relief valve
	Excessive bearing clearance	Replace bearings
Oil pressure too high	Oil relief valve stuck (closed)	Repair relief valve
Noisy valves	Incorrect lash adjuster	Bleed air or replace lash adjuster
	Thin or diluted engine oil (low oil pressure)	Change engine oil
	Valve stem or valve guide worn or damage	Replace valve and/or guide
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check engine oil level
	Low oil pressure	Refer to “Oil pressure drop”
	Thin or diluted engine oil	Change engine oil
	Excessive bearing clearance	Replace bearings
Timing belt noise	Incorrect belt tension	Adjust belt tension
Excessive engine rolling and vibration	Loose engine roll stopper (Front, Rear) Loose transaxle mount bracket Loose engine mount bracket Loose center member	Retighten
	Broken transaxle mount insulator Broken engine mount insulator Broken engine roll stopper insulator	Replace

TSB Revision



SERVICE ADJUSTMENT PROCEDURES

M11FAAA0

ENGINE OIL CHECK

(1) Check to ensure that the engine oil level is within the level range indicated on the oil dip stick.
(2) Check to ensure that the oil is not noticeably dirty or mixed with coolant or gasoline, and that it has the proper viscosity.

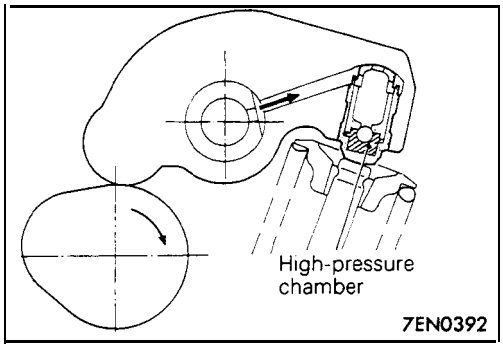
LASH ADJUSTERS CHECK

M11FEAGa

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.

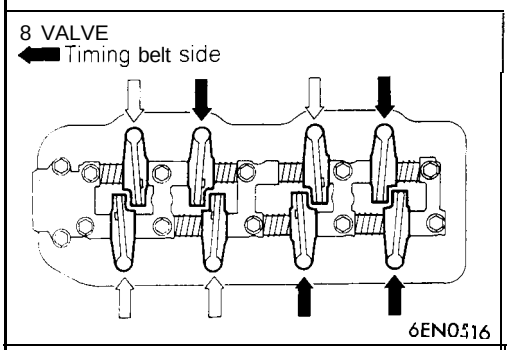
NOTE
- If the oil amount is small, air will be sucked from the oil strainer and mixed in the oil passage.
- If the oil amount is excessive, the oil will be stirred by the crank and mixed with a large amount of air.
- Air and oil can not be separated easily in the deteriorated oil, and the amount of air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

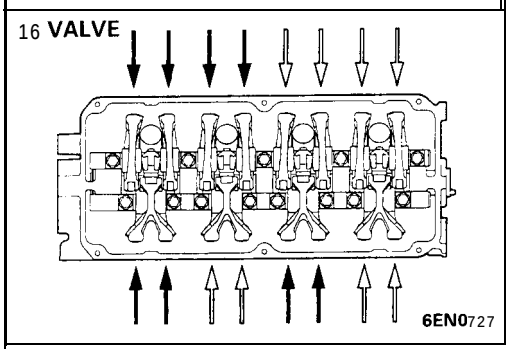


If such mixed-in air enters the high pressure chamber in the lash adjuster, the air in the high-pressure chamber will be compressed while the valve is opened, the lash adjuster will be excessively compressed and abnormal noise will be produced when the valve is closed.
This is the same phenomenon which 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.

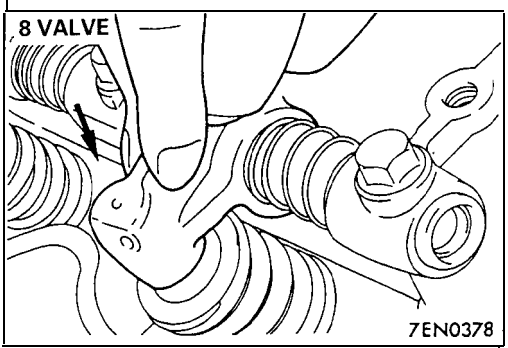
(2) Start the engine, and slowly race* it several times (10 times or less).
If the abnormal noise is eliminated by racing the engine, it means that the air is released from the high-pressure chamber of the lash adjuster and the function of the lash adjuster is returned to normal.
- Gradually increase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

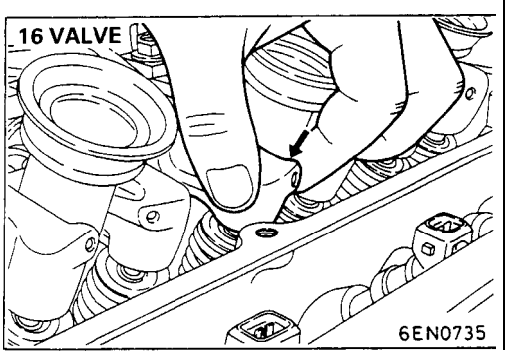
NOTE
- If the vehicle is parked on a slope for a long time, the oil will be sometimes reduced in the lash adjuster, and air will enter the high-pressure chamber when the engine is started.
- After the vehicle is parked for a long time, the oil will go out of the oil passage. Since it takes a little time 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 lowers easily when the part directly above the rocker arm lash adjuster is pressed, the lash adjuster is defective and must be replaced. When replacing the lash adjuster, bleed the air from all adjusters and then assemble them. Then inspect with procedures ① to ⑤, and confirm that there are no abnormalities

NOTE
- The lash adjuster can be accurately checked for defects with the leak down test.
- Refer to the engine service manual for the leak down test and lash adjuster air bleeding procedure.

If the rocker arm is extremely hard when pressed down, the lash adjuster is normal, so look for a different cause of abnormal sound.

COMPRESSION PRESSURE CHECK M11FFAL

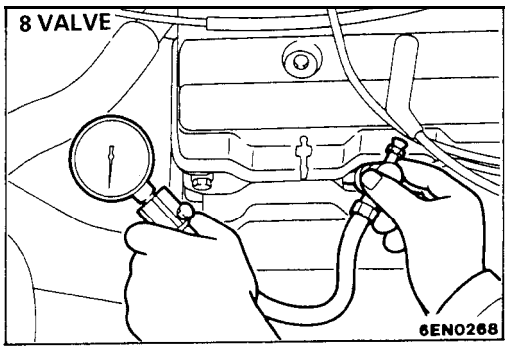
(1) Before inspection, verify that the engine oil, starter motor and battery are normal. Then, perform the following.
- Engine coolant temperature: 80–95°C(176–203°F)
- Lights, electric cooling fan and accessories: OFF
- Transaxle: P range
- Steering wheel: Neutral position

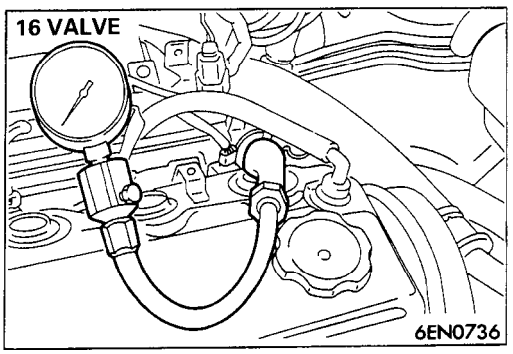
(2) Disconnect the spark plug cable.
(3) Remove all the spark plugs
(4) Disconnect the connector of the distributor.

NOTE
This will prevent the engine control module from controlling the ignition and fuel injection.

(5) Cover the spark plug holes with a cloth, etc., and crank the engine. Then verify that no foreign material sticks to the cloth, etc.

Caution
1. **During cranking, be especially careful of the spark plug installing hole.**
2. **Very hot water, oil, fuel, etc., which may have entered the cylinder somehow, will violently spout through the spark plug hole if the compression is measured in the entrapped state. This is very dangerous.**





(6) Set up the compression gauge in the spark plug mounting hole.

(7) Fully open the throttle valve, and cranking the engine, measure the compression pressure.

Standard value:
<8 VALVE> 1,250 kPa (178 psi) [250–400 rpm]
<16 VALVE> 1,300 kPa (185 psi) [250–400 rpm]
Limit:
<8 VALVE> 880 kPa (125 psi) [250–400 rpm]
<16 VALVE> 980 kPa (139 psi) [250–400 rpm]

(8) Measure the compression pressure of each cylinder, and verify that the pressure difference among the cylinders is less than the limit value.

Limit: max. 100 kPa (14 psi)

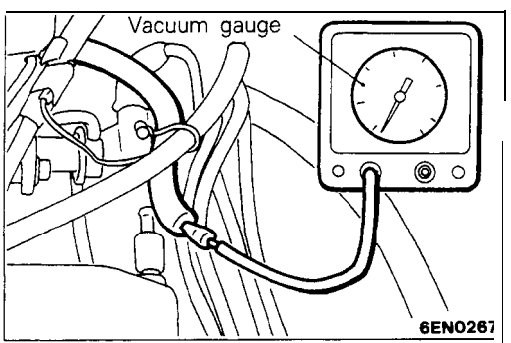
(9) If a cylinder's compression pressure or pressure difference is outside the limit, fill a small amount of engine oil through the spark plug hole and repeat Items (7) and (8) above.
① If the compression is increased when the oil is filled, the piston and/or cylinder wall may be worn or damaged.
② If the compression is not increased even though the oil is filled, the valve may be thermally seized, the valve contact may be improper or pressure may leak at the gasket.

(10) Connect the connector of the distributor.

(11) Install the spark plug and spark plug cable.

(12) Erase the diagnostic trouble code with the Scan tool or reconnect the battery (–) cable 10 seconds or more after it was disconnected.

NOTE
This will erase the memory of the diagnostic trouble code which resulted from disconnection of the distributor connector.



MANIFOLD VACUUM INSPECTION M11FNAC

(1) Before inspection and adjustment, put the vehicle into the following state.
- Engine coolant temperature: 85–95°C (185–203°F)
- Lights, electric, cooling fan, and accessories: OFF
- Transaxle: Neutral (N or P for vehicles with an automatic transaxle)
- Steering wheel: Neutral position

(2) Check that the idling revolution speed is normal.

(3) Remove the PCV hose from the PCV valve and attach a vacuum gauge.
(4) Check that the negative pressure at the intake manifold during idle revolution is normal.

Standard value:
<8 VALVE> Approx. 500 mmHg (20 in.Hg)
<16 VALVE> Approx. 510 mmHg (20 in.Hg)

(5) If outside the standard value, isolate the cause by referring to the following table and repair the fault.

Symptom	Cause	Remedy
• The vacuum gauge reading is less than standard value, but the pointer is stable.	• Ignition timing is retarded.	• Adjust the ignition timing.
• The vacuum gauge pointer swings slowly.	• The gas mixture is excessively rich.	• Check Multiport Fuel Injection system.
• The vacuum gauge pointer drops irregularly.	• The gas mixture is excessively lean.	• Check Multiport Fuel Injection system.
• The vacuum gauge pointer drops intermittently to 30 to 160 mmHg (1.2 to 6.3 in.Hg).	• Incomplete close contact of intake and exhaust valve seats.	• Check and repair the valve.
• The vacuum gauge pointer drops suddenly from the normal reading to 250 mmHg (9.8 in.Hg), then returns to normal.	• Broken cylinder head gasket	• ,Replace cylinder head gasket.

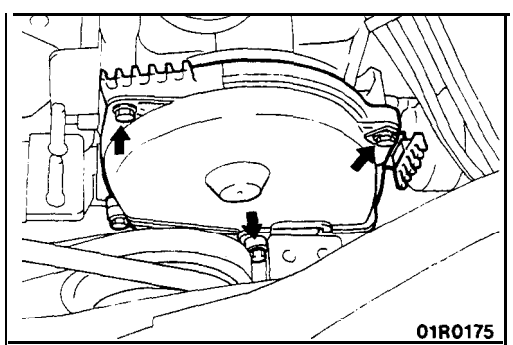
TIMING BELT TENSION ADJUSTMENT <8 VALVE>

M11FGCBa

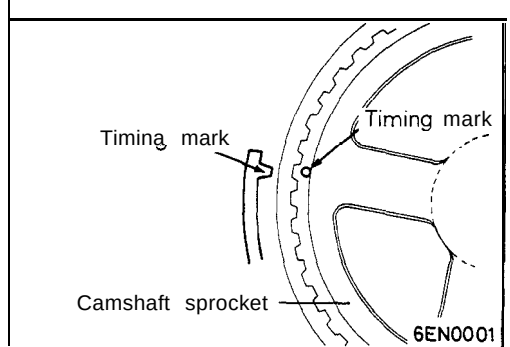
There are 2 access holes in the timing belt front lower cover. These can be used to readjust the tension of the timing belt by the following procedure without removing the timing belt front lower cover. However, timing belt "B", which drives the right silent shaft, cannot be adjusted unless the cover is removed.
(1) Turn the steering wheel all the way to the left.
(2) Remove the left side undercover panel.

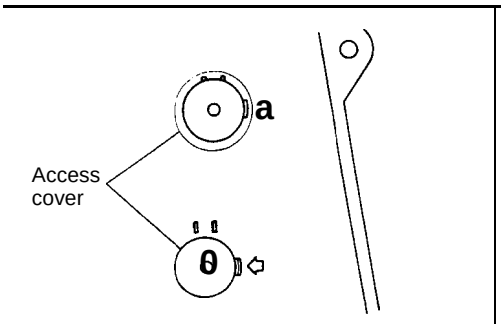
NOTE
This work is done so that the crankshaft can be turned.

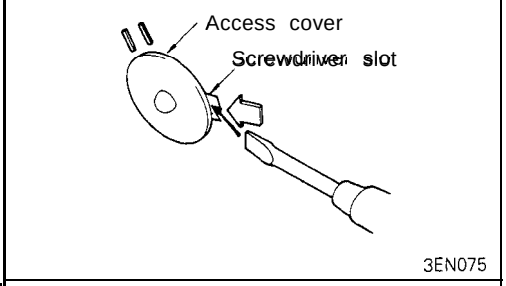
(3) Place a piece of wood against the engine oil pan and jack up.
(4) Remove the engine mounting bracket.
(5) Remove the timging belt front upper cover.
(6) Remove the four spark plugs.
(7) Turn the crankshaft clockwise and check the timing belt condition.



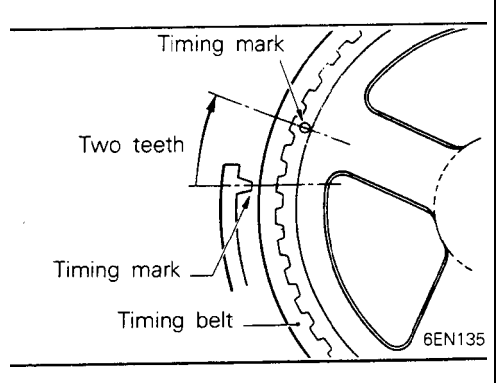
(8) Turn the crankshaft clockwise and align the timing marks.



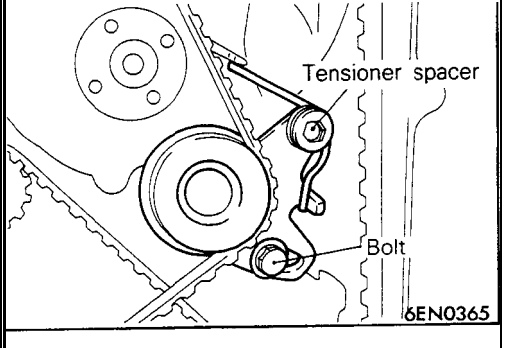




(9) Remove the air conditioning drive belt and the generator drive belt.
(10) Remove the access covers. There are easily removed by inserting a screwdriver into the slots indicated by the raised arrows in the timing belt cover and twisting.
(11) Insert the special tool (MD998051-01) from the pivot side access hole and loosen the tension spacer (with a tensioner lock nut on it) 1 to 2 turn.
Next insert a 14 mm socket wrench from the slot side access hole and loosen the tensioner lock bolt 1 to 2 turn.

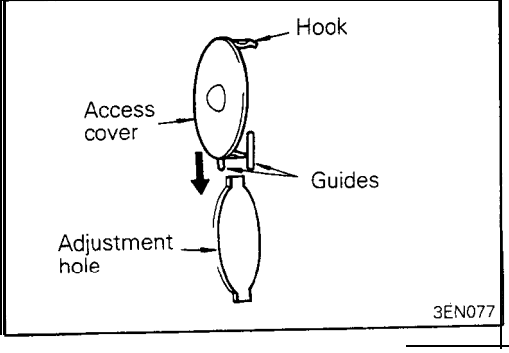


(12) Turn the crankshaft clockwise by two teeth of the camshaft sprocket.



(13) First tighten the timing belt tensioner installation bolt (on the lower side), and then tighten the tensioner spacer (upper side).

Caution
Be sure to tighten the bolt (lower side) first. If the tensioner spacer of pivot side is tightened first, the tensioner will rotate with it and belt tension may become loose.



(14) Install the access cover. The access cover may be easily installed by passing the hooks between the guides and sliding it in.
(15) Install the air conditioning drive belt and generator drive belt and adjust the slack. (Refer to P.11-12.)
(16) Install the timing belt front upper cover.
(17) Install the engine mounting bracket.
(18) Install the spark plugs.
(19) Install the left side undercover panel.

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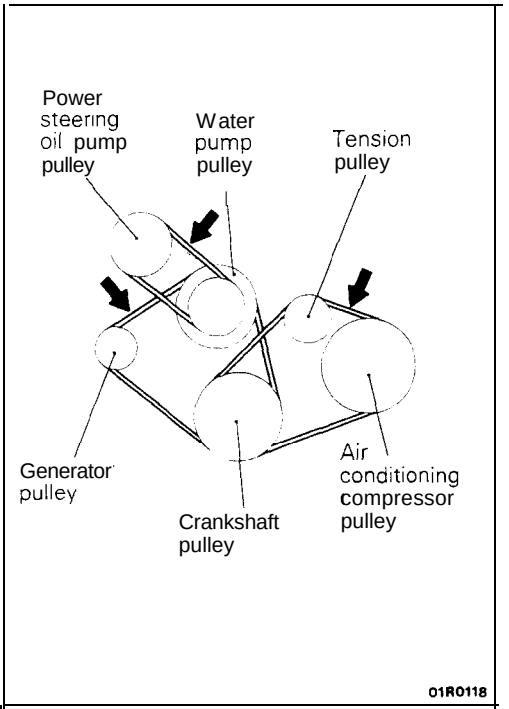
DRIVE BELTS TENSION ADJUSTMENT M11FMB80

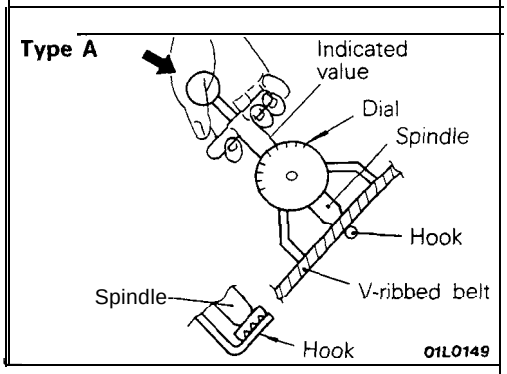
(1) Check that the belts are not damaged.

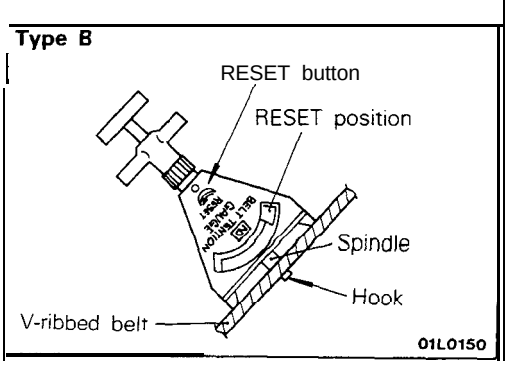


(2) Apply 100N (22 lbs.) force to the belt back midway between the pulleys as shown in the figure, measure the deflection or, by using a belt-tension gauge, check the belt's tension.

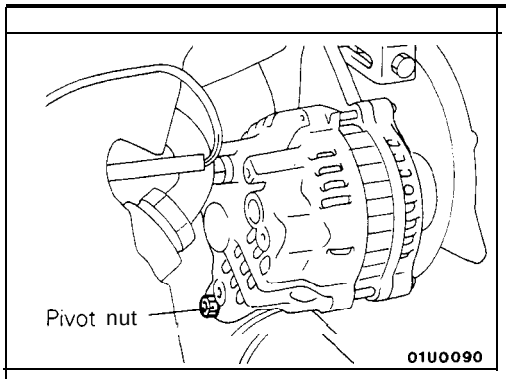
Standard value:

Items		Check value	Adjustment value	
			New belt	Used belt
For generator	Deflection mm (in.)	9.0–11.5 (.354–.453)	7.5–9.0 (.295–.354)	10 (.394)
	Gauge N (lbs.)	250–500 (55–110)	500–700 (110–154)	400 (88)
For A/C compressor	Deflection mm (in.)	Approx. 8.0 (.315)	5.0–5.5 (.197–.217)	6.0–7.0 (.236–.276)
	Gauge N (lbs.)	250–500 (55–110)	320–400 (71-88)	470–570 (104–126)
For P/S pump	Deflection mm (in.)	6.0–9.0 (.236–.354)	–	





NOTE
There is more than one type of belt-tension gauge (type A and type B, for example), so be sure to use the gauge according to its instructions for use.



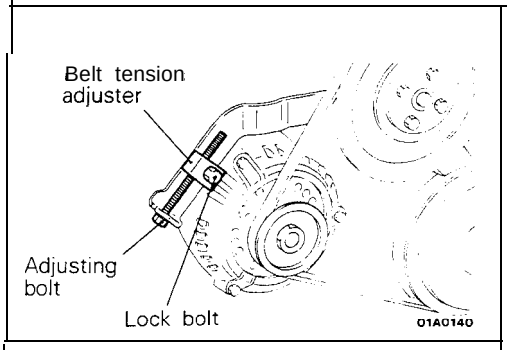
TENSION ADJUSTMENT OF THE GENERATOR DRIVE BELT

Caution

1. Before checking, turn the engine one time or more.

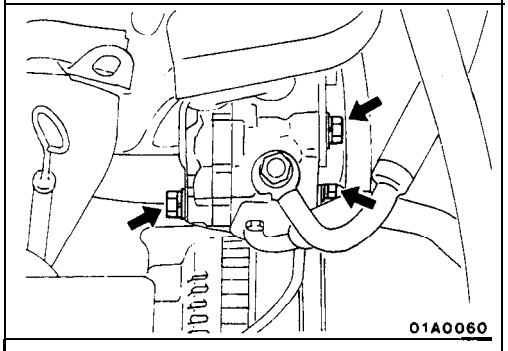
2. If the belt tension is too strong, it is possible that the generator or water pump bearing is damaged. If the belt tension is too weak, however, sounds of its slipping will be heard, and the belt's service life will be reduced.

1. Loosen the generator pivot nut.



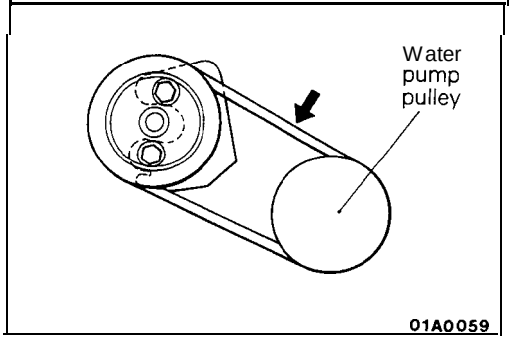
2. Loosen the lock bolt of the belt tension adjuster.
3. Using the adjustment bolt, adjust the belt tension to specified.
4. Tighten the lock bolt.
5. Tighten the generator pivot nut.
6. Check the deflection or the tension of the belt; readjust if necessary.

NOTE
Even for a new belt, the adjustment value for a used belt should be used to make the adjustment if the belt has been used for as long as five minutes or more.

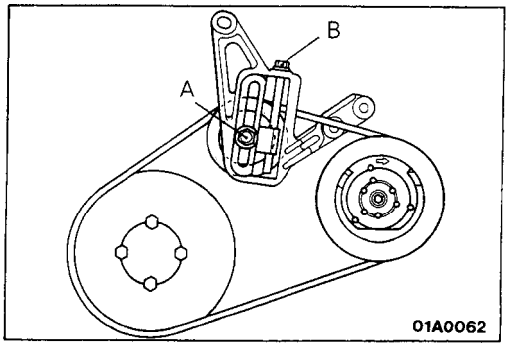


DEFLECTION ADJUSTMENT OF POWER STEERING OIL PUMP DRIVE BELT

1. Loosen power steering oil pump fixing bolt.



2. Move power steering pump, tension belt moderately and adjust deflection.
3. Tighten fixing bolts.
4. Run the engine one time or more.
5. Check the belt deflection. Readjust, if necessary.



TENSION ADJUSTMENT OF THE AIR CONDITIONING COMPRESSOR DRIVE BELT

1. Loosen tension pulley fixing bolt A.
2. Adjust belt deflection with adjusting bolt B.
3. Tighten fixing bolt A.
4. Run the engine one time or more.
5. Check the belt tension. Readjust, if necessary.

NOTE
Even for a new belt, the adjustment value for a used belt should be used to make the adjustment if the belt has been used for as long as five minutes or more.

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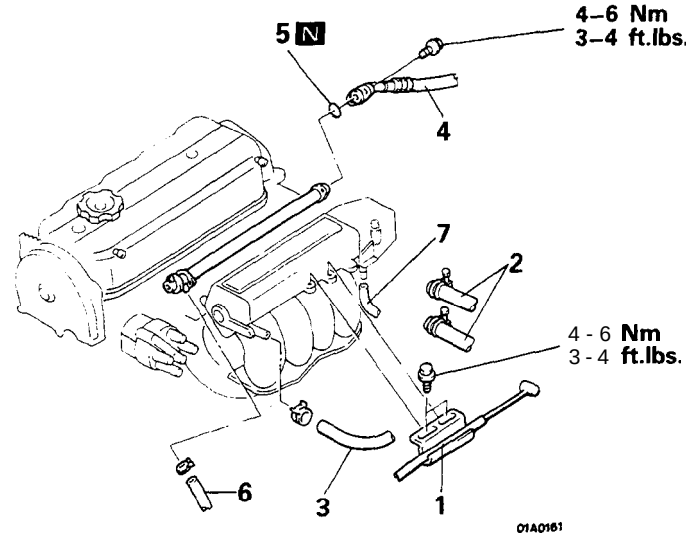
ENGINE ASSEMBLY <8 VALVE>

M11SA-A

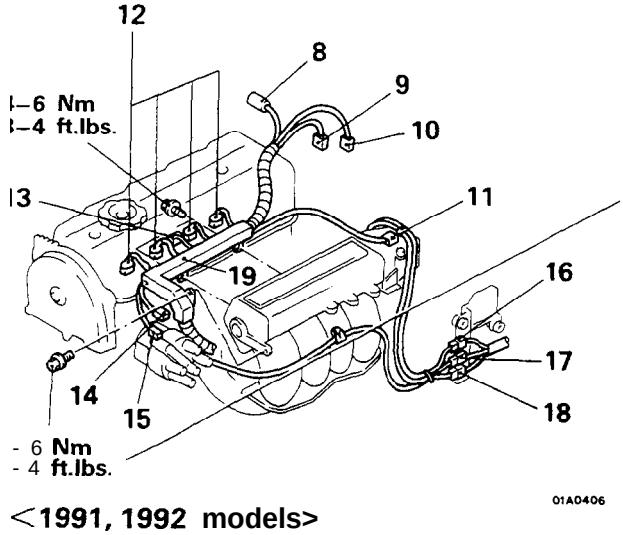
REMOVAL AND INSTALLATION

Pre-removal Operation
- Eliminating fuel pressure in fuel line (Refer to GROUP 13–On-Vehicle Inspection of MFI Components.)
- *Removal of the Hood (Refer to GROUP 42–Hood.)
- *Draining of the Coolant (Refer to GROUP 00–Maintenance Service.)
- *Removal of the Transaxle Assembly (Refer to GROUP 22, 23–Transaxle.)
- *Removal of the Radiator (Refer to GROUP 14–Radiator.)

Post-installation Operation
- *Installation of the Radiator (Refer to GROUP 14–Radiator.)
- *Installation of the Transaxle Assembly (Refer to GROUP 22, 23–Transaxle.)
- *Refilling of the Coolant (Refer to GROUP 00–Maintenance Service.)
- Installation of the Hood (Refer to GROUP 42–Hood.)



<1989 models>



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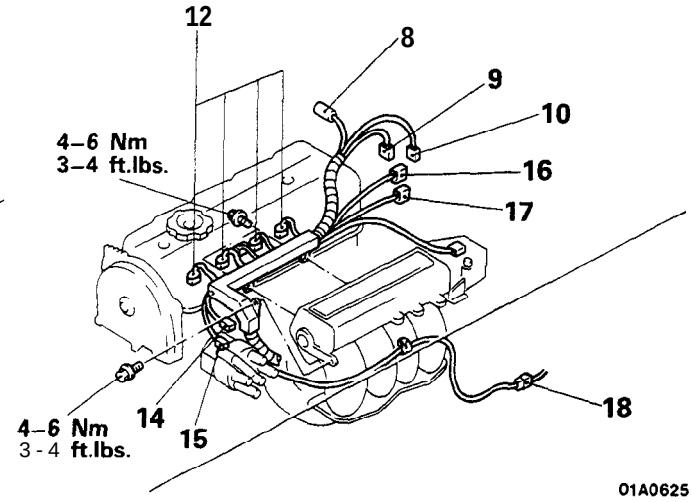
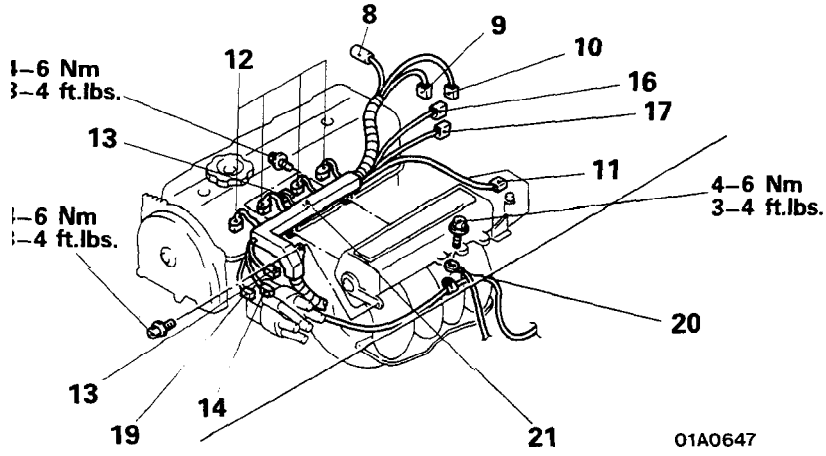


<1991, 1992 models>



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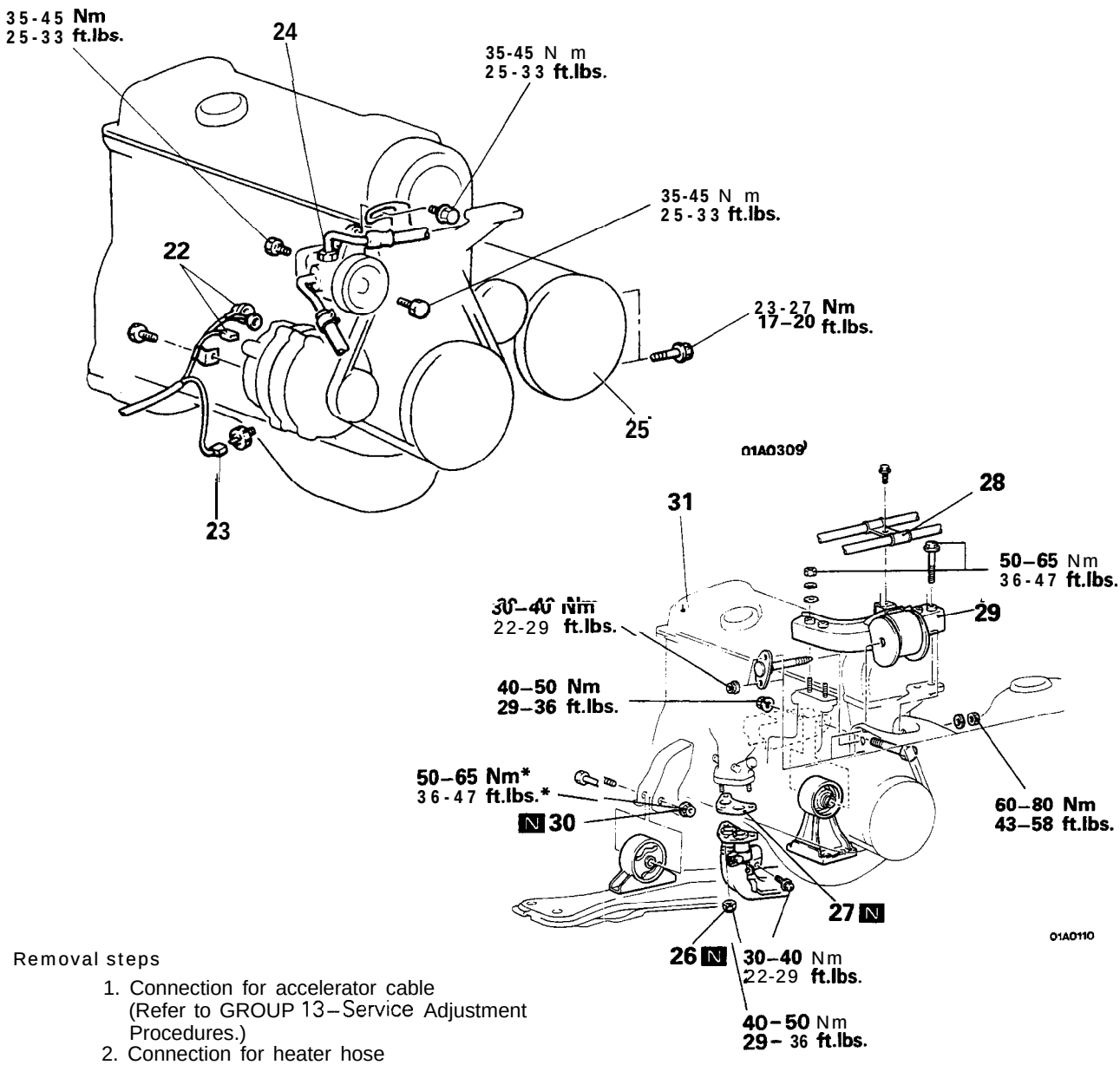
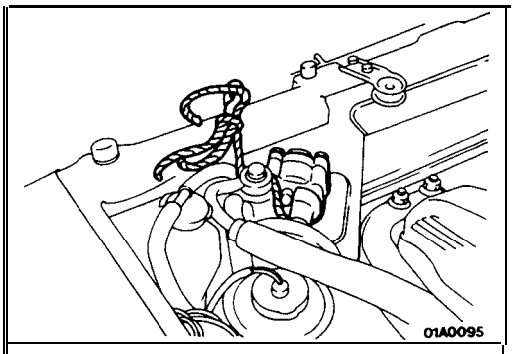
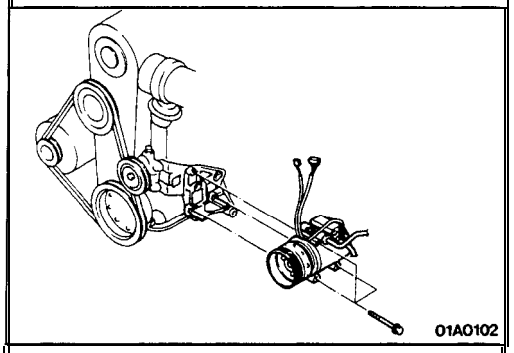


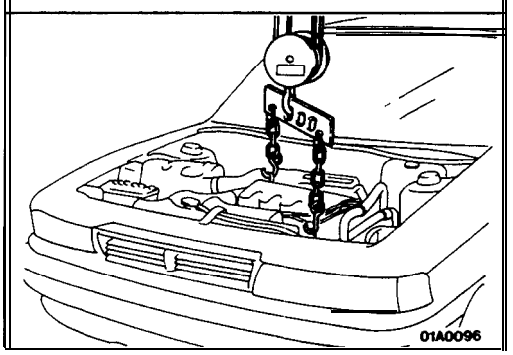
Removal steps

1. Connection for accelerator cable (Refer to GROUP 13–Service Adjustment Procedures.)
2. Connection for heater hose
3. Connection for brake booster vacuum hose
4. Connection for fuel high pressure hose
5. O-ring
6. Connection for fuel return hose
7. Connection for vacuum hose
8. Connection for oxygen sensor
9. Connection for engine coolant temperature gauge unit
10. Connection for engine coolant temperature sensor
11. Connection for ISC
12. Connection for injector
13. Connection for EGR temperature sensor (California vehicles only)
14. Connection for ignition power transistor
15. Connection for condenser
16. Connection for TPS
17. Connection for idle speed control motor position sensor
18. Connection for distributor
19. Connection for crankshaft position sensor
20. Connection for ground cable
21. Control wiring harness
22. Connection for generator
23. Connection for oil pressure switch
24. Power steering oil pump
25. Air conditioning compressor
26. Self-locking nuts
27. Gasket
28. Clamp of pressure hose (Power steering) and high pressure hose (Air conditioning)
29. Engine mount bracket
30. Self locking nut
31. Engine assembly

NOTE
For tightening locations indicated by the * symbol, first tighten temporarily, and then make the final tightening with the entire weight of the engine applied to the vehicle body.







SERVICE POINTS OF REMOVAL M1 1SBBC

24. REMOVAL OF POWER STEERING OIL PUMP

Remove the oil pump (with the hose attached).

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

25. REMOVAL OF AIR CONDITIONING COMPRESSOR

Disconnect the connection of the air conditioning compressor, and then remove the compressor (with the hose attached) from the compressor bracket.

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

29. REMOVAL OF ENGINE MOUNT BRACKET

(1) Attach wire or similar material to the engine hook, and then suspend (to the extent that there is no slackness of the wire) by using a chain block or similar arrangement.
(2) Remove the engine mount bracket.

31. REMOVAL OF ENGINE ASSEMBLY

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

SERVICE POINTS OF INSTALLATION M11SDAX

31. INSTALLATION OF ENGINE ASSEMBLY

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

25. INSTALLATION OF AIR CONDITIONING COMPRESSOR/24. POWER STEERING OIL PUMP

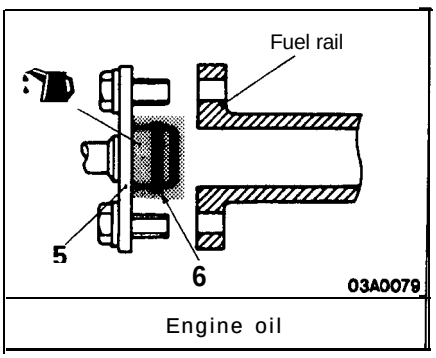
Adjust belt tension. (Refer to P. 11-12.)

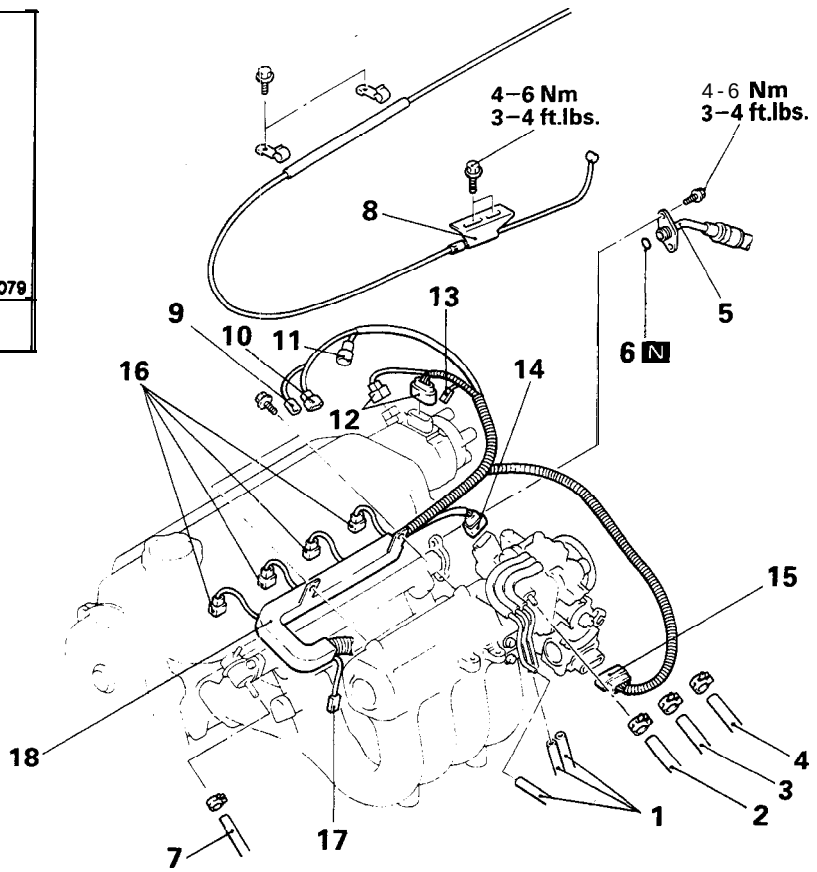
ENGINE ASSEMBLY <16 VALVE>

REMOVAL AND INSTALLATION

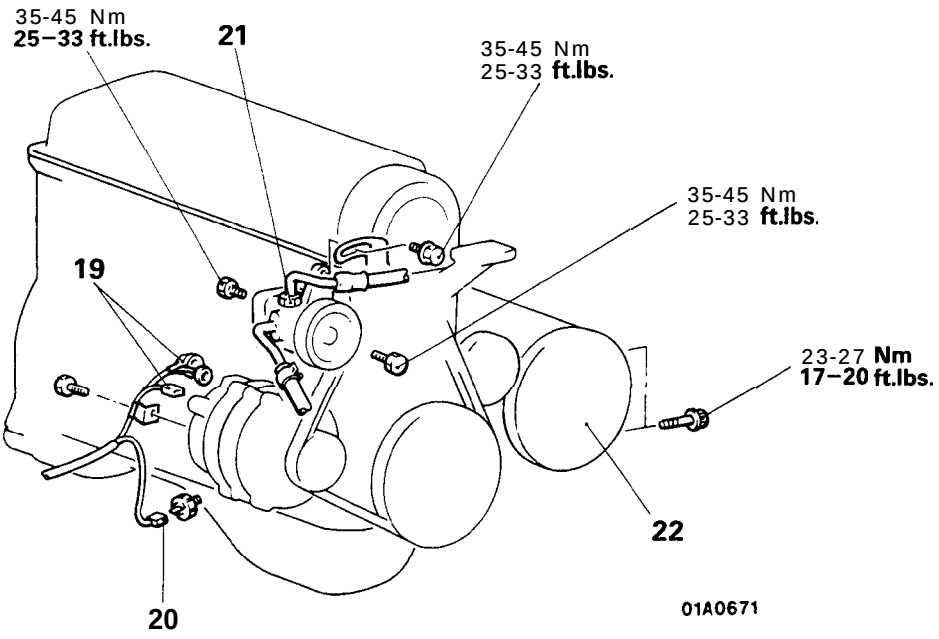
Pre-removal Operation
@Eliminating Fuel Pressure in Fuel Line (Refer to GROUP 13-Service Adjustment Procedures.)
- Removal of the Hood (Refer to GROUP 42-Hood.)
- Draining of the Engine Coolant (Refer to GROUP 00-Maintenance Service)
- Removal of the Transaxle (Refer to GROUP 22, 23-Transaxle.)
- Removal of the Radiator (Refer to GROUP 14-Radiator.)

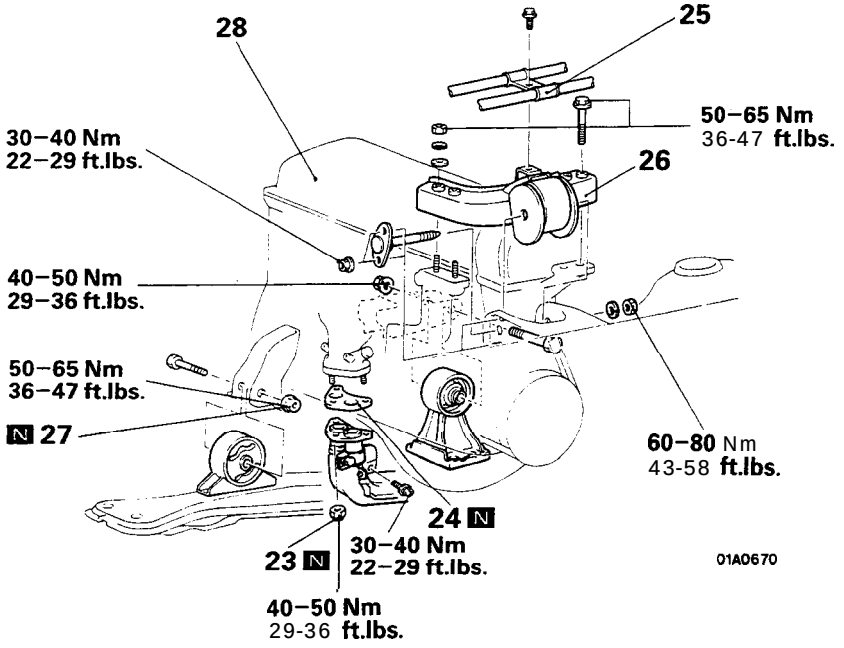
Post-installation Operation
- Installation of the Radiator (Refer to GROUP 14-Radiator.)
- Installation of the Transaxle (Refer to GROUP 22, 23-Transaxle.)
- Refilling of the Engine Coolant (Refer to GROUP 00-Maintenance Service.)
- Installation of the Hood (Refer to GROUP 42-Hood.)





Removal steps
1. Vacuum hose connection
2. Brake booster vacuum hose connection
3. Heater hose connection (cylinder head → heater unit)
4. Heater hose connection (Heater unit → water inlet pipe)
5. Fuel high pressure hose connection
6. O-ring
7. Fuel return hose connection
8. Accelerator cable connection
9. Engine coolant temperature gauge unit connector
10. Engine coolant temperature sensor connector
11. Oxygen sensor connector
12. Distributor connector
13. Condenser connector
14. TPS connector
15. IAC connector
16. Injector connector
17. Air conditioning compressor connector
18. Control harness





Removal steps

19. Connection for generator
20. Connection for oil pressure switch
◆◆ ● ◆21 Power steering oil pump (Refer to P.11-16.)
◆◆◆◆22. Air conditioning compressor (Refer to P.I 1-16.)
23. Self-locking nuts
24. Gasket
25. Clamp of pressure hose (Power steering) and high pressure hose (Air conditioning)
◗ ☒ 26. Engine mount bracket (Refer to P.I l-l 6.)
27. Self locking nut
◆◆ ● ◆28. Engine assembly (Refer to P.I 1-16.)

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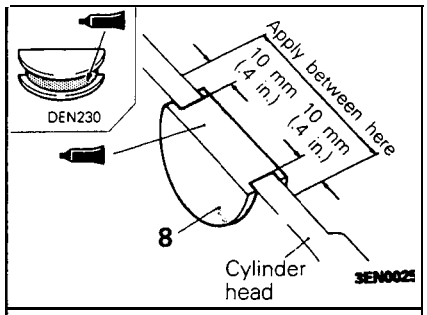
CAMSHAFT AND CAMSHAFT OIL SEAL <8 VALVE>

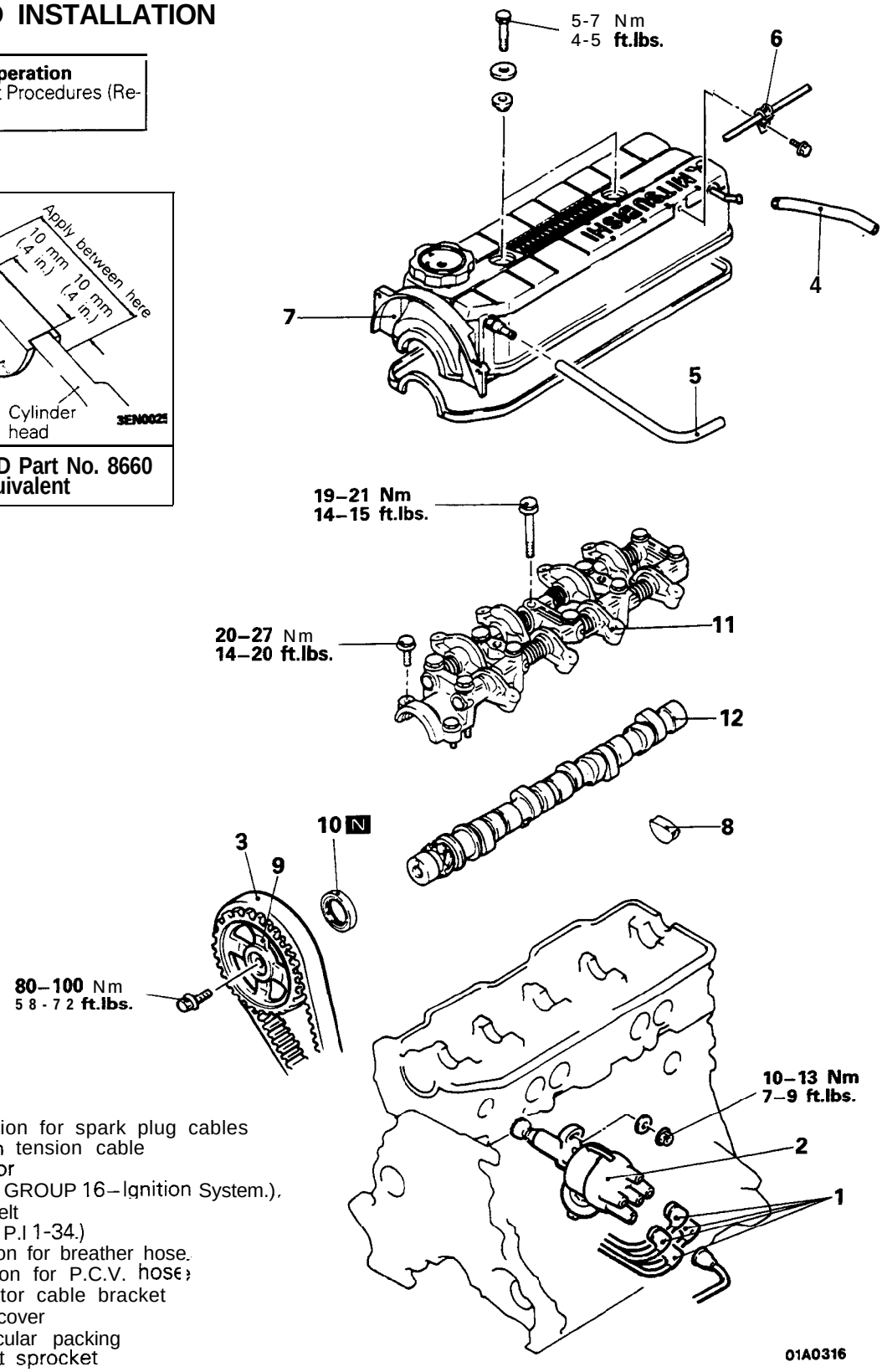
M11ZA-A

REMOVAL AND INSTALLATION

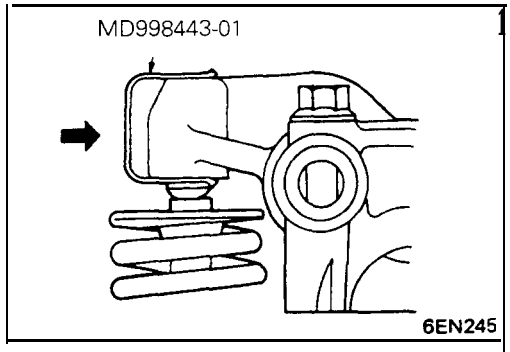
Post-installation Operation
- Service Adjustment Procedures (Refer to P.11-7.)



Sealant: 3M ATD Part No. 8660 or eauivalent



Removal steps
1. Connection for spark plug cables and high tension cable
2. Distributor (Refer to GROUP 16–Ignition System.)
3. Timing belt (Refer to P.11-34.)
4. Connection for breather hose
5. Connection for P.C.V. hose
6. Accelerator cable bracket
7. Rocker cover
8. Semi-circular packing
9. Camshaft sprocket
10. Oil seal
11. Rocker arm and shaft assembly
12. Camshaft



SERVICE POINTS OF REMOVAL M11ZBAE

11. REMOVAL OF ROCKER ARM AND SHAFT ASSEMBLY

Before removing the rocker arm and shaft assembly, use the special tool to ensure that the auto-lash adjuster doesn't fall out.

Caution
Do not disassemble the rocker arm and shaft assembly.

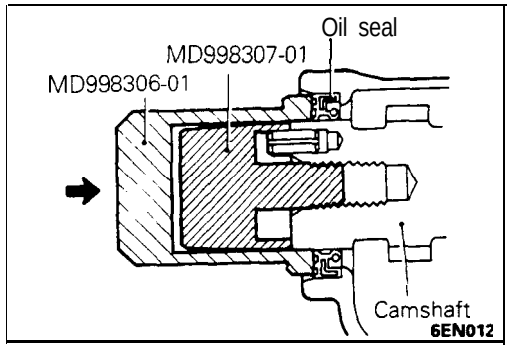
SERVICE POINTS OF INSTALLATION M11ZDAG

12. INSTALLATION OF CAMSHAFT

Install in the cylinder head after applying a coat of engine oil to the camshaft journal and cams.

11. INSTALLATION OF ROCKER ARM AND SHAFT ASSEMBLY

(1) Place the rocker arm and shaft assembly on the cylinder head and tighten the bearing cap bolt.
(2) Remove the special tool.



10. INSTALLATION OF OIL SEAL

(1) Install special tool, camshaft oil seal guide, to the end of the camshaft and apply engine oil to the outer surface of special tool.
(2) Using special tool, camshaft oil seal installer, press-in the oil seal.

CAMSHAFT AND CAMSHAFT OIL SEAL <16 VALVE>

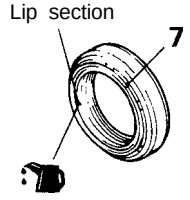
M11HA-1

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of Distributor (Refer to GROUP 16–Distributor)
- Removal of timing Belt Cover (Refer to P.11-42.)

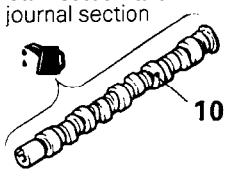
Post-installation Operation
- Installation of Distributor (Refer to GROUP 16–Distributor)
- Installation of Timing Belt Cover (Refer to P.11-42.)
- Service Adjustment Procedures (Refer to P.11-7.)

Lip section



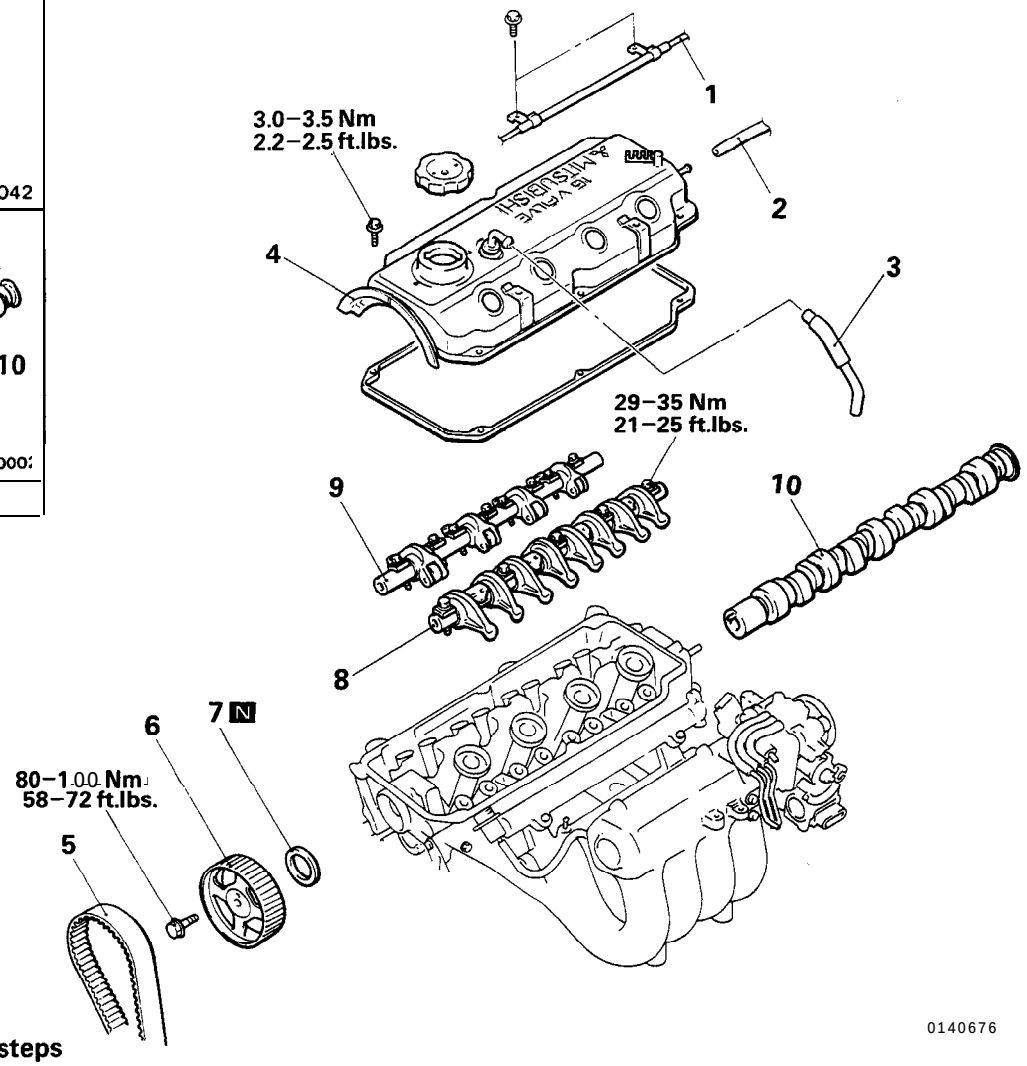
01 N0042

Cam section and journal section



1G9000

Engine oil



0140676

Removal steps

1. Accelerator cable connection
2. Breather hose connection
3. PCV hose connection
4. Rocker cover
5. Timing belt (Refer to P.11-42.)
6. Camshaft sprocket
7. Camshaft oil seal
8. + Rocker arms and rocker arm shaft assembly (Intake side)
9. Rocker arms and rocker arm shaft assembly (Exhaust side)
10. Camshaft

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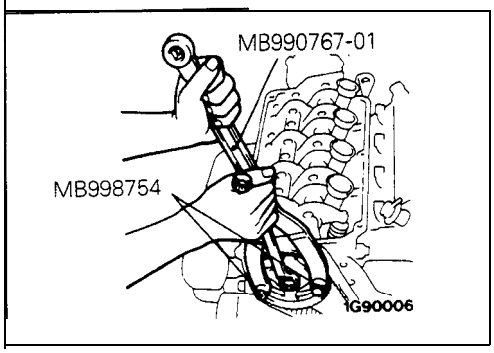
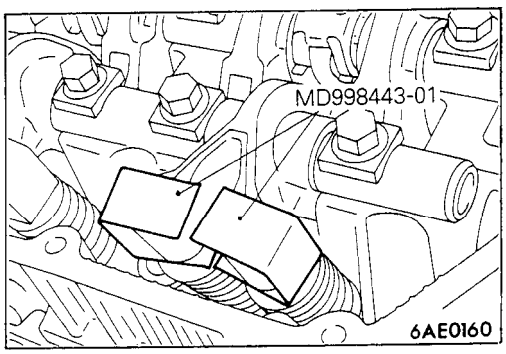


SERVICE POINTS OF REMOVAL M11HBAL

6. REMOVAL OF CAMSHAFT SPROCKET

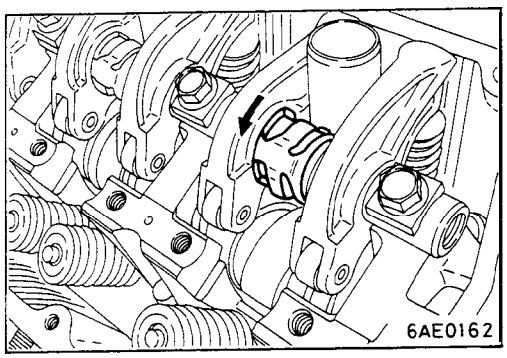
Using the special tool, remove the camshaft sprocket.



8. REMOVAL OF ROCKER ARMS AND ROCKER ARM SHAFT ASSEMBLY (INTAKE SIDE)/9. ROCKER ARMS AND ROCKER ARM SHAFT ASSEMBLY (EXHAUST SIDE)

Before removing the rocker arm and shaft assembly, use the special tool to ensure that the auto-lash adjuster doesn't fall out.

Caution
Do not disassemble the rocker arm and shaft assembly.



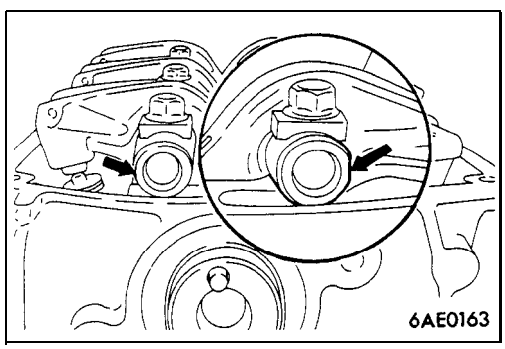
SERVICE POINTS OF INSTALLATION M11HCAM

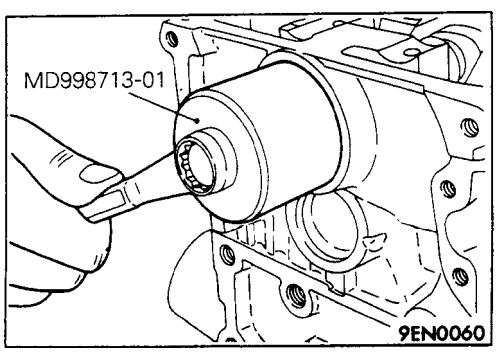
8. INSTALLATION OF ROCKER ARMS AND ROCKER ARM SHAFT ASSEMBLY (INTAKE SIDE)

(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.





7. INSTALLATION OF CAMSHAFT OIL SEAL

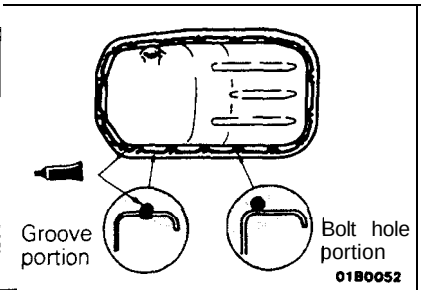
Using the special tool, install the camshaft oil seal.

OIL PAN AND OIL SCREEN

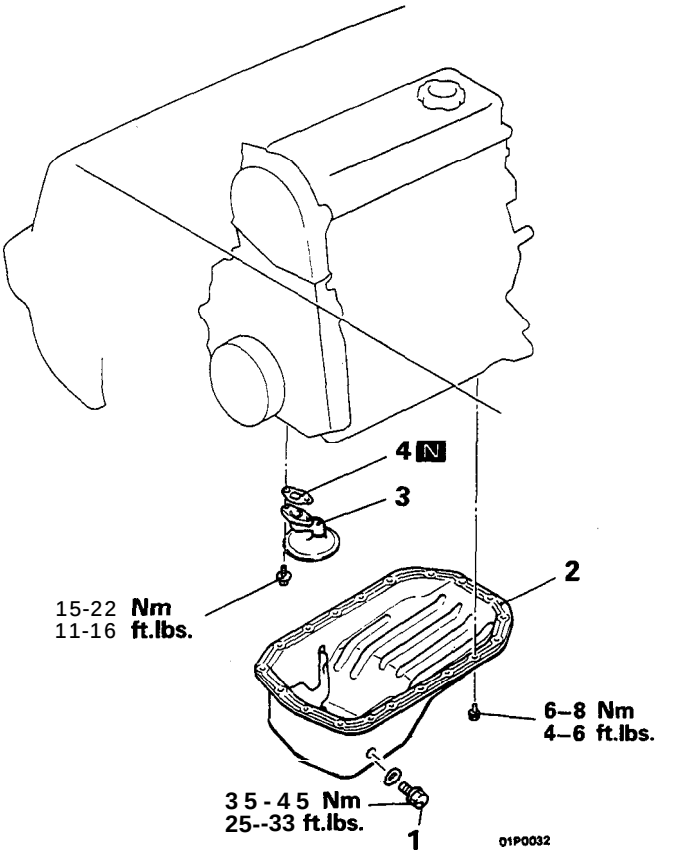
M11HA-A

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Draining and Refilling of Engine Oil (Refer to GROUP 00–Maintenance Service.)

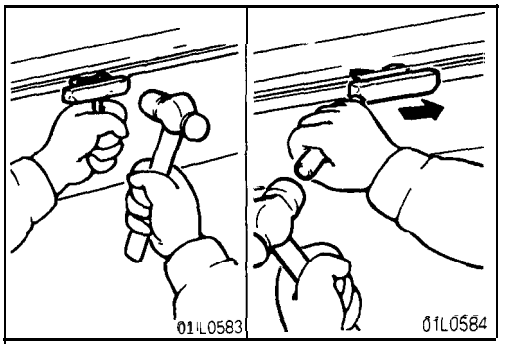


Sealant: MITSUBISHI GENUINE PART No.MD970389 or equivalent



Removal steps

1. Drain plug
2. Oil pan
3. Oil screen
4. Oil screen gasket



SERVICE POINTS OF REMOVAL

M11HBAF0

2. REMOVAL OF OIL PAN

(1) Remove the oil pan mounting bolts.

(2) Tap the general service tool in between the cylinder block and the oil pan.

Caution
Do not use a screwdriver, a chisel or a similar tool when removing the oil pan.

(3) Remove the oil pan by placing a brass bar at the corner of the general service tool and then tapping with a hammer.

INSPECTION

M11HCAC0

- Check the oil pan for damage and cracks. Replace if faulty.
- Check the oil screen for clogging; damage and cracks. Replace if faulty.

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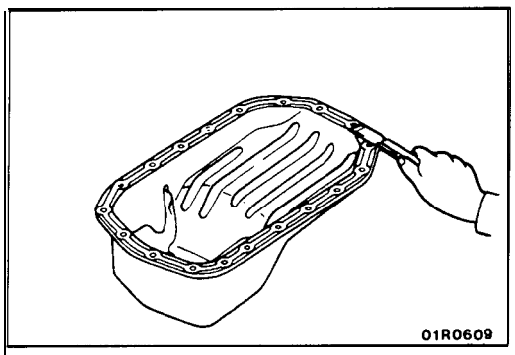
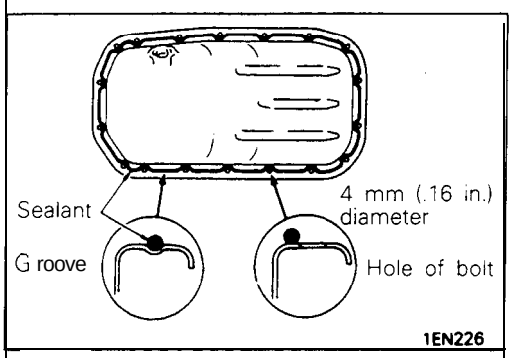
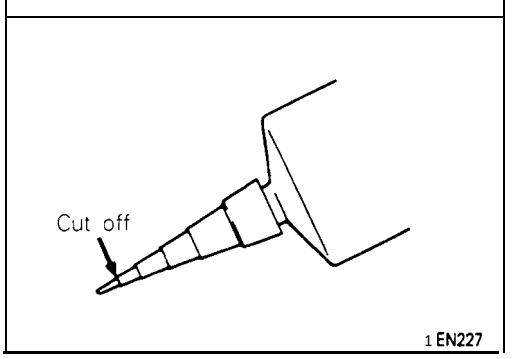






SERVICE POINTS OF INSTALLATION M11HDA00

2. INSTALLATION OF OIL PAN

(1) Use a wire brush or other tool to scrape clean all gasket surfaces of the cylinder block and oil pan so that all loose material is removed.

(2) Gasket surfaces must be free of oil and dirt.

(3) Apply the specified sealant around the surface of oil pan as specified in illustration.

Specified sealant: MITSUBISHI GENUINE PART No.MD970389 or equivalent

NOTE
To squeeze out proper amount of sealant, cut off the nozzle of sealant. This will provide a nozzle 4 mm (.16 in.) in diameter.

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

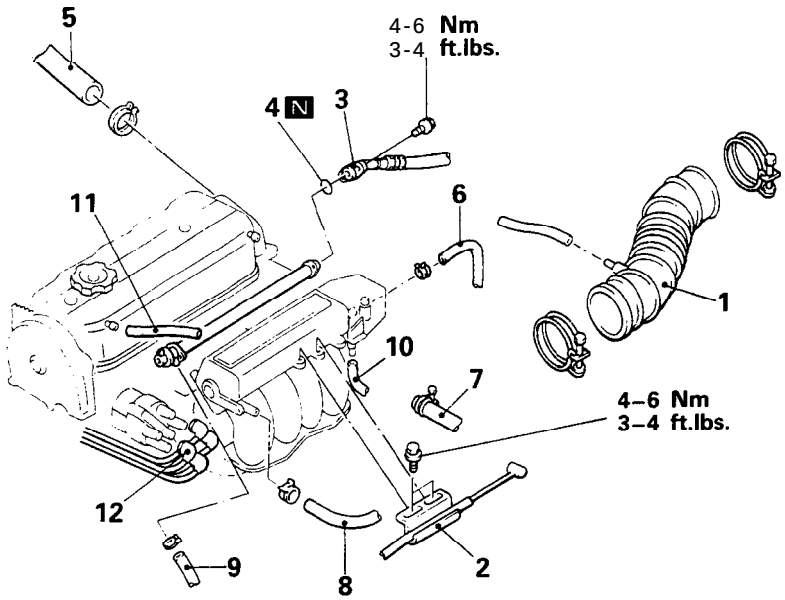
CYLINDER HEAD GASKET <8 VALVE>

M11JA-A

REMOVAL AND INSTALLATION

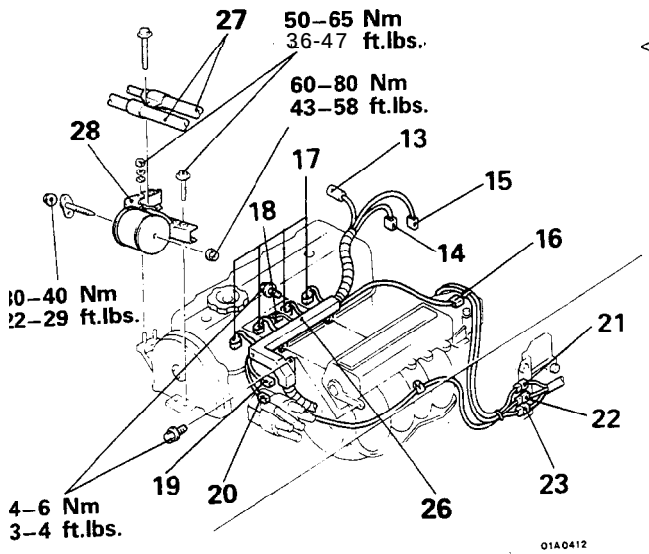
Pre-removal **Operation**
- Draining of Coolant (Refer to GROUP 00–Maintenance Service.)

Post-installation Operation
- Filling of Engine Coolant (Refer to GROUP 00–Maintenance Service.)
- Service Adjustment Procedures (Refer to P.11-7.)



01A0310

<1989 models>



01A0412

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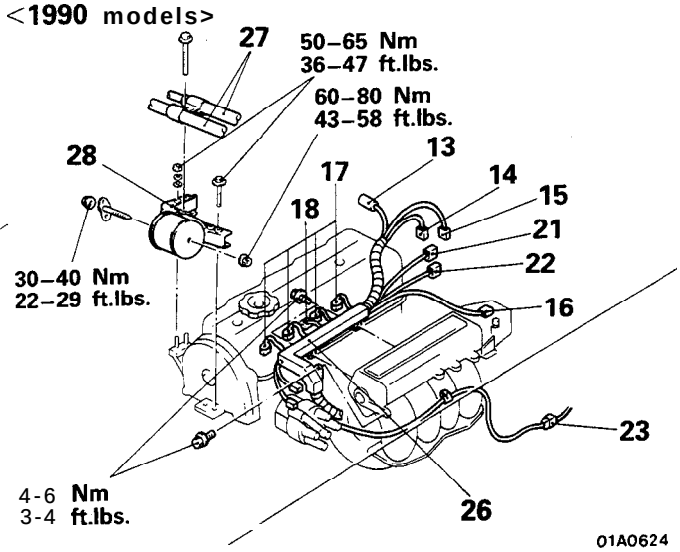

01A0624

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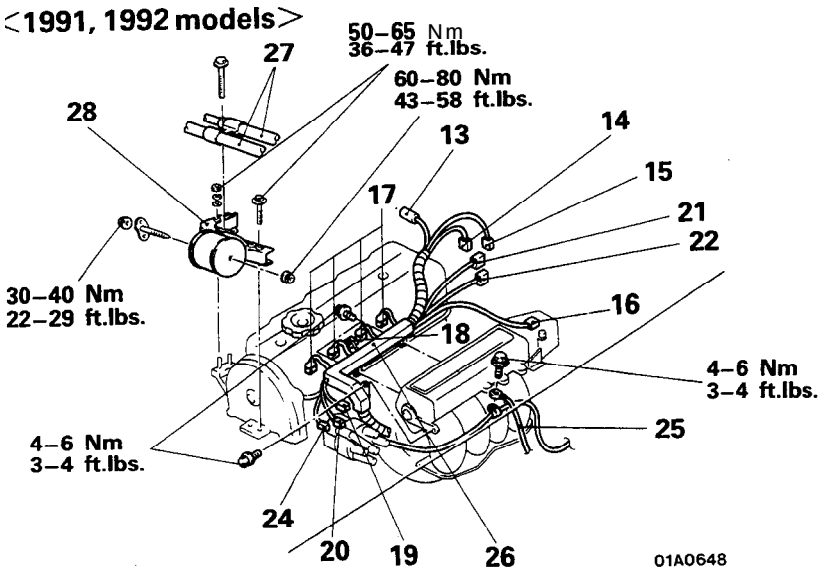

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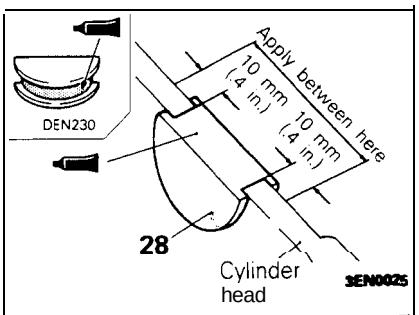
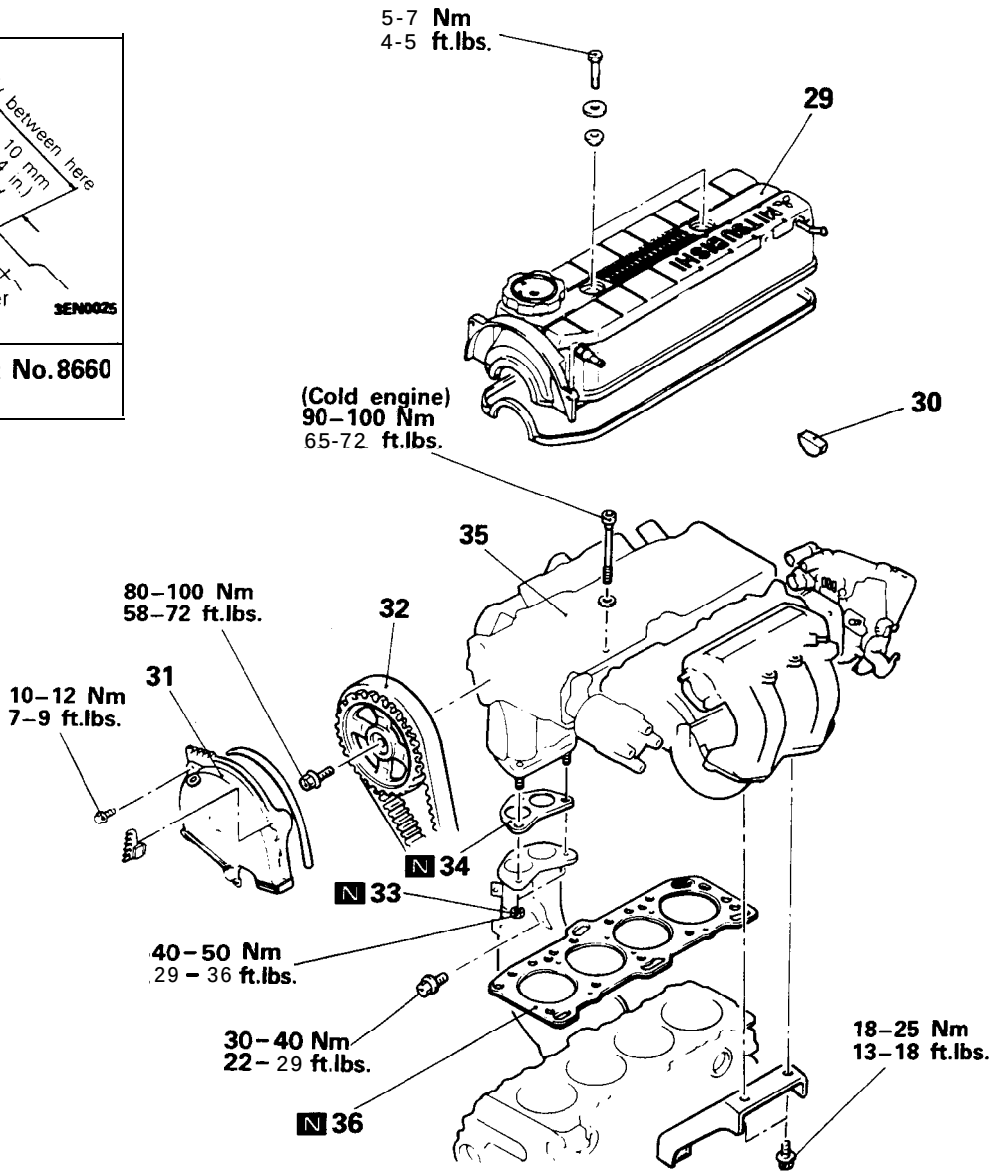


Sealant: 3M ATD Part No.8660 or equivalent



Removal steps

1. Air intake hose
2. Connection for accelerator cable or throttle cable (Refer to GROUP 13– Service Adjustment Procedures.)
3. Connection for fuel high pressure hose
4. O-ring
5. + Connection for radiator upper hose
6. Connection for water by-pass hose
7. Connection for heater hose
8. Connection for brake booster vacuum hose
9. Connection for fuel return hose
10. Connection for vacuum hose
11. P.C.V. hose
12. Connection for spark plug cable
13. Connection for oxygen sensor
14. Connection for engine coolant temperature gauge unit
15. Connection for engine coolant temperature sensor
16. Connection for ISC
17. Connection for injector
18. Connection for EGR temperature sensor (California vehicles only)
19. Connection for ignition power transistor
20. Connection for condenser
21. Connection for TPS
22. Connection for ISC motor position sensor
23. Connection for distributor
24. Connection for crankshaft position sensor
25. Connection for ground cable
26. Control wiring harness
27. Clamp for pressure hose (Power steering) and high pressure hose (Air conditioning)
28. Engine mounting bracket
29. Rocker cover
30. Semi-circular packing
31. Timing belt front upper cover
32. Camshaft sprocket
33. Self-locking nuts
34. Gasket
35. Cylinder head assembly
36. + Cylinder head gasket

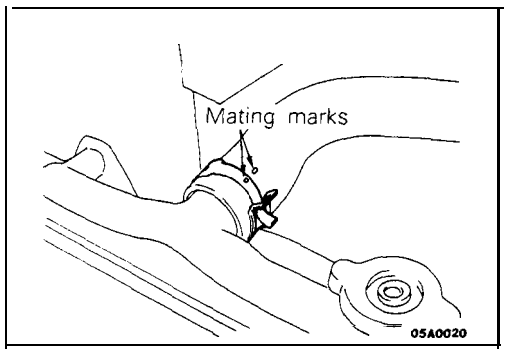
TSB Revision

SERVICE POINTS OF REMOVAL M11JBAI

3. DISCONNECTION OF FUEL HIGH PRESSURE HOSE

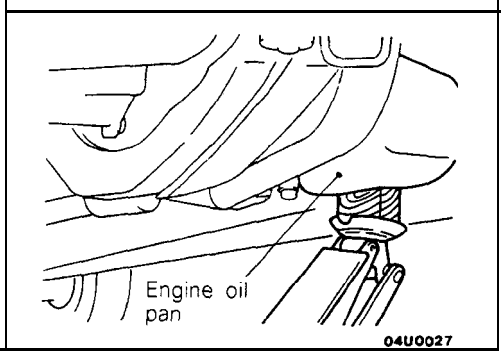
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

For information concerning the bleeding of the residual pressure, refer to GROUP 13–On-Vehicle Inspection of MFI Components.



5. REMOVAL OF RADIATOR UPPER HOSE

Make mating marks on the radiator hose and hose clamp, and then disconnect the radiator hose.

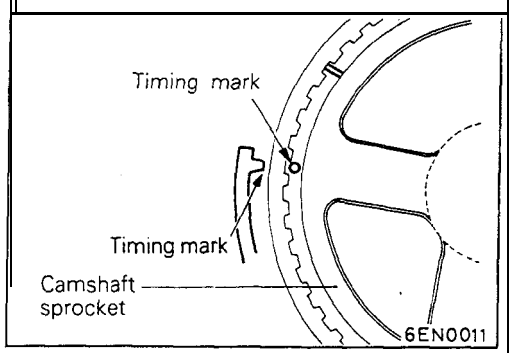


28. REMOVAL OF ENGINE MOUNTING BRACKET

(1) Jack up the vehicle after placing a wooden block between the jack and the engine's oil pan.

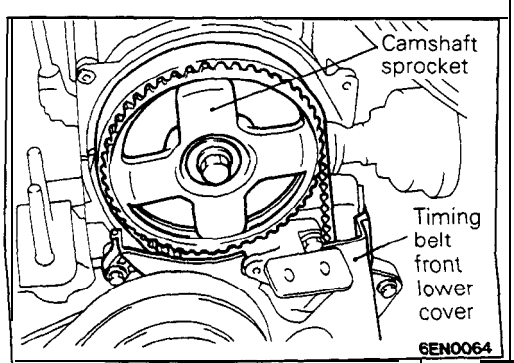
Caution
Jack up carefully, so as not to apply an excessive load to the various parts.

(2) Remove the engine mount bracket.



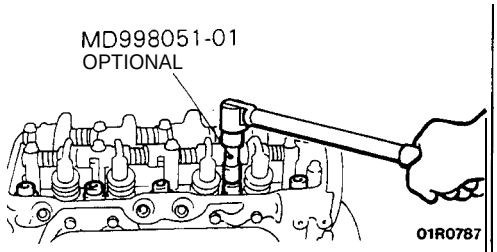
32. REMOVAL OF CAMSHAFT SPROCKET

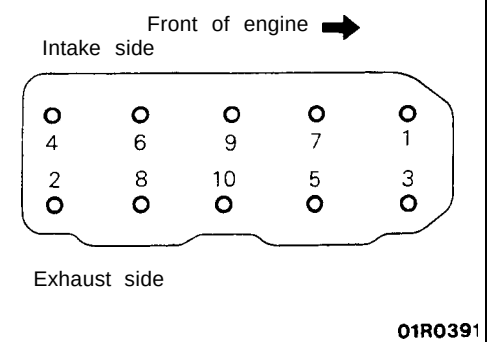
(1) Rotate the crankshaft and align the timing mark.



(2) Remove the camshaft sprocket (with the timing belt attached), and place on the timing belt front lower cover.

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

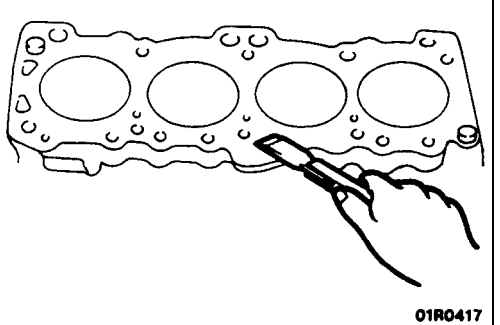




35. REMOVAL OF CYLINDER HEAD ASSEMBLY

(1) Using the special tool, remove cylinder head bolts in sequence shown in figure.
(2) Remove the cylinder head assembly.

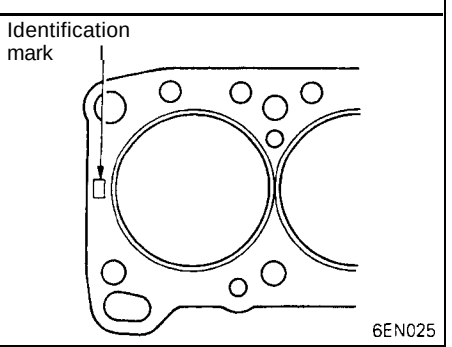
SERVICE POINTS OF INSTALLATION M11JDBC



36. INSTALLATION OF CYLINDER HEAD GASKET

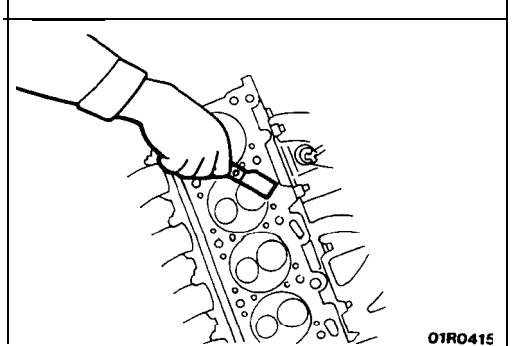
(1) Use a scraper to remove the cylinder head gasket from the cylinder block.

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



(2) Clean the cylinder block and head surfaces that are in contact with the gasket.
(3) Lay the cylinder head gasket on cylider block with the identification mark at front top.

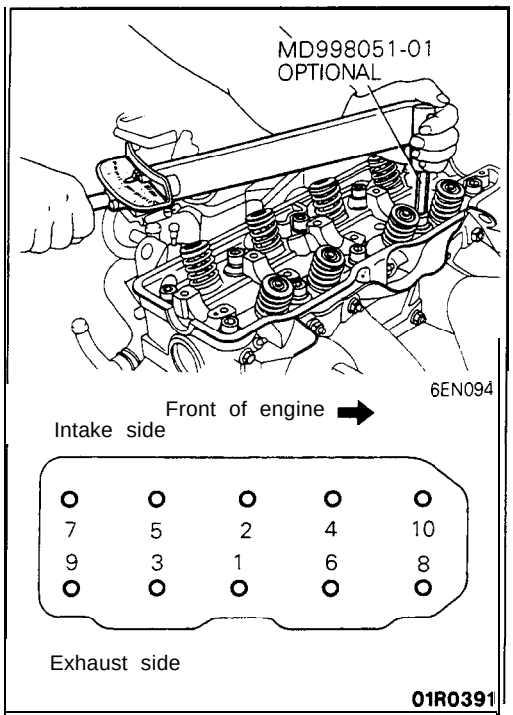
Caution
Do not apply sealant to cylinder head gasket.



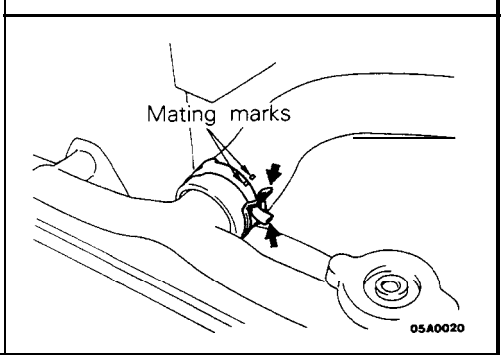
35. INSTALLATION OF CYLINDER HEAD ASSEMBLY

(1) Use a scraper to remove the cylinder head gasket from the cylinder head assembly.

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



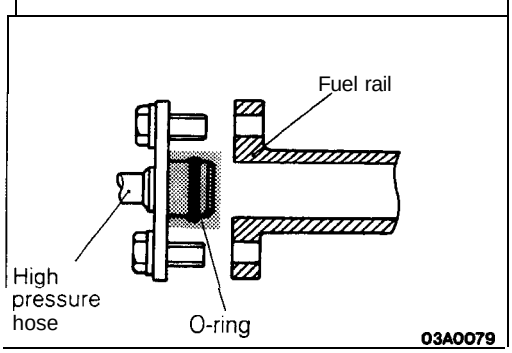
(2) Using the special tool, tighten the bolts in the order shown in two or three steps.



5. INSTALLATION OF RADIATOR UPPER HOSE

Align the mating marks (of the radiator hose and hose clamp), and then, while applying force in the direction of the arrow in the illustration, seat the hose clamp to the trace marks (on the hose) remaining from the prior connection.

Caution
Be sure to install the hose clamp at the trace marks (on the hose) remaining from the prior connection.



3. CONNECTION OF FUEL HIGH PRESSURE HOSE

When connecting the high-pressure fuel hose to the fuel rail, apply a coating of engine oil to the hose union, and insert so that the O-ring is not damaged.

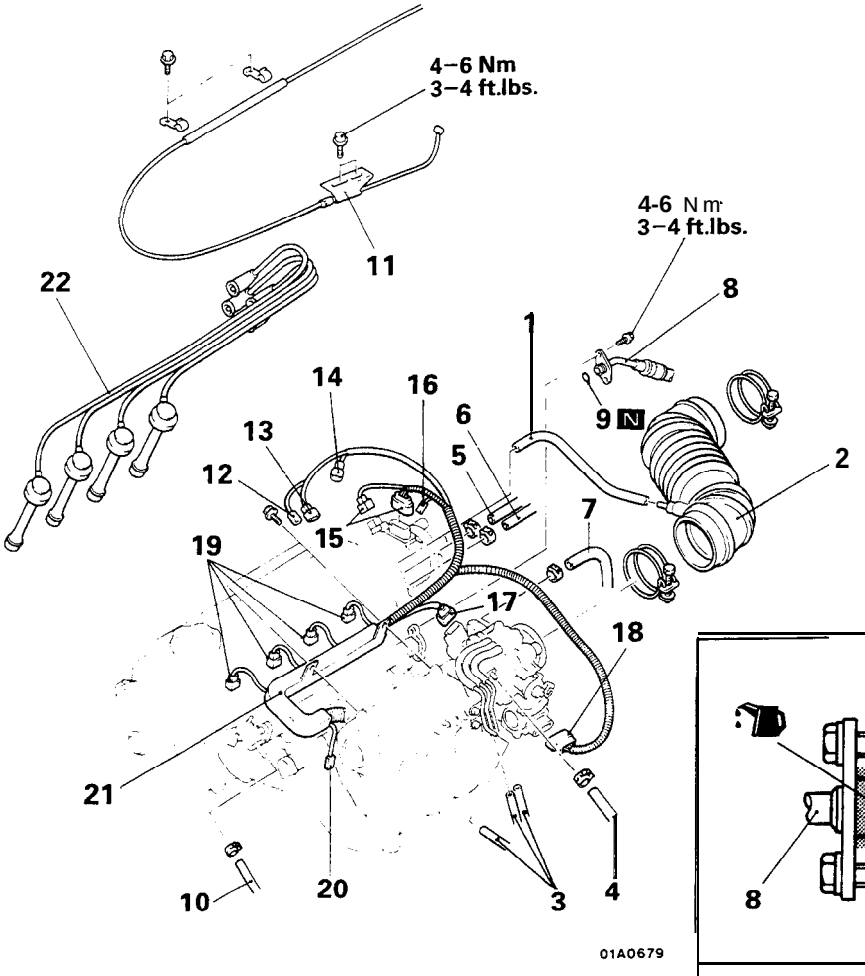
CYLINDER HEAD GASKET <16 VALVE>

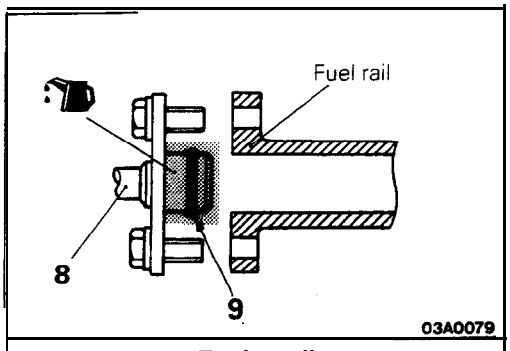
MI 1JA-C

REMOVAL AND INSTALLATION

Pre-removal Operation
- Releasing of Fuel Line Pressure (Refer to GROUP 13–Service Adjustment Procedures.)
- Draining of the Engine Coolant (Refer to GROUP 14–Service Adjustment Procedures.)
- Draining of the Engine Oil

Post-installation Operation
- Supplying of the Engine Coolant (Refer to GROUP 14–Service Adjustment Procedures.)
- Supplying of the Engine Oil
- Accelerator Cable Adjustment (Refer to GROUP 13–Service Adjustment Procedures.)





Engine oil

Removal steps
1. Breather hose
2. Air intake hose
3. Vacuum hose connection
4. Brake booster vacuum hose connection
5. Water hose connection (cylinder head → throttle body)
6. Heater hose connection (cylinder head → heater unit)
7. Water hose connection (throttle body → water inlet pipe)
8. Fuel high pressure hose connection
9. O-ring
10. Fuel return hose connection
11. Accelerator cable connection
12. Engine coolant temperature gauge unit connector
13. Engine coolant temperature sensor connector
14. Oxygen sensor connector
15. Distributor connector
16. Condenser connector
17. TPS connector
18. IAC connector
19. Injector connector
20. Air conditioning compressor connector
21. Control harness
22. Spark plug cable

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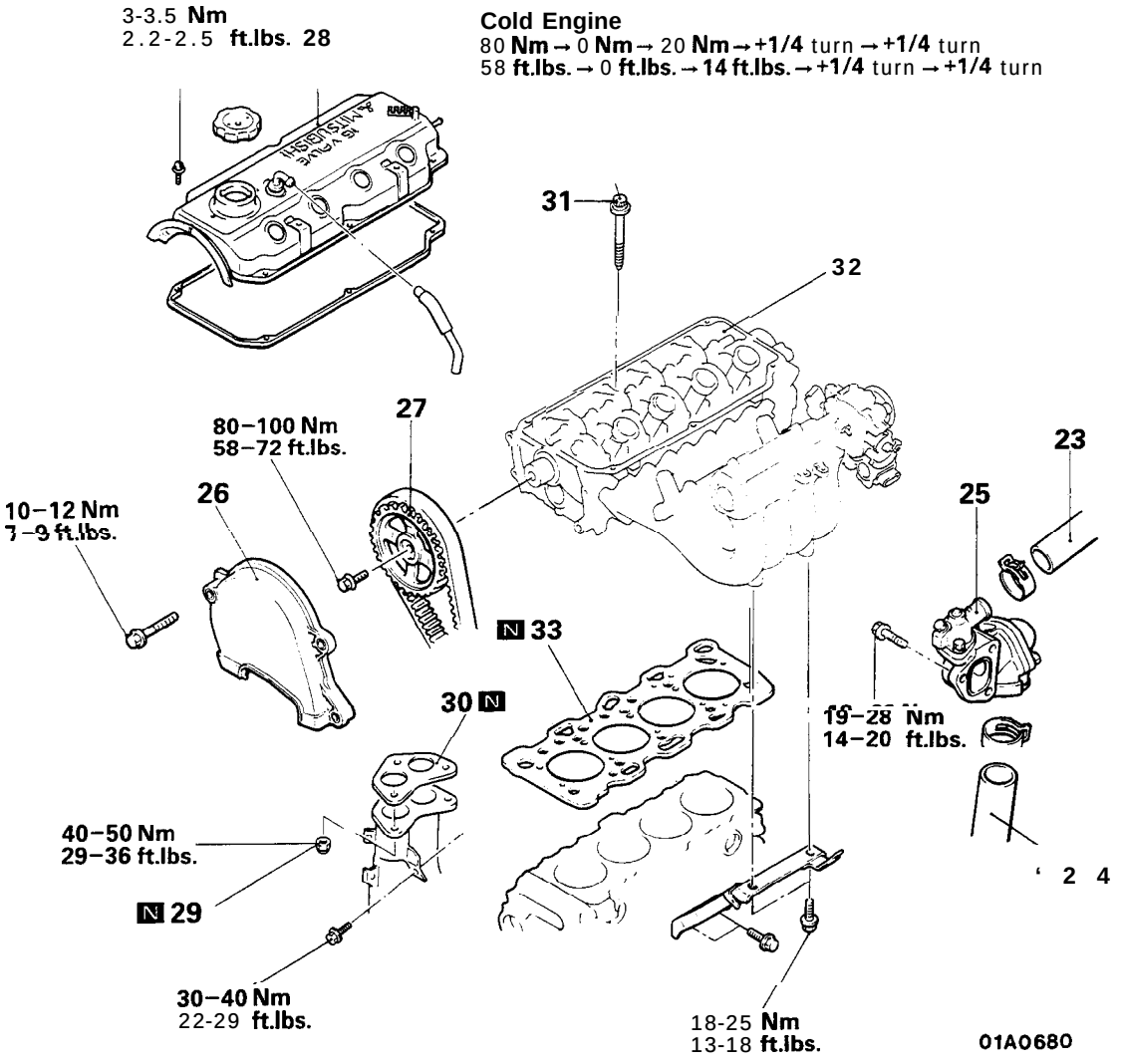
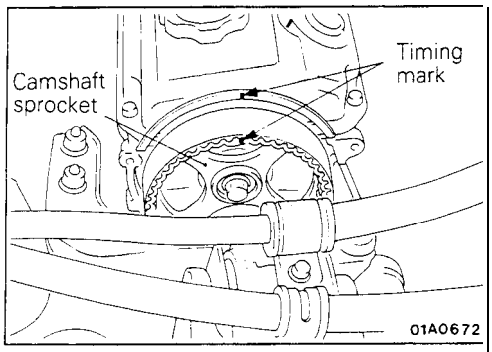


23. Connection for radiator upper hose
24. Connection for radiator lower hose
◆◆25. Water inlet fitting, thermostat and thermostat case assembly
26. Timing belt upper cover
◆◆ 27. Camshaft sprocket
28. Rocker cover
29. Self-locking nuts
30. Gasket
◆◆31. Cylinder head bolt
◆◆◆◆32. Cylinder head assembly
● +33. Cylinder head gasket

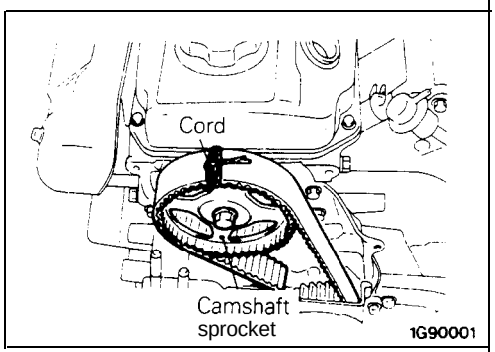


SERVICE POINTS OF REMOVAL M11JBAZ

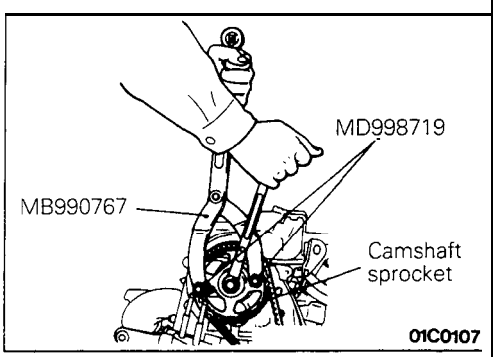
27. REMOVAL OF CAMSHAFT SPROCKET

(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.

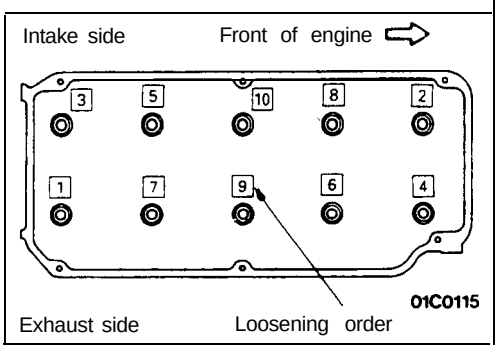


(2) Tie the camshaft sprocket and timing belt with a cord so that the position of the camshaft sprocket will not move with respect to the timing belt.



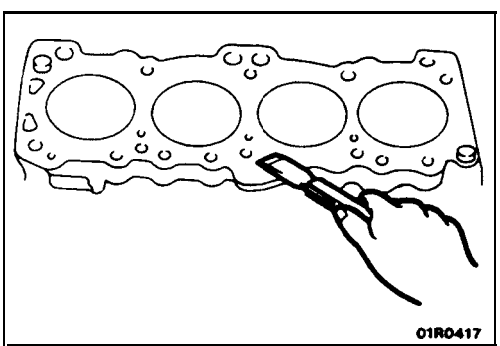
(3) Use the special tool to remove the camshaft sprocket with the timing belt attached.

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



32. REMOVAL OF CYLINDER HEAD ASSEMBLY

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

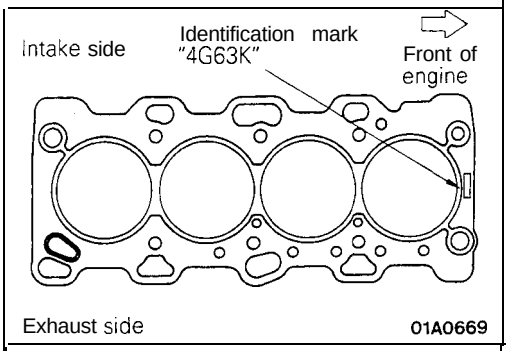


SERVICE POINTS OF INSTALLATION M11JDCV

33. INSTALLATION OF CYLINDER HEAD GASKET

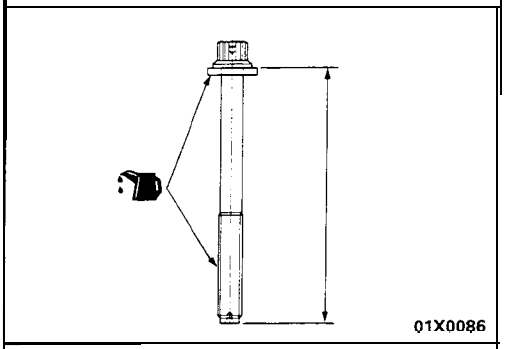
(1) Use a scraper or gasket remover to remove the gasket adhering of the cylinder block.

Caution
When doing this, be careful not to let any foreign substances such as gasket scraps enter the cylinder or the engine coolant and oil passages.



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

Caution
The cylinder head gasket is easy to mis-install, so be sure to check it. If it is mis-installed, malfunctions such as no oil rising to the cylinder head will occur.



32. INSTALLATION OF CYLINDER HEAD ASSEMBLY/31. CYLINDER HEAD BOLT

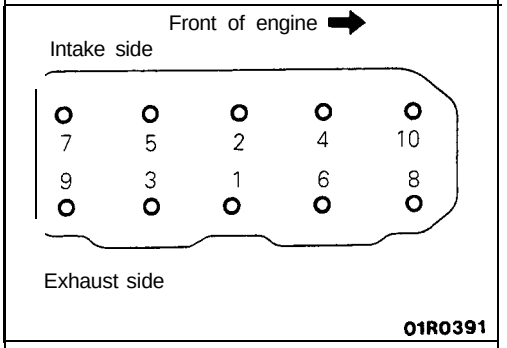
(1) Use a scraper to clean the gasket surface of the cylinder head assembly.

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

(2) When installing the cylinder head bolts, check that the shank length of each bolt meets the limit. If the limit is exceeded, replace the bolt.

Limit: Max. 99.4 mm (3.91 in.)

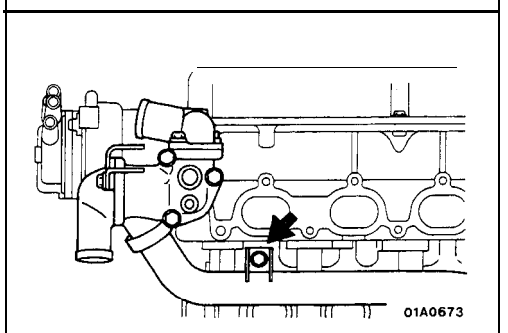
(3) Apply engine oil to the threaded part of the bolt and the washer.
(4) According to the tightening sequence, tighten the bolts to the specified torque 80 Nm (58 ft.lbs.).
(5) Loosen bolts completely.
(6) Torque bolts to 20 Nm (14.5 ft.lbs.).
(7) Tighten bolts 1/4 turns (90") more.
(8) Tighten bolts 1/4 turns (90") additionally.



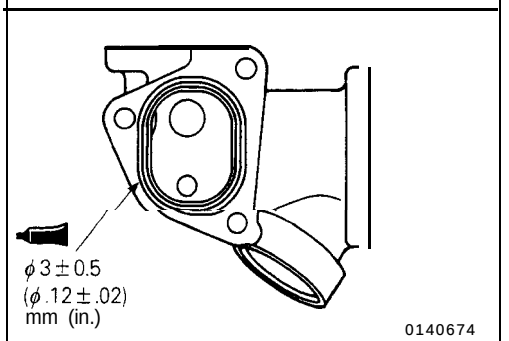
25. INSTALLATION OF WATER INLET FITTING, THERMOSTAT AND THERMOSTAT CASE ASSEMBLY

(1) Loosen the water inlet pipe bolt shown in the illustration.
(2) Apply specified sealant to the thermostat case assembly as shown in the illustration.

Specified sealant: MITSUBISHI GENUINE PART No.MD970389 or equivalent



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

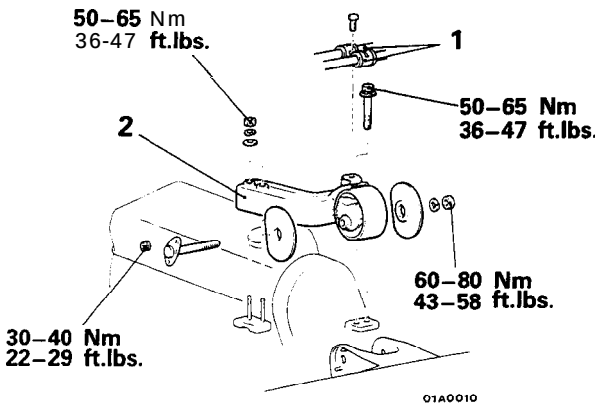


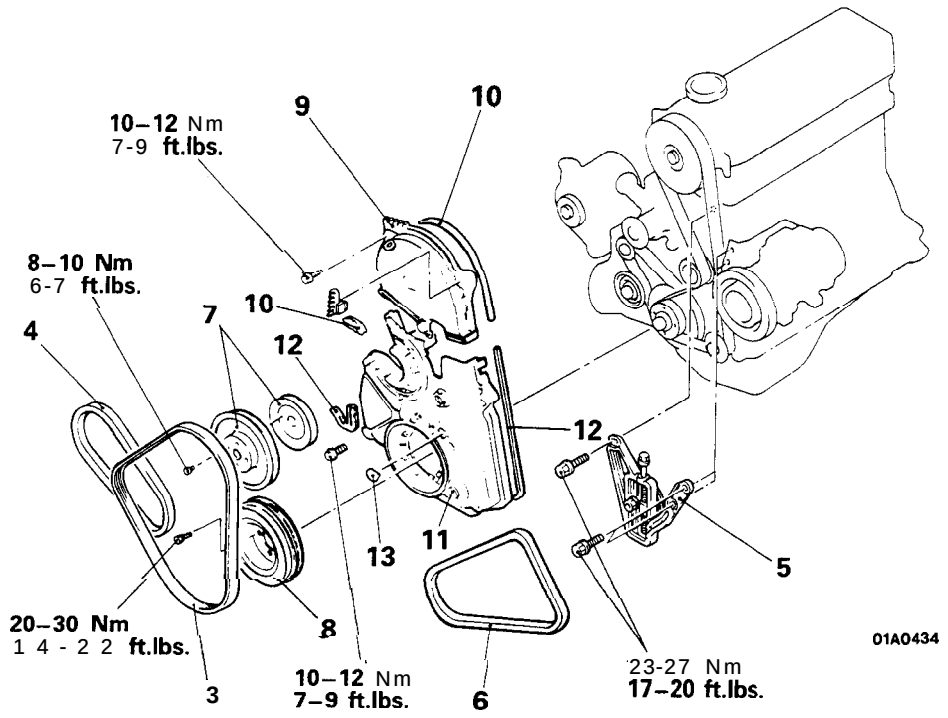
TIMING BELT <8 VALVE>

M11KA-A

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of under cover



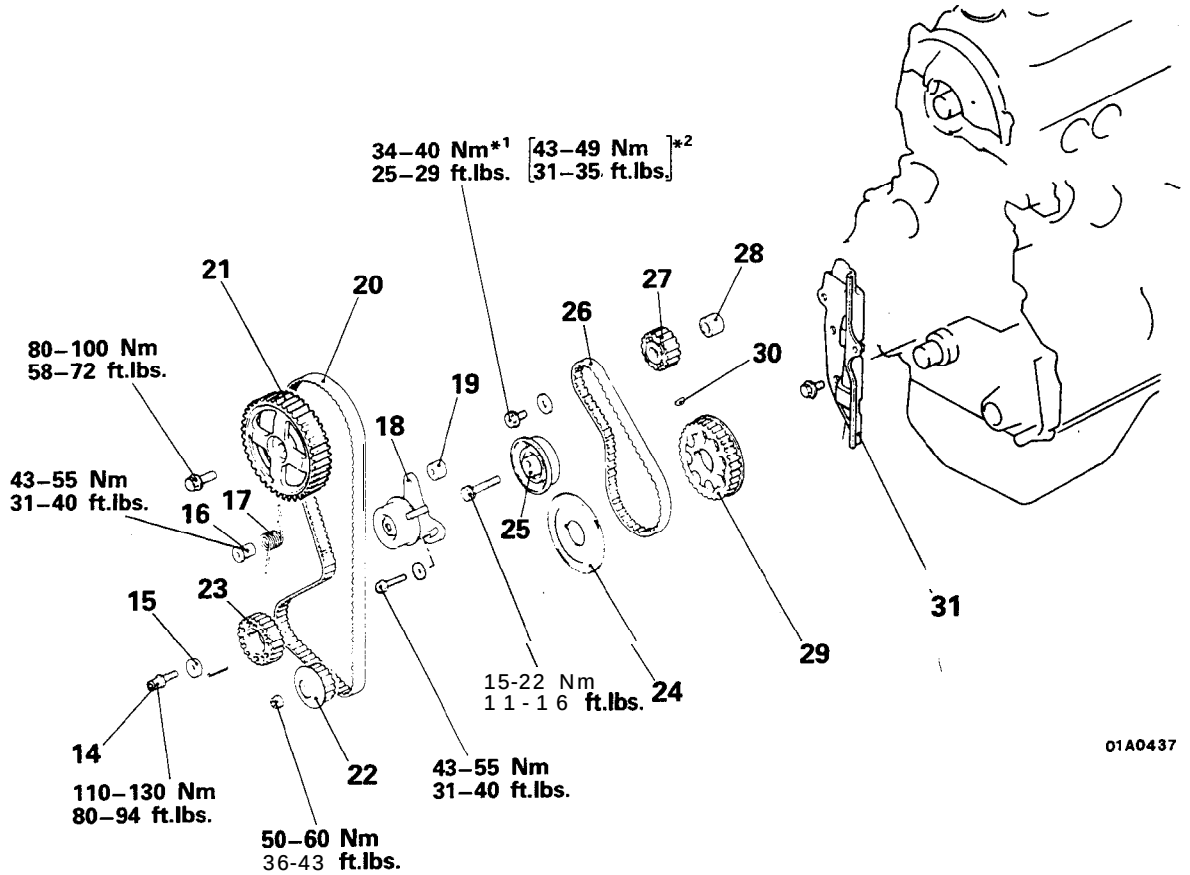


Removal steps

1. Clamp for pressure hose (power steering) and high pressure hose (air conditioning)
- ◻ 2. Engine mount bracket
3. Drive belt (generator)
4. Drive belt (power steering)
5. Tensioner pulley bracket
6. Drive belt (air conditioning)
7. Water pump pulley
8. Crankshaft pulley
9. Timing belt front upper cover
10. Gasket
11. Timing belt front lower cover
12. Gasket
13. Access cover
14. Crankshaft sprocket bolt
15. Special washer
16. Tensioner spacer
17. Tensioner spring
18. Timing belt tensioner
19. Spacer
- ◻ 20. Timing belt
21. Camshaft sprocket
◆◆ 22. Oil pump sprocket
23. Crankshaft sprocket
24. Flange
25. Timing belt tensioner “B”
- ◻ 26. Timing belt “B”
27. Right silent shaft sprocket
28. Spacer
29. Crankshaft sprocket “B”
30. Key
31. Timing belt under cover

TSB Revision

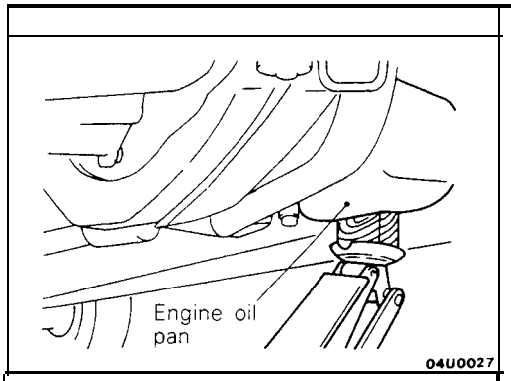
Post-installation Operation
- installation of under cover
- Service Adjustment Procedures (Refer to P.11-7.)



Installation steps
- 31. Timing belt under cover
- 30. Key
- ● * 29. Crankshaft sprocket "B"
- ● 28. Spacer
- 27. Right silent shaft sprocket
- 25. Timing belt tensioner "B"
- ● * 26. Timing belt "B"
- Adjustment of timing belt "B" tension
- ◆◆ *24. Flange
- 23. Crankshaft sprocket
- 22. Oil pump sprocket
- 21. Camshaft sprocket
- 19. Spacer
- ● 18. Timing belt tensioner
- ◆◆ 17. Tensioner spring
- ● + 16. Tensioner spacer
- ◆◆ 20. Timing belt
- Adjustment of timing belt tension
- 15. Special washer
- 14. Crankshaft sprocket bolt
- 13. Access cover
- 12. Gasket
- ◆◆ *11. Timing belt front lower cover
- 10. Gasket
- ● + 9. Timing belt front upper cover
- 8. Crankshaft pulley
- 7. Water pump pulley
- 6. Drive belt (air conditioning) (Refer to P.11-12.)
- 5. Tensioner pulley bracket
- 4. Drive belt (power steering) (Refer to P.11-12.)
- 3. Drive belt (generator) (Refer to P.11-12.)
- 2. Engine mount bracket
- 1. Clamp for pressure hose (power steering) and high pressure hose (air conditioning)

NOTE
*1: Vehicles built up to Nov. 1988
*2: Vehicles built from Dec. 1988

TSB Revision



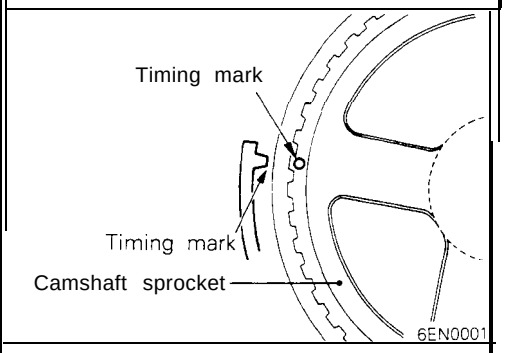
SERVICE POINTS OF REMOVAL M11KBDF

2. REMOVAL OF ENGINE MOUNT BRACKET

(1) Jack up the vehicle after placing a wooden block between the jack and the engine's oil pan.

Caution
Jack up carefully so as not to apply an excessive load to the various parts.

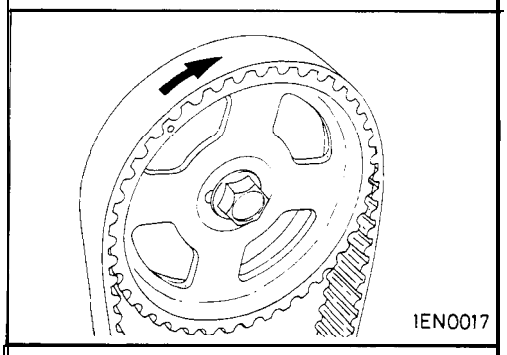
(2) Remove the engine mount bracket.



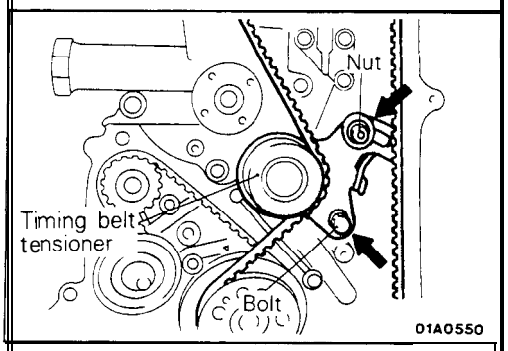
20. REMOVAL OF TIMING BELT

(1) Turn the crankshaft clockwise and align the timing marks.

Caution
The crankshaft must always be turned clockwise.



(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.

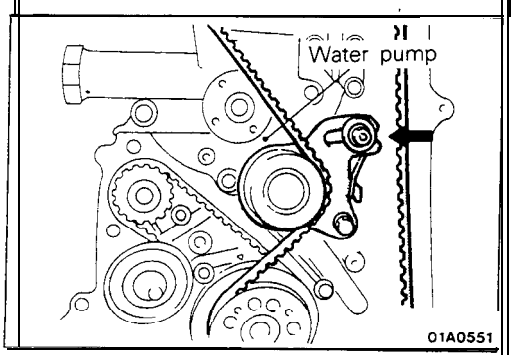


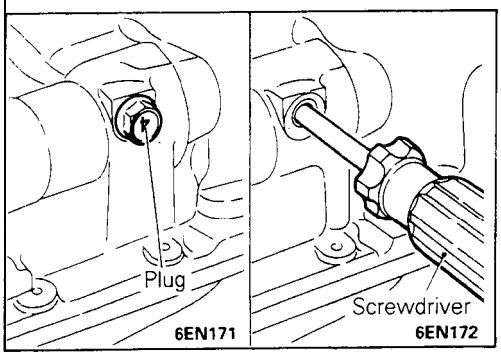
(3) Loosen the bolt and tension spacer of the timing belt tensioner.

(4) Move the timing belt tensioner to the water pump side and loosely tighten the bolt so that the tensioner doesn't return; then remove the timing belt.

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

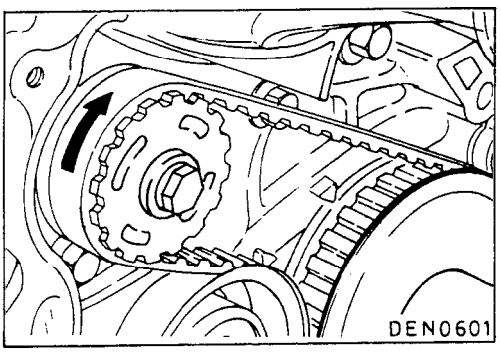
Caution
1. As water or oil on the belt can seriously reduce its usable life, ensure that the timing belt, sprocket, and tensioner stay clean and dry while removed, and never wash them. Parts that have become too dirty should be replaced.
2. When any of the parts are oily, check to see whether there are any oil leaks in any of the oil seals or the cam shaft oil seal on the front of the engine.





22. REMOVAL OF OIL PUMP SPROCKET

(1) Remove the plug on the side of the cylinder block.
(2) Insert a Phillips screwdriver [shank diameter 8 mm (.31 in.)] to block the left silent shaft.
(3) Remove the oil pump sprocket nut.
(4) Remove the oil pump sprocket.



26. REMOVAL OF TIMING BELT "B"

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.

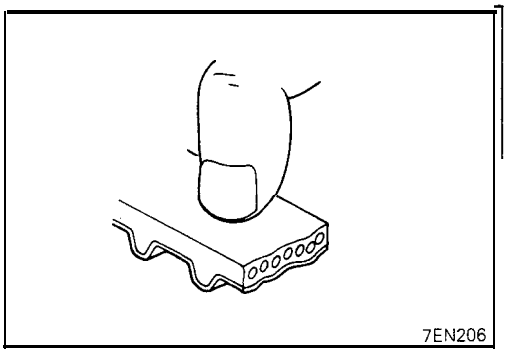
Caution
Water or oil on the belt shorten its life drastically, so the removed timing belt, sprocket, and tensioner must be free from oil and water. These parts should not be washed. Replace parts if seriously contaminated.
If there is oil or water on each part check the front case oil seals, camshaft oil seal and water pump for leaks.

INSPECTION M11KCAD

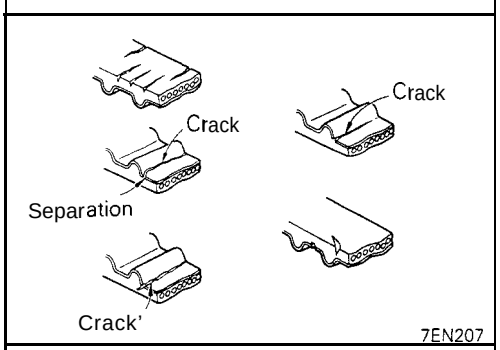
TIMING BELTS

The timing belts must be checked closely. Should the following defects be evident, replace the belt with a new one.

(1) Hardened back surface rubber
Glossy, non-elastic, and so hard that no mark is produced even when scratched by a fingernail.

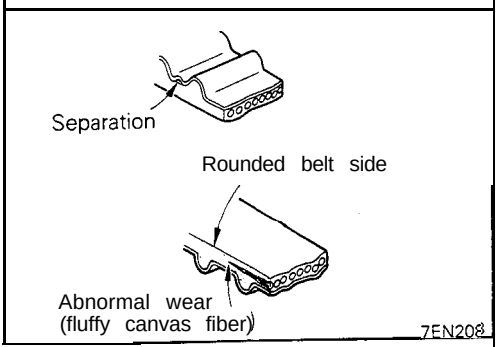


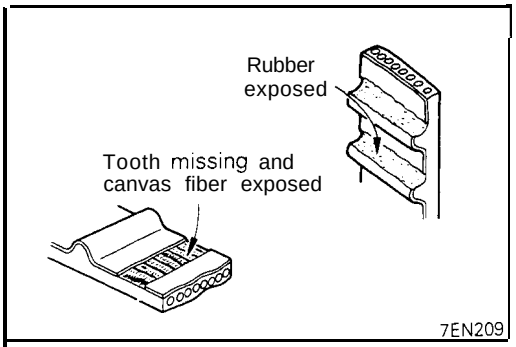
(2) Cracked back surface rubber.
(3) Cracked or separated canvas.
(4) Cracked tooth bottom.
(5) Cracked side.



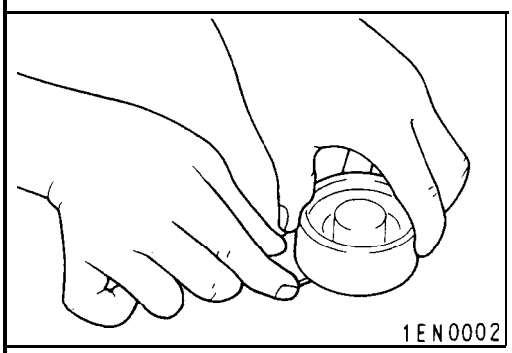
(6) Abnormal wear on side.

NOTE
Normal belt should have clear-cut sides as if cut by a sharp knife.





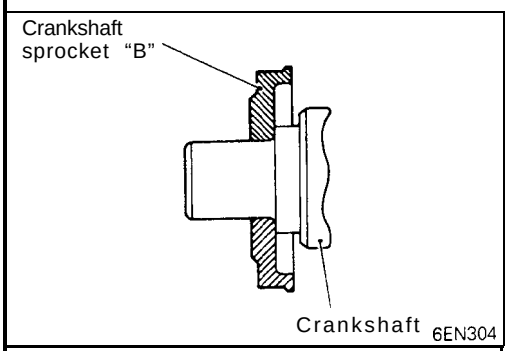
(7) Abnormal wear on teeth.
Initial stage:
Canvas on load side tooth flank worn (Fluffy **canvas** fibers, rubber gone and color changed to white, and unclear canvas texture)
Final stage:
Canvas on load side tooth flank worn down and rubber exposed (tooth width reduced)
(8) Missing tooth.



TENSIONER PULLEY

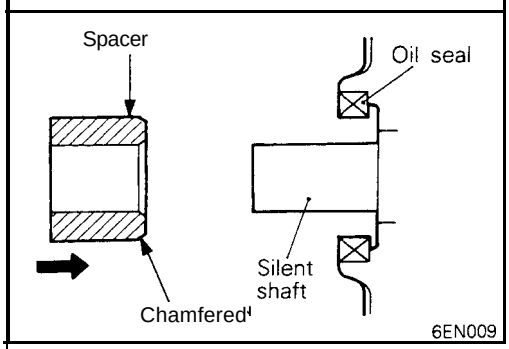
Turn the pulleys to check for possible binding, excessive play, and unusual noise. Replace the pulley if any of these defects is evident.

SERVICE POINTS OF INSTALLATION M11KDCE



29. INSTALLATION OF CRANKSHAFT SPROCKET "B"

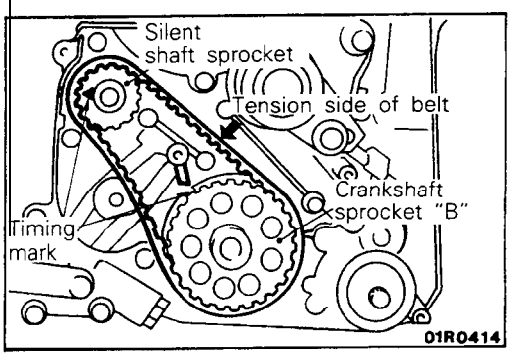
Install the crankshaft sprocket "B" as shown while paying attention to its direction.



28. INSTALLATION OF SPACER

(1) Apply a thin coat of engine oil to the outer circumference of the spacer.
(2) Install the spacer with the chamfered end facing the oil seal.

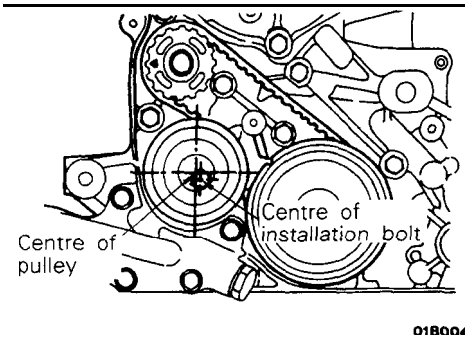
NOTE
If the spacer is installed adversely, the oil seal may be damaged, resulting in the oil leaks.



26. INSTALLATION OF TIMING BELT "B"

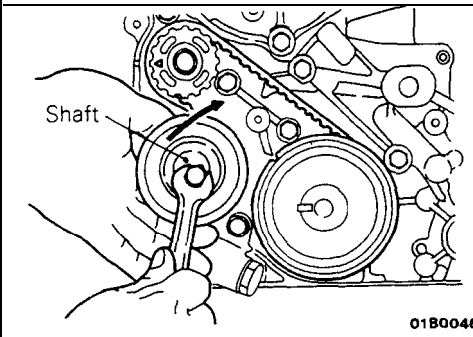
(1) Ensure that crankshaft sprocket "B" timing mark and the silent shaft sprocket timing mark are aligned.
(2) Fit timing belt "B" over crankshaft sprocket "B" and the silent shaft sprocket. Ensure that there is no slack in the belt.

TSB Revision



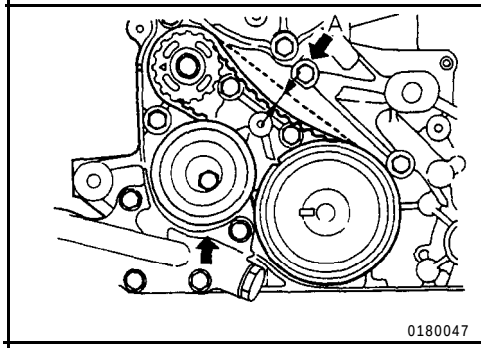
. ADJUSTMENT OF TIMING BELT "B" TENSION

(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.



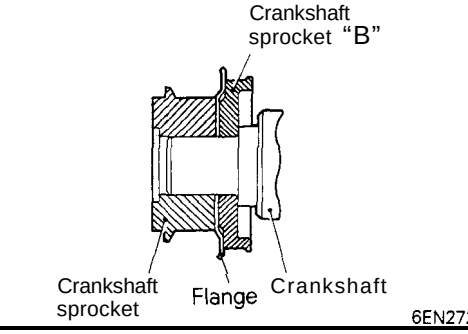
(2) Holding the timing belt "B" tensioner up with your finger in the direction of the arrow, place pressure on the timing belt so that the tension side of the belt is taut. Now tighten the bolt to fix the tensioner.

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.



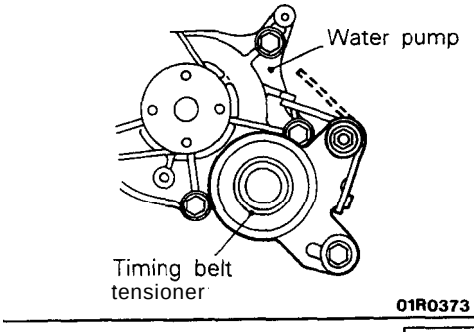
(3) To ensure that the tension is correct, depress the belt (point A) with a finger. If not, adjust.

Standard value: 5-7 mm (.20–.28 in.)



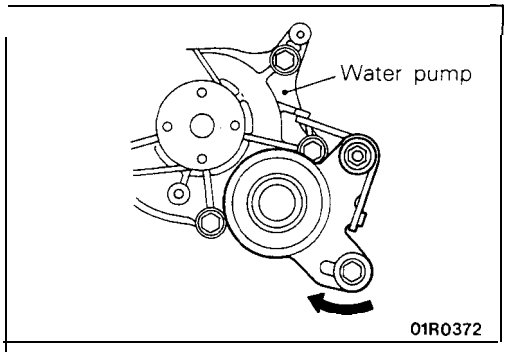
24. INSTALLATION OF FLANGE

Install the flange in correct direction as shown.

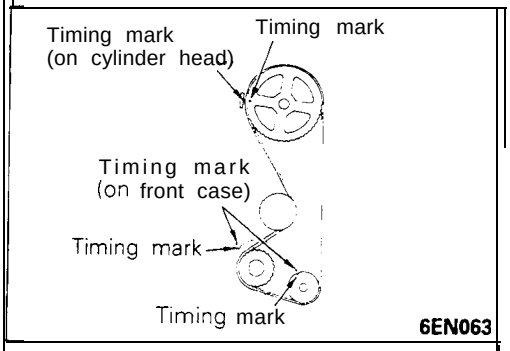


18. INSTALLATION OF TIMING BELT TENSIONER/ 17. TENSIONER SPRING/16. TENSIONER SPACER

(1) Install the tensioner spring, tensioner spacer and timing belt tensioner.
(2) Place the upper end of the tensioner spring against the water pump body.

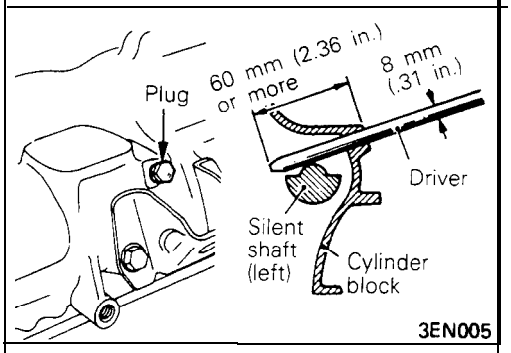


(3) Move tensioner fully toward water pump and temporarily secure tensioner.

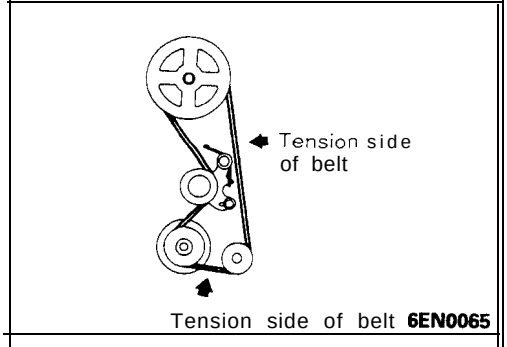


20. INSTALLATION OF TIMING BELT

(1) Ensure that the timing marks of the camshaft sprocket, the crankshaft sprocket, and the oil pump sprocket are all aligned.

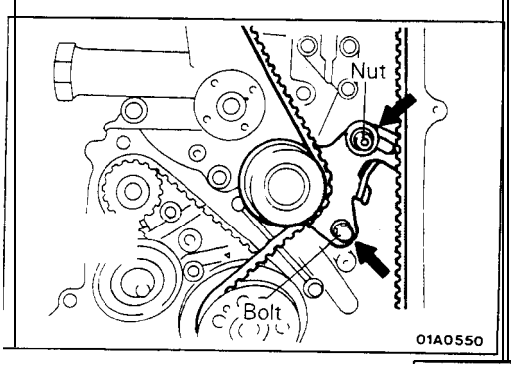


(2) When aligning the timing mark of the oil pump sprocket, remove the plug of the cylinder block; then insert the shaft of a cross-tip (+) screwdriver with a shaft diameter of 8 mm (.31 in.) into the plug hole and check to be sure that the screwdriver's shaft can be inserted at least 60 mm (2.36 in.). Do not remove the screwdriver until the timing belt is completely attached.
If the screwdriver's shaft can be inserted only to a depth of about 20 to 25 mm (.79 to .98 in.) because it contacts the silent shaft, turn the sprocket by one rotation and align the timing mark once again; then check again to be sure that the screwdriver's shaft can be inserted at least 60 mm (2.36 in.).



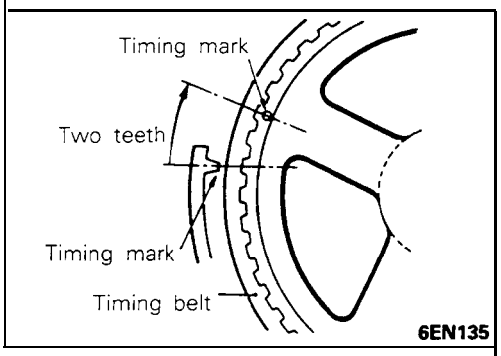
(3) Install timing belt. While making sure that tension side of belt is not slackened, install timing belt onto crankshaft sprocket, oil pump sprocket **and camshaft** sprocket in that order.

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.



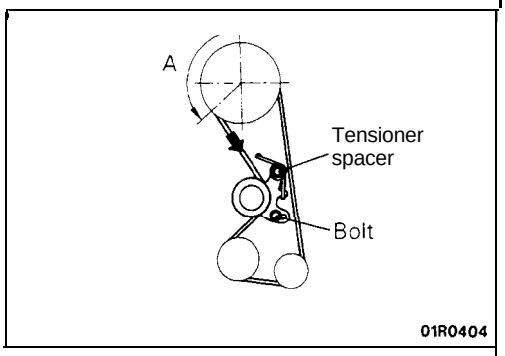
• ADJUSTMENT OF TIMING BELT TENSION

(1) Loosen tensioner mounting bolt. By so doing, tensioner will be moved by spring and will apply tension to belt.
(2) Recheck to be sure that each sprocket's timing mark is correct.



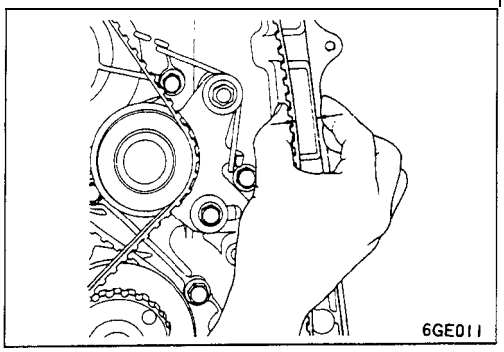
(3) Turn the crankshaft clockwise by two teeth of the camshaft sprocket.

Caution
As the purpose of this procedure is to apply the proper amount of tension on the timing belt, be sure not to rotate the crankshaft counter-clockwise or place pressure on the belt to check the amount of tension.



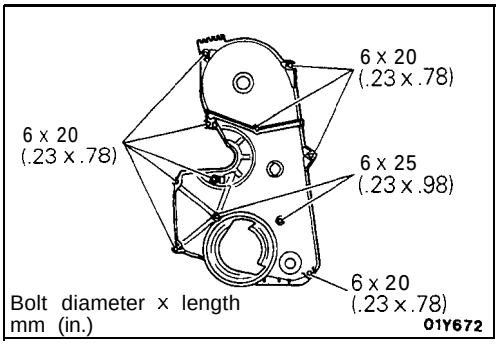
(4) Apply force on tensioner toward turning direction, (in the direction of the arrow) such that no portion of the belt raises out in portion A, place the belt on the camshaft sprocket such that the belt sprocket teeth are fully engaged.
(5) Tighten the tensioner installation bolt and tensioner spacer in that order.

Caution
If the tensioner spacer is tightened first, the tensioner will rotate with it and belt tension be thrown out of adjustment. Always tighten the bolt first.



(6) Check to see that the clearance between the outside of the belt and the cover are within the standard value by grasping the tension side (between the camshaft sprocket and oil pump sprocket) of the centre part of the timing belt between the thumb and index finger.

Standard value: 14 mm (.55 in.)



11. INSTALLATION OF TIMING BELT FRONT LOWER COVER/9. TIMING BELT FRONT UPPER COVER

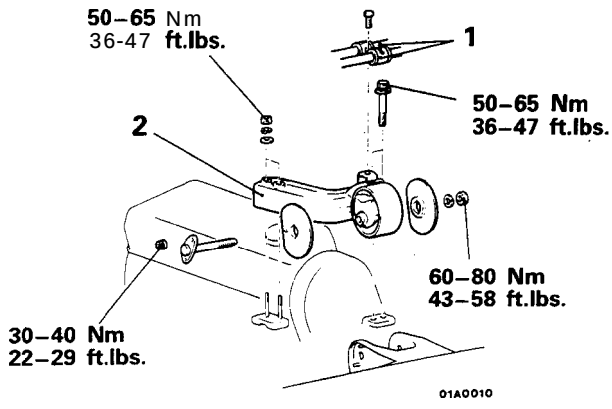
Note that the timing belt lower and upper cover attaching bolts differ in size from one place to another.

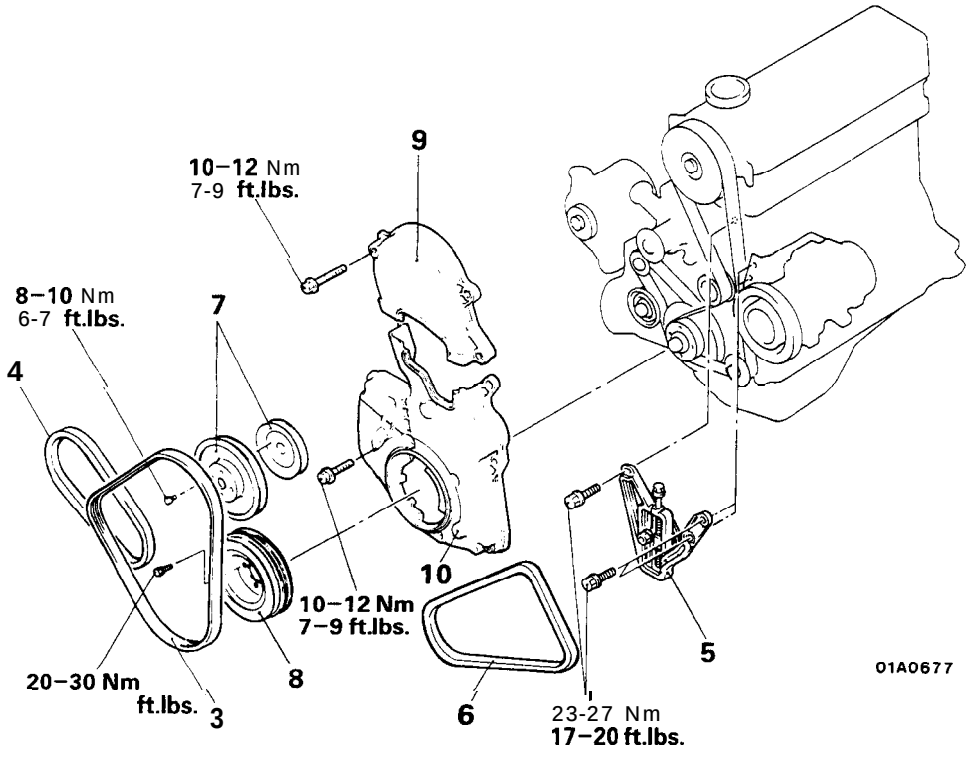
TIMING BELT <16 VALVE>

M11KA-A

REMOVAL AND INSTALLATION

Pre-removal Operation
• Removal of under cover



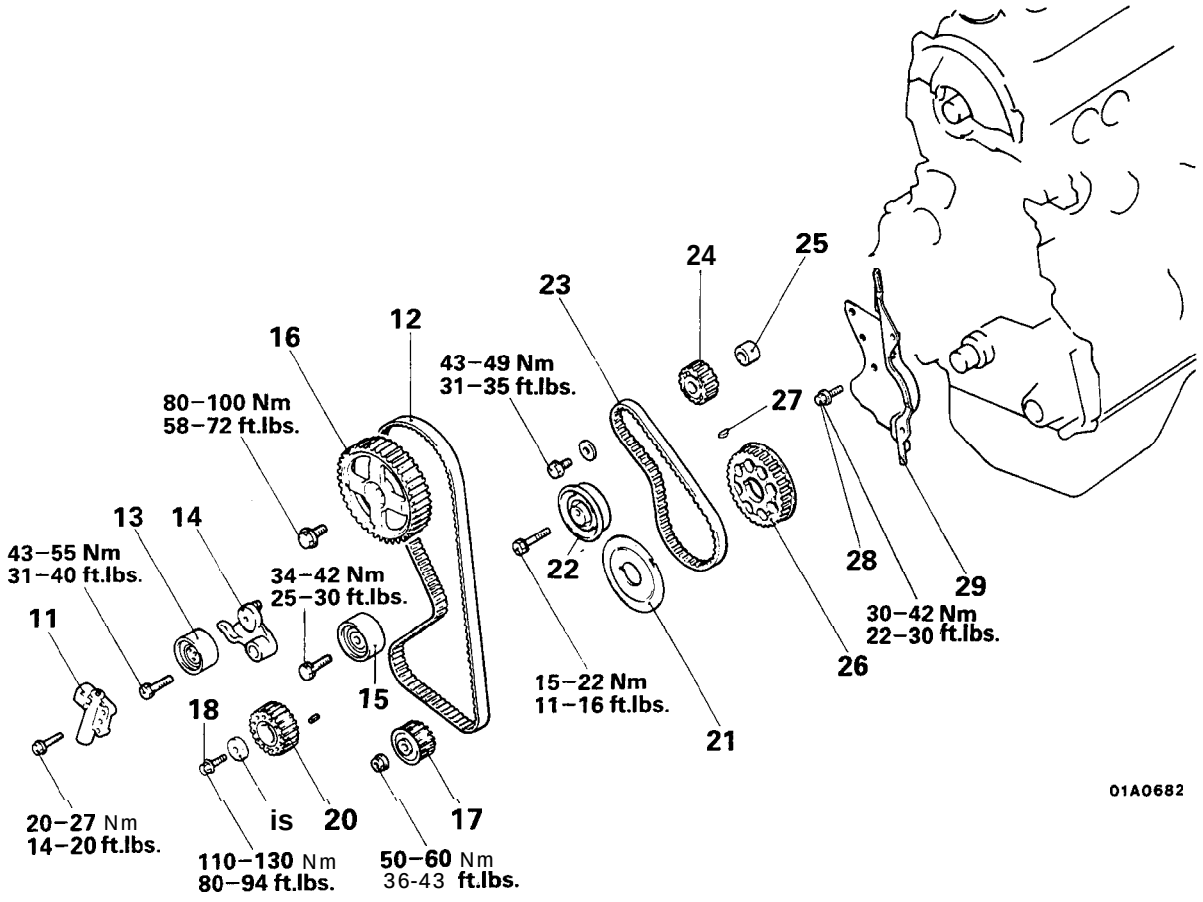


Removal steps

1. Clamp for pressure hose (power steering) and high pressure hose (air conditioning)
◆◆ 2. Engine mount bracket
3. Drive belt (generator)
4. Drive belt (power steering)
5. Tensioner pulley bracket
6. Drive belt (air conditioning)
7. Water pump pulley
8. Crankshaft pulley
9. Timing belt front upper cover
10. Timing belt front lower cover
◆◆ 11. Auto tensioner
◆◆ 12. Timing belt
13. Tensioner pulley
14. Tensioner arm
15. idle pulley
◆◆ 16. Camshaft sprocket
◆◆ 17. Oil pump sprocket
18. Crankshaft sprocket bolt
19. Special washer
20. Crankshaft sprocket
21. Flange
22. Timing belt tensioner "B"
◆◆ 23. Timing belt "B"
24. Right silent shaft sprocket
25. Spacer
27. Key
28. Engine support bracket bolt
29. Timing belt under cover

TSB Revision

Post-installation Operation
- Installation of under cover
- Service Adjustment Procedures (Refer to P.11-7)

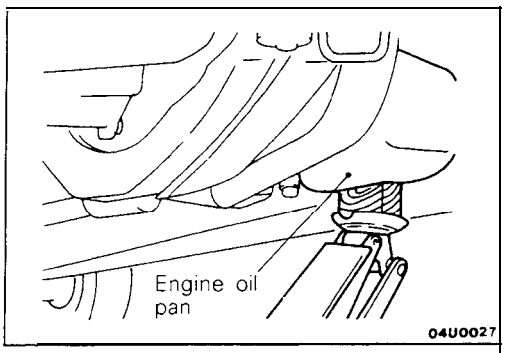


Installation steps

29. Timing belt under cover
- +28. Engine support bracket bolt
27. Key
- ◆◆26. Crankshaft sprocket "B"
- +25. Spacer
24. Right silent shaft sprocket
22. Timing belt tensioner "B"
- +23. Timing belt "B"
- ⊠ Adjustment of timing belt "B" tension
- ◆◆21. Flange
- +20. Crankshaft sprocket
19. Special washer
18. Crankshaft sprocket bolt
17. Oil pump sprocket
16. Camshaft sprocket
15. Idle pulley
- al 1. Auto tensioner
14. Tensioner arm
- ◆◆13. Tensioner pulley
- +I 2. Timing belt
- ⊠ Adjustment of timing belt tension
- 41 0. Timing belt front lower cover
- ◆◆ 9. Timing belt front upper cover

8. Crankshaft pulley
7. Water pump pulley
6. Drive belt (air conditioning) (Refer to P.11-12.)
5. Tensioner pulley bracket
4. Drive belt (power steering) (Refer to P.I1-12.)
3. Drive belt (generator) (Refer to P.I 1-12.)
2. Engine mount bracket
1. Clamp for pressure hose (power steering) and high pressure hose (air conditioning)

TSB Revision



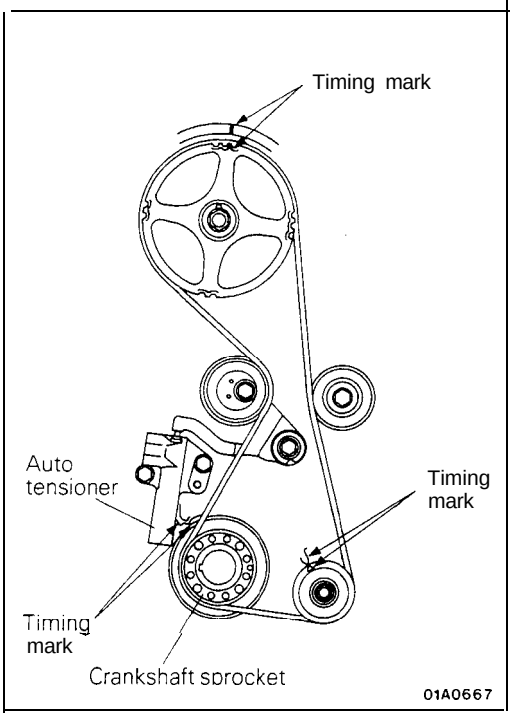
SERVICE POINTS OF REMOVAL M11KBDG

2. REMOVAL OF ENGINE MOUNT BRACKET

(1) With a wooden block placed against the oil pan part of the engine, jack up the vehicle.

Caution
Jack up gently, so as not to apply a load to the various parts.

(2) Remove the engine mount bracket.

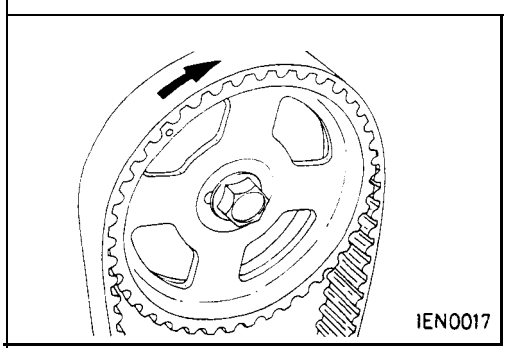


11. REMOVAL OF AUTO TENSIONER

(1) Turn the crankshaft clockwise and align the timing marks so as to bring the No.1 cylinder to compression top-dead-centre position.
At this time the timing marks of the camshaft sprocket and the upper surface of the cylinder head should coincide, and the dowel pin of the camshaft sprocket should be at the upper side.

Caution
The crankshaft must always be rotated clockwise.

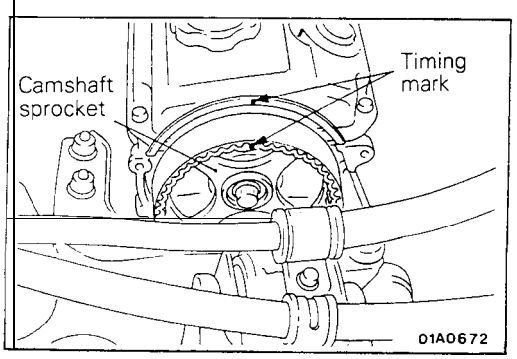
(2) Remove the auto tensioner.



12. REMOVAL OF TIMING BELT

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.

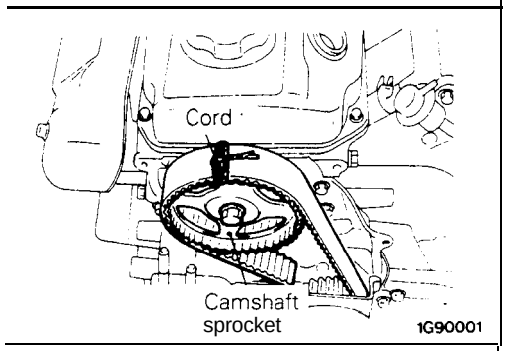
Caution
Water or oil on the belt shorten its life drastically, so the removed timing belt, sprocket, and tensioner must be free from oil and water. These parts should not be washed. Replace parts if seriously contaminated.
If there is oil or water on each part check the front case oil seals, camshaft oil seal and water pump for leaks.



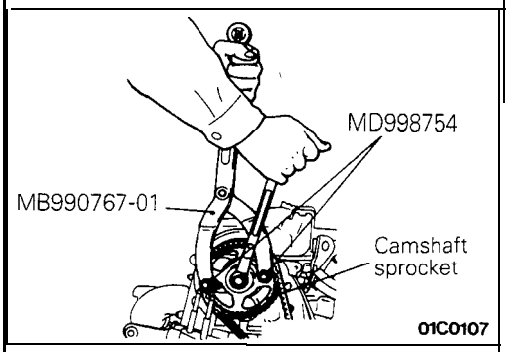
16. REMOVAL OF CAMSHAFT SPROCKET

(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.

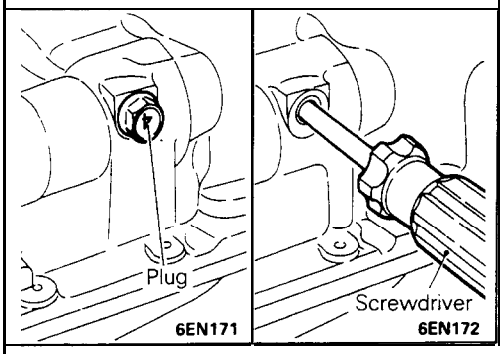


(2) Tie the camshaft sprocket and timing belt with a cord so that the position of the camshaft sprocket will not move with respect to the timing belt.



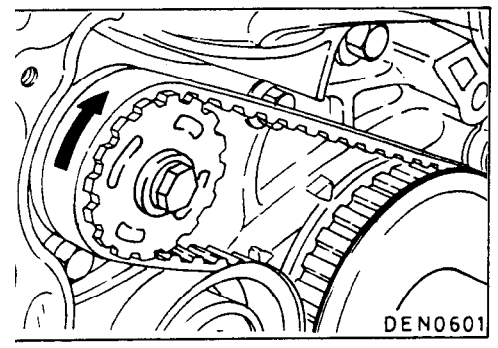
(3) Use the special tool to remove the camshaft sprocket with the timing belt attached.

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



17. REMOVAL OF OIL PUMP SPROCKET

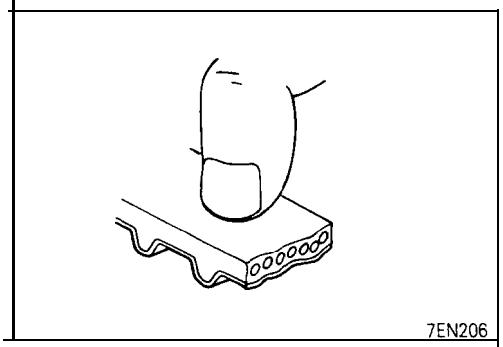
(1) Remove the plug on the side of the cylinder block.
(2) Insert a Phillips screwdriver [shank diameter 8 mm (.31 in.)] to block the left silent shaft.
(3) Remove the oil pump sprocket nut.
(4) Remove the oil pump sprocket.



23. REMOVAL OF TIMING BELT "B"

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.

Caution
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

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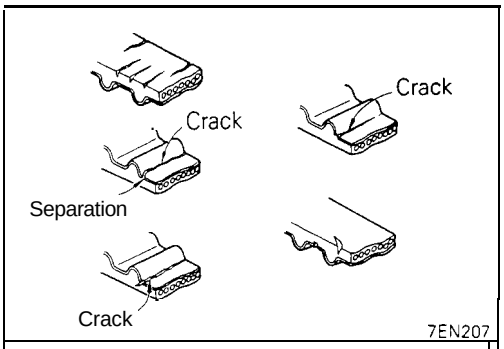
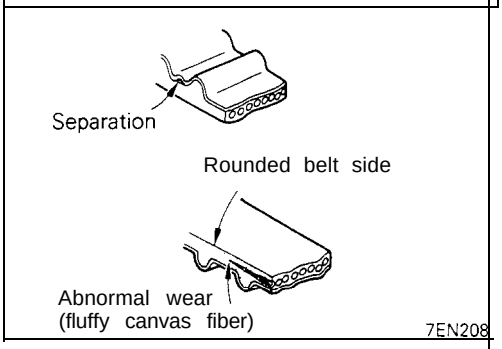
TIMING BELTS

The timing belts must be checked closely. Should the following defects be evident, replace the belt with a new one.
(1) Hardened back surface rubber
Glossy, non-elastic, and so hard that no mark is produced even when scratched by a fingernail.

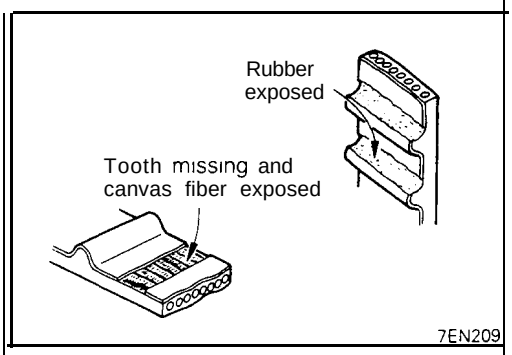


(2) Cracked back surface rubber.
(3) Cracked or separated canvas.
(4) Cracked tooth bottom.
(5) Cracked side.

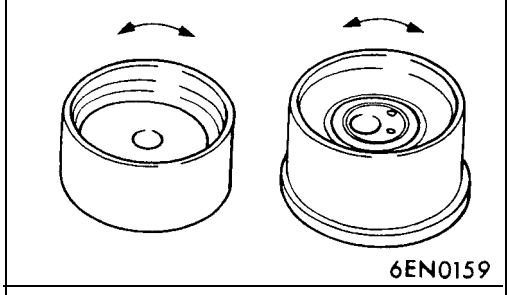


(6) Abnormal wear on side.

NOTE
Normal belt should have clear-cut sides as if cut by a sharp knife.

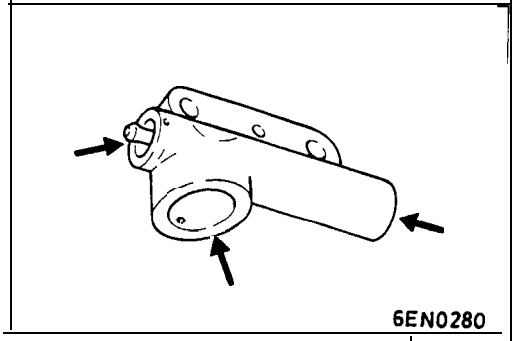


(7) Abnormal wear on teeth.
Initial stage:
Canvas on load side tooth flank worn (Fluffy canvas fibers, rubber gone and color changed to white, and unclear canvas texture)
Final stage:
Canvas on load side tooth flank worn down and rubber exposed (tooth width reduced)
(8) Missing tooth.



TENSIONER PULLEY AND IDLER PULLEY

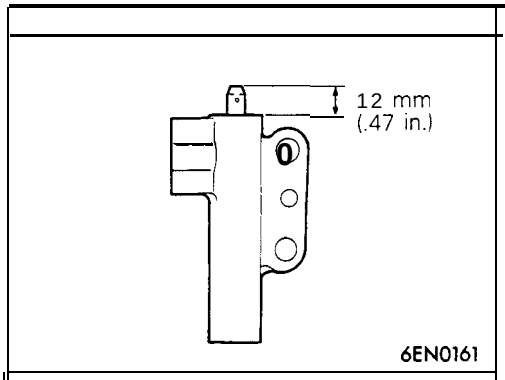
(1) Turn the pulleys to check for possible binding, excessive play, and unusual noise. Replace the pulley if any of these defects is evident.
(2) Replace if there is a grease leak.



AUTO TENSIONER

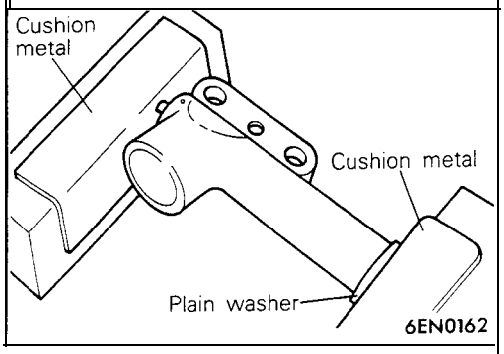
(1) Check the auto tensioner for possible leaks and replace as necessary.
(2) Check the rod end for wear or damage and replace as necessary.

TSB Revision



(3) Measure the rod protrusion. If it is out of specification, replace the auto tensioner.

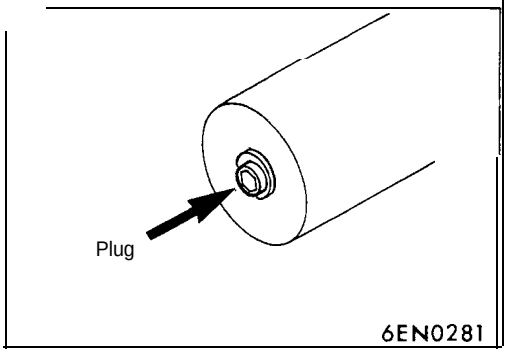
Standard value: 12 mm (.47 in.)



(4) Using a vise with soft jaws push in the auto tensioner rod. If the rod can be easily retracted, replace the auto tensioner. You should feel a fair amount of resistance when pushing the rod in.

Caution

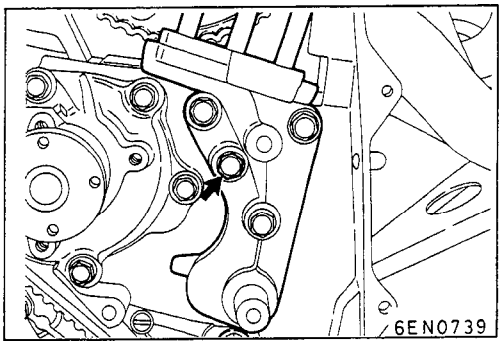
1. Clamp the auto tensioner in the vise so it maintains a level position.



2. If the plug at the bottom of the auto tensioner protrudes, surround it with a plain washer as illustrated to prevent the plug from being in direct contact with the vise.

SERVICE POINTS OF INSTALLATION M11KDCF

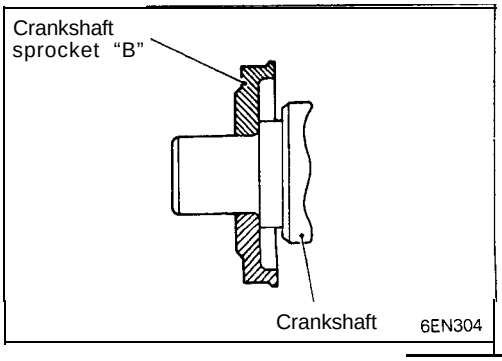
28. INSTALLATION OF ENGINE SUPPORT BRACKET BOLT



Apply sealant to the bolt shown in the figure and tighten it to the specified torque.

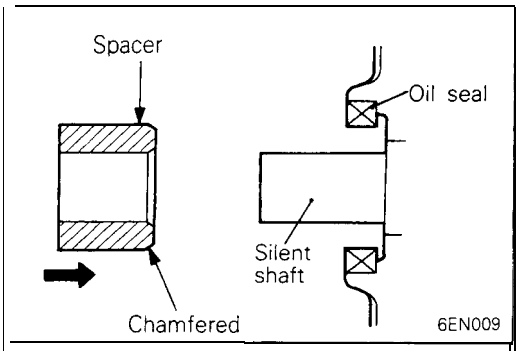
Specified sealant: 3M ATD Part No.8660 or equivalent

26. INSTALLATION OF CRANKSHAFT SPROCKET "B"



Install the crankshaft sprocket "B" as shown while paying attention to its direction.

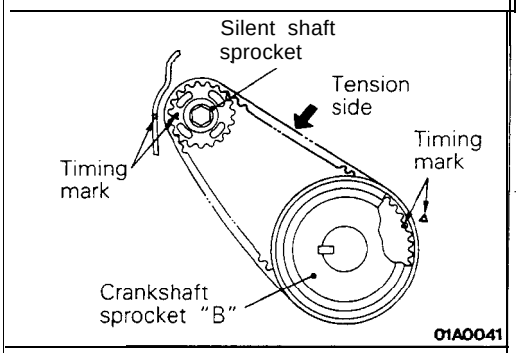
TSB Revision



25. INSTALLATION OF SPACER

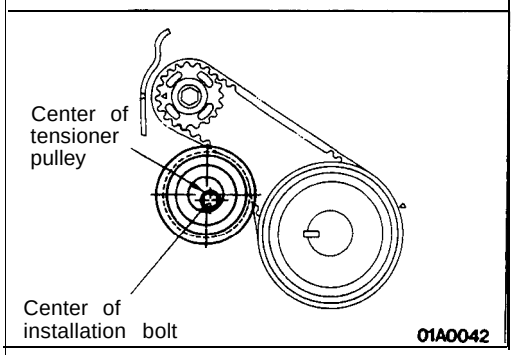
(1) Apply a thin coat of engine oil to the outer circumference of the spacer.
(2) Install the spacer with the chamfered end facing the oil seal.

NOTE
If the spacer is installed adversely, the oil seal may be damaged, resulting in the oil leaks.



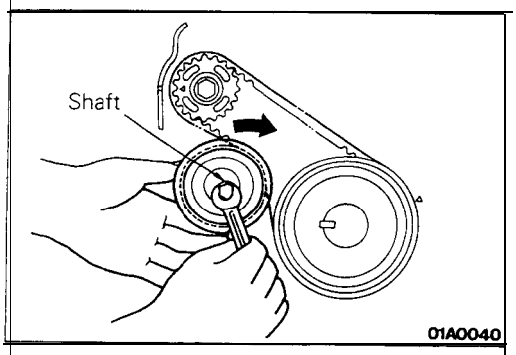
23. INSTALLATION OF TIMING BELT "B"

(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.



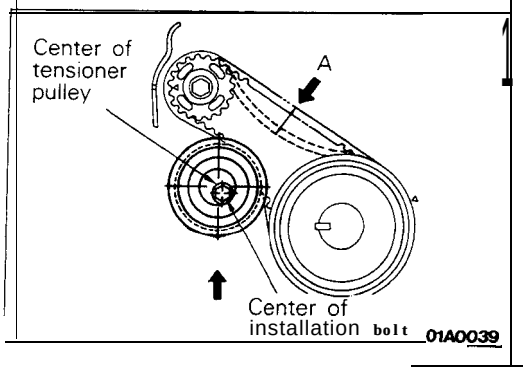
. ADJUSTMENT OF TIMING BELT "B" TENSION

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



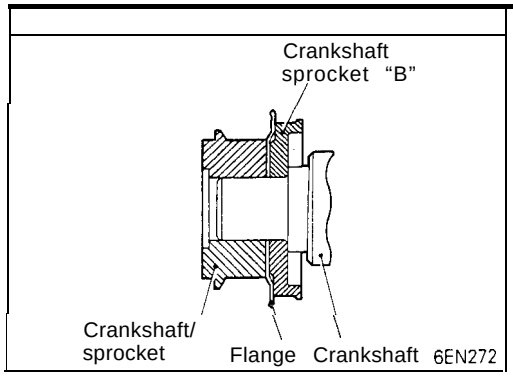
(2) Holding the timing belt "B" tensioner up with your finger in the direction of the arrow, place pressure on the timing belt so that the tension side of the belt is taut. Now tighten the bolt to fix the tensioner.

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 (.20–.28 in.)



21. INSTALLATION OF FLANGE

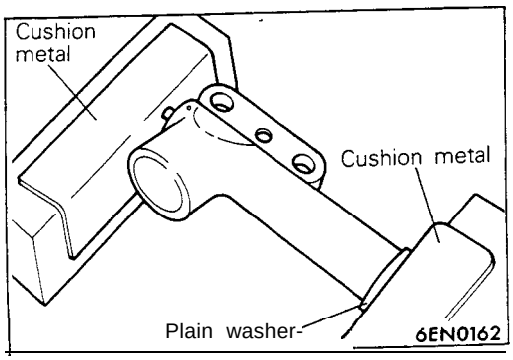
Install the flange in correct direction as shown.

Caution
Pay special attention to the direction of the flange. If it is installed in the wrong direction, a broken timing belt could result.

20. INSTALLATION OF CRANKSHAFT SPROCKET

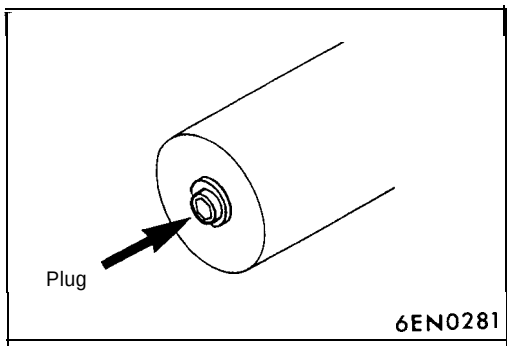
Install the crankshaft sprocket in the correct direction as shown.

Caution
Pay special attention to the direction of the flange. If it is installed in the wrong direction, a broken timing belt could result.

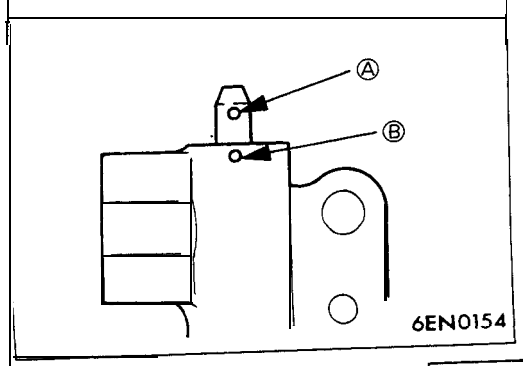


11. INSTALLATION OF AUTO TENSIONER

(1) If the auto tensioner rod is in its fully extended position, reset it as follows.
① Keep the auto tensioner level and, in that position, clamp it in the vise with soft jaws.

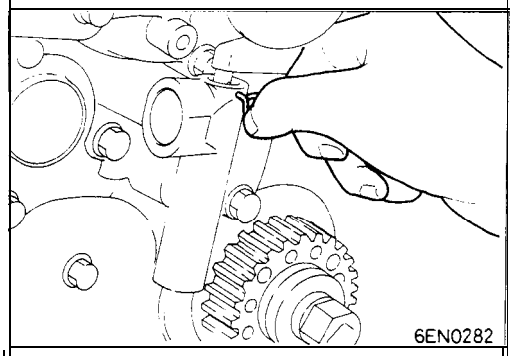


If the plug at the bottom of the auto tensioner protrudes, surround it with a plain washer as illustrated to prevent the plug from being in direct contact with the vise.



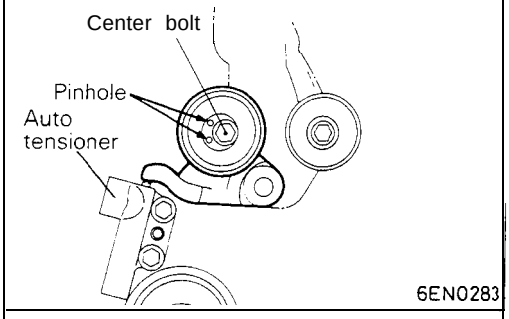
② Push in the rod little by little with the vise until the set hole Ⓐ in the rod is aligned with that Ⓑ in the cylinder.
③ Insert a wire [1.4 mm (.055 in.) in diameter] into the set holes.
④ Unclamp the auto tensioner from the vise.

TSB Revision



(2) Install the auto tensioner.

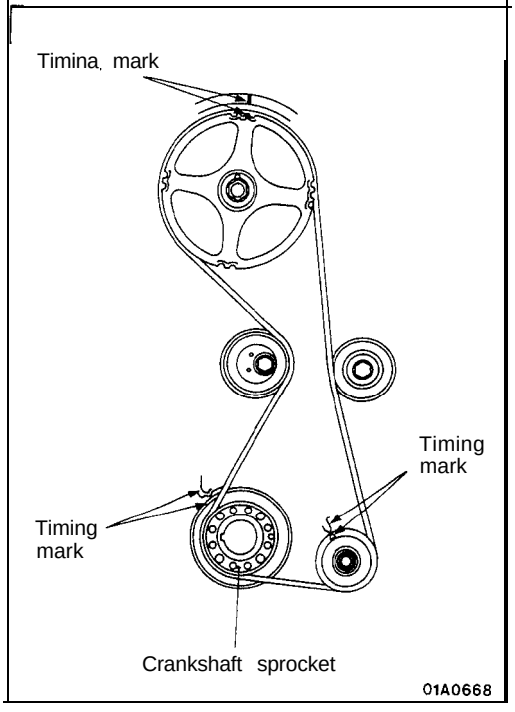
Caution
Leave the wire installed in the auto tensioner.



13. INSTALLATION OF TENSIONER PULLEY

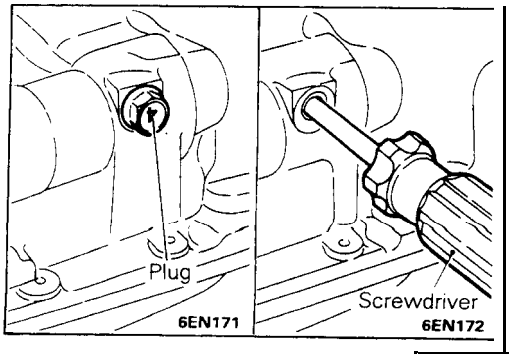
(1) Install the tensioner pulley onto the tensioner arm.
(2) Locate the pinhole in the tensioner pulley shaft to the left of the center bolt. Then, tighten the center bolt finger-tight.

Caution
Leave the wire installed in the auto tensioner.



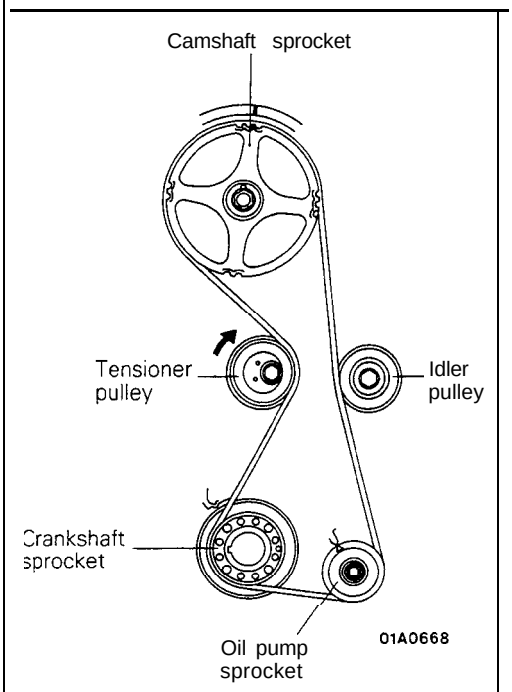
12. INSTALLATION OF TIMING BELT

(1) Ensure that the timing marks of the camshaft sprocket, the crankshaft sprocket, and the oil pump sprocket are all aligned.

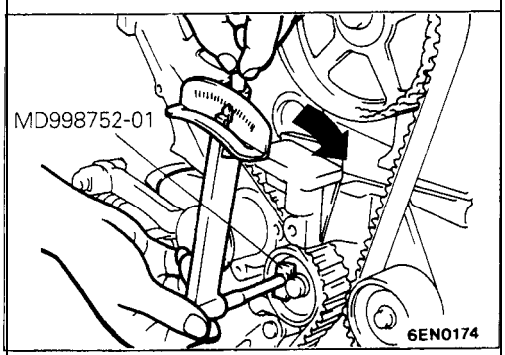


(2) Remove the plug on the cylinder block and insert a Phillips screwdriver [shank diameter 8 mm (.31 in.)] through the hole.
If it can be inserted as deep as 60 mm (2.4 in.) or more, the timing marks are correctly aligned. If the inserted depth is only 20–25 mm (.8–1.0 in.), turn the oil pump sprocket one turn and realign timing marks. Then check to ensure that the screwdriver can be inserted 60 mm (2.4 in.) or more. Keep the screwdriver inserted until the installation of the timing belt is finished.

NOTE
Step (2) is performed to ensure that the oil pump sprocket is correctly positioned with reference to the silent shafts.



(3) Install the timing belt around sprockets as follows.
① Install the timing belt around the tensioner pulley and crankshaft sprocket and secure the timing belt onto the tensioner pulley with your left hand.
② Pulling the belt with your right hand, install it around the oil pump sprocket.
③ Install the belt around the idler pulley.
④ Turn the camshaft sprocket one tooth clockwise to align its timing mark with the cylinder head top surface (see illustration in step ①). Then, pulling the belt with both hands, install it around the camshaft sprocket.
⑤ Gently raise the tensioner pulley as shown by the arrow, so that the belt does not sag, and temporarily tighten the center bolt.

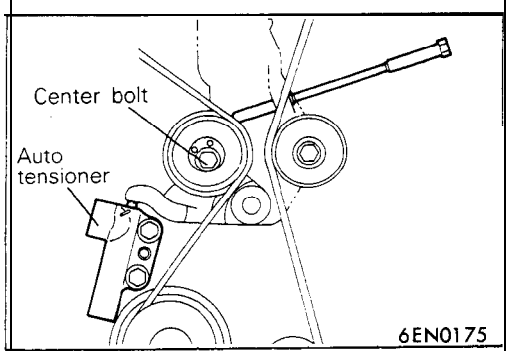


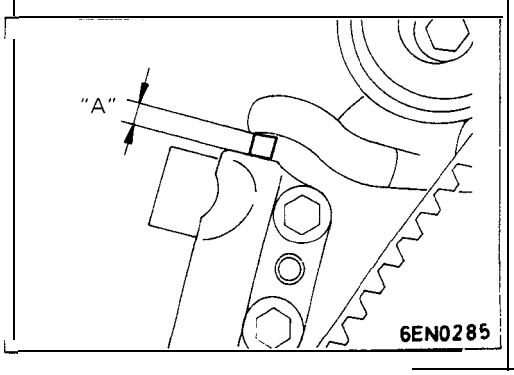
. ADJUSTMENT OF TIMING BELT TENSION

(1) After turning the crankshaft 1/4 turn counterclockwise, turn it clockwise to move the No.1 cylinder to top dead center.
(2) Loosen the center bolt, and then, as shown in the illustration, attach the special tool and a torque wrench and apply a torque of 2.6-2.8 Nm (1.88–2.03 ft.lbs.). If the body interferes with the special tool and the torque wrench, use a jack to slightly raise the engine assembly.

NOTE
Use a torque wrench that is capable of measurement within a range of 0–3 Nm (0–2.2 ft.lbs.)

(3) Holding the tensioner pulley with the special tool and torque wrench, tighten the center bolt to specification.
(4) Screw the tool into the engine left support bracket until **its end makes contact with the tensioner arm. At that** point, screw the tool in some more and then remove the set wire attached to the auto tensioner.
(5) Remove the tool.

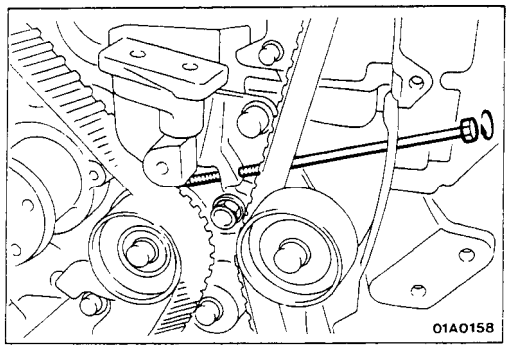




(6) Rotate the crankshaft two complete turns clockwise and leave it as is for about 15 minutes. Then, measure the auto tensioner protrusion "A" (distance between the tensioner arm and auto tensioner body) to ensure that it is up to specification.

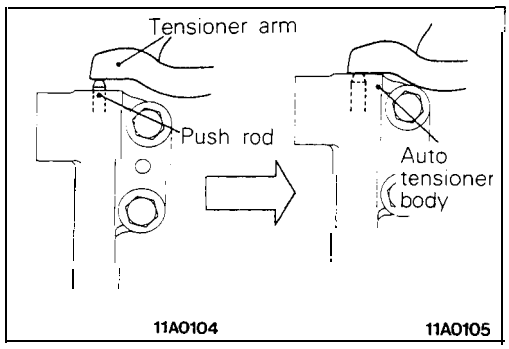
Standard value: 3.8-4.5 mm (.15–.18 in.)

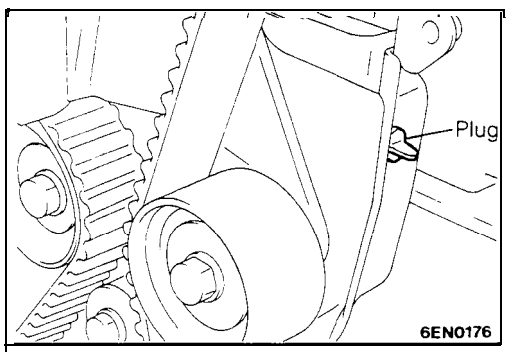
If it is out of specification, repeat steps (6) through (11) until the specified value is obtained.



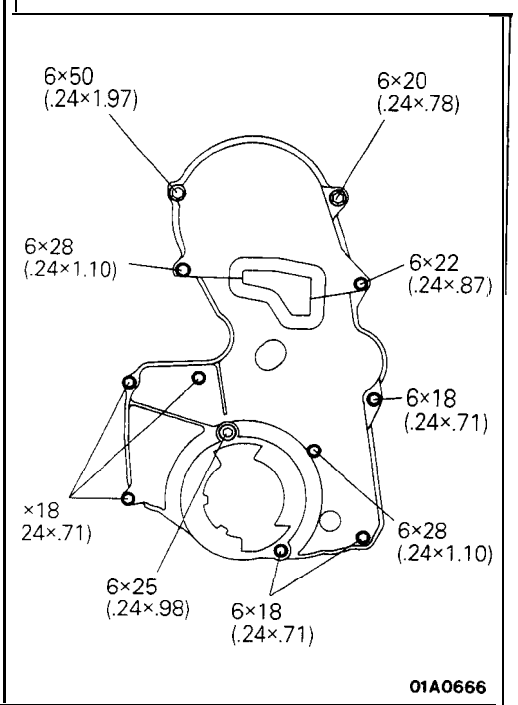
(7) If the clearance between the tensioner arm and the auto tensioner body cannot be measured (when the engine is being mounted, etc.), the following procedures can be used to substitute for the ordinary method of measurement.
① Screw in the tool until it contacts the tensioner arm.
② From that point of contact, further screw in the tool, screwing it in until the push rod of the auto tensioner body is caused to move backward and the tensioner arm contacts the auto tensioner body. Check to be sure that the amount that the tool has been screwed in (when the push rod moves backward) is the standard value.

Standard value: 2.5-3 turns





(8) Install the rubber plug to the timing belt rear cover



10. INSTALLATION OF TIMING BELT LOWER COVER/9. TIMING BELT UPPER COVER

The dimensions of the installation bolts for the timing covers differ according to the installation location, so be sure not to install the bolts in the incorrect locations.

ENGINE <DOHC>

SPECIFICATIONS

GENERAL SPECIFICATIONS

M11CA-B

Items		Specifications
Type		In-line Double, Over Head Camshaft
Number of cylinders		4
Bore	mm (in.)	85 (3.35)
Stroke	mm (in.)	88 (3.46)
Piston displacement	cm^3 (cu.in.)	1,997 (121.9)
Compression ratio		9.0 (Non-Turbo), 9.8 (Non-Turbo)*, 7.8 (Turbo)
Firing order		1–3–4–2
Silent shaft		Equrpped
Valve timing		
Intake valve		
Opens (BTDC)		26” (Non-Turbo), 21° (Non-Turbo)*, 21° (Turbo)
Closes (ABDC)		46” (Non-Turbo), 43” (Non-Turbo)*, 51” (Turbo)
Exhaust valve		
Opens (BBDC)		55” (Non-Turbo), 57” (Non-Turbo)*, 57” (Turbo)
Closes (ATDC)		9° (Non-Turbo), 15” (Non-Turbo)“, 15” (Turbo)
Lubrication		Pressure feed-full flow filtration

● : 1992 models

SERVICE SPECIFICATIONS

M11CB-B

Items		Standard Value	Limit
Engine adjustments			
Engine compression pressure	kPa (psi)/rpm		
<Non-Turbo> Up to 1991 models		1,350 (192)/250–400	min. 960 (137)/250–400
from 1992 models		1,550 (220)/250–400	min. 1,120 (159)/250–400
<Turbo>		1,150 (164)/250– 400	min. 800 (114)/250–400
Engine compression pressure difference between each cylinder	kPa (psi)	—	max. 100 (14)
Intake manifold vacuum-at idle	mmHg (in.Hg)	Approx. 500 (20)	—
Cylinder head bolt < 1993 models>		—	99.4 (3.91)
Drive belt			
For generator			
Deflection	mm (in.)		
Inspection		9.0–11.5 (.354–.453)	
New belt		7.5–9.0 (.295–.354)	
Used belt		10 (.394)	
Tension	N (lbs.)		
Inspection		250–500 (55–110)	
New belt		500–700 (110– 154)	
Used belt		400 (88)	

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Items		Standard Value	Limit
For air conditioning compressor			
Deflection	mm (in.)		
Inspection		Approx. 8 (.315)	
New belt		5.0–5.5 (.197–.217)	
Used belt		6.0–7.0 (.236–.276)	
Tension	N (lbs.)		
Inspection		250–500 (55–110)	
New belt		470–570 (104–126)	
Used belt		320–400 (71–88)	
For power steering pump			
Deflection	mm (in.)		
Inspection		6.9–9.0 (.236–.354)	
Timing belt			
Amount of projection of auto tensioner rod	mm (in.)	12 (.47)	
Timing belt "B" tension	mm (in.)	5-7 (.20–.28)	
Amount of projection of auto tensioner rod (distance between the tensioner arm and auto tensioner body)	mm (in.)	3.8-4.5 (.15–.18)	
Auto tensioner rod retraction	rpm	2.5-3	

TORQUE SPECIFICATIONS

M11CC--

Items	Nm	ft.lbs.
Engine mount insulator nut (large)	60–80	43-58
Engine mount insulator nut (small)	30–40	22-29
Engine mount bracket nut and bolt	50–65	36-47
Front roll stopper insulator nut	50–65	36-47
Front roll stopper bracket to center member	40–50	29-36
Rear roll stopper insulator nut	40–50	29-36
Rear roll stopper bracket to crossmember	40–50	29-36
Transaxle mount insulator nut	60–80	43-58
Transaxle mount bracket to body	40–50	29-36
Fuel high pressure hose to fuel rail	4 - 6	3 - 4
Accelerator cable adjusting bolt	4 - 6	3 - 4
Front exhaust pipe to exhaust manifold		
<FWD (Non-Turbo)>	40–50	29-36
<AWD (Non-Turbo)>	30–40	22-29
Front exhaust pipe to exhaust fitting <Turbo>	40–60	29-43
Power steering oil pump to bracket	35-45	25-33
Air conditioning compressor bracket	23-27	17–20
Oil pan drain plug	35-45	26-33
Oil pan	6 - 8	4 - 6
Oil screen	15-22	11–16
Oil return pipe <Turbo>	8–10	6 - 7
Left member installation bolt (front)	80–100	58–72
Left member installation bolt (rear)	70–80	51–58

TSB Revision

Items	Nm	ft.lbs.
Transfer assembly		
<M/T>	55–60	40–43
<A/T>	60–80	44-57
Front exhaust pipe to engine	30–40	22-29
Center bearing bracket	36-46	26-33
Timing belt cover	10–12	7-9
Cylinder head bolt (Cold engine) <Up to 1992 models>	90–100	65-72
<From 1993 models>	20 → 1/4 turn → 1/4 turn	14 → 1/4 turn → 1/4 turn
Camshaft sprocket	80–100	58-72
Water pump pulley bolt	8–10	6-7
Crankshaft pulley bolt	20–30	14-22
Crankshaft sprocket bolt	110–130	80–94
Timing belt B tensioner bolt	15-22	11-16
Tension pulley bracket bolt	23-27	17–20
Right silent shaft sprocket bolt	34–40*1 [43–49]*2	25–29*1 [31–35]*
Oil pump sprocket nut	50–60	36-43
Control wiring harness and intake manifold plenum or air intake manifold	4-6	3-4
Front roll stopper bracket bolt	55-75	40–54
Front engine support bracket bolt	50–70	36-51
Exhaust pipe support bracket bolt	30–42	22–30
Left engine support bracket bolt	30–42	22–30
Rear roll stopper bracket bolt	110–130	80–94
Front case bolt Bolts 30 mm (1.12 in.) long	27-34	20–25
Other bolts	20–27	14–20
Engine mount bracket to bracket	17-26	12-19
Front engine support bracket to bracket	17-26	12-19
Air cleaner body installation bolt	8–10	6-7
Air cleaner body and resonator assembly	8–10	6-7
Control wiring harness clamp bolt	10–12	7-9
Rocker cover bolt	2.5-3.5	2-3
Center cover bolt	2.5-3.5	2-3
Camshaft bearing cap bolt	19-21	14-15
Crankshaft position sensor nut	10–13	7-9
Throttle body stay	15-22	11-16
Radiator assembly bolt	9-14	7–10
Branch tube bolt	8–10	6-7
ntake manifold stay bolt	25–30	18-22
Auto tensioner	20–27	14–20
Tension pulley bolt	43-55	31–40
dle pulley bolt	34-42	25–30
riming belt rear right cover	10–12	7-9
riming belt rear left cover (lower) - Faster together with the left engine support bracket	30–42	22–30
riming belt rear left cover (upper)	10–12	7-9
Valve body bolt	10–12	7-9

NOTE
*1: Vehicles built up to Nov. 1988
*2: Vehicles built from Dec. 1988

TSB **Revision**

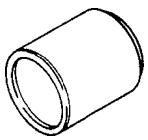
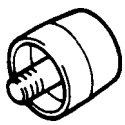
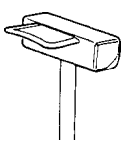
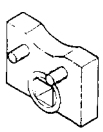
SEALANTS AND ADHESIVES

M11CE-B

Items	Specified sealant
Semi-circular packing Rocker cover Oil pressure switch Engine support bracket bolt <From 1993 models>	3M ATD Part No.8660 or equivalent
Oil pan	MITSUBISHI GENUINE PART No.MD970389 or equivalent

SPECIAL TOOLS

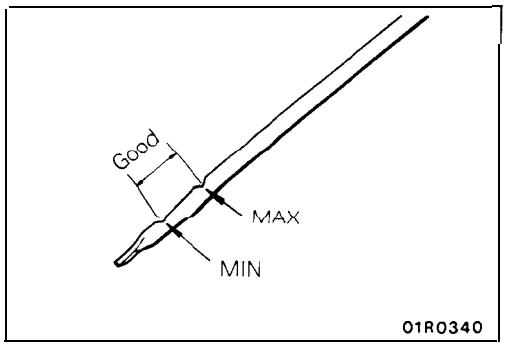
M11DA-B

Tool	Number	Name	Use
	MD998306-01	INSTALLER, camshaft oil seal Use with MD998307-01	Installation of camshaft oil seal
	MD998307-01	GUIDE, camshaft oil seal Use with MD998306-01	
	MD998051-01 OPTIONAL: AVAILABLE FROM O.T.C.	WRENCH, cylinder head bolt	Tightening of cylinder head to block <Up to 1992 models>
	GENERAL SERVICE TOOL	Oil pan gasket cutter	Removal of the oil pan
	MD998752-01	Tension pulley wrench	Adjustment of timing belt tension

TROUBLESHOOTING

M11EAAM

Refer to P.11-6.



SERVICE ADJUSTMENT PROCEDURES

M11FAAA0

ENGINE OIL CHECK

(1) Check to ensure that the engine oil level is within the level range indicated on the oil dip stick.
(2) Check to ensure that the oil is not noticeably dirty or mixed with coolant or gasoline, and that it has the proper viscosity.

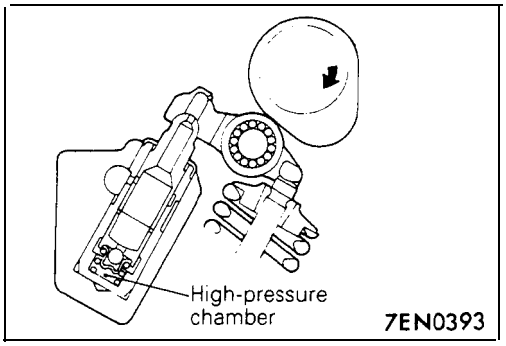
LASH ADJUSTERS CHECK

M11FEAGb

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.

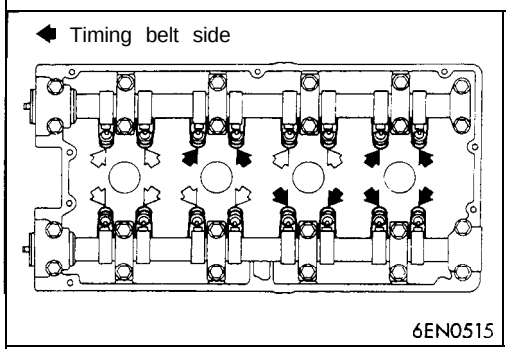
NOTE
- If the oil amount is small, air will be sucked from the oil strainer and mixed in the oil passage.
- If the oil amount is excessive, the oil will be stirred by the crank and mixed with a large amount of air.
- Air and oil can not be separated easily in the deteriorated oil, and the amount of air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

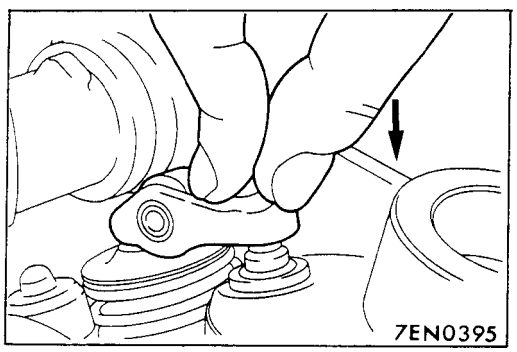


If such mixed-in air enters the high pressure chamber in the lash adjuster, the air in the high-pressure chamber will be compressed while the valve is opened, the lash adjuster will be excessively compressed and abnormal noise will be produced when the valve is closed.
This is the same phenomenon which 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 rpm (for 30 seconds), and then gradually slow down the engine to the idling speed (for 30 seconds).

NOTE
- 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.
- 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 lowers easily when the part directly above the rocker arm lash adjuster is pressed, the lash adjuster is defective and must be replaced. When replacing the lash adjuster, bleed the air from all adjusters and then assemble them. Then inspect with procedures ① to ⑤, and confirm that there are no abnormalities.

NOTE
- The lash adjuster can be accurately checked for defects with the leak down test.
- Refer to the engine service manual for the leak down test and lash adjuster air bleeding procedure.

If the rocker arm is extremely hard when pressed down, the lash adjuster is normal, so look for a different cause of abnormal sound.

DASH POT INSPECTION AND ADJUSTMENT <Non-Turbo-M/T>

(1) Perform after inspecting the idle rotation speed.
(2) The vehicle should be prepared as follows before the inspection.
- Engine coolant temperature: 80–95°C (176–203°F)
- Lights, electric cooling fan and accessories: OFF
- Transaxle: Neutral
- Steering wheel: neutral position

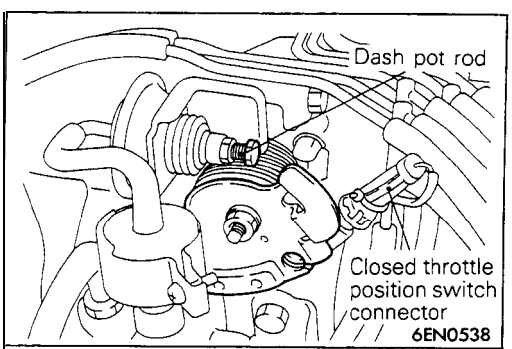
(3) Either set the tachometer or connect the data link connector (white) to the scan tool.

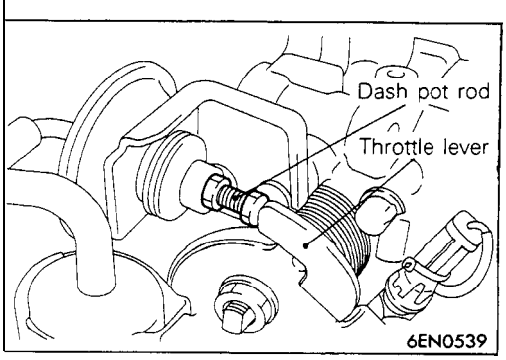
NOTE
For setting the tachometer. refer to GROUP 13 – Service Adjustment Procedures.

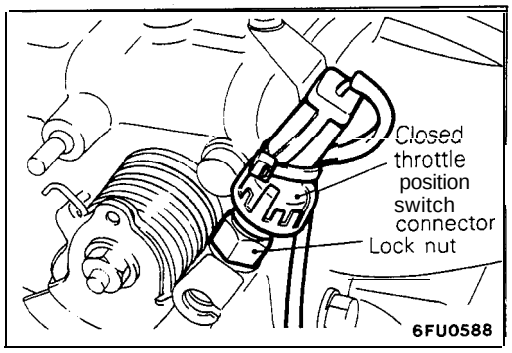
(4) Start the engine.
(5) Open the throttle valve until the dash pot rod is fully stroked.
(6) Gradually close the throttle valve until you find the point where the throttle lever touches the dash pot rod (the dash pot begins to shorten).
Maintain the throttle valve at this touching point,
(7) Check the engine speed (speed when the dash pot begins to operate).

Standard value: 3,900 ±200 rpm

(8) If outside the standard value, loosen the rod's lock nut and turn the rod to adjust.
(9) To release the maintained state of the throttle valve, check that the engine speed gradually decreases to the idle speed,
(10) Disconnect the closed throttle position switch connector (fixed SAS).







(11) Check that there is continuity between the closed throttle position switch terminal and body.

NOTE
When there is continuity, a clearance will be created between the throttle lever and dash pot rod when the dash pot rod is pressed lightly.

(12) When there is no continuity, lower the engine speed when the dash pot begins operation to within the standard value tolerance. Make sure to create continuity between the closed throttle position switch terminal and body.

COMPRESSION PRESSURE CHECK M11 FFAL

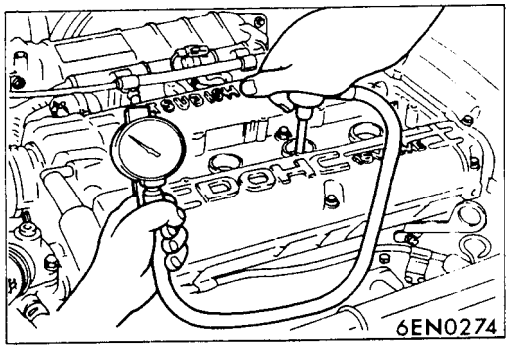
(1) Before inspection, verify that the engine oil, starter motor and battery are normal. Then, perform the following.
- Engine coolant temperature: 80–95°C (176–205°F)
- Lights, electric cooling fan and accessories: OFF
- Transaxle: P range
- Steering wheel: Neutral position

(2) Disconnect the spark plug cable.
(3) Remove all the spark plugs.
(4) Disconnect the connector of the crankshaft position sensor.

NOTE
This will prevent the engine control module from controlling the ignition and fuel injection.

(5) Cover the spark plug holes with a cloth, etc., and crank the engine. Then verify that no foreign material sticks to the cloth, etc.

Caution
1. **During cranking, be especially careful of the spark plug installing hole.**
2. **Very hot water, oil, fuel, etc., which may have entered the cylinder somehow, will violently spout through the spark plug hole if the compression is measured in the entrapped state. This is very dangerous.**



(6) Set up the compression gauge in the spark plug mounting hole.
(7) Fully open the throttle valve, and cranking the engine. measure the compression pressure.

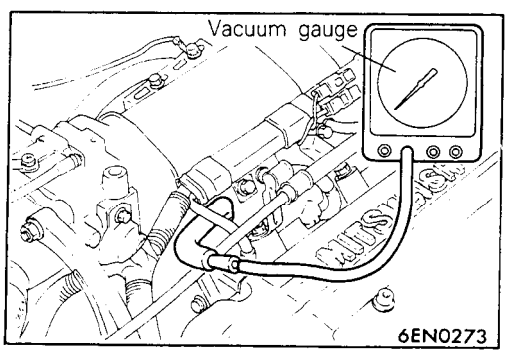
Standard value:
<Non-Turbo>
Up to 1991: 1,350 kPa (192 psi) [250–400 rpm]
From 1992: 1,550 kPa (220 psi) [250–400 rpm]
<Turbo> 1,150 kPa (164 psi) [250–400 rpm]
Limit:
<Non-Turbo>
up to 1991: 960 kPa (137 psi) [250–400 rpm]
From 1992: 1,120 kPa (159 psi) [250–400 rpm]
<Turbo> 800 kPa (114 psi) [250–400 rpm]

(8) Measure the compression pressure of each cylinder. and verify that the pressure difference among the cylinders is less than the limit value.

Limit: max. 100 kPa (14 psi)

(9) If a cylinder's compression pressure or pressure difference is outside the limit, fill a small amount of engine oil through the spark plug hole and repeat Items (7) and (8) above.
① If the compression is increased when the oil is filled, the piston and/or cylinder wall may be worn or damaged.
② If the compression is not Increased even though the oil is filled, the valve may be thermally seized, the valve contact may be improper or pressure may leak at the gasket.
(10) Connect the connector of the crankshaft position sensor.
(11) Install the spark plug and spark plug cable.
(12) Erase the diagnostic trouble code with the scan tool or reconnect the battery (–) cable 10 seconds or more after it was disconnected.

NOTE
This will erase the memory of the diagnostic trouble code which resulted from disconnection of the crankshaft position sensor connector.



MANIFOLD VACUUM INSPECTION M11FNAD

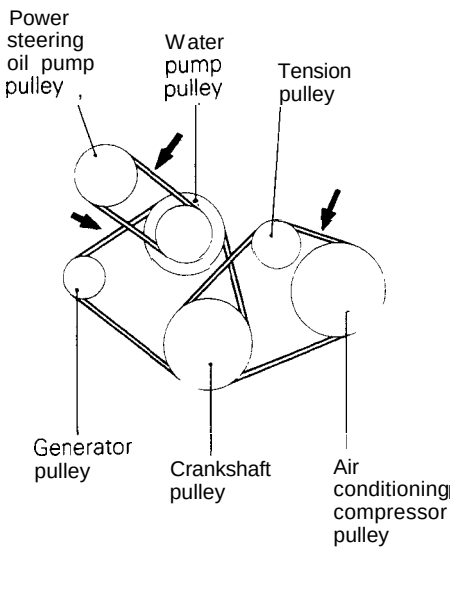
(1) Before inspection and adjustment, put the vehicle into the following state.
- Engine coolant temperature: 85–95°C (185–205°F)
- Lights, motor cooling fan, and accessories: OFF
- Transaxle: N (Neutral)
- Steering wheel: Neutral

(2) Check that the idling revolution speed is normal.
(3) Remove the PCV hose from the PCV valve and attach a vacuum gauge.
(4) Check that the negative pressure at the intake manifold during idle revolution is normal.
Standard value: Approx. 500 mmHg (20 in.Hg)
(5) If outside the standard value, isolate the cause by referring to the following table and repair the fault.

Symptom	Cause	Remedy
• The vacuum gauge reading is less than standard value, but the pointer is stable.	• Ignition timing is retarded.	• Adjust the ignition timing.
• The vacuum gauge pointer swings slowly.	• The gas mixture is excessively rich.	• Check Multiport fuel injection system.
• The vacuum gauge pointer drops irregularly.	• The gas mixture is excessively lean.	• Check Multiport fuel injection system.
• The vacuum gauge pointer drops intermittently to 30 to 160 mmHg (1.2 to 6.3 in.Hg).	* Incomplete close contact of intake and exhaust valve seats.	• Check and repair the valve.
• The vacuum gauge pointer drops suddenly from the normal reading to 250 mmHg (9.8 in.Hg), then returns to normal.	. Broken cylinder head gasket	• Replace cylinder head gasket.

DRIVE BELTS TENSION ADJUSTMENT M11FMBB1

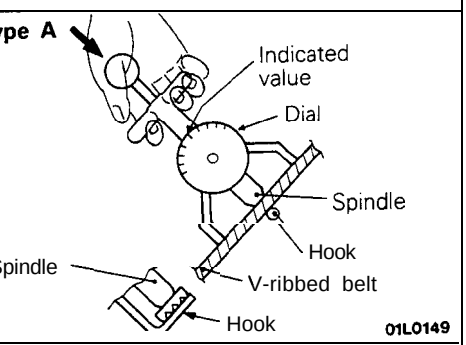
(1) Check that the belts are not damaged.



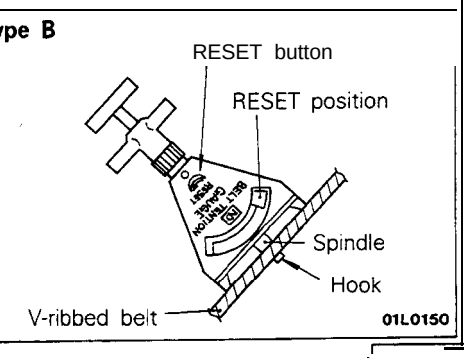
(2) Apply 100N (22 lbs.) force to the belt back midway between the pulleys as shown in the figure, measure the deflection or, by using a belt-tension gauge, check the belt's tension.

Standard value:

Items		Check value	Adjustment value	
			New belt	Used belt
For generator	Deflection mm (in.)	9.0–11.5 (.354–.453)	7.5–9.0 (.295–.354)	10 (.394)
	Gauge N (lbs.)	250–500 (55–110)	500–700 (110–154)	400 (88)
For A/C compressor	Deflection mm (in.)	Approx. 8.0 (.315)	5.0–5.5 (.197–.217)	6.0–7.0 (.236–.276)
	Gauge N (lbs.)	250–500 (55–110)	320–400 (71–88)	470–570 (104–126)
For P/S pump	Deflection mm (in.)	6.0–9.0 (.236–.354)	–	–



NOTE
There is more than one type of belt-tension gauge (type A and type B, for example), so be sure to use the gauge according to its instructions for use.



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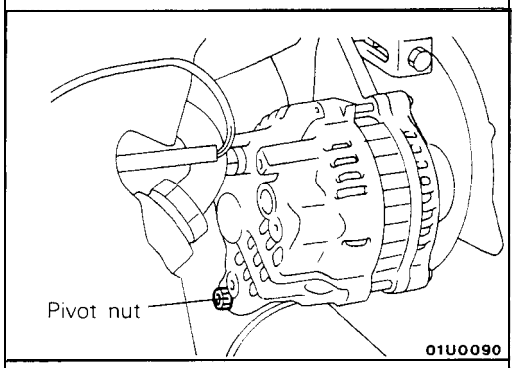
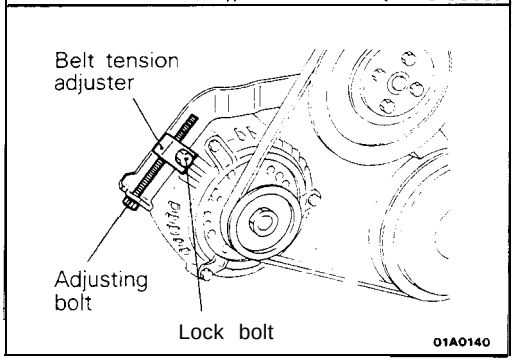




TENSION ADJUSTMENT OF THE GENERATOR DRIVE BELT

Caution

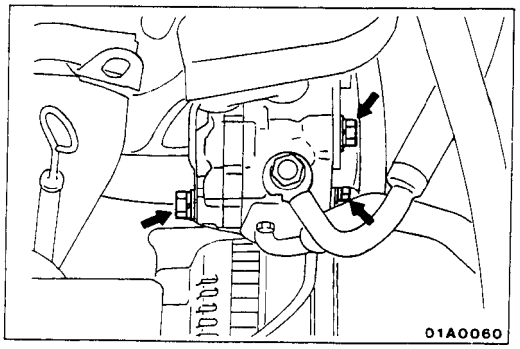
1. Before checking, turn the engine one time or more.

2. If the belt tension is too strong, it is possible that the generator or water pump bearing is damaged. If the belt tension is too weak, however, sounds of its slipping will be heard, and the belt's service life will be reduced.

1. Loosen the generator pivot nut
2. Loosen the lock bolt of the belt tension adjuster.
3. Using the adjustment bolt, adjust the belt tension to specified.
4. Tighten the lock bolt.
5. Tighten the generator pivot nut.
6. Check the deflection or the tension of the belt; readjust if necessary.

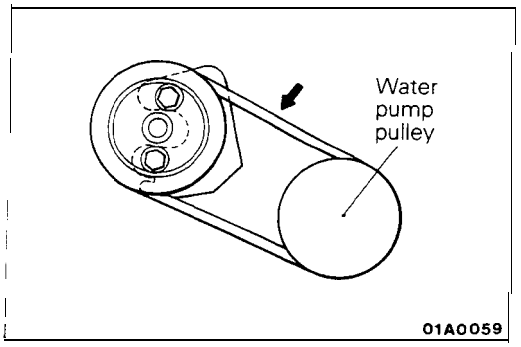
NOTE

Even for a new belt, the adjustment value for a used belt should be used to make the adjustment if the belt has been used for as long as five minutes or more.

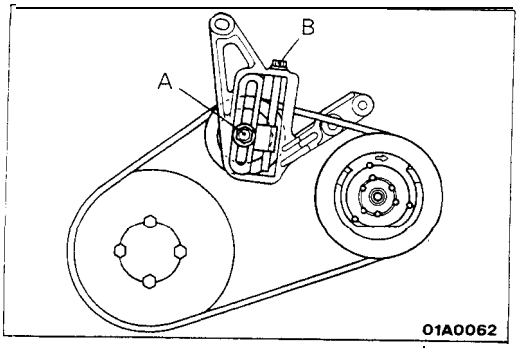


DEFLECTION ADJUSTMENT OF POWER STEERING OIL PUMP DRIVE BELT

1. Loosen power steering oil pump fixing bolt.



2. Move power steering pump, tension belt moderately and adjust deflection.
3. Tighten fixing bolts.
4. Run the engine one time or more.
5. Check the belt deflection. Readjust, if necessary.



TENSION ADJUSTMENT OF THE AIR CONDITIONING COMPRESSOR DRIVE BELT

1. Loosen tension pulley fixing bolt A.
2. Adjust belt deflection with adjusting bolt B.
3. Tighten fixing bolt A.
4. Run the engine one time or more.
5. Check the belt tension. Readjust, if necessary.

NOTE

Even for a new belt, the adjustment value for a used belt should be used to make the adjustment if the belt has been used for as long as five minutes or more.

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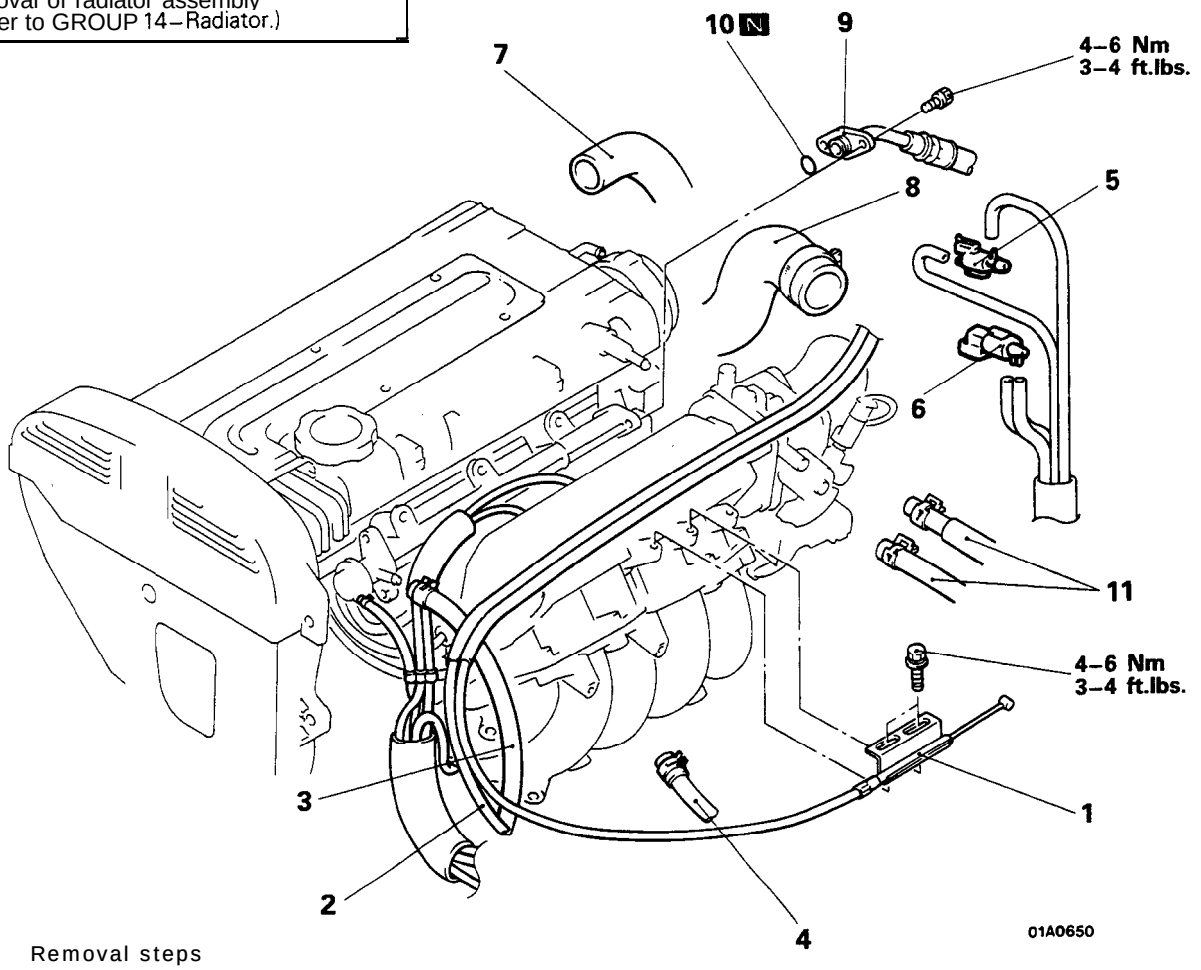
ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

M11SA-B

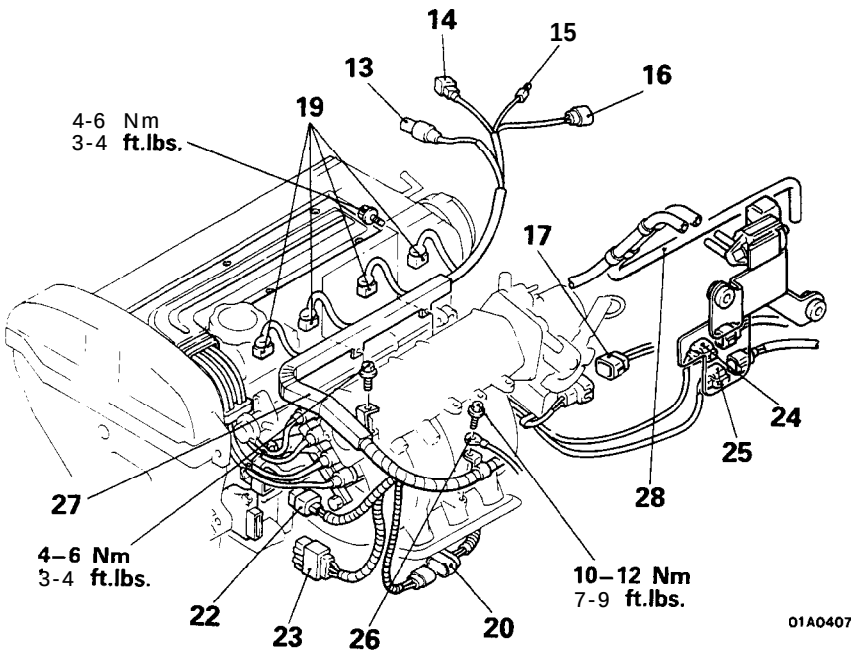
Pre-removal Operation
- Eliminating fuel pressure in fuel lines (Refer to GROUP 13–On-Vehicle Inspection of MFI Components.)
- Removal of the hood (Refer to GROUP 42–Hood.)
- Draining of engine coolant (Refer to GROUP 00–Maintenance Service.)
- Removal of transaxle assembly (Refer to GROUP 22, 23–Transaxle.)
- *Removal of radiator assembly (Refer to GROUP 14–Radiator.)

Post-installation Operation
- installation of radiator assembly (Refer to GROUP 14–Radiator.)
- Installation of transaxle assembly (Refer to GROUP 22, 23–Transaxle.)
- Refilling engine coolant (Refer to GROUP 00–Maintenance Service.)
- Installation of the hood (Refer to GROUP 42–Hood.)

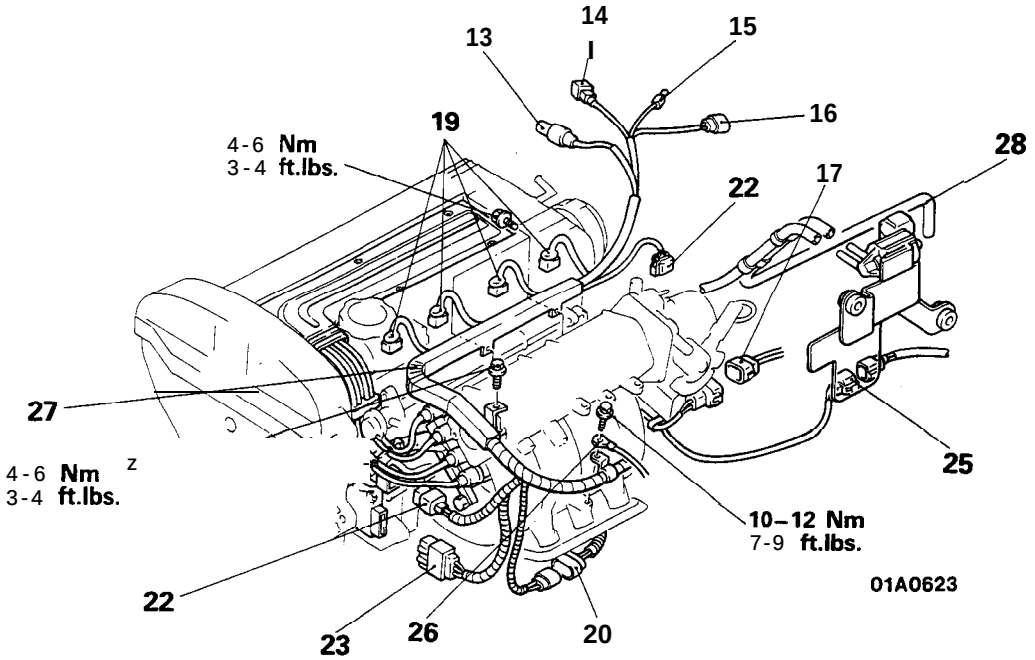


Removal steps
1. Connection for accelerator cable or throttle cable (Refer to GROUP 13–Service Adjustment Procedures.)
2. Connection for throttle cable (Auto-cruise control)
3. Connection for fuel return hose
4. Connection for brake booster vacuum hose
5. Connection for fuel pressure solenoid (Turbo)
6. Connection for EGR solenoid (Turbo: California)
7. Connection for air hose A (Turbo)
8. Connection for air hose D (Turbo)
9. Connection for fuel high pressure hose
10. O-ring
11. Connection for heater hoses

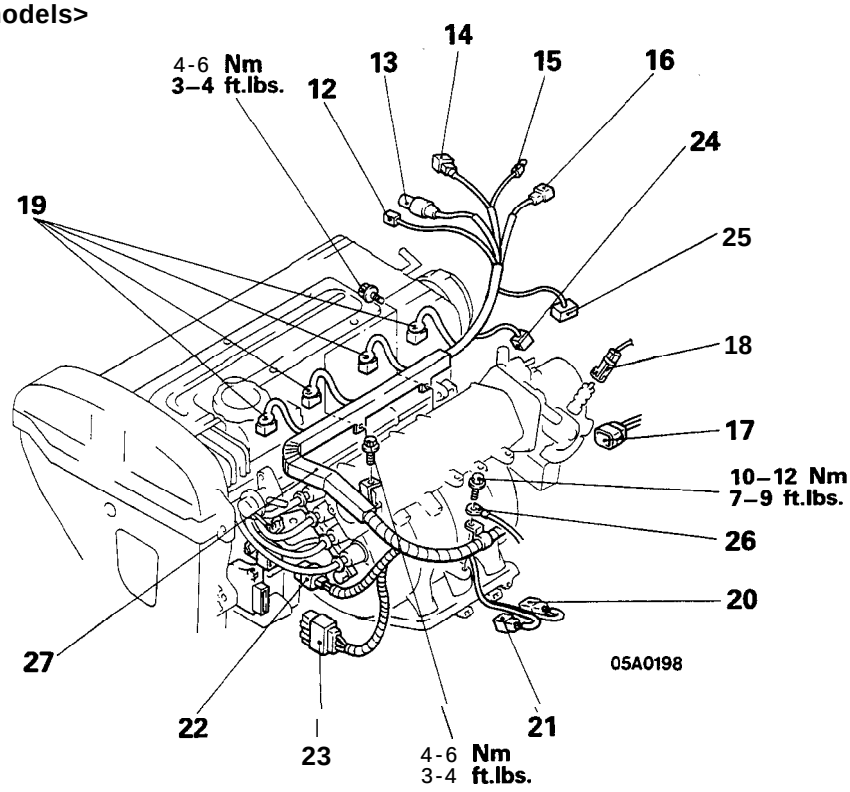
<1989 models>



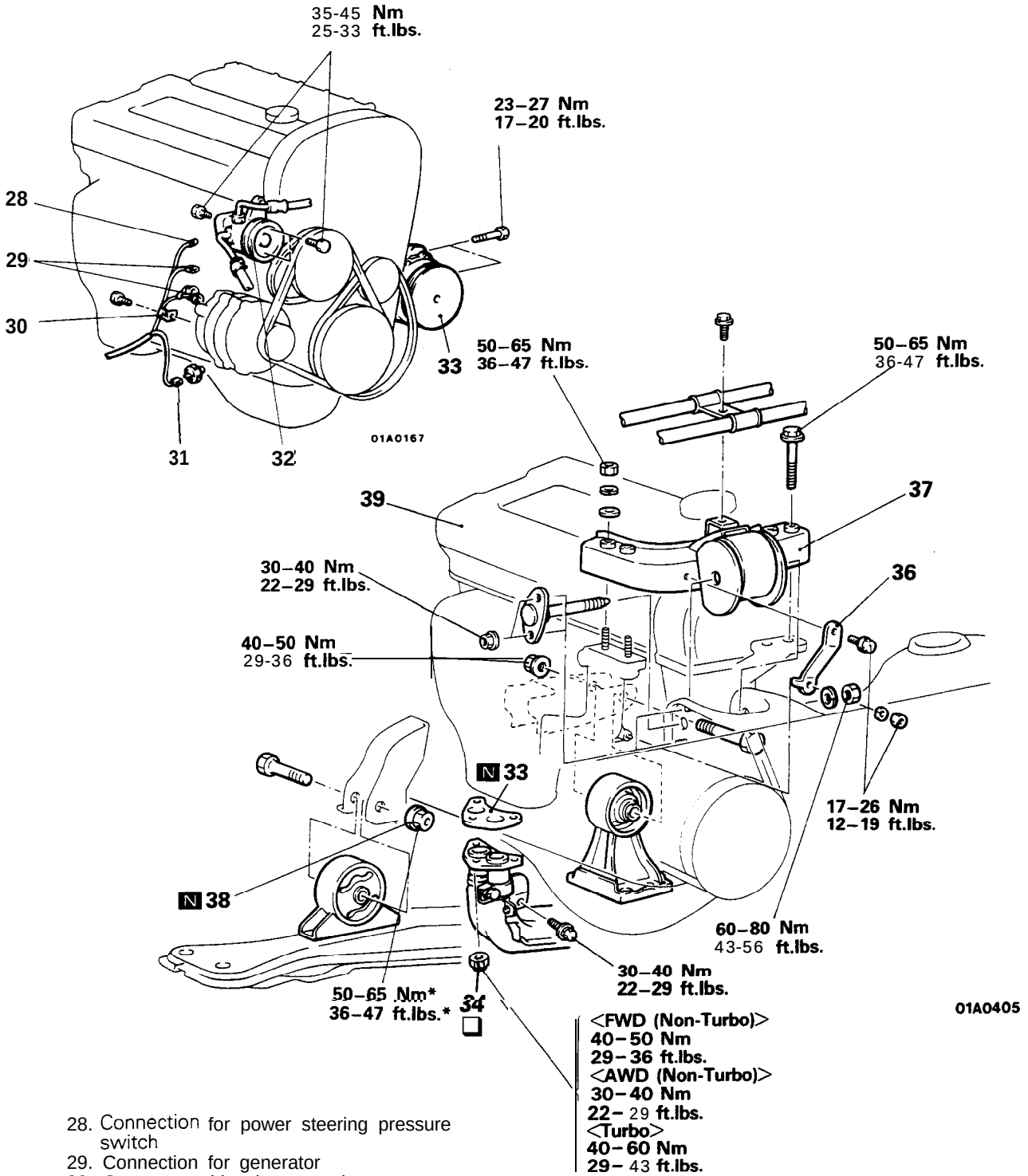
< 1990 models>



<From 1991 models>

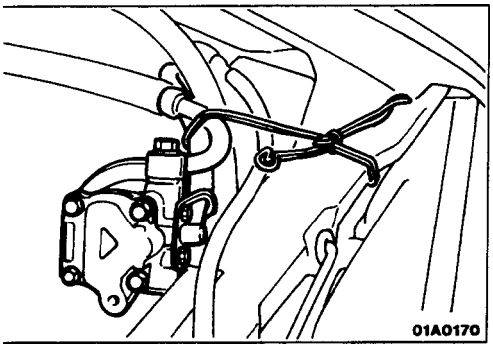


12. Connection for engine coolant temperature switch
13. Connection for oxygen sensor
14. Connection for engine coolant temperature sensor
15. Connection for engine coolant temperature gauge unit
16. Connection for air conditioning engine coolant temperature switch
17. Connection for IAC motor
18. Connection for closed throttle position switch
19. Connection for fuel injectors
20. Connection for EGR temperature sensor (California vehicles only)
21. Connection for knock sensor (Turbo)
22. Connection for ignition coil
23. Connection for ignition power transistor
24. Connection for throttle position sensor
25. Connection for crankshaft position sensor
26. Connection for ground cable
27. Control wiring harness



28. Connection for power steering pressure switch
29. Connection for generator
30. Generator wiring harness clamps
31. Connection for oil pressure switch
◆◆◆32. Connection for power steering oil pump
◆◆◆33. Connection for air conditioning compressor
34. Self-locking nut
35. Gasket
36. Bracket
◆◆ 37. Engine mount bracket
38. Self locking nut
◆◆ ● + 39. Engine assembly

NOTE
For tightening locations indicated by the ● , symbol, first tighten temporarily, and then make the final tightening with the entire weight of the engine applied to the vehicle body.

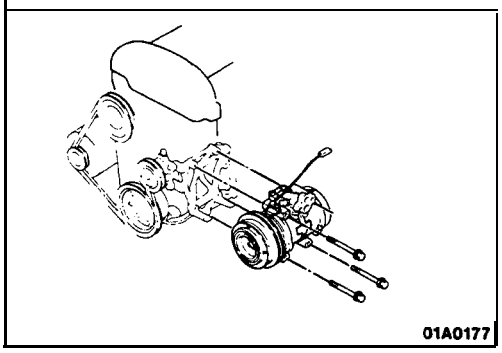


SERVICE POINTS OF REMOVAL M11SBDF

32. DISCONNECTION OF POWER STEERING OIL PUMP

Disconnect the oil pump with hoses from the bracket.

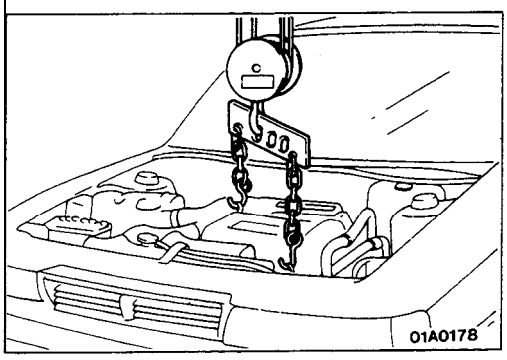
NOTE
The removed power steering oil pump should be fastened (by using rope, etc.) in a position that will not interfere with the removal/installation of the engine assembly.



33. DISCONNECTION OF AIR CONDITIONING COMPRESSOR

Disconnect air conditioning compressor connector and remove it with hoses from the compressor bracket.

NOTE
The removed air conditioning compressor should be fastened (by using rope, etc.) in a position that will not interfere with the removal/installation of the engine assembly.



37. DISCONNECTION OF ENGINE MOUNT BRACKET

Before removing the engine mount bracket installation bolt, use a chain block or similar arrangement to suspend the engine assembly (to the extent that there is no looseness of the chain).

39. REMOVAL OF ENGINE ASSEMBLY

After checking that the cables, hoses, harness connectors, etc. are all removed, slowly raise the chain block to lift the engine assembly upward out of the engine compartment.

SERVICE POINTS OF INSTALLATION M11SDAY

39. INSTALLATION OF ENGINE ASSEMBLY

When mounting the engine, check to be sure that the cables, hoses, harness connectors, etc. are all in the correct position.

33. INSTALLATION OF AIR CONDITIONING COMPRESSOR/32. POWER STEERING OIL PUMP

Adjust belt tension. (Refer to P.11-61.)

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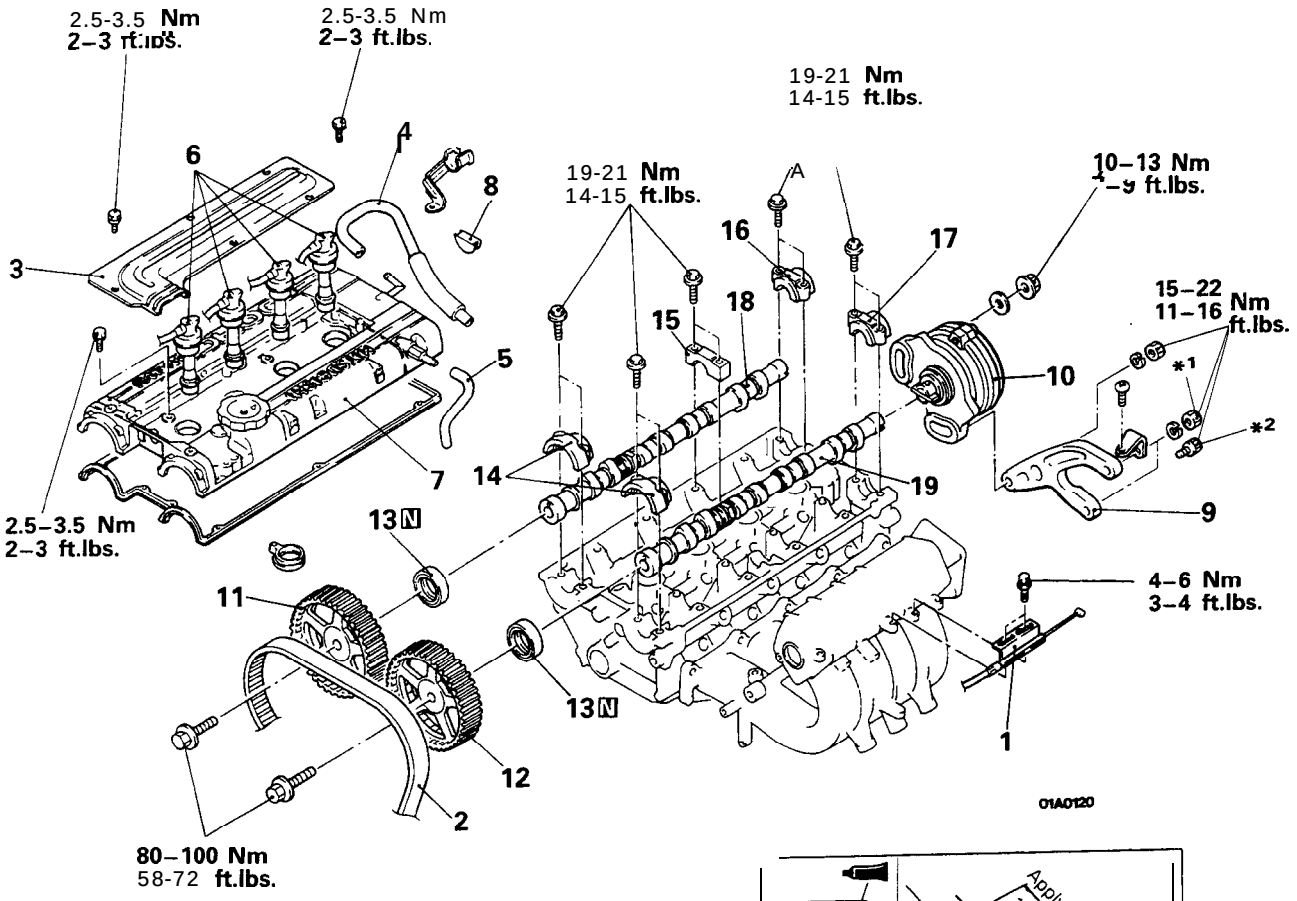
CAMSHAFT AND CAMSHAFT OIL SEALS

REMOVAL AND INSTALLATION

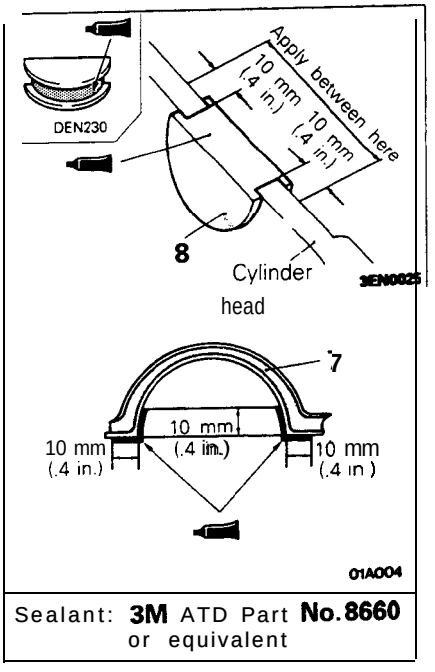
M11ZA-B

Post-installation Operation
- Service Adjustment Procedures (Refer to P.11-57.)

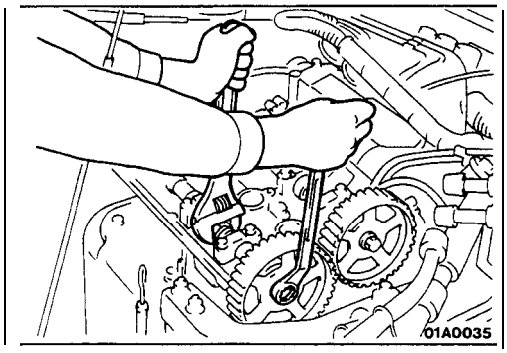


Removal steps
- 1 Connection for accelerator cable or throttle cable (Refer to GROUP 13– Service Adjustment Procedures.)
- 2. Timing belt (Refer to P.I 1-80.)
- 3. Center cover
- 6. Connection for spark plug cables
- 7. Rocker cover
- 8. Semi-circular packing
- 9. Throttle body stay
- ◆◆ 10. Crankshaft position sensor
- ◆◆ 11. Exhaust camshaft sprocket
- ◆◆ 12. Intake camshaft sprocket
- ◆◆ ◆◆ 13. Camshaft oil seals
- ◆◆ ● + 14. Front camshaft bearing caps
- ◆◆ ● * 15. Camshaft bearing caps
- ◆◆ ● + 16. Rear camshaft bearing cap (R.H
- ◆◆ ● a 17. Rear camshaft bearing cap (L.H.
- ● + 18. Exhaust camshaft
- ◆◆ 19. Intake camshaft

NOTE
*1: <Non-Turbo>
*2: <Turbo>



Sealant: 3M ATD Part No.8660 or equivalent



SERVICE POINTS OF REMOVAL M11ZBAD

11. REMOVAL OF EXHAUST CAMSHAFT SPROCKET/ 12. INTAKE CAMSHAFT SPROCKET

(1) Using a wrench at the hexagonal part of the camshaft (to prevent the crankshaft from turning), loosen the cramshaft sprocket bolt.
(2) Remove the camshaft sprokets.

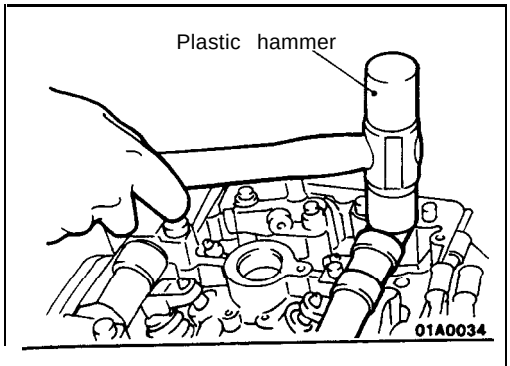
13. REMOVAL OF CAMSHAFT OIL SEALS

Remove the oil seals using a screwdriver or similar tool.

Caution
Take care not to damage front camshaft bearing cap and camshaft.

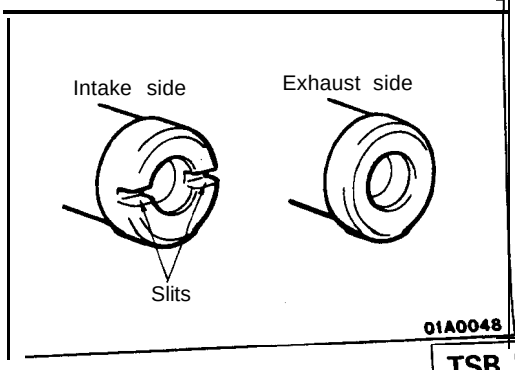
14./15./16./17. REMOVAL OF CAMSHAFT BEARING CAPS

(1) Loosen the bearing cap installation bolts in two or three steps.



(2) Remove the bearing cap.

NOTE
If the bearing cap is difficult to remove, use a plastic hammer to gently tap the rear part of the camshaft, and then remove.



SERVICE POINTS OF INSTALLATION M1 1ZDAF

19. INSTALLATION OF INTAKE **CAMSHAFT/18.** EXHAUST **CAMSHAFT**

(1) Install the camshafts on the cylinder head.

Caution
Be sure not to mistake the intake side and the exhaust side. There are slits for crankshaft position sensor drive in the rear end of the intake camshaft.

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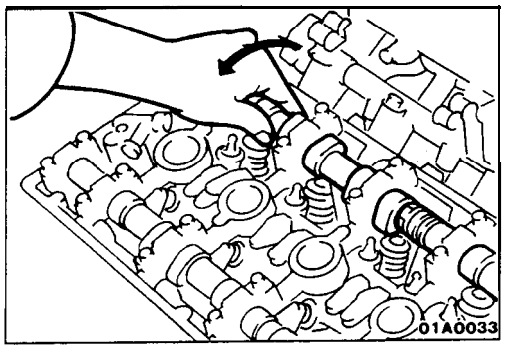
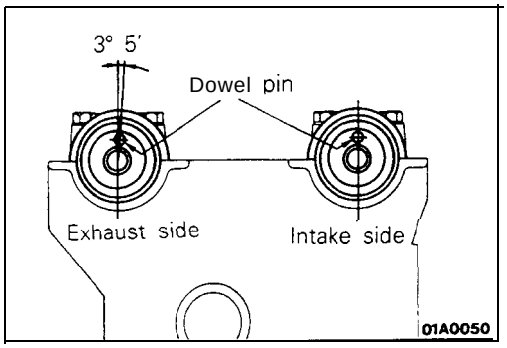


NOTE
Install new camshafts using the following procedure.

(1) Remove the rocker arms.
(2) Lay the camshafts on the cylinder head and install the bearing caps.
(3) Check that the camshaft can be easily turned by hand.
(4) After checking, remove the bearing caps and the camshafts, and install the rocker arms.

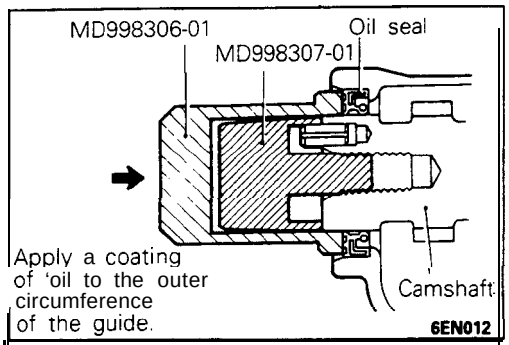


(2) The camshaft's dowel pins should be at the positions shown in the figure.

17./16./15./14. INSTALLATION OF CAMSHAFT BEARING CAPS

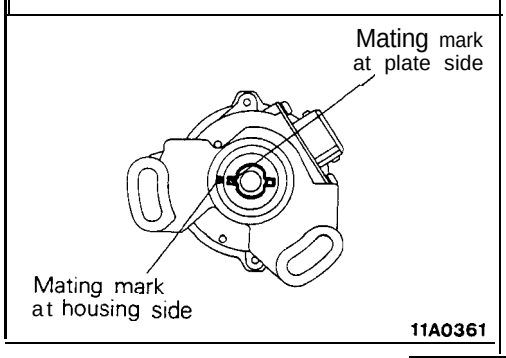
Tighten the bearing cap installation bolts to the specified torque in two or three steps.

Caution
Tighten uniformly, otherwise the rocker arms will not be straight.



13. INSTALLATION OF CAMSHAFT OIL SEALS

Using the special tool, press in the oil seal as shown in the figure.



10. INSTALLATION OF THE CRANKSHAFT POSITION SENSOR

(1) Align the mating mark (punch mark) on the housing of the crankshaft position sensor with the mating mark (notch) in the plate.
(2) Install the crankshaft position sensor to the engine.

Caution
When tightening the nut of the crankshaft position sensor, make sure that the crankshaft position sensor does not turn.

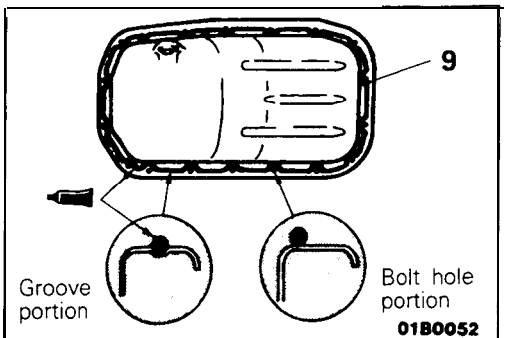
(3) Check that the ignition timing is set at the standard value. (Refer to GROUP 16–Ignition system.)

OIL PAN AND OIL SCREEN

M11HA-B

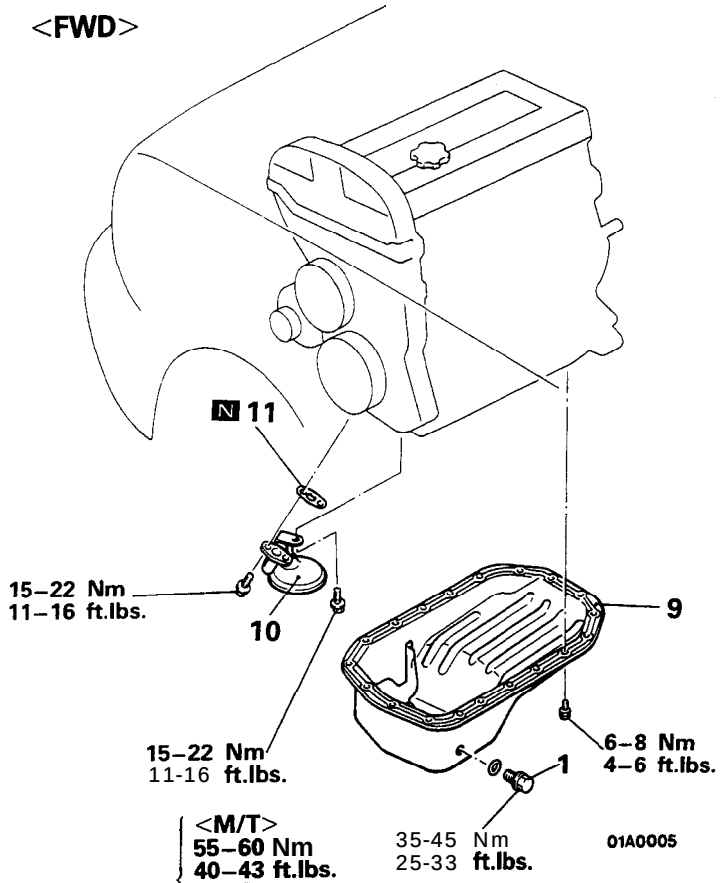
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Draining and Refilling of Engine Oil (Refer to GROUP 00–Maintenance Service.)

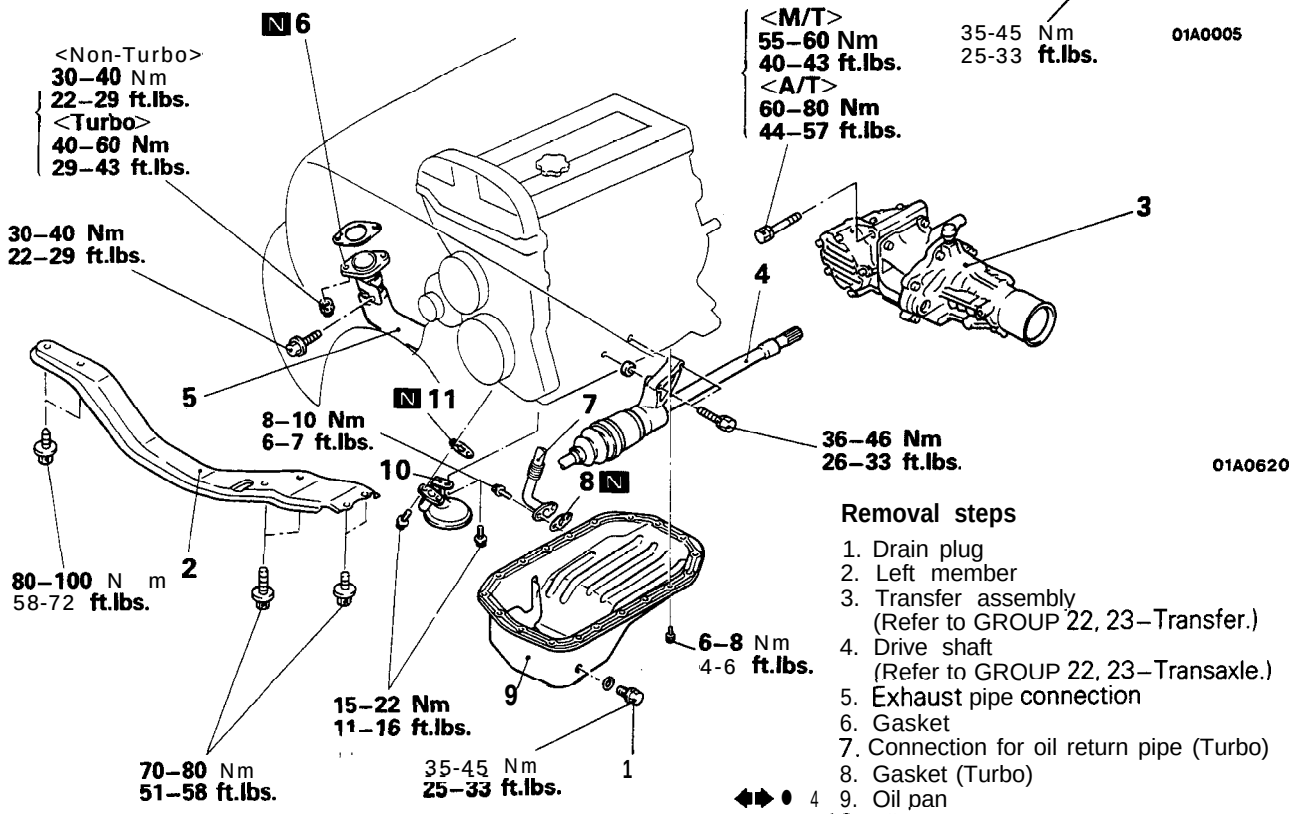


Sealant: MITSUBISHI GENUINE PART No. MD970389or equivalent

<FWD>



<AWD> <Up to 1992 models>

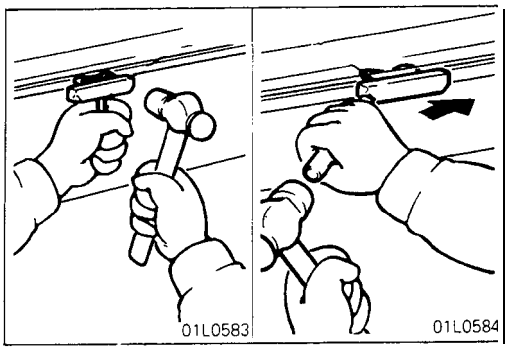


Removal steps

1. Drain plug
2. Left member
3. Transfer assembly (Refer to GROUP 22, 23–Transfer.)
4. Drive shaft (Refer to GROUP 22, 23–Transaxle.)
5. Exhaust pipe connection
6. Gasket
7. Connection for oil return pipe (Turbo)
8. Gasket (Turbo)
9. Oil pan
10. Oil screen
11. Gasket

◆■● 4

TSB Revision



SERVICE POINTS OF REMOVAL M11HBAF1

9. REMOVAL OF OIL PAN

(1) Remove the oil pan mounting bolts.

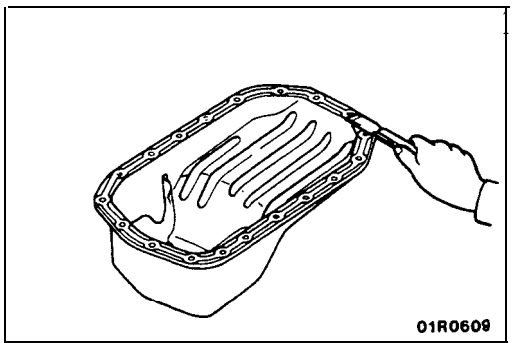
(2) Tap the general service tool in between the cylinder block and the oil pan.

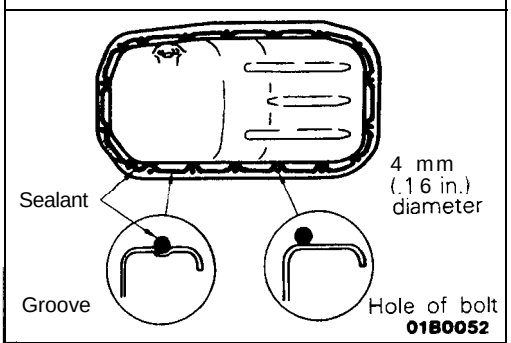
Caution
Do not use a screwdriver, a chisel or a similar tool when removing the oil pan.

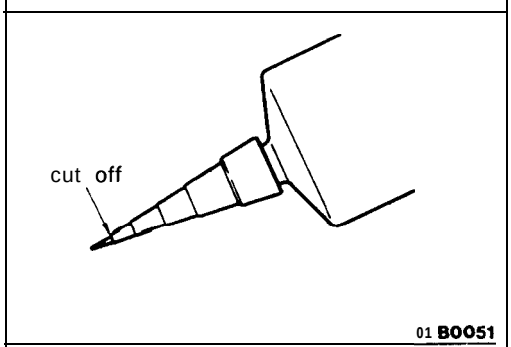
(3) Remove the oil pan by placing a brass bar at the corner of the general service tool and then tapping with a hammer.

INSPECTION M11HCAC1

- Check the oil pan for damage and cracks. Replace if faulty.
- Check the oil screen for clogging; damage and cracks. Replace if faulty.







SERVICE POINTS OF INSTALLATION M11HDAO1

9. INSTALLATION OF OIL PAN

(1) Use a wire brush or other tool to scrape clean all gasket surfaces of the cylinder block and oil pan so that all loose material is removed.

(2) Gasket surfaces must be free of oil and dirt.

(3) Apply the specified sealant around the surface of the oil pan as specified in illustration.

Specified sealant: MITSUBISHI GENUINE PART No.MD970389 or equivalent

NOTE
To squeeze out proper amount of sealant, cut off the nozzle of sealant. This will provide a nozzle 4 mm (.16 in.) in diameter.

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

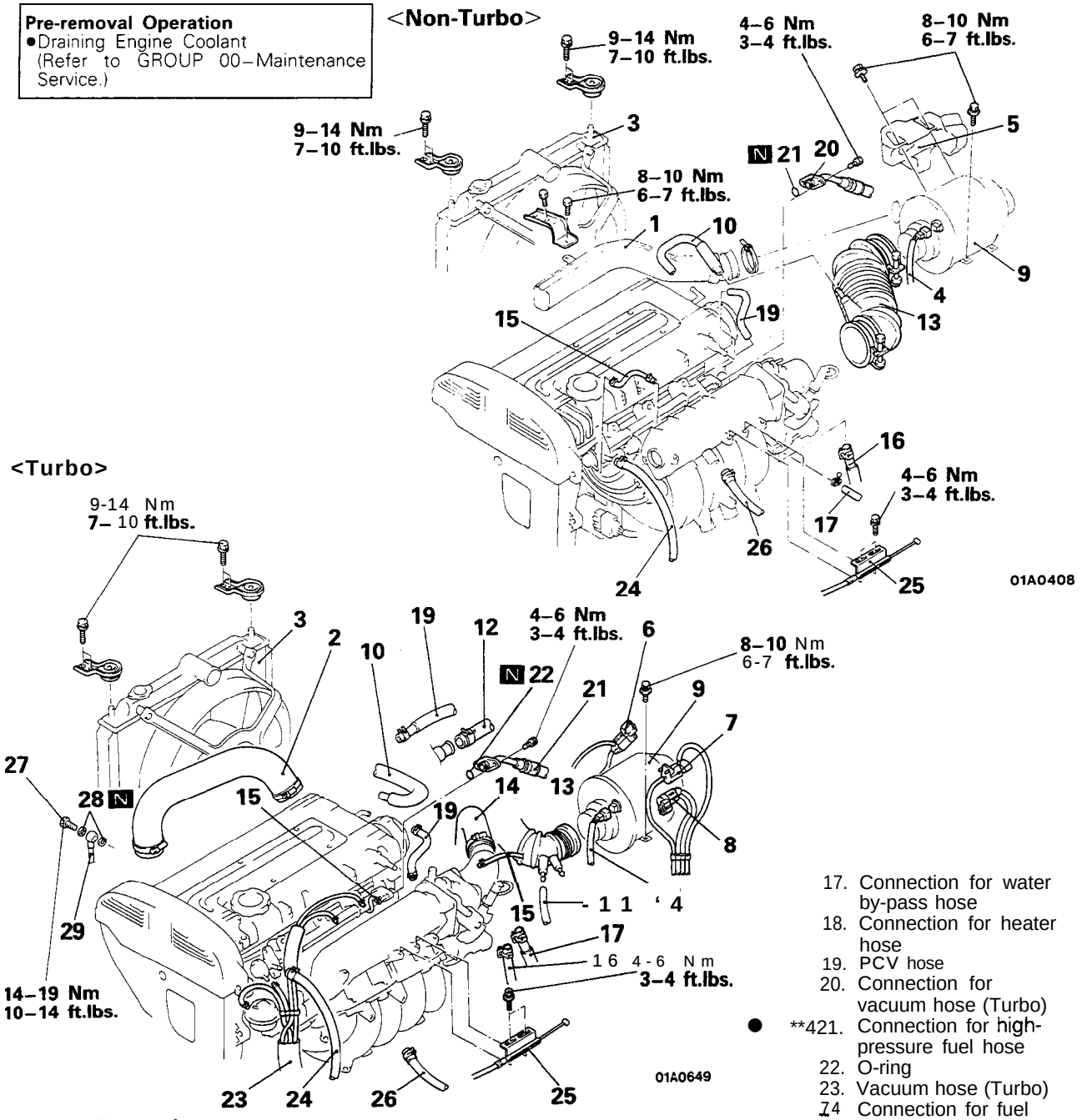
TSB Revision

CYLINDER HEAD GASKET

M11JA-B

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining Engine Coolant (Refer to GROUP 00–Maintenance Service.)

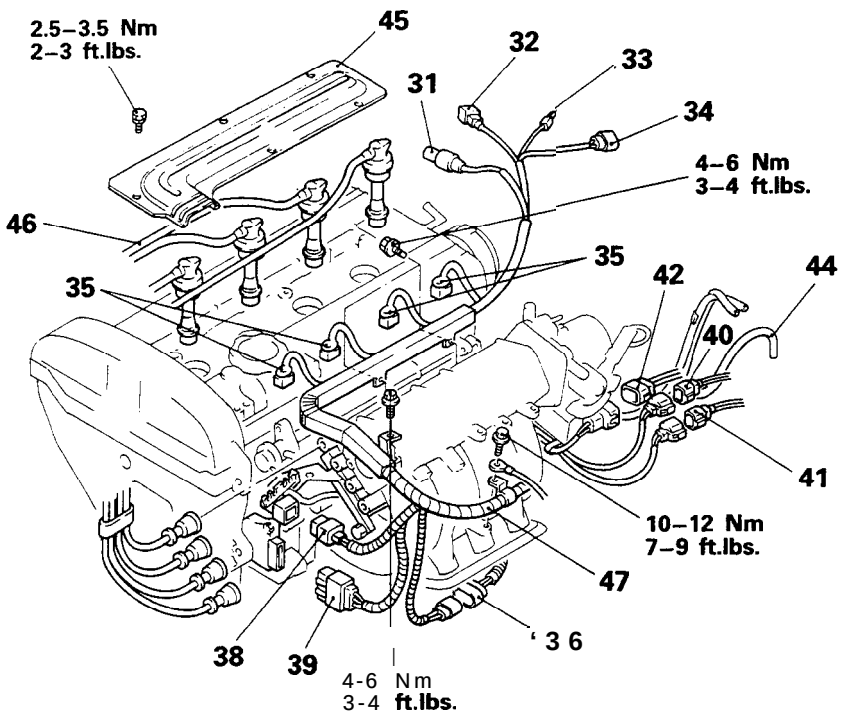


Removal steps

1. Branch tube
2. Air hose A (Turbo)
3. Radiator assembly (Refer to GROUP 14–Radiator.)
4. Volume air flow sensor connector
5. Resonator assembly
6. Turbocharger waste gate solenoid (Turbo)
7. Fuel pressure solenoid (Turbo)
8. EGR solenoid (Turbo)
9. Air cleaner assembly
11. Connection for purge hose (Turbo)
12. Connection for by-pass air hose (Turbo)
13. Air intake hose
10. Breather hose
14. Connection for air hose D (Turbo)
15. Connection for vacuum hose
16. Connection for water hose (Turbo)
17. Connection for water by-pass hose
18. Connection for heater hose
19. PCV hose
20. Connection for vacuum hose (Turbo)
- **421. Connection for high-pressure fuel hose
22. O-ring
23. Vacuum hose (Turbo)
24 Connection for fuel return hose
25. Connection for accelerator cable or throttle cable (Refer to GROUP 13–Service Adjustment Procedures.)
26. Connection for brake booster vacuum hose
27. Eye-bolt (Turbo)
28. Gasket (Turbo)
29. Connection for oil pipe (Turbo)

TSB Revision

<1989 models>



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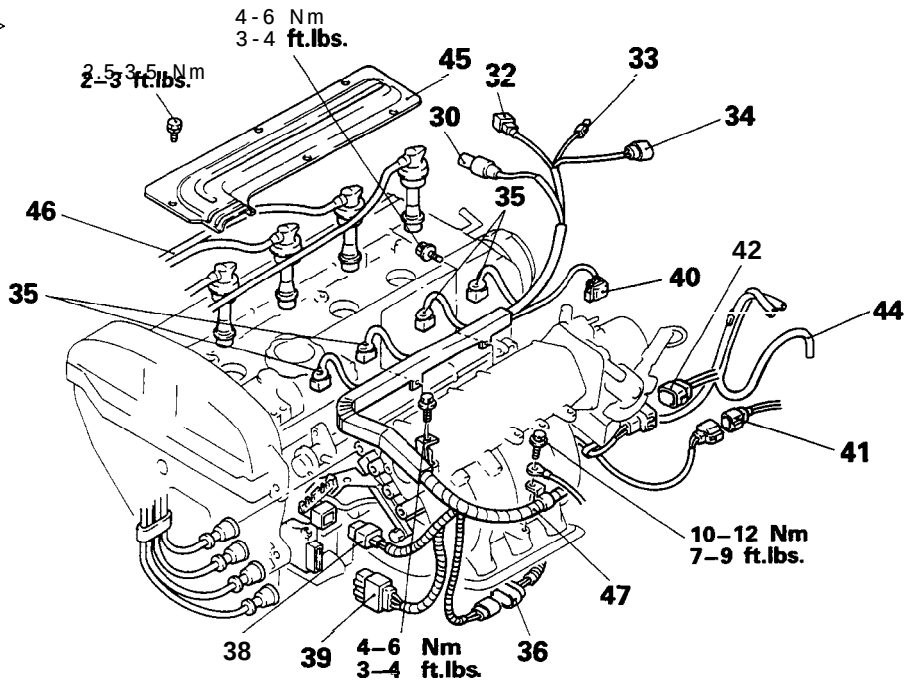
<1990 models>



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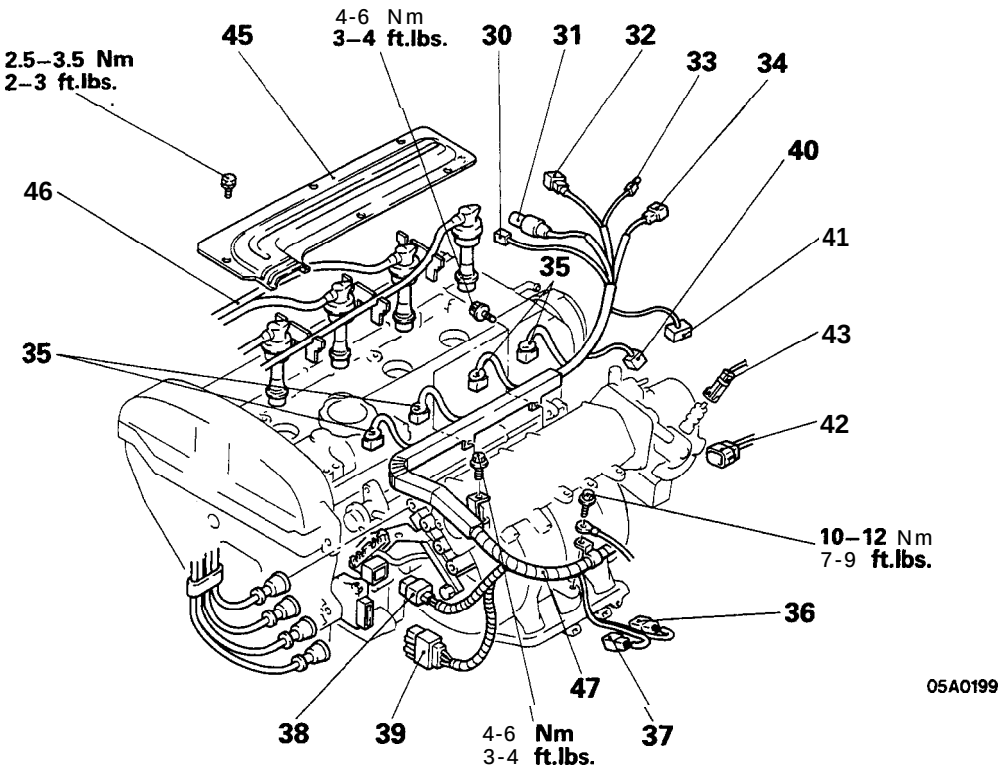
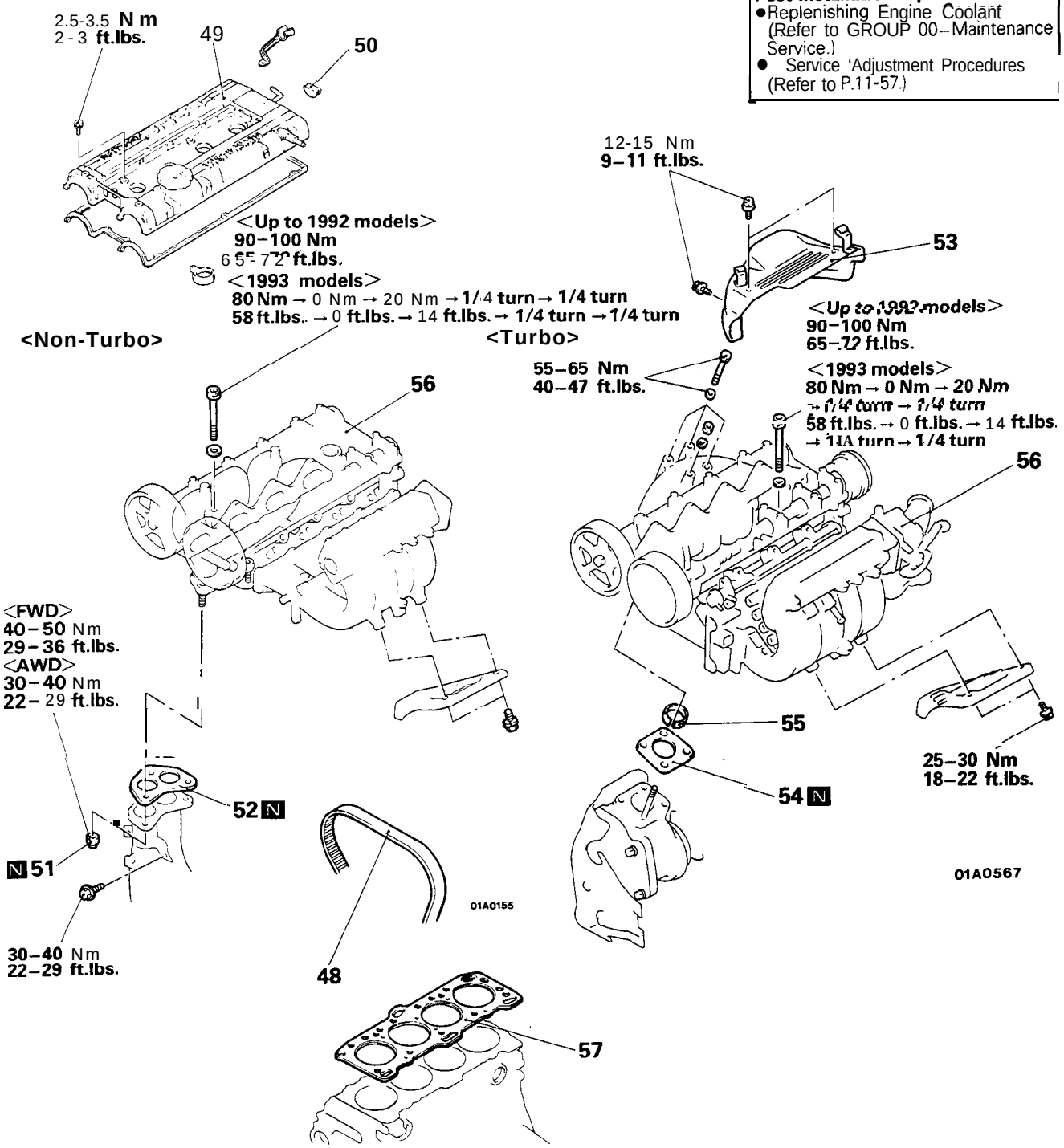


Removal steps

30. Connection for engine coolant temperature switch
31. Connection for oxygen sensor
32. Connection for engine coolant temperature sensor
33. Connection for engine coolant temperature gauge unit
34. Connection for air conditioning engine coolant temperature switch
35. Connection for injector
36. Connection for EGR temperature sensor (California vehicles only)
37. Connection for knock sensor (Turbo)
38. Connection for ianition coil
39. Connection for ignition power transistor
40. Connection for throttle position sensor
41. Connection for crankshaft position sensor
42. Connection for IAC motor
43. Connection for closed throttle position switch
44. Connection for vacuum hoses
45. Center cover
46. Connection for spark plug cable assembly
47. Control wiring harness

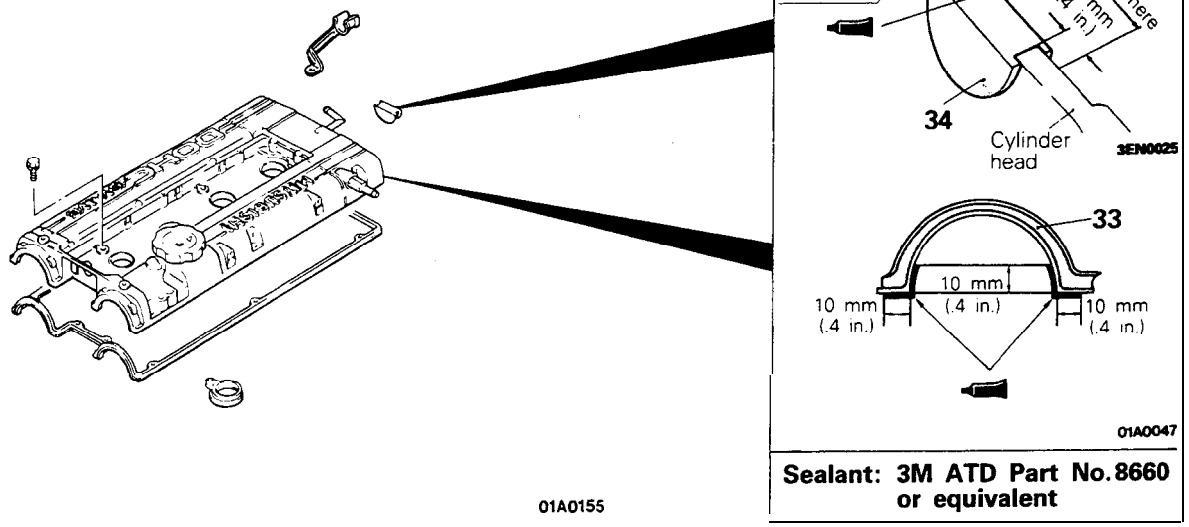
Post-installation Operation
- Replenishing Engine Coolant (Refer to GROUP 00–Maintenance Service.)
- Service 'Adjustment Procedures (Refer to P.11-57.)



48. Timing belt (Refer to P.I 1-80.)
49. Rocker cover
50. Semi-circular packing
51. Self locking nut (Non-Turbo)
52. Gasket (Non-Turbo)
53. Heat protector (Turbo)
54. Gasket (Turbo)
55. Ring (Turbo)
◆◆ ● * 56. Cylinder head assembly
●◆ 57. Cylinder head gasket

TSB Revision

SEALING POINTS



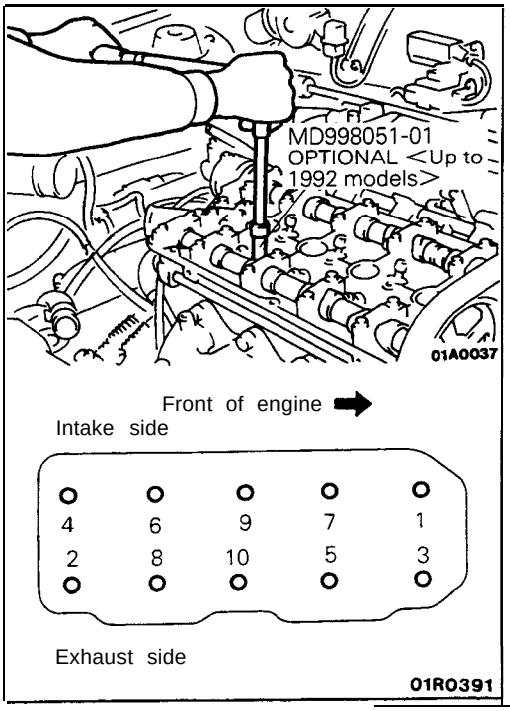
Sealant: 3M ATD Part No. 8660 or equivalent

SERVICE POINTS OF REMOVAL M11JBAUa

21. DISCONNECTION OF HIGH-PRESSURE FUEL HOSE

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.

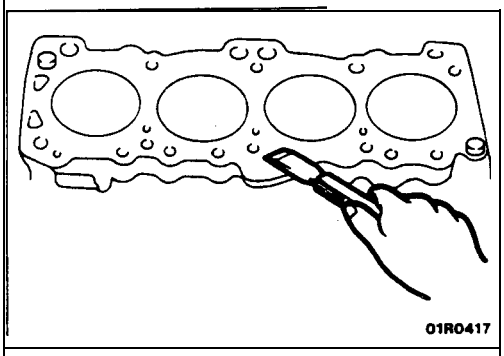
For information concerning the bleeding of the residual pressure, refer to GROUP 13–On-vehicle Inspection of MFI Components.

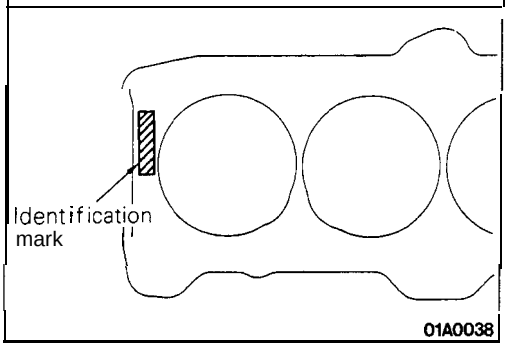


56. REMOVAL OF CYLINDER HEAD ASSEMBLY

Using the tool, loosen the bolts in the order shown in the figure (in 2 or 3 cycles) and remove. Then remove the cylinder head assembly.

TSB Revision





SERVICE POINTS OF INSTALLATION M11JDAN

57. INSTALLATION OF CYLINDER HEAD GASKET

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

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

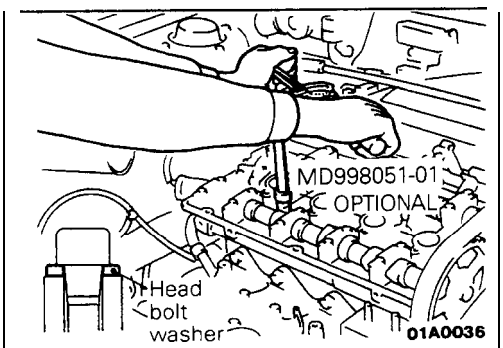
(2) Make sure that the gasket has the proper identification mark for the engine.

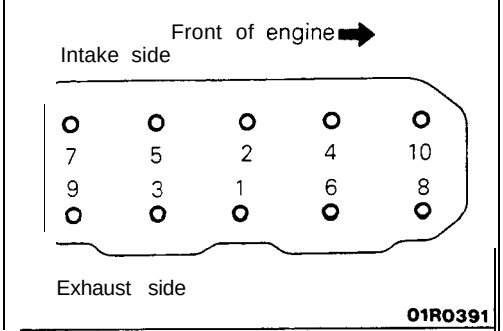
(3) Lay the cylinder head gasket on the cylinder block with the identification mark at the front top.

56. INSTALLATION OF CYLINDER HEAD ASSEMBLY <Up to 1992 models>

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

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

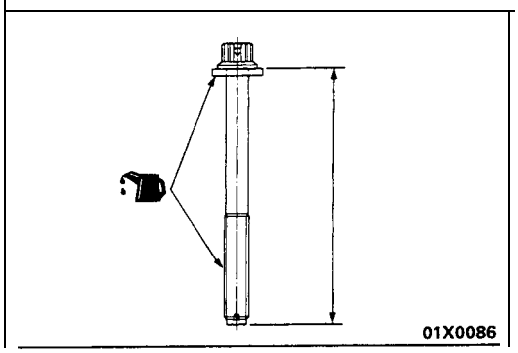


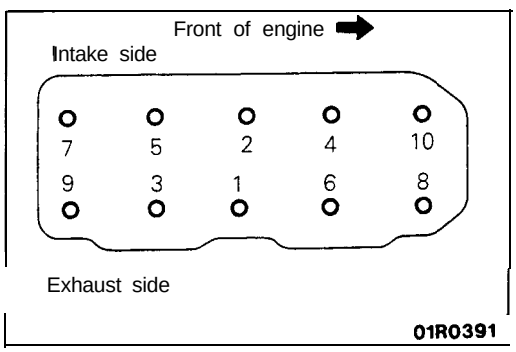


(2) Using the special tool and a torque wrench, tighten the bolts to the specified torque in the order shown in the figure. (in two or three cycles.)

Caution
Install the head bolt **washers as shown in the diagram.**

TSB Revision





< 1993 models>

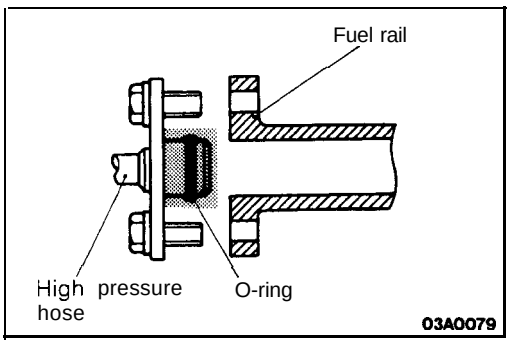
(1) Use a scraper to clean the gasket surface of the cylinder head assembly.

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

(2) When installing the cylinder head bolts, check that the shank length of each bolt meets the limit. If the limit is exceeded, replace the bolt.

Limit: Max. 99.4 mm (3.91 in.)

(3) Apply engine oil to the threaded part of the bolt and the washer.
(4) According to the tightening sequence, tighten the bolts to the specified torque 80 Nm (58 ft.lbs.).
(5) Loosen bolts completely.
(6) Torque bolts to 20 Nm (14.5 ft.lbs.).
(7) Tighten bolts 1/4 turns (90°) more.
(8) Tighten bolts 1/4 turns (90") additionally.



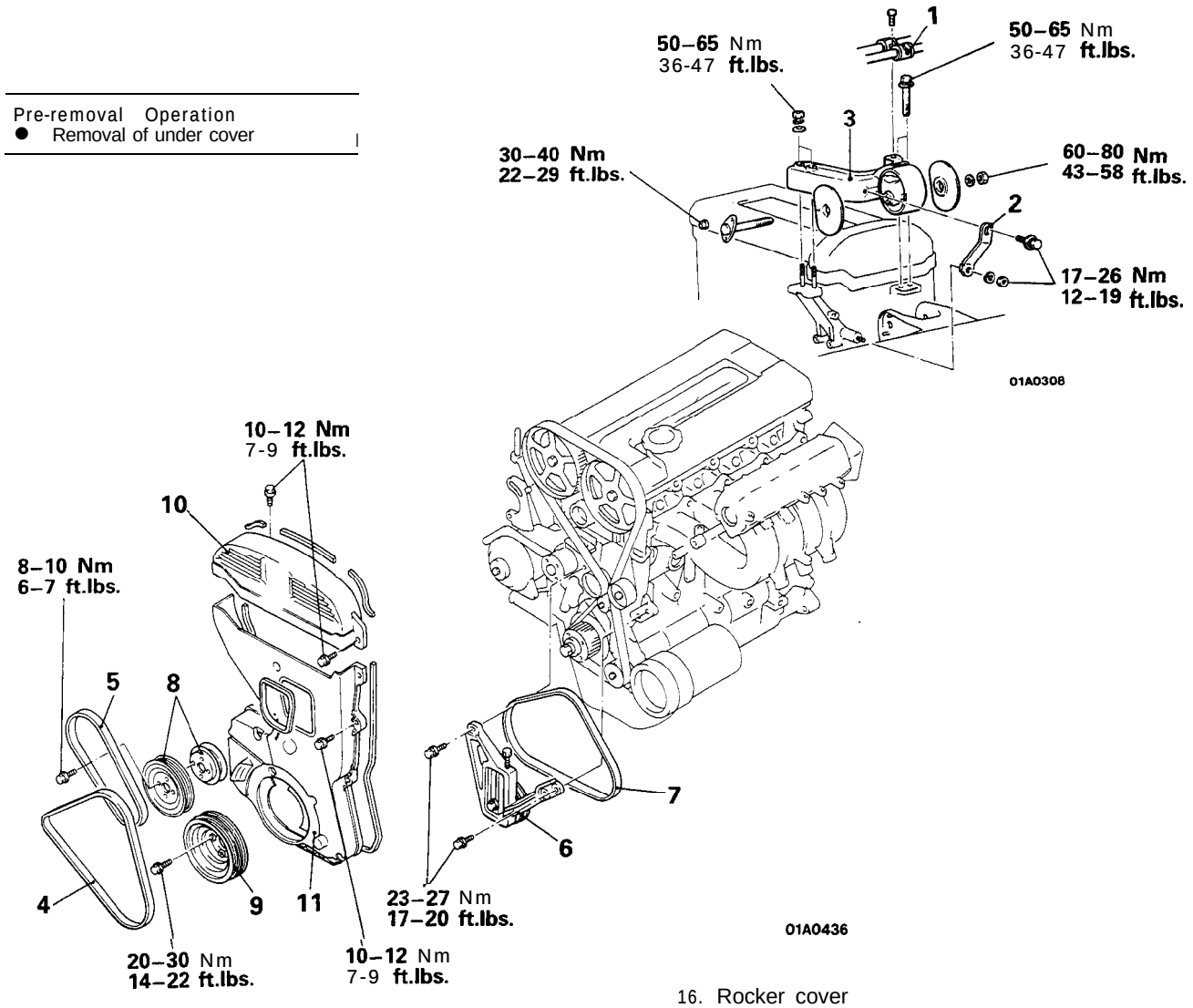
21. CONNECTION OF HIGH-PRESSURE FUEL HOSE

When connecting the high-pressure fuel hose to the fuel rail, apply a coating of engine oil to the hose union, and insert so that the O-ring is not damaged.

TIMING BELT

M11KA-B

REMOVAL AND INSTALLATION

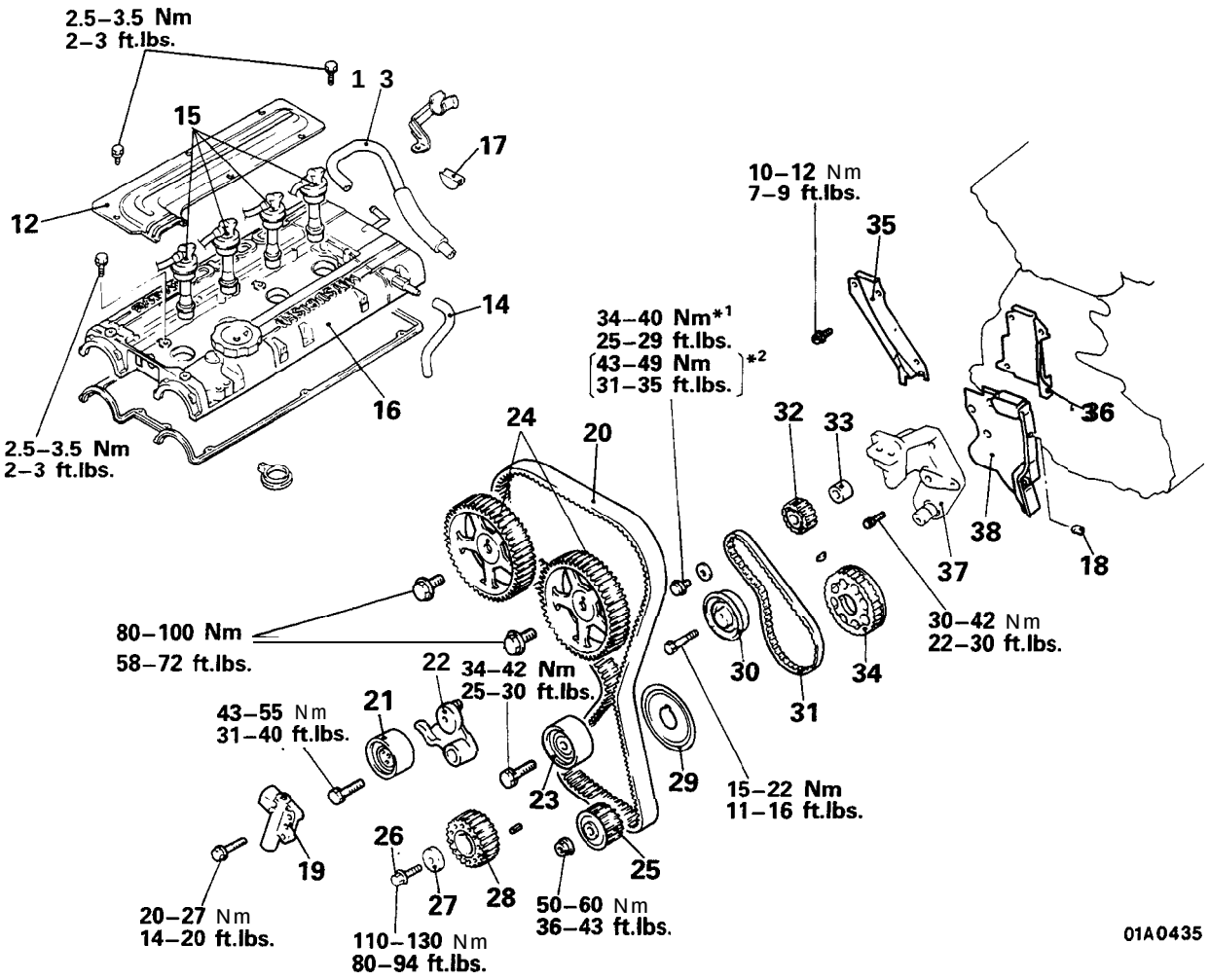


Pre-removal Operation
- Removal of under cover

Removal steps

1. Clamp for pressure hose (power steering) and high pressure hose (air conditioning)
2. Bracket
3. Engine mount bracket
4. Drive belt (generator)
5. Drive belt (power steering)
6. Tensioner pulley bracket
7. Drive belt (air conditioning)
8. Water pump pulley
9. Crankshaft pulley
10. Timing belt front upper cover
11. Timing belt front lower cover
12. Center cover
13. Breather hose
14. PCV hose
15. Connection for spark plug cables
16. Rocker cover
17. Semi-circular packing
18. Plug rubber
19. Auto tensioner
20. Timing belt
21. Tensioner pulley
22. Tensioner arm
23. Idle pulley
24. Camshaft sprocket
25. Oil pump sprocket
26. Crankshaft sprocket bolt
27. Special washer
28. Crankshaft sprocket
29. Flange
30. Tensioner "B"
31. Timing belt "B"
32. Silent shaft sprocket
33. Spacer
34. Crankshaft sprocket "B"
35. Timing belt rear right cover
36. Timing belt rear left cover (upper)
37. Engine support bracket
38. Timing belt rear left cover (lower)

TSB Revision



Installation steps

38. Timing belt rear left cover (lower)
◆◆ 37. Engine support bracket
36. Timing belt rear left cover (upper)
35. Timing belt rear right cover
◆◆ 34. Crankshaft sprocket "B"
● * 33. Spacer
32. Silent shaft sprocket
◆◆ 31. Timing belt "B"
Adjustment of timing belt "B" tension
30. Tensioner "B"
◆◆ 29. Flange
● C 28. Crankshaft sprocket
27. Special washer
26. Crankshaft sprocket bolt
◆◆ 25. Oil pump sprocket
● 24. Camshaft sprocket
23. Idle pulley
● + 19. Auto tensioner
22. Tensioner arm
◆◆ 21. Tensioner pulley
◆◆ 20. Timing belt
◆◆ Adjustment of timing belt tension
18. Plug rubber
17. Semi-circular packing
16. Rocker cover
15. Connection for spark plug cables
14. PCV hose
13. Breather hose

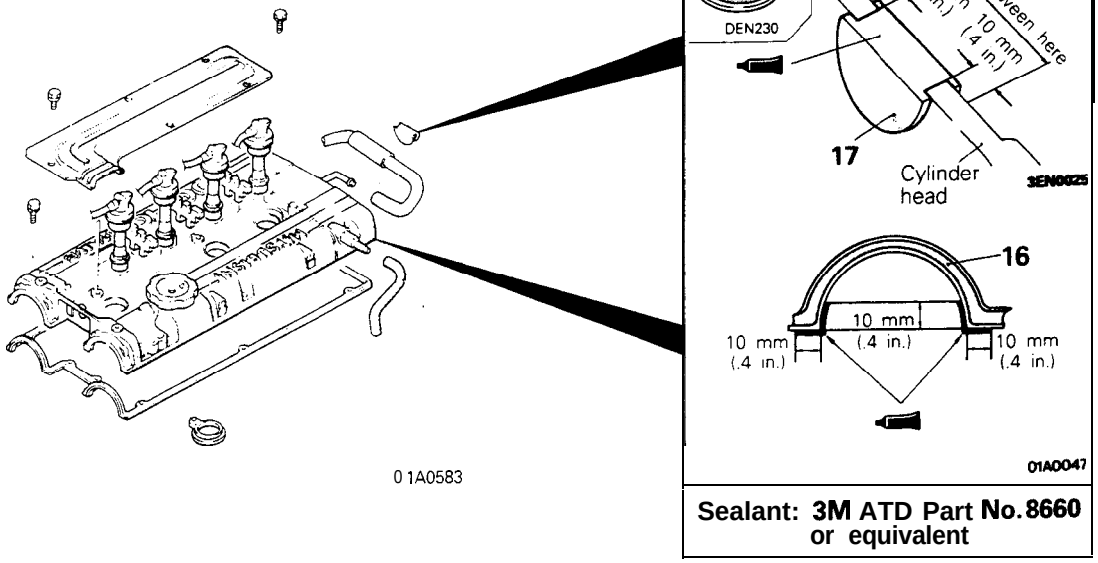
Post-installation Operation
- Installation of under cover
- Service Adjustment Procedures (Refer to P.11-57.)

12. Center cover
◆◆ 11. Timing belt front lower cover
● + 10. Timing belt front upper cover
9. Crankshaft pulley
8. Water pump pulley
7. Drive belt (air conditioning) (Refer to P.I 1-61.)
6. Tensioner pulley bracket
5. Drive belt (power steering) (Refer to P.11-61.)
4. Drive belt (generator) (Refer to P.I 1-61.)
3. Engine mount bracket
2. Bracket
1. Clamp for pressure hose (power steering) and high pressure hose (air conditioning)

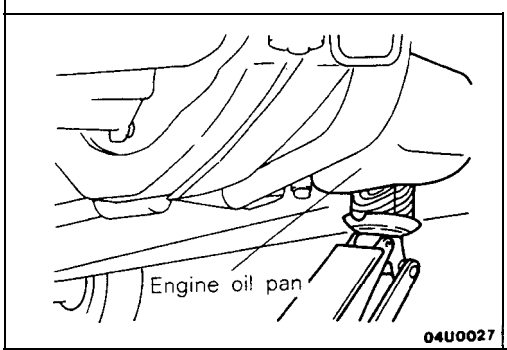
NOTE
*1: Vehicles built up to Nov. 1988
*2: Vehicles built from Dec. 1988

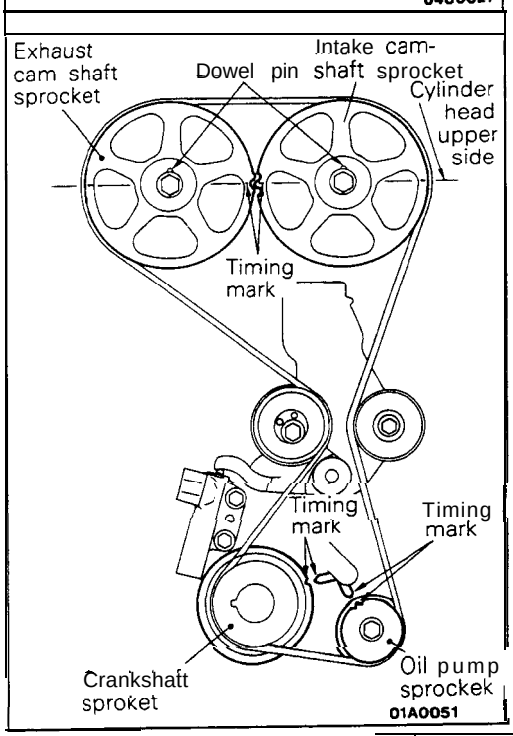
TSB Revision

SEALING POINTS



Sealant: 3M ATD Part No.8660 or equivalent





SERVICE POINTS OF REMOVAL

M11KBDG

3. REMOVAL OF ENGINE MOUNT BRACKET

(1) With a wooden block placed against the oil pan part of the engine, jack up the vehicle.

Caution
Jack up gently, so as not to apply a load to the various parts.

(2) Remove the engine mount bracket.

4. REMOVAL OF DRIVE BELT

Before removing the drive belt, loosen the water pump pulley mounting bolts.

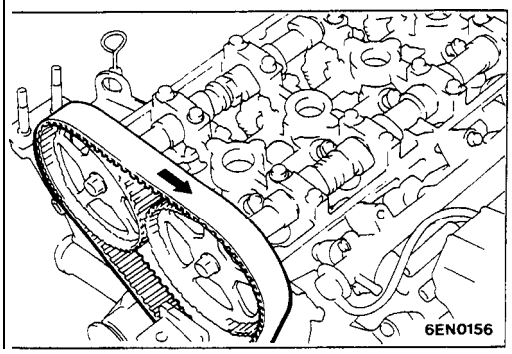
19. REMOVAL OF AUTO TENSIONER

(1) Turn the crankshaft clockwise and align the timing marks so as to bring the No. 1 cylinder to compression top-dead-centre position.
At this time the timing marks of the camshaft sprocket and the upper surface of the cylinder head should coincide, and the dowel pin of the camshaft sprocket should be at the upper side.

Caution
The crankshaft must always be rotated clockwise.

(2) Remove the auto tensioner.

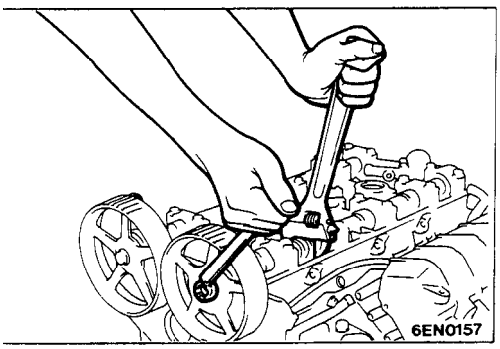
TSB Revision



20. REMOVAL OF TIMING BELT

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.

Caution
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.

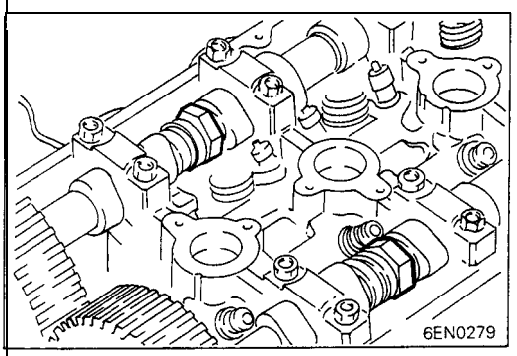


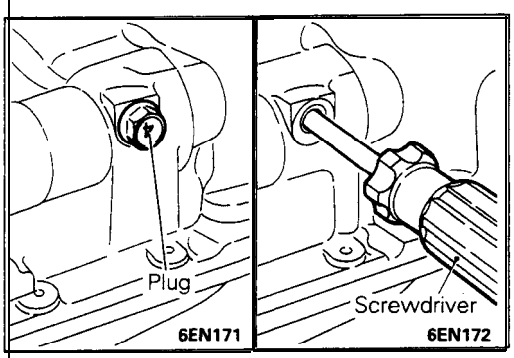
24. REMOVAL OF CAMSHAFT SPROCKETS

(1) Using a wrench, hold the camshaft at its hexagon (between the No. 2 and No. 3 journals) and remove the camshaft sprocket bolt.

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

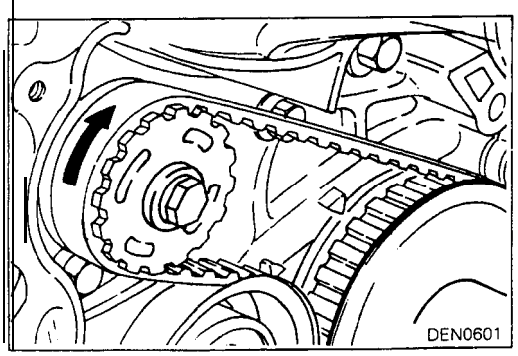
(2) Remove the camshaft sprockets.





25. REMOVAL OF OIL PUMP SPROCKET

(1) Remove the plug on the side of the cylinder block.
(2) Insert a Phillips screwdriver [shank diameter 8 mm (.31 in.)] to block the left silent shaft.
(3) Remove the oil pump sprocket nut.
(4) Remove the oil pump sprocket.



31. REMOVAL OF TIMING BELT "B"

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.

Caution
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.

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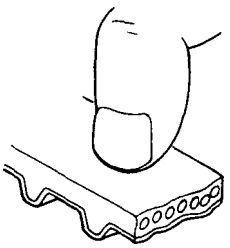

7EN206

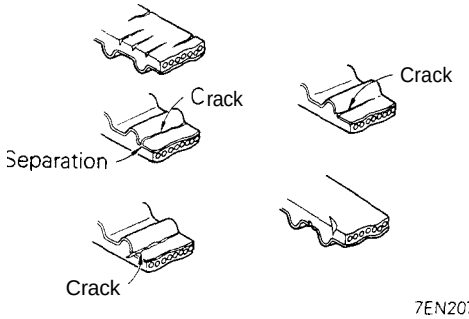
INSPECTION

M11KCAC

TIMING BELTS

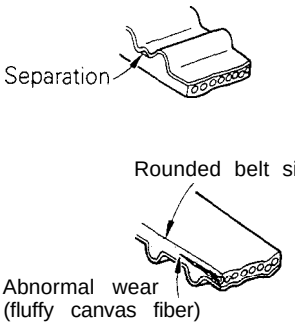
The timing belts must be checked closely. Should the following defects be evident, replace the belt with a new one.

(1) Hardened back surface rubber
Glossy, non-elastic, and so hard that no mark is produced even when scratched by a fingernail.



7EN207

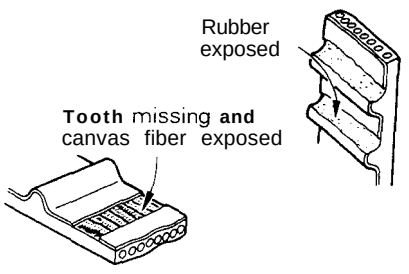
(2) Cracked back surface rubber.
(3) Cracked or separated canvas
(4) Cracked tooth bottom.
(5) Cracked side.



7EN208

(6) Abnormal wear on side.

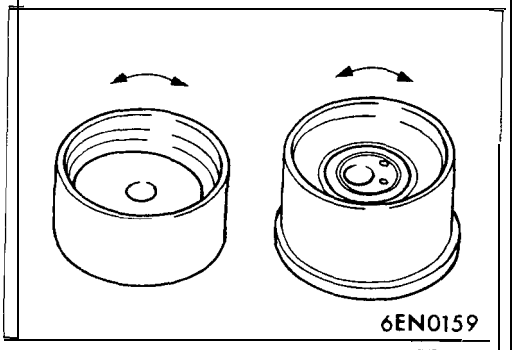
NOTE
Normal belt should have clear-cut sides as if cut by a sharp knife.



7EN209

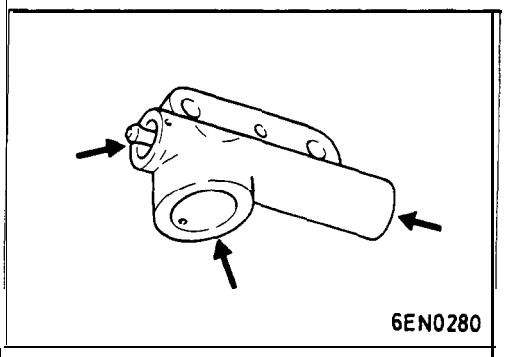
(7) Abnormal wear on teeth.
Initial stage:
Canvas on load side tooth flank worn (Fluffy canvas fibers, rubber gone and color changed to white, and unclear canvas texture)
Final stage:
Canvas on load side tooth flank worn down and rubber exposed (tooth width reduced)

(8) Missing tooth.


6EN0159

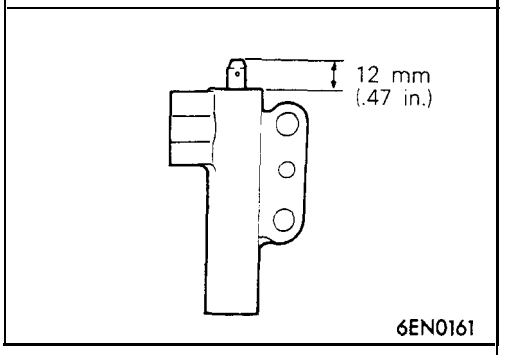
TENSIONER PULLEY AND IDLER PULLEY

(1) Turn the pulleys to check for possible binding, excessive play, and unusual noise. Replace the pulley if any of these defects is evident.
(2) Replace if there is a grease leak.


6EN0280

AUTO TENSIONER

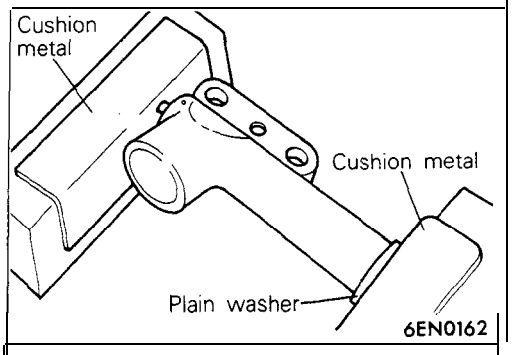
(1) Check the auto tensioner for possible leaks and replace as necessary.
(2) Check the rod end for wear or damage and replace as necessary.



6EN0161

(3) Measure the rod protrusion. If it is out of specification, replace the auto tensioner.

Standard value: 12 mm (.47 in.)

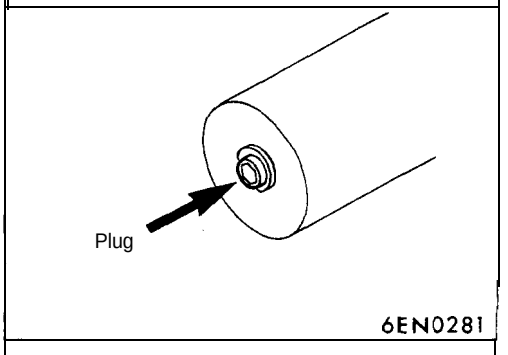


6EN0162

(4) Using a vise with soft jaws push in the auto tensioner rod. If the rod can be easily retracted, replace the auto tensioner. You should feel a fair amount of resistance when pushing the rod in.

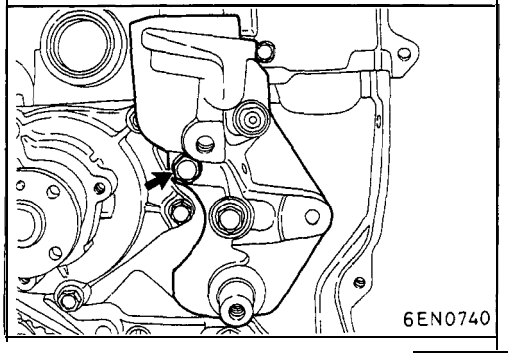
Caution

1. Clamp the auto tensioner in the vise so it maintains a level position.



6EN0281

2. If the plug at the bottom of the auto tensioner protrudes, surround it with a plain washer as illustrated to prevent the plug from being in direct contact with the vise.

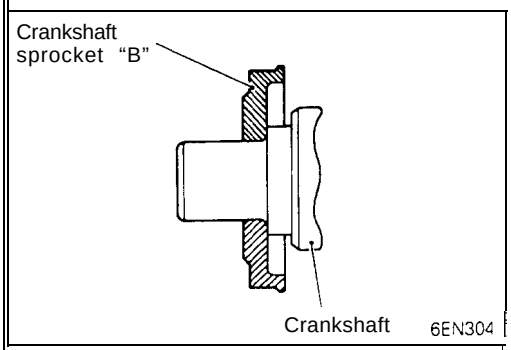

6EN0740

SERVICE POINTS OF INSTALLATION M11KDCF

37. INSTALLATION OF ENGINE SUPPORT BRACKET

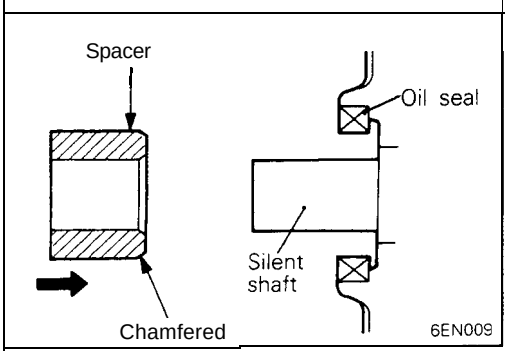
Apply sealant to the bolt shown in the figure and tighten it to the specified torque.

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



34. INSTALLATION OF CRANKSHAFT SPROCKET "B"

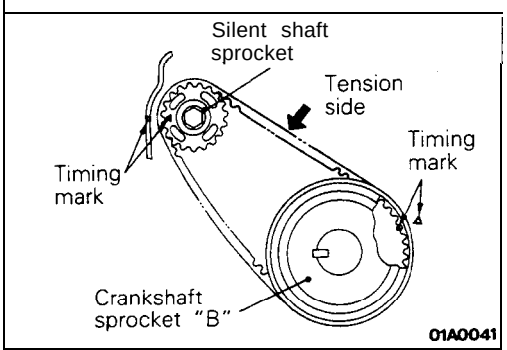
Install the crankshaft sprocket "B" as shown while paying attention to its direction.



33. INSTALLATION OF SPACER

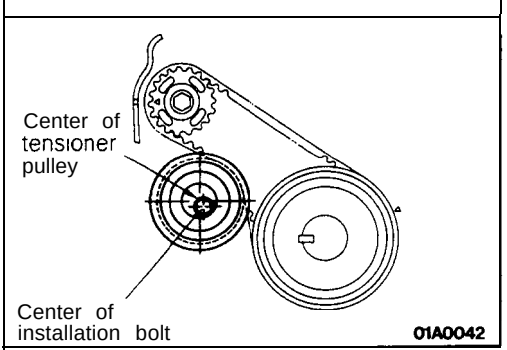
(1) Apply a thin coat of engine oil to the outer circumference of the spacer.
(2) Install the spacer with the chamfered end facing the oil seal.

NOTE
If the spacer is installed adversely, the oil seal may be damaged, resulting in the oil leaks.



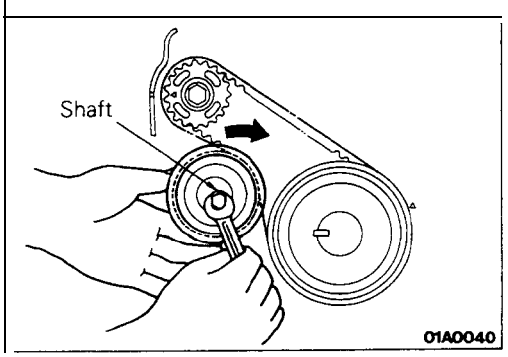
31. INSTALLATION OF TIMING BELT "B"

(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.



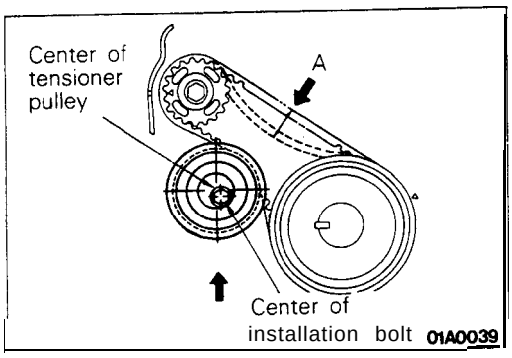
. ADJUSTMENT OF TIMING BELT "B" TENSION

(1) Temporarily fix the timing belt "B" tensioner such that the center of the tensioner pulley is to the left and above the center 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.



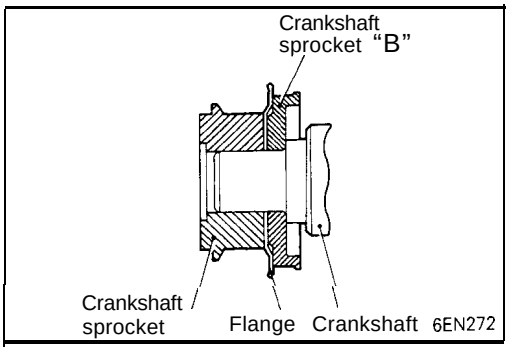
(3) To ensure that the tension is correct, depress the belt (point A) with a finger. If not, adjust.

Standard value: 5-7 mm (.20–.28 in.)

29. INSTALLATION OF FLANGE

Install the flange in correct direction as shown

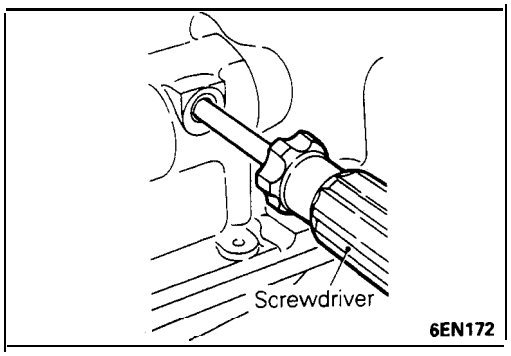
Caution
Pay special attention to the direction of the flange. If it is installed in the wrong direction, a broken timing belt could result.



28. INSTALLATION OF CRANKSHAFT SPROCKET

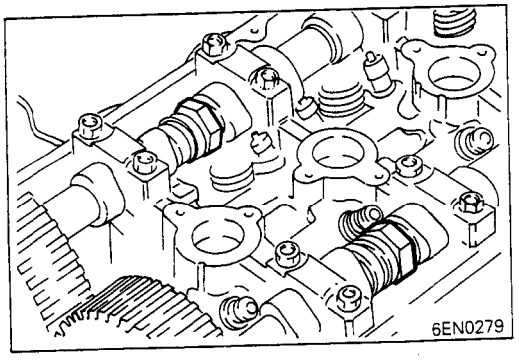
Install the crankshaft sprocket in the correct direction as shown.

Caution
Pay special attention to the direction of the flange. If it is installed in the wrong direction, a broken timing belt could result.



25. INSTALLATION OF OIL PUMP SPROCKET

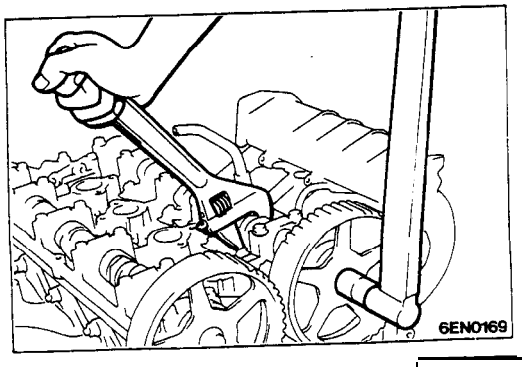
(1) Insert a Phillips screwdriver [shank diameter 8 mm (.31 in.) shaft] through the plug hole on the left side of cylinder block to block the left silent shaft.
(2) Install the oil pump sprocket.
(3) Apply engine oil to the nut bearing surface and tighten the nut to the specified torque.

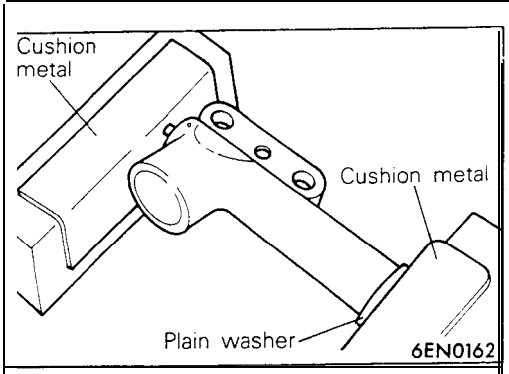


24. INSTALLATION OF CAMSHAFT SPROCKETS

Using a wrench, hold the camshaft at its hexagon (between the No.2 and No.3 journals) and tighten the bolt to specification.

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

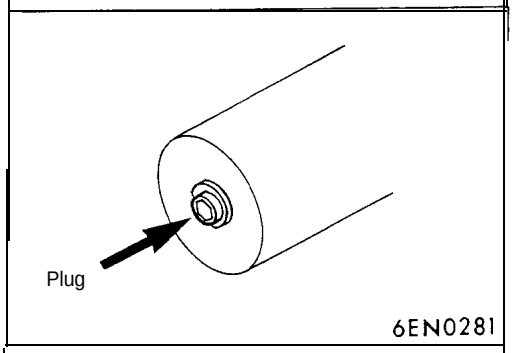




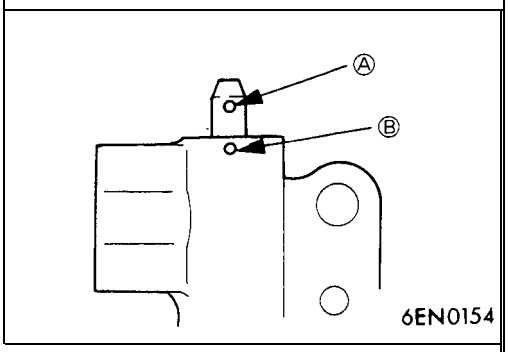
19. INSTALLATION OF AUTO TENSIONER

(1) If the auto tensioner rod is in its fully extended position, reset it as follows.

① Keep the auto tensioner level and, in that position, clamp it in the vise with soft jaws.



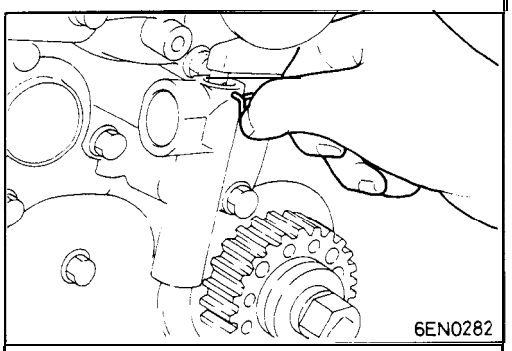
If the plug at the bottom of the auto tensioner protrudes, surround it with a plain washer as illustrated to prevent the plug from being in direct contact with the vise.



② Push in the rod little by little with the vise until the set hole Ⓐ in the rod is aligned with that Ⓑ in the cylinder.

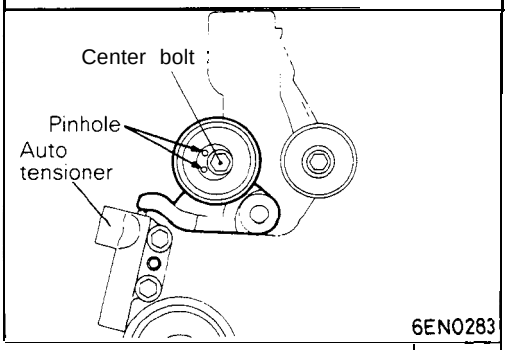
③ Insert a wire [1.4 mm (.055 in.) in diameter] into the set holes.

④ Unclamp the auto tensioner from the vise.



(2) Install the auto tensioner.

Caution
Leave the wire installed in the auto tensioner.



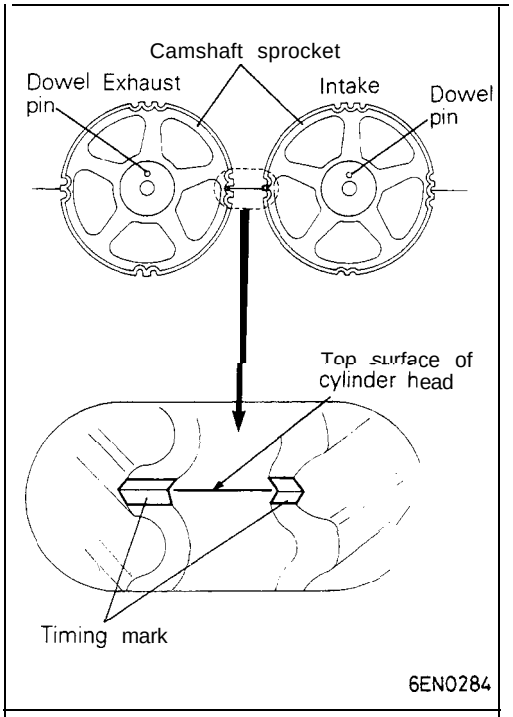
21. INSTALLATION OF TENSIONER PULLEY

(1) Install the tensioner pulley onto the tensioner arm.

(2) Locate the pinhole in the tensioner pulley shaft to the left of the center bolt. Then, tighten the center bolt finger-tight.

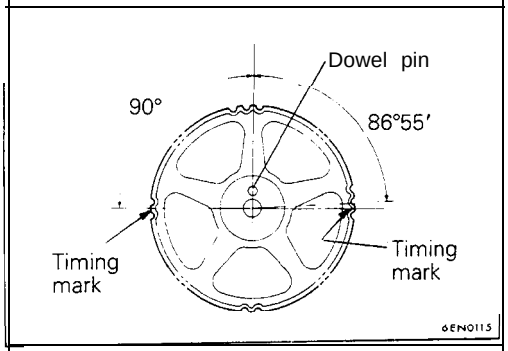
Caution
Leave the wire installed in the auto tensioner.

TSB Revision



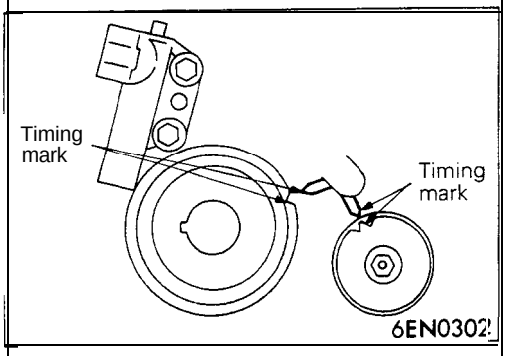
20. INSTALLATION OF TIMING BELT

(1) Turn the two sprockets so that their dowel pins are located on top. Then, align the timing marks facing each other with the top surface of the cylinder head. When you let go of the exhaust camshaft sprocket, it will rotate one tooth in the counterclockwise direction. This should be taken into account when installing the timing belt on the sprockets.

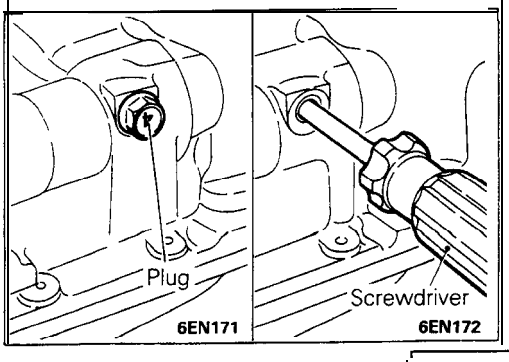


NOTE
The same camshaft sprocket is used for the intake and exhaust camshafts and is provided with two timing marks. When the sprocket is mounted on the exhaust camshaft, use the timing mark on the right with the dowel pin hole on top. For the intake camshaft sprocket, use the one on the left with the dowel pin hole on top.

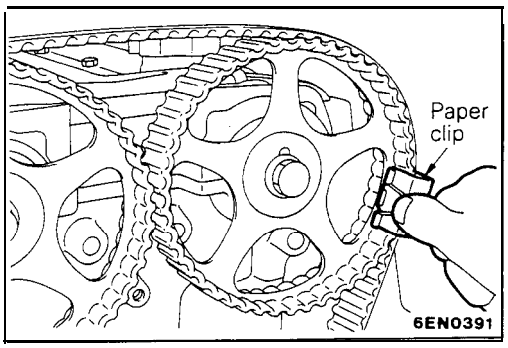
(2)
(3)



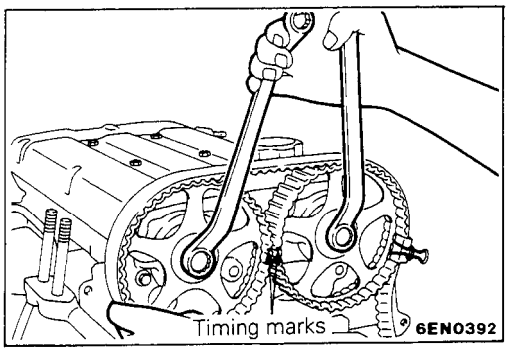
(4)



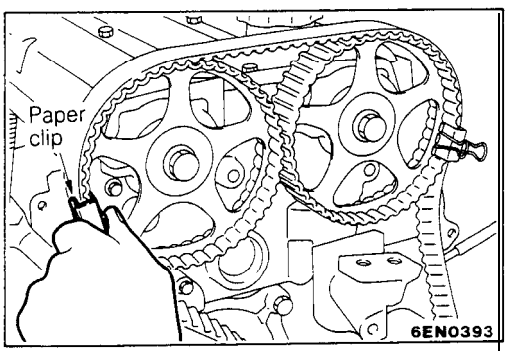
TSB Revision



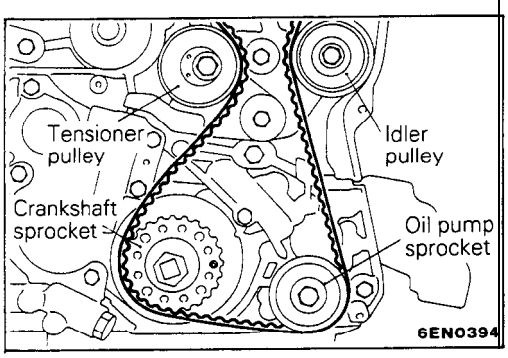
(5) Install the timing belt around the intake side camshaft sprocket and fix it at indicated position by a spring type paper clip (binder clip).



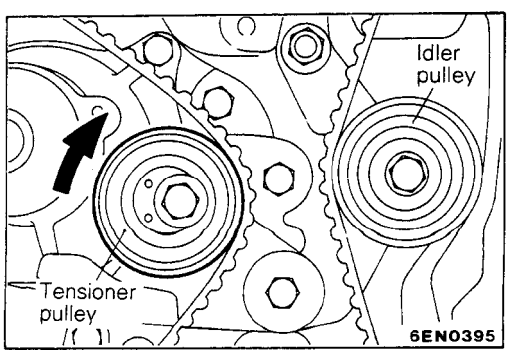
(6) Install the timing belt around the exhaust side sprocket, aligning the timing marks with the cylinder head top surface using two wrenches.



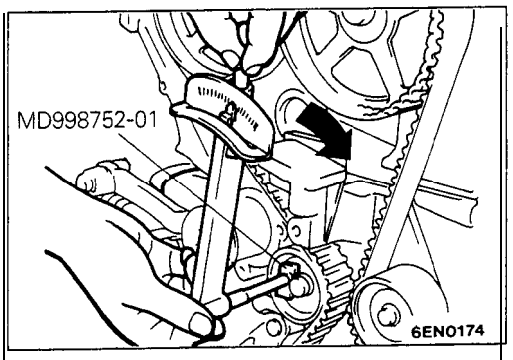
(7) Fix the belt at indicated position by another binder clip.

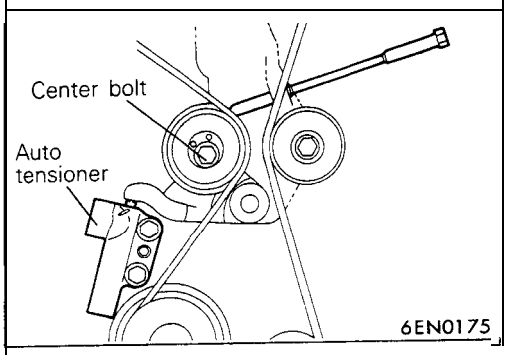


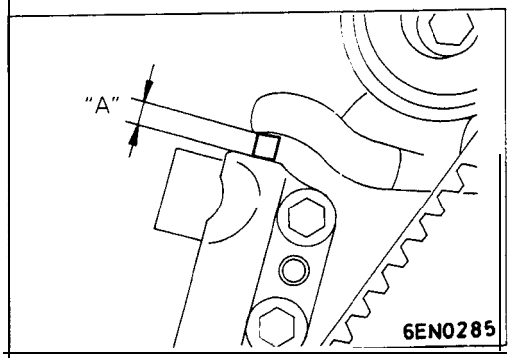
(8) Install the timing belt around the idler pulley, the oil pump sprocket, the crankshaft sprocket and the tensioner pulley in the order shown.
(9) Remove the two binder clips.

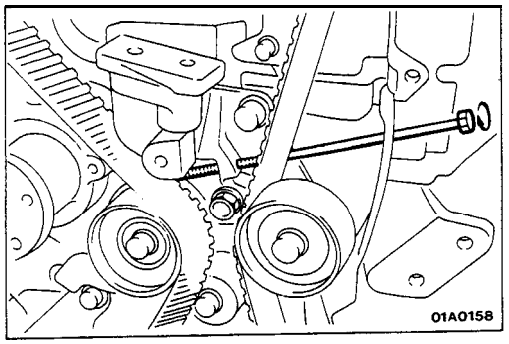


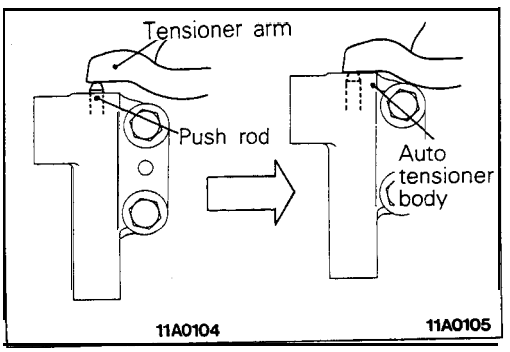
(10) Lift up the tensioner pulley in the direction of arrow and tighten the center bolt.
(11) Check to see that all timing marks are lined up.
(12) Remove the screwdriver inserted and fit the plug.
(13) Give the crankshaft a quarter counter-clockwise turn. Then, turn it clockwise until the timing marks are lined up again.











. ADJUSTMENT OF TIMING BELT TENSION

(1) After turning the crankshaft 1/4 turn counterclockwise, turn it clockwise to move the No. 1 cylinder to top dead center.

(2) Loosen the center bolt, and then, as shown in the illustration, attach the special tool and a torque wrench and apply a torque of 2.6-2.8 Nm (1.88–2.03 ft.lbs.). If the body interferes with the special tool and the torque wrench, use a jack to slightly raise the engine assembly.

NOTE
Use a torque wrench that is capable of measurement within a range of 0- 3 Nm (0- 2.2 ft.lbs.).

(3) Holding the tensioner pulley with the special tool **and** torque wrench, tighten the center bolt to specification.

(4) Screw the tool into the engine left support bracket until its end makes contact with the tensioner arm. At that point, screw the tool in some more and then remove the set wire attached to the auto tensioner.

(5) Remove the tool.

(6) Rotate the crankshaft two complete turns clockwise and leave it as is for about 15 minutes. Then, measure the auto tensioner protrusion "A" (distance between the tensioner arm and auto tensioner body) to ensure that it is up to specification.

Standard value: 3.8-4.5 mm (.15–.18 in.)

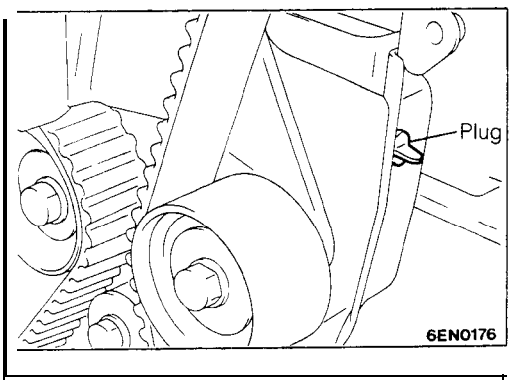
If it is out of specification, repeat steps (6) through (11) until the specified value is obtained.

(7) If the clearance between the tensioner arm and the auto tensioner body cannot be measured (when the engine is being mounted, etc.), the following procedures can be used to substitute for the ordinary method of measurement.

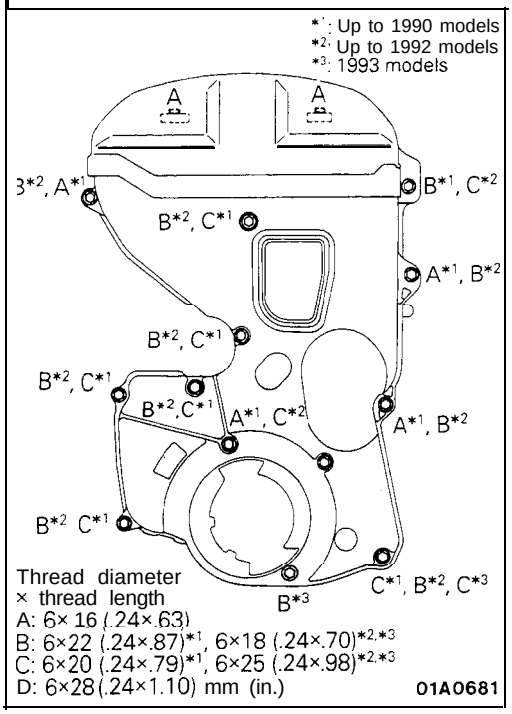
① Screw in the tool until it contacts the tensioner arm.

② From that point of contact, further screw in the tool. screwing it in until the push rod of the auto tensioner body is caused to move backward and the tensioner arm contacts the auto tensioner body.
Check to be sure that the amount that the tool has been screwed in (when the push rod moves backward) is the standard value.

Standard value: 2.5 – 3 turns



(8) Install the rubber plug to the timing belt rear cover.



11. INSTALLATION OF TIMING BELT LOWER COVER/ 10. TIMING BELT UPPER COVER

The dimensions of the installation bolts for the timing covers differ according to the installation location, so be sure not to install the bolts in the incorrect locations.

FUEL

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FUEL SYSTEM <SOHC-8 VALVE>

GENERAL INFORMATION

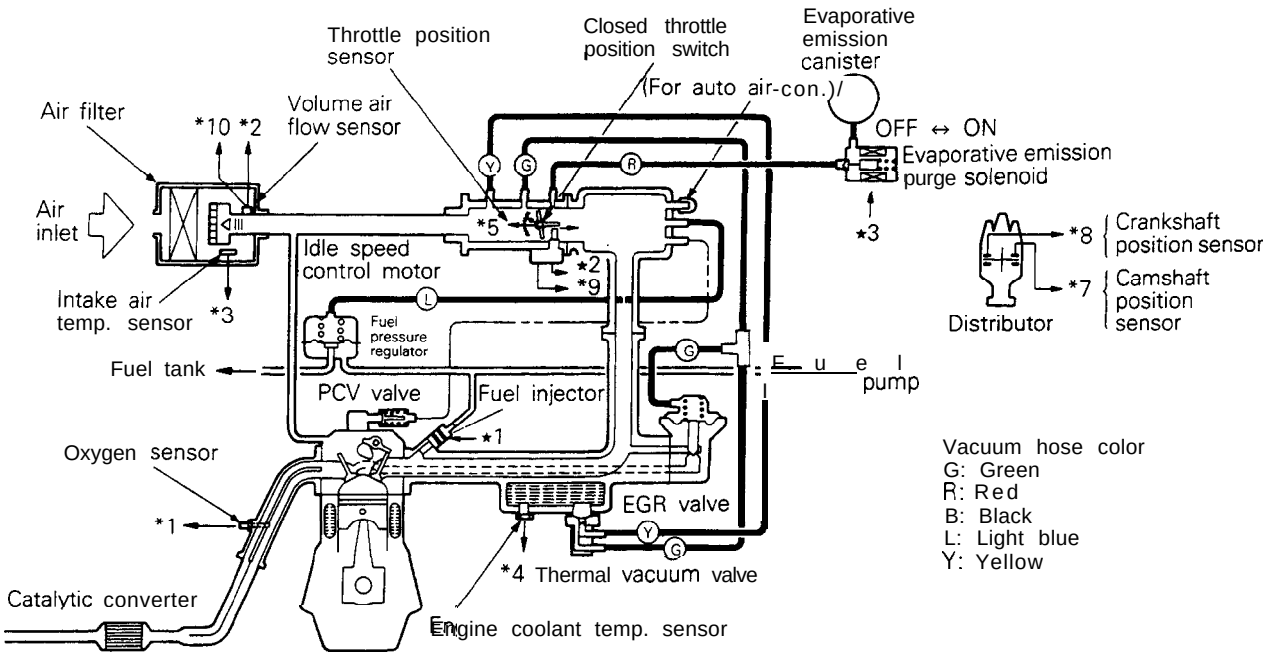
M13BA--

MFI SYSTEM DIAGRAM

<Federal>

*1 Oxygen sensor *2 Volume air flow sensor *3 Intake air temperature sensor *4 Engine coolant temperature sensor *5 Throttle position sensor *6 Closed throttle position switch *7 Camshaft position sensor *8 Crankshaft position sensor *9 Idle speed control motor position sensor	*10 Barometric pressure sensor • Ignition switch-ST • Power supply • Vehicle-speed sensor • Air conditioning switch • Park/neutral position switch • Power steering pressure switch	⇨ Engine control module ⇨	*1 Injector *2 Idle speed control motor *3 Evaporative emission purge solenoid • Fuel pump control • Multiport fuel injection relay • A/C compresser clutch relay • Ignition timing control • On-board diagnostic output • Check engine/malfunction indicator lamp

A/T: Vehicles with an automatic transaxle



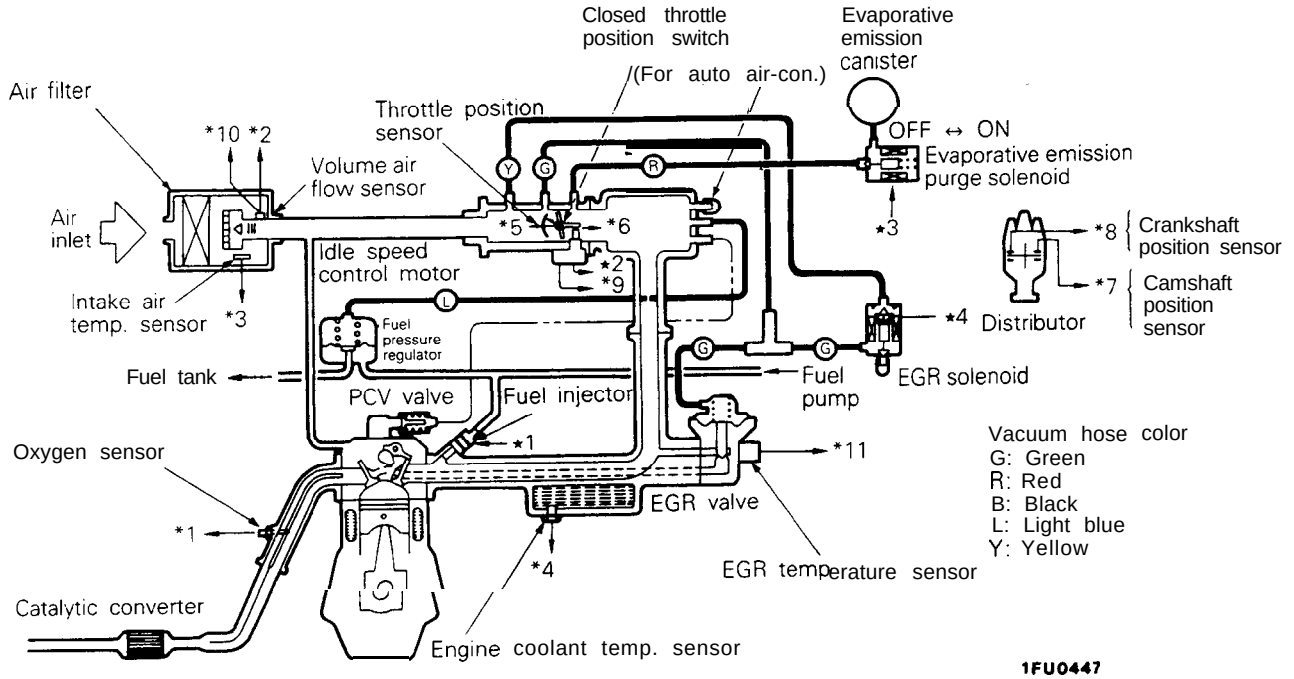
PCV: Positive Crankcase Ventilation

6FU1125

<California>

*1 Oxygen sensor *2 Volume air flow sensor *3 Intake air temperature sensor *4 Engine coolant temperature sensor *5 Throttle position sensor *6 Closed throttle position switch *7 Camshaft position sensor *8 Crankshaft position sensor *9 Idle speed control motor position sensor	*10 Barometric pressure sensor *11 EGR temperature sensor • Ignition switch-ST • Power supply • Vehicle-speed sensor • Air conditioning switch • Park/neutral position switch • Power steering pressure switch	⇒ Engine control module ⇒	*1 Injector *2 Idle speed control motor *3 Evaporative emission purge solenoid *4 EGR solenoid • Fuel pump control (Multiport fuel injection relay) • A/C compresser clutch relay • Ignition timing control • On-board diagnostic output • Check engine/malfunction indicator lamp

A/T: Vehicles with an automatic transaxle



PCV: Positive Crankcase Ventilation

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SPECIFICATIONS

GENERAL SPECIFICATIONS

M13CA--

Items		Specifications
Fuel		
Tank capacity	dm^3 (gal.)	60 (15.9)
Return system		Equipped
Filter		High pressure type
Fuel pump		
Type		Electrical, in-tank type
Driven by		Electric motor
Throttle body		
Throttle bore	mm (in.)	50 (1.9691
Throttle position sensor		Variable resistor type
Idle speed control motor		Electric motor
Closed throttle position switch		Contact type, within idle speed control motor
Idle speed control motor position sensor		Variable resistor type
Engine control module		
Identification model No.		
<Federal>		E2T14473*1, E2T36273*2, E2T36278*3
<California>		E2T14472*1, E2T36272*2, E2T36277*3
Sensors		
Volume air flow sensor		Karman vortex type
Barometric pressure sensor		Semiconductor diffusion type
Intake air temperature sensor		Thermistor type
Engine coolant temperature sensor		Thermistor type
Oxygen sensor		Zirconia type
Vehicle speed sensor		Reed switch type
Park/neutral position switch		Contact switch type
Camshaft position sensor		Photo interrupter type
Crankshaft position sensor		Photo interrupter type
EGR temperature sensor <California>		Thermistor type
Power steering pressure switch		Contact switch type
Actuators		
Multiport fuel injection relay type		Contact switch type
Injector type and number		Electromagnetic, 4
Injector identification mark		B210H*1.*2, N210H*3
Evaporative emission purge solenoid		ON/OFF type solenoid valve
EGR solenoid <California>		Duty cycle type solenoid valve
Fuel pressure regulator		
Regulated pressure	kPa (psi)	335 (47.6)

NOTE
*1: <1989 models>
*2: <1990 models>
*3: <From 1990.5 models>

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SERVICE SPECIFICATIONS

M13CB--

Items		Specifications
Basic ignition timing		5° ± 2°BTDC at curb idle
Curb idle speed	r p m	750 ± 100
Idle speed when air conditioning is on	rpm	
<M/T>		850 at neutral position
<A/T>		700 at D range
Basic idle speed	r p m	750 ± 50
Throttle position sensor adjusting voltage	V	0.48–0.52 at curb idle
Throttle position sensor resistance	kΩ	3.5-6.5
Idle speed control motor coil resistance	Ω	5-35 [at 20°C (68°F)]
Idle speed control motor position sensor resistance	kΩ	4 - 6
Intake air temperature sensor resistance	kΩ	2 . 7 [at 20°C (68°F)]
Engine coolant temperature sensor resistance	kΩ	
20°C (68°F)		2.5
80°C (176°F)		0.3
Fuel pressure	kPa (psi)	
Vacuum hose disconnection		330–350 (47–50) at curb idle
Vacuum hose connection		Approx. 270 (38) at curb idle
Injector coil resistance	Ω	13-16 [at 20°C (68°F)]

TORQUE SPECIFICATIONS

M13CC--

Items	Nm	ft.lbs.
Oxygen sensor	40–50	30–36
Engine coolant temperature sensor	20–40	15-29
Throttle position sensor attaching screws	1.5-2.5	1.1-1.8
Idle speed control motor attaching screws	2.5–4.5	1.8-3.3
Fuel rail mounting bolts	10–13	7-9
High-pressure fuel hose to fuel rail	4-6	3-4
Fuel pressure regulator to fuel rail	7-11	5-8
Throttle body mounting bolts	15-22	11–16
Accelerator cable adjusting bolts	4-6	3-4
Fuel tank drain plug	17-26	12-19
Electrical fuel pump		
Screws	2-3	1.4-2.2
Bolt (at lower side)	9-14	7–10
Fuel gauge unit mounting screws	2-3	1.4-2.2
High pressure hose to electrical fuel pump	30–40	22-29
High pressure hose to fuel main pipe	30–40	22-29
Fuel main pipe to fuel filter	30–40	22-29
Eye bolt	25-35	18-25
Fuel filter mounting bolts	9-14	7–10
Fuel pipes clip attaching bolt	9-14	7–10

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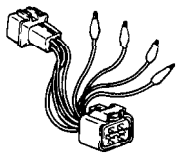
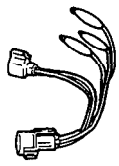
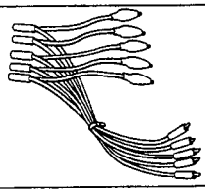
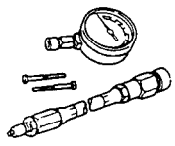
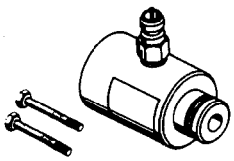
SEALANT

M13CE--

Items	Specified sealant
Engine coolant temperature sensor threaded portion	3M NUT locking No.4171 or equivalent

SPECIAL TOOLS

MI 3DA--

Tool	Number	Name	Use
	MD998464-01*1	Test harness (4 pin, square)	• Closed throttle position switch inspection • Idle speed control motor position sensor inspection
	OPTIONAL: AVAILABLE FROM O.T.C.		
	MD998478-01*1	Test harness (3 pin, triangle)	• Throttle position sensor inspection
	OPTIONAL: AVAILABLE FROM O.T.C.		
	MB991348*2	Test harness set	• Throttle position sensor adjustment • Checking by using the oscilloscope
	MIT210196	Fuel pressure test assembly	• Measurement of fuel pressure
	MD998742-01	Fuel pressure test adapter	
	MB991269*1 or MB991341 • z	Scan tool (Multi-use tester <MUT>)	• Reading diagnostic trouble code • MFI system inspection
		ROM pack (for Scan tool)	
	(For the number, refer to GROUP 00-Precautions before service.)		

NOTE
*1: <1 989 models>
• *: <From 1990 models>

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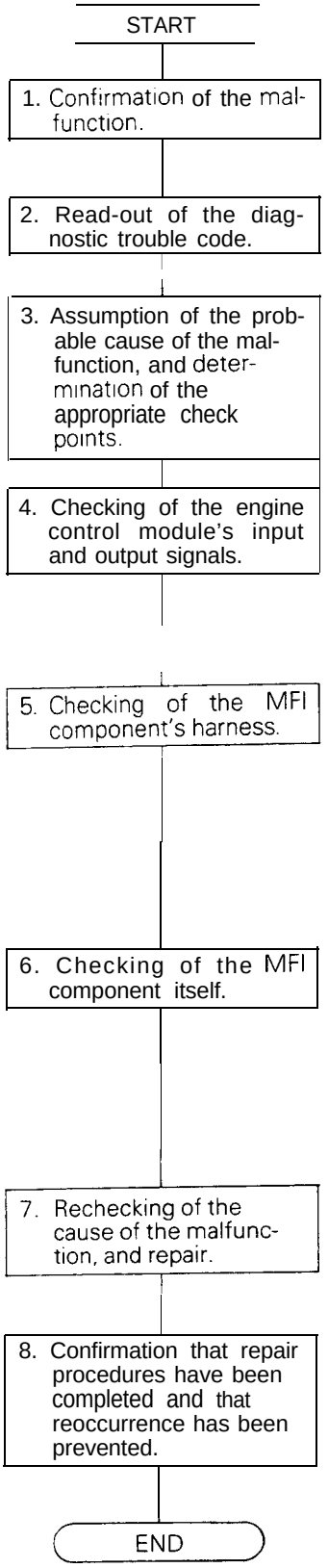
TROUBLESHOOTING

EXPLANATION OF TROUBLESHOOTING PROCEDURES

M13EBAD

Effective troubleshooting procedures related to problems of the MFI system are described below.



1. Confirmation of the malfunction.
   - Cause the malfunction to reoccur and check the details of the malfunction and the conditions (engine condition, driving conditions, etc.) when the malfunction reoccurs.
2. Read-out of the diagnostic trouble code.
   - When the diagnostic trouble code is read out and the diagnostic trouble code is output, refer to the diagnostic chart and repair the indicated location of the malfunction.
3. Assumption of the probable cause of the malfunction, and determination of the appropriate check points.
   - Refer to the "CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS" and confirm the sequence of checking for the indicated malfunction.
4. Checking of the engine control module's input and output signals.
   - Using the scan tool or an oscilloscope, check the input and output signals of the engine control module.
   - If the input and output signals are normal, sensor input/actuator control can. be judged to be normal, so check the input and output signals of the subsequent check point.
5. Checking of the MFI component's harness.
   - If an abnormal condition of the input and output signals of the engine control module is discovered, check, and repair if necessary, the body harness of the MFI component.
   - After making this repair, again check the input and output signals of the engine control module; if they are normal, proceed to the checking of the input and output signals of the subsequent check point.
6. Checking of the MFI component itself.
   - If the input and output signals of the engine control module are abnormal even though the body harness is normal, check the MFI component itself, and repair or replace as necessary.
   - After making this repair or replacement, again check the input and output signals of the engine control module; if they are normal, proceed to the checking of the input and output signals of the subsequent check point.
7. Rechecking of the cause of the malfunction, and repair.
   - If the input and output signals of the engine control module are abnormal even though the harness checking and the checking of the unit itself indicate that the condition is normal, refer to the troubleshooting hints to recheck the probable cause, and then check other groups and reapir as necessary.
8. Confirmation that repair procedures have been completed and that reoccurrence has been prevented.
   - Perform a test to try to get the malfunction to reoccur, and confirm that it does not.
   - Eliminate the true cause of the malfunction so as to prevent its reoccurrence.

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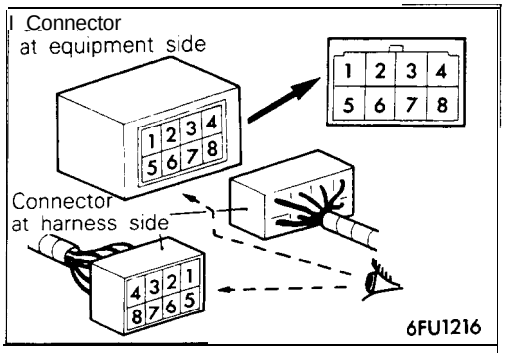
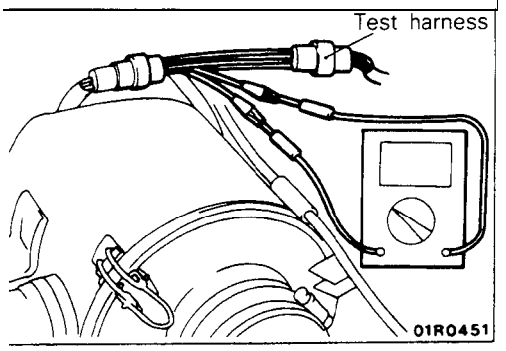
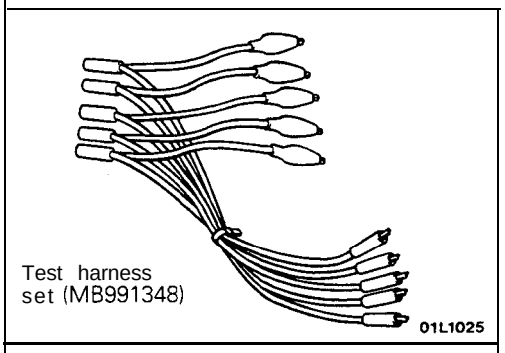


EXPLANATION AND PRECAUTION RELATED TO HARNESS CHECKING

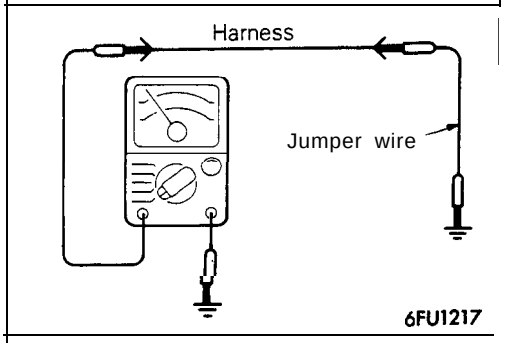
- Connector symbols are described as seen from the end of the terminal for the connector.
- The abbreviation "B+" used for the normal judgment value when checking the voltage is the abbreviation for battery positive voltage.



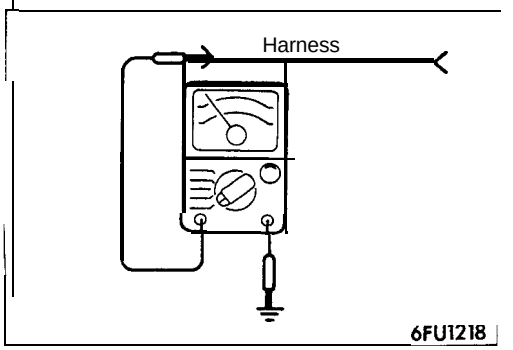
- Be sure to use the special tool (test harness) when, for a waterproof connector, checking while the circuit is conductive.
  If a probe is inserted from the harness side, the waterproof capability will be lowered, thereby causing/corrosion, never do so.



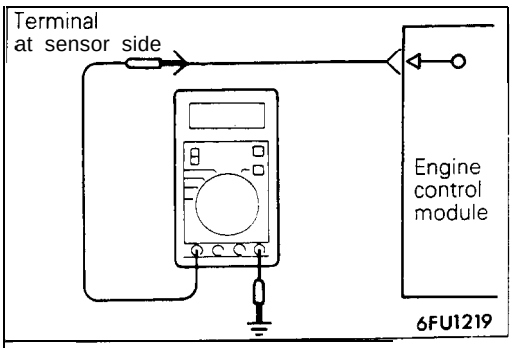
If there is no test harness compatible with the connector, it is OK to use the test harness set (MB991348) that can be directly connected between terminals.



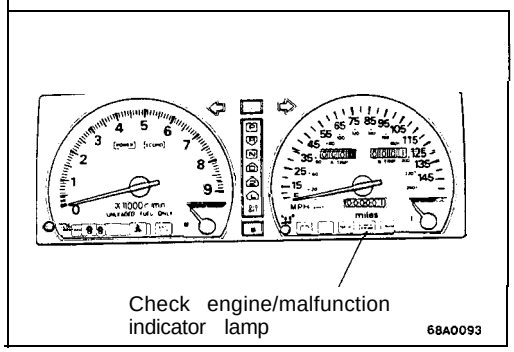
- When a connector is disconnected in order to check terminal voltage, etc., never insert a probe if the terminal to be checked is a female pin, because the forceful insertion of a probe will cause improper or incomplete contact.
- When checking for damaged or disconnected wiring of a harness (open circuit) and if both ends of the harness are unconnected, use a jumper wire to ground one end of the harness, and then check for continuity between the other end and ground. By doing this, you can check for damaged or disconnected wiring , and, if there is no continuity, the harness should be repaired.



- When checking for a harness short-circuit (short-circuit to ground), open one end of the harness and then check for continuity between the other end and ground.
  If there is continuity, the harness is short-circuited to ground and should be repaired.



- If the voltage (power-supply voltage) supplied to a sensor is not normal, repair the harness.
  If the voltage to the sensor is still not normal after the harness has been repaired, repalce the engine control module and check again.



CHECK ENGINE/MALFUNCTION INDICATOR LAMP

Among the on-board diagnostic items, a check engine/malfunction indicator lamp comes on to notify the driver of the emission control items when an irregularity is detected.
However, when an irregular signal returns to normal and the engine control module judges that it has returned to normal, the check engine/malfunction indicator lamp goes out.
Moreover, when the ignition switch is turned off, the light goes out. Even if the ignition switch is turned on again, the light does not come on until the irregularity is detected.
Here, immediately after the ignition switch is turn on, the check engine/malfunction indicator lamp is lit for 5 seconds to indicate that the check engine/malfunction indicator lamp operates normally.

ITEMS INDICATED BY THE CHECK ENGINE/ MALFUNCTION INDICATOR LAMP

Engine control module
Oxvaen sensor
Volume air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Idle speed control motor position sensor
Crankshaft position sensor
Camshaft position sensor
Barometric pressure sensor
Injector
Fuel pump
EGR <California>

CHECK ENGINE/MALFUNCTION INDICATOR LAMP INSPECTION

(1) Check to be sure, when the ignition switch is set to the "ON" position, that the lamp illuminates for about five seconds and then switches OFF.
(2) If the lamp does not illuminate, check for damage or disconnection of the harness, or for a blown fuse or a failed light bulb.

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ON-BOARD DIAGNOSTIC

The engine control module monitors the input/output signals (some signals at all times and the others under specified conditions) of the engine control module.

When it is noticed that an irregularity has continued for a specified time or longer from when the irregular signal is initially monitored, passing a certain number, the engine control module judges that an irregularity has occurred, memorizes the diagnostic trouble code, and outputs the signal to the on-board diagnostic output terminal.

There are 15 on-board diagnostic items including the normal state, and the diagnostic results can be read out with a voltmeter or scan tool.

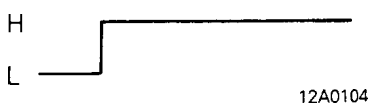
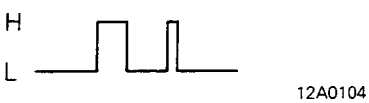
Moreover, since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the engine control module connector is disconnected. In addition, beginning with the engine control module of 1990 and later models, the diagnostic trouble codes are erased by turning on the ignition switch and sending the diagnostic trouble code erase signal from the scan tool to the engine control module.

Caution

If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal from the scan tool to the engine control module or disconnect the battery terminal (–) for 10 seconds or more, and the diagnostic memory will be erased.

The 15 on-board diagnostic items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

DIAGNOSTIC CHART (FAULT TREE)

Diagnostic trouble code		On-board diagnostic item	Check item (Remedy)	Memory
No.	Output signal pattern			
–		Engine control module	(Replace engine control module)	–
11		Oxygen sensor	• Harness and connector • Oxygen sensor . Fuel pressure • Injectors (Replace if defective.) • Intake air leaks	Retained
12		Volume air flow sensor	• Harness and connector (if harness and connector are normal, replace volume air flow sensor assembly.)	Retained
13		Intake air temperature sensor	• Harness and connector • Intake air temperature sensor	Retained

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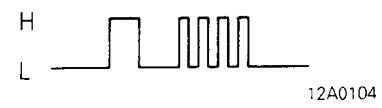
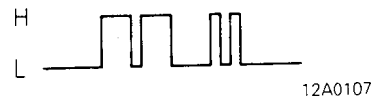
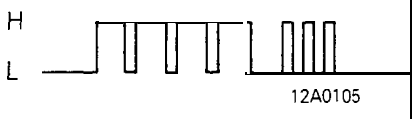
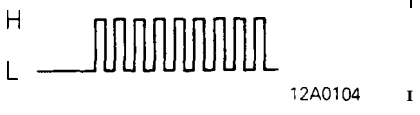
Diagnostic trouble code		On-board diagnostic item	Check item (Remedy)	Memory
No.	Output signal pattern			
14		Throttle position sensor	• Harness and connector • Throttle position sensor • Closed throttle position switch	Retained
15		Idle speed control motor position sensor	• Harness and connector • Idle speed control motor position sensor • Throttle position sensor	Retained
21		Engine coolant temperature sensor	• Harness and connector • Engine coolant temperature sensor	Retained
22		Crankshaft position sensor	• Harness and connector (If harness and connector are normal, replace distributor assembly.)	Retained
23		Camshaft position sensor	• Harness and connector (If harness and connector are normal, replace distributor assembly.)	Retained
24		Vehicle speed sensor (reed switch)	• Harness and connector • Vehicle speed sensor (reed switch)	Retained
25		Barometric pressure sensor	• Harness and connector (If harness and connector are normal, replace barometric pressure sensor assembly.)	Retained
41		Injector	• Harness and connector • Injector coil resistance	Retained
42		Fuel pump	• Harness and connector • Multiport fuel injection relay	Retained

Diagnostic trouble code No.	Diagnostic trouble code Output signal pattern	On-board diagnostic item	Check item (Remedy)	Memory
43		EGR <California>	• Harness and connector • EGR temperature sensor • EGR valve • EGR solenoid • EGR valve control vacuum	Retained
–		Normal state	–	–

NOTE
Replace the engine control module if a diagnostic trouble code is output although the inspection reveals that there is no problem with the check items.

TROUBLESHOOTING TABLE

NOTE
*: The failsafe back-up function is in operation.

Diagnostic trouble code No.	On-board diagnostic item	Diagnostic content	Major cause	Remarks (trouble phenomenon, etc.)
–	Engine control module	The engine control module itself is abnormal.	–	• Engine stop • Impossible start
11	Oxygen sensor	Though the air/fuel mixture ratio closed loop control is operated, the signal voltage of the oxygen sensor does not vary (to be lean/rich).	(1) The oxygen sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the oxygen sensor circuit.	• Deterioration of exhaust gas purifying performance*
			(3) The fuel pressure is improper. (4) The injector is troubled. (5) Air is sucked through the gasket clearance, etc. (6) The engine control module is troubled.	• Deterioration of exhaust gas purifying performance* • Abnormal start • Unstable idling • Abnormal acceleration
12	Volume air flow sensor	Though the engine is running, the signal frequency of the air flow sensor is 10Hz or less.	(1) Volume air flow sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the volume air flow sensor circuit. (3) The engine control module is troubled.	• Abnormal acceleration* • Unstable idling*
13	Intake air temperature sensor	(1) The signal voltage of the intake air temperature sensor is 4.5V or higher. (2) The signal voltage of the intake air temperature sensor is 0.27V or lower.	(1) The intake air temperature sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the air intake temperature sensor circuit. (3) The engine control module is troubled.	• Slightly improper driveability* • At high temperatures, (a) Improper start* (b) Unstable idling*

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Diagnostic trouble code No.	On-board diagnostic item	Diagnostic content	Major cause	Remarks (trouble phenomenon, etc.)
14	Throttle position sensor	(1) The signal voltage of the throttle position sensor is 0.2V or lower. (2) Though the closed throttle position switch is on, the signal voltage of the throttle position sensor is 2V or higher.	(1) The throttle position sensor is troubled or improperly adjusted. (2) Open-circuit, short-circuit or improper connector contact occurs in the throttle position sensor circuit.	• Slightly improper acceleration <M/T> • Improper driveability <A/T> • Engine stop
			(3) The closed throttle position switch ON is troubled. (4) The closed throttle position switch signal line is short-circuited. (5) The engine control module is troubled.	• Engine stop • Racing is impossible
15	Idle speed control motor position sensor	(1) The signal voltage of the idle speed control motor position sensor is 4.8V or higher. (2) The signal voltage of the idle speed control motor position sensor is 0.2V or lower. (3) During idling, the signal voltage of the idle speed control motor position sensor for the throttle valve opening degree is excessively low.	(1) The idle speed control motor position sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the idle speed control motor position sensor circuit. (3) The throttle position sensor is troubled or improperly adjusted. (4) Open-circuit, short-circuit or improper connector contact occurs in the throttle position sensor circuit. (5) The engine control module is troubled.	• Engine stop*
21	Engine coolant temperature sensor	(1) The signal voltage of the engine coolant temperature sensor is 4.6V or higher. (2) The signal voltage of the engine coolant temperature sensor is 0.11 V or lower. (3) During engine warming-up, the engine coolant temperature sensor signal indicates that the engine coolant temperature drops.	(1) The engine coolant temperature sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the engine coolant temperature sensor circuit. (3) The engine control module is troubled.	During cold weather, • Starting is impossible*. • Unstable idling* • Improper acceleration*
22	Crankshaft position sensor	Though the engine is cranking 4 seconds or more, the signal voltage of the crankshaft position sensor does not vary (to be high/low).	(1) The crankshaft position sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the crankshaft position sensor circuit. (3) The engine control module is troubled.	• Engine stop • Starting is impossible.
23	Camshaft position sensor	Though the engine is running, the signal voltage of the camshaft position sensor does not vary (to be high/low).	(1) The camshaft position sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the camshaft position sensor circuit. (3) The engine control module is troubled.	• Unstable idling* • Improper acceleration*

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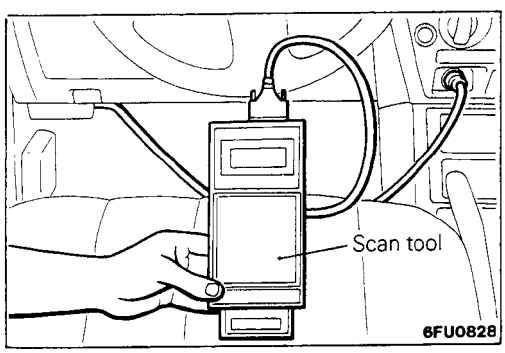
Diagnostic trouble code No.	On-board diagnostic item	Diagnostic content	Major cause	Remarks (trouble phenomenon, etc.)
24	Vehicle speed sensor (reed switch)	During acceleration of engine revolution speed of 3,000 rpm or more, the signal voltage of the vehicle speed sensor does not vary (to be high/low).	(1) The vehicle speed sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the vehicle speed sensor circuit. (3) The engine control module is troubled.	The engine sometimes cuts off when stopping afte deceleration.
25	Barometric pressure sensor	(1) The signal voltage of the barometric pressure sensor is 4.5V or higher. (2) The signal voltage of the barometric pressure sensor is 0.2V or lower.	(1) The barometric pressure sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the barometric pressure sensor circuit. (3) The engine control module is troubled.	• Unstable idling* • Improper acceleration* • Improper start*
41	Injector	Injector is not continuously driven for 4 seconds during engine cranking or idle operation.	(1) The injector is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the injector sensor circuit. (3) The engine control module is troubled.	• Unstable idling • Improper acceleration • Improper start
42	Fuel pump	The engine runs but power to drive the motor is not supplied to the fuel pump.	(1) Open-circuit, short-circuit or improper connector contact occurs in the fuel pump power supply circuit. (2) The multiport fuel injection relay is troubled. (3) The engine control module is troubled.	• Impossible start • Engine stop
43	EGR <California>	During engine running after warming-up, (1) The EGR amount is small. (The signal voltage of the EGR temperature sensor is excessively high.) (2) The signal voltage of the EGR temperature sensor is 0.1 V or less.	(1) The EGR valve is not opened. (2) The negative pressure of the EGR valve control is excessively low. (3) The EGR solenoid is troubled. (4) The EGR temperature sensor is troubled. (5) Open-circuit, short-circuit or improper connector contact occurs in the EGR temperature sensor circuit. (6) The engine control module is troubled.	• Deterioration of exhaust gas purifying performance

FAILSAFE/BACK-UP FUNCTIONS LIST

If trouble with any major sensor is detected by the on-board diagnostic, the vehicle will be kept in the safe driving conditions according to the preset control logic.

Trouble item	Control content for trouble
Volume air flow sensor	Fuel injection timing and ignition timing are determined according to the throttle position sensor (TPS) and engine revolution speed signal (crankshaft position sensor signal).
Intake air temperature sensor	The control is executed with the suction air temperature regarded as 25°C(77°F).
Throttle position sensor (TPS)	The fuel injection rate is not increased for acceleration according to the throttle position sensor signal.
Idle speed control motor position sensor	After the idle speed control motor plunger is driven and contracted, the idle revolution speed is not controlled.
Engine coolant temperature sensor	The control is executed with the engine coolant temperature regarded as 80°C(176°F). (Even if the sensor signal becomes normal again, the control is continued until the ignition switch is turned off.)
Camshaft position sensor	Simultaneous injection of fuel is executed for all cylinders. (In this case, the No.1 cylinder top dead center is not detected at all after the ignition key is turned on.)
Barometric pressure sensor	The control is executed with the pressure regarded as 760 mmHg (30 in.Hg).
Oxygen sensor	Closed loop control of the air/fuel mixture ratio is not executed.



READ OUT OF DIAGNOSTIC TROUBLE CODE

Precautions for operation

(1) When battery voltage is low, no detection of failure is possible. Be sure to check the battery for voltage and other conditions before starting the test.

(2) On-board diagnostic item is erased if the battery or the engine control module connector is disconnected. Do not disconnect the battery before the diagnostic result is completely read.

Using Scan Tool

(1) Switch OFF the ignition switch.
(2) Connect the power-source terminal of the scan tool to the cigarette lighter socket.
(3) Connect the scan tool to the data link connector.
(4) Turn ignition switch to ON.
(5) Using the scan tool, read out and make a note of the on-board diagnostic output.
(6) Refer to the diagnostic chart, and repair the indicated location of malfunction.
(7) Erase the diagnostic trouble code. (Refer to P.13-17.)

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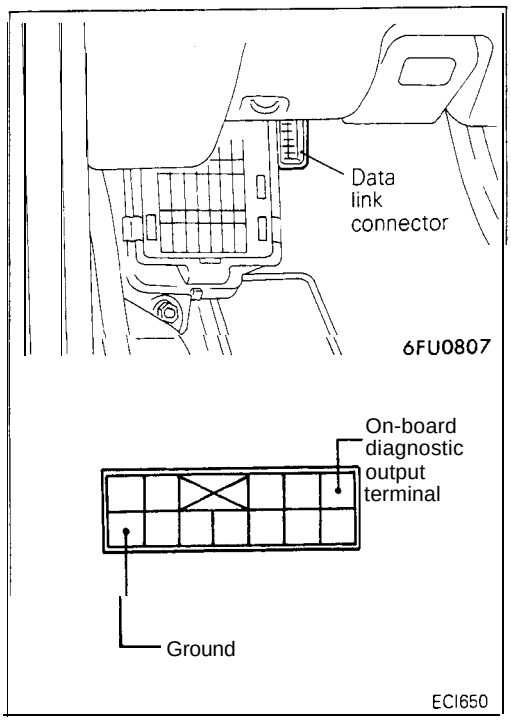

Using Voltmeter

(1) Connect an analog-type voltmeter between the ground/ terminal and the on-board diagnostic output terminal of the data link connector.
(2) Set the ignition switch to the "ON" position.
(3) Make a note of the pattern of the on-board diagnostic output indicated by the voltmenter's indicator.
(4) Refer to the diagnostic chart, and repair the indicated location of malfunction.
(5) Erase the diagnostic trouble code.

CLEAR MEMORY OF DIAGNOSTIC TROUBLE CODE

If the Scan Tool is Used <From 1990 models>

Connect the scan tool to the data link connector, and then erase by following the steps below.)
(1) To erase diagnostic trouble code for the engine coolant temperature sensor or idle speed control motor position sensor, first turn the ignition switch OFF once and then ON again.
(2) Select "4. SPECIAL TEST" of the scan tool's function-select menu.
(3) Then select item No.5, "ERASE DIAG.".
(4) If "ERASE DIAG. CODE?" is displayed, press the "YES" key.
(5) Input ID code "19".
(6) When "FINISHED ERASING DIAG. CODE" is displayed, press the "CLEAR" key.
(7) Read out the on-board diagnostic output and check to be sure that the correct code is being output.

If the Scan Tool is not Used

(1) Turn the ignition switch to OFF.
(2) Disconnect the ground cable from the battery terminal for ten seconds or longer, and then reconnect it.
(3) Read out the on-board diagnostic output and check to be sure that the correct code is being output.

CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS

Check items \ Problem symptoms	Starting		Idling stability			Driving						Reference page
	Will not start	Starting problem	Idling instability (Rough idling)	Incorrect idling speed	Improperidling continuity	Hesitation, sag	Poor acceleration	Stumble	Shock	Surge	Knocking	
Power supply	① 1											42
Engine control module power ground	② 2											45
Fuel pump	③ 3	① 1			① 1	① 1	① 1					46
Volume air flow sensor		⑨ 10			⑪ 10	⑧ 8		④ 4	③ 3		③ 3	49
Intake air temperature sensor			①			④ 4	③ 3				① 1	51
Barometric pressure sensor			③			⑦ 7	⑤ 5				② 2	53
Engine coolant temperature sensor		4	② 1	① 1	④ 4	⑥ 6	④ 4	② 2		③ 3		55
Throttle position sensor						⑤ 5		① 1				57,59
Closed throttle position switch		④ 5	④ 2	② 2	③ 3					④ 4		61,63
Idle speed control motor position sensor			⑧ 4	⑥ 3	⑤ 5				⑤			64,67
Camshaft position sensor	⑤ 5	⑦ 8			⑨ 8				① 1			69,71
Crankshaft position sensor	⑥ 6	⑧ 9			⑩ 9				② 2			73,75
Ignition switch-ST (M/T)	④ 4	③ 3										77
Ignition switch-ST and Park/neutral position switch (A/T)	④ 4	③ 3		⑤								78
Vehicle speed sensor					⑧				⑥			80
Power steering pressure switch				③								81
Air conditioning switch and A/C compressor clutch relay				④								83
Oxygen sensor			⑥									87
Injectors	⑧ 8	⑥ 7	⑦ 3		⑦ 7	⑨ 9	⑥ 6	⑤ 5		⑤ 5		90
Idle speed control motor (DC Motor)		⑤ 6	⑨ 5	⑦ 4	⑥ 6				⑦			93,94
Ignition coil and ignition power transistor	⑦ 7						⑦ 7		④ 4		④ 4	96
Evaporative emission purge solenoid			⑤									99
GR solenoid <California>						③ 3		③ 3		② 2		101
Fuel pressure		② 2	⑩ 6		② 2	② 2	② 2			① 1		102

○: Warm engine (Figures inside the ○ indicate the checking sequence.)
□: Cold engine (Figures inside the ❑ indicate the checking sequence.)

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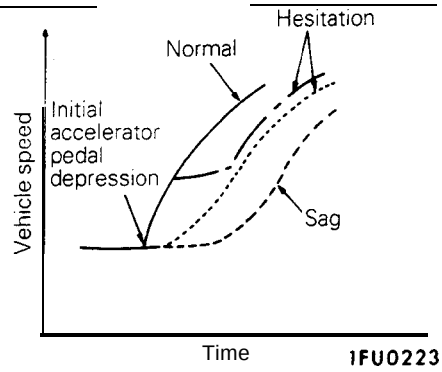
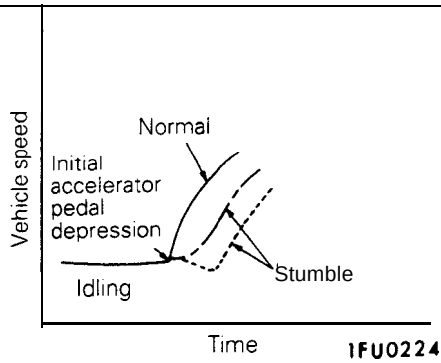
PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

	Items	Symptom
Starting	Won't start (no initial combustion)	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start
	Starting problem (Initial combustion, then stall)	There is combustion within the cylinders, but then the engine soon stalls.
	(Starting takes a long time.)	Engine won't start quickly
Idling stability	Idling instability (Rough idling)	Engine speed doesn't remain constant; changes during idling. Usually, ajudgement 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 accelator pedal, regardless of whether the vehicle is moving or not. (2) Pass out .....The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle (engine rpm) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine rpm) during such acceleration. Serious hesistation 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 rpm response is delayed when the accelerator pedal is initially depressed for acceleration from the stopped condition 
	Shock	The feeling of a comparativley 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".

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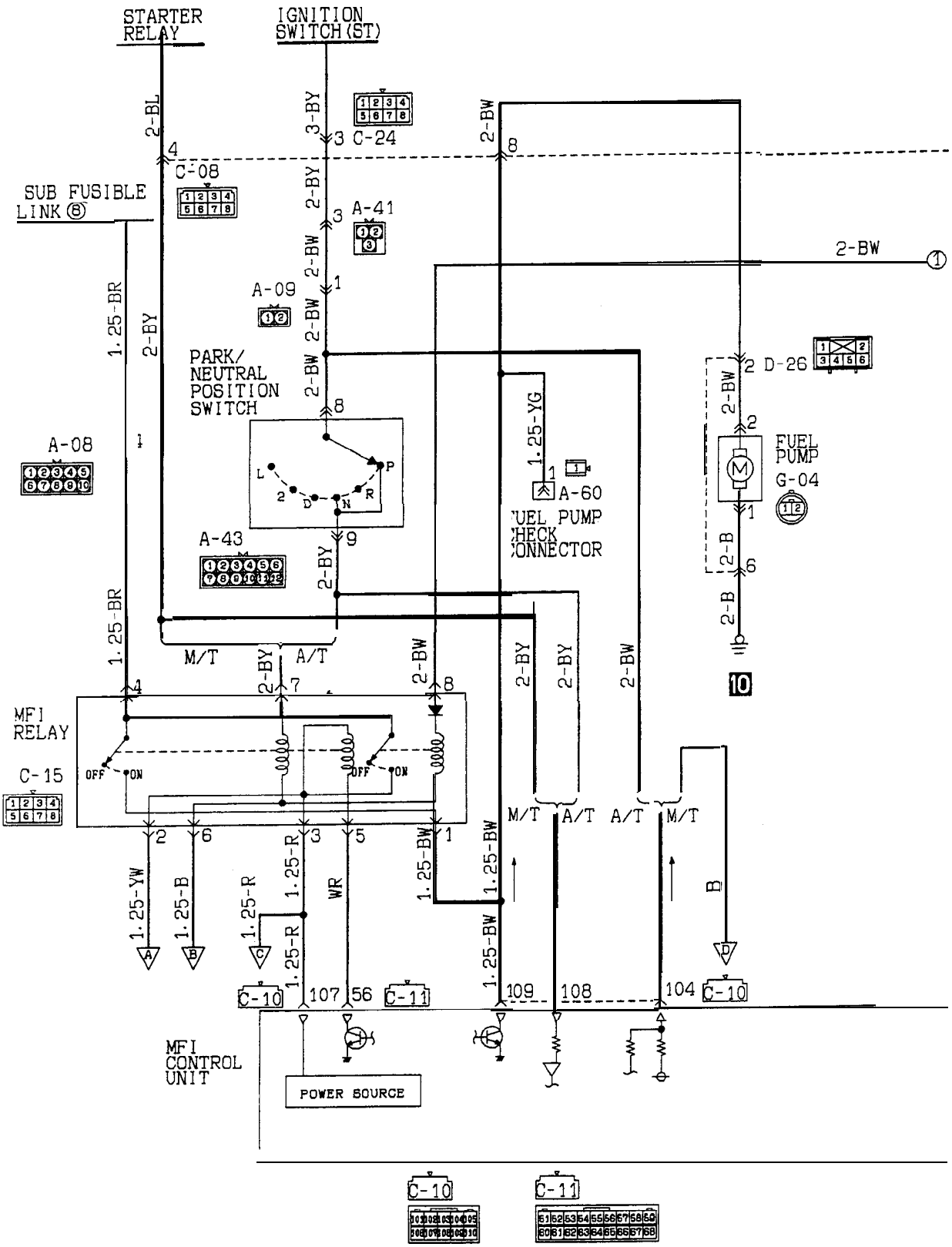
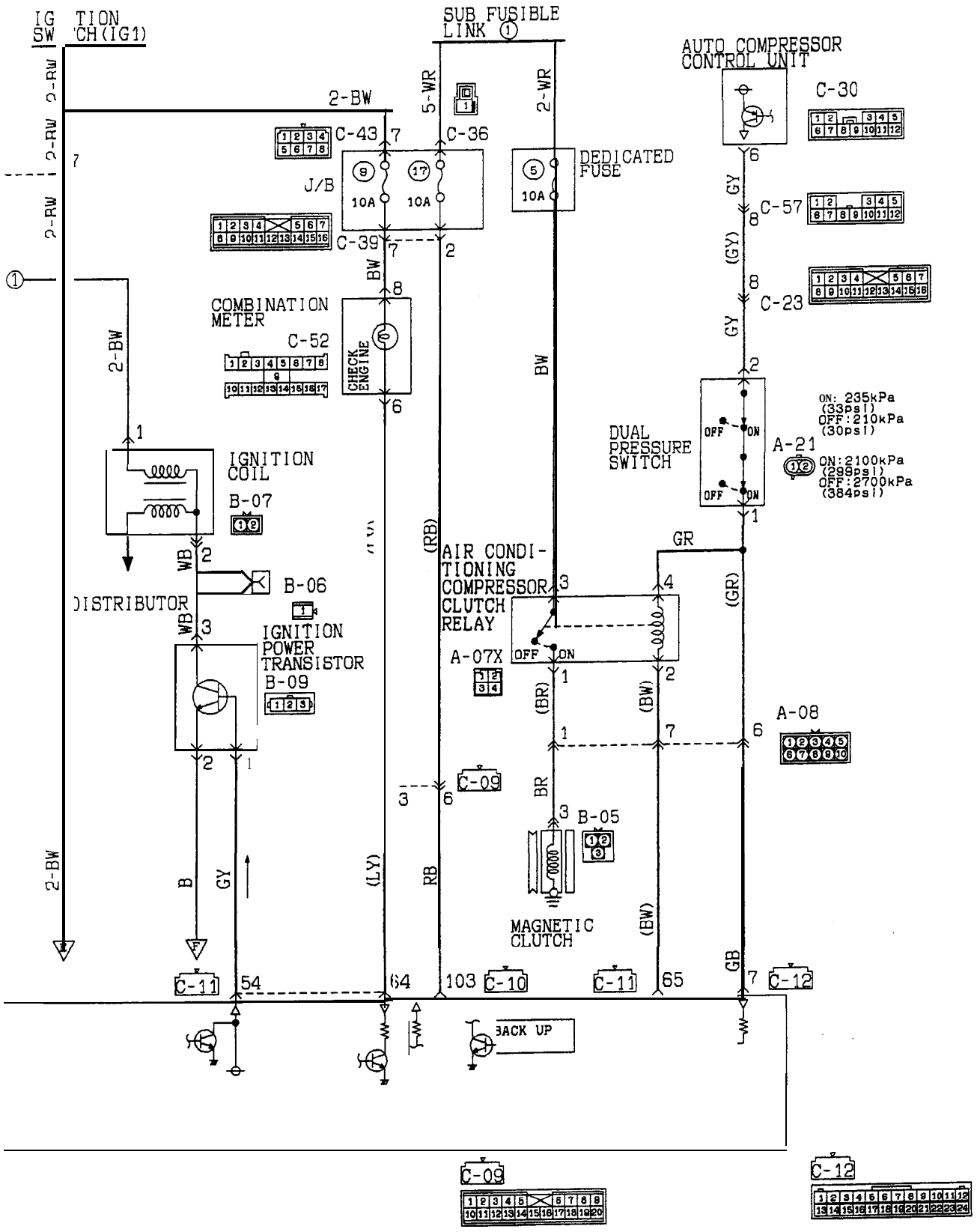
CIRCUIT DIAGRAM

<1989 models>

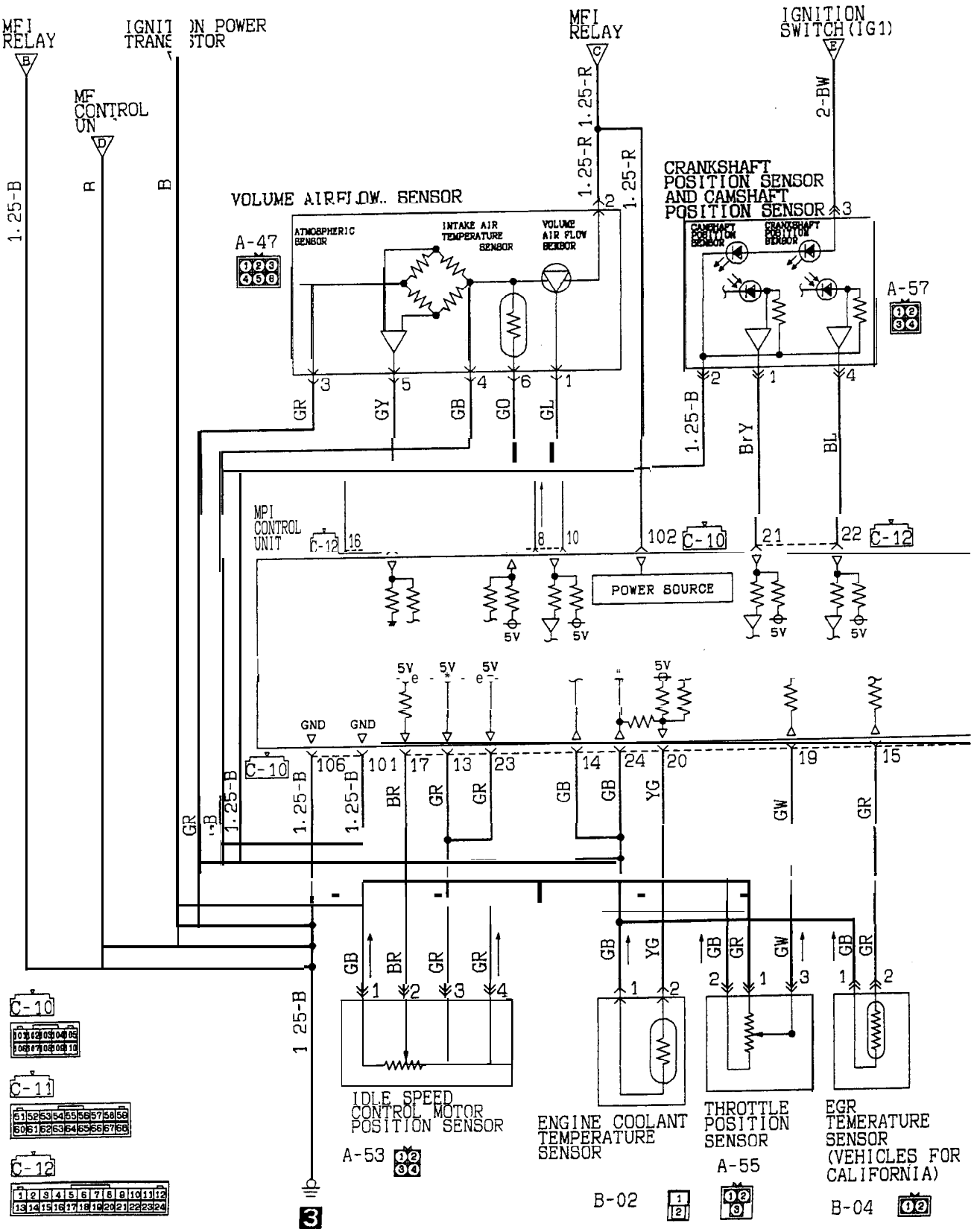


X35-AC-H0525-NM


IG TION SW CH(IG1)
SUB FUSIBLE LINK ①
AUTO COMPRESSOR CONTROL UNIT
C-30
2-BW
5-WR
2-WR
C-43
C-36
DEDICATED FUSE
J/B
10A
10A
10A
C-39
C-57
C-23
COMBINATION METER
C-52
CHECK ENGINE
IGNITION COIL
B-07
DUAL PRESSURE SWITCH
A-21
ON: 235kPa (33psi)
OFF: 210kPa (30psi)
ON: 2100kPa (299psi)
OFF: 2700kPa (384psi)
DISTRIBUTOR
B-06
IGNITION POWER TRANSISTOR
B-09
AIR CONDITIONING COMPRESSOR CLUTCH RELAY
A-07X
OFF
ON
A-08
C-09
B-05
MAGNETIC CLUTCH
C-11
C-10
C-12
BACK UP

CIRCUIT DIAGRAM (CONTINUED)

<1989 models>



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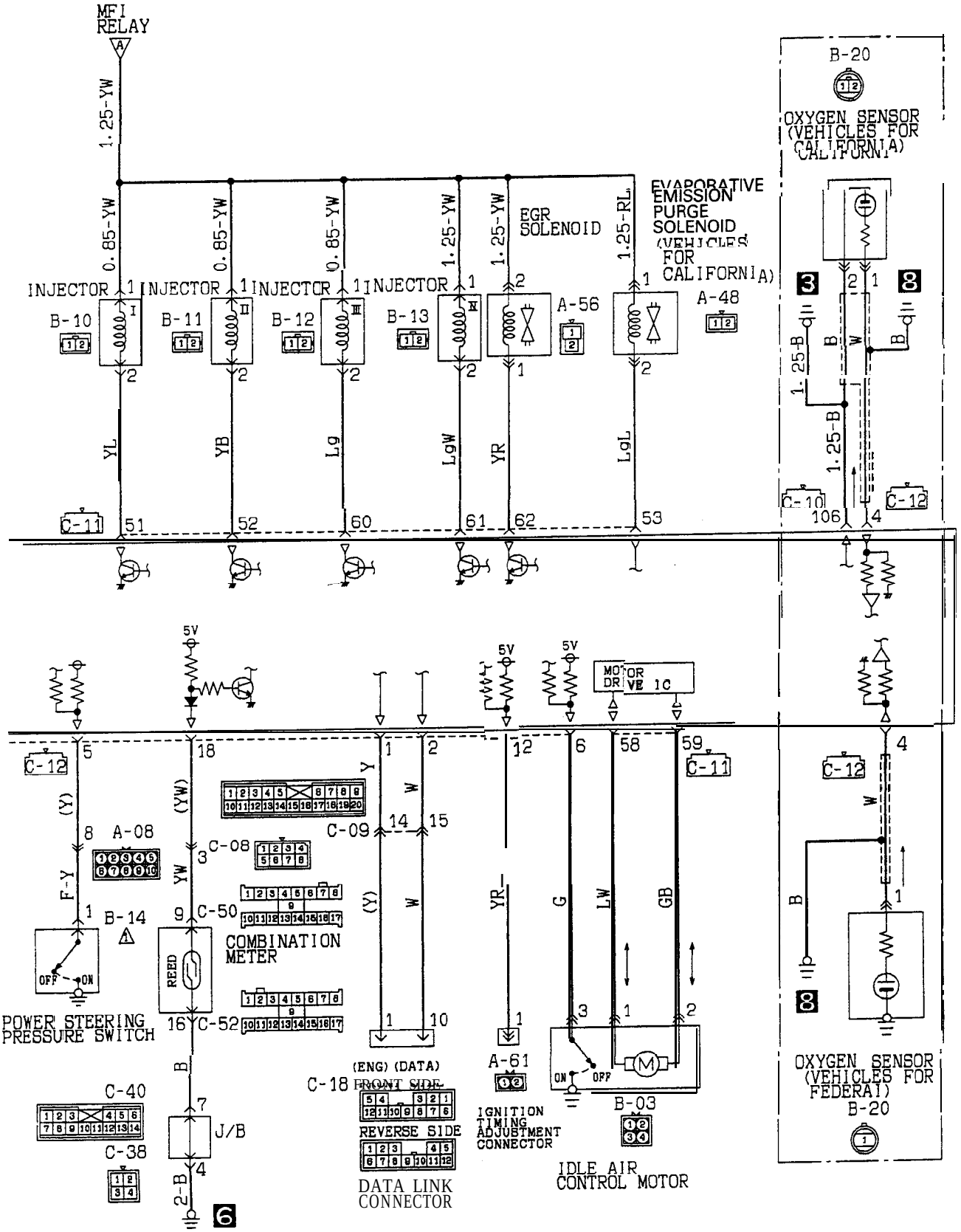
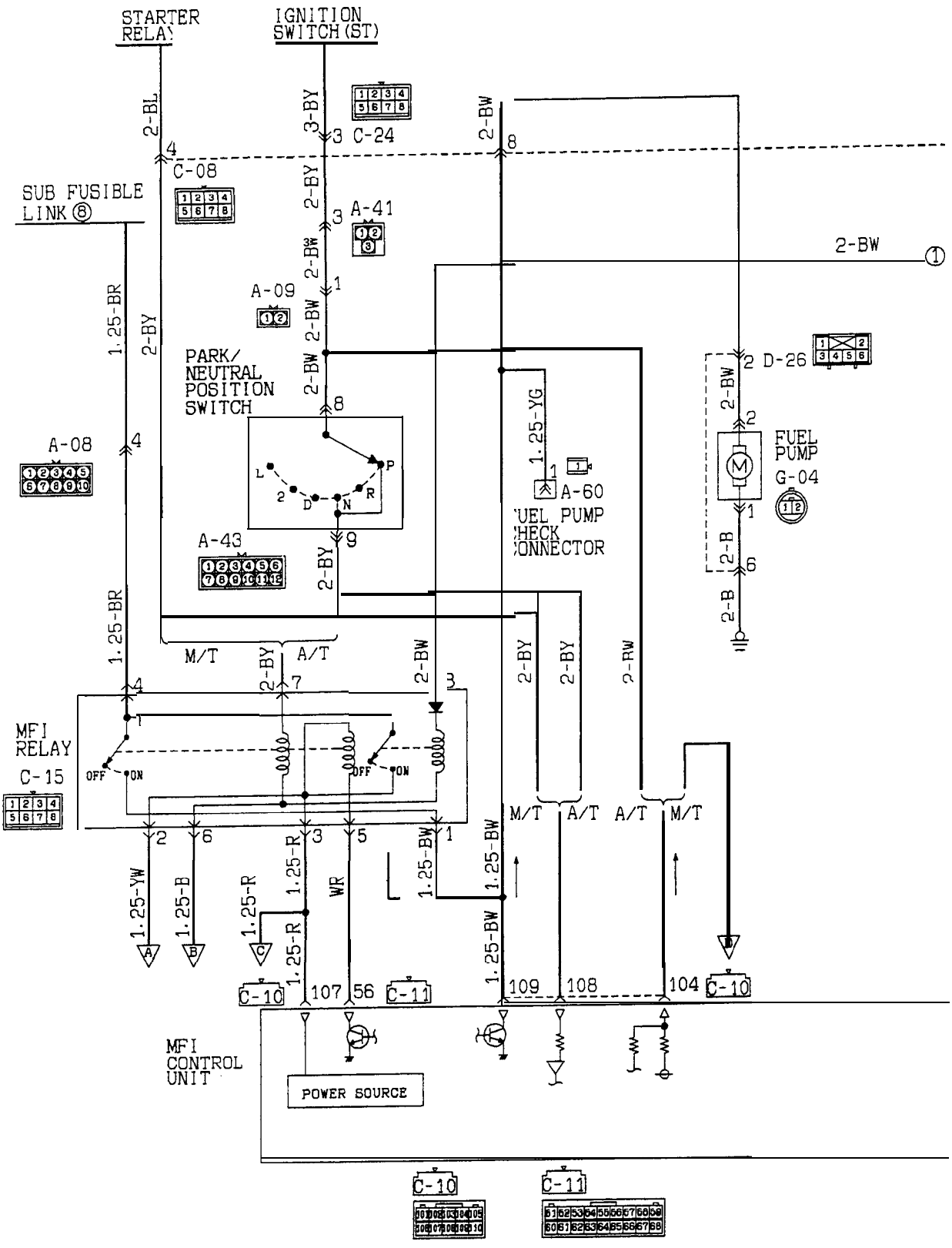

MFI RELAY
1.25-YW
0.85-YW
INJECTOR
B-10
B-11
B-12
B-13
EGR SOLENOID
A-56
EVAPORATIVE EMISSION PURGE SOLENOID (VEHICLES FOR CALIFORNIA)
A-48
B-20
OXYGEN SENSOR (VEHICLES FOR CALIFORNIA)
1.25-B
C-10
C-12
C-11
YL
YB
Lg
LgW
YR
LgL
5V
MOTOR DRIVE IC
C-09
C-08
C-50
C-52
A-08
B-14
COMBINATION METER
REED
POWER STEERING PRESSURE SWITCH
C-40
C-38
J/B
2-B
6
(ENG) (DATA)
C-18 FRONT SIDE
REVERSE SIDE
DATA LINK CONNECTOR
A-61
IGNITION TIMING ADJUSTMENT CONNECTOR
B-03
IDLE AIR CONTROL MOTOR
OXYGEN SENSOR (VEHICLES FOR FEDERAL)
B-20
8

CIRCUIT DIAGRAM

< 1990 models>



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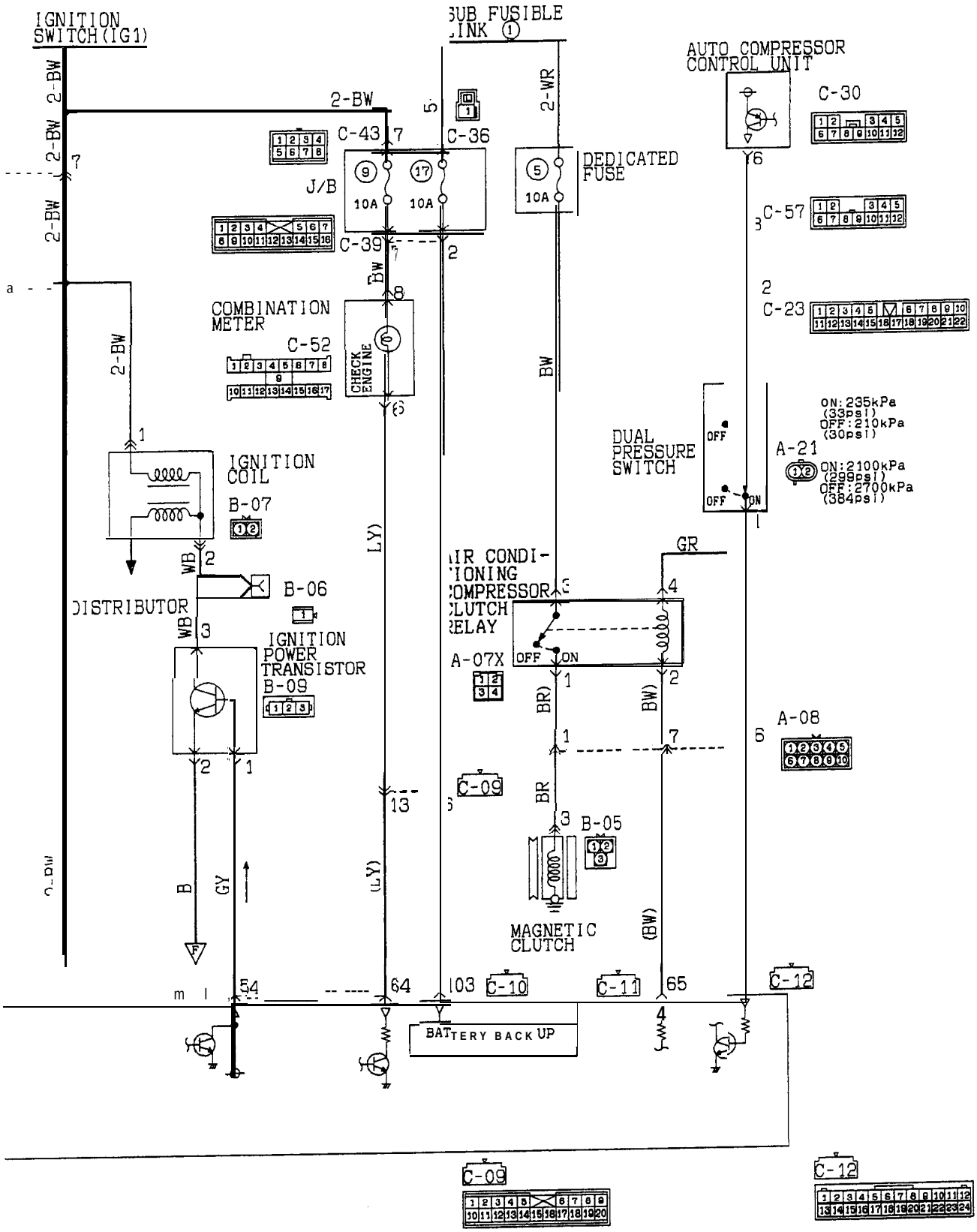

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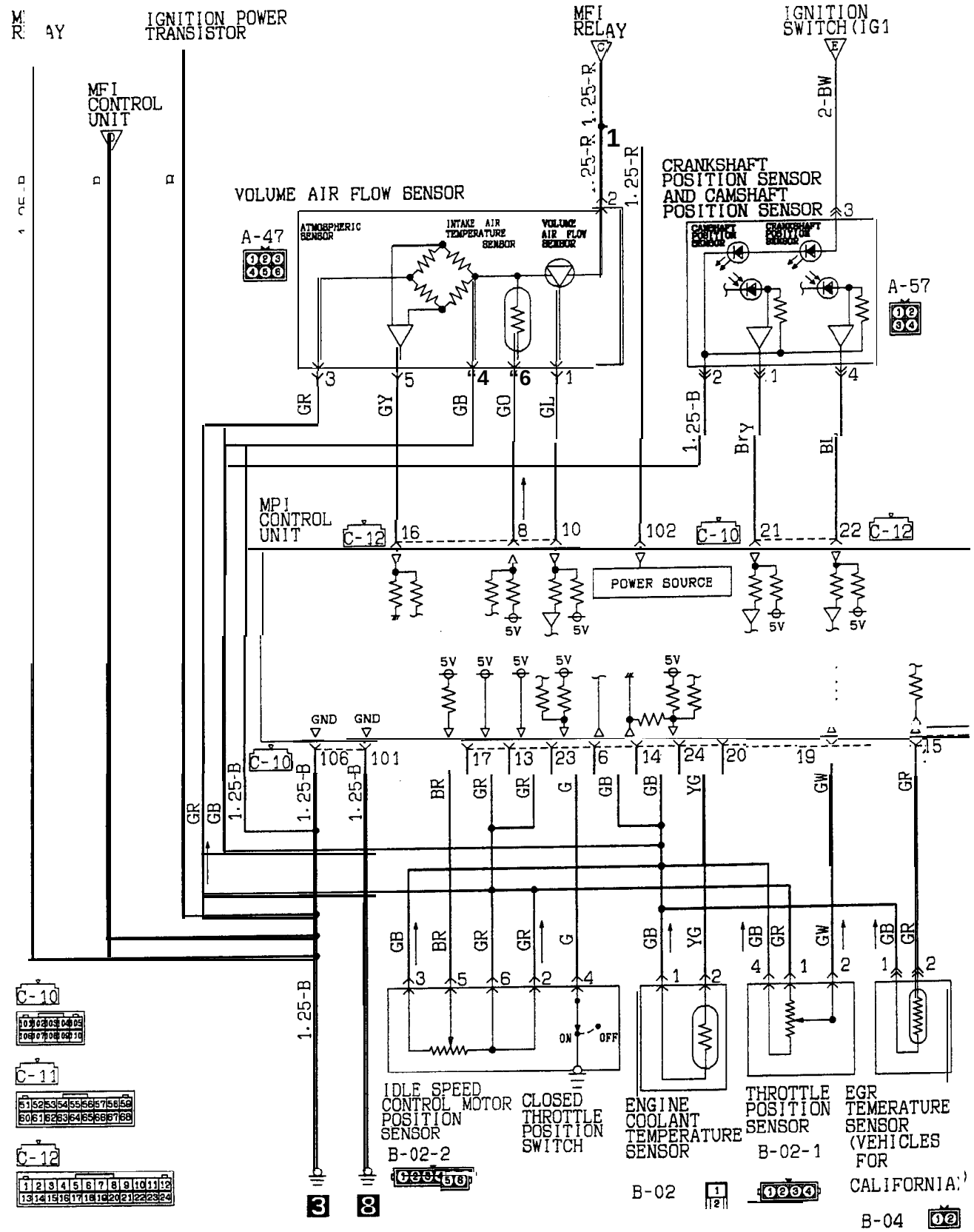
CIRCUIT DIAGRAM (CONTINUED)

<1990 models>



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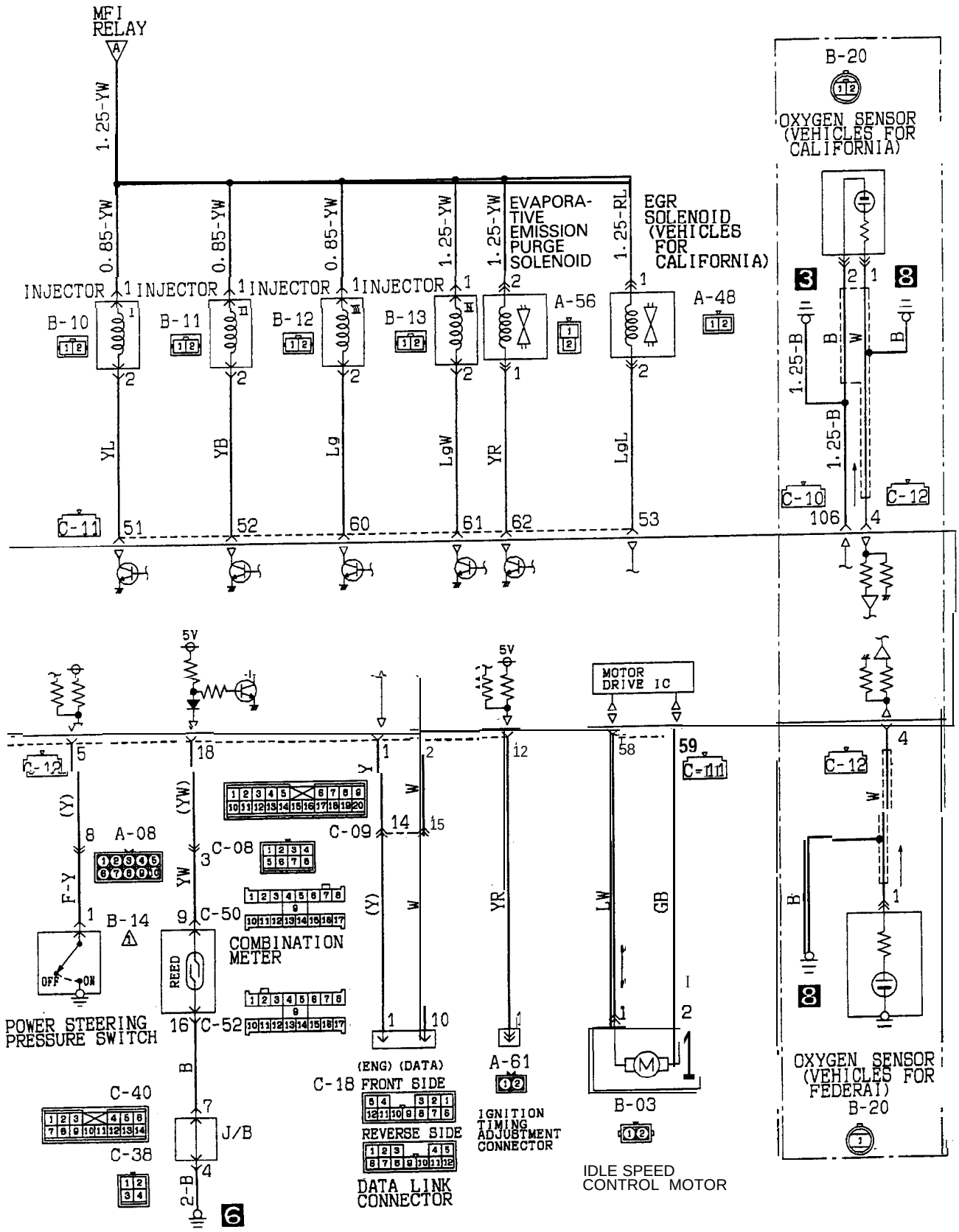
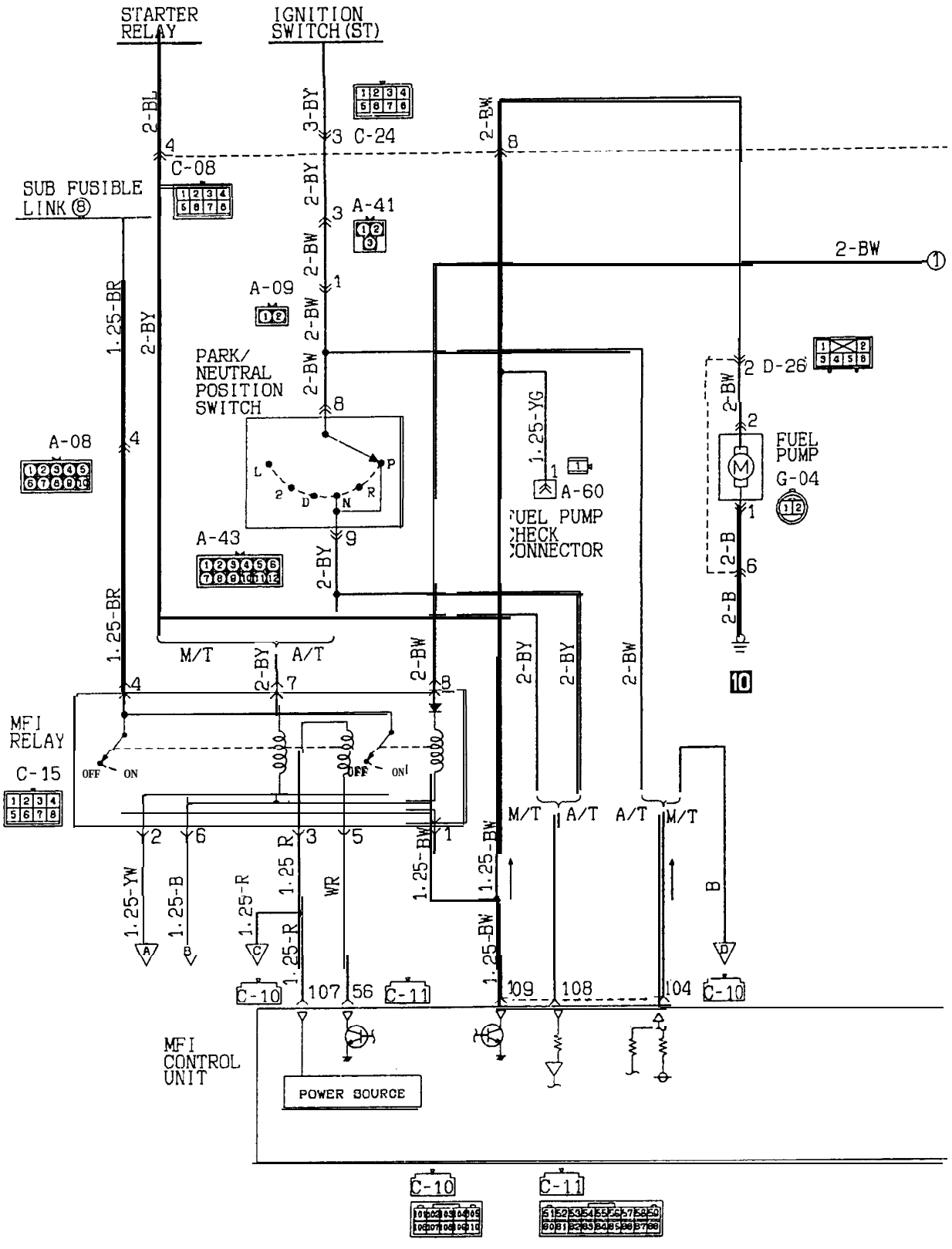
TSB Revision


MFI RELAY
1.25-YW
0.85-YW
0.85-YW
0.85-YW
1.25-YW
1.25-YW
1.25-RL
EVAPORATIVE EMISSION PURGE SOLENOID
EGR SOLENOID (VEHICLES FOR CALIFORNIA)
INJECTOR
INJECTOR
INJECTOR
INJECTOR
B-10
B-11
B-12
B-13
A-56
A-48
YL
YB
Lg
LgW
YR
LgL
C-11
51
52
60
61
62
53
B-20
OXYGEN SENSOR (VEHICLES FOR CALIFORNIA)
1.25-B
1.25-B
C-10
C-12
106
5V
5V
MOTOR DRIVE IC
C-12
C-11
59
A-08
C-08
C-09
C-50
C-52
B-14
COMBINATION METER
REED
POWER STEERING PRESSURE SWITCH
OFF
ON
C-40
C-38
J/B
2-B
(ENG) (DATA)
C-18 FRONT SIDE
REVERSE SIDE
DATA LINK CONNECTOR
A-61
IGNITION TIMING ADJUSTMENT CONNECTOR
B-03
IDLE SPEED CONTROL MOTOR
OXYGEN SENSOR (VEHICLES FOR FEDERAI)
B-20

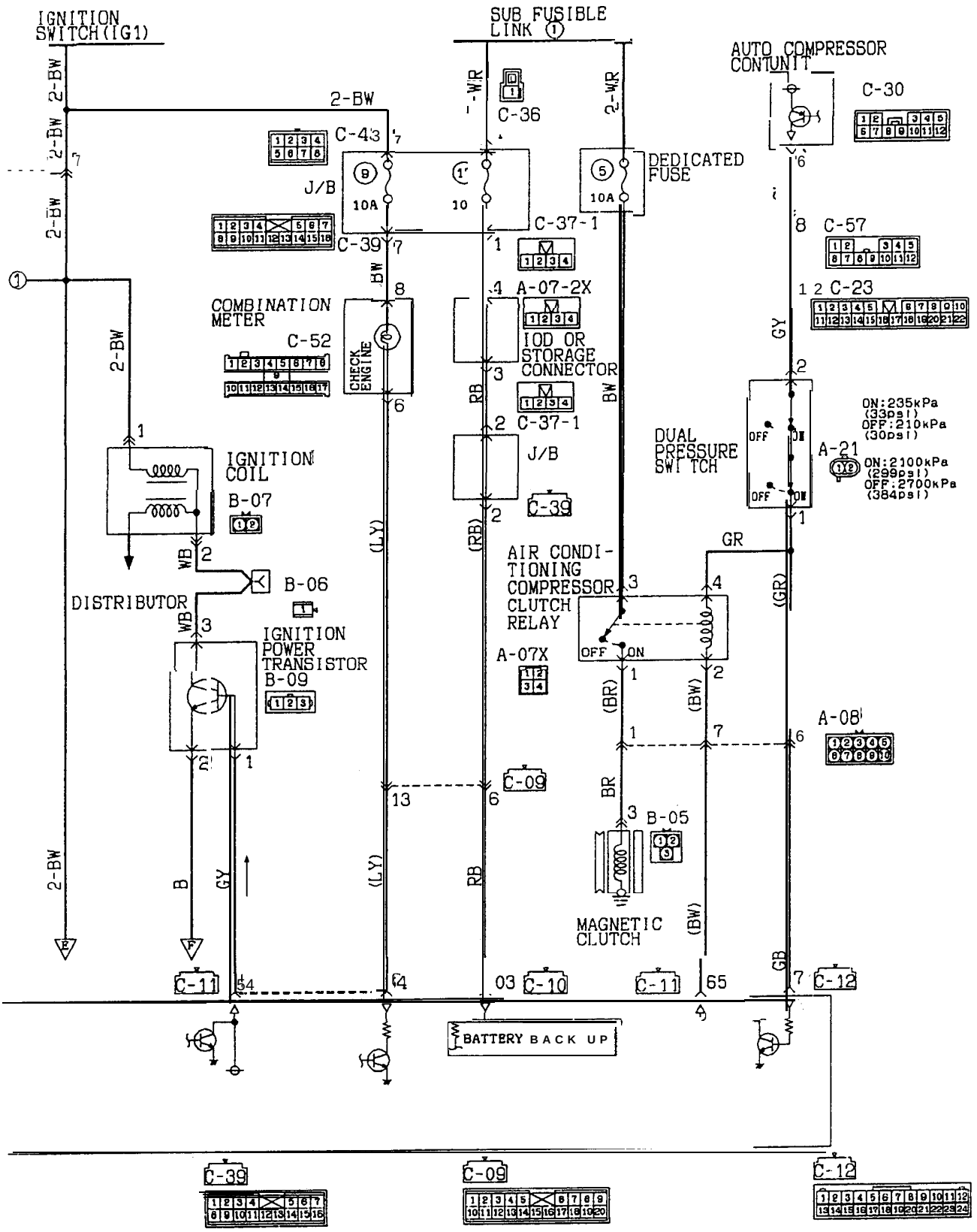
CIRCUIT DIAGRAM

<1991, 1992 models>



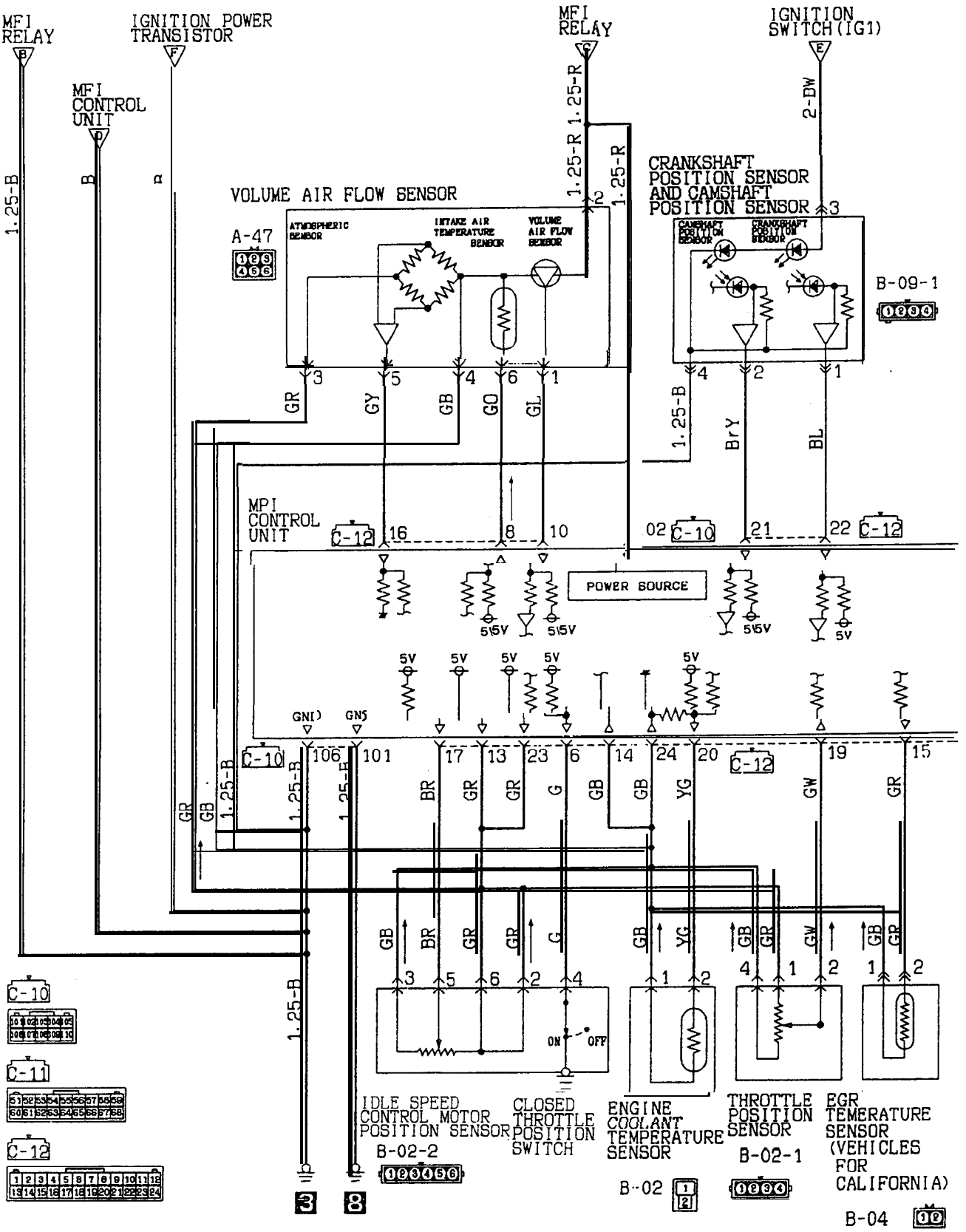
X35-AC-H0534-NM

TSB Revision

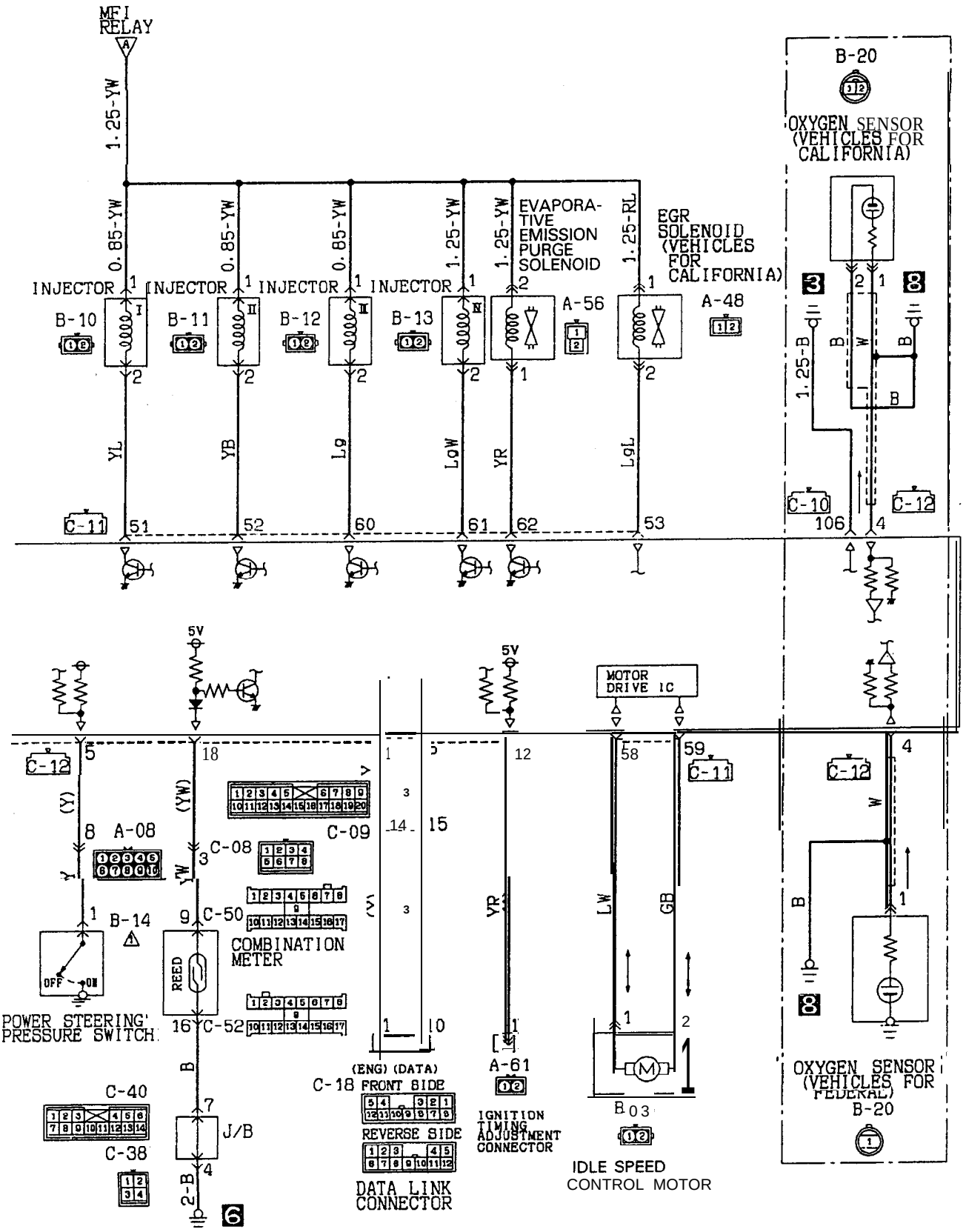

IGNITION SWITCH (IG1)
SUB FUSIBLE LINK
AUTO COMPRESSOR CONTUNIT
C-30
C-36
C-43
J/B
DEDICATED FUSE
C-39
C-37-1
C-57
C-23
A-07-2X
COMBINATION METER
C-52
CHECK ENGINE
IOD OR STORAGE CONNECTOR
DUAL PRESSURE SWITCH
A-21
ON:235kPa (33psi)
OFF:210kPa (30psi)
ON:2100kPa (299psi)
OFF:2700kPa (384psi)
IGNITION COIL
B-07
B-06
DISTRIBUTOR
IGNITION POWER TRANSISTOR
B-09
AIR CONDITIONING COMPRESSOR CLUTCH RELAY
A-07X
A-08
B-05
MAGNETIC CLUTCH
C-11
C-10
C-12
BATTERY BACK UP
2-BW
2-WR
BW
RB
GY
GR
(GR)
(BR)
(BW)
(LY)
WB
B
BR
GB

CIRCUIT DIAGRAM (CONTINUED)

<1991, 1992 models>



TSB Revision


MFI RELAY
1.25-YW
0.85-YW
INJECTOR
B-10
B-11
B-12
B-13
YL
YB
Lg
LgW
YR
LgL
EVAPORATIVE EMISSION PURGE SOLENOID
A-56
1.25-RL
EGR SOLENOID (VEHICLES FOR CALIFORNIA)
A-48
B-20
OXYGEN SENSOR (VEHICLES FOR CALIFORNIA)
1.25-B
C-10
106
C-12
C-11
51
52
60
61
62
53
5V
MOTOR DRIVE IC
58
59
C-09
C-08
A-08
B-14
C-50
COMBINATION METER
REED
POWER STEERING PRESSURE SWITCH
C-52
C-40
C-38
J/B
2-B
(ENG) (DATA)
C-18 FRONT SIDE
REVERSE SIDE
DATA LINK CONNECTOR
A-61
IGNITION TIMING ADJUSTMENT CONNECTOR
B03
IDLE SPEED CONTROL MOTOR
OXYGEN SENSOR (VEHICLES FOR FEDERAL)
B-20

FUEL TANK AND FUEL LINE

M13EAAA

Symptom	Probable cause	Remedy
Engine malfunctions due to insufficient fuel supply	Bent or kinked fuel pipe or hose	Repair or replace
	Clogged fuel pipe or hose	Clean or replace
	Clogged fuel filter or in-tank fuel filter	Replace
	Water in fuel filter	Replace the fuel filter or clean the fuel tank and fuel line
	Dirty or rusted fuel tank interior	Clean or replace
	Malfunctioning fuel pump (Clogged filter in the pump)	Replace
Evaporative emission control system malfunctions (When fuel tank filler tube cap is removed, pressure releasng noise is heard)	Mispiping of vapor line	Correct
	Disconnect vapor line piping joint	Correct
	Folded, bent, cracked or clogged vapor line	Replace
	Faulty fuel tank filler tube cap	Replace
	Malfunctioning fuel tank pressure control valve	Replace

SERVICE ADJUSTMENT PROCEDURES

CURB IDLE SPEED INSPECTION

M13FHAA

(1) The vehicle should be prepared as follows before the inspection.

- Engine coolant temperature: 85–95°C (185–203°F)
- Lights, electric cooling fan and accessories: OFF
- Transaxle: Neutral (P for vehicles with an automatic transaxle)

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

NOTE
Refer to P.13-33 for information concerning connection Of a tachometer.

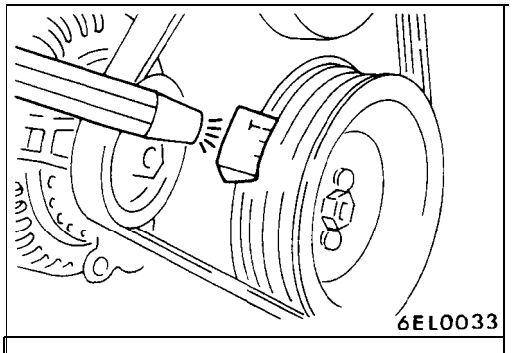
(3) Set a timing light in position.
(4) Ground the terminal for adjustment of ignition timing.
(5) Start the engine and let it idle.
(6) Check whether or not the ignition timing is the standard value; if not, adjust.

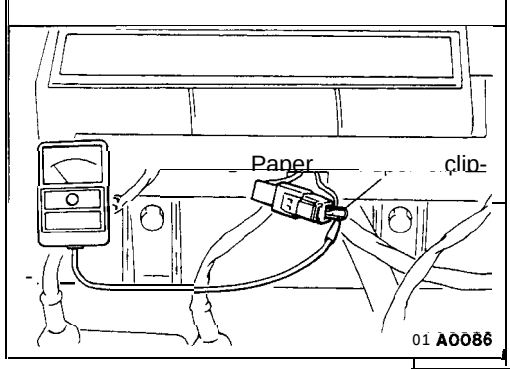
Standard value: **5°BTDC ± 2°**

(7) Stop grounding the terminal for adjustment of ignition timing.
(8) Let the engine idle for two minutes.
(9) Check the idling rpm.

Curb idle speed: 750 ± 100 rpm

NOTE
The idling rpm is automatically regulated by the idle-speed control system.





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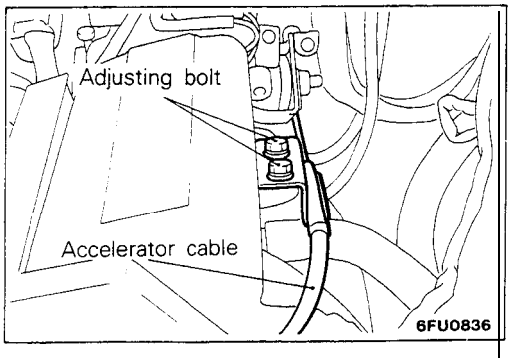
(10)If not within the standard value range, refer to the CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS and check the MFI component.

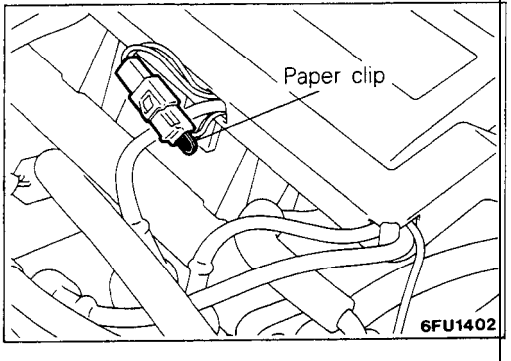
BASIC IDLE SPEED ADJUSTMENT M13FHBA

(1) The vehicle should be prepared as follows before the inspection and adjustment.

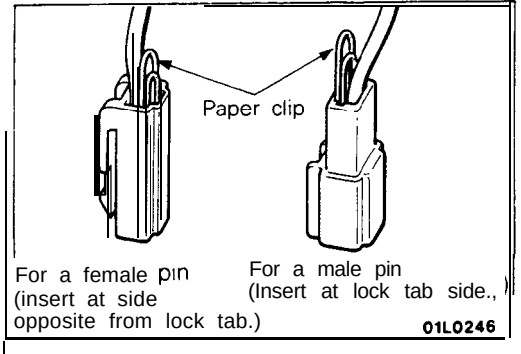
- Engine coolant temperature: 85–95°C (185–205°F)
- Lights, electric cooling fan and accessories: OFF
- Transaxle: Neutral (P for vehicles with an automatic transaxle)



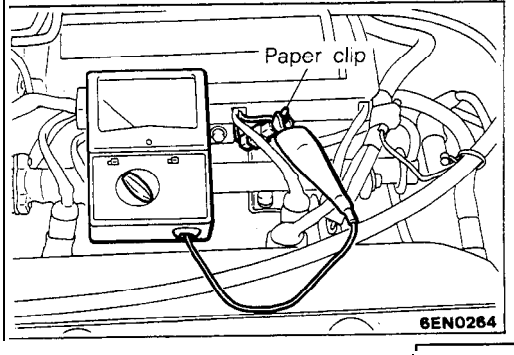
(2) Slacken the accelerator cable enough.
(3) Connect the scan tool to the data link connector (white).



(4) If the scan tool is not used, follow the steps below.
① Insert a paper clip (from the harness side) into the I-pin connector shown in the figure at the left.
Take care not to disconnect the connector.



Caution
The paper clip should be inserted between the terminals as shown in the figure at the left.,



② Connect a primary-voltage-detection type of tachometer to the paper clip.

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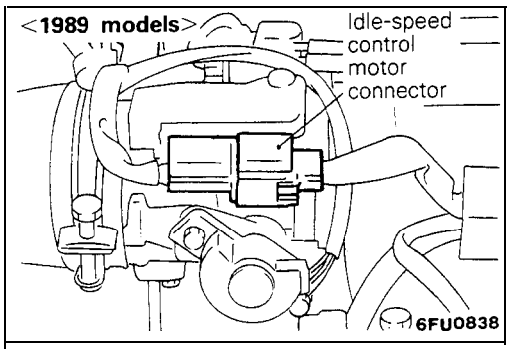
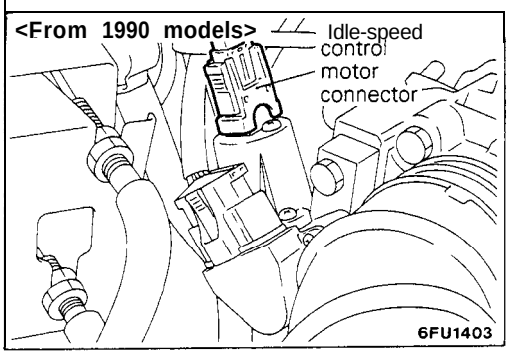
(5) Switch ON the ignition switch (but do not start the engine) and leave as if for 15 seconds or longer.

NOTE
When the ignition switch is switched ON, the idle speed control plunger extends to the fast-idle opening degree, and, after 15 seconds have passed, contracts to the initial position and stops there.
Initial position: the suitable idling position at which the idle speed control motor position sensor output voltage is 0.9V.



(6) Switch OFF the ignition switch.
(7) Disconnect the connector of the idle-speed control motor, and then secure the ISC motor at the initial position.
(8) Sufficiently loosen the fixed SAS.
(9) Start the engine and let it idle.



(10) Check the basic idling speed.
If the scan tool is used, select No.22 and then read the idling speed.

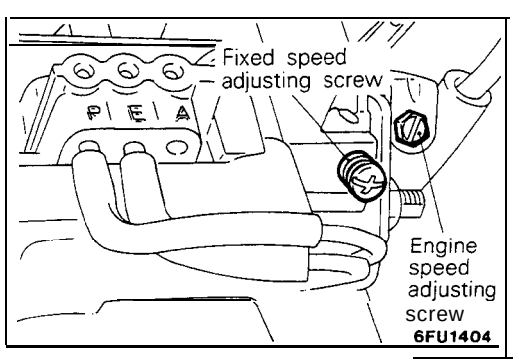
Basic idling speed: 750 ± 50 rpm

NOTE
The engine speed may be 20 to 100 rpm lower than indicated above for a new vehicle [driven approximately 500 km (300 miles) or less], but no adjustment is necessary.
If the engine stalls or the rpm is low even though the vehicle has been driven approximately 500 km (300 miles) or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13-35.)

(11) If there is a deviation from the standard value, turn the engine speed adjustment screw to make the adjustment.

NOTE
When the engine speed adjustment screw is turned to make the adjustment, use a hexagonal wrench if possible, and, in order to prevent backlash of the screw, make the final adjustment at the tightening side.

(12) Tighten the fixed SAS until the engine speed increases; then return the fixed SAS to find the point (the "touch point") at which the engine speed does not decrease. Then, from that point, return the fixed SAS and additional one-half turn.



(13) Switch OFF the ignition switch.

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(14) Adjust the play of the accelerator cable. (Refer to P.13-329.)
(15) Connect the idle-speed control motor's connector.
(16) Adjust the throttle-position sensor.
(17) Start the engine again and let it run at idle speed for about ten minutes; check to be sure that the idling condition is normal.

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING M13FICK

(1) Start the engine and warm it up until the temperature of the engine coolant reaches 80°C (176°F) or higher; then stop the engine.
(2) Disconnect the air intake hose at the throttle body side.
(3) Spray cleaning liquid (from the intake port of the throttle body) onto the valve, and then leave as is for about five minutes.
(4) Start the engine and race it a few times; then let it run at idle speed for about one minute.

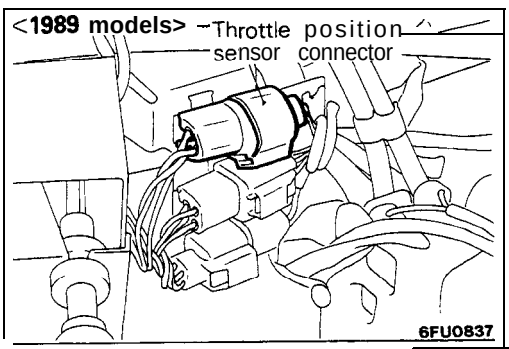
NOTE
If the engine idling speed is unstable (or the engine stalls), let the engine run with the throttle valve slightly open.

(5) If deposits are not removed from the throttle valve, repeat steps (3) and (4).
(6) Connect the air intake hose.
(7) Using the scan tool, erase the diagnostic trouble code, or disconnect the battery's ground cable for ten seconds or longer and then reconnect it.
(8) Adjust the basic idle speed (engine speed adjusting screw). (Refer to P.13-33.)
(9) Adjust the throttle position sensor.

THROTTLE POSITION SENSOR ADJUSTMENT M13FIEC

Caution
The adjustment of the throttle-position sensor should be made after completion of the basic idle-speed adjustment.

(1) Connect the scan tool to the data link connector (white).



(2) If a scan tool is not used, perform the following operation.
< 1989 models>
① Disconnect the throttle position sensor connector and use the special tool (test harness) between the disconnected connector.

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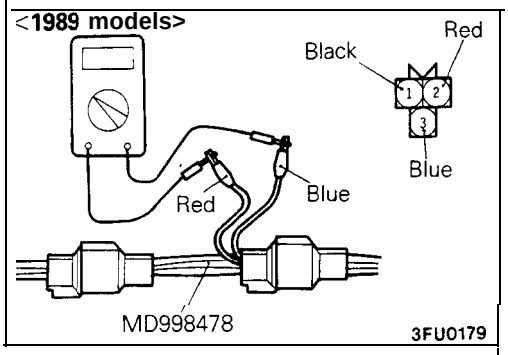
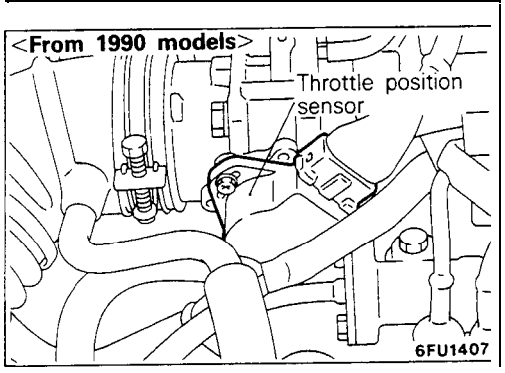
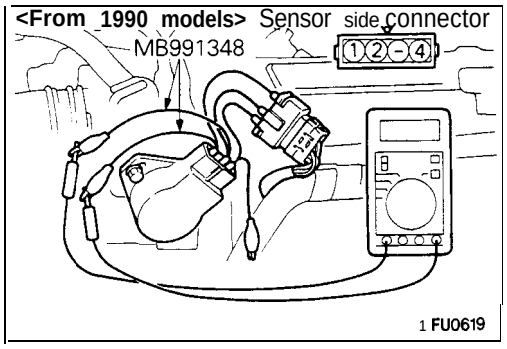


② Connect a digital type voltmeter between terminal ③ (blue clip, sensor output) of the throttle position sensor and terminal ② (red clip, sensor ground).



<From 1990 models>

① Disconnect the throttle position sensor connector and use the special tool (test harness set) between the disconnected connector.



② Connect a digital type voltmeter between terminal ② (sensor output) of the throttle position sensor and terminal ④ (sensor ground).

(3) Switch ON the ignition switch (but do not start the engine) and leave as is for 15 seconds or longer.

NOTE

When the ignition switch is switched ON, the idle speed control plunger extends to the fast-idle opening degree, and, after 15 seconds have passed, contracts to the initial position and stops there.

Initial position: the suitable idling position at which the idle speed control motor position sensor output voltage is 0.9 V.

(4) Check the throttle-position sensor's output voltage.

If the scan tool is used, select No. 14 and then read the throttle-position sensor's output voltage.

Standard value: 0.48–0.52 V

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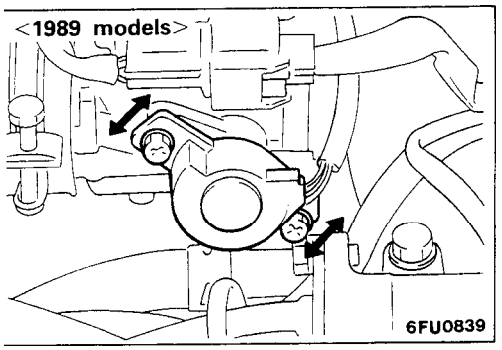
<1989 models>



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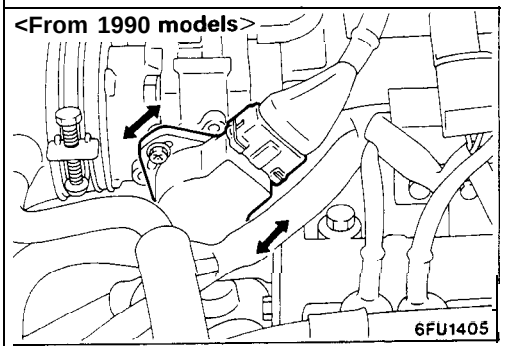


(5) If there is a deviation from the standard value, loosen the throttle-position sensor installation bolt and then turn the throttle-position sensor itself to make the adjustment. Be sure to securely retighten the bolt after making the adjustment.

NOTE

- The output voltage becomes higher when the throttle-position sensor is turned clockwise.
- A diagnostic trouble code for idle speed control motor position sensor may be output when adjusting the throttle position sensor. The reason is that, when the throttle position sensor is turned, the throttle position sensor voltage may differ from the normal voltage during idling, but this is no malfunction of the idle speed control motor position sensor.

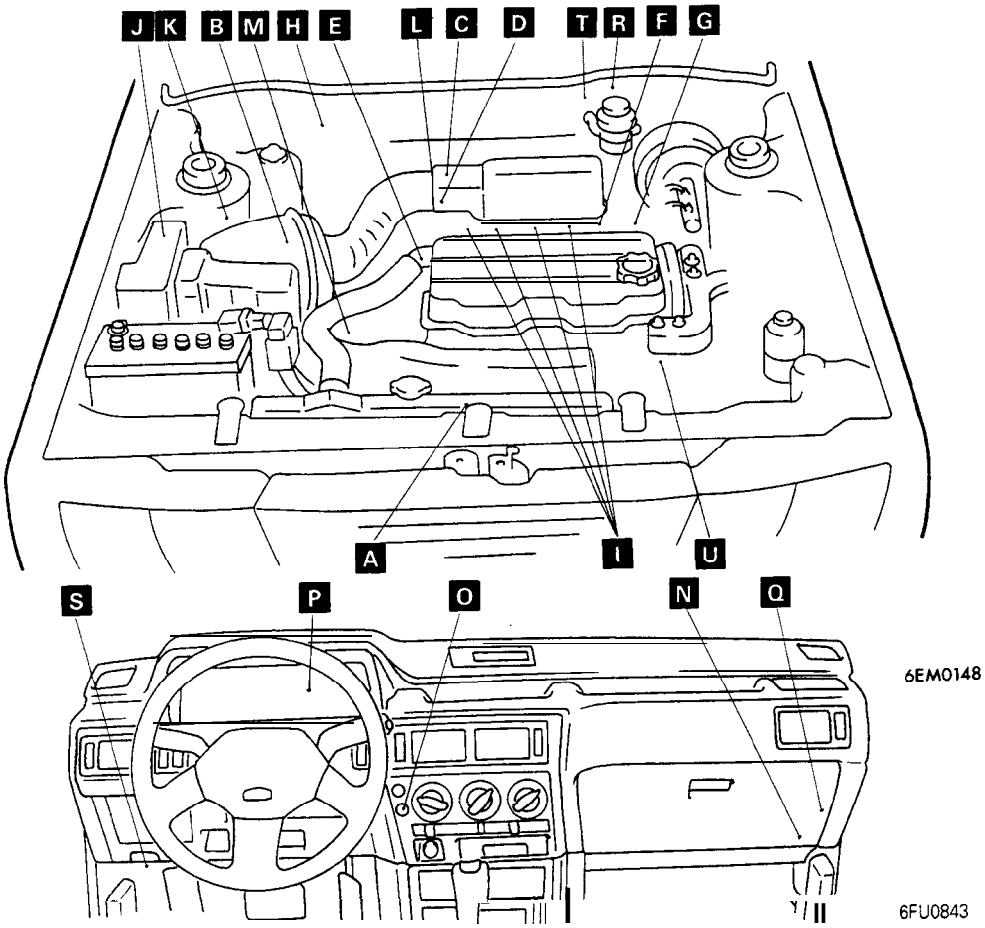
(6) Switch OFF the ignition switch.

(7) If a diagnostic trouble code is output when adjusting the throttle position sensor, use the scan tool and erase the diagnostic trouble code or first disconnect the battery (–) cable from the battery terminal for 10 seconds or more and then reconnect it. (This will erase the memory for the diagnostic trouble code due to adjustment of the throttle position sensor.)

ON-VEHICLE INSPECTION OF MFI COMPONENTS

M13YA--

COMPONENT LOCATION



Name	Symbol
Air conditioning compressor clutch relay	J
Air conditioning switch	0
Crankshaft position sensor and camshaft position sensor	G
Data link connector	S
EGR solenoid <California>	K
EGR temperature sensor <California>	L
Engine control module	Q
Engine coolant temperature sensor	E
Evaporative emission purge solenoid	H
Fuel pump check terminal	T
Idle speed control motor (closed throttle position switch, idle speed control motor position sensor)	C

Name	Symbol
Ignition coil (ignition power transistor)	F
Ignition timing adjustment terminal	R
Injector	I
Multiport fuel injection relay	N
Oxygen sensor	A
Park/neutral position switch <A/T>	M
Power steering pressure switch	U
Throttle position sensor	D
Vehicle speed sensor (reed switch)	P
Volume air flow sensor (incorporating intake air temperature sensor and barometric pressure sensor)	B

NOTE
The “Name” column is arranged in alphabetical order

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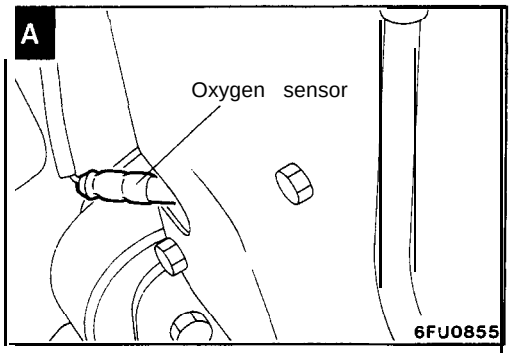
A



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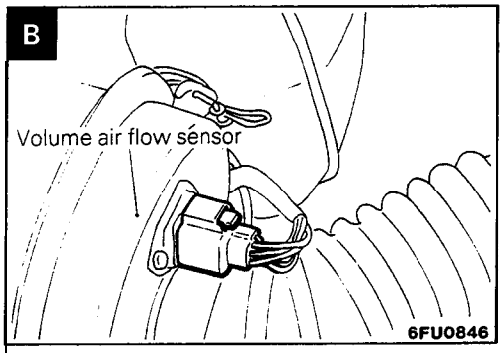

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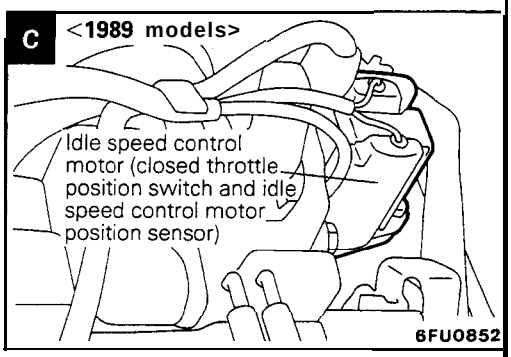

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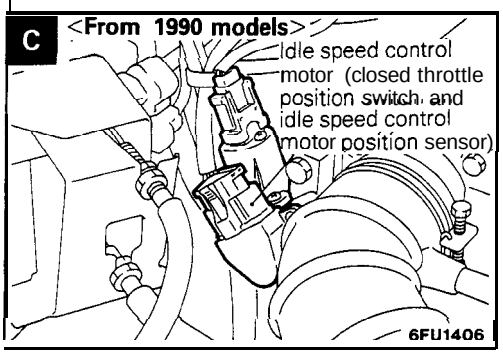

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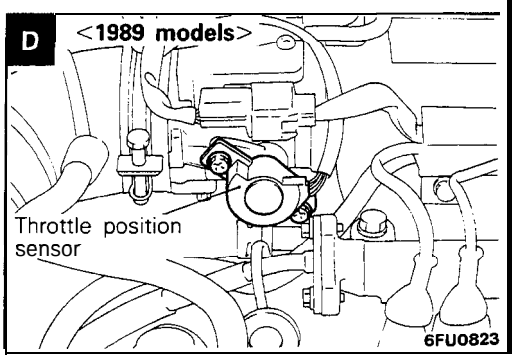

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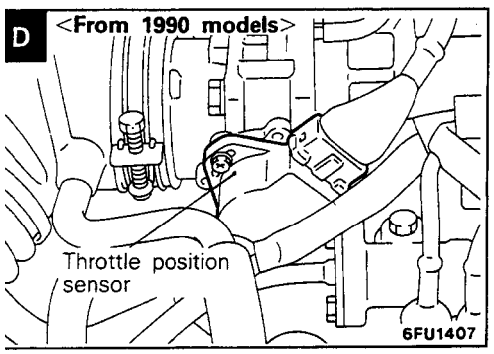

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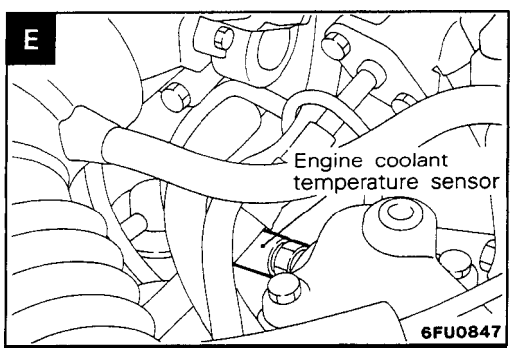

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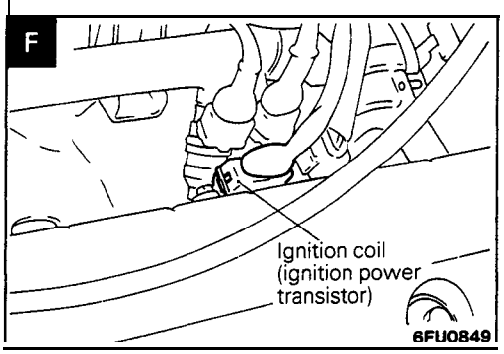

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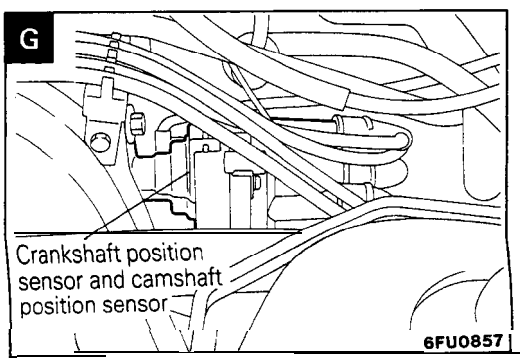

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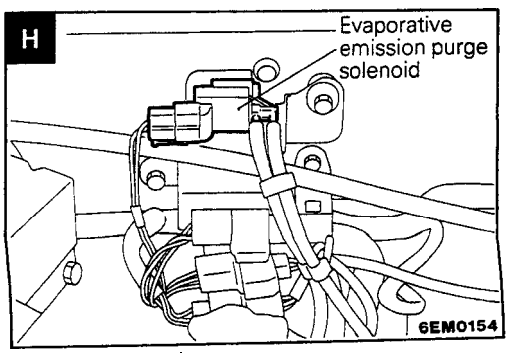

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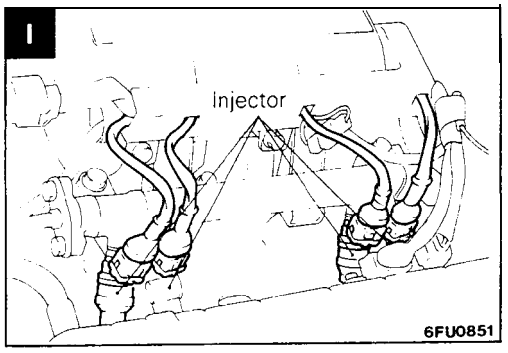

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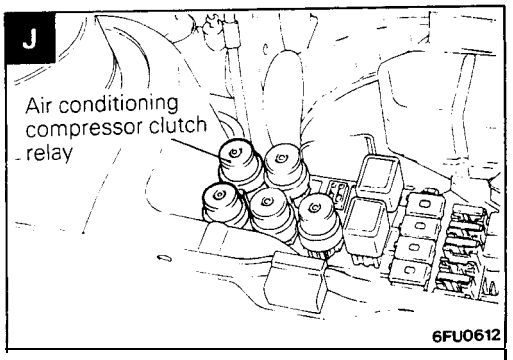
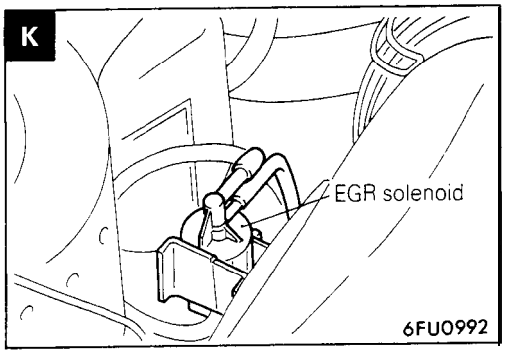


K



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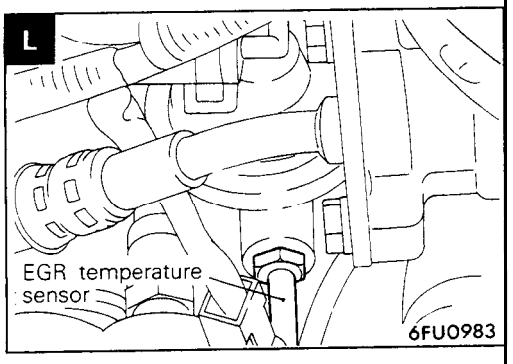

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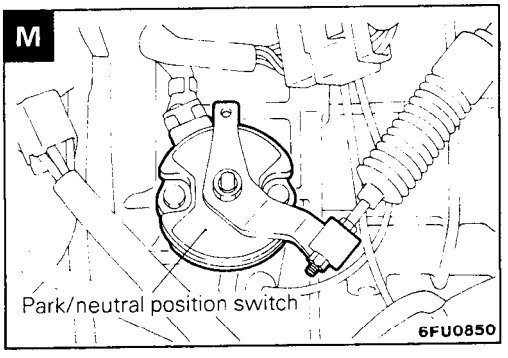

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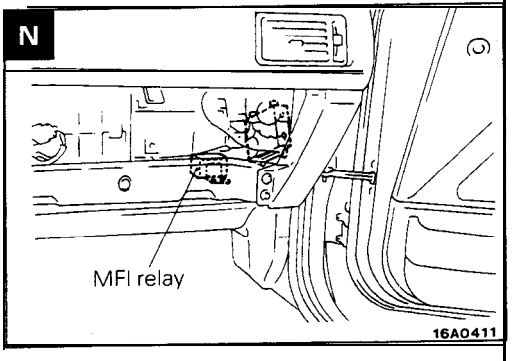

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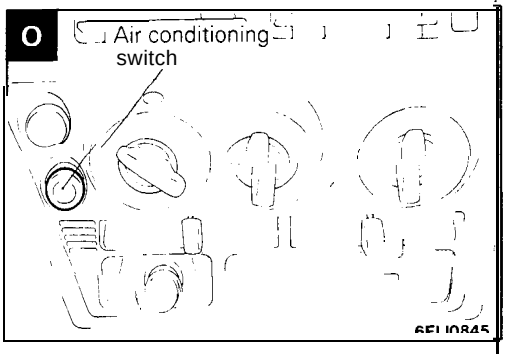

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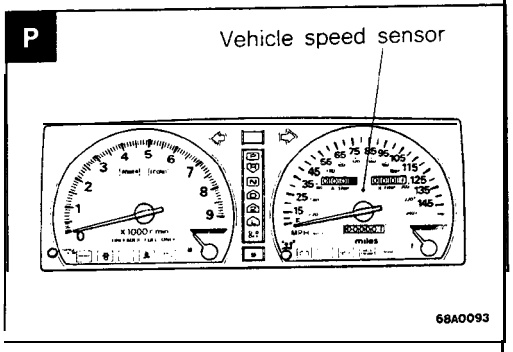

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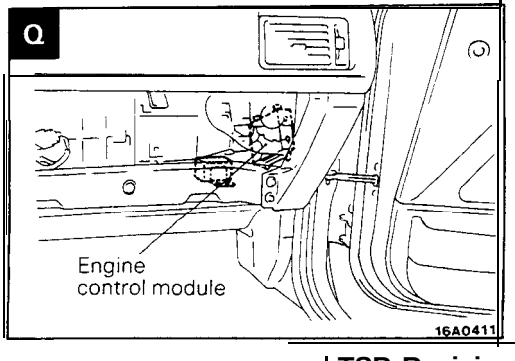
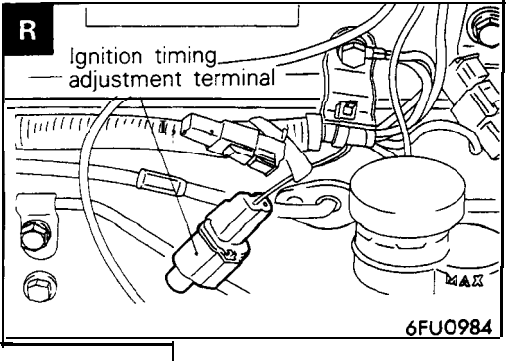
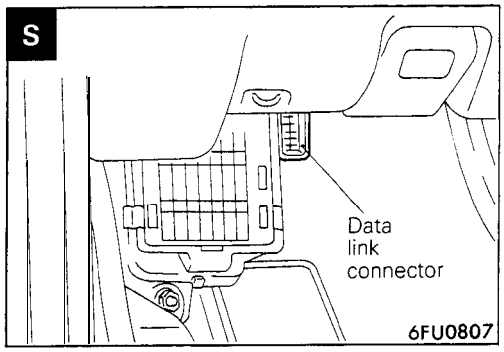
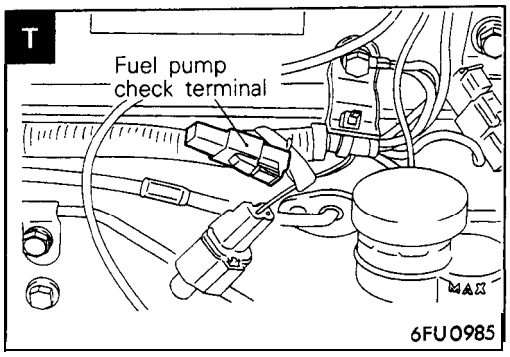


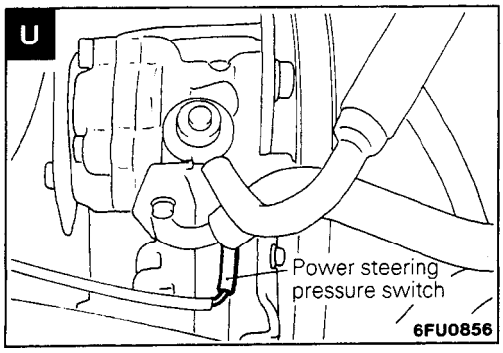
R



TSB Revision

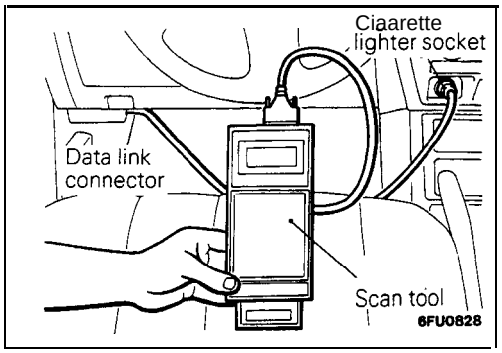






COMPONENTS INSPECTION PROCEDURE-USING THE SCAN TOOL MI 3YBAG

(1) Switch OFF the ignition switch.
(2) Insert the power-supply terminal of the scan tool into the cigarette lighter socket.
If it is necessary to make the inspection while cranking the engine, use the battery harness to take power directly from the battery.
(3) Connect the scan tool to the data link connector.
(4) Switch ON the ignition switch.
(5) Select the vehicle model and the system.
- Select by pressing the YES key.



(6) Select the function, and then check the input and output signals of the engine control module.
If there is an abnormal condition, check the body harness, the component itself, etc., and repair as necessary.
- Function selection menu
  - ❑ SELF-DIAG CODE
  - ❑ DATA LIST
  - ❑ ACTUATOR TEST
  - ❑ SPECIAL TEST
- After checking, press the CLEAR key.

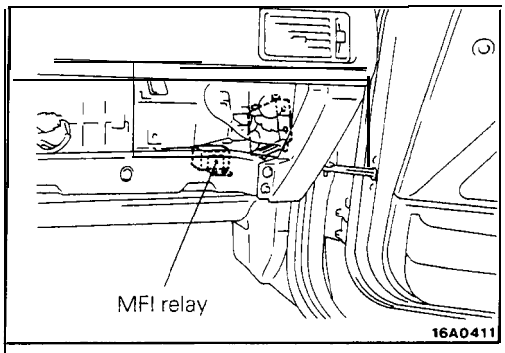
(7) After making the repair, use the scan tool to recheck, and confirm that the abnormal condition of the input and output signals has been corrected to the normal condition by the repair.
(8) Erase the diagnostic trouble code from the memory.
- Use the scan tool to make the erasure. (Refer to P.13-17.) <From 1990 models>
- Switch OFF the ignition switch and disconnect the ground cable from the battery terminal for ten seconds or longer, and then reconnect it. <1989 models>

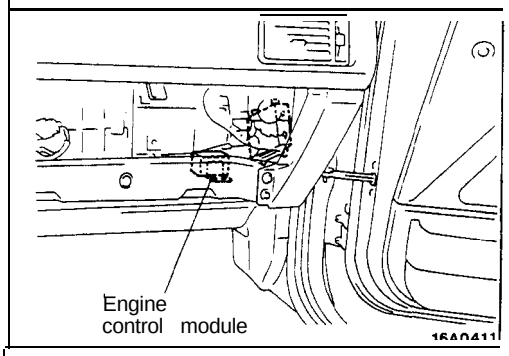
TSB Revision

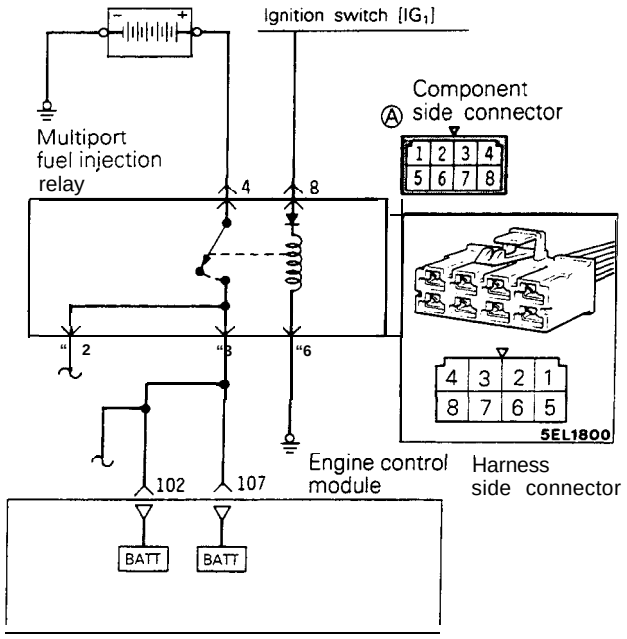
(9) Switch OFF the ignition switch.
(10) Disconnect the scan tool.
(11) Restart the engine and perform a driving test, etc. to confirm that the malfunction has been corrected.

POWER SUPPLY

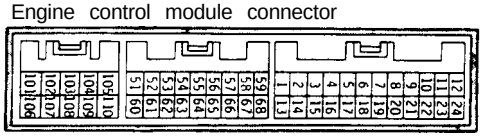
M13YCAA







Engine control module connector



OPERATION

- While the ignition switch is ON, battery power supply is supplied to the engine control module, injectors, volume air flow sensor, etc.
- When the ignition switch is switched ON, current flows from the ignition switch, via the MFI relay coil to ground.

As a result, the MFI relay switch is switched ON, and power is supplied, by way of the MFI relay switch, from the battery to the engine control module.

INSEPCTION

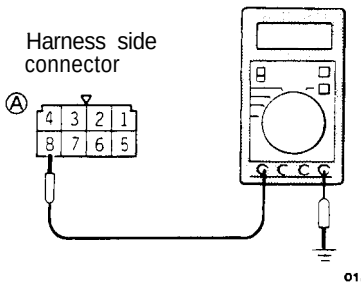
Using Scan Tool

Function	Item No.	Data display	Check conditions	Standard value
Data reading	16	Engine control module power-supply voltage	Ignition switch: ON	Battery positive voltage

TSB Revision

HARNESS INSPECTION

1

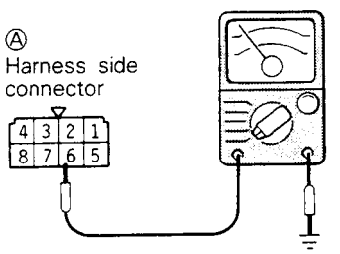


Measure the power supply voltage of the multiport fuel injection relay.
. Multiport fuel injection relay connector: Disconnected
. Ignition switch: ON

Voltage [V]
Battery positive voltage

OK → 2
Repair the harness. (Ignition switch–Ⓐ8)

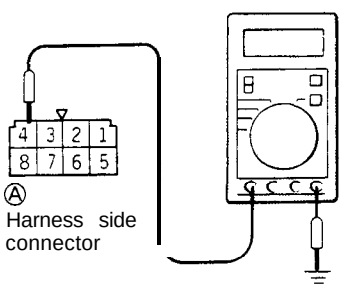
2



Check for continuity of the ground circuit.
· Multiport fuel injection relay connector: Disconnected

OK → 3
Repair the harness. (Ⓐ6–Ground)

3

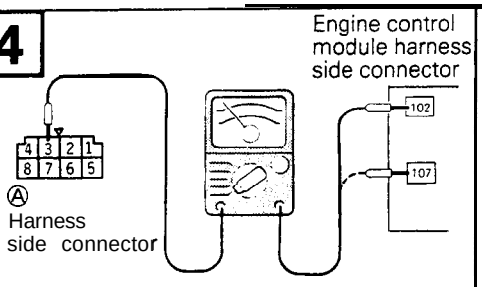


Measure the power supply voltage of the multiport fuel injection relay.
· Multiport fuel injection relay connector: Disconnected

Voltage [V]
Battery positive voltage

OK → 4
Repair the harness
F E & -

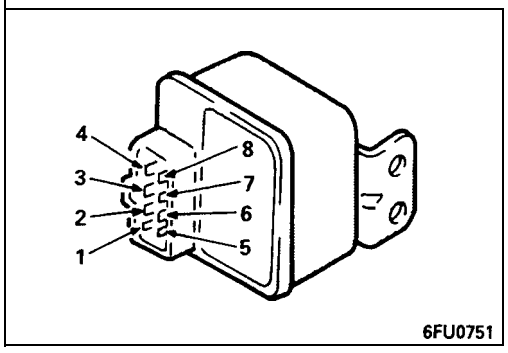
4



Check for open-circuit or short-circuit to ground between the engine control module and the multiport fuel injection relay.
. Engine control module connector: Disconnected
. Multiport fuel injection relay connector: Disconnected

OK → STOP
Repair the harness (102–Ⓐ3) (107–Ⓐ3)

TSB Revision



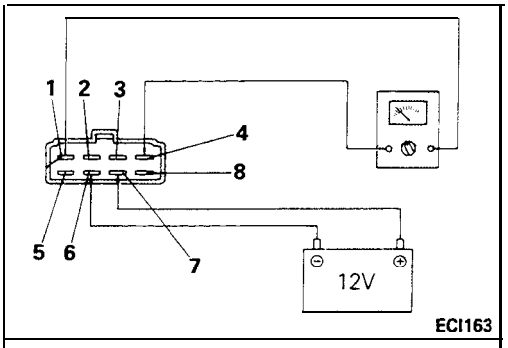
6FU0751

MULTIPORT FUEL INJECTION RELAY INSPECTION

Caution
When applying battery voltage directly, make sure that it is applied to correct terminal. Otherwise, the relay could be damaged.

(1) Check continuity of the multiport fuel injection relay coil.

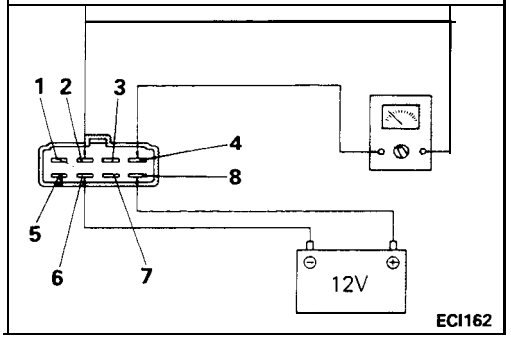
Measuring terminals	Continuity
③–⑤	Conductive (approx. 95 Ω)
②–⑤	
⑥–⑦	Conductive (approx. 35 Ω)
⑥–⑧	Conductive in one direction only



ECI163

(2) Check the continuity of the multiport fuel injection relay contacts between terminals ①–④.

Relay coil (between terminals ⑥–⑦)	Continuity
Not energized	Non-conductive (∞ Ω)
Energized	Conductive (0 Ω)



ECI162

(3) Check the continuity of the multiport fuel injection relay contacts between terminals ②–④.

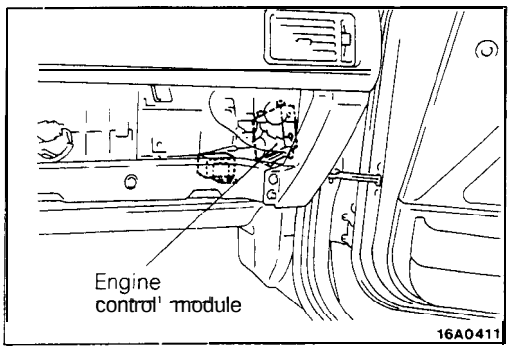
Relay coil (between terminals ⑧–⑥)	Continuity
Not energized	Non-conductive (∞ Ω)
Energized	Conductive (0 Ω)

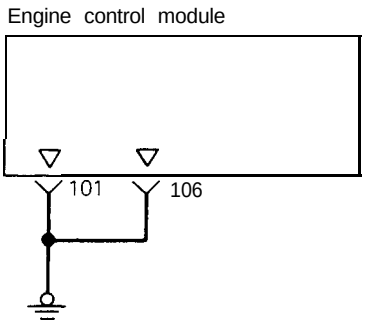
(4) If not as specified, replace the multiport fuel injection relay.

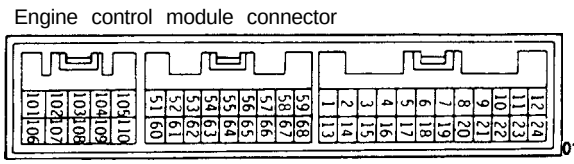
TSB Revision

ENGINE CONTROL MODULE POWER GROUND

M13YDAA







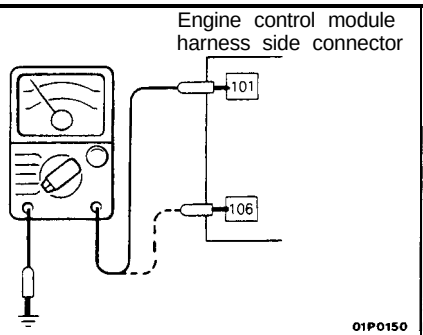
OPERATION

Grounding of the engine control module.

TROUBLESHOOTING HINTS

If there is incorrect or incomplete contact of the engine control module's ground line, the engine control module will not function correctly.

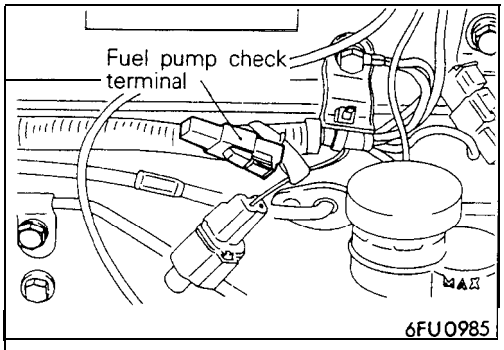
HARNESS INSPECTION

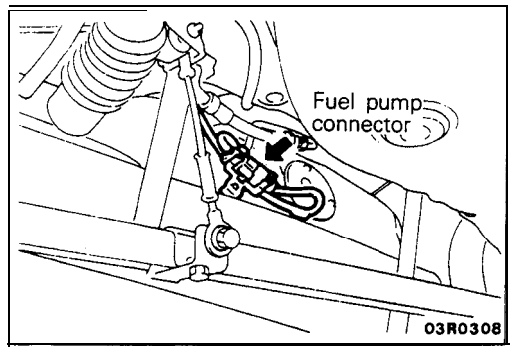
1		Check for continuity of the ground circuit wiring. • Engine control module connector: Disconnected	OK → STOP Repair the harness (101 – Ground 106 – Ground) OK →

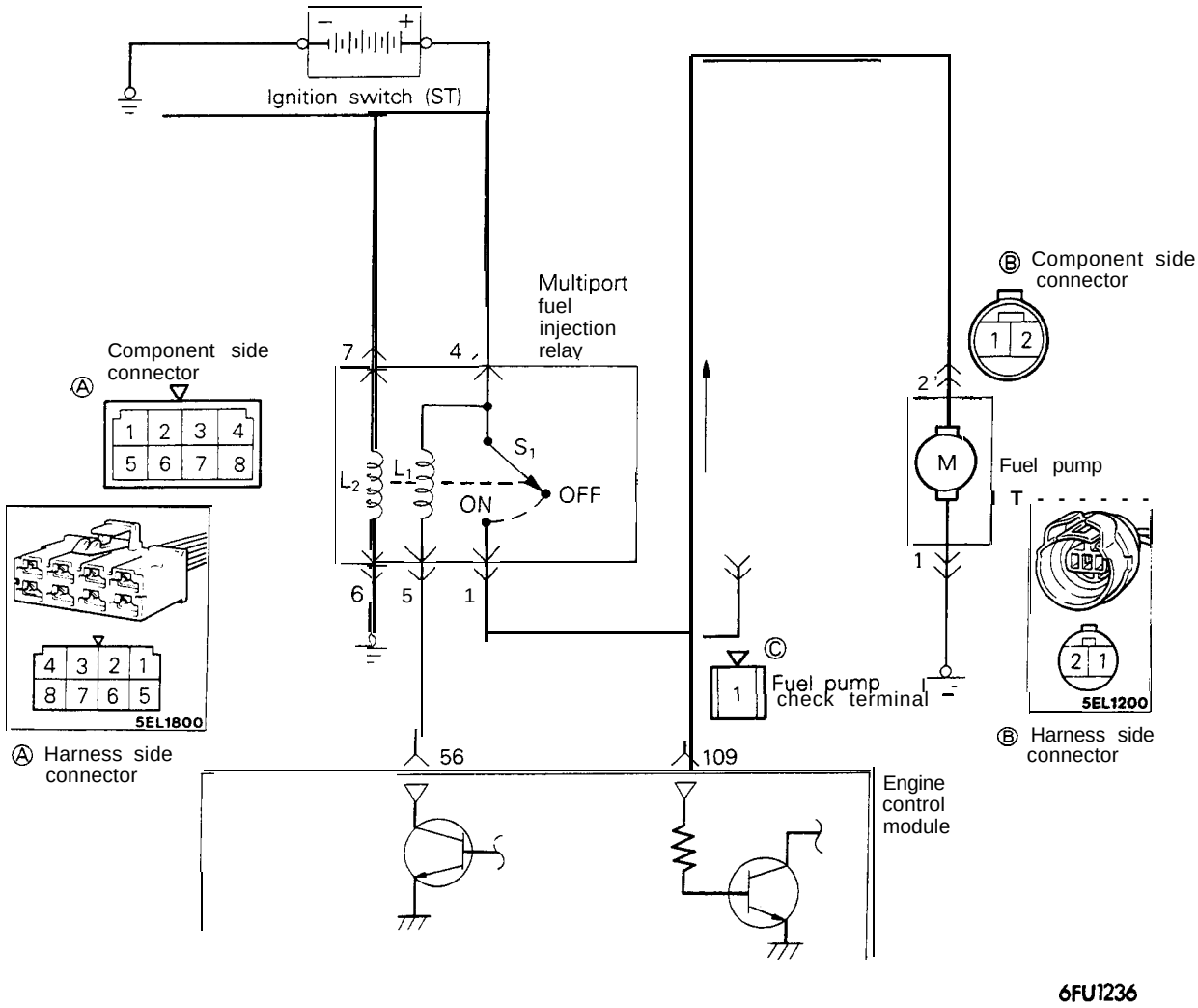
TSB Revision

FUEL PUMP

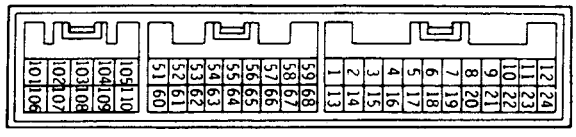
M13YEAB







Engine control module connector



01L0838

TSB Revision

OPERATION

- Activates the fuel pump during engine cranking and while the engine is running.
- When the ignition switch is set to the START position, current flows, by way of the multiport fuel injection relay coil, from the ignition switch to ground. As a result, the multiport fuel injection relay switch is switched ON, and the power for activation of the fuel pump is supplied, by way of the multiport fuel injection relay switch, from the battery to the fuel pump.
- While the engine is running, the engine control module switches ON the power transistor, after which current flows to the multiport fuel injection relay coil, and the power for activation of the fuel pump is supplied to the fuel pump.
- When the multiport fuel injection relay switch is switched ON, battery voltage is also applied to the engine control module, and so the engine control module detects the fact that the power for activation of the fuel pump is being supplied to the fuel pump.

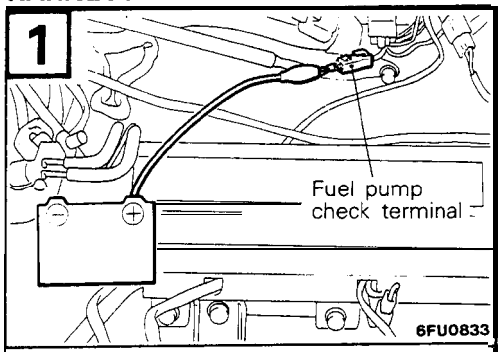
INSPECTION

Using Scan tool

Function	Item No.	Actuation	Inspection conditions	Description	Normal condition
Actuator test	07	Actuates fuel pump, circulating fuel.	. Engine cranking . Fuel pump forced activation The inspection should be conducted for both of the above conditions.	Hold the return hose between two fingers so as to feel the pulsation of the flowing of fuel.	Pulsation can be felt.
				Listen to the pump sound at a place near the fuel tank.	Pump sound can be heard.

HARNESS INSPECTION

1

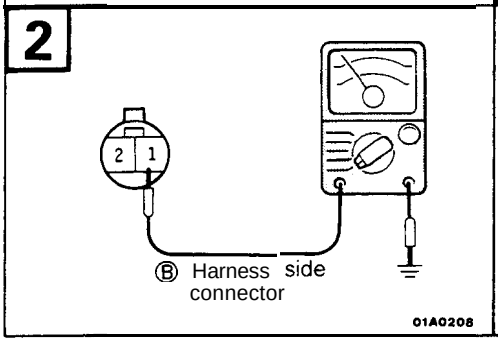


Check the fuel pump.
. Apply battery voltage to the checking terminal and operate the pump.

OK → 4

NG → 2

2

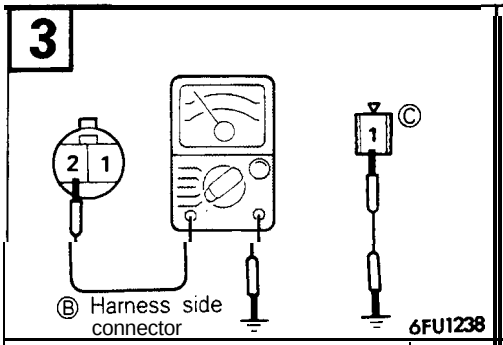


Check for continuity of the ground circuit.
· Fuel pump connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓑ1 – Ground)

3



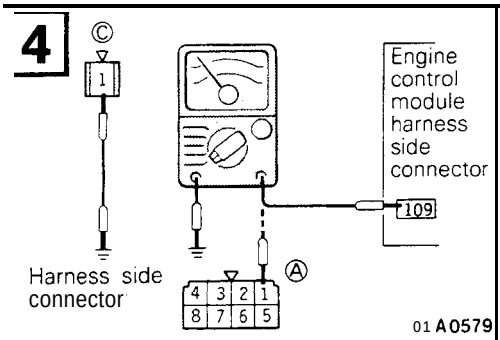
Check for continuity between the fuel pump and the checking terminal.
. Fuel pump connector: Disconnected

OK → 4

NG → Repair the harness. (Ⓑ2 – ©1)

TSB Revision

4

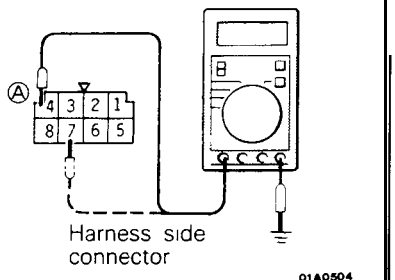


Check for continuity between the checking terminal and the engine control module, and between the multiport fuel Injection relay terminals.
. Multiport fuel injection relay connector: Disconnected
. Engine control module connector: Disconnected
. Fuel pump connector: Disconnected

OK → 5

NO → Repair the harness. (Ⓐ1 – Ⓒ1) (Ⓒ1 – 109)

5



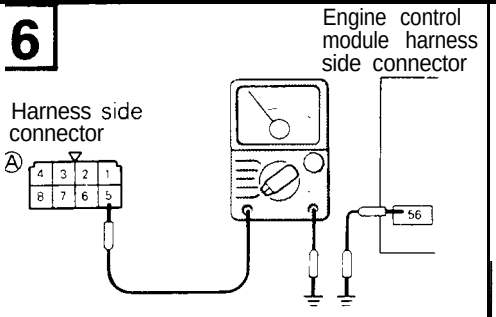
Measure the power supply voltage of the multiport fuel injection relay.
. Multiport fuel injection relay connector: Disconnected
· Ignition switch START (Ⓐ7 when checked only)

Voltage (V)
8 or more

OK → 6

NO → Repair the harness. (Ⓐ4 – Batt.) (Ⓐ7 – Ignition switch)

6

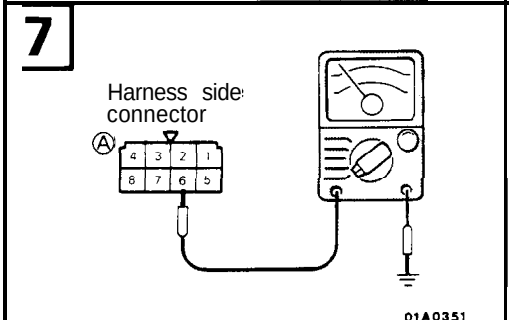


Check for an open-circuit, or a short-circuit to ground, between the multiport fuel injection relay and the engine control module.
. Multiport fuel injection relay connector: Disconnected
. Engine control module connector: Disconnected

OK → 7

NO → Repair the harness. (Ⓐ5 – 56)

7

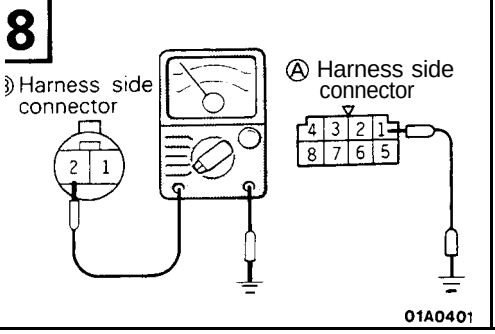


Check for continuity, of the ground circuit.
· Multiport fuel injection relay connector: Disconnected.

OK → 8

NO → Repair the harness. (Ⓐ6 – Ground)

8



Check for an open-circuit, or a short-circuit to ground, between the multiport fuel injection relay and the fuel pump.
· Multiport fuel injection relay connector: Disconnected
. Fuel pump connector: Disconnected

OK → STOP

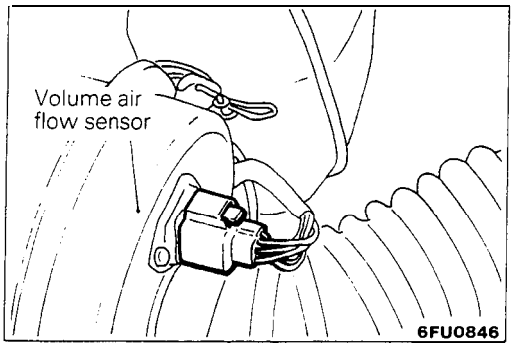
NO → Repair the harness. (Ⓐ1 – Ⓑ2)

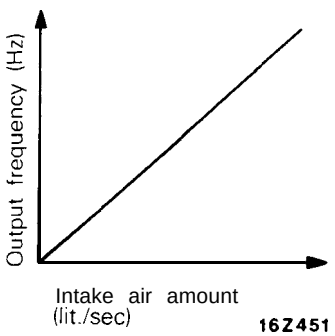
MULTIPORT FUEL INJECTION RELAY INSPECTION

Refer to P.13-44.

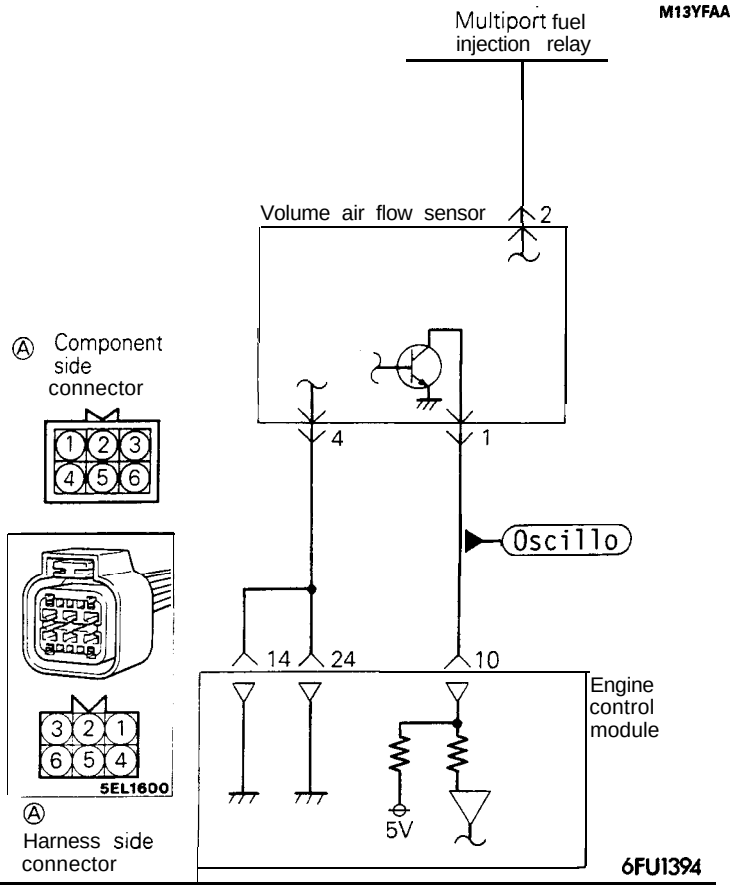
TSB Revision

VOLUME AIR FLOW SENSOR





M13YFAA



OPERATION

- The volume air flow sensor is incorporated within the air cleaner; it functions to convert the amount of engine air intake to pulse signals of a frequency proportional to the amount of engine air intake, and to input those/signals to the engine control module. The engine control module then, based upon those signals, calculates the amount to fuel injection, etc.
- The power for the volume air flow sensor is supplied from the multiport fuel injection relay to the volume air flow sensor, and is grounded at the engine control module. The volume air flow sensor, by intermitting the flow of the 5V voltage applied from the engine control module, produces pulse signals.

TROUBLESHOOTING HINTS

Hint 1:
If the engine sometimes stalls, try starting the engine and shaking the volume air flow sensor harness.
If the engine then stalls, incorrect or improper contact of the volume air flow sensor connector is the probable cause.
Hint 2:
If, when the ignition switch is switched ON (but the engine is not started), the volume air flow sensor output frequency is any value other than zero, a malfunction of the volume air flow sensor or of the engine control module is the probable cause.
Hint 3:
If idling is possible even though the volume air flow sensor output frequency is deviated from the standard value, the cause is usually a malfunction other than of the volume air flow sensor.

Examples:
(1) The flow of air within the volume air flow sensor is disturbed. (Air duct disconnection or clogged air cleaner element)
(2) Incomplete combustion within a cylinder. (Malfunction of spark plugs, ignition coil, injectors, compression pressure, etc.)
(3) Air is taken into the intake manifold through a leaking gasket, etc.
(4) Incomplete close contact of the EGR valve seat.

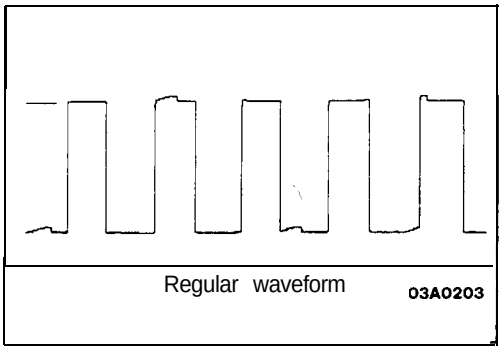
TSB Revision

INSPECTION

Using Scan Tool

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	12	Sensor detection air volume (frequency)	. Engine coolant temperature: 85–95°C (185–205°F) . Lights, cooling fan, electrical accessories: OFF . Transaxle: neutral (A/T models: "P" range)	750 rpm (Idling)	25–50 Hz
				2,000 rpm	70–130 Hz
				Racing	Frequency increases as racing rpm increases.

NOTE
The volume air flow sensor output frequency may be about 10% higher than indicated above when the vehicle is new [driven approximately 500 km (300 miles) or less].

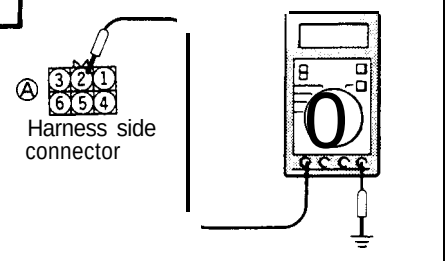


Using Oscilloscope

(1) Run the engine at idle speed.
(2) Connect the probe to the osilloscope pick-up point as shown in the circuit diagram, and check the wave form.

HARNESS INSPECTION

1



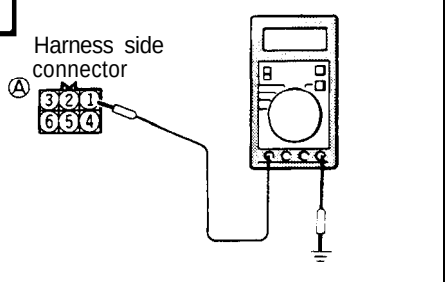
Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Ⓐ2 – Multiport fuel injection relay) or check the multiport fuel injection relay

2



Measure the terminal voltage.
. Connector: Disconnected
. Ignition switch: ON

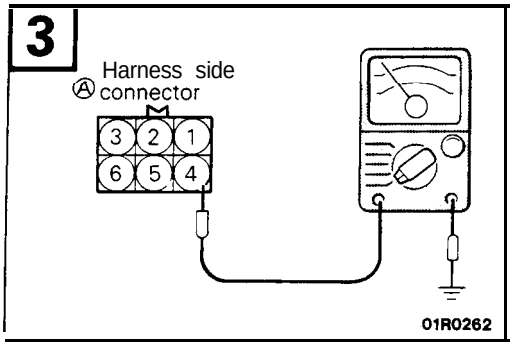
Voltage (V)
4.8–5.2

OK → 3

NG → Repair the harness. (Ⓐ1 – 10)

TSB Revision

3



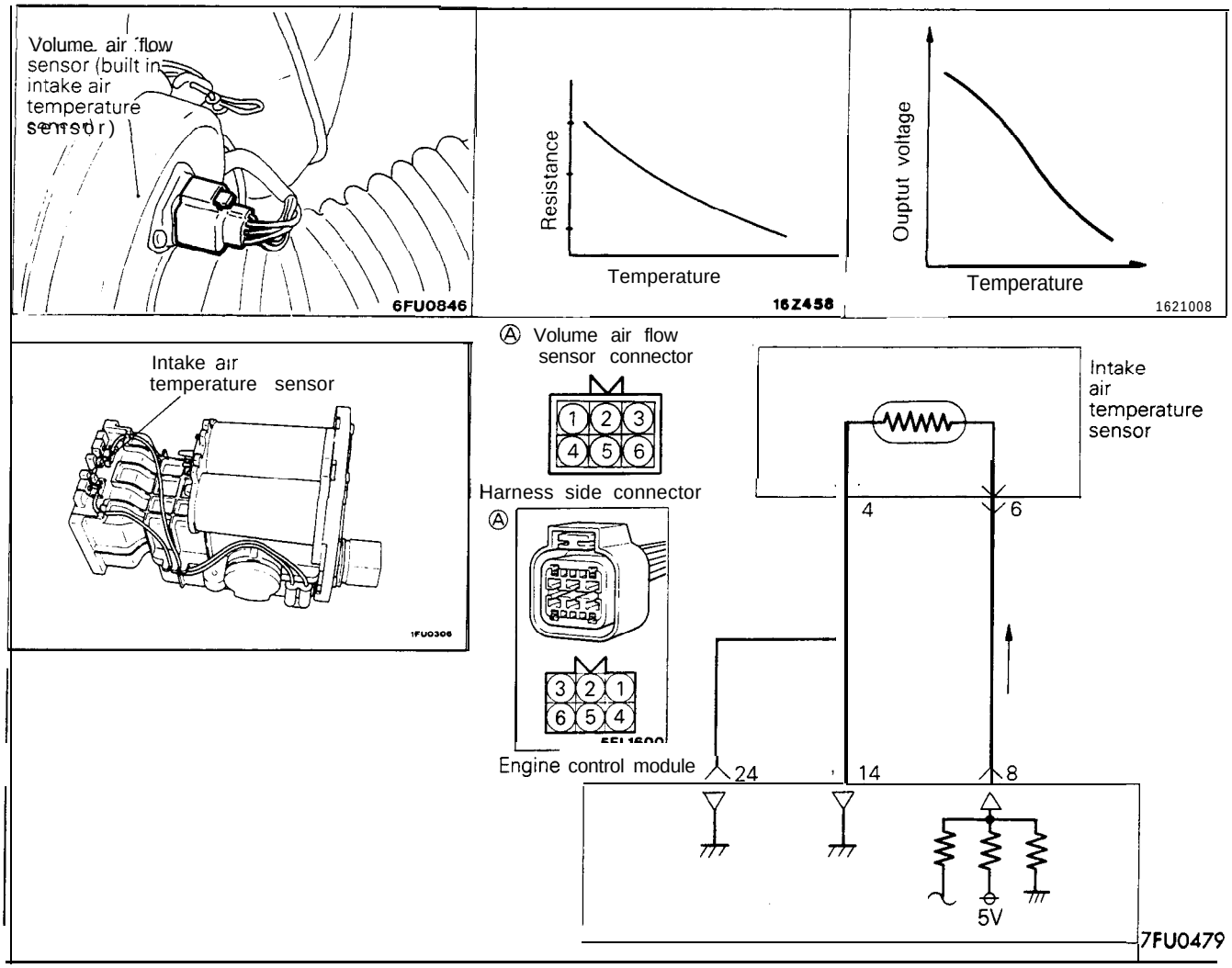
Check for continuity of the ground circuit.
. Connector: Disconnected

OK → STOP

OK → Repair the harness. (Ⓐ4 – 14 24)

INTAKE AIR TEMPERATURE SENSOR

M13YGAA



OPERATION

- The intake air temperature sensor functions to convert the temperature of the air (intaken to the engine) to voltage, and to input that voltage (as signals) to the engine control module. The engine control module, based upon those signals, then corrects the amount of fuel injection, etc.
- The 5V power supply within the engine control module is supplied, by way of the resistance within the unit, to the intake air temperature sensor; it passes through the intake air temperature sensor, which is a type of resistor, and is grounded at the engine control module.
  Note that the resistance of the intake air temperature sensor decreases when the temperature of the intake air increases.
- The intake air temperature sensor terminal voltage becomes higher when the resistance of the intake air temperature sensor increases, and becomes lower when the resistance decreases.

TSB Revision

Consequently, the intake air temperature sensor terminal voltage varies in accordance with the temperature of the intake air, becoming lower when the temperature of the intake air increases.

TROUBLESHOOTING HINTS

Because the intake air temperature sensor detects the temperature of the intake air in the air cleaner, it indicates a temperature different than the temperature of the outside air when the engine is running.

INSPECTION

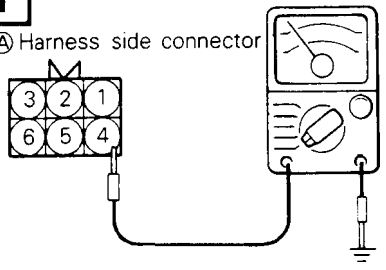
Using Scan tool

Function	Item No.	Data display	Check conditions	Intake air temp.	Standard value
Data reading	13	Sensor detection temperature	Ignition switch: ON Or, engine running	At −20°C (−4°F)	−20°C
				At 0°C (32°F)	0°C
				At 20°C (68°F)	20°C
				At 40°C (104°F)	40°C
				At 80°C (176°F)	80°C

HARNESS INSPECTION

1

Ⓐ Harness side connector



01R0262

Check for continuity of the ground circuit.

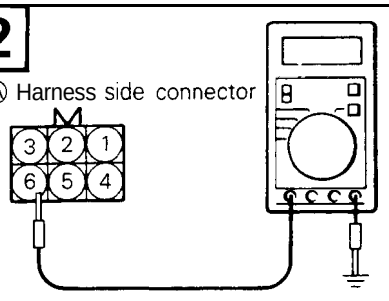
. Connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ4 – 14 24)

2

Ⓐ Harness side connector



01R0261

Measure the power supply voltage.

Connector: Disconnected

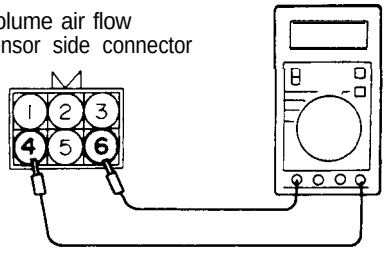
Ignition switch: ON

Voltage (V)
4.5-4.9

OK → STOP

NG → Repair the harness. (Ⓐ6 – 8)

Volume air flow sensor side connector



6FU0622

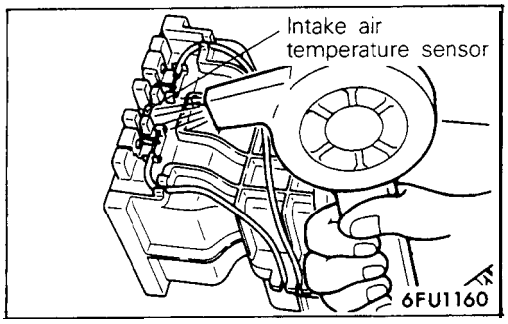
SENSOR INSPECTION

(1) Disconnect the volume air flow sensor connectors.

(2) Measure resistance between terminals ④ and ⑥.

Temperature °C (°F)	Resistance (kΩ)
0 (32)	6.0
20 (68)	2.7
80 (176)	0.4

TSB Revision



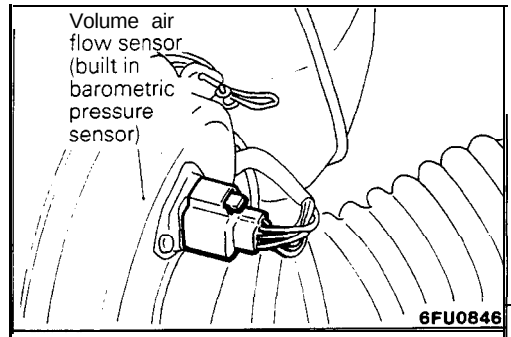
(3) Measure resistance while heating the sensor using a hair drier.

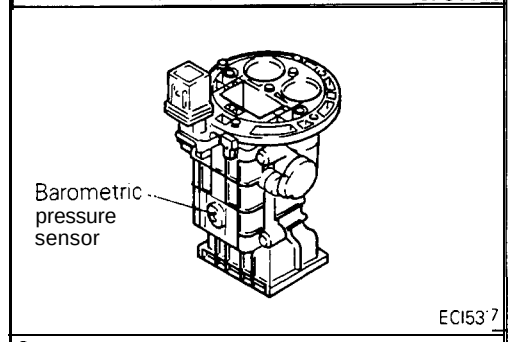
Temperature °C (°F)	Resistance (kΩ)
Higher	Smaller

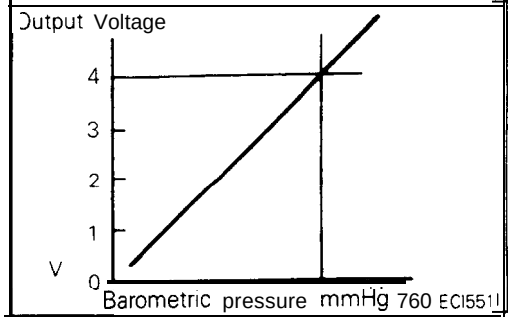
(4) If the value deviates from the standard value or the resistance remains unchanged, replace the volume air flow sensor assembly.

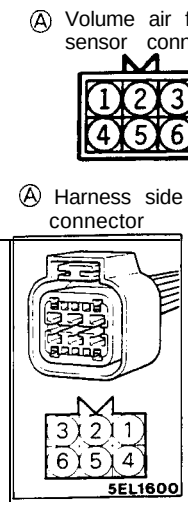
BAROMETRIC PRESSURE SENSOR

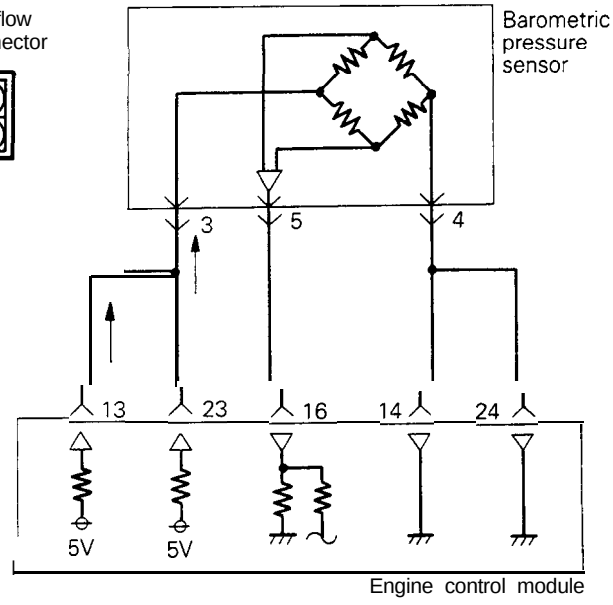
M13YHAA

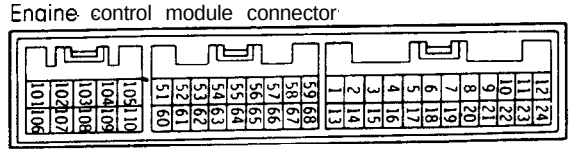












OPERATION

- The barometric-pressure sensor functions to convert the barometric pressure to voltage, and to input that voltage (as signals) to the engine control module.
  The engine control module, based upon those signals, then corrects the amount to fuel injection, etc.
- The 5V power supply within the engine control module is supplied to the barometric-pressure sensor; it passes through the circuitry within the sensor, and is grounded at the engine control module.
- The barometric-pressure sensor output voltage is sent to the engine control module in proportion to the barometric pressure (absolute pressure).

TSB Revision

TROUBLESHOOTING HINTS

Hint 1:
If there is a malfunction of the barometric-pressure sensor. driveability of the vehicle will become worse particularly at high altitude.

Hint 2:
If, during high-speed driving, there is a noticeable sharp drop of the displayed pressure of the barometric-pressure sensor, check for clogging of the air cleaner.

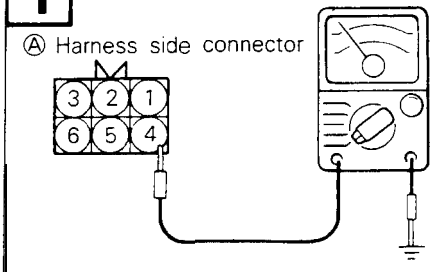
INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Altitude	Standard value
Data reading	25	Sensor detection pressure	Ignition switch: ON	At 0 m (0 ft.)	760 mmHg
				At 600 m (1,969 ft.)	710 mmHg
				At 1,200 m (3,937 ft.)	660 mmHg
				At 1,800 m (5,906 ft.)	610 mmHg

HARNESS INSPECTION

1

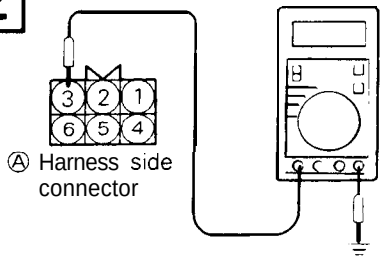


Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 2

NO → Repair the harness. (Ⓐ4 – 14, 24)

2



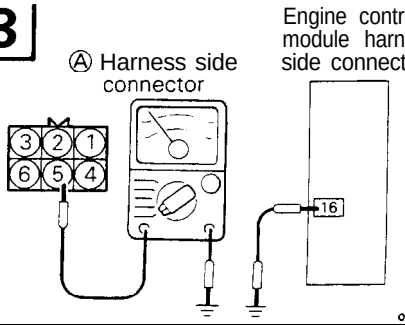
Measure the power supply voltage of the barometric pressure sensor.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 3

NO → Repair the harness. (Ⓐ3 – 13, 23)

3



Check for an open-circuit or a short-circuit to ground between the engine control module and the barometric pressure sensor.
• Volume air flow sensor connector: Disconnected
Engine control module connector: Disconnected

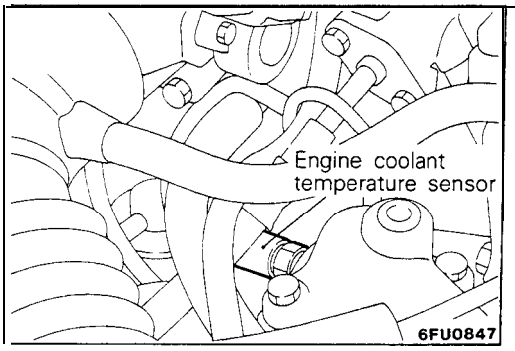
OK → STOP

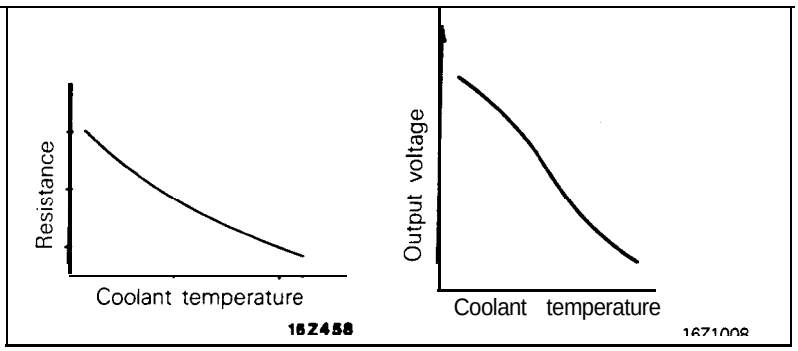
NO → Repair the harness. (Ⓐ5 – 16)

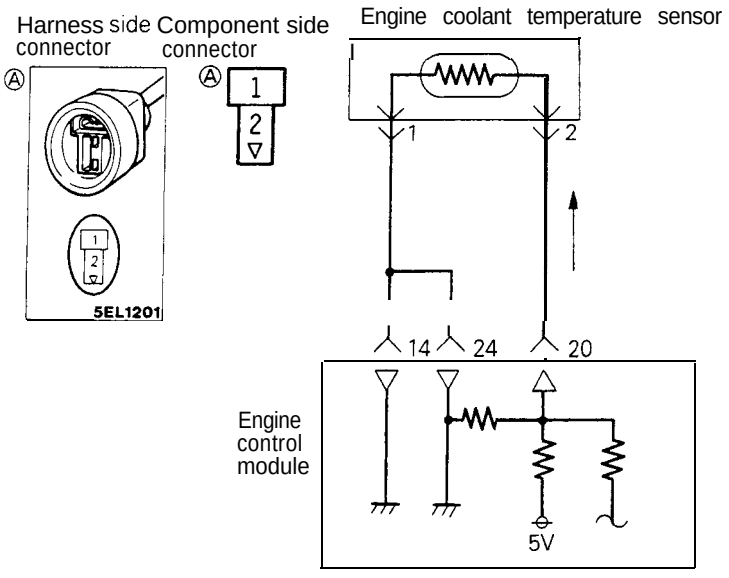
TSB Revision

ENGINE COOLANT TEMPERATURE SENSOR

M13YIAB







6FU1239

OPERATION

- The engine coolant temperature sensor functions to convert the barometric pressure to voltage, and to input that voltage (as signals) to the engine control module.
  The engine control module, based upon those signals, regulates the amount ot fuel injection and the fast-idling speed when the engine is cold.
- The 5V power supply within the engine control module is supplied, by way of the resistance within the unit, to the engine coolant temperature sensor; it passes through the engine coolant temperature sensor, which is a type of resistor, and is grounded at the engine control module.
  Note that the resistance of the engine coolant temperature sensor decreases when the temperature of the coolant increases.
- The engine coolant temperature sensor terminal voltage becomes higher when the resistance of the engine coolant temperature sensor increases, and becomes lower when the resistance decreases. Consequently, the engine coolant temperature sensor terminal voltage varies in accordance with the temperature of the coolant, becoming lower when the temperature of the coolant increases.

TROUBLESHOOTING HINTS

if, during engine warm-up, the fast-idling speed is not correct, or black smoke is emitted the problem is usually a malfunction of the engine coolant temperature sensor.

TSB Revision

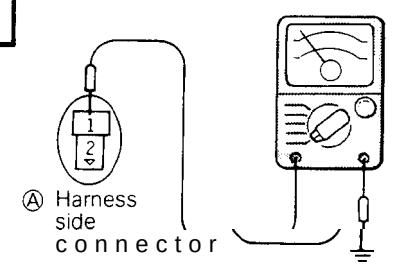
INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Coolant temperature	Standard value
Data reading	21	Sensor detection temperature	Ignition switch: ON Or, engine running	At −20°C (−4°F)	−20°C
				At 0°C (32°F)	0°C
				At 20°C (68°F)	20°C
				At 40°C (104°F)	40°C
				At 80°C (176°F)	80°C

HARNESS INSPECTION

1

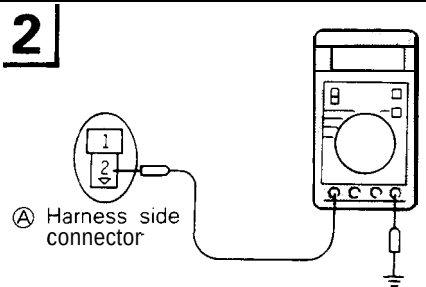


Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ1 – 14, 24)

2



Measure the power supply voltage.
. Connector: Disconnected
Ignition switch: ON

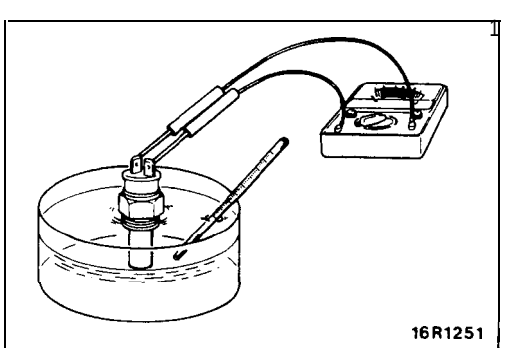
Voltage (V)
4.5–4.9

OK → STOP

NG → Repair the harness. (Ⓐ2 – 20)

SENSOR INSPECTION

(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 (°F)	Resistance (kΩ)
0 (32)	5.9
20 (68)	2.5
40 (104)	1.1
80 (176)	0.3

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

TSB Revision

INSTALLATION

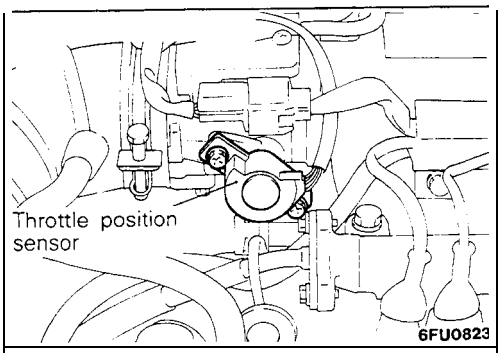
(1) Apply sealant 3M NUT locking No.41 71 or equivalent to threaded portion.
(2) Install engine coolant temperature sensor and tighten it to specified torque.

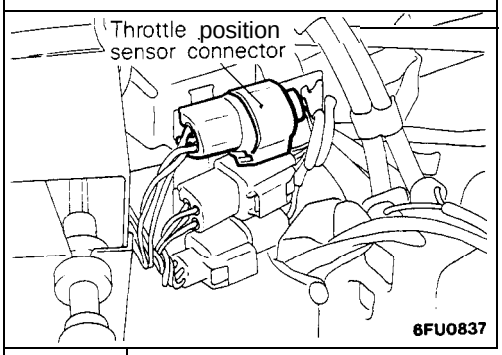
Sensor tightening torque: 20–40 Nm (15-29 ft.lbs.)

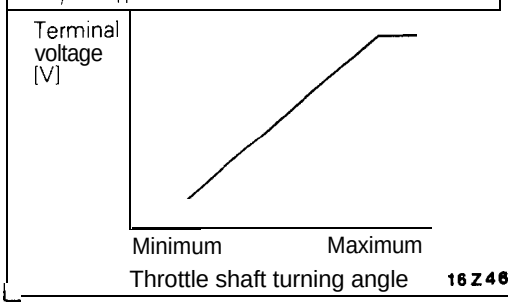
(3) Fasten harness connectors securely

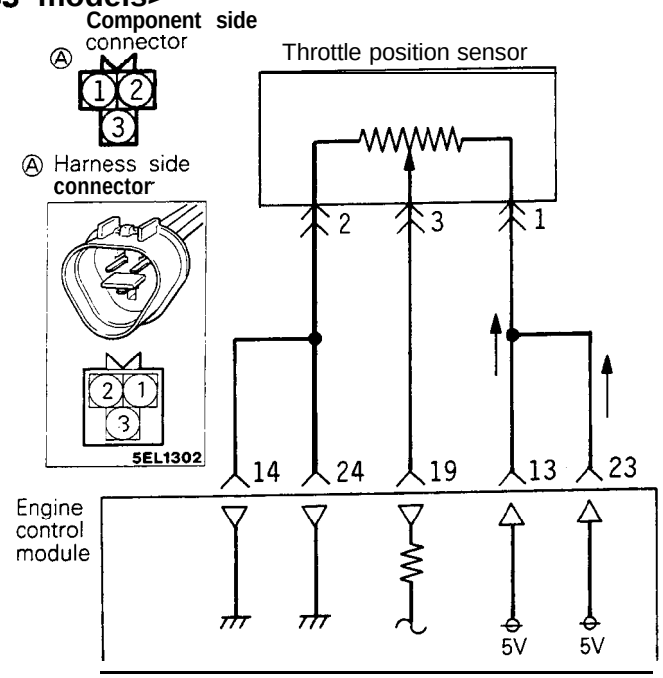
THROTTLE POSITION SENSOR <1989 models>

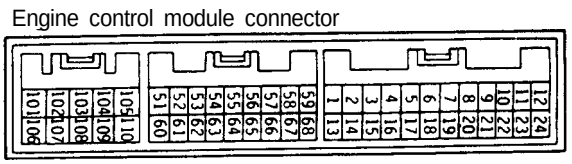
M13YJAE











OPERATION

- The throttle-position sensor functions to convert the degree of opening of the throttle valve to voltage, and to input that voltage (as signals) to the engine control module. The engine control module, based upon those signals, then regulates the amount of fuel injection, etc.
- The 5V power supply within the engine control module is supplied to the throttle-position sensor, after which it passes through the resistance within the sensor and is grounded at the engine control module.
- When the throttle valve shaft is rotated all the way from the idling position to the fully open position, the resistance between the throttle-position sensor's variable-resistance terminal and the ground terminal also increases in accordance with that rotation, and, as a result, the voltage of the throttle-position sensor's variable-resistance terminal also becomes higher in accordance with that rotation.

TSB Revision

TROUBLESHOOTING HINTS

Hint 1:
The signals of the throttle-position sensor are more important for control of the automatic transaxle than for control of the engine; shifting "impact shocks" are produced if there is a malfunction of the throttle-position sensor.

Hint 2:
If the voltage of the throttle-position sensor deviates from the standard value, check once again after making the throttle-position sensor adjustment.

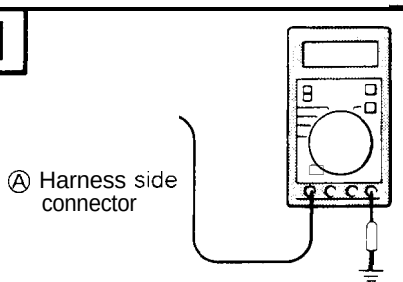
INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Throttle valve	Standard value
Data reading	14	Sensor voltage	Ignition switch: ON held for 15 sec. or more	To idle position	450–550 mV
				Gradually opening	Becomes higher proportional to valve opening.
				To fully open	4,500–5,500 mV

HARNESS INSPECTION

1



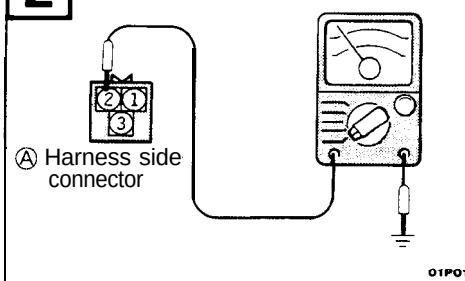
Measure the power supply voltage of the throttle position sensor.
. Connector:' Disconnected
. Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 2

NG → Repair the harness. (Ⓐ1–13, 23)

2

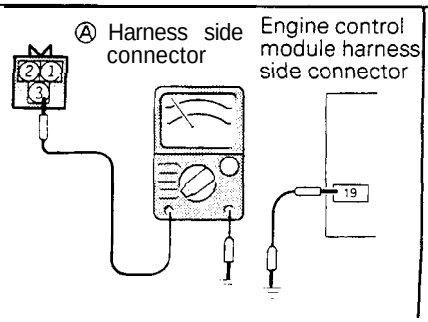


Check for continuity of the ground circuit.
Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ2–14, 24)

3

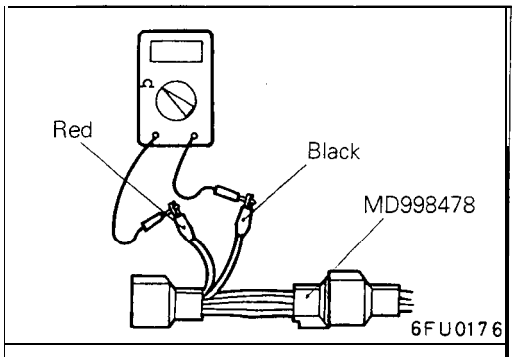


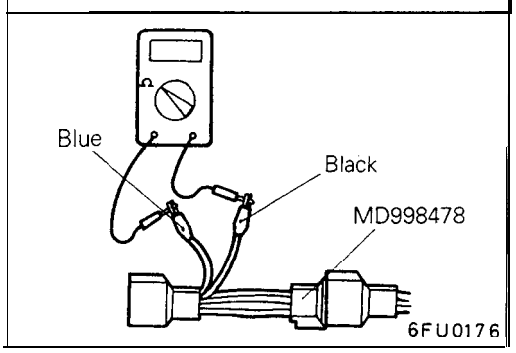
Check for an open-circuit, or a short-circuit to ground, between the engine control module and the throttle position sensor.
: Throttle position sensor connector: Disconnected
Engine control module connector: Disconnected

OK → STOP

NG → Repair the harness. (Ⓐ3–19)

TSB Revision





SENSOR INSPECTION

(1) Disconnect the throttle position sensor connector, and connect the special tool (Test harness) between the disconnected connectors.

(2) Measure the resistance between terminal ① (black clip of special tool) and terminal ② (red clip) of the connector on throttle position sensor side.

Standard value: 3.5-6.5 kΩ

(3) Measure the resistance between terminal ② (black clip of special tool) and terminal ③ (blue clip).

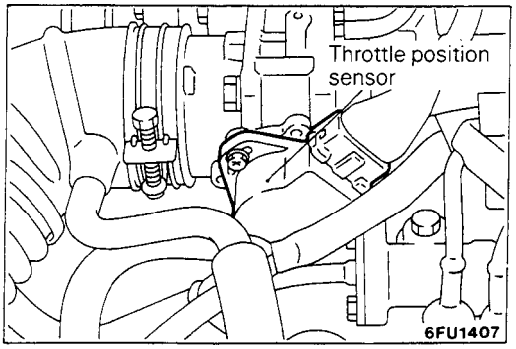
Open the throttle valve slowly from idle position to fully open position	Resistance should vary from approx. 0.5 kΩ to 3.5-6.5 kΩ smoothly in proportion to change in throttle valve opening

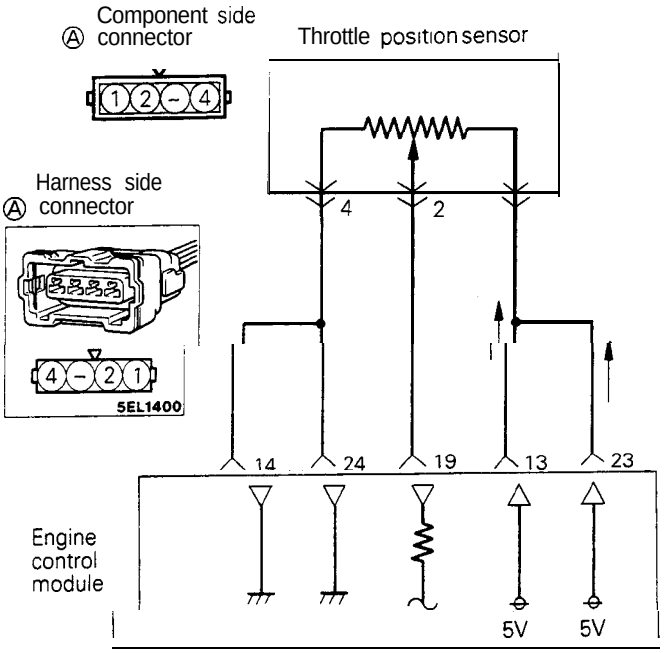
(4) If the resistance does not conform with specification, or does not vary smoothly, replace the throttle position sensor.

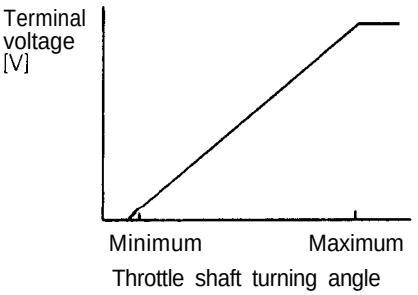
Throttle position sensor installation torque: 1.5-2.5 Nm (1.1-1.8 ft.lbs.)

THROTTLE POSITION SENSOR <From 1990 models>

M13YJAF

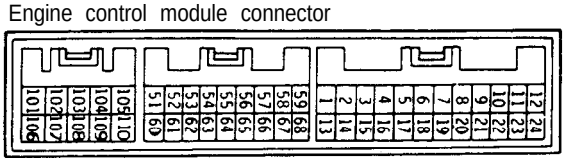






6FU1240

Engine control module connector



01L0838

TSB Revision

OPERATION

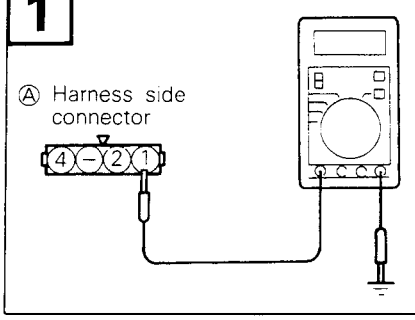
TROUBLESHOOTING HINTS

INSPECTION-Using Scan tool

Refer to P.13-57.

HARNESS INSPECTION

1



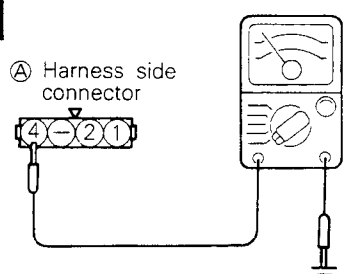
Measure the power supply voltage of the throttle position sensor.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 2

NG → Repair the harness. (Ⓐ1–13, 23)

2

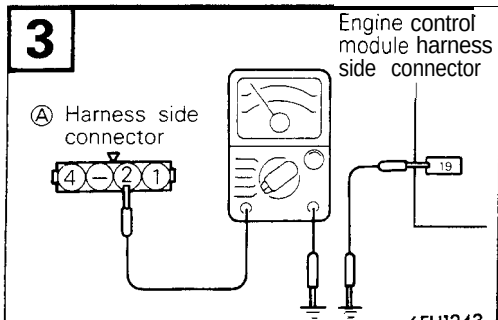


Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ4–14, 24)

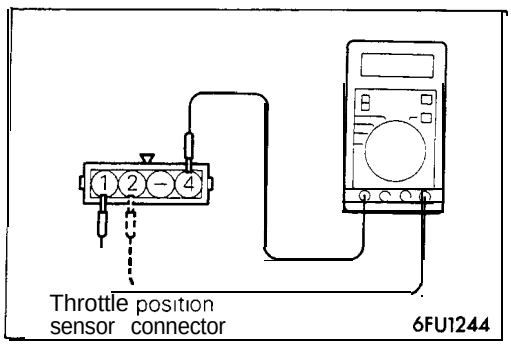
3



Check for an open-circuit, or a short-circuit to ground between the engine control module and the throttle position sensor.
. Throttle position sensor connector: Disconnected
. Engine control module connector: Disconnected

OK → STOP

NG → Repair the harness. (Ⓐ2–19)



SENSOR INSPECTION

(1) Disconnect the throttle position sensor connector.
(2) Measure resistance between terminal ④ (sensor ground) and terminal ① (sensor power).

Standard value: 3.5-6.5 kΩ

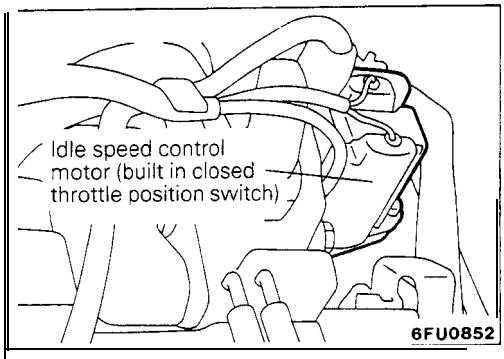
(3) Connect a pointer type ohmmeter between terminal ④ (sensor ground terminal) and terminal ② (sensor output terminal).
(4) Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
(5) If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

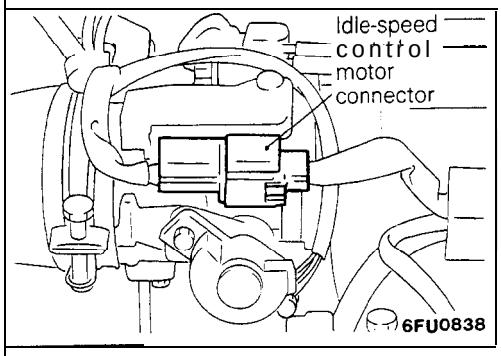
Throttle position sensor installation torque: 1.5-2.5 Nm (1.1–1.8 ft.lbs.)

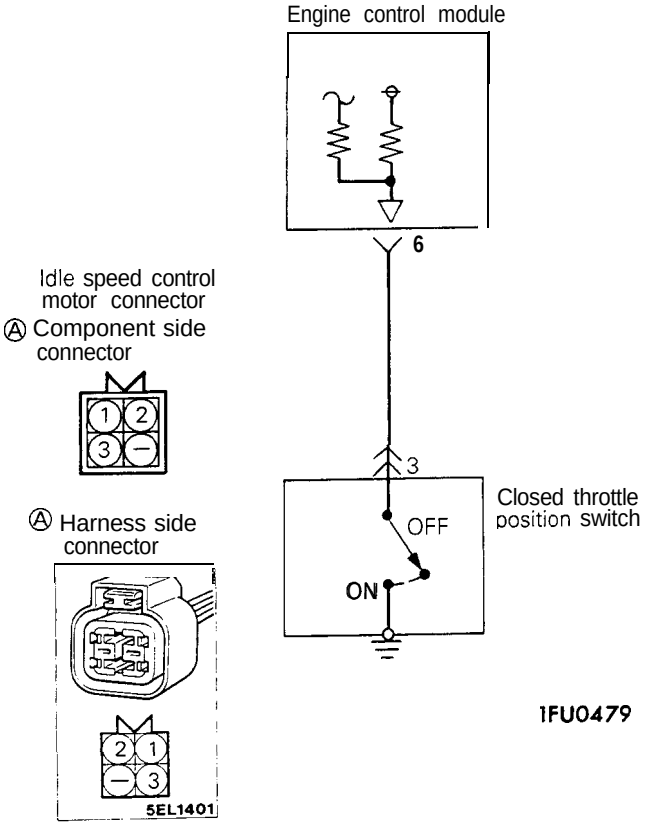
TSB Revision

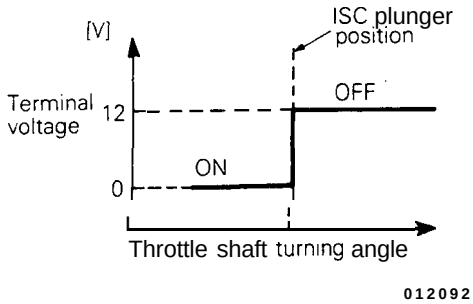
CLOSED THROTTLE POSITION SWITCH <1989 models>

M13YKAE









OPERATION

- The closed throttle position switch functions to convert (to HIGH/LOW-level voltage) data as to whether the accelerator is depressed or released, and to input that voltage (as signals) to the engine control module. The engine control module, based upon those signals, regulates the idle-speed control motor.
- Voltage within the engine control module is applied, by way of the resistance, to the closed throttle position switch.
  When the foot is taken off the accelerator, the closed throttle position switch is switched **ON,** so the current is grounded.
  As a result, the closed throttle position switch terminal voltage changes from HIGH to LOW level.

TROUBLESHOOTING HINTS

If there is an abnormal condition of the closed throttle position switch output even though the results of the checking of the closed throttle position switch harness and of the component itself indicate a normal condition, the cause may be presumed to be one of the following.

(1) Improper adjustment of the accelerator cable or the automatic-cruise-control cable.
(2) Improper adjustment of the fixed SAS.

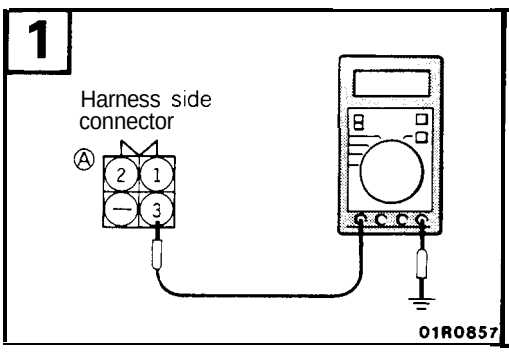
TSB Revision

INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Throttle valve	Normal indication
Data reading	26	Switch status	Ignition switch: ON (Check after pumping accelerator several times.)	To idle position	ON
				Slightly opened	OFF

HARNESS INSPECTION

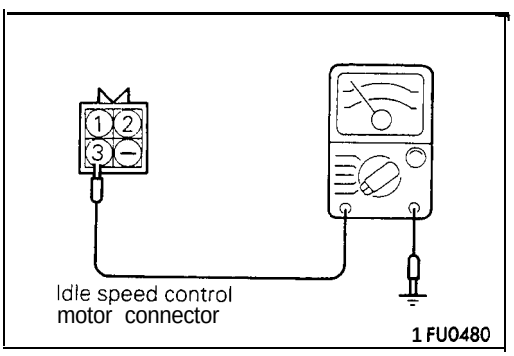


Measure the power supply voltage of the closed throttle position switch.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4 or more

OK → STOP

NG → Repair the harness. (Ⓐ3–6)



SENSOR INSPECTION

(1) Disconnect the idle speed control motor connector.
(2) Check the continuity between terminal ③ and body ground.

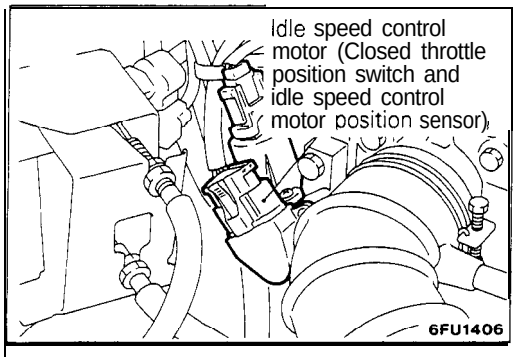
Accelerator pedal	Continuity
Depressed	Non-conductive (∞Ω)
Released	Conductive (0.Ω)

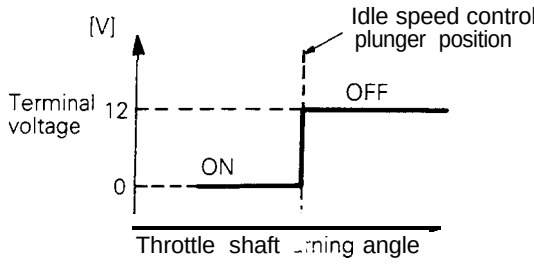
(3) If out of specification, replace the idle speed control motor assembly.

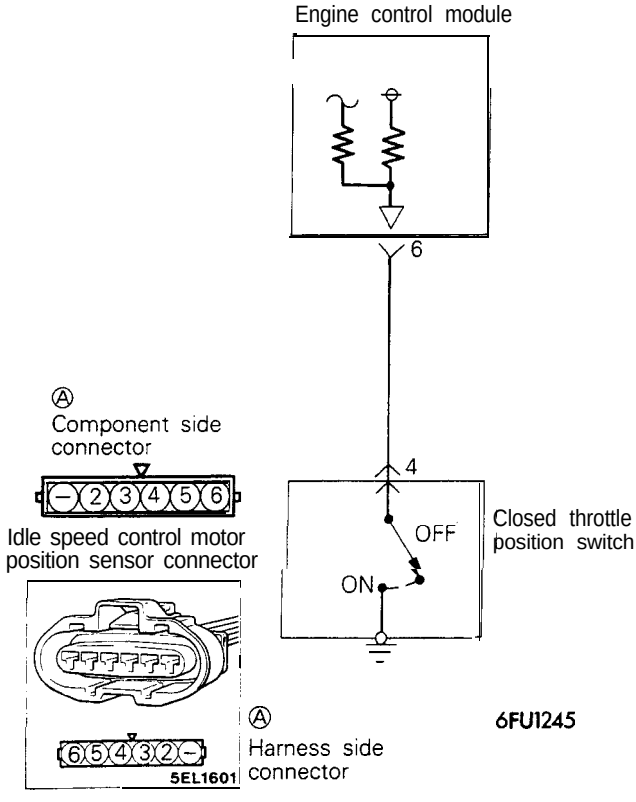
TSB Revision

CLOSED THROTTLE POSITION SWITCH <From 1990 models>

M13YKAF







OPERATION

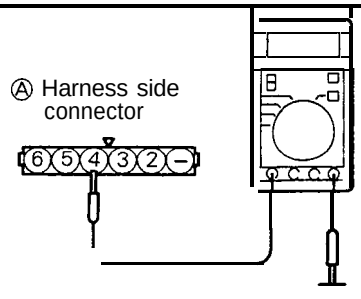
TROUBLESHOOTING HINTS

INSPECTION-Using Scan tool

Refer to P.13-61.

HARNESS INSPECTION

1

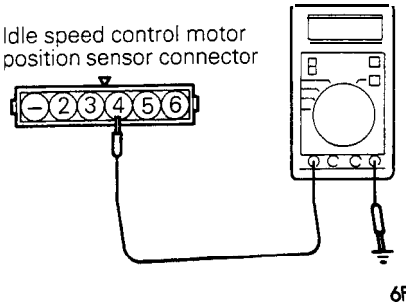


Measure the power supply voltage of the closed throttle position switch.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4 or more

OK → 2

NO → Repair the harness. (Ⓐ4–6)



SENSOR INSPECTION

(1) Disconnect the idle speed control motor position sensor connector.

(2) Check the continuity between terminal ④ and body ground.

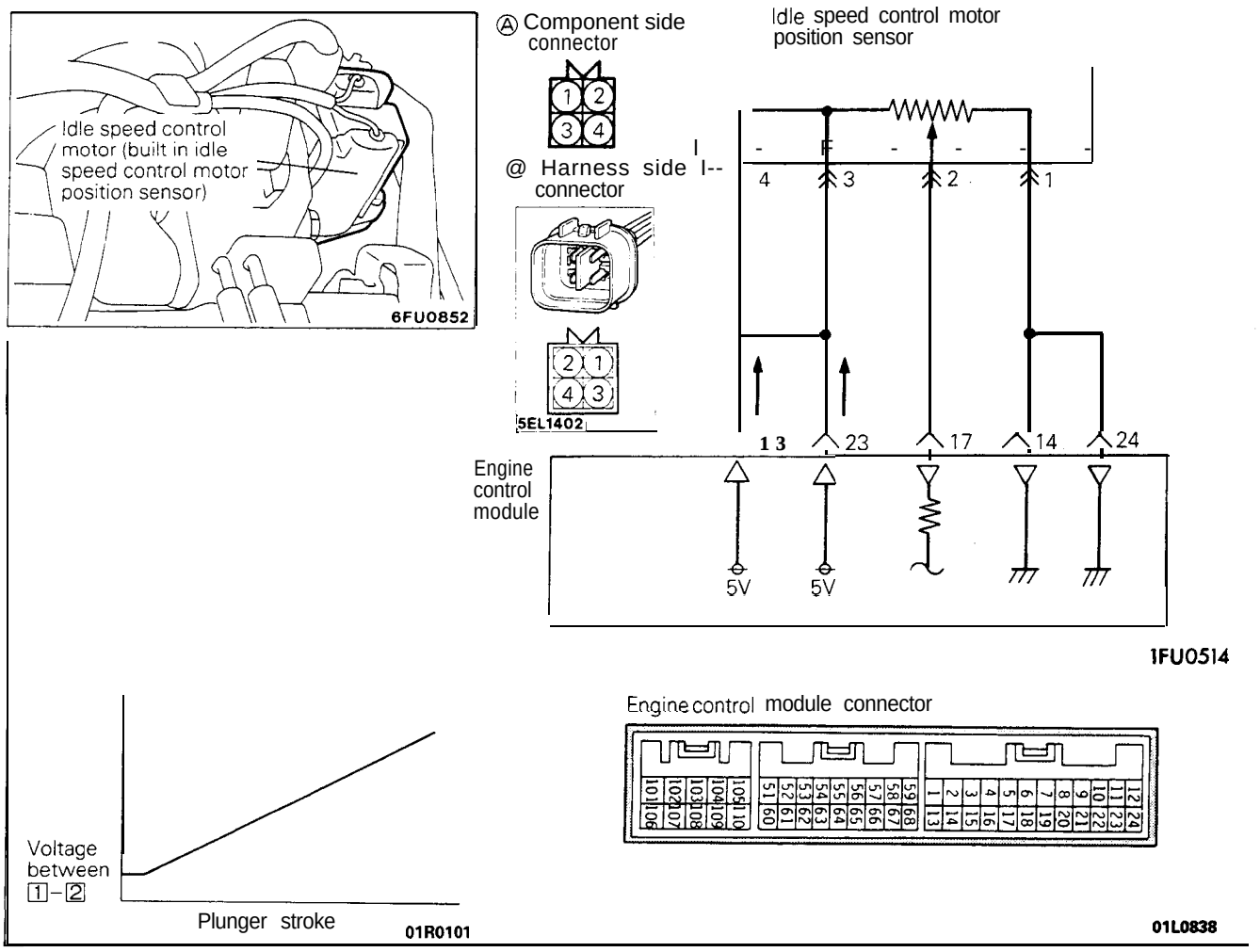
Accelerator pedal	Continuity
Depressed	Non-conductive (∞Ω)
Released	Conductive (0.Ω)

(3) If out of specification, replace the idle speed control motor assembly.

TSB Revision

IDLE SPEED CONTROL MOTOR POSITION SENSOR <1989 models>

M13YYAD



OPERATION

- The idle speed control motor position sensor functions to convert the data concerning the position of the plunger (located within the idle-speed control motor) to voltage, and to input that voltage (as signals) to the engine control module. The engine control module, based upon those signals, then functions to regulate the idle-speed control motor.
- The 5V power supply within the engine control module is supplied to the idle speed control position sensor; it then passes through the resistance within the sensor and is grounded at the engine control module.
- When the plunger located within the idle-speed control motor extends from its contracted condition, the resistance between the idle speed control motor position sensor's variable-resistance terminal and the ground terminal also increases in accordance with that extension. As a result, the voltage of the idle speed control motor position sensor's variable-resistance terminal also becomes higher in accordance with the extension.

TROUBLESHOOTING HINTS

Hint 1:

The idle speed control motor position sensor is the most important sensor for control of the idling speed; there is very often a malfunction of this sensor if a problem occurs when the engine load is caused to fluctuate, such as when, during idling, the air conditioning switch is switched back and forth between OFF and ON, etc.

Hint 2:

If the output voltage of the idle speed control motor position sensor deviates from the standard value even though the results of the checking of the idle speed control motor position sensor harness and of the component itself are normal, the malfunction may be presumed to be among the following:

TSB Revision

(1) Improper adjustment of the basic idling speed.
(2) Deposits adhering to the ttirottle valve.
(3) Air being taken into the intake manifold due to a gasket leak, etc.
(4) Improper seating of the EGR valve seat.
(5) Imcomplete combustion within a cylinder. (Malfunction of spark plugs, ignition coil, injectors, compression pressure, etc.)

OPERATION

ISC motor position sensor is a variable resistor type, and is integrated in the ISC motor system. The sliding pin of ISC motor position sensor is in contact with the end of the plunger. Therefore, as the plunger moves, the internal resistance of ISC motor position sensor varies. This leads to the variation of the output voltage. ISC motor position sensor detects the plunger position of the ISC motor system, and sends the signal to ECM. ECM processes the ISC motor position sensor signal, idle signal, coolant temperature signal, load signal (A/T & A/C) and vehicle speed signal to control the opening angle of the throttle valve and revolution speed during engine idling.

TROUBLESHOOTING HINTS

Since idling is not controlled when ISC motor position sensor is troubled, idling may not be evenly maintained.

INSPECTION

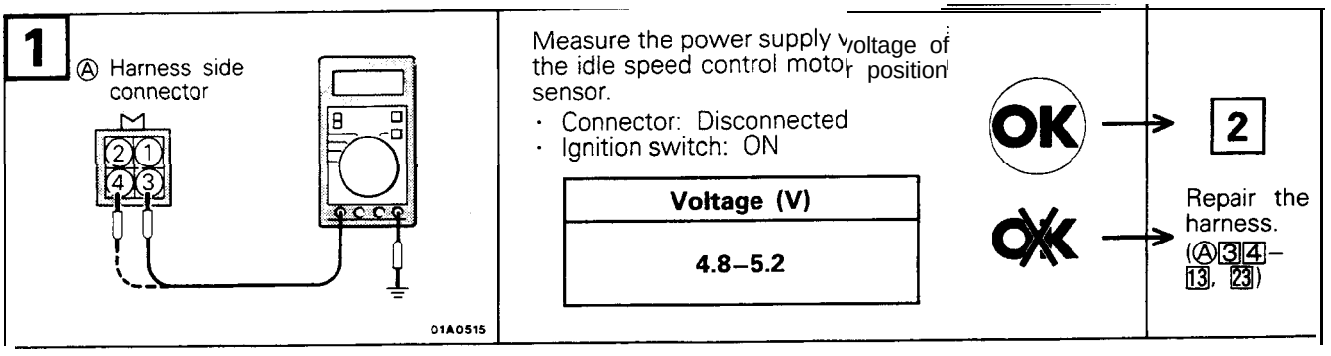
Using Scan tool

Function	Item No.	Data display	Inspection conditions	Load conditions	Standard value
Data reading	15	Sensor detection voltage	. Engine coolant temperature: 85–95°C (185–203°F) . Lights, cooling fan, electrical accessories: OFF . Transaxle: neutral (A/T models: "P" range) • Closed throttle position switch: ON (The compressor clutch must be operating when the air conditioning switch is ON.) • Engine: running at idle	Air conditioning switch: OFF	500– 1,300 mV
				Air conditioning switch: ON	800– **1,800** mV
				Air conditioning switch: ON Select lever: shift to "D" range.	900– 1,900 mV

NOTE
The idle speed control motor position sensor output voltage may be about 500 mV higher than indicated above when the vehicle is new [driven approximately 500 km (300 miles) or less].

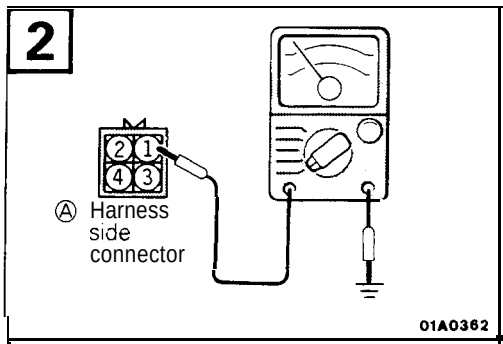
Caution
Before shifting the select lever to the "D" range, apply the brakes to prevent the vehicle from moving forward.

HARNESS INSPECTION



TSB Revision

2

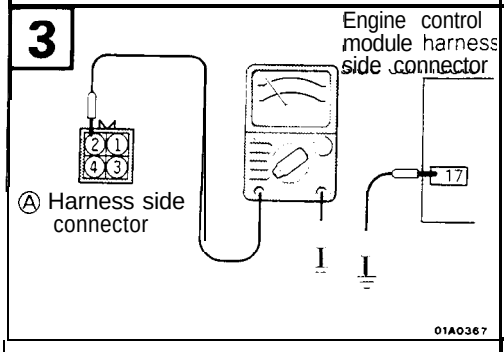


Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ1 – 14, 24)

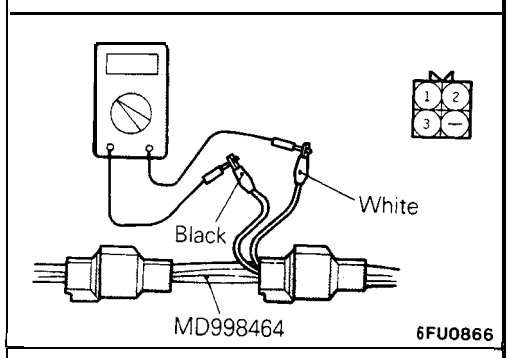
3

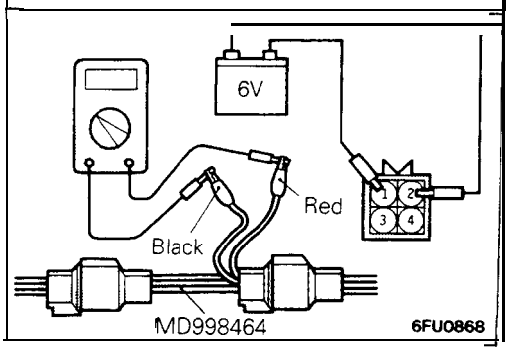


Check for an open-circuit, or a short-circuit to ground between the engine control module and the idle speed control motor position sensor.
• Engine control module connector: Disconnected
. idle speed control motor position sensor connector: Disconnected

OK → STOP

NG → Repair the harness. (Ⓐ2 – 17)





SENSOR INSPECTION

(1) Disconnect the idle speed control motor position sensor connector, and connect the special tool (test harness) to the connector on idle speed control motor position sensor side.

(2) Measure the resistance between terminal ① (black clip of special tool) and terminal ③ (white clip) of the idle speed control motor position sensor connector.

Standard value: 4-6 kΩ

(3) Disconnect the idle speed control motor connector.

(4) Connect a 6V DC power supply between terminals ① and ② of the idle speed control motor connector to activate (extend and retract) the idle speed control motor. Measure the resistance between terminal ① (black clip of special tool) and terminal ② (red clip) of the idle speed control motor position sensor connector.

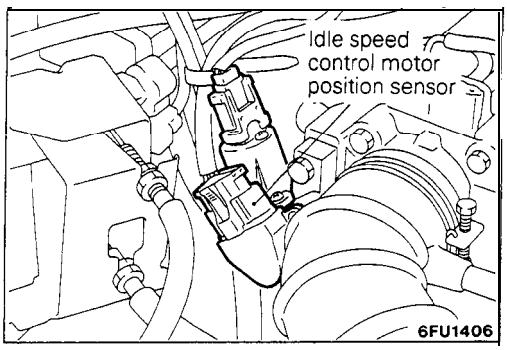
Standard value: Smooth increase/decrease in accordance with extension and retraction of idle speed control motor plunger.

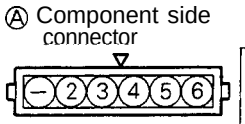
Caution
Apply only a 6V DC or lower voltage. Application of higher voltage could cause locking of the servo gears.

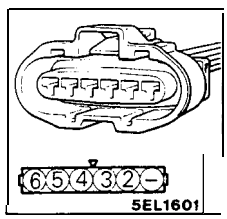
(5) If there is a deviation from the standard value, or if the change is not smooth, replace the idle speed control motor assembly.

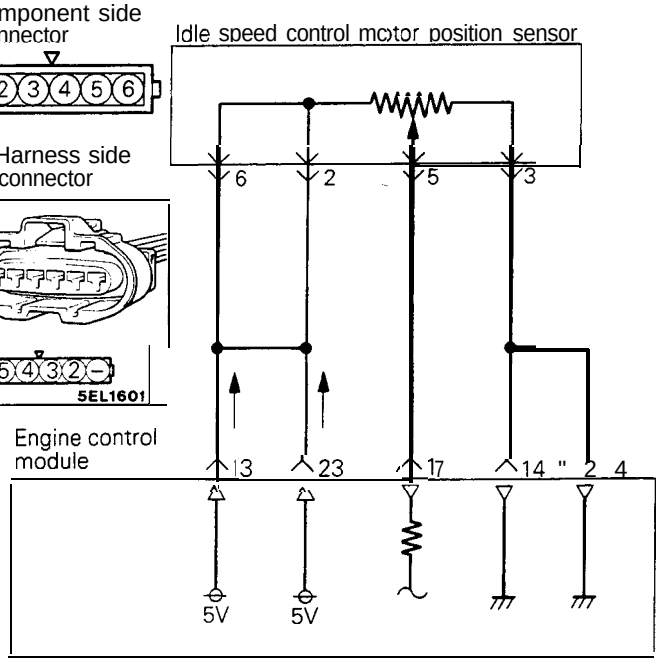
TSB Revision

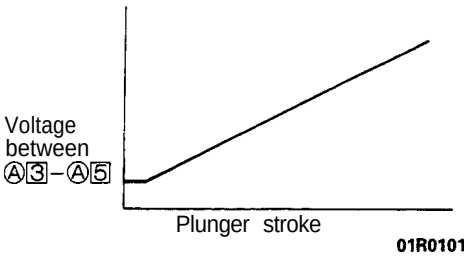
IDLE SPEED CONTROL MOTOR POSITION SENSOR <From 1990 models> M13YYAE

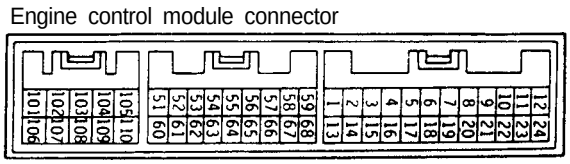












OPERATION

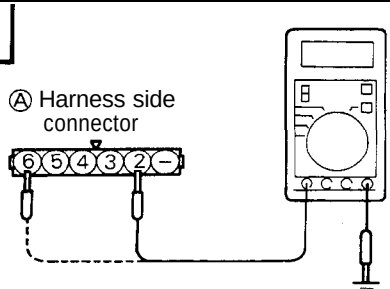
TROUBLESHOOTING HINTS

INSPECTION-Using Scan tool

Refer to P.13-64.

HARNESS INSPECTION

1



Measure the power supply voltage of the idle speed control motor position sensor.

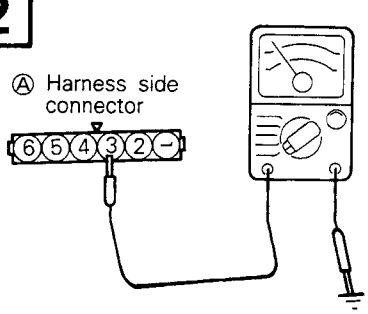
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 2

NG → Repair the harness. (Ⓐ2 El-m, 23)

2



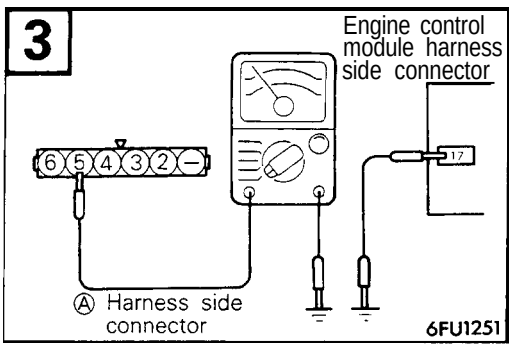
Check for continuity of the ground circuit.

. Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ3–14, 24)

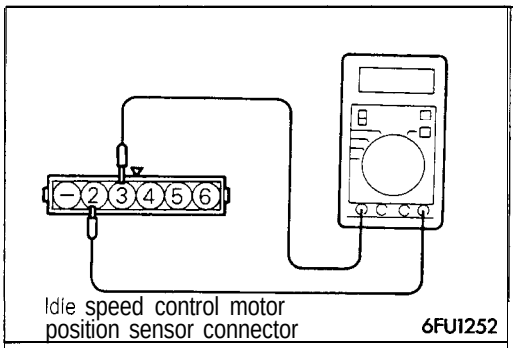
3

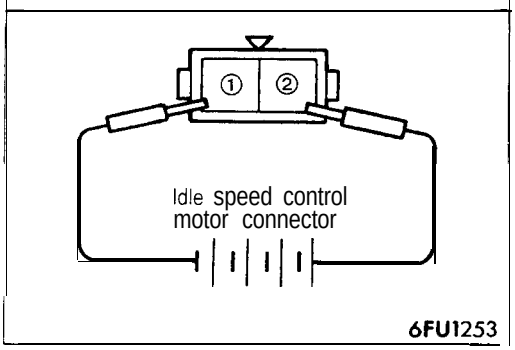


Check for an open-circuit, or a short-circuit to ground, between the engine control module and the idle speed control motor position sensor.
. Engine control module connector: Disconnected
. Idle speed control motor position sensor connector: Disconnected

OK → STOP

OK → Repair the harness. (Ⓐ5 – 17)





SENSOR INSPECTION

(1) Disconnect the idle speed control motor position sensor connector.
(2) Measure the resistance between terminals ② and ③.

Standard value: 4-6 kΩ

(3) Disconnect the idle speed control motor connector.
(4) Connect DC 6V between terminals ① and ② of the idle speed control motor connector, and then measure the resistance between terminals ③ and ⑤ of the idle speed control motor position sensor connector when the idle speed control motor is activated (caused to expand and contract).

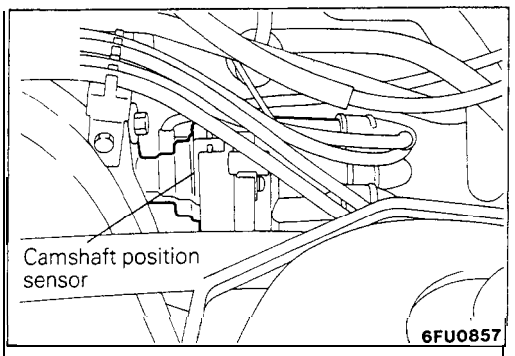
Standard value: Smooth increase/decrease in accordance with expansion and contraction of the idle speed control motor plunger.

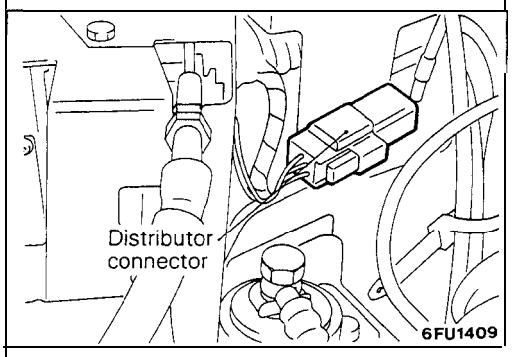
Caution
Apply only a 6V DC or lower voltage. Application of higher voltage could cause locking of the servo gears.

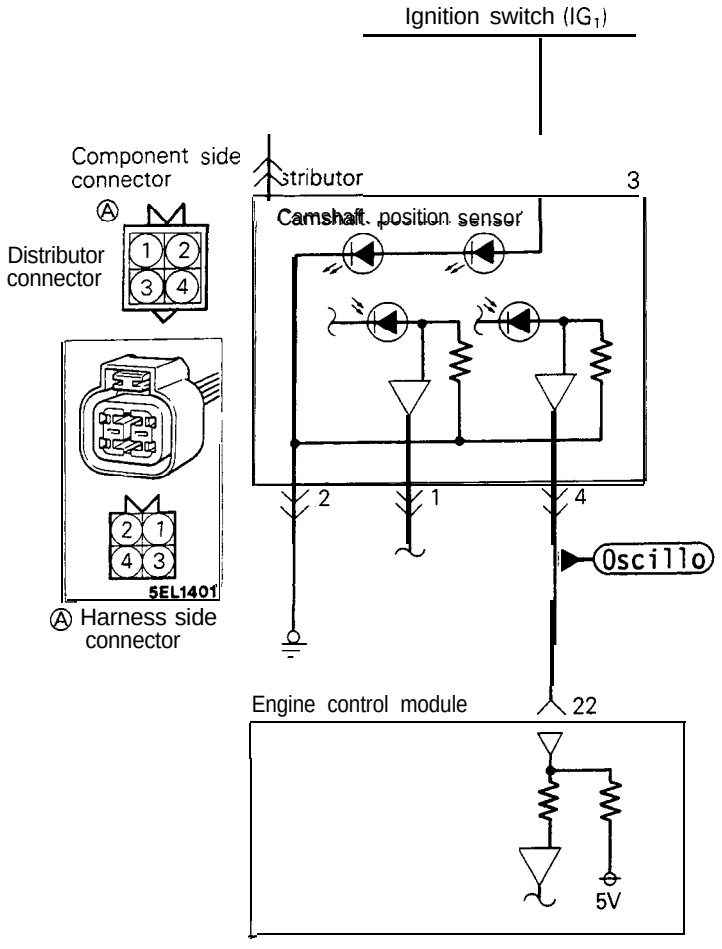
(5) If there is a deviation from the standard value, or if the change is not smooth, replace the idle speed control motor assembly.

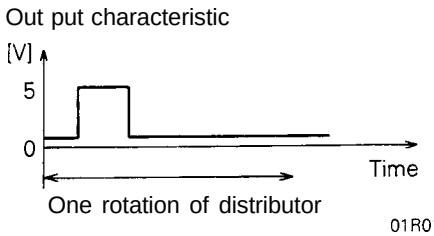
CAMSHAFT POSITION SENSOR <Up to 1990 models>

M13YLAA









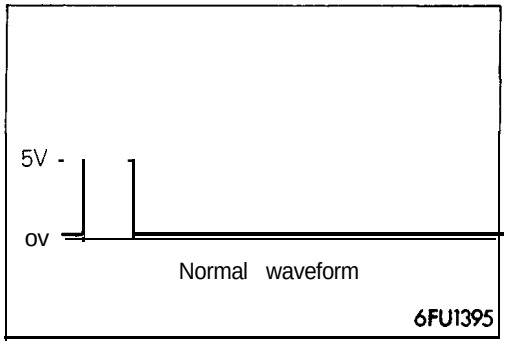
6FU1255

OPERATION

- The camshaft position sensor functions to detect the top dead center position of the No. 1 cylinder and to convert those data to pulse signals that are input to the engine control module. The engine control module, based upon those signals, calculates the sequence of fuel injection.
- The power for the camshaft position sensor is supplied from the ignition switch–IG and is grounded to the vehicle body. The camshaft position sensor, by intermitting the flow (to ground) of the 5V voltage applied from the engine control module, produces pulse signals.

TROUBLESHOOTING HINTS

If there is a malfunction of the camshaft position sensor, the sequential injection will not be correct, resulting in such problems as engine stalling, unstable idling, and poor acceleration.



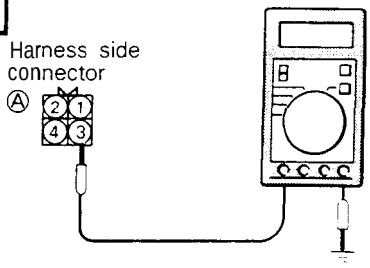
INSPECTION

Using Oscilloscope

(1) Run the engine at the idle speed.
(2) Connect the probe to the oscilloscope pick-up point in the circuit diagram, and check the waveform.

HARNESS INSPECTION

1



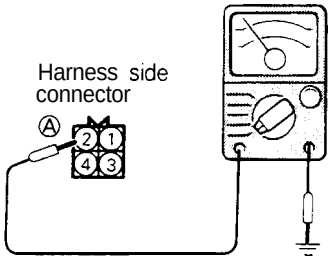
Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Ⓐ3 – Ignition switch)

2

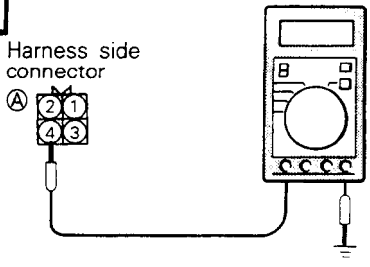


Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ2 – Ground)

3



Check the voltage of the output circuit.
. Connector: Disconnected
. Ignition switch: ON

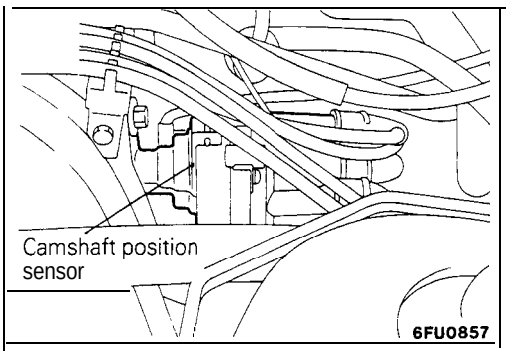
Voltage (V)
4.8–5.2

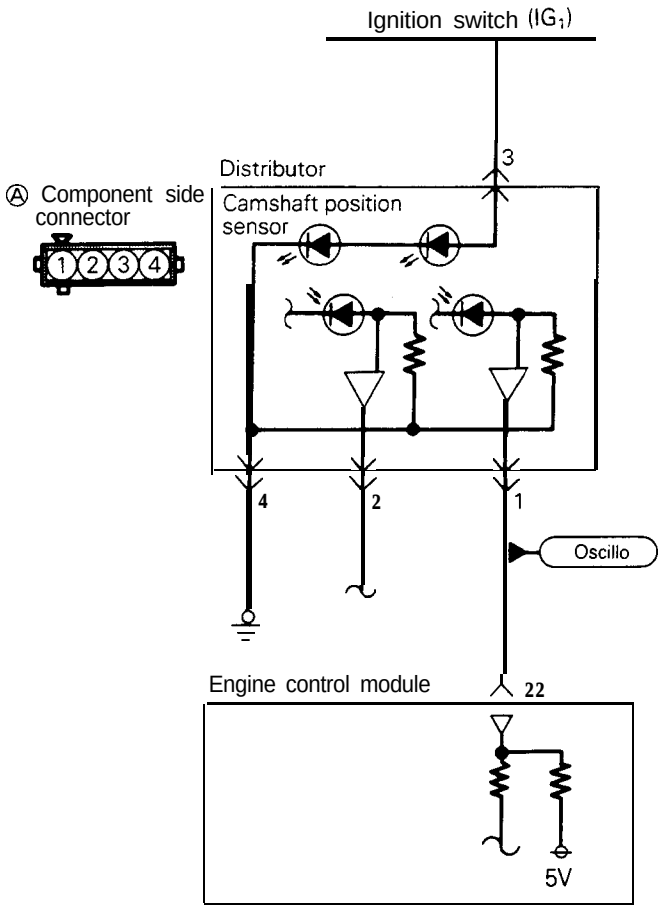
OK → STOP

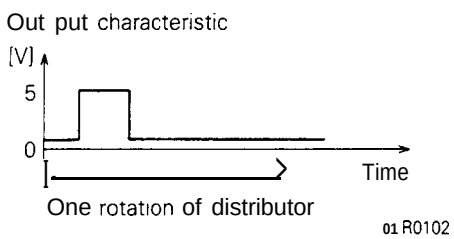
NG → Repair the harness. (Ⓐ4 – 22)

CAMSHAFT POSITION SENSOR <From 1991 models>

M13YLAB







OPERATION

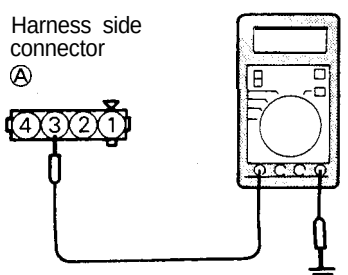
TROUBLESHOOTING HINTS

INSPECTION-Using Oscilloscope

Refer to P.13-69.

HARNESS INSPECTION

1 Harness side connector Ⓐ



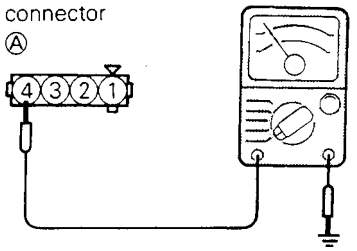
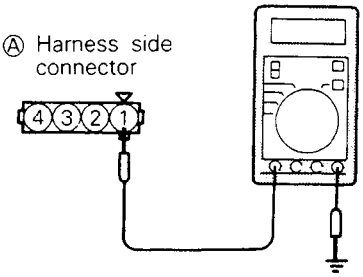
Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → **2**

NG → Repair the harness. (Ⓐ3 – Ignition switch)

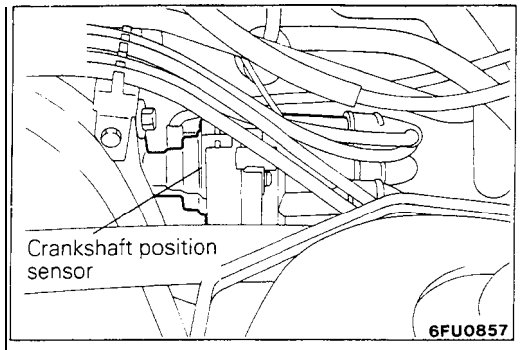
TSB Revision

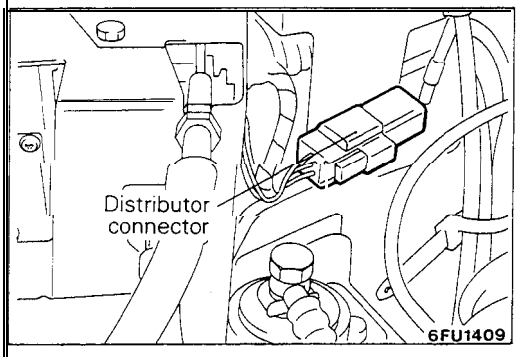
2	Harness side connector Ⓐ  7FU0497	Check for continuity of the ground circuit. Connector: Disconnected	OK → 3 NG → Repair the harness. (Ⓐ4 – Ground)
3	Ⓐ Harness side connector  7FU0498	Check the output circuit voltage. . Connector: Disconnected . Ignition switch: ON **Voltage (V)**: **4.8–5.2**	OK → STOP NG → Repair the harness. (Ⓐ1 – 22)

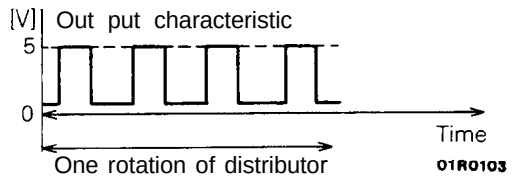
TSB Revision

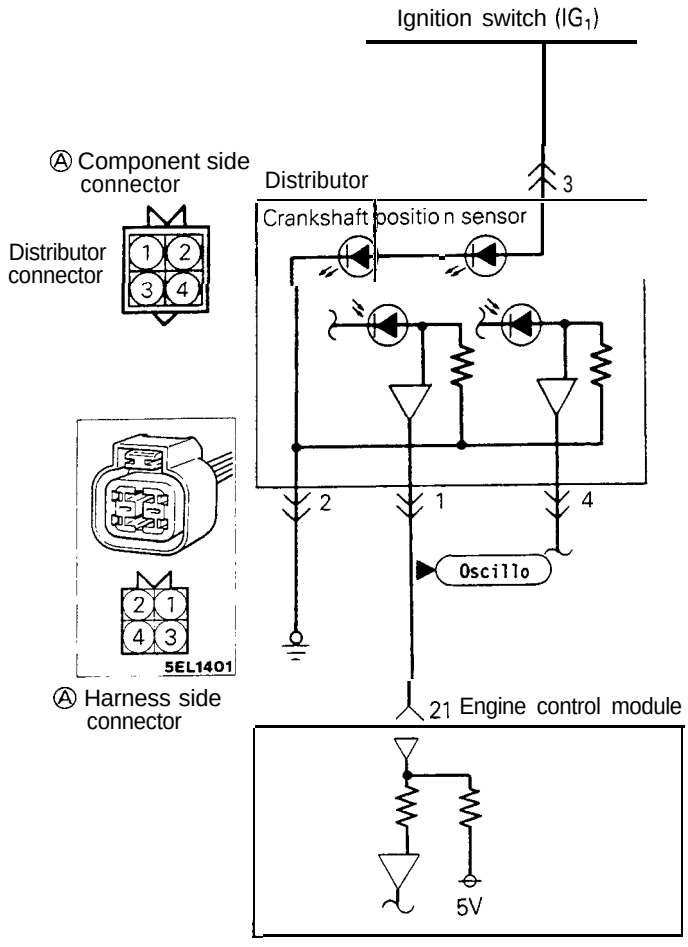
CRANKSHAFT POSITION SENSOR <Up to 1990 models>

M13YMAA









OPERATION

- The crankshaft position sensor functions to detect the crank angle (position) of each cylinder, and to convert those data to pulse signals, which are then input to the engine control module. The engine control module, based upon those signals, calculates the engine rpm, and also regulates the fuel injection timing and the ignition timing.
- The power for the crankshaft position sensor is supplied from the ignition switch–IG and is grounded to the vehicle body. The crankshaft position sensor, by intermitting the flow (to ground) of the 5V voltage applied from the engine control module, produces pulse signals.

TROUBLESHOOTING HINTS

Hint 1:
If an impact is suddenly felt during driving or the engine suddenly stalls during idling, try shaking the crankshaft position sensor during idling.
If the engine stalls, the cause may be presumed to be improper or incomplete contact of the crankshaft position sensor's connector.
Hint 2:
If the crankshaft position sensor output rpm is 0 rpm during cranking when the engine cannot be started, the cause may be presumed to be a malfunction of the crankshaft position sensor or a broken timing belt.
Hint 3:
If the indicated value of the crankshaft position sensor output rpm is 0 rpm during cranking when the engine cannot be started, the cause may be presumed to be a failure of the ignition coil's primary current to intermittently pulse correctly, so a malfunction of the ignition system circuitry, the ignition coil and/or the ignition power transistor is the probable cause.

TSB Revision

Hint 4:
If idling is possible even though the crankshaft position sensor indicated rpm is a deviation from the standard value, the cause is usually a malfunction of something other than the crankshaft position sensor.

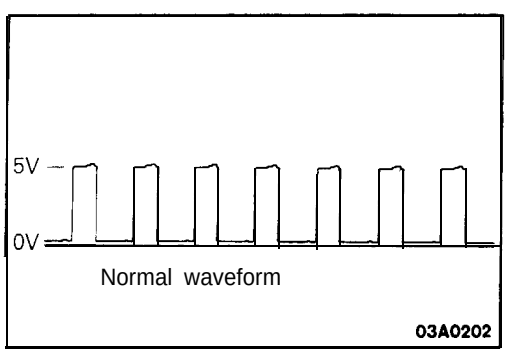
Examples:
(1) Malfunction of the coolant-temperature sensor.
(2) Malfunction of the idling-speed control motor.
(3) Improper adjustment of the standard idling speed.

INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Description	Normal condition
Data reading	22	Cranking rpm	. Engine: Cranking . Tachometer connection (Check intermittent flow of ignition coil primary current by tachometer.)	Compare cranking rpm and scan tool indicated rpm.	Both agree.

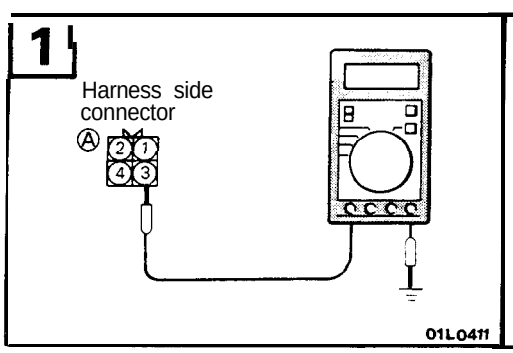
Function	Item No.	Data display	Inspection conditions	Engine coolant temperature	Standard value
Data reading	22	Idling rpm	· Engine: Idling · Closed throttle position switch: ON	At –20°C (–4°F)	1,500–1,700 rpm
				At 0°C (32°F)	1,350–1,550 rpm
				At 20°C (68°F)	1,200–1,400 rpm
				At 40°C (104°F)	900–1,100 rpm
				At 80°C (176°F)	150–850 rpm



Using Oscilloscope

(1) Run the engine at idle speed.
(2) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram, and check the waveform.

HARNESS INSPECTION



Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

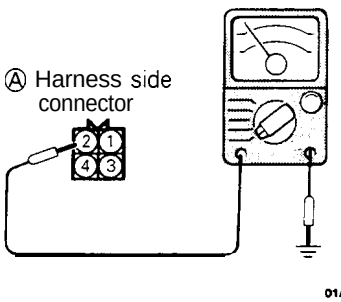
Voltage (V)
Battery positive voltage

OK → 2

OK → Repair the harness. (Ⓐ3 – Ignition switch)

TSB Revision

2

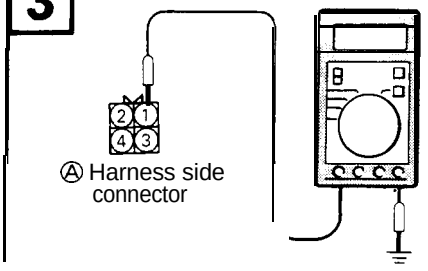


Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 3

OK → Repair the harness. (Ⓐ2 – Ground)

3



Check the voltage of the output circuit.
. Connector: Disconnected
. ignition switch: ON

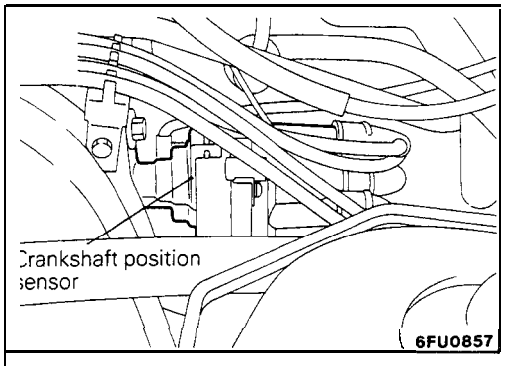
Voltage (V)
4.8–5.2

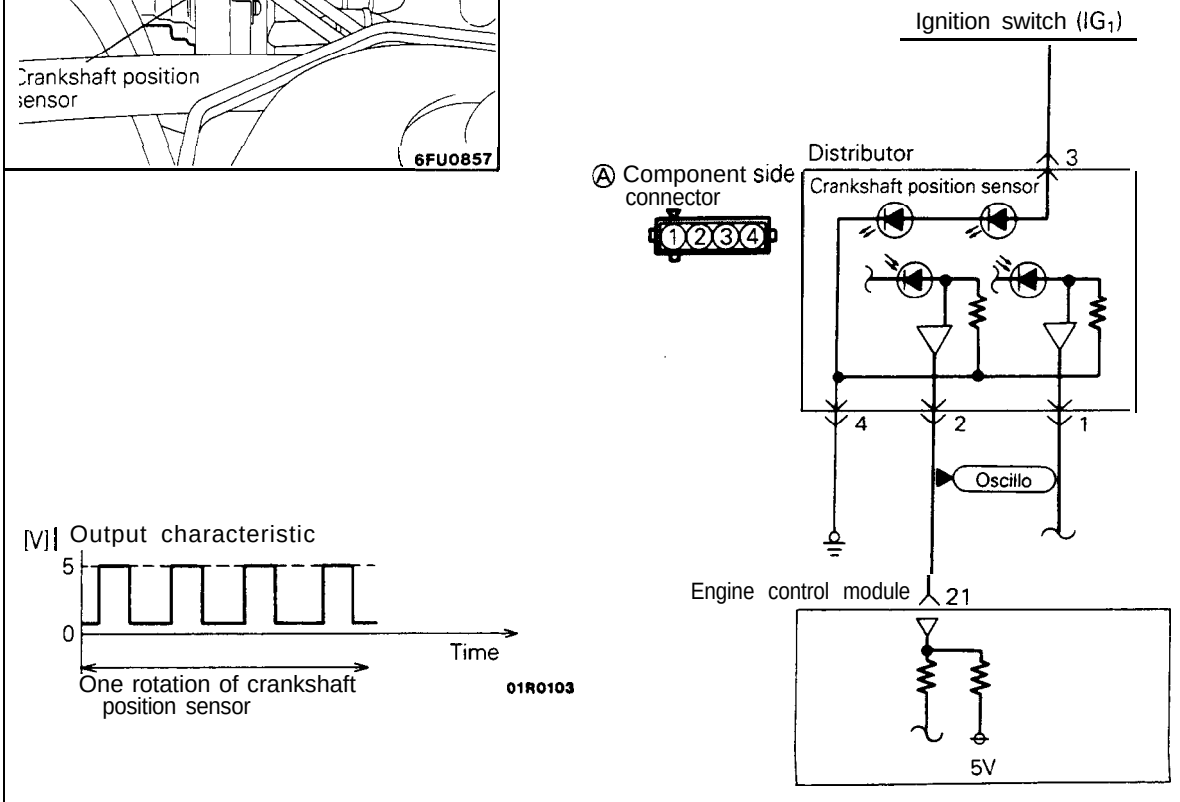
OK → STOP

OK → Repair the harness. (Ⓐ1 – 21)

CRANKSHAFT POSITION SENSOR <From 1991 models>

M13YMAB

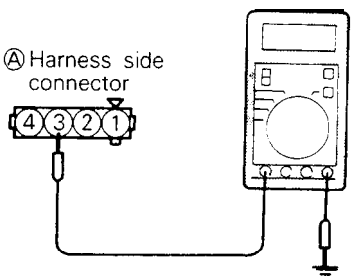




OPERATION
TROUBLESHOOTING HINTS
INSPECTION-Using Scan tool
INSPECTION-Using Oscilloscope
Refer to P.13-73.

HARNESS INSPECTION

1



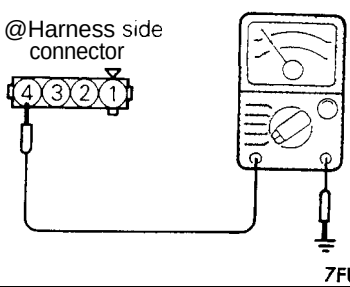
Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Ⓐ3 – Ignition switch)

2

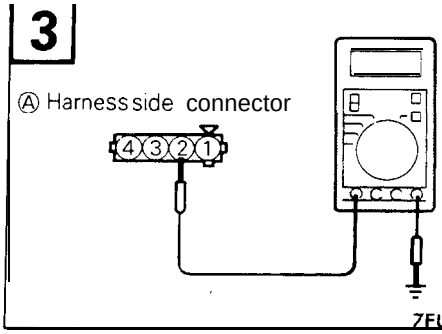


Check for continuity of the ground circuit,
Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ4 – Ground)

3



Check the voltage of the output circuit.
. Connector: Disconnected
. Ignition switch: ON

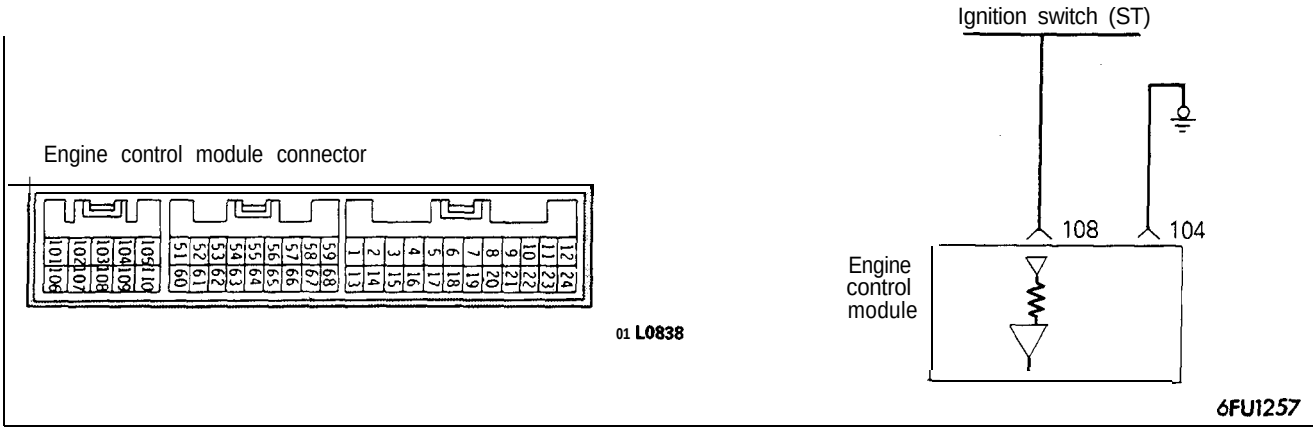
Voltage (V)
4.8–5.2

OK → STOP

NG → Repair the harness. (Ⓐ2 – 21)

IGNITION SWITCH-ST <M/T>

M13YNAA



OPERATION

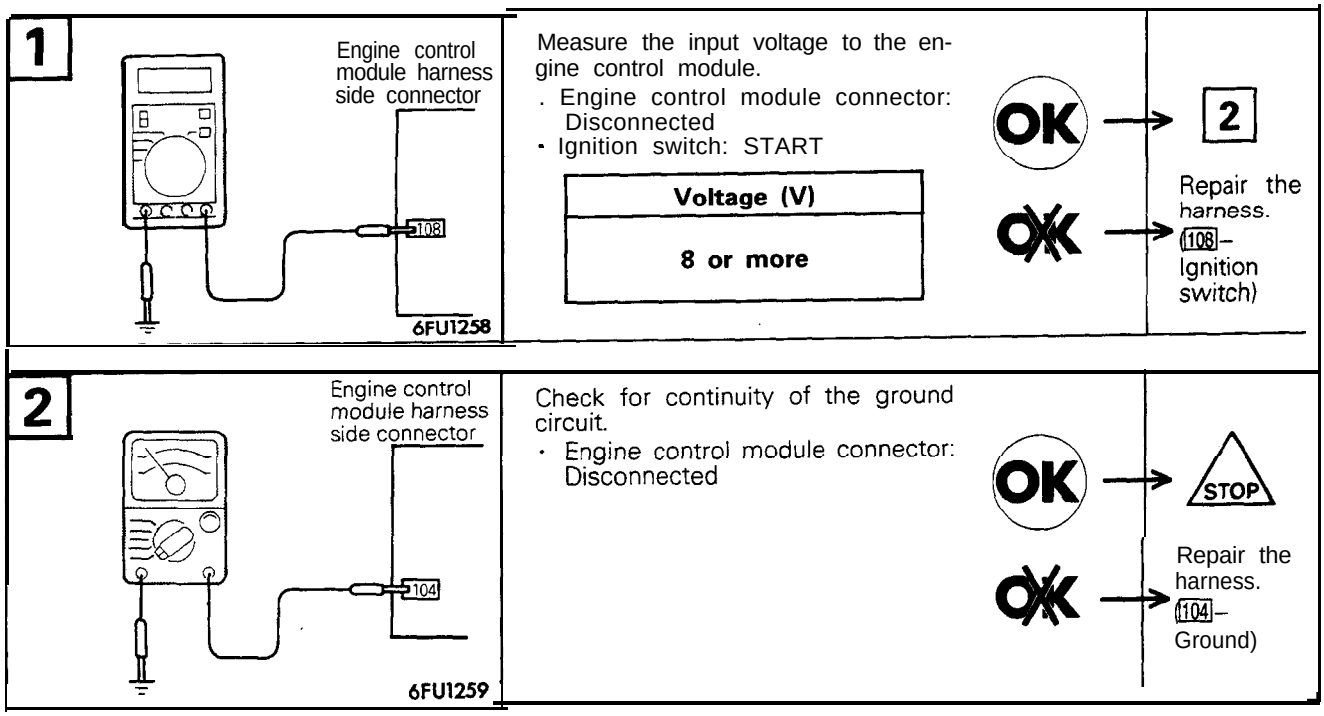
- The ignition switch-ST inputs HIGH-level signals to the engine control module during engine cranking. The engine control module, based on those signals, regulates fuel injection during starting, etc.
- When the ignition switch is set to START, the battery voltage during engine cranking is, by way of the ignition switch, applied to the engine control module, and the engine control module thus detects the fact that the engine is cranking.

INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine	Normal indication
Data reading	18	Switch status	Ignition switch: ON	Stopping	OFF
				Cranking	ON

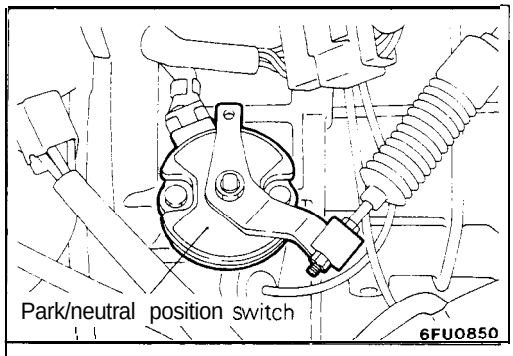
HARNESS INSPECTION

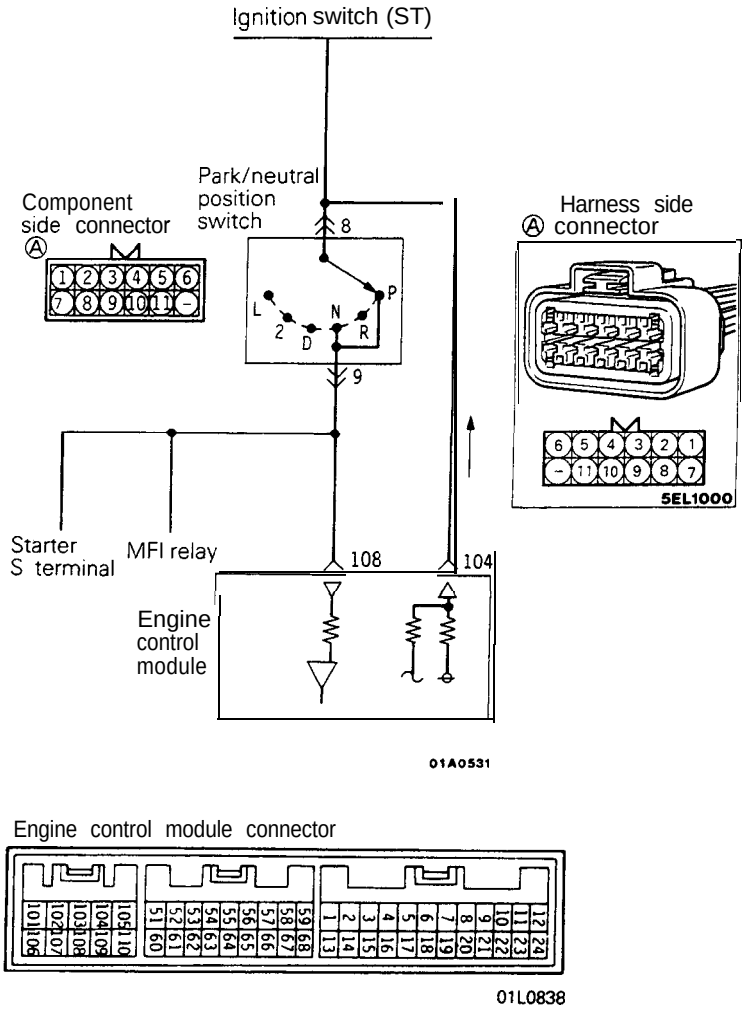


TSB Revision

IGNITION SWITCH-ST AND PARK/NEUTRAL POSITION SWITCH <A/T>

M13YOAA





Engine control module connector

OPERATION

- The ignition switch-ST inputs HIGH-level signals to the engine control module during engine cranking. The engine control module, based on those signals, regulates fuel injection during starting, etc.
- When the ignition switch is set to START, the battery voltage during engine cranking is, by way of the ignition switch and the park/neutral position switch, applied to the engine control module, and the engine control module thus detects the fact that the engine is cranking.
  Note that battery voltage is not applied to the engine control module if the position of the selector lever is other than the "P" or "N" range.
- The park/neutral position switch functions to convert the voltage to HIGH level or LOW level depending upon whether the selector lever is at the "P" or "N" range or is at some position other than the "P" or "N" range, and inputs the result to the engine control module. The engine control module, based upon those signals, then regulates the operation of the idle speed control motor.
- Battery voltage within the engine control module is applied, by way of the resistance, to the park/neutral position switch. When the selector lever is set to the "P" or "N" range, continuity is created, via the starter motor, between the engine control module's park/neutral position switch terminal and ground, and the terminal voltage becomes LOW level.

TROUBLESHOOTING HINTS

If the output of the park/neutral position switch is abnormal even though the results of the checking of the park/neutral position switch harness and of the component itself are normal, it is probable that the cause is improper adjustment of the control cable.

TSB Revision

INSPECTION

Using Scan tool

Ignition switch-ST

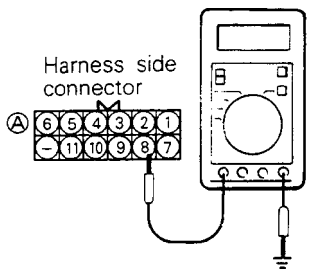
Function	Item No.	Data display	Check conditions	Engine	Normal display
Data reading	18	Switch status	. Ignition switch: ON	Stopped	OFF
				Cranking	ON

Park/neutral position switch

Function	Item No.	Data display	Check conditions	Selector lever position	Normal display
Data reading	29	Shift position	. Ignition switch: ON	Por N	Por N
				D, 2, Lor R	D, 2, L or R

HARNESS INSPECTION

1



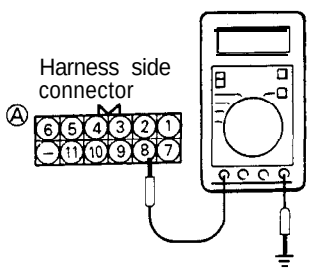
Measure the power supply voltage of the park/neutral position switch.
. Engine control module connector: Disconnected
. Park/neutral position switch connector: Disconnected
• Ignition switch: START

Voltage (V)
Battery positive voltage

OK → 2

NG → Check the power supply circuit.

2



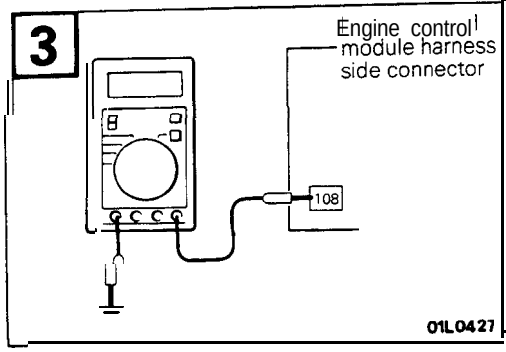
Measure the park/neutral position switch terminal input voltage.
• Engine control module connector: Connected
• Park/neutral position switch connector: Disconnected
• Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 3

NG → Repair the harness. (A8–104)

3



Measure the input voltage of engine control module.
. Engine control module connector: Disconnected
. Park/neutral position switch connector: Connected
• Selector lever: "P" range
. Ignition switch: START

Voltage (V)
8 or more

OK → STOP

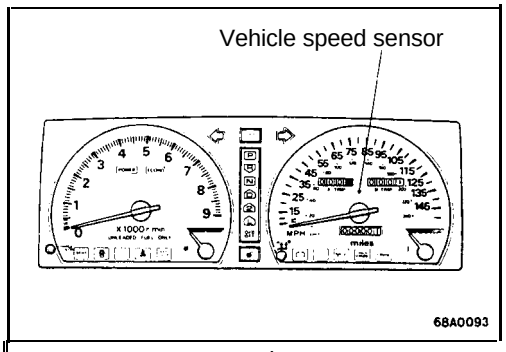
NG → Repair the harness. (A9–108)

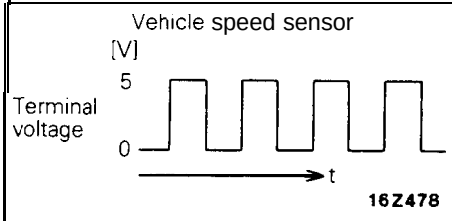
PARK/NEUTRAL POSITION SWITCH INSPECTION

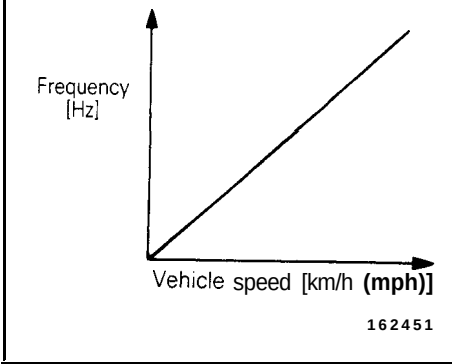
Refer to GROUP 23–Troubleshooting.

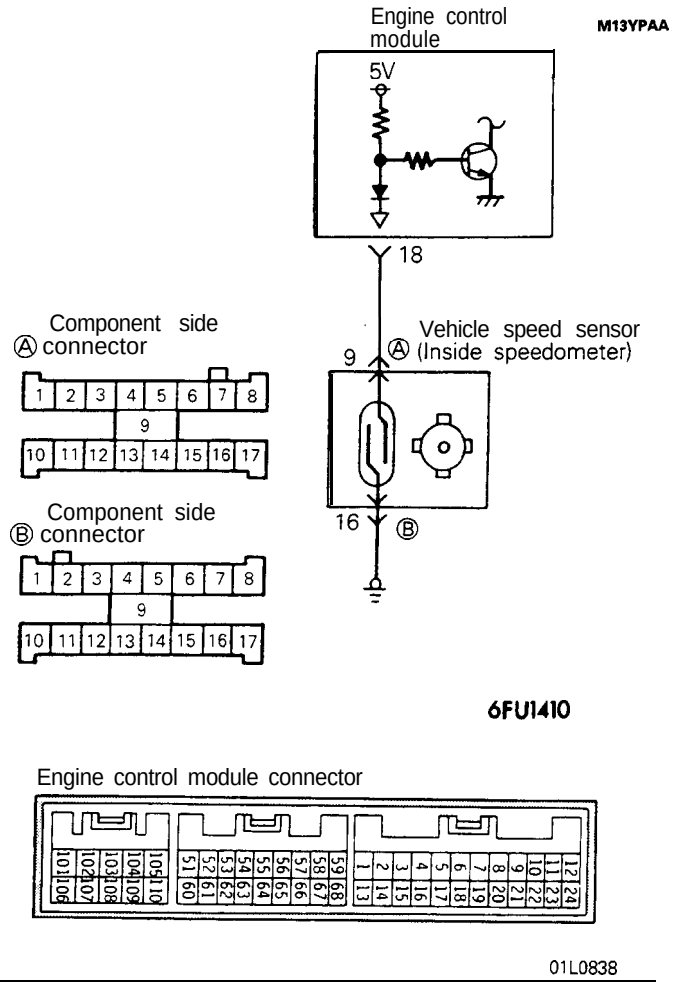
TSB Revision

VEHICLE SPEED SENSOR









OPERATION

- The vehicle-speed sensor is incorporated within the speedometer; it converts vehicle-speed data to pulse signals and inputs those signals to the engine control module. The engine control module, based upon those signals, regulates the idle-speed control motor, etc.

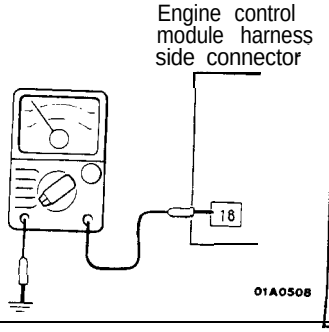
TROUBLESHOOTING HINTS

If 'there is damaged or disconnected wiring, or a short-circuit, of the vehicle-speed sensor signal circuit. the engine may stall when the vehicle speed is reduced and the vehicle is stopped.

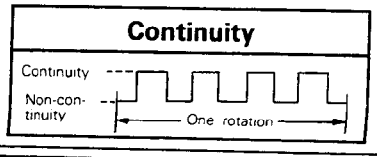
- The vehicle-speed sensor, by intermitting by the reed switch the flow (to ground) of the approximately 5V voltage applied from the engine control module, produces vehicle-speed signals.

HARNESS INSPECTION

1



Check the vehicle speed sensor output circuit for continuity.
. Engine control module connector: Disconnected
. Move the vehicle.



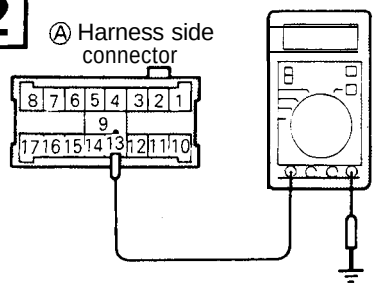
OK → STOP

OK → 2

TSB Revision

2

Ⓐ Harness side connector



6FU1265

Measure the power supply voltage of the vehicle speed sensor.
. Connector: Disconnected
. Ignition switch: ON

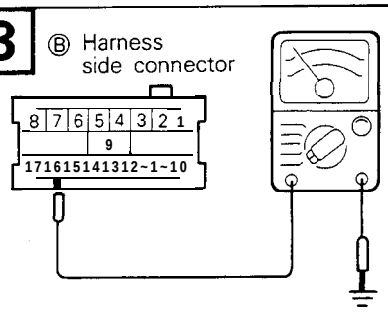
Voltage (V)
4.5-4.9

OK → 3

NG → Repair the harness. (Ⓐ9–18)

3

Ⓑ Harness side connector



6FU1485

Check for continuity of the ground circuit.
Connector: Disconnected

OK → STOP

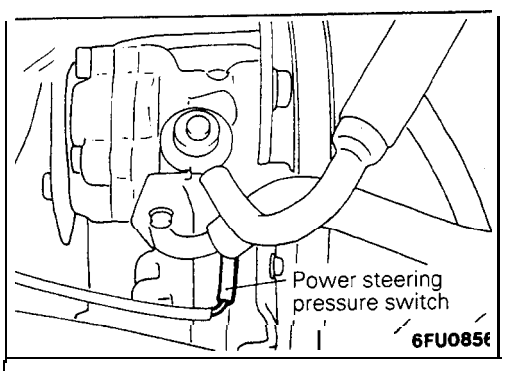
NG → Repair the harness. (Ⓑ16–Ground)

SENSOR INSPECTION

Refer to GROUP 54–Meters and Gauges.

POWER STEERING PRESSURE SWITCH

M13YQAA



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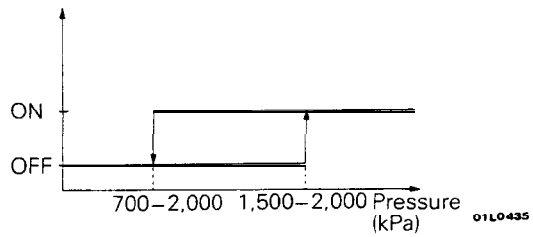
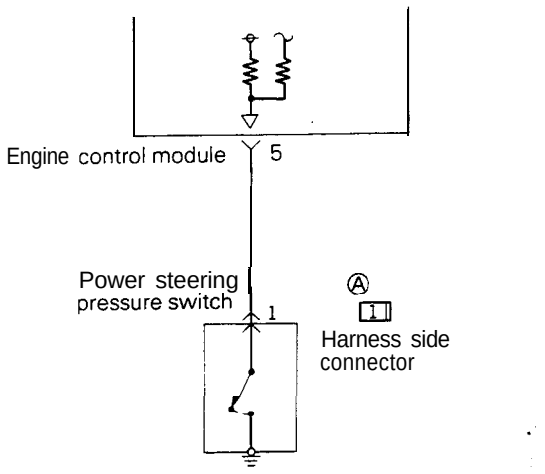
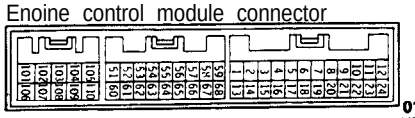


01L0435



7FU0536

Enoine control module connector



01L0838

TSB Revision

OPERATION

- The power-steering pressure switch functions to convert data as to whether there is or is not a power steering load to LOW-or HIGH-level voltage, and the resulting signals are input to the engine control module. The engine control module, based upon those signals, regulates the idle-speed control motor.
- The battery voltage within the engine control module is applied, by way of the resistance, to the power-steering pressure switch. When steering maneuvers are made, the pressure of the power-steering oil increases, thus switching ON the power-steering pressure switch, with the result that the current is grounded. As a result, the power-steering pressure switch voltage changes from HIGH level to LOW level.

INSPECTION

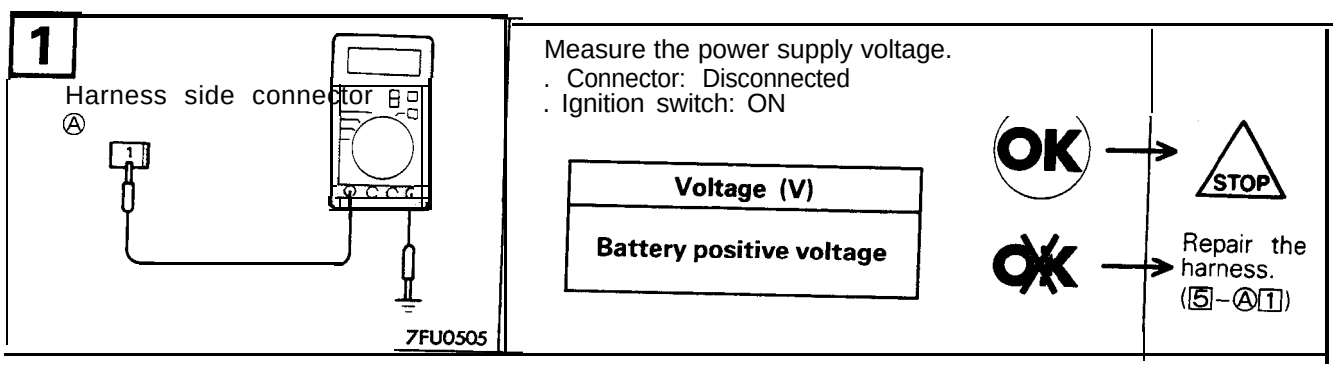
(1) Using Scan tool

Function	Item No.	Data display	Inspection conditions	Steering wheel	Normal indication
Data reading	27	Switch status	Engine: Idling	Steering wheel idle state	OFF
				During steering wheel operation	ON

(2) Checking Oil Pressure

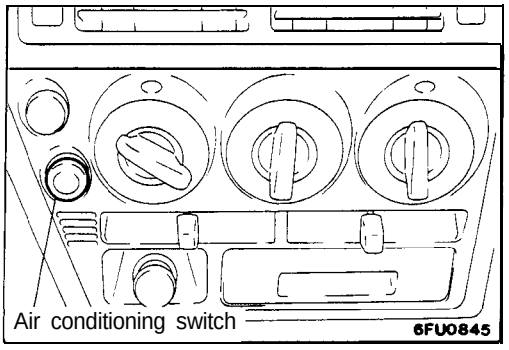
Steering wheel	Oil pump delivery pressure (ref. value)
Straight forward	less than 1,470– 1,961 kPa (213-284 psi)
Turned	more than 1,470– 1,961 kPa (213-284 psi)

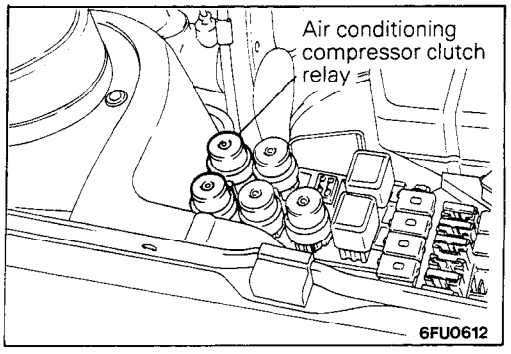
HARNESS INSPECTION

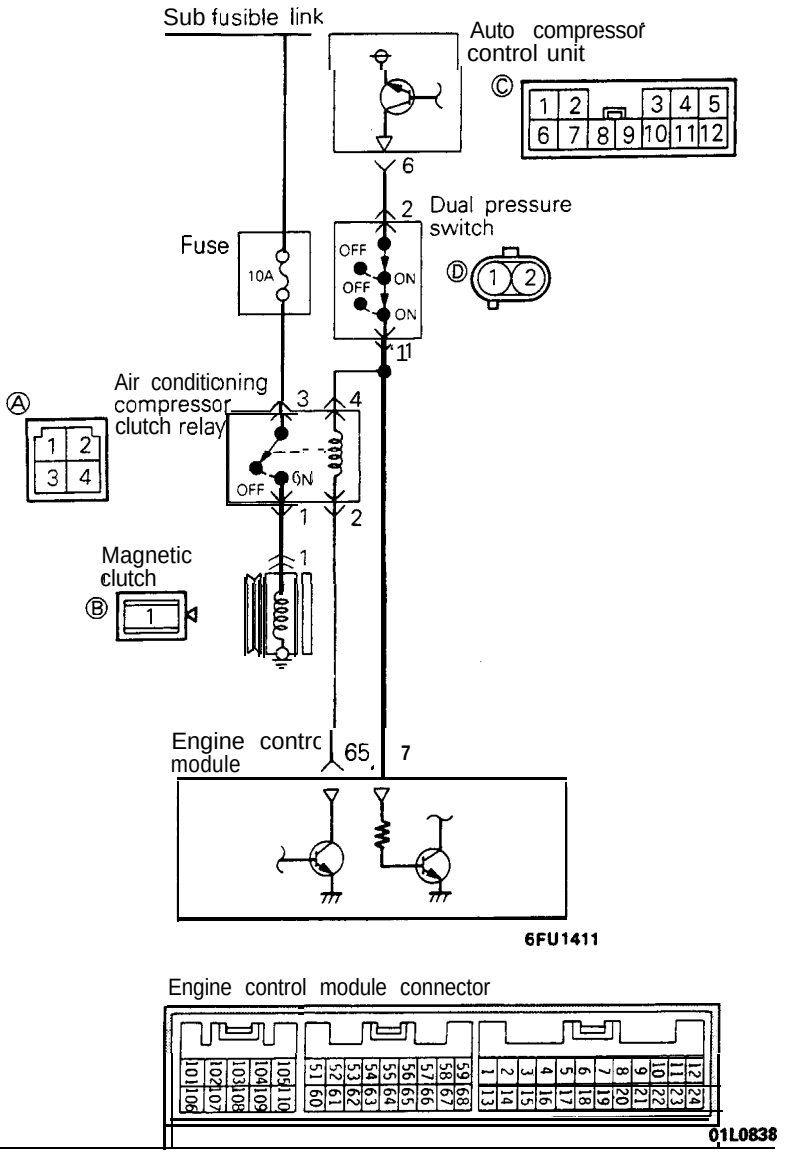


TSB Revision

AIR CONDITIONING SWITCH AND A/C COMPRESSOR CLUTCH RELAY M13YRAB







OPERATION

- The air conditioning switch applies battery voltage to the engine control module when the air conditioning is switch is switched ON.
- When the air conditioning signals are input, the engine control module activates the idle-speed control motor, and also switches ON the power transistor. As a result, current flows to the power relay coil and the relay switch is switched ON, the air conditioning compressor's magnetic clutch is activated.

TROUBLESHOOTING HINTS

If the air conditioning compressor's magnetic clutch is not activated when the air conditioning switch is switched ON during idling, it is probable that the cause is a malfunction of the air conditioning control system.

INSPECTION

Using Scan tool

Air conditioning switch

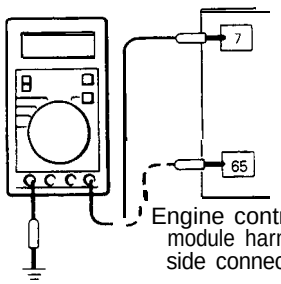
Function	Item No.	Data display	Check conditions	Air conditioning switch	Normal display
Data reading	28	Switch status	. Engine idling (The air conditioning compressor should be activated when the air conditioning switch is switched ON.)	OFF	OFF
				ON	ON

Air conditioning compressor clutch relay

Function	Item No.	Data display	Check conditions	Air conditioning switch	Normal display
Data reading	49	Air conditioning compressor clutch relay status	. Engine: idling after warm up	OFF	OFF (Compressor clutch non-activation)
				ON	ON(Compressor clutch activation)

HARNESS INSPECTION

1



Engine control module harness side connector

01R0863

Measure the power supply voltage of the air conditioning circuit.

. Engine control module connector: Disconnected
. ignition switch: ON
• Air conditioning switch: ON

Voltage (V)
Battery positive voltage

OK → STOP

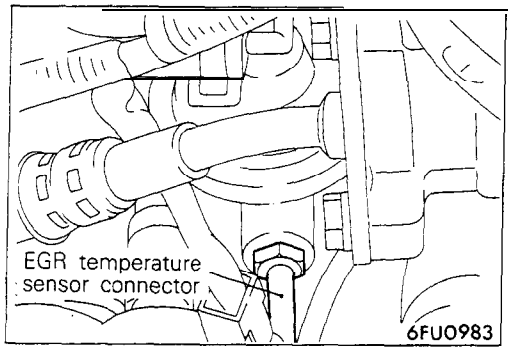
NG → Check the air conditioning circuit.

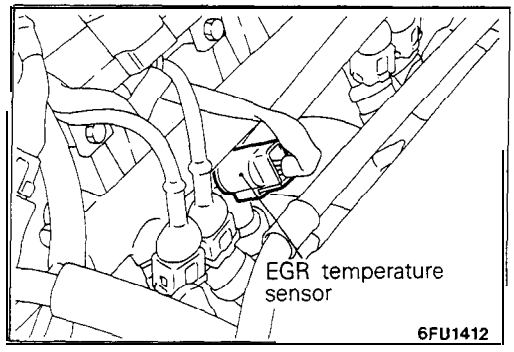
AIR CONDITIONING INSPECTION

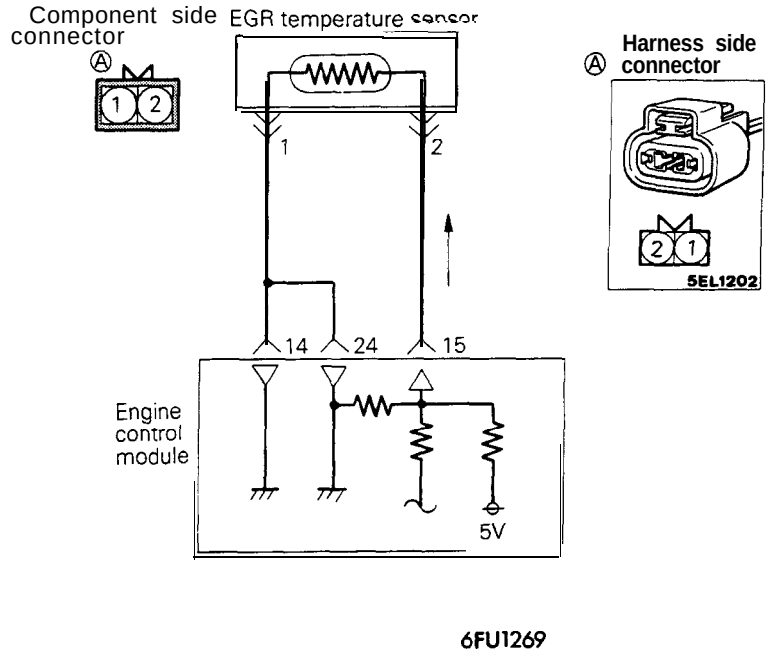
Refet to GROUP 55–Air conditioning.

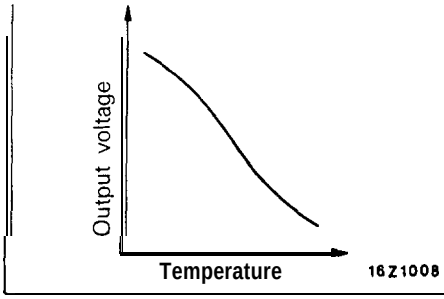
EGR TEMPERATURE SENSOR <Calif.>

M13YZAA









OPERATION

- The EGR temperature sensor functions to convert the data regarding the temperature of the EGR gas downstream from the EGR valve to voltage, and to input that voltage (as signals) to the engine control module.
- The 5V power supply within the engine control module is supplied, by way of the resistance within the unit, to the EGR temperature sensor; it passes through the EGR temperature sensor, which is a type of resistor, and is grounded at the engine control module.
  Note that the resistance of the EGR temperature sensor decreases when the EGR gas volume increases and the temperature of the EGR gas increases.
- The EGR temperature sensor terminal voltage **becomes higher when the resistance of the** EGR temperature sensor increases, and becomes lower when the resistance decreases.
  Consequently, the EGR temperature sensor terminal voltage varies in accordance with the temperature of the EGR gas, becoming lower when the temperature of the EGR gas increases.

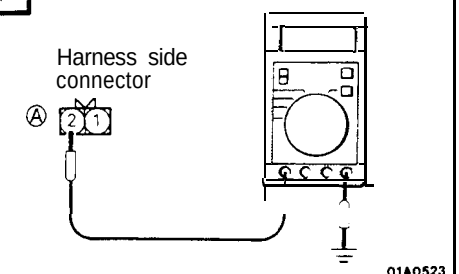
TSB Revision

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	43	Sensor temperature	. Engine: warm up . Engine is maintained in a constant state for 2 minutes or more . Remove the vacuum hose (green stripes) from the EGR solenoid and plug both the removed vacuum hose end and solenoid valve nipple.	750 rpm (Idling)	70°C or lower
				3,500 rpm	70°C or higher

HARNESS INSPECTION

1



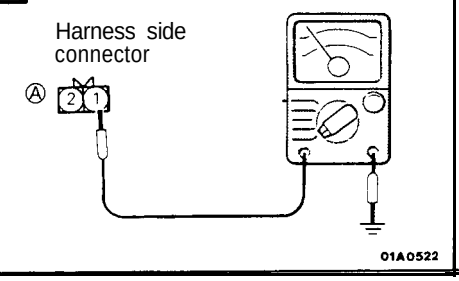
Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4.3–4.7

OK → 2

NG → Repair the harness. (Ⓐ2–15)

2



Check for continuity of the ground circuit.
. Connector: Disconnected

OK → STOP

NG → Repair the harness. (Ⓐ1–14 24)

SENSOR INSPECTION

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

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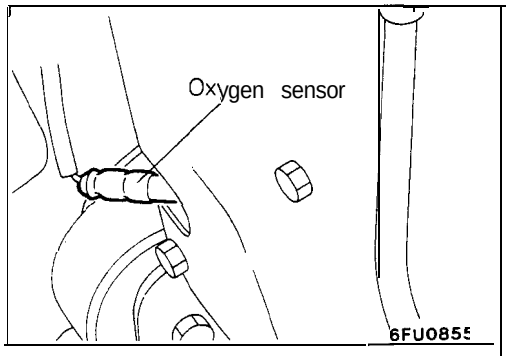
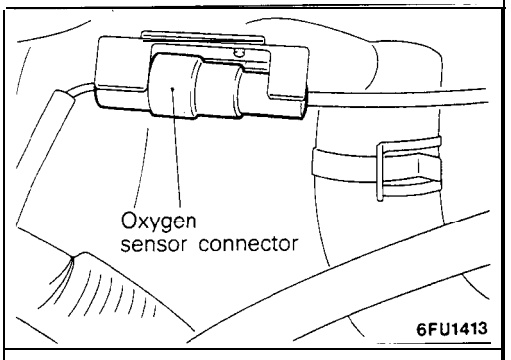
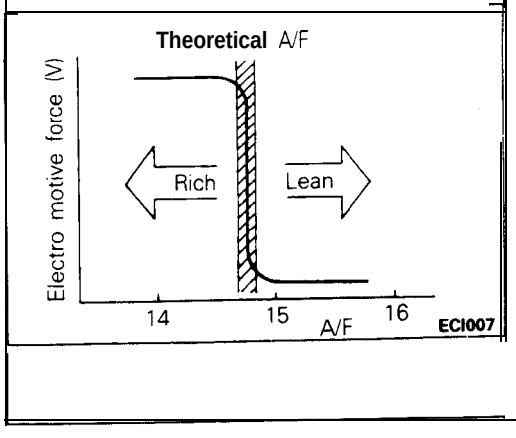
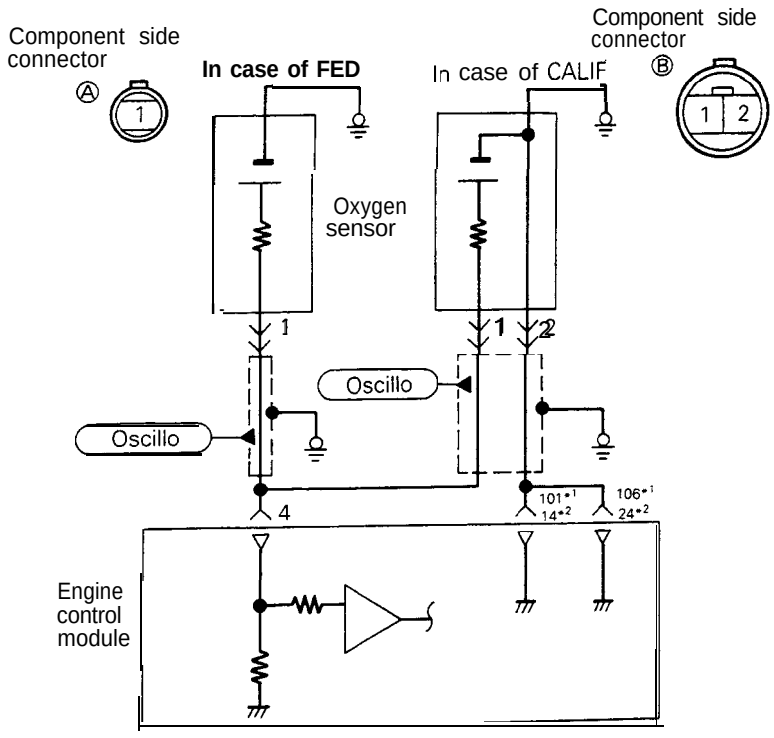
OXYGEN SENSOR

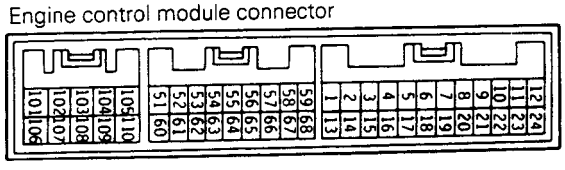
M13YSAA











NOTE
- 1:<1989 models>
*2:<From **1990 models>**

OPERATION

- The oxygen sensor functions to detect the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the engine control module.
- If the air/fuel mixture ratio is richer than the theoretical air/fuel mixture ratio (i.e., if the concentration of oxygen in the exhaust gas is sparse), a voltage of approximately 1V is output; if the air/fuel mixture ratio in leaner than the theoretical air/fuel mixture ratio (i.e., if the concentration is dense), a voltage of approximately OV is output.
- The engine control module, based upon those signals, regulates the amount of fuel injection so that the air/fuel mixture ratio becomes the theoretical air/fuel mixture ratio.

TSB Revision

TROUBLESHOOTING HINTS

Hint 1:
The exhaust gas purification performance will worsen if there is a malfunction of the oxygen sensor.
Hint 2:
If the oxygen sensor output voltage deviates from the standard value even though the results of the checking of the oxygen sensor are normal, the cause is probably a malfunction of a component related to mixture control.

Examples:
(1) Malfunction of an injector.
(2) Air leakage into the intake manifold from a leaking gasket.
(3) Malfunction of the volume air flow sensor, the intake air temperature sensor, the barometric-pressure sensor, or the engine coolant temperature sensor.

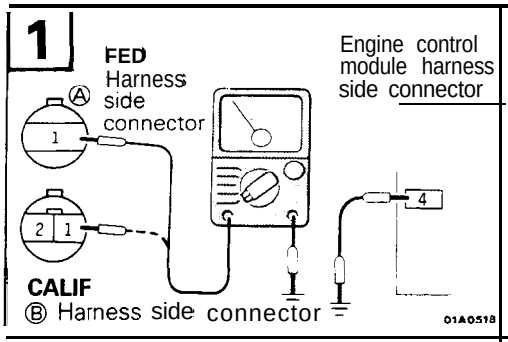
INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	11	Sensor detection voltage	Engine: warm up (Make the mixture lean by engine speed reduction, and rich by racing)	When sudden deceleration from 4,000 rpm	250 mV or lower
				When engine is suddenly raced	500 – 1,000 mV
			Engine: warm up (using the oxygen sensor signal, check the air/fuel mixture ratio, and also check the condition of control by the engine control module)	750 rpm (Idling)	400 mV or lower (changes) 600 – 1,000 mV
				2,000 rpm	

HARNESS INSPECTION

1

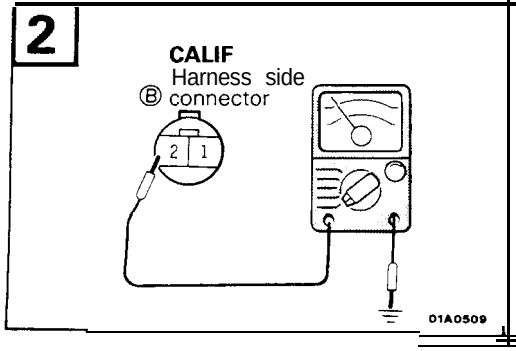


Check for an open-circuit, or a short-circuit to ground between the engine control module and the oxygen sensor.
. Oxygen sensor connector: Disconnected
. Engine control module connector: Disconnected

OK → FED STOP / CALIF 2

OK → Repair the harness. (Ⓐ1–4 Ⓑ1–4)

2



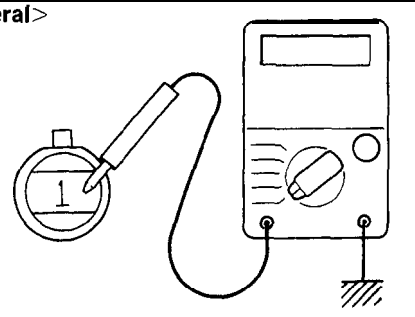
Check for continuity of the ground circuit.
· Connector: Disconnected

OK → STOP

OK → Repair the harness. (Ⓑ2 – Ground)

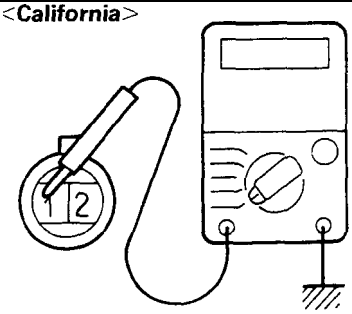
TSB Revision

<Federal>



6EM139

<California>



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SENSOR INSPECTION

Caution

1. Before checking, warm up the engine until engine coolant temperature reaches 85 to 95°C (185 to 205°F).

2. Use an accurate digital voltmeter.

(1) Disconnect the oxygen sensor connector and connect a voltmeter to the oxygen sensor connector.

(2) While repeating engine racing, measure the oxygen sensor output voltage.

Engine	Oxygen sensor output voltage	Remarks
Race	0.6–1.0V	Make air-fuel mixture rich by accelerator operation

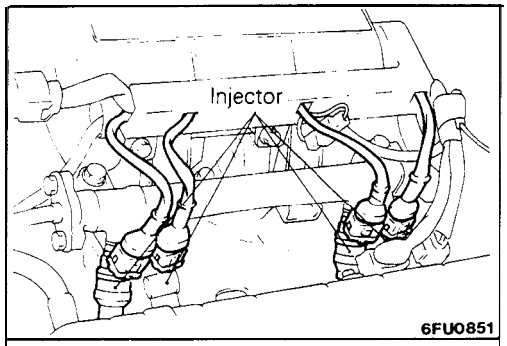
NOTE

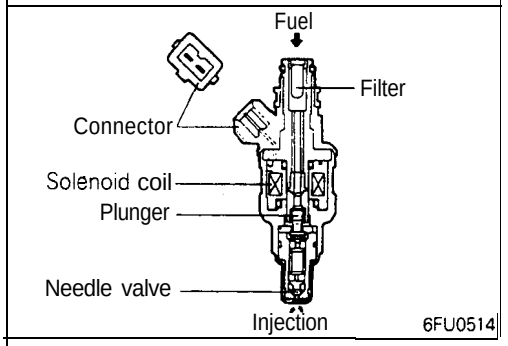
For removal and installation of the oxygen sensor, refer to GROUP 15–Exhaust Manifold.

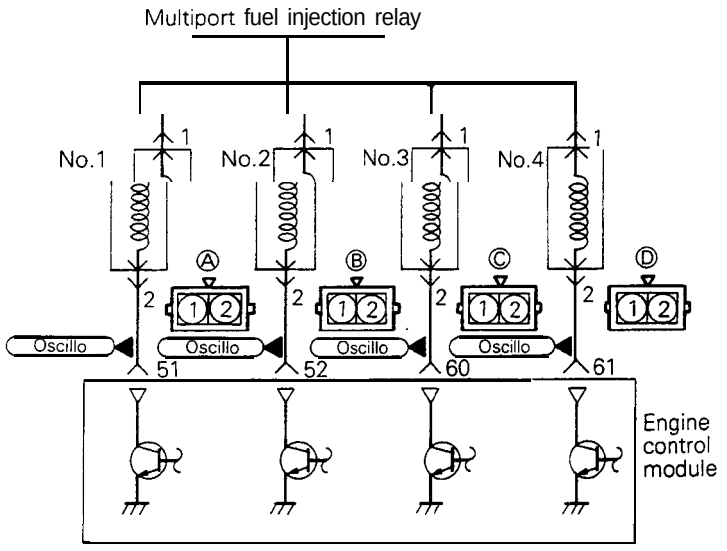
Oxygen sensor installation torque: 40–50 Nm (30–36 ft.lbs.)

INJECTORS

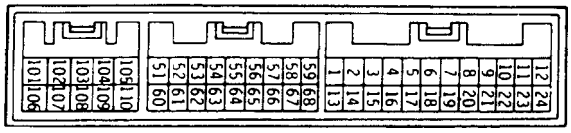
M13YTAA







Engine control module connector



OPERATION

- The injectors are electromagnetic-valve-equipped injection nozzles that function to inject fuel based upon injection signals from the engine control module.
- Because the surface area of the injection ports is fixed and because the pressure of the fuel relative to the pressure within the manifold is also regulated to a fixed pressure, the amount of fuel injection by injectors is determined by the length of time that the needle valve is open, or, in other words, by the length of time of current flow to the solenoid coil.
- Battery power supply is supplied, by way of the multiport fuel injection relay, to the injectors. When the engine control module switches ON the power transistor within the unit and current flows to the solenoid coil, the injectors open and fuel is injected.

TROUBLESHOOTING HINTS

Hint 1:
If there is a problem with starting while the engine is warm, perform the combustion test and check for leakage of the injectors.
Hint 2:
If the engine can't be started, and the injectors are not activated during cranking, the cause is probably a malfunction such as described below, not with the injectors.
(1) Malfunction of the circuit for supply of power to the engine control module, or of the ground circuit.
(2) Malfunction of the multiport fuel injection relay.
(3) Malfunction of the crankshaft position sensor and/or the camshaft position sensor.
Hint 3:
If there is a cylinder for which the idling condition does not change when, during idling, the fuel injection of the injectors is cut off in sequence, check that cylinder as described below.
(1) Check the injector and harness.
(2) Check the spark plugs and the high-tension cable.
(3) Check the compression pressure.
Hint 4:
If the injector activation time deviates from the standard value even though the results of the checking of the injector's harness and of the injector itself are normal, the cause may be pressumed to be one of the following,
(1) Incomplete combustion within the cylinder. (Malfunction of the spark plugs, the ignition coil, the compression pressure, etc.)
(2) Incomplete close contact of the EGR valve seat.
(3) Increased engine resistance.

TSB Revision

INSPECTION

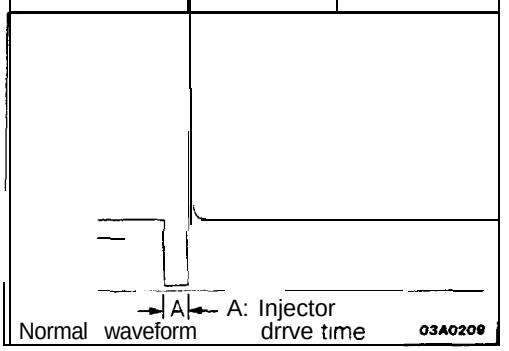
Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine coolant temperature	Standard value
Data reading	41	Activation time*1	Engine cranking	At 0°C (32°F)*2	Approx. 21 ms
				At 20°C (68°F)	Approx. 43 ms
				At 80°C (176°F)	Approx. 10 ms

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	41	Activation time*3	. Engine coolant temperature: 85–95°C (185–205°F) • Lights, cooling fan, electrical accessories: OFF . Transaxle: neutral (A/T models: "P" range)	750 rpm (Idling)	2.5–4.0 ms
				2,000 rpm	2.5–4.0 ms
				During sudden racing	Increases

NOTE
*1: The injector activation time indicates the time under the following conditions: a power source voltage of 11V and a cranking rpm of 250 rpm or less.
*2: Simultaneous injection at four cylinders when engine coolant temperature is 0°C (32°F).
*3: The injector activation time may be about 10% longer than indicated above when the vehicle is new [driven approximately 500 km (300 miles) or less].

Function	Item No.	Description	Inspection conditions	Normal indication
Actuator test	01	No. 1 injector is shut off.	Engine: idling after warm up (Shut off the injectors in sequence during after engine warm-up, check the idling condition.)	The idling condition changes more. (Either becomes more unstable, or engine stalls.)
	02	No. 2 injector is shut off.		
	03	No. 3 injector is shut off.		
	04	No. 4 injector is shut off.		

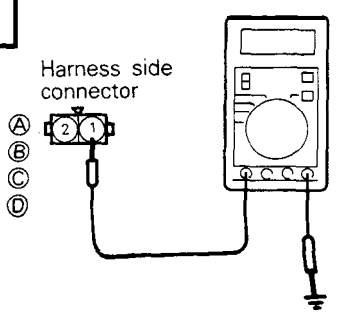


Using Oscilloscope

(1) Run the engine at idle speed.
(2) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram, and check the waveform at the drive side of each injector.

HARNESS INSPECTION

1



Measure the power supply voltage of the injector.
. Connector: Disconnected
. Ignition switch: ON

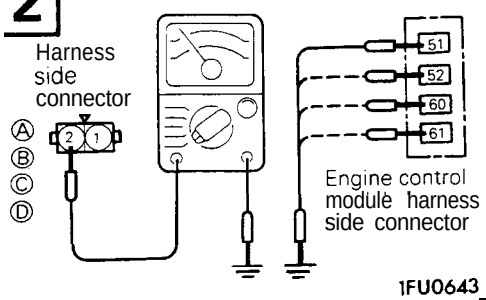
Voltage (V)
Battery positive voltage

OK → **2**
Repair the harness. (ⒶⒷⒸⒹ 1–Multi-port fuel injection relay)

OK →

TSB Revision

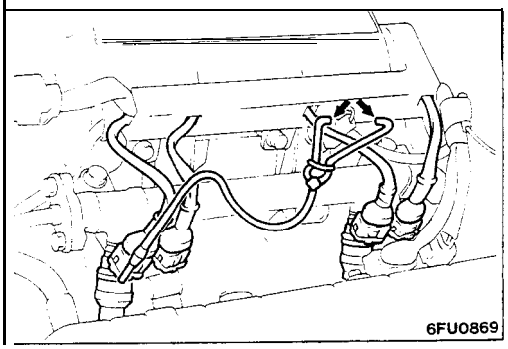
2



Check for an open-circuit, or a short-circuit to ground between the engine control module and the injector.
. Engine control module connector: Disconnected
. Injector connector: Disconnected

OK → STOP

OK → Repair the harness. (ⒶⒷⒸⒹ 2 – 51 52 60 61)



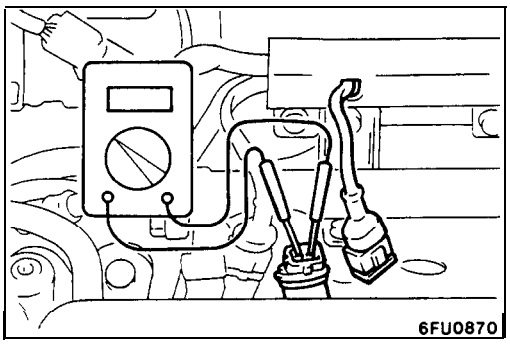
ACTUATOR INSPECTION

CHECKING OPERATION SOUND

Using a sound scope, check the operation sound ("chi-chi-chi") of injectors during idling or during cranking.
Check that as the rotating speed increases, the frequency of the operating sound also increases.

Caution
Note that even if the injector you are checking is not operating, you will hear the operating sound of the other injectors.

NOTE
If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or engine control module is suspected.



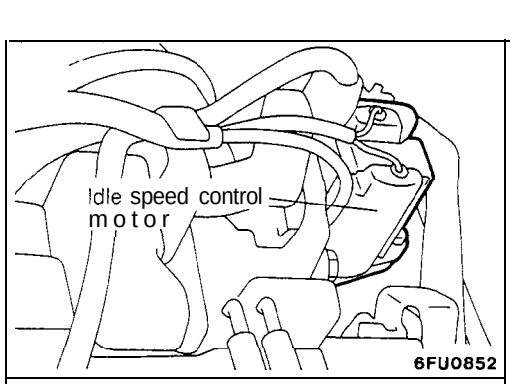
MEASURING RESISTANCE BETWEEN TERMINALS

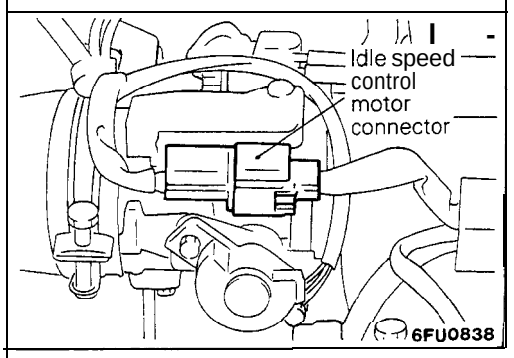
(1) Remove the injector connector.
(2) Measure the resistance between the terminals.
Standard value: 13-16 Ω [at 20" (68°F)]
(3) Install the injector connector.

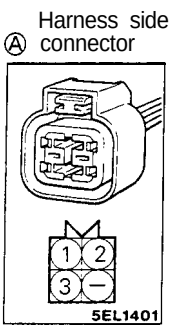
TSB Revision

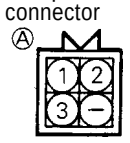
IDLE SPEED CONTROL MOTOR (DC MOTOR) < 1989 models>

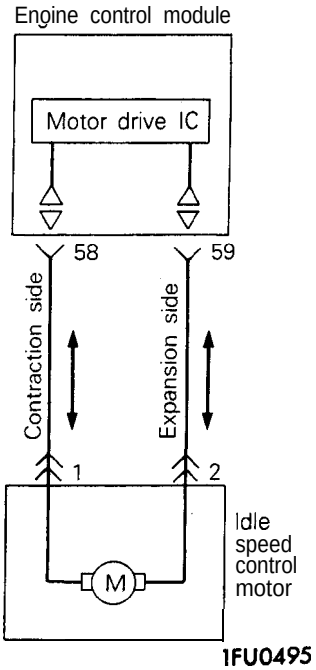
M13YUAF



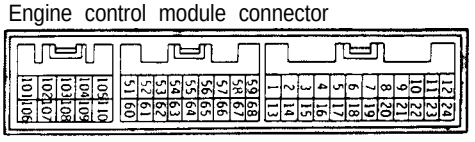








Engine control module connector



OPERATION

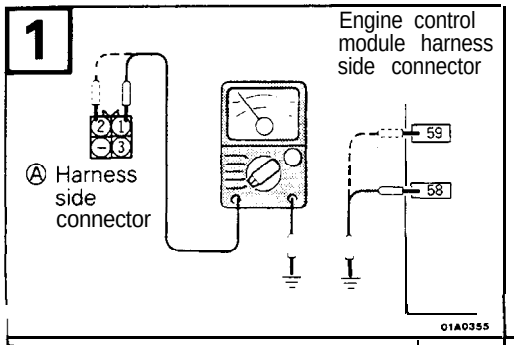
- The volume of intake air during idling is regulated by the opening and closing of the throttle valve, caused by expansion and contraction of the servo plunger.
- The servo plunger expands or contracts in accordance with whether the DC motor (located within the idle speed control motor) is driven in the forward or reverse direction.
- The DC motor is driven in either the forward or reverse direction according to the direction of switching of the current flow of the motor-activation IC within the engine control module.

TROUBLESHOOTING HINTS

If there is unstable idling or engine stalling, etc., and it is difficult to presume the cause of the problem, switch ON the ignition switch and leave as is for 15 seconds or longer; then disconnect the servo connector.

The cause of the problem can then be easily presumed by checking in this condition.
Note that, if necessary, the engine speed adjusting screw should be turned to adjust the engine rpm.

HARNESS INSPECTION

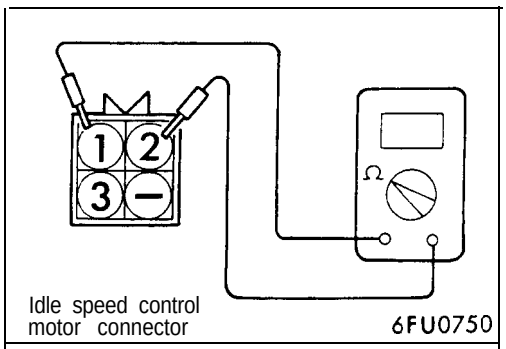


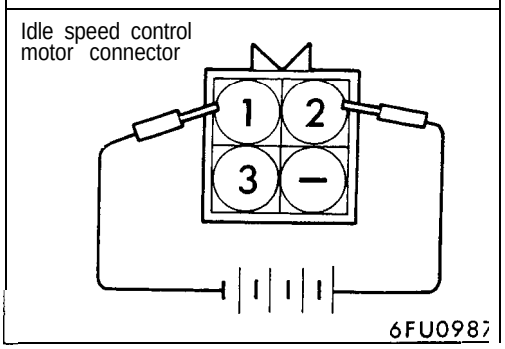
Check for an open-circuit, or a short-circuit to ground between the engine control module and the idle speed control motor.

OK → STOP

NG → Repair the harness. (Ⓐ1–58 Ⓐ2–59)

TSB Revision





ACTUATOR INSPECTION

(1) Disconnect the idle speed control motor connector.
(2) Check continuity of the idle speed control motor coil.

Measuring terminals	Continuity
①–② Conductive	5 to 35Ω resistance at 20°C (68°F)

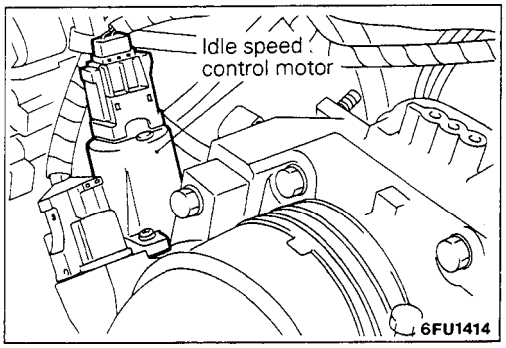
(3) Connect 6V DC between terminal ① and terminal ② of the idle speed control motor connector, and check to be sure that the idle speed control motor operates.

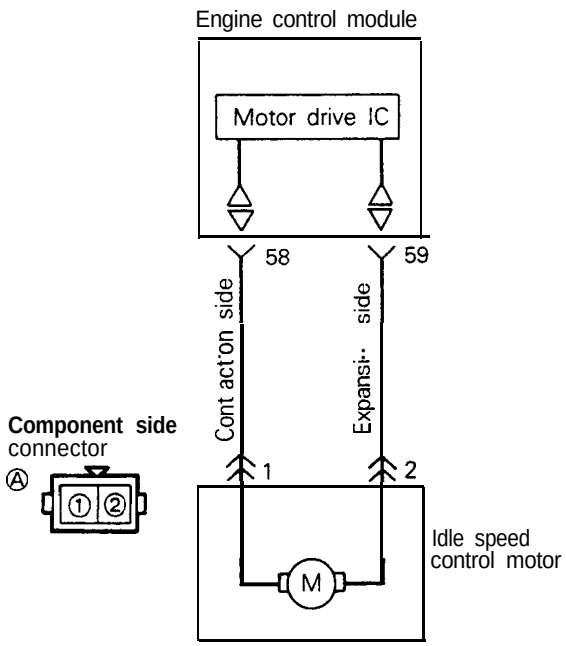
Caution
Apply only a 6V DC or lower voltage. Application of higher voltage could cause locking of the servo gears.

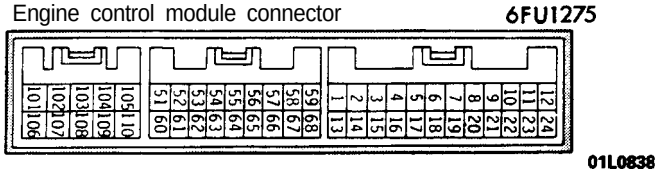
(4) If not, replace idle speed control motor as an assembly.

IDLE SPEED CONTROL MOTOR (DC MOTOR) <From 1990 models>

M13YUAG







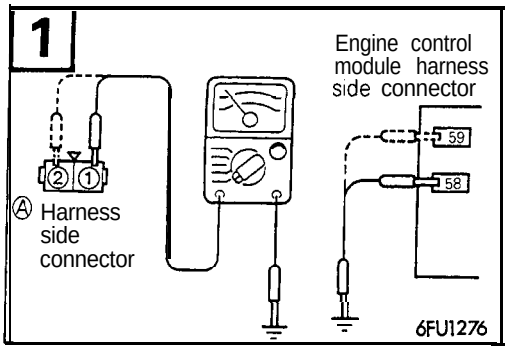
OPERATION

TROUBLESHOOTING HINTS

Refer to *P.1* 3-93.

TSB Revision

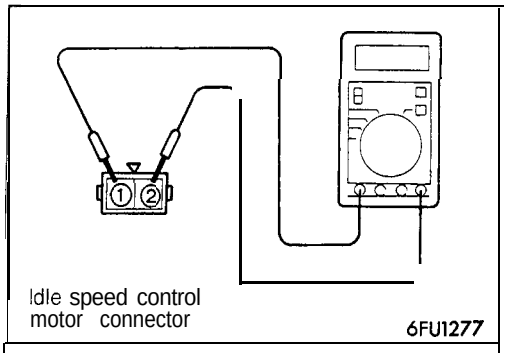
HARNESS INSPECTION

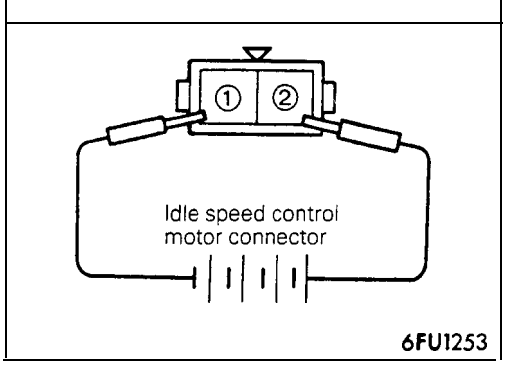


Check for an open-circuit, or a short-circuit to ground between the engine control module and the idle speed control motor.

OK → STOP

OK → Repair the harness. (Ⓐ1 – 58, Ⓐ2 – 59)





ACTUATOR INSPECTION

(1) Disconnect the idle speed control motor connector.
(2) Check continuity of the idle speed control motor coil.

Measuring terminals	Continuity
①–② Conductive	5 to 35Ω resistance at 20°C (68°F)

(3) Connect 6V DC between terminal ① and terminal ② of the idle speed control motor connector, and check to be sure that the idle speed control motor operates.

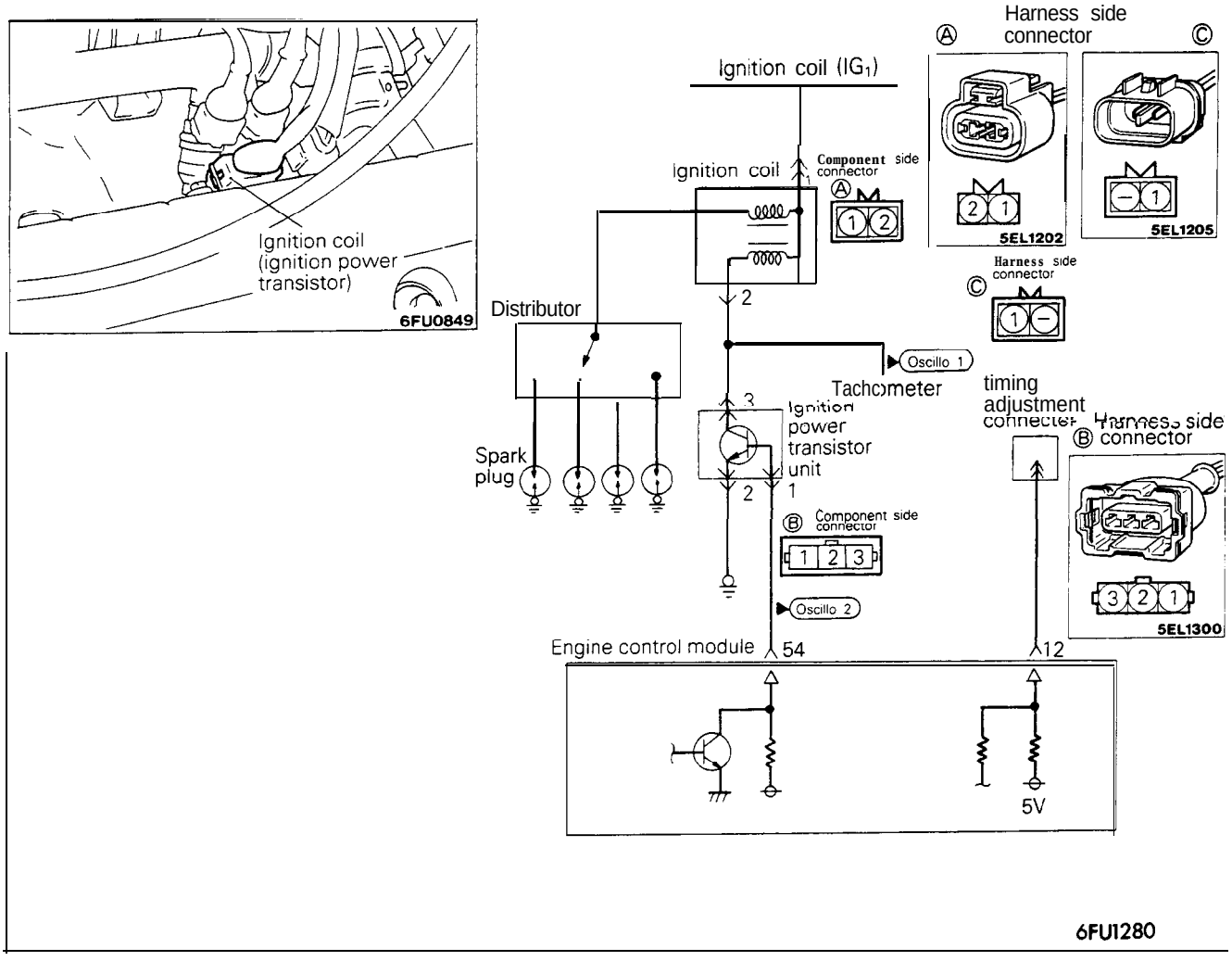
Caution
Apply only a 6V DC or lower voltage. Application of higher voltage could cause locking of the servo gears.

(4) If not, replace idle speed control motor as an assembly.

TSB Revision

IGNITION COIL AND IGNITION POWER TRANSISTOR

M13YVAA



OPERATION

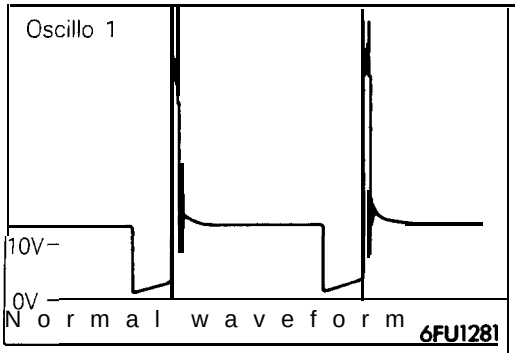
- When the ignition power transistor unit is switched ON by the signals from the engine control module, the primary current of the ignition coil will flow. When the ignition power transistor unit is switched OFF, the primary current flow is interrupted, and high voltage is produced at the secondary coil.
- When the engine control module switches OFF the power transistor within the unit, the battery voltage within the unit is applied to the ignition power transistor unit, and the ignition power transistor unit is switched ON. In addition, the power transistor unit is switched ON when the engine control module switches ON the power transistor within the unit.

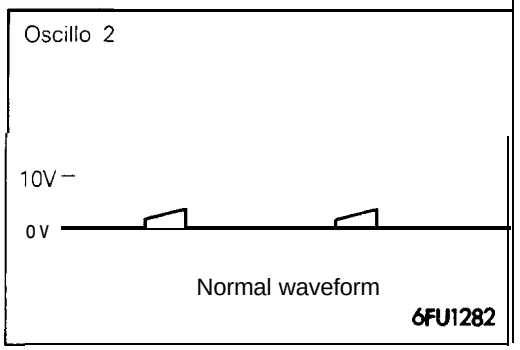
INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	44	Ignition advance	. Engine: warm up . Timing light: set (Use the timing light to check the actual ignition timing.)	750 rpm (idling)	5– 15 “BTDC
				2,000 rpm	30–40 “BTDC

TSB Revision





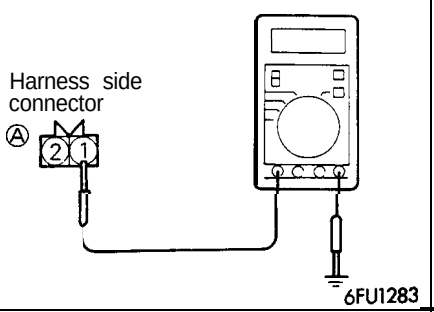
Using Oscilloscope

1. Primary signal of ignition coil
   (1) Run the engine at an idle revolution speed.
   (2) Connect the probe to oscilloscope pick-up point 1 as shown in the circuit diagram, and check the primary signal of the ignition coil.

2. Control signal of ignition power transistor
   (1) Connect the probe to oscilloscope pick-up point 2 as shown in the circuit diagram, and check the control signal of the ignition power transistor,

HARNESS INSPECTION

1



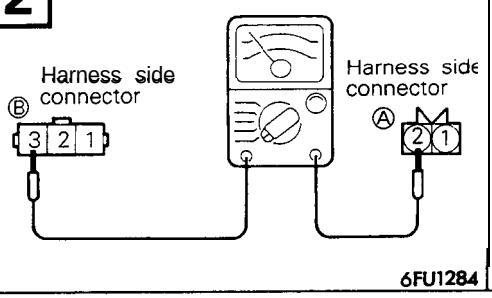
Measure the power supply voltage of the ignition coil.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (A1 – Ignition switch)

2

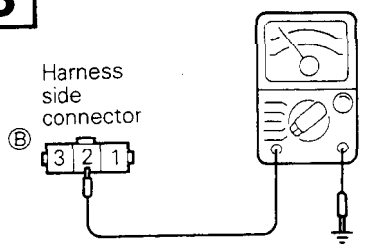


Check for an open-circuit, or a short-circuit to ground, between the ignition power transistor and ignition coil.
. Ignition coil connector: Disconnected
. Ignition power transistor connector: Disconnected

OK → 3

NG → Repair the harness. (A2 – B3)

3



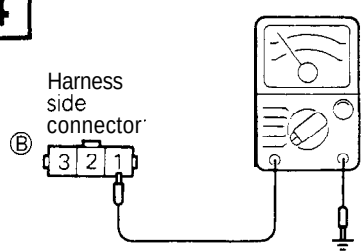
6FU1285

Check for continuity of the ground circuit.
Connector: Disconnected

OK → 4

NO → Repair the harness. (Ⓑ2 – Ground)

4



6FU1286

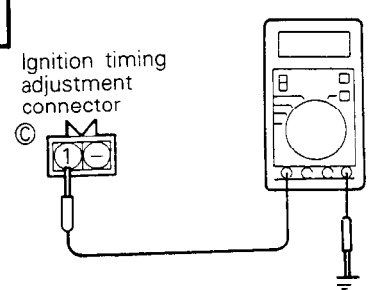
Measure the voltage of the control signal circuit of the ignition power transistor.
- Connector: Disconnected
- Ignition switch: START

Voltage (V)
2–6

OK → 5

NO → Repair the harness. (Ⓑ1 – 54)

5



6FU1287

Measure the voltage of the ignition timing adjustment terminal.
- Ignition switch: ON

Voltage (V)
4.0–5.2

OK → STOP

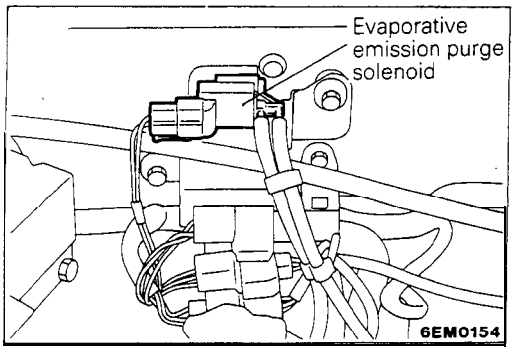
NO → Repair the harness. (Ⓒ1 – 12)

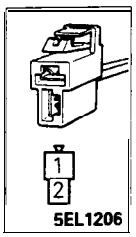
ACTUATOR INSPECTION

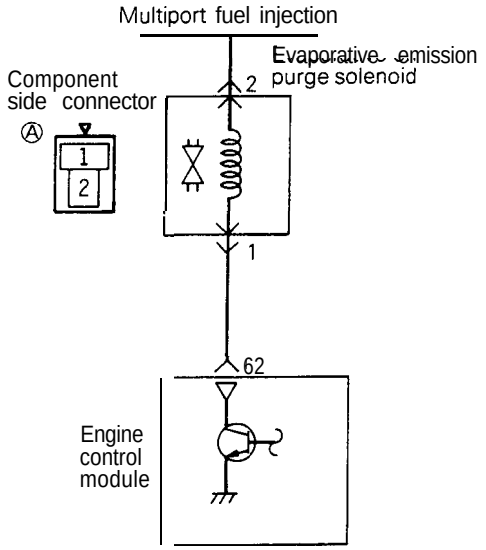
Refer to GROUP 16–Ignition System.

EVAPORATIVE EMISSION PURGE SOLENOID

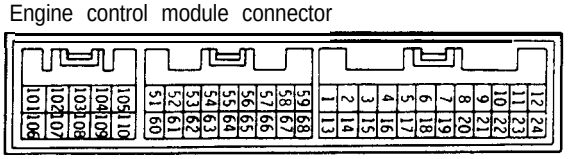
M13YWAA







Engine control module connector



OPERATION

- The evaporative emission purge solenoid is an ON/OFF type of solenoid valve; it functions to regulate the introduction of purge air from the evaporative emission canister to the intake manifold plenum.
- Battery power supply is supplied, by way of the multiport fuel injection, to the evaporative emission purge solenoid. When the engine control module switches ON the power transistor within the unit, current flows to the coil, and purge air is introduced.

INSPECTION

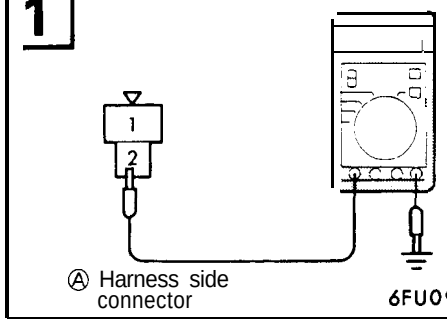
Using Scan tool

Function	Item No.	Activation	Check conditions	Normal condition
Actuator test	08	Solenoid valve is switched from OFF to ON.	. Ignition switch: ON	Operating sound is heard when driven.

TSB Revision

HARNESS INSPECTION

1



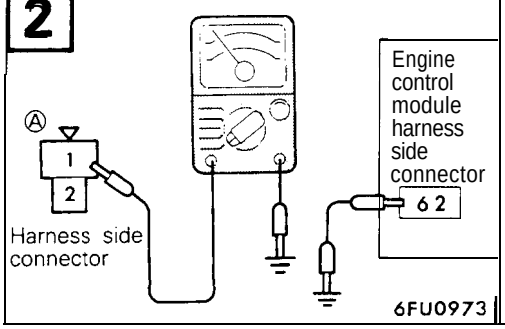
Measure the power supply voltage.
Connector: Disconnected
Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Multiport fuel injection relay−Ⓐ2)

2



Check for an open-circuit, or a short-circuit to ground between the evaporative emission purge solenoid and the engine control module.
- Evaporative emission purge solenoid connector: Disconnected
- Engine control module connector: Disconnected

OK → STOP

NG → Repair the harness. (Ⓐ1−62)

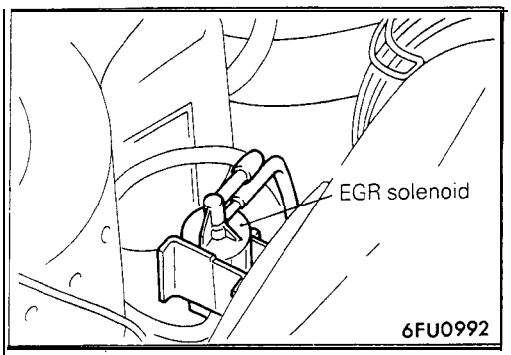
ACTUATOR INSPECTION

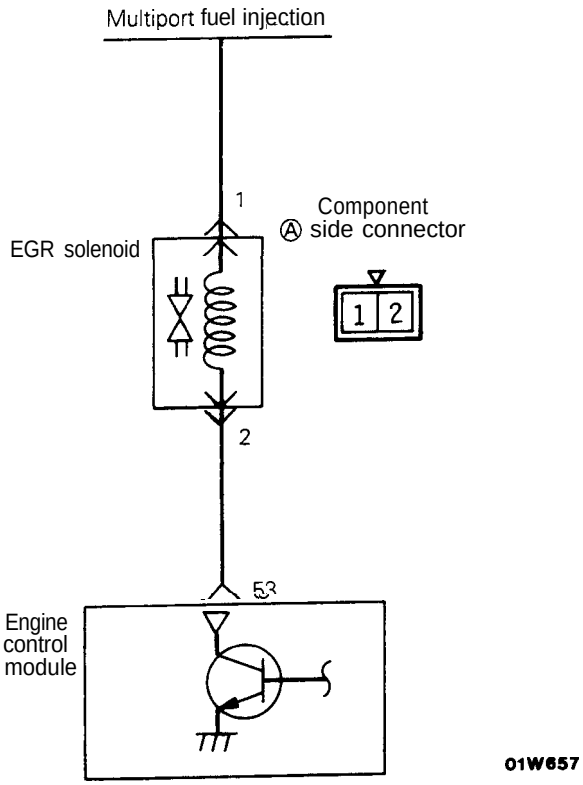
Refer to GROUP 17−Evaporative Emission Control System.

TSB Revision

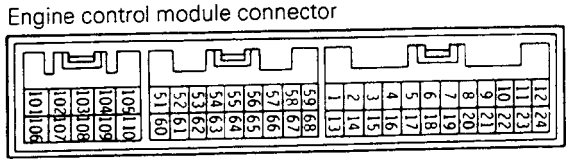
EGR SOLENOID <Calif.>

M13YZBA





Engine control module connector



OPERATION

- The EGR solenoid is a duty-control type of solenoid valve; it performs its control function by leaking the EGR valve-activation vacuum to the throttle body A port.
- Battery power supply is supplied, by way of the multiport fuel injection, to the EGR solenoid. When the engine control module switches OFF the power transistor within the unit, current stops flowing to the coil, and the EGR valve-activation negative pressure leaks.

TROUBLESHOOTING HINTS

If the diagnostic trouble code for EGR system malfunction is output even though the results of checking the EGR solenoid harness and the component itself are normal, check the EGR valve, the vacuum hose piping, and the EGR passage for clogging.

INSPECTION

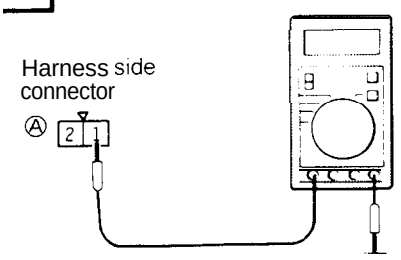
Using Scan tool

Function	Item No.	Description	Inspection conditions	Normal condition
Actuator test	10	Solenoid valve switched from OFF to ON	Ignition switch: ON	Operating sound is heard when driven.

TSB Revision

HARNESS INSPECTION

1



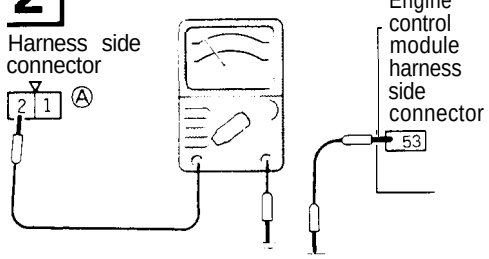
Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Ⓐ1 – Multiport fuel injection relay)

2



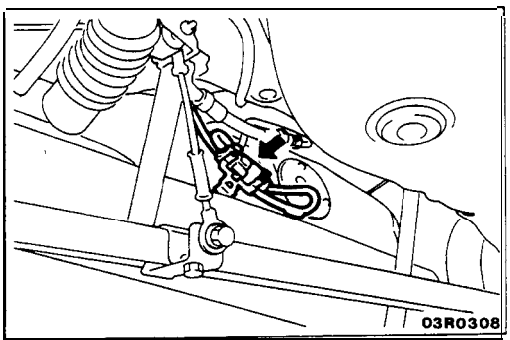
Check for an open-circuit, or a short-circuit to ground between the EGR solenoid and the engine control module.
. EGR solenoid connector: Disconnected
• Engine control module connector: Disconnected

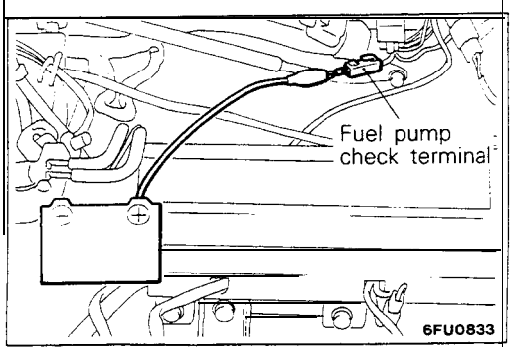
OK → STOP

NG → Repair the harness. (Ⓐ2 – 53)

ACTUATOR INSPECTION

Refer to GROUP 17—Exhaust Gas Recirculatin (EGR) System.





FUEL PRESSURE

RELEASE OF RESIDUAL PRESSURE FROM HIGH PRESSURE FUEL HOSE

Make the following operations to release the pressure remaining in fuel pipe line so that fuel will not flow out.

① Disconnect the fuel pump harness connector at the fuel tank rear side.
② Start the engine and after it stops by itself, turn the ignition switch to OFF.
③ Disconnect the battery (−) terminal.
④ Connect the fuel pump harness connector.

FUEL PUMP OPERATION CHECK

(1) Connect the (+) battery terminal to the fuel pump drive terminal and the (−) terminal to the chassis. Confirm that the fuel pump operates at this time.

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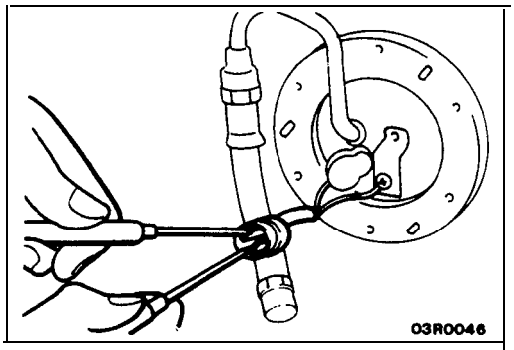
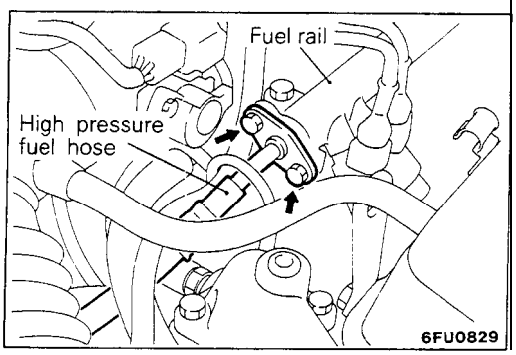


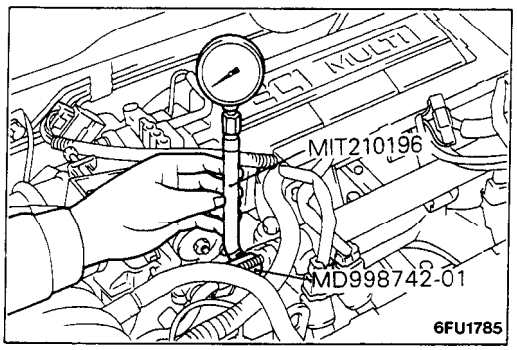
(2) Lift up the chassis, and disconnect the connector from the fuel pump which is mounted on the rear area of the fuel tank.
(3) Check the terminals, wiring, etc., for damage.
(4) Using an ohmmeter, check the motor continuity.



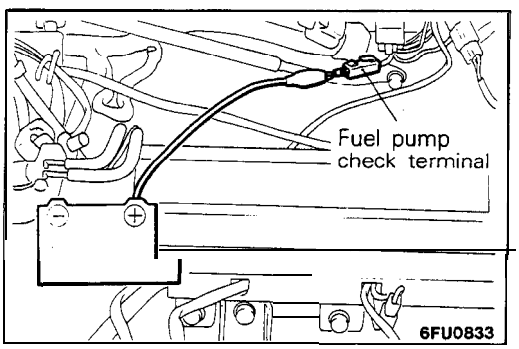
FUEL PRESSURE TEST

(1) Reduce the internal pressure of the fuel pipes and hoses. (Refer to P.13-1OZ.)
(2) Disconnect the fuel high pressure hose at the fuel rail side.

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



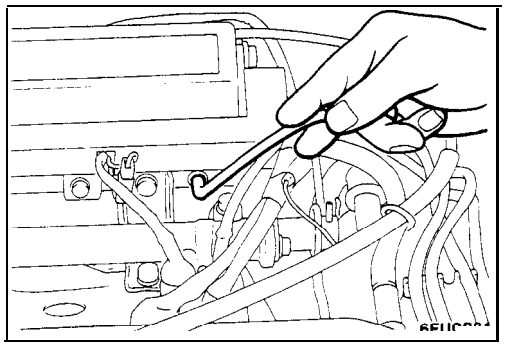
(3) Place the MD998742-01 adapter on the end of the fuel rail, then attach the fuel high pressure hose to the adapter using the bolts supplied with the MIT2 10196 fuel pressure test assembly.
(4) Attach one end of the fuel hose supplied with the MIT21 0196 to the quick-disconnect fitting on the MD998742-01 adapter. Attach the other end of the hose to the fuel pressure gauge.
(5) Connect the (–) battery terminal.



(6) Connect a jumper wire to the fuel pump check terminal and to the positive (+) terminal of the battery to activate the fuel pump. With fuel pressure applied, check to be sure that there is no fuel leakage from the fuel pressure gauge and the special tool connection part.
(7) Disconnect the jumper wire (from the fuel pump check terminal) to stop the fuel pump.
(8) Start the engine and let it idle.

(9) Measure the fuel pressure during idling.

Standard value: Approx. 270 kPa (38 psi) at curb idle



(10) Disconnect the vacuum hose from the fuel pressure regulator, and then measure the fuel pressure while using a finger to plug the end of the hose.

Standard value: 330–370 kPa (47-53 psi) at curb idle speed

(11) Check to be sure that the fuel pressure during idling does not decrease even after the engine is raced a few times.

(12) Use a finger to gently press the fuel return hose while repeatedly racing the engine, and check to be sure that there is fuel pressure in the return hose also.

NOTE
There will be no fuel pressure in the return hose if there is insufficient fuel flow.

(13) If the fuel pressure measured in steps (9) to (12) deviates from the standard value range, check for the probable cause by referring to the table below, and then make the appropriate repair.

Condition	Probable cause	Remedy
. Fuel pressure is too low. . Fuel pressure drops during racing. . No fuel pressure in fuel return hose.	Fuel filter is clogged.	Replace the fuel filter.
	Malfunction of the valve seat within the fuel pressure regulator, or fuel leakage to return side caused by spring deterioration.	Replace the fuel pressure regulator.
	Fuel pump low discharge pressure.	Replace the fuel pump.
Fuel pressure is too high	The valve within the fuel pressure regulator is sticking.	Replace the fuel pressure regulator.
	Clogging of the fuel return hose and/or the pipe.	Clean or replace the hose and/or pipe.
No change of the fuel pressure when vacuum hose is connected and when not connected.	Damaged vacuum hose or nipple clogging.	Replace the vacuum hose, or clean the nipple.

(14) Stop the engine and check for a change of the value indicated by the fuel pressure gauge. The condition is normal if there is no decrease of the indicated value within two minutes.
If there is a decrease of the indicated value, monitor the speed of the decrease, and, referring to the table below. determine the cause of the problem and make the appropriate repair.

Condition	Probable cause	Remedy
After the engine is stopped, the fuel pressure drops graudally.	Injector leakage	Replace the injector.
	Leakage at the fuel pressure regulator valve seat	Replace the fuel pressure regulator.
There is a sudden sharp drop of the fuel pressure immediately after the engine is stopped.	The check valve (within the fuel pump) is not closed.	Replace the fuel pump.

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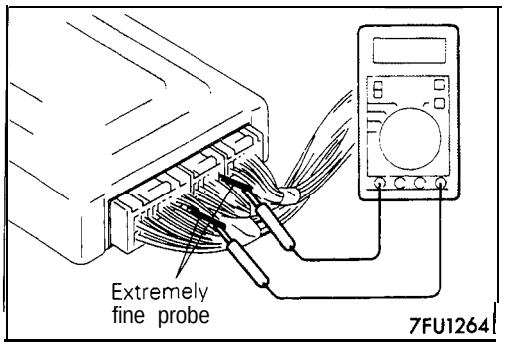
(15) Reduce the internal pressure of the fuel pipes and hoses. (Refer to P.13-102.)
(16) Disconnect the fuel pressure gauge and the special tools from the fuel rail.

Caution
Because there will be some residual pressure in the fuel pipe line, use a shop towel to cover so that fuel doesn't splatter.

(17) Replace the O-ring at the end of the fuel high-pressure hose with a new one.
(18) After connecting the fuel high-pressure hose to the fuel rail, tighten the installation bolt.
(19) Check to be sure that there is no fuel leakage.
① Apply battery voltage to the terminal for activation of the fuel pump so as to activate the fuel pump.
② With fuel pressure applied, check for leakage of the fuel line.



INSPECTION OF ENGINE CONTROL MODULE TERMINAL VOLTAGE

MI 3ZALBa

(1) Connect the extremely fine probe (paper clip, etc.) to the probe of the voltmeter.
(2) At each terminal of the engine control module connector, insert the extremely fine probe from the wire side, and measure the voltage referring to the check chart.

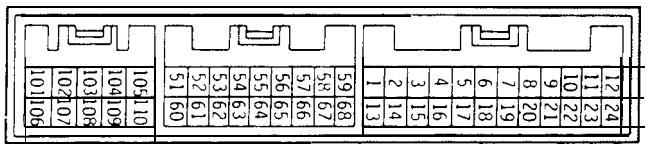
NOTE
1. In the state in which the connector of the engine control module is connected, measure the voltage.
2. Measure the voltage across each terminal to the terminal No. 106. (ground terminal).
3. You may find it convenient to pull out the engine control module to make it easier to reach the connector terminals.
4. Inspection need not be executed in the chart's sequence.

Caution
Short-circuiting the positive (+) probe between a connector terminal and ground could damage the vehicle wiring, the sensor, the engine control module, or all there. Use care to prevent this!

(3) If voltmeter shows any deviation 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.

TERMINAL VOLTAGE CHECK CHART

Terminal arrangement of engine control module connector



01L0838

NOTE
B+: Battery positive voltage

Terminal No.	Check item	Check condition (Engine state)		Standard value	Remarks
103	Backup power supply	Ignition switch: OFF		B+	
102	Power supply	ignition switch: ON		B+	
107					
109	Fuel pump drive signal	Engine: Cranking		8V or higher	
		Engine: Idling		B+	
56	Multiport fuel injection relay (Fuel pump)	Ignition switch: ON		B+	
		Engine: Idling		0–3V	
23	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V	
10	Volume air flow sensor	Engine: idling		2.2–3.2V	
		Engine speed: 2,000 rpm			
3	Air intake temperature sensor	Ignition switch: ON	Air intake temperature of 0°C (32°F)	3.2–3.8V	
			Air intake temperature of 20°C (68°F)	2.3–2.9V	
			Air intake temperature of 40°C (104°F)	11.5–2.1V	
			Air intake temperature of 80°C (176°F)	0.4–1.0V	
16	Barometric pressure sensor	Ignition switch: ON	Altitude of 0 m (0 ft.)	3.7–4.3V	
			Altitude of 1,200 m (3,937 ft.)	3.2–3.8V	
20	Engine coolant temperature sensor	Ignition switch: ON	Coolant temperature of 0°C (32°F)	3.2–3.8V	
			Coolant temperature of 20°C (68°F)	2.3–2.9V	
			Coolant temperature of 40°C (104°F)	1.3–1.9V	
			Coolant temperature of 80°C (176°F)	0.3–0.9V	
9	Throttle position sensor	Ignition switch: It is kept ON for 15 seconds or more	Set the throttle valve to the idling position.	0.4–0.6V	
			Fully open the throttle valve.	4.5–5.5V	
	Closed throttle position switch	Ignition switch: ON	Set the throttle valve to the idling position.	0–1V	
			Slightly open the throttle valve.	4V or higher	

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Terminal No.	Check item	Check condition (Engine state)		Standard value	Remarks
22	Camshaft position sensor	Engine: Cranking		0.2 – 3.0V	
		Engine: Idling			
21	Crankshaft position sensor	Engine: Cranking		0.2 – 3.0V	
		Engine: Idling			
108	Ignition switch-ST	Engine: Cranking		8V or higher	
104	Park/neutral position switch	Ignition switch: ON	Set the selector lever to P or N.	0 – 3V	
			Set the selector lever to D, 2, L or R.	8 – 14V	
18	Vehicle speed sensor	• Ignition switch: ON • Slowly run the vehicle forward		0 ⟷ 5V (Repeat the variation.)	
5	Power steering pressure switch	Engine: Idling operation after warming-up	Steering wheel idle state	B+	
			During steering wheel operation	0 – 3V	
7	Air conditioning switch	Engine: Idling	Turn OFF the air conditioning switch.	0 – 3V	
			Turn ON the air conditioning switch. (The air conditioning compressor is in the drive state.)	B+	
35	Air conditioning compressor clutch relay	• Engine: Idling • Air conditioning switch: OFF-ON (The air conditioning compressor is in the drive state.)		B+ or temporarily 6V or higher ↓ 0 – 3V	
1	Oxygen sensor	Engine: Keep the engine speed at 2,000 rpm after warming up. (For checking, use a digital voltmeter.)		0 ⟷ 0.8V (Repeat the variation.)	
51	No. 1 Injector	Engine: After warming up, rapidly press the accelerator pedal from the idling state.		Voltage temporarily drops slightly from 14V to 11V.	
52	No. 2 Injector				
53	No. 3 Injector				
31	No. 4 Injector				
54	Ignition power transistor unit	Engine speed: 3.000 rpm		0.3 – 3V	
32	Evaporative emission purge solenoid	ignition switch: ON		B+	
		Keep the engine speed at 3,000 rpm after the warmed-up engine is started.		0 – 3V	
12	Ignition timing adjustment terminal	ignition switch: ON	Ground the ignition timing adjustment terminal.	0 - 1V	
			Release the ground of the ignition timing adjustment terminal.	4.0 – 5.5V	

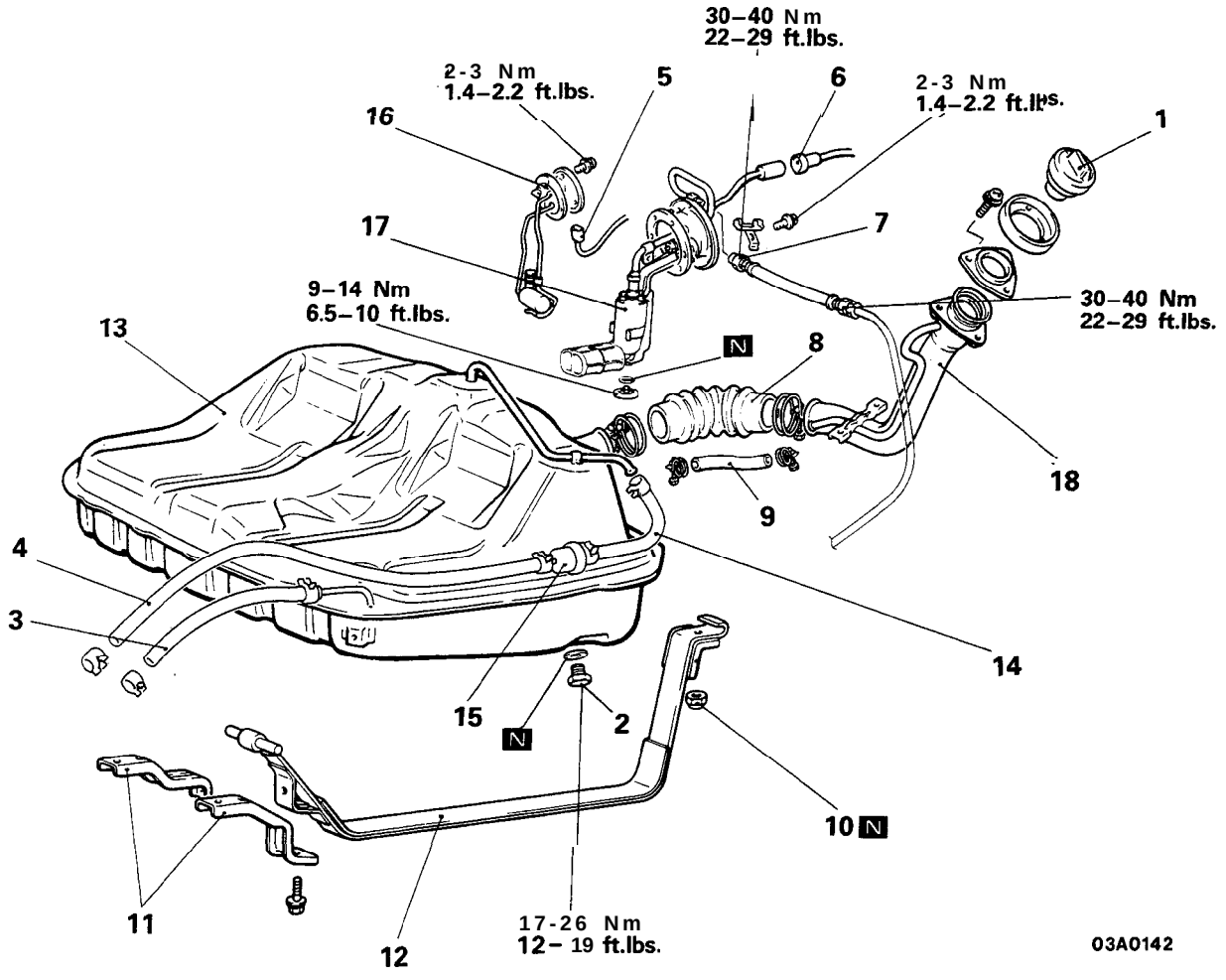
TSB Revision

Terminal No.	Check item	Check condition (Engine state)		Standard value	Remarks
64	Check engine/ malfunction Indicator lamp	Ignition switch: OFF → ON		0 – 3V ↓ 9 – 13V (After several minutes have elapsed)	
53	EGR solenoid	Ignition switch: ON		B+	
		Engine: After warming up, rapidly press the accelerator pedal from the idling state.		It temporarily drops slightly from B+.	
15	EGR temperature sensor	Ignition switch: ON	Sensor temperature of 50°C (122°F)	3.6 – 4.4V	
			Sensor temperature of 100°C (212°F)	2.2 – 3.0V	
58	Idle speed control motor (Contraction)	Ignition switch: 15 seconds have elapsed since the ignition switch was turned on.		4V or higher (Temporarily) ↓ 0 – 1V	
59	Idle speed control motor (Expansion)	Ignition switch: Soon after the ignition switch is turned on.		4V or higher (Temporarily) ↓ 0 - 1V	
	Idle speed control motor position sensor	Ignition switch: 15 seconds have elapsed since the ignition switch was turned on.		1.2V or higher ↓ 0.7 – 1.1V	

FUEL TANK

M13GA--

REMOVAL AND INSTALLATION



Removal steps

1. Fuel tank filler tube cap
2. Drain plug
- + 3. Return hose
- + 4. Vapor hose
5. Fuel gauge unit connector
6. Electrical fuel pump connector
- + 7. High pressure hose to fuel pump connection
- + 8. Filler hose
- + 9. Vapor hose
- + 10. Self-locking nut
11. Tank band stay
12. Tank band
13. Fuel tank
- 4 14. Vapor hose
- 15. Fuel tank pressure control valve
16. Fuel gauge unit
17. Electrical fuel pump
18. Fuel tnak filler tube

Pre-removal Operation
- Draining of the Fuel
- Release of Residual Pressure from High Pressure Fuel Hose (Refer to P.13-102.)

Post-installation Operation
- Measurement of Fuel Pressure (Refer to P.13-103.)
- Supplying of the Fuel

Caution
When disconnecting the high pressure fuel hose, cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

TSB Revision

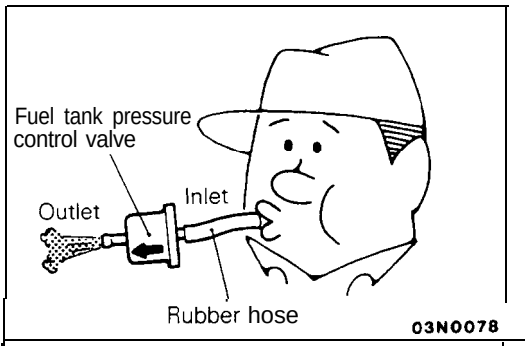
INSPECTION M13GCAI

- Check the hoses and the pipes for crack or damage.
- Check the fuel tank filler tube cap for malfunction.
- Check the fuel tank for deformation, corrosion or crack.
- Check the fuel tank for dust or foreign material.

NOTE
If the inside of the fuel tank is to be cleaned, use any one of the following:
(1) Kerosene
(2) Trichloroethylene
(3) A neutral emulsion type detergent

FUEL TANK PRESSURE CONTROL VALVE

(1) Remove the fuel tank pressure control valve.
(2) Check the valve function after a clean rubber hose is installed on it.



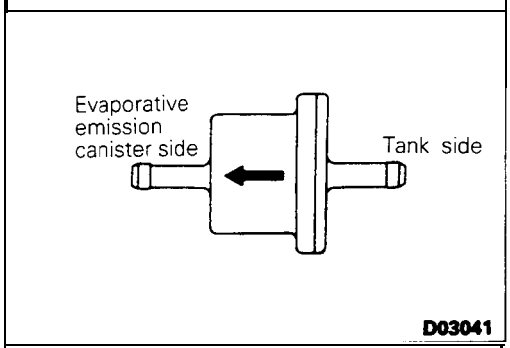
Check procedure	Normal function
Blow from the inlet (fuel tank side).	Air passes through after you feel a slight resistance.
Blow from the outlet (evaporative emission canister side).	Air flows.

(3) Check the valve for crack or leakage.

SERVICE POINTS OF INSTALLATION M13GDAI

15. INSTALLATION OF FUEL TANK PRESSURE CONTROL VALVE

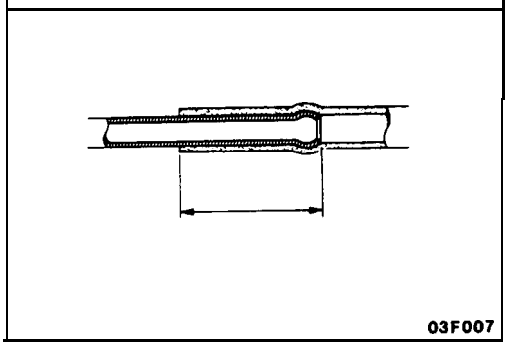
Install so that the fuel tank pressure control valve is facing in the direction shown in the figure.



14./4. CONNECTION OF VAPOR HOSE/3. RETURN HOSE

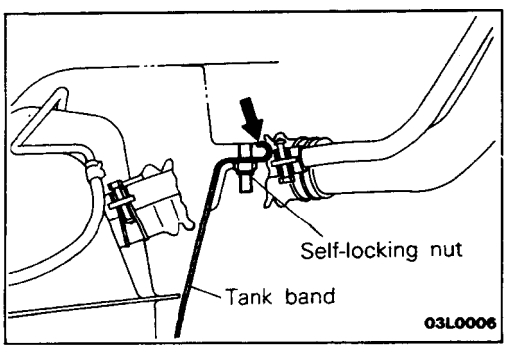
When attaching the fuel hose to the pipe, be sure that the hose is attached as shown in the illustration.

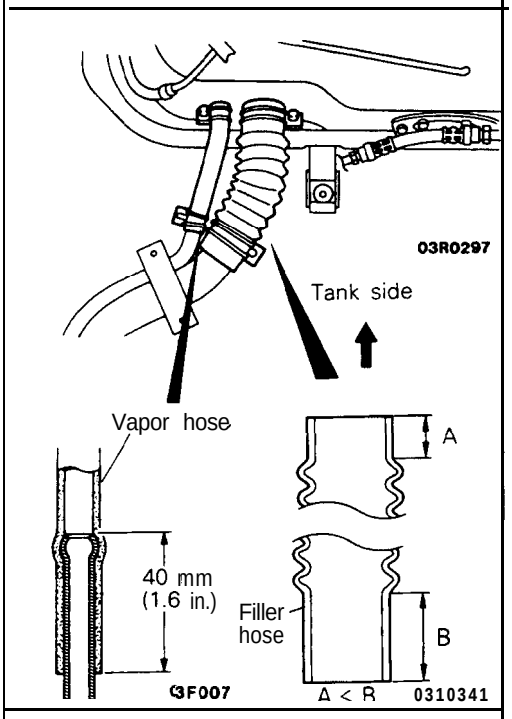
Standard value : 25–30 mm (1.0–1.2 in.)



10. INSTALLATION OF SELF-LOCKING NUT

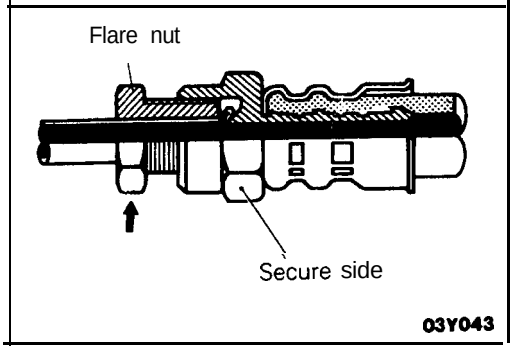
Tighten the self-locking nuts until the rear end of the tank band contacts the body.





9. CONNECTION OF VAPOR HOSE/8. FILLER HOSE

(1) The vapor hose should be connected all the way at the tank, and approximately 40 mm (1.6 in.) at the fuel tank filler tube.
(2) The end of the filler hose with the shorter straight pipe part should be connected at the tank side.



7. CONNECTION OF HIGH PRESSURE HOSE TO FUEL PUMP

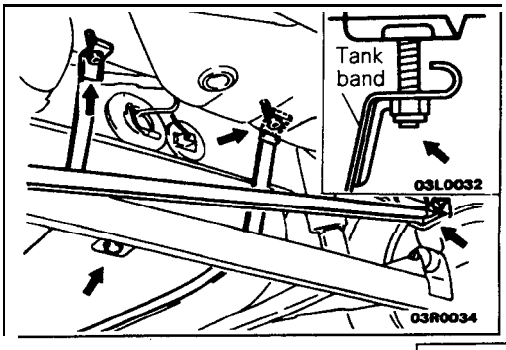
Temporarily tighten the flare nut by hand, and then tighten it to the specified torque, being careful that the fuel hose does not become twisted.

Caution
When tightening flare nut, be careful not to bend or twist line to prevent damage to fuel pump low connection.

FUEL PUMP REPLACEMENT M13GFAC

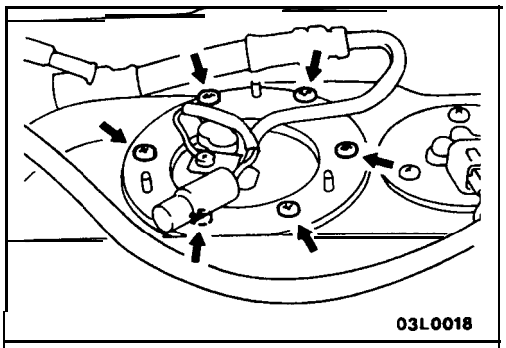
(1) Disconnect the fuel pump connector.
(2) Remove the fuel tank filler tube cap.
(3) Drain the fuel.
(4) **Disconnect the fuel high pressure hose and main pipe.**

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.

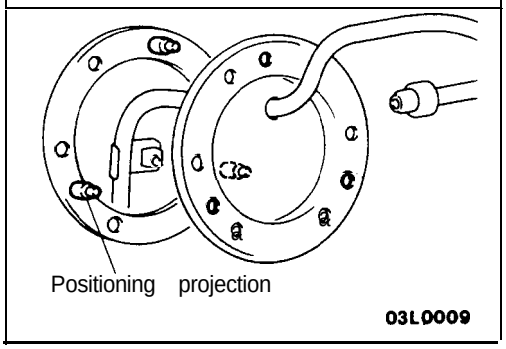


(5) Loosen the self-locking nuts to the end of the stud bolt.
(6) Disconnect the lateral rod right side body coupling; then lower the lateral rod and use wire or similar material to suspend from the axle beam.
(7) For models equipped with the ACTIVE-Electronic Control Suspension (E.C.S.) disconnect the rear height sensor and the lateral rod. (Refer to GROUP 33B–Service Adjustment Procedures.)

TSB Revision



(8) Remove the fuel pump installation screws and the bolt for holding the fuel pump (at the lower side of the fuel tank), and then remove the fuel pump from the fuel tank.



(9) Align the three positioning projections of the packing with the holes in the fuel pump.

(lO)When the fuel pump is installed, the holding bolt at the lower side of the fuel tank should be installed first. Care should be taken at this time that the O-ring is not pinched.

(1 l)For models equipped with the ACTIVE-E.C.S., check the operation of the ACTIVE-E.C.S. after installation of the rear height sensor. (Refer to GROUP 33B–Service Adjustment Procedures.)

FUEL LINE AND VAPOR LINE

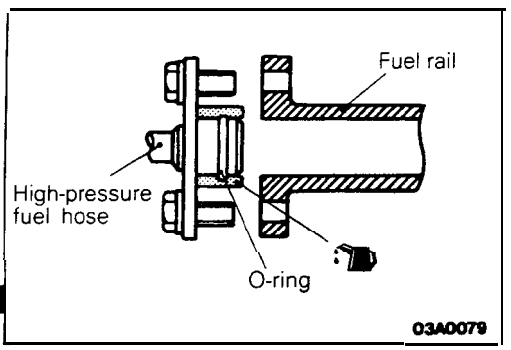
REMOVAL AND INSTALLATION

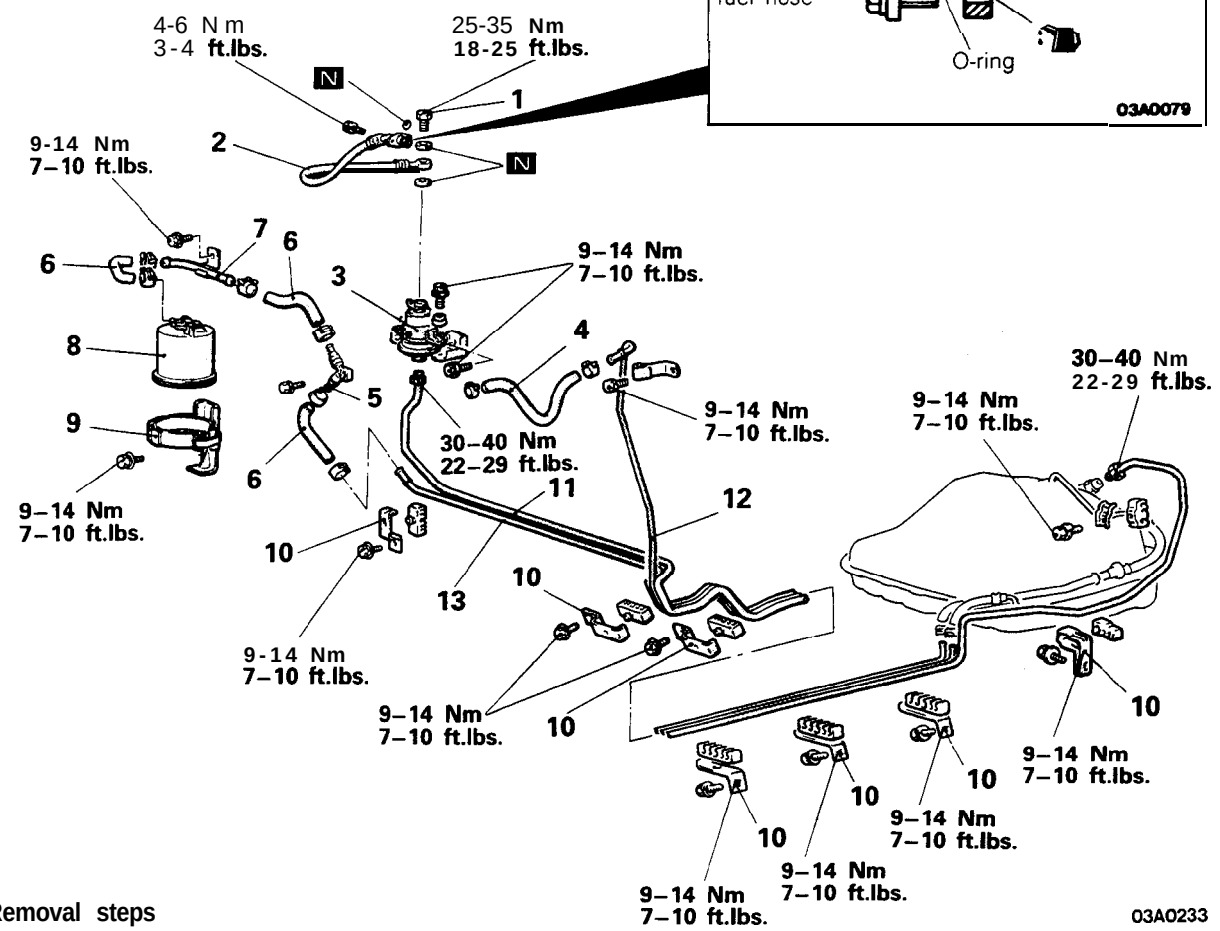
M13KA--

Pre-removal Operation
- Removal of the Battery Tray
  (Refer to GROUP 54–Starter Motor)

*Release of Residual Pressure from High Pressure Fuel Hose
(Refer to P.13-102.)

Post-installation Operation
*Measurement of Fuel Pressure
(Refer to P.13-103.)
- Installation of the Battery Tray
  (Refer to GROUP 54–Starter Motor)

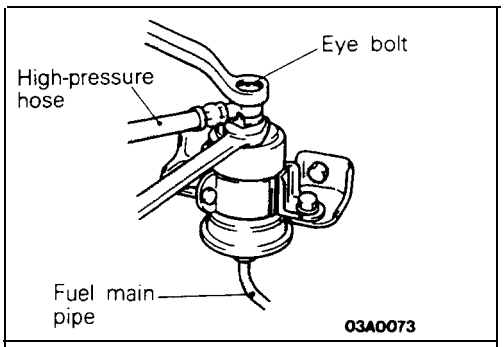


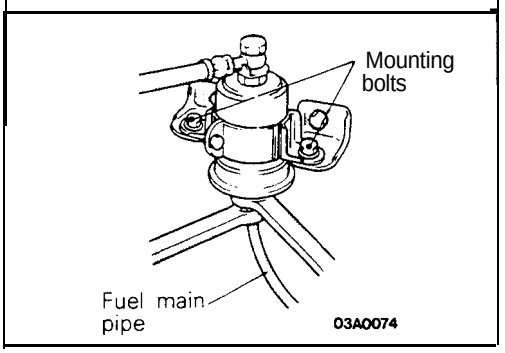


Removal steps

◆◆ 1. Eye bolt
- * 2. High pressure fuel hose
- **+ 3. Fuel filter
- + 4. Fuel return hose
  5. Check valve
- + 6. Fuel vapor hose
  7. Vapor pipe assembly
  8. Evaporative emission canister
  9. Evaporative emission canister holder
  10. Clip
  11. Fuel main pipe
  12. Fuel return pipe
  13. Fuel vapor pipe

TSB Revision





SERVICE POINTS OF REMOVAL M13KBAM

1. REMOVAL OF EYE BOLT

Remove the eye bolt while holding the fuel filter nut securely.

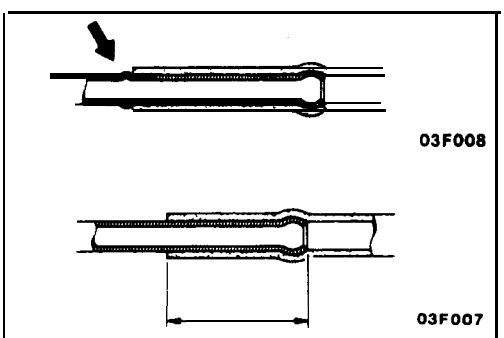
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

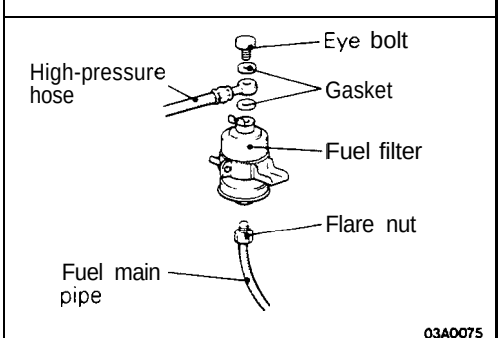
3. REMOVAL OF FUEL FILTER

(1) Loosen the main pipe flare nut while holding the fuel filter nut securely.
(2) Remove the fuel filter mounting bolts, and then remove the fuel filter from the bracket.

INSPECTION M13KCAB

- Check the hose and pipes for cracks, bend, deformation and clogging.
- Check the evaporative emission canister for clogging.
- Check the fuel filter for clogging and damage.





SERVICE POINTS OF INSTALLATION M13KDAP

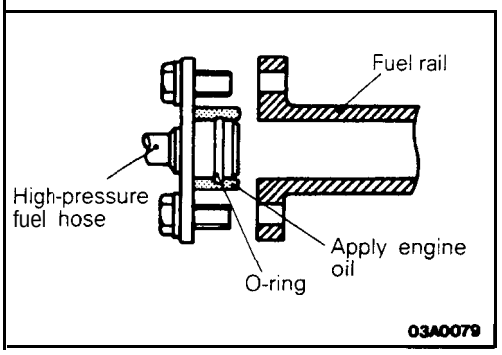
6. INSTALLATION OF FUEL VAPOR HOSE/4. FUEL RETURN HOSE

(1) If the fuel pipe has a stepped part, connect the fuel hose to the pipe securely, up to the stepped part, as shown in the figure.
(2) If the fuel pipe does not have a stepped part, connect the fuel hose to the pipe securely, so that it is the standard value.

Standard value: 20–25 mm (.8–1.0 in.)

3. INSTALLATION OF FUEL FILTER

(1) When installing the fuel filter, first temporarily install the filter to the filter bracket; then insert the main pipe at the connector part of the filter, and manually screw in the main pipe's flare nut.
(2) Holding the fuel filter nut, tighten the fuel main pipe's flare nut and eye bolt at the specified torque. Then tighten the filter to the bracket.



2. INSTALLATION OF HIGH PRESSURE FUEL HOSE

Apply engine oil to the hose union.
Insert the hose, being careful not to damage the O-ring, and tighten securely.

Caution
Because there is high pressure applied between the fuel pump and the injection mixer, be especially sure that there is no fuel leakage in this area.

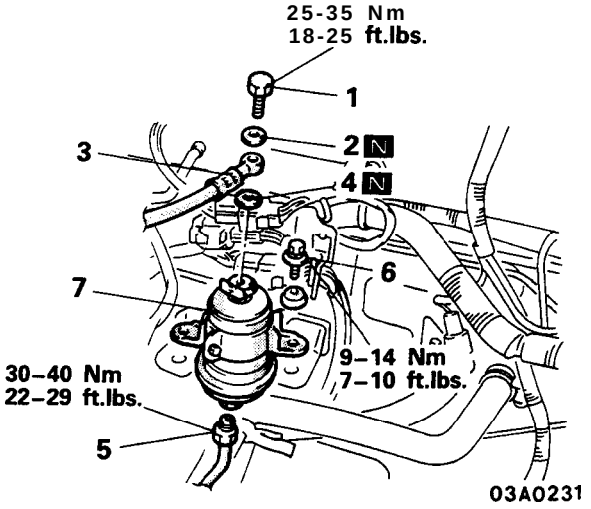
FUEL FILTER

REMOVAL AND INSTALLATION

M13VA--

Pre-removal Operation
@Release of Residual Pressure from High Pressure Fuel Hose
(Refer to P.13-102.)

Post-installation Operation
@Measurement of Fuel Pressure
(Refer to P.13-103.)



Fuel filter removal steps

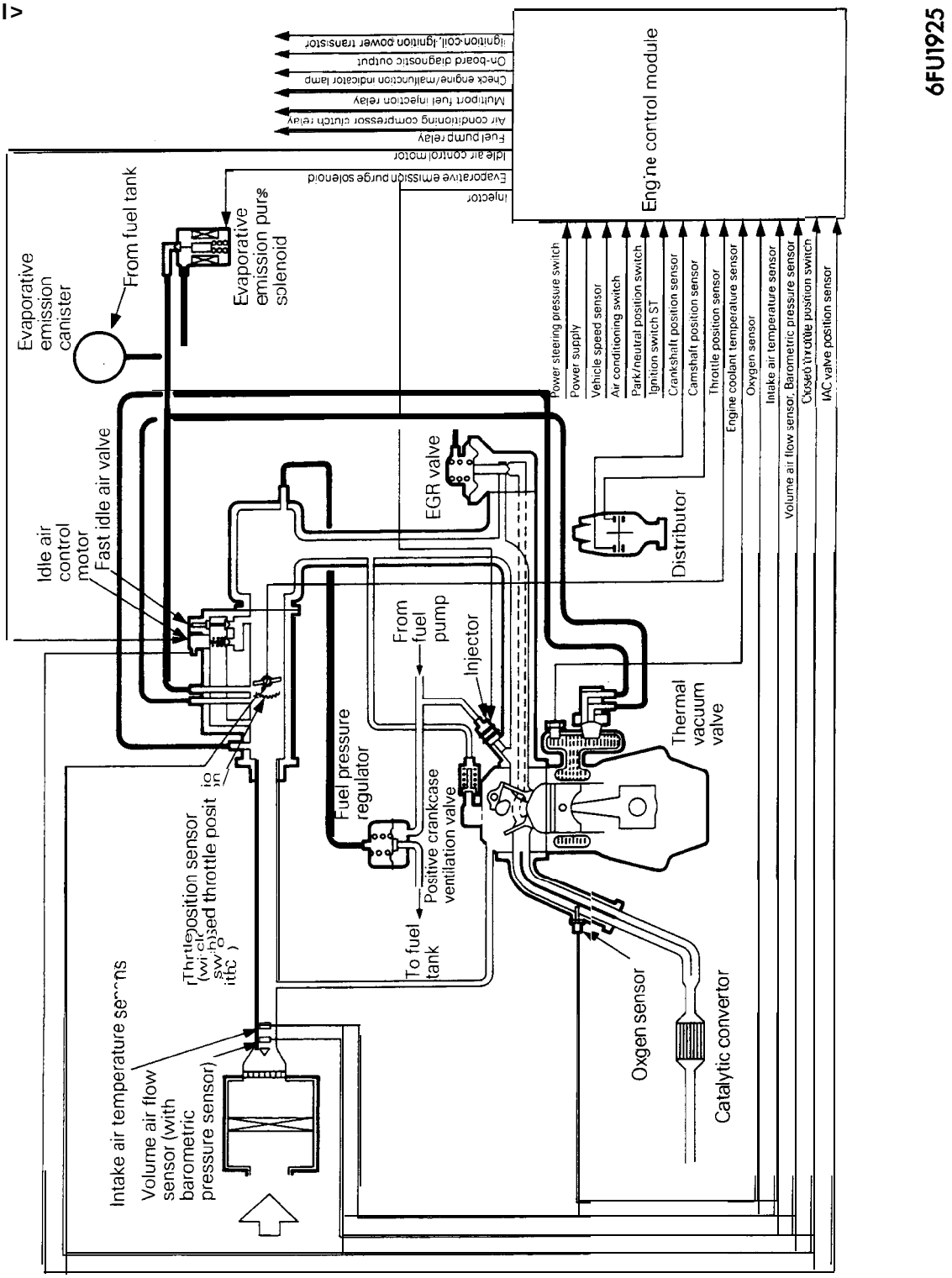
1. Eye bolt (Refer to P.13-114.)
2. O-ring
3. Connection for high pressure fuel hose
4. O-ring
5. Connection for fuel main pipe
6. Mounting bolt
7. Fuel filter (Refer to P.13-114.)

FUEL SYSTEM <SOHC-16 VALVE>

GENERAL INFORMATION

MFI SYSTEM DIAGRAM

<Federal>



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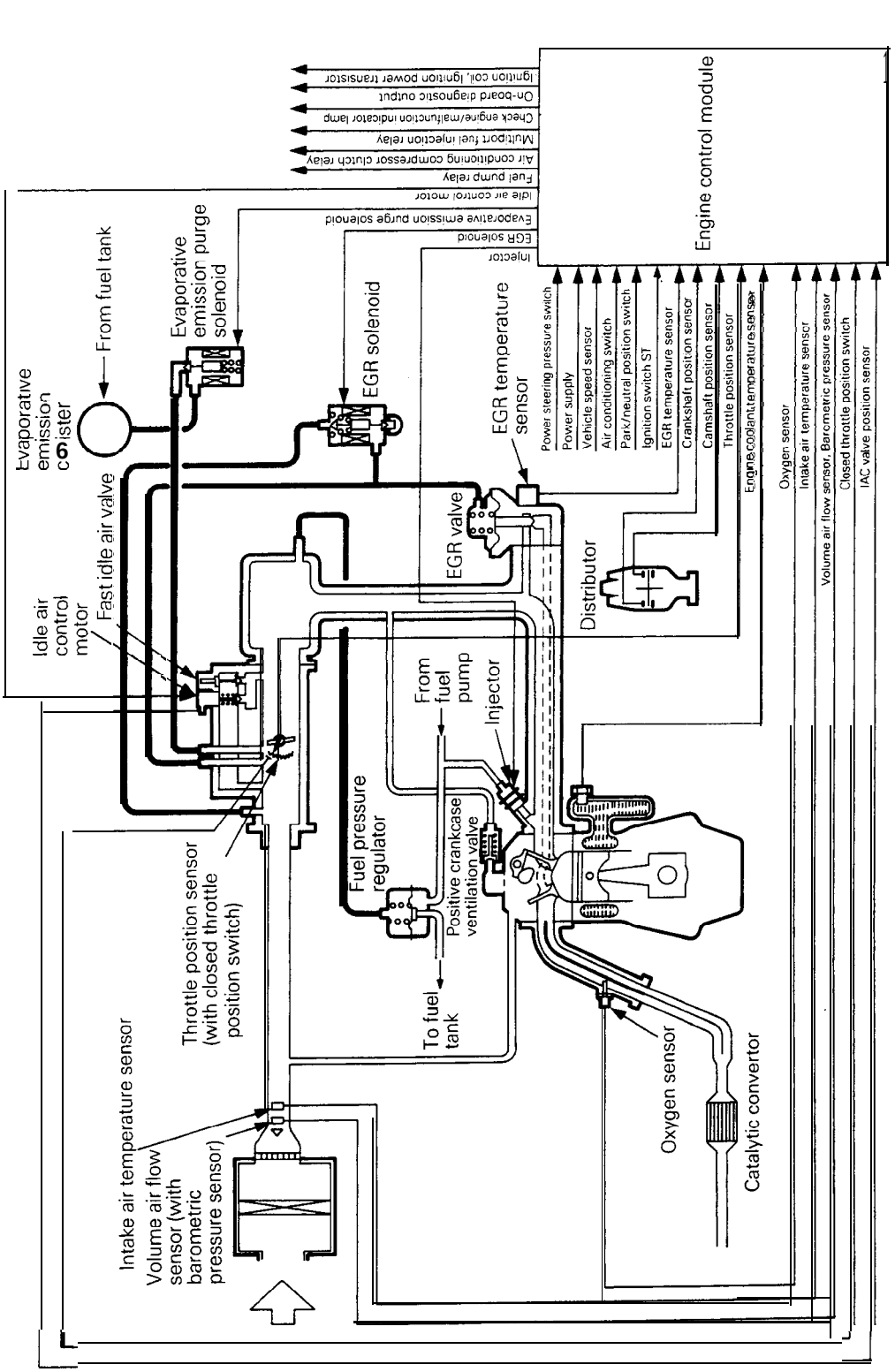

6FU1937
Engine control module
Ignition coil, Ignition power transistor
On-board diagnostic output
Check engine/malfunction indicator lamp
Multiport fuel injection relay
Air conditioning compressor clutch relay
Fuel pump relay
Idle air control motor
Evaporative emission purge solenoid
EGR solenoid
Injector
Power steering pressure switch
Power supply
Vehicle speed sensor
Air conditioning switch
Park/neutral position switch
Ignition switch ST
EGR temperature sensor
Crankshaft position sensor
Camshaft position sensor
Throttle position sensor
Engine coolant temperature sensor
Oxygen sensor
Intake air temperature sensor
Volume air flow sensor, Barometric pressure sensor
Closed throttle position switch
IAC valve position sensor
From fuel tank
Evaporative emission canister
Evaporative emission purge solenoid
EGR solenoid
EGR temperature sensor
EGR valve
Distributor
Fast idle air valve
Idle air control motor
From fuel pump
Injector
Fuel pressure regulator
Positive crankcase ventilation valve
To fuel tank
Throttle position sensor (with closed throttle position switch)
Intake air temperature sensor
Volume air flow sensor (with barometric pressure sensor)
Oxygen sensor
Catalytic convertor

SPECIFICATIONS

GENERAL SPECIFICATIONS

M13CA--

Items	Specifications
Fuel	
Tank capacity	60 (15.9)
Return system	Equipped
Filter	High pressure type
Fuel pump	
Type	Electrical, in-tank type
Driven by	Electric motor
Throttle body	
Throttle bore mm (in.)	50 (1.969)
Throttle position sensor	Variable resistor type
Idle air control motor	DC motor type DC motor type by-pass air control system with the Fast Idle Air Valve (FIAV)
Closed throttle position switch	Rotary contact type, within throttle position sensor
IAC valve position sensor	Hall element type
Engine control module	
Identification model No.	
< Federal >	E2T36281
<California>	E2T36280
Sensors	
Volume air flow sensor	Karman vortex type
Barometric pressure sensor	Semiconductor diffusion type
Intake air temperature sensor	Thermistor type
Engine coolant temperature sensor	Thermistor type
Oxygen sensor	Zirconia type
Vehicle speed sensor	Reed switch type
Park/neutral position switch	Contact switch type
Camshaft position sensor	Hall element type
Crankshaft position sensor	Hall element type
EGR temperature sensor <California>	Thermistor type
Power steering pressure switch	Contact switch type
Actuators	
Multiport fuel injection relay type	Contact switch type
Injector type and number	Electromagnetic, 4
Injector identification mark	MDH240
Evaporative emission purge solenoid	ON/OFF step solenoid valve
EGR solenoid <California>	Duty cycle type solenoid valve
Fuel pressure regulator	
Regulated pressure kPa (psi)	335 (47.6)

SERVICE SPECIFICATIONS

M13CB--

Items		Specifications
Basic ignition timing		5° ± 2°BTDC at curb idle
Curb idle speed	r p m	700 ± 100
Idle speed when air conditioning is on	rpm	
< M / T >		850 at neutral position
< A / T >		650 at D range
Basic idle speed	r p m	700 ± 50
Throttle position sensor adjusting voltage	mV	400–1,000
Throttle position sensor resistance	kΩ	3.5-6.5
Intake air temperature sensor resistance	kΩ	2.7 [at 20°C (68°F)]
Engine coolant temperature sensor resistance	kΩ	
20°C (68°F)		2.4
80°C (176°F)		0.3
Oxygen sensor output voltage	V	0.6–1.0
Fuel pressure	kPa (psi)	
Vacuum hose disconnection		330–350 (47–50) at curb idle
Vacuum hose connection		Approx. 270 (38) at curb idle
Injector coil resistance	Ω	13-16 [at 20°C (68°F)]

TORQUE SPECIFICATIONS

Refer to P.13-6.

SEALANT

Refer to P.13-7.

SPECIAL TOOLS

M13DA-B

Refer to P.13-7.

TROUBLESHOOTING

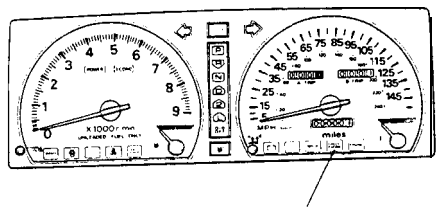
EXPLANATION OF TROUBLESHOOTING PROCEDURES

M13EBCC

Refer to P.13-8.

EXPLANATION AND PRECAUTION RELATED TO HARNESS CHECKING

Refer to P.13-9.



CHECK ENGINE/MALFUNCTION INDICATOR LAMP

Among the on-board diagnostic items, a check engine/malfunction indicator lamp comes on to notify the driver of the emission control items when an irregularity is detected.
However, when an irregular signal returns to normal and the engine control module judges that it has returned to normal, the check engine/malfunction indicator lamp goes out.
Moreover, when the ignition switch is turned off, the light goes out. Even if the ignition switch is turned on again, the light does not come on until the irregularity is detected.
Here, immediately after the ignition switch is turn on, the check engine/malfunction indicator lamp is lit for 5 seconds to indicate that the check engine/malfunction indicator lamp operates normally.

ITEMS INDICATED BY THE CHECK ENGINE/ MALFUNCTION INDICATOR LAMP

Engine control module
Oxygen sensor
Volume air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crankshaft position sensor
Camshaft position sensor
Barometric pressure sensor
Ignition timing adjustment signal
Injector
EGR <California>

Caution
Check engine/malfunction indicator lamp will come on even when terminal for ignition timing adjustment is short-circuited. Therefore, it is not abnormal that the light comes on even when terminal for ignition timing adjustment is short-circuited at the time of ignition timing adjustment.

CHECK ENGINE/MALFUNCTION INDICATOR LAMP INSPECTION

(1) Check to be sure, when the ignition switch is set to the "ON" position, that the lamp illuminates for about five seconds and then switches OFF.
(2) If the lamp does not illuminate, check for damage or disconnection of the harness, or for a blown fuse or a failed light bulb.

ON-BOARD DIAGNOSTIC

The engine control module monitors the input/output signals (some signals at all times and the others under specified conditions) of the engine control module.

When it is noticed that an irregularity has continued for a specified time or longer from when the irregular signal is initially monitored, passing a certain number, the engine control module judges that an irregularity has occurred, memorizes the diagnostic trouble code, and outputs the signal to the on-board diagnostic output terminal.

There are 15 on-board diagnostic items including the normal state, and the diagnostic results can be read out with a voltmeter or scan tool.

Moreover, since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the engine control module connector is disconnected. In addition, beginning with the engine control module of 1990 and later models, the diagnostic trouble codes are erased by turning on the ignition switch and sending the diagnostic trouble code erase signal from the scan tool to the engine control module.

Caution

If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal from the scan tool to the engine control module or disconnect the battery terminal (–) for 10 seconds or more, and the diagnostic memory will be erased.

The 15 on-board diagnostic items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

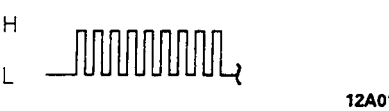
Caution

The diagnostic trouble code of ignition timing adjustment signal is outputted when terminal for ignition timing adjustment is short-circuited. Therefore, it is not abnormal that the code is outputted even when terminal for ignition timing adjustment is short-circuited at the time of ignition timing adjustment.

DIAGNOSTIC CHART (FAULT TREE)

No.	Diagnostic trouble code Output signal pattern	On-board diagnostic item	Check item (Remedy)	Memory
		Engine control module	(Replace engine control module)	–
11		Oxygen sensor	• Harness and connector • Oxygen sensor • Fuel pressure • Injectors (Replace if defective.) • Intake air leaks	Retained
12		Volume air flow sensor	• Harness and connector (If harness and connector are normal, replace volume air flow sensor assembly.)	Retained
13		Intake air temperature sensor	• Harness and connector • Intake air temperature sensor	Retained

Diagnostic trouble code		On-board diagnostic item	Check item (Remedy)	Memory
No.	Output signal pattern			
14	12A0104	Throttle position sensor	• Harness and connector • Throttle position sensor • Closed throttle position switch	Retained
21	12A0107	Engine coolant temperature sensor	• Harness and connector • Engine coolant temperature sensor	Retained
22	12A0107	Crankshaft position sensor	• Harness and connector (If harness and connector are normal, replace distributor assembly.)	Retained
23	12A0107	Camshaft position sensor	• Harness and connector (If harness and connector are normal, replace distributor assembly.)	Retained
24	12A0107	Vehicle speed sensor (reed switch)	• Harness and connector • Vehicle speed sensor (reed switch)	Retained
25	12A0107	Barometric pressure sensor	• Harness and connector (If harness and connector are normal, replace barometric pressure sensor assembly.)	Retained
36	12A0107	Ignition timing adjustment signal	• Harness and connector	–
41	12A0107	Injector	• Harness and connector • Injector coil resistance	Retained

Diagnostic trouble code No.	Diagnostic trouble code Output signal pattern	On-board diagnostic item	Check item (Remedy)	Memory
43		EGR <California>	• Harness and connector • EGR temperature sensor • EGR valve • EGR solenoid • EGR valve control vacuum	Retained
55		IAC valve position sensor	• Harness and connector • IAC valve movement (If harness, connector and IAC valve movement are normal, replace idle air control motor assembly.)	Retained
–		Normal state	–	–

NOTE
1. Replace the engine control module if a diagnostic trouble code is output although the inspection reveals that there is no problem with the check items.
2. The code numbers will be displayed in order, starting from the lowest.

TROUBLESHOOTING TABLE

NOTE
*: **The** failsafe/back-up function is in operation.

Diagnostic trouble code No.	On-board diagnostic item	Diagnostic content	Major cause	Remarks (trouble phenomenon, etc.)
–	Engine control module	The engine control module itself is abnormal.	–	• Engine stop • Impossible start
11	Oxygen sensor	Though the air/fuel mixture ratio closed loop control is operated, the signal voltage of the oxygen sensor does not vary (to be lean/rich).	(1) The oxygen sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the oxygen sensor circuit.	• Deterioration of exhaust gas purifying performance*
			(3) The fuel pressure is improper. (4) The injector is troubled. (5) Air is sucked through the gasket clearance, etc. (6) The engine control module is troubled.	• Deterioration of exhaust gas purifying performance* • Abnormal start • Unstable idling • Abnormal acceleration
12	Volume air flow sensor	Though the engine is running, the signal frequency of the air flow sensor is 1 0Hz or less.	(1) Volume air flow sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the volume air flow sensor circuit. (3) The engine control module is troubled.	• Abnormal acceleration* • Unstable idling* • Inappropriate idle speed*

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Diagnostic trouble code No.	On-board diagnostic item	Diagnostic content	Major cause	Remarks (trouble phenomenon, etc.)
13	Intake air temperature sensor	(1) The signal voltage of the intake air temperature sensor is 4.5V or higher. (2) The signal voltage of the intake air temperature sensor is 0.27V or lower.	(1) The intake air temperature sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the air intake temperature sensor circuit. (3) The engine control module is troubled.	• Slightly improper driveability* • At high temperatures, (a) Improper start (b) Unstable idling*
14	Throttle position sensor	(1) The signal voltage of the throttle position sensor is 0.2V or lower. (2) Though the closed throttle position switch is on, the signal voltage of the throttle position sensor is 2V or higher.	(1) The throttle position sensor is troubled or improperly adjusted. (2) Open-circuit, short-circuit or improper connector contact occurs in the throttle position sensor circuit.	• Slightly improper acceleration <M/T> • Improper driveability <A/T> • Engine stop
			(3) The closed throttle position switch ON is troubled. (4) The closed throttle position switch signal line is short-circuited. (5) The engine control module is troubled.	• Engine stop • Racing is impossible
21	Engine coolant temperature sensor	(1) The signal voltage of the engine coolant temperature sensor is 4.6V or higher. (2) The signal voltage of the engine coolant temperature sensor is 0.11 V or lower. (3) During engine warming-up, the engine coolant temperature sensor signal indicates that the engine coolant temperature drops.	(1) The engine coolant temperature sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the engine coolant temperature sensor circuit. (3) The engine control module is troubled.	During cold weather • Starting is impossible*. • Unstable idling* • Improper acceleration*
22	Crankshaft position sensor	Though the engine is cranking 4 seconds or more, the signal voltage of the crankshaft position sensor does not vary (to be high/low).	(1) The crankshaft position sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the crankshaft position sensor circuit. (3) The engine control module is troubled.	• Engine stop • Starting is impossible.
23	Camshaft position sensor	Though the engine is running, the signal voltage of the camshaft position sensor does not vary (to be high/low).	(1) The camshaft position sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the camshaft position sensor circuit. (3) The engine control module is troubled.	• Unstable idling* • Improper acceleration*

Diagnostic trouble code No.	On-board diagnostic item	Diagnostic content	Major cause	Remarks (trouble phenomenon, etc.)
24	Vehicle speed sensor (reed switch)	During acceleration of engine revolution speed of 3,000 rpm or more, the signal voltage of the vehicle speed sensor does not vary (to be high/low).	(1) The vehicle speed sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the vehicle speed sensor circuit. (3) The engine control module is troubled.	The engine sometimes cuts off when stopping afte deceleration.
25	Barometric pressure sensor	(1) The signal voltage of the barometric pressure sensor is 4.5V or higher. (2) The signal voltage of the barometric pressure sensor is 0.2V or lower.	(1) The barometric pressure sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the barometric pressure sensor circuit. (3) The engine control module is troubled.	• Unstable idling* • Improper acceleration* • Improper start*
36	Ignition timing adjusting signal	The ignition timing adjusting signal line is short-circuited to the ground.	(1) The ignition timing adjusting signal line is short-circuited to the ground. (2) The engine control module is troubled.	• Improper acceleration • Engine overheat
41	Injector	Injector is not continuously driven for 4 seconds during engine cranking or idle operation.	(1) The injector is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the injector sensor circuit. (3) The engine control module is troubled.	• Unstable idling • Improper acceleration • improper start
43	EGR <California>	During engine running after warming-up, (1) The EGR amount is small. (The signal voltage of the EGR temperature sensor is excessively high.) (2) The signal voltage of the EGR temperature sensor is 0.1 V or less.	(1) The EGR valve is not opened. (2) The negative pressure of the EGR valve control is excessively low. (3) The EGR solenoid is troubled. (4) The EGR temperature sensor is troubled. (5) Open-circuit, short-circuit or improper connector contact occurs in the EGR temperature sensor circuit. (6) The engine control module is troubled.	• Deterioration of exhaust gas purifying performance
55	IAC valve position sensor	IAC valve does not move to the intended position (opening angle), even though idle air control motor operates many times.	(1) The IAC valve position sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the IAC valve position sensor circuit. (3) The idle air control motor (DC motor) is troubled. (4) Open-circuit, short-circuit or improper connector contact occurs in the idle air control motor (DC motor) circuit. (5) The engine control module is troubled.	• Inappropriate idle speed* • Engine stops* • Unstable idling*

FAILSAFE/BACK-UP FUNCTIONS LIST

If trouble with any major sensor is detected by the on-board diagnostic, the vehicle will be kept in the safe driving conditions according to the preset control logic.

Trouble item	Control content for trouble
Volume air flow sensor	(1) Fuel injection timing and ignition timing are determined according to the throttle position sensor (TPS) and engine revolution speed signal (crankshaft position sensor signal). (2) The IAC motor is fixed in the appointed position so idle air control is not performed.
Intake air temperature sensor	The control is executed with the suction air temperature regarded as 25°C (77°F).
Throttle position sensor (TPS)	The fuel injection rate is not increased for acceleration according to the throttle position sensor signal.
Engine coolant temperature sensor	The control is executed with the coolant temperature regarded as 80°C (176°F).
Camshaft position sensor	Simultaneous injection of fuel is executed for all cylinders. (In this case, the No.1 cylinder top dead center is not detected at all after the ignition key is turned on.)
Barometric pressure sensor	The control is executed with the pressure regarded as 760 mmHg (30 in. Hg.).
IAC valve position sensor	Idle air control motor is not performed.
Oxygen sensor	Closed loop control of the air/fuel mixture ratio is not executed.

READ OUT OF DIAGNOSTIC TROUBLE CODE

Refer to P.13-16.

CLEAR MEMORY OF DIAGNOSTIC TROUBLE CODE

Refer to P.13-17.

CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS

Problem symptoms / Check items	Starting		Idling stability			Driving						Stopping	Reference page
	Will not start	Starting problem	Idling instability Rough idling	Incorrect idling speed	Improper idling continuity	Hesitation, sag	Poor acceleration	Stumble	Shock	Surge	Knocking	Run-on (Dieseling)	
Power supply	① 1												P.13-143
Engine control module power ground	② 2												P.13-146
Fuel pump	③ 3	① 1			① 1	① 1	① 1						P.13-147
Volume air flow sensor					⑫ 10	⑨ 9		⑤ 5	⑥ 6		③ 3		P.13-150
Intake air temperature sensor			⑥			⑤ 5	④ 4				① 1		P.13-152
Barometric pressure sensor			⑧			⑧ 8	⑥ 6				② 2		P.13-154
Engine coolant temperature sensor		3	⑦ 6	① 1	⑥ 6	⑦ 7	⑤ 5	④ 4		③ 3			P.13-155
Throttle position sensor						⑥ 6		③ 3	④ 4				P.13-157
Closed throttle position switch			④ 4	② 2	⑤ 5								P.13-160
IAC valve position sensor			③ 3	⑥ 3	④				⑤ 5				P.13-162
Camshaft position sensor	⑤ 5	⑥ 7			⑨ 8				② 2				P.13-165
Crankshaft position sensor	⑥ 6	⑦ 8			⑩ 9				③ 3				P.13-167
Ignition switch-ST <M/T>	④ 4	③ 4											P.13-171
Ignition switch-ST and park/neutral position switch <A/T>	④ 4	③ 4		⑤									P.13-172
Vehicle speed sensor					⑦				⑦				P.13-173
Power steering pressure switch				③									P.13-175
Air conditioning switch and A/C compressor clutch relay				④									P.13-176
Oxygen sensor			⑩										P.13-179
Injectors	⑧ 8	② 2	② 2		③ 3	② 2	② 2	① 1		① 1		①	P.13-181
Idle air control motor (DC motor)		④ 5	① 1	⑦ 4	② 2				⑧ 7				P.13-184
Ignition coil and ignition power transistor	⑦ 7				⑪ 10		⑦ 7		① 1		④ 4		P.13-186
Evaporative emission purge solenoid			⑨										P.13-189
EGR solenoid <California>						④ 4		⑥ 6		④ 4			P.13-191
Fuel pressure		⑤ 6	⑤ 5		⑧ 7	③ 3	③ 3	② 2		② 2			P.13-192

0 : Warm engine (number inside indicates check order)
□: Cold engine (number inside indicates check order)

PROBLEM SYMPTOMS TABLE (FOR YOUR INFOMATION)

Refer to P.13-19.

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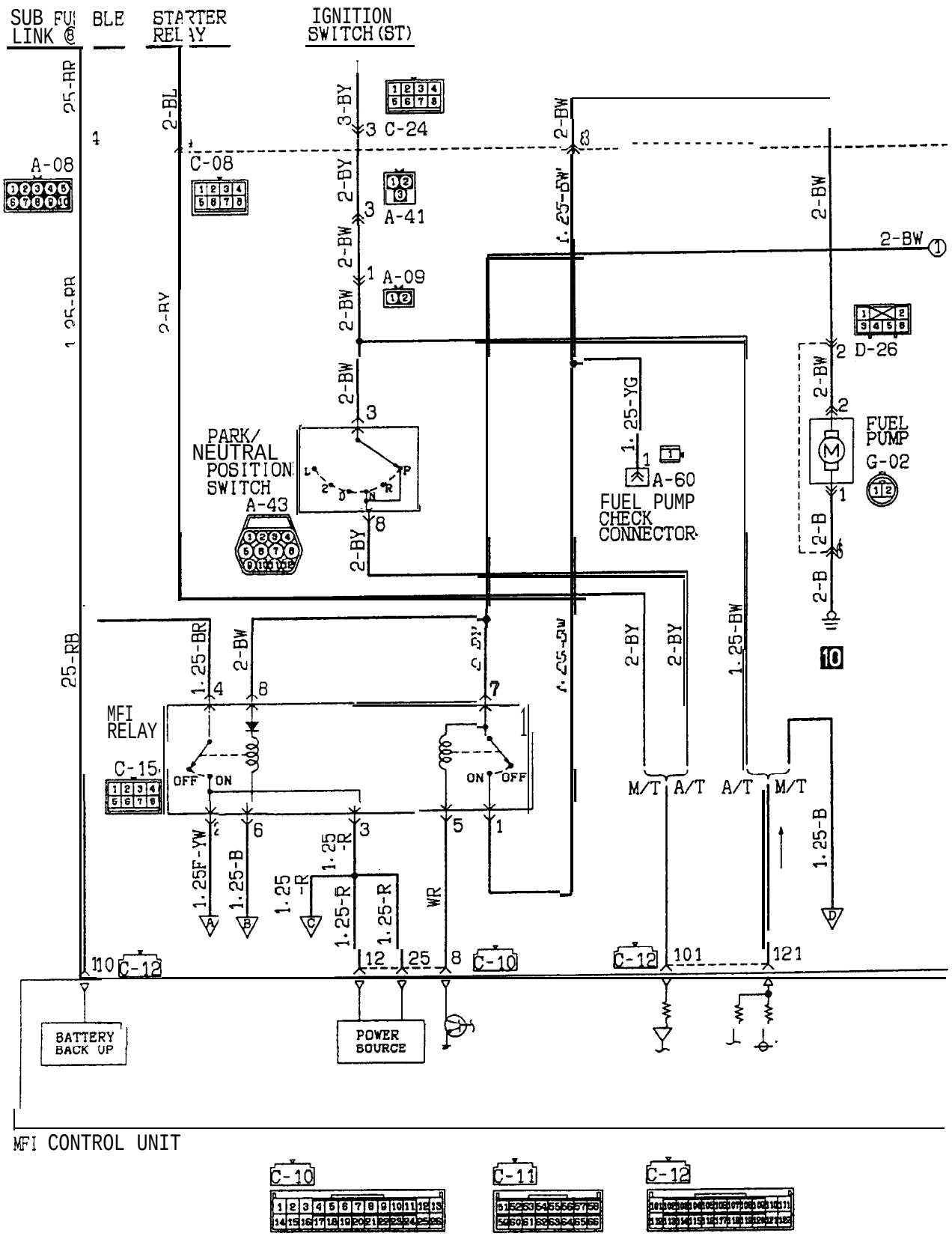
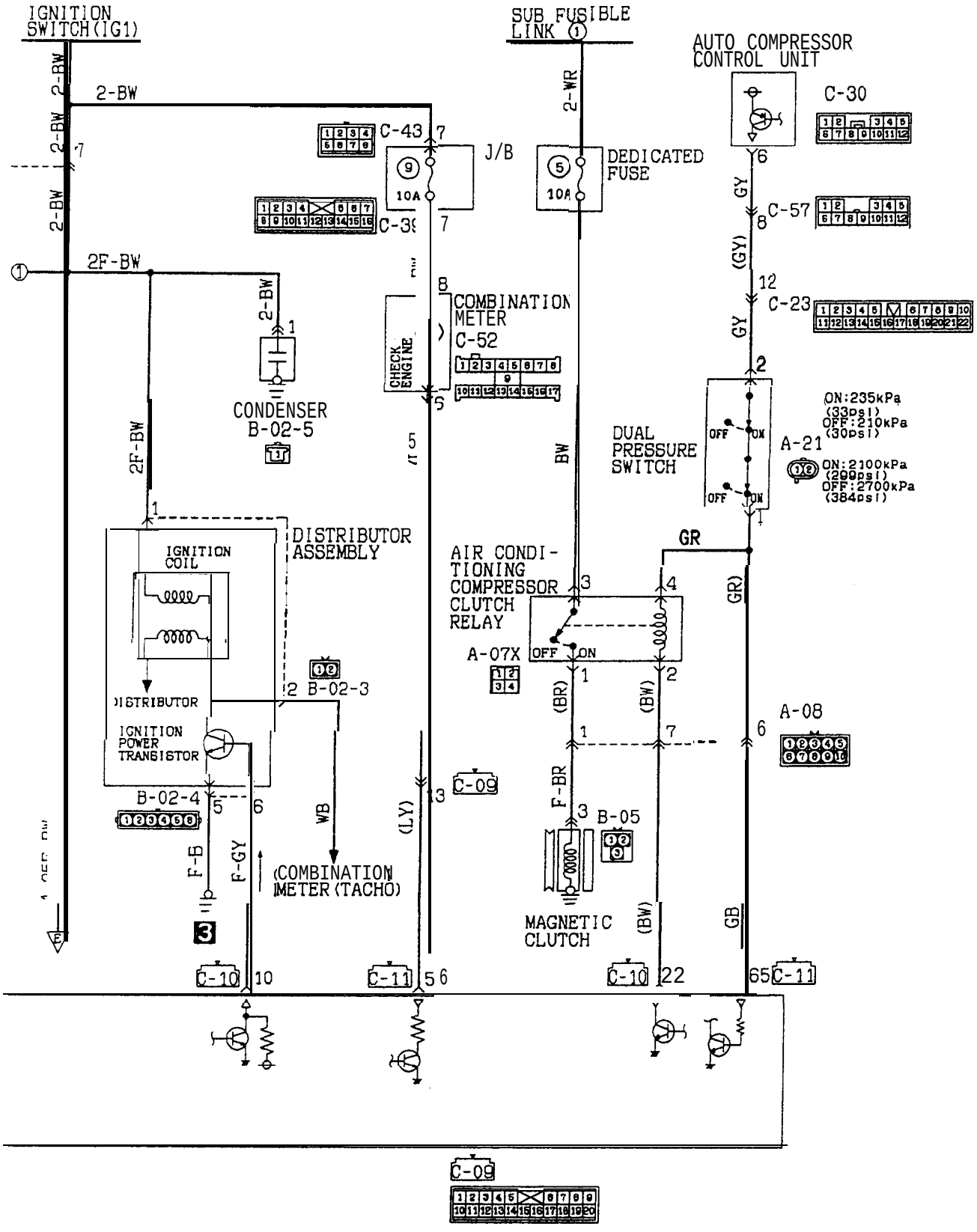
CIRCUIT DIAGRAM

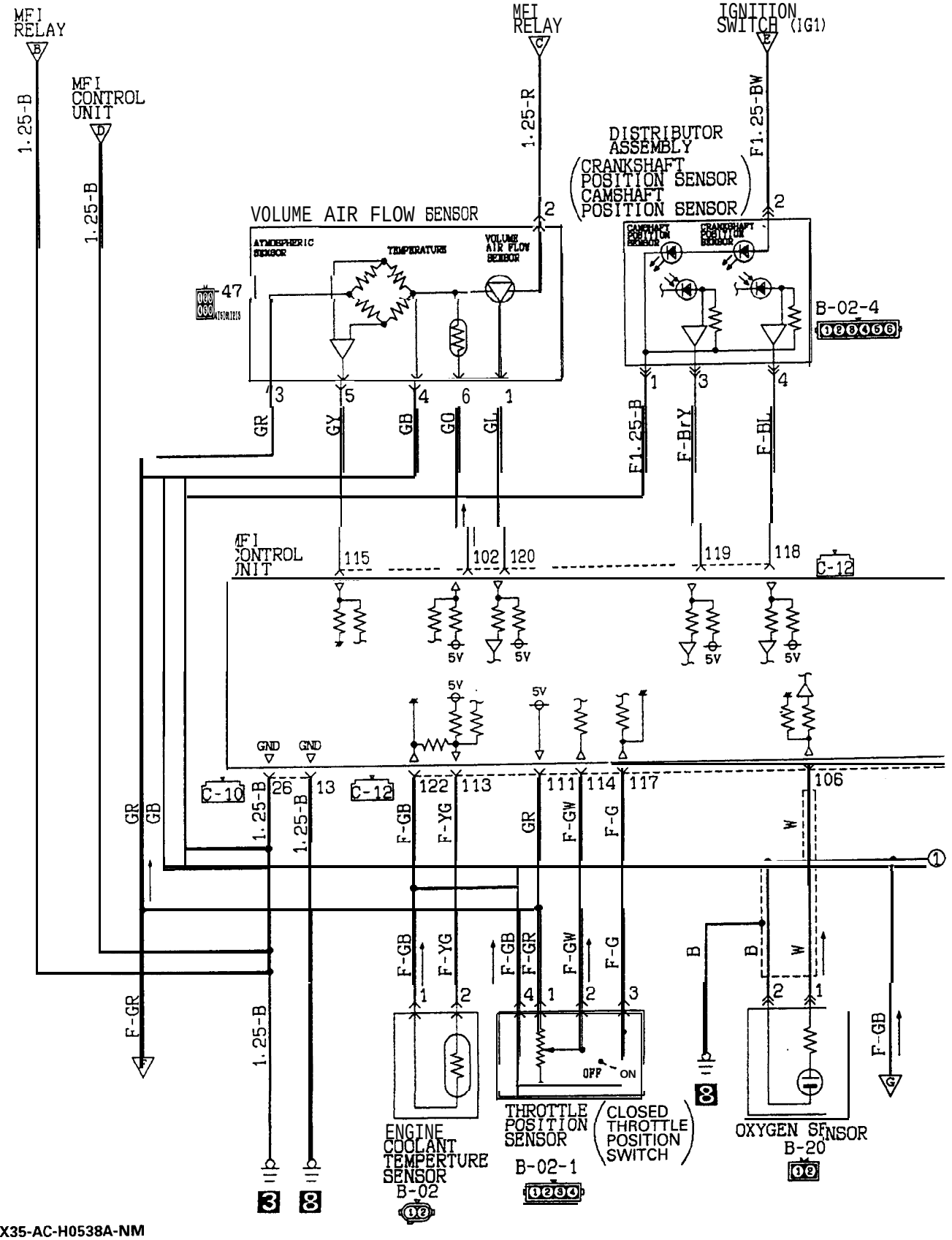
< 1993 models>




IGNITION SWITCH(IG1)
SUB FUSIBLE LINK
AUTO COMPRESSOR CONTROL UNIT
C-30
C-43
J/B
DEDICATED FUSE
10A
C-57
C-23
C-39
COMBINATION METER
C-52
CHECK ENGINE
CONDENSER
B-02-5
DUAL PRESSURE SWITCH
A-21
ON:235kPa (33psi)
OFF:210kPa (30psi)
ON:2100kPa (299psi)
OFF:2700kPa (384psi)
DISTRIBUTOR ASSEMBLY
IGNITION COIL
DISTRIBUTOR
IGNITION POWER TRANSISTOR
B-02-3
B-02-4
AIR CONDITIONING COMPRESSOR CLUTCH RELAY
A-07X
A-08
B-05
C-09
C-10
C-11
MAGNETIC CLUTCH
COMBINATION METER(TACHO)
2-BW
2F-BW
2-WR
GY
(GY)
BW
GR
(BR)
(BW)
F-BR
F-B
F-GY
WB
(LY)
GB

CIRCUIT DIAGRAM (CONTINUED)

< 1993 models>



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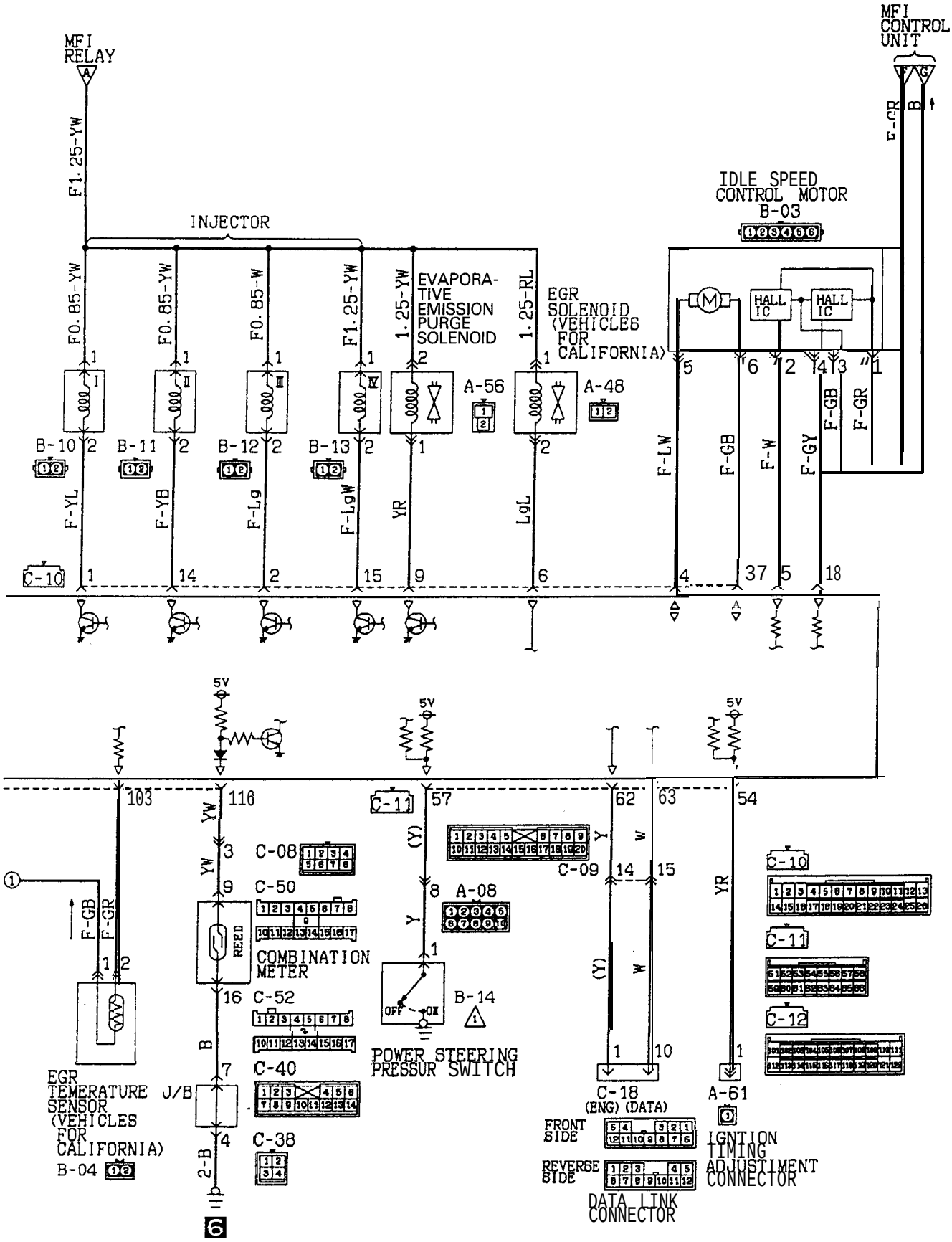

MFI RELAY
MFI CONTROL UNIT
INJECTOR
IDLE SPEED CONTROL MOTOR B-03
EVAPORA-TIVE EMISSION PURGE SOLENOID
EGR SOLENOID (VEHICLES FOR CALIFORNIA)
HALL IC
HALL IC
A-56
A-48
B-10
B-11
B-12
B-13
C-10
F1.25-YW
F0.85-YW
F0.85-W
F1.25-YW
1.25-YW
1.25-RL
F-YL
F-YB
F-Lg
F-LgW
YR
LgL
F-LW
F-GB
F-W
F-GY
F-GB
F-GR
5V
C-11
C-08
C-50
C-52
C-40
C-38
C-09
C-18 (ENG) (DATA)
A-61
A-08
B-14
COMBINATION METER
REED
POWER STEERING PRESSUR SWITCH
EGR TEMERATURE SENSOR (VEHICLES FOR CALIFORNIA)
B-04
J/B
2-B
FRONT SIDE
REVERSE SIDE
DATA LINK CONNECTOR
IGNTION TIMING ADJUSTMENT CONNECTOR
C-12
6

NOTE

FUEL TANK AND FUEL LINE

M13EAAB

Symptom	Probable cause	Remedy
Engine malfunctions due to insufficient fuel supply	Bent or kinked fuel pipe or hose	Repair or replace
	Clogged fuel pipe or hose	Clean or replace
	Clogged fuel filter or in-tank fuel filter	Replace
	Water in fuel filter	Replace the fuel filter or clean the fuel tank and fuel line
	Dirty or rusted fuel tank interior	Clean or replace
	Malfunctioning fuel pump (Clogged filter in the pump)	Replace
Evaporative emission control system malfunctions [When fuel tank filler tube cap is removed, pressure releasing noise is heard)	Mispiping of vapor line	Correct
	Disconnected vapor line piping joint	Correct
	Folded, bent, cracked or clogged vapor line	Replace
	Faulty fuel tank filler tube cap	Replace
	Malfunctioning fuel tank pressure control valve	Replace

SERVICE ADJUSTMENT PROCEDURES

CURB IDLE SPEED INSPECTION

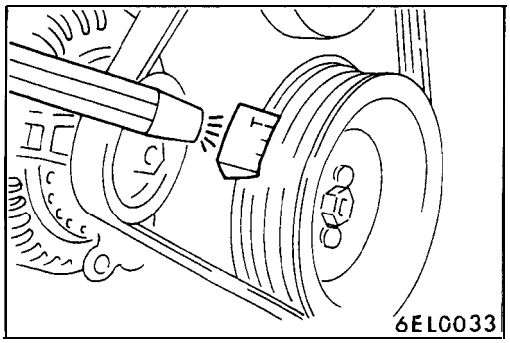
M13FHAB

(1) The vehicle should be prepared as follows before the inspection.

- Engine coolant temperature: 85–95°C(185–203°F)
- Lights, electric cooling fan and accessories: OFF
- Transaxle: Neutral (P for vehicles with an automatic transaxle)

(2) Connect a tachometer.

NOTE
Refer to P.13-134 for information concerning connection Of a tachometer.



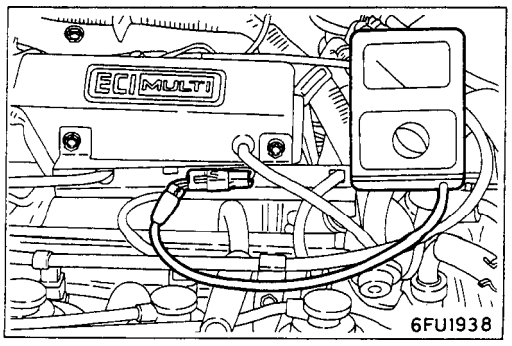
(3) Set a timing light in position.
(4) Ground the terminal for adjustment of ignition timing.
(5) Start the engine and let it idle.
(6) Check whether or not the ignition timing is the standard value; if not, adjust.

Standard value: 5°BTDC ± 2"

(7) Stop grounding the terminal for adjustment of ignition timing.
(8) Let the engine idle for two minutes.
(9) Check the idling rpm.

Curb idle speed: 700 ± 100 rpm

NOTE
The idling rpm is automatically regulated by the idle air control system.



(10) If not within the standard value range, refer to the CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS and check the MFI component,

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BASIC IDLE SPEED ADJUSTMENT

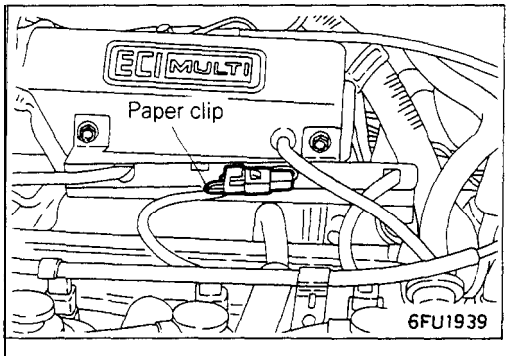
M13FHBX

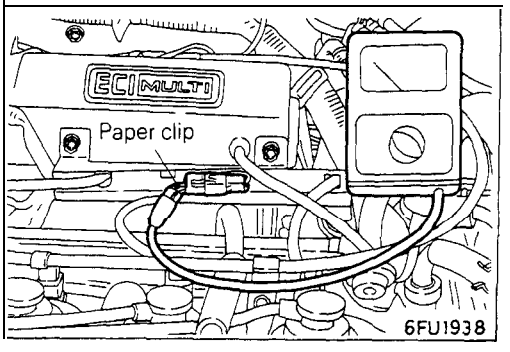
NOTE
1. The standard idling speed has been adjusted, by the engine speed adjusting screw, by the manufacturer, and there should usually be no need for readjustment.
2. Use the following procedure to adjust when the idling speed drops due to an incorrect adjustment, high idling speed, or when a load such as the air conditioning is applied on the engine.
3. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle air control motor, the compression pressure, etc. are all normal.

(1) The vehicle should be prepared as follows before the inspection and adjustment.
- Engine coolant temperature: 85–95°C (185–203°F)
- Lights, cooling fan and accessories: OFF
- Transaxle: neutral (A/T for P range)
- Steering wheel: neutral position

(2) Connect the scan tool to the data link connector (white).

NOTE
When the scan tool is connected, the diagnostic test mode control terminal should be grounded.

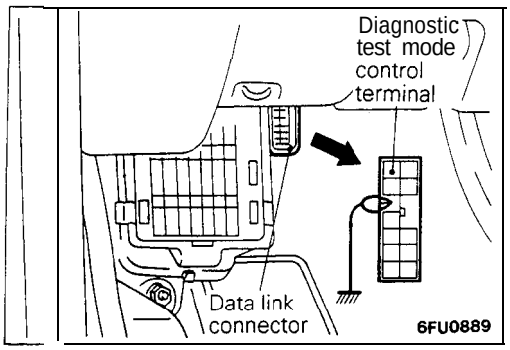




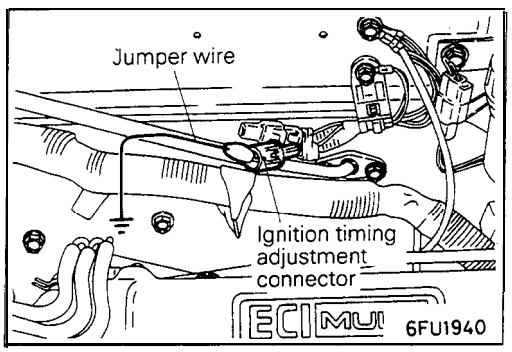
(3) If the scan tool is not used, follow the steps below.
① Insert a paper clip into the I-pin connector (blue) shown in the figure at the left.

② Connect a primary-voltage-detection type of tachometer to the paper clip.

TSB Revision



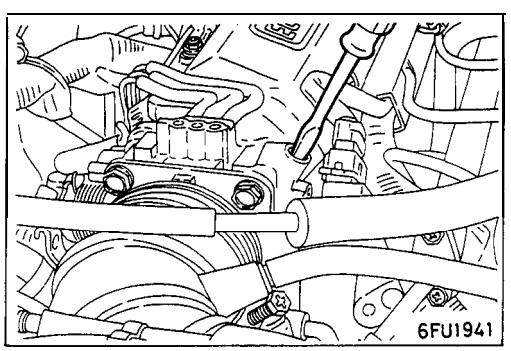
③ Use a jumper wire to ground the diagnostic test mode control terminal of the data link connector.



(4) Remove the waterproof female connector from the ignition timing adjustment connector.
(5) Use a jumper wire to ground the ignition timing adjustment terminal.
(6) Start the engine and run at idle.
(7) Check the basic idle speed. If the scan tool is used, select item No.22 and read the idle speed.

Standard value: 750 ±50 rpm

NOTE
1. The engine speed may be 20 to. 100 rpm lower than indicated above for a new vehicle (drive approximately 500 km (300 miles) 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 (300 miles) or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13-136.)

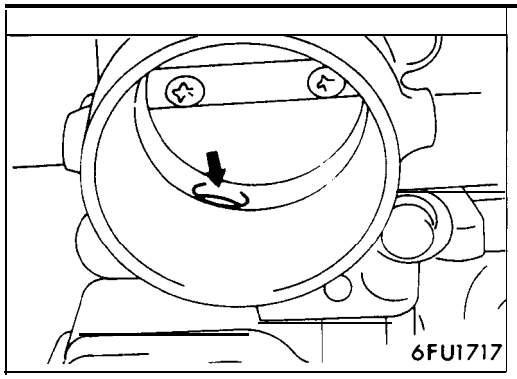


(8) If not within the standard value range, turn the engine speed adjusting screw to make the necessary adjustment.

NOTE
If the idling speed is higher than the standard value range even when the RPM adjusting screw 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), and, if so the throttle body should be replaced.

(9) Switch OFF the ignition switch.
(10) If the scan tool was not used, disconnect the jumper wire from the diagnostic test mode control terminal.
(11) Disconnect the jumper wire from the ignition timing adjustment terminal and return the connector to its original condition.
(12) Start the engine again and let it run at idle speed for about ten minutes; check to be sure that the idling condition is normal.

TSB Revision



THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

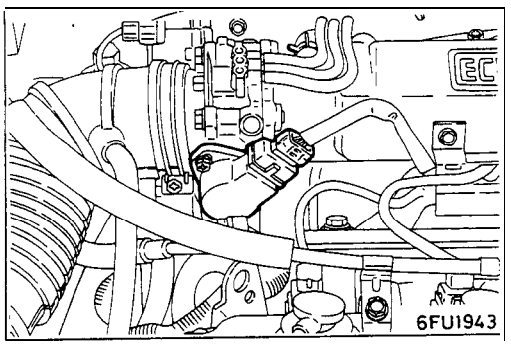
M13FICV

(1) Start the engine and warm it up until the engine coolant is heated to 80°C (176°F) 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 scan tool to erase the diagnostic trouble code.
(10) Adjust the basic idle speed. (Refer to P.13-134.)

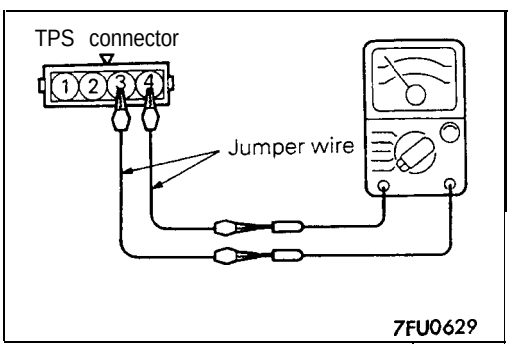
NOTE
If the engine hunts when idling after adjustment of the basic idle speed, remove the ⊖ cable from the battery for 10 seconds or more, and then run the engine at idle again.



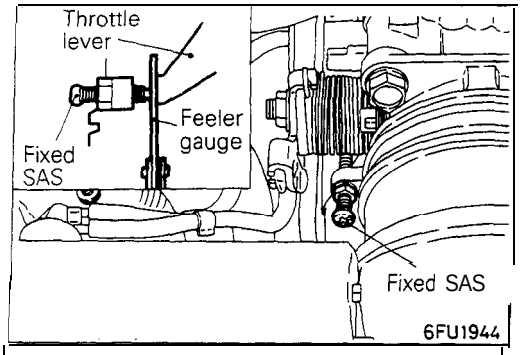
CLOSED THROTTLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT

M13FIFF

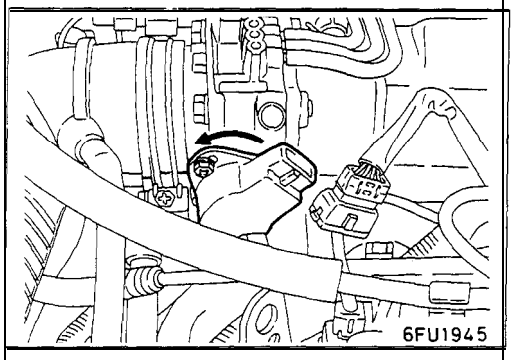
(1) Disconnect the connector of the throttle position sensor.



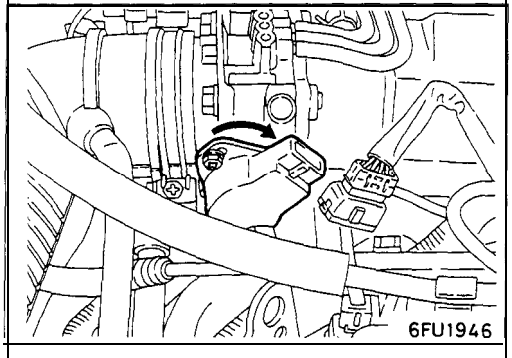
(2) Connect an ohmmeter between terminal ③ (closed throttle position switch) and ④ (sensor ground) by using jumper wires.



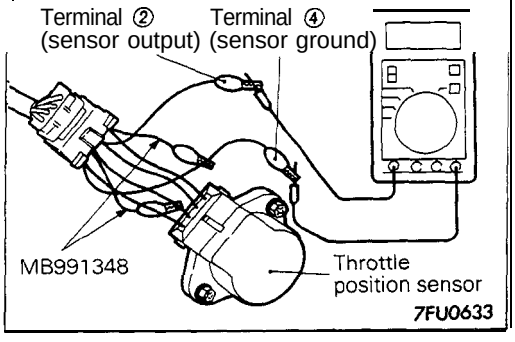
(3) Insert a feeler gauge with a thickness of 0.65 mm (.0256 in.) between the fixed SAS and the throttle lever.



(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.

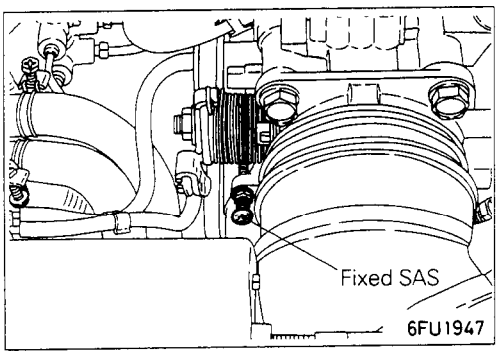


(8) Connect the scan tool to the data link connector (white).
(9) If not using the scan tool, proceed as follows:
① Disconnect the throttle position sensor connectors and connect the special tool, Test Harness Set, between the disconnected connectors.
② Connect a digtal voltmeter between the throttle position sensor terminal ② (sensor output) and terminal ④ (sensor ground).
(10) Turn the ignition switch ON (but do not start the engine).
(11) Check the throttle position sensor output voltage.
When using the scan tool, select item No.14 and read the throttle position sensor output voltage.

Standard value: 400–1000 mV

(12) If there is a deviation from the standard value, check the throttle position sensor and the related harness.
(13) Remove the feeler gauge.
(14) Switch OFF the ignition switch.

TSB Revision



FIXED SAS ADJUSTMENT

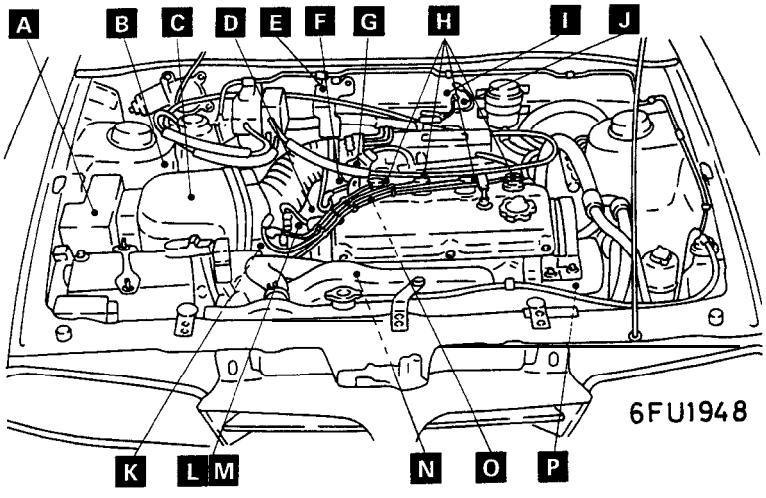
M13FIDE

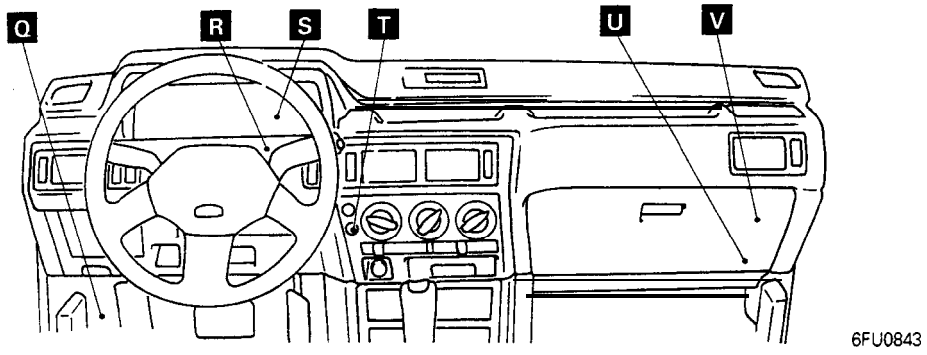
NOTE
1. The fixed SAS should not be moved unnecessarily; it has been precisely adjusted by the manufacturer.
2. If the adjustment for any reason is disturbed, readjust as follows.

(1) Loosen the tension of the accelerator cable sufficiently.
(2) Back out the fixed SAS lock nut.
(3) Turn the fixed SAS anti-clockwise until it is sufficiently backed out, and fully close the throttle valve.
(4) Tighten the fixed SAS until the point where the throttle lever is touched (i.e., the point at which the throttle valve begins to open) is found.
From that point, tighten the fixed SAS 1-1/4 turn.
(5) While holding the fixed SAS so that it doesn't move, tighten the lock nut securely.
(6) Adjust the tension of the accelerator cable.
(7) Adjust the basic idling speed.
(8) Adjust the closed throttle position switch and throttle position sensor. (Refer to P.13-136.)

ON-VEHICLE INSPECTION OF MFI COMPONENTS

COMPONENT LOCATION





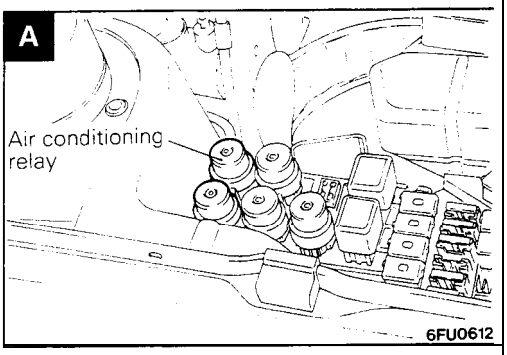
Name	Symbol
Air conditioning compressor clutch relay	A
Air conditioning switch	T
Camshaft position sensor and crankshaft position sensor	M
Check engine/malfunction indicator lamp	S
Data link connector	Q
EGR solenoid <California>	I
EGR temperature sensor <California>	0
Engine control module	V
Engine coolant temperature sensor	F
Evaporative emission purge solenoid	J
Fuel pump check terminal	G
Idle air control motor	D

Name	Symbol
Ignition coil (ignition power transistor)	L
Ignition timing adjustment terminal	K
Injector	H
Multiport fuel injection relay	U
Oxygen sensor	N
Park/Neutral position switch (A/T)	B
Power steering pressure switch	P
Throttle position sensor (with closed throttle position switch)	E
Vehicle speed sensor (reed switch)	R
Volume air flow sensor (with incorporated intake air temperature sensor and barometric pressure sensor)	C

NOTE
The “Name” column is arranged in alphabetical order.

TSB Revision

A



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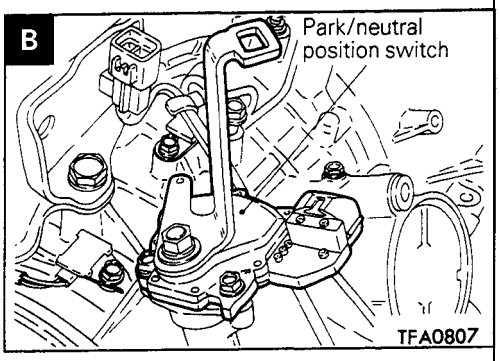
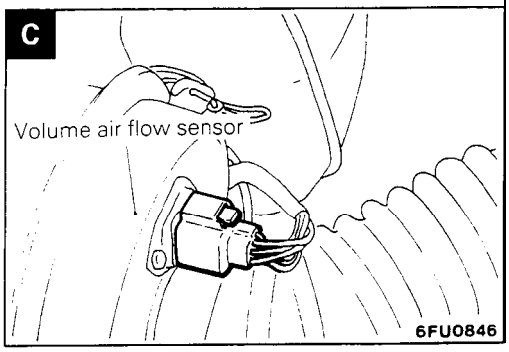


C



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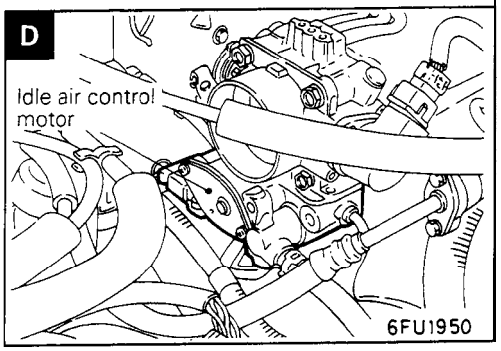

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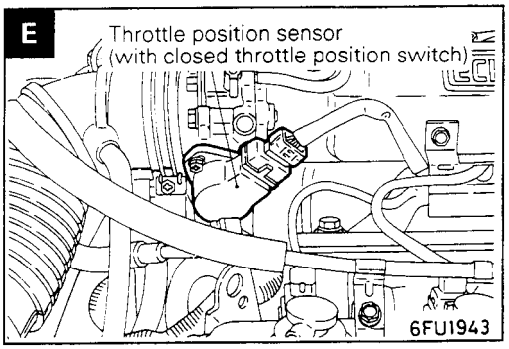

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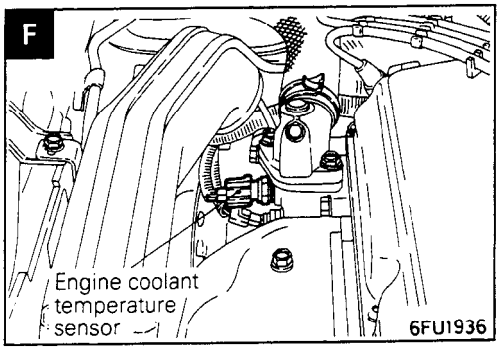
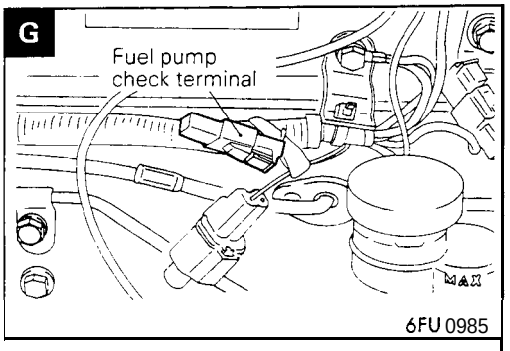


G



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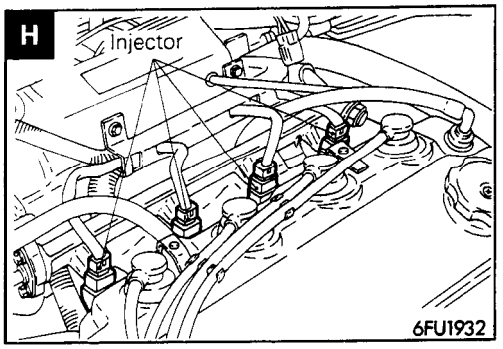

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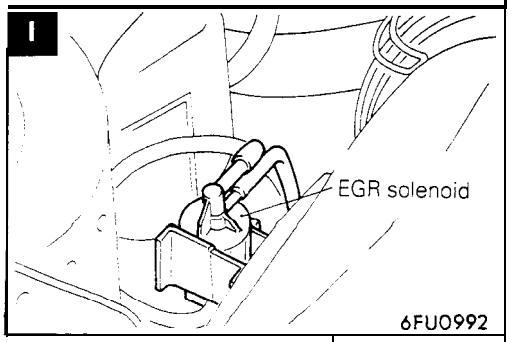

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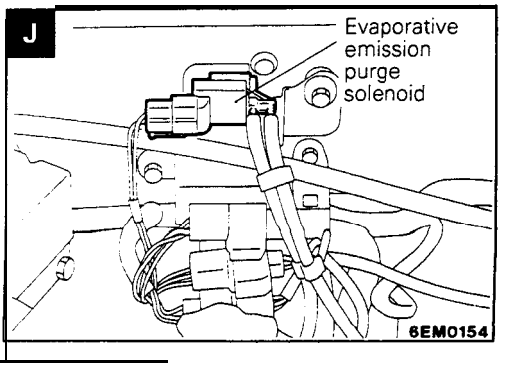
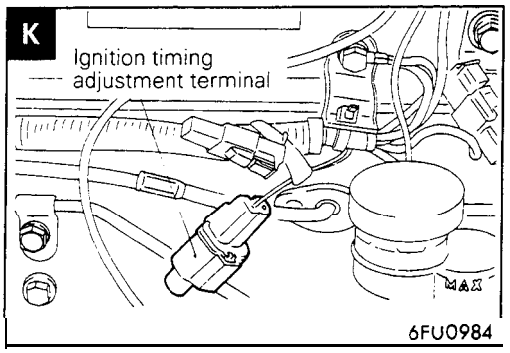
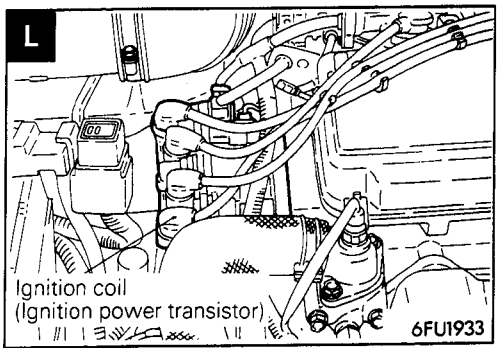


TSB Revision

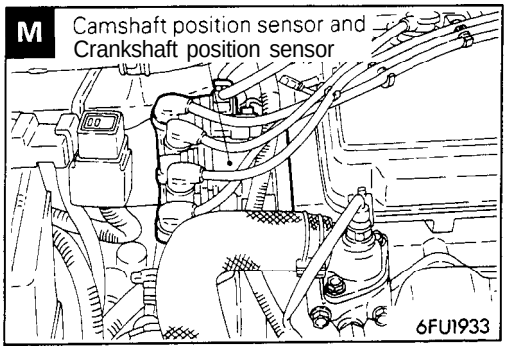
K


Ignition timing
adjustment terminal
6FU0984

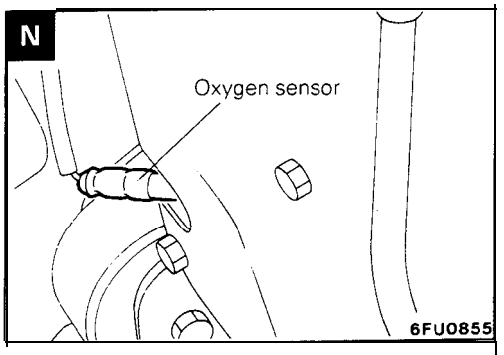
L


Ignition coil
(Ignition power transistor)
6FU1933

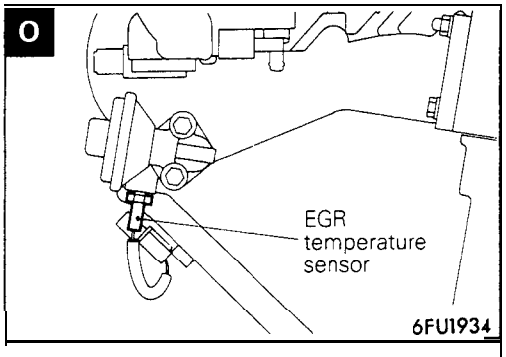
M


Camshaft position sensor and
Crankshaft position sensor
6FU1933

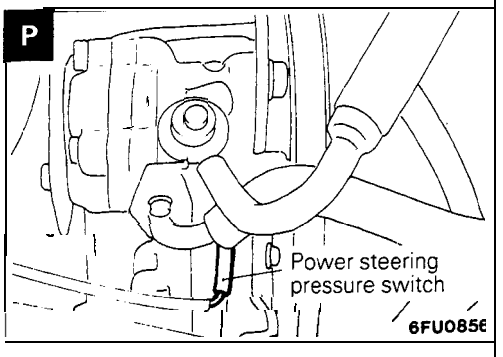
N


Oxygen sensor
6FU0855

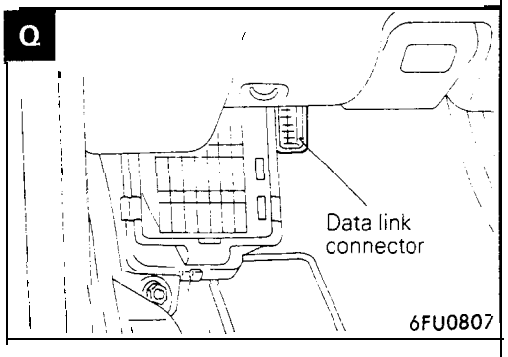
O


EGR
temperature
sensor
6FU1934

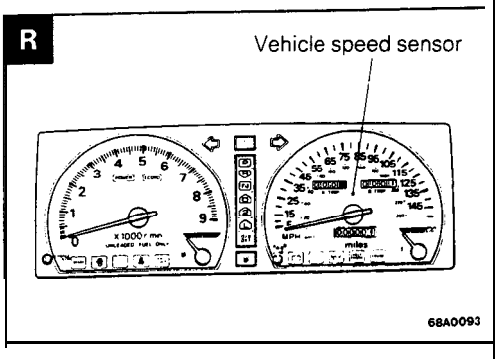
P


Power steering
pressure switch
6FU0856

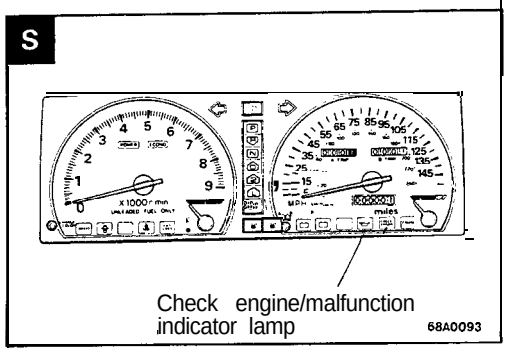
Q


Data link
connector
6FU0807

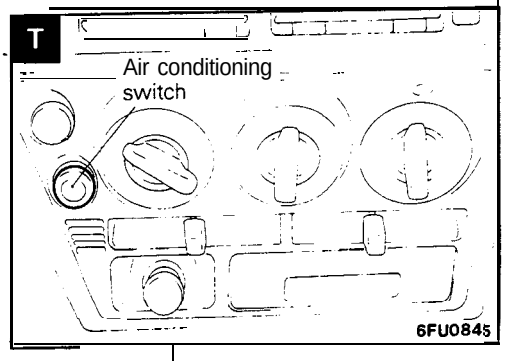
R


Vehicle speed sensor
68A0093

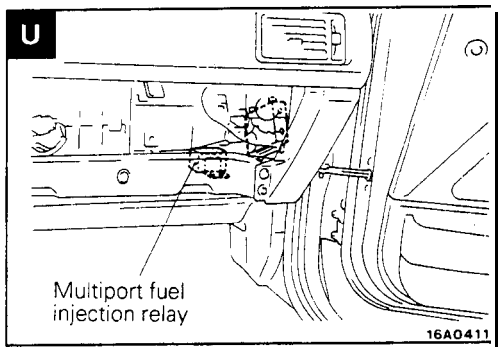
S


Check engine/malfunction
indicator lamp
68A0093

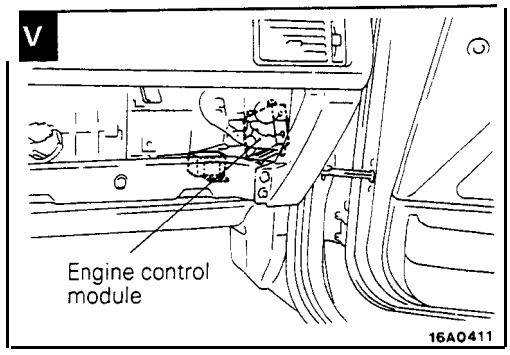
T


Air conditioning
switch
6FU0845

U



V

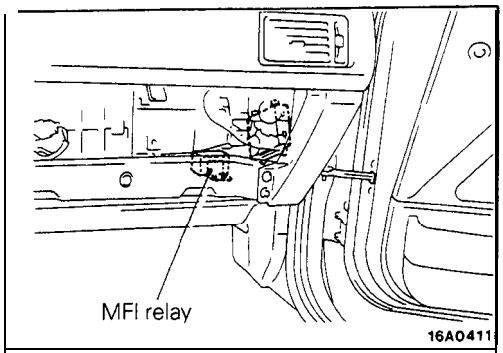


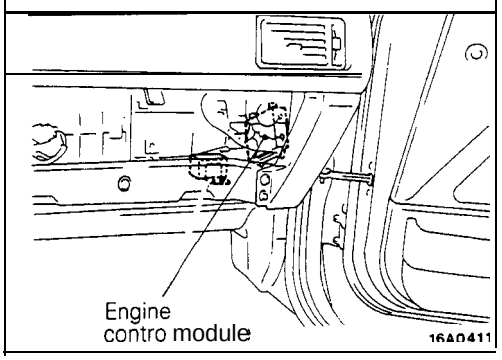
COMPONENTS INSPECTION PROCEDURE– USING THE SCAN TOOL MI 3YBAG

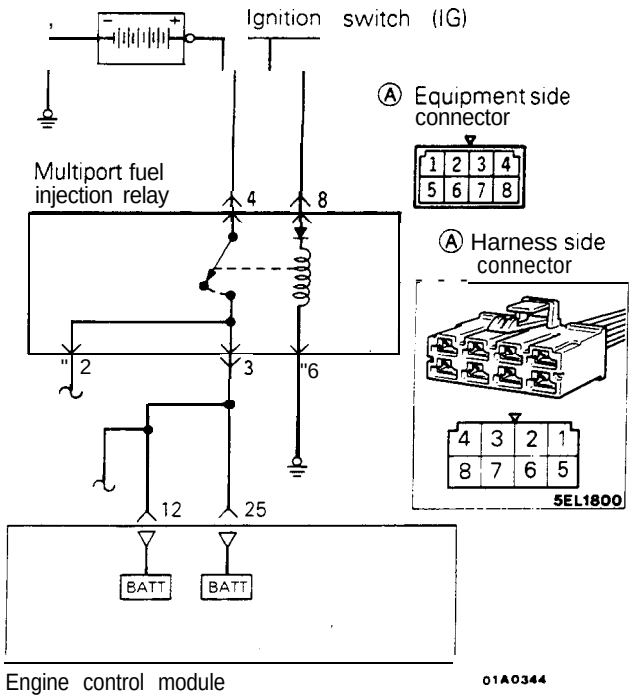
Refer to P.13-41.

TSB Revision

POWER SUPPLY



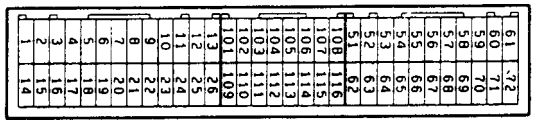




Engine control module

01A0344

Enaine control module connector



7FU0653

OPERATION

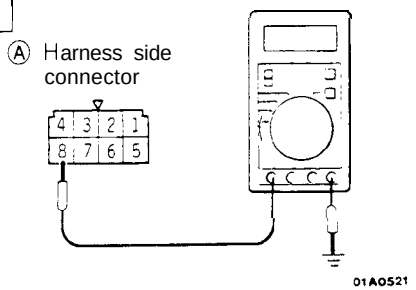
Using San Tool

Refer to P.13-42.

TSB Revision

HARNESS INSPECTION

1



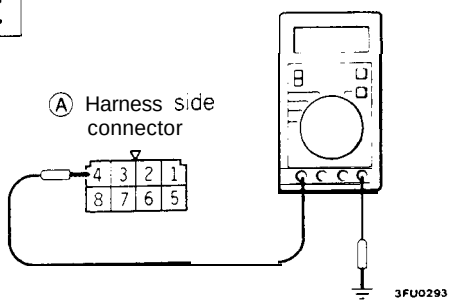
Measure the power supply voltage of the multiport fuel injection relay.
- Multiport fuel injection relay connector: Disconnected

Ignition switch	Voltage (V)
OFF	0 – 1
ON	B+

OK → 2

NG → Repair the harness. (Ignition switch – Ⓐ8) or check the Ignition switch.

2



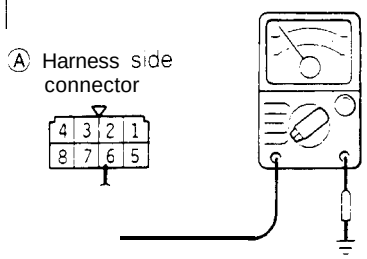
Measure the power- supply voltage of the multiport fuel injection relay.
- Multiport fuel injection relay connector: Disconnected

Voltage (V)
B+

OK → 3

NG → Repair the harness. (Battery – Ⓐ4)

3

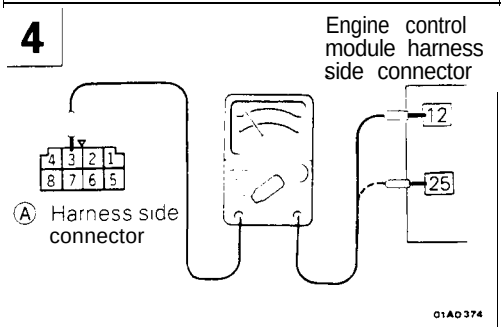


Check for continuity of the ground circuit.
- Multiport fuel injection relay connector: Disconnected

OK → 4

NG → Repair the harness (Ⓐ6 – Ground)

4

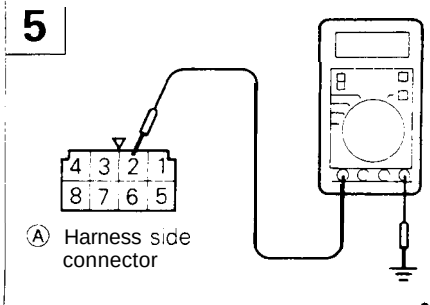


Check for open circuit, or short circuit to ground, between the engine control module and the multiport fuel injection relay.
- Engine control module connector: Disconnected
- Multiport fuel injection relay connector: Disconnected

OK → ❑

NG → Repair the harness. (12 – Ⓐ3) (25 – Ⓐ3)

5



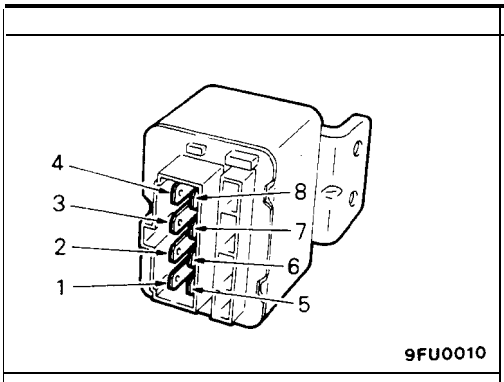
Measure the power voltage to the actuator
- Multiport fuel injection relay connector: Connected
- ECM connector: Connected

Engine	Voltage [V]
Cranking	8V or more
Racing	B+

OK → STOP

NG → Replace the multi-port fuel injection relay.

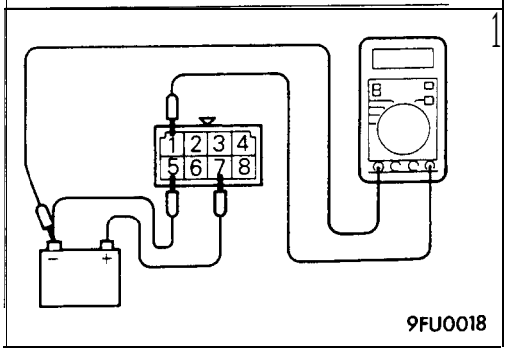
TSB Revision



MULTIPORT FUEL INJECTION RELAY INSPECTION

(1) Remove the multiport fuel injection relay.
(2) Check the continuity between the multiport fuel injection relay terminals.

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

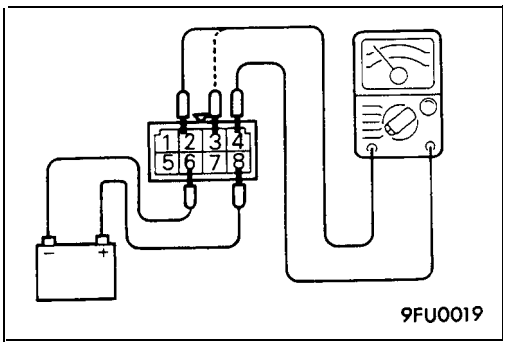


(3) Use jumper leads to connect multiport fuel injection relay terminal ⑦ to the battery (+) terminal and terminal ⑤ to the battery (−) terminal.

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 multiport fuel injection relay terminal ① while connecting and disconnecting the jumper lead at the battery (−) terminal.

Jumper lead	Voltage at terminal 1
Connected	B+
Disconnected	0V



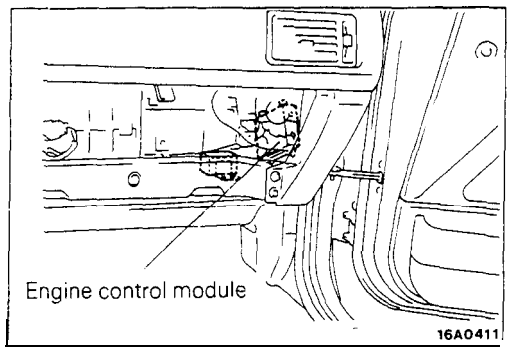
(5) Use the jumper leads to connect multiport fuel injection relay terminal ⑧ to the battery (+) terminal and terminal ⑥ to the battery (−) terminal.
(6) Check the continuity between multiport fuel injection relay terminals ②−④ and terminals ③−④ while connecting and disconnecting the jumper lead at the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

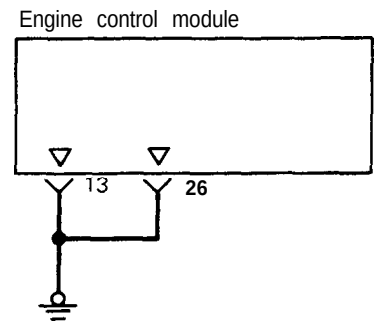
Jumper lead	Continuity between terminals 2 – 4	Continuity between terminals 3 – 4
Connected	Continuity (0Ω)	Continuity (0Ω)
Disconnected	No continuity (∞Ω)	No continuity (∞Ω)

(7) If there is a defect, replace the multiport fuel injection relay.

TSB Revision

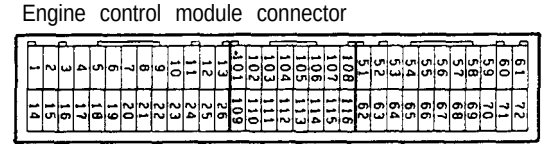
ENGINE CONTROL MODULE POWER GROUND





01A0191

Engine control module connector



7FU0653

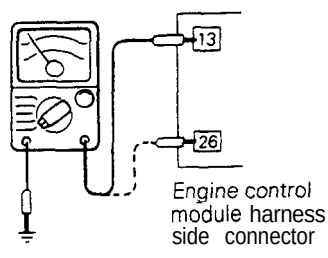
OPERATION

TROUBLESHOOTING HINTS

Refer to P.13-45.

HARNESS INSPECTION

1



01P0180

Check for continuity of the ground circuit.

- Connector: Disconnected

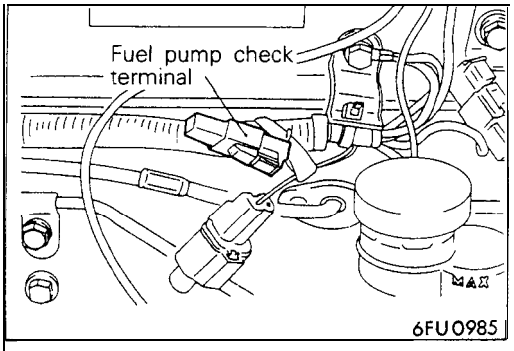
OK → STOP

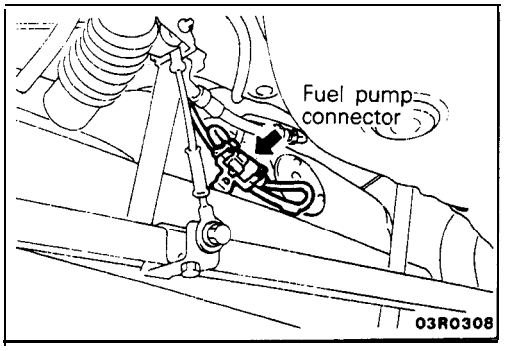
OK → Repair the harness. (O-Ground) @-Ground)

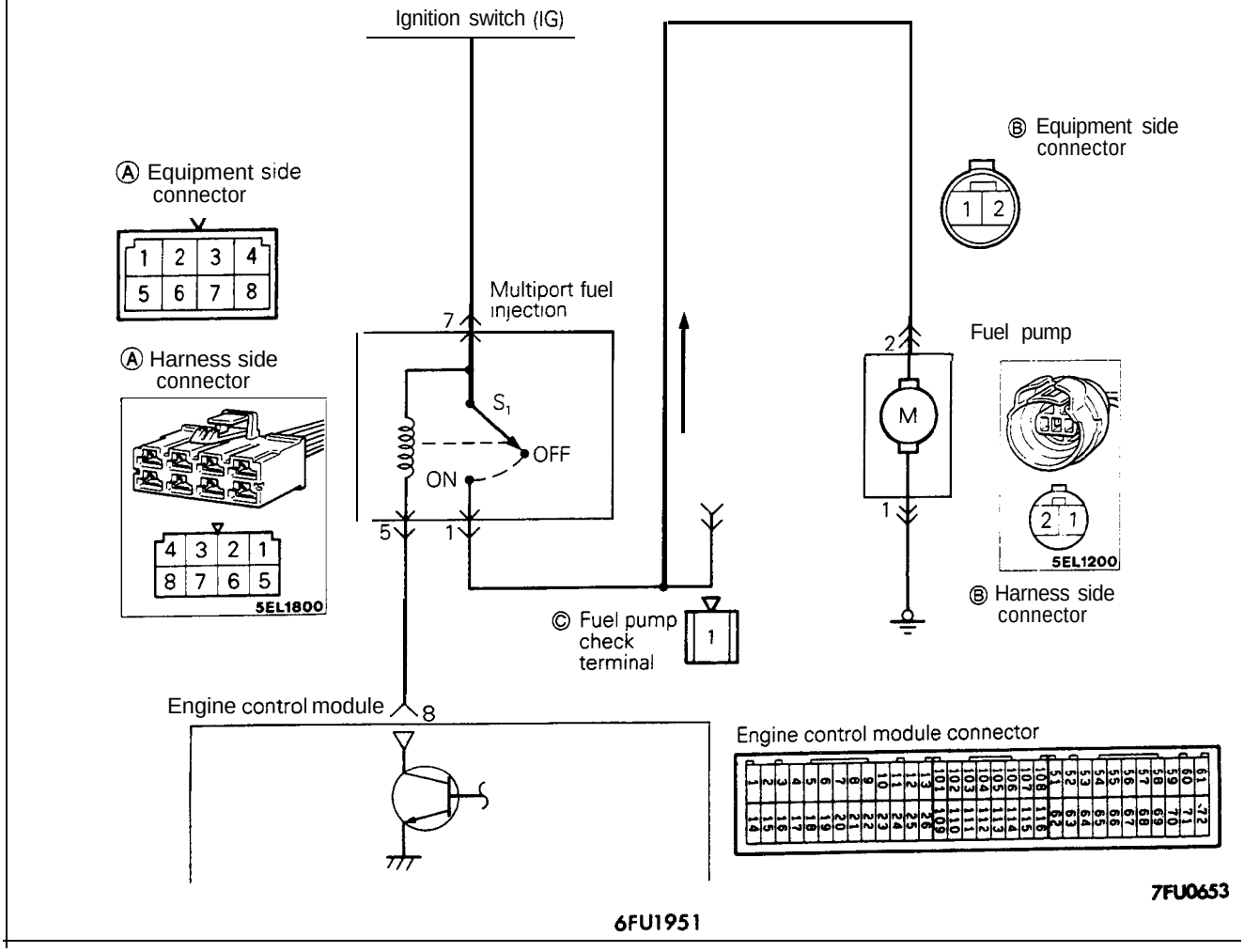
TSB Revision

FUEL PUMP

M13YEAB







OPERATION

- The fuel pump is driven when the engine is cranking and while the engine is running.
- When the engine is cranking and while the engine is running, the engine control module turns the power transistor ON to supply power to the multiport fuel injection relay coil. This causes the multiport fuel injection relay switch to turn ON, and current is supplied from the ignition switch via the multiport fuel injection relay switch to drive the fuel pump.

INSPECTION

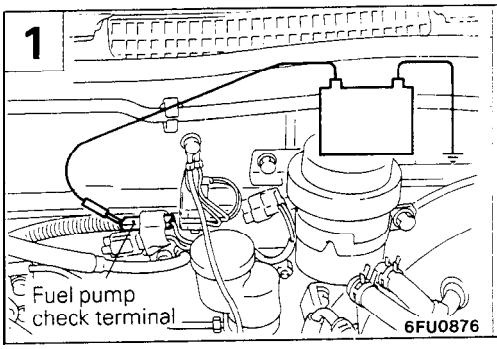
Using Scan Tool

Refer to P.13-46.

TSB Revision

HARNESS INSPECTION

1

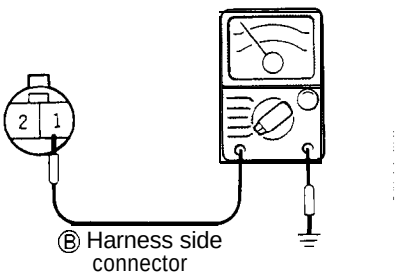


Check the fuel pump.
- Apply battery voltage to the checking terminal and operate the pump.

OK → 4

NG → 2

2

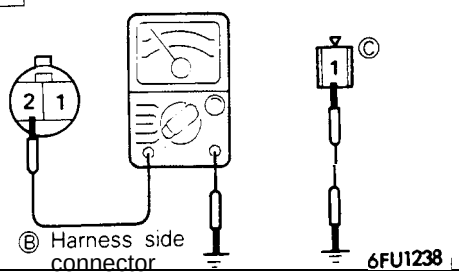


Check for continuity of the fuel pump grounding line.
- Fuel pump connector: Disconnected

OK → 3

NG → Repair the harness (Ⓑ1 – Ground)

3

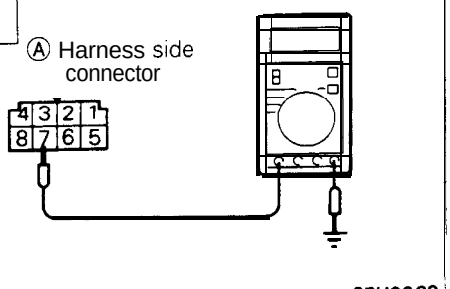


Check for open-circuit or short circuit between the fuel pump and the fuel pump drive terminal.
- Fuel pump connector: Disconnected
- Multiport fuel injection relay connector: Disconnected

OK → 4

NG → Repair the harness. (Ⓑ2 – ©1)

4



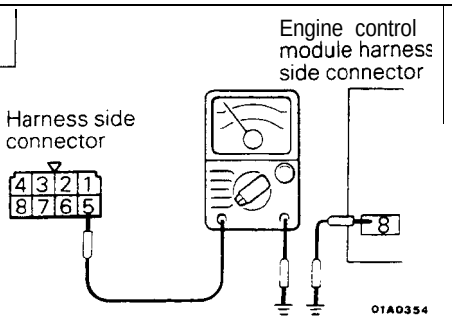
Measure the power supply voltage of the multiport fuel injection relay.
- Multiport fuel injection relay connector: Disconnected

Ignition switch	Voltage (V)
OFF	0
START	8V or more

OK → 5

NG → Repair the harness. (Ignition switch – Ⓐ7) or check for ignition switch.

5



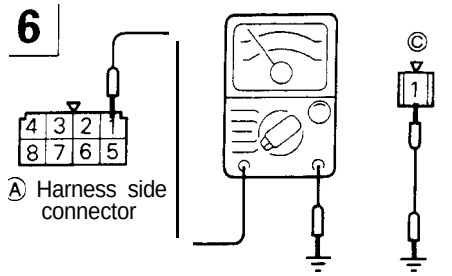
Check for an open circuit, or short-circuit to ground between the multiport fuel injection relay and the engine control module.
- Multiport fuel injection relay connector: Disconnected
- Engine control module connector: Disconnected

OK → 6

NG → Repair the harness. (Ⓐ5 – 8)

TSB Revision

6



9FU0024

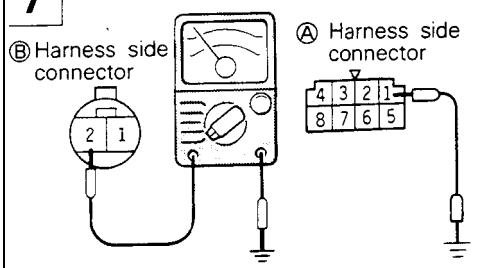
Check for continuity between the fuel pump checking terminal and between the multiport fuel injection relay terminals.

- Multiport fuel injection relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → 7

NG → Repair the harness. (Ⓐ1 – ©1)

7



01A0401

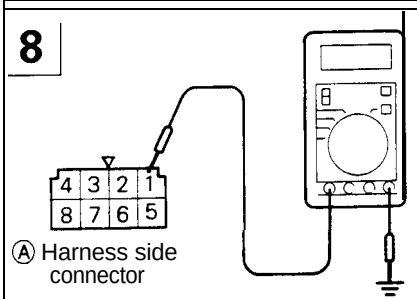
Check for an open circuit, or short-circuit to ground between the multiport fuel injection relay and the fuel pump.

- Multiport fuel injection relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → 8

NG → Repair the harnes. (Ⓐ1 – Ⓑ2)

8



6FU1753

Measure the power supply voltage of the fuel pump.

- Multiport fuel injection relay connector: Connected
- Engine control module connector: Connected

Engine	Voltage [V]
Cranking	8V or more
Racing	B+

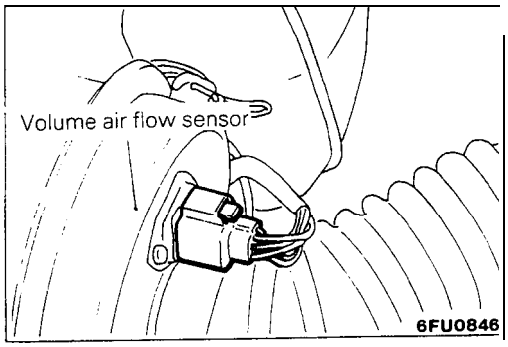
OK → STOP

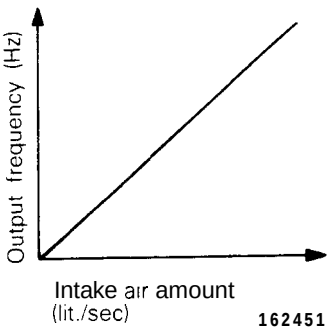
NG → Multiport fuel injection relay or engine control module is defective.

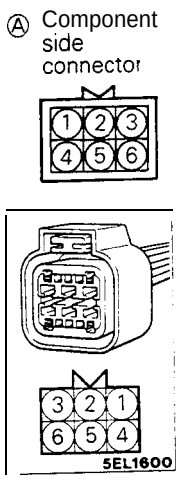
MULTIPORT FUEL INJECTION RELAY INSPECTION

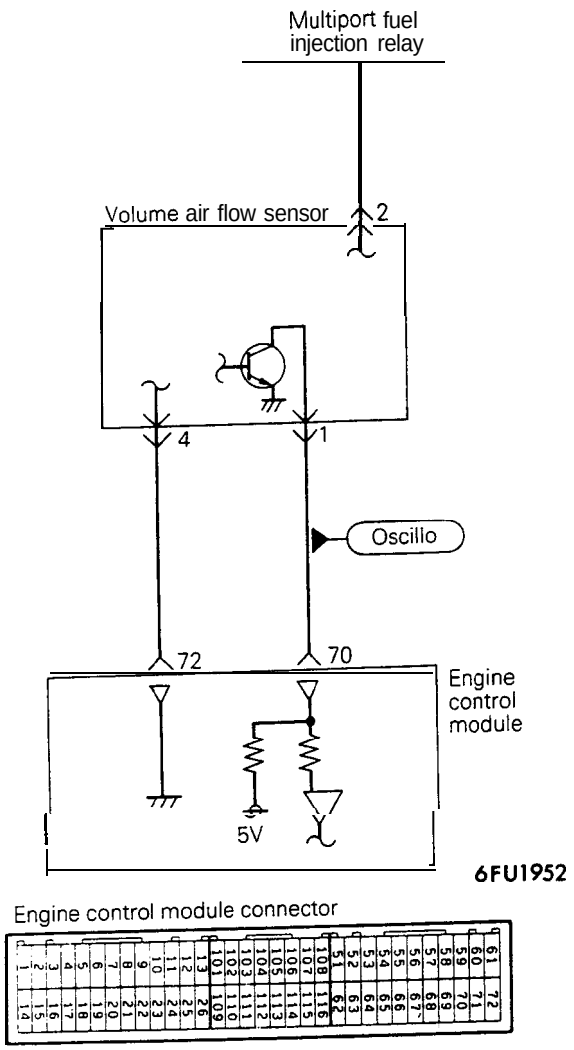
Refer to P.13-145.

VOLUME AIR FLOW SENSOR









OPERATION

TROUBLESHOOTING HINTS

Refer to P.13-49.

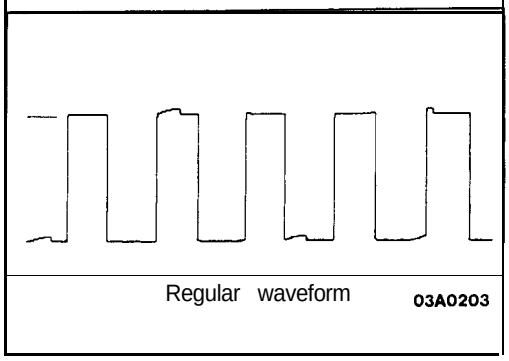
INSPECTION

Using Scan Tool

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	12	Sensor detection air volume (frequency)	. Engine coolant temperature: 85–95°C (185–205°F) . Lights, cooling fan, electrical accessories: OFF Transaxle: neutral (A/T models: "P" range)	Idle speed	18–44 Hz
				2,000 rpm	64–104 Hz
				Racing	Frequency increases as racing rpm increases.

NOTE
The volume air flow sensor output frequency may be about 10% higher than indicated above when the vehicle is new [driven approximately 500 km (300 miles) or less].

TSB Revision

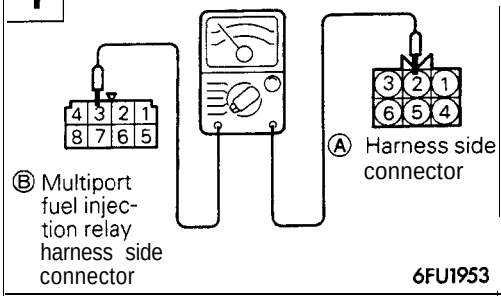


Using Oscilloscope

(1) Run the engine at idle speed.
(2) Connect the probe to the osilloscope pick-up point as shown in the circuit diagram, and check the wave form.

HARNESS INSPECTION

1



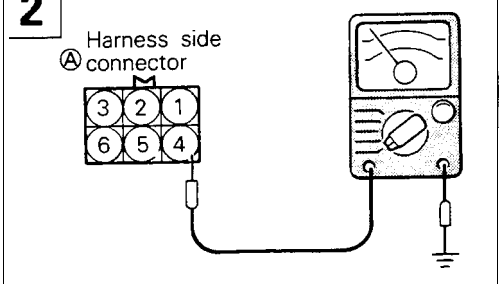
Check for continuity between volume air flow sensor and multiport fuel injection relay.
- Multiport fuel injection relay connector: Disconnected
- Volume air flow sensor connector: Disconnected

NOTE
Touch the circuit tester probes to both ends of the harness

OK → 2

NO → Repair the harness (Ⓐ2 – Ⓑ3)

2

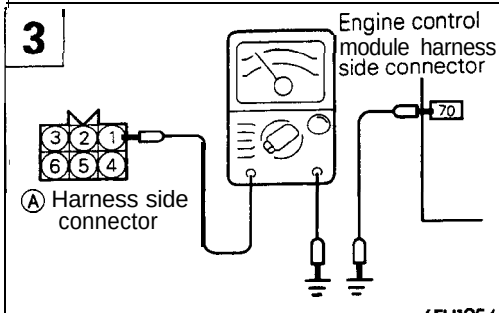


Check for continuity of the ground circuit.
- Volume air flow sensor connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓐ4 – 72)

3

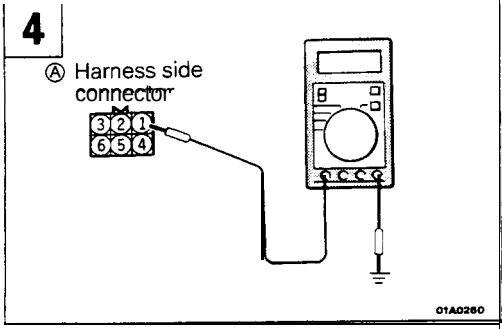


Check for broken wire or short-circuit to ground, between volume air flow sensor and engine control module.
- Volume air flow sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → 4

NO → Repair the harness. (Ⓐ1 – 70)

4



Measure the impressed voltage.
- Volume air flow sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

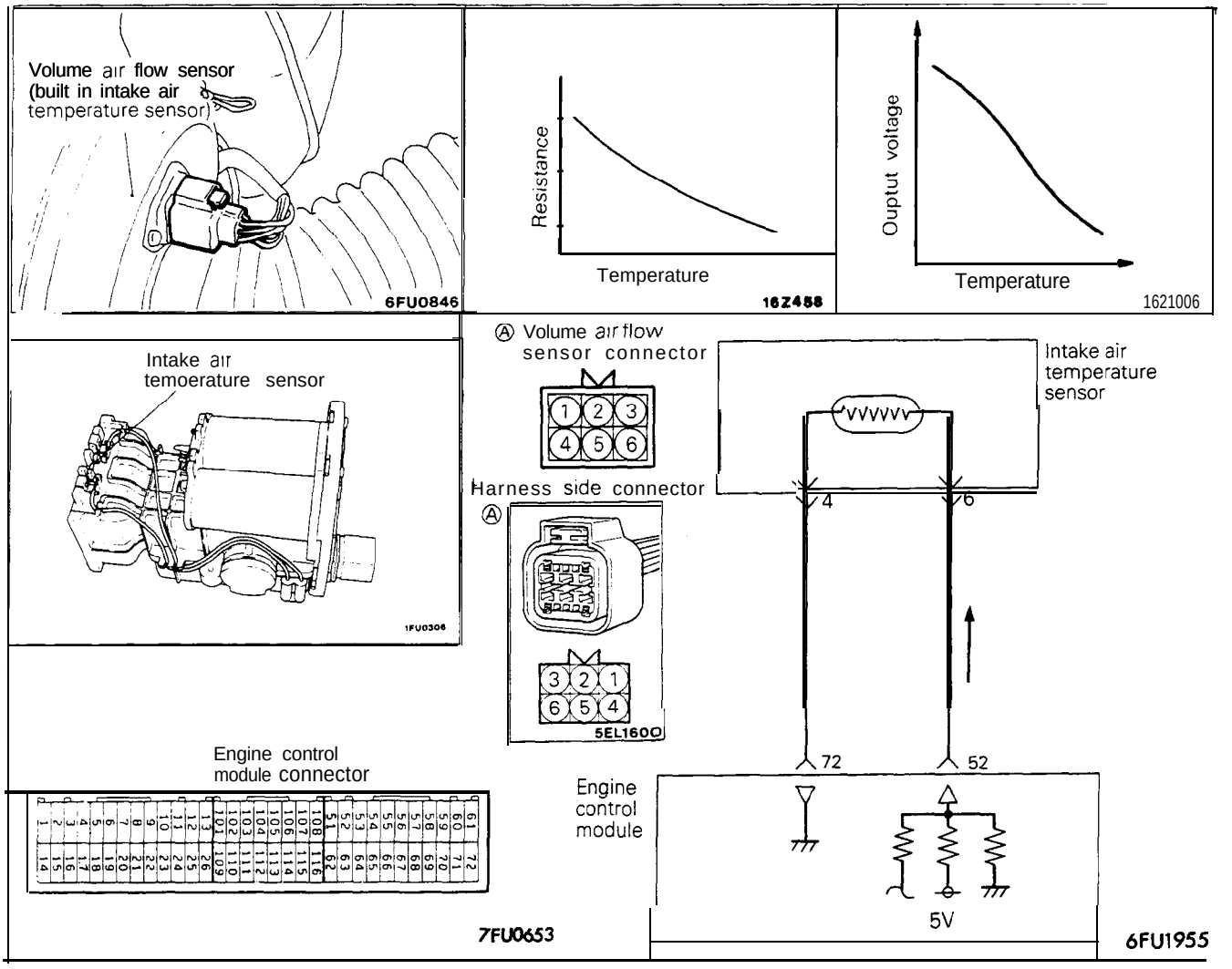
OK → STOP

NO → Replace the engine control module.

I TSB Revision

INTAKE AIR TEMPERATURE SENSOR

M13YGAA



OPERATION

TROUBLESHOOTING HINTS

INSPECTION

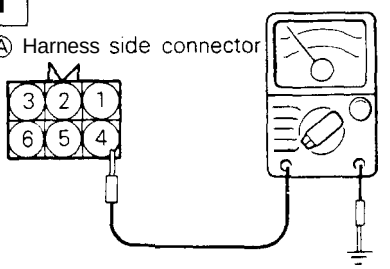
Using Scan Tool

Refer to P.13-51.

HARNESS INSPECTION

1

Ⓐ Harness side connector



Check for continuity of the ground circuit.

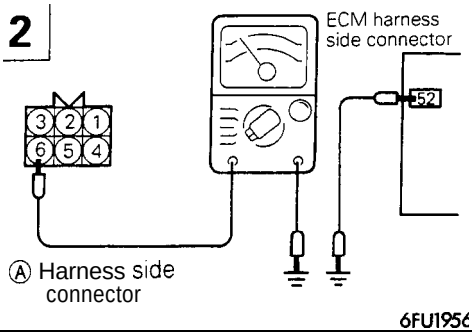
- Volume air flow sensor connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ4 – 72)

TSB Revision

2



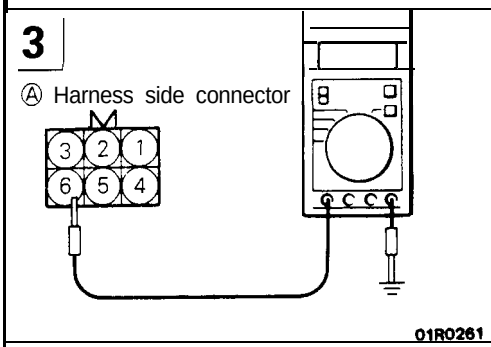
Check for open circuit or short circuit to ground, between intake air temperature sensor and engine control module.

- Volume air flow sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ6 – 52)

3



Measure the impressed voltage.

- Volume air flow sensor connector: Disconnected
- Engine control module connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.5 – 4.9

OK → A STOP

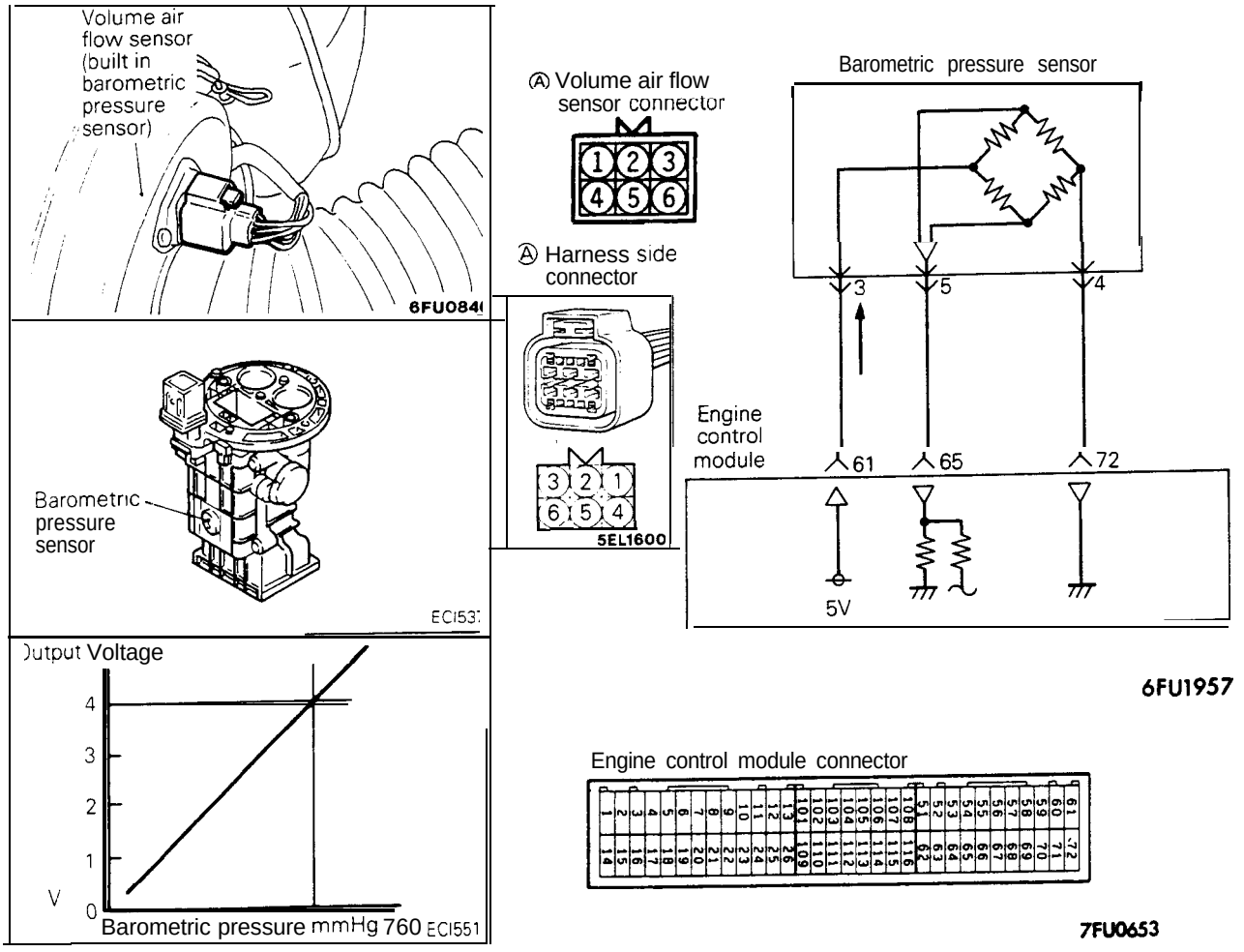
NG → Replace the engine control module.

SENSOR INSPECTION

Refer to P.13-52.

BAROMETRIC PRESSURE SENSOR

M13YHAA



OPERATION

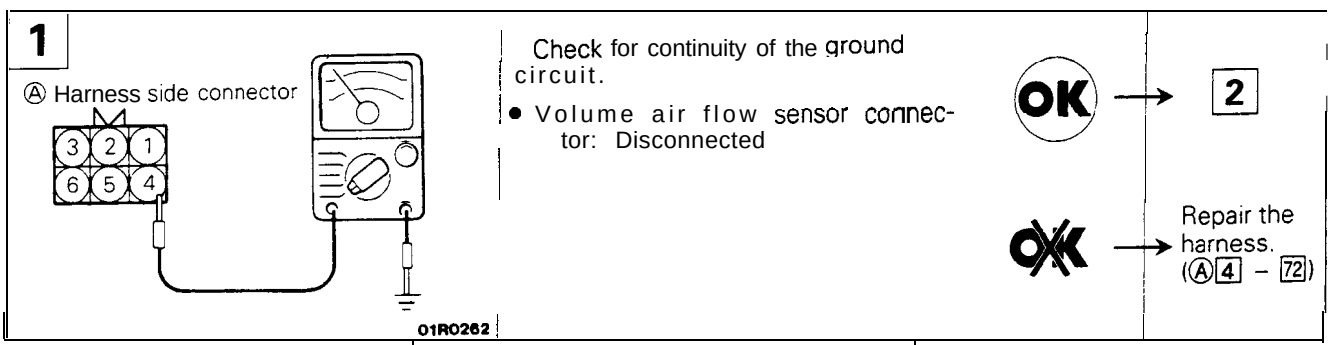
TROUBLESHOOTING HINTS

INSPECTION

Using Scan Tool

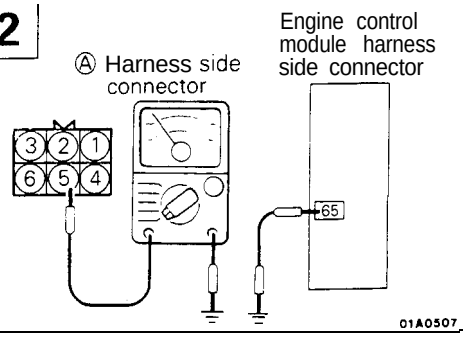
Refer to P.13-53.

HARNESS INSPECTION



TSB Revision

2



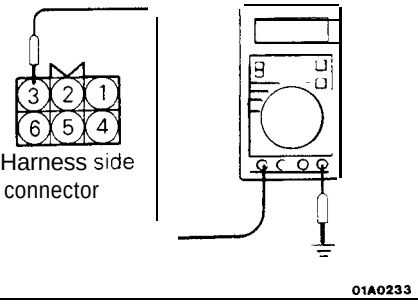
Check for an open circuit, or a short-circuit to ground between the engine control module and the barometric pressure sensor.

- Volume air flow sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ 2 – 65)

3



Measure the impressed voltage of the barometric pressure sensor.

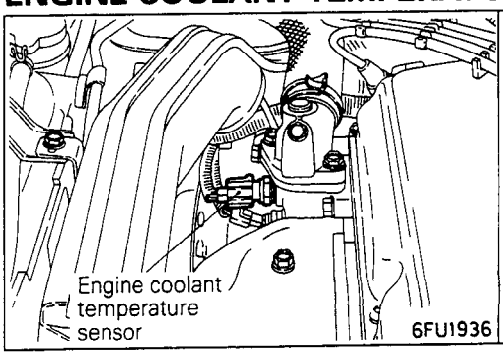
- Volume air flow sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

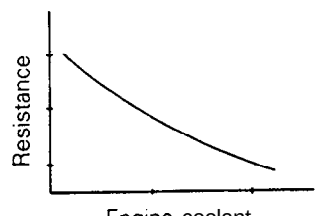
Voltage (V)
4.8 – 5.2

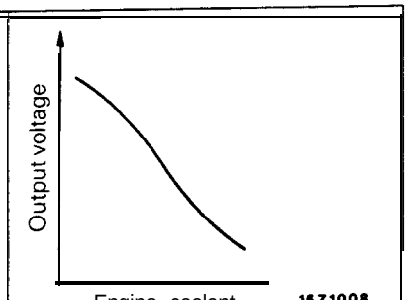
OK → STOP

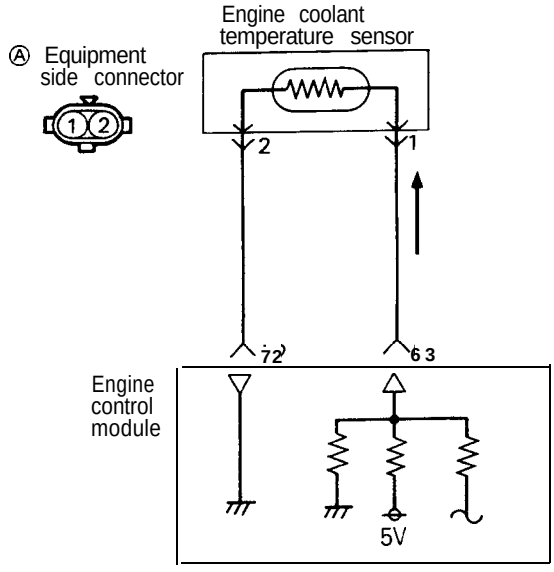
NG → Replace the engine control module.

ENGINE COOLANT TEMPERATURE SENSOR

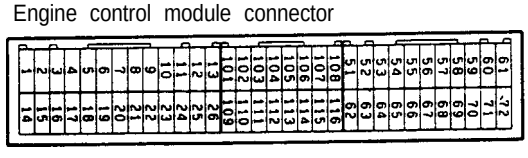








Engine control module connector



7FU0653

9FU0106

TSB Revision

OPERATION

TROUBLESHOOTING HINTS

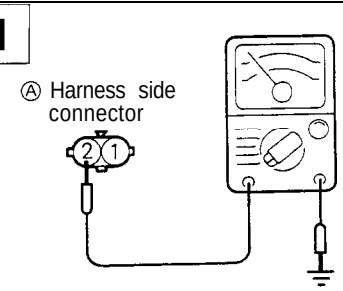
INSPECTION

Using Scan Tool

Refer to P.13-55.

HARNESS INSPECTION

1



9FU0112

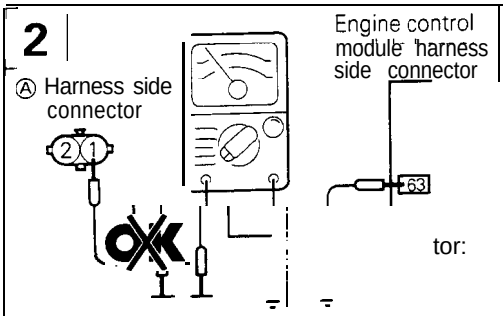
Check for continuity of the ground circuit.

- Engine coolant temperature sensor connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ2 – 22)

2



9FU0113

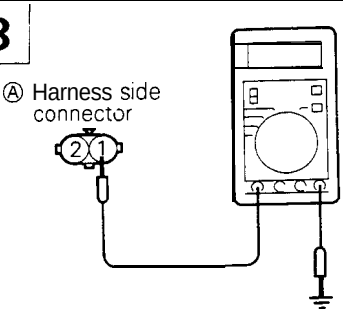
Check for open circuit or short-circuit to ground, between engine coolant temperature and engine control module.

- Engine coolant temperature connector: Disconnected
- Engine control module connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ1 – 63)

3



9FU0114

Measure the impressed voltage.

- Engine coolant temperature sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch. ON

Voltage (V)
4.5 – 4.9

OK → STOP

NG → Replace the engine control moaure.

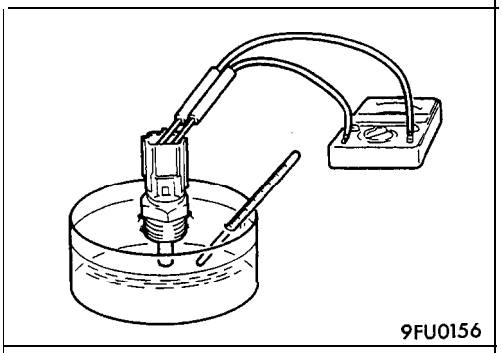
SENSOR INSPECTION

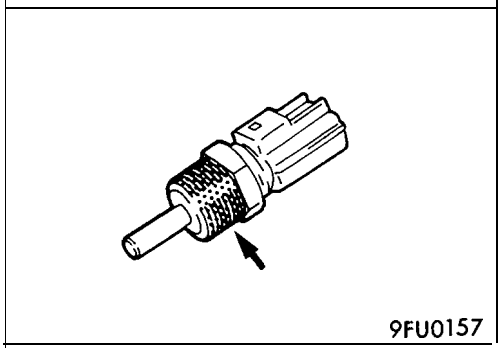
Caution

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

(1) Remove engine coolant temperature sensor from the thermostat housing.

TSB Revision


9FU0156


9FU0157

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

Temperature [°C(°F)]	Resistance (kΩ)
0 (32)	5.8
20 (68)	2.4
40 (104)	1.1
80 (176)	0.3

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

INSTALLATION

(1) Apply sealant to threaded portion.

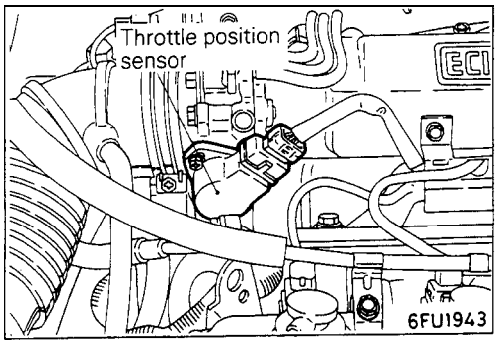
Specified sealant: 3M NUT locking Part No. 4171 or equivalent

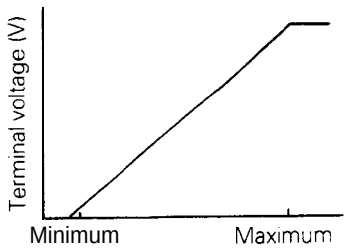
(2) Install engine coolant temperature sensor and tighten it to specified torque.

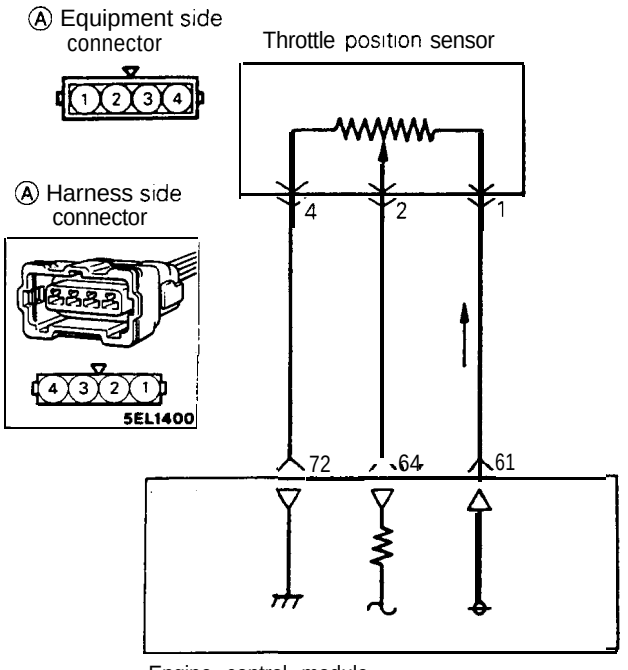
Sensor tightening torque: 20–40 Nm (15-29 ft.lbs.)

(3) Fasten harness connectors securely.

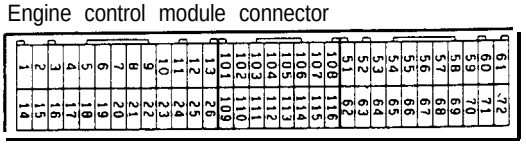
THROTTLE POSITION SENSOR







Engine control module connector



7FU0672

7FU0653

OPERATION

- The throttle position sensor converts the throttle position opening into a voltage and inputs it to the engine control module, which then controls the fuel injection, based on the input signal.
- The 5V power in the engine control module is supplied to the throttle position sensor. It flows through the resistor in the sensor and is then grounded in the engine control module.
- As the throttle valve shaft rotates from the idle position to wide open position, the resistance between the variable resistor terminal of the throttle position sensor and the ground terminal increases. As a result, the voltage at the throttle position sensor variable resistance terminal also increases.

TROUBLESHOOTING HINTS

Hint 1: The throttle position sensor signal is more important in the control of automatic transaxle than in the engine control. Shifting shock and other troubles will be caused if this sensor is faulty.

Hint 2: If the output voltage of the throttle position sensor is out of specification, adjust the sensor and check the voltage again.
If there is an evidence of disturbed fixed SAS setting, adjust the fixed SAS.

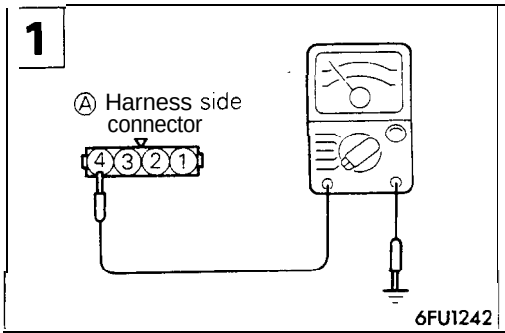
INSPECTION

Using Scan Tool

Function	item No.	Data display	Check condition	Throttle valve	Standard value
Data reading	14	Sensor voltage	Ignition switch: ON	At idle position	300 – 1000 mV
				Open slowly	Increases with valve opening
				Open widely	4,500 – 5,500 mV

HARNESS INSPECTION

1



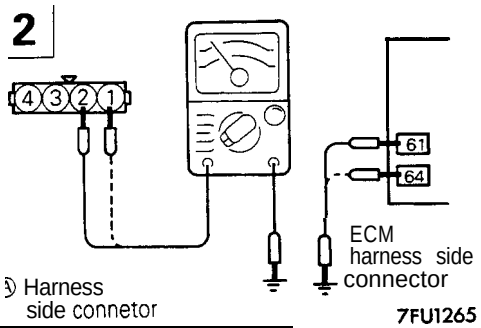
Check for continuity of the ground circuit.

- Throttle position sensor connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ4 – 72)

2



Check for an open-circuit, or a short-circuit to ground between the engine control module and the throttle position sensor.

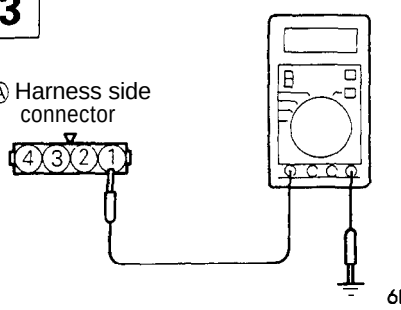
- Throttle position sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ2 – 64) (Ⓐ1 – 61)

TSB Revision

3



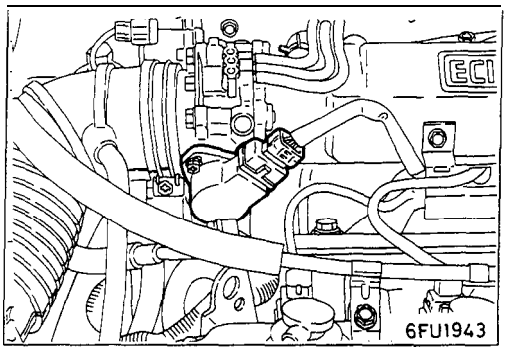
Measure the impressed voltage of the throttle position sensor.

- Throttle position sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

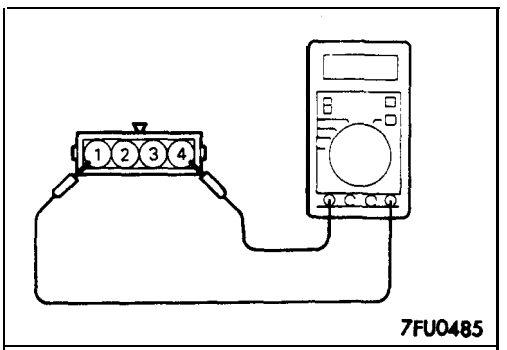
OK → STOP

NG → Replace the engine control module.



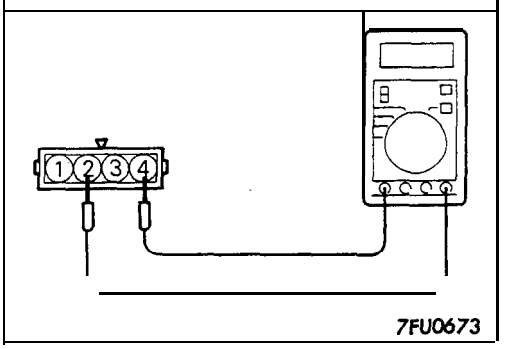
SENSOR INSPECTION

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

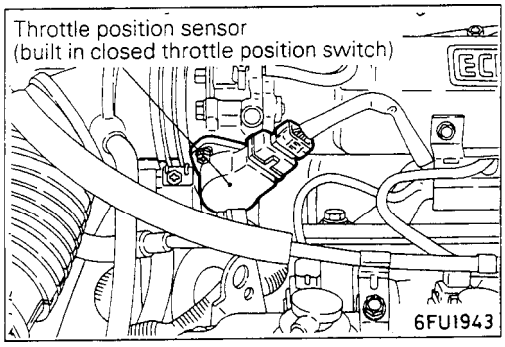
(4) If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

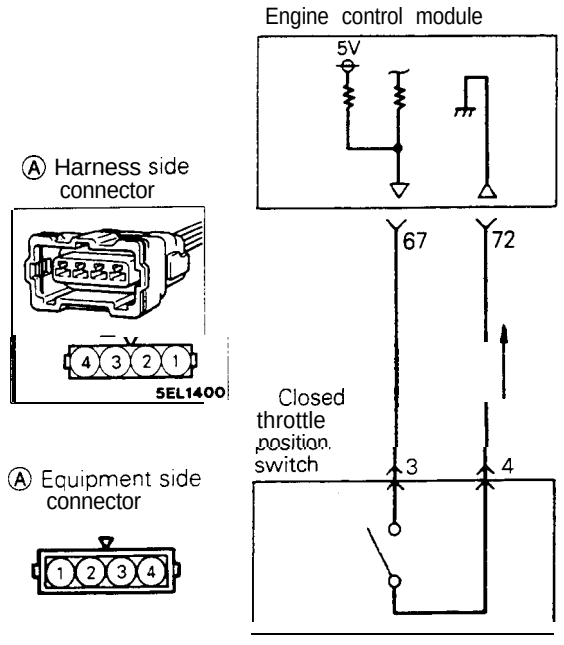
N O T E

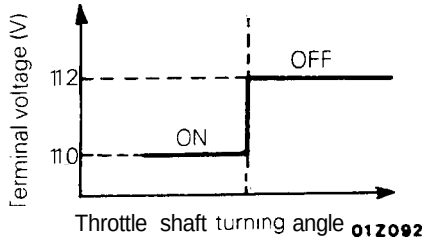
For the throttle position sensor adjustment procedure, refer to P.13-136.

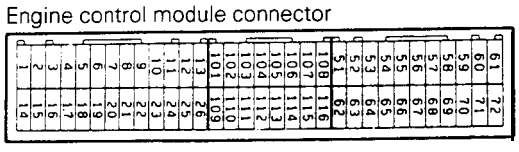
TSB Revision

CLOSED THROTTLE POSITION SWITCH









OPERATION

- The closed throttle position switch senses whether the accelerator pedal is depressed or not, converts it into high/low voltage and inputs the voltage to the engine control module, which then controls the idle air control motor based on the input signal.
- A voltage is applied to the closed throttle position switch from the engine control module. When the accelerator pedal is released, the closed throttle position switch is turned on to conduct the voltage to ground. This causes the closed throttle position switch terminal voltage to go low from high.

INSPECTION

Using Scan Tool

Refer to P.13-62.

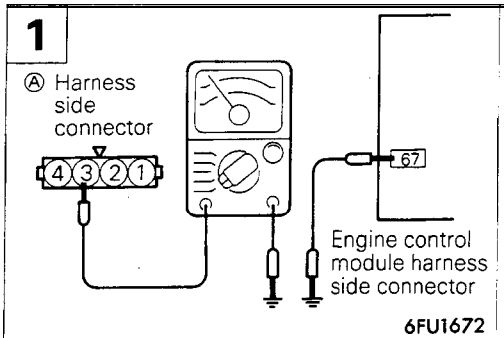
TROUBLESHOOTING HINTS

If the closed throttle position switch harness and individual check results are normal but the closed throttle position switch output is abnormal, the following troubles are suspected.

(1) Poorly adjusted accelerator cable
(2) Poorly adjusted fixed SAS

HARNESS INSPECTION

1



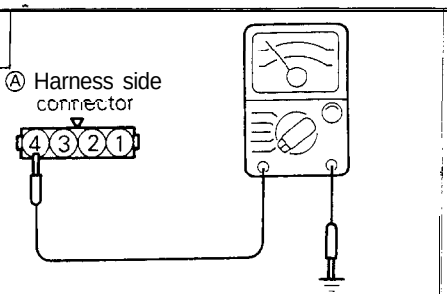
Check for open-circuit, or short-circuit to ground, between closed throttle position switch and engine control module.

- Engine control module connector: Disconnected
- Closed throttle position switch connector: Disconnected

OK → 2

NO → Repair the harness. (Ⓐ3 – 67)

2



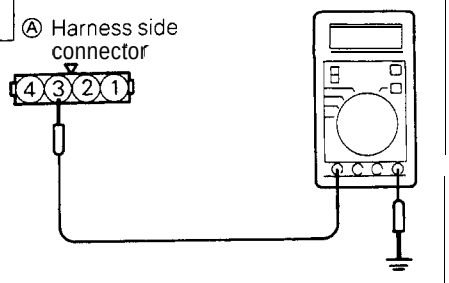
Check for continuity of the ground circuit.

- Closed throttle position switch connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓐ4 – 72)

3



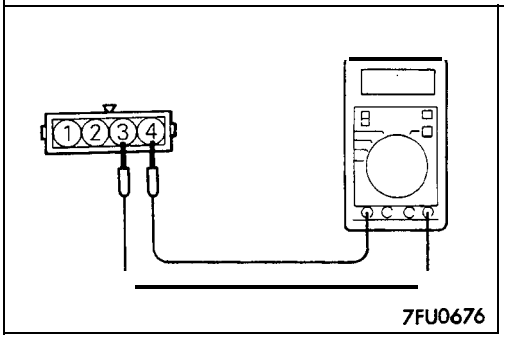
Measure the impressed voltage of the closed throttle position switch.

- Connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

Voltage (V)
4 or more

OK → STOP

NO → Replace the engine control module.



SENSOR INSPECTION

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

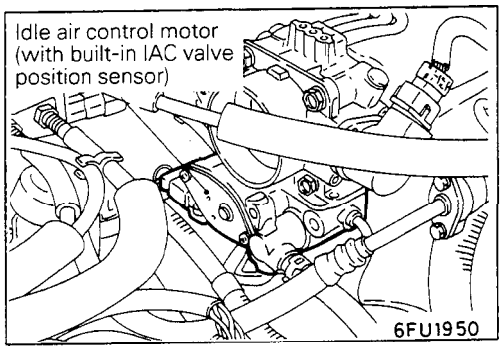
Accelerator pedal	Continuity
Depressed	Non-conductive (∞ Ω)
Released	Conductive (0 Ω)

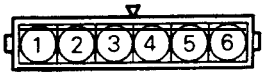
(3) If out of specification, replace the throttle position sensor.

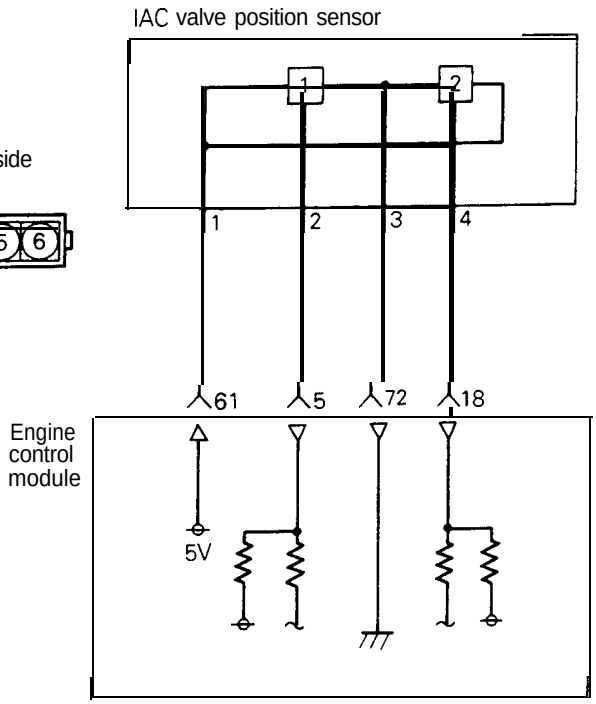
NOTE
After replacement, the throttle position sensor and closed throttle position switch should be adjusted. (Refer to P.13-136.)

TSB Revision

IAC VALVE POSITION SENSOR

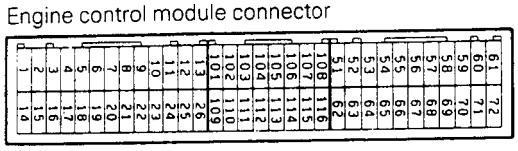






9FU0026

Engine control module connector



7FU0653

OPERATION

- The IAC valve position sensor converts the changes (increase or decrease) in the valve position of the idle air control motor into pulse signals and inputs these signals to the engine control module. The engine control module determines the valve position from these signals and also controls the idle air control motor.
- 5V power is supplied to the IAC valve position sensor from the engine control module, and the ground connection is positioned in the engine control module.
- 5V power is applied to the two IAC valve position sensor output terminals from the engine control module. When the IAC valve position is changed (increased or decreased) by the DC motor inside the idle air control motor, the IAC valve position sensor generates a pulse signal from the opening and closing between the output terminal and the ground.

TROUBLESHOOTING HINTS

Hint 1: The IAC valve position sensor is the most important sensor for controlling the idle speed. If a malfunction develops when the engine is idling and the engine load is varied by turning the air conditioning switch to ON and OFF, etc., this sensor is probably defective.

TSB Revision

INSPECTION

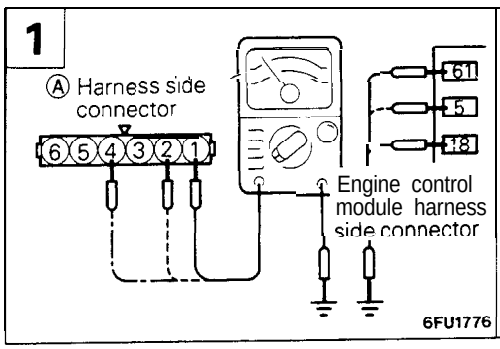
Using Scan Tool

Function	Item No.	Data display	Check condition	Load state	Standard value
Data reading	55	IAC valve position step	• Engine coolant temperature: 85 to 95°C (185 to 203°F) • Lights, electric cooling fan, accessories: OFF • Transaxle: Neutral (P range for A/T) • Closed throttle position switch: ON • Engine: At idle (Compressor clutch to be operating in case air conditioning switch is ON)	Air conditioning switch: OFF	2-20 step
				Air conditioning switch: Turn from OFF to ON	Increase from 8-50 step
				• Air conditioning switch: OFF • Selector lever: Shift to D range	Increase from 3-40 step

NOTE
In a new vehicle [driven approximately 500 km (300 miles) or less], the IAC valve position sometimes exceeds the standard value by approximately 20 steps.

Caution
When shifting the selector lever to the D range, apply brake to prevent the vehicle from moving forward.

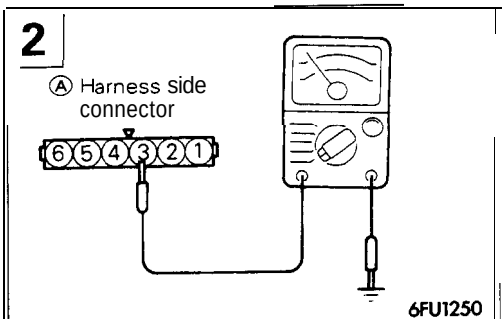
HARNESS INSPECTION



Check for open circuit, or short-circuit to ground, between engine control module and IAC valve position sensor.
- Engine control module connector: Disconnected
- IAC valve position sensor connector: Disconnected

OK → 2

NG → Repair the harness (Ⓐ 1 – 61) (Ⓐ 2 – 5) (Ⓐ 4 – 18)

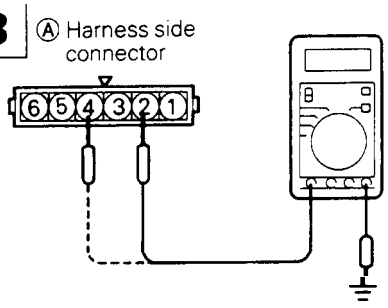
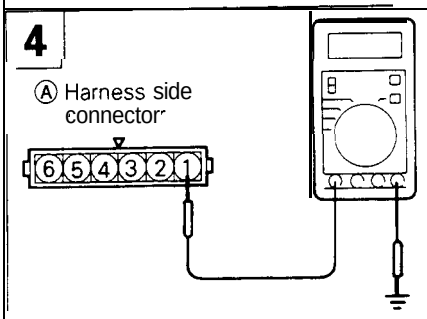


Check for continuity of the ground circuit.
- IAC valve position sensor connector: Disconnected

OK → 3

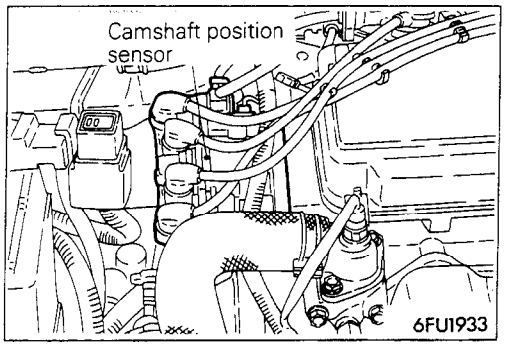
NG → Repair the harness (Ⓐ 3 – 72)

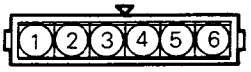
TSB Revision

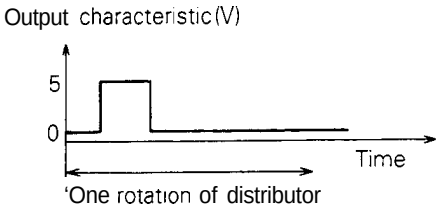
3 Ⓐ Harness side connector  6FU1724	Measure the impressed voltage. • IAC valve position sensor connector: Disconnected • [illegible] control module connector: Connected • Ignition switch: ON Voltage (V): 4.8 – 5.2	OK →	4
		OK →	Replace the engine control module.
4 Ⓐ Harness side connector  6FU1723	Measure the impressed voltage. • IAC valve position sensor connector: Disconnected * Engine control module connector: Connected • Ignition switch: ON Voltage (V): 4.8 – 5.2	OK →	STOP
		OK →	Replace the engine control module.

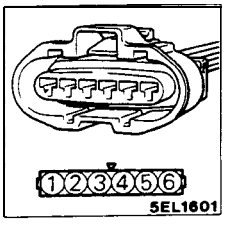
TSB Revision

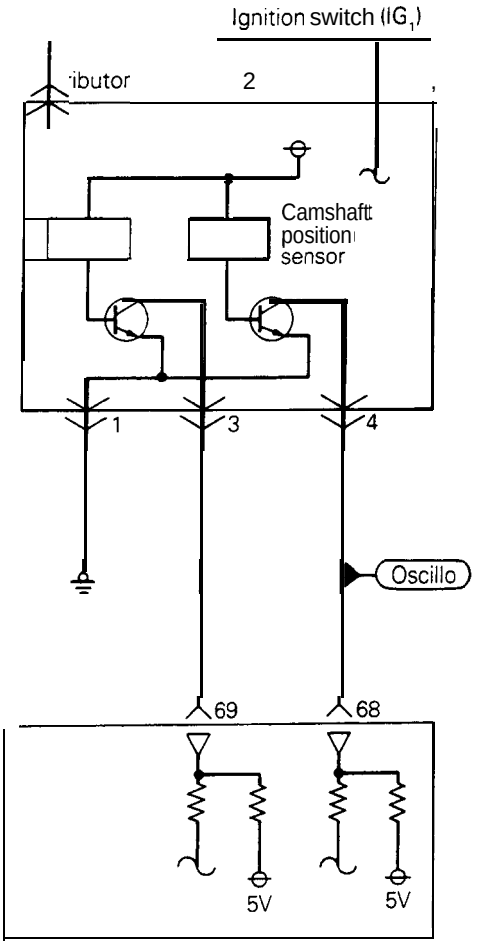
CAMSHAFT POSITION SENSOR



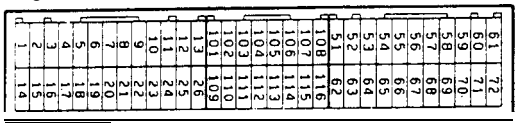








Engine control module connector



7FU0653

9FU0027

OPERATION

- The camshaft position sensor detects the top dead center on the compression stroke of the No.1 cylinder, converts it into a pulse signal and inputs it to the engine control module. The engine control module determines the fuel injection sequence based on this signal.
- Power to the camshaft position sensor is supplied from the ignition switch (IG), and the ground is located in the engine control module. A 5V voltage is applied from the engine control module to the camshaft position sensor output terminal, and the camshaft position sensor generates a pulse signal as it switches from OPEN to SHORT (power transistor inside the sensor switches ON/OFF) between the output terminal and the ground.

TROUBLESHOOTING HINTS

Hint 1: If the camshaft position sensor is defective, proper sequential injection will not occur, so the engine will stall, or unstable idling and poor acceleration will occur.

Hint 2: When the camshaft position sensor outputs a pulse signal when the ignition switch is turned to ON (without starting the engine), the camshaft position sensor or engine control module is probably defective.

TSB Revision

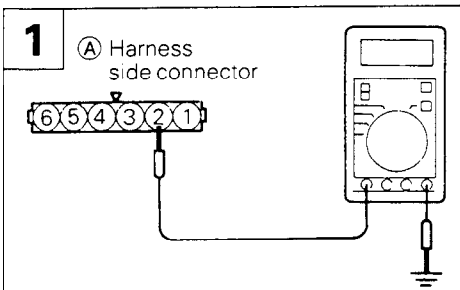
INSPECTION

Using Oscilloscope

Refer to P.13-69.

HARNESS INSPECTION

1



Measure the power supply voltage.

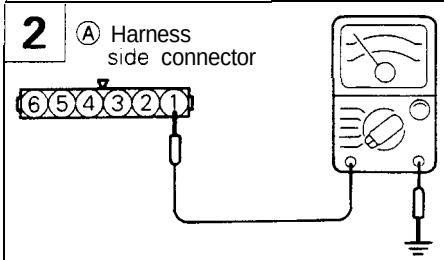
- Crankshaft position sensor connector: Disconnected
- Ignition switch: ON

Voltage (V)
B+

OK → 2

NG → Repair the harness (Ⓐ2 – Ignitionswitch) or check the ignition switch

2



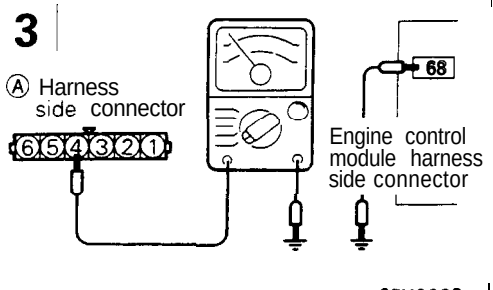
Check for continuity of the ground circuit.

- Crankshaft position sensor connector: Disconnected

OK → 3

NG → Repair the harness (Ⓐ1 – Ground)

3



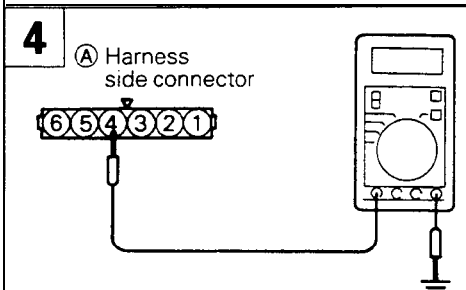
Check for open circuit or short circuit to ground, between camshaft position sensor and engine control module.

- Engine control module connector: Disconnected
- Crankshaft position sensor connector: Disconnected

OK → 4

NG → Repair the harness (Ⓐ4 – 68)

4



Measure the impressed voltage.

- Crankshaft position sensor connector: Disconnected
- Engine control module connector: Connected
- ignition switch: ON

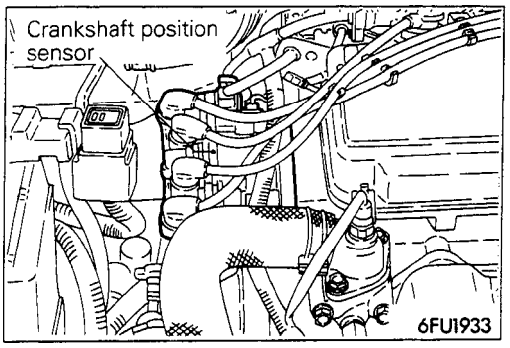
Voltage (V)
4.8 – 5.2

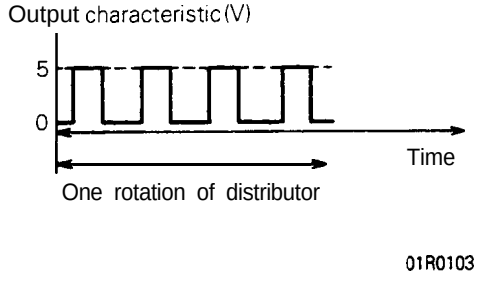
OK → STOP

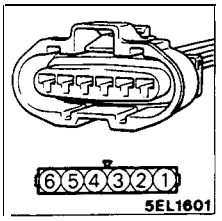
NG → Replace the engine control module

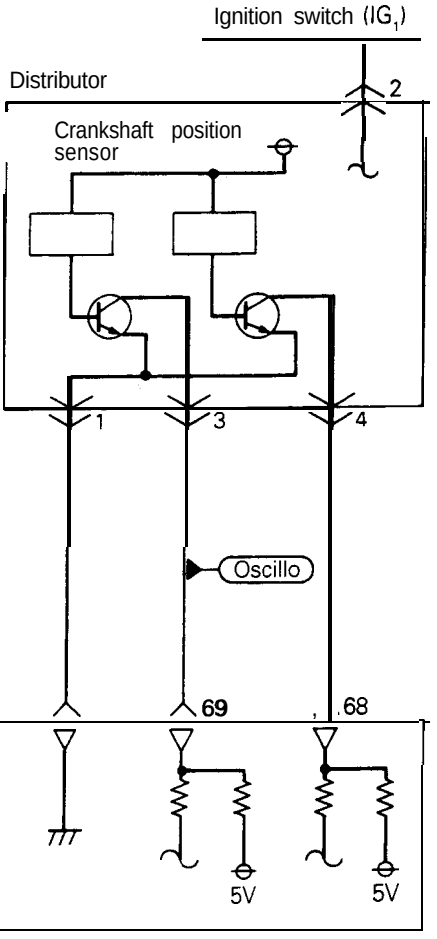
TSB Revision

CRANKSHAFT POSITION SENSOR

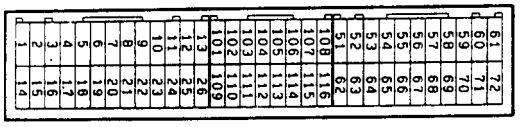








Engine control module connector



7FU0653

9FU0027

OPERATION

- The crankshaft position sensor detects the crank angle (piston position) of each cylinder, converts it to a pulse signal and inputs it to the engine control module. The engine control module computes the engine speed and the intake air amount for one stroke and outputs the injector drive signal and injection command signal based on this signal.
- Power to the crankshaft position sensor is supplied from the ignition switch (IG), and the ground is located in the engine control module. A 5V voltage is applied from the engine control module to the crankshaft position sensor output terminal, and the crankshaft position sensor generates a pulse signal as it switches from OPEN to SHORT (power transistor inside the sensor switches ON/OFF) between the output terminal and the ground.

TROUBLESHOOTING HINTS

Hint 1: If unexpected shocks are felt during driving or the engine stalls suddenly during idling, shake the crankshaft position sensor harness. if this causes the engine to stall, poor contact of the sensor connector is suspected.

Hint 2: If the crankshaft position sensor outputs a pulse signal when the ignition switch is turned to ON, (without starting the engine), the crankshaft position sensor or engine control module is probably defective.

Hint 3: If the tachometer reads 0 rpm when the engine that has failed to start is cranked, faulty crankshaft position sensor or broken timing belt is suspected.

Hint 4: If the tachometer reads 0 rpm when the engine that has failed to start is cranked, the primary current of the ignition coil is not turned on and off. Therefore, troubles in the ignition circuit and ignition coil or faulty ignition power transistor is suspected.

Hint 5: If the engine can be run at idle even though the crankshaft position sensor reading is out of specification, troubles are often in other than the crankshaft position sensor.
[Examples]
(1) Faulty water temperature sensor
(2) Faulty idle air control motor
(3) Poorly adjusted basic idle speed

INSPECTION

Using Scan Tool

Function	Item No.	Data display	Check condition	Check content	Normal state
Data reading	22	Cranking speed	• Engine cranking • Tachometer connected (check on and off of primary current of ignition coil by tachometer)	Compare cranking speed, and scan tool reading	Indicated speed to agree

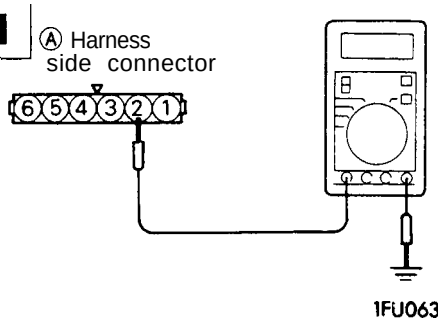
Function	Item No.	Data display	Check condition	Check content	Normal state
Data reading	22	Idle speed	• Engine: idling • Closed throttle position switch: ON	–20°C (–4°F)	1,275–1,475 rpm
				0°C (32°F)	1,220–1,420 rpm
				20°C (68°F)	1,100–1,300 rpm
				40°C (104°F)	950–1,150 rpm
				80°C (176°F)	600–800 rpm

Using Oscilloscope

Refer to P.13-74.

HARNESS INSPECTION

1



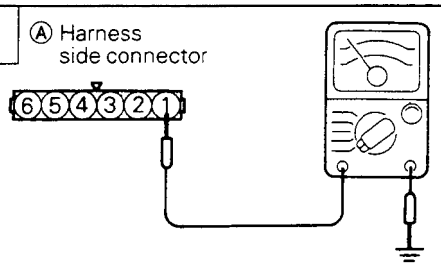
Measure the power supply voltage.
- Crankshaft position sensor connector: Disconnected
- Ignition switch: ON

Voltage (V)
B+

OK → 2

NG → Repair the hahrness (Ⓐ 2 – Ignition switch) or check the ignition switch

2

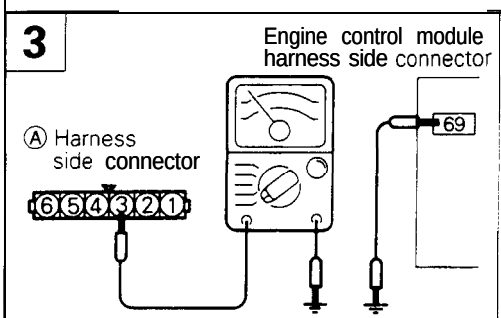


Check for continuity of the ground circuit.
- Crankshaft position sensor connector: Disconnected

OK → 3

NG → Repair the harness (Ⓐ 1 – Ground)

3

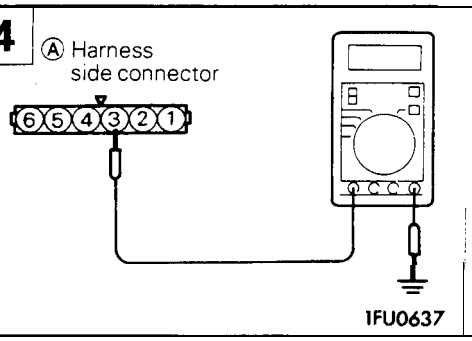


Check for open circuit, or short-circuit to ground, between crankshaft position sensor and engine control module.
- Engine control module connector: Disconnected
- Crankshaft position sensor connector: Disconnected

OK → 4

NG → Repair the harness (Ⓐ 3 – 69)

4



Measure the impressed voltage.
- Crankshaft position sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON.

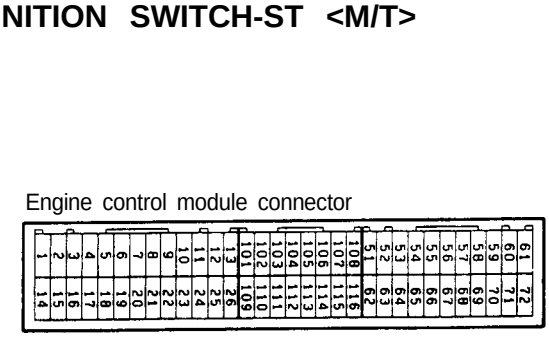
Voltage (V)
4.8 – 5.2

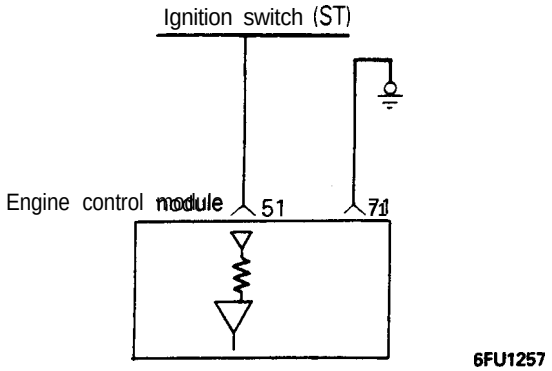
OK → STOP

NG → Replace the engine control module

TSB Revision

IGNITION SWITCH-ST <M/T>





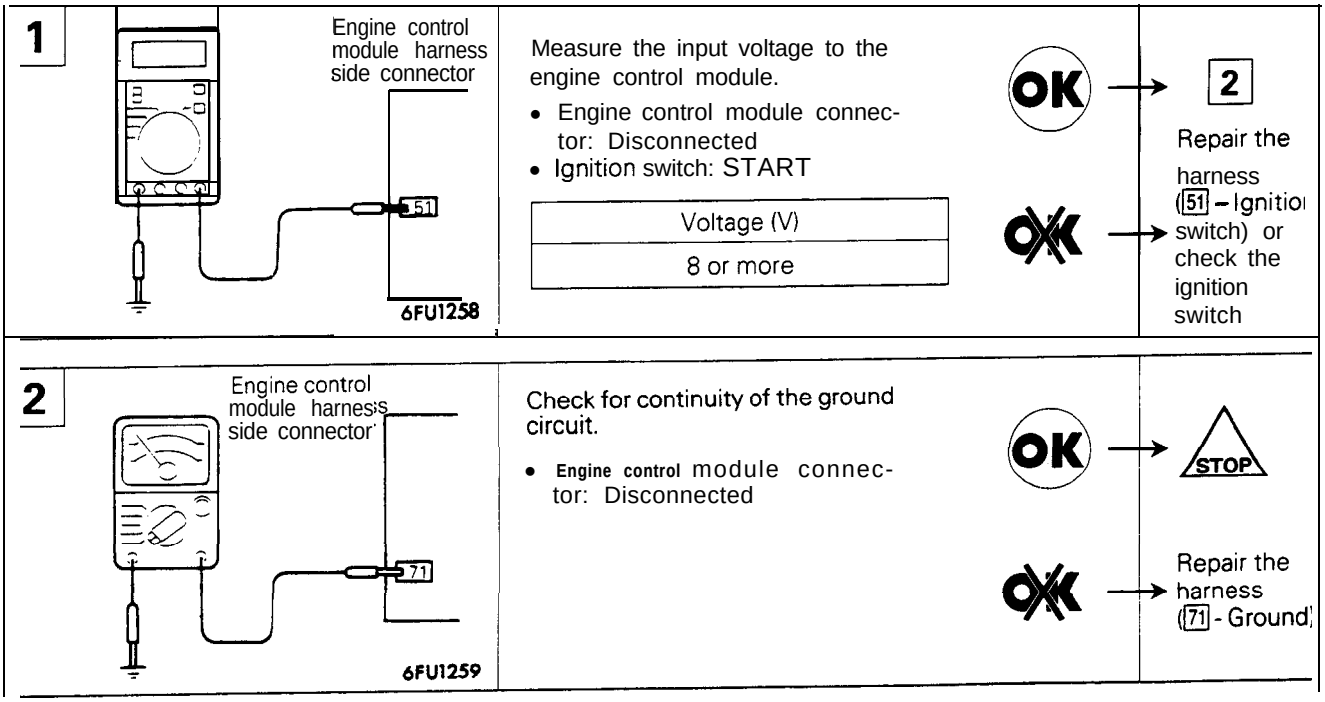
OPERATION

INSPECTION

Using Scan Tool

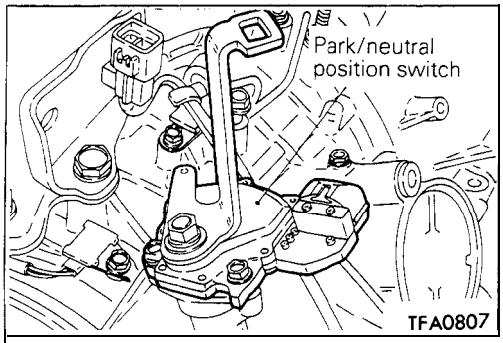
Refer to P.13-77.

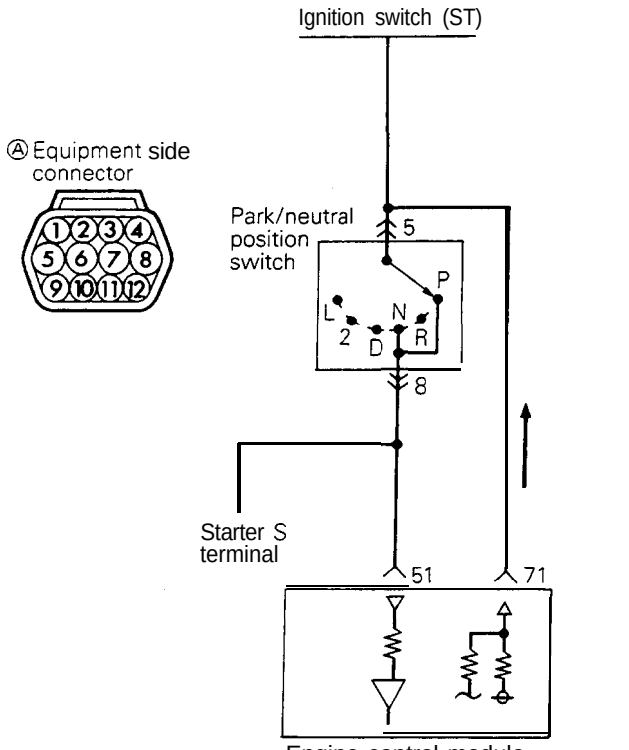
HARNESS INSPECTION



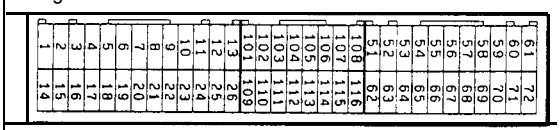
TSB Revision

IGNITION SWITCH-ST AND PARK/NEUTRAL POSITION SWITCH <A/T>





Engine control module connector



7FU0653 9FU0265

OPERATION

TROUBLESHOOTING HINTS

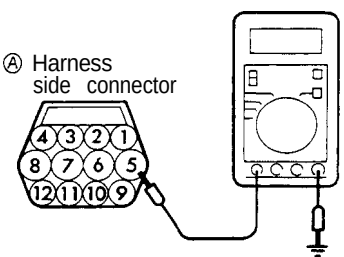
INSPECTION

Using Scan Tool

Refer to P.13-78.

HARNESS INSPECTION

1



9FU0266

Measure the power supply voltage of the park/neutral position switch.-

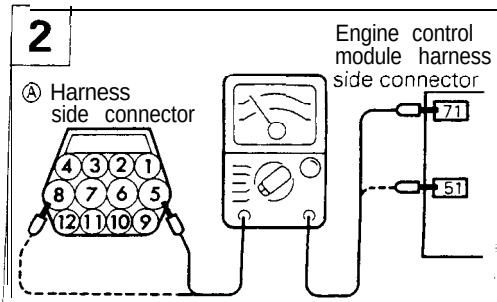
- Engine control module connector: Disconnected
- Park/neutral position switch connector: Disconnected
- Ignition switch: START

Voltage (V)
B+

OK → 2

NG → Check the power supply circuit

2



9FU0267

Check for continuity between park/neutral position switch and engine control module.

- Engine control module connector: Disconnected
- Park/neutral position switch connector: Disconnected

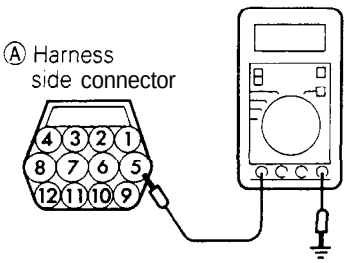
NOTE

Touch the circuit tester probes to both ends of the harness

OK → 3

NG → Repair the harness (Ⓐ 5 – 71) (Ⓐ 8 – 51)

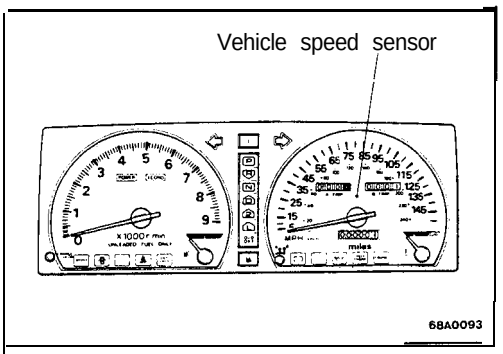
TSB Revision

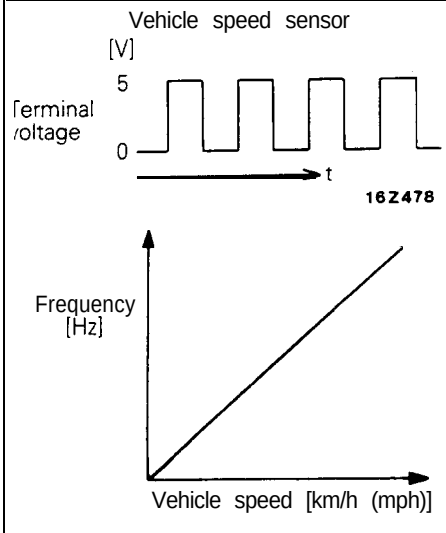
3		
Ⓐ Harness side connector  9FU0266	Measure the impressed voltage to park/neutral position switch terminal. • Engine control module connector: Connected • Park/neutral position switch connector: Disconnected • Ignition switch: ON Voltage (V): B+	OK → STOP NG → Replace the engine control module

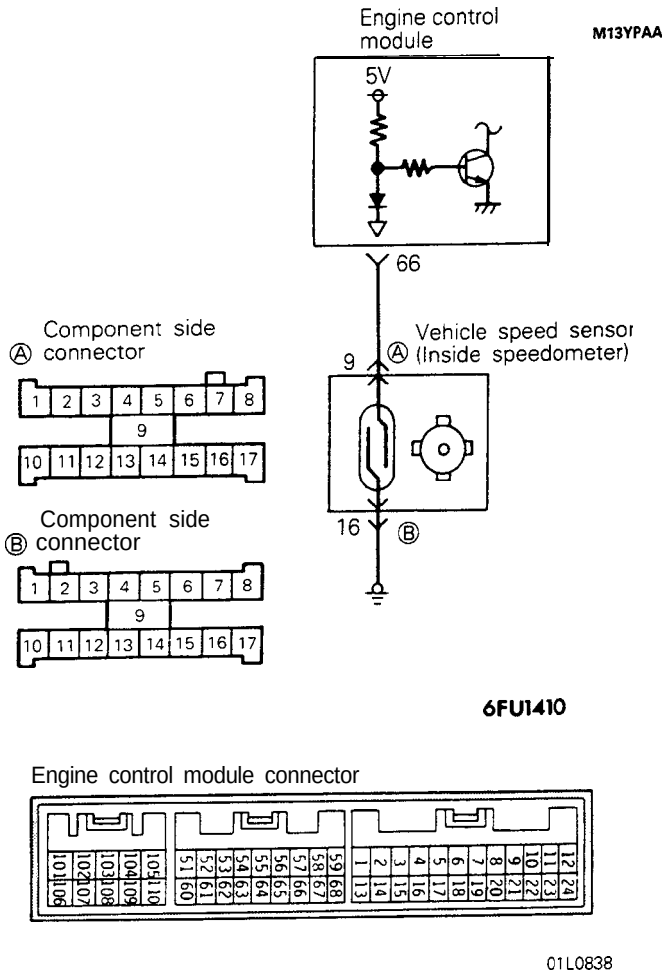
PARK/NEUTRAL POSITION SWITCH INSPECTION

Refer to GROUP 23–Troubleshooting.

VEHICLE SPEED SENSOR







OPERATION

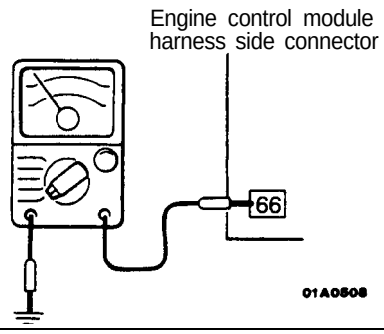
TROUBLESHOOTING HINTS

Refer to P.13-80.

TSB Revision

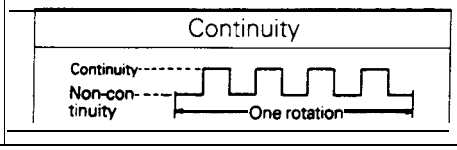
HARNESS INSPECTION

1



Check the vehicle speed sensor output circuit for continuity.

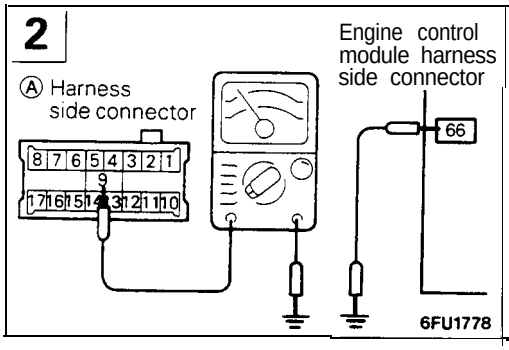
- Engine control module connector: Disconnected
- Move the vehicle.



OK → 4

~~OK~~ → 2

2



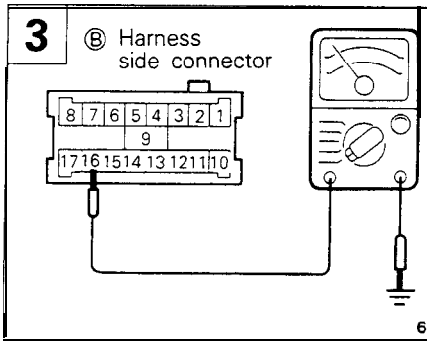
Check for open circuit or short-circuit to ground, between engine control module and vehicle speed sensor.

- Engine control module connector: Disconnected
- Vehicle speed sensor connector: Disconnected

OK → 3

~~OK~~ → Repair the harness (Ⓐ9 – 66)

3



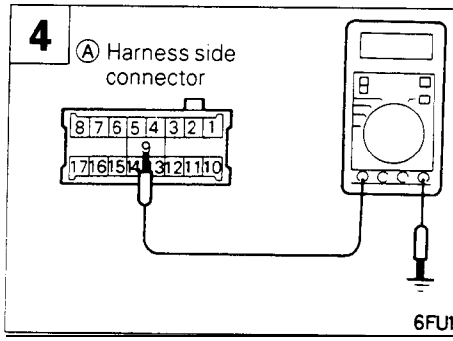
Check for continuity of the ground circuit.

- Vehicle speed sensor: Disconnected

OK → 4

~~OK~~ → Repair the harness (Ⓑ16 – Ground)

4



Measure the impressed voltage.

- Vehicle speed sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

Voltage (V)
4.5 – 4.9

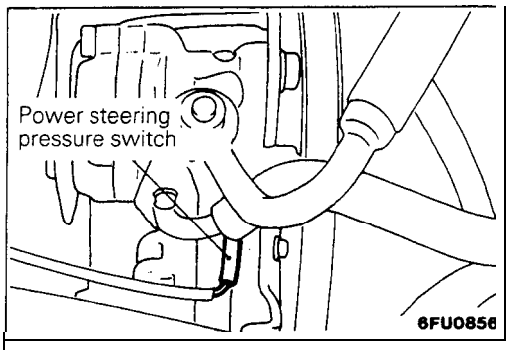
OK → STOP

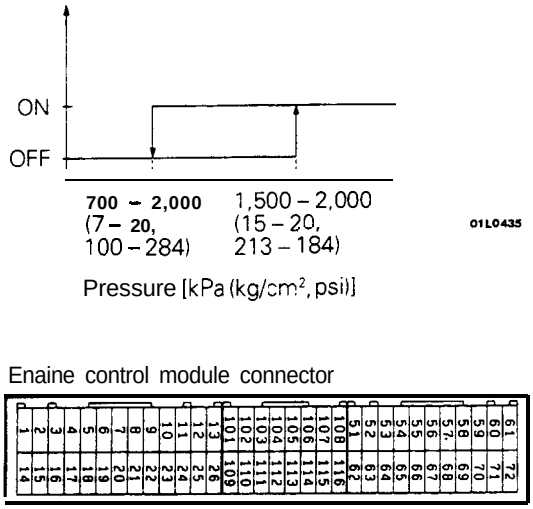
~~OK~~ → Replace the engine control module

SENSOR INSPECTION

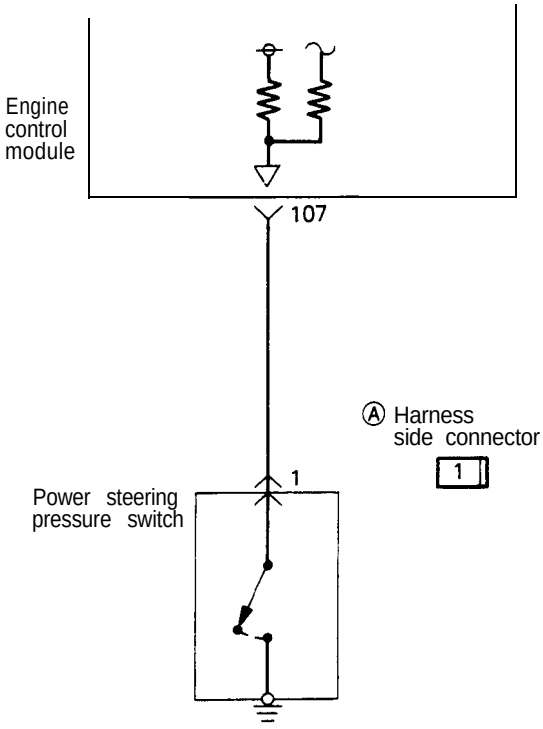
Refer to GROUP 54–Meters and Gauges.

POWER STEERING PRESSURE SWITCH





Enaine control module connector



7FU0653

OPERATION

INSPECTION

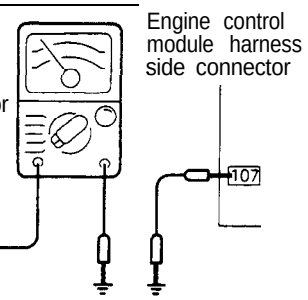
Using Scan Tool

Refer to P.13-82.

HARNESS INSPECTION

1

Ⓐ Harness side connector 1



Check for open circuit or short-circuit to ground, between engine control module and power steering pressure switch.

- Power steerina pressure switch connector: Disconnected
- Engine control module connector: Disconnected

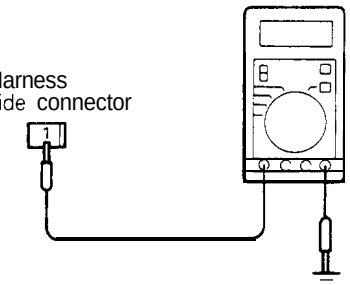
OK → 2

NG → Repair the harness (Ⓐ1 – 107)

TSB Revision

2

Ⓐ Harness side connector



7FU0505

Measure the impressed voltage.

- Power steering pressure switch connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

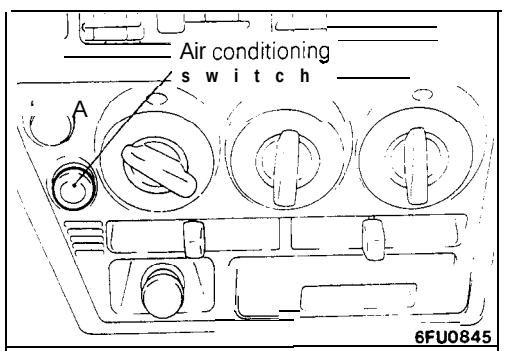
Voltage (V)
B+

OK → STOP

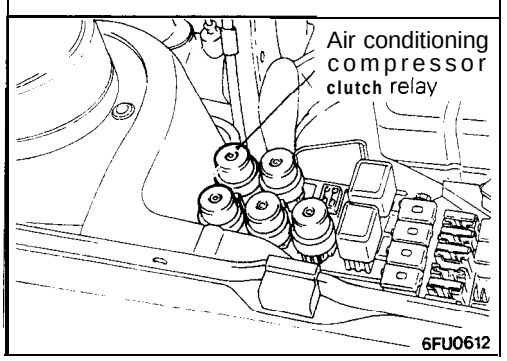
NG → Replace the engine control module

AIR CONDITIONING SWITCH AND A/C COMPRESSOR CLUTCH RELAY

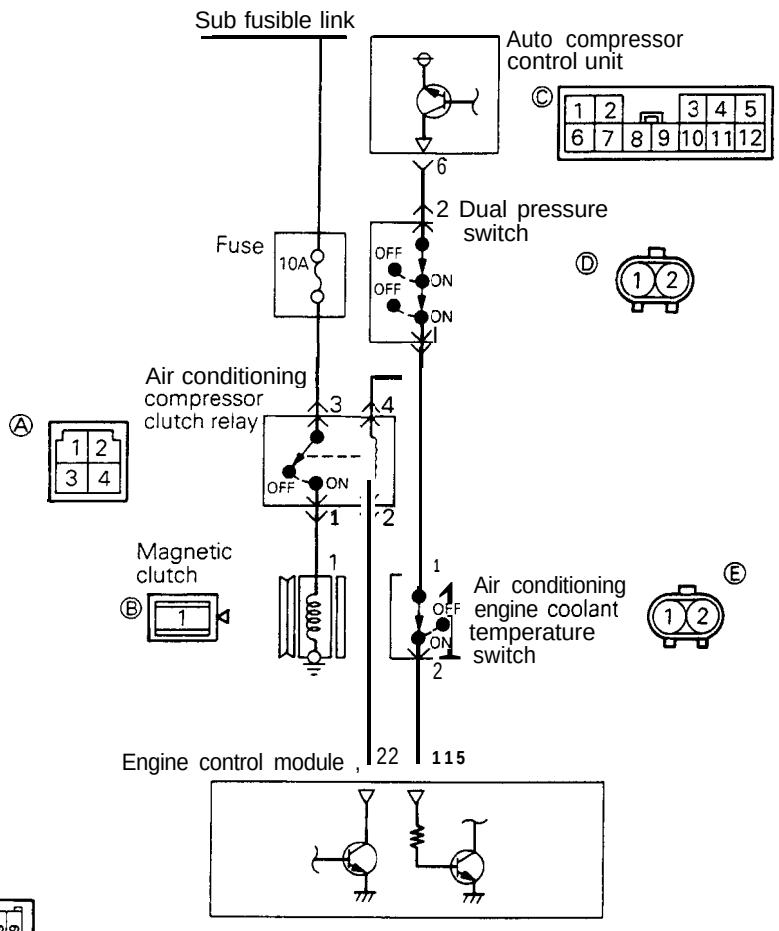
M13YRAB1



6FU0845

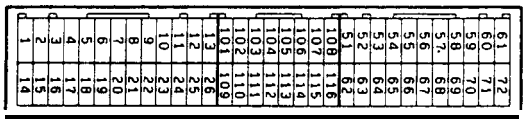


6FU0612



6FU1457

Engine control module connector



7FU0653

OPERATION

TROUBLESHOOTING HINTS

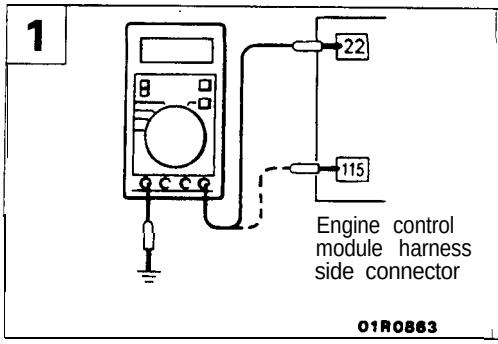
INSPECTION

Using Scan Tool

Refer to P.13-83.

TSB Revision

HARNESS INSPECTION



Measure the power supply voltage of the air conditioning circuit.
- Air conditioning switch: ON
- Engine control module connector: Disconnected
- Ignition switch: ON

Voltage (V)
6V or more

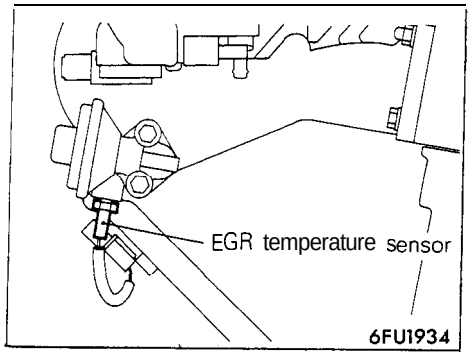
OK → STOP

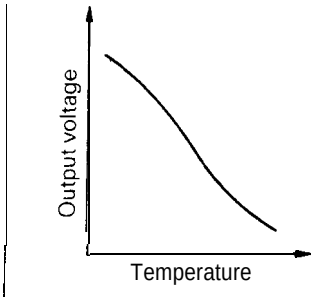
NG → Check the air conditioning circuit

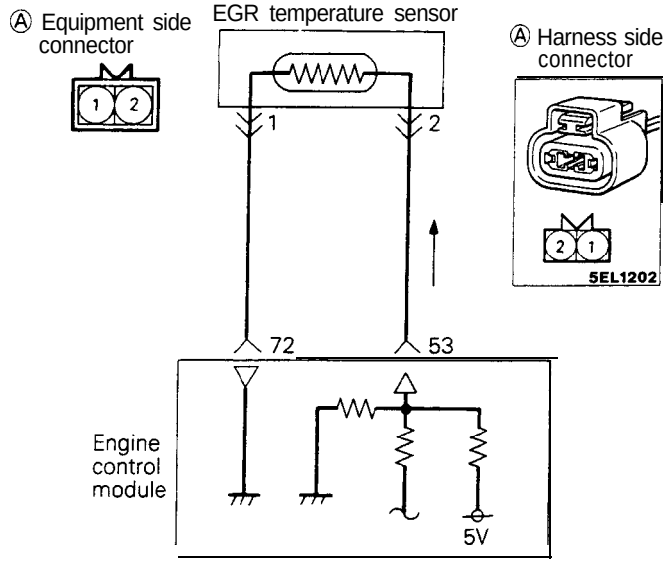
AIR CONDITIONING INSPECTION

Refer to GROUP 55–Air Conditioning.

EGR TEMPERATURE SENSOR <California>







OPERATION

Refer to P.13-85.

INSPECTION

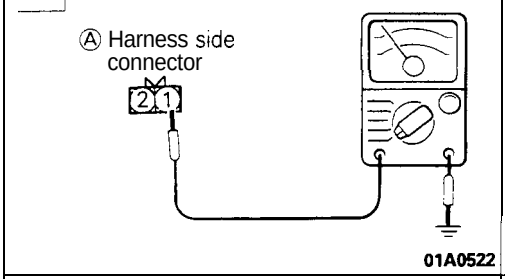
Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	43	Sensor temperature	. Engine: warm up • Engine is maintained in a constant state for 2 minutes or more • Remove the vacuum hose (green stripes) from the EGR solenoid and plug both the removed vacuum hose end and solenoid valve nipple.	Idle speed	70°C(158°F) or lower
				3,500 rpm	70°C(158°F) or higher

TSB Revision

HARNESS INSPECTION

1



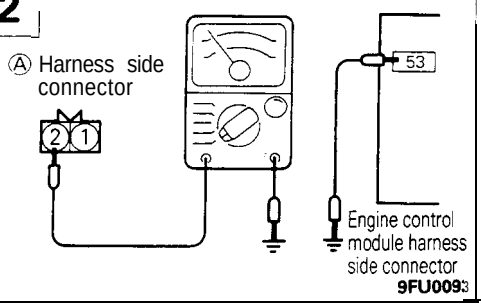
Check for continuity of the ground circuit.

- EGR temperature sensor connector: Disconnected

OK → 2

NO → Repair the harness. (Ⓐ1–72)

2



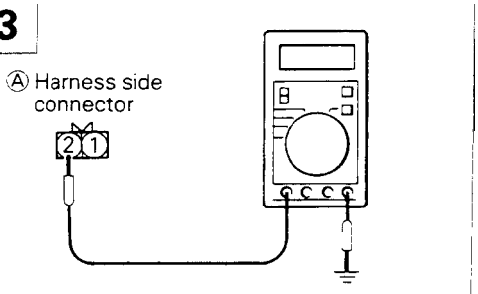
Check for an open circuit, or a short circuit to ground between the engine control module and the EGR temperature sensor.

- EGR temperature sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓐ2–53)

3



Measure the Impressed voltage.

- Connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

Voltage (V)
4.3 – 4.7

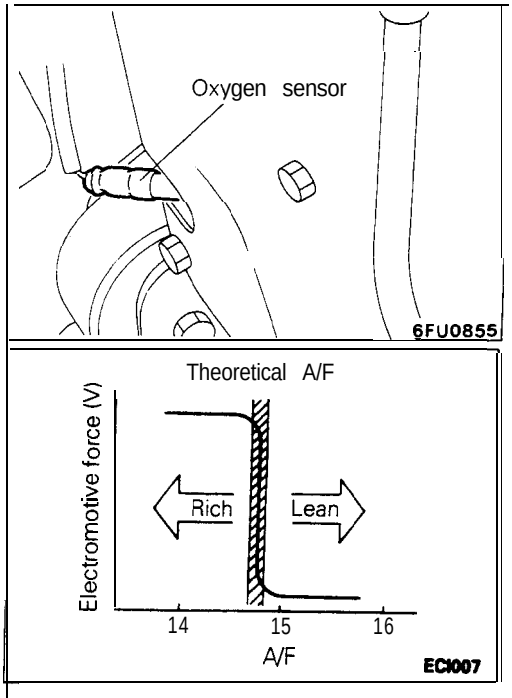
OK → STOP

NO → Replace the engine control module.

SENSOR INSPECTION

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

OXYGEN SENSOR



OPERATION

TROUBLESHOOTING HINTS

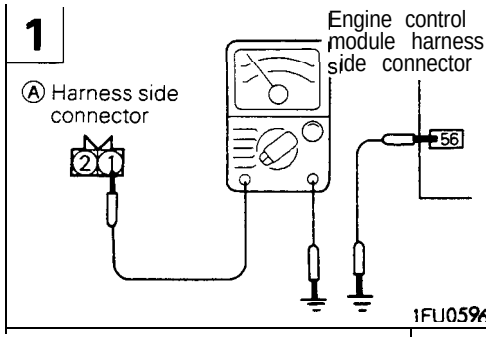
INSPECTION

Using Scan Tool

Refer to P.13-87.

HARNESS INSPECTION

1



Check for an open circuit, or a short circuit to ground, between the engine control module and the oxygen sensor.

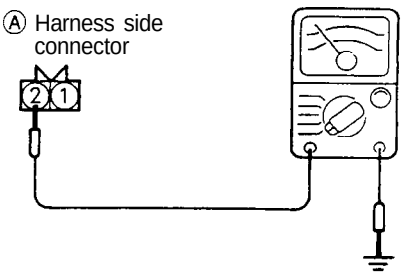
- Oxygen sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → 2

NG → Repair the harness (Ⓐ1 – 56)

TSB Revision

2 Ⓐ Harness side connector



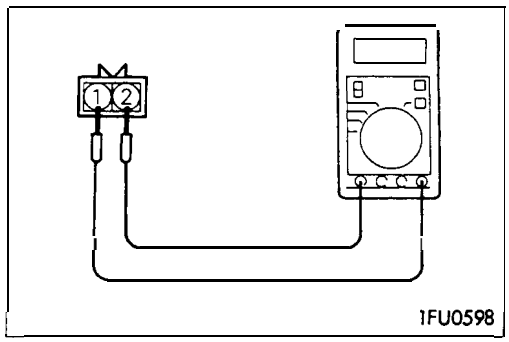
1FU0597

Check for continuity of the ground circuit.

- Oxygen sensor connector: Disconnected

OK → STOP

NG → Repair the harness (Ⓐ2 – 72)



1FU0598

SENSOR INSPECTION

(1) Warm the engine and check to be sure that the engine coolant temperature is 85–95°C (185–203°F).

(2) Disconnect the oxygen sensor connector and connect a digital voltmeter.

Caution
When disconnecting the oxygen sensor connector, do not pull the connector or lead wire too strongly.

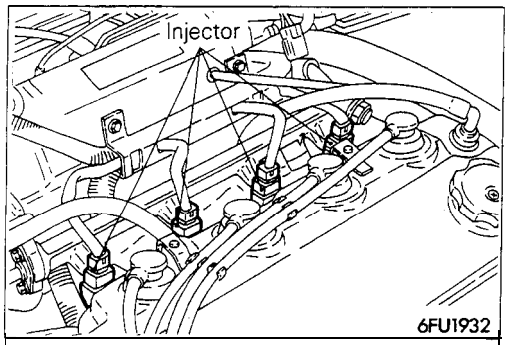
(3) Race the engine repeatedly and measure the oxygen sensor output voltage.

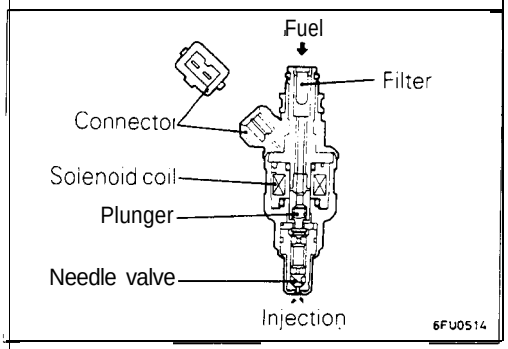
Engine	Sensor output voltage	Remark
When racing the engine	0.6 – 1.0 V	When the air/fuel mixture ratio is enriched by racing the engine repeatedly, a normal oxygen sensor will output a voltage of 0.6 – 1.0V.

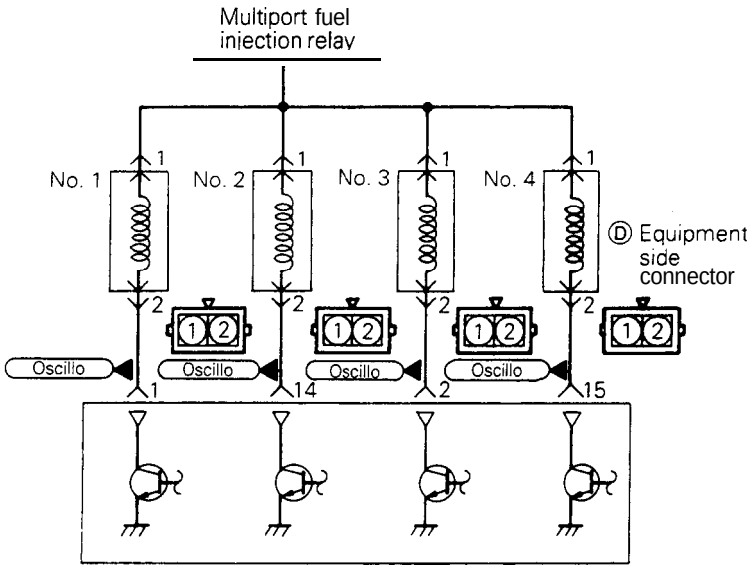
(4) If the sensor is defective, replace the oxygen sensor.

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

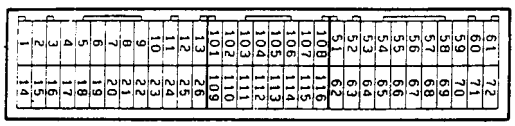
INJECTORS







Engine control module connector



OPERATION

TROUBLESHOOTING HINTS

Refer to P.13-90.

TSB Revision

INSPECTION

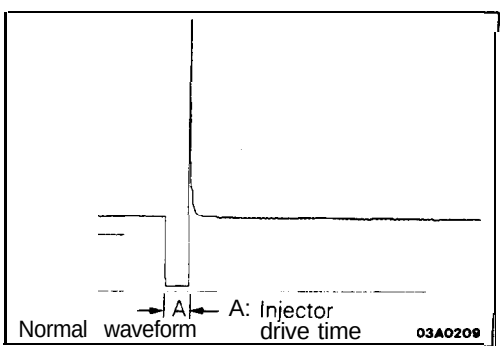
Using Scan Tool

Function	Item No.	Data display	Check condition	Coolant temperature	Standard value
Data reading	41	Drive time *1	Engine: Cranking	0°C (32°F) *2	Approx. 20 ms
				20°C (68°F)	Approx. 40 ms
				80°C (176°F)	Approx. 9.8 ms

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	41	Drive time *3	• Engine coolant temperature: 85 to 95°C (185 to 203°F) • Lights, electric cooling fan, accessories: OFF • Transaxle: Neutral (P range for A/T)	Idle speed	2.2-3.4 ms
				2,000 rpm	1.7–2.9 ms
				When sharp racing is made	To increase

NOTE
*1: The injector drive time refers to when the supply voltage is 11V and the cranking speed is less than 250 rpm.
*2: When engine coolant temperature is lower than 0°C (32°F), injection is made by four cylinders simultaneously.
*3: When the vehicle is new [within initial operation of about 500 km (300 miles)], the injector drive time may be about 10% longer

Function	Item No.	Drive content	Check condition	Normal state
Actuator test	01	No. 1 injector shut off	Engine: Idling after warm-up (Shut off the injectors in sequence during after engine warm-up, check the idling condition)	Idle state to change further (becoming less stable or stalling)
	02	No. 2 injector shut off		
	03	No. 3 injector shut off		
	04	No. 4 injector shut off		



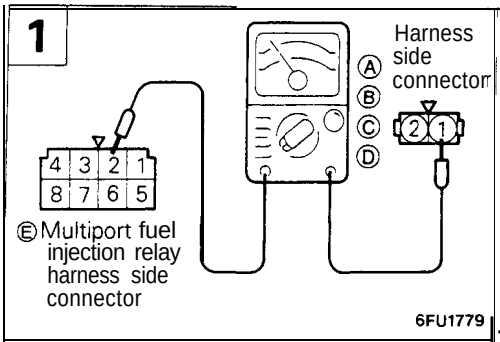
Using Oscilloscope

(1) Run the engine at idle speed.
(2) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram, and check the waveform at the drive side of each injector.

TSB Revision

HARNESS INSPECTION

1



Check for continuity between injector and multiport fuel injection relay.

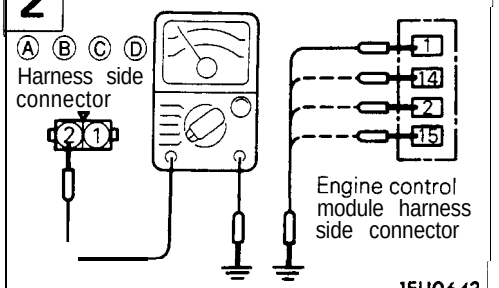
- Injector connector: Disconnected
- Multiport fuel injection relay connector: Disconnected

NOTE
Touch the circuit tester probes to both ends of the harness.

OK → 2

NG → Repair the harness (ⒶⒷⒸⒹ1 – Ⓔ2)

2



Check for an open circuit, or a short circuit to ground between the engine control module and the injector.

- Engine control module connector: Disconnected
- Injector connector: Disconnected

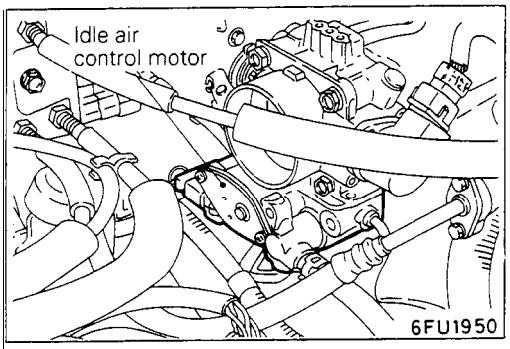
OK → STOP

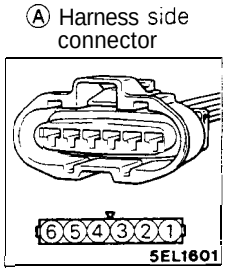
NG → Repair the harness (ⒶⒷⒸⒹ 2 – 1, 14, 2, 15)

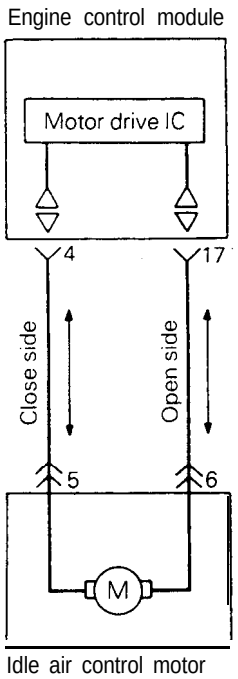
ACTUATOR INSPECTION

Refer to P.13-92.

IDLE AIR CONTROL MOTOR (DC MOTOR)

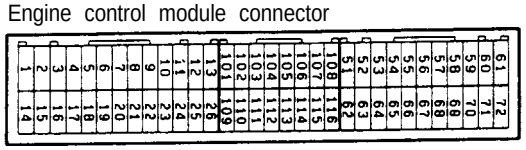






6FU1734

Engine control module connector



7FU0653

OPERATION

- The volume of intake air during engine idling is controlled by the opening and closing of the IAC valve for bypassing the throttle valve, located at the air intake port.
- The IAC valve opens and closes depending on whether the DC motor inside the idle air control motor is turning clockwise or anti-clockwise.
- The DC motor turns clockwise or anti-clockwise according to the change in the direction of current in the motor drive IC inside the engine control module.

TROUBLESHOOTING HINTS

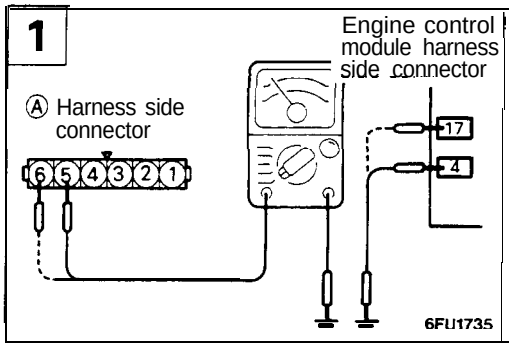
Hint 1: While the engine is idling, if the idle speed and IAC valve position (step) change when the air conditioning switch is turned to ON and OFF, it can be assumed that the idle air control motor and the IAC valve position sensor are operating normally.

Hint 2: If the IAC valve position (step) is outside the standard position, the malfunction is probably one of the following:

(1) Basic idle speed adjustment is wrong.
(2) Some deposit is adhering to the throttle valve.
(3) Air is being drawn into the air intake manifold through a defectivegasket seal.
(4) EGR valve sheet adhesion is defective.
(5) Combustion malfunction inside a cylinder.
(Spark plug, ignition coil, injector or compression pressure is defective.)

TSB Revision

HARNESS INSPECTION



Check for open circuit, or short-circuit to ground, between idle air control motor and engine control module.

- Idle air control motor connector: Disconnected
- Engine control module connector: Disconnected

OK → STOP

NG → Repair the harness (Ⓐ5 – 4) (Ⓐ6 – 17)

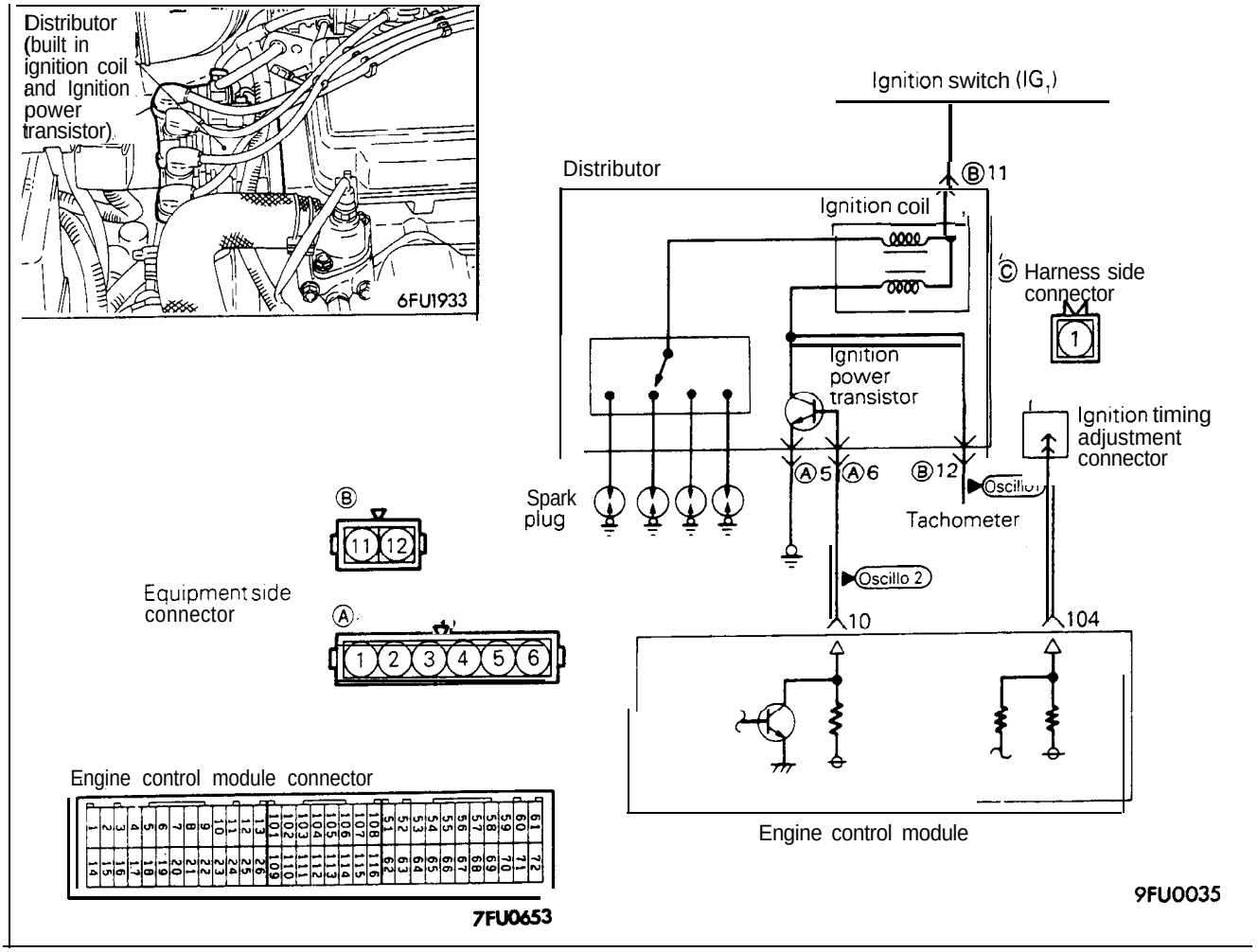
ACTUATOR INSPECTION

Use a sound scope to check if the sound of the idle air control motor 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 air control motor.

IGNITION COIL AND IGNITION POWER TRANSISTOR



OPERATION

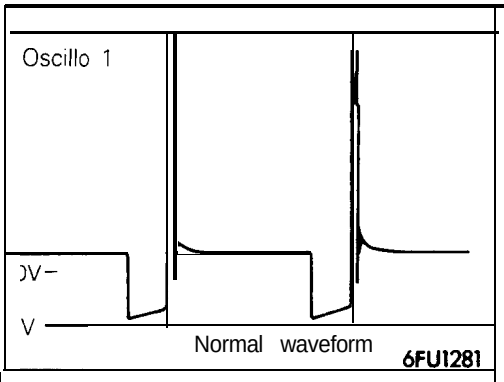
Refer to P.13-96.

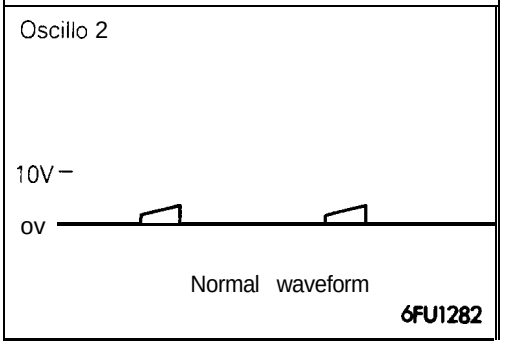
INSPECTION

Using Scan Tool

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	44	Ignition advance	• Engine: Warming up • Timing light: Set (set timing light to check actual ignition timing)	Idle speed	0- 13 “BTDC
				2,000 rpm	19-39 “BTDC

TSB Revision





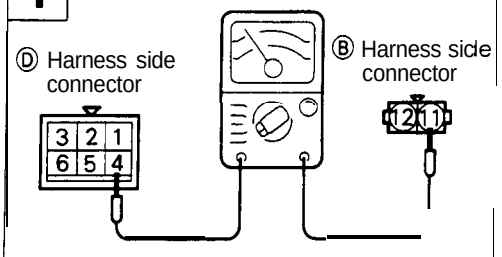
Using Oscilloscope

1. Primary signal of ignition coil
   (1) Run the engine at an idle revolution speed.
   (2) Connect the probe to oscilloscope pick-up point 1 as shown in the circuit diagram, and check the primary signal of the ignition coil.

2. Control signal of power transistor
   (1) Connect the probe to oscilloscope pick-up point 2 as shown in the circuit diagram, and check the control signal of the power transistor.

HARNESS INSPECTION

1



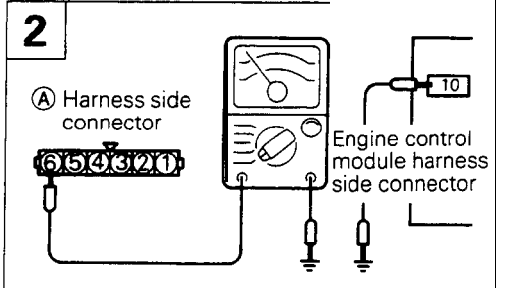
Check for continuity between ignition coil and ignition switch [IG].
- Ignition switch [IG] connector: Disconnected
- ignition coil connector: Disconnected

NOTE
Touch the circuit tester probes to both ends of the harness.

OK → 2

NG → Repair the harness (Ⓑ11 – Ⓓ4)

2

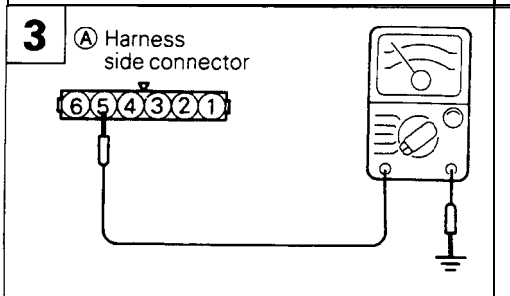


Check for open-circuit, or short-circuit to ground, between ignition power transistor and engine control module.
- Ignition power transistor connector: Disconnected
- Engine control module connector: Disconnected

OK → 3

NG → Repair the harness (Ⓐ6 – 10)

3



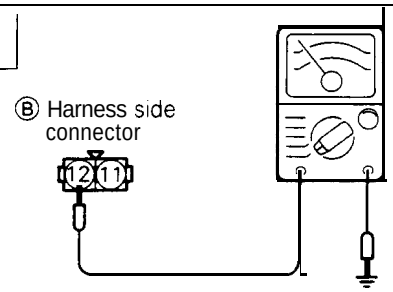
Check for continuity of the ground circuit of an ignition power transistor.
- Ignition power transistor connector: Disconnected

OK → 4

NG → Repair the harness (Ⓐ5 – Ground)

TSB Revision

4



9FU0038

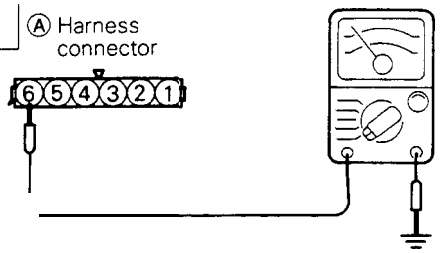
Check to be sure that there is no continuity between the ignition coil and the earth.

- Ignition coil connector: Disconnected

OK → 5

NG → Check for short in the ignition coil primary circuit

5



1FU0650

Measure the voltage of the control signal circuit of the ignition power transistor.

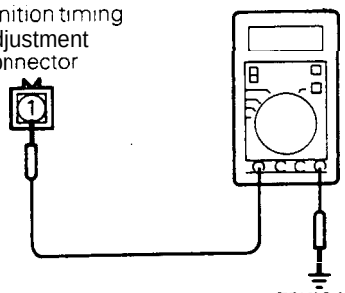
- Ignition power transistor connector: Disconnected
- Ignition switch: START

Voltage (V)
2 – 6

OK → 6

NG → Repair the harness (Ⓐ6 – 10)

6



7FU1060

Measure the voltage of the ignition timing adjustment terminal.

- Ignition switch: ON

Voltage (V)
4.0 – 5.2

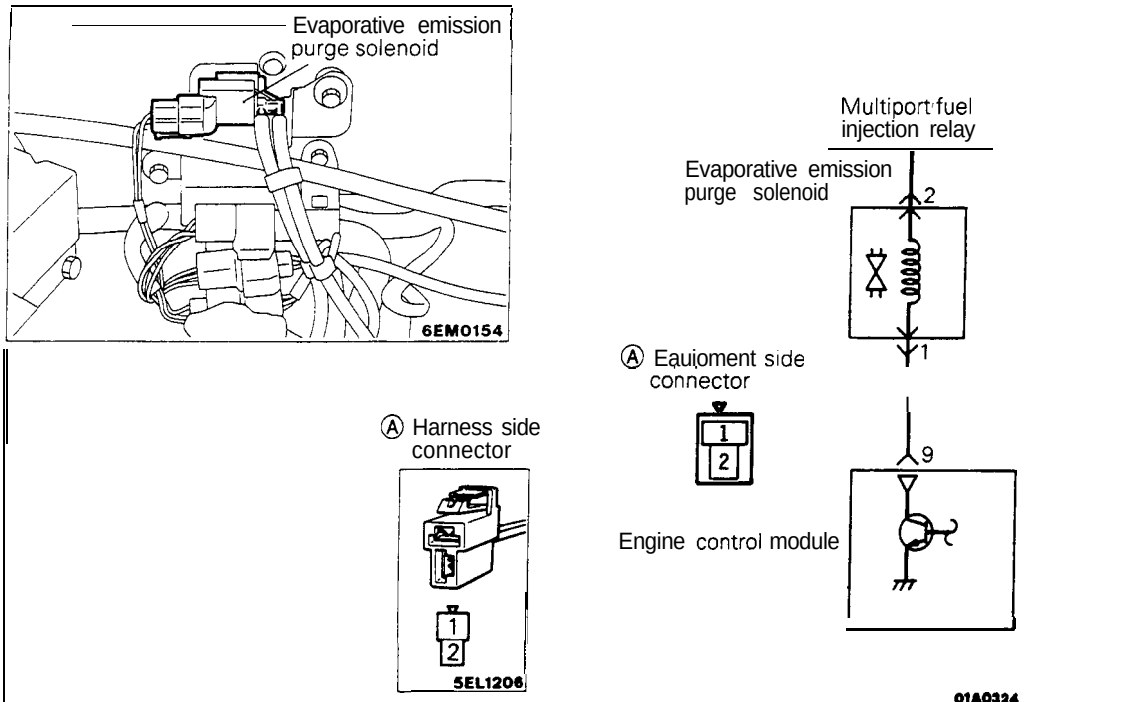
OK → STOP

NG → Repair the harness (Ⓒ1 – 104)

ACTUATOR INSPECTION

Refer to GROUP 16 – Ignition System.

EVAPORATIVE EMISSION PURGE SOLENOID



OPERATION

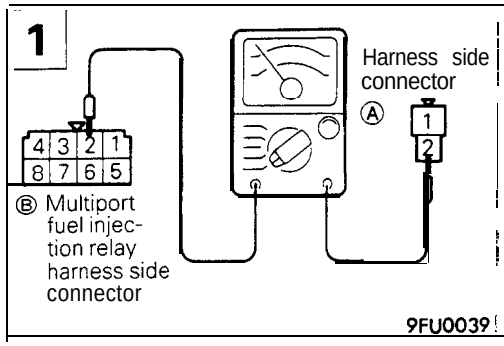
INSPECTION

Using Scan Tool

Refer to P.13-99.

TSB Revision

HARNESS INSPECTION



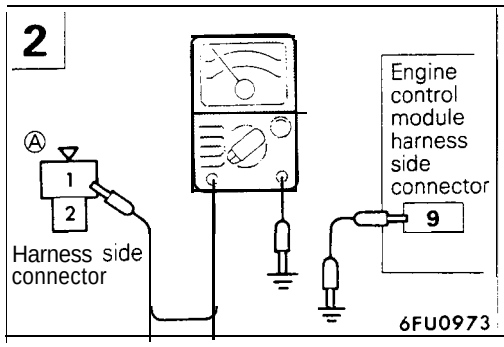
Check for continuity between evaporative emission purge solenoid and multiport fuel injection relay.

- Evaporative emission purge solenoid connector: Disconnected
- Multiport fuel injection relay connector: Disconnected

NOTE
Touch the circuit tester probes to both ends of the harness.

OK → 2

NG → Repair the harness (Ⓐ2 – Ⓑ2)



Check for an open circuit, or a short-circuit to ground, between the evaporative emission purge solenoid and the engine control module.

- Evaporative emission purge solenoid connector: Disconnected
- Engine control module connector: Disconnected

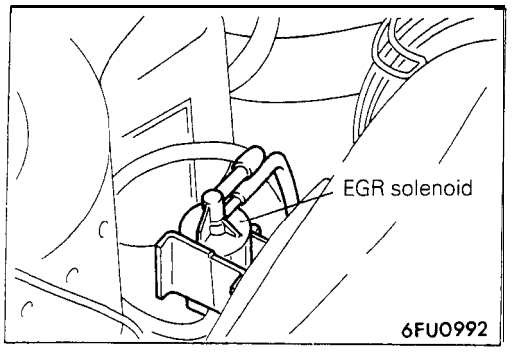
OK → STOP

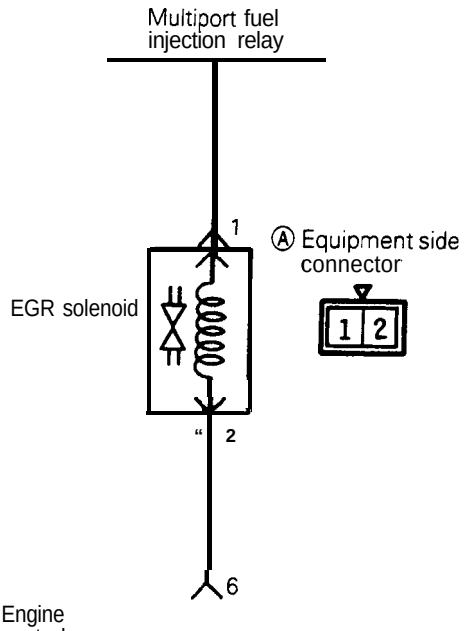
NG → Repair the harness (Ⓐ1 – 9)

ACTUATOR INSPECTION

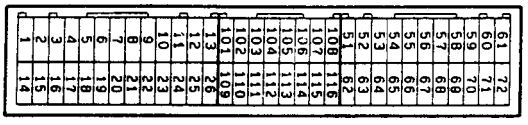
Refer to GROUP 17 – Evaporative Emission Control System.

EGR SOLENOID <California>





Engine control module connector



7FU0653

OPERATION

TROUBLESHOOTING HINTS

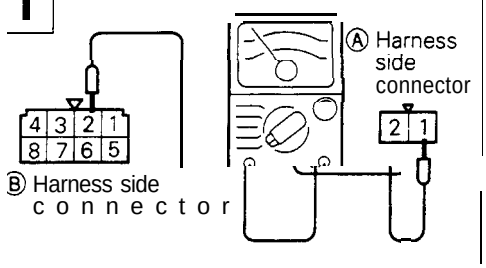
INSPECTION

Using Scan Tool

Refer to P.13-101.

HARNESS INSPECTION

1



Check for continuity between EGR solenoid and multiport fuel injection relay.

- EGR solenoid connector: Disconnected
- Multiport fuel injection relay connector: Disconnected

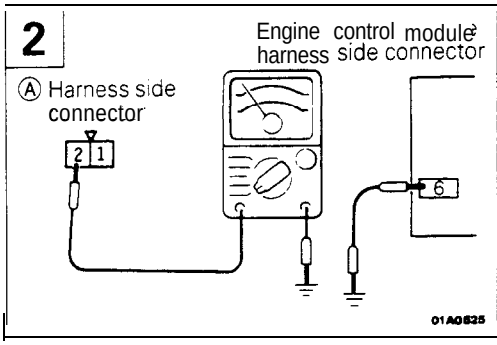
NOTE

Touch the circuit tester probes to both ends of the harness.

OK → 2

NG → Repair the harness (Ⓐ 1 – Ⓑ 2)

TSB Revision



Check for an open circuit, or a short-circuit to ground, between the EGR solenoid and the engine control module.

- EGR solenoid connector: Disconnected
- Engine control module connector: Disconnected

OK → STOP

NG → Repair the harness (Ⓐ2 – 6)

ACTUATOR INSPECTION

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

FUEL PRESSURE TEST

Refer to P.13-102.

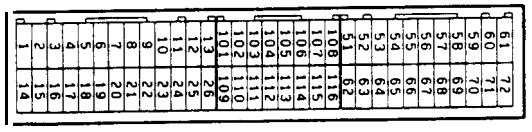
INSPECTION OF ENGINE CONTROL MODULE TERMINAL VOLTAGE

NOTE
Make the voltage measurement between terminal No.26 (ground terminal) and each terminal.

Refer to P.13-105.

TERMINAL VOLTAGE CHECK CHART

Terminal arrangement of engine control module connector



NOTE
B+: Battery positive voltage

Terminal No.	Check Item	Check Condition (Engine Condition)	Standard value
60	Backup power supply	Ignition: OFF	B+
12	Power supply	Ignition: ON	B+
25			
8	Multiport fuel injection relay (Fuel pump)	Ignition switch: ON	B+
		Engine: Idle speed	0-3V
61	Sensor impressed voltage	Ignition switch: ON	4.5-5.5V
70	Volume air flow sensor	Engine: Idle speed	2.2-3.2V
		Engine rpm: 2,000 rpm	

TSB Revision

Terminal No.	Check Item	Check Condition (Engine Condition)		Standard value
19	Volume air flow sensor reset signal	Engine: Idle speed		0-1V
		Engine rpm: 3,000 rpm		6-9V
52	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C (32°F)	3.2-3.8V
			When intake air temperature is 20°C (68°F)	2.3-2.9V
			When intake air temperature is 40°C (104°F)	1.5-2.1V
			When intake air temperature is 80°C (176°F)	0.4-1.0V
65	Barometric pressure sensor	Ignition switch: ON	When altitude is 0 m	3.7-4.3V
			When altitude is 1,200 m (3,937 ft.)	3.2-3.8V
63	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C (32°F)	3.2-3.8V
			When engine coolant temperature is 20°C (68°F)	2.3-2.9V
			When engine coolant temperature is 40°C (104°F)	1.3-1.9V
			When engine coolant temperature is 80°C (176°F)	0.3-0.9V
64	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position.	0.3-0.6V
			Fully open throttle valve.	4.5-5.5V
67	Closed throttle position switch	Ignition switch: ON	Set throttle valve to idle position.	0-1V
			Slightly open throttle valve	4V or more
68	Camshaft position sensor	Engine: Cranking		0.2-3.0V
		Engine: Idle speed		
69	Crankshaft position sensor	Engine: Cranking		0.2-3.0V
		Engine: Idle speed		
51	Ignition switch-ST	Engine: Cranking		8V or more
71	Park/neutral position switch	Ignition switch: ON	Set selector lever to P or N.	0-3V
			Set selector lever to D, 2, L or R.	8-14V
66	Vehicle speed sensor	Ignition switch: ON Move the vehicle slowly forward.		0↔5V (Changes repeatedly)
107	Power steering pressure switch	Engine: Idling after warming up	Steering wheel idle state	B+
			During steering wheel operation	0-3V
115	Air conditioning switch	Engine: Idle speed	Turn the air conditioning switch OFF	0-3V
			Turn the air conditioning switch ON. (Air conditioning compressor is operating)	B+
22	Air conditioning compressor clutch relay	Engine: Idle speed Air conditioning switch: OFF-ON Turn the conditioning switch ON. (Air conditioning compressor is operating)		B+ or temporarily 6V or more ↓ 0-3V

TSB Revision

Terminal No.	Check Item	Check Condition (Engine Condition)		Standard value
56	Oxygen sensor	Engine: Running at 2,000 rpm after having warmed up. (Check using a digital type voltmeter.)		0↔0.8V (Changes repeatedly)
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.		From 11–14V, momentarily drops slightly
14	No. 2 injector			
2	No. 3 injector			
15	No. 4 injector			
10	Ignition power transistor unit	Engine rpm: 3,000 rpm		0.3-3.0V
9	Evaporative emission purge solenoid	Ignition switch: ON		B+
		Running at 3,000 rpm while engine is warming up after having been started.		0-3V
104	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
106	Check engine/malfunction indicator lamp	Air conditioning switch: OFF-ON		0-3V ↓ 9-13V (After several seconds have elapsed)
6	EGR solenoid <California>	Ignition switch: ON		B+
		Engine is idling after having warmed up		From B+ momentarily drops
53	EGR temperature sensor <California>	Ignition switch: ON	When the sensor temperature is 50°C (122°F).	3.6-4.4 V
			When the sensor temperature is 180°C (212°F).	2.2–3.0 V
5	IAC valve position sensor No.1	Ignition switch: Immediately after turning ON		1.5-4V (Momentarily) O-1V or 4.5-5.5V
18	AC valve position sensor No.2	Ignition switch: Immediately after turning ON		1.5-4V (Momentarily) ↓ 0-1V or 4.5-5.5V
4	Idle air control motor (closed)	Ignition switch: Immediately after turning ON		2V or more (Momentarily) ↓ 0-1V
17	Idle air control motor (open)	Ignition switch: Immediately after turning ON		4V or more (Momentarily) ↓ 0-1V

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FUEL TANK

Refer to P.13-109.

FUEL LINE AND VAPOR LINE

Refer to P.13-113.

FUEL FILTER

Refer to P.13-115.

FUEL SYSTEM <DOHC>

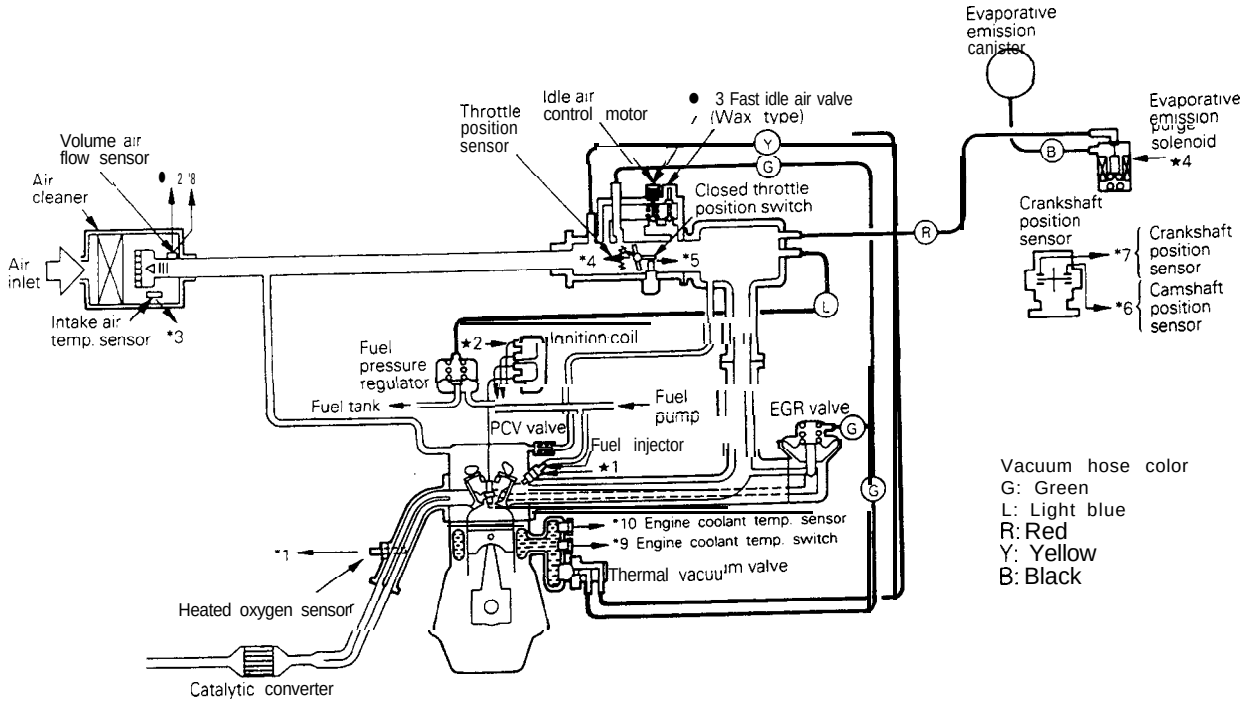
GENERAL INFORMATION

M13BA-A

MFI SYSTEM DIAGRAM

<Federal-Non-Turbo Up to 1991 models>

*1 Heated oxygen sensor *2 Volume air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Closed throttle position switch *6 Camshaft position sensor *7 Crankshaft position sensor *8 Barometric pressure sensor *9 Engine coolant temperature switch (for cooler cut-off)	'10 Engine coolant temperature sensor • Ignition switch ST • Power supply • Vehicle-speed sensor . Air conditioning switch • Power steering pressure switch	Engine control mudule	★1 Injector ★2 Ignition coil (Low-voltage power-distribution type) ★3 Idle air control motor ★4 Evaporative emission purge solenoid	• Fuel pump control (Multiport fuel injection relay) • Air conditioning compressor clutch relay • Ignition timing control • On-board diagnostic output • Check engine/malfunction indicator lamp

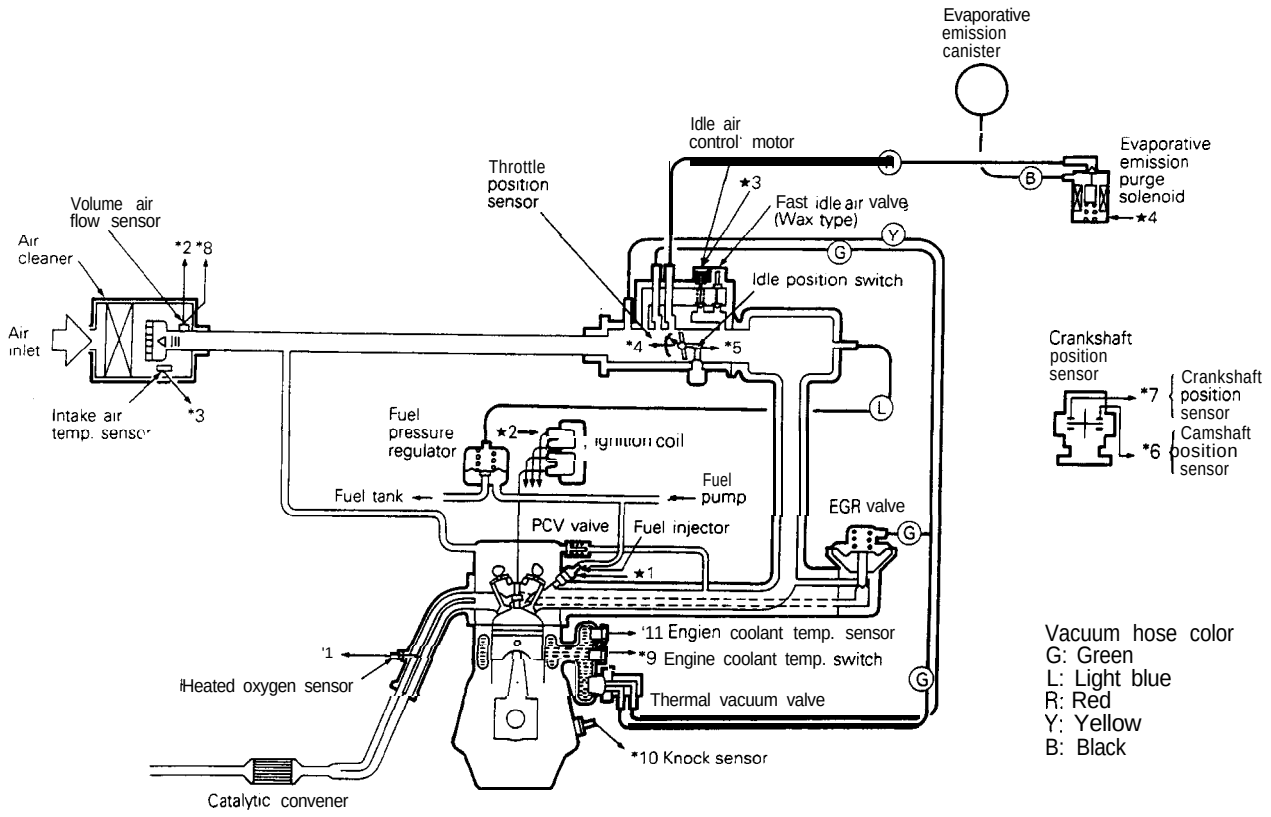


6EM0163

PCV: Positive Crankcase Ventilation

<Federal-Non-Turbo From 1992 models>

*1 Heated oxygen sensor *2 Volume air flow sensor *3 intake air temperature sensor *4 Throttle position sensor *5 Closed throttle position switch *6 Camshaft position sensor *7 Crankshaft position sensor '8 Barometric pressure sensor '9 Engine coolant temperature switch (for cooler cut-off)	*10 Knock sensor *11 Engien coolant temperature sensor • Ignition switch ST • Power supply • Vehicle-speed sensor • Air conditioning switch • Power steering pressure switch	Engine control mudule	★1 Injector ★2 Ignition coil (Low-voltage power-distribution type) ★3Idle air control motor ★4 Evaporative emission purge solenoid	• Fuel pump control (Multiport fuel injection relay) • Air conditioning compressor clutch relay • Ignition timing control • On-board diagnostic output • Check engine/malfunction indicator lamp



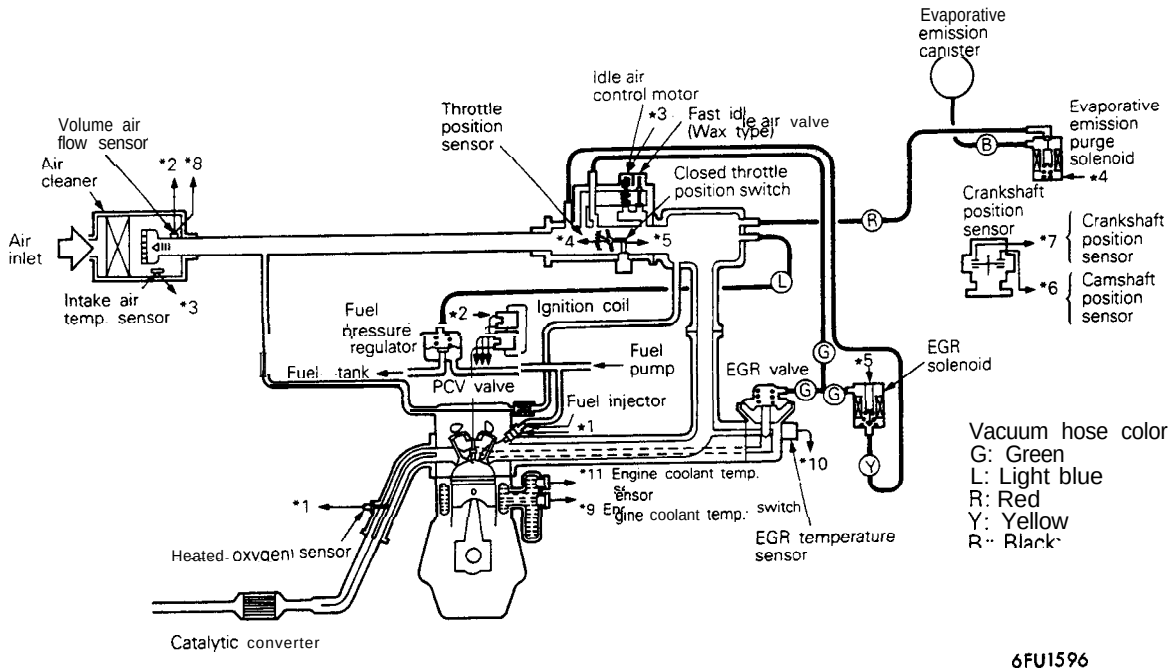
PCV: Positive Crankcase Ventilation

6EM0352

TSB Revision

<California-Non-Turbo Up To 1991 models>

*1 Heated oxygen sensor *2 Volume air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Closed throttle position switch *6 Camshaft position sensor *7 Crankshaft positron sensor '8 Barometric pressure sensor '9 Engine coolant temperature switch (for cooler cut-off)	*10EGR temperature sensor *11 Engien coolant temperature sensor . Ignition switch ST • Power supply • Vehicle-speed sensor • Air conditioning switch • Power steering pressure switch	Engine control mudule	★1 Injector ★2 Ignition coil (Low-voltage power-distribution type) ★3Idle air control motor ★4 Evaporative emission purge solenoid ★5 EGR solenoid	◗ Fuel pump control (Multiport fuel injection relay) ◗ Air conditioning compressor clutch relay ◗ Ignition timing control ◗ On-board diagnostic output ◗ Check engine/malfunction indicator lamp

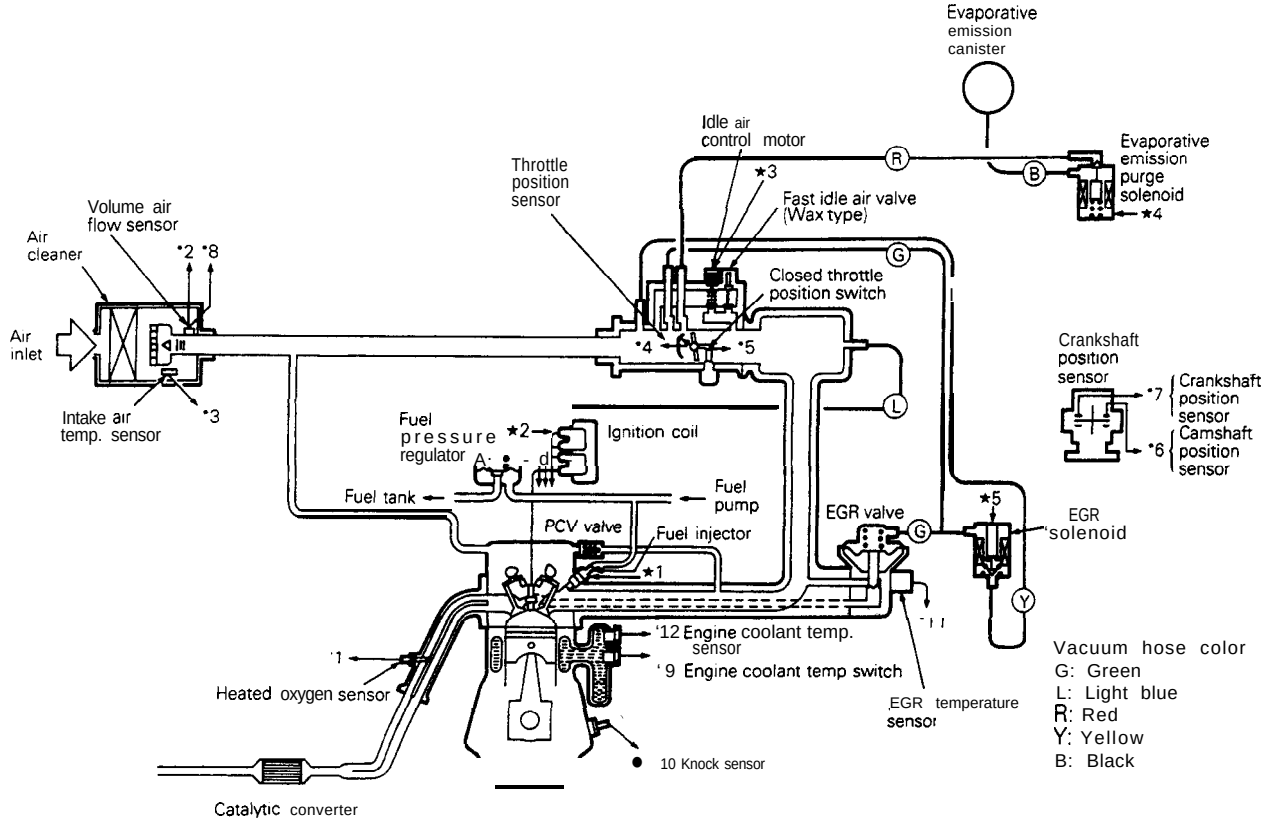


PCV: Positive Crankcase Ventilation

TSB Revision

<California-Non-Turbo From 1992 models>

*1 Heated oxygen sensor *2 Volume air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Closed throttle position switch *6 Camshaft position sensor '7 Crankshaft position sensor '8 Barometric pressure sensor *9 Engine coolant temperature switch (for cooler cut-off)	*10 Knock sensor '11 EGR temperature sensor '12 Engien coolant temperature sensor • Ignition switch ST • Power supply • Vehicle-speed sensor • Air conditioning switch • Power steering pressure switch	Engine control mudule	★1 Injector ★2 Ignition coil (Low-voltage power-distribution type) ★3 Idle air control motor • 4 Evaporative emission purge solenoid ★5 EGR solenoid	• Fuel pump control (Multiport fuel injection relay) • Air conditioning compressor clutch relay • Ignition timing control • On-board diagnostic output • Check engine/malfunction indicator lamp



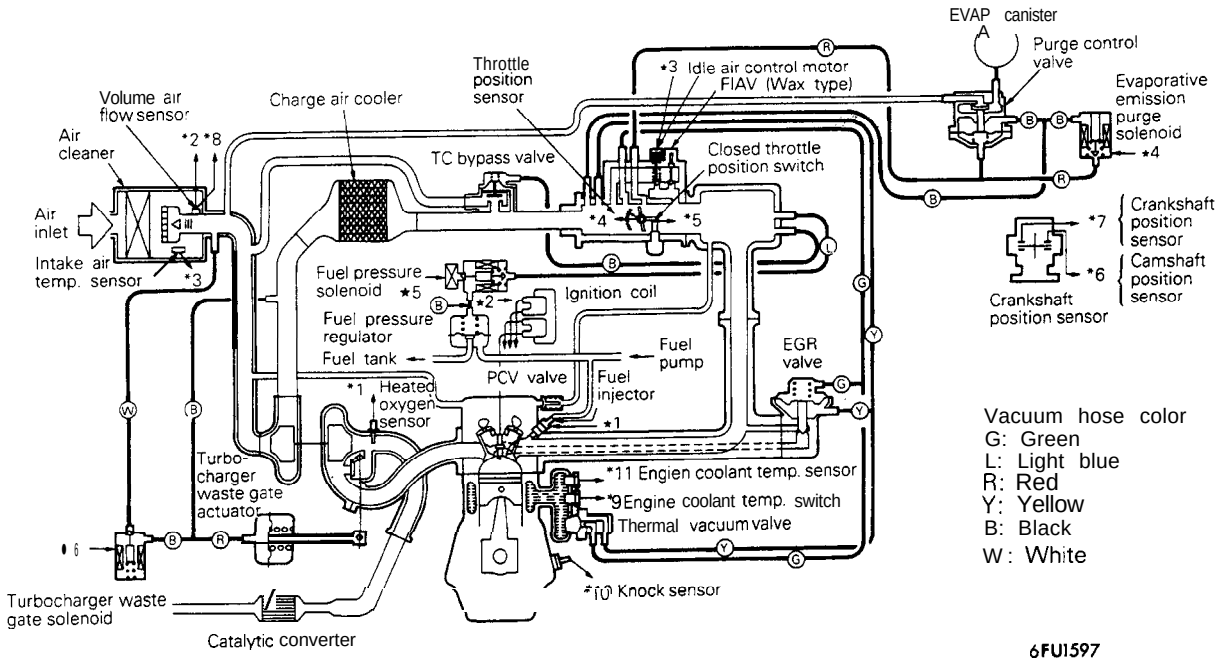
PCV: Positive Crankcase Ventilation

6EM0353

TSB Revision

<Federal-Turbo>

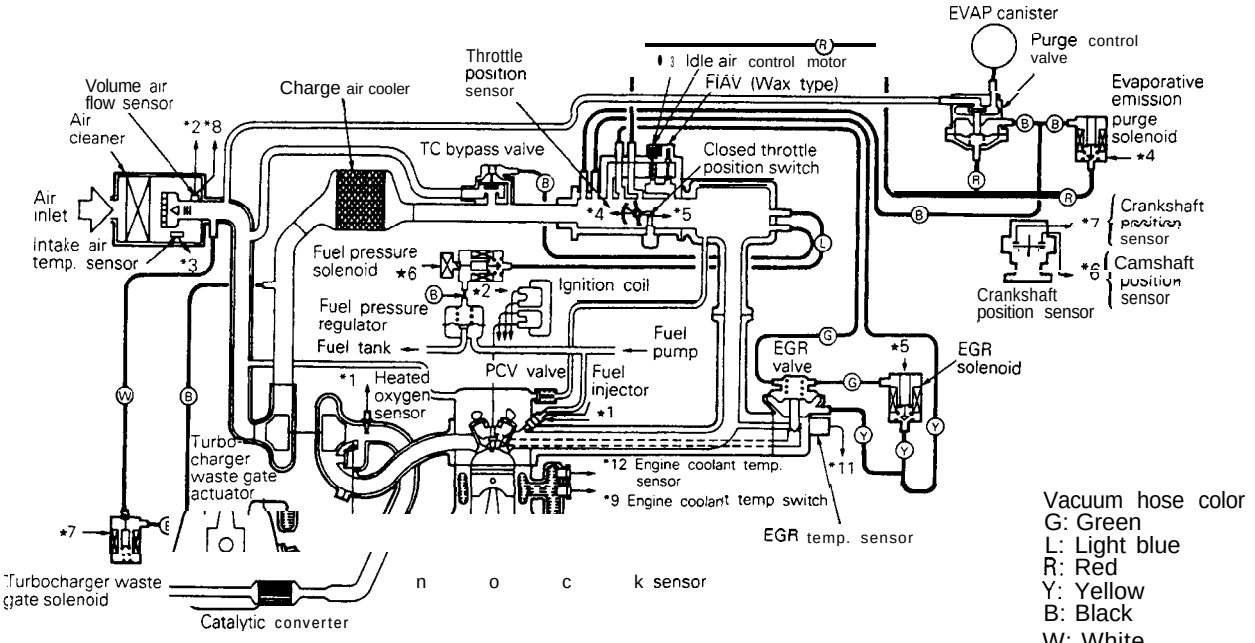
*1 Heated oxygen sensor *2 Volume air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Closed throttle position switch *6 Camshaft position sensor *7 Crankshaft position sensor *8 Barometric pressure sensor *9 Engine coolant temperature switch (for cooler cut-off)	*10 Knock sensor *11 Engien coolant temperature sensor • Ignition switch ST • Power supply • Vehicle-speed sensor . Air conditioning switch • Power steering pressure switch	Engine control mudule	★1 Injector ★2 Ignition coil (Low-voltage power-distribution type) ★3 Idle air control motor ★4 Evaporative emission purge solenoid ★5 Fuel pressure solenoid ★6 Turbocharger waste gate solenoid	. Fuel pump control (Multiport fuel injection relay) • Air conditioning compressor clutch relay . Ignition timing control • On-board diagnostic output . Check engine/malfunction indicator lamp



PCV: Positive Crankcase Ventilation
FIAV Fast Idle Air Valve

<California-Turbo>

*1 Heated oxygen sensor *2 Volume air flow sensor *3 Intake air temperature sensor '4 Throttle position sensor "5 Closed throttle position switch '6 Camshaft position sensor *7 Crankshaft positron sensor *8 Barometric pressure sensor *9 Engine coolant temperature switch (for cooler cut-off)	*10 Knock sensor '11 EGR temperature sensor '12 Engien coolant temperature sensor • Ignition switch ST • Power supply • Vehicle-speed sensor • Air conditioning switch • Power steering pressure switch	Engine control mudule	★1 Injector ★2 Ignition coil (Low-voltage power-distribution type) ★3Idle air control moto ★4 Evaporative emission purge solenoid ★5 EGR solenoid ★6 Fuel pressure solenoid ★7 Turbocharger waste gate solenoid	• Fuel pump control (Multiport fuel injection relay) • Air conditioning compressor clutch relay • Ignition timing control • On-board diagnostic output • Check engine/malfunction indicator lamp



PCV: Positive Crankcase Ventilation
FIAV: Fast Idle Air Valve

6FU1598

SPECIFICATIONS

GENERAL SPECIFICATIONS

M13CA-A

Items	Specifications
Fuel	
Tank capacity dm³ (gal.)	
<FWD>	60 (15.9)
<AWD>	62 (16.4)
Return system	Equipped
Filter	High pressure type
Fuel pump	
Type	Electrical, in-tank type
Driven by	Electric motor

TSB Revision

Items	Specifications
Throttle body	
Throttle bore mm (in.)	60 (2.362)
Throttle position sensor	Variable resistor type
Idle air control motor	Stepper motor type The stepper motor type by-pass air control system with the Fast Idle Air Valve (FIAV)
Closed throttle position switch	Contact switch type
Engine control module	
Identification model No.	
<Federal>	E2T33375: FWD*1, E2T36 17 1: FWD*2 E2T36 18 1: FWD*3, E2T37372: FWD*4 E2T37380: FWD*5 E2T36 178: AWD-Non-Turbo*2 E2T37374: AWD-Non-Turbo*4 E2T37382: AWD-Non-Turbo*5 E2T37378: AWD-Turbo*4
<California>	E2T33373: FWD*1, E2T36175: FWD*2 E2T36 180: FWD*3, E2T3737 1: FWD*4 E2T37379: FWD*5 E2T36 177: AWD-Non-Turbo*2 E2T37373: AWD-Non-Turbo*4 E2T37381: AWD-Non-Turbo*5 E2T37377: AWD-Turbo*4
Sensors	
Volume air flow sensor	Karman vortex type
Barometric pressure sensor	Semiconductor diffusion-type
Intake air temperature sensor	Thermistor type
Engine coolant temperature sensor	Thermistor type
Heated oxygen sensor	Zirconia sensor
Vehicle-speed sensor	Reed switch type
Knock sensor <Turbo, Non-Turbo From 1992 models>	Piezoelectric device type
Camshaft position sensor	Photo interrupter type
Crankshaft position sensor	Photo interrupter type
EGR temperature sensor <California>	Thermistor type
Power steering pressure switch	Contact switch type
Actuators	
Multiport fuel injection relay type	Contact switch type
Injector type and number	Electromagnetic, 4
Injector identification mark	B240H: Non-Turbo*1,*2,*3 N240H: Non-Turbo*4,*5 B450L: Turbo*4,*5
Evaporative emission purge solenoid	ON/OFF type solenoid valve
EGR solenoid <California>	Duty cycle type solenoid valve
Fuel pressure solenoid <Turbo>	ON/OFF type solenoid valve
Turbocharger waste gate solenoid <Turbo>	ON/OFF type solenoid valve
Fuel pressure regulator	
Regulated pressure kPa (psi)	
<Non-Turbo>	335 (47.6)
<Turbo>	255 (36.3)

NOTE
● 1: <1989 models>, ● 2: <1990 models>, *3:<1990.5 models>, ● 4: <1991 models>, ● 5: <From 1992 models>

TSB Revision

SERVICE SPECIFICATIONS

M13CB-A

Items		Specifications
Basic ignition timing		5° ±2°BTDC at curb idle
Curb idle speed	rpm	750 ± 100: Non-Turbo 800 ± 100: Turbo
Idling rpm when air conditioning ON	rpm	
<M/T>		850 at neutral position
<A/T>		700 at D range
Basic idle speed	rpm	750 ± 50: Non-Turbo 800 ± 50: Turbo
Throttle position sensor adjustment voltage	V	0.48–0.52 at curb idle
Throttle position sensor resistance	kΩ	3.5-6.5
Idle air control motor (stepper motor) coil resistance	a	28-33 [at 20°C (68°F)]
Intake air temperature sensor resistance	kΩ	2.7 [at 20°C (68°F)]
Engine coolant temperature sensor resistance	kΩ	
20°C (68°F)		2.5
80°C (176°F)		0.3
Fuel pressure	kPa (psi)	
Vacuum hose disconnection		
<Non-Turbo>		330–350 (47–50) at curb idle
<Turbo>		250–270 (36-38) at curb idle
Vacuum hose connection		
<Non-Turbo>		Approx. 270 (38) at curb idle
<Turbo>		Approx. 190 (27) at curb idle
Injector coil resistance	a	
<Non-Turbo>		13-16 [at 20°C (68°F)]
<Turbo>		2–3 [at 20°C (68°F)]
Fuel hose insertion distance	mm (in.)	25–30 (1.0– 1.2)

TORQUE SPECIFICATIONS

M13CC-A

Items	Nm	ft.lbs.
Heated oxygen sensor	40–50	30–36
Engine coolant temperature sensor	20–40	15-29
Throttle position sensor attaching screws	1.5–2.5	1.1-1.8
Idle air control motor attaching screws	2.5-4.5	1.8–3.3
Fuel rail mounting bolts	10–13	7-9
High-pressure fuel hose to fuel rail	4-6	3-4
Fuel pressure regulator to fuel rail	8–10	6-7
Throttle body mounting bolts and nuts	15-22	11–6
Accelerator cable adjusting bolts	4-6	3-4
Fuel tank drain plug	17-26	12-19
Electrical fuel pump	1–2	.7–1.4
Fuel tank mounting bolt	21–31	15-22
Fuel unit mounting screws	2-3	1.4–2.2
High pressure hose to electrical fuel pump	30–40	22-29
High pressure hose to fuel main pipe	30–40	22-29
Fuel main pipe to fuel filter	30–40	22-29
Eye bolt	25-35	18-25

gauge

TSB Revision

Items	Nm	ft.lbs.
Fuel filter mounting bolts	9-14	7–10
Fuel pipes clip attaching bolt	9-14	7–10

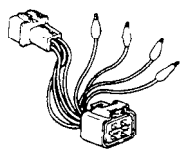
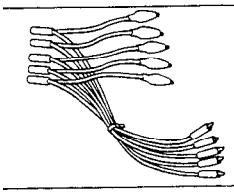
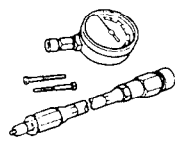
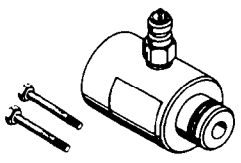
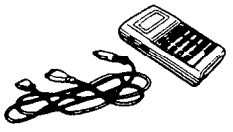
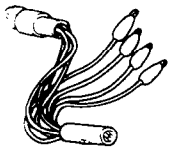
SEALANT

M13CE-A

Items	Specified sealant
Engine coolant temperature sensor threaded portion Fuel tank hole cover <AWD>	3M NUT locking No.4171 or equivalent 3M ART Part No.8626 or 3M Adhesive EC-5310 or equivalent

SPECIAL TOOLS

M13DA-A

Tool	Number	Name	Use
	MD998464-01*1 OPTIONAL: AVAILABLE FROM O.T.C.	Test harness (4 pin, square)	• Throttle position sensor inspection and adjustment • Closed throttle position switch inspection
	MD991348	Test harness set	• Throttle position sensor adjustment • Checking by using the oscilloscope
	MIT210196	Fuel pressure test assembly	• Measurement of fuel pressure
	MD998742-01	Fuel pressure test adapter [used with MIT210196]	
	MB991269*1 or MB991341*2	Scan tool (Multi-use tester <MUT>)	• Reading diagnostic trouble code • MFI system inspection
	(For the number, refer to GROUP 00– Precautions before service.)	ROM pack (for scan tool)	• Reading diagnostic trouble code • MFI system inspection
	MD998460	Test harness (4 pin, round)	• Heated oxygen sensor inspection

NOTE
*1: <1989 models>, *2: <From 1990 models>

TSB Revision

TROUBLESHOOTING

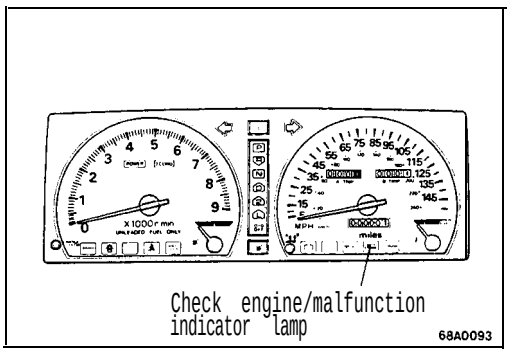
M13EBADa

EXPLANATION OF TROUBLESHOOTING PROCEDURES

Refer to P.13-8.

EXPLANATION AND PRECAUTION RELATED TO HARNESS CHECKING

Refer to P.13-9.



CHECK ENGINE/MALFUNCTION INDICATOR LAMP

Among the on-board diagnostic items, a check engine/malfunction indicator lamp comes on to notify the driver of the emission control items when an irregularity is detected.
However, when an irregular signal returns to normal and the engine control module judges that it has returned to normal, the check engine/malfunction indicator lamp goes out.
Moreover, when the ignition switch is turned off, the light goes out. Even if the ignition switch is turned on again, the light does not come on until the irregularity is detected.
Here, immediately after the ignition switch is turned on, the check engine/malfunction indicator lamp is lit for 5 seconds to indicate that the check engine/malfunction indicator lamp operates normally.

ITEMS INDICATED BY THE CHECK ENGINE/ MALFUNCTION INDICATOR LAMP

Engine control module
Heated oxygen sensor
Volume air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crankshaft position sensor
Camshaft position sensor
Barometric pressure sensor
Knock sensor <Turbo, Non-Turbo from 1992 models>
Injector
Fuel pump
EGR <California>
Ignition coil, Ignition power transistor unit

CHECK ENGINE/MALFUNCTION INDICATOR LAMP INSPECTION

(1) Check to be sure, when the ignition switch is set to the "ON" position, that the lamp illuminates for about five seconds and then switches OFF.
(2) If the lamp does not illuminate, check for damage or disconnection of the harness, or for a blown fuse or a failed light bulb.

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ON-BOARD DIAGNOSTIC

The engine control module monitors the input/output signals (some signals at all times and the others under specified conditions) of the engine control module.

When it is noticed that an irregularity has continued for a specified time or longer from when the irregular signal is initially monitored, passing a certain number, the engine control module judges that an irregularity has occurred, memorizes the diagnostic trouble code, and outputs the signal to the on-board diagnostic output terminal.

There are 16 on-board diagnostic items, including the normal state, and the diagnostic results can be read out with a voltmeter or scan tool.

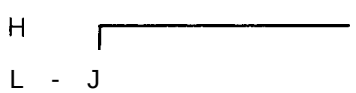
Moreover, since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the engine control module connector is disconnected. In addition, beginning with the engine control module of 1990 and later models, the diagnostic trouble code are erased by turning on the ignition switch and sending the diagnostic trouble code erase signal from the scan tool to the engine control module.

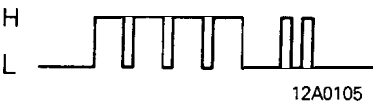
Caution

If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal from the scan tool to the engine control module or disconnect the battery terminal (–) for 10 seconds or more, and the diagnosis memory will be erased.

The 16 on-board diagnostic items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

DIAGNOSTIC CHART (FAULT TREE)

Diagnostic trouble code No.	Output signal pattern	On-board diagnostic item	Check item (Remedy)	Memory
–		Engine control module	(Replace engine control module)	–
11		Heated oxygen sensor	• Harness and connector • Heated oxygen sensor • Fuel pressure • Injectors (Replace if defective.) • Intake air leaks	Retained
12		Volume air flow sensor	• Harness and connector (If harness and connector are normal, replace volume air flow sensor assembly.)	Retained
13		Intake air temperature sensor	• Harness and connector • intake air temperature sensor	Retained

Diagnostic trouble code		On-board diagnostic item	Check item (Remedy)	Memory
No.	Output signal pattern			
14		Throttle position sensor	• Harness and connector • Throttle position sensor • Closed throttle position switch	Retained
21		Engine coolant temperature sensor	• Harness and connector • Engine coolant temperature sensor	Retained
22		Crankshaft position sensor	• Harness and connector (If harness and connector are normal, replace crankshaft position assembly.)	Retained
23		Camshaft position sensor	• Harness and connector (If harness and connector are normal, replace crankshaft position assembly.)	Retained
24		Vehicle speed sensor (reed switch)	• Harness and connector • Vehicle speed sensor (reed switch)	Retained
25		Barometric pressure sensor	• Harness and connector (If harness and connector are normal, replace barometric pressure sensor assembly.)	Retained
31		Knock sensor <Turbo, Non-Turbo from 1992 models>	• Harness and connector (If harness and connector are normal, replace knock sensor.)	Retained
41		Injector	• Harness and connector • Injector coil resistance	Retained
12		Fuel pump	• Harness and connector • Multiport fuel injection relay	Retained

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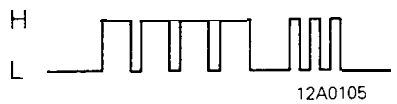
Diagnostic trouble code		On-board diagnostic item	Check item (Remedy)	Memory
No.	Output signal pattern			
43	 12A0105	EGR <California>	• Harness and connector • EGR temperature sensor • EGR valve • EGR solenoid • EGR valve control vacuum	Retained
44	12A0105	Ignition coil, Ignition power transistor unit	• Harness and connector • Ignition coil • Ignition power transistor	Retained
–	12A0104	Normal state	–	–

NOTE
Replace the engine control module if a diagnostic trouble code is output although the inspection reveals that there is no problem with the check items.

TROUBLESHOOTING TABLE

NOTE
*: The failsafe/back-up function is in operation.

Diagnostic trouble code No.	On-board diagnostic item	Diagnostic content	Major cause	Remarks (trouble phenomenon, etc.)
–	Engine control module	The engine control module itself is abnormal.	–	• Engine stop • Impossible start
11	Heated oxygen sensor	Though the air/fuel mixture ratio closed loop control is operated, the signal voltage of the heated oxygen sensor does not vary (to be lean/rich).	(1) The heated oxygen sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the heated oxygen sensor circuit.	• Deterioration of exhaust gas purifying performance*
			(3) The fuel pressure is improper. (4) The injector is troubled. (5) Air is sucked through the gasket clearance, etc. (6) The engine control module is troubled.	• Deterioration of exhaust gas purifying performance* • Abnormal start • Unstable idling • Abnormal acceleration
12	Volume air flow sensor	Though the engine is running, the signal frequency of the volume air flow sensor is 10Hz or less.	(1) Volume air flow sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the volume air flow sensor circuit. (3) The engine control module is troubled.	• Abnormal acceleration* • Improper idling revolution speed* • Unstable idling*

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agnostic trouble ode No.	On-board diagnostic item	Diagnostic content	Major cause	Remarks (trouble phenomenon, etc.)
13	Intake air temperatu-re sensor	(1) The signal voltage of the intake air temperature sensor is 4.5V or higher. (2) The signal voltage of the intake air temperature sensor is 0.27V or lower.	(1) The intake air temperature sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the air intake temperature sensor circuit. (3) The engine control module is troubled.	• Slightly improper driveability* • At high temperatures, (a) Improper start* (b) Unstable idling*
14	Throttle position sensor	(1) The signal voltage of the throttle position sensor is 0.2V or lower. (2) Though the closed throttle position switch is on, the signal voltage of the throttle position sensor is 2V or higher.	(1) The throttle position sensor is troubled or improperly adjusted. (2) Open-circuit, short-circuit or improper connector contact occurs in the throttle position sensor circuit.	• Slightly improper acceleration < M / T > • Improper driveability <A/T> • Engine stop
			(3) The closed throttle position switch ON is troubled. (4) The closed throttle position switch signal line is short-circuited. (5) The engine control module is troubled.	• Engine stop • Racing is impossible
21	Engine coolant temperatu-re sensor	(1) The signal voltage of the engine coolant temperature sensor is 4.6V or higher. (2) The signal voltage of the engine coolant temperature sensor is 0.1 1 V or lower. '(3) During engine warming-up, the engine coolant temperature sensor signal indicates that the engine coolant temperature drops.	(1) The engine coolant temperature sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the engine coolant temperature sensor circuit. (3) The engine control module is troubled.	During cold weather, • Starting is impossible.* • Unstable idling* • Improper acceleration*
22	Crankshaft position sensor	Though the engine is cranking 4 seconds or more, the signal voltage of the crankshaft position sensor does not vary (to be high/low).	(1) The crankshaft position sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the crankshaft position sensor circuit. (3) The engine control module is troubled.	• Engine stop • Starting is impossible.
23	Camshaft position sensor	Though the engine is running, the signal voltage of the camshaft position sensor does not vary (to be high/low).	(1) The camshaft position sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the camshaft position sensor circuit. (3) The engine control module is troubled.	• Engine stop*
24	Vehicle speed sensor (reed switch)	During acceleration of engine revolution speed of 3,000 rpm or more, the signal voltage of the vehicle speed sensor does not vary (to be high/low).	(1) The vehicle speed sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the vehicle speed sensor circuit. (3) The engine control module is troubled.	The engine sometimes cuts off when stopping after deceleration.

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Diagnostic trouble code No.	On-board diagnostic item	Diagnostic content	Major cause	Remarks (trouble phenomenon, etc
25	Barometric pressure sensor	(1) The signal voltage of the barometric pressure sensor is 4.5V or higher. (2) The signal voltage of the barometric pressure sensor is 0.2V or lower.	(1) The barometric pressure sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the barometric pressure sensor circuit. (3) The engine control module is troubled.	• Unstable idling* • Improper acceleration* • Improper start*
31	Knock sensor	Open-circuit in the knock sensor circuit.	(1) The knock sensor is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the knock sensor circuit. (3) The engine control module is troubled.	• Improper acceleration*
41	Injector	Injector is not continuously driven for 4 seconds during engine cranking or idle operation.	(1) The injector is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the injector sensor circuit. (3) The engine control module is troubled.	• Unstable idling • Improper acceleration • Improper start
42	Fuel pump	The engine runs but power to drive the motor is not supplied to the fuel pump.	(1) Open-circuit, short-circuit or improper connector contact occurs in the fuel pump power supply circuit. (2) The multiport fuel injection relay is troubled. (3) The engine control module is troubled.	• Impossible start • Engine stop
43	EGR <California>	During engine running after warming-up, (1) The EGR amount is small. (The signal voltage of the EGR temperature sensor is excessively high.) (2) The signal voltage of the EGR temperature sensor is 0.1 V or less.	(1) The EGR valve is not opened. (2) The negative pressure of the EGR valve control is excessively low. (3) The EGR solenoid is troubled. (4) The EGR temperature sensor is troubled. (5) Open-circuit, short-circuit or improper connector contact occurs in the EGR temperature sensor circuit. (6) The engine control module troubled.	• Deterioration of exhaust gas purifying performance
44	Ignition coil/ignition power transistor unit	During engine running, the ignition signal is not input. However, cases in which ignition signals are input to all cylinders are excluded.	(1) The ignition coil is troubled. (2) Open-circuit, short-circuit or improper connector contact occurs in the igntion primary circuit. (3) The ignition power transistor unit is troubled. (4) The engine control module is troubled.	• Unstable idling* • Improper acceleration* • Improper start*

FAILSAFE/BACK-UP FUNCTIONS LIST

If trouble with any major sensor is detected by the on-board diagnostic, the vehicle will be kept in the safe driving conditions according to the preset control logic.

Trouble item	Control content for trouble
Volume air flow sensor	(1) Fuel injection timing and ignition timing are determined according to the throttle positior sensor (TPS) and engine revolution speed signal (crankshaft position sensor signal). (2) The idle air control motor is fixed at the specified position, and the idle revolution speec control is not executed.
Intake air temperature sensor	The control is executed with the suction air temperature regarded as 25°C (77°F).
Throttle positron sensor (TPS)	The fuel injection rate is not increased for acceleration according to the throttle position sensor signal.
Engine coolant temperature sensor	The control is executed with the engine coolant temperature regarded as 80°C (176°F). (Even if the sensor signal becomes normal again, the control is continued until the ignition switch is turned off.)
Camshaft position sensor	(1) Simultaneous injection of fuel is executed for all cylinders. (In this case, the No. 1 cylinder top dead center is not detected at all after the ignition key is turned on.) (2) Fuel is cut 4 seconds after trouble is detected. (In this case, the No. 1 cylinder top dead center is not detected at all after the ignition key is turned on.)
Barometric pressure sensor	The control is executed with the pressure regarded as 760 mmHg (30 in.Hg.).
Knocksensor	The ignition timing is retarded further from the normal state, and ignition is executed even when knocking does not occur.
Ignition coil, ignition power transistor unit	Fuel is cut in the cylinder where the ignition signal is abnormal.
Heated oxygen sensor	Closed loop control of the air/fuel mixture ratio is not executed.

READ OUT OF DIAGNOSTIC TROUBLE CODE

Refer to P.13-16.

CLEAR MEMORY OF DIAGNOSTIC TROUBLE CODE

Refer to P.13-17.

CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS

Check items \ Problem symptoms	Starting		Idling stability			Driving						Reference page
	Will not start	Starting problem	Idling instability (Rough idling)	Incorrect idling speed	Improper idling continuity	Hesitation sag	Poo accelera on	Stumble	Shock	Surge	Knocking	
Power supply and ignition switch-IG	① 1											255
Engine control module power ground	② 2											45
Fuel pump	③ 3	① 1			① 1	① 1	① 1					258
Volume air flow sensor		⑨ 10			⑩ 9	⑨ 9		④ 4	③ 3		③ ❑	261
Intake air temperature sensor			①			⑤ 5	④ 4				① ❑	263
Barometric pressure sensor			③			⑧ 8	⑥ 6				② ❑	266
Engine coolant temperature sensor		4	② 1	① 1	④ 4	⑦ 7	⑤ 5	② 2		④ 4		268
Throttle position sensor						⑥ 6		① 1				270,27
Closed throttle position switch		④ 5	④ 2	② 2	③ 3					⑤ 5		274,27
Camshaft position sensor	⑤ 5	⑦ 8			⑧ 7				① 1			277,27
Crankshaft position sensor	⑥ 6	⑧ 9			⑨ 8				② 2			280,28
Ignition switch-ST <M/T>	④ 4	③ 3										77
Ignition switch-ST and park/neutral position switch <A/T>	④ 4	③ 3		⑥								78
Vehicle speed sensor					⑦				⑤			80
Power steering oil pressure switch				③								81
Air conditioning switch and A/C compressor clutch relay				④								285
Knock sensor <Turbo, Non-Turbo From 1992 models>											⑤ ❑	287
Heated oxygen sensor			⑥									290,29
Injectors	⑧ 8	⑥ 7	⑦ 3		⑥ 6	⑩ 10	⑦ 7	⑤ 5		⑥ 6		295
Idle air control motor (stepper motor)		⑤ 6	⑧ 4	⑤ 3	⑤ 5				⑥			298
Ignition coil and ignition power transistor	⑦ 7						⑧ 8		④ 4		④ 4	302,30
Evaporative emission purge solenoid			⑤									99
EGR solenoid						④ 4		③ 3		③ 3		101
Fuel pressure solenoid <Turbo>			⑨			③ 3				② 2		307
Turbocharger waste gate control solenoid <Turbo>							③ 3					309
Fuel pressure		② 2	⑩ 5		② 2	② 2	② 2			① 1		312

○: Warm engine (Figures inside the ○ indicate the checking sequence.)
□: Cold engine (Figures inside the ❑ indicate the checking sequence.)

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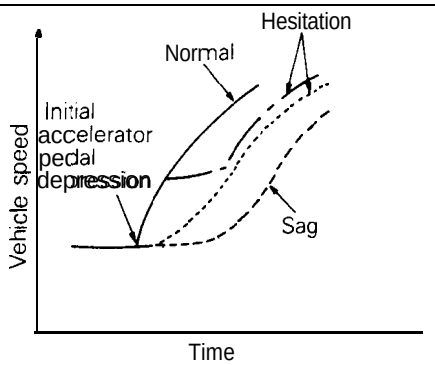
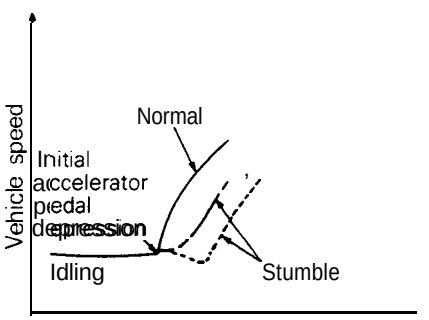
PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

Item		Symptom
Starting	Won't start (no initial combustion)	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Starting problem (initial combustion, then stall)	There is combustion within the cylinders, but then the engine soon stalls.
	(Starting takes a long time.)	Engine won't start quickly.
Idling stability	Idling instability (Rough idling)	Engine speed doesn't remain constant; changes during idling. Usually, a judgment 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 vehicle is moving or not. (2) Pass out ..... The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle speed (engine rpm) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine rpm) during such acceleration. Serious hesitation is called "sag".  IFU0223
	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 rpm response is delayed when the accelerator pedal is initially depressed for acceleration from the stopped condition.  IFU0224
	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.

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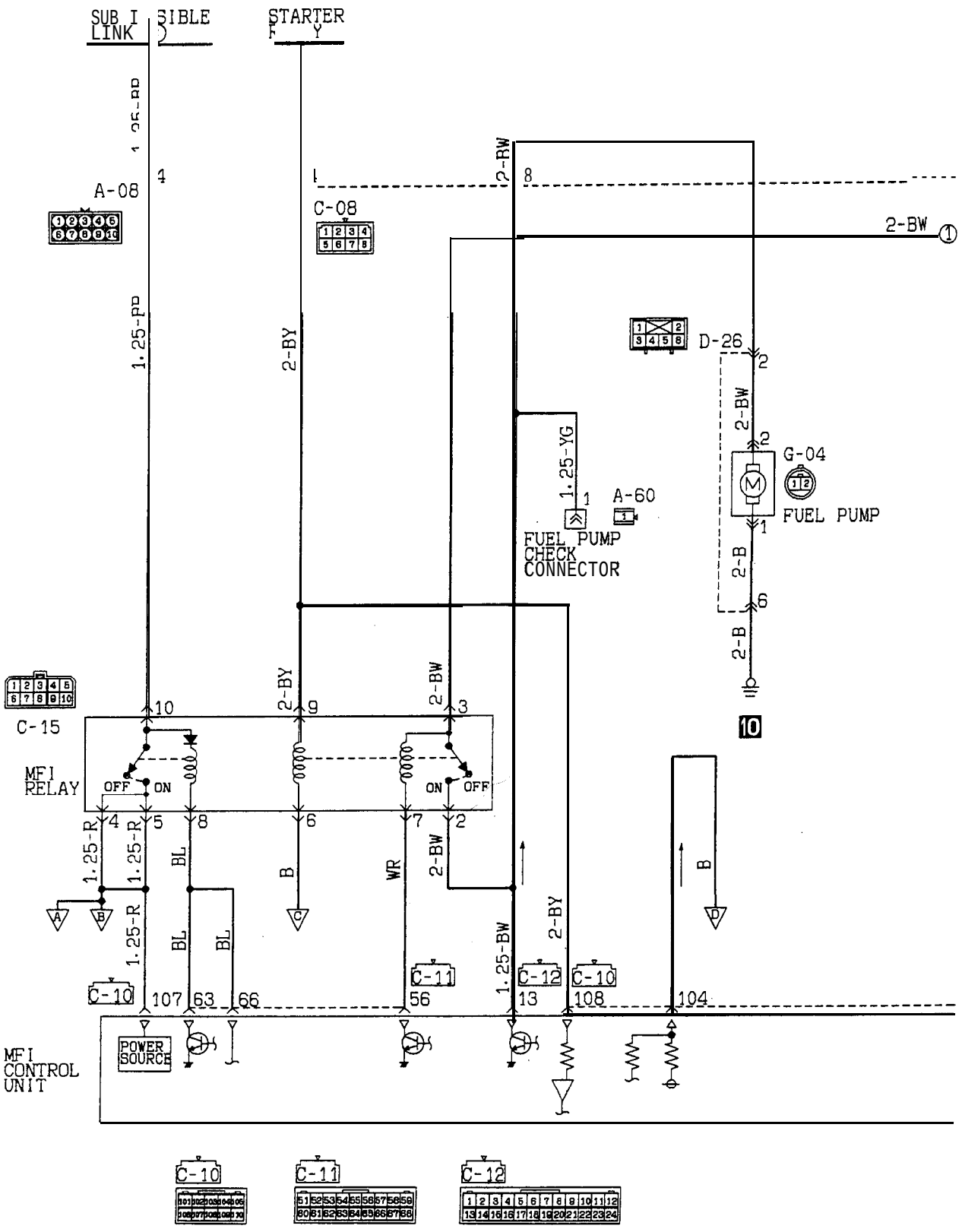
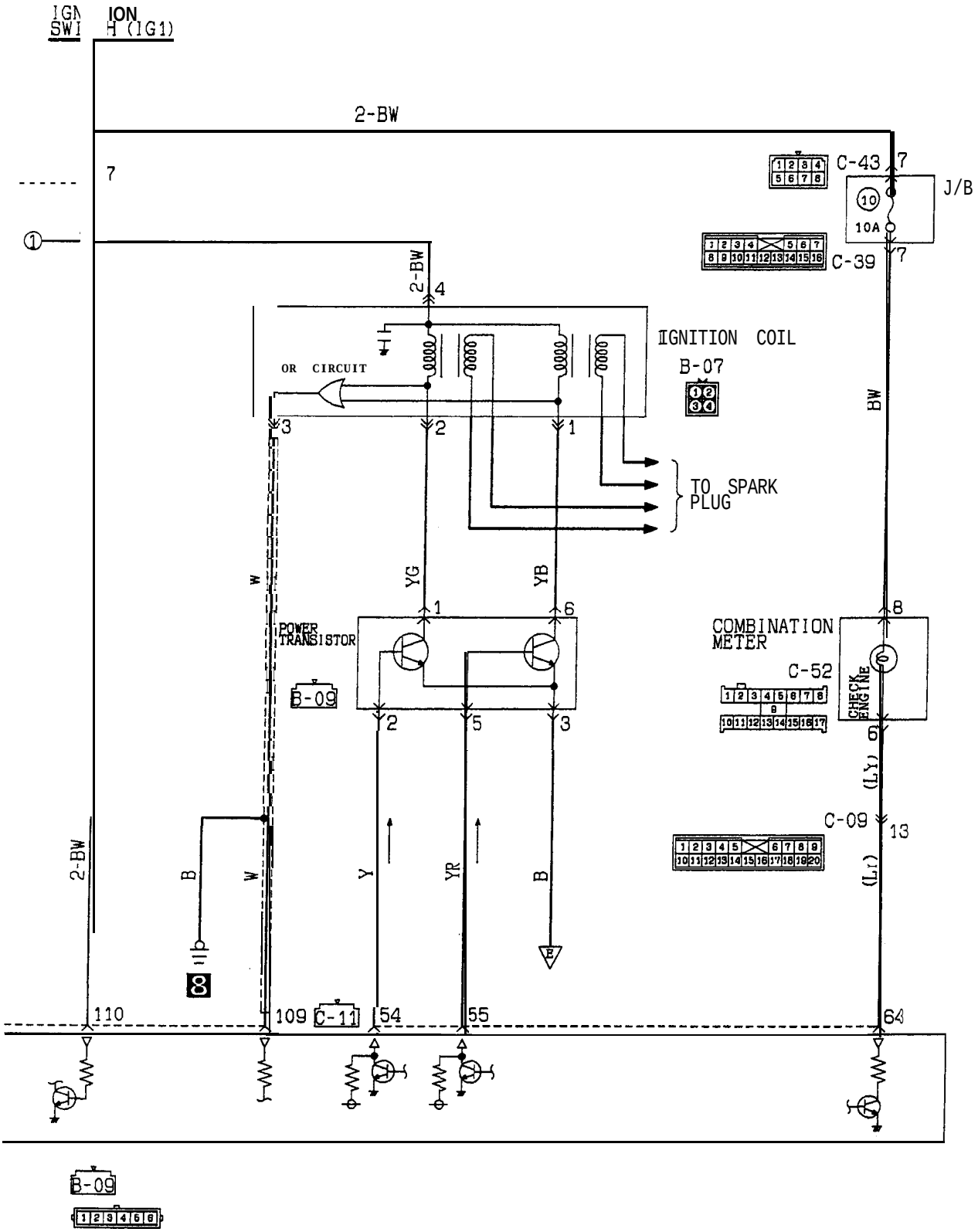
CIRCUIT DIAGRAM

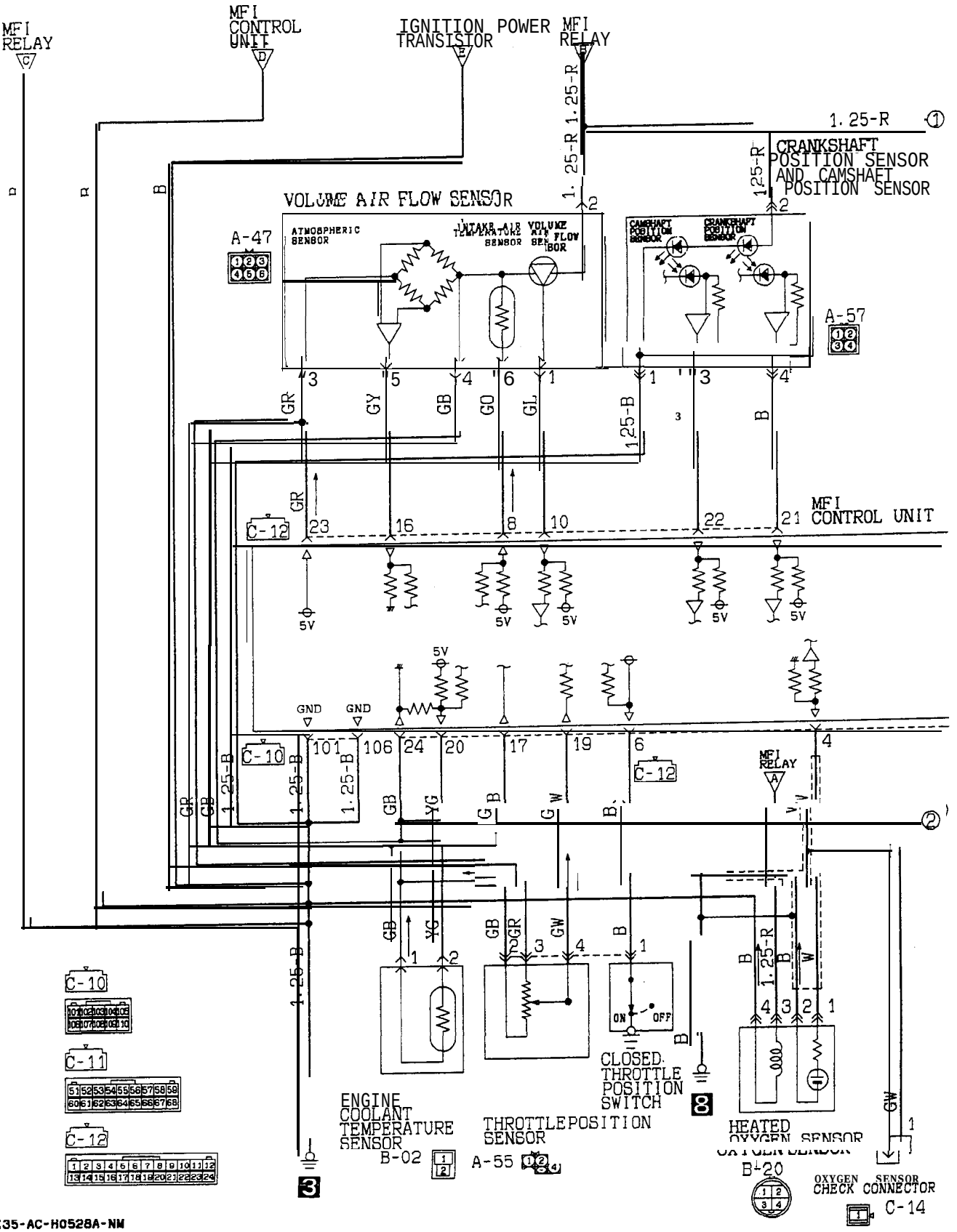
< 1989 models>

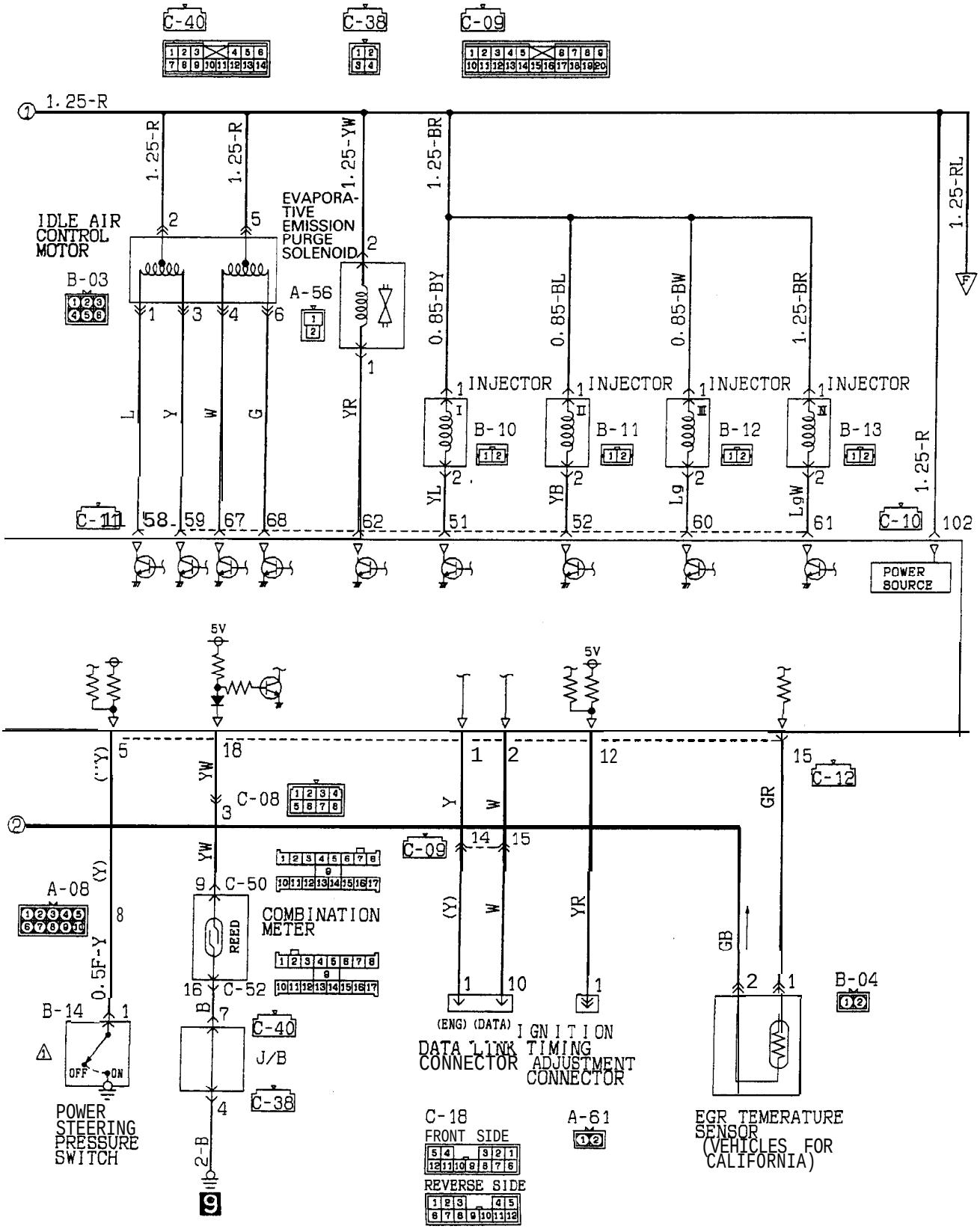



IGNITION SWITCH (IG1)
2-BW
7
C-43
J/B
10A
C-39
2-BW
4
IGNITION COIL
B-07
OR CIRCUIT
3
2
1
TO SPARK PLUG
BW
W
YG
YB
POWER TRANSISTOR
B-09
1
6
2
5
3
COMBINATION METER
C-52
CHECK ENGINE
8
6
(LY)
C-09
13
(Lr)
2-BW
B
W
Y
YR
B
11
8
110
109
C-11
54
55
64
B-09

CIRCUIT DIAGRAM (CONTINUED)

< 1989 models>





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CIRCUIT DIAGRAM (CONTINUED)

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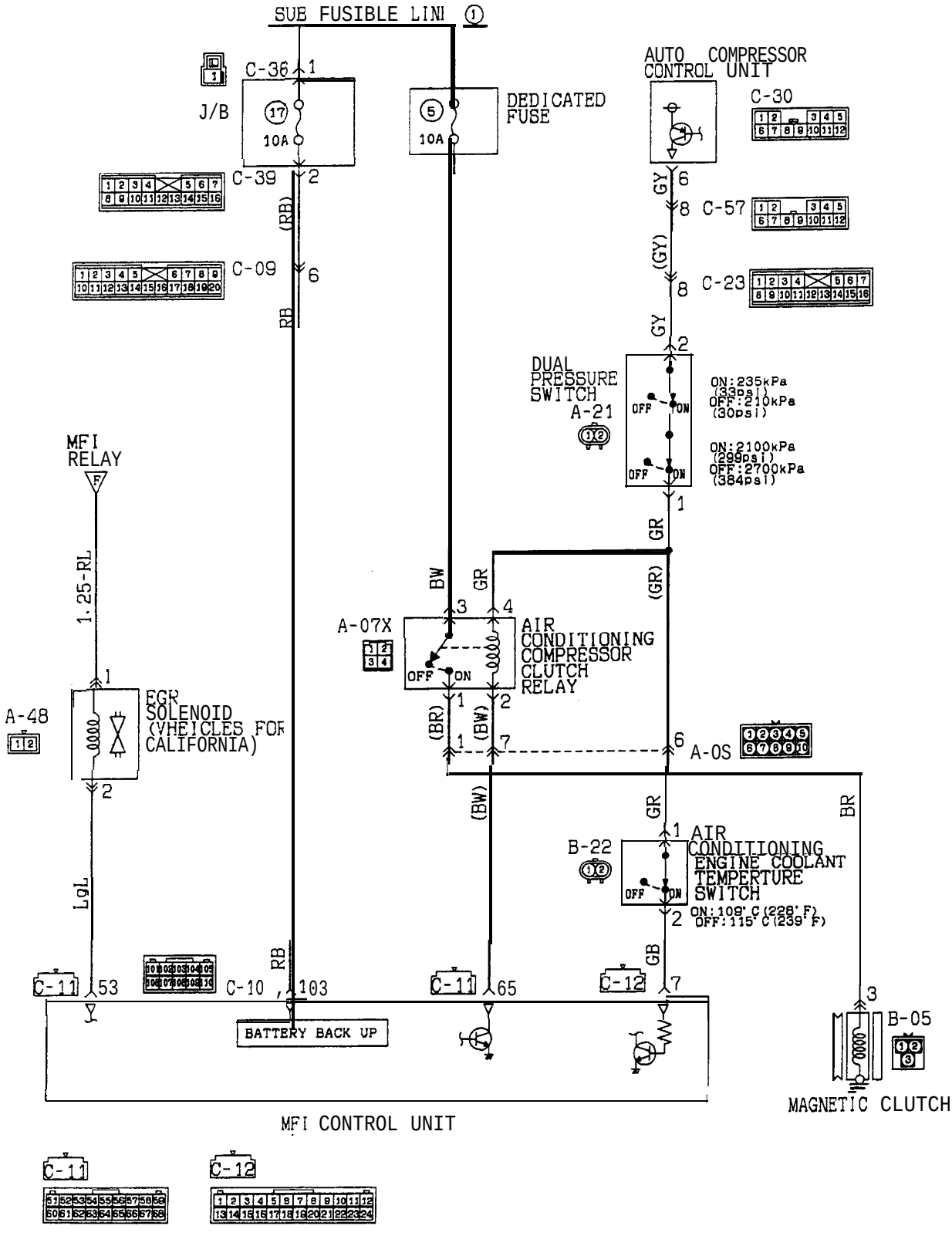
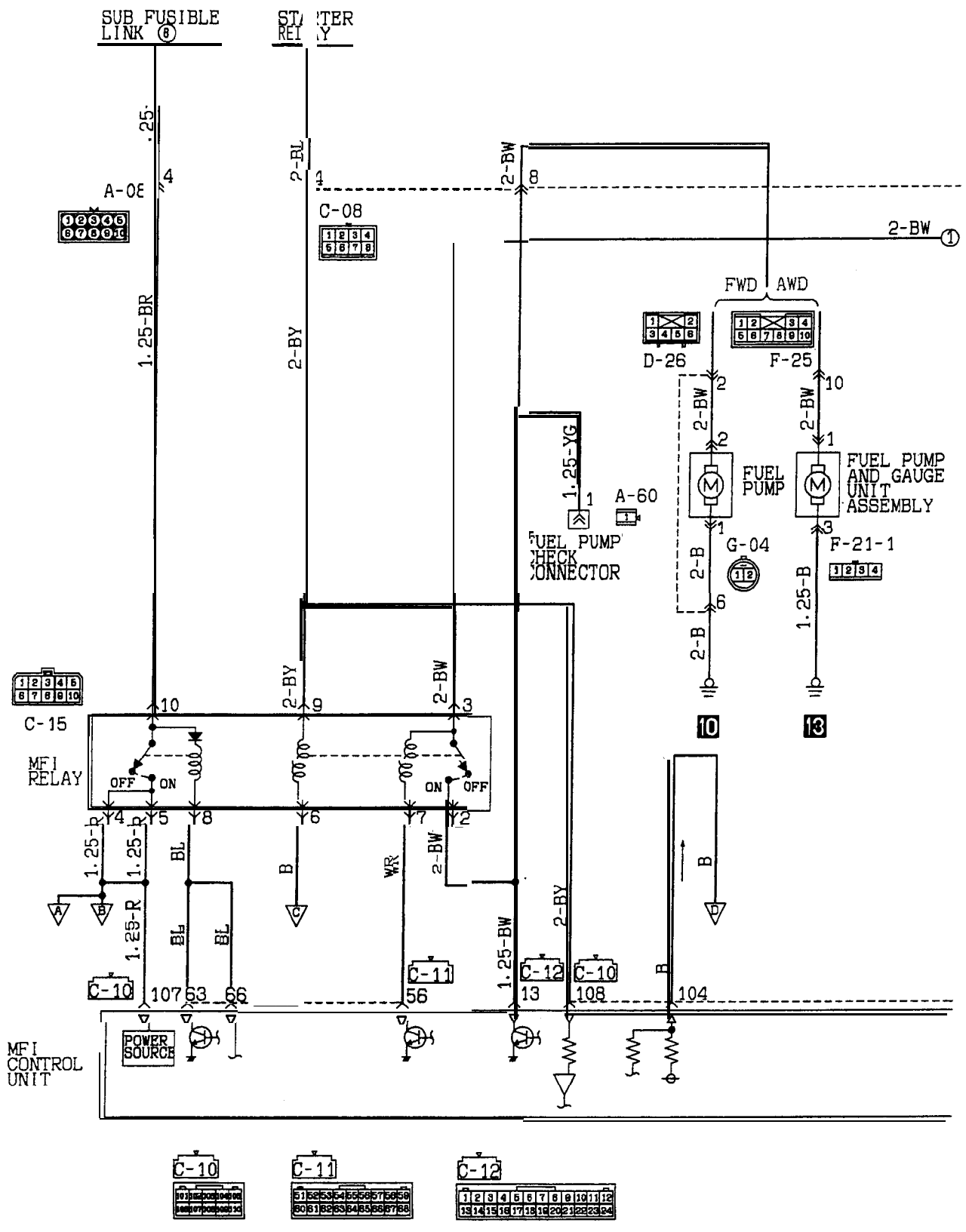


KX35-AC-H0528B-NN

CIRCUIT DIAGRAM

< 1990 models>

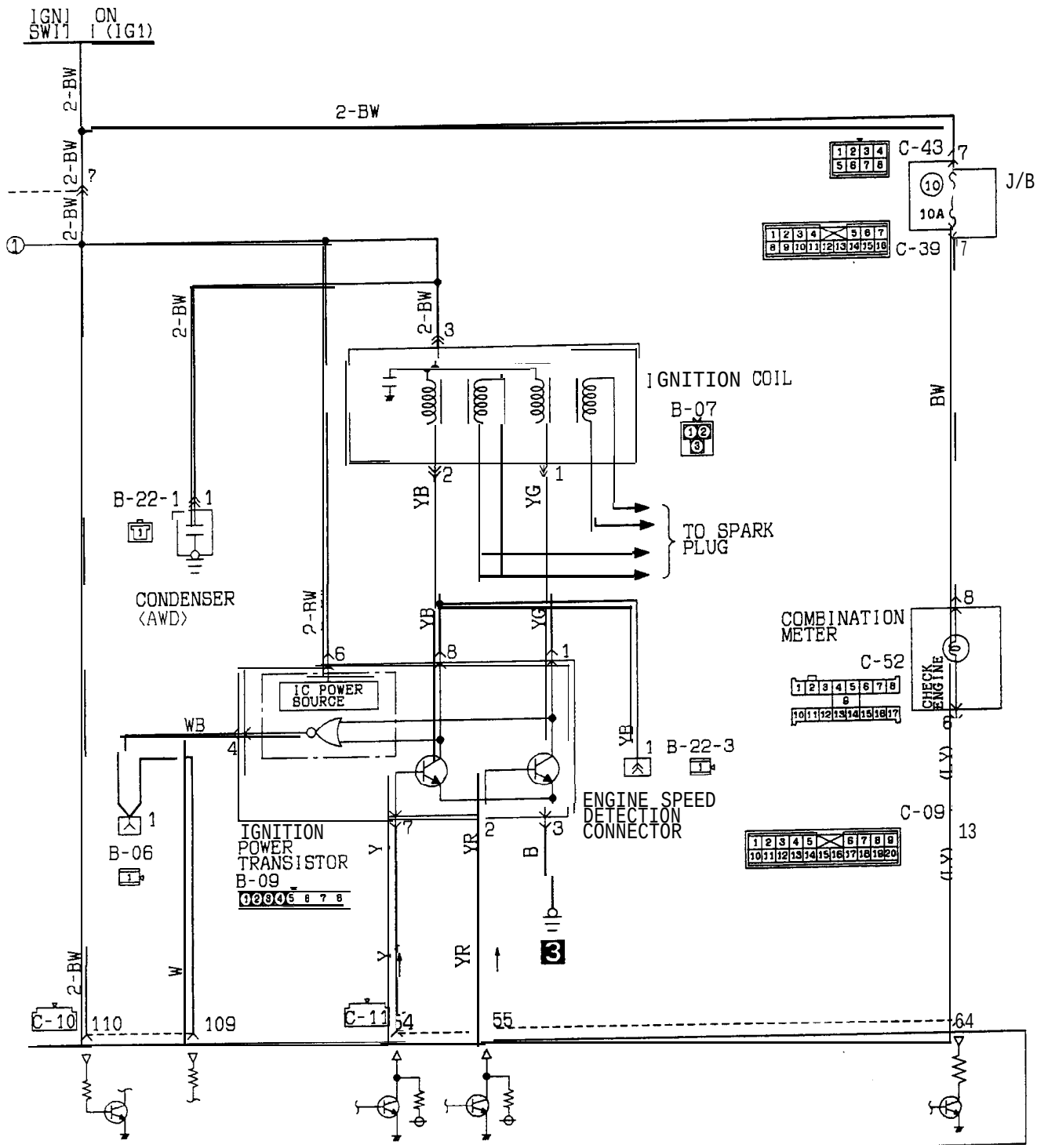


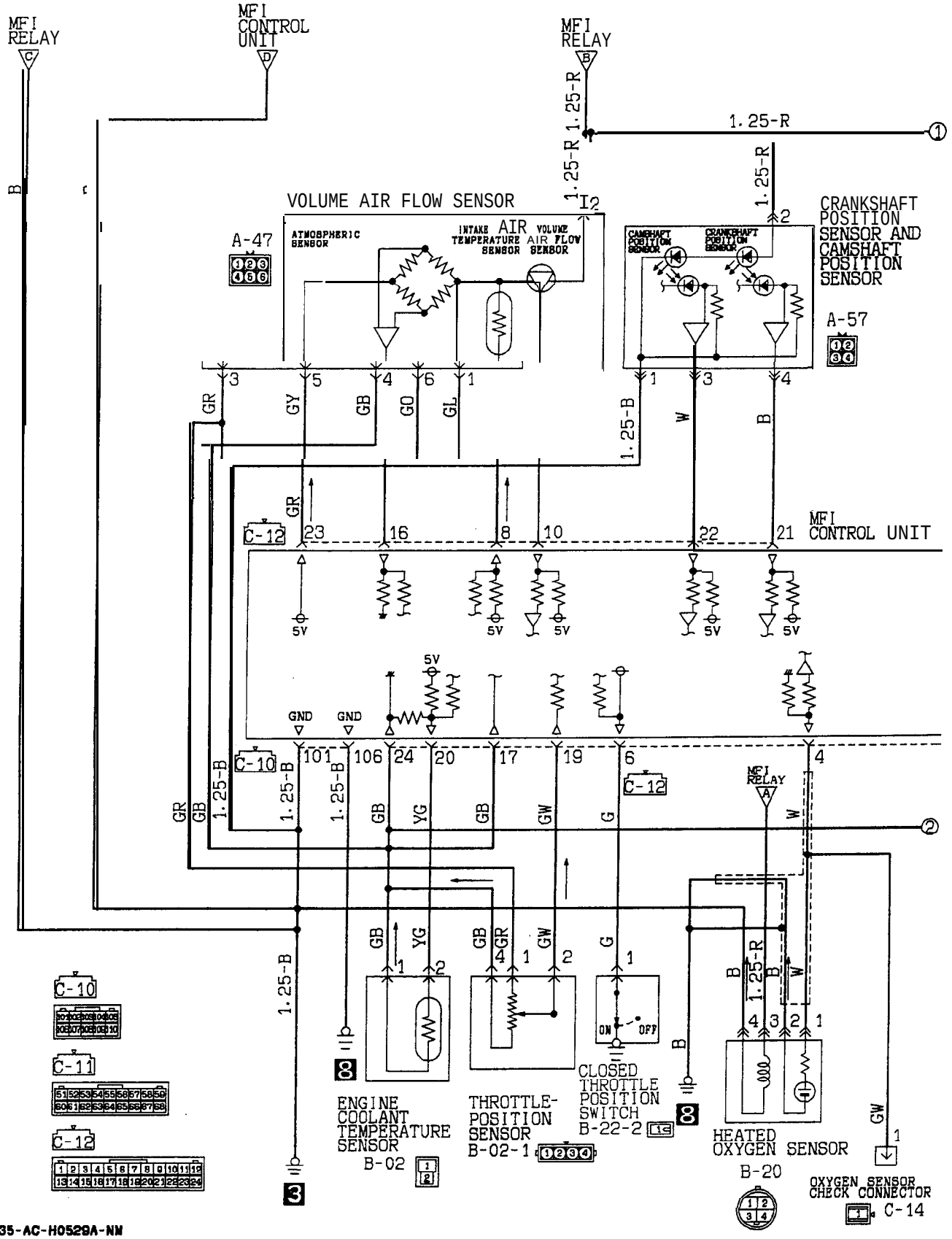
KX35-AC-H0529-NM

TSB Revision

CIRCUIT DIAGRAM (CONTINUED)

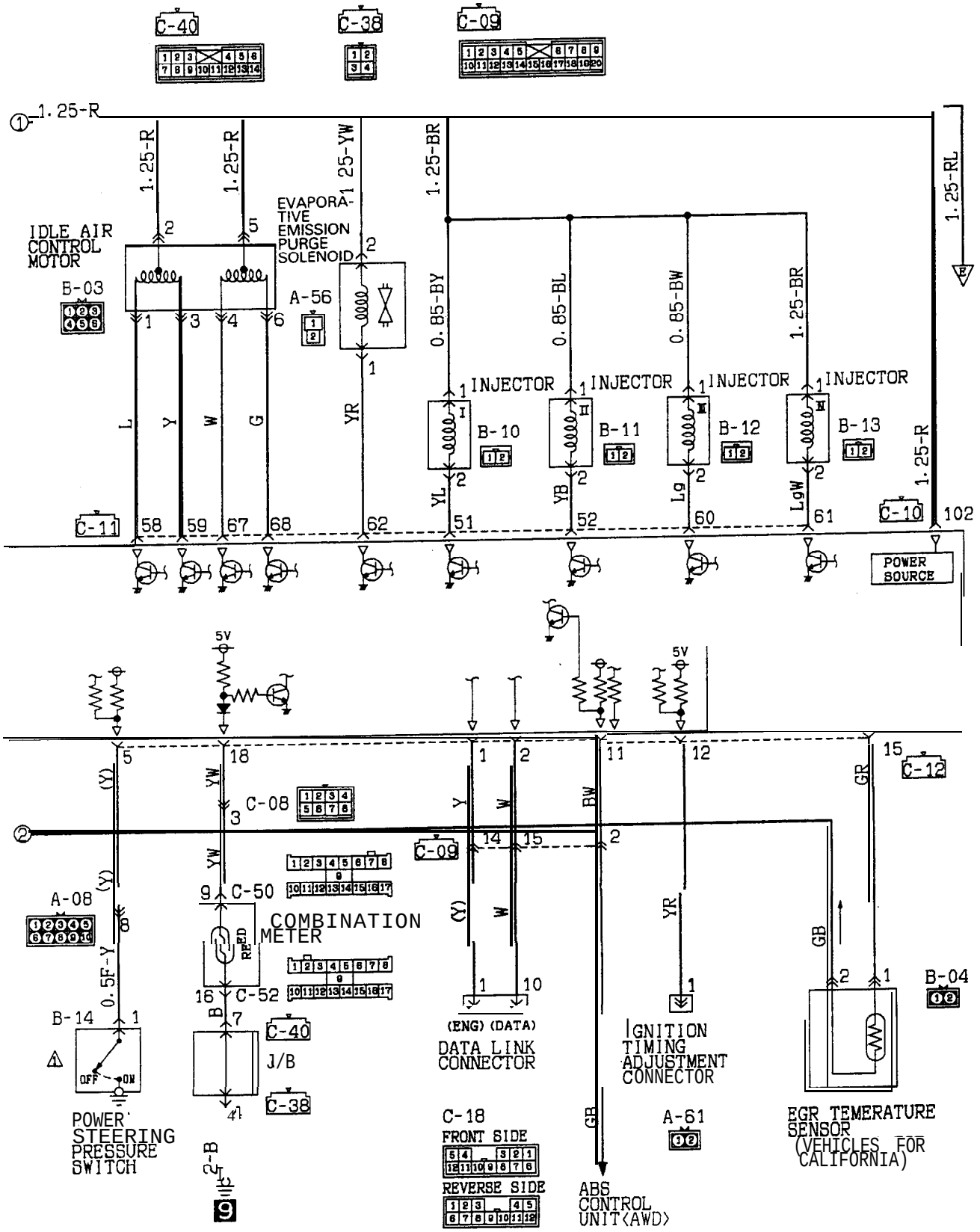
< 1990 models>

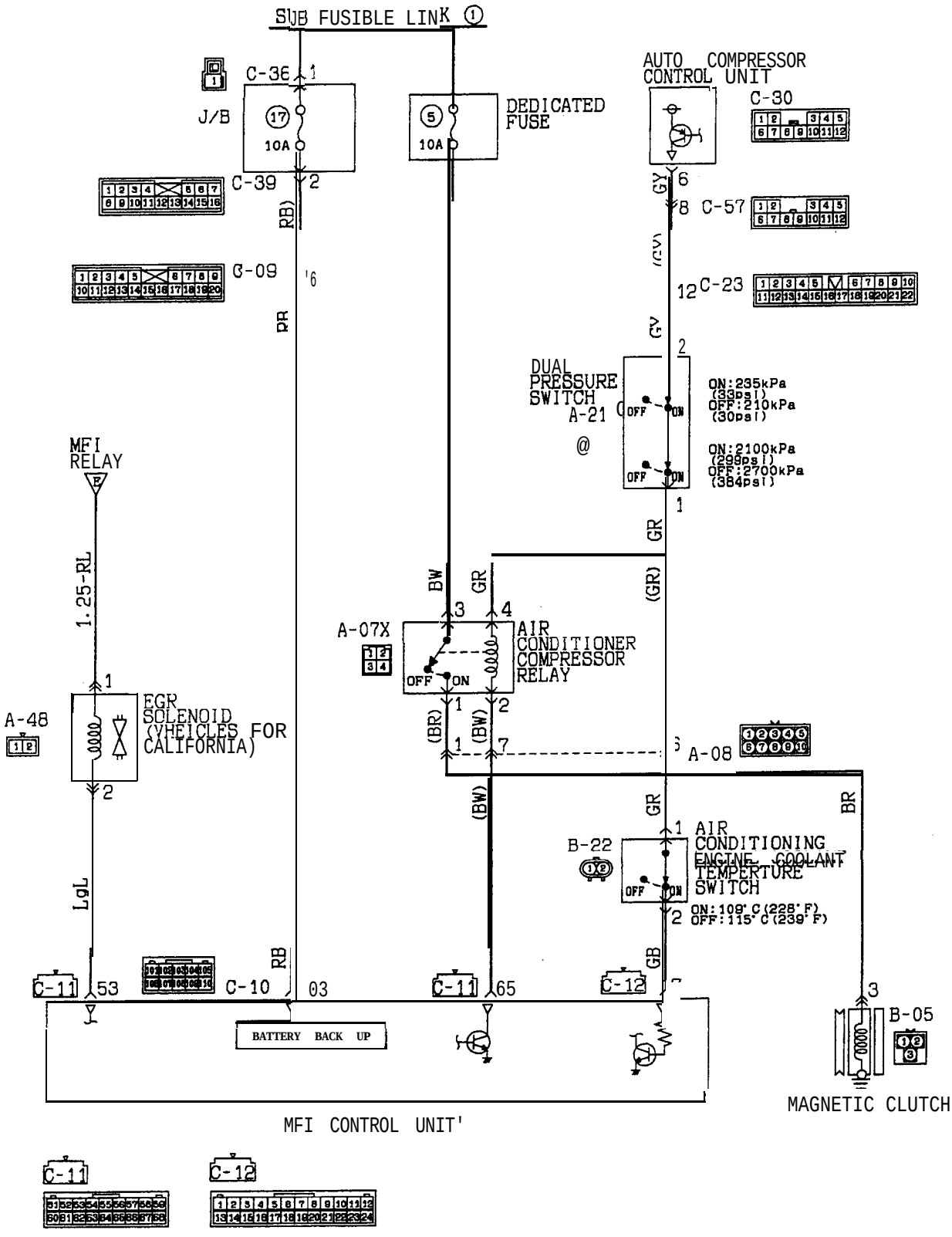



MFI RELAY
MFI CONTROL UNIT
MFI RELAY
1.25-R
VOLUME AIR FLOW SENSOR
A-47
ATMOSPHERIC SENSOR
INTAKE AIR TEMPERATURE SENSOR
VOLUME AIR FLOW SENSOR
CRANKSHAFT POSITION SENSOR AND CAMSHAFT POSITION SENSOR
A-57
GR
GY
GB
GO
GL
1.25-B
W
B
C-12
MFI CONTROL UNIT
5V
GND
C-10
C-11
C-12
ENGINE COOLANT TEMPERATURE SENSOR B-02
THROTTLE-POSITION SENSOR B-02-1
CLOSED THROTTLE POSITION SWITCH B-22-2
HEATED OXYGEN SENSOR B-20
OXYGEN SENSOR CHECK CONNECTOR C-14
KX35-AC-H0529A-NM

CIRCUIT DIAGRAM (CONTINUED)

< 1990 models>

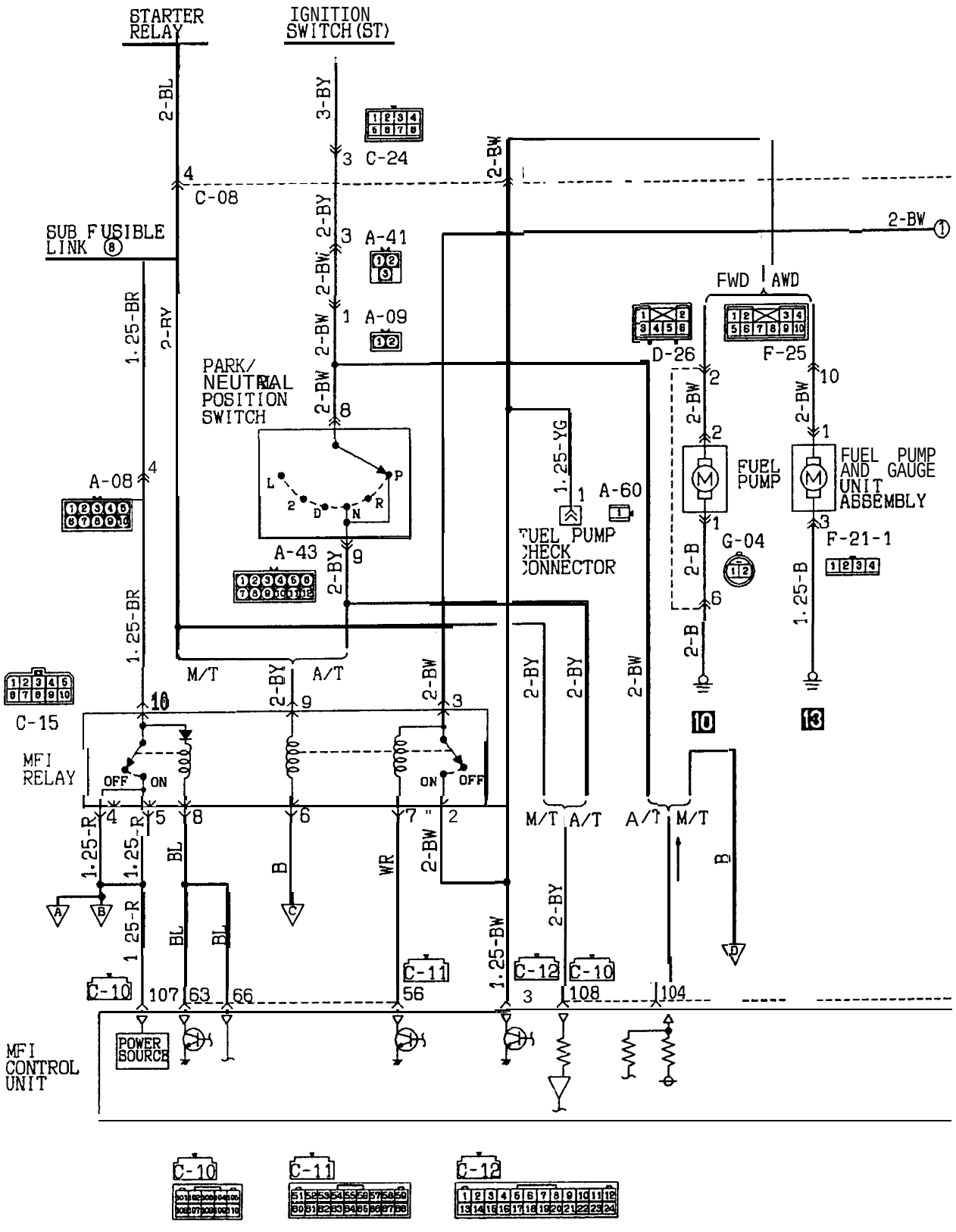




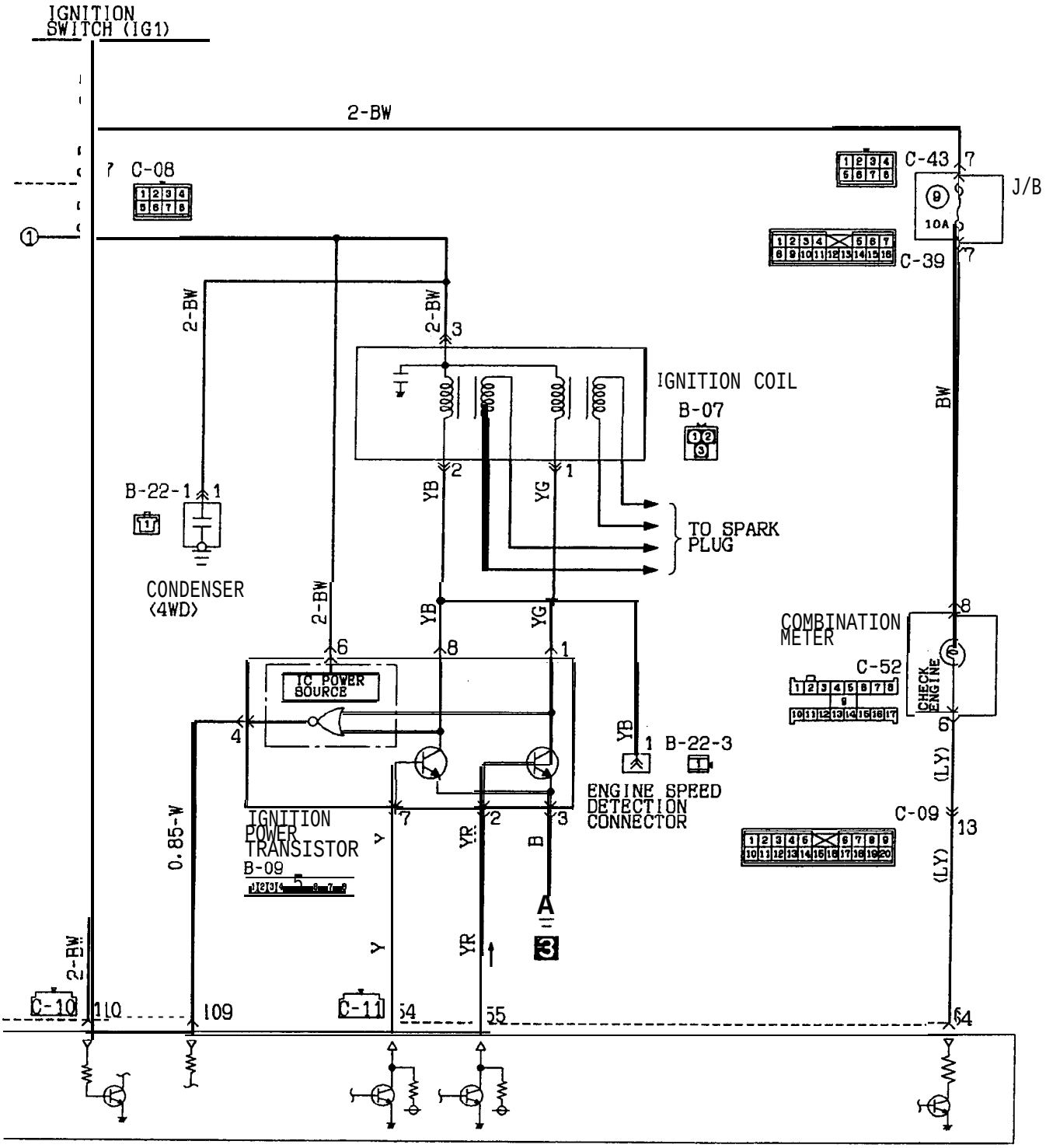
KX35-AC-H0529B-NM

CIRCUIT DIAGRAM

<1991 models (Non-turbo)>

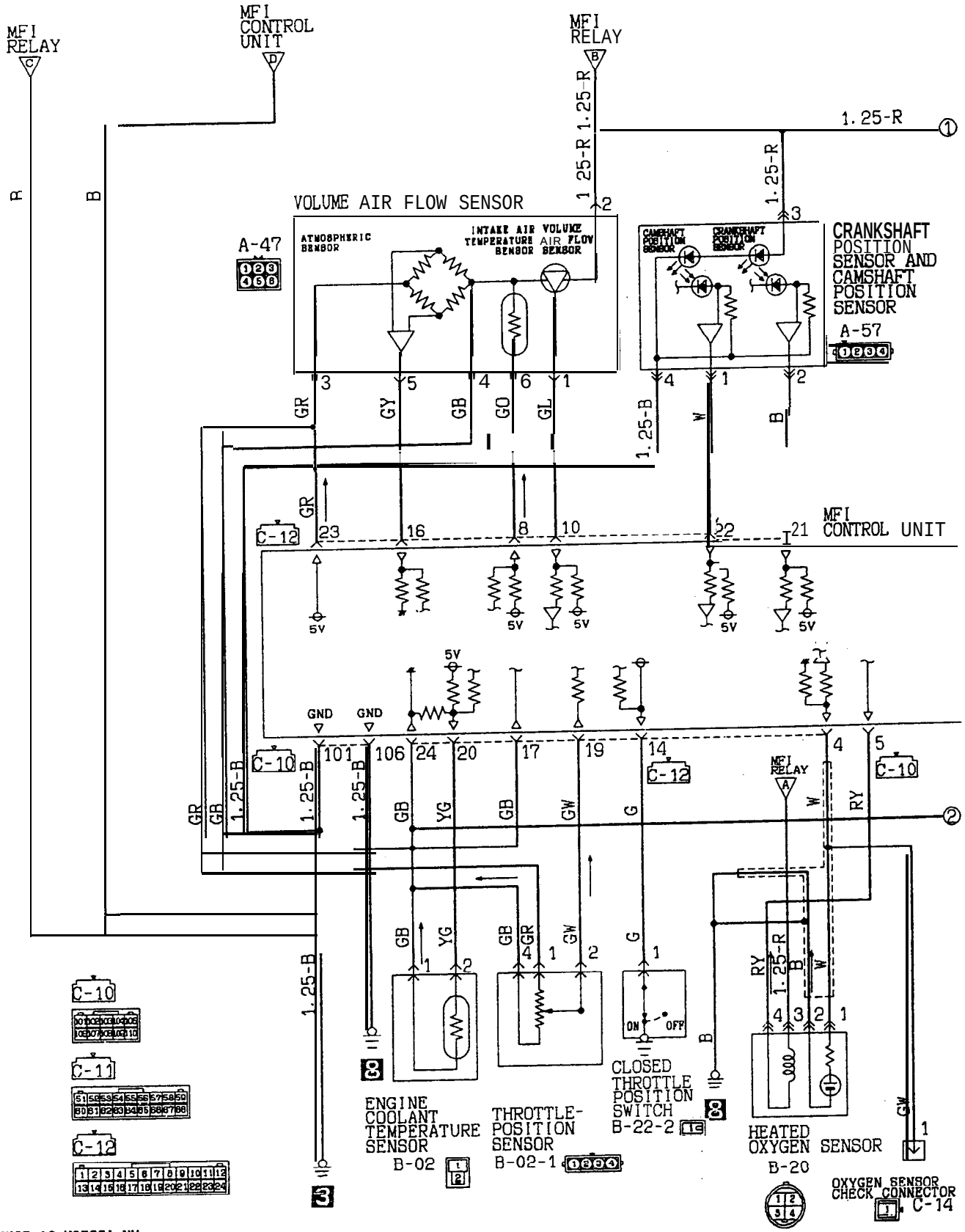


X35-AC-H0535-NM


IGNITION SWITCH (IG1)
2-BW
C-08
C-43
J/B
10A
C-39
2-BW
2-BW
IGNITION COIL
B-07
BW
B-22-1
CONDENSER <4WD>
YB
YG
TO SPARK PLUG
2-BW
IC POWER SOURCE
COMBINATION METER
C-52
CHECK ENGINE
YB
B-22-3
ENGINE SPEED DETECTION CONNECTOR
IGNITION POWER TRANSISTOR
B-09
0.85-W
Y
YR
B
(LY)
C-09
13
A
3
2-BW
C-10
110
109
C-11
54
55
64

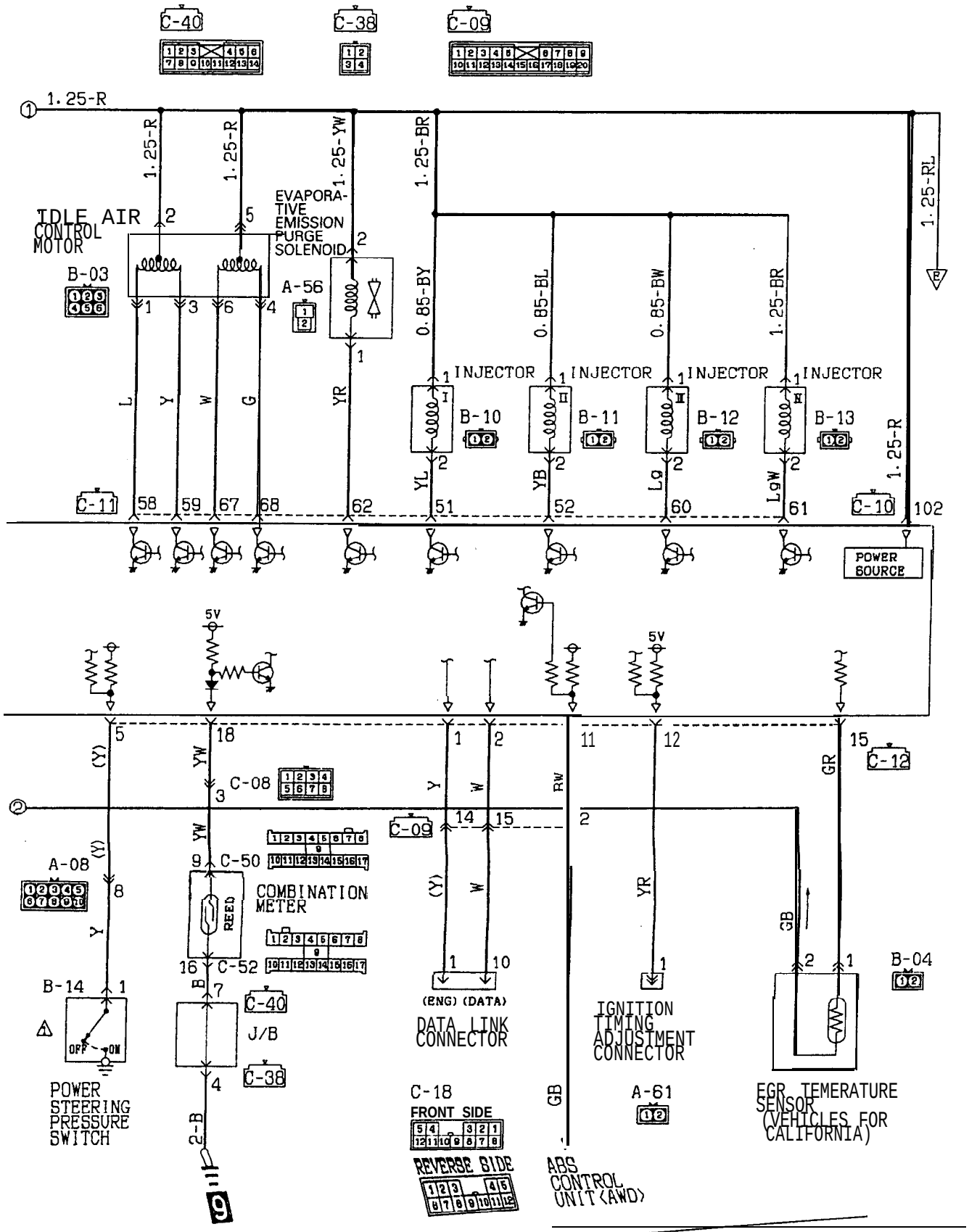
CIRCUIT DIAGRAM (CONTINUED)

< 1990 models (Non-turbo)>



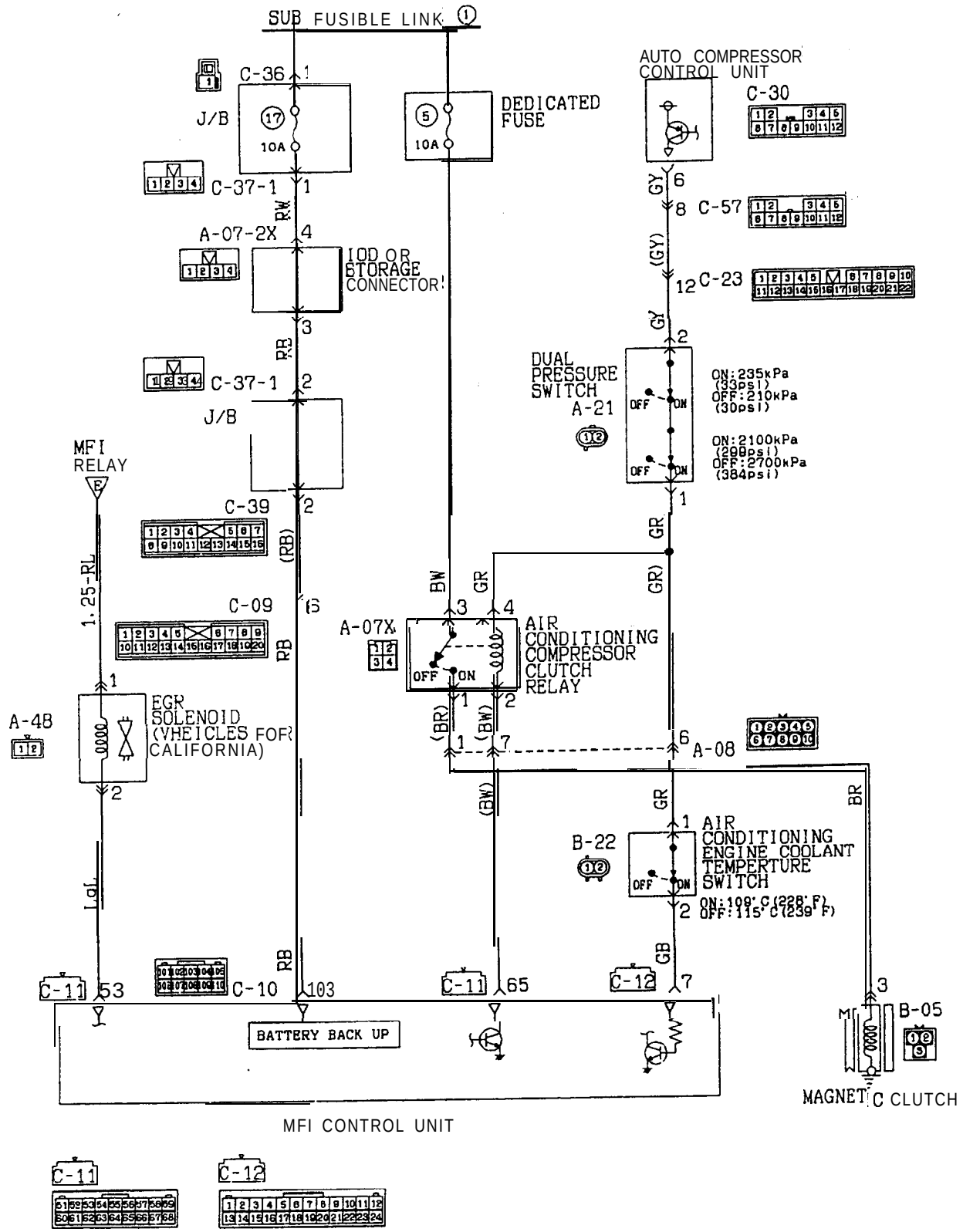
KX35-AC-H0535A-NW

TSB Revision


C-40
C-38
C-09
1.25-R
IDLE AIR CONTROL MOTOR
B-03
EVAPORA-TIVE EMISSION PURGE SOLENOID
A-56
0.85-BY
0.85-BL
0.85-BW
1.25-BR
1.25-RL
INJECTOR
B-10
B-11
B-12
B-13
C-11
C-10
POWER SOURCE
5V
C-08
C-09
C-12
A-08
C-50
COMBINATION METER
REED
C-52
B-14
OFF
ON
J/B
C-40
C-38
POWER STEERING PRESSURE SWITCH
(ENG) (DATA)
DATA LINK CONNECTOR
C-18
FRONT SIDE
REVERSE SIDE
IGNITION TIMING ADJUSTMENT CONNECTOR
A-61
B-04
EGR TEMERATURE SENSOR (VEHICLES FOR CALIFORNIA)
ABS CONTROL UNIT<AWD>
2-B

CIRCUIT DIAGRAM (CONTINUED)

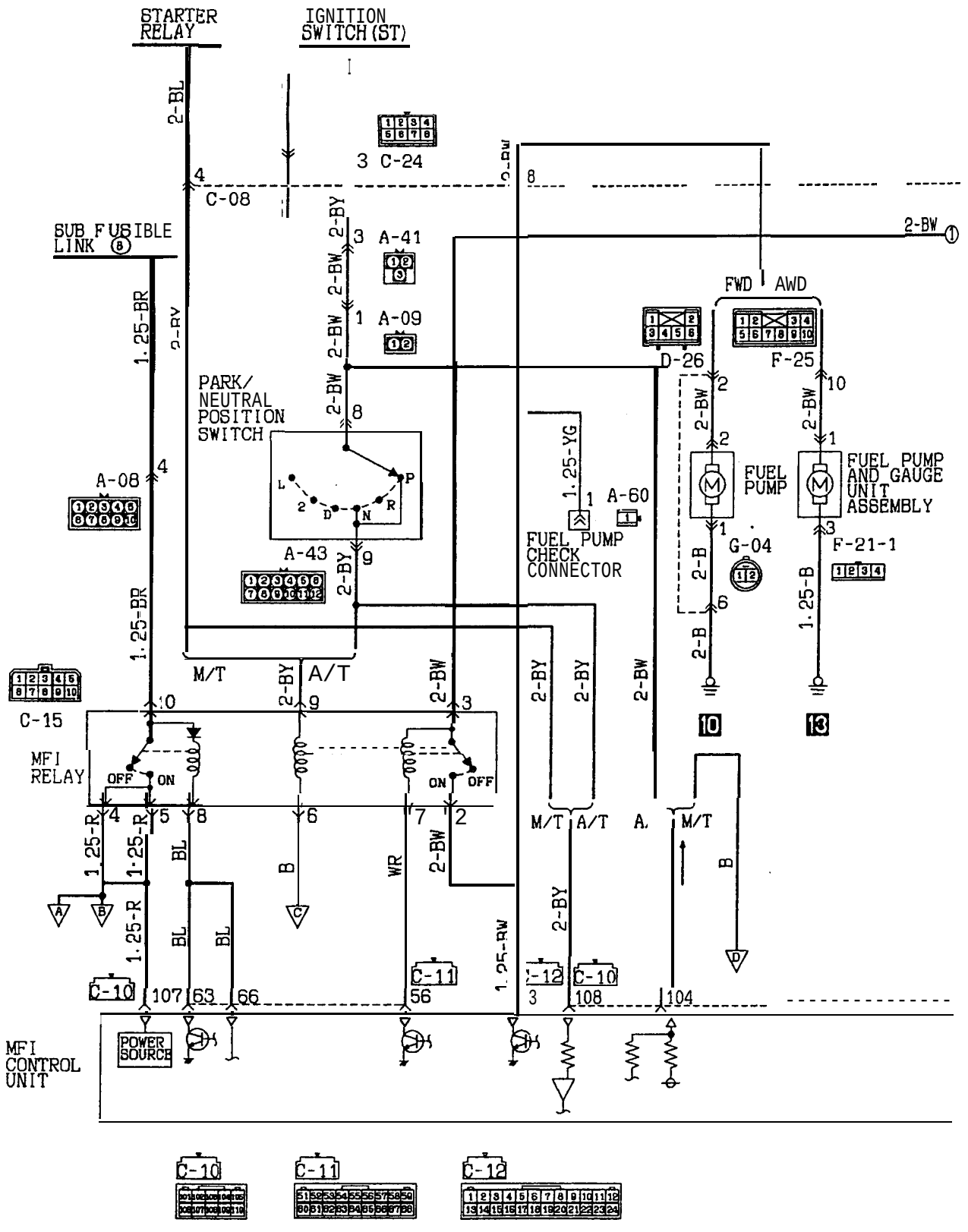
< 1990 models (Non-turbo)>



KX35-AC-H0535B-NW

CIRCUIT DIAGRAM

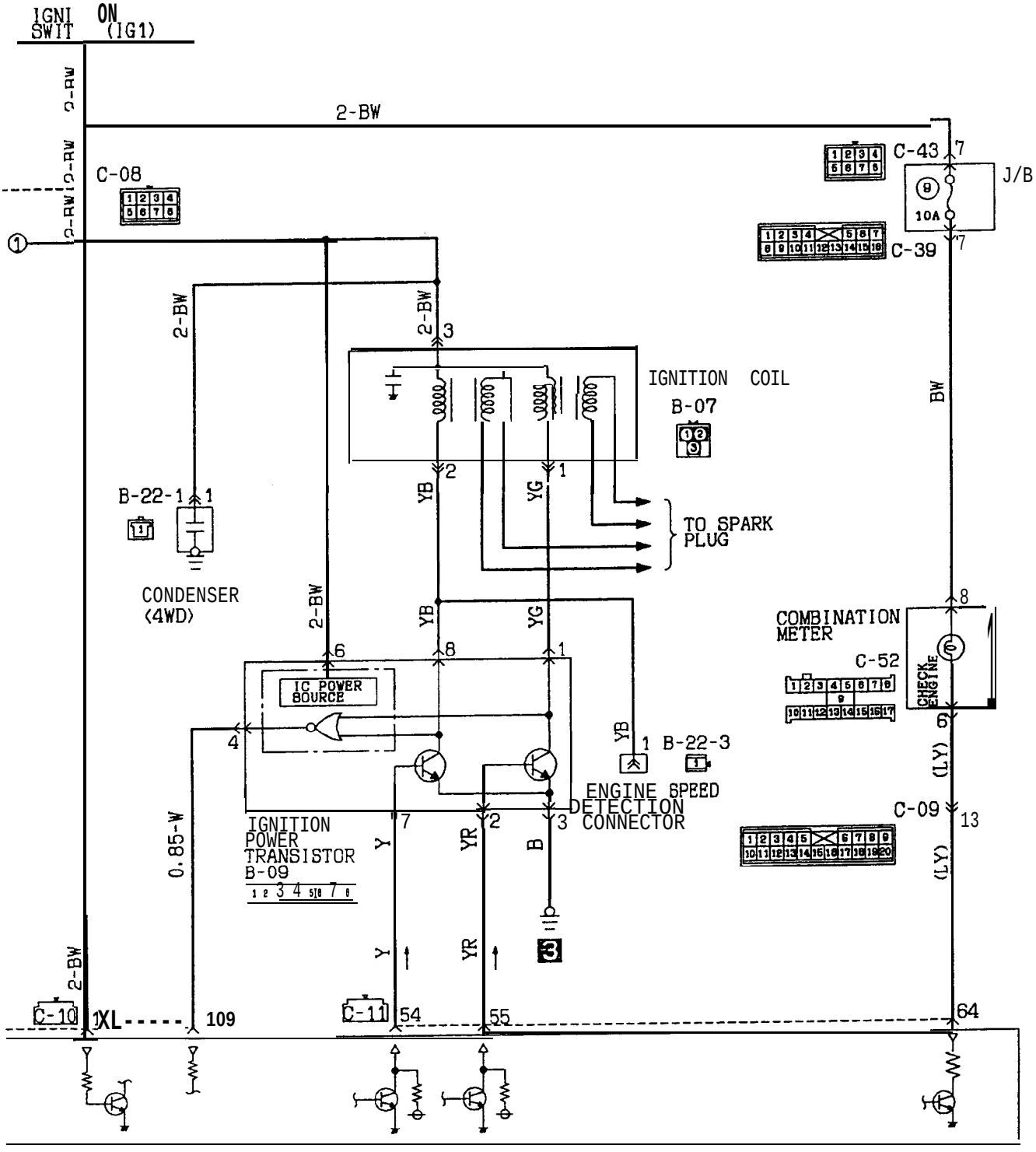
< 1992 models (Non-turbo)>

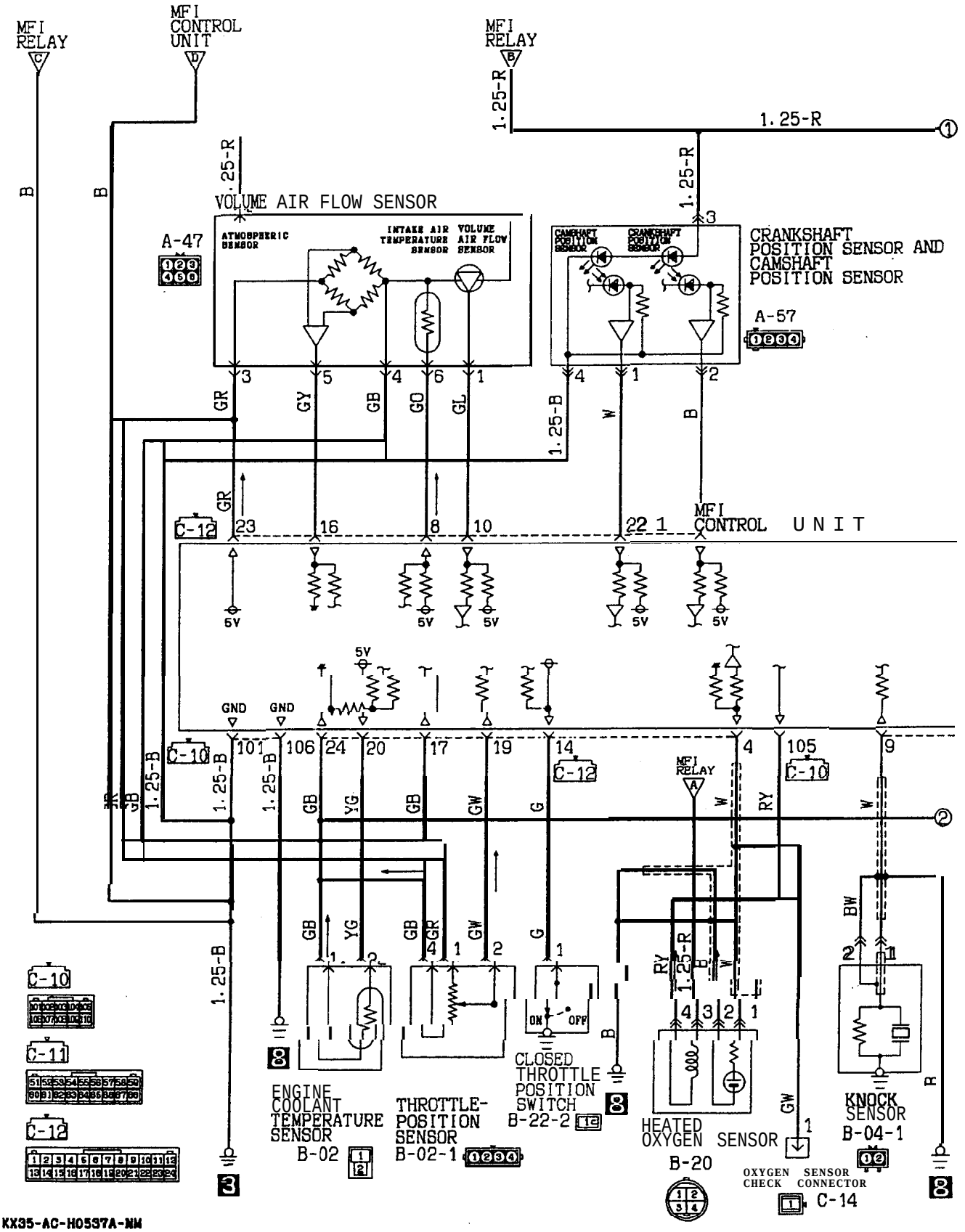


KX35-AC-H0537-NM

CIRCUIT DIAGRAM (CONTINUED)

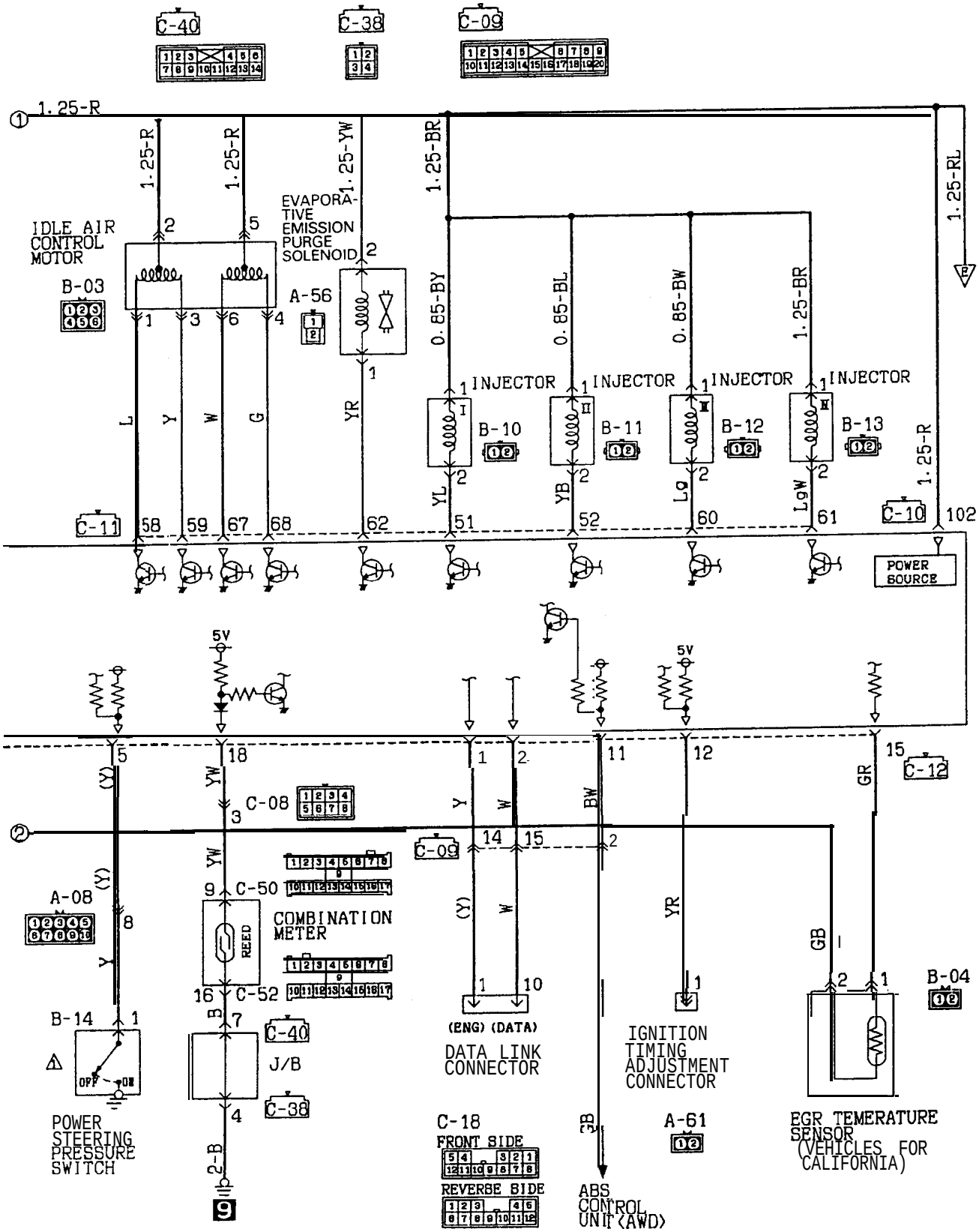
< 1992 models (Non-turbo)>

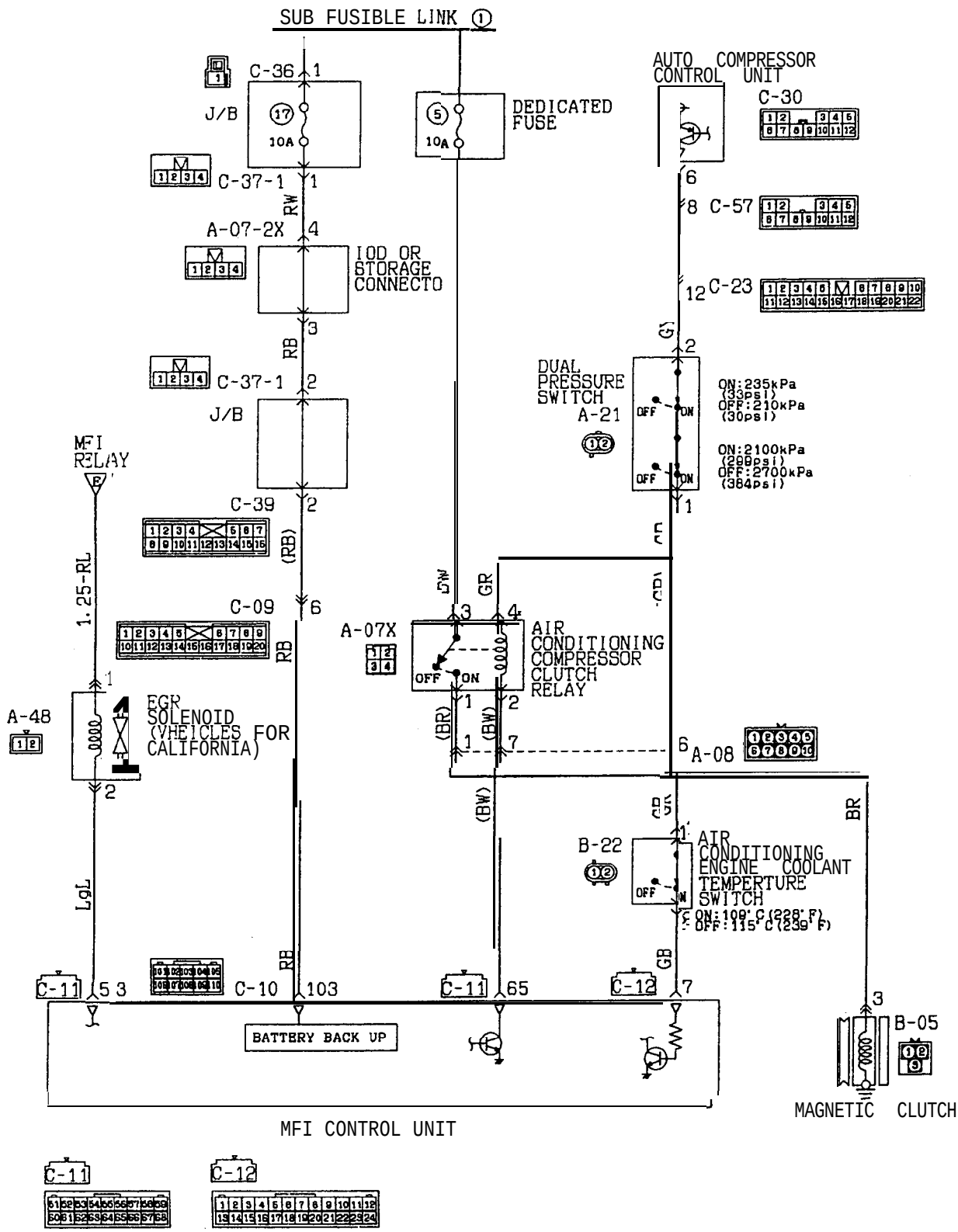



MFI RELAY
MFI CONTROL UNIT
MFI RELAY
1.25-R
VOLUME AIR FLOW SENSOR
A-47
ATMOSPHERIC SENSOR
INTAKE AIR TEMPERATURE SENSOR
VOLUME AIR FLOW SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
CRANKSHAFT POSITION SENSOR AND CAMSHAFT POSITION SENSOR
A-57
GR
GY
GB
GO
GL
W
B
C-12
MFI CONTROL UNIT
5V
GND
C-10
C-11
C-12
RY
BW
ENGINE COOLANT TEMPERATURE SENSOR B-02
THROTTLE-POSITION SENSOR B-02-1
CLOSED THROTTLE POSITION SWITCH B-22-2
HEATED OXYGEN SENSOR B-20
KNOCK SENSOR B-04-1
OXYGEN SENSOR CHECK CONNECTOR C-14
KX35-AC-H0537A-NM

CIRCUIT DIAGRAM (CONTINUED)

< 1992 models (Non-turbo)>

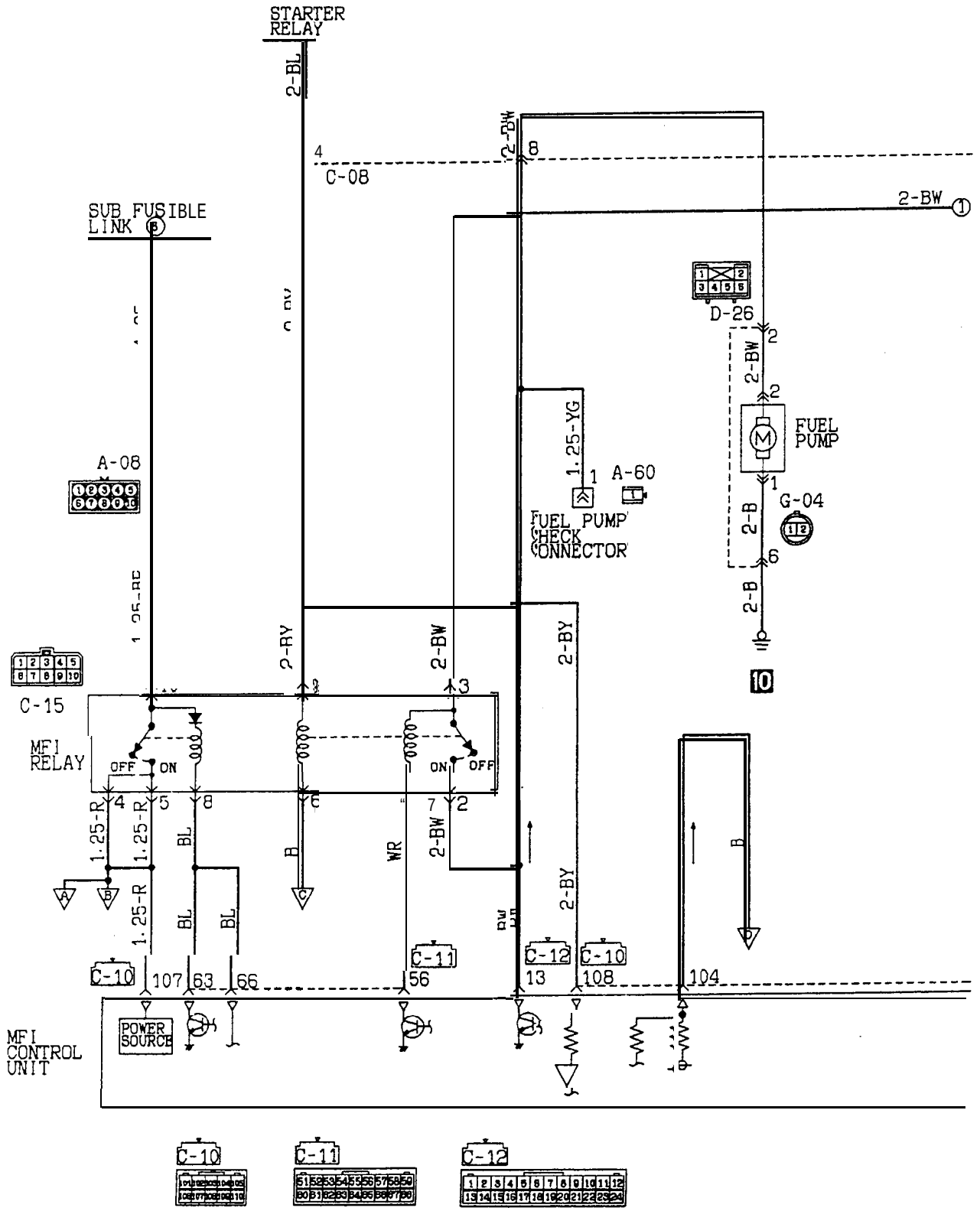




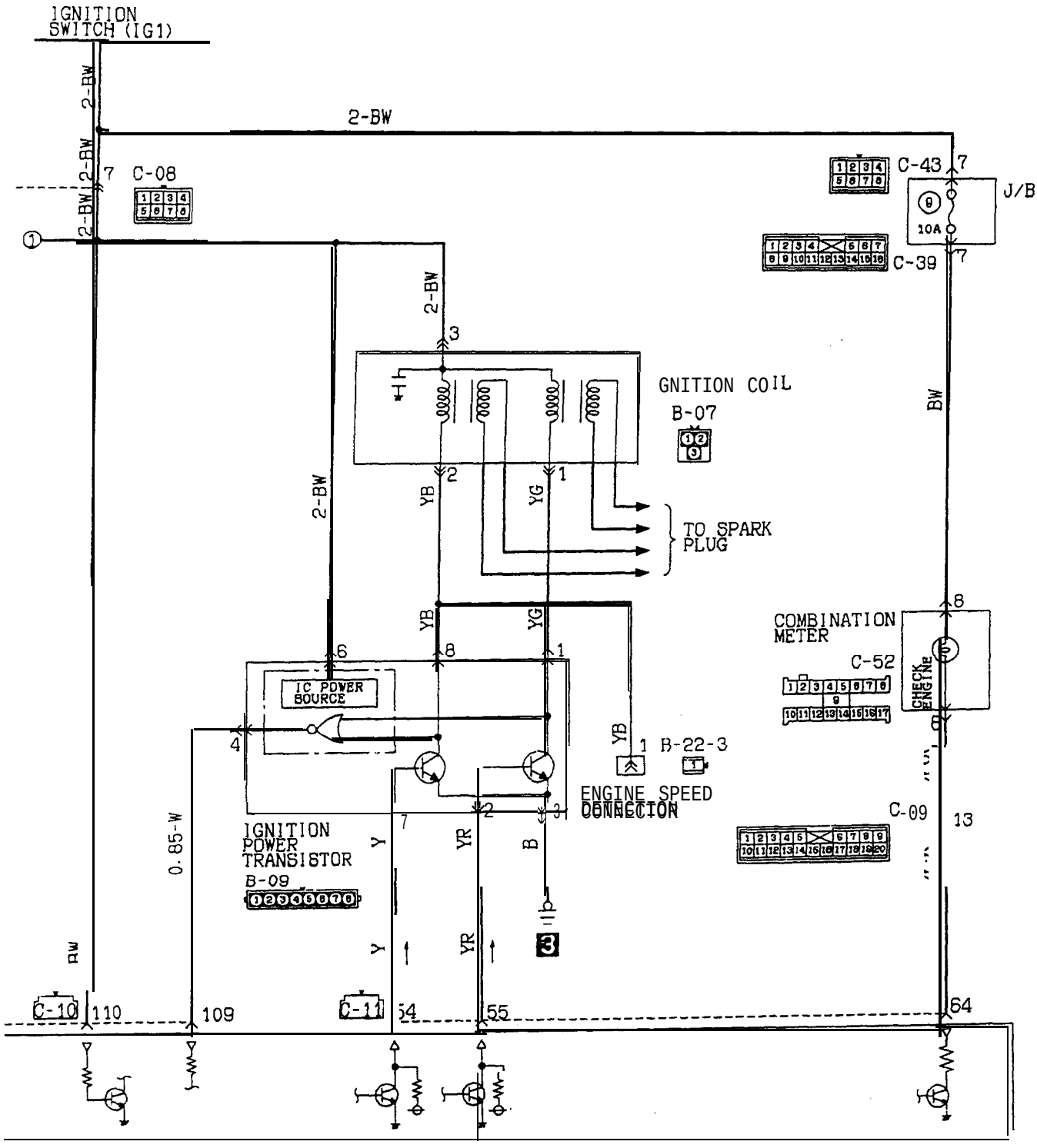
KX35-AC-H0537B-NM

CIRCUIT DIAGRAM

<From 1991 models (Turbo)>

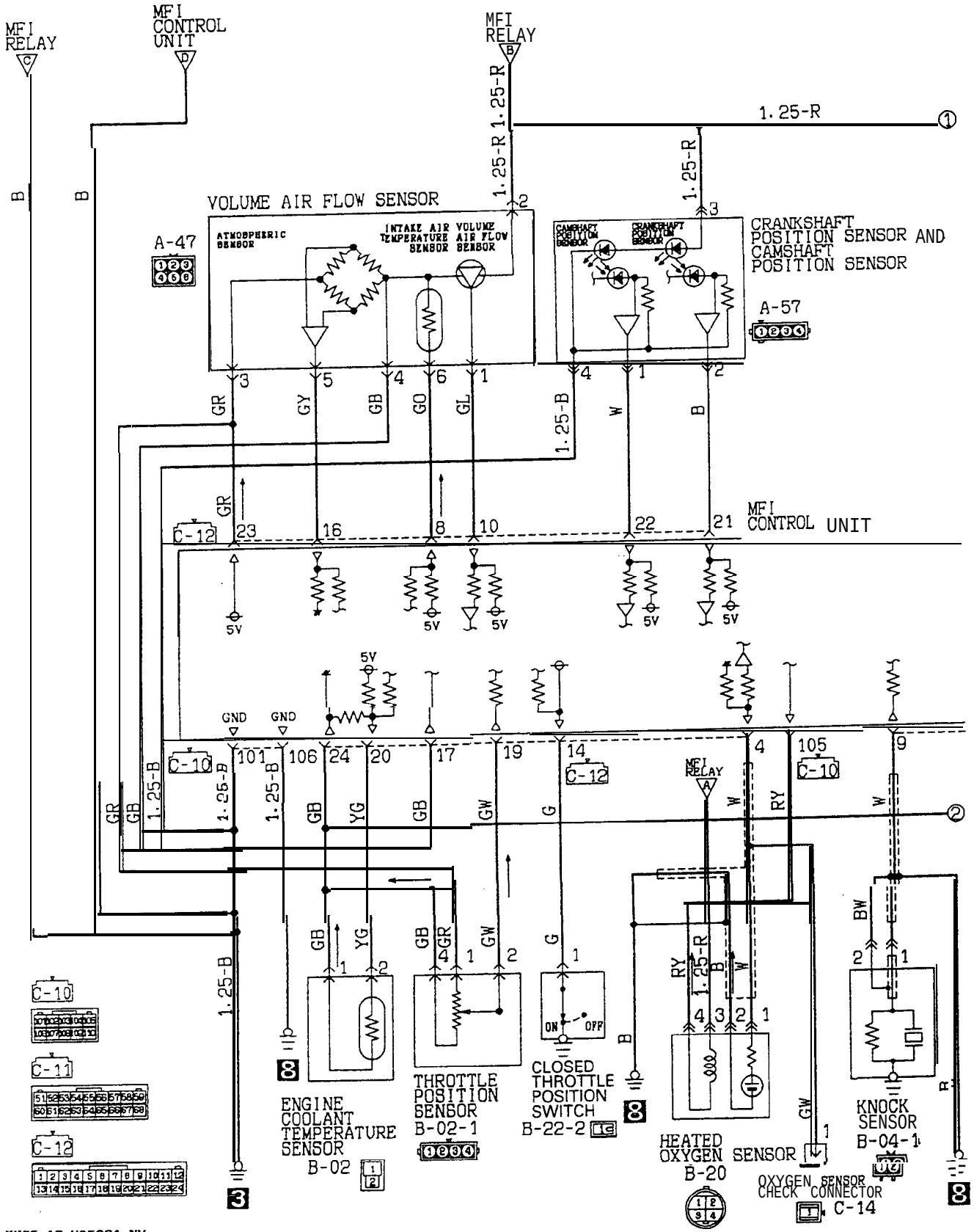


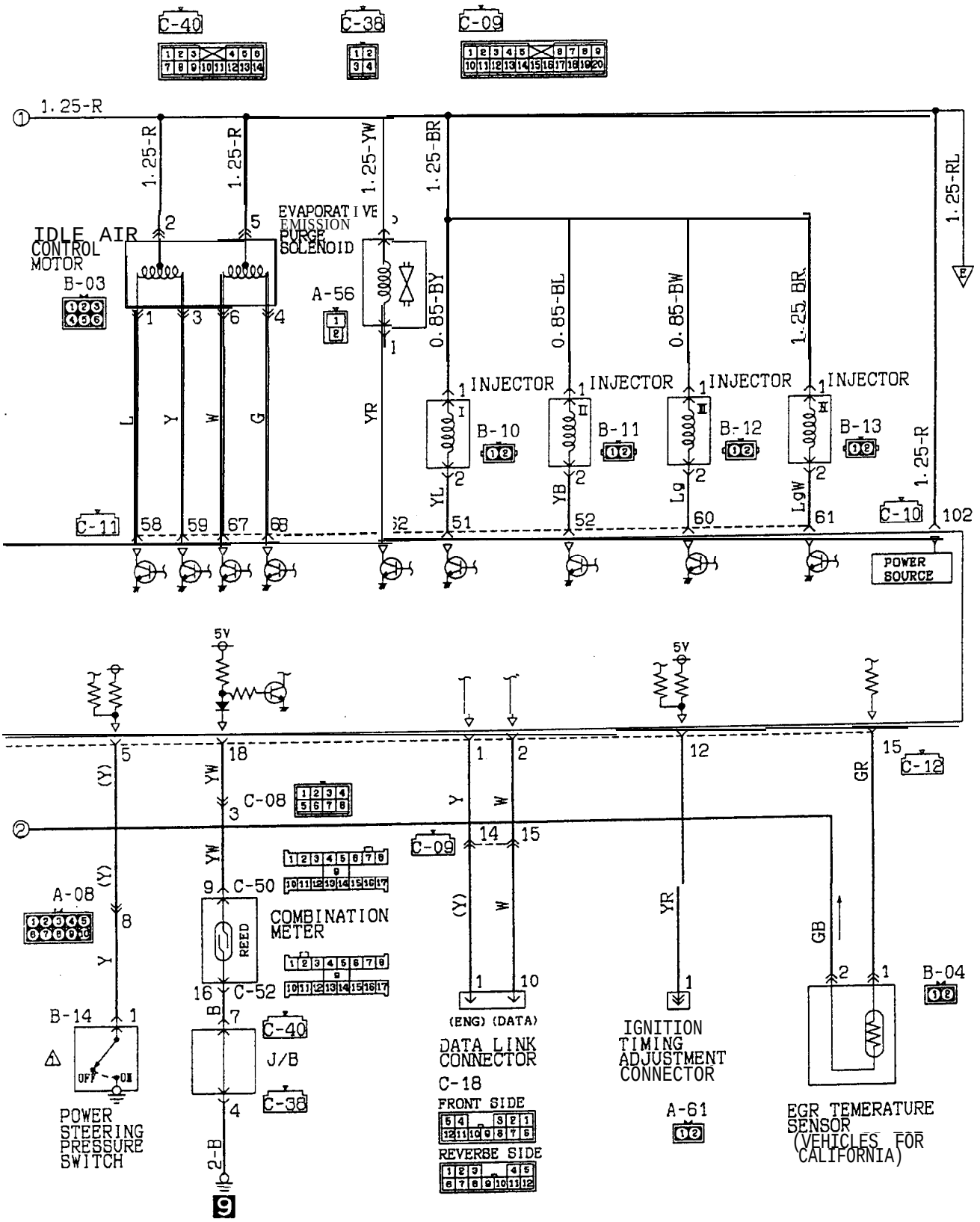
XX35-AC-H0539-RM


IGNITION SWITCH (IG1)
2-BW
C-08
C-43
J/B
10A
C-39
GNITION COIL
B-07
TO SPARK PLUG
YB
YG
BW
COMBINATION METER
C-52
CHECK ENGINE
IC POWER SOURCE
B-22-3
ENGINE SPEED CONNECTION
C-09
IGNITION POWER TRANSISTOR
B-09
0.85-W
Y
YR
B
C-10
C-11
110
109
54
55
64
13

CIRCUIT DIAGRAM (CONTINUED)

<From 1991 models (Turbo)>

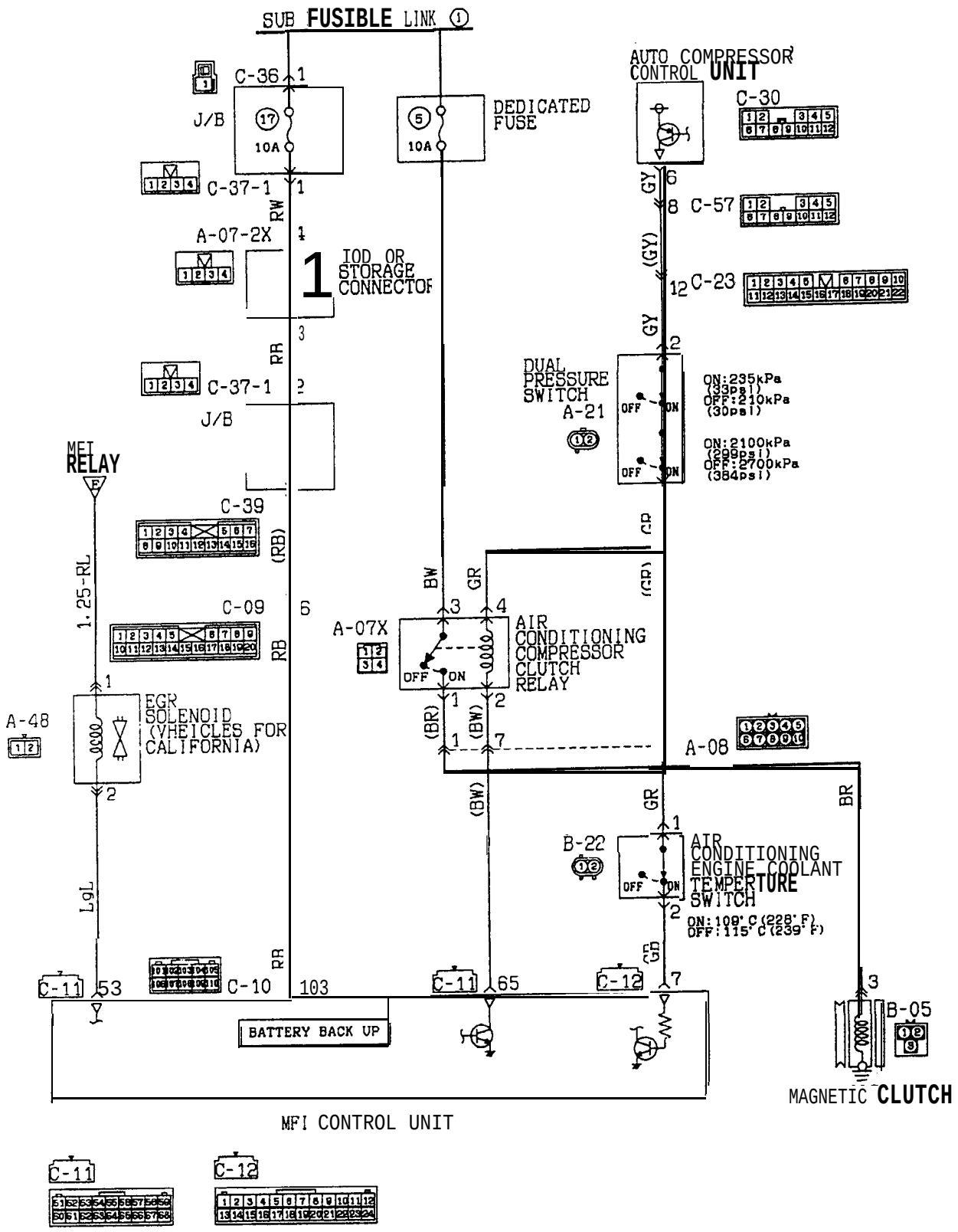




TSB Revision

CIRCUIT DIAGRAM (CONTINUED)

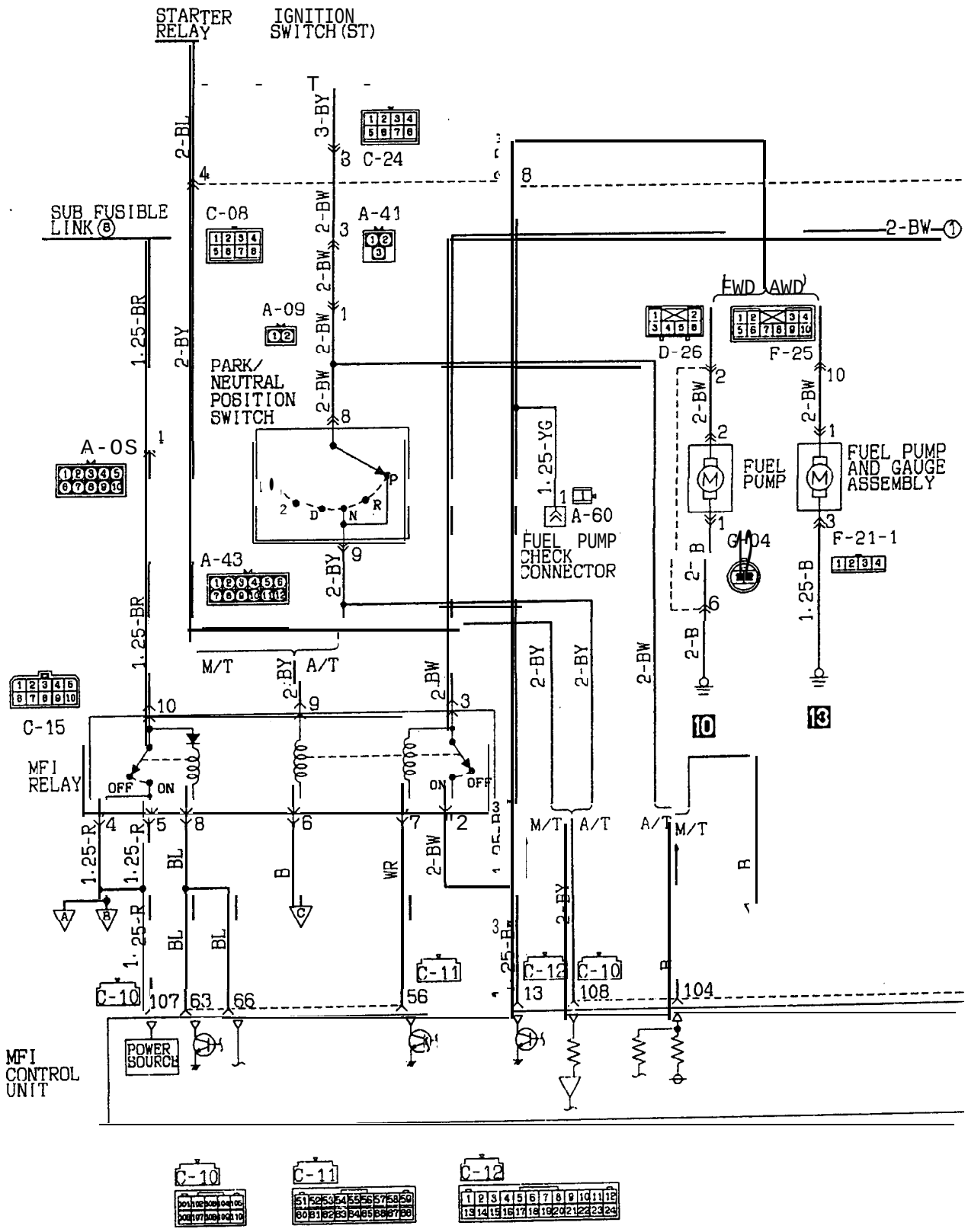
<From 1991 models (Turbo)>



KX35-AC-H05398-NW

CIRCUIT DIAGRAM

<1993 models>

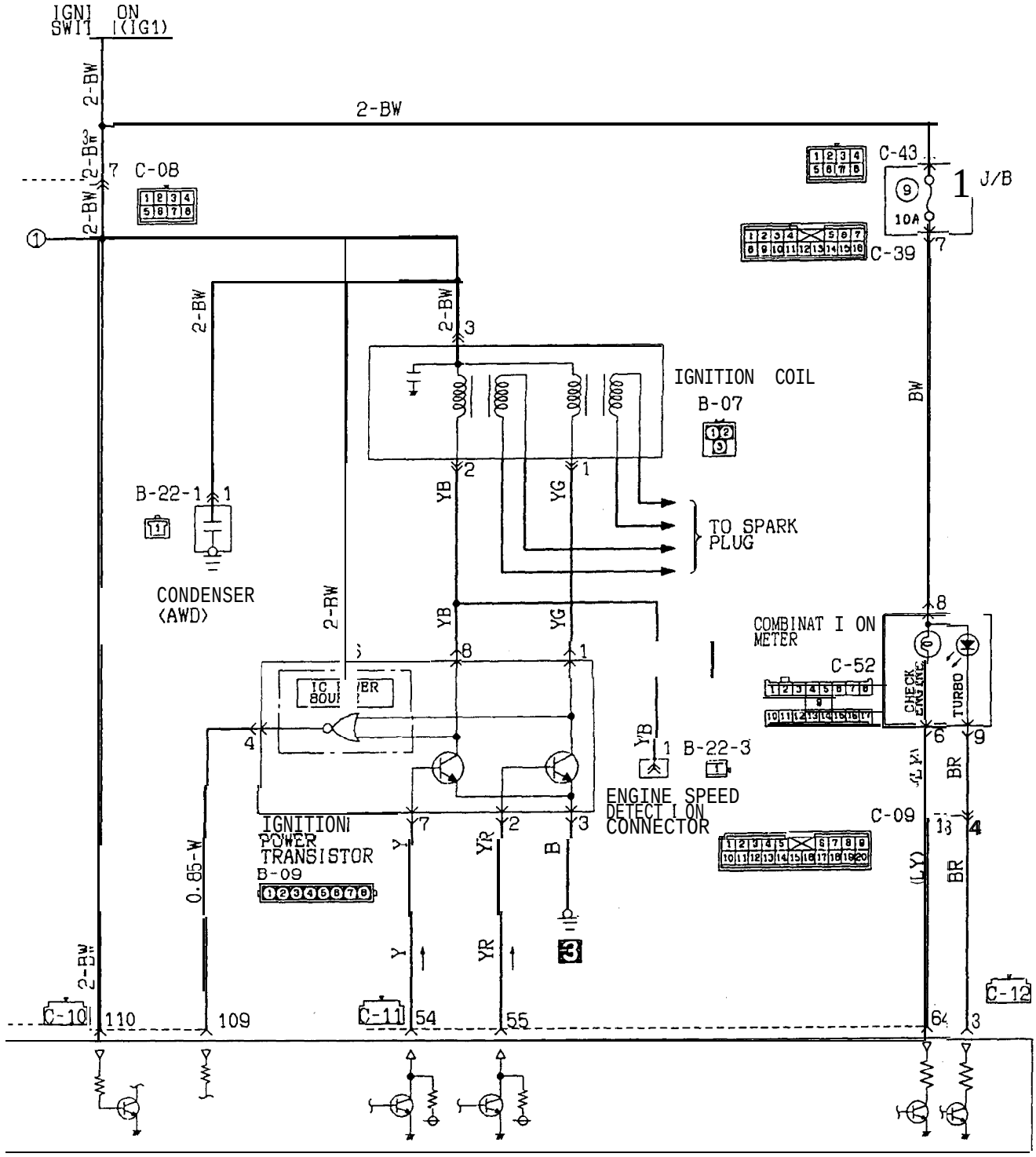


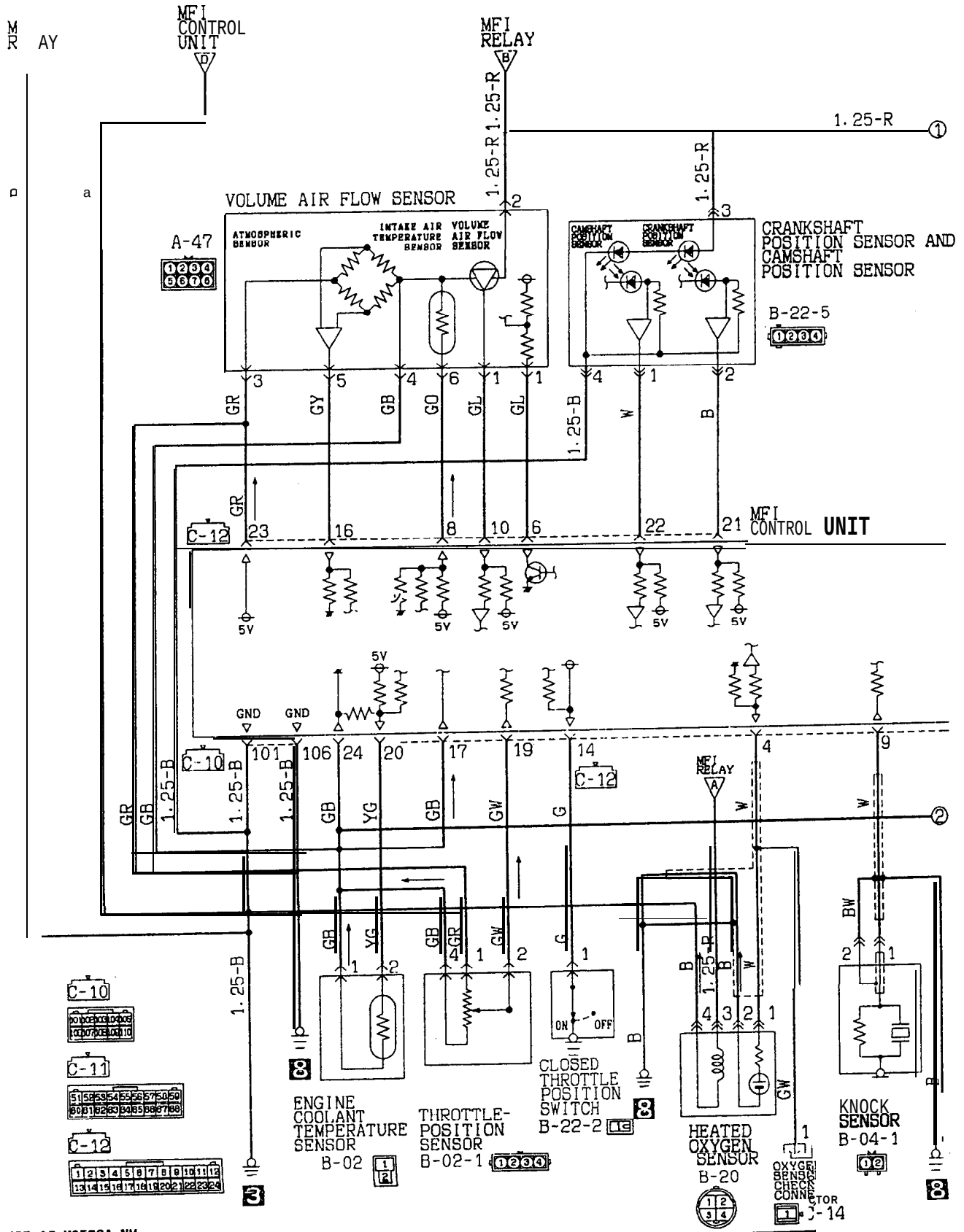
X35-AC-H0538-NN

TSB Revision

CIRCUIT DIAGRAM (CONTINUED)

<1993 models>



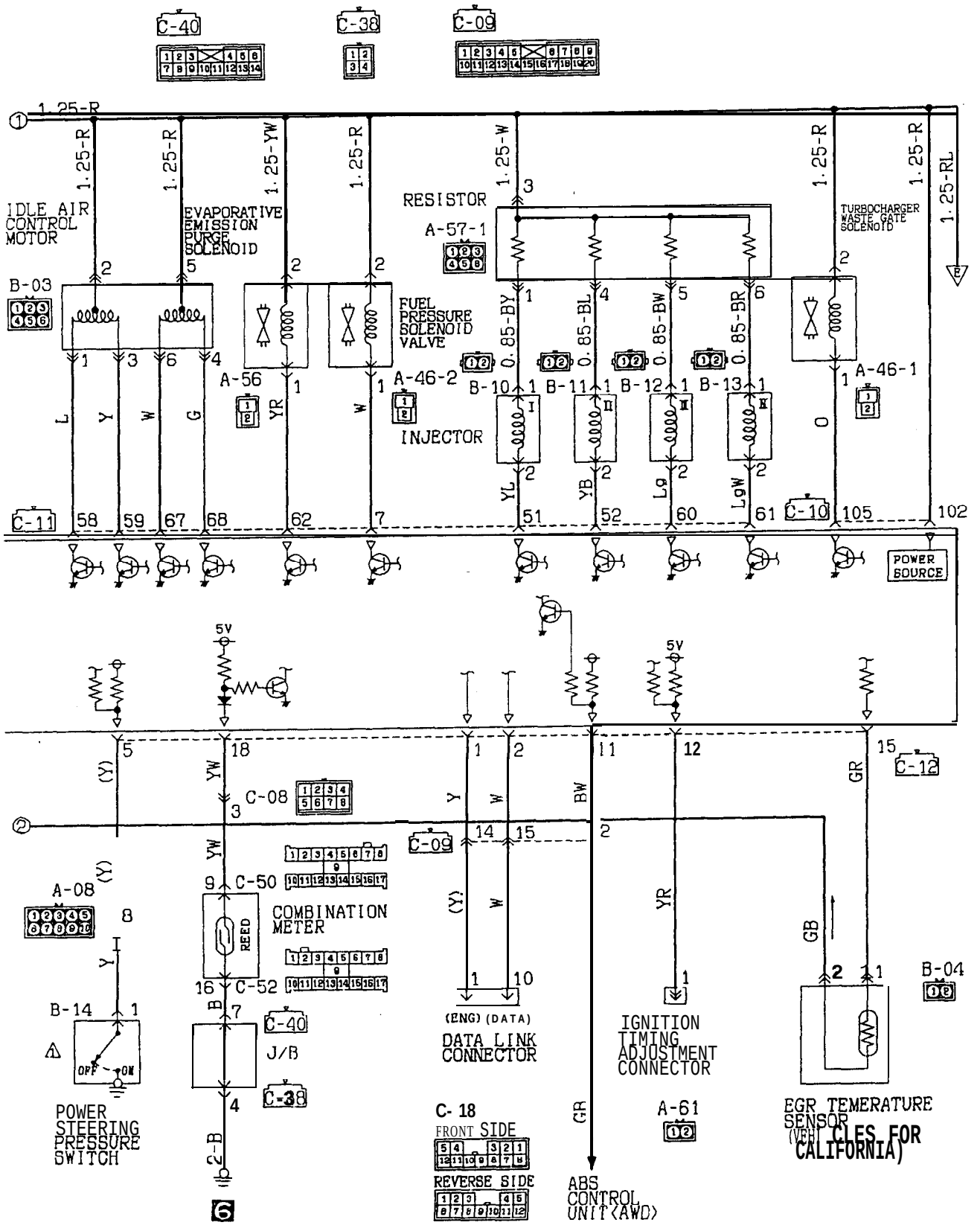


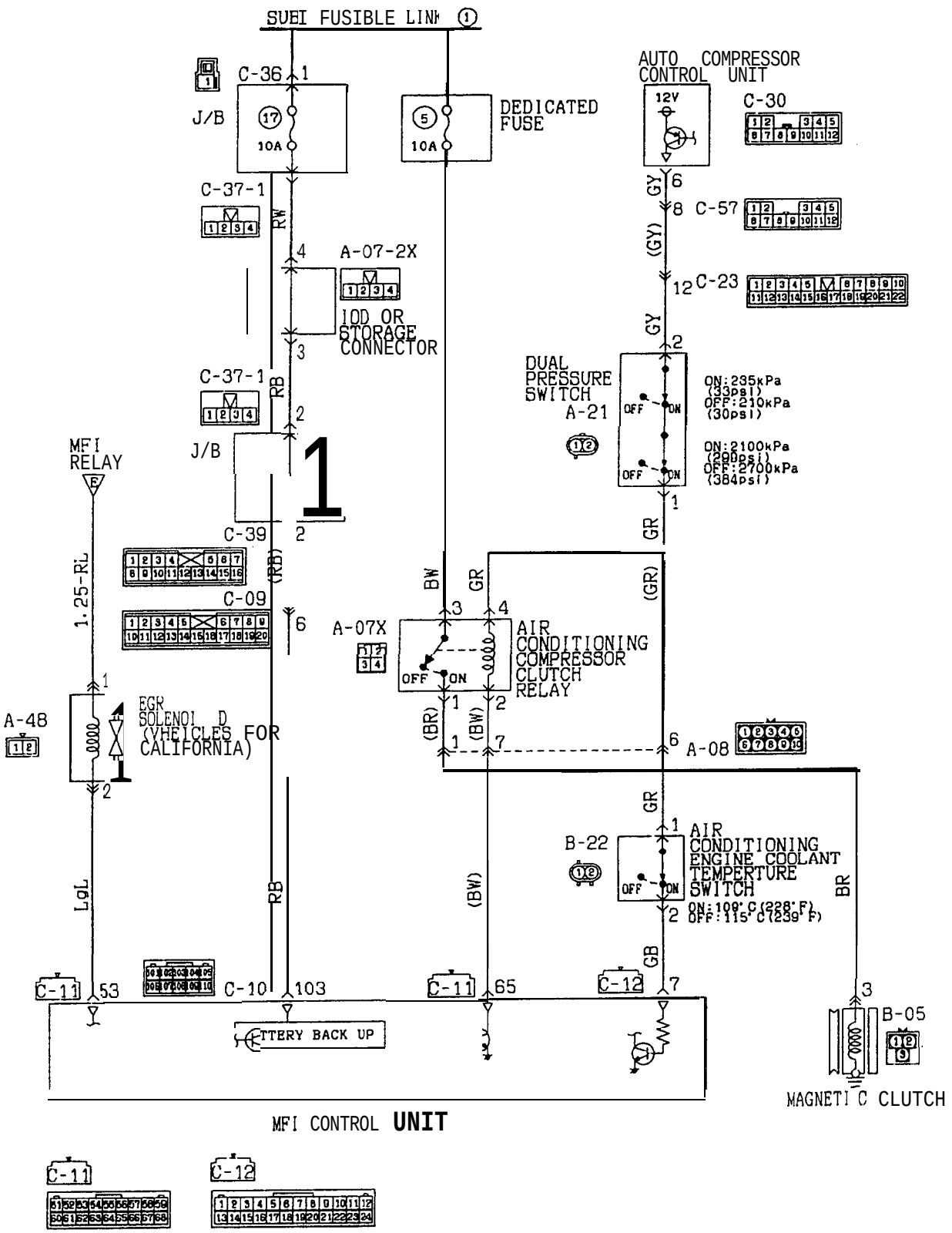
KX35-AC-H0536A-NM

TSB Revision

CIRCUIT DIAGRAM (CONTINUED)

< 1993 models>





KX35-AC-H0538B-NM

FUEL TANK AND FUEL LINE

M13EAAA

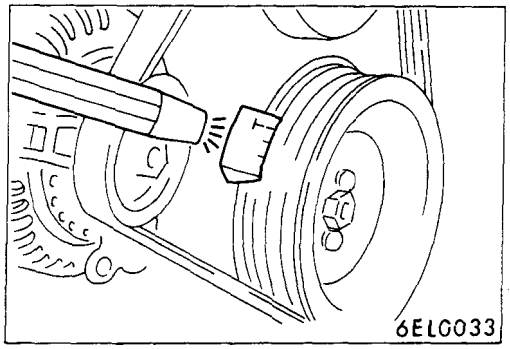
Symptom	Probable cause	Remedy
Engine malfunctions due to insufficient fuel supply	Bent or kinked fuel pipe or hose	Repair or replace
	Clogged fuel pipe or hose	Clean or replace
	Clogged fuel filter or in-tank fuel filter	Replace
	Water in fuel filter	Replace the fuel filter or clean the fuel tank and fuel line
	Dirty or rested fuel tank interior	Clean or replace
	Malfunctioning fuel pump (Clogged filter in the pump)	Replace
Evaporative emission control system malfunctions (When fuel tank filler tube cap is removed, pressure releasing noise is heard)	Mispiping of vapor line	Correct
	Disconnect vapor line piping joint	Correct
	Folded, bent, cracked or clogged vapor line	Replace
	Faulty fuel tank filler tube cap	Replace
	Malfunctioning fuel tank pressure control valve	Replace

SERVICE ADJUSTMENT PROCEDURES

CURB IDLE SPEED INSPECTION M13FHAB

(1) The vehicle should be prepared as follows before the inspection.

- Engine coolant temperature: 85–95°C (185–205°F)
- Lights, electric cooling fan and accessories: OFF
- Transaxle: Neutral (P for vehicles with an automatic transaxle)

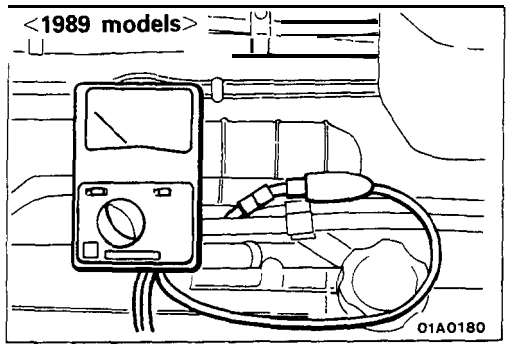


(2) Connect a tachometer.

NOTE
1. Refer to P.13-246 for information concerning connection of a tachometer.
2. For tachometer, one-half of the actual engine rpm is indicated, so the actual engine rpm in two times the indicated value shown by the tachometer. <From 1990 models>

(3) Set a timing light in position.
(4) Ground the terminal for adjustment of ignition timing.
(5) Start the engine and let it idle.
(6) Check whether or not the ignition timing is the standard value; if not, adjust.

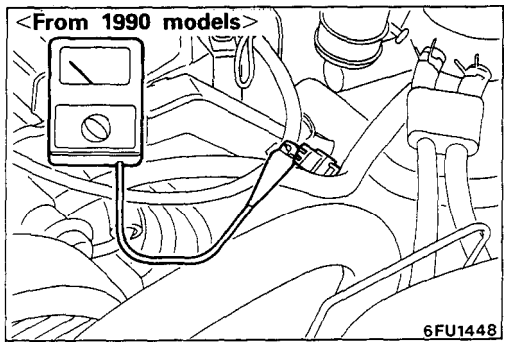
Standard value: 5°BTDC ± 2"



(7) Stop grounding the terminal for adjustment of ignition timing.
(8) Let the engine idle for two minutes.
(9) Check the idling rpm.

Curb idle speed: 750 ± 100 rpm <Non-Turbo>
800 ± 100 rpm <Turbo>

NOTE
The idling rpm is automatically regulated by the idle air system.



(10) If not within the standard value range, refer to the **CHECK** CHART CLASSIFIED BY PROBLEM SYMPTOMS and check the MFI component.

BASIC IDLE SPEED ADJUSTMENT M13FHBT

NOTE
1. The standard idling speed has been adjusted, by the engine speed adjusting screw (RPM adjusting screw), by the manufacturer, and there should usually be no need for readjustment.
2. Use the following procedure to adjust when the idling speed drops due to an incorrect adjustment, high idling speed, or when a load such as the air conditioning is applied **on the engine.**
3. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle air control motor, the compression pressure, etc. are all normal.

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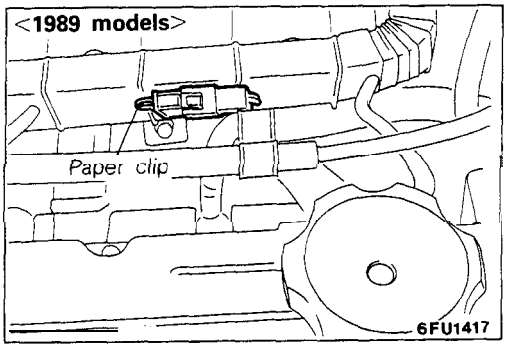
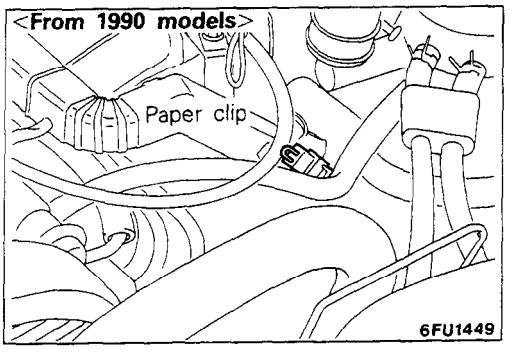
(1) The vehicle should be prepared as follows before the inspection and adjustment.
- Engine coolant temperature: 85–95°C (185–205°F)
- Lights, electric cooling fan and accessories: OFF
- Transaxle: Neutral
  (P for vehicles with an automatic transaxle)

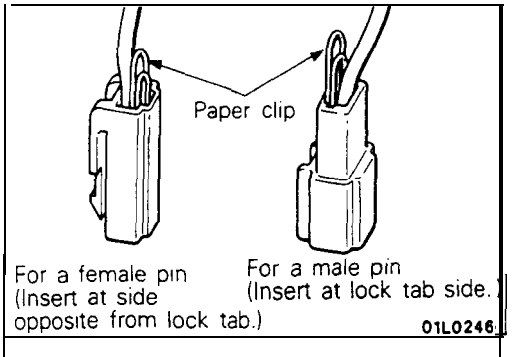
(2) Connect the scan tool to the data link connector (white).

NOTE
When the scan tool is connected, the diagnostic test mode control terminal is grounded.

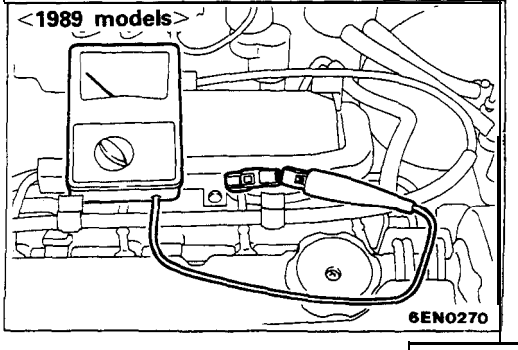


(3) If the scan tool is not used, follow the steps below.
① Insert a paper clip (from the harness side) into the I-pin connector shown in the figure at the left.
Take care not to disconnect the connector.



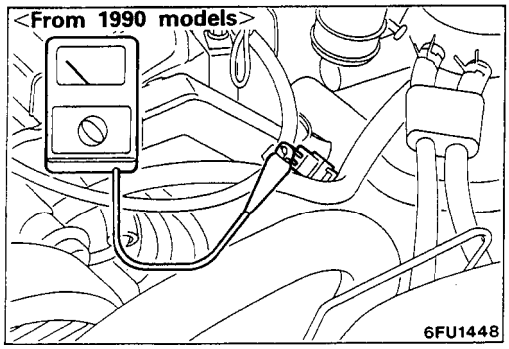


Caution
The paper clip should be inserted between the terminals as shown in the figure at the left.

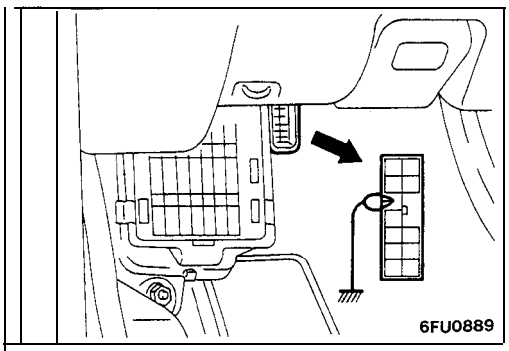


② Connect a primary-voltage-detection type of tachometer to the paper clip.

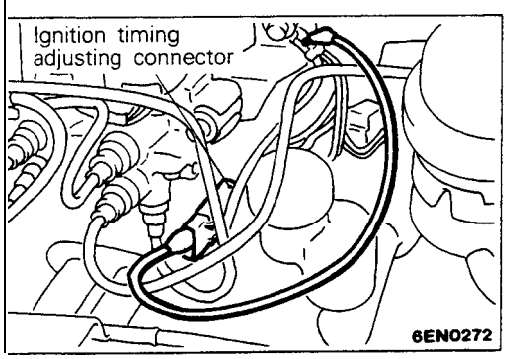
TSB Revision



NOTE
For rpm, one-half of the actual engine rpm is indicated, so the actual engine rpm in two times the indicated value shown by the tachometer. <From 1990 models>



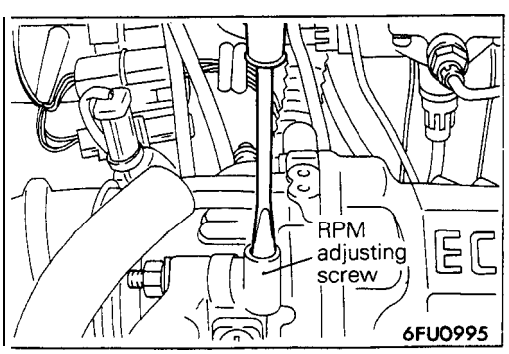
③ Use a jumper wire to ground the diagnostic test mode control terminal of the data link connector.



(4) Use a jumper wire to ground the terminal for adjustment of ignition timing.
(5) Start the engine and let it idle.
(6) Check the standard idling rpm.
If the scan tool is used, select item No.22 and read out the idling rpm.

Basic idle speed: 750 ± 50 rpm <Non-Turbo>
800 ± 50 rpm <Turbo>

NOTE
1. The engine speed may be 20 to 100 rpm lower than indicated above for a new vehicle [driven approximately 500 km (300 miles) 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 (300 miles) or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13-248.)



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

NOTE
If the idling speed is higher than the standard value range even when the RPM adjusting screw is fully closed, check whether or not there is any indication that the CTP switch (fixed SAS) has been moved.
If there is an indication that it has been moved, adjust the CTP switch (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), and, if so, the throttle body should be replaced.

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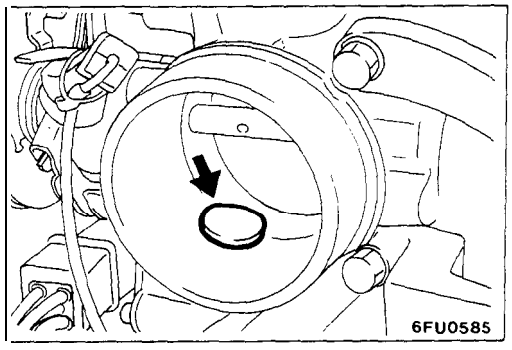
(8) Switch OFF the ignition switch.
(9) If the scan tool was not used, disconnect the jumper wire from the diagnostic test mode control terminal.
(10) Disconnect the jumper wire from the terminal for adjustment of ignition timing, and return the connector to its original condition.
(11) Start the engine again and let it run at idle speed for about ten minutes; check to be sure that the idling condition is normal.



THROTTLE BODY (THROTTLE VALVE AREA) CLEANING M13FICL

(1) Start the engine and warm it up until the temperature of the engine coolant reaches 80°C (176°F) or higher; then stop the engine.
(2) Disconnect the air intake hose at the throttle body side.
(3) Plug the bypass passage entrance of the throttle body.

Caution
Be absolutely sure that no cleaning liquid enters the bypass passage.

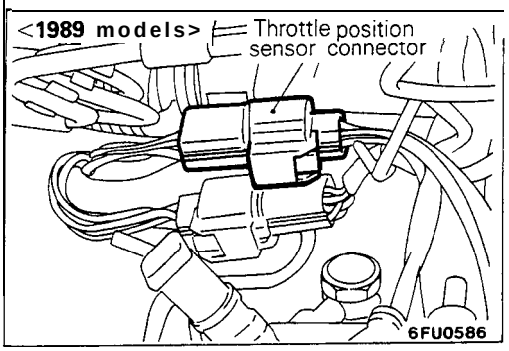
(4) Spray cleaning liquid (from the intake port of the throttle body) onto the valve, and then leave as is for about five minutes.
(5) Start the engine and race it a few times; then let it run at idle speed for about one minute.

NOTE
If, because the bypass passage is plugged, the engine idling speed is unstable (or the engine stalls), let the engine run with the throttle valve slightly open.

(6) If deposits are not removed from the throttle valve, repeat steps (4) and (5).
(7) Remove the plug from the bypass passage entrance.
(8) Connect the air intake hose.
(9) Using the scan tool, erase the diagnostic trouble code, or disconnect the battery's ground cable for ten seconds or longer and then reconnect it.
(10) Adjust the basic idle speed (engine speed adjusting screw). (Refer to P.13-245.)

THROTTLE POSITION SENSOR ADJUSTMENT M13FIEE

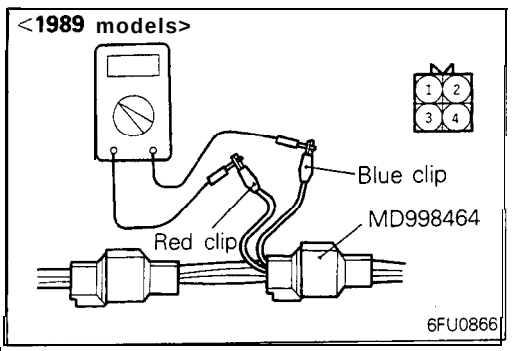
(1) Connect the scan tool to the data link connector (white).



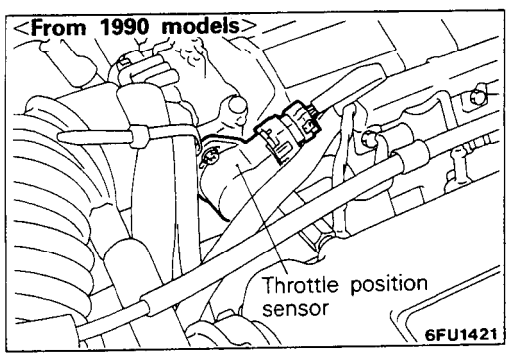
(2) If a scan tool is not used, perform the following operation.

<1989 models>

① Disconnect the throttle-position sensor connector, and connect the special tool (test harness) between the disconnected connectors.

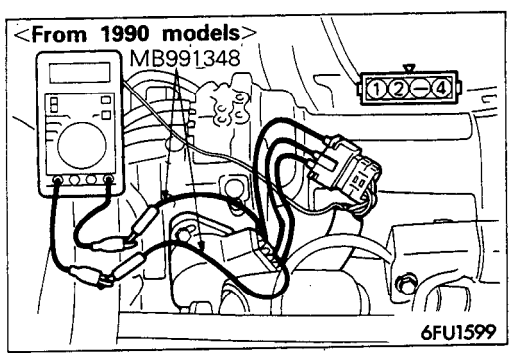


② Connect a digital-type voltmeter between the ② terminal (red clip, sensor ground) and the ④ terminal (blue clip, sensor output) of the throttle-position sensor connector.



<From 1990 models>

① Disconnect the throttle position sensor connector and use the special tool (test harness set) between the disconnected connector.

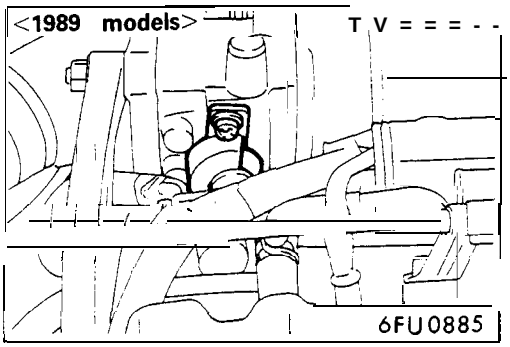


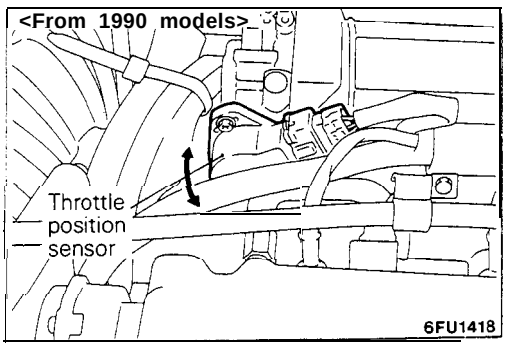
② Connect a digital type voltmeter between terminal ② (sensor output) of the throttle position sensor and terminal ④ (sensor ground).

(3) Switch ON the ignition switch.
(Do not start the engine.)

(4) Check the throttle-position sensor's output voltage.
When a scan tool is used, select Item No.14 to read the throttle position sensor output voltage.

Standard value: 0.48–0.52 V.



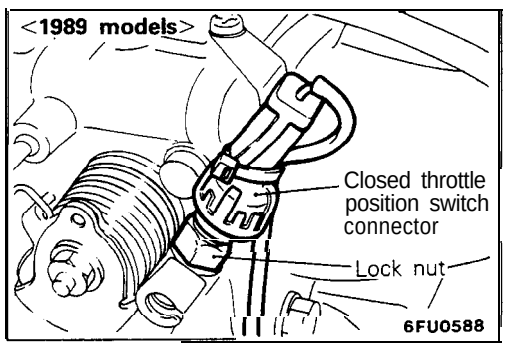


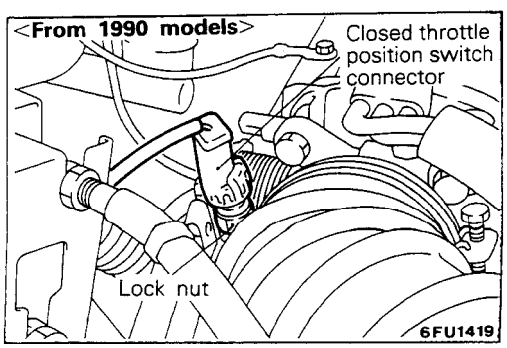
(5) If there is a deviation from the standard value, loosen the throttle-position sensor installation bolt and then turn the throttle-position sensor itself to make the adjustment after the throttle body was removed. Be sure to securely retighten the bolt after making the adjustment.

NOTE
The output voltage becomes higher when the throttle-position sensor is turned clockwise.
For removal and installation of throttle body, refer to "Engine Service Manual".

(6) Switch OFF the ignition switch.
(7) If the diagnostic trouble code is output while adjusting the throttle position sensor, use a scan tool to erase the diagnostic trouble code, or disconnect the battery cable from the negative terminal of the battery for more than 10 seconds and then reconnect the cable. (This will cancel the memory of the failure code due to throttle position sensor adjustment.)

CLOSED THROTTLE POSITION SWITCH (FIXED SAS) ADJUSTMENT M13FIDA





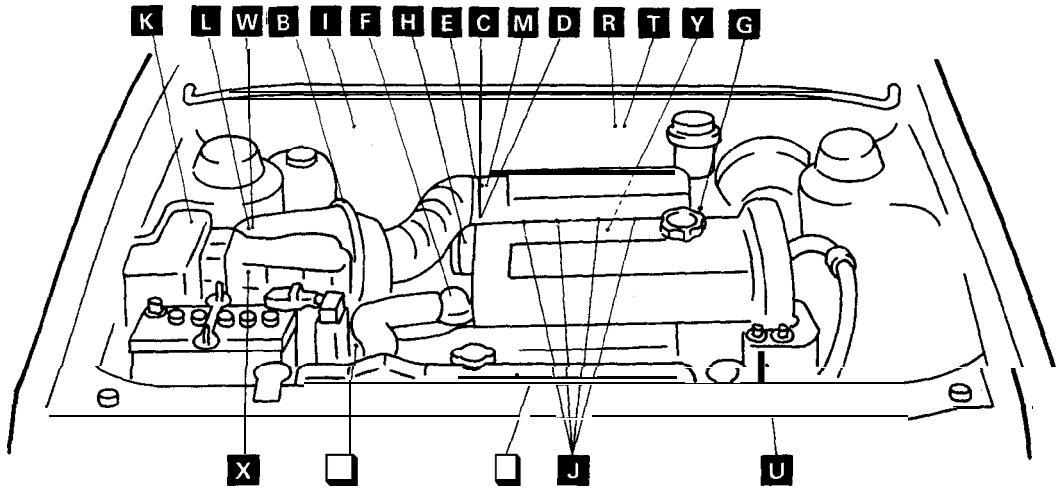
NOTE
1. The closed throttle position switch has been precisely adjusted by the manufacturer; it should not, therefore, be moved to another setting.
2. If however, the adjustment is for any reason accidentally disturbed, or the closed throttle position switch is replaced, make the necessary readjustment by following the steps below.

(1) Sufficiently relax the tension of the accelerator cable.
(2) Disconnect the connector of the closed throttle position switch (fixed SAS).
(3) Loosen the lock nut of the closed throttle position switch (fixed SAS).
(4) Turn the closed throttle position switch (fixed SAS) in the counter-clockwise direction until it is sufficiently loosened, and securely close the throttle valve fully.
(5) Connect an ohmmeter between the closed throttle position switch terminal and the body.
(6) Begin tightening the closed throttle position switch and locate the point at which the closed throttle position switch is switched ON (conductive with body). (This is the point at which the throttle valve begins to open.) From that point, then tighten the closed throttle position switch 15/16 turn.
(7) Securely tighten the lock nut while holding the closed throttle position switch so that it won't turn.
(8) Adjust the tension of the accelerator cable.
(9) Adjust the basic idling speed (engine speed adjusting screw). (P.13-245.)
(10) Adjust the throttle-position sensor. (P.13-248.)

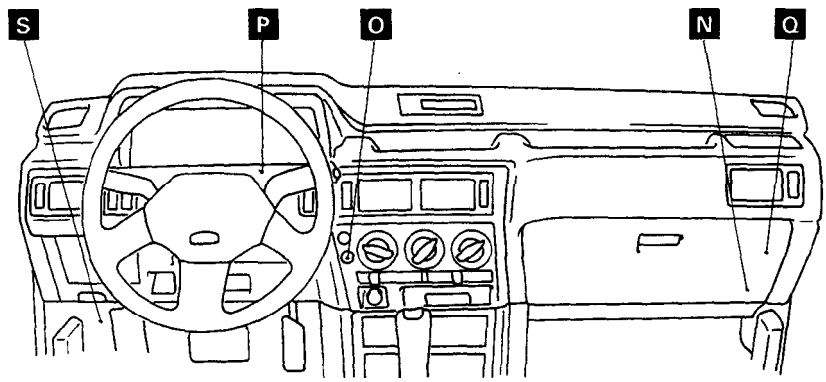
ON VEHICLE INSPECTION OF MFI COMPONENTS

M13YA-A

COMPONENT LOCATION



6EM0166



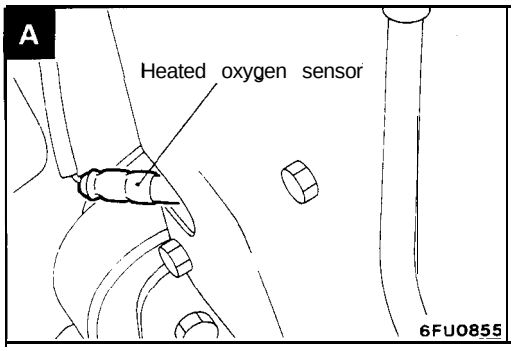
6FU0843

Name	Symbol
Air conditioning compressor clutch relay	K
Air conditioning switch	0
Closed throttle position switch (fixed SAS)	E
Crankshaft position sensor and camshaft position sensor	H
Data link connector	S
Engine control module	Q
Engine coolant temperature sensor	F
EGR solenoid	L
EGR temperature sensor	M
Evaporative emission purge solenoid	I
Fuel pressure solenoid	W
Fuel pump check terminal	T
Heated oxygen sensor	**A**
idle air control motor (stepper motor)	C
Ignition coil (ignition power transistor)	G
Ignition timing adjustment terminal	R
Injector	J
Knock sensor	Y
Multiport fuel injection relay	N
Park/neutral position switch <A/T>	V
Power steering pressure switch	U
Throttle position sensor	D
Turbocharger waste gate solenoid	X
Vehicle speed sensor (reed switch)	P
Volume air flow sensor (incorporating intake air temperature sensor and barometric pressure sensor)	B

NOTE
The "Name" column is arranged in alphabetical order.

TSB Revision

A



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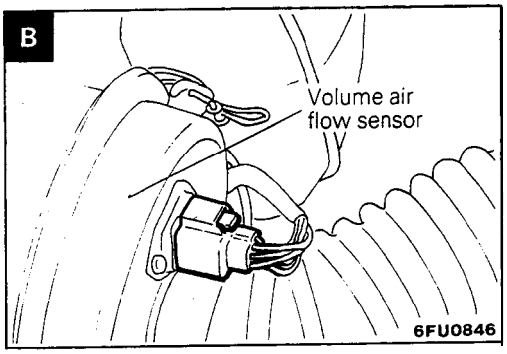

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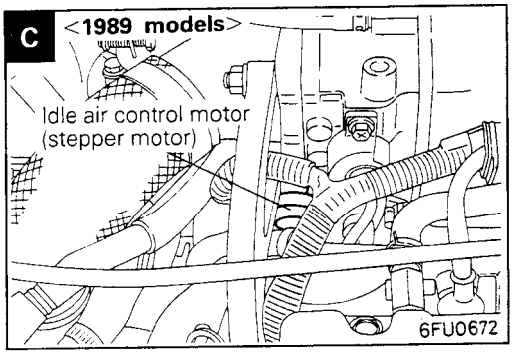

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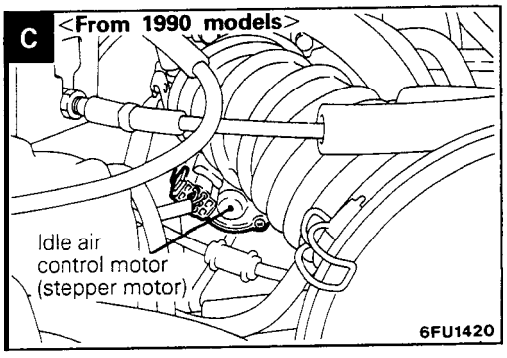

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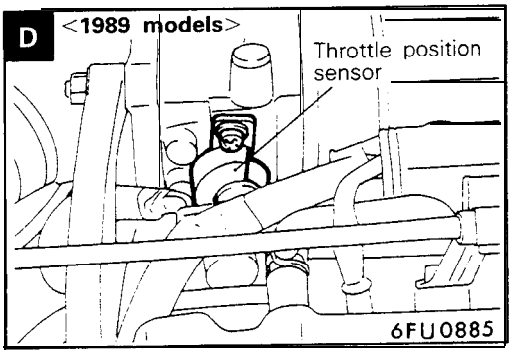

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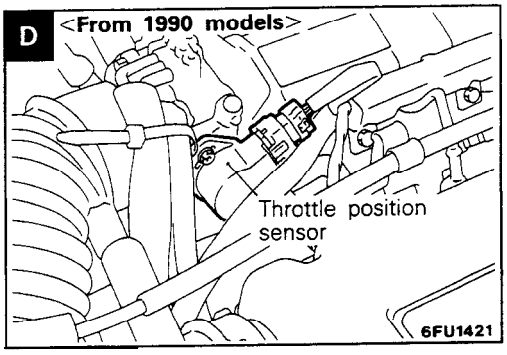

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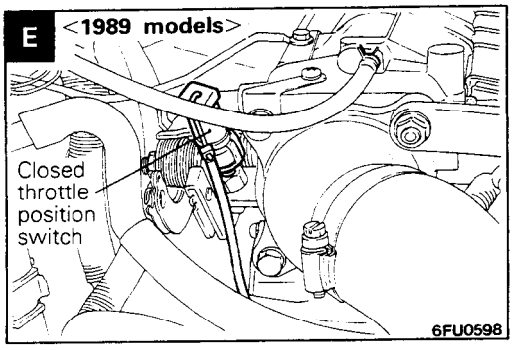

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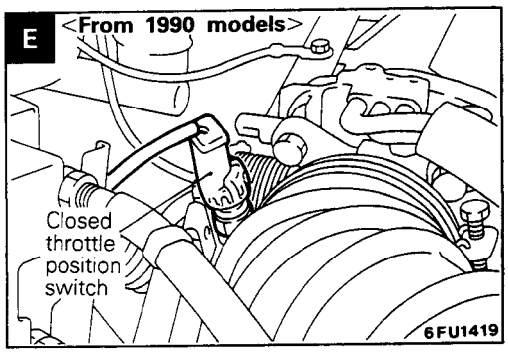

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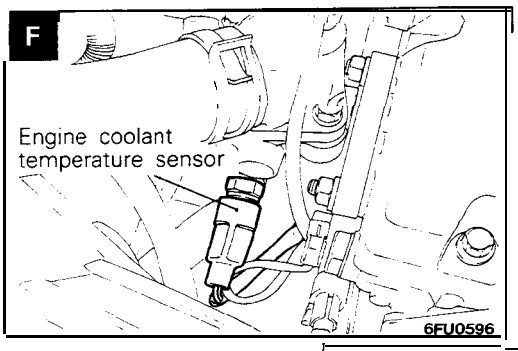

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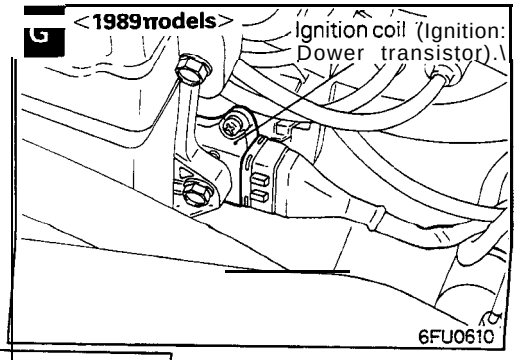

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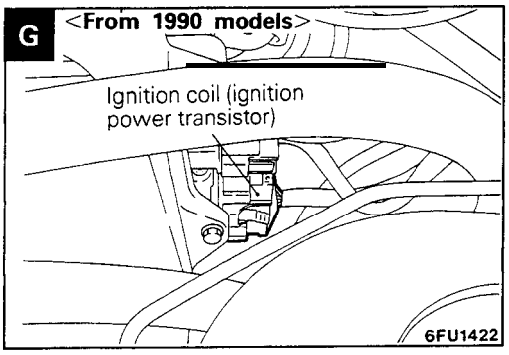

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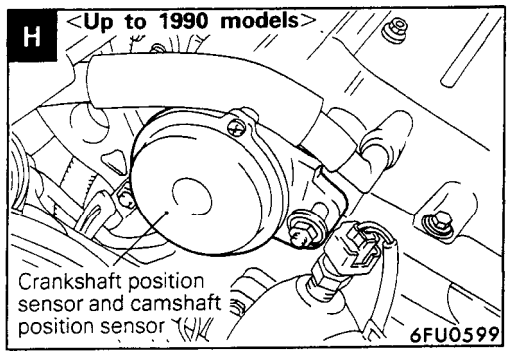

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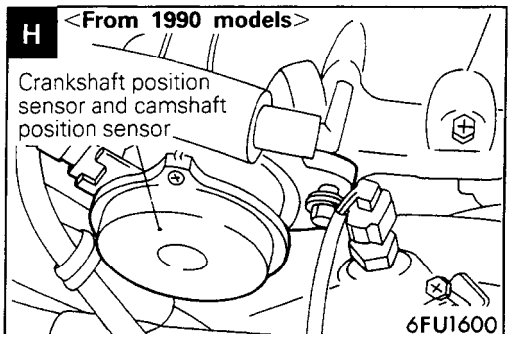

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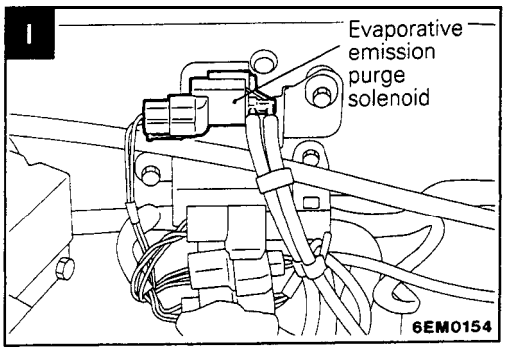

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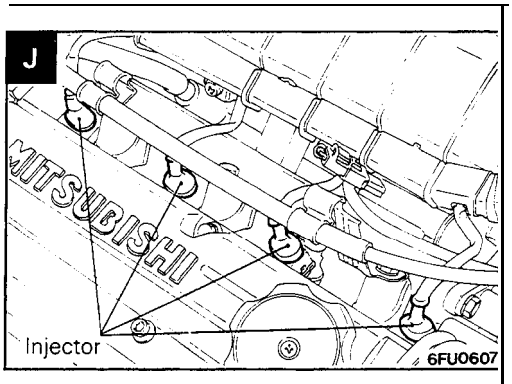

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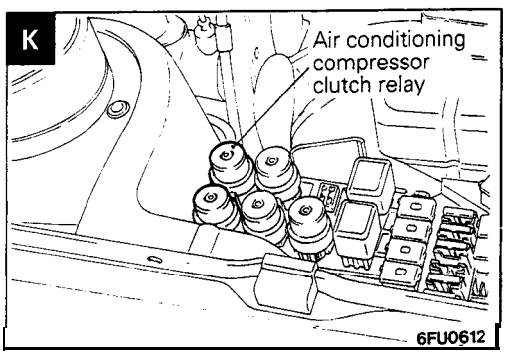

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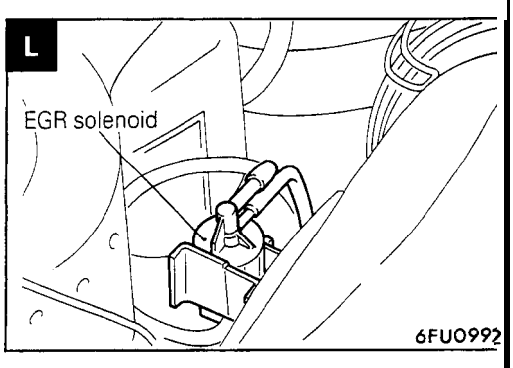

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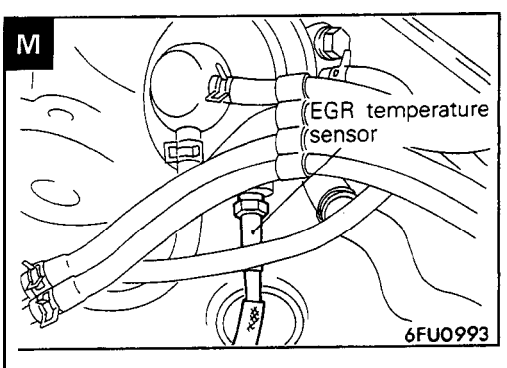

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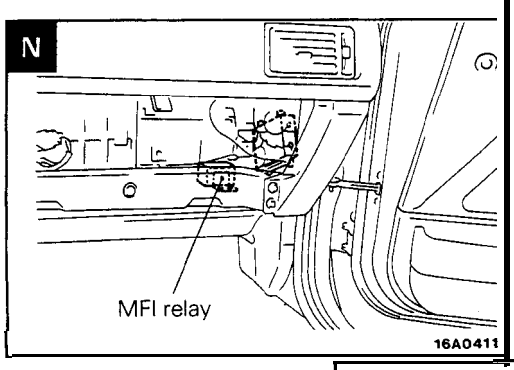

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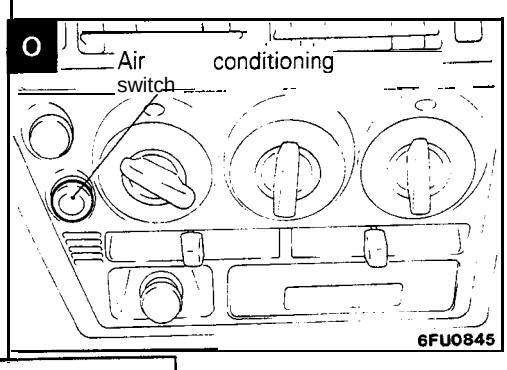

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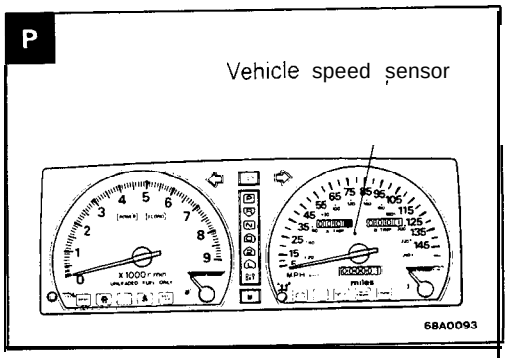

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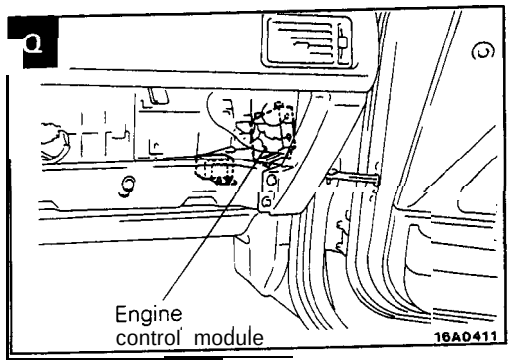

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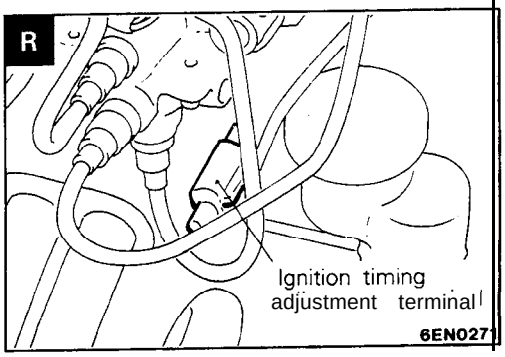

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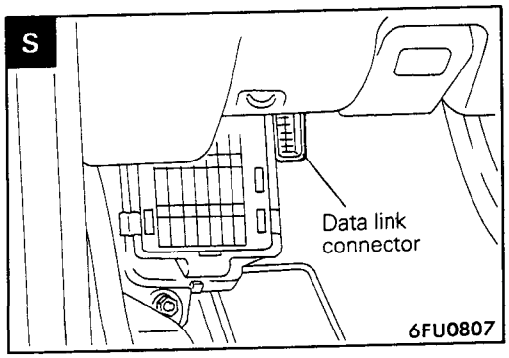

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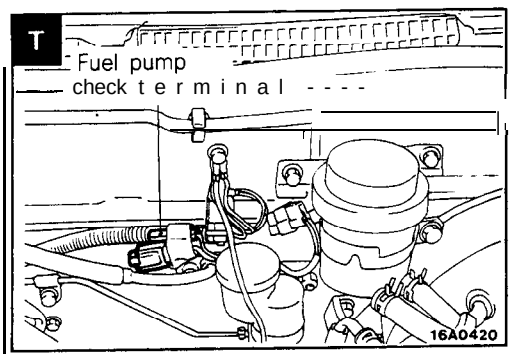

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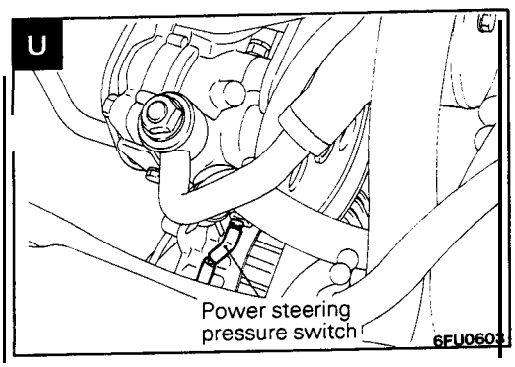

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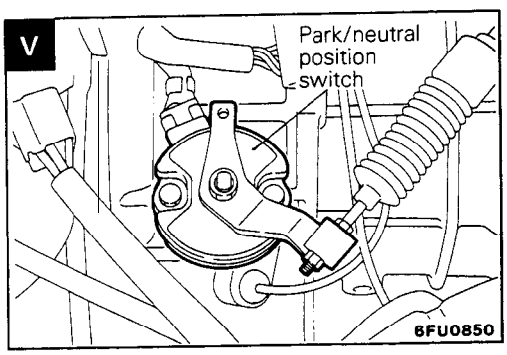

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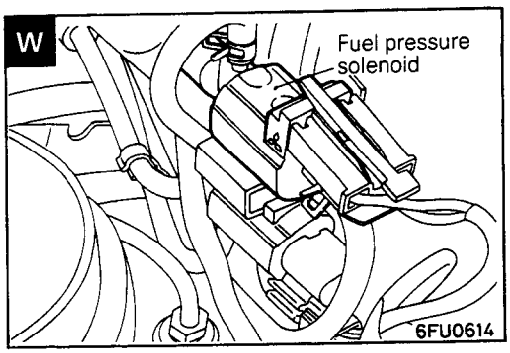

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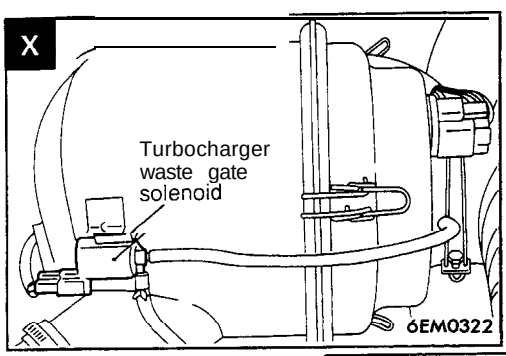

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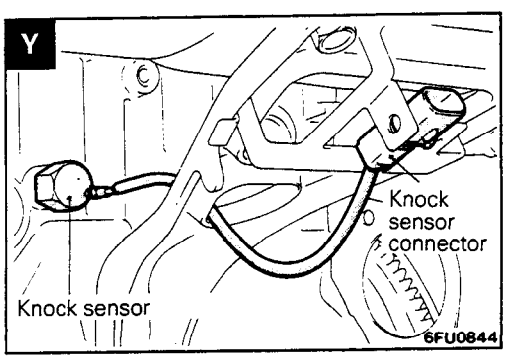


TSB Revision

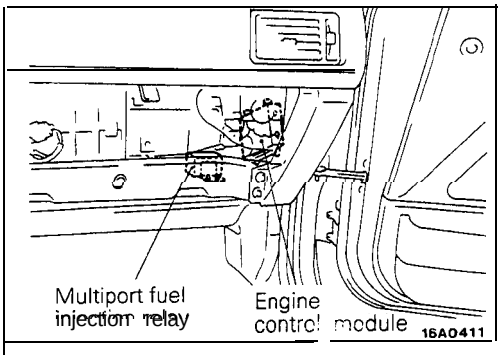
COMPONENTS INSPECTION PROCEDURE– Using Scan Tool

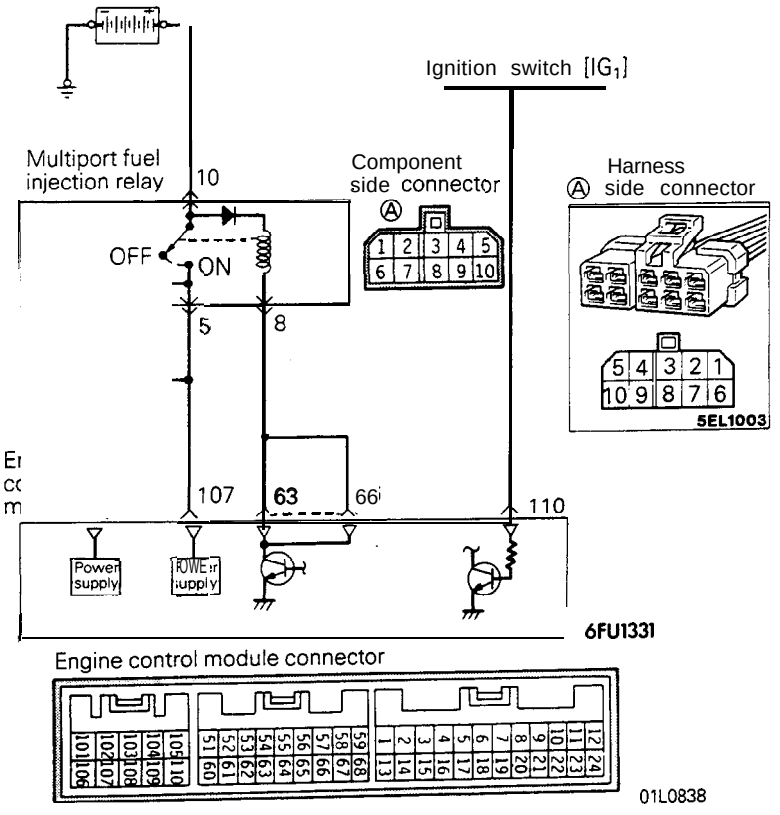
M13YBAGa

Refer to P.13-41.

POWER SUPPLY AND IGNITION SWITCH-IG

M13YCAB





OPERATION

- While the ignition switch is ON, battery power supply is supplied to the engine control module, injectors, volume air flow sensor, etc.
- When the ignition switch is switched ON, current flows from the ignition switch, via the multiport fuel injection relay coil to ground.

As a result, the multiport fuel injection relay switch is switched ON, and power is supplied, by way of the multiport fuel injection relay switch, from the battery to the engine control module.

INSPECTION

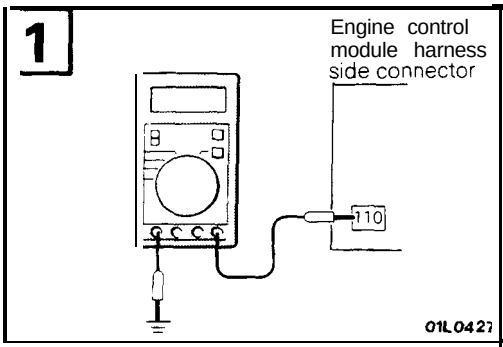
Using Scan tool

Function	Item No.	Data display	Check conditions	Standard value
Data reading	16	Engine control module power-supply voltage	Ignition switch: ON	Battery positive voltage

TSB Revision

HARNESS INSPECTION

1



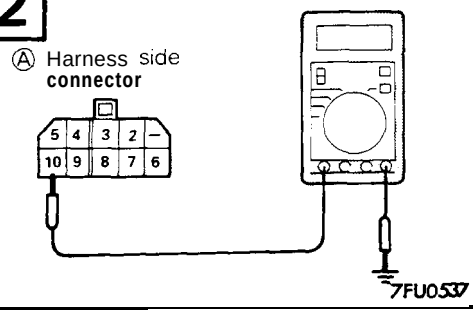
Measure the ignition switch terminal input voltage.
. Engine control module connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → STOP

NG → Repair the harness. (Ignition switch – 110)

2



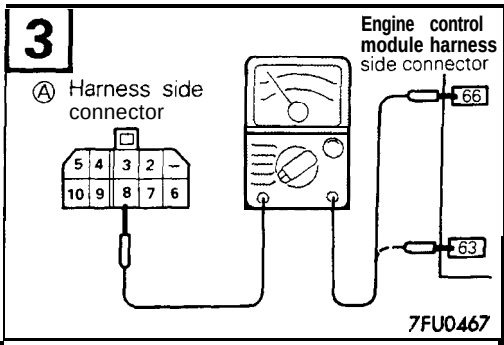
Measure the power supply voltage of the multiport fuel injection relay.
. Connector: Disconnected

Voltage (V)
Battery positive voltage

OK → 3

NG → Repair the harness. (Battery – Ⓐ10)

3

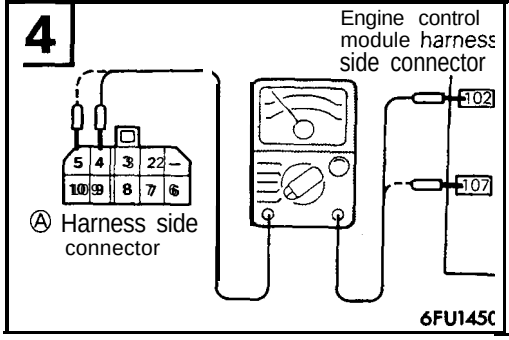


Check for an open-circuit, or a short-circuit to ground, between the engine control module and the multiport fuel injection relay.
. Engine control module connector: Disconnected
. Multiport fuel injection relay connector: Disconnected

OK → 4

NG → Repair the harness. (Ⓐ8 – 63, Ⓐ8 – 68)

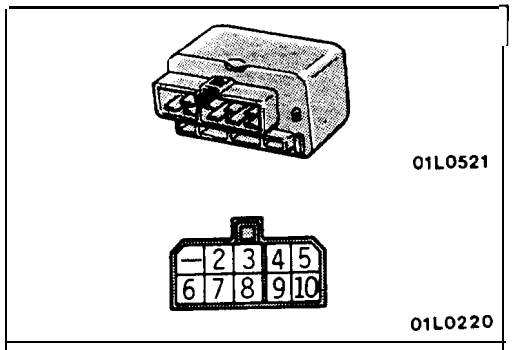
4



Check for an open-circuit, or a short-circuit to ground, between the engine control module and the multiport fuel injection relay.
. Multiport fuel injection relay connector: Disconnected
. Engine control module connector: Disconnected

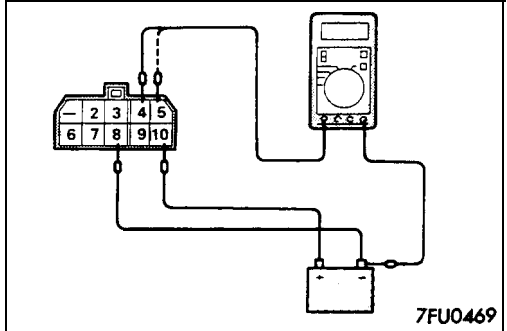
OK → STOP

NG → Repair the harness. (Ⓐ4, 5 – 102, 107)



MULTIPORT FUEL INJECTION RELAY INSPECTION

(1) Remove the multiport fuel injection relay.

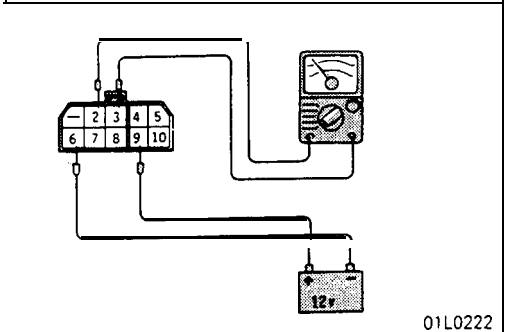


(2) Use jumper wires and connect multiport fuel injection relay terminal ⑩ to the battery ⊕ terminal and terminal ⑧ to the battery ⊖ terminal.

Caution
Be very careful when connecting the jumper wires because the relay will be damaged if a mistake is made with the contact terminals.

(3) With battery ⊖ terminal jumper wire connected and disconnected, measure the voltage at multiport fuel injection relay terminals ④ and ⑤.

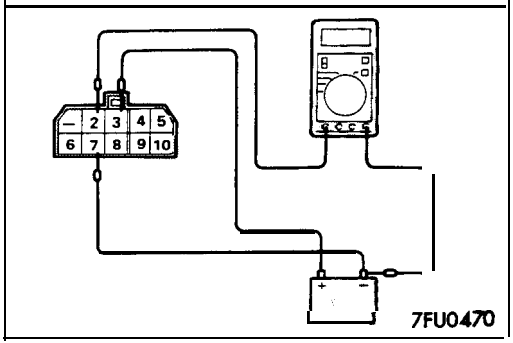
Jumper wire	Terminal voltage ④	Terminal voltage ⑤
Connection	Battery positive voltage	Battery positive voltage
Not connected	0V	0V



(4) Use jumper wires to connect multiport fuel injection relay terminal ⑨ to the battery ⊕ terminal and terminal ⑥ to the battery ⊖ terminal.

(5) Disconnecting the jumper wire on the terminal ⊖ side of the battery, check whether or not continuity exists across terminals ② and ③ of the multiport fuel injection relay.

Jumper wire	Continuity between terminals ②–③
Connection	Yes
Not connected	No



(6) Use jumper wires and connect multiport fuel injection relay terminal ③ to the battery ⊕ terminal and terminal ⑦ to the battery ⊖ terminal.

(7) With the battery ⊖ terminal jumper wire connected and disconnected, measure the voltage at multiport fuel injection relay terminal ②.

Jumper wire	Terminal Voltage ②
Connection	Battery positive voltage
Not connected	OV

(8) Replace the multiport fuel injection relay if faulty

ENGINE CONTROL MODULE POWER GROUND

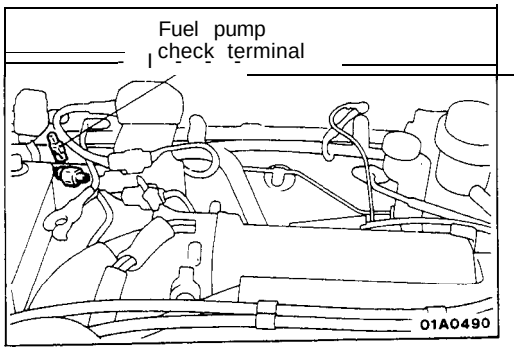
M13YDDAAa

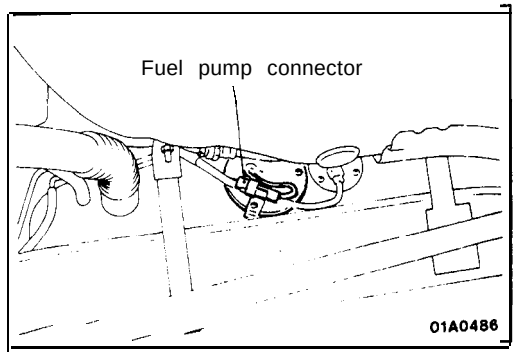
Refer to P.13-45.

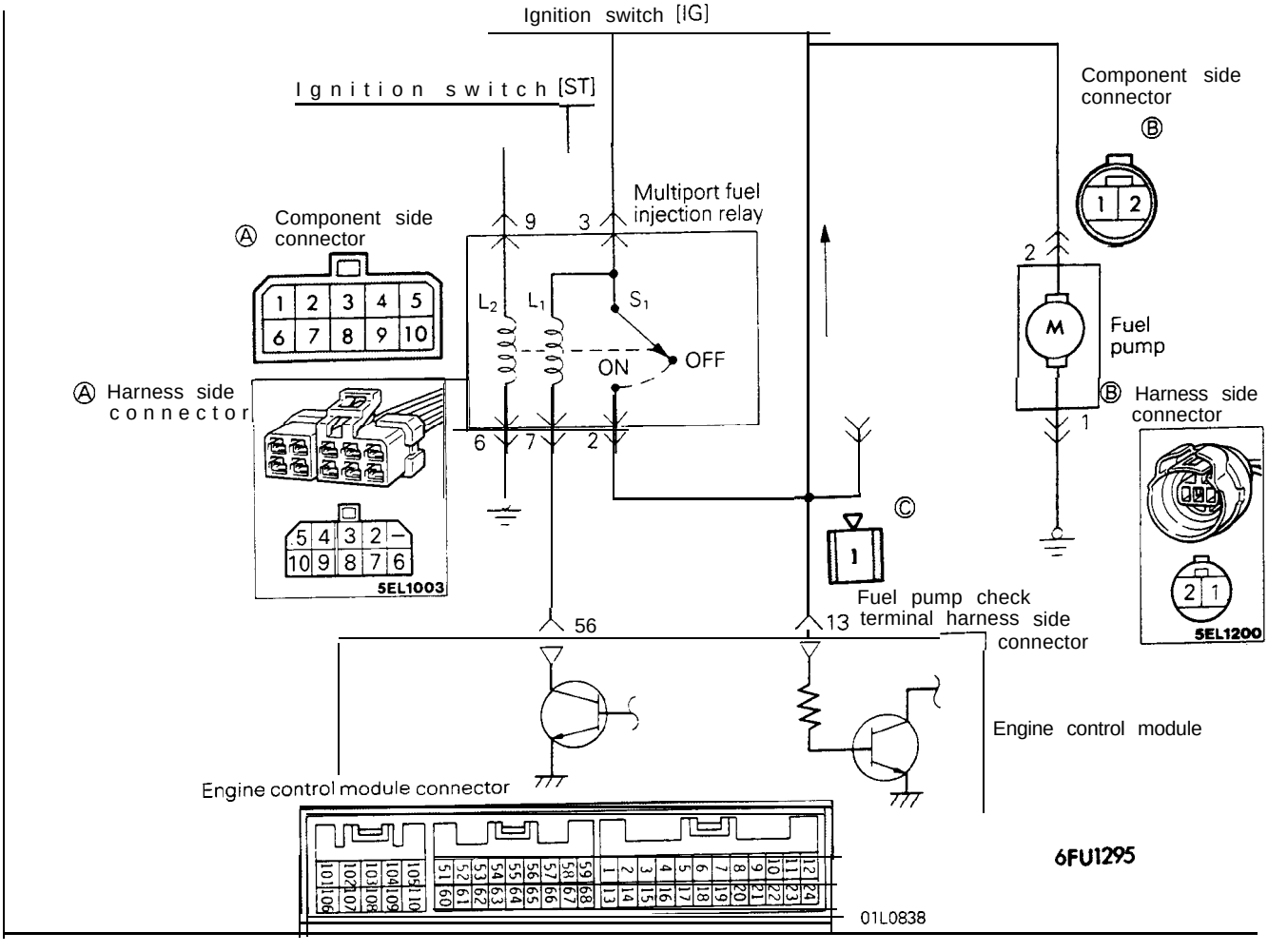
TSB Revision

M13YEABa

FUEL PUMP







OPERATION

- Activates the fuel pump during engine cranking and while the engine is running.
- When the ignition switch is set to the START position, the current flows, by way of the multiport fuel injection relay coil, from the ignition switch to ground. As a result, the multiport fuel injection relay switch is switched ON, and the power for activation of the fuel pump is supplied, by way of the multiport fuel injection relay switch, from the battery to the fuel pump.
- While the engine is running, the engine control module switches ON the power transistor, after which current flows to the multiport fuel injection relay coil, and the power for activation of the fuel pump is supplied to the fuel pump.
- When the multiport fuel injection relay switch is switched ON, battery voltage is also applied to the engine control module, and so the engine control module detects the fact that the power for activation of the fuel pump is being supplied to the fuel pump.

TSB Revision

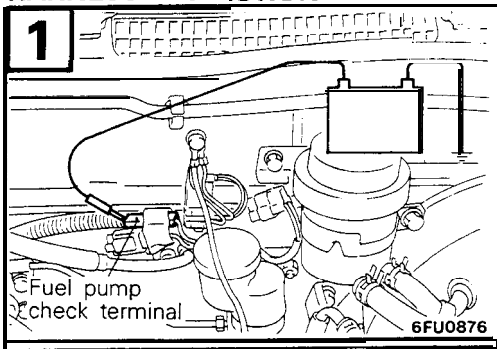
INSPECTION

Using Scan tool

Function	Item No.	Actuation	Inspection conditions	Description	Normal condition
Actuator test	07	Actuates fuel pump, circulating fuel.	. Engine cranking . Fuel pump forced activation The inspection should be conducted for both of the above conditions.	Hold the return hose between two fingers so as to feel the pulsation of the flowing of fuel.	Pulsation can be felt.
				Listen to the pump sound at a place near the fuel tank.	Pump sound can be heard.

HARNESS INSPECTION

1

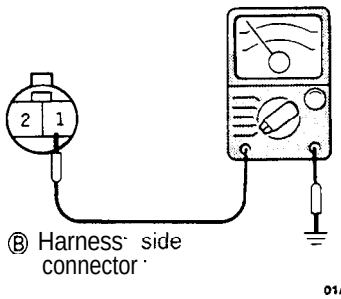


Check the fuel pump.
. Apply battery voltage to the checking terminal and operate the pump.

OK → 4

NG → 2

2

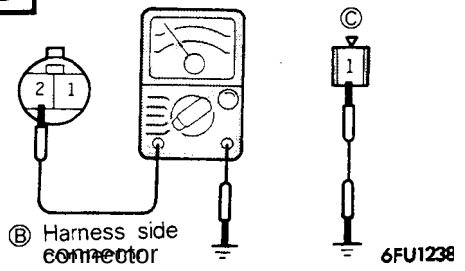


Check the ground circuit of the fuel pump.
Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓑ1 – Ground)

3

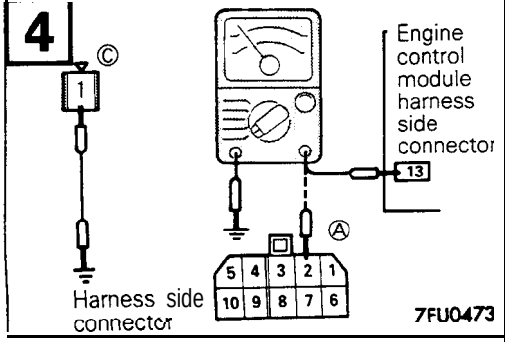


Check for continuity between the fuel pump and the checking terminal.
· Connector: Disconnected

OK → 4

NG → Repair the harness. (Ⓑ2 – Ⓒ1)

4



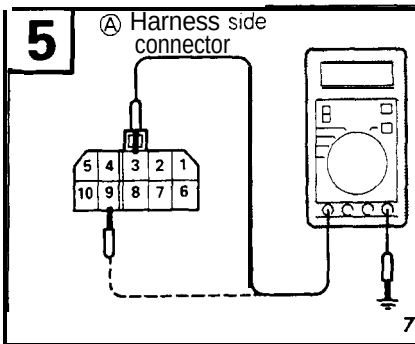
Check for continuity between the checking terminal and the engine control module, and between the multiport fuel Injection relay terminals.
·Multiport fuel injection relay connector: Disconnected
· Engine control module connector: Disconnected
· Fuel pump connector: Disconnected

OK → 5

NG → Repair the harness. (Ⓐ2 – Ⓒ1, Ⓒ1 – 13)

TSB Revision

5

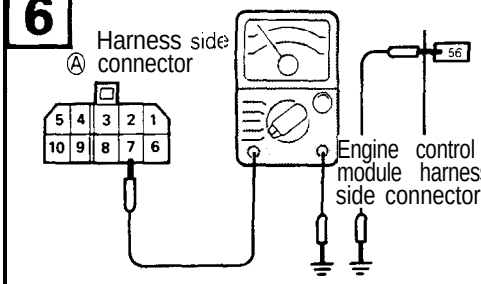


Measure the power supply voltage of the multiport fuel injection relay ignition switch.
Connector: Disconnected
. Ignition switch: START (Ⓐ9 when checked)
. Ignition switch: ON (Ⓐ3 when checked)

Voltage (V)
8 or more

OK → 6
Repair the harness. (Ignition switch [ON] – Ⓐ3 Ignition switch [ST] – Ⓐ9)

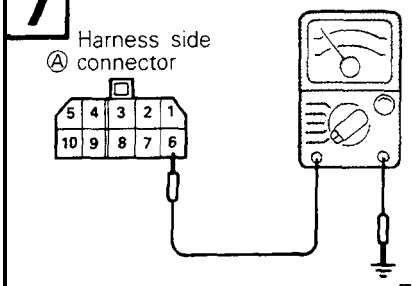
6



Check for an open-circuit, or a short-circuit, to ground between the multiport fuel injection relay and the engine control module.
. Multiport fuel injection relay connector: Disconnected
. Engine control module connector: Disconnected

OK → 7
Repair the harness. (Ⓐ7 – 56)

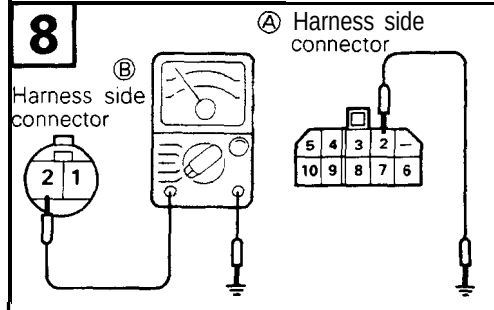
7



Check for continuity, of the ground circuit.
. Connector: Disconnected.

OK → 8
Repair the harness. (Ⓐ6 – Ground)

8



Check for an open-circuit, or a short-circuit to ground, between the multiport fuel injection relay and the fuel pump.
- Multiport fuel injection relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → STOP
Repair the harness. (Ⓐ2 – Ⓑ2)

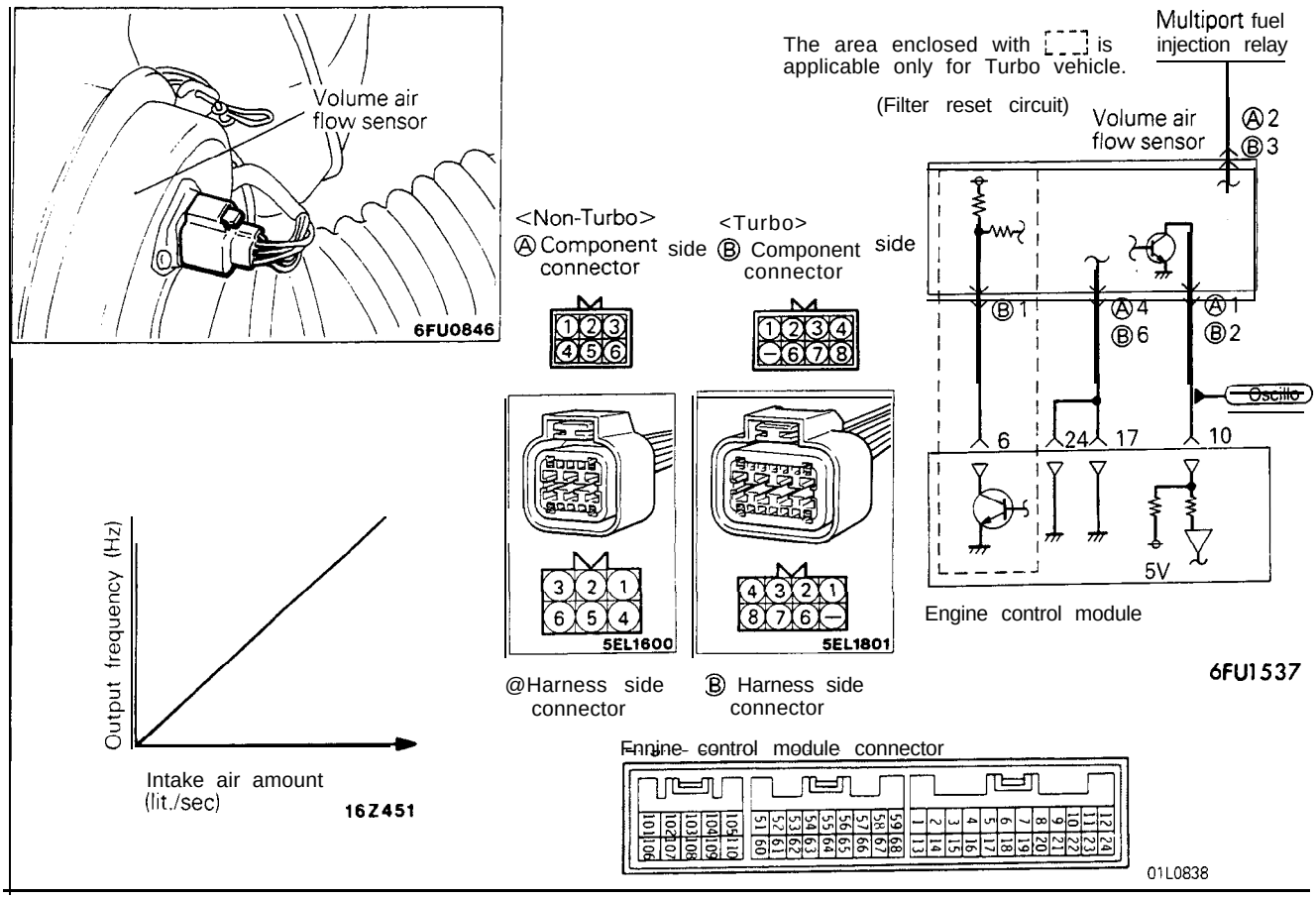
MULTIPORT FUEL INJECTION RELAY INSPECTION

Refer to P. 13-257.

TSB Revision

VOLUME AIR FLOW SENSOR

M13YFAAa



OPERATION

- The volume air flow sensor is incorporated within the air cleaner; it functions to convert the amount of engine air intake to pulse signals of a frequency proportional to the amount of engine air intake, and to input those/signals to the engine control module. The engine control module then, based upon those signals, calculates the amount of fuel injection, etc.
- The power for the volume air flow sensor is supplied from the multiport fuel injection relay to the volume air flow sensor, and is grounded at the engine control module. The volume air flow sensor, by intermitting the flow of the 5V voltage applied from the engine control module, produces pulse signals.

TROUBLESHOOTING HINTS

HINT 1:

If the engine sometimes stalls, try starting the engine and shaking the volume air flow sensor harness.

If the engine then stalls, incorrect or improper contact of the volume air flow sensor connector is the probable cause.

Hint 2:

If, when the ignition switch is switched ON (but the engine is not started), the volume air flow sensor output frequency is any value other than zero, a malfunction of the volume air flow sensor or of the engine control module is the probable cause.

Hint 3:

If idling is possible even though the volume air flow sensor output frequency is deviated from the standard value, the cause is usually a malfunction other than of the volume air flow sensor.

Examples:

(1) The flow of air within the volume air flow sensor is disturbed. (Air duct disconnection or clogged air cleaner element)
(2) Incomplete combustion within a cylinder. (Malfunction of spark plugs, ingnition coil, injectors, compression pressure, etc.)
(3) Air is taken into the intake manifold through a leaking gasket, etc.
(4) Incomplete close contact of the EGR valve seat.

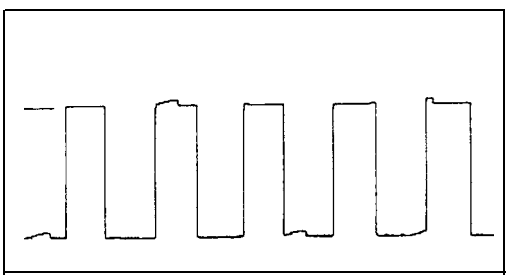
TSB Revision

INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	12	Sensor detection air volume (frequency)	. Engine coolant temperature: 85–95°C (185–205°F) . Lights, cooling fan, electrical accessories: OFF . Transaxle: neutral (A/T models: "P" range)	Idling	25–50 Hz <Non-Turbo> 30–50 Hz <Turbo>
				2,000 rpm	60–90 Hz <Non-Turbo> 50–80 Hz <Turbo>
				Racing	Frequency increases as racing rpm increases.

NOTE
The volume air flow sensor output frequency may be about 10% higher than indicated above when the vehicle is new [driven approximately 500 km (300 miles) or less].

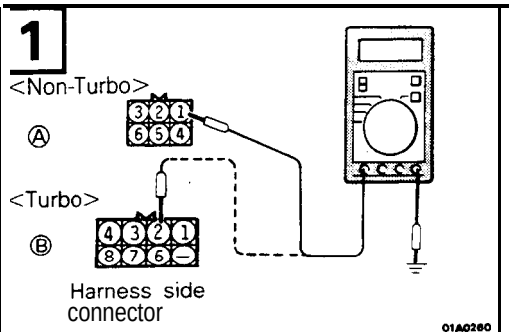

Regular waveform 03A0203

Using Oscilloscope

(1) Run the engine at idle speed.
(2) Connect the probe to the osilloscope pick-up point as shown in the circuit diagram, and check the wave form.

HARNESS INSPECTION

1



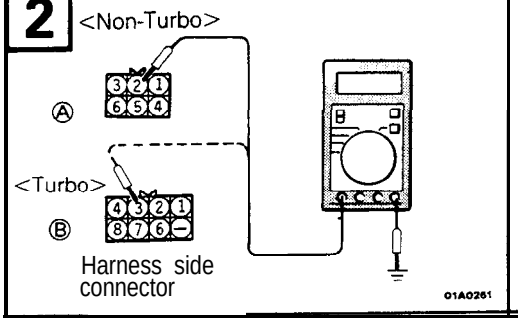
Measure the terminal voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4.8–5.2

OK → **2**

NG → Repair the harness. (Ⓐ1–10 Ⓑ2–10)

2 <Non-Turbo>



Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

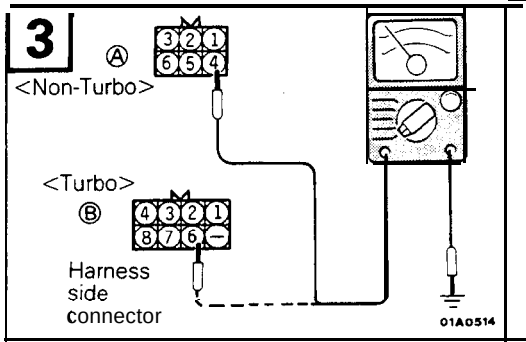
Voltage (V)
Battery positive voltage

OK → **3**

NG → Repair the harness. (Ⓐ2–Multiport fuel injection relay Ⓑ3–Multiport fuel injection relay) or check the multiport fue injection relay.

TSB Revision

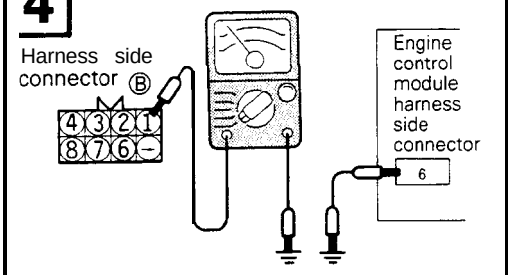
3



Check for continuity of the ground circuit of the VAF sensor.
. Connector: Disconnected

OK → <Non-Turbo> STOP
OK → <Turbo> 4 (Ⓐ4–17, 24 Ⓑ6–17, 24)

4

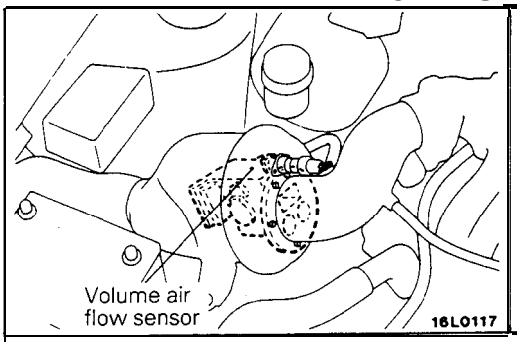


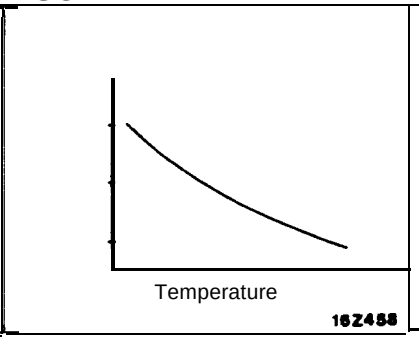
Check for continuity between the engine control module and volume air flow sensor.
. Engine control module connector: Disconnected
• Volume air flow sensor connector: Disconnected

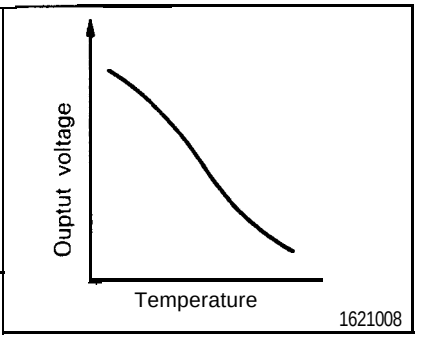
OK → A STOP
OK → Repair the harness. (Ⓑ1–6)

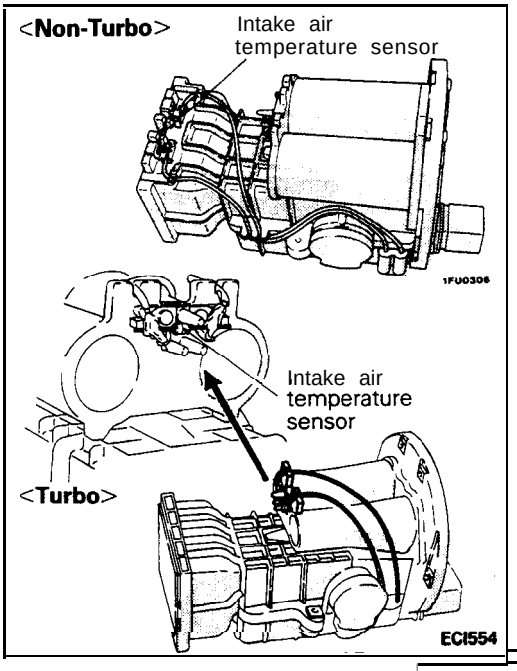
INTAKE AIR TEMPERATURE SENSOR

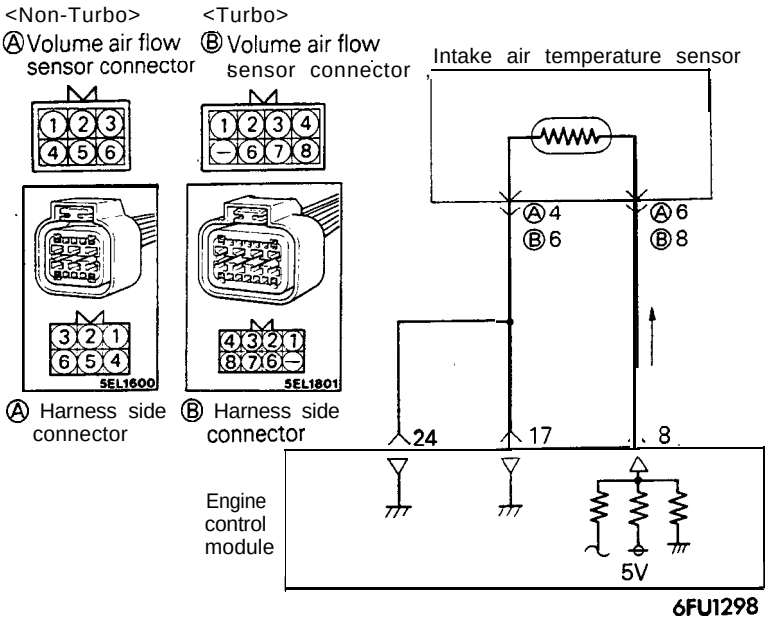
M13YGAA1











TSB Revision

OPERATION

- The intake air temperature sensor functions to convert the temperature of the air (intaken to the engine) to voltage, and to input that voltage (as signals) to the eingine control module. The engine control module, based upon those signals, then corrects the amount of fuel injection, etc.
- The 5V power supply within the engine control module is supplied, by way of the resistance within the unit, to the intake air temperature sensor; it passes through the intake air temperature sensor, which is a type of resistor, and is grounded at the engine control module.

Note that the resistance of the intake air temperature sensor decreases when the temperature of the intake air increases.

* The intake air temperature sensor terminal voltage becomes higher when the resistance of the intake air temperature sensor increases, and becomes lower when the resistance decreases. Consequently, the intake air temperature sensor terminal voltage varies in accordance with the temperature of the intake air, becoming lower when the temperature of the intake air increases.

TROUBLESHOOTING HINTS

Because the intake air temperature sensor detects the temperature of the intake air in the air cleaner, it indicates a temperature different than the temperature of the outside air when the engine is running.

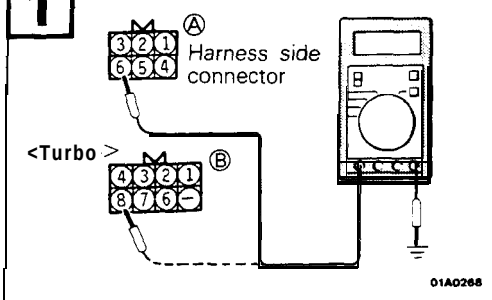
INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Intake air temp.	Standard value
Data reading	13	Sensor detection temperature	Ignition switch: ON Or, engine running	At −20°C (−4°F)	−20°C
				At 0°C (32°F)	0°C
				At 20°C (68°F)	20°C
				At 40°C (104°F)	40°C
				At 80°C (176°F)	80°C

HARNESS INSPECTION

1 <Non-Turbo>



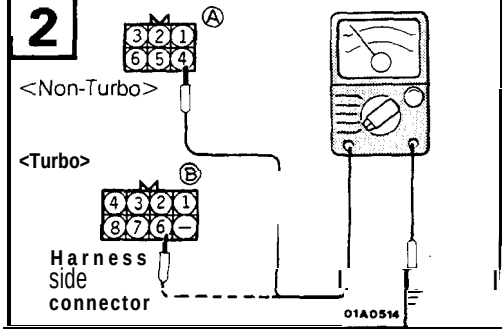
Measure the power supply voltage.
· Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4.5–4.9

OK → 2

OK → Repair the harness. (Ⓐ6–8 Ⓑ8–8)

2

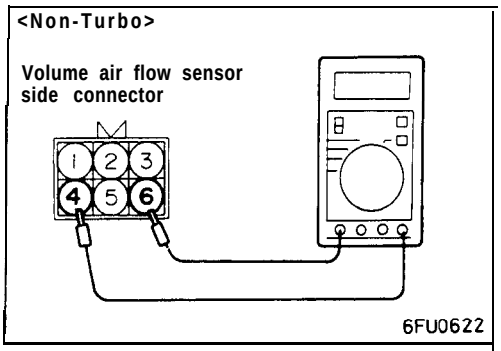


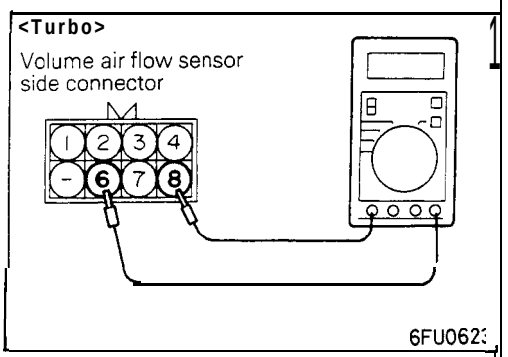
Check for continuity of the ground circuit of the intake air temperature sensor.
. Connector: Disconnected

OK → STOP

OK → Repair the harness. (Ⓐ4–17, 24 Ⓑ6–17, 24)

TSB Revision

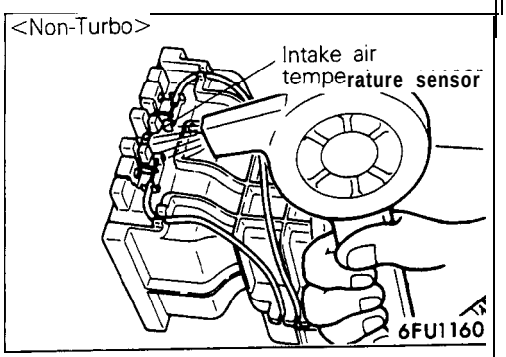




SENSOR INSPECTION

(1) Disconnect the volume air flow sensor connectors.
(2) Measure resistance between terminals ④ and ⑥. <Non-Turbo>
(3) Measure resistance between terminals ⑥ and ⑧. <Turbo>

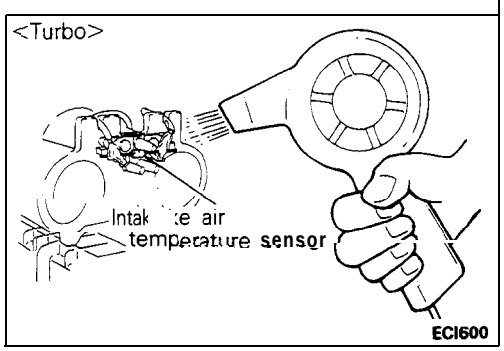
Temperature °C (°F)	Resistance (kΩ)
0 (32)	6.0
20 (68)	2.7
80 (176)	0.4



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

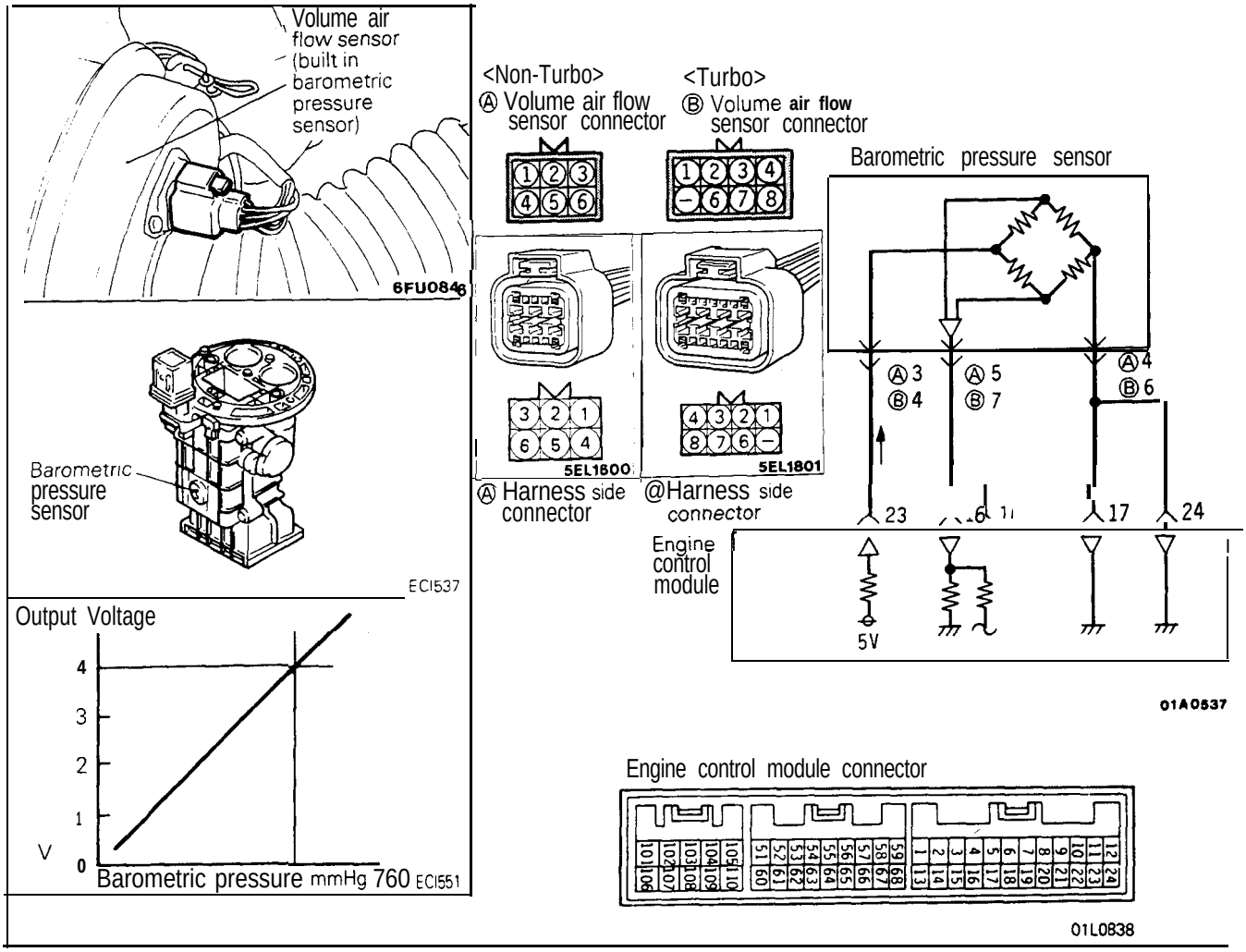
Temperature °C (°F)	Resistance (kΩ)
Higher	Smaller

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



BAROMETRIC PRESSURE SENSOR

M13YHAA1



OPERATION

- The barometric-pressure sensor functions to convert the barometric pressure to voltage, and to input that voltage (as signals) to the engine control module.
  The engine control module, based upon those signals, then corrects the amount of fuel injection, etc.
- The 5V power supply within the engine control module is supplied to the barometric-pressure sensor; it passes through the circuitry within the sensor, and is grounded at the engine control module.
- The barometric-pressure sensor output voltage is sent to the engine control module in proportion to the barometric pressure (absolute pressure).

TROUBLESHOOTING HINTS

Hini 1:
If there is a malfunction of the barometric-pressure sensor, driveability of the vehicle will become worse particularly at high altitude.

Hint 2:
If. during high-speed driving, there is a noticeable sharp drop of the displayed pressure of the barometric-pressure sensor, check for clogging of the air cleaner.

TSB Revision

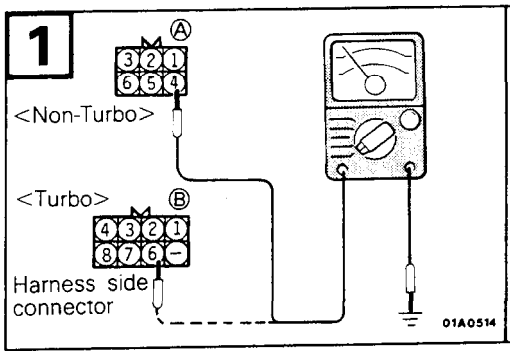
INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Altitude	Standard value
Data reading	25	Sensor detection pressure	Ignition switch: ON	At 0 m (0 ft.)	760 mmHg
				At 600 m (1,969 ft.)	710 mmHg
				At 1,200 m (3,937 ft.)	660 mmHg
				At 1,800 m (5,906 ft.)	610 mmHg

HARNESS INSPECTION

1

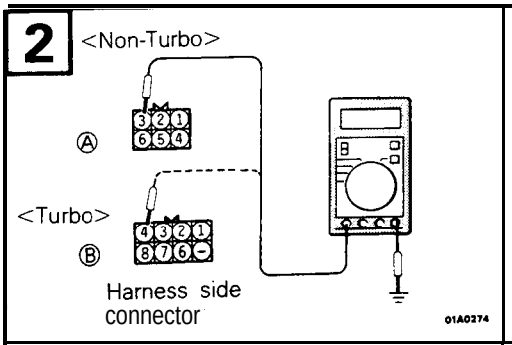


Check for continuity of the ground circuit.
. Connector: Disconnected

OK → **2**

NO → Repair the harness. (Ⓐ4–17, 24 Ⓑ6–17, 24)

2



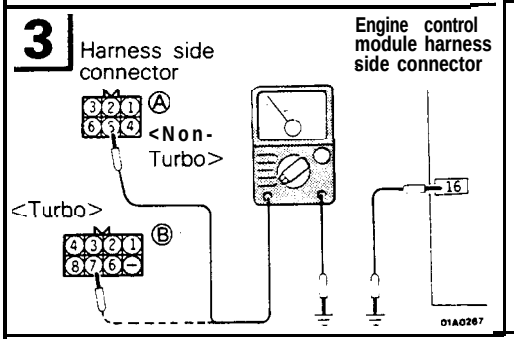
Measure the power supply voltage of the barometric pressure sensor.
· Connector: Disconnected
· Ignition switch: ON

Voltage (V)
4.8–5.2

OK → **3**

NO → Repair the harness. (Ⓐ3–23 Ⓑ4–23)

3



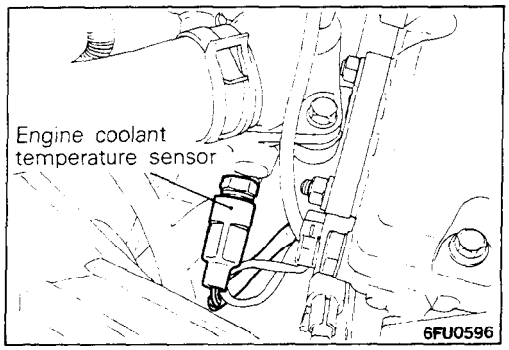
Check for an open-circuit, or a short-circuit to ground, between the engine control module and the barometric pressure sensor.
. Volume air flow sensor connector: Disconnected
· Engine control module connector: Disconnected

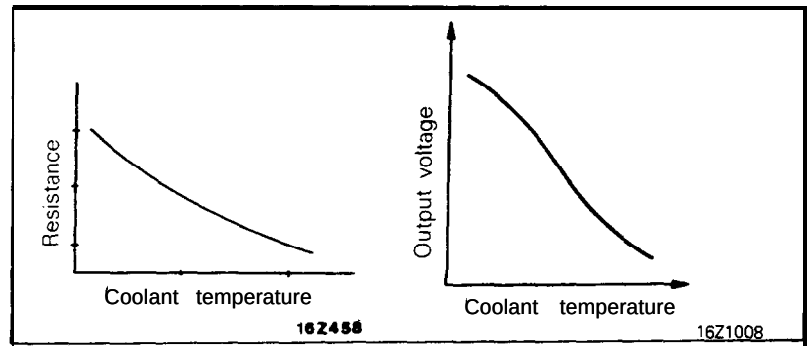
OK → STOP

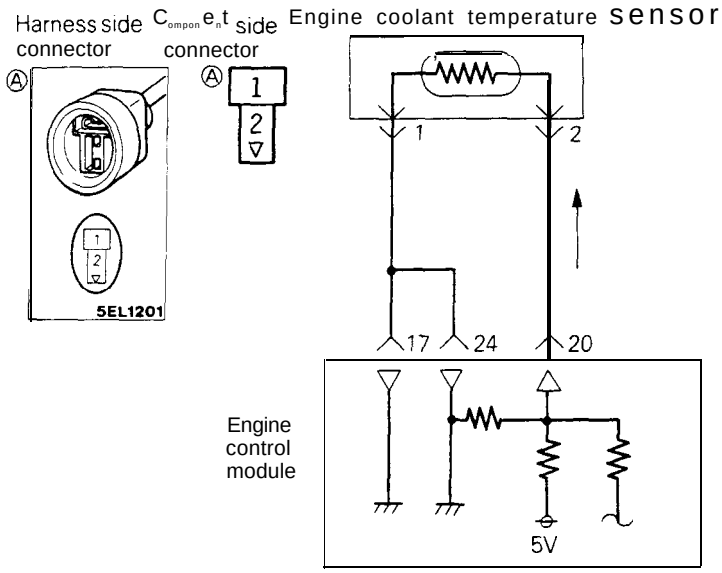
NO → Repair the harness. (Ⓐ5–16 Ⓑ7–16)

ENGINE COOLANT TEMPERATURE SENSOR

M13YIAB1







OPERATION

- The engine coolant temperature sensor functions to convert the barometric pressure to voltage, and to input that voltage (as signals) to the engine control module.
  The engine control module, based upon those signals, regulates the amount of fuel injection and the fast-idling speed when the engine is cold.
- The 5V power supply within the engine control module is supplied, by way of the resistance within the unit, to the engine coolant temperature sensor; it passes through the engine coolant temperature sensor, which is a type of resistor, and is grounded at the engine control module.
  Note that the resistance of the engine coolant temperature sensor decreases when the temperature of the coolant increases.
- The engine coolant temperature sensor terminal voltage becomes higher when the resistance of the engine coolant temperature sensor increases, and becomes lower when the resistance decreases. Consequently, the engine coolant temperature sensor terminal voltage varies in accordance with the temperature of the coolant, becoming lower when the temperature of the coolant increases.

TROUBLESHOOTING HINTS

If, during engine warm-up, the fast-idling speed is not correct, or black smoke is emitted, the problem is usually a malfunction of the engine coolant temperature sensor.

TSB Revision

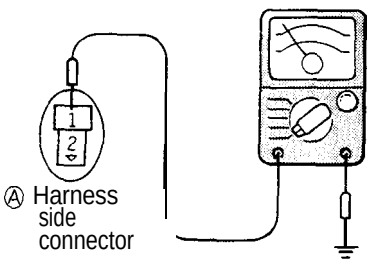
INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Coolant temperature	Standard value
Data reading	21	Sensor detection temperature	Ignition switch: ON Or, engine running	At −20°C (−4°F)	−20°C
				At 0°C (32°F)	0°C
				At 20°C (68°F)	20°C
				At 40°C (104°F)	40°C
				At 80°C (176°F)	80°C

HARNESS INSPECTION

1



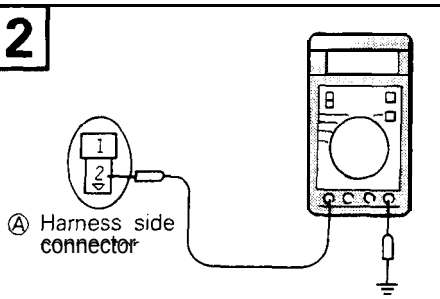
01L0463

Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 2

~~OK~~ → Repair the harness. (Ⓐ1–17, 24)

2



01L0461

Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4.5-4.9

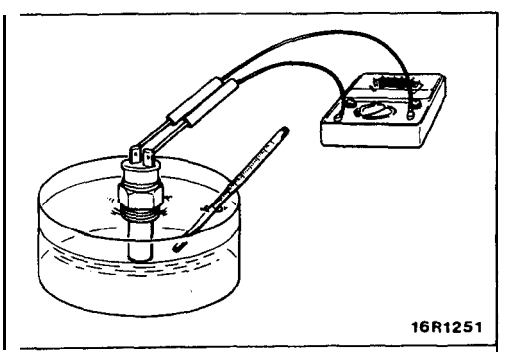
OK → STOP

~~OK~~ → Repair the harness. (Ⓐ1–20)

SENSOR INSPECTION

(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.



16R1251

Temperature °C (°F)	Resistance (kΩ)
0 (32)	5.9
20 (68)	2.5
40 (104)	1.1
80 (176)	0.3

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

INSTALLATION

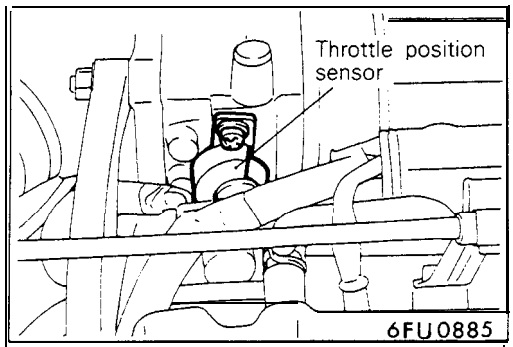
(1) Apply sealant 3M NUT locking No.4171 or equivalent to threaded portion.
(2) Install engine coolant temperature sensor and tighten it to specified torque.

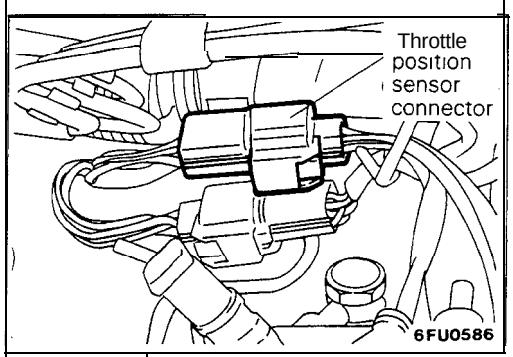
Sensor tightening torque:
20–40 Nm (15-29 ft.lbs.)

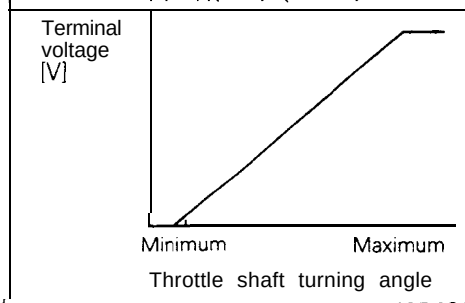
(3) Fasten harness connectors securely.

THROTTLE POSITION SENSOR <1989 models>

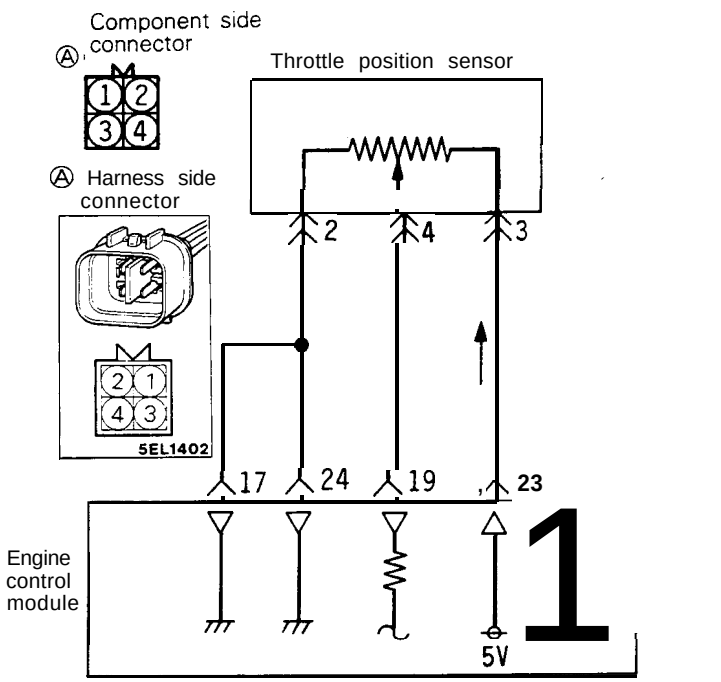
M13YJAE1



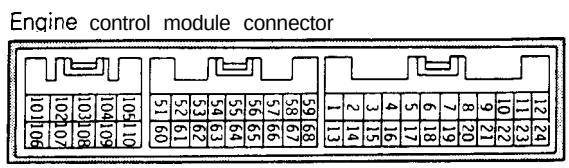




16Z461



01A0527



01L0838

OPERATION

- The throttle-position sensor functions to convert the degree of opening of the throttle valve to voltage, and to input that voltage (as signals) to the engine control module. The engine control module, based upon those signals, then regulates the amount of fuel injection, etc.
- The 5V power supply within the engine control module is supplied to the throttle-position sensor, after which it passes through the resistance within the sensor and is grounded at the engine control module.
- When the throttle valve shaft is rotated all the way from the idling position to the fully open position, the resistance between the throttle-position sensor's variable-resistance terminal and the ground terminal also increases in accordance with that rotation, and, as a result, the voltage of the throttle-position sensor's variable-resistance terminal also becomes higher in accordance with that rotation.

TSB Revision

TROUBLESHOOTING HINTS

Hint 1:
The signals of the throttle-position sensor are more important for control of the automatic transaxle than for control of the engine; shifting "impact shocks" are produced if there is a malfunction of the throttle-position sensor.

Hint 2:
If the voltage of the throttle-position sensor deviates from the standard value, check once again after making the throttle-position sensor adjustment. In addition, if there are any indications that the fixed SAS has been moved, adjust the fixed SAS.

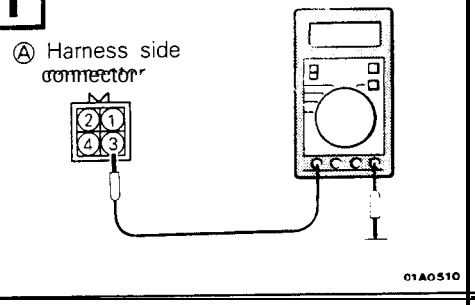
INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Throttle valve	Standard value
Data reading	14	Sensor detection voltage	Ignition switch: ON	To idle position	450–550 mV
				Gradually opening	Becomes higher proportional to valve opening.
				To fully open	4,500–5,500 mV

HARNESS INSPECTION

1



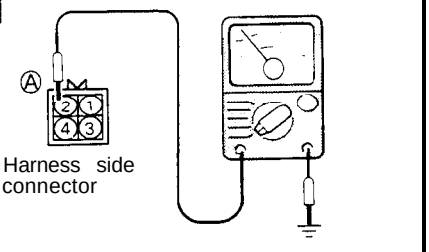
Measure the power supply voltage of the TPS.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 2

NG → Repair the harness. (Ⓐ1–23)

2

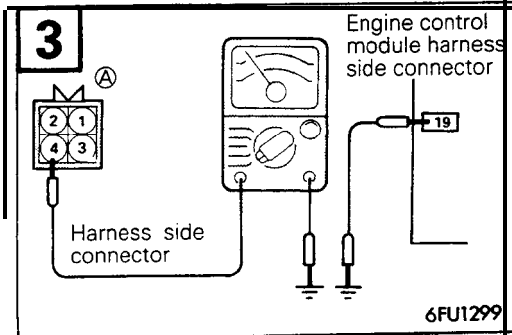


Check for continuity of the ground circuit of the TPS.
. Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ2–17, 24)

3

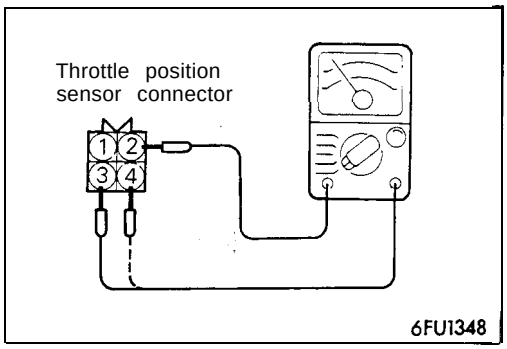


Check for an open-circuit, or a short-circuit to ground, between the engine control module and the throttle position sensor.
. Throttle position sensor connector: Disconnected
. Engine. control module connector: Disconnected

OK → △

NG → Repair the harness. (Ⓐ4–19)

TSB Revision



SENSOR INSPECTION

(1) Disconnect the throttle position sensor connector.
(2) Measure resistance between terminal ② (sensor ground) and terminal ③ (sensor power).

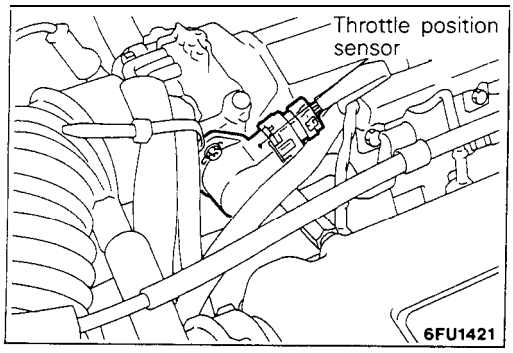
Standard value: 3.5-6.5 kΩ

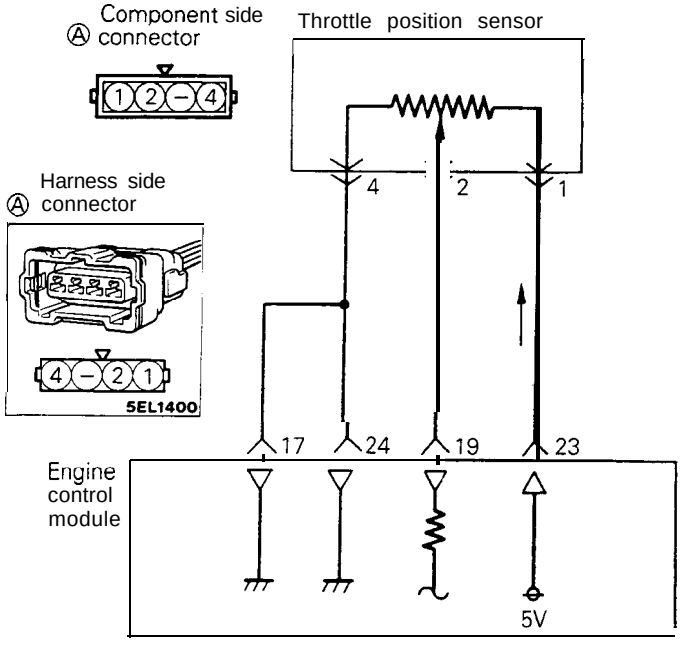
(3) Connect a pointer type ohmmeter between terminal ② (sensor ground) and terminal ④ (sensor output).
(4) Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
(5) If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

Throttle position sensor installation torque: 1.5-2.5 Nm (1.1-1.8 ft.lbs.)

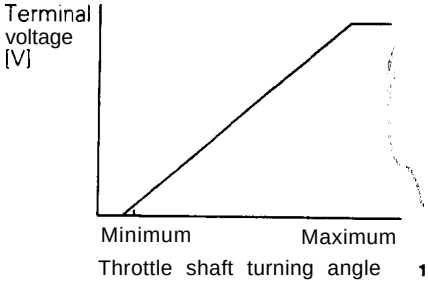
THROTTLE POSITION SENSOR <From 1990 models>

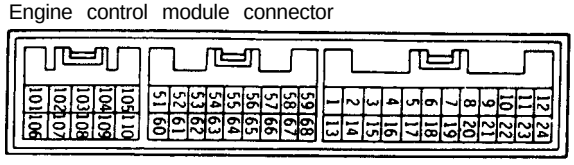
M13YJAF1





7FU0481





OPERATION

TROUBLESHOOTING HINTS

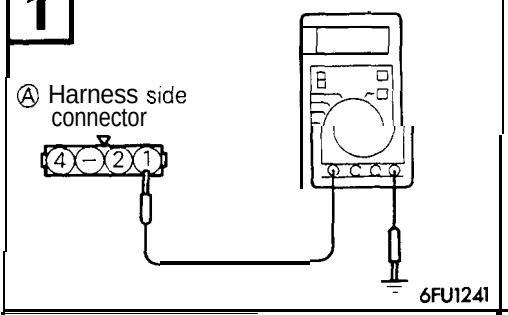
INSPECTION-Using Scan tool

Refer to P.13-270.

TSB Revision

HARNESS INSPECTION

1



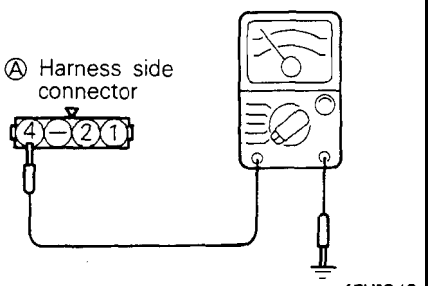
Measure the power supply voltage of the throttle position sensor.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 2

NG → Repair the harness. (Ⓐ1–23)

2

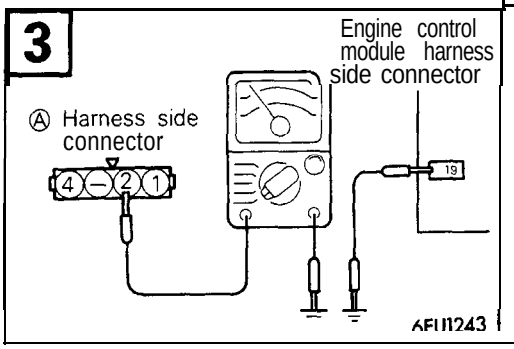


Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ4–17, 24)

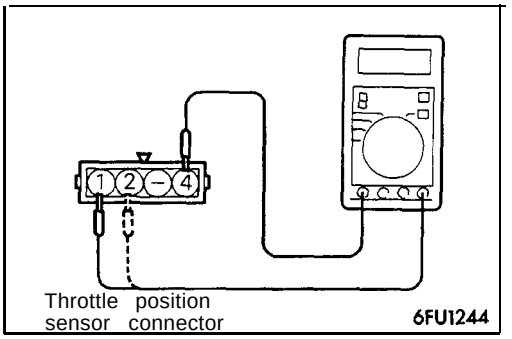
3



Check for an open-circuit, or a short-circuit to ground, between the engine control module and the throttle position sensor.
• Throttle aosition sensor connector: Disconnected
. Engine control module connector: Disconnected

OK → STOP

NG → Repair the harness. (Ⓐ2–19)



SENSOR INSPECTION

(1) Disconnect the throttle position sensor connector.
(2) Measure resistance between terminal ④ (sensor ground) and terminal ① (sensor power).

Standard value: 3.5-6.5 kΩ

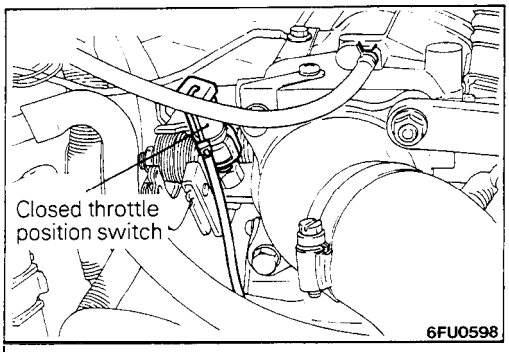
(3) Connect a pointer type ohmmeter between terminal ④ (sensor ground terminal) and terminal ② (sensor output terminal).
(4) Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
(5) If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

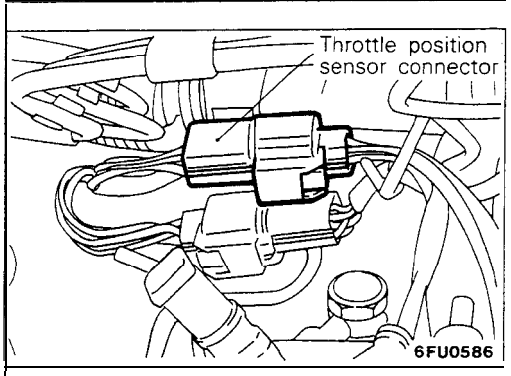
Throttle. position sensor installation torque: 1.5-2.5 Nm (1.1-1.8 ft.lbs.)

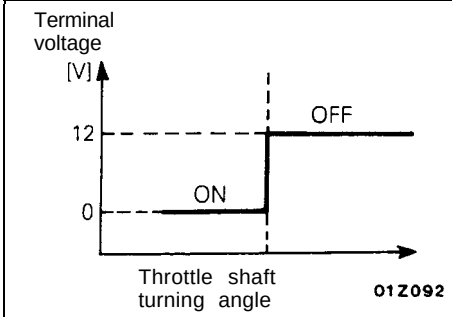
TSB Revision

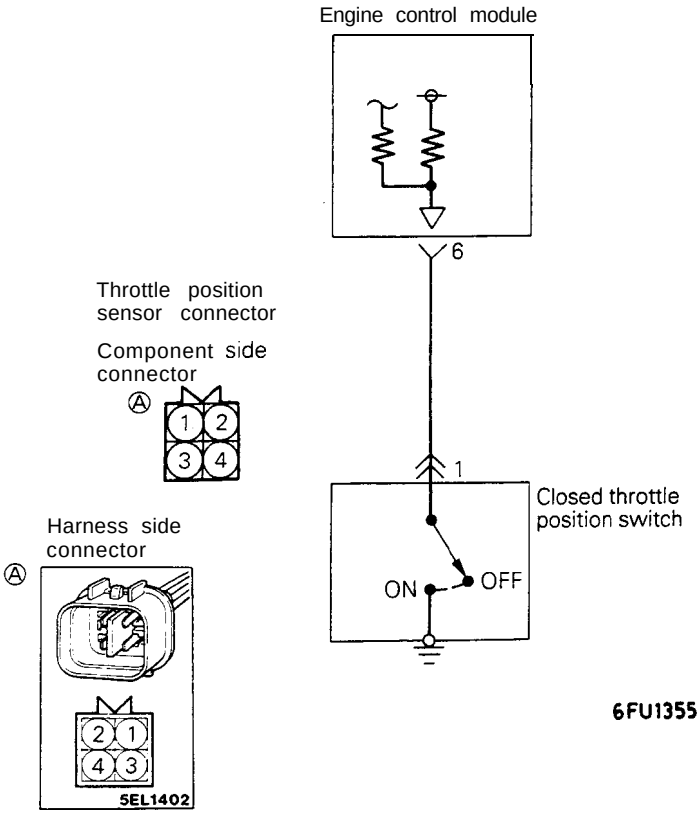
CLOSED THROTTLE POSITION SWITCH <1989 models>

M13YKAE1









OPERATION

- The closed throttle position switch functions to convert (to HIGH/LOW-level voltage) data as to whether the accelerator is depressed or released, and to input that voltage (as signals) to the engine control module. The engine control module, based upon those signals, regulates the idle air control motor.
- Voltage within the engine control module is applied, by way of the resistance, to the closed throttle position switch.
  When the foot is taken off the accelerator, the closed throttle position switch is switched ON, so the current is grounded.
  As a result, the closed throttle position terminal voltage changes from HIGH to LOW level.

TROUBLESHOOTING HINTS

If there is an abnormal condition of the closed throttle position switch switch output even though the results of the checking of the closed throttle position switch harness and of the component itself indicate a normal condition, the cause may be presumed to be one of the following.

(1) Improper adjustment of the accelerator cable or the automatic-cruise-control cable.
(2) Improper adjustment of the closed throttle position switch (fixed SAS).

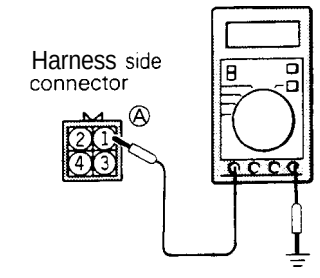
INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Throttle valve	Normal indication
Data reading	26	Switch status	Ignition switch: ON (Check after pumping accelerator several times.)	To idle position	ON
				Slightly opened	OFF

HARNESS INSPECTION

1

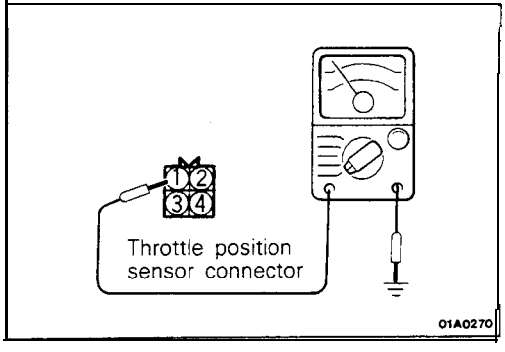


Measure the power supply voltage of the closed throttle position switch.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4 **or more**

OK → STOP

NG → Repair the harness. (Ⓐ1–6)



SENSOR INSPECTION

(1) Disconnect the throttle position sensor connector
(2) Check the continuity between terminal ① and body ground.

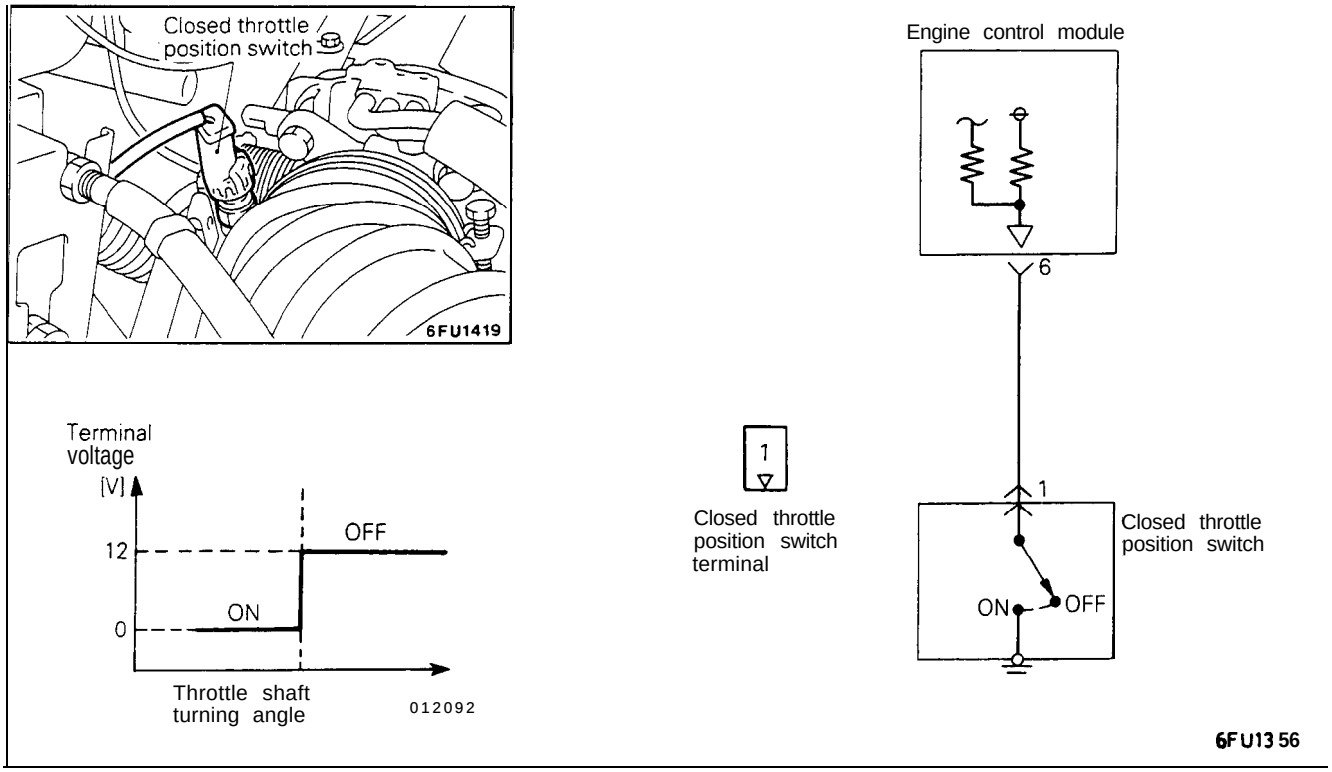
Accelerator pedal	Continuity
Depressed	Non-conductive (∞ Ω)
Released	Conductive (0 Ω)

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

TSB Revision

CLOSED THROTTLE POSITION SWITCH <From 1990 models>

M13YKAF1



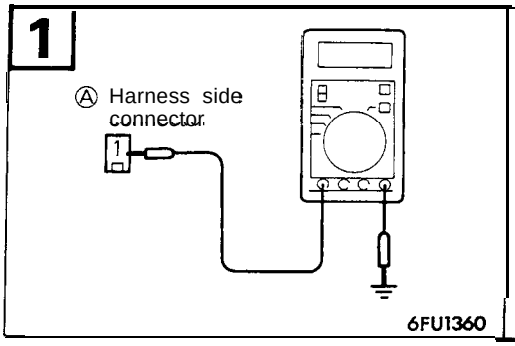
OPERATION

TROUBLESHOOTING HINTS

INSPECTION-Using Scan tool

Refer to P.13-274.

HARNESS INSPECTION

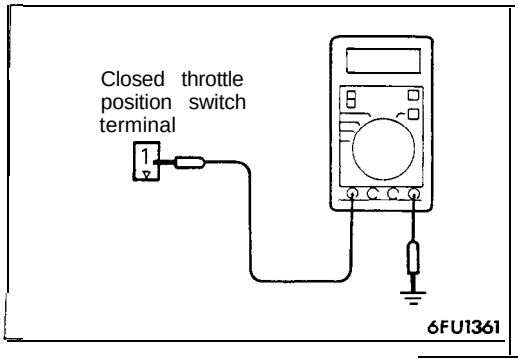


Measure the power supply voltage of the closed throttle position switch.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4 or more

OK → STOP

NO → Repair the harness. (Ⓐ1–6)



SENSOR INSPECTION

(1) Disconnect the closed throttle position switch connector.
(2) Check the continuity between terminal ① and sensor ground.

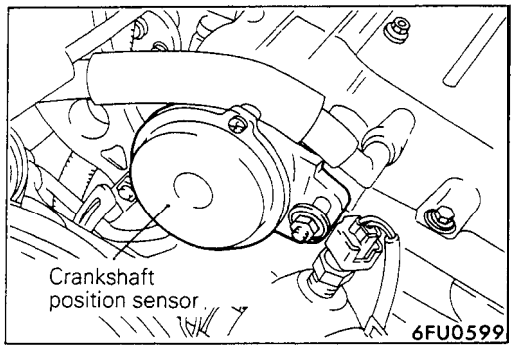
Accelerator pedal	Continuity
Depressed	Non-conductive (∞ Ω)
Released	Conductive (0 Ω)

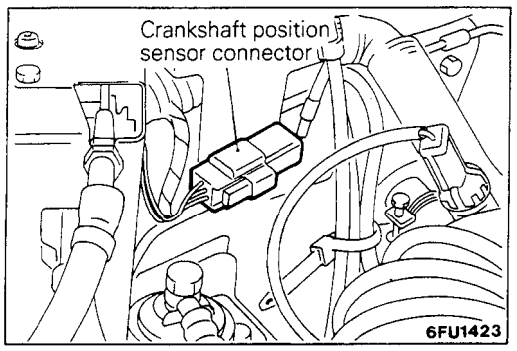
(3) If out of specification, replace the closed throttle position switch.

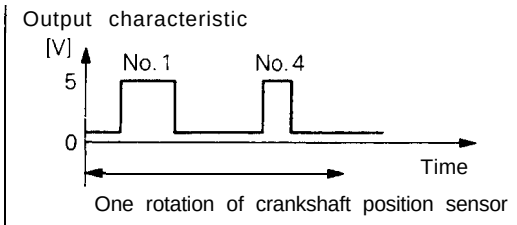
TSB Revision

CAMSHAFT POSITION SENSOR <Up to 1990 models>

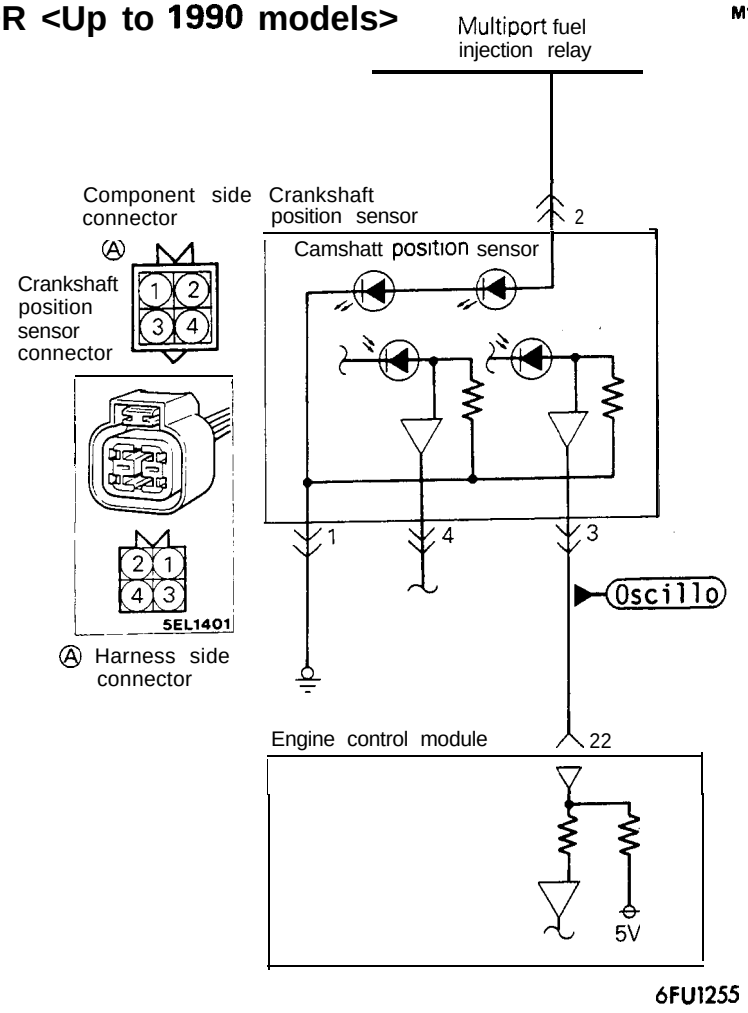
M13YLAAa







01A0528

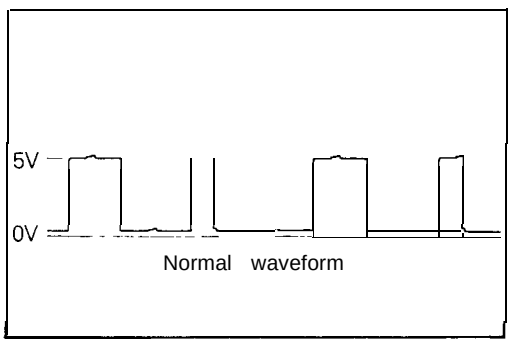


OPERATION

- The camshaft position sensor functions to detect the top dead center position of the No.1 cylinder and to convert those data to pulse signals that are input to the engine control module. The engine control module, based upon those signals, calculates the sequence of fuel injection.
- The power for the camshaft position sensor is supplied from the multiport fuel injection relay and is grounded to the vehicle body. The camshaft position sensor, by intermitting the flow (to ground) of the 5V voltage applied from the engine control module produces pulse signals.

TROUBLESHOOTING HINTS

If there is a malfunction of the camshaft position sensor, the sequential injection will not be correct, resulting in such problems as engine stalling, unstable idling, and poor acceleration.



INSPECTION

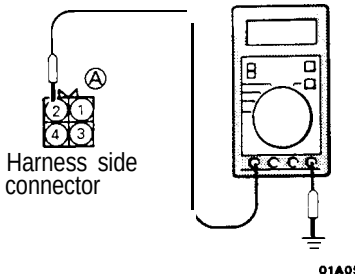
Using Oscilloscope

(1) Run the engine at an idle speed.
(2) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram, and check the waveform.

TSB Revision

HARNESS INSPECTION

1



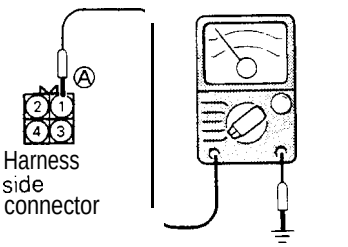
Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Ⓐ2 – Multi-port fuel injection relay)

2

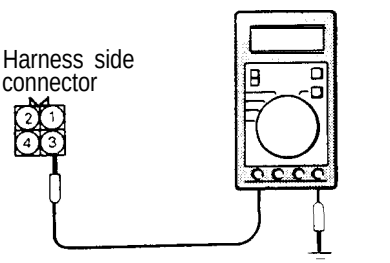


Check for continuity of the ground circuit.
Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ1 – Ground)

3



Check the output circuit voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8–5.2

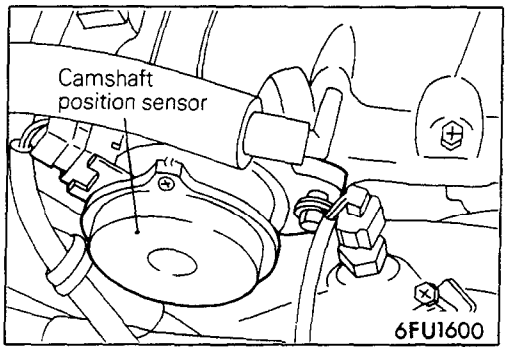
OK → STOP

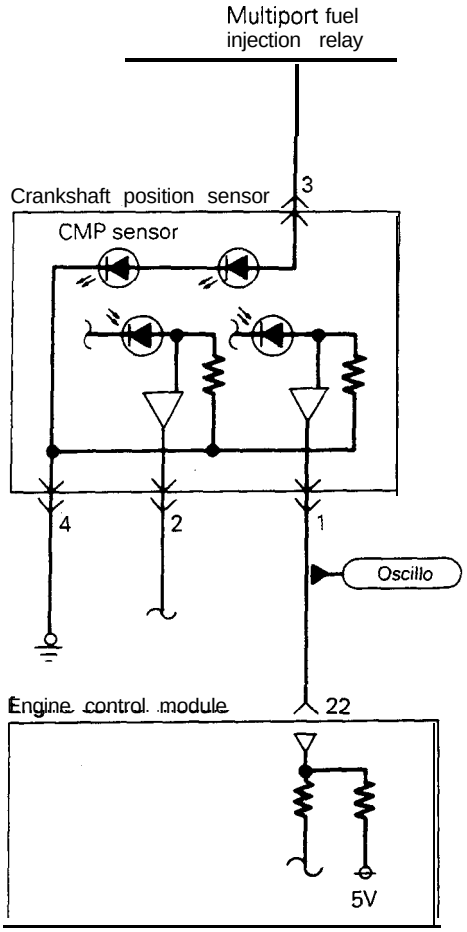
NG → Repair the harness. (Ⓐ3 – 22)

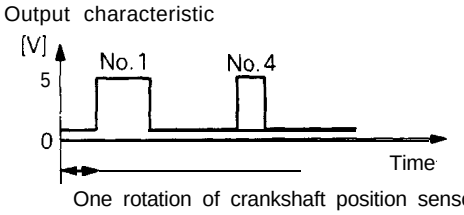
TSB Revision

CAMSHAFT POSITION SENSOR <From 1991 models>

M13YLAB1







01A0528

7FU0493

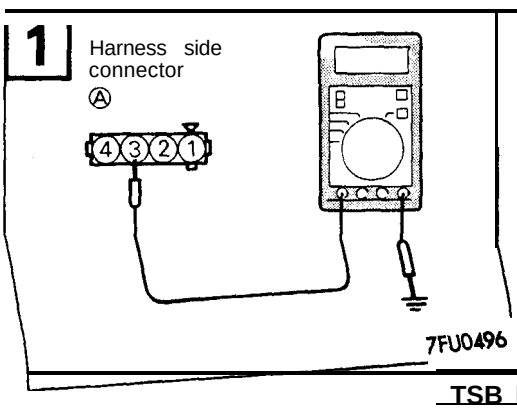
OPERATION

TROUBLESHOOTING HINTS

INSPECTION-Using Oscilloscope

Refer to P.13-277.

HARNESS INSPECTION



Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

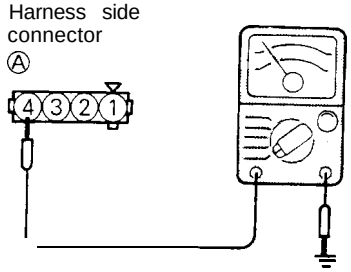
Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Ⓐ3 – Multiport fuel injection relay)

TSB Revision

2 Harness side connector Ⓐ



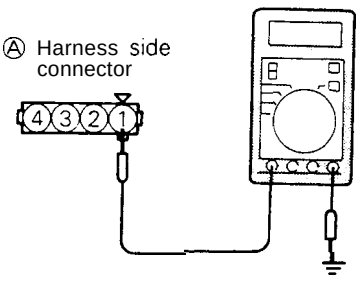
7FU0497

Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ4 – Ground)

3 Ⓐ Harness side connector



7FU0498

Check the output circuit voltage.
. Connector: Disconnected
. Ignition switch: ON

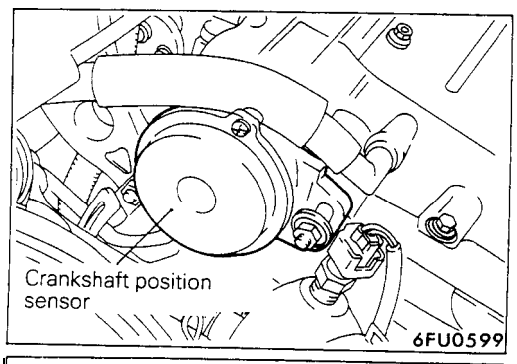
Voltage (V)
4.8–5.2

OK → STOP

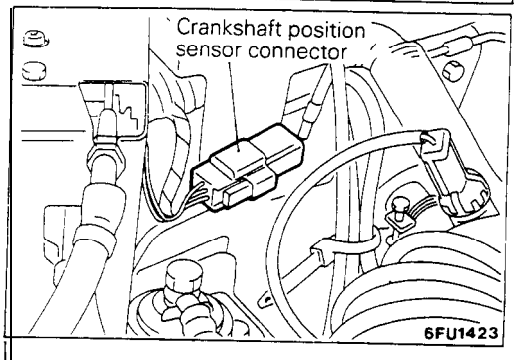
NG → Repair the harness. (Ⓐ1 – 22)

CRANKSHAFT POSITION SENSOR <Up to 1990 models>

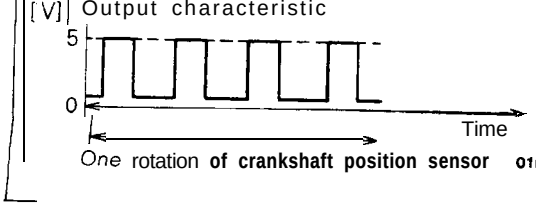
M13YMAA1



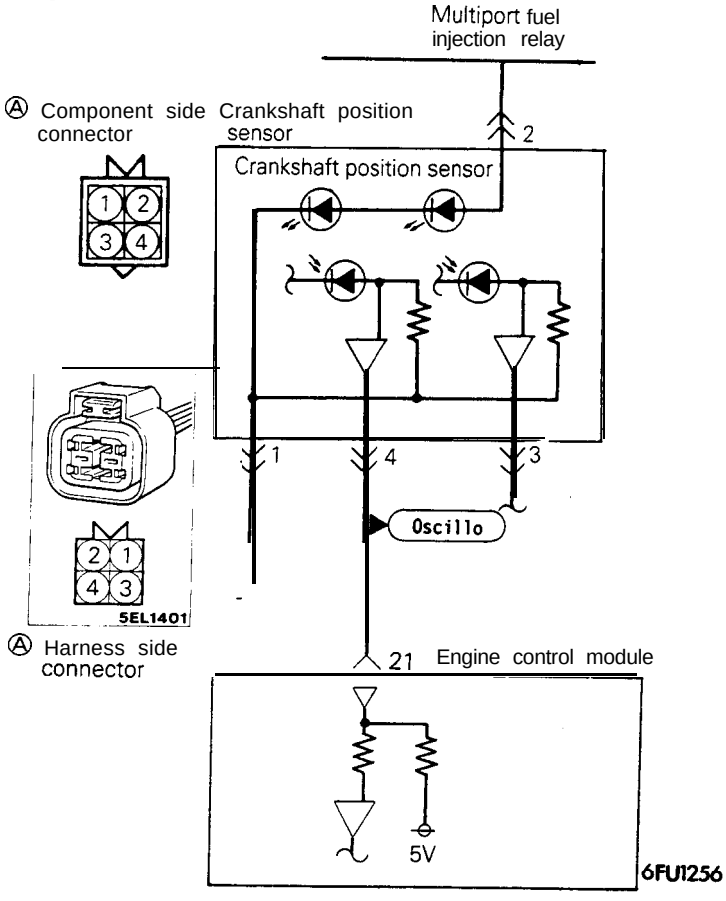
6FU0599



6FU1423



One rotation of crankshaft position sensor 01R0103



6FU1256

OPERATION

- The crankshaft position sensor functions to detect the crank angle (position) of each cylinder, and to convert those data to pulse signals, which are then input to the engine control module. The engine control module, based upon those signals, calculates the engine rpm, and also regulates the fuel injection timing and the ignition timing.
- The power for the crankshaft position sensor is supplied from the ignition switch–IG and is grounded to the vehicle body. The crankshaft position sensor, by intermitting the flow (to ground) of the 5V voltage applied from the engine control module, produces pulse signals.

TROUBLESHOOTING HINTS

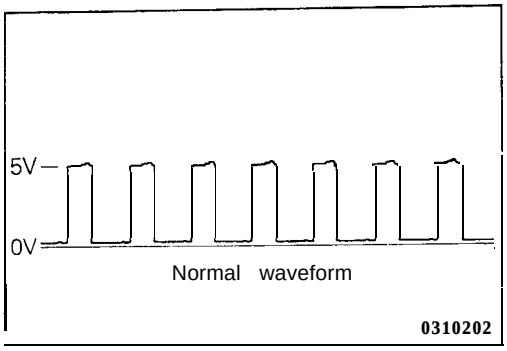
Hint 1:
If an impact is suddenly felt during driving or the engine suddenly stalls during idling, try shaking the crankshaft position sensor during idling.
If the engine stalls, the cause may be presumed to be improper or incomplete contact of the crankshaft position sensor's connector.
Hint 2:
If the crankshaft position sensor output rpm is 0 rpm during cranking when the engine cannot be started, the cause may be presumed to be a malfunction of the crankshaft position sensor or a broken timing belt.
Hint 3:
If the indicated value of the crankshaft position sensor output rpm is 0 rpm during cranking when the engine cannot be started, the cause may be presumed to be a failure of the ignition coil's primary current to intermittently pulse correctly, so a malfunction of the ignition system circuitry, the ignition coil and/or the power transistor is the probable cause.
Hint 4:
If idling is possible even though the crankshaft position sensor indicated rpm is a deviation from the standard value, the cause is usually a malfunction of something other than the crankshaft position sensor.
Examples:
(1) Malfunction of the coolant-temperature sensor.
(2) Malfunction of the idle air control motor.
(3) Improper adjustment of the standard idling speed.

INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Description	Normal condition
Data reading	22	Cranking rpm	. Engine: Cranking . Tachometer connection (Check intermittent flow of ignition coil primary current by tachometer.)	Compare cranking rpm and scan tool indicated rpm.	Both agree.

Function	Item No.	Data display	Inspection conditions	Engine coolant temp.	Standard value
Data reading	22	Idling rpm	· Engine: Idling · Closed throttle position switch: ON	At –20°C (–4°F)	1,450–1,700 rpm
				At 0°C (32°F)	1,350–1,600 rpm
				At 20°C (68°F)	1,180–1,450 rpm
				At 40°C (104°F)	1,000–1,250 rpm
				At 80°C (176°F)	650–850 rpm <Non-Turbo> 700–900 rpm <Turbo>



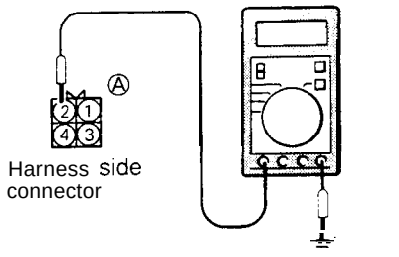
Using Oscilloscope

(1) Run the engine at an idle speed.

(2) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram, and check the waveform.

HARNESS INSPECTION

1



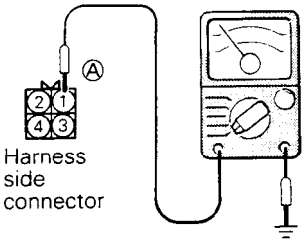
Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Ⓐ2 – Multi-port fuel injection relay)

2

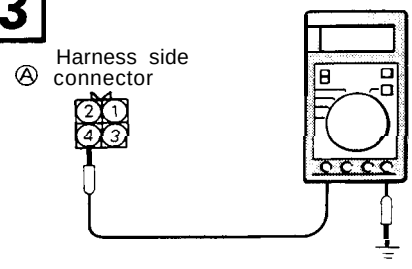


Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 3

NG → Repair the harness. (K&III-Ground)

3



Check the voltage of the output circuit.
. Connector: Disconnected
. Ignition switch: ON

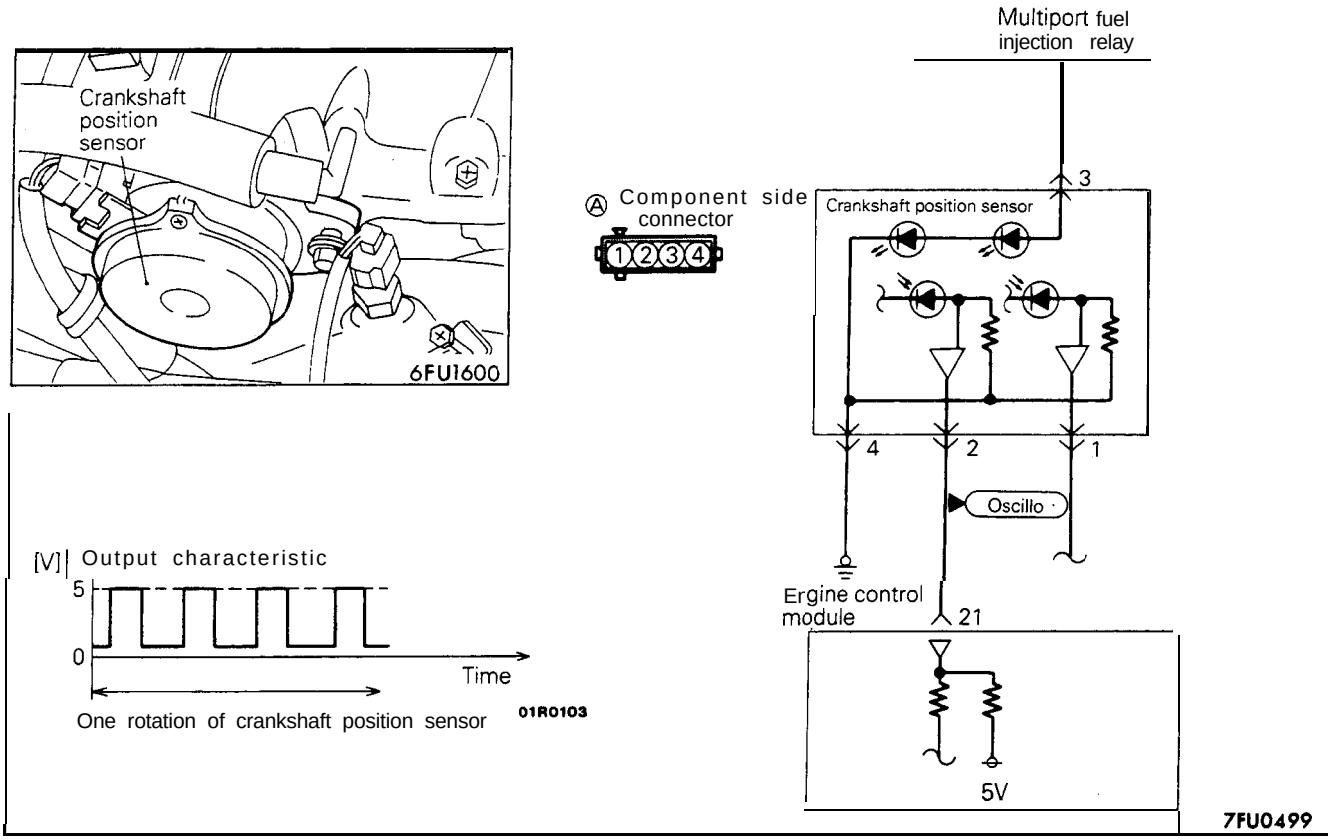
Voltage (V)
4.8–5.2

OK → STOP

NG → Repair the harness. (Ⓐ4 – 21)

CRANKSHAFT POSITION SENSOR <From 1991 models>

M13YMAB1



OPERATION

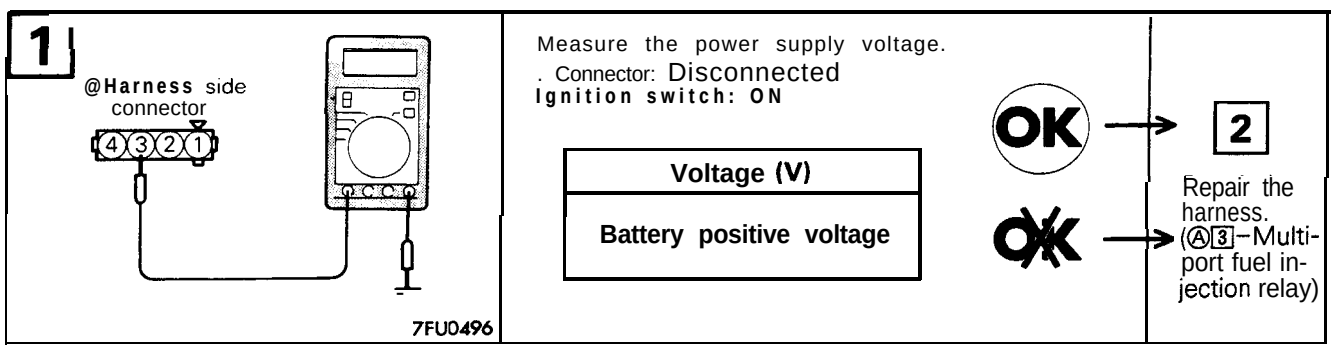
TROUBLESHOOTING HINTS

INSPECTION-Using Scan tool

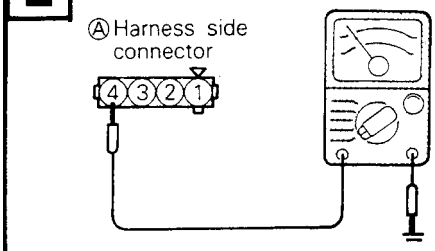
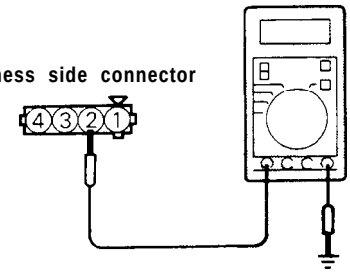
INSPECTION-Using Oscilloscope

Refer to P.13-281.

HARNESS INSPECTION



TSB Revision

2  7FU0497	Check for continuity of the ground circuit. . Connector: Disconnected	OK →	**3**
		OK →	Repair the harness. (Ⓐ4 – Ground)
3 Ⓐ **Harness side connector**  7FU0501	Check the voltage of the output circuit. . Connector: Disconnected . Ignition switch: ON **Voltage (V)**: **4.8–5.2**	OK →	STOP
		OK →	Repair the harness. (Ⓐ2 – 21)

IGNITION SWITCH-ST M13YNAAa

Refer to P.13-77.

IGNITION SWITCH-ST AND PARK/NEUTRAL POSITION SWITCH M13YOAc

Refer to P.13-78.

VEHICLE SPEED SENSOR M13YPAAa

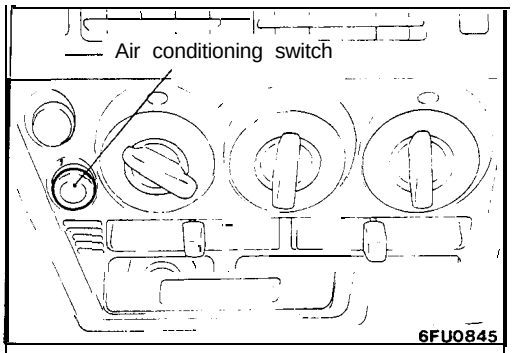
Refer to P.13-80.

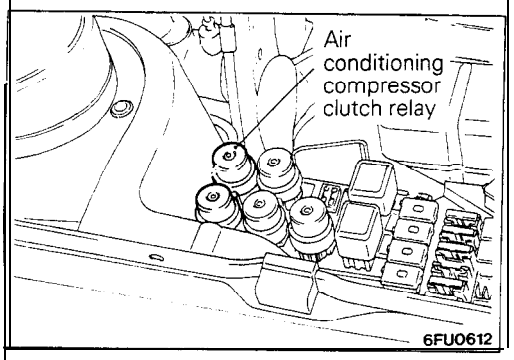
POWER STEERING PRESSURE SWITCH M13YQAAa

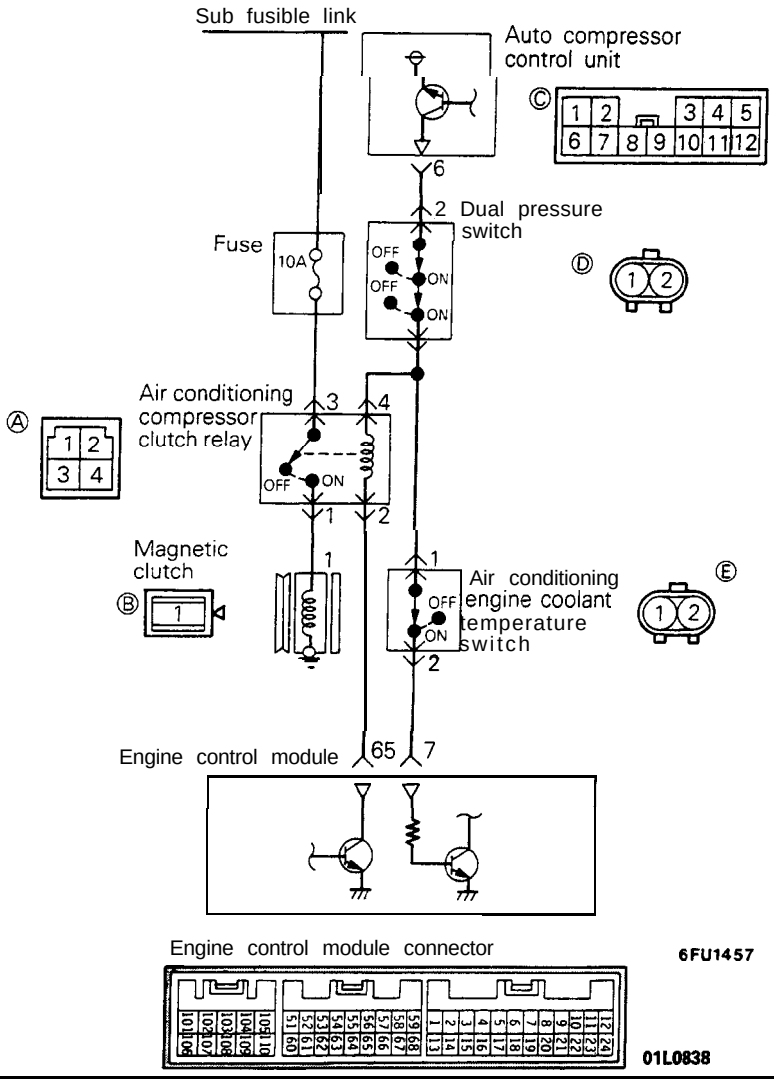
Refer to P.13-81.

AIR CONDITIONING SWITCH AND A/C COMPRESSOR CLUTCH RELAY

M13YRAB1







OPERATION

- The air conditioning switch applies battery voltage to the engine control module when the air conditioning is switched ON.
- When the air conditioning signals are input, the engine control module activates the idle air control motor, and also switches ON the power transistor. As a result, current flows to the A/C compressor clutch relay coil and the relay switch is switched ON, the air conditioning compressor's magnetic clutch is activated.

TROUBLESHOOTING HINTS

If the air conditioning compressor's magnetic clutch is not activated when the air conditioning switch is switched ON during idling, it is probable that the cause is a malfunction of the air conditioning control system.

TSB Revision

INSPECTION

Using Scan tool

Air conditioning switch

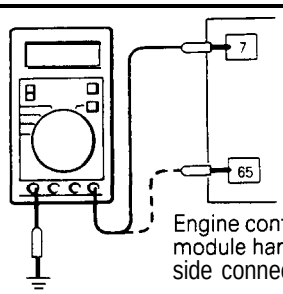
Function	Item No.	Data display	Check conditions	Air conditioning switch	Normal display
Data reading	28	Switch status	. Engine idling (The air conditioning compressor should be activated when the air conditioning switch is switched ON.)	OFF	OFF
				ON	ON

Air conditioning compressor clutch relay

Function	Item No.	Data display	Check conditions	Air conditioning switch	Normal display
Data reading	49	Air conditioning compressor clutch relay status	. Engine: idling after warm up	OFF	OFF (Compressor clutch non-activation)
				ON	ON(Compressor clutch activation)

HARNESS INSPECTION

1



01R0863

Measure the power supply voltage of the air conditioning circuit.
. Engine control module connector: Disconnected
• Ignition switch: ON
• Air conditioning switch: ON

Voltage (V)
Battery positive voltage

OK → STOP

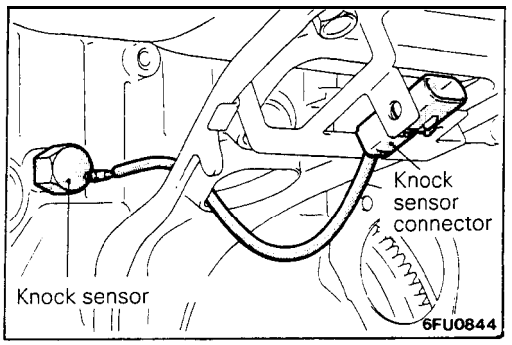
NG → Check the air conditioning circuit.

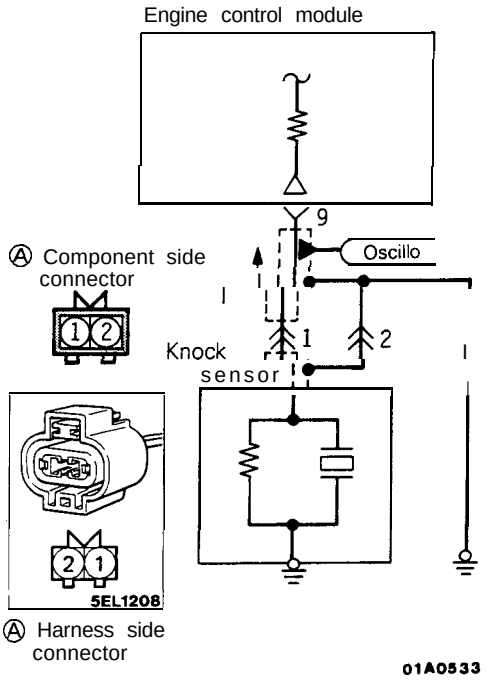
AIR CONDITIONING INSPECTION

Refer to GROUP 55–Air Conditioning.

KNOCK SENSOR <Turbo, Non-Turbo From 1992 models>

M13ZAAA





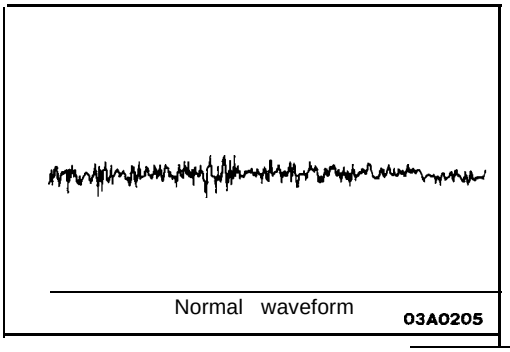
OPERATION

The knock sensor converts cylinder block vibrations due to knocking into voltage according to the strength of the vibrations and inputs it to the engine control module.
The engine control module controls the delay in spark timing according to this signal.

TROUBLESHOOTING HINTS

When knocking occurs when driving at maximum load, the following troubles, other than the knock sensor, can be inferred.

(1) Incorrect spark plug heat rating
(2) Incorrect gasoline
(3) Mis-adjustment of standard spark timing



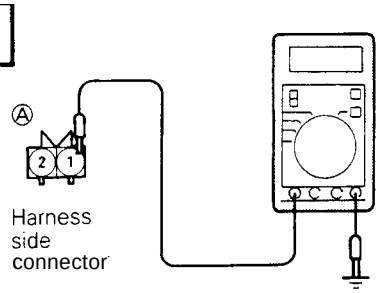
INSPECTION

Using Oscilloscope

(1) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram.
(2) Rev up the engine to 5,000 rpm, and check the waveform.

TSB Revision

1



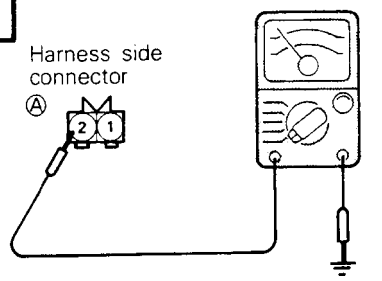
Measure the terminal voltage.
. Connector: Disconnected

Voltage (V)
8–11

OK → 2

NG → Repair th harness. (Ⓐ1–9)

2



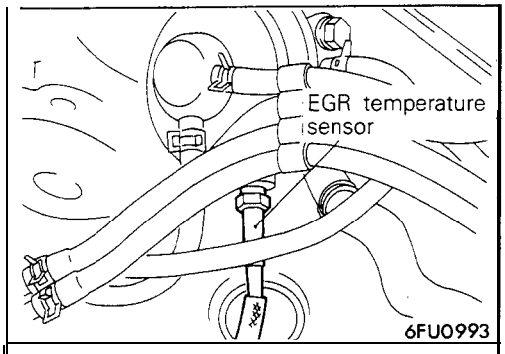
Check for continuity of the ground circuit.
. Connector: Disconnected

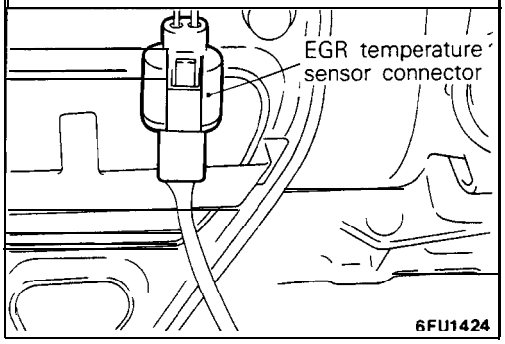
OK → STOP

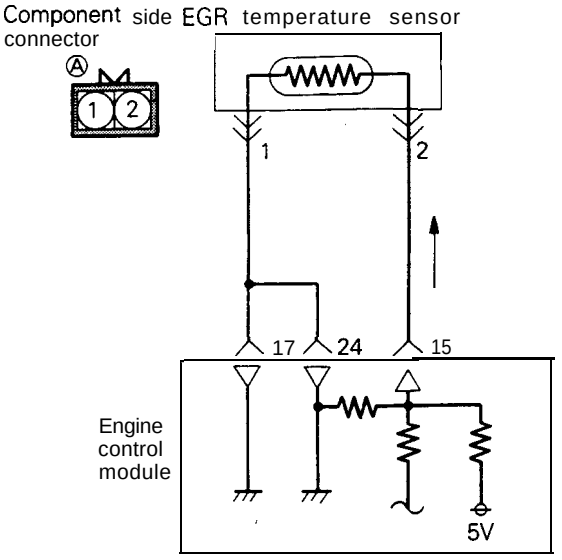
NG → Repair the harness. (Ⓐ2–Ground)

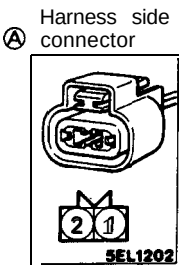
EGR TEMPERATURE SENSOR <Calif.>

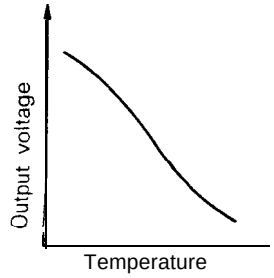
M13YZAA1











TSB Revision

OPERATION

- The EGR temperature sensor functions to convert the data regarding the temperature of the EGR gas downstream from the EGR valve to voltage, and to input that voltage (as signals) to the engine control module.
- The 5V power supply within the engine control module is supplied, by way of the resistance within the unit, to the EGR temperature sensor; it passes through the EGR temperature sensor, which is a type of resistor, and is grounded at the engine control module.

  Note that the resistance of the EGR temperature sensor decreases when the EGR gas volume increases and the temperature of the EGR gas increases.
- The EGR temperature sensor terminal voltage becomes higher when the resistance of the EGR temperature sensor increases, and becomes lower when the resistance decreases.

Consequently, the EGR temperature sensor terminal voltage varies in accordance with the temperature of the EGR gas, becoming lower when the temperature of the EGR gas increases.

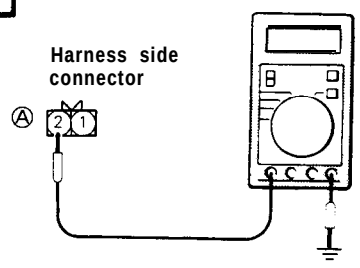
INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	**43**	Sensor temperature	. Engine: warm up . Engine is maintained in a constant state for 2 minutes or more . Remove the vacuum hose (green stripes) from the EGR solenoid and plug both the removed vacuum hose end and solenoid valve nipple.	Idling	100°C (212°F) or lower <Non-Turbo> 70°C (158°F) or lower <Turbo>
				3,500 rpm	150°C (302°F) or higher <Non-Turbo> 70°C (158°F) or higher <Turbo>

HARNESS INSPECTION

1



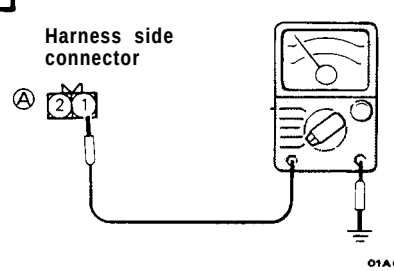
Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
4.3–4.7

OK → 2

NG → Repair the harness. (A-2 – 15)

2



Check for continuity of the ground circuit.
. Connector: Disconnected

OK → STOP

NG → Repair the harness. (A-1 –)

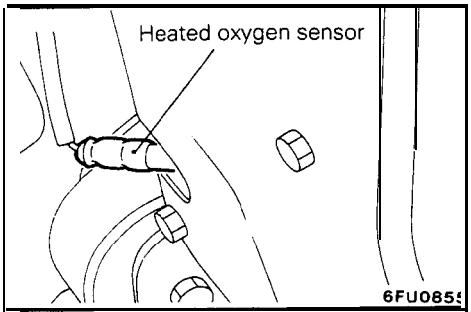
SENSOR INSPECTION

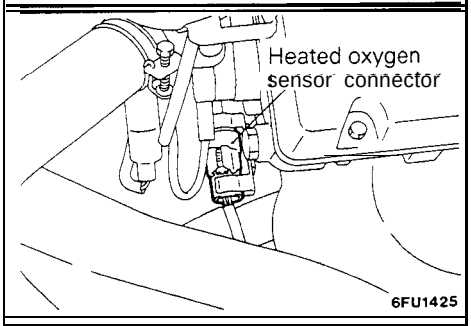
Refer to GROUP 17–Exhaust Gas Recirculation (EGR) System.

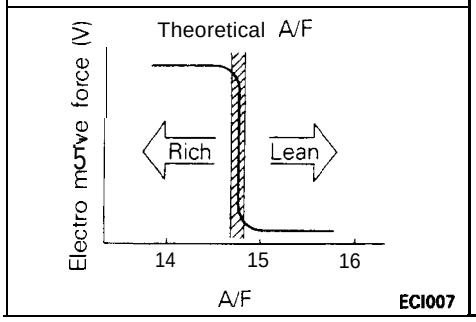
TSB Revision

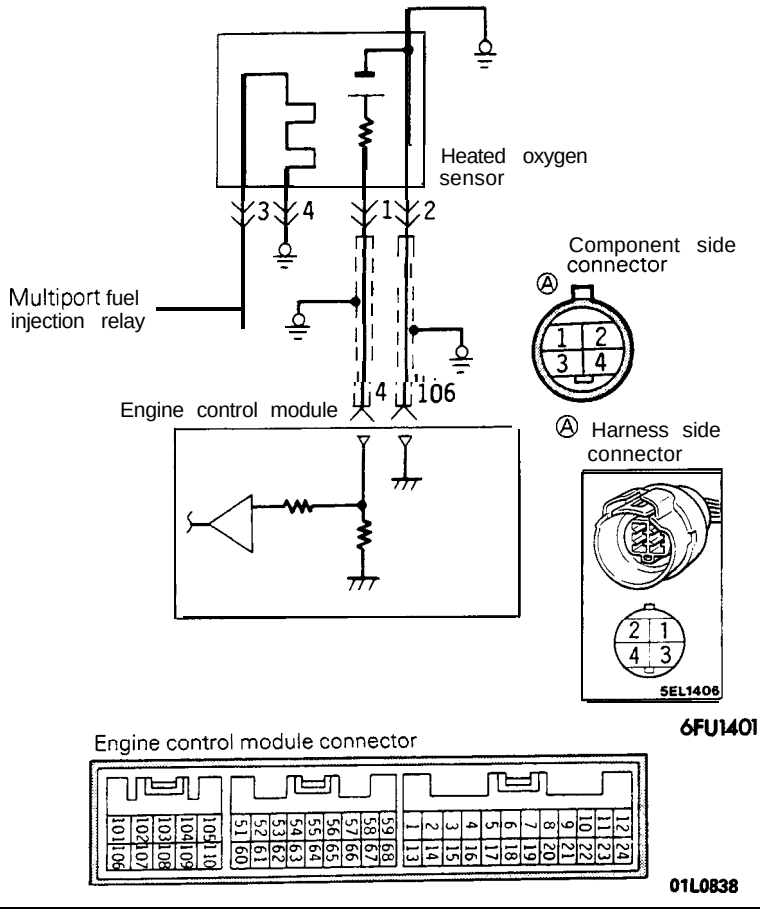
HEATED OXYGEN SENSOR <Up to 1990.5 model-Non-Turbo, Turbo>

M13YSAAa









OPERATION

- The heated oxygen sensor functions to detect the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the engine control module.
- If the air/fuel mixture ratio is richer than the theoretical air/fuel mixture ratio (i.e., if the concentration of oxygen in the exhaust gas is sparse), a voltage of approximately IV is output; if the air/fuel mixture ratio in leaner than the theoretical air/fuel mixture ratio (i.e., if the concentration is dense), a voltage of approximately ov is output.
- The engine control module, based upon those signals, regulates the amount of fuel injection so that the air/fuel mixture ratio becomes the theoretical air/fuel mixture ratio.
- Battery power supply is applied, by way of the multiport fuel injection relay, to the oxygen sensor heater. As a result, the sensor element is heated by the heater, so that the heated oxygen sensor shows excellent response even if the temperature of the exhaust gas is low.

TROUBLESHOOTING HINTS

HINT 1:
The exhaust gas purification performance will worsen if there is a malfunction of the heated oxygen sensor.
Hint 2:
If the heated oxygen sensor output voltage deviates from the standard value even though the results of the checking of the heated oxygen sensor are normal, the cause is probably a malfunction of a component related to mixture control.

Examples:
(1) Malfunction of an injector.
(2) Air leakage into the intake manifold from a leaking gasket.
(3) Malfunction of the volume air flow sensor, the intake air temperature sensor, the barometric-pressure sensor, or the engine coolant temperature sensor.

TSB Revision

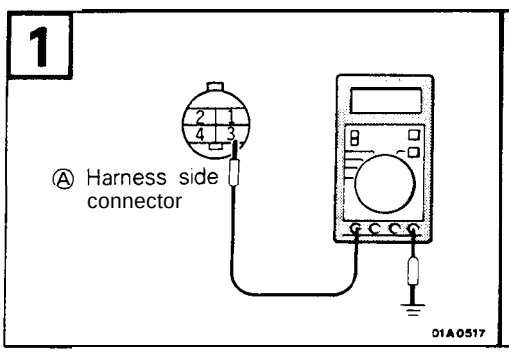
INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	11	Sensor detection voltage	Engine: warm up (Make the mixture lean by engine speed reduction, and rich by racing)	When sudden deceleration from 4,000 rpm	250 mV or lower
				When engine is suddenly raced	500– 1,000 mV
			Engine: warm up (using the oxygen sensor signal, check the air/fuel mixture ratio, and also check the condition of control by the engine control module)	750 rpm (Idling) <Non-Turbo> 800 rpm (Idling) <Turbo>	400 mV or lower (changes) 600– 1,000 mV
				2,000 rpm	

HARNESS INSPECTION

1



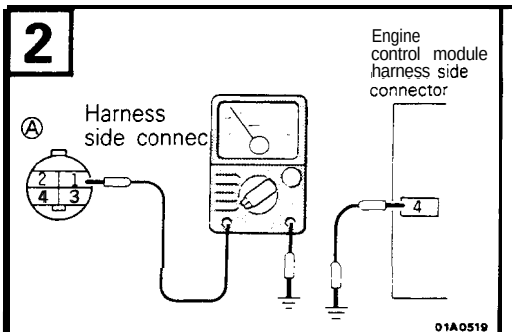
Measure the power supply voltage of the heated oxygen sensor.
Connector: Disconnected
Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Ⓐ3–MFI relay)

2

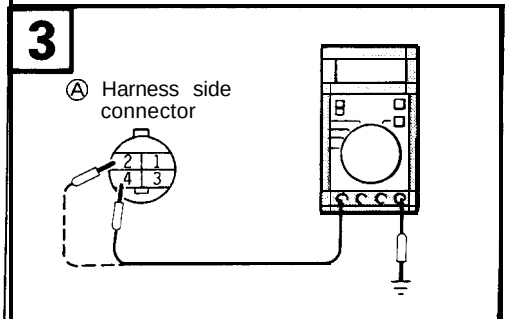


Check for an open-circuit or a short-circuit to ground, between the engine control module and the heated oxygen sensor.
. Heated oxygen sensor connector: Disconnected
. Engine control module connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ1–4)

3

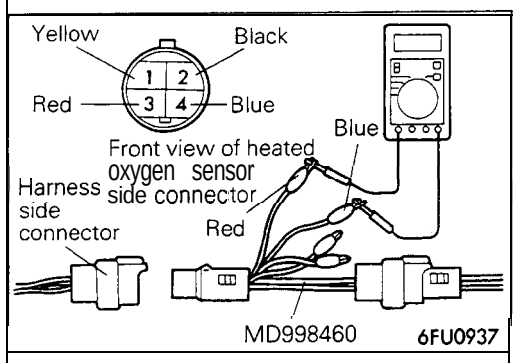


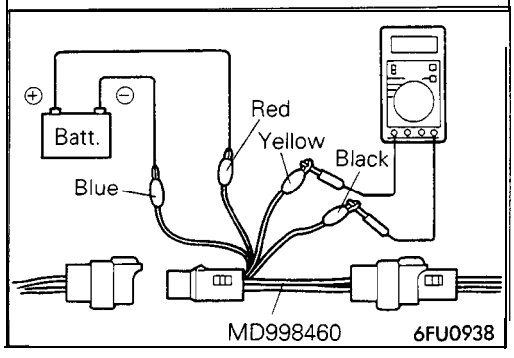
Check for continuity of the ground circuit.
. Connector: Disconnected

OK → STOP
Repair the harness. (Ⓐ2–106) Ⓐ4–Ground)

NG →

TSB Revision





SENSOR INSPECTION

(1) Disconnect the heated oxygen sensor connector, and connect the special tool (harness connector) to the heated oxygen sensor side.
(2) Check that there is continuity [approx. 12Ω at 20°C (68°F)] between heated oxygen sensor connector terminal ③ (red clip of special tool) and terminal ④ (blue clip).
(3) If there is no continuity, replace the heated oxygen sensor.
(4) Warm up the engine until the engine coolant temperature exceeds 80°C (176°F).
(5) Use jumper wires to connect heated oxygen sensor terminal ③ (red clip of special tool) and terminal ④ (blue clip) to the battery ⊕ terminal and ⊖ terminal.

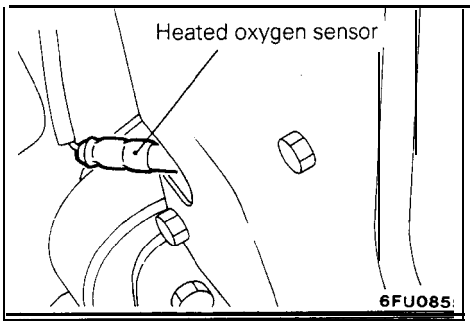
Caution
Be very careful when connecting the jumper wires because the heated oxygen sensor will be damaged if a mistake is made in the connecting terminals.

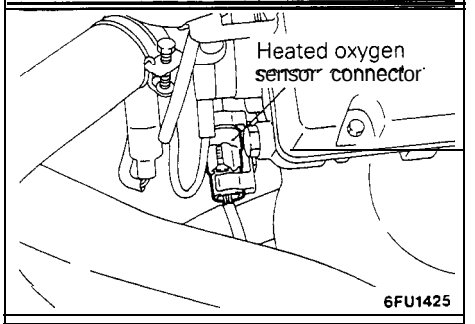
(6) Connect a digital voltmeter between terminal ① (yellow clip of special tool) and terminal ② (black clip).
(7) While repeatedly racing the engine, measure the output voltage of the heated oxygen sensor.

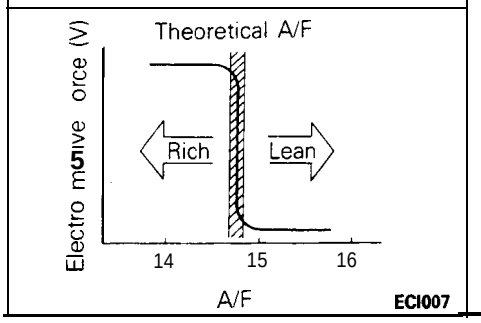
Engine	Heated oxygen sensor output voltage	Remark
When racing engine	0.6–1.0 V	When the air/fuel mixture ratio becomes rich by repeatedly racing the engine, the normal heated oxygen sensor output is approximately 0.6–1.0 V.

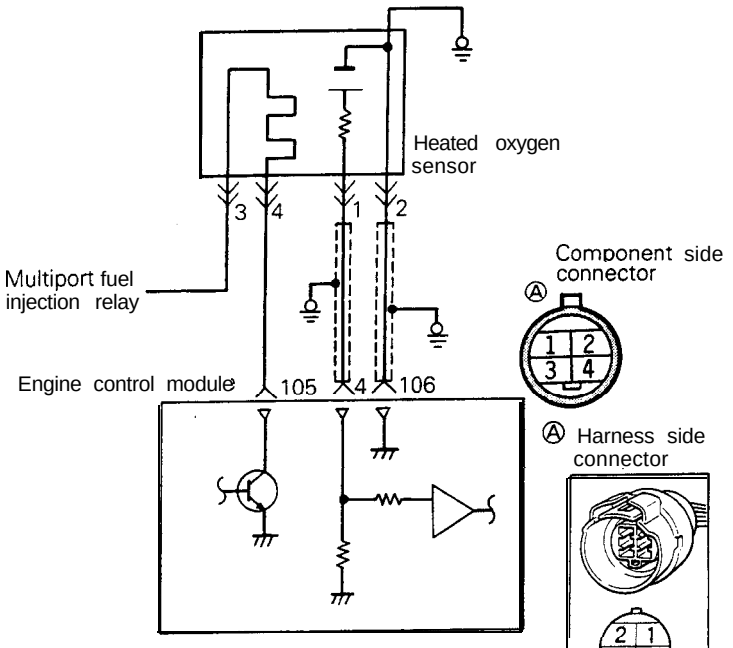
HEATED OXYGEN SENSOR <From 1991 model-Non-Turbo>

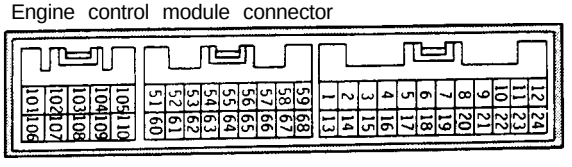
M13YSAAa











OPERATION

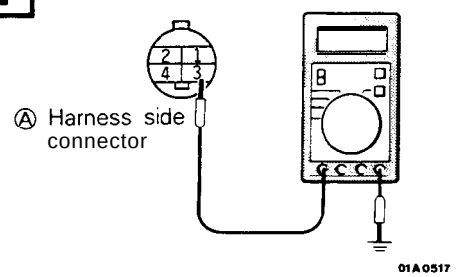
TROUBLESHOOTING HINTS

INSPECTION-Using Scan tool

Refer to P.13-290.

HARNESS INSPECTION

1



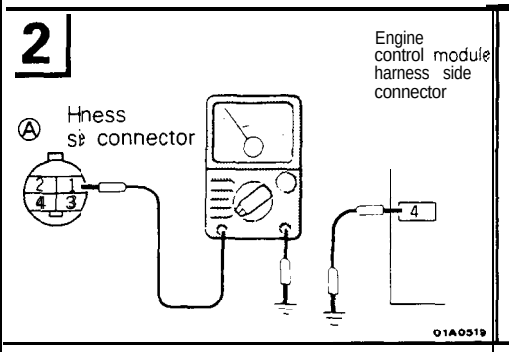
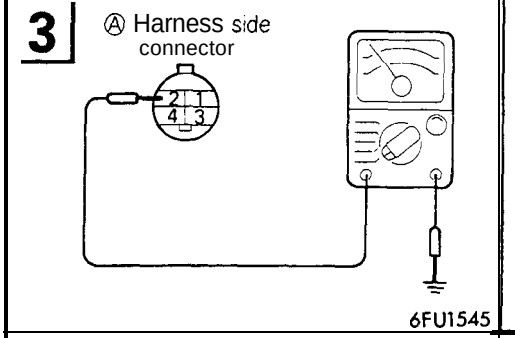
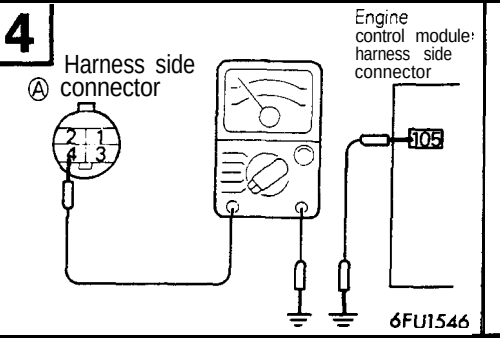
Measure the power supply voltage of the heated oxygen sensor.
Connector: Disconnected
Ignition switch: O N

Voltage (V)
Battery positive voltage

OK → **2**

NG → Repair the harness. (A3–MFI relay)

TSB Revision

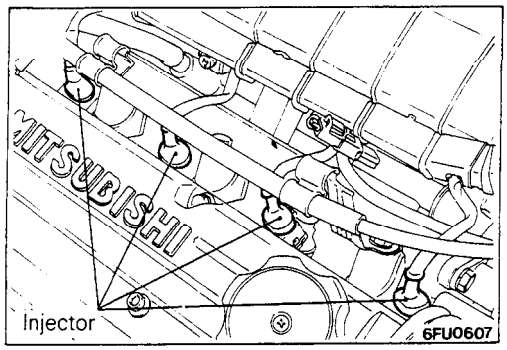
2 	Check for an open-circuit or a short-circuit to ground, between the engine control module and the heated oxygen sensor. . Heated oxygen sensor connector: Disconnected . Engine control module connector: Disconnected	OK →	3
		NG →	Repair the harness. (Ⓐ1–4)
3 	Check for continuity of the ground circuit. . Connector: Disconnected	OK →	4
		NG →	Repair the harness. (Ⓐ2–106)
4 	Check for an open-circuit or a short-circuit to ground, between the engine control module and the heated oxygen sensor. . Heated oxygen sensor connector: Disconnected . Engine control module connector: Disconnected	OK →	STOP
		NG →	Repair the harness. (Ⓐ4–105)

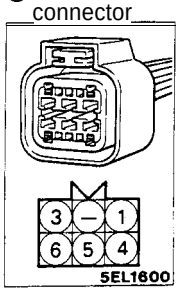
SENSOR INSPECTION

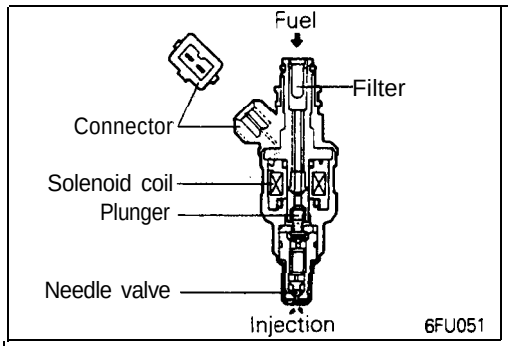
Refer to P.13-292.

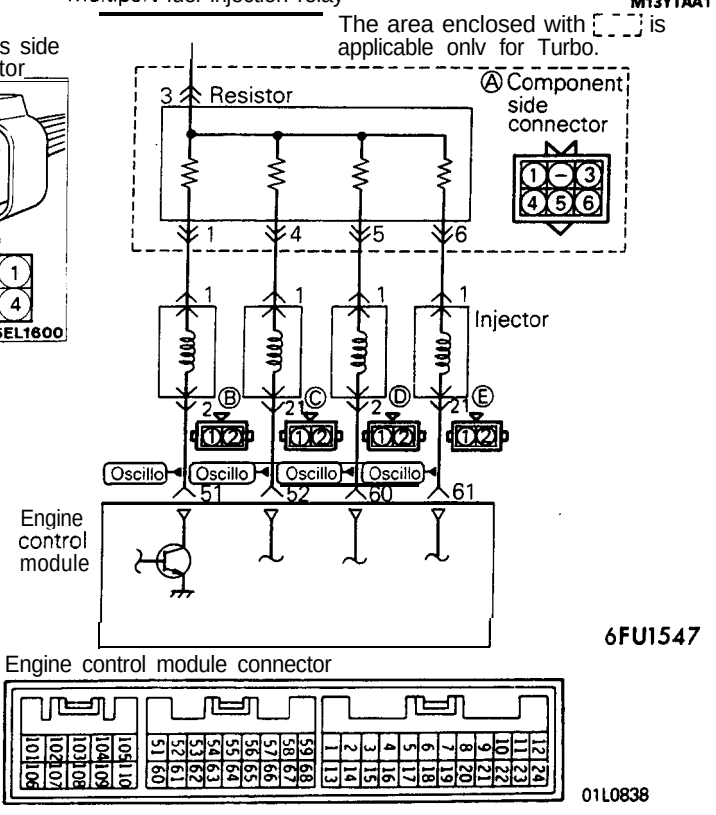
TSB Revision

INJECTORS









OPERATION

- The injectors are electromagnetic-valve-equipped injection nozzles that function to inject fuel based upon injection signals from the engine control module.
- Because the surface area of the injection ports is fixed and because the pressure of the fuel relative to the pressure within the manifold is also regulated to a fixed pressure, the amount of fuel injection by injectors is determined by the injection of the injectors is cut off in sequence, length of time that the needle valve is open, or, in other words, by the length of time of current flow to the solenoid coil.
- Battery power supply is supplied, by way of the multiport fuel injection relay, to the injectors. When the engine control module switches ON the power transistor within the unit and current flows to the solenoid coil, the injectors open and fuel is injected.

TROUBLESHOOTING HINTS

Hint 1:
If there is a problem with starting while the engine is warm, perform the combustion test and check for leakage of the injectors.
Hint 2:
If the engine can't be started, and the injectors are not activated during cranking, the cause is probably a malfunction such as described below, not with the injectors.
(1) Malfunction of the circuit for supply of power to the engine control module, or of the ground circuit.
(2) Malfunction of the multiport fuel injection relay.
(3) Malfunction of the crankshaft position sensor and/or the camshaft position sensor.

Hint 3:
If there is a cylinder for which the idling condition does not change when, during idling, the fuel check that cylinder as described below.
(1) Check the injector and harness.
(2) Check the spark plugs and the high-tension cable.
(3) Check the compression pressure.

Hint 4:
if the injector activation time deviates from the standard value even though the results of the checking of the injector's harness and of the injector itself are normal, the cause may be pressumed to be one of the following,
(1) Incomplete combustion within the cylinder. (Malfunction of the spark plugs, the ignition coil, the compression pressure, etc.)
(2) Incomplete close contact of the EGR valve seat.
(3) Increased engine resistance.

TSB Revision

INSPECTION

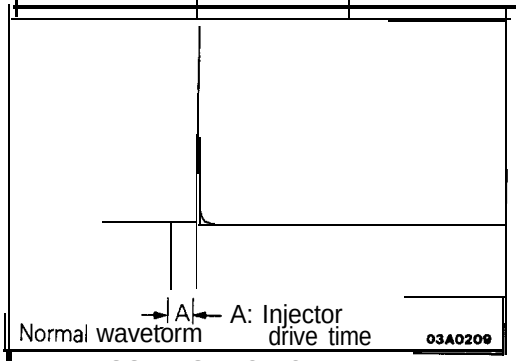
Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine coolant temperature	Standard value
Data reading	41	Activation time*1	Engine cranking	At 0°C (32°F)*2	Approx. 17 ms <Non-Turbo> Approx. 40 ms <Turbo>
				At 20°C (68°F)	Approx. 38 ms <Non-Turbo> Approx. 19 ms <Turbo>
				At 80°C (176°F)	Approx. 9 ms <Non-Turbo> Approx. 4.5 ms <Turbo>

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	41	Activation time*3	. Engine coolant temperature: 85–95°C (185–205°F) . Lights, cooling fan, electrical accessories: OFF . Transaxle: neutral	Idling	2.4-3.2 ms <Non-Turbo> 1.6-2.6 ms <Turbo>
				2,000 rpm	1.9–2.9 ms <Non-Turbo> 1.4-2.2 ms <Turbo>
				During sudden racing	Increases

NOTE
*1: The injector activation time indicates the time under the following conditions: a power source voltage of 11V and a cranking rpm of 250 rpm or less.
*2: Simultaneous injection at four cylinders when engine coolant temperature is 0°C (32°F).
*3: The injector activation time may be about 10% longer than indicated above when the vehicle is new [driven approximately 500 km (300 miles) or less].

Function	Item No.	Description	Inspection conditions	Normal indication
Actuator test	01	No. 1 injector is shut off.	Engine: idling after warm up (Shut off the injectors in sequence during after engine warm-up, check the idling condition.)	The idling condition changes more. (Either becomes more unstable, or engine stalls.)
	02	No. 2 injector is shut off.		
	03	No. 3 injector is shut off.		
	04	No. 4 injector is shut off.		

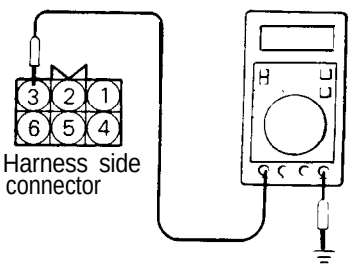


Using Oscilloscope

(1) Run the engine at idle speed.
(2) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram, and check the waveform at the drive side of each injector.

HARNESS INSPECTION

1 <Turbo>



Measure the power supply voltage of the resistor.
. Connector: Disconnected
. Ignition switch: ON

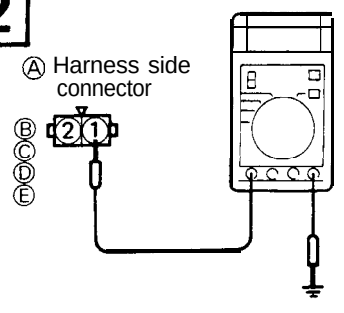
Voltage (V)
Battery positive voltage

OK → 2

OK → Repair the harness. (Ⓐ3–MFI relay)

TSB Revision

2



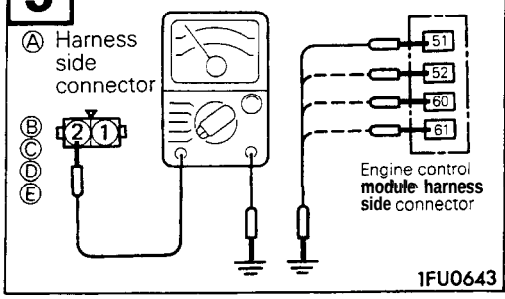
Measure the power supply voltage of the injector.
. Resistor connector: Connected <Turbo>
. Injector connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 3

NG → Repair the harness. (ⒷⒸⒹⒺ1 –MFI relay) Check the power supply. Check the resistor. <Turbo>

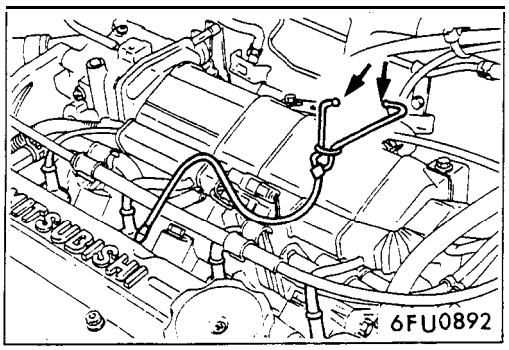
3



Check for an open-circuit, or a short-circuit to ground, between the injector and the engine control module.
· Injector connector: Disconnected
· Engine control module connector: Disconnected

OK → STOP

NG → Repair the harness. (ⒷⒸⒹⒺ 2 – 51 52 60 61)



ACTUATOR INSPECTION

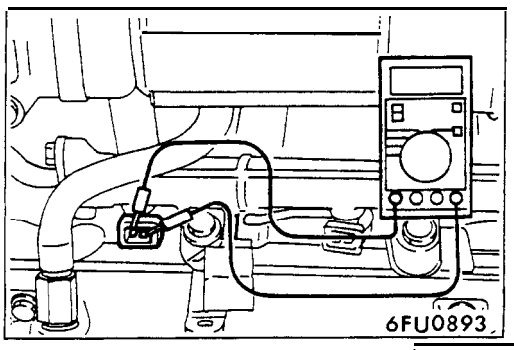
INJECTOR

CHECKING OPERATION SOUND

Using a sound scope, check the operation sound ("chi-chi-chi") of injectors during idling or during cranking.
Check that as the rotating speed increases, the frequency of the operating sound also increases.

Caution
Note that even if the injector you are checking is not operating, you will hear the operating sound of the other injectors.

NOTE
If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or engine **control** module is suspected.



MEASURING RESISTANCE BETWEEN TERMINALS

(1) Remove the injector connector.
(2) Measure the resistance between the terminals.
Standard value:
13-16 Ω [at 20°C (68°F)] <Non-Turbo>
2-3 Ω [at 20°C (68°F)] <Turbo>
(3) Install the injector connector.

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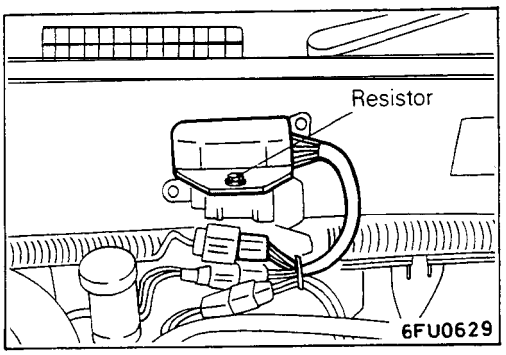
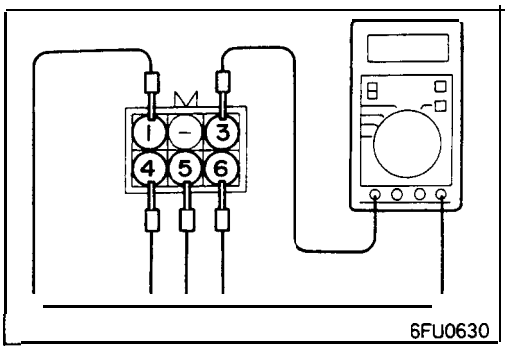




RESISTOR <Turbo>

MEASURING RESISTANCE BETWEEN TERMINALS

(1) Disconnect the resistor connector.

(2) Measure the resistance between the terminals.

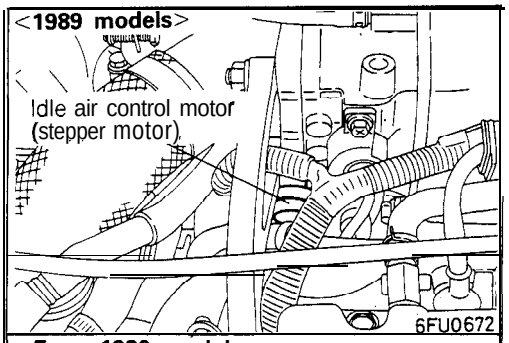
Standard value:

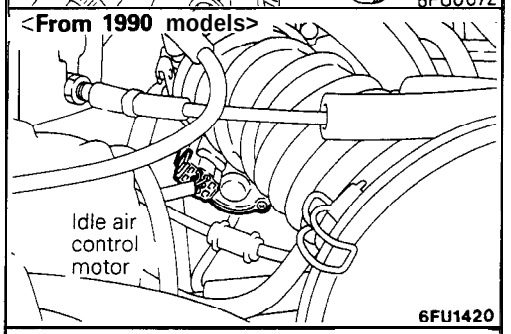
Measurement terminals	Resistance (Ω)
①–③	5.5–6.5 [at 20°C (68°F)]
④–③	
⑤–③	
⑥–③	

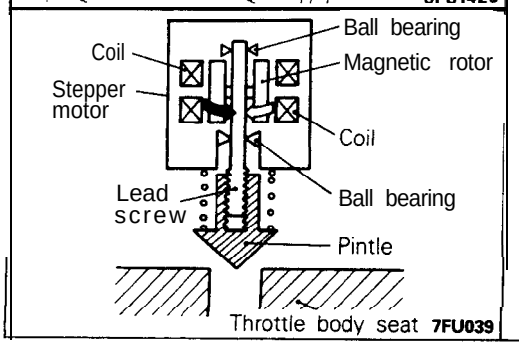
(3) If the resistance deviates from the standard value, replace the resistor.

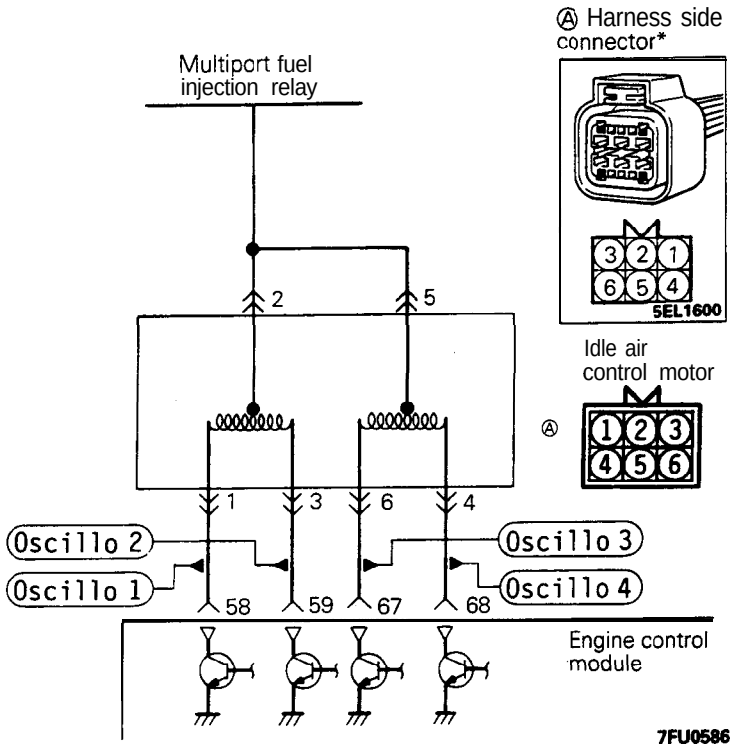
IDLE AIR CONTROL MOTOR (STEPPER MOTOR)

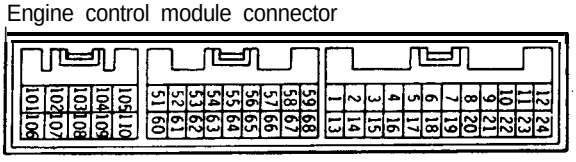
M13YUAH











N O T E

*: Indicates a connector that, from 1990 models, is the direct-connect type.

TSB Revision

OPERATION

- The amount of air taken in during idling is regulated by the opening and closing of the servo valve located in the air passage that bypasses the throttle valve.
- The servo valve is opened or closed by the activation of the stepper motor (incorporated within the idle air control motor) in the forward or reverse direction.
- Battery power supply is supplied, by way of the multiport fuel injection relay, to the coil of the stepper motor. The engine control module switches ON the power transistors (located within the engine control module) in sequential order, and, when current flows to the stepper motor coil, the stepper motor is activated in the forward or reverse direction.

TROUBLESHOOTING HINTS

Hint 1: If the number of stepper motor steps increases to 100– 120 steps or decreases to 0 step, the cause may be presumed to be a malfunction of the stepper motor or damaged or disconnected wiring of the harness.

Hint 2: If the number of stepper motor steps deviates from the standard value even though the results of the checking of the harness of the idle air control motor and of the component itself indicate no abnormal condition, the cause may be presumed to be one of the following.

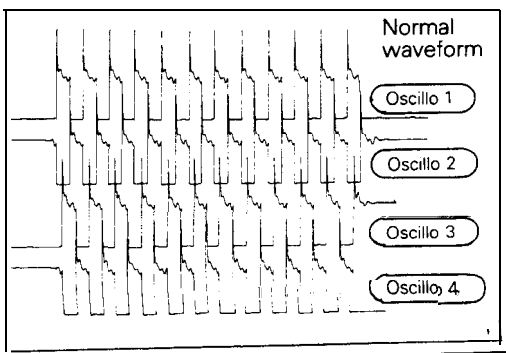
(1) Improper adjustment of the standard idling speed.
(2) Deposits adhered to the throttle valve.
(3) Leakage of air into the intake manifold from a gasket gap, etc.
(4) Incomplete close contact of the EGR valve seat.
(5) Incomplete combustion within the cylinder.
(Malfunction of the spark plugs, the ignition coil, the injectors, the compression pressure, etc.)

INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Load conditions	Standard value
Data reading	45	Stepper motor steps	. Engine coolant temperature: 85–95°C (185–205°F) . Lights, electrical cooling fan and accessories: OFF . Transaxle: neutral . Closed throttle switch: ON (The compressor clutch should be activated when the air conditioning switch is switched ON.) • Engine: idling	. Air conditioning switch: OFF	4–14 Step <Non-Turbo> 5–15 Step <Turbo>
				• Air conditioning switch: ON	20–60 Step <Non-Turbo> 30–40 Step <Turbo>

NOTE
When the vehicle is new (driven approximately 500 km (300 miles) or less) the number of steps may be about 30 steps greater than the standard value indicated above.



Using Oscilloscope

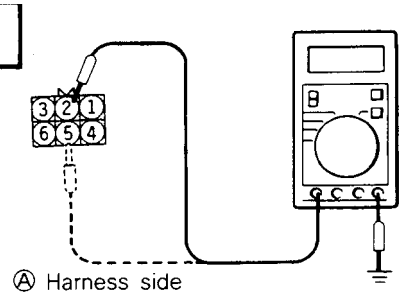
(1) Connect the probe to each oscilloscope pick-up point as shown in the circuit diagram.
(2) Start the engine.
(3) When the air conditioning switch is turned on, the idling speed increases to operate the idle air control. Check the instantaneous waveform.

NOTE
Keep in mind that the waveform can be observed only when idle air control is in operation.

TSB Revision

HARNESS INSPECTION

1



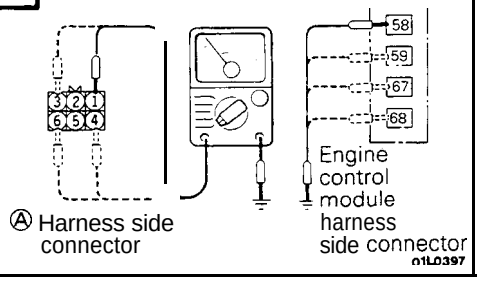
Measure the power supply voltage of the idle air control motor.
- Idle air control motor connector: Disconnected
- Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (MFI relay –Ⓐ2 MFI relay –Ⓐ5)

2



Check for an open-circuit, or a short-circuit to ground, between the engine control module and idle air control motor.
- Engine control module connector: Disconnected
- Idle air control motor connector: Disconnected

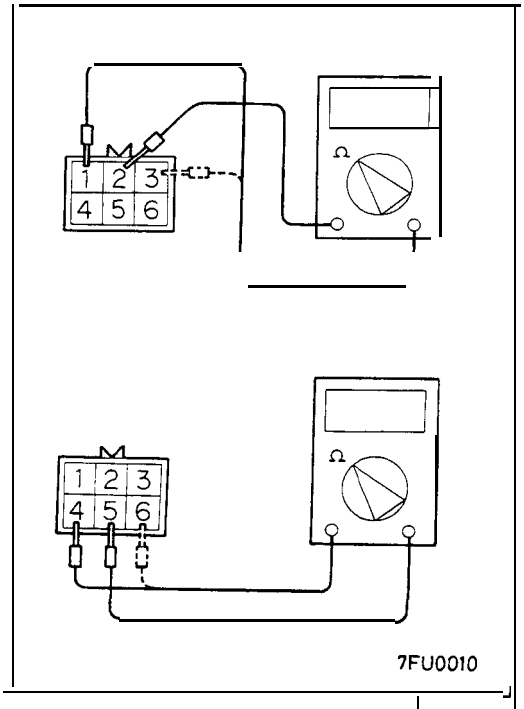
OK → STOP

NG → Repair the harness. (Ⓐ1 – 58, Ⓐ3 – 59, Ⓐ6 – 67, Ⓐ4 – 68)

ACTUATOR INSPECTION

Checking the Operation Sound

(1) Check that the operation sound of the stepper motor can be heard after the ignition is switched ON (but without starting the motor).
(2) 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 module.



Checking the Coil Resistance

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

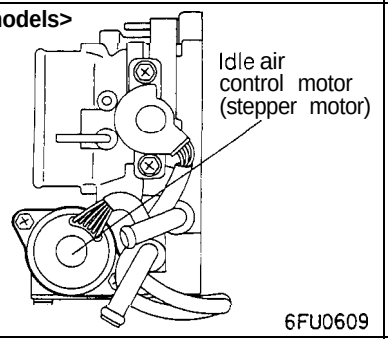
Standard value: 28-33 Ω at 20°C (68°F)

(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 air control motor side.

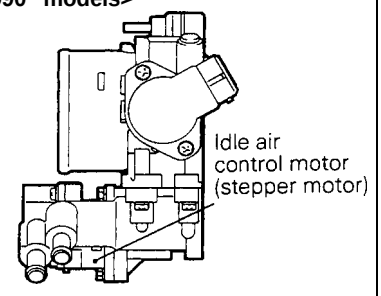
Standard value: 28-33 Ω at 20°C (68°F)

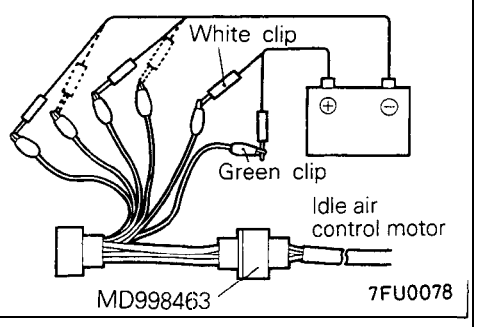
TSB Revision

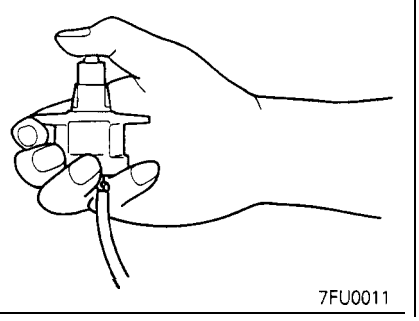
<1989 models>



<From 1990 models>







Operational Check

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

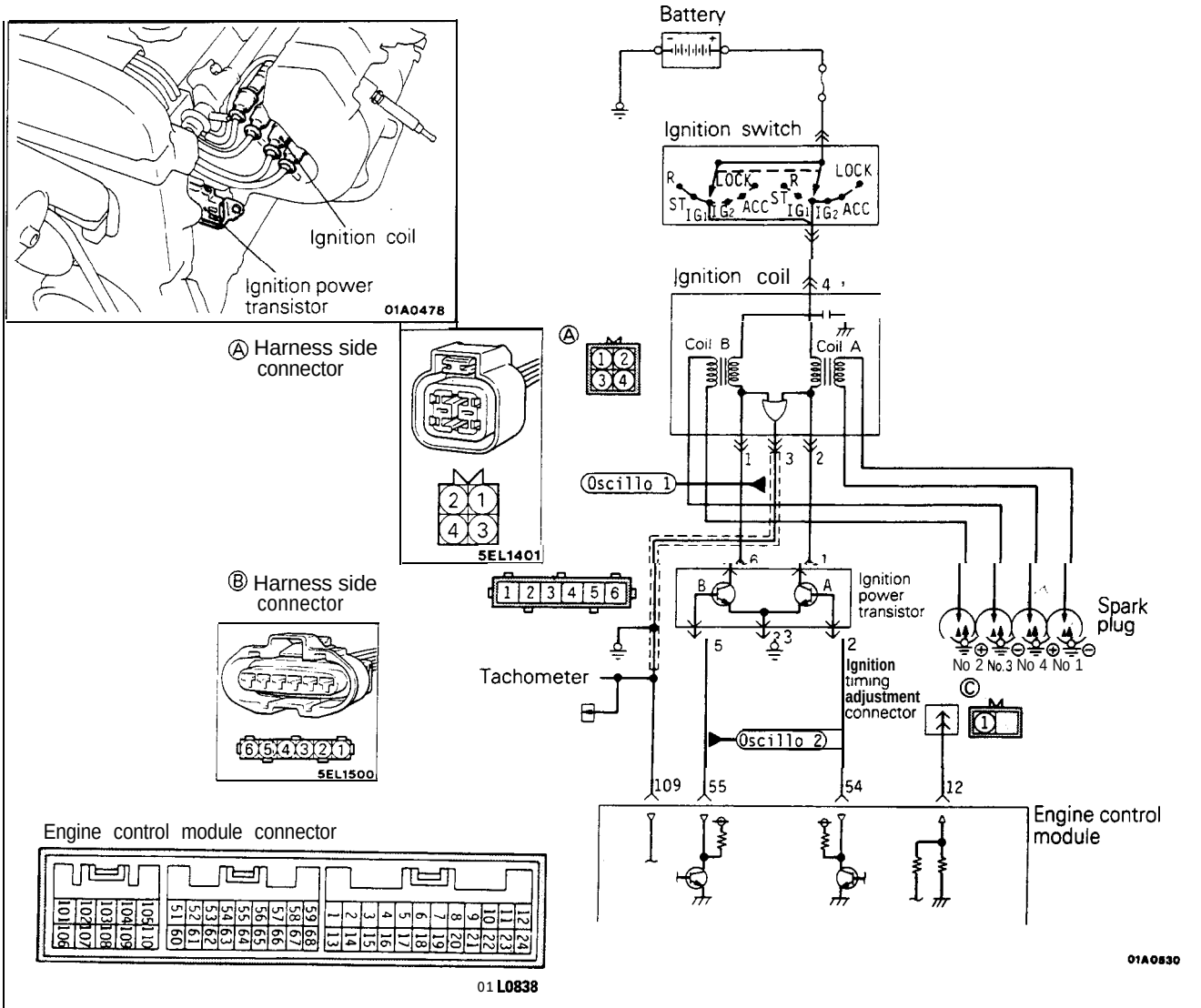
(3) Connect the special tool (Test harness) to the idle air control motor connector.
(4) Connect the positive (+) terminal of a power supply (approx. 6 V) to the white clip and the green clip.

(5) With the idle air control motor as shown in the illustration, connect the negative (-) terminal of the power supply to each clip as described in the following steps, and check whether or not a vibrating feeling (a feeling of very slight vibration of the stepper motor) is generated as a result of the activation of the stepper motor.
   ① Connect the negative (−) terminal of the power supply to the red and black clip.
   ② Connect the negative (−) terminal of the power supply to the blue and black clip.
   ③ Connect the negative (−) terminal of the power supply to the blue and yellow clip.
   ④ Connect the negative (−) terminal of the power supply to the red and yellow clip.
   ⑤ Connect the negative (−) terminal of the power supply to the red and black clip.
   ⑥ Repeat the tests in sequence from (5) to (1).
(6) If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.

TSB Revision

IGNITION COIL AND IGNITION POWER TRANSISTOR <1989 models>

M13YVAAa



OPERATION

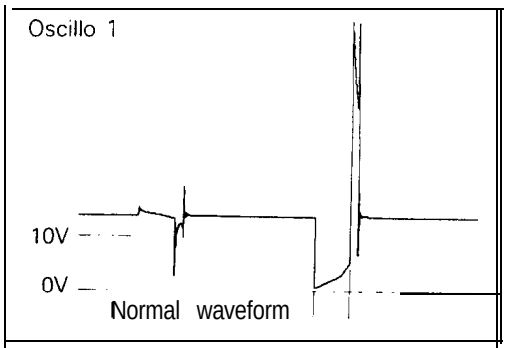
- When ignition power transistor unit A is switched ON by signals from the engine control module, primary current flows to ignition coil A. When ignition power transistor unit A is switched OFF, the primary current is interrupted, high voltage is generated at secondary coil A, and the spark plug for the No.1 and No.4 cylinders sparks. When, however, ignition power transistor unit B is switched from ON to OFF, the spark plug for the No.2 and No.3 cylinders sparks.
- When the engine control module switches OFF the power transistor inside the unit, battery voltage is applied to the ignition power transistor unit, and the ignition power transistor unit is switched ON.
  When the engine switches ON the ignition power transistor within the unit, however, the ignition power transistor unit is switched OFF.

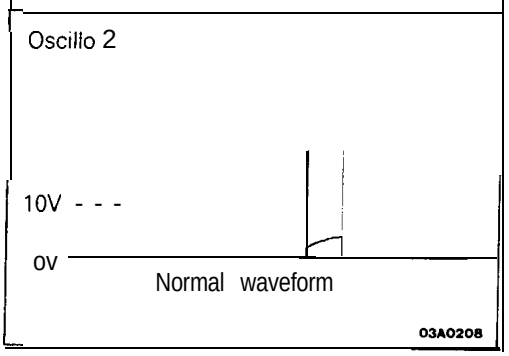
TSB Revision

INSPECTION

Using Scan tool

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	44	Ignition advance	. Engine: warm . Timing light: set (Use the timing light to check the actual ignition timing.)	750 rpm (idling)	5-15" BTDC
				2,000 rpm	32 – 4 1 "BTDC





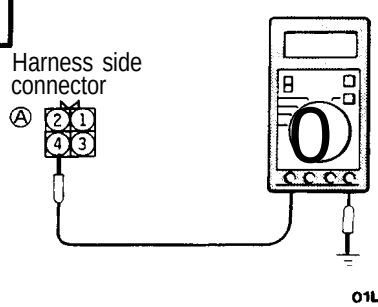
Using Oscilloscope

1. Primary signal of ignition coil
   (1) Run the engine at an idle revolution speed.
   (2) Connect the probe to oscilloscope pick-up point 1 as shown in the circuit diagram, and check the primary signal of the ignition coil.

2. Control signal of ignition power transistor
   (3) Connect the probe to oscilloscope pick-up point 2 as shown in the circuit diagram, and check the control signal of the ignition power transistor.

HARNESS INSPECTION

1



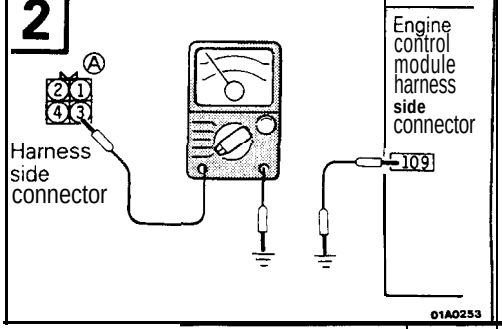
Measure the power supply voltage of the ignition coil.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (A4 – Ignition switch)

2



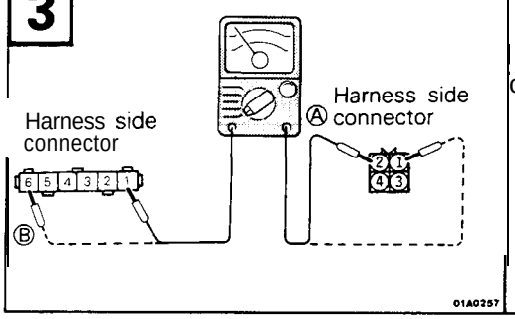
Check for an open-circuit, or a short-circuit to ground, between the engine control module and the ignition coil.
· Engine control module connector: Disconnected
· Ignition coil connector: Disconnected

OK → 3

NG → Repair the harness. (A3 – 109)

TSB Revision

3

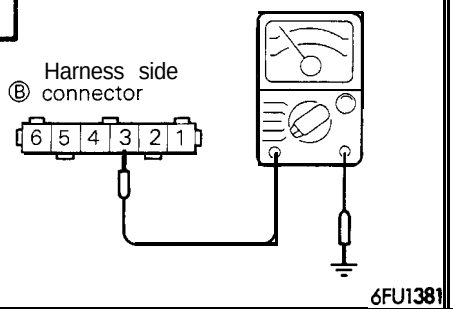


Check for an open-circuit, or a short-circuit to around, between the ignition power transistor and the ignition coil.
- ignition coil connector: Disconnected
- Ignition power transistor connector: Disconnected

OK → 4

NG → Repair the harness. (Ⓐ2–Ⓑ1, Ⓐ1–Ⓑ6)

4

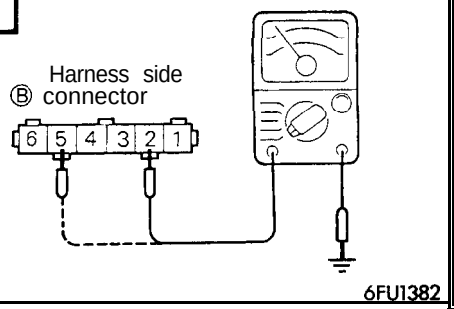


Check for continuity of the ground circuit.
- Connector: Disconnected

OK → 5

NG → Repair the harness. (Ⓑ3–Ground)

5



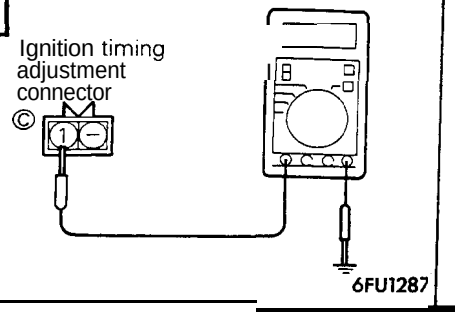
Measure the voltage of the control signal circuit of the ignition power transistor.
- Ignition power transistor connector: Disconnected
- Ignition switch: START

Voltage (V)
0.5–4.0

OK → 6

NG → Repair the harness. (Ⓑ2–54, Ⓑ5–55)

6



Measure the voltage of the ignition timing adjustment terminal.
- Ignition switch: ON

Voltage (V)
4.0–5.2

OK → STOP

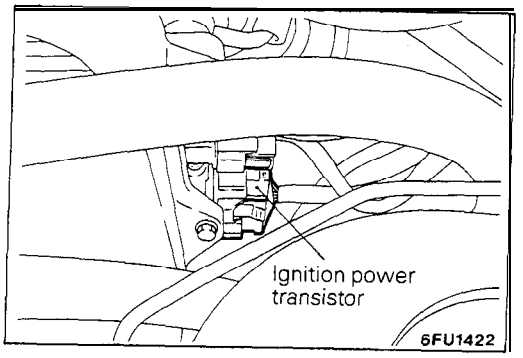
NG → Repair the harness. (Ⓒ1–12)

ACTUATOR INSPECTION

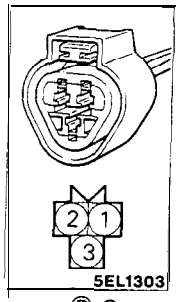
Refer to GROUP 16–Ignition System.

IGNITION COIL AND IGNITION POWER TRANSISTOR <From 1990 models>

M13YVAAb

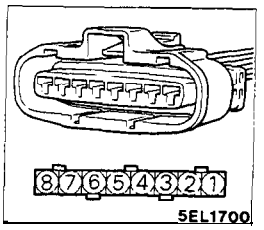


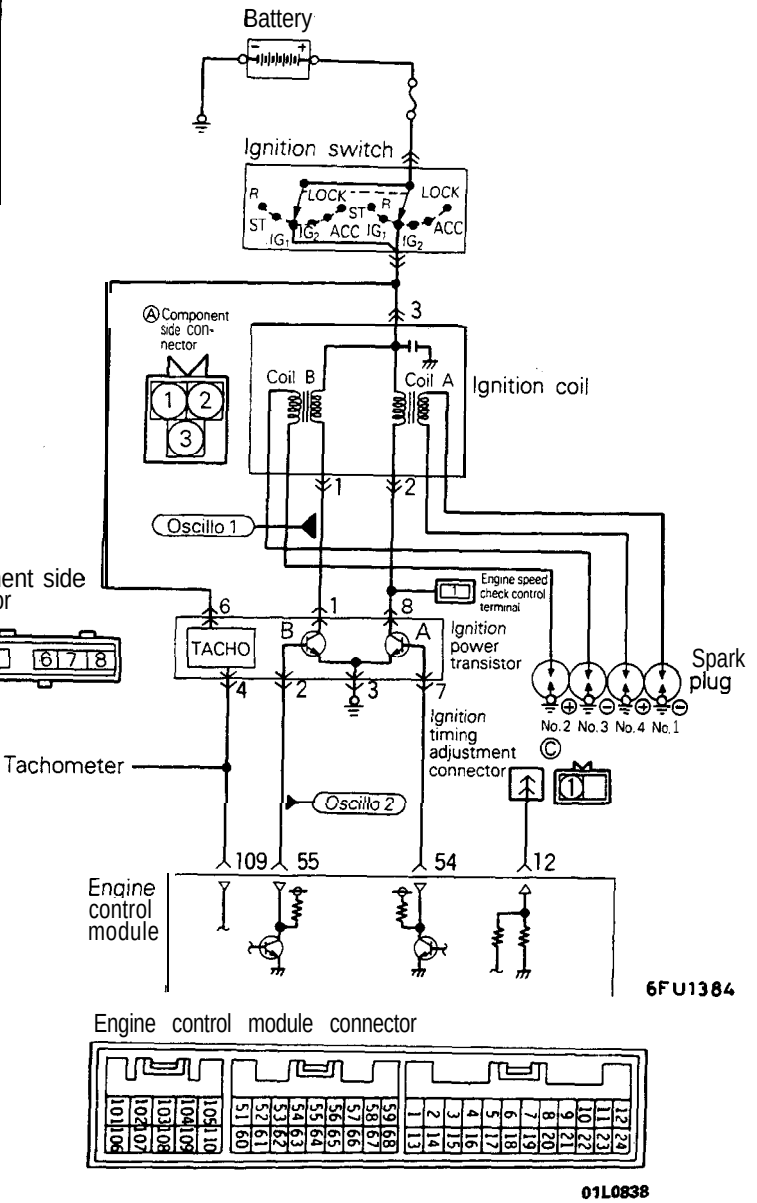
Ⓐ Harness side connector



Ⓑ Component side connector

Ⓑ Harness side connector





OPERATION

INSPECTION

Using Scan tool

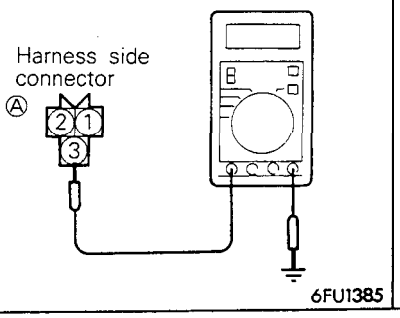
Refer to P.13-302.

Function	Item No.	Data display	Inspection conditions	Engine condition	Standard value
Data reading	44	Ignition advance	· Engine: warm · Timing light: set (Use the timing light to check the actual ignition timing.)	750 rpm (idling)	5– 15° BTDC
				2,000 rpm	33–41° BTDC <Non-Turbo> 30–40° BTDC <Turbo>

TSB Revision

HARNESS INSPECTION

1



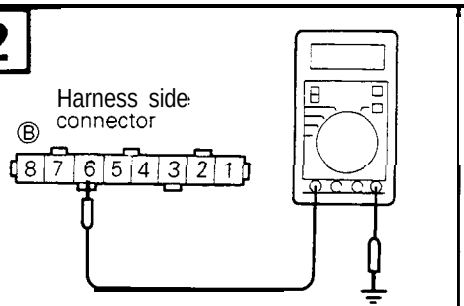
Measure the power supply voltage of the ignition coil.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Ⓐ3 – Ignition switch)

2



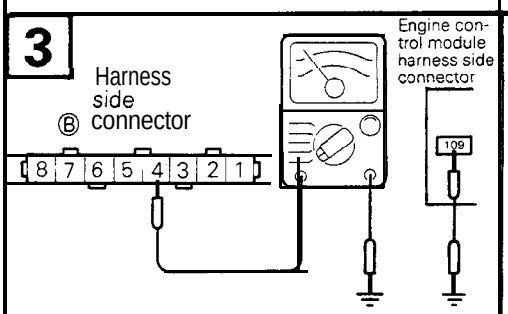
Measure the power supply voltage of the ignition coil.
. Connector: Disconnected
. ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 3

NG → Repair the harness. (Ⓑ6 – Ignition switch)

3

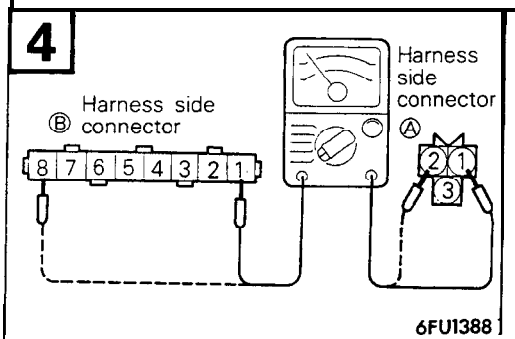


Check for an open-circuit, or a short-circuit to ground, between the engine control module and the ignition power transistor.
. Engine control module connector: Disconnected
. Ignition power transistor connector: Disconnected

OK → 4

NG → Repair the harness. (Ⓑ4 – 109)

4

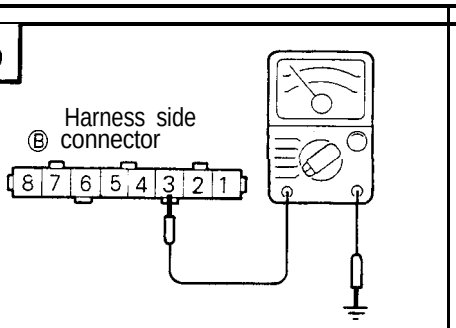


Check for an open-circuit, or a short-circuit to ground, between the ignition power transistor and the ignition coil.
· Ignition coil connector: Disconnected
· Ignition power transistor connector: Disconnected

OK → 5

NG → Repair the harness. (Ⓐ1 – Ⓑ1, Ⓐ2 – Ⓑ8)

5



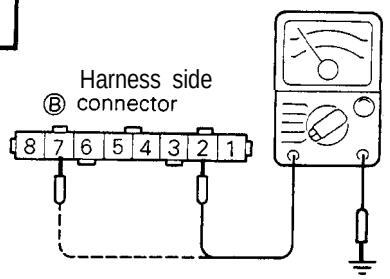
Check for continuity of the ground circuit.
. Connector: Disconnected

OK → 6

NG → Repair the harness. (Ⓑ3 – Ground)

TSB Revision

6



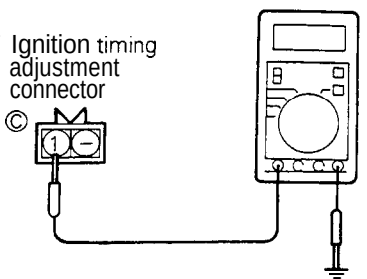
Measure the voltage of the control signal circuit of the ignition power transistor.
- Connector: Disconnected
- Ignition switch: START

Voltage (V)
0.5–4.0

OK → 7

NG → Repair the harness. (Ⓑ2–55, Ⓑ7–54)

7



Measure the voltage of the ignition timing adjustment terminal.
. Ignition switch: ON

Voltage (V)
4.0–5.2

OK → STOP

NG → Repair the harness. (©1–12)

ACTUATOR INSPECTION

Refer to GROUP 16–Ignition System.

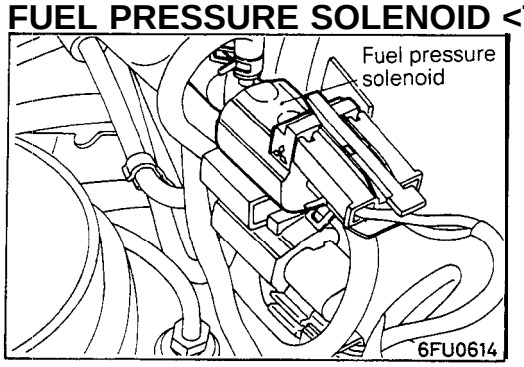
EVAPORATIVE EMISSION PURGE SOLENOID M13YWAAa

Refer to P.13-99.

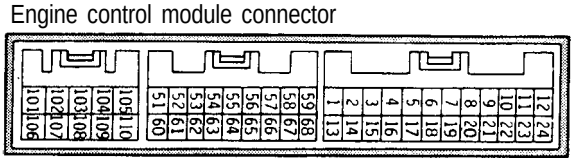
EGR SOLENOID <Calif.> M13YZBAa

Refer to P.13-101.

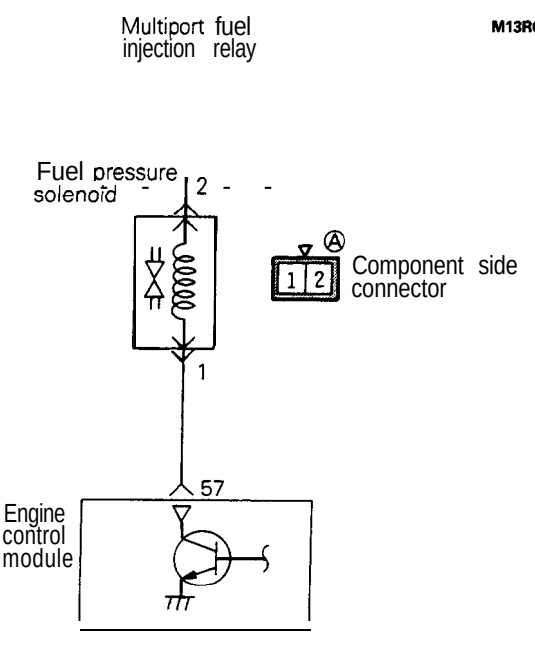
FUEL PRESSURE SOLENOID <Turbo>



Engine control module connector



M13RCMA



TSB Revision

OPERATION

- The fuel pressure solenoid is an ON-OFF type of solenoid valve and changes pressure fed into the fuel pressure regulator to intake manifold pressure and barometric pressure.
- Battery power is supplied to the fuel pressure solenoid via the multiport fuel injection relay. When the engine control module turns on the power transistor in the unit, current flows in the coil and barometric pressure is fed to the fuel pressure regulator.
- If engine coolant temperature (approximately 95°C (203°F) or more) and also air intake temperature (approximately 50°C (122°F) or more) are high when the engine is started, fuel pressure is controlled in order to maintain pressure at approximately 260 kPa (37 psi) immediately after starting and then, after a lapse of approximately 30 seconds to 2 minutes, to lower it to approximately 190 kPa (27 psi).

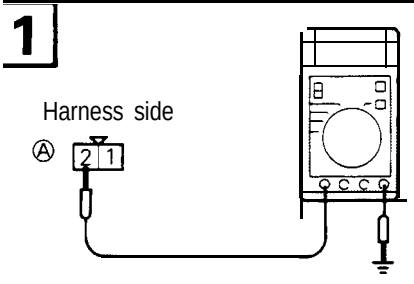
INSPECTION

Using Scan tool

Function	Item No.	Description	Inspection conditions	Normal condition
Actuator test	09	Solenoid valve switched from OFF to ON	Ignition switch: ON	Operating sound is heard when driven.

HARNESS INSPECTION

1



6FU1580

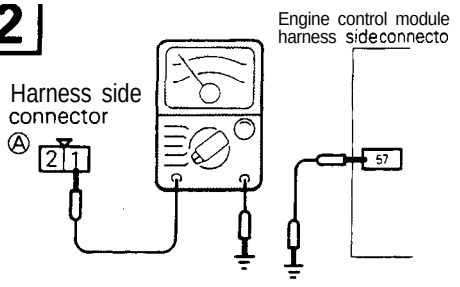
Measure the power supply voltage
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
OK Battery positive voltage

OK → 2

Repair the harness. (Ⓐ2 – MFI relay)

2



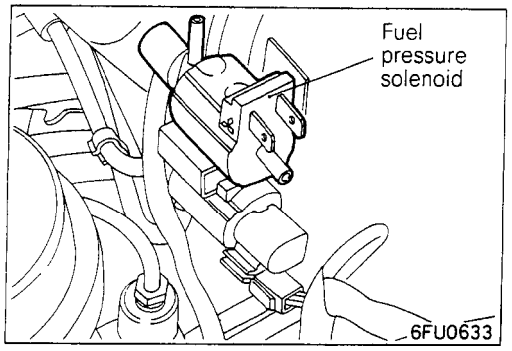
6FU1581

Check for an open-circuit, or short-circuit to ground, between the fuel pressure solenoid and the engine control module.
- Engine control module connector: Disconnected
. Fuel pressure solenoid connector: Disconnected

OK → STOP

OK → Repair the harness. (Ⓐ1 – 57)

TSB Revision

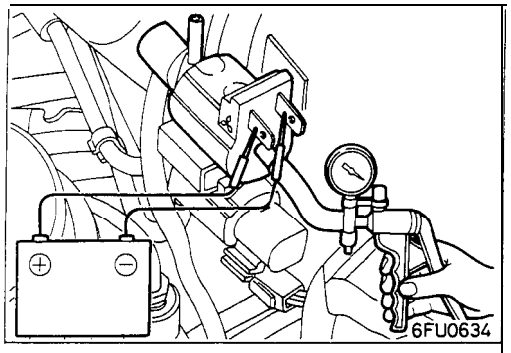


ACTUATOR INSPECTION

Operation inspection

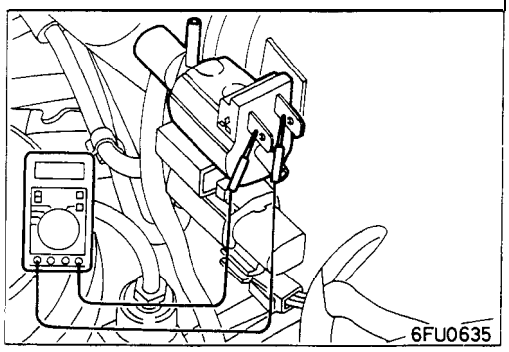
NOTE
When removing the vacuum hose, make a mark so that it can later be installed in the original connecting position.

(1) Remove the vacuum hose (blue stripe, black) from the solenoid valve.
(2) Cut off the harness connector.



(3) Apply a negative pressure in the nipple to which the black vacuum hose is connected with a hand vacuum pump and check that it is airtight when voltage is applied to the solenoid valve terminal and when not applied.

Battery voltage	Other solenoid valve nipple	Normal condition
Not applied	Open	Vacuum leaks.
	Closed by finger	Vacuum is maintained.
Applied	Open	Vacuum is maintained.



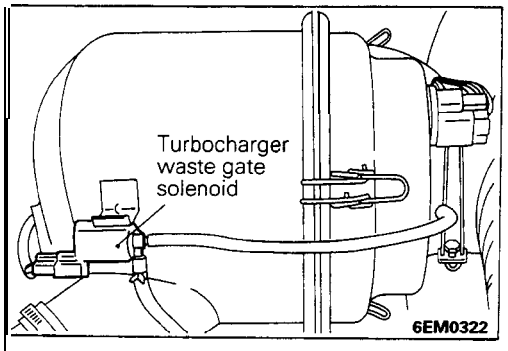
Inspection of coil resistance

Measure coil resistance with a tester.

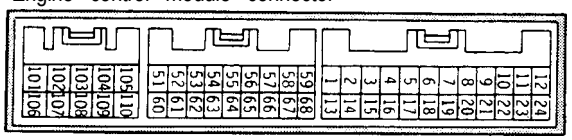
Standard value: 36-46 Ω [at 20°C (68°F)]

TURBOCHARGER WASTE GATE SOLENOID <Turbo>

M13ZABA



Engine control module connector



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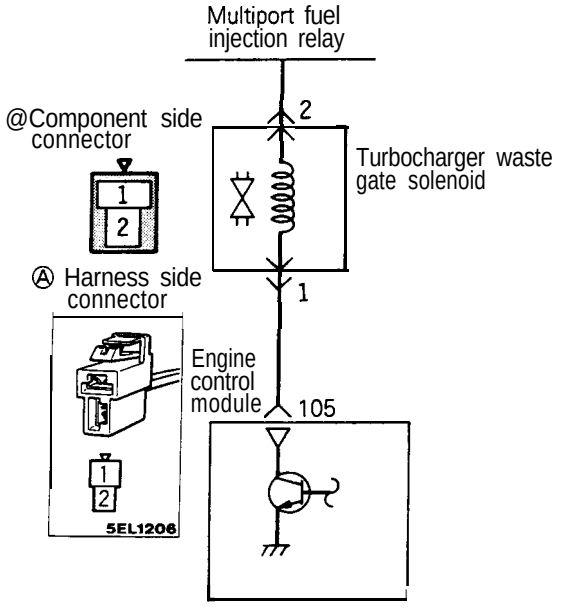

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OPERATION

- The turbocharger waste gate solenoid is an ON-OFF type solenoid valve and controls the leaking of overboost pressure that is fed to the turbocharger waste gate actuator.
- Battery power is supplied to the turbocharger waste gate solenoid via the multiport fuel injection relay. When the engine control **module** turns on the power transistor inside **the unit,** current flows to the coil and some overboost pressure that is fed to the turbocharger waste gate solenoid leaks out.

TROUBLESHOOTING HINTS

Since the results of the inspection of the turbocharger waste gate solenoid harness and single parts are normal, the following troubles can be inferred if there is some trouble such as poor acceleration, etc.

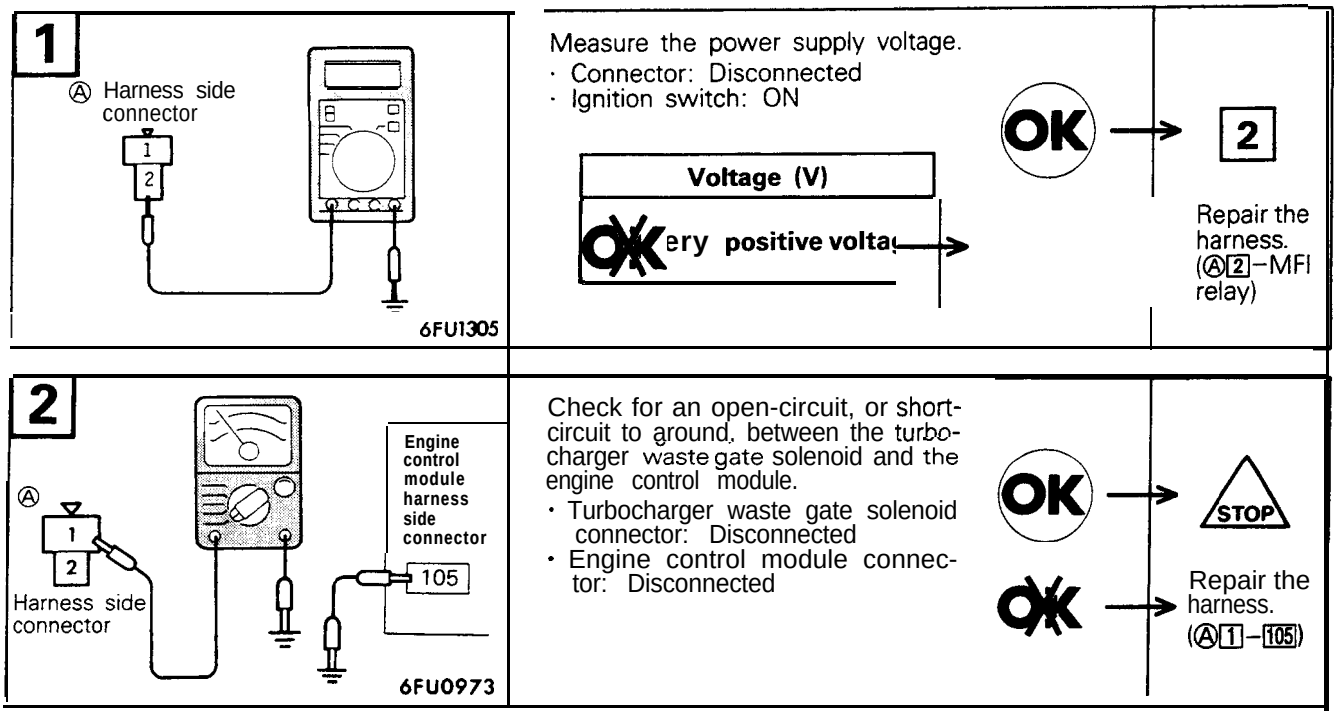
(1) Malfunction of the overboost pressure control system
(2) Poor intake air hose connection
(3) Malfunction of turbo charger, turbocharger waste gate solenoid
(4) Clogging of exhaust gas system

INSPECTION

Using Scan tool

Function	Item No.	Description	Inspection conditions	Normal condition
Actuator test	12	Solenoid valve switched from OFF to ON	ignition switch: ON	Operating sound is heard when driven.

HARNESS INSPECTION



ACTUATOR INSPECTION

Refer to GROUP 15.

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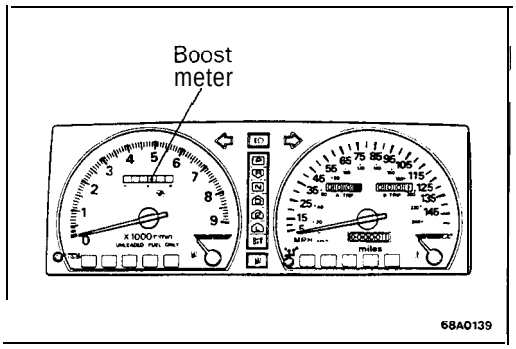
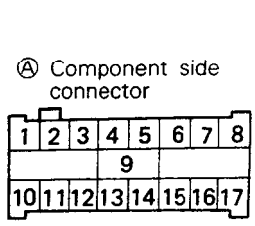
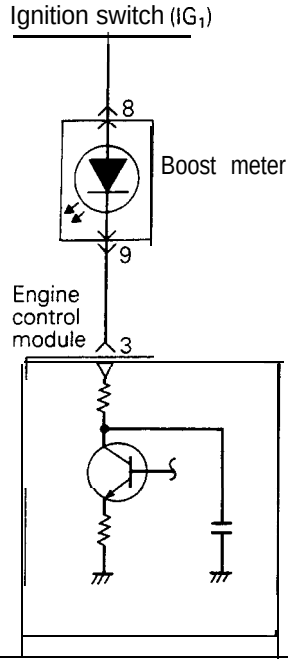
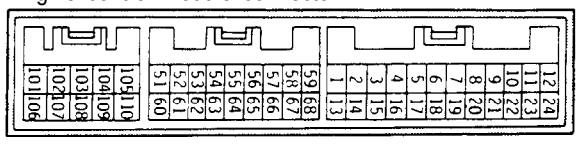
BOOST METER <Turbo>

M13ZACA



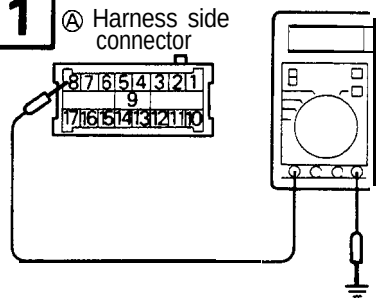






HARNESS INSPECTION

1



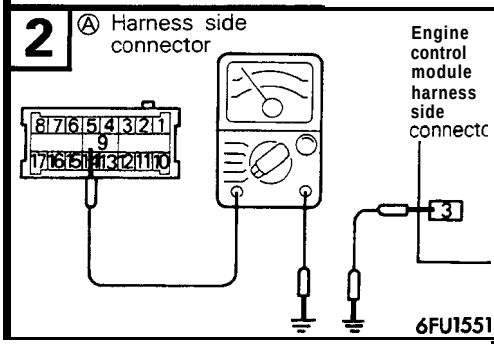
Measure the power supply voltage.
. Connector: Disconnected
. Ignition switch: ON

Voltage (V)
Battery positive voltage

OK → 2

NG → Repair the harness. (Ⓐ8–MFI relay)

2



Check for an open-circuit or a short-circuit to ground, between the engine control module and the boost meter.
• Booste meter connector: Disconnected
• Engine control module connector: Disconnected

OK → STOP

NG → Repair the harness. (Ⓐ9–3)

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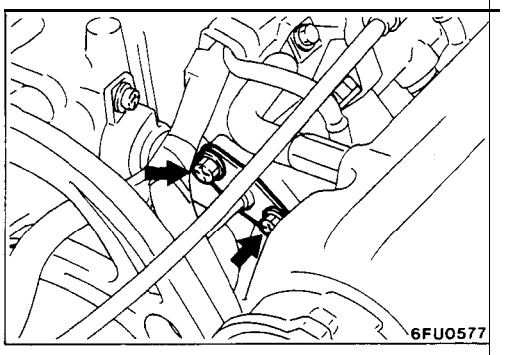
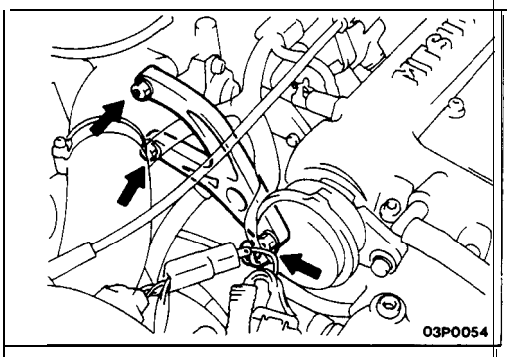


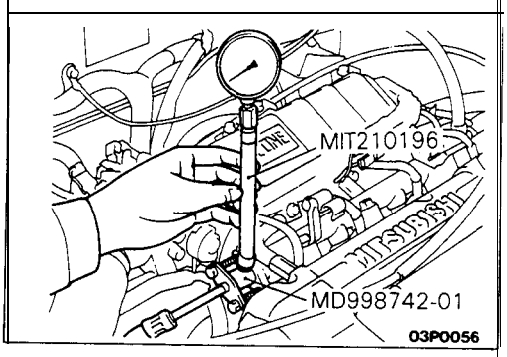
FUEL PRESSURE TEST M13YXAAa

(1) Reduce the internal pressure of the fuel pipes and hoses.
(2) Disconnect the fuel high pressure hose at the fuel rail side.

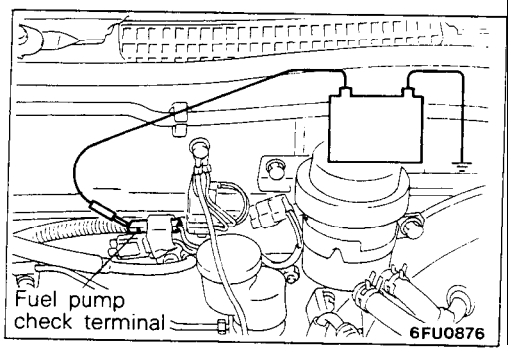
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



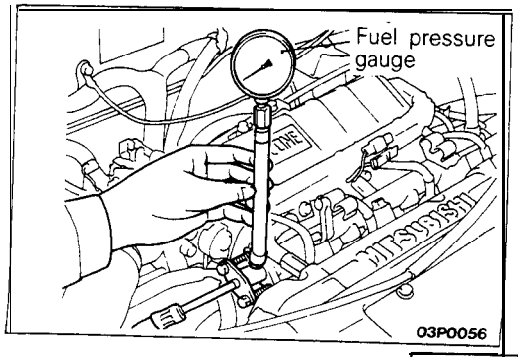
(3) Remove the throttle body stay.



(4) Place the MD998742-01 adapter on the end of the fuel rail, then attach the fuel high pressure hose to the adapter using the bolts supplied with the MIT210196 fuel pressure test assembly.
(5) Attach one end of the fuel hose supplied with the MIT21 0196 to the quick-disconnect fitting on the MD998742-01 adapter. Attach the other end of the hose to the fuel pressure gauge.
(6) Connect the (–) battery terminal.



(7) Connect a jumper wire to the terminal for activation of the fuel pump and to the positive (+) terminal of the battery to activate the fuel pump. With fuel pressure applied, check to be sure that there is no fuel leakage from the fuel pressure gauge and the special tool connection part.
(8) Disconnect the jumper wire (from the terminal for activation of the fuel pump) to stop the fuel pump.
(9) Start the engine and let it idle.



(10) Measure the fuel pressure during idling.

Standard value:
Approx. 270 kPa (38 psi) <Non-Turbo>
Approx. 190 kPa (27 psi) <Turbo>

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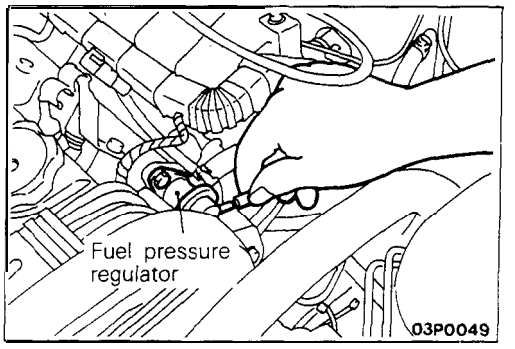

(11)Disconnect the vacuum hose from the fuel pressure regulator, and then measure the fuel pressure while using a finger to plug the end of the hose.

Standard value:
330–350 kPa (47–50 psi) <Non-Turbo>
250–270 kPa (36-38 psi) <Turbo>

(12)Check to be sure that the fuel pressure during idling does not decrease even after the engine is raced a few times.

(13)Use a finger to gently press the fuel return hose while repeatedly racing the engine, and check to be sure that there is fuel pressure in the return hose also.

NOTE
There will be no fuel pressure in the return hose if there is insufficient fuel flow.

(14)If the fuel pressure measured in steps (10) to (13) deviates from the standard value range, check for the probable cause by referring to the table below, and then make the appropriate repair.

Condition	Probable cause	Remedy
. Fuel pressure is too low. . Fuel pressure drops during racing. . No fuel pressure in fuel return hose.	Fuel filter is clogged.	Replace the fuel filter.
	Malfunction of the valve seat within the fuel pressure regulator, or fuel leakage to return side caused by spring deterioration.	Replace the fuel pressure regulator.
	Fuel pump low discharge pressure.	Replace the fuel pump.
Fuel pressure is too high.	The valve within the fuel pressure regulator is sticking.	Replace the fuel pressure regulator.
	Clogging of the fuel return hose and/or the pipe.	Clean or replace the hose and/or pipe.
No change of the fuel pressure when vacuum hose is connected and when not connected.	Damaged vacuum hose or nipple clogging.	Replace the vacuum hose, or clean the nipple.
	Malfunction of the fuel pressure control system <Turbo>	Checking the fuel pressure control system <Turbo>

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(15) Stop the engine and check for a change of the value indicated by the fuel pressure gauge. The condition is normal if there is no decrease of the indicated value within two minutes.
If there is a decrease of the indicated value, monitor the speed of the decrease, and, referring to the table below, determine the cause of the problem and make the appropriate repair.

Condition	Probable cause	Remedy
After the engine is stopped, the fuel pressure drops graudally.	injector leakage	Replace the injector.
	Leakage at the fuel pressure regulator valve seat	Replace the fuel pressure regulator.
There is a sudden sharp drop of the fuel pressure immediately after the engine is stopped.	The check valve (within the fuel pump) is not closed.	Replace the fuel pump.

(16) Reduce the internal pressure of the fuel pipes and hoses. (Refer to P. 13-102.)
(17) Disconnect the fuel pressure gauge and the special tools from the fuel rail.

Caution
Because there will be a some residual pressure in the fuel pipe line, use a shop towel to cover so that fuel doesn't splatter.

(18) Replace the O-ring at the end of the fuel high-pressure hose with a new one.
(19) After connecting the fuel high-pressure hose to the fuel rail, tighten the installation bolt.
(20) Check to be sure that there is no fuel leakage.
① Apply battery voltage to the terminal for activation of the fuel pump so as to activate the fuel pump.
② With fuel pressure applied, check for leakage of the fuel line.

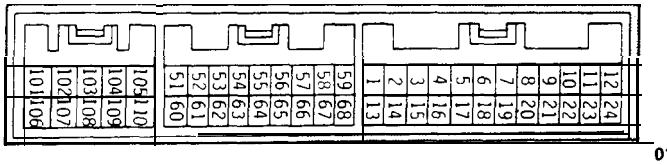
INSPECTION OF ENGINE CONTROL MODULE TERMINAL VOLTAGE

M13ZALCa

Refer to P.13-105.

TERMINAL VOLTAGE CHECK CHART

Terminal arrangement of engine control module connector



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NOTE:
B+: Battery positive voltage

Terminal No.	Check item	Check condition (Engine state)		Standard value	Remarks
103	Backup power supply	Ignition switch: OFF		B+	
102	Power supply	Ignition switch: ON		B+	
107					
110	Ignition switch-IG	Ignition switch: ON		B+	
13	Fuel pump drive signal	Engine: Cranking		8V or higher	
		Engine: Idling		B+	
63	Multiport fuel injection relay (Power supply)	Ignition switch: OFF		B+	
66		Ignition switch: ON		0–3V	
56	Multiport fuel injection relay (Fuel pump)	Ignition switch: ON		B+	
		Engine: Idling		0–3V	
23	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V	
10	Volume air flow sensor	Engine: Idling		2.2–3.2V	
		Engine speed: 2,000 rpm			
8	Air intake temperature sensor	Ignition switch: ON	Air intake temperature of 0°C (32°F)	3.2–3.8V	
			Air intake temperature of 20°C (68°F)	2.3–2.9V	
			Air intake temperature of 40°C (104°F)	1.5–2.1V	
			Air intake temperature of 80°C (176°F)	0.4–1.0V	
16	Barometric pressure sensor	Ignition switch ON	Altitude of 0 m (0 ft.)	3.7–4.3V	
			Altitude of 1,200 m (3,937 ft.)	3.2–3.8V	
20	Engine coolant temperature sensor	Ignition switch: ON	Coolant temperature of 0°C (32°F)	3.2–3.8V	
			Coolant temperature of 20°C (68°F)	2.3–2.9V	
			Coolant temperature of 40°C (104°F)	1.3–1.9V	
			Coolant temperature of 80°C (176°F)	0.3–0.9V	

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Terminal No.	Check item	Check condition (Engine state)		Standard value	Remarks
19	Throttle positron sensor	Ignition switch: It is kept ON for 15 seconds or more	Set the throttle valve to the idling position.	0.4 – 0.6V	
			Fully open the throttle valve.	4.5 – 5.5V	
14	Closed throttle position switch	Ignition switch: ON	Set the throttle valve to the idling position.	0 – 1V	
			Slightly open the throttle valve.	4V or higher	
22	Camshaft position sensor	Engine: Cranking		0.2 – 3.0V	
		Engine: Idling			
21	Crankshfat position sensor	Engine: Cranking		0.2 – 3.0V	
		Engine: Idling			
108	Ignition switch-ST	Engine: Cranking		8V or higher	
104	Park/neutral position switch	Ignition switch: ON	Set the selector lever to P or N.	0 – 3V	
			Set the selector lever to D, 2, L or R.	8 – 14V	
18	Vehicle speed sensor	• Ignition switch: ON • Slowly run the vehicle forward		0 ⟷ 5V (Repeat the variation.)	
5	Power steering pressure switch	Engine: Idling operation after warming-up	Steering wheel idle state	B+	
			During steering wheel operation	0 – 3V	
7	Air conditioning switch	Engine: Idling	Turn OFF the air conditioning switch.	0 – 3V	
			Turn ON the air conditioning switch. (The air conditioning compressor is in the drive state.)	B+	
35	Air conditioning compressor clutch relay	• Engine: Idling • Air conditioning switch: OFF → ON (The air conditioning compressor is in the drive state.)		B+ or temporarily 6V or higher ↓ 0 – 3V	
1	Heated oxygen sensor	Engine: Keep the engrne speed at 2.000 rpm after warming up. (For checking, use a digital voltmeter.)		0 ⟷ 0.8V (Repeat the variation.)	
51	No. 1 Injector	Engine: After warming up, rapidly press the accelerator pedal from the idling state,		Voltage temporarily drops slightly from 14V to 11V.	
52	No. 2 Injector				
30	No. 3 Injector				
31	No. 4 Injector				
38	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started (approx. 1 minute)		B+ ↑ ↓ 0 – 3V (Repeat the variation.)	
39	Stepper motor coil <A2>				
37	Stepper motor coil <B1>				
8	Stepper motor coil <B2>				

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Terminal No.	Check item	Check condition (Engine state)		Standard value	Remarks
54	Ignition power transistor unit	Engine speed: 3,000 rpm		0.3 – 3V	
55	Ignition power transistor unit B				
62	Evaporative emission purge solenoid	Ignition switch: ON		B+	
		Keep the engine speed at 3,000 rpm after the warmed-up engine is started,		0 – 3V	
57	Fuel pressure solenoid	Ignition switch: ON		B+	
		Engine: Cranking → Idling (Within approx. 2 seconds)		0 – 3V ↓ B+	
105	Turbocharger waste gate solenoid	Ignition switch: ON		B+	
		Engine: Idling (When premium gasoline is used.)		0 – 3V	
3	Boost meter	Ignition switch: ON		4 – 13V	
		Engine: After warming up, rapidly press the accelerator pedal from the idling state		It temporarily drops-slightly from B+.	
01	Engine ignition signal	Engine: 3,000 rpm		0.3 – 3V	
2	Ignition timing adjustment terminal	Ignition switch: ON	Ground the ignition timing adjustment terminal.	0 - 1V	
			Release the ground of the ignition timing adjustment terminal.	4.0 – 5.5V	
4	Check engine/ malfunction indicator lamp	Ignition switch: OFF → ON		0 – 3V ↓ 9 – 13V (After several minutes have elapsed)	
3	EGR solenoid	Ignition switch: ON		B+	
		Engine: After warming up, rapidly press the accelerator pedal from the idling state.		It temporarily drops slightly from B+.	
5	EGR temperature sensor	Ignition switch: ON	Sensor temperature of 50°C (122°F)	3.6 – 4.4V	
			Sensor temperature of 100°C (212°F)	2.2 – 3.0V	
105	Oxygen sensor heater	Engine: Idling operation after warming up		0 – 3V B+	
		Engine speed: 5,000 rpm		B+	
11	Anti-lock braking signal	Engine: Idling ● First start after ignition switch is turned on. ● Vehicle speed: 0 → 10 km/h		13 – 15V ↓ 0 – 3V (Temporarily)	

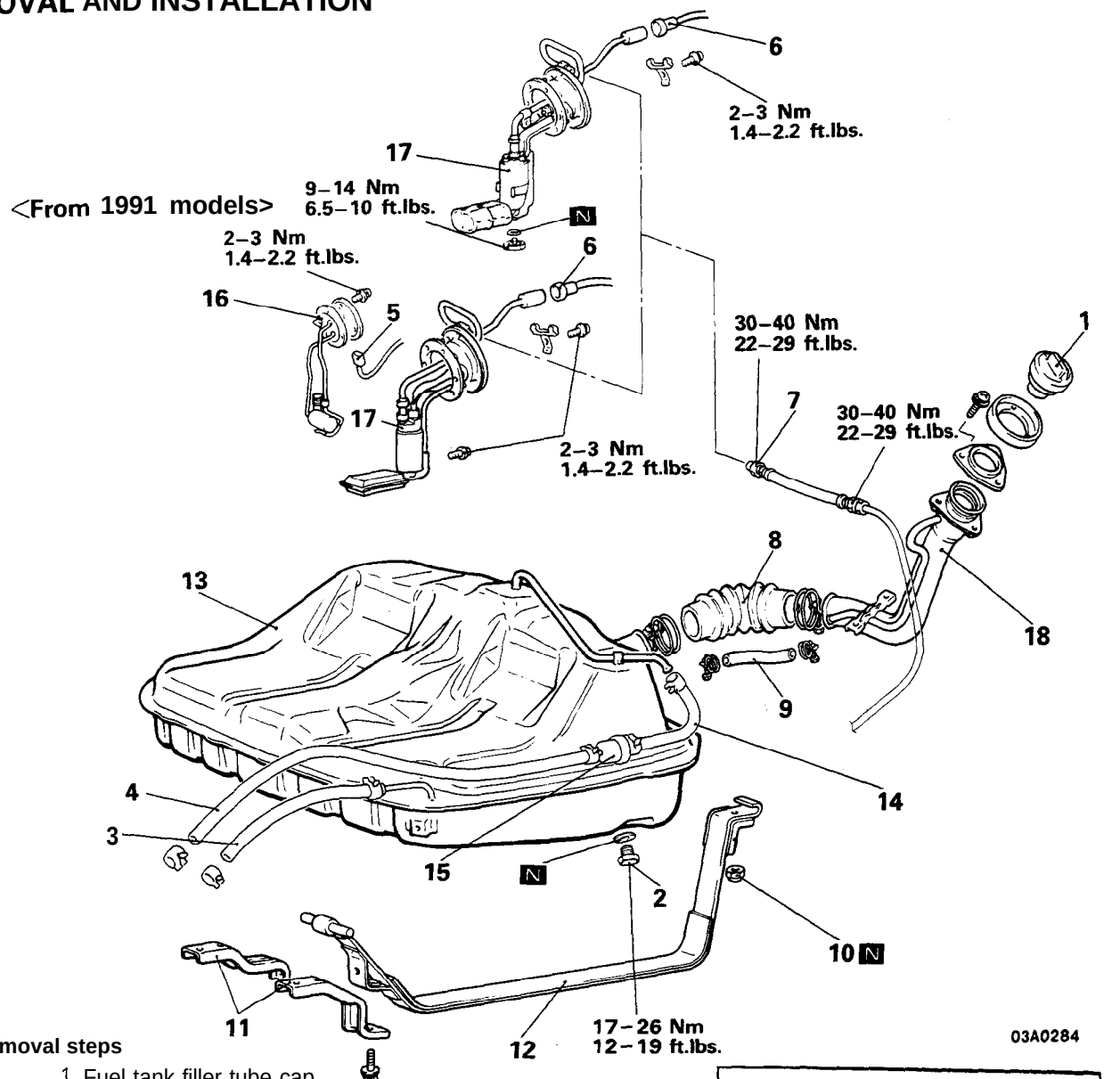
FUEL TANK <FWD>

M13GA--A

REMOVAL AND INSTALLATION

<Up to 1990 models>

<From 1991 models>



Removal steps

1. Fuel tank filler tube cap
2. Drain plug
- + 3. Return hose
- + 4. Vapor hose
5. Fuel gauge unit connector
6. Electrical fuel pump connector
- 4 7. High pressure hose to fuel pump connection
- ◆◆ 8. Filler hose
- ◆◆ 9. Vapor hose
- ◆◆ 10. Self-locking nut
11. Tank band stay
12. Tank band
13. Fuel tank
- ◆◆ 14. Vapor hose
- + 15. Fuel tank pressure control valve

16. Fuel gauge unit
17. Electrical fuel pump
18. Fuel tank filler tube

Pre-removal Operation
- Draining of the Fuel
- Release of Residual Pressure from High Pressure Fuel Hose (Refer to P.13-312.)

Post-installation Operation
- Measuerment of Fuel Pressure (Refer to P.13-312.)
- Supplying of the Fuel

Caution
When disconnecting the high pressure fuel hose, cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

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INSPECTION M13GCAI1

- Check the hoses and the pipes for crack or damage.
- Check the fuel tank filler tube cap for malfunction.
- Check the fuel tank for deformation, corrosion or crack.
- Check the fuel tank for dust or foreign material.

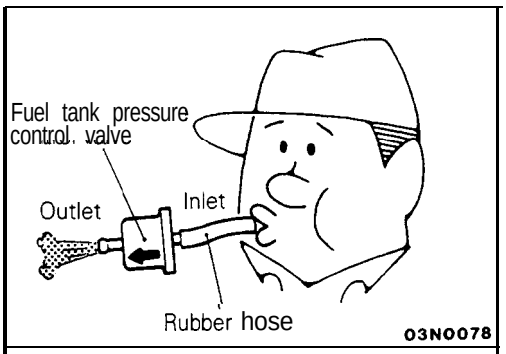
NOTE
If the inside of the fuel tank is to be cleaned, use any one of the following:
(1) Kerosene
(2) Trichloroethylene
(3) A neutral emulsion type detergent

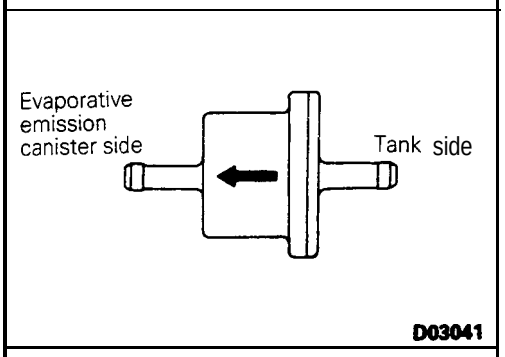
FUEL TANK PRESSURE CONTROL VALVE

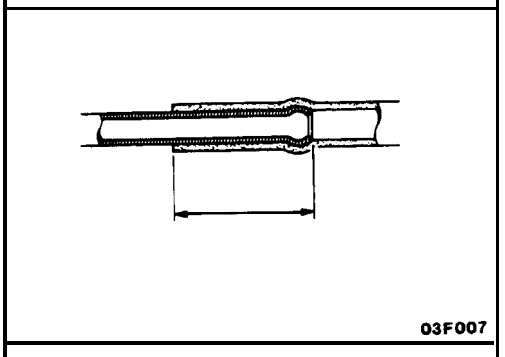
(1) Remove the fuel tank pressure control valve.
(2) Check the valve function after a clean rubber hose is installed on it.

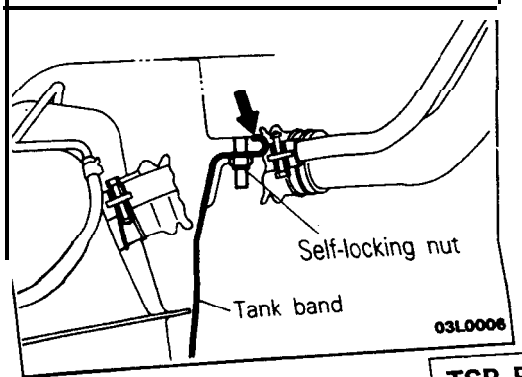
Check procedure	Normal function
Blow from the inlet (fuel tank side).	Air pressure through after you feel a slight resistance.
Blow from the outlet (evaporative emission canister side).	Air flows.

(3) Check the valve for crack or leakage.









SERVICE POINTS OF INSTALLATION M13GDAI1

15. INSTALLATION OF FUEL TANK PRESSURE CONTROL VALVE

Install so that the fuel tank pressure control valve is facing in the direction shown in the figure.

14./4. CONNECTION OF VAPOR HOSE/3. RETURN HOSE

When attaching the fuel hose to the pipe, be sure that the hose is attached as shown in the illustration.

Standard value : 25–30 mm (1.0–1.2 in.)

10. INSTALLATION OF SELF-LOCKING NUT

Tighten the self-locking nuts until the rear end of the tank band contacts the body.

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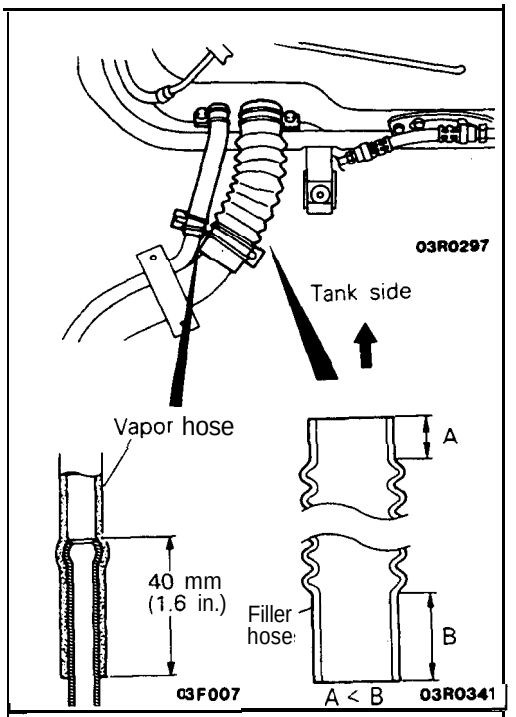
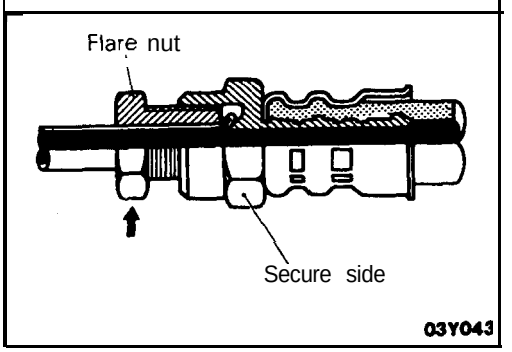


9. CONNECTION OF VAPOR HOSE/8. FILLER HOSE

(1) The vapor hose should be connected all the way at the tank, and approximately 40 mm (1.6 in.) at the fuel tank filler tube.
(2) The end of the filler hose with the shorter straight pipe part should be connected at the tank side.



7. CONNECTION OF HIGH PRESSURE HOSE TO FUEL PUMP

Temporarily tighten the flare nut by hand, and then tighten it to the specified torque, being careful that the fuel hose does not become twisted.

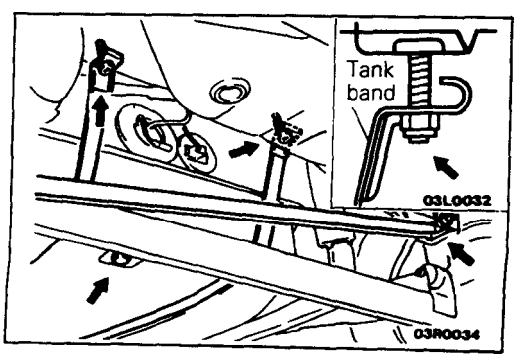
Caution
When tightening flare nut, be careful not to bend or twist line to prevent damage to fuel pump low connection.

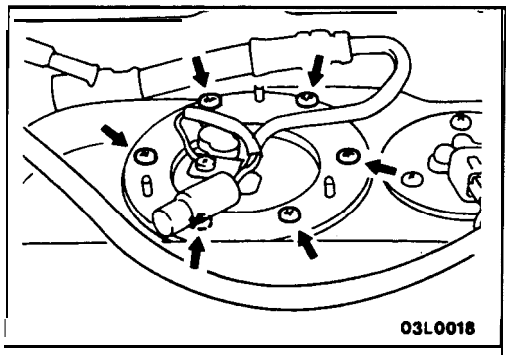
FUEL PUMP REPLACEMENT M13GFAC1

(1) Disconnect the fuel pump connector.
(2) Remove the fuel tank filler tube cap.
(3) Drain the fuel.
(4) Disconnect the fuel high pressure hose and main pipe.

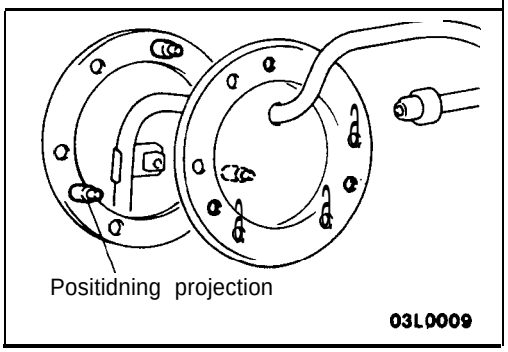
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

(5) Loosen the self-locking nuts to the end of the stud bolt.
(6) Disconnect the lateral rod right side body coupling; then lower the lateral rod and use wire or similar material to suspend from the axle beam.
(7) For models equipped with the ACTIVE-Electronic Control Suspension (E.C.S.) disconnect the rear height sensor and the lateral rod. (Refer to GROUP 33B–Service Adjustment Procedures.)





(8) Remove the fuel pump installation screws and the bolt for holding the fuel pump (at the lower side of the fuel tank), and then remove the fuel pump from the fuel tank.



(9) Align the three positioning projections of the packing with the holes in the fuel pump.

(10) When the fuel pump is installed, the holding bolt at the lower side of the fuel tank should be installed first. Care should be taken at this time that the O-ring is not pinched.

(11) For models equipped with the ACTIVE-E.C.S., check the operation of the ACTIVE-E.C.S. after installation of the rear height sensor. (Refer to GROUP 33B–Service Adjustment Procedures.)

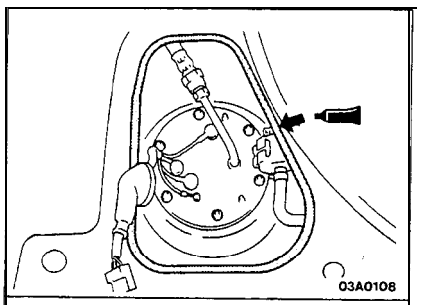
FUEL TANK <AWD>

M13GA--B

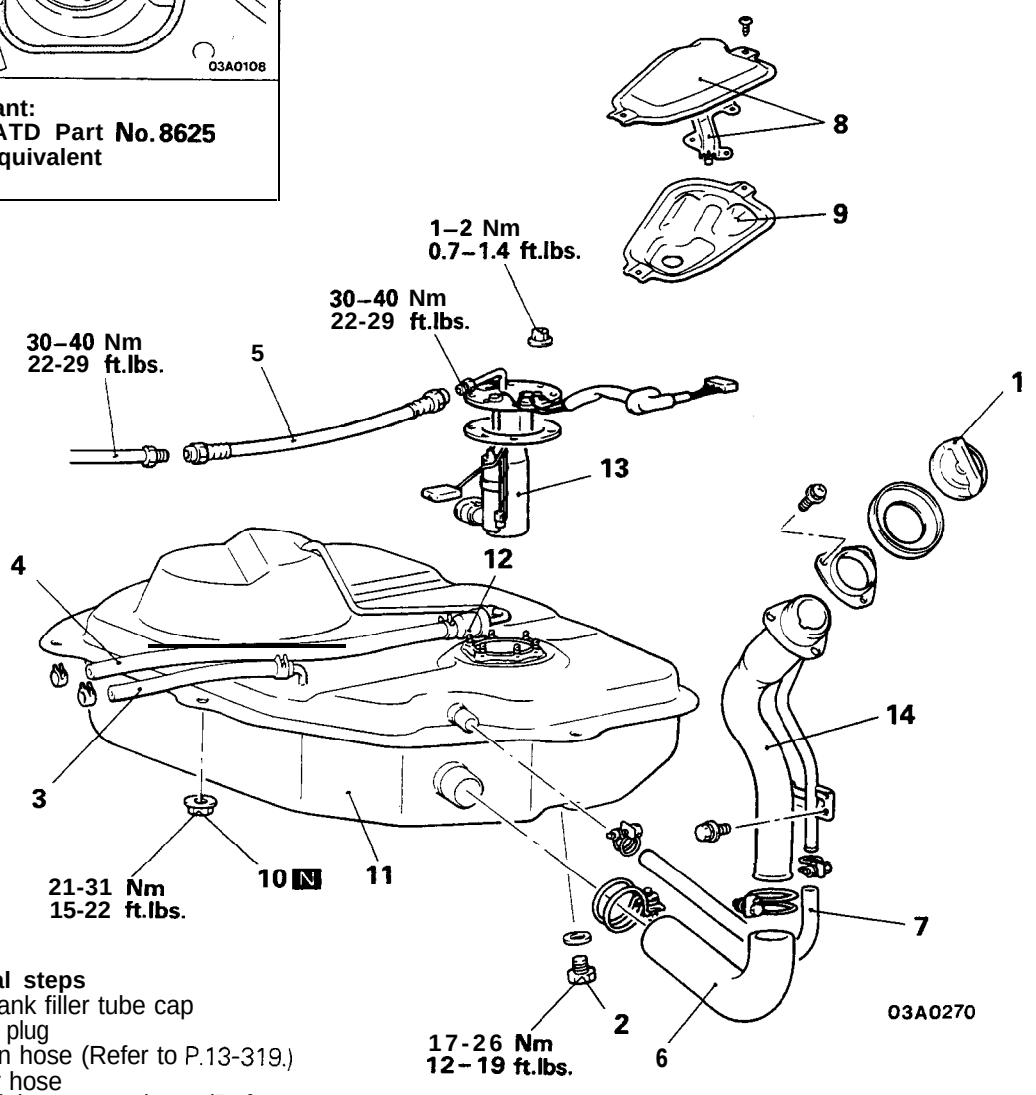
REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of the Fuel
- Release of Residual Pressure from High Pressure Fuel Hose (Refer to P.13-312.)

Post-installation Operation
- Measurement of Fuel Pressure (Refer to P.13-312.)
- Supplying of the Fuel



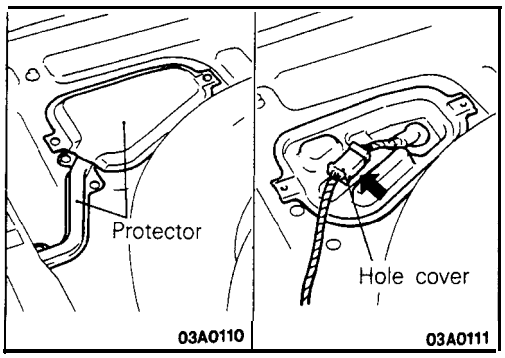
Sealant:
3M ATD Part No.8625
or equivalent



Removal steps
1. Fuel tank filler tube cap
2. Drain plug
3. Return hose (Refer to P.13-319.)
4. Vapor hose
5. Fuel high pressure hose (Refer to P.13-319.)
6. Filler hose
7. Vapor hose (Refer to P.13-319.)
8. Protector
9. Hole cover
10. Self-locking nut
11. Fuel tank
12. **Fuel tank pressure control valve (Refer to** P.13-319.)
13. **Fuel pump and gauge assembly**
14. Fuel tank filler tube

Caution
When disconnecting the high pressure fuel hose, cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

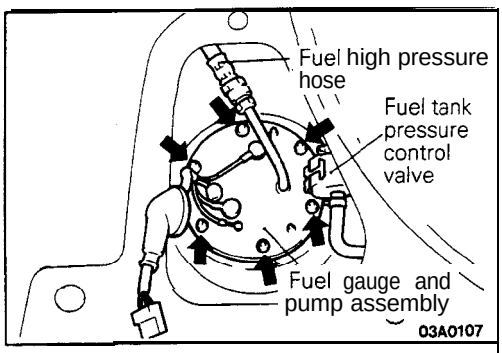
TSB Revision



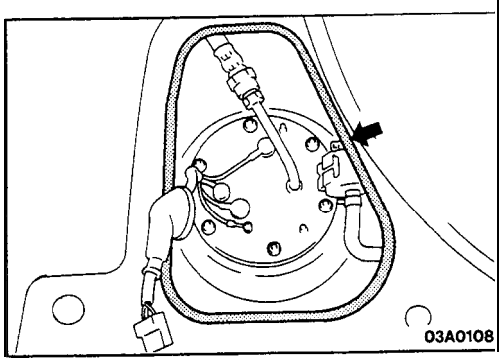
FUEL PUMP AND GAUGE ASSEMBLY REPLACEMENT

M13GEAG

(1) Remove the protectors.
(2) Disconnect the fuel pump and gauge assembly harness connector, and then remove the hole cover.



(3) Bleed the remaining pressure from the fuel pipe line to prevent fuel discharge. (Refer to P.13-312.)
(4) Disconnect fuel high pressure hose and remove the fuel tank pressure control valve, then remove the fuel pump and gauge assembly.



(5) Apply the specified sealant to the rear floor pan.

Specified sealant: 3M ATD Part No.8625 or equivalent

(6) After installing the fuel pump and gauge assembly, start the engine and check to ensure that there is no fuel leakage.

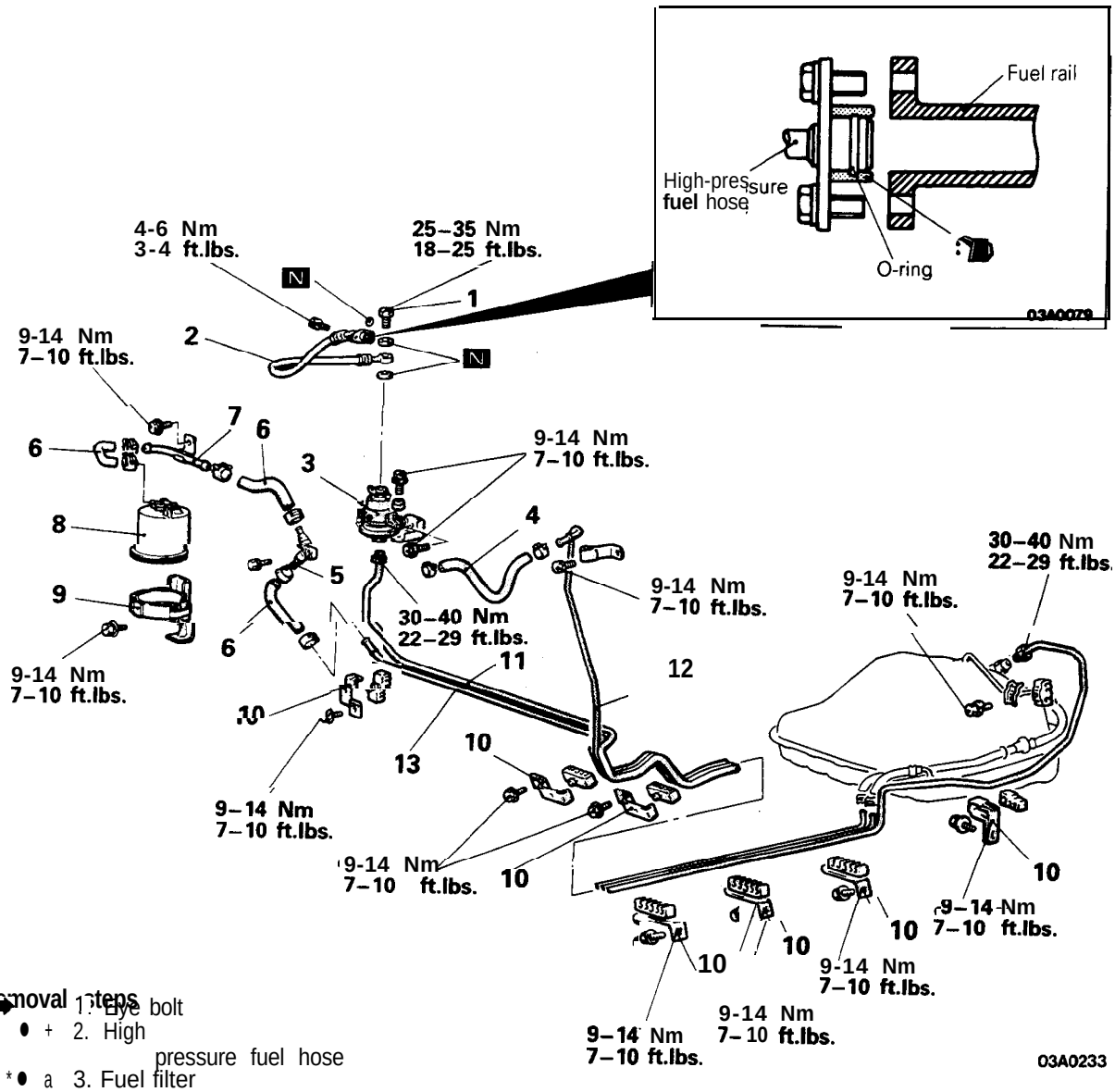
FUEL LINE AND VAPOR LINE <FWD>

REMOVAL AND INSTALLATION

M13KA--A

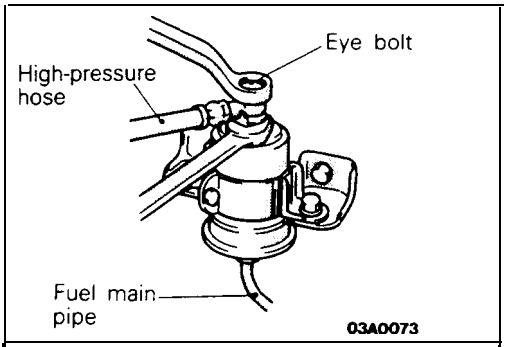
Pre-removal Operation
@Removal of the Battery Tray
(Refer to GROUP 54–Starter Motor)
*Release of Residual Pressure from High Pressure Fuel Hose
(Refer to P.13-312.)

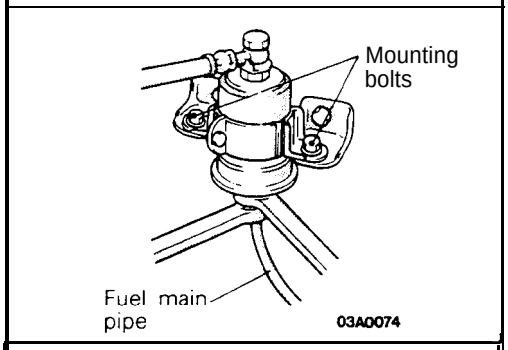
Post-installation Operation
*Measurement of Fuel Pressure
(Refer to P.13-312.)
*Installation of the Battery Tray
(Refer to GROUP 54–Starter Motor)

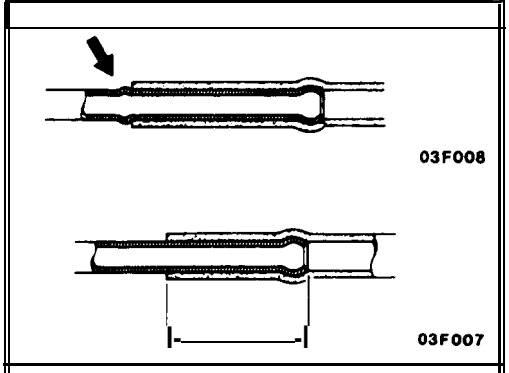


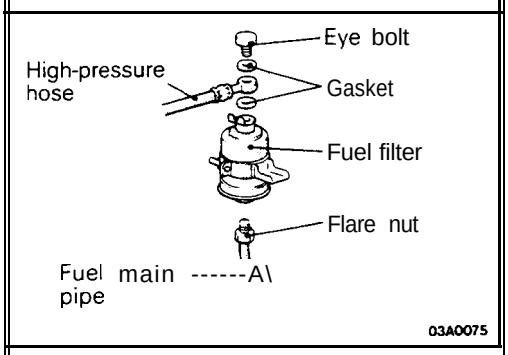
Removal steps
- 1. Eye bolt
- 2. High pressure fuel hose
- 3. Fuel filter
- 4. Fuel return hose
- 5. Check valve
- 6. Fuel vapor hose
- 7. Vapor pipe assembly
- 8. Evaporative emission canister
- 9. Evaporative emission canister holder
- 10. Clip
- 11. Fuel main pipe
- 12. Fuel return pipe
- 13. Fuel vapor pipe

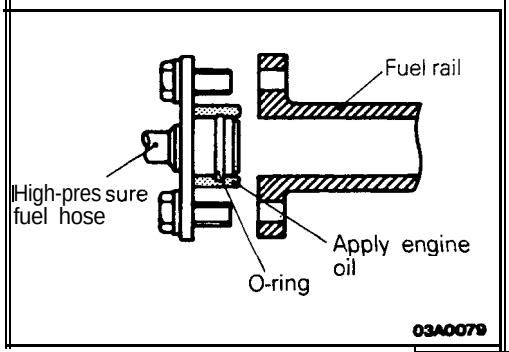
TSB Revision











SERVICE POINTS OF REMOVAL M13KBAM1

1. REMOVAL OF EYE BOLT

Remove the eye bolt while holding the fuel filter nut securely.

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. REMOVAL OF FUEL FILTER

(1) Loosen the main pipe flare nut while holding the fuel filter nut securely.
(2) Remove the fuel filter mounting bolts, and then remove the fuel filter from the bracket.

INSPECTION M13KCAB1

- Check the hose and pipes for cracks, bend, deformation and clogging.
- Check the evaporative emission canister for clogging.
- Check the fuel filter for clogging and damage.

SERVICE POINTS OF INSTALLATION M13KDAP1

6. INSTALLATION OF FUEL VAPOR HOSE/4. FUEL RETURN HOSE

(1) If the fuel pipe has a stepped part, connect the fuel hose to the pipe securely, up to the stepped part, as shown in the figure.
(2) If the fuel pipe does not have a stepped part, connect the fuel hose to the pipe securely, so that it is the standard value.

Standard value: 20–25 mm (.8–1.0 in.)

3. INSTALLATION OF FUEL FILTER

(1) When installing the fuel filter, first temporarily install the filter to the filter bracket; then insert the main pipe at the connector part of the filter, and manually screw in the main pipe's flare nut.
(2) Holding the fuel filter nut, tighten the fuel main pipe's flare nut and eye bolt at the specified torque. Then tighten the filter to the bracket.

2. INSTALLATION OF HIGH PRESSURE FUEL HOSE

Apply engine oil to the hose union.
Insert the hose, being careful not to damage the O-ring, and tighten securely.

Caution
Because there is high pressure applied between the fuel pump and the injection mixer, be especially sure that there is no fuel leakage in this area.

TSB Revision

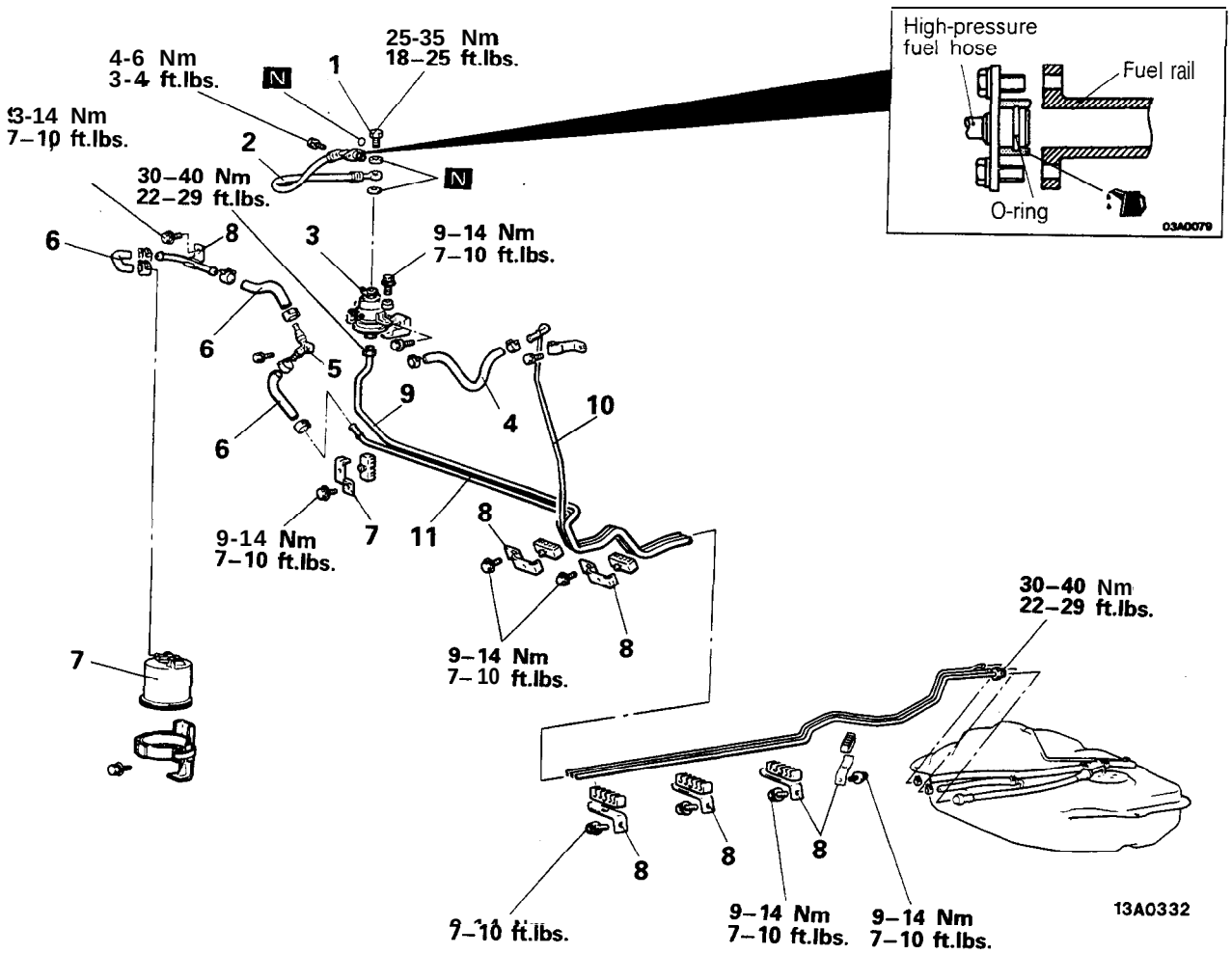
FUEL LINE AND VAPOR LINE <AWD>

M13KA--B

REMOVAL AND INSTALLATION

Pre-removal Operation
*Removal of the Battery Tray
(Refer to GROUP 54–Starter Motor)
*Release of Residual Pressure from High Pressure Fuel Hose
(Refer to P.13-312.)

Post-installation Operation
•Measurement of Fuel Pressure
(Refer to P.13-312.)
*Installation of the Battery Tray
(Refer to GROUP 54–Starter Motor.)



Removal steps
1. Eye bolt (Refer to P.13-325.)
2. Fuel high-pressure hose (Refer to P.13-325.)
3. Fuel filter (Refer to P.13-325.)
4. Fuel return hose (Refer to P.13-325.)
5. Check valve
6. Fuel vapor hose (Refer to P.13-325.)
7. Evaporative emission canister
8. Clip
9. Fuel main pipe
10. Fuel return pipe
11. Fuel vapor pipe

Caution
Because there is high pressure applied between the fuel pump and the injection mixer, be especially sure that there is no fuel leakage in this area.

TSB Revision

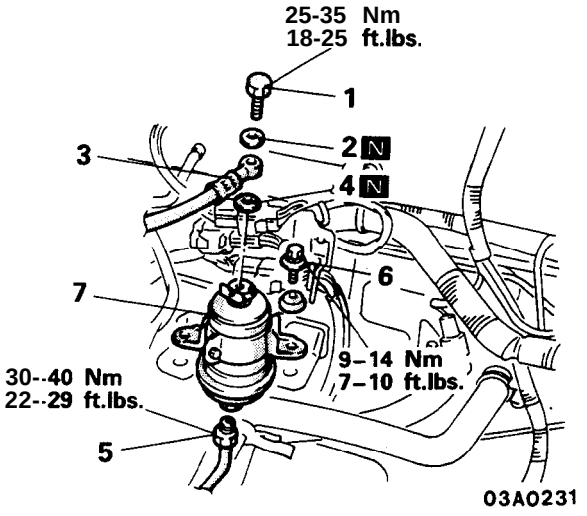
FUEL FILTER

REMOVAL AND INSTALLATION

M13VA--A

Pre-removal Operation
- Release of Residual Pressure from High Pressure Fuel Hose (Refer to P.13-312.)

Post-installation Operation
- *Measurement of Fuel Pressure (Refer to P.13-312.)



Fuel filter removal steps

1. Eye bolt (Refer to P.13-325.)
2. O-ring
3. Connection for high pressure fuel hose
4. O-ring
5. Connection for fuel main pipe
6. Mounting bolt
7. Fuel filter (Refer to P.13-325.)

TSB Revision

ENGINE CONTROL

SPECIFICATIONS

SERVICE SPECIFICATIONS

M13CB--B

Items	Specifications
Standard value	
Accelerator cable play mm (in.)	
<M/T>	1–2 (.04–.08)
<A/T>	3-5 (.12–.20)
Accelerator switch switching point mm (in.)	4-8 (.16–.31)

TORQUE SPECIFICATIONS

M13CC--B

Items	Nm	ft.lbs.
Accelerator arm bracket to body	8-12	6-9
Throttle body side inner cable to intake manifold plenum	4-6	3-4
Accelerator arm side inner cable to body	4-6	3-4

SEALANT

M13CE--B

Items	Specified sealant
Accelerator arm bracket	3M ATD Part No.8663 or equivalent

TROUBLESHOOTING

M13EGAB

ACCELERATOR CABLE AND ACCELERATOR PEDAL

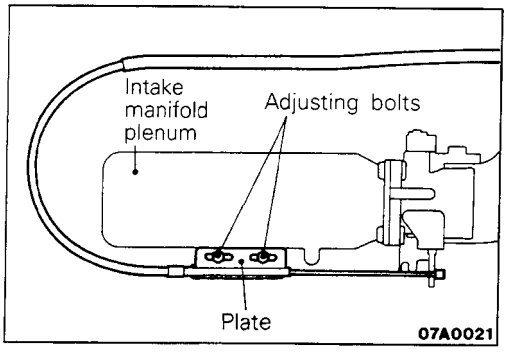
Symptom	Probable cause	Remedy
Throttle valve will not fully open or close	Misadjusted accelerator cable	Adjust
	Misadjusted automatic speed-control cable	Adjust
	Broken return spring	Replace
	Throttle lever malfunction	Replace
Accelerator pedal operation not smooth (over acceleration)	Accelerator pedal wrongly tightened	Repair
	Misinstalled accelerator cable	Repair
	Accelerator cable requires lubrication	Lubricate or replace

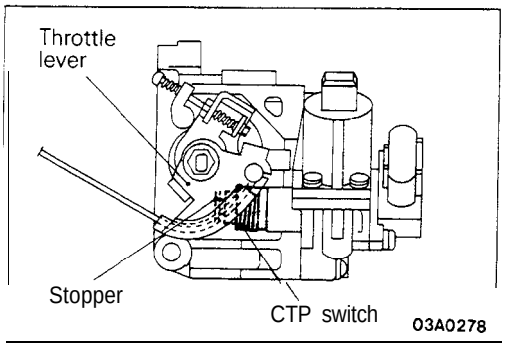
SERVICE ADJUSTMENT **PROCEDURES**

M13FBCE

ACCELERATOR CABLE INSPECTION AND ADJUSTMENT

For models equipped with the auto-cruise control system, refer to P. 13-398.





(1) Confirm there are no sharp bends in accelerator cable.
(2) On models with an SOHC engine, turn the ignition switch to the ON position (without starting the engine) and leave in that condition for approximately 15 seconds.
(3) Loosen the adjusting bolts on the intake manifold plenum, and then secure the outer cable so that the free play of the inner cable will be the standard value.

Standard value:

< M / T >	**1 – 2 mm (.04 – .08 in.)**
<A/T>	3-5 **mm (.12 – .20 in.)**

NOTE

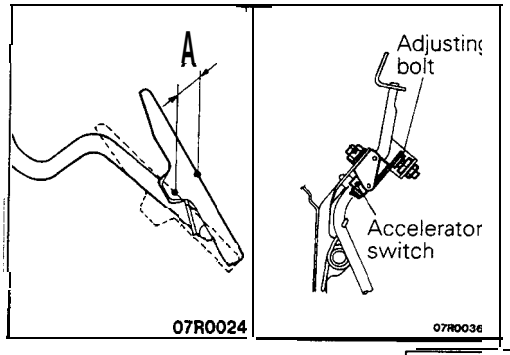
If there is excessive play of the accelerator cable, the vehicle speed drop ("undershoot") when climbing a slope will be large.

If there is no play (excessive tension) of the accelerator cable, the idling speed will increase.

(4) After adjusting, confirm that throttle valve fully opens and closes by operating pedal.
(5) Adjust accelerator cable play and confirm throttle lever stopper touches the closed throttle position switch.

ACCELERATOR SWITCH INSPECTION AND ADJUSTMENT

M13FTBBa



(1) After warning up the engine, check to be sure that the accelerator switch is ON when the accelerator pedal is in the free condition. If there is a malfunction, adjust by using the adjusting bolt.
(2) Press the accelerator pedal by hand until the accelerator switch switches from ON to OFF and confirm that the amount of pedal movement (A in the figure) is within the standard value range.

Standard value:
Accelerator switch switching point
4–8 mm (.16–.31 in.)

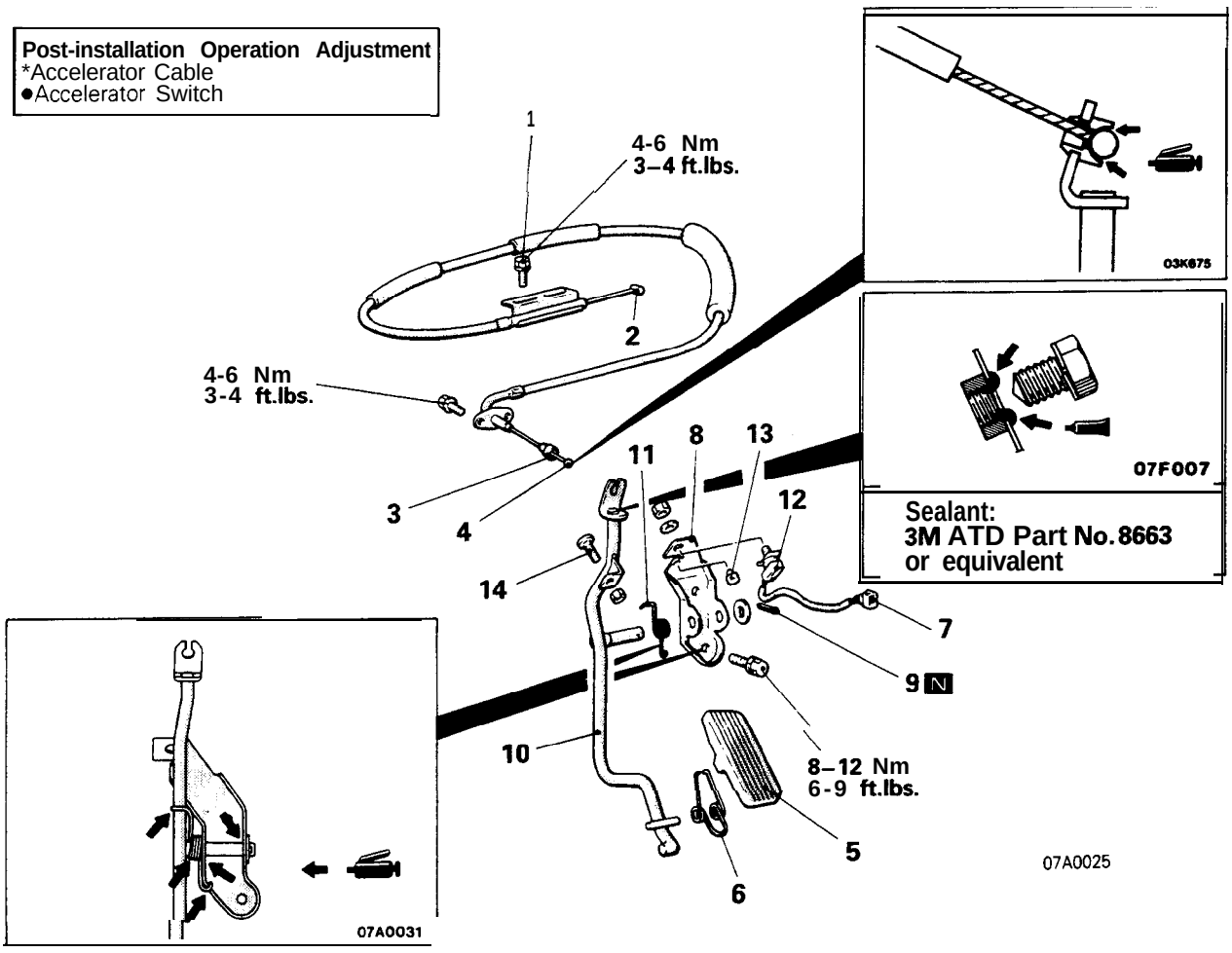
(3) If the distance (A in the figure) is not within the standard value, adjust it by using the adjusting bolt.

TSB Revision

ENGINE CONTROL

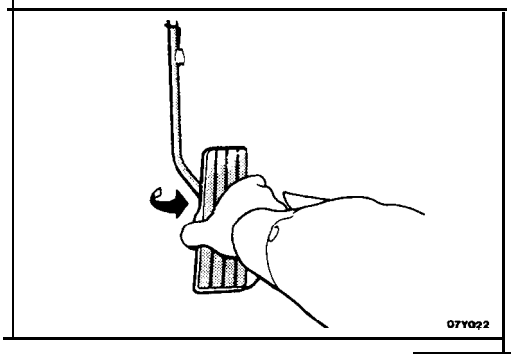
REMOVAL AND INSTALLATION

M13OA--



Removal steps

- 1. Adjusting bolt
- 2. Throttle body side inner cable
- ● 4 3. Bushing
- ◆◆ 4. Accelerator arm side inner cable
- ◆◆ 5. Accelerator pedal
- 6. Spring
- 7. Accelerator switch connector <A/T>
- ● + 8. Accelerator arm bracket
- 9. Split pin
- 10. Accelerator arm
- 11. Return spring
- 12. Accelerator switch <A/T>
- 13. Accelerator arm stopper
- 14. Bolt <A/T>



SERVICE POINTS OF REMOVAL

M13OBAC

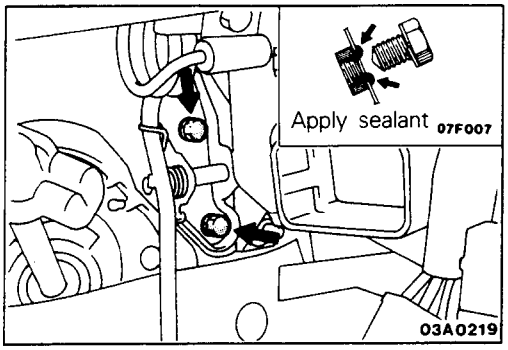
5. REMOVAL OF ACCELERATOR PEDAL

Pull the left side of the accelerator pedal toward you, and then remove the accelerator pedal from the accelerator arm.

TSB Revision

INSPECTION M13OCAH

- Check the inner and outer cable for damage.
- Check the cable for smooth movement.
- Check the accelerator arm for bending.
- Check the return spring for deterioration.
- Check the connection of bushing to end metal fitting.
- Check the accelerator switch for ON/OFF switching. <A/T>

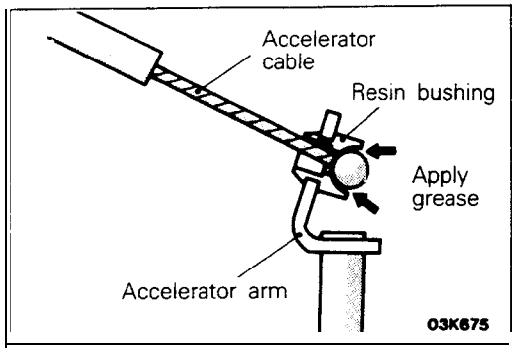


SERVICE POINTS OF INSTALLATION M13ODAW

8. APPLICATION OF SEALANT TO ACCELERATOR ARM BRACKET

Apply the specified sealant to the bolt mounting hole, and then tighten the accelerator arm bracket.

Specified sealant: 3M ART Part No.8663 or equivalent



4. APPLICATION OF GREASE TO ACCELERATOR ARM SIDE INNER CABLE/3. BUSHING

(1) Securely install the resin bushing of the accelerator cable on the end of the accelerator arm.
(2) Apply multipurpose grease around the cable end.

AUTO-CRUISE CONTROL SYSTEM

SPECIFICATIONS

GENERAL SPECIFICATIONS

M13CA--B

Items		Specifications
Auto-cruise control switch		
Rated load	A	
Main		2.0 ± 0.5
SET		0.2 ± 0.1
RESUME		0.2 ± 0.1
Voltage drop	V	0.1 or less
Stop light switch		
Rated load	A	0.1–1.5
Voltage drop (at rated load)	V	0.15 or less
Clutch pedal position switch		
Rated load	A	0.1–1.5
Voltage drop (at rated load)	V	0.15 or less
Auto-cruise control unit		
Set error	km/h (mph)	±1.0 (±0.6)
Range of speed control	km/h (mph)	40–145 (25–90)
Actuator		
Drive system		Electrical (DC motor) type <Up to 1990 models>, Vacuum type <From 1991 models>
Stroke	mm (in.)	38-42 (1.5-1.7)
Auto-cruise vacuum pump		
Rated load	A	0.4 or less

SERVICE SPECIFICATIONS

M13CB--C

Items		Specifications
Electrical type		
Accelerator cable B (throttle valve side) play	mm (in.)	1–2 (.04–.08)
Actuator clutch coil resistance	Ω	Approx. 20
Vacuum type		
Accelerator cable play	mm (in.)	
<M/T>		0–1 (0–.04)
<A/T>		2-3 (.08–.12)
Throttle cable play	mm (in.)	1–2 (.04–.08)
Auto-cruise cable play	mm (in.)	1–2 (.04–.08)
Control valve, release valve resistance	Ω	50–60

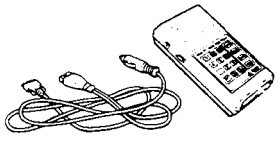
TORQUE SPECIFICATIONS

M13CC--C

Items	Nm	ft.lbs.
Electrical type		
Auto-cruise control actuator protector	4-6	3-4
Actuator bracket	9-14	7–10
Accelerator cable plate	4-6	3-4
Vacuum type		
Link protector	4-6	3-4
Link assembly	9-14	7–10
Auto-cruise vacuum pump	4-6	3-4
Accelerator cable plate	4-6	3-4

SPECIAL TOOLS

M14DA--C

Tool	Number	Name	Use
	MB991269*1 or MB991341*2	Scan tool (Multi-use tester <MUT>)	• Checking of the on-board diagnostic output
		ROM pack	
	(For the number, refer to GROUP 00–Precautions Before Service.)		NOTE *1: <1989 models> ● ? <1991 models> ● *: <1 990 models> ● 4: <1992 models>

TROUBLESHOOTING

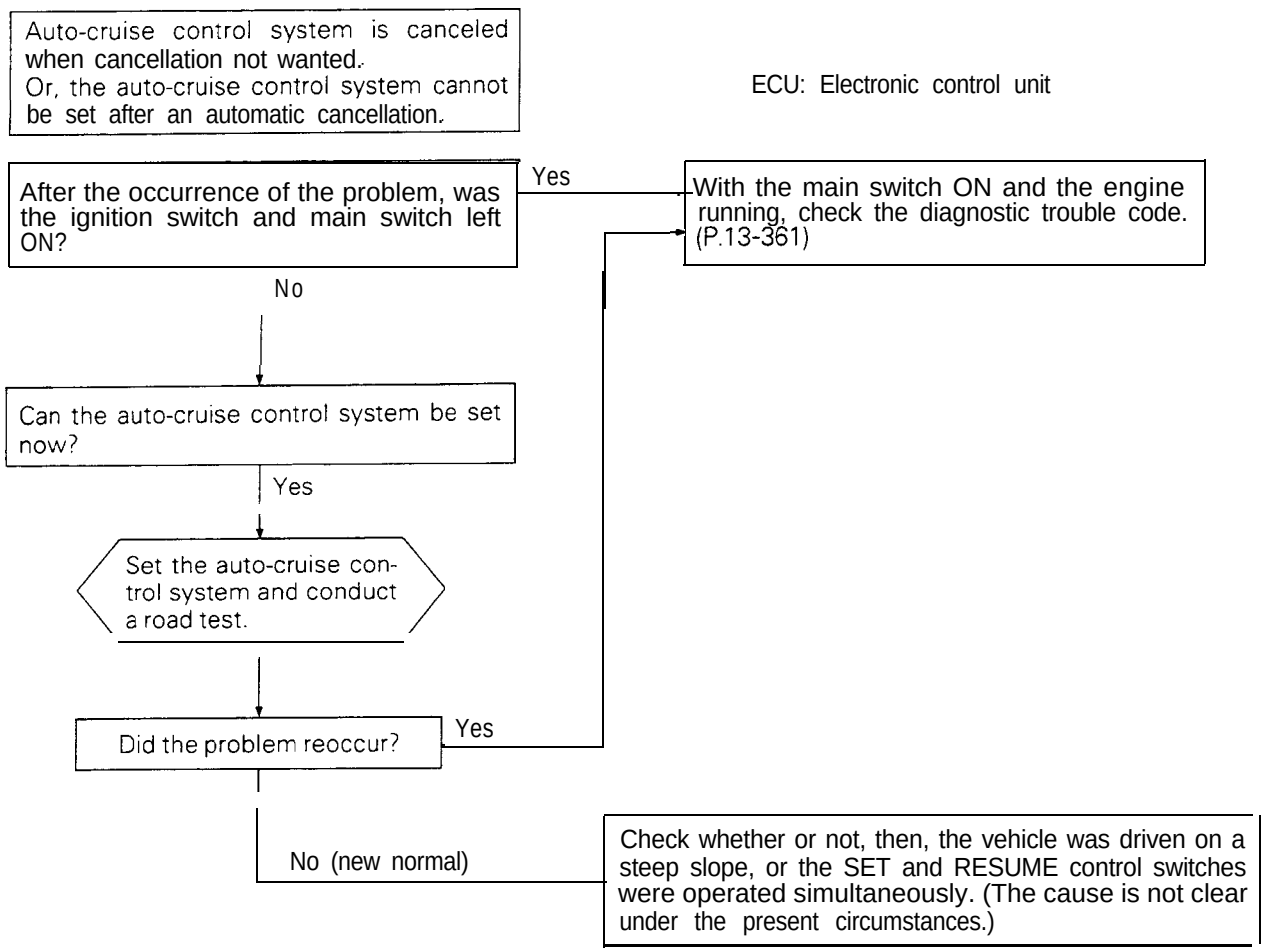
M13EBDH

<Electrical type: Up to 1990 models>

The auto-cruise control system performs control functions for the setting or cancellation of the fixed-speed driving speed based upon the data provided by input signals. As a result, when the auto-cruise control system is canceled, the cause of the cancellation is memorized in a separate circuit by the ECU, regardless of whether or not the auto-cruise control system condition is normal or abnormal, thus providing the ECU with the on-board diagnostic function by certain fixed patterns, as well as the function of being able to check whether or not the ECU's input switches or sensor are normal. Thus, by effectively using these function, the time required checking and repair can be shortened.

NOTE
When the computer (ECU) power supply (ignition switch and main switch) is switched OF-F, the memorized diagnostic trouble codes are erased, and so for this reason the power supply must be left ON until the checking is completed.

TROUBLESHOOTING QUICK-REFERENCE CHART



TSB Revision

Auto-cruise control system cannot be set.

Prepare to conduct input check. (Refer to P.13-362.)

Were codes No. 21, 22 and 25 displayed when, with the vehicle stationary, the input check codes were recalled?

No

- Damaged or disconnected wiring of the ECU power-supply circuit (Go to check chart 1 on page 13-339.)
- Damaged or disconnected wiring of the SET or RESUME switch (Go to check chart 2 and 3 on page 13-338, 339.)

Yes

Are the results of all input checks normals?

Yes

No

Check results	Probable cause	Remedy	Check chart No.
Code 21 remains even though SET switch is set to OFF.	SET switch ON malfunction	Replace the control switch.	No. 2
	SET switch input line short-circuit	Repair the harness.	
Code 22 remains even though RESUME switch is set to OFF.	RESUME switch ON malfunction	Replace the control switch.	No. 3
	RESUME switch input line short-circuit	Repair the harness.	
Code 23 remains even though CANCEL switch is set to OFF.	Malfunction of the CANCEL circuit (ON malfunction)	Check or repair each CANCEL circuit.	No. 6-1, 6-2, 6-3
Code 25 does not disappear, and code 24 does not appear, even though vehicle speed reaches approximately 40 km/h (25 mph) or higher.	Malfunction of the vehicle-speed sensor circuit (damaged or disconnected wiring, or short-circuit)	Check or repair the vehicle speed sensor circuit.	No. 4

Check the actuator circuit. (Go to check chart No.5 on page 13-343.)

NOTE

If. after the occurrence of the problem, the ignition switch and the main switch have not been switched OFF, it is possible to determine (by checking the on-board diagnostic output code) which circuit canceled the system's operation.

This chart is to be used, then, for troubleshooting if it is not possible to use the on-board diagnostic for checking.

NOTE

If the results of the check of the actuator circuit (check Chart No.5) and of the actuator itself (P.13-396) reveal no abnormal condition, replace the electronic control unit (ECU).

Trouble symptom	Probable cause	Check chart No.	Remedy
• The set vehicle speed varies greatly upward or downward. • "Hunching" (repeated alternating acceleration and deceleration) occurs after setting is made.	Malfunction of the vehicle speed sensor circuit	No.4	Repair the vehicle speed sensor system, or replace the part.
	Malfunction of the speedometer cable or speedometer drive gear		
	Actuator circuit poor contact	No.5	Repair the actuator system or replace the part.
	Malfunction of the actuator		
	Malfunction of the ECU	–	Replace the ECU.
The auto-cruise control system is not canceled when the brake pedals is depressed.	Damaged or disconnected wiring of the stop light switch input circuit; brake switch (for auto-cruise control) malfunction (short-circuit)	If the input check code No.23 indicates a malfunction. No.6-1	Repair the harness or replace the stop light switch.
	Actuator drive circuit short-circuit.	No.5	Repair the harness or replace the actuator.
	Malfunction of the ECU	–	Replace the ECU.
The auto-cruise control system is not canceled when the clutch pedal is depressed. (vehicles with a manual transaxle) It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of clutch pedal position switch input circuit	If the input check code No.23 indicates a malfunction. No.6-3	Repair the harness, or repair or replace the clutch pedal position switch.
	Clutch pedal position switch improper installation (won't switch ON)		
	Malfunction of the ECU	–	Replace the ECU.
The auto-cruise control system is not canceled when the shift lever is moved to the "N" position. (vehicles with an automatic transaxle) It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of park/neutral position switch input circuit	If the input check code No.23 indicates a malfunction. No.6-2	Repair the harness, or repair or replace the park/neutral position switch.
	Improper adjustment of park/neutral position switch		
	Malfunction of the ECU	–	Replace the ECU.

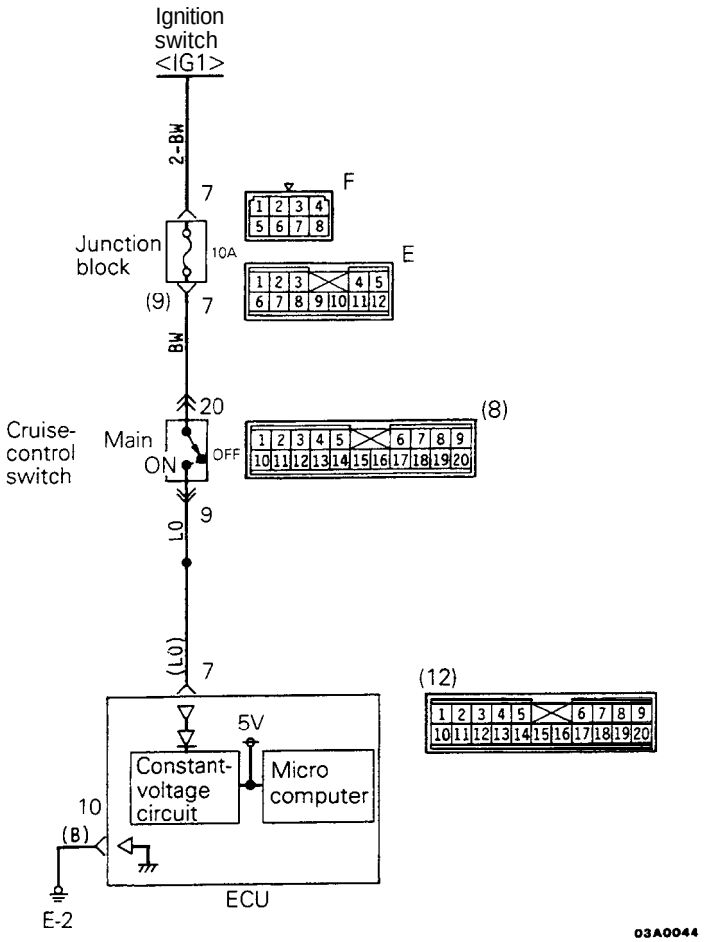
Trouble symptom	Probable cause	Check chart No.	Remedy
Cannot decelerate by using the SET switch	Temporary damaged or disconnected wiring of SET switch input circuit	No. 2	Repair the harness or replace the SET switch.
	Actuator circuit poor contact	No. 5	Repair the harness or replace the actuator.
	Malfunction of the actuator		
	Malfunction of the ECU	–	Replace the ECU.
Cannot accelerate or resume speed by using the RESUME switch.	Damaged or disconnected wiring, or short-circuit, of RESUME switch input circuit	No. 3	Repair the harness or replace the RESUME switch.
	Actuator circuit poor contact	No. 5	Repair the harness or replace the actuator.
	Malfunction of the actuator		
	Malfunction of the ECU	–	Replace the ECU.
Auto-cruise control system can be set while traveling at a vehicle speed of less than 40 km/h (25 mph), or there is no automatic cancellation at that speed.	Malfunction of the vehicle-speed sensor circuit	No. 4	Repair the vehicle-speed sensor system, or replace the part.
	Malfunction of the speedometer cable or the speedometer drive gear		
	Malfunction of the ECU	–	Replace the ECU.
The indicator light of the combination meter does not illuminate. But auto-cruise control system is normal.)	Damaged or disconnected bulb of indicator light	–	Repair the harness or replace the light bulb.
	Harness damaged or disconnected		

Trouble symptom	Probable cause	Check chart No.	Remedy
Malfunction of control function by ON/OFF switching of ELC 4 A/T accelerator switch (Non-operation of torque converter clutch, 2nd gear hold, etc.)	Malfunction of circuit related to accelerator switch OFF function	No. 7	Repair the harness or replace the part.
	Malfunction of the ECU		
Overdrive is not canceled during fixed speed driving. <A/T>	Malfunction of circuit related to overdrive cancelation, or malfunction of ECU	No. 8	Repair the harness or replace the part.
No shift to overdrive during manual driving. <A/T>			

TSB Revision

CHECK CHART

1. CHECKING THE CONTROL UNIT POWER SUPPLY CIRCUIT



Description of operation

When the "MAIN" switch (of the cruise-control's switches) is switched ON while the ignition switch is ON, current flows to the ignition switch (IG1), to fuse no. (9) of the junction block, and to the cruise-control switch, the control unit, and to ground.

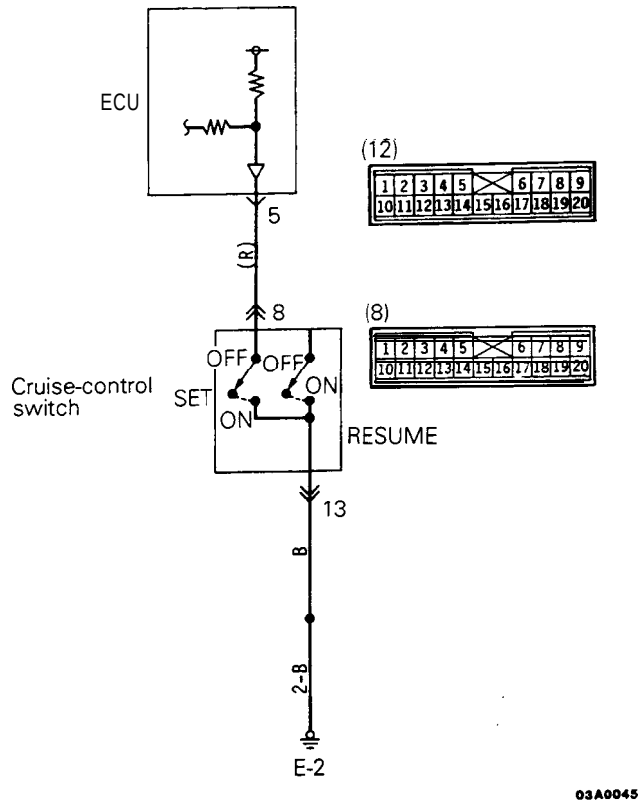
Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
7	Control unit power supply	When the cruise-control switch (main switch) is switched ON	12V
10	Control unit ground	At all times	0V

TSB Revision

2. CHECKING THE SET SWITCH CIRCUIT



Description of operation

When the SET switch is switched ON (at the vehicle speed desired to be maintained, and with the main switch of the cruise-control switches **ON)** that vehicle speed is maintained as a constant **speed.**

Furthermore, the constant speed is gradually reduced (the "coasting" feature) when the SET switch is pressed and held while the vehicle is traveling at the previously **set constant speed,** and, when the SET switch is released, the vehicle then maintains that newly set constant speed **(the** speed at which the SET switch was released).

Current flows to the control unit, the cruise control switch ("SET"), and to ground.

Troubleshooting hint

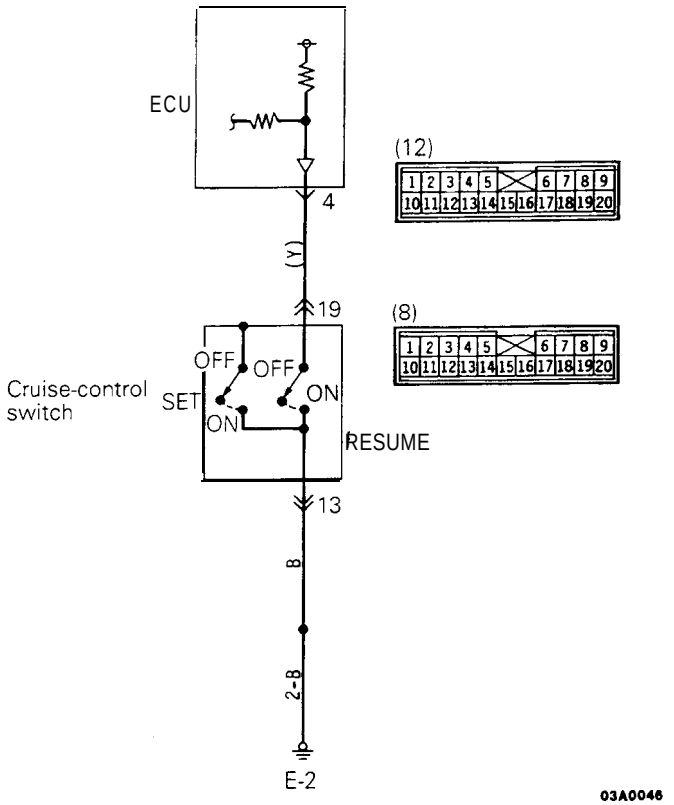
Diagnostic–No.15 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
5	SET switch	When the SET switch is switched ON	ov
		When the SET switch is switched OFF	12V

TSB Revision

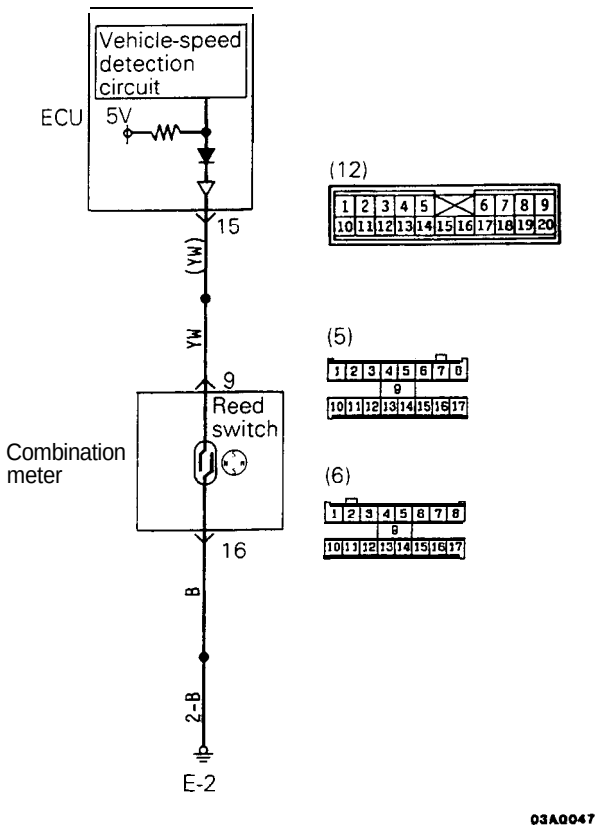
3. CHECKING THE RESUME SWITCH CIRCUIT



Terminal No.	Signal	Conditions	Terminal voltage
4	RESUME switch	When the RESUME switch is switched ON	ov
		When the RESUME switch is switched OFF	12V

TSB Revision

4. CHECKING THE VEHICLE-SPEED SENSOR CIRCUIT



Description of operation

The vehicle-speed sensor is installed within the speedometer; it sends to the control unit pulse signals that are proportional to the rotation speed (i.e., the vehicle speed) of the transmission's output gear.

This vehicle-speed sensor is the reed switch **type** of sensor; it generates four pulse signals for each rotation of the speedometer's driven gear.

Troubleshooting hint

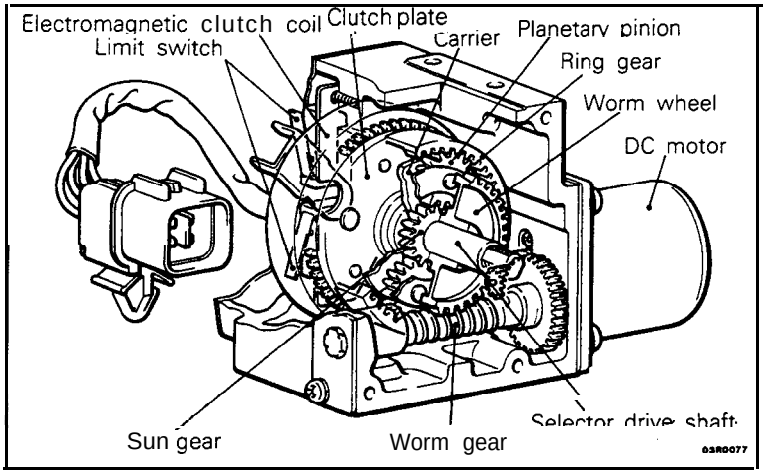
Diagnostic–No.12 (automatically cancelled)

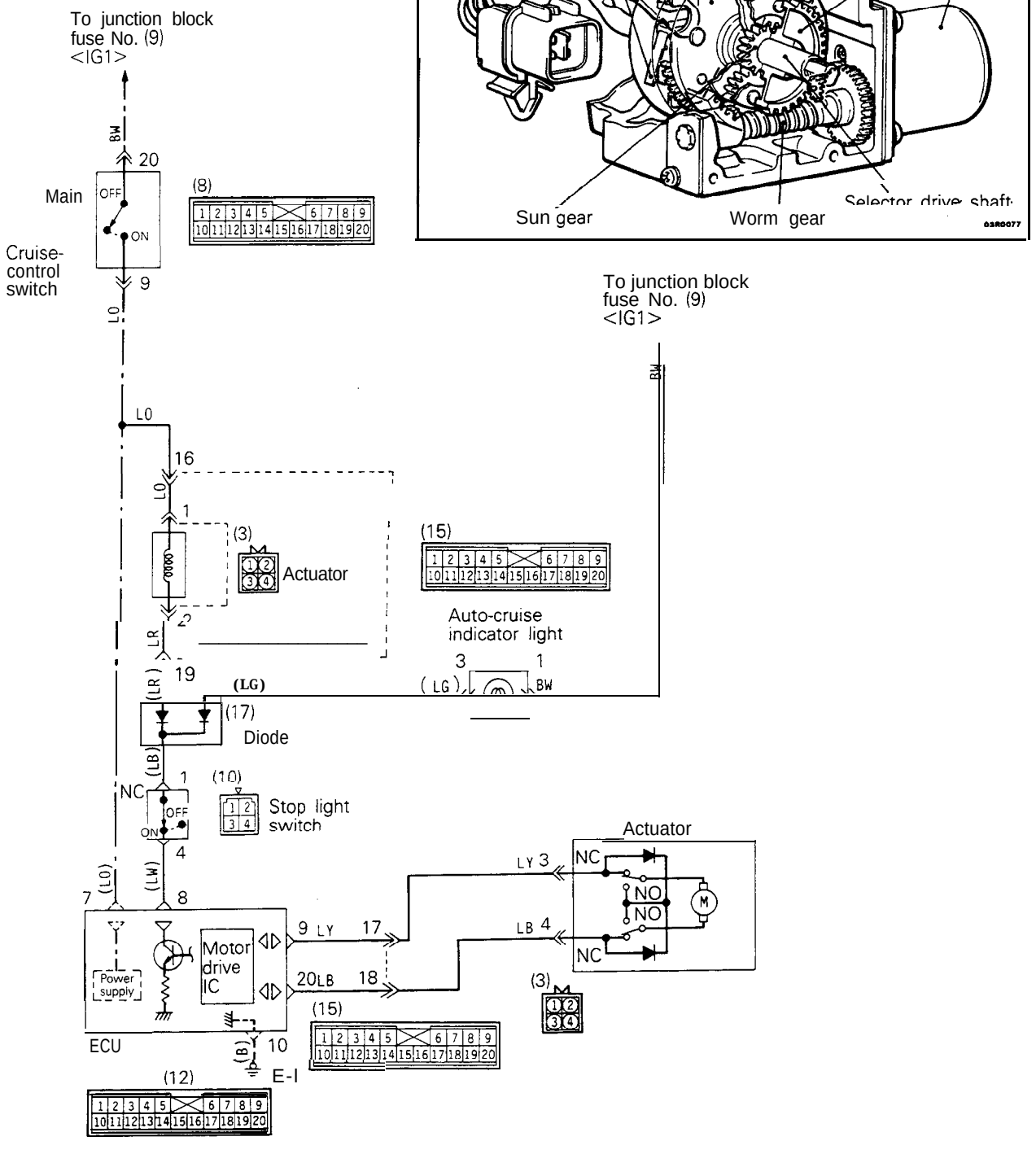
ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
15	Vehicle-speed sensor	Move the vehicle forward slowly.	ov – 0.7V ← Flashing → 3V or higher

TSB Revision

5. CHECKING THE ACTUATOR CIRCUIT



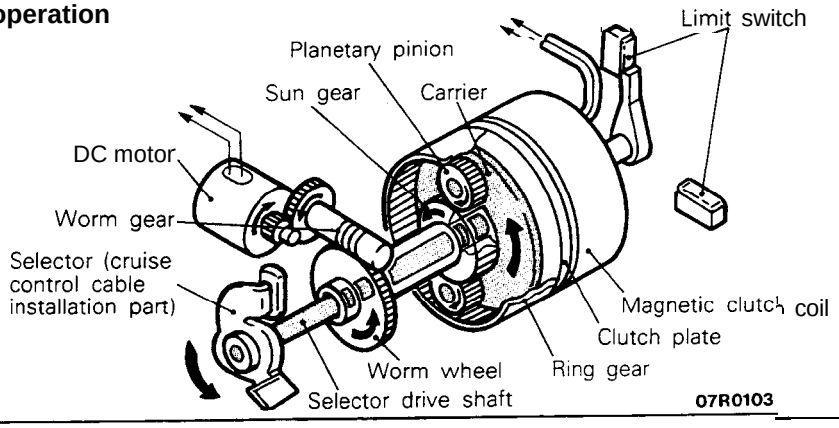


16A0620

NOTE
NC: ON at all times
NO: OFF at all times

TSB Revision

Description of operation



1. When (with the main switch ON) the driver switches ON the SET switch when the prescribed vehicle speed is reached, the control unit sends current to the electromagnetic clutch coil of the actuator, thus attracting the clutch plate, and also illuminating the auto-cruise indicator light, Then, when the ring gear of the planetary pinion is secured, the control motor at the same time causes the DC motor to be switched ON, and the DC motor operates at high speed.
2. The rotation of the DC motor is, as described in the illustration above, transmitted to the worm gear, and thereafter to the worm wheel, the sun gear, and the planetary pinion in that sequence. Because the ring gear is secured at this time, the planetary pinion rotates while revolving around the sun gear. Because the planetary pinion is installed to the carrier, both the carrier and the selecotr drive shaft unified with it, as well as the selector, are caused to rotate.
3. The switching of the direction (PULL or REL.) of rotation of the selector is accomplished by reversing the direction of current flow to the motor, and this is automatically regulated by the control unit.
4. The current flow to the electromagnetic clutch is interrupted if the driver switches OFF the main switch, or if the operation of the auto cruise control system is cancelled as a result of the input of a cancel signal to the control unit because the stop light switch, clutch pedal position switch (for a manual transaxle) or the park/neutral position switch (for an automatic transaxle) is activated.
5. As a result of the interruption of current to the electromagnetic clutch, the clutch plate is caused to return from the electromagnetic clutch side to the ring gear side by the force of the spring, and therefore the ring gear becomes free.
6. When the ring gear becomes free, the planetary pinion becomes free relative to the sun gear, and thus the selector is caused, by the return spring installed to the selector part, to return to its original position.

Troubleshooting hint

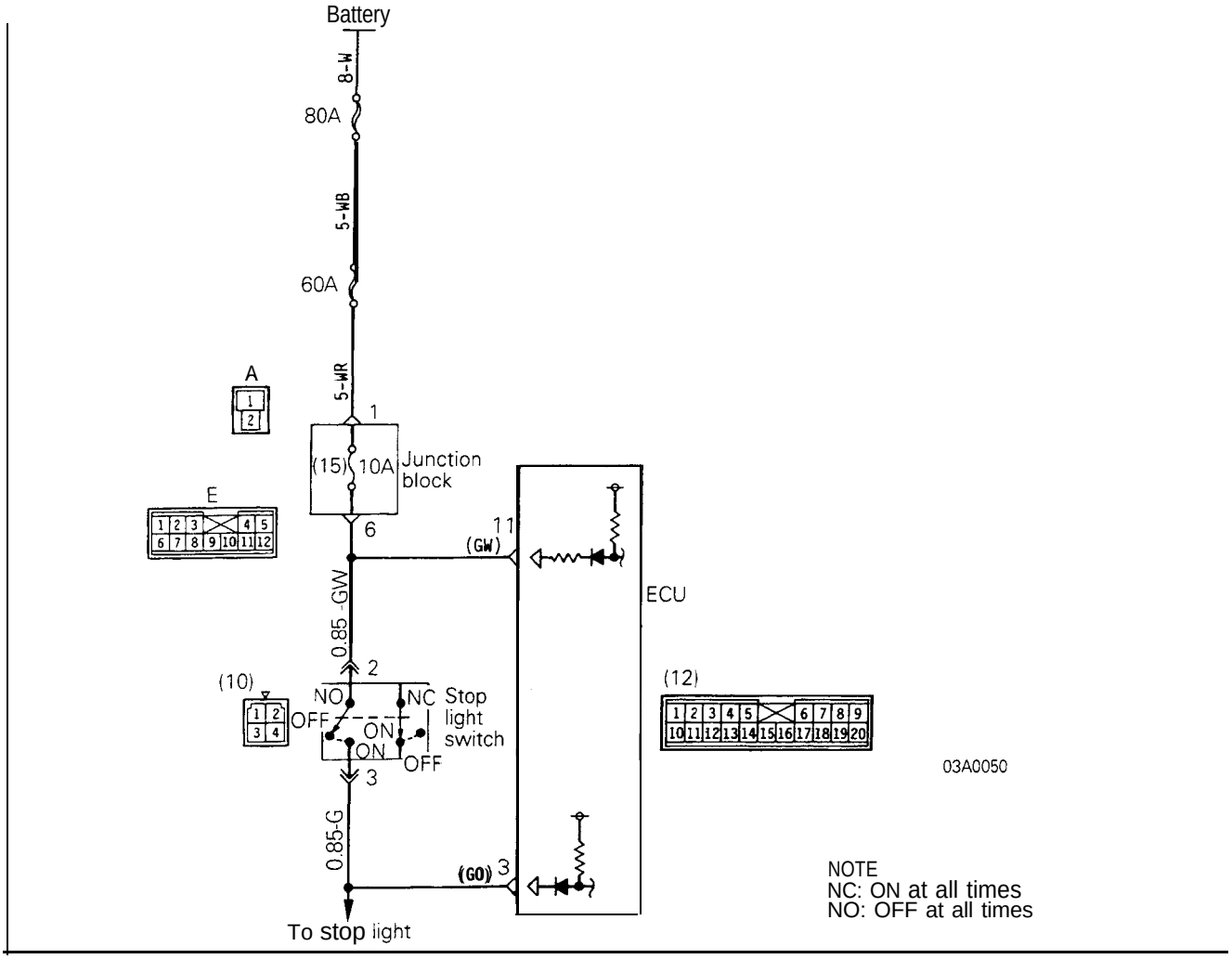
Diagnostic–No.11 (automatically cancelled)

ECU terminal voltage

Terminal NO.	Signal	Conditions	Terminal voltage
8	Transistor for electromagnetic clutch coil	When the cruise-control switch (main switch) is switched ON	ov
9	DC motor drive ("PULL" side)	During acceleration by RESUME switch	12V
	DC motor drive ("REL." side)	During speed reduction (coasting) by SET switch	ov
20	DC motor drive ("PULL" side)	During acceleration by RESUME switch	ov
	DC motor drive ("REL." side)	During speed reduction (coasting) by SET switch	12V

TSB Revision

6-1. CHECKING THE STOP LIGHT SWITCH CIRCUIT



Description of operation

When the brake pedal is depressed during constant-speed travel, the stop light switch's **(NC)** contacts for the cruise-control system open, with the result that the current to the electromagnetic clutch of the actuator is interrupted, thus cancelling the constant-speed travel.
At the same time, moreover, the closing of the (NO) contacts for the stop light results in the sending of the cancel signal to the control unit, so that the actuator's electromagnetic clutch current is discontinued within the control unit, thereby canceling the constant-speed travel.
The flow of current is from the battery to fuse No. (15) of the junction block, the stop light switch. and the control unit.

Troubleshooting hint

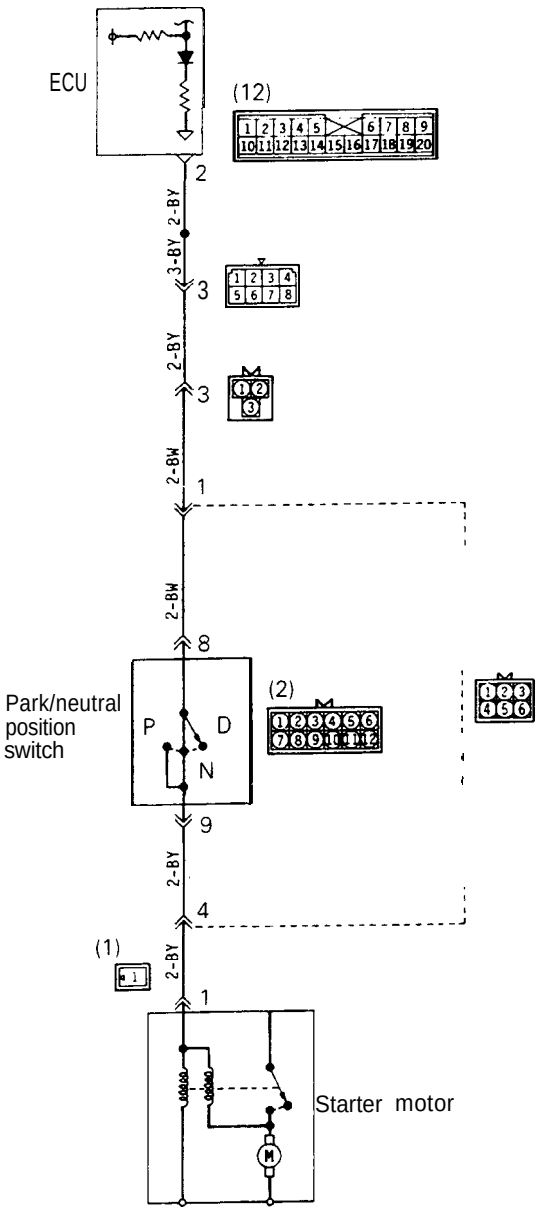
Diagnostic–No.16 (automatically cancelled)

ECU terminal voltage

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

TSB Revision

6-2. CHECKING THE PARK/NEUTRAL POSITION SWITCH CIRCUIT <A/T>



Description of operation

The park/neutral position switch also functions as the switch for the starter.
If the selector handle is moved to the **"N"** position during constant-speed travel, current flows to the control unit, park/neutral position switch, starter motor, and to ground; the cancel signal is therefore input to the control unit, thus canceling the constant-speed travel.

Troubleshooting hint

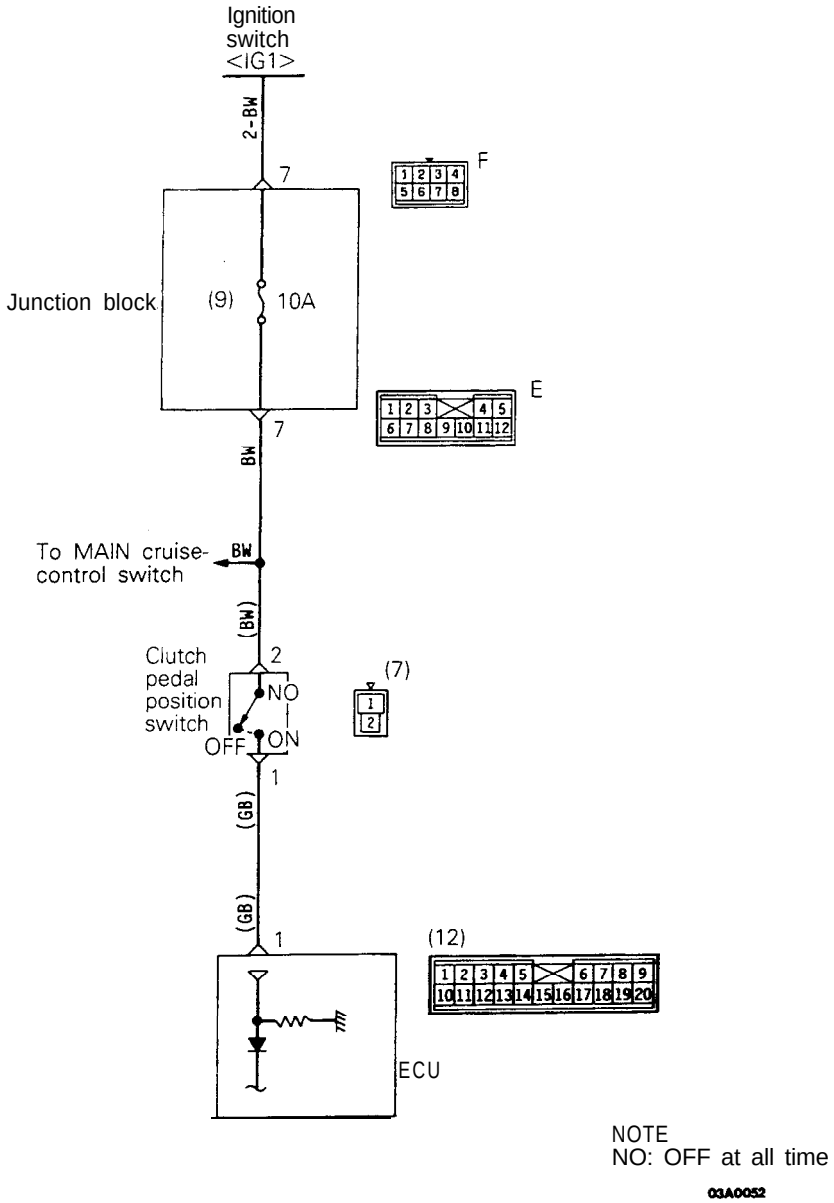
Diagnostic–No.16 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
2	Park/neutral position switch	At all times	12V

TSB Revision

6-3. CHECKING THE CLUTCH PEDAL POSITION SWITCH CIRCUIT <M/T>



Description of operation

If the clutch pedal is depressed during constant-speed travel, the contacts of the clutch pedal position switch close, with the result that the cancel signal is sent to the control unit, so that the current to the electromagnetic clutch of the actuator is discontinued within the control unit, thereby canceling the constant-speed travel. The flow of current is to the ignition switch (IG1), fuse No. (9) of the junction block, the clutch pedal position switch, and the control unit.

Troubleshooting hint

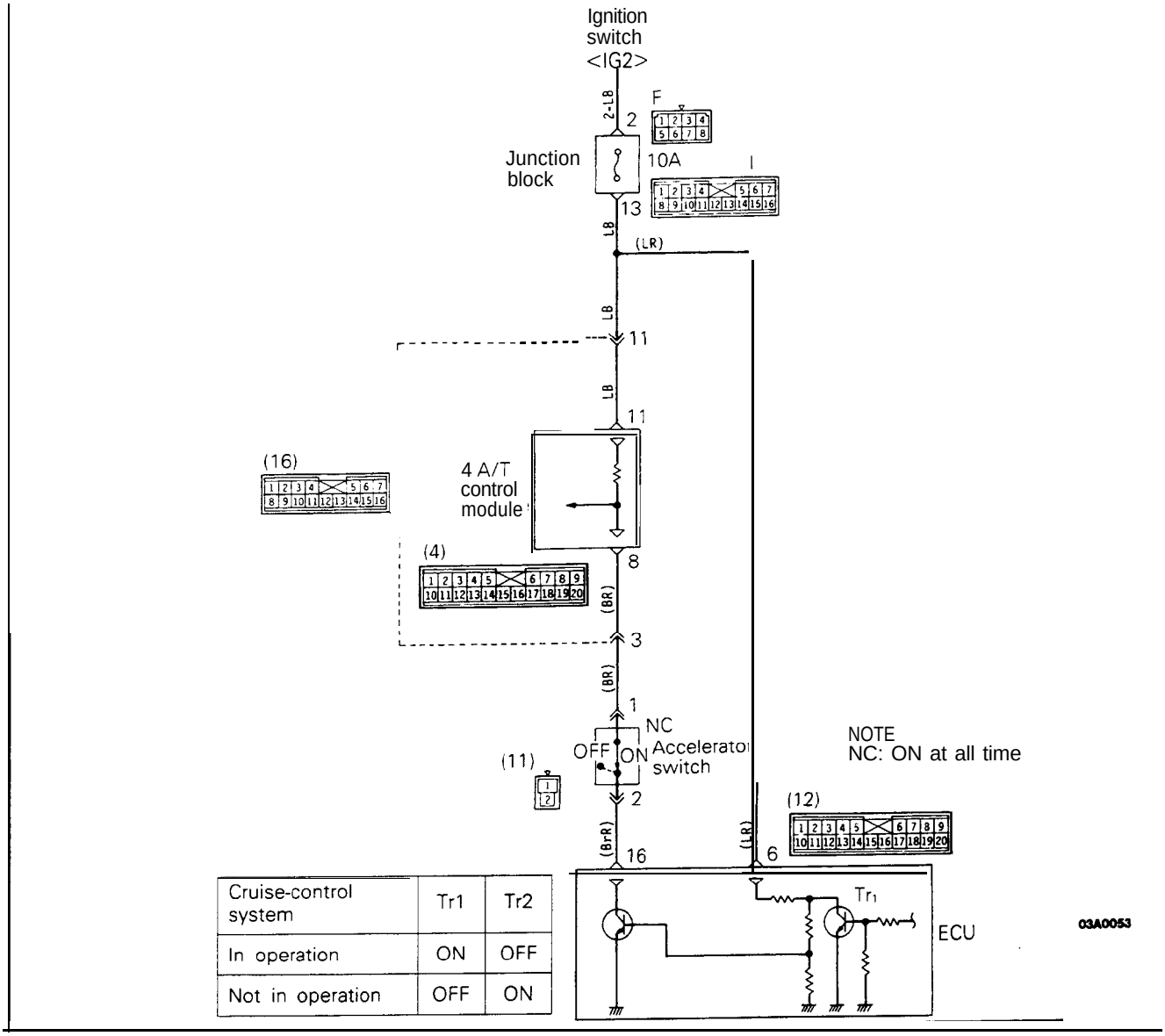
Diagnostic–No.16 (automatically cancelled)

ECU temrinal voltage

Terminal No.	Signal	Conditions	Terminal voltage
1	Clutch pedal position switch	When the clutch pedal is depressed	12V
		When the clutch pedal is not depressed	ov

TSB Revision

7. CHECKING THE CIRCUITS RELATED TO THE ACCELERATOR SWITCH OFF FUNCTION <A/T>



Cruise-control system	Tr1	Tr2
In operation	ON	OFF
Not in operation	OFF	ON

Description of operation

The accelerator switch is a switch that detects the operational status of the accelerator pedal; it is one of the sensors of the automatic transaxle. Because the status of the accelerator pedal during constant-speed driving is non-operational, the ground circuit (transistor Tr2) of the accelerator switch is switched OFF only during constant-speed driving in order not to interfere with the function of the automatic transaxle.

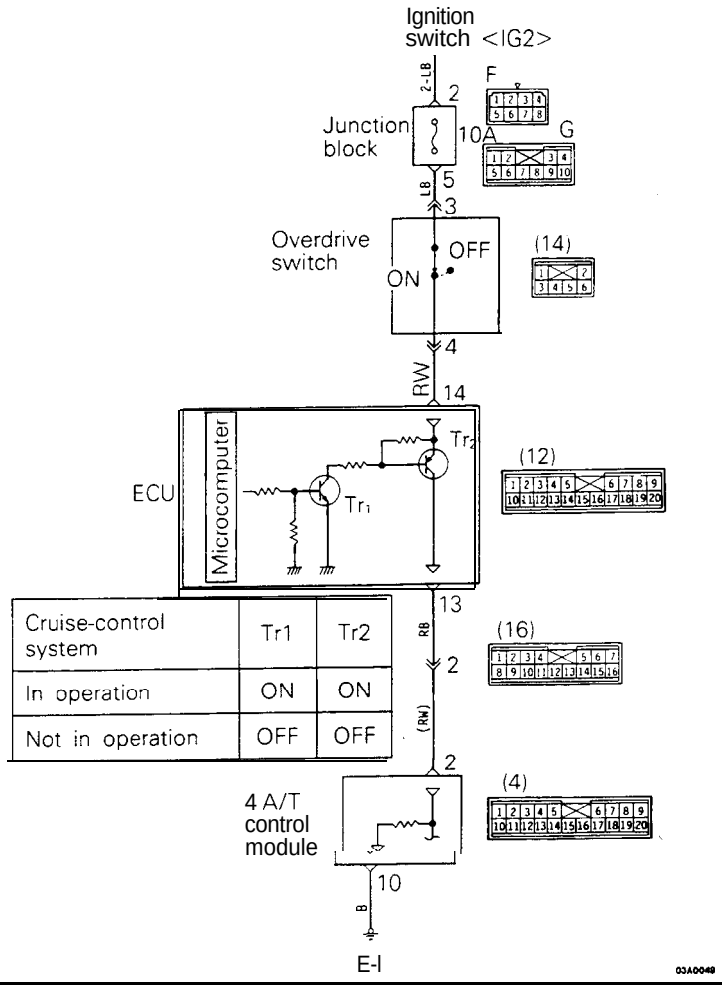
Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
6	Control unit power supply (IG2)	At all times	12V
16	Accelerator switch	When the accelerator pedal is depressed	ov
		When the accelerator pedal is not depressed	12V

TSB Revision

8. CHECKING THE CIRCUITS RELATED TO THE OVERDRIVE-CANCELLATION FUNCTION <A/T>



Cruise-control system	Tr1	Tr2
In operation	ON	ON
Not in operation	OFF	OFF

Description of operation

This is a function that cancels the overdrive function for a certain fixed period of time, if during constant-speed travel in overdrive, the actual vehicle speed decreases to less than the vehicle speed retained in the memory, and then after a short time causes the vehicle speed to return to the vehicle speed retained in the memory.
Overdrive is canceled under the following conditions.

1. If the “RESUME” switch is used.
2. If, during constant-speed travel, the actual vehicle speed decreases to 1.25 km/h (.78 mph) or more below the set vehicle speed.

Under either of the conditions described above, the overdrive-ON signals output from the microcomputer (within the control unit) are no longer output, and transistor Trl is switched OFF.
As a result, transistor Tr2 is also switched OFF, causing the current passing through the overdrive switch of the selector handle to be interrupted at transistor Tr2, with the result that the drive is controlled at 3rd gear.

Troubleshooting hint

ECU terminal voltage

Termianl No.	Signal	Conditions	Terminal voltage
13	4A/T control module	When the overdrive switch is switched ON	12V
14	Overdrive switch	When the overdrive switch is switched ON	12V

TSB Revision

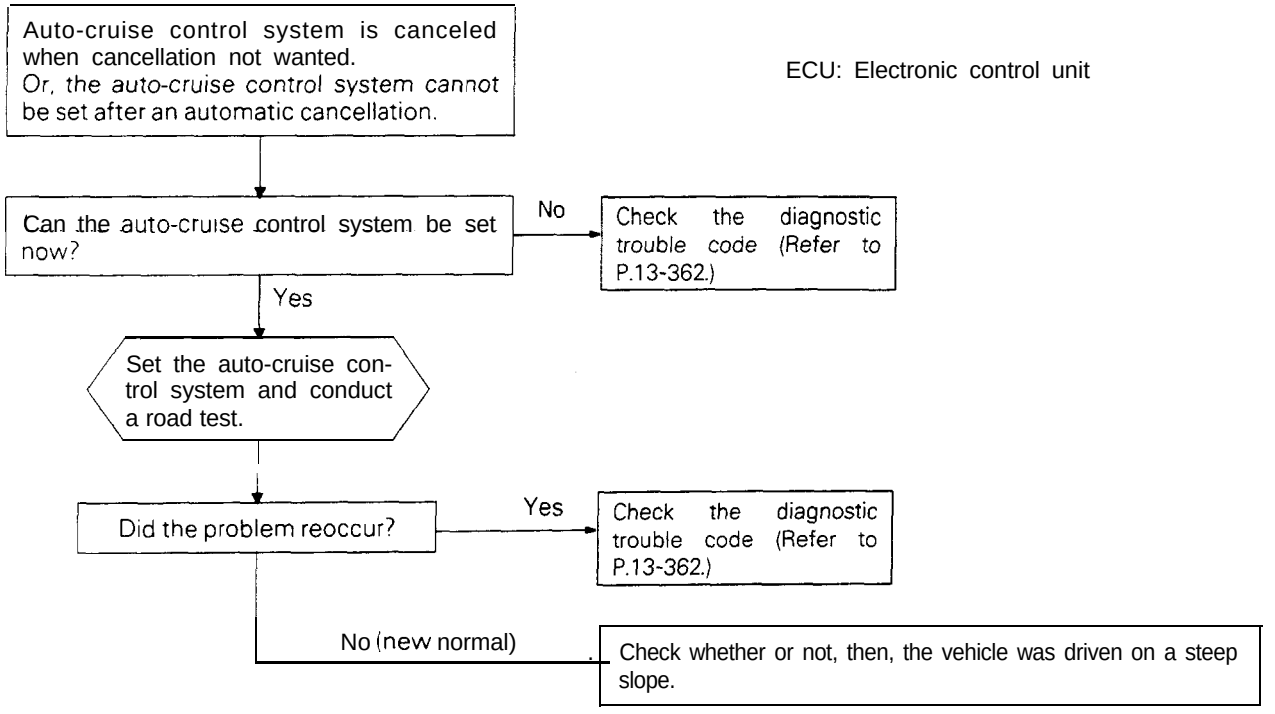
TROUBLESHOOTING

M13EBDQ

<Vacuum type: From 1991 models>

The auto-cruise control system performs control functions for the setting or cancellation of the fixed-speed driving speed based upon the data provided by input signals. As a result, when the auto-cruise control system is canceled by abnormal system operation, the cause of the cancellation is memorized in a separate circuit by the ECU, thus providing the ECU with the on-board diagnostic function by certain fixed patterns, as well as the function of being able to check whether or not the ECU's input switches or sensor are normal. Thus, by effectively using these function, the time required checking and repair can be shortened.

TROUBLESHOOTING QUICK-REFERENCE CHART



TSB Revision

Auto-cruise control system cannot be set.

NOTE
This chart is to be used, then, for troubleshooting if it is not possible to use the on-board diagnostic for checking.

Prepare to conduct input check. (Refer to P.13-363.)

Where codes No.21, 22, 23, 25 and 26, displayed when, with the vehicle stationary, the input check codes were recalled?

No →
- Damaged or disconnected wiring of the ECU power-supply circuit (Go to check chart 1.)
- Damaged or disconnected wiring of the SET or RESUME switch (Go to check chart 2 and 3.)
- Damaged or disconnected wiring of the stop light switch, clutch pedal position switch or park/neutral position switch (Go to check chart 6, 7 or 8.)

Yes

Are the results of all input checks normals?

Yes

No

Check results	Probable cause	Remedy	Check chart No.
Code 21 remains even though SET switch is set to OFF.	SET switch ON malfunction	Replace the control switch.	No. 2
	SET switch input line short-circuit	Repair the harness.	
Code 22 remains even though RESUME switch is set to OFF.	RESUME switch ON malfunction	Replace the control switch.	No. 3
	RESUME switch input line short-circuit	Repair the harness.	
Code 23 is not canceled even if the stop light switch is turned OFF by releasing the brake pedal.	Malfunction of stop light switch circuit.	Replace stop light switch or repair harness.	No. 6
Code 25 does not disappear, and code 24 does not appear, even though vehicle speed reaches approximately 40 km/h (25 mph) or higher.	Malfunction of the vehicle-speed sensor circuit (damaged or disconnected wiring, or short-circuit)	Check or repair the vehicle speed sensor circuit.	No. 4
Code 26 is not canceled even if the clutch pedal position switch is turned OFF by releasing the clutch pedal.	Malfunction of clutch pedal position switch circuit.	Replace clutch pedal position switch or repair harness.	No. 8
Code 26 is not canceled even if the select lever is moved to anything but N, P <A/T>.	Malfunction of park/neutral position switch circuit.	Replace park/neutral position switch or repair harness.	No. 7

Check the auto-cruise vacuum pump circuit. (Go to check chart No.5.)

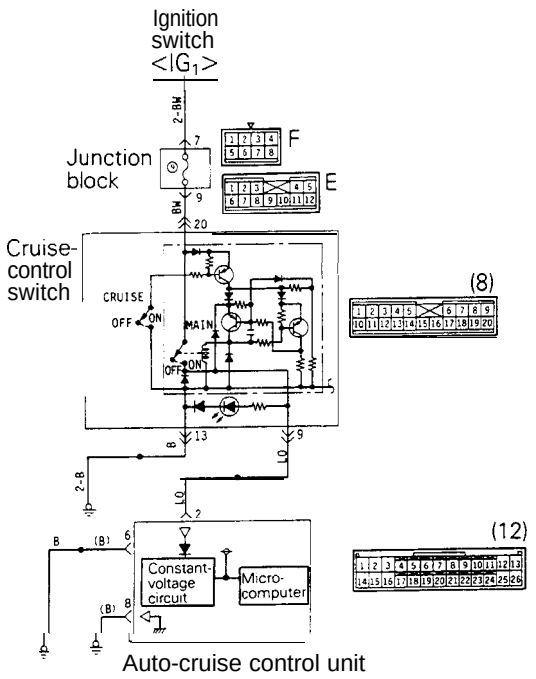
NOTE
If the results of the check of the auto-cruise vacuum pump circuit (check chart No. 5) and of the auto-cruise vacuum pump and actuator itself (P.13-401.) reveal no abnormal condition, replace the electronic control unit (ECU).

Trouble symptom	Probable cause	Check chart No.	Remedy
• The set vehicle speed varies greatly upward or downward. • "Hunching" (repeated alternating acceleration and deceleration) occurs after setting is made.	Malfunction of the vehicle speed sensor circuit	No.4	Repair the vehicle spee sensor system, or replace the part.
	Malfunction of the speedometer cable or speedometer drive gear		
	Auto-cruise vacuum pump circuit poor contact	No.5	Repair the auto-cruise vacuum pump or replac the part.
	Malfunction of the auto-cruise vacuum pump		
	Malfunction of the ECU	–	Replace the ECU.
The auto-cruise control system is not canceled when the brake pedals is depressed.	Damaged or disconnected wiring of the stop light switch input circuit; brake switch (for auto-cruise control) malfunction (short-circuit)	If the input check code No.23 indicates a malfunction. No.6	Repair the harness or replace the stop light switch.
	Auto-cruise vacuum pump drive circuit short-circuit.	No.5	Repair the harness or replace the auto-cruise vacuum pump.
	Malfunction of the ECU	–	Replace the ECU.
The auto-cruise control system is not canceled when the clutch pedal is depressed. (vehicles with a manual transaxle) It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of clutch pedal position switch input circuit	If the input check code No.26 indicates a malfunction. No.8	Repair the harness, or repair or replace the clutch pedal position switch.
	Clutch pedal position switch improper installation (won't switch ON)		
	Malfunction of the ECU	–	Replace the ECU.
The auto-cruise *control* system is not canceled when the shift lever is moved to the "N" position. (vehicles with an automatic transaxle) It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of park/neutral position switch input circuit	If the input check code No.26 indicates a malfunction. No.7	Repair the harness, or repair or replace the park/neutral position switch.
	Improper adjustment of park/neutral position switch		
	Malfunction of the ECU	–	Replace the ECU.
Cannot decelerate by using the SET switch	Temporary damaged or disconnected wiring of SET switch input circuit	No.2	Repair the harness or replace the SET switch.
	Auto-cruise vacuum pump circuit poor contact	No.5	Repair the harness or replace the auto-cruise vacuum pump and actuator.
	Malfunction of the auto-cruise vacuum pump and actuator (including clogging of negative pressure passage)		
	Malfunction of the ECU	–	Replace the ECU.

Trouble symptom	Probable cause	Check chart No.	Remedy
Cannot accelerate or resume speed by using the RESUME switch.	Damaged or disconnected wiring, or short-circuit, of RESUME switch input circuit	No. 3	Repair the harness or replace the RESUME switch.
	Auto-cruise vacuum pump circuit poor contact	No. 5	Repair the harness or replace the auto-cruise vacuum pump and actuator.
	Malfunction of the auto-cruise vacuum pump and actuator (including air leak from negative pressure passage)		
	Malfunction of the ECU	–	Replace the ECU,
Auto-cruise control system can be set while traveling at a vehicle speed of less than 40 km/h (25 mph), or there is no automatic cancellation at that speed.	Malfunction of the vehicle-speed sensor circuit	No. 4	Repair the vehicle-speed sensor system, or replace the part.
	Malfunction of the speedometer cable or the speedometer drive gear		
	Malfunction of the ECU	–	Replace the ECU.
The indicator light of combination meter does not illuminate. (But auto-cruise control system is normal.)	Damaged or disconnected bulb of indicator light	–	Repair the harness or replace the bulb.
	Harness damaged or disconnected		
Malfunction of control function by ON/OFF switching of ELC 4 A/T accelerator switch (Non-operation of torque converter clutch, 2nd gear hold, etc.)	Malfunction of circuit related to accelerator switch OFF function	No. 9	Repair the harness or replace the part.
	Malfunction of the ECU		
Overdrive is not canceled during fixed speed driving. <A/T>	Malfunction of circuit related to overdrive cancellation, or malfunction of ECU	No. 10	Repair the harness or replace the part.
No shift to overdrive during manual driving. <A/T>			

CHECK CHART

1. CHECKING THE CONTROL UNIT POWER SUPPLY CIRCUIT



13A0377

Description of operation

When the cruise control switch (CRUISE) is switched ON while the ignition switch is ON, current flows to the ignition switch (IG,), to fuse No.(11) of the junction block, and to the cruise-control switch (MAIN switch), the control unit, and to ground.
When the ignition switch is turned OFF, the MAIN switch in the cruise control switch is also turned OFF.

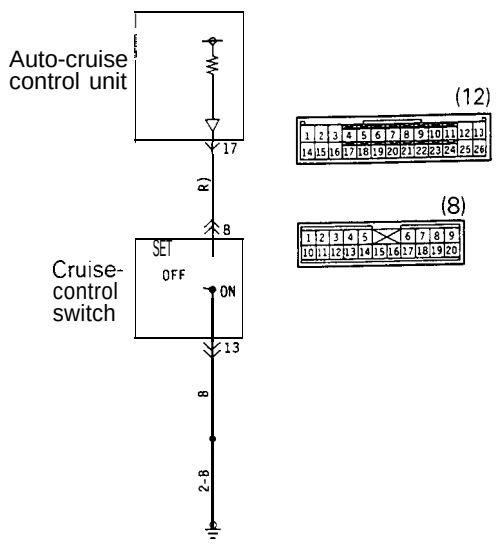
Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
2	Control unit power supply	When the cruise-control switch (CRUISE) is switched ON.	Battery positive voltage
6, 8	Control unit ground	At all times	ov

NOTE
- The connector Nos. in Section "AUTO-CRUISE CONTROL RELATED HARNESSES" and the connector names in the junction block are represented.
  (Applicable on the next page and subsequence.)

2. CHECKING THE SET SWITCH



13A0386

Description of operation

When the SET switch is switched ON (at the vehicle speed desired to be maintained, and with the CRUISE switch of the cruise-control switches ON) that vehicle speed is maintained as a constant speed.
Furthermore, the constant speed is gradually reduced (the "coasting" feature) when the SET switch is pressed and held while the vehicle is traveling at the previously set constant speed, and, when the SET switch is released, the vehicle then maintains that newly set constant speed (the speed at which the SET switch was released).
Current flows to the control unit, the cruise control switch ("SET"), and to ground.

Troubleshooting hint

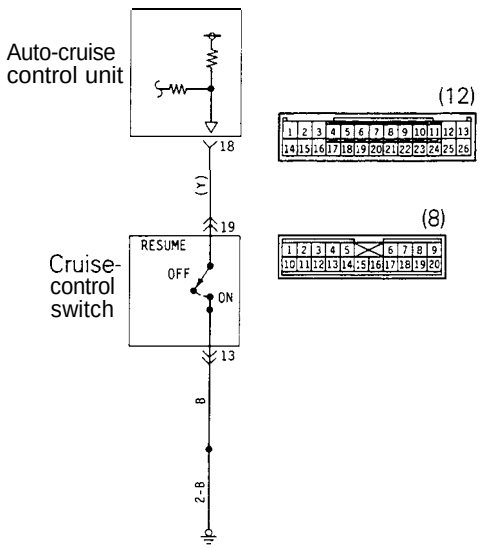
Diagnostic–No.15 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
17	SET switch	When the SET switch is switched ON.	ov
		When the SET switch is switched OFF.	Battery positive voltage

TSB Revision

3. CHECKING THE RESUME SWITCH CIRCUIT



13A0382

Description of operation

The set speed (before cancellation) resumes when the RESUME switch is switched ON, even if the constant-speed control has been cancelled.
That speed will not resume, however, even if the RESUME switch is switched ON, if the CRUISE switch is switched OFF and if the vehicle speed decreases to 40 km/h (25 mph) or lower.
In addition, when the RESUME is switched ON and held while the vehicle is traveling at a constant speed, the vehicle speed will increase; the speed at which the switch is subsequently released will become the newly set constant speed.
Current flows to the control unit, the cruise control switch (RESUME), and to ground.

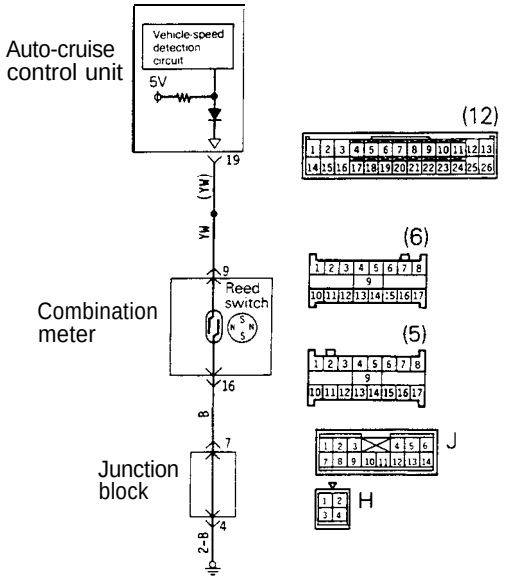
Troubleshooting hint

Diagnostic–No.15 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
18	RESUME switch	When the RESUME switch is switched ON.	0V
		When the RESUME switch is switched OFF.	Battery positive voltaae

4. CHECKING THE VEHICLE-SPEED SENSOR CIRCUIT



13A0381

Description of operation

The vehicle-speed sensor is installed within the speedometer; it sends to the control unit pulse signals that are proportional to the rotation speed (i.e., the vehicle speed) of the transaxle's output gear.
This vehicle-speed sensor is the reed switch type of sensor; it generates four pulse signals for each rotation of the speedometer's driven gear.

Troubleshooting hint

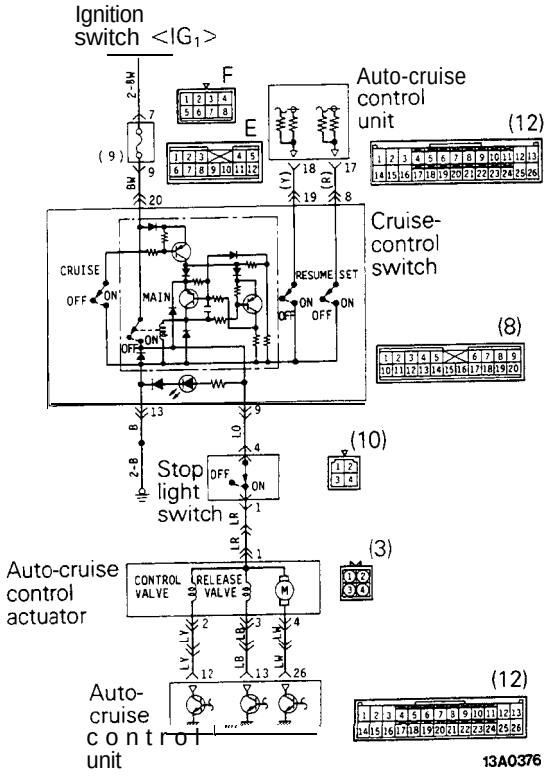
Diagnostic–No.12 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
19	Vehicle-speed sensor	Move the vehicle forward slowly.	0V–0.7V ↑ Flashing ↓ 3V–higher

TSB Revision

5. CHECKING THE AUTO-CRUISE CONTROL VACUUM PUMP



Description of operation

Hold mode
When the SET switch is turned ON by the driver turning the CRUISE switch ON when a determined speed is reached, the control unit receives a set signal, and turns the auto-cruise vacuum pump motor ON. After the constant speed is reached, the motor, control valve and release valve are repeatedly turned ON and OFF according to driving conditions.

Acceleration mode
When the RESUME switch is pressed, the control unit receives a RESUME signal and it not only turns the auto-cruise vacuum pump motor ON but also turns the control valve and release valve ON (valve is closed)

Deceleration mode
When the SET switch is held down, the control unit receives a set signal and it not only turns the auto-cruise vacuum pump motor and control valve OFF (valve is opened) but also turns the release valve ON (valve IS closed).

Release mode
When the CRUISE switch is turned OFF, the control unit receives a cancel signal and it not only turns the auto-cruise vacuum pump motor OFF but also turns the control valve and release valve OFF (valve is opened).

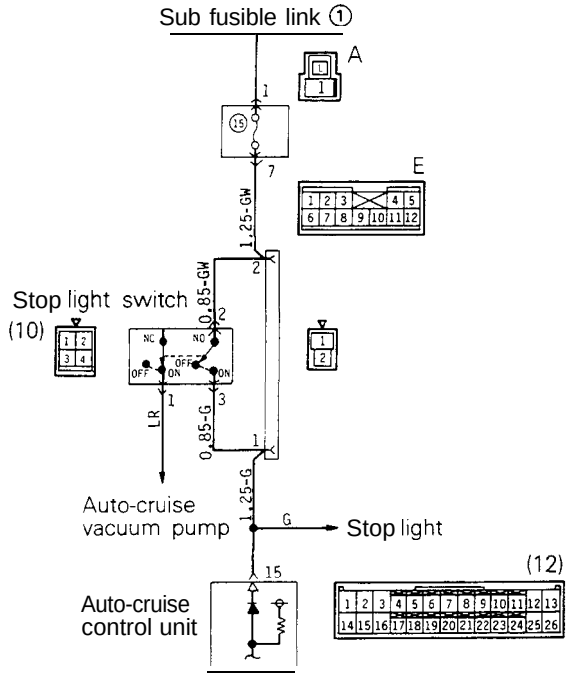
Troubleshooting hint

Diagnostic–No.1 1 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Mode/Terminal voltage (V)			
		Hold	Acceleration	Deceleration	Release
26	Auto-cruise vacuum pump drive	Battery positive voltage or 0	0	Battery positive voltage	Battery positive voltage
13	Control valve open/close		0	Battery positive voltage	Battery positive voltage
12	Release valve open/close		0	0	Battery positive voltage

6. CHECKING THE STOP LIGHT SWITCH CIRCUIT



Description of operation

When the brake pedal is depressed during constant-speed travel, the stop light switch's (NC) contacts for the cruise-control system open, with the result that the current to the auto-cruise vacuum pump is interrupted, thus canceling the constant-speed travel.
At the same time, moreover, the closing of the (NO) contacts for the stop light results in the sending of the cancel signal to the control unit, so that the auto-cruise vacuum pump current is discontinued within the control unit, thereby canceling the constant-speed travel.
The flow of current is from the sub fusible link ① to fuse No. ⑮ of the junction block, the stop light switch, and the control unit.

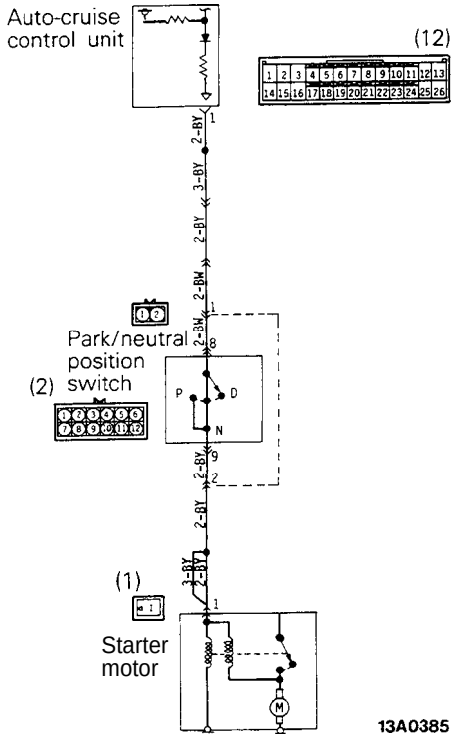
Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
15	Stop light switch (load side)	When the brake pedal is depressed.	Battery positive voltage
		When the brake pedal is not depressed.	ov

NOTE
NC: Indicates ON at all times. (For cruise control)
NO: Indicates OFF at all times. (For stop light)

7. CHECKING THE PARK/NEUTRAL POSITION SWITCH CIRCUIT <A/T>



Description of operation

The park/neutral position switch also functions as the switch for the starter. If the selector lever is moved to the "N" position during constant-speed travel, current flows to the control unit, park/neutral position switch, starter motor, and to ground; the cancel signal is therefore input to the control unit, thus canceling the constant-speed travel.

Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
1	Park/Neutral position switch	At all times	Battery positive voltage

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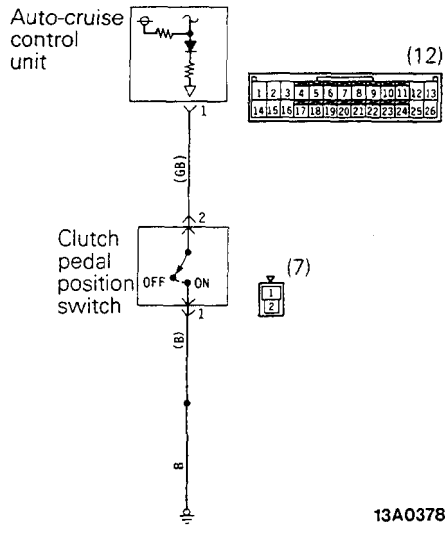
8. CHECKING THE CLUTCH PEDAL POSITION SWITCH CIRCUIT <M/T>



Description of operation

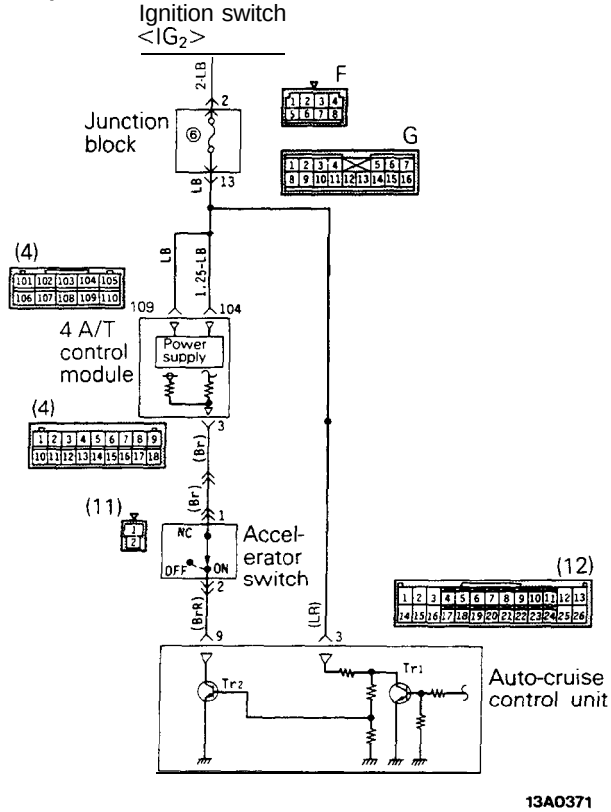
If the clutch pedal is pressed when driving at a constant speed, the clutch pedal position switch is turned ON and a cancel signal is input to the control unit and the determined driving speed is canceled because current flows to the clutch pedal position switch junction block from the control unit and to ground.

Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
1	Clutch pedal position switch	When the clutch pedal is depressed.	ov
		When the clutch pedal is not depressed.	Battery positive voltage

9. CHECKING THE CIRCUITS RELATED TO THE ACCELERATOR SWITCH OFF FUNCTION <A/T>



Description of operation

The accelerator switch is a switch that detects the operational status of the accelerator pedal; it is one of the sensors of the automatic transaxle.
Because the status of the accelerator pedal during constant-speed driving is non-operational, the ground circuit (transistor Tr_2) of the accelerator switch is switched OFF only during constant-speed driving in order not to interfere with the function of the automatic transaxle.

Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
3	Control unit power supply	At all times	Battery positive voltage
9	Accelerator switch	When the accelerator pedal is depressed.	0V
		When the accel-erator pedal is not depressed.	Battery positive voltage

NOTE
NC: Indicates ON at all time

Cruise-control system	Tr_1	Tr_2
In operation	ON	OFF
Not in operation	OFF	ON

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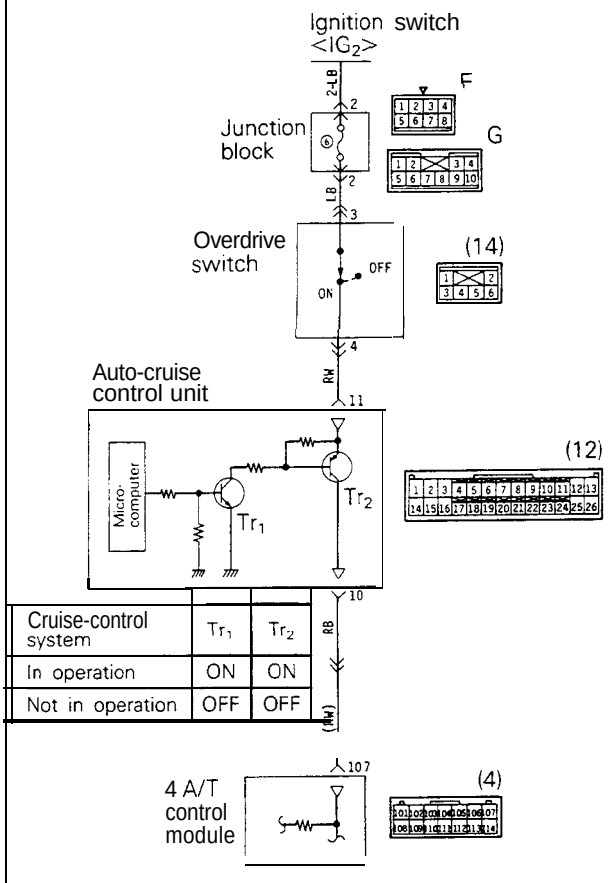
10. CHECKING THE CIRCUITS RELATED TO THE OVERDRIVE-CANCELLATION FUNCTION <A/T>



13A0379

Description of operation

This is a function that cancels the overdrive function for a certain fixed period of time, if during constant-speed travel in overdrive, the actual vehicle speed decreases to less than the vehicle speed retained in the memory. and then after a short time causes the vehicle speed to return to the vehicle speed retained in the memory.
Overdrive is cancelled under the following conditions.
If, during constant-speed travel, the actual vehicle speed decreases to 7 km/h (4.4 mph) or more below the set vehicle speed.
Under either of the conditions described above, the overdrive-ON signals output from the microcomputer (with the control unit) are no longer output, and transistor Tr_1 is switched OFF. As a result, transistor Tr_2 is also switched OFF, causing the current passing through the overdrive switch of the selector handle to be interrupted at transistor Tr_2, with the result that the drive is controlled at 3rd gear.

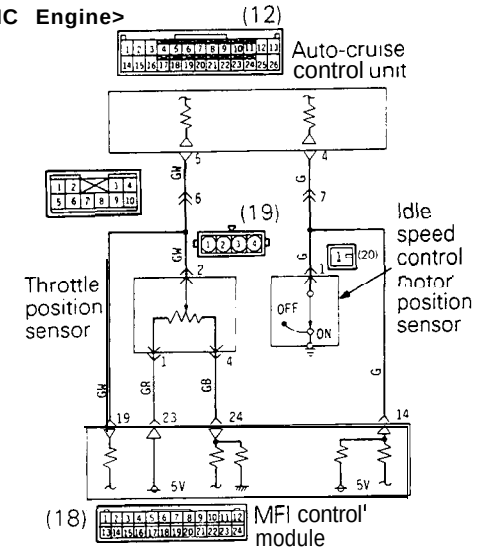
Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
10	4 A/T control module	When the overdrive switch is switched ON.	Battery positive voltage
11	Overdrive switch	When the overdrive switch is switched ON.	Battery positive voltage

11. CHECKING THE THROTTLE POSITION SENSOR AND CLOSED THROTTLE POSITION SWITCH CIRCUIT

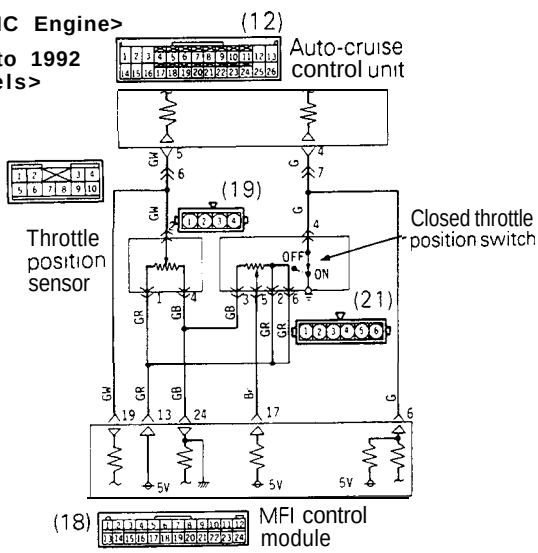
<DOHC Engine>



13A0424

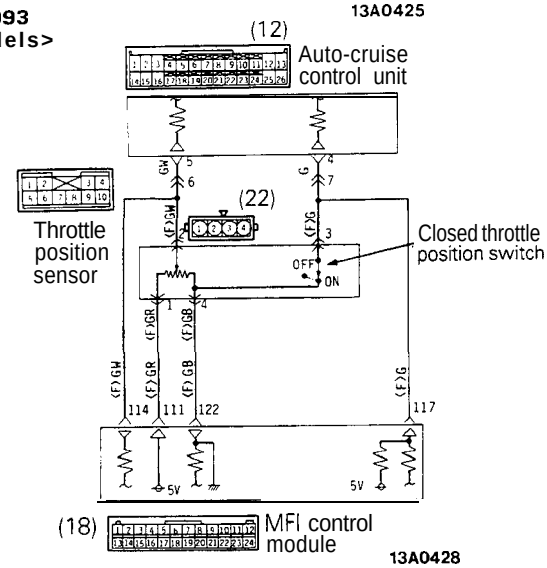
<SOHC Engine>

<up to 1992 models>



13A0425

<1993 models>



13A0428

Description of operation

The throttle position sensor and closed throttle position switch aremounted in the idle speed control motor position sensor Or throttle body and are sensors in the MFI system. The closed throttle position switch is turned OFF when the accelerator pedal is pressed and ON when it is released. In addition, throttle position sensor output voltage varies according to the degree of opening of the throttle valve.

Troubleshooting hint

<Throttle position sensor>

Diagnostic–No.17

<Closed throttle position switch>

Diagnostic–No.17

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
4	Closed throttle position switch	When accelerator -pedal is pressed	Battery positive voltage
		When accelerator pedal is released	ov
5	Throttle position sensor	When accelerator pedal is pressed all the way down	4.0V–5.5V
		When accelerator pedal is released	0.48–0.72V

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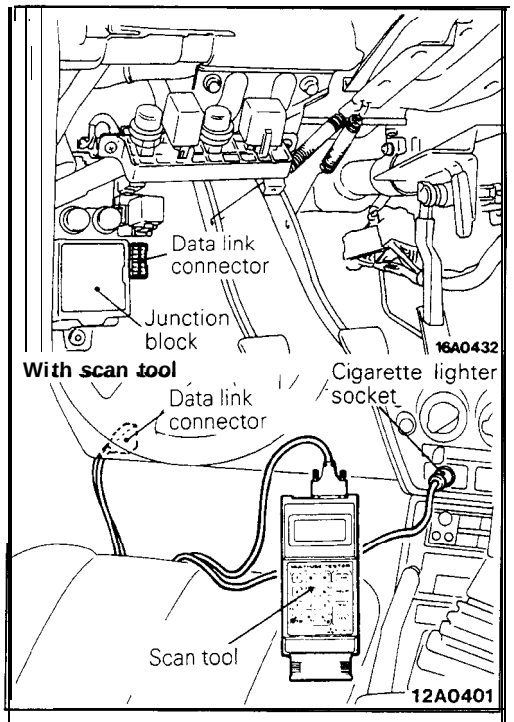
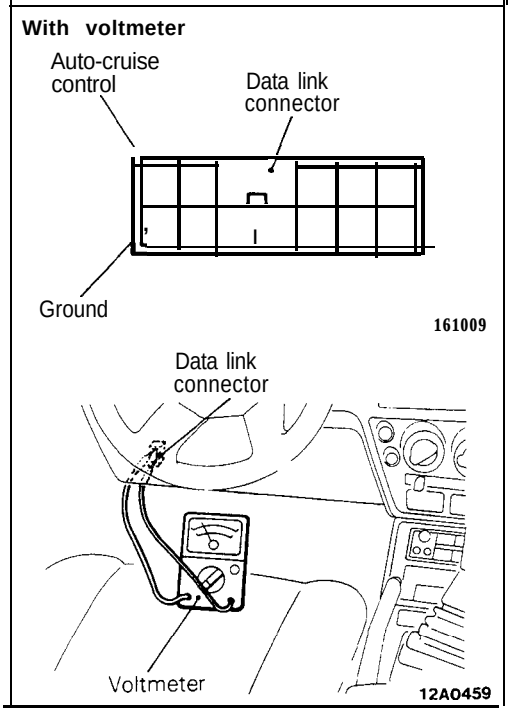




ON-BOARD DIAGNOSTIC CHECK

On-board diagnostic checking is performed when there has been an automatic cancellation, without cancel switch operation.

(1) The following two methods can be used for checking the diagnostic. Note that the data link connector is located under the driver's side instrument panel.

① If a scan tool is used

Connect the scan tool's socket and connector to the cigarette lighter socket and the data link connector, and set the tester. Use the tester according to its operation instructions; display the diagnostic trouble code number and then check.

② If a voltmeter is used

Connect a voltmeter between the ground terminal and the terminal for auto-cruise control of the data link connector.

It is possible to discover which circuit is the cause of the cancellation by verifying the indication shown by the voltmeter with the display patterns shown on the next page.

(2) When the diagnostic trouble code No. is displayed, check by referring to the check chart applicable to that number.

NOTE

Canceling the diagnostic trouble codes

The diagnostic trouble codes remain in memory until the battery is turned off but they can be canceled in the following ways without disconnecting the battery terminals.

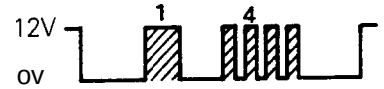
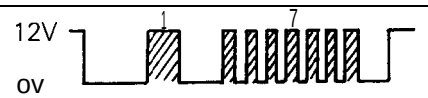
① By turning on the ignition switch.

② By turning the main switch ON while the SET switch is ON and then, within 1 second, turning the RESUME switch ON. (Put into condition for input check reception).

③ By turning ON the SET switch and stop light switch at the same time and continuing the ON condition for 5 seconds or more.

④ By checking that the diagnostic trouble codes are canceled using a scan tool or voltmeter.

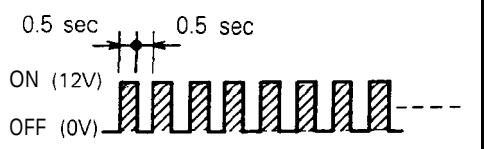
DIAGNOSTIC DISPLAY PATTERNS AND TROUBLE CODES

Code No.	Display patterns (output codes) (use with voltmeter)	Probable cause	Check chart No.
11		Abnormal condition of actuator drive system <Electrical type> Abnormal condition of auto-cruise vacuum pump drive system <Vacuum type>	No. 5
12		Abnormal condition of vehicle-speed signal system	No. 4
13*		Low-speed limiter activation (The system is normal if it can be reset.) <Electrical type>	–
14*		Automatic cancellation activated by vehicle speed reduction. (The system is normal if it can be reset.) <Electrical type>	–
15*		Control switch malfunction (when SET and RESUME switches switched ON simultaneously)	No. 2, 3
16*		Cancel switch ON signal input (including input wirings damage or disconnection, or problem in circuitry within the control unit) <Electrical type>	No. 6-1, 6-2, 6-3
		Abnormal condition of auto-cruise control unit	–
17*		Throttle position sensor malfunction Closed throttle position switch malfunction	No. 11

NOTE

1. Codes indicated by the * symbol are displayed, if the conditions are satisfied, even if the system is normal. In either case, the system is normal if it can be reset. If there is an automatic cancellation not intentionally made by the driver, however, excluding cancellations explicitly made by the cancel procedure, there may be a temporary malfunction such as poor contact of a harness connector even though the system can be reset, and for that reason it is necessary to check according to each individual check chart that is applicable.

Display when vehicle speed is less than approximately 20 km/h (12 mph), or before the auto-cruise control system is set



03R0196

2. Diagnostic trouble codes are displayed when, after cancellation of the auto-cruise control system, the vehicle speed decreases to less than approximately 20 km/h (12 mph), and are erased by switching OFF the ignition switch or the main switch. <Electrical type>
   Diagnostic trouble codes are displayed when, after cancellation of the auto-cruise control system, the vehicle speed decreases to less than approximately 20 km/h (12 mph), and are canceled by turning OFF the battery or canceling the diagnostic trouble codes. (Refer to P.13-361.) <Vacuume type>

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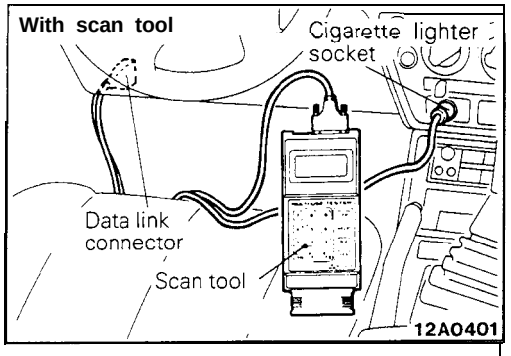
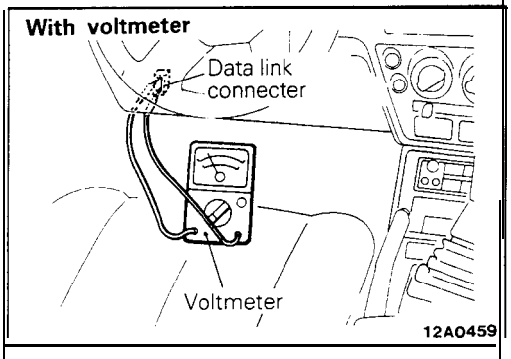
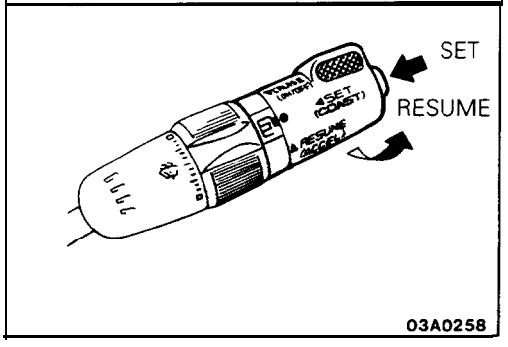
After the diagnostic trouble codes in the memory are erased, if (when the power supply of the electronic control unit is switched ON once again) the power supply of the electronic control unit is normal, the on-board diagnostic output code display will be as below, regardless of whether the system condition is normal or not.

① If a scan tool is used:
"NORMAL!!" will be displayed.

② If a voltmeter is used:
Continuous ON/OFF signals will be displayed at 0.5 second intervals.
(Refer to the figure at the left.)







INPUT CHECKING

Input checks should be made when the auto-cruise control system cannot be set and when it is necessary to check (when a malfunction related to the auto-cruise control system occurs) whether or not the input signals are normal.

NOTE
1. If inspection of on-board diagnostic is necessary, confirm diagnostic trouble code first and conduct input check.
2. Input check can be conducted by set operations. On-board diagnostic terminal outputs display patterns.
3. Display codes are displayed only if the circuit is normal according to the conditions shown in the table on the next page.

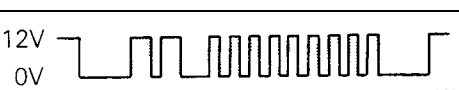
WITH SCAN TOOL

(1) The setting of the scan tool is the same as for the on-board diagnostic check.
(2) Turn the ignition switch to ON and switch OFF the main switch.
(3) Select the cruise control system from the scan tool's menu.
(4) With the set switch ON, switch ON the main switch, and then, within one second, switch ON the resume switch.
(5) Select the diagnostic trouble code from the scan tool's menu.
(6) Perform each input operation according to the input check table (on the next page) and read the codes.
(7) Switch the main switch OFF.

WITH VOLTMETER

(1) The voltmeter is set in the same way as for the on-board diagnostic check.
(2) Turn the ignition switch to ON and switch OFF the main switch.
(3) With the set switch ON, switch ON the main switch, and then, within one second, switch ON the resume switch.
(4) Perform each input operation according to the input check table (on the next page) and read the codes.
(5) Switch the main switch OFF.

INPUT CHECK TABLE

Code No.	Display patterns (output codes) (use with voltmeter)	Input operation	Check results
21		SET switch ON	SET switch circuit normal
22		RESUME switch ON	RESUME switch circuit normal
23		<Electrical type> Each cancel switch ON 1. Stop light switch (brake pedal depressed) 2. Clutch pedal position switch (clutch pedal depressed) <M/T> 3. Park/neutral position switch (shift lever to "N" range) <A/T> <Vacuum type> Stop light switch ON (brake pedal depressed)	<Electrical type> Each cancel circuit normal <Vacuum type> Stop light switch normal
24		Driving at approximately to 40 km/h (25 mph) or higher	When both No.4 and No.5 can be confirmed, vehicle-speed sensor circuit normal.
25		Driving at less than approximately to 40 km/h (25 mph) or stopped	
26		1. Clutch pedal position switch ON (clutch pedal depressed) <M/T> 2. Park/Neutral position switch ON (shift lever to "N" or "P" range) <A/T>	Clutch pedal position switch, park/neutral position switch normal
28		Throttle position sensor output voltage over 1.5V (when the accelerator pedal is pressed more than half way)	Throttle position sensor normal
29		Closed throttle position switch OFF (accelerator pedal depressed)	Closed throttle position switch normal

NOTE
1. Each code will be displayed in an order of priority beginning from No. 1.
   If there is no display, it is possible that there is a malfunction of the ECU power-supply circuit or the SET and/or RESUME switch, so check according to check charts 1.2 and 3 (P.13-339, 340, 341, 354, 355).
2. Continue each input operation until the output code is emitted.
   If no output codes are emitted for inputs even though the display pattern is repeated two or more times, there is a malfunction of the switch sensor.
3. When each input operation is performed and the signals for the conditions are received by the computer, each output code will be repeatedly displayed in the sequence of priority for as long as that signal continues.
4. If, during the display of output codes, the input operation is canceled (if, for example, the SET switch is set from ON to OFF), the code will be displayed for one cycle of the display, but will not be displayed during the next cycle. This makes it possible, therefore, to check the OFF condition (existence of not of a short-circuit of the input line or the switch).

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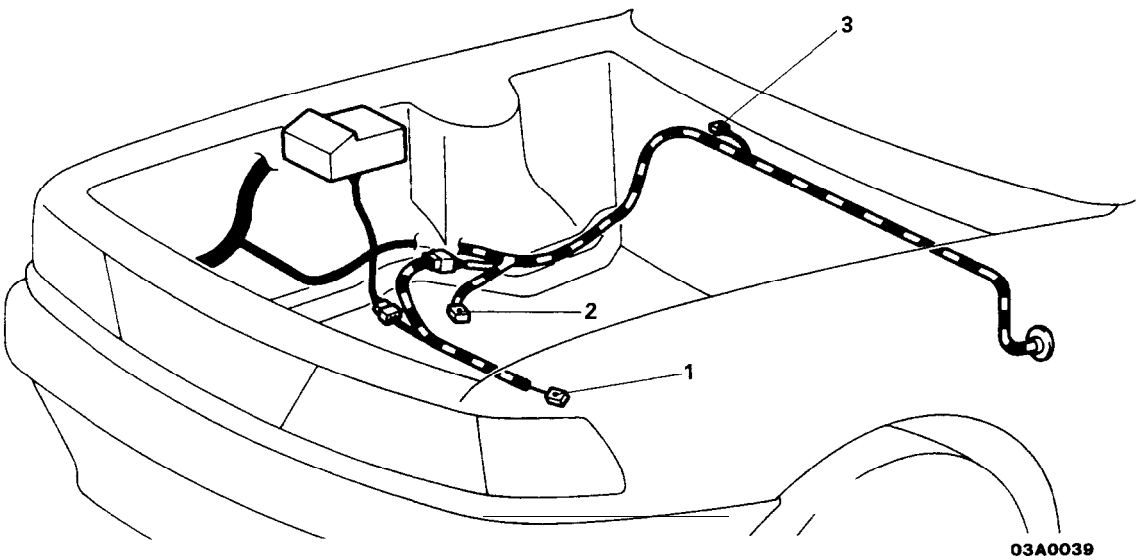
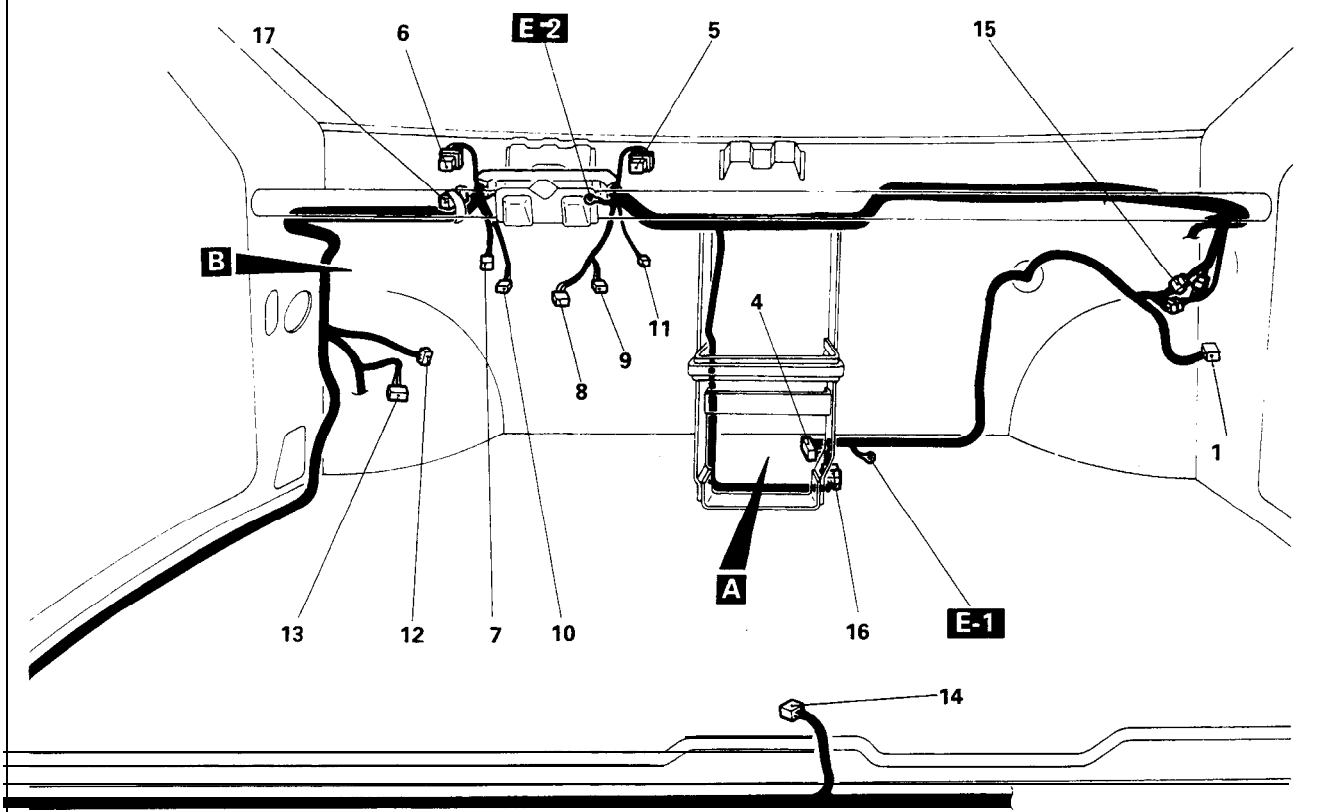
AUTO-CRUISE CONTROL RELATED HARNESSES

<ENGINE COMPARTMENT>



<INSIDE THE CABIN>



1– Starter motor
2 – Park/neutral position switch
3 – Actuator <Up to 1990 models>, Auto-cruise pump <From 199 1 models>
4 – 4 A/T control module
5 – Combination meter
6 – Combination meter
7 – Clutch pedal position switch
8 – Column switch
9 – Ignition switch
10 – Stop light switch
11– Accelerator control unit
12 – Auto-cruise control unit
13 – On-board diagnostic output terminal
14 – Overdrive switch
15 – Control harness and body harness coupling
16 – Control harness and body harness coupling
17 – Diode <Up to 1990.5 models>
18 – MFI control module

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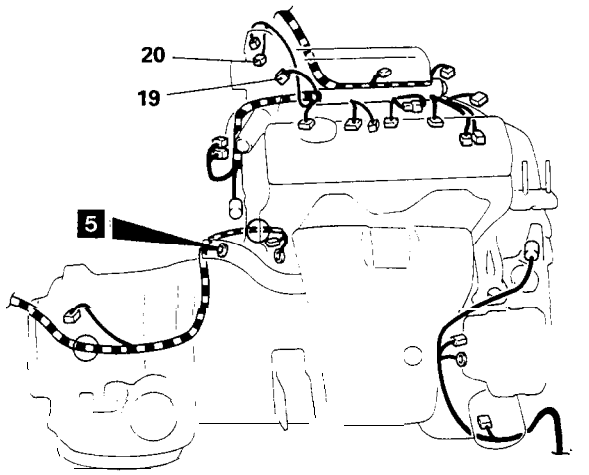
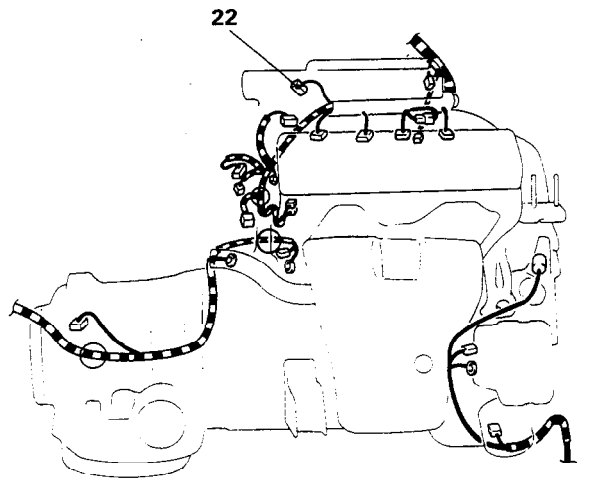
<Engine>

SOHC

<Up to 1992 models>

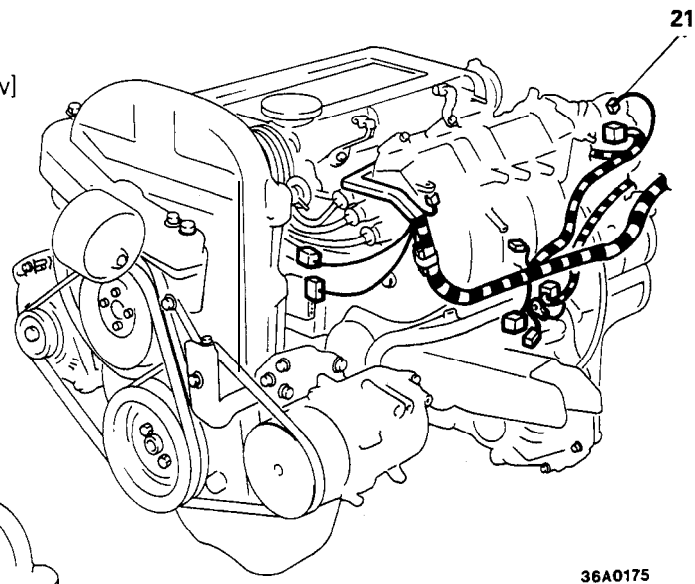


< 1993 models>

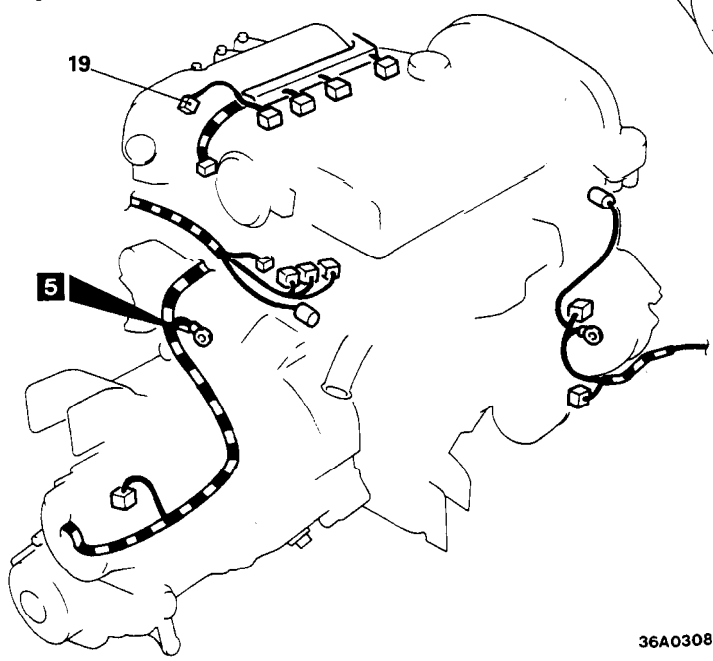


DOHC

[Rear side view]

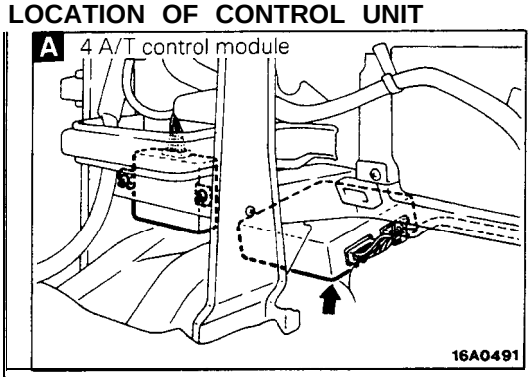


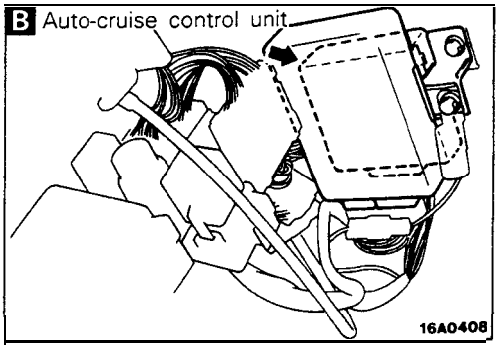
[Front side view]



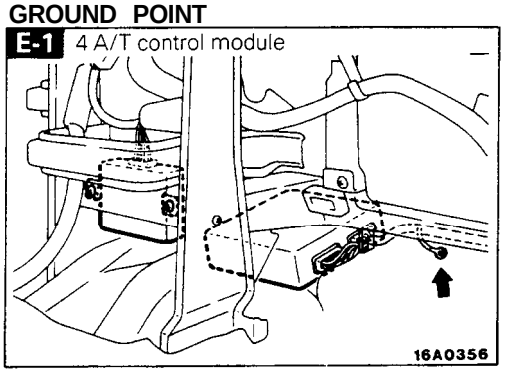
19 – Throttle position sensor
20 – Idle speed control motor position sensor
21 – Closed throttle position switch
22 – Throttle position sensor
(Closed throttle position switch)

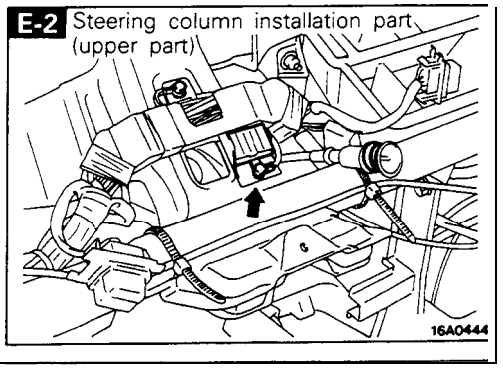
LOCATION OF CONTROL UNIT





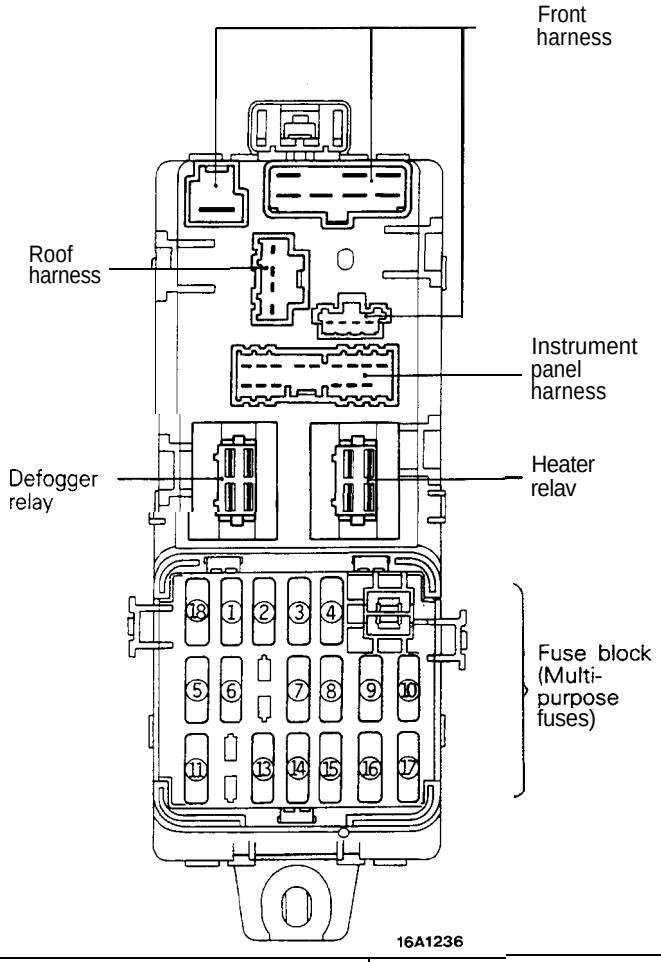
GROUND POINT



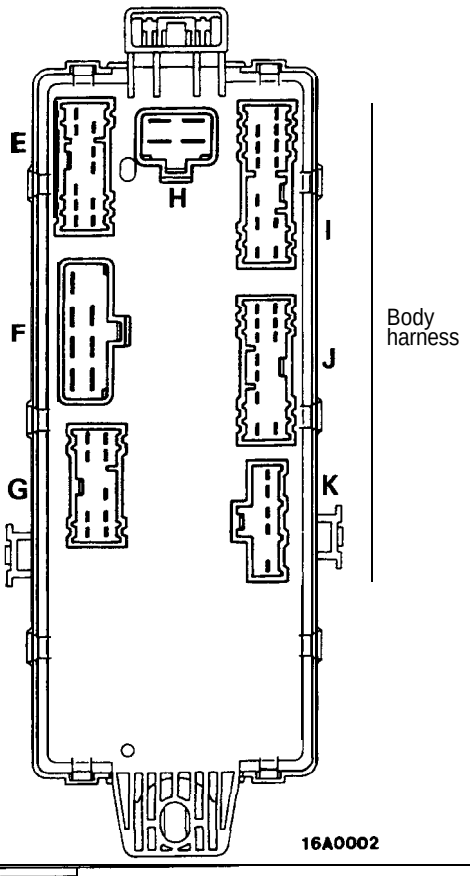


JUNCTION BLOCK

Outer side



Rear side



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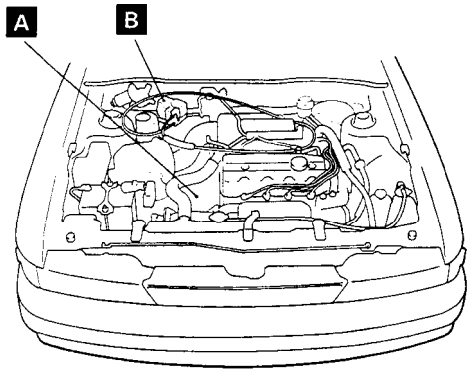
AUTO-CRUISE CONTROL COMPONENTS LOCATION

Name	Symbol	Name	Symbol
Accelerator pedal switch <A/T>	K	Clutch pedal position switch <M/T>	M
Auto-cruise control actuator <Electrical type>	C	Diode	E
Auto-cruise control actuator <Vacuum type>	B	Park/neutral position switch <A/T>	A
Auto-cruise control switch	H	Overdrive switch <A/T>	J
Auto-cruise control unit	D	Stop light switch	L
Auto-cruise control vacuum pump <Vacuum type>	C	Vehicle speed sensor (Reed switch)	F
		4-speed automatic transaxle control module	I
Auto-cruise indicator light	G		

NOTE
The "Name" column is arranged in alphabetical order.

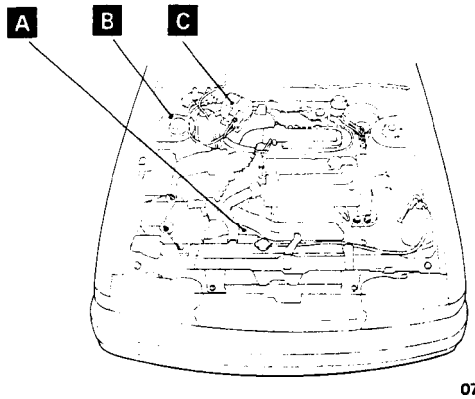
<Engine compartment>

SOHC



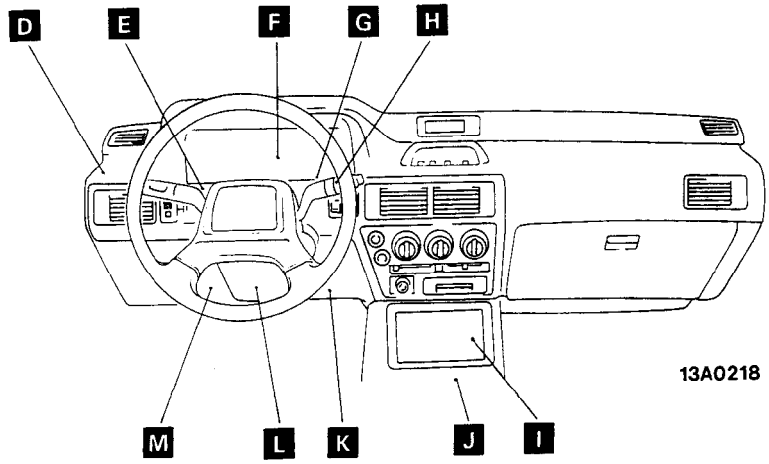
07A0034

DOHC



07A0035

<Interior>



13A0218

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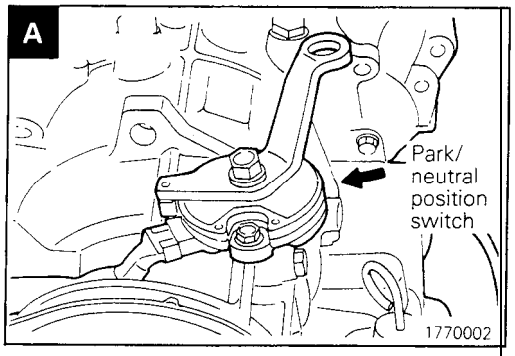
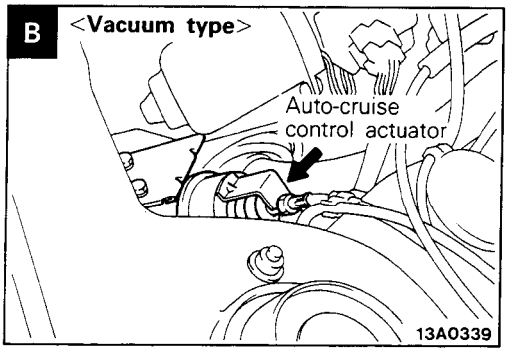
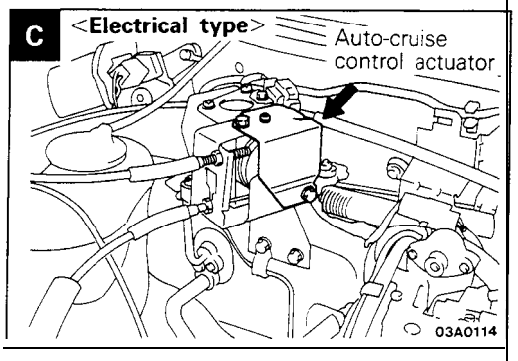
A



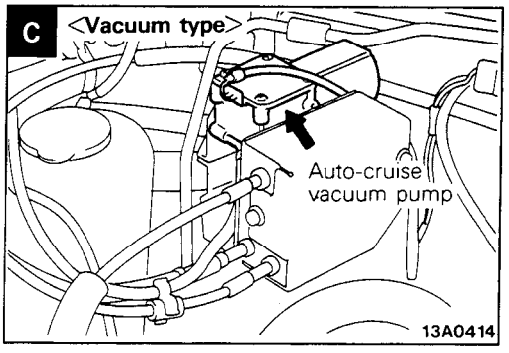
B <Vacuum type>



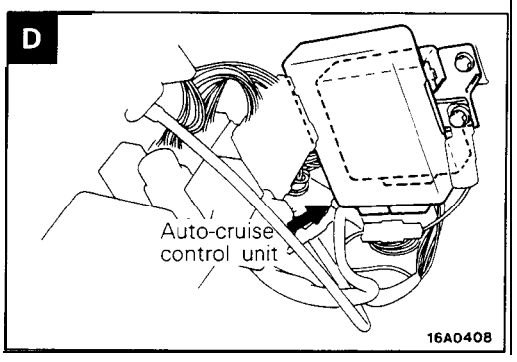
C <Electrical type>



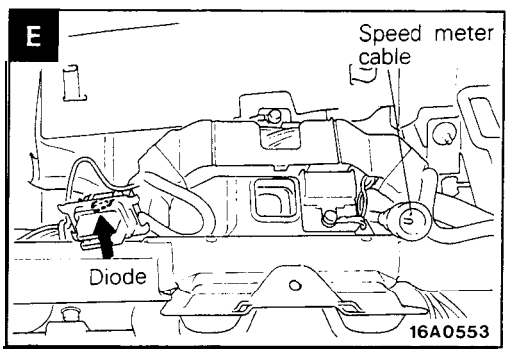
C <Vacuum type>



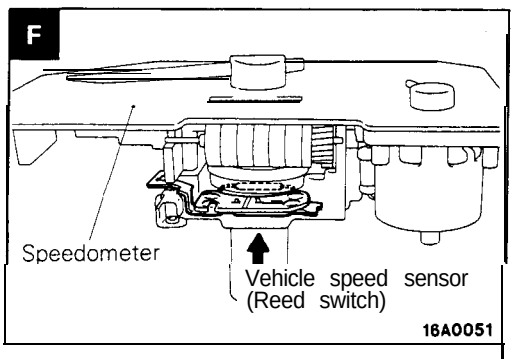
D



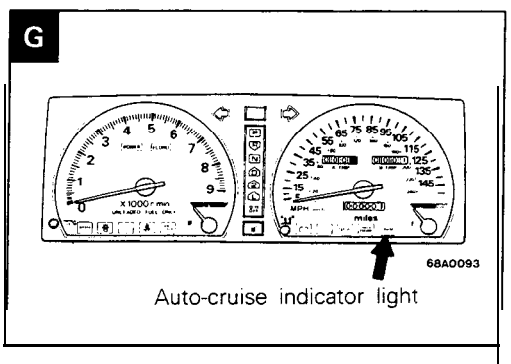
E



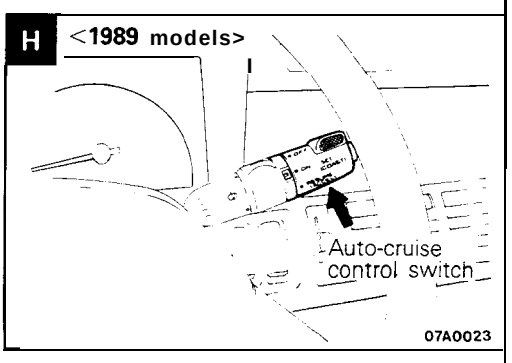
F



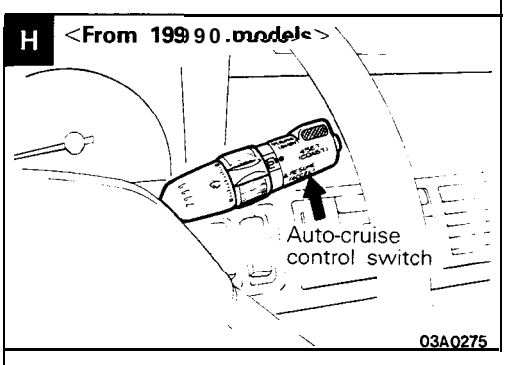
G



H <1989 models>



H <From 1990 models>



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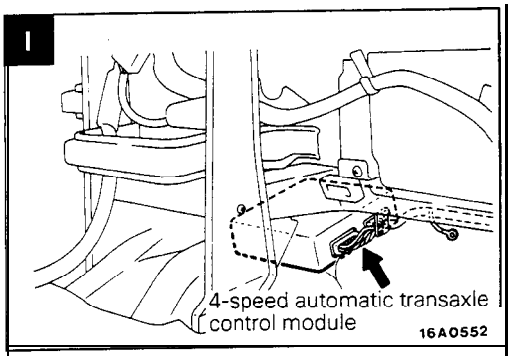
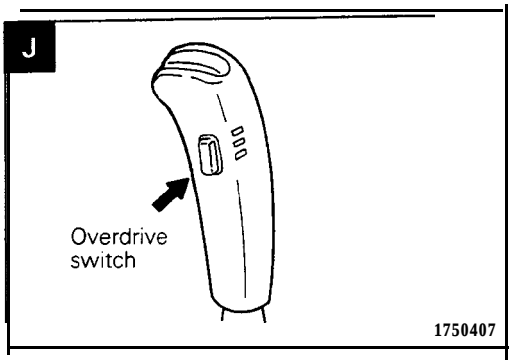
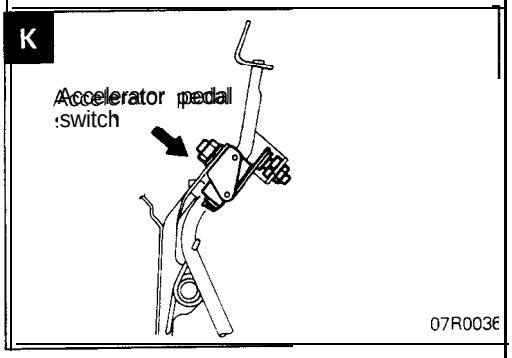
I


4-speed automatic transaxle
control module
16A0552

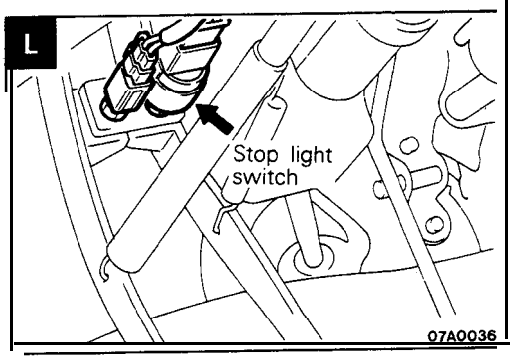
J


Overdrive
switch
1750407

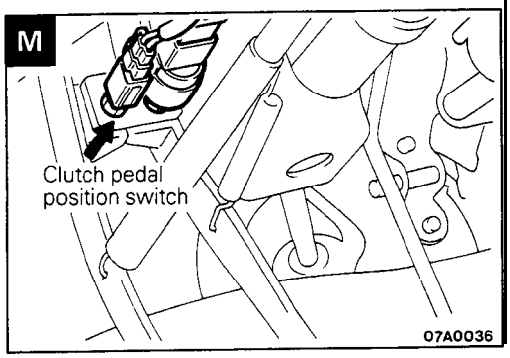
K


Accelerator pedal
switch
07R003E

L

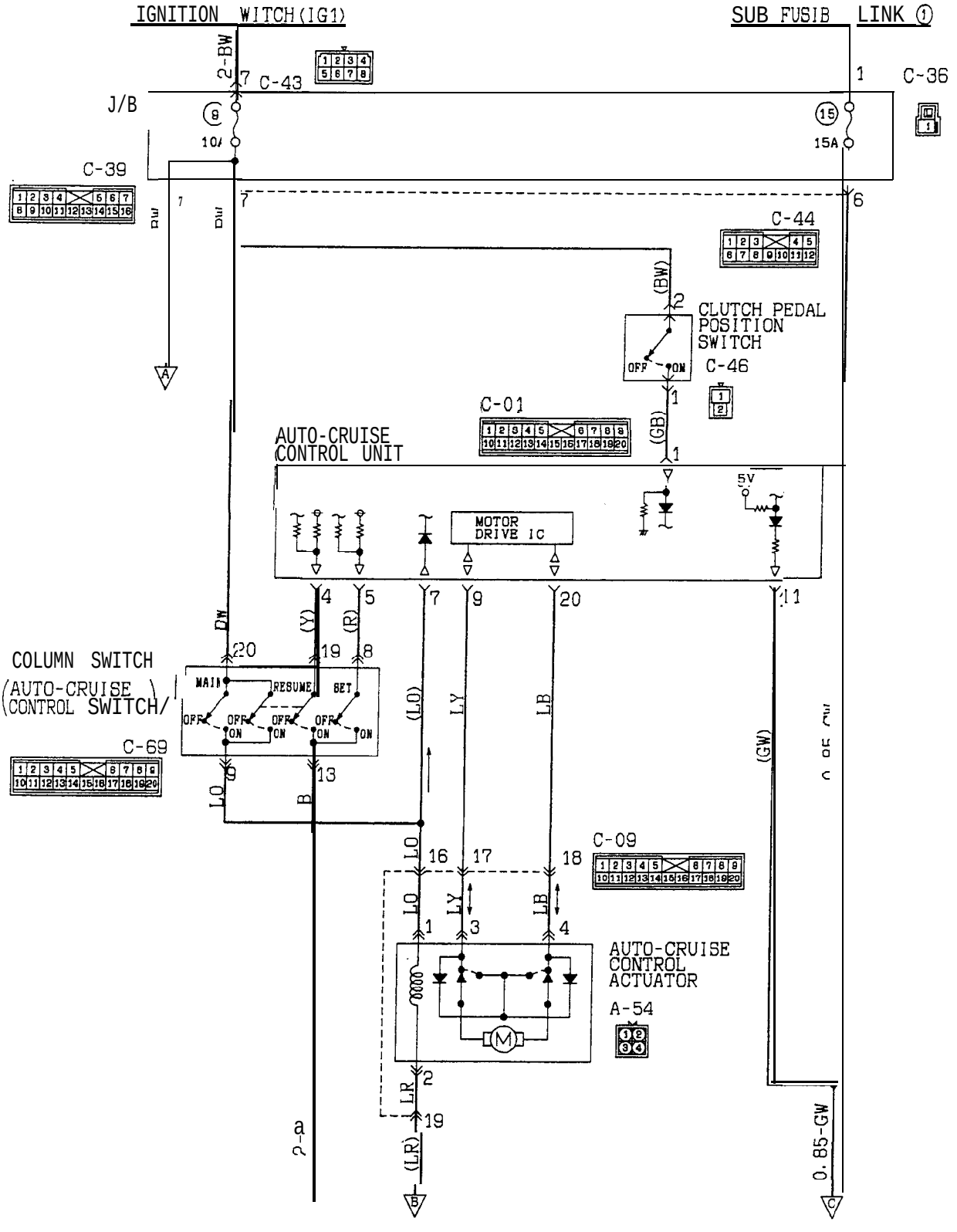

Stop light
switch
07A0036

M


Clutch pedal
position switch
07A0036

CIRCUIT DIAGRAM

<M/T (1989 models)>



XX35-AC-H1534-NM

CIRCUIT DIAGRAM (CONTINUED)

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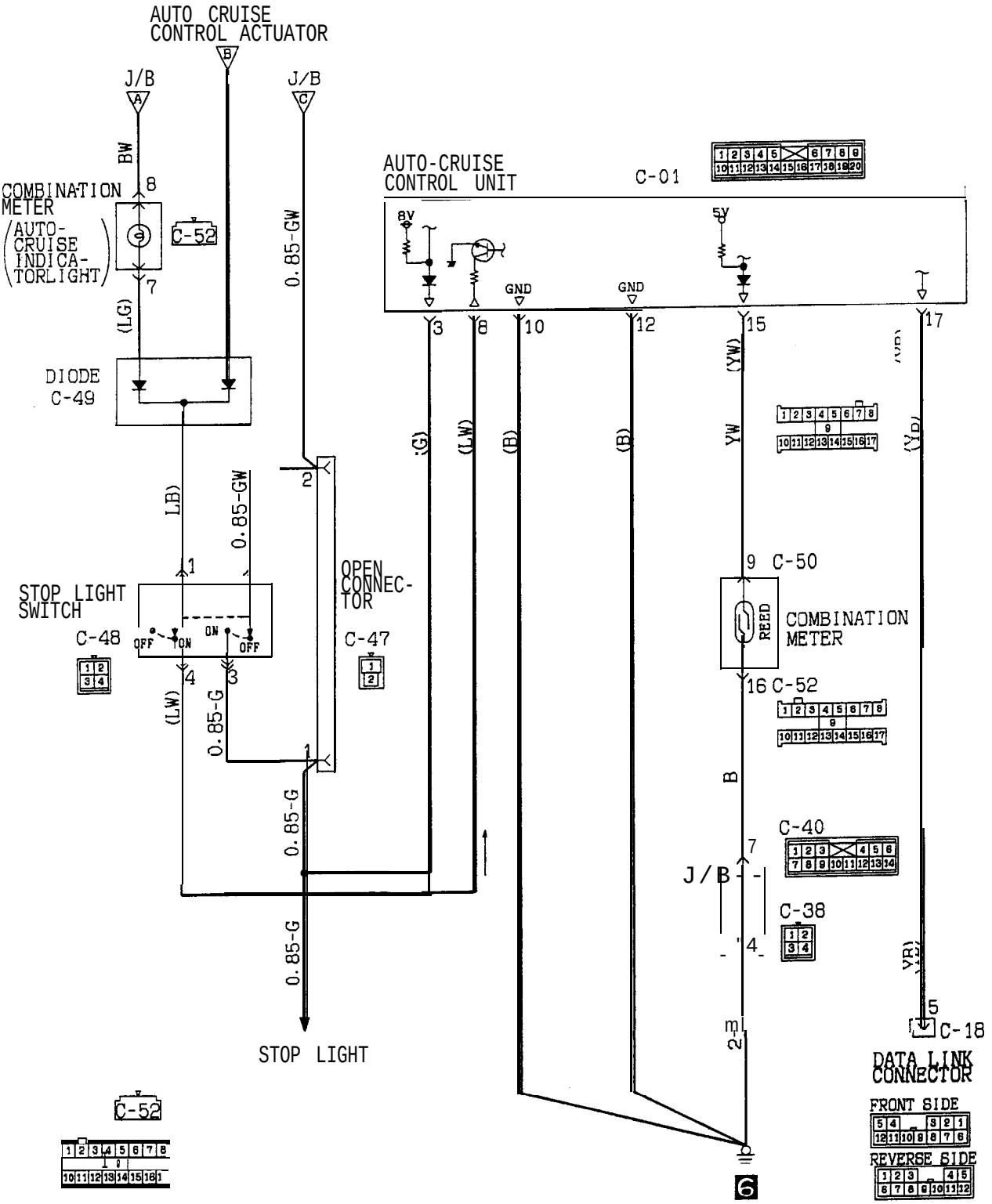

CIRCUIT DIAGRAM

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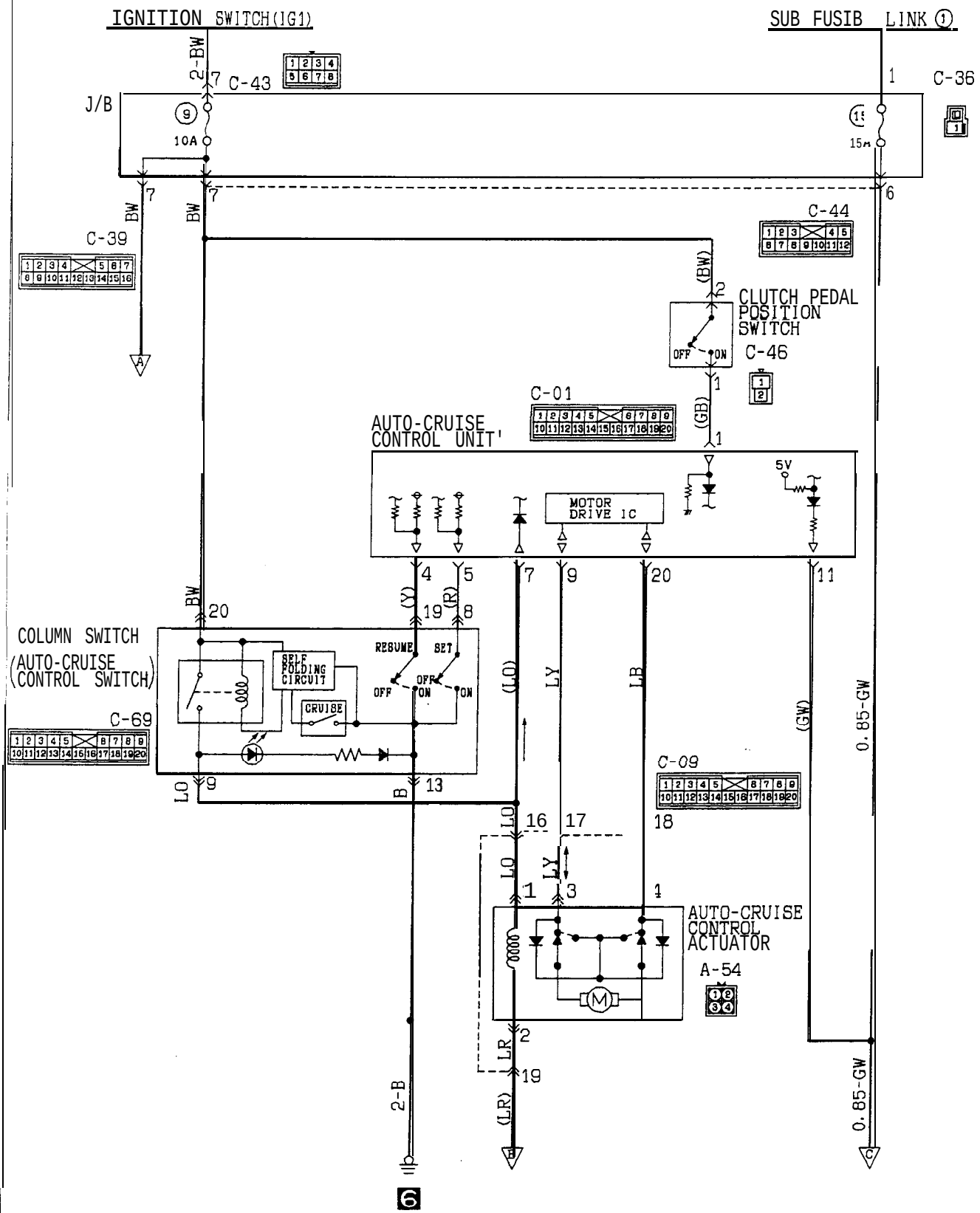

KX35-AC-H1535-NM

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CIRCUIT DIAGRAM (CONTINUED)

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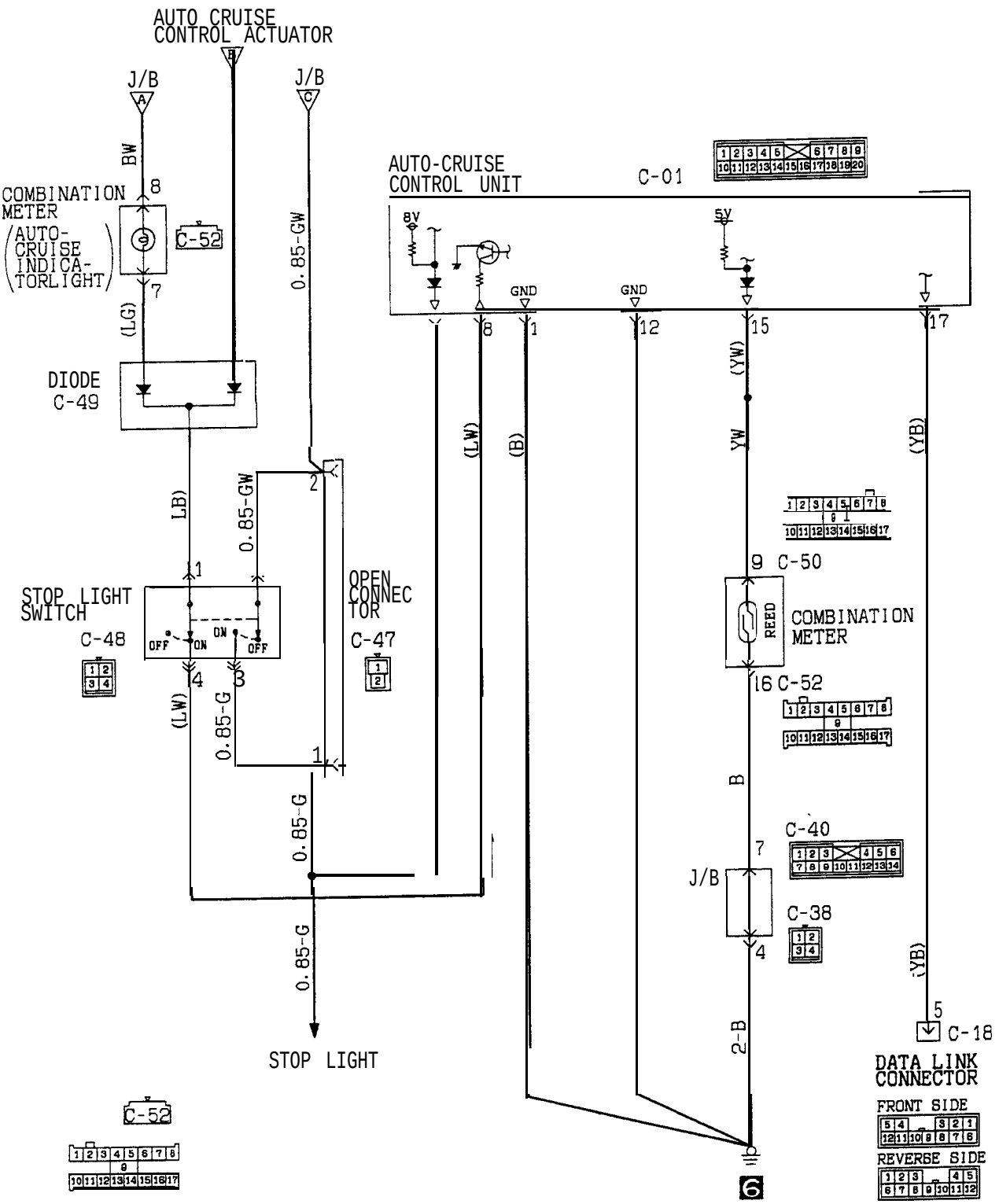

CIRCUIT DIAGRAM

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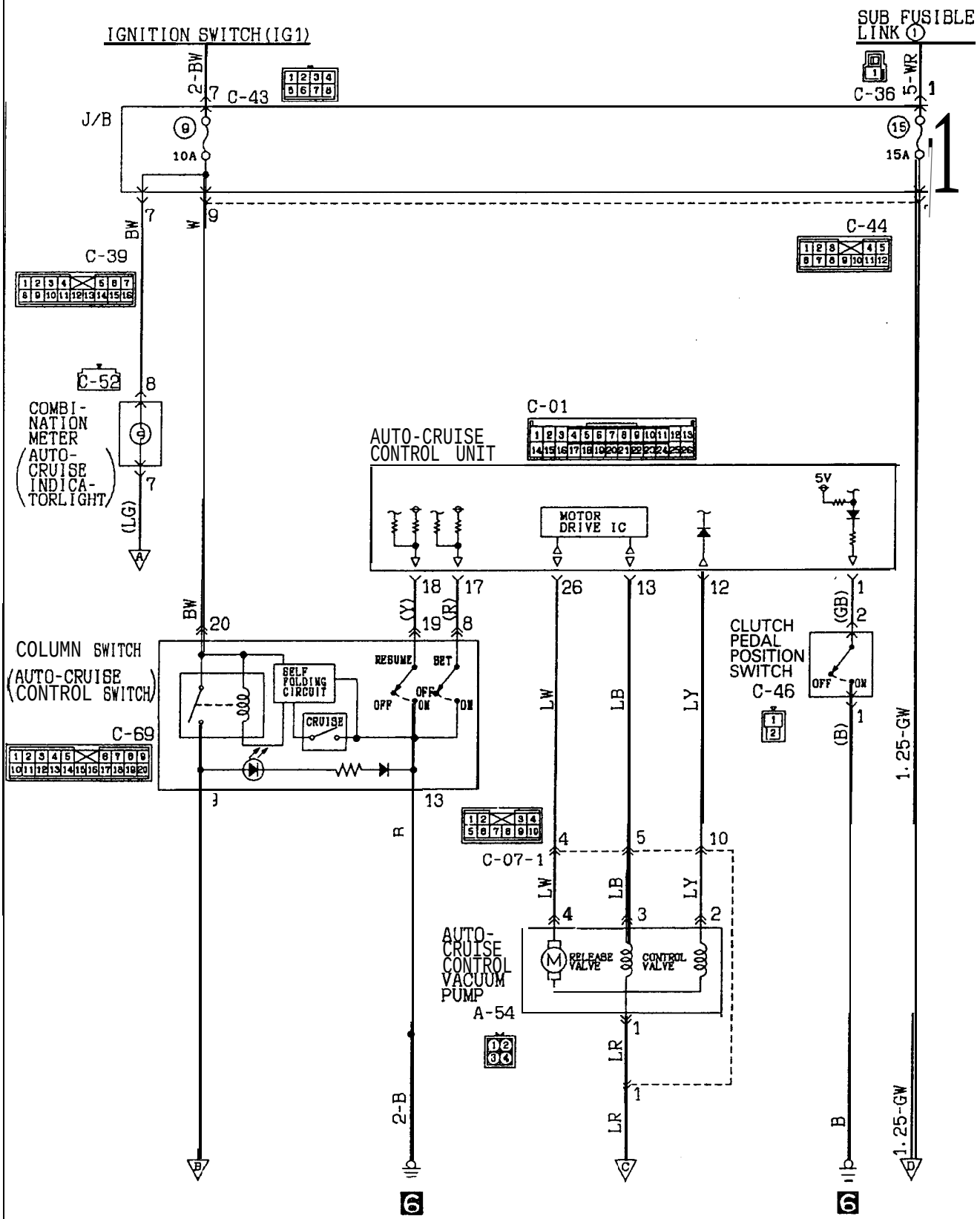

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CIRCUIT DIAGRAM (CONTINUED)

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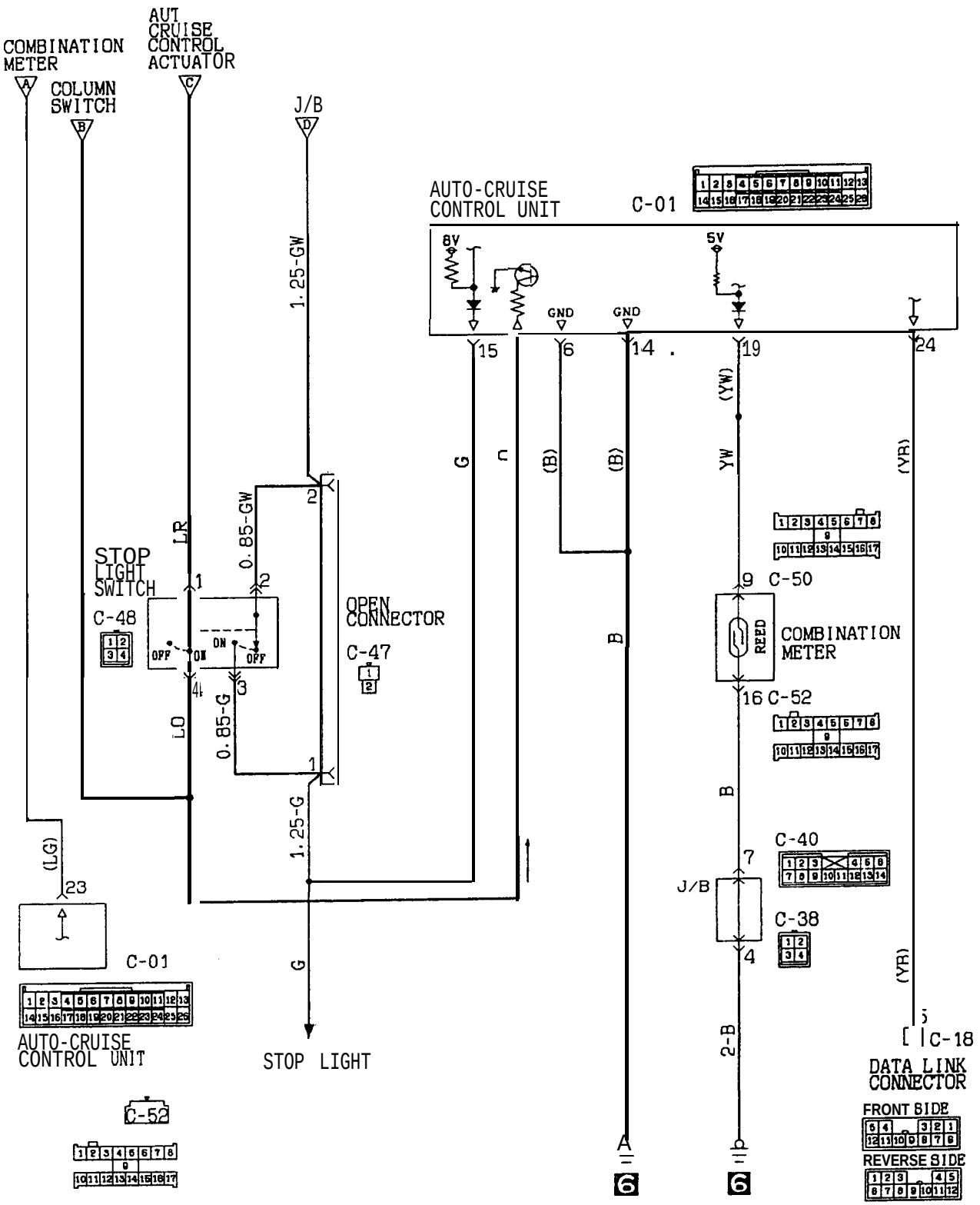

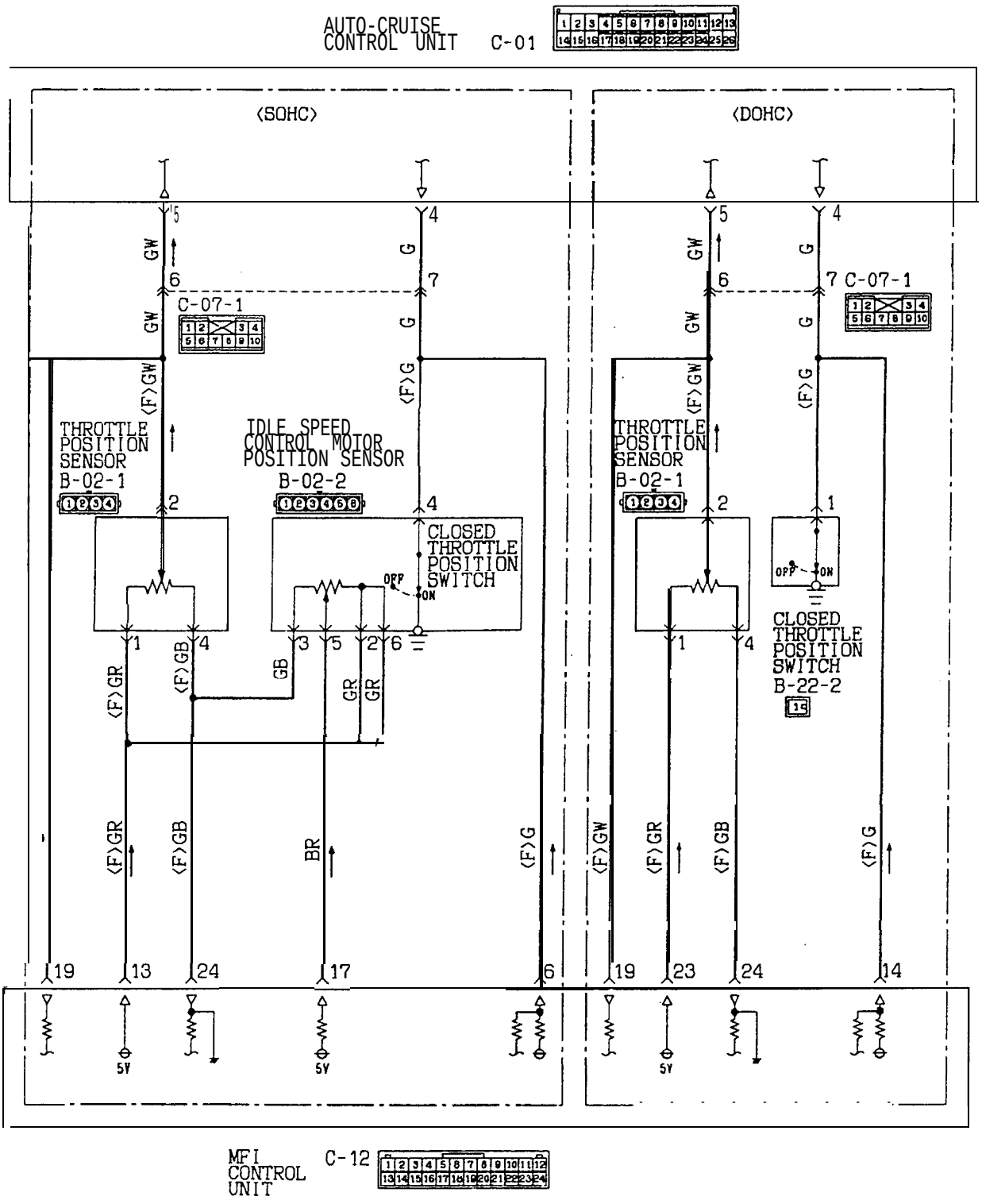

KX35-AC-H1555A-NW

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CIRCUIT DIAGRAM

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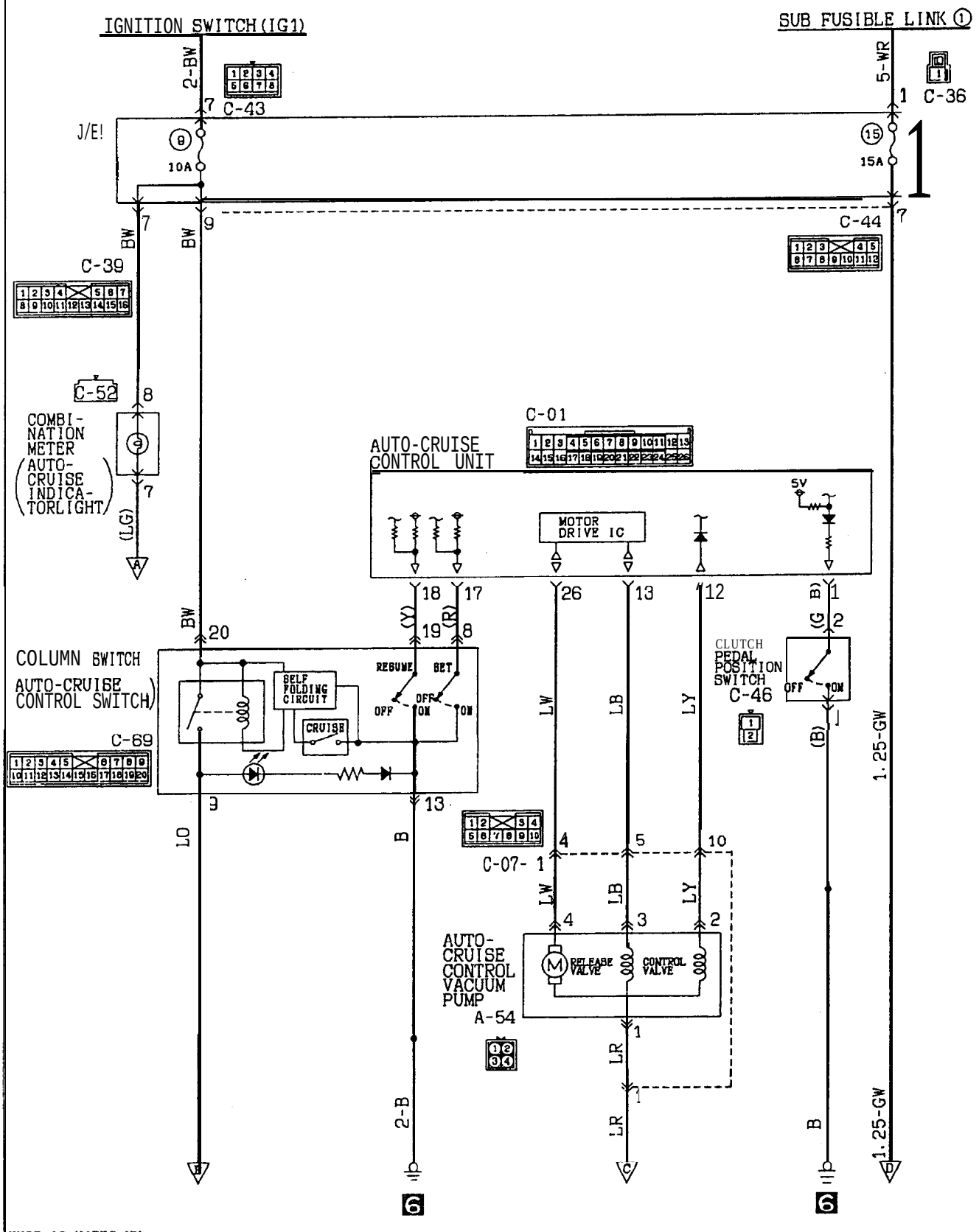
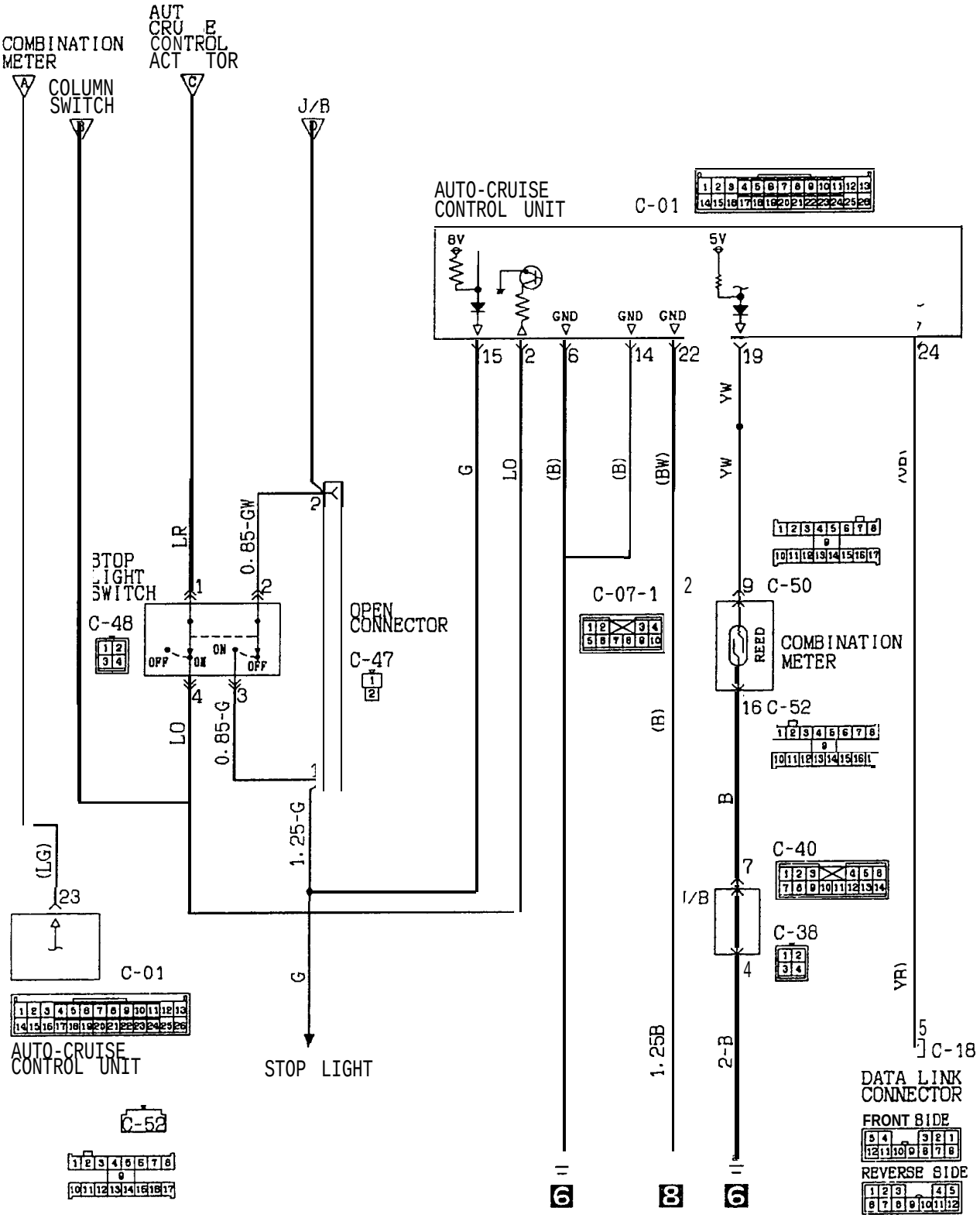
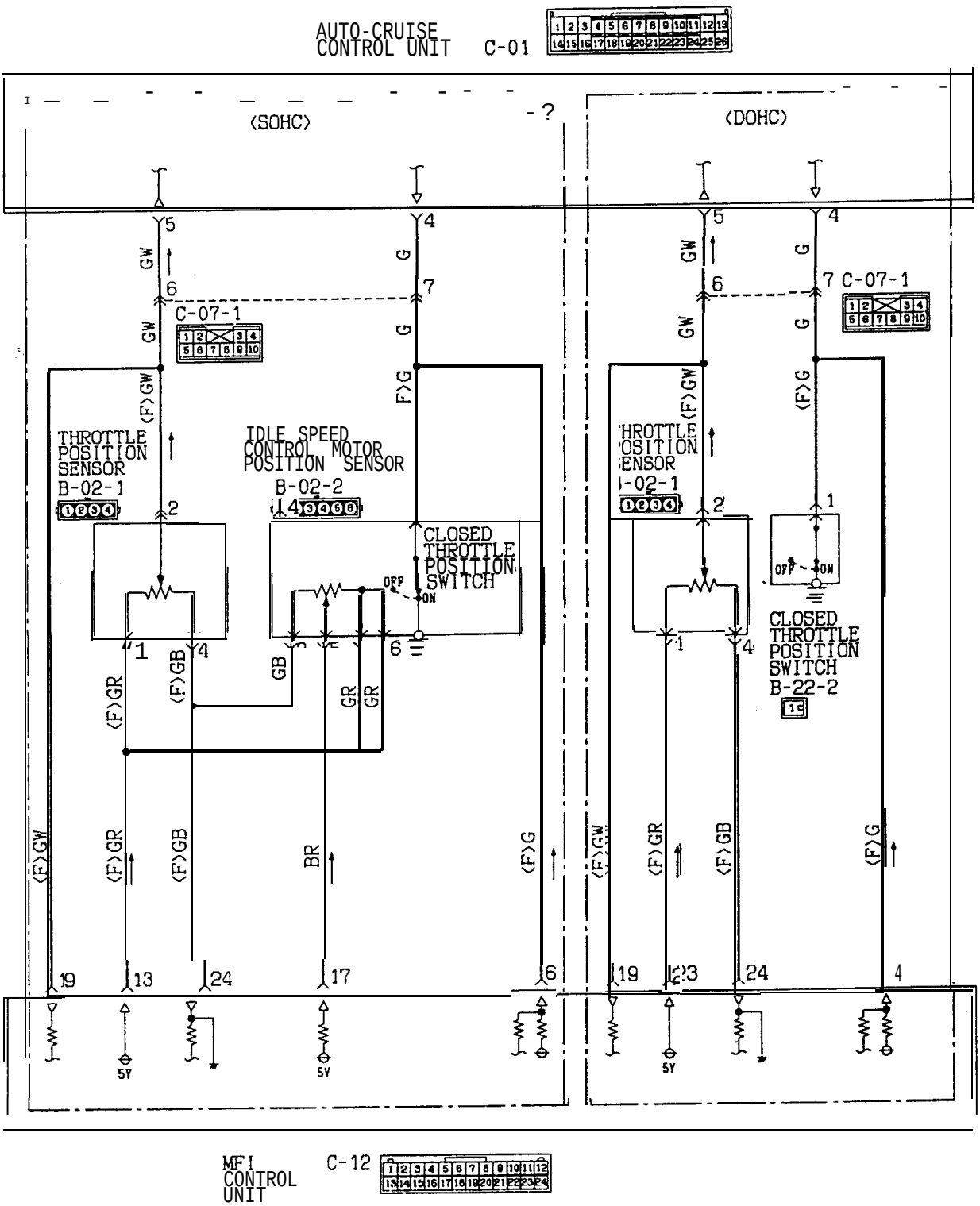



COMBINATION METER
AUT CRU E CONTROL ACT TOR
COLUMN SWITCH
J/B
AUTO-CRUISE CONTROL UNIT
C-01
8V
5V
GND
GND
GND
15
2
6
14
22
19
24
G
LO
(B)
(B)
(BW)
YW
YW
LR
0.85-GW
STOP LIGHT SWITCH
C-48
OFF
ON
ON
OFF
1
2
4
3
OPEN CONNECTOR
C-47
C-07-1
2
9 C-50
REED
COMBINATION METER
16 C-52
LO
0.85-G
1.25-G
(B)
B
7
C-40
I/B
C-38
4
(LG)
23
G
C-01
AUTO-CRUISE CONTROL UNIT
STOP LIGHT
C-52
1.25B
2-B
YR)
5
C-18
DATA LINK CONNECTOR
FRONT SIDE
REVERSE SIDE
6
8
6

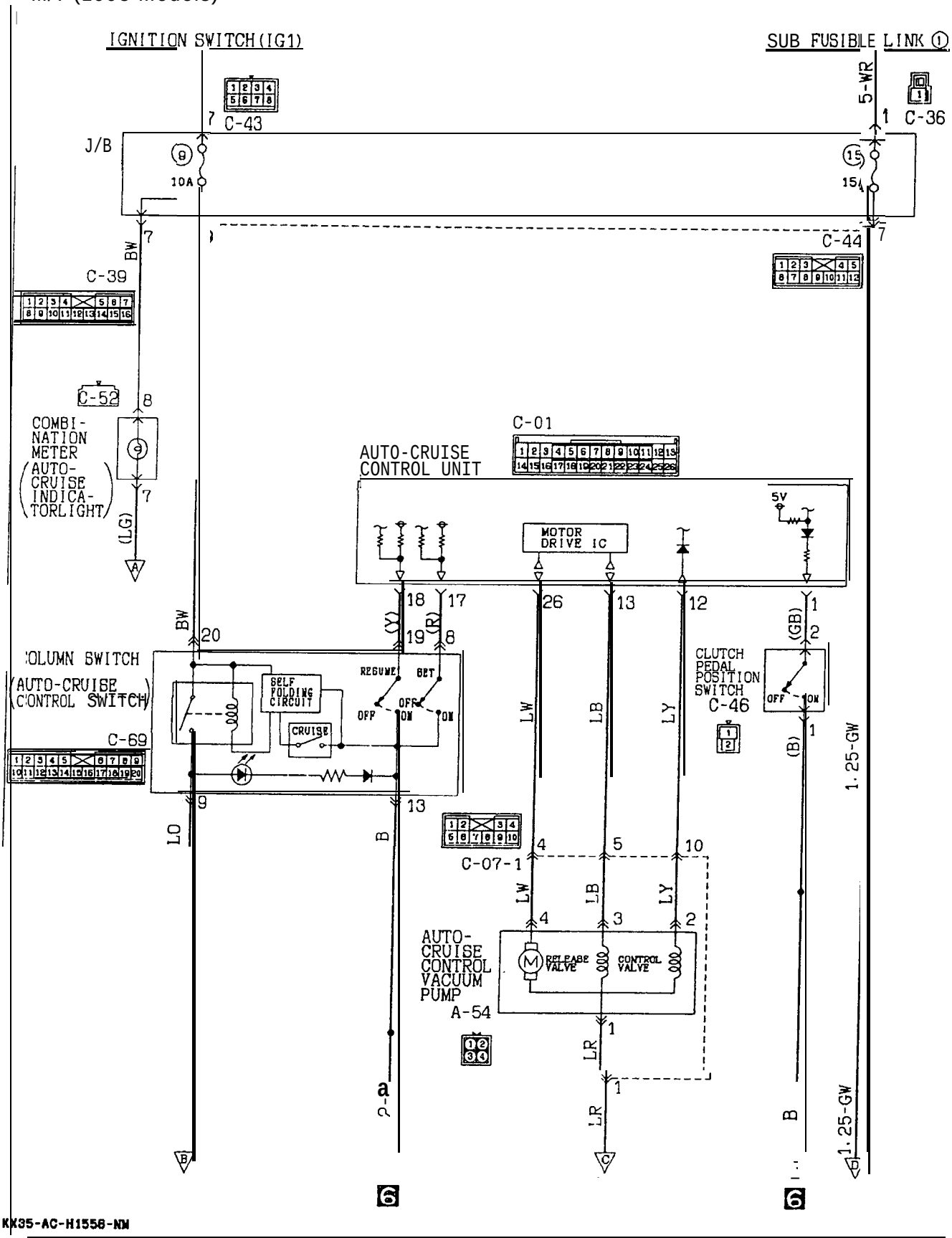
CIRCUIT DIAGRAM (CONTINUED)

<M/T (1992 models)>



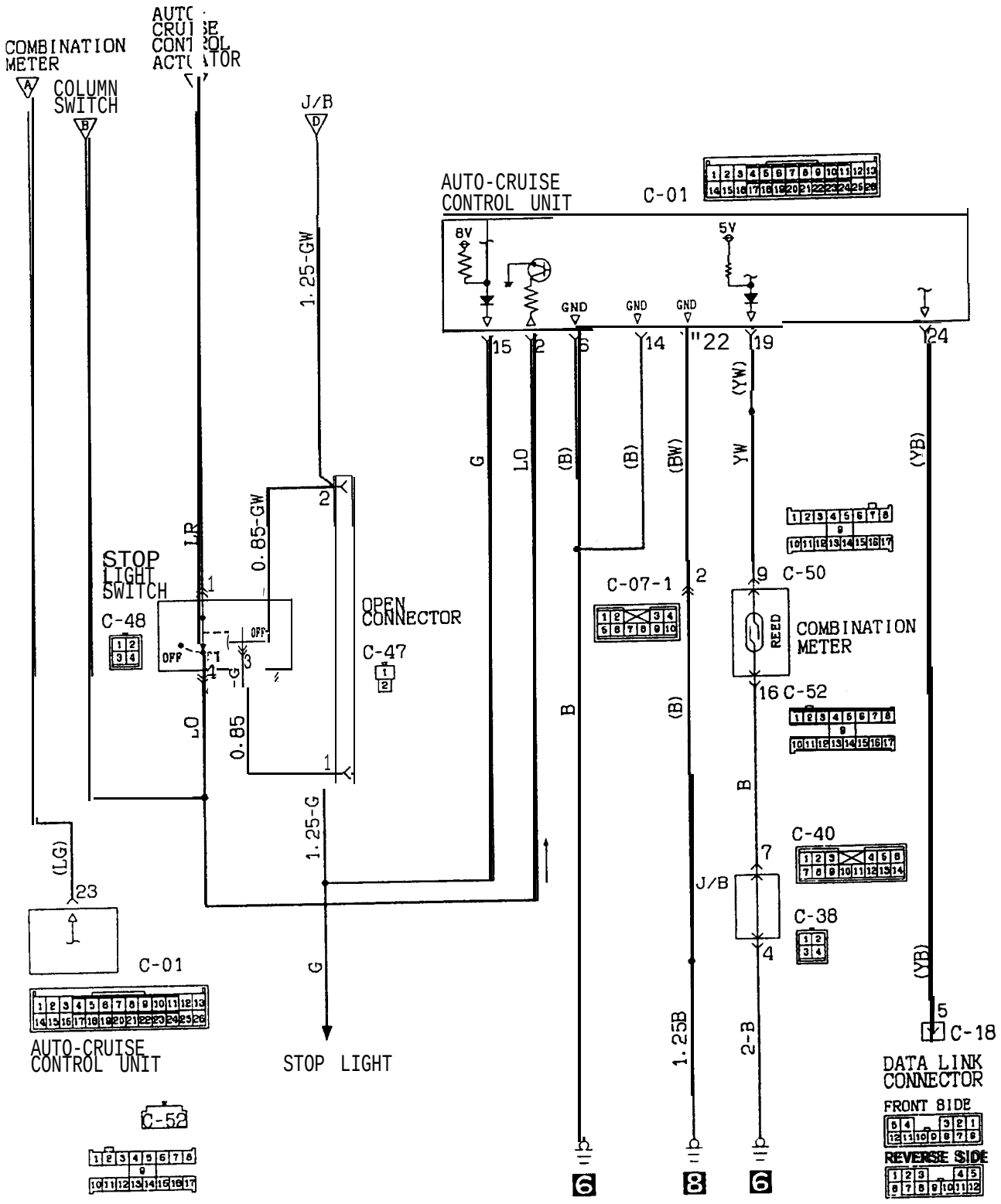
CIRCUIT DIAGRAM

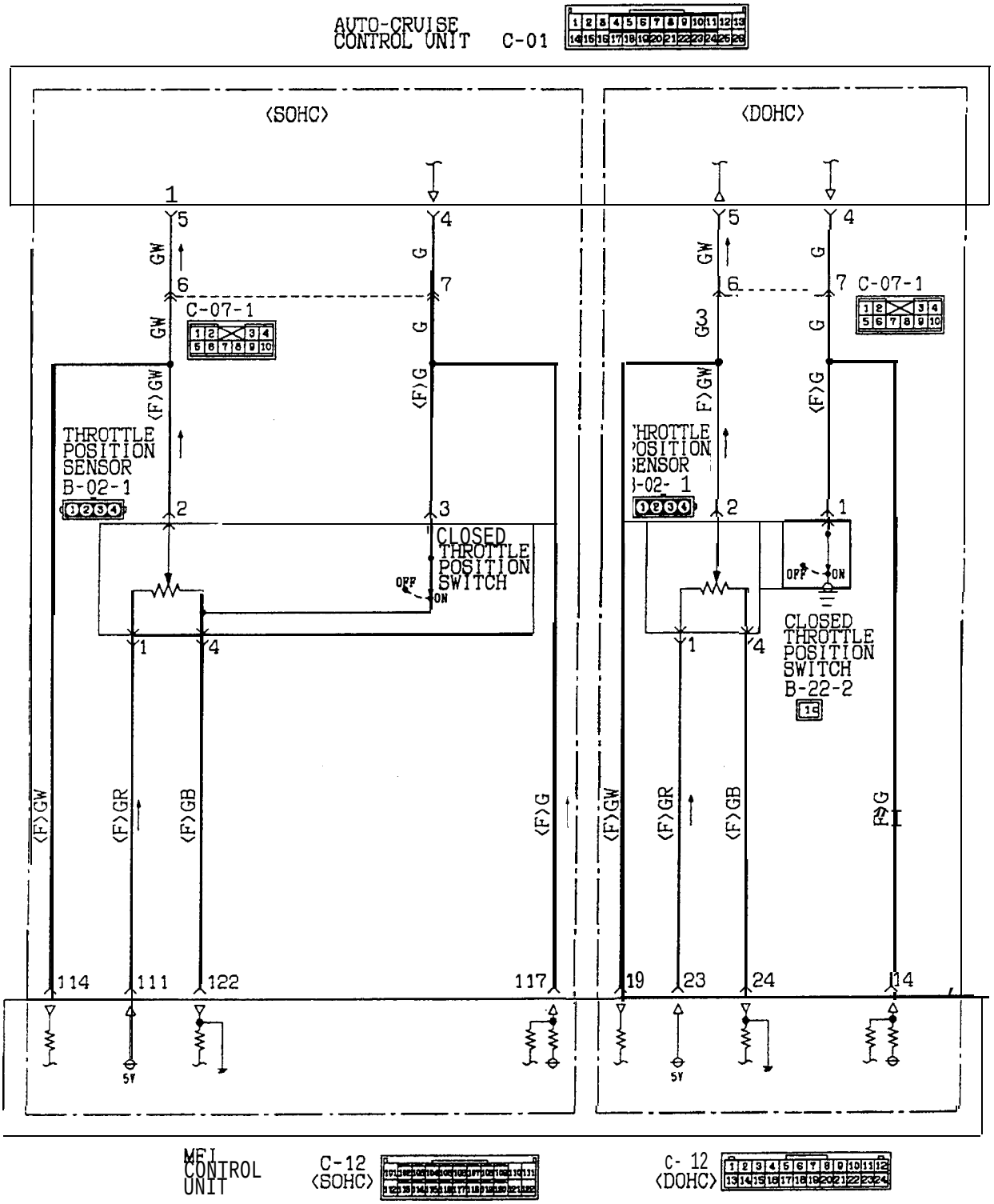
<M/T (1993 models)>



CIRCUIT DIAGRAM (CONTINUED)

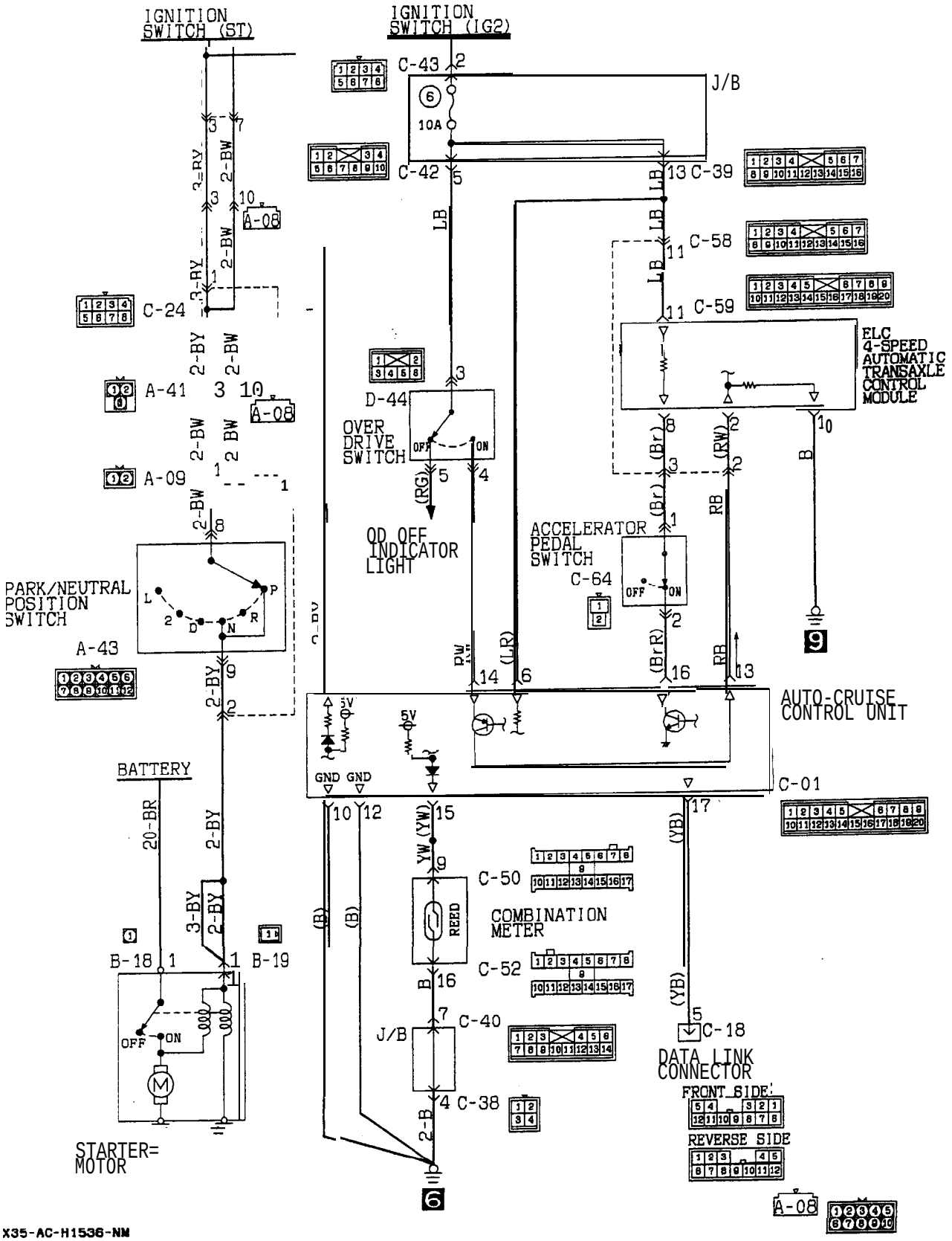
<M/T (1993 models)>



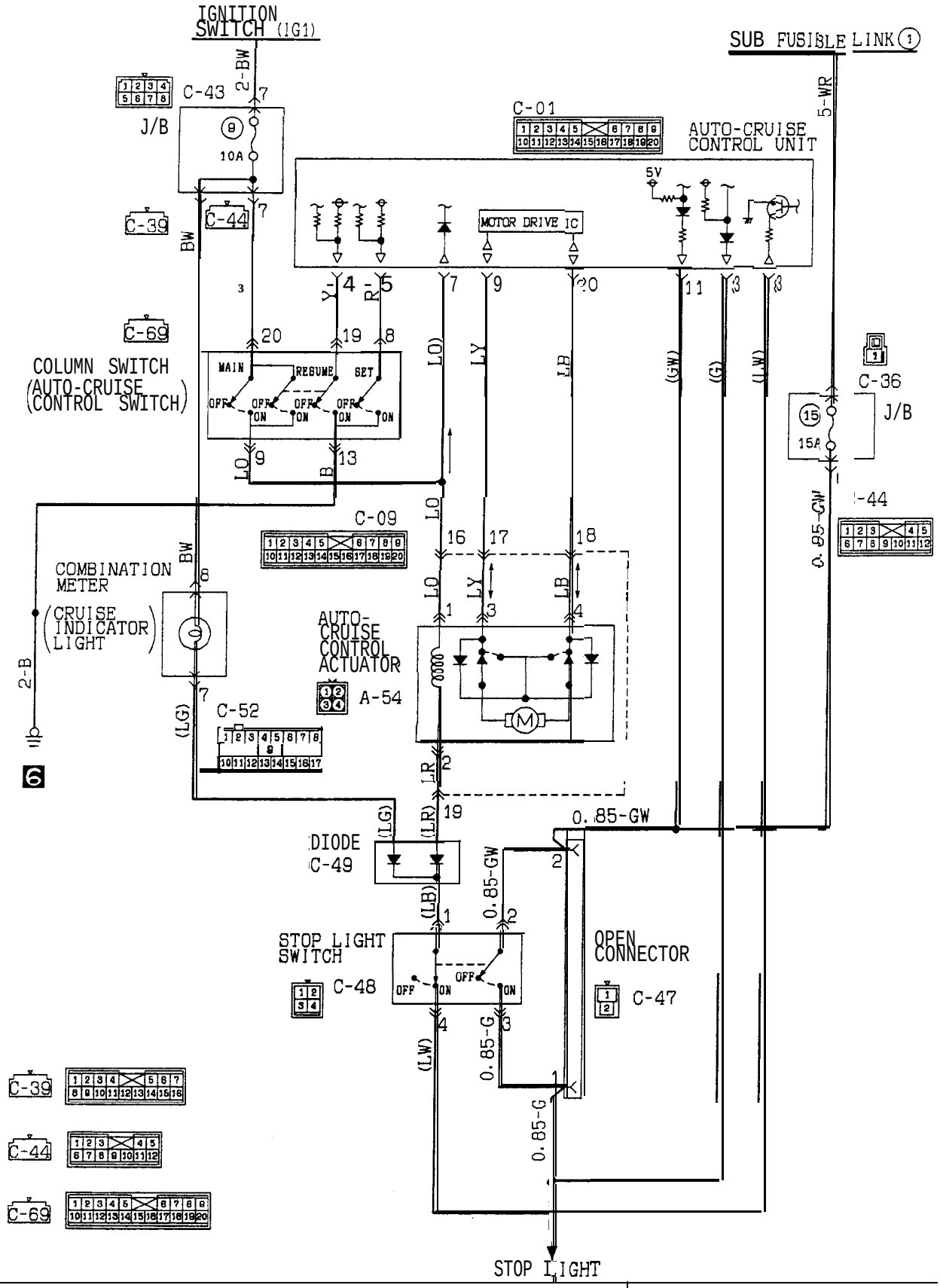

AUTO-CRUISE CONTROL UNIT C-01
〈SOHC〉
〈DOHC〉
C-07-1
THROTTLE POSITION SENSOR B-02-1
CLOSED THROTTLE POSITION SWITCH
CLOSED THROTTLE POSITION SWITCH B-22-2
OFF
ON
〈F〉GW
〈F〉GR
〈F〉GB
〈F〉G
R/G
114
111
122
117
19
23
24
14
5V
MFI CONTROL UNIT
C-12 〈SOHC〉
C-12 〈DOHC〉

CIRCUIT DIAGRAM

<A/T (1989 models)>



TSB Revision



TSB Revision

CIRCUIT DIAGRAM

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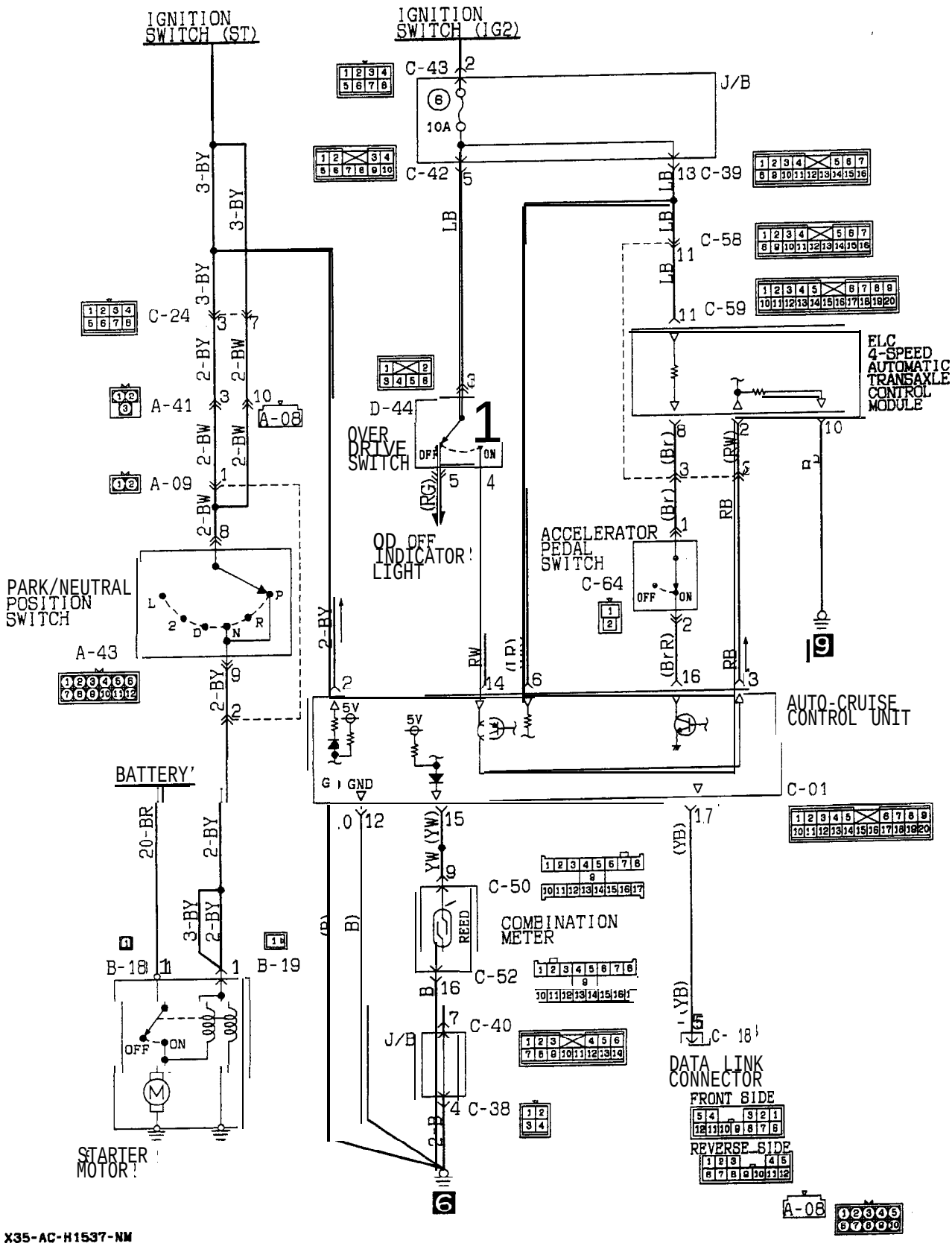
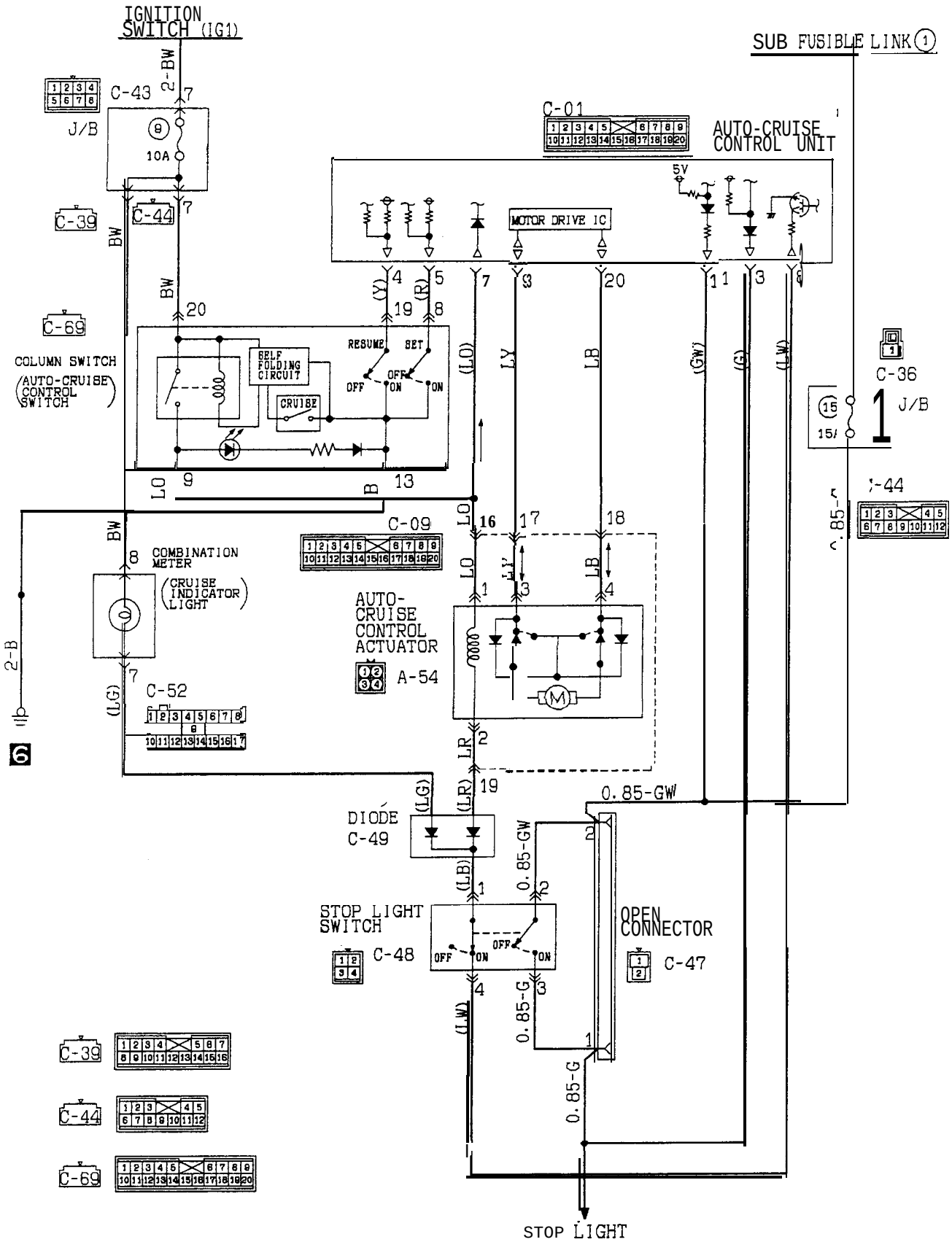


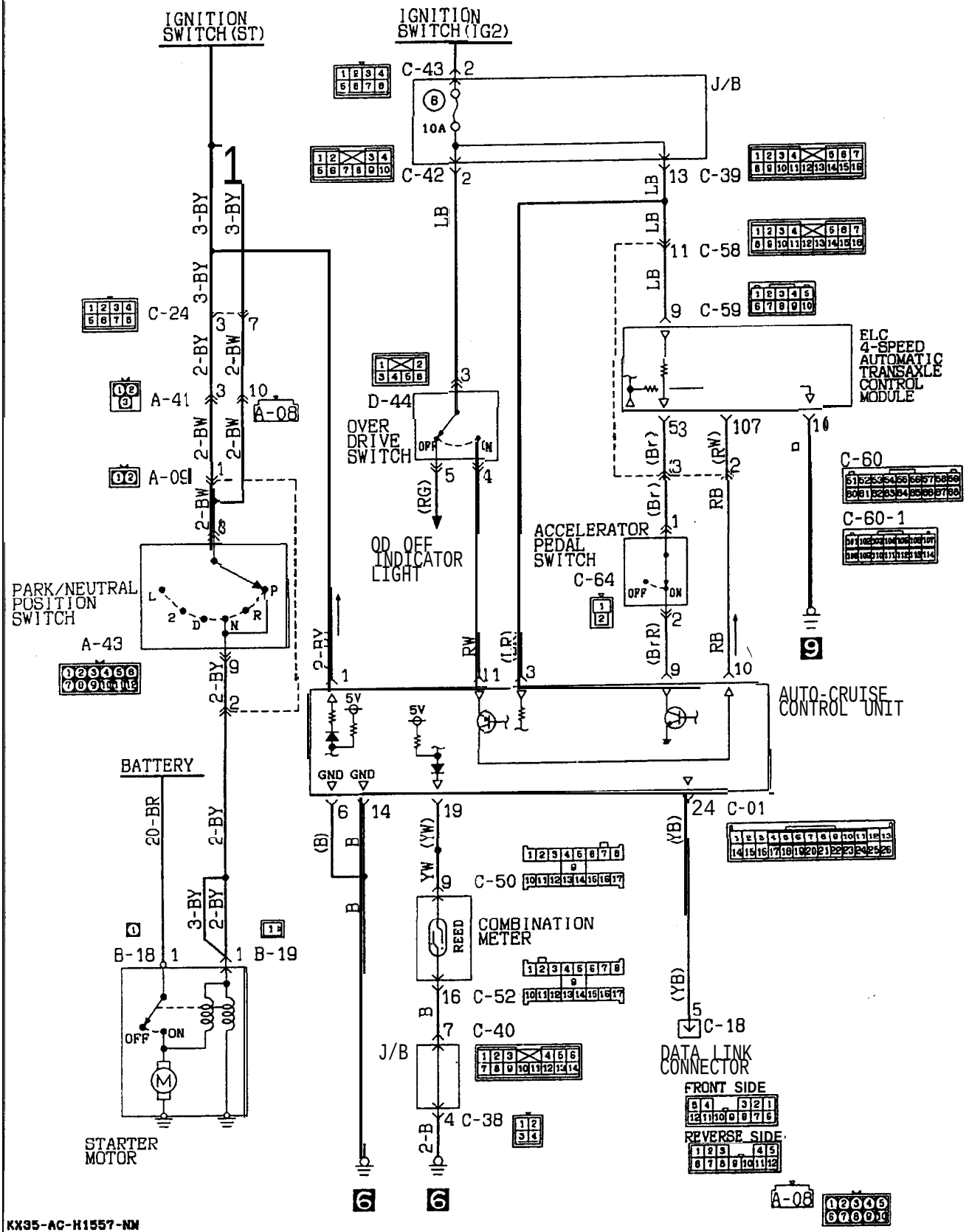
TSB Revision



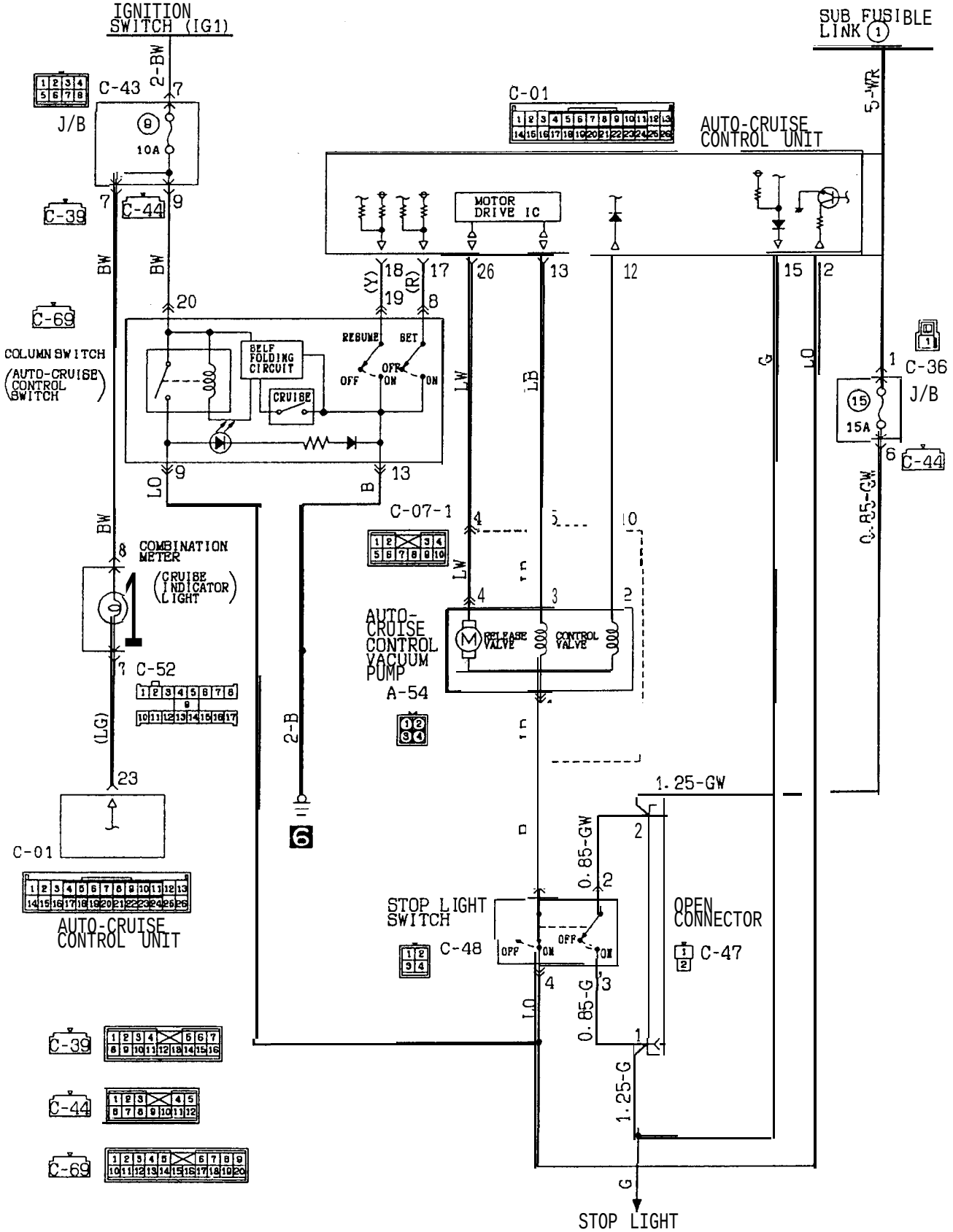
TSB Revision

CIRCUIT DIAGRAM

<A/T (1991 models)>



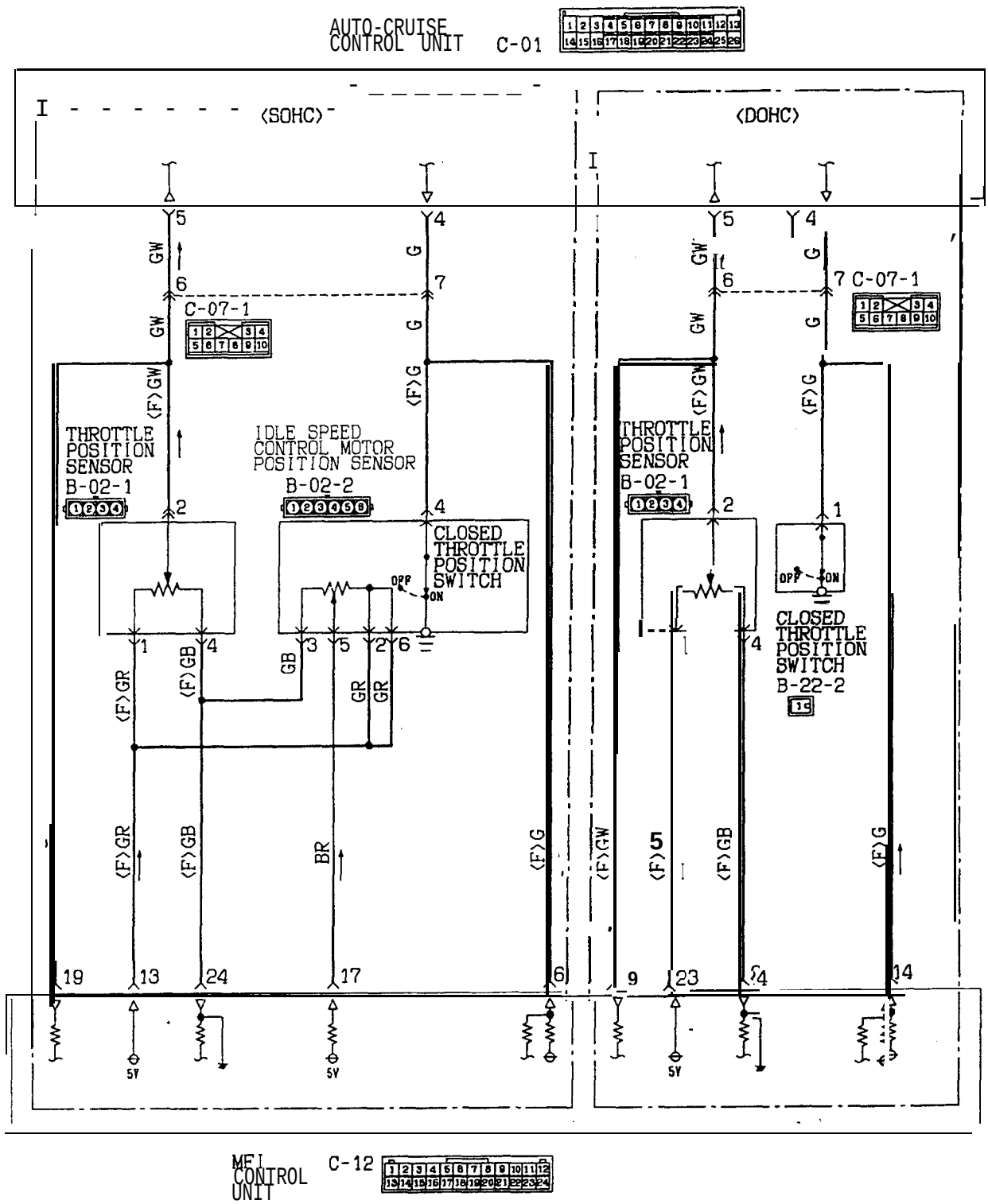
TSB Revision



TSB Revision

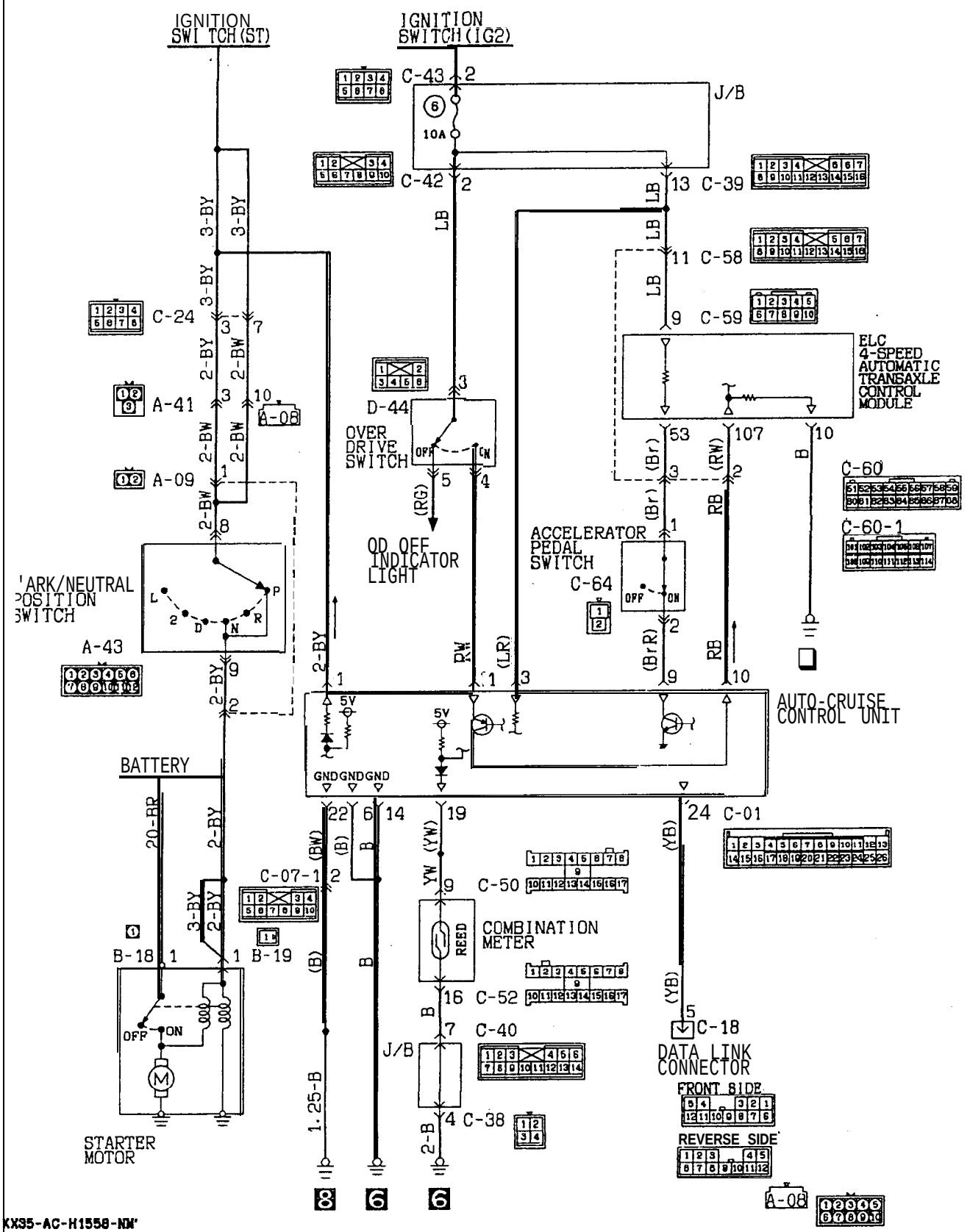
CIRCUIT DIAGRAM (CONTINUED)

<A/T (1991 models)>



CIRCUIT DIAGRAM

<A/T (1992 models)>

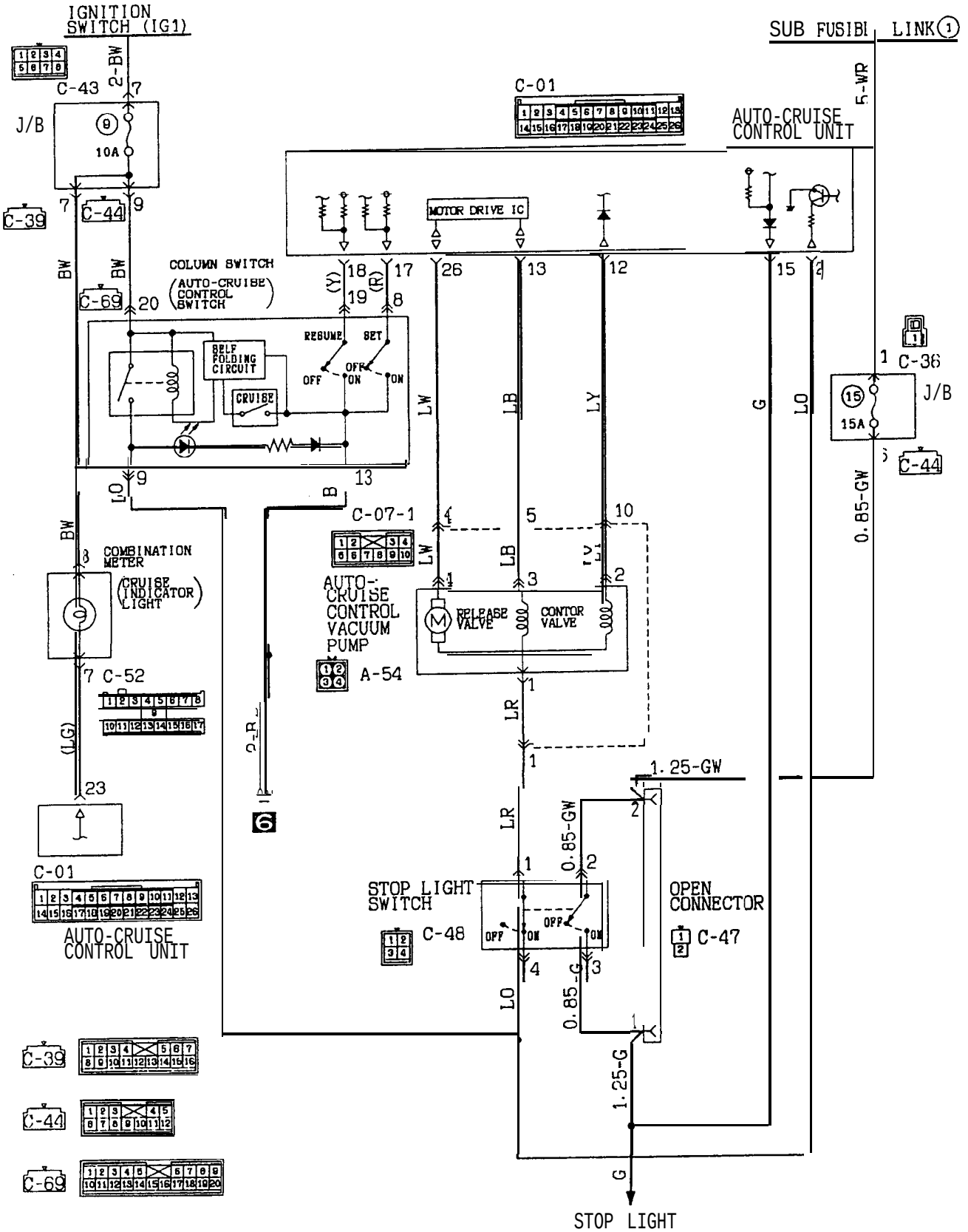


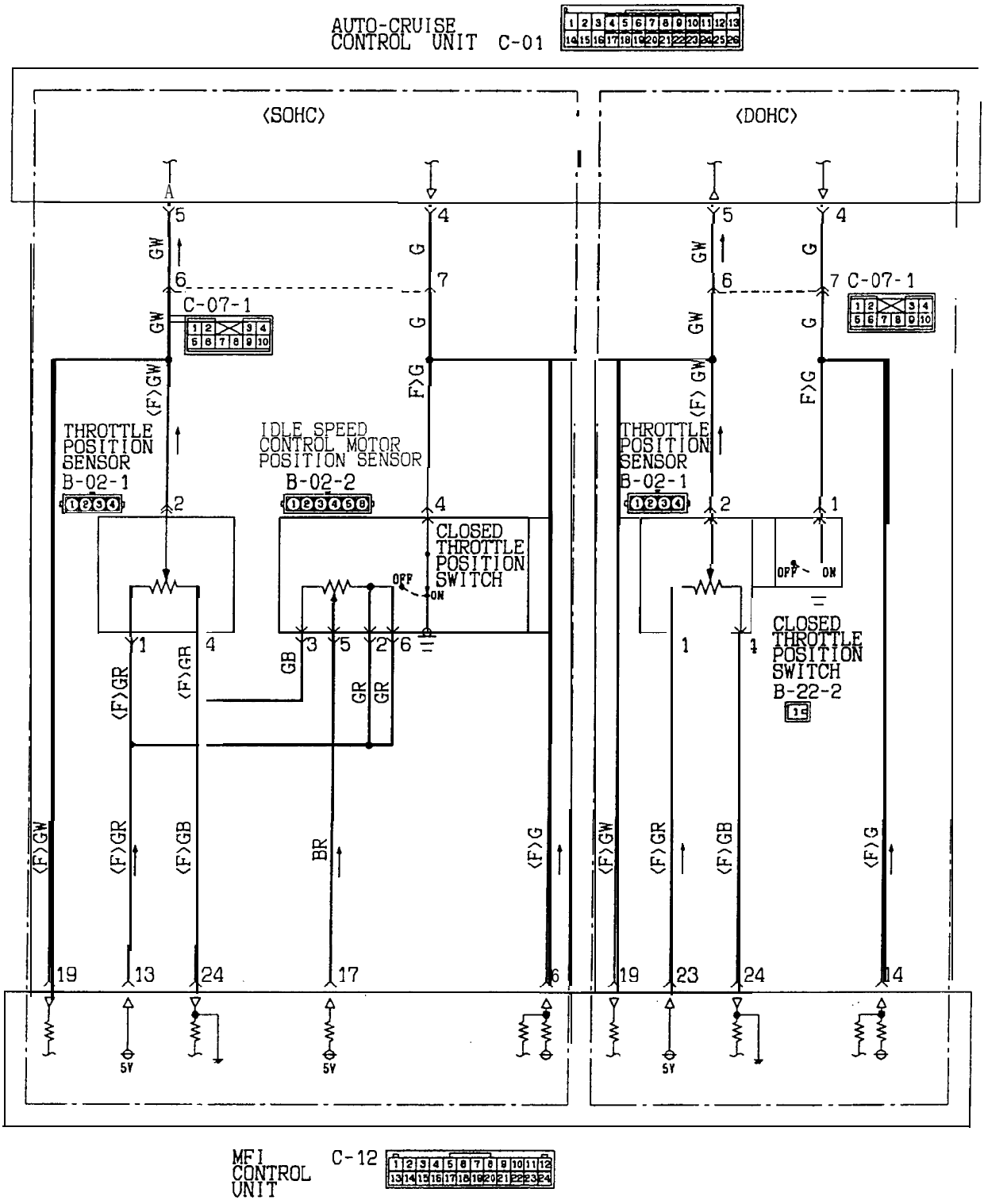
XX35-AC-H1558-NM

TSB Revision

CIRCUIT DIAGRAM (CONTINUED)

<A/T (1992 models)>



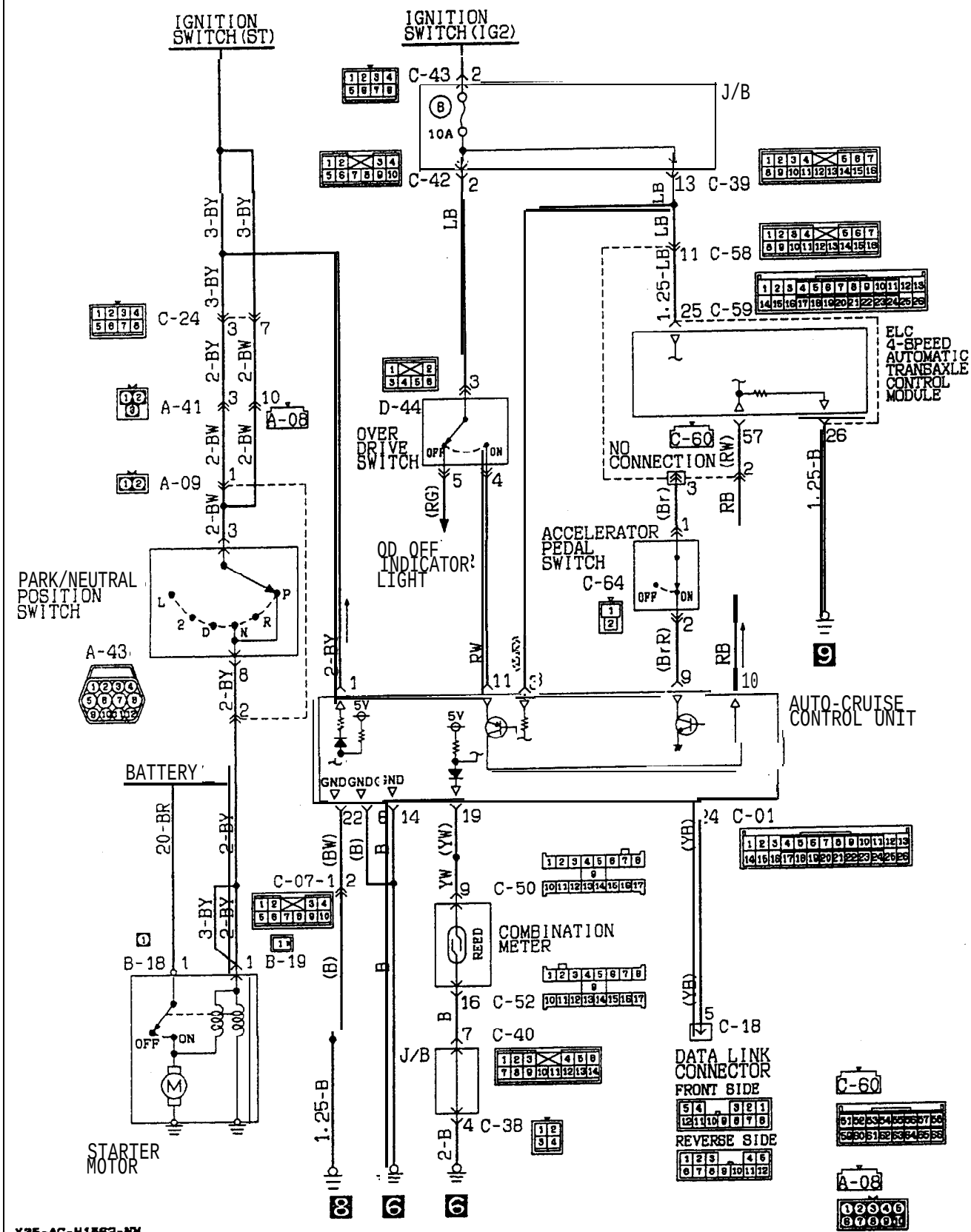


KX35-AC-H1558A-NN

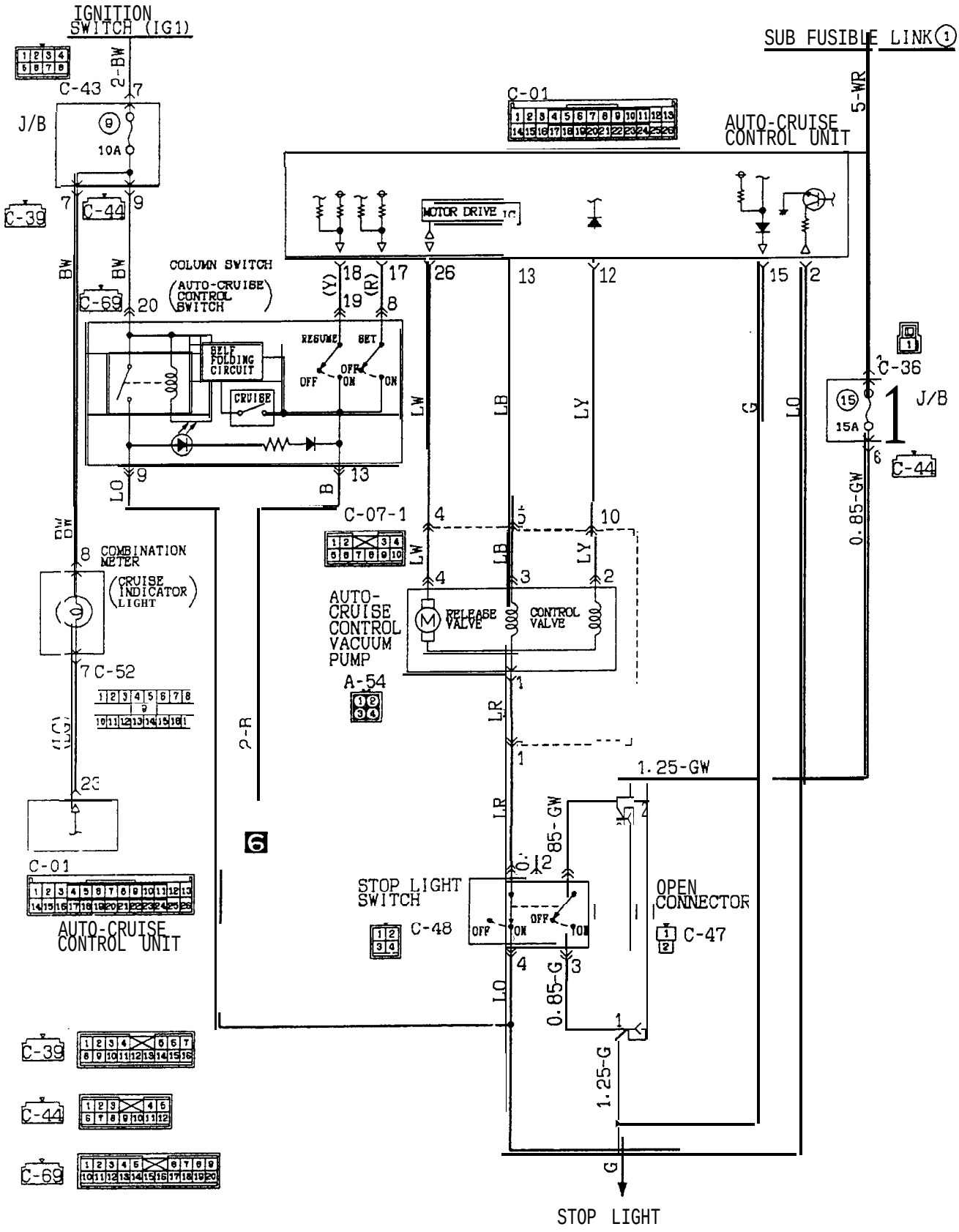
TSB Revision

CIRCUIT DIAGRAM

(A/T (1993 models)>



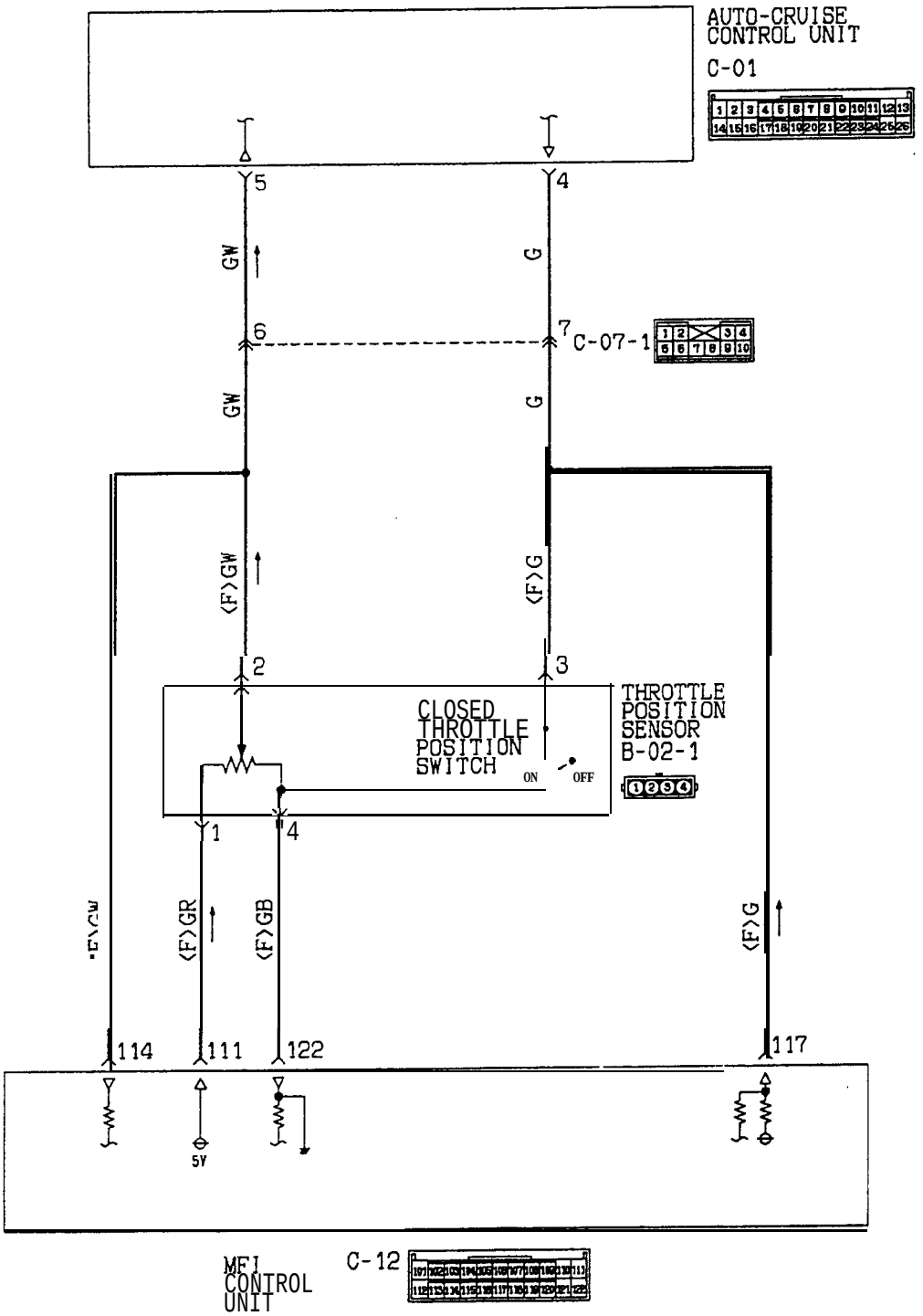
TSB Revision



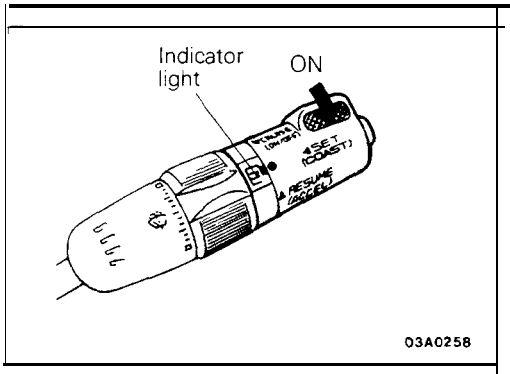
TSB Revision

CIRCUIT DIAGRAM (CONTINUED)

<A/T (1993 models)>



XX35-AC-H1562A-NW

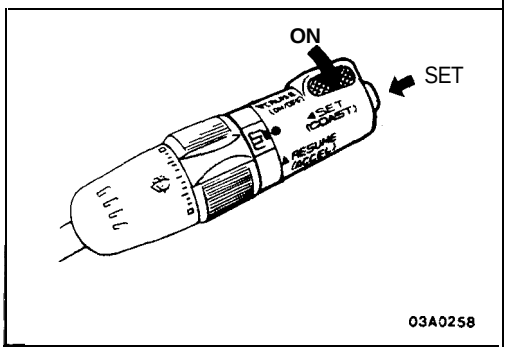


SERVICE ADJUSTMENT PROCEDURES
M13FTAF

AUTO-CRUISE CONTROL SYSTEM INSPECTION

AUTO-CRUISE CONTROL MAIN SWITCH CHECK

(1) Turn the ignition key to ON.
(2) Check to be sure that the indicator light within the switch illuminates when the main switch is switched ON.



AUTO-CRUISE CONTROL SETTING CHECK

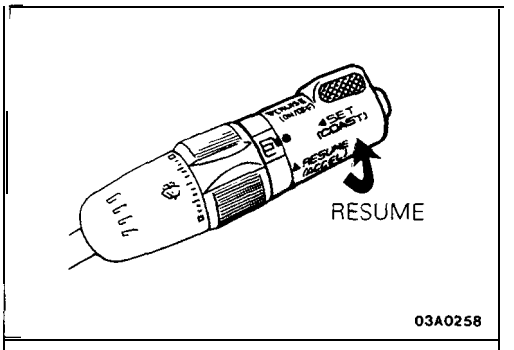
(1) Switch ON the main switch.
(2) Drive at the desired speed within the range of approximately 40–145 km/h (25–90 mph).
(3) Press the SET button.
(4) Check to be sure that the speed is the desired constant speed when the switch is released, and also check to be sure that the auto cruise indicator light (within the combination meter) illuminates.

NOTE
<Electrical type>
If the vehicle speed decreases to approximately 20 km/h (12 mph) below the set speed, because of climbing a hill for example, the auto-cruise control will be cancelled.
<Vacuum type>
If the vehicle speed decreases to approximately 15 km/h (9 mph) below the set speed, because of climbing a hill for example, the auto-cruise control will be cancelled.

SPEED-INCREASE SETTING CHECK

(1) Set to the desird speed.
(2) Turn the control switch to RESUME position.
(3) Check to be sure that acceleration continues while the switch is hold, and that when it is released the constant speed at the time when it was released becomes the driving speed.

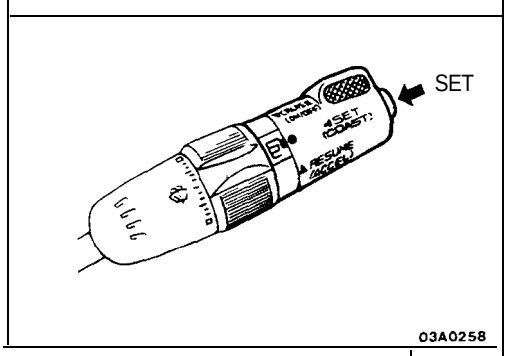
NOTE
Even if, during acceleration, the vehicle speed reaches or exceeds the high limit [approximately 145 km/h (90 mph)], acceleration will continue, however, when the switch is released, the set speed ("memorized speed") will become the high limit of the vehicle speed.



SPEED REDUCTION SETTING CHECK

(1) Set to the desired speed.
(2) Press the SET button.
(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.

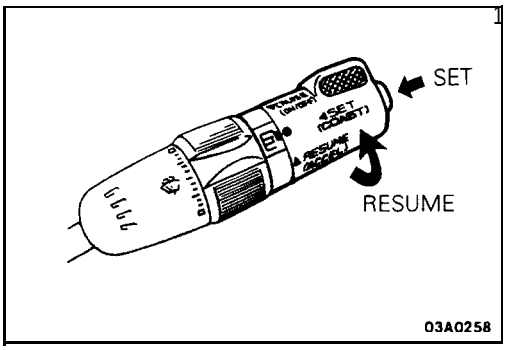
NOTE
When the vehicle speed reaches the low limit [approximately 40 km/h (25 mph)] during deceleration, the automatic speed control will be cancelled.



TSB Revision

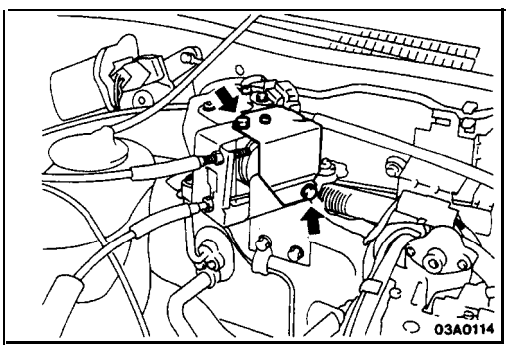
AUTO-CRUISE CONTROL CANCELLATION CHECK

(1) Set the auto-cruise control.
(2) Check to be sure that there is a return to ordinary driving, and that the illumination of the auto-cruise indicator stops, when either of the operations below is performed.
① The brake pedal is depressed.
② The clutch pedal is depressed. <M/T>
③ The shift lever is moved to the "N" or "P" range. <A/T>
④ The auto-cruise control main switch is switched OFF.
⑤ The ignition switch is turned to OFF.



CHECK OF RETURN TO THE SET SPEED BEFORE CANCELLATION

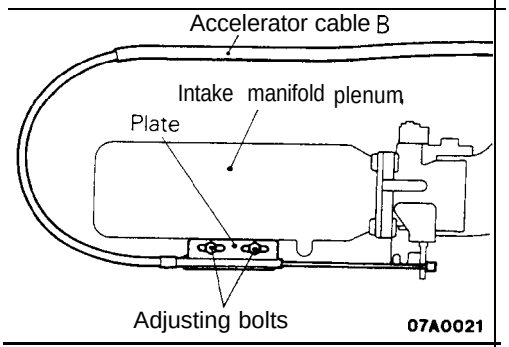
(1) Set the auto-cruise control.
(2) Check to be sure that the auto-cruise control is cancelled when either of the operations below is performed.
① The brake pedal is depressed.
② The clutch pedal is depressed. <M/T>
③ The shift lever is moved to the "N" range. <A/T>
(3) Turn the control switch to RESUME position and release (RESUME switch ON→OFF) while driving at a vehicle speed of approximately 40 km/h (25 mph) or higher.
(4) After switching RESUME switch to OFF, check to be sure that there is a return to the auto-cruise control speed before it will be cancelled and the vehicle will travel at the constant speed.



ACCELERATOR CABLES INSPECTION AND ADJUSTMENT

<Electrical type: Up to 1990 models>

(i) Turn air conditioning and lights OFF.
Inspect and adjust at no load.
(2) Warm engine until stabilized at idle.
(3) Confirm idle speed is at prescribed rpm.
(4) Stop engine (ignition switch OFF).
(5) Confirm there are no sharp bends in accelerator cables.
(6) Check inner cables for correct slack.
(7) If there is too much slack or no slack, adjust play by the following procedures.
① Remove the actuator's protector.
② On models with an SOHC engine, turn the ignition switch to the ON position (without starting the engine) and leave in that condition for approximately 15 seconds.



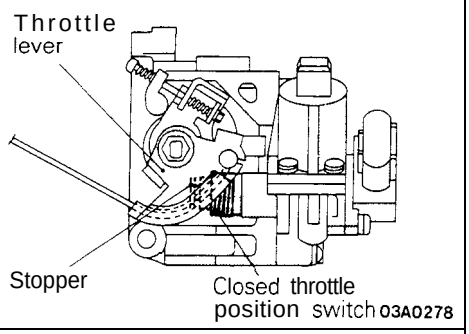
③ Adjust accelerator cable B (throttle valve side); after loosening the adjustment bolts at the intake manifold plenum side and freeing the inner cable, use the adjustment bolts to secure the plate so that the free play of the inner cable becomes the standard value.

Standard value: 1–2 mm (.04–.08 in.)

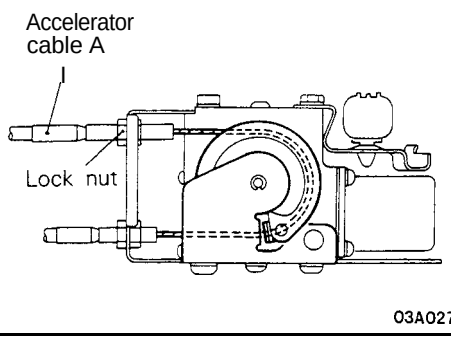
NOTE

If there is excessive play of the accelerator cable, the vehicle speed drop ("undershoot") when climbing a slope will be large.

If there is no play (excessive tension) of the accelerator cable, the idling speed will increase.



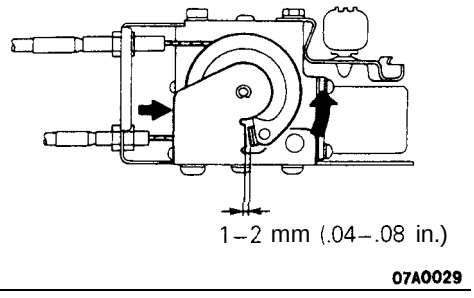
④ Confirm that the throttle lever touches the closed throttle position switch.



⑤ Adjust accelerator cable A (accelerator pedal side) by loosening the lock nut.

<M/T>	**O-l mm (0–.04 in.)**
<A/T>	2-3 **mm (.08–.12 in.)**

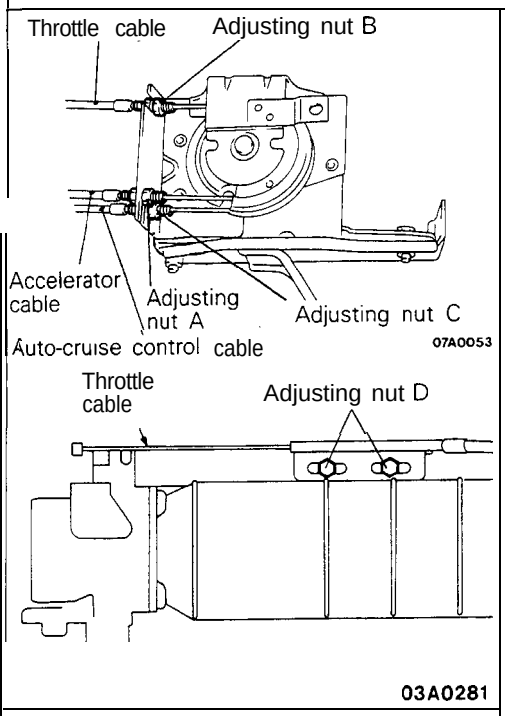
Caution
Do not decrease the play of cable B.



⑥ After making the adjustment of the cable as described above, check to be sure that the throttle lever at the engine side is caused to move the distance shown in the illustration when the actuator link is turned.

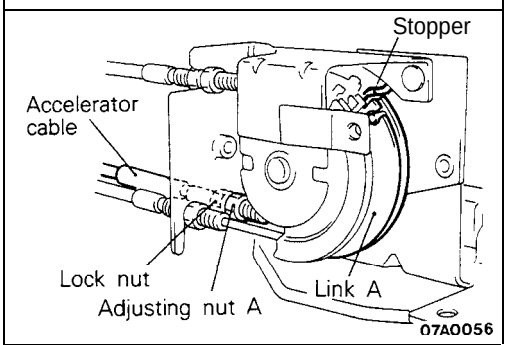
⑦ Install the protector to the actuator.

(8) After adjusting, confirm that throttle valve fully opens and closes by operating pedal.



<Vacuum type: From 1991 models>

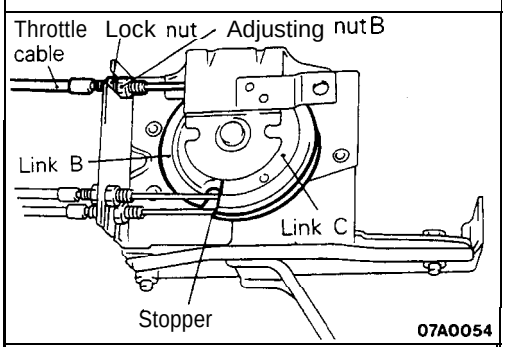
(1) Remove the link protector. (Refer to P.13-402.)
(2) Check that there are. no sharp bends and breaks in the accelerator cable, throttle cable and auto-cruise control cable.
(3) Turn the ignition switch to the ON position (without starting the engine) and leave in that condition for approximately 15 seconds.
(4) Leave plenty of play in each cable and temporarily install adjusting nuts A, B, C and adjusting bolts D.



(5) Adjust with adjusting nut A so when link A hits the stopper, the accelerator cable play (inner cable play) reaches the standard value.

Standard value
M/T: O-l mm (0–.04 in.)
A/T: 2-3 mm (.08–.12 in.)

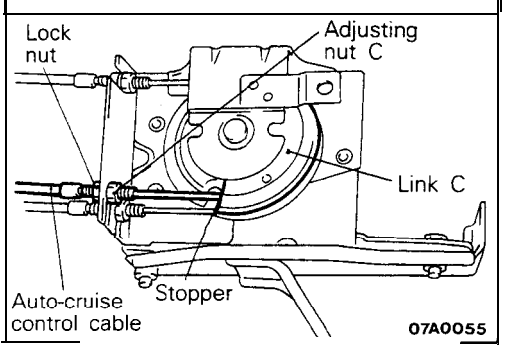
(6) Fix the accelerator cable with the lock nut.



(7) Adjust with adjusting nut B so when link B hits the stopper of link C, throttle cable play (inner cable play) reaches the standard value.

Standard value: 1–2 mm (.04–.08 in.)

(8) Fix the throttle cable with lock nut and adjusting bolt D.

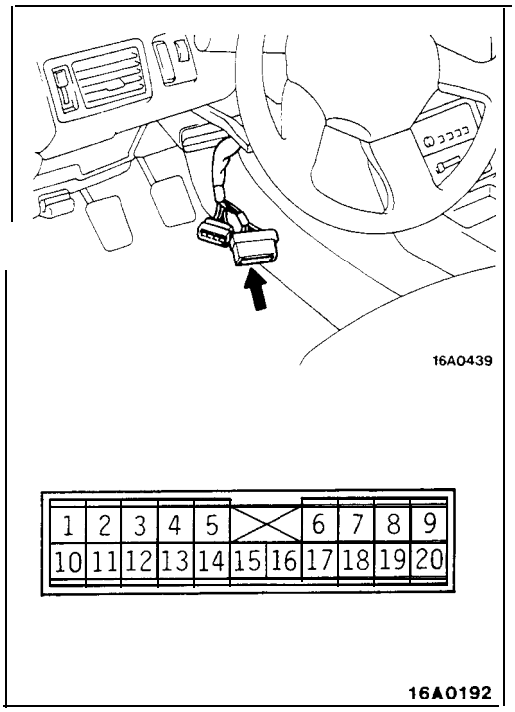


(9) Adjust with adjusting nut C so when the link C stopper hits the end of link B, the auto-cruise control cable play (inner cable play) reaches the standard value.

Standard value: 1–2 mm (.04–.08 in.)

(10) Fix the auto-cruise cable with the lock nut.
(11) After adjusting, confirm that throttle valve fully opens and closes by operating pedal.

TSB Revision



INDIVIDUAL PARTS INSPECTION

AUTO-CRUISE CONTROL SWITCH INSPECTION

(1) Remove the instrument under cover and the lower column cover.
(2) Disconnect the column switch connector and check the continuity between the terminals.

C-O: continuity

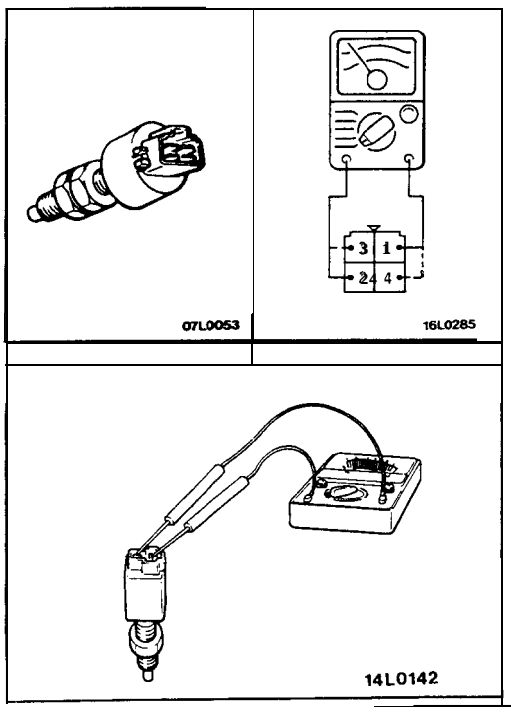
<1989 models>

Switch position \ Terminal	8	9	13	19	20
OFF					
Main switch ON		O			O
SET switch ON	0		0		
RESUME switch ON		0			0

<From 1990 models>

Switch position \ Terminal	8	9	13	19	20
OFF					
Main switch ON			O		0
SET switch ON	O		0		
RESUME switch ON					

NOTE
If there is an abnormal condition (any condition not described in the table above), replace the column switch.



STOP LIGHT SWITCH/BRAKE SWITCH INSPECTION

(1) Diconnect the connector.
(2) Check for continuity between the terminals of the switch.

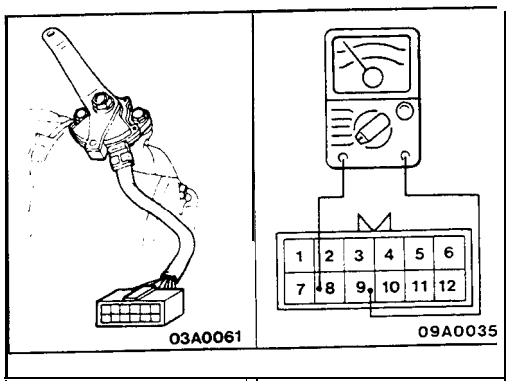
O—O :continuity

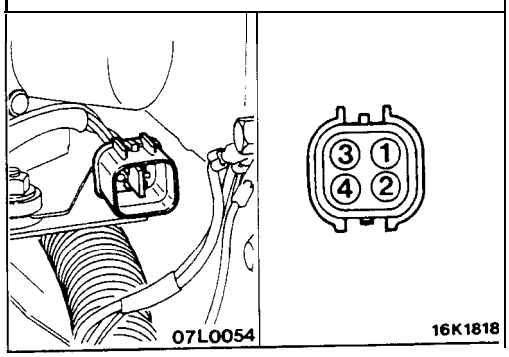
Measurement conditions \ Switch / Terminal	Brake switch 3	Brake switch 4	Stop light siwtch 1	Stop light siwtch 2
When brake pedal depressed.			O	O
When brake pedal not depressed.	0	0		

CLUTCH PEDAL POSITION SWITCH INSPECTION

(1) Disconnect the connector.
(2) Check to be sure that there is continuity between connector terminals when the clutch pedal is depressed.

TSB Revision





PARK/NEUTRAL POSITION SWITCH ("N" AND "P" POSITIONS) INSPECTION

(1) Disconnect the connector.
(2) Check to be sure that there is continuity between connector terminals 8 and 9 when the shift lever is moved to the "N" range.

ACTUATOR INSPECTION <Electrical type: Up to 1990 models>

(1) Disconnect the connector.
(2) Measure the resistance value of the clutch coil.

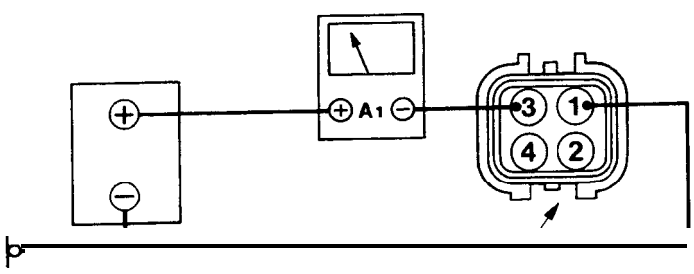
Resistance of clutch coil between connector terminals (1) – (3)

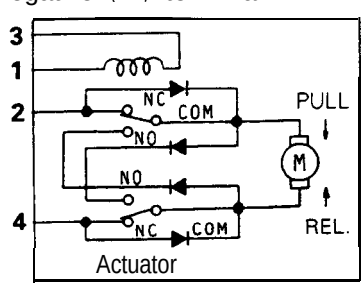
Standard value: Approx. 20Ω

ACTUATOR OPERATION CHECK <Electrical type: Up to 1990 models>

Disconnect the actuator's connector and, in the order described below, check the actuator's operation and the circuit tester's indication; replace the actuator assembly if any abnormal condition is discovered.

(1) Checking the clutch coil solenoid operation
Connect terminal (3) of the actuator through the ammeter to the positive (+) terminal of the battery, and connect terminal (1) to the negative (–) terminal.





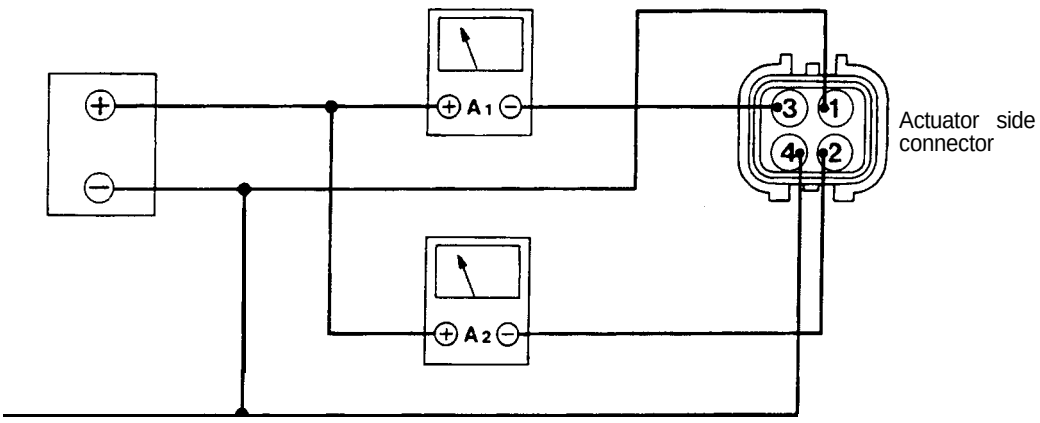
Judgement		Probable cause
Normal	Abnormal	
Solenoid operation sound ("click") can be heard. A_1 : 0.5–0.7A	No solenoid sound $A_1 = 0A$	Damaged or disconnected wiring of clutch coil
	No solenoid sound $A_1 = \infty A$	Short-circuit of clutch coil

NOTE
NC: ON at all times
NO: OFF at all times

TSB Revision

(2) Checking the motor (PULL direction) and limit switch operation

In the condition described in (1), connect terminal (2) of the actuator, through the ammeter, to the positive (+) side and terminal (4) to the negative (−) side.

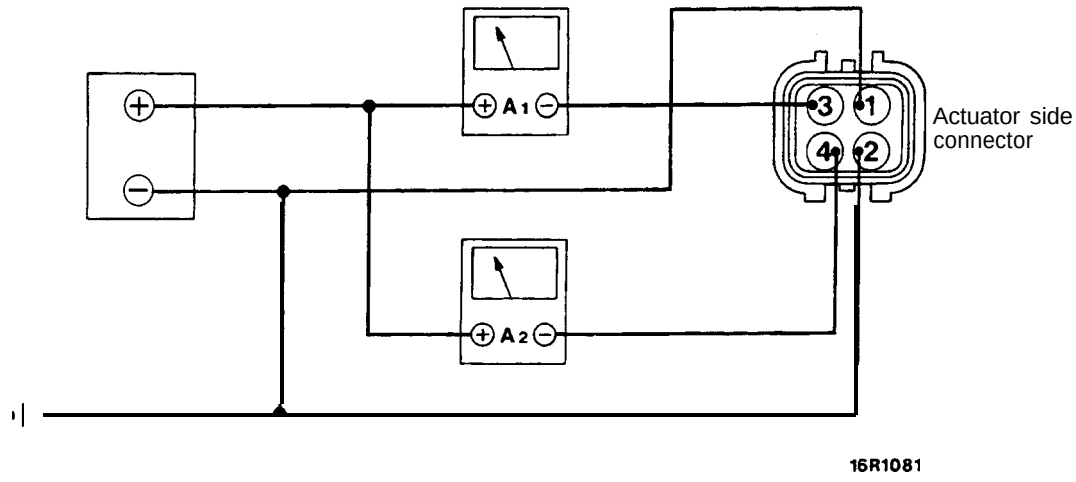


16R1082

Judgement		Probable cause
Normal	Abnormal	
Current is cut off when selector is turned in PULL direction for full stroke (fully open). A_1: 0.5–0.7A Az: less than 0.5A (when current ON)	Selector moves in PULL direction but A_2 equal or more than 1A A:: 0.5–0.7A	• Improper backlash between gears • Imminent burning between shaft and metal • Insufficient thrust clearance
	Selector doesn't move. A_2 equal or more than IA A_1: 0.5–0.7A	• Shaft burned • Foreign material caught between gears • Motor burned
	Selector doesn't move. $A_2 = 0A$ A I: 0.3–0.7A	• Damaged or disconnected internal lead wire • Damaged or disconnected motor wiring • Poor contact of limit switch • Open diode
With the selector stroke at the intermediate level, disconnect the connection to terminal 3) and cut the current low to the clutch coil.	The selector doesn't return to the original position even if the current to the clutch coil is cut.	Malfunction of clutch operation (Clutch plate remains engaged with clutch)

TSB Revision

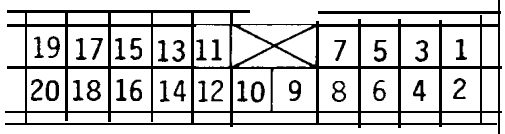
(3) Checking the motor (REL. direction) and limit switch operation
Reverse the connections to terminal (4) and terminal (2) from those described in (2).



16R1081

Judgement		Probable cause
Normal	Abnormal	
Current is cut off when selector is turned in REL. direction for full stroke (fully closed). A_1 : 0.5–0.7A A_2: less than 0.5A (when current ON)	Selector moves in REL. direction but A_2 equal or more than IA A_1: 0.5–0.7A	• Improper backlash between gears • Imminent burning between shaft and metal • Insufficient thrust clearance
	Selector doesn't move. A_2 equal or more than IA A_1 : 0.5–0.7A	• Shaft burned • Foreign material caugh between gears • Motor burned
	Selector doesn't move $A_2 = 0A$ A_1 : 0.3–0.7A	• Damaged or disconnected internal lead wire • Damaged or disconnected motor wiring • Poor contact of limit switch • Open diode

ECU connector terminals



16R1060

ELECTRONIC CONTROL UNIT (ECU) SIGNAL CIRCUIT CHECK <Electrical type: Up to 1990 models>

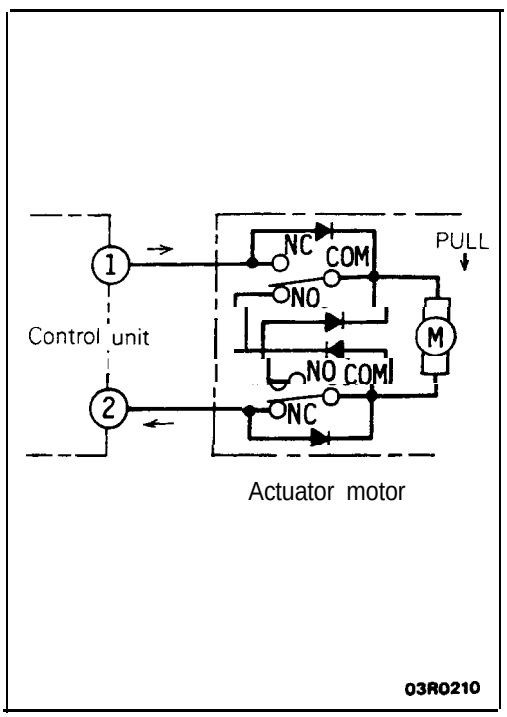
Disconnect the connector of the ECU, and then check at the body side wiring harness according to the chart below.

IG S/W: Ignition switch
MAIN S/W: Main switch
OD S/W: Overdrive switch

Terminal	Connection or measured part	Measurement item	Tester connection	Check conditions	Standard
1	Actuator (motor)	Resistance	1 – *1 2	Actuator selector (Fully closed position)	Approx. 12Ω
3	Stop light switch (for auto-cruise control cancellation) and actuator (clutch)	Voltage	3 – Ground	IG S/W ON, Main S/W ON (Don't press brake pedal.)	Battery positive voltage
				Press brake pedal after checking above.	Battery positive voltage → 0V
5	Power supply (MAIN)	Voltage	5 – Ground	IG S/W ON, Main S/W ON	Battery positive voltage
6	None		–	–	–
7	Power supply (IG_2)	Voltage	7 – Ground	IG S/W ON	Battery positive voltage
8*2	On-board diagnostic	–	–	–	–
9	Accelerator pedal switch	Voltage	9 – Ground	IG S/W ON (Accelerator pedal free)	Battery positive voltage
				Press accelerator pedal after checking above.	Battery positive voltage → 0V
10	Vehicle speed sensor	Voltage	10 – Ground	With the ignition key at the ON position, slowly turn the speedometer cable.	4 voltage changes/ cable rotation
11	SET switch	Continuity	11 – Ground	SET switch ON (Press)	Continuity
				SET switch OFF (Release)	No continuity
12	OD switch	Voltage	12 – Ground	IG S/W ON, OD S/W ON position	Battery positive voltage
				IG S/W ON, OD S/W OFF position	0V
13	RESUME switch	Continuity	13 – Ground	RESUME switch ON (Turn)	Continuity
				RESUME switch OFF (Release)	No continuity
14*2	4 A/T control module	–	–	–	–
15	Stop light switch load side	Voltage	15 – Ground	Press the brake pedal.	Battery positive voltage
16	Ground	Continuity	16 – Ground	At all times	Continuity

TSB Revision

Terminal	Connection of measured part	Measurement item	Tester connection	Check conditions		Standard
17	Park/neutral position switch (P, N)	Continuity	17–Ground	"P" or "N" range		Continuity
				Other than "P" or "N" range		No continuity
18	Stop light switch power supply side	Voltage	18–Ground	At all times		Battery positive voltage
19	Clutch pedal position switch	Voltage	19–Ground	IG S/W ON	Clutch pedal position switch ON	Battery positive voltage
					Clutch pedal position switch OFF	0V
20	Ground	Continuity	20–Ground	At all times		Continuity

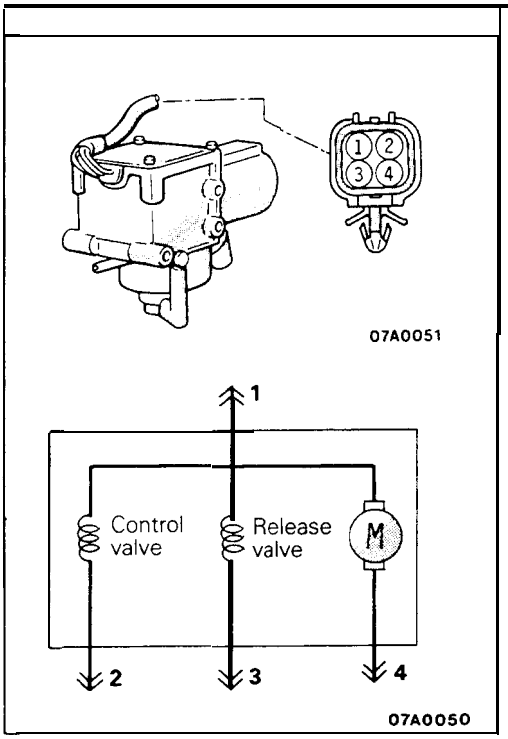


NOTE

1. As shown by the *1 symbol, the limit switch within the actuator will become as shown in the figure at the left if the. actuator selector is at the fully closed position when the resistance between terminals No. 1 and No. 2 is measured; for that reason, after checking the polarity of the tester, the tester's probe should be connected so that current flows from the No. 1 terminal to the No. 2 terminal.
2. For terminals No. 8 and 14 indicated by the *2 symbol, it is necessary to check individual terminal voltages with the ECU's harness connector connected and with the ignition switch ON.
   (1) The No.8 terminal is normal if the diagnostic trouble code can be confirmed. (Refer to P.13-361.)
   (2) The No. 14 terminal is normal if there is approximately 12V with the auto-cruise control system not functioning and the overdrive switch switched ON. (Refer to P. 13-349.)

VEHICLE-SPEED SENSOR INSPECTION

Refer to GROUP 54–Meters and Gauges for checking of vehicle speed sensor.



AUTO-CRUISE CONTROL VACUUM PUMP INSPECTION <Vacuum type: From 1991 models>

Inspection of solenoid valves (control valve, release valve)

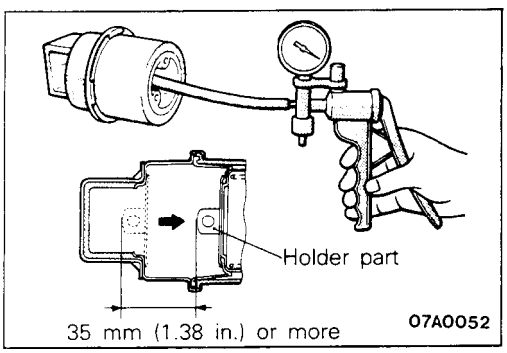
(1) Remove the auto-cruise control vacuum pump connector.
(2) Measure the resistance value between terminals ①–② and between ①–③.

Standard value: 50–60 Ω

(3) Check that the solenoid valve makes an operating noise when batten/ voltage is impressed between terminals ①–② and between ①–③.
(4) If there is a malfunction of the solenoid valve, replace the auto-cruise control vacuum pump assembly.

Motor inspection

(1) Remove the auto-cruise control vacuum pump connector.
(2) Check that the motor revolves when battery voltage is impressed between terminals ①–④.



ACTUATOR INSPECTION

<Vacuum type: From 1991 models>

(1) Remove the actuator.
(2) Apply negative pressure to the actuator with the vacuum pump and check that the holder moves more than 35 mm (1.38 in.). In addition, check that there is no change in the position of the holder when negative pressure is maintained in that condition.
(3) First install the actuator and then inspect and adjust the cruise control cable (Refer to P.13-394.)

VEHICLE-SPEED SENSOR INSPECTION

Refer to GROUP 54–Meters and Gauges for checking of vehicle speed sensor.

ACCELERATOR SWITCH INSPECTION

Refer to GROUP 23–Troubleshooting.

TSB Revision

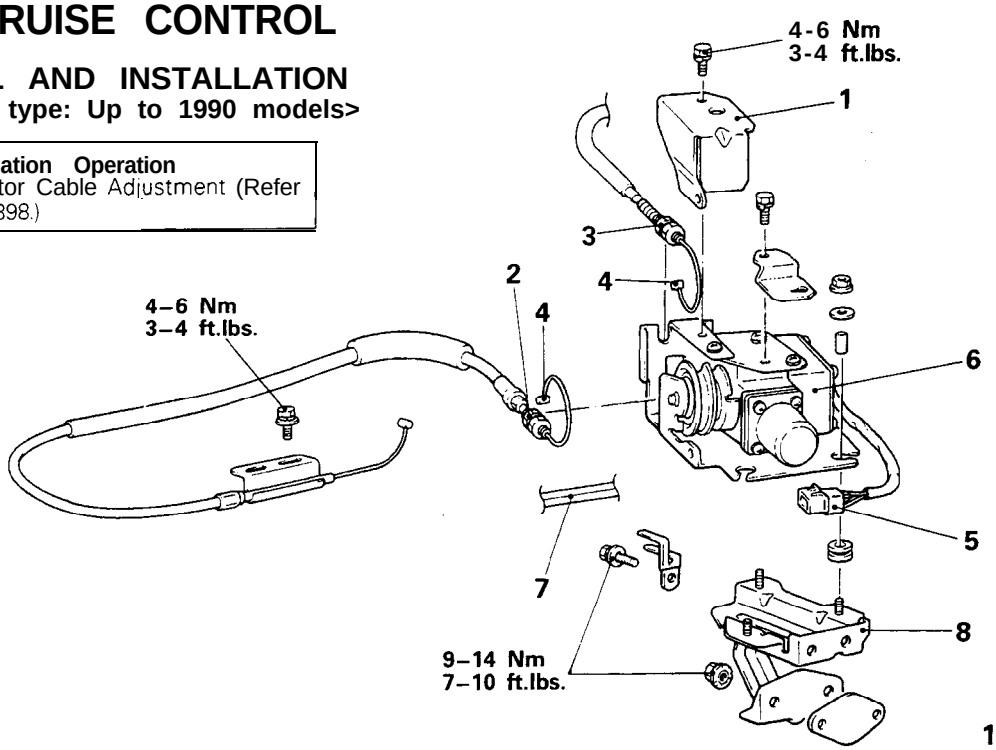
AUTO-CRUISE CONTROL

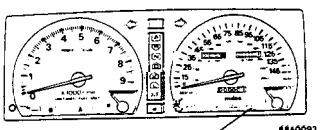
M13TD--

REMOVAL AND INSTALLATION

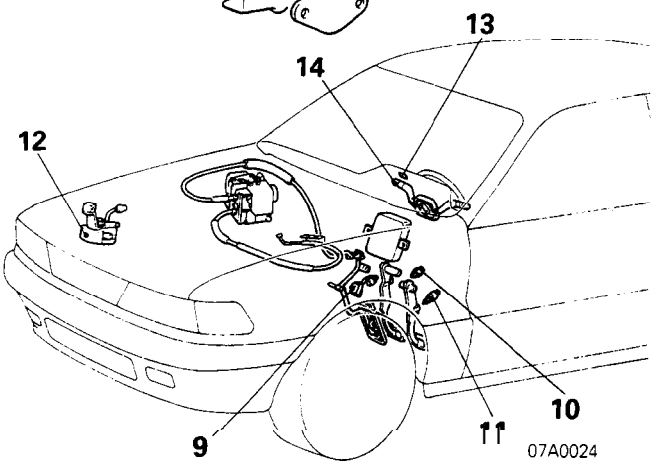
<Electrical type: Up to 1990 models>

Post-installation Operation
- Accelerator Cable Adjustment (Refer to P. 13-398.)





18



Removal steps of actuator

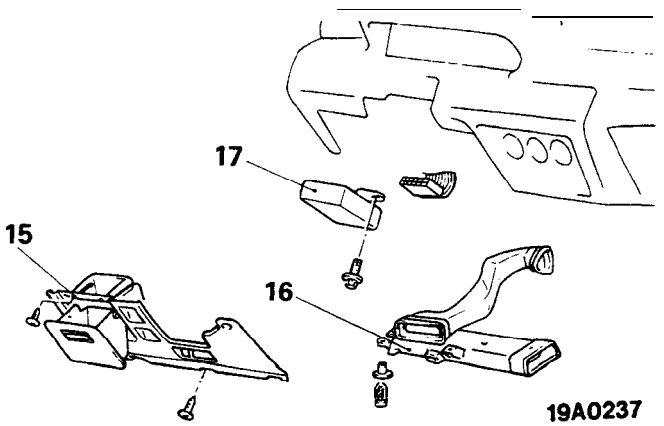
1. Protector
2. Accelerator cable B adjusting nut
3. Accelerator cable A adjusting nut
4. Actuator side inner cable
5. Actuator connector
6. Actuator
7. Air hoses
   <ACTIVE-Electronic Control Suspension>
8. Bracket

Removal steps of sensor and switches

9. Accelerator switch <A/T>
10. Stop light switch
11. Clutch pedal position switch <M/T>
12. Park/neutral position switch <A/T>
13. Vehicle speed sensor (Refer to GROUP 54–Meters and Gauges.)
14. Auto-cruise control switch (Refer to GROUP 54–Column Switch.)

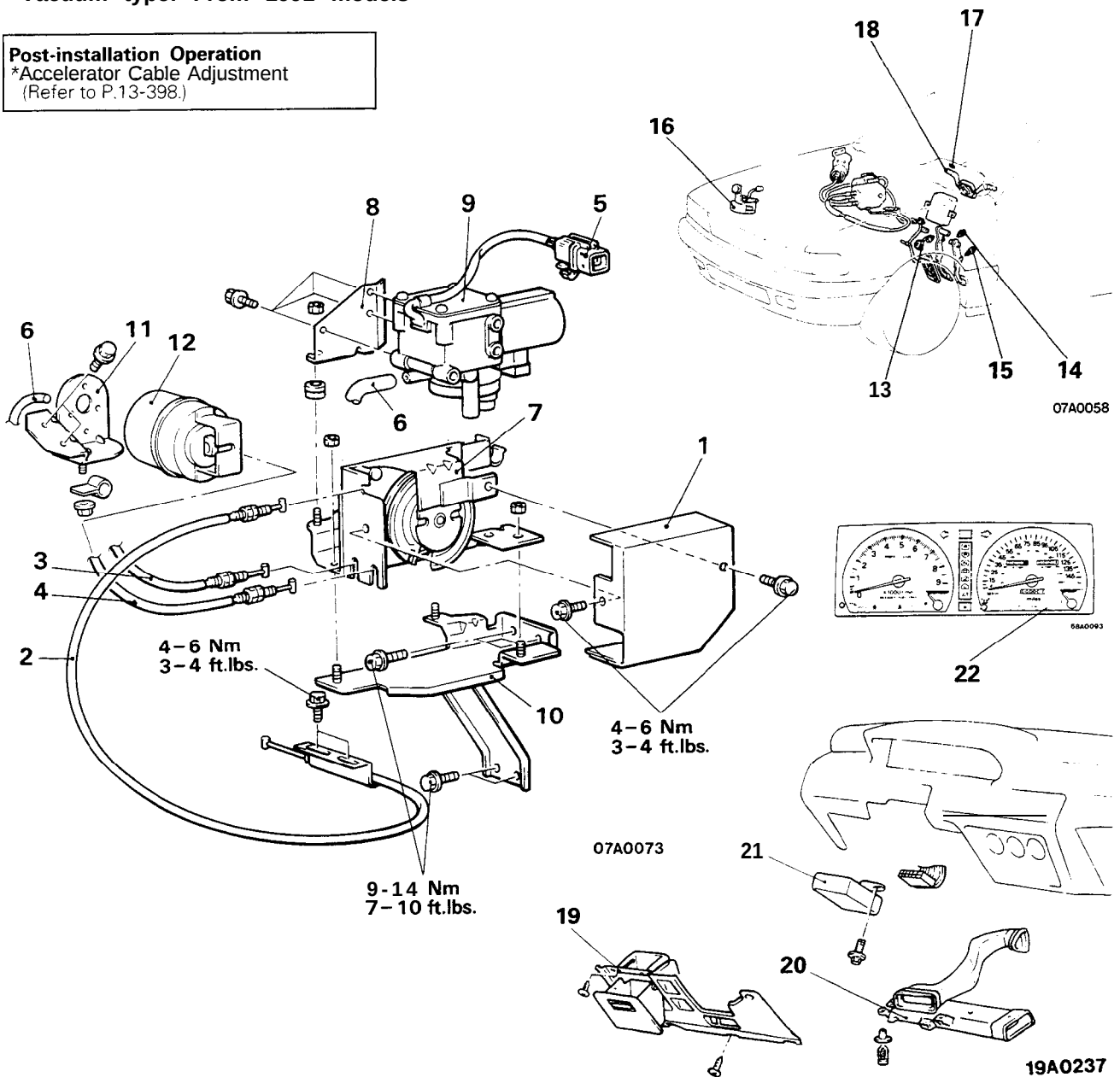
Removal steps of control unit

15. Instrument under cover
16. Lap shower duct and foot shower nozzle
17. Control unit
18. Auto-cruise control indicator light (Refer to GROUP 54–Meters and Gauges.)



<Vacuum type: From 1991 models>

Post-installation Operation
*Accelerator Cable Adjustment
(Refer to P.13-398.)



Removal steps of actuator

1. Link protector
2. Throttle cable
3. Accelerator cable
4. Auto-cruise control cable
5. Auto-cruise pump connector
- * 6. Vacuum hose
7. Link assembly
8. Pump bracket
9. Auto-cruise pump assembly
10. Auto-cruise bracket
11. Actuator bracket
12. Auto-cruise actuator

Removal steps of sensor and switches

13. Accelerator switch <A/T>
14. Stop light switch
15. Clutch pedal position switch <M/T>
16. Park/neutral position switch <A/T>
17. Vehicle speed sensor (Refer to GROUP 54–Meters and Gauges.)
18. Auto-cruise control switch (Refer to GROUP 54–Column Switch.)

Removal steps of control unit

19. Instrument under cover
20. Lap shower duct and foot shower nozzle
21. Control unit
22. Auto-cruise control indicator light (Refer to GROUP 54–Meters and Gauges.)

TSB Revision

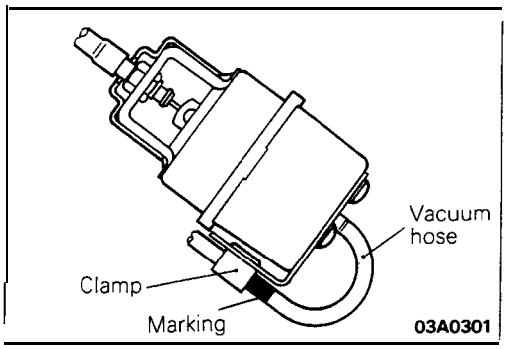
INSPECTION

M13TDCC

- Check the inner and outer cable for damage.
- Check the cable for smooth movement.
- Check the actuator cover for damage.

CHECKING THE ACTUATOR

Refer to P.13-397.



SERVICE POINTS OF INSTALLATION

6. INSTALLATION OF VACUUM HOSE

Align the marking end of the vacuum hose to the clamp position and install.

COOLING

CONTENTS

M14AA-

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WATER HOSE AND WATER PIPE <SOHC> 23

WATER PUMP <DOHC> 20

WATER PUMP <SOHC> 15

SPECIFICATIONS

GENERAL SPECIFICATIONS

M14CA--

Items	Specifications
Cooling method	Water-cooled, pressurized, forced circulation with electrical fan
Radiator	
Type	Pressurized corrugated fin type
Radiator fan motor	
Type	Direct current ferrite type
Water pump	
Type	Centrifugal impeller type
Thermostat	
Type	Wax pellet type with jiggle valve
Identification mark	88 (Stamped on flange), *82 (Stamped on flange)
Drive belt	
Type	V-ribbed belt
Engine coolant temperature gauge unit	
Type	Thermistor type
Engine coolant temperature sensor (Engine control)	
Type	Thermrstor type
Air conditioning engine coolant temperature switch <Normal closed type>	
Type	Thermistor type
Engine coolant temperature switch <Normal opened type> (Air conditioning or A/T control)	
Type	Thermistor type

*· · · SOHC 1 6VALVE

SERVICE SPECIFICATIONS

M14CB--

Items		Specifications
Standard value		
Range of coolant antifreeze concentration	%	30–60
Thermostat		
Valve opening temperature of thermostat	°C (°F)	88 (190), *82 (180)
Full-opening temperature of thermostat	°C (°F)	100 (212) or more, *95 (203) or more
Opening pressure of radiator cap high pressure valve	kPa (psi)	75–105 (11-15)
Thermo sensor (on radiator)		
Operating temperature		
OFF → ON	°C (°F)	8 2 - 8 8 (180–190)
ON → OFF	°C (°F)	78-84 (172-183)

*· · · SOHC 1 6VALVE

Items		Specifications
Engine coolant temperature gauge unit		
Resistance		
At 70°C (158°F)	Ω	104 ± 13.5
Engine coolant temperature sensor (Engine control)		
Resistance		
At 20°C (68°F)	kΩ	2.45 ± 0.24
At 80°C (176°F)	Ω	296 ± 32
Air conditioning engine coolant temperature switch <always closed type>		
ON → OFF operating temperature	°C (°F)	112-118 (234-244)
Engine coolant temperature switch <always opened type> (Air conditioning or A/T control)		
OFF → ON operating temperature	°C (°F)	100–104 (212-219)
Limit		
Opening pressure of radiator cap high pressure valve	kPa (psi)	65 (9.2)

TORQUE SPECIFICATIONS

M14CC--

Items	Nm	ft.lbs.
Radiator upper insulator	9-14	7–10
Reserve tank, bracket installation bolt	9-14	7–10
Thermosensor to radiator	35	25
Automatic transaxle oil cooler hose cramp	4-6	3-4
Automatic transaxle oil cooler hose mounting bolt	3-5	2-4
Water outlet fitting bolts	17–20	12-14
Water inlet fitting bolts	10–15	7–10
Engine mount insulator nut (large)	60–80	43-58
Engine mount insulator nut (small)	30–40	22-29
Engine mount bracket to engine	50–65	36-47
Bracket between engine mount bracket and engine	17-26	12-19
Water pump installation bolt		
Bolt head mark "4T"	12-15	9–11
Bolt head mark "7T"	20–27	14–20
Water pump pulley bolt	8–10	6-7
Damper pulley, crankshaft pulley	20–30	14-22
Timing belt front upper cover installation bolt	10–12	7-9
Timing belt front lower cover installation bolt	10–12	7-9
Crankshaft sprocket installation bolt	110–130	80–94
Timing belt B tensioner	15-22	11–16
Tension pulley bracket for air conditioning	23-27	17–20
Automatic tensioner installation bolt	20–27	14–20
Tensioner pulley installation bolt	43-55	31–40
Oil level gauge	12-15	9–11
Front exhaust pipe to exhaust manifold		
<FWD>	40–50	29–36
<AWD>	30–40	22-29
Front exhaust pipe bracket	30–40	22-29
Exhaust manifold cover (A), (B) <DOHC> <SOHC–1993 models>	12-15	9-11
Heat protector <SOHC> <Up to 1992 models>	12-15	9–11

TSB **Revision**

Items	Nm	ft.lbs.
Exhaust manifold to cylinder head		
<SOHC> <Up to 1992 models>	15–20	11–14
< 1993 models>	25–30	18-22
	27-33	20–23
<DOHC>	25–30	18-22
Engine hanger to engine bracket	12-15	9-11
Oxygen sensor	40–50	29-36
Water inlet pipe installation bolt		
Transaxle side	43-55	31–40
Engine block side <Up to 1992 models>	10–15	7–10
< 1993 models>	12-15	9-11
Engine coolant temperature gauge unit	10–12	7-9
Engine coolant temperature sensor (Engine control)	20–40	14-29
Air conditioning engine coolant temperature switch <always closed type>	30–40	22-29
Engine coolant temperature switch <always opened type> (Air conditioning or A/T control)	10–14	8–10
Rocker cover installation bolt	5-7	4-5
Exhaust manifold to turbocharger	55-65	40–47
Eye bolt (oil pipe)	14-19	10–14
Air outlet fitting installation bolt	9-14	7–10
Water pipe B	40–50	29-36
Front exhaust pipe to turbocharger	40–60	29-43
Eye bolt (water pipe)	35–50	25-36
Water pipe B clamp	10–12	7-9
Oil return pipe	8–10	6-7
Water hose installation bolt		
<M8>	12-15	9-11
<M6>	10–12	7-9
Nater hose to turbocharger	8–10	6-7
Ixhaust pipe support bracket	30–42	22–30
Exhaust pipe support bracket to front exhaust pipe	30–40	22-29

LUBRICANT

M14CD–

Item	Specified lubricant	Quantity
Engine coolant	High quality ethylene glycol antifreeze coolant	6.5 dm^3 (6.9 qts.)

SEALANT

M14CE–

Items	Specified sealant
Engine coolant temperature sensor (Engine control) Air conditioning engine coolant temperature switch <always closed type> Engine coolant temperature switch <always opened type> (Air conditioning or A/T control)	3M nut locking Part No.4171 or equivalent
Engine coolant temperature gauge unit	3M ATD Part No.8660 or equivalent

SPECIAL TOOL

M14DA--

Tool	Number	Name	Use
	MIT21 0863	Radiator cap test adapter	Radiator cap test

TROUBLESHOOTING

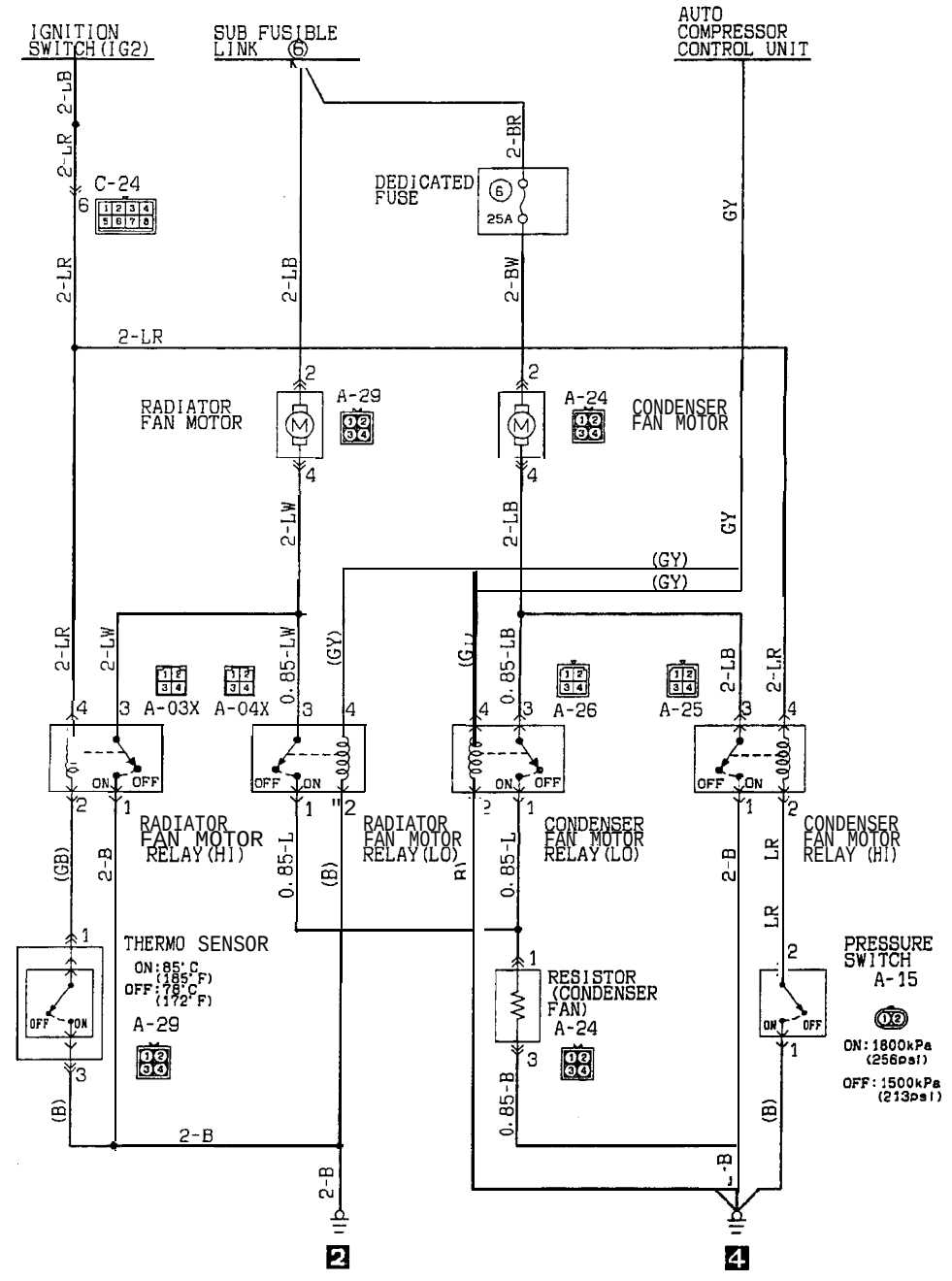
M14EAAI

Symptom	Probable cause	Remedy
Overheat	Insufficient engine coolant	Replenish
	Too high an anti-freeze concentration	Correct anti-freeze concentration
	Loose or broken drive belt	Replace
	Inoperative electric cooling fan	
	Faulty thermosensor	Replace
	Faulty electrical motor	Replace
	Faulty radiator fan relay	Replace
	Damaged or blocked (insufficiently ventilated) radiator fins	Correct
	Water leaks	
	Damaged radiator core joint	Replace
	Corroded or cracked hoses (radiator hose, heater hose, etc.)	Replace
	Loose bolt or leaking gasket in water outlet fitting (thermostat)	Correct or replace
	Loose water pump mounting bolt or leaking gasket	Correct or replace
	Faulty radiator cap valve or setting of spring	Replace
	Loose intake manifold bolts or leaking from gasket	Retorque bolts or replace gasket
	Cracked intake manifold	Replace
	Faulty automatic transaxle oil cooler operation	
	Blocked or collapsed hose and pipe	Replace
	Loose hose and pipe connection	Correct
	Faulty thermostat operation	Replace
	Faulty water pump operation	Replace
	Water passage clogged with slime or rust deposit or foreign substance	Clean
No rise in temperature	Faulty thermostat	Replace

TSB Revision

CIRCUIT DIAGRAM

<Non-Turbo (FWD, AWD-M/T)>



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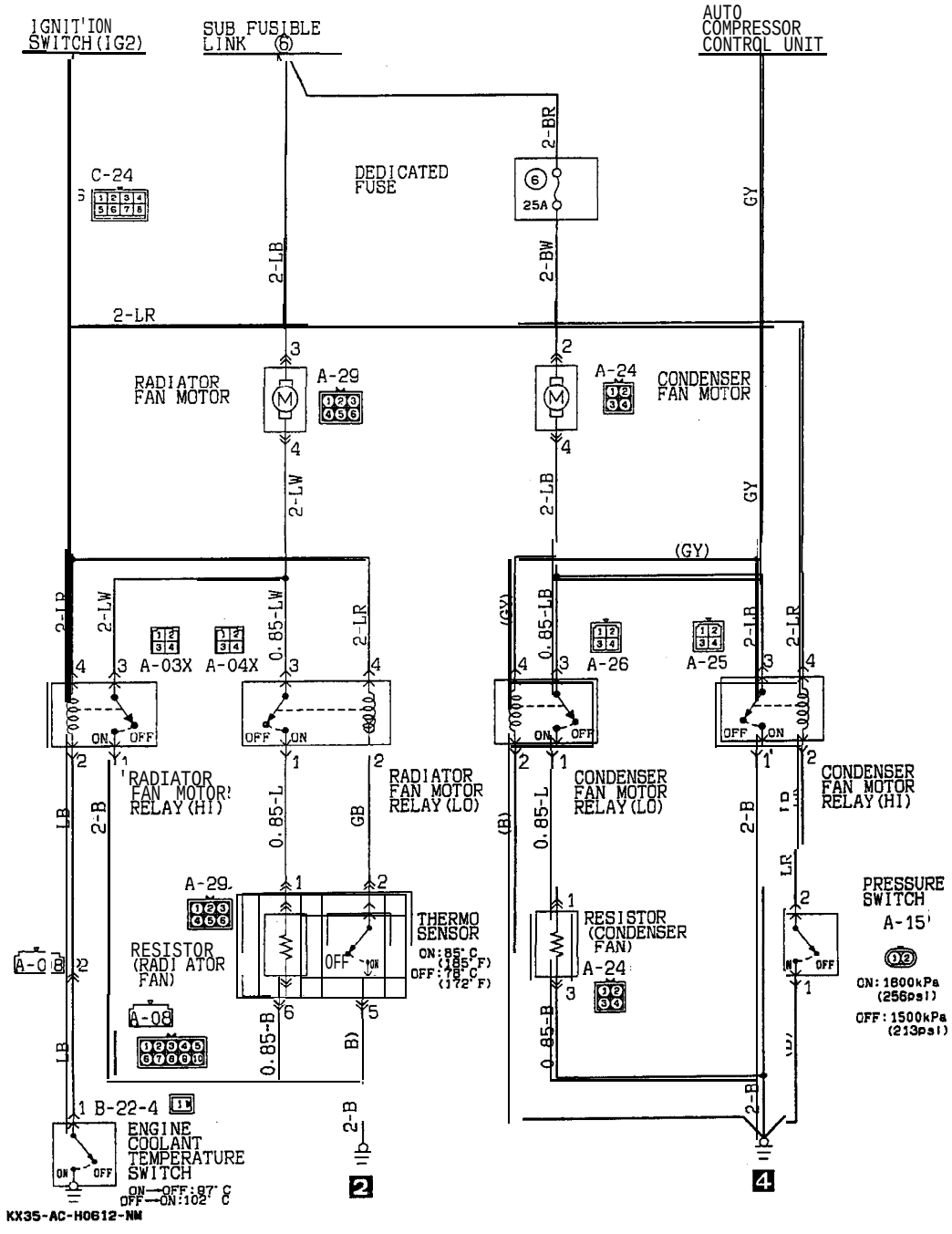
<Non-Turbo (AWD-A/T), Turbo>



OPERATION

- When the engine coolant temperature reaches approximately 85°C(185°F) in the ignition switch "ON" position, the thermo sensor is turned on to flow electricity through the radiator fan motor relay (coil) and the thermo sensor to the ground. The radiator fan motor relay contact will be closed.
- Then, electricity will flow through the radiator fan motor and the radiator fan motor relay (contact) to the ground to rotate the radiator fan motor.

NOTE
For models equipped with the air conditioning, refer to GROUP 55–Troubleshooting for information concerning the operation of the condenser fan.

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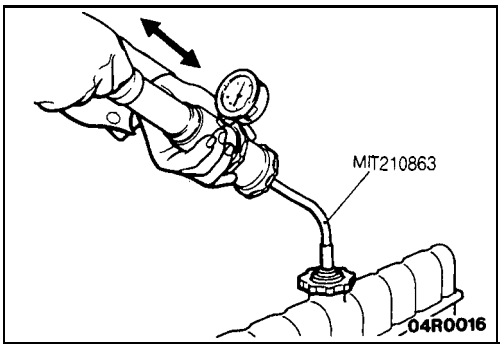


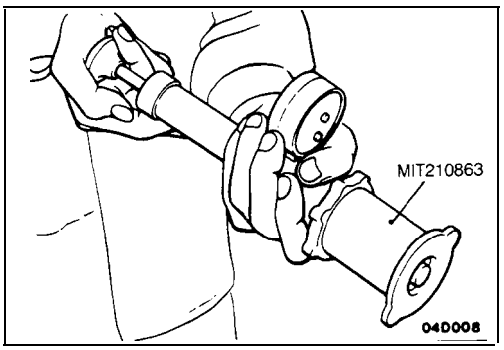
SERVICE ADJUSTMENT PROCEDURES M14FAAB

ENGINE COOLANT LEAK CHECK

1. Loosen radiator cap.
2. Confirm that the engine coolant level is up to the filler neck.
3. Install a radiator cap tester to the radiator filler neck and apply 160 kPa (23 psi) pressure. Hold pressure for two minutes, while checking for leakage from the radiator, hose or connections.

   Caution
   Be sure to completely clean away any moisture from the places checked.
   When the tester is removed, be careful not to spill any engine coolant from it.
   Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.

4. If there is leakage, repair or replace the appropriate part.



RADIATOR CAP PRESSURE TEST M14FBAA

1. Use a special tool to attach the cap to the tester.
2. Increase the pressure until the indicator of the gage stops moving.

   Limit: 65 kPa (9.2 psi)
   Standard value: 75– 105 kPa (1 1 – 15 psi)

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

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

ENGINE COOLANT REPLACEMENT M14FCAA

Refer to GROUP 00–Maintenance Service.

ENGINE COOLANT CONCENTRATION TEST M14FDAA

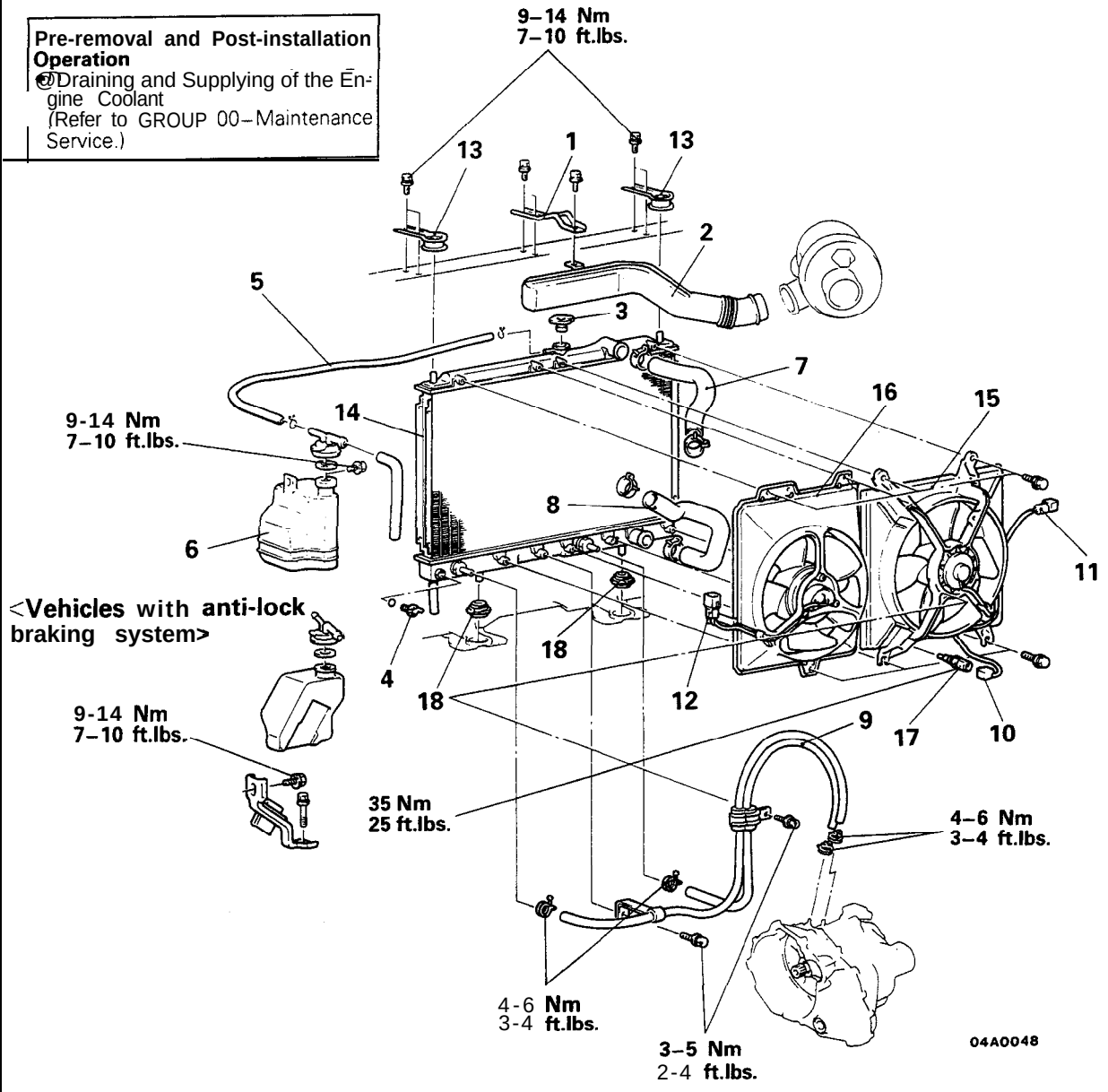
Refer to GROUP 00–Maintenance Service.

RADIATOR

M14QA--

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
● Draining and Supplying of the Engine Coolant
(Refer to GROUP 00–Maintenance Service.)



Removal steps

1. Branch tube bracket <Non-Turbo>
2. Branch tube <Non-Turbo>
3. Radiator cap
4. Drain plug
5. Overflow tube
6. Reserve tank
7. ◆◆ ● + Radiator upper hose
8. ◆◆ ◆◆ Radiator lower hose
9. ◆◆ Automatic transaxle oil cooler hoses <Vehicles with A/T>
10. Thermo sensor connector
11. Radiator fan motor connector
12. Condenser fan motor connector <Non-Turbo (FWD, AWD–M/T)–Vehicles with air conditioning>
13. Upper insulator
14. Radiator assembly
15. Radiator fan motor assembly
16. Condenser fan motor assembly <Non-Turbo (FWD, AWD–M/T)–Vehicles with air conditioning>
17. Thermo sensor
18. Lower insulator

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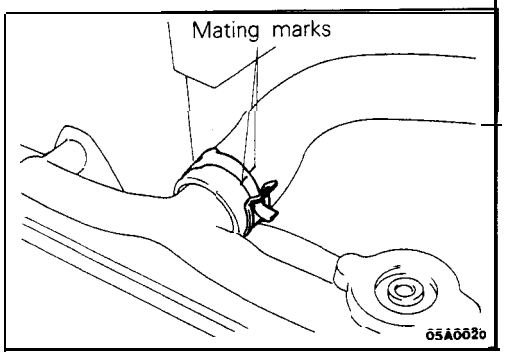


SERVICE POINTS OF REMOVAL M14QBAH

7. REMOVAL OF RADIATOR UPPER HOSE/8. RADIATOR LOWER HOSE

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

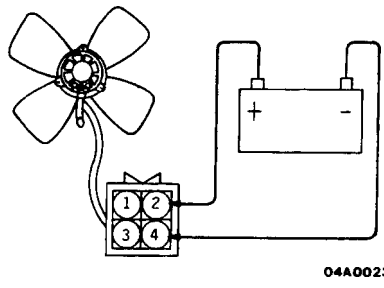
9. DISCONNECTION OF AUTOMATIC TRANSAXLE OIL COOLER HOSES

Use a plug or otherwise cover the hose and nipple part of the radiator so that dust, dirt, foreign materials, etc. do not enter after the hose has been disconnected from the radiator.

INSPECTION M14QCAN

- Check for foreign material between radiator fins.
- Check the radiator fins for bent, or damage.
- Check the radiator for corrosion, damage, rust or scale.
- Check the radiator hoses for cracks, damage or deterioration.
- Check the reserve tank for damage.
- Check the automatic transaxle oil cooler hoses for cracking, damage or deterioration.

<Non-Turbo (FWD, AWD–M/T)>



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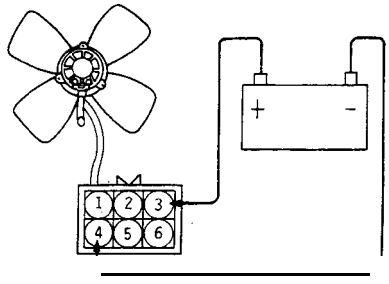
<Non-Turbo (AWD–A/T), Turbo>



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RADIATOR FAN MOTOR INSPECTION

(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.

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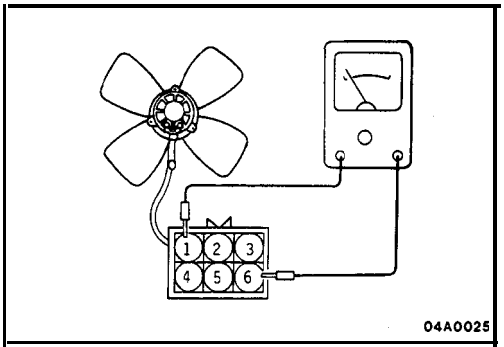
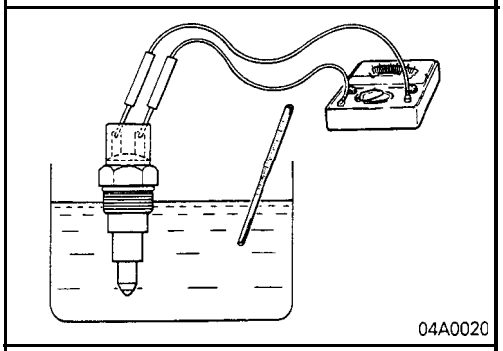


RESISTOR INSPECTION <Non-Turbo (AWD–A/T), Turbo>

(1) Remove the radiator fan motor connector.
(2) Measure the resistance between terminals ① and ⑥.
(3) It can be judged OK if the resistance value is within the following range.

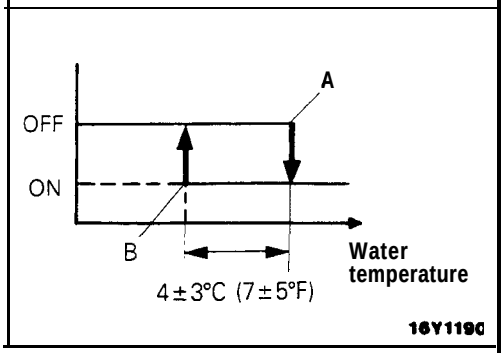
Resistance value: 0.26–0.32 Ω



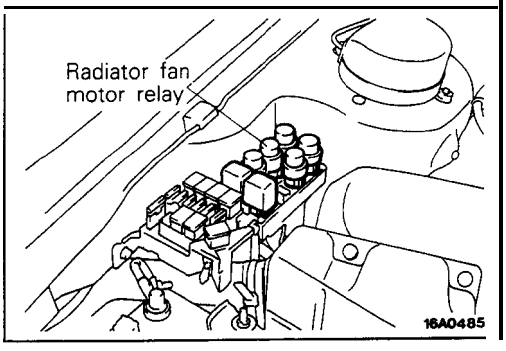
THERMO SENSOR INSPECTION

Check for **continuity** with the thermo sensor in hot water.

NOTE
Immerse thermo sensor in hot water up to mounting thread to check for continuity.

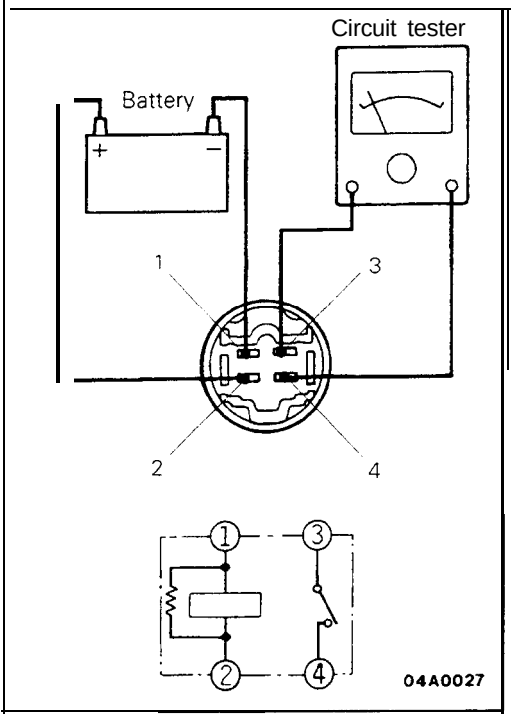


Standard value:
Continuity at 82–88°C (180–190°F) . . . . . at A point
No continuity at 78–84°C (172–183°F) . . . . . at B point



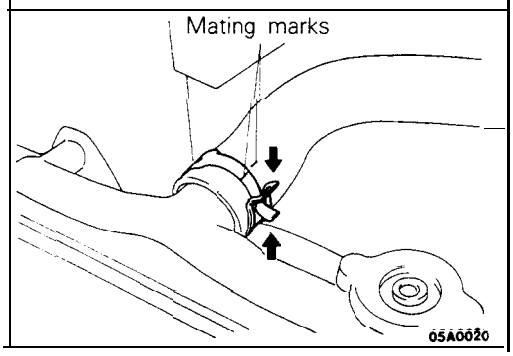
RADIATOR FAN MOTOR RELAY INSPECTION

(1) Remove radiator fan motor. relay from engine room relay box.



(2) Connect battery to terminal 2 and check continuity between terminals with terminal 1 grounded.

Power is supplied	3–4 terminals	Continuity
Power is not supplied	3–4 terminals	No continuity
	1–2 terminals	Continuity



SERVICE POINTS OF INSTALLATION M140DAF

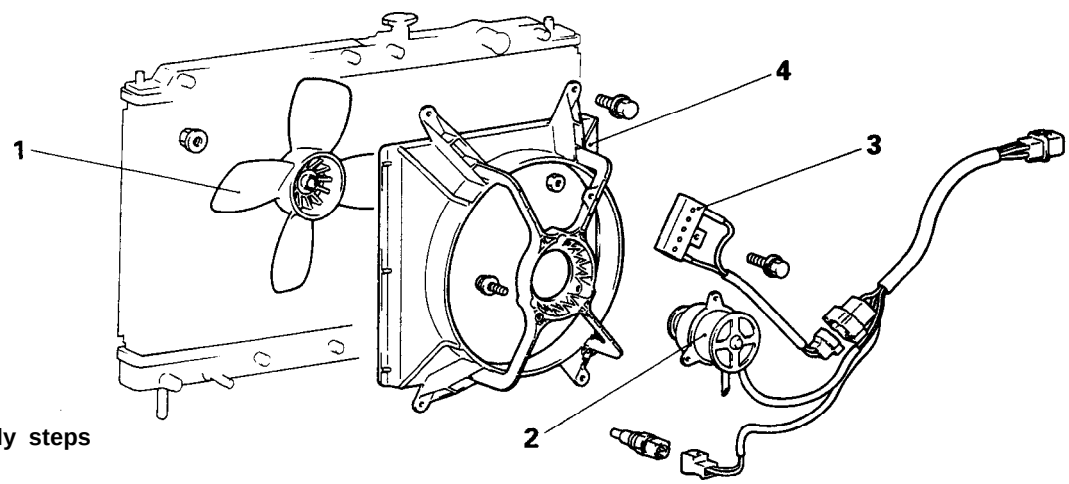
8. INSTALLATION OF RADIATOR LOWER HOSE/7. RADIATOR UPPER HOSE

Align the mating marks on the radiator hose and hose clamp and then connect them; then, applying force in the direction indicated by the arrow in the illustration, seat the clamp to the trace marks of the previous connection.

Caution
Be sure to install the hose clamps at the trace marks of the previous connection.

RADIATOR FAN MOTOR ASSEMBLY M14TA--

DISASSEMBLY AND REASSEMBLY



Disassembly steps

1. Fan
2. Radiator fan motor
3. Resistor
   <Non-Turbo (AWD–A/T), Turbo>
4. Shroud

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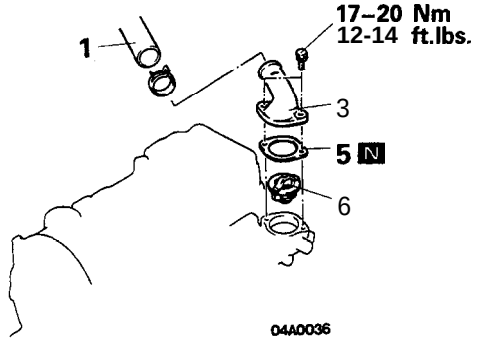
THERMOSTAT

M14GB--

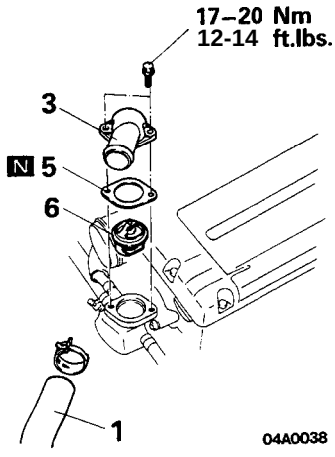
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Draining and Supplying of the Engine Coolant (Refer to GROUP 00–Maintenance Service.)

<SOHC>
<Up to 1992 models>



<DOHC>



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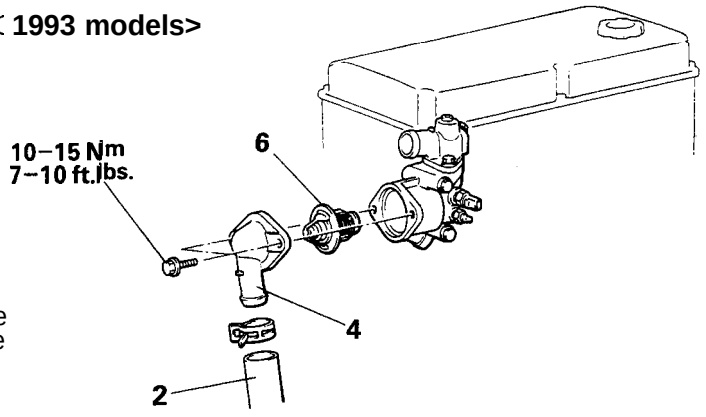
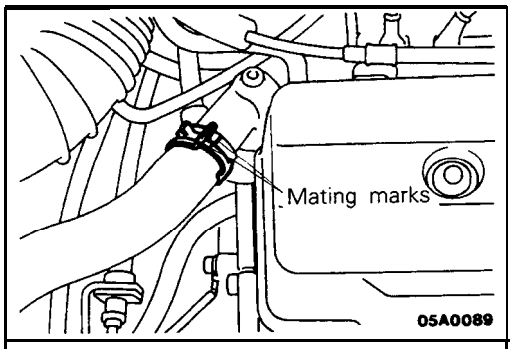


Removal steps
- ◆◆ 1. Connection for radiator upper hose
- ◆◆ 2. Connection for radiator lower hose
- 3. Water outlet fitting
- 4. Water inlet fitting
- 5. Gasket
- ◆◆ 6. Thermostat

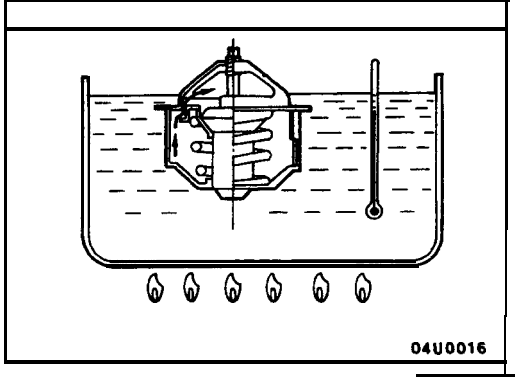


SERVICE POINTS OF REMOVAL

M14GCAA

1. DISCONNECTION OF RADIATOR UPPER HOSE/2. RADIATOR LOWER HOSE

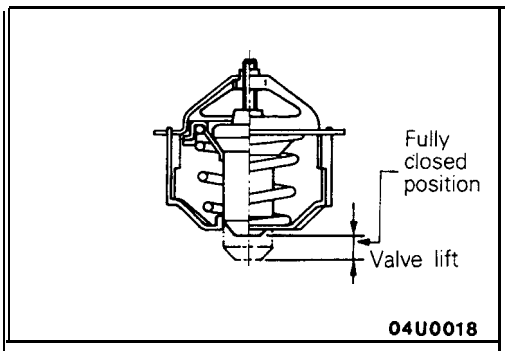
After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.



INSPECTION

M14GDAL

- Check that valve closes tightly at room temperature.
- Check for defects or damage.
- Check for rust or encrustation on valve. Remove if any.
- Immerse thermostat in container of water. Stir to raise water temperature and check that thermostat valve opening temperature and the temperature with valve fully open [valve lift-over 8 mm (.31 in.)] are at the standard value.



Standard value:

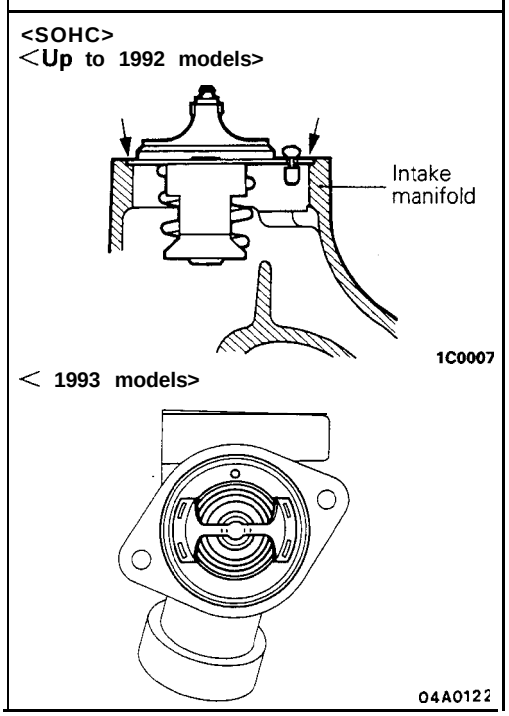
Valve opening temperature	
DOHC, SOHC 8VALVE	**88°C (190°F)**
SOHC 1 6VALVE	**82°C (180°F)**
Full-open temperature	
DOHC, SOHC 8VALVE	**100°C (212°F)**
SOHC 16VALVE	**95°C (203°F)**

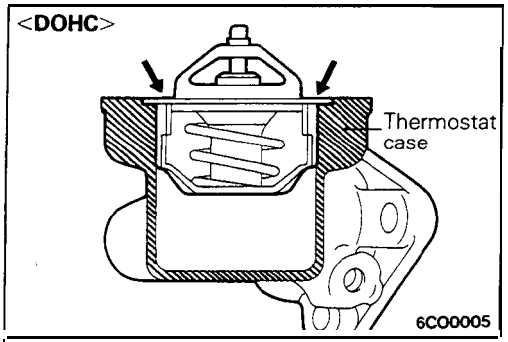
NOTE
Measure valve height when fully closed. Calculate lift by measuring the height when fully open.

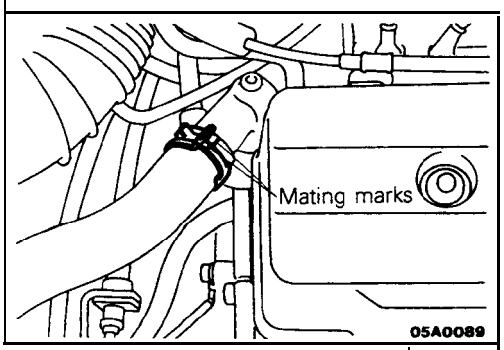
SERVICE POINTS OF INSTALLATION M14GEAG

6. INSTALLATION OF THERMOSTAT

Install the thermostat so that the flange fits perfectly to the recessed seat of the thermostat case or intake manifold.







2. CONNECTION OF RADIATOR LOWER HOSE/ 1. RADIATOR UPPER HOSE

Align the mating marks on the radiator hose and hose clamp and then connect them; then seat the clamp to the trace marks of the previous connection.

Caution
If the radiator hose and hose clamp mating marks are not aligned and installed, water leaks may occur.

TSB Revision

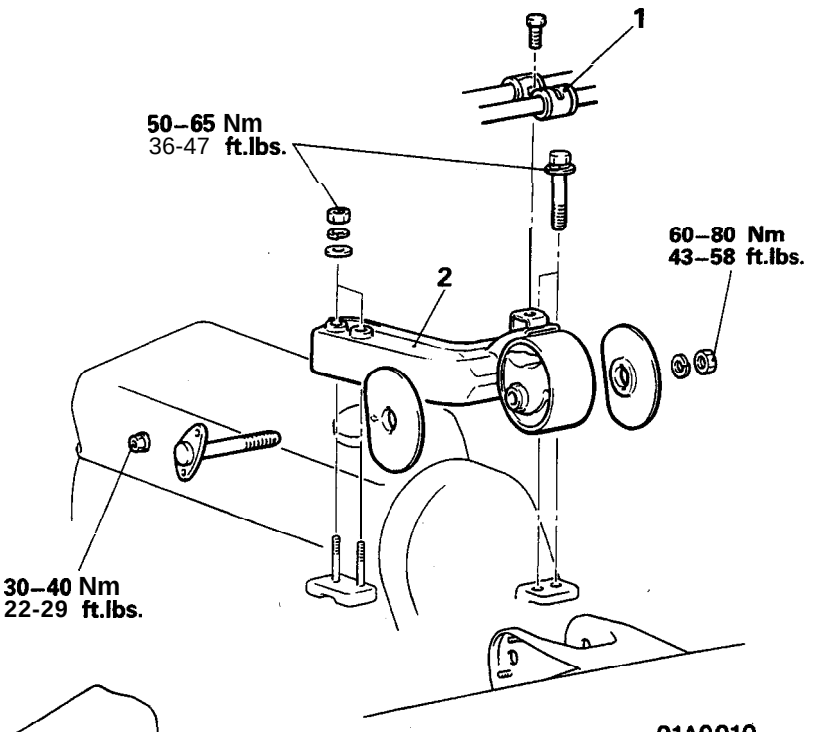
WATER PUMP <SOHC>

M14MB-A

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of the Under Cover
- Draining of the Engine Coolant (Refer to GROUP 00–Maintenance Service.)

Post-installation Operation
- *Installation of the Under Cover
- *Supplying of the Engine Coolant (Refer to GROUP 00–Maintenance Service.)
- Engine Adjustment (Refer to GROUP 1 I-Service Adjustment Procedures.)



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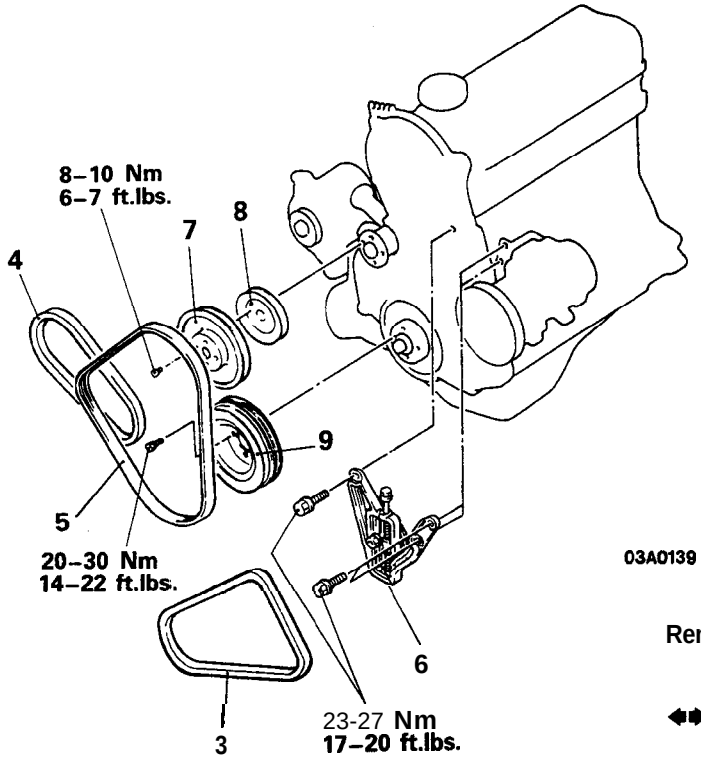

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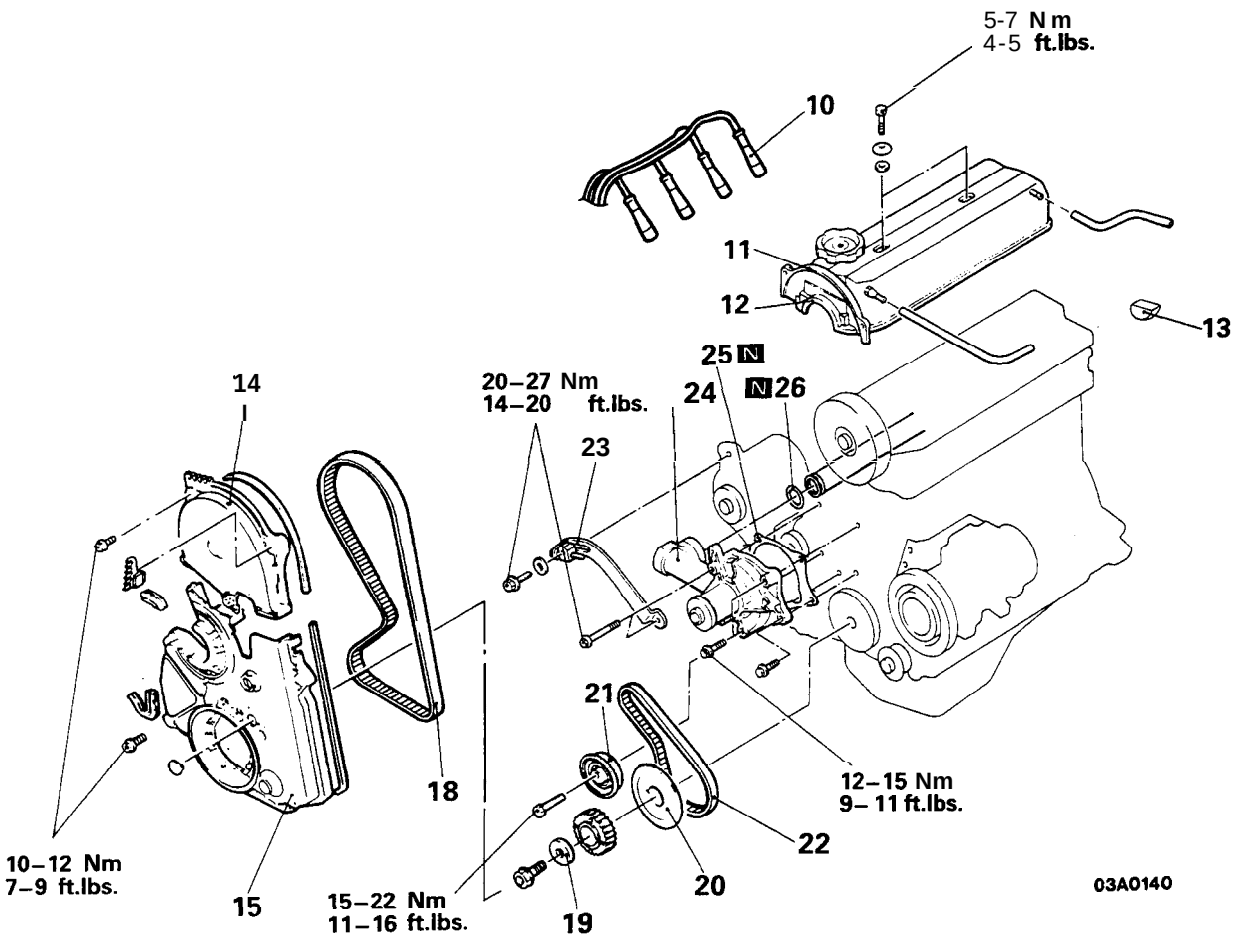
Removal steps

1. Clamp part of hoses (Power steering and air conditioning)
2. Engine mount bracket
3. Drive belt (Air conditioning) (Refer to GROUP 00–Maintenance Service.)
4. Drive belt (Power steering) (Refer to GROUP 00–Maintenance Service.)
5. Drive belt (Refer to GROUP 00-Maintenance Service.)
6. Tension pulley bracket
7. Water pump pulley (Power steering)
8. Water pump pulley
9. Damper pulley

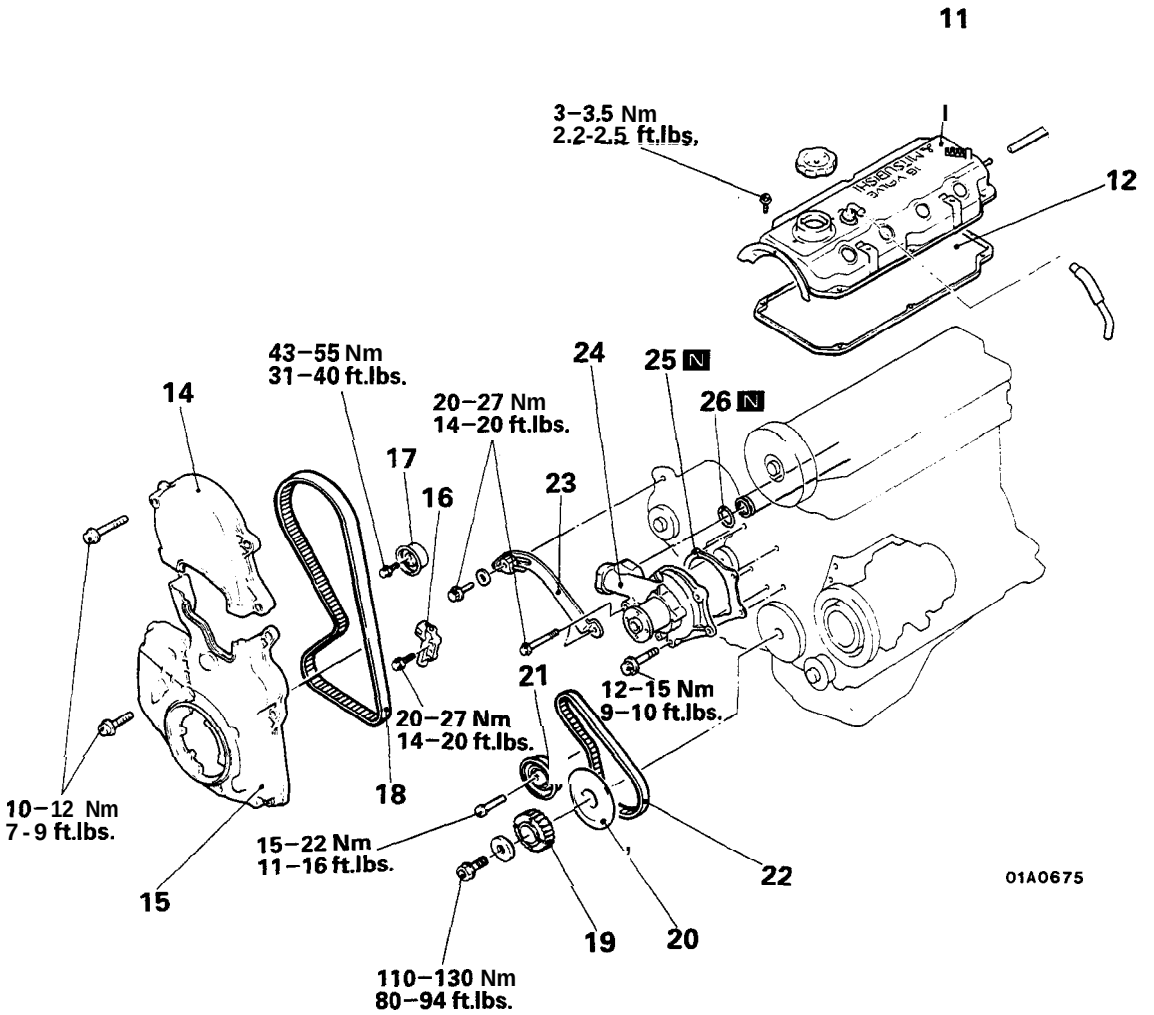
<Up to 1992 models>



10. Spark plug cable
11. Rocker cover (Refer to GROUP 11 – Timing Belt)
12. Rocker cover gasket
13. Semi-circular packing (Refer to GROUP 11 -Timing Belt)
14. Timing belt front upper cover (Refer to GROUP 11 -Timing Belt)
15. Timing belt front lower cover (Refer to GROUP 11 -Timing Belt)
18. Timing belt (Refer to GROUP 11 -Timing Belt)
19. Crankshaft sprocket
20. Flange (Refer to GROUP 11 -Timing Belt B.)
21. Timing belt B tensioner
22. Timing belt B (Refer to GROUP 11 – Timing Belt B.)
23. Generator brace
● 424. Water pump
25. Water pump gasket
➡◀26. O-ring

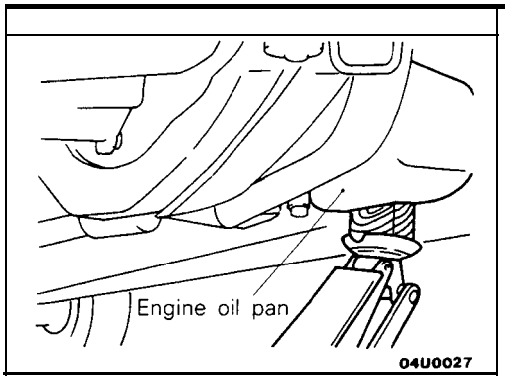
TSB Revision

<1993 models>



11. Rocker cover (Refer to GROUP 11 -Timing Belt.)
12. Rocker cover gasket
14. Timing belt front upper cover (Refer to GROUP 11-Timing Belt.)
15. Timing belt front lower cover (Refer to GROUP 11-Timing Belt.)
16. Automatic tensioner (Refer to GROUP 11 -Timing Belt.)
17. Tension pulley
18. Timing belt (Refer to GROUP 11 -Timing Belt.)
19. Crankshaft sprocket
20. Flange (Refer to GROUP 11 -Timing Belt B.)
21. Timing belt B tensioner
22. Timing belt B (Refer to GROUP 11-Timing Belt B.)
23. Generator brace
24. Water pump
25. Water pump gasket
26. O-ring

TSB Revision



SERVICE POINTS OF REMOVAL M14MCAK

2. REMOVAL OF ENGINE MOUNT BRACKET

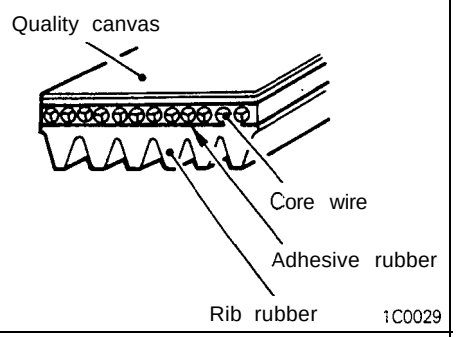
(1) Place a wooden block at the oil pan part of the engine, and then jack up the vehicle.

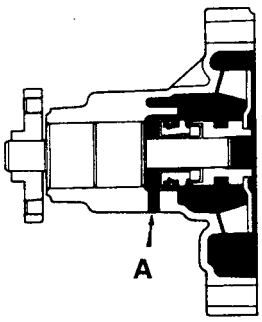
Caution
Jack up carefully, so as not to apply a load to each part.

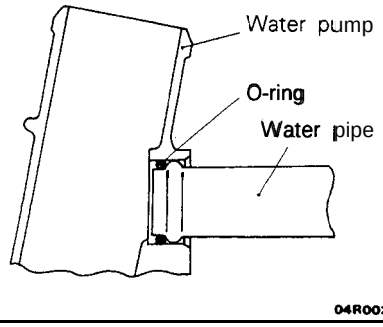
(2) Remove the engine mount bracket.

5. REMOVAL OF DRIVE BELT

Before removing the V-ribbed belt, loosen the water pump pulley installation bolt.







INSPECTION M14MDAG

V-RIBBED BELT

Check following items and replace if faulty.

- Check belt surface for damage, peeling or cracks.
- Check belt surface for oil or grease.
- Check belt rubber for wear or brittleness.
- Check the pulleys for cracks or damage.

WATER PUMP

- Check each part for cracks, damage or wear, and replace the water pump assembly if necessary.
- Check the bearing for damage, abnormal noise and sluggish rotation, and replace the water pump assembly if necessary.
- Check the seal unit for leaks, and replace the water pump assembly if necessary.
- Check for water leakage. If water leaks from hole “A”, seal unit is leaking. Replace as an assembly.

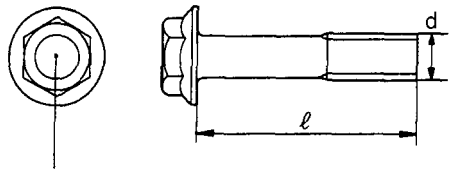
SERVICE POINTS OF INSTALLATION M14MEAM

26. INSTALLATION OF O-RING

Insert the O-ring to the water inlet pipe, and coat the outer 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.**

TSB Revision



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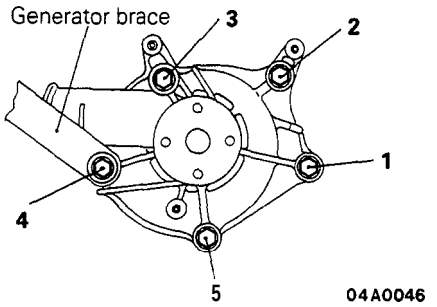
<Up to 1992 models>



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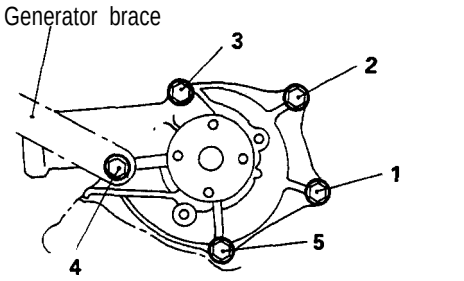


6CO0010

24. INSTALLATION OF WATER PUMP

(1) Clean both gasket surfaces of water pump body and cylinder block.
(2) Install new water pump gasket and water pump assembly and tighten the bolts.

<Up to 1992 models>

No.	Identification mark	Bolt diameter (d) x length (ℓ) mm (in.)	Torque Nm (ft.lbs.)
1	4	8 x 20 (.31 x .79)	12-15 (9–10)
2	4	8 x 30 (.31 x 1.18)	
3	7	8 x 65 (.31 x 2.56)	20–27 (15–19)
4	7	8 x 65 (.31 x 2.56)	
5	4	8 x 30 (.31 x 1.18)	12-15 (9–10)

< 1993 models>

No.	Identification mark	Bolt diameter(d) × length (ℓ) mm (in.)	Torque Nm (ft.lbs.)
1	4	8 × 14 (.31 × .55)	12–15 (9–10)
2	4	8 × 22 (.31 × .87)	
3	4	8 × 25 (.31 × .98)	
4	7	8 × 65 (.31 × 2.56)	20–27 (15-19)
5	4	8 × 22 (.31 × .87)	12–15 (9–10)

TSB Revision

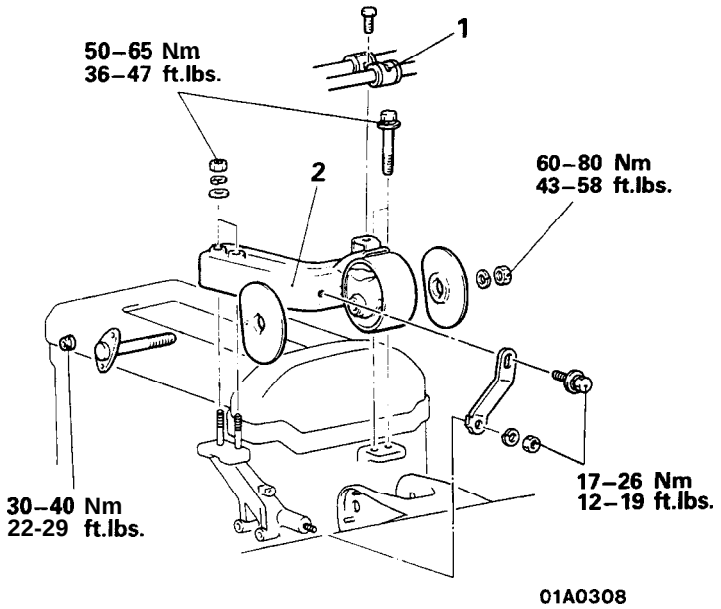
WATER PUMP <DOHC>

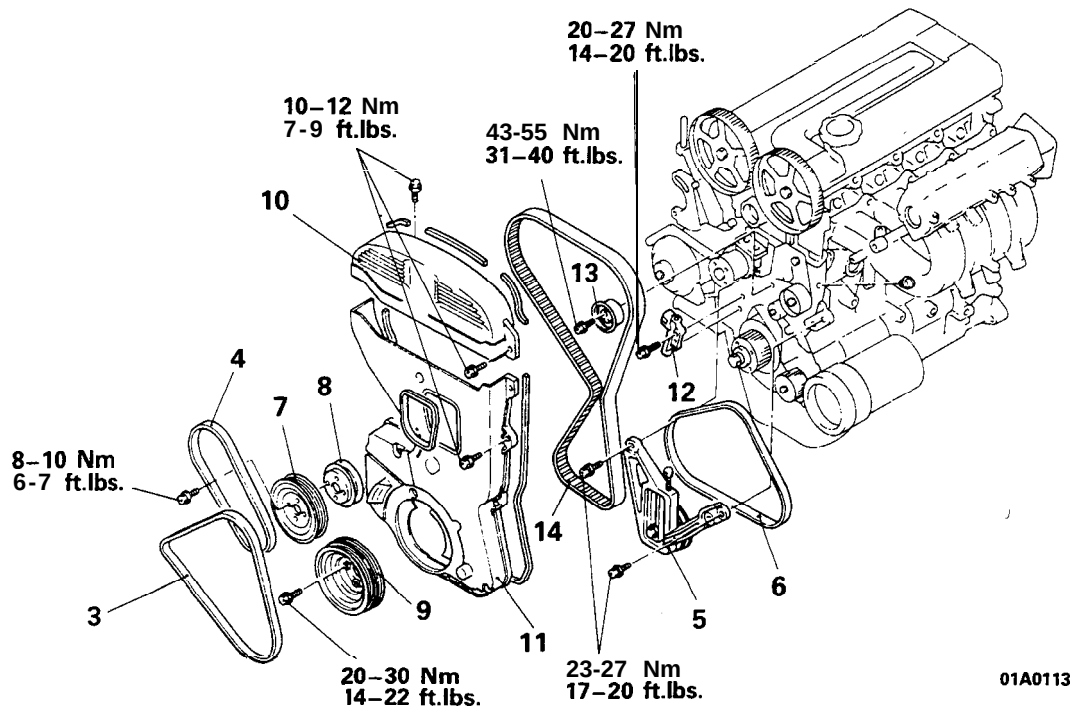
M14MB-B

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of the Under Cover
- Draining of the Engine Coolant (Refer to GROUP 00–Maintenance Service.)

Post-installation Operation
*Installation of the Under Cover
*Supplying of the Engine Coolant (Refer to GROUP 00–Maintenance Service.)
- Engine Adjustment (Refer to GROUP 11–Service Adjustment Procedures.)

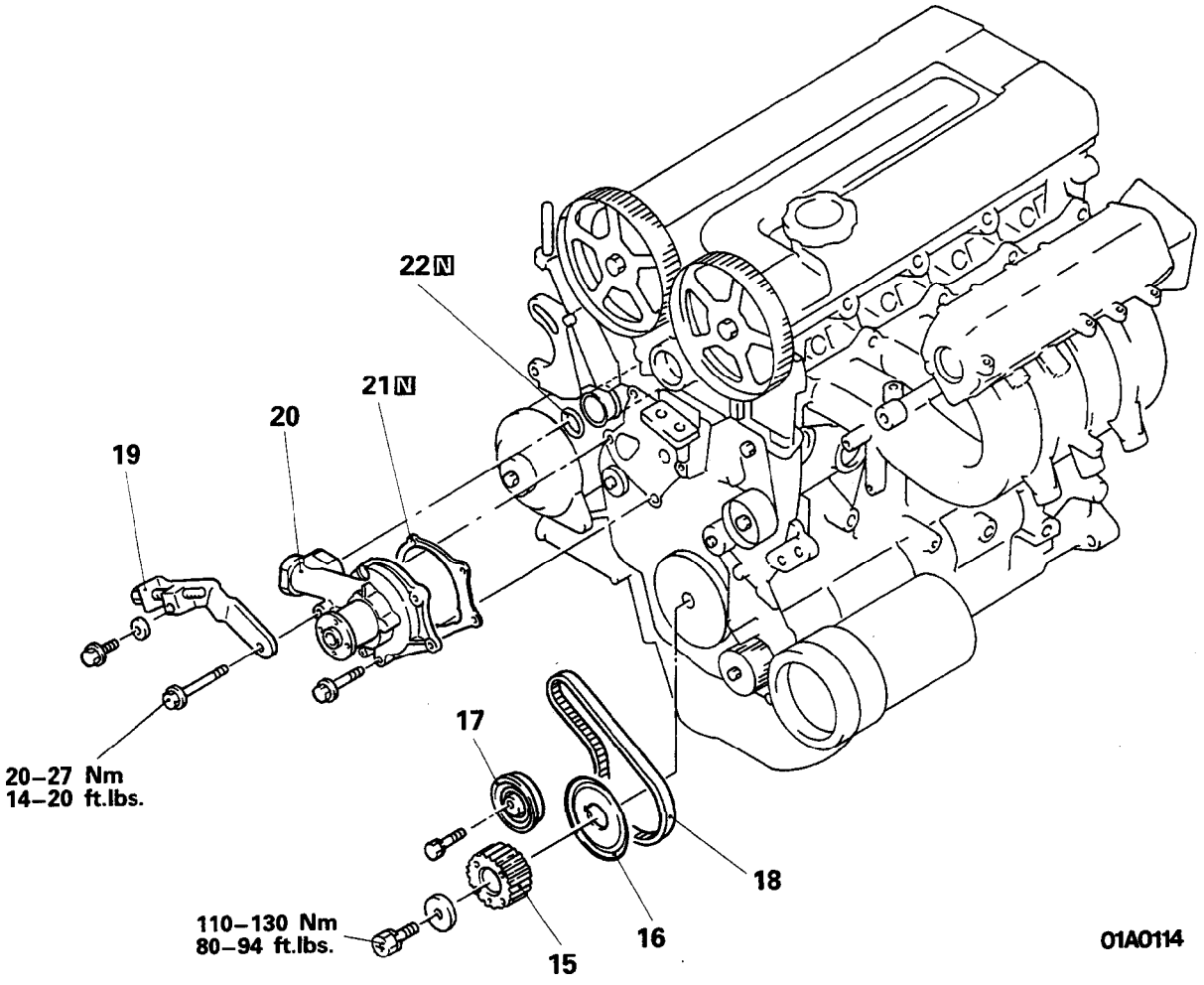




Removal steps

1. Clamp part of hoses (Power steering and air conditioning)
2. Engine mount bracket (Refer to P.14-18.)
3. Drive belt (Refer to GROUP 00–Maintenance Service.)
4. Drive belt (Power steeringj (Refer to GROUP 00–Maintenance Service.)
5. Tension pulley bracket
6. Drive belt (Air conditioning) (Refer to GROUP 00–Maintenance Service.)
7. Water pump pulley
8. Water pump pulley (Power steering)
9. Crankshaft pulley
10. Timing belt upper cover (Refer to GROUP 11 -Timing Belt.)
11. Timing belt lower cover (Refer to GROUP 11 -Timing Belt.)
12. Automatic tensioner (Refer to GROUP 11 -Timing Belt.)
13. Tensioner pulley
14. Timing belt (Refer to GROUP 11-Timing Belt B.)

TSB Revision



15. Crankshaft sprocket
16. Flange (Refer to GROUP 11 -Timing Belt B.)
17. Timing belt B tensioner
18. Timing belt B (Refer to GROUP 11– Timing Belt B.)
19. Generator brace
◆◆ 20. Water pump
21. Water pump gasket
22. O-ring (Refer to P.14-18.)

INSPECTION

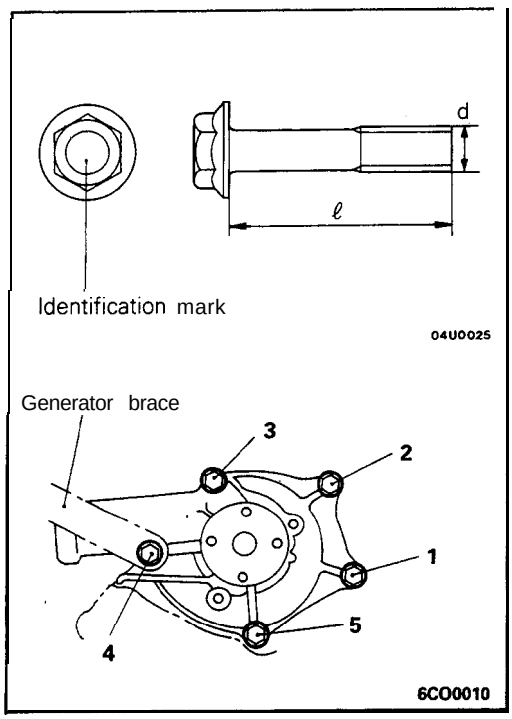
M14MDAN

V-RIBBED BELT

Refer to P.14-18.

WATER PUMP

- Check each part for cracks, damage or wear, and replace the water pump assembly if necessary.
- Check the bearing for damage, abnormal noise and sluggish rotation, and replace the water pump assembly if necessary.
- Check the seal unit for leaks, and replace the water pump assembly if necessary.
- Check for water leakage.



SERVICE POINTS OF INSTALLATION

M14MEAU

20. INSTALLATION OF WATER PUMP

(1) Clean both gasket surfaces of water pump body and cylinder block.

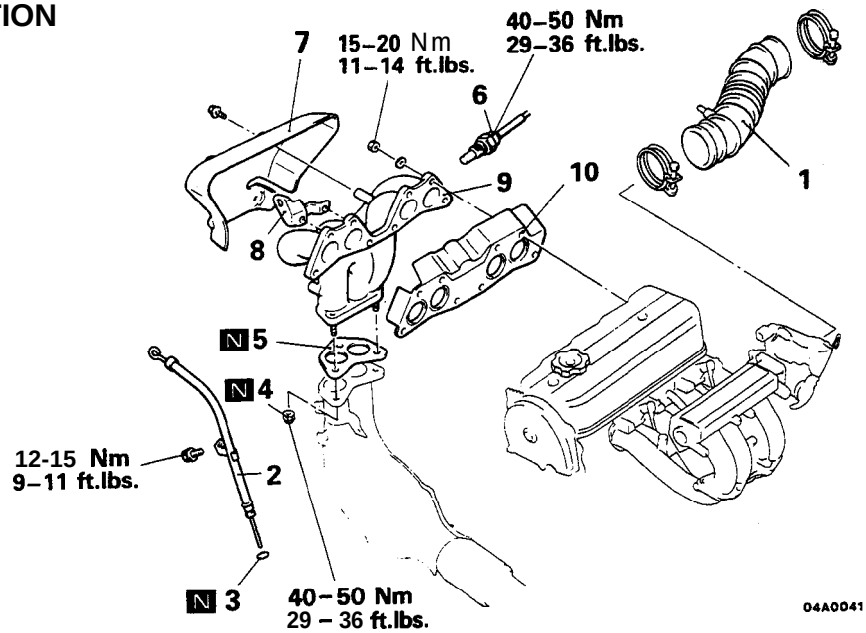
(2) Install new water pump gasket and water pump assembly and tighten the bolts.

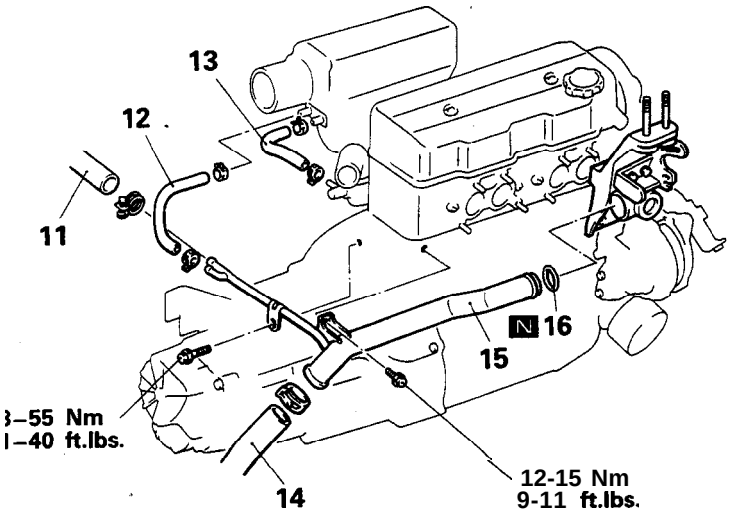
No.	identification mark	Bolt diameter (d) x length (ℓ) mm (in.)	Torque Nm (ft.lbs.)
1	4	8 x 14 (.31 x .55)	12-15 (9–10)
2	4	8 x 22 (.31 x .87)	
3	4	8 x 30 (.31 x 1.18)	
4	7	8 x 65 (.31 x 2.56)	20–27 (15–19)
5	4	8 x 28 (.31 x 1.10)	12-15 (9–10)

WATER HOSE AND WATER PIPE <SOHC> <Up to 1992 models> M14IA-A

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Draining and Supplying of the Engine Coolant
(Refer to GROUP 00–Maintenance Service.)





Removal steps
1. Air intake hose
2. Oil level gauge
3. O-ring
4. Self-locking nut
5. Gasket
6. Connection for oxygen sensor
7. Exhaust manifold cover (A)
8. Engine hanger
9. Exhaust manifold
10. Exhaust manifold gasket
11. Connection for heater hose
12. Water by-pass hose
13. Water hose
14. Connection for radiator lower hose (Refer to P.14-10.)
15. Water inlet pipe (Refer to P.14-18.)
16. O-ring (Refer to P.14-18.)

INSPECTION M14ICAA

WATER PIPE AND HOSE INSPECTION

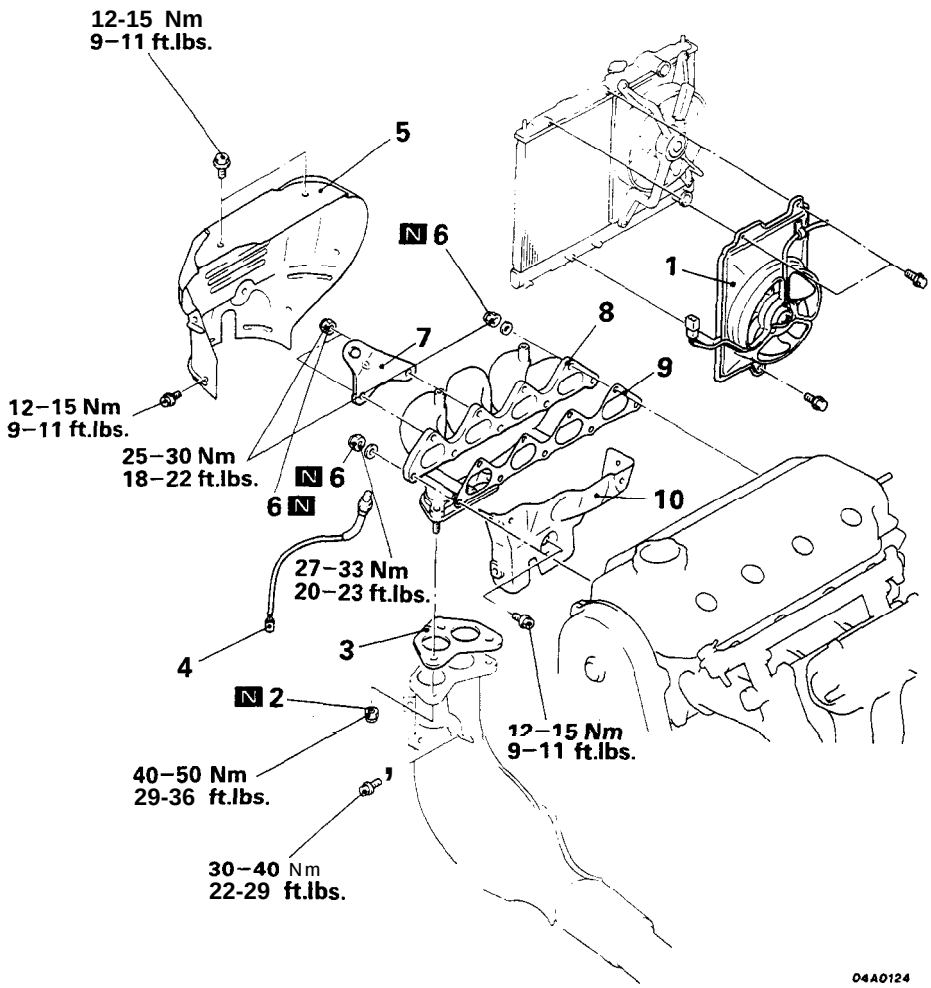
Check the water pipe and hose for cracks, damage, clog and replace them if necessary.

TSB **Revision**

WATER HOSE AND WATER PIPE <SOHC> <1993 models> M14IA-B

REMOVAL AND INSTALLATION

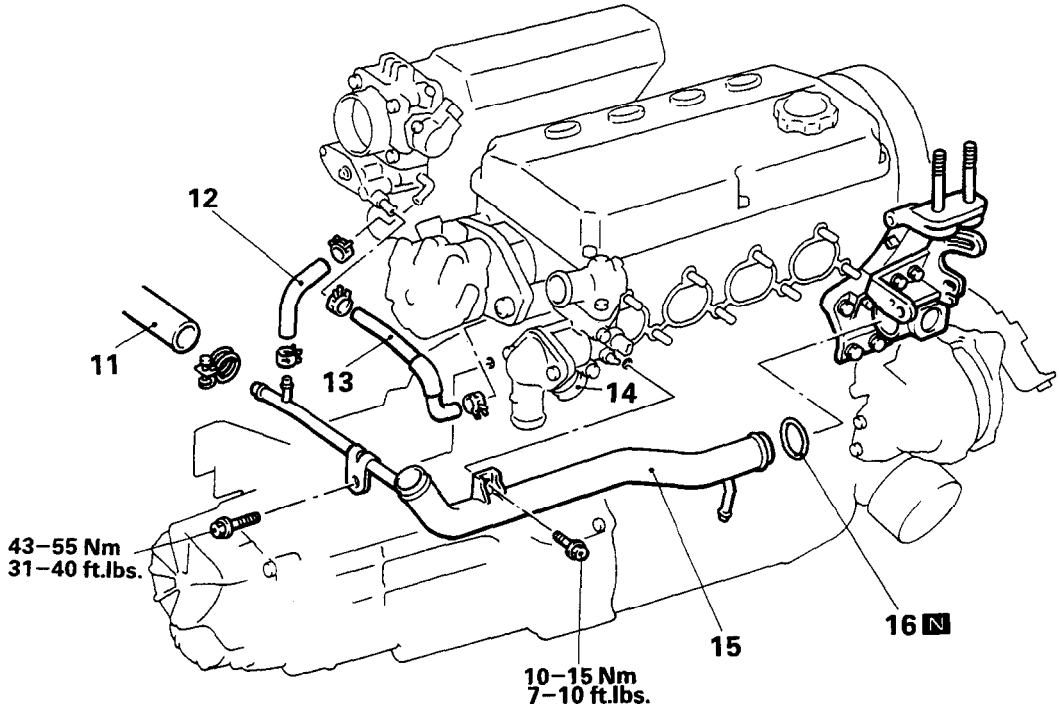
Pre-removal and Post-installation Operation
*Draining and Supplying of the Engine Coolant
(Refer to GROUP 00–Maintenance Service.)



Removal steps

1. Condenser fan motor assembly <Vehicles with air conditioning>
2. Self-locking nut
3. Gasket
4. Connection for oxygen sensor connector
5. Exhaust manifold cover (A)
6. Self-locking nut
7. Engine hanger
8. Exhaust manifold
9. Exhaust manifold gasket
10. Exhaust manifold cover (B)

TSB Revision



11. Connection for heater hose
12. Water by-pass hose
13. Water hose
14. Connection for thermostat case
15. Water inlet pipe
16. O-ring

INSPECTION

M07ICAAa1

WATER PIPE AND HOSE INSPECTION

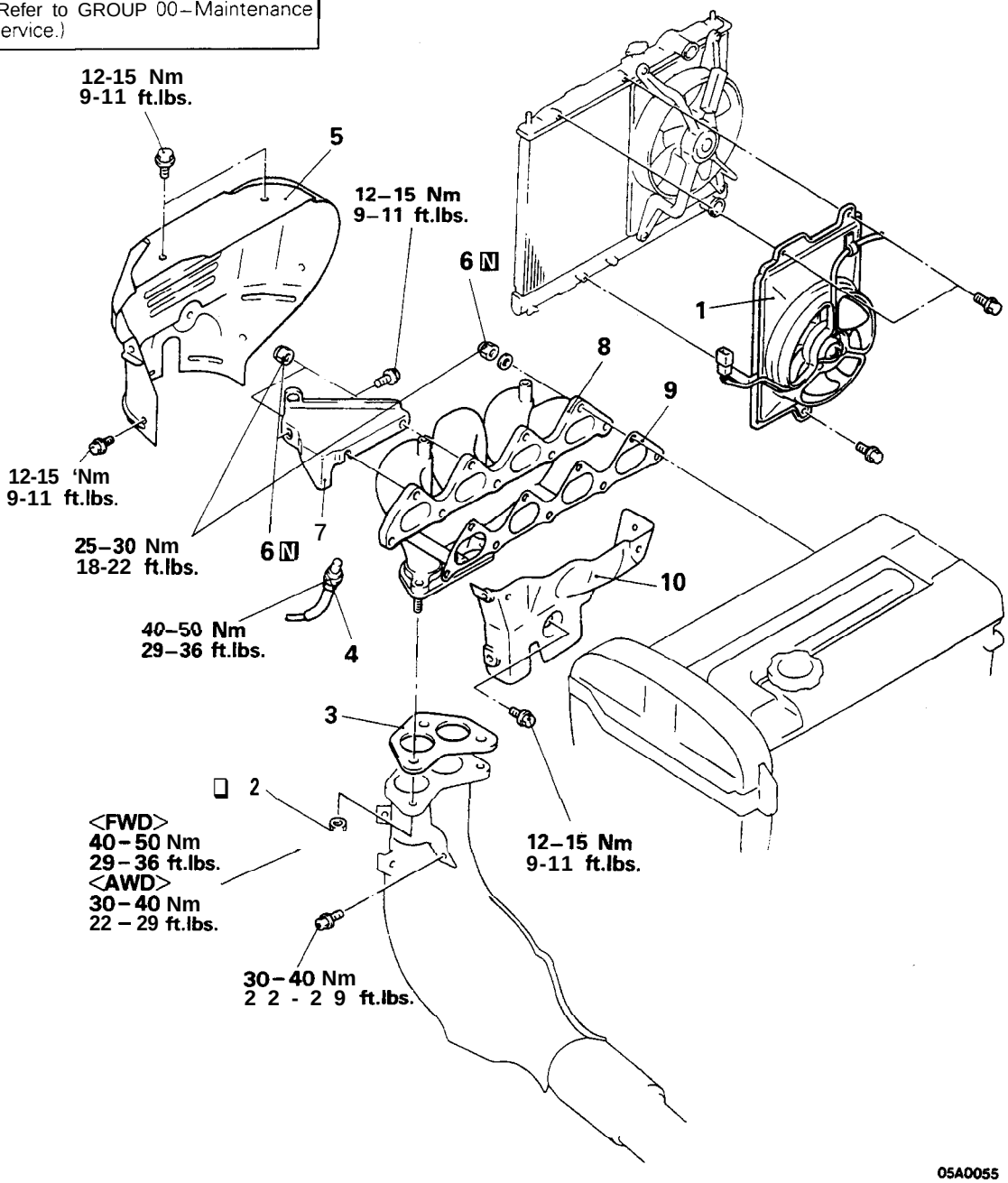
Check the water pipe and hose for cracks, damage, clog and replace them if necessary.

WATER HOSE AND WATER PIPE <DOHC (Non-Turbo)>

M14IA-B

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Draining and Supplying of the Engine Coolant (Refer to GROUP 00–Maintenance Service.)



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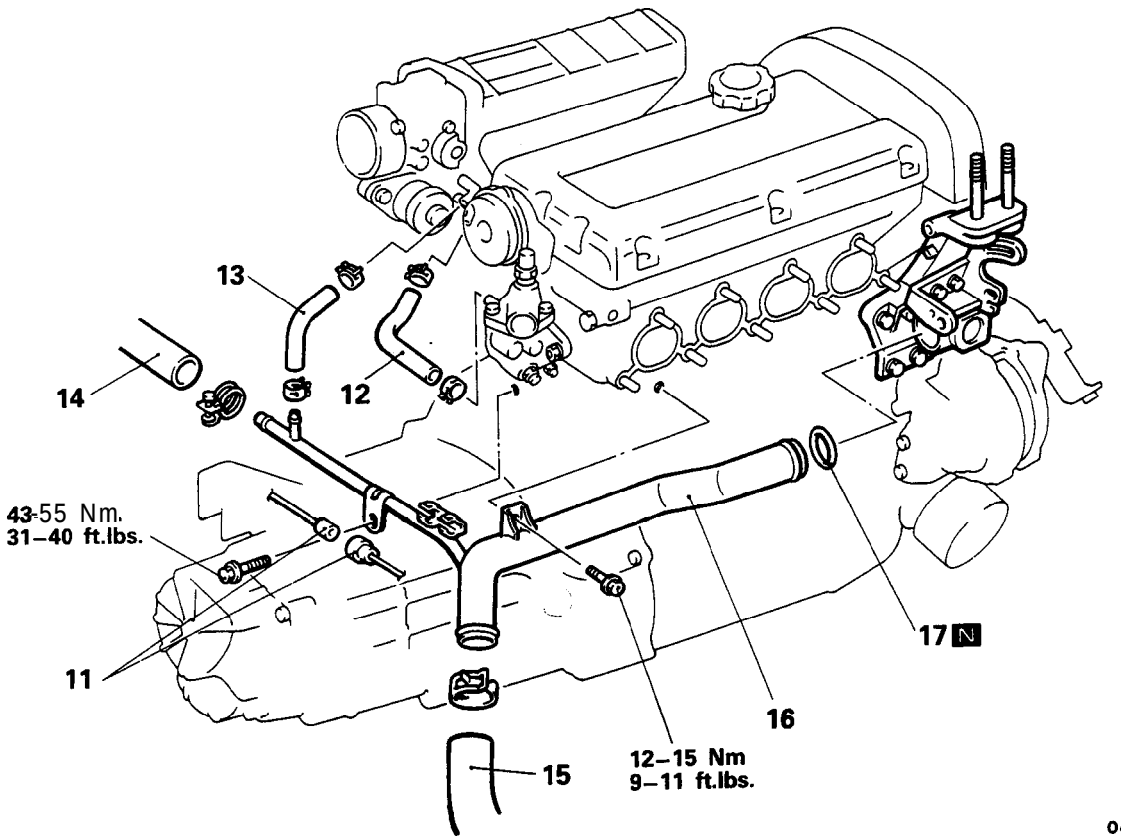
Removal steps

1. Condenser fan motor assembly (FWD, AWD–M/T) <Vehicles with an air conditioning>
2. Self-locking nut
3. Gasket
4. Connection for oxygen sensor
5. Exhaust manifold cover (A)
6. Self-locking nut
7. Engine hanger
8. Exhaust manifold
9. Exhaust manifold gasket
10. Exhaust manifold cover (B)



Removal steps

11. Connection for oxygen sensor and control harness
12. Water hose
13. Water by-pass hose
14. Connection for heater hose
15. Connection for radiator lower hose (Refer to P.14-10.)
16. Water inlet pipe (Refer to P.14-18.)
17. O-ring (Refer to P.14-18.)

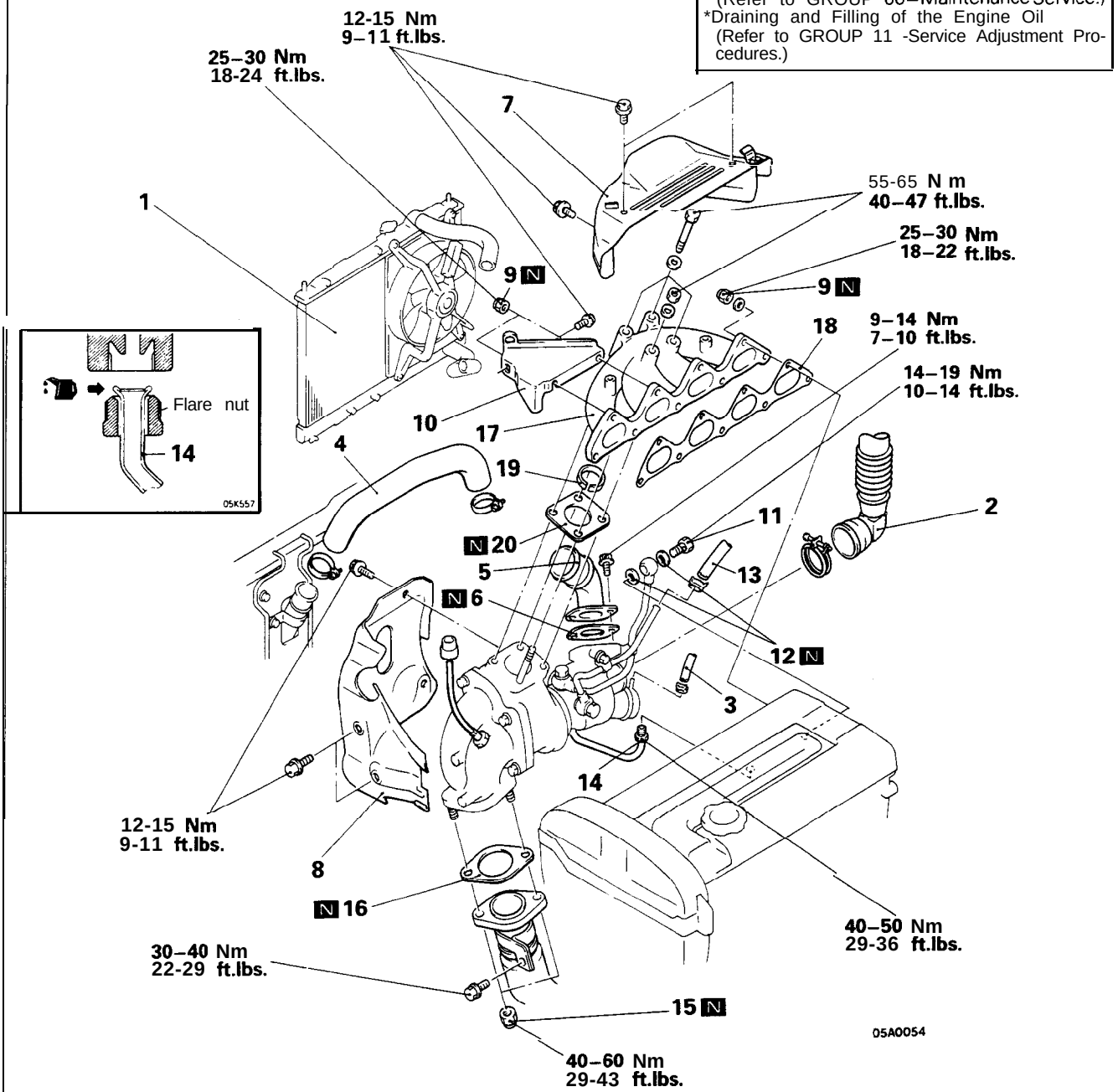
TSB Revision

WATER HOSE AND WATER PIPE <DOHC (Turbo)> <Up to 1992 models>

M14IA-C

REMOVAL AND INSTALLATION

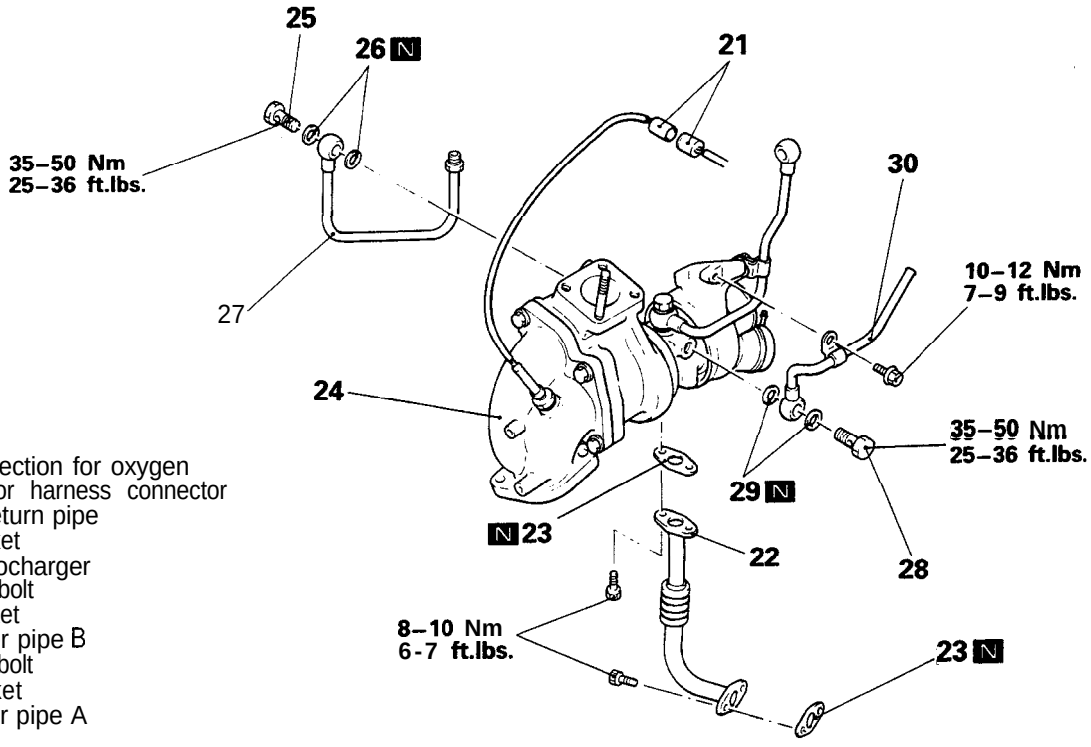
Pre-removal and Post-installation Operation
- Draining and Filling of the Engine Coolant (Refer to GROUP 00–Maintenance Service.)
- *Draining and Filling of the Engine Oil (Refer to GROUP 11 -Service Adjustment Procedures.)



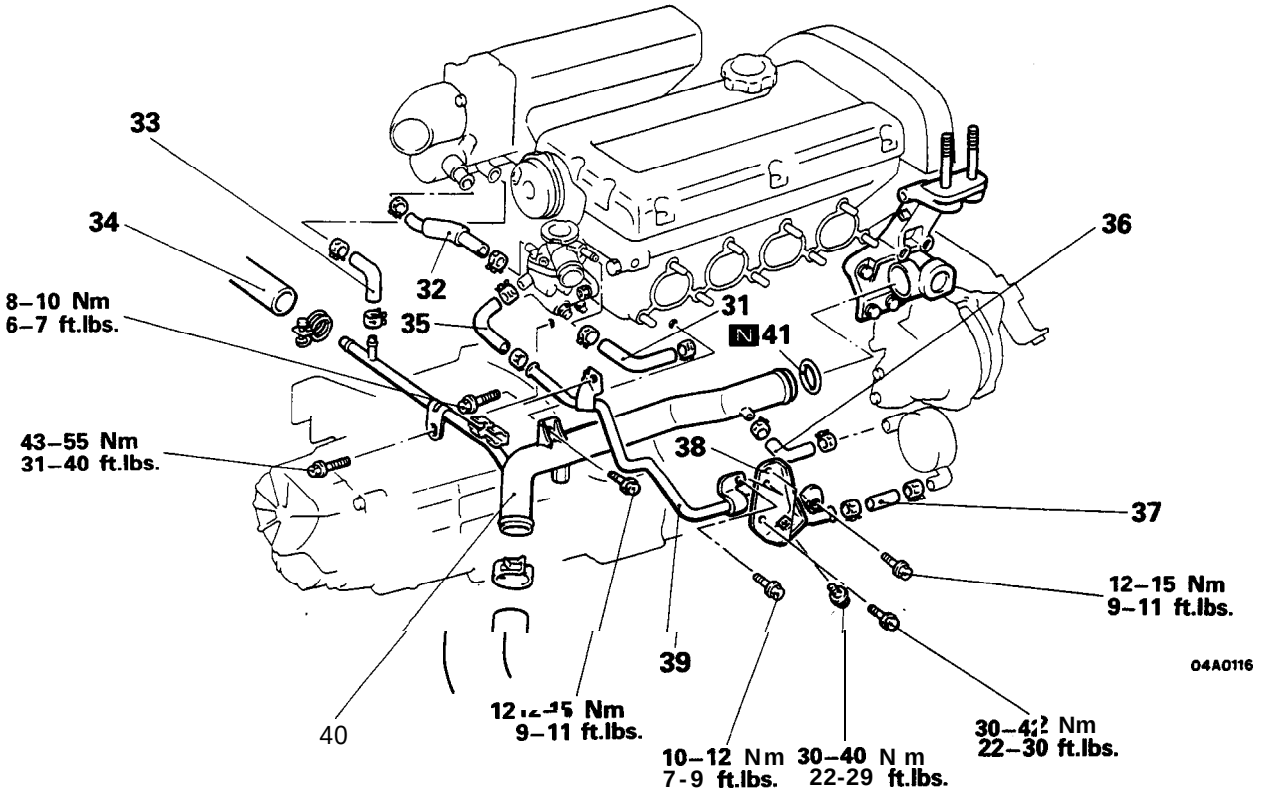
Removal steps

1. Radiator (Refer to P.14-9.)
2. Connection for air intake hose
3. Connection for vacuum hose
4. Connection for air hose A
5. Air outlet fitting
6. Gasket
7. Heat protector A
8. Heat protector B
9. Self-locking nut
10. Engine hanger
11. Eye bolt
12. Gasket
13. Connection for water hose
14. Connection for water pipe B
15. Self-locking nut
16. Gasket
17. Exhaust manifold
18. Exhaust manifold gasket
19. Ring
20. Gasket

TSB Revision



21. Connection for oxygen sensor harness connector
22. Oil return pipe
23. Gasket
◆◆▶◆ 24. Turbocharger
25. Eye bolt
26. Gasket
27. Water pipe B
28. Eye bolt
29. Gasket
30. Water pipe A



31. Water hose (To turbocharger)
32. Water hose
33. Water by-pass hose
34. Connection for heater hose
35. Water hose
36. Water hose
37. Water hose
38. Exhaust pipe support bracket
39. Water pipe
40. Water inlet pipe (Refer to P.14-18.)
41. O-ring (Refer to P.14-18.)

SERVICE POINTS OF REMOVAL M14IBAG

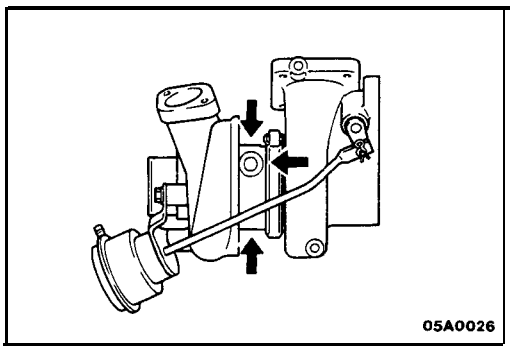
24. REMOVAL OF TURBOCHARGER ASSEMBLY

Remove the turbocharger assembly with the exhaust fitting, water pipe A, water pipe B and the oil pipe attached to it.

INSPECTION M14ICAE

WATER PIPE AND HOSE INSPECTION

Refer to P.14-23.



SERVICE POINTS OF INSTALLATION M14IDAR

24. INSTALLATION OF TURBOCHARGER ASSEMBLY

Clean the alignment surfaces shown in the illustration.

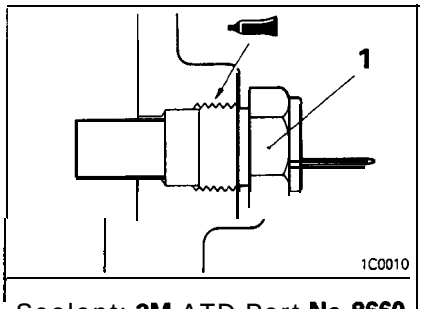
Caution
When cleaning, care must be taken so that a piece of the gasket does not enter the oil passage hole.

ENGINE COOLANT TEMPERATURE GAUGE UNIT, ENGINE COOLANT TEMPERATURE SENSOR AND ENGINE COOLANT TEMPERATURE SWITCH

M1408--

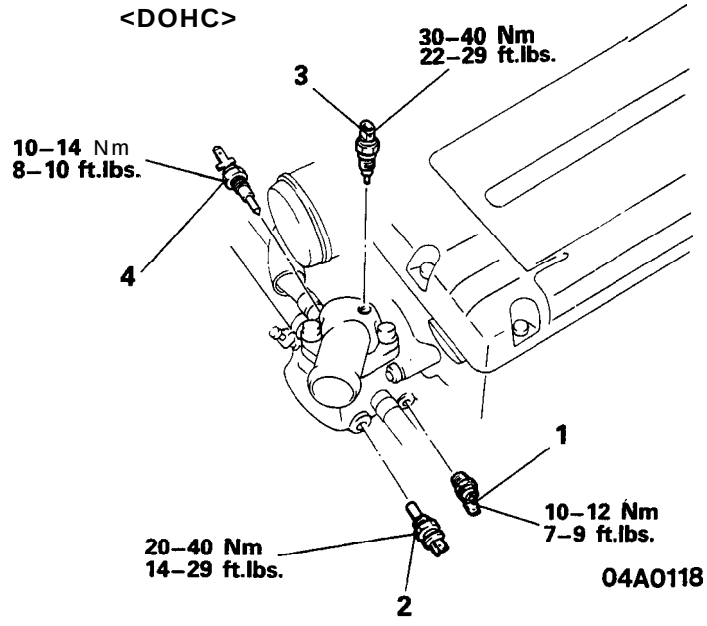
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Draining and Supplying of the Engine Coolant (Refer to GROUP 00–Maintenance Service.)



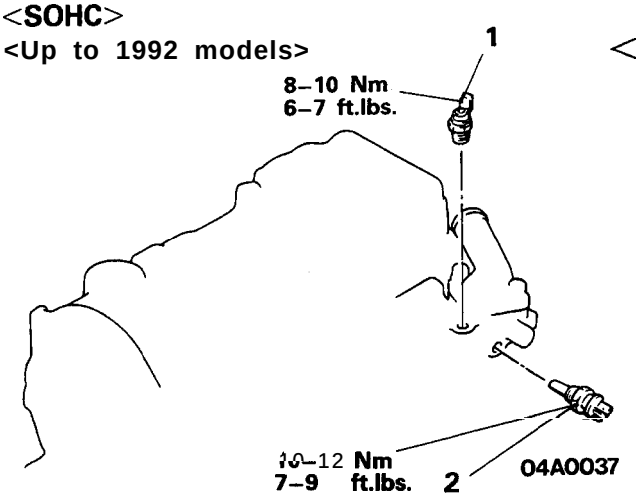
Sealant: 3M ATD Part No.8660 or equivalent

<DOHC>

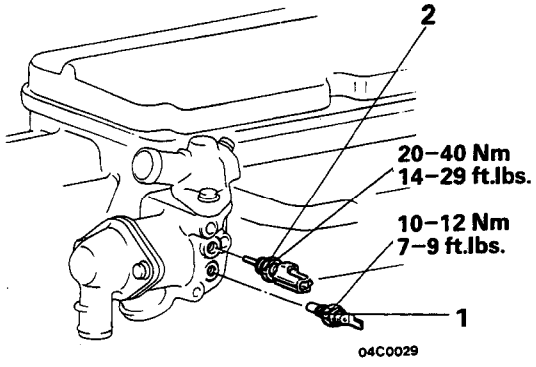


<SOHC>

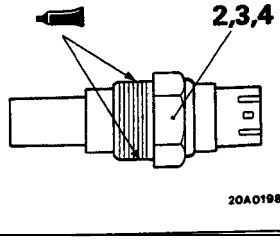
<Up to 1992 models>



<1993 models>



1. Engine coolant temperature gauge unit
2. Engine coolant temperature sensor (Engine control)
3. Air conditioning engine coolant temperature switch <always closed type>
4. Engine coolant temperature switch, <always opened type> (Air conditioning or A/T control)



Sealant: 3M Nut locking Part No.4171 or equivalent

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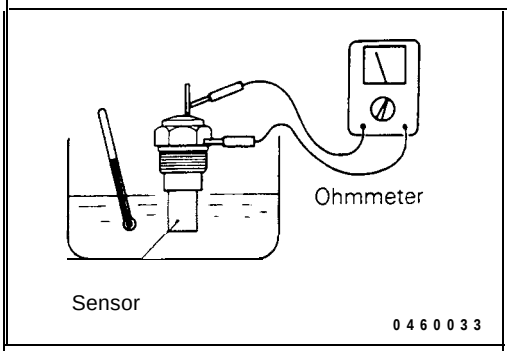


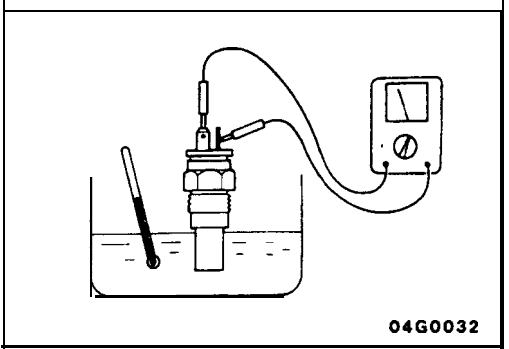
INSPECTION

M140DAM

ENGINE COOLANT TEMPERATURE GAUGE UNIT

Raise the water temperature and measure the resistance if within the standard value.

Standard value: 104 ± 13.5 Ω [at 70°C (158°F)]

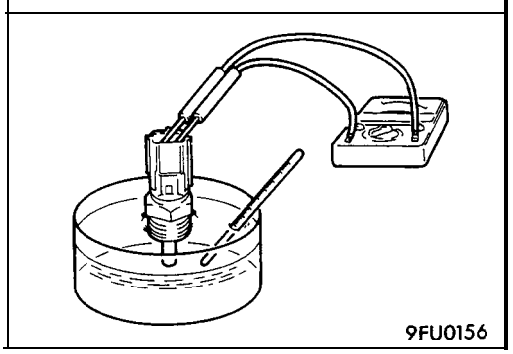


ENGINE COOLANT TEMPERATURE SENSOR (Engine control) <Up to 1992 models>

Raise the water temperature and measure the resistance if within the standard value.

Standard value:

At 20°C (68°F)	**2.45 ± 0.24 kΩ**
At 80°C (176°F)	**296 ± 32 Ω**



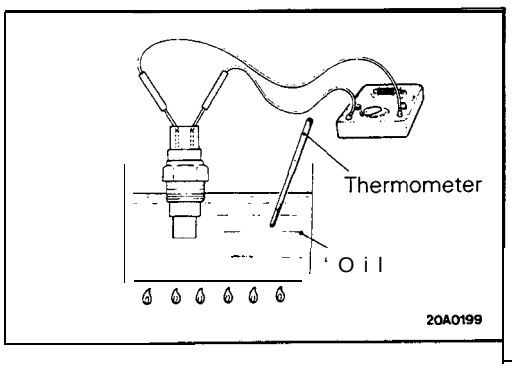
<1993 models>

(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 (°F)]	Resistance (kΩ)
0 (32)	**5.8**
20 (68)	**2.4**
40 (104)	1.1
80 (176)	**0.3**

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



AIR CONDITIONING ENGINE COOLANT TEMPERATURE SWITCH

<Normal closed type>

(1) Immerse the air conditioning engine coolant temperature switch in oil and then heat (by using a gas stove flame or similar method) so as to increase the oil temperature.

(2) Check to be sure that the air conditioning engine coolant temperature switch is switched OFF when the oil temperature reaches the standard value.

Standard value: 112–118°C (234–244°F)

Caution

The oil used above should be engine oil and should be stirred well while being heated; do not heat more than necessary.

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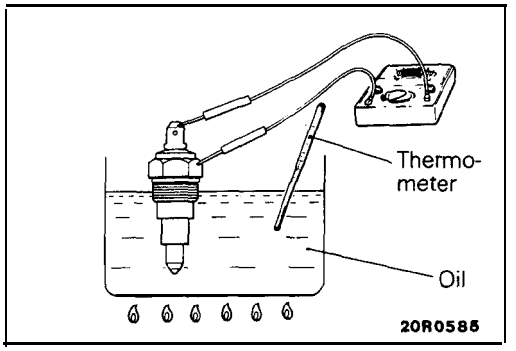

ENGINE COOLANT TEMPERATURE SWITCH
<Normal opened type>
(Air conditioning or A/T control)

(1) Remove the engine coolant temperature switch from the water outlet fitting.
(2) immerse the engine coolant temperature switch in oil and heat by a gas stove or similar method so as to increase the oil temperature.
(3) Check to be sure that the engine coolant temperature switch is switched ON when the oil temperature reaches the standard value.

Standard value: 100–104°C (212–219°F)

Caution
Use engine oil for this test; stir it well while heating, and do not heat more than necessary.

NOTES

INTAKE AND EXHAUST

CONTENTS

M15AA--

AIR CLEANER 9

CHARGE AIR COOLER 12

EXHAUST MANIFOLD <DOHC-Non-Turbo> 30

EXHAUST MANIFOLD <SOHC-8 VALVE> 27

EXHAUST MANIFOLD <SOHC-16 VALVE> 28

EXHAUST PIPE AND MAIN MUFFLER <DOHC> 33

EXHAUST PIPE AND MAIN MUFFLER <SOHC> 32

INTAKE MANIFOLD <DOHC> 21

INTAKE MANIFOLD <SOHC-8 VALVE> 14

INTAKE MANIFOLD <SOHC-16 VALVE> 18

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- Intake Charge Pressure Control System Inspection 7
- Turbocharger Bypass Valve Inspection 8
- Turbocharger Supercharging Pressure Inspection 7
- Turbocharger Waste Gate Solenoid Inspection 8
- Intake Manifold Vacuum Inspection ..... Refer to GROUP 11

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- Torque Specifications 2

TROUBLESHOOTING 5

- Abnormal Noise
- Exhaust Gas Leakage

TURBOCHARGER 24

SPECIFICATIONS

GENERAL SPECIFICATIONS

M15CA--

Items	Specifications
Air cleaner	
Element	Unwoven cloth type
Exhaust system	
Front exhaust pipe <Non-Turbo>	Dual type
Front exhaust pipe <Turbo>	Single type
Muffler	Expansion resonance type
Coupling	Flat coupling
Suspension system	Rubber hangers and O-rings
Turbocharger	
Type	Exhaust gas turbine type
Identification No.	TD05H-14B-6
intake charge pressure control	Turbocharger waste gate actuator and valve
Intercooler	
Type	Air cooled type

SERVICE SPECIFICATIONS

M15CB--

Items		Standard	Limit
Intake and exhaust manifolds			
Distortion of cylinder head contacting surface	mm (in.)	Less than 0.15 (.0059)	0.3 (.012)
Turbocharger waste gate solenoid terminal resistance [at 20°C (68°F)]	Ω	36-44	
Turbocharger			
Supercharging pressure	kPa (psi)	31–70 (4.4–10.1)	

TORQUE SPECIFICATIONS

M15CC--

Items	Nm	ft.lbs.
Air cleaner		
Air cleaner to body	8–10	6-7
Air duct	8–10	6–7
Resonator	8–10	6-7
Branch tube	8–10	6-7
Charge air cooler		
Air hose B	8–10	6-7
Air pipe A	12-15	9-11
Air pipe B	12-15	9-11
Turbocharger by-pas valve to air pipe B	15-22	11-16
Charge air cooler	12–15	9-11

Items	Nm	ft.lbs.
Intake manifold <SOHC>		
Accelerator cable to intake manifold plenum	**4-6**	**3-4**
Fuel high pressure hose to fuel rail	**4-6**	**3-4**
Fuel rail to intake manifold	10–13	7-9
Ignition coil <8 VALVE>	**12-15**	**9-11**
Intake manifold stay	**18-25**	**13-18**
Intake manifold to engine	15–20	11–14
Throttle body		
<8 VALVE>	10–13	**7-9**
<16 VALVE>	**15-22**	11–16
Intake manifold plenum stay	15–20	11–14
Intake manifold plenum to intake manifold	15–20	11–14
Water outlet fitting	17–20	**12-14**
EGR valve		
<8 VALVE>	10–15	**7-11**
<16 VALVE>	**17-26**	**13-18**
EGR temperature sensor <Vehicles for California>	10–12	7-9
Distributor	10–13	7-9
Thermo valve <Vehicles for Federal>	20–40	**14-28**
Control harness protector to intake manifold plenum	**4-6**	**3-4**
Vacuum pipe and hose assembly to intake manifold	**8-12**	**6-8**
ntake manifold <DOHC>		
Accelerator cable to intake manifold	**4-6**	**3-4**
Throttle body stay	**15-22**	11–16
Fuel high pressure hose to fuel rail	**4-6**	**3-4**
Fuel rail to engine	10–13	7-9
Intake manifold stay	25–30	**18-22**
Intake manifold to engine		
Mounting bolt (M8)	15–20	11–14
Mounting nut and bolt (M10)	30–42	22–30
Ignition coil	20–27	14–20
Ignition power transistor unit	10–12	7-9
Throttle body	**15-22**	11–16
EGR valve	15–22	11–16
EGR temperature sensor <Vehicles for California>	10–12	7-9
Control harness protector to intake manifold	**4-6**	**3-4**
Control harness clamp bolt	10–12	7-9
xhaust manifold <SOHC>		
Heat protector to exhaust	**12-15**	9-11
Exhaust manifold to engine		
<8 VALVE>	15–20	11–14
< 16 VALVE>	25–30 **27-33**	**18-22** 20–23
Oxygen sensor	40–50	29-36
xhaust manifold <DOHC (Non-turbo)>		
Exhaust manifold cover (A), (B)	12–15	9-11
Engine hanger to engine mount	**12-15**	9-11
Engine manifold to engine	25–30	**18-22**
Oxygen sensor	40–50	29-36

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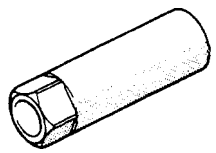
Items	N·m	ft.lbs.
Exhaust manifold <DOHC (turbo)>		
Front exhaust pipe to exhaust fitting	40–60	29-43
Front exhaust pipe to engine	30–40	22-29
Heat protector (A), (B)	12-15	9-11
Engine oil level gauge guide mounting bolt	12-15	9-11
Engine hanger to engine	12-15	9-11
Exhaust manifold to engine	25–30	18-22
Exhaust manifold to turbocharger	55-65	40–47
Oil pipe to engine	14-19	10–14
Water pipe.(B) to water inlet pipe	40–50	29-36
Turbocharger waste gate actuator	10–13	7-9
Oxygen sensor	40–50	29-36
Water pipe (B) to turbocharger	35–50	25-36
Air outlet fitting	17–20	12-14
Oil pipe to turbocharger	28-34	20–25
Water pipe (A) to turbocharger	35–50	25-36
Water pipe (A) mounting bolt	10–12	7-9
Exhaust fitting	55-65	40–47
Oil return pipe	8–10	6-7
Exhaust manifold and turbocharger		
Front exhaust pipe to turbocharger	40–60	29-43
Front exhaust pipe to engine	30–40	22-29
Heat protector (A), (B)	12-15	9-11
Engine hanger to engine	12-15	9-11
Exhaust manifold to engine	25–30	18-22
Exhaust manifold to turbocharger	55-65	40–47
Oil pipe to engine	14-19	10–14
Water pipe (B) to water inlet pipe	40–50	29-36
Oxygen sensor	40–50	29-36
Water pipe (B) to turbocharger	35–50	25-36
Air outlet fitting	17–20	12-14
Oil pipe to turbocharger	28-34	20–25
Water pipe (A) to turbocharger	35–50	25-36
Water pipe (A) mounting bolt	10–12	7-9
Exhaust fitting	55-65	40–47
Oil return pipe	8–10	6-7
Exhaust pipe and main muffler		
Front exhaust pipe to exhaust manifold		
<FWD>	40–50	29-36
<AWD (Non-Turbo)>	30–40	22-29
<AWD (Turbo)>	40–60	29-43
Front exhaust pipe clamp	30–40	22-29
Rubber hanger	10–15	7-11
Front exhaust pipe to catalytic converter	40–60	29-43
Catalytic converter to center exhaust pipe	30–40	22-29
Hanger bracket to body	10–15	7-11
Hook to center exhaust pipe	10–15	7-11
Center exhaust pipe to main muffler	30–40	22–29
Moulding to main muffler	4-6	3-4

TSB Revision

SPECIAL TOOL

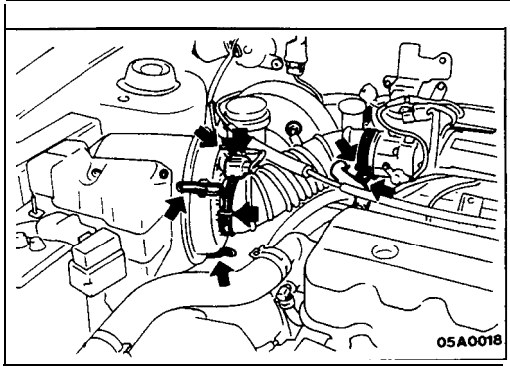
M15DA-

Tool	Number	Name	Use
	M 0998703	Oxygen sensor wrench	Removal/Installation of oxygen sensor < Non-Turbo >
	MD998748	Oxygen sensor wrench	Removal/Installation of oxygen sensor <Turbo>

TROUBLESHOOTING

M15EAAB

Symptom	Probable cause	Remedy
Exhaust gas leakage	Loose joints	Retighten
	Broken pipe or muffler	Repair or replace
Abnormal noise	Broken separator in muffler	Replace
	Broken rubber hangers	
	Interference of pipe or muffler with vehicle body	Correct
	Broken pipe or muffler	Repair or replace



SERVICE ADJUSTMENT PROCEDURES

M15GBAF

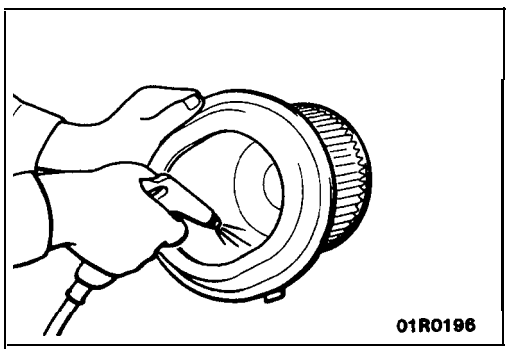
AIR CLEANER ELEMENT INSPECTION AND REPLACEMENT

<Non-Turbo>

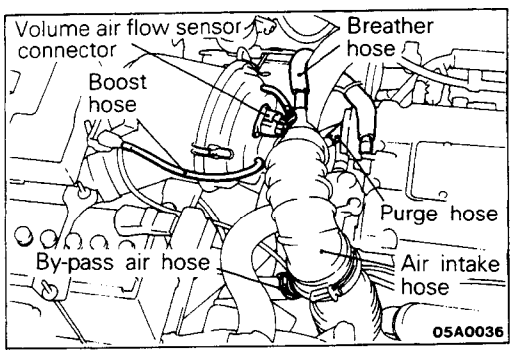
(1) Disconnect the volume air flow sensor connector.
(2) Disconnect the connection of the breather hose.
(3) Remove the air intake hose.
(4) Push the air intake hose backward, and remove the air cleaner cover.

Caution
Care must be taken when removing the air cleaner cover, because the volume air flow sensor is attached.

(5) Take out the air cleaner element.



(6) Check the air cleaner element for dirt or clogging; if necessary, clean by using compressed air.
(7) Replace the air cleaner element if the dirt or clogging is serious.
(8) Insert the element into the air cleaner body and install the air cleaner cover.
(9) Install the air intake hose.
(10) Connect the breather hose and the volume air flow sensor connector.



<Turbo>

(1) Disconnect the volume air flow sensor connector.
(2) Disconnect the breather hose, purge hose, by-pass air hose and boost hose connections.
(3) Remove the air intake hose on the air cleaner cover side and then move the air intake hose to the front of the air cleaner body.
(4) Unclamp the air cleaner cover.

Caution
Care must be taken when removing the air cleaner cover, because the volume air flow sensor is attached.

(5) Take out the air cleaner element.
(6) Check the air cleaner element for dirt or clogging; if necessary, clean by using compressed air.
(7) Replace the air cleaner element if the dirt or clogging is serious.
(8) Insert the element into the air cleaner body and install the air cleaner cover.
(9) Install the air intake hose.
(10) Connect the breather hose, purge hose, by-pass air hose and boost hose.
(11) Connect the volume air flow sensor connector.

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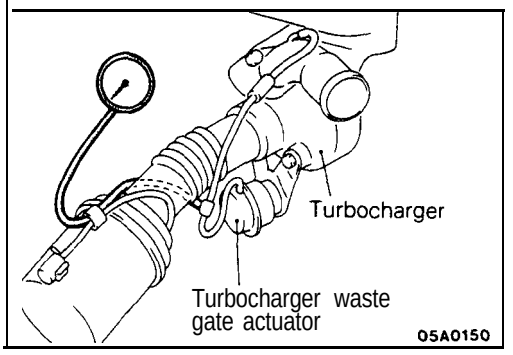


TURBOCHARGER SUPERCHARGING PRESSURE INSPECTION M15GAAB

Caution
Perform running inspection with two passengers in the vehicle and where full throttle acceleration can be safely made.
The pressure gauge reading is taken by a front seat passenger.

(1) Disconnect the supercharging pressure control hose at the solenoid valve (fixed to the air cleaner), and plug the nipple. Attach the pressure gauge to the hose.
(2) Drive the vehicle with full throttle and accelerate the engine to a speed of more than 3,500 rpm at 2nd gear. Measure the supercharging pressure when the pointer is stabilized.

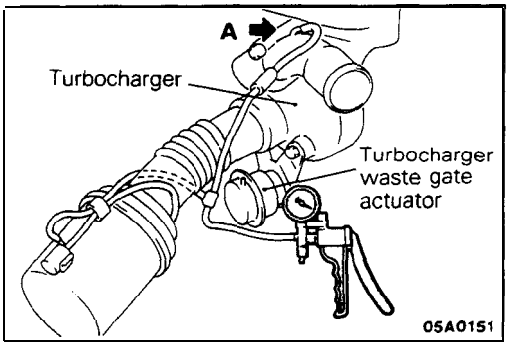
Standard value: 31–70 kPa (4.4–10.1 psi)

Caution
If the supercharging pressure deviates from the standard value, check the following items for possible causes.

When pressure is high:
Turbocharger waste gate actuator malfunction

When pressure is low:
Turbocharger waste gate actuator malfunction
Supercharging pressure leaks
Faulty turbocharger

INTAKE CHARGE PRESSURE CONTROL SYSTEM INSPECTION M15GFAAa



(1) Disconnect the vacuum hose (white-striped) from the turbocharger waste gate actuator, and connect the hand vacuum pump to the vacuum hose.
(2) Disconnect the vacuum hose (black) from the boost nipple which controls the turbocharger waste gate actuator.
(3) Insert the blind plug into the nipple from which the vacuum hose was disconnected.
(4) Keep the (–) terminal of the battery disconnected for 10 seconds or longer, and then reconnect the terminal.
(5) Close and open the vacuum hose (black) end with your finger, and apply negative pressure to check the negative pressure state.

Engine state	Hose (black)	Normal state
stop (Ignition switch: ON)	Opened	Negative pressure leaks.
	Closed by finger	Negative pressure is maintained.
Idling		Negative pressure leaks.

NOTE
If negative pressure is not normal, it can be assumed that there is a malfunction in the turbocharger waste gate solenoid or vacuum hose.

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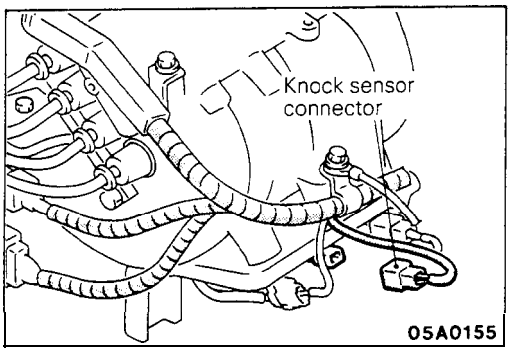


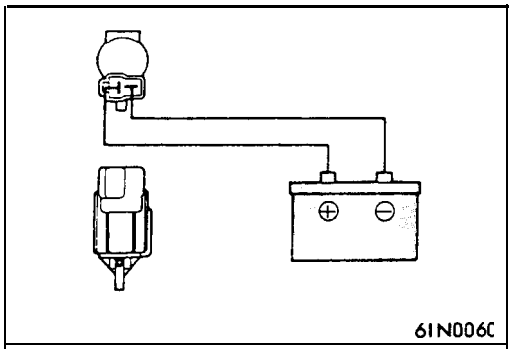
(6) Put a blind plug on the vacuum hose (black) end.
(7) Apply negative pressure when idling. and check the negative pressure state when the knock sensor is connected and disconnected.

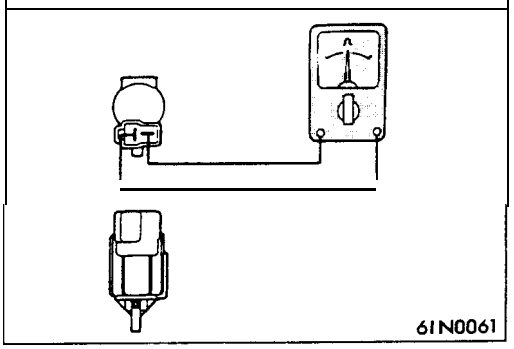
Engine state	Knock sensor connector	Normal state
Idling	Connection	Negative pressure leaks.
	Disconnection	Negative pressure is maintained.

NOTE
If negative pressure is not normal, it can be assumed that there is a malfunction in the knock sensor circuit.

(8) Turn off the ignition switch, and connect the connector of the knock sensor.
(9) Use scan tool to erase the diagnostic trouble code or disconnect the (−) terminal of the battery for 10 seconds or more.

NOTE
This erases the diagnostic memory of the knock sensor trouble by disconnecting the knock sensor connector.



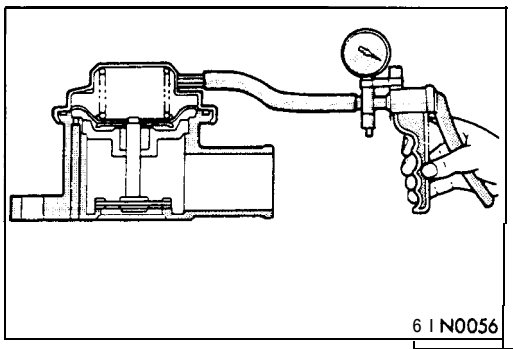


TURBOCHARGER WASTE GATE SOLENOID INSPECTION M15GGAA

(1) Operation check
Using a hand vaccum pump, apply a negative pressure to the solenoid valve nipple on which the white vacuum hose is connected, and check air-tightness when the voltage is applied to the solenoid valve terminal and when it is released from the terminal.

Battery voltage	Other nipple of solenoid valve	Normal state
When applied	Opened	Negative pressure leaks.
	Closed by finger	Negative pressure is maintained.
When released	Opened	Negative pressure is maintained.

(2) Continuity check of coil
Measure the solenoid valve terminal resistance.
Standard value: 36-44 Ω [at 20°C (68°F)]



TURBOCHARGER BYPASS VALVE INSPECTION M15GHAA

(1) Remove the turbocharger bypass valve.
(2) Connect the hand vacuum pump to the nipple of the turbocharger bypass valve.
(3) Apply a negative pressure of approx. 53.3 kPa (7.7 psi), and check operation of the valve. Also check that air tightness is maintained.

Negative 'pressure	Valve operation
About 53.3 kPa (7.7 psi)	It starts opening.

-1

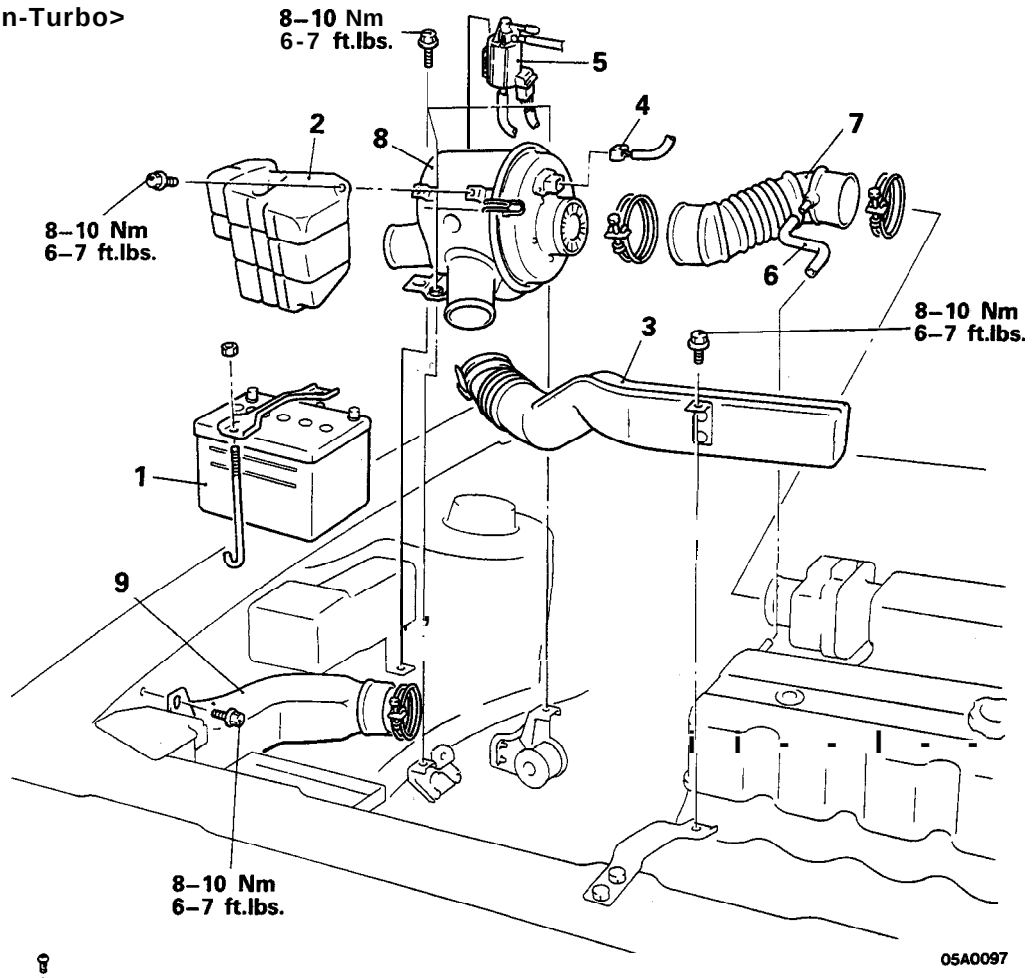
TSB Revision

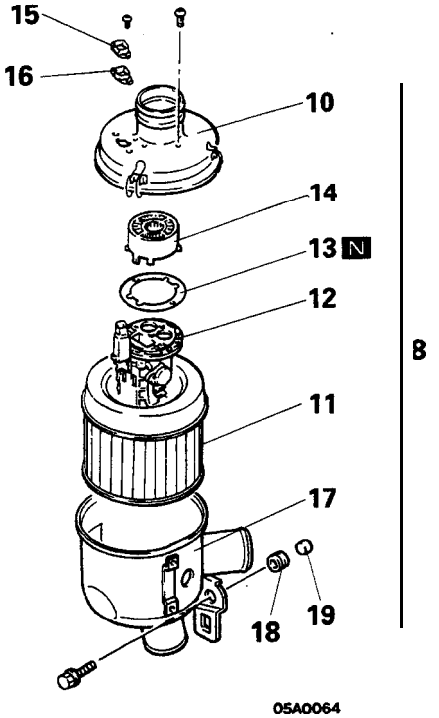
AIR CLEANER

REMOVAL AND INSTALLATION

M15FA--

<Non-Turbo>



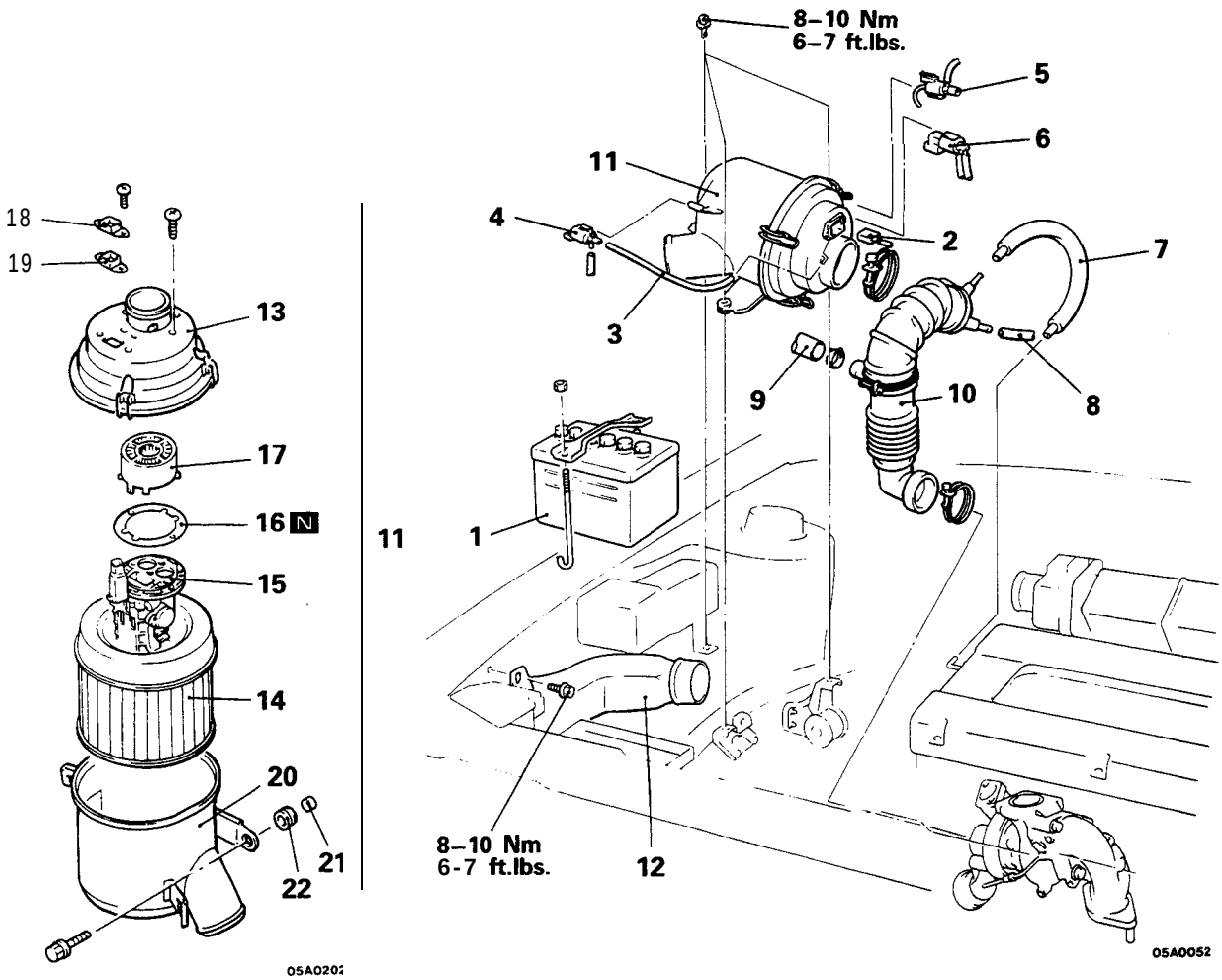


Removal steps

1. Battery
2. Resonator
3. Branch tube
4. Connection for volume air flow sensor connector
5. EGR solenoid <Vehicles for California>
6. Breather hose
7. Air intake hose
8. Air cleaner
9. Air duct
10. Air cleaner cover
11. Air cleaner element
12. Volume air flow sensor assembly
13. Volume air flow sensor gasket
14. Noise reduction filter
15. Cover
16. Grommet
17. Air cleaner body
18. Insulator
19. Collar

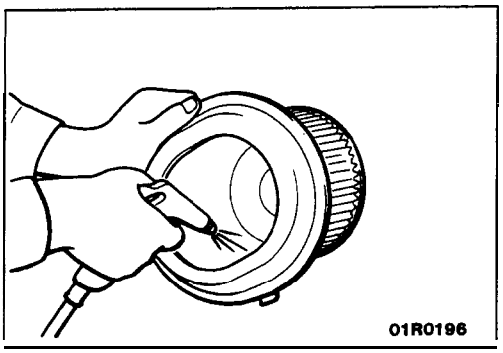
TSB Revision

<Turbo>



Removal steps

1. Battery
2. Connection for volume air flow sensor connector
3. Connection for boost hose
4. Turbocharger waste gate solenoid
5. Fuel pressure solenoid
6. EGR solenoid (Vehicles for California)
7. Breather hose
8. Purge hose
9. By-pass air hose
10. Air intake hose
11. Air cleaner
12. Air duct
13. Air cleaner cover
14. Air cleaner element
15. Volume air flow sensor assembly
16. Volume air flow sensor gasket
17. Noise reduction filter
18. Cover
19. Grommet
20. Air cleaner body
21. Insulator
22. Collar



INSPECTION M15FCABa

- Check the air cleaner body, cover or packing for deformation, corrosion or damage.
- Check the air duct for damage.
- Check the air cleaner element for clogging, contamination or damage.
  If element is slightly clogged, remove dust by blowing air from inside of element.

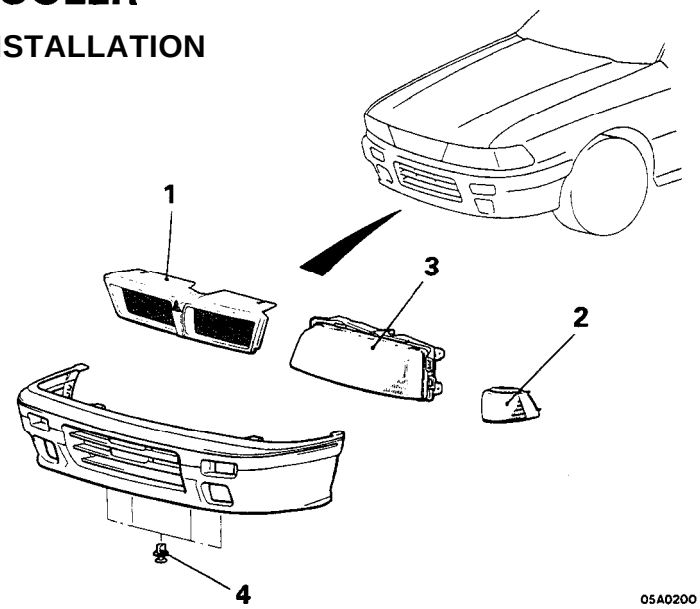
VOLUME AIR FLOW SENSOR CHECK

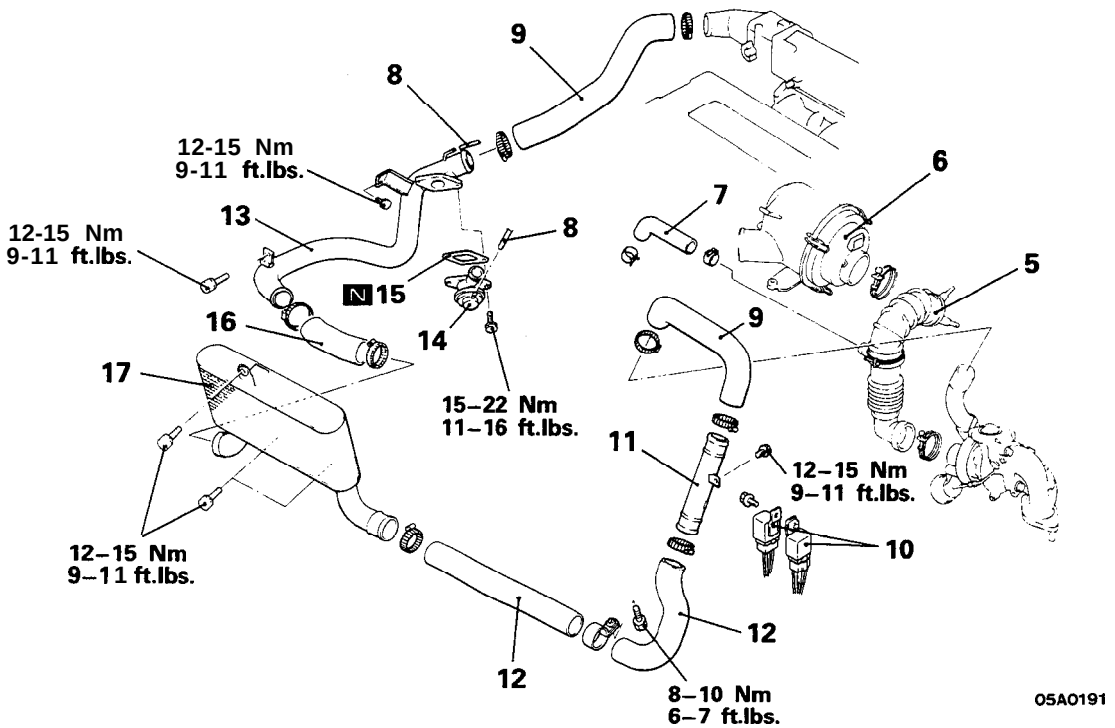
For inspection of volume air flow sensor, refer to GROUP 13–Volume Air Flow Sensor Check.

CHARGE AIR COOLER

M15TA--

REMOVAL AND INSTALLATION

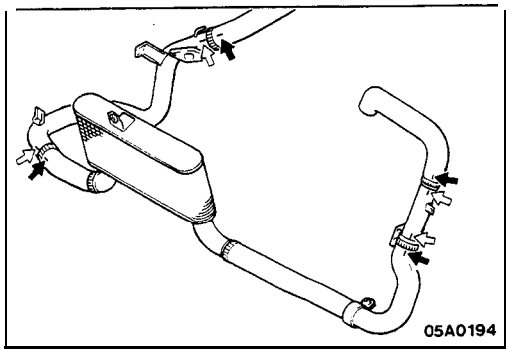




Removal steps

◀■▶ 1. Radiator grille (Refer to GROUP 51 -Front Grille.)
◀■▶▶◀ 2. Front combination light (Refer to GROUP 54–Headlight.)
3. Headlight
4. Front bumper face coupling clip
5. Air intake hose
6. Air cleaner (Refer to P.15-9.)
7. Air by-pass hose
8. Vacuum hose
9. Air hose A
10. Power relay assembly (for A/C)
11. Air pipe A
12. Air hose B
13. Air pipe B
14. Turbocharger by-pass valve
15. Gasket
16. Air hose C
● + 17. Charge air cooler

TSB Revision



INSPECTION M15TCAA

- Check the charge air cooler fins for bending, damage, or foreign matter.
- Check the charge air cooler hoses for cracking, damage, or wear.

SERVICE POINTS OF INSTALLATION M15TDAB

17. INSTALLATION OF CHARGE AIR COOLER

Connect the air hoses and air pipes by aligning the paint marks on the hoses with the projections and indentations on the pipes.

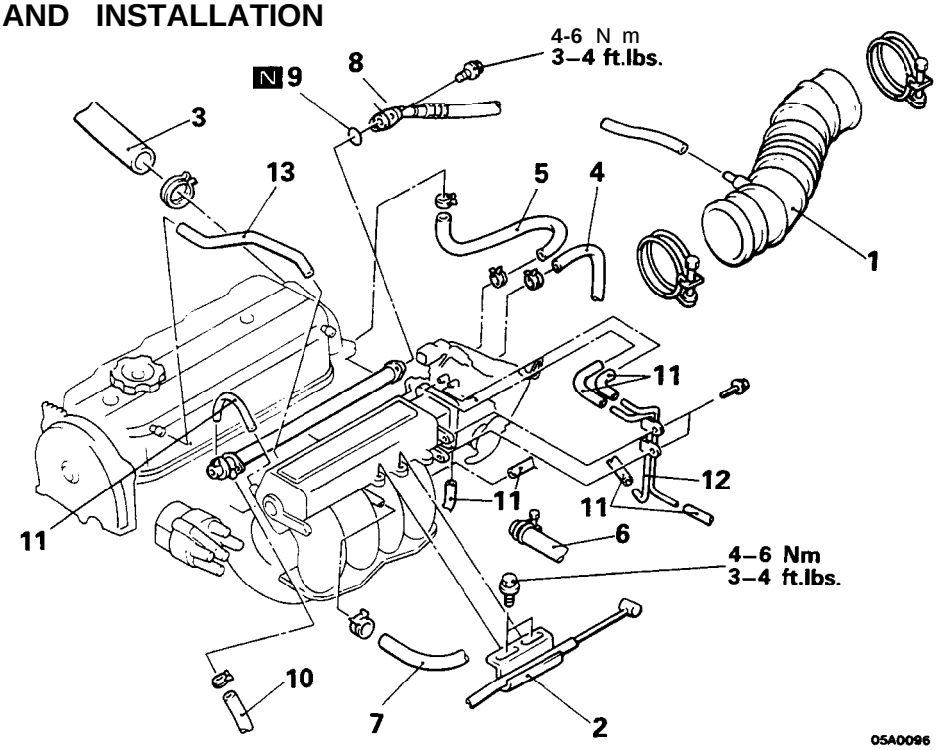
Caution
Be careful not to allow any foreign matter to get into the hoses, pipes, or the charge air cooler itself.

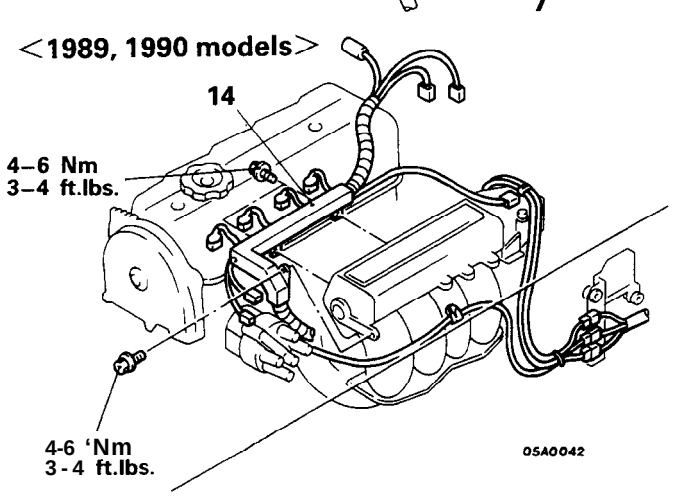
NOTE
⇦: Projection or indentation (pipe)
⬅: Paint mark (hose)

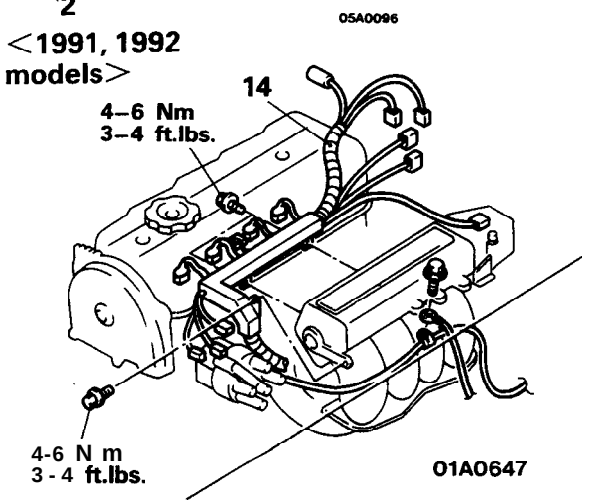
INTAKE MANIFOLD <SOHC-8 VALVE> <Up to 1992 models>

REMOVAL AND INSTALLATION

M15MA-A







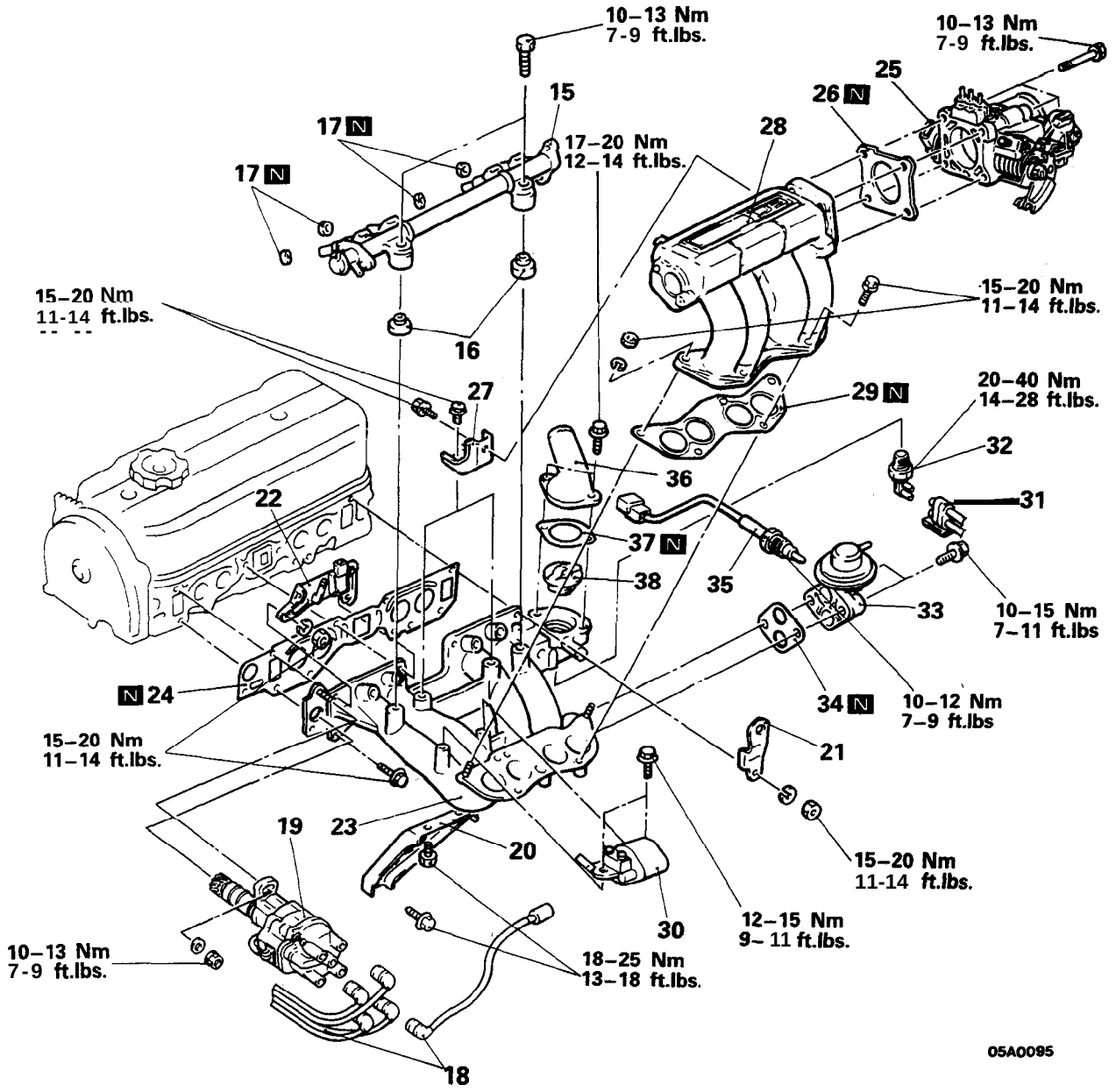
Removal steps

1. Air intake hose
2. Connection for accelerator cable
3. Connection for radiator upper hose
4. Connection for water by-pass hose
5. Water hose
6. Connection for heater hose
7. Connection for brake booster vacuum hose
8. Connection for fuel high pressure hose
9. O-ring
10. Connection for fuel return hose
11. Connection for vacuum hoses
12. Vacuum pipe
13. PCV hose
14. Connection for control harness

Pre-removal Operation
- Draining of Engine Coolant (Refer to GROUP 00–Maintenance Service.)

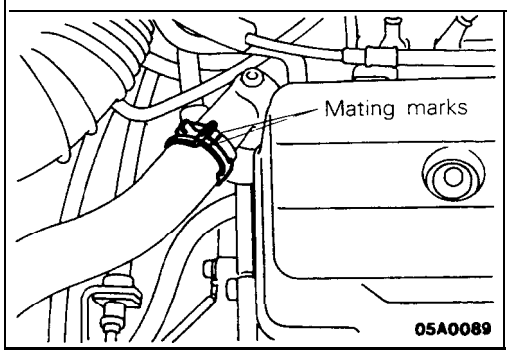
Post-installation Operation
- Filling of Engine Coolant (Refer to GROUP 00–Maintenance Service.)
- Adjustment of Accelerator Cable (Refer to GROUP 13–Engine Control.)
- inspection of Fuel Pressure (Refer to GROUP 13–On-Vehicle Inspection of MFI Components.)

TSB Revision



◆◆ ◆◆ 15. Fuel rail, fuel injector and pressure regulator
16. Insulator
17. Insulator
18. High tension cable and spark plug cable
19. Distributor
20. Intake manifold stay
21. Engine hanger
22. Ignition power transistor bracket
23. Intake manifold
24. Intake manifold gasket
25. Throttle body assembly
26. Gasket
(Refer to GROUP 13–Throttle Body.)
27. Intake manifold plenum stay
28. Intake manifold plenum
29. Intake manifold plenum gasket
30. Ignition coil
31. Thermal vacuum valve <Vehicles for Federal>
32. Thermo valve <Vehicles for Federal>
33. EGR valve
34. EGR gasket
35. EGR temperature sensor <Vehicles for California>
36. Water outlet fitting
37. Gasket
38. Thermostat

TSB Revision



SERVICE POINTS OF REMOVAL M15MBAIa

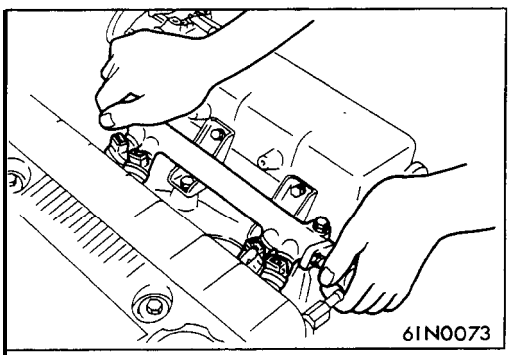
3. DISCONNECTION OF RADIATOR UPPER HOSE

Make mating marks on the radiator hose and the hose clamp, and then remove the radiator hose.

8. DISCONNECTION OF FUEL HIGH PRESSURE HOSE

Relieve pressure in the fuel pipe line to prevent fuel outflow.
(Refer to GROUP 13–Service Adjustment Procedures.)

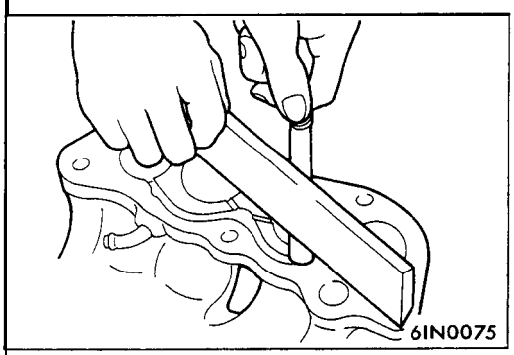
Caution
Cover fuel pipe line with rag after relieving pressure as certain pressure may still remain.



15. REMOVAL OF FUEL RAIL, FUEL INJECTION AND PRESSURE REGULATOR

Remove fuel rail with fuel injector and pressure regulator.

Caution
Do not drop injector when removing fuel rail.



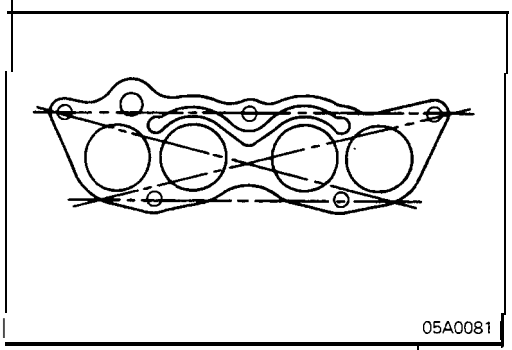
INSPECTION M15MCAI

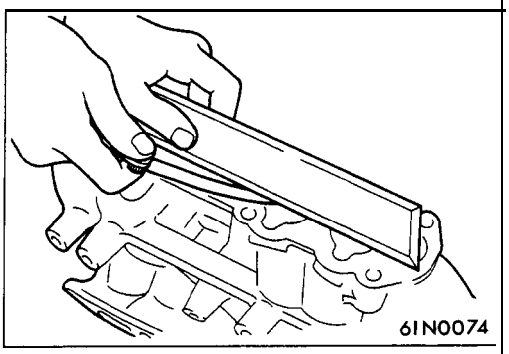
Check the following points; replace the part if a problem is found.

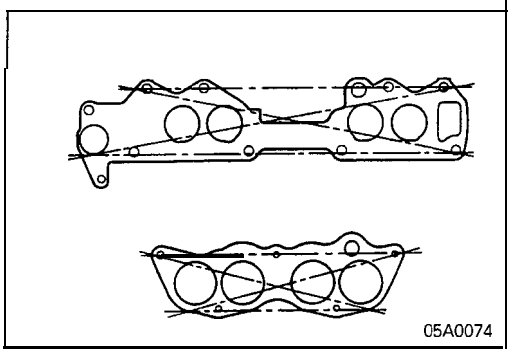
INTAKE MANIFOLD PLENUM

(1) Check intake manifold plenum for defect or cracks. Replace if defective or cracked.
(2) Check load (negative pressure) of drain port. Check cooling water and jet air passages for clogging. Clean if required.
(3) Check deflection of installation surface with straight edge and feeler gauge.

Standard value: 0.15 mm (.006 in.) or less
Limit: 0.3 mm (.012 in.)





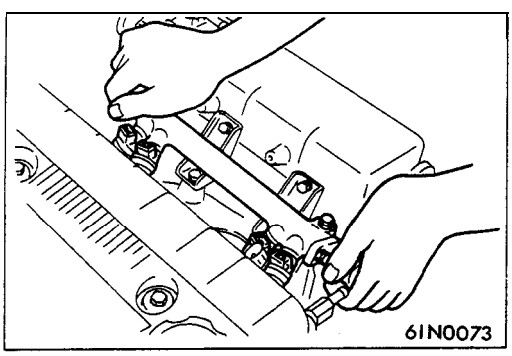


INTAKE MANIFOLD

(1) Check for damage or cracking of any part.
(2) Check load (negative pressure) of drain port. Check cooling water and jet air passages for clogging. Clean if required.
(3) Check deflection of installation surface with straight edge and feeler gauge.

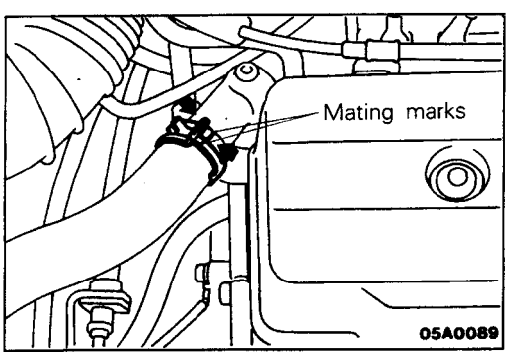
Standard value: 0.15 mm (.006 in.) or less
Limit: 0.3 **mm (.012 in.)**

SERVICE POINTS OF INSTALLATION M15MDAK



15. INSTALLATION OF FUEL RAIL, FUEL INJECTOR AND PRESSURE REGULATOR

Caution
Be careful not to drop the injector when the fuel rail is installed.



3. CONNECTION OF RADIATOR UPPER HOSE

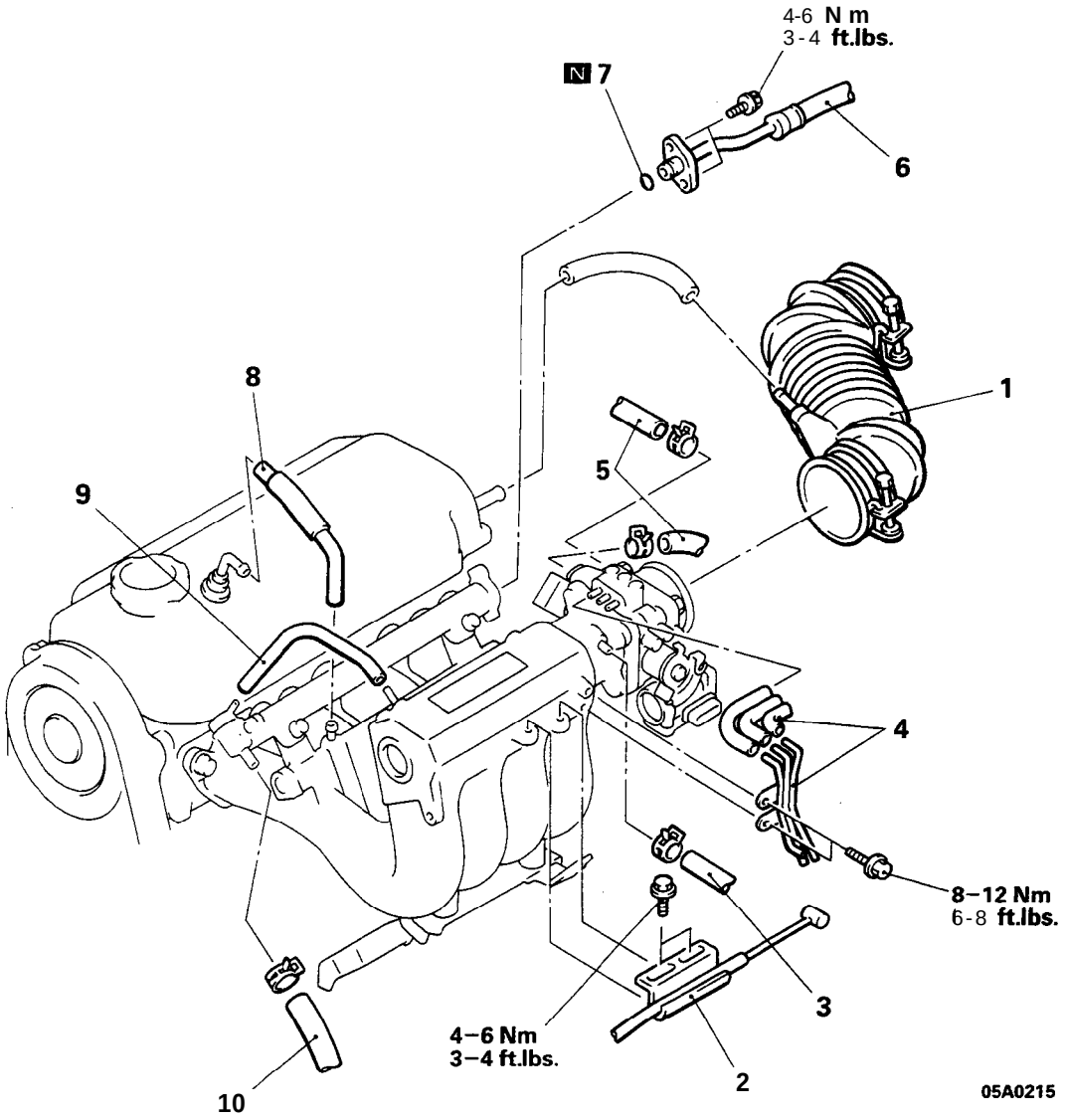
Align the mating marks on the radiator hose and the hose clamp and install; then apply pressure where shown by the arrows in the illustration so that the clamp is correctly seated at the clamp's previous trace indentations.

Caution
Be absolutely sure that the hose clamp is correctly seated to its previous trace indentations.

INTAKE MANIFOLD <SOHC–16 VALVE> < 1993 models>

REMOVAL AND INSTALLATION

M15MA-A



Removal steps

1. Air intake hose
2. Connection for accelerator cable
3. Connection for brake booster vacuum hose
4. Connection for vacuum pipe and hose assembly
5. Connection for water hose
6. Connection for fuel high pressure hose
7. O-ring
8. PCV hose
9. Connection for vacuum hose
10. Connection for fuel return hose

Pre-removal Operation

- Draining of Engine Coolant (Refer to GROUP 00–Maintenance Service.)

Post-installation Operation

- Filling of Engine Coolant (Refer to GROUP 00–Maintenance Service.)
- Adjustment of Accelerator Cable (Refer to GROUP 13–Engine Control.)
- inspection of Fuel Pressure (Refer to GROUP 13–On-vehicle Inspection of MFI Components.)

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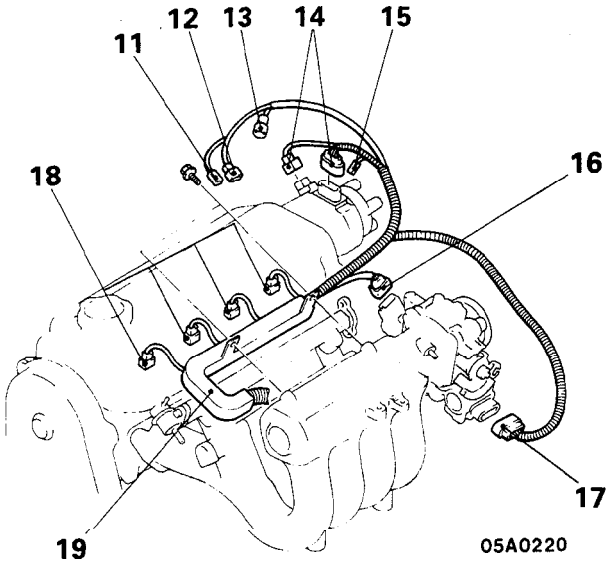
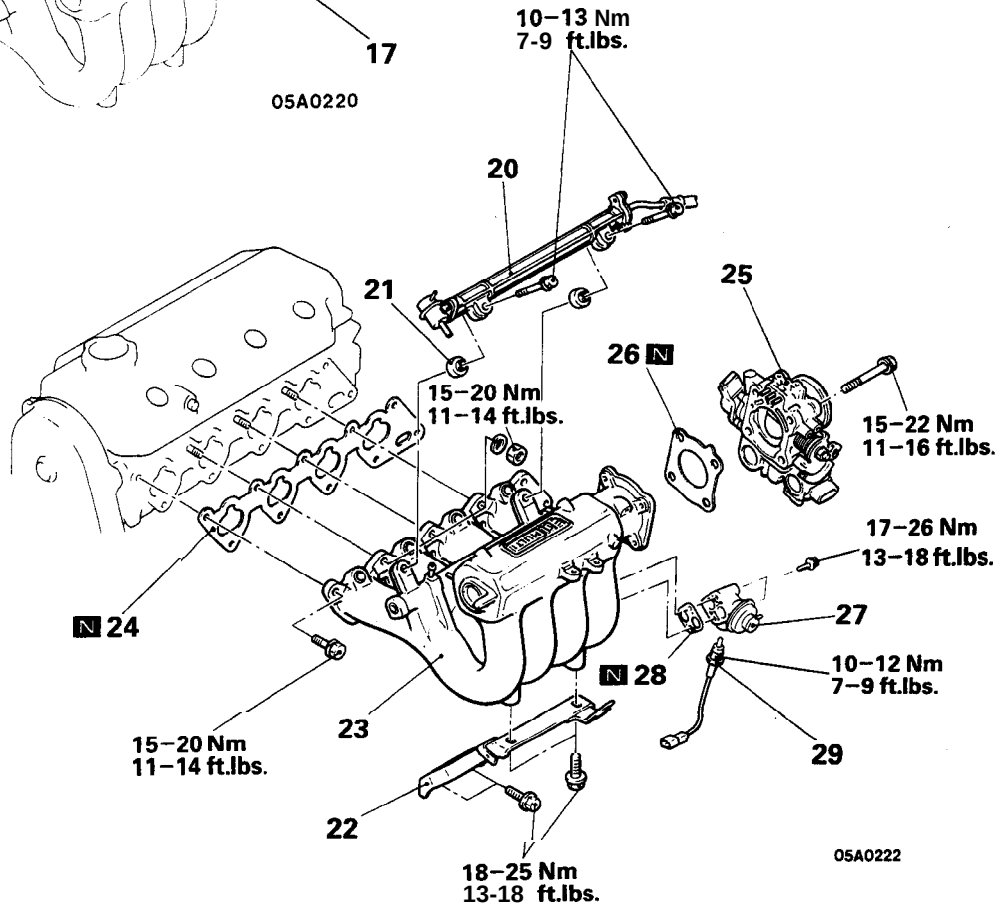




11. Engine coolant temperature gauge unit connector
12. Engine coolant temperature sensor connector
13. Oxygen sensor connector
14. Distributor connector
15. Condenser connector
16. TPS connector
17. IAC connector
18. injector connector
19. Control harness

◆◆▶◀20. Fuel rail, injector and pressure regulator assembly
21. Insulator
22. Intake manifold stay
23. Intake manifold
24. Intake manifold gasket
25. Throttle body
▶◀26. Throttle body gasket
27. EGR valve
28. EGR gasket
29. EGR temperature sensor <Vehicles for California>

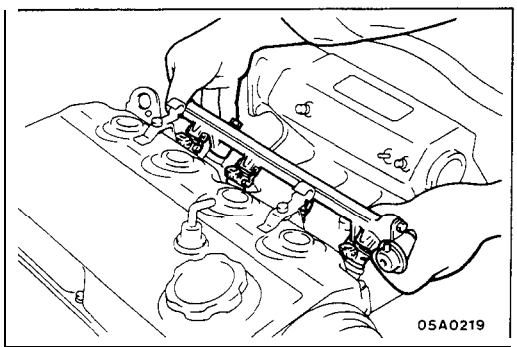
TSB Revision

SERVICE POINTS OF REMOVAL M15MBAJ

6. DISCONNECTION OF FUEL HIGH PRESSURE HOSE

Relieve pressure in the fuel pipe line to prevent fuel outflow. (Refer to GROUP 13-Service Adjustment Procedures.)

Caution
Cover fuel pipe line with rag after relieving pressure as certain pressure may still remain.



20. REMOVAL OF FUEL RAIL, FUEL INJECTOR AND PRESSURE REGULATOR

Remove fuel rail with fuel injector and pressure regulator on.

Caution
Do not drop injector when removing fuel rail.

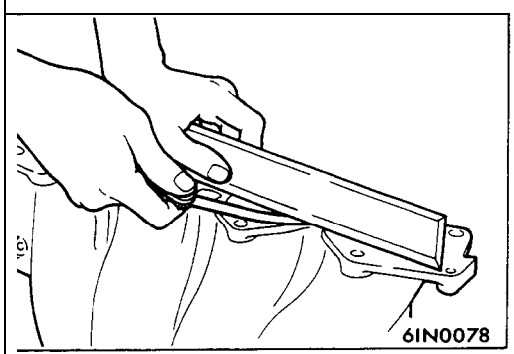
INSPECTION M15MCAJ

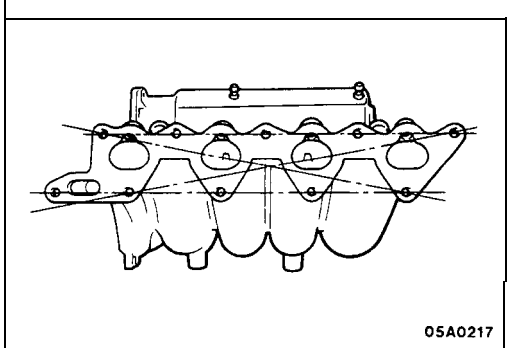
Check the following points; replace the part if a problem is found.

INTAKE MANIFOLD

1. Check for damage or cracking of any part.
2. Check for obstruction of the negative pressure (vacuum) outlet port, and for obstruction of the water passage or gas passage.
3. Using a straight edge and a thickness gage, check for distortion of the cylinder head installation surface.

Standard value: 0.15 mm (.006 in.) or less
Limit: 0.3 **mm (.012 in.)**





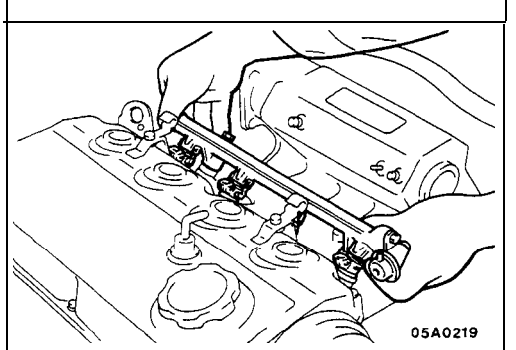
SERVICE POINTS OF INSTALLATION M15MDAL

26. INSTALLATION OF GASKET

Refer to GROUP 13-Throttle Body.

20. INSTALLATION OF FUEL RAIL, FUEL INJECTOR AND PRESSURE REGULATOR

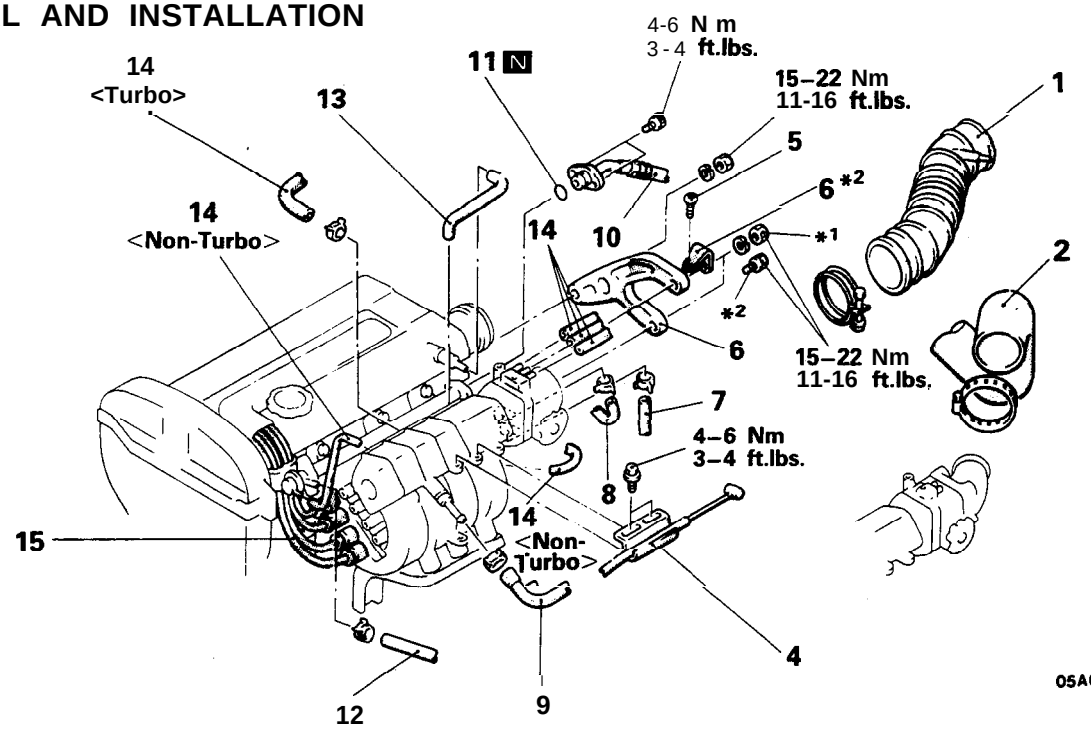
Caution
Be careful not to drop the injector when the fuel rail is installed.

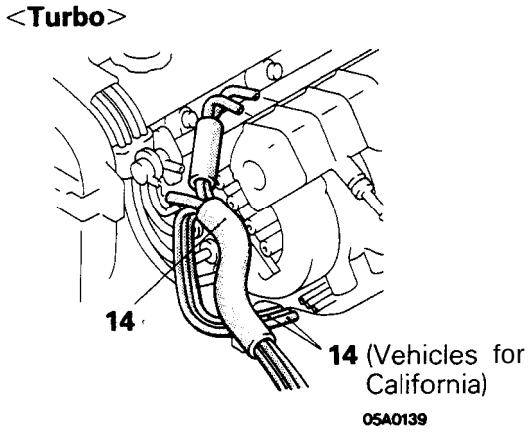


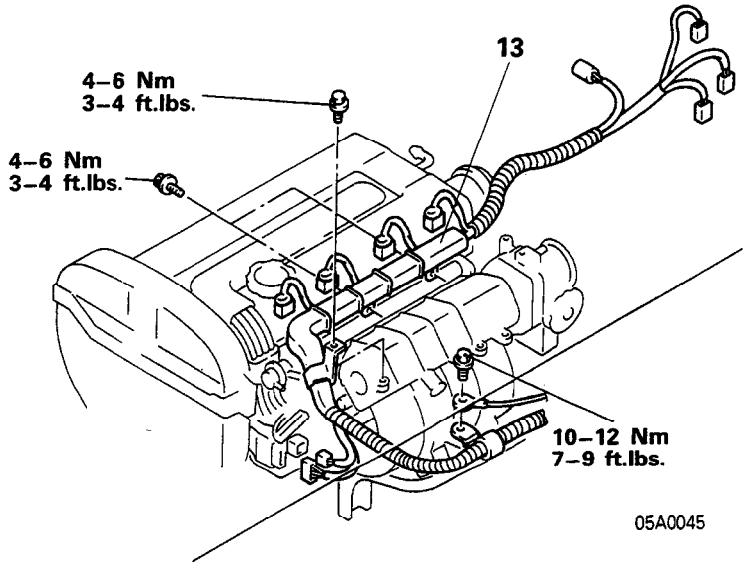
INTAKE MANIFOLD <DOHC>

REMOVAL AND INSTALLATION

M15MA-B







Removal steps

1. Air intake hose <Non-Turbo>
2. Air hose D <Turbo>
3. Connection for control harness
4. Connection for accelerator cable
5. Ground plate installation screw
6. Throttle body stay and ground plate
7. Connection for water by-pass hose
8. Connection for water hose
9. Connection for brake booster vacuum hose
- ◆◆ 10. Connection for fuel high pressure hose
11. O-ring
12. Connection for fuel return hose
13. Connection for PCV hose
14. Connection for vacuum hoses
15. Connection for spark plug cable

NOTE
• I: <Non-Turbo>
*2: <Turbo>

Pre-removal Operation
- Draining of Engine Coolant (Refer to GROUP 00–Maintenance Service.)

Post-installation Operation
- Filling of Engine Coolant (Refer to GROUP 00–Maintenance Service.)
- Adjustment of Accelerator Cable (Refer to GROUP 13–Engine Control.)
- Inspection of Fuel Pressure (Refer to GROUP 13–On-Vehicle Inspection of MFI Components.)

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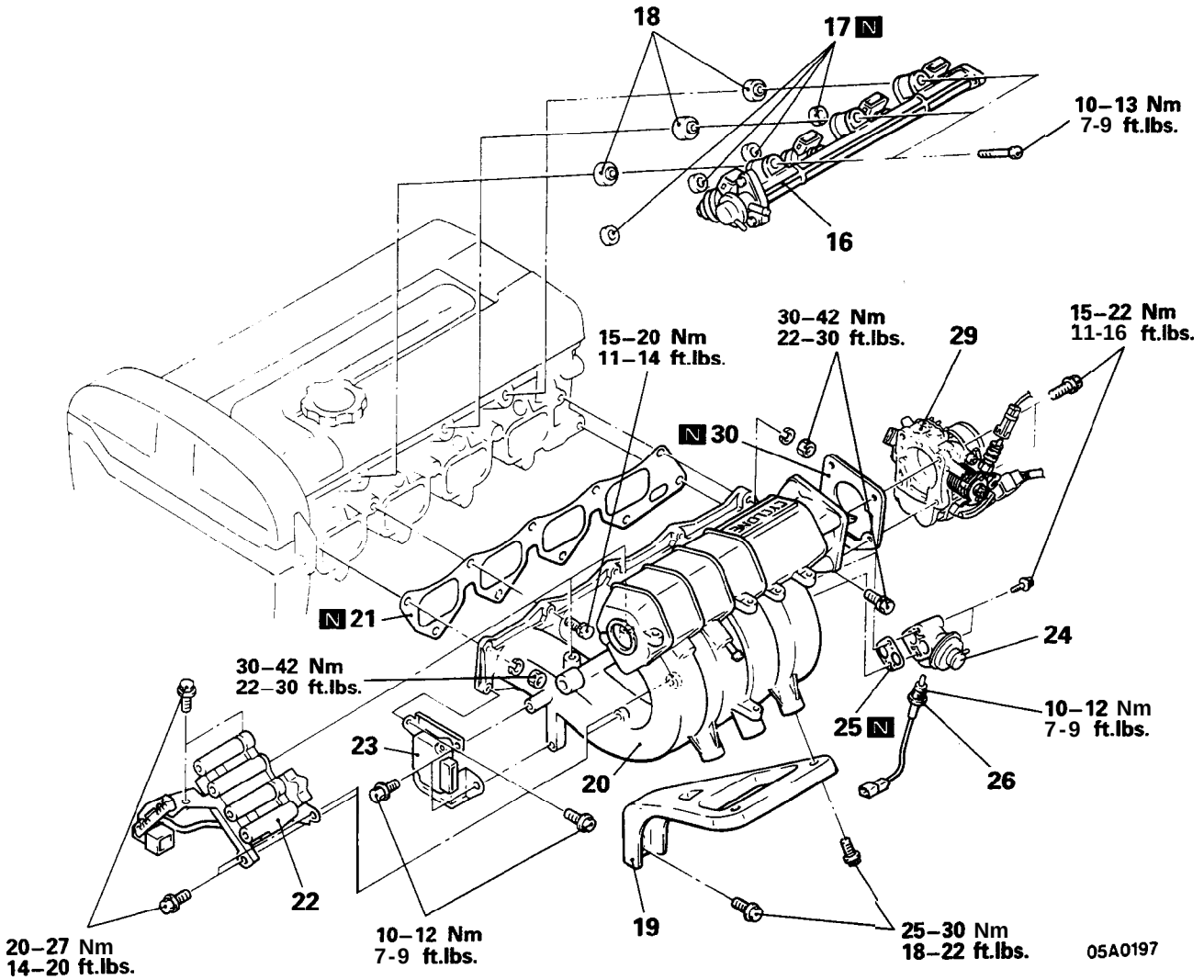
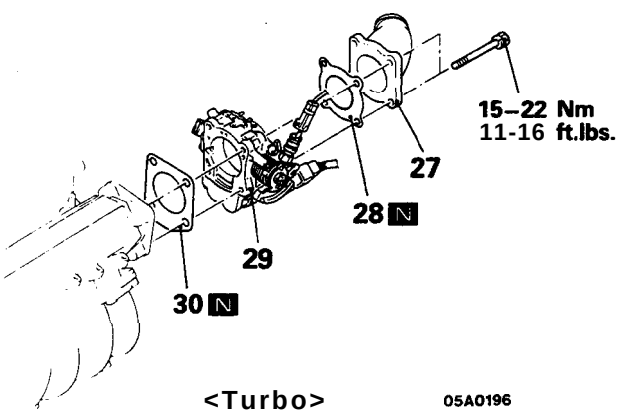


◆■▶◆ 16. Fuel rail, fuel injector and pressure regulator
17. Insulator
18. Insulator
19. Intake manifold stay
20. Intake manifold
21. Intake manifold gasket
22. Ignition coil
23. Power transistor unit
24. EGR valve
25. Gasket
26. EGR temperature sensor <Vehicles for California>
27. Air fitting <Turbo>
28. Gasket <Turbo>
29. Throttle body
30. Gasket
(Refer to GROUP 13–Throttle Body.)

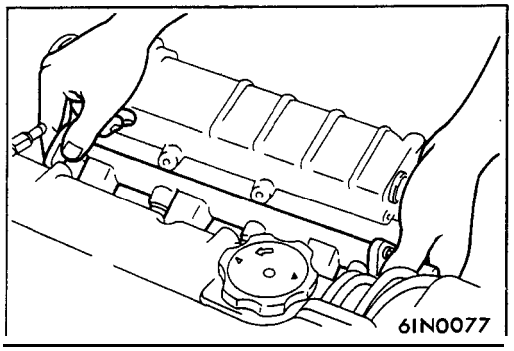


SERVICE POINTS OF REMOVAL M15MBAJa

10. DISCONNECTION OF FUEL HIGH PRESSURE HOSE

Relieve pressure in the fuel pipe line to prevent fuel outflow. (Refer to GROUP 13–MFI Components on Vehicle Inspection.)

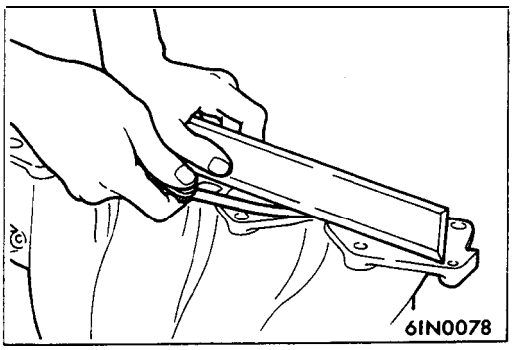
Caution
Cover fuel pipe line with rag after relieving pressure as certain pressure may still remain.



16. REMOVAL OF FUEL RAIL, FUEL INJECTOR AND PRESSURE REGULATOR

Remove fuel rail with fuel injector and pressure regulator on.

Caution
Do not drop injector when removing fuel rail.



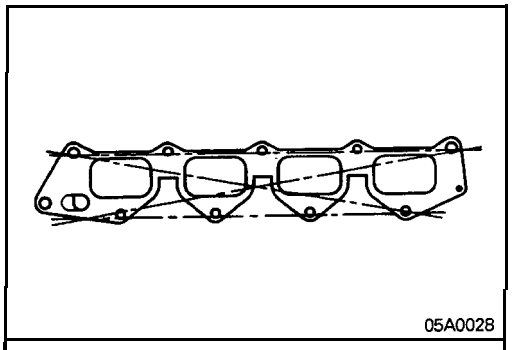
INSPECTION M15MCAJ

Check the following points; replace the part if a problem is found.

INTAKE MANIFOLD

1. Check for damage or cracking of any part.
2. Check for obstruction of the negative pressure (vacuum) outlet port, and for obstruction of the water passage or gas passage.
3. Using a straight edge and a thickness gage, check for distortion of the cylinder head installation surface.

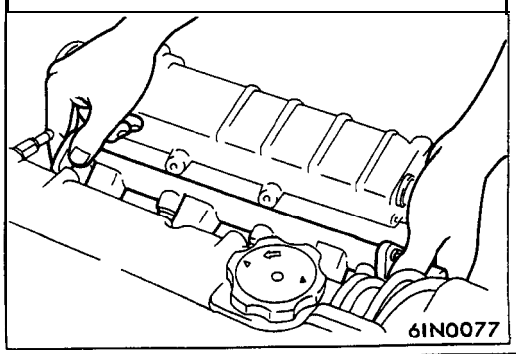
Standard value: 0.15 mm (.006 in.) or less
Limit: 0.3 **mm (.012 in.)**



SERVICE POINTS OF INSTALLATION M15MDAL

16. INSTALLATION OF FUEL RAIL, FUEL INJECTOR AND PRESSURE REGUL ATOR

Caution
Be careful not to drop the injector when the fuel rail is installed.

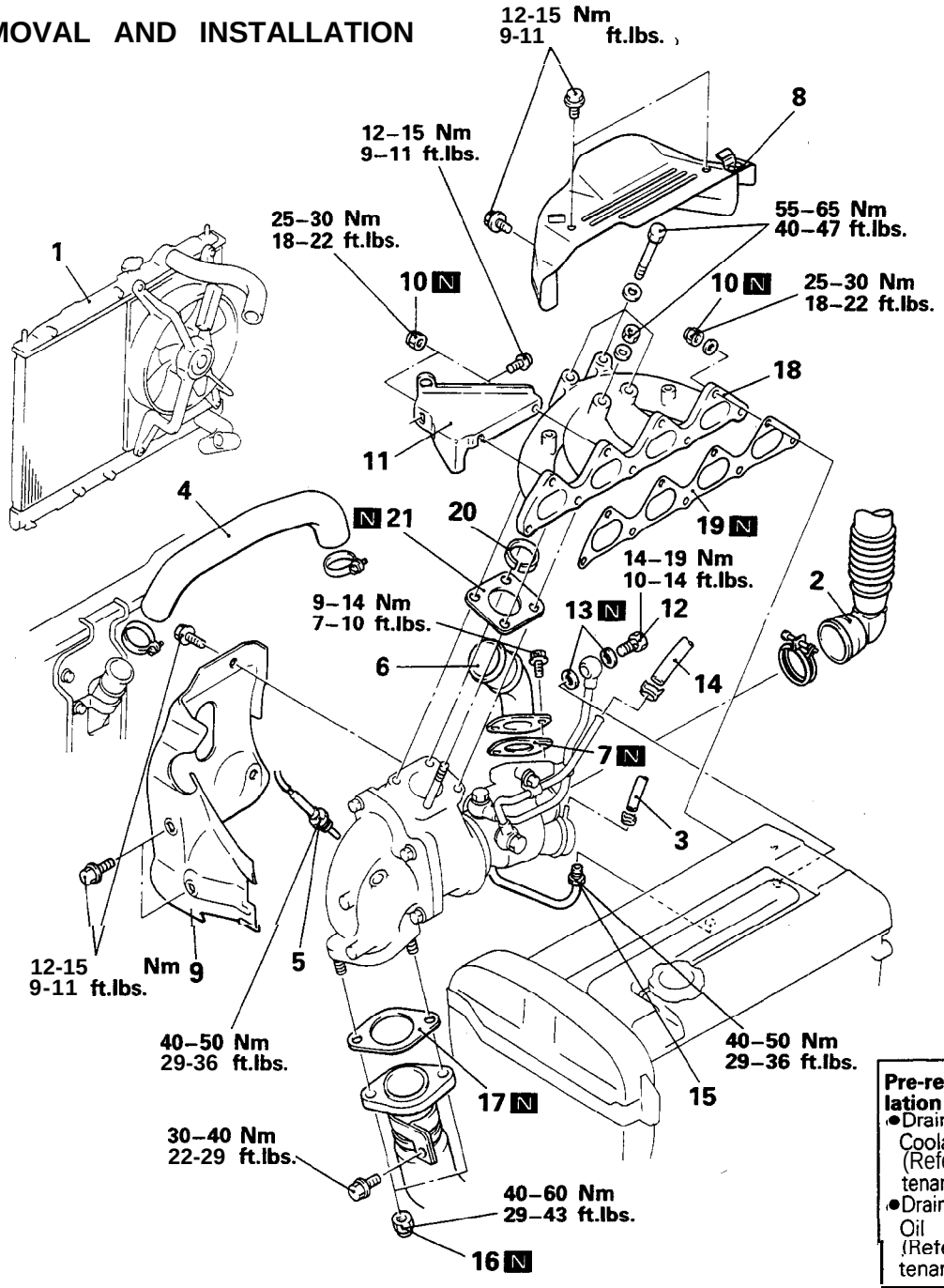


TSB Revision

TURBOCHARGER

REMOVAL AND INSTALLATION

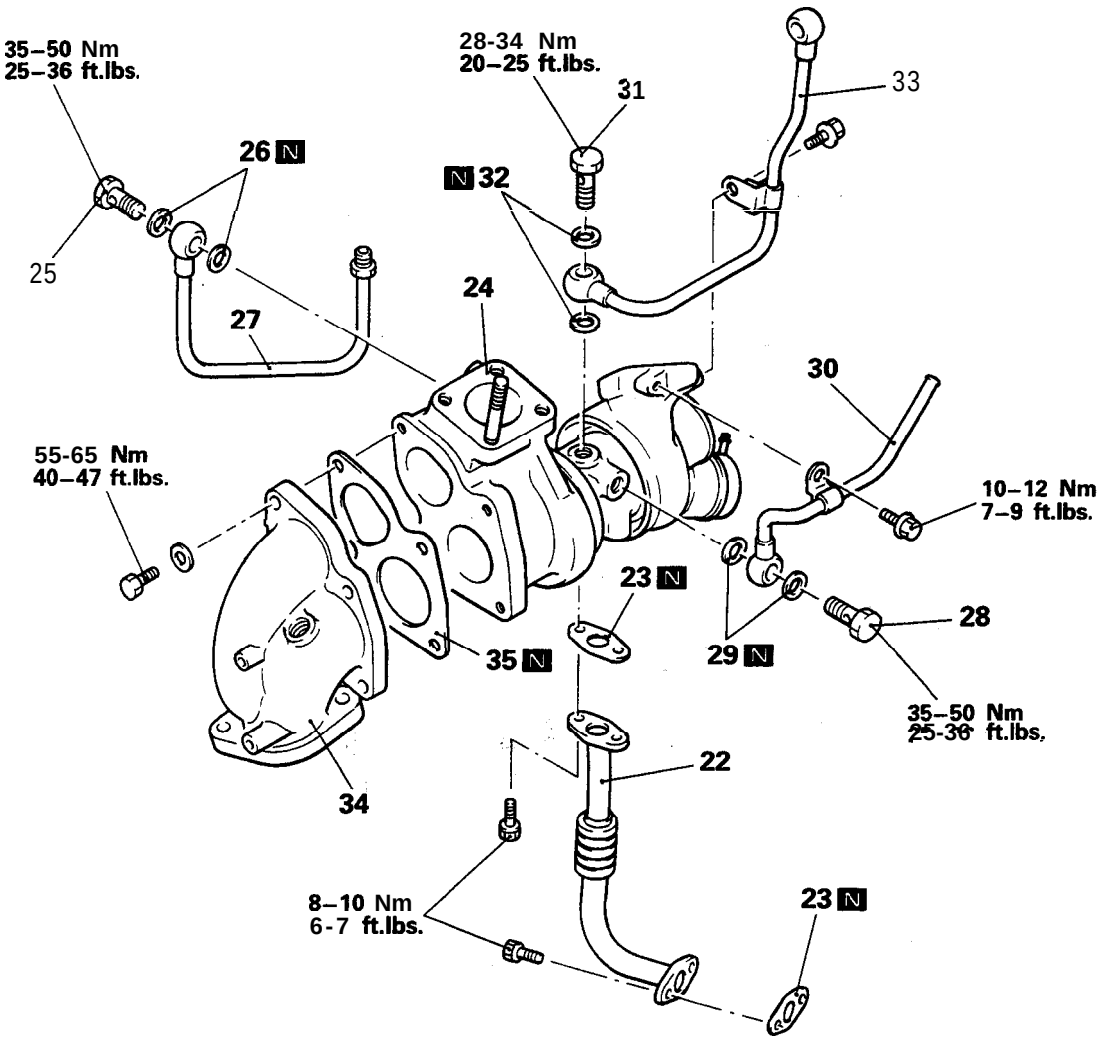
M15LA--



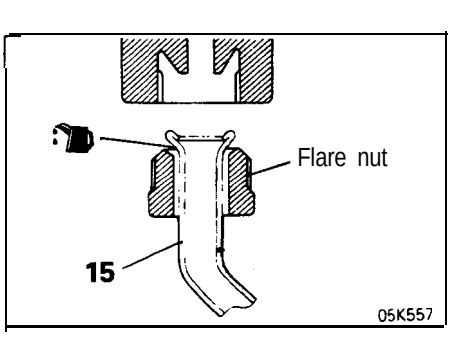
Pre-removal and Post-installation Operation
- Draining and Refilling Engine Coolant (Refer to GROUP 00–Maintenance Service.)
- Draining and Refilling Engine Oil (Refer to GROUP 00–Maintenance Service.)

Removal steps

1. Radiator (Refer to GROUP 14–Radiator.)
2. Connection for air intake hose
3. Connection for vacuum hose
4. Connection for air hose A
◆◆ **5.** Oxygen sensor
6. Air outlet fitting
7. Gasket
8. Heat protector A
9. Heat protector B
10. Self-locking nut
11. Engine hanger
12. Eye bolt
13. Gasket
14. Connection for water hose
15. Connection for water pipe B
16. Self-locking nut
17. Gasket
18. Exhaust manifold
19. Exhaust manifold gasket
20. Ring
21. Gasket



22. Oil return pipe
23. Gasket
● I)● + 24. Turbocharger
25. Eye bolt
26. Gasket
27. Water pipe B
28. Eye bolt
29. Gasket
30. Water pipe A
31. Eye bolt
32. Gasket
● ▯ 33. Oil pipe
34. Exhaust fitting
35. Gasket



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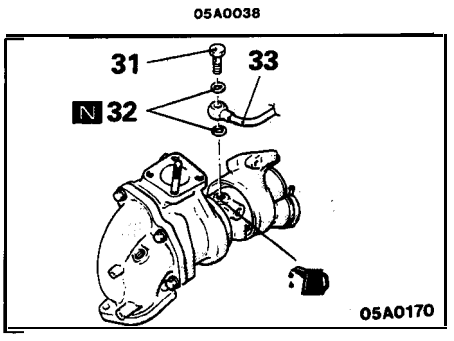
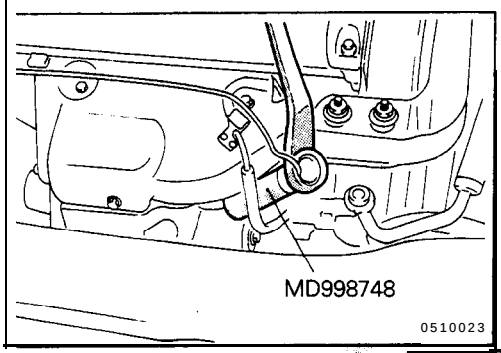




SERVICE POINTS OF REMOVAL

M15LBADa

5. REMOVAL OF OXYGEN SENSOR

Disconnect the connector of the oxygen sensor, and install the special tool to the oxygen sensor.
Then, using an offset (box-end) wrench, remove the oxygen sensor.

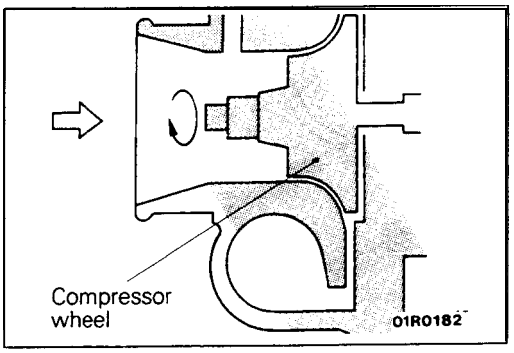
TSB Revision

24. REMOVAL OF TURBOCHARGER ASSEMBLY

Remove the turbocharger assembly with the exhaust fitting, water pipe A, water pipe B and the oil pipe attached to it.

33. REMOVAL OF OIL PIPE

Caution
After disconnecting the oil pipe, take care that foreign material does not enter the oil passage hole of the turbocharger assembly.



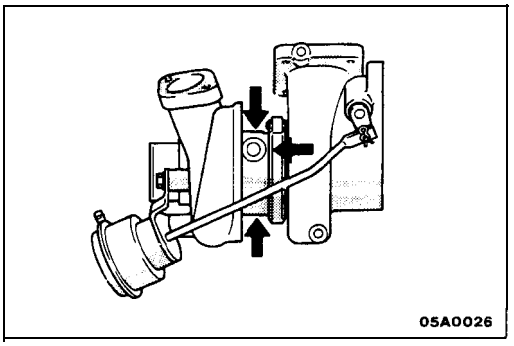
INSPECTION M15LCAC

TURBOCHARGER ASSEMBLY CHECK

- Visually check the turbine wheel and the compressor wheel for cracking or other damage.
- Check whether the turbine wheel and the compressor wheel can be easily turned by hand.
- Check for oil leakage from the turbocharger assembly.
- Check whether or not the turbocharger waste gate valve remains open. If any problem is found, replace the part after disassembly.

OIL PIPE AND OIL-RETURN PIPE CHECK

Check the oil pipe and oil-return pipe for clogging, bending, or other damage.
If there is clogging, clean it.



SERVICE POINTS OF INSTALLATION M15LDADa

24. INSTALLATION OF TURBOCHARGER ASSEMBLY

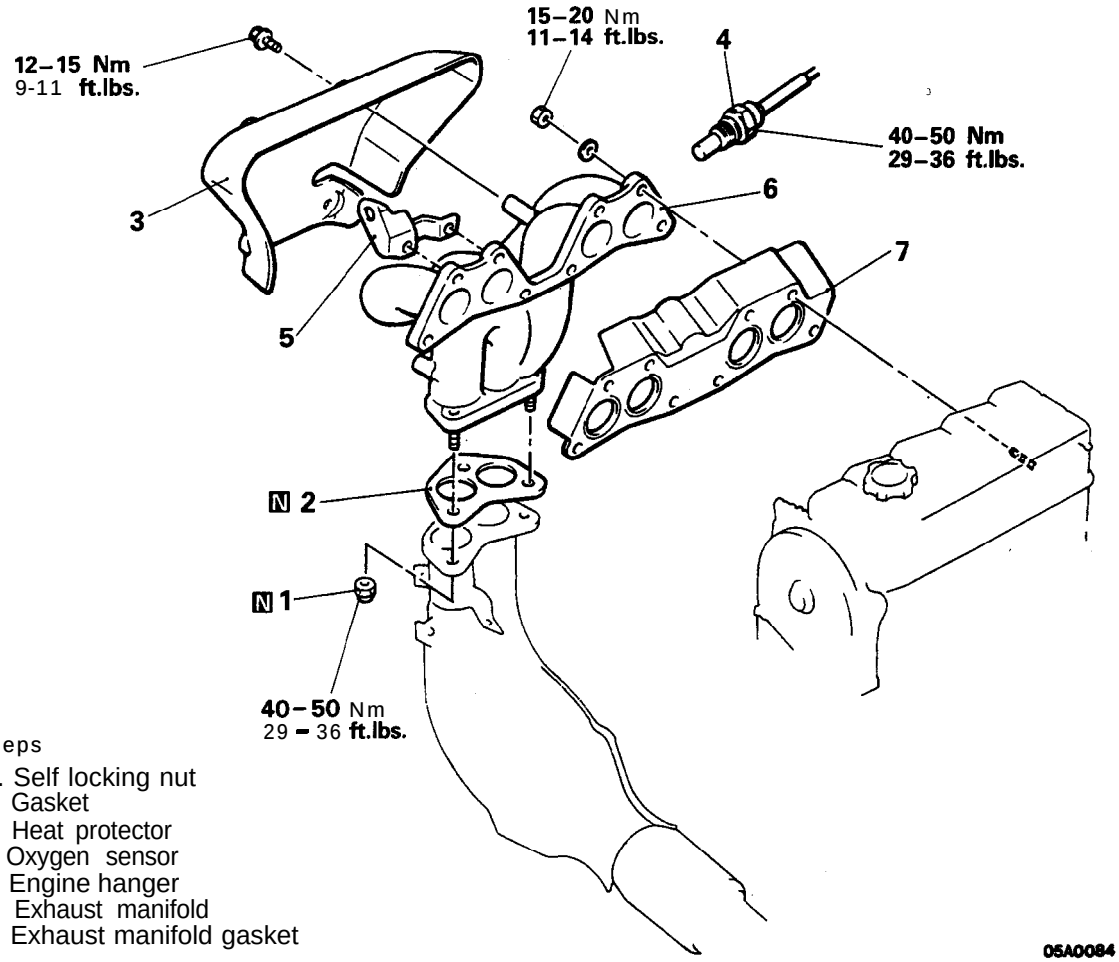
Clean the alignment surfaces shown in the illustration.

Caution
When cleaning, care must be taken so that a piece of the gasket does not enter the oil passage hole.

EXHAUST MANIFOLD <SOHC-8 VALVE> <Up to 1992 models>

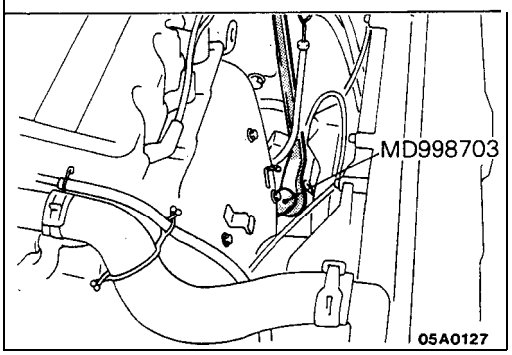
REMOVAL AND INSTALLATION

M15NA-A



Removal steps

1. Self locking nut
2. Gasket
3. Heat protector
4. Oxygen sensor
5. Engine hanger
6. Exhaust manifold
7. Exhaust manifold gasket



SERVICE POINTS OF REMOVAL

M15NBAG

4. REMOVAL OF OXYGEN SENSOR

Disconnect the connector of the oxygen sensor, and install the special tool to the oxygen sensor.
Then, using an offset (box-end) wrench, remove the oxygen sensor.

INSPECTION

M15NCAL

Check the following points; replace the part if a problem is found.

EXHAUST MANIFOLD

Check for damage or cracking of any part.

EXHAUST MANIFOLD GASKET

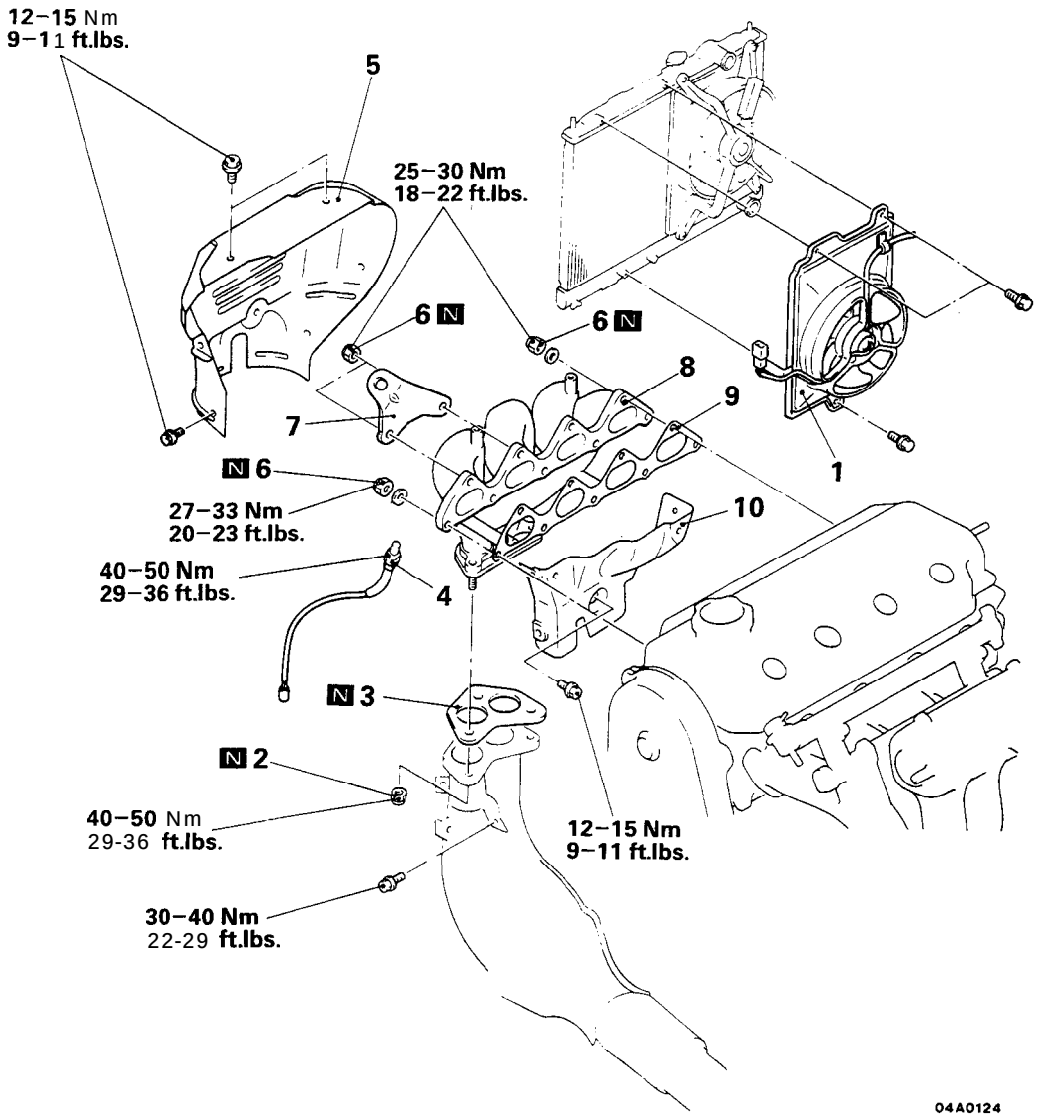
Check for flaking or damage of the gasket.

TSB Revision

EXHAUST MANIFOLD <SOHC-16 VALVE> <1993 models>

REMOVAL AND INSTALLATION

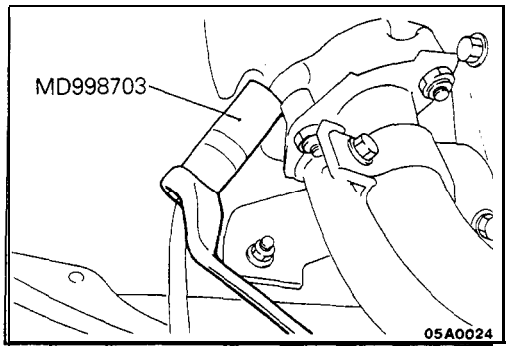
M15NA-B



Removal steps

1. Condenser fan motor (Vehicles with air conditioning)
2. Self locking nut
3. Gasket
◀1▶ 4. Oxygen sensor
5. Exhaust manifold cover (A)
6. Self locking nut
7. Engine hanger
8. Exhaust manifold
9. Exhaust manifold gasket
10. Exhaust manifold cover(B)

TSB Revision



SERVICE POINTS OF REMOVAL M15NBAF1

4. REMOVAL OF OXYGEN SENSOR

Disconnect the connector of the oxygen sensor, and install the special tool to the oxygen sensor.
Then, using an offset (box-end) wrench, remove the oxygen sensor.

INSPECTION M15NCAL1

Check the following points; replace the part if a problem is found.

EXHAUST MANIFOLD

Check for damage or cracking of any part.

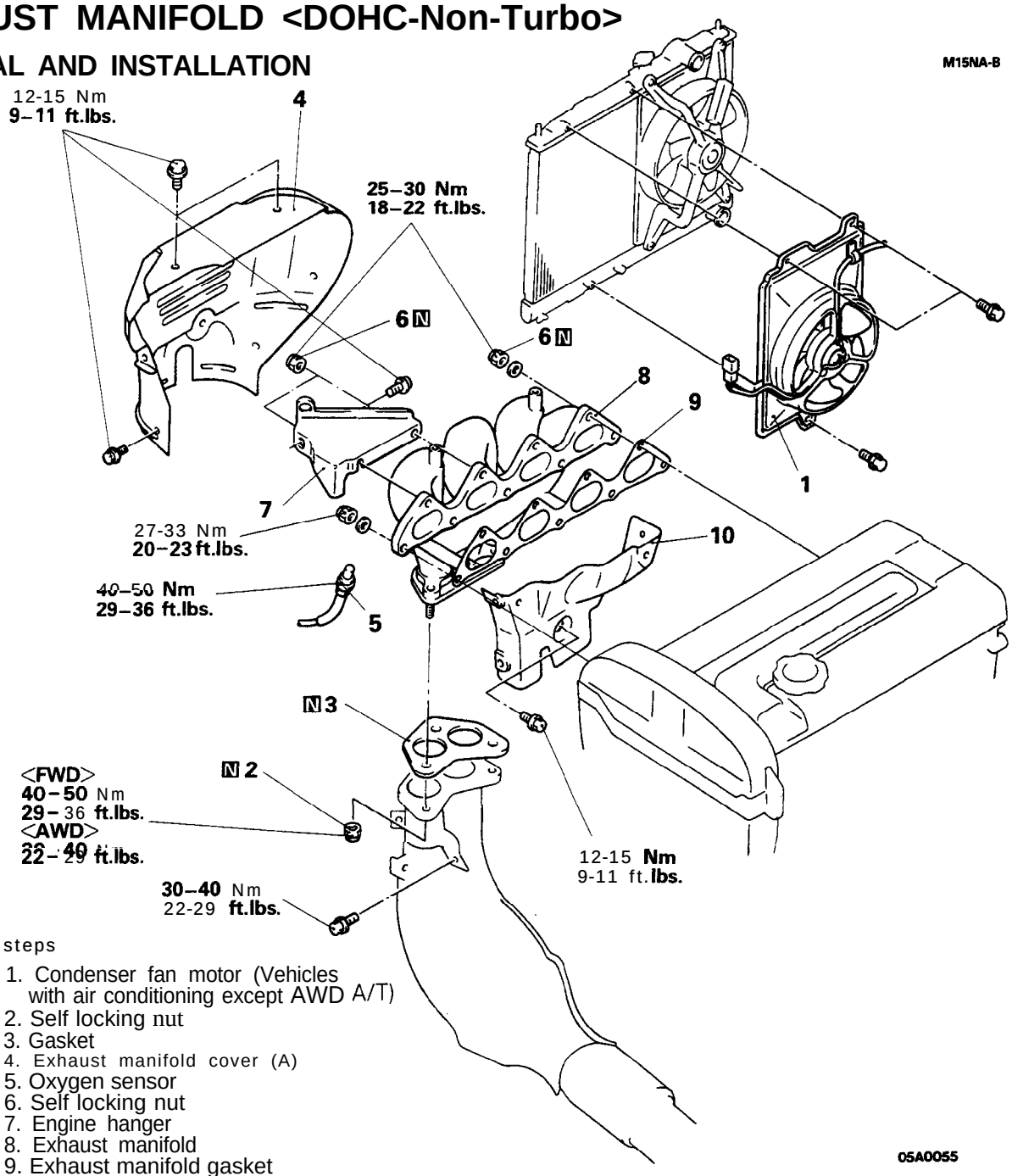
EXHAUST MANIFOLD GASKET

Check for flaking or damage of the gasket.

EXHAUST MANIFOLD <DOHC-Non-Turbo>

REMOVAL AND INSTALLATION

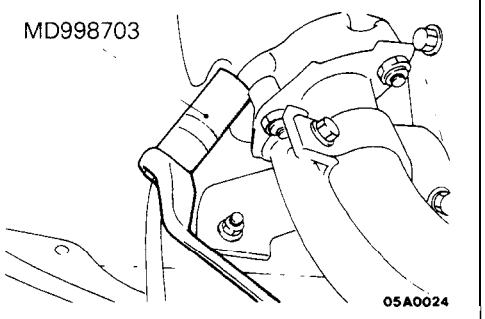
M15NA-B



Removal steps

1. Condenser fan motor (Vehicles with air conditioning except AWD A/T)
2. Self locking nut
3. Gasket
4. Exhaust manifold cover (A)
- ☒ 5. Oxygen sensor
6. Self locking nut
7. Engine hanger
8. Exhaust manifold
9. Exhaust manifold gasket
10. Exhaust manifold cover (B)

05A0055



SERVICE POINTS OF REMOVAL

M15NBAH

5. REMOVAL OF OXYGEN SENSOR

Disconnect the connector of the oxygen sensor, and install the special tool to the oxygen sensor.
Then, using an offset (box-end) wrench, remove the oxygen sensor.

INSPECTION

M15NCAT

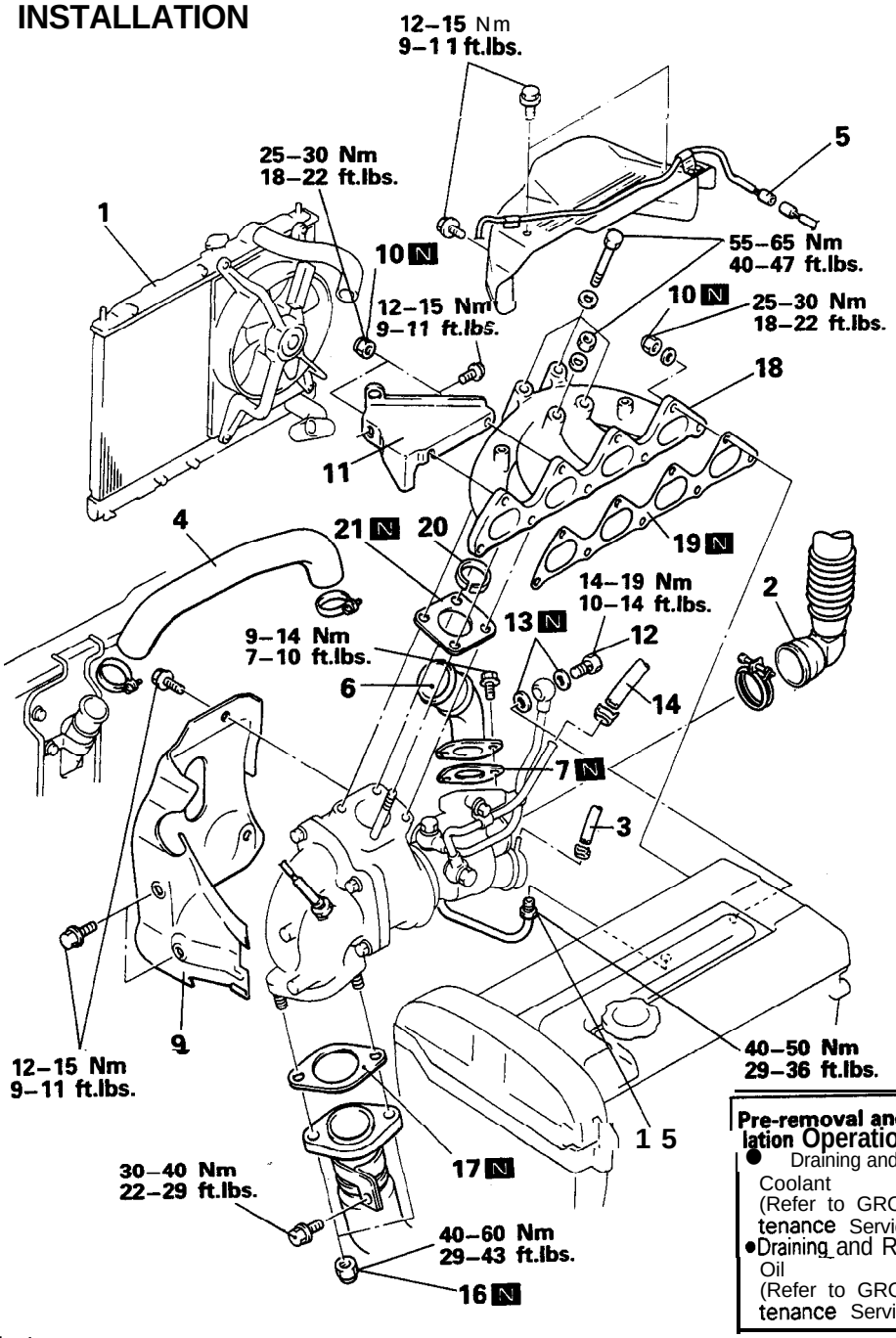
Refer to P.15-29

TSB Revision

EXHAUST MANIFOLD <DOHC–TURBO>

M15NA-C

REMOVAL AND INSTALLATION



Pre-removal and Post-installation Operation
- Draining and Refilling Engine Coolant (Refer to GROUP 00–Maintenance Service.)
- Draining and Refilling Engine Oil (Refer to GROUP 00–Maintenance Service.)

Removal steps

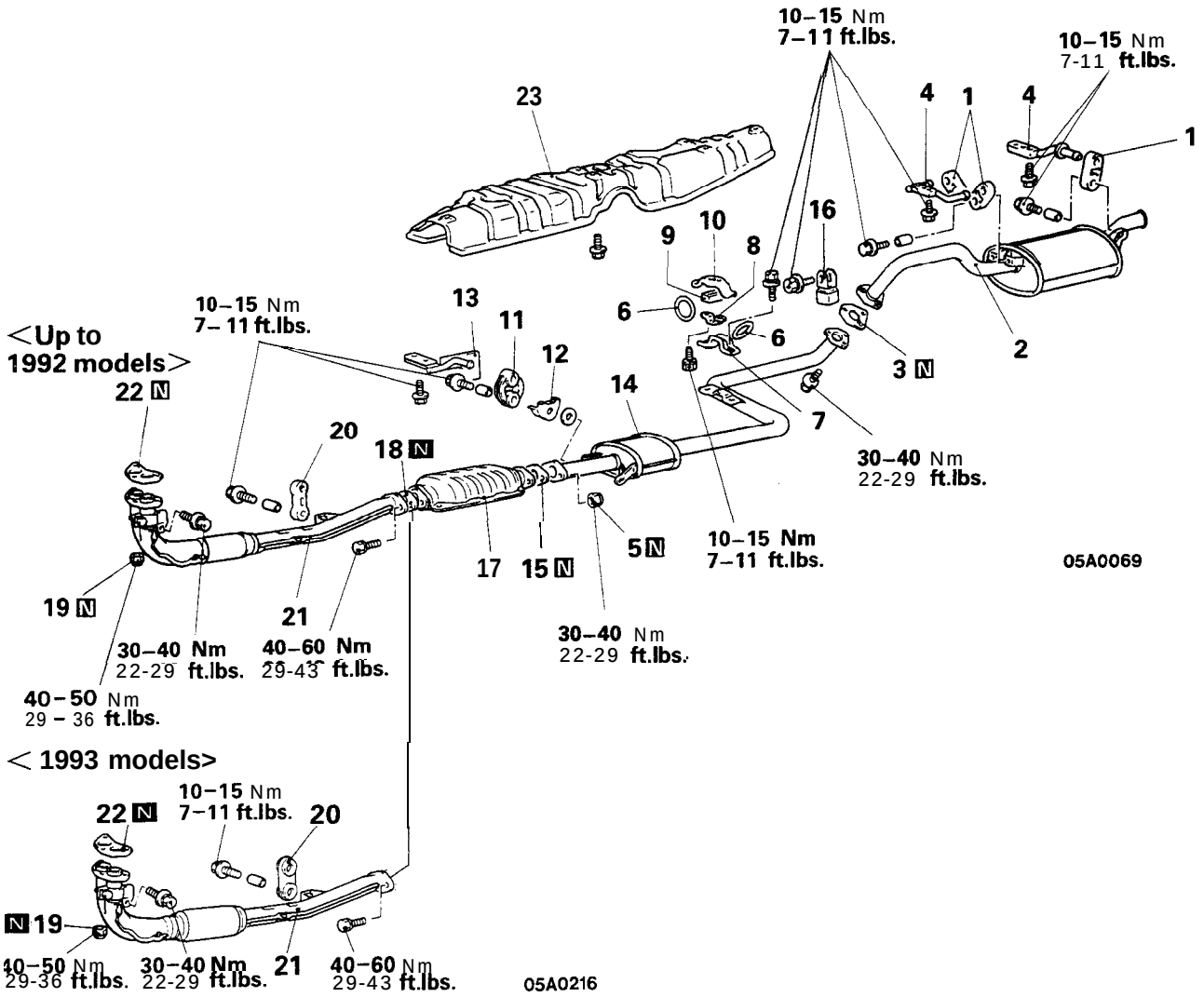
◆◆ 1. Radiator (Refer to GROUP 14–Radiator.)
2. Connection for air intake hose
3. Connection for vacuum hose
4. Connection for air hose A
5. Oxygen sensor connector
6. Air outlet fitting
7. Gasket
8. Heat protector A
9. Heat protector B
10. Self-locking nut
11. Engine hanger
12. Eye bolt
13. Gasket
14. Connection for water hose
15. Connection for water pipe B
16. Self-locking nut
17. Gasket
18. Exhaust manifold
19. Exhaust manifold gasket
20. Ring
21. Gasket

TSB Revision

EXHAUST PIPE AND MAIN MUFFLER <SOHC>

M15RA-A

REMOVAL AND INSTALLATION



Removal steps

1. Hanger
2. Main muffler
3. Gasket
4. Hanger bracket
5. Self locking nut
6. O-ring
7. Hook
8. Bracket
9. Stopper
10. Hanger bracket
11. Hanger
12. Protector
13. Hanger bracket
14. Center exhaust pipe
15. Gasket
16. Dynamic damper
17. Catalytic converter
18. Gasket
19. Self locking nut
20. Hanger
21. Front exhaust pipe
22. Gasket
23. Front floor heat protector panel

INSPECTION

M15RCAH

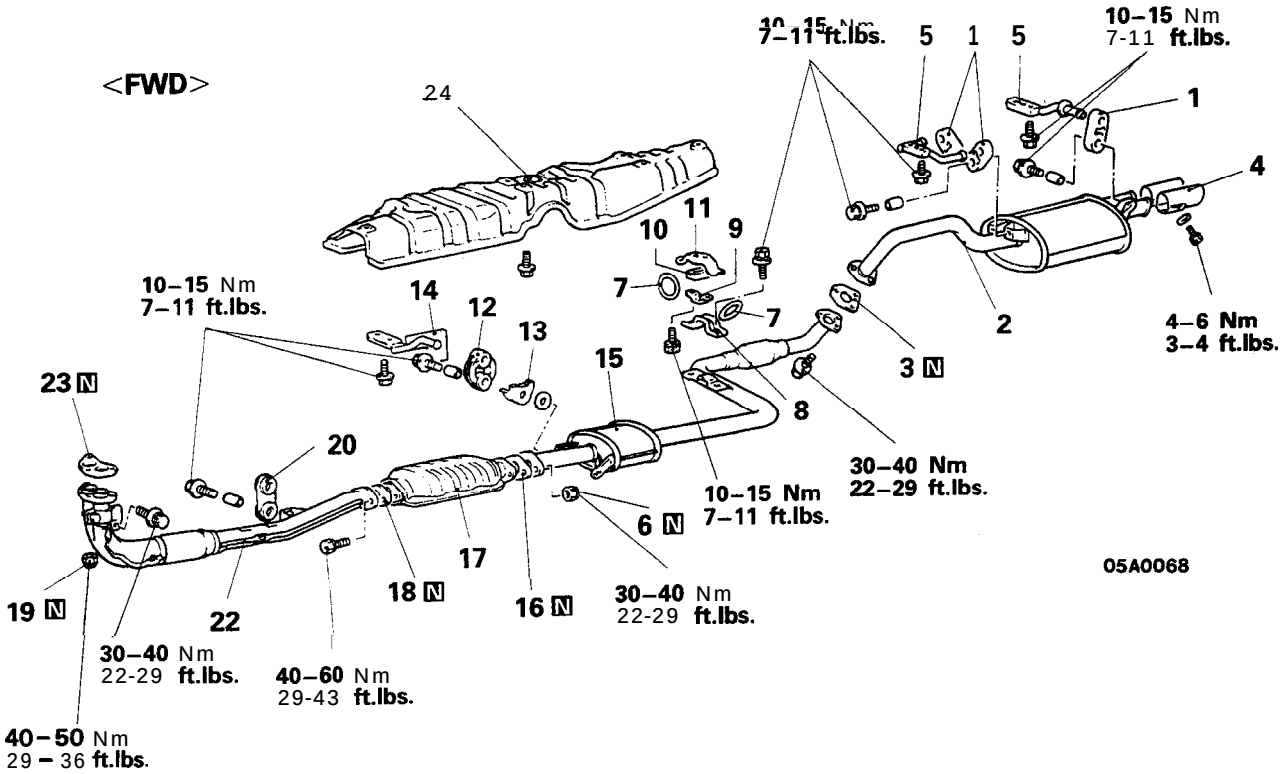
- Check the mufflers and pipes for corrosion or damage.
- Check the rubber hangers and rubber O-rings for deterioration or damage.
- Check for gas leakage from mufflers and pipes.

TSB Revision

EXHAUST PIPE AND MAIN MUFFLER <DOHC>

M15RA-B

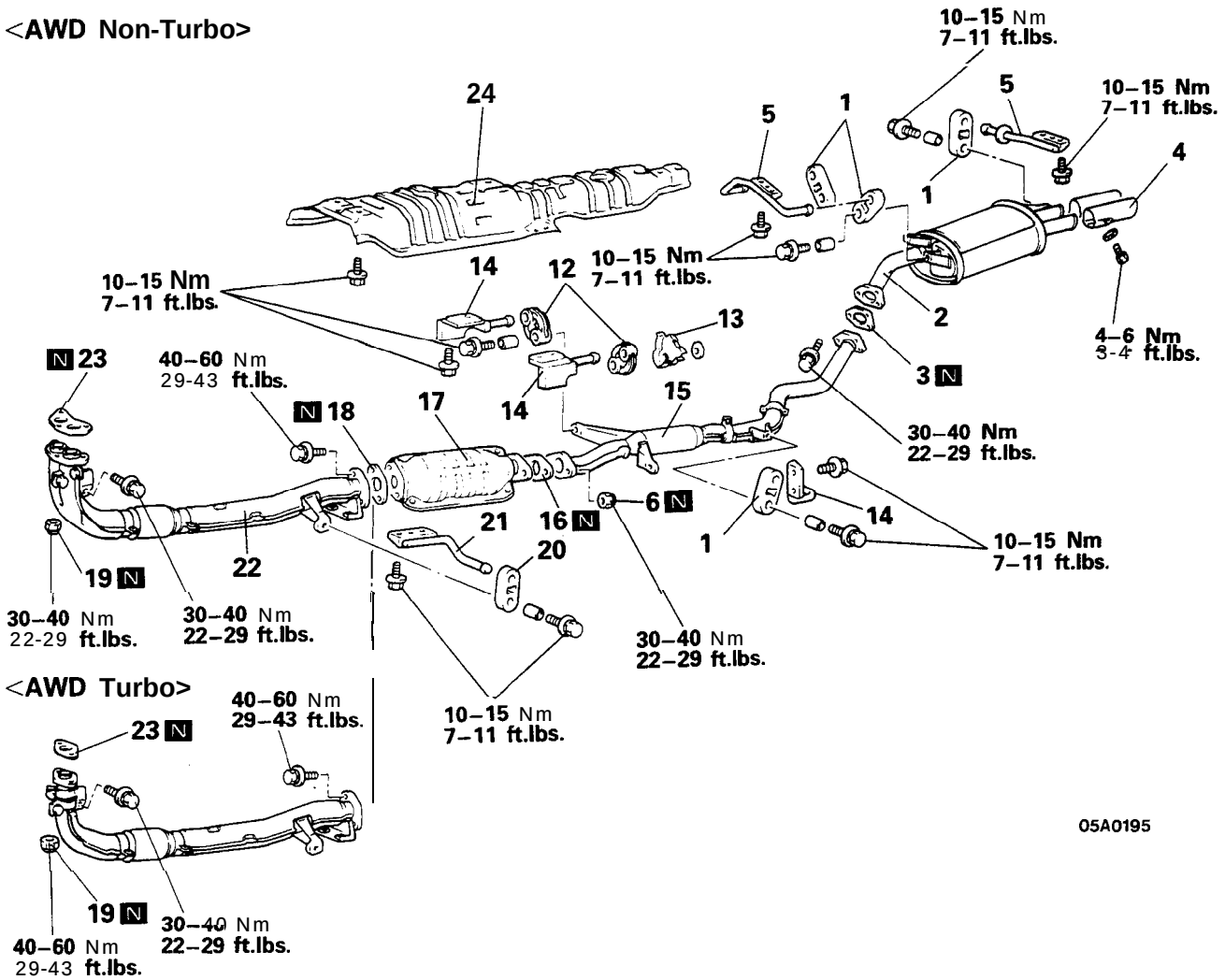
REMOVAL AND INSTALLATION



Removal steps

1. Hanger
2. Main muffler
3. Gasket
4. Moulding
5. Hanger bracket
6. Self locking nut
7. O-ring
8. Hook
9. Bracket
10. Stopper
11. Hanger bracket
12. Hanger
13. Protector
14. Hanger bracket
15. Center exhaust pipe
16. Gasket
17. Catalytic converter
18. Gasket
19. Self locking nut
20. Hanger
22. Front exhaust pipe
23. Gasket
24. Front floor heat protector panel

TSB Revision



Removal steps

1. Hangers
2. Main muffler
3. Gasket
4. Moulding
5. Hanger bracket
6. Self locking nut
12. Hanger
13. Protector
14. Hanger bracket
15. Center exhaust pipe
16. Gasket
17. Catalytic converter
18. Gasket
19. Self locking nut
20. Hanger
21. Hanger bracket
22. Front exhaust pipe
23. Gasket
24. Front floor heat protector panel

INSPECTION

M15RCAL

Refer to P.15-32

EMISSION CONTROL SYSTEMS

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M17AA--

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SPECIFICATIONS

GENERAL SPECIFICATIONS

M17CA--

Positive crankcase ventilation system	Closed type with Positive Crankcase Ventilation valve
Evaporative emission control system Evaporative emission canister	Evaporative emission canister storage type Charcoal type
Exhaust emission control system Exhaust gas recirculation system EGR valve Thermal vacuum valve <Federal> EGR temperature sensor <California> EGR solenoid <California> Catalytic converter Location	 Vacuum-actuated diaphragm type Bimetal type Thermistor type Duty cycle solenoid valve Monolith type Under floor

SERVICE SPECIFICATIONS

M17CB--

Items		Specifications
Evaporative emission purge solenoid coil resistance	Ω	36-44 [at 20°C (68°F)]
Thermal vacuum valve closing temperature	°C (°F)	65 (149)
EGR temperature sensor resistance	kΩ	60–83 [at 50°C (122°F)] 11-14 [at 100°C (212°F)]
EGR solenoid coil resistance	Ω	36-44 [at 20°C (68°F)]

TORQUE SPECIFICATIONS

M17CC--

Items	N·m	ft.lbs.
Positive crankcase ventilation valve	8-12	6-8.6
EGR valve installation bolt	17-26	12-19
Thermal vacuum valve	20–40	15–30
EGR temperature sensor	10–12	7.3-8.6

SEALANT

M17CE--

Items	Specified sealant
Thermal vacuum valve thread portion	3M NUT locking Part No.4171 or equivalent

TROUBLESHOOTING

M17EA--

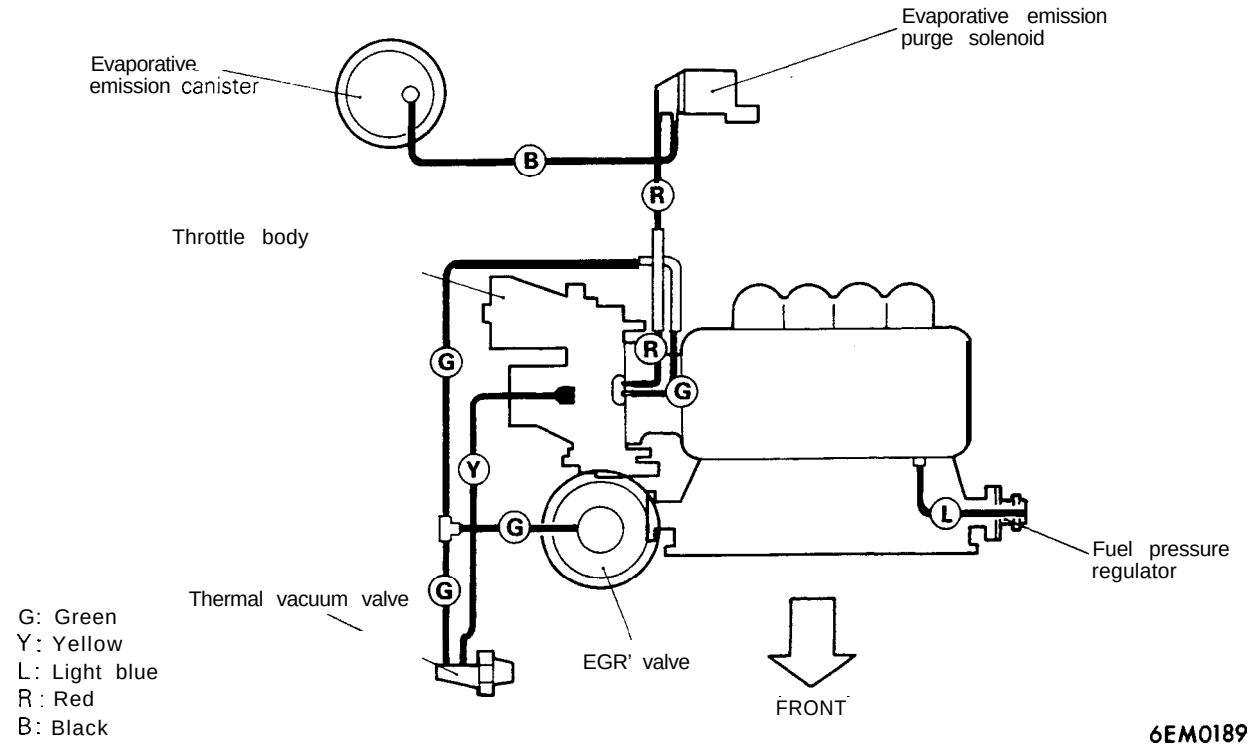
Symptom	Probable cause	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	The EGR valve is not closed.	Repair or replace
	Malfunction of the evaporative emission purge solenoid	Repair or replace
Rough idle or engine stalls	The EGR valve is not closed.	Repair or replace
	Vacuum hose disconnected or damaged	Repair or replace
	Malfunction of the positive crankcase ventilation valve	Replace
	Malfunction of the purge control system	Check the system; if there is a problem, check its component parts.
Engine hesitates or poor acceleration	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts.
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system
Poor fuel mileage	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts.

VACUUM HOSES

M17JA--

VACUUM HOSES ROUTING

<Federal-SOHC (1989 models)>



6EM0189

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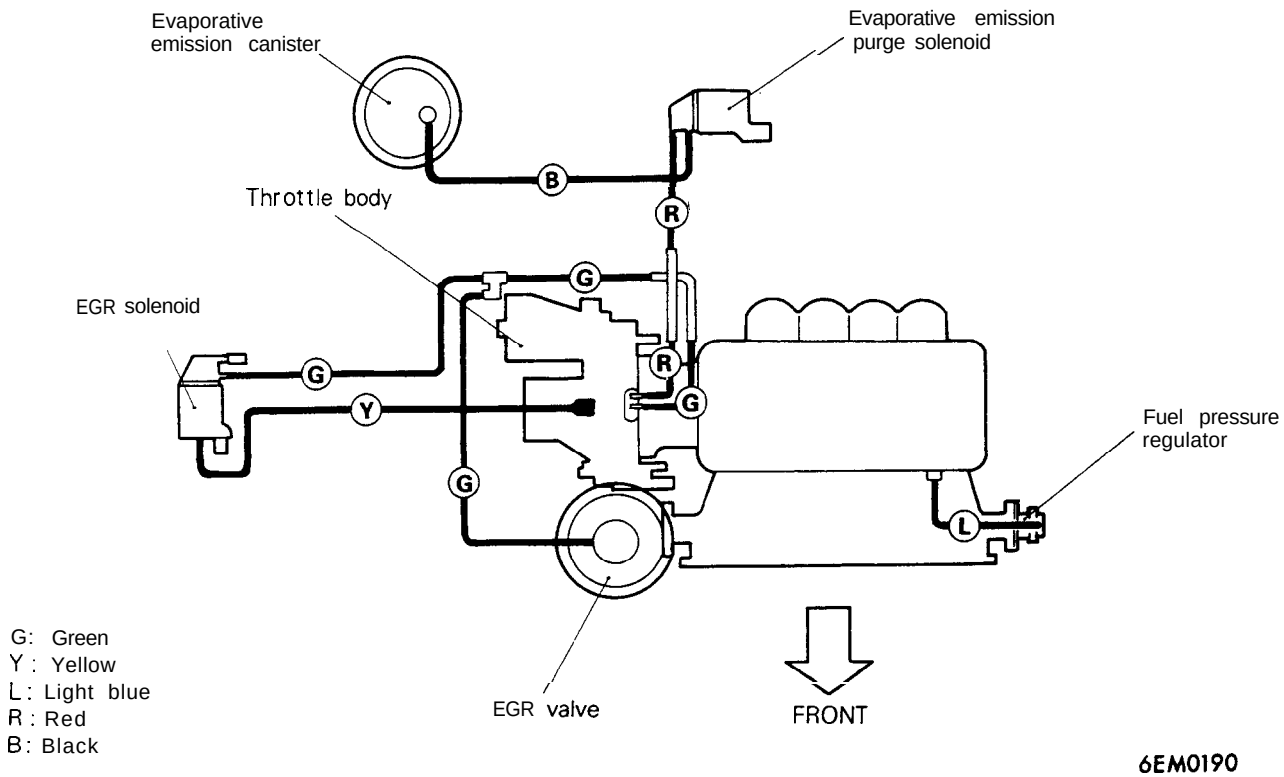

6EM0190

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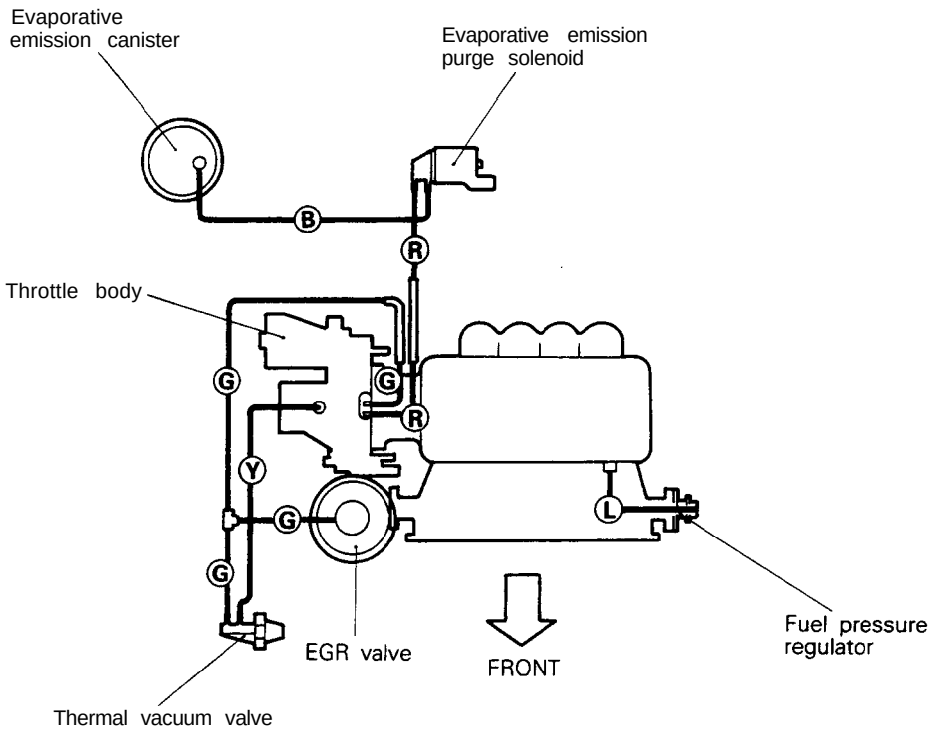

G: Green
Y: Yellow
L: Light blue
R: Red
B: Black

6EM0283

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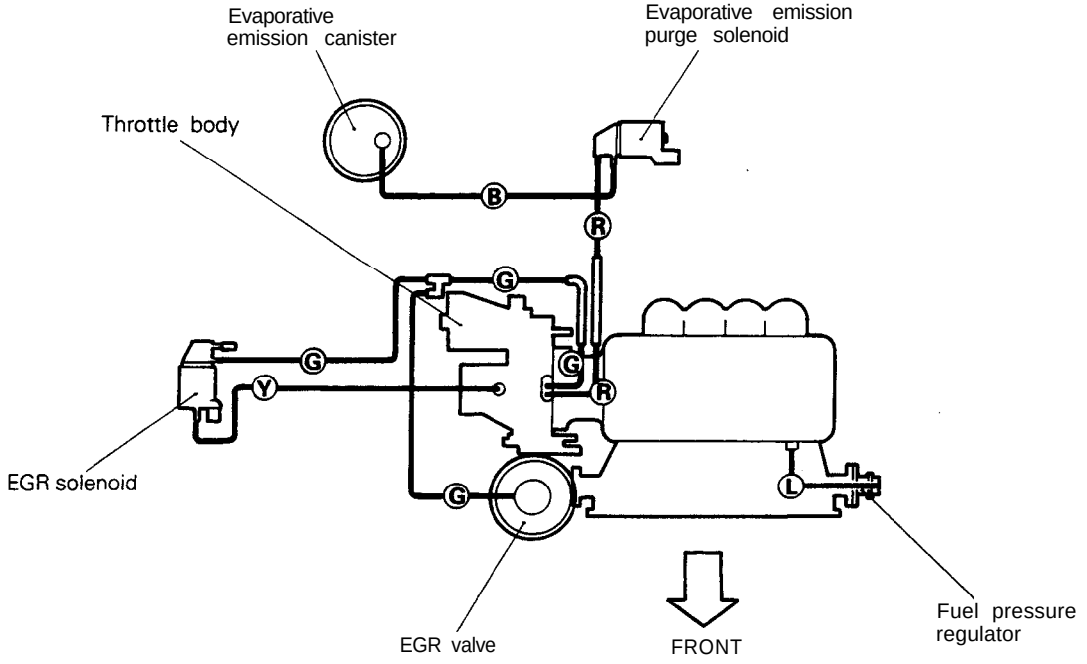

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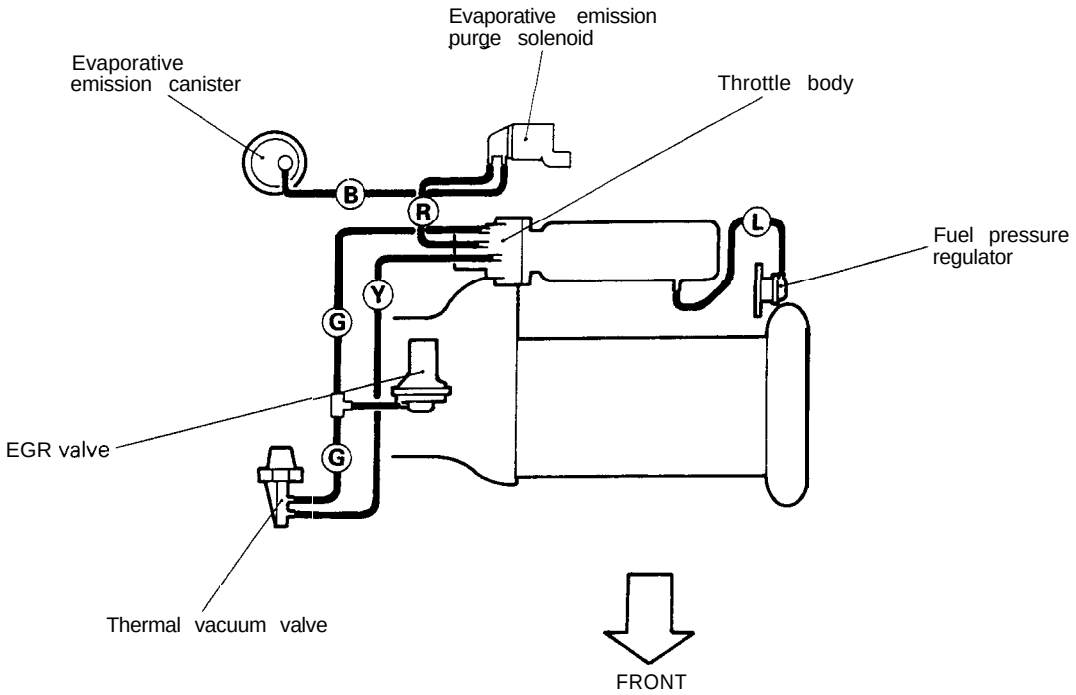
L: Light blue
R: Red
B: Black

6EM0284

TSB Revision

<Federal-DOHC (1989 models)>



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L: Light blue
R: Red
B: Black

6EM0191

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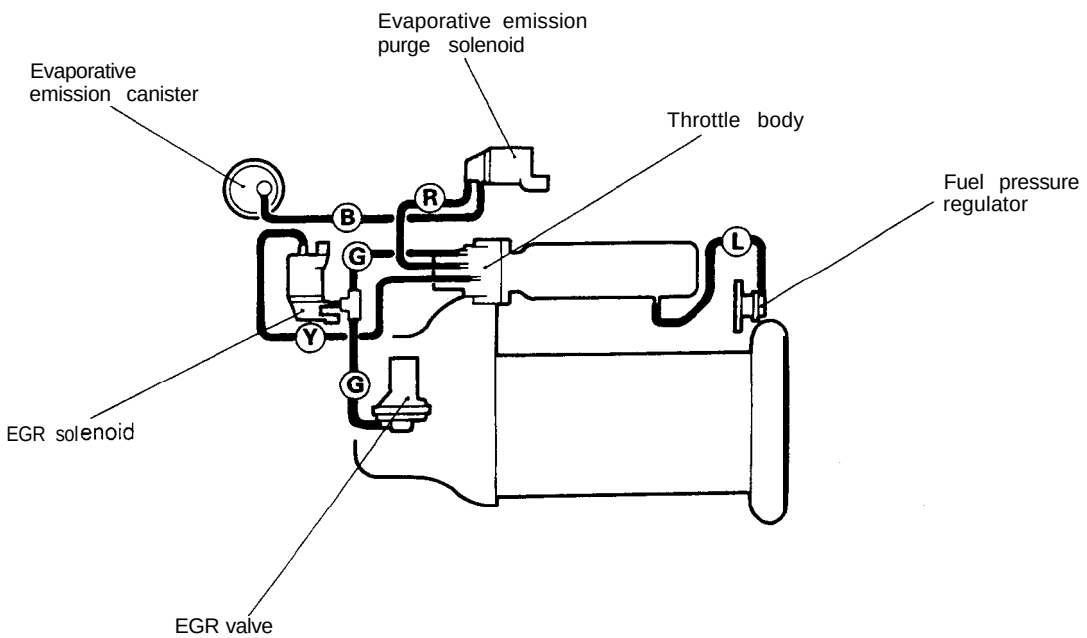

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Y Yellow
L: Light blue
R: Red
B: Black

6EM0192

TSB Revision

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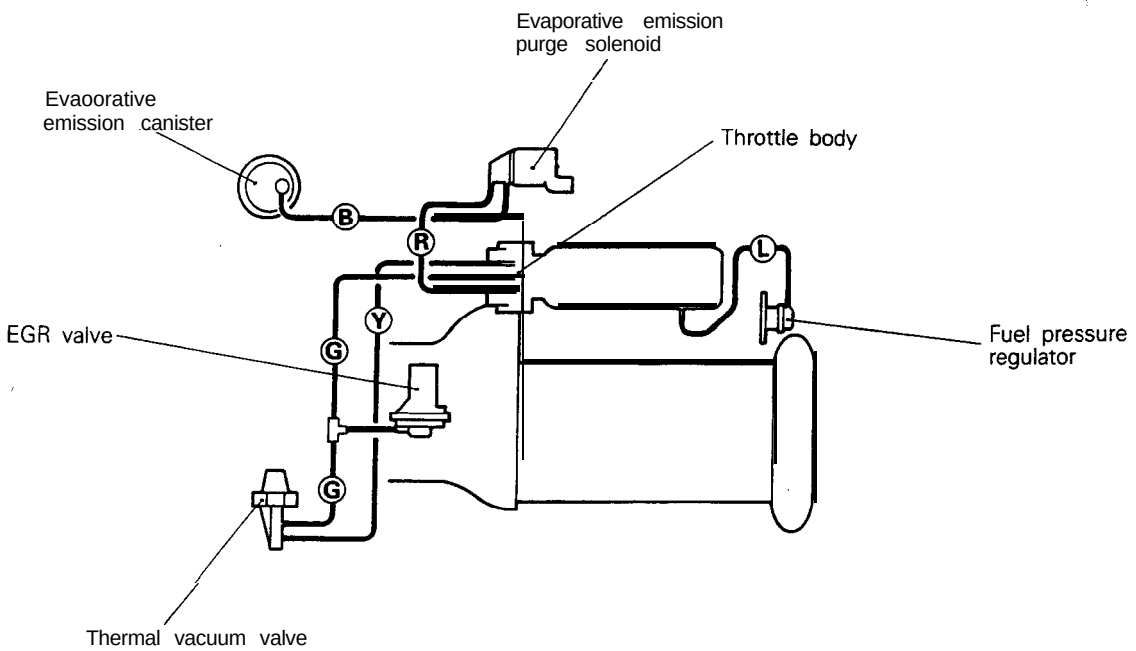

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L: Light blue
R: Red
B: Black

6EM0318

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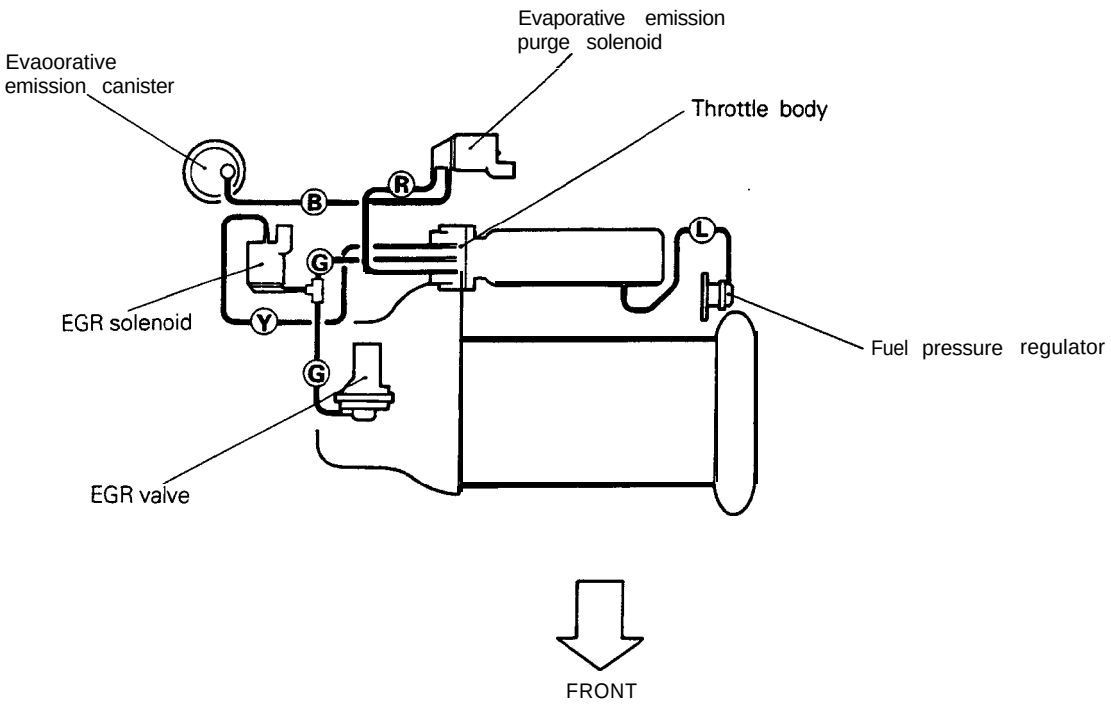

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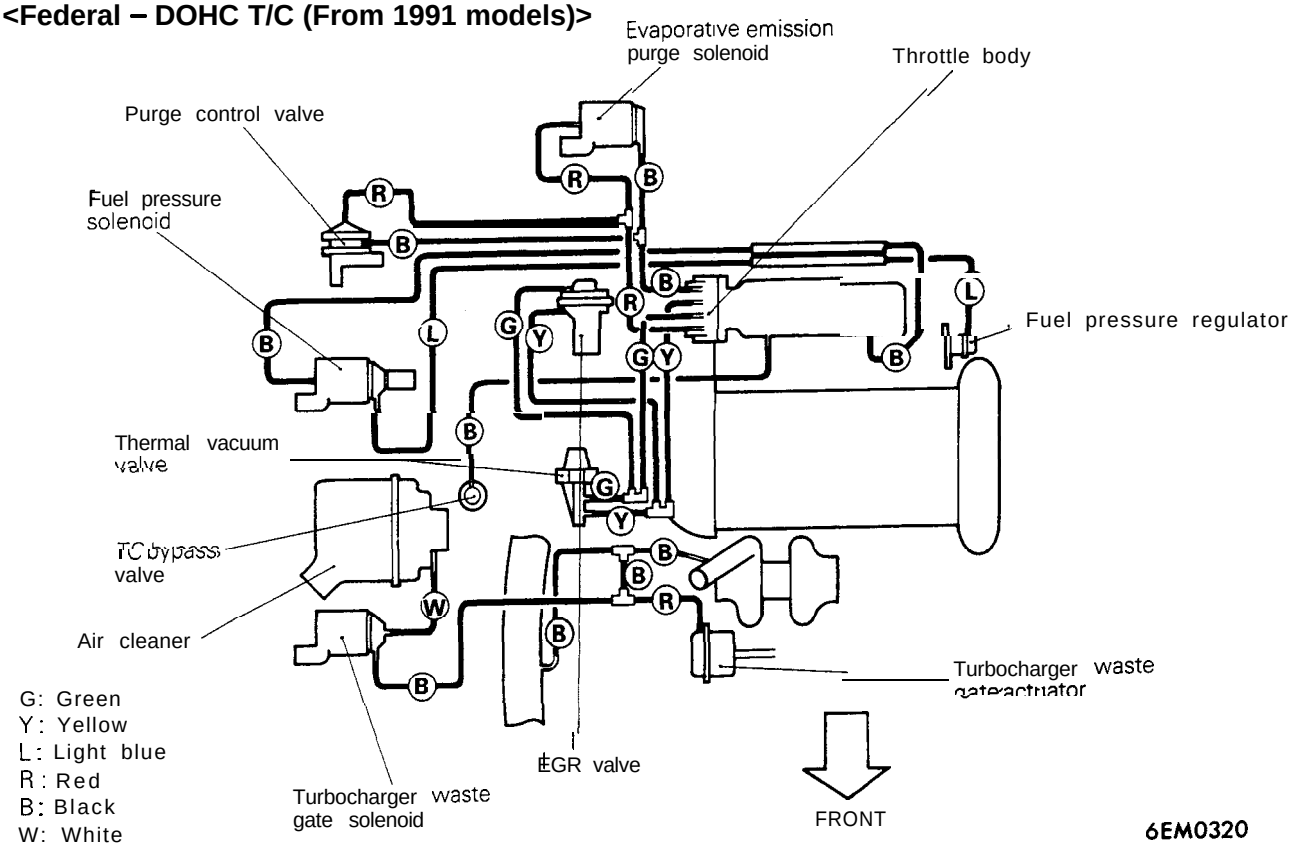
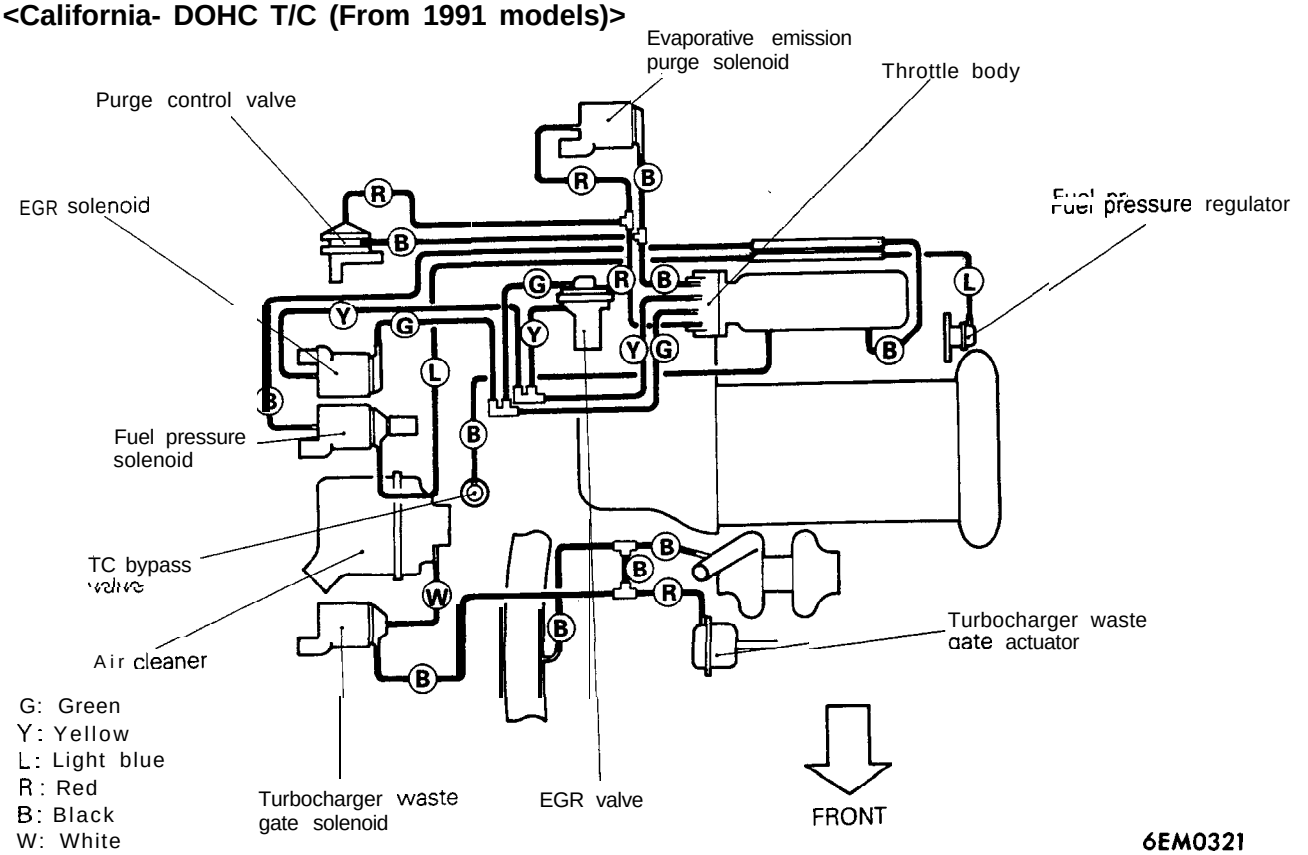
6EM0319

TSB Revision

<Federal – DOHC T/C (From 1991 models)>



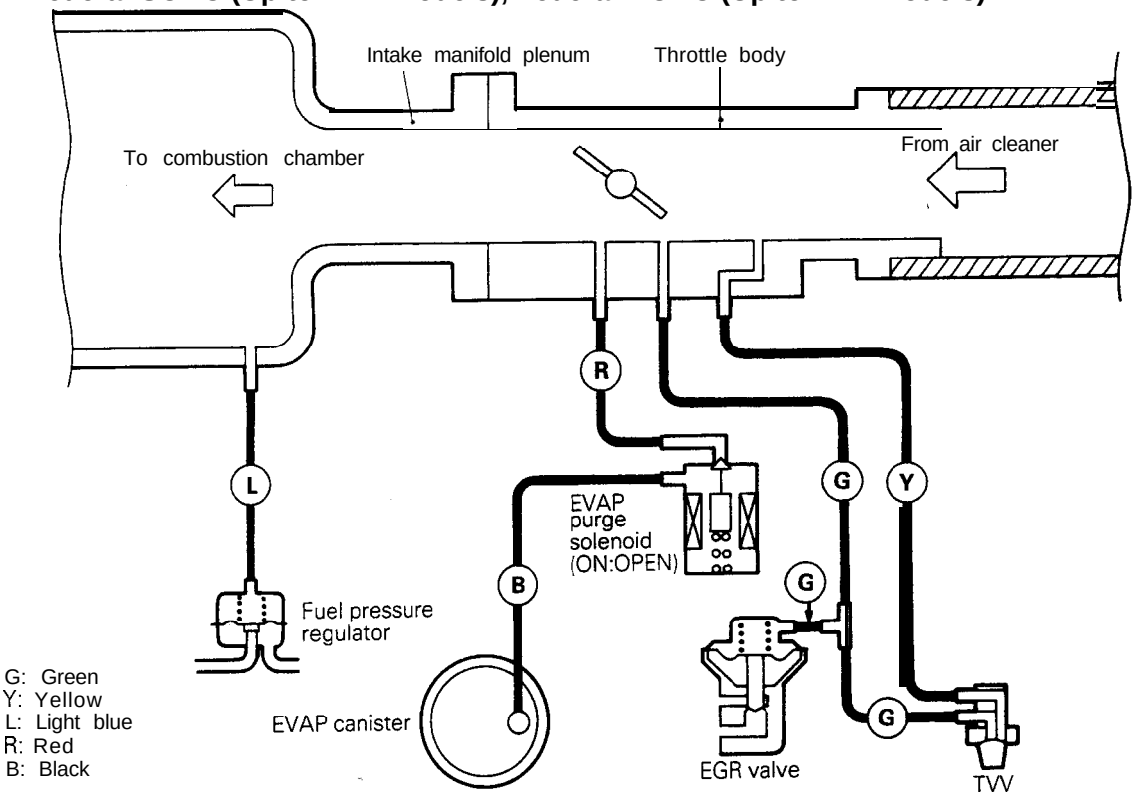
<California- DOHC T/C (From 1991 models)>



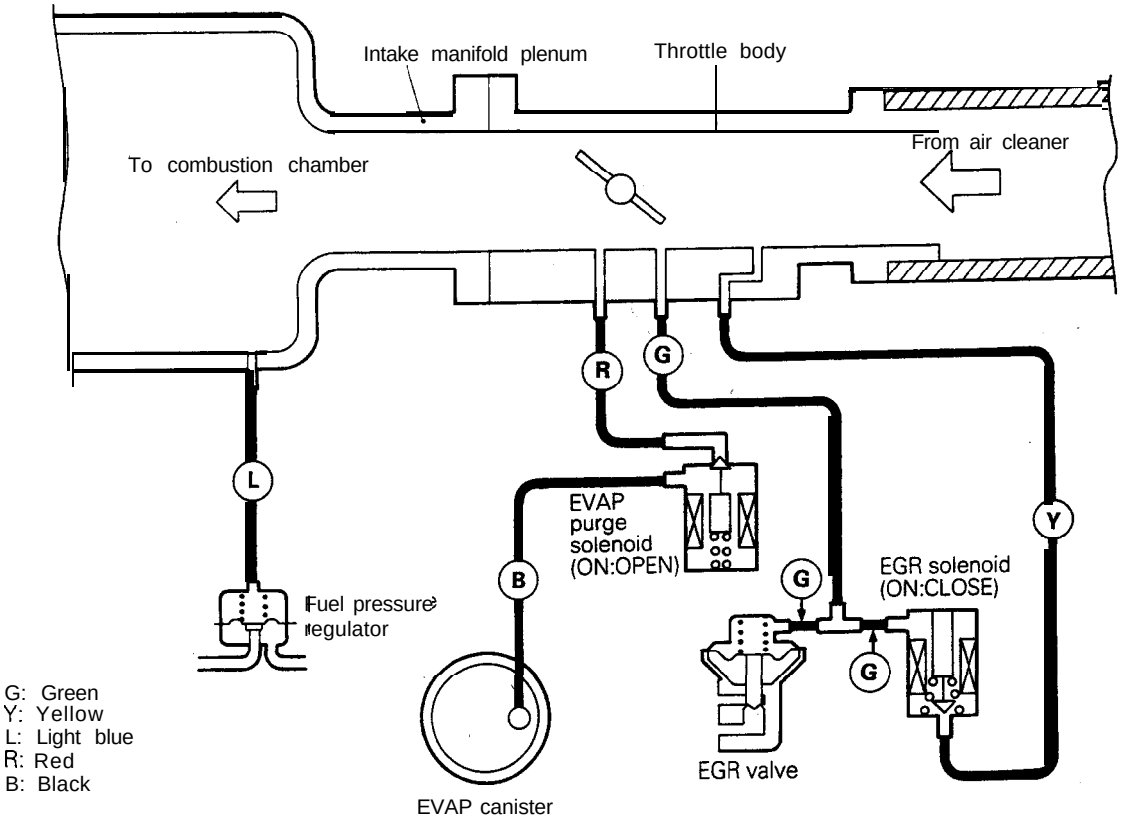
TSB Revision

VACUUM CIRCUIT DIAGRAM

<Federal-SOHC (Up to 1992 models), Federal-DOHC (Up to 1991 models)>



<California-SOHC (Up to 1992 models), California-DOHC (Up to 1991 models)>



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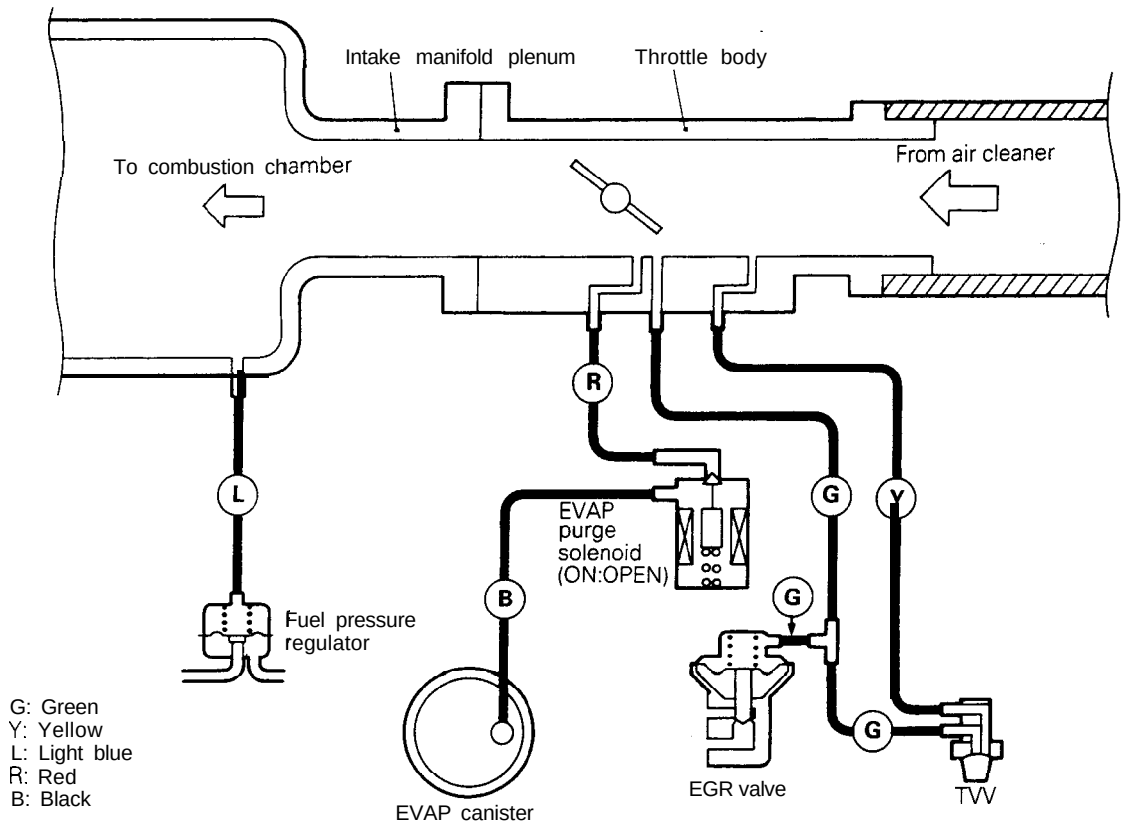

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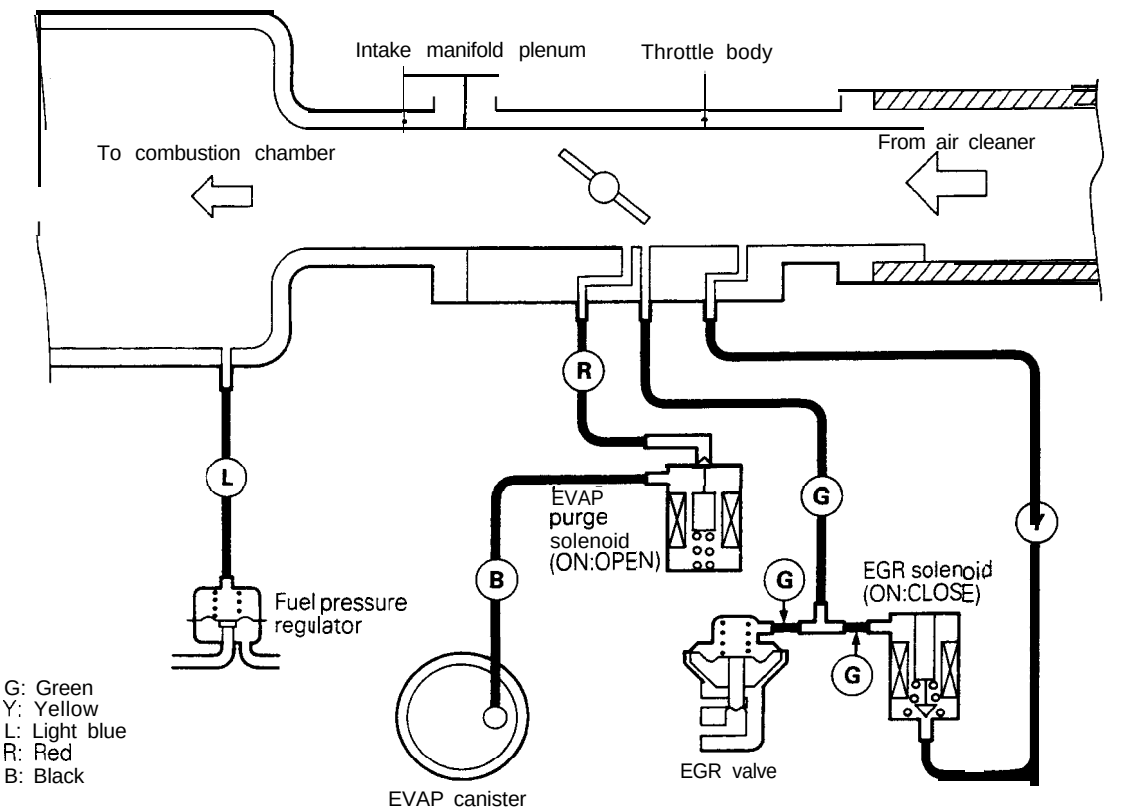

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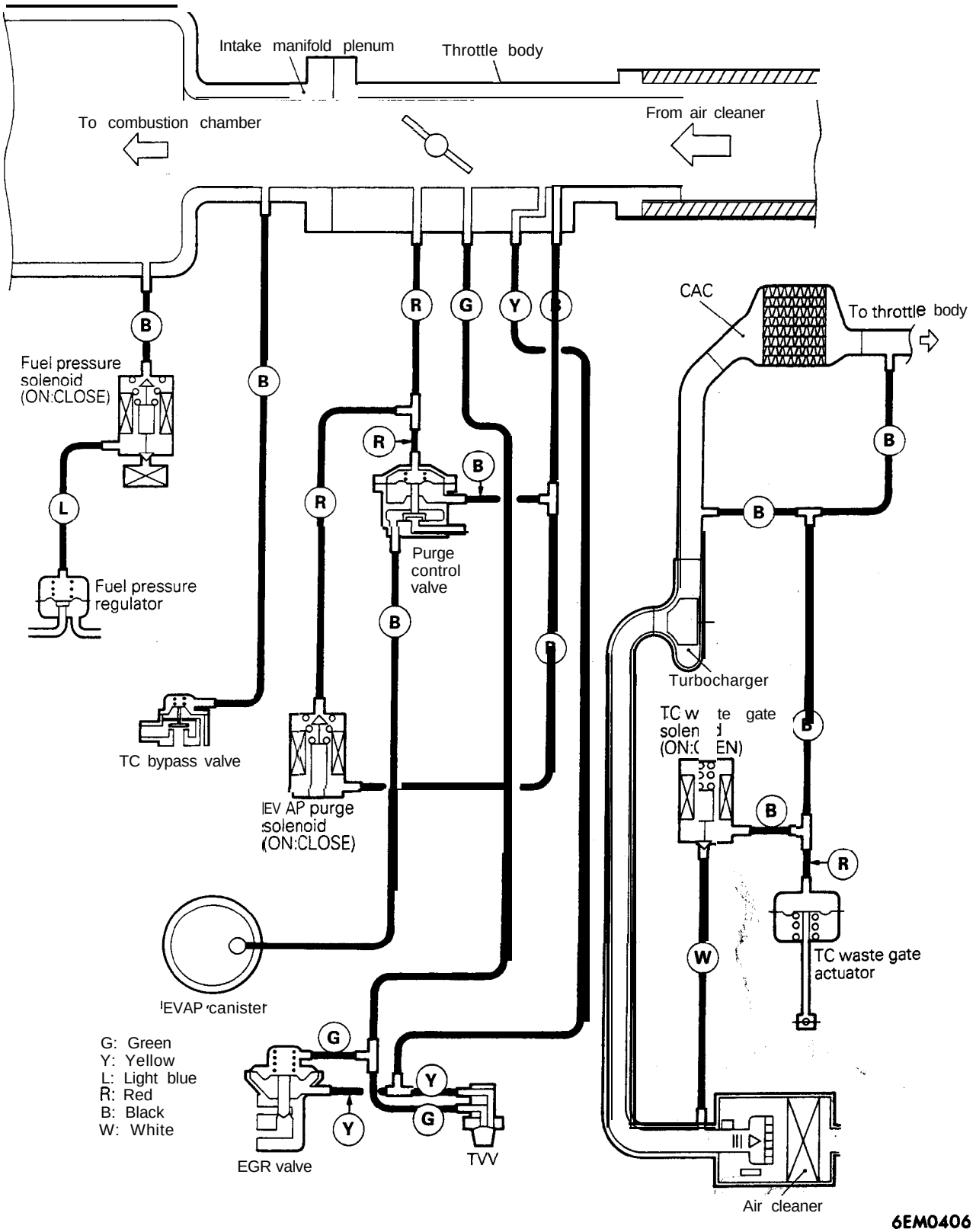

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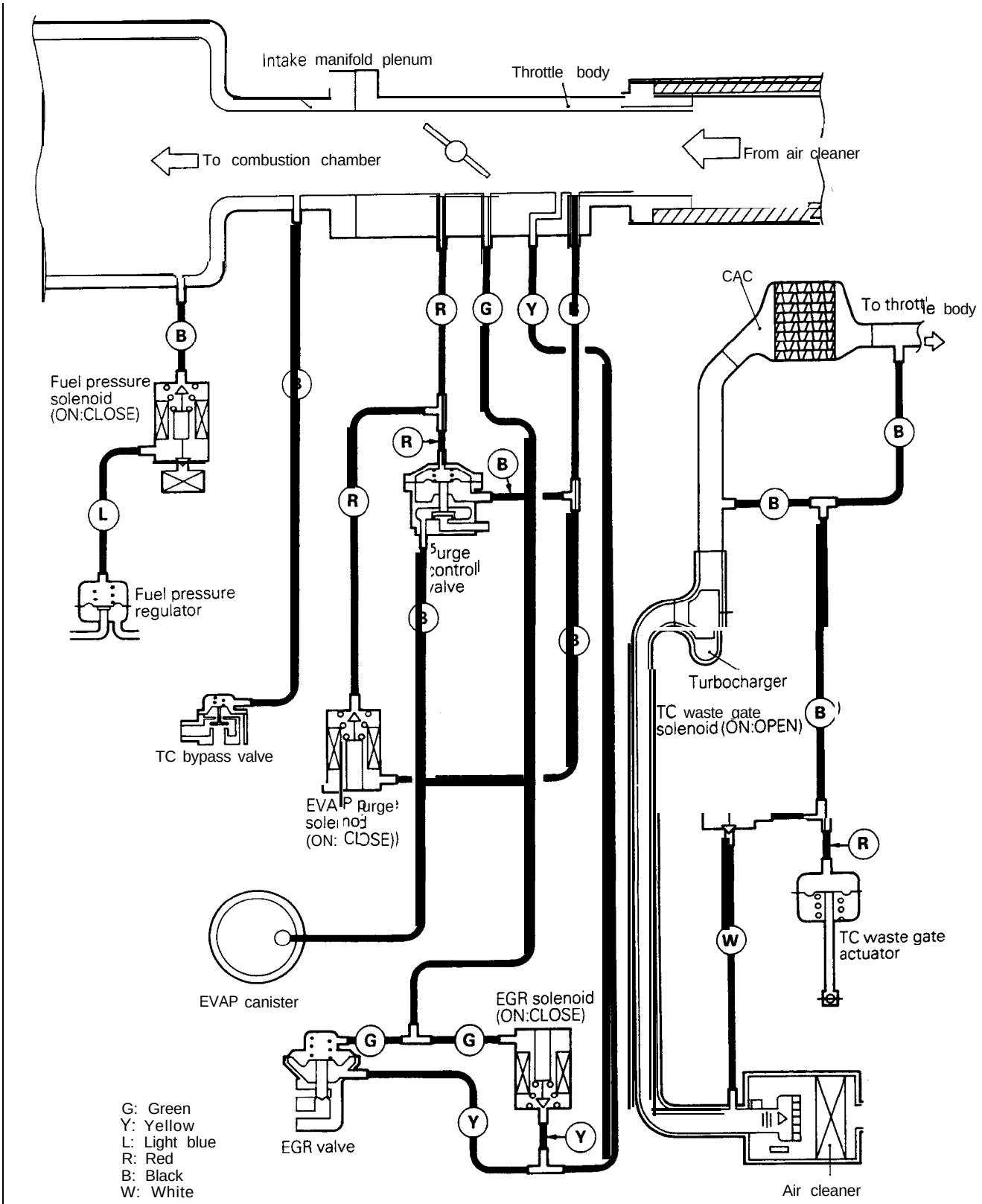


INSPECTION M17JCAD

(1) Referring to the VACUUM HOSES ROUTING, confirm that the vacuum hoses are properly connected.
(2) Check the hoses for irregularities (disconnection, looseness, etc.) and confirm that there is no breakage or damage.

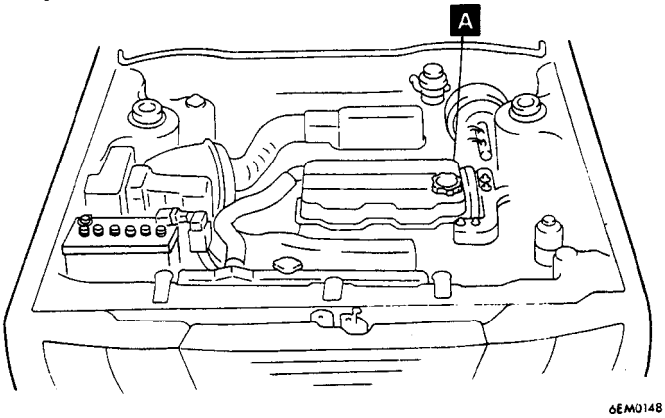
INSTALLATION M17JDAD

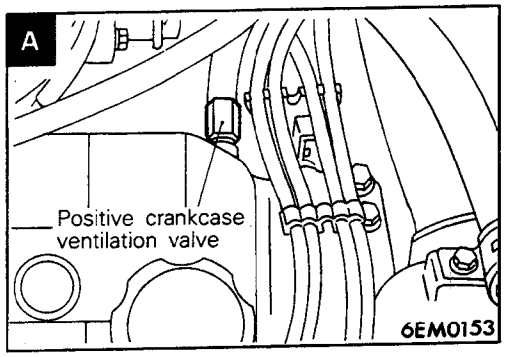
(1) When connecting a hose, firmly press it onto the nipple.
(2) Referring to the VACUUM HOSES ROUTING, connect the hoses correctly.

POSITIVE CRANKCASE VENTILATION SYSTEM M171A--

COMPONENT LOCATION

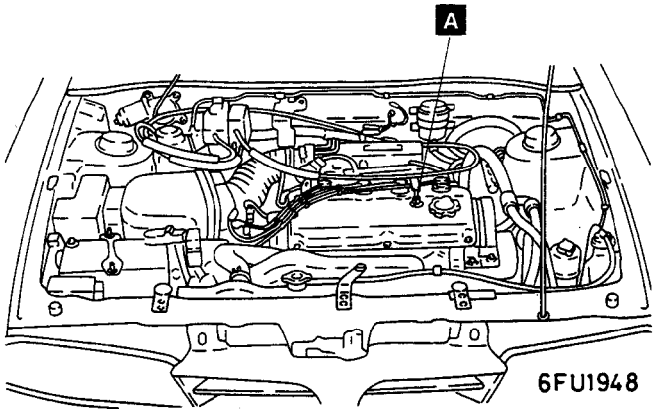
<SOHC-Up to 1992 models>

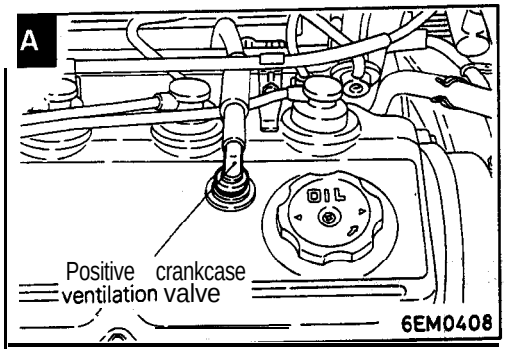




Name	Symbol
Positive crankcase ventilation valve	A

<SOHC-From 1993 models>

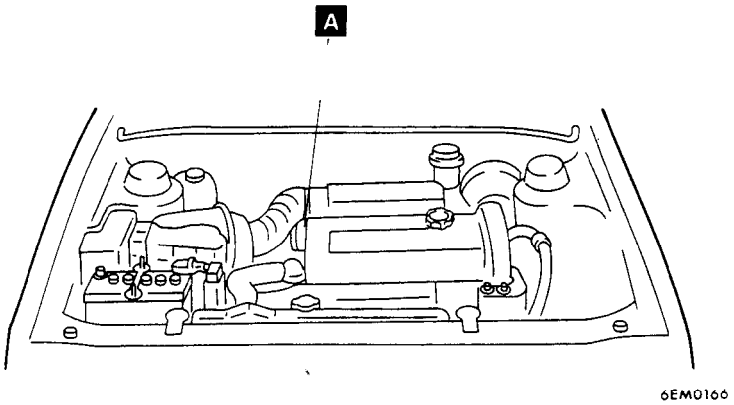


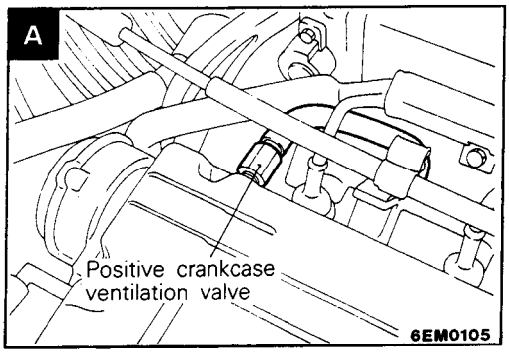


Name	Symbol
Positive crankcase ventilation valve	A

TSB Revision

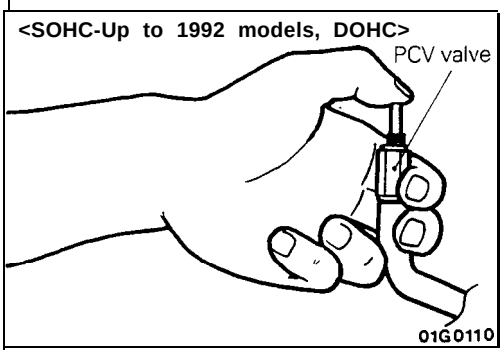
<DOHC>





Name	Symbol
Positive crankcase ventilation valve	A

<SOHC-Up to 1992 models, DOHC>



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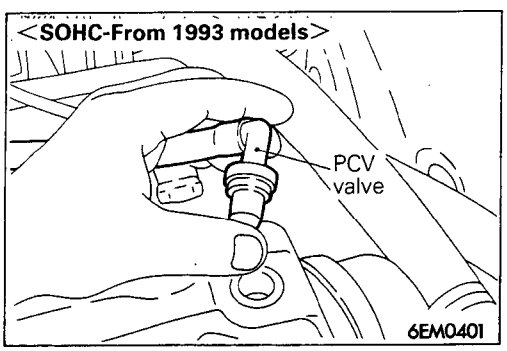
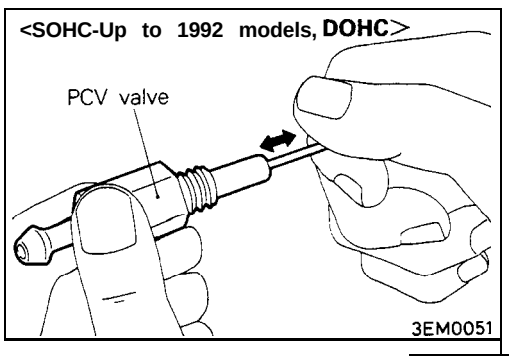


<SOHC-Up to 1992 models, DOHC>



CRANKCASE VENTILATION SYSTEM INSPECTION

M17IAAD

(1) Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve. Then, remove PCV valve from the rocker cover and reconnect it to the ventilation hose.
(2) Idle the engine and put a finger to the open end of PCV valve to make sure that intake manifold vacuum is felt on the finger.

NOTE
At this time, the plunger inside the PCV valve moves back and forth.

(3) If vacuum is not felt on finger, clean the PCV valve and ventilation hose in cleaning solvent or replace if necessary.

POSITIVE CRANKCASE VENTILATION (PCV) VALVE INSPECTION

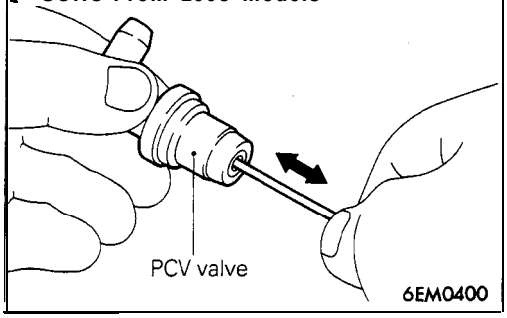
(1) Remove the PCV valve.
(2) Insert a thin rod from the side of the PCV valve that is mounted to the rocker cover. Move the rod back and forth and confirm that the plunger moves.
(3) If the plunger does not move, the PCV valve is clogged, so clean or replace it.

INSTALLATION <SOHC-Up to 1992 models, DOHC>

Install PCV valve and tighten to specified torque.

Specified tightening torque: 8-12 Nm (6-8.5 ft.lbs.)

<SOHC-From 1993 models>

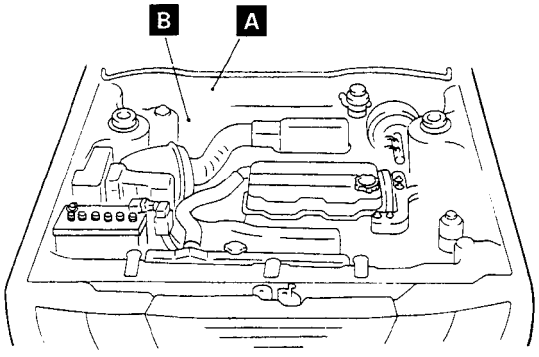


EVAPORATIVE EMISSION CONTROL SYSTEM

M17IB-

COMPONENT LOCATION

<SOHC-Up to 1992 models>



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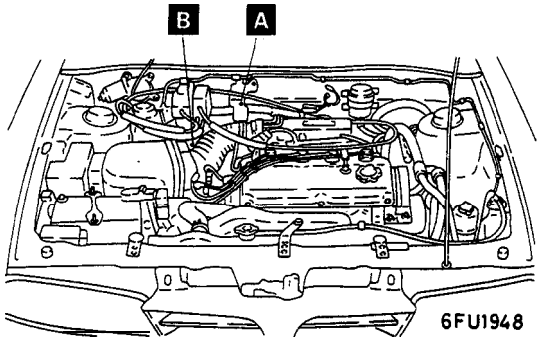
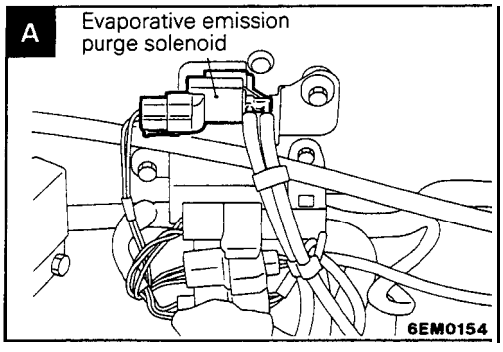
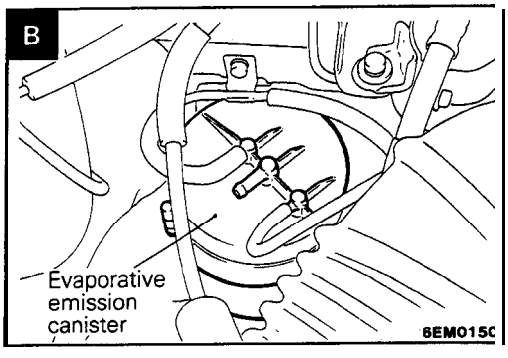


Name	Symbol
Evaporative emission canister	B
Evaporative emission purge solenoid	A





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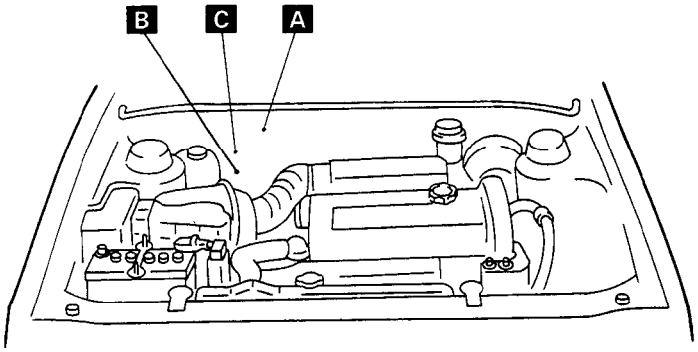
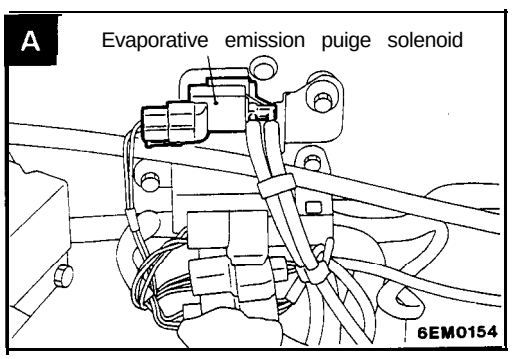
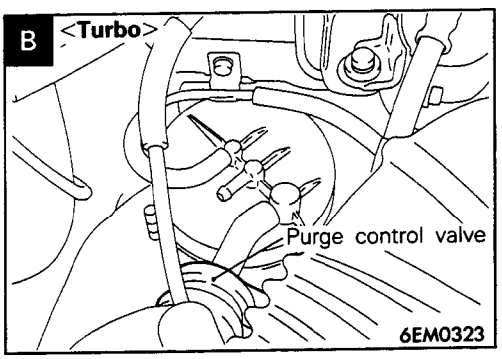
<DOHC>

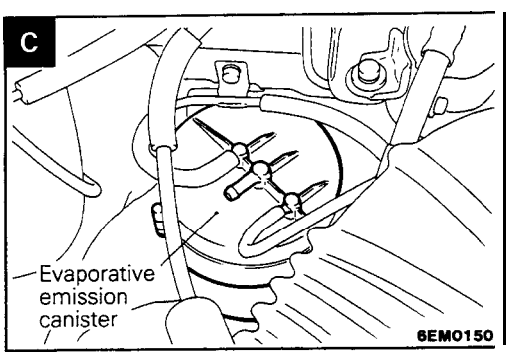


6EM0166

Name	Symbol
Evaporative emission canister	C
Evaporative emission purge solenoid	A
Purge control valve <Turbo>	B

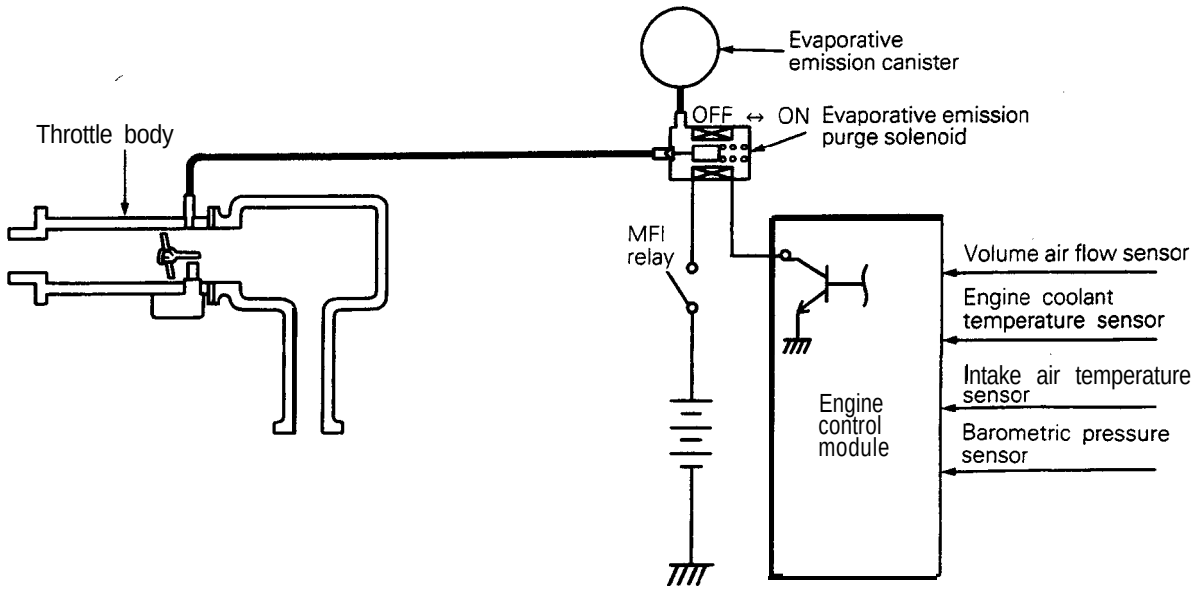






PURGE CONTROL SYSTEM INSPECTION <Non-Turbo>

M171BBF



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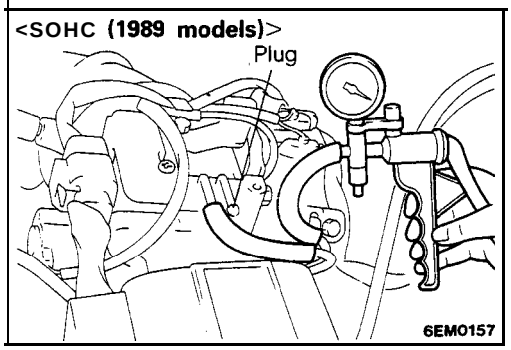

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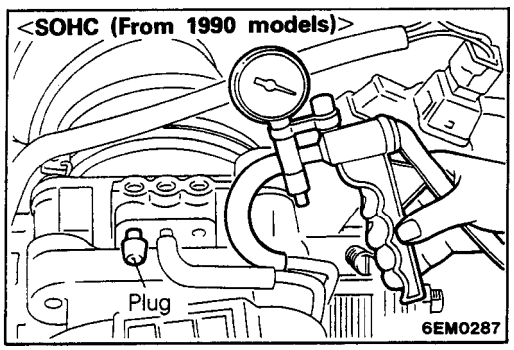

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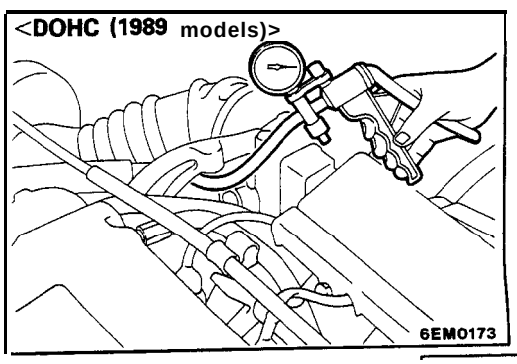


(1) Disconnect the vacuum hose (red stripes) from the throttle body and connect it to a hand vacuum pump.
(2) Plug the nipple from which the vacuum hose was removed.
(3) Under the engine conditions described below, provide a vacuum by using the hand vacuum pump, and then check.

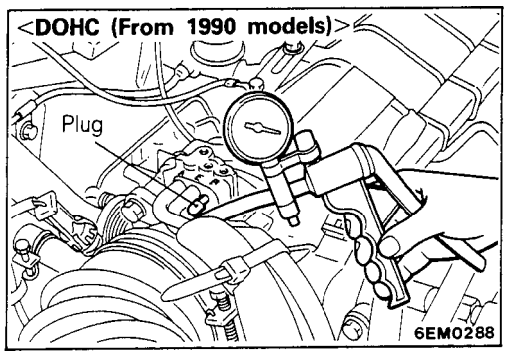
When engine is cold-coolant temperature:
60°C (140°F) or less

Engine operating condition	Applying vacuum	Result
Idling	375 mmHg (14 in.Hg.)	Vacuum is maintained
3,000 rpm		

When engine is hot-coolant temperature:
70°C (158°F), or higher

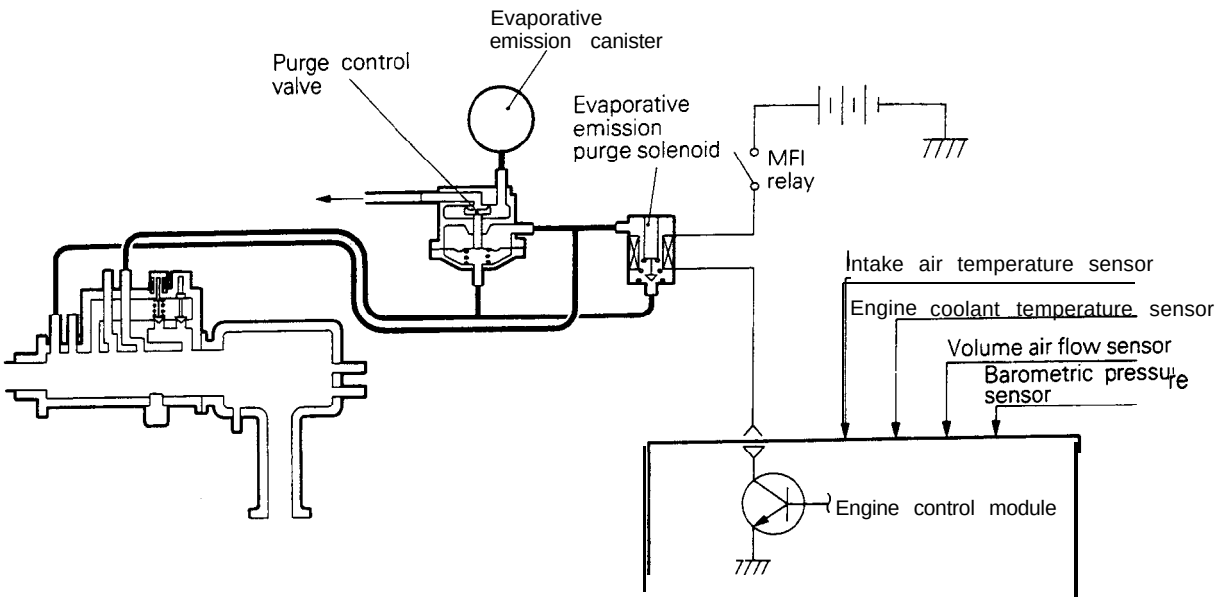
Engine operating condition	Applying vacuum	Result
Idling	375 mmHg (14 in.Hg.)	Vacuum is maintained
Within 3 minutes after engine start 3,000 rpm	Try applying vacuum	Vacuum leaks
After 3 minutes have passed after engine start 3,000 rpm	375 mmHg (14 in.Hg.)	Vacuum will be maintained momentarily, after which it will leaks. NOTE: The vacuum will leak continuously if the altitude is 2,200 m (7,200 ft.) or higher, or the intake air temperature is 50°C (122°F) or higher.

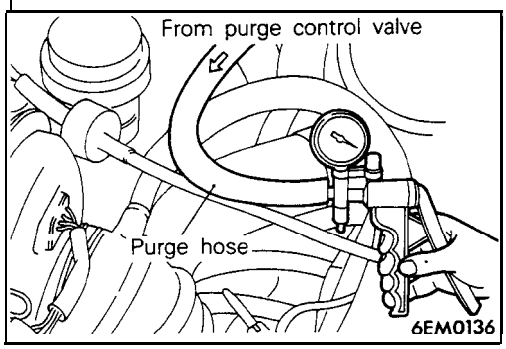
TSB Revision



PURGE CONTROL SYSTEM INSPECTION <Turbo>

M171BBL





(1) Disconnect the purge air hose from the air intake hose, and plug the air intake hose. Then, connect the hand vacuum pump to the purge air hose.
(2) Under the engine conditions shown below, check by applying vacuum from a hand vacuum pump.

When engine is cold-coolant temperature: 60°C (140°F) or less

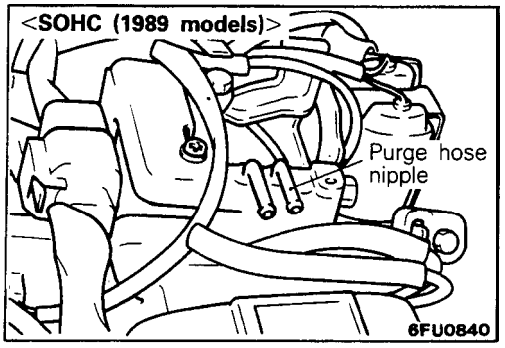
Engine operating condition	Applying vacuum	Result
Idling Vacuum 3,000 rpm	375 mmHg (14.8 in.Hg.)	maintained

TSB Revision

When engine is hot-coolant temperature: 70°C (158°F) or higher

Engine operating condition	Applying vacuum	Result
Idling	375 mmHg (14.8 in.Hg.)	Vacuum is maintained
3,000 rpm within three minutes after starting engine	Try applying vacuum	Vacuum leaks
3,000 rpm after three minutes have elapsed after starting engine	375 mmHg (14.8 in.Hg.)	Vacuum will be maintained momentarily, after which it will leaks. NOTE The vacuum will leak continuously if the altitude is 2,200 m (7,200 ft.) or higher, or the intake air temperature is 50°C (122°F) or higher.

<SOHC (1989 models)>



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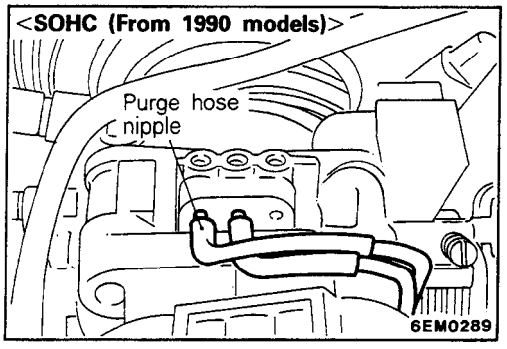

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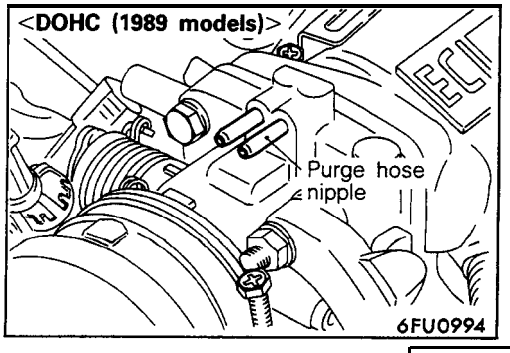


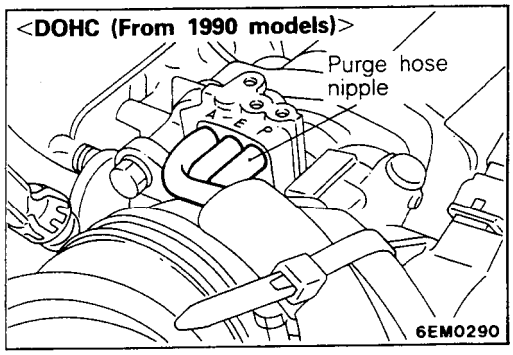
PURGE PORT VACUUM M17FVBC

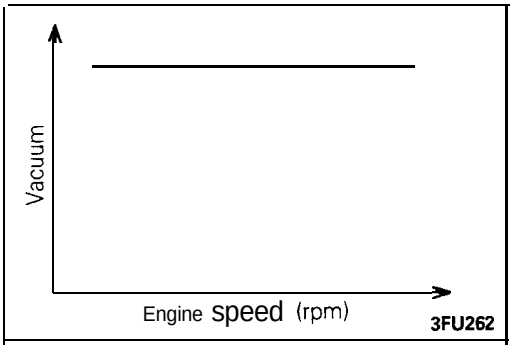
INSPECTION <SOHC-Up to 1992 models, DOHC Non-Turbo-Up to 1991 models, DOHC Turbo>

Engine coolant temperature: 85 – 95°C (185 – 205°F)

(1) Disconnect the vacuum hose from the throttle body purge hose nipple and connect a hand vacuum pump to the nipple.

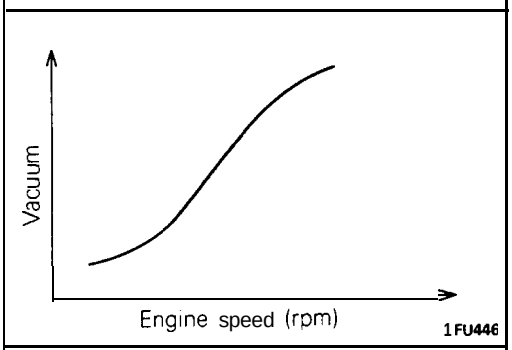
TSB Revision





(2) Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum remains fairly constant.

NOTE
If there is no vacuum created, it is possible that the throttle body port may be clogged and require cleaning.

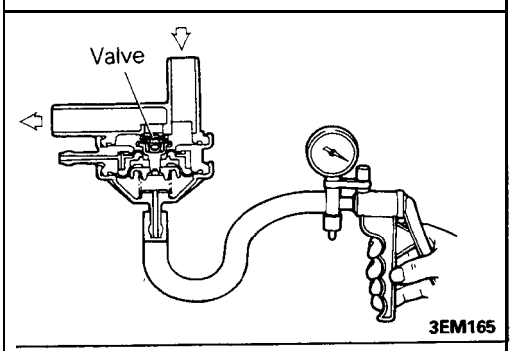


INSPECTION <SOHC-From 1993 models, DOHC Non-Turbo From 1992 models>

Engine coolant temperature: 85–95°C (185–205°F)

(1) Disconnect the vacuum hose from the throttle body purge hose nipple and connect a hand vacuum pump to the nipple.
(2) Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum raises proportionately with the rise in engine speed.

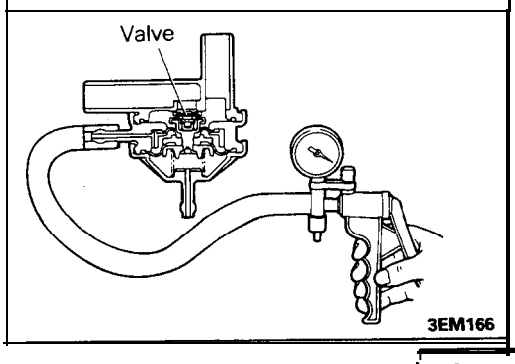
NOTE
If there is a problem with the change in vacuum, it is possible that the throttle body port may be clogged and require cleaning.



PURGE CONTROL VALVE <Turbo> M171BCC

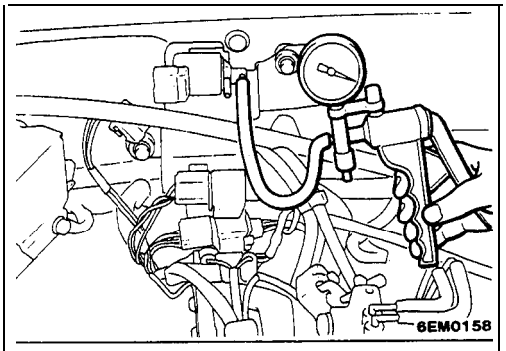
INSPECTION

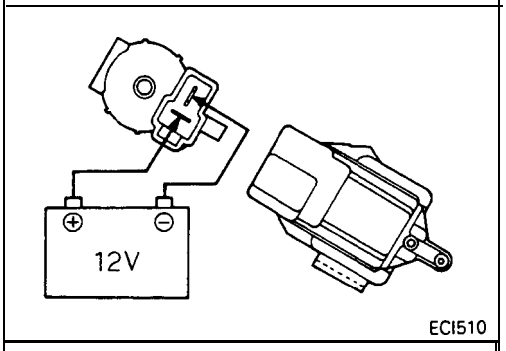
(1) Remove the purge control valve.
(2) Connect a hand vacuum pump to the vacuum nipple of the purge control valve.
(3) Apply a vacuum of 400 mmHg (15.7 in.Hg.) and check airtightness.
(4) Blow in air lightly from the evaporative emission canister side nipple and check conditions as follows.

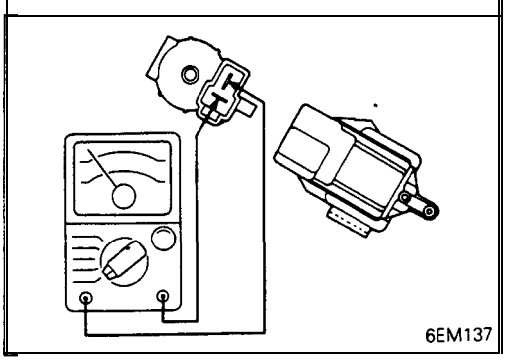


Hand vacuum pump vacuum	Normal condition
0 mmHg (0 in.Hg.) (No vacuum is applied)	Air does not blow through
200 mmHg (8.0 in.Hg.) or more	Air blow through

(5) Connect a hand vacuum pump to the positive pressure nipple of the purge control valve.
(6) Apply a vacuum of 400 mmHg (15.7 in.Hg.) and check air-tightness.







EVAPORATIVE EMISSION PURGE SOLENOID

INSPECTION M17IBFD

NOTE
When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to the original position.

(1) Disconnect the vacuum hoses (non stripe and red stripe hoses) from the solenoid valve
(2) Disconnect the harness connector from solenoid valve.
(3) Connect a hand vacuum pump to the nipple to which the red-striped vacuum hose was connected.
(4) Apply a vacuum and check for air-tightness when voltage applied directly to the evaporative emission purge solenoid when the voltage is discontinued.

Battery voltage		Result
Non-Turbo	When applied	Vacuum leaks
	When discontinued	Vacuum is maintained
Turbo	When applied	Vacuum is maintained
	When discontinued	Vacuum leaks

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

Standard value: 36-44 Ω [at 20°C (68°F)]

VOLUME AIR FLOW SENSOR, ENGINE COOLANT TEMPERATURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR M17IBGB

To inspect these parts, refer to GROUP 13-On-Vehicle Inspection of MFI Components.

AIR CONDITIONING SWITCH M17IBHB

To inspect the air conditioning switch, refer to GROUP 55-Air Conditioning Switch.

FUEL TANK PRESSURE CONTROL VALVE M17IBEB

To inspect the fuel tank pressure control valve, refer to GROUP 13-Fuel Tank.

EVAPORATIVE EMISSION CANISTER M17IBIB

To inspect the evaporative emission canister, refer to GROUP 13-Fuel Line and Vapor Line.

FUEL TANK FILLER TUBE CAP INSPECTION M17IBJA

Check the gasket of the fuel tank filler tube cap, and the filler cap itself, for damage or deformation; replace the cap if necessary.

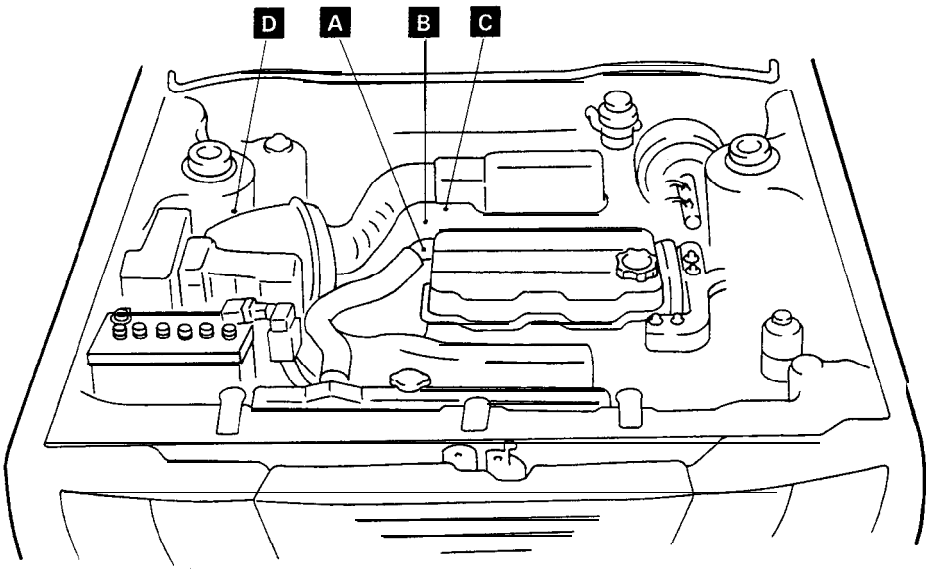
TSB Revision

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

M171C--

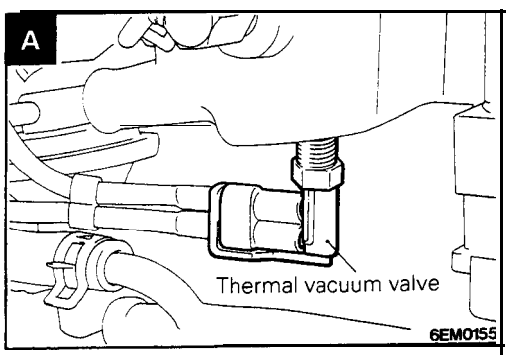
COMPONENT LOCATION

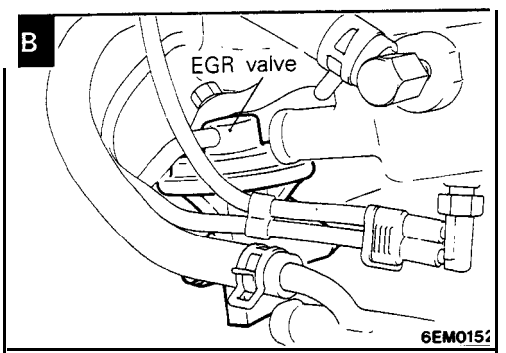
<SOHC-Up to 1992 models>

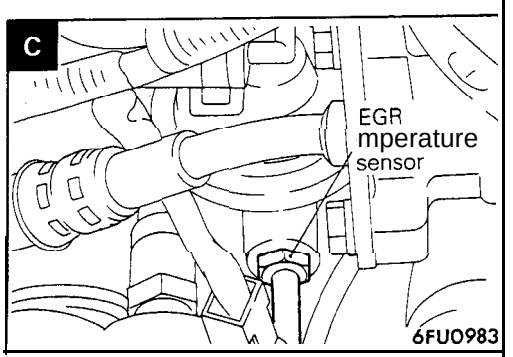


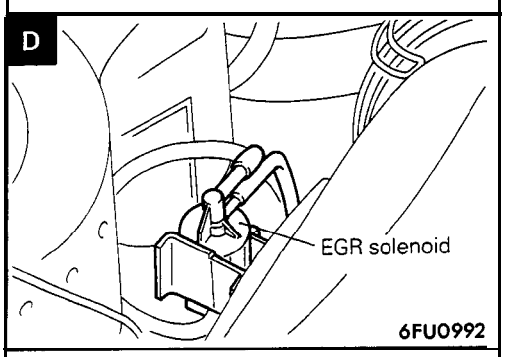
6EM0148

Name	Symbol
EGR solenoid <California>	D
EGR valve	B
EGR temperature sensor <California>	C
Thermal vacuum valve <Federal>	A



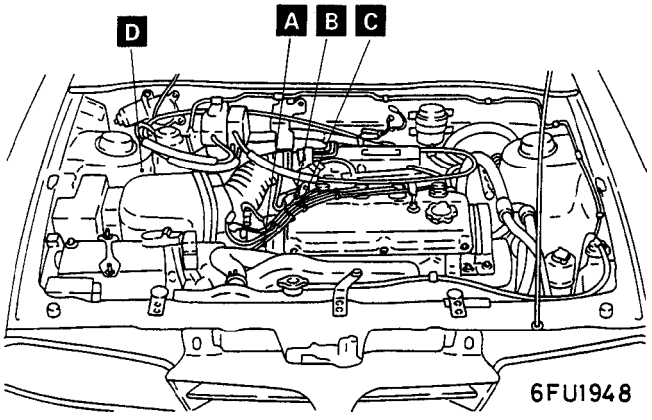




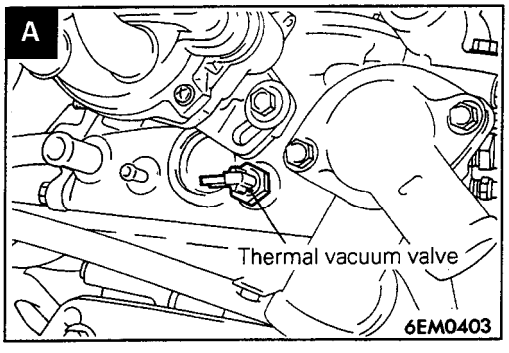


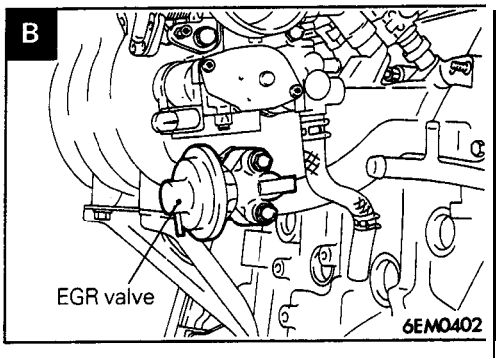
TSB Revision

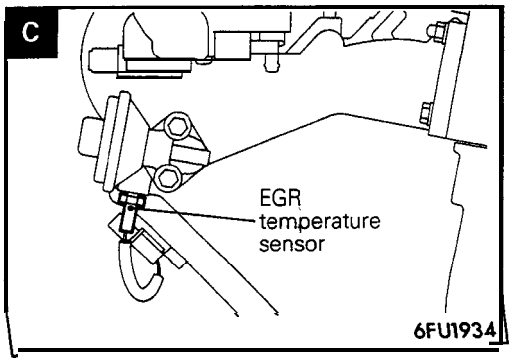
<SOHC-From 1993 models>

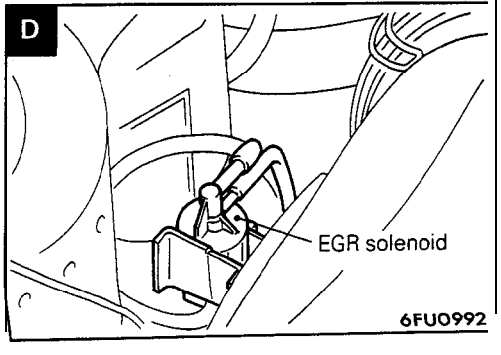


Name	Symbol
EGR solenoid <California>	D
EGR valve	B
EGR temperature sensor <California>	C
Thermal vacuum valve <Federal>	A









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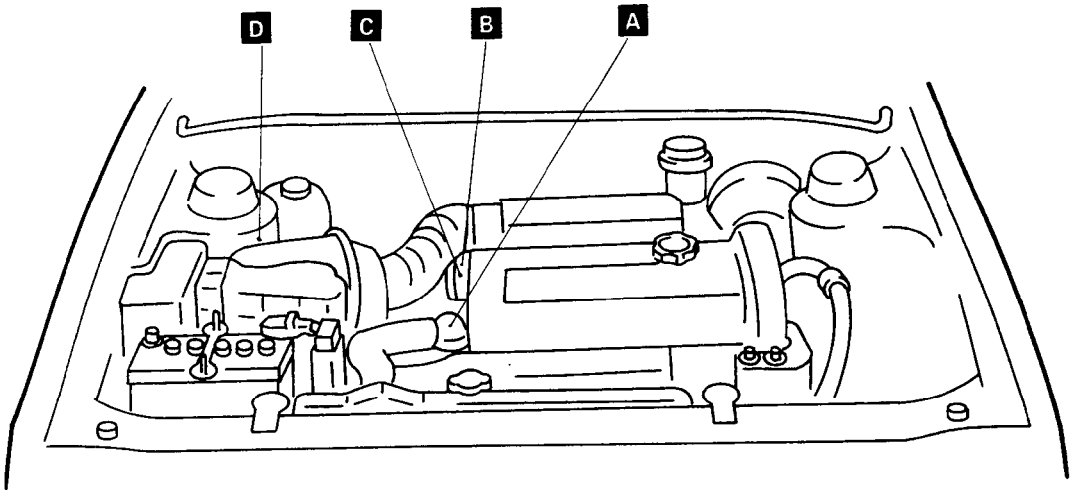
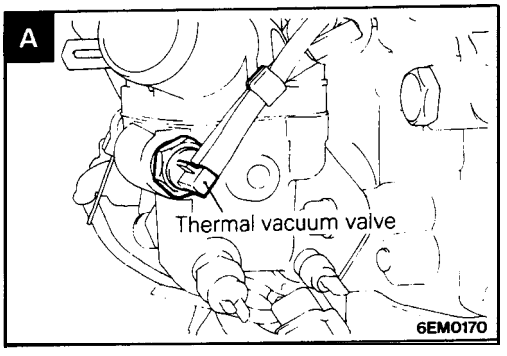
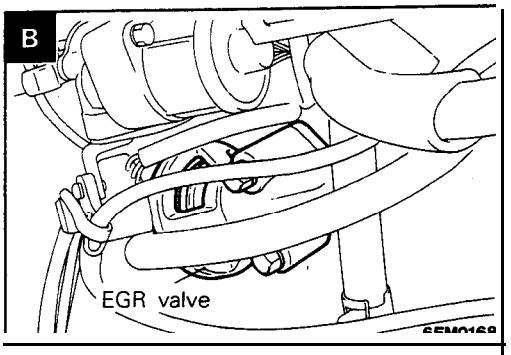
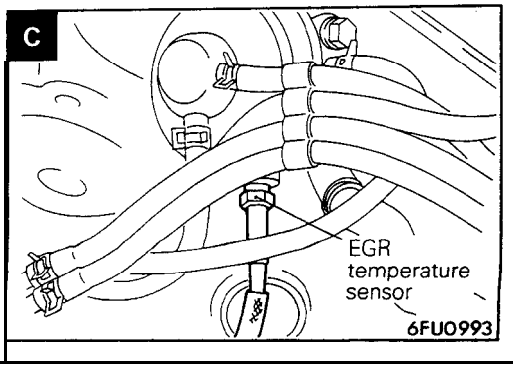


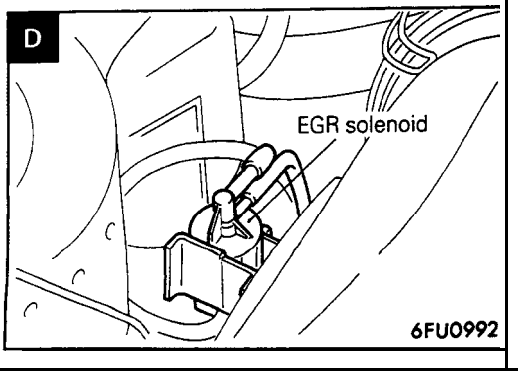
6EM0166

Name	Symbol
EGR solenoid <California>	D
EGR valve	B
EGR temperature sensor <California>	C
Thermal vacuum valve <Federal>	A









TSB Revision

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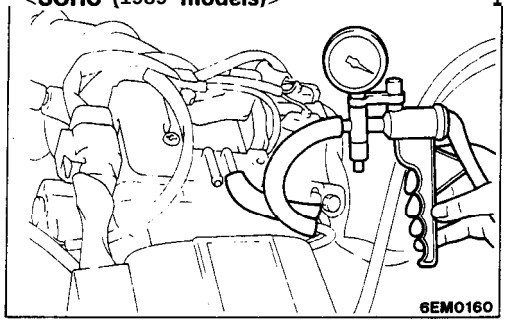

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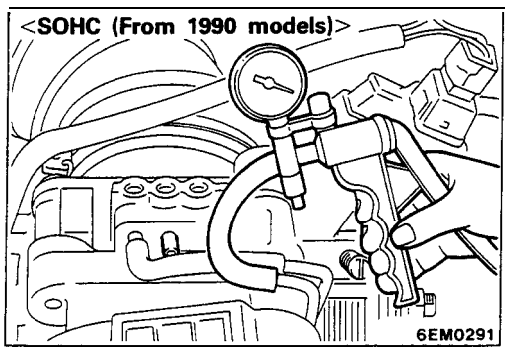

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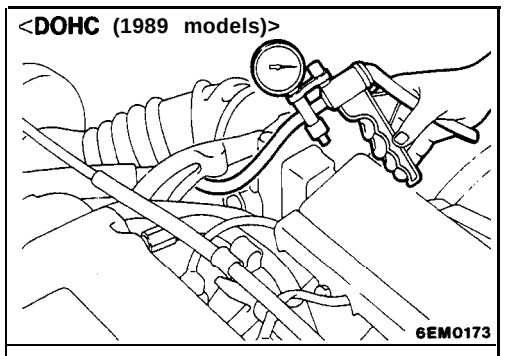

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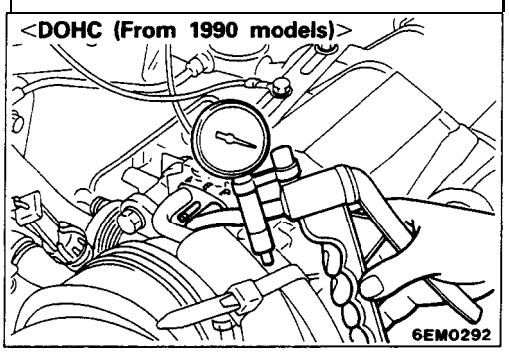
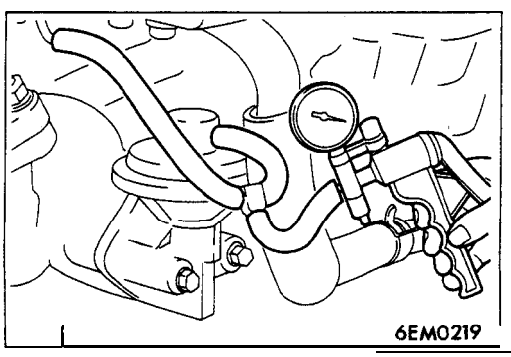




EGR SYSTEM INSPECTION <Federal> M17ICJF

(1) Disconnect the vacuum hose (green stripe) from the throttle body, and connect a hand vacuum pump to the vacuum hose.
(2) Under the engine conditions described below, provide a vacuum by using the hand vacuum pump, and then check.

When Engine is Cold–
coolant temperature 50°C (122°F) or below

Engine operating condition	Applying vacuum	Result
Idling	Try applying vacuum	Vacuum leaks

When Engine is Hot–
coolant temperature 85°–95°C (185°–205°F) or higher

Engine operating condition	Applying vacuum	Result
Idling	45 mmHg (1.7 in.Hg.)	Vacuum is maintained
Changes from idling to slightly unstable	220 mmHg (8.7 in.Hg.)	Vacuum is maintained

EGR SYSTEM INSPECTION <California>

(1) Disconnect the vacuum hose (green striped hose) from the exhaust gas recirculation (EGR) valve, and then connect a manual vacuum pump via the three-way terminal.
(2) Check the following points when the engine is cold [engine coolant temperature is 20°C (68°F) or below] and when the engine is warm [engine coolant temperature is 70°C (158°F) or higher].

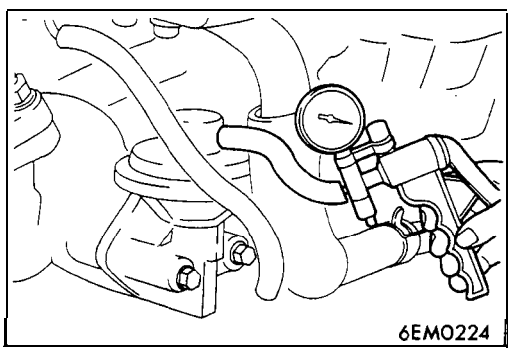
TSB Revision

<When the engine is cold>

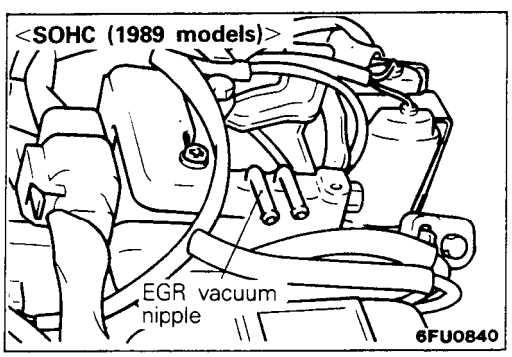
Engine condition	Normal condition
Press the accelerator pedal suddenly and race the engine.	Vacuum: no change (atmospheric pressure)

<When the engine is warm>

Engine condition	Normal condition
Press the accelerator pedal suddenly and race the engine.	Vacuum rises temporarily to 100 mmHg (3.9 in.Hg).



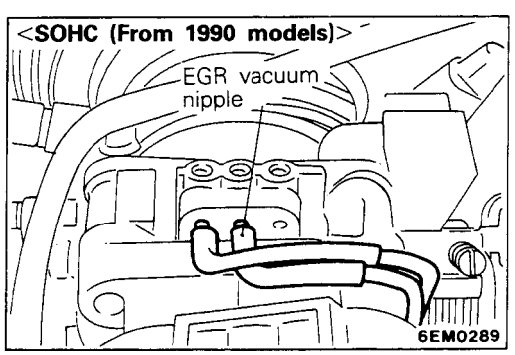
(3) Disconnect the three-way terminal and connect the manual vacuum pump directly to the exhaust gas recirculation (EGR) valve.
(4) Check whether the engine stalls or the idling is unstable when a vacuum of 155 mmHg (5.9 in.Hg) or higher is applied during idling.

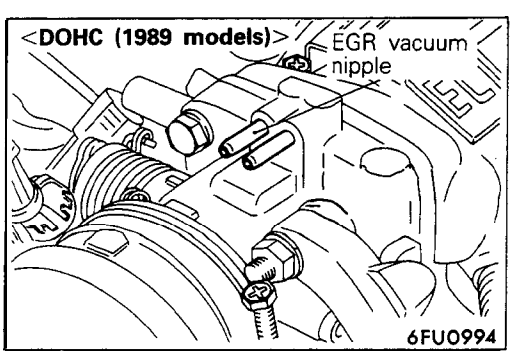


EGR VALVE CONTROL VACUUM M17FV8B

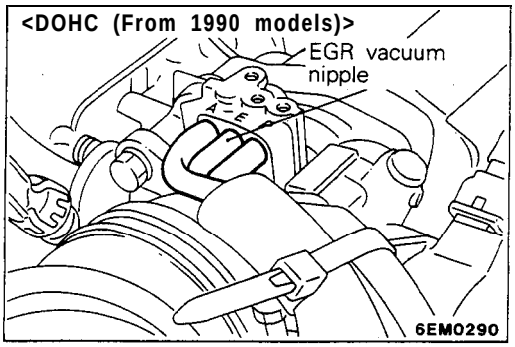
INSPECTION

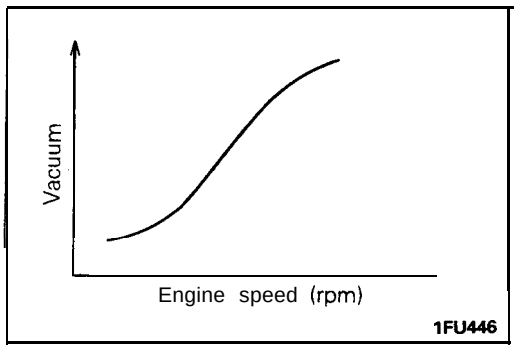
Engine coolant temperature: 85–95°C (185–205°F)
(1) Disconnect the vacuum hose from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.





TSB Revision



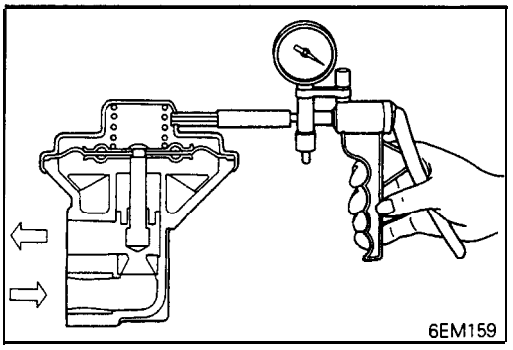


(2) Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum raises proportionately with the rise in engine speed.

NOTE
if there is a problem with the change in vacuum, it is possible that the throttle body port may be clogged and require cleaning.

EGR VALVE M17ICKF

INSPECTION



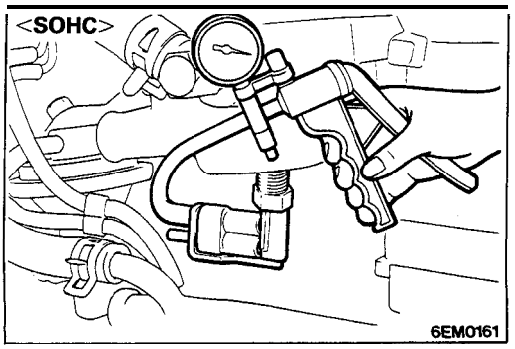
(1) Remove the EGR valve and check it for sticking, deposit of carbon, etc.
If such condition exists, clean with adequate solvent to ensure tight valve seat contact.
(2) Connect a hand vacuum pump to the EGR valve.
(3) Apply a vacuum of 500 mmHg (19.6 in.Hg.) and check air tightness.
(4) Blow in air from one passage of the EGR to check condition as follows.

Applying vacuum	Result
45 mmHg (1.7 in.Hg.)	Air does not blow through
220 mmHg (8.7 in.Hg.)	Air blows through

INSTALLATION

(1) Install a new gasket and EGR valve, tighten bolts to specified torque.

Specified tightening torque: 17-26 Nm (12-19 ft.lbs.)



THERMAL VACUUM VALVE <Federal> M17ICNG

INSPECTION

(1) Disconnect the vacuum hoses from the thermal vacuum valve, and connect a hand vacuum pump to nipple of the thermal vacuum valve.
(2) Apply a vacuum and check the air passage through the thermal vacuum valve.

TSB Revision

Engine coolant temperature	Result
50°C (122°F) or less	Vacuum leaks.
80°C (176°F) or more	Vacuum is maintained.

REMOVAL

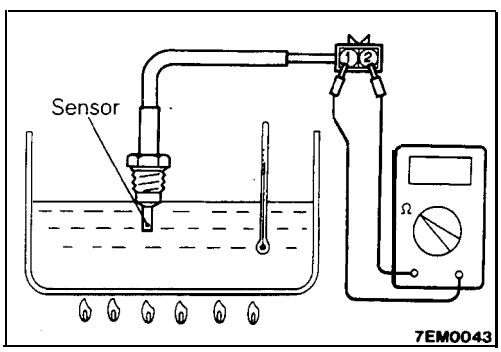
(1) When removing the thermal vacuum valve, do not use wrenches or other tools on the resin part.
(2) When disconnecting the vacuum hose, put a mark on the hose so that it may be reconnected at original position.

INSTALLATION

(1) Apply specified sealant to the threads of thermal vacuum valve and tighten to specified torque. When installing the thermal vacuum valve, do not use wrenches or other tools on the resin part.

Specified sealant:
3M NUT Locking Part No.4171 or equivalent
Specified torque: 20–40 Nm (15–30 ft.lbs.)

(2) Reconnect the vacuum hose as it was before.



EGR TEMPERATURE SENSOR <California> M17ICZB

INSPECTION

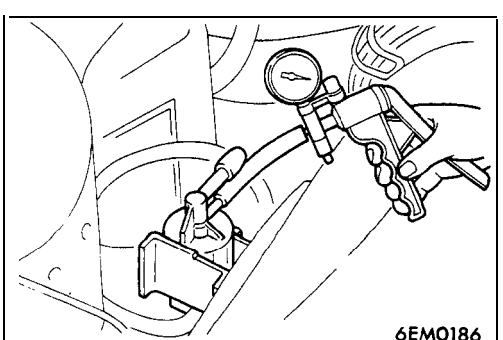
(1) Remove the EGR temperature sensor.
(2) Place the EGR temperature sensor in water, and then measure the resistance value between terminals 1 and 2 while increasing the water's temperature.
Replace the EGR temperature sensor if there is a significant deviation from the standard value.

Temperature [°C (°F)]	Resistance (kΩ)
50 (122)	60–83
100 (212)	11–14

INSTALLATION

(1) Install the EGR temperature sensor, tighten to specified torque.

Specified tightening torque:
10–12 Nm (7.3-8.6 ft.lbs.)



EGR SOLENOID <California> M17ICRB

INSPECTION

NOTE
When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to the original position.

(1) Disconnect the vacuum hoses (yellow and green stripe) from the solenoid valve.
(2) Disconnect the harness connector.
(3) Connect a hand vacuum pump to the nipple to which the green-striped vacuum hose was connected.

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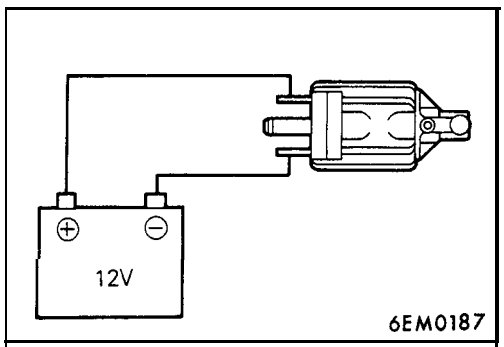
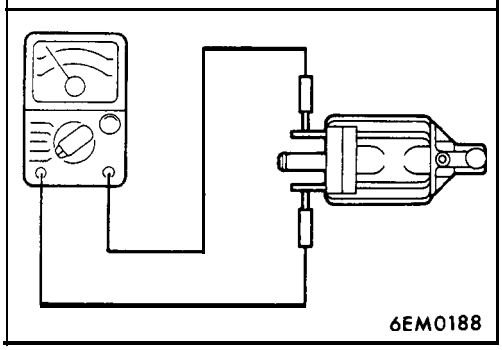


(4) Apply a vacuum and check for air-tightness when voltage applied directly to the EGR solenoid when the voltage is discontinued.

Battery voltage	Result
When applied	Negative pressure is maintained.
When discontinued	Negative pressure leaks.



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

Standard value: 36-44 Ω [at 20°C (68°F)]

CATALYTIC CONVERTER M1171CBC

INSPECTION

Check for damage, cracks or fusion and replace if faulty.

Caution

1. Operation of any type, including idling, should be avoided if engine misfiring occurs. Under this condition 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 tuneup according to manufacturer's specifications should be made to correct the conditions as soon as possible.

MIXTURE CONTROL (MFI) SYSTEM M1171CAC

- For the inspection of mixture control (MFI) system, refer to GROUP 13.
- For the on-board diagnostic, refer to GROUP 13–On-board Diagnostic.

NOTE

CLUTCH

CONTENTS

M21AA--

CLUTCH CONTROL **10**

CLUTCH MASTER CYLINDER **12**

CLUTCH PEDAL 7

CLUTCH RELEASE CYLINDER **13**

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- Clutch Pedal Inspection and Adjustment 5

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- General Specifications 2
- Lubricants 3
- Service Specifications 2
- Torque Specifications 3

TROUBLESHOOTING **4**
- Clutch chatters
- Clutch noise
- Clutch pedal feels “heavy”
- Clutch slips
- Gear shift malfunction

CAUTION
When servicing clutch assemblies or components for vehicles with SOHC engine (Up to 1991 models), do NOT create dust by sanding or by cleaning clutch parts with a dry brush or with compressed air. (A water dampened cloth should be used). The clutch disc contains “Asbestos Fibers” which can become airborne if dust is created during service operations. Breathing dust containing “Asbestos Fibers” may cause serious bodily harm.

SPECIFICATIONS

GENERAL SPECIFICATIONS

M21CA--

Items		Specifications	
		Non-Turbo	Turbo
Clutch operating method		Hydraulic type	Hydraulic type
Clutch disc*1			
Type		Single dry disc type	Single dry disc type
Facing diameter			
O.D. x I.D.	mm (in.)	215 x 140 (8.5 x 5.5) 225 x 150 (8.9 x 5.9)*2	225 x 150 (8.9 x 5.9)
Clutch cover assembly			
Type		Diaphragm spring strap drive type	Diaphragm spring strap drive type
Clutch release cylinder			
I.D.	mm (in.)	20.64 (13/16)	20.64 (13/16)*3 19.05 (3/4)*4

NOTE
*1: Non-asbestos discs on vehicles with DOHC engine and SOHC engine (From 1992 models)
*2: 1992 models DOHC engine
● *3: 1991 models
*4: 1992, 1993 models

SERVICE SPECIFICATIONS

M21CB--

Items		Specifications
Standard value		
Clutch pedal height	mm (in.)	176-181 (6.9–7.1)
Clutch pedal clevis pin play	mm (in.)	1–3 (.04–.12)
Clutch pedal free play	mm (in.)	6-13 (.24–.51)
Distance between the clutch pedal and the firewall when the clutch is disengaged	mm (in.)	55 (2.2) or more
Limit		
Facing rivet sink	mm (in.)	0.3 (.012)
Diaphragm spring end height difference	mm (in.)	0.5 (.02)

TORQUE SPECIFICATIONS

M21CC-

Items	Nm	ft.lbs.
Clutch pedal to clutch pedal support bracket	25–35*1 or 20–25*2	18–25*1 or 14–18*2
Clutch pedal support bracket	8-12	6-9
Clutch pedal bracket	8-12	6-9
Clutch pedal support bracket to firewall	10–15	7–11
Brake booster installation nut	11-17	8-12
Master cylinder to firewall	10–15	7–11
Pedal rod to clutch pedal support bracket	17-26	12-19
Clutch tube flare nut	13-17	9-12
Clutch tube bracket	8-12	6.0–8.7
Clutch release cylinder	15-21	11-15
Clutch release cylinder to union bolt	20–25	14-18
Clutch cover assembly	15-21	11-15

NOTE
*1: 1989 models
*2: From 1990 models

LUBRICANTS

M21CD-

Items	Specified lubricants
inner surface of' clutch release bearing Inner surface of clutch disc spline Input shaft spline Contact portion of release fork to release cylinder push rod	MITSUBISHI genuine grease Part No. 0101011 or equivalent
Inner surface of clutch release cylinder and outer circumference of piston and cap	Conforming to DOT 3 or DOT 4

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TROUBLESHOOTING

M21EAAJ

Symptom	Probable cause	Remedy
Clutch slips	Insufficient clutch pedal play	Adjust
	Excessive wear of clutch disc facing	Replace
	Hardening of clutch disc facing, or adhesion of oil	Replace
	Clutch release fork catching	Repair or replace parts
	Weak or damaged diaphragm spring	Replace
	Clogging of hydraulic system	Repair or replace parts
Gear shift malfunction	Excessive clutch pedal play	Adjust
	Distorted clutch disc, excessive oscillation	Replace
	Clutch cover assembly worn	Replace
	Clutch disc spline worn or corroded	Replace
	Clutch disc facing peeling	Replace
	Clutch release bearing worn	Replace
	Damaged pressure plate or flywheel	Replace
	Leakage, air introduction or clogging of hydraulic system	Repair or replace parts
Clutch noise	Insufficient clutch pedal play	Adjust
	Improper installation of clutch cover assembly	Repair or replace parts
	Excessive wear of clutch disc facing	Replace
	Clutch release fork catching	Repair or replace parts
	Clutch release bearing worn	Replace
	Weak or damaged torsion spring	Replace
	Damaged pilot bushing	Replace
	Insufficient lubrication of bearing sleeve sliding surface	Repair
Clutch pedal feels “heavy”	Insufficient lubrication of clutch pedal	Repair
	Insufficient lubrication of clutch disc spline	Repair
	Clutch release fork catching	Repair or replace parts
	Insufficient lubrication of bearing sleeve sliding surface	Repair
Clutch chatters	Worn or damaged clutch disc facing	Replace
	Oil adhered to clutch disc facing	Replace
	Uneven height of diaphragm spring	Repair or replace parts
	Weak or damaged torsion spring	Replace
	Damaged pressure plate or flywheel	Replace
	Loose or damaged mounting	Replace or tighten mounting

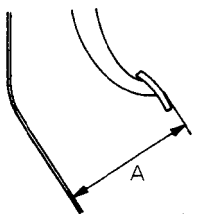
TSB Revision

SERVICE ADJUSTMENT PROCEDURES

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

M21FAAK

Clutch pedal height



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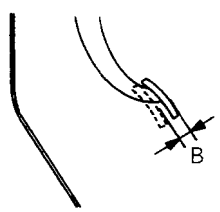
Clutch pedal clevis pin play

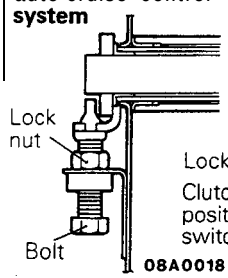


08Y043

1. Measure the clutch pedal height (from the face of the pedal pad to the firewall) and the clutch pedal clevis pin play (measured at the face of the pedal pad.)

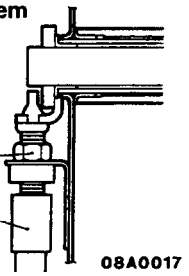
   Standard value (A): 176-181 mm (6.9-7.1 in.)
   Standard value (B): 1–3 mm (.04–.12 in.)

Vehicles without auto-cruise control system



08A0018

Vehicles with auto-cruise control system



08A0017

2. If either the clutch pedal height or the clutch pedal clevis pin play are not within the standard value range, adjust as follows :
   (1) For vehicles without auto-cruise control system, turn and adjust the bolt so that the pedal height is the standard value, and then secure by tightening the lock nut.

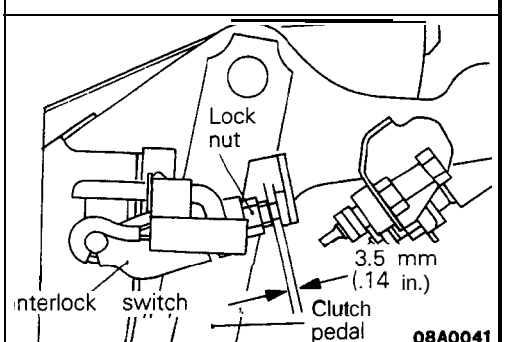
   Vehicles with auto-cruise control system, disconnect the clutch pedal position switch connector and turn the switch for standard clutch pedal height. Then lock with the lock nut.

   NOTE
   When the pedal height is lower than the standard value, loosen the bolt or clutch pedal position switch, and then turn the push rod to make the adjustment. After making the adjustment, tighten the bolt or clutch pedal position switch to reach the pedal stopper, and then lock with the lock nut.

08A0025

   (2) Turn the push rod to adjust the clutch pedal clevis pin play to agree with the standard value and then secure the push rod with the lock nut.

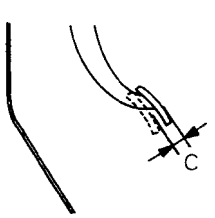
   Caution
   When adjusting the pedal height or the clutch pedal clevis pin play, be careful not to push the push rod toward the master cylinder.



08A0041

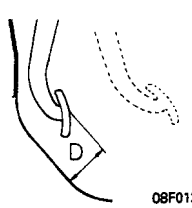
3. Check to be sure that the interlock switch is as shown in the illustration when the clutch pedal is depressed its full stroke [151 mm (6.0 in.)]. If necessary, loosen the lock nut and adjust.

Clutch pedal free play



08Y043

Distance between the clutch pedal and the **firewall** when the clutch is disengaged



08F013

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 firewall when the clutch is disengaged are within the standard value ranges.

   Standard value (C): 6-13 **mm (.24–.51 in.)**
   Standard value (D): 55 **mm (2.2 in.) or more**

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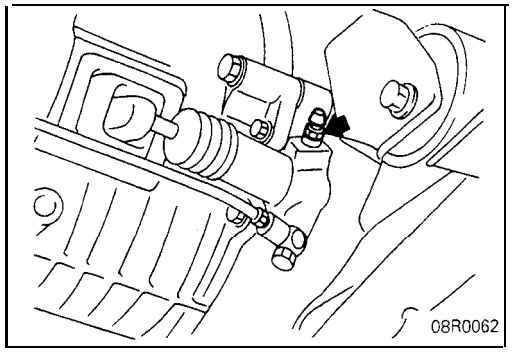
5. If the clutch pedal free play and the distance between the clutch pedal and the firewall when the clutch is disengaged do not agree with the standard values, it is probably the result of either air in the hydraulic system or a faulty master cylinder or clutch. Bleed the air, or disassemble and inspect the master cylinder or clutch.



BLEEDING M21FBAD

Whenever the clutch tube, the clutch hose, and/or the clutch master cylinder have been removed, or if the clutch pedal is spongy, bleed the system.

Specified brake fluid: Conforming to DOT3 or DOT4

Caution
Use the specified brake fluid. Avoid using a mixture of the specified fluid and other fluid.

CLUTCH PEDAL

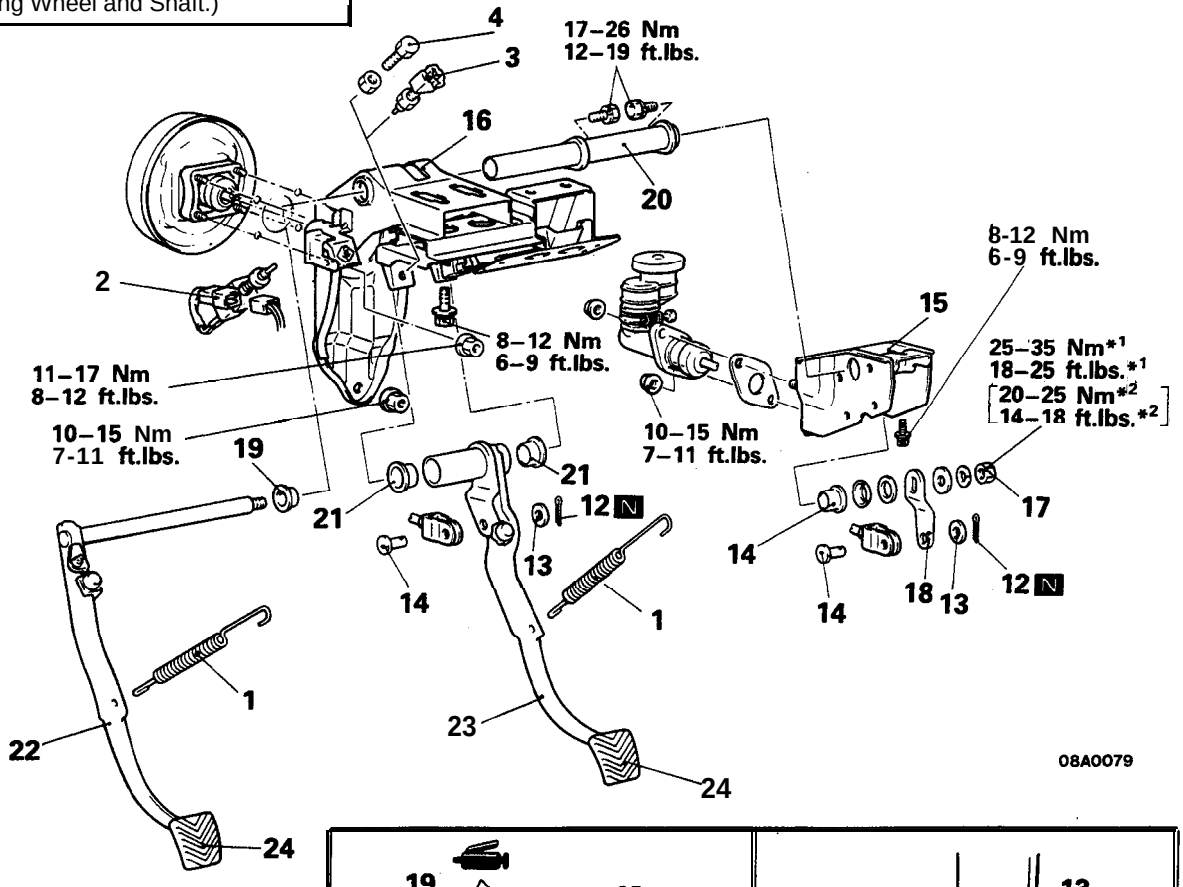
M21PA--

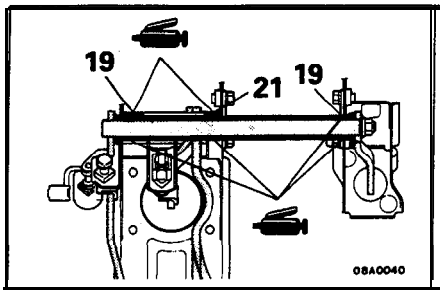
REMOVAL AND INSTALLATION

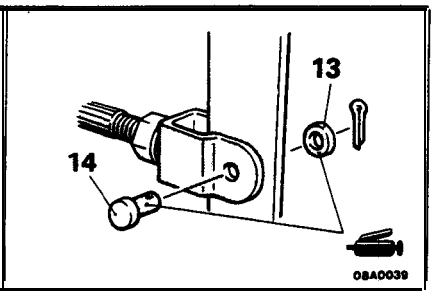
<Non-Turbo>

Pre-removal and Post-installation Operation
*Removal and Installation of Instrument Under Cover
(Refer to GROUP 52–Instrument Panel.)
● Removal and Installation of Steering Column Assembly (Refer to GROUP 37A–Steering Wheel and Shaft.)

Adjustment
● Adjustment of Brake Pedal (Refer to GROUP 35–Service Adjustment Procedures.)
●Adjustment of Clutch Pedal (Refer to P.21-5.)







Removal steps

1. Return spring
2. Interlock switch
3. Clutch pedal position switch <Vehicles with auto-cruise control system>
4. Bolt <Vehicles without auto-cruise control system>
12. Cotter pin
13. Washer
14. Clevis pin
15. Clutch pedal bracket
16. Pedal suppon bracket
17. Nut
18. Lever
19. Bushing (small)
20. Pedal rod
21. Bushing (large)
22. Clutch pedal
23. Brake pedal
24. Pedal pad

NOTE
● ': 1989 models
● *: From 1990 models

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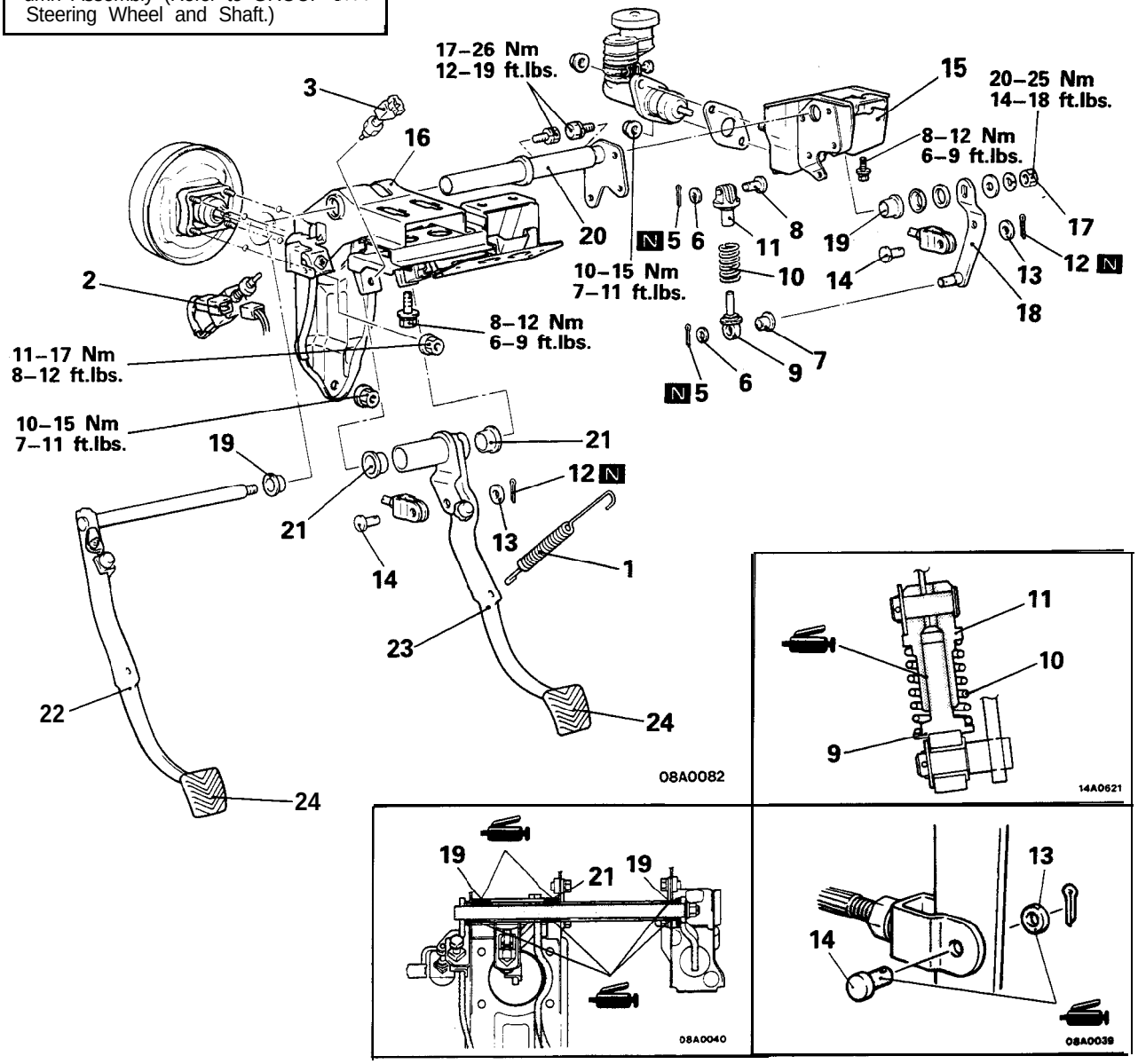
<Turbo>

Pre-removal and Post-installation Operation
- Removal and Installation of instrument Under Cover (Refer to GROUP 52–Instrument Panel.)
- Removal and Installation of Steering Column Assembly (Refer to GROUP 37A–Steering Wheel and Shaft.)

Adjustment
- Adjustment of Brake Pedal (Refer to GROUP 35–Service Adjustment Procedures.)

*Adjustment of Clutch Pedal (Refer to P.21-5.)



Removal steps

1. Return spring
2. Interlock switch
3. Clutch pedal position switch
5. Cotter pin
6. Washer
7. Bushing
8. Clevis pin
9. Rod B
10. Turn over spring
11. Rod A
12. Cotter pin
13. Washer
14. Clevis pin
15. Clutch pedal bracket
16. Pedal support bracket
17. Nut
18. Lever
19. Bushing (small)
20. Pedal rod
21. Bushing (large)
22. Clutch pedal
23. Brake pedal
24. Pedal pad

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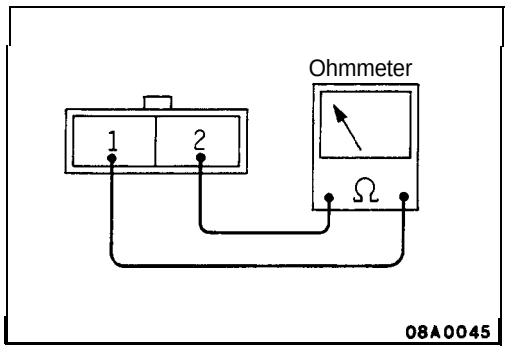
INSPECTION

M21PCAG

- Check the pedal shaft and bushing for wear.
- Check the clutch pedal for bend or torsion.
- Check the return spring for damage or deterioration.
- Check the pedal pad for damage or wear.



- **INTERLOCK SWITCH INSPECTION**

(1) Disconnect the connector.
(2) Check to be sure that there is continuity between connector terminals 1 and 2 when the clutch pedal is depressed fully.

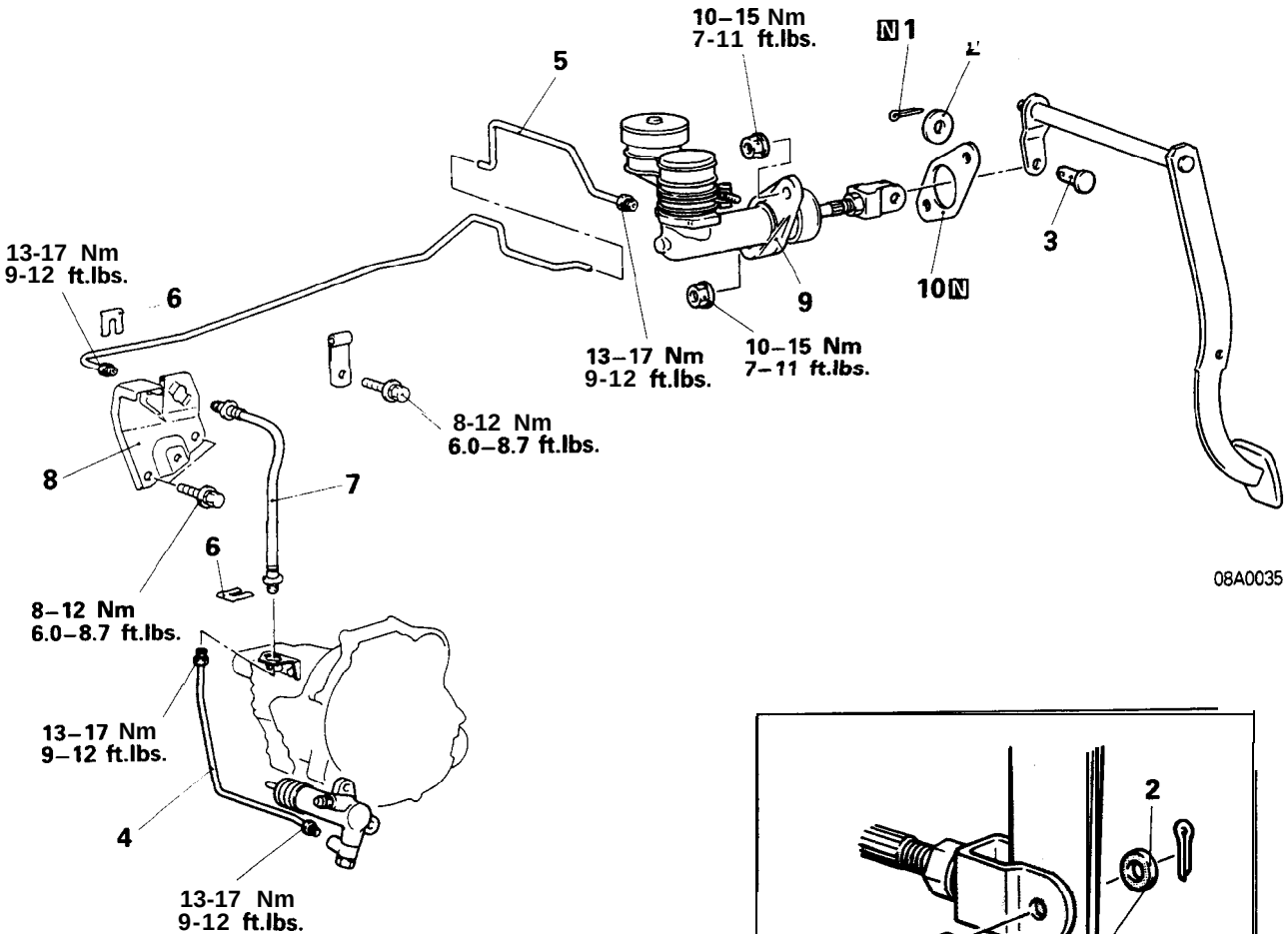
CLUTCH CONTROL

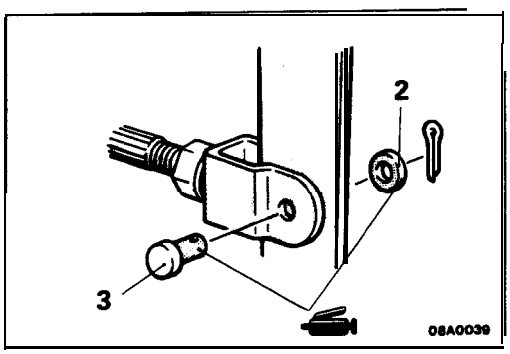
M21JA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of the Clutch Fluid

Post-installation Operation
- Supplying of Clutch Fluid
- Bleeding of the Clutch Line (Refer to P.21-6.)





Removal steps

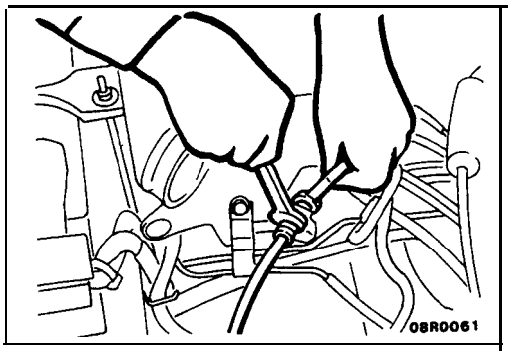
1. Cotter pin
2. Washer
3. Clevis pin
- a 4. Clutch tube
- + 5. Clutch tube

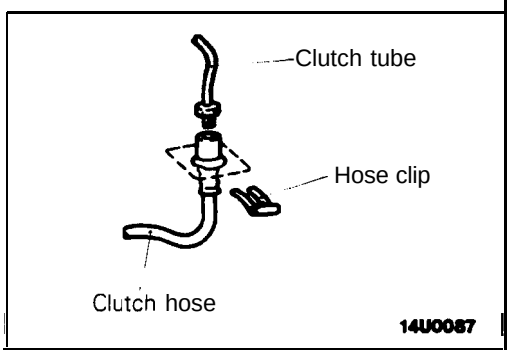
◆■◆ 6. Hose clips

◆■◆■◆ 7. Clutch hose

8. Bracket
9. Clutch master cylinder
10. Sealer

TSB Revision





SERVICE POINTS OF REMOVAL M21JBAD

6. DISCONNECTION OF HOSE CLIPS/7. CLUTCH HOSE

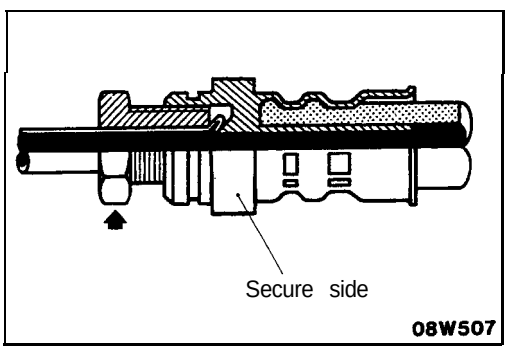
To disconnect clutch hose from the clutch tube, proceed. as follows:

(1) Secure the nut on the clutch hose and loosen the flare nut on the clutch tube.

(2) Remove the clip from the clutch hose to remove clutch hose from bracket.

INSPECTION M21JCAC

- Check the clutch hose or tube for cracks or clogging.



SERVICE POINTS OF INSTALLATION M21JDAI

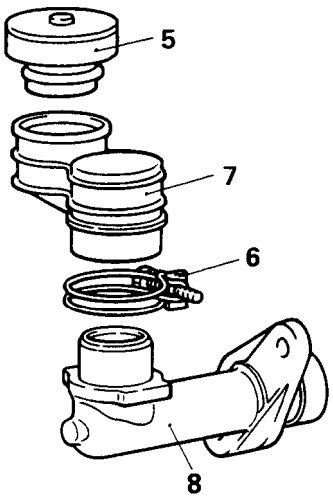
7. INSTALLATION OF CLUTCH HOSE/5. CLUTCH TUBE/4. CLUTCH TUBE

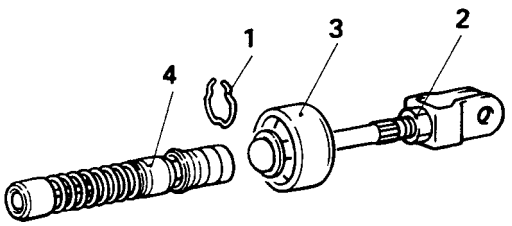
Temporarily tighten the flare nut by hand, and then tighten it to the specified torque, being careful that the clutch hose does not become twisted.

CLUTCH MASTER CYLINDER

M21NA–

DISASSEMBLY AND REASSEMBLY

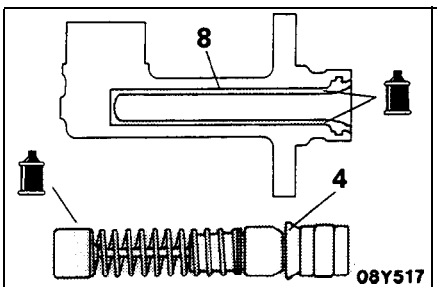




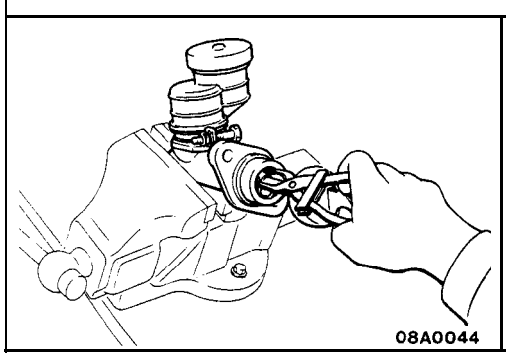
08A0034

Disassembly steps

1. 'Piston stop ring
2. Push rod
3. Boot
◆◆ 4. Piston assembly
5. Reservoir cap
6. Reservoir band
7. Reservoir
8. Master cylinder body



Brake Fluid: Conforming to DOT3 or DOT4



SERVICE POINTS OF DISASSEMBLY

M21NBAC

4. REMOVAL OF PISTON ASSEMBLY

Caution

1. **Do not damage the master cylinder body and piston assembly.**
2. **Do not disassemble piston assembly.**

INSPECTION

M21NCAC

- Check the inside cylinder body for rust or scars.
- Check the piston cup for wear or deformation.
- Check the piston for rust or scars.
- Check the clutch tube connection part for clogging.

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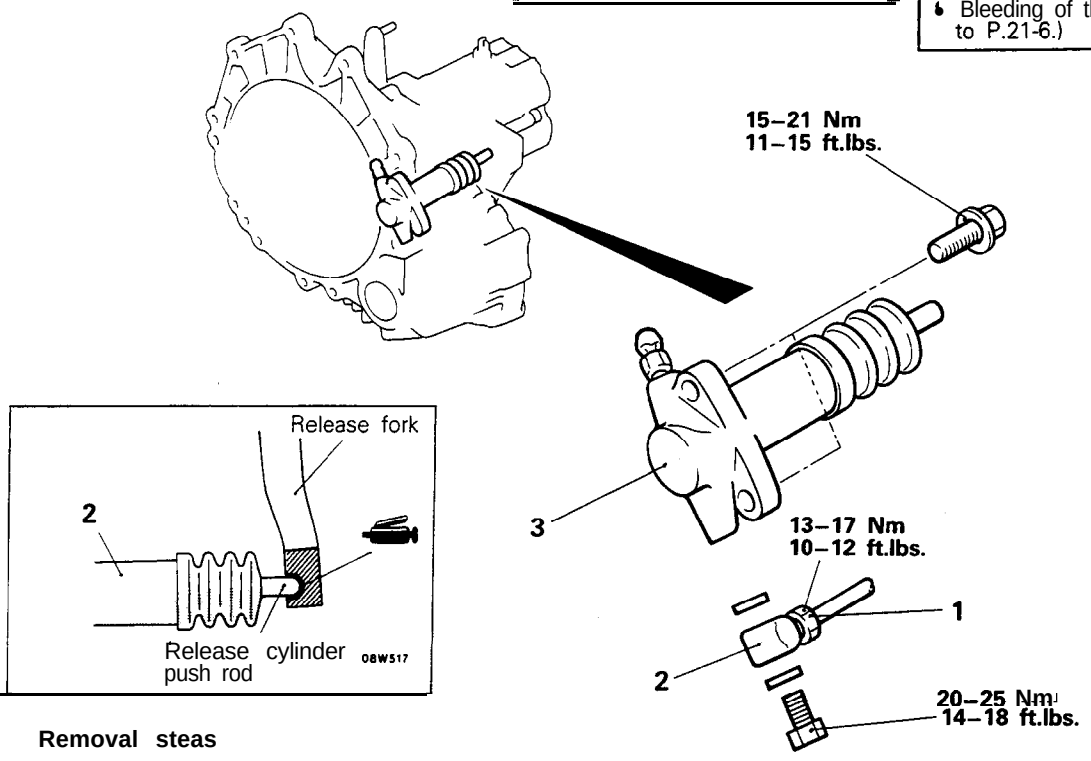
CLUTCH RELEASE CYLINDER

M21HA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of the clutch fluid

Post-installation Operation
- Supplying of clutch fluid
- Bleeding of the clutch line (Refer to P.21-6.)



Removal steas

1. Clutch tube
2. Union
3. Clutch release cylinder

INSPECTION

M21HCAA

- Check the clutch release cylinder for fluid leakage.
- Check the clutch release cylinder boots for damage.

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NOTES

MANUAL TRANSAXLE

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M22AA--

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SPECIFICATIONS

GENERAL SPECIFICATIONS

M22CA-A

Items	Specifications		
	4G63-SOHC	4G63-DOHC	
Model	KM206<1989 models> F5M22 <From 1990 models>	KM206<1 989 models> F5M22<1990 and 1991 models>	F5M31< 1992 and 1993 models>
Type	5-speed	5-speed	5-speed
Gear ratio			
1st	3.363	3.083	2.846
2nd	1.947	1.947	1.833
3rd	1.285	1.285	1.217
4th	0.939	0.939	0.888
5th	0.756	0.756	0.731
Reverse	3.083	3.083	3.166
Final reduction ratio	4.02 1	4.592	4.913
Speedometer gear ratio (driven/drive)	29/36 (30/36 . 1993 models only)	30/36	30/36

NOTE
Only the model code for KM206 and F5M22 is different.

TORQUE SPECIFICATIONS

M22CC-A

Items	Nm	ft.lbs.
Shift lever to lever (A)	19-28	13–20
Lever (A) to bracket assembly	19-28	13–20
Drain plug	30–35	22-25
Filler plug	30–35	22-25
Starter motor mounting bolt	27-34	20–25
Transaxle bracket	60–80	43-58
Shift lever knob	4.5-7.5	3-5
Shift cable and select cable to body	9-14	7–10
Shift lever assembly to body	9-14	7–10
Clutch release cylinder mounting bolt	15-22	11–16
Clutch tube to transaxle assembly	15-22	11-16
Transaxle mount bracket to transaxle	60–80	43-58
Shift cable and select cable to transaxle	15-22	11-16
Front height sensor rod to lower arm	17-26	12-19
Transaxle mounting bolt [12 mm diameter bolt]	43-55	32-39
Transaxle mounting bolt [IO mm diameter bolt]	30–35	22-25
Transaxle mounting bolt [8 mm diameter bolt]	10–12	7-9
Tie rod end to knuckle	24-35	17-25
Lower arm ball joint to knuckle	60–72	43-52
Bell housing cover	10–12	7-9

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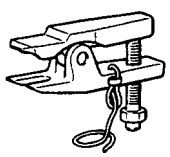
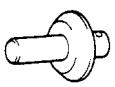
LUBRICANTS

M22CD-A

Items	Specified lubricant	Quantity
Manual transaxle oil	Hypoid gear oil SAE 75W–85W conforming to API classification GL-4 or higher	1.8 dm³ <KM206, F5M22> (1.9 qts.) 2.3 dm³ <F5M31> (2.4 qts.)
Shift lever bushing	Front Wheel Bearing Grease Part Number 3837794 or eauivalent	As required

SPECIAL TOOLS

M22DA-A

Tool	Number	Name	Use
	MB991113-01 OPTIONAL: AVAILABLE FROM O.T.C	Steering linkage puller	● Disconnection of the coupling of the knuckle and lower arm ball joint ● Disconnection of the coupling of the knuckle and tie-rod end ball joint
	MD998325-01	Differential oil seal installer	Installation of input shaft front oil seal

TROUBLESHOOTING

M22EAABa

Symptom	Probable cause	Remedy
Vibration, noise	a. Loose or damaged transaxle and engine mounts	a. Tighten or replace mounts
	b. Inadequate shaft end play	b. Correct end play
	c. Worn of damaged gears	c. Replace gears
	d. Use of inadequate grade of oil	d. Replace with specified oil
	e. Low oil level	e. Replenish
	f. Inadequate engine idle speed	f. Adjust idle speed
Oil leakage	a. Broken or damaged, oil seal or O-ring	a. Replace oil seal or O-ring
Hard shift	a. Faulty control cable	a. Replace control cable
	b. Poor contact or wear of synchronizer ring and gear cone	b. Correct or replace
	c. Weakened synchronizer spring	c. Replace synchronizer spring
	d. Use of inadequate grade of oil	d. Replace with specified oil
Jumps out of gear	a. Worn gear shift fork or broken poppet spring	a. Replace shift fork or poppet spring
	b. Synchronizer hub to sleeve spline clearance too large	b. Replace synchronizer hub and sleeve

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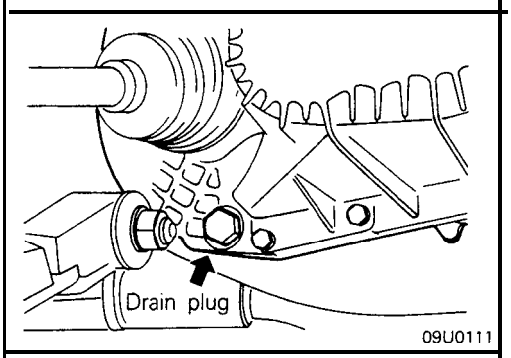
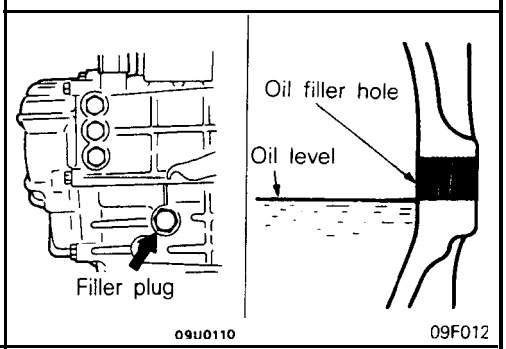




SERVICE ADJUSTMENT PROCEDURES

M22FBAB1

TRANSAXLE OIL LEVEL INSPECTION

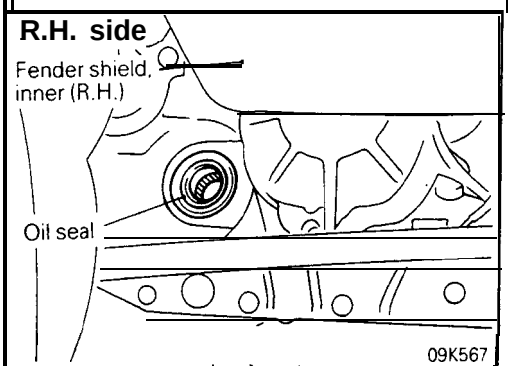
Refer to GROUP 00–Maintenance Service.

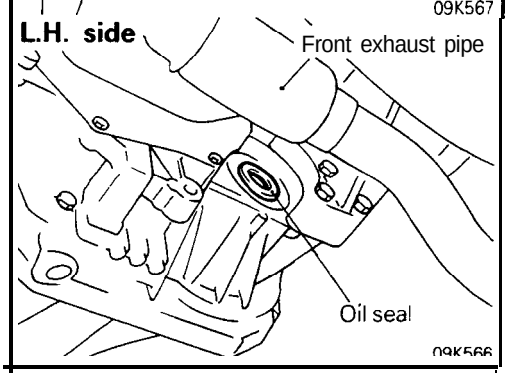
TRANSAXLE OIL REPLACEMENT

M22FCAD

(1) Position vehicle on a flat level.
(2) Remove filler and drain plugs and allow the transaxle oil to drain.
(3) Refill the transaxle to the proper level with specified transaxle oil. The oil level should be the bottom of the oil filler hole.

Transaxle oil: Hypoid gear oil SAE 75W-85W conforming to API classification GL-4 or higher
<KM206, F5M22> 1.8 dm³ (1.9 qts.)
<F5M31> 2.3 dm³ (2.4 qts.)

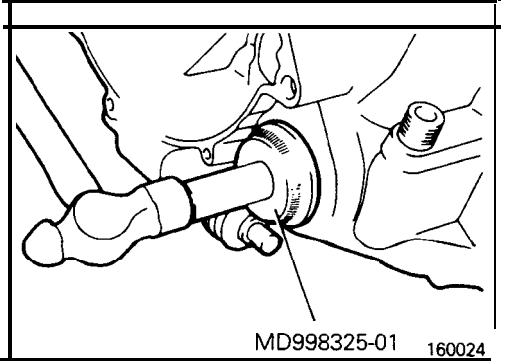




DRIVE SHAFT OIL SEALS REPLACEMENT

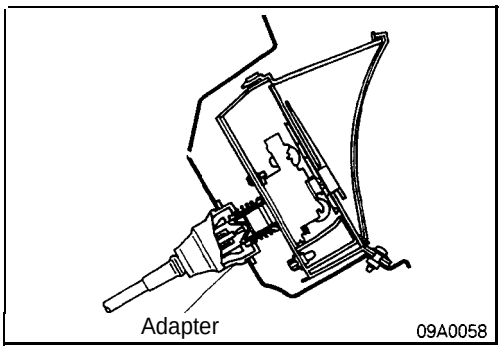
M22FDAG

(1) Disconnect the drive shaft from the transaxle. (Refer to GROUP 26–Drive Shaft.)
(2) Using a flat-tip (–) screwdriver, remove the oil seal.



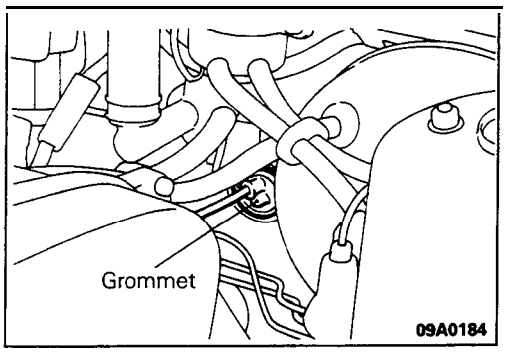
(3) Using the special tool, tap the drive shaft oil seal into the transaxle.
(4) Apply a coating of the transaxle oil to the lip of the oil seal.

Transaxle oil: Hypoid gear oil, SAE 75W–85W conforming to API GL-4 or higher



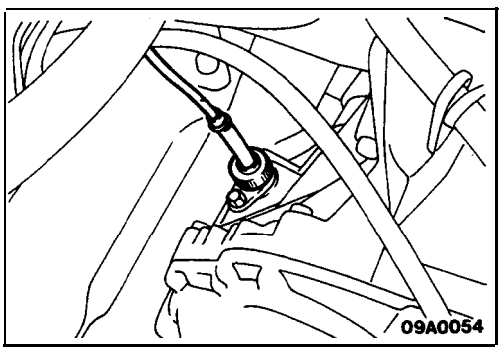
SPEEDOMETER CABLE REPLACEMENT M22FEAE

1. Correctly insert the adapter into the instrument panel, and fasten the new speedometer cable.



2. Install the grommet so that, as shown in the illustration, the cable attachment part is positioned upward.

Caution
1. The cable arrangement should be made so that the radius of cable bends is 150 mm (5.9 in.) or more.
2. The arrangement of the speedometer cable should be such that it does not interfere with brake tubes, etc.



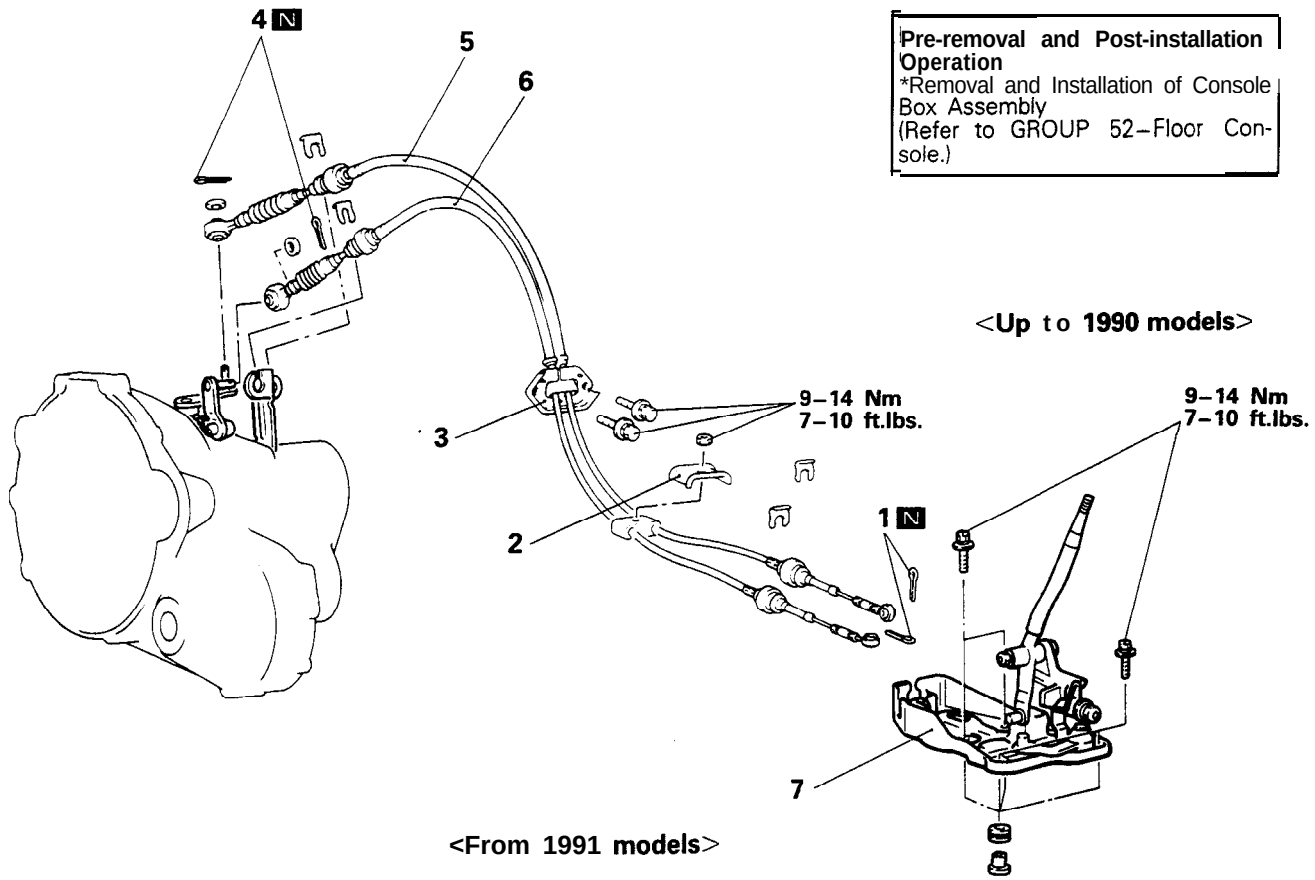
3. At the transaxle end of the speedometer cable, the key joint should be inserted into the transaxle, and the nut should be securely tightened.

Caution
If the cable is not correctly and securely connected, it may cause incorrect indication by the speedometer, or abnormal noise. Be sure to connect it correctly.

TRANSAXLE CONTROL

REMOVAL AND INSTALLATION

M22JA-A



Pre-removal and Post-installation Operation
*Removal and Installation of Console Box Assembly
(Refer to GROUP 52–Floor Console.)

Removal steps

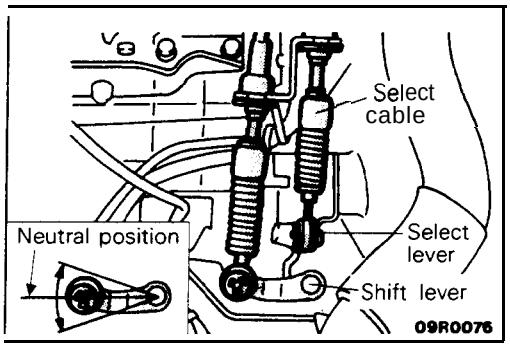
1. Cotter pin
2. Retainer
3. Retainer
4. Cotter pin
- * 5. Shift cable
- + 6. Select cable
7. Shift lever assembly

INSPECTION

M22JCAD

- Check the select cable for function and for damage.
- Check the shift cable for function and for damage.
- Check the boot for damage.
- Check each bushing for wear or abrasion, sticking, impeded action, and damage.
- Check the spring for deteriorated strength.

TSB Revision

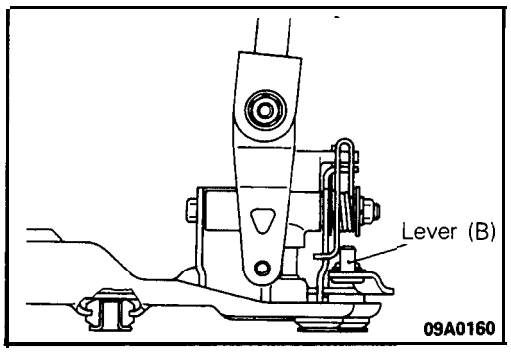


SERVICE POINTS OF INSTALLATION M22JDAK

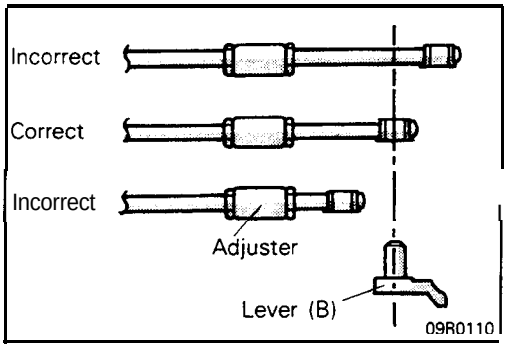
6. INSTALLATION OF SELECT CABLE

(1) Move the transaxle shift lever to the neutral position.

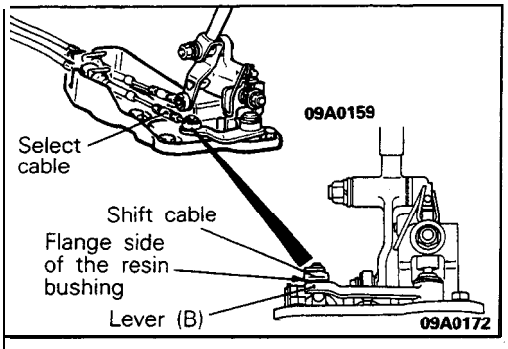
NOTE
The select lever will be set to the neutral position when the transaxle shift lever is moved to the neutral position.



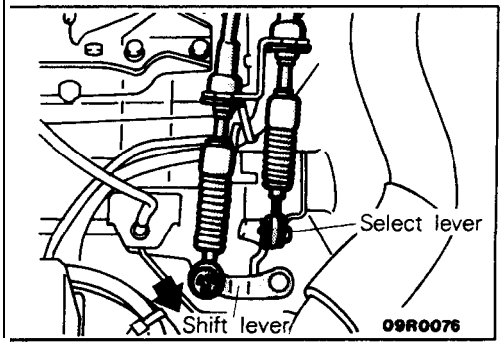
(2) Move lever (B) to the neutral position.



(3) Adjust, by using the adjuster, so that the end of the select cable is positioned as shown in the illustration relative to lever (B).



(4) The flange side of the resin bushing at the select cable end should be at the lever (B) end surface.



5. INSTALLATION OF SHIFT CABLE

(1) With the select lever in neutral, move the transaxle shift lever (in the direction shown in the illustration) to set it to 4th gear.

NOTE
If the shift lever does not move easily, depress and hold the clutch pedal.

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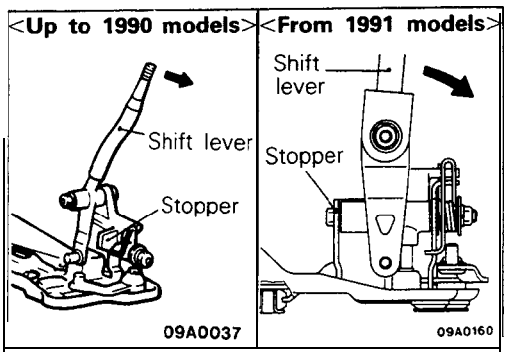
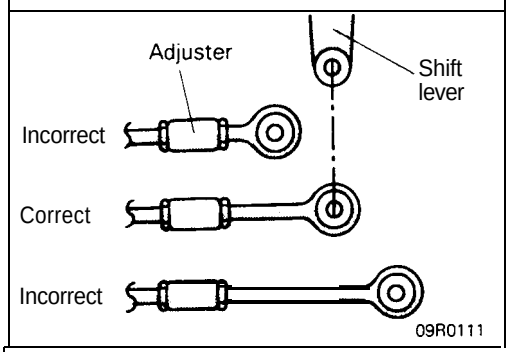
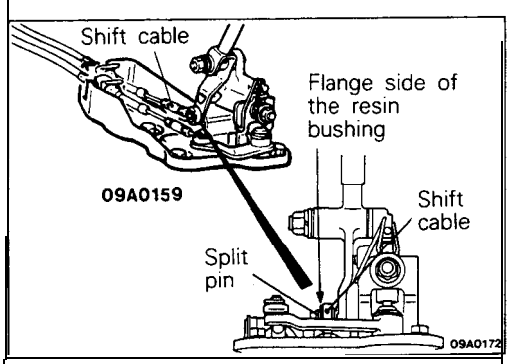


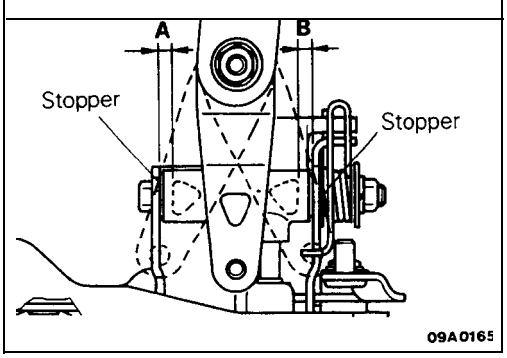
(2) Move the shift lever (at the vehicle interior side) downward, in the direction (4th gear position) shown in the illustration until it contacts the stopper.



(3) Adjust, by using the adjuster, so that the end of the shift cable is positioned as shown in the illustration relative to the shift lever (interior side).



(4) The flange side of the resin bushing at the shift cable end should be at the split pin side.



(5) Adjust the length of the shift cable, by using the adjuster, so that the clearance (A) and (B) between the shift lever and the two stoppers are equal when the shift lever is shifted to 3rd gear and 4th gear.
(6) Move the shift lever to each position and check that the shifting is smooth.

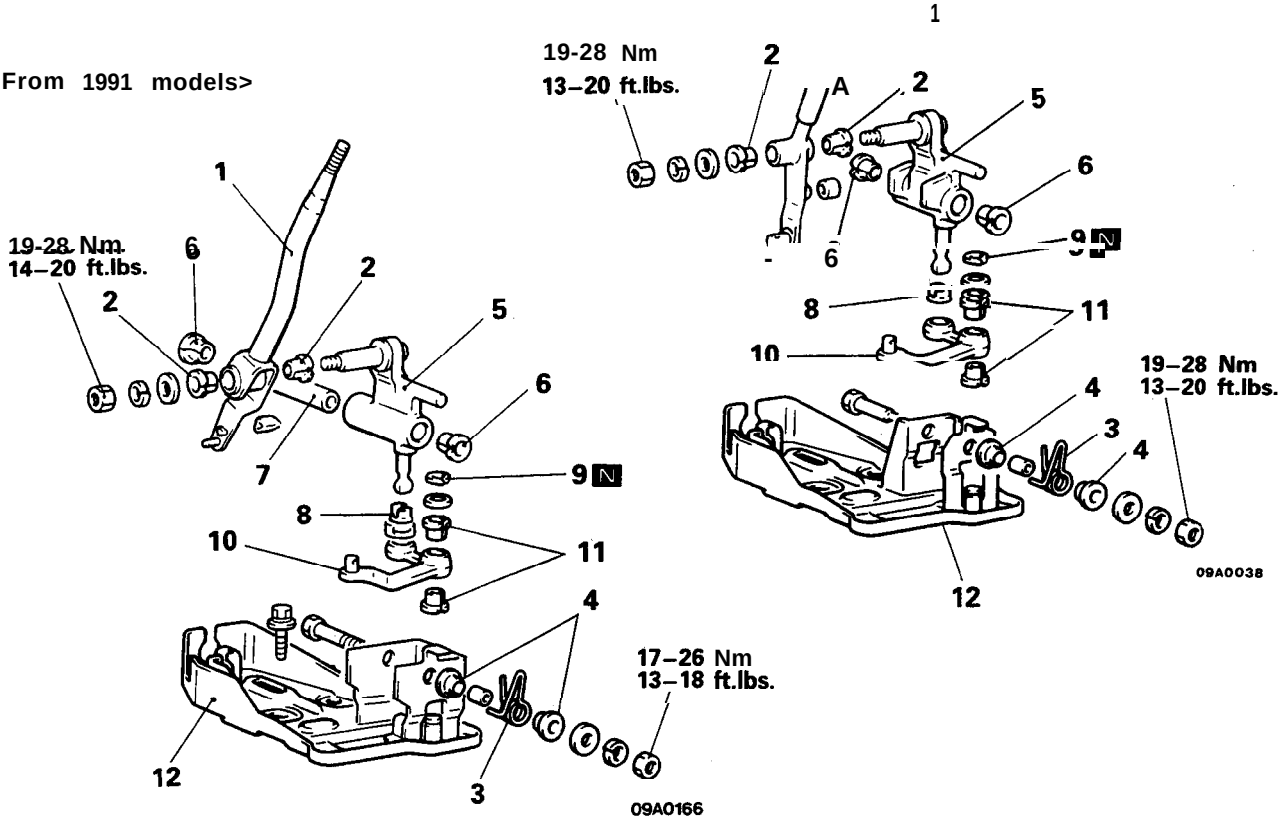
TSB Revision

SHIFT LEVER ASSEMBLY

M22GE-A

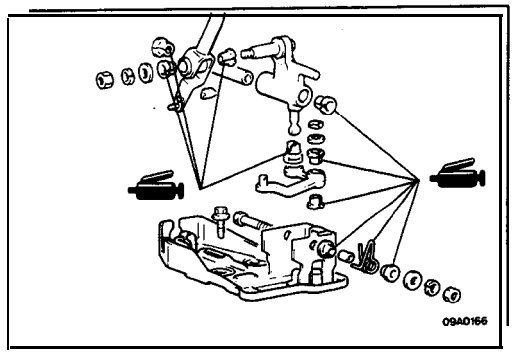
DISASSEMBLY AND REASSEMBLY

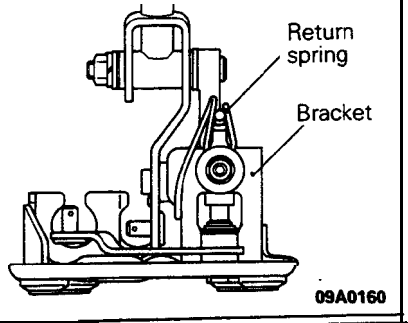
<Up to 1990 models>



Disassembly steps

1. Shift lever
2. Bushing
- + 3. Return spring
4. Bushing
5. Lever (A)
6. Bushing
7. Collar <From 1991 models>
8. Bushing
9. Snap ring
10. Lever (B)
11. Bushing
12. Bracket assembly





SERVICE POINTS OF REASSEMBLY

M22GHAJ

3. INSTALLATION OF RETURN SPRING

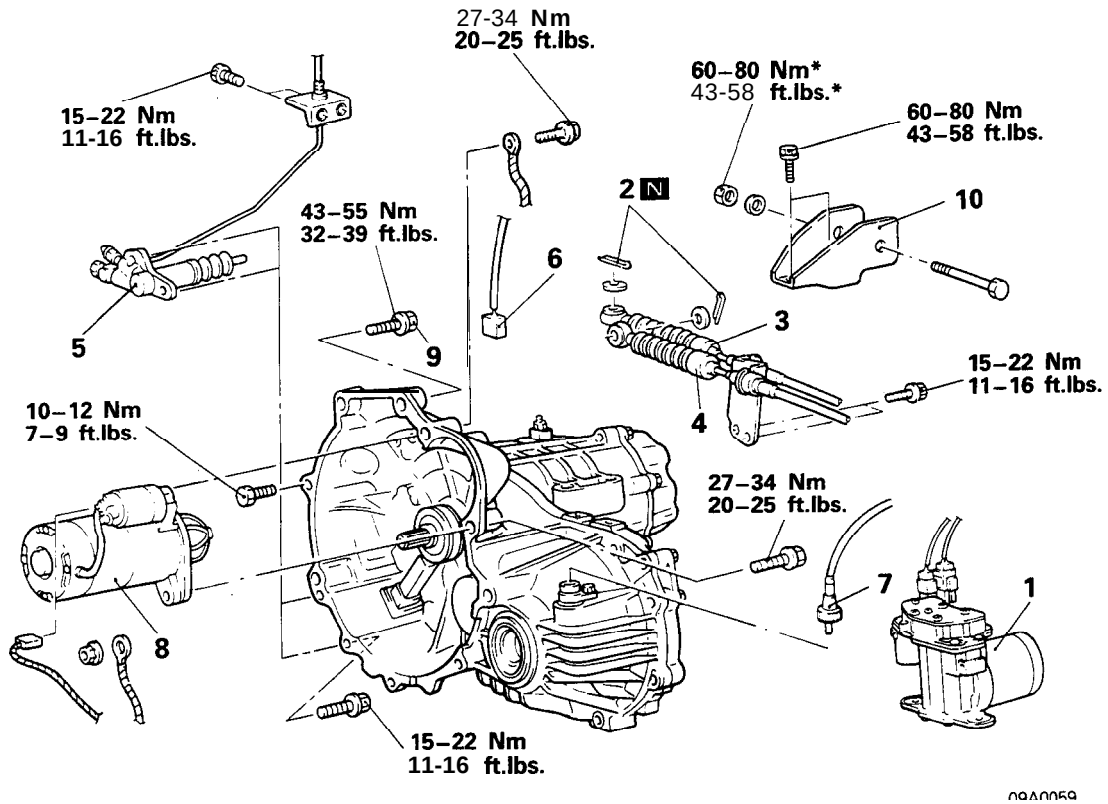
Make sure that the end of the spring contacts the part (shown in the illustration) of the bracket.

TSB Revision

TRANSAXLE

M22MA-A

REMOVAL AND INSTALLATION



Removal steps

- ◖ ☒ 1. Connection for compressor assembly <ACTIVE-ECS>
- 2. Cotter pin
- 3. Connection for select cable
- 4. Connection for shift cable
- ◆■◆ 5. Connection for clutch release cylinder
- 6. Backup light switch connector
- 7. Connection for speedometer cable
- ◖ + 8. Connection for starter
- 9. Transaxle assembly upper part coupling bolt
- 10. Transaxle mount bracket

Pre-removal Operation
- Draining of the Transaxle Oil (Refer to P.22-4.)
- Removal of the Battery and Battery Tray
- Removal of the Air Cleaner Assembly (Refer to GROUP 15–Air Cleaner.)

Post-installation Operation
- Supplying of Transaxle Oil (Refer to P.22-4.)
- Installation of the Air Cleaner Assembly (Refer to GROUP 15–Air Cleaner.)
- Installation of the Battery and Battery Tray

*Checking the Operation of the Shift Lever
- Checking the Operation of the Meters and Gauges

NOTE
For tightening locations indicated by the * symbol, first tighten temporarily, and then make the final tightening with the entire weight of the engine applied to the vehicle body.

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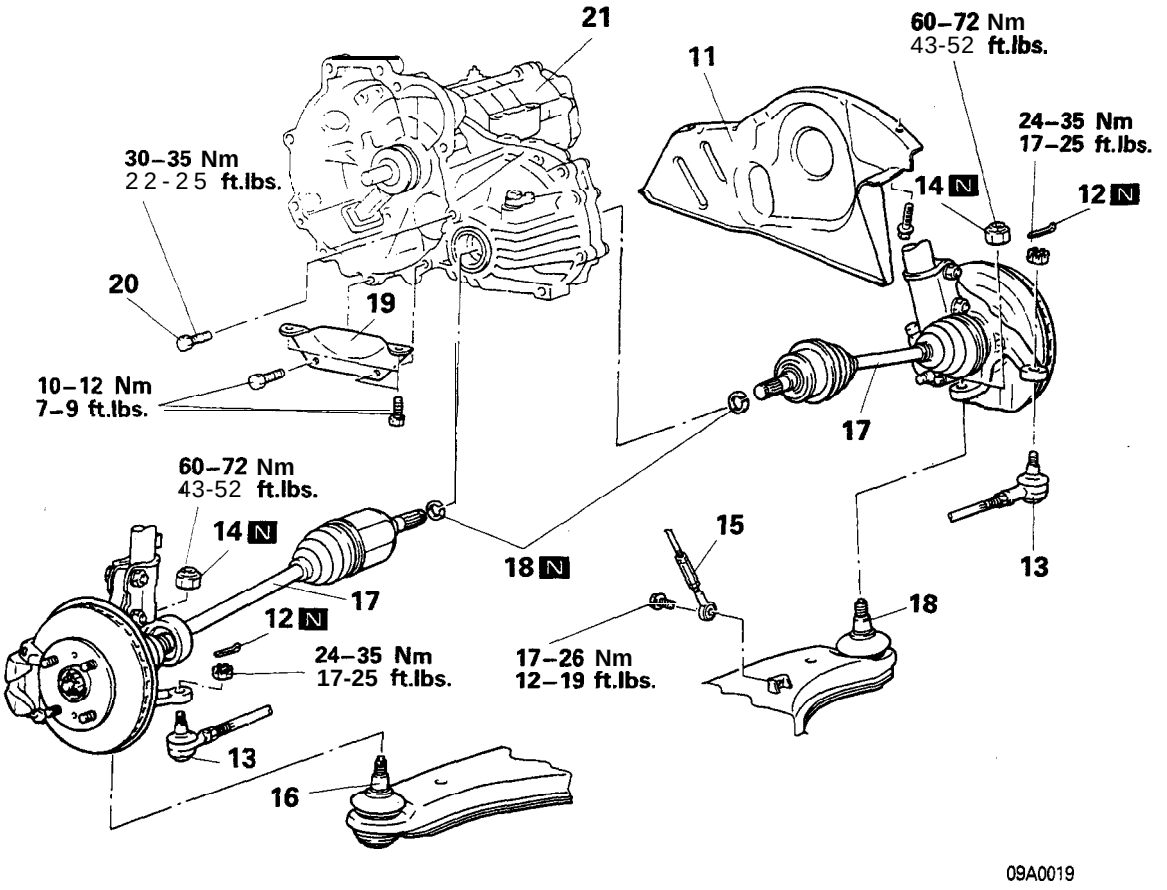
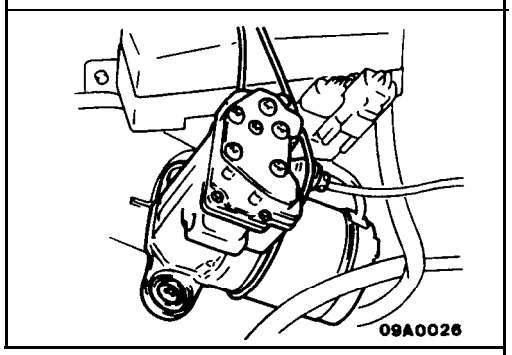


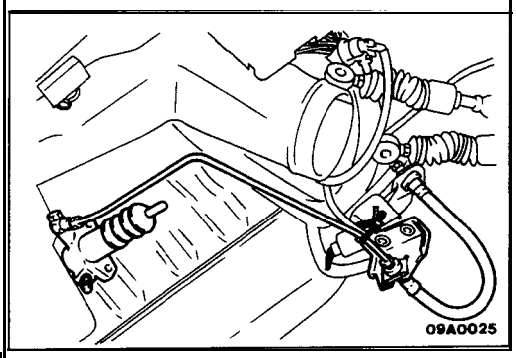
◆◆ 11. Under cover
12. Cotter pin
◆◆ 13. Connection for tie rod end
14. Self-locking nut
● 4 15. Front height sensor rod <ACTIVE-ECS>
◆◆ 16. Connection for lower arm ball joint
◆◆◆◆ 17. Connection for drive shaft
18. Circiip
19. Bell housing cover
20. Transaxle assembly lower part coupling bolt
◆◆ 21. Transaxle assembly



SERVICE POINTS OF REMOVAL M22MBAK

1. DISCONNECTION OF COMPRESSOR ASSEMBLY FROM TRANSAXLE ASSEMBLY <ACTIVE-ECS>

Remove the compressor assembly from the bracket, and then secure at the body side without disconnecting the air hose coupling.

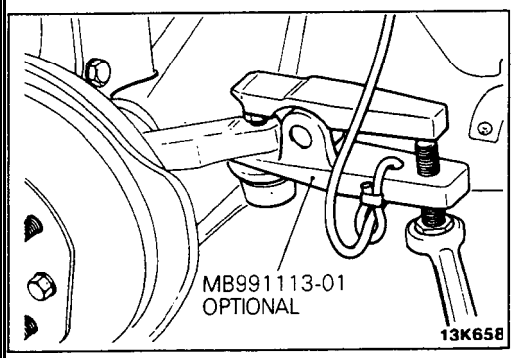


5. DISCONNECTION OF CLUTCH RELEASE CYLINDER FROM TRANSAXLE ASSEMBLY

Remove the clutch release cylinder and clutch oil line bracket installation bolt, and then secure at the body side without disconnecting the oil line coupling.

11. REMOVAL OF UNDER COVER

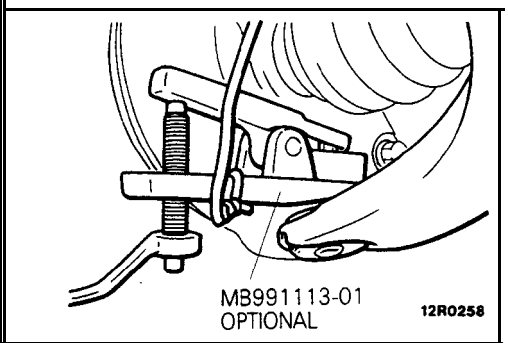
Lift the vehicle before removing the under cover.



13. DISCONNECTION OF TIE ROD END FROM KNUCKLE

Using the special tool, disconnect the tie rod end from the knuckle.

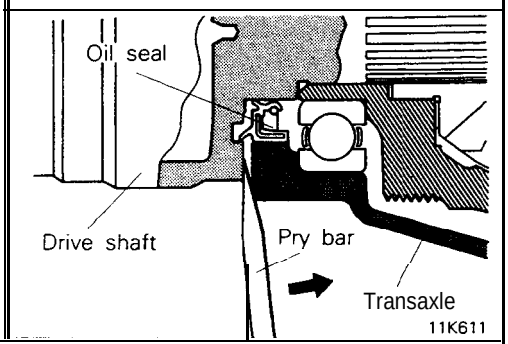
Caution
1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it.



16. DISCONNECTION OF LOWER ARM BALL JOINT

Using the special tool, disconnect the lower arm ball joint from the knuckle.

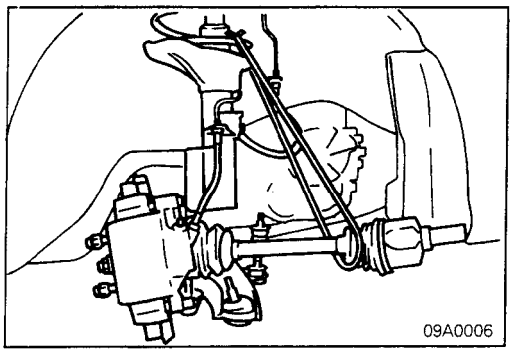
Caution
1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it.



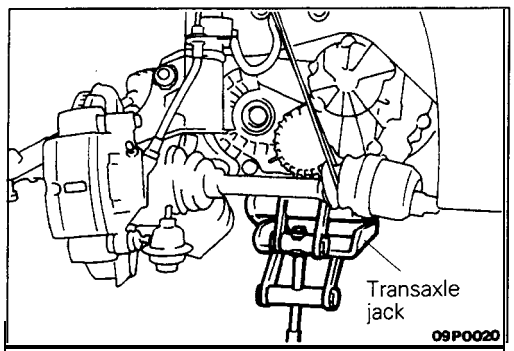
17. DISCONNECTION OF DRIVE SHAFT

(1) Insert a pry bar between the transaxle case and the drive shaft, and then pry the drive shaft from the transaxle.

Caution
1. Do not pull on the drive shaft; doing so will damage the inboard joint; be sure to use the pry bar.
2. Do not insert the pry bar so deep as to damaged the oil seal.



(2) Keep the removed drive shaft as far away from the transaxle case as possible, and secure (by using rope, etc.) the joints to the body so that it does not fall.



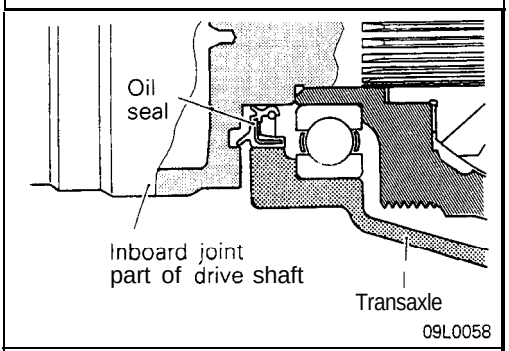
21. REMOVAL OF TRANSAXLE ASSEMBLY

Support the transaxle assembly by using a transaxle jack; then, after moving the transaxle assembly to the right, lower it.

NOTE

When supporting the transaxle assembly by the transaxle jack, take care to be sure that the jack's force is applied to a wide area, not to only a small localized area.

SERVICE POINTS OF INSTALLATION M22MDAK



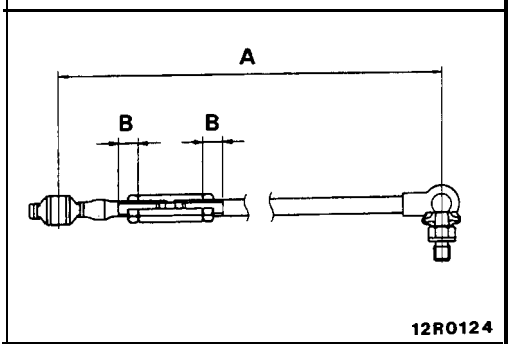
17. INSTALLATION OF DRIVE SHAFT

(1) Provisionally install the drive shaft so that the inboard joint part of the drive shaft is straight, and not bent relative to the transaxle.

Caution

Care must be taken to ensure that the oil seal lip part of the transaxle is not damaged by the serrated part of the drive shaft.

(2) Align the serrations and securely insert the drive shaft into the transaxle.



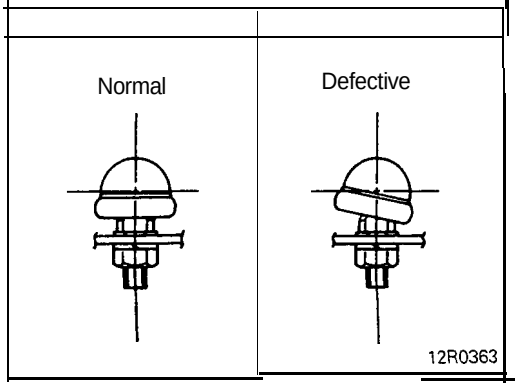
15. INSTALLATION OF FRONT HEIGHT SENSOR ROD

Install the rod so that dimension A in the figure is within the following range.

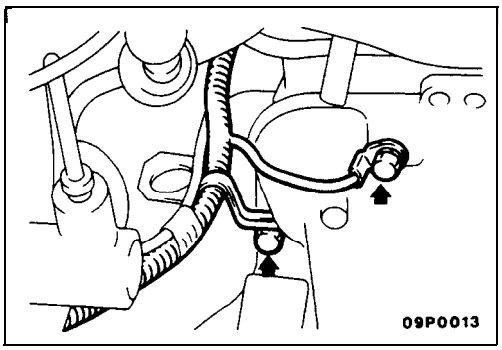
Dimension A: 254.5 ± 0.5 mm (10 ± .02 in.)

NOTE

(1) Adjust the rod length so that dimension B is equal.



(2) The ball joint on the end of the rod should be installed with the ball centered.



8. INSTALLATION OF STARTER

Tighten with the lower starter installation the wiring harness clip bolt.

SPECIFICATIONS

M22CA-B

GENERAL SPECIFICATIONS

Items	Specifications	
Model	W5M31	W5M33
Applicable engine	4G63	4G63-T/C
Type	5-speed	5-speed
Gear ratio		
1st	2.846	2.846
2nd	1.684	1.684
3rd	1.115	1.115
4th	0.833	0.833
5th	0.690	0.666
Reverse	3.166	3.166
Reduction ratio		
Primary	1.680	1.275
Secondary	3.100	3.866
Transfer	1.090	1.090
Speedometer gear ratio (driven/drive)	30/36	30/36

NOTE: The AWD vehicles have been discontinued from 1993 models.

TORQUE SPECIFICATIONS

M22CC-B

TRANSAXLE

Items	Nm	ft.lbs.
Bell housing cover mounting bolt	10–12	7-9
Starter motor mounting bolt	27-34	20–25
Transaxle mount bracket mounting bolt	60–80	43-58
Shift cable and select cable bracket mounting bolt	15–22	11-16
Rear cover mounting bolt	35-42	26–30
Transaxle case mounting bolt	35-42	26–30
Clutch release cylinder mounting bolt	15-22	11-16
Clutch tube to transaxle assembly	15-22	11-16
Front height sensor rod to lower arm	17-26	12-19
Transaxle mounting bolt [12 mm diameter bolt]	43-55	32-39
Transaxle mounting bolt [IO mm diameter bolt]	30–35	22-25
Transaxle mounting bolt [8 mm diameter bolt]	10–12	7-9
Tie rod end to knuckle	24-35	17–25
Lower arm ball joint to knuckle	60–72	43-52
Center bearing bracket installation bolts	36-46	26-33
Front exhaust pipe to exhaust fitting	30–40	22-29
Front exhaust pipe clamp	30–40	22-29
Right member installation bolt (front)	80–100	58-72
Right member installation bolt (rear)	70–80	51–58
Transfer assembly mounting bolt	55–60	40–43

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Items	Nm	ft.lbs.
Restrict ball	30–35	22-25
Speedometer mounting bolt	3-5	2.5-3.5
Oil filler plug	30–35	22-25
Oil drain plug	30–35	22-25
Input shaft lock nut	140–160	102–115
Intermediate shaft lock nut	140–160	102–115
Center differential drive gear mounting bolt	70–80	51–57
Front differential drive gear mounting bolt	130–140	95–101
Stopper bracket mounting bolt	15-22	11-15
Reverse idler gear shaft mounting bolt	43-55	32-39
Reverse shift lever mounting bolt	15-22	11–15
Bearing retainer mounting bolt	15-22	11-15
Interlock plate mounting bolt	20–27	15-19
Center member mounting bolt	60–80	43-58
Drive shaft center bearing mounting bolt	36-46	26-33
Driven bevel gear lock nut	140–160	101–115
Select lever assembly mounting bolt	15-22	11-15
Reverse brake cone screw bolts	4.0–5.5	3-4

TRANSFER

Items	Nm	ft.lbs.
Transfer assembly mounting bolt	55–60	40–43
Hanger bracket mounting bolt	15–22	11–15
Front exhaust pipe and exhaust manifold <Non-Turbo>	30–40	22-29
Front exhaust pipe to exhaust fitting <Turbo>	40–60	29-43
Front exhaust pipe clamp bolt	30–40	22-29

LUBRICANTS

M22CD-B

Items	Specified lubricant	Quantity dm^3 (qts.)
Transaxle	Hypoid gear oil, SAE 75W/80W conforming to API classification GL-4 or higher	2.3 (2.4)
Transfer	Hypoid gear oil, SAE 75W/80W conforming to API classification GL-4 or higher	0.6 (.6)

SEALANTS AND ADHESIVES

M22CE-B

Transaxle

Items	Specified sealant and adhesive
Faying surfaces of transaxle case and clutch housing Faying surfaces of clutch housing and adapter	Mitsubishi genuine sealant Part No. MD997740 or equivalent

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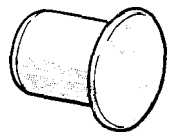
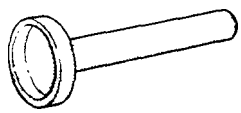
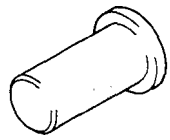
SPECIAL TOOLS

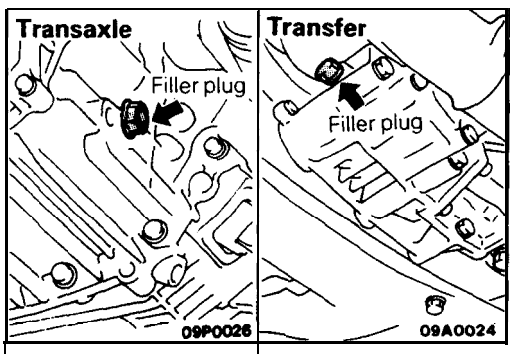
M25DA--

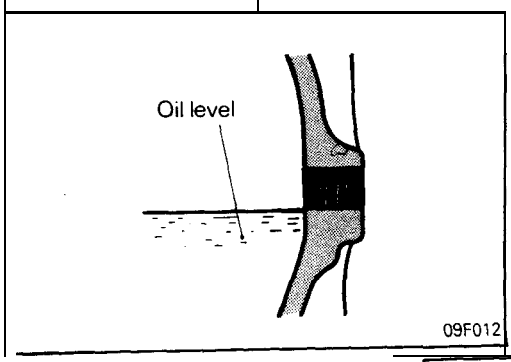
Tool	Number	Name	Use
	MB99 1193	Plug	Prevention of entry of foreign objects into the transaxle and transfer
	MD998803	Differential oil seal installer	Installation of differential oil seal
	MD998304-01	Oil seal installer	Installation of front output shaft bearing and transfer extention housing oil seal

TROUBLESHOOTING

M22EAAE

Refer to P.22-3.





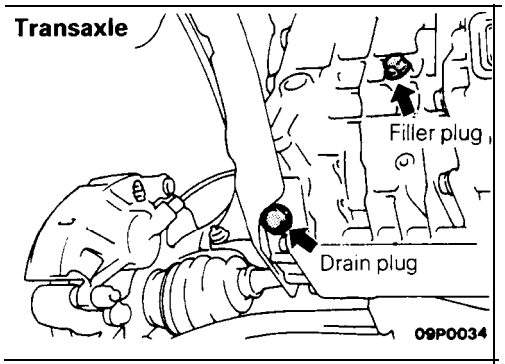
SERVICE ADJUSTMENT PROCEDURES

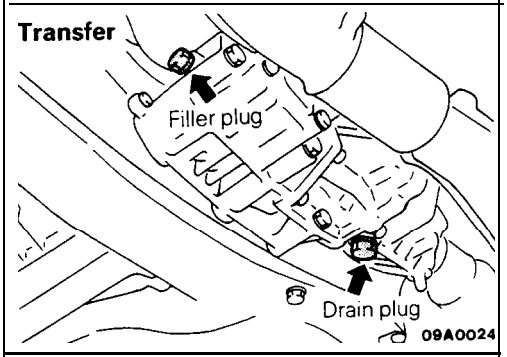
TRANSAXLE OIL LEVEL INSPECTION

M22FBAB2

Refer to GROUP 00–Maintenance Service.

TSB Revision

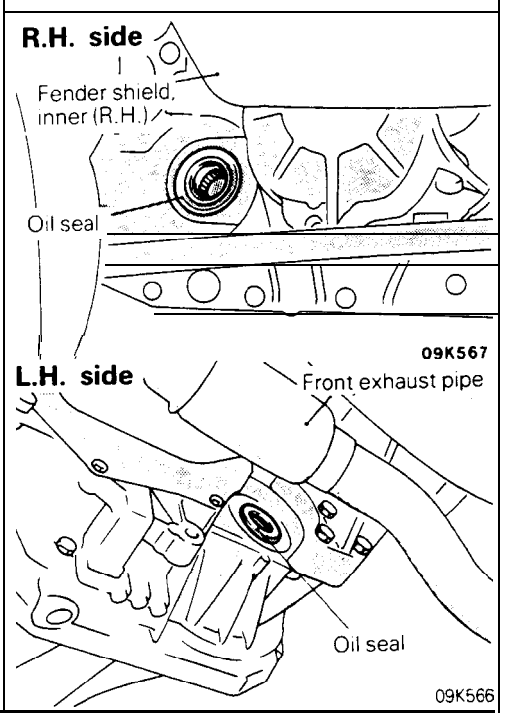




TRANSAXLE OIL REPLACEMENT M22FCAH

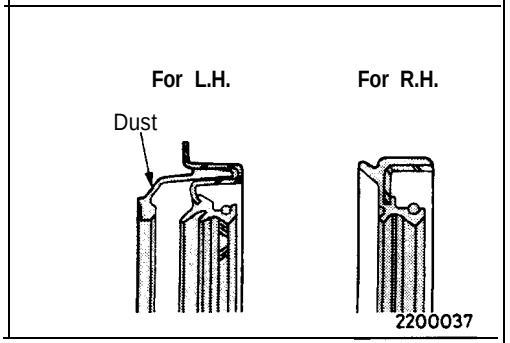
(1) Position vehicle on a flat level and remove filler and drain plugs to drain transaxle oil.
(2) Pour in fresh transaxle oil through filler port until it reaches the bottom of filler port.

Transaxle oil: Hypoid gear oil SAE 75W–85W conforming to API classification GL-4 or higher
Transaxle: 2.3 dm³ (2.4 qts.)
Transfer: 0.6 dm³ (.6 qt.)

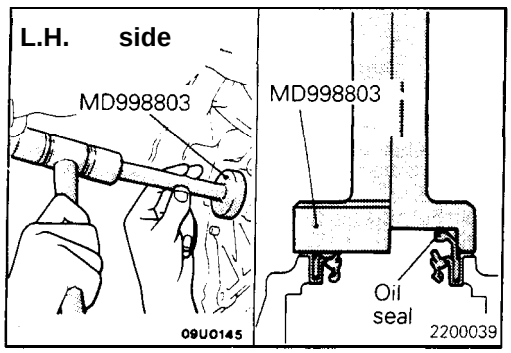


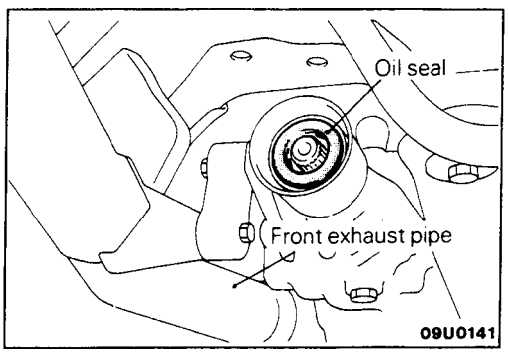
DRIVE SHAFT OIL SEALS REPLACEMENT M22FDAH

(1) Disconnect the drive shaft from the transaxle. (Refer to GROUP 26–Drive Shaft.)
(2) Remove the transfer assembly.
(3) Using a flat-tip (–) screwdriver, remove the oil seal.



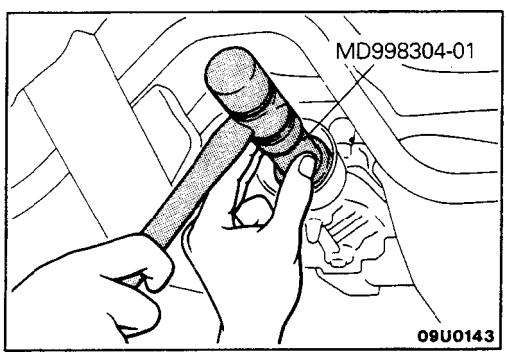
(4) Install the oil seals using the following procedure:
Using the special tool, tap the oil seal into the transaxle. Note that there are two types of oil seals, one for R.H. and the other for L.H., and the shape of each type is different, as shown.





TRANSFER OIL SEAL REPLACEMENT M22FGAF

(1) Pull out the propeller shaft from the transaxle. (Refer to GROUP 25–Propeller Shaft.)
(2) Using a fiat-tip (–) screwdriver, remove the oil seal.



(3) Using the special tool, tap the drive shaft oil seal into the transaxle.
(4) Apply a coating of the transaxle.

Transaxle oil: Hypoid gear oil SAE 75W–85W conforming to API classification GL-4 or higher

SPEEDOMETER CABLE REPLACEMENT M22FEAH

Refer to P.22-5.

TRANSAXLE CONTROL M22JA-B

Refer to P.22-6.

SHIFT LEVER ASSEMBLY M22GE-B

Refer to P.22-9.

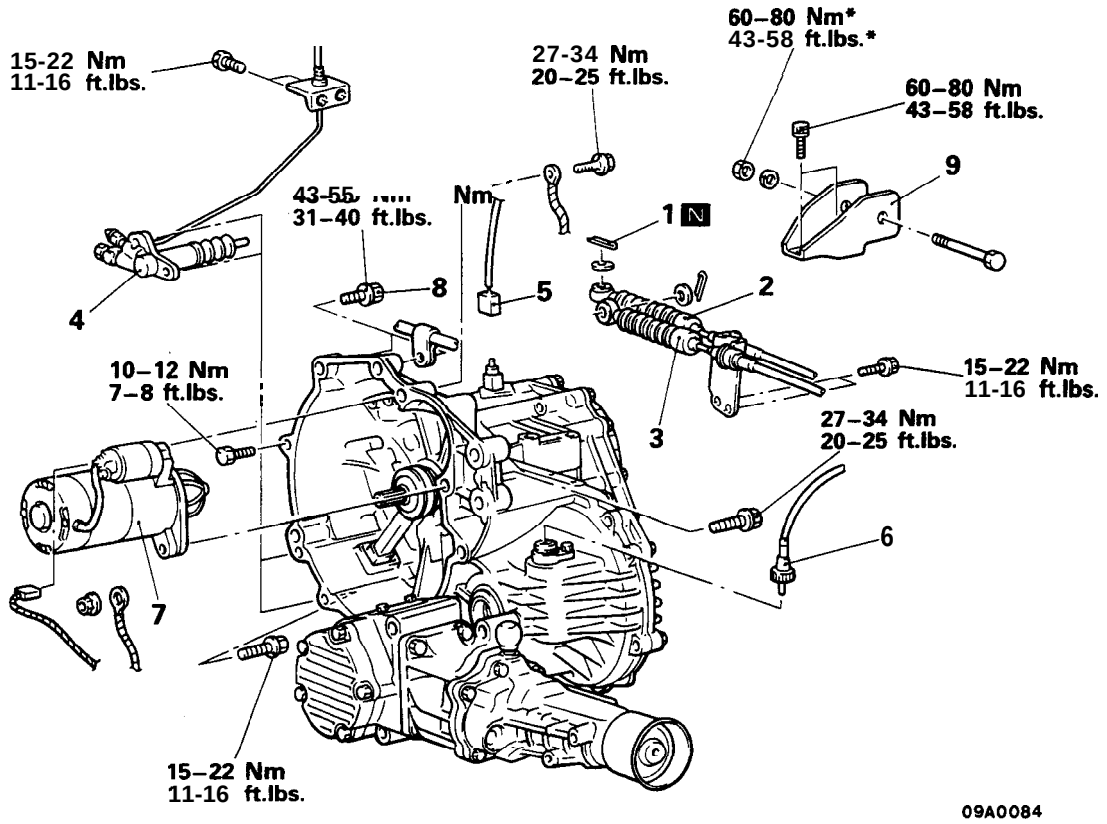
TRANSAXLE

REMOVAL AND INSTALLATION

M22MA-B

Pre-removal Operation
- Draining of the Transaxle Oil (Refer to P.22-18.)
- Removal of the Battery and Battery Tray
- *Removal of the Air Cleaner Assembly (Refer to GROUP 15–Air Cleaner.)

Post-installation Operation
- @Supplying of Transaxle Oil (Refer to P.22-18.)
- Installation of the Air Cleaner Assembly (Refer to GROUP 15–Air Cleaner.)
- *Installation of the Battery and Battery Tray
- *Checking the Operation of the Shift Lever
- *Checking the Operation of the Meters and Gauges



Removal steps

1. Cotter pin
2. Connection for select cable
3. Connection for shift cable
4. Connection for clutch release cylinder (Refer to P.22-12.)
5. Connection for backup light switch connector
6. Connection for speedometer cable
7. Connection for starter (Refer to P.22-14.)
8. Transaxle assembly upper part coupling bolt
9. Transaxle mount bracket

NOTE
For tightening locations indicated by the * symbol. first tighten temporarily, and then make the final tightening with the entire weight of the engine applied to the vehicle body.

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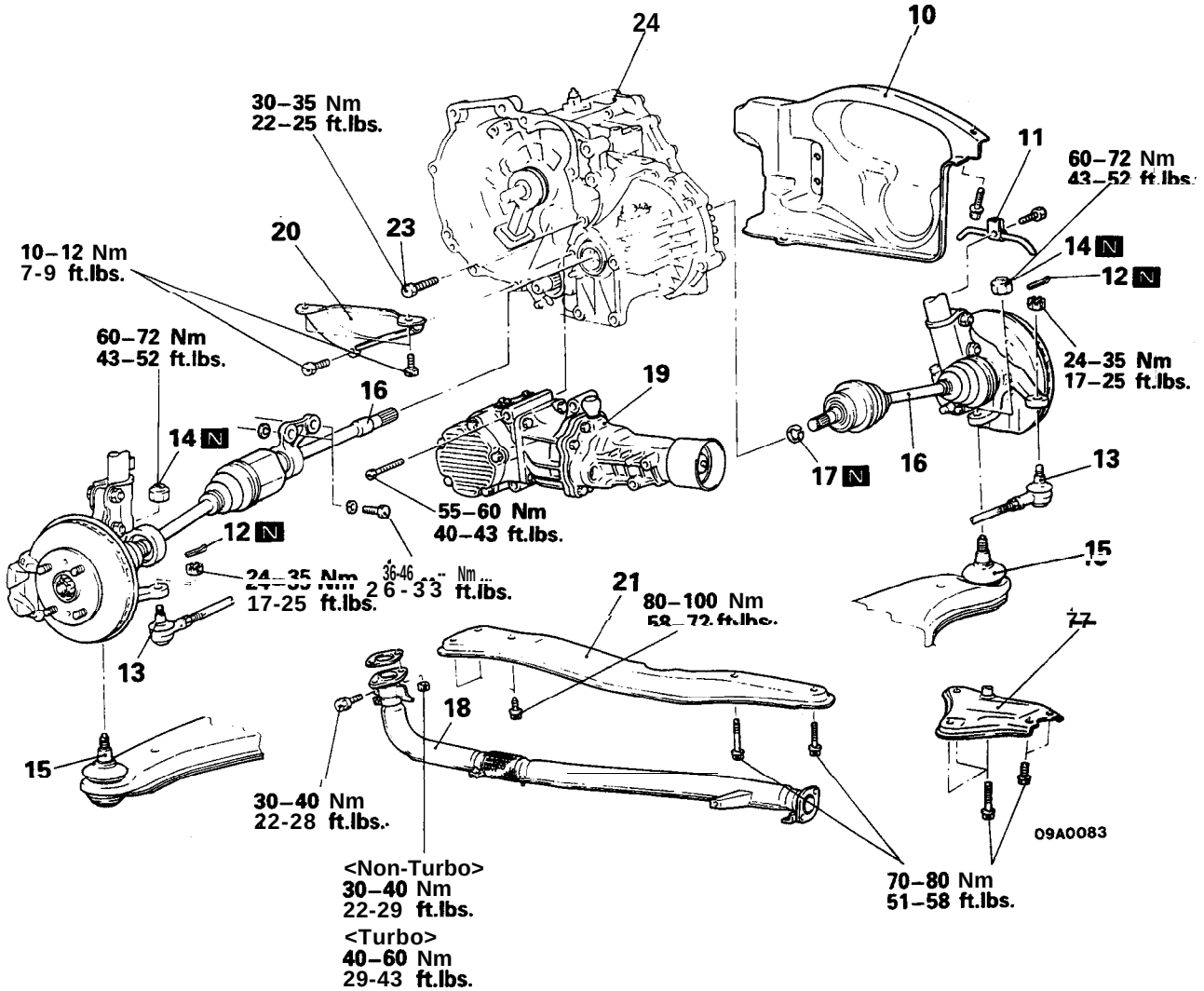

10. Under cover
11. Speed sensor <Vehicles with Anti-lock Braking System>
12. Cotter pin
13. Connection for tie rod end (Refer to P.22-12.)
14. Self-locking nut
15. Connection for lower arm ball joint (Refer to P.22-12.)
16. Connection for drive shaft (Refer to P.22-12.)
17. Circlip
18. Front exhaust pipe
19. Transfer assembly (Refer to P.22-23.)
20. Bell housing cover
21. Right member
22. Gusset
23. Transaxle assembly lower part coupling bolt
24. Transaxle assembly (Refer to P.22-13.)

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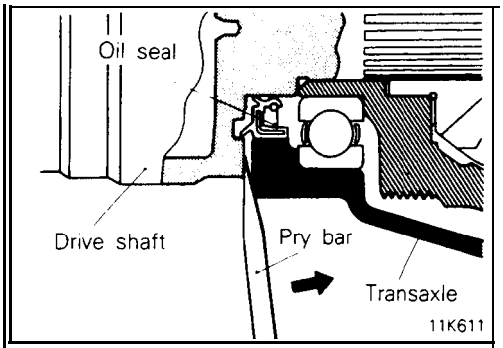
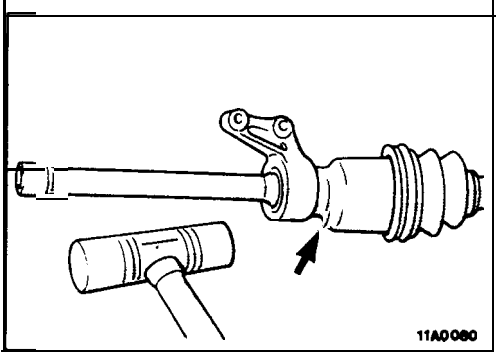
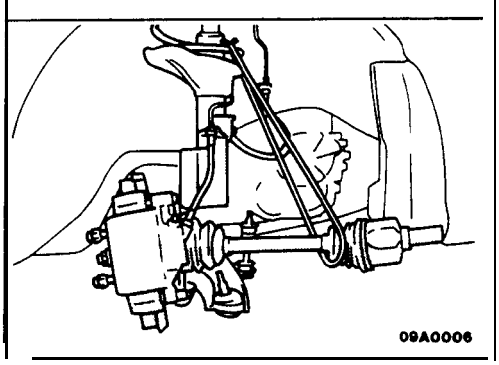






SERVICE POINTS OF REMOVAL

M22MBAT

16. DISCONNECTION OF DRIVE SHAFT

<R.H.>

insert a pry bar between the transaxle case and the drive shaft, and then pry the drive shaft from the transaxle.

Caution

1. **Do not pull on the drive shaft; doing so will damage the inboard joint; be sure to use the pry bar.**
2. **Do not insert the pry bar so deep as to damage the oil seal.**

<L.H.>

(1) Take out the drive shaft by lightly tapping the drive shaft T.J. case with a plastic hammer.

NOTE
Remove the drive shaft with the hub and knuckle, etc., as an assembly.

Caution

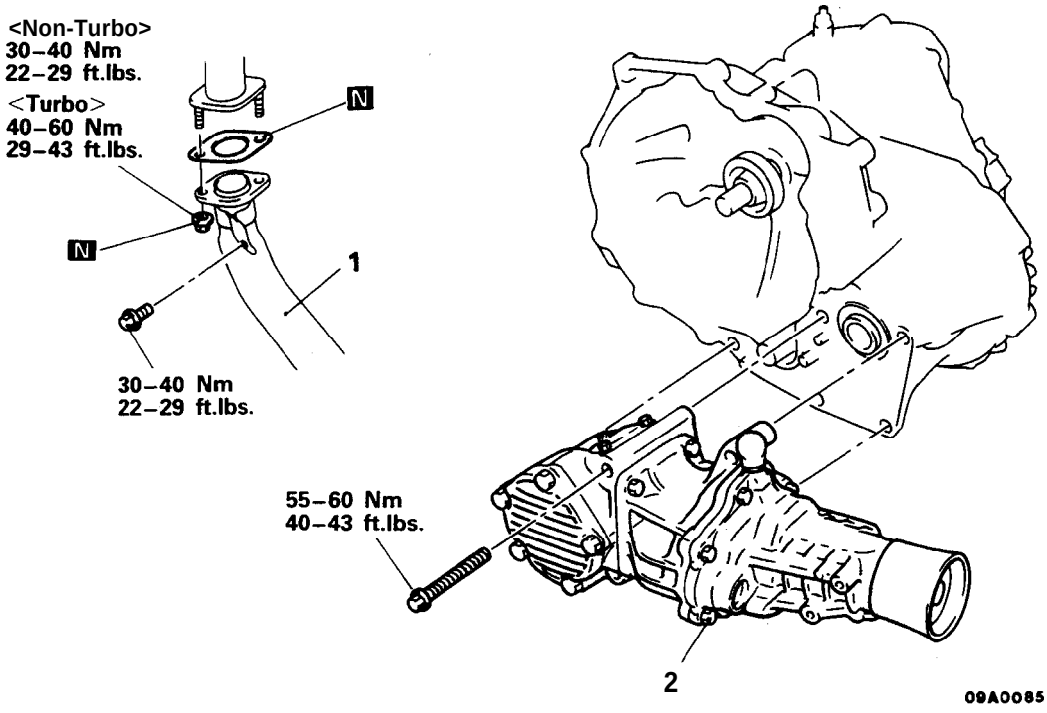
1. **Removing the drive shaft from the outboard joint side can cause damage to the inboard joint. Always use a plastic hammer, etc., to remove the drive shaft.**
2. **Tapping on the center bearing can damage it. Never tap on the bearing.**

(2) Keep the removed drive shaft as far away from the transaxle case as possible, and secure (by using rope. etc.) the joints to the body so that it does not fall.

TRANSFER

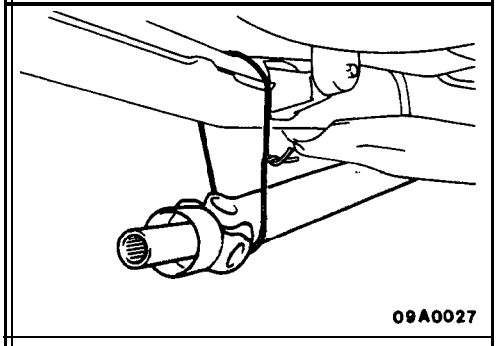
REMOVAL AND INSTALLATION

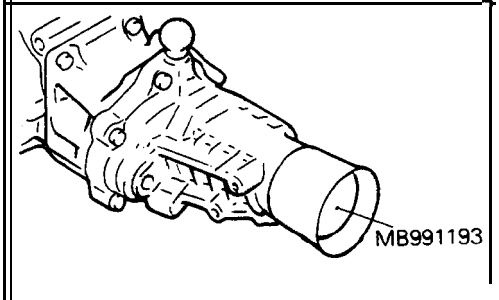
M22MA-C



Removal steps

1. Front exhaust pipe (Refer to GROUP 15–Exhaust Pipe and Main Muffler.)
◆◆ 2. Transfer assembly





SERVICE POINTS OF REMOVAL

M22MBAU

2. REMOVAL OF TRANSFER ASSEMBLY

After moving the transfer assembly to the left and lowering the front side, then remove it from the propeller shaft.

Caution

1. **Be cautious to avoid damaging the transfer oil seal lip.**
2. **The propelle shaft should be suspended so that it is not sharply bent.**
3. **Cover the transfer opening with the special tool to prevent transaxle oil discharge and the entry of foreign objects.**

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NOTES

AUTOMATIC TRANSAXLE

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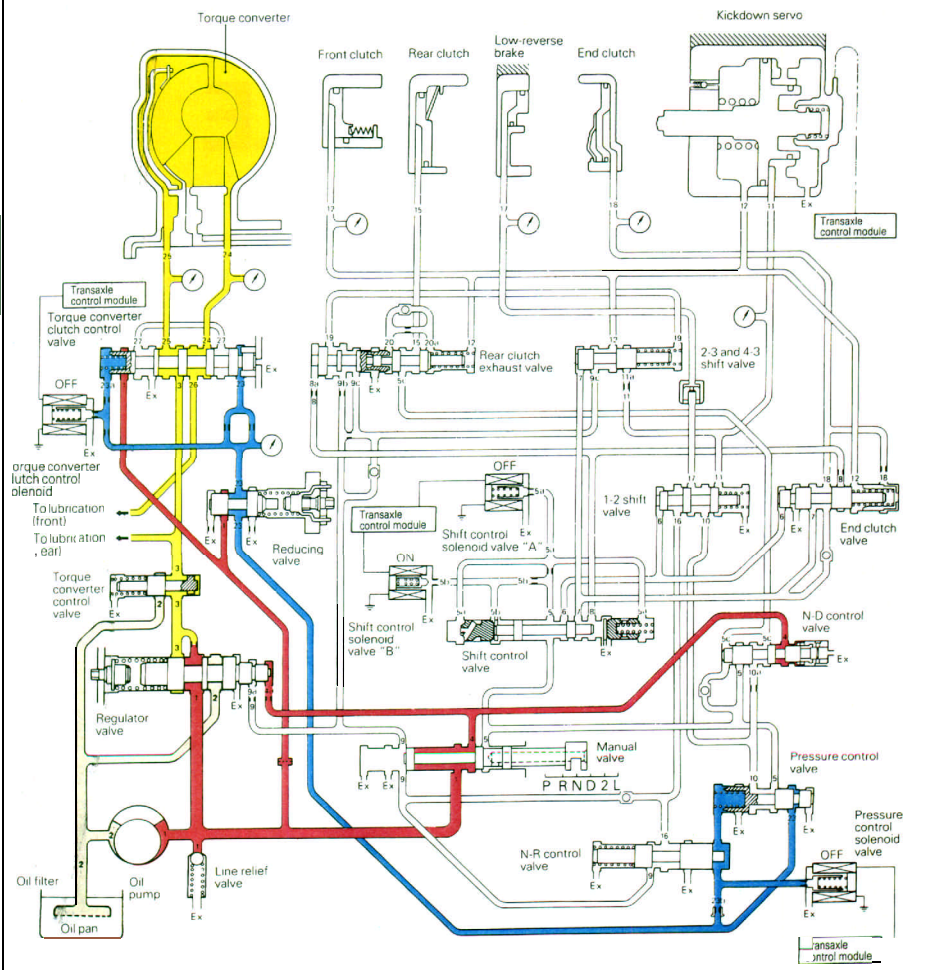
GENERAL INFORMATION

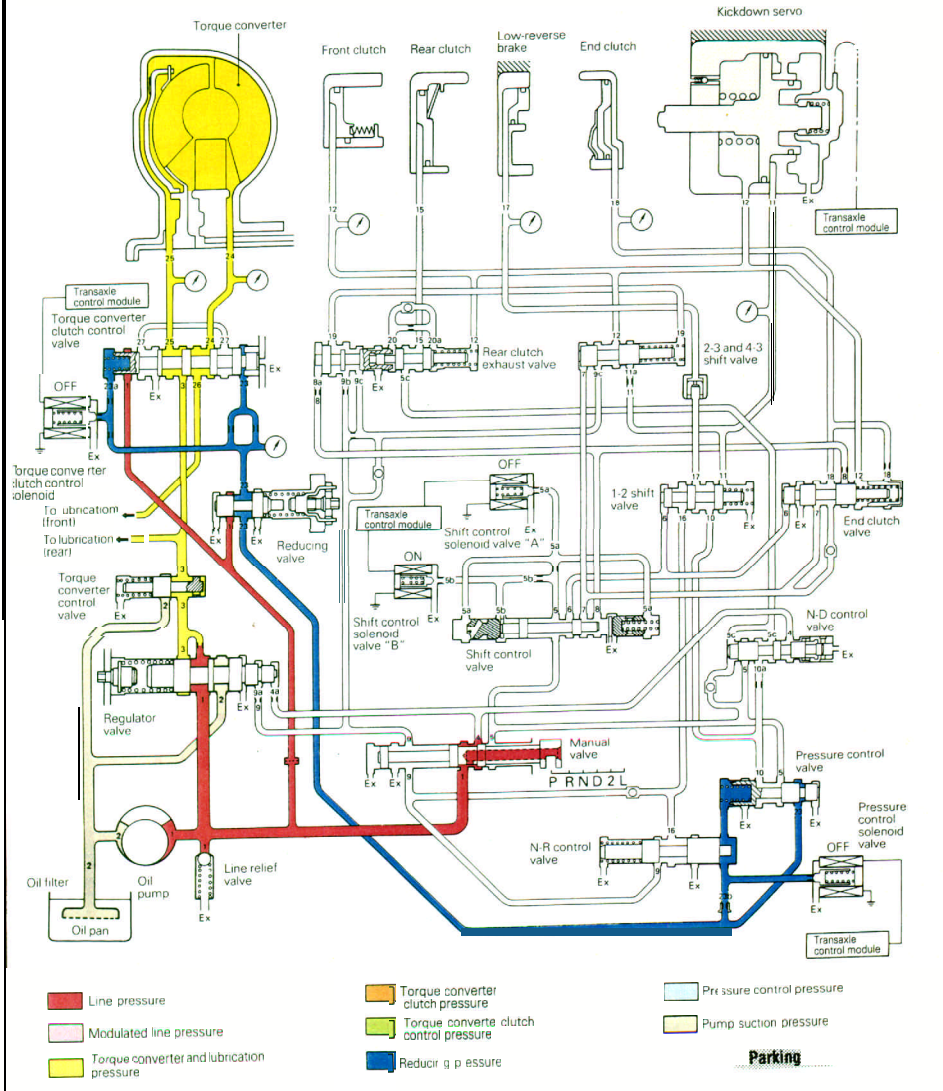
M23BABLa

Hydraulic Circuit–Neutral for 1989 and 1990 model



1750224

Hydraulic Circuit-Parking for 1989 and 1990 model



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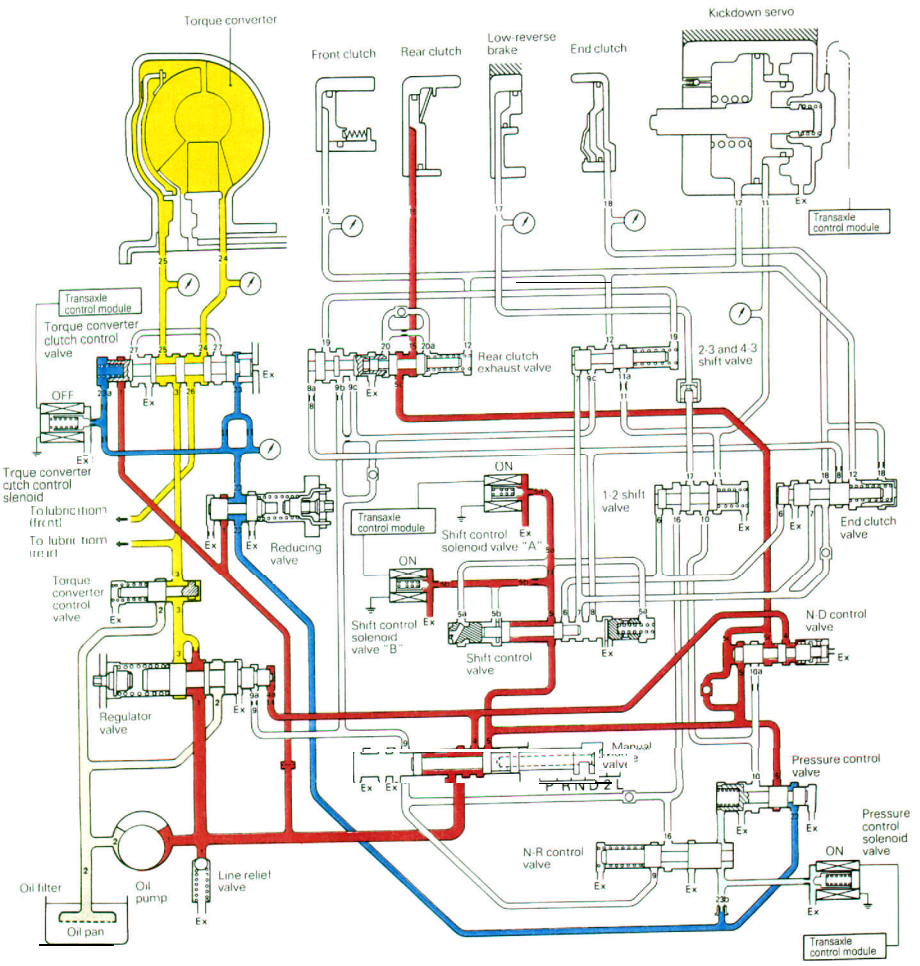
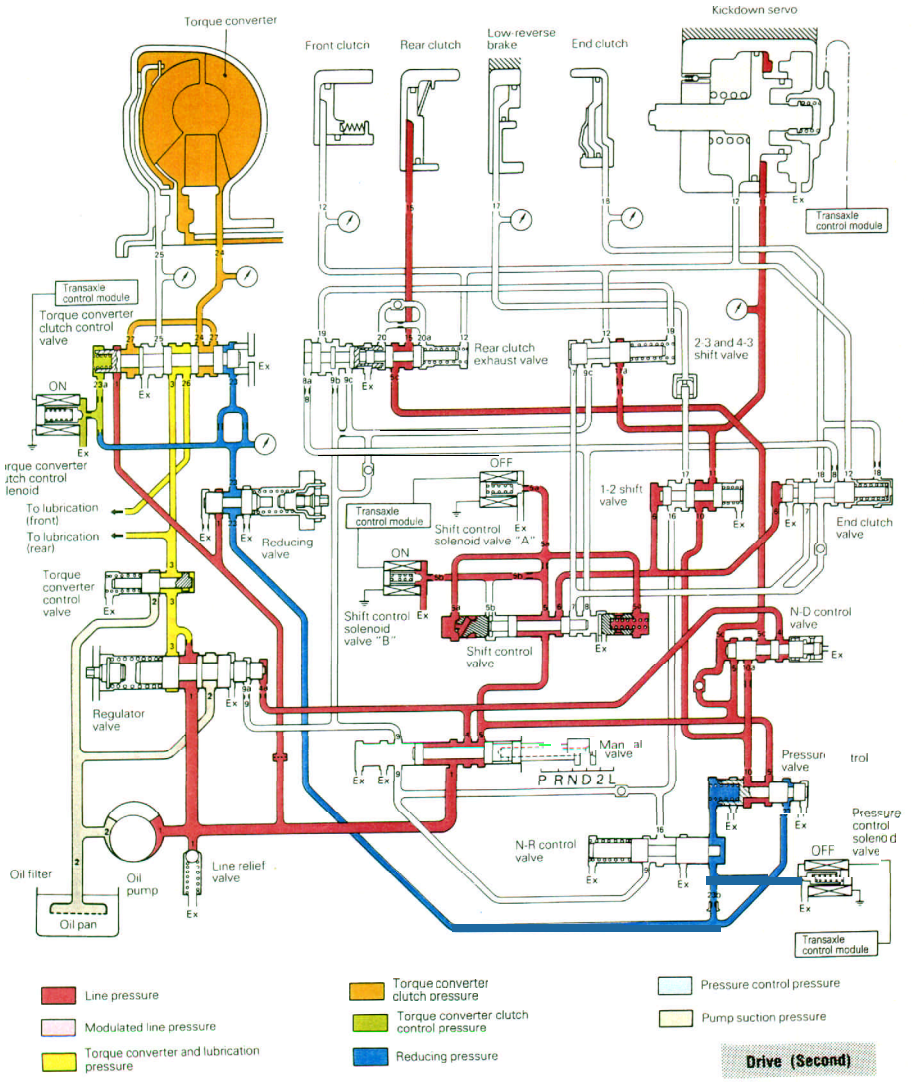
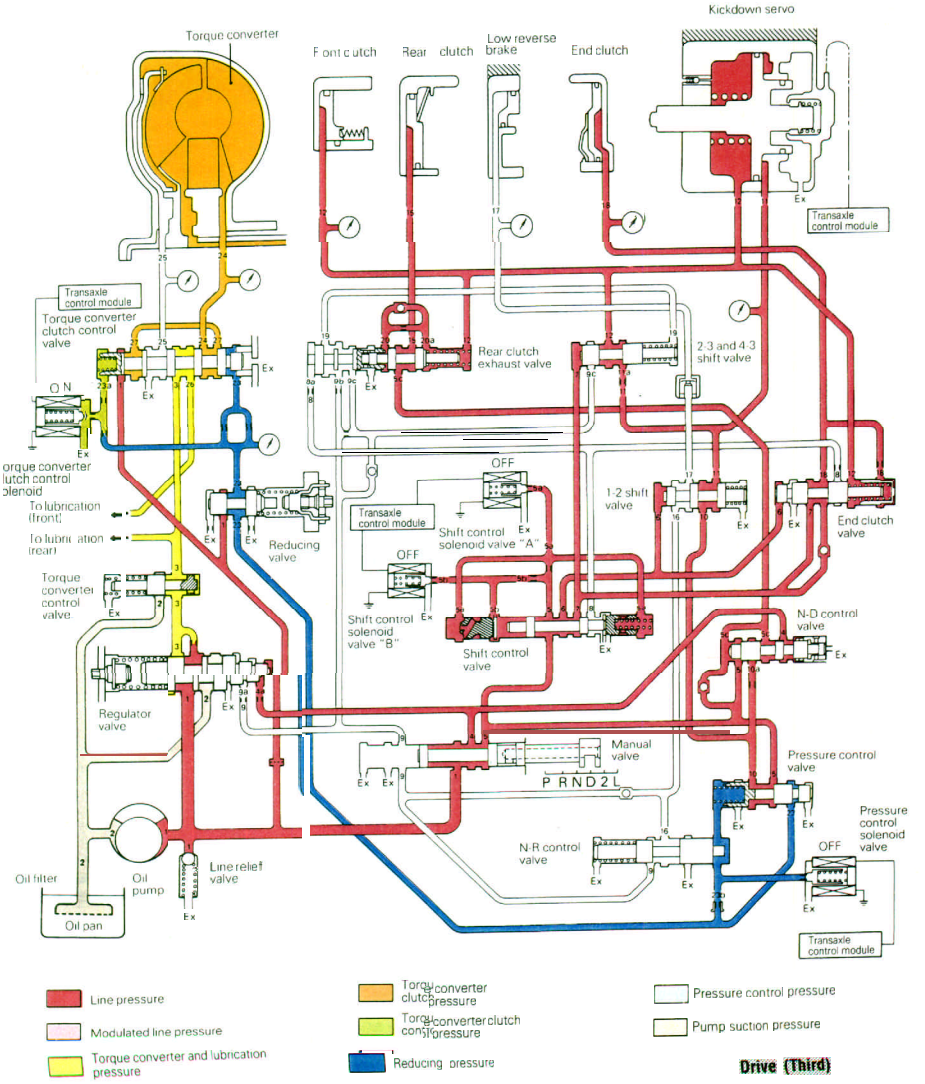
Hydraulic Circuit-Drive First for 1989 and 1990 model



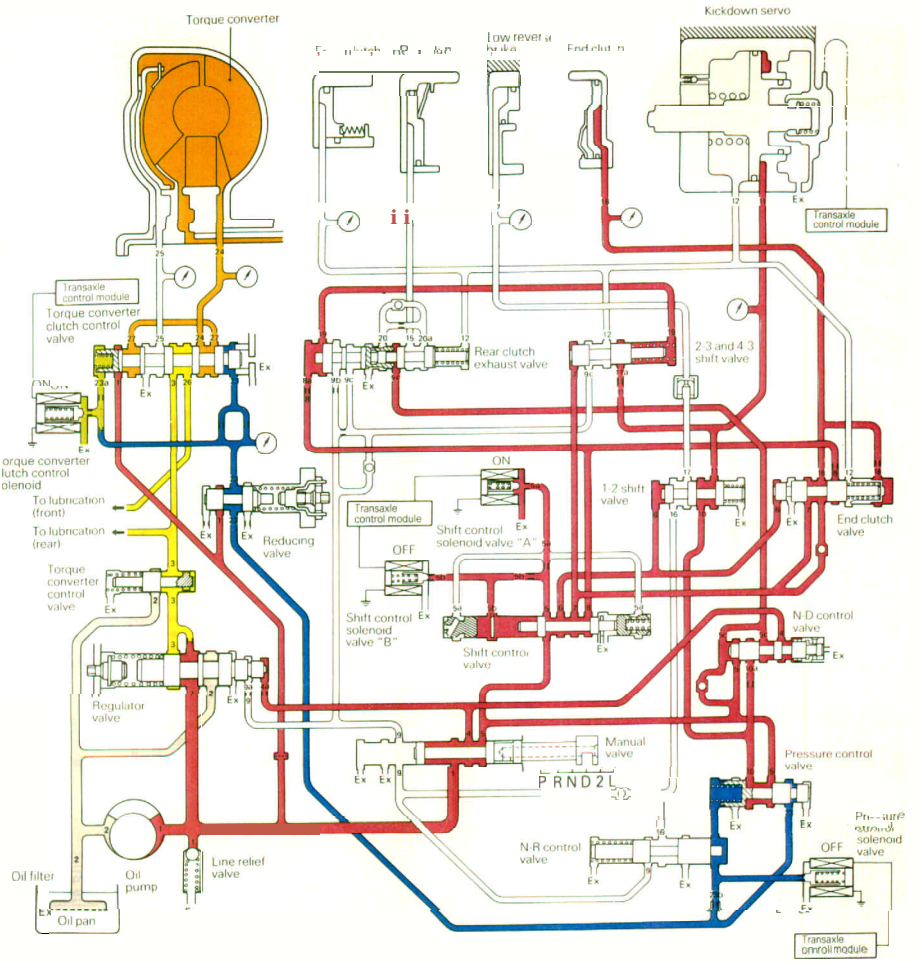
Hydraulic Circuit-Drive Second for 1989 and 1990 model



lydraulic Circuit-Drive Third for 1989 and 1990 model

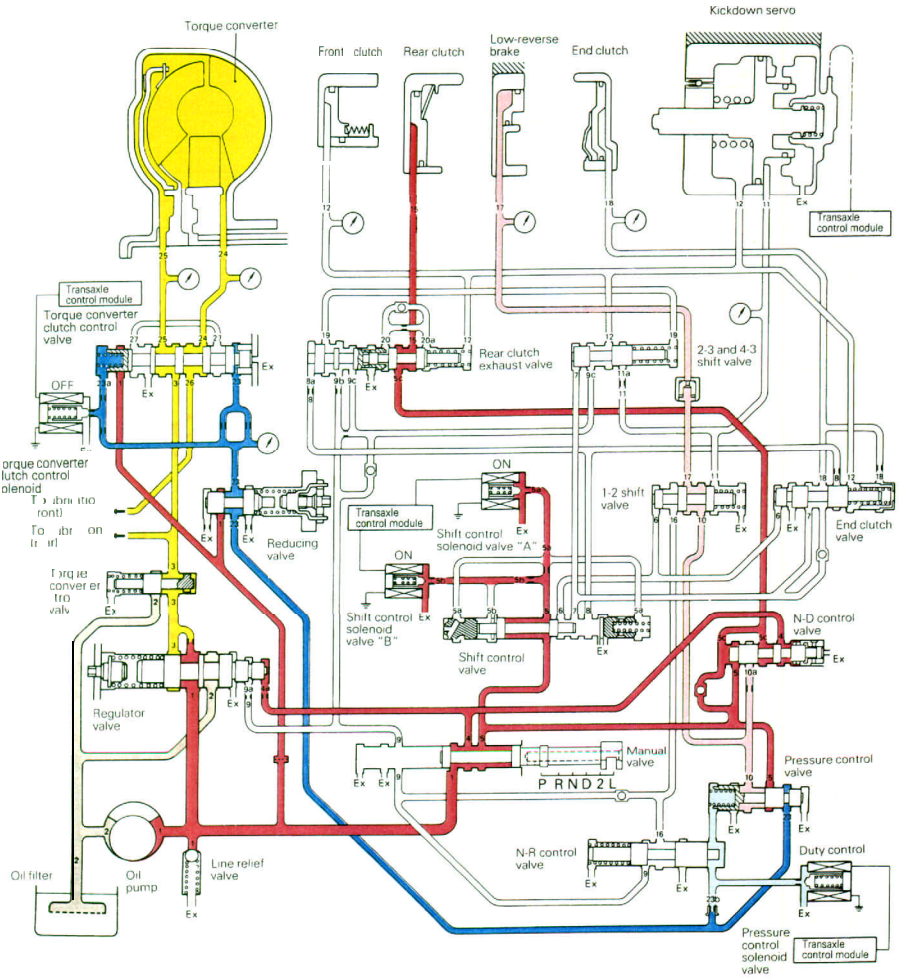


Hydraulic Circuit-Drive Fourth for 1989 and 1990 model

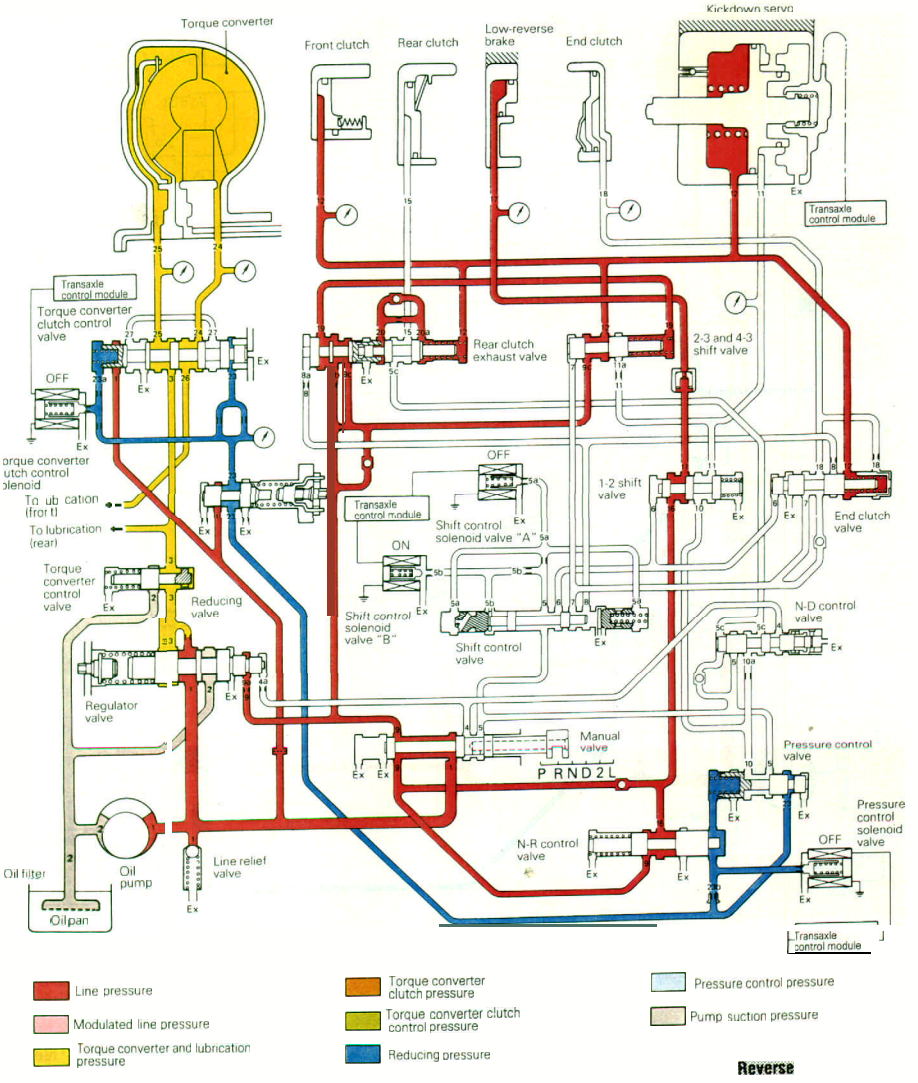


1750250

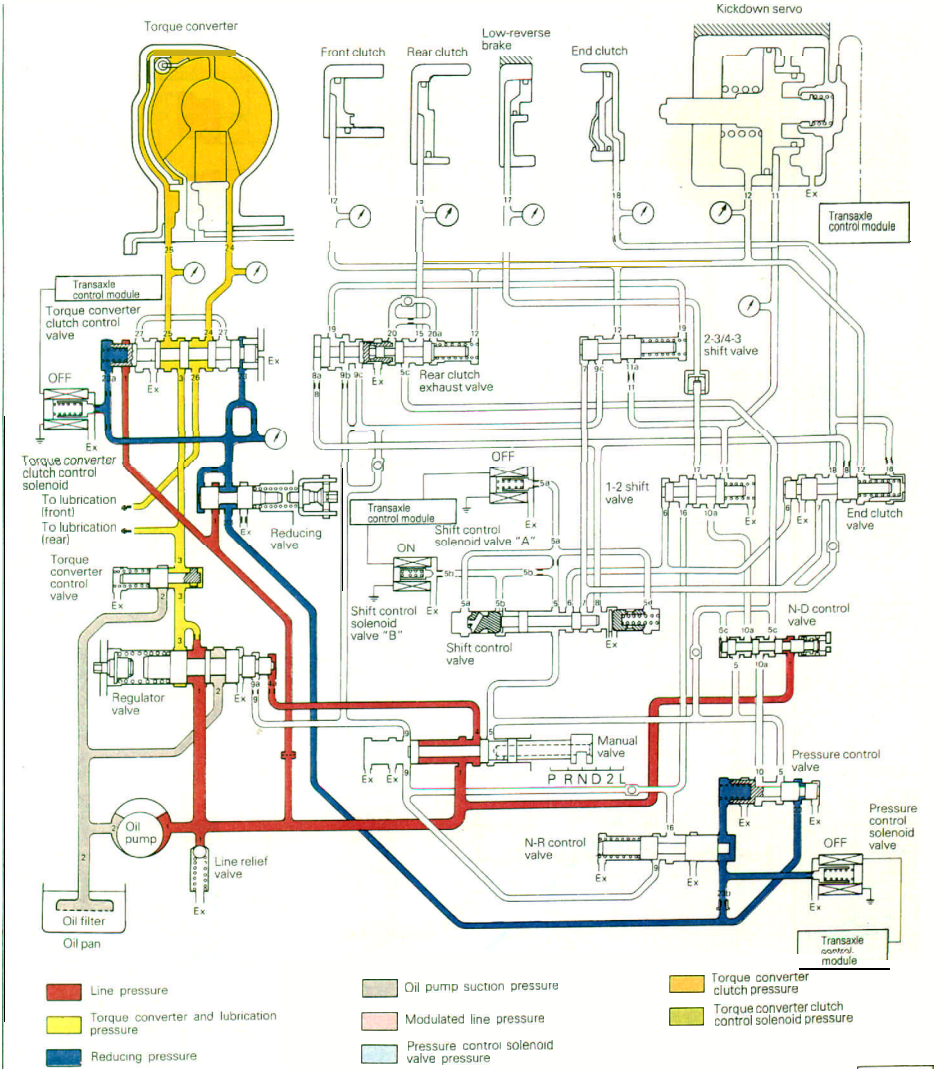
lydraulic Circuit-Lock-up for 1989 and 1990 model



lydraulic Circuit-Reverse for 1989 and 1990 model



Hydraulic Circuit-Neutral for 1990.5, 1991, 1992 and 1993 model



Neutral

TFA0070

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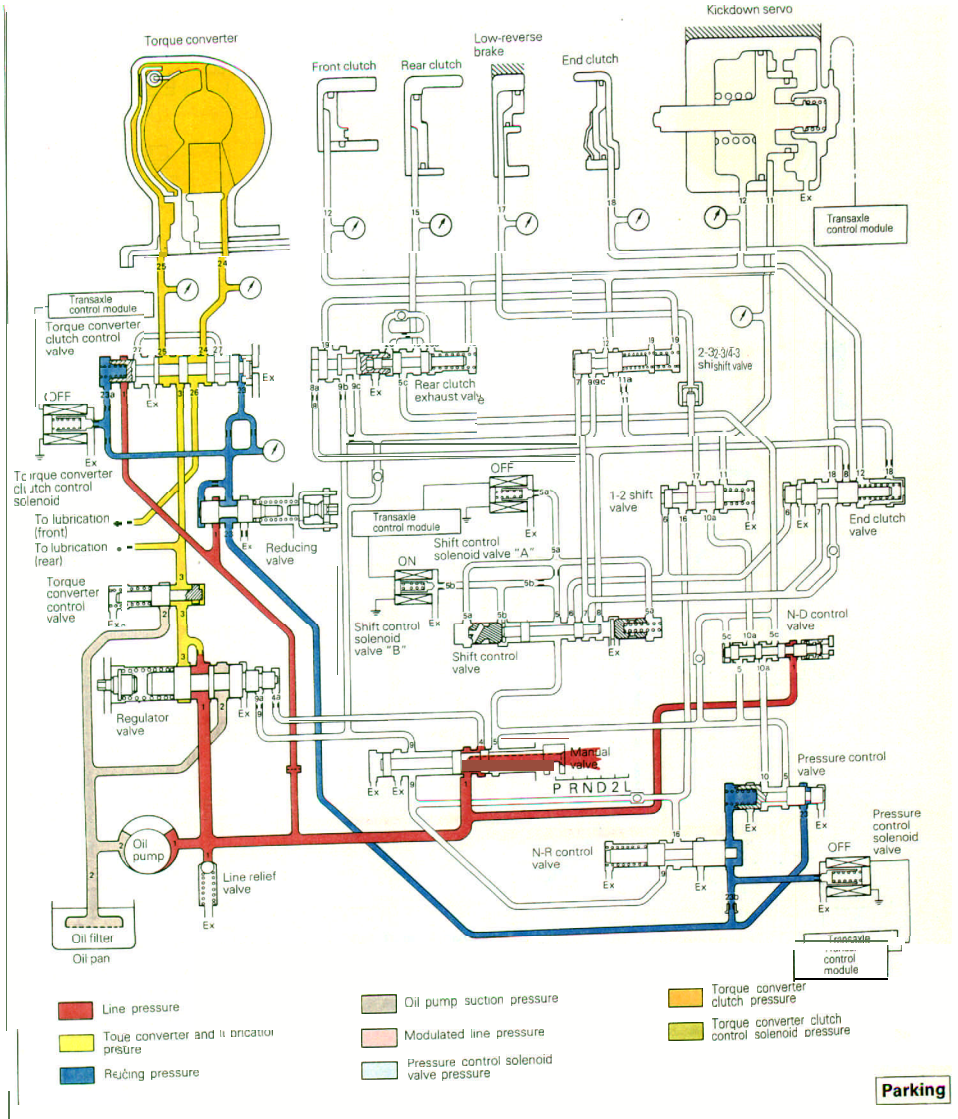
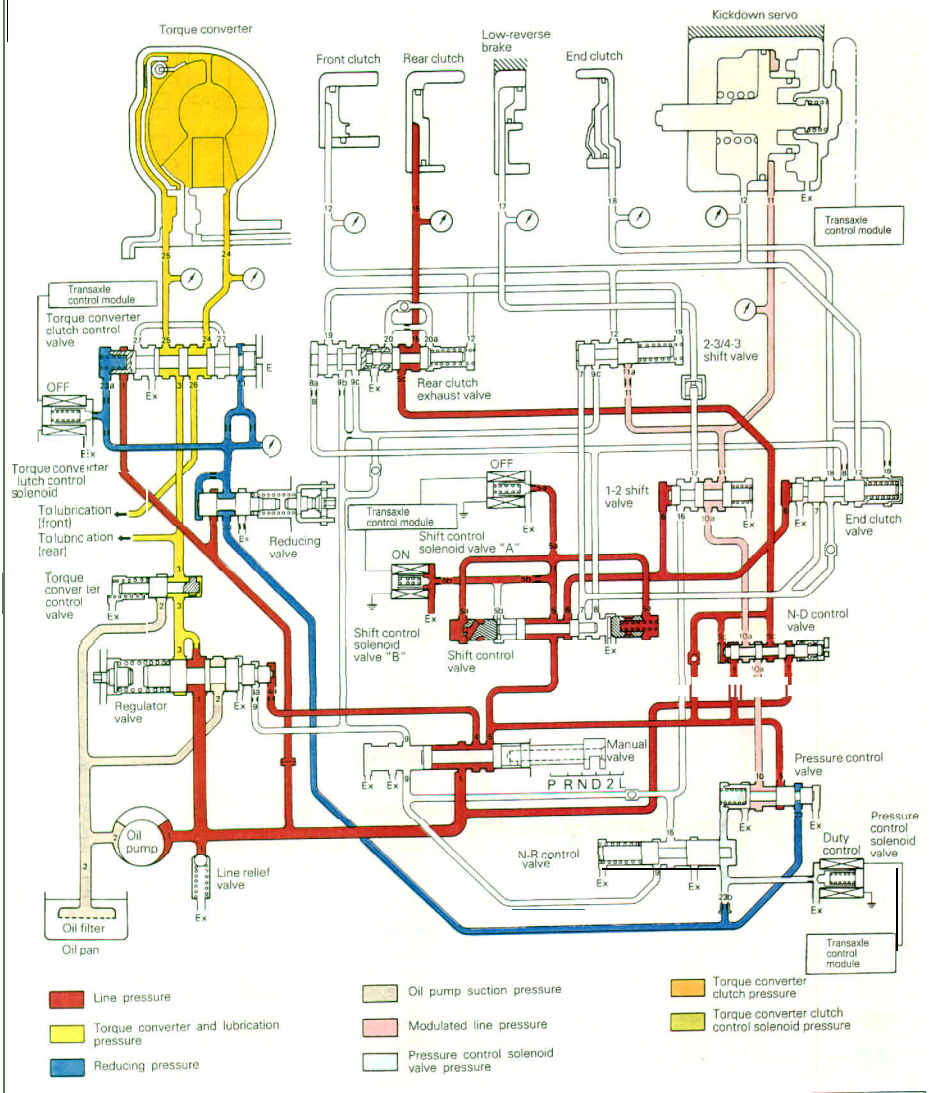
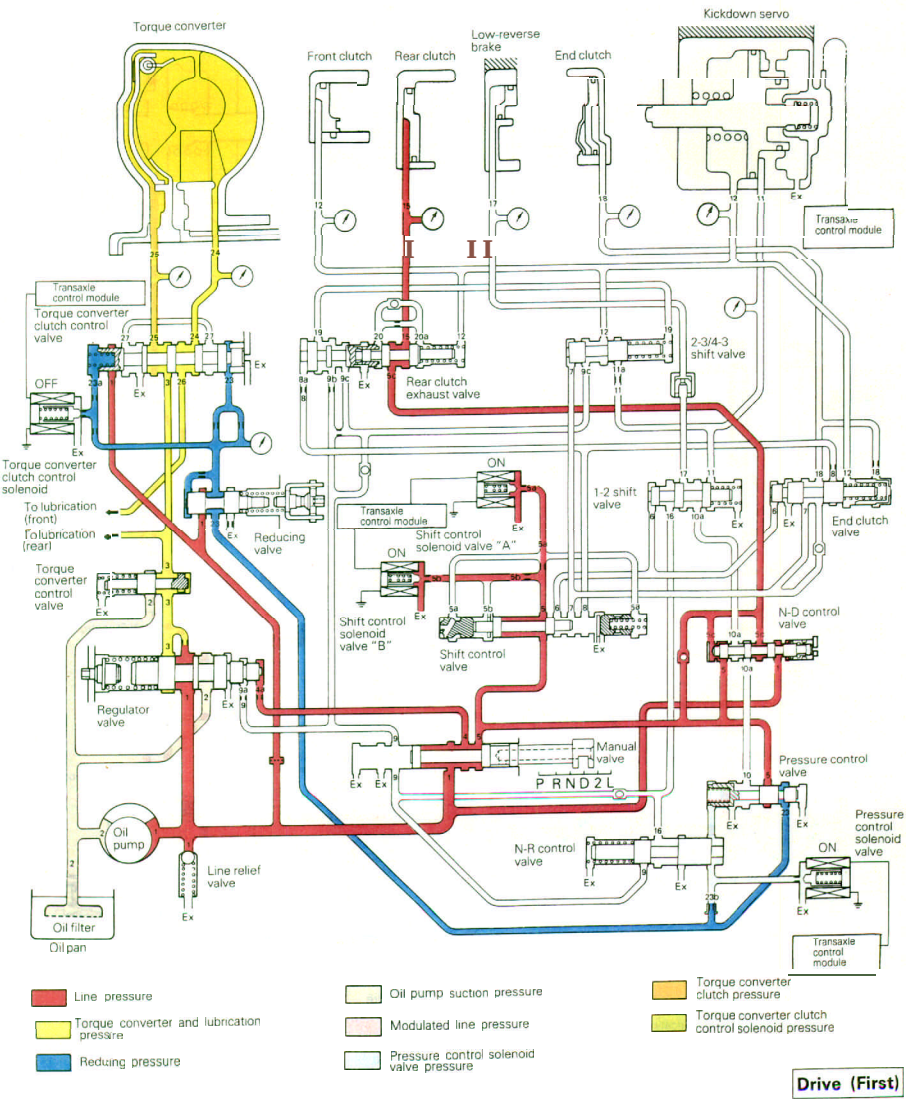
Hydraulic Circuit–Parking for 1990.5, 1991, 1992 and 1993 model



Hydraulic Circuit-Drive Stopping for 1990.5, 1991, 1992 and 1993 model



Hydraulic Circuit-Drive First for 1990.5, 1991, 1992 and 1993 model



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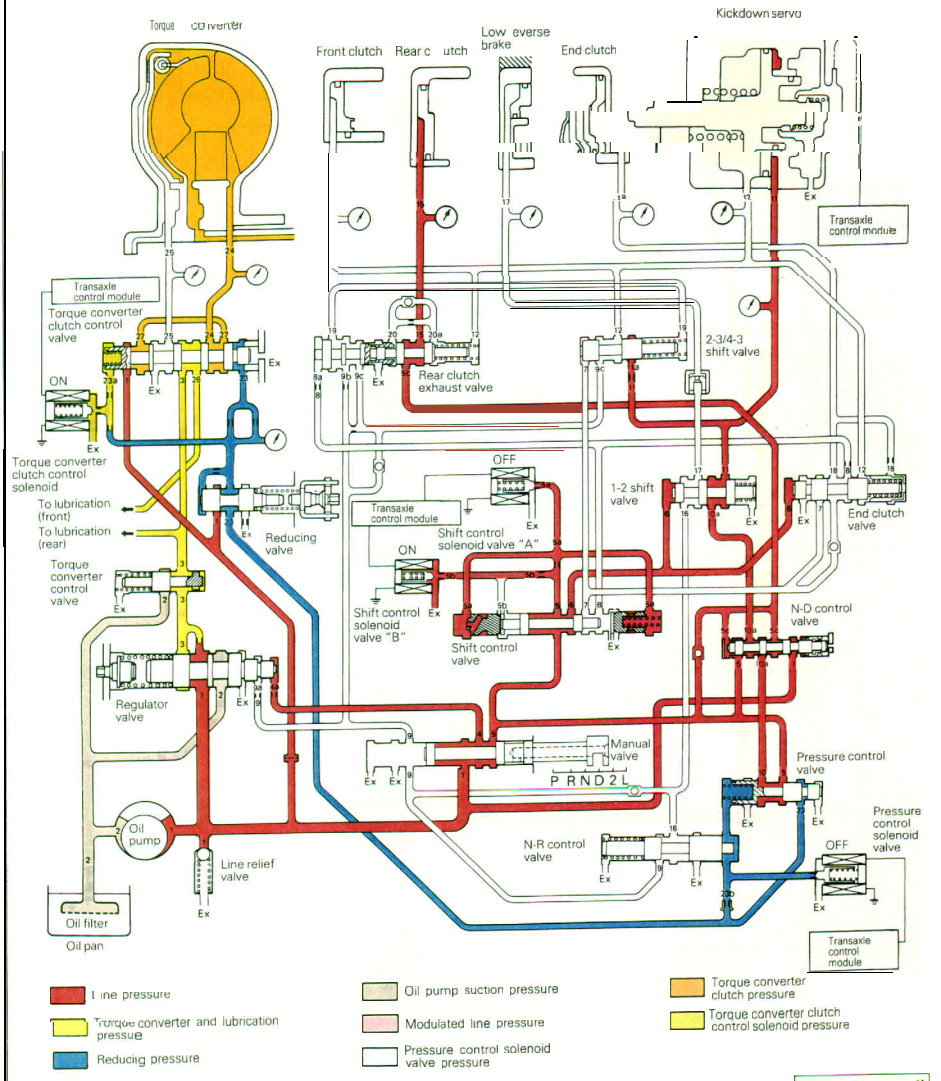
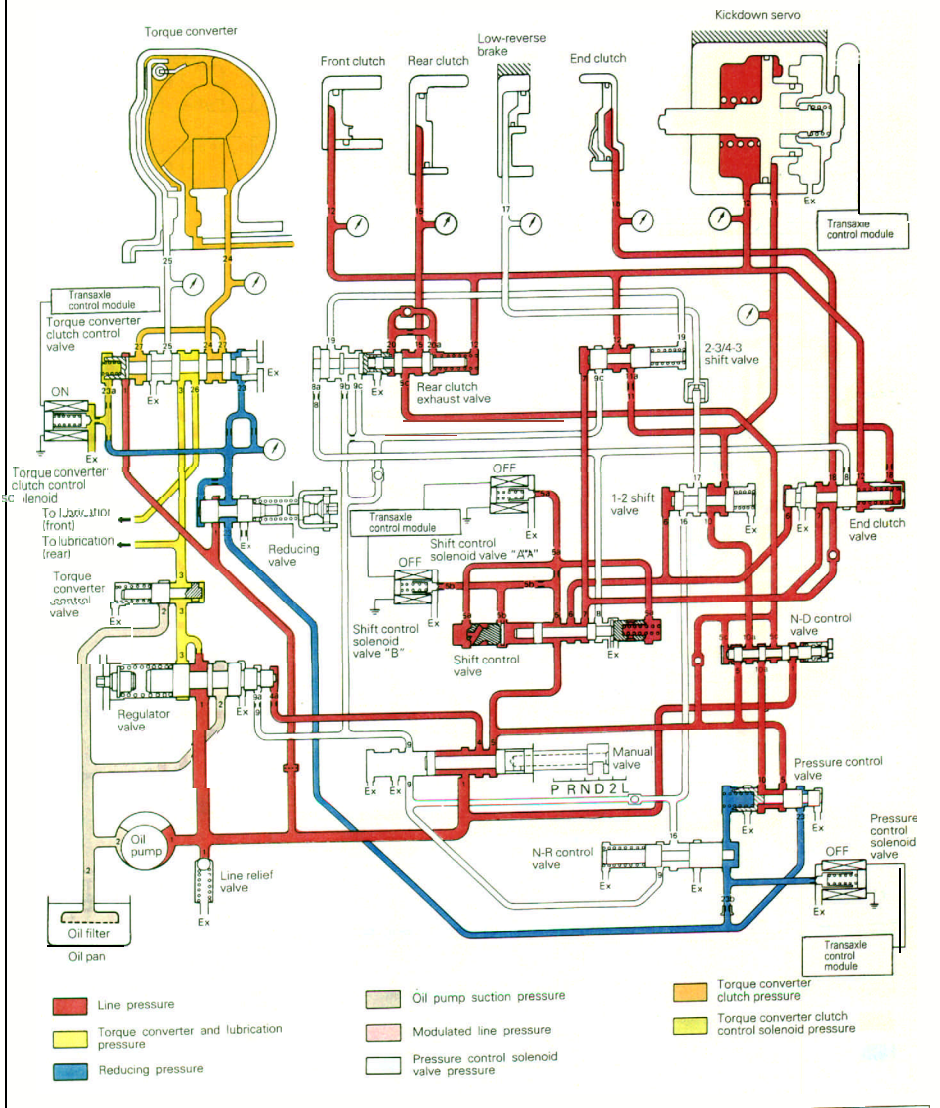
Hydraulic Circuit-Drive Second for 1990.5, 1991, 1992 and 1993 model



Drive (Second)

TFA0073

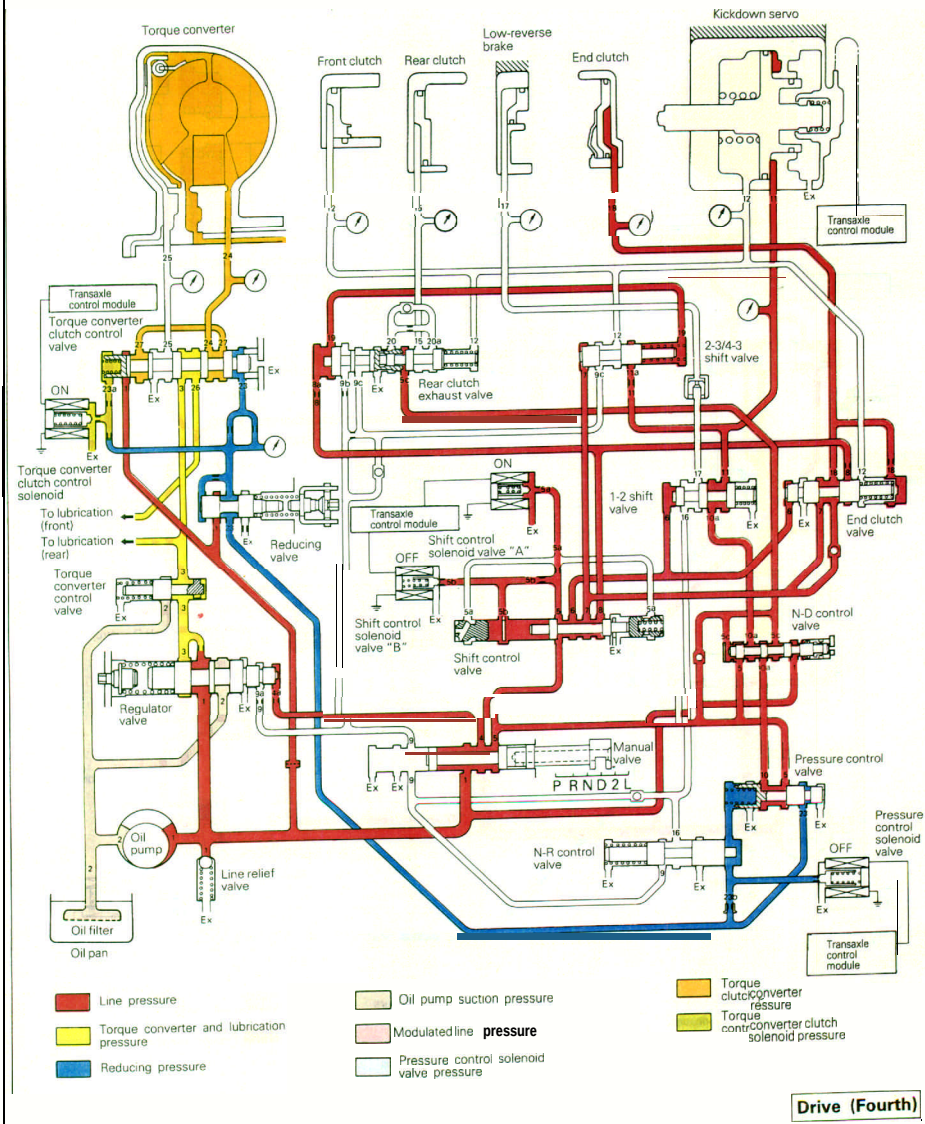
Hydraulic Circuit-Drive Third for 1990.5, 1991, 1992 and 1993 model



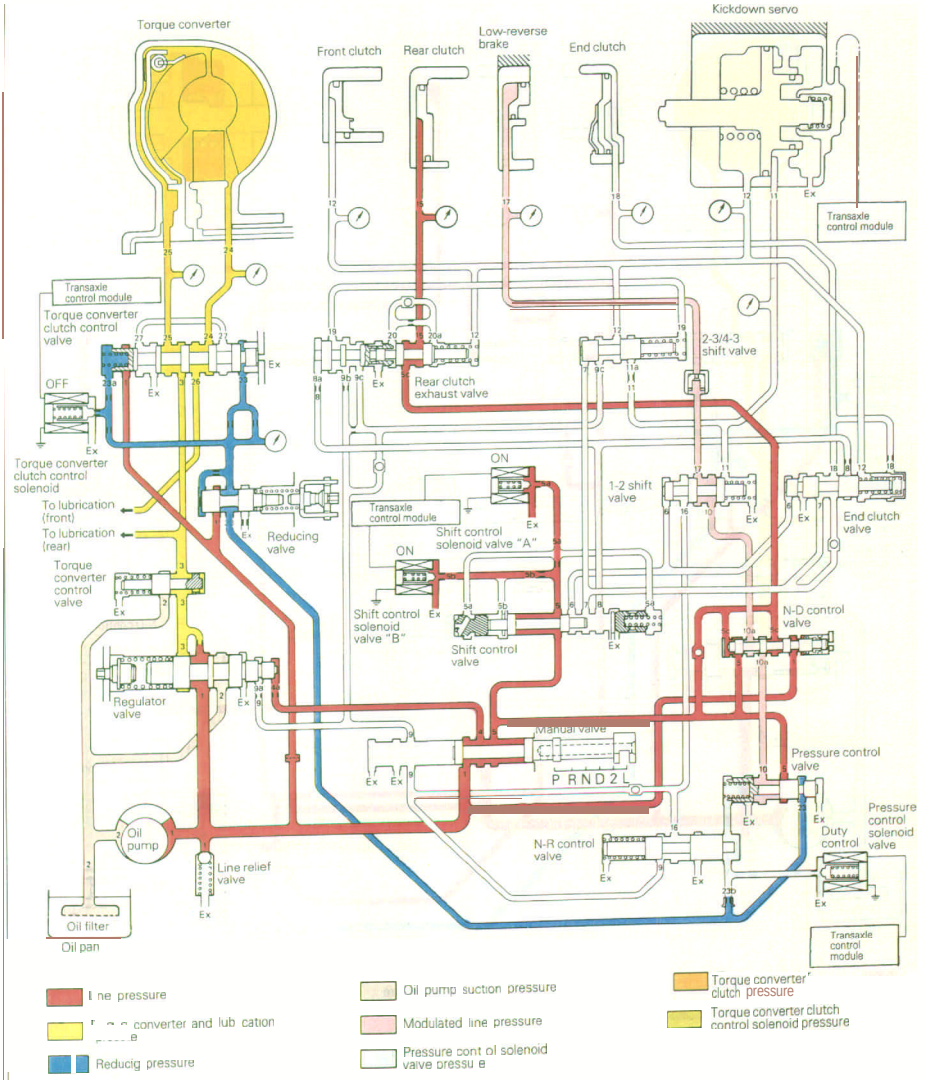
Drive (Third)

TFA0074

Hydraulic Circuit-Drive Fourth for 1990.5, 1991, 1992 and 1993 model



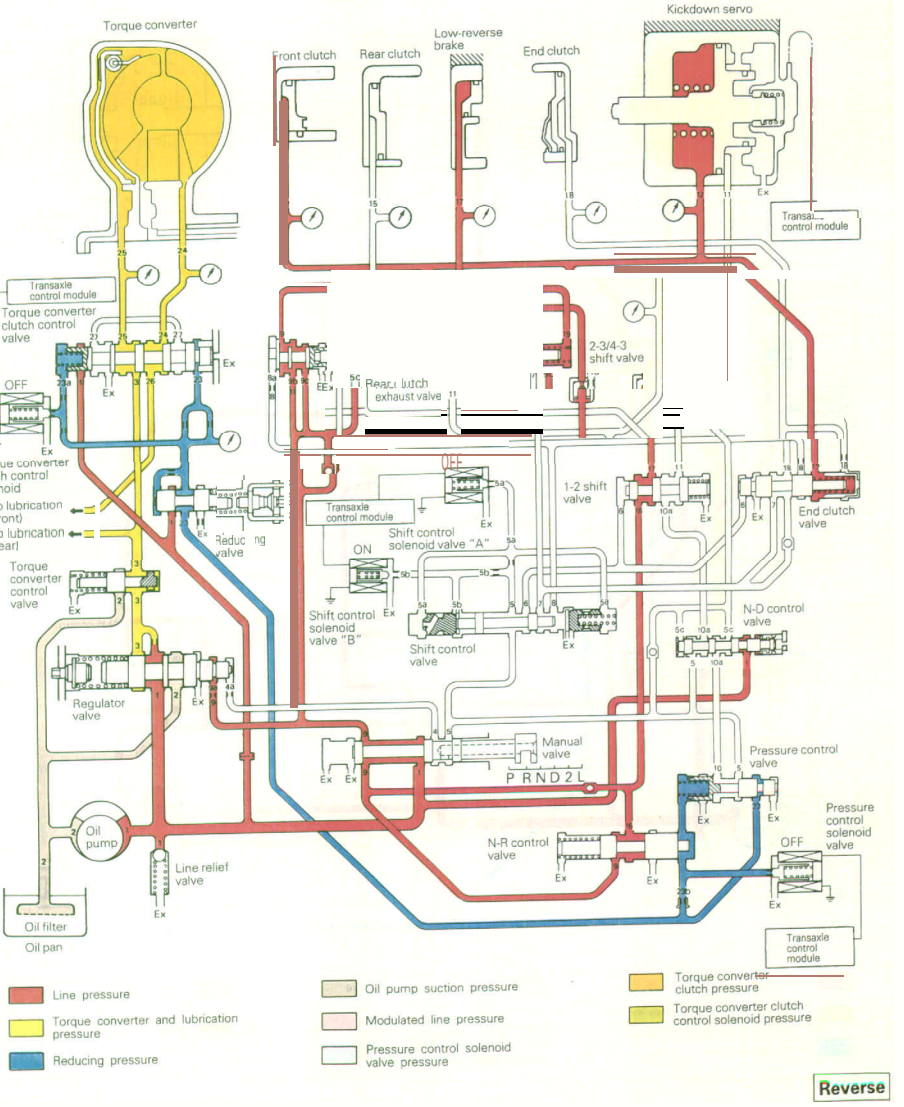
Hydraulic Circuit–Lock-up for 1990.5, 1991, 1992 and 1993 model



(First) p

TFA0076

Hydraulic Circuit–Reverse for 1990.5, 1991, 1992 and 1993 model



SPECIFICATIONS

The AWD vehicles have been discontinued from 1993 models.

GENERAL SPECIFICATIONS

M23CA--

Items	Specifications					
Type	KM175-5-R1 (1989 model) 4G63	F4A22-2-MPA2 (1990 model) 4G63	F4A22-2-MPD3 (1991, 1992 model) 4G63	F4A22-2-MPE4 (1993 model) 4G63-SOHC	F4A22-2-MQD4 (1991 model) 4G63-DOHC	F4A22-2-MQD6 (1992 model) 4G63-DOHC
Torque converter						
Type	3-element with torque converter clutch	3-element with torque converter clutch	3-element with torque converter clutch	3-element with torque converter clutch	3-element with torque converter clutch	3-element with torque converter clutch
Engine stall speed rpm	1,800 – 2,800	1,800 – 2,800	1,800 – 2,800	1,800 – 2,800	1,800 – 2,800	1,800 – 2,800
Stall torque ratio	2.17	2.17	2.17	1.90	1.90	1.90
Transaxle						
Type	Electronically controlled 4-speed full-automatic	Electronically controlled 4-speed full-automatic	Electronically controlled 4-speed full-automatic	Electronically controlled 4-speed full-automatic	Electronically controlled 4-speed full-automatic	Electronically controlled 4-speed full-automatic
Gear ratio						
First	2.846	2.846	2.846	2.846	2.846	2.846
Second	1.581	1.581	1.581	1.581	1.581	1.581
Third	1.000	1.000	1.000	1.000	1.000	1.000
Fourth	0.685	0.685	0.685	0.685	0.685	0.685
Reverse	2.176	2.176	2.176	2.176	2.176	2.176
Final gear ratio	4.007	4.007	4.007	4.007	4.007	4.007
Speeddmeter gear ratio (driven/drive)	29/36	29/36	29/36	30/36	30/36	30/36

Items	Specifications	
Type	W4A32-1-UQA (1991 model) 4G63-DOHC	W4A32-1-UQA2 (1992 model) 4G63-DOHC
Torque converter		
Type	3-element with torque converter clutch	3-element with torque converter clutch
Engine stall speed rpm	1,800 – 2,800	1,800 – 2,800
Stall torque ratio	1.90	1.90
Transaxle		
Type	Electronically controlled 4-speed full-automatic	Electronically controlled 4-speed full-automatic
Gear ratio		
First	2.846	2.846
Second	1.581	1.581
Third	1.000	1.000
Fourth	0.685	0.685
Reverse	2.176	2.176
Reduction ratio		
Primary	1.228	1.228
Secondary	3.600	3.600
Speedometer gear ratio (drive/driven)	36/30	36/30
Transfer		
Type	Constant mesh	Constant mesh
Gear ratio	1.090	1.090

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TORQUE SPECIFICATIONS

M23CC--

Items	Nm	ft.lbs.
Oil pan bolts	10–12	7-9
Tie rod end to knuckle	24-35	17-25
Lower arm ball joint to knuckle	60–72	43-52
Transaxle mounting bracket to transaxle	60–80	43-58
Special bolts	46-53	33-38
Selector lever assembly mounting bolts	9-14	7–10
Starter motor mounting bolt	27-34	20–25
Oil cooler hose clamp	4-6	3-4
Hose bracket	3-5	2-4
Cover to selector knob	2.0 or more	1.4 or more
Selector knob to lever assembly	2.0 or more	1.4 or more
Bell housing cover to engine	10–12	7-9
Transaxle mounting bolt [IO mm (.40 in.) diameter bolt]	10–12	7.2-8.7
Transaxle mounting bolt [8 mm (.31in.) diameter bolt]	30–35	22-25
Control cable to body	9-14	7–10
Indicator panel	1–2	0.7– 1.4
Lever assembly to bracket assembly	10–14	8–10
Drive plate-to-converter tightening bolt	46-53	34-38
Drain plug	30–35	22-25
Pressure check plug	8–10	6-7
Pulse generator mounting bolt	10–12	7-9
Valve body assembly mounting bolt	10–12	7-9
Oil filter bolt	5-7	4-5
Kickdown locking nut	25-32	18-23

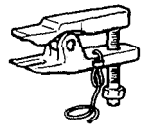
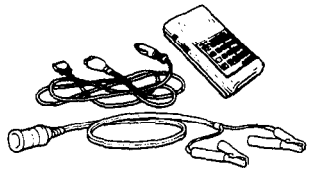
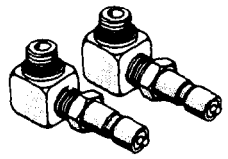
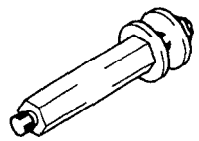
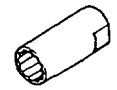
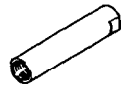
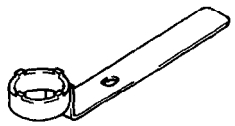
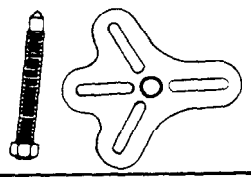
LUBRICANTS

M23CD--

Items	Specified lubricant	Quantity
Transaxle fluid dm^3 (qts.)	DIAMOND ATF SP or equivalent	6.1 (6.4): FWD AA 6.5 (6.9): AWD A/T
Transfer oil (AWD only) dm^3 (qts.)	Hypoid gear oil SAE 75W–85W conforming to API GL-4 or higher	0.6 (0.6)

SPECIAL TOOLS

M23DA-

Tool	Number	Name	Use
	MB991113-01 OPTIONAL: AVAILABLE FROM O.T.C.	Steering linkage puller	Disconnection of the tie rod
	MB991269*1 or MB991341*2	Scan tool (Multi-use tester <MUT>)	Checking of the diagnostic trouble code, actuator testing, and checking of the service data
	(For the number, refer to GROUP 00– Precautions before service.)	ROM pack (for scan tool)	Checking of the diagnostic trouble code, actuator testing, and checking of the service data
	MD998330-01	Oil pressure gauge	Measurement of the hydraulic pressure
	MD998332-01	Oil pressure gauge adapter	Measurement of the hydraulic pressure
  	MD998916-01 MD998916-1-01 MD998916-2-01 MD998916-3-01	Kickdown servo adjustment wrench set Kickdown servo wrench adapter Outlet sleeve Inner sleeve	Adjustment of kickdown servo
	MD998918-01	Kickdown servo wrench	Adjustment of kickdown servo
	GENERAL SERVICE TOOL	Axle puller	Removal of the drive shaft

NOTE
*1: 1989 model
*2: From 1990 model

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Based upon use of the troubleshooting guide, the probable location of the problem should be estimated.

⇩

Checks should be made of fluid levels and the condition of the ATF, as well as the condition of the manual control cables; adjustments should then be made if found to be necessary.

⇩

If a presumption has been made that there is an abnormal condition somewhere in the electronic-control system, check the fault code, in order to determine the probable location of the problem, by using a scan tool or voltmeter.

⇩

When the abnormal system is discovered, check each element (sensors, etc.) one by one, and make repairs as necessary.

⇩

When the abnormal condition is presumed to be in the oil-pressure-control system, check by making an oil-pressure test.

⇩

When the result of the oil-pressure test does not satisfy the specified pressure, check each system at places related to the valve body, check the oil-pressure passages for leakage, etc.

⇩

If the problem is unusually dirty ATF, abnormal noises, oil leakage, or slippage of the clutch or brakes, or an abnormal condition of the transaxle itself, disassemble and repair the transaxle.

TROUBLESHOOTING

M23EBAKb

Functional malfunctions of the ELC-4A/T can lead to other problems, such as those described below:

(1) Improper maintenance and/or adjustments
(2) Malfunctions of the electronic control functions
(3) Malfunctions of mechanical functions
(4) Malfunctions of hydraulic control functions
(5) Malfunctions of engine performance
etc.

In order to properly determine ("Troubleshoot") the source of these malfunctions, it is first essential to methodically question the user concerning the details of the problem, such as the condition of the problem, the situation at the time the problem occurred, and any other relevant information, all in as much detail as possible. The user should also be asked whether or not the problem has occurred more than once, and under what conditions.

Subsequently, certain tests should be conducted in a certain order, as described at the left.

NOTES

TROUBLESHOOTING GUIDE

		Problem / Presumed cause	Driving impossible or abnormal (before start-off): Starter motor won't function	Forward/backward movement impossible	Forward movement impossible	Backward movement impossible	Engine stalls when N → D or R	Clutch slips at D (stall rpm too high)	Clutch slips at R (stall rpm too high)	Stall rpm too low	Vehicle moves at P or N	Engine starts, or vehicle moves, between N-R or N-D	Parking does not hold	Abnormal vibration-shock when shift to D-2-1-R
Engine	1	Abnormal idling rpm					⊗							×
	2	Performance malfunction					×			×				
Transaxle (power train)	3	Improper adjustment of manual linkage	×	⊗	⊗	⊗		⊗	⊗		⊗	⊗	⊗	⊗
	4	Malfunction of torque convertor		×	×	×				×				
	5	Operation malfunction of oil pump		×	×	×		×	×					
	6	Malfunction of one-way clutch			×			×						
	7	Damaged or worn gear or other rotating part, or improper adjustment of the preload												
	8	Malfunction of parking mechanism									×		×	
	9	Cracked drive plate, or loose bolt		×										
	10	Worn inside diameter of front clutch retainer				×			×					
Transaxle hydraulic system (including friction elements)	11	Low fluid level		⊗	⊗	⊗		×	×					
	12	Line pressure too low (seal damaged, leakage, looseness, etc.)		⊗	⊗	⊗		⊗	⊗					
	13	Malfunction of valve body (sticking valve, working cavity, adjustment, etc)		⊗	⊗	⊗	×	×	×		×	×		×
	14	Malfunction of front clutch or piston				×			×					×
	15	Malfunction of rear clutch or piston			⊗			×						×
	16	Malfunction of kickdown band or piston												
	17	Improper adjustment of kickdown servo												
	18	Malfunction of low-reverse brake or piston		×		×			×					×
	19	O-ring of low-reverse brake circuit between valve body and case not Installed				×			×					
	20	Malfunction of end clutch or piston (check ball hole, other)												
Electronic-control system	21	Malfunction of Park/Neutral position switch, damaged or disconnected wiring, or improper adjustment	×								×	×		×
	22	Malfunction of TPS, or improper adjustment												×
	23	Pulse generator (A) damaged or disconnected wiring, or short-circuit												
	24	Pulse generator (B) damaged or disconnected wiring, or short-circuit				×								
	25	Malfunction of kickdown servo switch												
	26	SCSV-A or B damaged or disconnected wiring, or short-circuit or sticking (valve open)												
	27	Malfunction of ignition signal system												
	28	Incorrectly grounded ground strap												
	29	PCSV damaged or disconnected wiring, or short-circuit												
	30	PCSV damaged or disconnected wiring (valve open)		⊗	⊗	⊗		×	×					
	31	TCC solenoid damaged or disconnecting wiring (valve closed)												
	32	TCC solenoid short-circuit or sticking (valve open)					⊗							
	33	Malfunction of overdrive control switch												
	34	Malfunction of accelerator switch, or improper adjustment												×
	35	Malfunction of oil-temperature sensor												
	36	Malfunction of lead switch												
	37	Poor contact of ignition switch												
	38	Malfunction of transaxle control module												×

NOTE: ⊗ indicates items of high priority during inspection.
Abbreviations: TPS = Throttle position sensor SCSV = Shift control solenoid valve

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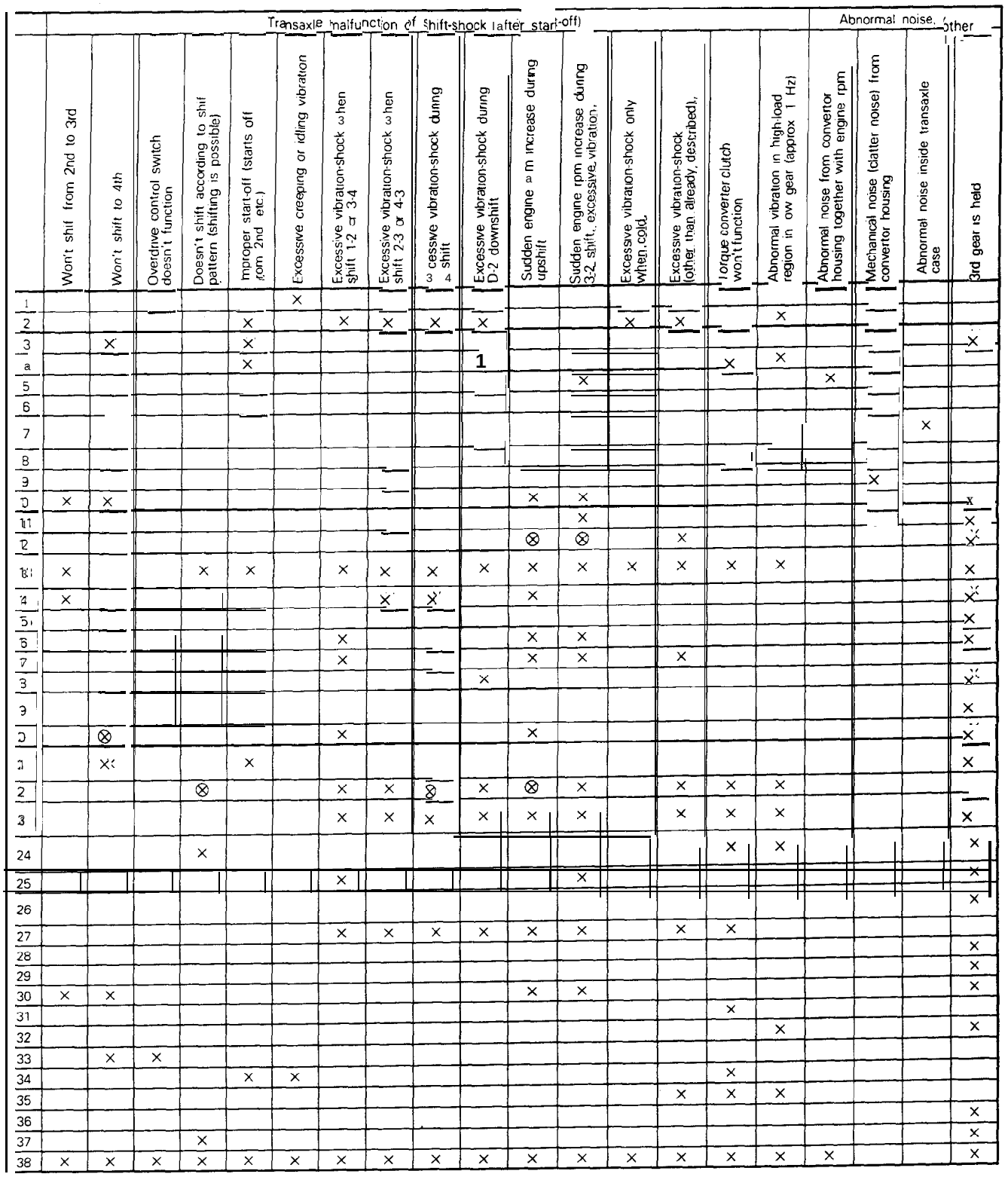

PSCV = Pressure control solenoid valve
TCC = Torque converter clutch

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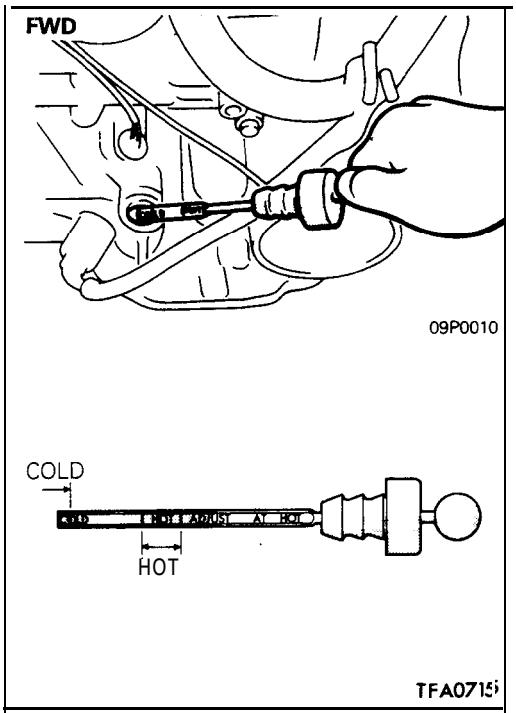
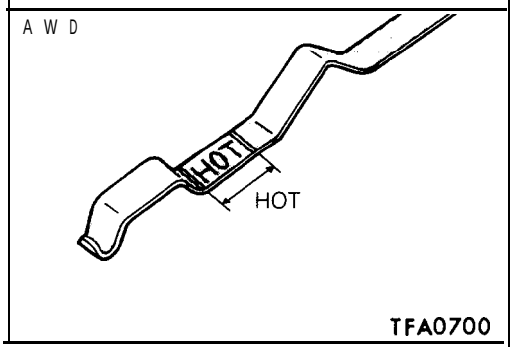
DATA LINK AND TEST

FLUID LEVEL AND CONDITION

1. Drive until the fluid temperature reaches the usual temperature [70–80°C (160– 180°F)].
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. This operation is necessary to be sure that fluid level check is accurate.
4. Before removing dipstick, wipe all dirt from area around dipstick. Then take out the dipstick and check the condition of the fluid.
   The transaxle should be overhauled under the following conditions.
   - If there is a "burning" odor.
   - If the fluid color 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 dipstick. If fluid level is low, add automatic transaxle fluid until level reaches "HOT" range.
   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.
   Improper filling can also raise fluid level too high. When transaxle has too much fluid, gears churn up foam and cause same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle 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 transaxle vent where it may be mistaken for a leak.
6. Be sure to examine fluid on dipstick closely.

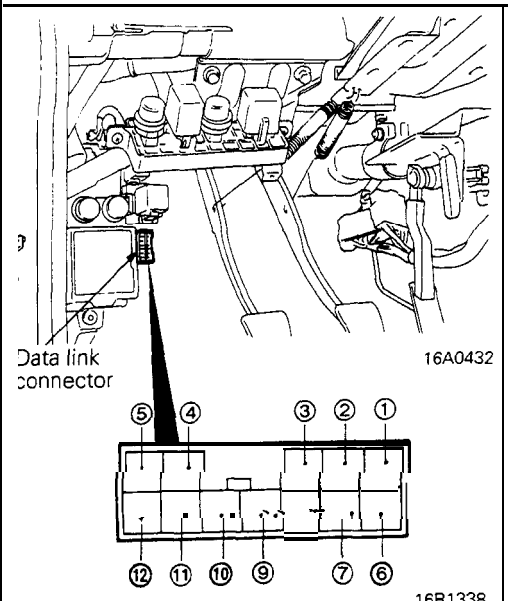




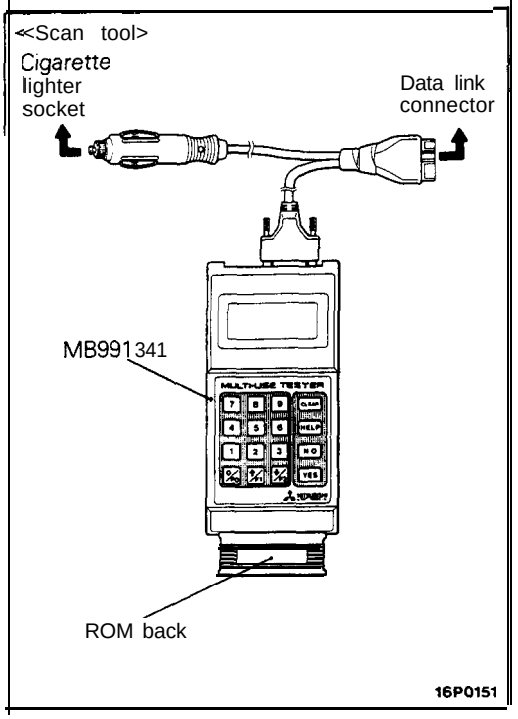
CONTROL CABLE

Whether control cable is properly adjusted can be confirmed by checking whether park/neutral position switch is performing well.

1. Apply parking brakes and service brakes securely.
2. Place selector lever to "R" range.
3. Set ignition key to "ST" position.
4. Slowly move the selector lever upward until it clicks as it fits in notch of "P" range. If starter motor operates when lever makes a click, "P" position is correct.
5. Then slowly move selector lever to "N" range by the same procedure as in foregoing paragraph. If starter motor operates when selector lever fits in "N", "N" position is correct.
6. Also check to be sure the vehicle doesn't begin to move and the lever doesn't stop between P-R-N-D.
7. The control cable is properly adjusted if, as described above,the starter motor starts at both the "P" range and the "N" range.



⑥: ELC-4A/T [2 modes]
⑩: Data link control
⑫: Ground



READ OUT OF FAULT CODES

(1) Connect the voltmeter or scan tool to the connector for data link.

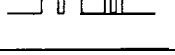
(2) Read the output fault codes.
Then follow the remedy procedures according to the "Fault Code Description" on the following page.

NOTE
- As many as a maximum of ten fault codes, in the sequence of occurrence, can be stored in the Random Access Memory (RAM) incorporated within the control module.
- The same fault code can be stored as many as three times.
- If the number of stored fault codes or fault patterns exceeds ten, already stored fault codes will be erased, in sequence beginning with the oldest.
- Do not disconnect the battery until all fault codes or fault patterns have been read out, because all stored fault codes or fault patterns will be canceled when the battery is disconnected.

(3) If the fail-safe system is activated and the transaxle is locked in 3rd gear, the fault code in the Fail-Safe Code Description will be stored in the RAM.
Three of these fault codes can be stored.

(4) The cancelation will occur if, with the transaxle locked in 3rd gear, the ignition key is turned to the OFF position, but the fault code is stored in the RAM.

Fault Code Description for 1989 and 1990 model

Fault code	Fault code (for voltmeter)	Cause	Remedy
21		Abnormal increase of TPS output	• Check the throttle position sensor connector. • Check the throttle position sensor itself. • Adjust the throttle position sensor. • Check the accelerator switch (No. 28: output or not). • Check the throttle position sensor output circuit harness.
22		Abnormal decrease of TPS output	
23		Incorrect adjustment of the throttle-position sensor system	
24		Damaged or disconnected wiring of the oil temperature sensor system	• Check the oil temperature sensor circuit harness. • Check the oil temperature sensor connector. • Check the oil temperature sensor itself.
25		Damaged or disconnected wiring of the kickdown servo switch system, or improper contact	• Check the kickdown servo switch output circuit harness. • Check the kickdown servo switch connector. • Check the kickdown servo switch itself.
26		Short circuit of the kickdown servo switch system	
27		Damaged or disconnected wiring of the ignition pulse pick-up cable system	• Check the ignition pulse signal line.
28		Short circuit of the accelerator switch system or improper adjustment	• Check the accelerator switch output circuit harness. • Check the accelerator switch connector. • Check the accelerator switch itself. • Adjust the accelerator switch.
31		Malfunction of the microprocessor	• Replace the control unit.
32		First gear command during high-speed driving	• Replace the control unit.
33		Damaged or disconnected wiring of the pulse generator B system	• Check the pulse generator B output circuit harness. • Check pulse generator B itself. • Check the vehicle speed reed switch (for chattering).

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Fault code	Fault code (for voltmeter)	Cause	Remedy
41		Damaged or disconnected wiring of the shift control solenoid valve A system	• Check the solenoid valve connector. • Check shift control solenoid valve A itself. • Check the shift control solenoid valve A drive circuit harness
42		Short circuit of the shift-control solenoid valve A system	
43		Damaged or disconnected wiring of the shift control solenoid valve B system	• Check the solenoid valve connector. • Check shift control solenoid valve B itself. • Check the shift control solenoid valve B drive circuit harness.
44		Short circuit of the shift control solenoid valve B system	
45		Damaged or disconnected wiring of the pressure control solenoid valve system	• Check the solenoid valve connector. • Check the pressure control Solenoid valve itself. • Check the pressure control solenoid valve drive circuit harness.
46		Short circuit of the pressure control solenoid valve system	
47		Damaged or disconnected wiring of the torque converter clutch control solenoid system	• Check the solenoid valve connector. • Check the torque converter clutch control solenoid itself. • Check the torque converter clutch control solenoid drive circuit harness.
48		Short circuit of the damper clutch control solenoid valve system	
49		Malfunction of the torque converter clutch system	• Check the torque converter clutch control solenoid drive circuit harness. • Check the torque converter clutch hydraulic pressure system. • Check the torque converter clutch control solenoid itself. • Replace the control unit.
51		First gear non-synchronous	• Check the pulse generator output circuit harness. • Check the pulse generator connector. • Check pulse generator A and pulse generator B themselves. • Kickdown brake slippage.
52		Second gear non-synchronous	• Check the pulse generator A output circuit harness. • Check the pulse generator A connector. • Check pulse generator A itself. • Kickdown brake slippage.

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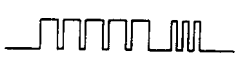
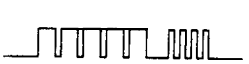
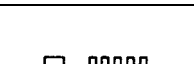
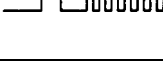
Fault code	Fault code (for voltmeter)	Cause	Remedy
53		Third gear non-synchronous	• Check the pulse generator A output circuit harness. • Check the pulse generator connector. • Check pulse generator A and pulse generator B themselves. * Front clutch slippage. • Rear clutch slippage.
54		Fourth gear non-synchronous	• Check the pulse generator A output circuit harness. • Check the pulse generator A connector. • Check pulse generator A itself. • Kickdown brake slippage.

Fault Code Description for 1990.5, 1991, 1992 and 1993 model

Appropriate transaxle		Code No.	output pattern	Description	Remedy
AWI	FWI				
0	0	11		Abnormal increase of TPS output	• Check the throttle position sensor connector. • Check the throttle position sensor itself. • Adjust the throttle position sensor. • Check the accelerator switch (Code No. 24 output or not).
0	0	12		Abnormal decrease of TPS output	
0	0	13		Malfunction of the throttle-position sensor or incorrect adjustment	
0	0	15		Damaged or disconnected wiring of low oil temperature sensor (1992 model) or oil temperature sensor (1993 model)	• Check the oil temperature sensor connector. • Check the oil temperature sensor itself.
0	–	16		Short circuit of high oil temperature sensor (1992 model)	
0	–	17		Damaged or disconnected wiring of high oil temperature sensor or short-circuit of low oil temperature sensor (1992 model)	
0	0	21		Damaged or disconnected wiring of the kickdown servo switch	• Check the kickdown servo switch connector. • Check the kickdown servo switch itself.
0	0	22		Short circuit of the kickdown servo switch	

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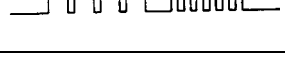
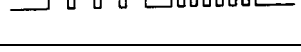
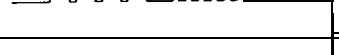
propriate transaxl		Code No.	Output pattern	Description	Remedy
WD	FWC				
0	0	23		Damaged or disconnected wiring of the ignition pulse pick-up cable	• Check the ignition pulse signal line.
0	0	24		Short circuit of the accelerator switch or improper adjustment	• Check the accelerator switch connector. • Check the accelerator switch itself. • Adjust the accelerator switch.
0	–	31		Damaged or disconnected wiring of the pulse generator A	• Check the pulse generator (AWD) A and pulse generator B themselves. • Check the vehicle speed reed switch (for chattering).
0	0	32		Damaged or disconnected wiring of the pulse generator B	
0	0	41		Damaged or disconnected wiring of the shift control solenoid valve A	• Check the solenoid valve connector. • Check shift control solenoid valve A itself.
0	0	42		Short circuit of the shift control solenoid valve A	
0	0	43		Damaged or disconnected wiring of the shift control solenoid valve B	• Check the solenoid valve connector. • Check shift control solenoid valve B itself.
0	0	44		Short circuit of the shift control solenoid valve B	
0	0	45		Damaged or disconnected wiring of the pressure control solenoid valve	• Check the solenoid valve connector. • Check the pressure control solenoid valve itself.
0	0	46		Short circuit of the pressure control solenoid valve	
0	0	47		Damaged or disconnected wiring of the torque converter clutch control solenoid	• Check the solenoid valve connector. • Check the torque converter clutch control solenoid itself.
0	0	48		Short circuit of the torque converter clutch control solenoid	
0	0	49		Malfunction of the torque converter clutch system	• Check the torque converter clutch hydraulic pressure system. • Check the torque converter clutch control solenoid itself. • Replace the control Unit.

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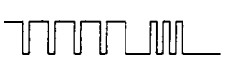
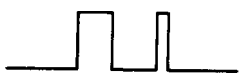
Appropriate transaxle		Code No.	Output pattern	Description	Remedy
AWC	'WC				
0	0	51		First gear non-synchronous	• Check the pulse generator A and pulse generator B connectors • Check pulse generator A and pulse generator B themselves. • Rear clutch slippage.
0	0	52		Second gear non-synchronous	• Check the pulse generator A and pulse generator B (AWD only) connectors. • Check pulse generator A and pulse generator B (AWD only) themselves. • Rear clutch slippage (AWD only). • Kickdown brake slippage.
0	0	53		Third gear non-synchronous	• Check the pulse generator A and pulse generator B connectors. • Check the pulse generator A and pulse generator B themselves. • Front clutch slippage. • Rear clutch slippage.
0	○	54		Fourth gear non-synchronous	• Check the pulse generator A and pulse generator B (AWD only) connectors. • Check pulse generator A and pulse generator B (AWD only) themselves. • End clutch slippage (AWD only). • Kickdown brake slippage.
0	○	—		Normal	—
0	○	—	No change as a constant output (or 0V)	Defective transaxle control rnodule (TCM)	• TCM power supply inspection • TCM ground inspection • TCM replacement

Fail Safe Item for 1989 and 1990 model

Output code		Description	Fail-safe	Note (relation to fault code)
Code No.	Output pattern (for voltmeter)			
11		Malfunction of the microprocessor	3rd gear hold	When code No. 31 is generated 4th time.
12		First gear command during high speed driving	3rd gear(D) or 2nd gear (2, L) hold	When code No. 32 is generated 4th time.
13		Damaged or disconnected wiring of the pulse generator B system	3rd gear(D) or 2nd gear (2,L) hold	When code No. 33 is generated 4th time.

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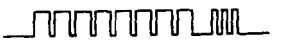
Output code		Description	Fail-safe	Note (relation to fault code)
Code No.	Output pattern (for voltmeter)			
14		Damaged or disconnected wiring, or short circuit, of shift control solenoid valve A	3rd gear hold	When code No. 41 or 42 is generated 4th time.
15		Damaged or disconnected wiring, or short circuit, of shift control solenoid valve B	3rd gear hold	When code No. 43 or 44 is gnerated 4th time.
16		Damaged or disconnected wiring, or short circuit, of the pressure control solenoid valve	3rd gear(D) or 2nd gear (2, L) hold	When code No. 45 or 46 is generated 4th time.
17		Shift steps non-synchronous	3rd gear(D) or 2nd gear (2, L) hold	When either code No. 51, 52 53 or 54 is generated 4th time.

Fail Safe Item for 1990.5, 1991, 1992 and 1993 model

ppropriate transaxle		Code No.	Output pattern	Description	Fail-safe	Note (relation to fault code)
AWD	F W D					
0	–	81		Damaged or disconnected wiring of the pulse generator A	3rd gear(D) or 2nd gear (2, L) hold	31
0	0	82		Damaged or disconnected wiring of the pulse generator B	3rd gear (D) or 2nd gear (2, L) hold	32
0	0	83		Damaged or disconnected wiring, or short circuit, of shift control solenoid valve A	3rd gear hold	41.42
0	0	84		Damaged or disconnected wiring, or short circuit, of shift control solenoid valve B	3rd gear hold	43, 44
0	0	85		Damaged or disconnected wiring, or short circuit, of the pressure control solenoid valve	3rd gear(D) or 2nd gear (2, L) hold	45.46
0	0	86		Shift steps non-synchronous	3rd gear (D) or 2nd gear (2, L) hold	51, 52, 53. 54
0	0	–	No change as a constant output (or OV)	Defective transaxle control module (TCM)	Fixed for 3rd speed	–

TSB Revision

CHECKING THE CONTROL SYSTEM (WHEN A SCAN TOOL IS USED) FOR 1989 AND 1990 MODEL

Inspection item	Inspection content		Possible cause (or remedy) for the abnormality
	Inspection condition	Criterion value	
Pulse generator B • Service data • Item No. 13	D range, stopping state	0 rpm	• Defective pulse generator B or harness *Defective shield cable of pulse generator B • External noise invasion
	D range, 3rd speed, driving at 50 km/h (31 mph)	1,600–2,000 rpm	
	D range, 4th speed, driving at 50 km/h (31 mph)	1,600–2,000 rpm	
Pulse generator A • Service data • Item No. 19	D range. 2nd speed, driving at 30 km/h (19 mph)	0 rpm	• Defective pulse generator A or harness • Defective shield cable of pulse generator A • External noise invasion • Slip of kick-down brake
	D range, 3rd speed, driving at 50 km/h (31 mph)	1,400–1,800 rpm	
	D range, 4th speed, driving at 50 km/h (31 mph)	0 rpm	
Throttle positron sensor (TPS) • Service data • Item No. 21	Accelerator is fully closed.	0.5–0.6V	• If voltage is high at the full opening or closing, TPS is adjusted improperly. • If no variation is observed, TPS or circuit harness is defective. • If it does not vary smoothly, TPS or accelerator cable is defective.
	Slowly press in the accelerator pedal.	Variation of opening degree	
	Accelerator is fully opened.	4.5–5.0V	
Oil temperature sensor • Service data • Item No. 24	When engine is cold (before starting)	Equivalent to atmospheric temperature	• Oil temperature sensor or circuit harness is defective.
	During engine warming-up driving	It gradually rises.	
	After engine is warmed up	80–110°C (176°F–230°F)	
Kick-down servo switch • Service data • Item No. 25	L range. idling	ON	• Kick-down servo is adjusted improperly. • Kickdown servo switch or circuit harness is defective. • Defective kick-down servo
	D range, 1st or 3rd speed	ON	
	D range, 2nd or 4th speed	OFF	
Ignition signal cable • Service data • Item No. 27	N range, idling	650–750 rpm	• Ignition system is defective. • Harness of ignition signal pick-up circuit is defective.
	N range, 2,500 rpm (read on the tachometer)	2,400–2,600 rpm	
Accelerator pedal switch • Service data • Item No. 28	Accelerator is fully opened.	OFF	• Accelerator pedal switch is adjusted improperly. • Accelerator pedal switch or circuit harness is defective.
	Press in the accelerator pedal slightly.	ON	
Vehicle speed reed switch • Service data • Item No. 33	The vehicle stops.	0 km/h (0 mph)	• If high speed signal is output when the vehicle stops, the vehicle speed reed switch is defective. • In other cases, vehicle speed reed switch or circuit harness is defective.
	Driving at 30 km/h (19 mph)	30 km/h (19 mph)	
	Driving at 50 km/h (31 mph)	50 km/h (31 mph)	
Park/Neutral position (PNP) switch • Service data • Item No.34	Shift to P range	P	• Park/Neutral position switch is adjusted improperly. • Park/Neutral position switch or circuit harness is defective. • Manual control cable is defective.
	Shift to R range	R	
	Shift to N range	N	
	Shift to D range	D	
	Shift to 2 range	2	
	Shift to L range	L	
Overdrive switch • Service data • Item No. 35	Turn on the overdrive switch.	OD	• Overdrive switch or circuit harness is defective.
	Turn off the overdrive switch.	OD-OFF	
Power/economy switch • Service data • Item No. 36	Select the power pattern. (Including E pattern control at the low oil temperature)	Power	*Power/economy switch or circuit harness is defective.
	Select the economy pattern.	Economy	
Air conditioning relay signal • Service data • Item No.37	D range. air conditioning, idling-up state	ON	• Harness of circuit which detects the air conditioning power relay ON signal is defective.
	D range, air conditioning, switch-off state	OFF	

TSB Revision

Inspection item	Inspection content		Possible cause (or remedy) for the abnormality
	Inspection condition	Criterion value	
Transaxle gear position • Service data • Item No. 38	D range, idling	C	• TCM is defective. • Accelerator pedal switch system is defective. • Inhibitor switch system is defective. • TPS system is defective.
	L range, idling	1ST	
	2nd range, 2nd speed	2ND	
	D range, O/D-OFF, 3rd speed	3RD	
	D range, O/D, 4th speed	4TH	
PCSV duty • Service data • Item No. 45	D range, idling	50–70%	◎If accelerator pedal is pressed in even slightly in the idling state of D range duty must become 100%. • TCM is defective. • TPS system is defective. • Accelerator pedal switch is defective.
	D range, 1st speed	100%	
	D range, gear shift	Variation depending on the state	
Torque converter clutch slip amount • Service data • Item No. 47	D range, 3rd speed 1,500 rpm (read on the tachometer)	200–300 rpm	• Torque converter clutch is defective. • Ignition signal cable or pulse generator B system is defective. • Transaxle oil pressure is improper. • Torque converter clutch (TCC) solenoid is defective.
	D range, 3rd speed 3,500 rpm (read on the tachometer)	30–50 rpm	
Torque converter clutch (TCC) solenoid duty • Service data • Item No. 49	D range, 3rd speed 1,500 rpm (read on the tachometer)	0%	• TCM is defective. • TPS system is defective. • Pulse generator B system is defective.
	D range, 3rd speed 3,500 rpm (read on the tachometer)	Variation depending the load	

CHECKING THE CONTROL SYSTEM (WHEN A SCAN TOOL IS USED) FOR 1990.5, 1991, 1992 AND 1993 MODEL

Inspection item	Inspection content		Possible cause (or remedy) for the abnormality
	Inspection condition	Criterion value	
Throttle position sensor (TPS) • Data list • Item No. 11	Accelerator is fully closed.	0.5–0.6V	• If voltage is high at the full opening or closing, TPS is adjusted improperly. • If no variation is observed, TPS or circuit harness is defective. • If it does not vary smoothly. TPS or accelerator cable is defective.
	Slowly press in the accelerator pedal.	Variation of opening degree	
	Accelerator is fully opened.	4.5–5.0V	
Oil temperature sensor • Data list • Item No. 15	When engine is cold (before starting)	Equivalent to barometric temperature	• Oil temperature sensor or circuit harness is defective.
	During engine warming-up driving	It gradually rises.	
	After engine is warmed up	80–110°C (176°F–230°F)	
Kick-down servo switch *Data list • Item No. 21	L range, idling	ON	• Kick-down servo is adjusted improperly. • Krckdown servo switch or circuit harness is defective. *Defective kick-down servo
	D range. 1st or 3rd speed	ON	
	D range, 2nd or 4th speed	OFF	
'gnition signal Injection signal) • Data list • Item No. 23	N range, idling	650–900 rpm	• Ignition system is defective. • Harness of ignition signal pick-up circuit is defective.
	N range, 2,500 rpm (read on the tachometer)	2,400–2,600 rpm	
Accelerator pedal switch except 1993 models) • Data list • Item No. 24	Accelerator is fully closed.	ON	• Accelerator pedal switch is adjusted improperly. • Accelerator pedal switch or circuit harness is defective.
	Press in the accelerator pedal slightly.	OFF	
Air conditioning relay signal • Data list • Item No. 26	D range, air conditioning, idling-up state	ON	• Harness of circuit which detects the air conditioning power relay ON signal is defective.
	D range, air conditioning, switch-off state	OFF	
Transaxle gear position • Data list • Item No. 27	D range, idling	C	• TCM is defective. • Accelerator pedal switch system is defective. • Park/Neutral position switch system is defective. • TPS system is defective.
	L range, idling	1ST	
	2nd range, 2nd speed	2ND	
	D range, O/D-OFF. 3rd speed	3RD	
	D range, O/D. 4th speed	4TH	

TSB Revision

Inspection item	Inspection content		Possible cause (or remedy) for the abnormality
	Inspection condition	Criterion value	
Pulse generator A (FWD) ● Data list ● item No. 31	D range, 2nd speed, driving at 30 km/h (19 mph)	0 rpm	• Defective pulse generator A or harness *Defective shield cable of pulse gene rator A ● External noise invasion ● Slip of kick-down brake
	D range, 3rd speed, driving at 50 km/h (31 mph)	1,600–2,000 rpm	
	D range, 4th speed, driving at 50 km/h (31 mph)	0 rpm	
Pulse generator A (AWD) ● Data list • Item No. 31	D range, stopping state	0 rpm	• Defective pulse generator A or harness ● Defective shield cable of pulse gene rator A ● External noise invasion ● Slip of kick-down brake
	D range, 3rd speed, driving at 50 km/h (31 mph)	1,800–2,200 rpm	
	D range, 4th speed, driving at 50 km/h (31 mph)	1,200–1,600 rpm	
Pulse generator B ● Data list • Item No. 32	D range, stopping state	0 rpm	• Defective pulse generator B or harness ● Defective shield cable of pulse gene rator B • External noise invasion
	D range, 3rd speed, driving at 50 km/h (31 mph)	1,600–2,200 rpm	
	D ranoe. 4th speed. drivina at 50 km/h (31 mph)	1,600–2,200 rpm	
Overdrive switch ● Data list ● Item No. 35	Turn on the overdrive switch.	OD	● Overdrive switch or circuit harness is defective.
	Turn off the overdrive switch.	OD-OFF	
Power/economy switch *Data list ● item No. 36	Select the power pattern. (Including economy pattern control at the low oil temperature)	Power	● Powedeconomy switch or circuit har·ness is defective.
	Select the economy pattern.	Economy	
Park/Neutral position (PNP) switch ● Data list ● Item No. 37	Shift to P range	P	● Park/Neutral position switch is adjusted improperly. ● Park/Neutral position switch or circuit harness is defective. ● Manual control cable is defective. ● inspect the shift lock device when the selector lever is not moving.
	Shift to R range	R	
	Shift to N range	N	
	Shift to D range	D	
	Shift to 2 ranqe	2	
	Shift to L ranqe	L	
vehicle speed reed switch ● Data list • Item No. 38	The vehicle stops.	0 km/h (0 mph)	• If high speed signal is output when the vehicle stops, the vehicle speed reed switch is defective. ● In other cases, vehicle speed reed switch or circuit harness is defective.
	Driving at 30 km/h (19 mph)	30 km/h (19 mph)	
	Driving at 50 km/h (31 mph)	50 km/h (31 mph)	
PCSV duty ● Data list • item No. 45	D range, idling	50–70%	• If accelerator pedal is pressed in even slightly in the idling state of D range duty must become 100%. ● TCM is defective. ● TPS system is defective. *Accelerator pedal switch is defective.
	D range, 1st speed	100%	
	D range, gear shift	Variation depending on the state	
Torque converter clutch slip amount ● Data list ● Item No. 47	D range, 3rd speed 1,500 rpm (read on the tachometer)	100–300 rpm	• Torque converter clutch is defective. • Ignition signal cable or pulse generator system is defective. • Transaxle oil pressure is improper. • Torque converter clutch (TCC) solenoid is defective.
	D range, 3rd speed 3,500 rpm (read on the tachometer)	0 rpm	
Torque converter clutch (TCC) solenoid duty ● Data list ● Item No. 49	D range, 3rd speed 1.500 rpm (read on the tachometer)	0%	● TCM is defective. ● TPS system is defective. • Pulse generator B system is defective.
	D range, 3rd speed 3,500 rpm (read on the tachometer)	Variation depending the load	

TSB Revision

ELEMENT IN USE AT EACH POSITION OF SELECTOR LEVER

Selector lever position	Overdrive control switch	Shifting gear	Engine start	Parking mechanism	Clutch				Brake	
					C1	C2	C3	OWC	B1	B2
P	–	Neutral	Possible	●						
R	–	Reverse			●					●
N	–	Neutral	Possible							
D	ON	1st				●		●		
		2nd				●			●	
		3rd			●	●	●			
		OD					●		●	
D	OFF	1st				●		●		
		2nd				●			●	
		3rd			●	●	●			
2	–	1st				●		●		
		2nd				●			●	
L	–	1st				●				●

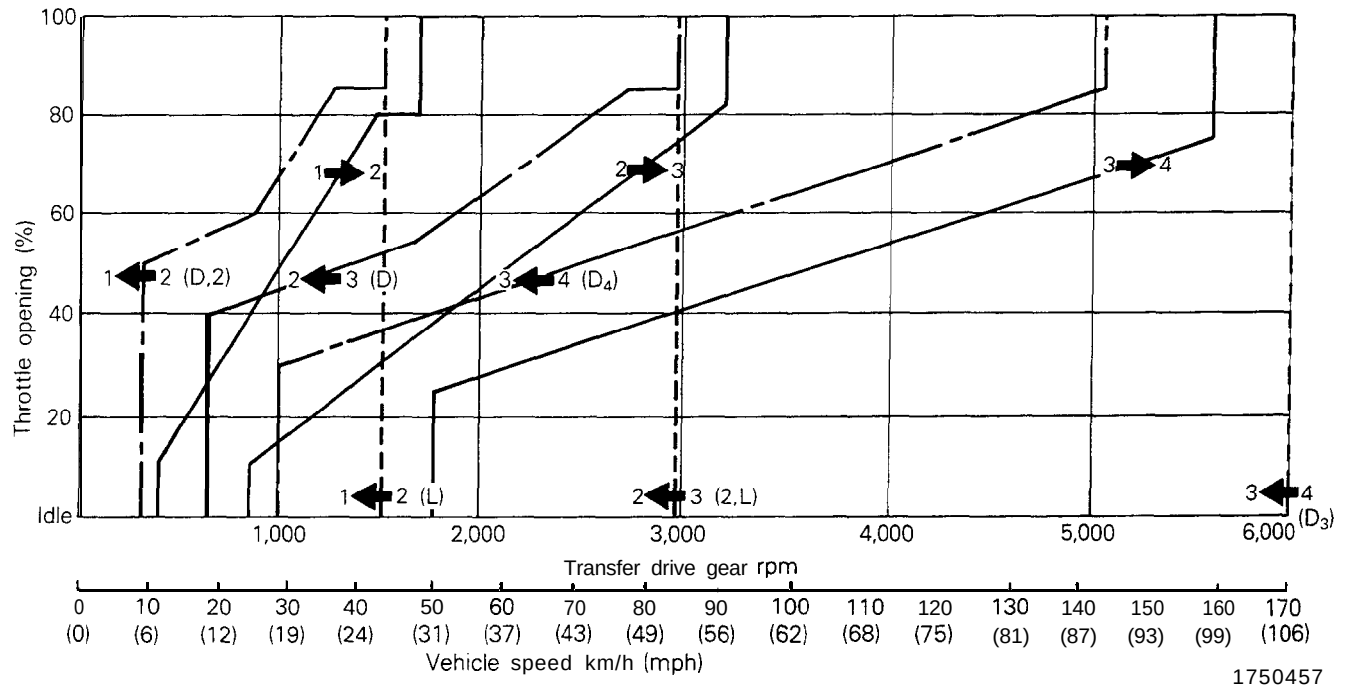
NOTE
C1 ..... Front clutch
C2..... Rear clutch
C3..... End clutch
OWC.....One-way clutch
B1 .....Kickdown brake
B2 ..... Low-reverse brake

SHIFT PATTERNS

Two shift patterns are pre-stored in the control unit of this transaxle. One is the power pattern (for more powerful performance), and the other is the economy pattern (for improved fuel consumption and quieter operation). (Refer to the diagram below.)
The driver can select and switch to the desired pattern by using the power/economy select switch on the center console.
The solid lines shown in these shift patterns indicate up-shifts, and the broken lines indicate down-shifts. The reason why there is a difference between the shift points for up-shifts and for down-shifts is so that up-shifts and down-shifts will not occur frequently when driving at a speed in the vicinity of the shift point.
When the vehicle is stopped, there is a shift to 2nd gear in order to obtain a suitable "creeping", but when the accelerator pedal is then depressed the vehicle starts off in 1st gear.

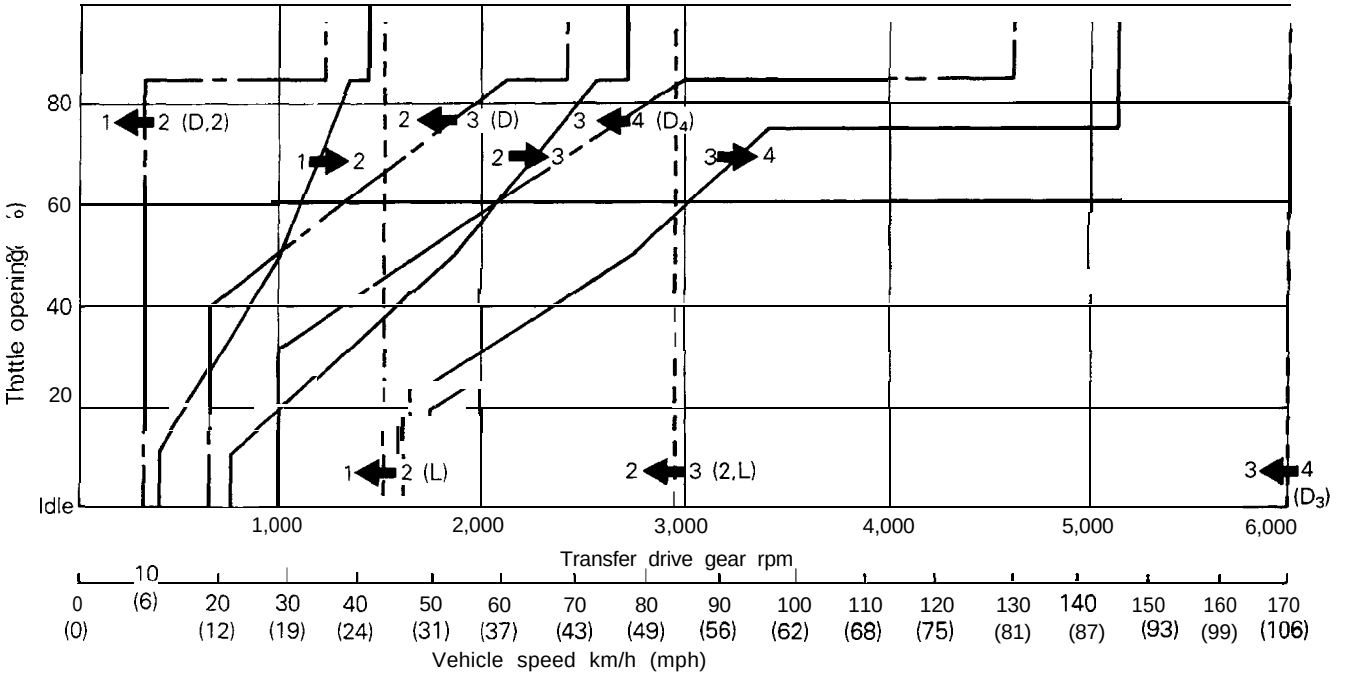
1989 and 1990 Model (Vehicles with SOHC Engine)

P range



1750457

E range

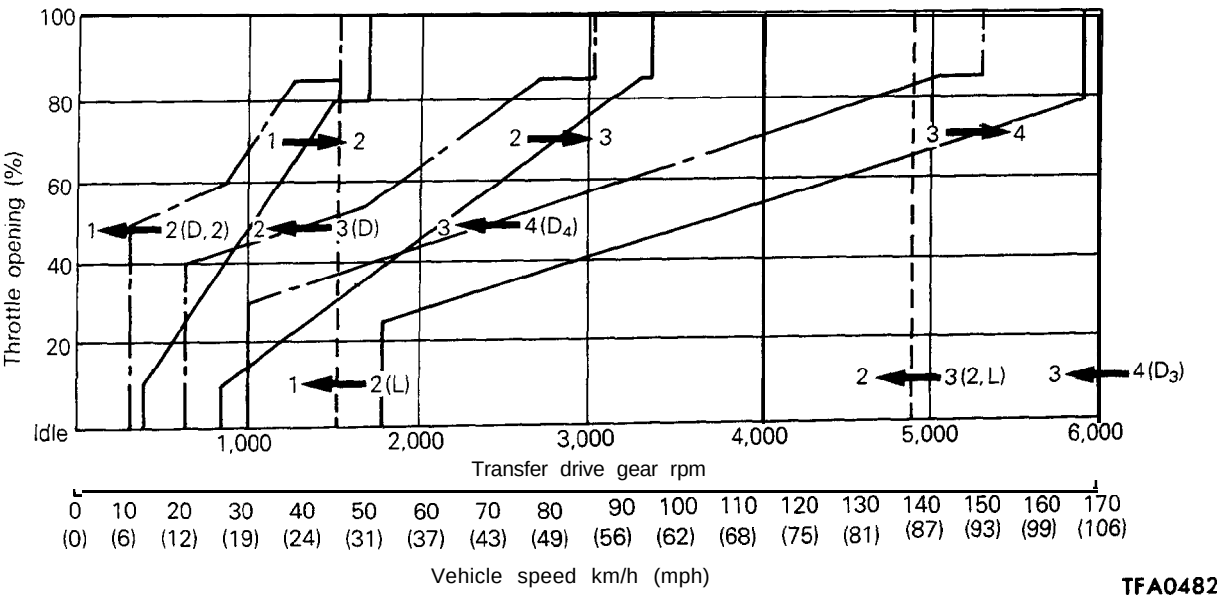


1750458

TSB Revision

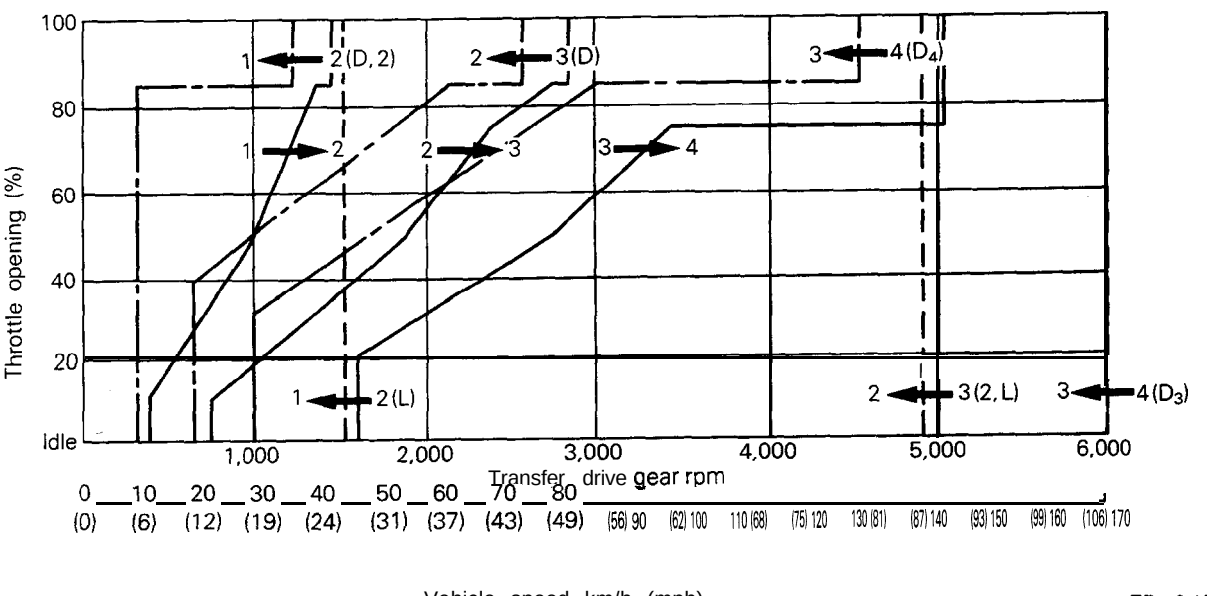
1990.5, 1991 and 1992 Model (Vehicles with SOHC Engine)

P range



TFA0482

E range

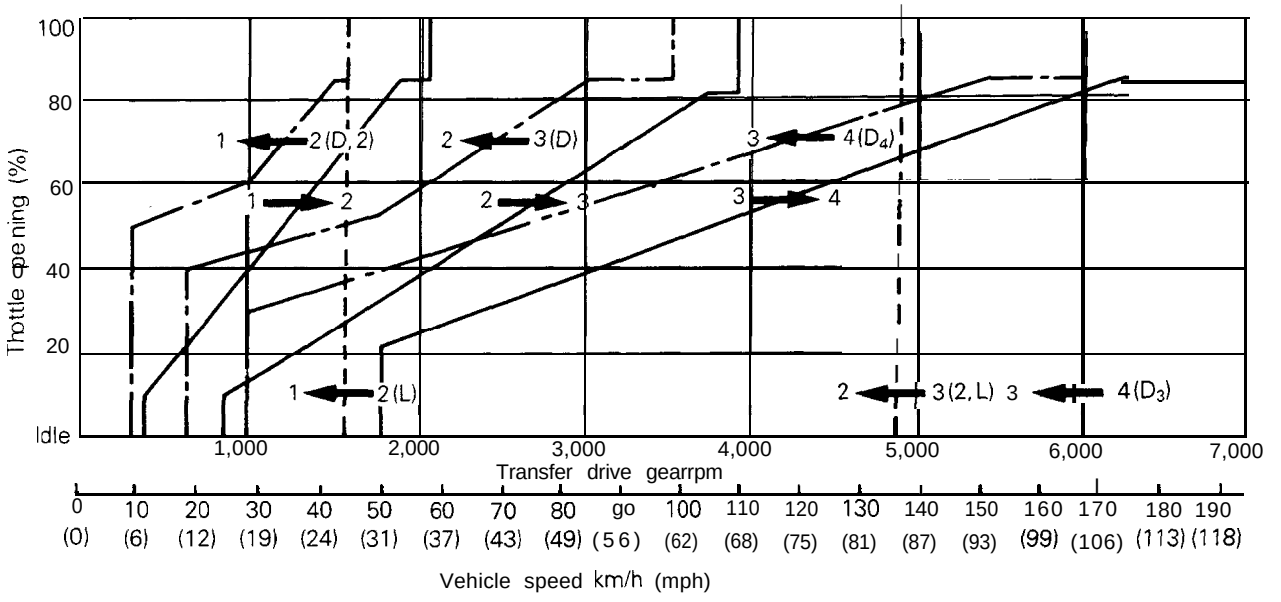


TFA0483

TSB Revision

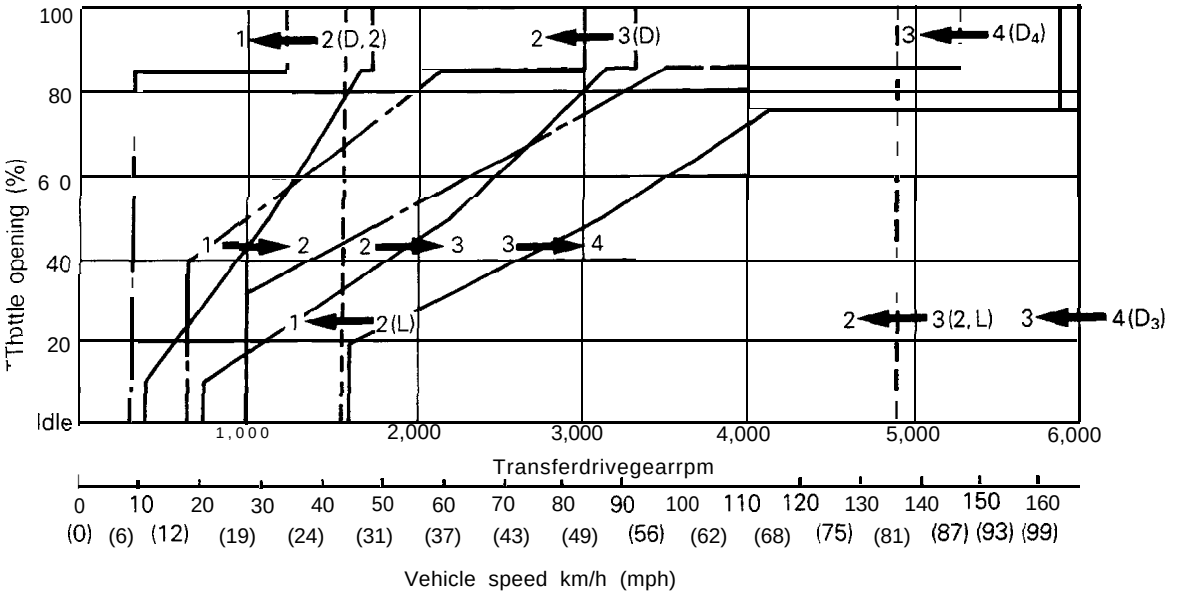
1990.5 Model (Vehicles with DOHC Engine)

P range



TFA0397

E range

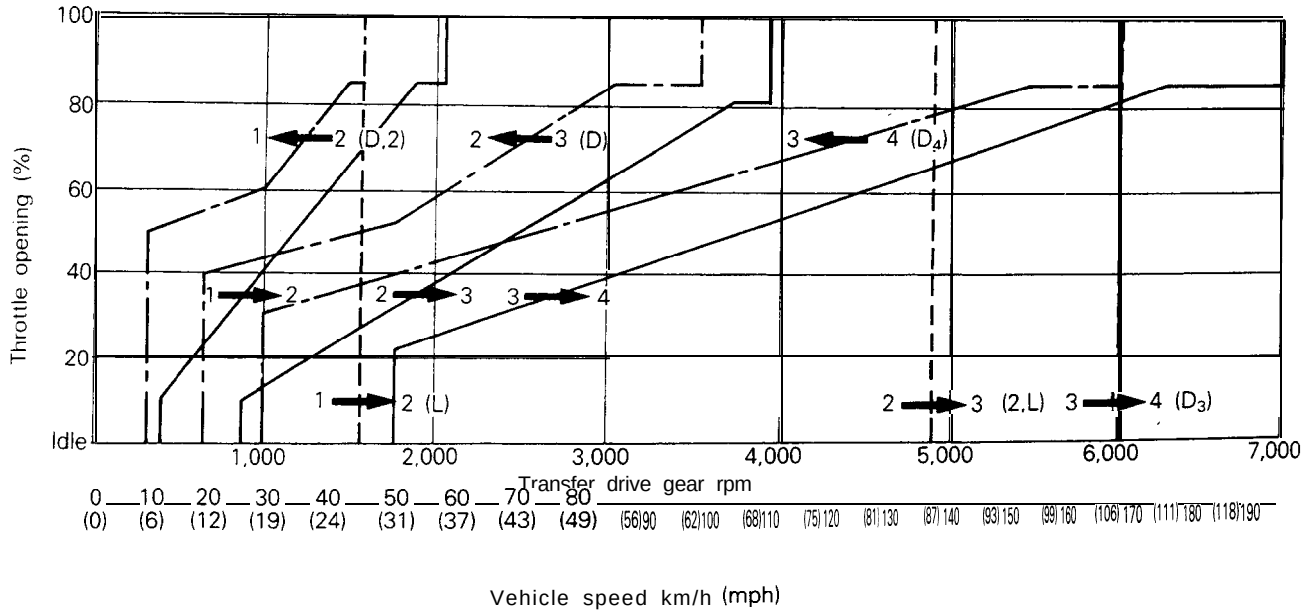


TFA0398

TSB Revision

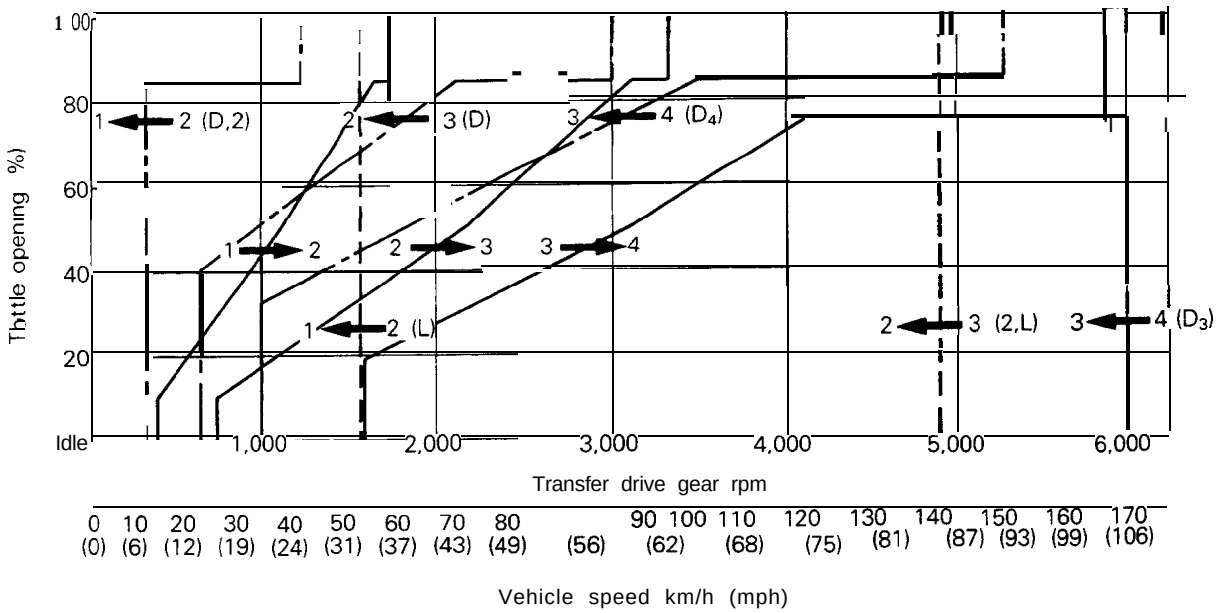
1991 and 1992 Model (Vehicles with DOHC Engine)

P range



TFA0488

E range

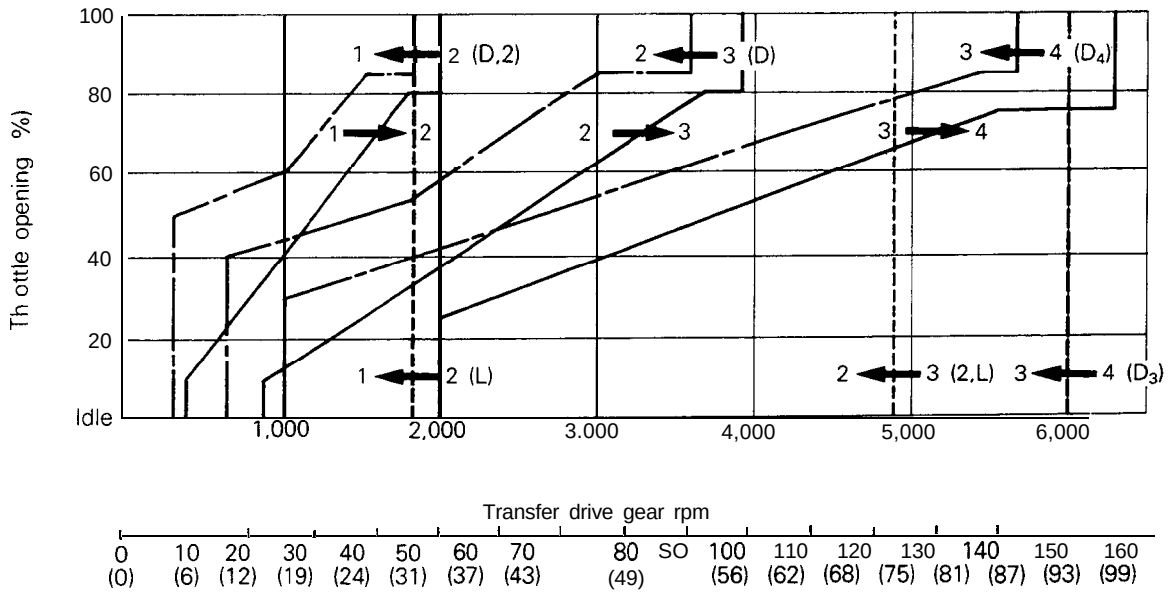


TFA0489

TSB Revision

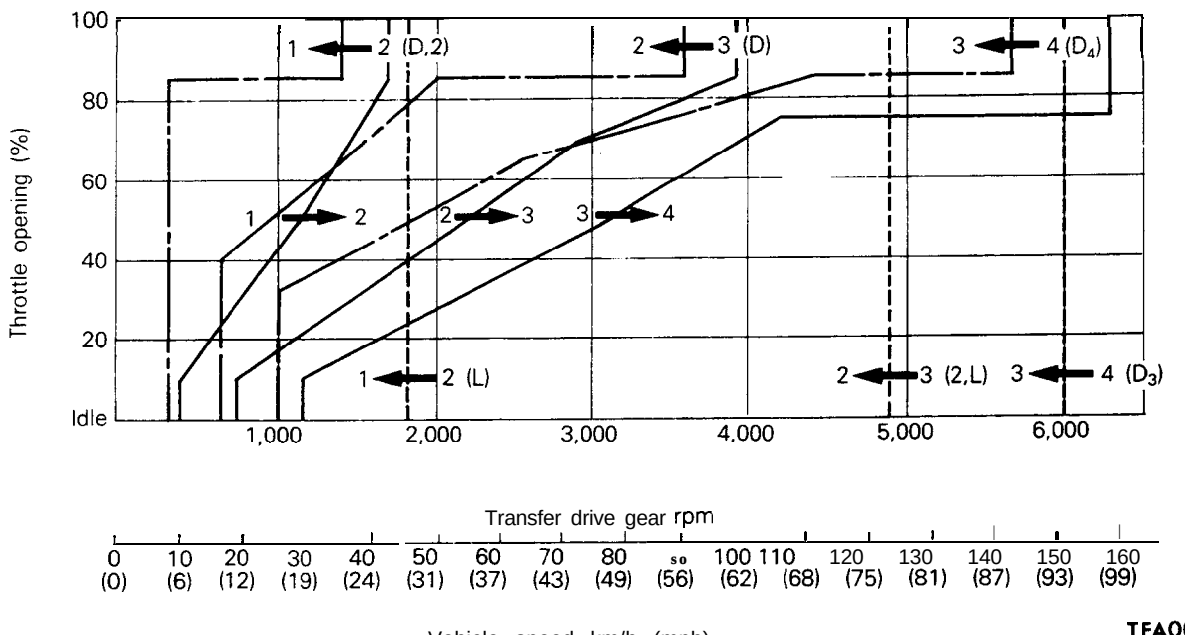
1991 and 1992 Model (AWD Vehicles with DOHC Engine)

P range



TFA0093

E range

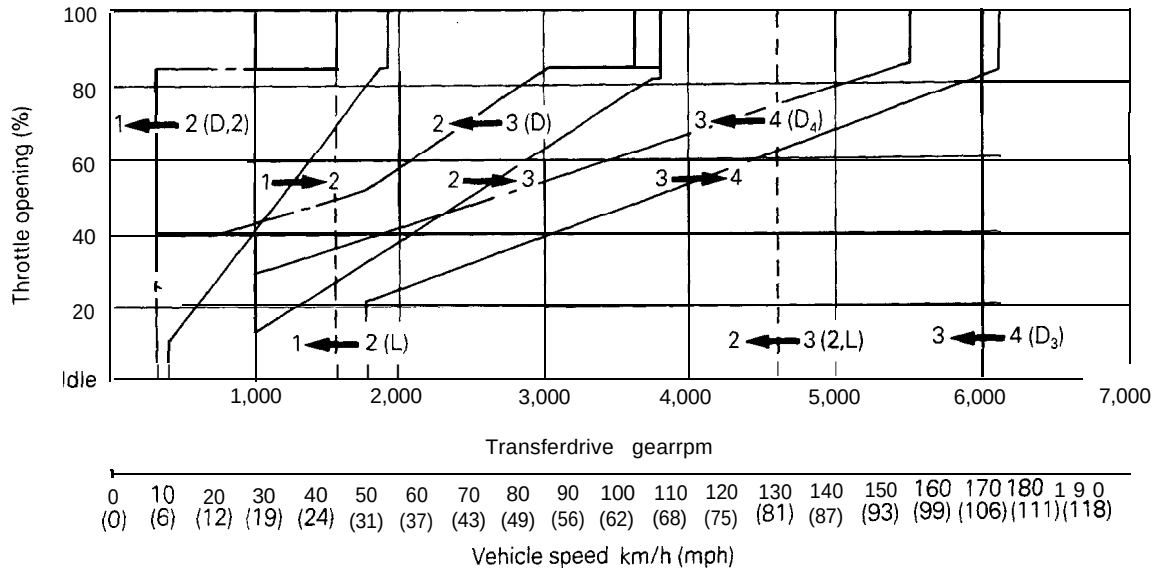


TFA0094

TSB Revision

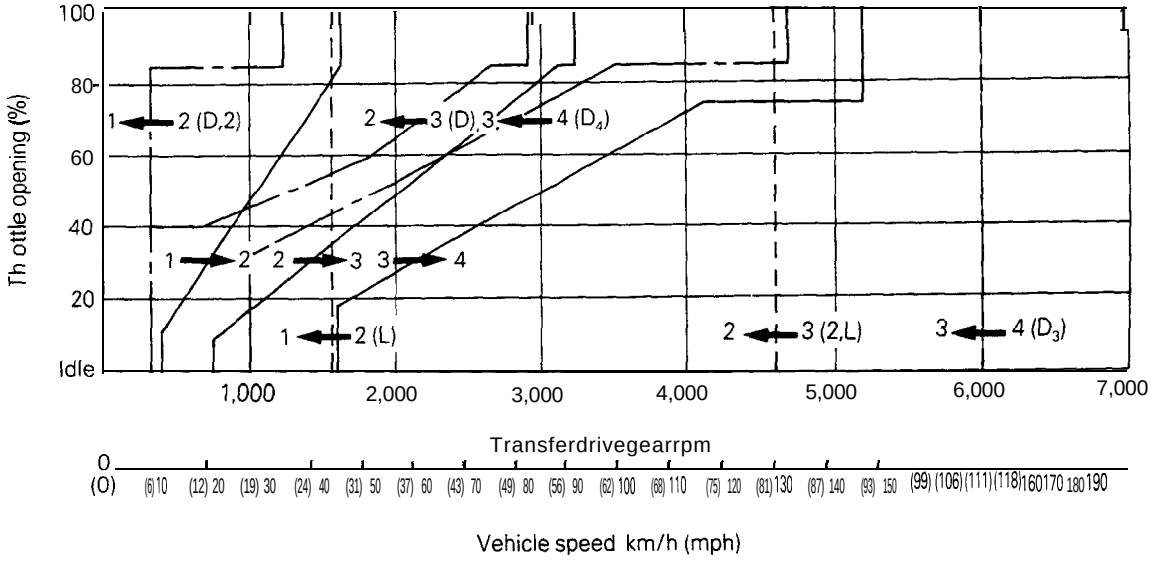
1993 model

P range



TFA0932

E range



TFA0933

TSB Revision

INSPECTION OF ELECTRONIC CONTROL SYSTEM COMPONENTS

1. Wiring

→ Based on the wiring diagram, check whether the continuity and grounding of each harness is OK.

→ No continuity → improper connection of connector, damaged or disconnected harness, or incorrect wiring connection. → Reconnect the connector; repair or replace the harness.

→ Continuity → Normal

2. Oil-temperature sensor

→ Vary the thermo-sensitive part from low temperature to high temperature and check the resistance between the terminals 1 and 2 (FWD), 1 and 2 or 2 and 3 (AWD ... Up to 1992 model)

→ No continuity (resistance: ∞) → Damaged or disconnected wiring → Replace the oil-temperature sensor

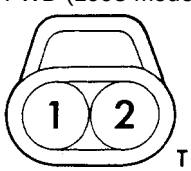
→ Changes of the resistance continuous and smooth. → Normal

FWD (Up to 1992 model)

1: (+) side
2: (−) side

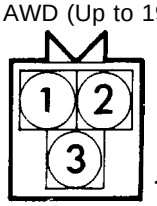
1750446

FWD (1993 model)



TFA0821

AWD (Up to 1992 model)



1. Low temperature side
2. Ground
3. High temperature side

1750447

3. Throttle-position sensor (TPS)

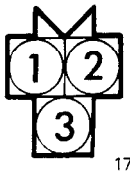
Check the resistance between terminals 1 and 2 (SOHC Engine ... 1989 model) 1 and 4 (SOHC Engine ... From 1990 model, DOHC Engine).

Resistance: high or infinite → Damaged or disconnected wiring → Replace the TPS.

3.5-6.5 kΩ/20°C (68°F)

TPS terminal

SOHC Engine (1989 model)



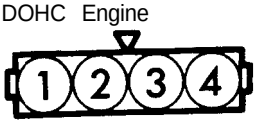
1. power
2. ground
3. output

1750445

Check the resistance between terminals 2 and 3 (SOHC Engine 1989 model) 4 and 2 (SOHC Engine ... From 1990 model, DOHC Engine) with the engine idling after throttle-valve opening warm-up.

Resistance: more or less tnan 0.4 kΩ/20°C (68°F) → Improper adjustment → Readjust the TPS installation.

SOHC Engine (From 1990 model) DOHC Engine



TFA0033

1. power
2. output
3. closed throttle position switch (AWD)
4. ground

Resistance: approx. 0.4 kΩ/20°C (68°F)

Check for changes of the resistance between terminals 2 and 3 (SOHC Engine ... 1989 model) 4 and 2 (SOHC Engine From 1990 model, DOHC Engine) when the throttle valve is operated from the idling position to the fully open position.

Changes of the resistance are not continuous. → Poor contact → Replace the TPS.

Changes of the resistance continuous and smooth.

Normal

4. Pulse generator A or B

Check the resistance between terminals 1 and 2 or 3 and 4.

Resistance: very low or very high → Short-circuit, or damaged or disconnected wiring → Replace the pulse generator.

Pulse generator terminals

1–2: pulse generator A
3-4: pulse generator B

1750338

215-275 Ω/20°C (68°F)

Normal

TSB Revision

5. Pulse generator A or B (checking by an oscilloscope)

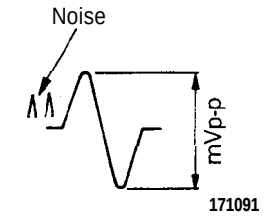
Connect the pulse generator and body harness, and connect an oscilloscope. Check with the chassis on a dynamo or with the front wheels raised.

With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 1 and 2.

- Very low voltage → incorrect installation of the pulse generator, or malfunction of the pulse generator.
  - Correct the installation condition, or replace the pulse generator.
- Noise in the waveform → Improper grounding of the pulse generator circuit's shielded wiring.
  - Replace the pulse generator.

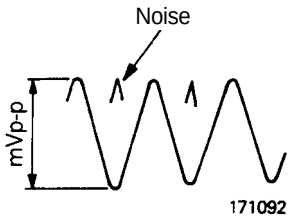
Oscilloscope waveform

FWD A/T



1,000 mVp-p or higher

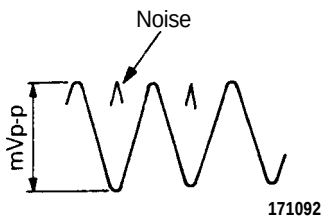
AWD AA



With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 3 and 4.

- Very low voltage → Incorrect installation of the pulse generator, or malfunction of the pulse generator.
  - Correct the installation condition, or replace the pulse generator.
- Noise in the waveform → Improper grounding of the pulse generator circuit's shielded wiring.
  - Replace the pulse generator.

500 mVp-p or higher



Normal

6. Pressure-control solenoid valve (PCSV)

Check the resistance between terminal 1 of the solenoid valve connector and the transaxle case.

Resistance: too low or too high → Short-circuit, or damaged or disconnected wiring → Replace the PCSV.

2.9 ±0.3Ω/20°C (68°F)

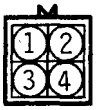
Connect 12V between the transaxle case and terminal 1; switch ON and OFF and check for operation noise.

No operation noise. (stroke: 0.3 mm (.012 in.) or less) → Foreign material caught between the valve and guide → Replace the PCSV.

Noise exists.

Normal

Solenoid valve connector terminals



1. PCSV
2. TCC solenoid
3. SCSV-A
4. SCSV-B

1750338

7. Shift-control solenoid valve (SCSV) A or B

Check the resistance between terminal 3 or 4 of the solenoid valve connector and the transaxle case.

Resistance: too low or too high → Short-circuit, or damaged or disconnected wiring → Replace the SCSV.

22.3 ±1.5Ω/20°C (68°F)

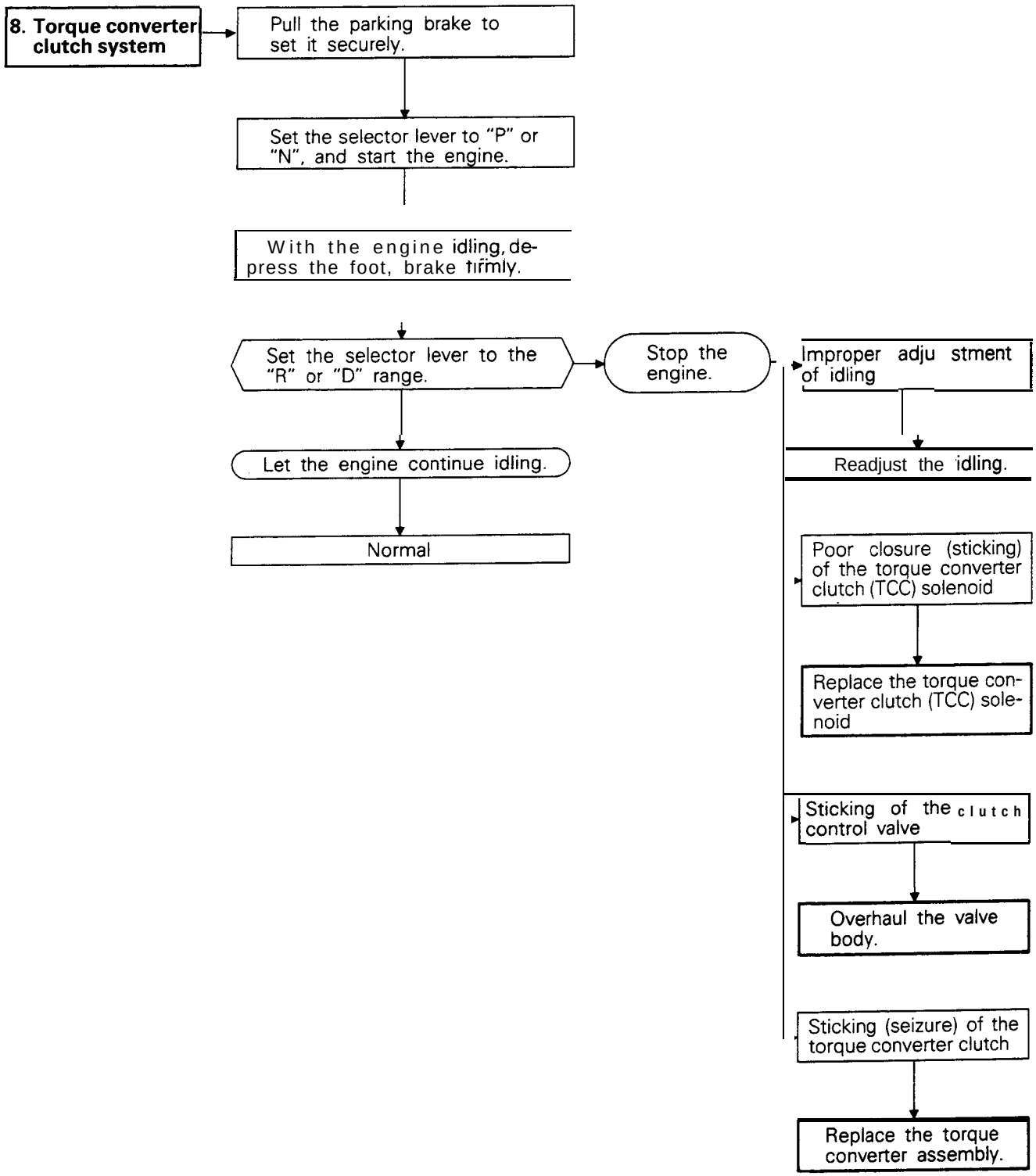
Connect 12V between the transaxle case and terminal 3 or 4; switch ON and OFF and check for operation noise of the solenoid valve, and check the valve stroke.

No operation noise. (stroke: 0.25 mm (.010 in.) or less) → Residue accumulated in valve and core. → Replace the SCSV.

Noise exists.

Normal

TSB Revision



TSB Revision

9. Torque converter clutch (TCC) solenoid

Check the resistance between terminal 2 of the solenoid valve connector and the transaxle case.

Resistance: too low or too high → Short-circuit, or damaged or disconnected wiring → Replace the TCC solenoid

Standard value: 3 Ω/20°C

Solenoid valve connector terminals

1750338

1: PCSV
2: TCC solenoid
3: SCSV-A
4: SCSV-B

Connect 12V between the transaxle case and terminal 2; switch ON and OFF and check for operation noise.

No operation noise. Check for sticking. * (Valve stroke: 0.3 mm (.012 in.) or less) → Foreign terminal caught between the valve and guide → Replace the TCC solenoid

*Sticking is usually at the release side.

Noise exists.

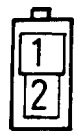
Normal

10. Accelerator switch (Up to 1992 model)

With the accelerator pedal not depressed, check the resistance between terminals 1 and 2.

No continuity (resistance: ∞) → Check the installation of the accelerator switch; adjust if necessary. → Problem not solved. → Replace the accelerator switch.

Continuity exists (resistance: 0)



171096

With the accelerator pedal depressed slightly (about 5%), check the resistance between terminals 1 and 2.

Continuity exists (resistance: 0)

No continuity (resistance: ∞)

Normal

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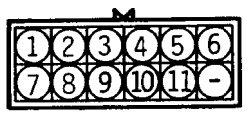
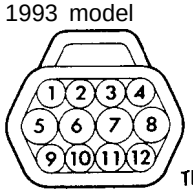
11. Park/Neutral position switch

Up to 1992 model



1750339

1993 model



TFA0802

In the "P" range, check for continuity between terminals 3 and 4, and terminals 8 and 9 ___ Up to 1992 model or terminals 1 and 4, and terminals 5 and 8 ... 1993 model

Continuitv exists

In the "R" range, check for continuity between terminals 4 and 7, and terminals 10 and 11 Up to 1992 model or terminals 4 and 10, and terminals 6 and 7 1993 model

Continuity exists

In the "N" range, check for continuity between terminals 2 and 4, and terminals 8 and 9 ... Up to 1992 model or terminals 2 and 4, and terminals 5 and 8 ... 1993 model

No continuity → Poor contact, or damaged or disconnected wiring.

Replace the park/neutral position switch.

Continuity exists

In the "D" range, check for continuity between terminals 4 and 6 ... Up to 1992 model or terminals 4 and 9 ... 1993 model

Continuity exists

In the "2" range, check for continuity between terminals 1 and 4 ... Up to 1992 model or terminals 3 and 4 ... 1993 model

Continuity exists

In the "L" range, check for continuity between terminals 4 and 5 . Up to 1992 model or terminals 4 and 11 . 1993 model

Continuitv exists

Normal

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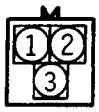
12. Kickdown (K/D) servo switch

1989 and 1990 model



1750447

1990.5, 1991 and 1992 model

TFA0389

1993 model

TFA0809

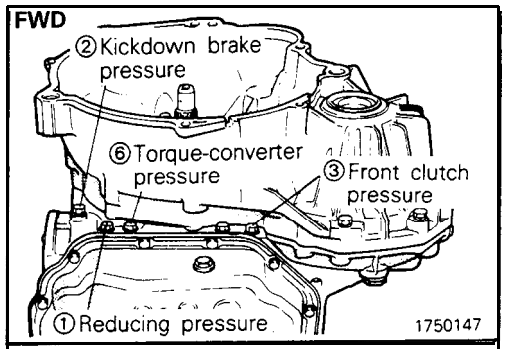
Check for continuity between the kickdown servo switch terminal and the transaxle case.

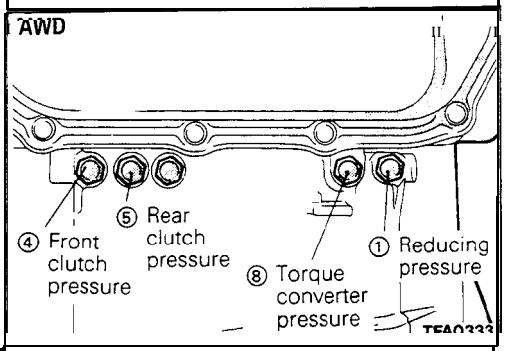
- No continuity → Poor contact, or damaged or disconnected wiring → Replace the K/D servo switch.
- Continuity exists → Start the engine, set to the "D" range, and let the engine idle; check for continuity between the kickdown servo switch terminal and the transaxle case.
  NOTE: Be sure the brakes are applied during this check.
  - Continuity exists → Poor contact (sticking) → Replace the K/D servo switch.
  - No continuity → Normal

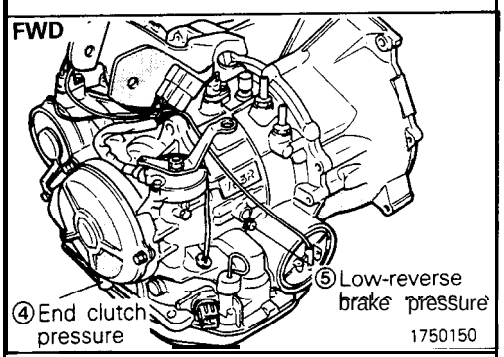
13. Transaxle control module (TCM)

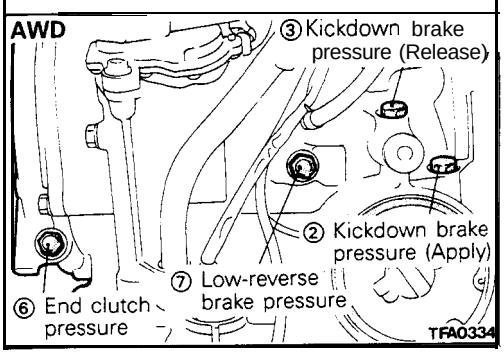
Disconnect the harness (both A and B connectors) from the vehicle's TCM. Then connect, via an intermediate harness for checking, a new TCM to this harness and make a road test.

- The problem does not occur. → Malfunction of the original TCM → Install a new TCM.
- Consider the original TCM to be normal, and again check the sensors, wiring, etc.
  → Same problem (as before TCM exchange) occurs.









OIL PRESSURE TESTS

1. Completely warm up the transaxle.
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 (MD998330-01) and the adaptor (MD998332-01) to each oil-pressure outlet port. When the reverse position pressure is to be tested, the 3,000 kPa (400 psi) type of gauge should be used.
5. Measure the oil pressure under various conditions , and check to be sure that the measured results are within the standard value range shown in the "Standard oil pressure table" below.
   If the oil pressure is not within the specified range, check and repair as described in the section "Remedial steps if oil pressure is not normal" on the next page.

STANDARD OIL PRESSURE TABLE
KM175, F4A22 ... Up to MODEL 1990

No.	Conditions			Standard oil pressure kPa (psi)					
	Select lever position	Engine speed rpm	Shift position	① Reducing pressure	② Kickdown brake pressure	③ Front clutch pressure	④ End clutch pressure	⑤ Low-reverse brake pressure	⑥ Torque-converter pressure
1	N	Idling	Neutral	370–490 (52–70)	–		–	–	☆
2	D	Idling	2nd gear	370–490 (52–70)	100–210 (14–30)	–		–	☆
3	D (SW-ON)	Approx. 2,500	4th gear	370–490 (52–70)	830–900 (118–128)	–	830–900 (118-128)	–	400–600 (56–84)
4	D (SW-OFF)	Approx. 2,500	3rd gear	370–490 (52–70)	830–900 (118–128)	830–900 (118–128)	830–900 (118–128)	–	400–600 (56–84)
5	2	Approx. 2,500	2nd gear	370–490 (52–70)	830–900 (118–128)	–		–	400–600 (56–84)
6	L	Approx. 1,000	1st gear	370–490 (52–70)	–		–	300–450 (43–63)	☆
7	R	Approx. 2.500	Reverse	370–490 (52–70)	–	1,640–2,240 (233–318)	–	1,640–2,240 (233–318)	400–600 (56–84)
		Approx. 1,000				1.000 (142) or more		1.000 (142) or more	

F4A22 ... From Model, 1990.5

No.	Conditions			Standard oil pressure kPa (psi)					
	Select lever position	Engine speed rpm	Shift position	① Reducing pressure	② Kickdown brake pressure	③ Front clutch pressure	④ End clutch pressure	⑤ Low-reverse brake pressure	⑥ Torque-converter pressure
1	N	Idling	Neutral	360–480 (51–68)	–	–	–	–	☆
2	D	Idling	2nd gear	360–480 (51–68)	100–210 (14–30)	–		–	☆
3	D (SW-ON)	Approx. 2.500	4th gear	360–480 (51–68)	830–900 (118–128)	–	830–900 (118–128)	–	450–650 (64–92)
4	D (SW-OFF)	Approx. 2.500	3rd gear	360–480 (51–68)	830–900 (118–128)	830–900 (118–128)	830–900 (118–128)	–	450–650 (64–92)
5	2	Approx. 2.500	2nd gear	360–480 (51–68)	830–900 (118–128)	–		–	450–650 (64–92)
6	L	Approx. 1.000	1st gear	360–480 (51–68)	–	–	–	300–450 (43–63)	☆
7	R	Approx. 2,500	Reverse	360–480 (51–68)	–	1,640–2,240 (233–318)	–	1,640–2,240 (233–318)	450–650 (64–92)
		Approx. 1.000				1.000 (142) or more		1.000 (142) or more	

NOTE
must be 10 kPa (1.4 psi) 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

TSB Revision

AWD

No.	Conditions			Standard oil pressure kPa (Psi)							
	Select lever position	Engine speed rpm	Shift position	① Reducing pressure	② Kickdown brake pressure (Apply)	③ Kickdown brake pressure (Release)	④ Front clutch pressure	⑤ Rear clutch pressure	⑥ End clutch pressure	⑦ Low-reverse brake pressure	⑧ Torque-converter pressure
1	N	Idling	Neutral	360–480 (51-68)	–	–		–	–	–	☆
2	D	Idling	2nd gear	360–480 (51–68)	100–210 (14–30)	–	–	730–830 (104–118)	–		☆
3	D (SW-ON)	Approx. 2,500	4th gear	360–480 (51-68)	830–900 (118–128)	–	–	–	830–900 (118–128)	–	450–650 (64–92)
4	D (SW-OFF)	Approx. 2,500	3rd gear	360–480 (51–68)	830–900 (118–128)	830–900 (118–128)	830–900 (118–128)	830–900 (118-128)	830–900 (118-128)	–	450–650 (64–92)
5	2	Approx. 2,500	2nd gear	360–480 (51-68)	830–900 (118–128)	–	–	830–900 (118–128)	–	–	450–650 (64–92)
6	L	Approx. 1,000	1st gear	360–480 (51 –68)	–	–	–	830–900 (118-128)	–	300–450 (43–64)	☆
7	R	Approx. 2,500	Reverse	360–480 (51–68)	–	1,640–2,240 (223-319)	1,640–2,240 (223–319)			1,640–2,240 (223–319)	450–650 (64-92)
		Approx. 1.000				1.000 (142) or more	1.000 (142) or more			1.000 (142) or more	

NOTE
must be 10 kPa (1.4 psi) 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.

TSB Revision

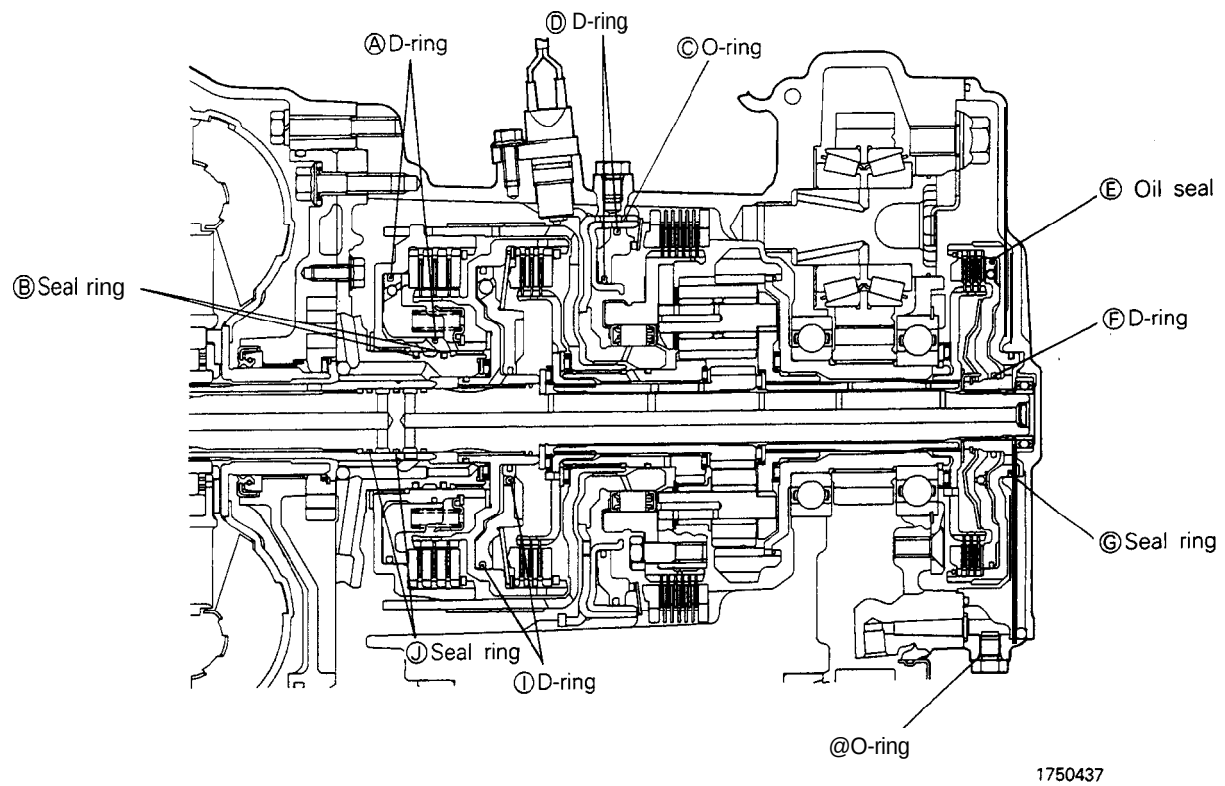
Remedial Steps If Oil Pressure Is Not Normal

FWD A/T

Trouble symptom	Probable cause	Remedy
1. *Line pressures are all low (or high). NOTE *"Line pressures" refers to oil pressures ②, ③, ④ and ⑤ in the "Standard oil pressure table" on the previous page.	a. Clogging of oil filter	a. Visually inspect the oil filter; replace the oil filte if it is clogged.
	b. Improper adjustment of oil pressure (line pressure) of regulator valve	b. Measure line pressure ② (kickdown brake pressure); if the pressure is not the standard value, readjust the line pressure, or, if necessary, replace the valve body assembly.
	c. Sticking of regulator valve	c. Check the operation of the regulator valve; repair if necessary, or replace the valve body assembly.
	d. Looseness of valve body tightening part	d. Tighten the valve body tightening bolt and installation bolt.
	e. Improper oil pump dischange pressure	e. Check the side clearance of the oil pump gear; replace the oil pump assembly if necessary.
2. Improper reducing pressure	a. Improper line pressure	a. Check the ② kickdown brake pressure (line pressure); if the line pressure is not the standard value, check as described in item 1 above.
	b. Clogging of the filter (L-shaped type) of the reducing-pressure circuit	b. Disassemble the valve body assembly and check the filter; replace the filter if it is clogged.
	c. Improper adjustment of the reducing pressure	c. Measure the ① reducing pressure; if it is not the standard value, readjust, or replace the valve body assembly.
	d. Sticking of the reducing valve	d. Check the operation of the reducing valve; if necessary, repair it, or replace the valve body assembly.
	e. Looseness of valve body tightening part	e. Tighten the valve body tightening bolt and installation bolt.
3. Improper kickdown brake pressure	a. Malfunction of the D-ring or seal ring of the sleeve or kickdown servo piston.	a. Disassemble the kickdown servo and check whether the seal ring or D-ring is damaged. If it is cut or has scratches, replace the seal ring or D-ring.
	b. Looseness of valve body tightening part	b. Tighten the valve body tightening bolt and installation bolt.
	c. Functional malfunction of the valve body assembly	c. Replace the valve body assembly.
4. Improper front clutch pressure	a. Malfunction of the D-ring or seal ring of the sleeve or kickdown servo piston.	a. Disassemble the kickdown servo and check whether the seal ring or D-ring is damaged. If it is cut or has scratches, replace the seal ring or D-ring.
	b. Looseness of valve body tightening part	b. Tighten the valve body tightening bolt and installation bolt.
	c. Functional malfunction of the valve body assembly	c. Replace the valve body assembly.
	d. Wear of the front clutch piston or retainer, or malfunction of the Ⓐ D-ring. Ⓑ seal ring. Refer to the figure on the next page.)	d. Disassemble the transaxle itself and check whether or not there is wear of the front clutch piston and retainer inner circumference, or damage of the D-ring. If there is any wear or damage, replace the piston, retainer, D-ring and/or seal ring.
5. Improper end clutch pressure	a. Malfunction of a D-ring Ⓕ or oil seal Ⓔ, Ⓖ of the end clutch or O-ring Ⓗ of the pipe (Refer to the following figure.)	a. Disassemble the end clutch and check the oil seal, D-ring of the piston, seal ring of the retainer, etc.; replace if there are cuts, scars, scratches or damage.
	b. Looseness of valve body tightening part	b. Tighten the valve body tightening bolt and installation bolt.
	c. Functional malfunction of the valve body assembly	c. Replace the valve body assembly.

TSB Revision

Trouble symptom	Probable cause	Remedy
6. Improper low-reverse brake pressure	a. O-ring between valve body and transaxle damaged or missing	a. Remove the valve body assembly and check to be sure that the O-ring at the upper surface of the upper valve body is not missing or damaged; install or replace the O-ring if necessary.
	b. Looseness of valve body tightening part	b. Tighten the valve body tightening bolt and installation bolt.
	c. Functional malfunction of the valve body assembly	c. Replace the valve body assembly.
	d. Malfunction of the D-ring Ⓓ of the low-reverse brake piston or the O-ring Ⓒ of the retainer (Refer to the figure below.)	d. Disassemble the transaxle itself and check the O-ring for damage; replace if there are cuts, scars, scratches or damage.
7. Improper torque converter pressure	a. Sticking of the torque converter clutch (TCC) solenoid or torque converter clutch (TCC) control valve.	a. Check the operation of the torque converter clutch system and the TCC solenoid.
	b. Clogging or leaking of the oil cooler and/or piping	b. Repair or replace, as necessary, the cooler and/or piping.
	c. Damaged seal ring Ⓙ of the input shaft (Refer to the figure above.)	c. Disassemble the transaxle itself and check for damage of the seal ring; replace the seal ring if there is damage.
	d. Malfunction of the torque converter	d. Replace the torque converter.



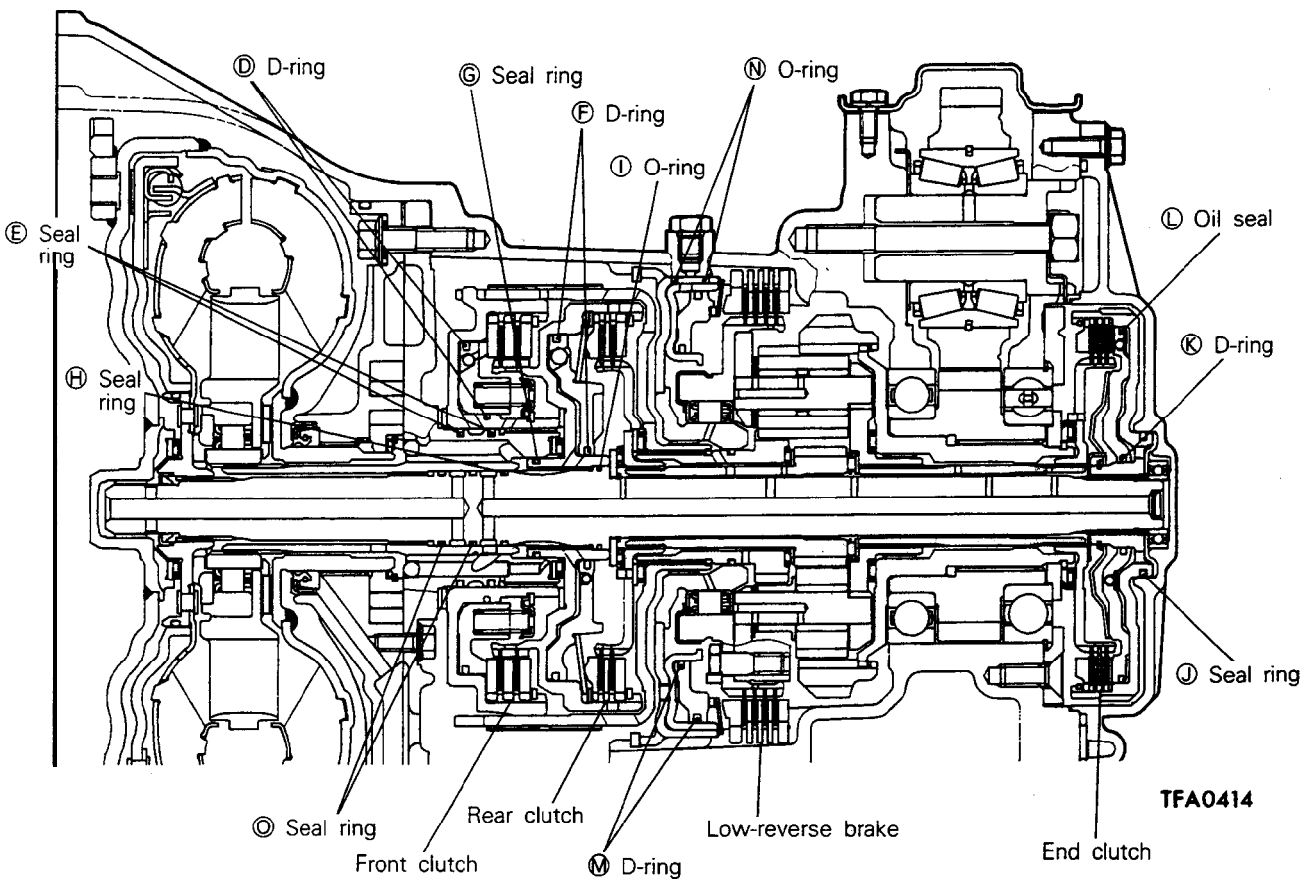
TSB Revision

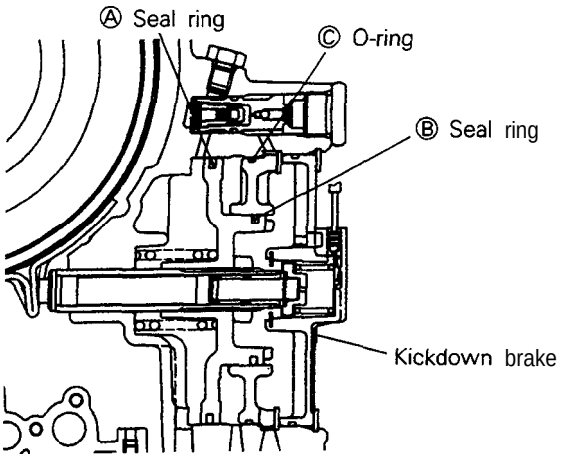
AWD A/T

Problem	Probable cause(s)	Remedy
1. All line pressures are low (or high). NOTE Line pressures are oil pressures 2, ③, ④, ⑤, ⑥ and g in the standard oil pressure table on the preceding page.	a. Clogged oil filter. b. Improper adjustment of the oil pressure (line pressure) of the regulator valve. c. Malfunction of the valve body assembly. d. Looseness of the valve body bolts. e. Improper discharge pressure of the oil pump. Looseness of each check plug, or malfunction of the O-ring.	a. Visually check the oil filter; replace it if it is clogged. b. Measure line pressure ② (kick-down brake pressure); readjust the line pressure if there is a deviation from the standard value, or replace the valve body assembly. c. Replace the valve body assembly. d. Tighten the valve body bolts to the specified torque. e. Check the side clearance of the oil pump gear; replace the oil pump assembly if necessary. f. Check each check plug; replace it if necessary.
2. Inappropriate reducing pressure.	a. Reducing pressure circuit filter (L shaped) is clogged. b. Reducing pressure is improperly adjusted. c. Malfunction of the valve body assembly.	a. Disassemble the valve body assembly and check the filter; replace the filter if it is clogged. b. ① Measure the reducing pressure; readjust if there is a diviation from the standard value, or replace the valve body assembly. c. Replace the valve body assembly.
3. Inappropriate kick-down brake pressure (apply).	a. Malfunction of the kick-down servo piston's Ⓐ seal ring, Ⓑ D-ring and/or the sleeve's Ⓒ O-ring. b. Malfunction of the valve body assembly.	a. Disassemble the kick-down servo and check the seal ring, O-ring and D-ring for damage. Replace the seal ring, O-ring or D-ring if they are cut, scarred or scratched. b. Replace the valve body assembly.
4. Inappropriate kick-down brake release pressure.	a. Malfunction of the kick-down servo piston's Ⓐ seal ring. b. Malfunction of the valve body assembly.	a. Disassemble the kick-down servo and check the seal ring, for damage. Replace the seal ring if it is cut, scarred or scratched. b. Replace the valve body assembly.
5. inappropriate front clutch pressure.	a. Malfunction of the kick-down servo piston's Ⓐ seal ring. b. Malfunction of the valve body assembly. c. Unusual wear or abrasion of the front clutch piston and/or the retainer, or malfunction of the Ⓓ D-ring and/or the Ⓔ seal ring.	a. Disassemble the kick-down servo and check the seal ring for damage. Replace the seal ring if it is cut, scarred or scratched. b. Replace the valve body assembly. c. Disassemble the transaxle itself and check for unusual wear or abrasion of the front clutch piston and/or retainer inner circumference, or for damage of the D-ring and/or seal ring. If unusual wear or abrasion, or damage, is discovered, replace the piston, retainer, D-ring or seal ring.
6. Inappropriate rear clutch pressure.	a. Malfunction of one or more of the following parts of the rear clutch: the piston's Ⓕ D-ring, or the retainer's Ⓖ seal ring, or the input shaft's Ⓗ seal ring or Ⓘ O-ring. b. Malfunction of the valve body assembly.	a. Disassemble the rear clutch and check the input shaft's O-ring, the retainer's seal ring, the piston's D-ring, etc.; replace any part that is discovered to be cut, scarred or scratched. b. Replace the valve body assembly.
Inappropriate end clutch pressure.	a. Malfunction of the end clutch's Ⓙ seal ring, Ⓚ D-ring and/or Ⓛ oil seal. b. Malfunction of the valve body assembly.	a. Disassemble the end clutch and check the piston's oil seal and D-ring, and the retainer's seal ring, etc.; replace any part that is cut, scarred or scratched. b. Replace the valve body assembly.

TSB Revision

Problem	Probable cause(s)	Remedy
8. Inappropriate low-reverse brake pressure.	a. Damage of the O-ring located between the valve body and the transaxle. b. Malfunction of the valve body assembly. c. Malfunction of the low-reverse brake piston's Ⓜ D-ring and/or the center support's Ⓝ O-ring.	a. Remove the valve body assembly and check whether or not there is an O-ring at the upper surface of the upper valve body, and if so whether it is damaged or not; replace it if it is cut, scarred or scratched. b. Replace the valve body assembly. c. Disassemble the transaxle itself and check for damage to the O-ring; replace it if it is cut, scarred or scratched.
9. Inappropriate torque converter pressure.	a. The torque converter clutch (TCC) solenoid or torque converter clutch (TCC) control valve. b. Clogging or leakage from the oil cooler or piping. c. Damage to the input shaft's Ⓞ seal ring. d. Malfunction of the torque converter.	a. Check the functioning of the torque converter clutch system and the TCC solenoid. b. Repair, or replace, the oil cooler or the piping. c. Disassemble the transaxle itself and check for damage to the seal ring; replace the seal ring if it is damaged. d. Replace the torque converter.





CONVERTER STALL TEST

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 transaxle clutches and low-reserve brake.

Caution
During this test, make sure that no one stand in front of or behind vehicle.

1. Check transaxle fluid level. Fluid should be at normal operating temperature [70–80°C (160–180°F)]. Engine coolant should also be at normal operating temperature [80–90°C (180–190°F)].
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 approximatey 1,000 rpm in neutral for 2 minutes to cool transaxle fluid between tests.

   Stall speed: 1,800–3,200 rpm
7. Place selector lever to "R" position and perform stall test by the same procedure as in foregoing item.

Stall Speed Above Specification in "D"
If stall speed is higher than specification, rear clutch or overrunning clutch of transaxle 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 transaxle or low-reverse brake is slipping. In this case, perform hydraulic test to locate cause of slippage.

Stall Speed Below 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.

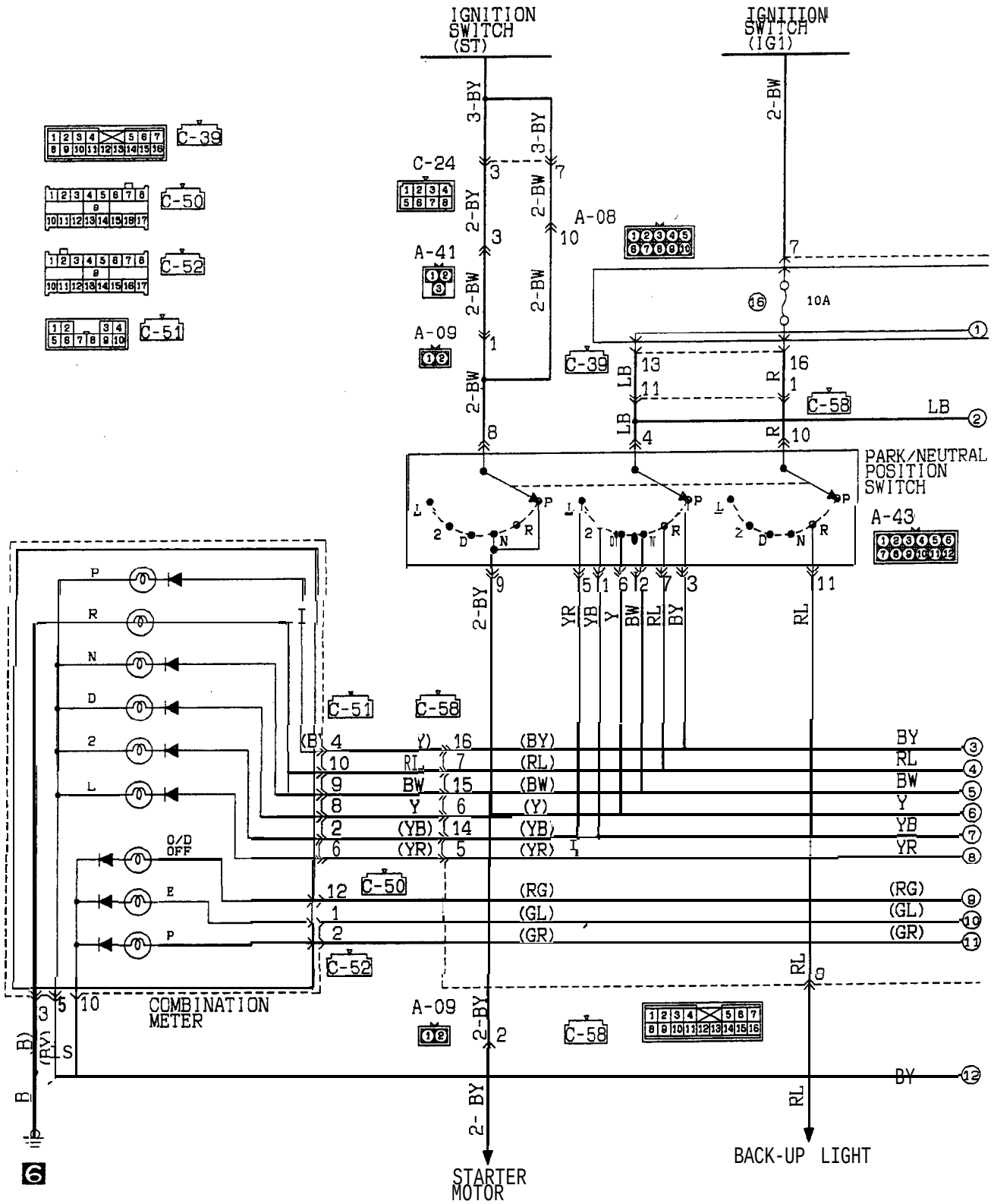
TRANSAXLE CONTROL

Symptom	Probable cause	Remedy
Selector lever operation is stiff	Incorrect adjustment of sleeve Incorrect adjustment of control cable	Adjust
	Excessive wear of detent plate Worn contact surfaces of pushbutton and sleeve	Replace
Starter motor does not operate with the selector lever in the "N" or "P" position	Malfunction in park/neutral position switch Malfunction of starter relay	Replace
	Incorrect adjustment of control cable	Adjust
Will not shift to 4-speed	Malfunction of OD switch	Replace

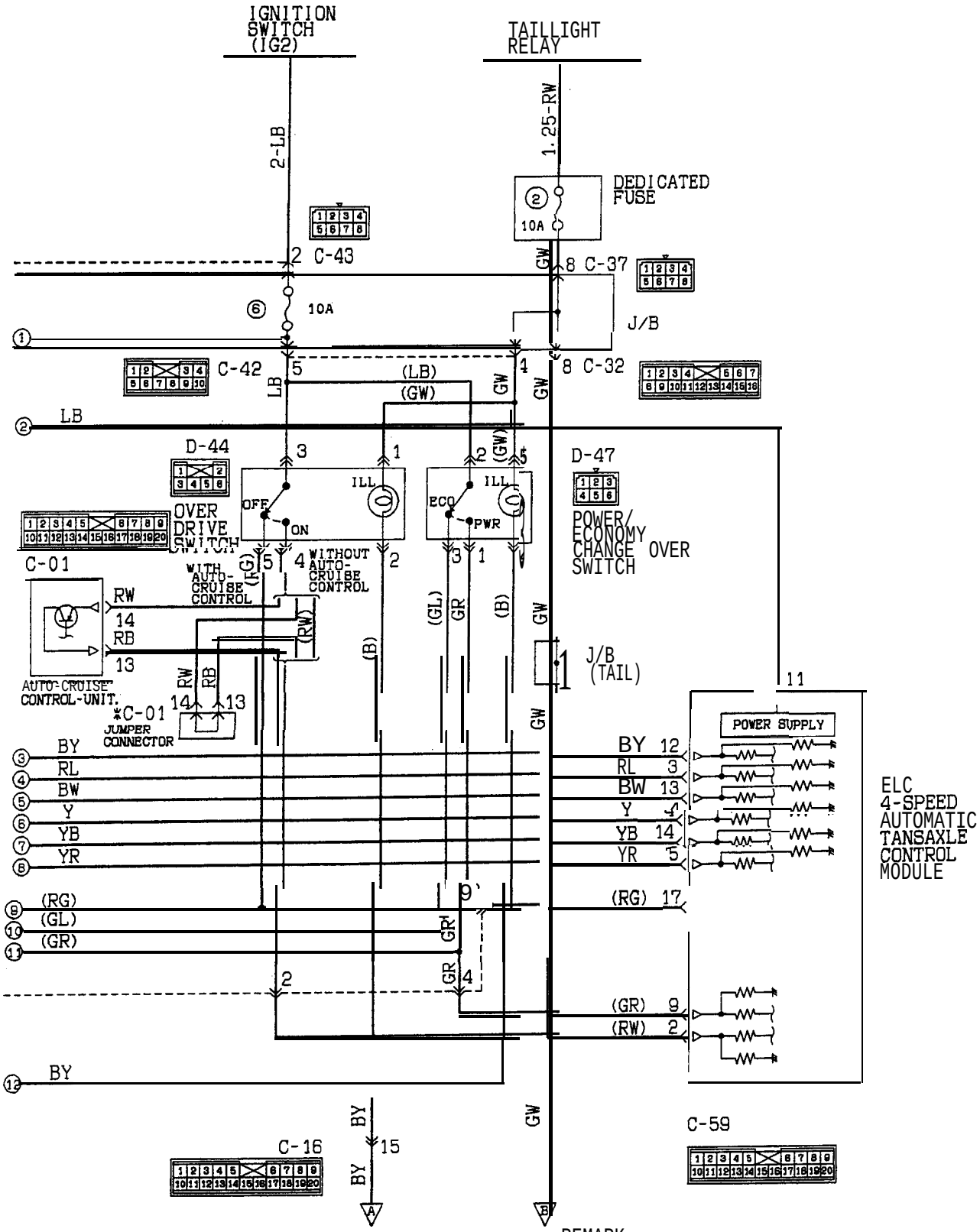
TSB Revision

CIRCUIT DIAGRAM

<1989 models>



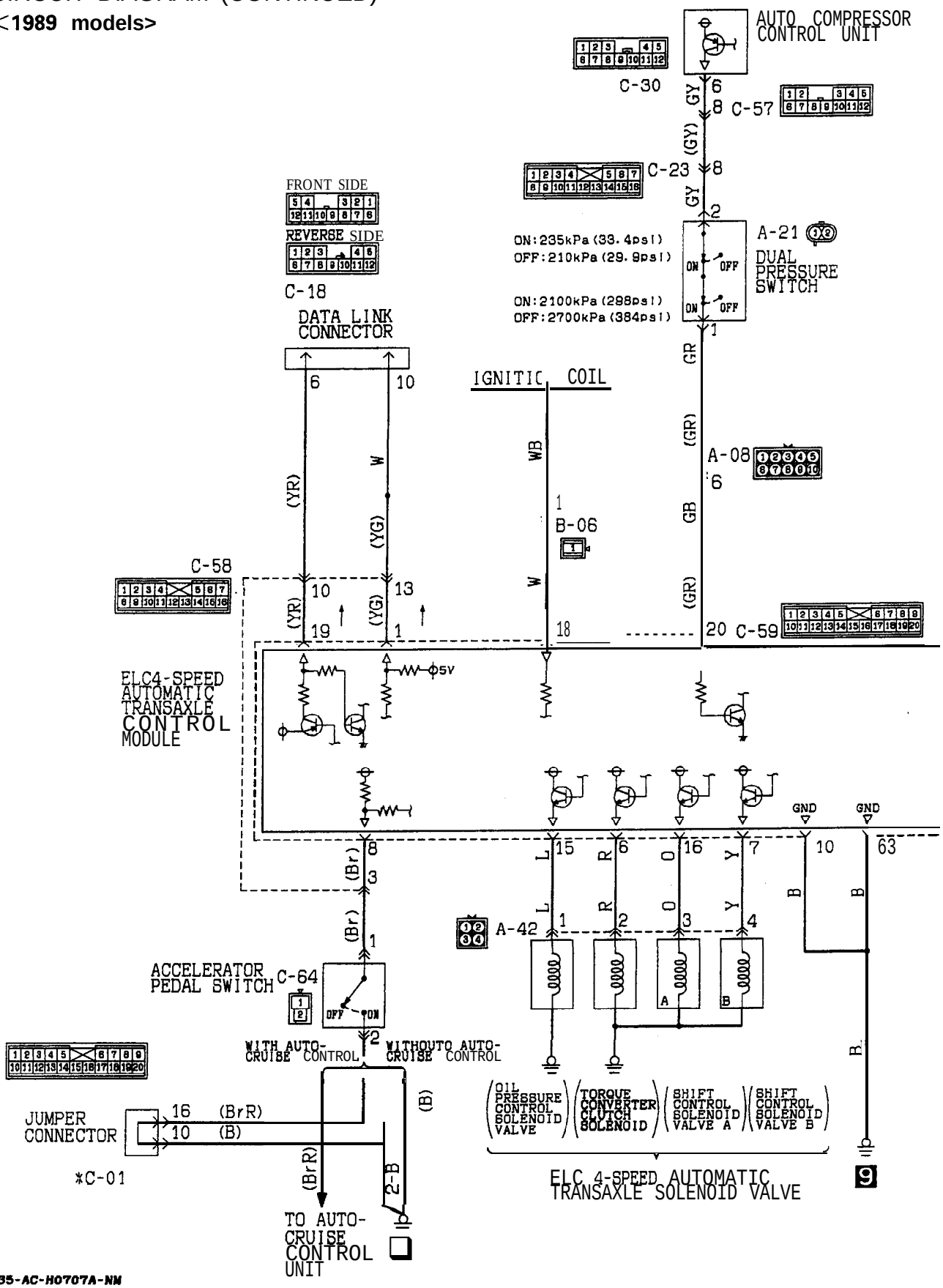
X35-AC-H0707-NM

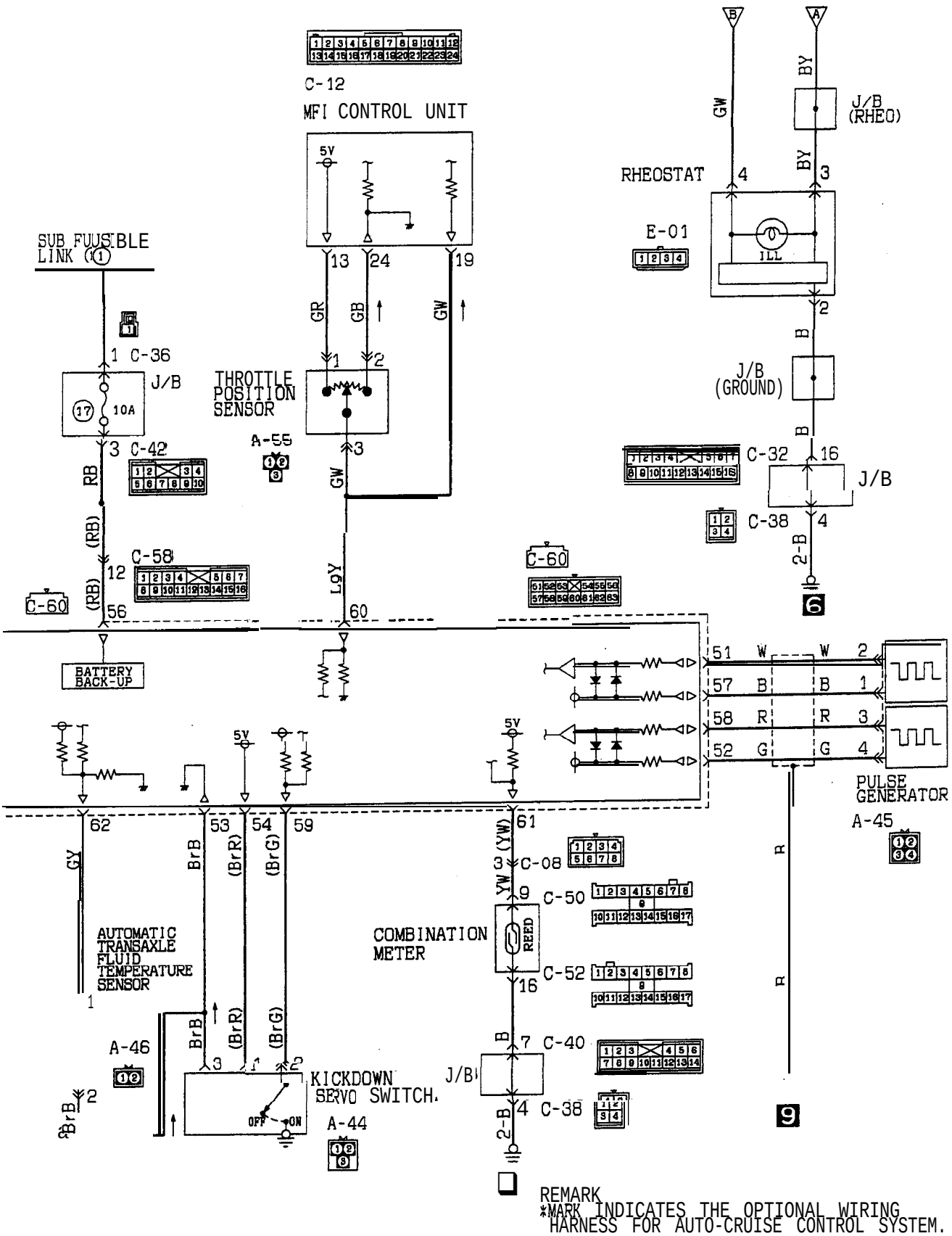


REMARK
*MARK INDICATES THE OPTIONAL WIRING HARNESS FOR AUTO-CRUISE CONTROL SYSTEM.

CIRCUIT DIAGRAM (CONTINUED)

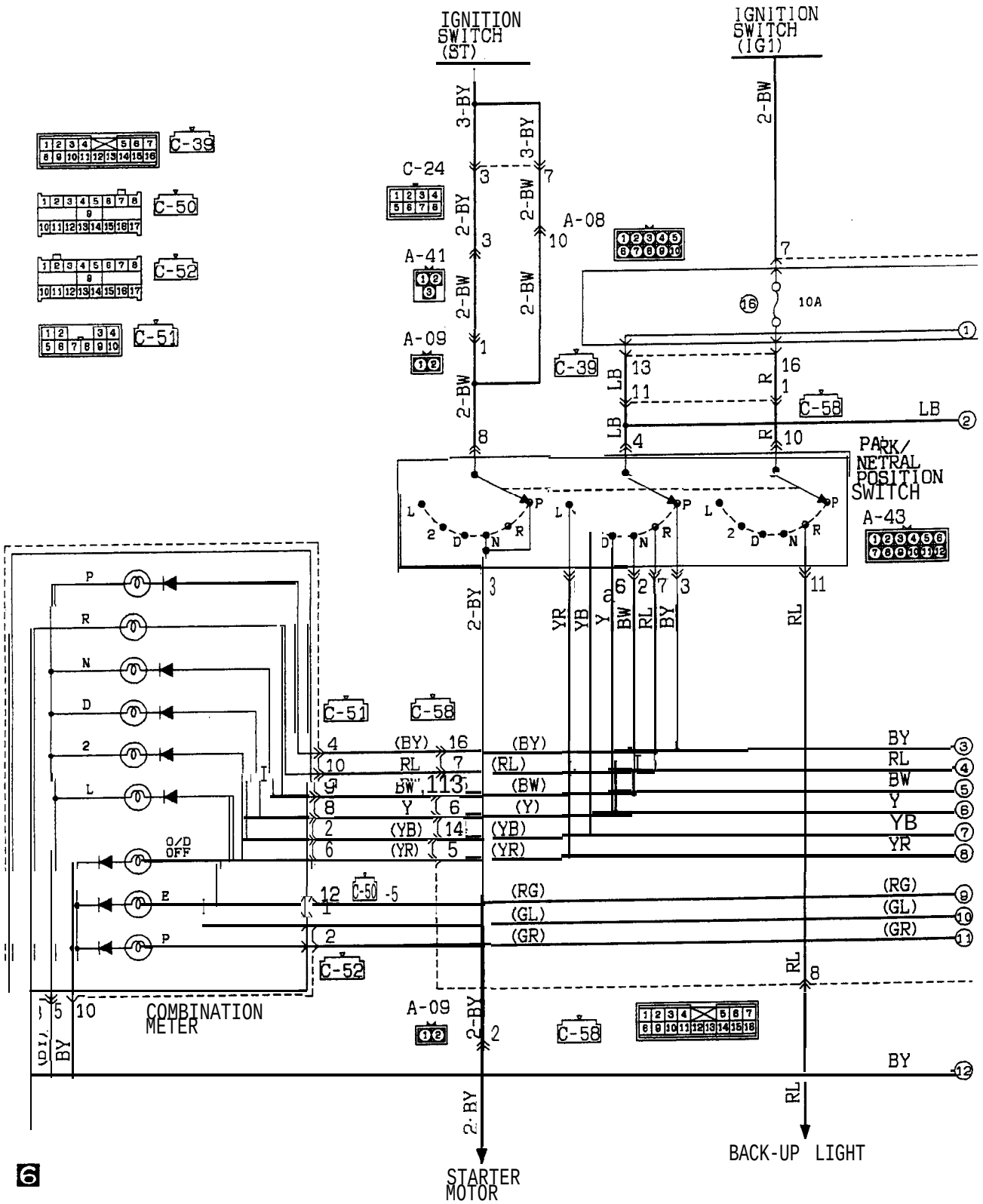
<1989 models>




C-12
MFI CONTROL UNIT
5V
13
24
19
GR
GB
GW
SUB FUUSIBLE LINK (1)
1 C-36
J/B
17
10A
3 C-42
RB
(RB)
12
C-58
56
C-60
THROTTLE POSITION SENSOR
A-55
1
2
3
LgY
60
BATTERY BACK-UP
RHEOSTAT
4
3
E-01
ILL
2
B
J/B (GROUND)
C-32
16
J/B
C-38
4
2-B
6
BY
J/B (RHEO)
51 W W 2
57 B B 1
58 R R 3
52 G G 4
PULSE GENERATOR
A-45
62
53
54
59
GY
BrB
(BrR)
(BrG)
AUTOMATIC TRANSAXLE FLUID TEMPERATURE SENSOR
A-46
KICKDOWN SERVO SWITCH.
OFF
ON
A-44
61
(YW)
3 C-08
YW
9 C-50
COMBINATION METER
REED
C-52
16
7 C-40
J/B
4 C-38
9
REMARK
*MARK INDICATES THE OPTIONAL WIRING HARNESS FOR AUTO-CRUISE CONTROL SYSTEM.

CIRCUIT DIAGRAM

< 1990 models>



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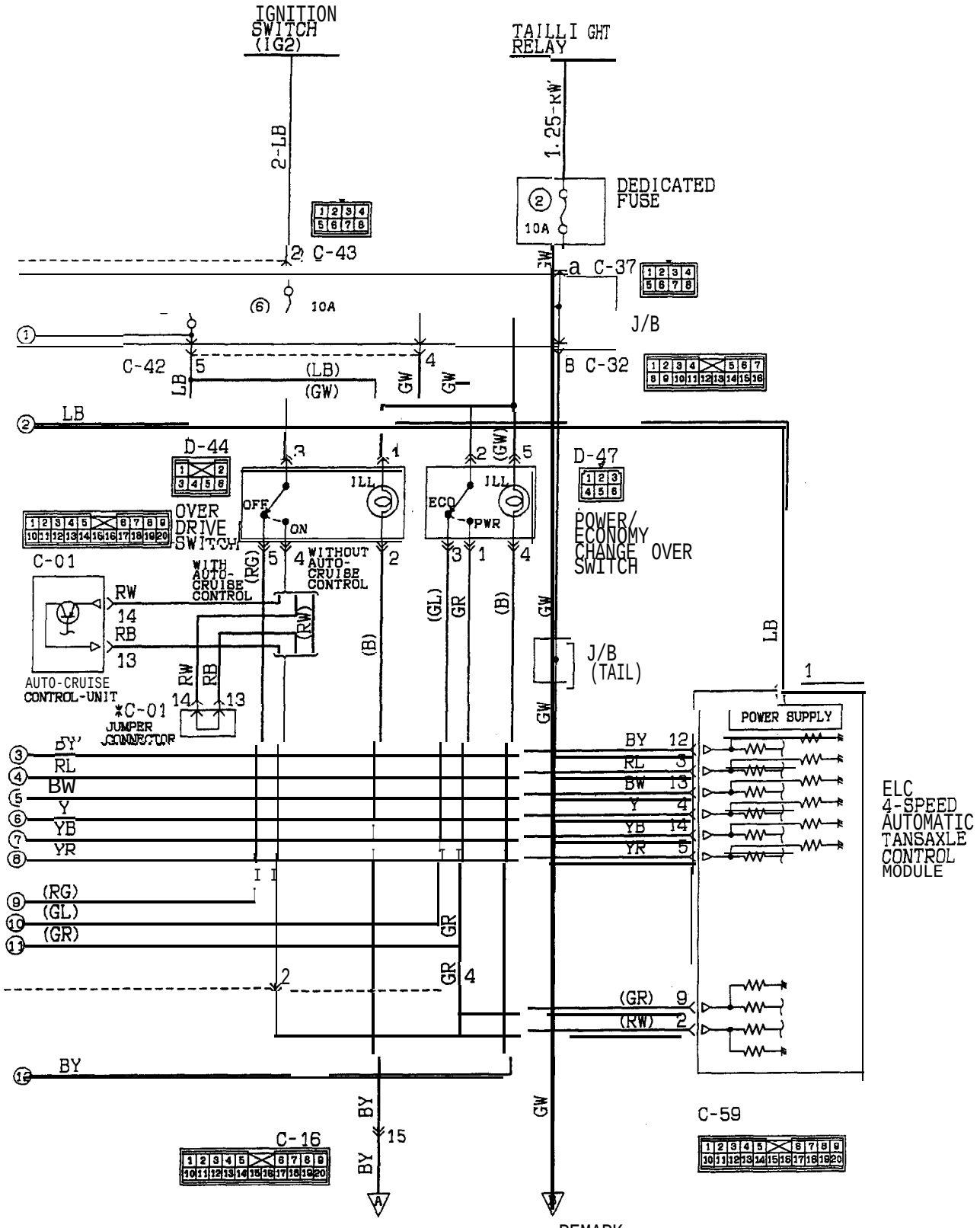
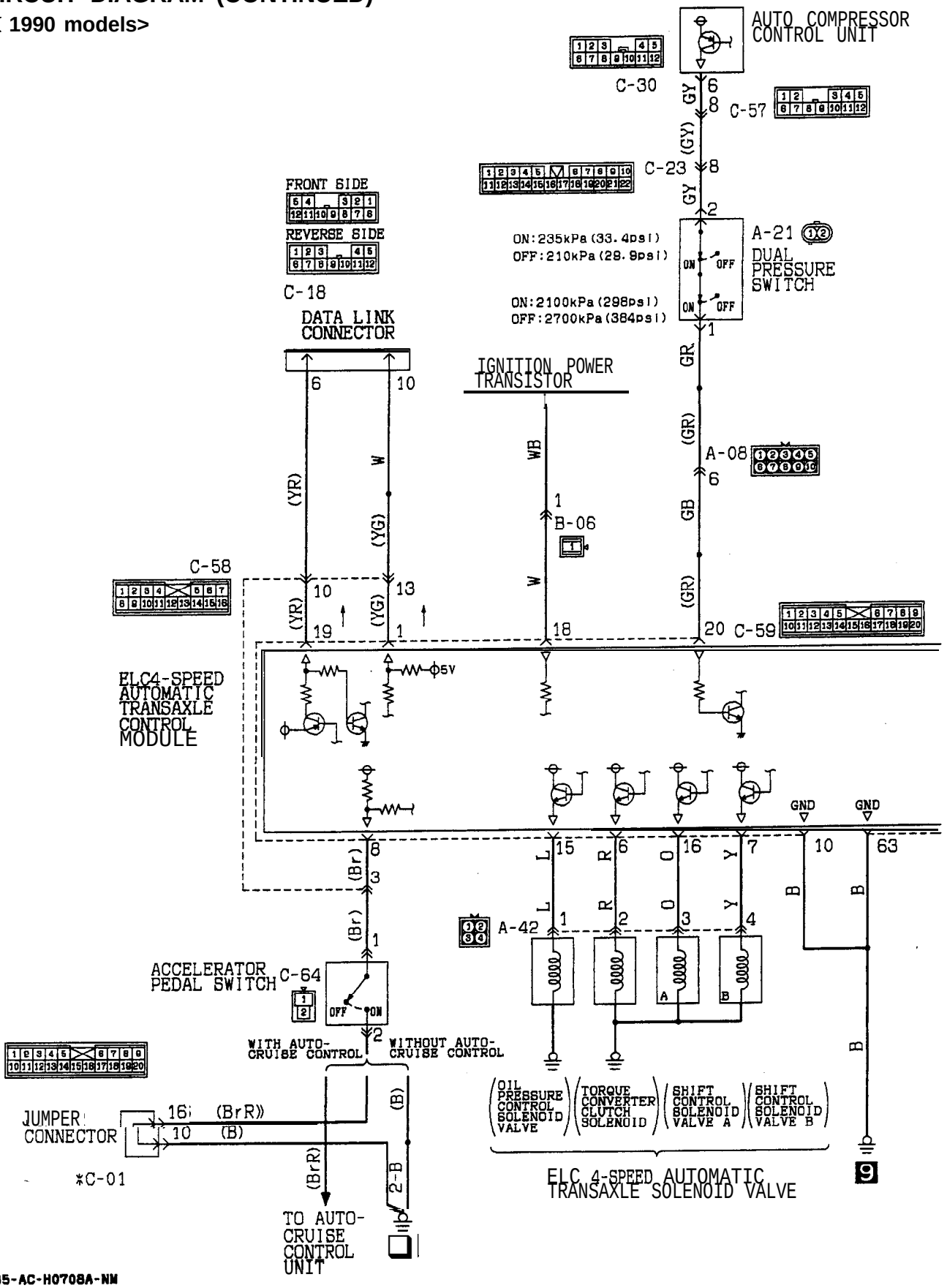


REMARK
*MARK INDICATES THE OPTIONAL WIRING HARNESS FOR AUTO-CRUISE CONTROL SYSTEM.

TSB Revision

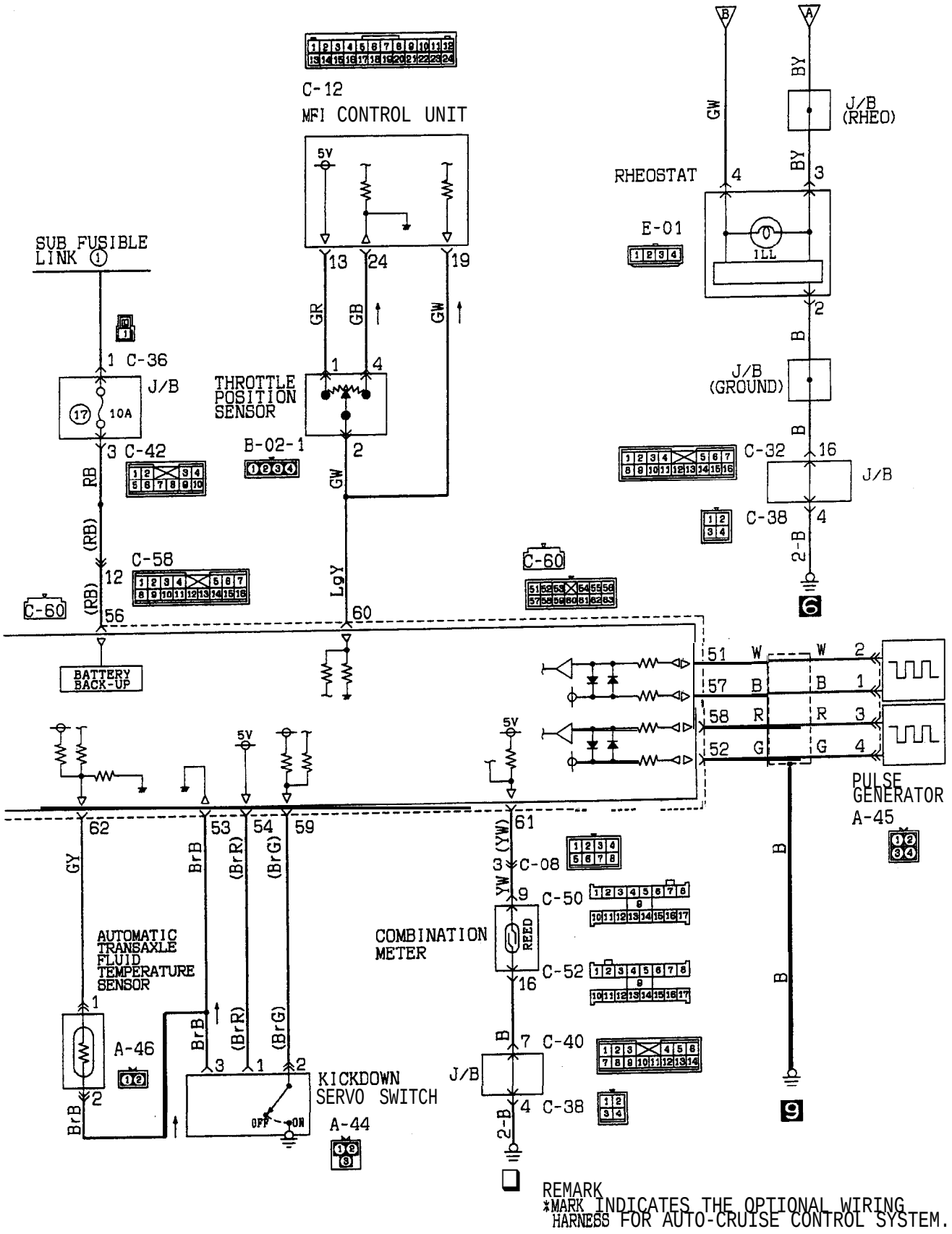
CIRCUIT DIAGRAM (CONTINUED)

< 1990 models>



KX35-AC-H0708A-NM

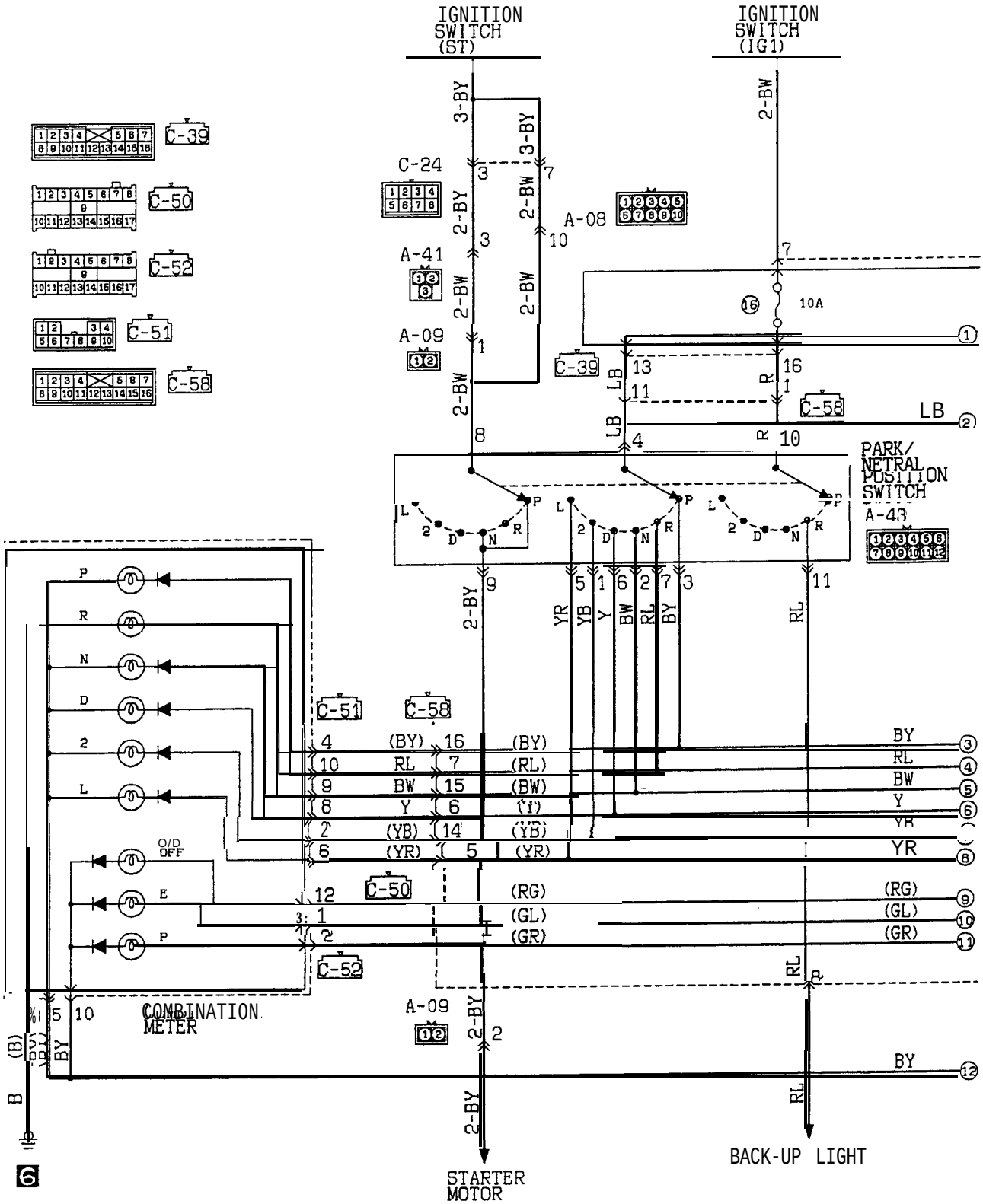
TSB Revision



REMARK
*MARK INDICATES THE OPTIONAL WIRING HARNESS FOR AUTO-CRUISE CONTROL SYSTEM.

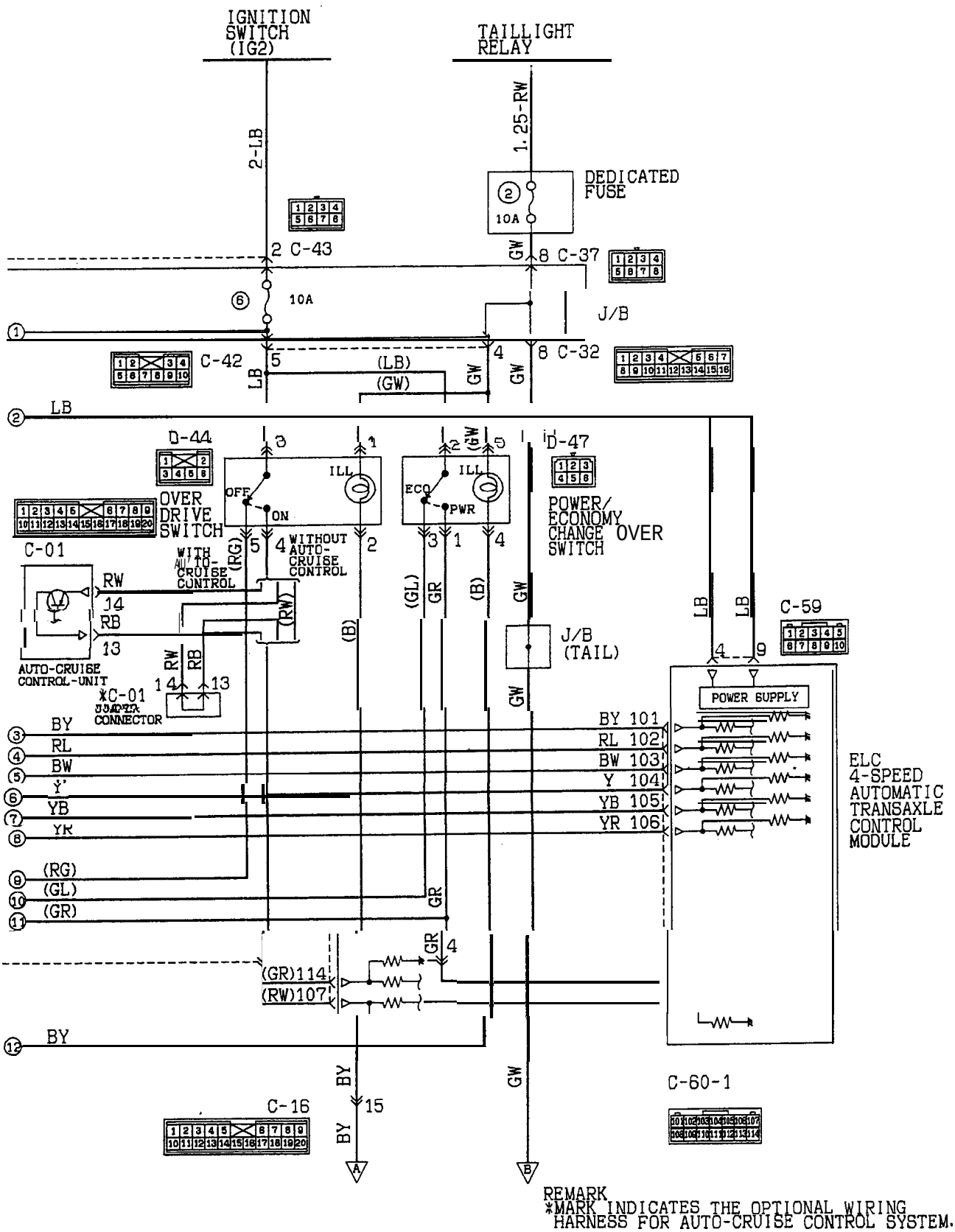
CIRCUIT DIAGRAM

< 1990.5 models>



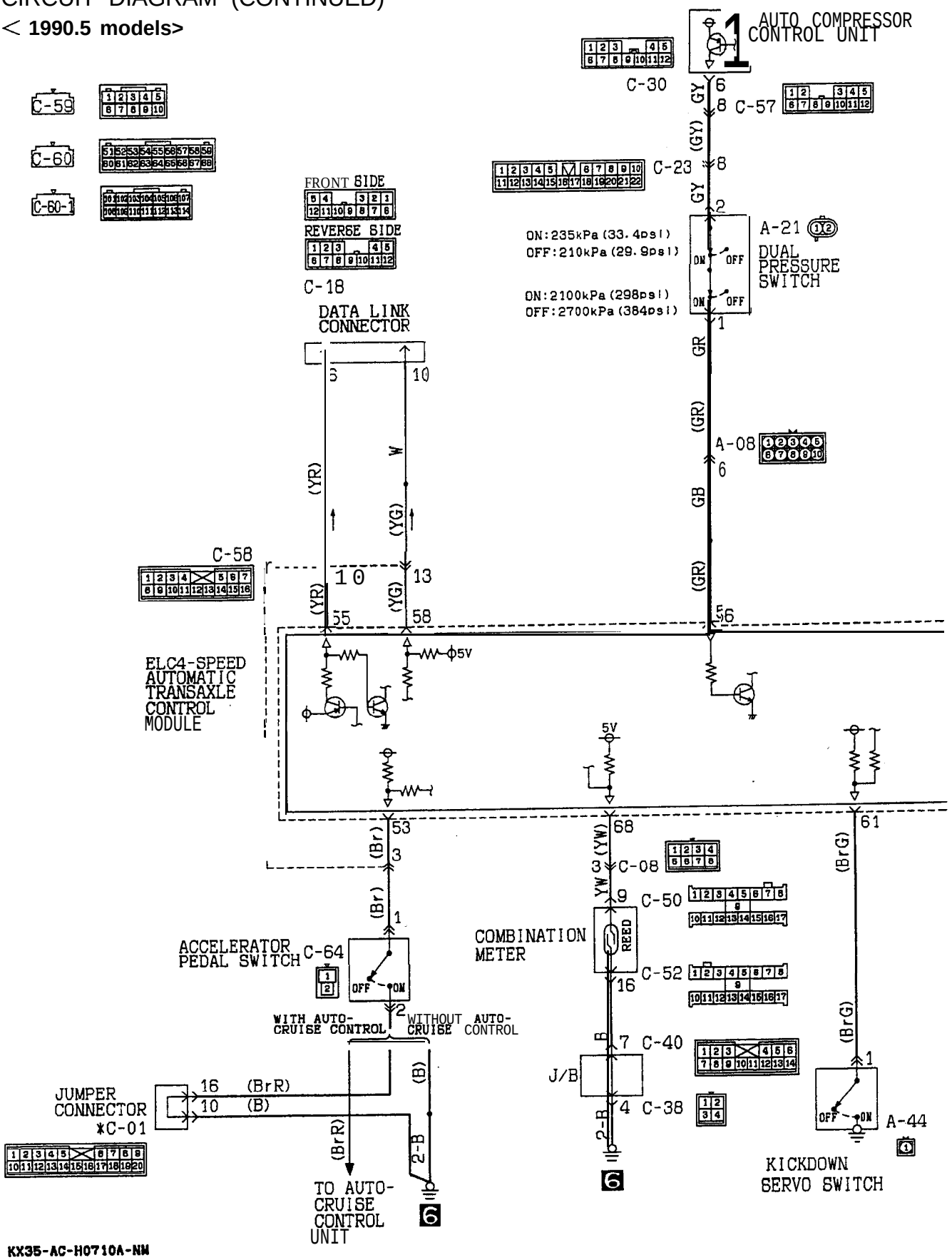
KX35-AC-H0710-NM

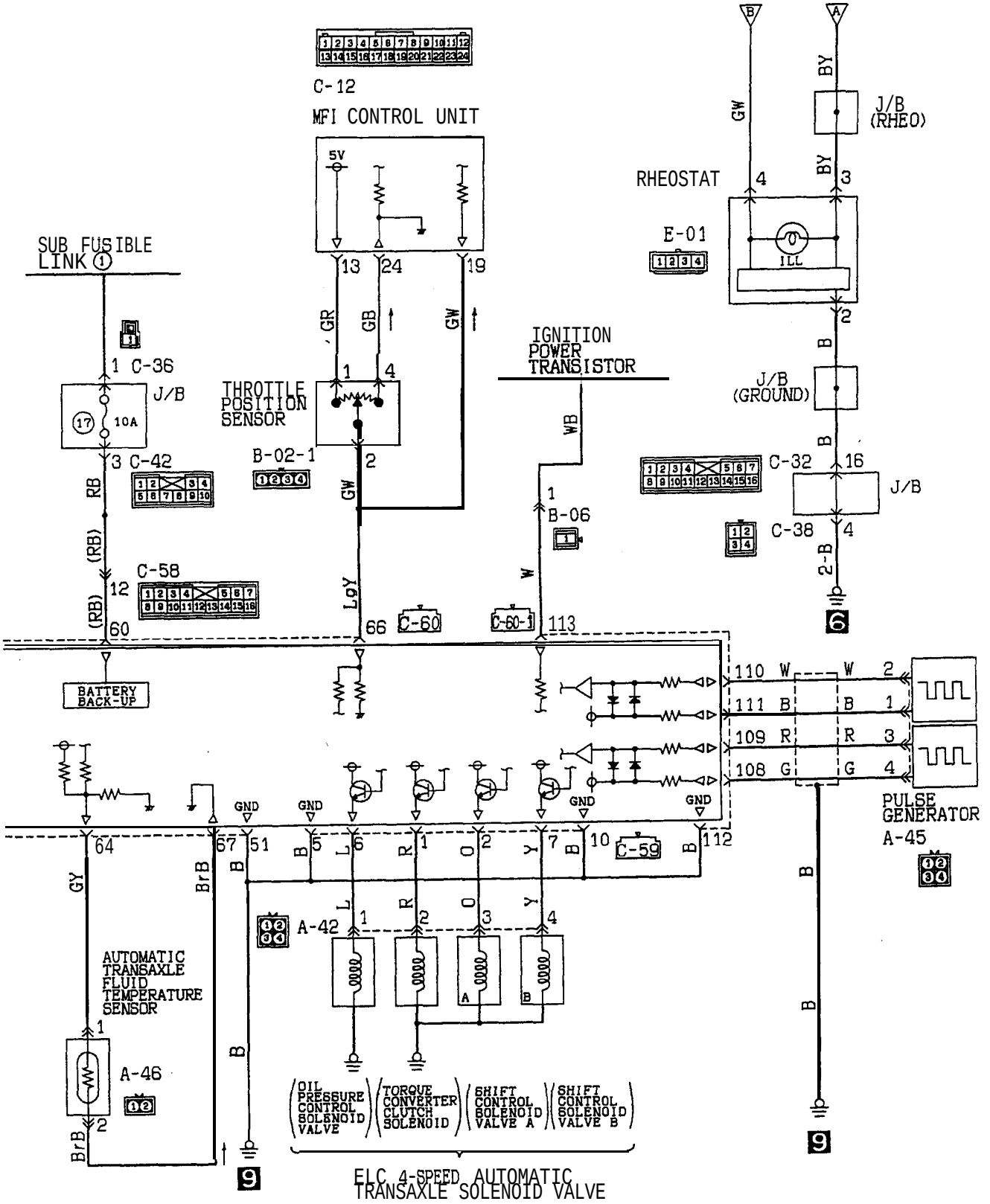
TSB Revision


IGNITION SWITCH (IG2)
TAILLIGHT RELAY
2-LB
1.25-RW
DEDICATED FUSE
10A
2 C-43
8 C-37
J/B
C-42
8 C-32
LB
(LB)
(GW)
GW
D-44
D-47
OVER DRIVE SWITCH
OFF
ON
ILL
ECO
PWR
POWER/ ECONOMY CHANGE OVER SWITCH
C-01
WITH AUTO-CRUISE CONTROL
WITHOUT AUTO-CRUISE CONTROL
RW
RB
(RG)
(GL)
GR
(B)
J/B (TAIL)
C-59
AUTO-CRUISE CONTROL-UNIT
*C-01 JOINT CONNECTOR
POWER SUPPLY
BY 101
RL 102
BW 103
Y 104
YB 105
YR 106
ELC 4-SPEED AUTOMATIC TRANSAXLE CONTROL MODULE
(GR)114
(RW)107
C-16
C-60-1
REMARK
*MARK INDICATES THE OPTIONAL WIRING HARNESS FOR AUTO-CRUISE CONTROL SYSTEM.

CIRCUIT DIAGRAM (CONTINUED)

< 1990.5 models>

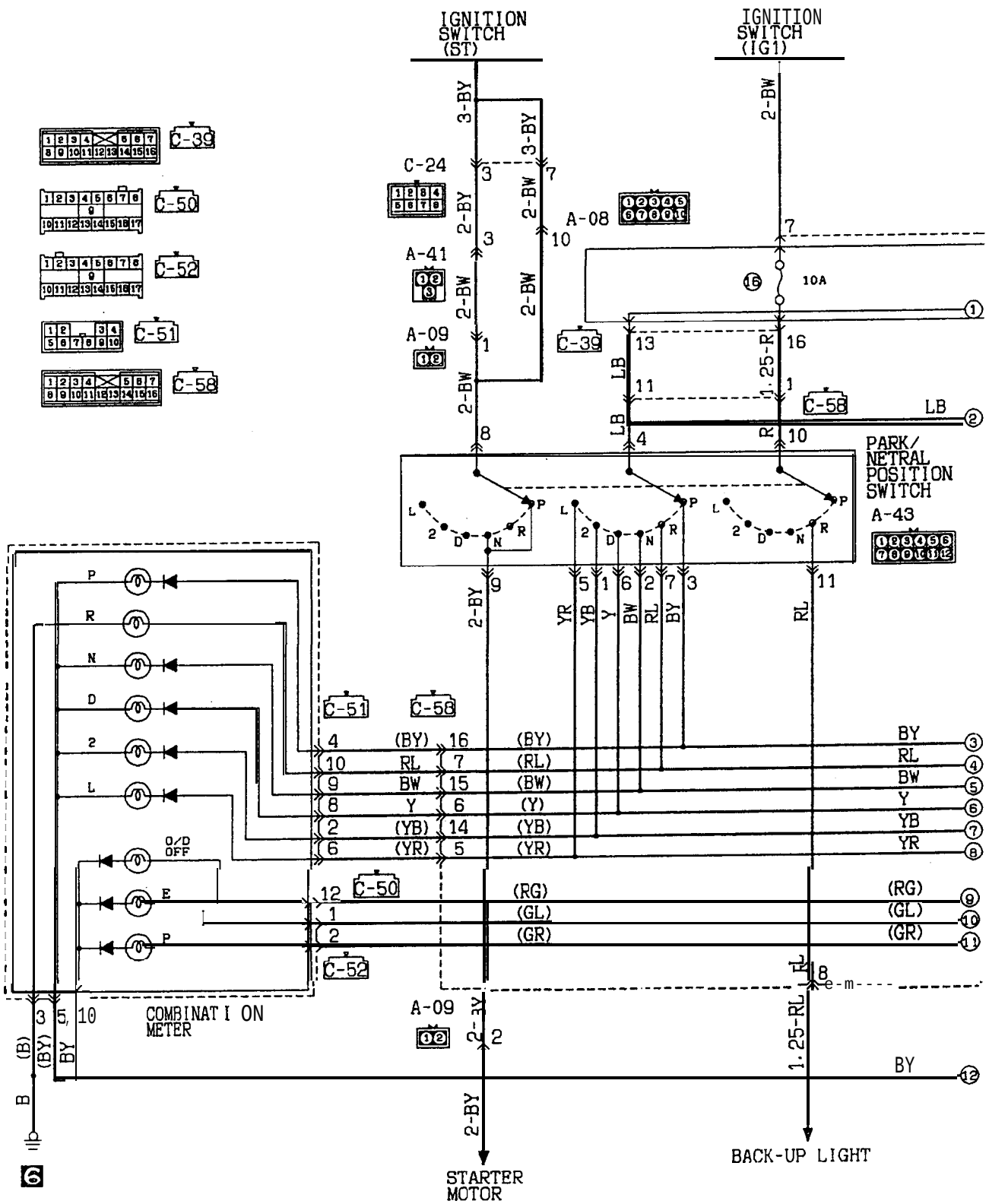




REMARK
*MARK INDICATES THE OPTIONAL WIRING HARNESS FOR AUTO-CRUISE CONTROL SYSTEM.

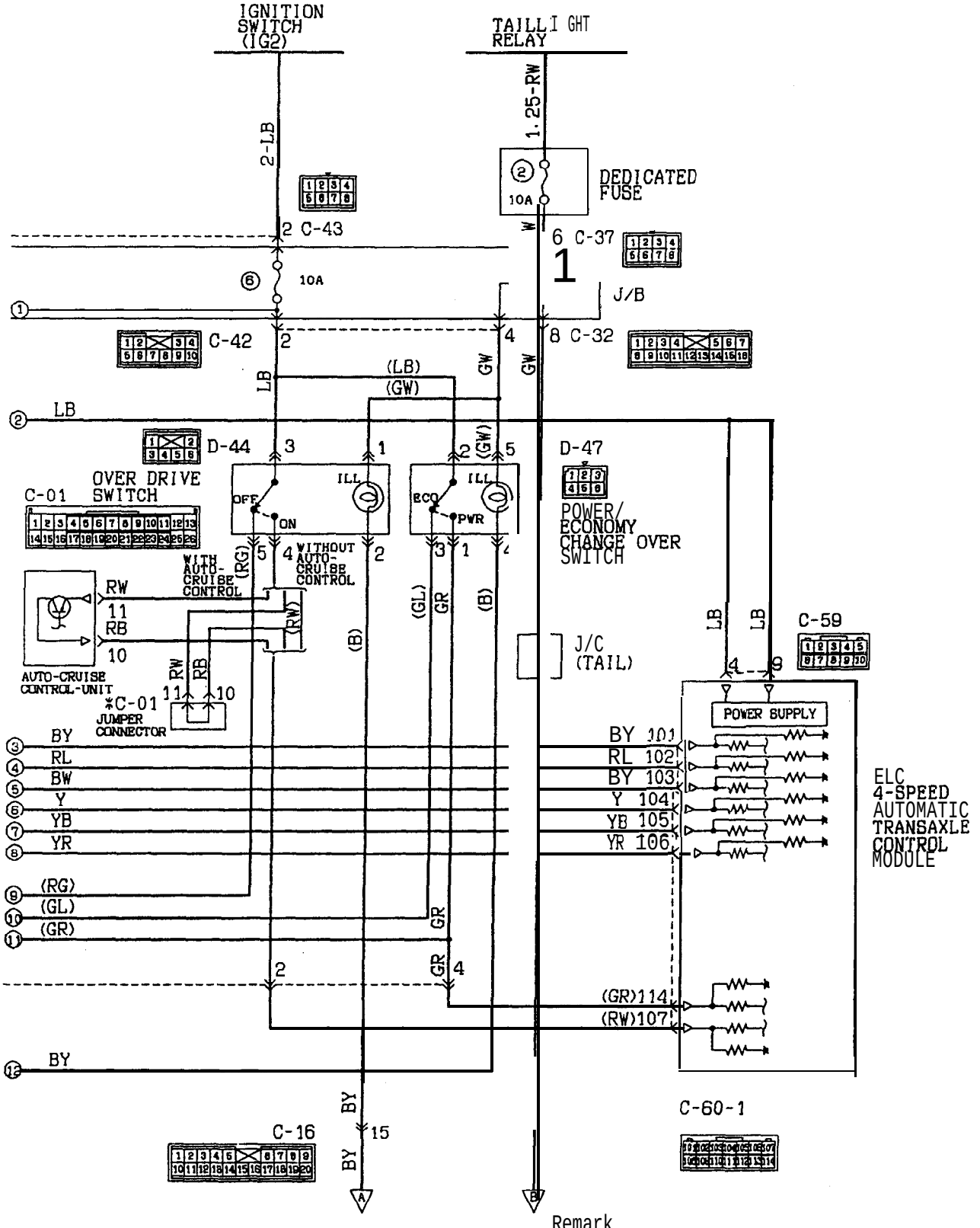
CIRCUIT DIAGRAM

<1991 and 1992 models>



KX35-AC-H0713-NM

TSB Revision

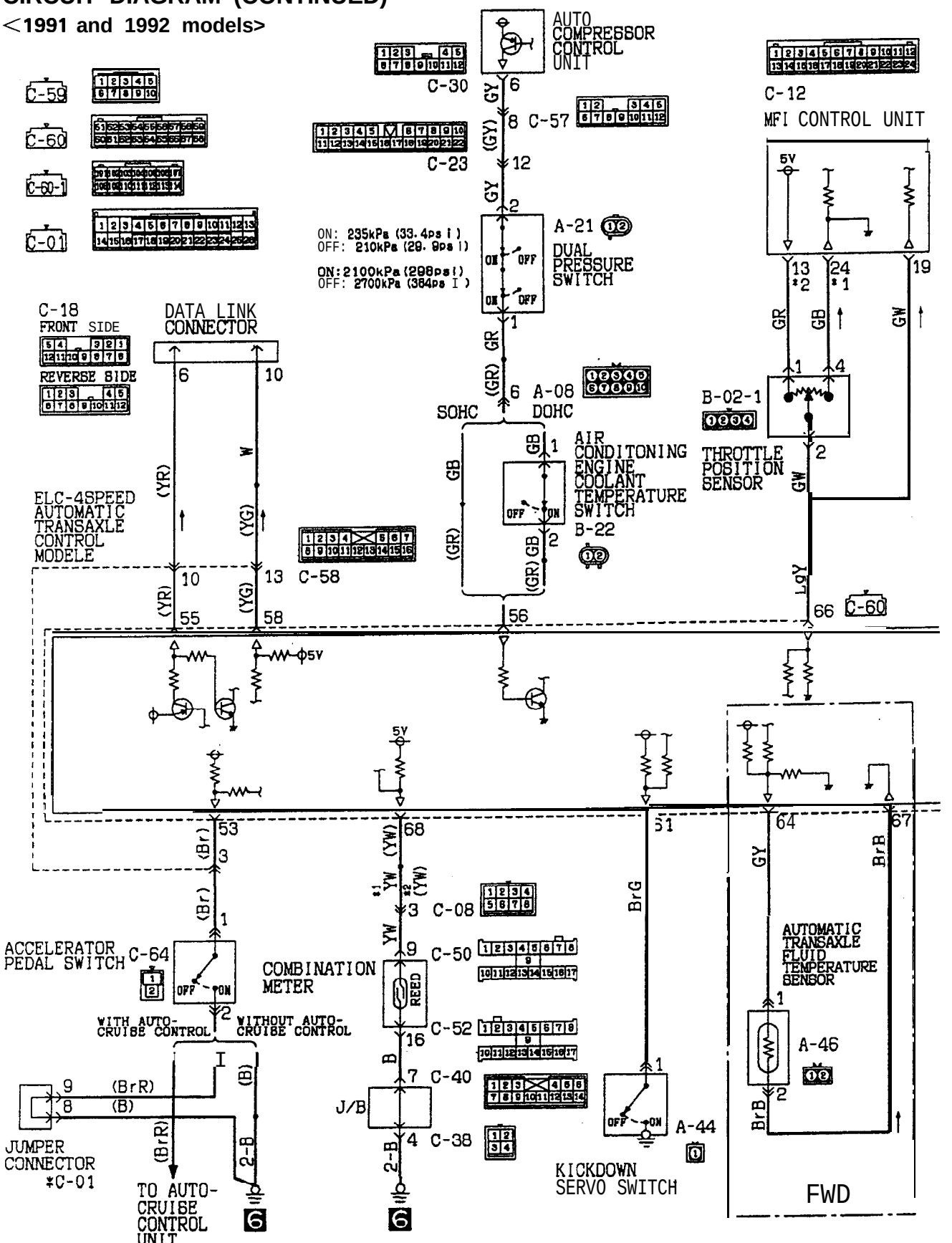


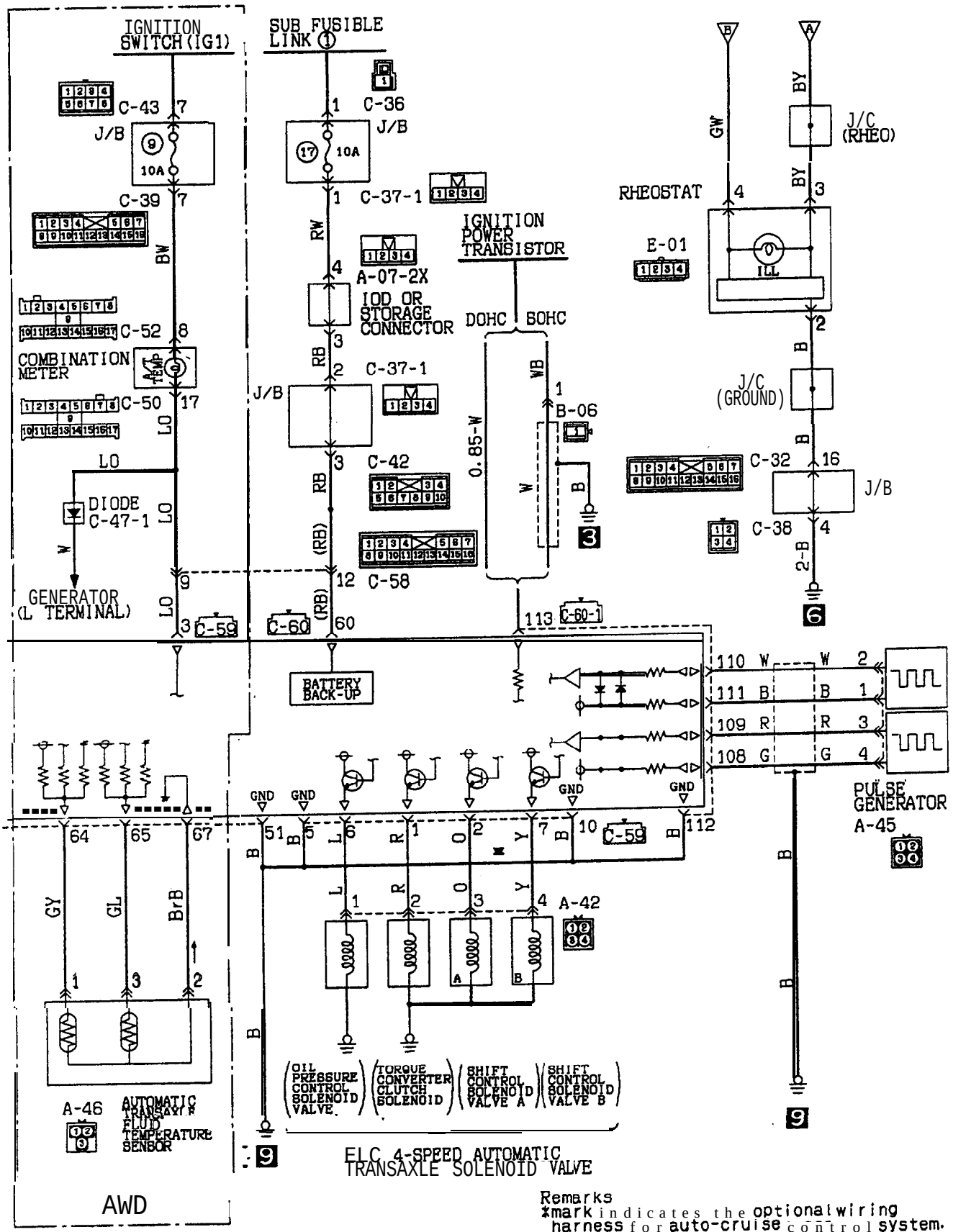
Remark
*mark indicates the optional wiring harness for AUTO-CRUISE CONTROL SYSTEM.

TSB Revision

CIRCUIT DIAGRAM (CONTINUED)

<1991 and 1992 models>

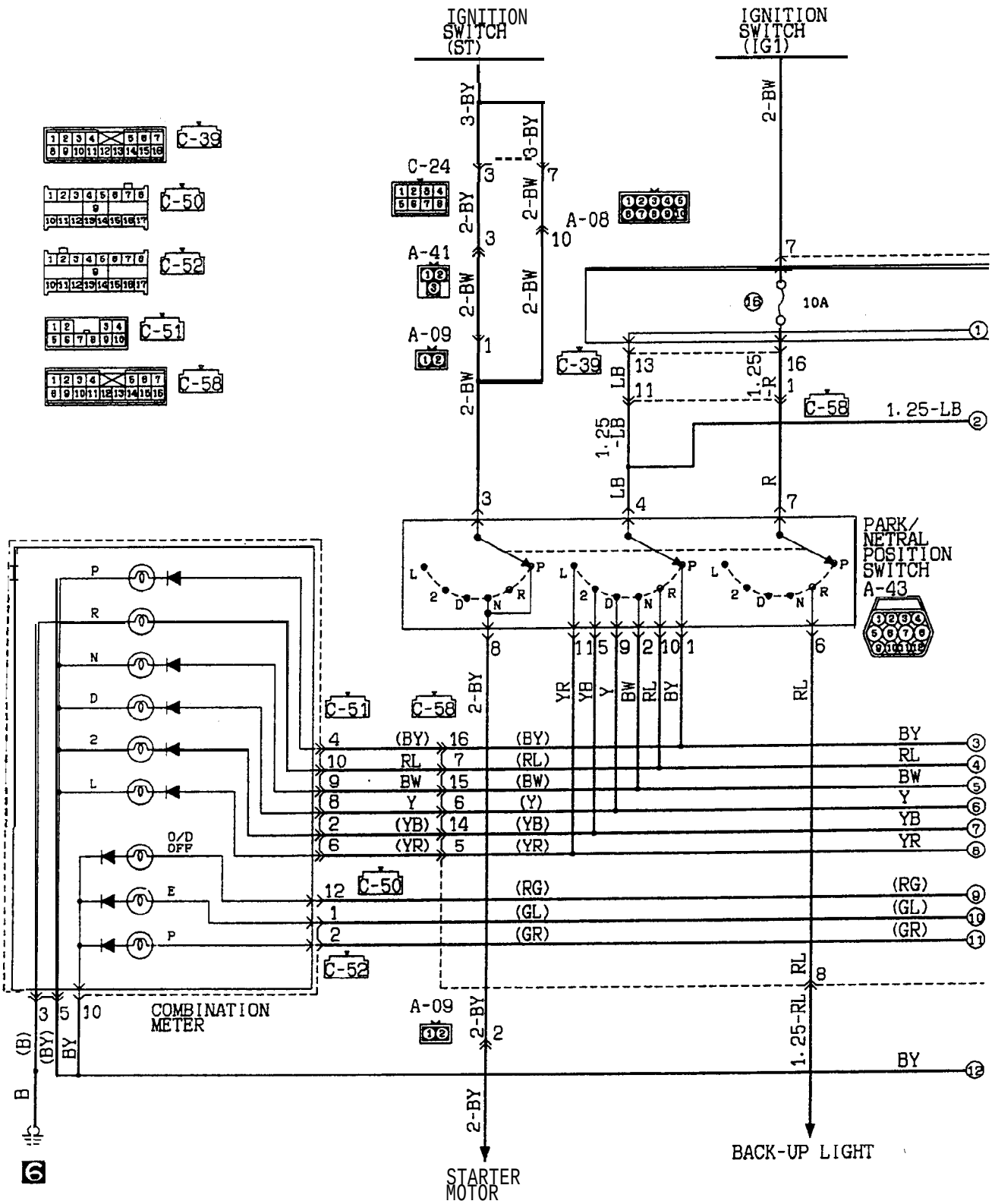




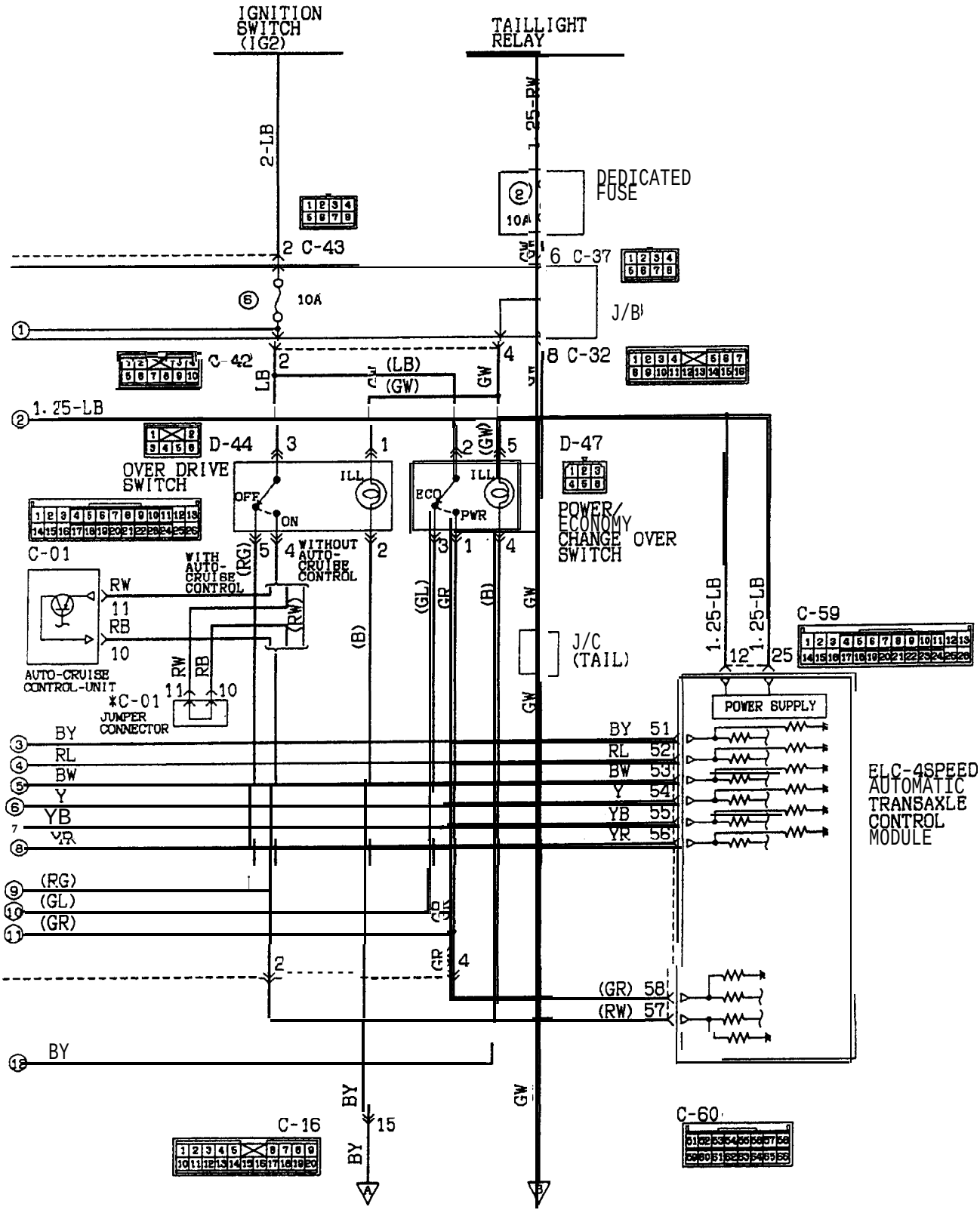
Remarks
*mark indicates the optional wiring harness for auto-cruise control system.
*1: DOHC
*2: SOHC

CIRCUIT DIAGRAM

<From 1993 models>



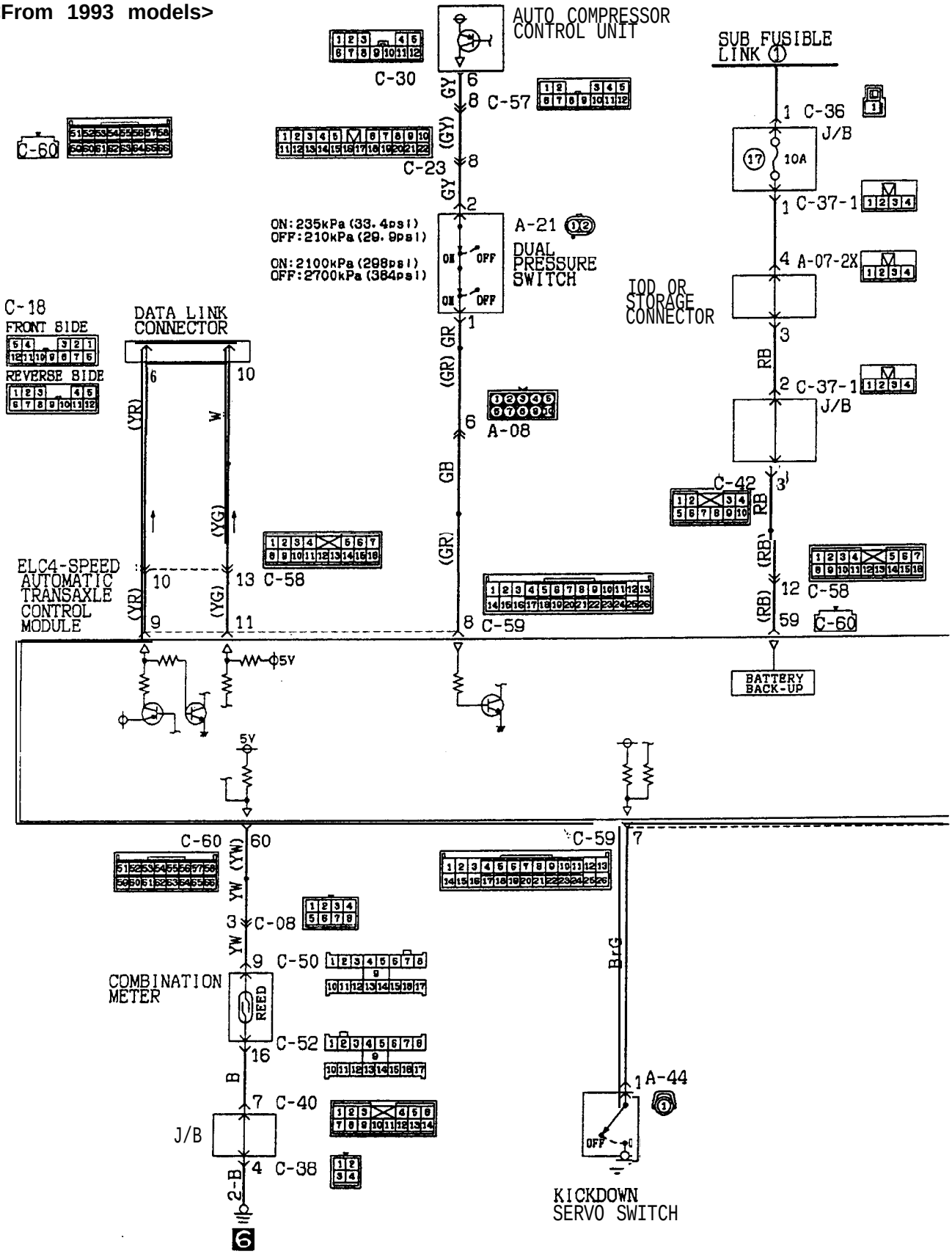
K35-AC-H0715-KM



Remark
*mark indicates the optional wiring harness for auto cruise control system

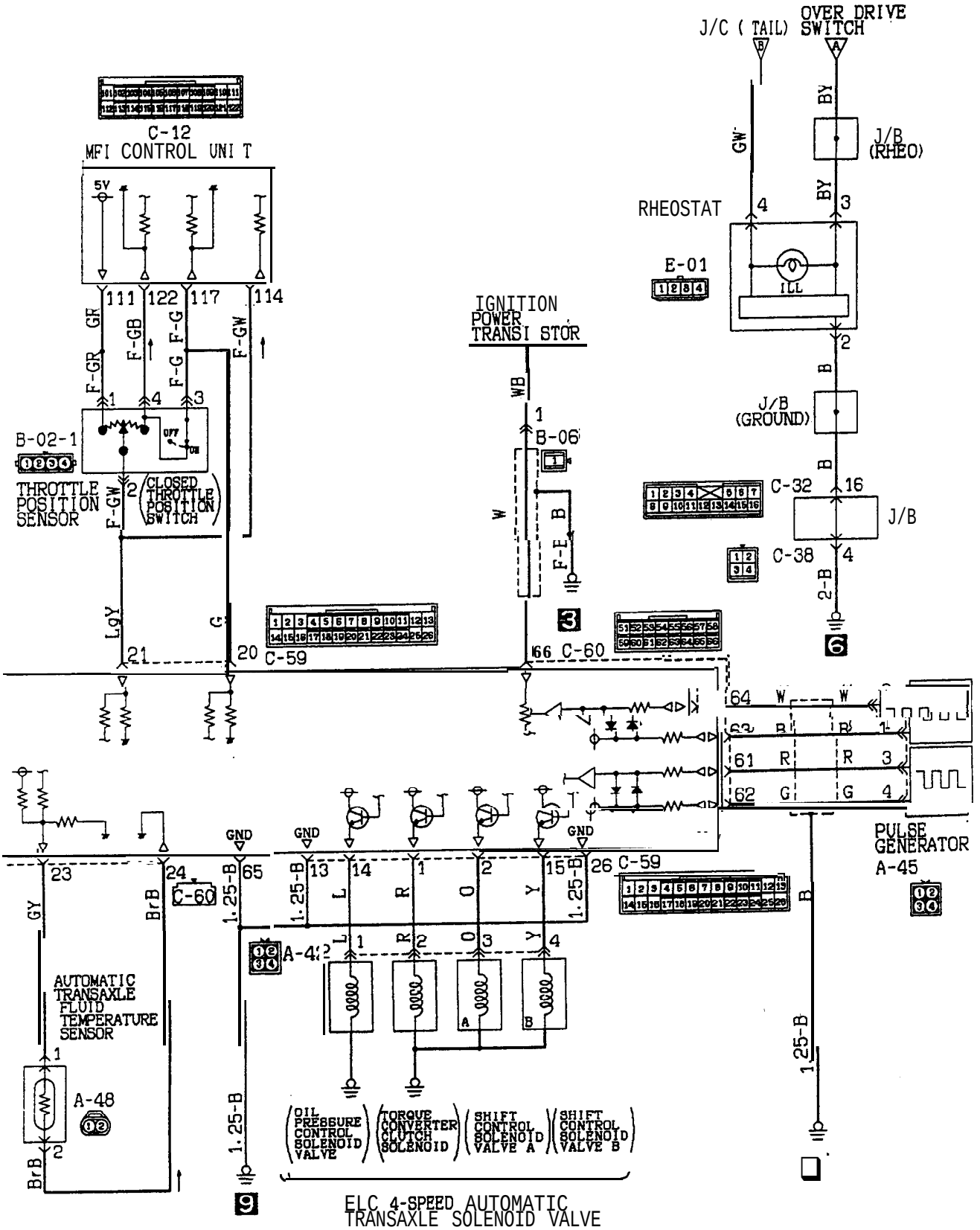
CIRCUIT DIAGRAM (CONTINUED)

<From 1993 models>



KX35-AC-H0715A-NM

TSB Revision



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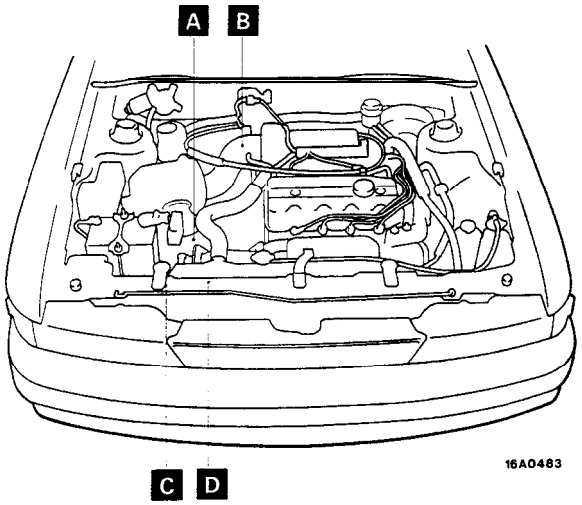
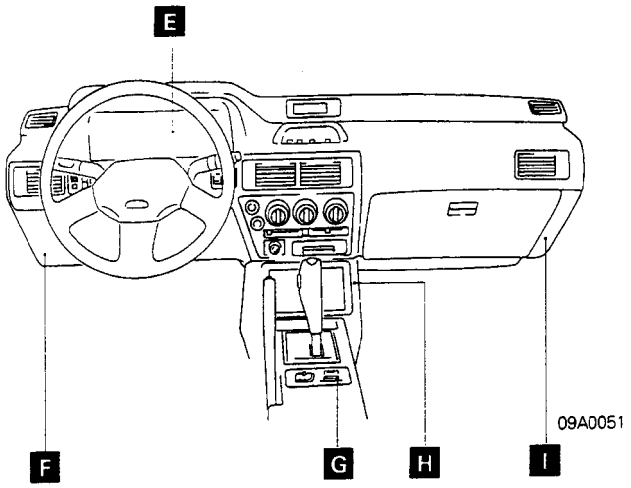
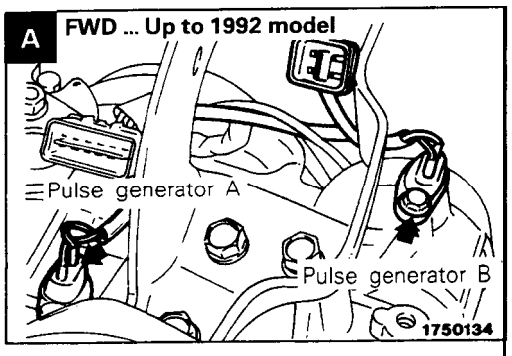
E.L.C. 4-SPEED AUTOMATIC TRANSAXLE CONTROL COMPONENT LAYOUT

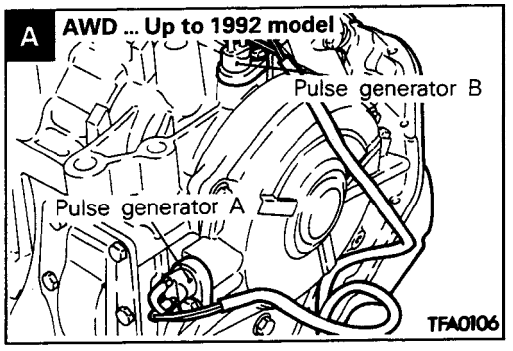
Name	Symbol	Name	Symbol
Data link connector	F	Pulse generator A	A
4 A/T control module	H	Pulse generator B	A
MFI control module	I	Solenoid valve	C
Oil temperature sensor	D	Throttle position sensor	B
Power (PWR)/Economy (ECO) switch	G	Vehicle-speed sensor	E

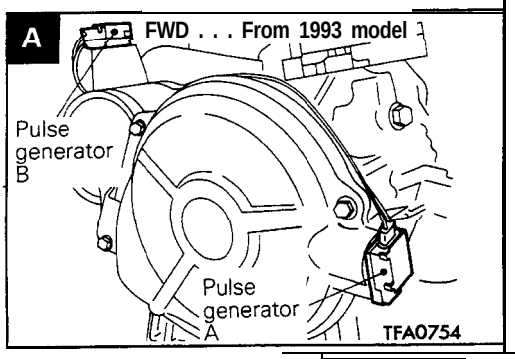
NOTE
The "Name" column is arranged in alphabetical order.
C and D are built into the transaxle. <From 1991 models>

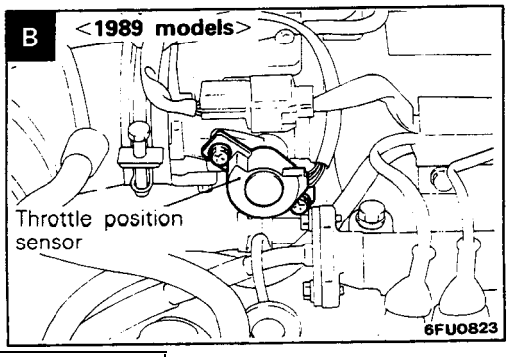












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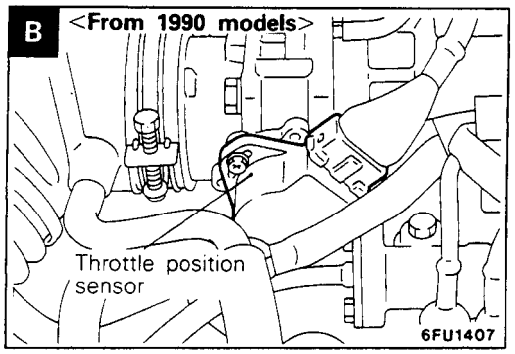
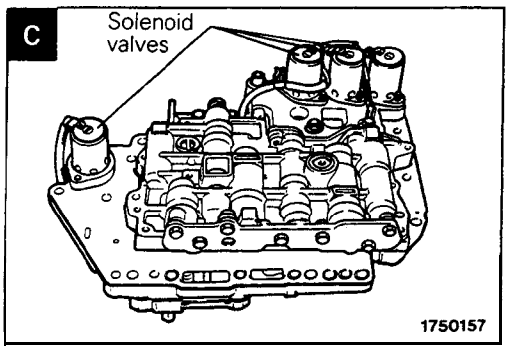
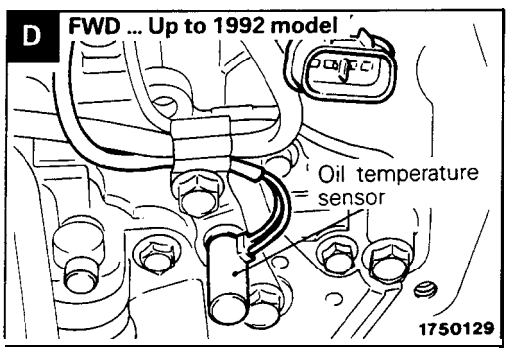
B <From 1990 models>



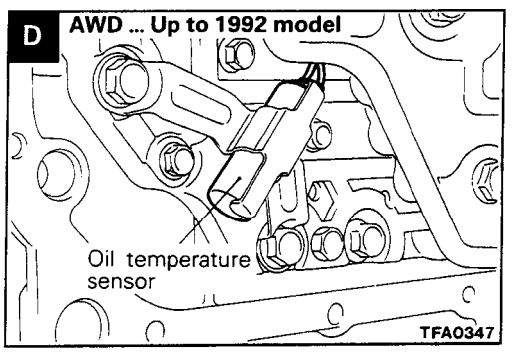
C



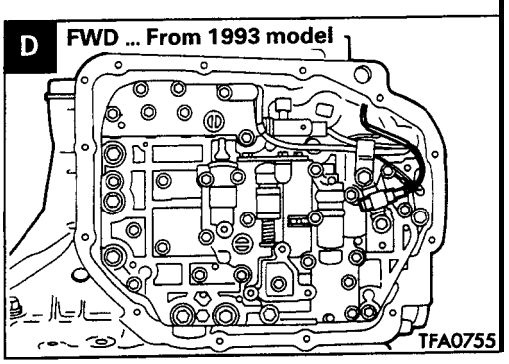
D FWD ... Up to 1992 model



D AWD ... Up to 1992 model



D FWD ... From 1993 model



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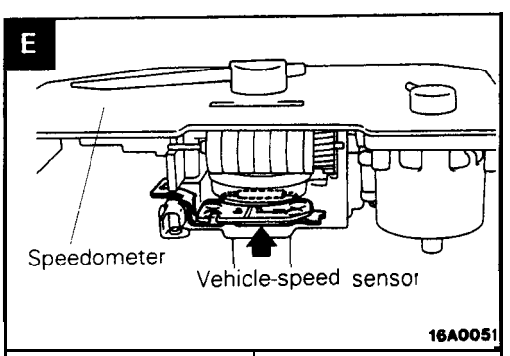

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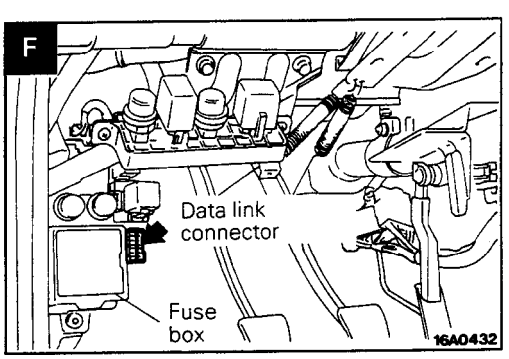
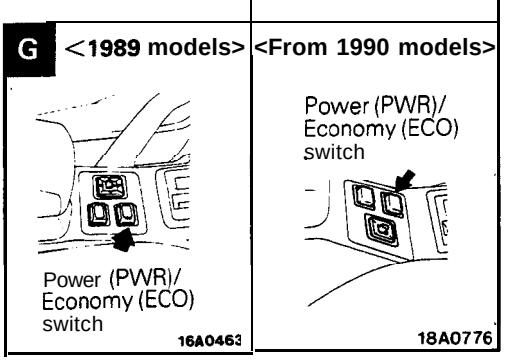


G <1989 models> <From 1990 models>



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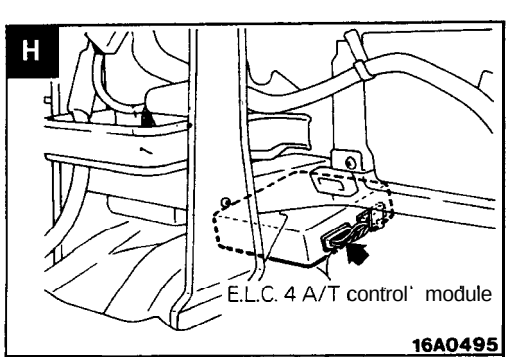

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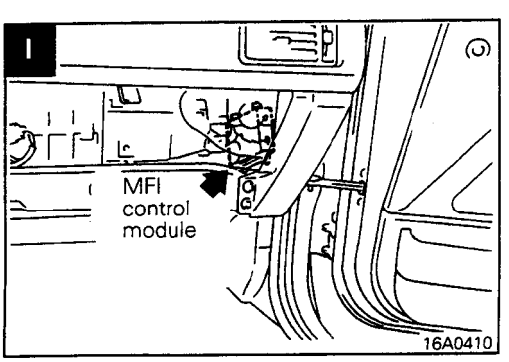
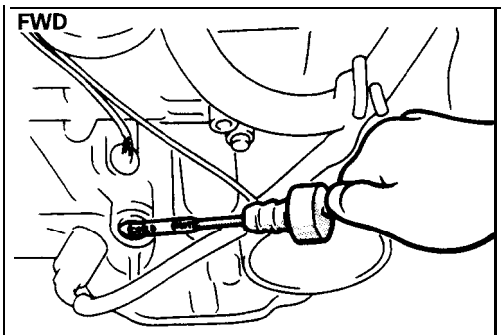
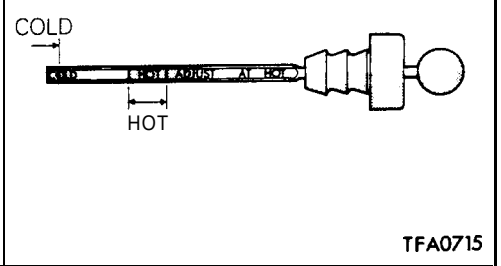
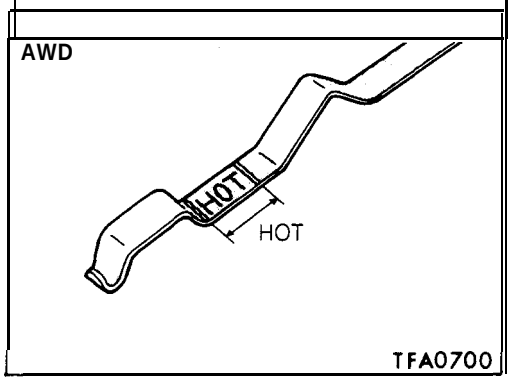


TSB Revision







SERVICE ADJUSTMENT PROCEDURES

M23FBBI

TRANSAXLE FLUID LEVEL INSPECTION

1. Drive until the fluid temperature reaches the usual temperature [70–80°C (160–180°F)].
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 dipstick, wipe all dirt from area around dipstick. Then take out the dipstick and check the condition of the fluid.
   The transaxle should be overhauled under the following conditions.
   - If there is a "burning" odor.
   - If the fluid color 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 dipstick. If fluid level is low, add automatic transaxle fluid until level reaches "HOT" range.

   Transaxle fluid: DIAMOND 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 too high. When transaxle 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 transaxle 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 transaxle vent where it may be mistaken for a leak.
6. Be sure to examine fluid on dipstick closely.

TRANSAXLE FLUID REPLACEMENT

M23FCBGa

Refer to GROUP 00–Maintenance Service.

TRANSFER OIL LEVEL INSPECTION

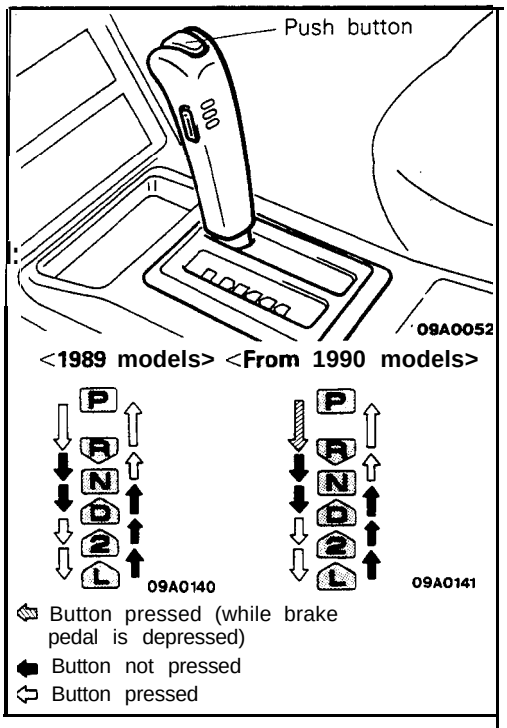
M23FXAA

Transfer oil level inspection is the same as for the manual transaxle transfer.
Refer to GROUP 00 – Maintenance Service.

TRANSFER OIL REPLACEMENT

M23FYAA

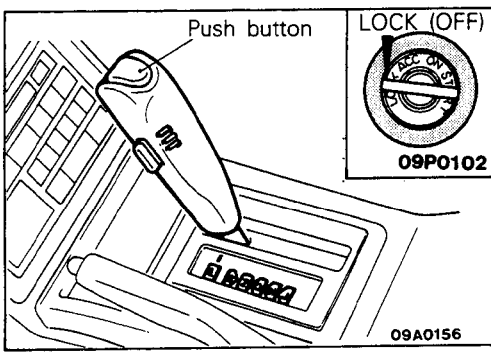
Transfer oil replacement is the same as for manual transaxle transfer.
Refer to GROUP 22–Service Adjustment Procedures.



SELECTOR LEVER OPERATION CHECK M23FIAE

1. Shift selector lever to each range and check that lever moves smoothly and is controled. 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.

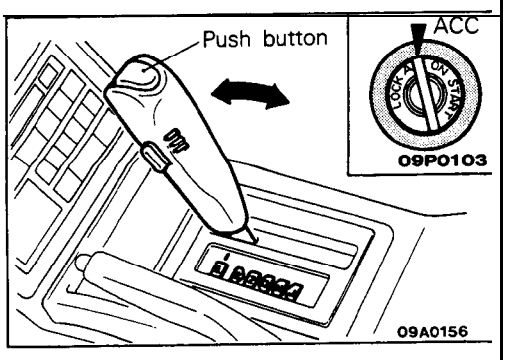
NOTE
To move the selector lever from the "P" position to any other position, first turn the ignition key to any position other than "LOCK (OFF)" and depress the brake pedal. <From 1990 models>



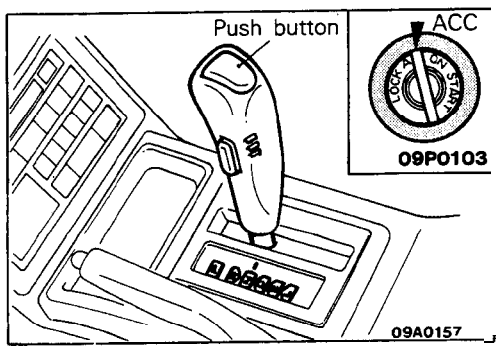
KEY INTERLOCK MECHANISM CHECK M23FUAA

Completely stop the vehicle and switch OFF the engine before making the check.

1. Check to be sure that, under the following conditions, the selector lever cannot be moved from the "P" position to any other position.
   Also check, at the same time, that the button cannot be pressed.
   Ignition key position: "LOCK (OFF)", or removed
   Brake pedal: Depressed



2. Check to be sure that, under the following conditions, the selector lever can be moved from the "P" position to any other position.
   Press the button a few times and check to be sure that the selector lever moves smoothly.
   Ignition key position: "ACC"
   Brake pedal : Depressed
   Button: Pressed



3. Check to be sure that, at all positions of the selector lever (other than "P"), the ignition key cannot be turned to the "LOCK (OFF)" position.
   Check to be sure that the ignition key smoothly turns to the "LOCK (OFF)" position when the selector lever is then set to the "P" position and the button is released.
   If a malfunction is discovered when following the above checking procedures, either adjust or check the key interlock cable mechanism. (Refer to P.23-97.)

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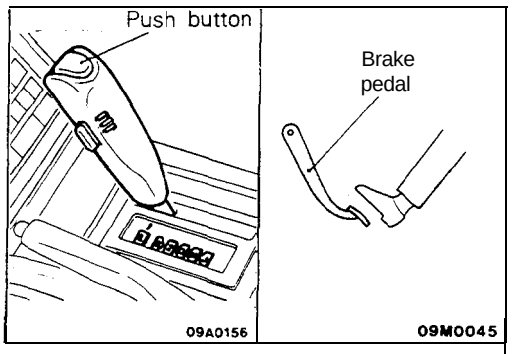
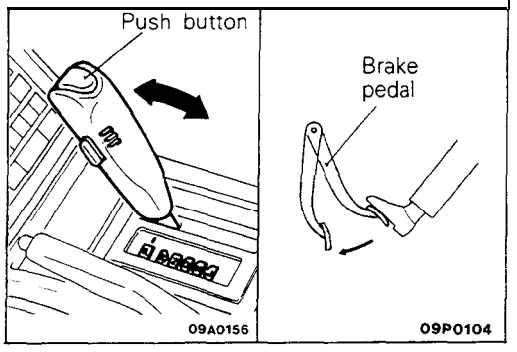




SHIFT LOCK MECHANISM CHECK M23FVAA

1. Check to be sure that, under the following conditions, the selector lever cannot be moved from the "P" position to any other position.

   Ignition key position: "ACC"
   Brake pedal: Not depressed
   Button: Pressed

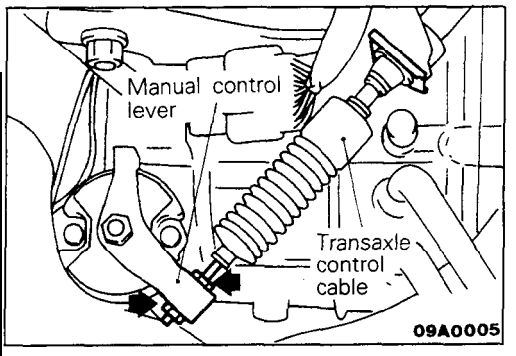
2. Check to be sure that, under the following conditions, the selector lever can be moved smoothly from the "P" position to other position.

   Ignition key position: "ACC"
   Brake pedal: Depressed
   Button : Pressed

3. Check to be sure that, under the following conditions, the selector lever can be moved smoothly from, the "R" position to the "P" position.

   Ignition key position: "ACC"
   Brake pedal: Released
   Button : Pressed

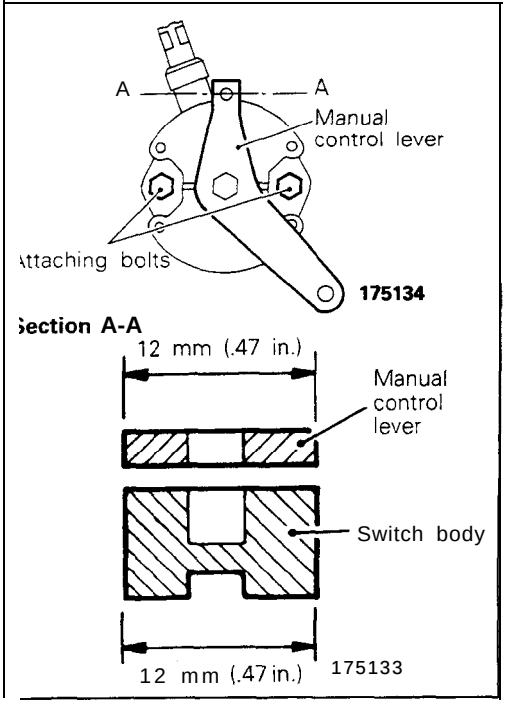
4. If a malfunction is discovered when following the above checking procedures, either adjust or check the shift lock cable mechanism. (Refer to P.23-97.)



PARK/NEUTRAL POSITION SWITCH ADJUSTMENT M23FKAIa

PARK/NEUTRAL POSITION SWITCH <1989 models>

1. Place selector lever in "N" (Neutral) position.
2. Loosen control cable to manual control lever coupling adjusting nuts (2 pcs.) to set cable and lever free.



3. Place manual control lever in "N" (neutral) position.
4. Turn park/neutral position switch body until 12 mm (.47 in.) wide end of manual control lever aligns with switch body flange [I 2 mm (.47 in.) wide portion].
5. Tighten attaching bolts (2 pcs.) taking care so that switch body is not displaced.

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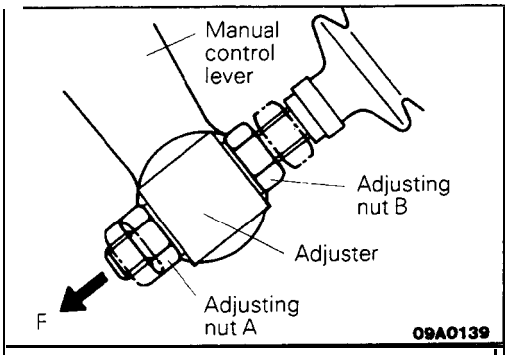
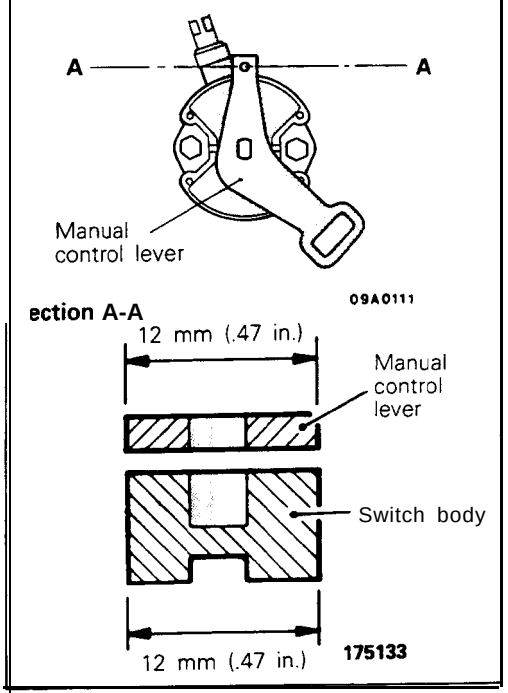


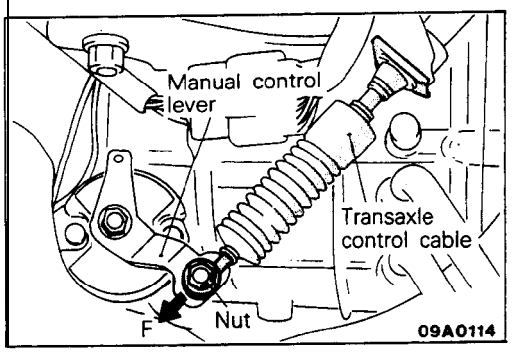
6. Loosen adjusting nuts A and B and keep them apart from the adjuster, and then gently pull the end of the cable in the direction of F.
7. Gently tighten adjusting nut A until there is contact with the adjuster.
8. Secure adjusting nut A and then turn nut B to lock.
9. Check that the selector lever is at the "N" position.
10. Check that the manual control lever moves to the positions corresponding to each position of the selector lever when the selector lever is operated.

PARK/NEUTRAL POSITION SWITCH < 1990 models>

1. Place selector lever in "N" (Neutral) position.
2. Place manual control lever in "N" (Neutral) position.
3. For adjustment, turn the park/neutral position switch body in order to align the end [12 mm (.47 in.) wide area] of the manual control lever to the flange [12 mm (.47 in.) wide area] of the park/neutral position switch body.
4. Tighten the mounting bolts of the park/neutral position switch body to the specified torque. At this time, take care to prevent dropping the switch body.

   Specified torque: 10–12 Nm (7-9 ft.lbs.)

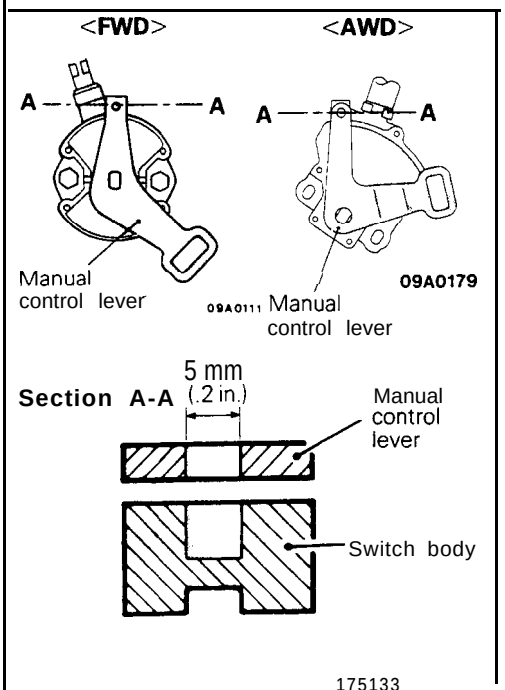




5. Loosen the nut shown in the figure, and lightly pull the end of the transaxle control cable in the "F" direction by hand.
6. Tighten the nut to the specified torque.

   Specified torque: 10–14 Nm (7–10 ft.lbs.)

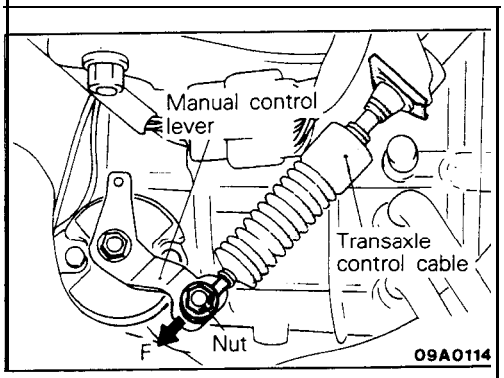
7. Check that the selector lever is in "N" position.
8. Check that it securely operates and functions on the transaxle side in the range which corresponds to each position of the selector lever.



PARK/NEUTRAL POSITION SWITCH
<From 1991 models>

1. Place selector lever in "N" (Neutral) position.
2. Place manual control lever in "N" (Neutral) position.
3. To adjust, rotate the switch body so that the manual control lever 5 mm (.2 in.) hole and the switch body 5 mm (.2 in.) hole are aligned.
4. Tighten the mounting bolts of the park/neutral position switch body to the specified torque. At this time, take care to prevent dropping the switch body.

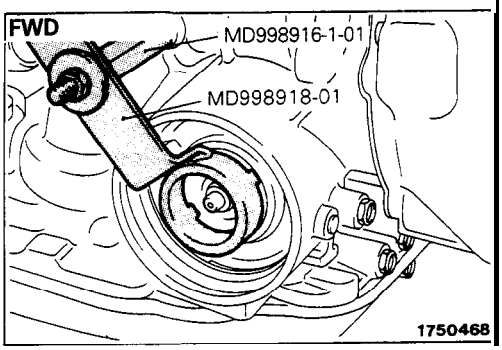
   Specified torque: 1 O-l 2 Nm (7-9 ft.lbs.)



5. Loosen the nut shown in the figure, and lightly pull the end of the transaxle control cable in the "F" direction by hand.
6. Tighten the nut to the specified torque.

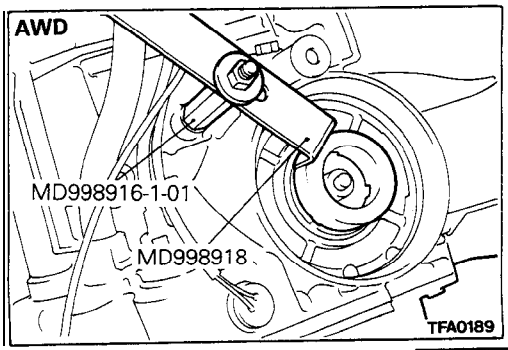
   Specified torque: 10–14 Nm (7–10 ft.lbs.)
7. Check that the selector lever is in "N" position.
8. Check that it securely operates and functions on the transaxle side in the range which corresponds to each position of the selector lever.

KICKDOWN SERVO ADJUSTMENT M23FRAB



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 transaxle case, tighten it by hand. Don't apply much torque.



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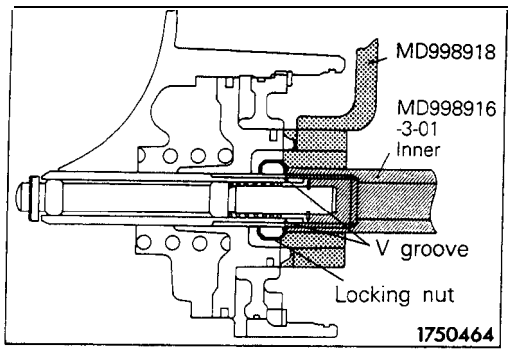
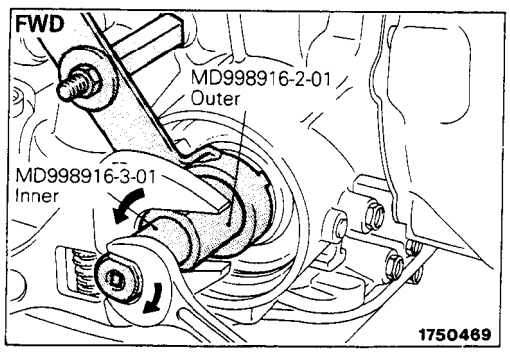
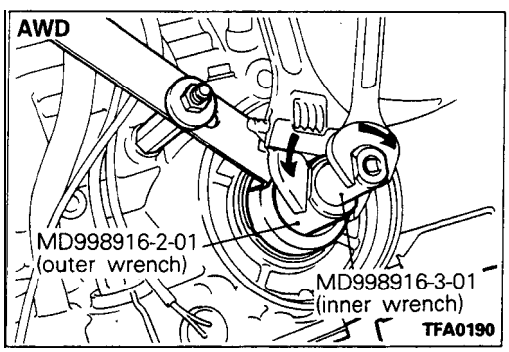
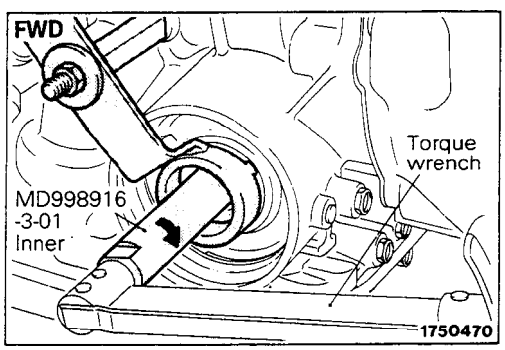


5. Loosen the locking nut to before the V groove of the adjusting rod, and tighten 'the special tool (inner) until it contacts the locking nut.

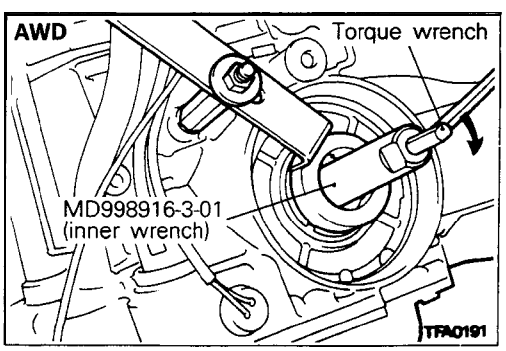


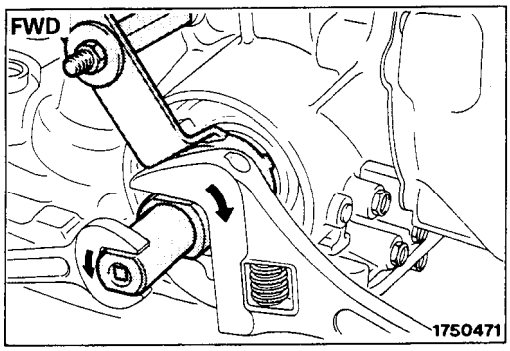
6. Engage the special tool (outer) on the lock nut.
Rotating the outer cylinder counterclockwise and the inner cylinder clockwise, lock the locking nut and special tool (inner).





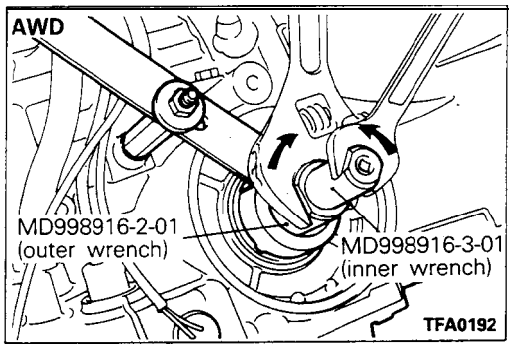
7. Attach the torque wrench to the special tool (inner), and repeat "tightening" and "returning" at a torque of 10 Nm (7.2 ft.lbs.) two times. Then, tighten it to a torque of 5 Nm (3.6 ft.lbs.). Then, back off the special tool (inner) 2 to 2¼ turns.

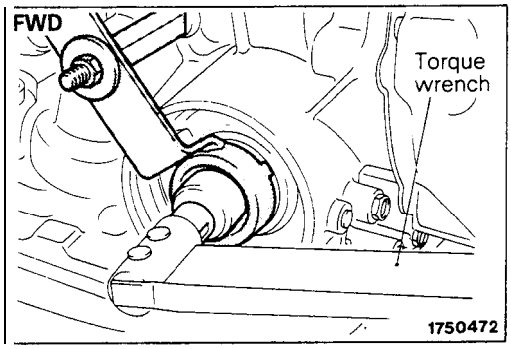




8. Engage the special tool (outer) on the locking nut.
Rotating the outer cyliner clockwise and the inner cylinder counterclockwise, unlock the locking nut and special tool (inner).

Caution
When unlocking the lock, apply equal force to both tools.



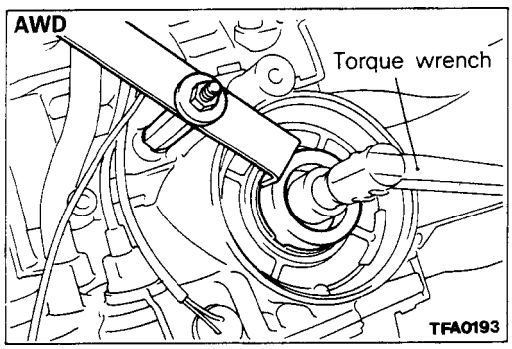


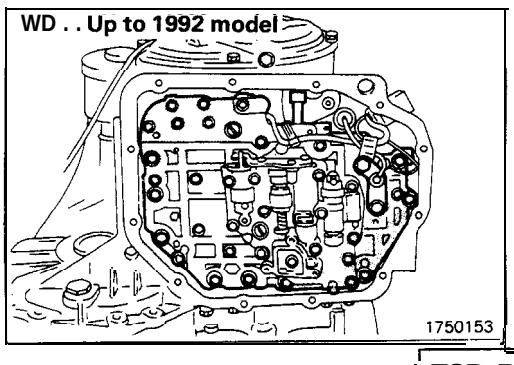
9. Tighten the locking nut by hand until the locking nut contacts the piston. Then, using the torque wrench, tighten to the specified torque.

Locking nut: 25-32 Nm (18-23 ft.lbs.)

Caution
If it is rapidly tightened with the socket wrench or torque wrench, the lock nut and adjusting rod may rotate together.

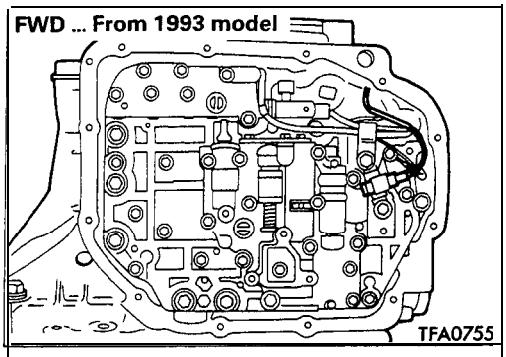
10. Remove the special tool which fastens the piston.
Attach the plug to the outlet of the low reverse pressure.

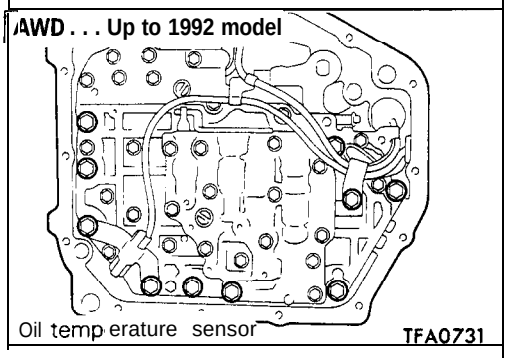


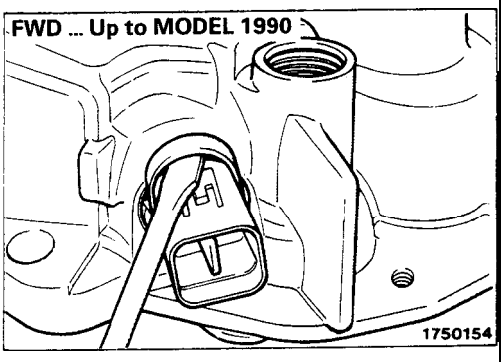


LINE PRESSURE ADJUSTMENT M23FSAB

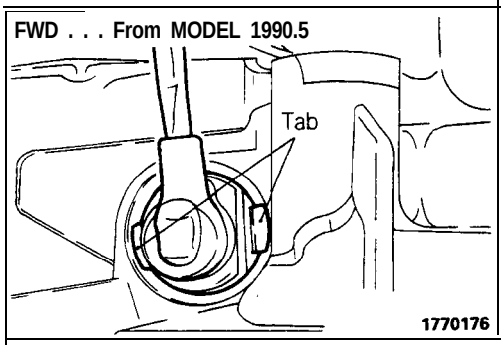
1. Drain out the automatic transaxle fluid.
2. Remove the oil pan.
3. Remove the oil filter.
4. Remove the oil-temperature sensor.



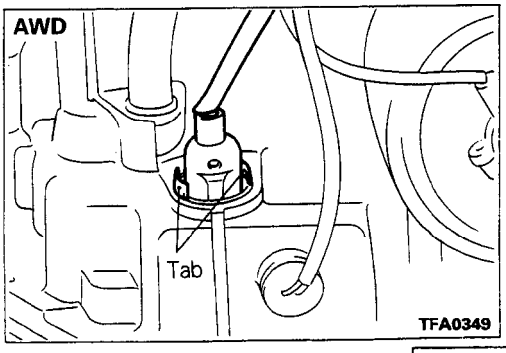




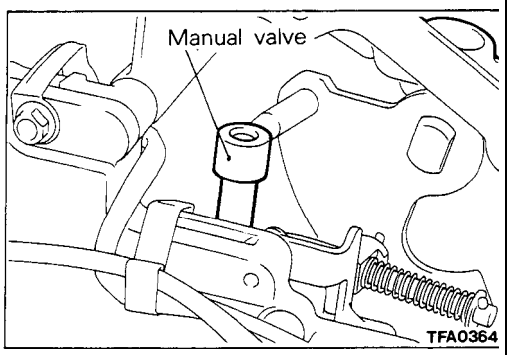
5. Remove the solenoid valve connector holding clip, and press in the connector.



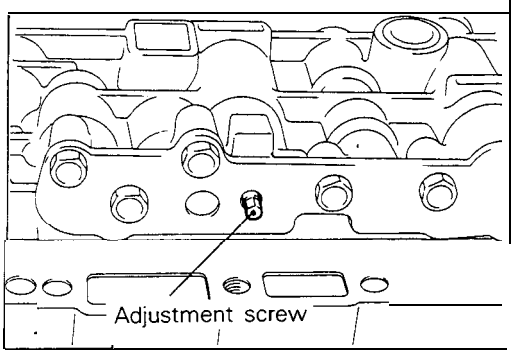
6. Press the tabs of the solenoid valve harness grommet, and then push into the case and remove.



TSB Revision

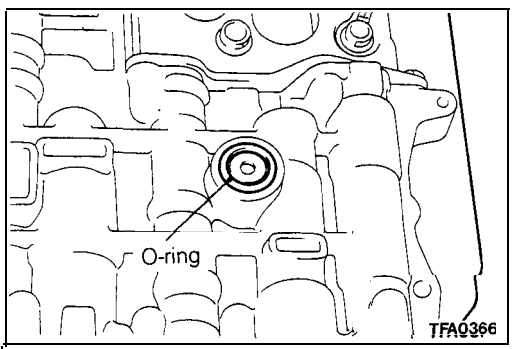


7. Remove the valve body assembly. The manual valve can come out, so be careful not to drop it.

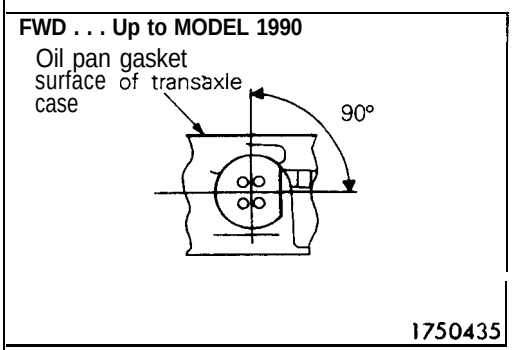


8. Turn the adjustment screw of the regulator valve and adjust so that the line pressure (kickdown brake pressure) becomes the standard value.
When the adjustment screw is turned to the clockwise, the line pressure becomes lower; when it is turned to counter-clockwise, it becomes higher.

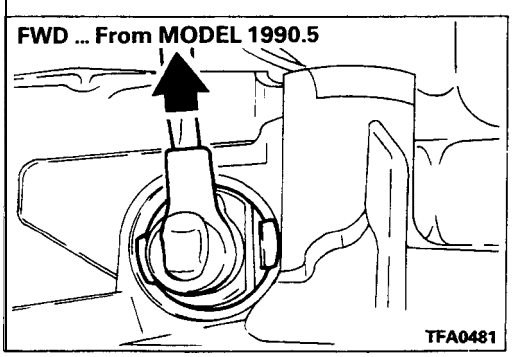
Standard value: 870–890 kPa (124-127 psi)
Oil pressure change for each turn of adjustment screw: 38 kPa (54 psi)



9. Check to be sure 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 connector with a new one.

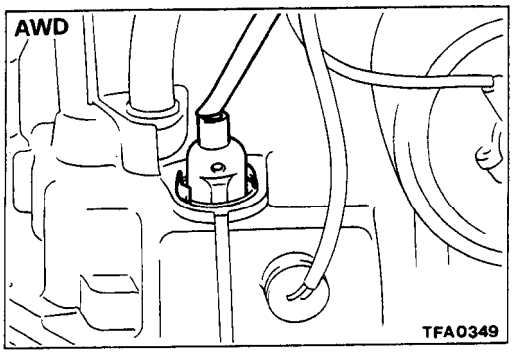


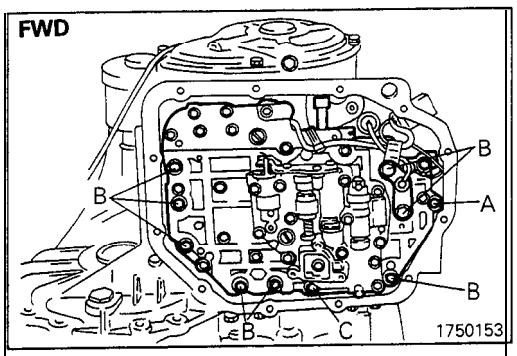
11. Install the valve body assembly to the case and then insert the solenoid valve connector into the case. Be sure, at this time, that the notched part of the connector faces as shown in the figure.
Also be careful that the lead wiring isn't caught.

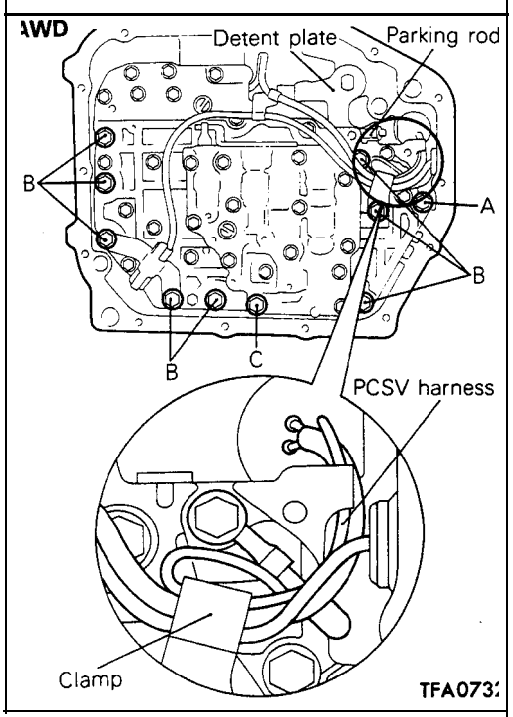


12. Replace the O-ring of the solenoid valve harness with a new one.
13. Tilt the solenoid valve harness over from the inner side of the transaxle case to the harness grommet installation hole' and install the harness grommet securely.
14. Install the harness grommet so that the lead wiring of the solenoid valve harness faces in the direction indicated by the arrow in the illustration. (FWD . . . From MODEL 1990.5)

TSB Revision







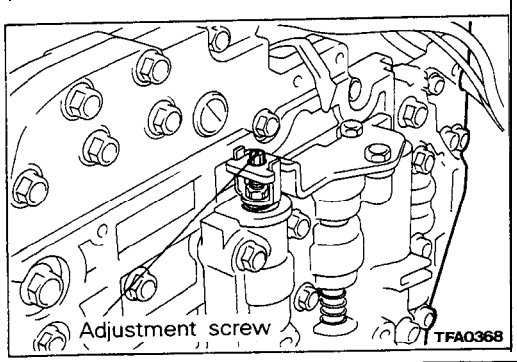
15. Tighten valve body assembly mounting.

Valve body assembly mounting bolts:
11 Nm (8.0 ft.lbs.)

A: 18 mm (.709 in.) long
B: 25 mm (.984 in.) long
C: 40 mm (1.575 in.) long

Caution (AWD)
Fix the solenoid valve and oil temperature sensor harness securely in the position shown. Since the harness of the pressure control solenoid valve (PCSV) is separately provided from the other harness, route the former harness as illustrated and clamp it. If clamping is forgotten, it will come into contact with the detent plate and parking rod.

16. Install the oil filter.
17. Install a new oil pan gasket and oil pan.
18. Pour in the specified amount of Automatic transaxle fluid.
19. Make the oil pressure test. Readjust if necessary.



REDUCING PRESSURE ADJUSTMENT M23FTABa

(If the scan tool is not available)

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. Turn 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.

TSB Revision

NOTE
When adjusting the reducing pressure, aim for the center value (425 kPa, 60 psi) of the standard value allowance.

Standard value: 415-435 kPa (59-62 psi)
Oil pressure change for each turn of adjustment screw:
22 kPa (3.1 psi) . . . FWD (Up to MODEL 1990)
45 kPa (6.4 psi) . . . FWD (From MODEL 1990.5, AWD)

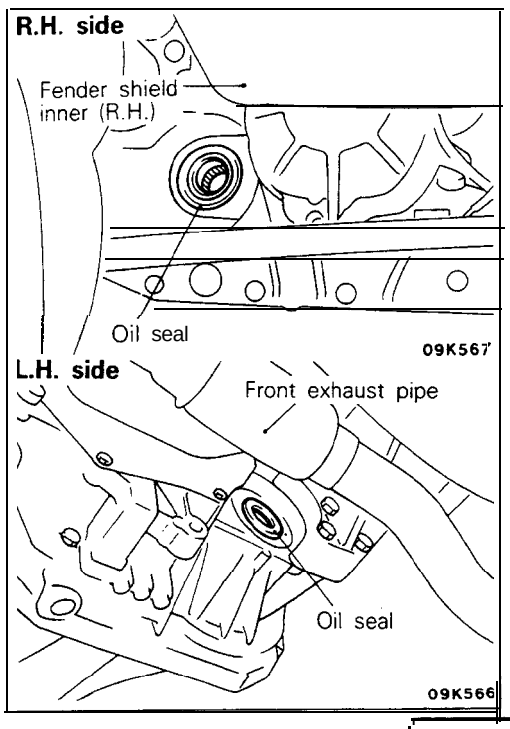
3. Install the oil filter and oil pan in the same way as for adjustment of the line pressure.
4. Make the oil pressure test. Readjust if necessary.

(If the scan tool is used)

1. Using the scan tool, forcibly drive the pressure control solenoid valve at 50% duty, and measure the kick-down brake apply pressure.
   If the kick-down brake apply pressure does not exist within the standard value width, adjust the pressure with the reducing pressure adjustment screw.

   Standard value: 275 ± 10 kPa (39 ± 1 psi)
   Oil pressure change for each turn of adjustment screw:
   25 kPa (3.6 psi) FWD (Up to MODEL 1990)
   22 kPa (3.1 psi) FWD (From MODEL 1990.5), AWD
2. Check to be sure that the reducing pressure (after the adjustment is completed) is within the range of 360–480 kPa (51 -68 psi.).

   Caution
   This adjustment should be made at an oil temperature of 70–80°C (160–180°F).
   If the adjustment is made at a temperature that is too high, the line pressure will drop during idling, with the result that it might not be possible to make the correct adjustment.



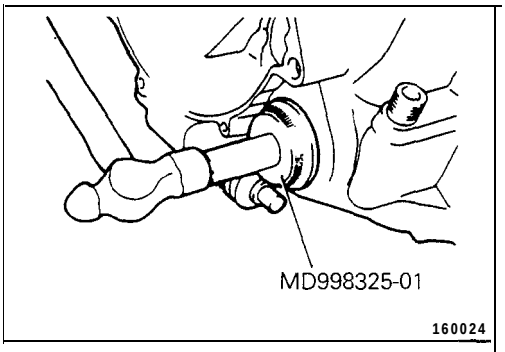
THROTTLE-POSITION SENSOR ADJUSTMENT M23FWAA

Refer to GROUP 13–On-Vehicle Inspection of MFI Components.

DRIVE SHAFT OIL SEALS REPLACEMENT M23FDBC

(1) Disconnect the drive shaft from the transaxle. (Refer to GROUP 26–Drive Shaft.)
(2) Using a flat-tip (–) screwdriver, remove the oil seal.

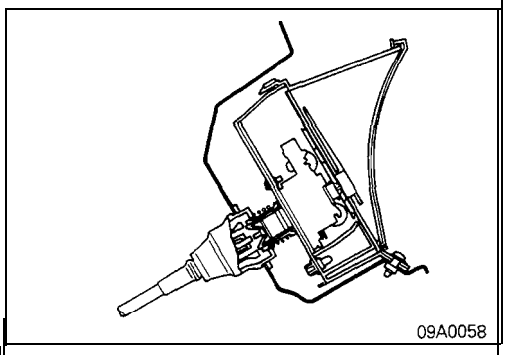
TSB Revision



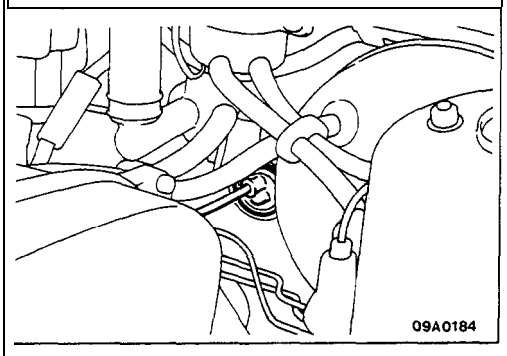
(3) Using the special tool, tap the drive shaft oil seal into the transaxle.
(4) Apply a coating of the transaxle fluid to the lip of the oil seal.

Transaxle fluid: DIAMOND ATF SP or equivalent

SPEEDOMETER CABLE REPLACEMENT M23FEAEa

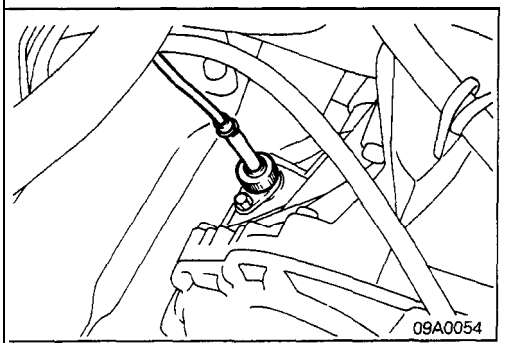


1. Correctly insert the adapter into the instrument panel, and fasten the new speedometer cable.



2. Install the grommet so that, as shown in the illustration, the cable attachment part is positioned upward.

Caution
(1) The cable arrangement should be made so that the radius of cable bends is 150 mm (5.9 in.) or more.
(2) The arrangement of the speedometer cable should be such that it does not interfere with brake tubes, etc.



3. At the transaxle end of the speedometer cable, the key joint should be inserted into the transaxle, and the nut should be securely tightened.

Caution
If the cable is not correctly and securely connected, it may cause incorrect indication by the speedometer, or abnormal noise. Be sure to connect it correctly.

TRANSAXLE CONTROL

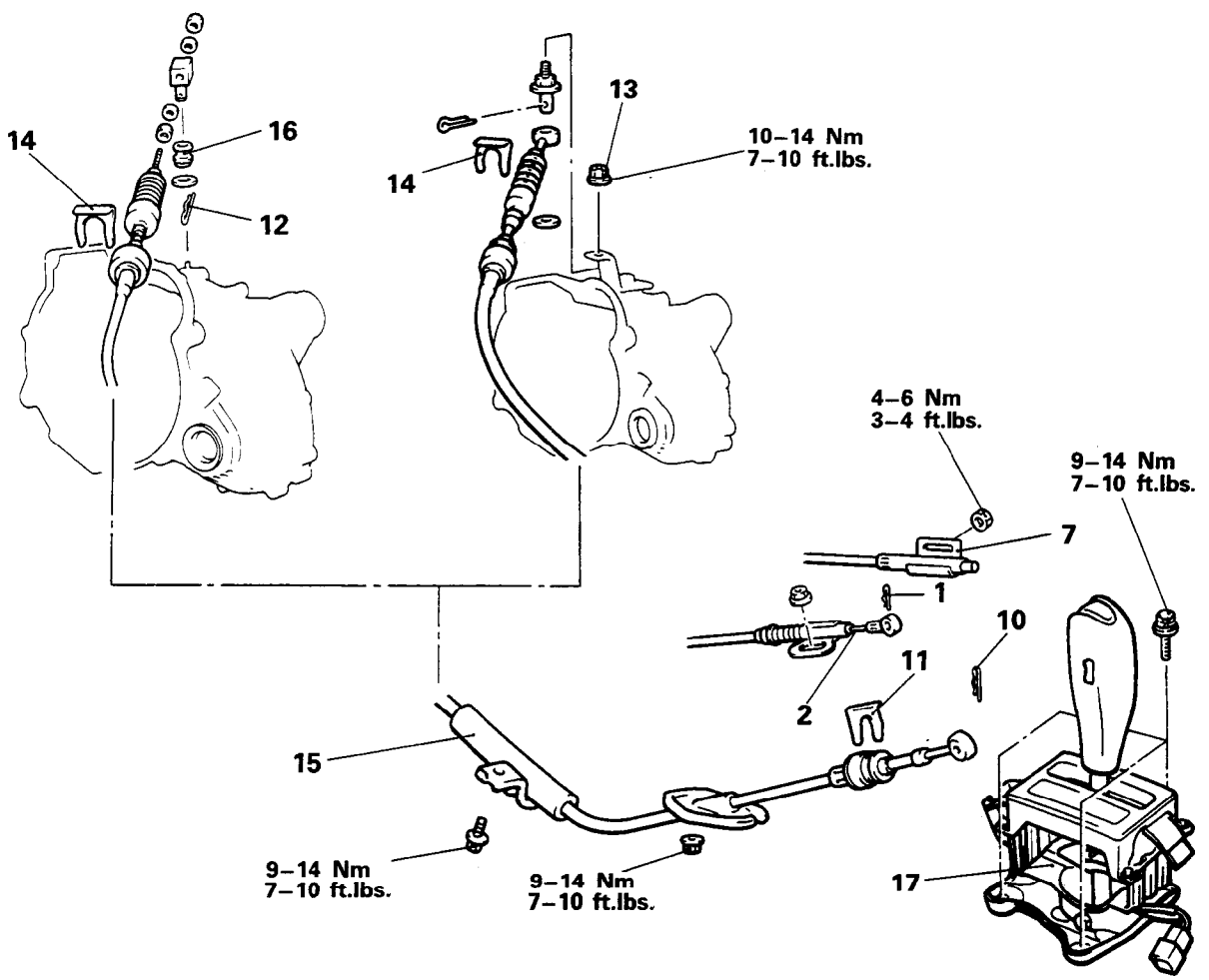
M23IA--

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Console Box Assembly (Refer to GROUP 52–Floor Console.)

*Removal and Installation of Air Cleaner (Refer to GROUP 15–Air Cleaner.)

<1989 models> <From 1990 models>

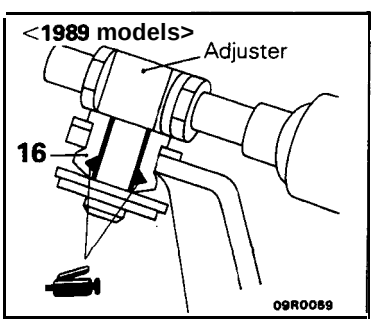


09A0158

Transaxle control cable and selector lever assmebly removal steps

1. Snap pin
2. Key-interlock cable (selector lever assembly side) } <From 1990 models>
7. Shift-lock cable (selector lever assembly side) }
10. Snap pin
11. Clip
12. Snap pin
13. Adjusting nut
14. Clip
15. Transaxle control cable
16. Bushing
17. Selector lever assembly

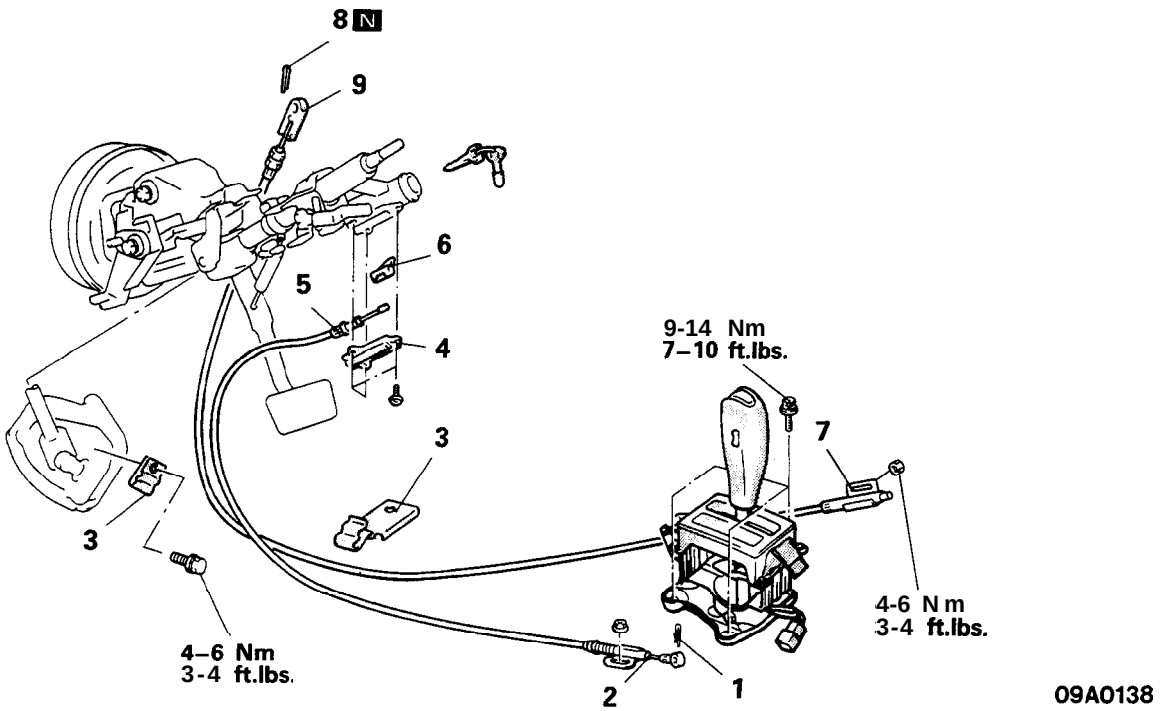
<1989 models>

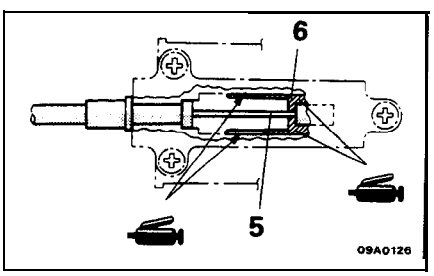


TSB Revision

Pre-removal and Post-installation Operation
- Removal and Installation of Console Box Assembly (Refer to GROUP 52–Floor Console.)
- Removal and Installation of Instrument Under Cover Assembly, Column Cover, Lap Shower Duct and Foot Shower Nozzle (Refer to GROUP 52–Instrument Panel.)

<From 1990 models>





Key-interlock cable removal steps
1. Snap pin
2. Key-interlock cable (selector lever assembly side)
3. Clamp
4. Cover
5. Key-interlock cable (steering lock assembly side)
6. Slide lever

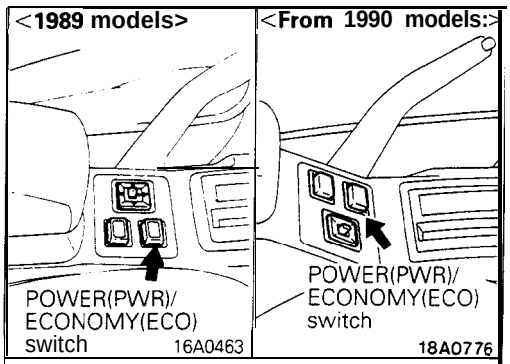
Shift-lock cable removal steps
3. Clamp
7. Shift-lock cable (selector lever assembly side)
8. Coffer pin
9. Shift-lock cable (brake pdeal side)

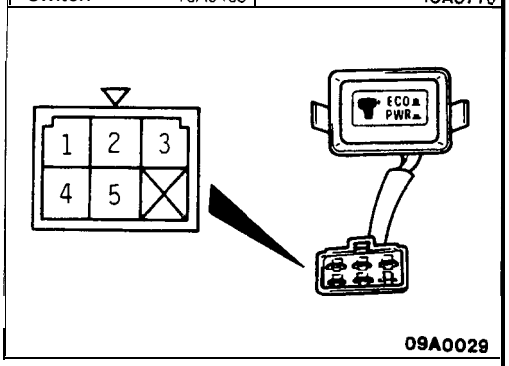
NOTE
Before connecting the key-interlock cable or the shift-lock cable, be sure to first connect and adjust the transaxle control cable.

INSPECTION

M231CAK

- Check the control cable for function and for damage.
- Check the bushing for wear or damage.





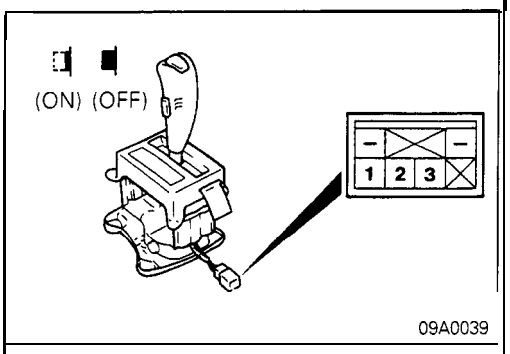
POWER (PWR)/ECONOMY (ECO) SWITCH

(1) Remove the POWER (PWR)/ECONOMY (ECO) switch from the console box.

(2) Check for continuity between terminals when the switch is OFF and when ON.

Switch position \ Terminal	1	2	3	4	–	5
ON (PWR)	O	O		O	O	O
OFF (ECO)		O	O	O	O	O

NOTE
O-O indicates that there is continuity between the terminals.

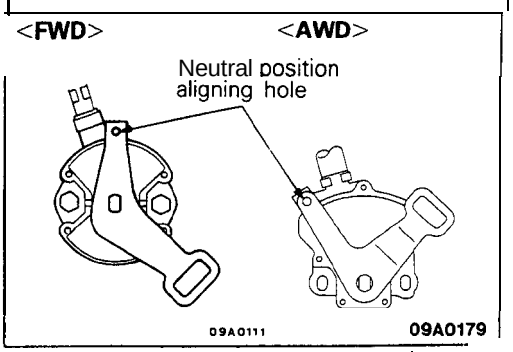


OVERDRIVE CONTROL SWITCH

Check for continuity between terminals when the switch is OFF and when ON.

Switch position \ Terminal	1	2	3
ON (Overdrive activation)	0	0	
OFF (Overdrive non-activation)	0		3

NOTE
O-O indicates that there is continuity between the terminals.

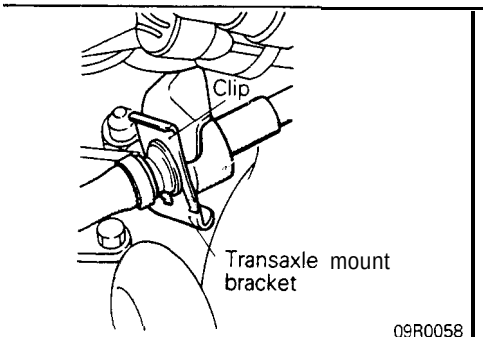


SERVICE POINTS OF INSTALLATION

M231DAQ

15. INSTALLATION OF TRANSAXLE CONTROL CABLE

Move the selector lever and the park/neutral position switch to the “N” position, and install the transaxle control cable.

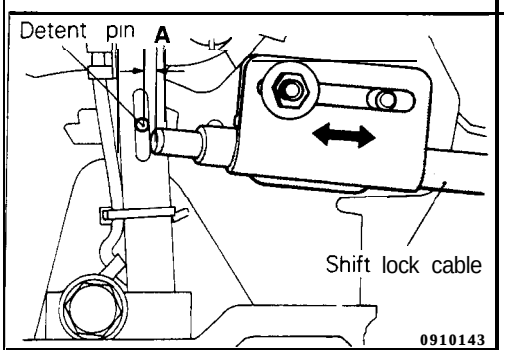


14. INSTALLATION OF CLIP

When connecting the control cable to the transaxle mount bracket, install the clip until it contacts the control cable, in the position shown in the figure.

. ADJUSTMENT OF TRANSAXLE CONTROL CABLE

Refer to the section concerning adjustment of the park/ neutral position switch. (Refer to P.23-84.)

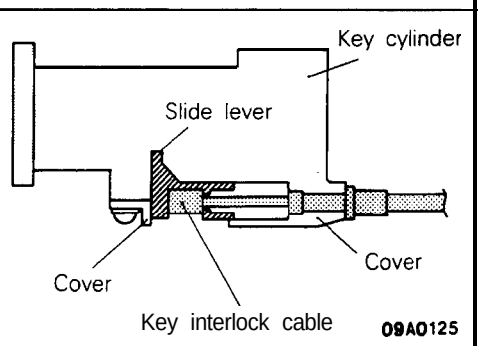


7. INSTALLATION OF SHIFT LOCK CABLE (SELECTOR LEVER ASSEMBLY SIDE)

(1) Move the selector lever to the "R" position.
(2) Clamp the shift lock cable.
(3) Connect the shift lock cable to the selector lever assembly, and temporarily tighten the nut.
(4) Slide the shift lock cable so that the distance between the selector lever assembly's detent pin and the end of the shift lock cable is the standard value, and then tighten the nut at the specified torque.

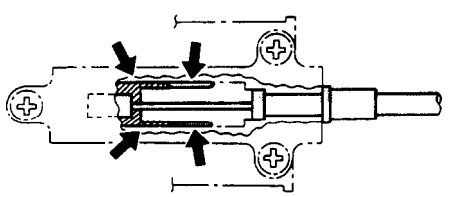
Standard value (A): 1–4 mm (.04–.15 in.)

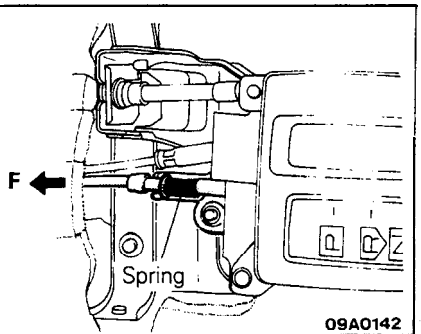
(5) After connecting the shift lock cable, check the shift lock mechanism. (Refer to P.23-84.)



6. INSTALLATION OF SLIDE LEVER/5. KEY INTERLOCK CABLE (STEERING LOCK ASSEMBLY SIDE)

(1) With the ignition key either at the "LOCK" position or removed, install the slide lever to the key cylinder.
(2) Connect, as shown in the figure, the key interlock cable to the slide lever and the key cylinder.
(3) Apply a light coating of multi-purpose grease where shown in the figure.
(4) Install the key interlock cable.



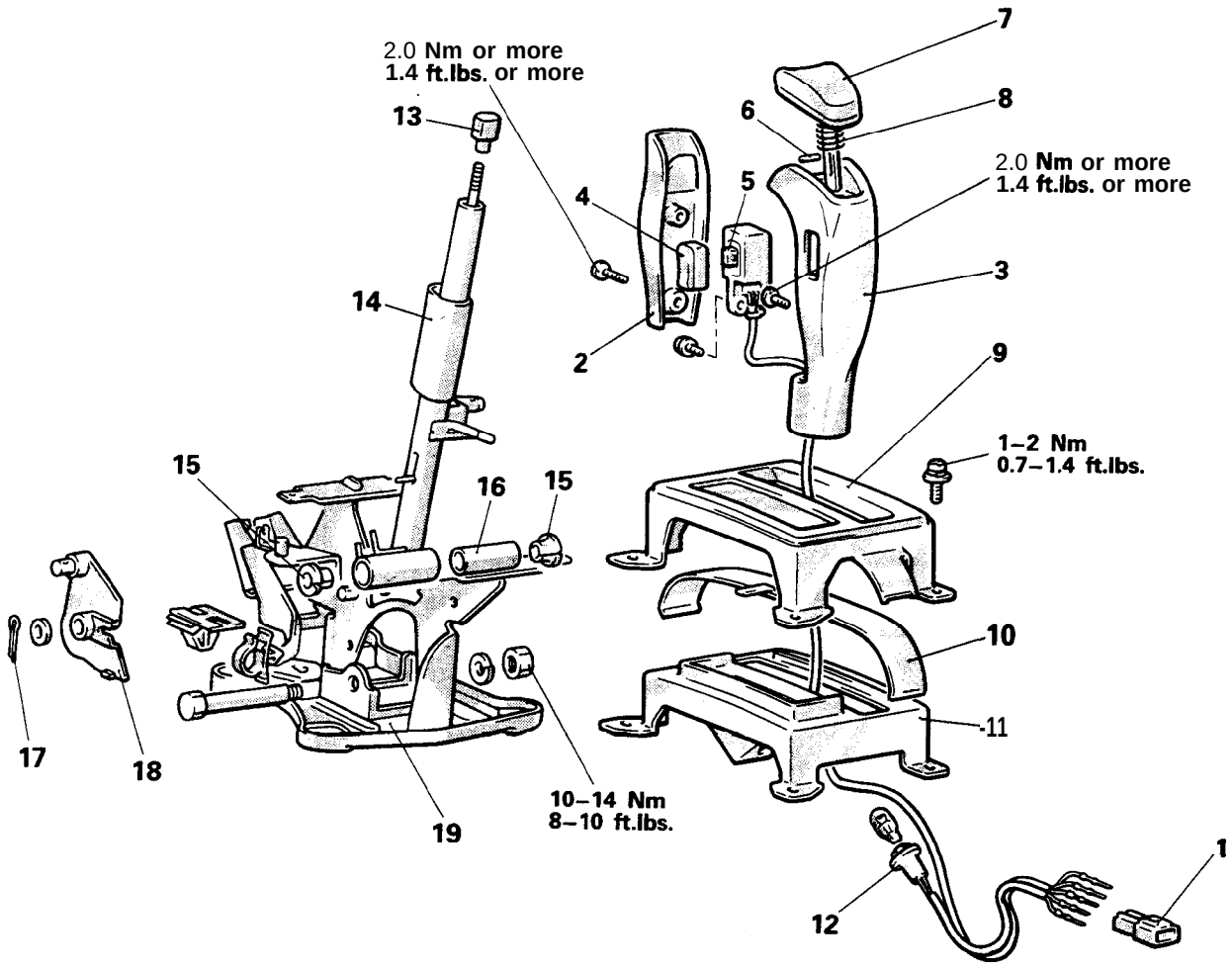


2. INSTALLATION OF KEY INTERLOCK CABLE (SELECTOR LEVER ASSEMBLY SIDE)

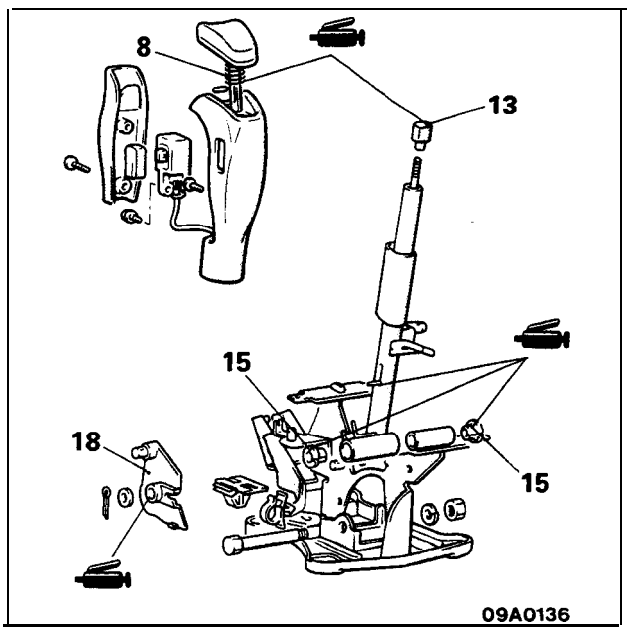
(1) Move the selector lever to the "P" postion.
(2) Connect the key interlock cable to the selector lever assembly's lock cam. Be sure that the spring installed to the key interlock cable is as shown in the figure.
(3) While gently pressing the lock cam in the F direction, tighten the nut to secure the key interlock cable.
(4) After connecting the key interlock cable, check the key interlock mechanism. (Refer to P.23-83.)

DISASSEMBLY AND REASSEMBLY (SELECTOR LEVER ASSEMBLY)

M23OE--



09A0135



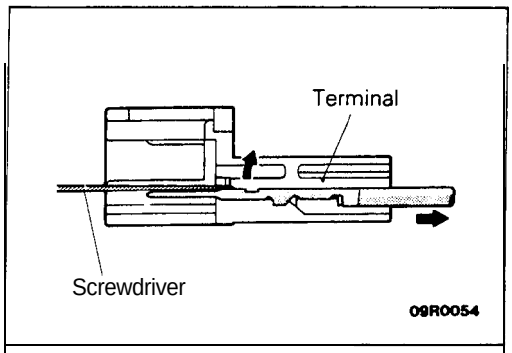
09A0136

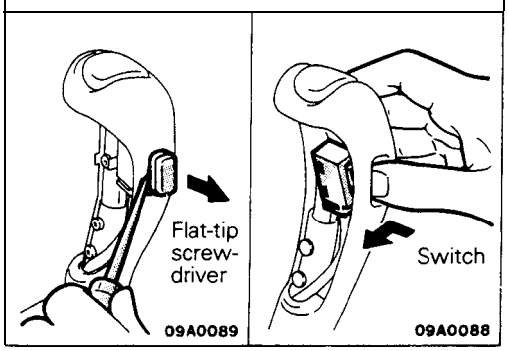
Disassembly steps

1. Overdrive control switch connector
2. Cover
3. Selector knob
4. Overdrive control switch button
5. Overdrive control switch
6. Pin
7. Pushbutton
8. Spring
9. Indicator panel
10. Slider
11. Indicator panel lower
12. Socket assembly
14. Lever assembly
15. Bushing
16. Pipe
17. Cotter pin
18. Lock cam

<From 1990 models>

19. Bracket assembly





SERVICE POINTS OF DISASSEMBLY M230FAC

1. REMOVAL OF OVERDRIVE CONTROL SWITCH CONNECTOR

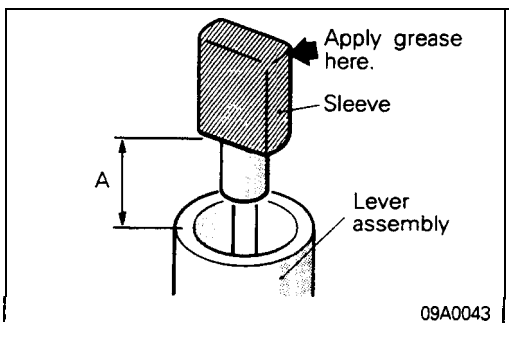
Disconnect the overdrive control switch connector and then remove the terminal from the overdrive control switch connector.

4. REMOVAL OF OVERDRIVE CONTROL SWITCH BUTTON/5. OVERDRIVE CONTROL SWITCH

(1) Using the flat-tip screwdriver, remove the overdrive control switch button.
(2) Pressing the switch, remove the overdrive control switch.

INSPECTION M230GAD

- Check the detent plate for wear.
- Check the bushing for wear or damage.
- Check the spring for damage or deterioration.



SERVICE POINTS OF REASSEMBLY M230HAL

13. INSTALLATION OF SLEEVE

(1) Place the selector lever in the "N" position, and then turn the sleeve so that the clearance between the **sleeve and the lever assembly end is within the** standard value.

Standard value (A): 15.2–15.9 mm (.598–.625 in.)

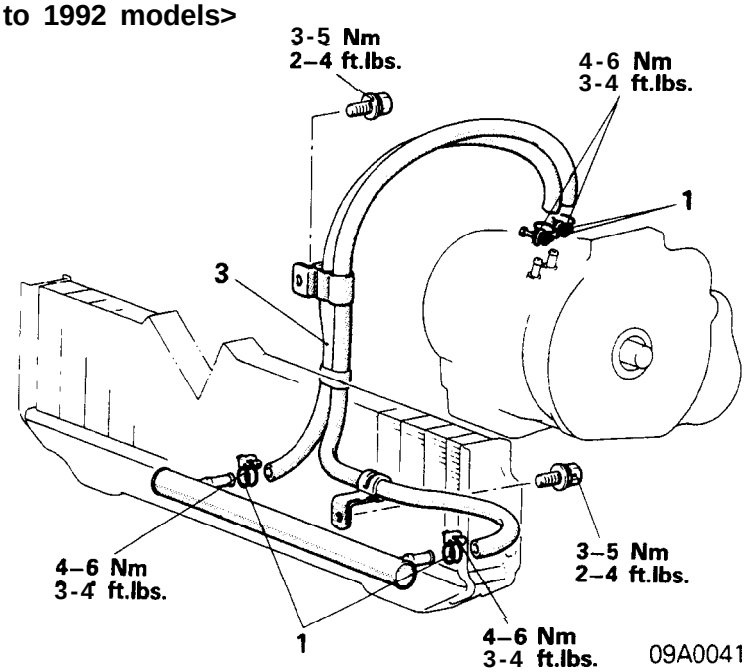
(2) Apply a coating of multi-purpose grease to the surface of the sleeve.

TRANSAXLE OIL COOLER HOSES

M23SA--

REMOVAL AND INSTALLATION

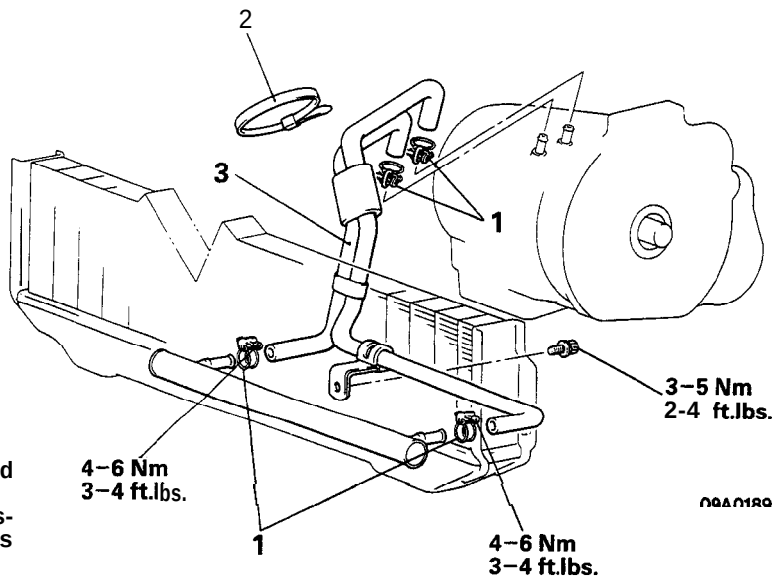
<Up to 1992 models>



Pre-removal and Post-installation Operation

- Drainage and Filling of Automatic Transaxle Fluid
  (Refer to GROUP 00 – Maintenance Service.)

< 1993 models>



Removal steps

1. Hose clamp
2. Cable clamp
3. Oil cooler hose assembly

Caution

1. Take care not to spill the transaxle fluid when removing components.
2. After removing the oil cooler hose assembly, plug so that foreign materials cannot enter the transaxle.

INSPECTION

M23SCAF

- Check the hose for crack, damage and clog.
- Check for rusted or clogged radiator oil cooler.

TSB Revision

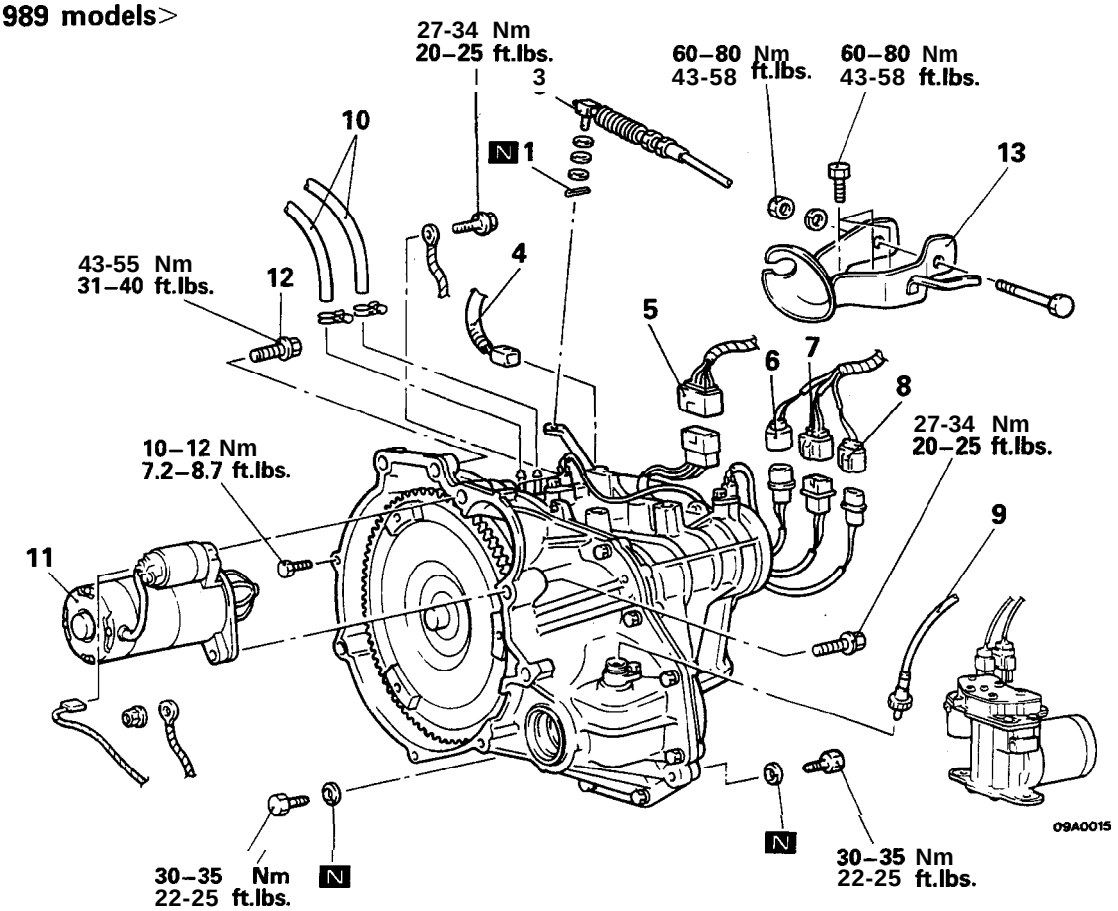
TRANSAXLE ASSEMBLY <FWD>

M23LA--

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
@Draining and Supplying of the Transaxle Fluid
(Refer to GROUP 00–Maintenance Service.)
*Removal and Installation of the Battery and Battery Tray
•Removal and Installation of the Air Cleaner
(Refer to GROUP 15–Air Cleaner.)
*Removal and Installation of the Air Compressor
(Vehicles with ACTIVE-ECS)
(Refer to GROUP 33B–Air Compressor.)

<1989 models>



Removal steps

1. Snap pin
3. Connection for transaxle control cable (Refer to P.23-84.)
4. Solenoid connector
5. Park/neutral position switch connector
6. Pulse generator connector
7. Kickdown servo switch connector
8. Oil temperature sensor connector
9. Connection for sppedometer cable
10. Connection for oil cooler hose
11. Connection for starter motor
12. Upper coupling bolt for transaxle assembly and engine assembly
13. Transaxle mount bracket

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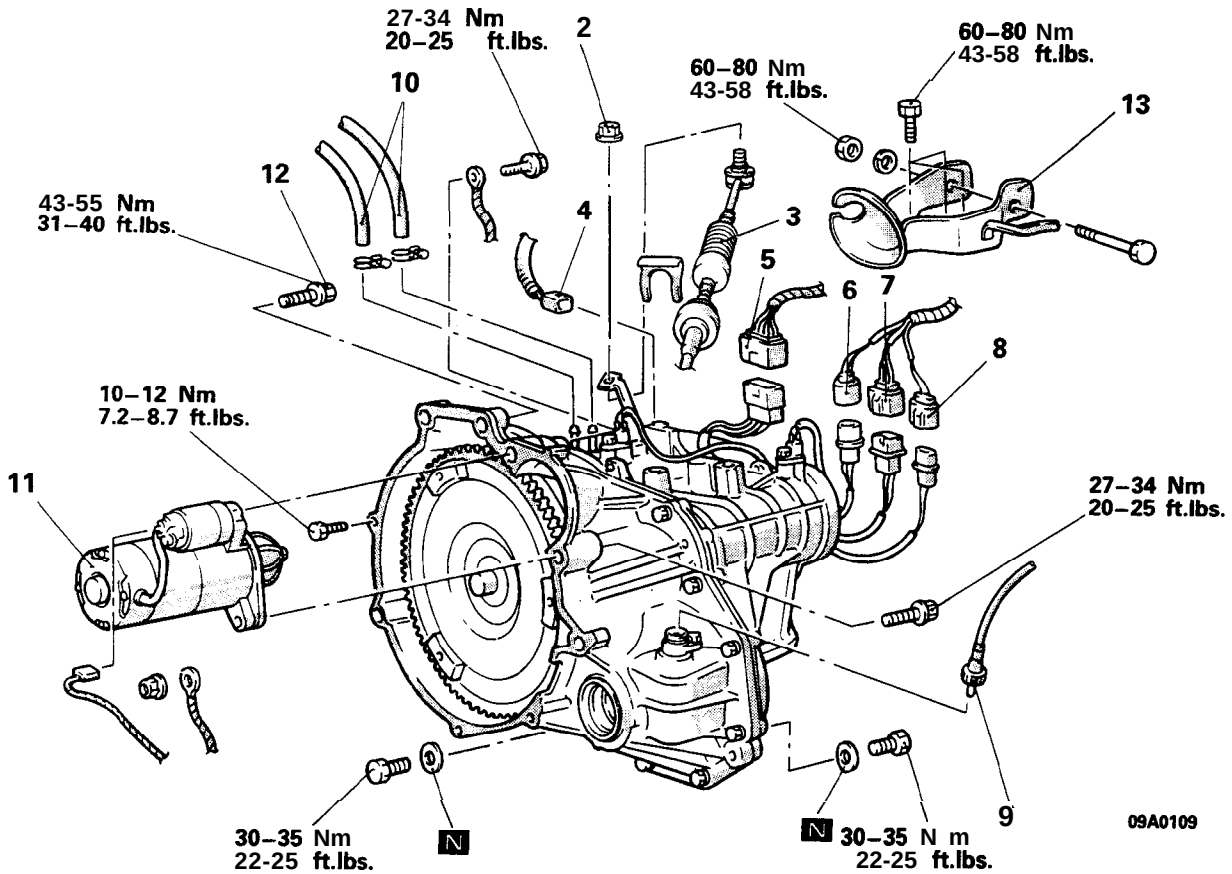
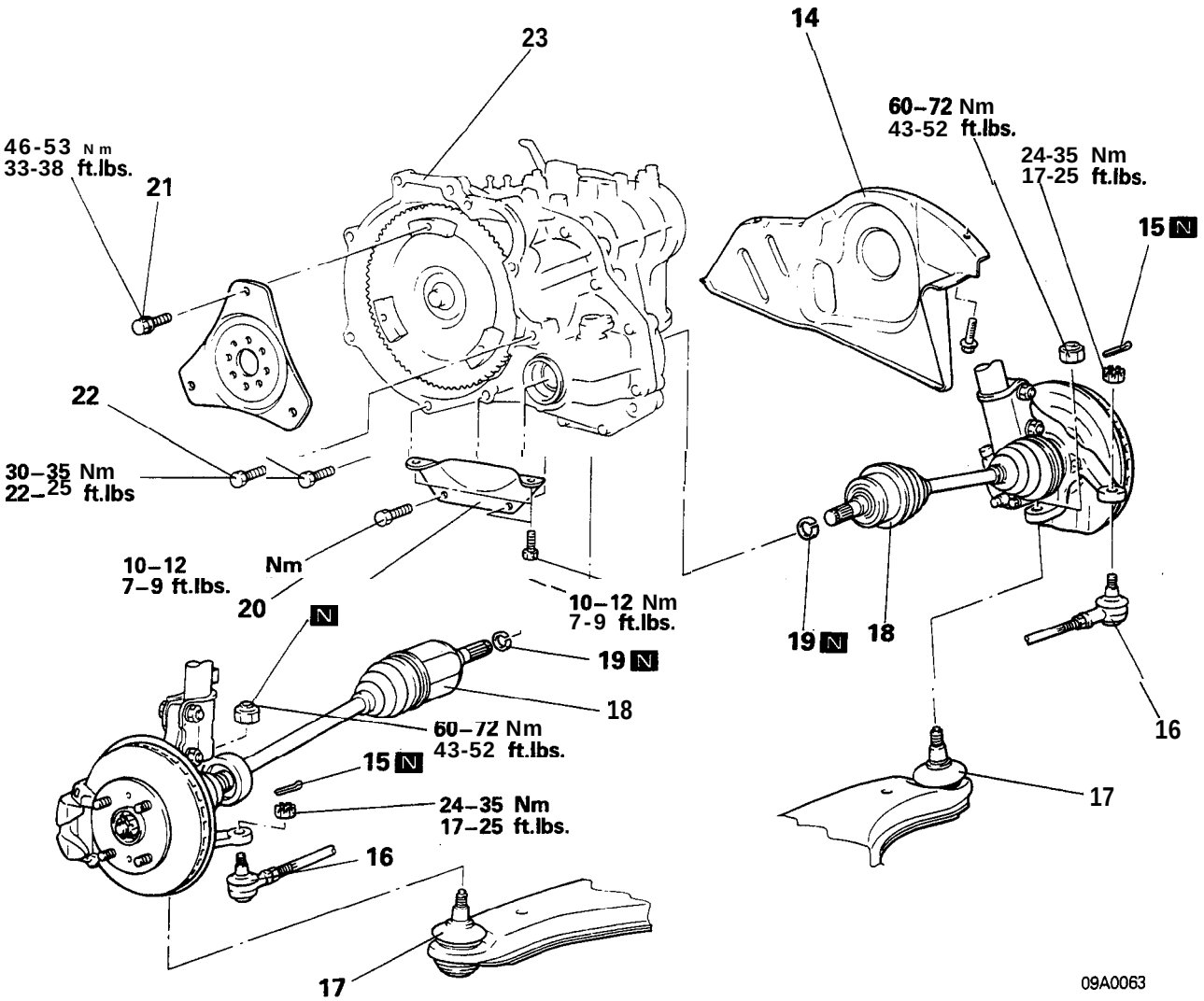
<From 1990 models>



Removal steps

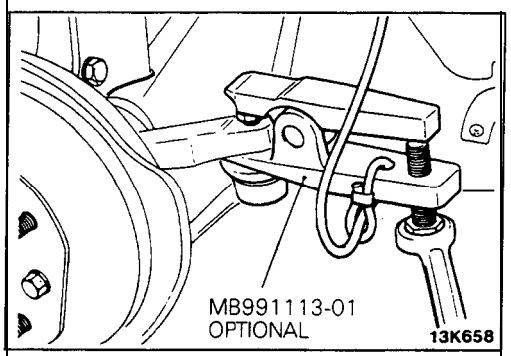
2. Adjusting nut
3. Connection for transaxle control cable (Refer to P.23-85.)
4. Solenoid connector
5. Park/neutral position switch connector
6. Pulse generator connector
7. Kickdown servo switch connector
8. Oil temperature sensor connector
9. Connection for speedometer cable
10. Connection for oil cooler hose
11. Connection for starter motor
12. Upper coupling bolt for transaxle assembly and engine assembly
13. Transaxle mount bracket

TSB Revision



14. Under guard
15. Cotter pin
16. Connection for tie rod end
17. Connection for lower arm ball joint
18. Connection for drive shaft
19. Circlip
20. Bell housing cover
21. Special bolts
22. Lower coupling bolt for transaxle assembly and engine assembly
23. Transaxle assembly

TSB Revision

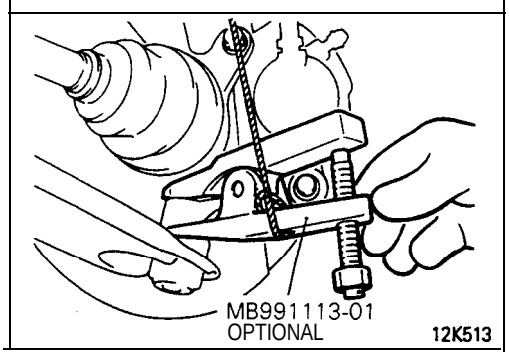


SERVICE POINTS OF REMOVAL M23LBAK

16. DISCONNECTION OF TIE ROD END

Using the special tool, disconnect the tie rod end from the knuckle.

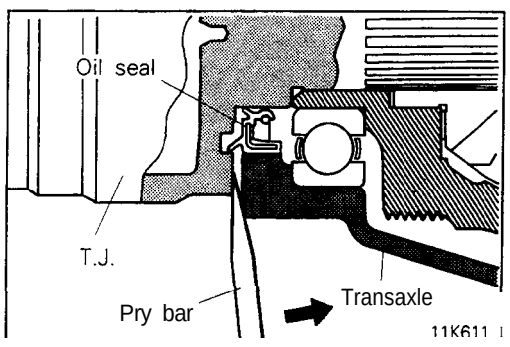
Caution
1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it.



17. DISCONNECTION OF LOWER ARM BALL JOINT

Using the special tool, disconnect the lower arm ball joint from the knuckle.

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

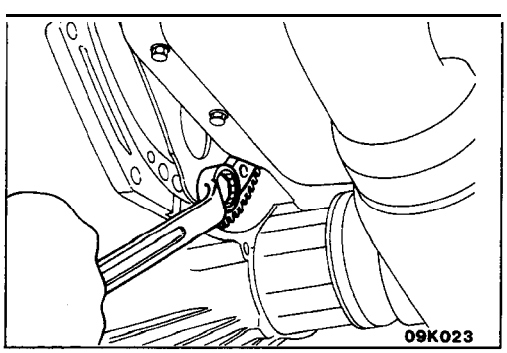


18. DISCONNECTION OF DRIVE SHAFT

(1) Insert a pry bar between the transaxle case and the drive shaft, and then pry the drive shaft from the transaxle.

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 damaged the oil seal.

(2) Keep the removed drive shaft as far away from the transaxle case as possible, and secure (by using rope. etc.) the T.J. to the body so that it does not fall.



21. REMOVAL OF SPECIAL BOLTS

(1) Remove the three special bolts connecting the converter to the drive plate.

NOTE
To remove the special bolts of torque converter, turn engine crankshaft with a box wrench to bring one of the bolts to the position appropriate for removal. After removing the bolt, turn the crankshaft in the same manner as above and remove all remaining bolts one after another.

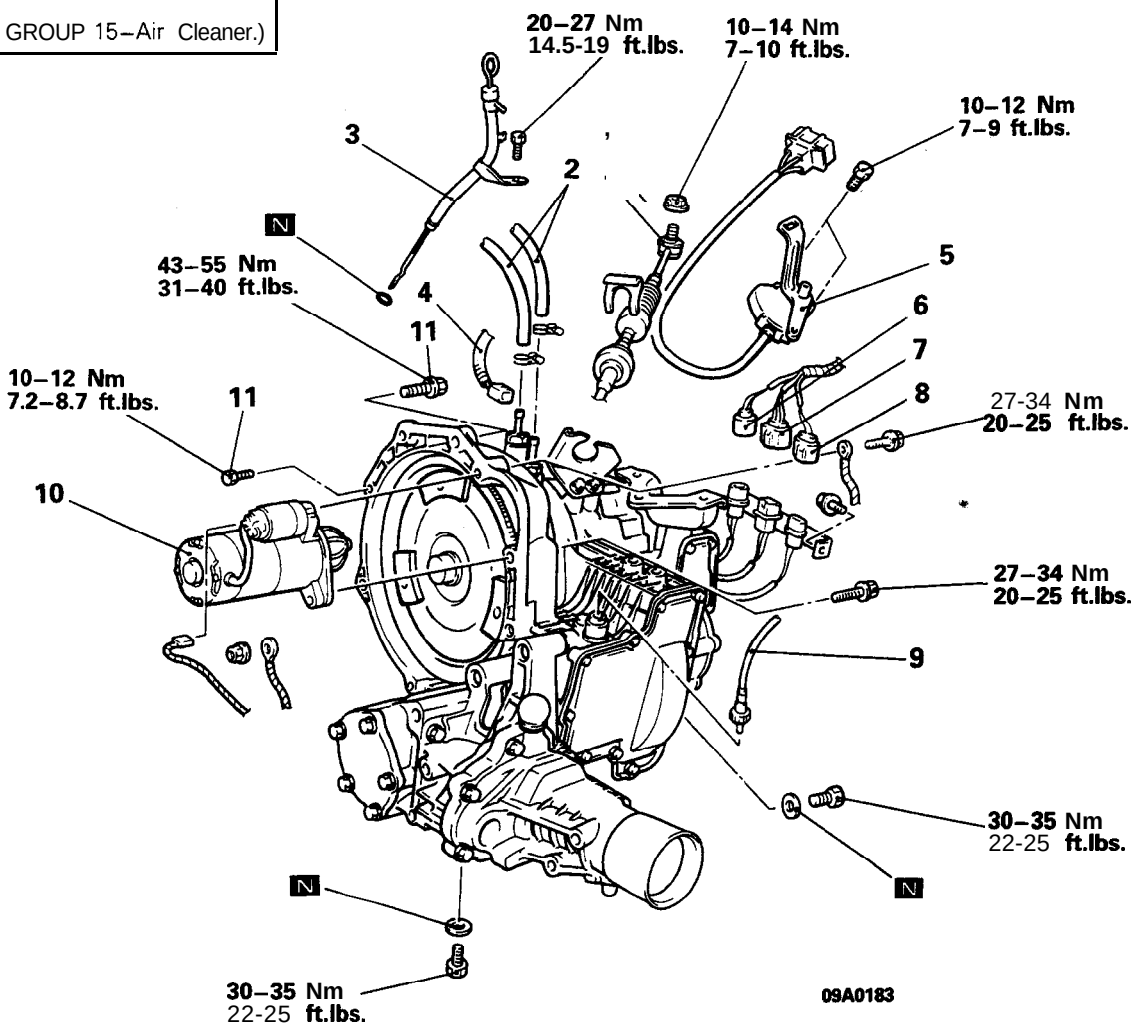
(2) After removing the special bolts, push the torque converter toward transaxle so that it does not remain on the engine side.

TRANSAXLE ASSEMBLY <AWD>

M23LA--1

REMOVAL AND INSTALLATION

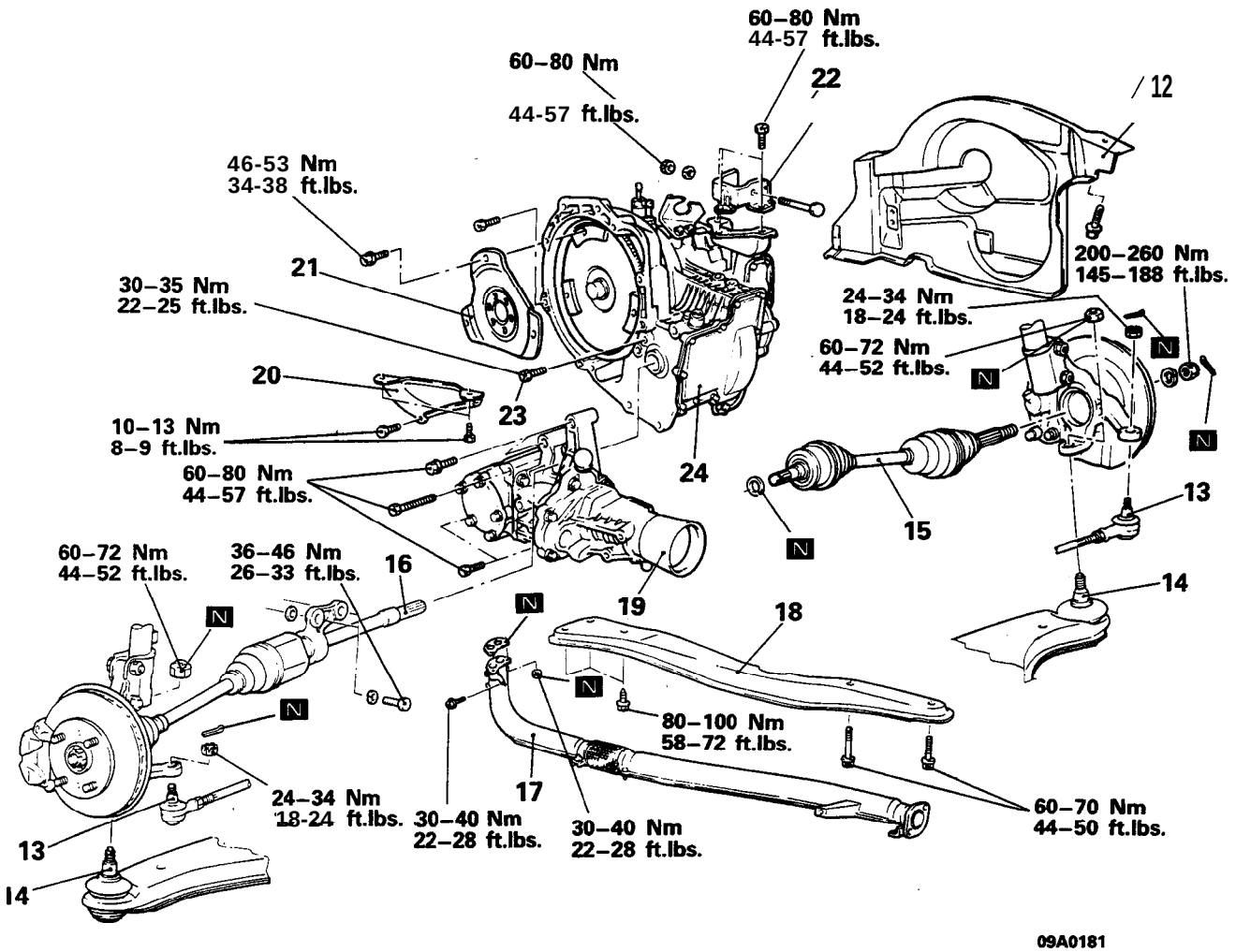
Pre-removal and Post-installation Operation
- Draining and Supplying of the Transaxle Fluid (Refer to GROUP 00–Maintenance Service.)
- Removal and Installation of the Battery and Battery Tray
- Removal and Installation of the Air Cleaner (Refer to GROUP 15–Air Cleaner.)



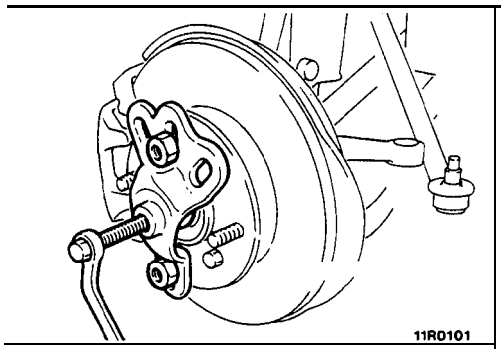
Removal steps

1. Connection for transaxle control cable (Refer to P.23-86.)
2. Connection for oil cooler hose
3. Automatic transaxle dipstick
4. Connection for solenoid connector
5. Park/neutral position switch (Refer to P.23-86.)
6. Connection for kickdown servo switch connector
7. Connection for pulse generator connector
8. Connection for oil temperature sensor connector
9. Connection for speedometer cable
10. Starter motor
11. Upper coupling bolt for transaxle assembly and engine assembly

TSB Revision



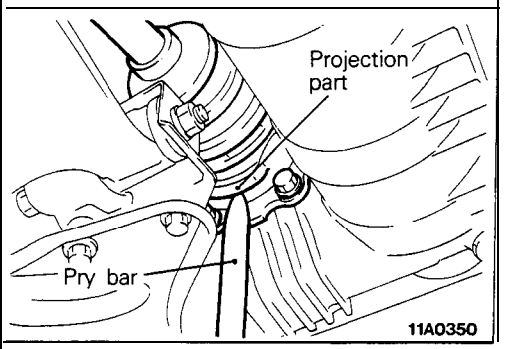
12. Under cover
◆◆ 13. Connection for tie rod end (Refer to P.23-104.)
◆◆ 14. Connection for lower arm ball joint (Refer to P.23-104.)
◆◆ ● * 15. Drive shaft (R.H.)
◆◆ 16. Connectin for drive shaft (L.H.)
17. Front exhaust pipe
18. Right member
◆◆ 19. Transfer assembly (Refer to P.23-108.)
20. Bell housing cover
21. Connection for drive plate and torque converter
22. Transaxle mounting bracket
23. Lower coupling bolt for transaxle assembly and engine assembly
◆◆◆◆ 24. Transaxle assembly (Refer to P.23-107.)


11R0101

SERVICE POINTS OF REMOVAL M23LBAU

15. REMOVAL OF DRIVE SHAFT (R.H.)

(1) Use the general service tool to push out the drive shaft from the front hub.



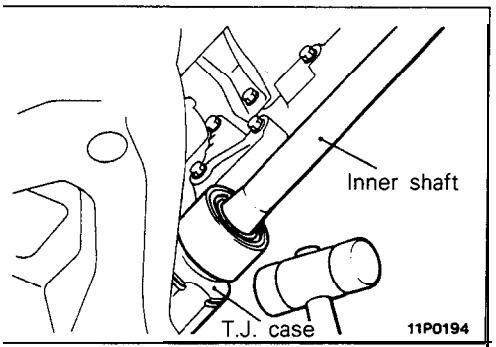
11A0350

(2) Insert a pry bar at the projection part and remove the drive shaft (R.H.) from the transaxle.

Caution
Do not pull out the drive shaft; doing so will damage the T.J.; be sure to use the pry bar.

16. DISCONNECTION OF DRIVE SHAFT (L.H.)

(1) Disconnect the inner shaft assembly from the transaxle by lightly tapping the T.J. case with a plastic hammer, etc.
(2) Suspend the drive shaft with wire or something similar so that there are no sudden bends in the joints.



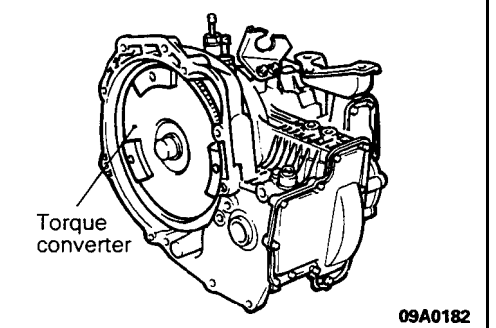
11P0194

SERVICE POINTS OF INSTALLATION M23LDAN

24. INSTALLATION OF TRANSAXLE ASSEMBLY

First install the torque converter on the transaxle and then install the transaxle assembly on the engine.

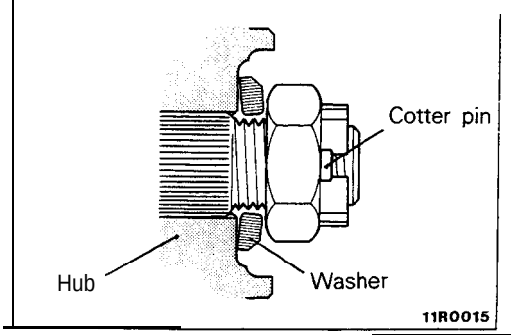
Caution
Be sure to install the torque converter on the transaxle first. If it is first installed on the engine, the oil seal on the transaxle side will be damaged.



09A0182

15. INSTALLATION OF DRIVE SHAFT (R.H.)

Install the drive shaft nut for the drive shaft (R.H.) in the following way.
(1) Be sure to installl the washer and drive shaft nut in the specified direction.
(2) After installing the wheel, lower the vehicle to the ground and finally tighten the drive shaft nut.
(3) If the position of the cotter pin holes does not match, tighten the nut up to 260 Nm (188 ft.lbs.) in maximum.
(4) Install the cotter pin in the first matching holes and bend it securely.

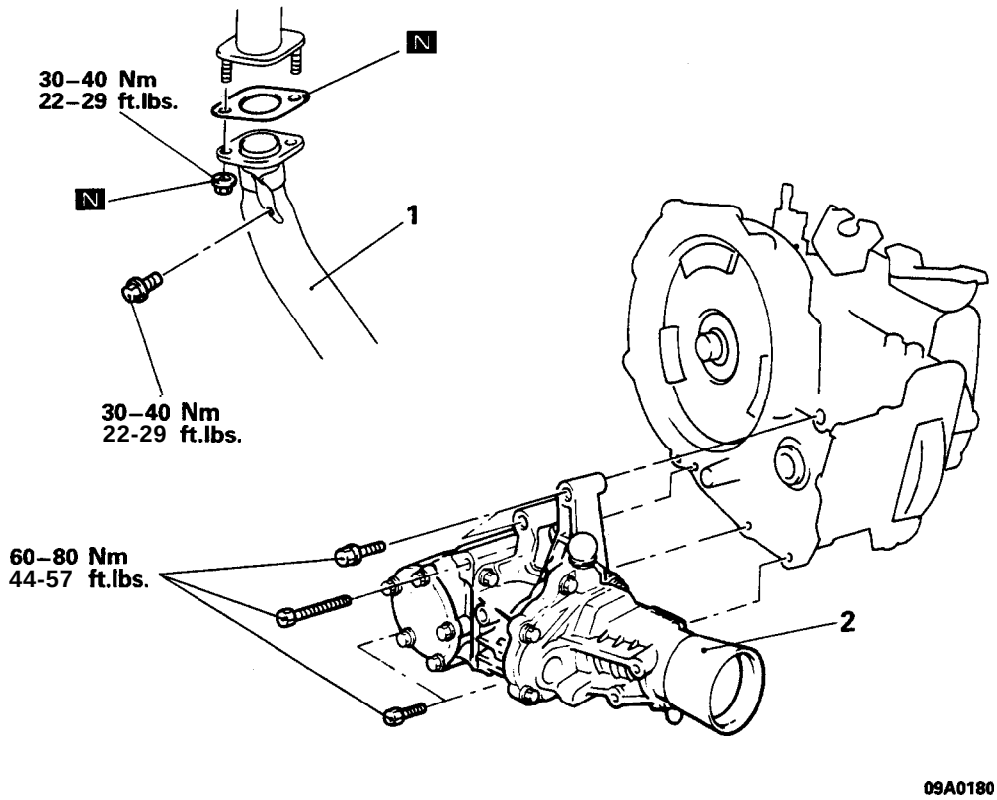


11R0015

TRANSFER

M23VA--

REMOVAL AND INSTALLATION



Removal steps

1. Front exhaust pipe
◆■► 2. Transfer assembly (Refer to P.23-105.)

TSB Revision

PROPELLER SHAFT

CONTENTS

M25AA--

PROPELLER SHAFT 4

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SPECIFICATIONS **2**

General Specifications 2

Lubricants 3

Service Specifications 2

Torque Specifications 2

TROUBLESHOOTING 3

SPECIFICATIONS

The AWD vehicles have been discontinued from 1993 models.

GENERAL SPECIFICATIONS

M25CA--

Items	Specifications	
	M/T	A/T
Propeller shaft		
Type	4 joint propeller shaft	4 joint propeller shaft
Length x O.D. mm (in.)		
Front	707 x 50.8 (27.8 x 2.00)	707 x 50.8 (27.8 x 2.00)
Center	777.5 x 65 (30.8 x 2.56)	764.4 x 65 (30.1 x 2.56)
Rear	530.5 x 50.8 (20.9 x 2.00)	543.3 x 50.8 (21.4 x 2.00)
Universal joint		
Type		
No. 1 (front)	Cross type	Cross type
No. 2 (center front)	Cross type	Cross type
No. 3 (center rear) [Lobro joint	Equal velocity type	Equal velocity type
No. 4 (rear) or D.O.J.]	Cross type	Cross type
Cross type universal joint bearing	Needle roller bearing (oilless type)	Needle roller bearing (oilless type)
Cross type universal joint		
Journal O.D. mm (in.)	14.689 (.5783)	14.689 (.5783)
Equal velocity joint type	Lobro joint (oilless type)	D.O.J. (oilless type)
Equal velocity joint size O.D.mm (in.)	94 (3.7)	94 (3.7)

NOTE
Propeller shaft length indicates the length between the center points of each joint.

SERVICE SPECIFICATIONS

M25CB--

Items	Specifications
Standard value	
Journal axial play mm (in.)	0.02–0.06 (.0008–.0024)
Limit	
Propeller shaft runout(Dial indicator reading)	
Front mm (in.)	0.6 (.024) or less
Center mm (in.)	0.6 (.024) or less
Rear mm (in.)	0.6 (.024) or less

TORQUE SPECIFICATIONS

M25CC--

Items	Nm	ft.lbs.
Center bearing self locking nut	30–40	22-29
Flange yoke to differential companion flange	30–35	22-25
Center propeller shaft to center yoke	160–220	116-159
Rear propeller shaft to companion flange	160–220	116-159
Companion flange to Lobro joint assembly <M/T>	30–40	22-29
Companion flange to D.O.J. assembly <A/T>	30–40	22-29

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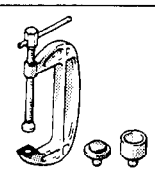
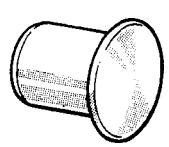
LUBRICANTS

M25CD--

Items		Specified lubricant	Quantity
Sleeve yoke surface		Hypoid gear oil API classification GL-4 or higher, SAE 75W–85W	As required
Lobro joint assembly <M/T>	Outer and inner races ball grooves Rubber packing	Repair kit grease	As required
	Lobro joint assembly inner part	Repair kit grease	45-55 g (1.59– 1.94 oz)
D.O.J. assembly <A/T>	Outer and inner races ball grooves Rubber packing	Repair kit grease	As required
	D.O.J. assembly inner part	Repair kit grease	105–115 g (3.7–4.0 oz)

SPECIAL TOOLS

M25DA--

Tool	Number	Name	Use
	GENERAL SERVICE TOOL	Universal joint remover and installer	Disassembly/reassembly of the universal joint
	MB991 193	Plug	Prevention of entry of foreign objects into the transaxle and transfer

TROUBLESHOOTING

M25EAAB

Symptom	Probable cause	Remedy
Noise at start	Worn journal bearing Worn sleeve yoke spline	Replace
	Loose propeller shaft installation	Retighten
Noise and vibration at high speed	Unbalanced propeller shaft	Replace
	Improper snap ring selection	Adjust the clearance
	Worn journal bearing	Replace

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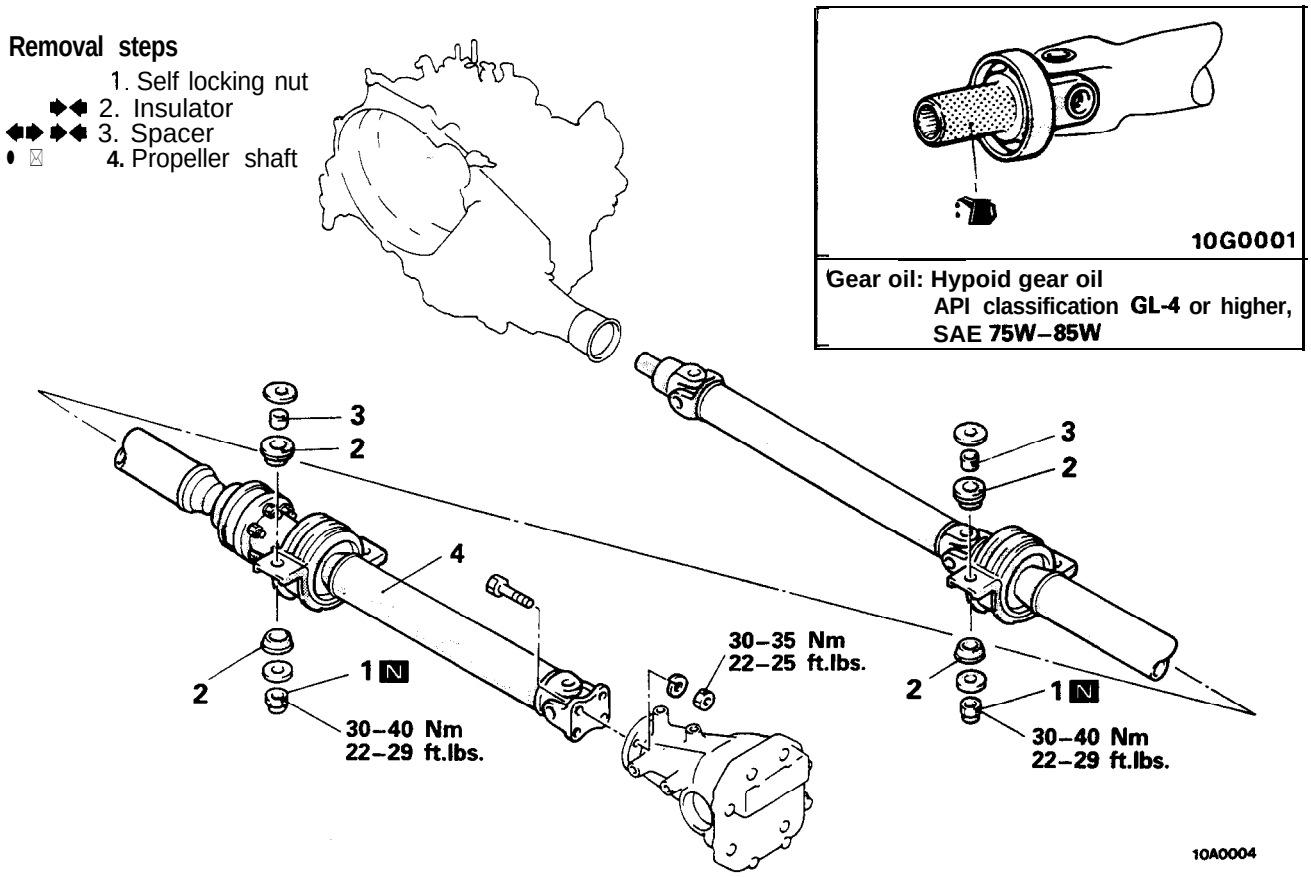
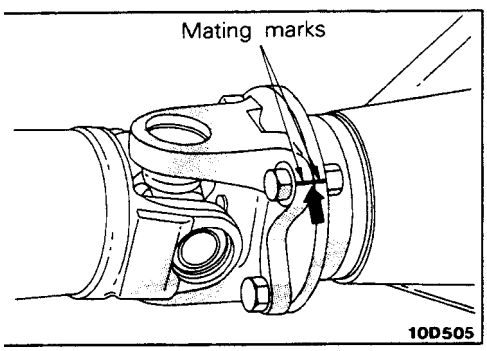
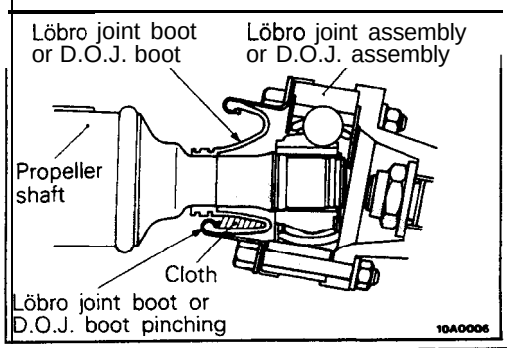
PROPELLER SHAFT

REMOVAL AND INSTALLATION

M25GA--







SERVICE POINTS OF REMOVAL

M25GBAH

3. REMOVAL OF SPACER

The number of spacers used on each vehicle differs. Check the number of spacers used and write it down for reference during reassembly.

4. REMOVAL OF PROPELLER SHAFT

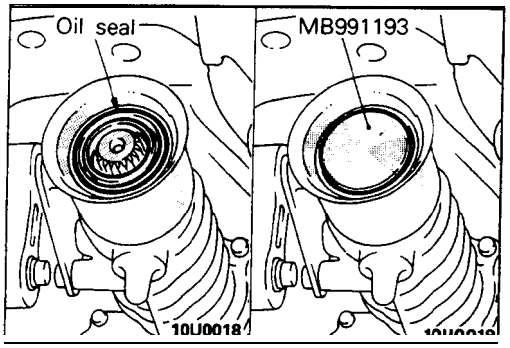
Make mating marks on the differential companion flange and flange yoke.

Caution

1. Remove the propeller shaft in a straight and level manner so as to ensure that the boot is not damaged through pinching.

NOTE

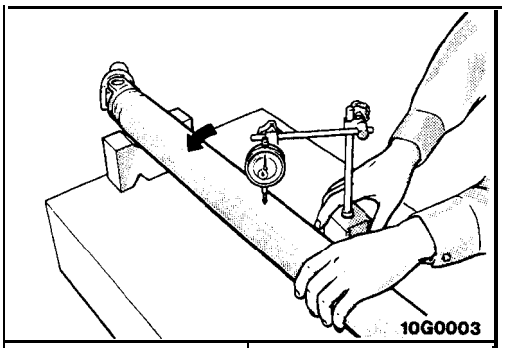
Damage to the boot can be avoided, and the work will be easier, if a piece of cloth or similar material is inserted in the boot.



2. **Do not lower rear end of the vehicle as the oil will flow out of the transfer.**
3. **Be cautious to avoid damage to the oil seal lip of the transfer.**
4. **Use the special tool provided as a cover to prevent the entry of foreign objects into the transfer.**

INSPECTION M25GCAH

- 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.

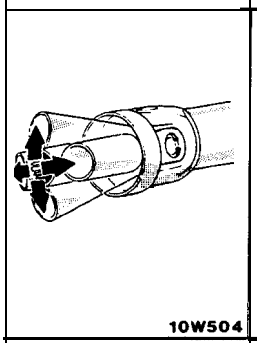


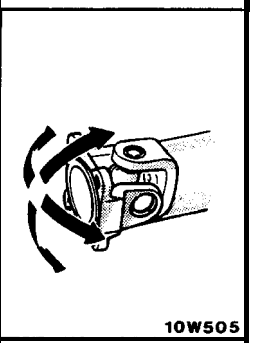
- Measure the propeller shaft runout with a dial indicator.

Limit:

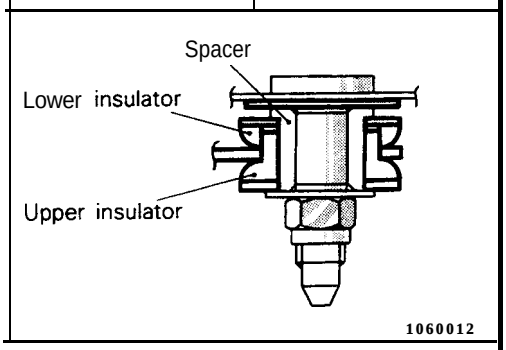
Front propeller shaft	0.6 **mm (.024 in.) or less**
Center propeller shaft	0.6 **mm (.024 in.) or less**
Rear propeller shaft	0.6 **mm (.024 in.) or less**

NOTE
Set the V-blocks as much as possible to the end of the shaft. Measure deflection at the center of the shaft.





- 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.



SERVICE POINTS OF INSTALLATION M25GDAN

3. INSTALLATION OF SPACER/2. INSULATOR

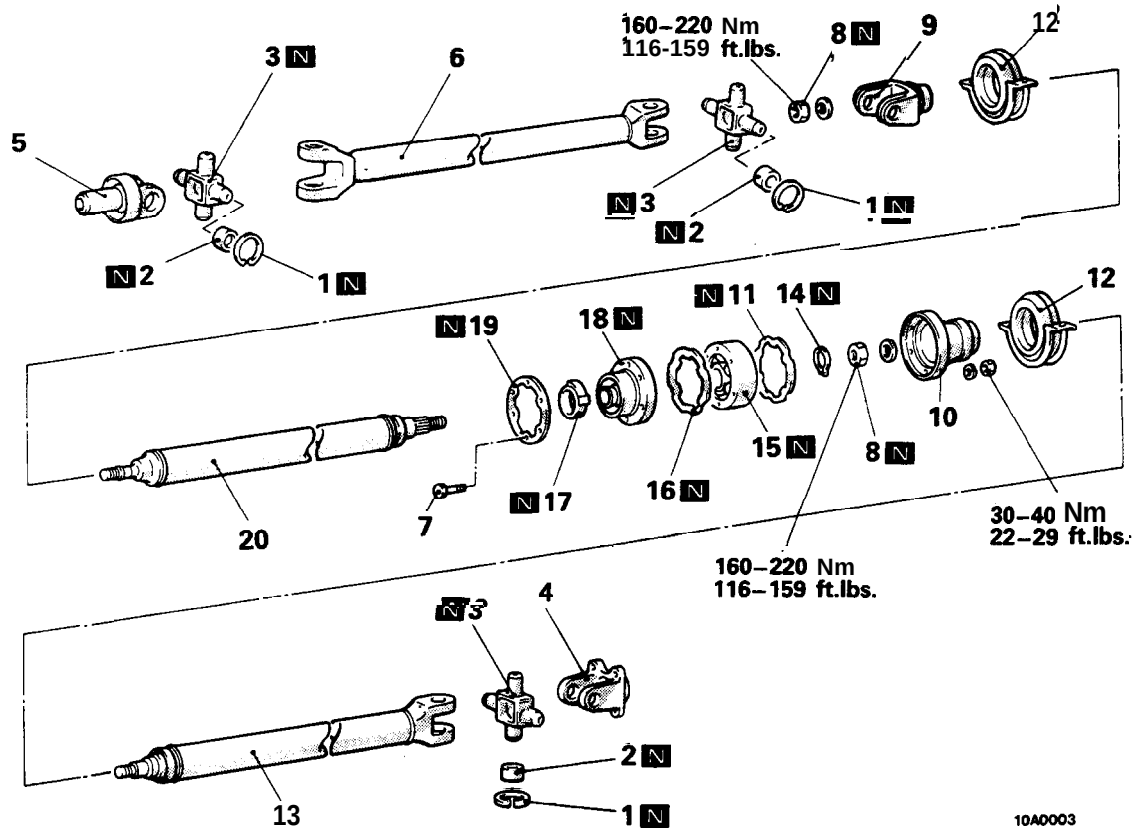
install spacers and insulators as indicated in the illustration.

Caution
When installing the center bearing, assemble the same spacers as removed from it (or new spacers of equal thickness).

PROPELLER SHAFT

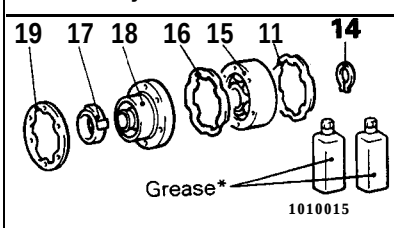
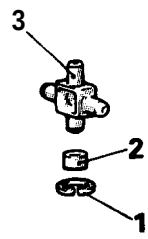
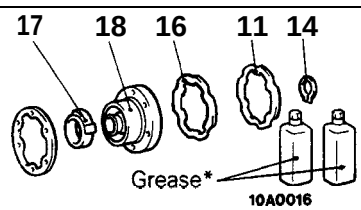
DISASSEMBLY AND REASSEMBLY

M25GE--



Disassembly steps

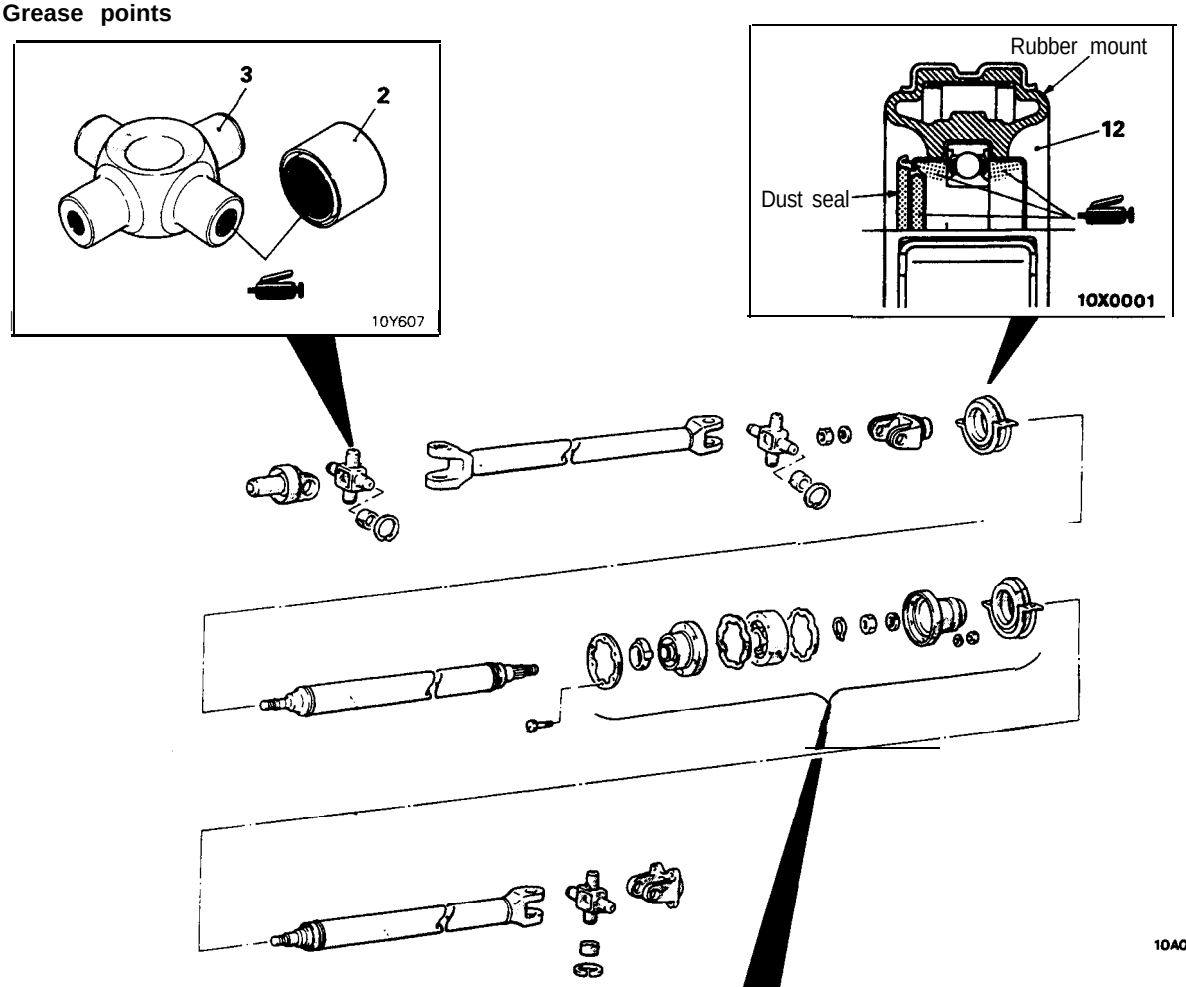
- ◆◆ ● * 1. Snap ring
- ◆◆ ◆◆ 2. Journal bearing
- ◆◆ 3. Journal
- 4. Flange yoke
- 5. Sleeve yoke
- 6. Front propeller shaft
- ● e◆◆ 7. Lobro joint assembly <M/T> or D.O.J. assembly <A/T> installation bolt
- ◆◆ ◆◆ 8. Self locking nut
- ● **+ 9. Center yoke
- ◆◆ ● +10. Companion flange
- ● + 11. Rubber packing
- ◆◆ ◆◆ 12. Center bearing assembly
- 13. Rear propeller shaft
- ● 4 14. Snap ring
- ◆◆ ◆◆ 15. Lobro joint assembly <M/T> or D.O.J. assembly <A/T>
- ● * 16. Rubber packing
- ◆◆ ◆◆ 17. Boot band
- ● + 18. Löbro joint boot <M/T> or D.O.J. boot <A/T>
- ◆◆ 19. Washer
- 20. Center propeller shaft

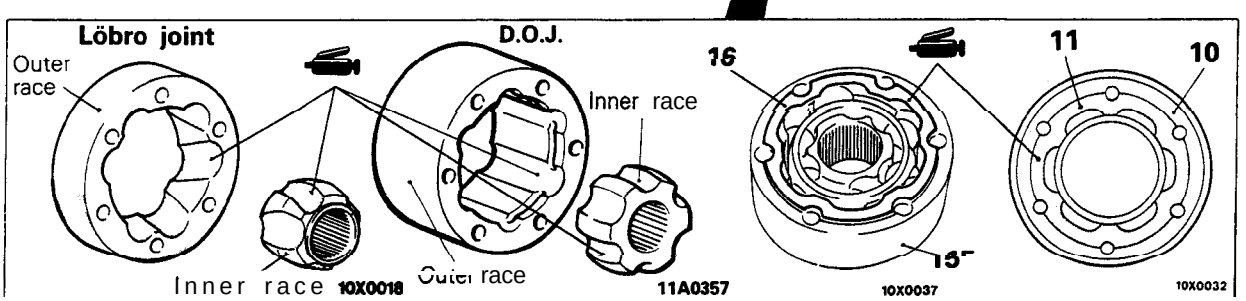
Löbro joint or D.O.J. kii	Universal joint kit
	
Löbro joint or D.O.J. boot kit	
	10A0011

NOTE
*: For the Löbro joint use one grease; for the D.O.J. use two greases.

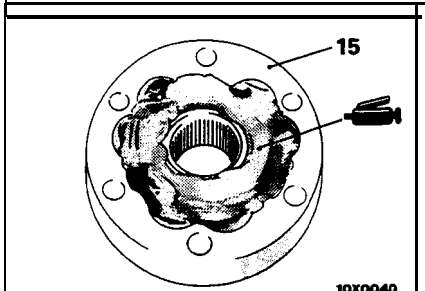
TSB Revision

Grease points





Grease: Repair kii grease



Grease: 'Repair kit grease
Löbro joint assembly:
45-55 g (1.59–1.94 oz.]
D.O.J. assembly:
105–115 g (3.7–4.0 oz.)

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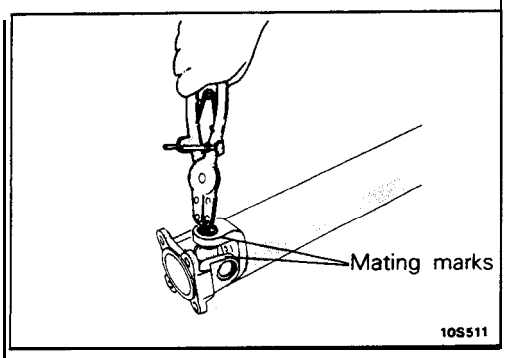
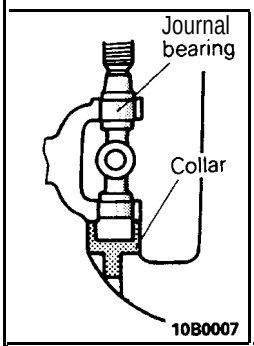
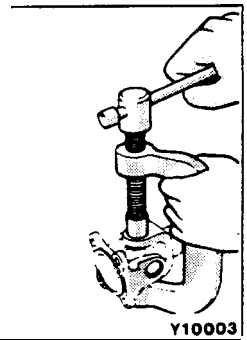


SERVICE POINTS OF DISASSEMBLY M25GFAKa

1. REMOVAL OF SNAP RING

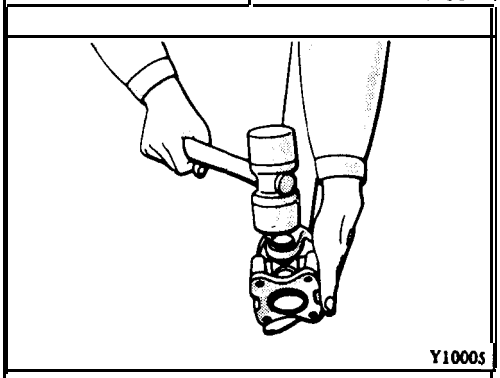
(1) Make mating marks on the yoke and universal joint that is to be disassembled.
(2) Remove the snap rings from the yoke with snap ring pliers.





2. REMOVAL OF JOURNAL BEARING

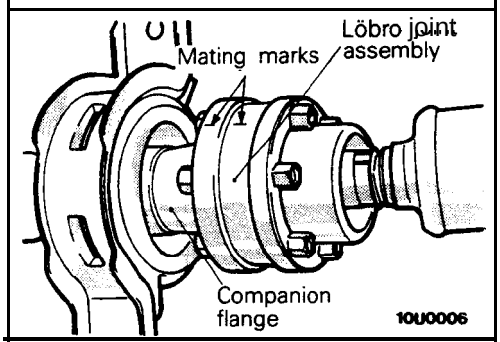
Force out the journal bearings from the yoke with a general service tool by the following procedures.
① install the collar to the special tool proper.
② Press the journal bearing by using the special tool to force out the journal bearing on the opposite side.



③ Pull out the journal bearing from the yoke.

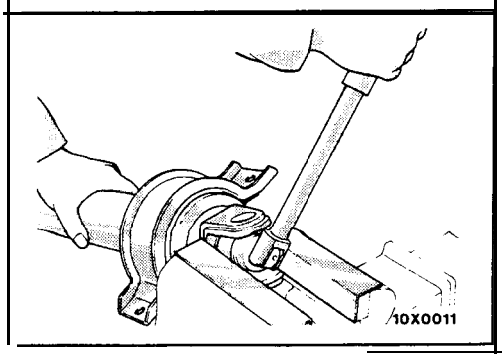
NOTE
If the journal bearing is hard to remove, strike the yoke with a plastic hammer.

④ Press the journal shaft by using the special tool to force out the remaining bearings.
⑤ Pull out the journal.



7. REMOVAL OF LÖBRO JOINT ASSEMBLY OR D.O.J. ASSEMBLY INSTALLATION BOLTS

(1) Place mating marks on the companion flange and Lobro joint assembly or D.O.J. assembly.
(2) Remove the Löbro joint or D.O.J. installation bolts and separate the Lobro joint or D.O.J. from the companion flange.

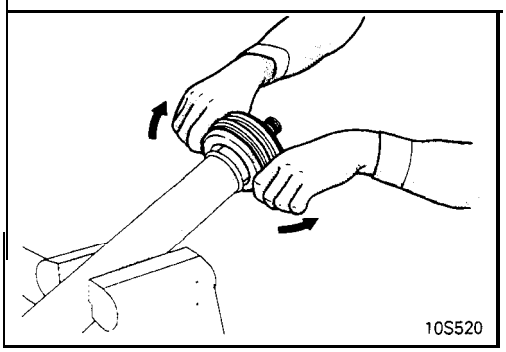


8. REMOVAL OF SELF LOCKING NUT/S. CENTER YOKE/ 10. COMPANION FLANGE/12. CENTER BEARING ASSEMBLY

(1) After placing mating marks on the center yoke and center propeller shaft, and companion flange and rear propeller shaft, remove the self locking nuts, then remove the center yoke and companion flange.

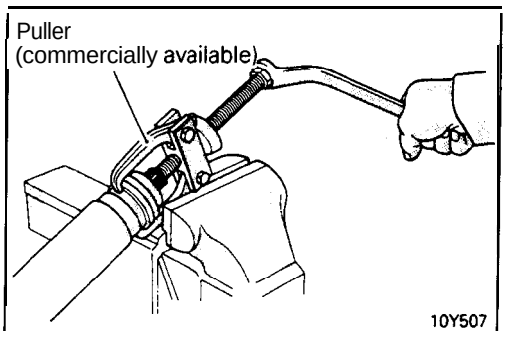
NOTE
Be careful not to damage or deform the dust seals on center propeller shaft assembly and rear propeller shaft.

TSB Revision

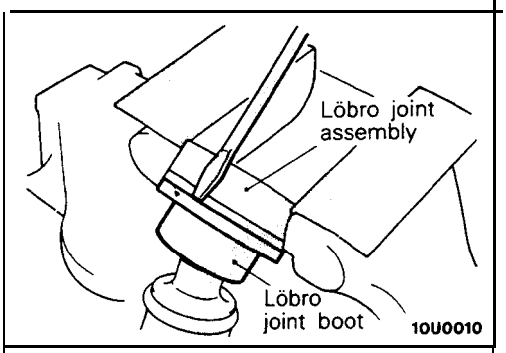


(2) After placing mating marks on the center bearing assembly (front) bracket and center propeller shaft, and the center bearing assembly (rear) bracket and rear propeller shaft, remove the center bearing bracket.

Caution
The mounting rubber cannot be removed from the center bearing bracket.

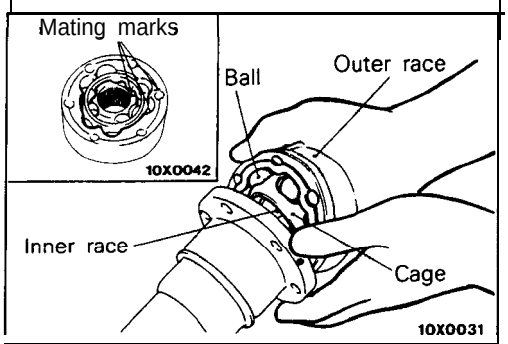


(3) Pull out the front and rear center bearings with a commercially available puller.



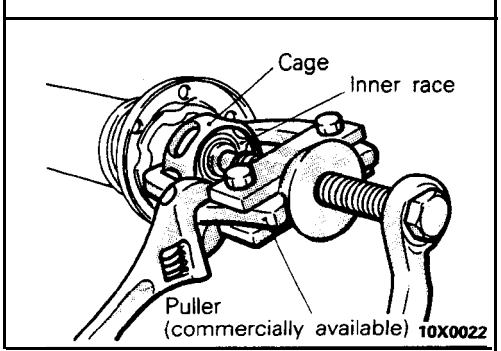
15. REMOVAL OF LÖBRO JOINT ASSEMBLY <M/T>

(1) Remove the Lobro joint boot from the Lobro joint assembly.



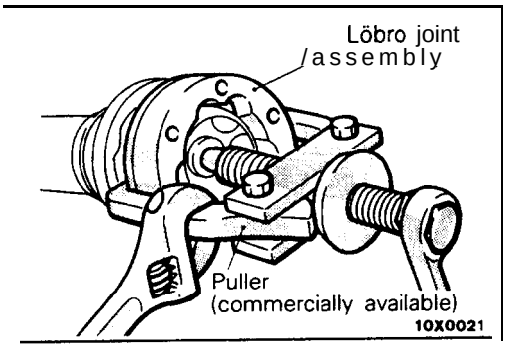
(2) Remove the Lobro joint assembly as follows:
① Put mating marks on the outer race, cage and inner race with a scriber.
② Remove the outer race and balls.

Caution
Note the positions of balls so that they can be reinstalled in their original positions.

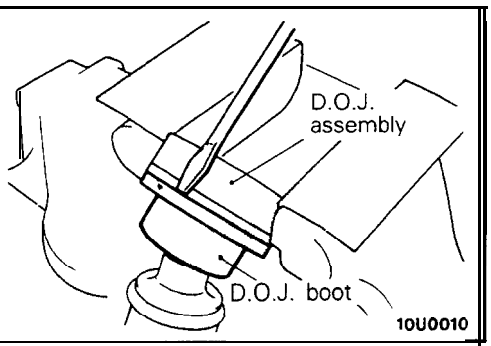


③ Remove the inner race with cage from the center propeller shaft by using a commercially available puller.

NOTE
When changing the grease on the Lobro joint assembly, wipe off the grease and clean the outer and inner races, cage and balls.

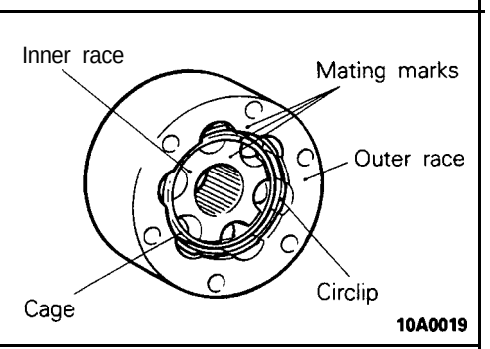


(3) If the outer race cannot be removed, remove the complete Lobro joint assembly from the center propeller shaft by using a commercially available puller.

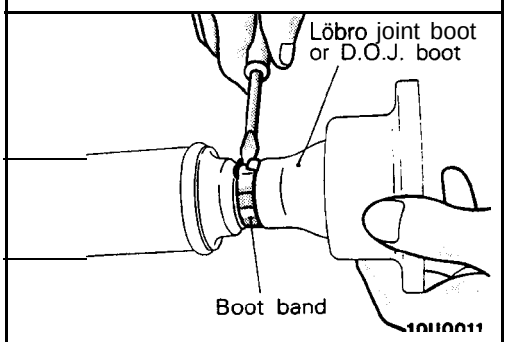


15. REMOVAL OF D.O.J. ASSEMBLY <A/T>

(1) Remove the D.O.J. boot from the D.O.J. assembly.
(2) Remove the snap ring and then remove the D.O.J. assembly from the center propeller shaft.

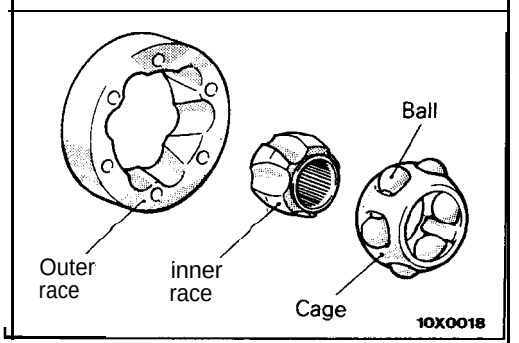


(3) When disassembling the D.O.J. assembly to clean, etc., first make mating marks with a scriber on the outer race, cage and inner race, then remove the circlip and disassemble the D.O.J. assembly.



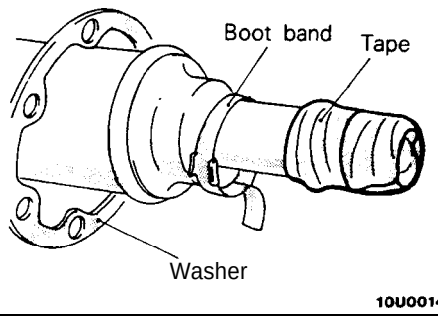
17. REMOVAL OF BOOT BAND

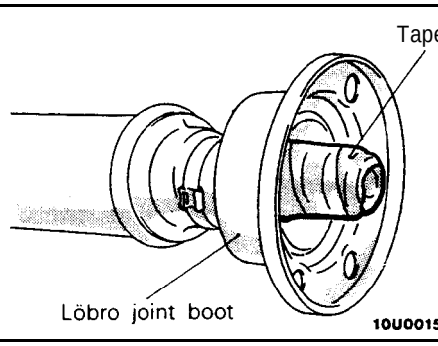
Caution
Be careful not to damage the Löbro joint boot or D.O.J. boot when the boot band is loosened.

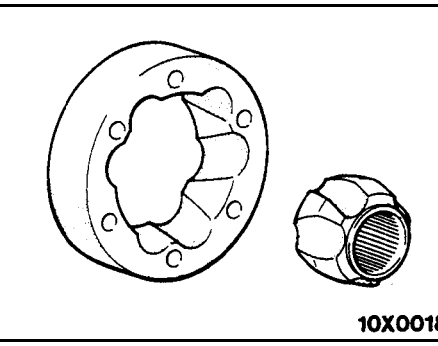


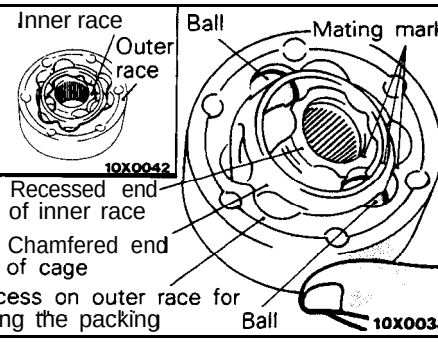
INSPECTION M25GCAF

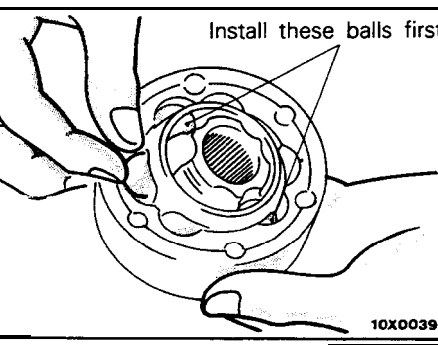
- Check the propeller shaft splines for wear or damage.
- Check the ball grooves in inner and outer races for uneven wear, damage or rust.
- Check ball surface for rust, wear or other damage.
- Check the cage for rust or damage.











SERVICE POINTS OF REASSEMBLY M25GHAQ

19. INSTALLATION OF WASHER/18. LÖBRO JOINT BOOT OR D.O.J. BOOT/17. BOOT BAND/16. RUBBER PACKING/15. LÖBRO JOINT ASSEMBLY OR D.O.J. ASSEMBLY / 14. SNAP RING

(1) Put the washer and boot band on the center propeller shaft.

(2) Wrap the splined end of center propeller shaft with adhesive tape.

(3) Install the Lobro joint boot on the center propeller shaft and then remove the adhesive tape on the splined end of the propeller shaft.

(4) Assemble the Lobro joint 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.

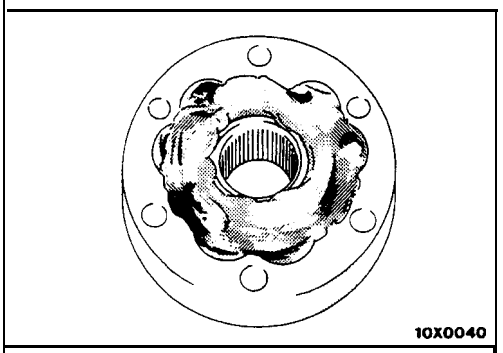
③ Assemble the inner race and cage in the outer race with their mating marks aligned.

NOTE

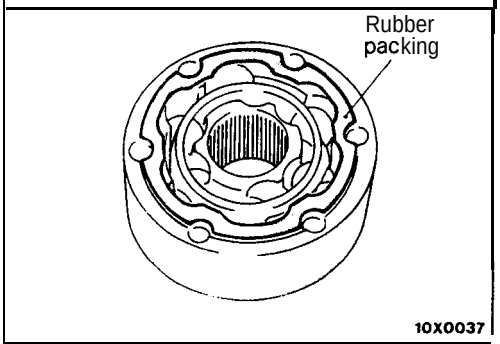
Make sure that the recessed end (where snap ring will be fitted) of the inner race, the recessed end (where packing will be fitted) of the outer race, and the chamfered end of the cage are all on the same side. Also ensure that the relative positions of the inner and outer races are as shown in the illustration.

④ Install the remaining balls in their original positions.

⑤ Check that the outer race rotates on the inner race smoothly.


10X0040

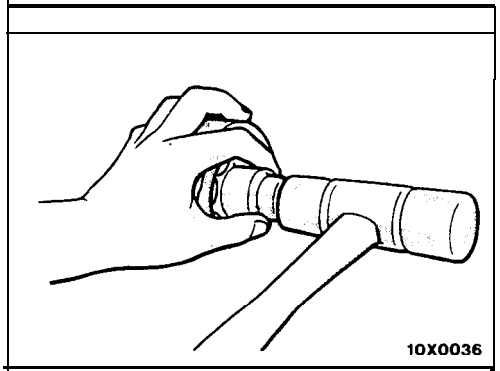
(5) Apply specified grease to the Lobro joint assembly.
Specified grease: Repair kit grease [45–55 g (1.59–1.94 oz.)]



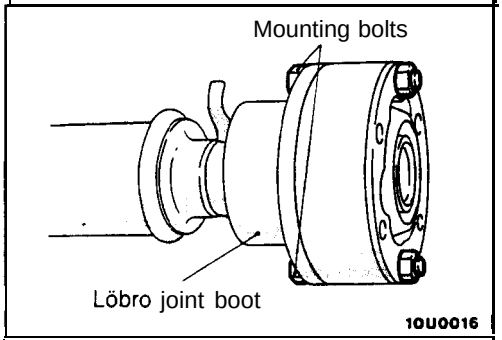
10X0037

(6) Apply a thin and even coat of the specified grease to the rubber packing and fit the packing in the boot side end of the Lobro joint assembly.
Specified grease: Repair kit grease

Caution
For the Löbro joint assembly, the side that has the concave part (for the rubber packing) in the outer race is the Lobro joint boot side.

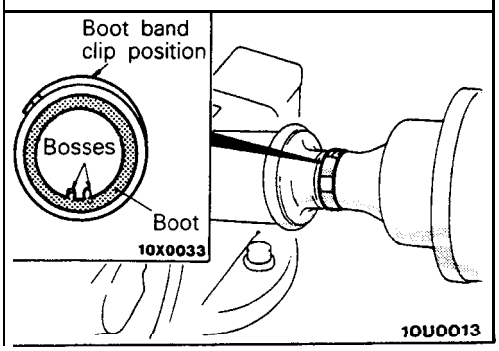

10X0036

(7) Install the Lobro joint assembly on the rear 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.



10U0016

(8) Secure the inner race with the snap ring.
(9) Realign the bolt holes in the boot and Lobro joint assembly utilizing the mounting bolts and fit the boot on the joint assembly.

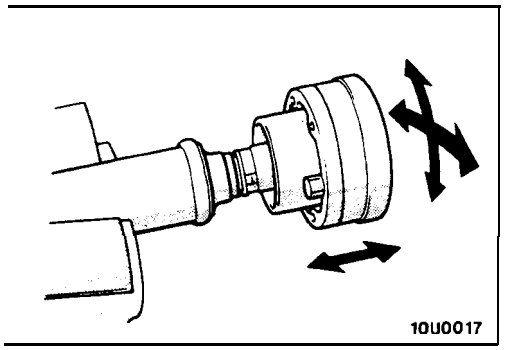


10U0013

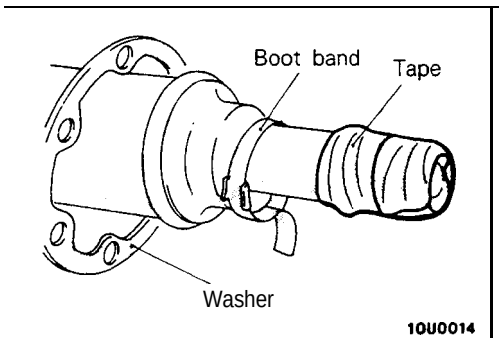
(10) Secure the boot with the boot band.

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.

TSB Revision



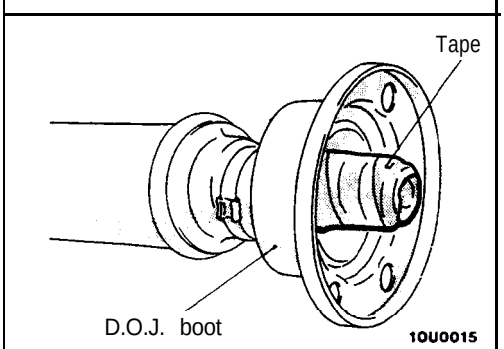
(11)Check that the Lobro joint assembly moves smoothly.



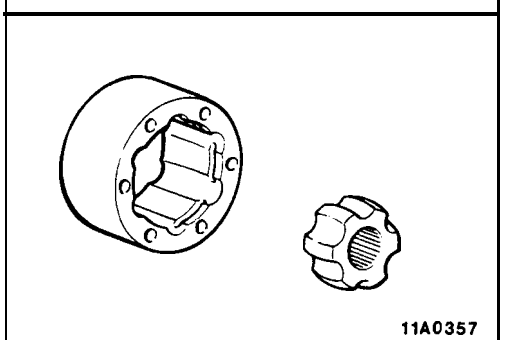
19. INSTALLATION OF WASHER/18. D.O.J. JOINT BOOT/17. BOOT BAND/16. RUBBER PACKING/15. D.O.J. ASSEMBLY <A/T>/14. SNAP RING

(1) Put the washer and boot band on the center propeller shaft.

(2) Wrap the splined end of center propeller shaft with adhesive tape.



(3) Install the D.O.J. boot on the center propeller shaft and then remove the adhesive tape on the splined end of the propeller shaft.



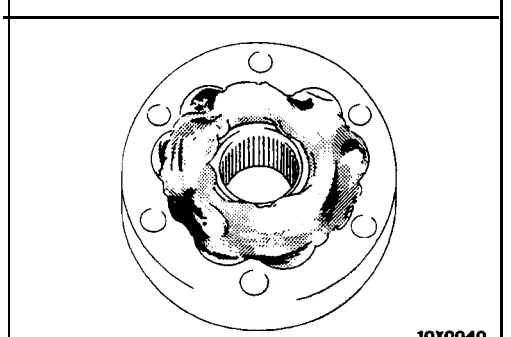
(4) Assemble the D.O.J. as follows:

① Apply a thin coat of the specified grease to the ball grooves of the inner and outer races.

Specified grease: Repair kit grease

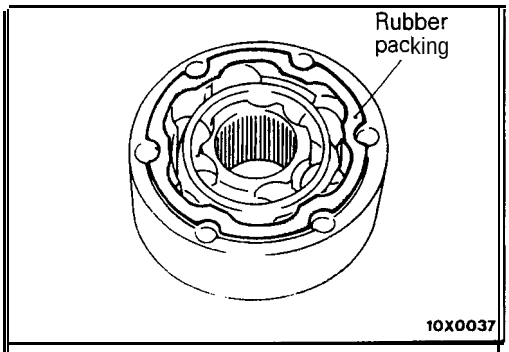
② **Assemble the inner race and cage in the outer race** with their mating marks aligned.

③ Install the circlip.



(5) Apply specified grease to the D.O.J. assembly.

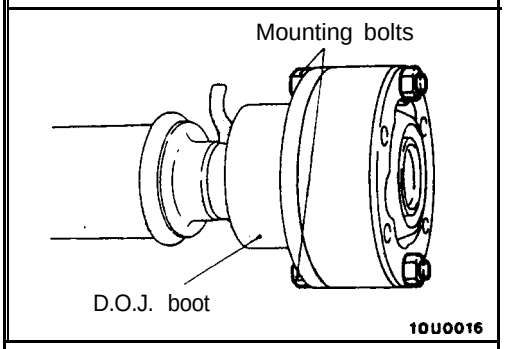
Specified grease: Repair kit grease [105–115 g (3.7–4.0 oz.)]



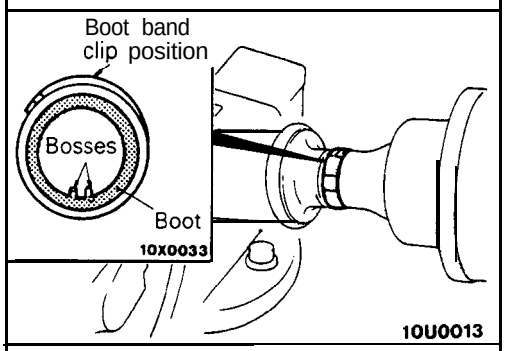
(6) Apply a thin and even coat of the specified grease to the rubber packing and fit the packing in the boot side end of the D.O.J. assembly.

Specified grease: Repair kit grease

Caution
For the D.O.J. assembly, the side that has the concave part (for the rubber packing) in the outer race is the D.O.J. boot side.

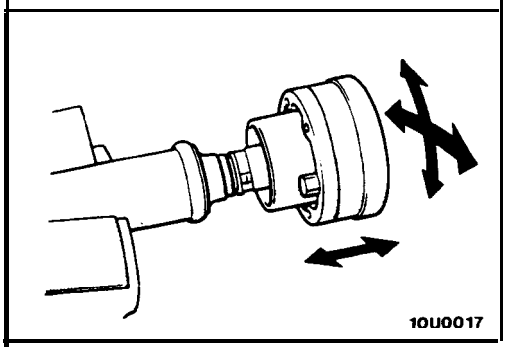


(7) Secure the inner race with the snap ring.
(8) Realign the bolt holes in the boot and D.O.J. assembly utilizing the mounting bolts and fit the boot on the joint assembly.

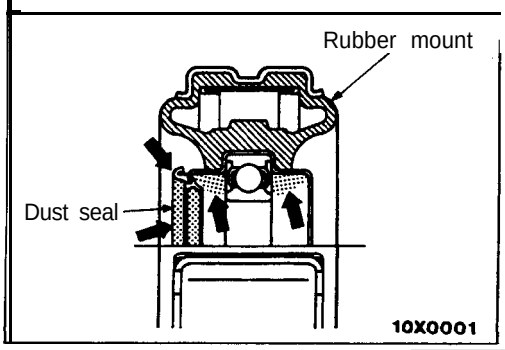


(9) Secure the boot with the boot band.

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.



(10) Check that the D.O.J. assembly moves smoothly.



12. INSTALLATION OF CENTER BEARING ASSEMBLY

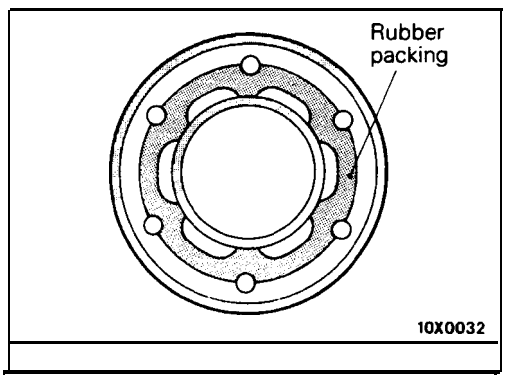
(1) Apply multipurpose grease to the center bearing front and rear grease grooves and to the dust seal lip.
(2) Be sure to fit the bearing into the rubber mount groove on the center bearing bracket.

NOTE
Face the bearing dust seal to the side of center bearing bracket mating mark.

(3) Assemble the center bearings to the center propeller shaft and rear propeller shaft.

TSB Revision

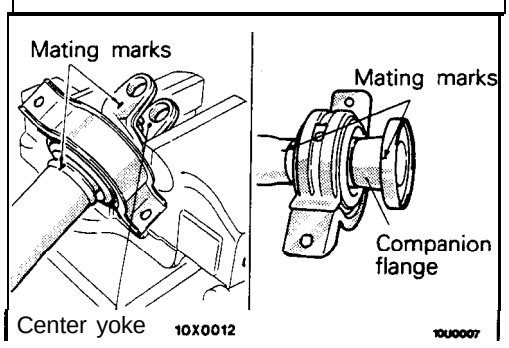
NOTE
Face the side onto which the center bearing bracket mating mark is placed and the dust seal is installed to the side of the center propeller shaft and rear propeller shaft.



11. INSTALLATION OF RUBBER PACKING/10. COMPANION FLANGE/9. CENTER YOKE/8. SELF LOCKING NUT

(1) Apply a thin and even coat of the specified grease to the rubber packing and fit the packing on the companion flange.

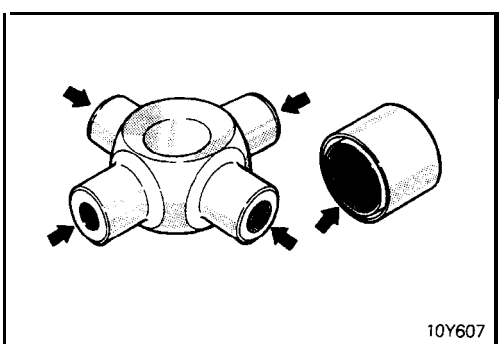
Specified grease: Repair kit grease



(2) Align the mating marks on the center propeller shaft and center yoke, and the rear propeller shaft and companion flange, then press fit the center bearing with self locking nuts, tightening to the specified torque.

7. INSTALLATION OF LÖBRO JOINT ASSEMBLY OR D.O.J. ASSEMBLY INSTALLATION BOLTS

(1) Secure the companion flange and Lobro joint assembly or D.O.J. assembly with installation bolts.
(2) Check for grease leakage from the Lobro joint boot or D.O.J. boot and companion flange installation parts.

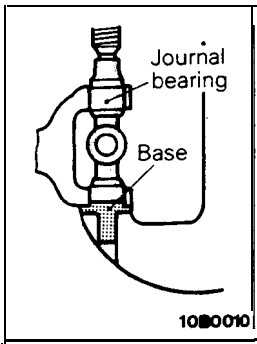


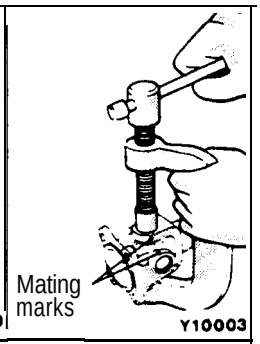
3. JOURNALS/Z. JOURNAL BEARING

(1) Apply multipurpose grease to the following parts of the universal joint kit.
① Shafts and grease sumps of journal
② Dust seal lips
③ Needle roller bearings

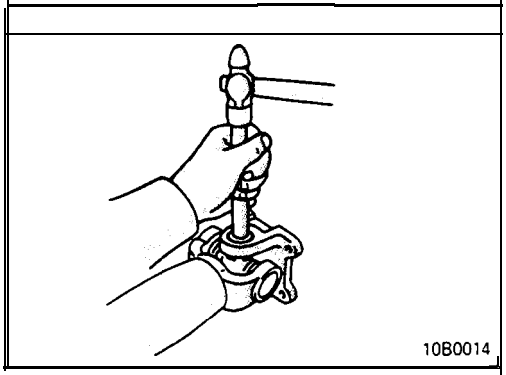
Caution
Do not apply excessive grease. Otherwise, faulty fitting of bearing caps and errors in the selection of snap rings may result.

TSB Revision



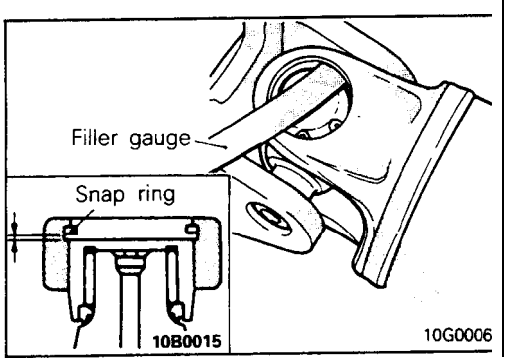


(2) Press fit the journal bearings to the yoke by using the general service tool according to the following procedures.
① Install the base to the general service tool proper.
② Insert both bearings in the yoke, and hold and press fit them by using the general service tool.



1. INSTALLATION OF SNAP RING

(1) Install snap rings of the same thickness onto both sides of each yoke.
(2) Press the bearing and journal into one side by using a brass bar with a diameter of 15 mm (.59 in.).



(3) Measure the clearance between the snap ring and the groove wall of the yoke with a filler gauge.
If the clearance exceeds the standard value, the snap rings should be replaced.
Standard value: 0.02–0.06 mm (.0008–.0024 in.)

FRONT AXLE

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M26AA--

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Service Specifications 2

Torque Specifications 2

TROUBLESHOOTING 5

SPECIFICATIONS

M26CA--

GENERAL SPECIFICATIONS

Items		FWD		AWD
Wheel bearing				
Type		Double-row angular-contact ball bearing		
O.D. × I.D.	mm (in.)	80 × 40 (3.15 × 1.57)		
Drive shaft				
Joint type		<Up to 1992 models>	<From 1993 models>	
Outer		R.J. or B.J.*	B.J.	B.J.
Inner		T.J.	T.J.	T.J.
Length	mm (in.)			
L.H. shaft		708 (27.9) or 706 (27.8)'	706 (27.8)	368 (14.5) <M/T>, 365 (14.4) <A/T>
R.H. shaft		368 (14.5) or 366 (14.4)*	366 (14.4)	368 (14.5) <M/T>, 371 (14.6) <A/T>

NOTE
R.J. : Rzeppa joint
B.J. : Bit-field joint
T.J. : Tripod joint
* : <DOHC>

SERVICE SPECIFICATIONS

M26CB--

Items	FWD			AWD
	SOHC		DOHC	
Standard value				
Setting of T.J. boot length mm (in.)	<Up to 1992 models>	<From 1993 models>		
L.H.	82 ± 3 (3.23 ± .12)	80 ± 3 (3.15 ± .12)	80 ± 3 (3.15 ± .12)	85 ± 3 (3.35 ± .12)
R.H.	85 ± 3 (3.35 ± .12)	80 ± 3 (3.15 ± .12)	80 ± 3 (3.15 ± .12)	85 ± 3 (3.35 ± .12)
Limit				
Hub end play mm (in.)	0.2 (.008) or less			
Wheel bearing starting torque (Hub starting torque) Nm (in.lbs.)	1.8 (16) or less			

TORQUE SPECIFICATIONS

M26CC--

Items	Nm	ft.lbs.
Drive shaft nut	200–260	144-188
Tie rod end ball joint	24-34	17-25
Knuckle to ball joint	60–72	43-52
Knuckle to strut assembly	110–140	80–101
Caliper assembly mounting bolt	80–100	58-72
Center bearing bracket	36-46	26-33
Front speed sensor bracket	9-14	7–10
Front toothed rotor	9-14	7–10

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LUBRICANTS

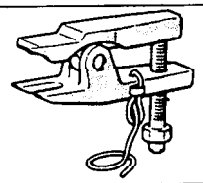
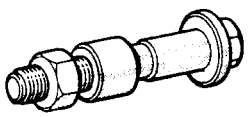
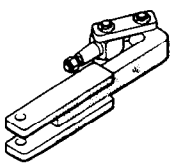
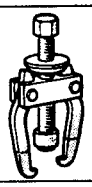
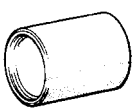
M26CD--

Items	Specified lubricants	Quantity
T.J. boot grease <SOHC> <FWD-DOHC> <AWD-DOHC>	Repair kit grease	 120 g (4.2 oz.) 130 g (4.5 oz.) 110 g (3.9 oz.)
B.J. boot grease <FWD-DOHC>, <SOHC>* <AWD-DOHC>	Repair kit grease	 110 g (3.9 oz.) 90 g (3.2 oz.)
R.J. boot grease <SOHC>	Repair kit grease	120 g (4.2 oz.)
inner dust seal Outer dust seal	Multipurpose grease	7–10 (.25–.35 oz.) 4-6 (.14–.21 oz.)

: From 1993 models

SPECIAL TOOLS

M26DA--

Tool	Number	Name	Use
	MB991113-01 OPTIONAL: AVAILABLE FROM O.T.C.	Steering linkage puller	Removal of the lower arm ball joint and tie rod
	MB990998-01	Front hub remover and installer	Removal or press-in the front hub
	MB991056	Knuckle arm bridge	Removal of the hub
	GENERAL SERVICE TOOL	Side bearing puller	Removal of the wheel bearing inner race
	MB990847-01	Rear suspension bushing remover and installer base	Press-fitting of the oil seal
	MB990947-01	Lower arm bushing arbor	

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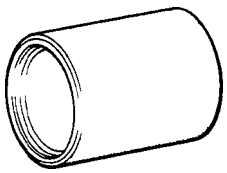
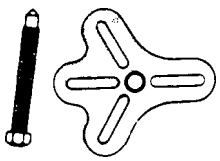
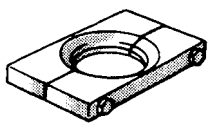
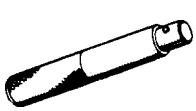
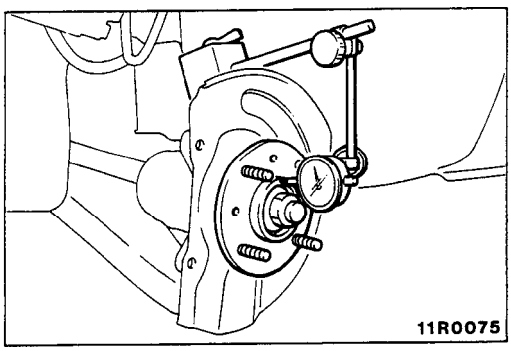
Tool	Number	Name	Use
	MB990890-01 OPTIONAL: AVAILABLE FROM O.T.C.	Rear suspension bushing base	Press-fitting of the wheel bearing and oil seal
	MB990883-01 **OPTIONAL: AVAILABLE FROM** O.T.C.	Rear suspension arbor	
	GENERAL SERVICE TOOL	Axle puller	Removal of the drive shaft
	MB991248 or MD998801	Inner shaft remover	Removal of the inner shaft
	GENERAL SERVICE TOOL	Bearing and oil seal installer set	Removal of wheel bearing
	MB990938-01 Handle		

TROUBLESHOOTING

M26EBAA

Symptom	Probable cause	Remedy
Vehicle pulls to one side	Seizure of drive shaft ball joint	Replace
	Abnormal wear, play or seizure of wheel bearing	Replace
	Malfunction of front suspension or steering	Adjust or replace
Vibration	Bend, damage or abnormal wear of drive shaft	Replace
	Play in drive shaft and hub serration	Replace
	Abnormal wear, play or seizure of wheel bearing	Replace
Shimmy	Improper wheel alignment	Adjust or replace
	Malfunction of front suspension or steering	Adjust or replace
Excessive noise	Broken boot, grease leakage	Replace, repack grease
	Bend, damage or abnormal wear of drive shaft	Replace
	Play of drive shaft and hub serration	Replace
	Abnormal wear, play or seizure of center bearing	Replace
	Abnormal wear, play or seizure of wheel bearing	Replace
	Loose wheel nut	Retighten
	Malfunction of front suspension and steering	Adjust or replace



SERVICE ADJUSTMENT PROCEDURES

HUB END PLAY INSPECTION

M26FAAB

1. Jack up the vehicle and remove the front wheels.
2. **Remove the disc brake caliper and suspend it** with **a wire.** (Refer to GROUP 35–Service Adjustment Procedures.)
3. Attach a dial indicator as shown in the illustration, and then measure the axial play while moving the hub back and forth.

   Limit : 0.2 mm (.008 in.) or less

4. If axial play exceeds the limit, disassemble and check parts.

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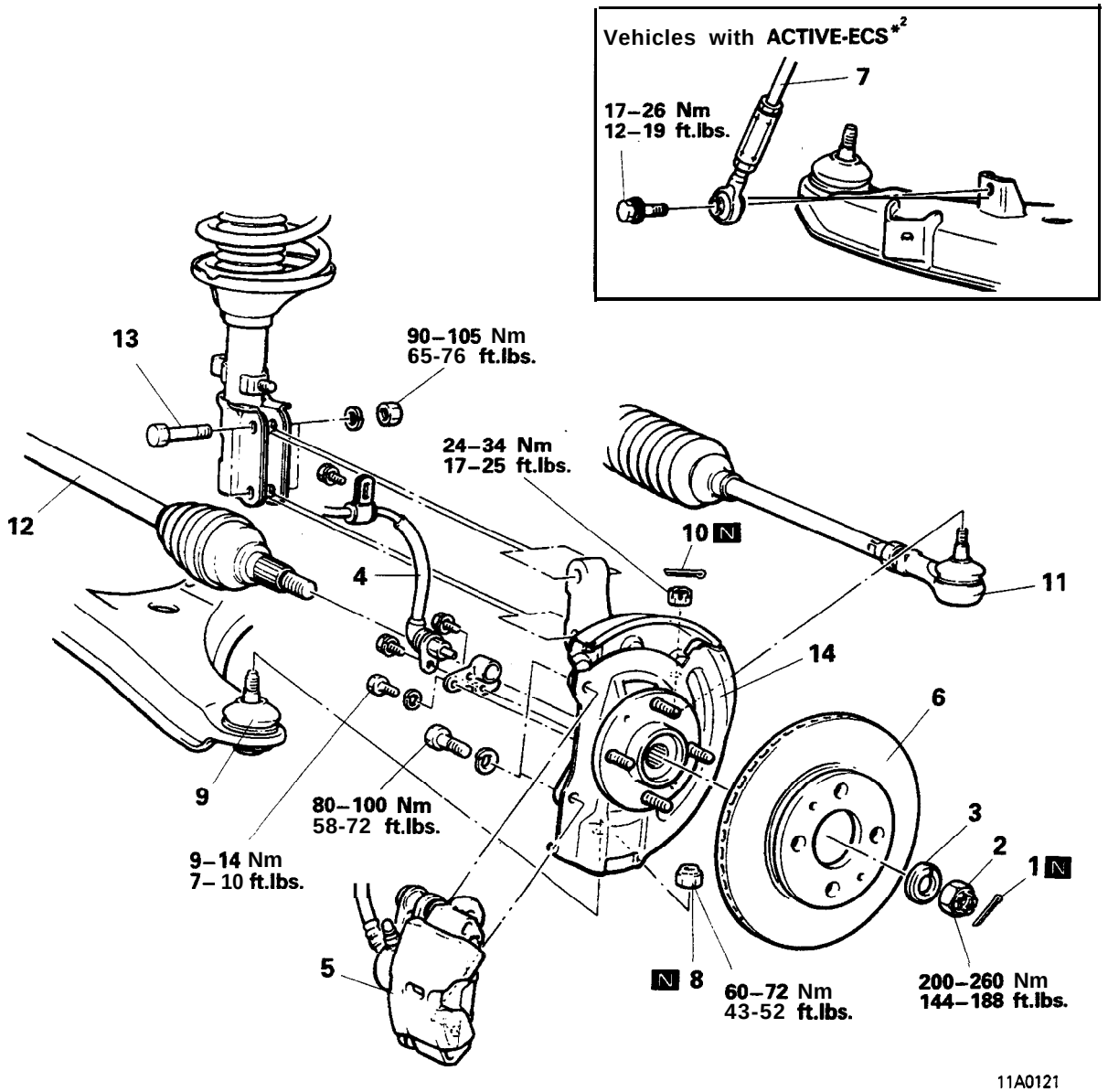
HUB AND KNUCKLE

M26IA--

REMOVAL AND INSTALLATION



Removal steps

- ⬮ + 1. Cotter pin
- ◆◆▶◀ 2. Drive shaft nut
- ● + 3. Washer
- ◆◆ 4. Front speed sensor connection <Vehicules with A.B.S.*1> (Refer to GROUP 35–Speed sensor)
- ◆◆ 5. Caliper assembly
- 6. Brake disc
- 7. Front height sensor connection <Vehicules with ACTIVE-ECS*2> (Refer to GROUP 33B–Height sensor)
- 8. Self locking nut
- ◆◆▶◀ 9. Lower arm ball joint connection
- 10. Cotter pin
- ◆◆ 11. Tie rod end connection
- ◆◆ 12. Drive shaft
- 13. Front strut mounting bolt
- 14. Hub and knuckle

NOTE
*1 : Anti-lock braking system
*2 : ACTIVE-Electronic Control Suspension

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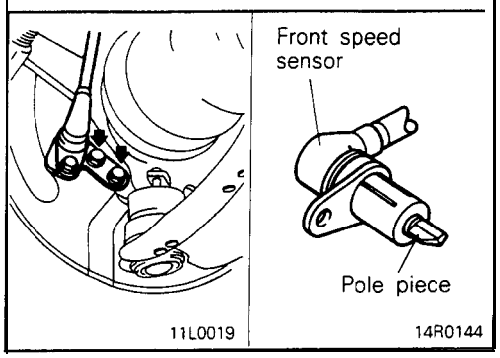


SERVICE POINTS OF REMOVAL M26IBAE

2. REMOVAL OF DRIVE SHAFT NUT

Loosen the drive shaft nut while the vehicle is on the floor with the brakes applied.

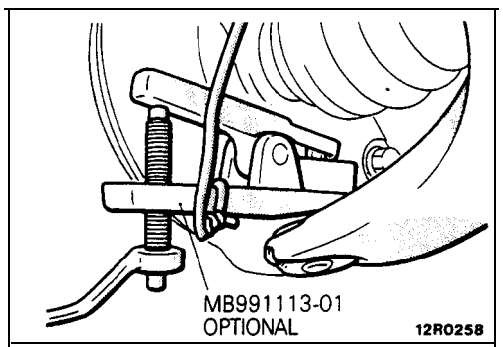
4. DISCONNECTION OF FRONT SPEED SENSOR

Remove the mounting bolts which hold the speed sensor bracket to the knuckle, and then remove the speed sensor.

Caution
Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.

5. REMOVAL OF CALIPER ASSEMBLY

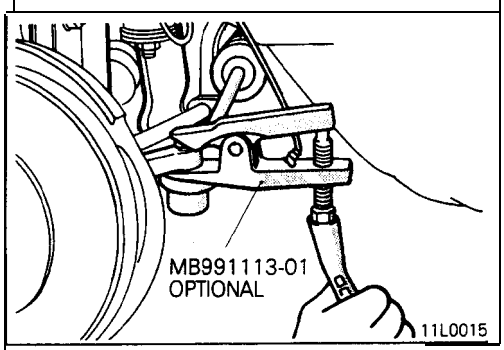
Remove the caliper assembly and suspend it with wires.



9. DISCONNECTION OF LOWER ARM BALL JOINT

Using the special tool, disconnect the lower arm ball joint from the knuckle.

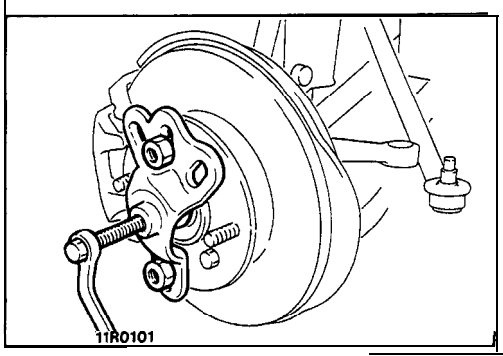
Caution
1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it.



11. DISCONNECTION OF TIE ROD END

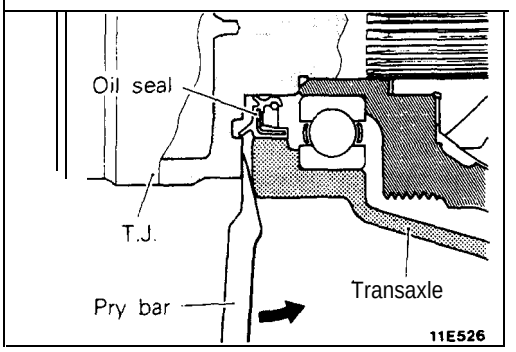
Using the special tool, disconnect the tie rod end from the knuckle.

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.



12. REMOVAL OF DRIVE SHAFT

(1) Use the general service tool to push out the drive shaft from the front hub.



(2) Insert a pry bar between the transaxle case and the drive shaft, and then pry the drive shaft from the transaxle.

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.

INSPECTION M26ICAD

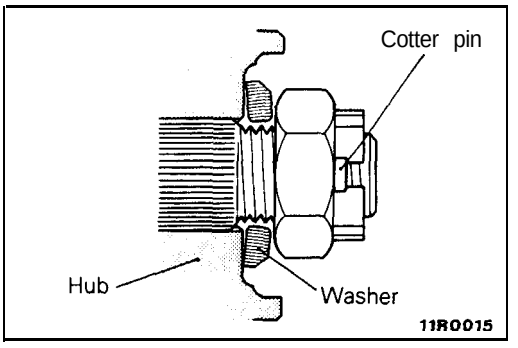
- Check the hub for cracks and spline for wear.
- Check the oil seal for damage.
- Check the knuckle for cracks.
- Check for defective bearing.

NOTE
If the meshing of the wheel bearing outer race and the knuckle, or of the wheel bearing inner race and the hub. is loose, replace the bearing or damaged parts.

SERVICE POINTS OF INSTALLATION M26IDAD

9. INSTALLATION OF LOWER ARM BALL JOINT

Lower the vehicle to the ground and tighten the knuckle to the lower arm ball joint connecting bolt.

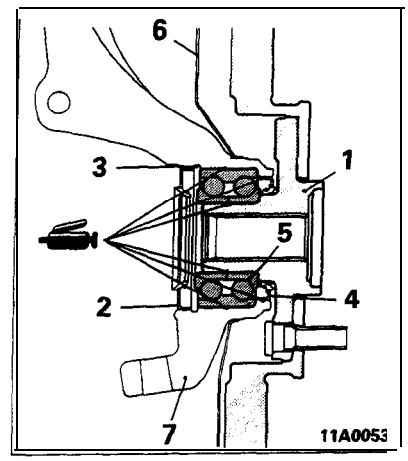


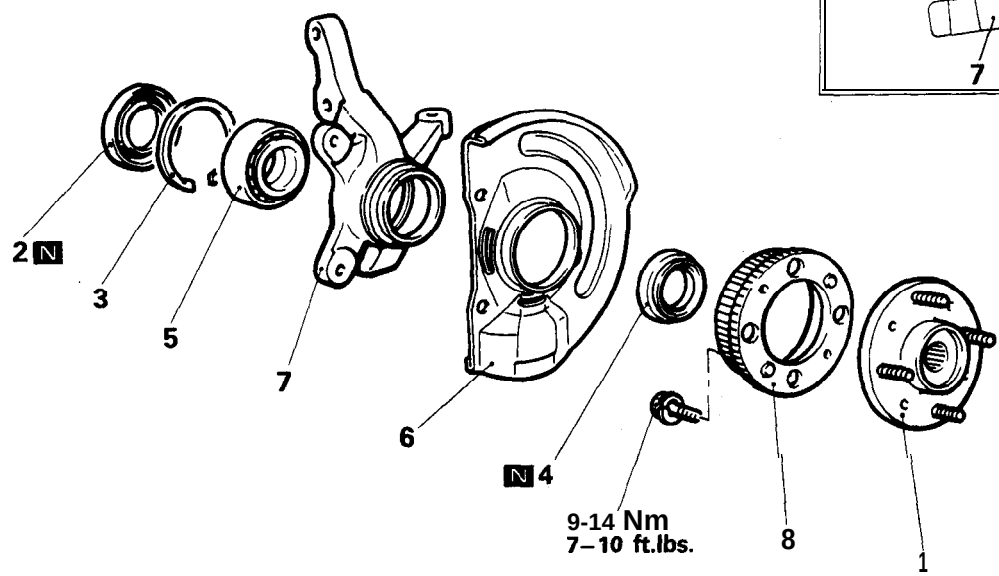
3. INSTALLATION OF WASHER/2. DRIVE SHAFT NUT/l. COTTER PIN

(1) Be sure to install the washer and wheel bearing nut in the specified direction.
(2) After installing the wheel, lower the vehicle to the ground and finally tighten the wheel bearing nut.
(3) If the position of the cotter pin holes does not match, tighten the nut up to 260 Nm (188 ft.lbs.) in maximum.
(4) Install the cotter pin in the first matching holes and bend it securely.

DISASSEMBLY AND REASSEMBLY

M26IE--



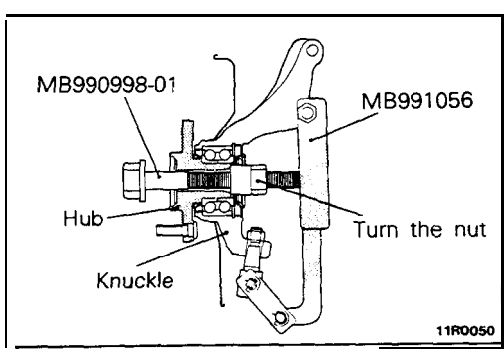


Disassembly steps

- ◆◆ 1. Front hub
- ◆◆ 2. Oil seal (drive shaft side)
- 3. Snap ring
- 4. Oil seal (hub side)
- ◆◆ 5. Wheel bearing
- 6. Dust shield
- 7. Knuckle
- 8. Front toothed rotor <A.B.S.> (Refer to GROUP 35–Wheel Speed Sensor.)

Reassembly steps

- 8. Front toothed rotor <A.B.S.> (Refer to GROUP 35–Wheel Speed Sensor.)
- 7. Knuckle.
- 6. Dust shield
- ◆◆ 5. Wheel bearing
- ● + 4. Oil seal (hub side)
- 3. Snap ring
- ◆◆ 1. Front hub
- ◆◆ Adjustment of wheel bearing starting torque
- ◆◆ 2. Oil seal (drive shaft side)



SERVICE POINTS OF DISASSEMBLY

M26IFAM

1. REMOVAL OF FRONT HUB

(1) Attach the special tools to the knuckle and front hub.
(2) Secure the knuckle in a vise.
(3) Tighten the nut of the special tool and remove the front hub from the knuckle.

Caution

1. Be sure to use the special tools.
2. If the front hub and knuckle are disassembled by striking them with a hammer, the bearing will be damaged.

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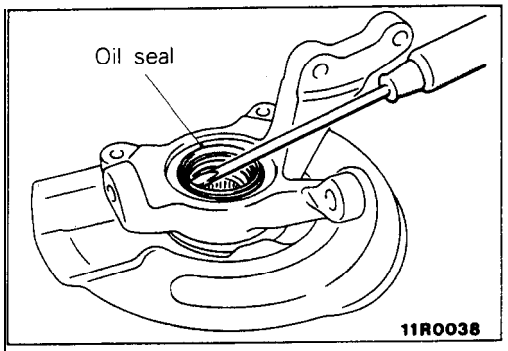
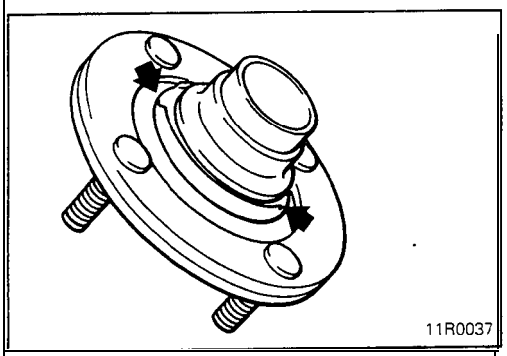


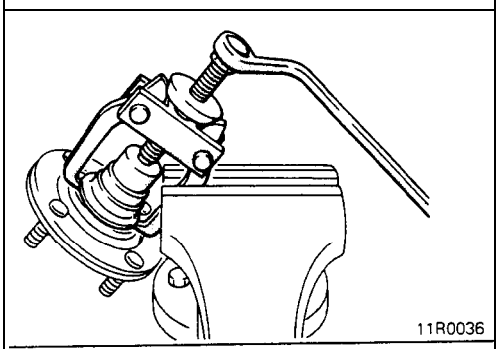
2. REMOVAL OF OIL SEAL (DRIVE SHAFT SIDE)

Remove the oil seal (drive shaft side) from the knuckle.



5. REMOVAL OF WHEEL BEARING

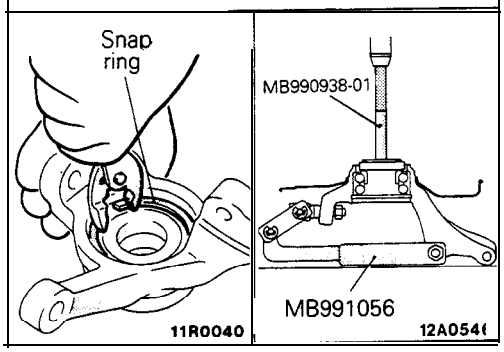
(1) Crush the oil seal in two places so that the tabs of the special tool will be caught on the wheel bearing inner race.



(2) Remove the wheel bearing inner race from the front hub by using the general service tool.

NOTE

Be careful that the front hub will not fall down as the wheel bearing inner race (outer side) is removed from the hub



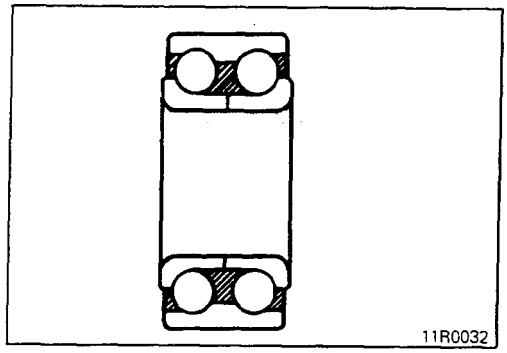
(3) Remove the snap ring from the knuckle.
(4) Remove the bearing by using the special tools.

Caution

Removal is easier if the outer side inner race removed from the hub is placed on the bearing and the wheel bearing is then removed.

INSPECTION M26IGABa

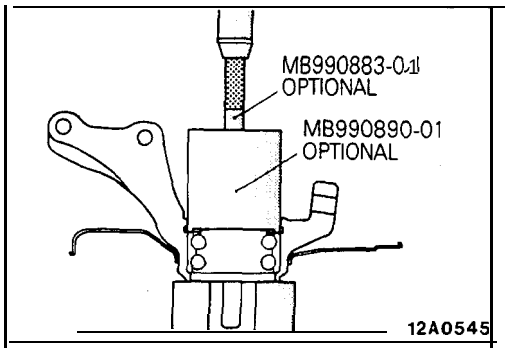
- Check the front hub and brake disc mounting surfaces for galling and contamination.
- Check the knuckle inner surface for galling and cracks.
- Check for defective bearing.



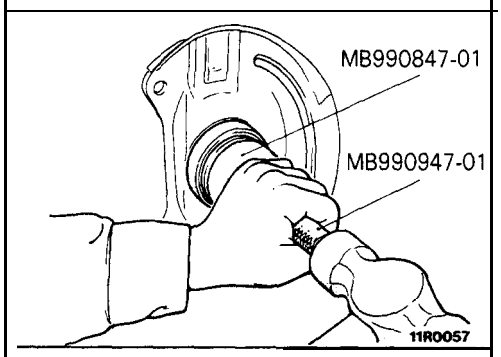
SERVICE POINTS OF REASSEMBLY M26IHAL

5. INSTALLATION OF WHEEL BEARING

(1) Fill the wheel bearing with multipurpose grease.
(2) Apply a thin coating of multipurpose grease to the knuckle and bearing contact surfaces.

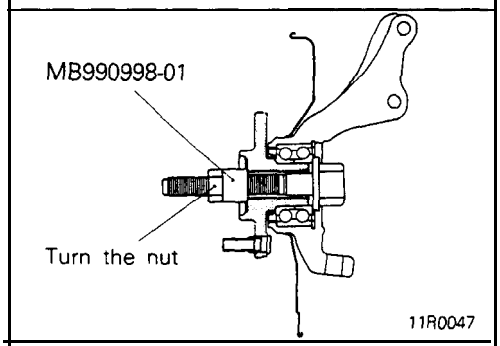


(3) With the wheel bearing inner race removed, press-in the bearing by using the special tools.
(4) Install the wheel bearing inner race to the wheel bearing.



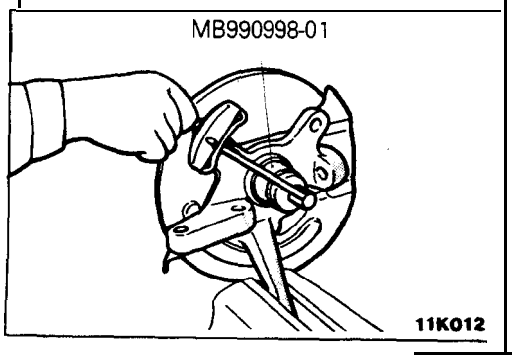
4. INSTALLATION OF OIL SEAL (HUB SIDE)

(1) Drive the oil seal (hub side) into the knuckle by using the special tools until it is flush with the knuckle end surface.
(2) Apply multipurpose grease to the lip of the oil seal and to the surfaces of the oil seal which contact the front hub.



1. INSTALLATION OF FRONT HUB

(1) Use the special tool to mount the front hub assembly onto the knuckle.
(2) Tighten the nut of the special tool to 200–260 Nm (144– 188 ft.lbs.).
(3) Rotate the front hub assembly in order to seat the bearing.
(4) Leave the special tool in place and take the measurements described below.

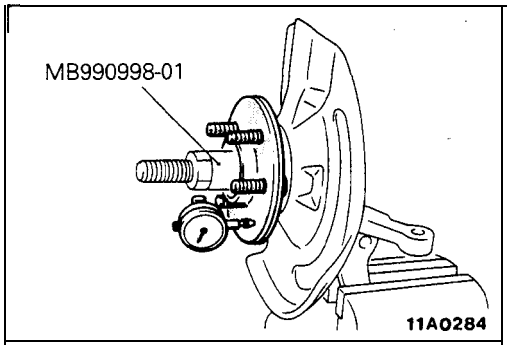


- **ADJUSTMENT OF WHEEL BEARING STARTING TORQUE**

(1) Measure the wheel bearing starting torque (hub starting torque) by using the special tools.

Limit: 1.8 Nm (16 in.lbs.) or less

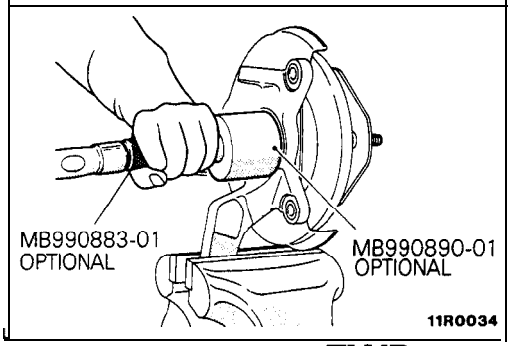
NOTE
The starting torque must be within the limit and, in addition, the bearing must not feel rough when rotated.



(2) Measure to determine whether the end play of the hub is within the specified limit or not.

Limit: 0.2 mm (.008 in.) or less

(3) If the starting torque and hub end play are not within the limit range while the nut is tightened to 200–260 Nm (144– 188 ft.lbs.), the bearing, hub and/or knuckle have probably not been installed correctly. Repeat the disassembly and assembly procedure.



2. INSTALLATION OF OIL SEAL (DRIVE SHAFT SIDE)

Drive the oil seal (drive shaft side) into the knuckle until it contacts the snap ring.
Apply multipurpose grease to the lip of the oil seal.

DRIVE SHAFT <FWD>

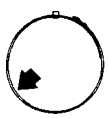
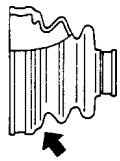
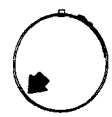
M26QA-A

The T.J.-R.J. type of drive shaft is used for SOHC engines, and the T.J.-B.J. type is used for DOHC engines.

PARTS DISTINCTION

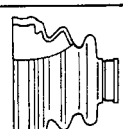
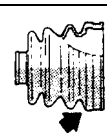
Boots and boot bands can be distinguished by the indicated part numbers shown below.

T.J.-R.J. TYPE

	T.J. boot band	T.J. boot	Boot band (small)	R.J. boot	R.J. boot band
Part shapes and part identification number location	 Identification location 11A0125	 Identification location 11R0156	identification location 11A0125	Identification location 11K033	 Identification location 11A0125
Part identification No.	110	019	218*1 or 206*2	020	126

NOTE
*1: R.J. side, *2: T.J. side

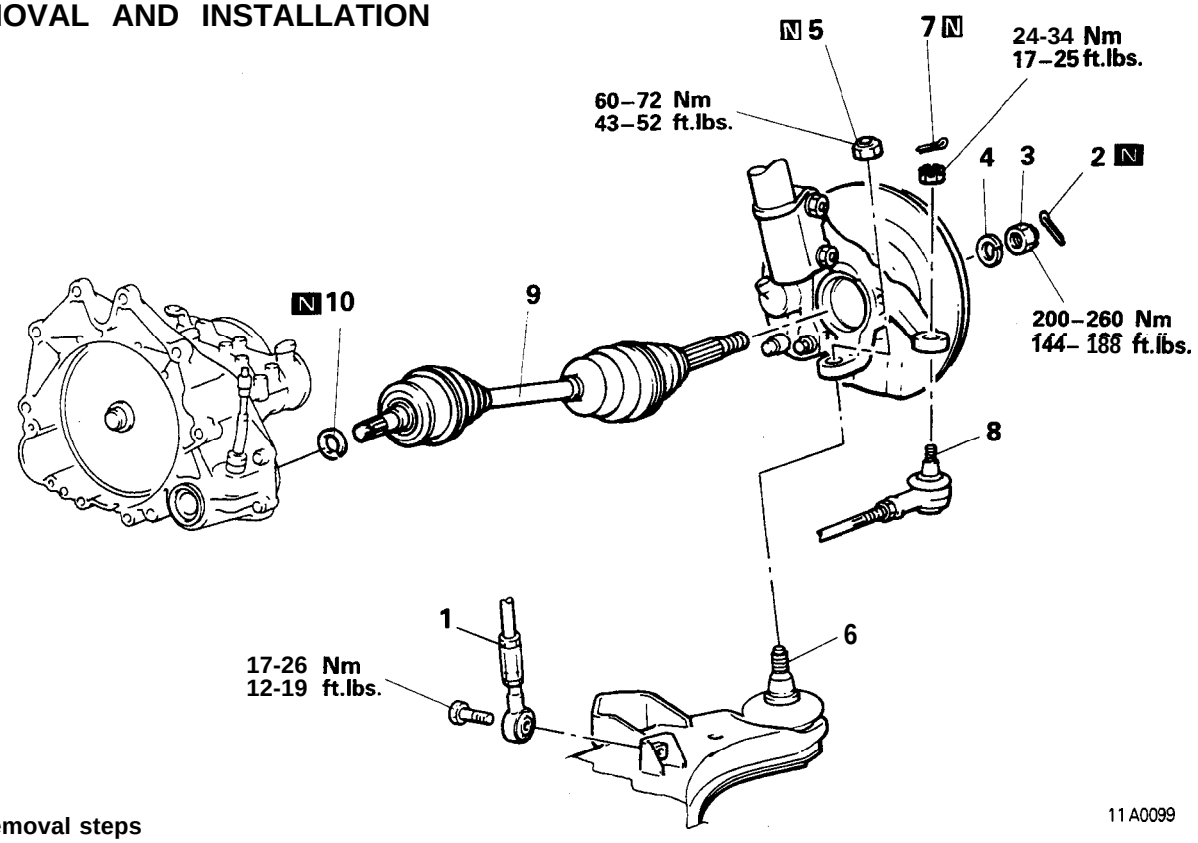
T.J-B.J TYPE

	T.J. boot band	T.J. boot	Boot band (small	B.J. boot	B.J. boot band
Part shapes and part identification number location	Identification location 11K033	 Identification location 11R0156	Identification location 11K033	 Identification location 11K033	Identification location 11K033
Part identification No.	20–12	17–55#TJ92	20–111	17-31 #BJ92L 17–69#BJ92L*	20–75

* : From 1993 models <SOHC>

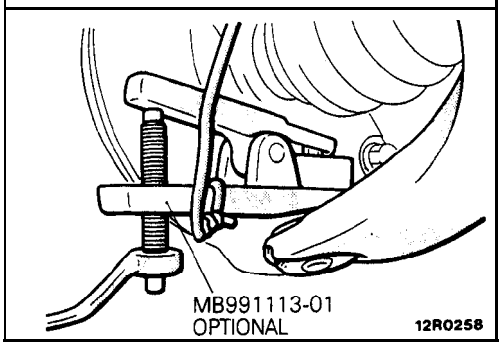
TSB Revision

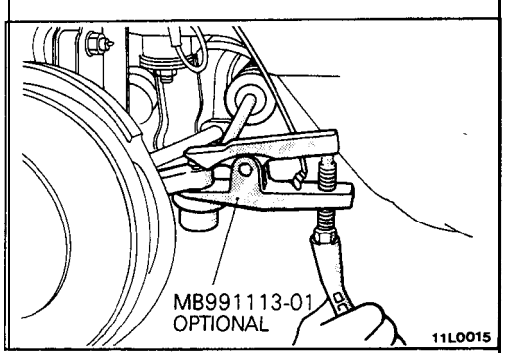
REMOVAL AND INSTALLATION



Removal steps

1. Front height sensor connection <Vehicles with ACTIVE-ECS> (Refer to GROUP 33B–Height Sensor)
● + 2. Cotter pin
◆◆ ● C 3. Drive shaft nut
● * 4. Washer
5. Self locking nut
◆◆ ● + 6. Lower arm ball joint connection
7. Cotter pin
◆◆ 8. Tie rod end connection
◆◆ 9. Drive shaft
10. Circlip





SERVICE POINTS OF REMOVAL M26QBAL

3. REMOVAL OF DRIVE SHAFT NUT

Loosen the drive shaft nut while the vehicle is on the floor with the brakes applied.

6. DISCONNECTION OF LOWER ARM BALL JOINT

Using the special tool, disconnect the lower arm ball joint from the knuckle.

Caution

1. Be sure to tie the cord of the special tool to the nearby part.

2. Loosen the nut but do not remove it.

8. DISCONNECTION OF TIE ROD END

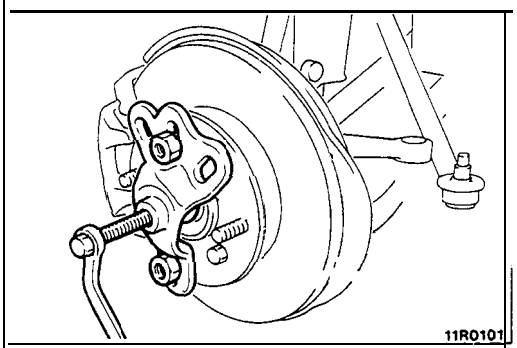
Using the special tool, disconnect the tie rod end from the knuckle.

Caution

1. Be sure to tie the cord of the special tool to the nearby part.

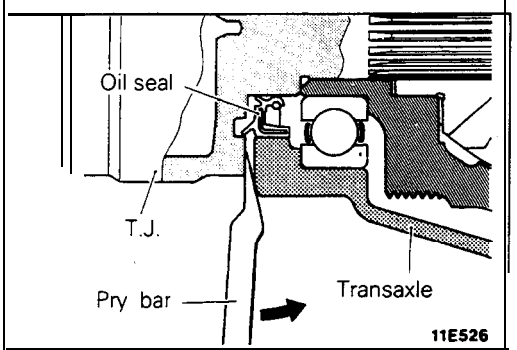
2. Loosen the nut but do not remove it.

TSB Revision



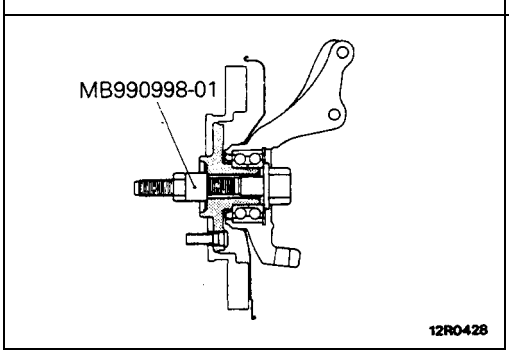
9. REMOVAL OF DRIVE SHAFT

(1) Use the general service tool to push out the drive shaft from the front hub.

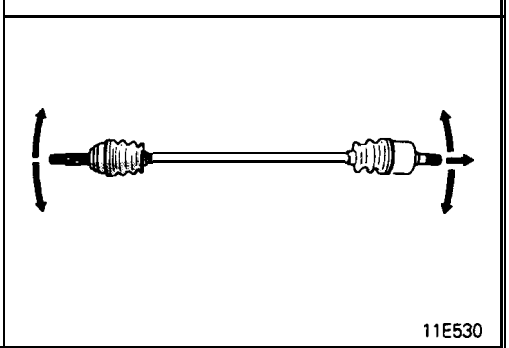


(2) Insert a pry bar between the transaxle case and the drive shaft, and then pry the drive shaft from the transaxle.

Caution
1. Do not pull on the drive shaft; doing so will damage the T.J.; be sure to use the pry bar.
2. Do not insert the pry bar so deep as to damage the oil seal.



Caution
Do not apply the vehicle weight to the wheel bearing while the drive shaft is disconnected. If the vehicle weight must unavoidably be applied (because of vehicle movement or some other reason), use the special tool to hold the wheel bearing, as shown in the figure.



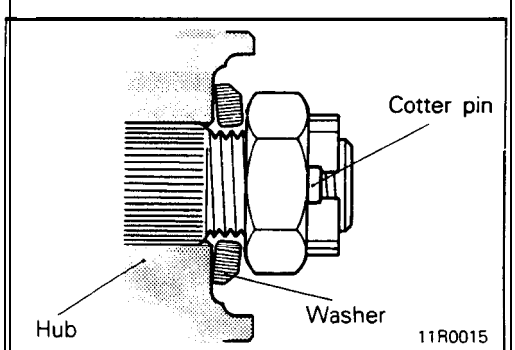
INSPECTION M260CAC

- 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.

SERVICE POINTS OF INSTALLATION M260DAJ

6. INSTALLATION OF LOWER ARM BALL JOINT

Lower the vehicle to the ground and tighten the knuckle to the lower arm ball joint connecting nut.

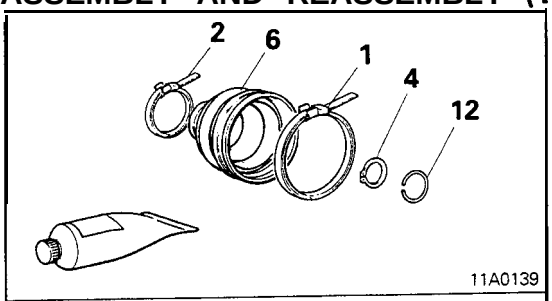


4. INSTALLATION OF WASHER/3. DRIVE SHAFT NUT/2. COTTER PIN

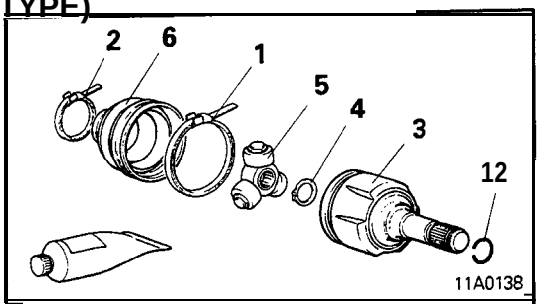
(1) Be sure to install the washer and wheel bearing nut in the specified direction.
(2) After installing the wheel, lower the vehicle to the ground and finally tighten the wheel bearing nut.
(3) If the position of the cotter pin holes does not match, tighten the nut up to 260 Nm (188 ft.lbs.) in maximum.
(4) Install the cotter pin in the first matching holes and bend it securely.

DISASSEMBLY AND REASSEMBLY (T.J.-R.J. TYPE)

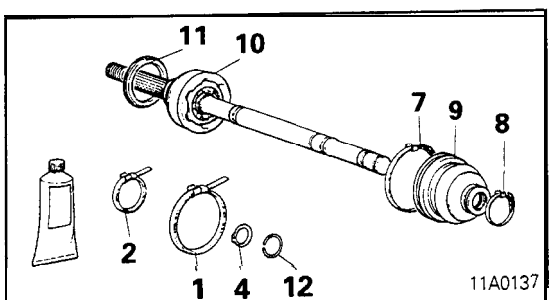
M26QE-A



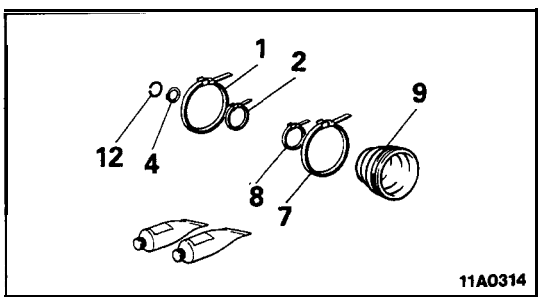
T.J. Boot kit



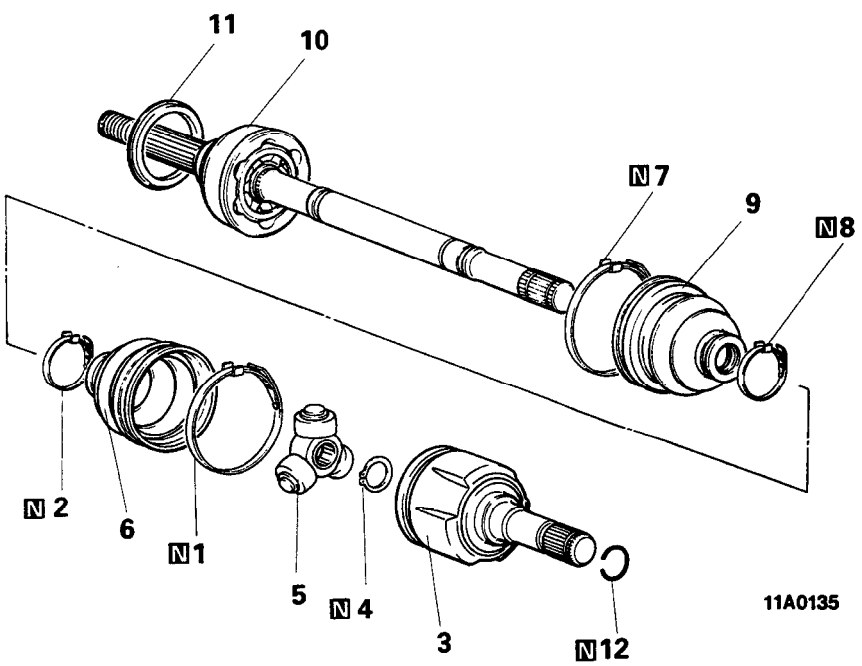
T.J. Joint kit



R.J. Joint and shaft kit



R.J. Boot kit

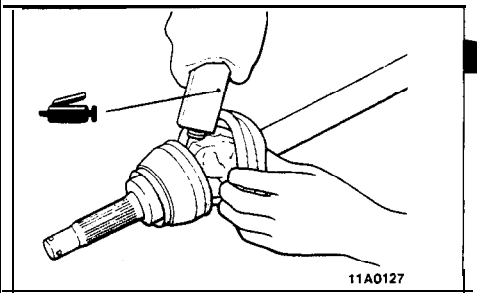


Disassembly steps

- ● + 1. T.J. boot band
- ● + 2. Boot band (small)
- 3. T.J. case
- ◆◆ 4. Snap ring
- ◆◆ 5. Spider assembly
- ◆◆ ◆◆ 6. T.J. boot
- 7. R.J. boot band
- 8. Boot band (small)
- ◆◆ ◆◆ 9. R.J. boot
- 10. R.J. assembly
- 11. Dust cover
- 12. Circlip

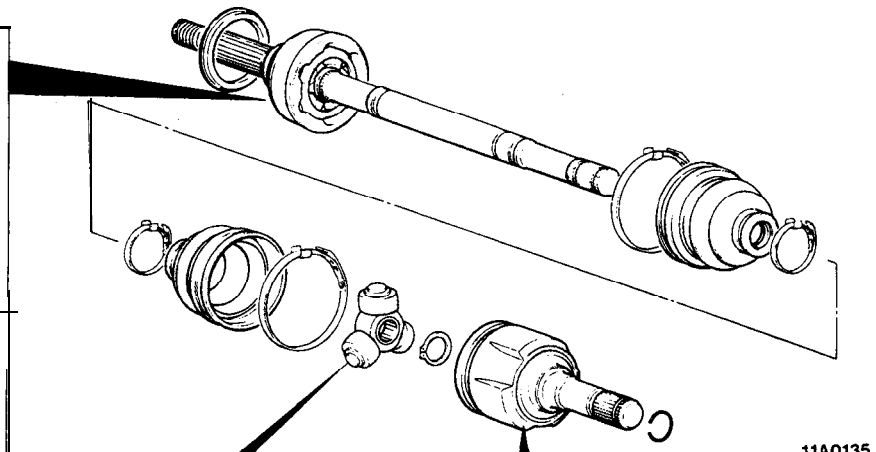
TSB Revision

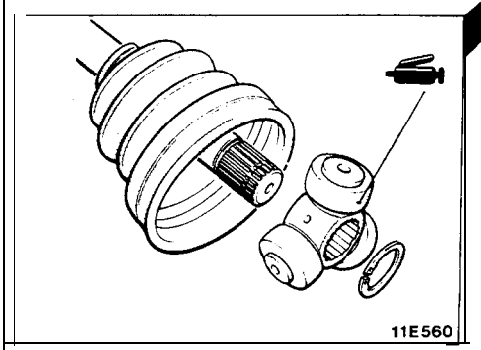
Lubrication points

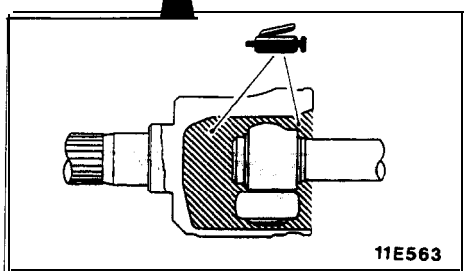


Grease: Repair kit grease
120 g (4.2 oz.)

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

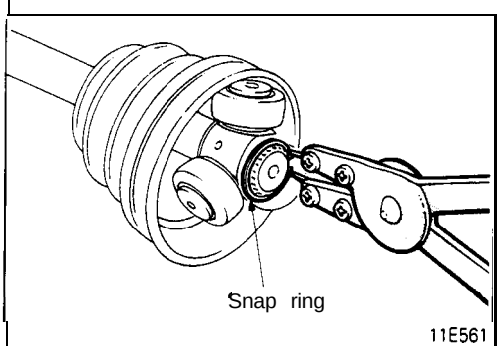


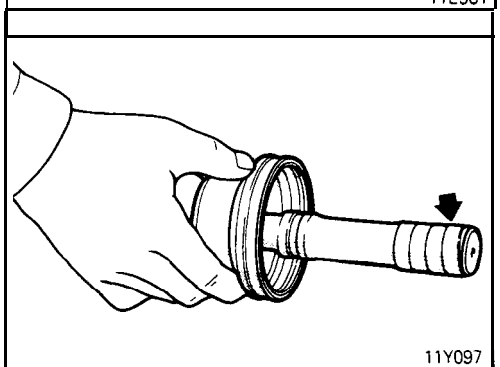




Grease: Repair kit grease
120 g (4.2 oz.)

NOTE
The grease in the repair kit should be divided in half for use, respectively. at the joint and inside the boot.





SERVICE POINTS OF DISASSEMBLY M26QFBC

4. REMOVAL OF SNAP RING/S. SPIDER ASSEMBLY

(I) Remove the snap ring from the drive shaft with the snap ring pliers.
(2) Take out the spider assembly from the drive shaft.
(3) Clean the spider assembly.

Caution
1. Do not disassemble the spider assembly.
2. If the T.J. of the drive shaft assembly is bent, the joint may be damaged. Use care in handling the drive shaft.
3. The drive shaft joint uses special grease. Do not mix old and new or different types of grease.

6. REMOVAL OF T.J. BOOT/9. B.J. BOOT

(1) Wrap vinyl tape around the splines on the T.J. side of the drive shaft so that the T.J. and B.J. boots are not damaged when they are removed.
(2) Withdraw the T.J. and B.J. boots from the drive shaft.

Caution
Do not disassemble the R.J.
Distinguish between R.J. boot and T.J. boot parts.

TSB Revision

INSPECTION M26QGBC

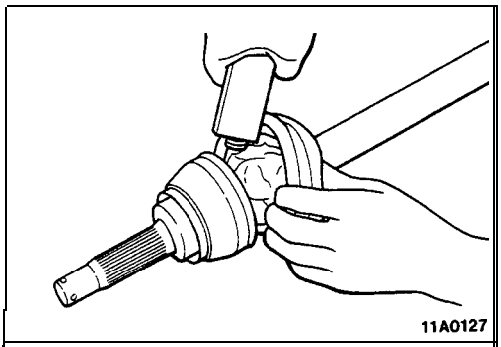
- Check the drive shaft for damage, bending or corrosion.
- Check the drive shaft splines for wear or damage.
- Check for entry of water and/or foreign material into R.J.
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside T.J. case for wear or corrosion.
- Check the boots for deterioration, damage or cracking.

SERVICE POINTS OF REASSEMBLY M26QHBE

9. INSTALLATION OF R.J. BOOT/6. T.J. BOOT

(1) Wrap vinyl tape around the spline part on the drive shaft, and then install the R.J. boot and and T.J. boot, in that order.

Caution
Distinguish between R.J. boot and T.J. boot parts according to the section "Parts Distinction", and be sure to assemble them correctly.



(2) Fill the inside of the R.J. and R.J. boot with the specified grease.

Specified grease:
Repair kit grease 120 g (4.2 oz.)

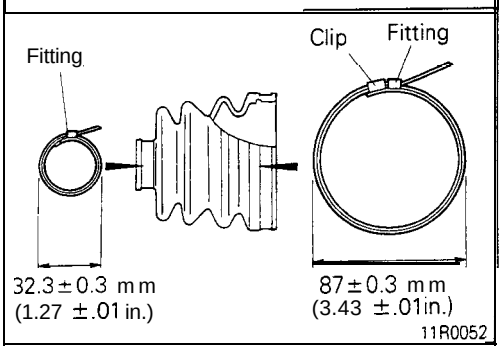
NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

(3) Install the R.J. boot to the R.J. assembly.

Caution
The boot bands should be tightened with the drive shaft at a 0° break angle.

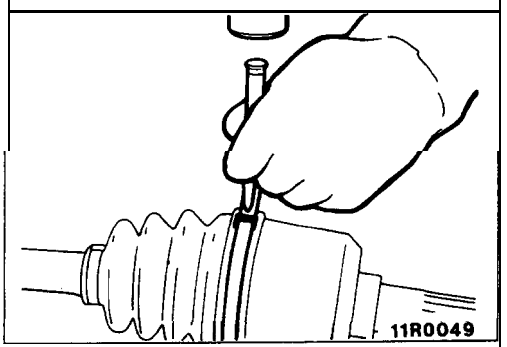
(4) Apply a light coating of the repair kit grease (used in the R.J.) to the installation surface of the boot band.

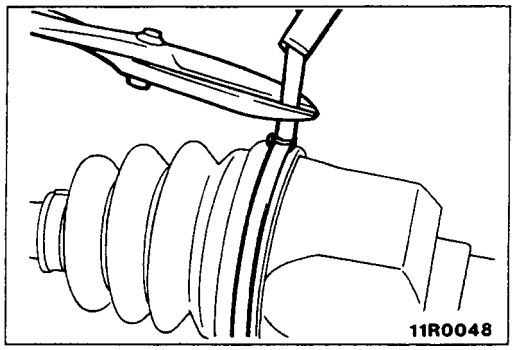
(5) Tighten so that the outer diameter of the boot band is the dimension indicated in the illustration, and then bend at the fitting part.



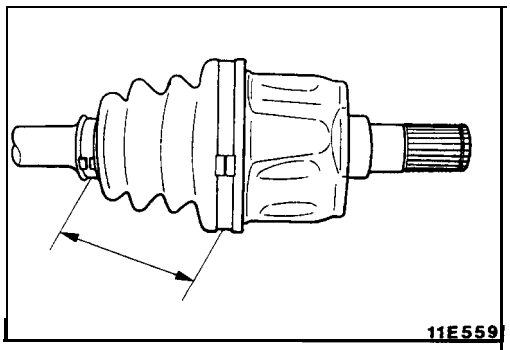
(6) Using a punch, crimp the centre part of the boot band fitting so as to securely hold the band.

Caution
Care must be taken not to cut, tear or puncture the boot.





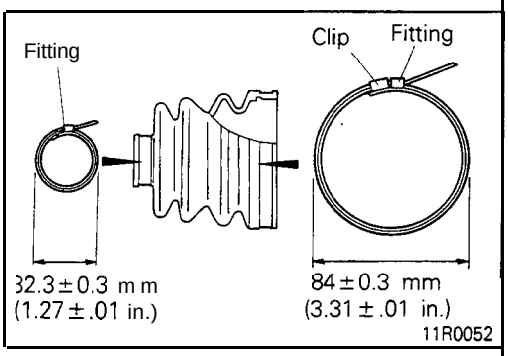
(7) For the boot band (small), cut away so that the length of the band width remains, and then bend it over the crimped band fitting.
For the boot band (large), cut away so that the length until the clip holder position remains, and then secure by the clip.



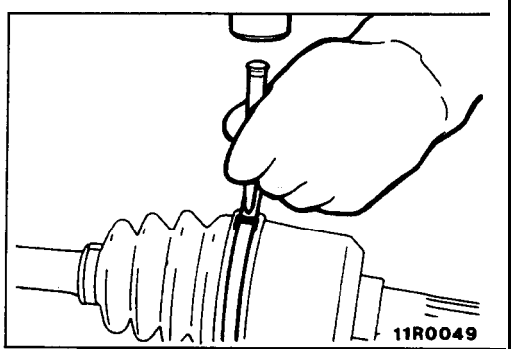
2. INSTALLATION OF BOOT BAND (SMALL)/1. T.J. BOOT BAND

(1) 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: L.H. 82±3 mm (3.23±.12 in.)
R.H. 85±3 mm (3.35±.12 in.)

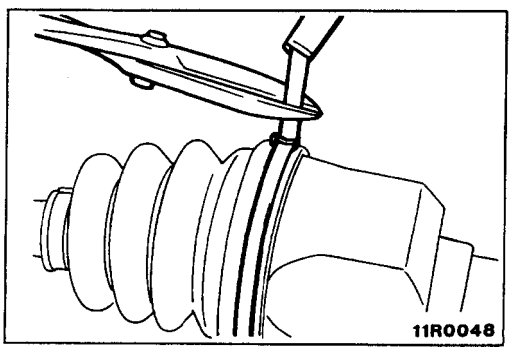


(2) Apply a light coating of the repair kit grease (used in the T.J.) to the installation surface of the boot band.
(3) Tighten so that the outer diamter of the boot band is the dimension indicated in the illustration, and then bend at the fitting part.



(4) Using a punch, crimp the centre part of the boot band fitting so as to securely hold the band.

Caution
Care must be taken not to cut, tear or puncture the boot.

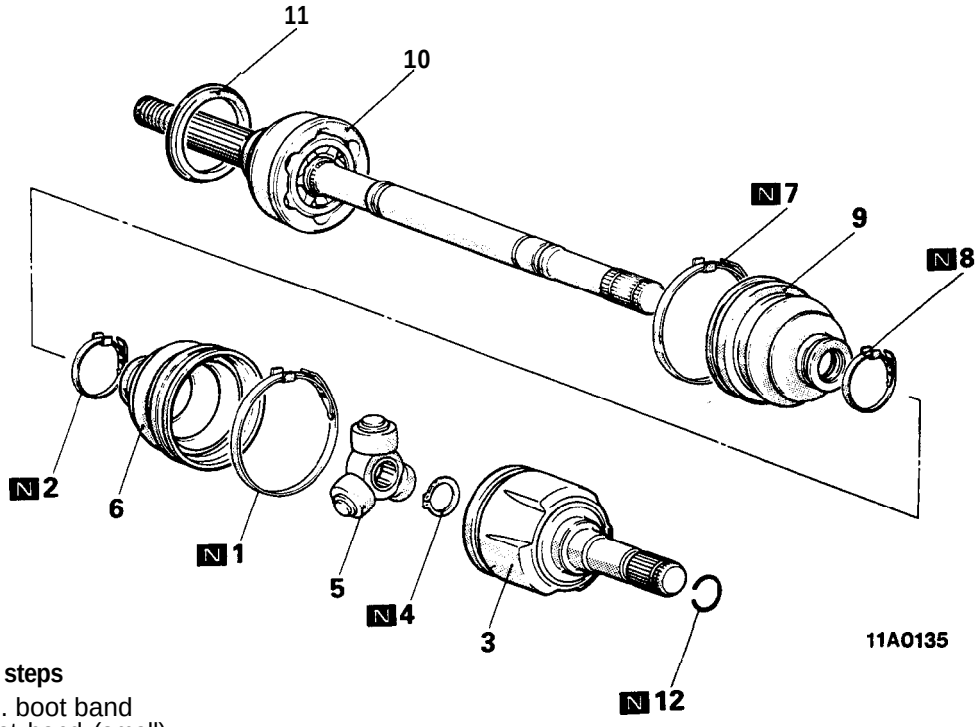


(5) For the boot band (small), cut away so that the length of the band width remains, and then bend it over the crimped band fitting.
For the boot band (large), cut away so that the length until the clip holder position remains, and then secure by the clip.

TSB Revision

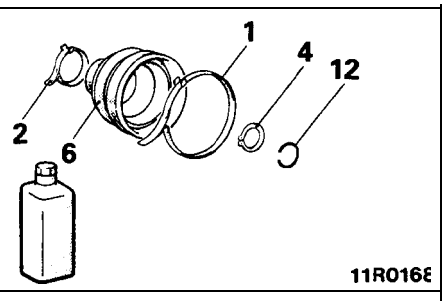
DISASSEMBLY AND REASSEMBLY (T.J.–B.J. TYPE)

M260E-8

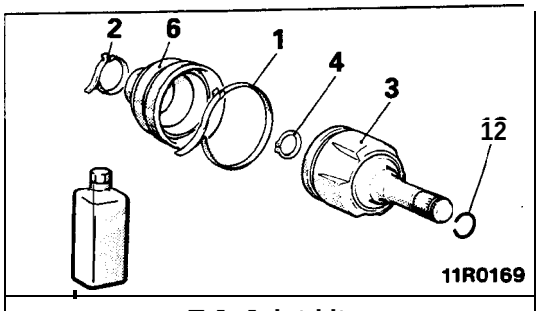


Disassembly steps

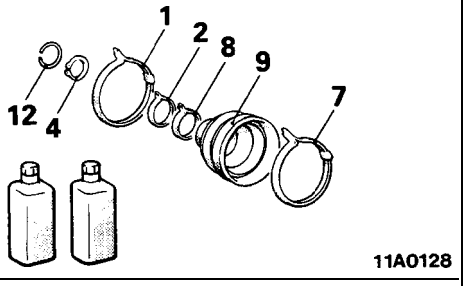
- ● 1. T.J. boot band
- ◆◆ 2. Boot band (small)
- **3.** T.J. case
- 4. Snap ring (Refer to P.26-16.)
- 5. Spider assembly (Refer to P.26-16.)
- ◆▮ ● + 6. T.J. boot band
- 7. B.J. boot band
- 8. Boot band (small)
- ◆▮◆ ◆◆ 9. B.J. boot
- 10. B.J. assembly
- 11. Dust cover
- 12. Circlip



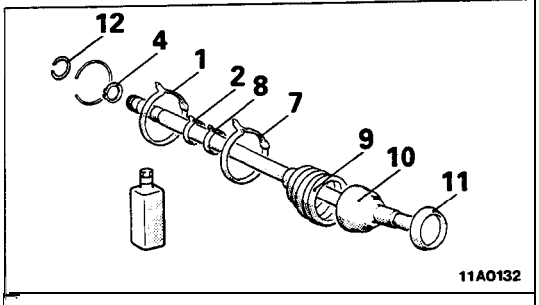
T.J. Boot kit



T.J. Joint kit



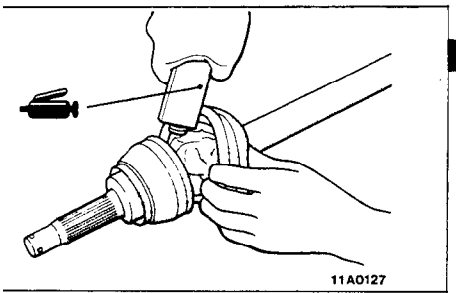
B.J. Boot kit



B.J. Joint and shaft kit

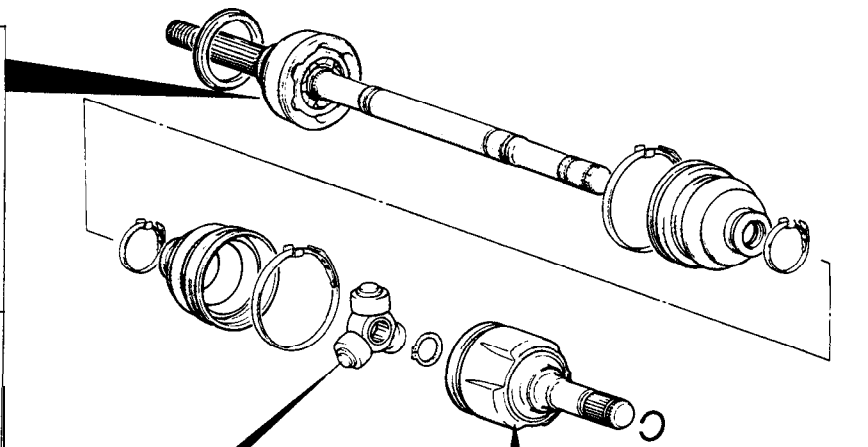
TSB Revision

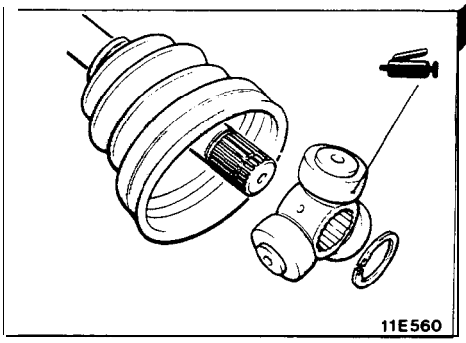
Lubrication points

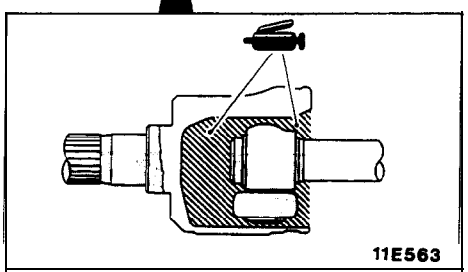


Grease: Repair kit grease
110 g (3.9 oz.)

NOTE
The grease in the repair kit should be divided in half for use. respectively, at the joint and inside the boot.

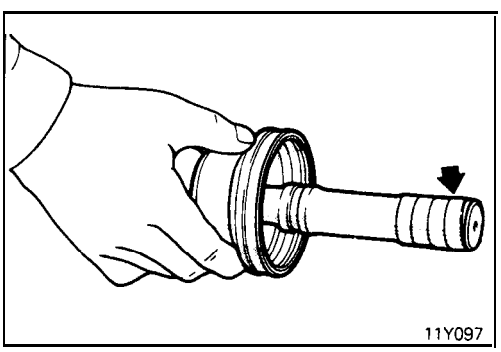






Grease: Repair kit grease
120 g (4.2 oz.) <SOHC>
130 g (4.5 oz.) <DOHC>

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.



SERVICE POINTS OF DESASSEMBLY M26QFDD

6. REMOVAL OF T.J BOOT/9. B.J. BOOT

(1) Wrap vinyl tape around the spline part on the T.J. side of the drive shaft so that the T.J. and B.J. boots are not damaged when they are removed.
(2) Withdraw the T.J. and R.J. boots from the drive shaft.

Caution
Do not disassemble the B.J.
Distinguish between B.J. boot and T.J. boot parts.

INSPECTION M26QGDC

- Check the drive shaft for damage, bending or corrosion.
- Check the drive shaft splines for wear or damage.
- Check for entry of water and/or foreign material into R.J.
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside T.J. case for wear of corrosion.
- Check the boots for deterioration, damage or cracking.

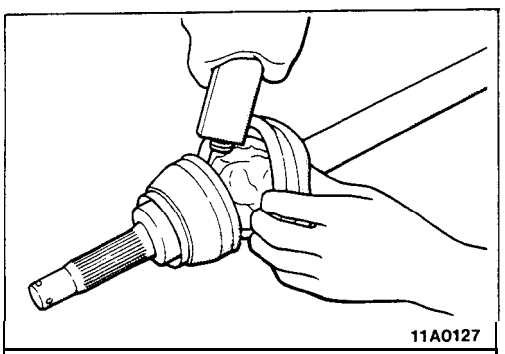
TSB Revision

SERVICE POINTS OF REASSEMBLY M26QHDE

9. INSTALLATION OF B.J. BOOT / 6. T.J. BOOT

(1) Wrap vinyl tape around the splines on the drive shaft, and then install the R.J. boot and T.J. boot, in that order. order.

Caution
Distinguish between B.J. boot and T.J. boot parts according to the section "Parts Distinction", and be sure to assemble them correctly.


11A0127

(2) Fill the inside of the B.J. and B.J. boot with the specified grease.

Specified grease: Repair kit grease
110 g (3.9 oz.)

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

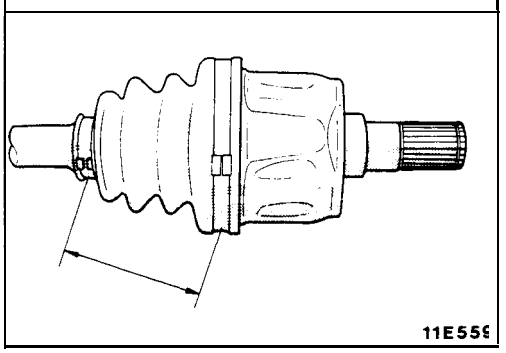
(3) Secure the boot bands.

Caution
The boot bands should be tightened with the drive shaft at a 0° joint angle.

2. INSTALLATION OF BOOT BAND (SMALL) / 1. T.J. BOOT BAND

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: 80 ± 3 mm (3.15 ± 0.12 in.)


11E55

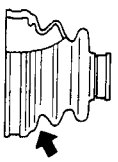
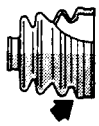
DRIVE SHAFT <AWD–UP TO 1992 MODELS>

M26QA-C

T.J.-B.J. type drive shaft is used. The left side drive shaft has an inner shaft and center bearing so that the left and right side drive shafts are same length.

PARTS DISTINCTION

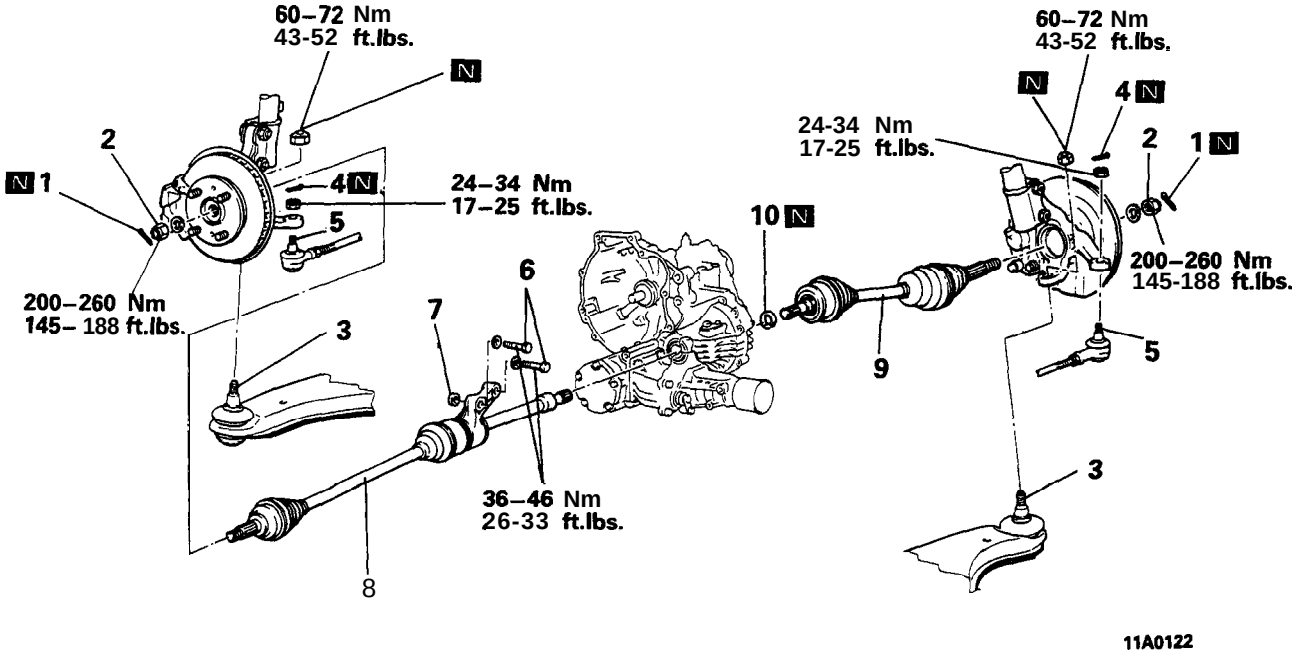
Boots and boot bands can be distinguished by the indicated part numbers shown below.

	T.J. boot band	T.J. boot	Boot band (small)	B.J. boot	B.J. boot band
Part shapes and part identification number location	Identification location 11K033	 Identification location 11R0156	Identification location 11K033	 Identification location 11K033	Identification location 11K033
	20–110	17–261#TJ87	20–146	17–249#BJ87L	20–113

TSB Revision

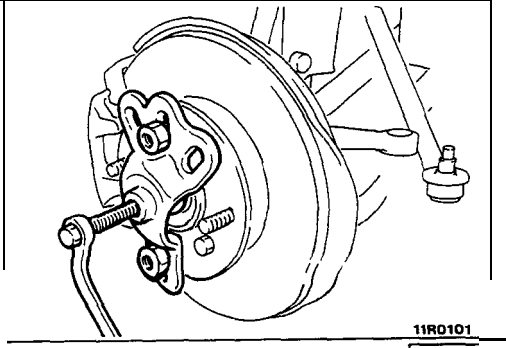
REMOVAL AND INSTALLATION

Pm-removal and Post-installation Operation
- Removal and installation of the Under Cover



Removal steps

1. Cotter pin
2. Drive shaft nut (Refer to P.26-13, 14.)
3. Lower arm ball joint connection (Refer to P.26-3.)
4. Cotter pin
5. Tie rod end connection (Refer to P.26-13.)
6. Center bearing bracket installation bolt
7. Spacer (Vehicles without air conditioning)
- ☒ 8. Drive shaft and inner shaft assembly (L.H.)
- ☒ 9. Drive shaft (R.H.)
10. Circlip

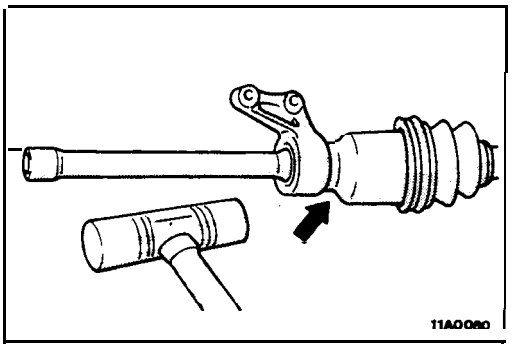


SERVICE POINTS OF REMOVAL M26QBAW

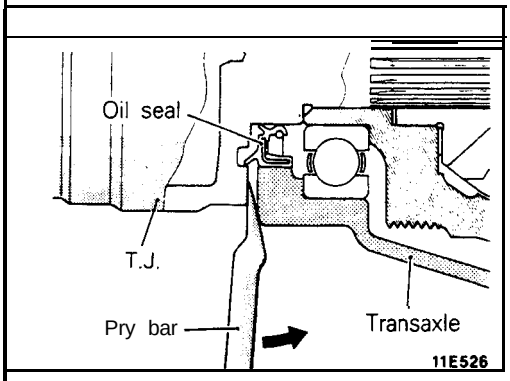
8. REMOVAL OF DRIVE SHAFT AND INNER SHAFT ASSEMBLY (L.H.)/9. DRIVE SHAFT (R.H.)

(1) Use the general service tool to push out the drive shaft and inner shaft assembly (L.H.) or the drive shaft (R.H.) from the front hub.

TSB Revision



(2) Remove the drive shaft and inner shaft assembly (L.H.) from the transaxle by lightly tapping the T.J. case with a plastic hammer, etc.



(3) Remove the drive shaft (R.H.) as described below.

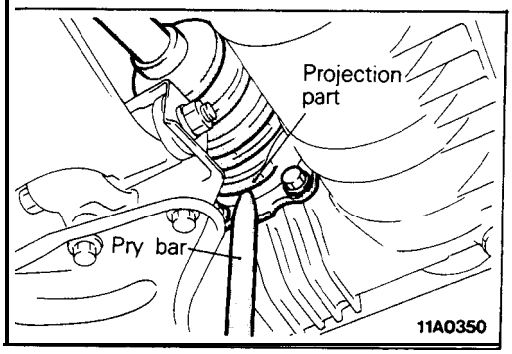
<M/T>

Insert a pry bar between the transaxle case and the drive shaft, and then pry the drive shaft from the transaxle.

Caution

1. Do not pull out 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.



<A/T>

Insert a pry bar at the projection part and remove the drive shaft (R.H.) from the transaxle.

Caution

Do not pull out the drive shaft; doing so will damage the T.J.; be sure to use the pry bar.

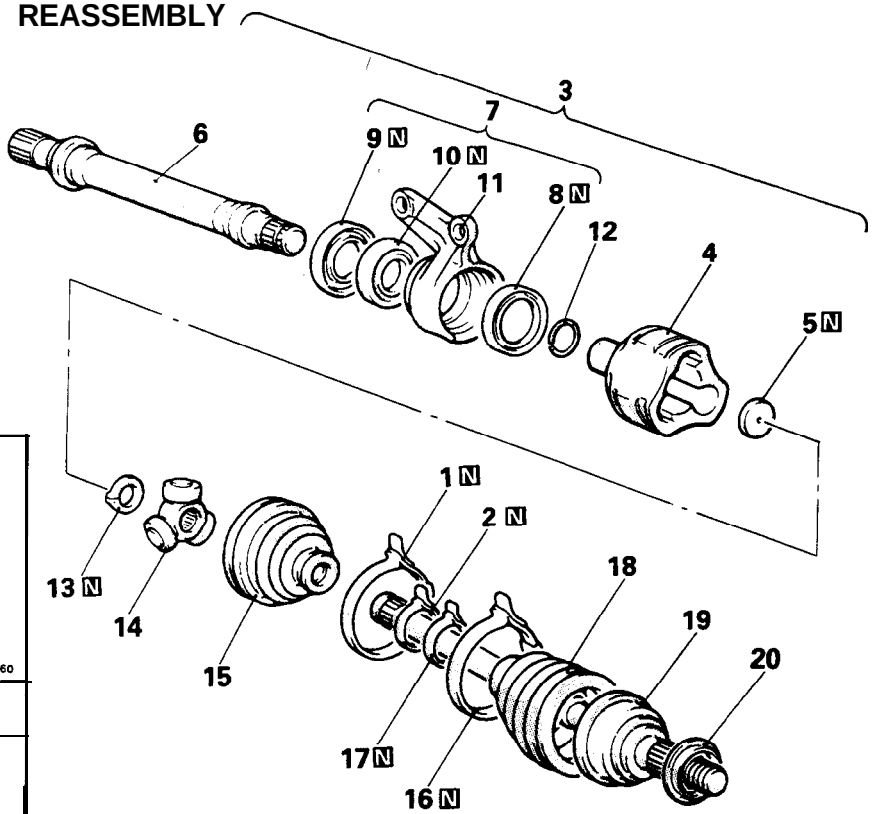
INSPECTION M2SQCAE

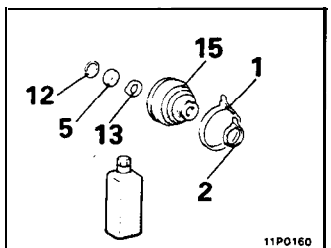
- Check the drive shaft boot for damage or deterioration.
- Check the ball joints for wear or operating condition.
- Check the spline part for wear or damage.
- Check the operation of the center bearing.

TSB Revision

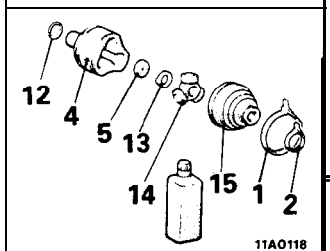
DISASSEMBLY AND REASSEMBLY

M26QE-C

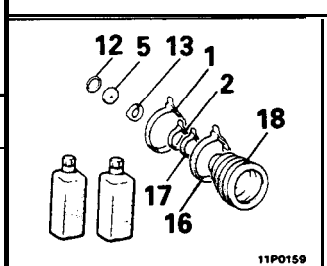




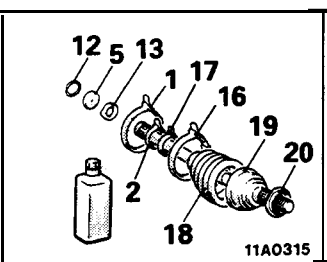
T.J. boot repair kit



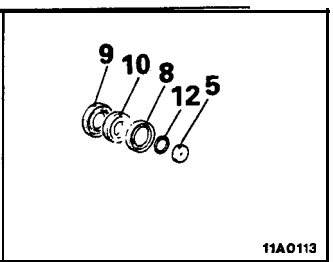
T.J. kit



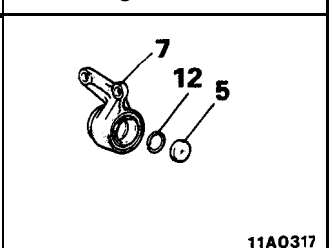
B.J. boot repair kit



B.J. kii



Bearing dust seal kii



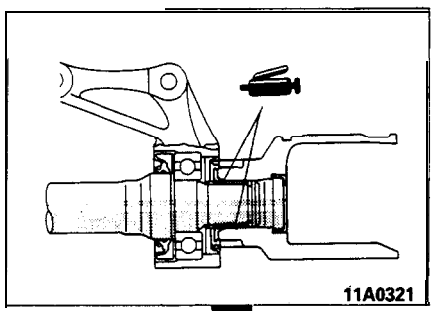
Bracket assembly kii

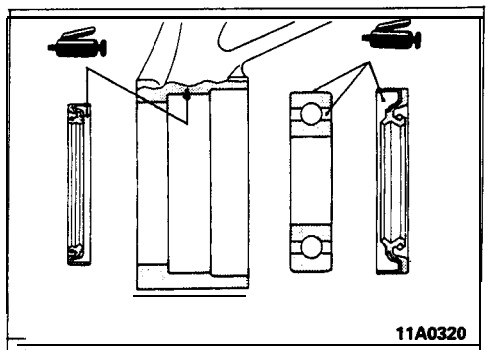
Disassembly steps

- ● + 1. T.J. boot band
- ● + 2. Boot band (small)
- ● + 3. T.J. case and inner shaft assembly
- 4. T.J. case
- 5. Seal plate
- ◆◆ ◆◆ 6. Inner shaft
- 7. Bracket assembly
- ◆◆ 8. Outer dust seal
- ◆◆ 9. Inner dust seal
- ◆◆ ● + 10. Center bearing
- 11. Center bearing bracket
- 12. Circlip
- 13. Snap ring (Refer to P.26-17.)
- 14. Spider assembly (Refer to P.26-17.)
- 15. T.J. boot (Refer to P.26-17,18.)
- 16. B.J. boot band
- 17. Boot band (small)
- 18. B.J. boot (Refer to P.26-17,18.)
- 19. B.J. assembly
- 20. Dust cover

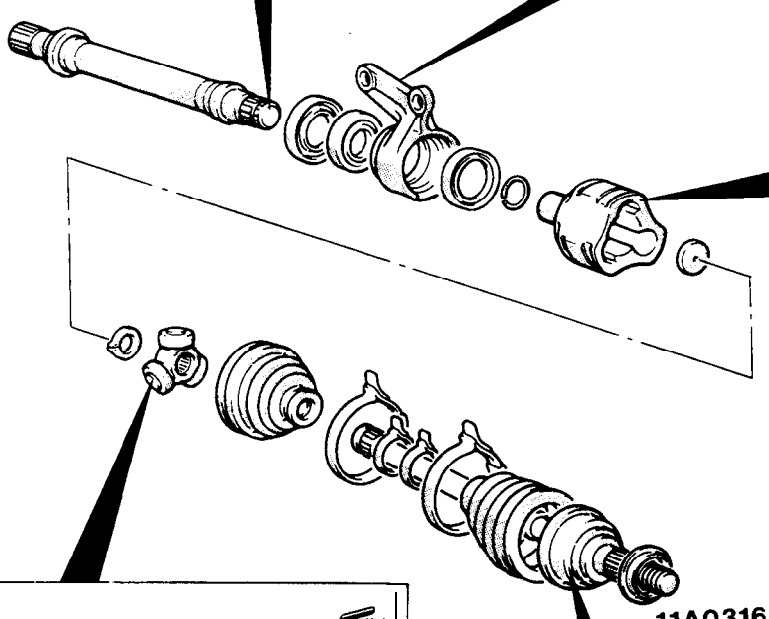
TSB Revision

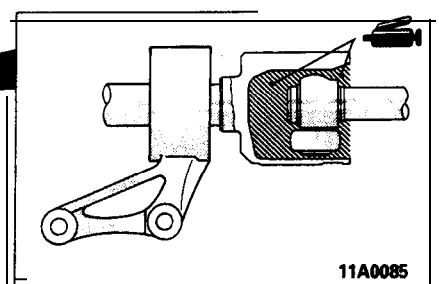
Grease Points





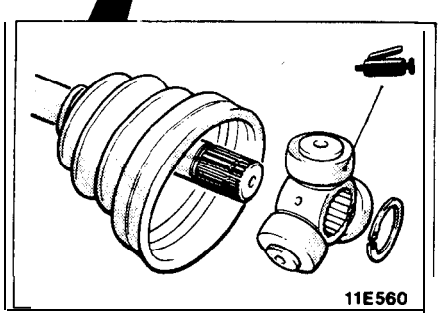
Grease: Multipurpose grease
Inner dust seal 7–10 g (.25–.35 oz.)
Outer dust seal 4-6 g (.14–.21 oz.)

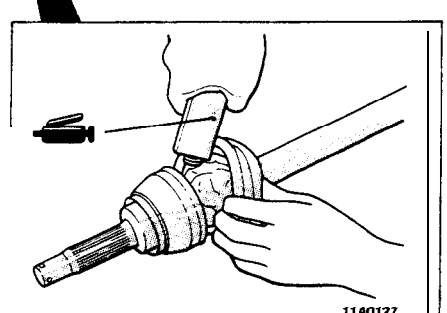




Grease: Repair kit grease
110 g (3.9 oz.)

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

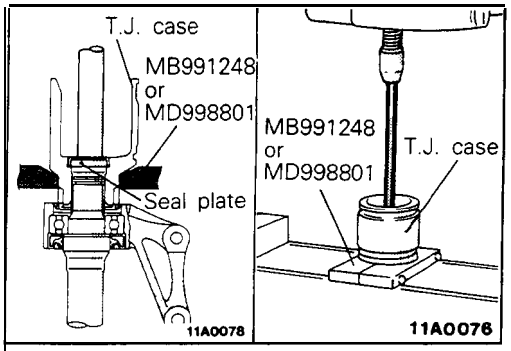




Grease: Repair kit grease
90 g (3.2 oz.)

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

TSB Revision

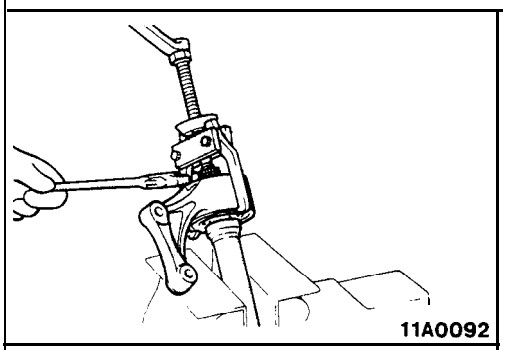


SERVICE POINTS OF DISASSEMBLY M26QFEC

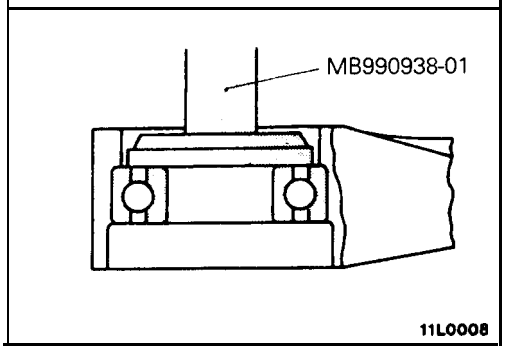
6. REMOVAL OF INNER SHAFT

(1) Using the special tool, remove the inner shaft assembly, together with the seal plate, from the T.J. case.

NOTE
Press the tool directly against the seal plate. The tool under pressure will puncture and deform the seal plate, and push out the inner shaft underneath.



(2) Use the general service tool to remove the inner shaft from the center bearing bracket.

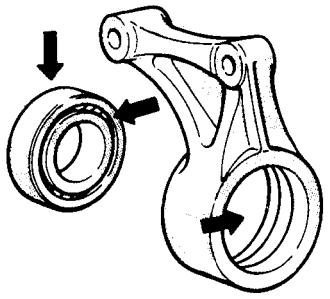


10. REMOVAL OF CENTER BEARING

Use the special tools to remove the center bearing from the center bearing bracket.

INSPECTION M26QGEB

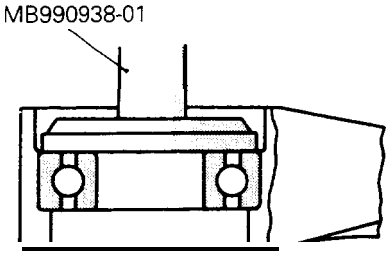
- Check the drive shaft for damage, bending or corrosion.
- Check the inner shaft for damage, bending or corrosion.
- Check the drive shaft splines for wear or damage.
- Check the inner shaft splines for wear or damage.
- Check for entry of water and/or foreign material into B.J..
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside T.J. case for wear of 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.


11A0091

SERVICE POINTS OF REASSEMBLY M2&QHED

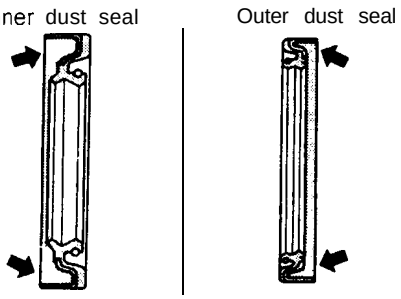
10. INSTALLATION OF CENTER BEARING

(1) Apply multipurpose grease to the center bearing and inside the center bearing bracket.



11 L0010

(2) Use the special tools to press-fit the center bearing into the center bearing bracket.

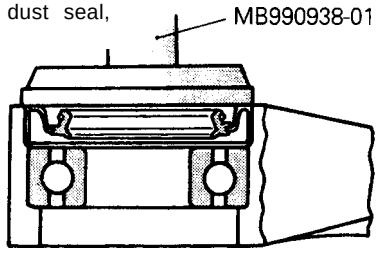


11L0012

9./8. INSTALLATION OF DUST SEALS

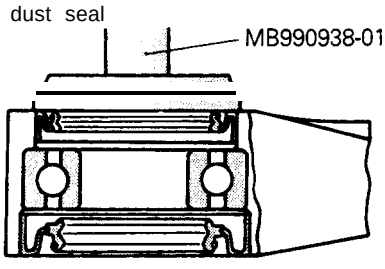
(1) Apply multipurpose grease to the rear surfaces of all dust seals.

Inner dust seal	**7–10 g (.25–.35 oz.)**
Outer dust seal	**4-6 g (.14–.21 oz.)**



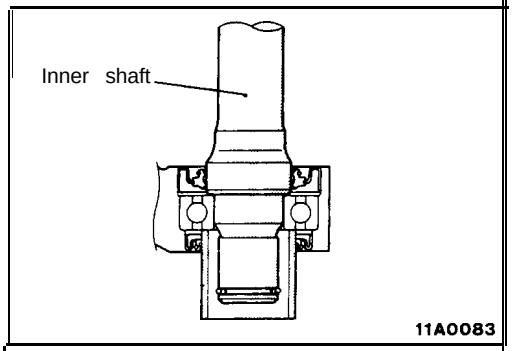
11L0009

(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.



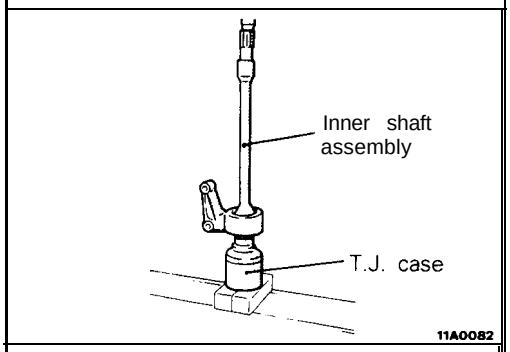
11L0007

NOTE
When applying grease, make sure that it does not adhere to anything outside the lip.



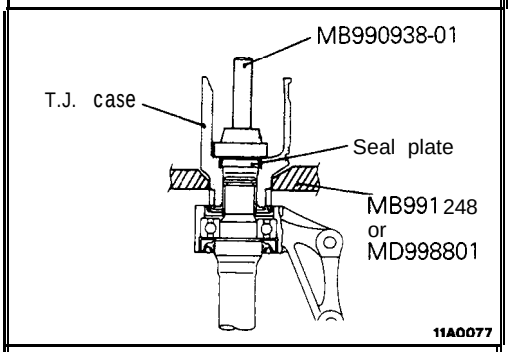
6. INSTALLATION OF INNER SHAFT

Use the pipe to hold the inner race of the center bearing and force the inner shaft into place.

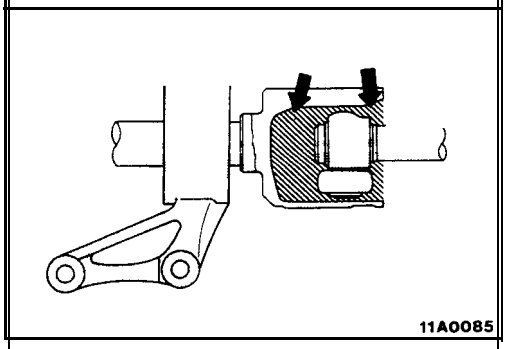


3. INSTALLATION OF T.J. CASE AND INNER SHAFT ASSEMBLY

(1) Apply multipurpose grease to the inner shaft spline, then press fit it into the T.J. case.



(2) Using the special tools, press the seal plate into the T.J. case.

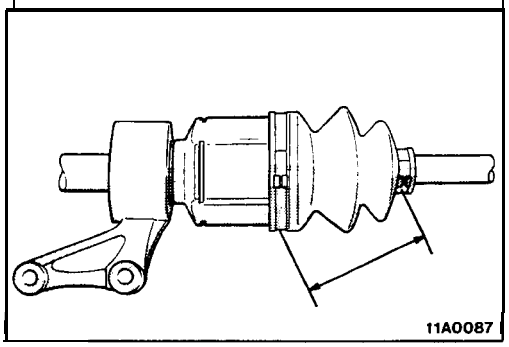


(3) Fill the specified grease furnished in the repair kit to the T.J. case.

Specified grease: Repair kit grease 110 g (3.9 oz.)

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution
The drive shaft joint uses special grease. Do not mix old and new or different types of grease.



2. INSTALLATION OF BOOT BAND (SMALL)/ 1. T.J. BOOT BAND

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: 85 ± 3 mm (3.35 ± .12 in.)

NOTES

REAR AXLE

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M27AA--

<AWD-UP TO 1992 MODELS>

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  - Oil leakage
- Drive Shaft
  - Noise

<FWD>

REAR AXLE HUB <VEHICLES WITH REAR DISC BRAKES> 8

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- Torque Specifications 2

TROUBLESHOOTING 2
- Abnormal Sound

REAR AXLE <FWD>

SPECIFICATIONS

GENERAL SPECIFICATIONS

M27CA-A

Items	SOHC	DOHC
Wheel bearing		
Type	Tapered roller bearing	Unit ball bearing
O.D. × I.D. mm (in.)		
Outer	39.9 × 17.5 (1.57 × .69)	–
inner	50.3 × 27.0 (1.98 × 1.06)	–

SERVICE SPECIFICATIONS

M27CB-A

Items		SOHC	DOHC
Standard value			
Rear hub rotary-sliding resistance	N (lbs.)		
When a new bearing is used		14 (3.08) or less	–
When the bearing is reused		11 (2.42) or less	–
Limit			
Wheel bearing end play	mm (in.)	–	0.05 (.020) or less
Rear hub rotary-sliding resistance	N (lbs.)	–	31 (7) or less

TORQUE SPECIFICATIONS

M27CC-A

Items	Nm	ft.lbs.
Wheel bearing nut (vehicles with rear drum brakes)	20 → 0 → 10	14 → 0 → 7
Wheel bearing nut (vehicles with rear disc brakes)	200–260	144-188
Caliper assembly mounting nut	50–60	36-43
Feed tube to rear oil pump	14-21	10–15
Rear hub to rotor	9-14	7–10
Rear oil pump attaching bolt	19-28	14–20
Rear speed sensor brackets	9-14	7–10

TROUBLESHOOTING

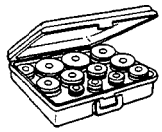
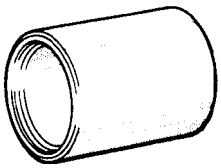
M27EA-A

Symptom	Probable cause	Remedy
Abnormal Sound	Loose wheel nuts	Tighten
	Damaged or worn wheel bearings Bent or distorted brake discs or drums	Replace

TSB Revision

SPECIAL TOOLS

M27DA-A

Tool	Number	Name	Use
	GENERAL SERVICE TOOL	Bearing and oil seal installer set	Installation of outer bearing outer race Installation of inner bearing outer race Installation of oil seal
	MB990938-01	Handle	
	MB990890-01 OPTIONAL: AVAILABLE FROM O.T.C.	Bushing remover and installer base	Installation of the drive gear

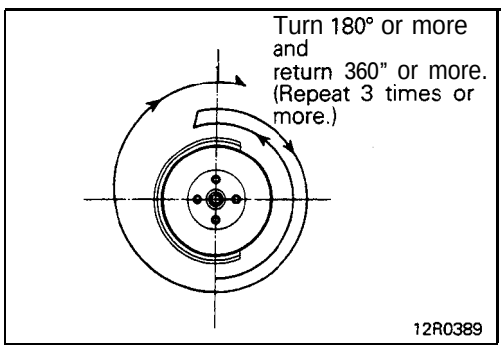
SERVICE ADJUSTMENT PROCEDURES

WHEEL BEARING END PLAY ADJUSTMENT

M27FBAJ

<VEHICLES WITH REAR DRUM BRAKES>

1. Inspect the play of the bearings while the vehicle is jacked up and resting on floor jack.
2. If there is any play, remove the hub cap, cotter pin, and lock cap, and then loosen the lock nut.
3. After tightening the lock nut to 20 Nm (14 ft.lbs.), turn the hub a few times to seat it to the bearing.



4. In order to seat the bearing properly, turn the hub (brake drum) 180° or more and then return it 360" or more; repeat this procedure again three or more times.
5. Return the lock nut to 0 Nm (0 ft.lbs.).
6. After tightening the lock nut at a torque of 10 Nm (7 ft.lbs.), rotate the hub again in the same way as described in step 4 so as to seat the bearing.
7. Then once again tighten the lock nut to 10 Nm (7 ft.lbs.).
8. Install the lock cap and cotter pin.
   If the position of the cotter pin is not matched with the holes of the lock cap, reposition the lock cap so that the holes align. If this can not be accomplished, back off the nut by not more than 15".

   Caution
   Check to be sure that the lock nut cannot be loosened manually.
9. After setting the cotter pin in place, seat the bearing in the same manner as in step 4.

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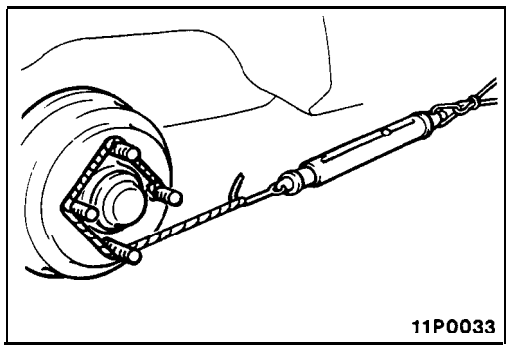
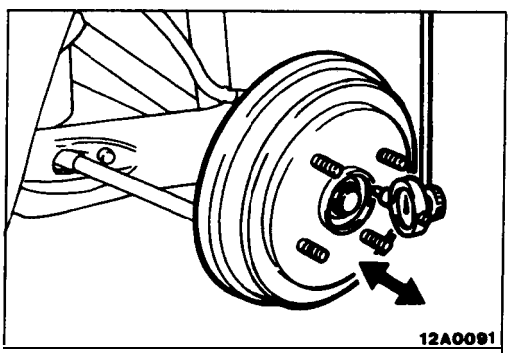


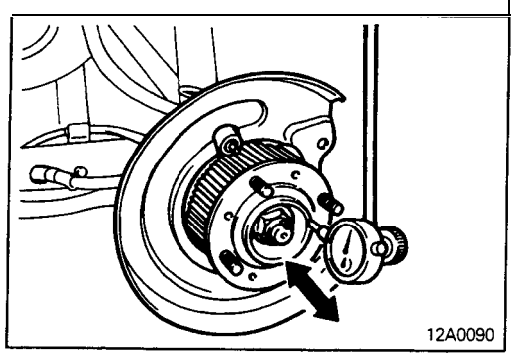
10. After securing the wheel nuts, attach a spring balance and rope to the hub bolt, and, pulling at a 90" angle from the hub bolt, measure to determine whether or not the rotary-sliding resistance of the rear hub is the standard value.

Standard value:
Rear hub rotary-sliding resistance
When a new bearing is used
14 **N** (3.08 **lbs.) or less**
When the bearing is reused
11 N (2.42 lbs.) or less

NOTE
If the standard value is exceeded, the lock nut should be tightened or the bearing replaced.

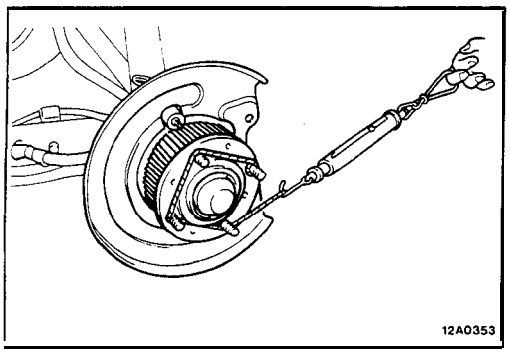


11. Check the bearing's end play.
Place a dial gauge against the hub surface; then move the hub in the axial direction and check whether or not there is end play.
Limit: 0 mm (0 in.)
12. If there is any play, the lock nut should be tightened or the bearing replaced.
13. After checking, be sure the hub rotates smoothly and that the cotter pin is correctly installed.



<VEHICLES WITH REAR DISC BRAKES>

1. Inspect the play of the bearings while the vehicle is jacked up and resting on floor jack.
2. Remove the hub cap and then release the parking brake.
3. Remove the caliper assembly and the brake disc.
4. Check the bearing's end play.
Place a dial gauge against the hub surface; then move the hub in the axial direction and check whether or not there is end play.
Limit: 0.05 mm (.0020 in.) or less
NOTE
If the limit value is exceeded, the lock nut should be tightened to the specified torque and check the end play again.
5. Replace the rear hub bearing unit if an adjustment cannot be made to within the limit.



REAR HUB ROTARY-SLIDING RESISTANCE (TORQUE) ADJUSTMENT M27FCAC

1. Inspect the play of the bearings while the vehicle is jacked up and resting on floor jack.
2. Release the parking brake.
3. Remove the caliper assembly and the brake disc.
4. After turning the hub a few times to seat the bearing, attach a spring balance and rope to the hub bolt, and, pulling at a 90° angle from the hub bolt, measure to determine whether or not the rotary-sliding resistance of the rear hub is the standard value.

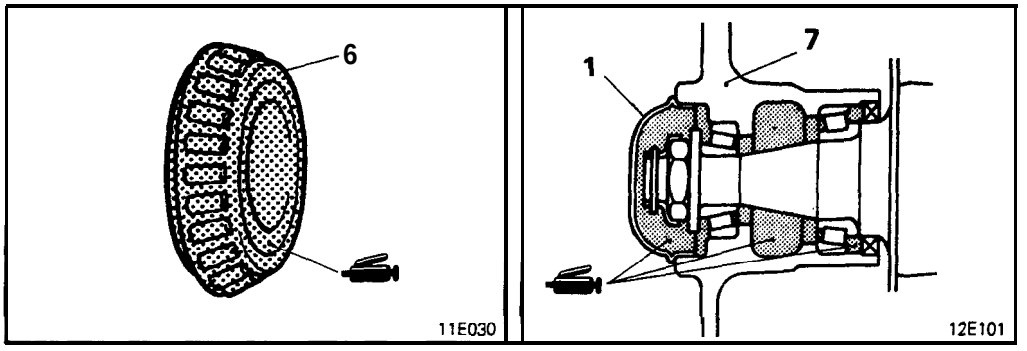
   Limit:
   Rear hub rotary-sliding resistance
   31 N (7 lbs.) or less

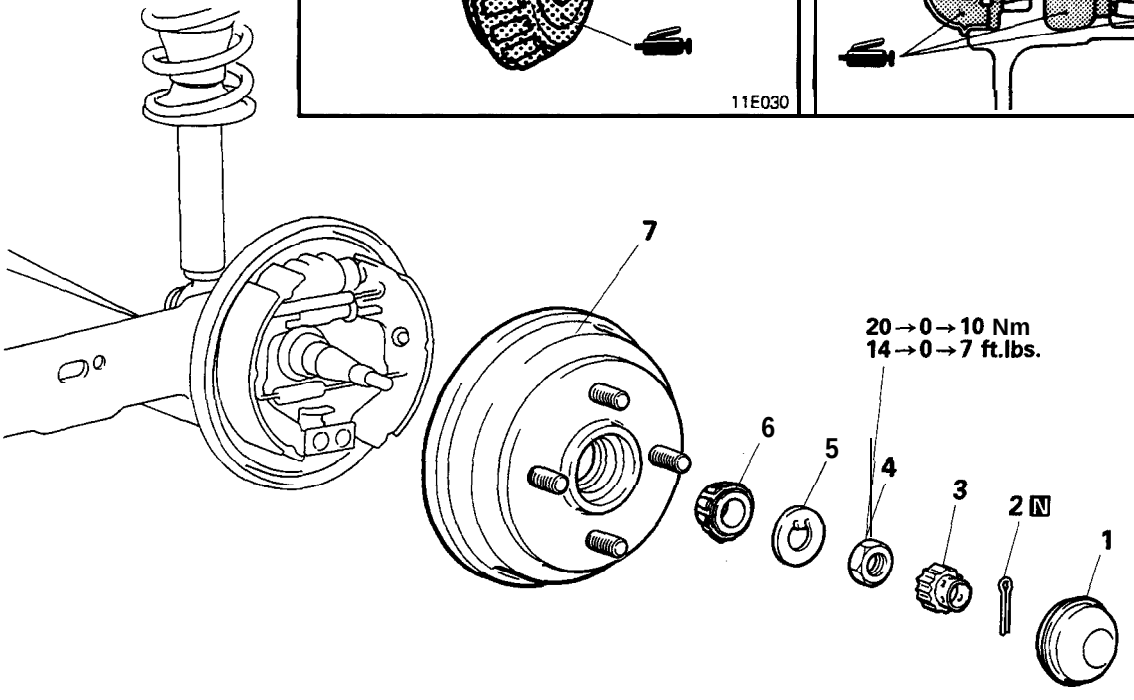
5. If the rear hub rotary-sliding resistance is exceed, loosen the nut and then tighten it to the specified torque, and check the rear hub rotary-sliding resistance again.
6. Replace the rear hub bearing unit if an adjustment cannot be made to within the limit.

REAR AXLE HUB <VEHICLES WITH REAR DRUM BRAKES>

M27MA--

REMOVAL AND INSTALLATION





Removal steps

1. Hub cap
2. Split pin
3. Lock cap
4. Lock nut

◆◆ Adjustment of wheel bearing end play (Refer to P.27-3.)

5. Tongued washer
6. Outer bearing inner race
7. Rear hub assembly

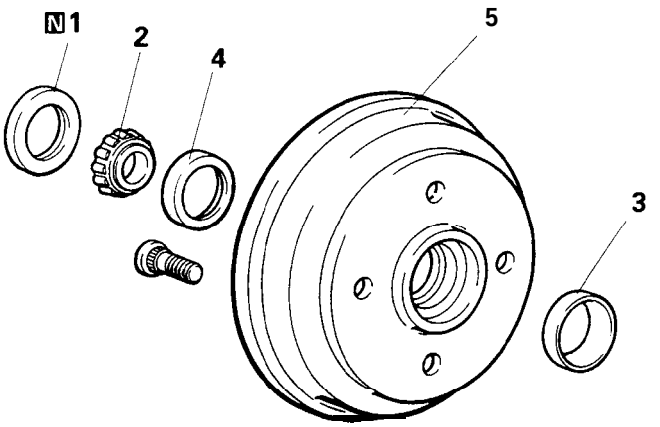
INSPECTION

M27MCAA

- Check the surface of bearings for seizure, discoloration or roughened raceway.
- Check the rear hub for wear or damage.

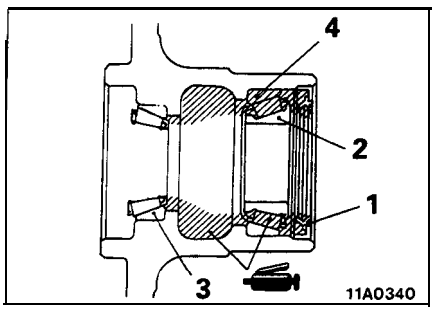
DISASSEMBLY AND REASSEMBLY

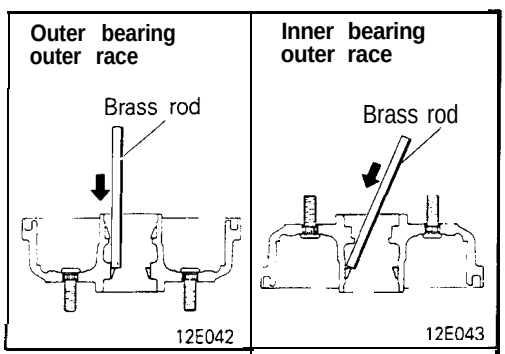
M27ME--

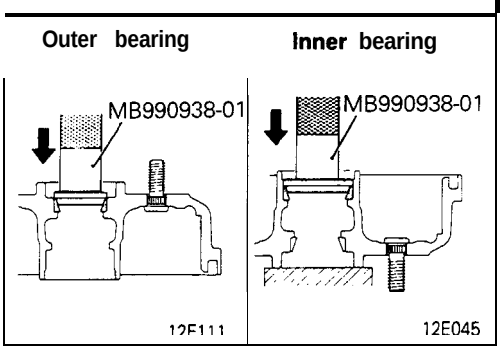


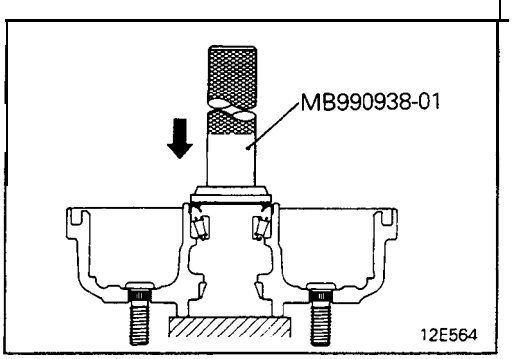
Disassembly steps

- * 1. Oil seal
  2. Inner bearing
- ◆◆ 3. Outer bearing outer race
- ◆◆ • c 4. Inner bearing outer race
  5. Rear hub









SERVICE POINTS OF DISASSEMBLY M27MEAB

3./4. REMOVAL OF BEARING RACES

Remove the inner and outer bearing outer races by driving with a brass rod.

INSPECTION M27MFAA0

- Check the oil seal for crack or damage.
- Check the surface of bearings for seizure, discoloration or roughened raceway.
- Check the rear hub for wear or damage.

SERVICE POINTS OF REASSEMBLY M27MGAA

4./3. INSTALLATION OF BEARING RACES

(1) Install the bearing outer races by using the special tool as illustrated.
(2) Apply multipurpose grease to the bearings.

1. INSTALLATION OF OIL SEAL

(1) Press the oil seal into the end of the rear hub by using the special tool.
(2) Apply multipurpose grease to the oil seal lip.

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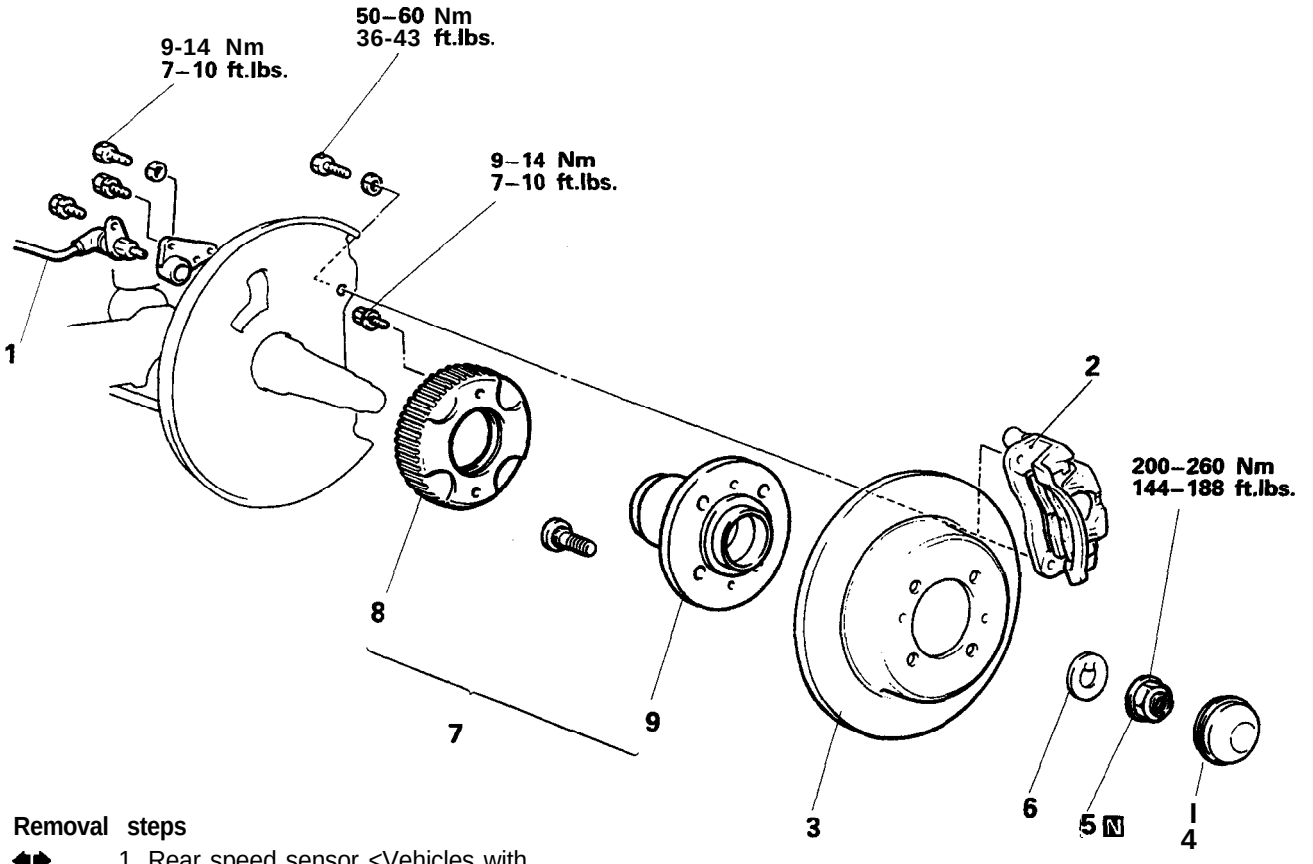
REAR AXLE HUB <VEHICLES WITH REAR DISC BRAKES>

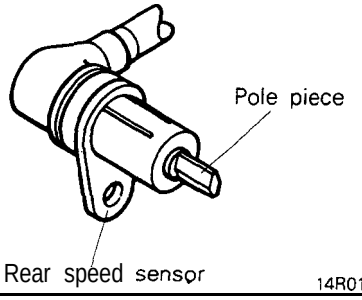
M27MA-A

REMOVAL AND INSTALLATION



Removal steps

- ◆◆ 1. Rear speed sensor <Vehicles with A.B.S.>
- ◆◆ 2. Caliper assembly
- 3. Brake disc
- 4. Hub cap
- ● 4 5. Nut
- 6. Tongued washer
- 7. Rear hub assembly
- ◆◆ 8. Rear rotor <Vehicles with A.B.S.>
- 9. Rear hub bearing unit



SERVICE POINTS OF REMOVAL

M27MBAB

1. REMOVAL OF REAR SPEED SENSOR

Caution

When removing the speed sensor from the adapter, be careful that the end pole piece does not strike the teeth of the rotor or other parts.

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2. REMOVAL OF CALIPER ASSEMBLY

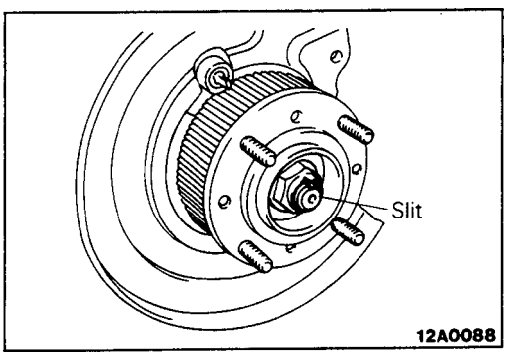
Remove the caliper assembly and suspend it with a piece of wire.

8. REMOVAL OF REAR ROTOR

Caution
Care must be taken not to scratch or otherwise damage the teeth of the rotor. The rotor must never be dropped. If the teeth of the rotor are chipped, resulting in a deformation of the rotor, it will not be able to accurately detect the wheel rotation speed, and the system will not function normally.

INSPECTION M27MFAA1

- Check the oil seal for crack or damage.
- Check the surface of bearings for seizure, discoloration or roughened raceway.
- Check the rear hub for wear or damage.



SERVICE POINTS OF INSTALLATION M27MDAC

5. INSTALLATION OF NUT

After tightening the nut, crimp the slit part.

REAR AXLE <AWD–UP TO 1992 MODELS>

SPECIFICATIONS

GENERAL SPECIFICATIONS

M27CA-B

Items			Specifications
Axle shaft			
Type			Semi-floating type
Shaft dimensions			
Outer bearing portion dia.		mm (in.)	35 (1.38)
Inner bearing portion dia.		mm (in.)	28 (1.10)
Center portion dia.		mm (in.)	34.5 (1.36)
Overall length		mm (in.)	214.9 (8.46)
Bearing			
O.D. x I.D.	Outer	mm (in.)	72 x 35 (2.83 x 1.38)
	inner	mm (in.)	58 x 28 (2.28 x 1.10)
Drive shaft			
Joint type	Outer		D.O.J.
	Inner		B.J.
Length (joint to joint) x diameter		mm (in.)	397 x 24 (15.6 x .94)
Differential			
Reduction gear type			Hypoid gear
Reduction ratio			
AWD A/T			3.307
AWD Turbo			3.545
Others			2.846
Differential gear type and configuration			
Side gear			Straight bevel gear x 2
Pinion gear			Straight bevel gear x 2
Number of teeth			
Drive gear			
AWD AA			43
AWD Turbo			39
Others			37
Drive pinion			
AWD Turbo			11
Others			13
Side gear			14
Pinion gear			10

NOTE
D.O.J.: Double offset joint
B.J.: Birfield joint

SERVICE SPECIFICATIONS

M27CB-B

Items		Specifications
Standard value		
Rear wheel bearing rotation sliding resistance	N (lbs.)	12 (2.6) or less
Setting of D.O.J. boot length	mm (in.)	76 ± 3 (3.00 ± .12)
Final drive gear backlash	mm (in.)	0.11 – 0.16 (.004 – .006)

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Items		Specifications
Differential gear backlash	mm (in.)	0–0.076 (0–.003)
Drive pinion rotation starting torque		
with oil seal	Nm (in.lbs.)	
New part		1.0–1.3 (9–11)
New part/reusable part		0.5–0.6 (4–5)
without oil seal	Nm (in.lbs.)	
New part		0.9–1.2 (8–10)
New part/reusable part		0.4–0.5 (3–4)
Limit		
Rear axle total backlash	mm (in.)	5 (.2)
Drive gear runout	mm (in.)	0.05 (.002)
Rear wheel bearing end play	mm (in.)	0.8 (.031)
Differential gear backlash	mm (in.)	0.2 (.008)

TORQUE SPECIFICATIONS

M27CC-B

Items	Nm	ft.lbs.
Drive shaft to companion flange	55-65	40–47
Axle shaft installation nut	160–220	116-159
Rear brake assembly installation bolts	50–60	36-43
Speed sensor installation bolts	9-14	7–10
Differential carrier to crossmember	100–120	72-87
Differential carrier to propeller shaft	30–35	22-25
Differential carrier to dynamic damper	80–100	58-72
Differential support member to bolt	110–130	80–94
Drain plug	60–70	43-51
Filler plug	40–60	29-43
Companion flange to drive pinion	160–220	116-159
Bearing cap installation bolt	40–60	29-43
Drive gear to differential case	80–90	58-65
Cover to gear carrier	30–42	22–30

LUBRICANTS

M27CD-

Items	Specified lubricants		Quantity
Rear axle gear oil	Hypoid gear oil/API classification GL-5 or higher Above –23°C (–10°F): SAE 90, 85W-90, 80W-90 From –34°C (–30°F) to –23°C (–10°F): SAE 80W, 80W-90 Below –34°C (–30°F): SAE 75W	lit. (qts.)	0.7 (.74)
B.J. boot grease D.O.J. boot grease	Repair kit grease	g (o.z.)	90 (3.2)

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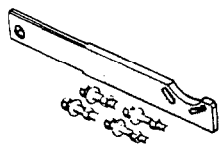
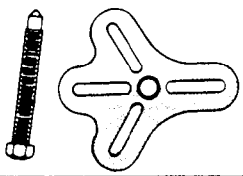
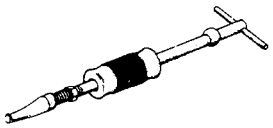
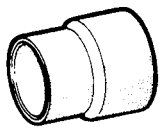
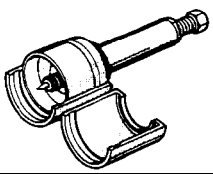
SEALANTS AND ADHESIVES

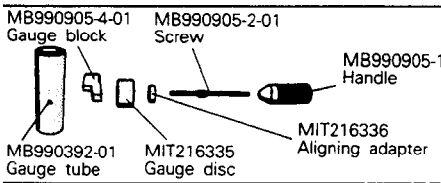
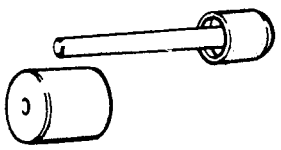
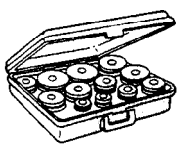
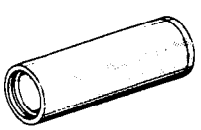
M27CE--

Items	Specified sealants and adhesives
Vent plug Differential cover	3M ATD Part No.8661, or 3M ATD Part No.8663 or equivalent
Drive gear threaded hole	3M stud locking Part No.4170 or equivalent

SPECIAL TOOLS

M27DA-B

ool	Number	Name	Use
	MB990767-01	End yoke holder	Removal of the companion flange
	GENERAL SERVICE TOOL	Axle puller	
	MB990211-01	Slide hammer with adapter	
	MB990799-01	Ball joint dust cover installer	Installation of rear axle shaft dust cover and oil seal
	MB991115	Oil seal installer	Installation of drive shaft oil seal
	MB990339-01	Pinion carrier bearing puller	Removal of the side bearing inner race Removal of the drive pinion rear bearing inner race
	MIT303173	Insert	
	MB990811-01	Side bearing cup remover step plate	Removal of the side bearing inner race

Tool	Number	Name	Use
		Pinion height gauge set	Measurement of the drive pinion height
	MB990031-01	Drive pinion oil seal installer	Installation of the front bearing inner race and oil seal
	MB990641	Lower arm bushing installer and remover A	Driving-out and installation of differential support member bushing
	GENERAL SERVICE TOOL	Bearing and oil seal installer set	Installation of drive pinion rear bearing outer race Installation of drive pinion front bearing outer race Removal of axle shaft inner bearing Installation of axle shaft inner bearing
	MB990938-01	Handle	
	MIT44801	Collet set	Removal of side bearing inner race Removal of drive pinion rear bearing inner race
	MIT215013	Bearing installer	Pressing of drive pinion rear bearing inner race Pressing of side bearing inner race
	GENERAL SERVICE TOOL	Side bearing puller	Removal of the wheel bearing inner race
	MIT304180	Handle	Installation of drive pinion oil seal

TROUBLESHOOTING

M27EA-B

Symptom	Probable cause	Remedy
AXLE SHAFT Noise while wheels are rotating	Brake drag Bent axle shaft Worn or scarred axle shaft bearing	Replace
Grease leakage	Worn or damaged oil seal Malfunction of bearing seal	Replace
DRIVE SHAFT Noise	Wear, play or seizure of ball joint Excessive drive shaft spline looseness	Replace
DIFFERENTIAL Constant noise	Improper final drive gear tooth contact adjustment Loose, worn or damaged side bearing Loose, worn or damaged drive pinion bearing	Correct or replace
	Worn drive gear, drive pinion Worn side gear spacer or pinion shaft Deformed drive gear or differential case Damaged gear	Replace
	Foreign material	Eliminate the foreign material and check; replace the parts if necessary
	Insufficient oil	Replenish
Gear noise while driving	Poor gear engagement improper gear adjustment Improper drive pinion preload adjustment	Correct or replace
	Damaged gear	Replace
	Foreign material	Eliminate the foreign material and check; replace the parts if necessary
	Insufficient oil	Replenish
Gear noise while coasting	Improper drive pinion preload adjustment Damaged gear	Correct or replace Replace
Bearing noise while driving or coasting	Cracked or damaged drive pinion rear bearing	Replace
Noise while turning	Loose side bearing Damaged side gear, pinion gear or pinion shaft	Replace
Heat	Insufficient gear backlash Excessive preload	Adjust
	Insufficient oil	Replenish
Oil leakage	Clogged vent plug	Clean or replace
	Cover insufficiently tightened Seal malfunction	Retighten, apply sealant, or replace the gasket
	Worn or damaged oil seal	Replace
	Excessive oil	Adjust the oil level

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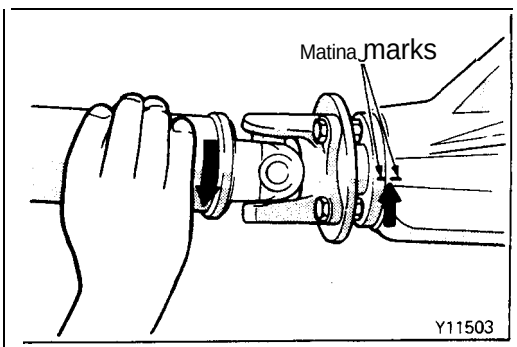
SERVICE ADJUSTMENT PROCEDURES

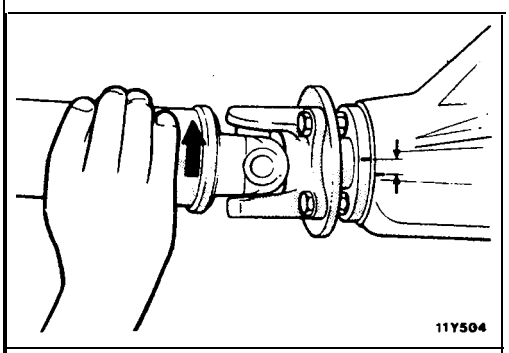
REAR AXLE TOTAL BACKLASH CHECK M27FAAF

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 (.2 in.)

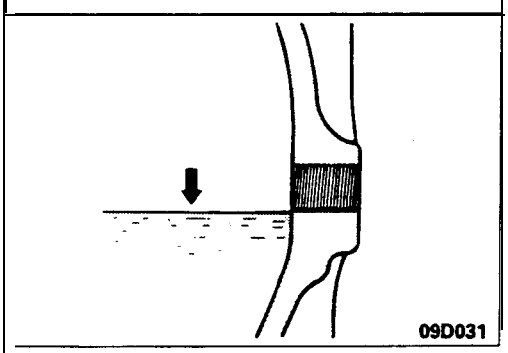
(4) If the backlash exceeds the limit, remove the differential carrier assembly and adjust the backlash. (Refer to P.27-29.)

GEAR OIL LEVEL CHECK M27FCAA

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 API Classification GL-5 or higher [0.7 liter (.74 qt.)]

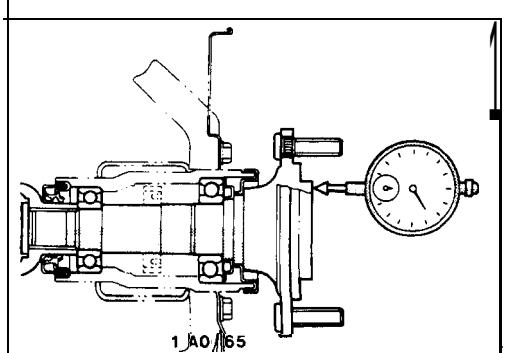
NOTE
Above −23°C (−10°F): SAE 90, 85W−90, 80W−90
From −34°C (−30°F)
to −23°C (−10°F): SAE 80W, 80W−90
Below −34°C (−30°F): SAE 75W



REAR WHEEL BEARING END PLAY CHECK M27FBAE

(1) Support the vehicle on axle stands positioned at the specified locations and remove the rear wheel.
(2) Separate the parking brake cable from the rear brake.
(3) Remove the caliper assembly and brake disc.
(4) Place a dial gauge as shown in the figure, and then measure the play when the axle shaft is moved in the axial direction.

Limit: 0.8 mm (.031 in.)



(5) If the play exceeds the limit, check the tightening torque of the companion flange of the axle shaft; if it is correct, replace the wheel bearing.

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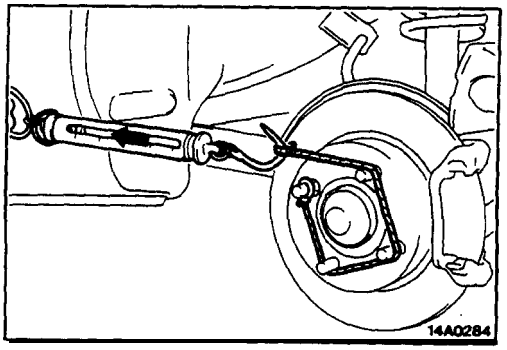


REAR WHEEL BEARING ROTATION SLIDING RESISTANCE CHECK M27FFAB

(1) Remove the drive shaft from the companion flange.
(2) Remove the brake pad or caliper assembly.
(3) Attach a spring balance and rope to the hub bolt, then, pulling the balance at a right angle to the hub bolt, measure the rotation sliding resistance to see whether it is within the standard value.

Standard value: 12N (2.6 lbs.) or less

(4) If the rotation sliding resistance exceeds the standard value, check the tightening torque of the axle shaft companion flange. If it is normal, replace the bearing.

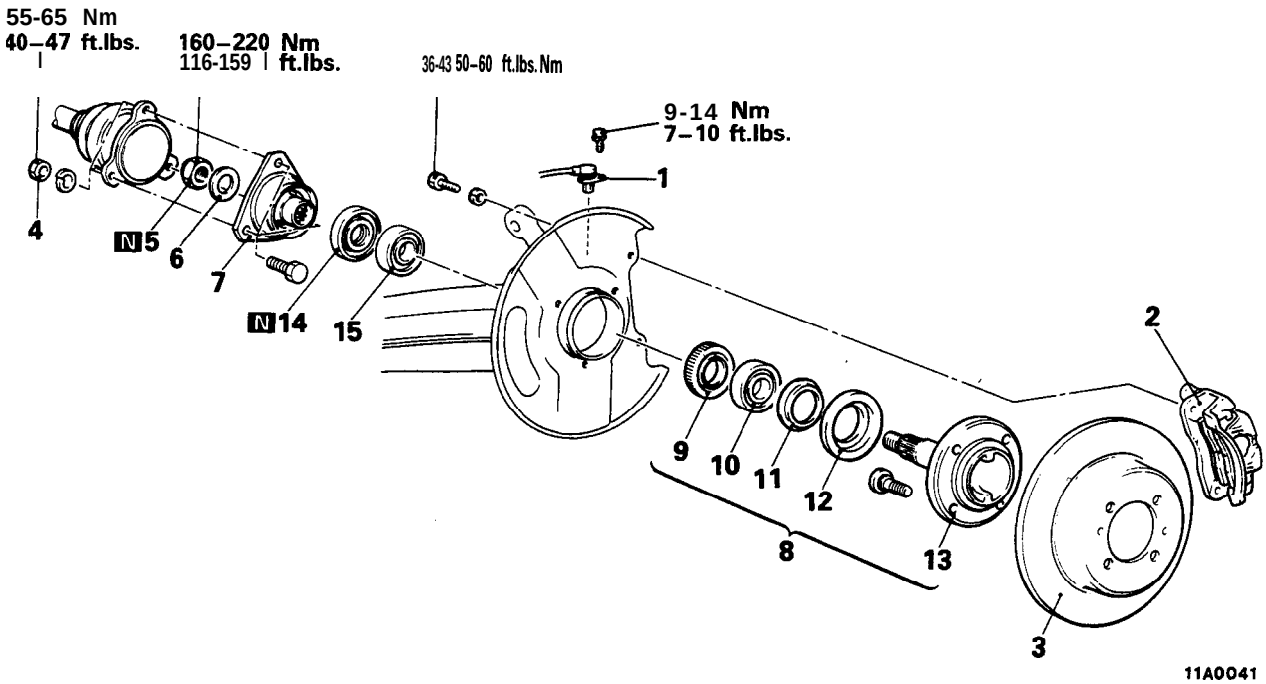
AXLE SHAFT

REMOVAL AND INSTALLATION

M27HA–

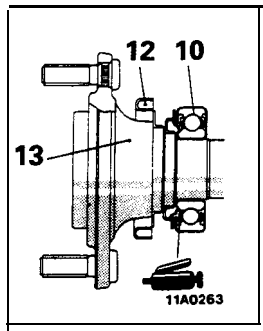
Pre-removal Operation
- Disconnecting of Parking Brake Cable End

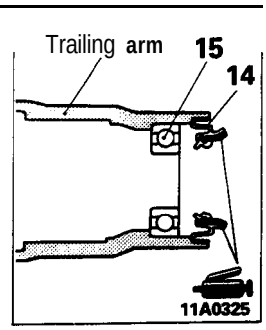
Post-installation Operation
- Connecting of Parking Brake Cable End
- Adjusting Parking Brake Lever Stroke (Refer to GROUP 36–Service Adjustment Procedures.)

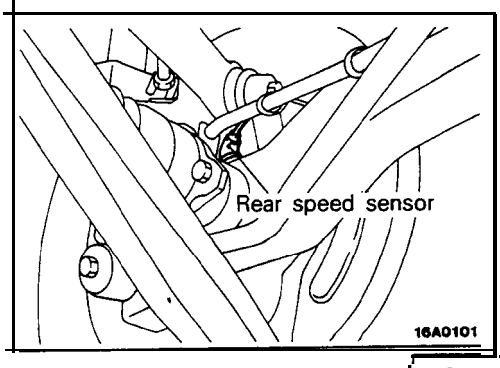


Removal steps

1. Rear speed sensor <Vehicles with A.B.S.>
2. Brake caliper assembly
3. Brake disc
4. Drive shaft mounting nut
5. Self locking nut
6. Washer
7. Companion flange
8. Axle shaft assembly
9. Rear rotor <Vehicles with A.B.S.>
10. Outer bearing
11. Dust cover
12. Dust cover
13. Axle shaft
14. Oil seal
15. inner bearing







SERVICE POINTS OF REMOVAL

M27HBAN

1. REMOVAL OF REAR SPEED SENSOR <VEHICLES WITH A.B.S.>

NOTE
Be cautious to ensure that the tip of the pole piece does not come in contact with other parts when removing the speed sensor.

2. REMOVAL OF BRAKE CALIPER ASSEMBLY
Remove the brake caliper assembly and suspend it with a piece of wire.

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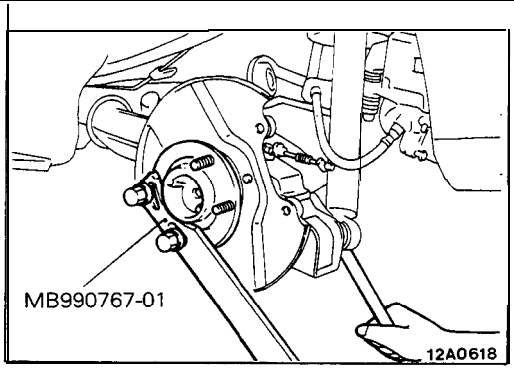
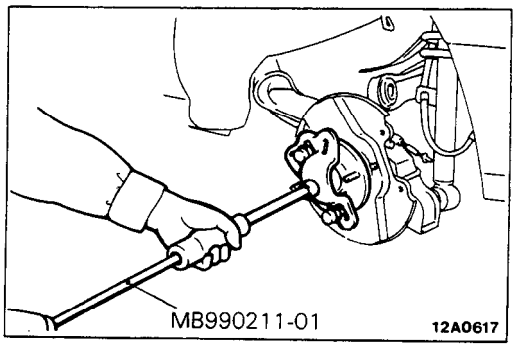


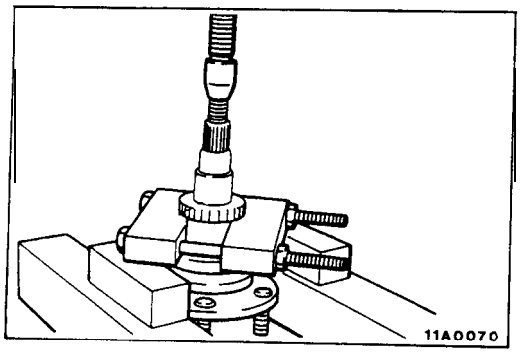
5. REMOVAL OF SELF LOCKING NUT

With the special tool, secure the axle shaft and remove the companion flange self-locking nut.



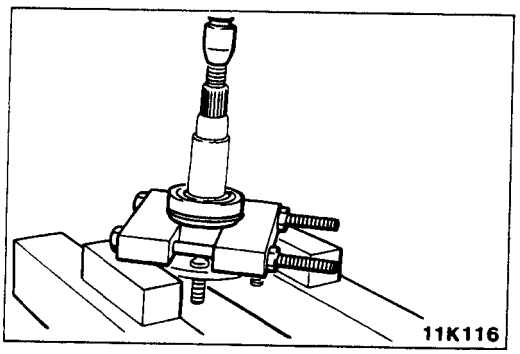
8. REMOVAL OF AXLE SHAFT ASSEMBLY

With the special tool, remove the axle shaft from the trailing arm.



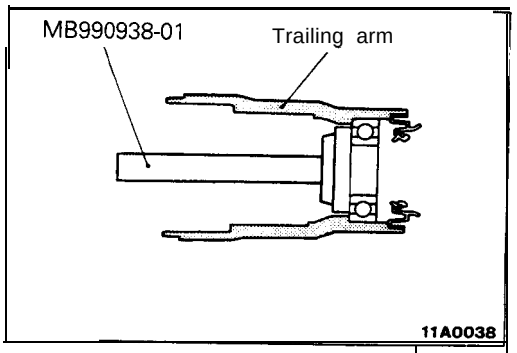
9. REMOVAL OF REAR ROTOR <VEHICLES WITH A.B.S.>

Remove the rear rotor from the axle shaft.



10. REMOVAL OF OUTER BEARING/11. DUST COVER

Remove the outer bearing and dust cover concurrently from the axle shaft.



14. REMOVAL OF OIL SEAL/15 INNER BEARING

With the special tool, remove the inner bearing and oil seal from the trailing arm.

INSPECTION

M27HCAF

- Check the companion flange for wear or damage.
- Check the dust cover for deformation or damage.
- Check the wheel bearings for burning or discoloration.
- Check the wheel bearing for unsmooth rotation.
- Check the axle shaft for cracking, wear or damage.
- Check oil seal for cracking or damage.

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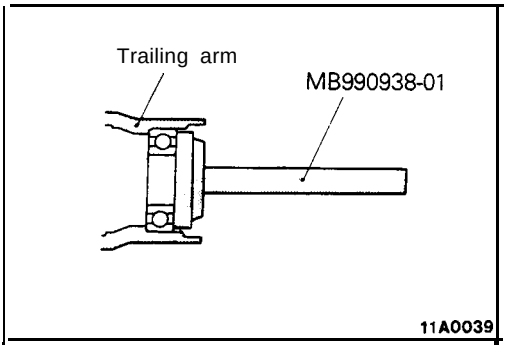
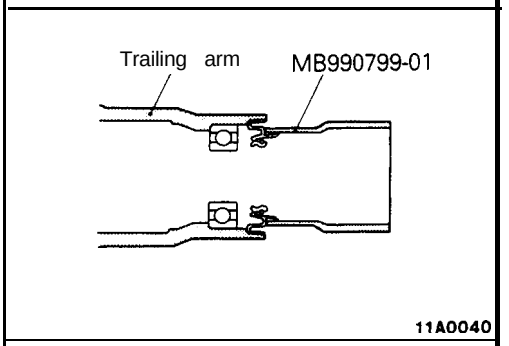
SERVICE POINTS OF INSTALLATION M27HDAQ



15. INSTALLATION OF INNER BEARING

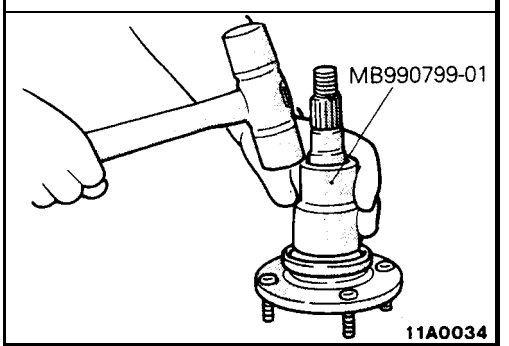
With the special tool, press fit the inner bearing onto the trailing arm.



14. INSTALLATION OF OIL SEAL

With the special tool, press fit the oil seal onto the trailing arm with the depression in the oil seal facing upward, and until it contacts the shoulder on the inside of the inner arm.

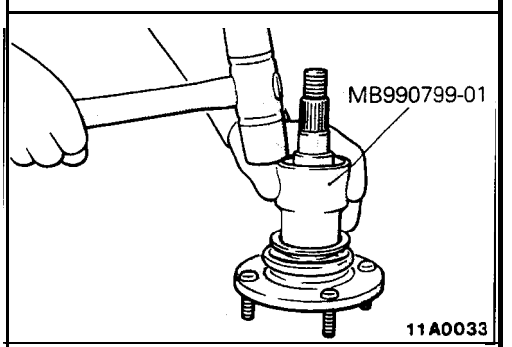
NOTE
When tapping the oil seal in, use a plastic hammer to lightly tap the top and circumference of the special tool, press fitting gradually and evenly.



12. INSTALLATION OF DUST COVER

Orienting the dust cover as shown in the illustration, and using the special tool, press fit the dust cover until it contacts the axle shaft shoulder.

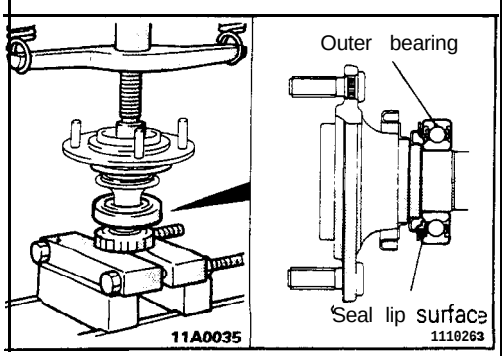
NOTE
When tapping the oil seal in, use a plastic hammer to lightly tap the top and circumference of the special tool, press fitting gradually and evenly.



11. INSTALLATION OF DUST COVER

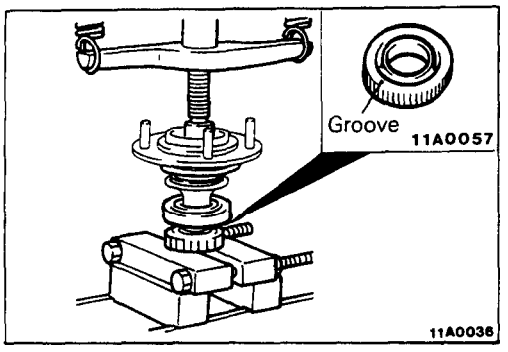
With the special tool, install the dust cover so that the depression is facing upward.

NOTE
When tapping the oil seal in, use a plastic hammer to lightly tap the top and circumference of the special tool, press fitting gradually and evenly.



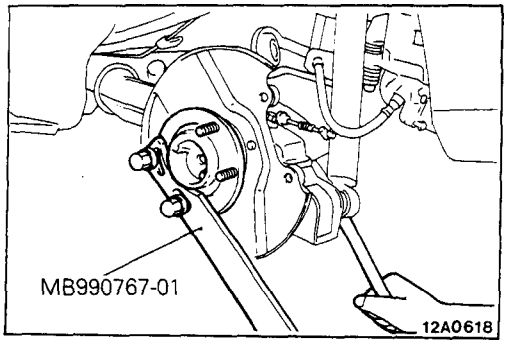
10. INSTALLATION OF OUTER BEARING

(1) Apply multi-purpose grease around the entire circumference of the inner side of the outer bearing seal lip.
(2) Press fit the outer bearing to the axle shaft so that the bearing seal lip surface is facing towards the axle shaft flange.



9. INSTALLATION OF REAR ROTOR <VEHICLES WITH A.B.S.>

Press fit the rear rotor to the axle shaft with the rear rotor groove surface toward the axle shaft flange.



5. INSTALLATION OF SELF LOCKING NUT

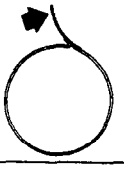
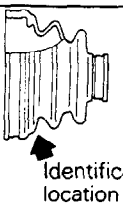
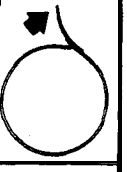
With the special tool, secure the axle shaft and tighten the companion flange self locking nut.

DRIVE SHAFT

M27JA--

PARTS DISTINCTION

Boots and boot bands can be distinguished by the indicated part numbers shown below.

	D.O.J. boot band	D.O.J. boot	Boot band (small)	B.J. boot	B.J. boot band
Part shapes and part identification number location	Identification location 	 Identification location 11R0156	Identification location	Identification location 11A0356	Identification location  11K033
Part identification No.	20–82	17-131 #BJ82	20–83	17–169 #BJ82	20–110

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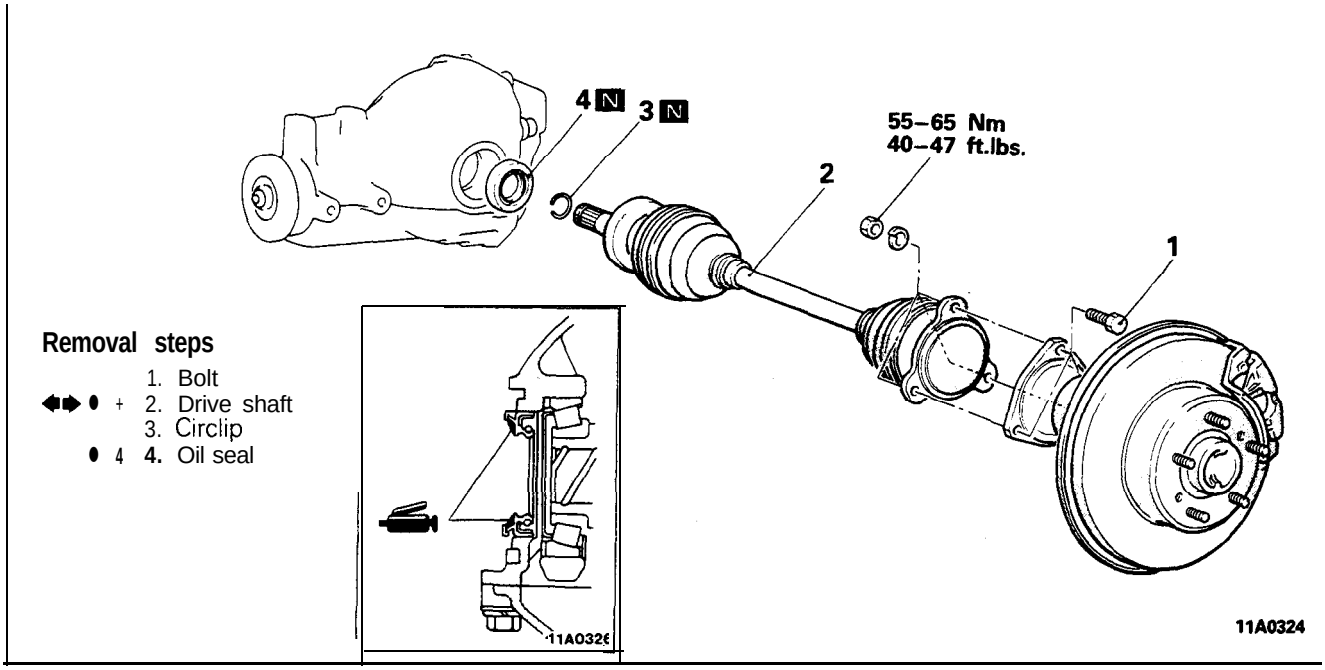
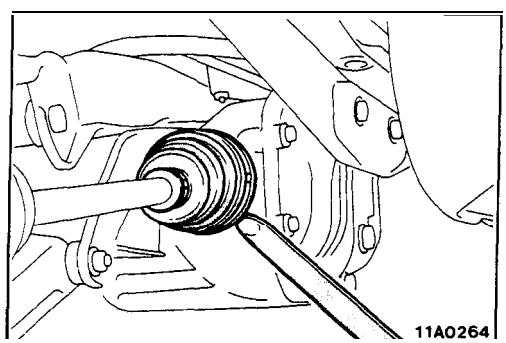
REMOVAL AND INSTALLATION



Removal steps

1. Bolt
2. Drive shaft
3. Circlip
4. Oil seal



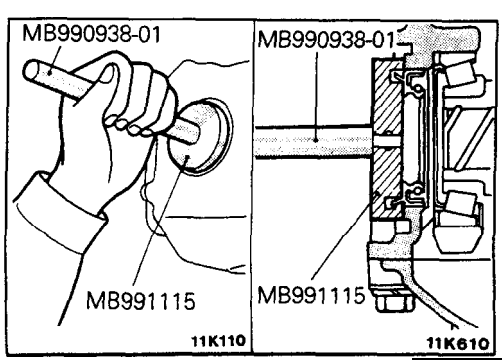
SERVICE POINTS OF REMOVAL M27JBAD

2. REMOVAL OF DRIVE SHAFT

Using a tire lever, etc. remove the drive shaft from the differential carrier.

INSPECTION M27JHAA

- Check the drive shaft boots for damage or deterioration.
- Check the ball joints (B.J. and D.O.J.) for excessive play or check operation.
- **Check the drive shaft spline for wear or damage.**



SERVICE POINTS OF INSTALLATION M27JCAF

4. INSTALLATION OF OIL SEAL

If the oil seal is to be replaced because of damage, drive it in by using the special tool.

2. INSTALLATION OF DRIVE SHAFT

Caution
Be cautious to ensure that the differential carrier oil seal is not damaged by the drive shaft spline.

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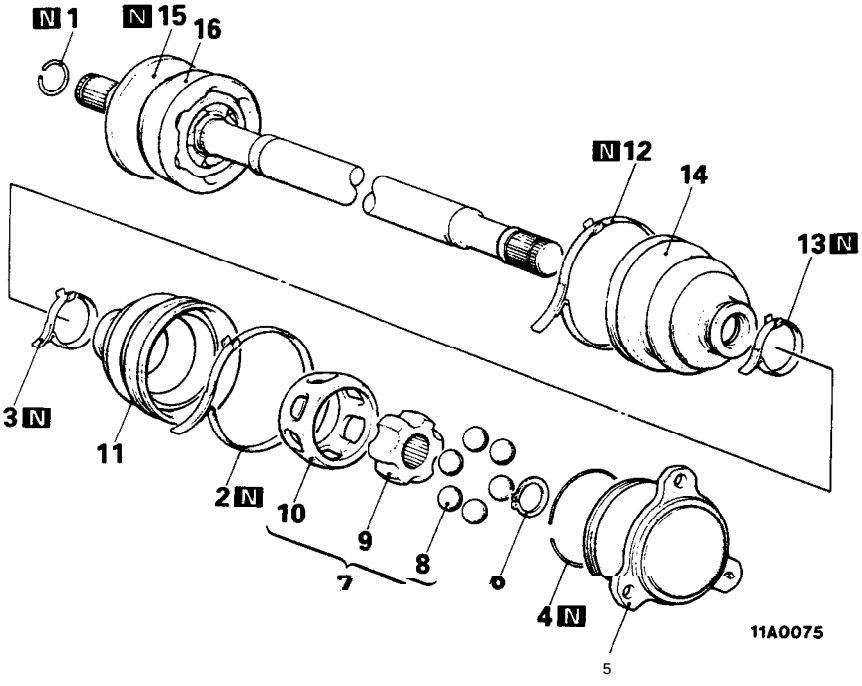
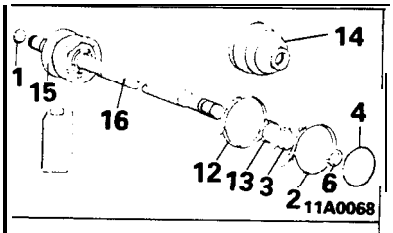
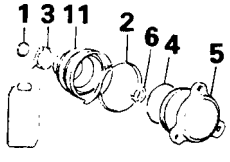
DISASSEMBLY AND REASSEMBLY

M27JD--

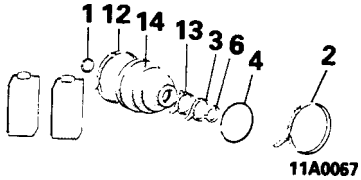




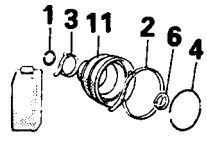
Drive shaft and B.J. kit



D.O.J. kit



B.J. boot repair kit



D.O.J. boot repair kit

Disassembly steps

- 1. Circlip
- 2. Boot band (B)
- 3. Boot band (C)
- 4. Circrip
- 5. D.O.J. outer race
- ◆◆ 6. Snap ring
- 7. D.O.J. inner race, cage and ball assembly
- ◆◆ 8. Balls
- ◆◆ 9. D.O.J. inner race
- 10. D.O.J. cage
- ● ☒ 11. D.O.J. boot
- 12. Boot band (A)
- 13. Boot band (C)
- ◆◆ **14.** B.J. boot
- 15. Dust cover
- 16. Drive shaft and B.J.

Reassembly steps

- 16. Drive shaft and B.J.
- 15. Dust cover
- ● 4 14. B.J. boot
- ● 4 12. Boot band (A)
- ◆◆ 13. Boot band (C)
- ● + 3. Boot band(C)
- ● a 2. Boot band (B)
- ◆◆ 11. D.O.J. boot
- ● + 7. D.O.J. inner race, cage and ball assembly
- 10. D.O.J. cage
- 9. D.O.J. inner race
- 8. Balls
- 6. Snap ring
- ◆◆ 5. D.O.J. outer race
- 4. Circlip
- 1. Circlip

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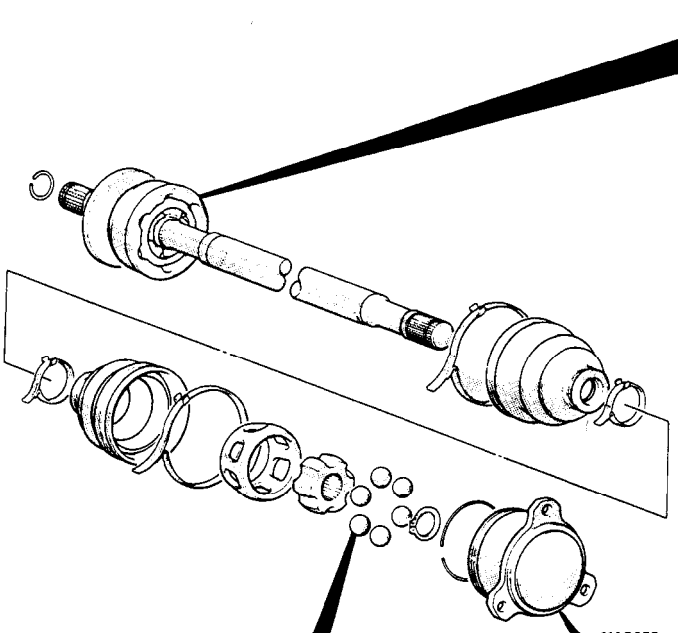
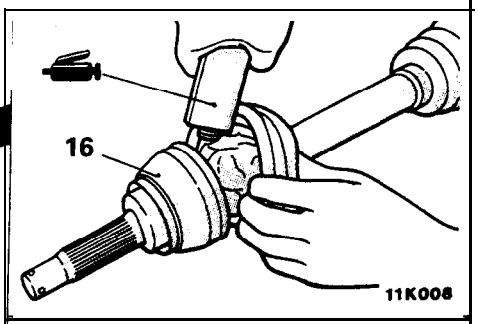
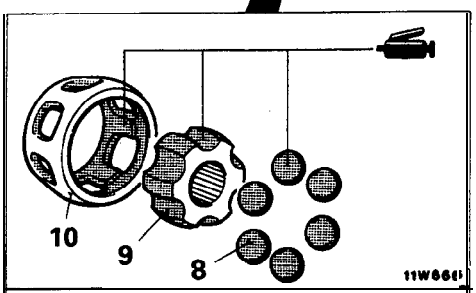
LUBRICATION POINTS

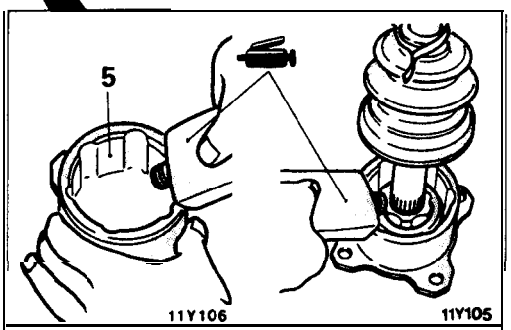




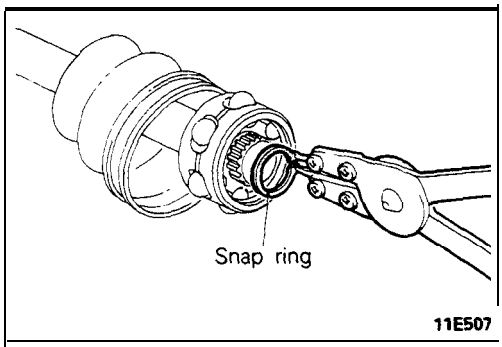
Grease: Repair kit grease 90 g (3.20 oz.)
Caution
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.
A special type of grease is used on the joint. Be cautious to ensure that no other grease is allowd to come in contact with the joint.

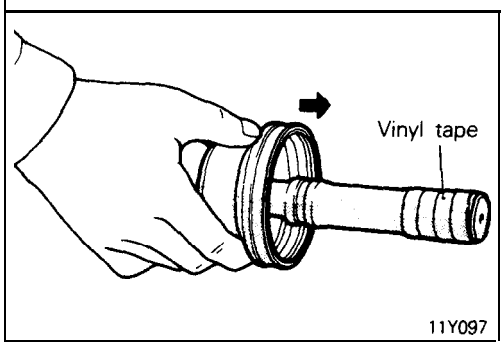


Grease: Repair kit grease



Grease: Repair kit grease 90 g (3.20 oz.)
Caution
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.
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.





SERVICE POINTS OF DISASSEMBLY M27JEAC

8. REMOVAL OF SNAP RING/8. BALLS/9. D.O.J. INNER RACE/10. D.O.J. CAGE

(1) Remove the snap ring with the snap ring pliers and then remove the D.O.J. inner race, the D.O.J. cage, and the balls as a unit.

(2) Clean the D.O.J. inner race, the D.O.J. cage, and the balls, without dismantling them.

Caution

1. Be careful that balls do not drop out of the cage.

2. If the balls drop out, press them back into the D.O.J. cage with the D.O.J. inner race.

11. REMOVAL OF D.O.J. BOOT/14. B.J. BOOT

(1) Wipe the grease off of the spline portion.

(2) Remove the D.O.J. boot and B.J. boot.

NOTE

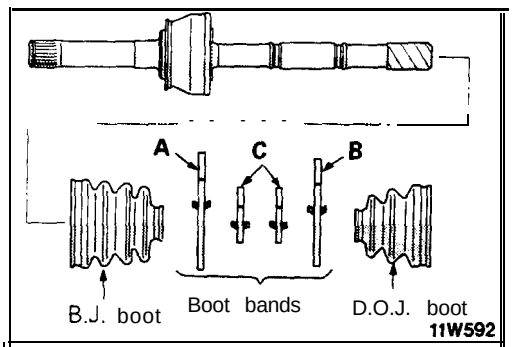
If the boots are reused, wrap vinyl tape around the drive shaft spline so that the boots are not damaged when they are removed.

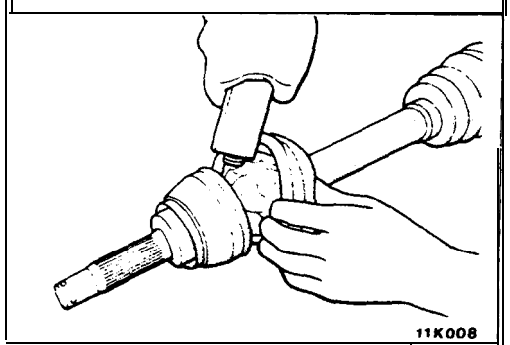
Caution

Do not disassemble the B.J.

INSPECTION M27JFAC

- Check the drive shaft for damage, bending or corrosion.
- Check the drive shaft spline for wear or damage.
- Check the B.J. for entry of water and/or foreign material.
- Check the D.O.J. outer race for damage or corrosion.
- Check the D.O.J. cage, balls and D.O.J. inner race for damage, corrosion or wear.





SERVICE POINTS OF REASSEMBLY M27JGAD

14. INSTALLATION OF B.J. BOOT/12. BOOT BAND (A)/13. BOOT BAND (C)/3. BOOT BAND (C)/2. BOOT BAND (B)/11. D.O.J. BOOT

(1) Wrap vinyl tape around the drive shaft spline.

(2) Insert the drive shaft in B.J. boot, boot band (A), (C), (C), (B), D.O.J. boot in that sequence.

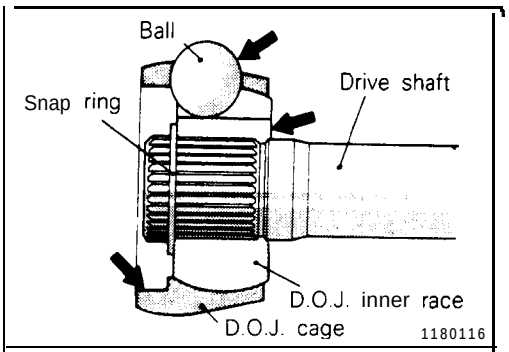
(3) Fill the inside of the B.J. and B.J. boot with the specified grease.

Specified grease: Repair kit grease 90 g (3.2 oz.)

Caution

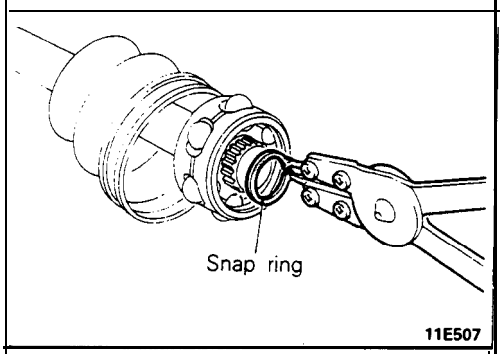
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

A special type of grease is used on the joint. Be cautious to ensure that not other grease is allowed to come in contact with the joint.



(4) Secure the B.J. boot with boot bands (A) and (C) to the drive shaft and B.J.

Caution
Ensure that the B.J. is at a zero angle with the drive shaft to ensure the boot contains the specified amount of air.

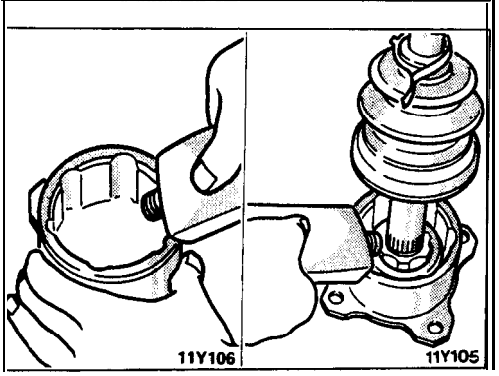


7. INSTALLATION OF D.O.J. INNER RACE, CAGE AND BALL ASSEMBLY

(1) Apply the specified grease to the D.O.J. cage, the balls and the D.O.J. inner race.

Specified grease: Repair kit grease (As required)

(2) Install the cage, balls and inner race to the drive shaft, then, using snap ring pliers, fit the snap ring securely into the groove in the shaft.



5. APPLICATION OF GREASE TO D.O.J. OUTER RACE

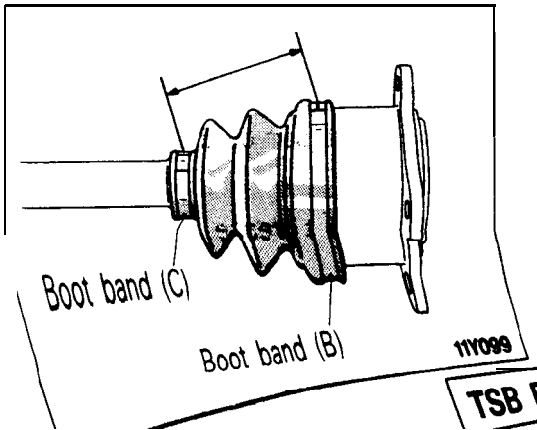
(1) Fill the specified grease to the D.O.J. outer race, fit the drive shaft into the D.O.J. outer race, and then fill more grease to the D.O.J. outer race.

Specified grease: Repair kit grease 90 g (3.2 oz.)

Caution
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.
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.

(2) Install the circlip to the D.O.J. outer race.
(3) Assemble the D.O.J. boot to the D.O.J. outer race, then secure the boot to the drive shaft with boot band (C).
(4) Place boot band (B) on the D.O.J. boot.

NOTE
Do not secure boot band (B).



(5) Set the D.O.J. boot bands at the specified distance in order to adjust the amount of air inside the D.O.J. boot, and then tighten the D.O.J. boot band (C) securely.

Standard value: 76±3 mm (3.00±.23 in.)

(6) Release a part of the D.O.J. boot from the D.O.J. outer race to allow pressure to escape from the boot.
(7) Tighten boot band (B) and secure the D.O.J. boot.

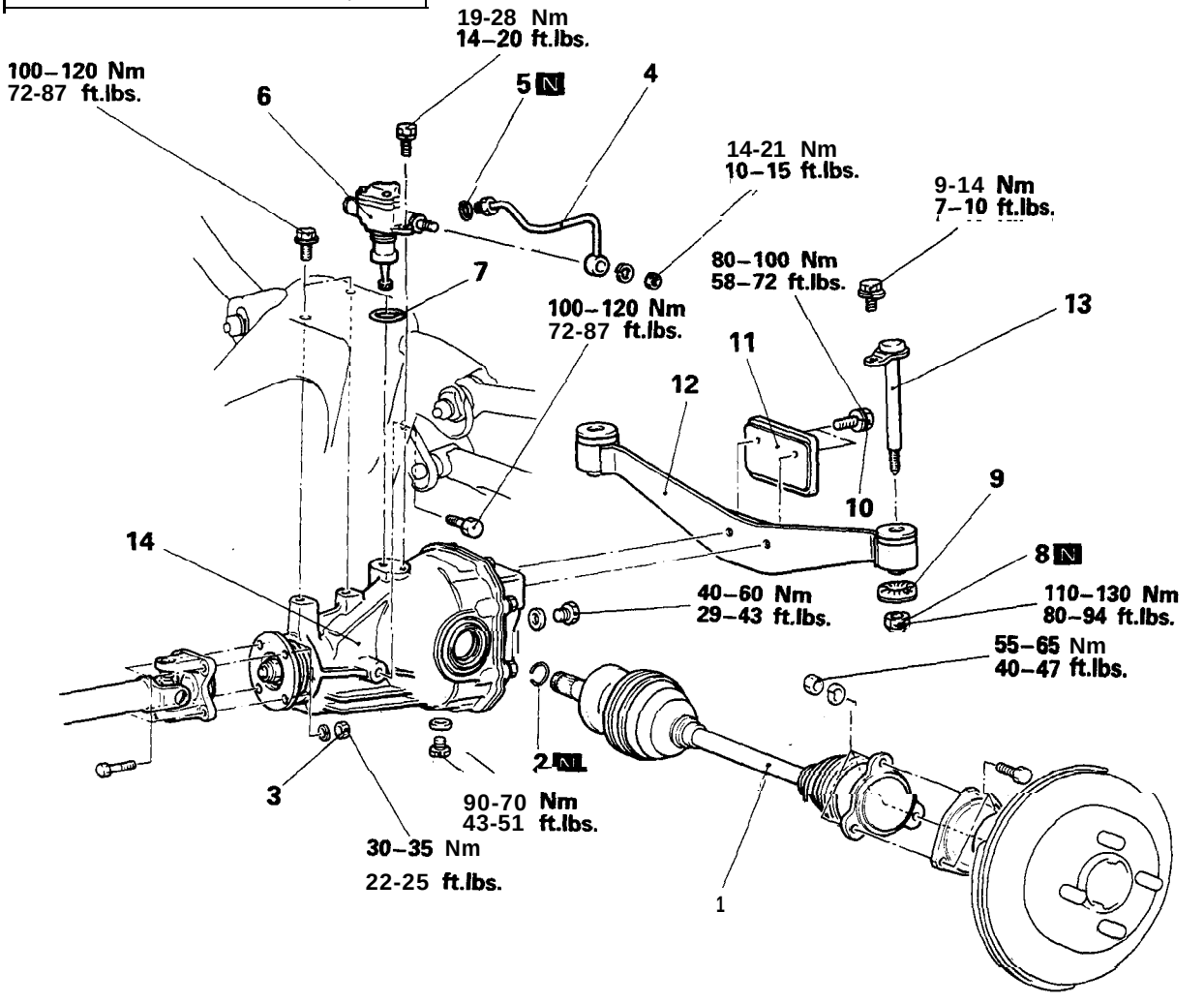
TSB Revision

DIFFERENTIAL CARRIER

REMOVAL AND INSTALLATION

M271A--

Pre-removal and Post-installation Operation
- Draining and Refilling of Differential Gear Oil (Refer to P.27-15.)
- Removal and installation of Center Exhaust Pipe (Refer to GROUP 15– Exhaust Pipe and Main Muffler.)



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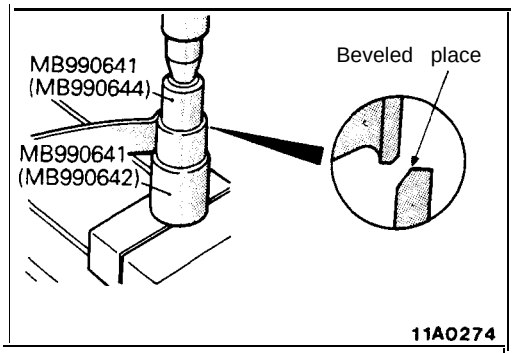
Removal steps

1. Circlip
2. Circlip shaft (Refer to P.27-21.)
3. Propeller shaft connection (Refer to GROUP 25–Propeller Shaft)
4. Feed tube (Vehicles with 4WS)
5. O-ring (Vehicles with 4WS)
6. Rear oil pump (Vehicles with 4WS)
7. O-ring (Vehicles with 4WS)
8. Differential support member installation nut
9. Stopper (lower)
10. Differential support member installation bolt
11. Dynamic damper (1 990 models)
12. Differential support member
13. Differential support member installation bolt
14. Differential carrier

TSB Revision

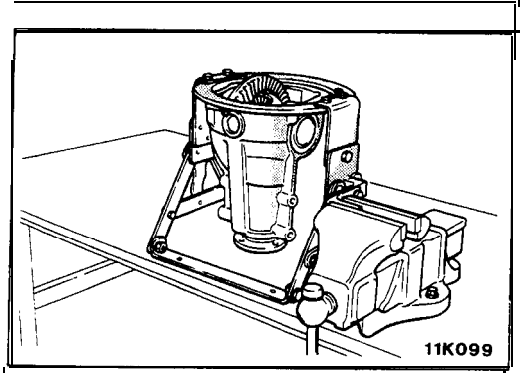


DIFFERENTIAL SUPPORT MEMBER BUSHING REPLACEMENT M27IKAA

Use the special tool to pull out and press in the differential support member bushing.

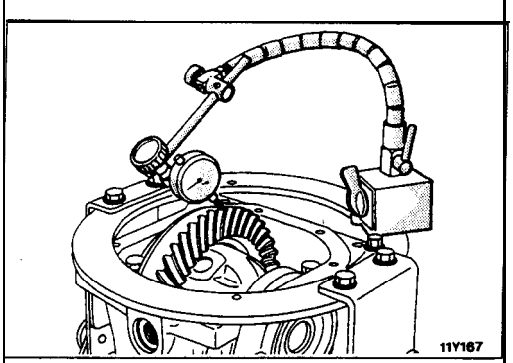
NOTE

Press in the bushing from the beveled part of the differential support member; press in until the end surface of the bushing outer cylinder is flush with the support member.



INSPECTION BEFORE DISASSEMBLY M27IEAI

Hold the working base in a vice, and attach the differential carrier to the working base.



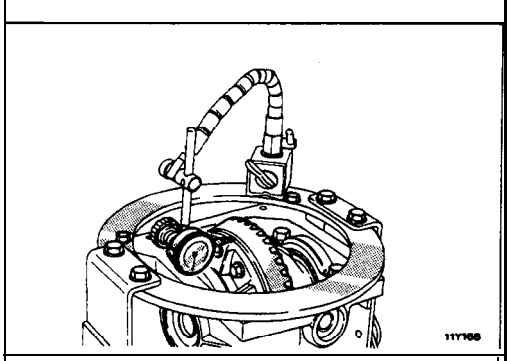
FINAL DRIVE GEAR BACKLASH

With the drive pinion locked in place, measure the final drive gear backlash with a dial indicator on the drive gear.

NOTE

Measure at four points or more on the circumference of the drive gear.

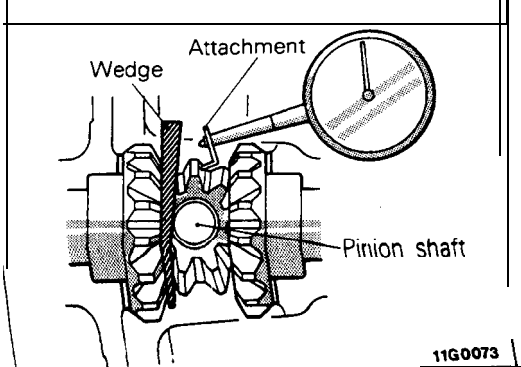
Standard value: 0.11–0.16 mm (.004–.006 in.)



DRIVE GEAR RUNOUT

Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

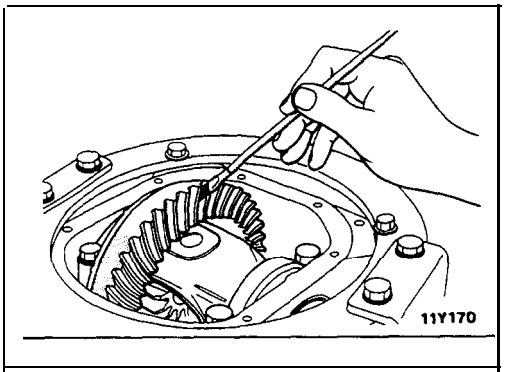
Limit: 0.05 mm (.002 in.)

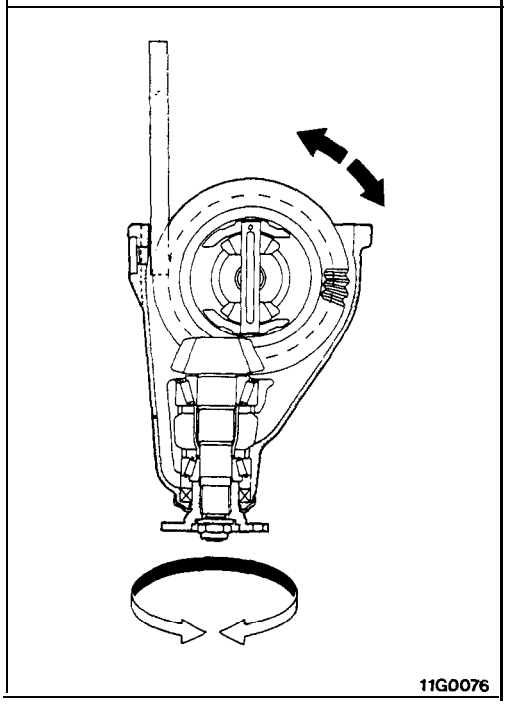


DIFFERENTIAL GEAR BACKLASH

While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

Standard value: 0–0.076 mm (0–.003 in.)
Limit: 0.2 mm (.008 in.)





FINAL DRIVE GEAR TOOTH CONTACT

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.

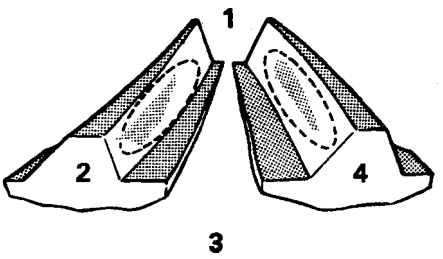
(2) Insert a brass rod between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear, so that the revolution torque [approximately 2.5–3.0 Nm (28-33 in.lbs.)] is applied to the drive pinion.

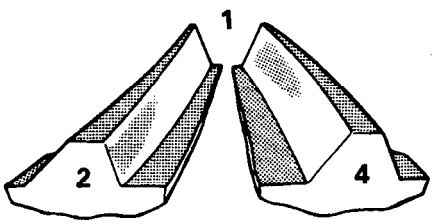
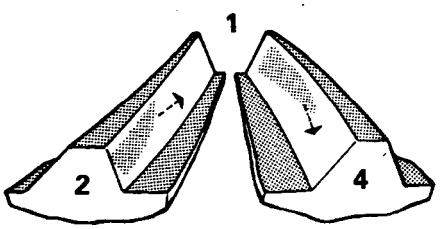
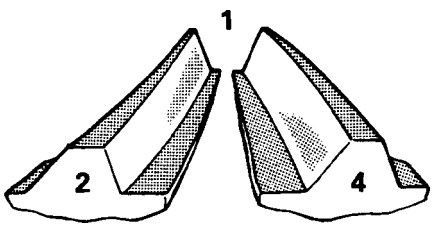
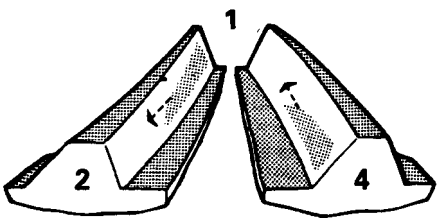
Caution
If the drive gear is rotated too much, the tooth contact pattern will become unclear and difficult to check.

(3) Check the tooth contact 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	
 3	 3
The drive pinion is positioned too far from the center of the drive gear.	Increase the thickness of the pinion height adjusting shim, and position the drive pinion closer to the center of the drive gear. Also, for backlash adjustment, position the drive gear farther from the drive pinion.
Tooth contact pattern resulting from insufficient pinion height	
 3	 3
The drive pinion is positioned too close to the center of the drive gear.	Decrease the thickness of the pinion height adjusting shim, and position the drive pinion farther from the center of the drive gear. Also, for backlash adjustment, position the drive gear closer to the drive pinion.

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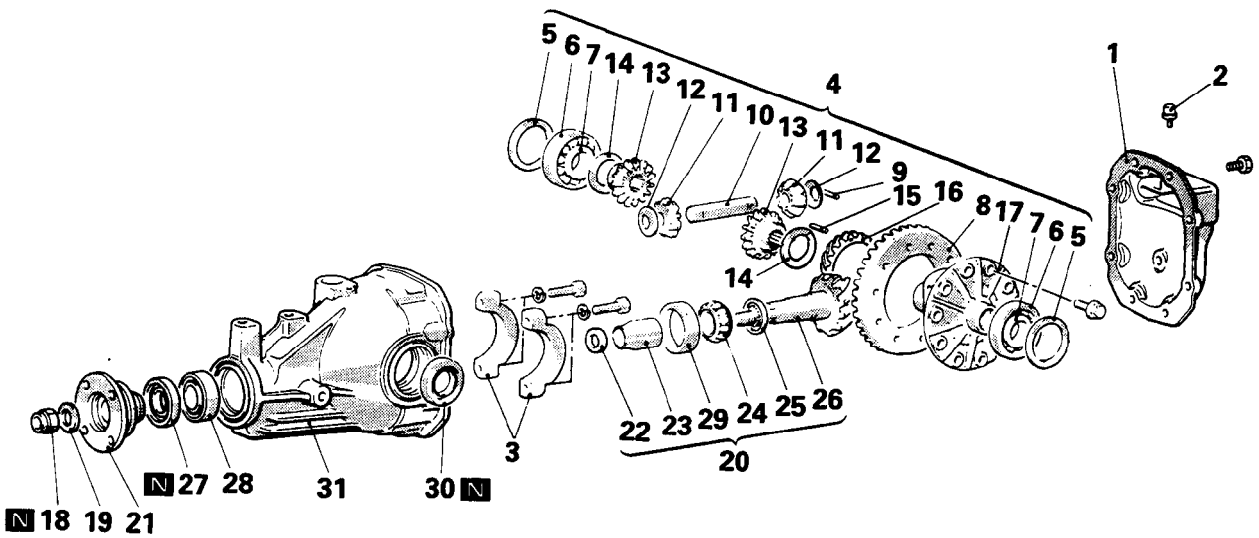
NOTE
(1) Tooth contact pattern is a method for judging the result of the adjustment of drive pinion height and final drive gear backlash. The adjustment of drive pinion hight and final drive gear backlash should be repeated until tooth contact patterns bear a similarity to the standard tooth contact 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

M271F--

Inspection Before Disassembly
- Final Drive Gear Backlash (Refer to P.27-27.)
- *Differential Gear Backlash <Conventional type> (Refer to P.27-27.)
- Drive Gear Runout (Refer to P.27-27.)
- *Final Drive Gear Tooth Contact (Refer to P.27-28.)



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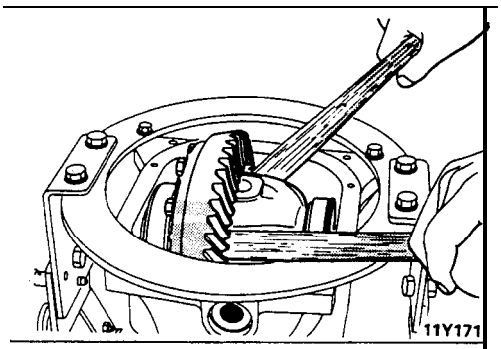
Disassembly steps

1. Differential cover
2. Vent plug
3. Bearing cap
4. Differential case assembly
5. Side bearing spacer
6. Side bearing outer race
7. Side bearing inner race
8. Drive gear
9. Lock pin
10. Pinion shaft
11. Pinion gear
12. Pinion washer
13. Side gears
14. Side gear spacer
15. Spring pin (Vehicles with 4WS)
16. Drive gear (Vehicles with 4WS)
17. Differential case
18. Self-locking nut
19. Washer
20. Drive pinion assembly
21. Companion flange
22. Drive pinion front shim (for preload adjustment)
23. Drive pinion spacer
24. Drive pinion rear bearing inner race
25. Drive pinion rear shim (for pinion height adjustment)
26. Drive pinion
27. Oil seal
28. Drive pinion front bearing
29. Drive pinion rear bearing outer race
30. Oil seal
31. Gear carrier



SERVICE POINTS OF DISASSEMBLY M27IGBC

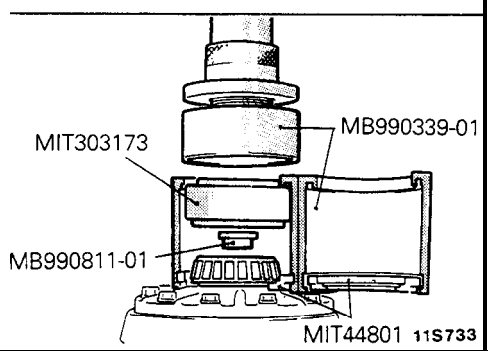
4. REMOVAL OF DIFFERENTIAL CASE ASSEMBLY

Prize out the differential case assembly using hammer shafts.

NOTE

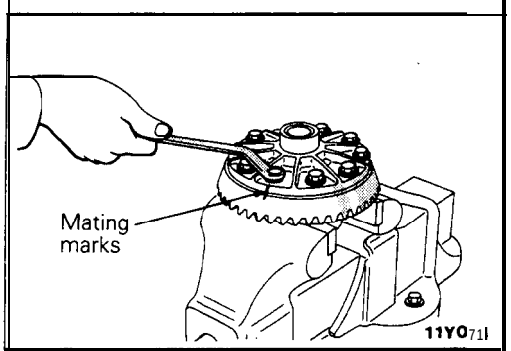
When removing the differential case assembly, the removal should be accomplished slowly and carefully and caution paid to ensure that the side bearing outer race is not dropped.

Keep the right and left side bearings separate, so that they do not become mixed at the time of reassembly.



7. REMOVAL OF SIDE BEARING INNER RACES

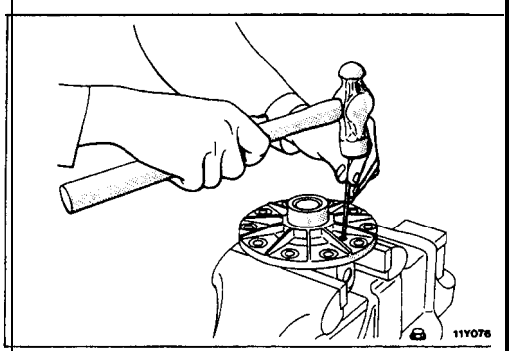
Pull out the side bearing inner races by using the special tools.



8. REMOVAL OF DRIVE GEAR

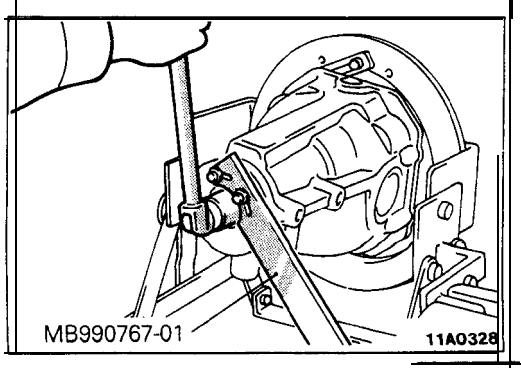
(1) Make the mating marks to the differential case and the drive gear.

(2) Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.



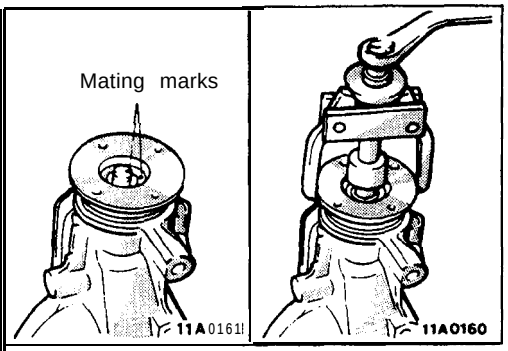
9. REMOVAL OF LOCK PIN

Drive out the lock pin with a punch and remove the pinion gears, pinion washers, side gears and side gear spacers.



18. REMOVAL OF SELF-LOCKING NUT

Use the special tools to hold the companion flange and remove the companion flange self-locking nut.

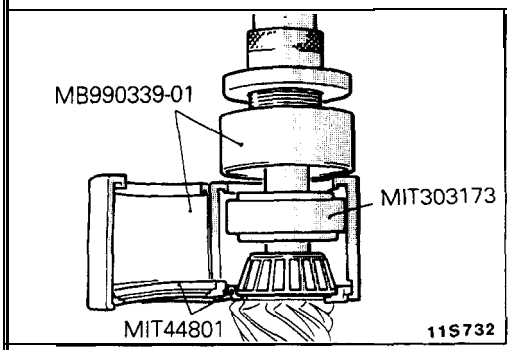


20. REMOVAL OF DRIVE PINION

(1) Make the mating marks to the drive pinion and companion flange.

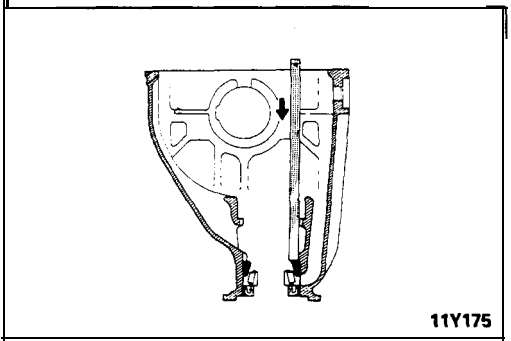
NOTE
Mating marks should not be made to the contact surfaces of companion flange and propeller shaft.

(2) Drive out the drive pinion together with the drive pinion spacer and drive pinion front shims.



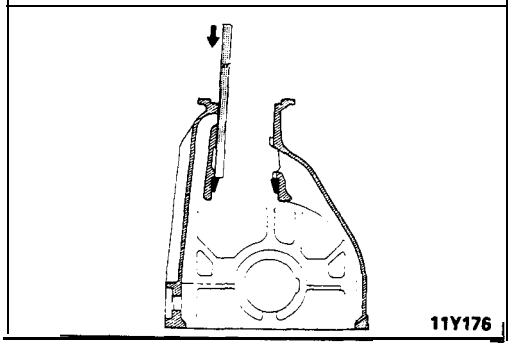
24. REMOVAL OF DRIVE PINION REAR BEARING INNER RACE

Pull out the drive pinion rear bearing inner race by using the special tools.



27. REMOVAL OF OIL SEAL/28. DRIVE PINION FRONT BEARING

Drive out the drive pinion front bearing from the gear carrier.



29. REMOVAL OF DRIVE PINION REAR BEARING OUTER RACE

Drive out the drive pinion rear bearing outer race from the gear carrier.

INSPECTION

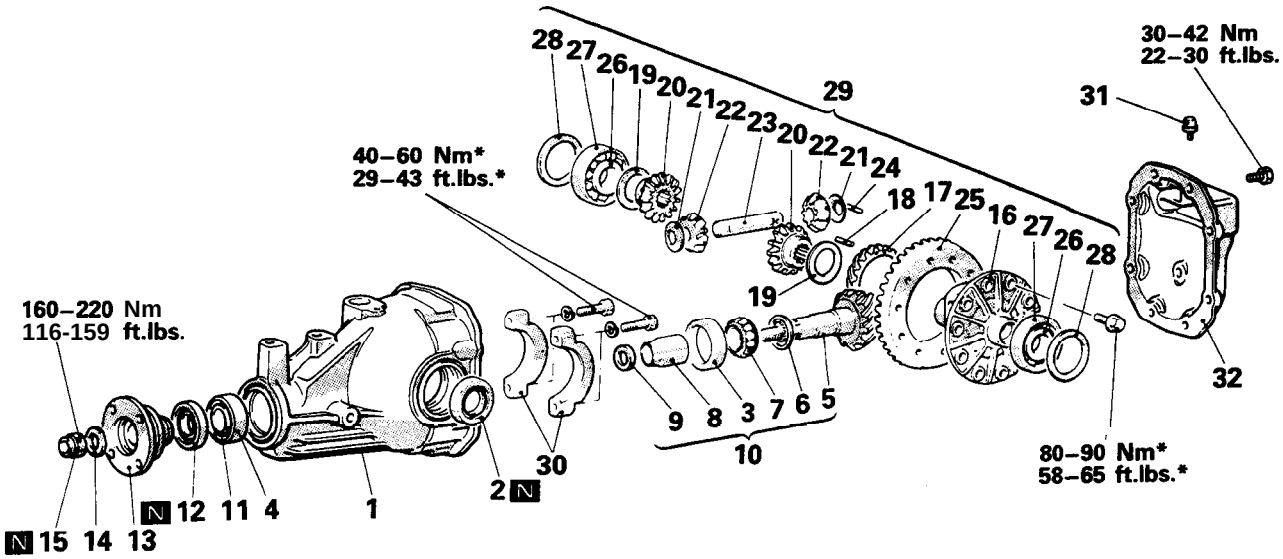
M271HAD

- Check the companion flange for wear or damage.
- Check the oil seal for wear or deterioration.
- Check the bearings for wear or discoloration.
- Check the gear carrier for cracks.
- Check the drive pinion and drive gear for wear or cracks.
- Check the side gears, pinion gears and pinion shaft for wear or damage.
- Check the side gear spline for wear or damage.

TSB Revision

REASSEMBLY

M27II–



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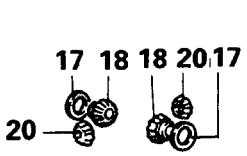
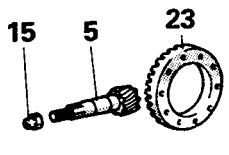


Differential gear set



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Final drive gear set

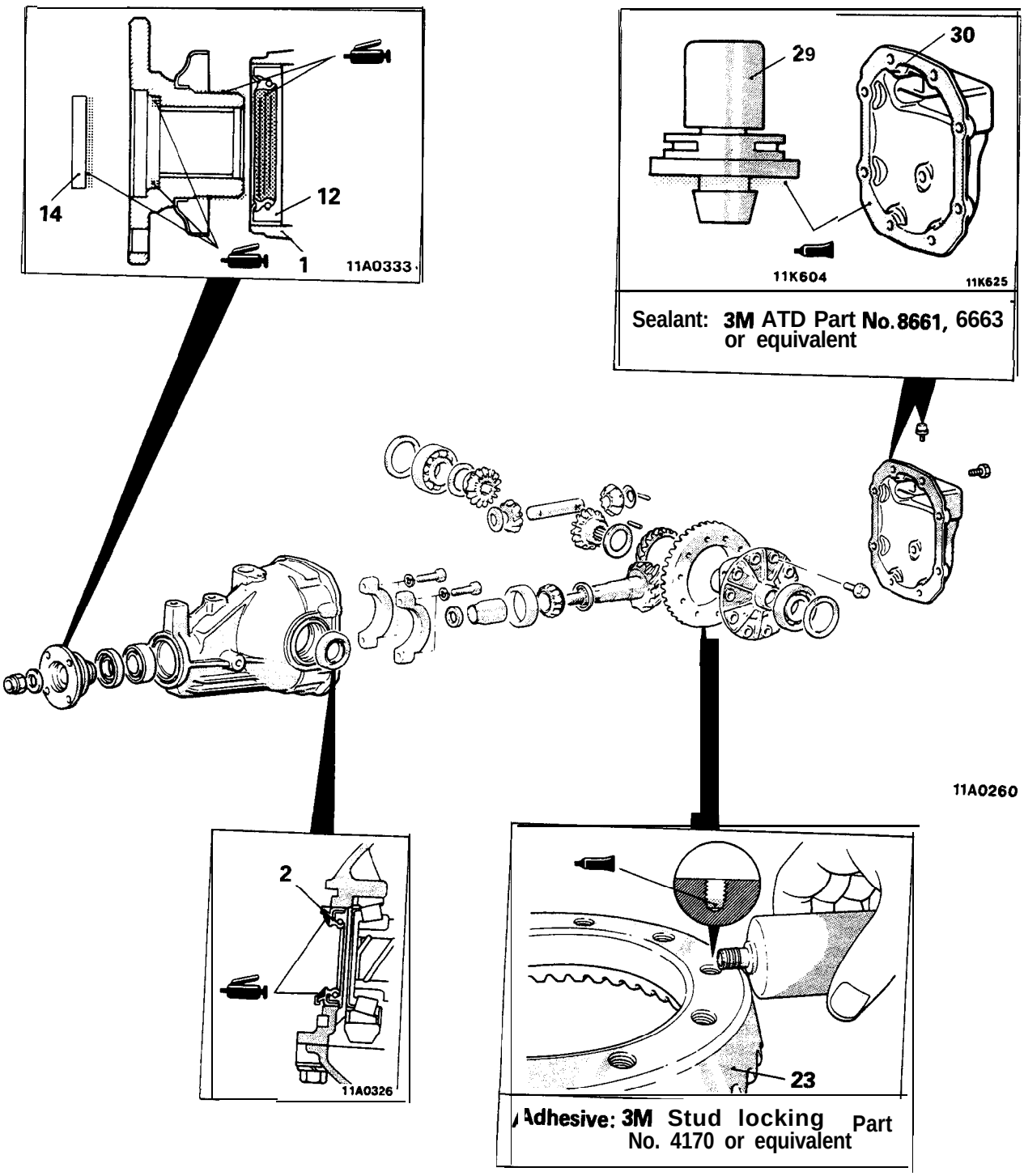
Reassembly steps

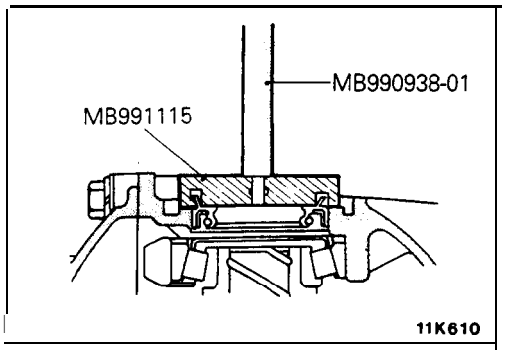
1. Gear carrier
2. Oil seal
3. Drive pinion rear bearing outer race
4. + Drive pinion front bearing outer race
   Adjustment of pinion height
5. Drive pinion
6. Drive pinion rear shim (for pinion height adjustment)
7. Drive pinion rear bearing inner race
8. Drive pinion spacer
   Adjustment of drive pinion preload
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
17. Drive gear (Vehicles with 4WS)
18. Spring pin (Vehicles with 4WS)
    Adjustment of differential gear backlash
19. Side gear spacer
20. Side gear
21. Pinion washer
22. Pinion gear
23. Pinion shaft
    a 24. Lock pin
    a 25. Drive gear
    * 26. Side bearing inner race
27. Side bearing outer race
    Adjustment of final drive gear backlash
28. Side bearing spacer
29. Differential case assembly
30. Bearing cap
31. Vent plug
32. Differential cover

NOTE
• : Tightening torque with oil applied

TSB Revision

Lubrication, sealing and adhesion points

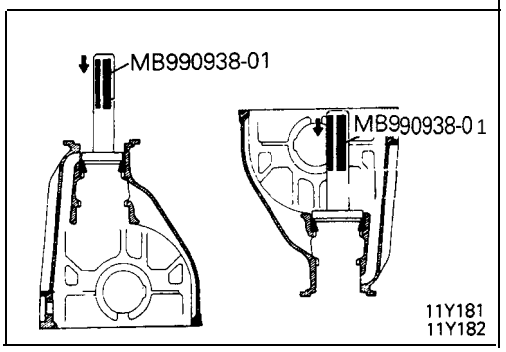




SERVICE POINTS OF REASSEMBLY M27IJBCa

2. PRESS FITTING OF OIL SEAL

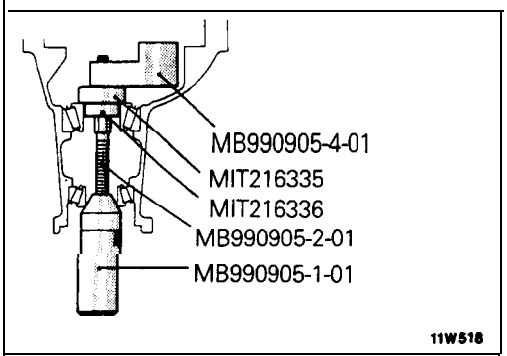
(1) With the special tool, press fit the oil seal until it is flush with the end of the gear carrier.
(2) Apply multipurpose grease to the oil seal lip.



3. INSTALLATION OF DRIVE PINION REAR BEARING OUTER RACE/A DRIVE PINION FRONT BEARING OUTER RACE

Press-fit the drive pinion rear and front bearing outer races into the gear carrier by using the special tool.

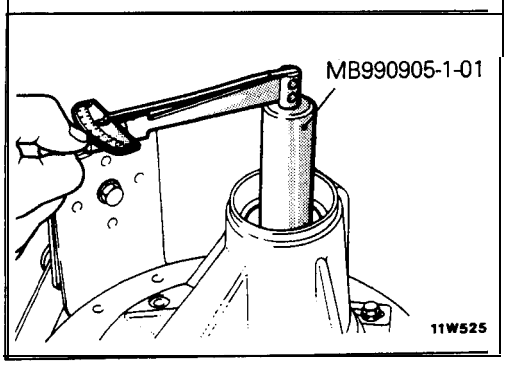
Caution
Be careful not to press in the outer race at an angle.



. ADJUSTMENT OF PINION HEIGHT

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.

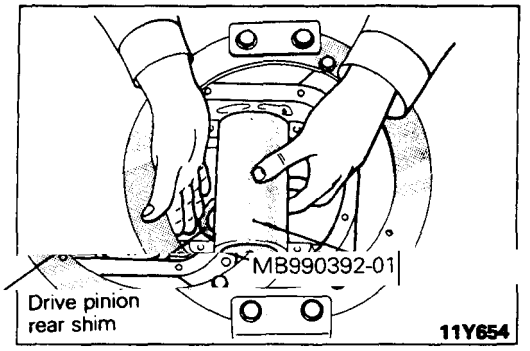


(2) Tighten the handle of the special tool until the standard value of drive pinion turning torque is obtained.
(3) Measure the drive pinion turning torque (without the oil seal).

Standard value:

Bearing classification	Bearing lubrication	Rotation torque (starting friction torque) Nm (in.lbs.)
New	None (with rust-prevention oil)	0.9–1.2 (8–10)
New/reused	Oil application	0.4–0.5 (3–4)

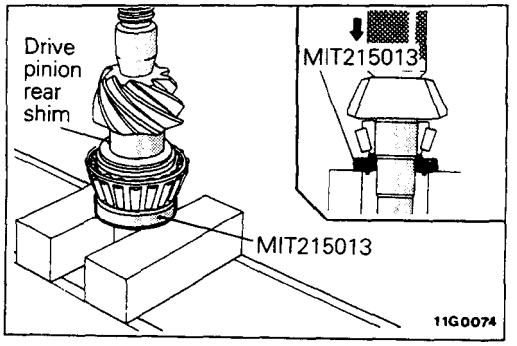
NOTE
(1) Gradually tighten the handle of the special tool while checking the drive pinion turning torque.
(2) Because the special tool cannot be turned one turn, turn it several times within the range that it can be turned; then, after fitting to the bearing, measure the rotation torque.



(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. 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.



(5) 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.

. ADJUSTMENT OF DRIVE PINION PRELOAD

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.

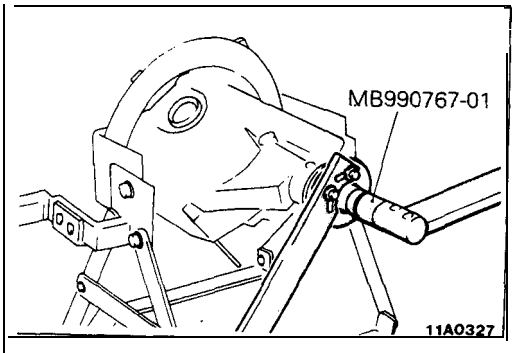
(2) Tighten the companion flange to the specified torque by using the special tools.

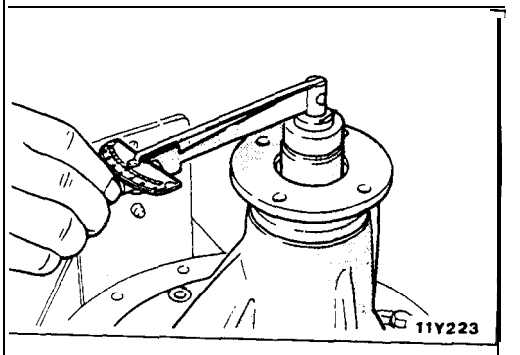
NOTE
Do not install the oil seal.

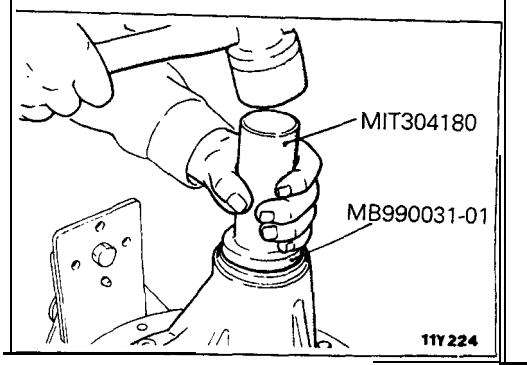
(3) Measure the drive pinion turning torque (without the oil seal) by using the special tools.

Standard value:

Bearing classification	Bearing lubrication	Rotation torque (starting friction torque) Nm (in.lbs.)
New	None (with rust-prevention oil)	0.9–1.2 (8–10)
New/reused	Oil application	0.4–0.5 (3–4)





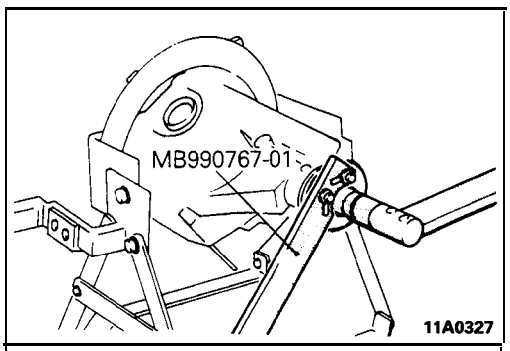


(4) If the drive pinion turning torque is not within the range of the standard value, adjust the turning torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

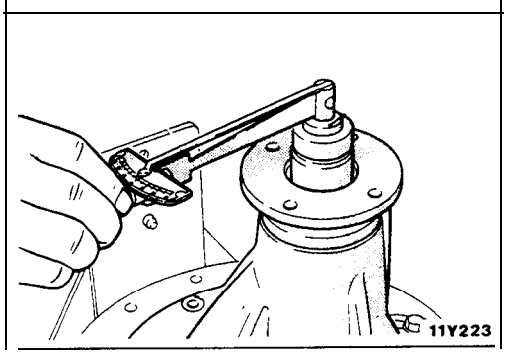
NOTE
When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.

(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.

TSB Revision



(6) Install the drive pinion assembly and companion flange with mating marks properly aligned, and tighten the companion flange self-locking nut to the specified torque by using the special tools.



(7) Measure the drive pinion turning torque (with oil seal) to verify that the drive pinion turning torque complies with the standard value.

Standard value:

Bearing classification	Bearing lubrication	Rotation torque (starting friction torque) Nm (in.lbs.)
New (10–11)	None (with rust-prevention oil)	
New/reused (4–5)	Oil application	

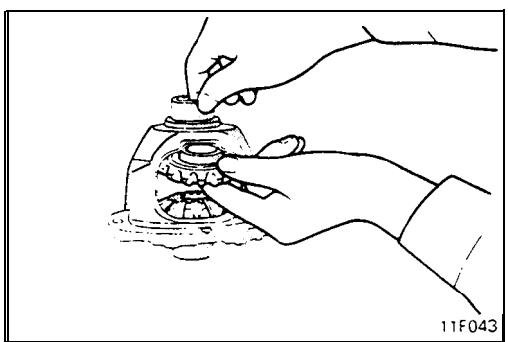
If there is a deviation from the standard value, check whether or not there is incorrect tightening torque of the companion flange tightening self-locking nut, or incorrect fitting of the oil seal.

. ADJUSTMENT OF DIFFERENTIAL GEAR BACKLASH

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.

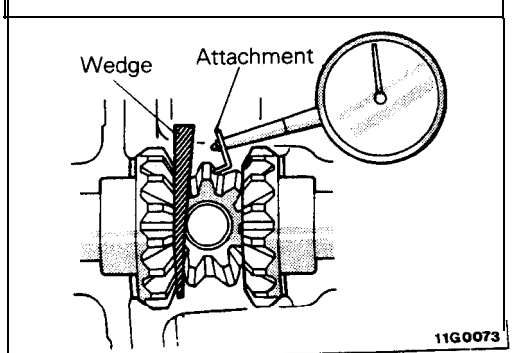


(3) Adjust the differential gear backlash by the following procedures:

① 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 (0–.003 in.)**
Limit: **0.2 mm (.008 in.)**



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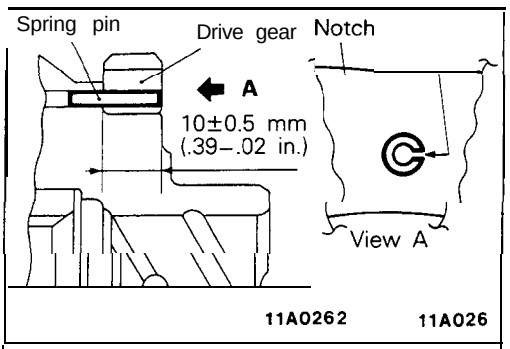
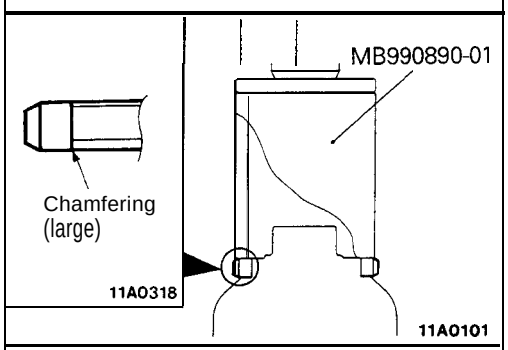
② If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear spacers.
③ Measure the differential gear backlash once again, and confirm that it is within the limit.

NOTE
(1) After adjustment, check that the backlash is the 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.

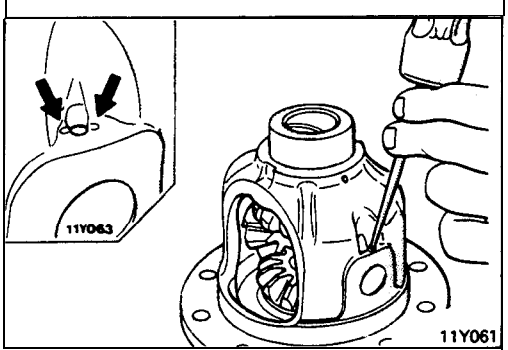


17. INSTALLATION OF DRIVE GEAR/18. SPRING PIN

(1) Before installing the drive gear, drive the spring pin into the differential case.
At this time, face the notch in the spring pin in the direction shown in the figure and have it stick out from the differential case by the dimension shown in the figure.

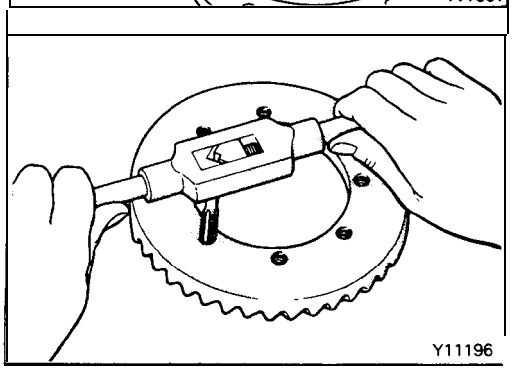


(2) Use the special tool to press fit the drive gear until it hits the end of the differential case.
At this time, the large chamfering of the inner circumference of the drive gear should be to the inside (side touching the differential case).
(3) Check that the drive gear and end of the spring pin are flush.



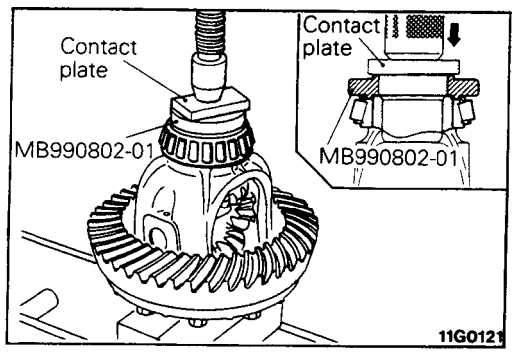
24. INSTALLATION OF LOCK PIN

(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.



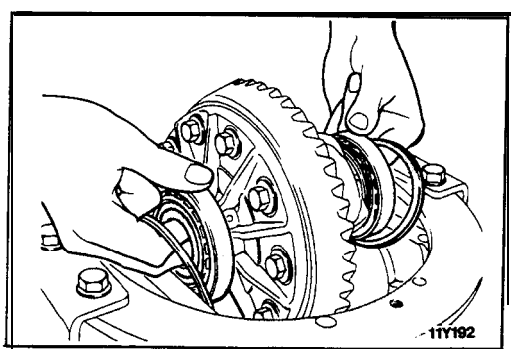
25. INSTALLATION OF DRIVE GEAR

(1) Clean the drive gear attaching bolts.
(2) Use an M10 X 1.25 tap to remove the adhesive adhering to the threaded holes of the drive gear, and then clean the threaded holes by applying compressed air.
(3) Install the drive gear onto the differential case with the mating marks properly aligned. Tighten the bolts to the specified torque in a diagonal sequence.



26. PRESS-FITTING OF SIDE BEARING INNER RACE

Press-fit the side bearing inner races to the differential case by using the special tool.

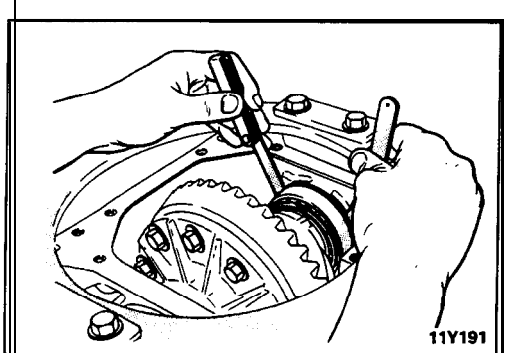


- **ADJUSTMENT OF FINAL DRIVE GEAR BACKLASH**

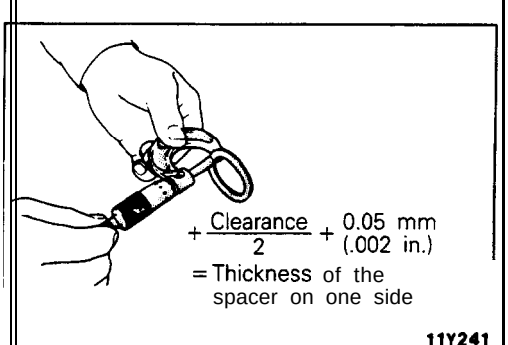
Adjust the final drive gear backlash by the following procedures:

(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.

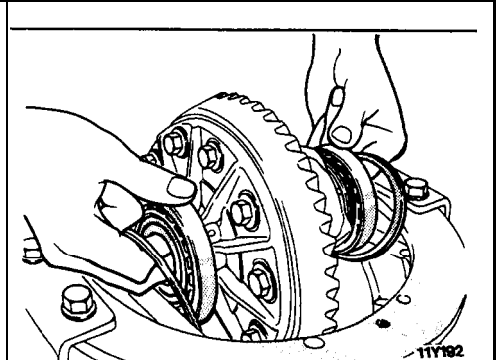
NOTE
Select side bearing spacers with the same thickness for both the drive pinion side and the drive gear side.



(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 (.002 in.), 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.

WHEEL AND TIRE

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M31AA--

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- Tire Inflation Pressure Check 4
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- Cracked Treads
- Feathered Edge
- Rapid Wear at Center
- Rapid Wear at Shoulders
- Scalloped Wear
- Wear on One Side

WHEEL AND TIRE 5

SPECIFICATIONS

GENERAL SPECIFICATIONS

M31CA--

Items		SOHC	DOHC-FWD	DOHC-AWD
Wheel				
Tire size		P185/70R14 87S	<Up to 1992 models> 195/65R14 89H or 195/60R15 86H <1993 models> 195/60R15 86H	195/65R14 89H or 195/60R15 86H or 195/60R15 87V
Wheel type		Steel type or Aluminium type	Steel type or Aluminium type	Steel type or Aluminium type
Wheel size		14 × 5½ JJ	14 × 5½ JJ or 15 × 6 JJ	14 × 5½ JJ or 15 × 6 JJ
Amount of wheel offset	mm (in.)	46 (1.8)	46 (1.8)	46 (1.8)
Tire inflation pressure	kPa (psi)			
Front		200 (29)	210 (30)	220 (32)
Rear		180 (26)	180 (26)	200 (29)
Spare wheel				
Tire size		T125/70D15	T125/70D15 T125/70D16*	T135/70D16
Wheel size		4T × 15	4T × 15 4T × 16*	4T × 16
Amount of wheel offset	mm (in.)	46 (1.8)	46 (1.8)	46 (1.8)
Tire inflation pressure	kPa (psi)	420 (60)	420 (60)	420 (60)

NOTE
* : <Anti-lock braking system>

SERVICE SPECIFICATIONS

Items		Specifications	
Limit			
Wheel runout		<Steel type>	<Aluminium type>
Radial	mm (in.)	1.2 (.047)	1.0 (.039)
Lateral	mm (in.)	1.2 (.047)	1.0 (.039)
Tread depth of tire	mm (in.)	1.6 (.06)	

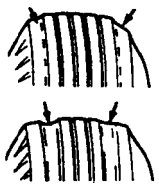
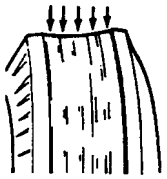
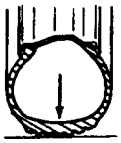
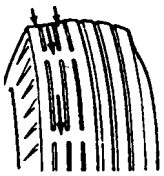
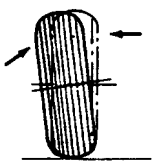
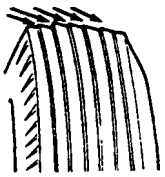
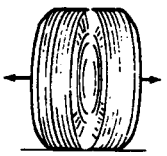
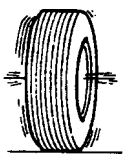
TORQUE SPECIFICATIONS

M31CC--

Items	Nm	ft.lbs.
Wheel nuts	90–110	65–80

TROUBLESHOOTING

M31EA–

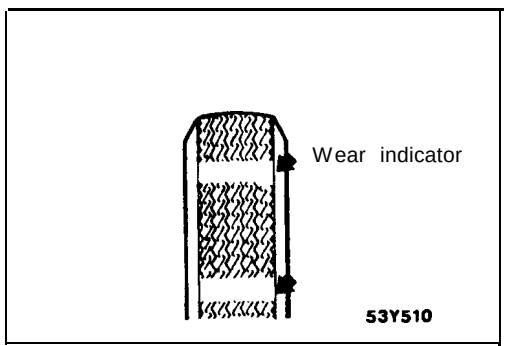
Symptom	Probable cause	Remedy
Rapid wear at shoulders 	Under-inflation or lack of rotation	Adjust the tire pressure
Rapid wear at center 	Over-inflation or lack of rotation 	
Cracked treads	Under-inflation	
Near on one side 	Excessive camber 	Inspect the camber
Feathered edge 	Incorrect toe-in 	Adjust 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 tires Inspect the front suspension alignment

TSB Revision

SERVICE ADJUSTMENT PROCEDURES

TIRE INFLATION PRESSURE CHECK M31FDAC

Check the inflation pressure of the tires. If it is not within the standard value, make the necessary adjustment.



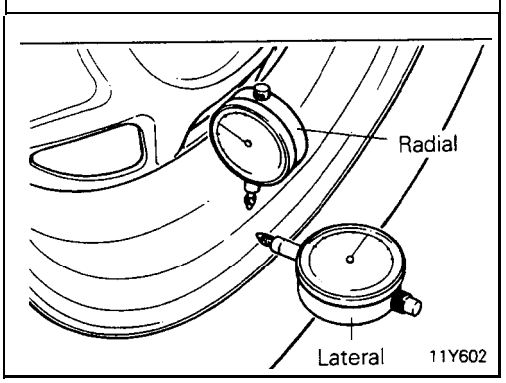
TIRE WEAR CHECK M31FBAB

Measure the tread depth of tires.

Limit: 1.6 mm (.06 in.)

If the remaining tread depth is less than the limit, replace the tire.

NOTE
When the tread depth of tires is reduced to 1.6 mm (.06 in.) or less, wear indicators will appear.



WHEEL RUNOUT CHECK M31FCAB

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:

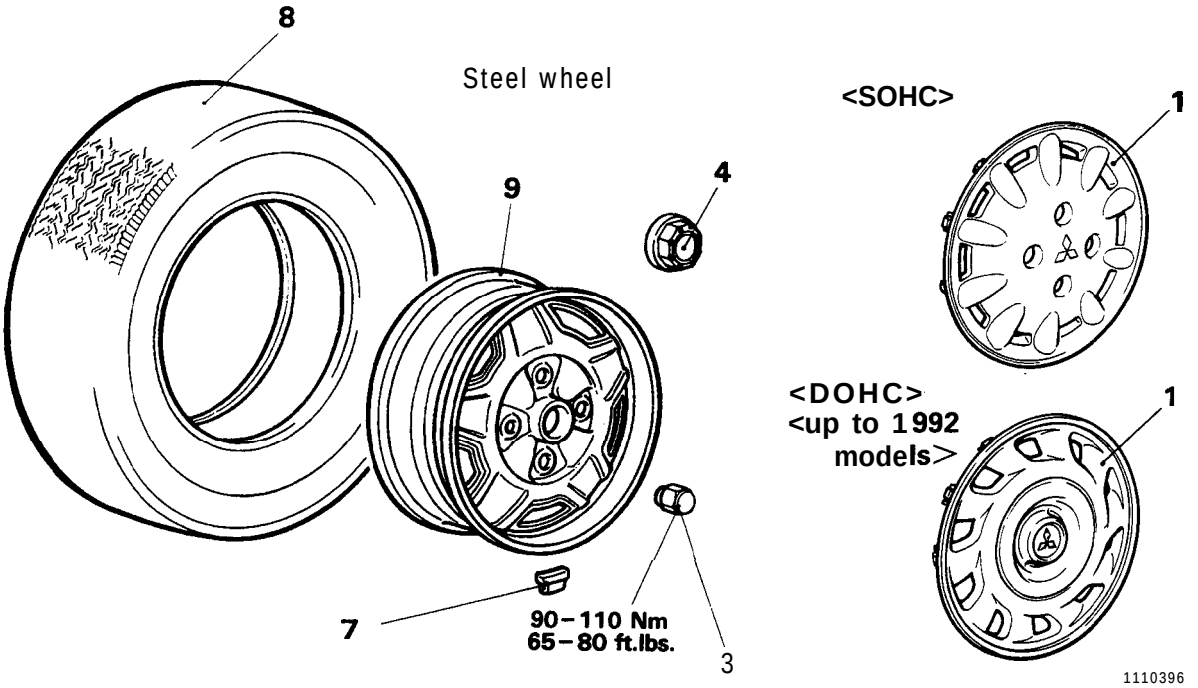
Radial	
<Steel type>	**1.2 mm (.047 in.)**
<Aluminium type>	**1.0 mm (.039 in.)**
Lateral	
<Steel type>	**1.2 mm (.047 in.)**
<Aluminium type>	**1.0 mm (.039 in.)**

If wheel runout exceeds the limit, replace the wheel.

WHEEL AND TIRE

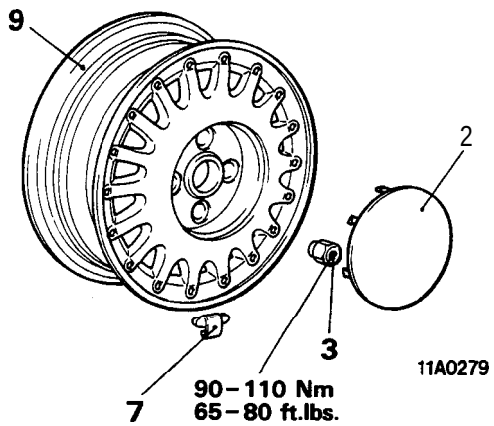
M31GA--

REMOVAL AND INSTALLATION

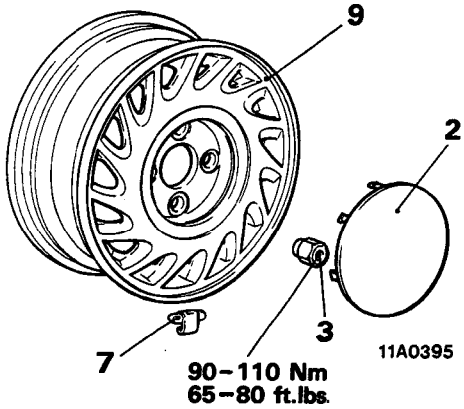


Aluminium type wheel

<14 inch- SOHC>



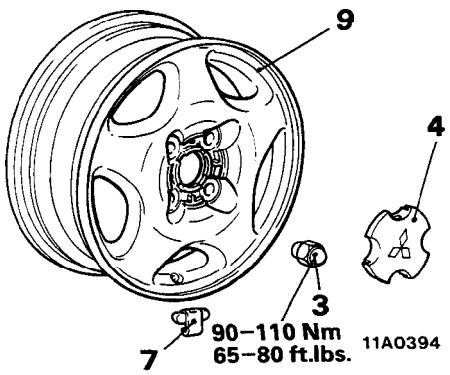
<14 inch-DOHC>
<Up to 1992 models>



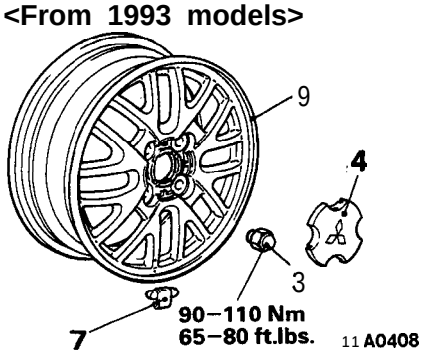
Removal steps

1. Wheel cover <Vehicles with wheel cover>
2. Center cover <Vehicles with center cover>
3. Wheel nuts
4. Center cap <Vehicles with center cap>
5. Spring
6. Ornament
7. Balance weight
8. Tire
9. Wheel

<15 inch>



<15 inch>
<From 1993 models>



INSTRUCTIONS FOR ALUMINUM TYPE WHEELS M31GFAA

1. Aluminum is vulnerable to alkalies. If a vehicle washing detergent has been used, or salt from sea water or road chemicals has adhered, wash the vehicle as soon as possible. After washing the vehicle, apply body or wheel wax to the aluminum type wheels to prevent corrosion.
2. When cleaning the vehicle with steam, do not direct steam onto the aluminum type wheels.
   When tightening nuts for aluminum type wheels, particularly observe the following:
   (1) Clean the hub surface of aluminum type wheels.
   (2) After finger-tightening wheel nuts, tighten them to specifications.
   (3) Do not use an impact wrench or push the wrench by foot to tighten the wheel nuts.
   (4) Do not apply oil to the threaded portions.

INSTRUCTIONS FOR TIRE CHAINS AND SNOW TIRES M31GGAA

1. Use tire chains only on front wheels. Do not use tire chains on rear wheels.
2. When using snow tires, use them on all four wheels for maneuverability and safety.

INSTRUCTIONS FOR COMPACT SPARE TIRE M31GHAA

1. The compact spare tire is designed to save space in the luggage compartment, and its lighter weight makes it easier to use if a flat tire occurs.
2. The following instructions for the compact spare tire should be observed.
   (1) Check the inflation pressure after installing the spare, and adjust to the specified pressure.
   (2) Avoid driving through automatic car washes and over obstacles that could possibly damage the vehicle's undercarriage. Because the tire is smaller than the original tire, car ground clearance is slightly reduced.
   (3) The compact spare tire should not be used on any other wheels, nor should standard tires, snow tires, wheel covers or trim rings be used with the compact spare wheel. If such use is attempted, damage to these items or other vehicle components may occur.

POWER PLANT MOUNT

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M32AA--

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ENGINE ROLL STOPPER 6
SPECIAL TOOL 3
SPECIFICATIONS 2
Service Specifications 2
Torque Specifications 2
TRANSAXLE MOUNTING 5
TROUBLESHOOTING 4

SPECIFICATIONS

SERVICE SPECIFICATIONS

M32CB–

Items	Specifications
Standard value	
Crossmember bushing (A) projection mm (in.)	7.2–10.2 (.28–.40)
Crossmember bushing (B) projection mm (in.)	6.5-9.5 (.26–.37)

TORQUE SPECIFICATIONS

M32CC–

Items	Nm	ft.lbs.
Engine mounting		
Engine mount insulator nut (large)	60–80	43-58
Engine mount insulator nut (small)	30–40	22-29
Engine mount bracket bolt	50–65	36-47
Engine mount bracket nut	50–65	36-47
Bracket	17-26	12-19
Transaxle mounting		
Transaxle mount insulator nut	60–80	43-58
Transaxle mount bracket to body	40–50	29-36
Engine roll stopper		
Front roll stopper insulator nut	50–65	36-47
Front roll stopper bracket to centermember	40–50	29-36
Rear roll stopper insulator nut	40–50	29-36
Rear roll stopper bracket to crossmember	40–50	29-36
Centermember and crossmember <FWD>		
Centermember installation bolts (front)	80–100	58-72
Centermember installation bolts (rear)	80–100	58-72
Stay installation bolts	70–80	51–58
Stabilizer bar bracket to crossmember	30–42	22–30
Stabilizer link installation bolts	35-45	25-33
Tie rod end ball joint to knuckle	24-34	17-25
Joint assembly and gear box connecting bolt	15–20	11–14
Steering gear box assembly to return tube	12-18	9-13
Steering gear box assembly to pressure hose	12-18	9-13
Steering gear box assembly to crossmember	60–80	43-58
Pressure hose blacket	9-14	7–10
Lower arm clamp to crossmember (nut)	35-47	25-34
Lower arm clamp to crossmember (bolt)	80–100	58-72
Lower arm clamp shaft to body	80–100*1 [100–120]*2	58–72*1 [72–87]*2
Lower arm mounting bolt	100–120	72-87
Crossmember to body	80–100	58-72

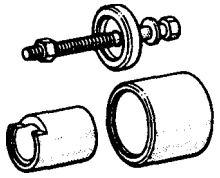
NOTE
*1: Vehicles built up to Dec. 1988
*2: Vehicles built from Jan. 1989

TSB Revision

Items	Nm	ft.lbs.
Centermember and crossmember <AWD>		
Front roll stopper to No. 1 crossmember	40–50	29-36
Front roll stopper insulator nut	50–65	36-47
No. 1 crossmember installation nut	80–100	58-72
Gusset installation bolt	70–80	51–58
Right member installation bolt (front)	80–100	58-72
Right member installation bolt (rear)	70–80	51–58
Left member installation bolt (front)	80–100	58-72
Left member installation bolt (rear)	70–80	51-58
Front exhaust pipe to exhaust fitting <Turbo>	40–60	29-36
Front exhaust pipe to engine <Turbo>	30–40	22-29
Front exhaust pipe to exhaust manifold <Non-Turbo>	30–40	22-29
Front exhaust pipe clamp <Non-Turbo>	30–40	22-29
Front exhaust pipe rear installation bolt	30–40	22-29
Front exhaust pipe hanger installation bolt	10–15	7–11
Stabilizer bar bracket to crossmember	30–42	22–30
Stabilizer link installation nut	35-45	25-33
Transfer assembly installation bolt		
M/T	55–60	40–43
A/T	60–80	44-57
Tie rod end ball joint to knuckle	24-34	17-25
Joint assembly and gear box connecting bolt	15–20	11–14
Steering gear box assembly to return tube	12-18	9-13
Steering gear box assembly to pressure hose	12-18	9-13
Steering gear box assembly to crossmember	60–80	43-58
Lower arm clamp to crossmember (nut)	35-47	25-34
Lower arm clamp to crossmember (bolt)	80–100	58-72
Lower arm clamp shaft to body	100–120	72-87
Lower arm mounting bolt	95–120	69-87
Crossmember to body	80–100	58-72

SPECIAL TOOL

M32DA--

Tool	Number	Name	Use
	MB991045	Bushing remover and installer	Removal and installation of the crossmember bushing

TROUBLESHOOTING

M32EAAC

Symptom	Probable cause	Remedy
Excessive engine wobble or vibration (with engine in normal condition)	Cracked rubber parts of insulator	Replace
	Insufficiently tightened parts	Retighten
Abnormal noise	Insufficiently tightened parts	Retighten

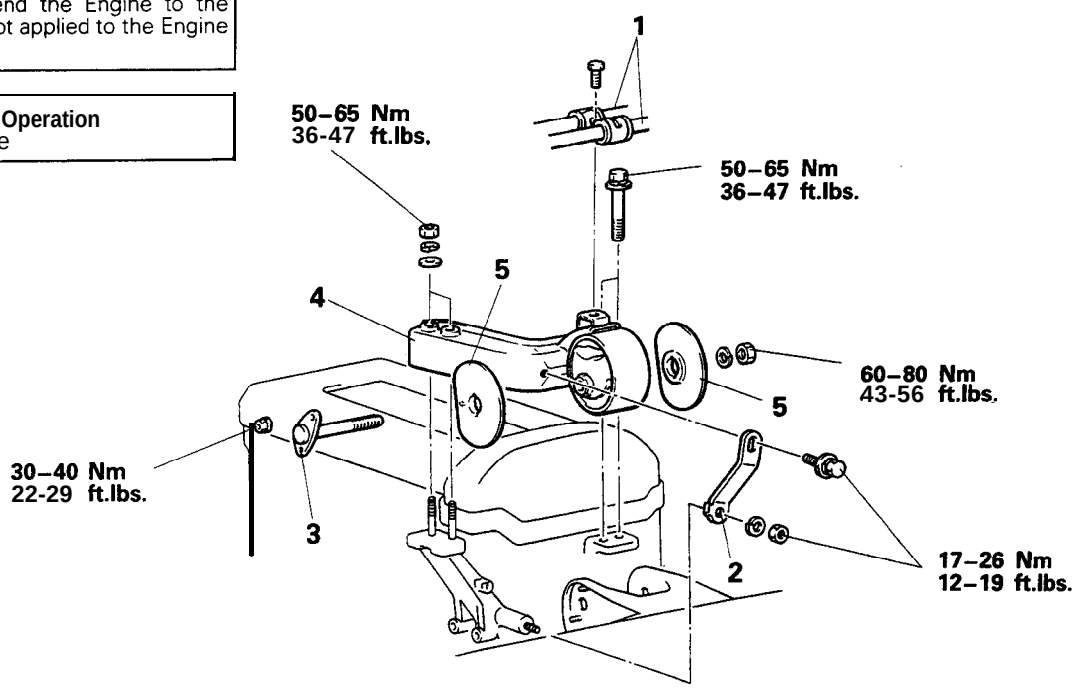
ENGINE MOUNTING

M32GA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Raise and Suspend the Engine to the Extent Force is not applied to the Engine Mount

Post-installation Operation
- Lower the Engine



Removal steps

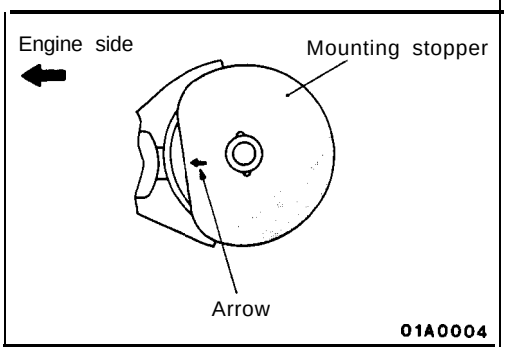
1. Pressure hose (power steering) and high pressure hose (air conditioner)
2. Bracket
3. Engine mount bracket and body connection bolt
4. Engine mount bracket
- + 5. Mounting stopper

INSPECTION

M32GCAH1

- Check each insulator for cracks or damage.
- Check each bracket for deformation or damage.

TSB Revision



SERVICE POINTS OF INSTALLATION M32GDAK

5. INSTALLATION OF MOUNTING STOPPER

Install the mounting stopper of the engine mount bracket so that the arrow faces the center part of the engine.

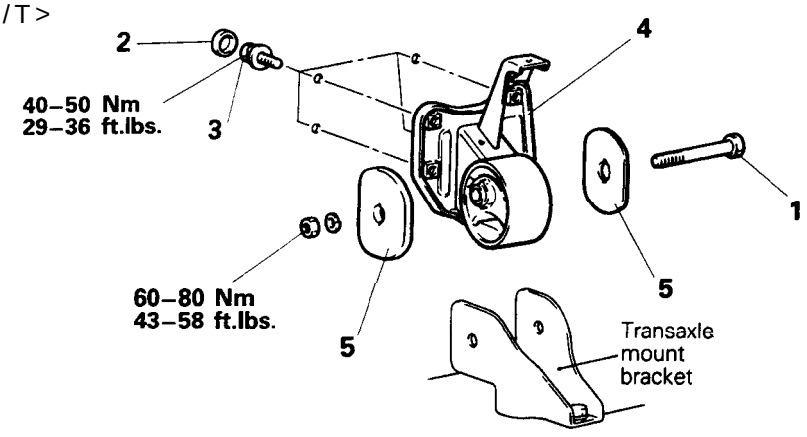
TRANSAXLE MOUNTING M32GE--

REMOVAL AND INSTALLATION

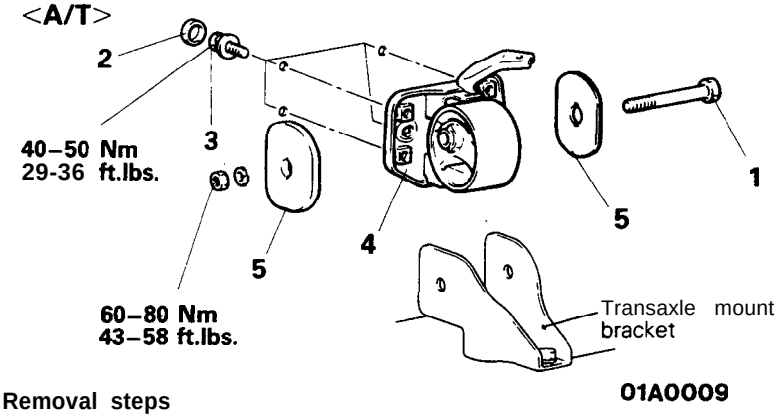
Pre-removal Operation
- Raise and Suspend the Transaxle to the Extent Force is not applied to the Transaxle Mount
- Removal of the Air Cleaner (Refer to GROUP 15–Air Cleaner.)

Post-installation Operation
- Lower the Transaxle
- @Installation of the Air Cleaner (Refer to GROUP 15–Air Cleaner.)

<M/T>



<A/T>



Removal steps

1. Transaxle mount bracket and transaxle connection bolt
2. Cap
3. Transaxle mount bracket installation bolt
4. Transaxle mount bracket
5. Mounting stopper

INSPECTION M32GCAH2

- Check each insulator for cracks or damage.
- Check each bracket for deformation or damage.

TSB Revision

ENGINE ROLL STOPPER

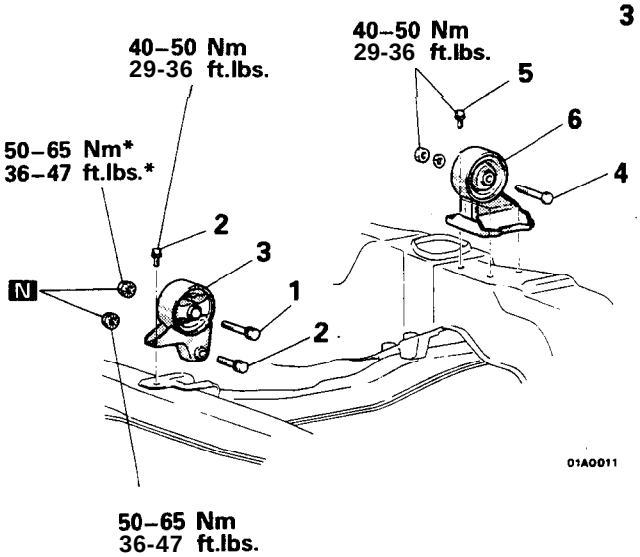
M32GF--

REMOVAL AND INSTALLATION

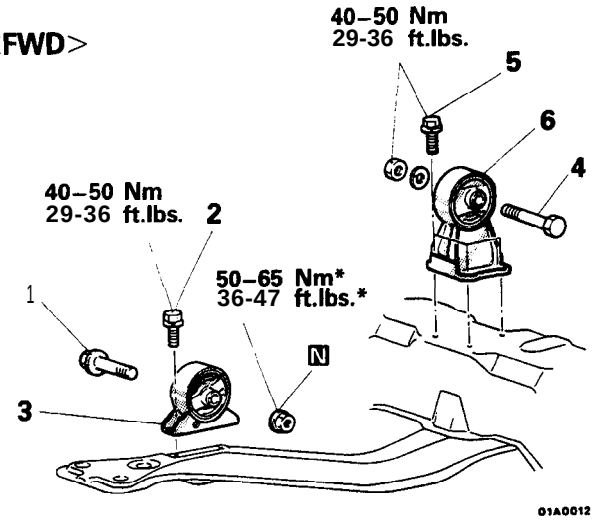
Pre-removal Operation
- Raise and Suspend the Engine to the Extent Force is not applied to the Engrne Mount

Post-installation Operation
- Lower the Engine

<AWD–UP TO 1992 MODELS>



<FWD>



Front roll stopper bracket removal steps

1. Front roll stopper bracket and engine connection bolt
2. Front roll stopper bracket installation bolt
- ◆ + 3. Front roll stopper bracket

Rear roll stopper bracket removal steps

4. Rear roll stopper bracket and engine connection bolt
5. Rear roll stopper bracket installation bolt
- ◆ + 6. Rear roll stopper bracket

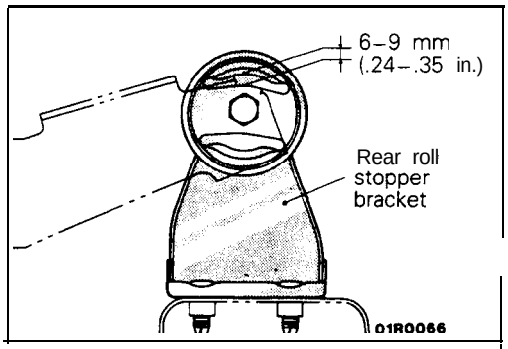
NOTE
* Indicates parts which should be temporarily tightened. and then fully tightened with the weight of the engine supported by the body

INSPECTION

M32GCAH3

- Check each insulator for cracks or damage.
- Check each bracket for deformation or damage.

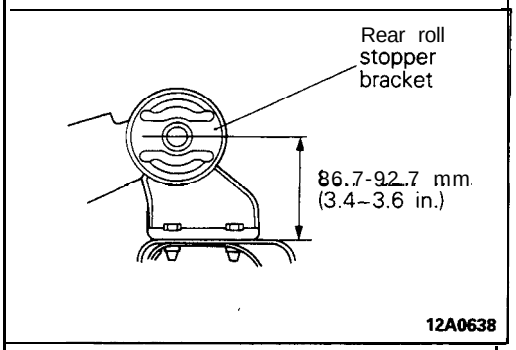
TSB **Revision**



SERVICE POINTS OF INSTALLATION M32GJAB

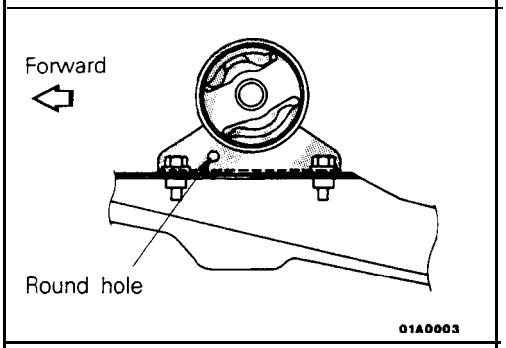
6. INSTALLATION OF REAR ROLL STOPPER BRACKET <Vehicles with FWD-A/T>

After temporarily tightening the rear roll stopper bracket, tighten so that, in the unladen vehicle condition, the dimension of the clearance of the insulator is the specified dimension.



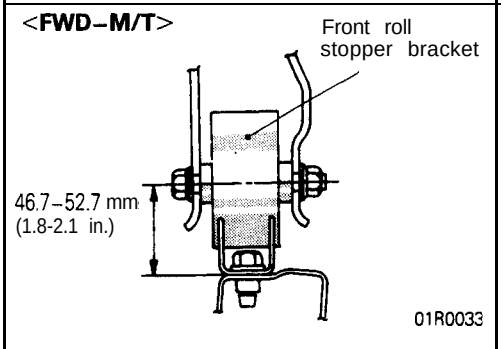
<Vehicles with AWD-A/T>

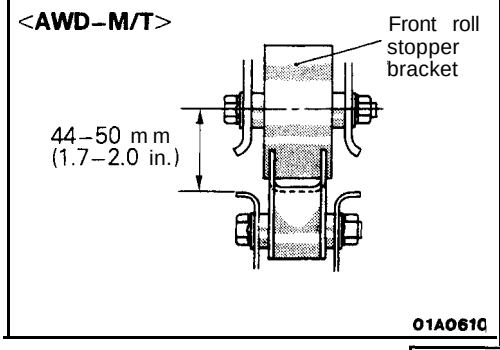
After temporarily tightening the rear roll stopper bracket, tighten so that, in the unladen vehicle condition, the distance from the center hole of the insulator to the lower edge of the bracket is the specified distance.



3. INSTALLATION OF FRONT ROLL STOPPER BRACKET

(1) Install the front roll stopper bracket so that the part where the round hole is made is facing the front of the vehicle.





(2) After temporarily tightening the front roll stopper bracket, tighten so that, in the unladen vehicle condition, the distance from the center hole of the insulator to the lower edge of the bracket is the specified distance.

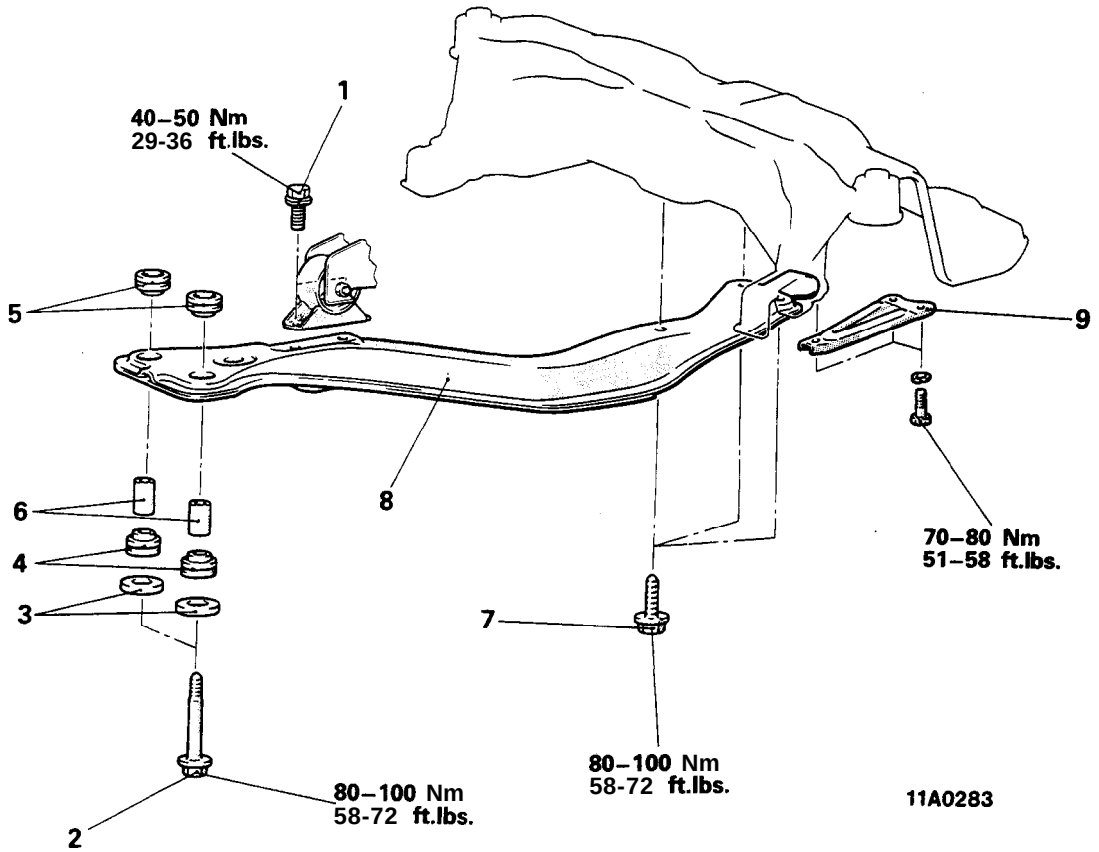
CENTERMEMBER AND CROSSMEMBER <FWD>

REMOVAL AND INSTALLATION

M32YA-A

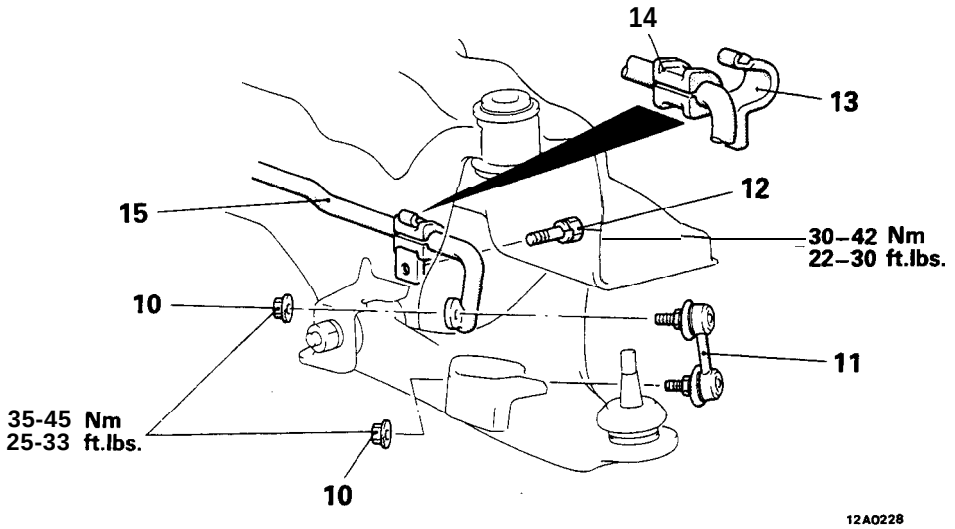
Pre-removal Operation
- Disconnection of the Front Exhaust Pipe when removing the Crossmember (Refer to GROUP 15–Exhaust Pipe and Main Muffler.)
- Raise and Suspend the Engine to the Extent Force is not applied to the Engine Mount
- Draining of the Power-steering Fluid (Refer to GROUP 37A–Service Adjustment Procedures.)

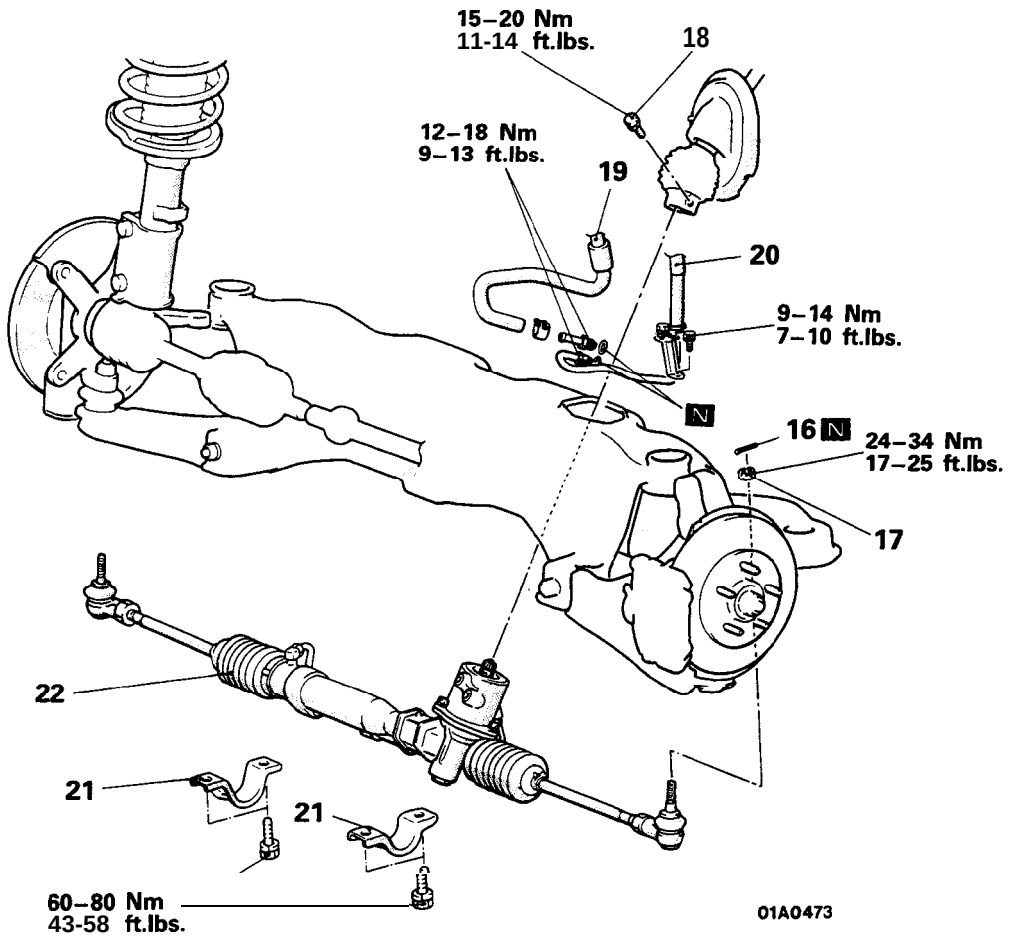
Post-installation Operation
- Lower the Engine
- Coupling of the Front Exhaust Pipe (Refer to GROUP 15–Exhaust Pipe and Main Muffler.)
- Air bleeding of the Power-steering Fluid (Refer to GROUP 37A– Service Adjustment Procedures.)
- Adjustment of the Front Wheel Alignment (Refer to GROUP 33A–Service Adjustment Procedures.)



Removal steps

1. Front roll stopper bracket mounting bolt
2. Centermember installation bolts (front)
3. Stopper
4. Bushing
5. Bushing
6. Collar
7. Centermember installation bolts (rear)
8. Centermember
9. Stay





10. Stabilizer link installation nut (Refer to GROUP 33A–Stabilizer Bar.)
11. Stabilizer link
12. Stabilizer bar bracket installation bolt
13. Stabilizer bar bracket
14. Bushing
15. Stabilizer bar (Refer to GROUP 33A–Stabilizer Bar.)
16. Cotter pin
17. Tie-rod end connection nut
18. Joint assembly connection bolt
19. Return tube connection
20. Pressure hose connection
21. Mounting brackets
22. Steering gear box assembly **(Refer to GROUP** 37A–Steering **Gear** Box.)

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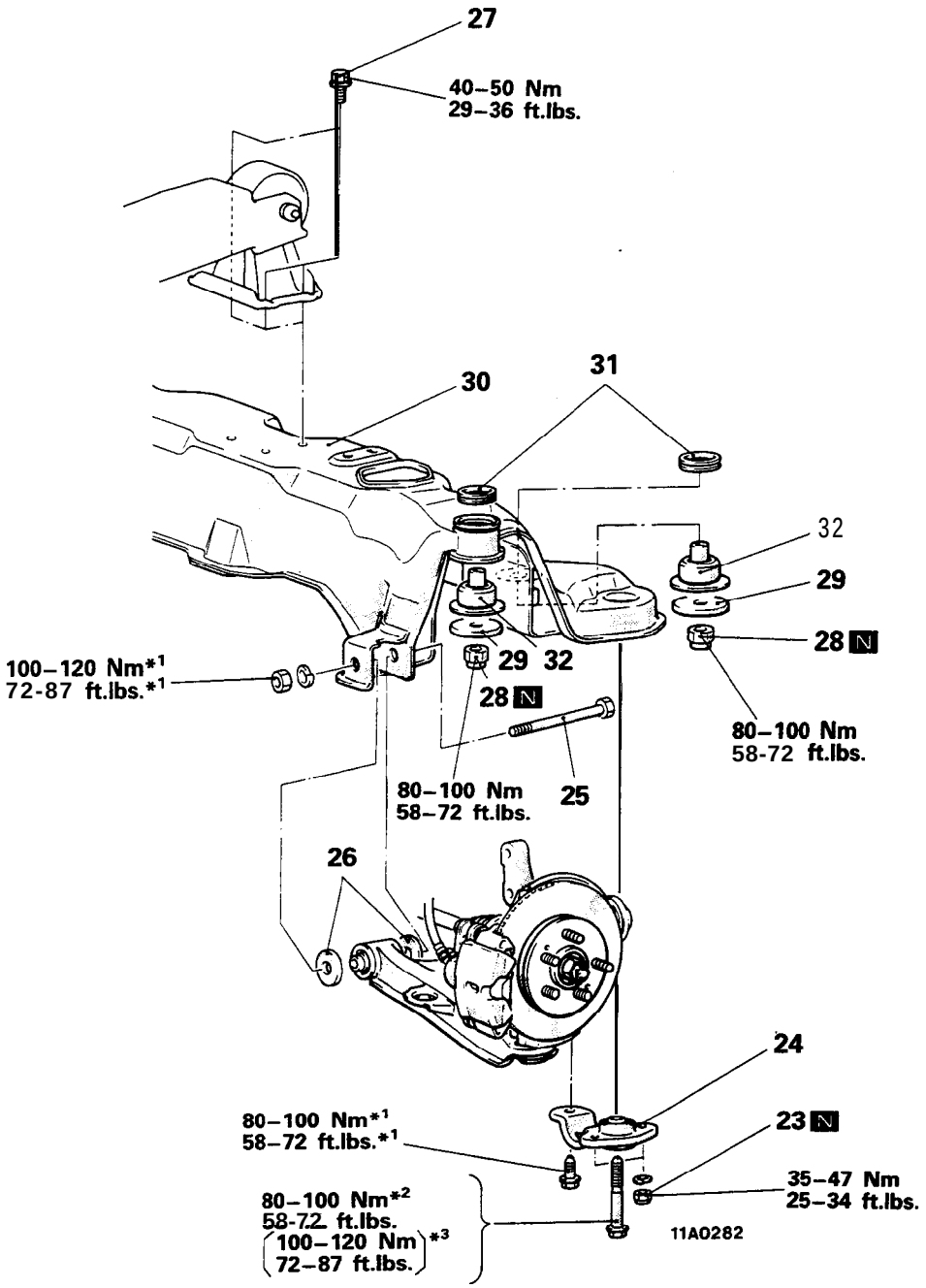


23. Self locking nut
24. Clamp
25. Lower arm mounting bolt
26. Stopper
27. Rear roll stopper bracket mounting bolt
28. Self locking nut
29. Lower plate
30. Crossmember
31. Stopper
32. Bushing

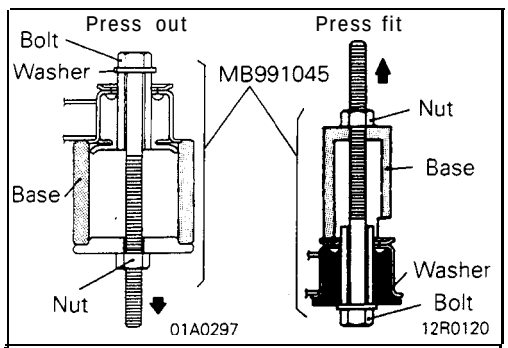
NOTE
*1: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.
*2: Vehicles built up to Dec. 1988
*3: Vehicles built from Jan. 1989

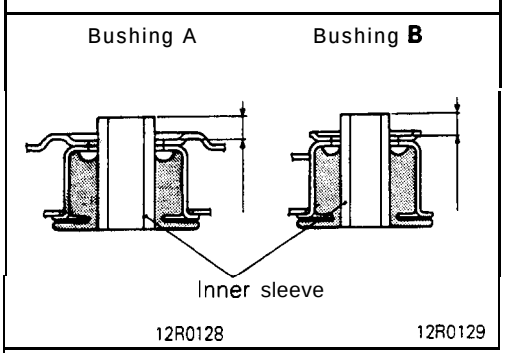
TSB Revision

INSPECTION

M32YCAA1

- Check the crossmember for cracks or deformation.
- Check the bushings for cracks or deterioration.
- Check the centermember for cracks or deformation.





BUSHING REPLACEMENT

M32YDAAa

(1) Use the special tool to remove and press in bushings A and B.

(2) Press in bushings A and B so that the projecting amount of the inner sleeve agrees with the standard value.

Standard value:

Bushing A	**7.2–10.2 mm (.28–.40 in.)**
Bushing B	**6.5-9.5 mm (.26–.37 in.)**

Caution

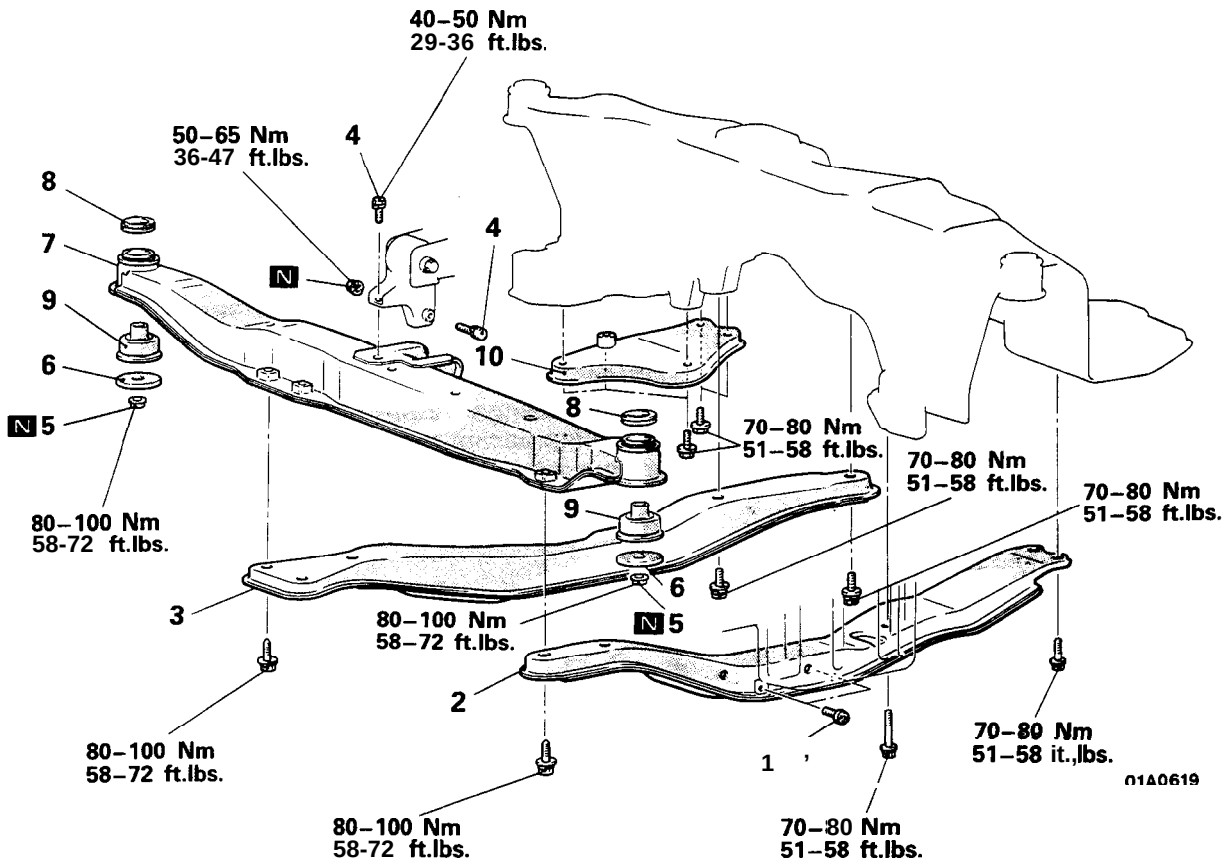
When pressing in, apply a solution of soap and water to the sliding part of the bushings, and then press them in without stopping one after the other.

If there is a pause during the pressing operation, the frictional resistance will prevent installation.

CENTERMEMBER AND CROSSMEMBER <AWD–UP TO 1992 MODELS>

REMOVAL AND INSTALLATION

M32YA-B



Removal steps

1. Cover installation screw
2. Left member
3. Right member
4. Front roll stopper installation bolt
5. No. 1 crossmember installation nut
6. Lower plate
7. No. 1 crossmember
8. Stopper(B)
9. Bushing (B)
10. Gusset

Pre-removal Operation
- Draining of the Power-steering Fluid (Refer to GROUP 37A–Service Adjustment Procedures.)

Post-installation Operation
- Air bleeding of the Power-steering Fluid (Refer to GROUP 37A–Service Adjustment Procedures.)
- Adjustment of the Front Wheel Alignment (Refer to GROUP 33A–Service Adjustment Procedures.)

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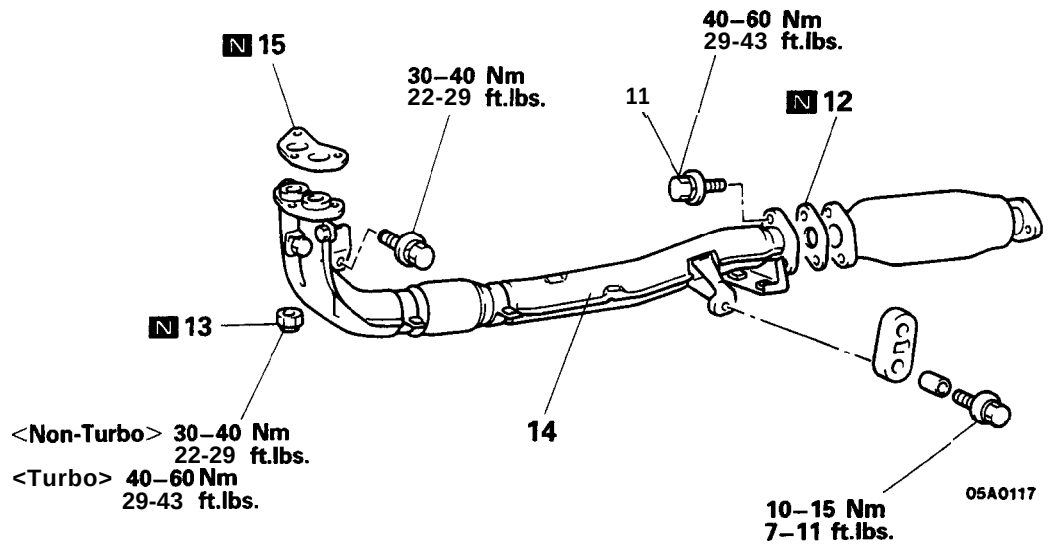
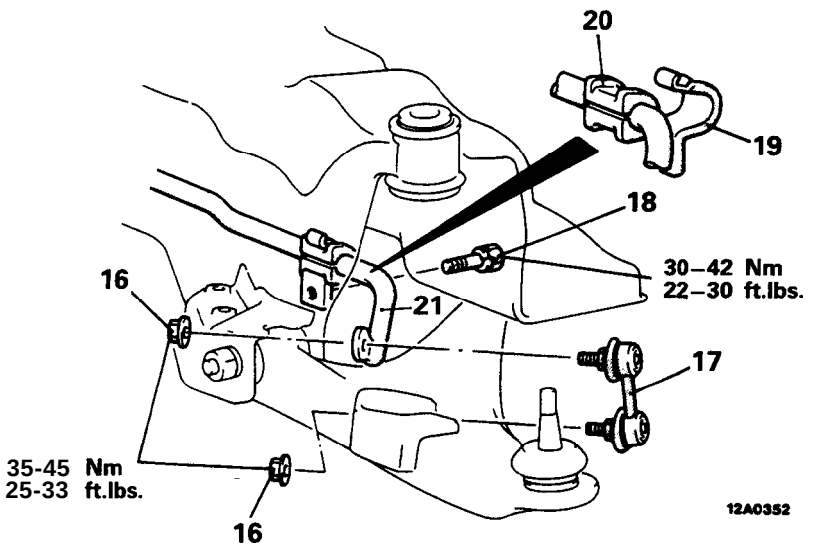
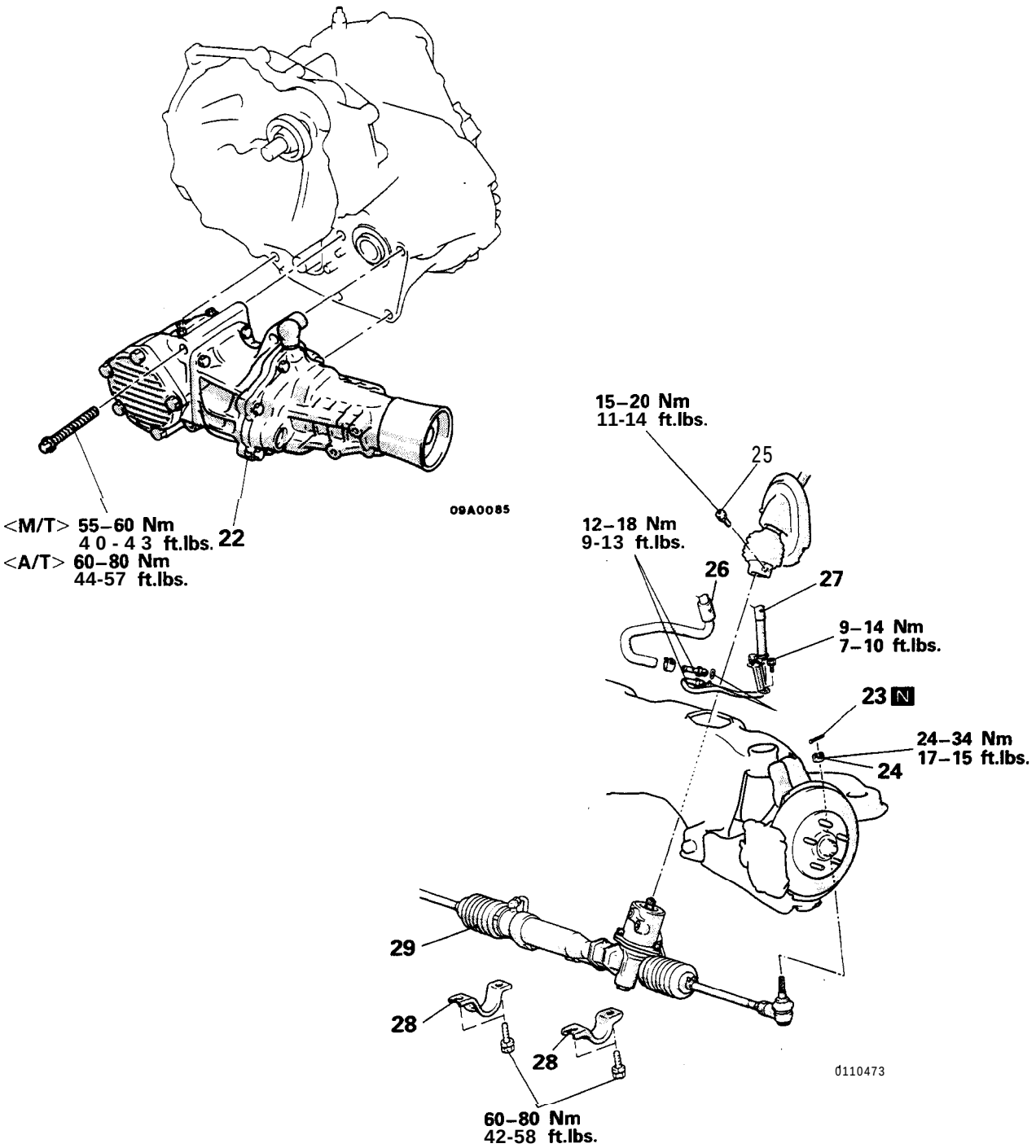


11. Front exhaust pipe rear installation bolt
12. Gasket
13. Self locking nut
14. Front exhaust pipe
15. Gasket

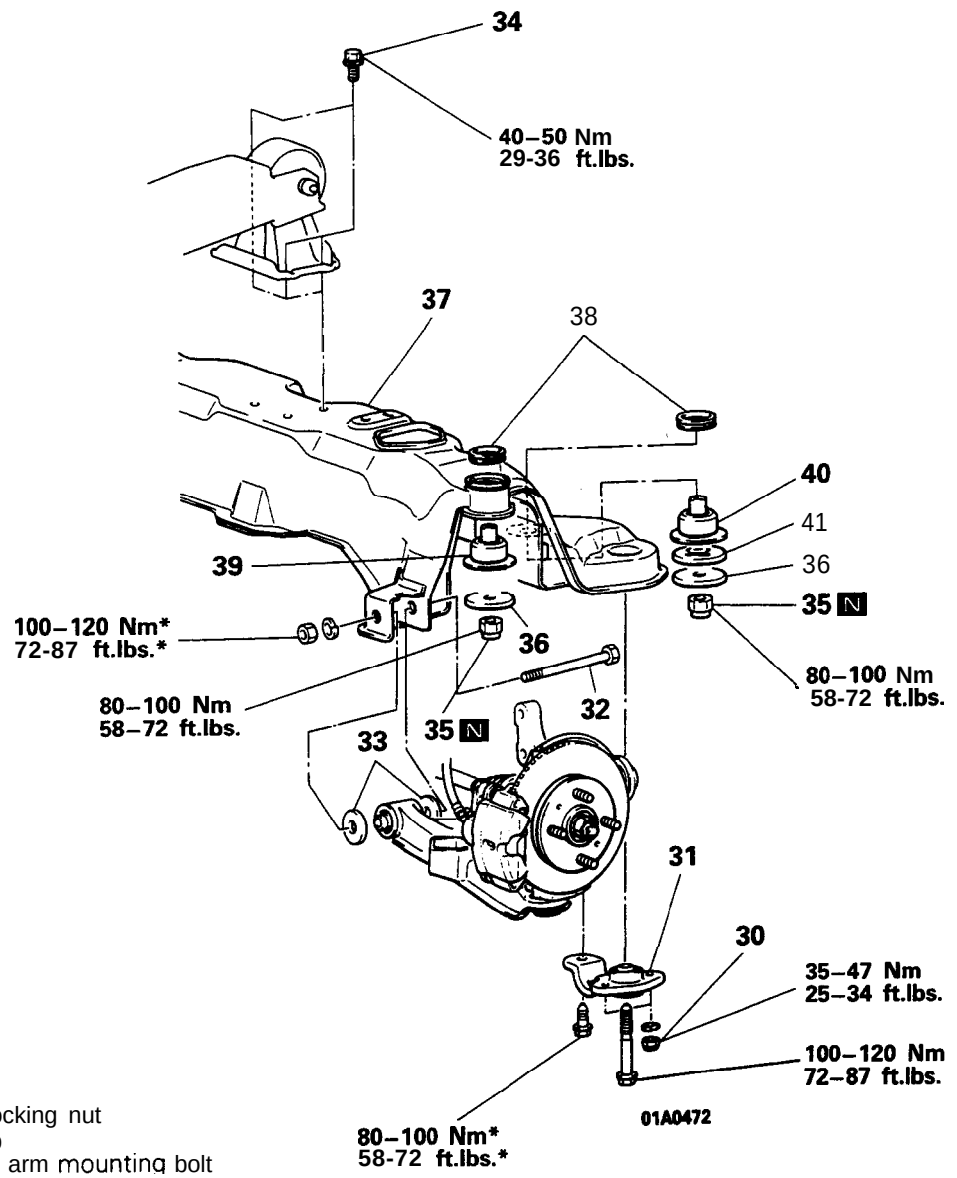


16. Stabilizer link installation nut
    (Refer to GROUP 33A–Stabilizer Bar.)
17. Stabilizer link
18. Stabilizer bar bracket installation bolt
19. Stabilizer bar bracket
    (Refer to GROUP 33A–Stabilizer Bar.)
20. Bushing
21. Stabilizer bar
    (Refer to GROUP 33A–Stabilizer Bar.)



22. Transfer assembly
23. Cotter pin
24. Tie-rod end connection nut
25. Joint assembly connection bolt
26. Return tube connection
27. Pressure hose connection
28. Mounting bracket
29. Steering gear box assembly
(Refer to GROUP 37A–Steering Gear Box.)

TSB Revision



30. Self locking nut
31. Clamp
32. Lower arm mounting bolt
33. Stopper
34. Rear roll stopper bracket mounting bolt
35. Self locking nut
36. Lower plate
37. Crossmember
38. Stopper
39. Spacers
40. Bushing

NOTE
* Indicates parts which should be temporarily tightened. and then fully tightened with the vehicle in the unladen condition.

INSPECTION M32YCAA2

- Check the crossmember for cracks or deformation.
- Check the bushings for cracks or deterioration.
- Check the centermember for cracks or deformation.

BUSHING REPLACEMENT M32YDAB

Refer to P.32-11.

TSB Revision

NOTES

FRONT SUSPENSION

CONTENTS

M33AA--

LOWER ARM 10

SERVICE ADJUSTMENT PROCEDURES 5
- Front Wheel Alignment 5
- Wheel Bearing Adjustment 5

SPECIAL TOOLS 4

SPECIFICATIONS 2
- General Specifications 2
- Service Specifications 3
- Torque Specifications 3

STABILIZER BAR 13

STRUT ASSEMBLY 6

TROUBLESHOOTING 4
- Excessive Vehicle Rolling
- Inclination of Vehicle
- Noise
- Poor Riding
- Steering Wheel is Heavy, Vibrates or Pulls to One Side

SPECIFICATIONS

M33CA-

GENERAL SPECIFICATIONS

<FWD>

Items	M/T		A/T	
Suspension system	McPherson strut with coil spring and compression rod type		McPherson strut with coil spring and compression rod type	
Coil spring				
Wire dia. x O.D. x free length mm (in.)	13.5x173.5x358 (.53x6.83x14.1)	14.0x174.0x376* (.55x6.85x14.8)	13.8x173.8x367 (.54x6.84x14.4)	14.0x174.0x376* (.55x6.85x14.8)
Coil spring identification color	Blue x 2	Pink x 2*	Pink x 1	Pink x 2*
Spring constant N/mm (lbs./in.)	20.0 (112)	20.0 (112)"	20.0 (112)	20.0 (112)*
Shock absorber				
Type	Hydraulic, cylindrical double acting type			
Maximum length mm (in.)	487 (19.17)			
Compressed length mm (in.)	340 (13.39)			
Stroke mm (in.)	147 (5.79)			
Damping force [at 0.3 m/sec. (.984 ft./sec.)]				
Expansion N (lbs.)	1,000 (220)			
Contraction N (lbs.)	300 (66)			

NOTE
* mark: <DOHC>

<AWD–UP TO 1992 MODELS>

Items	MIT	A/T, Turbo
Suspension system	McPherson strut with coil spring and compression rod type	McPherson strut with coil spring and compression rod type
Coil spring		
Wire dia. x O.D. x free length mm (in.)	14.2 x 174.2 x 352 (.56 x 6.86 x 13.9)	14.3 x 174.3 x 359.5 (.56 x 6.86 x 14.2)
Coil spring identification color	Orange x 1	Orange x 2
Spring constant N/mm (lbs./in.)	24 (134)	24 (134)
Shock absorber		
Type	Hydraulic, cylindrical double acting type	
Maximum length mm (in.)	501 (19.72)	
Compressed length mm (in.)	356 (14.01)	
Stroke mm (in.)	145 (5.71)	
Damping force [at 0.3 m/sec. (.984 ft./sec.)]		
Expansion N (lbs.)	1,400 (309)	
Contraction N (lbs.)	450 (99)	

SERVICE SPECIFICATIONS

M33CB-

Items		FWD	AWD
Standard value			
Camber		22' ± 30'	31' ± 30'
Caster		2° ± 30'	1°56' ± 30'
Toe-in	mm (in.)	0 ± 3 (0 ± .12)	0 ± 3 (0 ± .12)
Protruding length of stabilizer bar mounting bolt	mm (in.)	16-18 (.63–.70)*	–
Lower arm ball joint starting torque	N m (in.lbs.)	3–10 (26–87)	3–10 (26-87)
Stabilizer link ball joint starting torque	N m (in.lbs.)	1.7-3.2 (15-28)	1.7-3.2 (15–28)

NOTE
*: <1989 models>

TORQUE SPECIFICATIONS

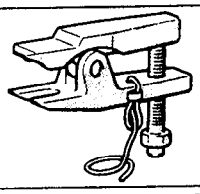
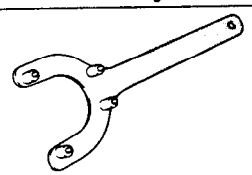
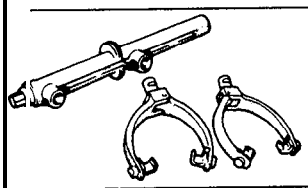
M33CC-

Items	Nm	ft.lbs.
Strut assembly to body	40–50	29-36
Knuckle to ball joint	60–72	43-52
Knuckle to strut assembly	90–105	65-76
Strut top end nut	60–70	43-51
Stabilizer bar bracket to crossmember	30–42	22–30
Stabilizer link	35-45	25-33
Lower arm clamp to crossmember (nut)	35-47	25-37
Lower arm clamp to crossmember (bolt)	80–100	58-72
Lower arm to crossmember	100–120	72-87
Stay to crossmember	70–80	51–81
Front exhaust pipe to exhaust manifold	40–50	29-36
Front exhaust pipe clamp	30–40	22-29
Stay to crossmember	70–80	51–58
Crossmember to body	80–100*1 [100–120]*2	58–72*1 [72–87]*2
Centermember installation bolts (rear)	80–100	58-72
Gusset to centermember	70–80	51–58
Left member installation bolt (front)	80–100	58-72
Left member installation bolt (rear)	70–80	51–58
Transfer assembly		
M/T	55–60	40–43
A/T	60–80	44-57

NOTE
*1: Bolt embossed ⑦ on bolt head
*2: Bolt embossed ⑩ on bolt head

SPECIAL TOOLS

M33DA-

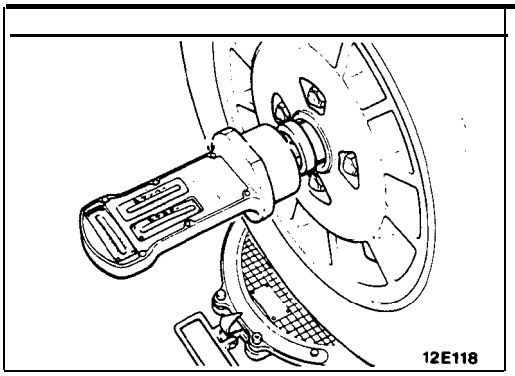
Tool	Number	Name	Use
	MB991113-01 OPTIONAL: AVAILABLE FROM O.T.C.	Steering linkage puller	Removal of the lower arm ball joint and tie rod
	MB991176	Spring seat holder	Disassembly/assembly of the strut assembly
	MB991237 MB991238	Spring compressor body Arm set	Compression of the front coil spring
	MB990800-01	Ball joint remover and installer	Installation of the dust cover

TROUBLESHOOTING

M33EAAC

Symptom	Probable cause	Remedy
Steering wheel is heavy, vibrates or pulls to one side	Suspension malfunction Ball joint Coil spring Wheel alignment	Adjust or replace
	Unbalanced or worn tires	Adjust or replace
Excessive vehicle rolling	Broken or deteriorated stabilizer Shock absorber malfunciton	Replace
Poor riding	Improper tire inflation pressure	Adjust
	Broken or deteriorated coil spring Shock absorber malfunction	Replace
Inclination of vehicle	Broken or deteriorated coil spring	Replace
Noise	Lack of lubrication	Lubricate
	Looseness and wear of each part	Retighten or replace
	Broken coil spring Shock absorber malfunction	Replace

TSB Revision



SERVICE ADJUSTMENT PROCEDURES

FRONT WHEEL ALIGNMENT M33FBAQ

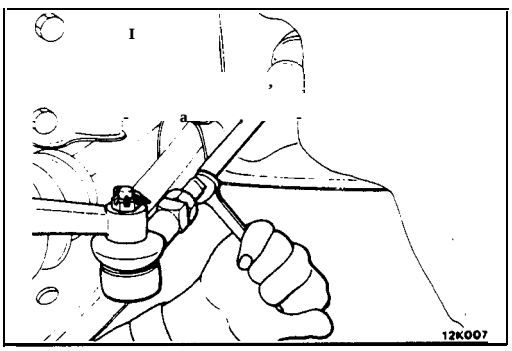
NOTE
The front suspension assembly must be free of worn, loose or damaged parts prior to measurement of front wheel alignments.
Measure wheel alignment by using the tool.

CAMBER AND CASTER

Standard value:	<FWD>	<AWD>
Camber	**22' ± 30'**	**31' ± 30**
Caster	**2° ± 30**	**1°56' ± 30**

Camber and caster are pre-set at the factory and cannot be adjusted.

NOTE
If camber and caster are not within specifications, replace bent or damaged parts.



TOE-IN

Standard value: 0 ± 3 mm (Of .12 in.)

1. 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.
3. For each half turn of the left and right tie rods, the toe-in will be adjusted by 6 mm (.24 in.).
4. After making the adjustments, use a turning radius gauge to confirm that the steering wheel turning angle is within the standard value range. (Refer to GROUP 37A–Service Adjustment Procedures.)

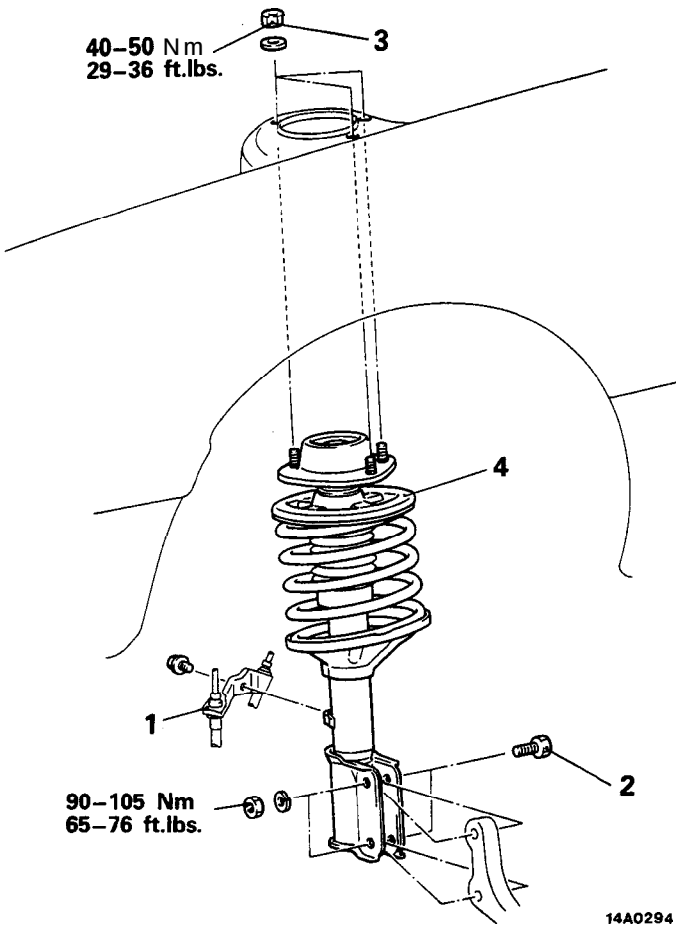
WHEEL BEARING ADJUSTMENT M33FCAA

Bearing preload is pre-set to the specified value by design and therefore can not be adjusted.

STRUT ASSEMBLY

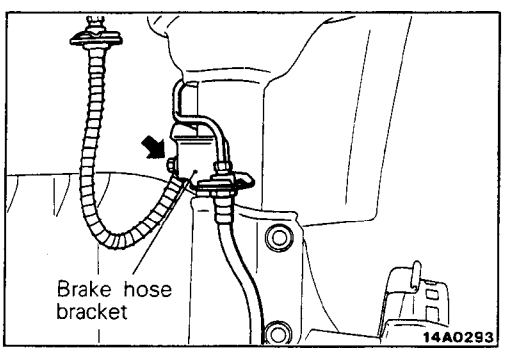
M33LA--

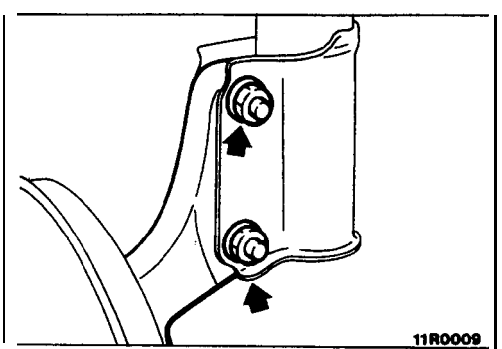
REMOVAL AND INSTALLATION



Removal steps

◆◆ 1. Brake hose and tube bracket
◆◆ 2. Strut lower mounting bolt
3. Strut upper mounting nut
◆◆ 4. Strut assembly





SERVICE POINTS OF REMOVAL

M33LBAF

1. REMOVAL OF BRAKE HOSE AND TUBE BRACKET

Do not pry the brake hose and tube clamp away when removing it.

2. REMOVAL OF STRUT LOWER MOUNTING BOLTS

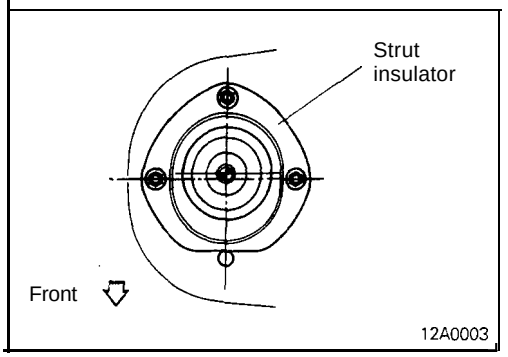
After the union between the strut and the knucke has been removed, jack up the lower arm, attaching the brake hose, tube and drive shaft to the knuckle with wire so that they will not be pulled on.

INSPECTION

M33LCAB

- Check for oil leaks from the strut assembly.
- Check the strut assembly shock absorber for damage or deformation.

TSB Revision



SERVICE POINTS OF INSTALLATION M33LDAG

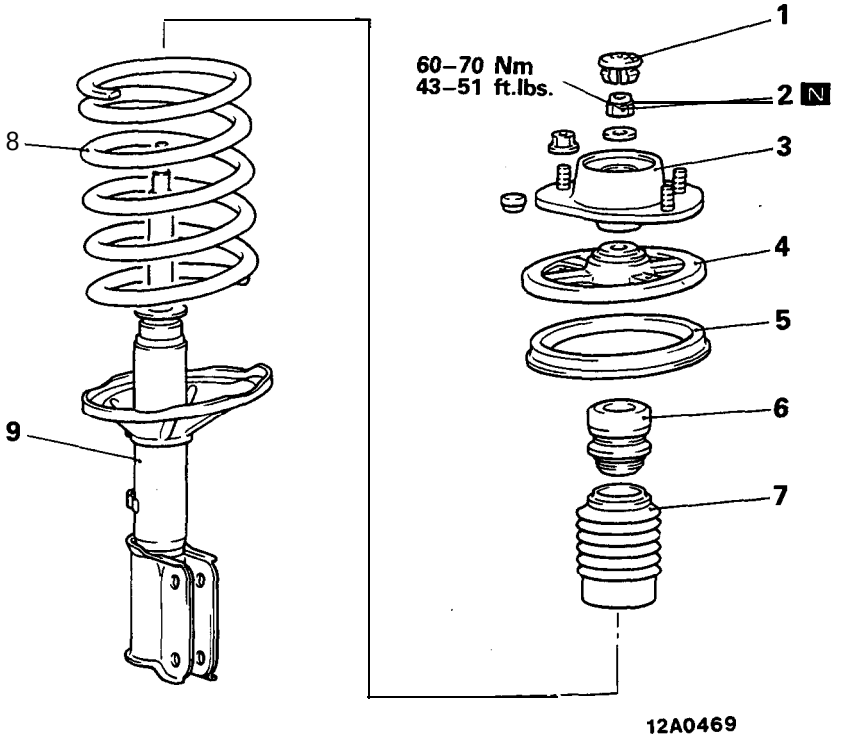
4. INSTALLATION OF STRUT ASSEMBLY

Install the strut assembly so that the strut insulator faces in the direction indicated in the illustration.

NOTE

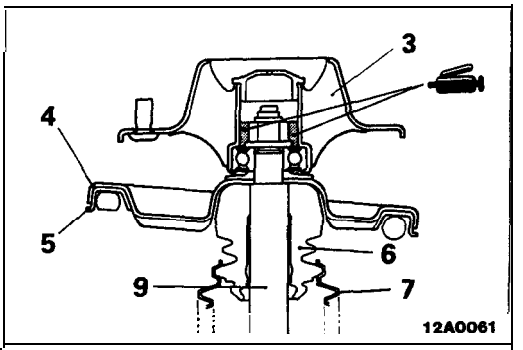
Be sure to confirm that the direction is correct, because there will be a deviation of the wheel alignment if it is not.

DISASSEMBLY AND REASSEMBLY M33LE--



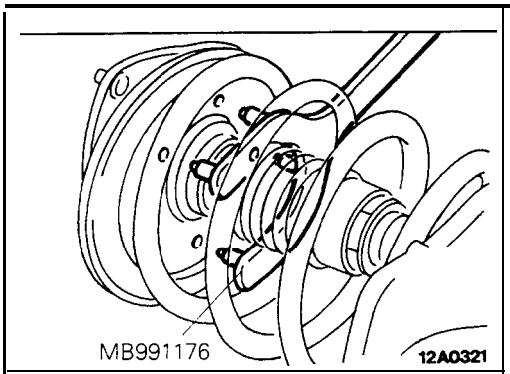
Disassembly steps

- 1. Dust cover
- ◆◆ ● + 2. Self-locking nut
- 3. Strut insulator
- ◆◆ 4. Spring seat, upper
- 5. Spring pad, upper
- ● + 6. Bump rubber
- ● + 7. Dust cover
- 8. Coil spring
- ◆◆ 9. Strut assembly



Caution
When applying the grease, take care that grease does not adhere to the insulator's rubber part.

TSB Revision

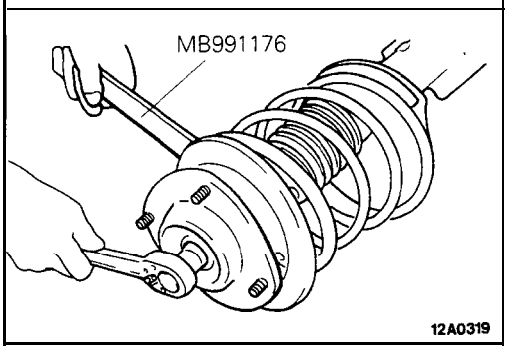


SERVICE POINTS OF DISASSEMBLY M33LFAI

2. REMOVAL OF SELF-LOCKING NUT

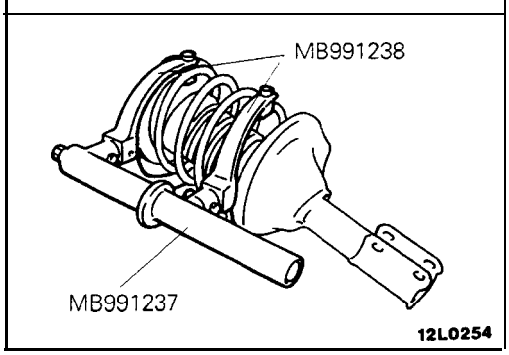
(1) Holding the spring upper seat with the special tool, loosen the self-locking nut.

Caution
The self-locking nut should be loosened only, not removed.



(2) Using the special tools, compress the coil spring, and then remove the self-locking nut.

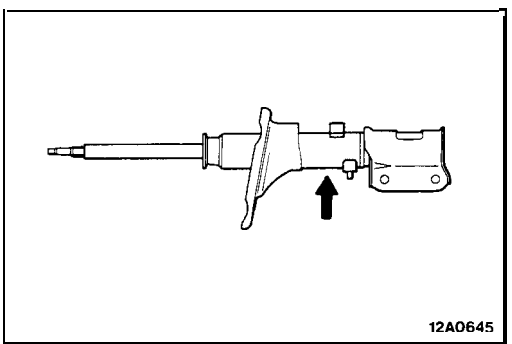
NOTE
Install the special tools evenly, and so that the maximum length will be attained within the installation range.



9. REMOVAL OF STRUT ASSEMBLY

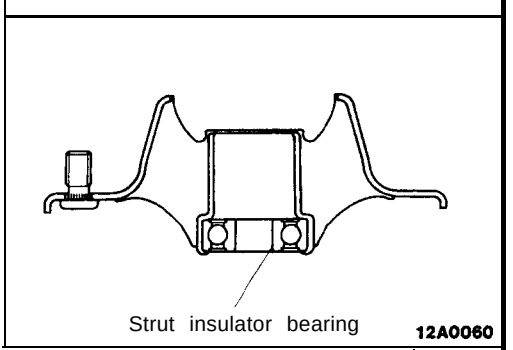
If it is to be discarded, place it horizontally with the piston rod sticking out and drill a hole approximately 3 mm (.12 in.) in diameter in the position shown in the figure to release the gas.

Caution
The gas is non-toxic but wear protective glasses because there is danger that dust from the drill, etc. may fly out along with the gas.

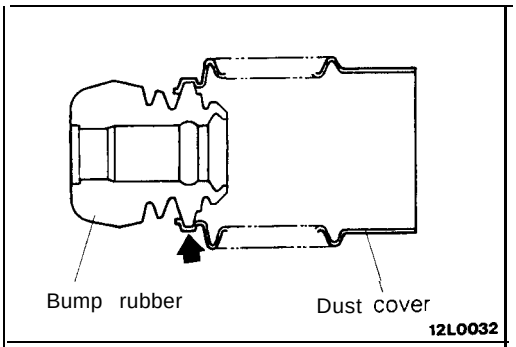


INSPECTION M33LGAE

- Check the strut insulator bearing for wear or rust.
- Check the rubber parts for damage or deterioration.
- Check the spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.



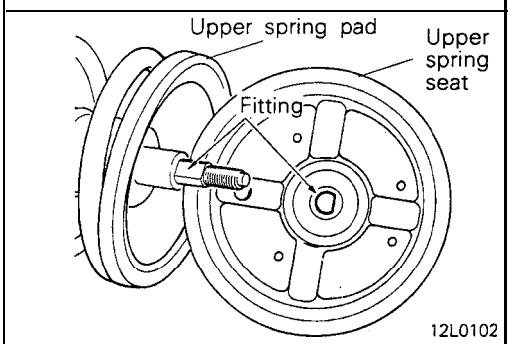
TSB Revision



SERVICE POINTS OF REASSEMBLY M33LHAL

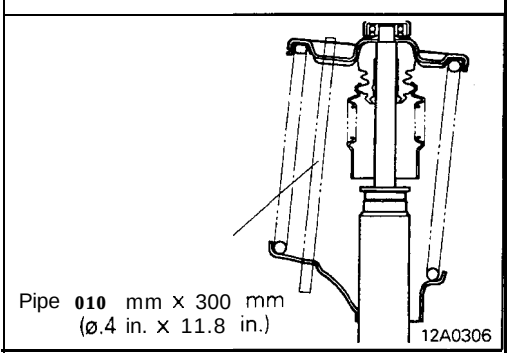
7. INSTALLATION OF DUST COVER/G. BUMP RUBBER

Join the dust cover and bump rubber.



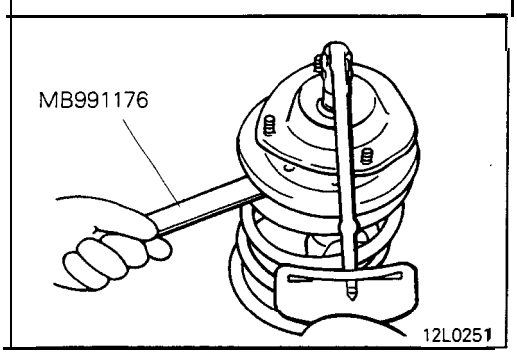
4. INSTALLATION OF SPRING UPPER SEAT ASSEMBLY

(1) Assemble the spring upper seat to the piston rod, fitting the notch in the rod to the shaped hole in spring seat.



(2) Line up the holes in the strut assembly spring lower seat with the hole in the spring upper seat.

NOTE
The job is easily accomplished with a pipe [ø10 mm x 300 mm (ø.4 in. x 11.8 in.)].



2. INSTALLATON OF SELF-LOCKING NUT

(1) With the coil spring held compressed by the special tools (MB991237 and MB991238), temporarily tighten the self-locking nut.

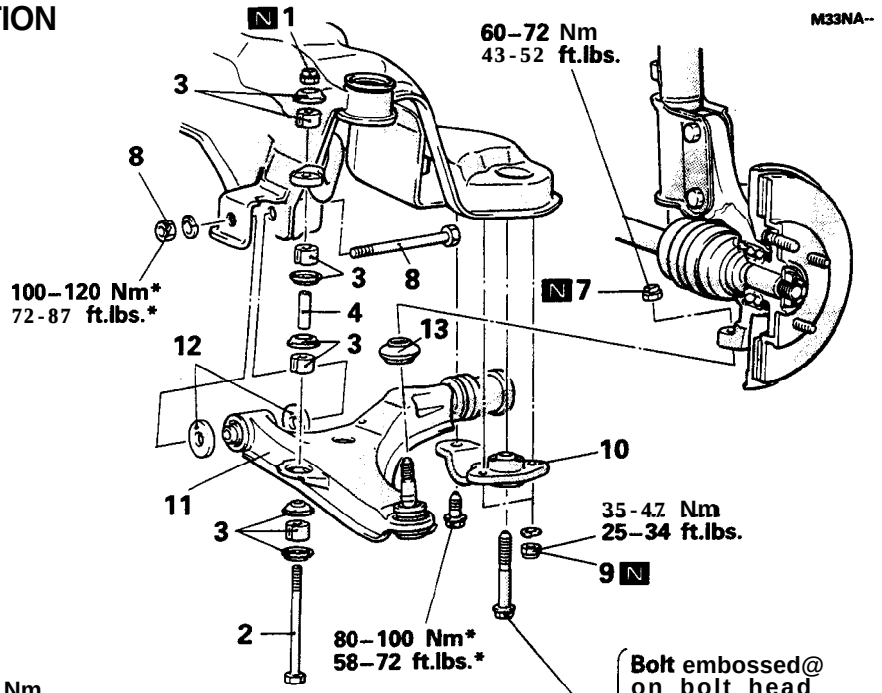
(2) Correctly align both ends of the coil spring with the grooves in the spring seat, and then loosen the special tools (MB991237 and MB991238).

(3) Using the special tool, tighten the strut insulator at the specified torque.

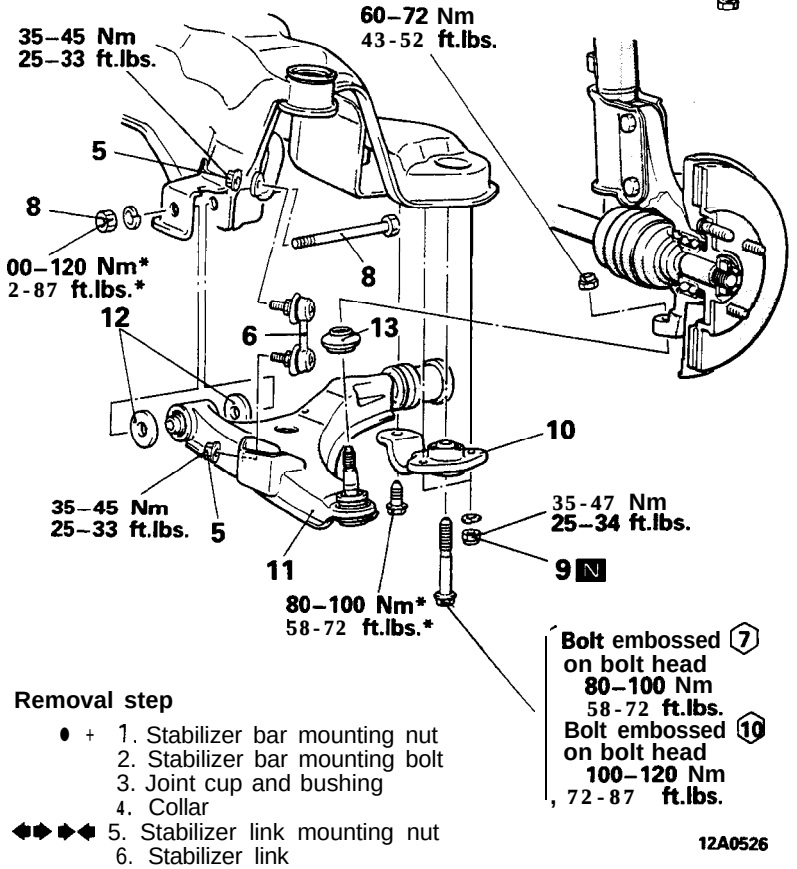
LOWER ARM

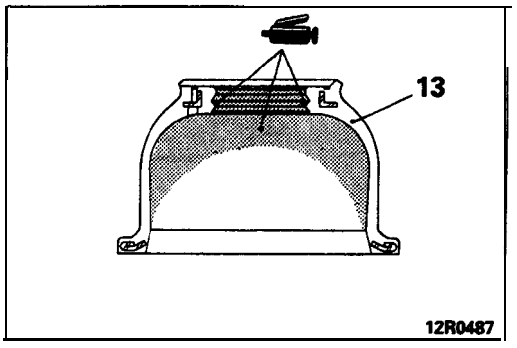
REMOVAL AND INSTALLATION

<1989 models>



<From 1990 models>





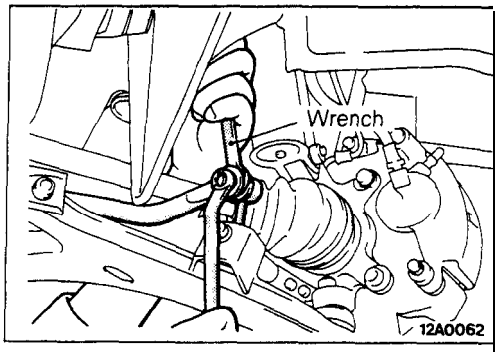
Removal step

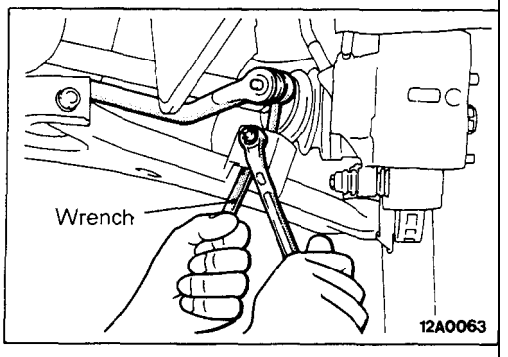
- ● + 1. Stabilizer bar mounting nut
- 2. Stabilizer bar mounting bolt
- 3. Joint cup and bushing
- 4. Collar
- ◆■▶◆ 5. Stabilizer link mounting nut
- 6. Stabilizer link
- ● ☒ 7. Self-locking nut
- 8. Lower arm mounting nut and bolt
- 9. Self-locking nut
- 10. Clamp
- 11. Lower arm
- 12. Stopper
- 13. Ball joint dust cover

NOTE

● : Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

TSB Revision

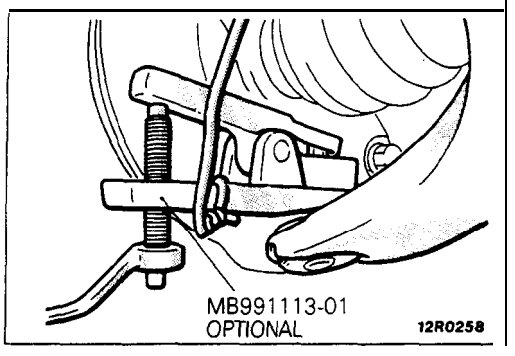




SERVICE POINTS OF REMOVAL M33NBAL

5. REMOVAL OF STABILIZER LINK MOUNTING NUTS

Using a wrench or similar tool to secure the ball studs at both ends of the stabilizer link, remove the mounting nuts.



7. REMOVAL OF SELF-LOCKING NUT

Using the special tool, disconnect the lower arm ball joint from the knuckle.

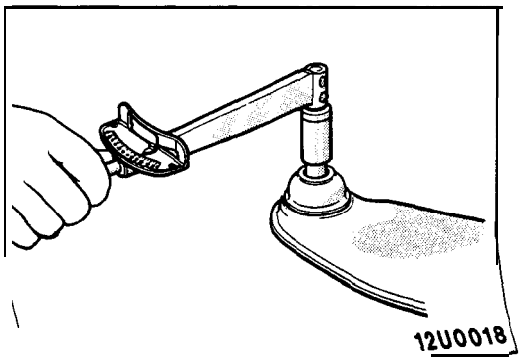
Caution

1. Be sure to tie the cord of the special tool to the nearby part.

2. Loosen the nut but do not remove it.

INSPECTION M33NCAE

- Check the bushing for wear and deterioration.
- Check the lower arm for bend or breakage.
- Check the clamp for deterioration or damage.
- Check the ball joint dust cover for cracks.
- Check all bolts for condition and straightness.



CHECKING OF BALL JOINT FOR STARTING TORQUE

(1) If a crack is noted in the dust cover, replace it, adding grease.

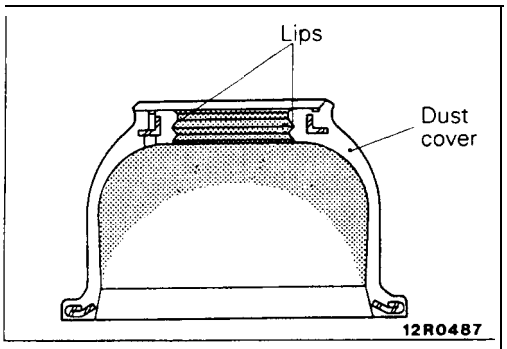
(2) Deflect from side to side the ball joint stud several times.

(3) Mount two nuts on the ball joint, and then measure the ball joint starting torque.

Standard value: 3–10 Nm (26-87 in.lbs.)

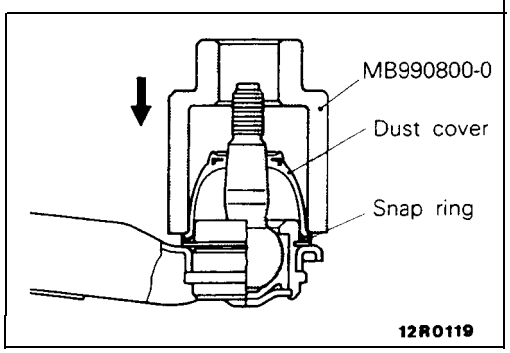
(4) If the starting torque exceeds the upper limit of standard value, replace the lower arm assembly.

(5) Even if the starting torque is below the lower limit of the standard value, the ball joint may be reused unless it has drag and excessive play.



BALL JOINT DUST COVER REPLACEMENT M33NEAF

(1) Remove the dust cover.
(2) Apply multipurpose grease to the lip and inside of the dust cover.

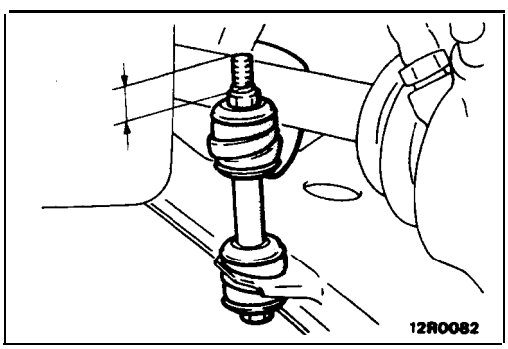


(3) Drive in the dust cover with special tool until it is fully seated.

SERVICE POINTS OF INSTALLATION M33NFAO

5. INSTALLATION OF STABILIZER LINK MOUNTING NUTS

Using a wrench or similar tool to secure the ball studs at both ends of the stabilizer link, tighten the mounting nuts.



1. INSTALLATION OF STABILIZER BAR MOUNTING NUT

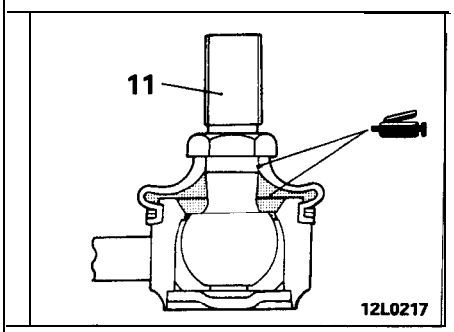
Tighten the nut on the stabilizer bar bolt to the specified distance.

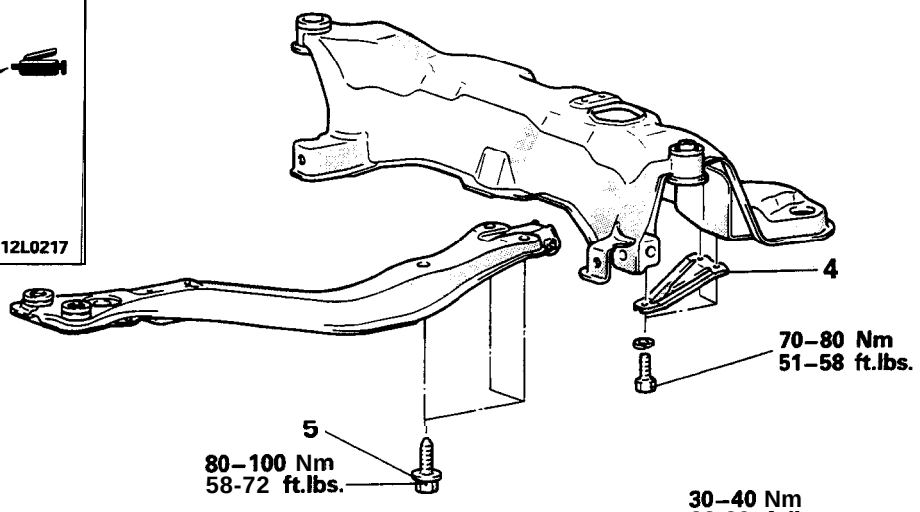
Protruding length of stabilizer bar mounting bolt
Standard value: 16-18 mm **(.63–.70** in.)

STABILIZER BAR <FWD>

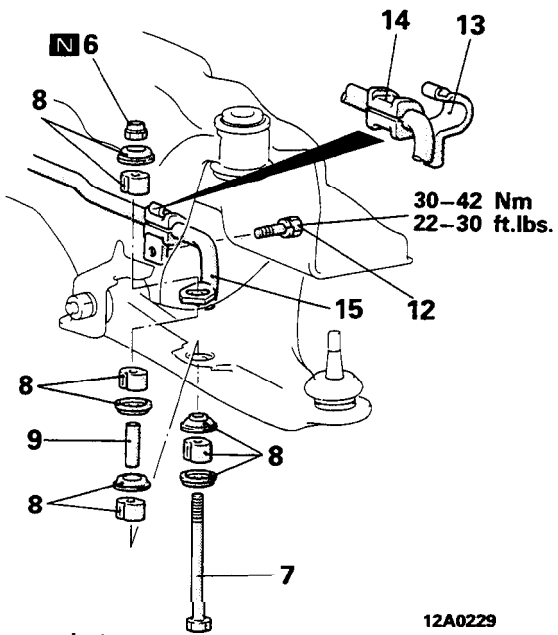
REMOVAL AND INSTALLAT ON

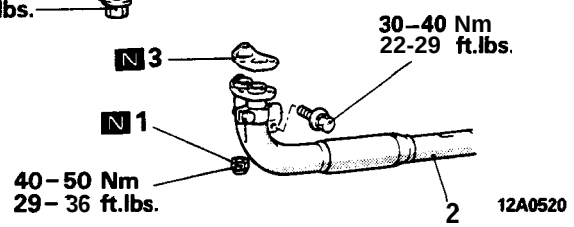
M33TA-A





<1989 models>





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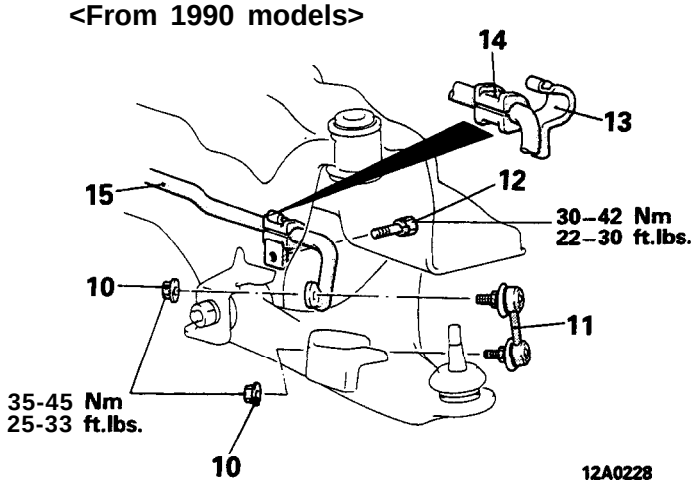
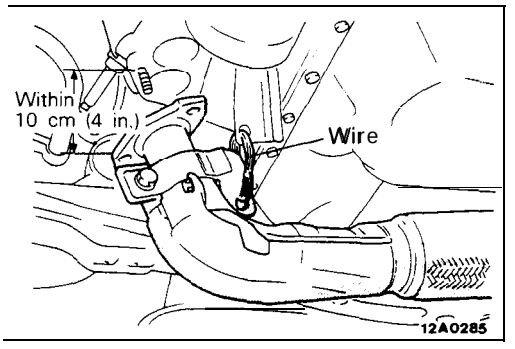


Removal steps

1. Self-locking nut
◆◆ 2. Front exhaust pipe
3. Gasket
4. Stay
5. Centermember rear installation bolt
◆◆ 6. Stabilizer bar mounting nut
7. Stabilizer bar mounting bolt
8. Joint cup and bushing
9. Collar
◆◆ ● +10. Stabilizer link mounting nut
11. Stabilizer link
12. Stabilizer bar bracket mounting bolt
◆◆ 13. Stabilizer bar bracket
14. Bushing
◆◆ 15. Stabilizer bar

TSB Revision

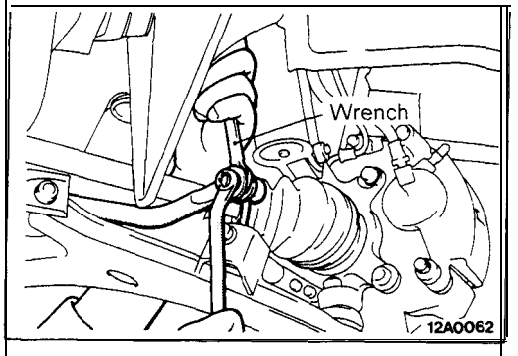


SERVICE POINTS OF REMOVAL M33TBAFa

2. REMOVAL OF FRONT EXHAUST PIPE

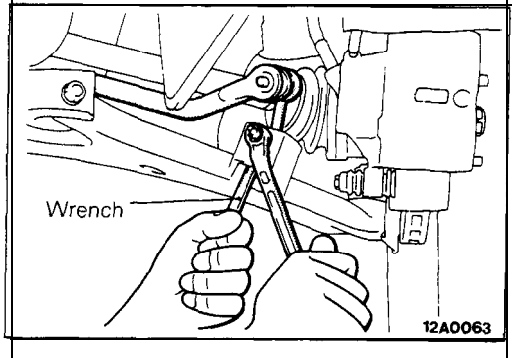
After disconnection of the front exhaust pipe assembly and the exhaust manifold, use wire, etc. to hang the front exhaust pipe down.

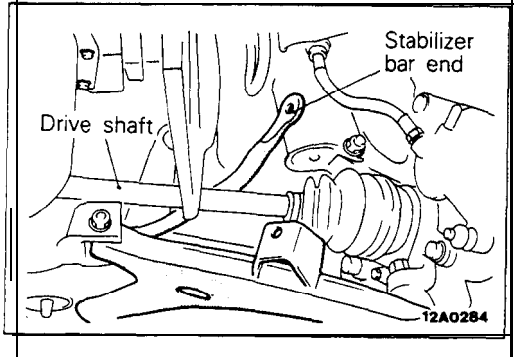
Caution
There is danger of damage to the interior if the flexible joint is bent very much. Do not bend it more than shown in the figure.



10. REMOVAL OF STABILIZER LINK MOUNTING NUT

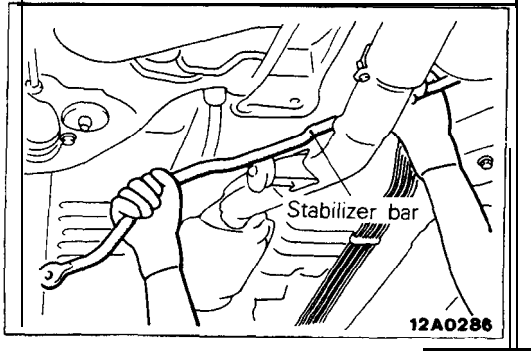
Using a wrench or similar tool to secure the ball studs at both ends of the stabilizer link, remove the mounting nuts.





15. REMOVAL OF STABILIZER BAR

(1) Pull out both ends of the stabilizer bar to the rear of the drive shaft.



(2) Move the right stabilizer bar until the end of the stabilizer bar clears the lower arm.
(3) **With** the end that has cleared the lower arm, pull out the stabilizer bar diagonally.

INSPECTION

M33TCAF

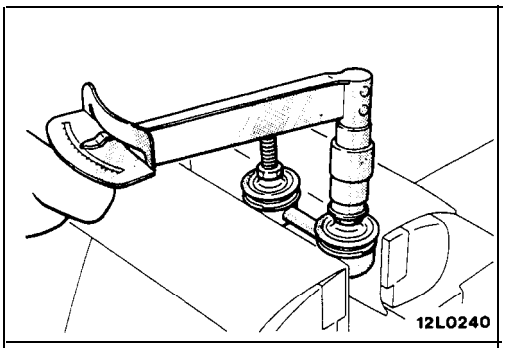
- Check the bushing for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check the stabilizer link ball joint dust cover for cracks.
- Check all bolts for condition and straightness.

CHECKING OF STABILIZER LINK BALL JOINT FOR STARTING TORQUE

(1) If a crack is noted in the dust cover, replace it, adding grease.
(2) Deflect side to side the stabilizer link ball joint stud several times.
(3) Mount two nuts on the ball joint, and then measure the ball joint starting torque.

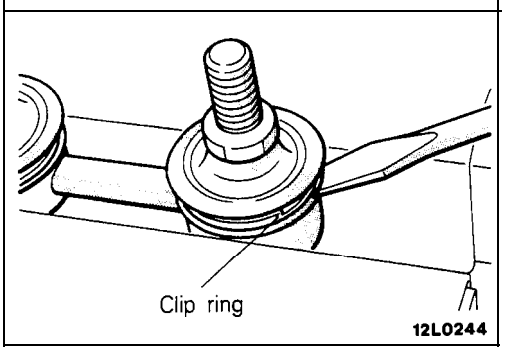
Standard value: 1.7-3.2 Nm (15-28 in.lbs.)

(4) If the starting torque exceeds the upper limit of standard value, replace the stabilizer link.
(5) Even if the starting torque is below the lower limit of the standard value, the ball joint may be reused unless it has drag and excessive play.

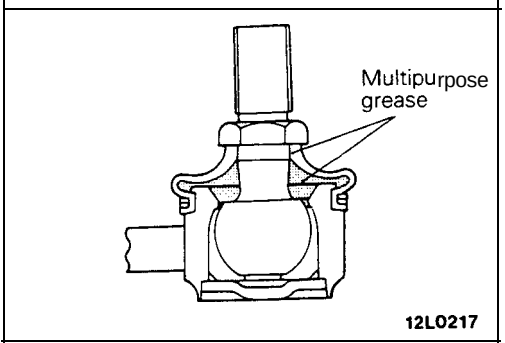


BALL JOINT DUST COVER REPLACEMENT-

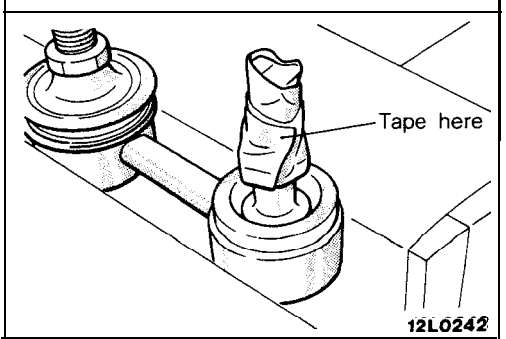
(1) Remove the clip ring and the dust cover.

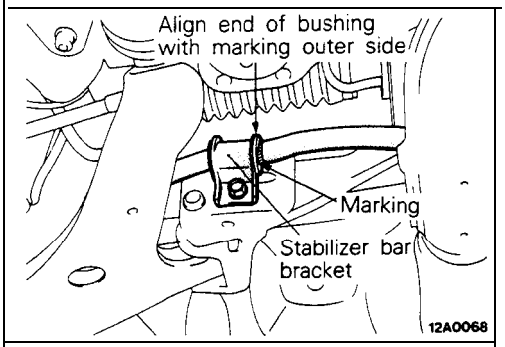


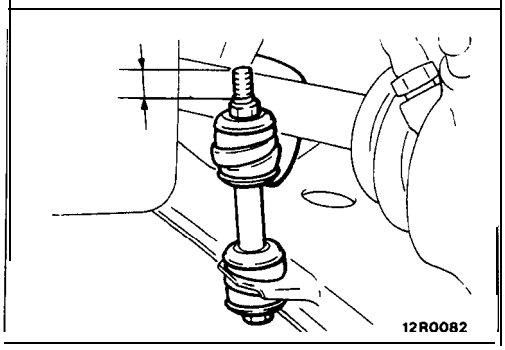
(2) Apply multipurpose grease to the lip and inside of the dust cover.



(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 link.







SERVICE POINTS OF INSTALLATION M33TDAK

13. INSTALLATION OF STABILIZER BAR BRACKET

(1) Temporarily tighten the stabilizer bar bracket.
(2) Align the bushing end with the marked part of the stabilizer bar, and then fully tighten the stabilizer bar bracket.

10. INSTALLATION OF STABILIZER LINK MOUNTING NUT

Using a wrench or similar tool to secure the ball studs at both ends of the stabilizer link, tighten the mounting nuts.

6. INSTALLATION OF STABILIZER BAR MOUNTING NUT

Tighten the nut on the stabilizer bar bolt to the specified distance.

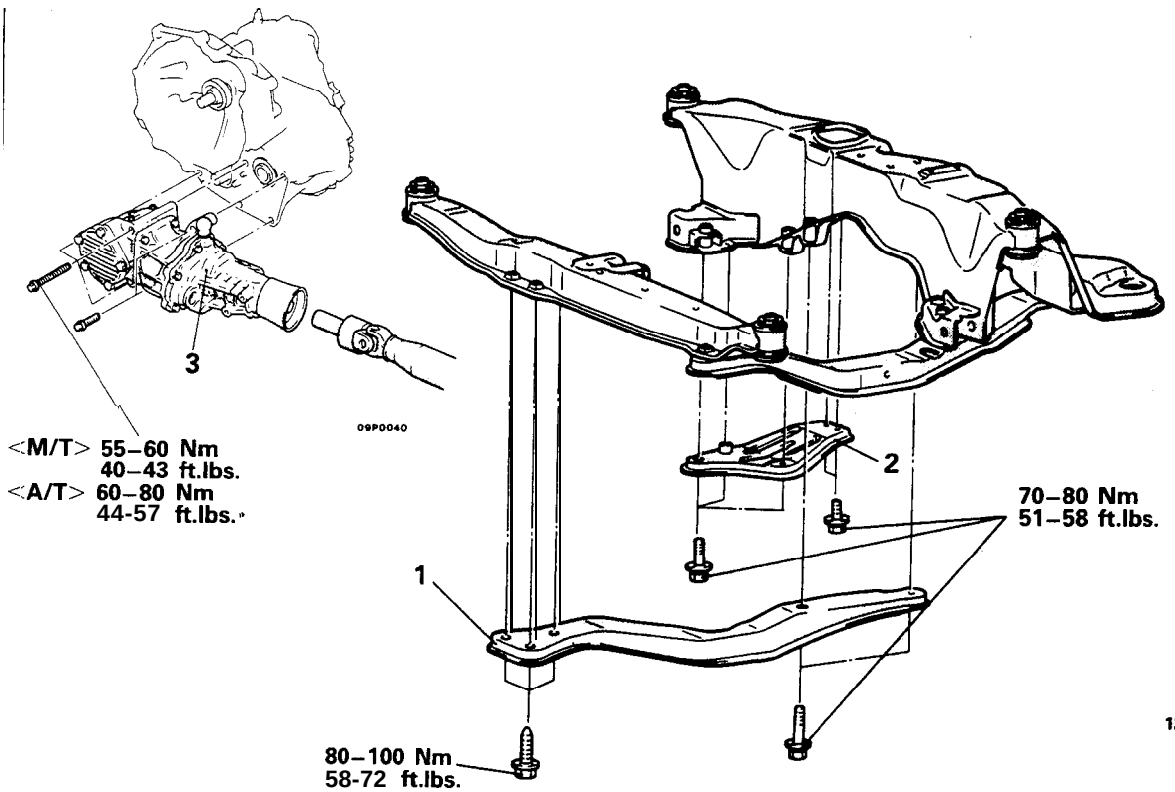
Protruding length of stabilizer bar mounting bolt
Standard value: 16-18 mm (.63–.70 in.)

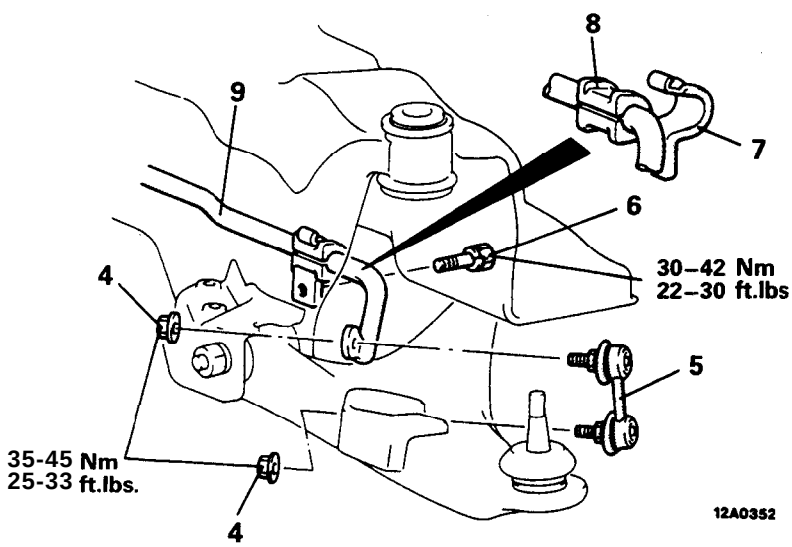
STABILIZER BAR <AWD–UP TO 1992 MODELS>

M33TA-B

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
@Removal of Front Exhaust Pipe
(Refer to GROUP 15–Exhaust Pipe and Main Muffler.)





Removal steps

1. Left member
2. Gusset
3. Transfer
4. Stabilizer link mounting nut (Refer to P.33A-14, 16.)
5. Stabilizer link
6. Stabilizer bar bracket installation bolt
7. Stabilizer bar bracket (Refer to P.33A-16.)
8. Bushing

◀■▶ 9. Stabilizer bar

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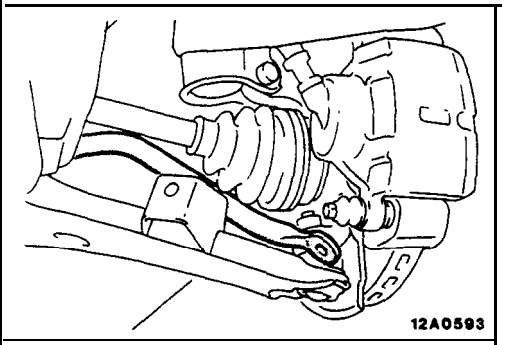

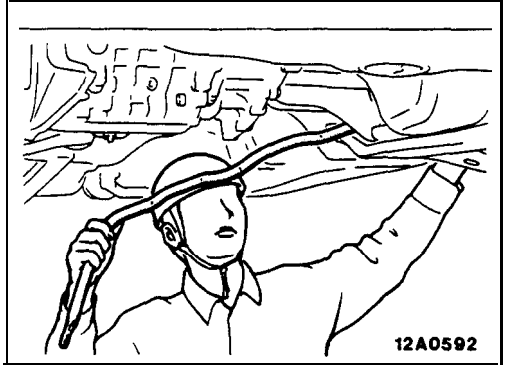

SERVICE POINTS OF REMOVAL M33TBAH

9. REMOVAL OF STABILIZER BAR

(1) Disconnect the coupling of the knuckle and lower arm at the right side.
(2) Pull out the left side stabilizer bar edge, pulling it out between the drive shaft and lower arm.

(3) Pull out the right side stabilizer bar edge, pulling it out from below the lower arm.

INSPECTION M33TCAI

Refer to P.33A-15.

BALL JOINT DUST COVER REPLACEMENT M33TEAE

Refer to P.33A-15.

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ACTIVE-ELECTRONIC CONTROL SUSPENSION

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AIR TUBE **133**

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STRUT ASSEMBLY **97**

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TROUBLESHOOTING **10**

SPECIFICATIONS

M33CA--

GENERAL SPECIFICATIONS

Items	Front suspension	Rear suspension
Suspension system	McPherson strut with coil spring and compression rod type	3-link, torsion axle with coil spring type
Coil spring		
Front	<Up to 1990 models>	<Up to 1990 models>
Wire dia. x upper end O.D. x lower end O.D. x free length mm (in.) [Coil spring identification color]	L.H. side 13.0 x 173 x 193 x 391 (.51x 6.81 x 7.59 x 15.39) [Light green x1]	L.H. side 9.5 x 119.5 x 119.5 x 428 (.37x 4.70 x 4.70 x 16.85) [Light green x1]
	R.H. side 13.0 x 173 x 193 x 379 (.51 x 6.81x 7.59 x 14.92) [Blue x 2]	R.H. side 9.5 x 119.5 x 119.5 x 412 (.51x 4.70 x 4.70 x 16.22) [Light green x 21
Rear	<From 1990.5 models>	<From 1990.5 models>
Wire dia. x O.D. x free length mm (in.) [Coil spring identification color]	L.H. side 13.5 x 173.5 x 192.5 x 317 (.53x 6.83 x 7.58 x 12.48) [Light green x 11	L.H. side 10.1 x 122.1 x 381.5 (.40x 4.81 x 15.02) [Light green x 21
	R.H. side 13.5 x 173.5 x 192.5 x 309 (.53x 6.83 x 7.58 x 12.17) [Blue x2]	R.H. side 10.1x 122.1 x 370 (.40x 4.81 x 14.57) [Light green x1]
Spring constant N/mm (lbs./in.)	12.9 (72.24) <Up to 1990 models> 19.4 (108.63) <From 1990.5 models>	9.4 (52.64) <Up to 1990 models> 13.5 (75.60) <From 1990.5 models>
Shock absorber		
Type	Hydraulic, cylindrical double acting type	Hydraulic, cylindrical double acting type
	<Up to 1990 models> <From 1990.5 models>	<up to 1990 models> <From 1990.5 models>
Max. length mm (in.)	489.5 (19.27) 489.5 (19.27)	491 (19.33) 491 (19.33)
Min. length mm (in.)	339.5 (13.37) 339.5 (13.37)	341 (13.43) 341 (13.43)
Stroke mm (in.)	150 (5.91) 150 (5.91)	150 (5.91) 150 (5.91)
Damping force [at 0.3 m/sec. (.9 ft./sec.)]		
Expansion N (lbs.)		
HARD	1,650 (364) 2,250 (496)	1,450 (320) 1,700 (375)
MEDIUM	1,100 (243) 1,100 (243)	850 (187) 850 (187)
SOFT	300 (66) 300 (66)	270 (60) 270 (60)
Contraction N (lbs.)		
HARD	570 (126) 570 (126)	500 (1 10) 540 (119)
MEDIUM	400 (88) 400 (88)	350 (77) 350 (77)
SOFT	220 (49) 220 (49)	200 (44) 200 (44)

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SERVICE SPECIFICATIONS

M33CB--

Items	Specifications
Standard value	
Toe-in mm (in.)	0 ± 3 (0 ± .12)
Camber	20' ± 30'
Caster	2" ± 30'
Rear height sensor rod Installation location dimension mm (in.)	314-316 (12.36-12.44)
Wheel arch height to center of wheel mm (in.)	
Front	381–391 (15.0–15.4)
Rear	357-367 (14.1–14.4)
High-pressure switch	
Pressure switch shut off pressure kPa (psi)	900 (128) or more
Pressure switch operation pressure kPa (psi)	710–810 (101–115)
Low-pressure switch	
Return pump activation pressure kPa (psi)	100–180 (14.2-25.6)
Return pump stop pressure kPa (psi)	50 (7.1) or less
Setting of T.J. boot length mm (in.)	80 ± 3 (3.15 ± .12)
Lower arm ball joint starting torque Nm (in.lbs.)	3–1 0 (26-87)
Stabilizer link ball joint starting torque Nm (in.lbs.)	1.7-3.2 (15-28)
Crossmember bushings projection mm (in.)	
Bushing A	7.2–10.2 (.28–.40)
Bushing B	6.5-9.5 (.26–.37)
Air compressor relief pressure kPa (psi)	1,000–1,300 (142-185)

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TORQUE SPECIFICATIONS

M33CC-

Items	Nm	ft.lbs.
Strut assembly		
Front strut upper mounting nut	40–50	29-36
Air tube to strut	8–10	6-7
Front height sensor rod mounting bolt	17-26	12-19
Front strut lower mounting nut	90–105	16-76
Actuator bracket to strut	40–60	29-43
Strut insulator installation nut	80–100	58-72
Lower arm		
Lower arm ball joint to knuckle	60–72	43-52
Lower arm clamp to crossmember (nut)	35-47	25-34
Lower arm clamp to crossmember (bolt)	80–100	58-72
Lower arm to crossmember	95–120	69-87
Stabilizer link mounting nut	35-45	25-33
Front height sensor rod mounting bolt	17-26	12-18
Stabilizer bar		
Center member rear installation bolt	80–100	58-72
Stay to crossmember	70–80	51-58
Front exhaust pipe to exhaust manifold		
<FWD (Non-Turbo)>	40–50	29-36
<AWD (Non-Turbo)>	30–40	22-29
Front exhaust pipe to exhaust fitting (Turbo>	40–60	29-43
Front exhaust pipe clamp	30–40	22-29
Front exhaust pipe to hanger	10–15	7-11
Stabilizer link mounting nut	35-45	25-33
Stabilizer bracket mounting bolt	30–42	22–30

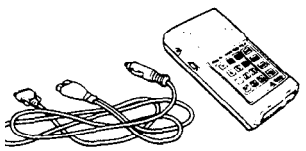
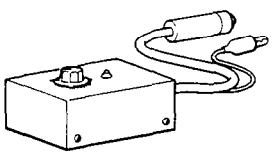
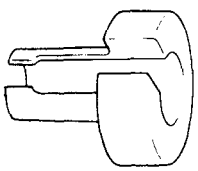
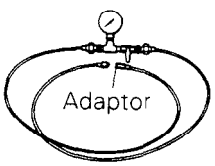
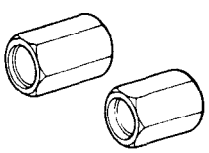
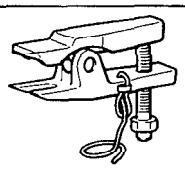
Items	Nm	ft.lbs.
Shock absorber assembly		
Air tube to shock absorber	8–10	6-7
Shock absorber upper mounting nut	40–50	29-36
Shock absorber lower mounting nut	80–100	58-72
Rear height sensor mounting bolt	17-26	12-19
Actuator bracket mounting nut	45-55	33–40
Piston rod tightening nut	45-55	33–40
Rear suspension assembly		
Brake tube bracket mounting bolt	17–26	12-19
Rear brake assembly mounting bolt	50–60	36-43
Dust shield mounting bolt	9-14	7–10
Flange nut	200–260	144-188
Rear speed sensor mounting bolt <Vehicles with *A.B.S.>	9-14	7–10
Air tube to shock absorber	8–10	6-7
Shock absorber upper mounting nut	40–50	29-36
Lateral rod mounting nut (body side)	80–100	58-72
Trailing arm mounting bolt	100–120	72-87
Rear height sensor rod mounting bolt	17-26	12-19
Lateral rod		
Lateral rod mounting nut (body side)	80–100	58-72
Lateral rod mounting nut (axle beam side)	100–120	72-87
Rear height sensor rod mounting bolt	17-26	12-19
Torsion axle and arm assembly		
Brake tube bracket mounting bolt	17-26	12-19
Rear brake assembly mounting bolt	50–60	36-43
Dust shield mounting bolt	9-14	7–10
Flange nut	200–260	144-188
Rear speed sensor mounting bolt <Vehicles with *A.B.S.>	9-14	7–10
Shock absorber lower mounting nut	80–100	58-72
Rear height sensor rod mounting bolt	17-26	12-19
Lateral rod mounting nut (axle beam side)	100–120	72-87
Trailing arm mounting bolt	100–120	72-87
Reserve tank		
Tank holder to body	9–14	7–10
Air tube to reserve tank	8–10	6–7

NOTE
*A.B.S.: Anti-lock braking system

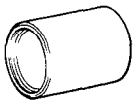
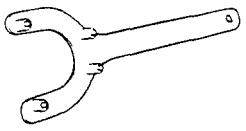
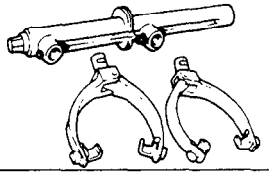
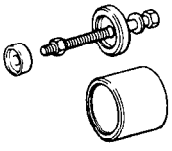
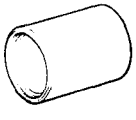
Items	Nm	ft.lbs.
Air compressor		
Air compressor mounting bolt	4 - 6	3 - 4
Air tube to air compressor	8–10	6 - 7
Compressor mounting bracket to transaxle	9 - 14	7–10
Solenoid valve and dryer		
Front solenoid valve bracket to body	7–11	5 - 8
Front solenoid valve to bracket	7 - 11	5 - 8
Air tube to dryer	8–10	6 - 7
Flow control solenoid valve to body	7–11	5 - 8
Rear solenoid valve bracket mounting nut	4 - 6	3 - 4
Rear solenoid valve to bracket	7–11	5 - 8
Air tube		
Joint	8–10	6 - 7
Height sensor		
Front height sensor rod to sensor	17-26	12-19
Front height sensor rod to lower arm	17-26	12-19
Front height sensor rod jam nut	9 - 14	7–10
Protector to body	9 - 14	7–10
Rear height sensor to body	9 - 14	7–10
Rear height sensor rod to sensor	4.8-7.2	4 - 5
Rear height sensor rod to bracket (1989 models)	17-26	12-19
Rear height sensor rod to bracket (From 1990 models)	4.8-7.2	4 - 5
Rear height sensor bracket (A) to bracket (B)	9 - 14	7–10
Front height sensor rod jam nut	9 - 14	7–10
G sensor		
G sensor bracket to body	4 - 6	3 - 4

SPECIAL TOOLS

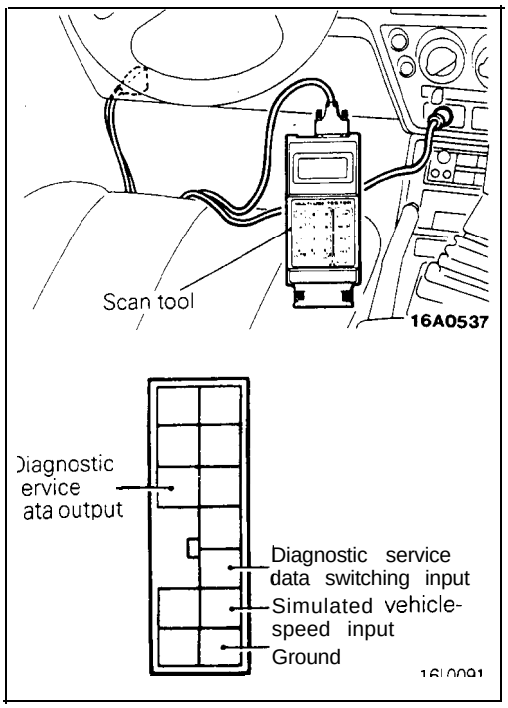
M33DA-A

Tool	Number	Name	Use
	MB991269 (1989 models) MB991341 (1990, 1991, 1992, 1993 models)	Scan tool (Multi-use tester <MUT>)	Checking of self-diagnosis codes Read-out of service data Testing of the actuator ACTIVE-ECS–Service Adjustment Procedures
	[For the number, refer to GROUP 00–Precautions Before Service]	ROM pack	
	MB991139	Vehicle-speed simulator	ACTIVE-ECS–Service Adjustment Procedures
	MB991229	Air tube releaser	Removal/installation of the air tube
	MB991075-01 Adaptor A (M 10 female) B (M 10 male) C (M 12 male) D (M 10 female)	Air pressure gauge	To check air pressure
	MB991226	Adaptor set	
	MB991113-01 OPTIONAL. AVAILABLE FROM O.T.C.	Steering linkage puller	Removal of the lower arm ball joint and tie rod
	MB990800-01 OPTIONAL: AVAILABLE FROM O.T.C.	Ball joint remover and installer	Installation of the dust cover

TSB Revision

Tool	Number	Name	Use
	MB990847-01	Rear suspension bushing remover and installer base	Installation of the oil seal
	MB990947-01	Lower arm bushing arbor	
	MB991176	Spring seat holder	Disassembly/assembly of the strut assembly
	MB991237 MB991238, MB991239	Spring compressor body Arm set	Compression of the front coil spring (MB991237, MB991238) Compression of the rear coil spring (MB991237, MB991239)
	MB991159	Bushing remover and installer	Driving-out and press-fitting of the trailing arm bushing
	MB990947-01	Lower arm bushing arbor	Driving-out and press-fitting of the lateral rod bushing
	MB990945	Lower arm bushing ring	
	MB990847-01	Bushing remover and installer base	

NOTES



TROUBLESHOOTING

M33EAADa

TROUBLESHOOTING POINTS

REGARDING THE DIAGNOSTIC FUNCTION

For the ACTIVE-Electronic Control Suspension (ACTIVE-ECS), the electronic control unit has been provided with the following functions in order to make checking of the electronic-control system easier.

(1) Diagnostic trouble code output
(2) Service data output
(3) Actuator test

Note that all of the above can be checked by using the scan tool.

Also note that the diagnostic trouble codes can be checked by using the voltmeter.

NOTE

For information concerning testing procedures by using the scan tool, refer to P.33B-11.

CHECKING THE ELECTRONIC CONTROL UNIT (ECU) SIGNAL CIRCUIT

(1) The circuit tester used must be highly sensitive and highly precise, with internal batteries of 3V or more.
(2) Care should be taken about the outflow of current from the tester when checking for continuity of terminals and the power-supply circuitry for the photo sensors (front and rear height sensors and steering angle velocity sensor). Use of the ×10 range is preferable, but the xl range can be used if the indicator does not move sufficiently to the right.
(3) The resistance values noted as standard values are simply reference values. If there is continuity, the part can be considered to be OK.
(4) If a power relay or solenoid valve is to be activated, first check carefully to be sure that there is no damaged or disconnected wiring or a short-circuit. Also do not make unnecessary connections so that wiring contacts the body. Take particular care to be sure that the wiring of battery power-supply connections is secure.

CHECKING BY USING THE SCAN TOOL

1. DIAGNOSTIC TROUBLE CODE OUTPUT

TROUBLESHOOTING CHART

Diagnostic trouble code No.	Malfunction	Vehicle condition	Probable cause	Action
0	Normal	–	–	–
*11	Damaged or disconnected wiring or short-circuit of G sensor input circuit, or G sensor malfunction.	Alarm light illuminates; among attitude-control modes, only rolling control stops. (Others operate normally.)	• Improper installation of G sensor. • G sensor internal wiring damaged or disconnected. • Damaged or disconnected wiring or short-circuit of G sensor circuit. • Connector of G sensor circuit disconnected. • Malfunction of ECU.	Troubleshooting hints classified by circuit [1]
*12	With the ignition key at the ON position and the vehicle speed at 40 km/h (25 mph) or higher, the output voltage of the generator "L" terminal is approximately 5V or lower	The charging warning light illuminates, and, furthermore, the system does not function when the vehicle is stopped (vehicle speed of 3 km/h (2 mph) or lower). NOTE The alarm light does not illuminate, and, furthermore, there is no detection of harness damage or disconnection between the generator "L" terminal and the ECU.	• Insufficient generator "L" terminal output voltage (malfunction of the charging system). • Harness short-circuit between the generator "L" terminal and the ECU. • ECU malfunction.	Troubleshooting hints classified by circuit [2]
13	The low-pressure switch is not switched OFF even though the attitude-control function is performed 30 times. The return pump is activated frequently.	The alarm light illuminates, and only the attitude-control function stops. (Other functions are normal.)	• Low-pressure switch is fused. • Damaged or disconnected wiring, or short-circuit, of the low-pressure switch circuit harness. • The connector of the low-pressure switch circuit is disconnected. • Air leakage from the low-pressure tank (including tubing). • ECU malfunction.	Troubleshooting hints classified by circuit [3]
*21	Damaged or disconnected wiring of the steering angular-velocity sensor input circuit, or a malfunction of the steering angular-velocity sensor.	The alarm light illuminates, and the attitude-control function stops. The damping force is held to MEDIUM, and the vehicle height is held to NORMAL	• Steering angular-velocity sensor malfunction. • Damaged or disconnected wiring of the steering angular-velocity sensor circuit harness. • Disconnection of the connector of the steering angular-velocity sensor circuit. • ECU malfunction.	Troubleshooting hints classified by circuit [9]

Diagnostic trouble code No.	Malfunction	Vehicle condition	Probable cause	Action
"22	An abnormal signal (a signal unlike any normal signal such as an error code, etc.) is input from the front height sensor; or, a malfunction of the vehicle-height discrimination circuit within the ECU.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM. NOTE Note that 32 seconds are required to determine that there is a malfunction.	• Front height sensor malfunction. • Damaged or disconnected wiring, or a short-circuit, of the front height sensor circuit. • Disconnection of the connector of the front height sensor circuit. • ECU malfunction.	Troubleshooting hints classified by circuit [10]
"23	An abnormal signal is input from the rear height sensor; or, a malfunction of the vehicle-height discrimination circuit within the ECU.	The alarm light illuminates, and the attitude-control function and the vehicle height control function are stopped. The damping force is held to MEDIUM NOTE Note that 32 seconds are required to determine that there is a malfunction.	• Rear height sensor malfunction. • Damaged or disconnected wiring, or a short-circuit, of the rear height sensor circuit. • Disconnection of the connector of the rear height sensor circuit. • ECU malfunction	Troubleshooting hints classified by circuit [11]
"24	There is damaged or disconnected wiring, or a short-circuit, of the vehicle-speed sensor input circuit. (The throttle is open 30% or more, and the output of the generator "L" terminal is HIGH level, but even so the input of the vehicle-speed pulses is not 30*1 seconds or longer.)	The alarm light illuminates, and the attitude-control function stops. The damping force is held to MEDIUM, and the vehicle height is held to NORMAL.	• Malfunction of the vehicle-speed sensor (damaged or disconnected wiring, or a short-circuit). • Damaged or disconnected wiring, or a short-circuit, of the vehicle-speed sensor circuit. • The connector of the vehicle-speed sensor circuit is disconnected. • ECU malfunction.	Troubleshooting hints classified by circuit [12]
25	There is damaged or disconnected wiring of the rear pressure sensor input circuit. (The rear internal pressure is abnormally high.)	The attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM. NOTE This code is also output during driving in an overloaded condition.	• Rear pressure sensor malfunction. • Damaged or disconnected wiring, or a short-circuit, of the rear pressure sensor circuit. • Disconnection of the connector of the rear pressure sensor circuit. • ECU malfunction	Troubleshooting hints classified by circuit [13]

NOTE
*1: 1989 models
From 1990 models: 60

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Diagnostic trouble code No.	Malfunction	Vehicle condition	Probable cause	Action
41	Damaged or disconnected wiring of the damping force switching actuator (step motor type) or of the actuator circuit, or a malfunction of an output transistor within the ECU.	The alarm light illuminates, and the attitude-control function and the damping-force control function are stopped. The vehicle height is held to NORMAL.	• All connectors of the damping-force switching actuator (step motor type) and the actuator circuit are disconnected. • Damaged or disconnected wiring, or a short-circuit, of the damping-force switching actuator (step motor type) and the harness of the ECU part of the actuator circuit. • ECU malfunction.	Troubleshooting hints classified by circuit [17]
42	There is damaged or disconnected wiring, or a short-circuit, of the solenoid valve power source relay circuit.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• The solenoid valve power source relay contacts are fused. • Damaged or disconnected wiring of the solenoid valve power source relay coil. • Damaged or disconnected wiring, or a short-circuit, of the solenoid valve power source relay circuit. • Disconnection of the connector of the solenoid valve power source relay circuit. • ECU malfunction.	Troubleshooting hints classified by circuit [7]
43	Damaged or disconnected wiring, or a short-circuit, of the compressor relay circuit, or a malfunction of an output transistor within the ECU.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• Damaged or disconnected wiring, or a short-circuit, of the compressor relay coil. • Damaged or disconnected wiring, or a short-circuit, of the compressor relay circuit harness. • Disconnection of the compressor relay circuit connector. • ECU malfunction.	Troubleshooting hints classified by circuit [18]
44	Damaged or disconnected wiring, or a short-circuit, of the return pump relay circuit, or a malfunction of an output transistor within the ECU.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• Damaged or disconnected wiring, or a short-circuit, of the return pump relay coil. • Damaged or disconnected wiring, or a short-circuit, of the return pump relay circuit harness. • Disconnection of the return pump relay circuit connector. • ECU malfunction.	Troubleshooting hints classified by circuit [19]

Diagnostic trouble code No.	Malfunction	Vehicle condition	Probable cause	Action
45	Damaged or disconnected wiring, or a short-circuit, of the exhaust valve actuation circuit (for vehicle-height adjustment), or a malfunction of an output transistor within the ECU.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• Damaged or disconnected wiring, or a short -circuit, of the exhaust valve coil (for vehicle -height adjustment). • Damaged or disconnected wiring, or a short -circuit, of the exhaust valve actuation circuit (for vehicle-height adjustment). • Disconnection of the connector of the exhaust valve actuation circuit (for vehicle-height adjustment). • ECU malfunction.	Troubleshooting hints classified by circuit [20]
46	Damaged or disconnected wiring, or a short-circuit, of the flow-rate switchover valve actuation circuit, or a malfunction of an output transistor within the ECU.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• Damaged or disconnected wiring, or a short -circuit, of the flow-rate switchover valve coil. • Damaged or disconnected wiring, or a short-circuit, of the flow-rate switchover valve circuit harness. • Disconnection of the flow-rate switchover valve circuit connector. • ECU malfunction.	Troubleshooting hints classified by circuit [21]
47	Damaged or disconnected wiring of the front or rear exhaust valve actuation circuit (for active control), or a malfunction of an output transistor within the ECU.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• Damaged or disconnected wiring of the front or rear exhaust valve coil (for active control). • Damaged or disconnected wiring of the front or rear exhaust valve circuit (for active control). • Disconnection of the connector of the front or rear exhaust valve circuit (for active control). • ECU malfunction.	Troubleshooting hints classified by circuit [22]
51	Damaged or disconnected wiring of the front or rear air-supply valve actuation circuit, or a malfunction of an output transistor within the ECU.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• Damaged or disconnected wiring of the front or rear air-supply valve coil. • Damaged or disconnected wiring of the front or rear air-supply valve circuit harness. • Disconnection of the connector of the front or rear air-supply valve circuit. • ECU malfunction.	Troubleshooting hints classified by circuit [23], [24]

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Diagnostic trouble code No	Malfunction	Vehicle condition	Probable cause	Action
52	Damaged or disconnected wiring of the left front or right front valve actuation circuit, or a malfunction of an output transistor within the ECU.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• Damaged or disconnected wiring of the left front or right front valve coil. • Damaged or disconnected wiring of the left front or right front valve circuit harness. • Disconnection of the connector of the left front or right front valve circuit. • ECU malfunction.	Troubleshooing hints classified by circuit [25]
53	Damaged or disconnected wiring of the left rear or right rear valve actuation circuit, or a malfunction of an output transistor within the ECU.	The alarm light illuminates, and the attitude-control function and, the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• Damaged or disconnected wiring of the left rear or right rear valve coil. • Damaged or disconnected wiring of the left rear or right rear valve circuit harness. • Disconnection of the connector of the left rear or right rear valve circuit. • ECU malfunction.	Troubleshooting hints classified by circuit [26]
54	Even though three minutes or more have passed for the vehicle-height adjustments of the front and the rear, and the pressure within the high-pressure tank is sufficient (the high-pressure switch is OFF), the vehicle-height adjustments are not completed.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• Overloaded condition. • Improper adjustment of the front or rear vehicle-height sensor. • Air-pressure line is clogged. • Malfunction of the front strut unit or the rear shock absorber unit air spring. • ECU malfunction.	Refer to Malfunction Symptoms Chart [A] on P.33B-17.
55	Even though three minutes or more have passed for the vehicle-height adjustments of the front and the rear, and with insufficient pressure within the high-pressure tank (the high-pressure switch is ON), the vehicle-height adjustments are not completed, or the compressor has operated continuously for four minutes or longer.	The alarm light illuminates, and the attitude-control function and the vehicle-height control function are stopped. The damping force is held to MEDIUM.	• Compressor malfunction. Damaged or disconnected wiring of the harness between the compressor relay and the compressor. Malfunction of the air compression of the compressor. • Air leakage from the high-pressure tank (non-airtight connection with the low-pressure tank). • High-pressure switch is fused.	Refer to Malfunction Symptoms Chart [B] on P.33B-17.
56	The return pump is continuously activated (repeatedly starts and stops eight times), even though neither the attitude-control function nor the vehicle-height control function has been initiated.	Control functions are not stopped (alarm lamp does not illuminate).	Air leakage within the front (left or right) or rear (left or right) valve.	Replace the front or rear solenoid valve.

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NOTE

(1) The alarm light does not illuminate for an abnormal condition (code No.12) of the generator output voltage ("L" terminal) or for air leakage (code No.56) within the front or rear valves.

(2) For malfunctions represented by a code number with the * symbol, if the malfunction is of a temporary nature (such as improper contact of a connector, etc.), the warning lamp's illumination will stop when the malfunction stops, and the function will return to normal.

(3) When the alarm light is illuminated (i.e. when a malfunction has been detected), the control mode cannot be switched (with the exception of a certain few malfunctions) when the control switch is pressed,.

(4) If two or more malfunctions occur at the same time, the corresponding code numbers will be displayed in order from the lowest one.

(5) Cancellation of malfunction codes after checking and repair (from 1990 models)

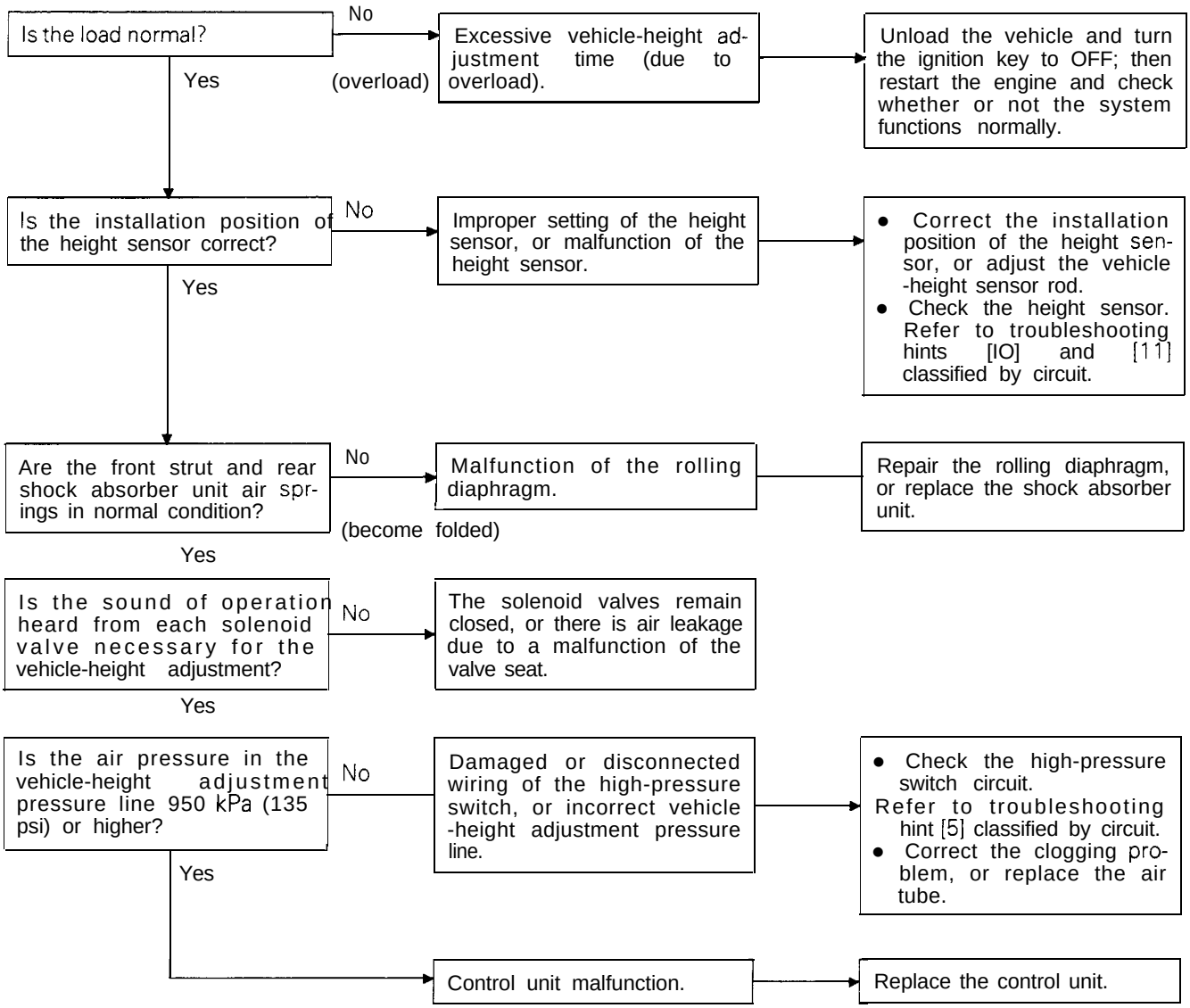
Method 1: Connect a scan tool and cancel as described below.

① Select "4 SPECIAL TEST" of the scan tool's function-select menu.
② Next, select item No.5 "ERASE DIAG.".
③ Press the YES key when "ERASE DIAG. DODE?" is displayed.
④ Input I D NBR. "3 7".
⑤ Press the CLEAR key when "FINISHED ERASING DIAG. CODE" is displayed.
⑥ Disconnect the scan tool.

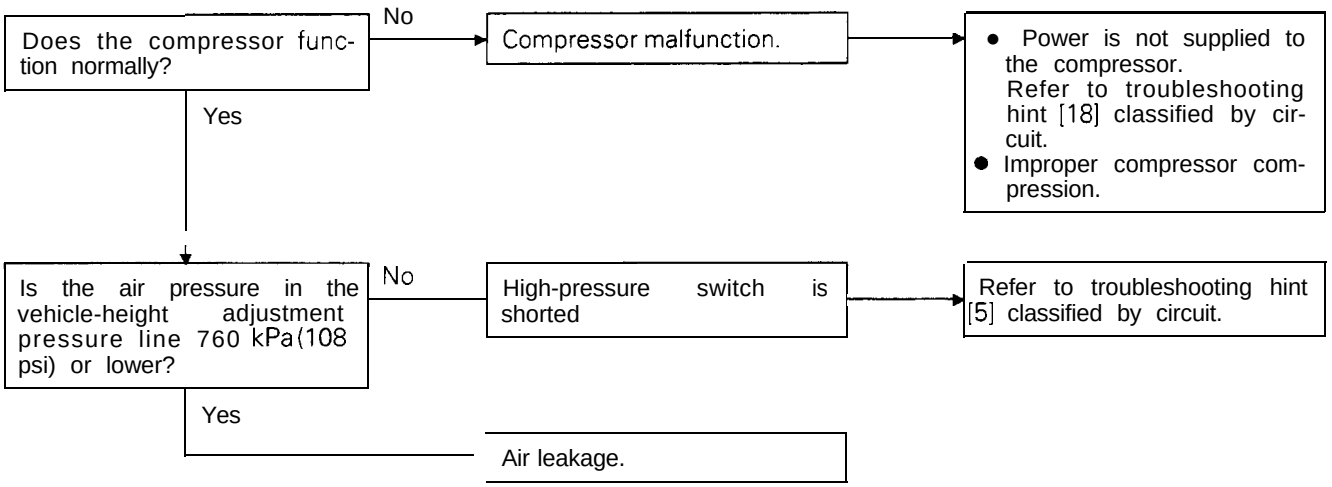
Method 2: Disconnect the ground cable from the battery's negative terminal for 10 seconds or longer, and then reconnect.
If this method is used, note that data entered to the memory of the radio and the clock will be erased, so readjustment is necessary after the work is completed.

CHECKING ACCORDING TO CHARTS CLASSIFIED BY THE MALFUNCTION SYMPTOM

[A] DIAGNOSTIC TROUBLE CODE NO.54



[B] DIAGNOSTIC TROUBLE CODE NO.55



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2. SERVICE DATA OUTPUT

Item No.	Service data item	Conditions for checking	Standard
11	G sensor	Vehicle horizontal condition	2.5 ± 0.6V
		After checking the above, shake the body to the left and right.	The indication fluctuate! above and below 2.5V.
12	Generator L terminal	Ignition switch at ON; engine not running.	LOW
		While engine is running.	HIGH
13	Low-pressure switch	Internal pressure of the low-pressure tank 40 kPa (5.7 psi) or lower. (In the actuator test mode, cause the return pump relay to switch ON several times in succession.)	ON
		Internal pressure of the low-pressure tank 170 kPa (24 psi) or higher. (In the actuator test mode, conduct the anti-roll action several times in succession.)	OFF
14	Throttle-position sensor	Gradually depress the accelerator pedal.	500mV | 5000mV
15	High-pressure switch	Internal pressure of the high-pressure tank 710 kPa (101 psi) or lower. (In the actuator test mode, activate the vehicle-height-increase function and vehicle-height-decrease function several times in succession until the compressor is activated.)	ON
		Internal pressure of the high-pressure tank 1,000 kPa (142 psi) or higher. (In the actuator test mode, cause the compressor relay to switch ON several times in succession.)	OFF
16	Ignition switch	Ignition switch OFF	OFF
		Ignition switch ON	ON
17	Control mode selection switch	Do not press any switch.	5.00V
		"HIGH" switch (only) ON.	4.02V
		"SOFT" switch (only) ON.	2.71V
		"AUTO" switch (only) ON.	1.53V
		"SPORT" switch (only) ON.	0.00V
18	Headlight switch	Headlight switch OFF	OFF
		Headlight switch ON	ON
21	Steering angle-velocity sensor	Turn the steering wheel at a very slow speed.	Left turn ↕ Right turn ST1 ST2 ON ON ON OFF OFF OFF OFF ON

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Item No.	Service data item	Conditions for checking	Standard
22	Front vehicle-height sensor	Switch ON the "HIGH" switch to set to the high vehicle height.	H 1011
		Switch ON the "AUTO" switch to set to the normal vehicle height.	N 1111
		Simulate a vehicle speed of 130 km/h (81 mph) to set to the low vehicle height.	L 0011
23	Rear vehicle-height sensor	Switch ON the "HIGH switch to set to the high vehicle height.	H 1011
		Switch ON the "AUTO" switch to set to the normal vehicle height.	N 1111
		Simulate a vehicle speed of 130 km/h (81 mph) to set to the low vehicle height.	L 0011
24	Vehicle-speed sensor	Actual driving	The speedometer indication and the value indicated by the scan tool must agree.
25	Rear pressure sensor	In the actuator test mode, activate the vehicle-height-increase function several times in order to increase the internal pressure of the rear struts.	The indicated value should Increase to the range of 0 to 5V each time the vehicle height is increased.
		Reference: When the vehicle is at the normal height, with the vehicle in the unladen condition.	0.90V
		Reference: When the vehicle is at the high height.	1.60V
		Reference: When the vehicle is at the low height.	0.86V
26	Stop light switch	Brake pedal not depressed.	OFF
		Brake pedal depressed.	ON
32	Back-up light switch	Move the shift lever to "reverse"	ON
		Return the shift lever to "neutral"	OFF
33	Door switches	Close all doors.	OFF
		Open each door one by one.	ON

3. ACTUATOR TEST

Before conducting the actuator test, check to be sure that the vehicle attitude is level.

Item No.	Actuator test description		Standard
01	Activation of the damping-switching actuator	SOFT	Check, one wheel at a time, to be sure that the damping becomes higher step by step when the check is conducted in the sequence 01 to 02 to 03 to 04.
02		AUTO-SOFT	
03		MEDIUM	
04		HARD	
05	Compressor relay: ON		The compressor should be activated at the moment of the setting to item No. 05, and then should stop three seconds later.
06	Return pump relay: ON		The return pump should be activated at the moment of the setting to item No. 06, and then should stop three seconds later.

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Item No.	Simulation test description		Flow-control solenoids			Front solenoids			Rear solenoids			Vehicle -height adjust-ment exhaust solenoid	Standard
			Flow-rate switchover valve	Front exhaust valve	Rear exhaust valve	Front air-supply valve	Right front valve	Left front valve	Rear air-supply valve	Right rear valve	Left rear valve		
07	Vehicle -height -decrease control	Start	OFF	ON	ON	OFF	ON	ON	OFF	ON	ON	ON	There must be no variation of the amount of decrease of the vehicle height for the front and rear and for the left and right sides. Moreover, there should be an immediate reset, three seconds later, to the original condition.
		Reset	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	
08	Vehicle -height -increase control	Start	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	There must be no variation of the amount of increase of the vehicle height for the front and rear and for the left and right sides. Moreover, there should be an immediate reset, three seconds later, to the original condition.
		Reset	OFF	ON	ON	OFF	ON	ON	OFF	ON	ON	ON	
09	Anti -rolling control (left turn)	Start*	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	There should be no noticeable difference of the amount of inclination of the body when left-turn and right-turn simulations are conducted. Moreover, there should be an immediate reset, three seconds later, to the original condition.
		Start	ON	OFF	OFF	ON	OFF	ON	ON	OFF	ON	OFF	
		Hold	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	
		Reset	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
10	Anti -rolling control (right turn)	Start*	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	
		Start	ON	OFF	OFF	ON	ON	OFF	ON	ON	OFF	OFF	
		Hold	OFF	ON	ON	OFF	ON	OFF	OFF	ON	OFF	OFF	
		Reset	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	

Actuation valve check points:
- Presence of an operation sound (if there is no operation sound, it is possible that air is not being supplied because of valve sticking.)
- There should be no abnormal noise.
- There should be no air leakage.

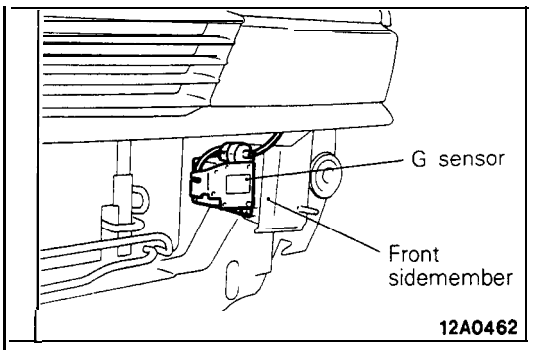
*: connection closed between right and left wheels

TROUBLESHOOTING HINTS CLASSIFIED ACCORDING TO CIRCUITS

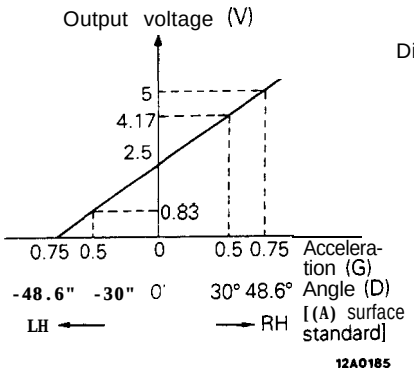
Contents

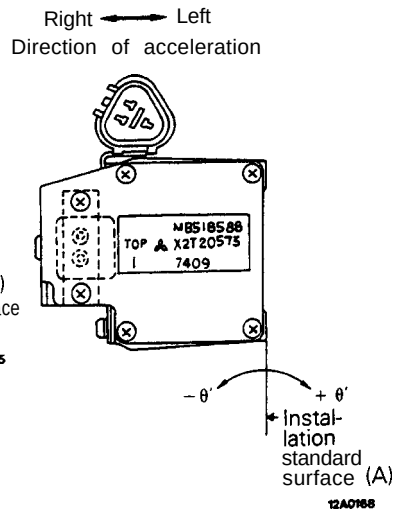
No.	Item	page
[1]	G-sensor circuit	P.33B-22
[2]	Generator "L" terminal circuit	P.33B-24
[3]	Low-pressure switch circuit	P.33B-26
[4]	Throttle-position sensor circuit	P.33B-28
[5]	High-pressure switch circuit	P.33B-30
[6]	ACTIVE-ECS power-supply circuit	P.33B-32
[7]	ACTIVE-ECS indicators circuit	P.33B-34
[8]	Headlight switch circuit	P.33B-38
[9]	Steering angular-velocity sensor circuit	P.33B-40
[10]	Front-height sensor circuit	P.33B-42
[11]	Rear-height sensor circuit	P.33B-44
[12]	Vehicle-speed sensor circuit	P.33B-46
[13]	Rear-pressure sensor circuit	P.33B-48
[14]	Stop light switch circuit	P.33B-50
[15]	Back-up switch circuit	P.33B-52
[16]	Door switch circuit	P.33B-53
[17]	Damping force switching actuator drive circuit	P.33B-54
[18]	Compressor drive circuit	P.33B-56
[19]	Return pump drive circuit	P.33B-58
[20]	Exhaust valve actuation circuit (for vehicle-height adjustment)	P.33B-60
[21]	Flow-rate switchover valve actuation circuit	P.33B-62
[22]	Front/rear exhaust valve activation circuit	P.33B-64
[23]	Front air-supply valve activation circuit	P.33B-66
[24]	Rear air-supply valve activation circuit	P.33B-68
[25]	Left front/right front valve activation circuit	P.33B-70
[26]	Left rear/right rear valve activation circuit	P.33B-72
[27]	ACTIVE-ECS-related diagnostic/service data output circuit	P.33B-74

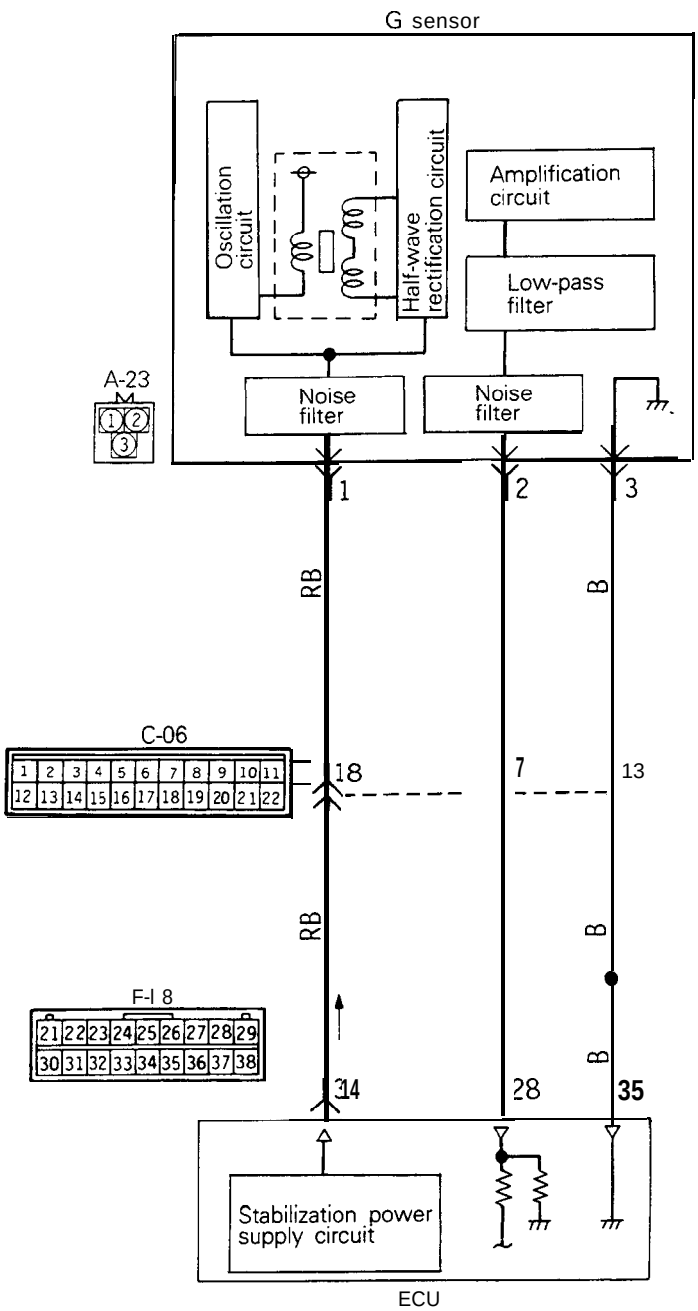
[1] G-SENSOR CIRCUIT



G-sensor output characteristic







Operation

The G-sensor detects the amount of acceleration that is generated (to the left or right) when the vehicle body turns. Applying the principle of the differential transformer, the magnetic field changes when the movable iron core within the coil moves in response to acceleration, and these changes are taken out as changes of voltage. Within the coil, silicon oil is enclosed in order to suppress the vibration of the movable iron core. Note that the G-sensor is a special sensor for control of rolling.

Diagnostic

When signals that are otherwise virtually inconceivable are input due to damaged or disconnected wiring or a short-circuit or similar problem of a heavy-line circuit, the alarm light illuminates and control is as described in the table below.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
11	Rolling control only stops	Normal operation	Normal operation	Accept			

Service data indication

Code No	Indication	Standard value	Display
11	G-sensor output voltage	2.5V when vehicle is horizontal	11: G SNSR. 2.5V

ECU terminal voltages (when connector is connected)

Terminal No	Signal	Condition	Terminal voltage
34	Power supply for sensor	When the ECU is activated	7.3V
28	G-sensor output signal	When stopped	2.5V
		When wiring is damaged or disconnected	ov
35	Sensor circuit earth	Constantly	ov

Checking the G-sensor circuit (with the connector disconnected)

Terminal No	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
28	G-sensor output	Resistance	28-2	Constantly	Continuity
34	G-sensor power source	Resistance	34-1	Constantly	Continuity

Troubleshooting hints

Malfunction mode	Malfunction probable cause	Malfunction	Note
Silicon oil leakage	Because the silicon oil for suppression of vibrations of the G-sensor movable iron core is leaking due to a collision, the sensitivity is oversensitive.	• Rolling control occurs frequently	–
Damaged or disconnected earth line	The ground line is damaged or disconnected. Malfunction is not detected because the ground line is grounded to the G sensor's body itself, however, noise is easily picked up.	• There are times of a feeling of incompatibility of the rolling control • Rolling control occurs suddenly; an error occurs	–

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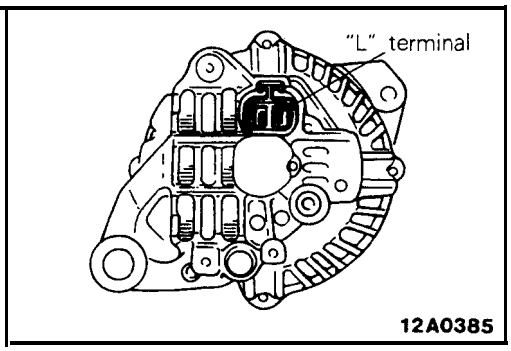
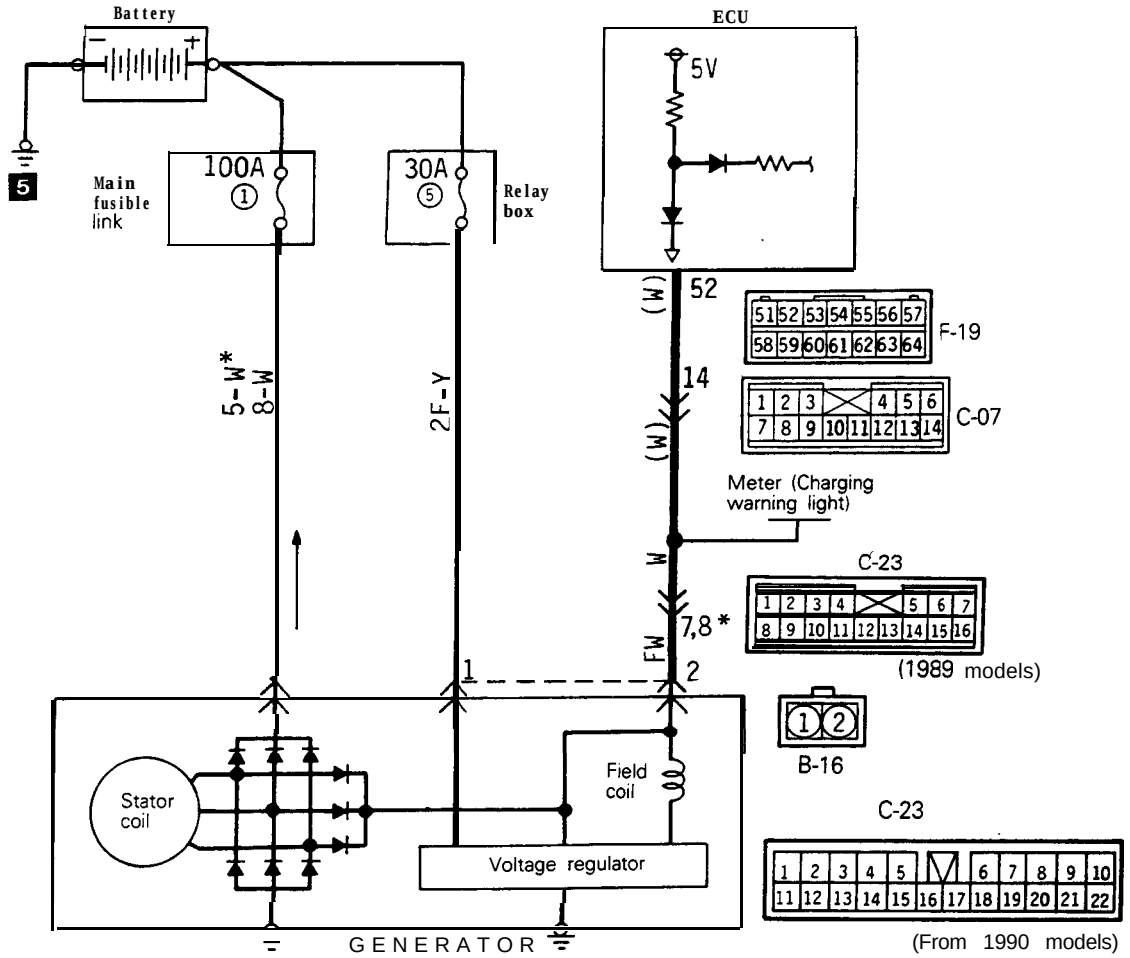
[2] GENERATOR "L" TERMINAL CIRCUIT





NOTE
* mark is applicable for 1990, 1991, 1992, 1993 models.

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Operation

The generator "L" terminal signal is used to determine whether or not the engine is operating.
This is in order to reduce the frequency of compressor operation, and is because activation of the system is possible while the engine is operating, or at a vehicle speed of 3 km/h (2 mph) or higher.

Diagnostic

When the generator "L" terminal is LOW level (as a result of a short-circuit of the heavy-line circuit or due to an abnormal condition of the generator) even though the vehicle speed is 40 km/h (25 mph), control is as described in the table below. Note, however, that there is no detection if there is damaged or disconnected wiring of the harness, and the alarm light does not illuminate.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
12	*"L" terminal "L" logic						

*"L" terminal "L" logic: As a result of system operation conditions, the system is not activated at a vehicle speed of less than 3 km/h (2 mph). When the vehicle speed becomes 3 km/h (2 mph) or higher all functions are normal. (Refer to the explanation of the operation.)

Service data indication

Code No.	Indication	Display
12	The output voltage level of the generator "L" terminal is indicated.	12: ALT. L TERMI. HIGH/LOW

ECU terminal voltage (when connector is connected)

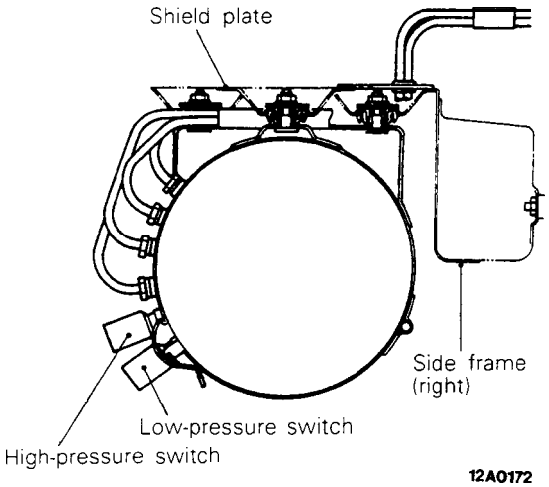
Terminal No.	Signal	Condition	Terminal voltage
52	Generator 'I" terminal signal	When engine stalls	0.5–3V
		When engine is operating	13–15V
		When harness wiring is damaged or disconnected	5V

Checking the generator "L" terminal circuit (with the connector disconnected)

Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
52	Generator	Voltage	52 ground	Ignition switch ON	2–5V
				While engine is operating	B+

B+: Battery positive voltage

[3] LOW-PRESSURE SWITCH CIRCUIT



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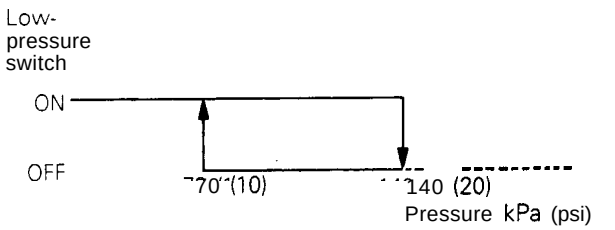

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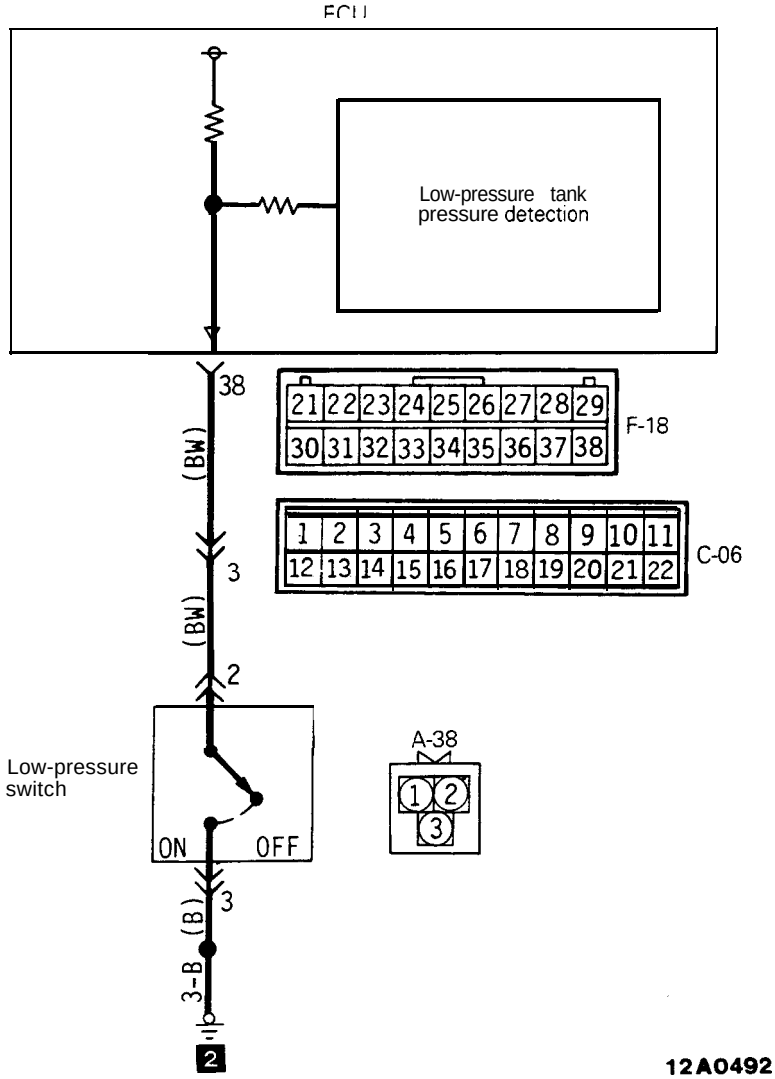

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Operation

The low-pressure switch is switched ON and OFF by the pressure in the low-pressure tank, and as a result the ECU functions to control the activation and stop of the return pump.
When the pressure in the low-pressure tank becomes 140 kPa (20 psi) or higher, it is switched OFF, and as a result the ECU sends the drive signal to the return pump. It is switched ON at a pressure of 70 kPa (10 psi) or lower, and the return pump stops two seconds later.

Diagnostic

If there is a short-circuit, or damaged or disconnected wiring, of the heavy-line circuit, or if the low-pressure switch becomes shorted, and the low-pressure switch is as a result always ON, (the alarm light illuminates during active attitude control)*, and control is as described in the table below.

*: Information in ( ) is applicable to 1989 models. Not applicable to 1990 models.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
13	Control stop	Normal operation	Normal operation	Accept			

Service data indication

Code No.	Indication	Display
13	Indicates ON or OFF condition of the low-pressure switch	13: LOW PRESS. SW. ON/OFF

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
38	Low-pressure tank pressure signal	When the low-pressure switch is ON	ov
		When the low-pressure switch is OFF	5V

Checking the low-pressure switch circuit [with the connector disconnected).

Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
38	Low-pressure switch	Resistance	38-36	Low-pressure tank internal pressure 70 kPa (10 psi) or below	Continuity
				Low-pressure tank internal pressure 140 kPa (20 psi) or higher.	No continuity

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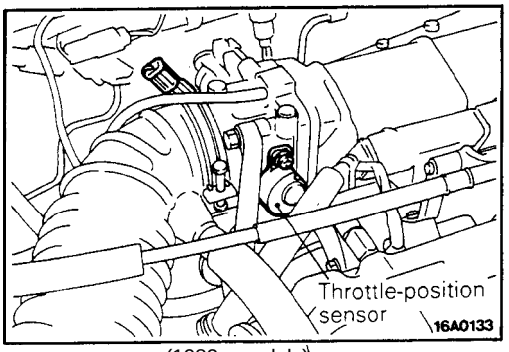
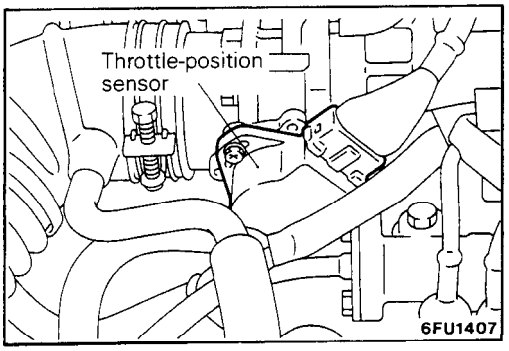
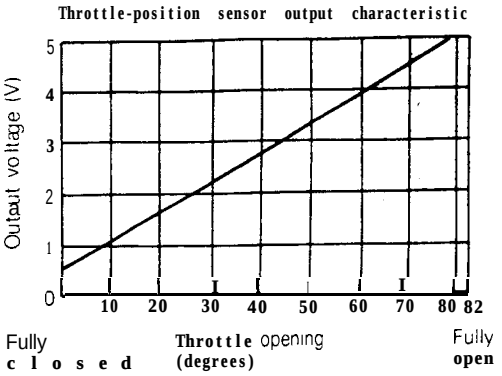
[4] THROTTLE-POSITION SENSOR CIRCUIT

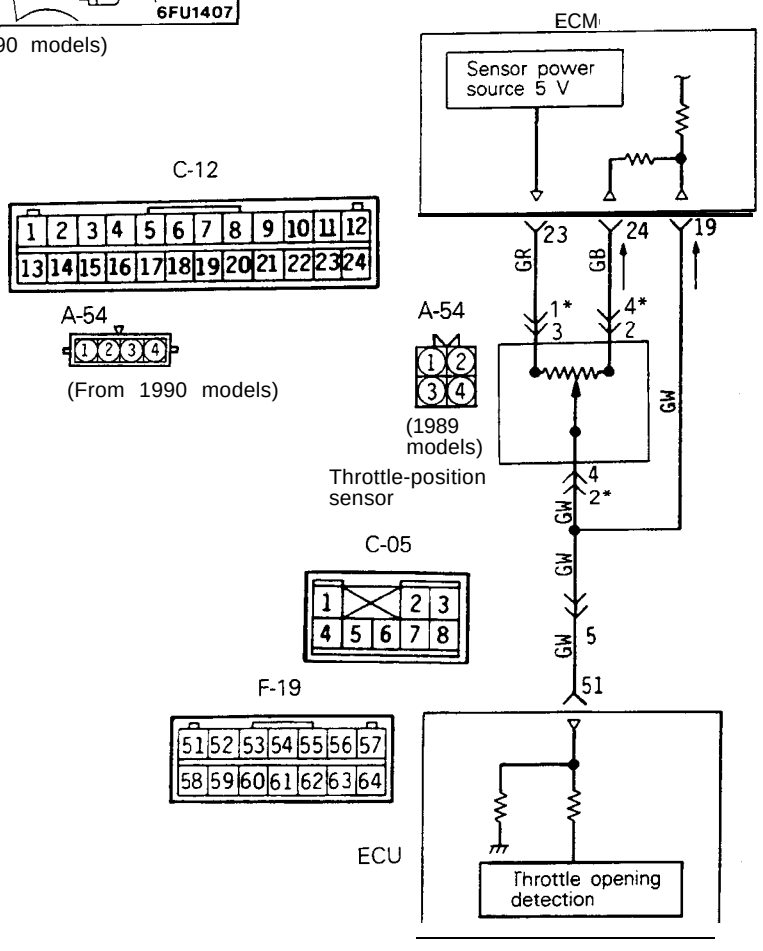


(1989 models)



(From 1990 models)





NOTE
* mark is applicable for 1990, 1991, 1992, 1993 models.

Operation

The throttle-position sensor is the same for the ECM of engine and transaxle. The ECM estimates the acceleration status of the vehicle according to the sensor output.

Service data indication

Code No	Indication	Display
14	The output voltage of the throttle -position sensor is indicated.	14: TPS 549 mV

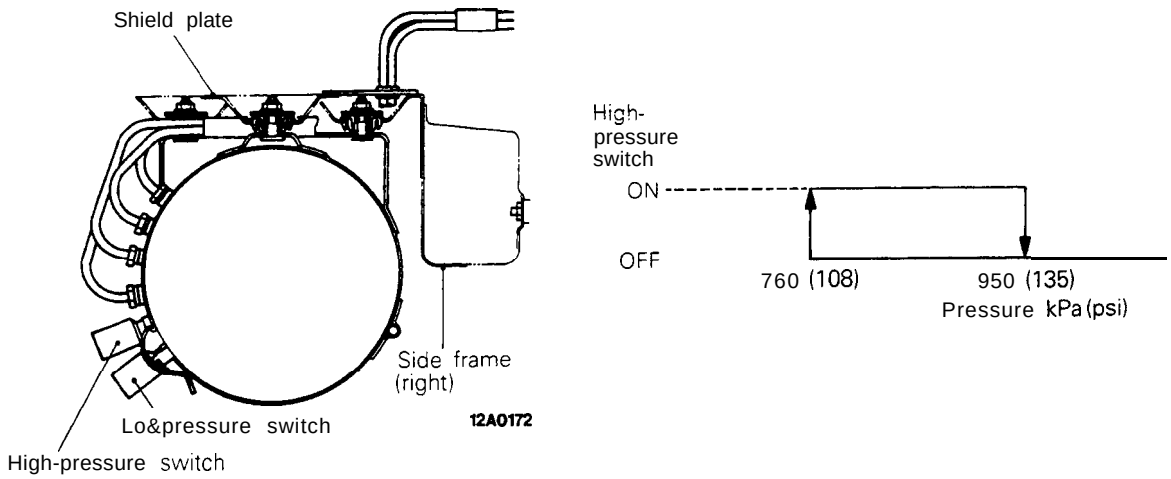
ECU terminal voltages (when connector is connected)

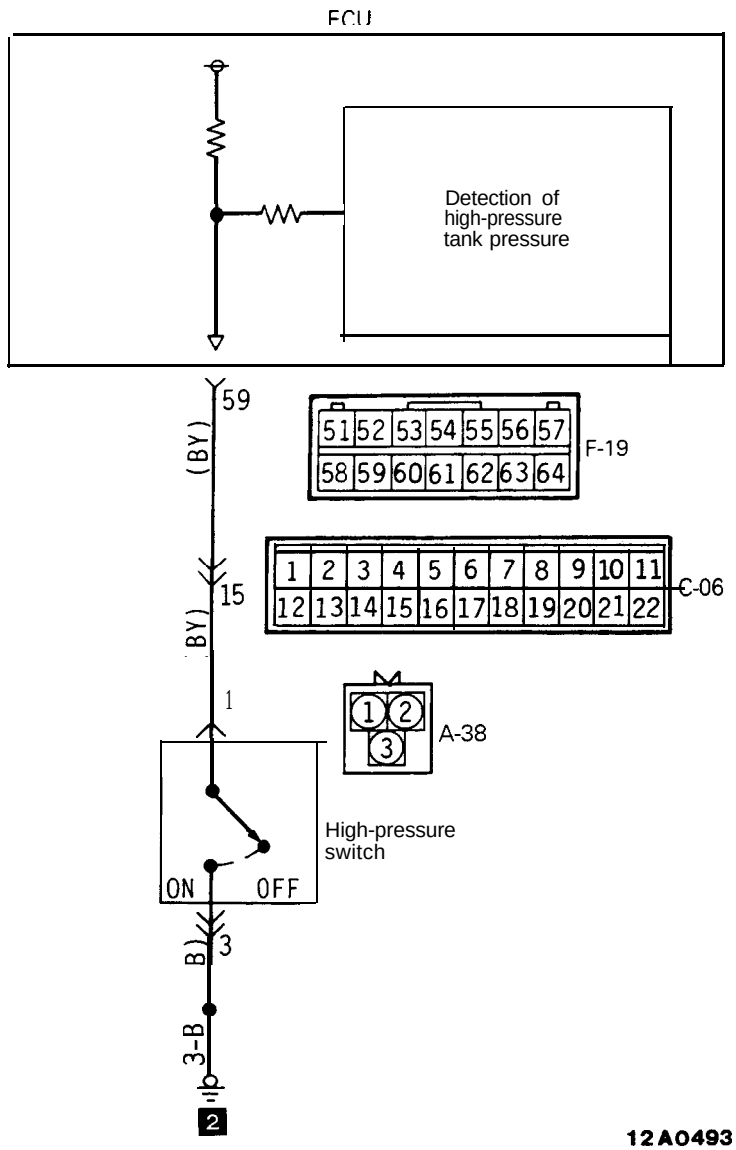
Terminal No.	Signal	Condition	Terminal voltage
51	Throttle-position sensor signal	During idle	0–1V
		When fully open	5V
		When there is damaged or disconnected wiring	0V

Checking the throttle-position sensor circuit (with the connector disconnected)

Terminal No	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
51	Throttle-positron sensor	Resistance	51 -ground	Change according to the throttle opening should be smooth and within the standard value range shown at the right.	0.5–5 kΩ

[5] HIGH-PRESSURE SWITCH CIRCUIT





Operation

The high-pressure switch is switched ON and OFF by the pressure in the high-pressure tank, and as a result the ECU functions to control the activation and stop of the compressor.
When the pressure in the high-pressure tank becomes 760 kPa(108 psi) or lower, the high-pressure switch is switched ON, and as a result the ECU sends the drive signal to the compressor.

Conversely, when the pressure of the high-pressure tank becomes 950 kPa (135 psi) or higher, the high-pressure switch is switched OFF, and the compressor is stopped two seconds thereafter.
Note, however, that the compressor is not activated, even if the high-pressure switch is switched ON, if the return pump is in operation. Note also that there is no diagnostic function for the high-pressure switch.

Service data indication

Code No	Indication	Display
15	Indicates the ON/OFF status of the high-pressure switch.	15: HIGH PRESS. SW. ON/OFF

ECU terminal voltages (with connector connected)

Terminal No.	Signal	Condition	Terminal voltage
59	High-pressure tank pressure signal	When high-pressure switch is ON (low pressure)	ov
		When high-pressure switch is OFF (high pressure)	5V

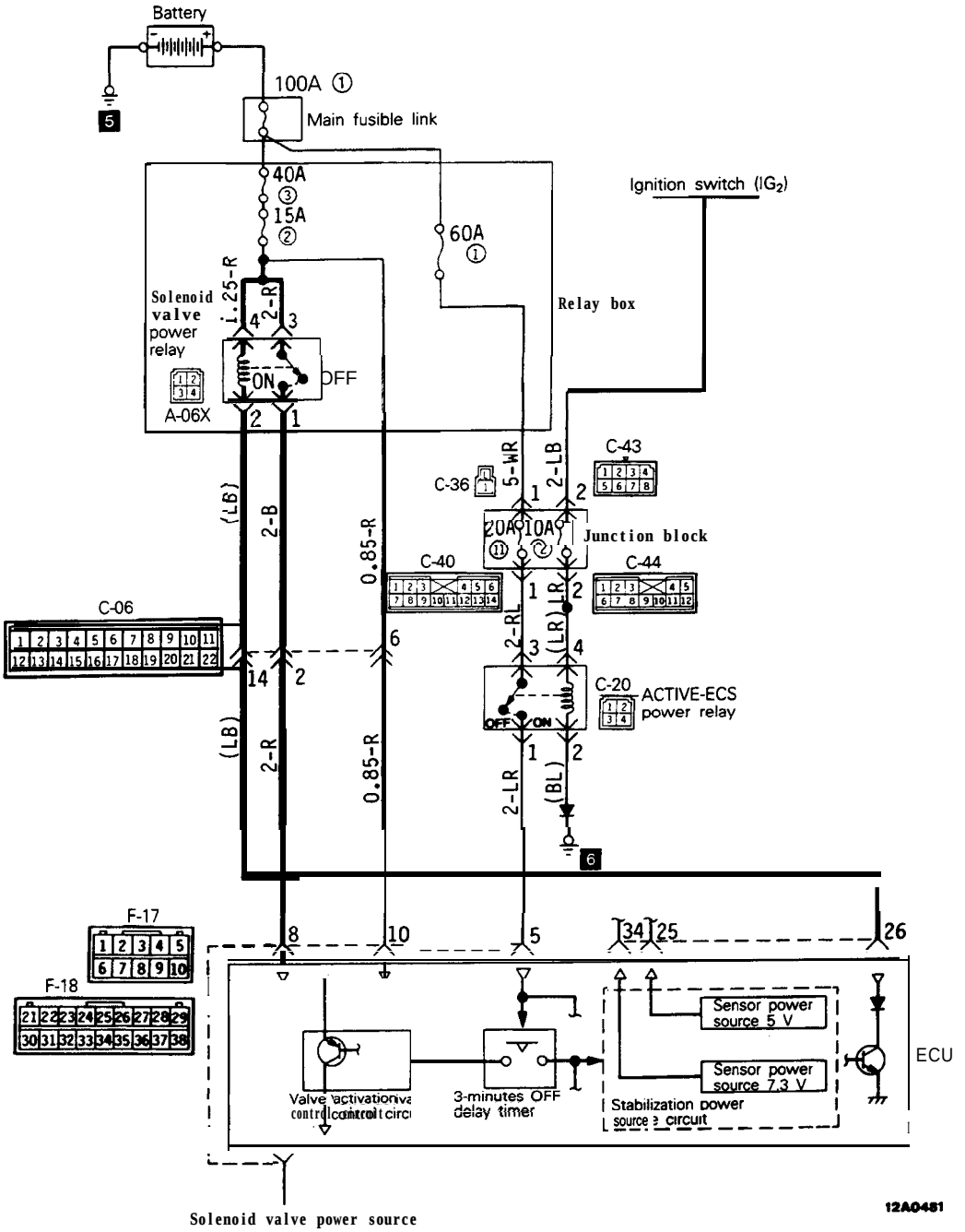
Checking the high-pressure switch circuit (with the connector disconnected)

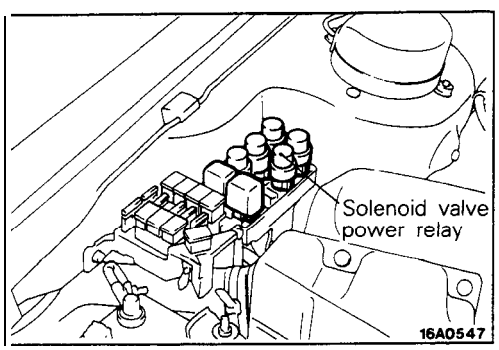
Terminal No	Connection destination or Measurement measured part		Tester connection	Check condition	Standard
59	High-pressure switch	Resistance	59-36	High-pressure tank internal pressure 760 kPa (108 psi) or lower	Continuity
				High-pressure tank internal pressure 950 kPa (135 psi) or higher	No continuity

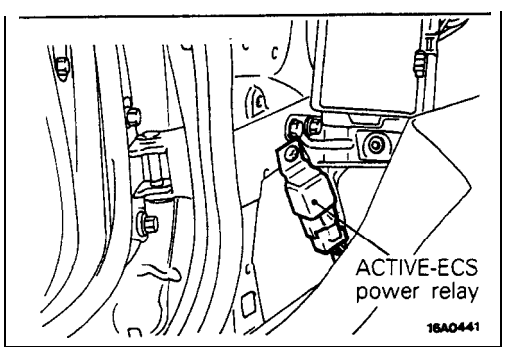
Troubleshooting hints

Malfunction mode	Malfunction probable cause	Malfunction	Note
Harness wiring damage or disconnection	Harness wiring damage or disconnection, or Improper switch contact	Compressor doesn't operate.	–
Harness short-circuit	Harness short-circuit, or switch short-circuit,	Compressor operates without stopping.	Diagnostic No.55 output.
Air leakage.	O-ring worn or damaged.	Rolling control feeling of Incompatibility. very freauent operation of compressor.	–

[6] ACTIVE-ECS POWER SOURCE CIRCUIT







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Operation

When the ignition is switched ON, the ECS power relay is also switched ON, and power is supplied to the system. At the same time, the ECU switches ON the solenoid valve power relay, and power is supplied to the solenoid valve activation circuit. As a result, system operation is possible.

When the ignition switch is switched OFF after driving, the three-minute OFF delay timer makes vehicle-height adjustment (down only) possible for a period of three minutes, thus preventing the vehicle height from increasing while passengers get out of the vehicle, etc.

Diagnostic

When problems such as damage or disconnection of the heavy-line circuit, or fusing of the contacts of the solenoid valve power relay, etc. occur, the alarm light illuminates, and control is as described in the table below.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
42	Rolling control only stops.	Held at MEDIUM	Rolling control only stops	Not accept			

Service data indication

Code No	Indication	Display
16	Indicates ON/OFF status of the ignition switch.	16: IGNITION SW. ON/OFF

ECU terminal voltage (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
5	Ignition (IG_2) power source signal	When ignition switch is ON	B+
		When ignition switch is OFF	0V
8	Solenoid valve power relay output signal	When system is normal	B+
		During fail-safe	0V
10	Battery (+B) power source	Constantly	B+
34	Sensor power source (7.3V)	Constantly	7.3V
25	Sensor power source (5V)	Constantly	5V
26	Solenoid valve power relay drive signal	When solenoid valve power relay is ON	0V
		When solenoid valve power relay is OFF	B+

B+: Battery positive voltage

Checking the ACTIVE-ECS power source circuit (with the connector disconnected)

Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
5	Ignition switch	Voltage	5–ground	Ignition switch OFF	0 V
				Ignition switch OFF-ON	0→B+
8	Solenoid valve power relay	Voltage	8–ground	Terminal 26 open.	0V
				Terminal 26 grounded	O-B+
10	ECU back-up power source	Voltage	1 O-ground	Constantly	B+

B+: Battery positive voltage

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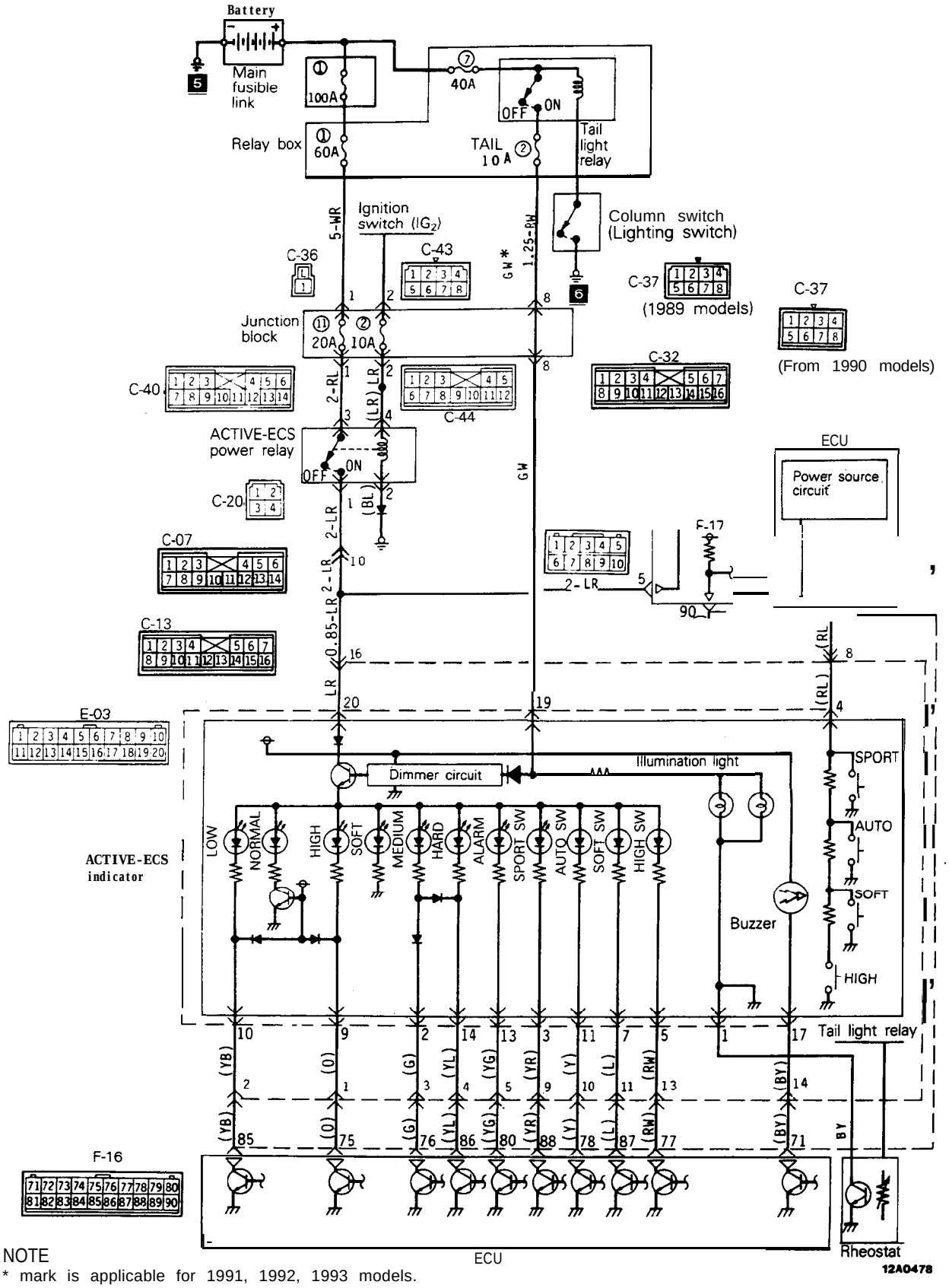
[7] ACTIVE-ECS indicators circuit



NOTE
* mark is applicable for 1991, 1992, 1993 models.

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Service data indication

Code No	Indication	Standard value		Indication example
17	ECU input voltage indications when SPORT, AUTO, SOFT, HIGH switches are pressed.	When switches are open	5V	17: MANUAL CNG. SW 4.03V
		When SPORT switch is ON	0V	
		When AUTO switch is ON	1.53V	
		When SOFT switch is ON	2.71V	
		When HIGH switch is ON	4.02V	

ACTIVE-ECS indicators check chart

1. Checking the power source circuit

Disconnect the battery terminals, and, after erasure of the ECU mode memory, turn the ignition key to the ON position.

↓

The sound of the damping force switching actuators (step motors), installed at the front struts and at the rear shock absorbers, will be heard.

No → • The ACTIVE-ECS power relay doesn't function
• Disconnected or damaged wiring of the fusible link, the fuse and/or the harness between the battery and the ACTIVE-ECS power relay contacts

Yes

When terminal 15 of the ACTIVE-ECS indicator is grounded, the "SOFT" damping force characteristic indicator and the "NORM" vehicle-height indicator will illuminate.

Yes → • Disconnected or damaged wiring of the ground line 15 of the ACTIVE-ECS indicator.

No

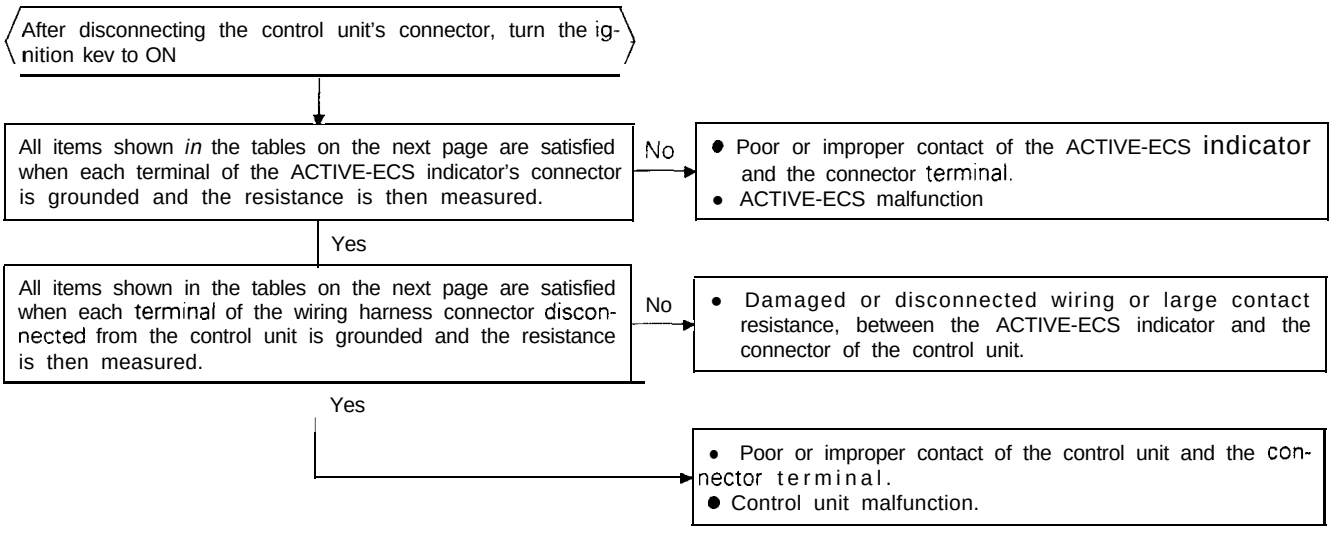
Approximately 12V is measured when the voltage between ground and terminal 20 of the indicator and the ACTIVE-ECS is measured.

No → • Disconnected or damaged wiring between the ACTIVE-ECS power relay and ECS indicator terminal 20.

Yes

ACTIVE-ECS Indicator power source circuit OK Proceed to checking of the individual ACTIVE-ECS indicators

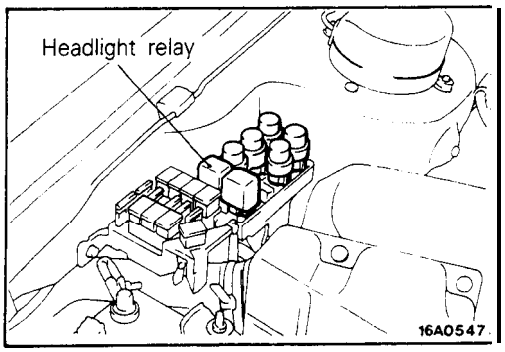
2. Checking the individual ACTIVE-ECS indicators

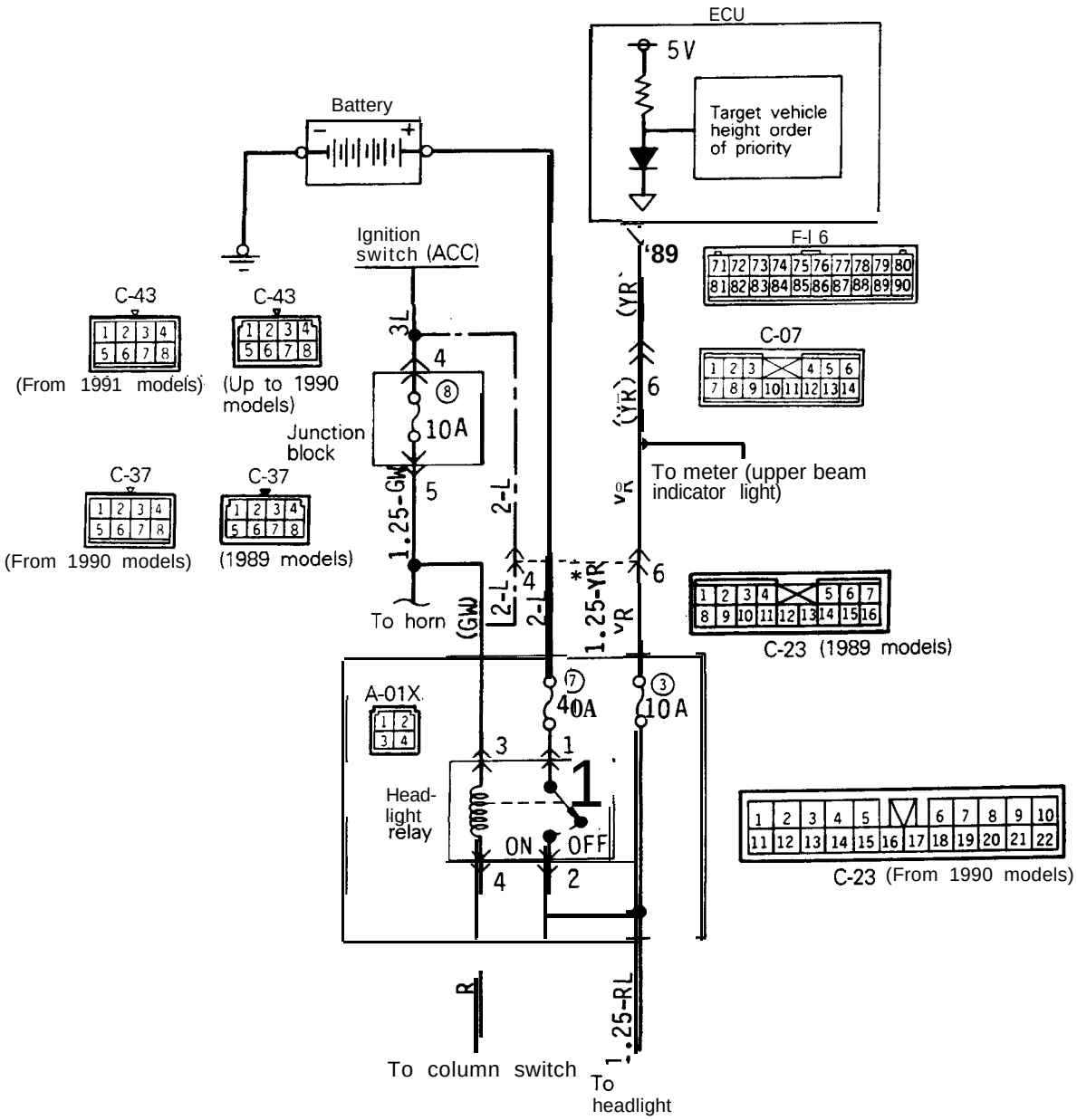


ACTIVE-ECS indicator connector terminal No	Control unit wiring harness connector terminal No	Normal
All terminals are not earthed	–	The "SOFT" damping force characteristic indicator and the "NORM" vehicle-height indicator illuminate.
1	–	The illumination light illuminates when battery voltage is applied to terminal 19.
2	76	In addition to the "SOFT" and "NORM" indicators, the "MEDIUM" damping force characteristic Indicator also illuminates.
3	88	In addition to the "SOFT" and "NORM" indicators, the "SOFT"*1 switch indicator also illuminates.
4	90	Connect a circuit tester and measure the resistance when the control mode and vehicle-height select switches are pressed: No switch is p No continuity.; SPORT 10Ω or less; AUTO Approx. 330 Ω; SOFT Approx. 890 Ω; HIGH Approx. 3090 Ω
5	77	In addition to the "SOFT" and "NORM" indicators, the "HIGH" switch indicator also illuminates
6*2	–	In addition to the "SOFT" and "NORM" indicators, the alarm light illuminates.
7	87	In addition to the "SOFT" and "NORM" indicators, the "SOFT" switch indicator also illuminates.
9	75	The "NORM" vehicle-height indicator illumination stops, and the "HIGH" vehicle-height indicator illuminates; the "SOFT" damping force characteristic indicator remains illuminated.
10	85	The "NORM" vehicle-height Indicator illumination stops, and the "LOW" vehicle-height indicator illuminates; the "SOFT" damping force characteristic indicator remains illuminated.
11	78	In addition to the "SOFT" and "NORM" indicators, the "AUTO" switch indicator also illuminates.
13	80	In addition to the "SOFT" and "NORM" indicators, the alarm light illuminates.
14	86	In addition to the "SOFT" and "NORM" indicators, the "MEDIUM" and "HARD" damping force characteristic indicators also illuminate
15	–	The "SOFT" damping force characteristic indicator and the vehicle-height indicator illuminate.
17	71	The buzzer sounds.
19	–	The "SOFT" and "NORM" indicators become slightly dimmer when terminal 20 is connected to terminal 19

NOTE
*1: 1989 models
"SPORT" mode is applicable for 1990, 1991, 1992, 1993 models
- *: Applicable to 1989 models only.

[8] HEADLIGHT SWITCH CIRCUIT





NOTE
* mark and chain line indicate 1991, 1992, 1993 models.

Operation

The ACTIVE-ECS system functions, in order to improve the "air drag" characteristic, to adjust the vehicle height to the LOW setting at the front end only during the daytime when the vehicle speed reaches 90 km/h (56 mph) or higher and continues at that speed for a period of ten seconds or longer.

During the nighttime, however, in order to prevent deviation of the headlight beams from the required directional path, the vehicle height is adjusted to the LOW setting for both the front end and the rear end when signals from the headlight relay are input.

Service data indication

Code No.	Indication	Display
18	Indicates the ON or OFF status of the headlight switch.	18: HEADLAMP SW. ON/OFF

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
89	Headlight switch signal	When headlight switch is ON	B+
		When headlight switch is OFF	ov
		When there is damaged or disconnected wiring	5V

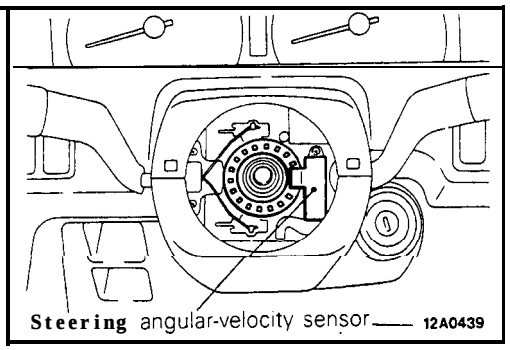
B+: Battery positive voltage

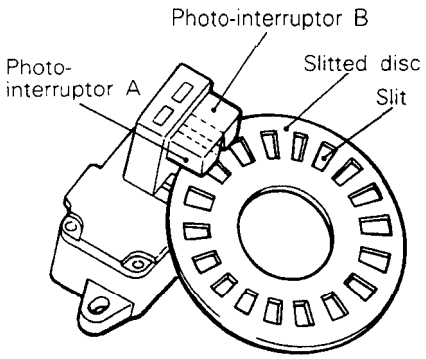
Headlight switch circuit (with the connector disconnected)

Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
89	Headlight relay	Voltage	89–ground	When the headlight switch is OFF	ov
				When the headlight switch is ON	B+

B+: Battery positive voltage

[9] STEERING ANGULAR-VELOCITY SENSOR CIRCUIT





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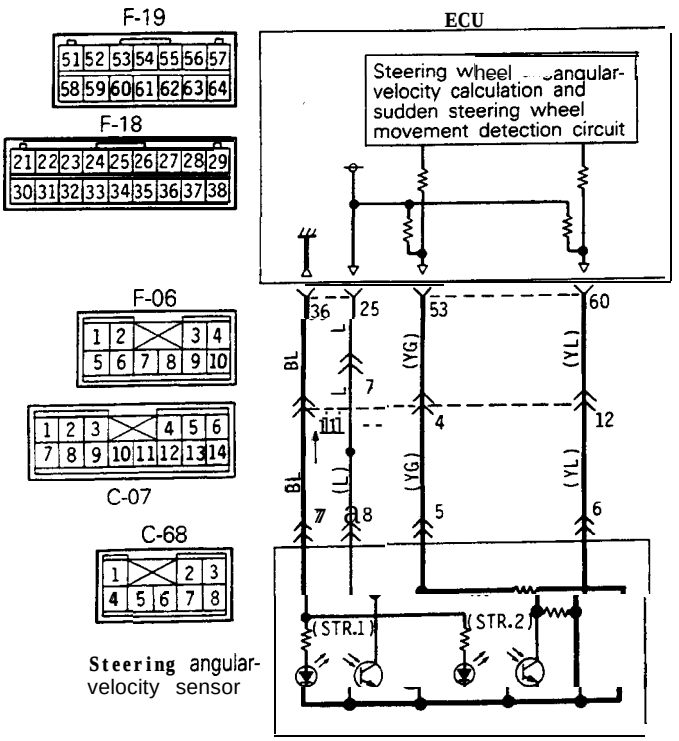

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Operation

The slitted disc installed to the steering shaft interrupts, or allows light to pass with the result that electric signals corresponding to the angular-velocity of the steering wheel movement are detected and passed to the ECU.

Diagnostic

If there is damage or disconnection of the heavy-line circuit, the alarm light illuminates and control is as described in the table below.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
21	Control stop	Held at MEDIUM	Held at NORM vehicle height.	Not accept			

Service data indication

Code No.	Indication	Display
21	Indicates the ON or OFF status individually for STR 1 and STR. 2.	21: STEER. SNSR. ST1 ON/OFF ST2 ON/OFF

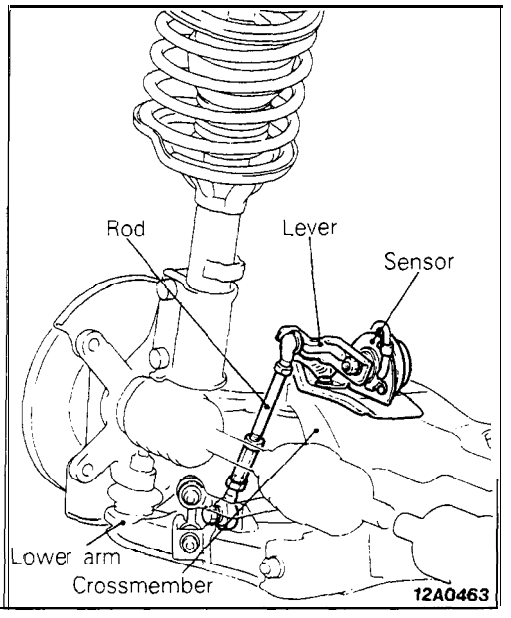
ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
25	Power source for sensor	When the ECU is activated	5V
53	Steering angular-velocity sensor (1)	When the photo-interruptor is ON	ov
		When the photo-interruptor is OFF	3.5V
60	Steering angular-velocity sensor (2)	When there is damaoe or disconnection of the harness	5V
36	Sensor circuit ground	Constantly	ov

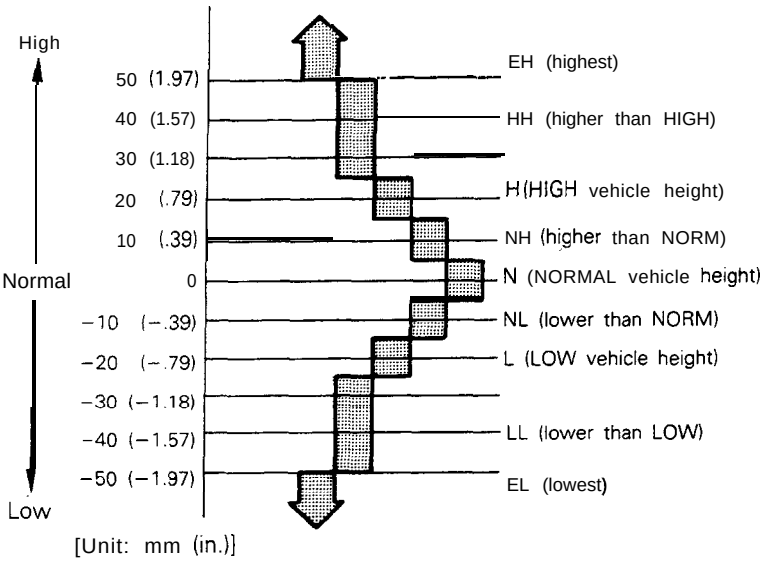
Checking the steering angular-velocity sensor circuit (with the connector disconnected)

Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
25 36	Steering angular-velocity sensor power-supply circuit	Resistance	25-36	Connect the tester's (–) probe to terminal 25, and the (+) probe to terminal 36. Note: Even if the result is good, the sensor must not be judged to be working.	Continuity exists. (The indicator fluctuates)
53 36	Steering angular-velocity sensor	Resistance	53-36	Turn the steering wheel slowly.	No continuity ↕ Continuity

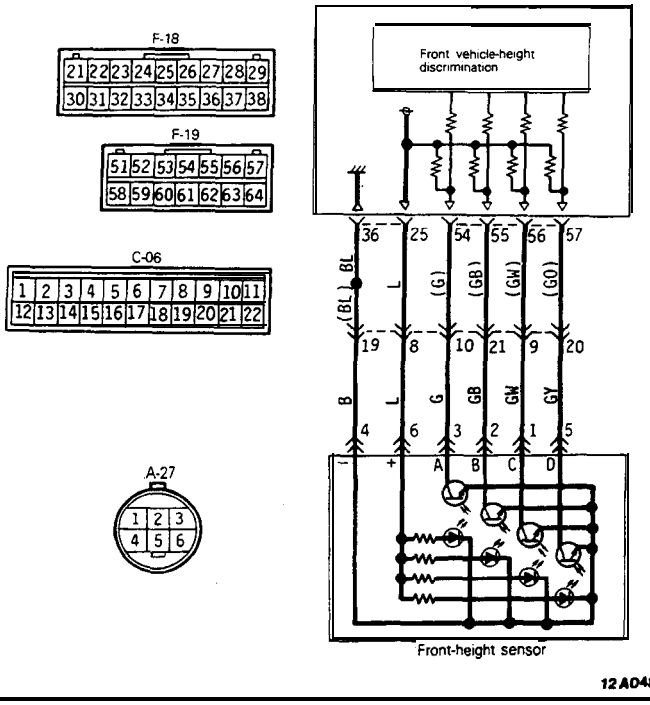
IO] FRONT-HEIGHT SENSOR CIRCUIT



Relationship between N (normal vehicle height) and other vehicle-height levels



[Unit: mm (in.)]



Operation

The front-height sensor detects (by detecting the relative position of the body and the front axle) the action movements (bouncing, nose diving, etc.), and the vehicle height, of the front of the vehicle,

The rotating disc plate rotates in the area between four pairs of light-emitting diodes and photo-transistors, and the slits in the disc thus interrupt, or let pass, the light beams between the light-emitting diodes and the photo-transistors.

By employing the data gathered in this way, the sensor can detect the vehicle height as any one of the nine level classifications.

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Diagnostic

When a signal (error code) indicating an abnormal condition (resulting from damage or disconnection of the heavy-line circuit, or a malfunction of a photo-transistor, etc.) is input, the alarm light illuminates and control is as described in the table below.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
22	Control stop	Held at MEDIUM	Control stop	Not accept			

Service data indication

Code No	Indication	Indication example	
22	Current vehicle-height level (ERROR when there is a malfunction) Indicates the ON or OFF status of each photo-interruptor.	When normal	22; N 1111 Indicates the vehicle-height level. ↳ Status of each photo-interruptor 1: ON, 0: OFF
		If mal-function	22; ERROR 0010 Indicates that an error code is beina output. ↳ Status of each photo-interruptor 1: ON. 0: OFF

ECU terminal voltages (when connector is connected)

Terminal No	Signal	Condition	Terminal voltage
25	Power source for sensor	When the ECU is activated	5V
54, 55 56.57	Front vehicle-height signal	When the photo-interruptors are ON	ov
		When the photo-interruptors are OFF	5V
36	Sensor circuit ground	Constantlv	ov

Checking the front-height sensor circuit (with the connector disconnected)

Terminal No	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
25 36	Front-height sensor power-supply circuit	Resistance	25-36	Contact the tester's (–) probe to terminal 25, and the (+) probe to terminal 36. Note Even if the result is good here, the sensor must not be judged tc be certainly good.	Continuity (The indicator fluctuates)
54 55 56 57	Front-height sensor	Resistance	54-36 55-36 56-36 57-36	Contact the tester's (–) probe to terminal 25, and the (+) probe to terminal 36, and check to be sure that there is continuity, leave the connections as they are. Connect the tester's (–) probe to each terminal of the wiring harness connector, and the (+) probe to terminal 36 Separate the lever (of the height sensor) from the rod, and slowly move the lever up and down.	No Continuity Continuity

Troubleshooting hints (mechanical malfunctions)

Malfunction mode	Malfunction probable cause	Malfunction	Note
Improper adjustment of the front-height sensor rod	Because of the improper adjustment of the front-height sensor rod, a signal not corresponding to the actual vehicle height is being sent to the ECU	• When the engine is stopped and left as it is, the height of only the front end decreases to lower than the NORMAL vehicle height • With the engine running, the height of the front end is lower than the NORMAL vehicle height • With the engine running (AUTO mode and NORMAL vehicle height), the height of the front end becomes higher than the NORMAL height)	–

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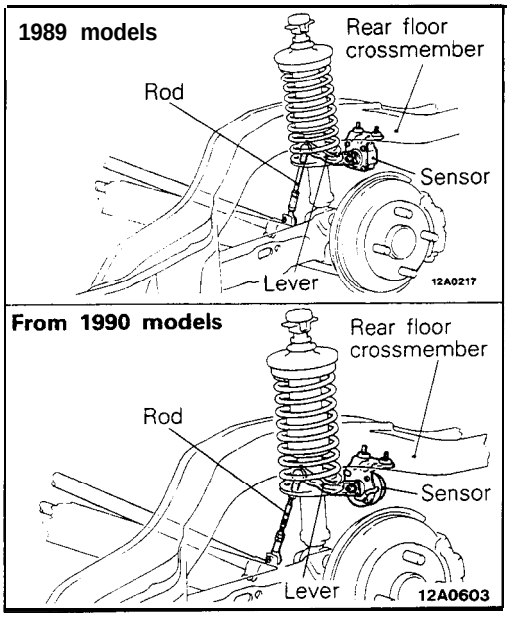
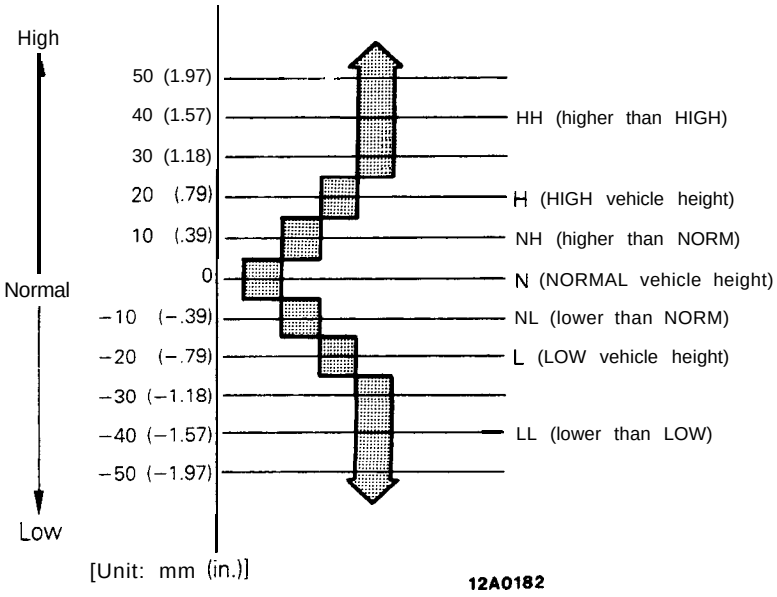
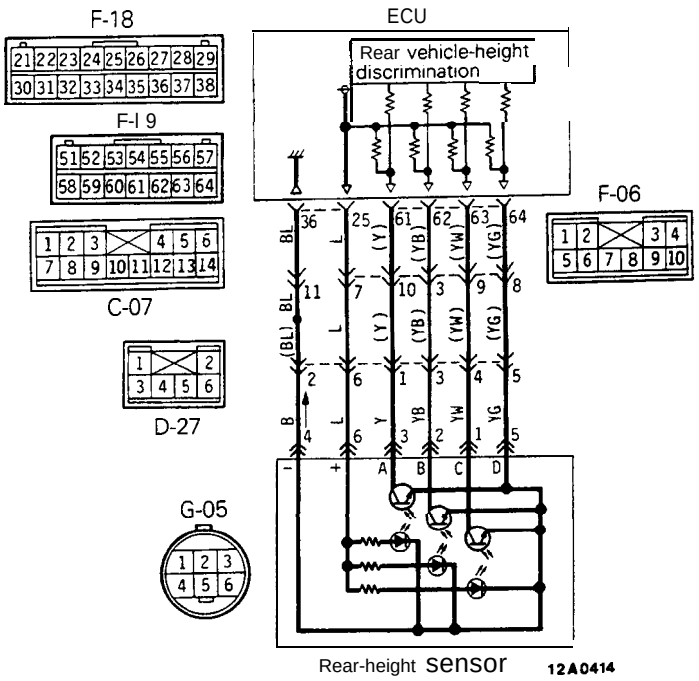
[11] REAR-HEIGHT SENSOR CIRCUIT







Operation

The rear-height sensor detects (by detecting the relative position of the body and the rear axle) the action movements (bouncing, pitching, etc.), and the vehicle height, of the rear of the vehicle. The rotating disc plate rotates in the area between three pairs of light-emitting diodes and photo-transistors, and the slits in the disc thus interrupt, or let pass. the light beams between the light-emitting diodes and the photo-transistors. By employing the data gathered in this way, the sensor can detect the vehicle height as any one of the seven level classifications.

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Diagnostic

When a signal (error code) indicating an abnormal condition (resulting from damage or disconnection of the heavy-line circuit, or a malfunction of a photo-transistor, etc.) is input, the alarm light illuminates and control is as described in the table below.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
23	Control stop	Held at MEDIUM	Control stop	Not accept			

Service data indication

Code No	Indication	Indication example	
23	Current vehicle-height level (ERROR when there is a malfunction) Indicates the ON or OFF status of each photo-interruptor.	When normal	23;N Indicates the vehicle-height level → 1111 Status of each photo-interruptor 1: ON, 0. OFF
		If mal-function	23; ERROR Indicates that an error code is being output. → 0010 Status of each photo-interruptor 1: ON, 0: OFF

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
25	Power source for sensor	When the ECU is activated	5V
61.62 63, 64	Front vehicle-height signal	When the photo-mterruptors are ON	ov
		When the photo-interruptors are OFF	5V
36	Sensor circuit ground	Constantly	ov

Checking the rear-height sensor circuit (with the connector disconnected)

Terminal No	Connection destination or Measurement measured part		Tester connection	Check condition	Standard
25 36	Rear-height sensor power-supply circuit	Resistance	25-36	Contact the tester's (–) probe to terminal 25. and the (+) probe to terminal 36 Note Even if the result is good here, the sensor must not be judged to be certainly good.	Continuity (The indicator fluctuates)
61 62 63	Rear-height sensor	A B C	Resistance	61-36 62-36 63-36	Contact the tester's (–) probe to terminal 25, and the (+) probe to terminal 36, and check to be sure that there is continuity; leave the connections as they are. Connect the tester's (–) probe to each terminal of the wiring harness connector, and the (+) probe to terminal 36. Separate the lever (of the height sensor) from the rod, and slowly move the lever up and down	No Continuity ↕ Continuity
64		D	Resistance	64–ground	Constantly	Continuity

Troubleshooting hints (mechanical malfunctions)

Malfunction mode	Malfunction probable cause	Malfunction	Note
Improper adjustment of the rear-height sensor rod	Because of the improper adjustment of the rear-height sensor rod, a signal not corresponding to the actual vehicle height is being sent to the ECU	• When the engine is stopped and left as it is, the height of only the rear end decreases to lower than the NORMAL vehicle height. • With the engine running, the height of the rear end is lower than the NORMAL vehicle height • With the engine running (AUTO mode and NORMAL vehicle height), the height of the rear end becomes higher than the NORMAL height).	–

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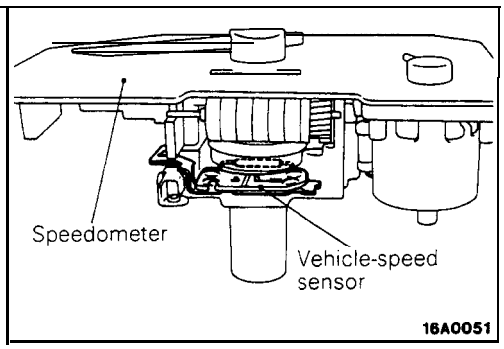
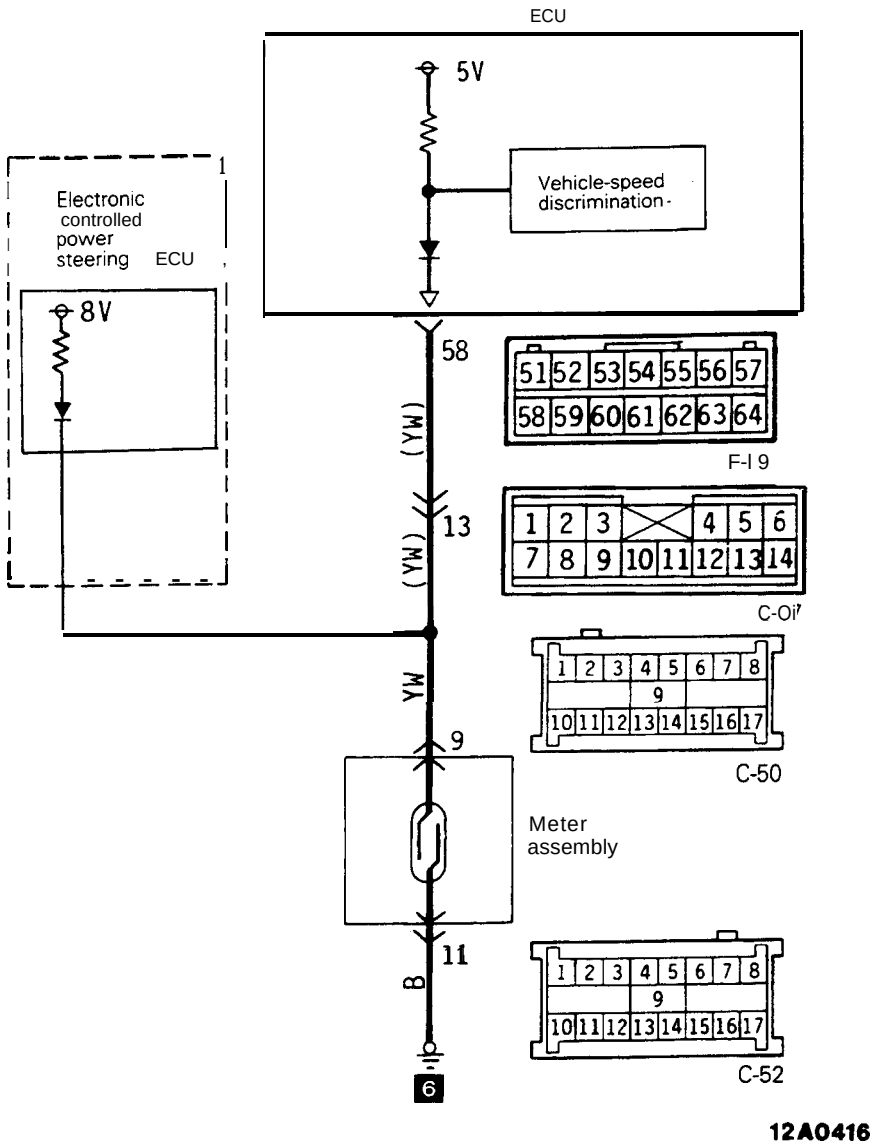
[12] VEHICLE-SPEED SENSOR CIRCUIT





Operation

The vehicle-speed sensor is a reed switch type with pulse signals being sent four times for each rotation of the transaxle output gear.

Diagnostic

If there is damage or disconnection of the heavy-line circuit, or a malfunction of the vehicle-speed sensor, the alarm light illuminates and control is as described in the table below.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
24	Control stop	Held at MEDIUM	Held at NORMAL	Not accept			

Service data indication

Code No	Indication	Display
24	Indicates the vehicle speed input to the ECU (including the simulated vehicle speed)	24: SPEED SNSR. 0 km/h

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
58	Vehicle-speed signal	When the vehicle-speed sensor reed switch is ON	ov
		*When the vehicle-speed sensor reed switch is OFF	8V

*In order to supply the EPS pull-up power (8V)

Checking the vehicle-speed sensor circuit (with the connector disconnected)

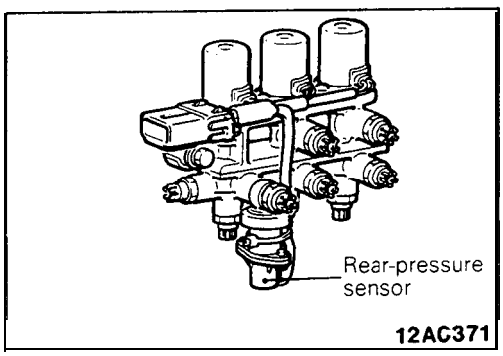
Terminal No	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
58	Vehicle-speed sensor	Resistance	58–ground	With the battery's (–) terminal disconnected, move the vehicle back and forth.	Continuity ↓ No continuity

Troubleshooting hints

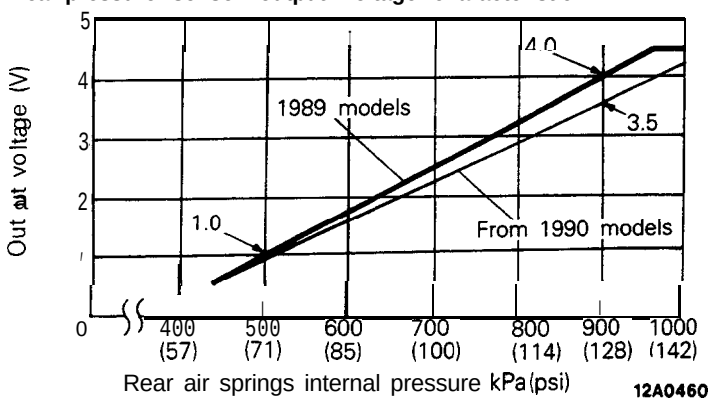
In actual urban driving, it is not so likely that the throttle is kept 30% or more open for more than 30 seconds. Therefore, the conditions have been somewhat stricter to prevent unnecessary application of the fall safe function due to the racing of the engine when stopped. However, the vehicle may run uncontrolled for some distance when the speed sensor fails.

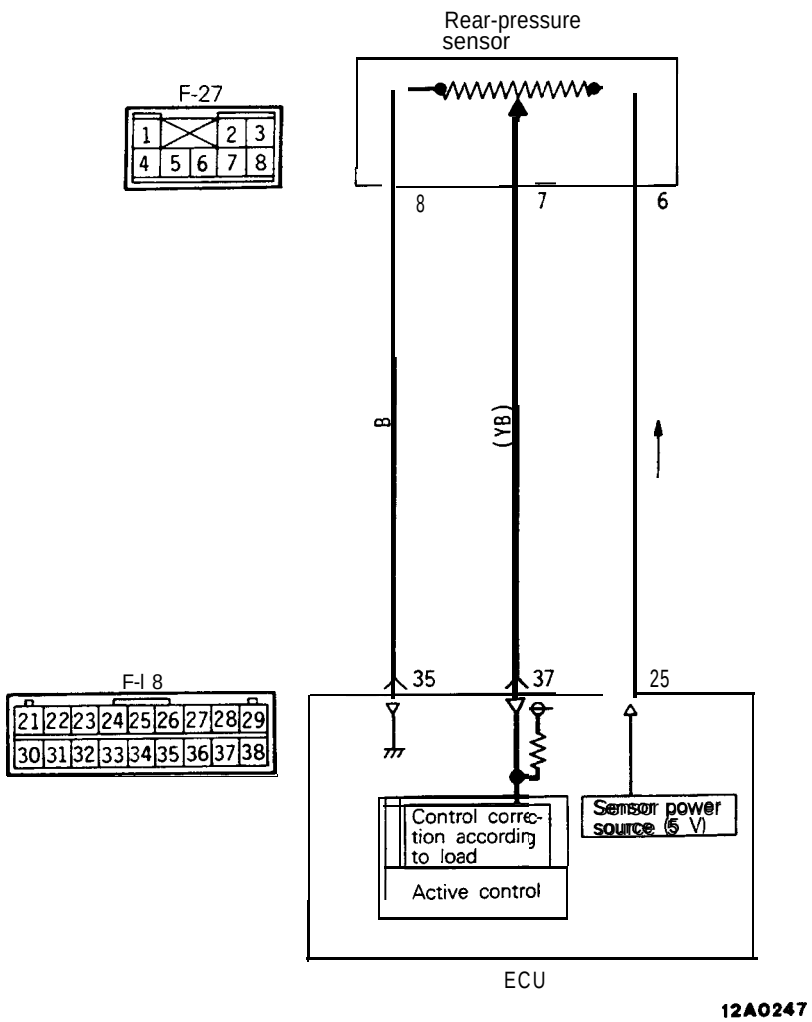
This takes into account that the vehicle speed sensor is shared by many systems such as EPS, Auto-cruise control, etc. and that the failure of the sensor can also be detected from the state of these systems.

[13] REAR-PRESSURE SENSOR CIRCUIT



Rear-pressure sensor output voltage characteristic





Operation

The rear-pressure sensor detects the internal pressure of the rear air springs.

Although the timing of air supply and exhaust for control of the vehicle attitude is basically determined according to a predetermined "map", the supplying and exhaust times are corrected as necessary, according to data from this sensor, in order to cope with changes of the load carried by the vehicle and other factors.

TSB Revision

Diagnostic

If, because of damage or disconnection of the heavy-line circuit, or a malfunction of the rear-pressure sensor, etc., a higher than normal value of the internal pressure of the air springs is indicated continuously, the alarm light illuminates*, and control is as described in the table below. Note, however, this diagnostic signal is given if there is an overload.

* 1989 models
  The alarm light does not illuminate for 1990, 1991, 1992, 1993 models.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
25	Control stop	Normal operation	Only the vehicle-height increase control function stops.	Not accept	Accept		

1990, 1991, 1992, 1993 models: HIGH-AUTO change possible. If the above diagnostic number is detected, the damping force that is the base of the SOFT mode and AUTO mode changes to the MEDIUM damping force.

Service data indication

Code No.	Indication	Standard value	Display
25	Rear-pressure sensor output voltage	Fluctuates within a range of 0.5V to 4.5V when the body is shaken from side to side.	25; RR. PRESS. SNSR. 2.45V

Condition		Reference value
Front seats: 2 persons	When HIGH vehicle height	1.60V
	When NORMAL vehicle height	0.90V
	When LOW vehicle height	0.86V

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
25	Power supply for sensor	When the ECU is activated	5V
37	Rear air spring pressure signal	Low rear air spring pressure High rear air spring pressure	0.5V | 4.5V
		When wiring is damaged or disconnected	5V
35	Sensor circuit ground	Constantly	ov

Checking the rear-pressure sensor (with the connector disconnected)

Terminal No	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
25 35	Rear-pressure sensor All resistances	Resistance	25-35	Constantly	Approx. 5 kΩ
37	Rear-pressure sensor output	Resistance	37-35	Change should be smooth (according to the air pressure applied to the rear -pressure sensor) within the standard value range shown at the right	0–5 kΩ

Troubleshooting hints (mechanical malfunctions)

Malfunction mode	Malfunction probable cause	Malfunction	Note
Harness short-circuit	Because of a short-circuit of the harness, etc , no correction of the air-supply and exhaust time can be made to compensate for a loaded condition of the vehicle.	Insufficient control of the attitude, resulting in a feeling of incompatibility	–
Air leakage	Wear, damage, etc. of the O-ring	Vehicle height decreases if not corrected	–

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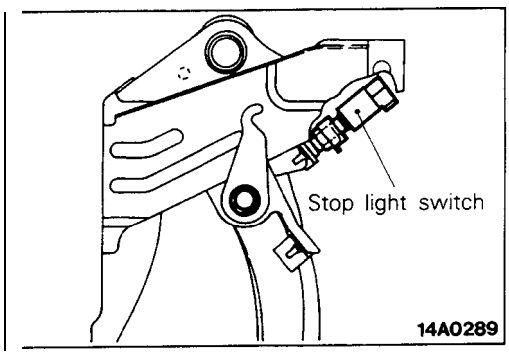
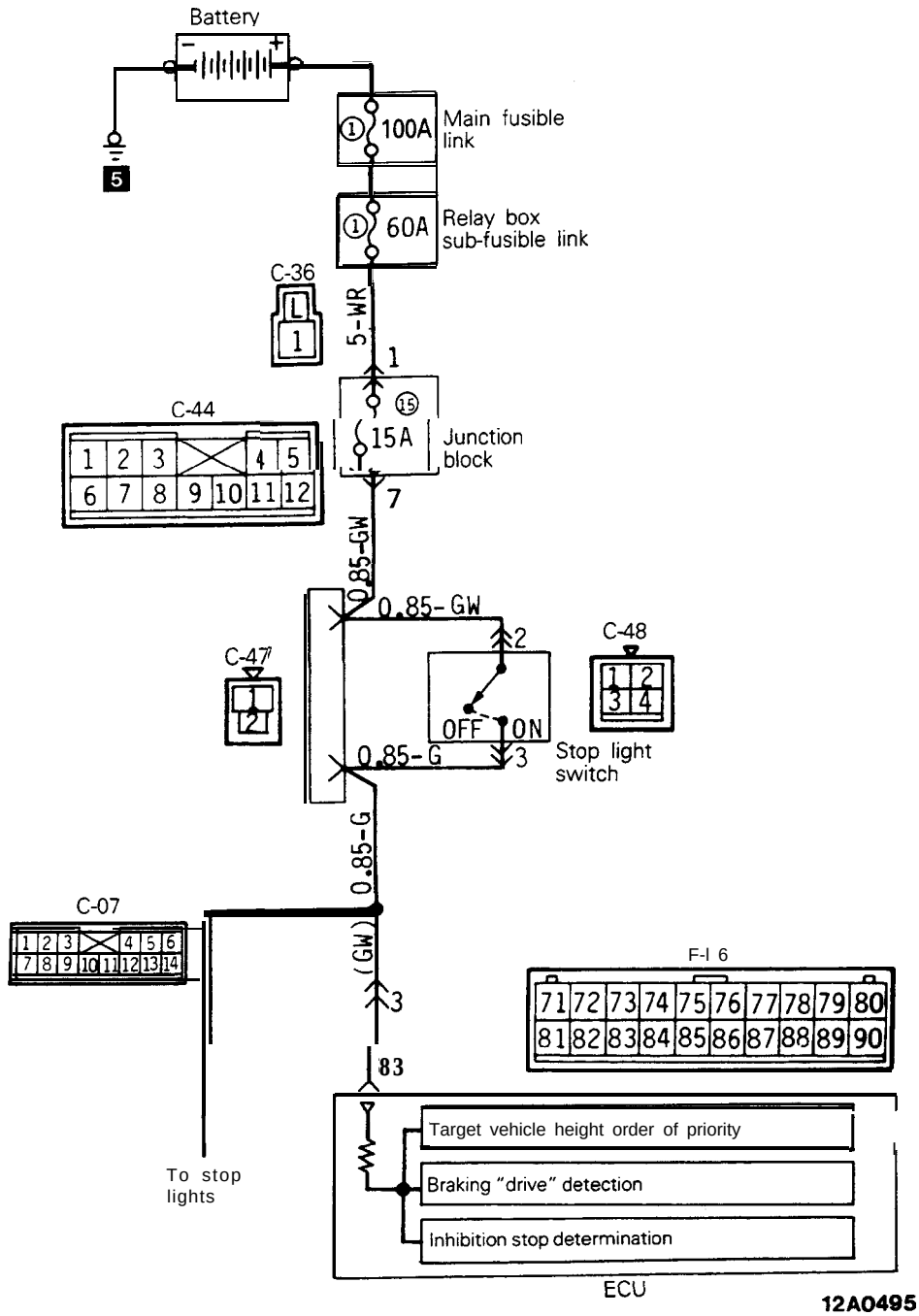
[14] STOP LIGHT SWITCH CIRCUIT





TSB Revision

Operation

When the brake pedal is depressed, the stop light switch is switched ON and 12V is sent to the ECU, thus resulting in the detection that braking is in progress.

Service data indication

Code No.	Indication	Display
26	Indicates the ON or OFF status of the stop light switch.	26; STOP LAMP SW. ON/OFF

ECU terminal voltages (when connector is connected)

Terminal No	Signal	Condition	Terminal voltage
83	Stop light switch signal	When the stop light switch is ON	0 V
		When the stop light switch is OFF	B+

B+: Battery positive voltage

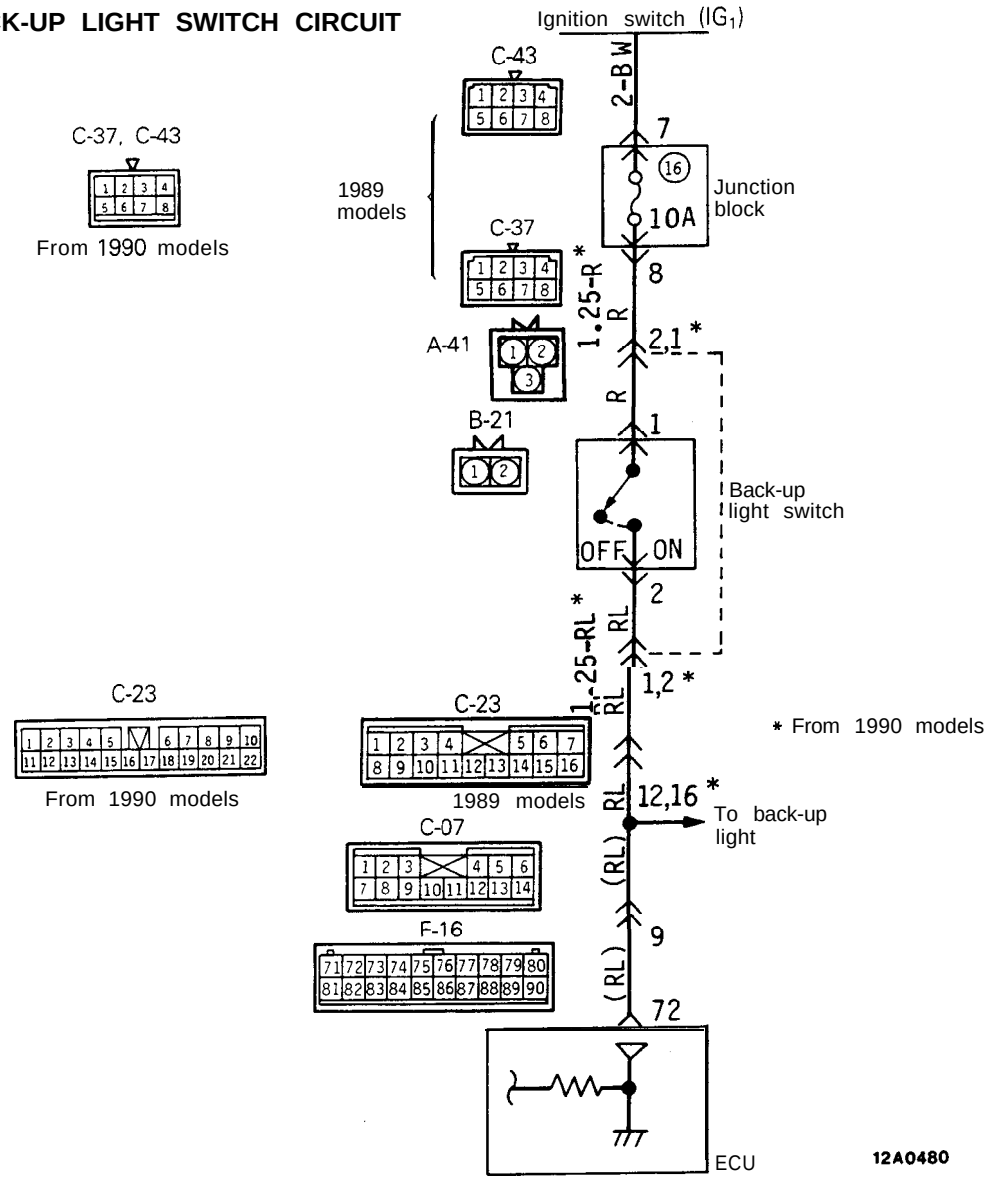
Checking the stop light switch circuit (with the connector disconnected)

Terminal No	Connection destination or measured part	Measurement	Tester connection	Check condition		Standard
83	Stop light switch	Voltage	83–ground	Ignition switch ON	Depress the brake pedal.	B+
					Do not depress the brake pedal.	0 V

B+: Battery positive voltage

TSB Revision

[15] BACK-UP LIGHT SWITCH CIRCUIT



Checking the back-up light switch circuit (with the connector disconnected)

Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition		Standard
72	Back-up light	Voltage	72–ground	With the shift lever shifted to the REVERSE position	Ignition switch OFF	ov
					Ignition switch ON	B+

B+: Battery positive voltage

Service data indication

Code No.	Indication	Display
32	Indicates the ON or OFF status of the back-up light switch.	32; M/T BACK LAMP ON/OFF

ECU terminal voltages (when connector is connected)

Terminal No	Signal	Condition	Terminal voltage
72	Manual transaxle back-up signal	When the back-up light switch is ON	B+
		When the back-up light switch is OFF	ov

B+: Battery positive voltage

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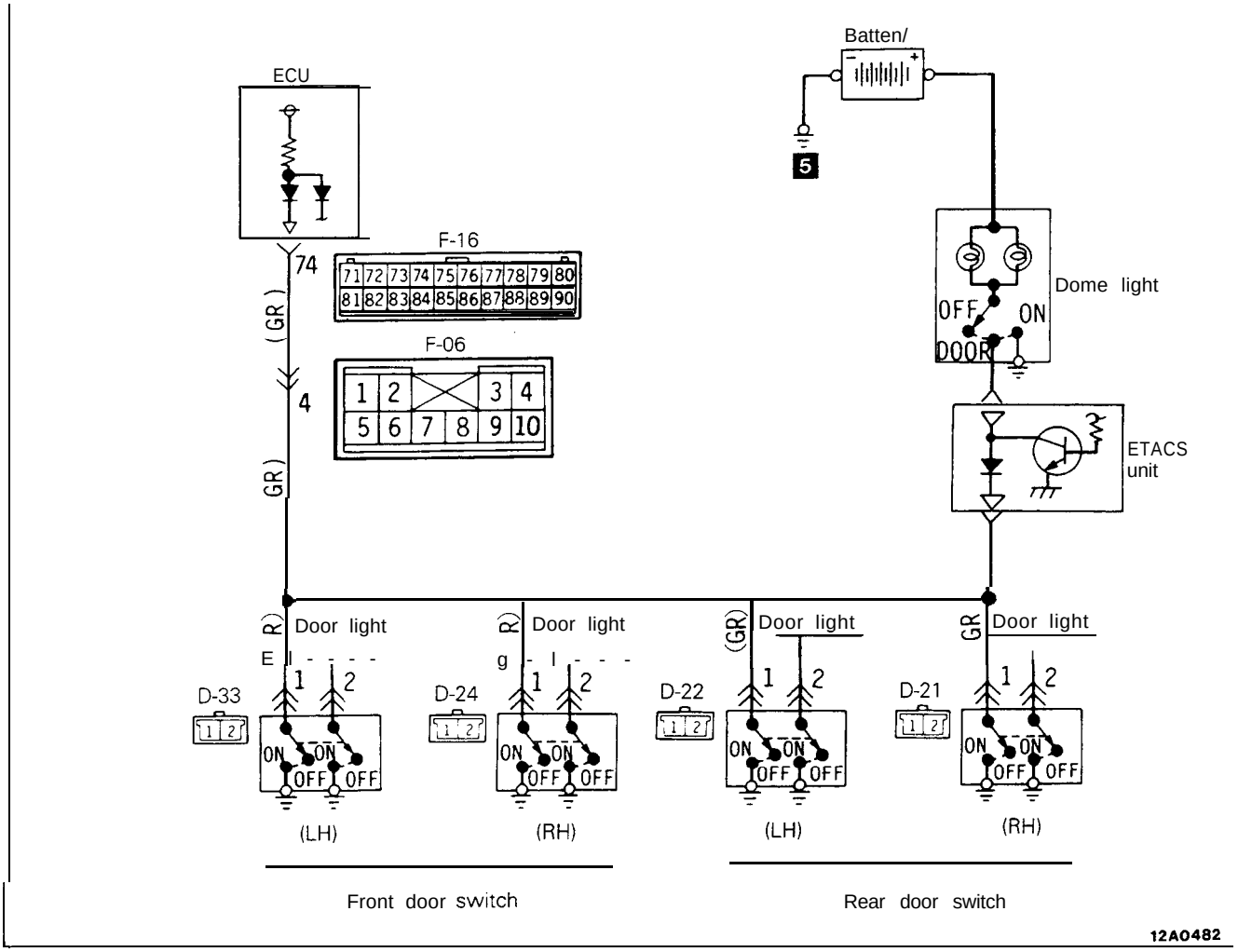
[16] DOOR SWITCH CIRCUIT



Service data indication

Code No	Indication	Display
33	Indicates the ON or OFF status of the door switch (Indicates ON if at least one door is opened.)	33: DOOR SW. ON/OFF

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
74	Door switch signal	When a door (at least one) is opened	ov
		When the door is closed	B+

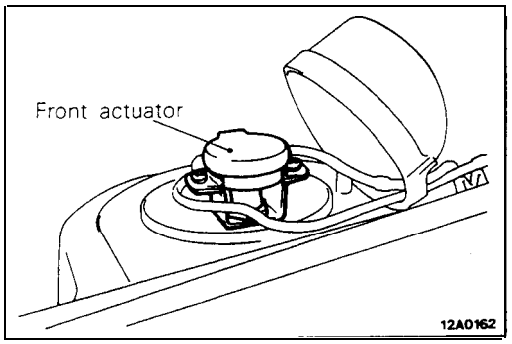
B+: Battery positive voltage

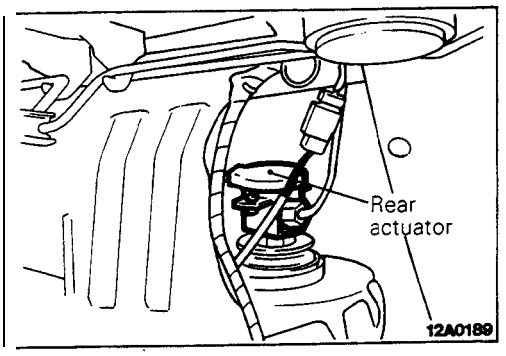
Checking the door switch circuit (with the connector disconnected)

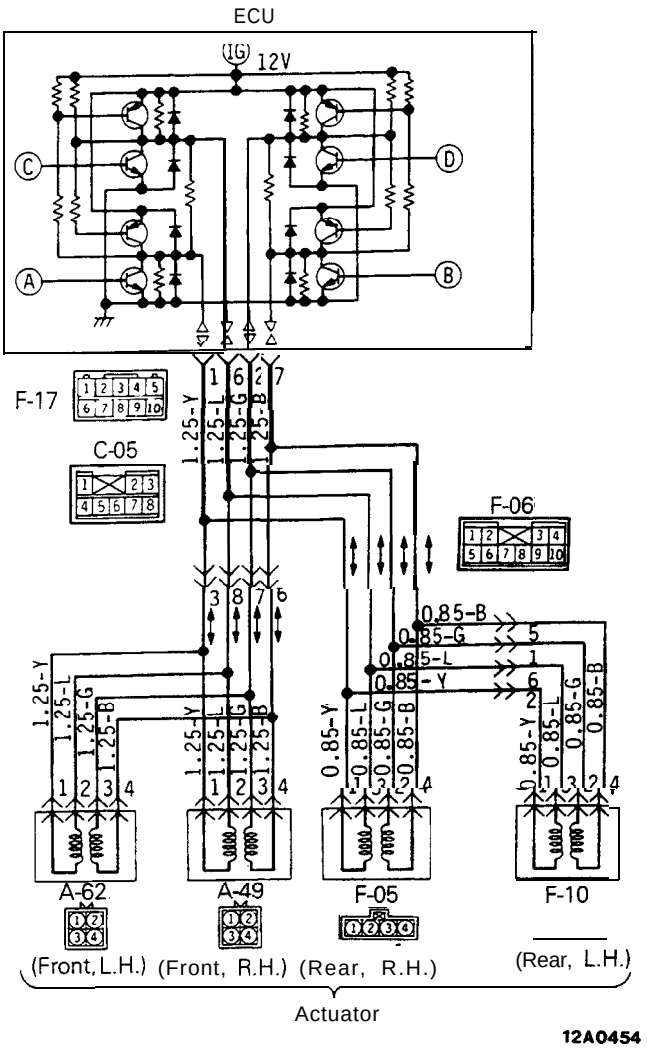
Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
74	Door switch	Resistance	74–ground	Disconnect the battery's negative (–) terminal and close all doors.	No continuity
				Disconnect the battery's negative (–) terminal and open the doors one by one.	Continuity

TSB Revision

[17] DAMPING FORCE SWITCHING ACTUATOR DRIVE CIRCUIT







Operation

The damping force switching actuator is the step motor. That allows the control rod of each shock absorber to rotate, thus selecting the damping force at one of four levels (HARD, MEDIUM, AUTO-SOFT or SOFT).

Diagnostic

If there is damage or disconnection of the heavy-line circuit, the alarm light illuminates, and control is as described in the table below. (Because the actuators are connected in parallel, there can be no detection if wiring damage or disconnection occurs at the final circuit.)

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
41	Control stop	Control stop	Held at NORMAL	Not accept			

Actuator compulsory activation

Code No.	Applicable operatron	Description of activation
01	SOFT damping force	The damping force is compulsorily switched to SOFT: there is a return to the original damping force three seconds thereafter
02	AUTO-SOFT damping force	The damping force is compulsorily switched to AUTO-SOFT; there is a return to the original damping force three seconds thereafter
03	MEDIUM damping force	The damping force is compulsorily switched to MEDIUM; there is a return to the original damping force three seconds thereafter
04	HARD damping force	The damping force is compulsorily switched to HARD; there is a return to the original damping force three seconds thereafter

ECU terminal voltages (when connector is connected)

Terminal No	Signal	Condition	Terminal voltage
1	Damping force switching actuator activation signal Phase A	When the damping force switching actuator is stopped	6V
		When the damping force switching actuator is activated	0 ⇄ B+
2	Damping force switching actuator activation signal Phase B	When wiring is damaged or disconnected	B+
6	Damping force switching actuator activation signal Phase C	When the damping force switching actuator is stopped	6V
		When the damping force switching actuator is activated	B+ ⇄ 0 pulse
7	Damping force switching actuator activation signal Phase D	When wiring is damaged or disconnected	ov

B+: Battery positive voltage

Checking the damping force switching actuator drive circuit (with the connector disconnected)

Terminal No	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
1 6	Damping force switching actuator (step motor)	Resistance	1–6	Four coils that have a constant resistance of 6.4 ± 0.1 ohms are connected in parallel (front and rear)	Approx 1.6 Ω
2 7	Damping force switching actuator (step motor)	Resistance	2-7	Four coils that have a constant resistance of 6.4 ± 0.1 ohms are connected in parallel (front and rear).	Approx. 1.6Ω

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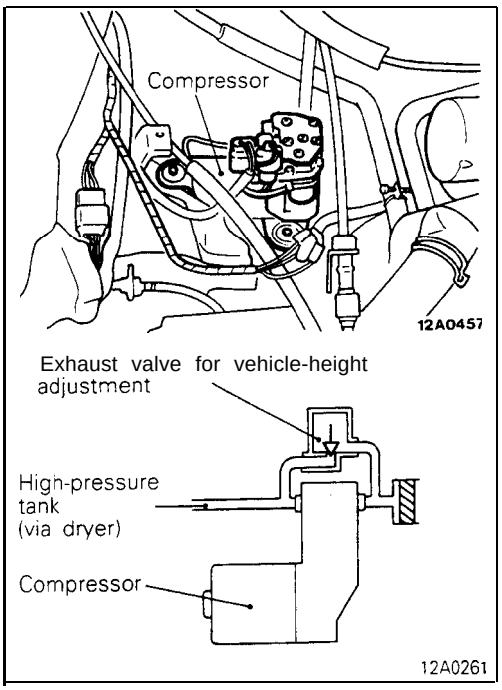
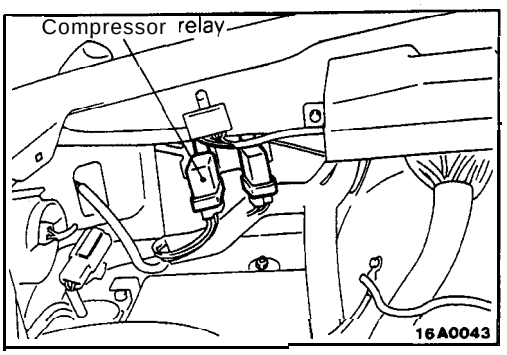
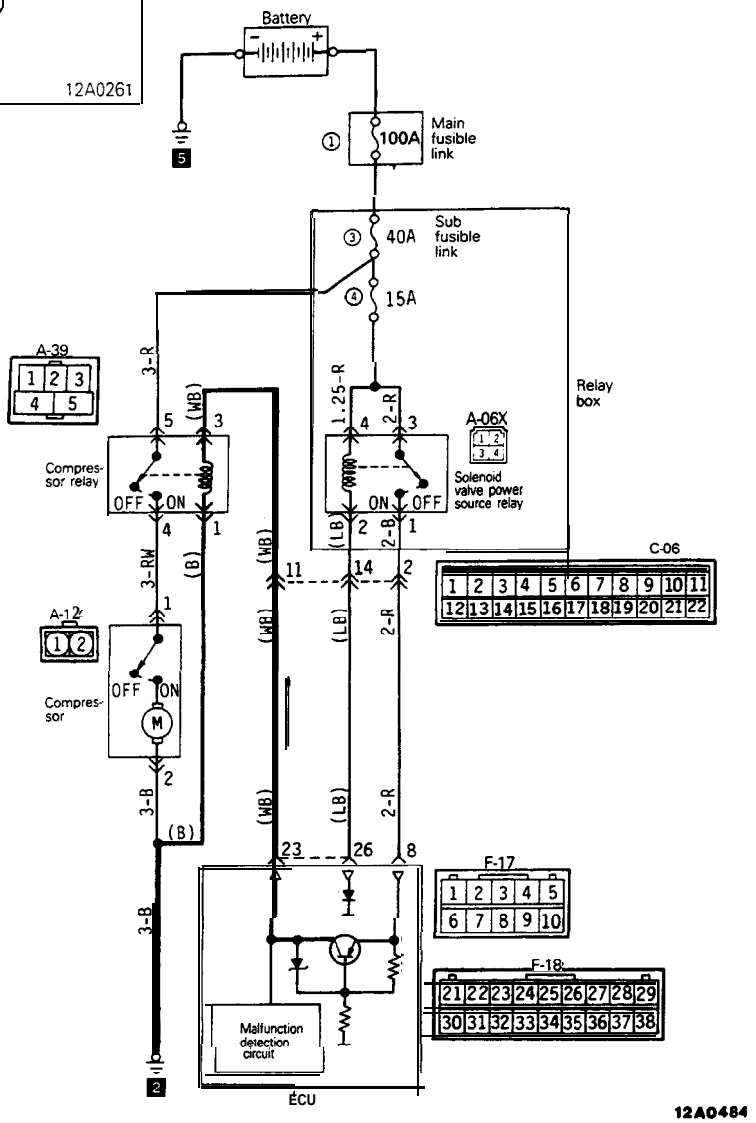
[18] COMPRESSOR DRIVE CIRCUIT







TSB Revision

Operation

The compressor is activated when the pressure within the high-pressure tank decreases to 760 kPa (108 psi) or lower, and then stops two seconds after the pressure reaches 950 kPa (135 psi). Note, however, that the compressor is not activated while the return pump is operating. A thermal switch is provided at the motor circuit. This thermal switch functions to interrupt the power to the motor (in order to protect the compressor) if the temperature within the compressor becomes high.

Diagnostic

If there is damage or disconnection of the heavy-line circuit, or a short-circuit, or a malfunction of the output transistor within the ECU, the alarm light illuminates and control is as described in the table below.
(Note that the diagnostic is only applicable up to the compressor relay.)

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
43	Control stop	Held at MEDIUM	Control stop	Not accept			

Actuator compulsory activation

Code No.	Applicable operation	Description of activation
05	Compressor relay ON	The compressor relay is compulsorily switched ON for a period of three seconds.

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
23	Compressor relay activation signal	When the compressor relay is ON	B+
		When the compressor relay is OFF	0V
		During fail-safe (solenoid valve power-source relay switch OFF)	0V

B+: Battery positive voltage

Checking the compressor drive circuit (with the connector disconnected)

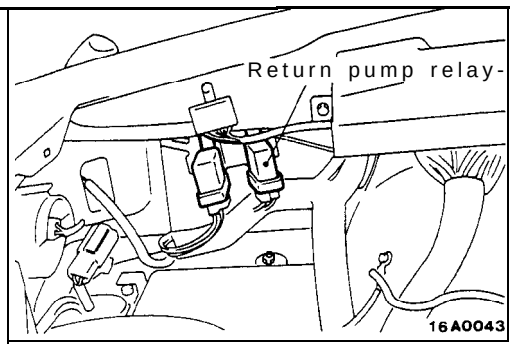
Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
23	Compressor relay	Resistance	52–ground	Constantly	Approx. 75Ω
				Next apply battery voltage to terminal 23.	Compressor operation

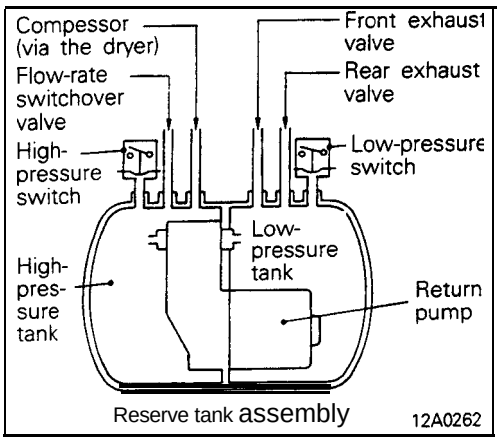
Troubleshooting hints (mechanical malfunctions)

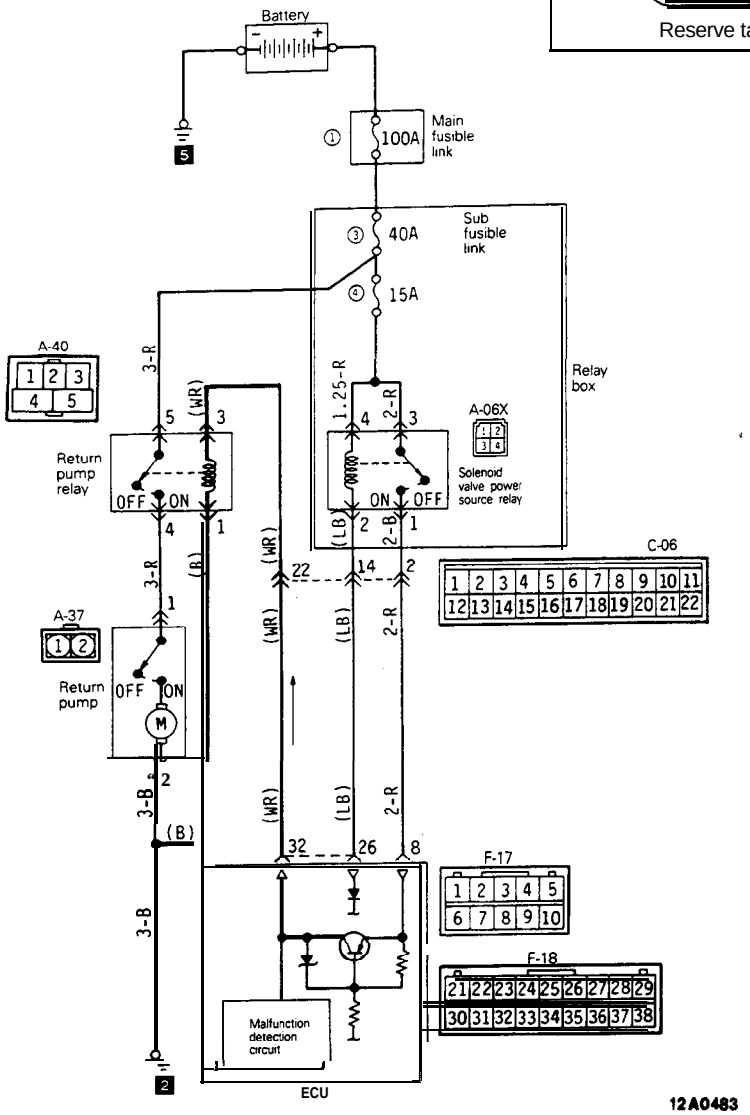
Malfunction mode	Malfunction probable cause	Malfunction	Note
The compressor relay is fused.	The compressor relay contacts are shorted.	The compressor won't stop, causing the battery to discharge.	–
The compressor is stuck.	The compressor won't operate due to shorting, etc.	The vehicle height can't be increased.	–

TSB Revision

[19] RETURN PUMP DRIVE CIRCUIT







Operation

The return pump is activated when the pressure within the low-pressure pressure tank increases to 140 kPa (20 psi) or higher, and then stops two seconds after the pressure is reduced to 70 kPa (10 psi) or lower.

A thermal switch is provided at the motor circuit. This thermal switch functions to interrupt the power to the motor (in order to protect the return pump) if the temperature within the return pump becomes high.

TSB Revision

Diagnostic

If there is damage or disconnection of the heavy-line circuit, or a short-circuit, or a malfunction of the output transistor within the ECU, the alarm light illuminates and 'control is as described in the table below. (Note that the diagnostic is only applicable up to the compressor relay.)

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
44	Rolling control only stops.	Held at MEDIUM	Rolling control only stops.	Not accept			

Actuator compulsory activation

Code No	Applicable operation	Description of activation
06	Return pump relay ON	The return pump relay is compulsorily switched ON for a period of three seconds.

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
32	Return pump relay activation signal	When the return pump relay is ON	B+
		When the return pump relay is OFF	ov
		During fail-safe (solenoid valve power source relay switch OFF)	ov

B+: Battery positive voltage

Checking the return pump drive circuit (with the connector disconnected)

Terminal No.	Connection destination o r measured part	Measurement	Tester connection	Check condition	Standard
32	Return pump relay	Resistance	32–ground	Constatly	Approx 75Ω
				Next apply battery voltage to terminal 32.	Return pump operation

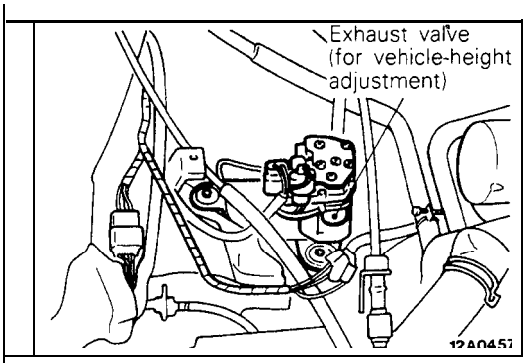
NOTE (Refer to Vol.2 GENERAL for the circuit diagram.)
Procedures for changing the internal pressure of the low-pressure tank
(1) For 70 kPa (10 psi) or lower
Short-circuit the battery power-source ⑩ terminal to the return pump relay ㉜ terminal in order to activate the return pump for a few seconds, and then leave as is.
(2) For 140 kPa (20 psi) or higher
Short-circuit the battery power-source ⑩ terminal to the front intake-air solenoid ㉑ terminal and the front right solenoid ④ terminal in order to connect the high-pressure tank and low-pressure tank, and then leave as is for a few seconds.
Procedures for changing the internal pressure of the high-pressure tank
(1) For 760 kPa (108 psi) or lower
Short-circuit the battery power-source ⑩ terminal to the discharge-air solenoid (for vehicle-height adjustment) ㉛ terminal, the front intake-air solenoid ㉑ terminal and the front right solenoid ④ terminal and the front discharge-air solenoid ㉔ terminal in order to release the atmosphere inside the high-pressure tank, and then leave as is for a few seconds.
(2) For 950 kPa (135 psi) or higher
Short-circuit the battery power-source ⑩ terminal to the compressor relay ㉓ terminal in order to activate the compressor for a few seconds, and then leave as is.

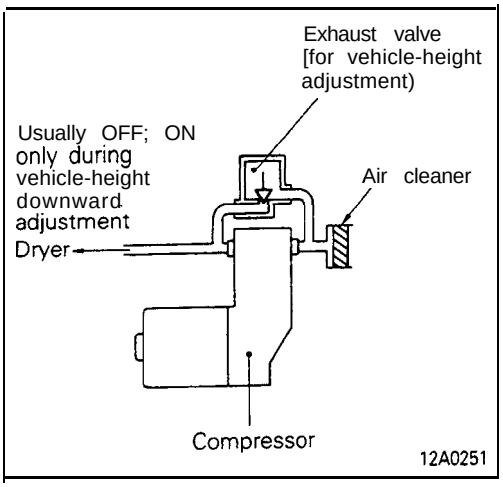
Troubleshooting hints (mechanical malfunctions)

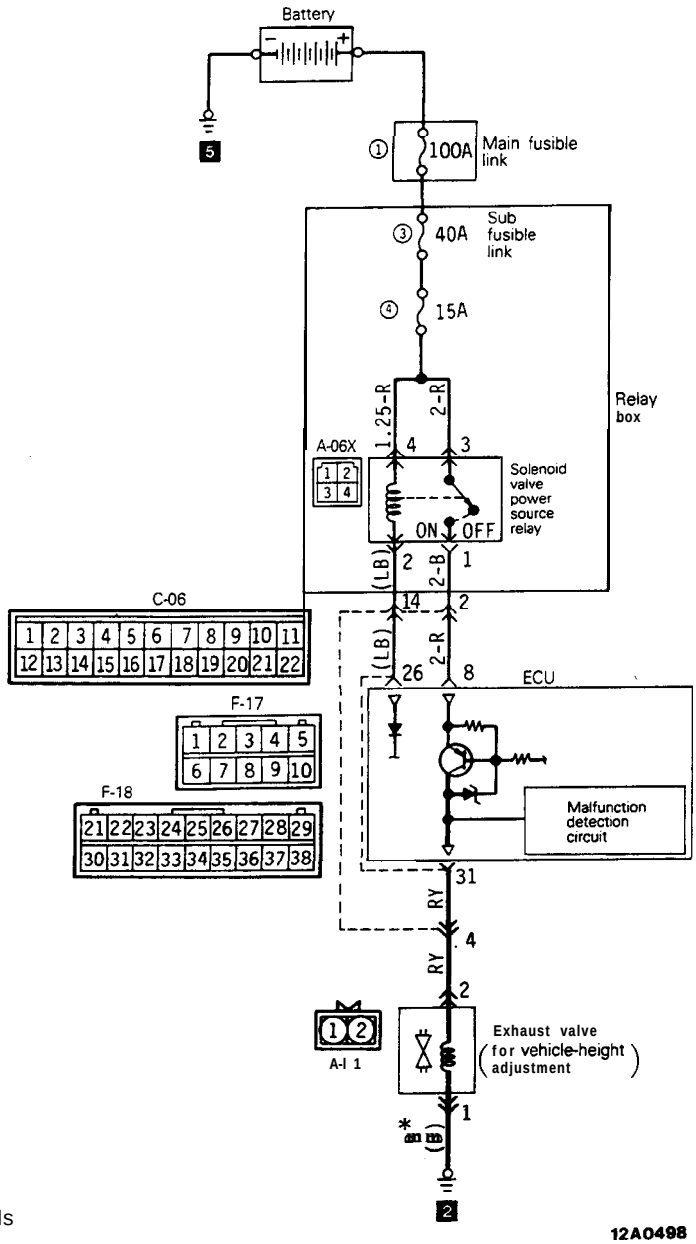
Malfunction mode	Malfunction probable cause	Malfunction	Note 1
The return pump relay is fused	The return pump relay contacts are shorted.	The return pump won't stop, causing the battery to discharge.	–
The return pump is stuck.	The return pump won't operate due to shorting, etc.	* Insufficient attitude-control effect. • Vehicle height increases after rolling control.	–

TSB Revision

[20] EXHAUST VALVE ACTIVATION CIRCUIT (FOR VEHICLE-HEIGHT ADJUSTMENT)







*: 1991 models

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Operation

The exhaust valve for adjustment of the vehicle height is installed at the compressor assembly.
This valve is switched ON only when a downward adjustment of the vehicle height is being made; it functions to discharge air (from the air springs) into the atmosphere.

Diagnostic

If there is damage or disconnection of the heavy-line circuit, or a short-circuit, or a malfunction of the output transistor within the ECU, the alarm light illuminates and control is as described in the table below.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
45	Rolling control only stops	Held at MEDIUM	Rolling control only stops.	Not accept			

Actuator compulsory activation

The exhaust valve for vehicle-height adjustment is activated by the following.

Code No	Applicable operation
07	Vehicle height downward adjustment

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
31	Exhaust valve (for vehicle-height adjustment) activation signal	When the exhaust valve (for vehicle-height adjustment) is ON (open)	B+
		When the exhaust valve (for vehicle-height adjustment) is OFF (closed)	ov
		During fail-safe (for solenoid valve power source relay switch OFF)	ov

B+: Battery positive voltage

Checking the exhaust valve (for vehicle-height adjustment) activation circuit (with the connector disconnected)

Terminal No	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
31	Exhaust valve (for vehicle-height adjustment)	Resistance	31 -ground	Constantly	Approx. 15Ω

Troubleshooting hints (mechanical malfunctions)

Malfunction mode	Malfunction probable cause	Malfunction	Note
Stuck in the OFF (closed) position	Air cannot be discharged because the valve is stuck in the OFF (closed) due to corrosion, freezing, etc. caused by moisture penetration.	Vehicle height doesn't decrease.	Diagnostic trouble code No.54 is output.
Stuck in the ON (open) position	Air discharge cannot be stopped because the valve is stuck in the ON (open) due to corrosion, freezing, etc. caused by moisture penetration.	• Vehicle height doesn't increase. • Compressor doesn't stop.	Diagnostic trouble code No.55 is output.
Air leakage at valve seat	Valve seat is worn.	• Vehicle height doesn't increase. • Compressor doesn't stop.	Diagnostic trouble code No.55 is output

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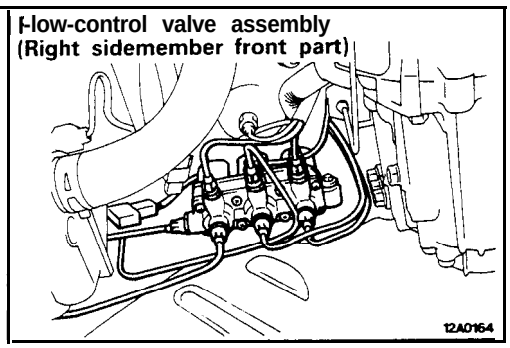
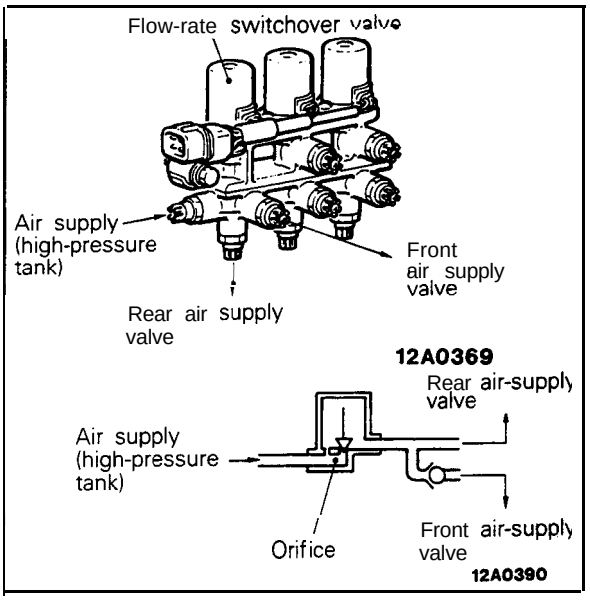
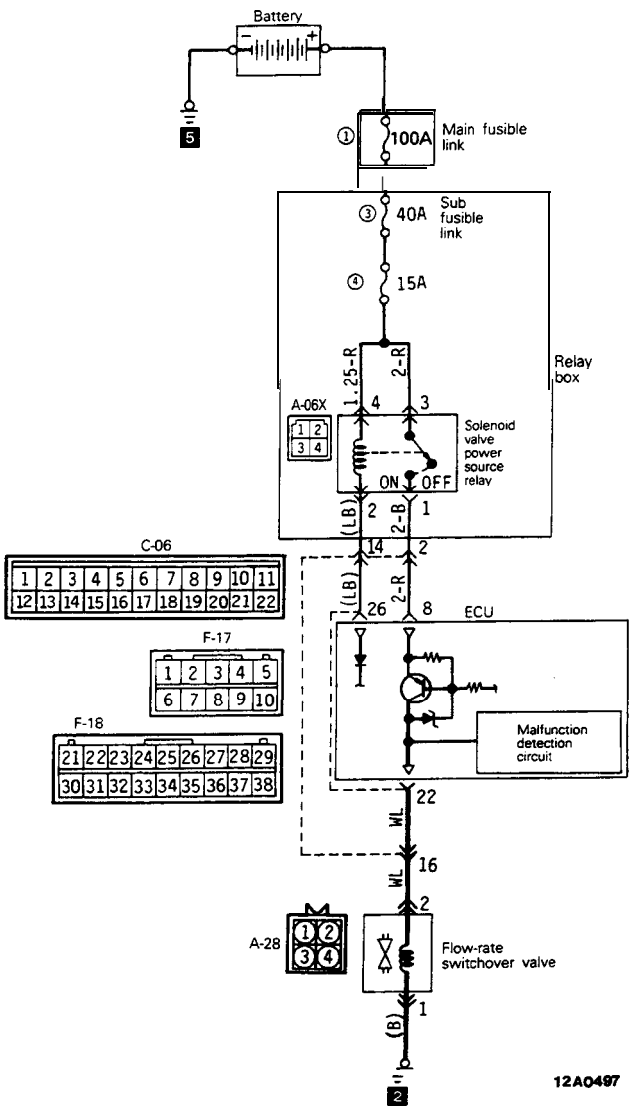
[21] FLOW-RATE SWITCHOVER VALVE ACTIVATION CIRCUIT







Operation

The flow-rate switchover valve switches, in two stages, the intake air flow volume supplied to each of the air springs.
Usually, during ordinary adjustments of the vehicle height, the flow-rate switchover valve is OFF (closed) in order to suppress the speed of the change of vehicle height to the appropriate speed, and the air is supplied to each of the air springs with the flow volume restricted by the orifice.
This valve is switched ON (opened) for rapid adjustment of the vehicle height, or during control of rolling, etc., when the vehicle is traveling on a bad road surface, thus permitting a greater amount of air to be supplied to the air springs.

Diagnostic

If there is damage or disconnection of the heavy-line circuit, or a short-circuit, or a malfunction of the output transistor within the ECU, the alarm light illuminates and control is as described in the table below.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
46	Rolling control only stops	Held at MEDIUM	Rolling control only stops	Not accept			

Actuator compulsory activation

The flow-rate switchover valve is activated by the following.

Code No	Applicable operation
09	Rolling control (left turn)
10	Rolling control (right turn)

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
22	Flow-rate switchover valve activation signal	When the flow-rate switchover valve is ON (open)	B+
		When the flow-rate switchover valve is OFF (closed)	ov
		During fail-safe (solenoid valve power source relay switch OFF)	ov

B+: Battery positive voltage

Checking the flow-rate switchover valve activation circuit (with the connector disconnected)

Terminal No	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
22	Flow-rate switchover valve activation signal	Resistance	22–ground	Constantly	Approx. 10Ω

Troubleshooting hints (mechanical malfunctions)

Malfunction mode	Malfunction probable cause	Malfunction	Note
Stuck in the OFF (closed) position	The valve is stuck in the OFF (closed) due to corrosion, freezing, etc. caused by moisture penetration.	• Insufficient rolling control effect, A feeling of incompatibility. • The vehicle height decreases after rolling control. • The vehicle height upward adjustment is slow when a poor road surface is detected.	
Stuck in the ON (open) position	The valve is stuck in the ON (open) due to corrosion, freezing, etc. caused by moisture penetration.	• The upward adjustment of the vehicle height is excessive. • There is a feelina of incompatibility during rolling control (excessive control):	–
Air leakage to atmosphere	Wear, etc of the O-ring, etc.	• The compressor is activated too frequently. • There is a feeling of incompatibility during rolling control	Very slight leakages cannot be detected Such leakage is detected a long time afterward by a decrease of the vehicle height.

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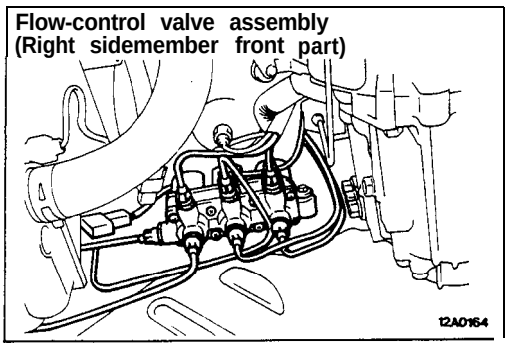
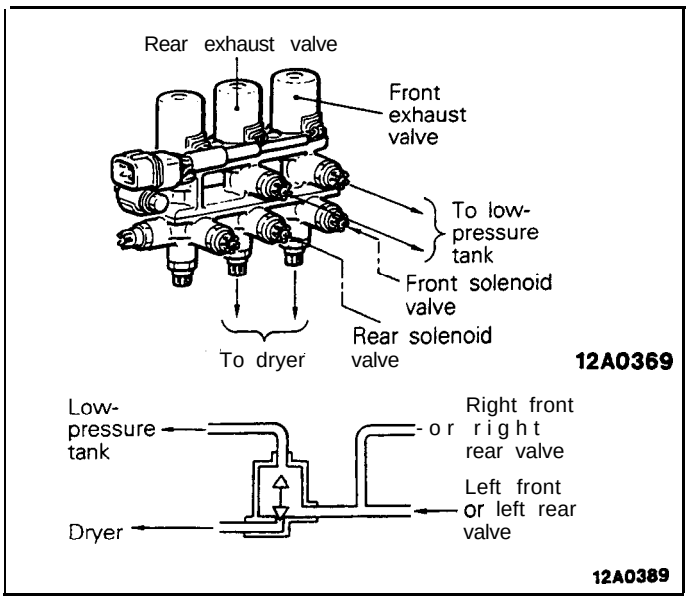
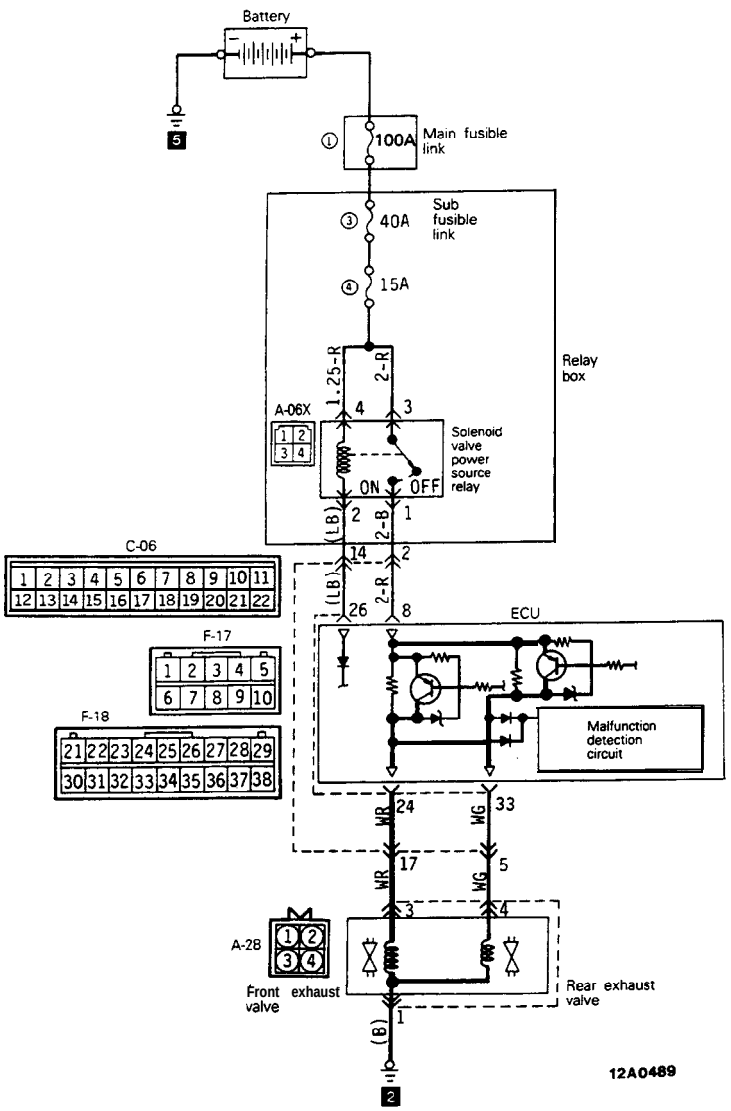
[22] FRONT/REAR EXHAUST VALVE ACTIVATION CIRCUIT







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Operation

These valves switch the air exhausted (from the front and rear left and right strut air springs) to either internal recirculation or discharge to the atmosphere. These valves are OFF (closed) during the attitude-control air-exhaust mode, and the exhaust air is led to the low-pressure tank and is once again circulated within the system. The valves are ON (open) during downward adjustment of the vehicle height, and the exhaust air, after passing through the dryer, is discharged (from the exhaust valves for vehicle-height adjustment) into the atmosphere. These valves are switched ON (opened), in order to maintain the differential pressure of the strut air springs, when the rolling control is being maintained.
(At this time, because the exhaust valves for vehicle-height adjustment are OFF (closed), air is not discharged to the atmosphere.)

Diagnostic

If there is damage or disconnection of the heavy-line circuit, or a malfunction of an output transistor within the ECU, the alarm light illuminates, and control is as described in the table below.
Note that the malfunction-detection circuit is the same for the front and the rear exhaust valves.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
47	Control stop	Held at MEDIUM	Control stop	Not accept			

Actuator compulsory activation

The front or the rear exhaust valves are activated by the following.

Code No	Applicable operation
07	Vehicle height downward adjustment
09	Rolling control (left turn)
10	Rolling control (right turn)

ECU terminal voltage (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
24	Front exhaust valve activation signal	When the front/rear exhaust valves are ON (open)	B+
		When the front/rear exhaust valves are OFF (closed)	o v
33	Rear exhaust valve activation signal	During fail-safe (for solenoid valve power source relay switch OFF)	o v

B+: Battery positive voltage

Checking the front/rear exhaust valves activation circuit (with the connector disconnected)

Terminal No	Connection destination measured pan	or $M_{easur}e\ m\ e_{nt}$	Tester connection	Check condition	Standard
24	Front exhaust valve	Resistance	24–ground	Constantly	Approx. 10Ω
33	Rear exhaust valve	Resistance	33–ground	Constantly	Approx 1 0Ω

Troubleshooting hints (mechanical malfunctions)

Malfunction mode	Malfunction probable cause	Malfunction	Note
Stuck in the OFF (closed) position	The exhaust air cannot be switched to the outside-discharge mode because the valve is stuck in the OFF (closed) due to corrosion, freezing, etc caused by moisture penetration	• The vehicle-height adjustment (downward) cannot be made at the front or rear. • The vehicle height decreases at the front or rear during rolling control hold. • The vehicle-height adjustment (downward) is too fast and is excessive. • The return pump is activated during the vehicle-height adjustment (downward)	–
Stuck in the ON (open) position	The exhaust air cannot be switched to the internal-circulation mode because the valve is stuck in the ON (open) due to corrosion, freezing, etc caused by moisture penetration.	• Insufficient attitude control effect (air cannot be discharged). • The front or rear vehicle height increases after the rolling control.	–

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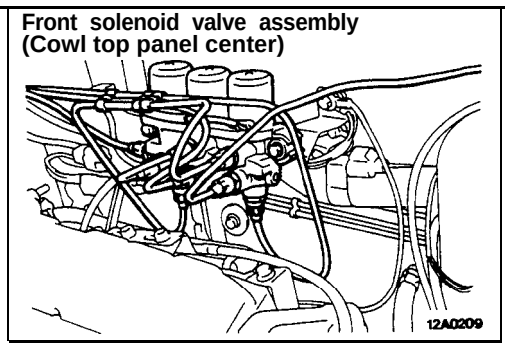
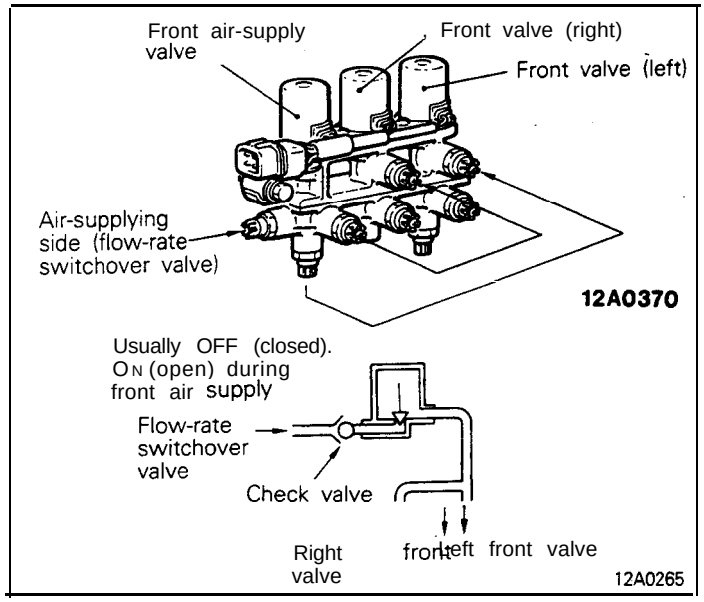
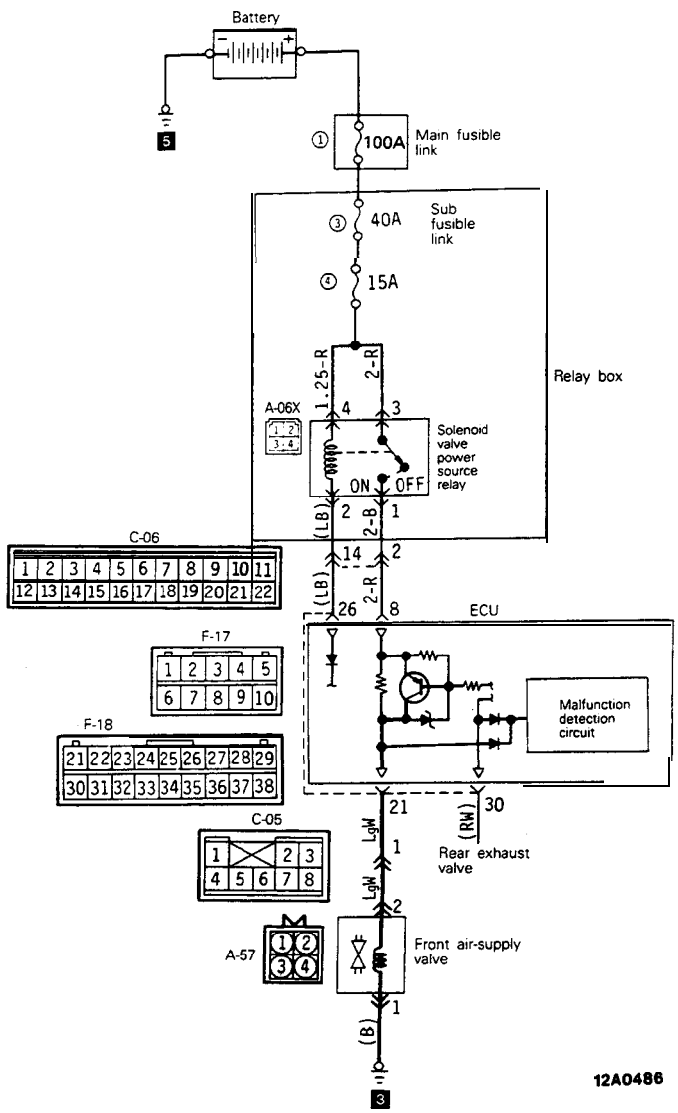
[23] FRONT AIR-SUPPLY VALVE ACTIVATION CIRCUIT







Operation

The front air-supply valves are switched ON (opened) for air supply to the left and right strut air springs during attitude control and during vehicle-height adjustment upward.

Usually, and during air exhaust, these valves are OFF (closed).
Note that a check valve is provided in these valves in order to prevent reverse flow of the air.

Diagnostic

If there is damage or disconnection of the heavy-line circuit, or a malfunction of an output transistor within the ECU, the alarm light illuminates, and control is as described in the table below.
Note that the malfunction-detection circuit is the same for the rear air-supply valves.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
51	Control stop	Held at MEDIUM	Control stop	Not accept			

Actuator compulsory activation

The front air-supply valves are activated by the **following.**

Code No	Applicable operation
0	Vehicle herght upward adjustment
09	Rolling control (left turn)
10	Rolling control (right turn)

ECU terminal voltage {when connector is connected)

Terminal No	Signal	Condition	Terminal voltage
21	Front air-supply valve activation signal	When the front air-supply valves are ON (open)	B+
		When the front air-supply valves are OFF (closed)	ov
		During fail-safe (for solenoid valve power source relay switch OFF)	ov

B+: Battery positive voltage

Checking the front air-supply valve activation circuit (with the connector disconnected)

Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
21	Front air-supply valve	Resistance	21 -ground	Constantly	Approx. 10Ω

Troubleshooting hints (mechanical malfunctions)

Malfunction mode	Malfunction probable cause	Malfunction	Note
Stuck in the OFF (closed) position	Air cannot be supplied in because the valve is stuck in the OFF (closed) due to corrosion, freezing, etc caused by moisture penetration	• The front vehicle-height will not increase. • Insufficient control of rolling and braking dive • The front vehicle-height decreases after rolling control.	–
Stuck in the ON (open) position	Air supply cannot be stopped because the valve is stuck in the ON (open) due to corrosion, freezing, etc. caused by moisture penetratron.	The front vehicle-height increases and the body tilts to one side	–
Air leakage at the valve seat	Valve seat is worn,	• When left as is, the front vehicle-height increases. • The front vehicle-height downward adjustment frequency increases.	Diagnostic No.56 output
Air leakage to **atmosphere**	Wear, etc of the O-ring, etc.	• When left as IS, the front vehicle-height decreases. • Air is not accumulated in the high-pressure tank. • The compressor is activated too frequently.	Very slight leakages cannot be detected Such leakage is detected a long time afterward by a decrease of the vehicle height

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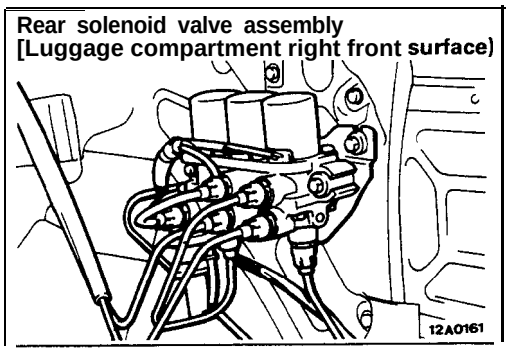
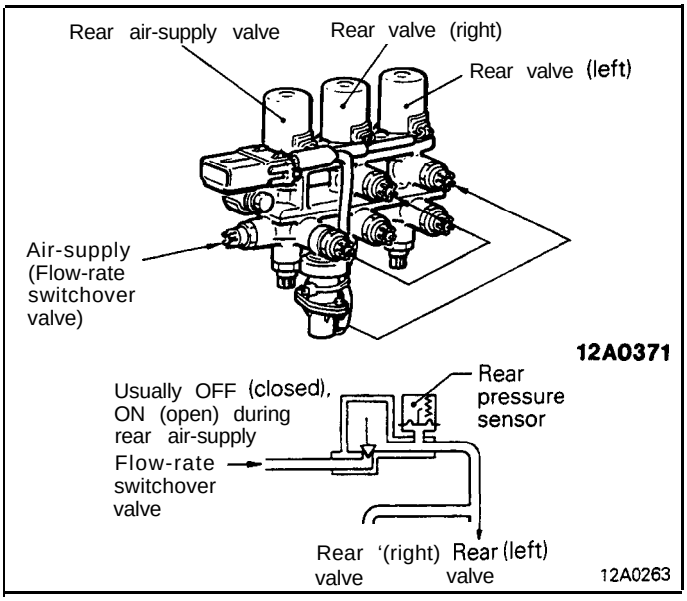
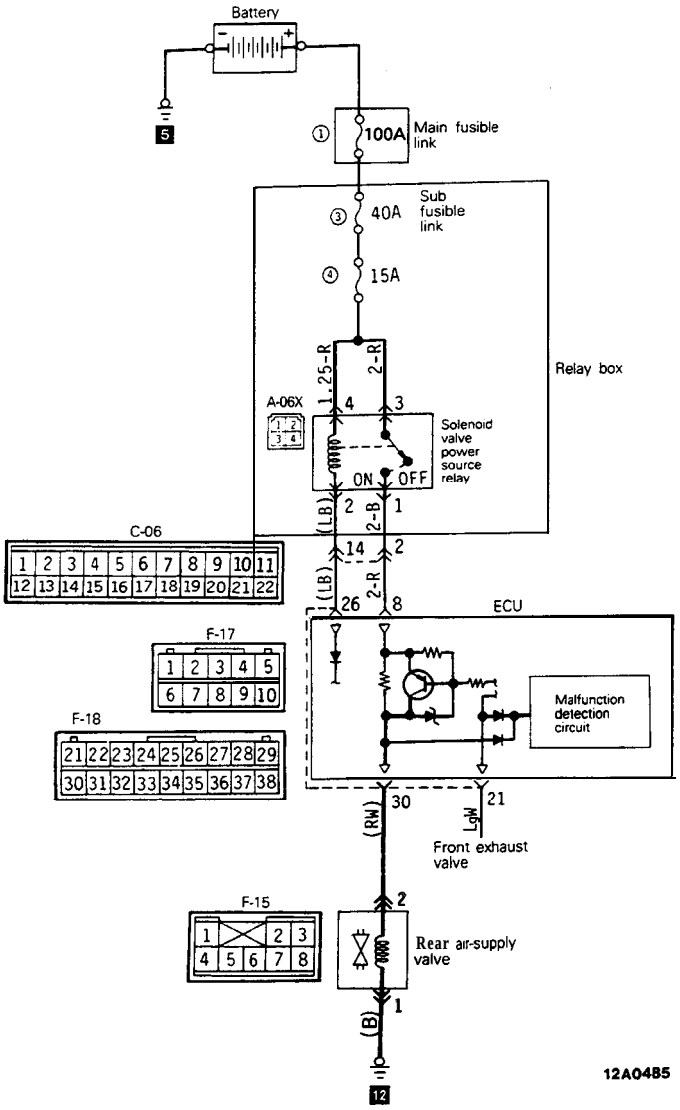
[24] REAR AIR-SUPPLY VALVE ACTIVATION CIRCUIT







Operation

The rear air-supply valves are switched ON (opened) for air supply to the left and right air springs during attitude control and during vehicle-height adjustment upward.

Usually, and during air exhaust, these valves are OFF (closed). Note that the rear-pressure sensors, for detection of the internal pressure of the rear shock absorbers, are installed in thesevalves.

Diagnostic

If there is damage or disconnection of the heavy-line circuit, or a malfunction of an output transistor within the ECU, the alarm light illuminates, and control is as described in the table below.
Note that the malfunction-detection circuit is the same for the front air-supply valves.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
51	Control stop	Held at MEDIUM	Control stop	Not accept			

Actuator compulsory activation

The rear air-supply valves are activated by the following.

Code No	Applicable operation
08	Vehicle height downward adjustment
09	Rolling control (left turn)
10	Rolling control (right turn)

ECU terminal voltage (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
30	Rear air-supply valve activation signal	When the rear air-supply valves are ON (open)	B+
		When the rear air-supply valves are OFF (closed)	0 v
		During fail-safe (for solenoid valve power source relay switch OFF)	0 v

B+: Battery positive voltage

Checking the rear air-supply valve activation circuit (with the connector disconnected)

Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
30	Rear air-supply valve	Resistance	30–ground	Constantly	Approx. 10Ω

Troubleshooting hints (mechanical malfunctions)

Malfunction mode	Malfunction probable cause	Malfunction	Note
Stuck in the OFF (closed) position	Air cannot be supplied in because the valve is stuck in the OFF (closed) due to corrosion, freezing, etc. caused by moisture penetration.	• The rear vehicle-height will not increase • Insufficient control of rolling and squat. • The rear vehicle-height decreases after rolling control.	–
Stuck in the ON (open) position	Air supply cannot be stopped because the valve is stuck in the ON (open) due to corrosion, freezing, etc. caused by moisture penetration.	The rear vehicle-height increases and the body tilts to one side	–
Air leakage at the valve seat	Valve seat is worn.	• When left as is, the rear vehicle-height increases • The rear vehicle-height downward adjustment frequency increases.	Diagnostic No.56 output
Air leakage to atmosphere	Wear, etc. of the O-ring, etc	• When left as is, the rear vehicle-height decreases • Air is not accumulated in the high-pressure tank • The compressor is activated too frequently.	Very slight leakages cannot be detected Such leakage is detected a long time afterward by a decrease of the vehicle height

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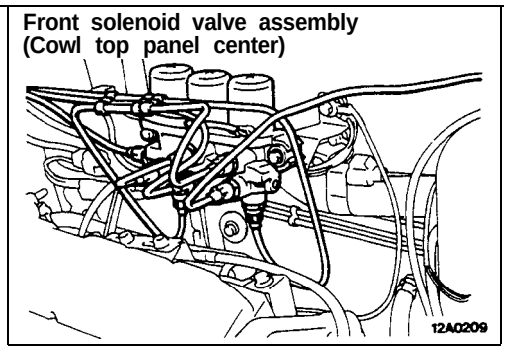
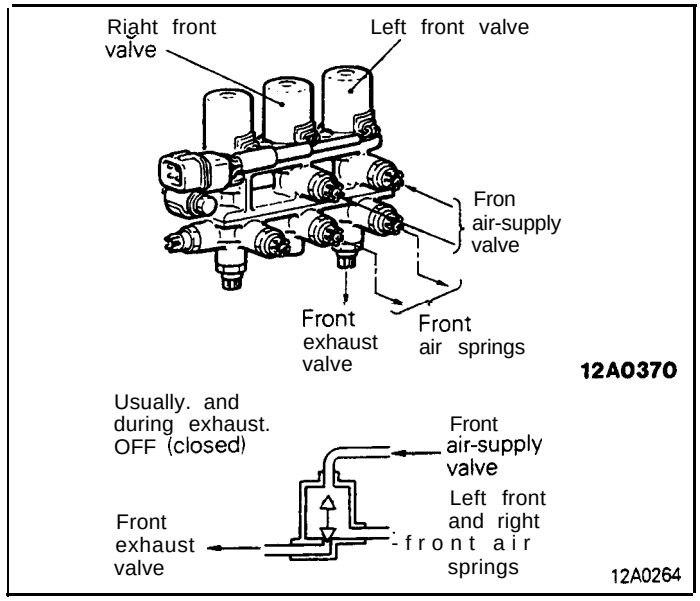
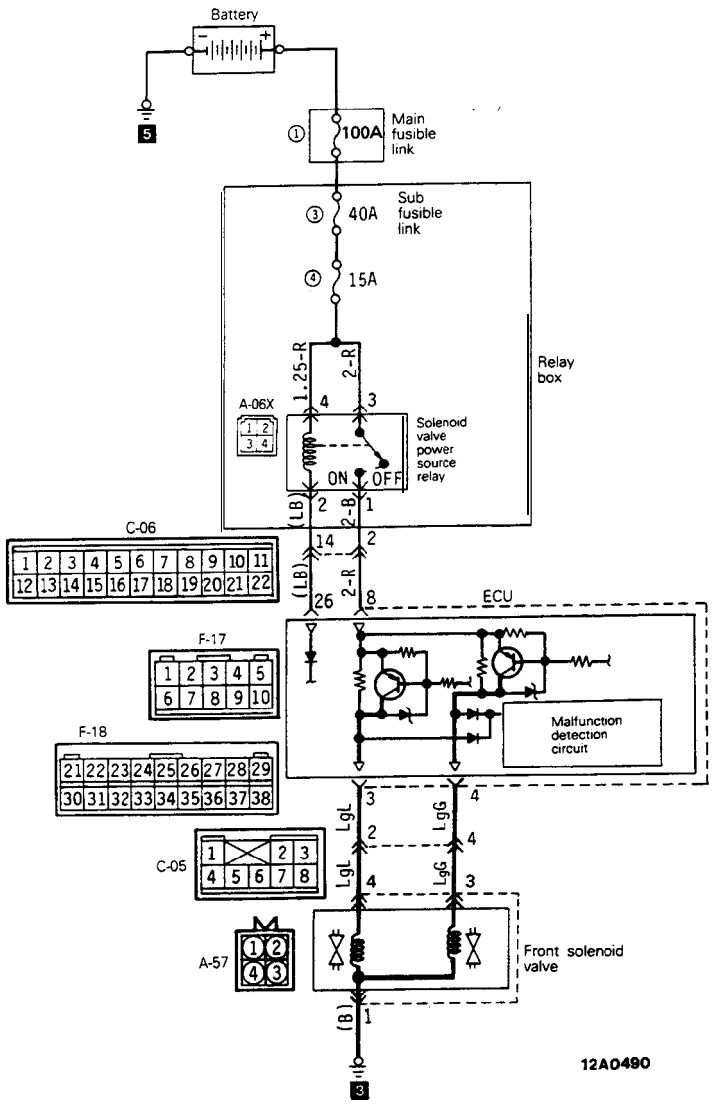
[25] LEFT FRONT/RIGHT FRONT VALVE ACTIVATION CIRCUIT







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Operation

The left front and right front valves are for switching the air intake and exhaust for the left front and right front strut air springs. These valves are usually, and during air intake, OFF (closed), and are ON (open) during exhaust.

Diagnostic

If there is damage or disconnection of the heavy-line circuit, or a malfunction of an output transistor within the ECU, the alarm light illuminates, and control is as described in the table below.
Note that the malfunction-detection circuit is the same for the left front and right front valves.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
52	Control stop	Held at MEDIUM	Control stop	Not accept			

Actuator compulsory activation

The left front and right front valves are activated by the following.

Code No.	Applicable operation
07	Vehicle height downward adjustment
09.10	Rolling control (left turning: left valve)/rolling control (right turning: right valve)

ECU terminal voltages (when connector is connected]

Terminal No	Signal	Condition	Terminal voltage
3	Left front valve activation signal	When the left/right front valves are ON	B+
		When the left/right front valves are OFF	ov
4	Right front valve activation signal	During fail-safe (for solenoid valve power source relay switch OFF)	ov

B+: Battery positive voltage

Checking the left front/right front valves activation circuit (with the connector disconnected)

Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
3	Left front valve	Resistance	3–ground	Constantly	Approx 10Ω
4	Right front valve	Resistance	4–ground	Constantly	Approx 10Ω

Troubleshooting hints (mechanical malfunctions)

Malfunction mode	Malfunction probable cause	Malfunction	Note
Stuck in the OFF (closed) position	Air cannot be discharged because the valve is stuck in the OFF (closed) due to corrosion, freezing, etc. caused by moisture penetration.	• The left front and right front vehicle height increases after rolling control. • Insufficient active control effect.	–
Stuck in the ON (open) position	Air cannot be taken in because the valve is stuck in the ON (open) due to corrosion. freezing, etc. caused by moisture penetration	• The left front and right front vehicle height decreases, and the body tilts to one side. • The return pump is activated too frequently.	Diagnostic trouble code No.56 is output.
Air leakage at valve seat	Valve seat is worn	When left as is, the front vehicle-height will decrease.	Diagnostic trouble code No.56 is output.
Air leakage to atmosphere	Wear, etc of the O-ring, etc	When left as is. the front vehicle-height will decrease.	Very slight leakages cannot be detected. Such leakage is detected a long time afterward by a decrease of the vehicle height

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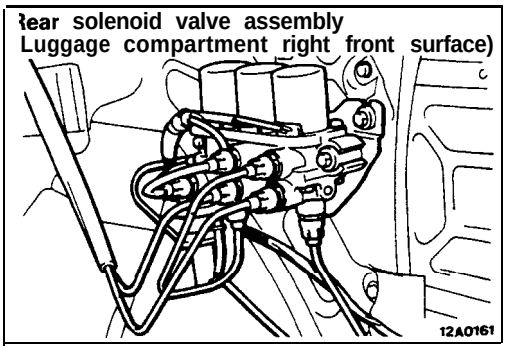
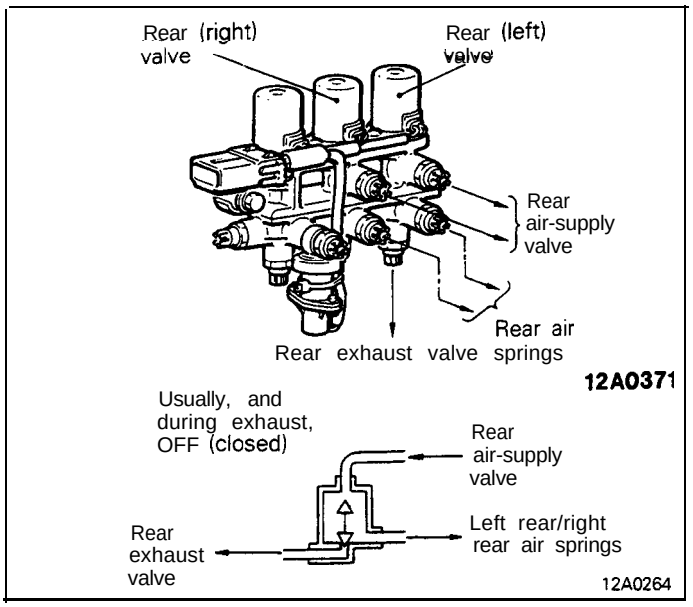
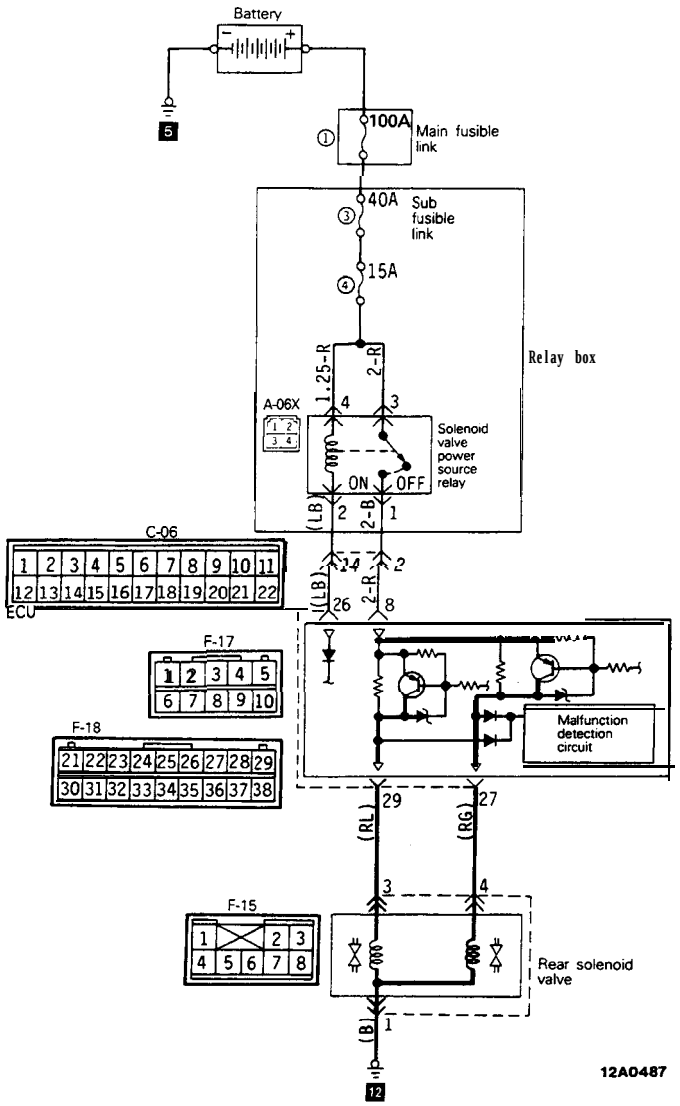
[26] LEFT REAR/RIGHT REAR VALVE ACTIVATION CIRCUIT







Operation

The left rear and right rear valves are for switching the air supply and exhaust for the left rear and right rear shock absorber air springs. These valves are usually, and during air supply, OFF (closed), and are ON (open) during exhaust.

Diagnostic

If there is damage or disconnection of the heavy-line circuit, or a malfunction of an output transistor within the ECU, the alarm light illuminates, and control is as described in the table below.
Note that the malfunction-detection circuit is the same for the left rear and right rear valves.

Diagnostic No.	Attitude control	Damping force control	Vehicle-height control	Switch acceptance			
				HIGH	SPORT	AUTO	SOFT
53	Control stop	Held at MEDIUM	Control stop	Not accept			

Actuator compulsory activation

The left rear and right rear valves are activated by the following.

Code No.	Applicable operation
07	Vehicle height downward adjustment
09.10	Rolling control (left turning, left valve)/rolling control (right turning: right valve)

ECU terminal voltages (when connector is connected)

Terminal No.	Signal	Condition	Terminal voltage
29	Left rear valve activation signal	When the left/right rear valves are ON	Battery positive voltage
		When the left/right rear valves are OFF	0V
27	Right rear valve activation signal	During fail-safe (for solenoid valve power source relay switch OFF)	0V

Checking the left rear/right rear valves activation circuit (with the connector disconnected)

Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
29	Left rear valve	Resistance	29–ground	Constantly	Approx 10Ω
27	Right rear valve	Resistance	27–ground	Constantly	Approx. 10Ω

Troubleshooting hints (mechanical malfunctions)

Malfunction mode	Malfunction probable cause	Malfunction	Note
Stuck in the OFF (closed) position	Air cannot be discharged because the valve is stuck in the OFF (closed) due to corrosion, freezing, etc. caused by moisture penetration.	• The left rear and right rear vehicle height increases after rolling control. • Insufficient active control effect.	
Stuck in the ON (open) position	Air cannot be taken in because the valve is stuck in the ON (open) due to corrosion, freezing, etc caused by moisture penetration.	• The left rear and right rear vehicle height decreases, and the body tilts to one side. • The return pump is activated too frequently	Diagnostic trouble code No.56 is output
Air leakage at valve seat	Valve seat is worn.	When left as is, the rear vehicle-height will decrease.	Diagnostic trouble code No.56 is output
Air leakage to atmosphere	Wear, etc. of the O-ring, etc.	When left as is, the rear vehicle-height will decrease.	Very slight leakages cannot be detected. Such leakage is detected a long time afterward by a decrease of the vehicle height.

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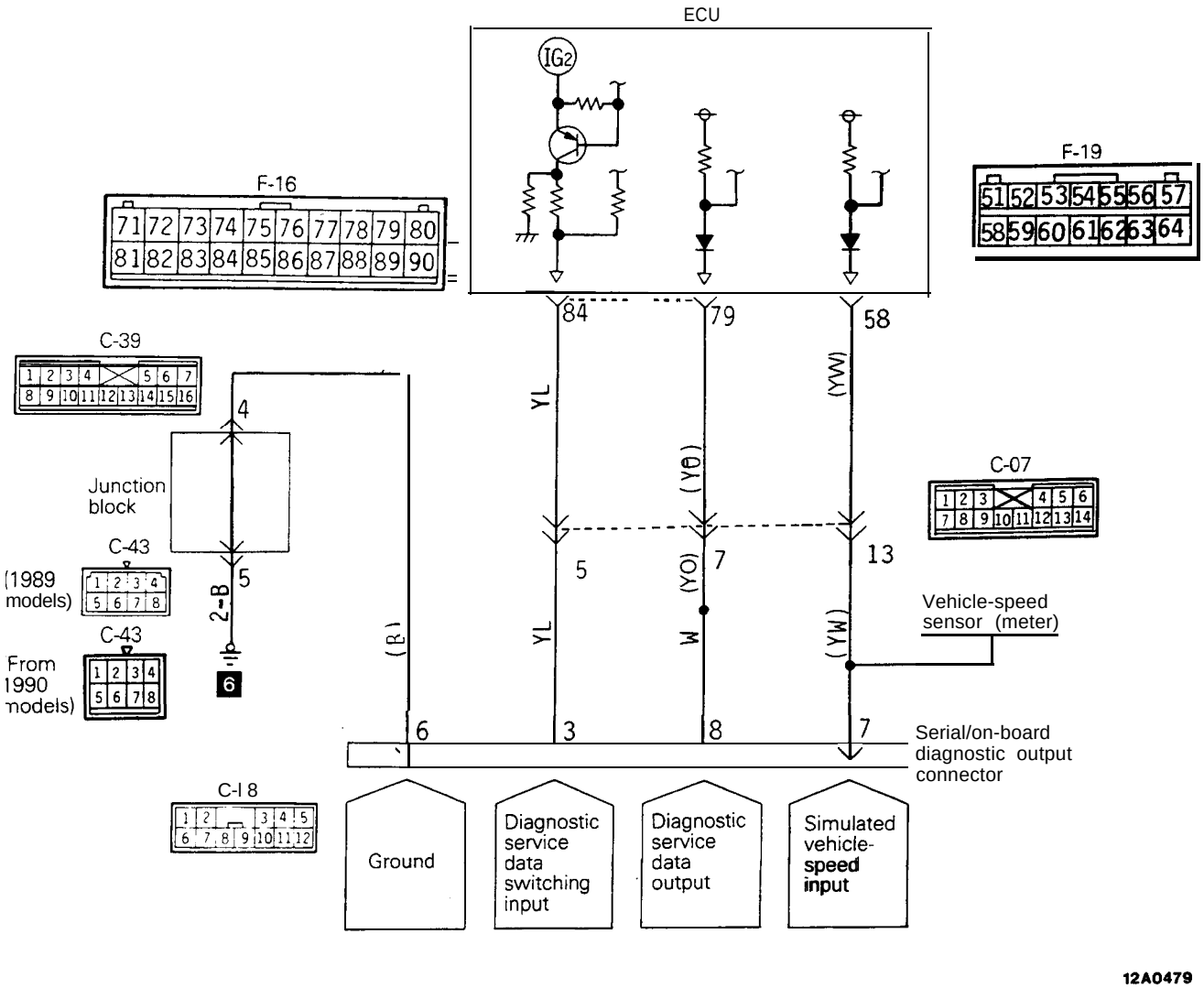
[27] ACTIVE-ECS RELATED DIAGNOSTIC/SERVICE DATA OUTPUT CIRCUIT



ECU terminal voltages (when connector is connected)

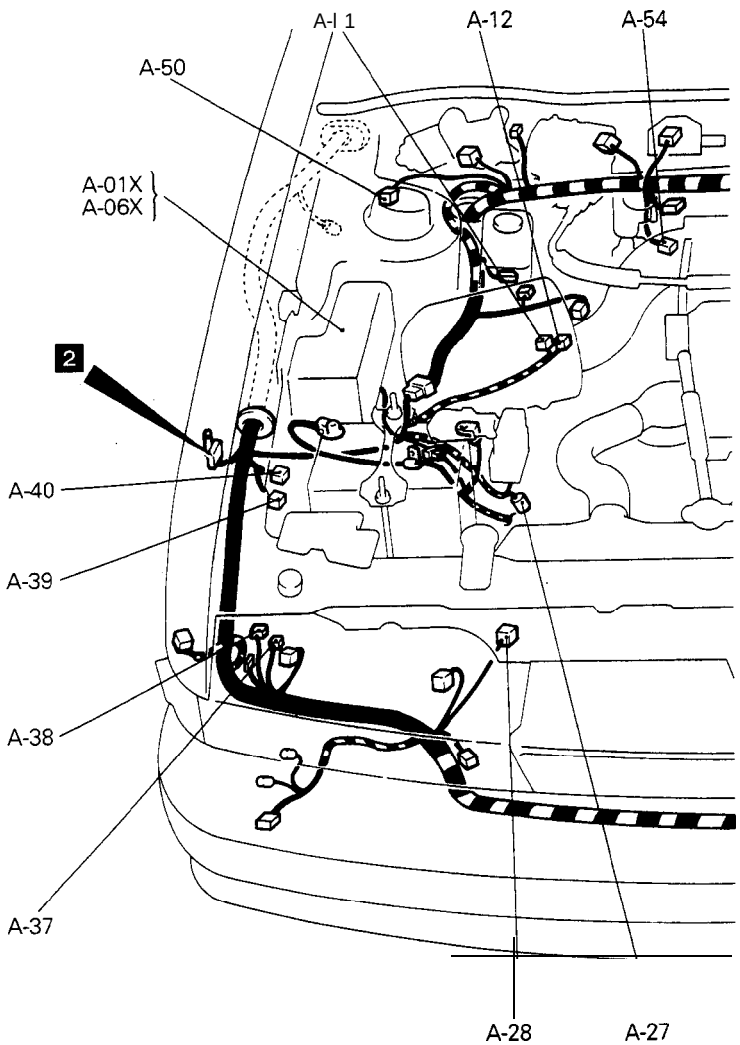
Terminal No.	Signal	Condition	Terminal voltage
79	Diagnostic/service data switching signal	When scan tool is connected	ov
		Usual	3.3V
84	Diagnostic/service data switching signal	Constantly	0V I Battery positive voltage

ACTIVE-ECS related diagnostic/service data output circuit (with the connector disconnected)

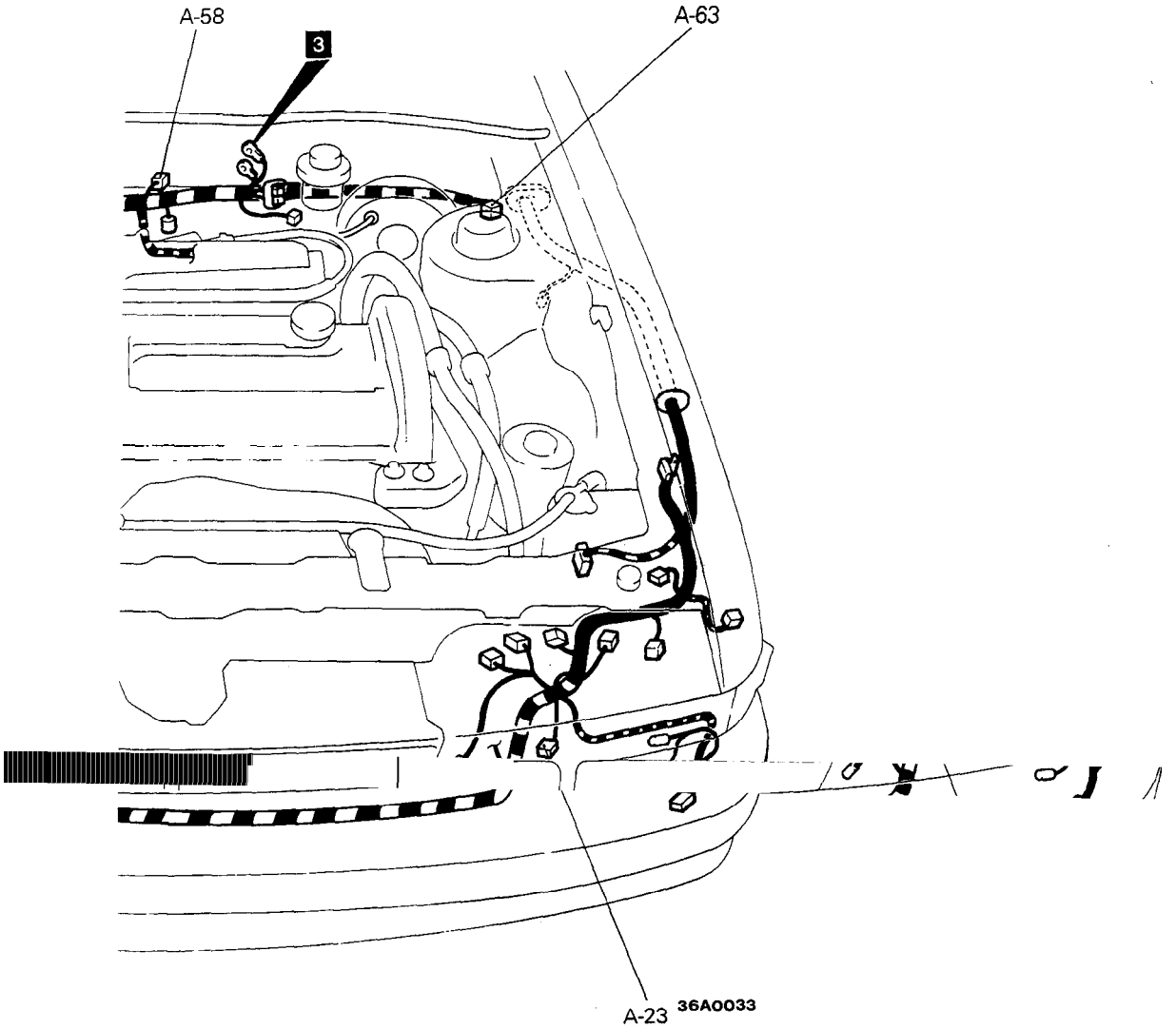
Terminal No.	Connection destination or measured part	Measurement	Tester connection	Check condition	Standard
79	Diagnostic/service data switching signal	Resistance	Diagnostic 79- concentrated connector	Constantly	Continuity
84	Harness for diagnostic/service data output	Resistance	Diagnostic 84- concentrated connector	Constantly	Continuity

CONFIGURATION DIAGRAMS

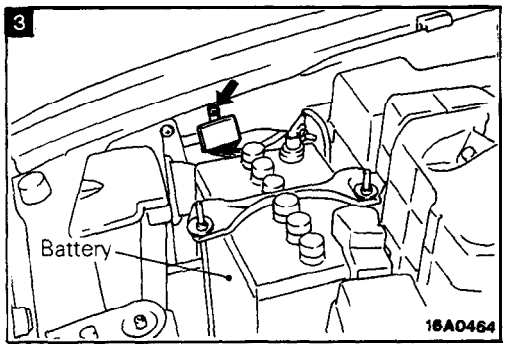
ENGINE ROOM

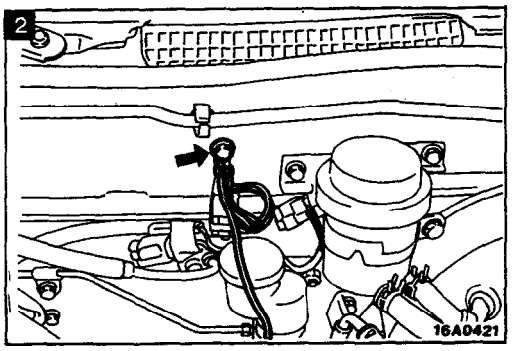


A-01X, A-06X } Refer to CENTRALIZED JUNCTION
A-I 1 ACTIVE-ECS exhaust solenoid valve
A-I 2 ACTIVE-ECS air compressor
A-23 ACTIVE-ECS G sensor
A-27 ACTIVE-ECS front vehicle height sensor
A-28 ACTIVE-ECS flow-control solenoid valve
A-37 ACTIVE-ECS return pump
A-38 ACTIVE-ECS pressure switch
A-39 ACTIVE-ECS air compressor relay
A-40 ACTIVE-ECS return pump relay
A-41 Front wiring harness and battery cable combination
A-50 ACTIVE-ECS front actuator
A-54 Throttle position sensor (1989 models)
A-58 ACTIVE-ECS front solenoid valve
A-63 ACTIVE-ECS front actuator

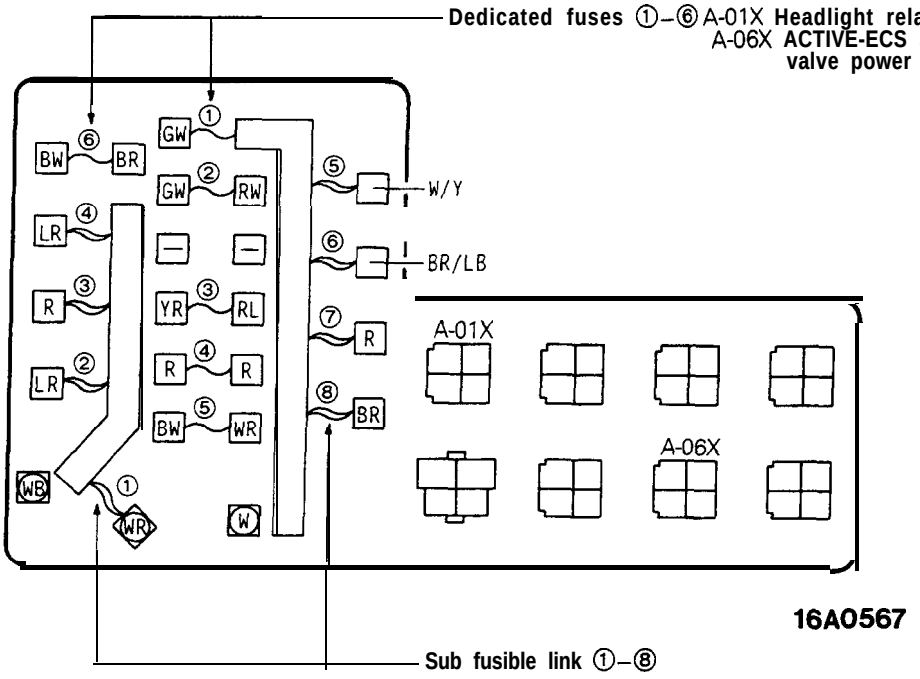


Ground point (detailed view)



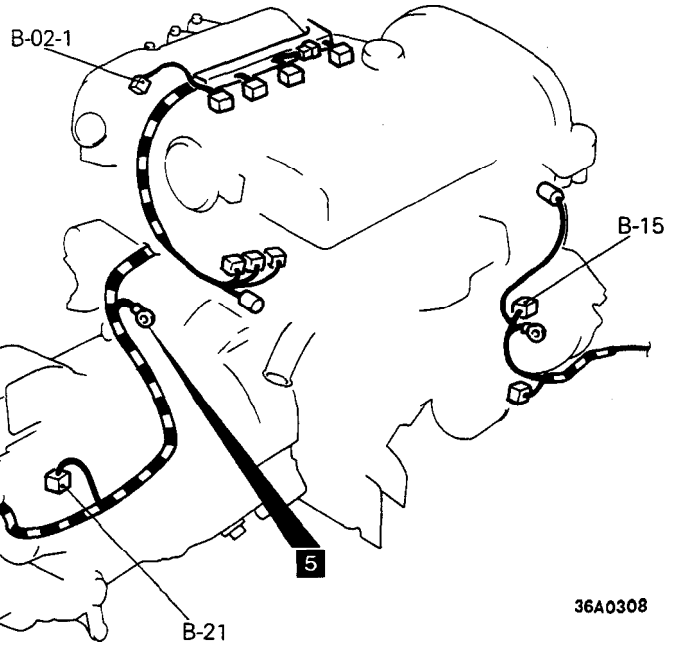


Concentrated junction

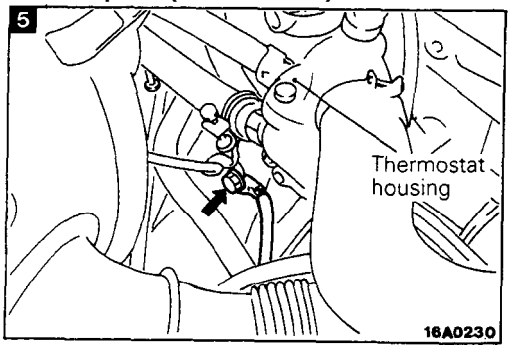


ENGINE AND TRANSAXLE

B-l 5 Alternator
B-21 **Backup light switch**
B-02-1 **Throttle** position **sensor (From 1990 models)**



Ground point (detailed view)



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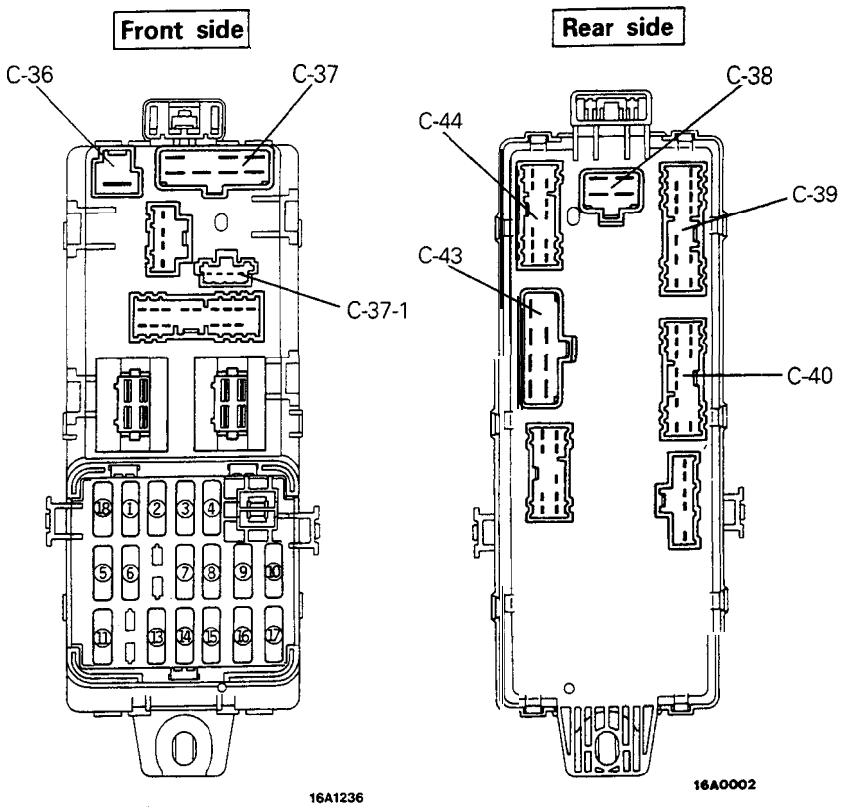
DASHBOARD PANEL

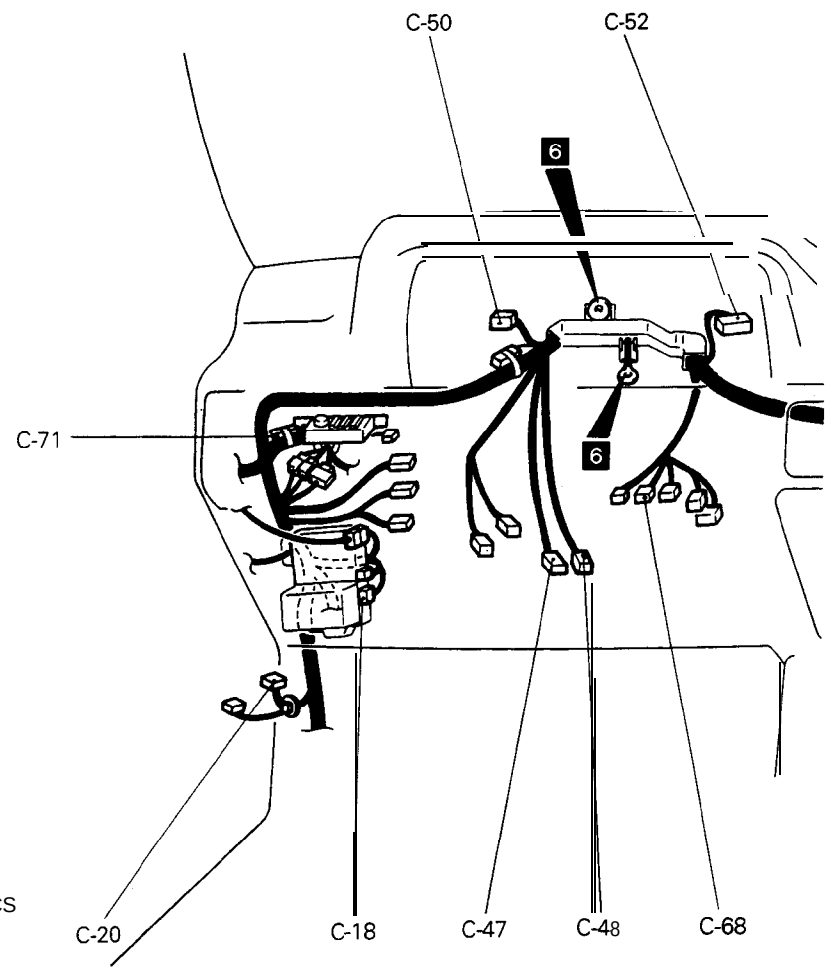
Junction block

C-36, C-37, C-37-1: Front harness and junction block coupling

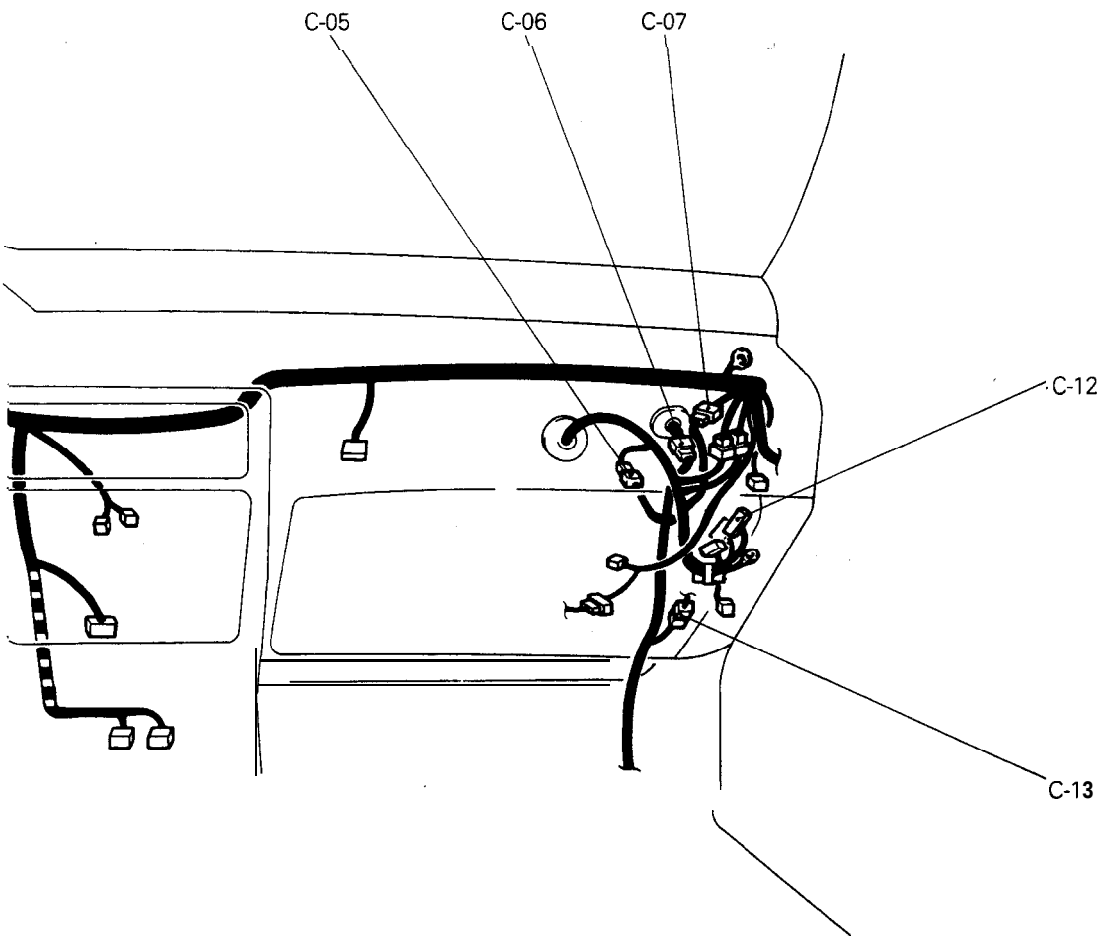
C-38, C-39, C-40, C-43, C-44: Body harness and junction block coupling



DASHBOARD PANEL



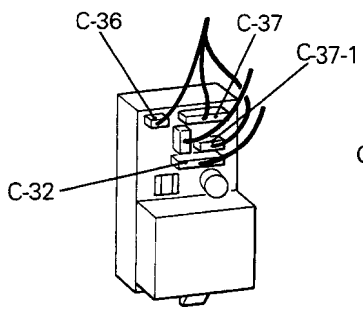
C-05 Control wiring harness and ACTIVE-ECS wiring harness combination
C-06 Front wiring harness and ACTIVE-ECS wiring harness combination
C-07 Body wiring harness and ACTIVE-ECS wiring harness combination
C-12 Engine control module
C-13 ACTIVE-ECS wiring harness and instrument wiring harness combination
C-I 8 Data link connector
C-20 ACTIVE-ECS relay
C-32 Instrument wiring harness and junction block combination
C-36, C-37, C-37-1 } Front wiring harness and junction block combination
C-38, C-39, C-40, C-43, C-44 } Body wiring harness and junction block combination
C-47 Stop light switch (2-pin)
C-48 Stop light switch (4-pin)
C-50, C-52 } Combination meter
C-68 Column switch
C-71 Diode (for ACTIVE-ECS Circuit)



36A0035

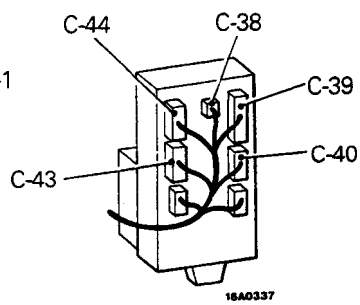
Junction block

Front side

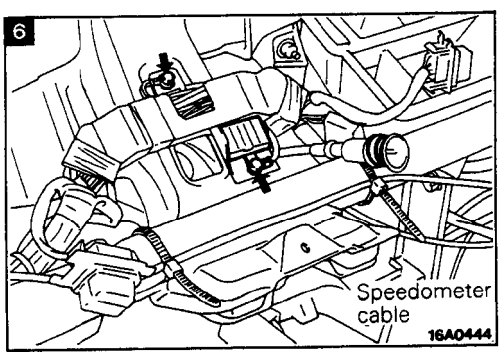


16A1264

Rear side



16A0337



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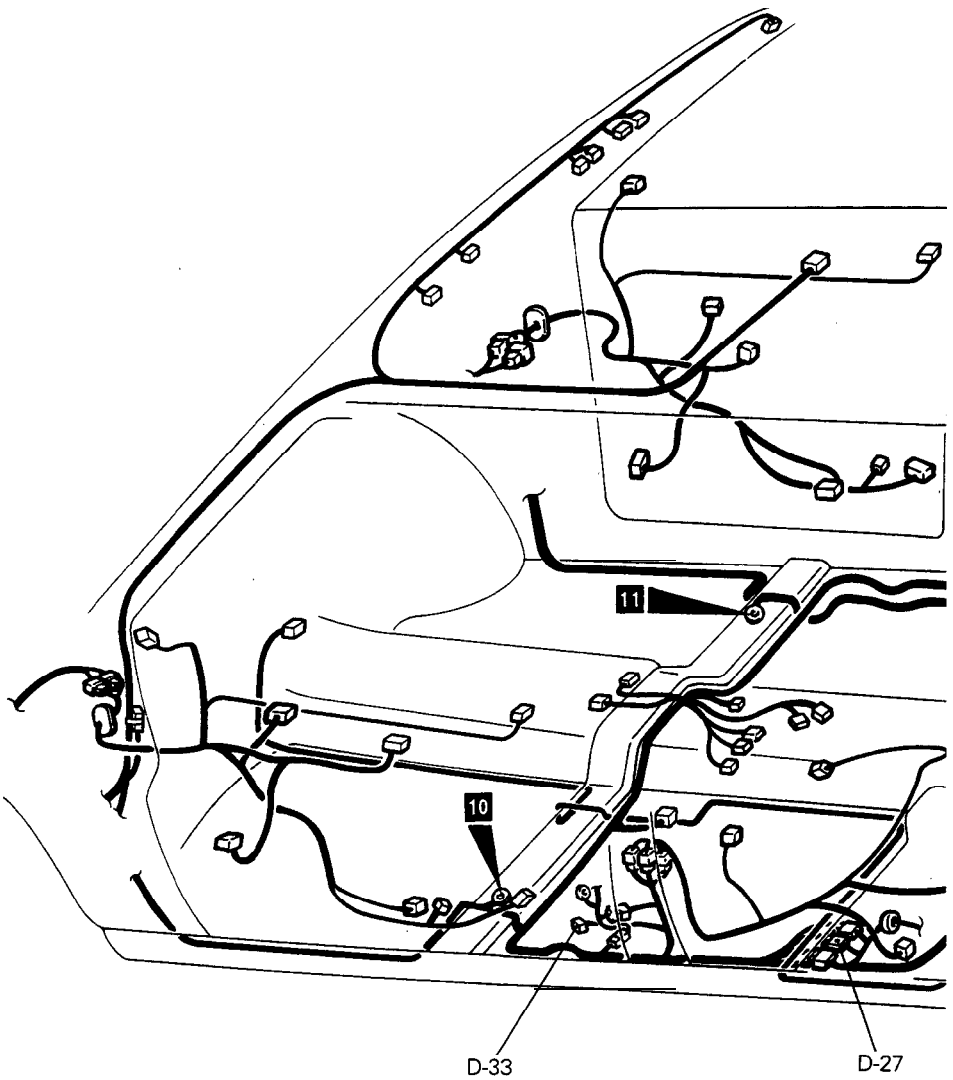
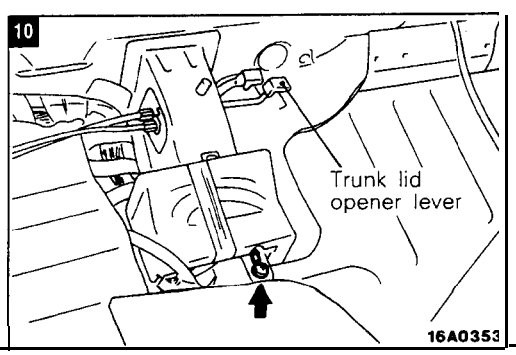
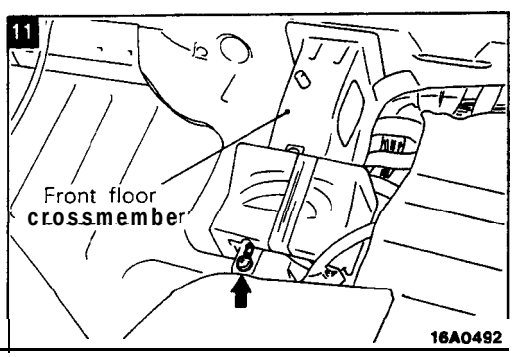
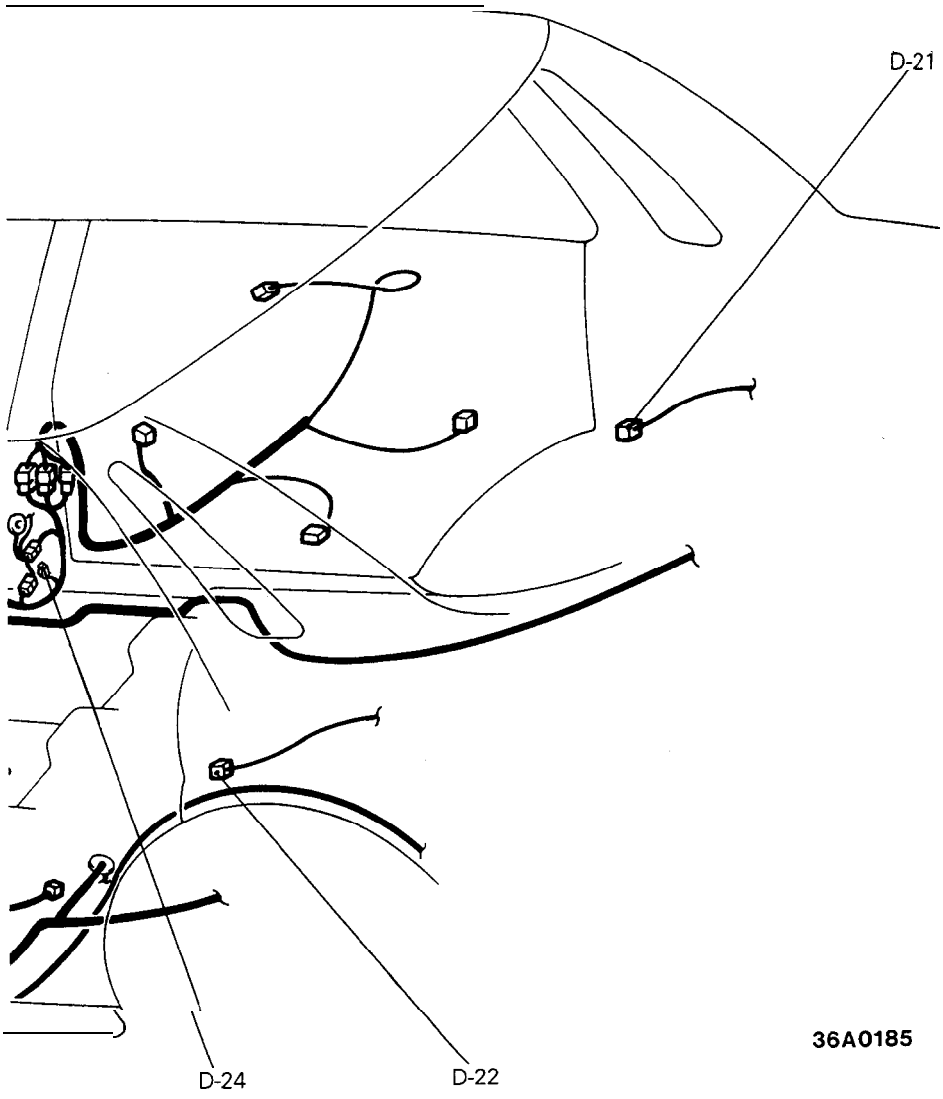
INTERIOR


11
10
D-33
D-27

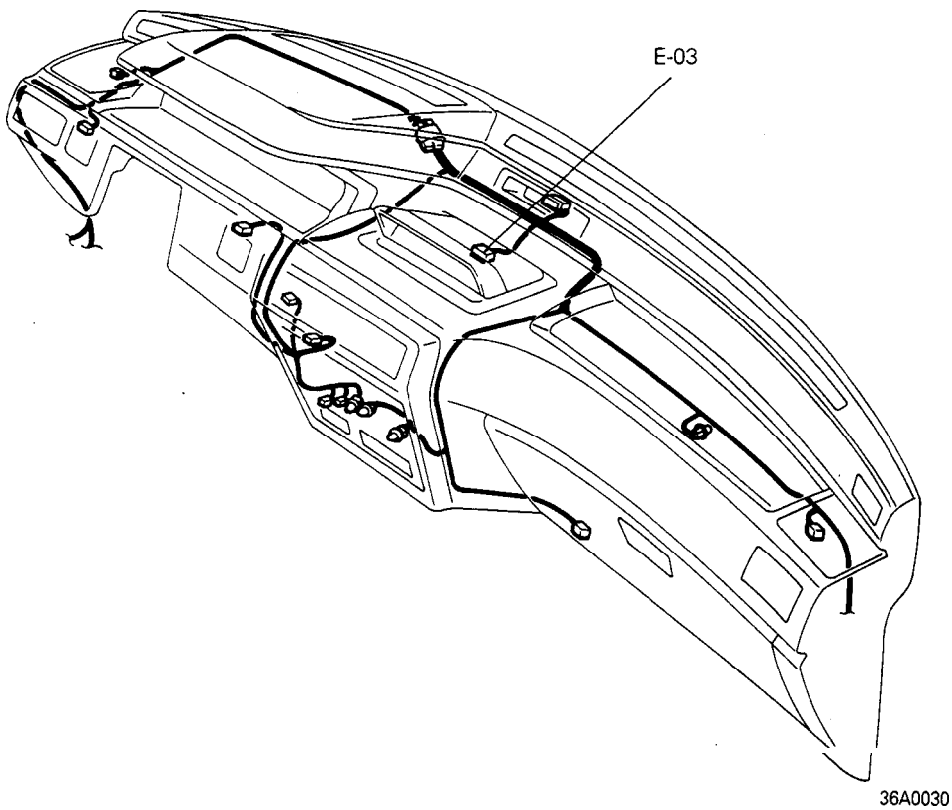

10
Trunk lid
opener lever
16A0353


11
Front floor
crossmember
16A0492



D-21 Door switch (Rear, R.H.)
D-22 Door switch (Rear, L.H.)
D-24 Door switch (Front, R.H.)
D-27 Body wiring harness and fuel wiring harness combination
D-33 Door switch (Front, L.H.)

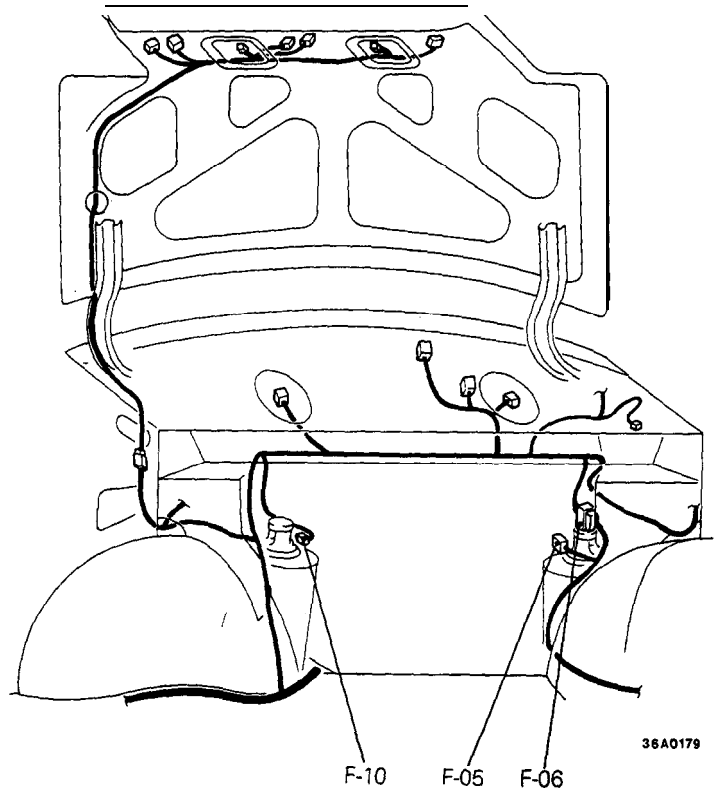
INSTRUMENT PANEL

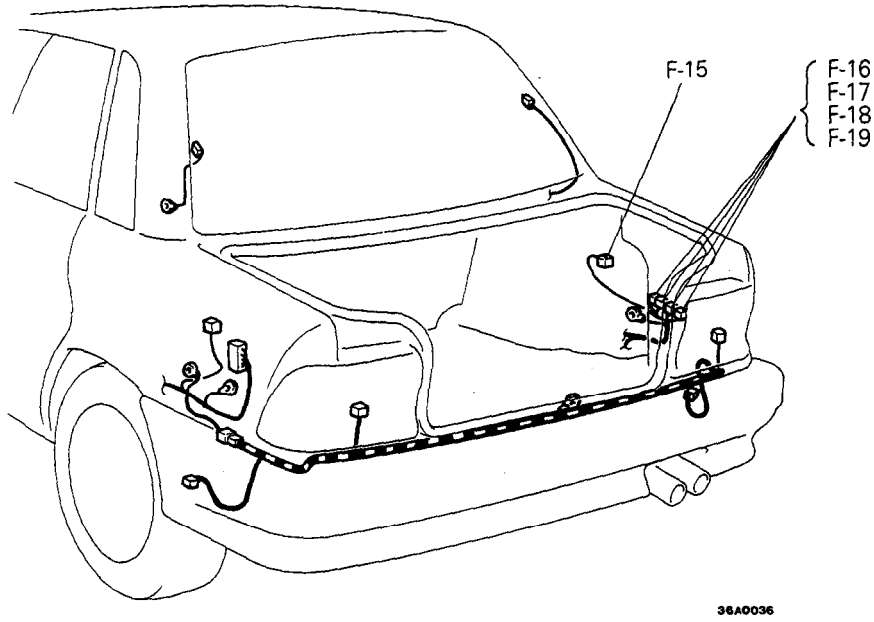


E-03 ACTIVE-ECS indicator

LUGGAGE COMPARTMENT

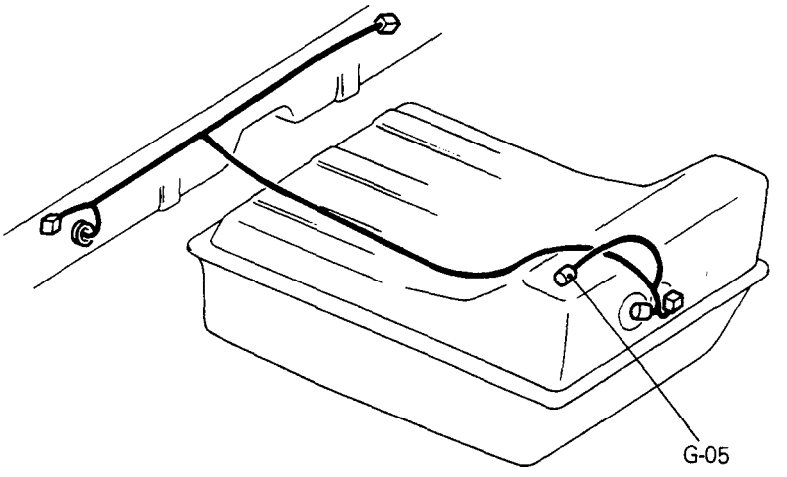
F-05 **ACTIVE-ECS rear actuator** (R.H.)
F-06 **ACTIVE-ECS wiring harness and body wiring harness combination**
F-10 **ACTIVE-ECS rear actuator** (L.H.)
F-15 **ACTIVE-ECS rear solenoid valve**
F-16, F-17, F-18, F-19 **ACTIVE-ECS electronic control unit**



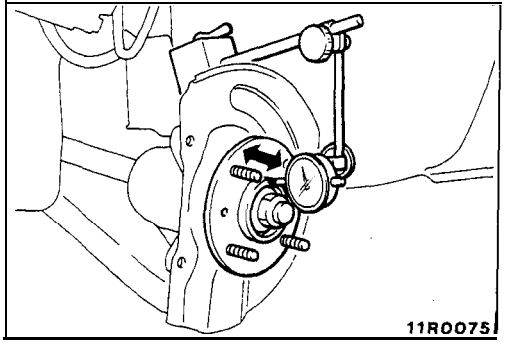


REAR UNDER FLOOR

G-05 ACTIVE-ECS rear vehicle-height sensor



16A0266



SERVICE ADJUSTMENT PROCEDURES

M33FAAA

HUB END PLAY INSPECTION

1. Jack up the vehicle and remove the front wheels.
2. Remove the disc brake caliper and suspend it with a wire. Refer to GROUP 26 FRONT AXLE-Service Adjustment Procedures.
3. Attach a dial indicator as shown in the illustration, and then measure the axial play while moving the hub back and forth.

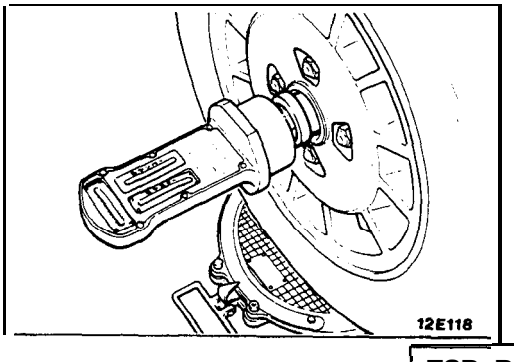
   Limit: 0.2 mm (.008 in.) or less

   NOTE
   Secure the brake disc and hub by the wheel nut so that the brake disc won't come of the hub.
4. If axial play exceeds the limit, disassemble and check parts.

FRONT WHEEL ALIGNMENT

M33FBAD

NOTE
The front suspension assembly must be free of worn, loose or damaged parts prior to measurement of front wheel alignments.
Measure wheel alignment by using the tool.



CAMBER AND CASTER

Standard value: Camber 22′±30
Caster 2°±30

Camber and caster are pre-set at the factory and cannot be adjusted.

NOTE
If camber and caster are not within specifications, replace bent or damaged parts.

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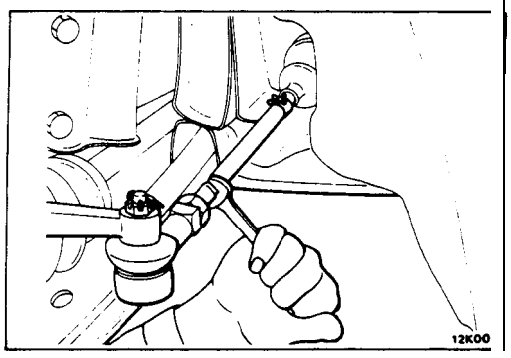


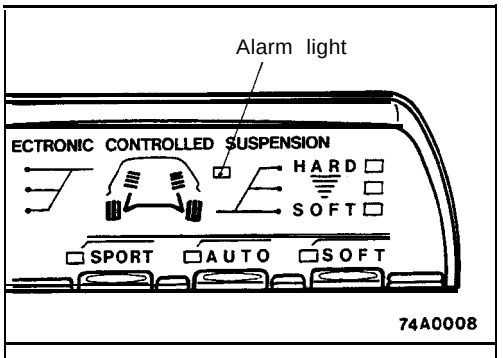
TOE-IN

Standard value: 0±3 mm (0±.12 in.)

1. 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.
3. For each half turn of the left and right tie rods, the toe-in will be adjusted by 6 mm (.24 in.).
4. After making the adjustments, use a turning radius gage to confirm that the steering wheel turning angle is within the standard value range. (Refer to GROUP 37A POWER STEERING-Service Adjustment Procedures.)

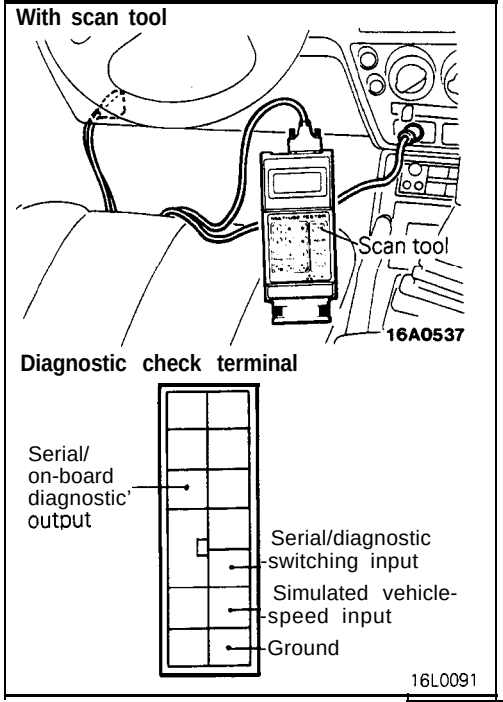
WHEEL BEARING ADJUSTMENT M33FCAA

Bearing preload is pre-set to the specified value by design and therefore can not be adjusted.



ALARM LIGHT CHECK M33FHAC

The bulb of the alarm light can be checked by whether or not it is illuminated for approximately 0.5 of a second by the Electronic Control Suspension control unit when the ignition key is turned ON, and, after the engine is started.



SYSTEM CHECKING BY USING ALARM LIGHT

1. After checking the alarm light 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 light does not illuminate.
2. While the alarm light is on, connect the scan tool or a voltmeter to the data link connector of the wiring harness and check the on-board diagnostic output code.
3. Use the output pattern for troubleshooting (Refer to P.33B-11.)

NOTE*
Although the alarm light illuminates under the following circumstances, there is no actual malfunction if, after the following procedures have been followed and then the alarm light does not illuminate after waiting about four minutes or more.

1. When there is an overload
   Stop the engine, unload the cargo, and then restart the engine.
2. 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.

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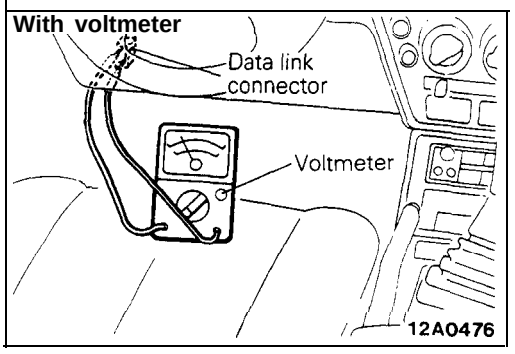


3. When vehicle-height adjustments are made frequently After stopping the engine, open the hood and allow the compressor to cool; then restart the engine.
4. When the vehicle is driven on winding roads in the mountains continuously for 18 minutes or longer. To protect the return pump from damage, stop the engine and then restart it.

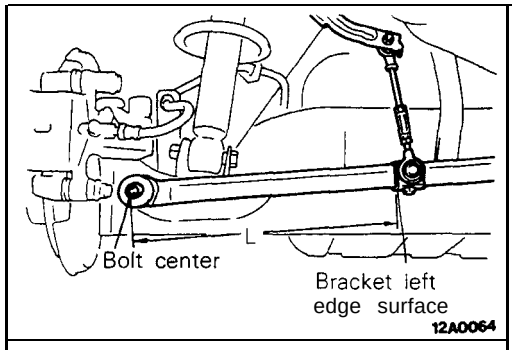
*: Applicable to 1989 models only.

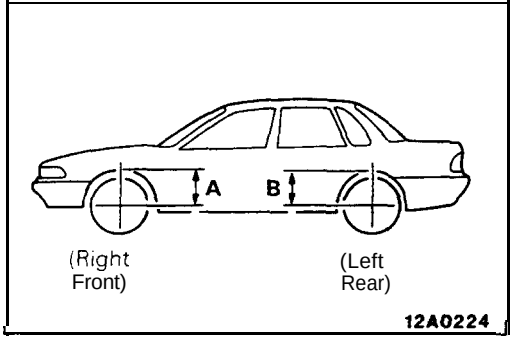
CHECKING BY ON-BOARD DIAGNOSTIC

1. Regardless of whether or not the alarm light is illuminated, check the diagnostic output codes at the diagnostic terminal.
2. If a malfunction code is output to the diagnostic terminal, perform the troubleshooting procedures according to the output code.

NOTE

Diagnostic trouble codes are entered into the memory, even if the ignition is at the OFF position, so that it is possible to check for the existence of malfunctions that occurred previously.





NORMAL VEHICLE HEIGHT CHECK AND ADJUSTMENT

1. Park the vehicle on a flat surface.
2. Measure dimension L (in the illustration) of the rear height sensor mounting bracket installation location.

   Rear height sensor mounting bracket installation length:

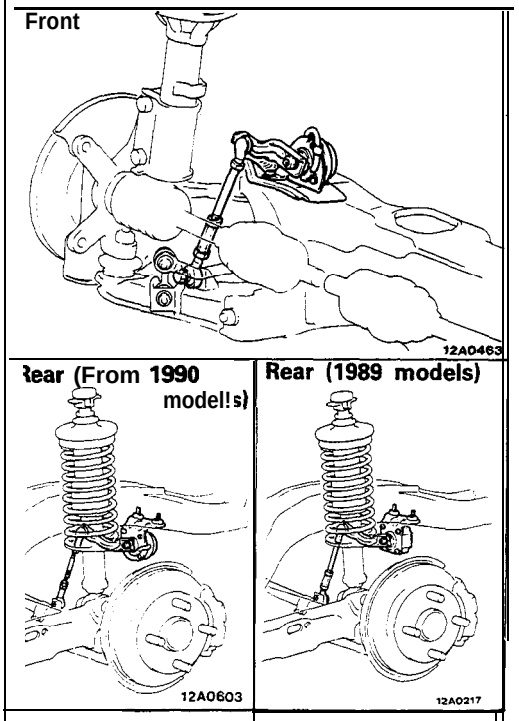
   Standard value (L): 314-316 mm (12.36–12.44 in.)
3. If dimension is not within the standard value, loosen the bracket mounting bolt and make the adjustment to within the standard value.
4. With the vehicle unloaded, start the engine and let it run for 3 minutes, Then check to be sure that, after the vehicle height adjustment is completed, the NORM vehicle height indicator light illuminates (indicating that the vehicle height adjustment is finished).
5. Measure the distance between the wheel arch and the centre of the axle for both the right front and left rear.

   Standard value:

A (Front)	**381–391 mm (15.0–15.4 in.)**
B (Rear)	**357-367 mm (14.1-14.4 in.)**

Caution

Check to be sure that the mounted dimension of the rear height sensor mounting bracket is within the standard value.

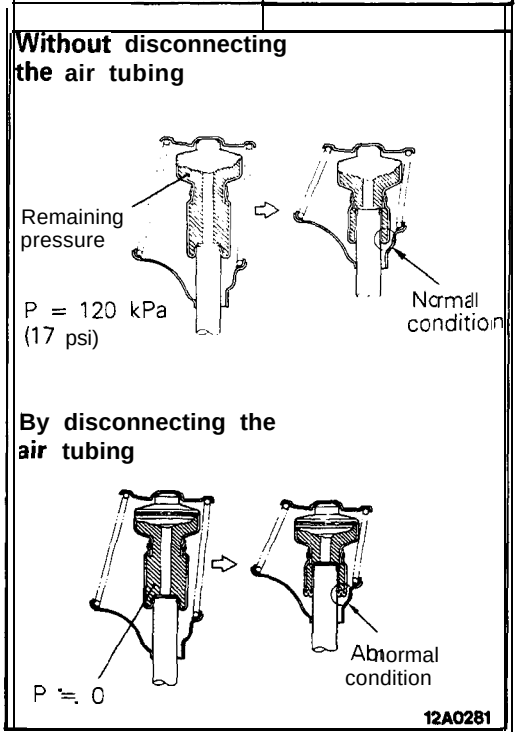


6. If the vehicle height is not within the standard value, loosen the turnbuckles of the front and rear height sensor rods, and then make the adjustment by changing the length of the rods. The vehicle height becomes higher when the rods are lengthened.

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).



ROLLING DIAPHRAGM CHECK

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.
3. Supply air to each air spring so as to return the diaphragm to the normal form.

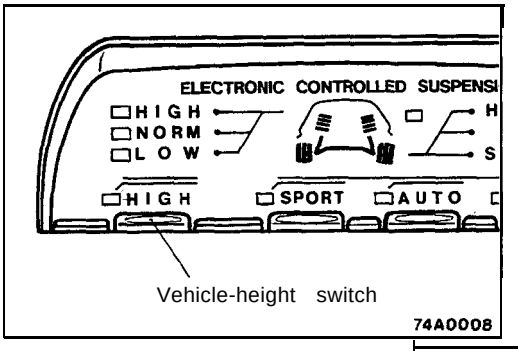
NOTE

Air should be introduced to the rear air springs and front air springs, in that sequence, for five seconds each.

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.



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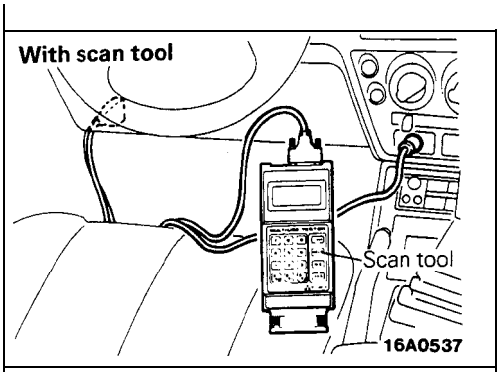

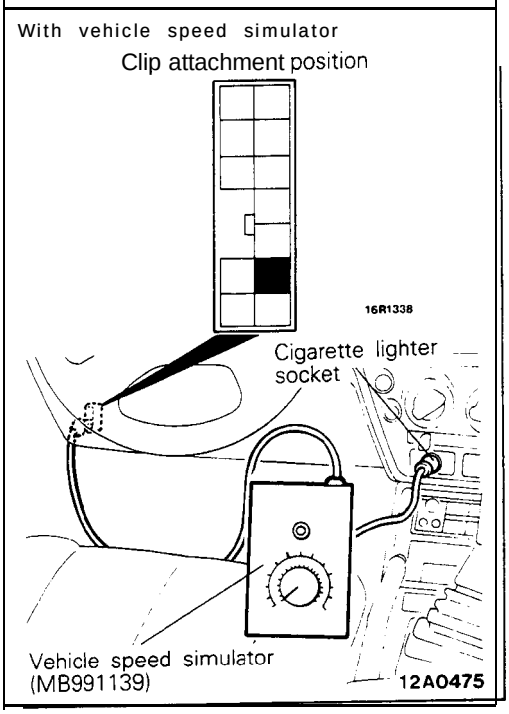

SYSTEM OPERATION CHECK

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 special tool (scan tool), or the special tool (vehicle speed simulator) and the special tool (adapter harness) to input simulated vehicle-speed signals.
2. **Never drive the vehicle while the simulated vehicle-speed signals are still being used.**

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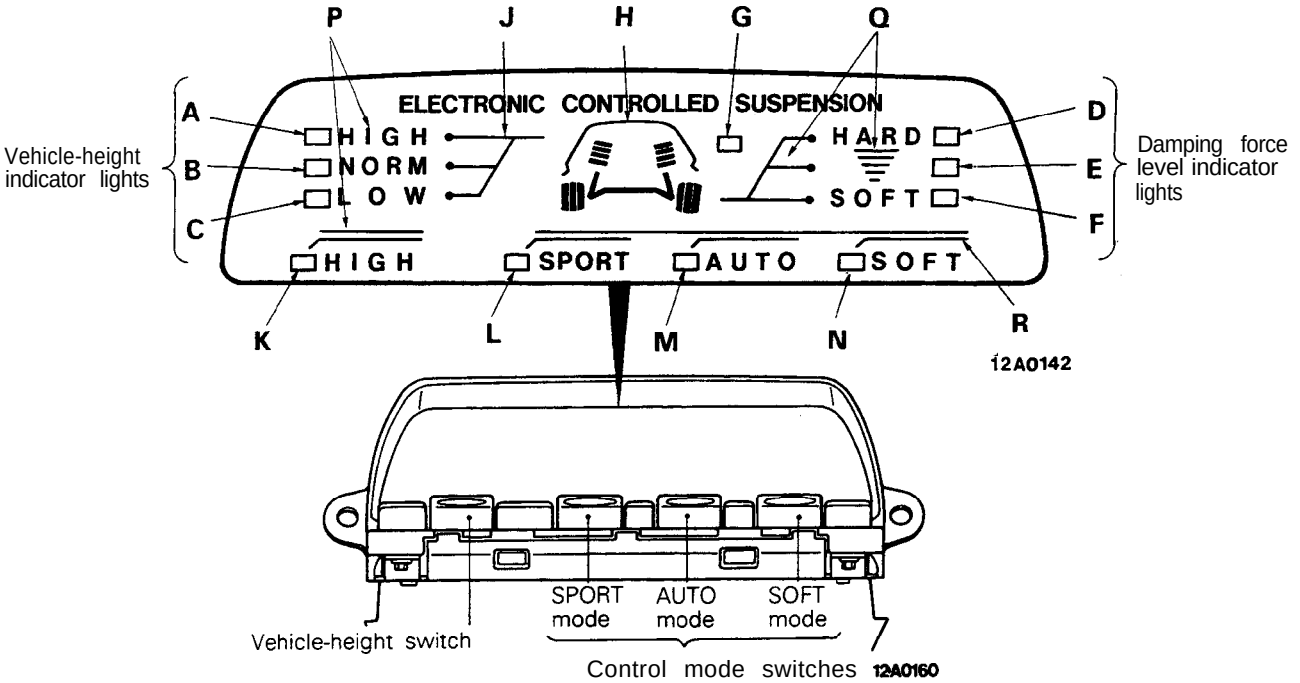
Indicator lights that illuminate for 0.5 second after ECU power ON	
Control mode	AUTO mode indicator
Damping force level	SOFT (one light ON)
Vehicle-height level	NORM

CHECKING THE ACTIVE-ECS INDICATOR LIGHTS

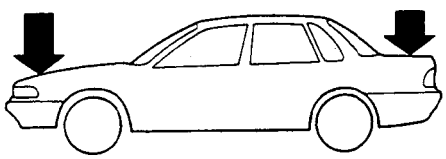
1. Check to be sure that the lights listed at the left illuminate when the ignition key is turned to the ON position, and for approximately 0.5 second after the engine is started, and that thereafter they indicate the control mode entered in the memory.
2. Check to be sure that the nighttime illumination light illuminates when the lighting switch is switched ON, and that the indicator lights become dimmer.



Symbol	Function	Illumination color	Nighttime dim	Symbol	Function	Illumination color	Nighttime dim
A	HIGH vehicle-height indicator light	Orange	Yes	J	ELECTRONIC CONTROL SUSPENSION	Green*	—
B	NORMAL vehicle-height indicator light	Orange	Yes	K	HIGH (vehicle-height) switch indicator light	Orange	Yes
C	LOW vehicle-height indicator light	Orange	Yes	L	SPORT mode indicator light	Orange	Yes
D	Illuminates during HARD	Orange	Yes	M	AUTO mode indicator light	Orange	Yes
E	Illuminates during HARD or MEDIUM	Orange	Yes	N	SOFT mode indicator light	Orange	Yes
F	Illuminates during HARD, MEDIUM or SOFT	Orange	Yes	P	Nighttime illumination light	Green*	—
G	Alarm light	Red	Yes	Q			
H	ECS symbol	Green*	—	R			

NOTE
The illumination color indicated by the * symbol indicates the nighttime illumination color (letters or lines only illuminate).

TSB Revision



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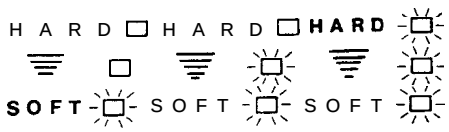

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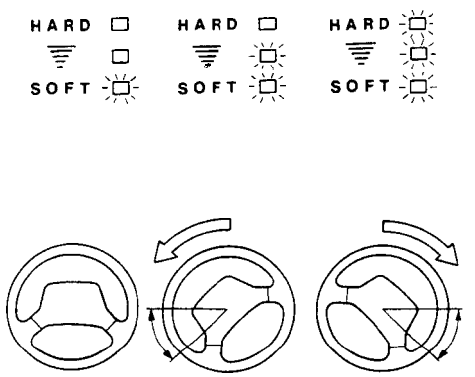


16A0460

CHECKING THE DAMPING FORCE

1. Move the wheels to the straight-ahead position.
2. Start the engine.
3. Set to the AUTO mode (normal vehicle height).
4. Press the control mode switches, and check the illumination of the damping force level indicator lights when the modes shown below are selected.
   In addition, 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 level indicator lights	Damping force
SOFT	One indicator light ON	SOFT
AUTO	One indicator light ON	AUTO-SOFT*1
MEDIUM-AUTO*2	Two indicator lights ON	MEDIUM
SPORT	Three indicator lights ON	HARD*3

NOTE
- *1: 1989 models
  SOFT for 1990, 1991, 1992, 1993 models.
- *2: 1989 models
  Not applicable for 1990, 1991, 1992, 1993 models.
- *3: 1989 models
  MEDIUM for 1990, 1991, 1992, 1993 models.

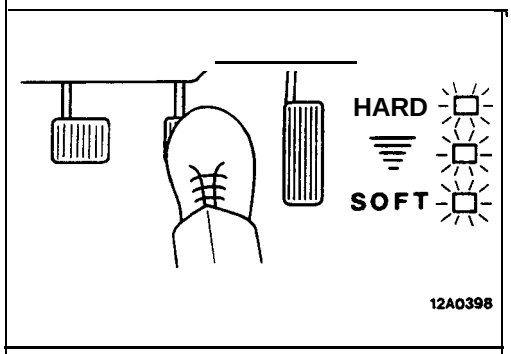
CHECKING THE ANTI-ROLLING FUNCTION

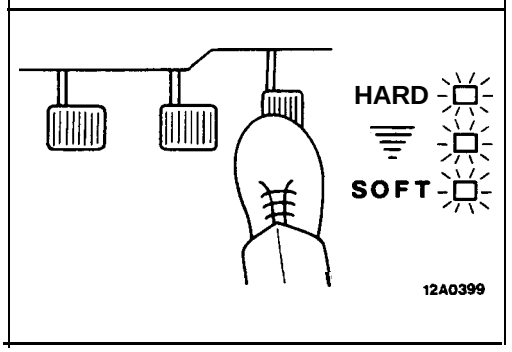
1. Move the wheels to the straight-ahead position.
2. Turn the ignition key to ON.
3. When simulated vehicle-speed signals of 35 km/h (22 mph) or higher are input and the steering wheel is turned 45" or more, the damping force characteristic indicator light will change to MEDIUM or HARD, depending on 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.

NOTE
The damping force characteristic will return to its previous level about tow seconds*4 after the change to MEDIUM or HARD.

- *4: 1989 models
  For 1990, 1991, 1992, 1993 models: one second

TSB Revision





CHECKING THE ANTI-DIVE FUNCTION

1. Turn the ignition key to ON.
2. input a simulated vehicle-speed signal of 3 km/h (2 mph) or more.
3. Select the AUTO or SOFT control mode.
4. With the brake pedal depressed (the stop lights ON), check that the damping force characteristic level indicator lights change to the HARD indication when the simulated vehicle-speed input signal is suddenly decreased from 100 km/h (62 mph) or higher, and that there is air supply at the front and exhaust at the rear.

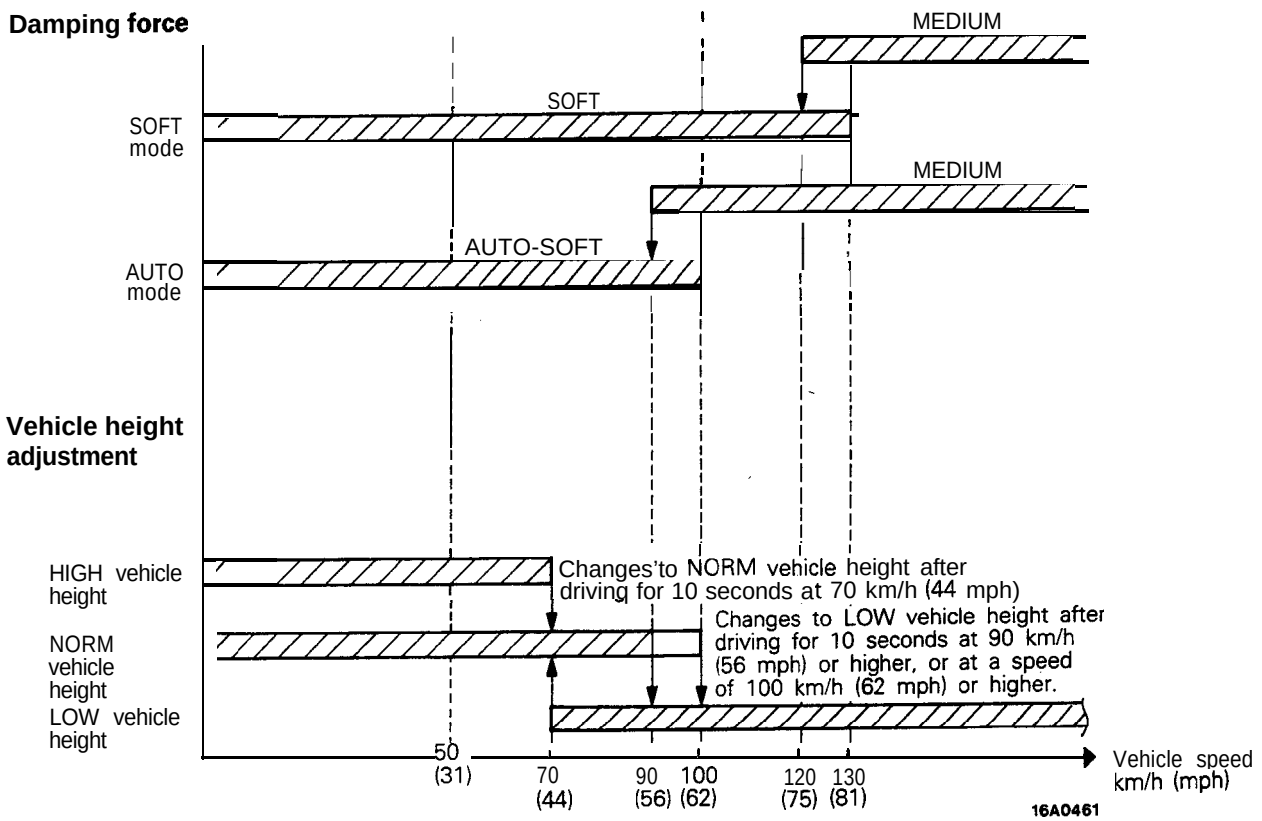
CHECKING THE ANTI-SQUAT FUNCTION

1. Turn the ignition key to ON.
2. Input a simulated vehicle-speed signal that is 3 km/h (2 mph) or higher and is less than 100 km/h (62 mph).
3. Select the AUTO or SOFT control mode.
4. Check that the damping force characteristic level indicator lights change to the HARD indication when the accelerator pedal is suddenly depressed, and that there is air exhaust at the front and supply at the rear.

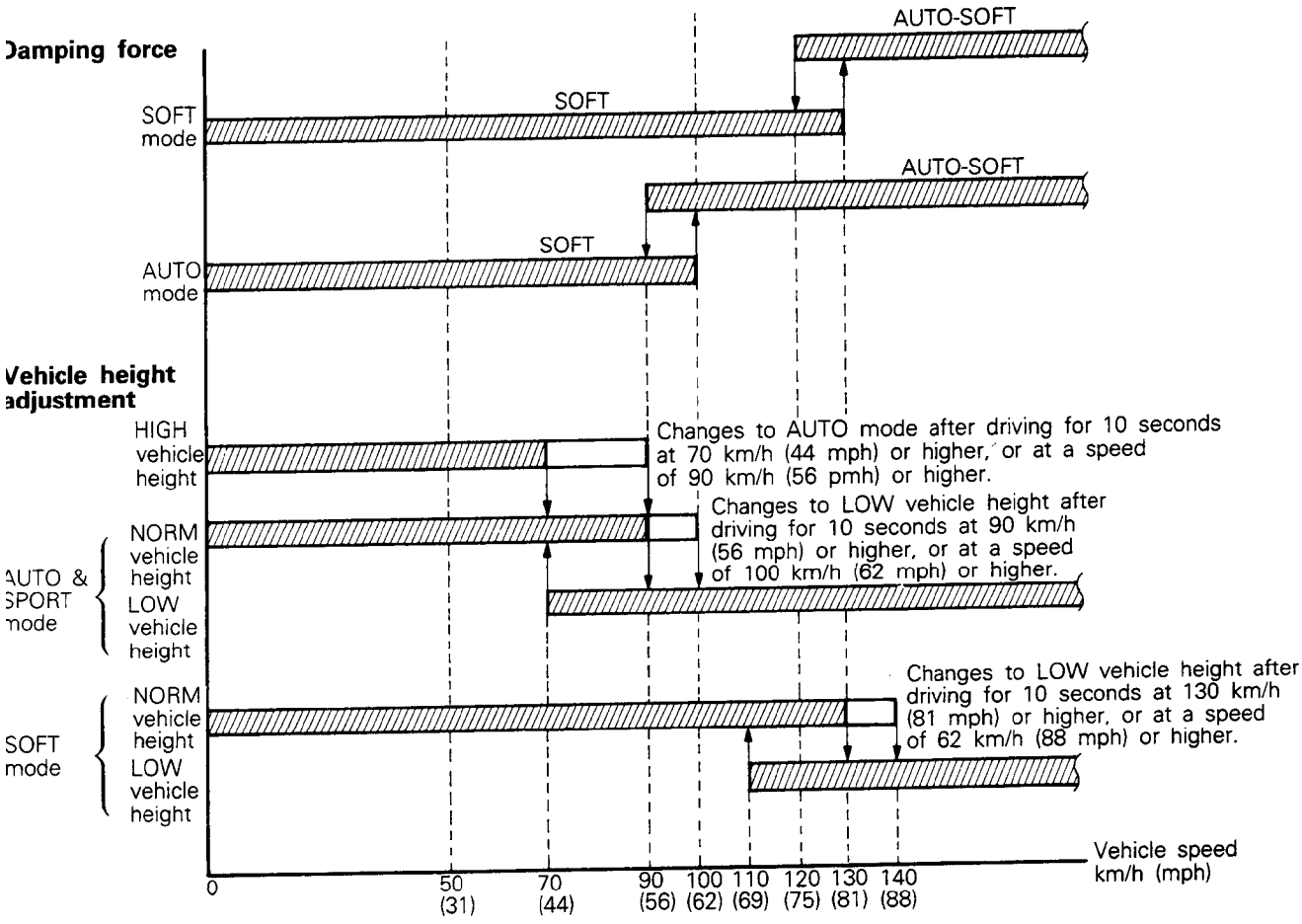
[1989 models]

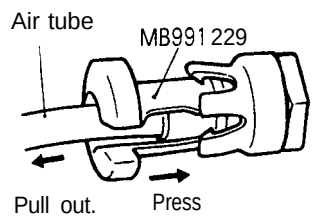
CHECKING THE VEHICLE-SPEED RESPONSE FUNCTION

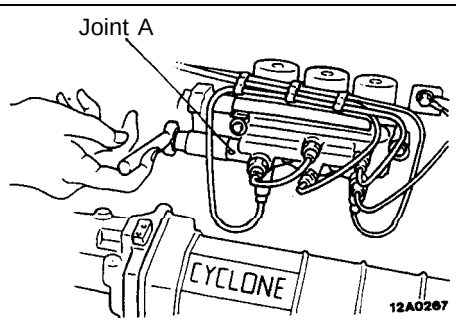
1. Start the engine.
2. Input simulated vehicle-speed signals and check whether or not there are changes of the damping force and of the vehicle height (as shown in the diagram below) according' to changes in the vehicle speed.



[From 1990 models]





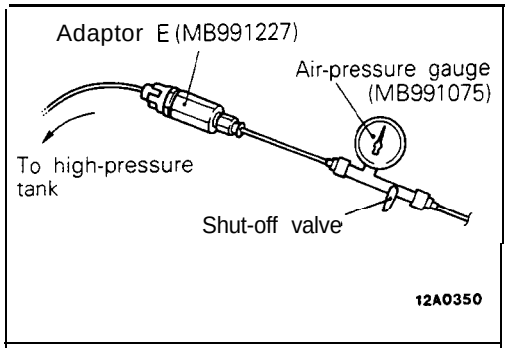


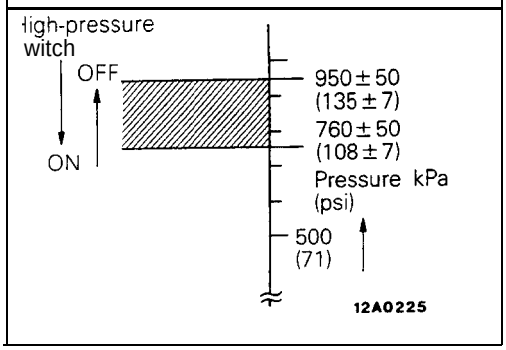
HIGH-PRESSURE SWITCH (HIGH-PRESSURE TANK SIDE) ACTUATION PRESSURE CHECK

1. Remove joint A of the yellow-marked air tube (for the front air-supply valves) of the front solenoid valve assembly.

NOTE
Removal is easier if the special tool is used to pull the air tube out, and then a socket wrench is used for removal.

TSB Revision





2. Connect the gauge side air tubes of the special tool (air-pressure gauge) to the disconnected air tube and joint, connecting them via the special tube (adaptor E).

   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.

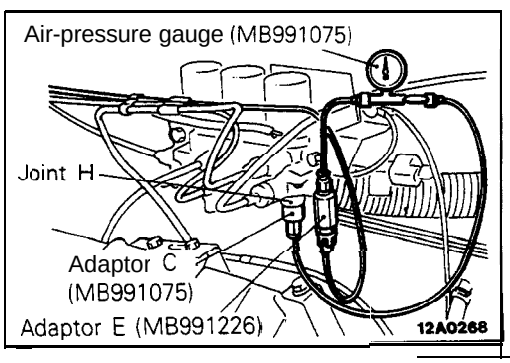
   Standard value: 900 kPa (128 psi) or higher

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: 710–810 kPa (101–115 psi)

   NOTE
   The ON/OFF status of the high-pressure switch at this time can be checked by the special tool MB991269 (1989 models), MB991341 (1990, 1991, 1992 models).
   (Refer to P.33B-18.)

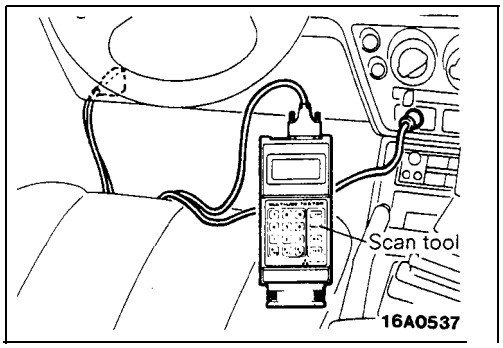
6. If the pressure within the high-pressure tank is not within the standard value range when the compressor is stopped (high-pressure switch OFF) or the compressor is activated (high-pressure switch ON), remove the reserve tank assembly and replace the high-pressure switch.



LOW-PRESSURE SWITCH (LOW-PRESSURE TANK SIDE) ACTUATION PRESSURE CHECK

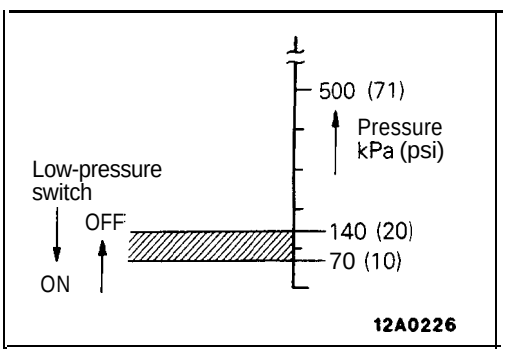
1. Remove joint H of the blue-marked air tube (for the left front valve) of the front solenoid valve assembly.
2. Connect the special tool (air-pressure gauge) between the disconnected air tube and the front solenoid valve assembly by using the special tools (adaptors E and C).

TSB Revision

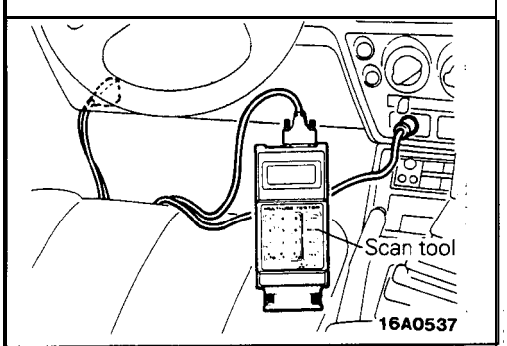


3. Connect the scan tool, start the engine, and wait until the compressor stops (the high-pressure switch is OFF).
4. Input simulated vehicle-speed signals [3 km/h (2 mph) or higher].
5. With the simulated vehicle-speed signals still being input. conduct actuator test No. 09 (left turn) or No. 10 (right 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
100–180 kPa (14-26 psi)
Return pump cut-off pressure
50 kPa (7 psi) 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.



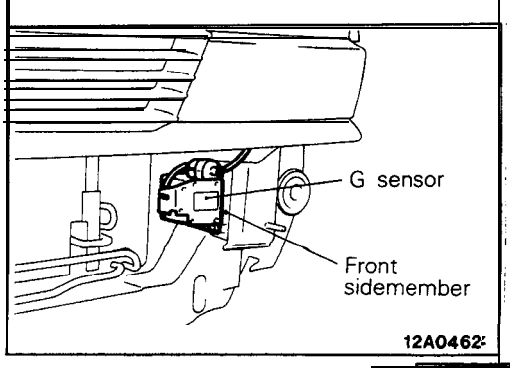
G-SENSOR OUTPUT VOLTAGE CHECK

1. Unload the vehicle and move it to a horizontal surface.
2. Connect the special tool (scan tool) and start the engine.
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 ± 0.16V

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.

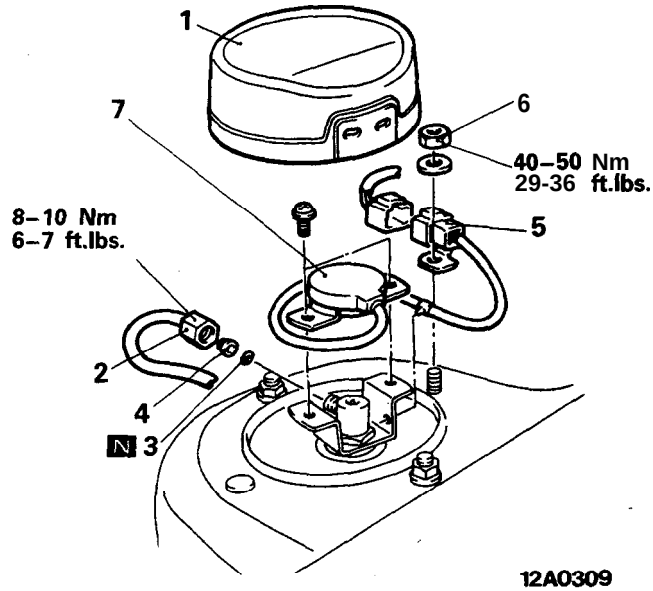
NOTE
If the G-sensor installation surface is at an angle (tilted) due to body deformation or some other cause, a washer(s) or shim(s) may be used to make an adjustment so that the output voltage is within the standard value range.



STRUT ASSEMBLY

M33ZOAC

REMOVAL AND INSTALLATION



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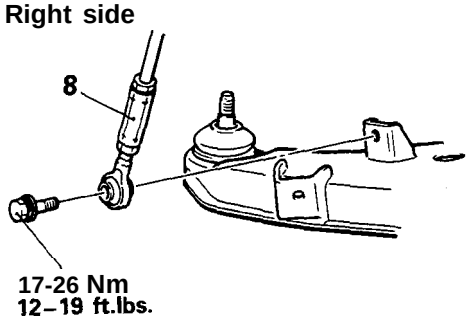
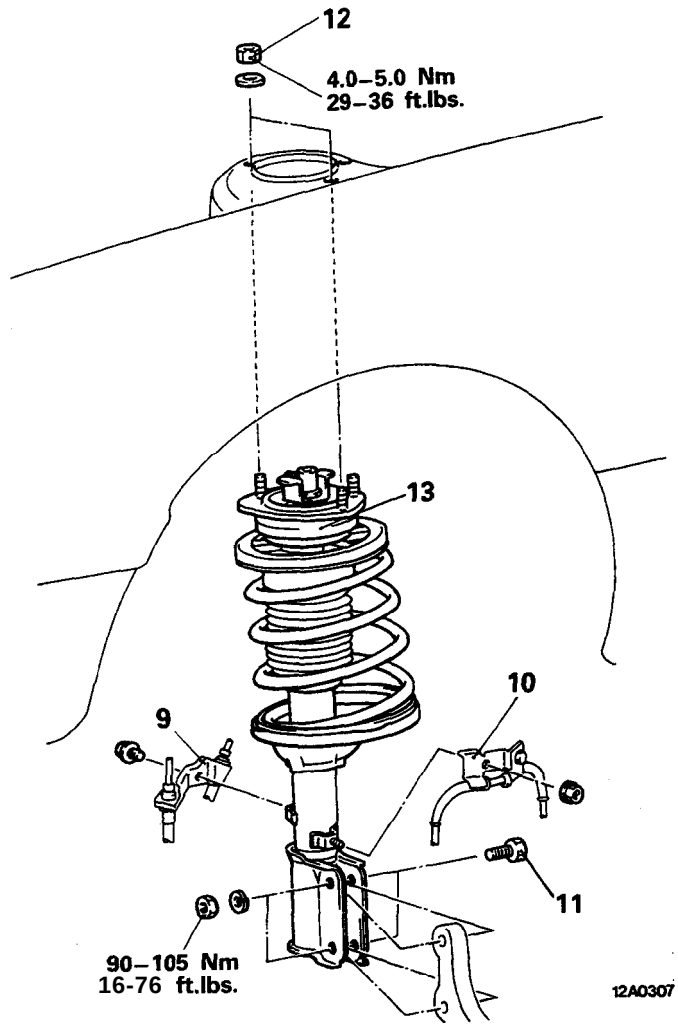
Right side



12A0230

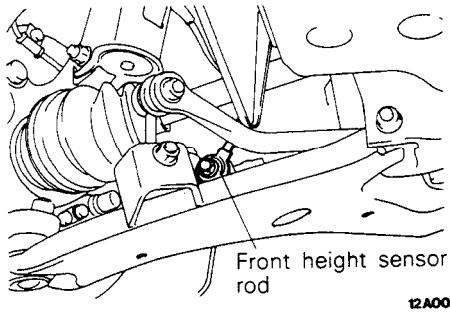


12A0307

Removal steps

1. Dust cover
- ● + 2. Air tube
3. O-ring
4. Bush
5. Actuator connector
6. Front strut upper mounting nut
7. Actuator
- ◆◆ 8. Front height sensor rod
- ◆◆ 9. Brake hose and tube clamp
10. Front speed sensor clamp <Vehicles with A.B.S.>
- ◆◆ 11. Front strut lower mounting bolts
12. Front strut upper mounting nuts
- ◆◆ 13. Strut assembly

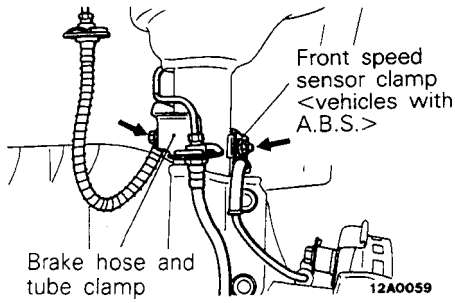
TSB Revision



SERVICE POINTS OF REMOVAL M33LBAE

8. REMOVAL OF FRONT HEIGHT SENSOR ROD

When removing the right strut assembly and knuckle union, always first remove the lower arm and front height sensor rod union.

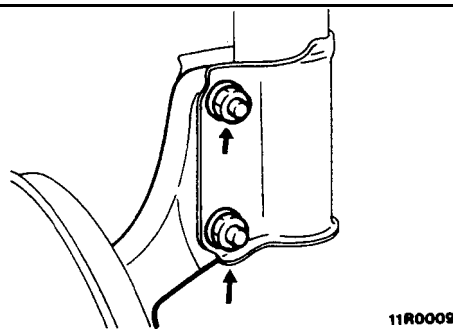


9. REMOVAL OF BRAKE HOSE AND TUBE CLAMP

Remove the brake hose and tube without prying them.

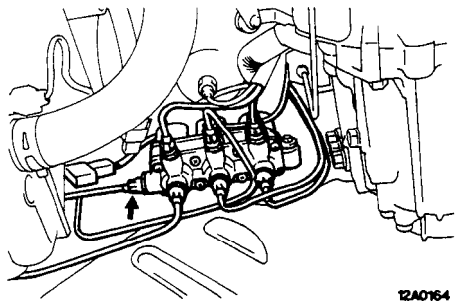
10. REMOVAL OF FRONT SPEED SENSOR CLAMP

Remove the front speed sensor clamp; be sure the front speed sensor harness doesn't stretch.



11. REMOVAL OF FRONT STRUT LOWER MOUNTING BOLTS

After the strut and knuckle union have been removed, jack up the lower arm, then hold the knuckle with wire, etc. not to pull on the brake hose and tube, the speed sensor wiring harness and the drive shaft.

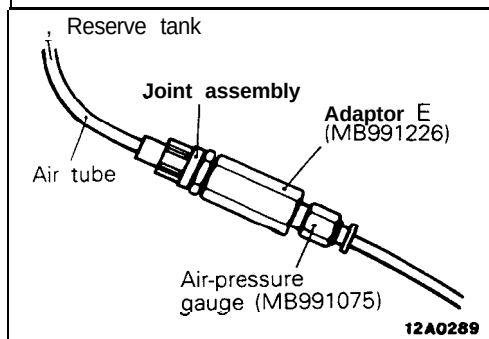


INSPECTION M33LCAC

CHECKING FOR STRUT ASSEMBLY AIR LEAKAGE

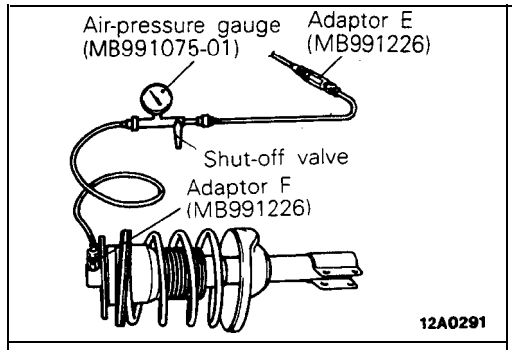
(1) Disconnect the flow-control solenoid valve's air tube (connected to the high-pressure side of the reservoir tank) shown in the illustration, and then take off the joint assembly.

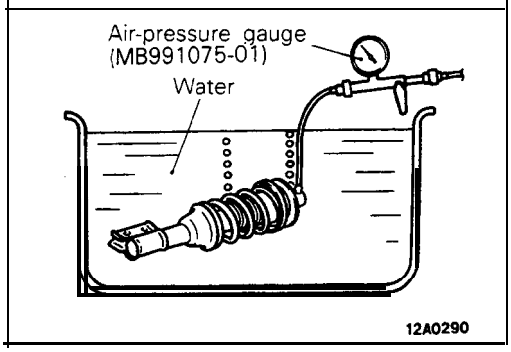
NOTE
This air tube is connected, via the reservoir tank and the dryer, to the compressor assembly.



(2) Install the removed joint assembly to the special tool (adaptor set) and then connect to the disconnected air tube.

TSB Revision





(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 strut assembly.
The installation at the strut side is done by using the special tool (adaptor set).

Caution
To prevent the entry of moisture during the strut 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.33B-126 for compressor connector array.

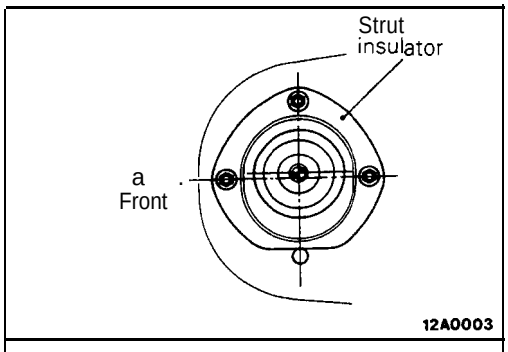
(5) Insert the strut assembly into a water tank and check for air leakage at a pressure of about 500 kPa (71 psi).

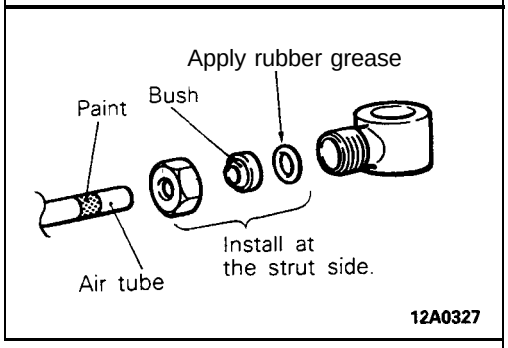
Caution
1. **Don't mistake the rise of bubbles attached to the outside of the strut for air leakage.**
2. **Dry the strut with an air blower after the check has been completed.**

(6) When air leakage is found, check the strut assembly and replace it as necessary.

CHECKING THE ACTUATOR

For detailed information concerning the checking of the actuator, refer to the troubleshooting guide and to the service adjustment procedures section.





SERVICE POINTS OF INSTALLATION M33LDAB

13. INSTALLATION OF STRUT ASSEMBLY

Install the strut assembly so that the strut insulator is in the direction shown in the figure.

NOTE
Be sure to check to be sure that the installation direction is correct, because if it is not the wheel alignment will be incorrect.

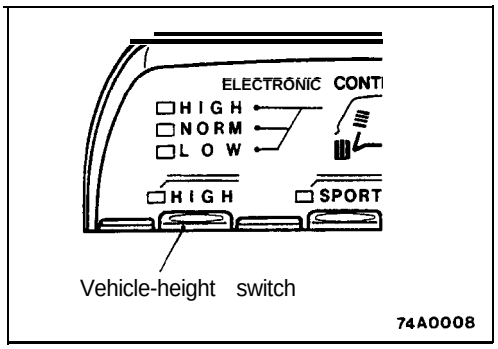
2. INSTALLATION OF AIR TUBE

(1) After coating the O-ring with rubber grease, install the O-ring, bush and flare nut to the strut 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 bush 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.

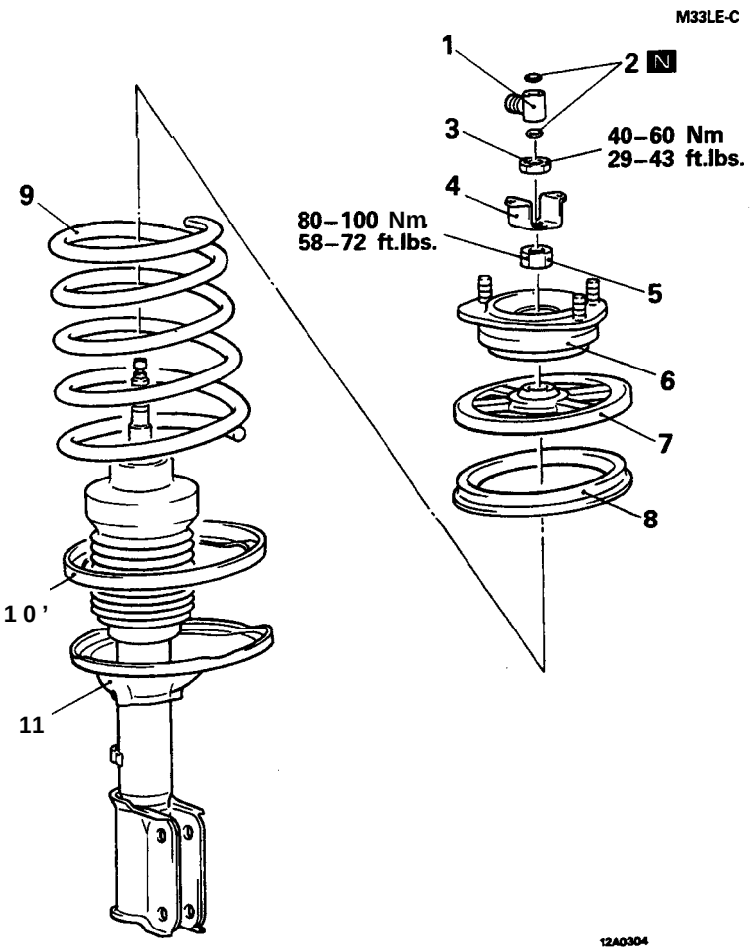
Caution
Air leakage may occur if the air tube connection is not complete and secure.



(3) In order to prevent double-folding of the air spring diaphragm after reconnection of the air tube, the vehicle-height switch should be pressed (with the vehicle lifted) two seconds or more so as to supply air to the air spring.

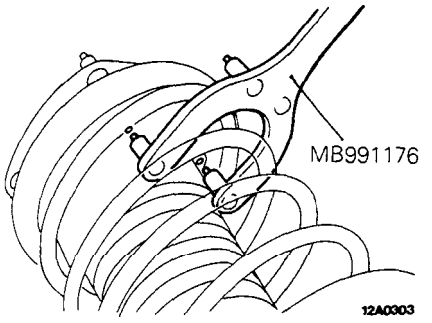
NOTE
By using the switch as described above, air should be introduced to the rear air springs and front air springs, in that sequence, for five seconds each.

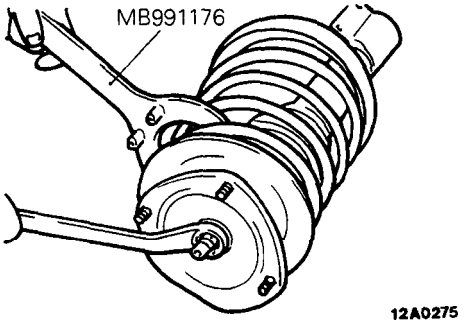
DISASSEMBLY AND REASSEMBLY

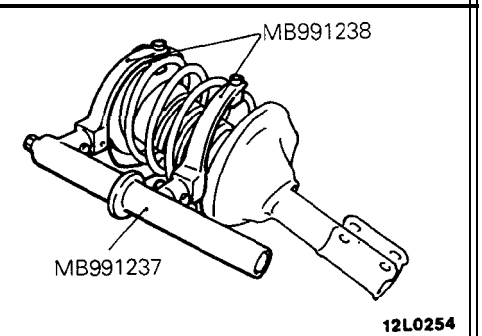


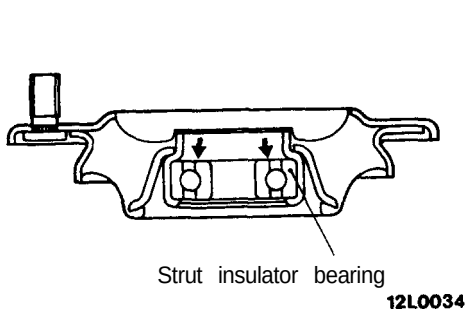
Disassembly steps

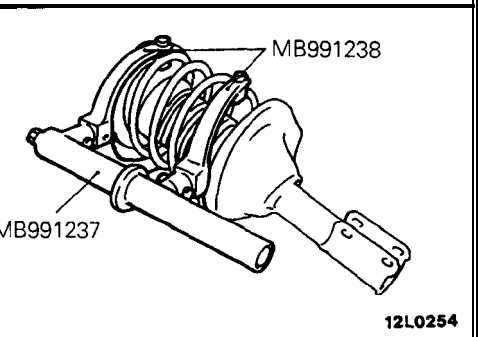
- ◆◆ 1. Joint
- ● + 2. O-ring
- 3. Actuator bracket mounting nut
- 4. Actuator bracket
- ● *● * 5. Strut insulator mounting nut
- 6. Strut insulator
- ◆◆ 7. Upper spring seat
- 8. Upper spring pad
- ● * 9. Coil spring
- 10. Lower spring pad
- 11. Strut assembly











SERVICE POINTS OF DISASSEMBLY M33LFAD

5. REMOVAL OF STRUT INSULATOR MOUNTING NUT

(1) Using the special tool, loosen (but do not remove) the strut insulator installation nut while holding the spring seat (upper).

Caution
Take care: Do not remove the nut.

(2) Using the special tool, compress the coil spring and then remove the strut insulator installation nut.

Cautions for coil spring compression during disassembly

(1) Place the strut assembly on a flat floor and attach the special tool.
(2) Install the arms of the special tool uniformly and so that, within the installation rang of the special tool, the length is maximum.
(3) Be careful that the position of attachment of the special tool's arm is not too deep or too shallow, and that the coil spring does not bend improperly during compression.

NOTE
The reinstallation of the coil spring will be made easier if, when the special tool is removed from the coil spring, a mark is made (by using a white felt pen or similar method) at the set position of the arm.

INSPECTION M33LGAC

- Check the rubber parts for damage or deterioration.
- Check the coil spring for deformation, deterioration or damage.
- Check the strut insulator bearing for wear.
- Check the shock absorber for deformation.

SERVICE POINTS OF REASSEMBLY M33LHAB

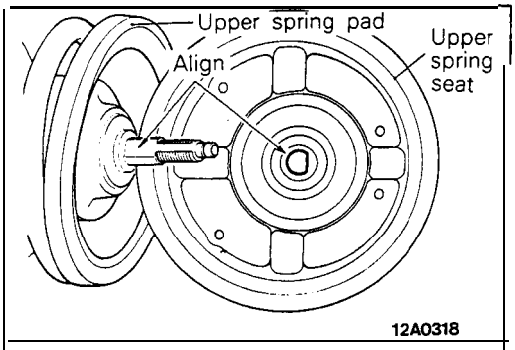
9. INSTALLATION OF COIL SPRING

Attach the special tool to the coil spring and compress the spring, and then install to the strut.

Caution for coil spring compression during reassembly

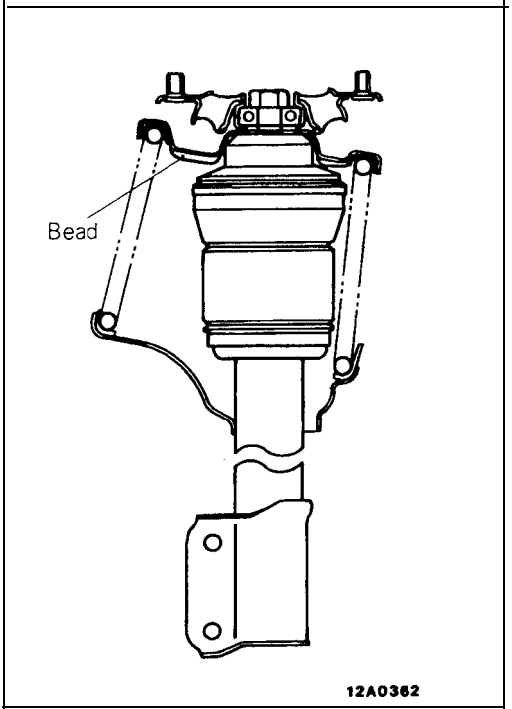
Insert the special tool from the direction opposite from the end of the coil spring, and set so that the arm's tab is at the approximate center of the coil spring's diameter.

NOTE
If the position of attachment of the arm of the special tool is too deep or too shallow, the coil spring will bend improperly during compression and will be difficult to fit to the spring seat.

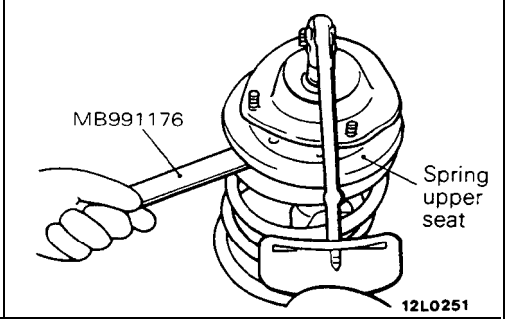


7. INSTALLATION OF UPPER SPRING SEAT

(1) Install the spring upper seat to the piston rod, and align the notched part of the piston rod and the hole in the spring seat.



(2) Align the bead of the spring upper seat and the facing direction of the knuckle bracket.



5. INSTALLATION OF STRUT INSULATOR MOUNTING NUT

Nut tightening

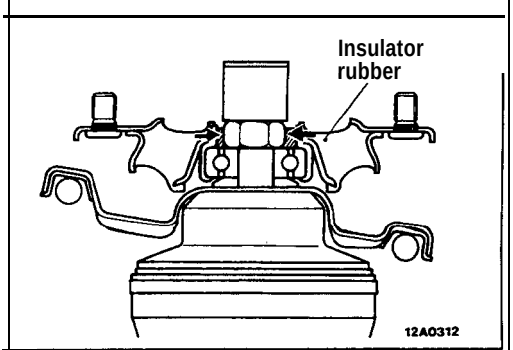
(1) **Loosely attach the strut insulator installation nut** to the strut assembly.

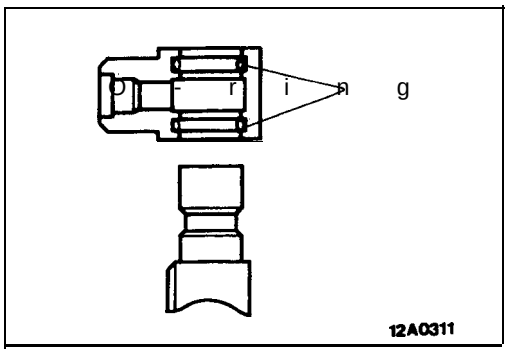
(2) Correctly align both ends of the coil spring with the groove in the spring seat, and then loosen the special tool.

(3) Using the special tool, hold the spring upper seat in place and tighten the strut insulator installation nut. Spring upper seat

(4) Apply a coating of multipurpose grease to the insulator bearing channel.

Caution
When coating with grease, take care that the grease does not adhere to the insulator rubber part.





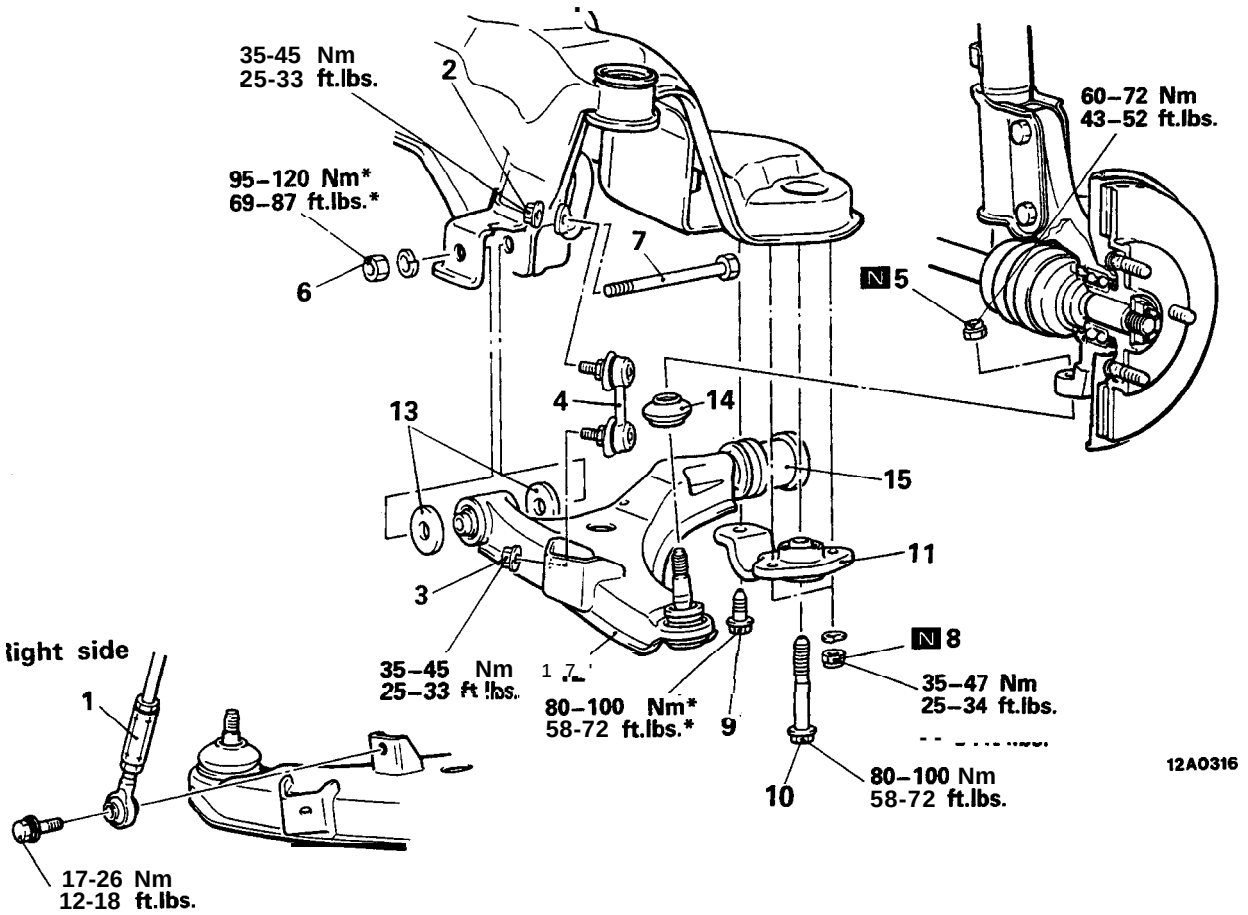
2. INSTALLATION OF O-RING/I. JOINT

Apply a coating of rubber grease to the O-ring, install it to the joint, and then install to the piston rod.

LOWER ARM

M33NA-A

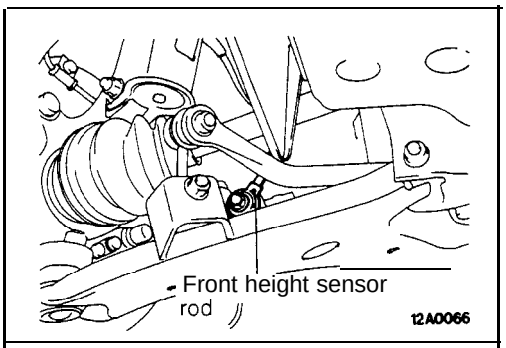
REMOVAL AND INSTALLATION

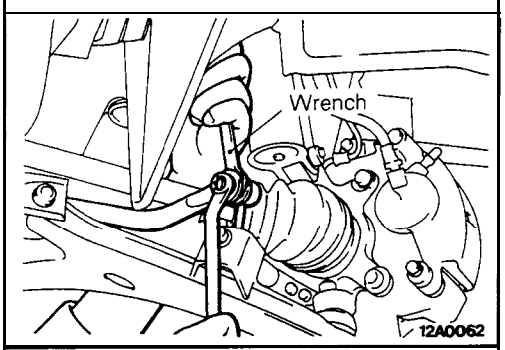


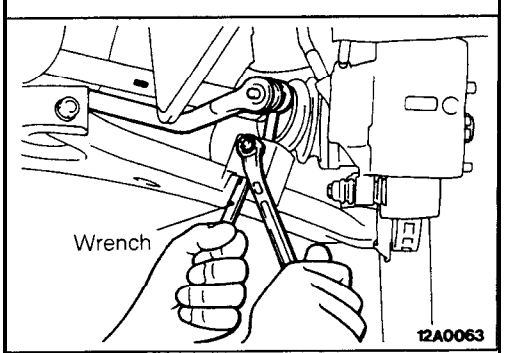
Removal steps

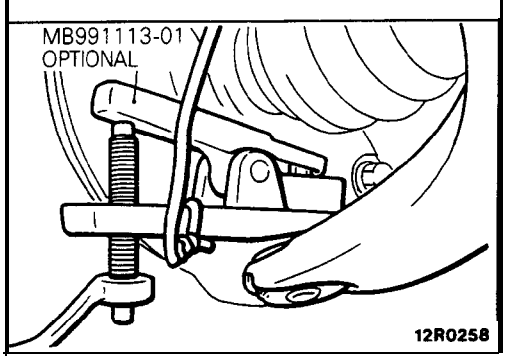
- ◆◆ 1. Front height sensor rod
- ◆◆ ◆◆ 2. Stabilizer link mounting nut (Stabilizer bar side)
- ◆◆ ◆◆ 3. Stabilizer link mounting nut (Lower arm side)
- 4. Stabilizer link
- ◆◆ 5. Lower arm ball-joint and knuckle coupling self-locking nut
- 6. Lower arm mounting nut
- 7. Lower arm mounting bolt
- 8. Clamp mounting self locking nut
- 9. Clamp mounting bolt (small)
- 10. Clamp mounting bolt (large)
- 11. Lower arm mounting clamp
- 12. Lower arm
- 13. Stopper
- 14. Dust cover
- 15. Rod bushing

NOTE
* : Indicates parts which should be temporarily tightened, and then fully tightened with the **vehicle** in the unladen condition.









SERVICE POINTS OF REMOVAL M33NBAC

1. REMOVAL OF FRONT HEIGHT SENSOR ROD

When removing the right strut assembly and knuckle union, always first remove the lower arm and front height sensor rod union.

2./3. REMOVAL OF STABILIZER LINK MOUNTING NUT

Use wrench or similar tool to secure the ball stud part at both ends of the stabilizer link, and then remove the nut.

5. REMOVAL OF LOWER ARM BALL JOINT

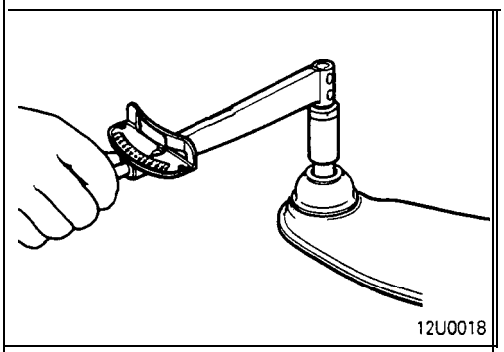
Using the special tool, disconnect the lower arm ball joint from the knuckle.

NOTE
(1) Always tie the cord of the special tool to the nearby part.
(2) Loosen the nut but do not remove it.

INSPECTION M33NCAB

- Check the lower arm for bend or breakage.
- Check the clamp for deterioration or damage.
- Check the bushing for wear and deterioration.
- Check the ball joint dust cover for cracks.
- Check all bolts for condition and straightness.

TSB Revision



BALL JOINT CHECKING FOR STARTING TORQUE

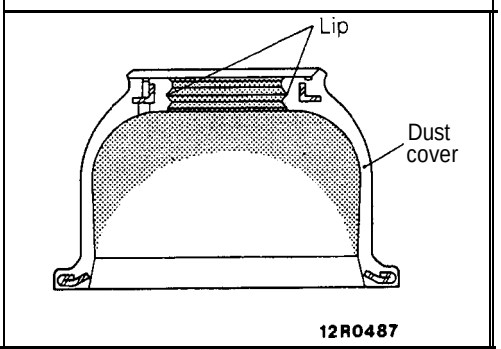
(1) If a crack is noted in the dust cover, replace it, adding grease.
(2) Turn side to side the ball joint stud several times.
(3) Mount two nuts on the ball joint, and then measure the ball joint starting torque.

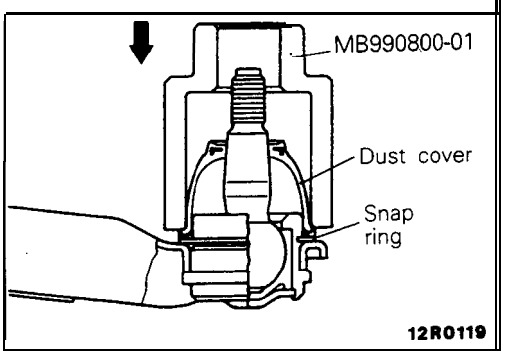
Standard value: 3–10 Nm (26-87 in.lbs.)

(4) If the starting torque exceeds the upper limit of standard value, replace the lower arm assembly.
Even if the starting torque is below the lower limit of the standard value, the ball joint may be reused unless it has drag and excessive play.

BALL JOINT DUST COVER REPLACEMENT M33NEAC

(1) Remove the dust cover.
(2) Apply multipurpose grease to the lip and inside of the dust cover.



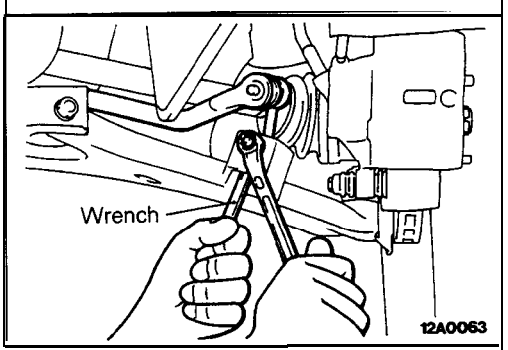


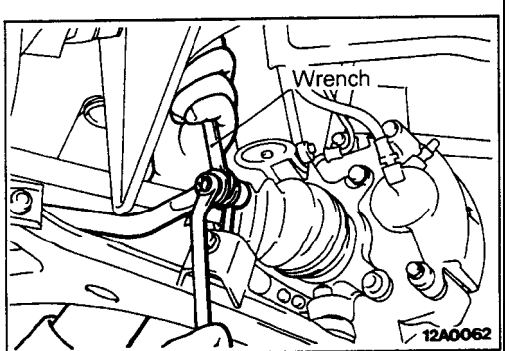
(3) Drive in the dust cover with special tool until it is fully seated.

SERVICE POINTS OF INSTALLATION M33NFAB

3./2. INSTALLATION OF STABILIZER LINK MOUNTING NUT

Use wrench or similar tool to secure the ball stud part at **both ends of the stabilizer link, and then tighten the nut.**

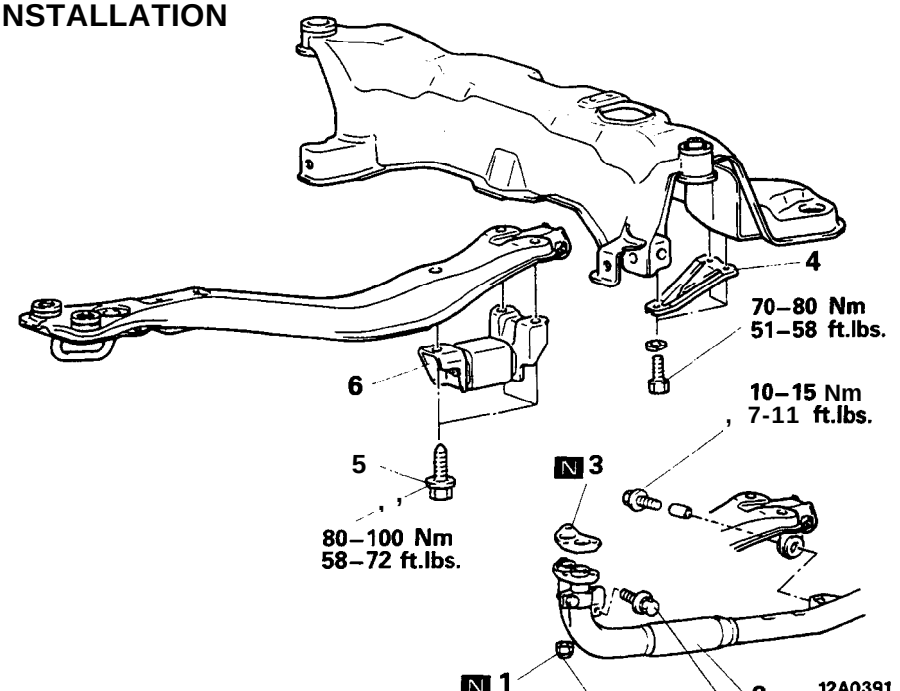




STABILIZER BAR

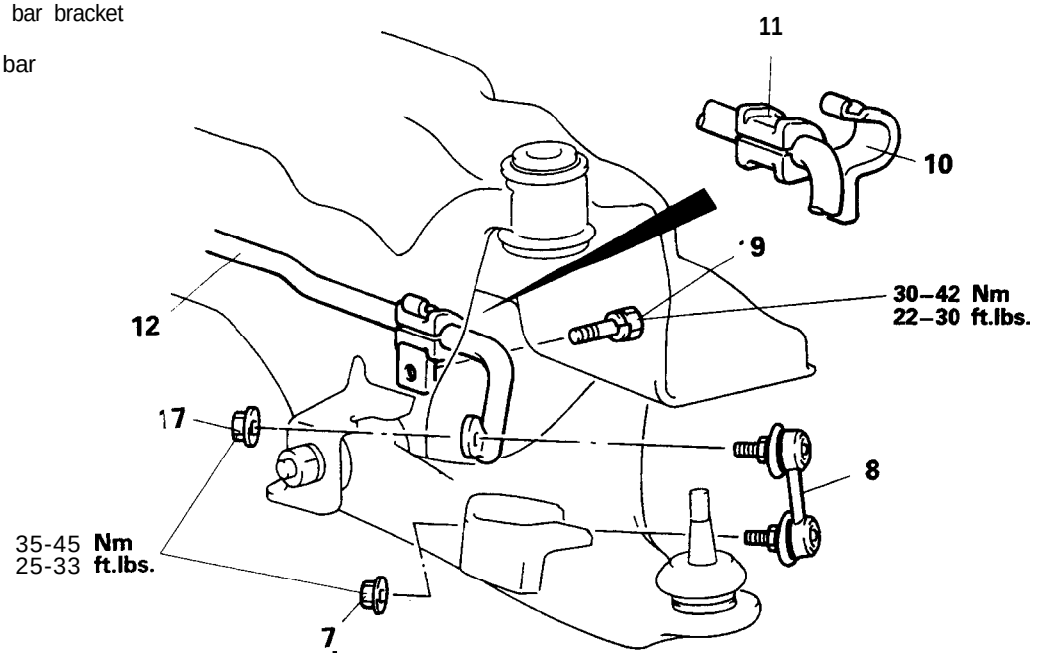
M33TA-A

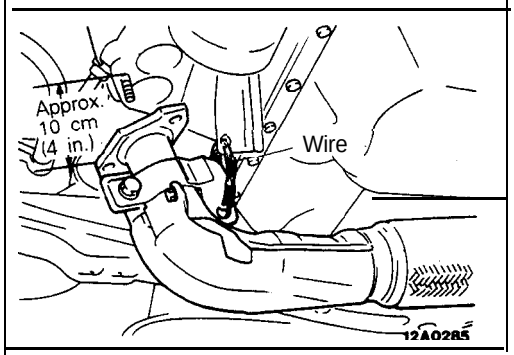
REMOVAL AND INSTALLATION



Removal steps

1. Self locking nuts
◆◆ 2. Front exhaust pipe
3. Gasket
4. Stay
5. Centermember rear installation bolts
6. Dynamic damper
◆◆ ◆◆ 7. Stabilizer link mounting nuts
8. Stabilizer link
9. Stabilizer bar bracket mounting bolt
● +10. Stabilizer bar bracket
11. Bushing
◆◆ 12. Stabilizer bar





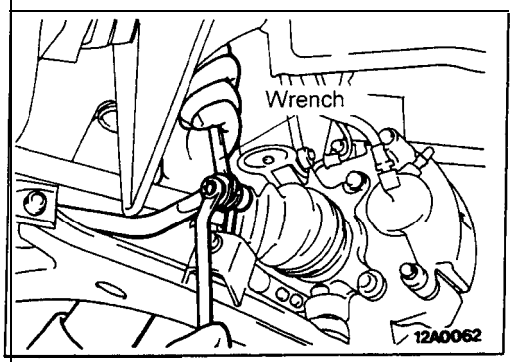
SERVICE POINTS OF REMOVAL

M33TBAAa

2. REMOVAL OF FRONT EXHAUST PIPE

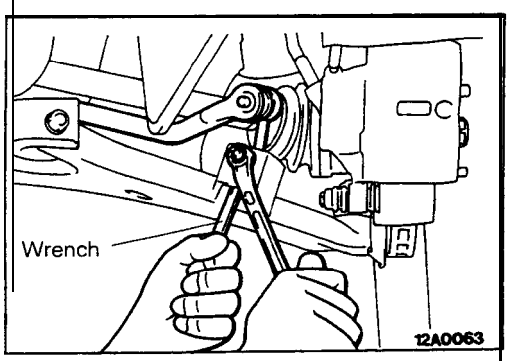
After disconnection of the front exhaust pipe assembly and the exhaust manifold, use wire, etc. to hang the front exhaust pipe down.

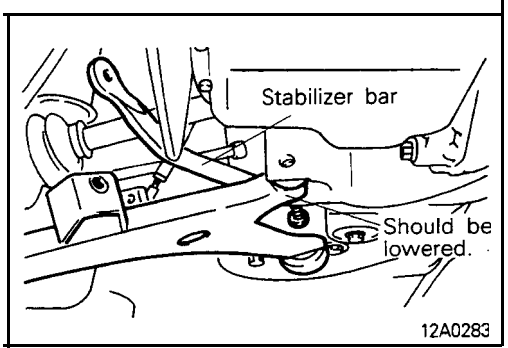
Caution
Do not bend the flexible joint more than shown in the figure, because there is danger the inside may be damaged if it is bent too much.



7. REMOVAL OF STABILIZER LINK MOUNTING NUTS

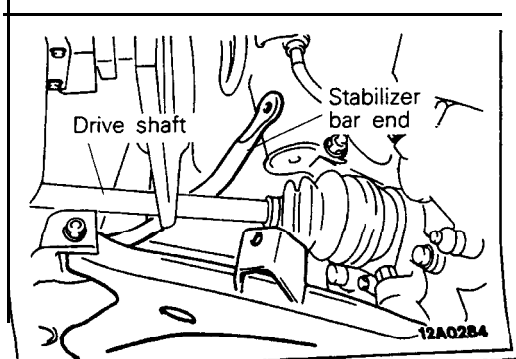
Using a wrench or similar tool to secure the ball studs at both ends of the stabilizer link, remove the mounting nuts.





12. REMOVAL OF STABILIZER BAR

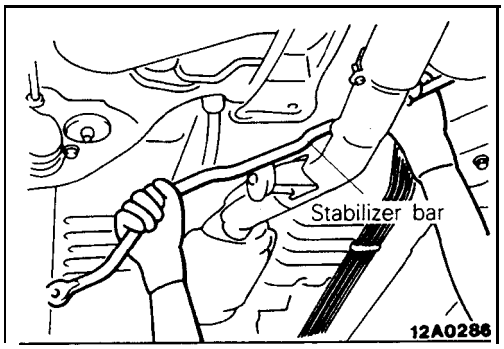
(1) Disconnect either the left or right lower arm from the crossmember, and slightly lower the installation part.



(2) Pull out both ends of the stabilizer bar to the rear of the drive shaft.

NOTE
First pass the end of the stabilizer bar (at the side at which the lower arm was not lowered) under the drive shaft, and then pull out toward the rear.

TSB Revision



(3) Move either the left or right stabilizer bar until the end of the stabilizer bar clears the lower arm.
(4) With the end that has cleared the lower arm, pull out the stabilizer bar diagonally.

INSPECTION M33TCAH

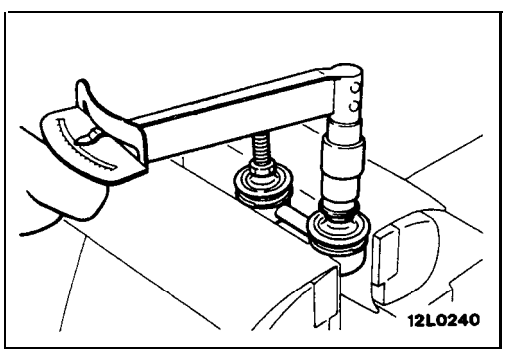
- Check the bushing for wear and deterioraton.
- Check the stabilizer bar for deterioration or damage.
- Check the stabilizer link bail joint dust cover for cracks.
- Check all bolts for condition and straightness.

CHECKING OF STABILIZER LINK BALL JOINT FOR STARTING TORQUE

(1) If a crack is noted in the dust cover, replace it, adding grease.
(2) Turn side to side the stabilizer link ball joint stud several times.
(3) Mount two nuts on the ball joint, and then measure the ball joint starting torque.

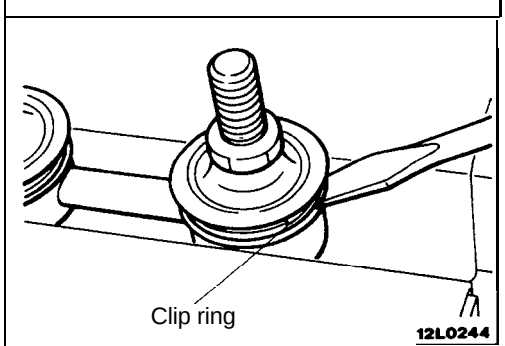
Standard value: 1.7-3.2 Nm (15-28 in.lbs.)

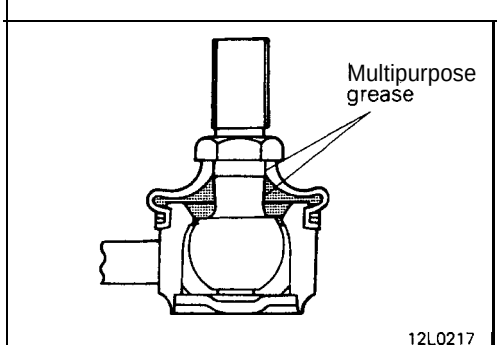
(4) If the starting torque exceeds the upper limit of standard value, replace the stabilizer link.
(5) Even if the starting torque is below the lower limit of the standard value, the ball joint may be reused unless it has drag and excessive play.



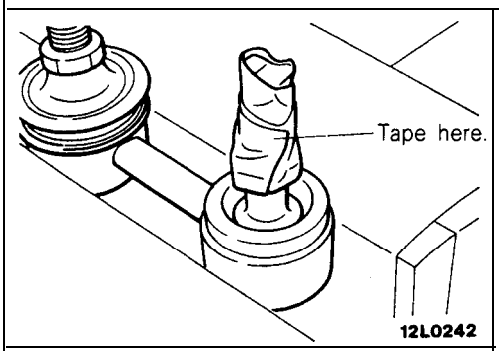
BALL JOINT DUST COVER REPLACEMENT M33TEAC

(1) Remove the clip ring and the dust cover.

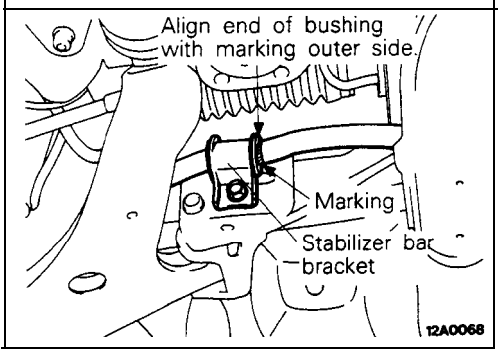




(2) Apply multipurpose grease to the lip and inside of the dust cover.



(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 link.

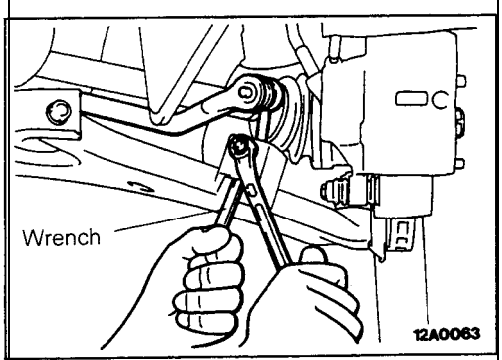


SERVICE POINTS OF INSTALLAION M33TDAN

10. INSTALLATION OF STABILIZER BAR BRACKET

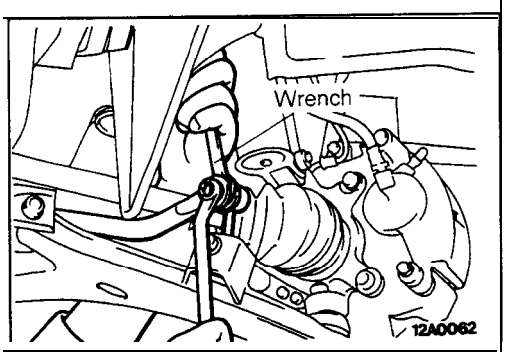
(1) Provisionally tighten the stabilizer bar bracket.
(2) Align the bushing end with the marked part of the stabilizer bar, and then fully tighten the stabilizer bar bracket.
(3) Provisionally tighten the removed lower arm installation part to the crossmember.

Caution
Make the final tightening with the vehicle in the unladen condition; the tightening should be at the specified tightening torque.



7. INSTALLATION OF STABILIZER LINK MOUNTING NUTS

Using a wrench or similar tool to secure the ball studs at both ends of the stabilizer link, tighten the mounting nuts.



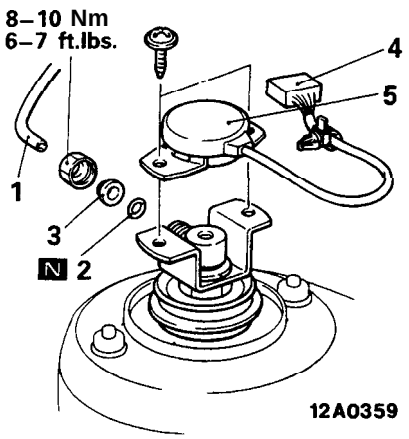
SHOCK ABSORBER ASSEMBLY

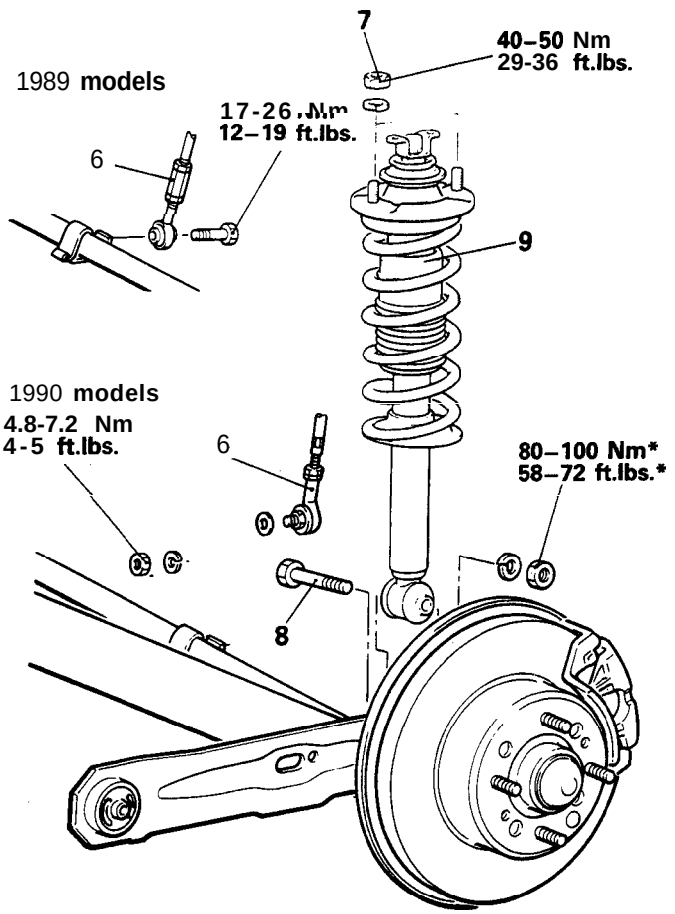
M33MA-A

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of Trunk Room Side Trim (Refer to GROUP 52–Trims)

Post-installation Operation
- Installation of Trunk Room Side Trim (Refer to GROUP 52–Trims.)

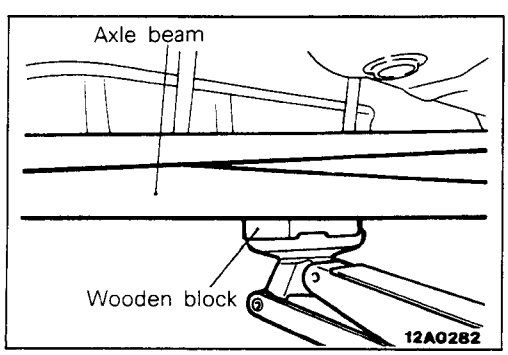




Removal steps

- ◗ ☒ 1. Air tube
  2. O-ring
  3. Bush
  4. Actuator connector
  5. Actuator
  6. Rear height sensor rod
  7. Shock absorber upper mounting nuts
  8. Shock absorber lower mounting bolts
- ◗ ☒ 9. Shock absorber assembly

NOTE
*: Points marked with an asterisk should first be tightened provisionally, then tightened fully when the vehicle is empty.



SERVICE POINTS OF REMOVAL

M33MBAI

9. REMOVAL OF SHOCK ABSORBER ASSEMBLY

(1) Jack up the torsional axle and arm assembly and keep it lifted up to some degree.

Caution

1. **Always insert a wooden block between the jack receptacle and the axle beam and place the jack at the centre of the axle beam.**
2. **Make sure that the jack does not contact the lateral rod.**

TSB Revision

(2) Remove the shock absorber upper mounting nuts and the lower mounting bolts, and then remove the shock absorber assembly.

INSPECTION M33MCAB

CHECKING FOR SHOCK ABSORBER ASSEMBLY AIR LEAKAGE

For information concerning checking for air leakage of the shock absorber assembly, refer to the section concerning the strut assembly (P.33B-98.)

CHECKING ACTUATOR

For information concerning the checking of the actuator, refer to the troubleshooting guide and the service adjustment procedures section.

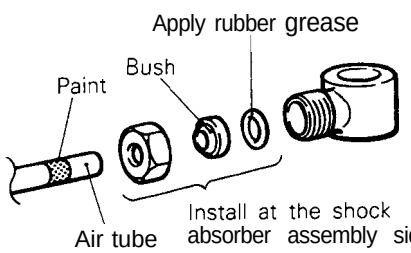
SERVICE POINTS OF INSTALLATION M33MEAF

1. CONNECTION OF AIR TUBE

(1) After applying a coating of rubber grease to the O-ring, install the O-ring, bush 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 the insertion is made.
2. The bush must be installed so that the projection part is facing in the direction indicated in the illustration.



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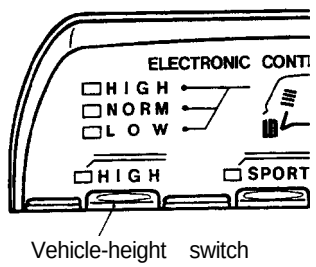
(2) First insert the air tube until resistance is felt, and then push in the tube until the painted place on the air tube.

Caution

Air leakage may occur if the air tube connection is not complete and secure.



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(3) In order to prevent double-folding of the air spring diaphragm after reconnection of the air tube. the vehicle-height switch should be pressed (with the vehicle lifted) two seconds or more so as to supply air to the air spring.

NOTE

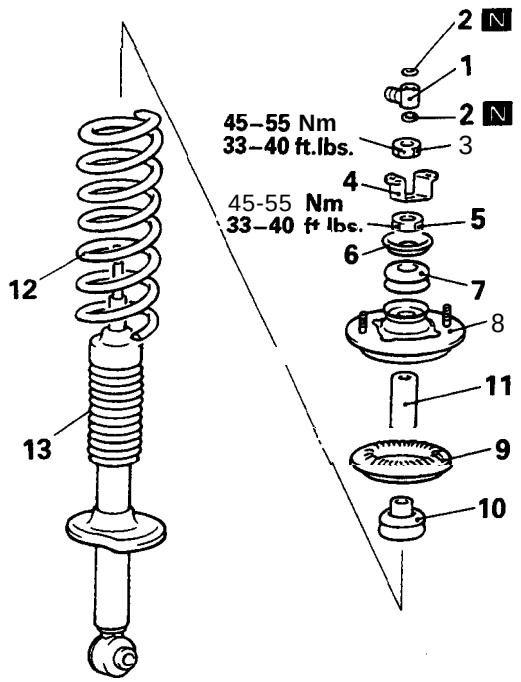
By using the switch as described above, air should be introduced to the rear air springs and front air springs, in that sequence, for five seconds each.

DISASSEMBLY AND REASSEMBLY

M33MU-A

Disassembly steps

- ● + 1. Joint
- ◆◆ 2. O-ring
- 3. Actuator bracket mounting nut
- 4. Actuator bracket
- ◆◆◆◆ 5. Piston rod tightening nut
- 6. Washer
- 7. Upper bushing (A)
- ◆◆ 8. Bracket assembly
- 9. Spring pad
- 10. Upper bushing (B)
- 11. Collar
- ● a 12. Coil spring
- 13. Shock absorber



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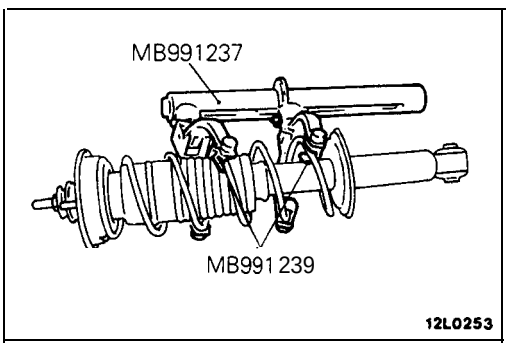

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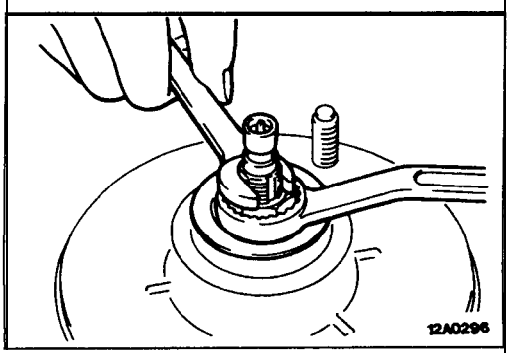


12A0296

SERVICE POINTS OF DISASSEMBLY

M33MVAB

5. REMOVAL OF PISTON ROD TIGHTENING NUT

(1) Compress the coil spring using the special tool.

Caution
Do not use an air tool to tighten the bolt of the special tool.

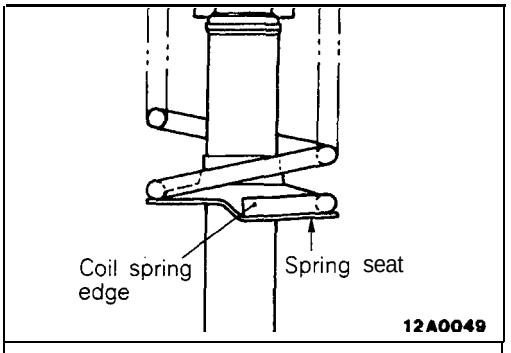
(2) While holding the piston rod, remove the piston rod tightening nut.

TSB Revision

INSPECTION

M33MQAB

- 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.

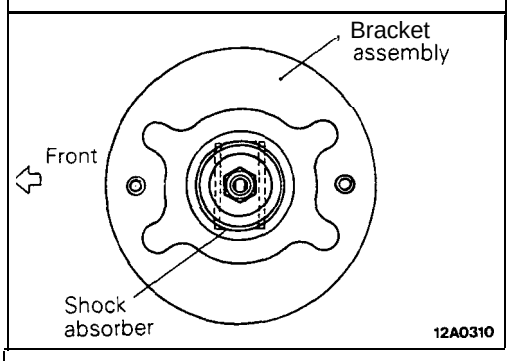


SERVICE POINTS OF REASSEMBLY

M33MWAB

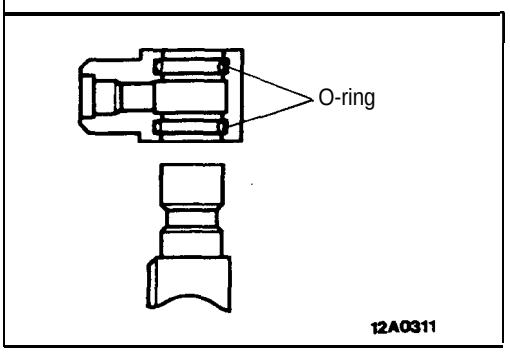
12. INSTALLATION OF COIL SPRING

(1) Use the special tool (MB991237 and MB991239) to compress the coil spring and insert it in the shock absorber.
(2) Align the edge of the coil spring to the position of the shock absorber spring seat as shown.



8. INSTALLATION OF BRACKET ASSEMBLY/5. PISTON ROD TIGHTENING NUT

(1) With the position of the bracket assembly as shown in the figure, tighten the tightening nut to the specified torque.
(2) Install the coil spring so that the lower edge fits into the spring seat groove and the upper edge fits into the spring pad groove, then remove the special tool (MB991237 and MB991239).



2. INSTALLATION OF O-RING/1. JOINT

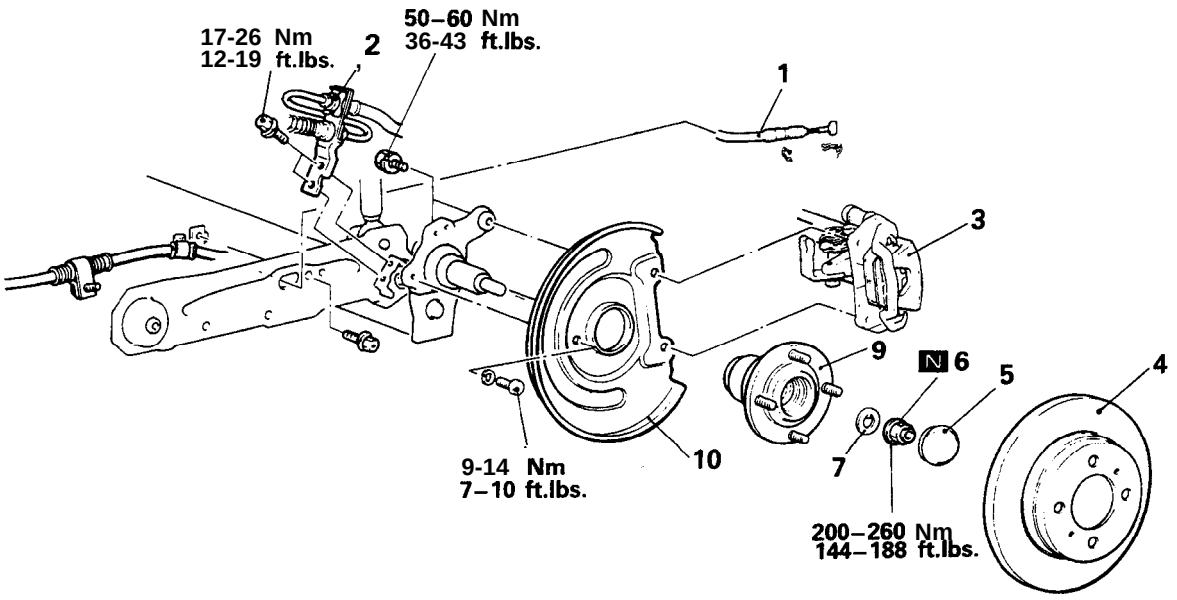
Apply a coating of rubber grease to the O-ring, install it to the joint, and then install to the piston rod.

TSB Revision

REAR SUSPENSION ASSEMBLY

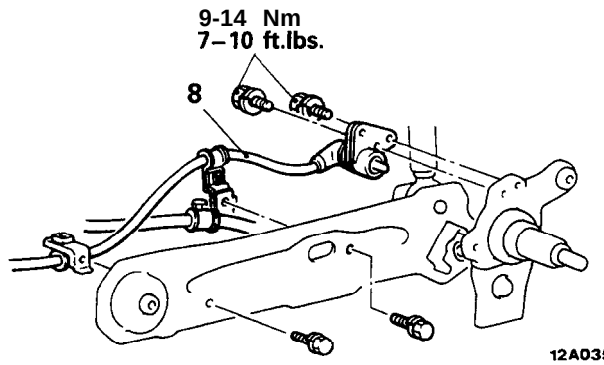
M33GA-A

REMOVAL AND INSTALLATION



12A0355

Vehicles with A.B.S.



12A0356

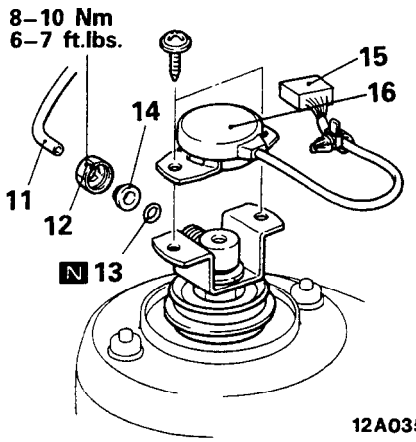
Pre-removal Operation
- Removal of Trunk Room Side Trim (Refer to GROUP 52–Trims.)

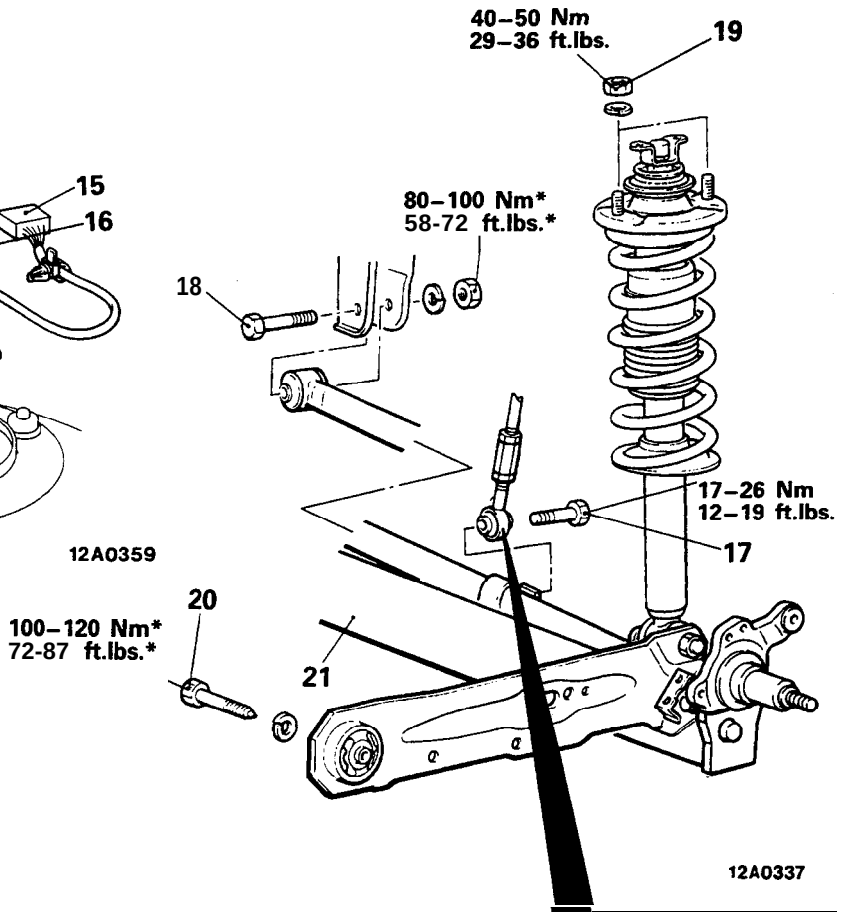
Removal steps

1. Parking brake cable
2. Brake tube and hose bracket
3. Rear disc brake
4. Brake disc
5. Hub cap
- \+ 6. Flange nut
7. Washer
8. Speed sensor <Vehicles with A.B.S.>
9. Rear axle assembly
10. Dust shield

Post-installation Operation
- installation of Trunk Room Side Trim. (Refer to GROUP 52–Trims.)
- Check the Brake Disc Runout, and Adjust. (Refer to GROUP 35–Service Adjustment. Procedures.)
- Check the Rear Disc Brakes Dragging Torque, and Adjust. (Refer to GROUP 35–Service Adjustment Procedures.)
- Checking Parking Brake Lever Stroke. (Refer to GROUP 36–Service Adjustment Procedures.)
- Check the Rolling Diaphragm for Double-folding. (Refer to P.33B-89.)

TSB Revision

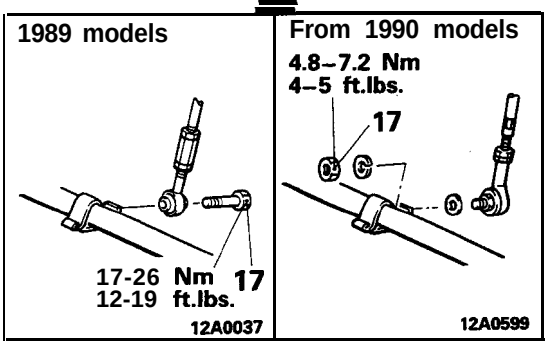


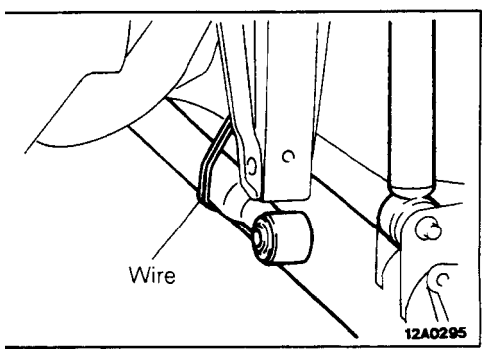


Removal steps

- Air tube
- 12. Joint
- 13. O-ring
- 14. Bush
- 15. Actuator connector
- 16. Actuator
- 17. Rear heiaht sensor rod mounting bolt (1989 models)
- 17-1. Rear height sensor rod mounting nut (From 1990 models)
- ◆◆ 18. Lateral rod mounting bolt (body side)
- ◆◆ 19. Shock absorber upper mounting nuts
- ◆◆ 20. Trailling arm mounting bolts
- ◆◆ 21. Rear suspension assembly

NOTE
*: Points marked with an asterisk shoud first be tightened provisionally, then tightened fully when the vehicle is empty.



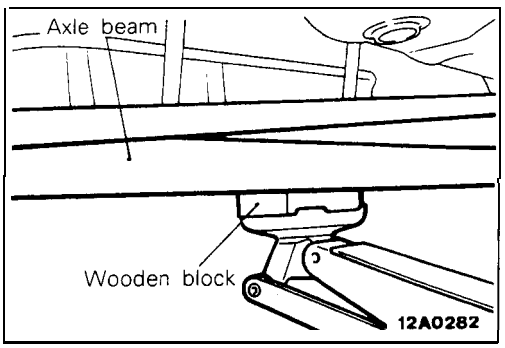


SERVICE POINTS OF REMOVAL M33GBBE

18. REMOVAL OF LATERAL ROD MOUNTING BOLT (BODY SIDE)

(1) Remove the lateral rod from the body.
(2) Secure and hold the lateral rod to the axle beam with wire, etc.

TSB Revision



19. REMOVAL OF SHOCK ABSORBER UPPER MOUNTING NUTS/20. TRAILING ARM MOUNTING BOLTS/21. REAR SUSPENSION ASSEMBLY

(1) Jack up the torsion axle and arm assembly in order to raise it slightly.

Caution
1. Always insert a wooden block between the jack receptacle and the axle beam and place the jack at the centre of the axle beam.
2. Make sure that the jack does not contact the lateral rod.

(2) Remove the shock absorber mounting bolts and the trailing arm mounting bolts.
(3) Lower the jack slowly, and then remove the rear suspension assembly.

INSPECTION M33GCBC

- Check the trailing arm and axle beam for deformation or damage.
- Check the torsion bar for damage.
- Check the lateral rod for damage or deformation.
- Check the bushings for cracking, deterioration, or unusual wear.

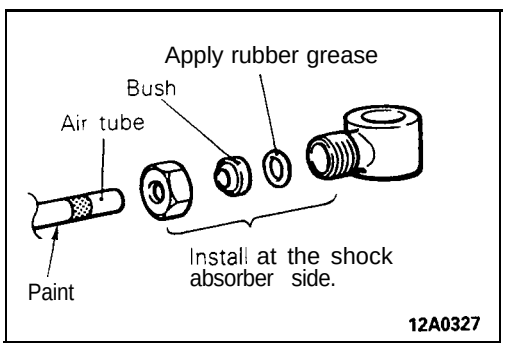
BUSHING REPLACEMENT

TRAILING ARM BUSHING

Refer to P.33B-121.

LATERAL ROD BUSHING

Refer to P.33B-118.



SERVICE POINTS OF INSTALLATION M33GDBC

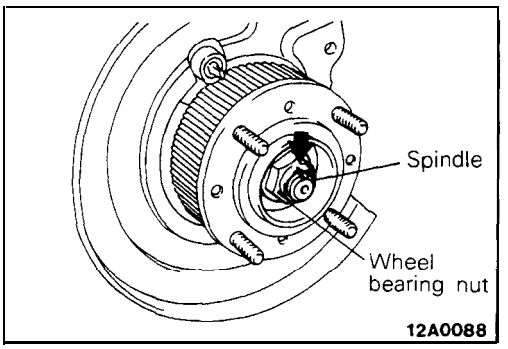
11. CONNECTION OF AIR TUBE

(1) After applying a coating of rubber grease to the O-ring, install the O-ring, bush and joint at the shock absorber assembly side.

Caution
1. The O-ring may be damaged if it is installed at the air tube side when the connection is made.
2. The bush 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.



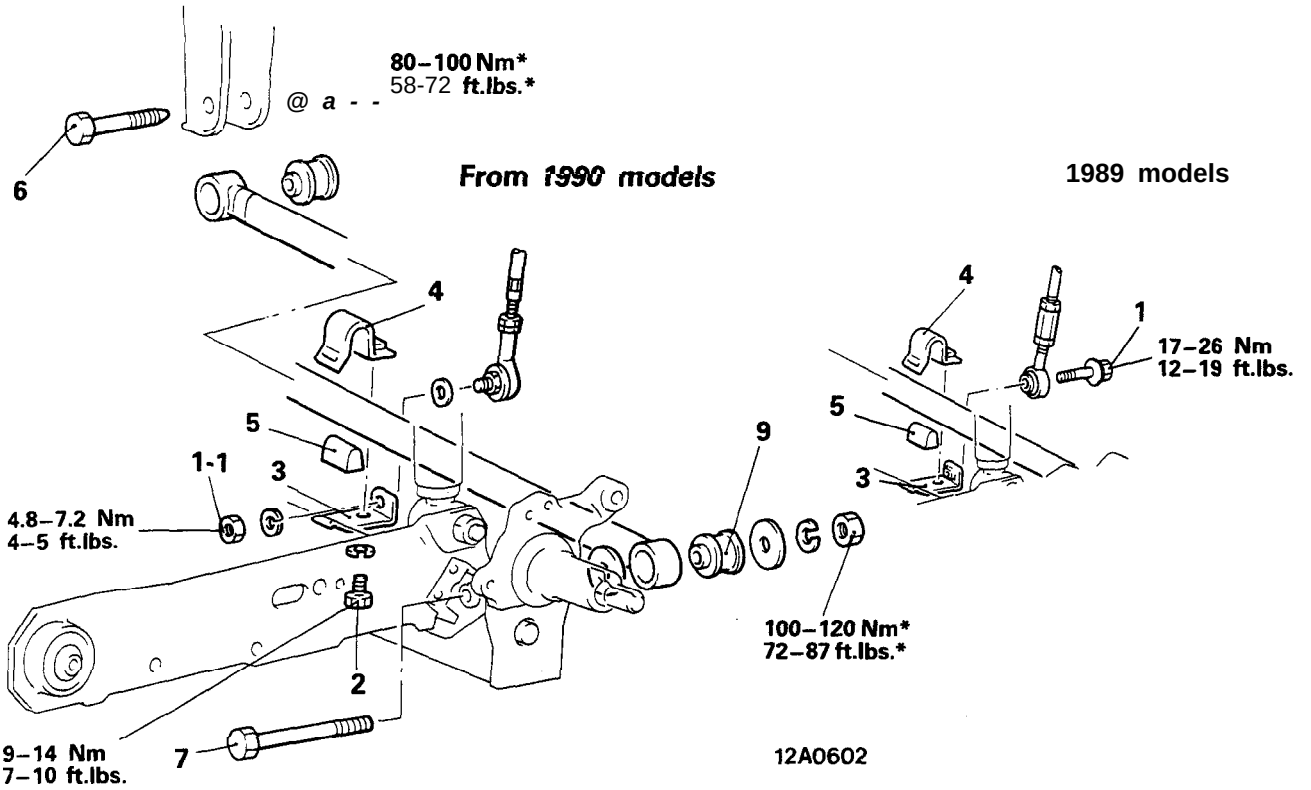
6. INSTALLATION OF THE FLANGE NUT

After tightening the flange nut, align with the indentation in the spindle, and crimp.

LATERAL ROD

REMOVAL AND INSTALLATION

M33UA-A



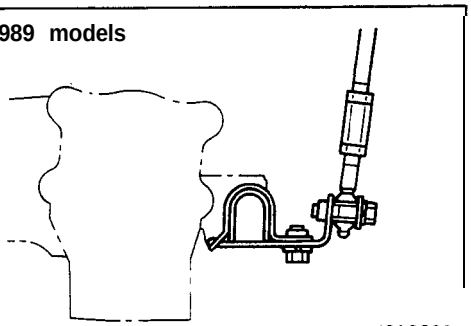
Removal steps

- ◆◆ 1. Rear height sensor rod mounting bolt (1989 models)
- 1-1. Rear height sensor rod mounting nut (From 1990 models)
- ● + 2. Rear height sensor bracket mounting bolt
- 3. Rear height sensor bracket B
- 4. Rear heigh sensor bracket A
- 5. Spacer
- 6. Lateral rod mounting bolt (body side)
- ◆◆ 7. Lateral rod mounting bolt (axle beam side)
- Lateral rod
- 9. Lateral rod bushing

NOTE
*: Points marked with an asterisk should first be tightened provisionally, then tightened fully when the vehicle is empty.

TSB Revision

1989 models



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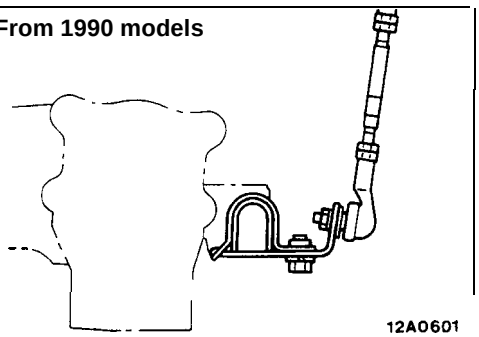
From 1990 models



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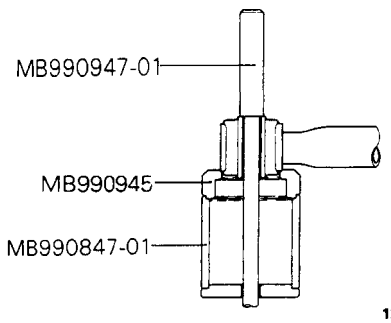
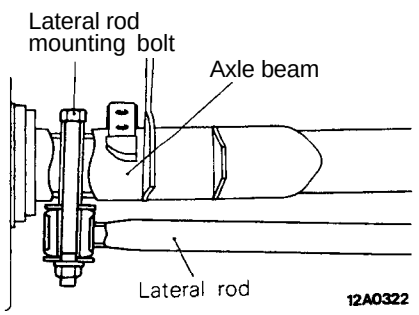
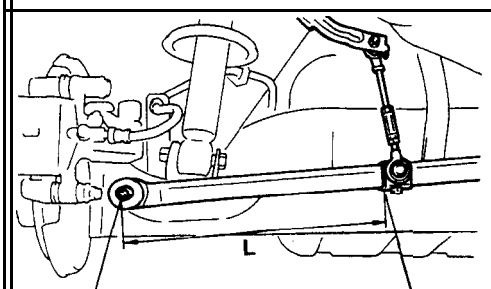


12R0142



12A0322



12A0064

SERVICE POINTS OF REMOVAL M33UBBA

1. REMOVAL OF REAR HEIGHT SENSOR ROD

NOTE

If anything other than the rear height sensor rod mounting bolt are removed, the height sensor installation dimension must be readjusted so remove other parts only when absolutely necessary.

INSPECTION M33UCAA

- Check lateral rod for damage and deformation.
- Check each bushing for cracks, deterioration and wear.

LATERAL ROD BUSHING REPLACEMENT M33UEAA

(1) Drive out the lateral rod bushing using the special tools.
(2) Press in the bushing using the special tools so that the amount of projection is equal at the left and right.

SERVICE POINTS OF INSTALLATION M33UDAA

7. INSTALLATION OF LATERAL ROD MOUNTING BOLT (AXLE BEAM SIDE)

Install the lateral rod mounting bolt from the direction shown in the illustration.

2. ADJUSTMENT OF REAR HEIGHT SENSOR BRACKET MOUNTING BOLT

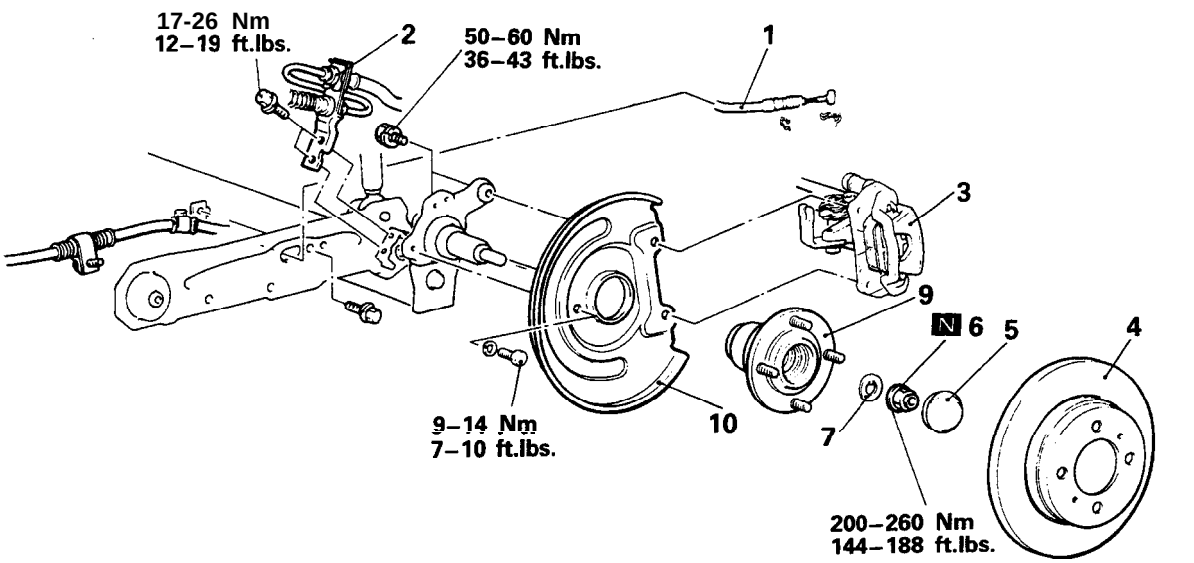
Move the height sensor bracket so that the display dimensions assume the standard values, then secure the bracket in place with the height sensor bracket mounting bolts.

Standard value (L): 315 ± 1 mm (12.4 ± .04 in.)

TORSION AXLE AND ARM ASSEMBLY

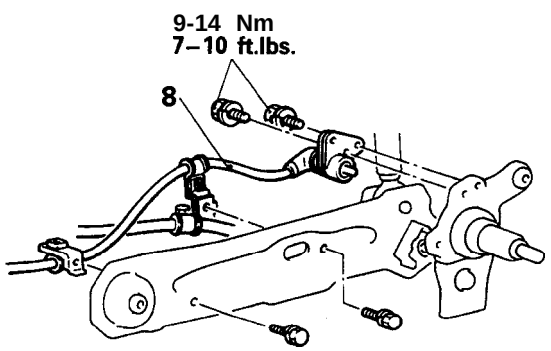
M33PA-A

REMOVAL AND INSTALLATION



12A0355

Vehicles with A.B.S.



12A0356

Removal steps

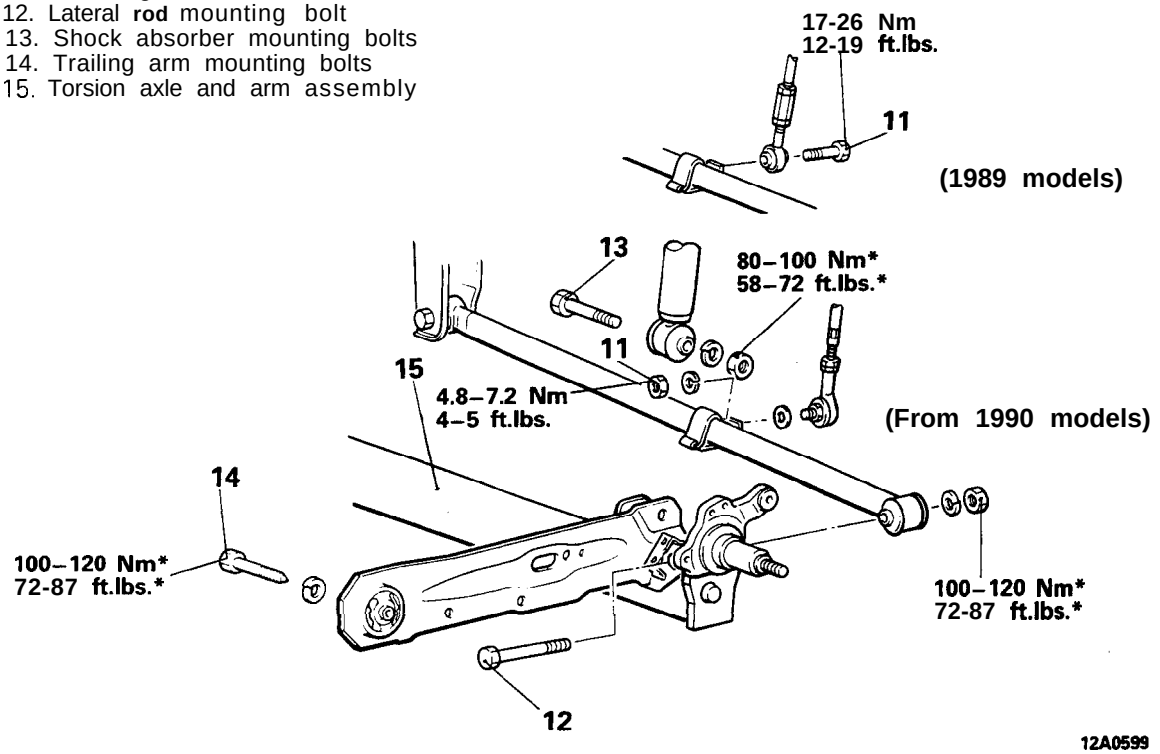
1. Parking brake cable
2. Brake hose and tube bracket
3. Rear disc brake
4. Rear brake disc
5. Hub cap
- ◆◆ 6. Flange nut
7. Washer
8. Speed sensor <vehicles with A.B.S.>
9. Rear axle assembly
10. Dust shield

Post-installation Operation

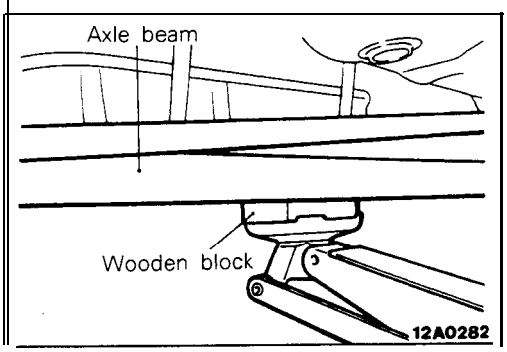
- Check the Brake Disc Runout, and Adjust. (Refer to GROUP 35–Service Adjustment Procedures.)
- Check the Rear Disc Brakes Dragging Torque, and Adjust. (Refer to GROUP 35–Service Adjustment Procedures.)
- Checking for Parking Brake Lever Stroke. (Refer to GROUP 35–Service Adjustment Procedures.)

TSB Revision

11. Rear height sensor rod mounting bolt or nut
◆◆ 12. Lateral **rod** mounting bolt
◆◆ 13. Shock absorber mounting bolts
◆◆ 14. Trailing arm mounting bolts
◆◆ 15. Torsion axle and arm assembly



VOTE
*: Points marked with an asterisk should first be tightened provisionally, then tightened fully when the vehicle is empty.



SERVICE POINTS OF REMOVAL M33PBAF

13. REMOVAL OF SHOCK ABSORBER MOUNTING BOLTS/14. TRAILING ARM MOUNTING BOLTS/15. TORSION AXLE AND ARM ASSEMBLY

(1) Jack up the torsion axle and arm assembly in order to raise it slightly.

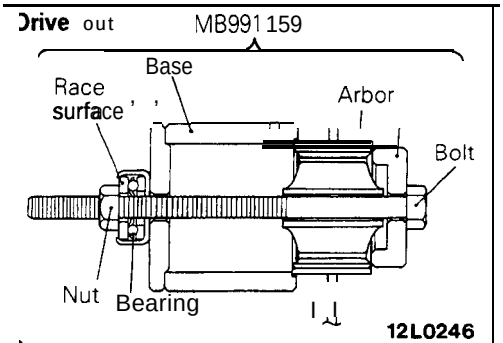
Caution
1. **Always insert a wooden block between the jack receptacle and the axle beam and place the jack at the centre of the axle beam.**
2. **Make sure that the jack does not contact the lateral rod.**

(2) Remove the shock absorber mounting bolts and the trailing arm mounting bolts.
(3) Lower the jack slowly, and then remove the torsion axle and arm assembly.

INSPECTION M33PCAE

- Check the trailing arm and axle beam for deformation or damage.
- Check the torsion bar for damage.

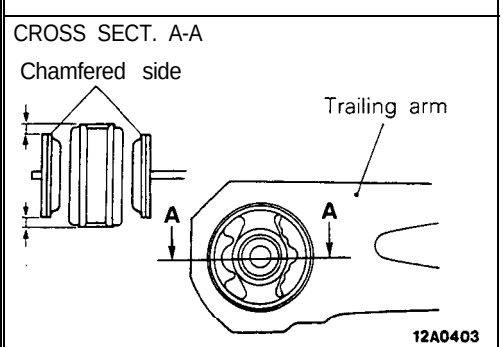
TSB Revision



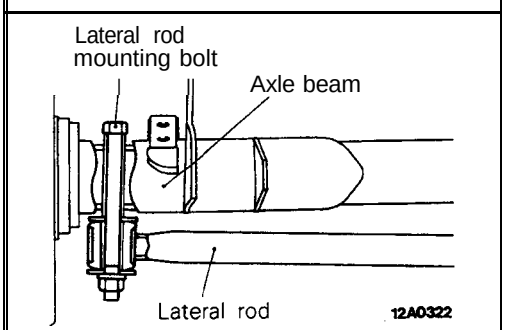
TRAILING ARM BUSHING REPLACEMENT M33PEAA

(1) Drive out and press in the arm bushing using the special tool.

Caution
Mount the bearing of the special tool so that the race surface faces toward the nut.



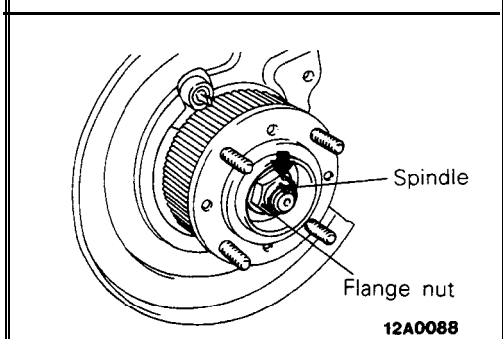
(2) Press in the bushing from the chamfered side onto the trailing arm so that the hole is in position as shown.
(3) Press in the bushing so that the amount of projection is uniform throughout.



SERVICE POINTS OF INSTALLATION M33PDAB

12. INSTALLATION OF LATERAL ROD MOUNTING BOLT

Install the lateral rod mounting bolt from the direction shown in the illustration.



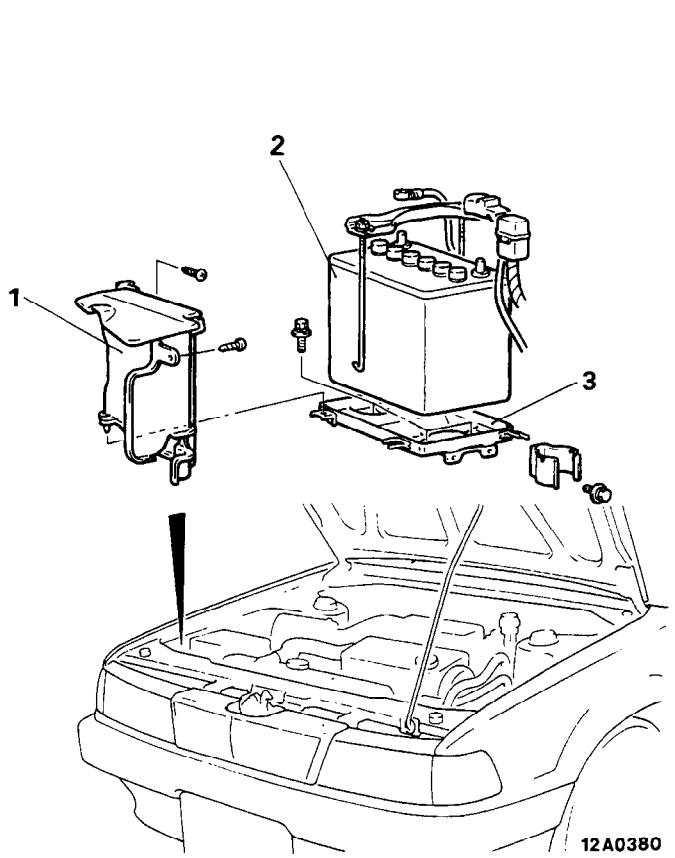
6. INSTALLATION OF THE FLANGE NUT

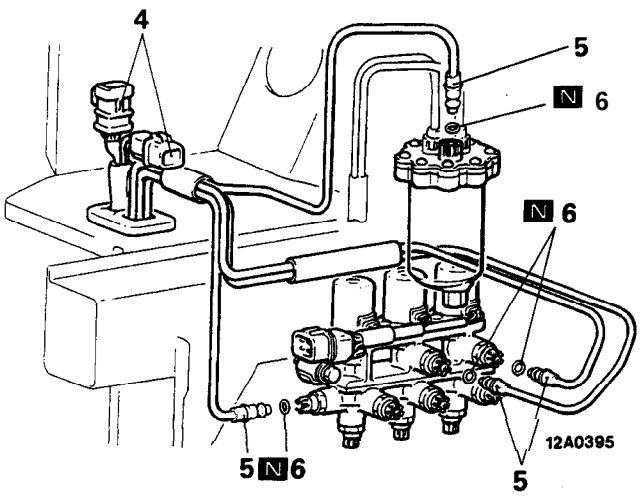
After tightening the flange nut, align with the indentation in the spindle, and crimp.

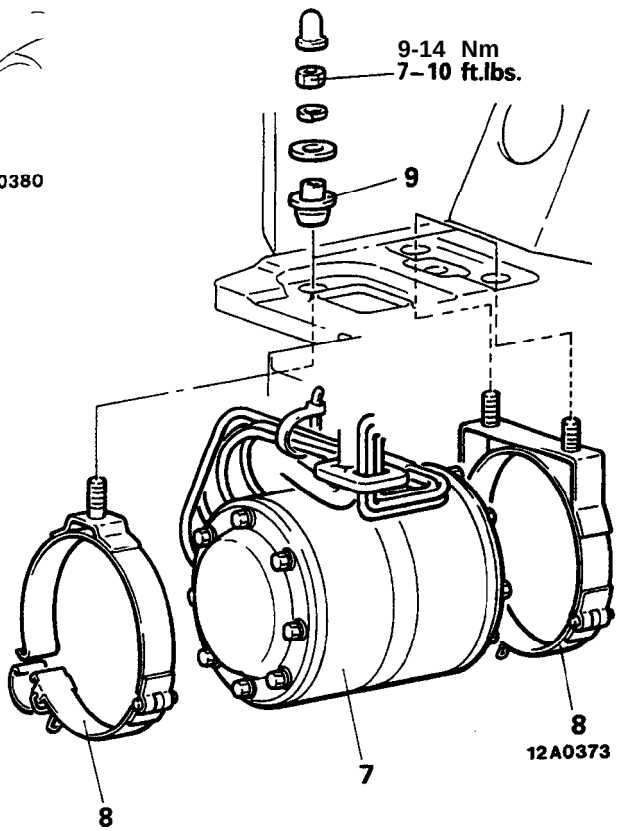
RESERVE TANK

M33ASAC

REMOVAL AND INSTALLATION

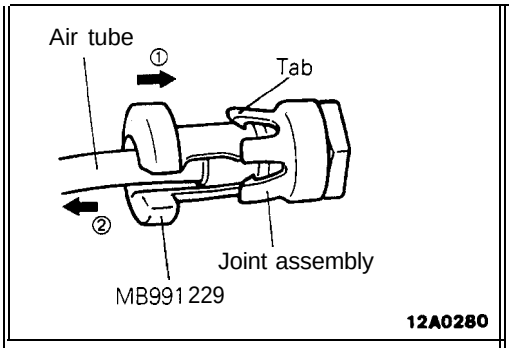


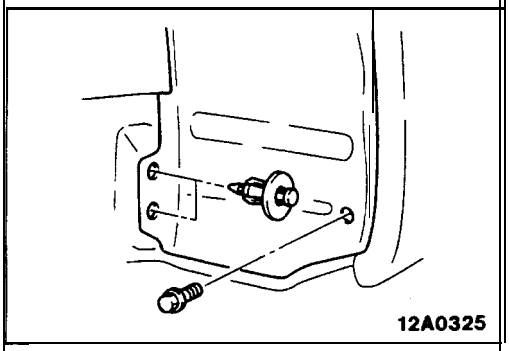


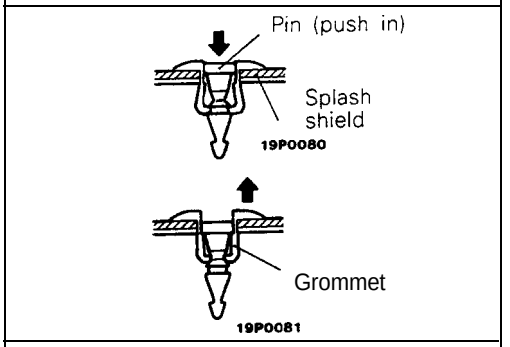


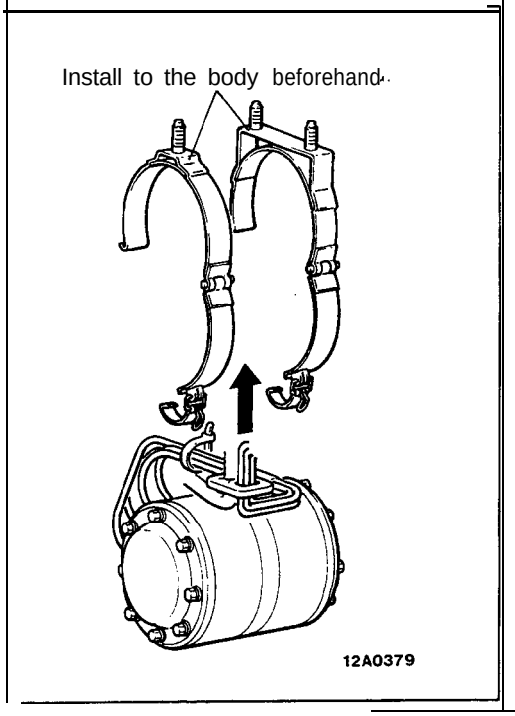
Removal steps

1. Air intake shield panel
2. Battery
3. Battery tray
4. Reserve tank connector
5. Air tubes
6. O-ring
7. Reserve tank
8. Tank holders
9. Bushes









SERVICE POINTS OF REMOVAL

5. REMOVAL OF AIR TUBES

(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
To prevent dust, dirt and other foreign material from getting into the air tubes, dryer or solenoid valve openings, use vinyl tape or similar material to cover these openings.

7. REMOVAL OF RESERVE TANK

(1) Remove the splash shield's installation clips (shown in the figure) and the bolt.
Note that the clips should be removed by the procedures described below.
① Using a cross-point (+) screwdriver or similar tool, push the pin at the center of the pin inward about 2 mm (.08 in.).
② Pull the clip outward to remove it.

NOTE
Do not push the pin in more than necessary, because the grommet may be damaged or the pin may fall inside if pushed too much.

(2) Remove the reserve tank installation nut, and then, taking care not to damage the air tube, remove the reserve tank.

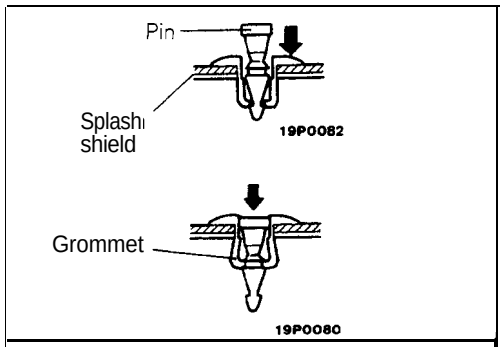
INSPECTION

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.

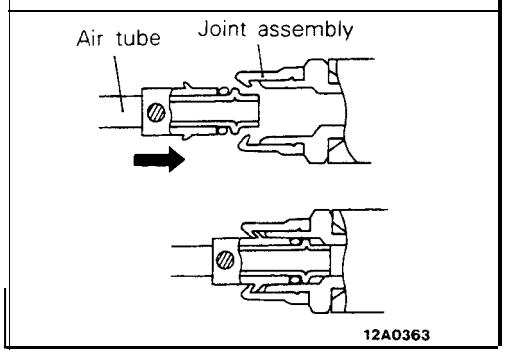
SERVICE POINTS OF INSTALLATION

7. INSTALLATION OF RESERVE TANK

(1) Install the tank holders to the body.
(2) Install the reserve tank to the tank holders, taking care not to damage the air tube.



(3) Install the splash shield's installation clips and the bolt. Note that the installation clips should be installed by the procedures described below.
① With the pin pulled out, insert the clip into the hole in the splash shield.
② Push the pin inward until its head is flush with the surface of the grommet.
③ Check to be sure that the splash shield is securely fixed.

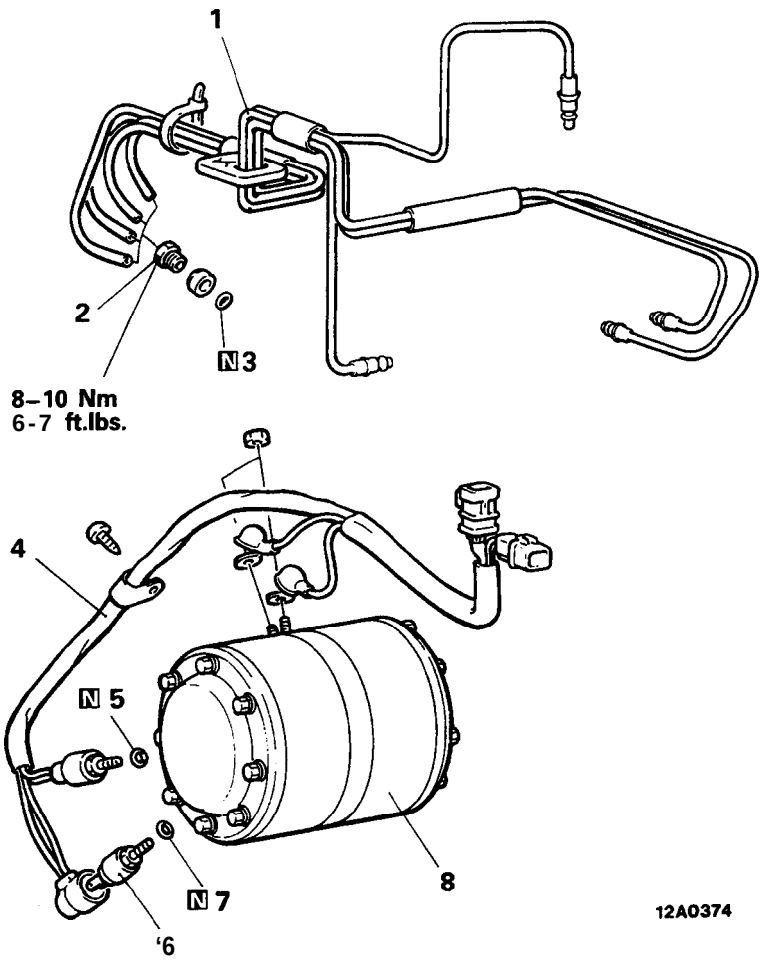


5. INSTALLATION OF AIR TUBES

Push the air tube' inward to 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.

DISASSEMBLY AND REASSEMBLY

M33ZVAA



Disassembly steps

- a 1. Air tubes
  2. Joint assembly
  3. O-ring
  4. Wiring harness (incorporated with high pressure switch)
  5. O-ring
  6. Low pressure switch
  7. O-ring
  8. Reserve tank

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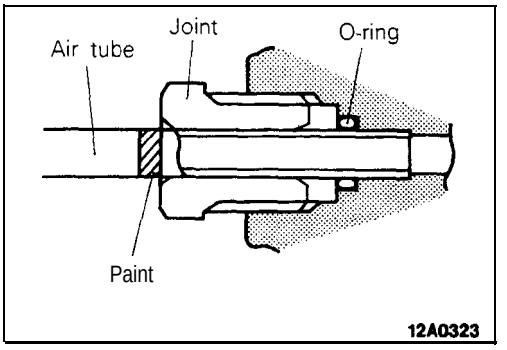


SERVICE POINTS OF REASSEMBLY

1. CONNECTION OF AIR TUBE

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.

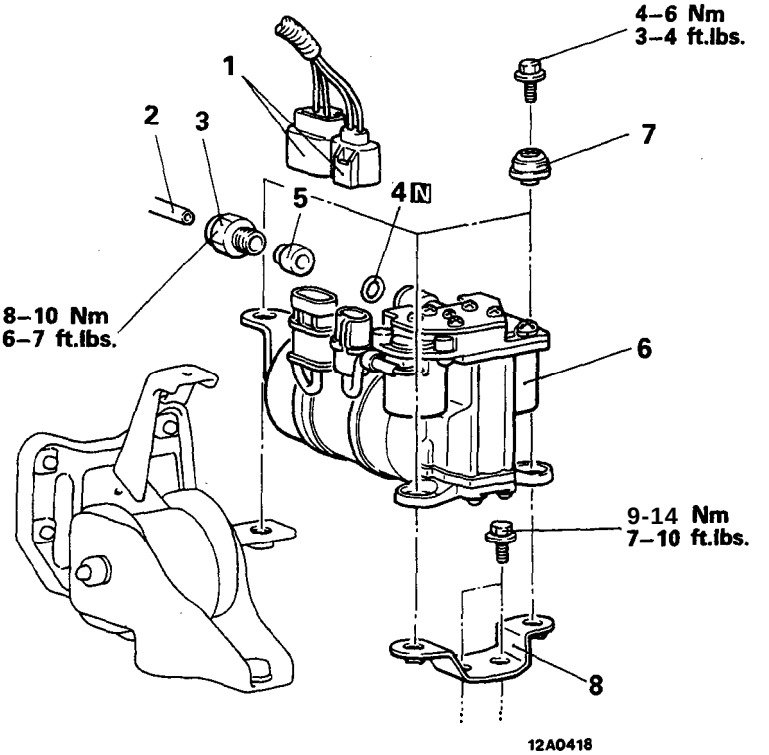
AIR COMPRESSOR

M33ZRAC

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of Air Cleaner
(Refer to GROUP 15–Air cleaner.)

Post-installation Operation
- Installation of Air Cleaner
(Refer to GROUP 15–Air cleaner.)



Removal steps

1. Front wiring harness connector
◆■► ►◆ 2. Air tube
3. Joint
4. O-ring
5. Connector
6. Air compressor assembly
7. Compressor mounting rubberes
8. Compressor mount bracket

TSB Revision

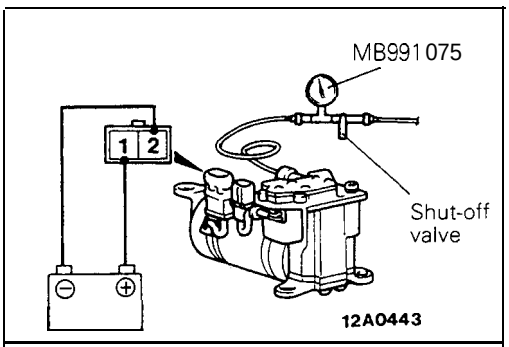
SERVICE POINTS OF REMOVAL

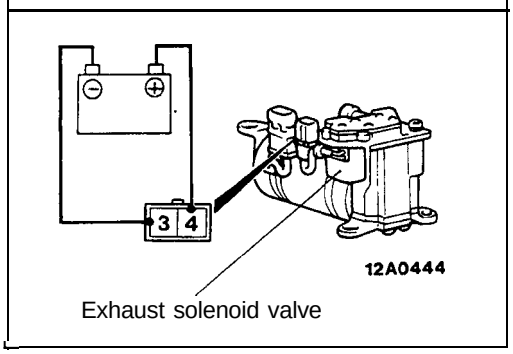
2. REMOVAL OF AIR TUBE

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

(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: 1,000–1,300 kPa (142-185 psi)

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 (29-43 psi). 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 (12V) 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.**

SERVICE POINTS OF INSTALLATION

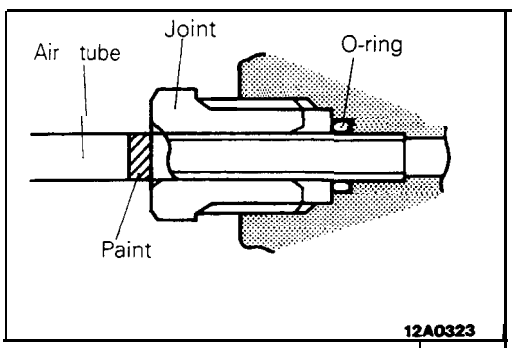
2. INSTALLATION OF AIR TUBE

(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.

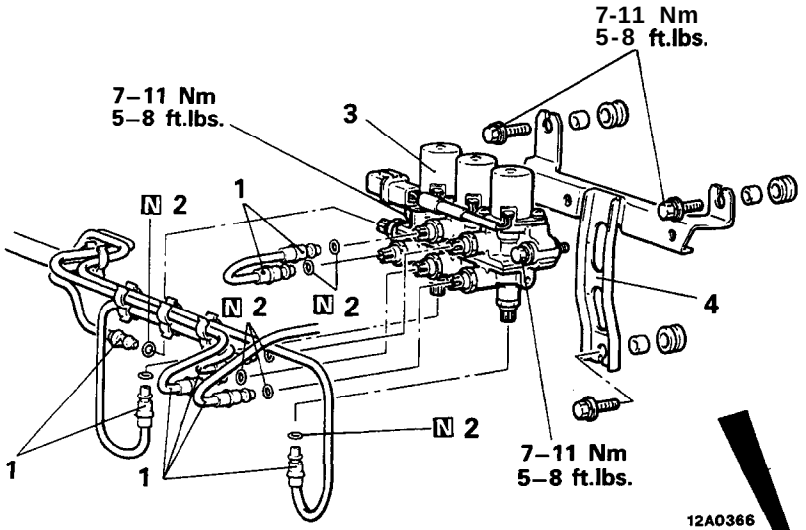


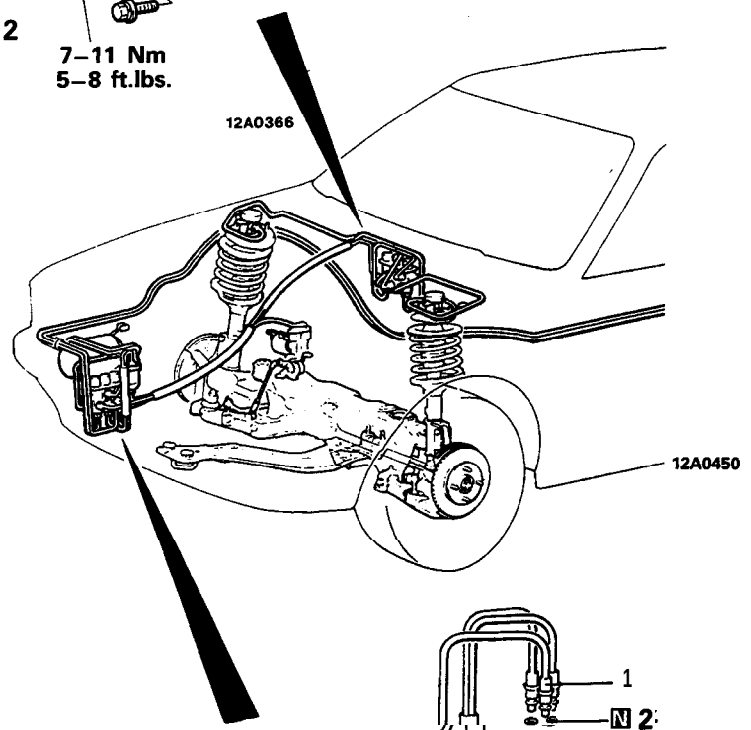
TSB Revision

SOLENOID VALVE AND DRYER

M33ZPAC

REMOVAL AND INSTALLATION





Front solenoid valve removal steps

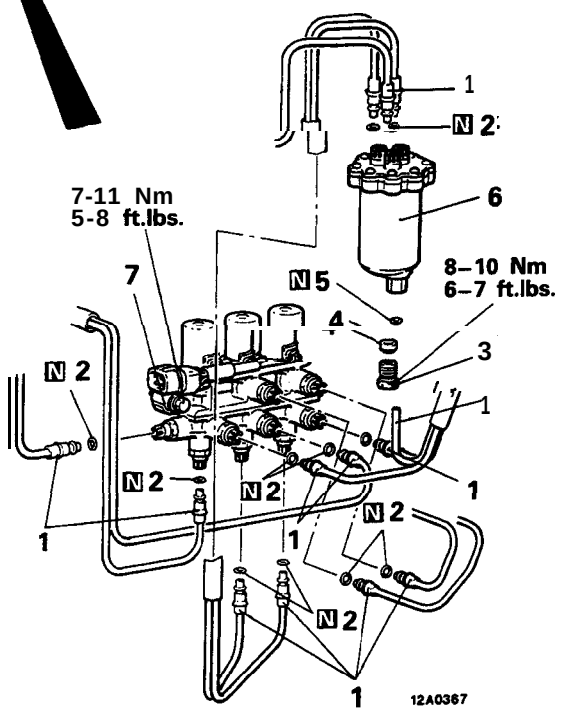
◆■► ►◆ 1. Air tubes
2. O-rings
3. Front solenoid valve assembly
4. Front solenoid valve bracket

Dryer removal steps

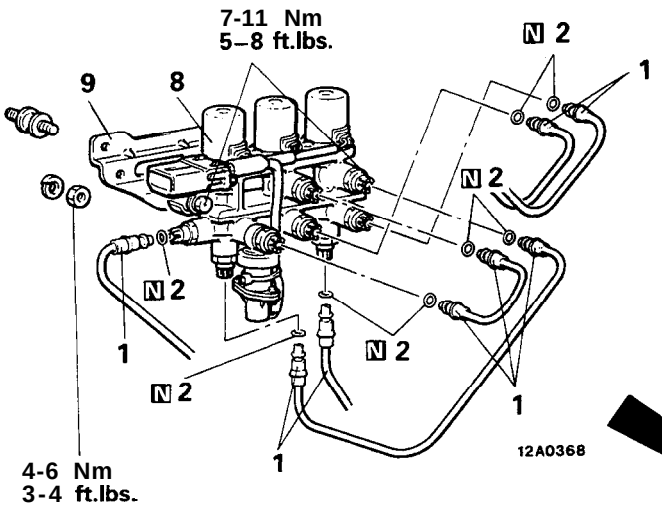
◆■► ►◆ 1. Air tubes
2. O-rings
3. Joint assembly
4. Bush
5. O-ring
6. Dryer

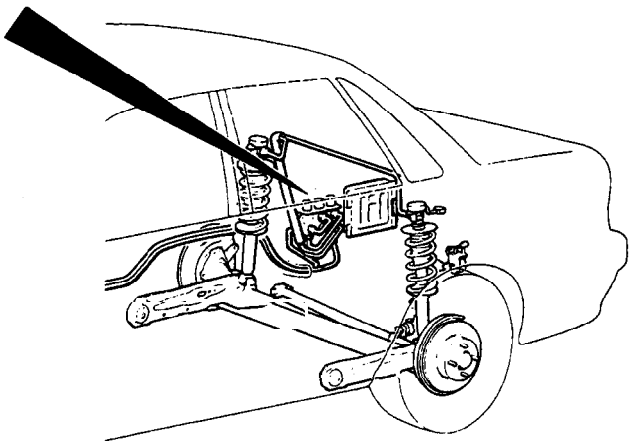
Flow control solenoid valve assembly removal steps

◆■► ● + 1. Air tubes
2. O-rings
7. Flow control solenoid valve assembly



TSB Revision



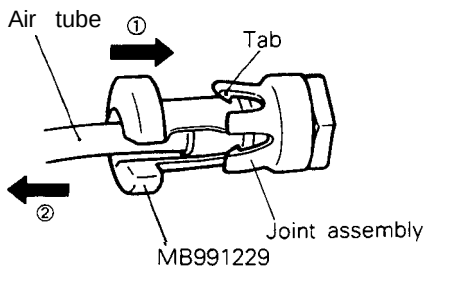


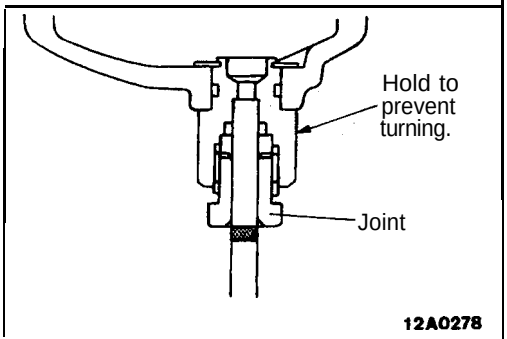
Pre-removal Operation
- Removal of Trunk Room Side Trim
(Refer to GROUP 52–Trims.)

Rear solenoid valve removal steps

◆■▶ ▶◆ 1. Air tubes
2. O-rings
8. Rear solenoid valve assembly
9. Rear solenoid valve bracket

12A0450





SERVICE POINTS OF REMOVAL

1. REMOVAL OF AIR TUBES

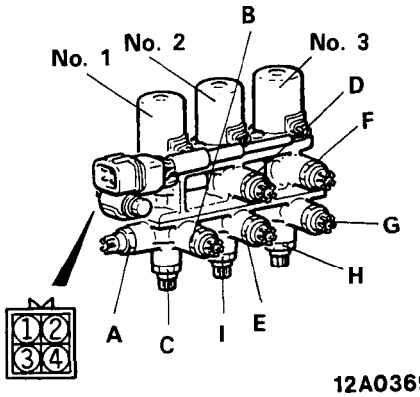
(1) Push the special tool inward, in direction ① shown in the figure, in order to expand the tabs of the joint.
(2) Pull out the air tube, together with the special tool, in direction ②.

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.

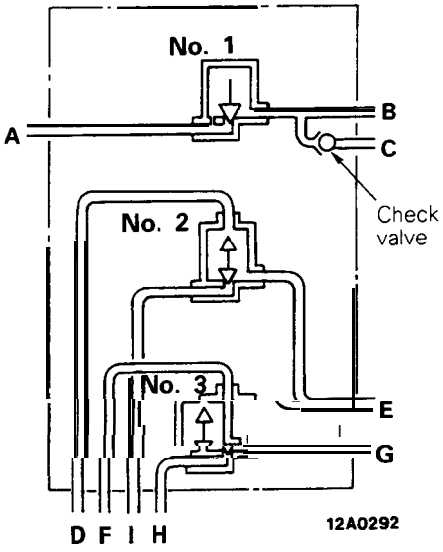
(3) For the air tube at the lower part of the dryer, loosen the joint, and then pull off.

NOTE
When loosening the joint, use a spanner at the hexagonal part of the joint installation part so as to prevent it from turning.

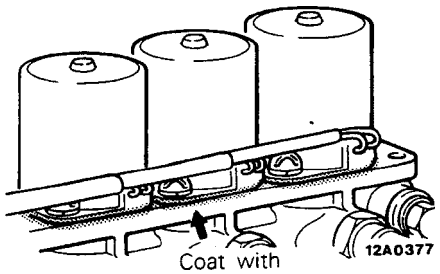
TSB Revision



12A0369



12A0292



12A0377

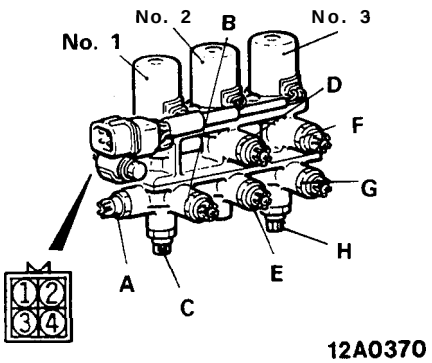
Coat with soap-and-water solution.

INSPECTION

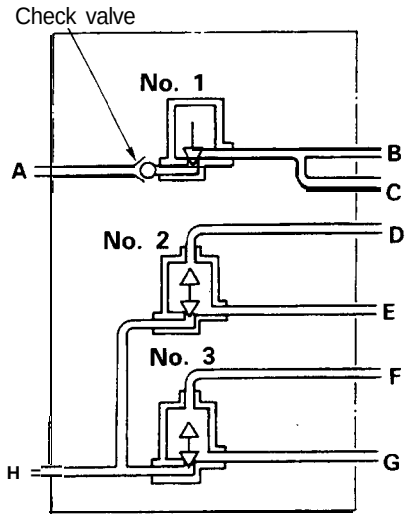
1. FLOW CONTROL SOLENOID VALVE

Check the No. 1–3 solenoid valves shown in the figure for correct operation and air leakage.

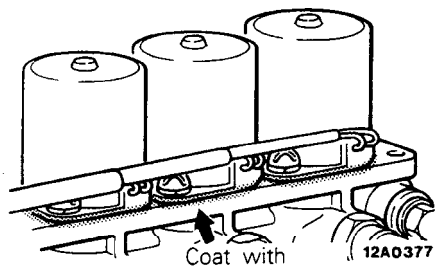
Check item	Condition	Result
Inject air from Part A and apply battery voltage to terminal ②, and then earth terminal ①.	A "click" noise will be heard, and the volume of air blown out from joints B and C will become greater.	Good
	Other than as described above.	Malfunction of No. 1 solenoid valve
Blow air in at joint E, apply battery voltage (12V) to terminal ③, 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 (12V) to terminal ④, 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 (142 psi) 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



12A0370



12A0293



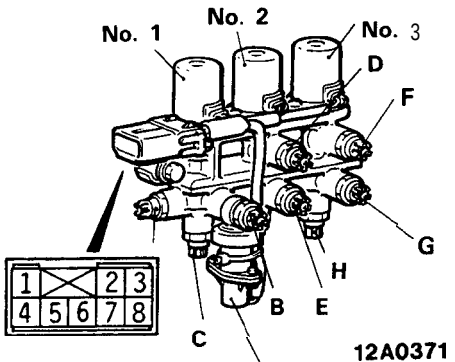
Coat with soap-and-water solution.

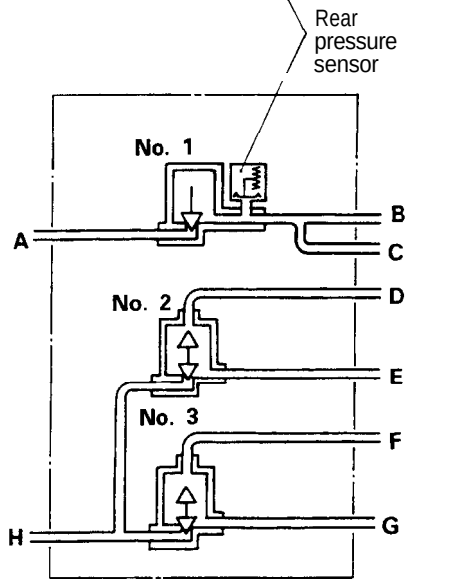
12A0377

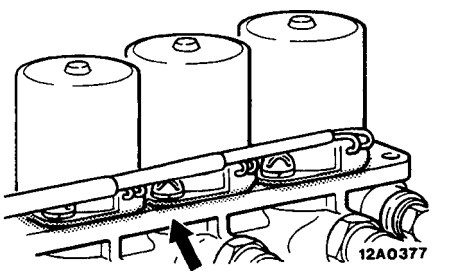
2. FRONT SOLENOID VALVE

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 (12V) to terminal ③, 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 (12V) to terminal ④, 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 (12V) 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(142 psi) 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







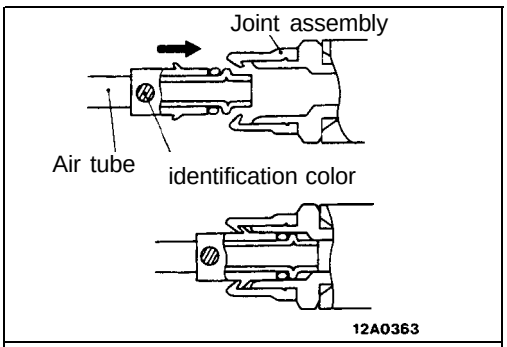
Coat with soap-and-water solution.

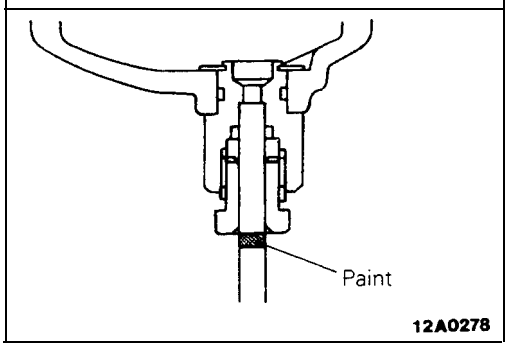
3. REAR SOLENOID VALVE

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 (12V) 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 (12V) to terminal ③, 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 (12V) to terminal ④, 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 (142 psi) 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

TSB Revision





SERVICE POINTS OF INSTALLATION

1. INSTALLATION OF AIR TUBES

(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 color of the tube and the color 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.

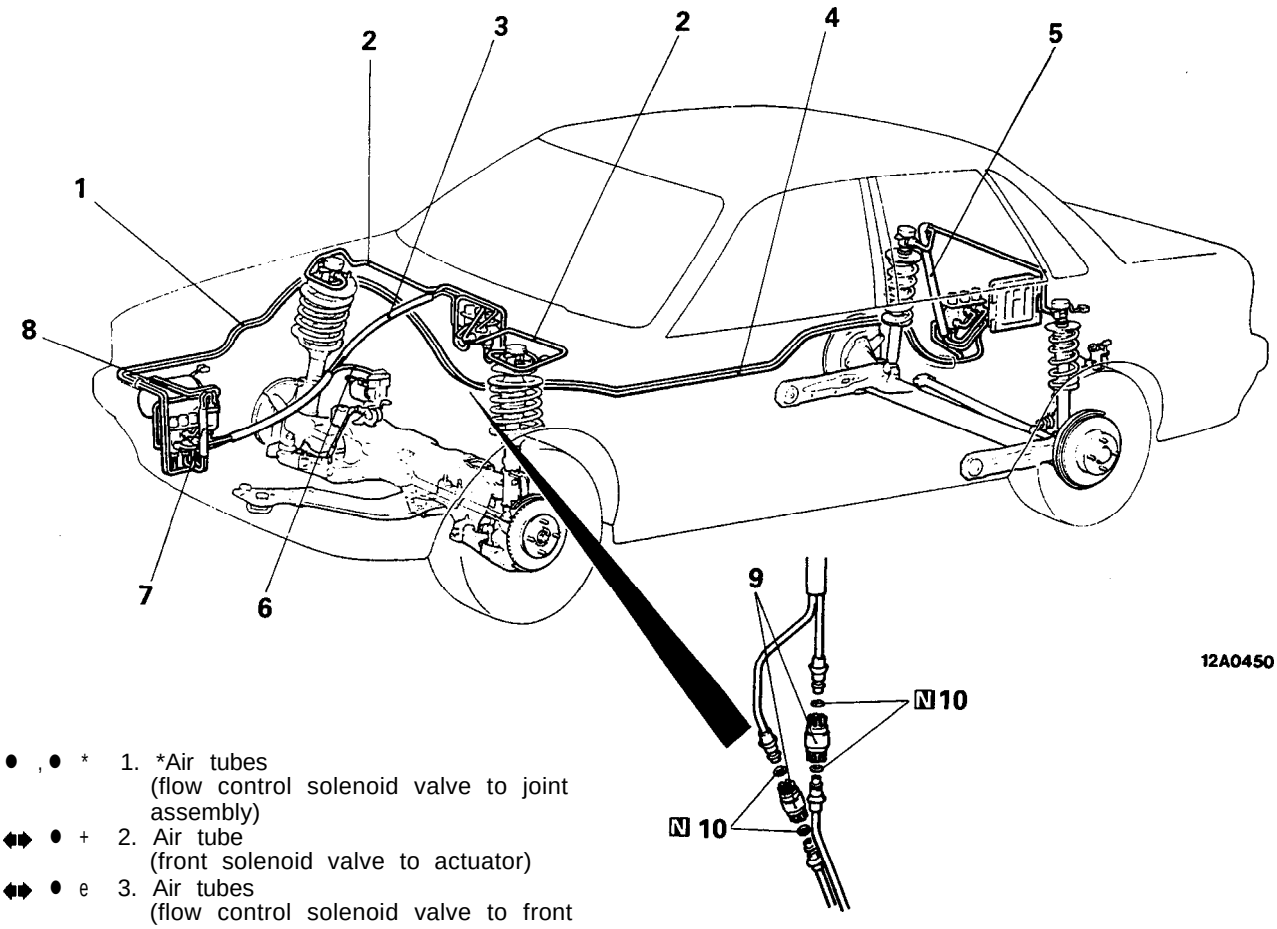
Caution
Air leakage may occur if the air tube connection is not complete and secure.

(3) After connection of the air tube, check for double-folding of the rolling diaphragm. (Refer to P.33B-89.)

AIR TUBE

M33ZOAC

REMOVAL AND INSTALLATION



12A0450

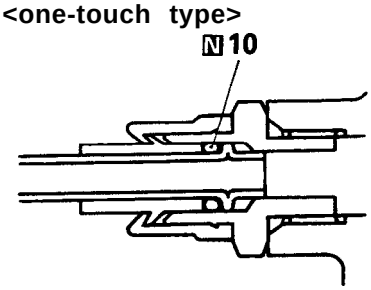
12A0378

- ● , ● * 1. *Air tubes (flow control solenoid valve to joint assembly)
- ◆■► ● + 2. Air tube (front solenoid valve to actuator)
- ◆■► ● e 3. Air tubes (flow control solenoid valve to front solenoid valve)
- ◆■► ● + 4. *Air tubes (joint assembly to rear solenoid valve)
- ◆■►►◄ 5. Air tube (rear solenoid valve to actuator)
- ◆■►►◄ 6. Air tube (flow control solenoid valve to air compressor)
- ● , ►◄ 7. Air tubes (dryer to flow control solenoid valve)
- ● e ● a 8. Air tubes (to reserve tank)
- 9. Joint assembly
- 10. O-rings
- 11. Joint
- 12. Bush

NOTE
(1) Connections within ( ) are air tube connections.
(2) Air tubes indicated by the • symbol are interwound with the harness.

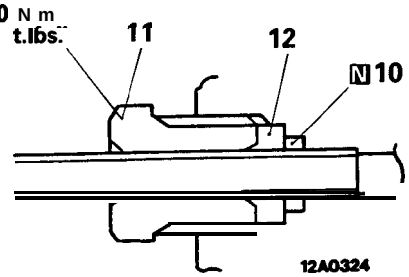
Cross-section of air tube joint

<one-touch type>



12A0173

<flare-nut type>



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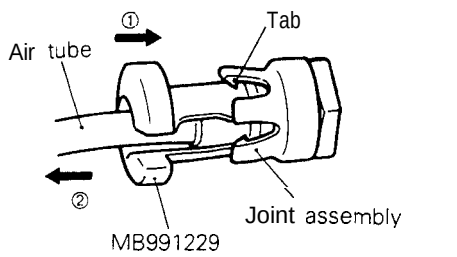
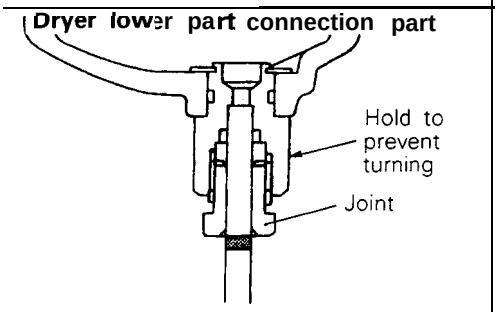


SERVICE POINTS OF REMOVAL

REMOVAL OF AIR TUBES

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

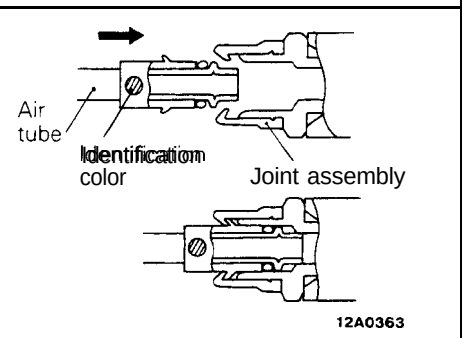
Loosen the joint and pull out the air tube.

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.



SERVICE POINTS OF INSTALLATION

INSTALLATION OF AIR TUBES

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

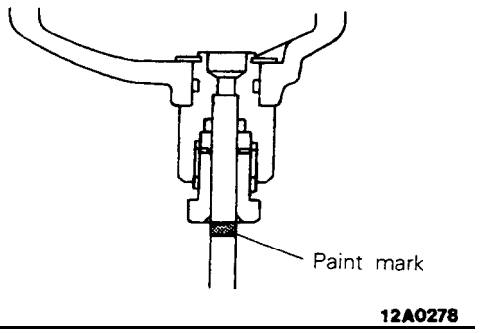
Before connecting the air tube, check to be sure that the identification color of the tube and the color at the joint agree.

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

(1) Check for double-folding at the rolling diaphragm. (Refer to P.33B-89.)
(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.

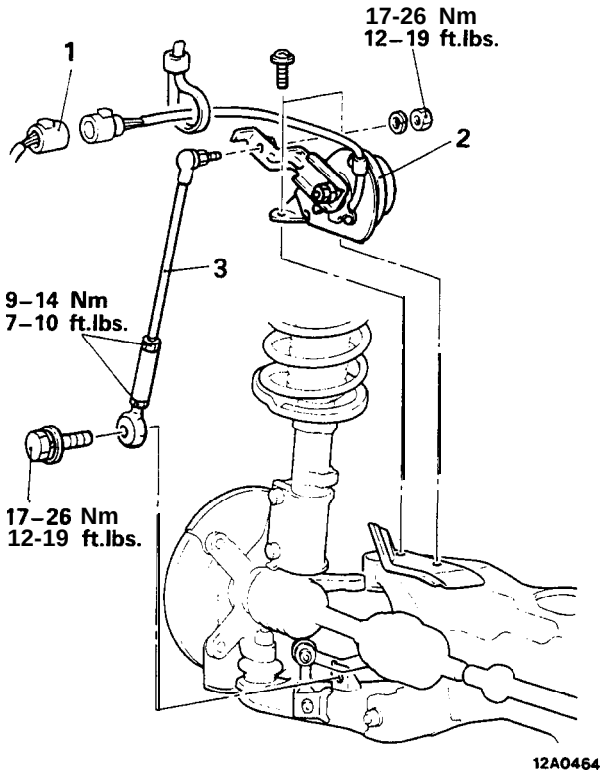
TSB Revision

HEIGHT SENSOR

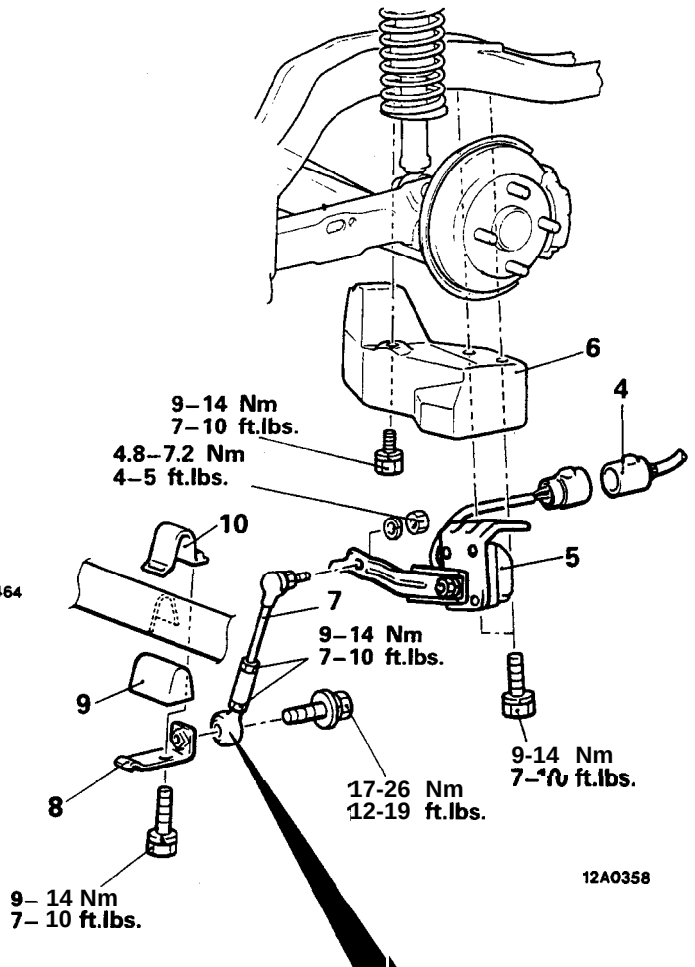
M33ZTAE

REMOVAL AND INSTALLATION

Front height sensor



Rear height sensor



Pre-removal Operation
- Removal of Air Compressor for Front Height Sensor (Refer to P.33B-125.)

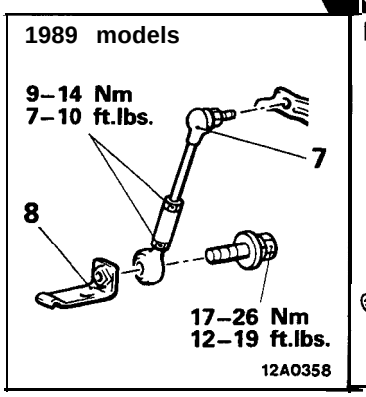
Post-installation Operation
- Checking and Adjustment of the NORMAL Vehicle-height (Refer to P.33B-88.)

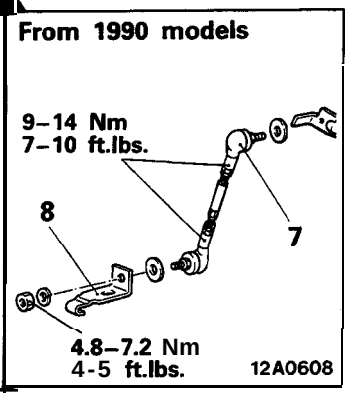
Front height sensor removal steps

1. Front wiring harness connector
- 2. Front height sensor
- 3. Front rod assembly

Rear height sensor removal steps

4. Body wiring harness connector
5. Rear height sensor
6. Protector
- a 7. Rear rod assembly
8. Rear height sensor bracket (B)
9. Spacer
10. Rear height sensor bracket (A)





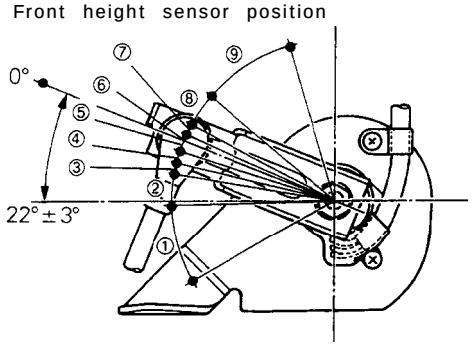
TSB Revision

Front height sensor connector terminal array

12R0185

No. 1 Sensor A
No. 2 Sensor B
No. 3 Sensor C
No. 4 Ground
No. 5 Sensor D
No. 6 Sensor power supply (+5V)

Front height sensor position



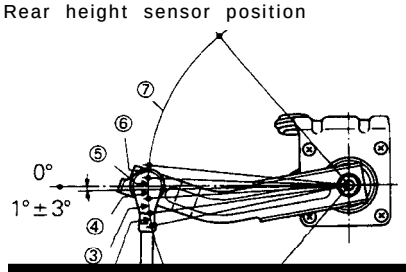
12A0465

Rear height sensor connector terminal array

12R0185

No. 1 Sensor A
No. 2 Sensor B
No. 3 Sensor C
No. 4 Ground
No. 6 Sensor power supply (+5V)

Rear height sensor position



INSPECTION

- Check the rod and link plate for bending or damage.
- Check the rod adjustment lock nut for looseness.

CHECKING THE SENSOR TERMINAL VOLTAGE

Connect the height sensor to the body harness and then check that each terminal voltage changes as shown in the table below when, with the ignition key at the ON position, the sensor's link plate is turned.

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 Height Sensor Terminal Voltages

(V)

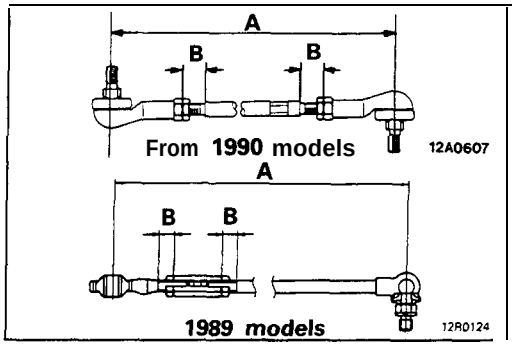
Vehicle height level	Sensor link position	Terminal No. 1	2	3	5
Maximum level	①	0–0.5	4.5-5	0–0.5	4.5–5
Higher than HIGH	②				
HIGH (target height)	③			4.5-5	
Higher than NORMAL	④				
NORMAL (target height)	⑤	4.5-5	0–0.5	0–0.5	0–0.5
Lower than NORMAL	⑥				
LOW (target height)	⑦		4.5-5		
Lower than LOW	⑧			4.5-5	
Minimum level	⑨				4.5–5

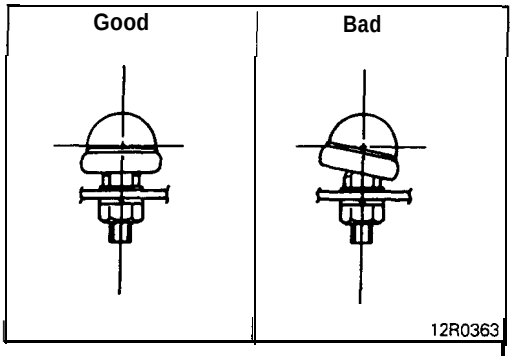
Rear Height Sensor Terminal Voltages

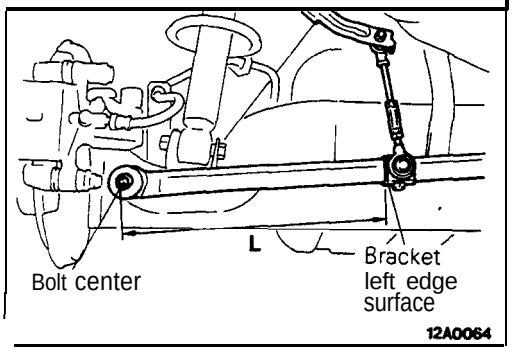
(V)

Vehicle height level	Sensor link position	Terminal No. 1	2	3
Higher than HIGH	①	0–0.5	4.5–5	0–0.5
HIGH (target height)	②			4.5–5
Higher than NORMAL	③		0–0.5	
NORMAL (target height)	④			0–0.5
Lower than NORMAL	⑤	4.5-5		
LOW (target height)	⑥		4.5–5	
Lower than LOW	⑦			4.5–5

TSB Revision







SERVICE POINTS OF INSTALLATION

7. INSTALLATION OF REAR ROD ASSEMBLY / 3. FRONT ROD ASSEMBLY

(1) Adjust the front and rear height sensors so that dimension A of the rod in the illustration is within specification.

Rod assembly length (A)

Front	**254-255 mm (9.9–10.0 in.)**
Rear	**149.5–150.5 mm (5.89–5.93 in.)**

Caution

1. **When adjusting the length of the rod, adjust so that dimension B is uniform**
2. **Height sensors must be installed so that the ball joint at the rod end is at rocking centre.**

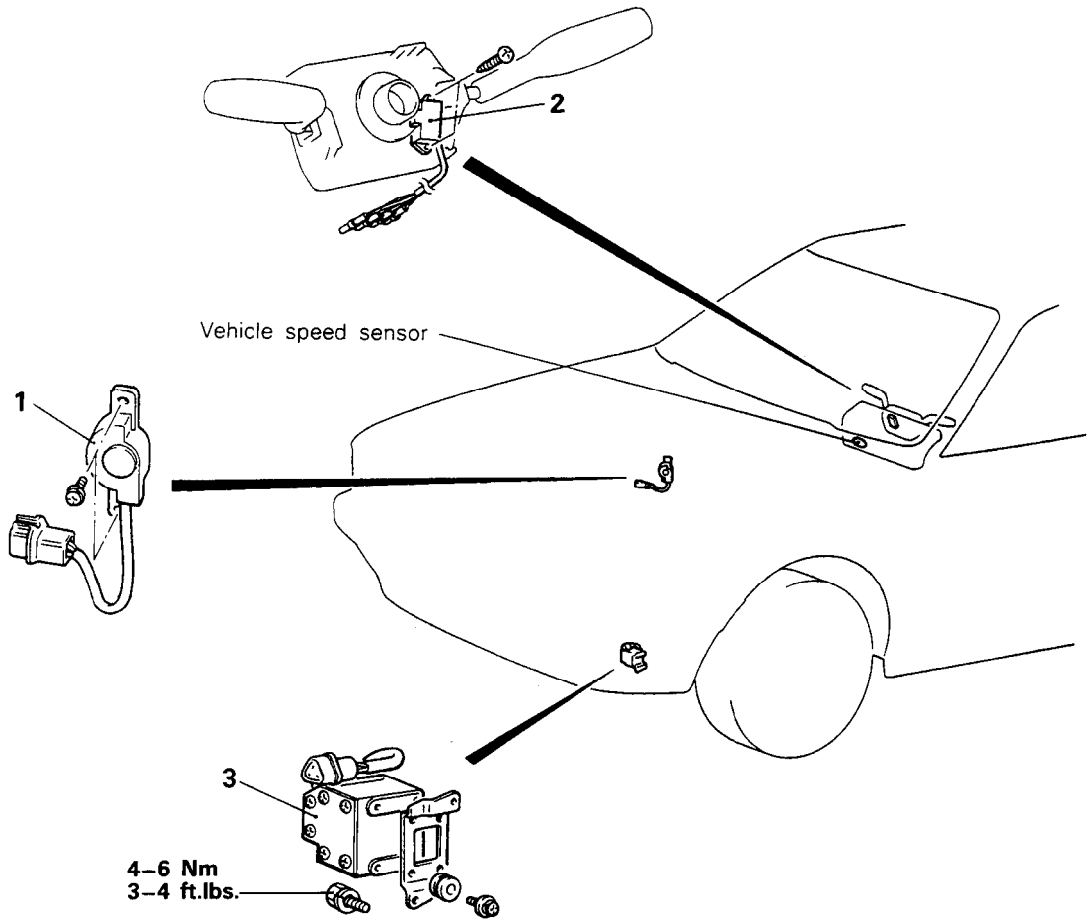
(2) When installing the rear rod assembly, install the rear height sensor brackets so that the dimension L in the illustration. is the standard value.

Standard value (L): 314-316 mm (12.3–12.4 in.)

ACTIVE-ECS SENSOR

M33ZUAC

REMOVAL AND INSTALLATION



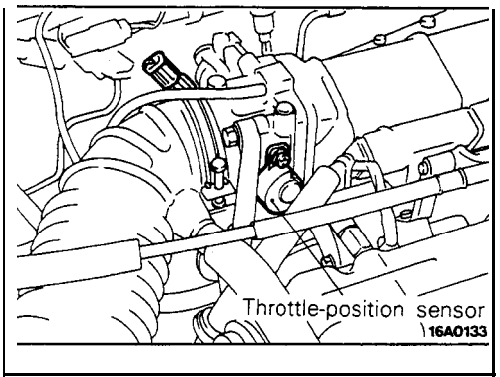
12A0449

Pre-removal Operation
*Removal of Steering Wheel and Column Cover for Steering Wheel Angular-velocity Sensor (Refer to GROUP 37A–Steering Column and Shaft.)
- Removal of Column Switch for Steering Wheel Angular-velocity Sensor (Refer to GROUP 54–Column Switch.)
- Removal of front bumper for G sensor (Refer to GROUP 51–Bumper.)

Post-installation Operation
- Adjustment of the Throttle-position Sensor (Refer to GROUP 13–Service Adjustment Procedures.)
- Checking of the G-sensor Output Voltage (Refer to P.33B-96.)

1. Throttle position sensor
2. Steering wheel angular-velocity sensor
3. G sensor

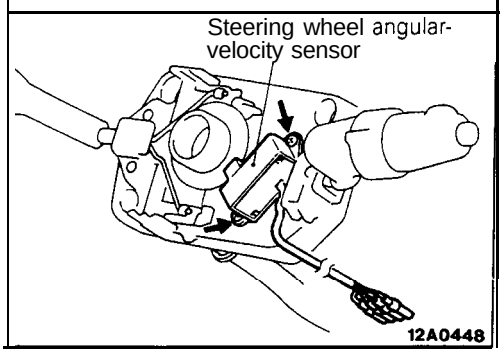
TSB Revision



SERVICE POINTS OF REMOVAL

1. REMOVAL OF THROTTLE POSITION SENSOR

Disconnect the harness connector, then remove the throttle position sensor from the throttle body.

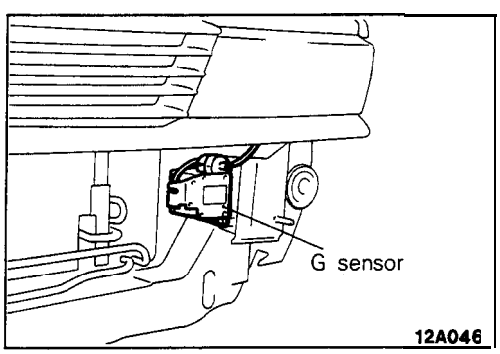


2. REMOVAL OF STEERING WHEEL ANGULAR-VELOCITY SENSOR

Remove the pin terminal from the column switch connector, then remove the steering wheel angular-velocity sensor from the column switch.

Caution

1. **The steering wheel angular-velocity 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.**



3. REMOVAL OF G SENSOR

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.

INSPECTION

For information concerning the procedures for checking each sensor, refer to the service adjustment procedures section and to the troubleshooting guide.

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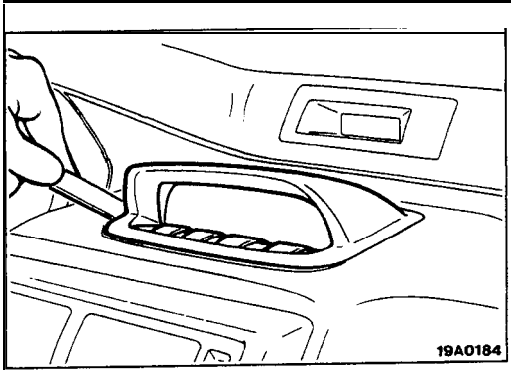


INDICATOR ASSEMBLY

SERVICE POINTS OF REMOVAL

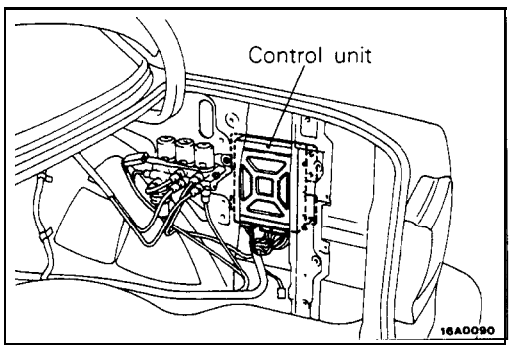
(1) Using a plastic trim tool, remove the indicator assembly from the instrument panel.
(2) Disconnect the connector and remove the indicator assembly.

INSPECTION

(1) Indicator light does not light (the circuit, light bulb, or LED have failed).

NOTE
Operate the ECS and check to see that the light bulbs and LED light.

(2) Do the lights loose intensity when the lighting switch is placed at ≡D and ≡D . For procedures for other inspections, refer to the troubleshooting section.



CONTROL UNIT

SERVICE POINTS OF REMOVAL

(1) Remove the trunk side trim.
(Refer to GROUP 52–Trims.)
(2) Remove the installation bolts and connectors, and then remove the control unit.

INSPECTION

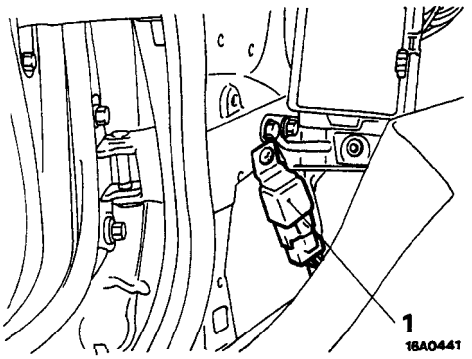
Referring to the troubleshooting section, check whether there is terminal voltage.

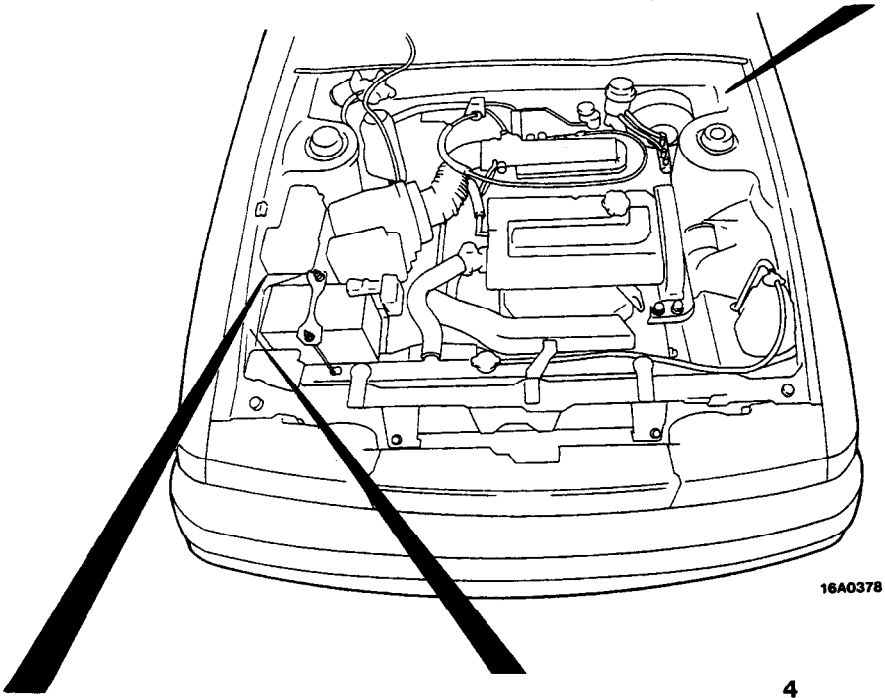
ACTIVE-ECS RELAY

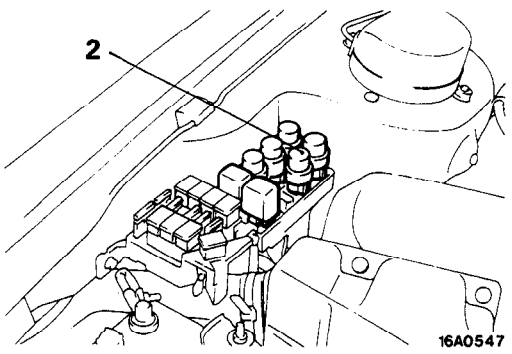
M33VA-A

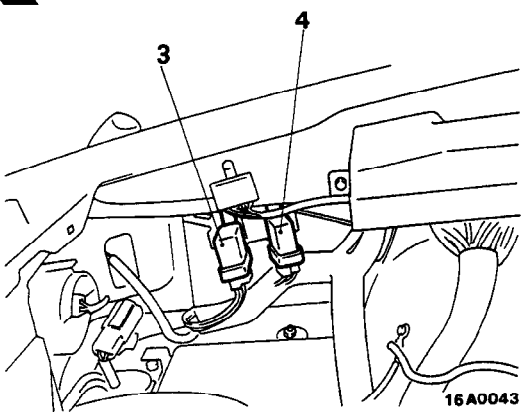
REMOVAL AND INSTALLATION

1. Power relay
2. Solenoid valve power relay
3. Compressor relay
4. Return pump relay

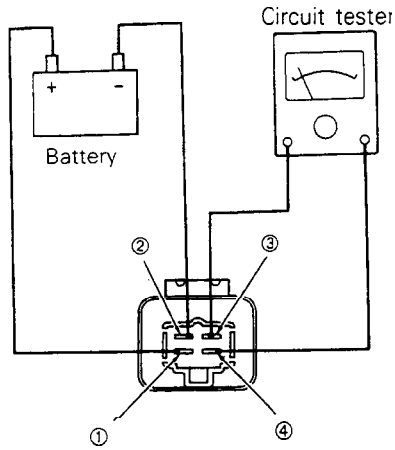






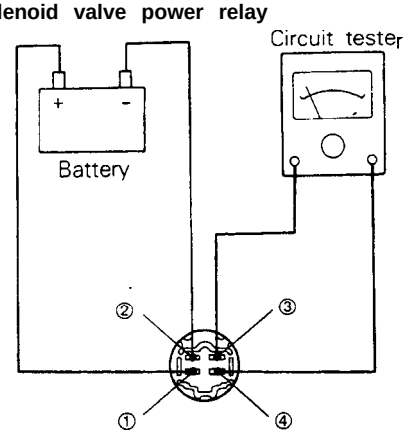


Power relay



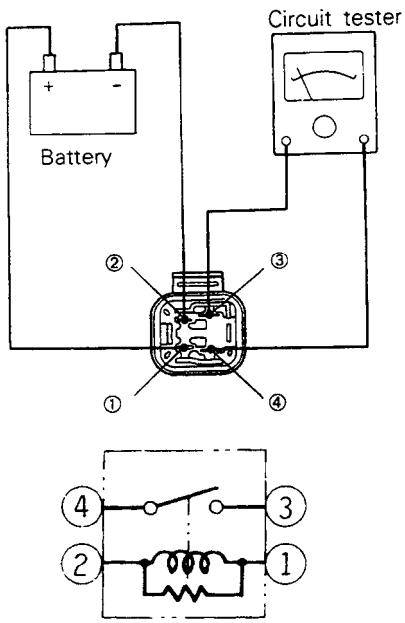
18L0346

Solenoid valve power relay



12A0276

Compressor relay, Return pump relay



12A0277

INSPECTION

Connect battery power source to terminal 1. Check circuit between terminals with terminal 2 grounded.

Power is supplied	Between 3-4 terminals	Continuity
Power is not supplied	Between 1–2 terminals	Continuity
	Between 3–4 terminals	No continuity

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REAR SUSPENSION

CONTENTS

M34AA-

<AWD-UP TO 1992 MODELS>

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SPECIFICATIONS <FWD>

GENERAL SPECIFICATIONS

M34CA-A

Items	SOHC		DOHC
	High line	Plemium line	
Suspension system	3-link, torsion axle with coil spring type		
Coil spring <Vehicles without Active ECS> Wire dia. x O.D. x free length mm (in.) [Coil spring identification color]	< 1989 models> 10.5 x 105.5 x 342.5 (.41 x 4.15 x 13.48) [Blue x 1] <From 1990 models> 10.5 x 105.5 x 349.5 (.41 x 4.15 x 13.76) [Blue x 2]	< 1989 models> 10.5 x 105.5 x 349.5 (.41 x 4.15 x 13.76) [Blue x 2] <From 1990 models> 10.8 x 105.8 x 356.5 (.43 x 4.17 x 14.04) [White x 1]	<From 1990.5 models> 10.8 x 105.8 x 356.5 (.43 x 4.17 x 14.04) [White x 1]
Coil spring <Vehicles with Active ECS> Wire dia. x upper end O.D. x lower end O.D. x free length mm (in.) [Coil spring identification color]	–	–	<Up to 1990 models> L.H. side 9.5 x 119.5 x 119.5 x 428 (.37 x 4.70 x 4.70 x 16.85) [Light green x 1] R.H. side 9.5 x 119.5 x 119.5 x 412 (.51 x 4.70 x 4.70 x 16.22) [Light green x 2] <From 1991 models> L.H. side 10.1 x 122.1 x 381.5 (.40 x 4.81 x 15.02) [Light green x 2] R.H. side 10.1 x 122.1 x 370 (.40 x 4.81 x 14.57) [Light green x 1]
Spring constant N/mm (lbs./in.) <Vehicles without Active ECS>	21 (117.6)	21 (117.6)	21 (117.6)
Spring constant N/mm (lbs./in.) <Vehicles with Active ECS>	–	–	9.4 (52.64) <Up to 1990 models> 13.5 (75.60) <From 1991 models>
Shock absorber Type	Hydraulic, cylindrical, double-acting type		Hydraulic, cylindrical double-acting type

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Items	SOHC		DOHC	
	High line	Plemium line		
<Vehicles without Active ECS>			<From 1990.5 models>	
Max. length mm (in.)	505 (19.9)		505 (19.9)	
Min. length mm (in.)	315 (12.4)		315 (12.4)	
Stroke mm (in.)	190 (7.5)		190 (7.5)	
Damping force [at 0.3 m/sec. (.9 ft./sec.)]				
Expansion N (lbs.)	750 (165)		750 (165)	
Contraction N (lbs.)	350 (77)		350 (77)	
<Vehicles with Active ECS>			<Up to 1990 models>	<From 1991 models>
Max. length mm (in.)	–		491 (19.33)	491 (19.33)
Min. length mm (in.)	–		341 (13.43)	341 (13.43)
Stroke mm (in.)	–		150 (5.91)	150 (5.91)
Damping force [at 0.3 m/sec. (.9 ft./sec.)]				
Expansion N (lbs.)				
HARD	–		1,450 (320)	1,700 (375)
MEDIUM	–		850 (187)	850 (187)
SOFT			270 (60)	270 (60)
Contraction N (lbs.)				
HARD			500 (110)	540 (119)
MEDIUM			350 (77)	350 (77)
SOFT	–		200 (44)	200 (44)
Wheel bearing				
Type	Tapered roller bearing		Unit ball bearing	
O.D. x I.D. mm (in.)				
Outer	39.9 x 17.5 (1.57 x .69)			
Inner	50.3 x 27.0 (1.98 x 1.06)			

SERVICE SPECIFICATIONS

M34CB-A

Items	SOHC	DOHC
Standard value		
Toe-in (Left-right difference) mm (in.)	0 ± 3 (0 ± .118)	0 4 3 (0 ± .118)
Camber	-45' ± 30'	-45' ± 30'

NOTE
Toe-in and camber cannot be adjusted.

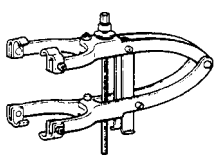
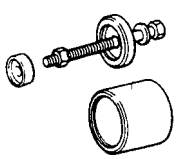
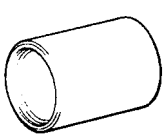
TORQUE SPECIFICATIONS

M34CC-A

Items	Nm	ft.lbs.
Dust shield	9-14	7–10
Flange nut	200–260	144-188
Wheel bearing nut	20 → 0 → 10	14 → 0 → 7
Shock absorber upper mounting nut	40–50	29-36
Shock absorber lower mounting nut	80–100	58-72
Speed sensor <Vehicles with ABS>	9-14	7–10
Lateral rod mounting nut (body side)	80–100	58-72
Lateral rod mounting bolt (axle beam side)	100–120	72-87
Trailing arm mounting bolt	100–120	72-87
Piston rod tightening nut	20–25	14-18
Brake hose and tube bracket mounting bolt	17–26	12-19
Rear drum brake assembly (backing plate) to axle beam	50–60	36-43

SPECIAL TOOLS

M34DA-A

Tool	Number	Name	Use
	MB990987-01	Spring compressor	Removal and installation of the coil spring
	MB991159	Bushing remover and installer	Driving-out and press-fitting of the trailing arm bushing
	MB990947-01	Lower arm bushing arbor	Driving-out and press-fitting of the lateral rod bushing
	MB990945	Lower arm bushing ring	
	MB990847-01	Bushing remover and installer base	

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TROUBLESHOOTING

M34EA-A

Symptom	Probable cause	Remedy
Squeaks or other abnormal noise	Loose rear suspension installation bolts and nuts	Retighten
	Malfunction of shock absorber Worn bushings	Replace
Poor ride	Excessive tire inflation pressure	Adjust the pressure
	Malfunction of shock absorber Weak or broken springs	Replace
Body tilting	Weak or deteriorated bushings Weak or broken springs	Replace

SERVICE ADJUSTMENT PROCEDURES

M34FAAC

REAR WHEEL ALIGNMENT INSPECTION

The rear suspension assembly must be free of worn, loosen or damaged parts prior to measurement of rear wheel alignment.

Standard value:

Toe-in (Left-right difference) **0 ± 3 mm (0 ± .118 in.)**

Camber **-45' ± 30'**

NOTE

The rear wheel alignment is set at the factory and cannot be adjusted.

If toe-in or camber is not within the standard value, replace bent or damaged parts.

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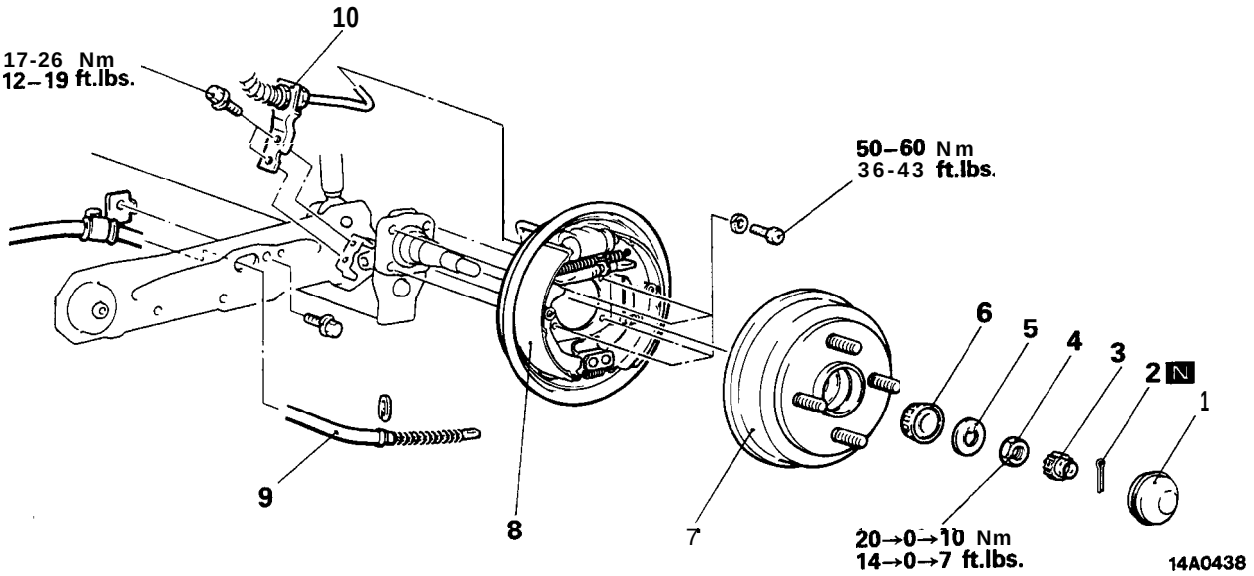
REAR SUSPENSION ASSEMBLY

REMOVAL AND INSTALLATION

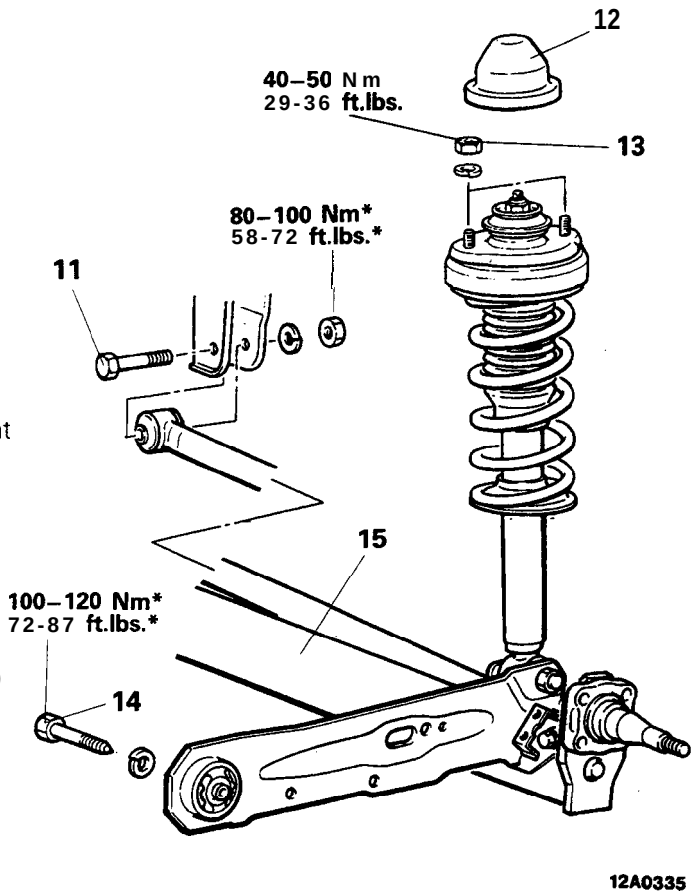
M34GA-A

<Vehicles with Rear Drum Brake>



Pre-removal Operation
- Removal of the Trunk Side Trim (Refer to GROUP 52–Trims.)

Post-installation Operation
- Installation of the Trunk Side Trim (Refer to GROUP 52–Trims.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36–Service Adjustment Procedures.)



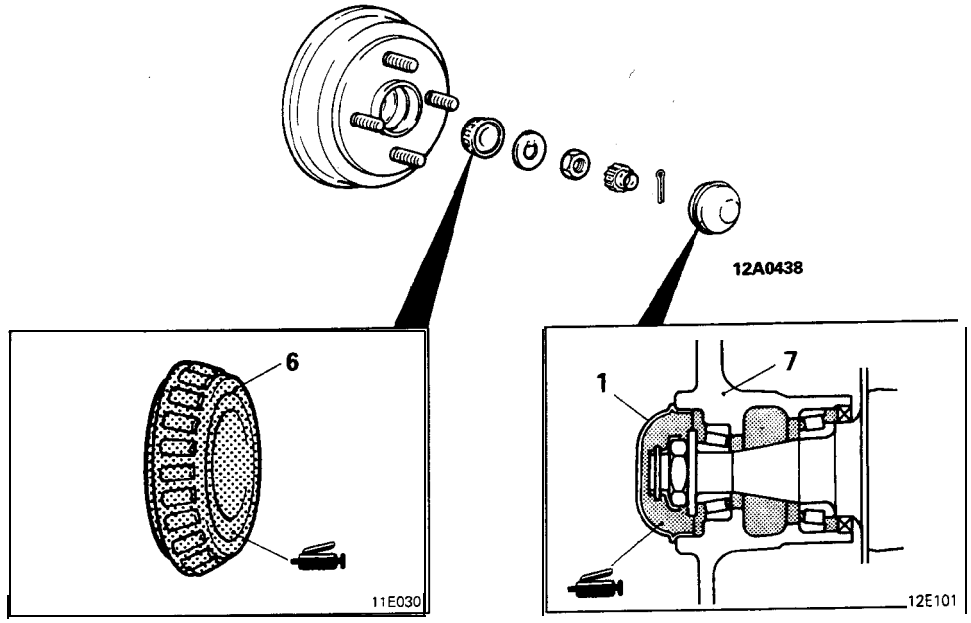
Removal steps

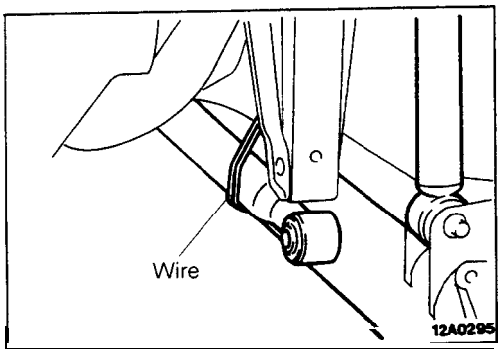
Adjustment of wheel bearing end play (Refer to GROUP 27–Service Adjustment Procedures)
1. Hub cap
2. Cotter pin
3. Lock cap
- ◆◆ 4. Wheel bearing nut
5. Washer
6. Outer wheel bearing inner race
7. Brake drum
8. Rear drum brake (Refer to GROUP 35–Rear Drum Brakes)
9. Parking brake cable
10. Brake hose and tube bracket
- ◆◆ 11. Lateral rod mounting bolt
12. Cap
- ◆◆ 13. Shock absorber upper mounting nut
- ◆◆ 14. Trailing arm mounting bolt
- ◆◆ 15. Rear suspension assembly

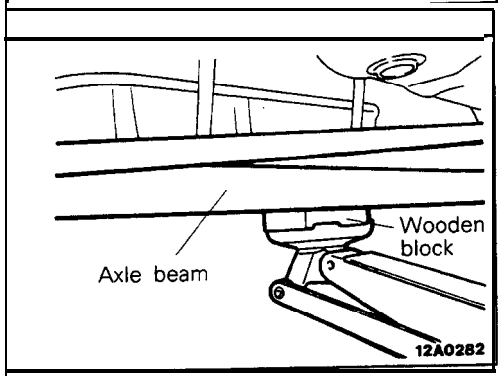
NOTE
* : Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

TSB Revision

Lubrication points







SERVICE POINTS OF REMOVAL M34GBAJ

11. REMOVAL OF LATERAL ROD MOUNTING BOLT

(1) Remove the lateral rod mounting bolt.
(2) Secure and hold the lateral rod to the axle beam with wire, etc.

13. REMOVAL OF SHOCK ABSORBER UPPER MOUNTING NUT/ 14. TRAILING ARM MOUNTING BOLT/ 15. REAR SUSPENSION ASSEMBLY

(1) Jack up the torsion axle and arm assembly in order to raise it slightly.

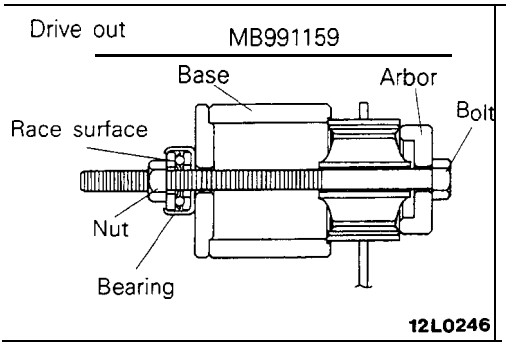
Caution
1. Always insert a wooden block between the jack receptacle and the axle beam and place the jack at the centre of the axle beam.
2. Make sure that the jack does not contact the lateral rod.

(2) Remove the shock absorber mounting nut and trailing arm mounting bolt.
(3) Lower the jack slowly, and then remove the rear suspension assembly.

INSPECTION M34GCAL

- Check the trailing arm and axle beam for deformation or damage.
- Check the torsion bar for damage.
- Check the lateral rod for damage or deformation.
- Check the bushings for cracking, deterioration, or unusual wear.

TSB Revision



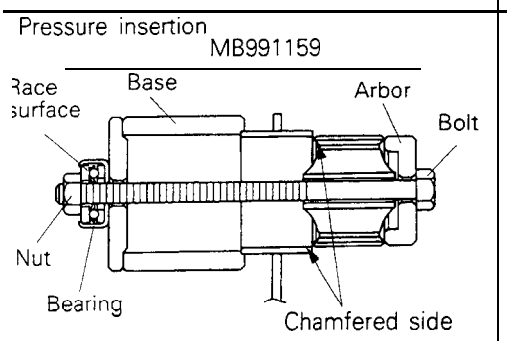
BUSHING REPLACEMENT

M34GTAE

TRAILING ARM BUSHING

(1) Drive out the trailing arm bushing using the special tool.

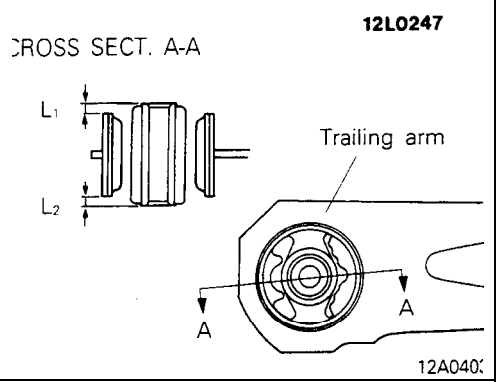
Caution
The bearing within the special tool should be installed, as shown in the figure, at the race surface nut side of the bearing.



(2) Press the bushing with the special tool into the trailing arm (from the chamfered part of the trailing arm) so that the bushing hole is at the position indicated in the figure.

(3) Be careful that the bushing hole is at the position indicated in the figure and that the difference in bushing projection distances does not exceed the following value.

$L_1 - L_2 = 0 \pm 1.0$ mm (0 ± .04 in.)

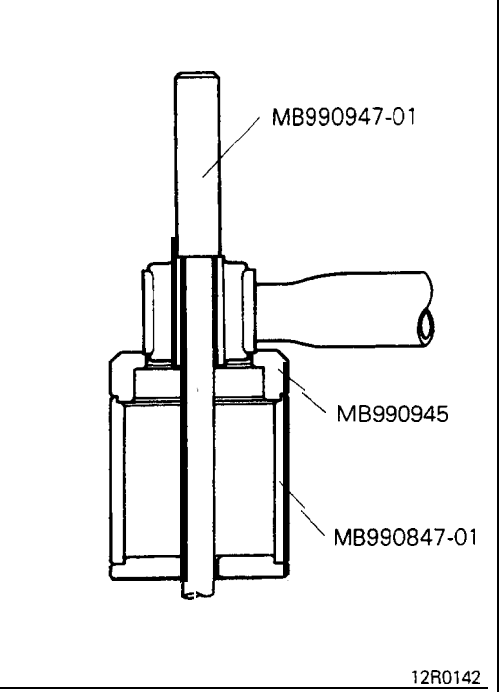


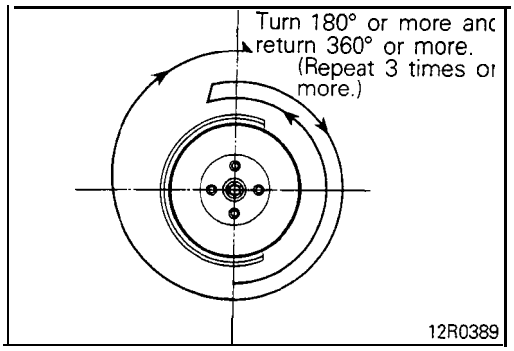
LATERAL ROD BUSHING (BODY SIDE)

(1) Drive out the lateral rod bushing using the special tool.

(2) Press in the bushing using the special tool so that the amount of projection is equal at the left and right.

NOTE
The replacement of the lateral rod bushing at the axle beam side is made by the same procedures described in steps (1) and (2) above.





SERVICE POINTS OF INSTALLATION M34GDAS

4. INSTALLATION OF WHEEL BEARING NUT

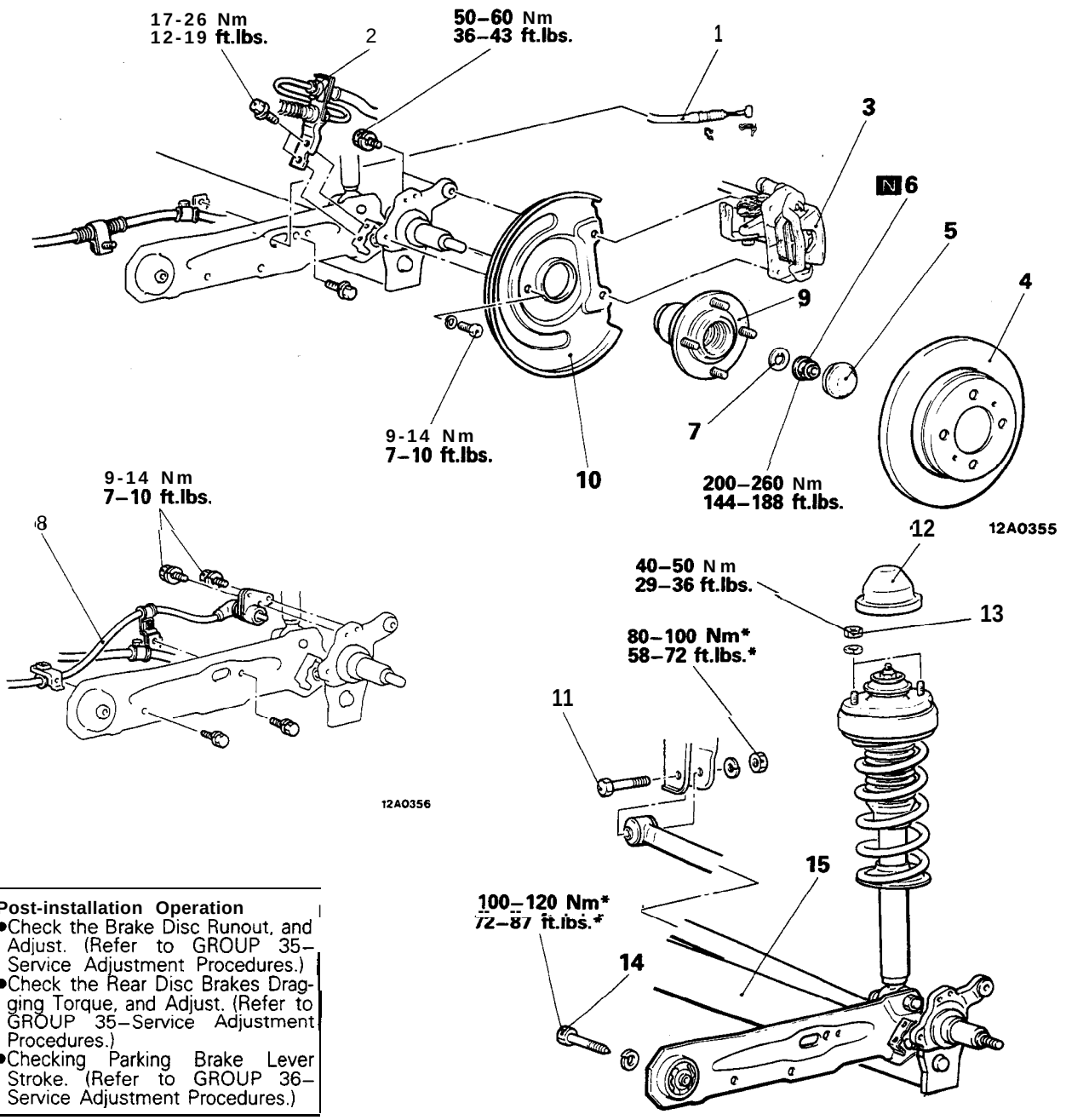
(1) After tightening the wheel bearing nut to 20 Nm (14 ft.lbs.), turn the hub a few times to seat the bearing.
(2) In order to seat the bearing properly, turn the hub (brake drum) 180" or more and then return it 360" or more; repeat this procedure again three or more times.
(3) Return the wheel bearing nut to 0 Nm (0 ft.lbs.).
(4) After tightening the wheel bearing nut at a torque of 10 Nm (7 ft.lbs.), rotate the hub again in the same way as described in step (2) so as to seat the bearing.
(5) Then once again tighten the wheel bearing nut to 10 Nm (7 ft.lbs.).
(6) Install the lock cap and cotter pin.
(7) If the position of the cotter pin is not matched with the holes of the lock cap, reposition the lock cap so that the holes align. If this can not be accomplished, back off the nut by not more than 15".

Caution
Check to be sure that the lock nut cannot be loosened manually.

(8) After setting the split pin in place, seat the bearing in the same manner as in step (2).

<Vehicles with Rear Disc Brake>

M34GA-B



Post-installation Operation
- Check the Brake Disc Runout, and Adjust. (Refer to GROUP 35– Service Adjustment Procedures.)
- Check the Rear Disc Brakes Dragging Torque, and Adjust. (Refer to GROUP 35–Service Adjustment Procedures.)
- Checking Parking Brake Lever Stroke. (Refer to GROUP 36– Service Adjustment Procedures.)

Removal steps

1. Parking brake cable
2. Brake tube and hose bracket
3. Rear disc brake
4. Brake disc
5. Hub cap

◆◆ 6. Flange nut (Refer to GROUP 33B–Rear Suspension Assembly.)

7. Washer
8. Speed sensor <Vehicles with A.B.S.>
9. Rear axle assembly
10. Dust shield

◆◆ 11. Lateral rod mounting bolt (Refer to P.34-6.)

12. Cap

◆◆ 13. Shock absorber upper mounting nut (Refer to P.34-6.)

◆◆ 14. Trailing arm mounting bolt (Refer to P.34-6.)

◆◆ 15. Rear suspension assembly (Refer to P.34-6.)

NOTE
*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

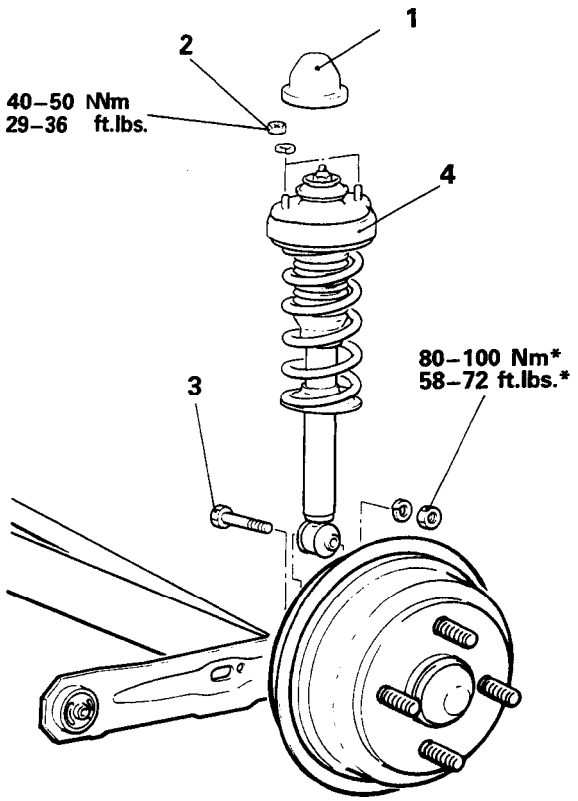
TSB Revision

SHOCK ABSORBER ASSEMBLY

M34NA-A

REMOVAL AND INSTALLATION

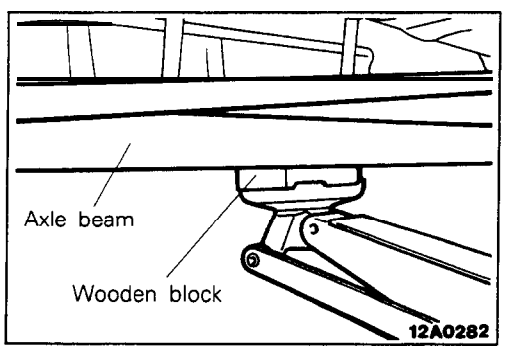
Pre-removal and Post-installation Operation
- Removal and Installation of the Trunk Side Trim (Refer to GROUP 52–Trims.)



Removal steps

1. Cap
2. ◆■◆ Shock absorber upper mounting nuts
3. ◆■◆ Shock absorber lower mounting bolt
4. ◆■◆ Shock absorber

NOTE
*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.



SERVICE POINTS OF REMOVAL

M34NBAA

2. REMOVAL OF SHOCK ABSORBER UPPER MOUNTING NUT/B. SHOCK ABSORBER LOWER MOUNTING BOLT/4. SHOCK ABSORBER

(1) Jack up the torsion axle and arm assembly in order to raise it slightly.

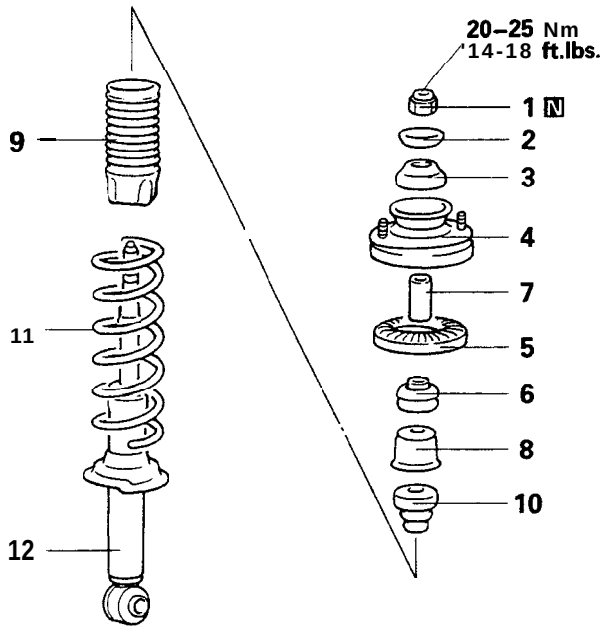
Caution
1. **Always insert a wooden block between the jack receptacle and the axle beam and place the jack at the center of the axle beam.**
2. **Be sure that the jack does not contact the lateral rod.**

(2) Remove the shock absorber's upper mounting nut and lower mounting bolt, and then remove the shock absorber.

TSB Revision

DISASSEMBLY AND REASSEMBLY

M34GM-A



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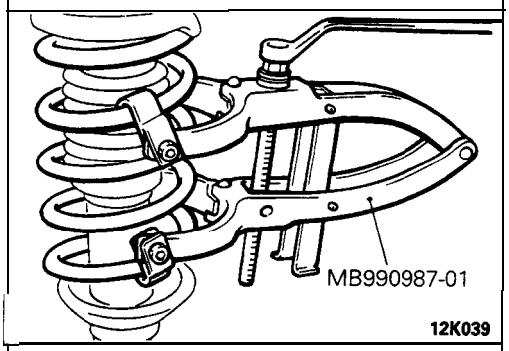
Disassembly steps

- ◆◆ ● + 1. Piston rod tightening nut
  2. Washer
  3. Upper bushing (A)
- ◆◆ 4. Bracket assembly
  5. Upper spring pad
  6. Upper bushing (B)
  7. Collar
- ◆◆ 8. Cup assembly
- ◆◆ 9. Dust cover
  10. Bump rubber
- ● + 11. Coil spring
  12. Shock absorber



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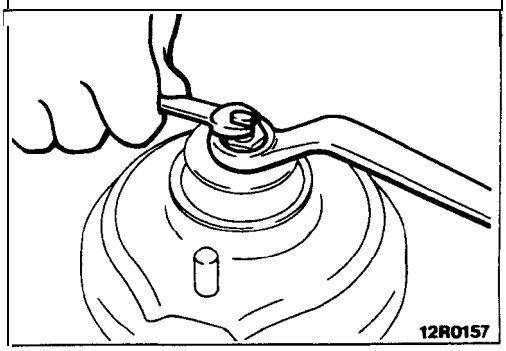

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SERVICE POINTS OF DISASSEMBLY

M34GNAA

1. REMOVAL OF PISTON ROD TIGHTENING NUT

(1) Before removing the piston rod tightening nut, compress the coil spring using the special tools.

Caution
Do not use an air tool to tighten the bolt of the special tool.

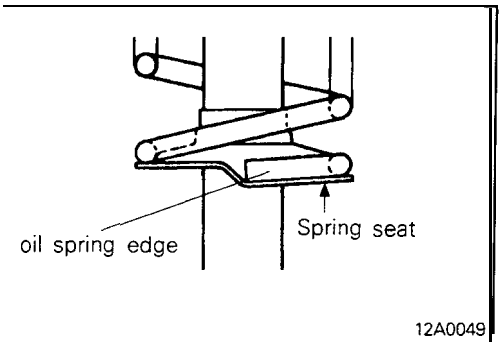
(2) While holding the piston rod, remove the piston rod tightening nut.

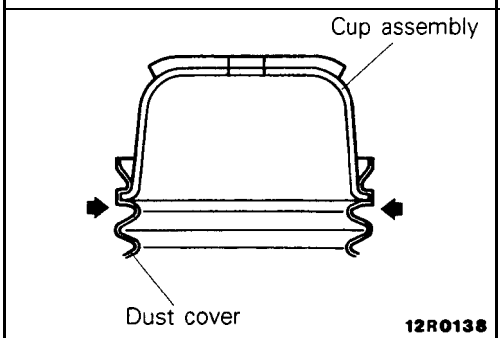
INSPECTION

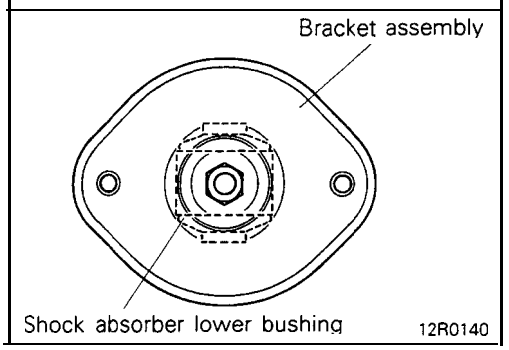
M34GOAA

- Check the rubber parts for damage.
- Check the coil springs for crack, damage or deterioration.

TSB Revision







SERVICE POINTS OF REASSEMBLY M34GPAB

11. INSTALLATION OF COIL SPRING

(1) Use the special tool (MB990987-01) to compress the coil spring and insert it in the shock absorber.
(2) Align the edge of the coil spring to the position of the shock absorber spring seat as shown.

9. INSTALLATION OF DUST COVER/8. CUP ASSEMBLY

As shown in the illustration, fit the dust cover to the cup assembly.

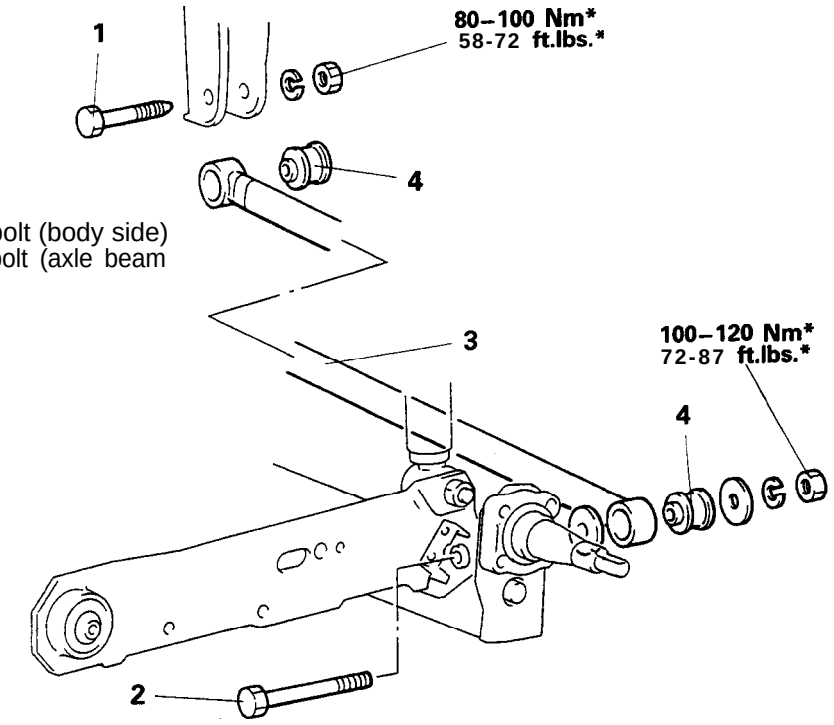
4. INSTALLATION OF BRACKET ASSEMBLY/l. PISTON ROD TIGHTENING NUT

(1) With the position of the bracket assembly as shown in the figure, tighten the tightening nut to the specified torque.
(2) Install the coil spring so that the lower edge fits into the spring seat groove and the upper edge fits into the spring pad groove, then remove the special tool (MB990987-01).

LATERAL ROD

REMOVAL AND INSTALLATION

M340A--



Removal steps

1. Lateral rod mounting bolt (body side)
◆◆ 2. Lateral rod mounting bolt (axle beam side)
3. Lateral rod
4. Lateral rod bushing

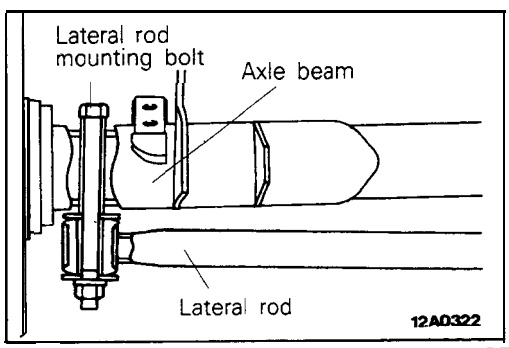
NOTE
*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

INSPECTION

M340CAAa

- Check the lateral rod for damage or deformation.
- Check the bushings for cracking, deterioration, or unusual wear.

NOTE
For information concerning the replacement of the lateral rod bushing, refer to P.34-8.



SERVICE POINTS OF INSTALLATION

M340DAA

2. INSTALLATION OF LATERAL ROD MOUNTING BOLT (AXLE BEAM SIDE)

Install the lateral rod mounting bolt from the direction shown in the illustration.

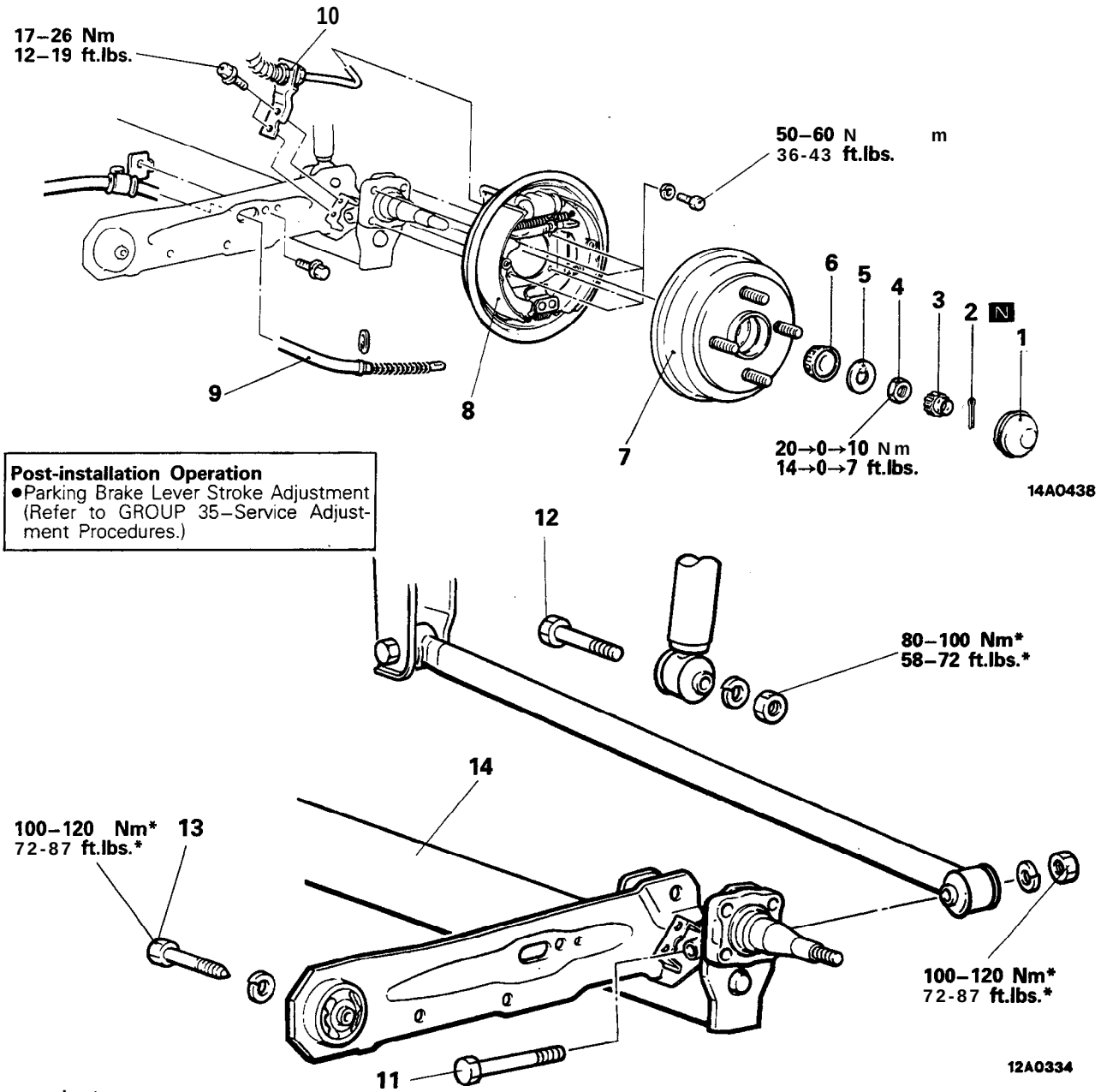
TSB Revision

TORSION AXLE AND ARM ASSEMBLY

M34PA--

REMOVAL AND INSTALLATION

<Vehicles with Rear Drum Brake>



Post-installation Operation
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 35–Service Adjustment Procedures.)

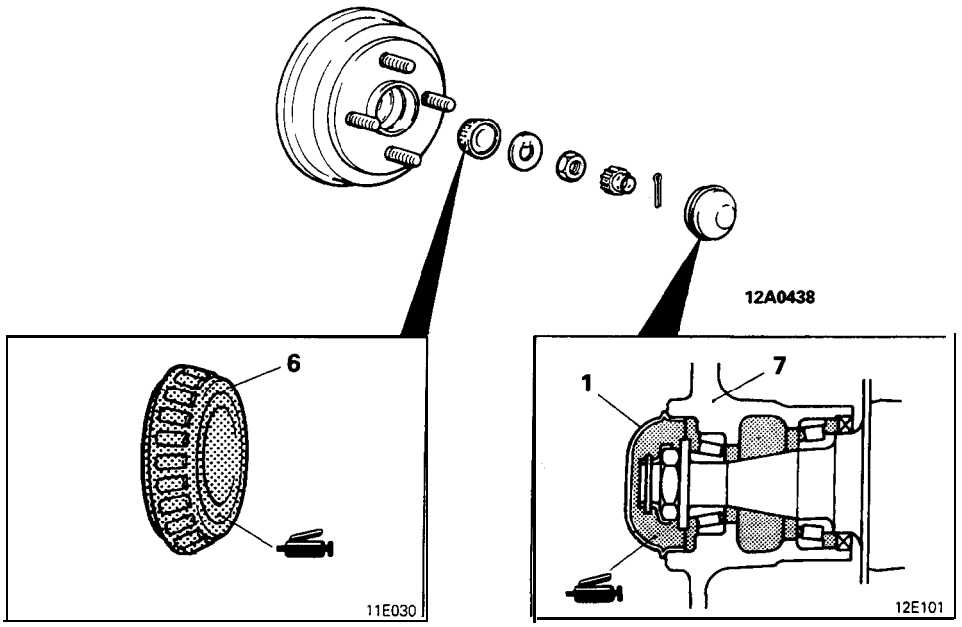
Removal steps

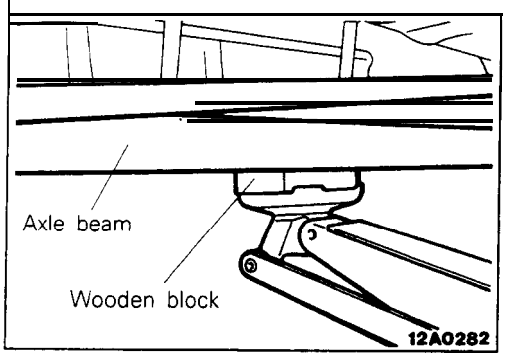
Adjustment of wheel bearing end play (Refer to GROUP 27–Service Adjustment Procedures)
1. Hubcap
2. Cotter pin
3. Cap
4. Wheel bearing nut
5. Washer
6. Outer wheel bearing inner race
7. Brake drum
8. Rear drum brake (Refer to GROUP 35–Rear Drum Brakes)
9. Parking brake cable
10. Brake hose and tube bracket
11. Lateral rod mounting bolt
12. Shock absorber lower mounting bolt
13. Trailing arm mounting bolt
14. Torsion axle and arm assembly

NOTE
*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

TSB Revision

Lubrication points





SERVICE POINTS OF REMOVAL M34PBAC

12. REMOVAL OF SHOCK ABSORBER LOWER MOUNTING BOLT/ 13. TRAILING ARM MOUNTING BOLT 14. TORSION AXLE AND ARM ASSEMBLY

(1) Jack up the torsion axle and arm assembly in order to raise it slightly.

Caution

1. **Always insert a wooden block between the jack receptacle and the axle beam and place the jack at the center of the axle beam.**
2. **Be sure that the jack does not contact the lateral rod.**

(2) Remove the shock absorber's mounting bolts and the trailing arm mounting bolt.

(3) Lower the jack slowly, and then remove the torsion axle and arm assembly.

INSPECTION M34PCAAa

- Check the trailing arm and axle beam for deformation or damage.
- Check the torsion bar for damage.
- Check the bushings for cracking, deterioration, or unusual wear.

NOTE

For information concerning the replacement of the trailing arm bushing, refer to P.34-8.

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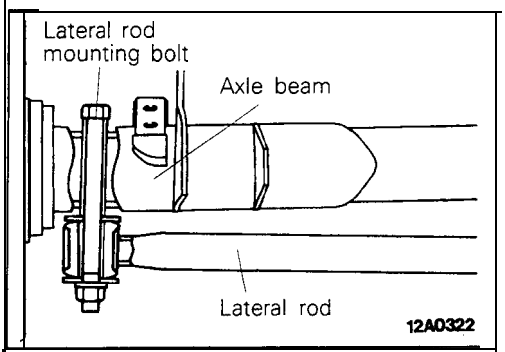
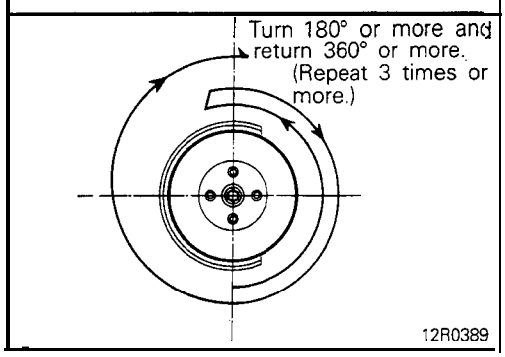




SERVICE POINTS OF INSTALLATION M34PDAH

11. INSTALLATION OF LATERAL ROD MOUNTING BOLT

Install the lateral rod mounting bolt from the direction shown in the illustration.

4. INSTALLATION OF WHEEL BEARING NUT

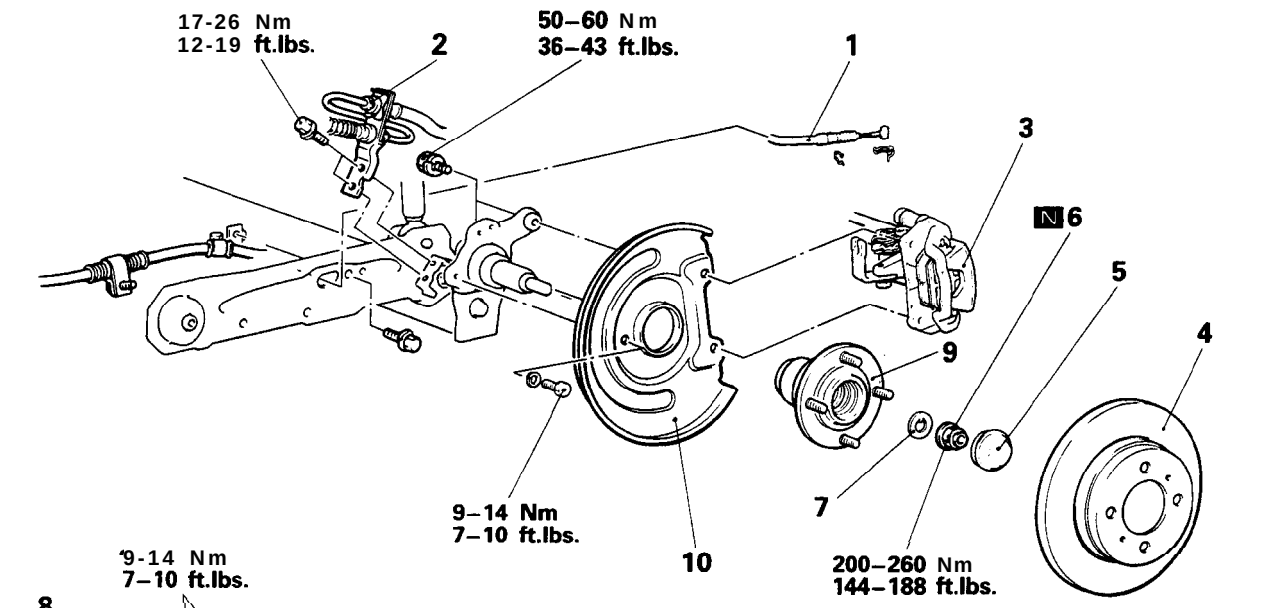
(1) After tightening the wheel bearing nut to 20 Nm (14 ft.lbs.), turn the hub a few times to seat the bearing.
(2) In order to seat the bearing properly, turn the hub (brake drum) 180" or more and then return it 360" or more; repeat this procedure again three or more times.
(3) Return the wheel bearing nut to 0 Nm (0 ft.lbs.).
(4) After tightening the wheel bearing nut at a torque of 10 Nm (7 ft.lbs.), rotate the hub again in the same way as described in step (2) so as to seat the bearing.
(5) Then once again tighten the wheel bearing nut to 10 Nm (7 ft.lbs.).
(6) Install the lock cap and cotter pin.
(7) If the position of the cotter pin is not matched with the holes of the lock cap, reposition the lock cap so that the holes align. If this can not be accomplished, back off the nut by not more than 15".

Caution
Check to be sure that the lock nut cannot be loosened manually.

(8) After setting the cotter pin in place, seat the bearing in the same manner as in step (2).

<Vehicles with Rear Disc Brake>

M34PA-A



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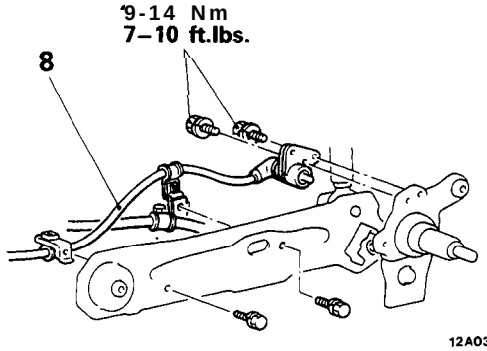

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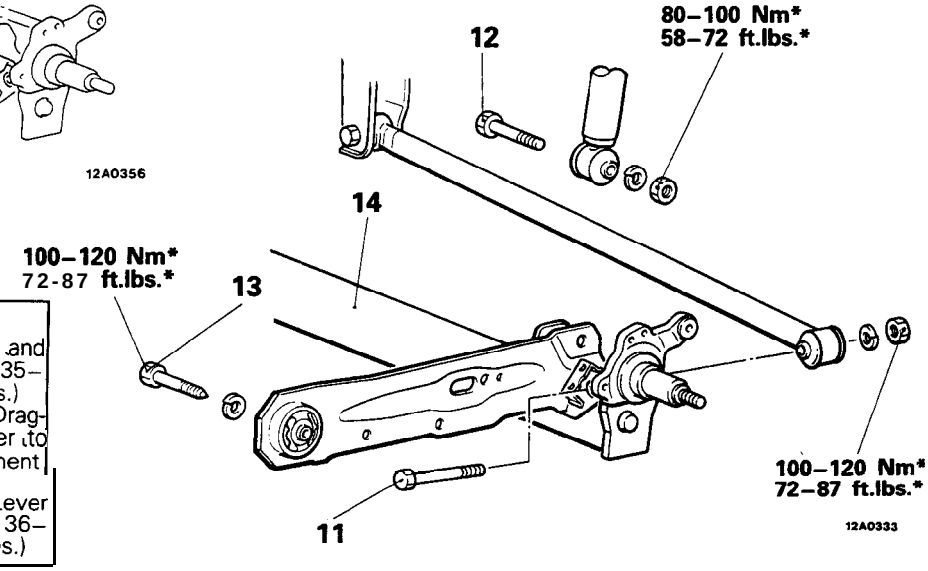

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Post-installation Operation
- Check the Brake Disc Runout, and Adjust. (Refer to GROUP 35– Service Adjustment Procedures.)
- Check the Rear Disc Brakes Dragging Torque, and Adjust. (Refer to GROUP 35–Service Adjustment Procedures.)
- Checking Parking Brake Lever Stroke. (Refer to GROUP 36– Service Adjustment Procedures.)

Removal steps

1. Parking brake cable
2. Brake tube and hose bracket
3. Rear disc brake
4. Brake disc
5. Hub cap
- 6. Flange nut (Refer to GROUP 33B–Rear Suspension Assembly.)
7. Washer
8. Speed sensor <Vehicles with A.B.S.>
9. Rear axle assembly
10. Dust shield
- ☒ 11. Lateral rod mounting bolt (Refer to P.34-14.)
◆◆ 12. Shock absorber lower mounting bolt (Refer to P.34-16.)
◆◆ 13. Trailing arm mounting bolt (Refer to P.34-16.)
◆◆ 14. Torsion axle and arm assembly (Refer to P.34-16.)

NOTE
*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

TSB Revision

SPECIFICATIONS <AWD–UP TO 1992 MODELS>

GENERAL SPECIFICATIONS

M34CA-B

Items		Specifications
Suspension system		Double wishbone suspension type
Coil spring		
Wire dia. x O.D. x free length	mm (in.)	11.0 x 106.0 x 389.5 (.43 x 4.17 x 15.3)
Coil spring identification colour		Pink x 1
Spring constant	N/mm (lbs./in.)	20.0 (112.0)
Shock absorber		
Type		Hydraulic, cylindrical, double-acting type
Max. length	mm (in.)	583 (23.0)
Min. length	mm (in.)	391 (15.4)
Stroke	mm (in.)	192 (7.6)
Damping force [at 0.3m/sec. (0.9 ft./sec.)]		
Expansion	N (lbs.)	1,200 (265)
Contraction	N (lbs.)	450 (99)

SERVICE SPECIFICATIONS

M34CB-B

Items		Specifications
Standard value		
Toe-in	mm (in.)	3 ± 3 (.12 ± .12)
Camber		–1°00′ ± 30′
Lower and upper arm ball joint starting torque	Nm (in.lbs.)	2-9 (17-78)
Protruding length of stabilizer link installation nut	mm (in.)	9–11 (.354–.433)
Stabilizer link ball joint starting torque	Nm (in.lbs.)	1.7-3.2 (15–28)

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TORQUE SPECIFICATIONS

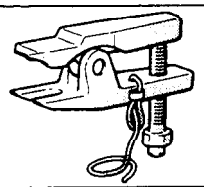
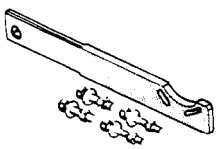
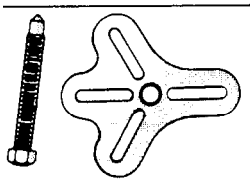
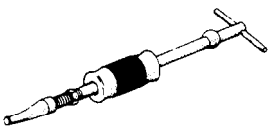
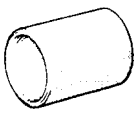
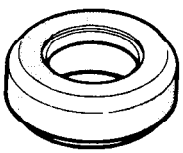
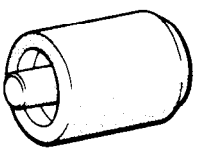
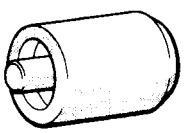
M34CC-B

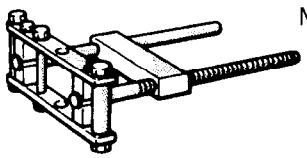
Items	Nm	ft.lbs.
Rear suspension assembly		
Center exhaust pipe to main muffler installation bolt	30–40	22-29
Hook installation bolt	10–15	7-11
Hanger installation bolt	10–15	7-11
Center exhaust pipe to front exhaust pipe installation nut	30–40	22-29
Rear shock absorber installation nut	40–50	29-36
Differential carrier to differential support member	80–100	58-72
Differential support member to body	110–130	80–94
Brake tube bracket to rear shock absorber	17-26	12-19
Differential carrier to propeller shaft	30–35	22-25
Crossmember bracket to body	70–85	51-61
Crossmember bracket to crossmember	110–130	80–94
Rear brake assembly installation bolt	50–60	36-43
Upper and lower arm		
Upper arm to crossmember	140–160	101–116
Upper arm to knuckle	60–72	43-52
Lower arm to crossmember	90–110	65–80
Lower arm to knuckle	60–72	43-52
Trailing arm		
Companion flange to rear axle shaft	160–220	116-159
Companion flange to drive shaft	55-65	40–47
Trailing arm to crossmember	140–160	101–116
Upper arm to knuckle	60–72	43-52
Lower arm to knuckle	60–72	43-52
Rear shock absorber (lower)	90–110	65–80
Rear brake assembly installation bolt	50–60	36-43
Rear speed sensor	9-14	7–10
Shock absorber assembly		
Shock absorber installation nut	40–50	29-36
Shock absorber installation bolt	90–110	65–80
Brake tube bracket to rear shock absorber	17-26	12-19
Piston rod tightening nut	20–25	14-18
Stabilizer bar		
Differential support member to body	110–130	80–94
Crossmember bracket to crossmember	110–130	80–94
Crossmember bracket to body	70–85	51-61
Stabilizer link to stabilizer bar	35-45	25-33

TSB Revision

SPECIAL TOOLS

M34DA-B

Tool	Number	Name	Use
	MB991113-01 OPTIONAL: AVAILABLE FROM O.T.C.	Steering linkage puller	Disconnection of the ball joint
	MB990767-01	End yoke holder	Removal of the rear axle shaft
	GENERAL SERVICE TOOL	Axle puller	
	MB990211-01	Sliding hammer with adapter	
	MB990847-01	Base	Removal and press-fitting of the lower arm bushing
	MB991245	Lower arm bushing ring	
	MB991246	Lower arm bushing arbor	
	MB990849	Upper arm bushing arbor	Removal and press-fitting of the trailing arm bushing
	MB990646	Control arm bushing installer and remover	

Tool	Number	Name	Use
	MB990800-01 OPTIONAL: AVAILABLE FROM O.T.C.	Ball joint remover and installer	Installation of the ball joint dust cover
	MB991254	Rod remover and installer	Replacement of trailing arm connecting rod

TROUBLESHOOTING

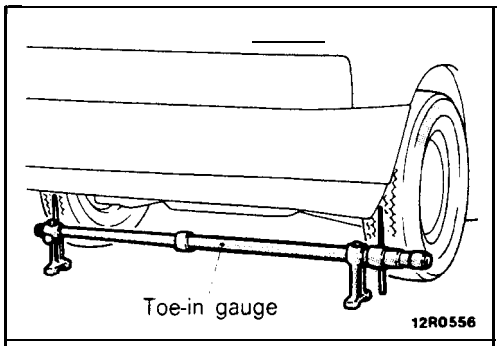
M34EA-B

Symptom	Probable cause	Remedy
Squeaks or other abnormal noise	Loose rear suspension installation bolts and nuts	Retighten
	Malfunction of shock absorber Worn bushings	Replace
	Upper arms and/or lower arms deformed or damaged	
	Trailing arms deformed or damaged	
	Crossmember deformed or damaged	
Poor ride	Excessive tire inflation pressure	Adjust the pressure
	Malfunction of shock absorber Weak or broken springs	Replace
	Stabilizer bar and/or stabilizer link deformed or damaged	
Body tilting	Weak or deteriorated bushings Weak or broken springs	Replace
	Upper arms and/or lower arms deformed or damaged	
	Trailing arms deformed or damaged	
	Crossmember deformed or damaged	

SERVICE ADJUSTMENT. PROCEDURES

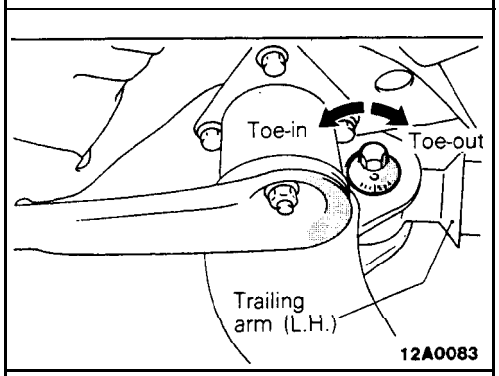
REAR WHEEL ALIGNMENT INSPECTION M34FDAB

The rear suspension assembly must be free of worn, loosen or damaged parts prior to measurement of wheel alignment.



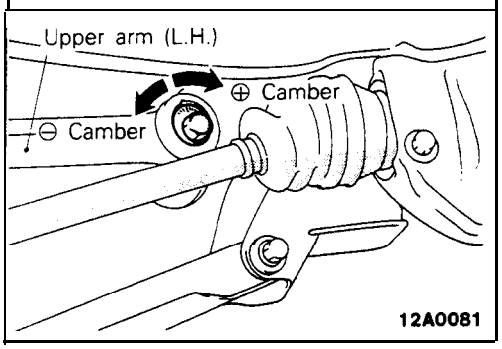
TOE-IN

(1) Measure the toe-in with a toe-in gauge.
Standard value: 3±3 mm (.12±.12 in.)



(2) If the toe-in is not within the standard value, adjust it by moving the mounting bolts located on the crossmember side of the trailing arm.

NOTE
Make the adjustment by moving the left and the right bolts equally.
Movement of one division on the scale will cause toe-in variation of about 2 mm (.08 in.).



CAMBER

(1) Measure the camber with a camber/caster/kingpin gauge.
Standard value: −1°00′±30′

(2) If the camber is not within the standard value, adjust it by moving the mounting bolt located on the crossmember side of the upper arm.

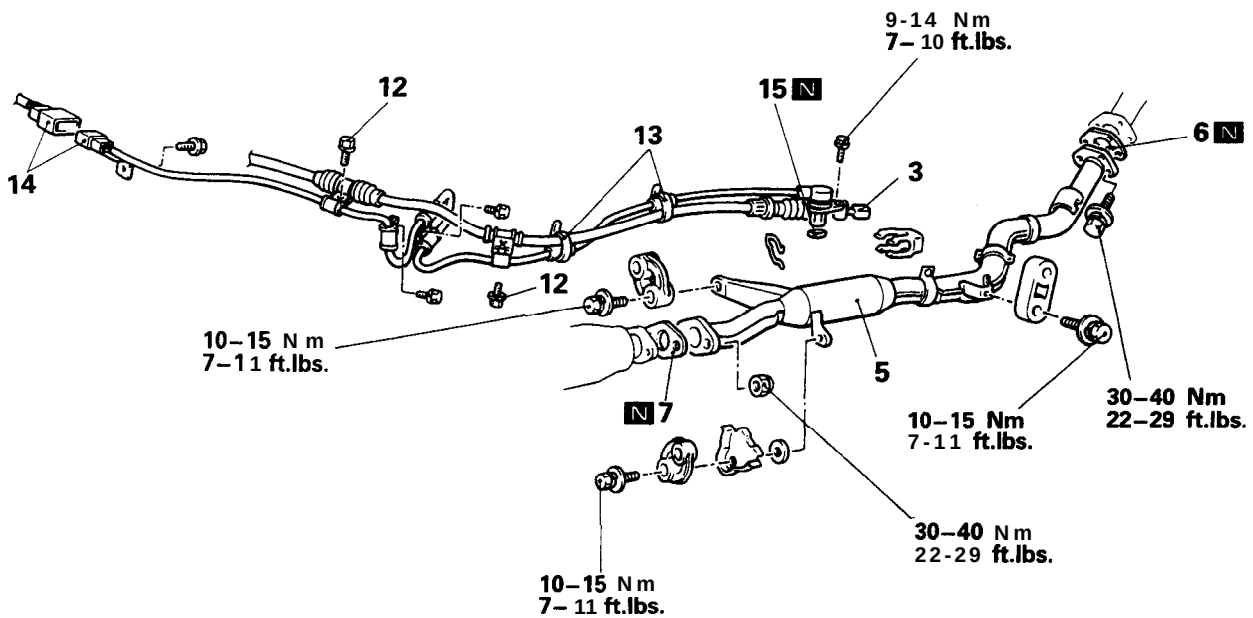
NOTE
Movement of one division on the scale will cause camber variation of about 15'.

Caution
1. As toe-in will vary 0.9 mm (.035 in.) for every camber scale adjustment, adjust the toe after adjusting camber.
2. The difference between the left and the right camber shall be less than 15'.

REAR SUSPENSION ASSEMBLY

REMOVAL AND INSTALLATION

M34GA-B



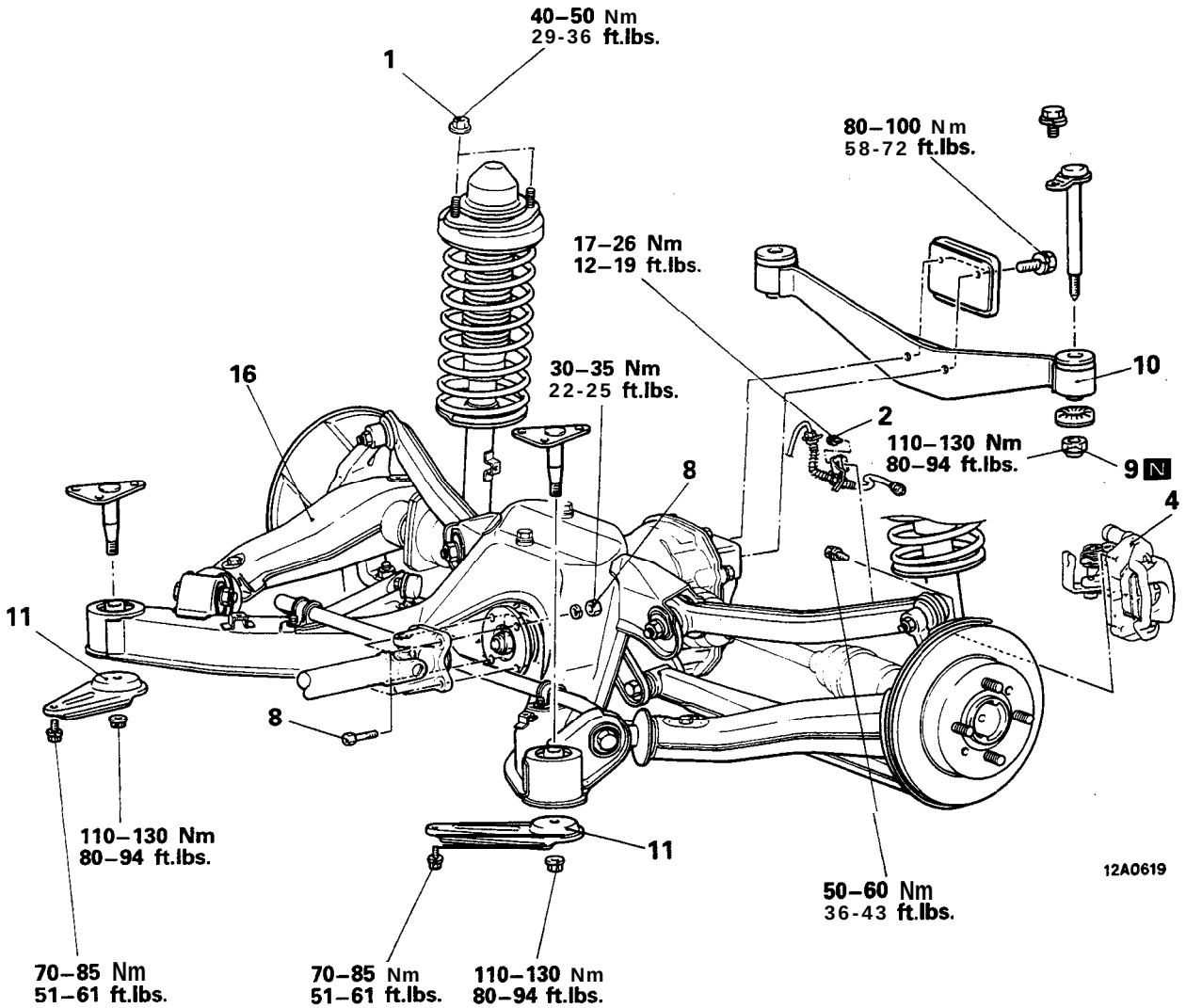
Pre-removal Operation
- Removal of Trunk Room Trim (Refer to GROUP 52–Trims.)

Post-installation Operation
- Check of Wheel Alignment (Refer to P.34-23.)
- Check of Parking Brake Lever Stroke (Refer to GROUP 36–Service Adjustment Procedures.)
- Installation of Trunk Room Trim (Refer to GROUP 52–Trims.)

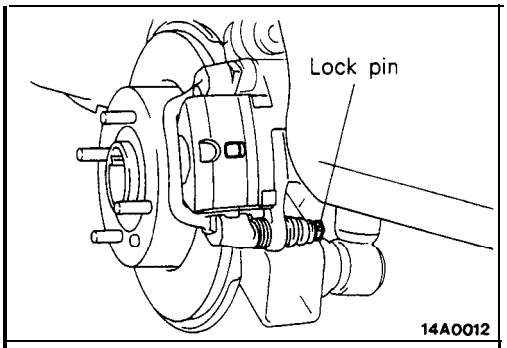
Removal steps

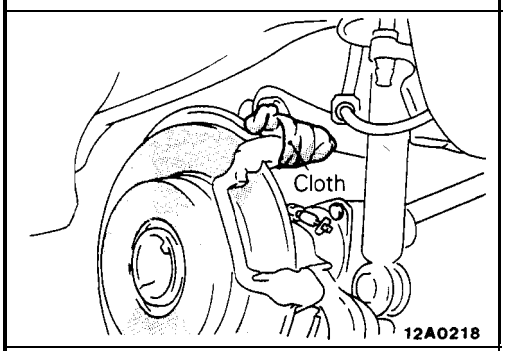
1. Shock absorber installation nut
2. Brake tube bracket installation bolt
3. Parking brake cable end
4. Caliper assembly
5. Center exhaust pipe
6. Gasket
7. Gasket
8. Propeller shaft installation bolt and nut

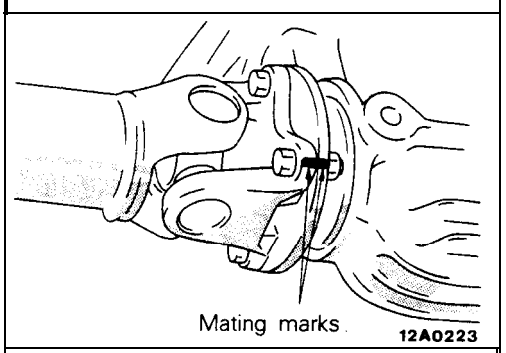
TSB Revision

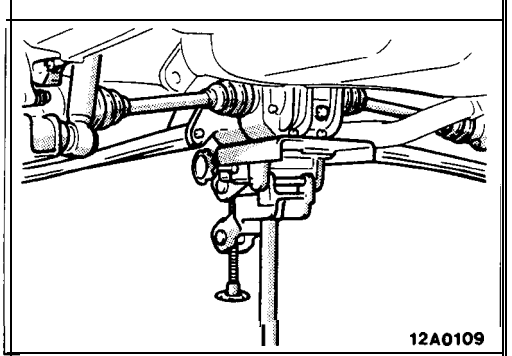


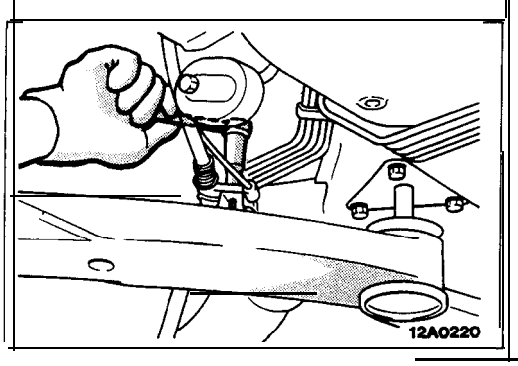
◆◆ 9. Self locking nut
10. Differential support member
11. Crossmember bracket
◆◆ 12. Parking brake cable and rear speed sensor installation bolt
13. Cable band
14. Rear speed sensor connector
15. O-ring
◆◆ 16. Rear suspension assembly











SERVICE POINTS OF REMOVAL M34GBAP

4. REMOVAL OF CALIPER ASSEMBLY

(1) Remove the lock pin, rotate the caliper assembly upward, then remove the caliper assembly and secure it with wire, etc.

Caution
The lock pin has a special grease applied to it, so be sure not to wipe it off, and ensure that the lock pin stays clean.

(2) After removing the caliper assembly, cover the guide pin with a cloth, etc.

8. REMOVAL OF PROPELLER SHAFT' INSTALLATION BOLT AND NUT

Place mating marks on the differential carrier companion flange and the propeller shaft flange yoke.

NOTE
The mating marks should be used as a reference for re-installation.

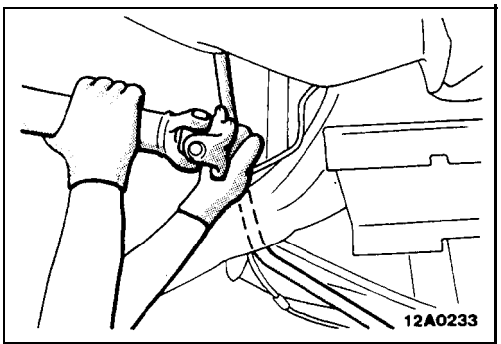
9. REMOVAL OF SELF LOCKING NUT

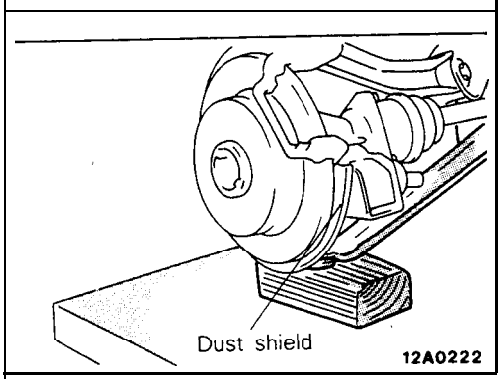
(1) Before removing the self locking nuts, support the differential case with a transaxle jack.
(2) Remove the self locking nuts.

12. REMOVAL OF PARKING BRAKE CABLE AND REAR SPEED SENSOR INSTALLATION BOLT

(1) Lower the transaxle jack slightly.
(2) Remove the parking brake cable and the rear speed sensor installation bolts.

NOTE
The task may be made easier by increasing the gap between the body and the crossmember.





16. REMOVAL OF REAR SUSPENSION ASSEMBLY

(1) Supporting the rear suspension assembly with a transmission jack, move it toward the rear (in the direction of the fuel tank).

(2) Gradually lower the transmission jack, avoiding contact with the stabilizer bar and the propeller shaft.

Caution

1. Ensure that the propeller shaft does not bend greatly.

2. Ensure that the löbro joint does not receive any shock.

NOTE

The lowering of the rear suspension assembly from the transmission jack requires three individuals due to the amount of weight being handled (one on the differential, and one on either side of the lower arm).

(3) In order to protect the rear suspension assembly dust shield, support the lower arm ball joint with a wooden block.

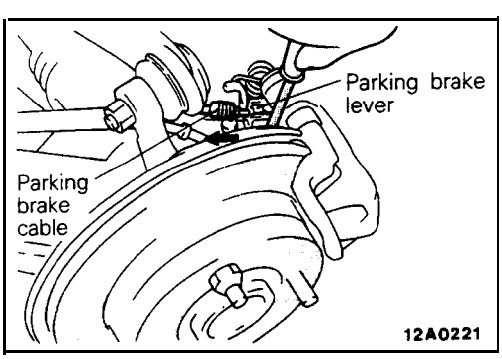
INSPECTION M34GCAM

- Check crossmember for cracks or other damage.

SERVICE POINTS OF INSTALLATION M34GDAR

8. INSTALLATION OF PROPELLER SHAFT INSTALLATION BOLT AND NUT

Install the propeller shaft to the differential carrier, ensuring that the mating marks are aligned.



3. INSTALLATION OF PARKING BRAKE CABLE END

NOTE

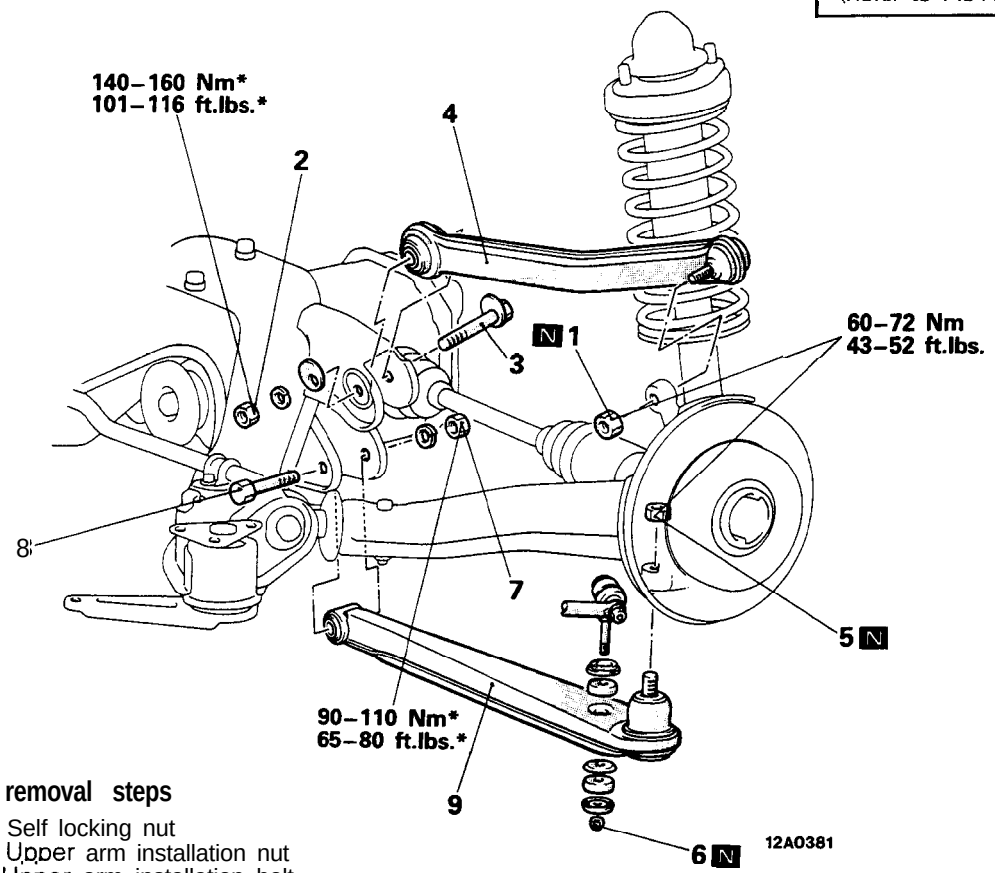
Connecting a parking brake cable end to parking brake lever and prying up the parking brake lever, the installation of the other cable end will be easy.

UPPER AND LOWER ARM

M34SA--

REMOVAL AND INSTALLATION

Post-installation Operation
- Check of Wheel Alignment (Refer to P.34-23.)



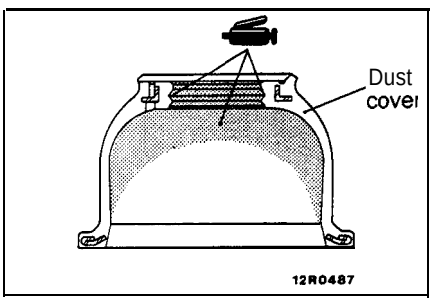
Upper arm removal steps

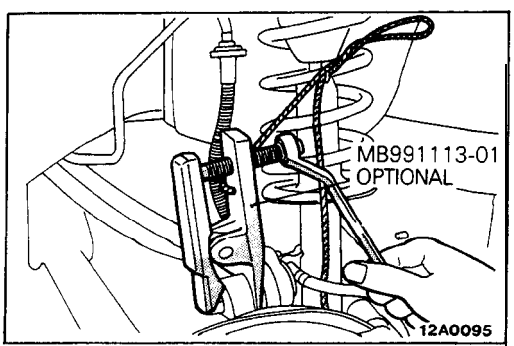
◆■▶ 1. Self locking nut
2. Upper arm installation nut
3. Upper arm installation bolt
4. Upper arm

Lower arm removal steps

◆■▶ 5. Self locking nut
◆■▶◆ 6. Stabilizer link installation nut
7. Lower arm installation nut
8. Lower arm installation bolt
9. Lower arm

NOTE
*: Indicates parts which should first be temporarily tightened, then fully tightened with the vehicle on the ground with no load (curb weight).





SERVICE POINTS OF REMOVAL

M34SBAA

1. REMOVAL OF SELF LOCKING NUT

With the special tool, disconnect the upper arm ball joint and knuckle.

Caution
While the special tool is being used, do not remove the self locking nut; only loosen it.

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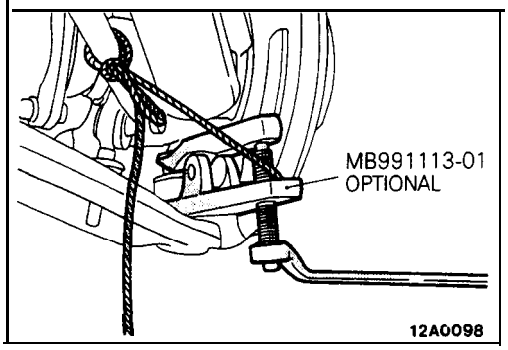
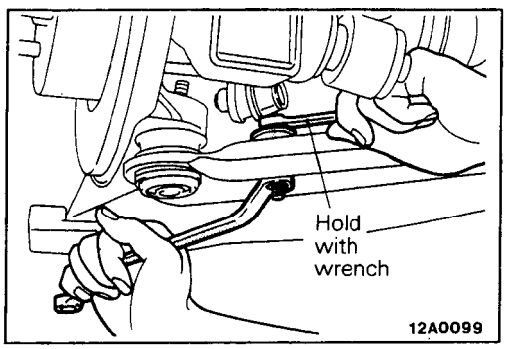


6. REMOVAL OF SELF LOCKING NUT

With the special tool, disconnect the lower arm ball joint and knuckle.

Caution
While the special tool is being used, do not remove the self locking nut; only loosen it.



6. REMOVAL OF STABILIZER LINK INSTALLATION NUT

Hold the stabilizer link with a wrench and remove the installation nut.

INSPECTION M34SCAA

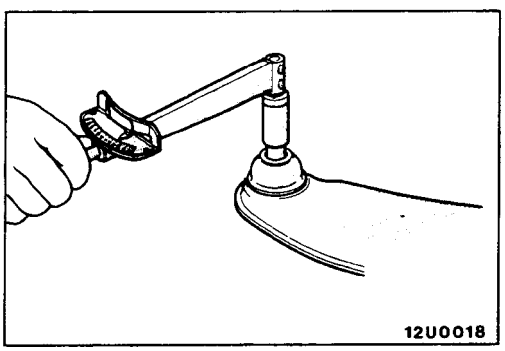
- Check the bushing for wear and deterioration.
- Check the upper arm or lower arm for bend or breakage.
- Check the ball joint dust cover for cracks.
- Check all bolts for condition and straightness.

CHECKING OF BALL JOINT FOR STARTING TORQUE

(1) If a crack is noted in the dust cover, replace it, adding grease.
(2) Deflect side to side the ball joint stud several times.
(3) Mount two nuts on the ball joint, and then measure the ball joint starting torque.

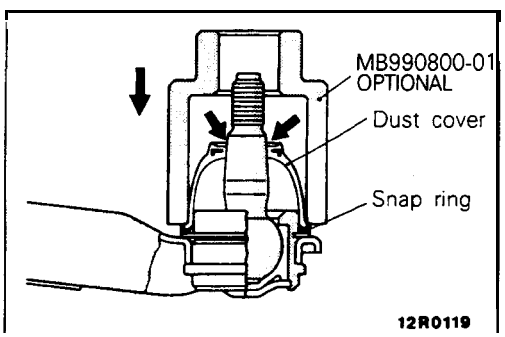
Standard value: 2-9 Nm (17-78 in.lbs.)

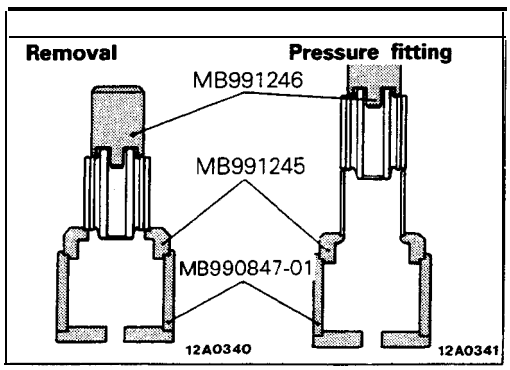
(4) If the starting torque exceeds the upper limit of standard value, replace the upper and lower arm assembly.
(5) Even if the starting torque is below the lower limit of the standard value, the ball joint may be reused unless it has drag and excessive play.



BALL JOINT DUST COVER REPLACEMENT M34SEAA

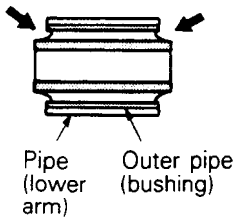
(1) Remove the dust cover.
(2) Apply multipurpose grease to the lip and inside of the dust cover.
(3) Drive in the dust cover with special tool until it is fully seated.





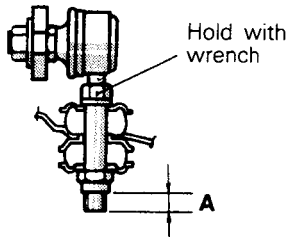
LOWER ARM BUSHING REPLACEMENT M34SFAA

(1) Use the special tool to remove and press fit the bushing.



12A0039

(2) Press fit the lower arm bushing until the bushing outer pipe edge flush with the lower arm pipe edge.



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SERVICE POINTS OF INSTALLATION M34SDAA

6. INSTALLATION OF STABILIZER LINK INSTALLATION NUT

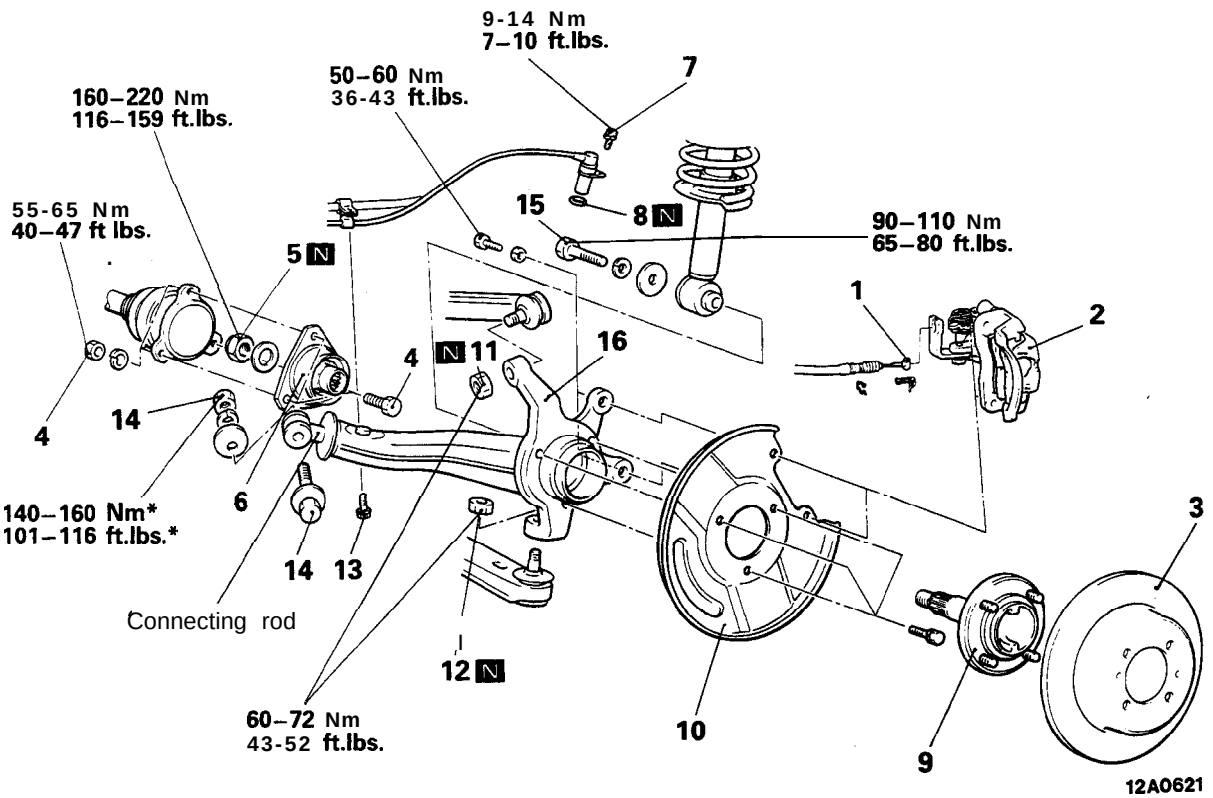
Holding the stabilizer link with a wrench, tighten the self locking nut so that the protrusion of the stabilizer link (dimension A indicated in illustration) is within the standard value.

Standard value: 9-11 mm (.354–.433 in.)

TRAILING ARM

REMOVAL AND INSTALLATION

M34TA--



Removal steps

1. Parking cable end
2. Rear brake assembly
3. Rear brake disc
4. Drive shaft and companion flange installation bolt, nut
5. Self locking nut
6. Companion flange
7. Rear speed sensor installation bolt <Vehicles with ABS>
8. O-ring
9. Rear axle shaft
10. Dust shield
11. Self locking nut (upper arm)
12. Self locking nut (lower arm)
13. Parking brake cable and rear speed sensor installation bolt
14. Trailing arm installation bolt, nut
15. Rear shock absorber installation bolt
16. Trailing arm

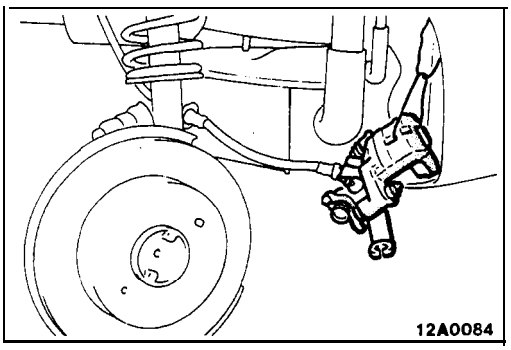
Post-installation Operation

- Zheck of Wheel Alignment (Refer to P.34-23.)
- Check of Parking Brake Lever Stroke (Refer to GROUP 36–Service Adjustment Procedures.)
- Rear Brake Disc Run-out Check (Refer to GROUP 35–Service Adjustment Procedures.)

NOTE

*: Indicates parts which should first be temporarily tightened, then fully tightened with the vehicle on the ground with no load (cerb weight).

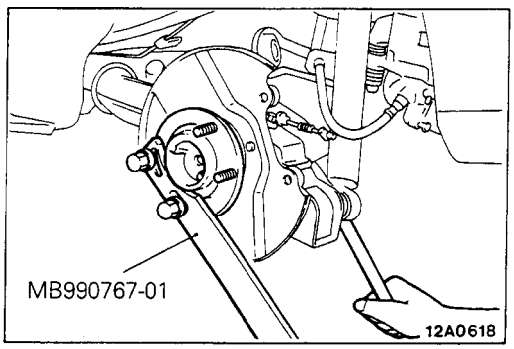
TSB Revision



SERVICE POINTS OF REMOVAL M34TBAA

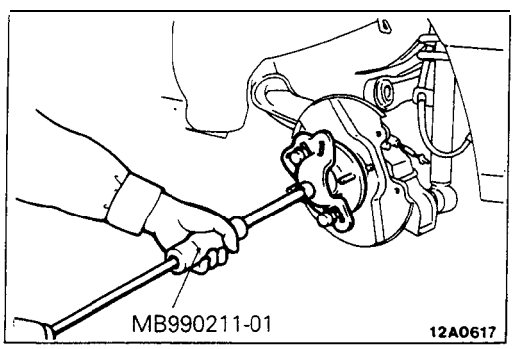
2. REMOVAL OF REAR BRAKE ASSEMBLY

Remove the rear brake assembly installation bolts, then suspend the rear brake assembly from the vehicle with wire, etc.



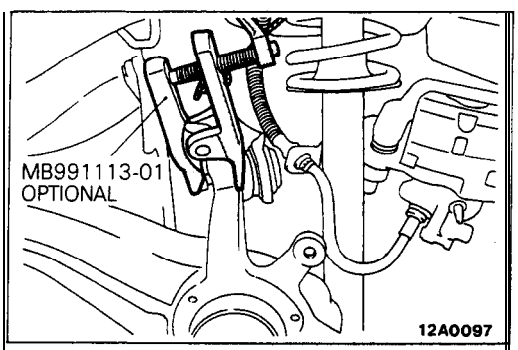
5. REMOVAL OF SELF LOCKING NUT

With the special tool, secure the rear axle shaft, then remove the self locking nut.



9. REMOVAL OF REAR AXLE SHAFT

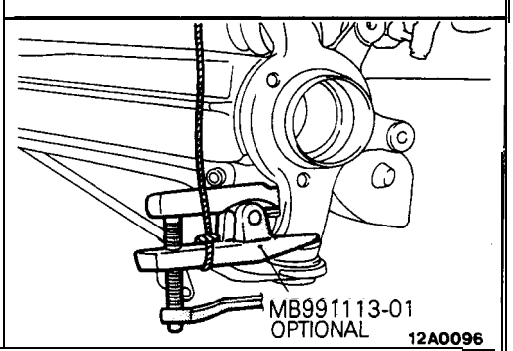
With the special tool, remove the rear axle shaft.



11. REMOVAL OF SELF LOCKING NUT (UPPER ARM)

With the special tool, disconnect the upper arm ball joint and knuckle.

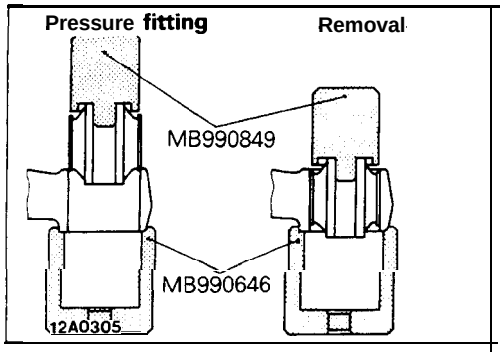
Caution
While the special tool is being used, do not remove the self locking nut; only loosen it.



12. REMOVAL OF SELF LOCKING NUT (LOWER ARM)

With the special tool, disconnect the lower arm ball joint and knuckle.

Caution
While the special tool is being used, do not remove the self locking nut; only loosen it.

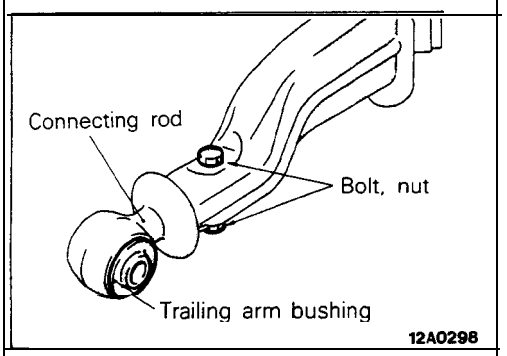


INSPECTION M34TCAA

- Check trailing arm for cracks and deformation.
- Check bushing for cracks, deterioration and wear.

TRAILING ARM BUSHING REPLACEMENT M34TEAA

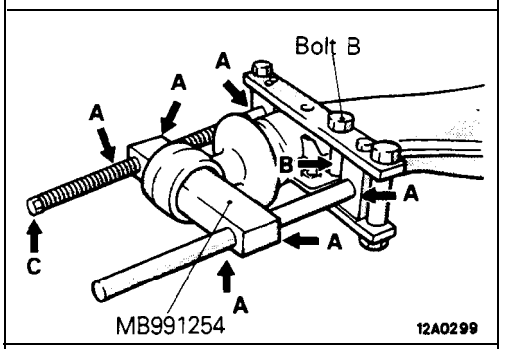
Use the special tool to remove and press fit the bushing.



CONNECTING ROD REPLACEMENT M34TFAA

Replace the connecting rod using the following procedure:

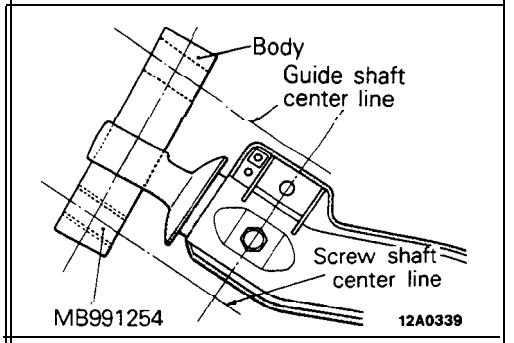
(1) Remove the trailing arm bushing.
(2) Remove the bolt and nut.



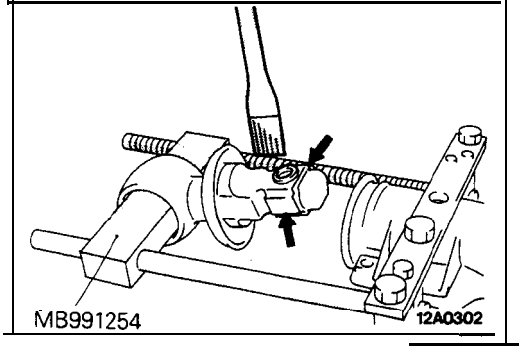
(3) Set the special tool onto the trailing arm as shown in the illustration.

NOTE
(1) Apply lubricant to the sliding portion of the special tool (at the arrow marked “A” in the illustration).
(2) Install bolt B to the trailing arm, at the point shown in the figure.

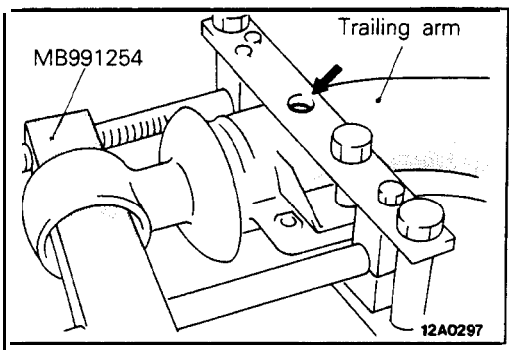
(4) Use a spanner, etc., to turn the portion marked “C” in the illustration to remove the connecting rod.



(5) Installation of the body (special tool) should be performed with the screw shaft and guide shaft center lines oriented as shown in the illustration.

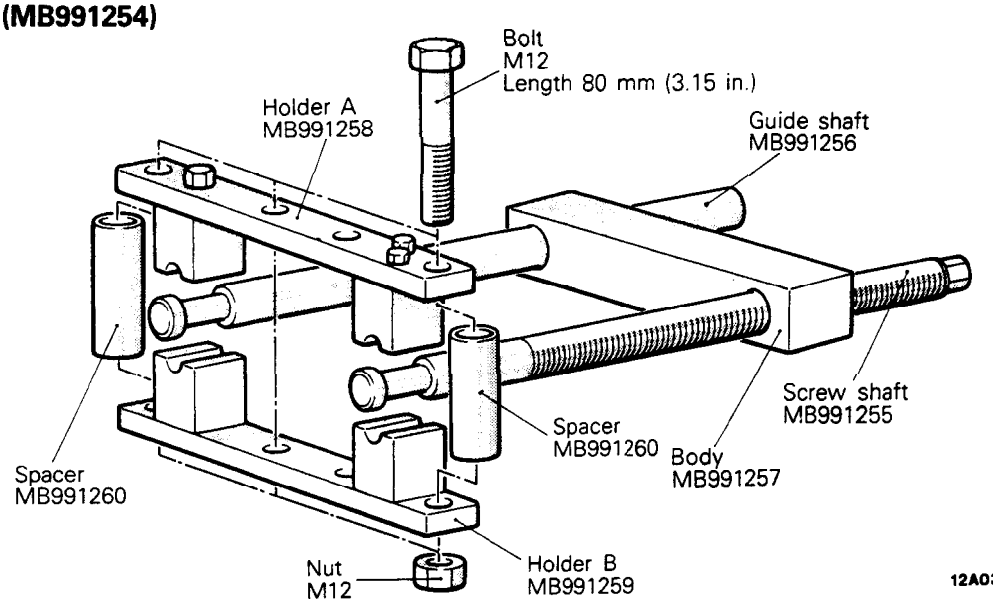


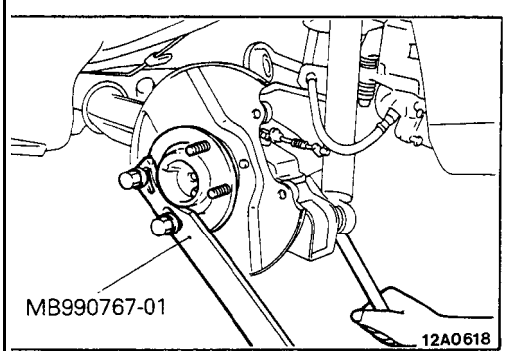
(6) Apply soapy water to the rubber portion of the connecting rod.
(7) Reverse the removal procedures to press fit.



(8) Remove the special tool after aligning the holes in the special tool and trailing arm.
(9) Tighten the bolts and nuts to the specified torque.
Tightening torque: 85–110 Nm (61–80 ft.lbs.)
(10) Press fit the trailing arm bushing. (Refer to P.34-33.)

<Reference>
Special tool (MB991254)





SERVICE POINTS OF INSTALLATION M34TDAA

9. INSTALLATION OF REAR AXLE SHAFT/6. COMPANION FLANGE/5. SELF LOCKING NUT

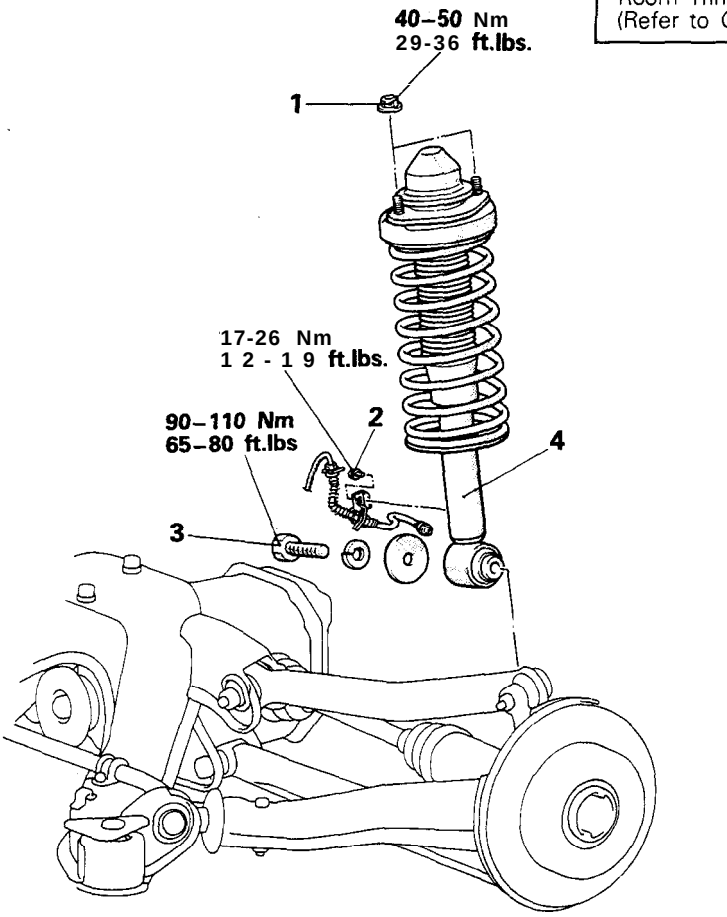
(1) Temporarily assemble the rear axle shaft to the trailing arm.
(2) Install the companion flange to the rear axle shaft, then install the self locking nut.
(3) Hold the rear axle shaft with the special tool so that it doesn't turn and tighten the locking nut.

SHOCK ABSORBER ASSEMBLY

REMOVAL AND INSTALLATION

M34NA-B

Pre-removal and Post-installation Operation
- Removal and Installation of Trunk Room Trim (Refer to GROUP 52–Trims.)



Removal steps

1. Shock absorber upper installation nut
2. Brake tube bracket installation bolt
3. Shock absorber lower installation bolt
4. Shock absorber assembly

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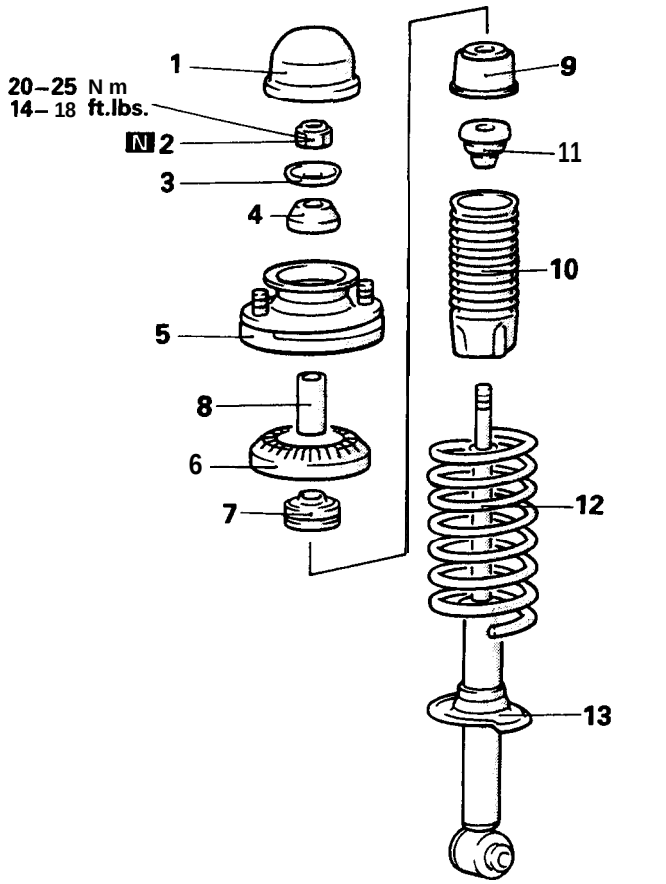
DISASSEMBLY AND REASSEMBLY

M34GM-B



Disassembly steps

1. Cap
2. Piston rod tightening nut (Refer to P.34-13.)
3. Washer
4. Upper bushing (A)
5. Bracket assembly (Refer to P.34- 3.)
6. Spring pad
7. Upper bushing (B)
8. Collar
9. Cup assembly (Refer to P.34-13.)
10. Dust cover (Refer to P.34-13.)
11. Bump rubber
12. Coil spring (Refer to P.34-13.)
13. Shock absorber

INSPECTION

M34GOAB

- Check the rubber parts for damage.
- Check the coil springs for crack, damage or deterioration.

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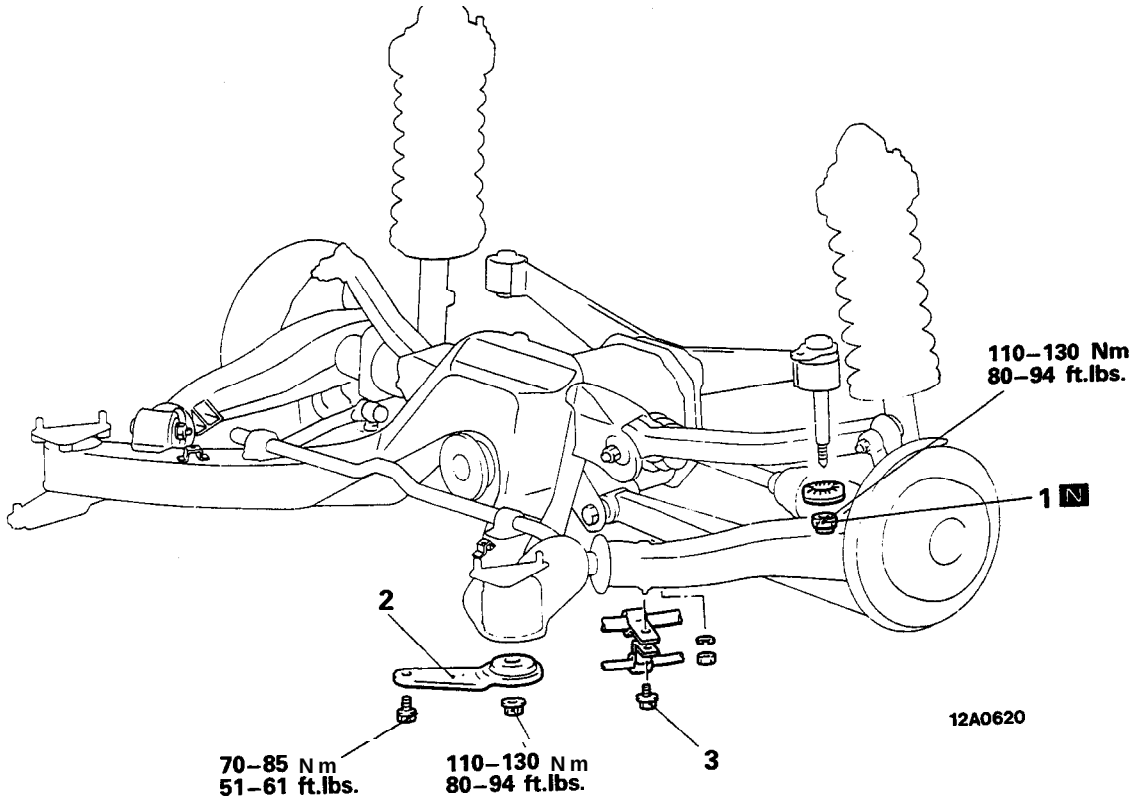
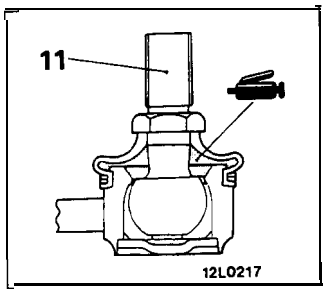
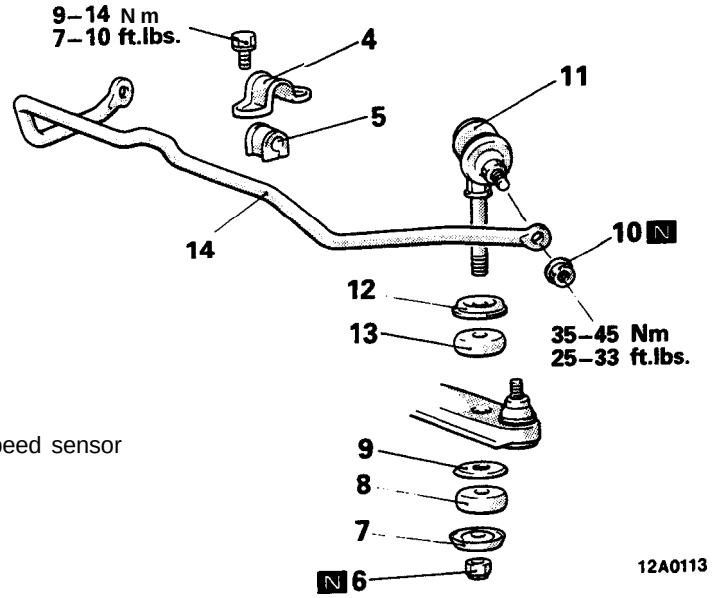
STABILIZER BAR

REMOVAL AND INSTALLATION

M341A--

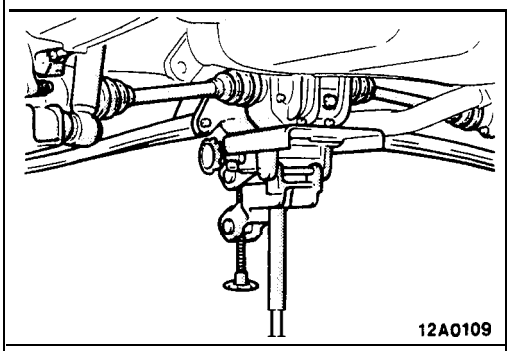






Removal steps

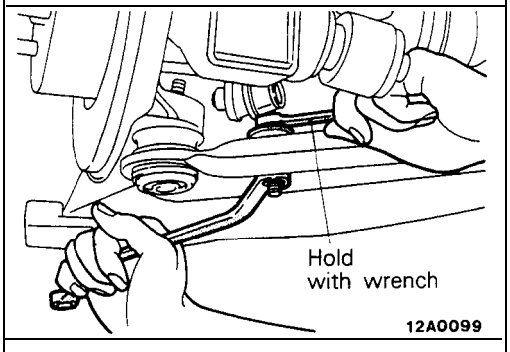
- ◆◆ 1. Self locking nut
- ◆◆ 2. Crossmember bracket
- 3. Parking brake cable and rear speed sensor installation bolt
- 4. Stabilizer bracket
- 5. Bushing
- ◆◆ ◆◆ 6. Self locking nut
- 7. Joint cup (A)
- 8. Stabilizer rubber
- 9. Joint cup (B)
- ◆◆ ◆◆ 10. Self locking nut
- ◆◆ ● +11. Stabilizer link
- 12. Joint cup (A)
- 13. Stabilizer rubber
- ◆◆ 14. Stabilizer bar



SERVICE POINTS OF REMOVAL M341DAB

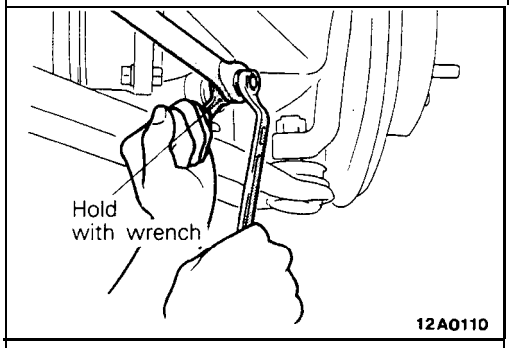
1. REMOVAL OF SELF LOCKING NUT/ 2. CROSSMEMBER BRACKET

(1) Support the rear suspension assembly with a transaxle jack.
(2) Remove the self locking nuts and crossmember brackets.



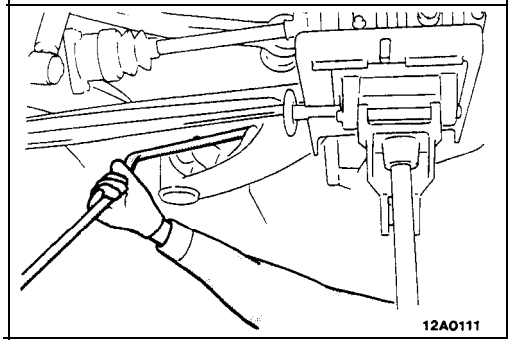
6. REMOVAL OF SELF LOCKING NUT

Hold the stabilizer link with a wrench, then remove the self locking nut.



10. REMOVAL OF SELF LOCKING NUT/l 1. STABILIZER LINK

(1) Hold the stabilizer links with a wrench and remove the self locking nuts.
(2) Remove the stabilizer links.

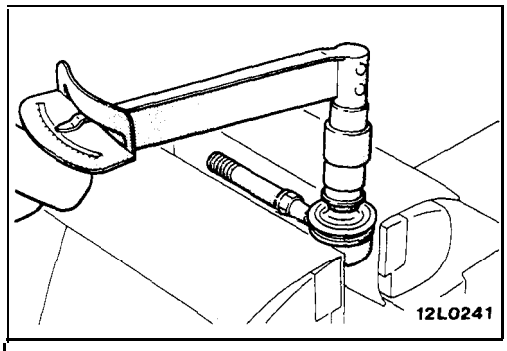


14. REMOVAL OF STABILIZER BAR

(1) Lower the transaxle jack slightly, maintaining a gap between the rear suspension and the body.
(2) Remove the stabilizer bar.

INSPECTION M34TCAF

- Check the bushing for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check the stabilizer link ball joint dust cover for cracks.
- Check all bolts for condition and straightness.



CHECKING OF STABILIZER LINK BALL JOINT FOR STARTING TORQUE

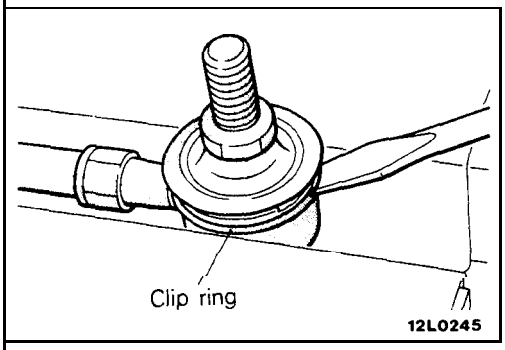
(1) If a crack is noted in the dust cover, replace it, adding grease.
(2) Deflect side to side the stabilizer link ball joint stud several times.
(3) Mount two nuts on the ball joint, and then measure the ball joint starting torque.

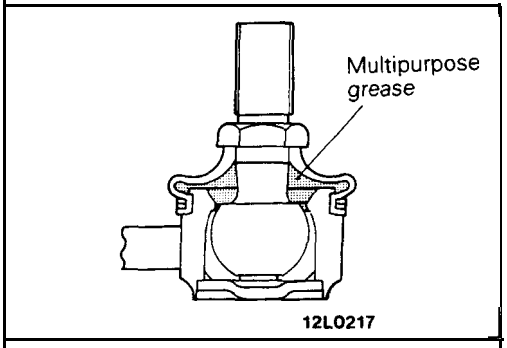
Standard value: 1.7-3.2 Nm (15–28 in.lbs.)

(4) If the starting torque exceeds the upper limit of standard value, replace the stabilizer link.
(5) Even if the starting torque is below the lower limit of the standard value, the ball joint may be reused unless it has drag and excessive play.

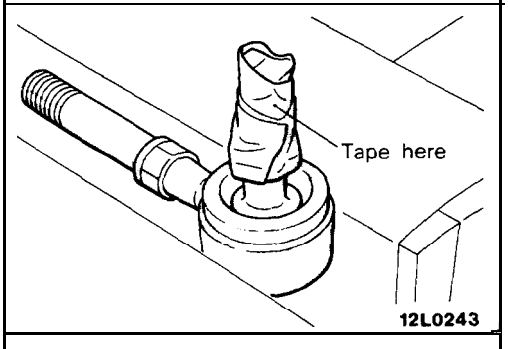
BALL JOINT DUST COVER REPLACEMENT M34KEAA

(1) Remove the clip ring and the dust cover.

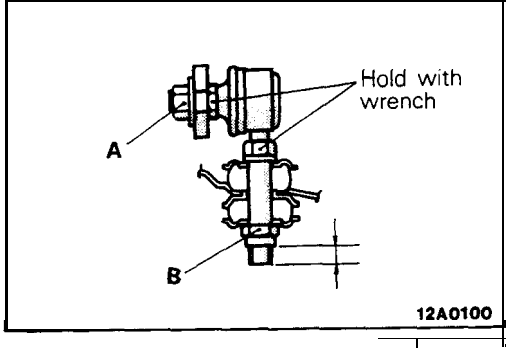




(2) Apply multipurpose grease to the lip and inside of the dust cover.



(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.



SERVICE POINTS OF INSTALLATION M34ICAD

11. INSTALLATION OF STABILIZER LINK/ 10. SELF LOCKING NUT/G. SELF LOCKING NUT

(1) Hold the stabilizer link ball studs with a wrench and install the self locking nut (A).
(2) Holding the stabilizer link with a wrench, tighten the self locking nut (B) so that the protrusion of the stabilizer link is within the standard value.

Standard value: 9-11 mm (.354–.433 in.)

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NOTES

SERVICE BRAKES

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M35AA--

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CAUTION
When servicing brake assemblies or components, do not create dust by sanding, grinding or by cleaning brake parts with a dry brush or with compressed air. A WATER DAMPENED CLOTH SHOULD BE USED. Many brake components contain asbestos fibers which can become air-borne if dust is created during service operations. Breathing dust which contains asbestos fibers can cause serious bodily harm.

SPECIFICATIONS

GENERAL SPECIFICATIONS [up to 1990.5 models] M35CA--

<FWD>

Items		Vehicles without A.B.S.*	Vehicles with A.B.S.
Master cylinder			
Type		Tandem type (with level sensor)	Tandem type (with level sensor)
I.D.	mm (in.)	22.2 (7/8)	23.8 (15/16)
Brake booster			
Type		Vacuum type	Vacuum type
Effective dia. of power cylinder	mm (in.)	230 (9.0)	Front side: 178 (7.0) Rear side: 203 (8.0)
Boosting ratio [Brake pedal depressing force]		4.0 [at 280 N (62 lbs.)]	5.0 [at 270 N (59 lbs.)]
Proportioning valve			
Split point	kPa (psi)	4,200 (597)	4,200 (597)
Decompression ratio		0.3	0.3
Front brakes			
Type		Floating caliper, single-piston, ventilated disc (AD54*1 or M-R44V*2)	Floating caliper, single-piston, ventilated disc (AD54*1 or M-R44V*2)
Disc O.D.	mm (in.)	266 (10.5)	266 (10.5)
Disc thickness	mm (in.)	24 (.94)	24 (.94)
Pad thickness	mm (in.)	15.5 (.61)*1 or 16 (.63)*2	15.5 (.61)*1 or 16 (.63)*2
Wheel cylinder I.D.	mm (in.)	53.9 (2⅛)	53.9 (2⅛)
Clearance adjustment		Automatic	Automatic
Rear disc brakes			
Type		–	Floating caliper, single-piston, non-ventilated disc (AD30P)
Disc O.D.	mm (in.)	–	265 (10.4)
Disc thickness	mm (in.)	–	10 (.39)
Pad thickness	mm (in.)	–	14.5 (.57)
Wheel cylinder I.D.	mm (in.)	–	30.1 (1 3/16)
Clearance adjustment		–	Automatic
Rear drum brakes			
Type		Leading-trailing	
Drum I.D.	mm (in.)	203 (8.0)	
Wheel cylinder I.D.	mm (in.)	17.4 (11/16)	
Clearance adjustment		Automatic	
Rotor teeth			
Front wheel side			98
Rear wheel side		–	98
Speed sensor			Magnet coil type

NOTE
*: Anti-lock Brakina Svstem
*1: <Up to 1990 models>
*2: <1990.5 models>

TSB Revision

<AWD>

Items		Vehicles without A.B.S.	Vehicles with A.B.S.
Master cylinder			
Type		Tandem type (with level sensor)	Tandem type (with level sensor)
I.D.	mm (in.)	23.8 (15/16)	25.4 (1)
Brake booster			
Type		Vacuum type	Vacuum type
Effective dia. of power cylinder	mm (in.)	Front side: 178 (7.0) Rear side: 203 (8.0)	Front side: 203 (8.0) Rear side: 230 (9.0)
Boosting ratio [Brake pedal depressing force]		5.0 [at 280 N (62 lbs.)]	5.5 [at 280 N (62 lbs.)]
Proportioning valve			
Split point	kPa (psi)	5,200 (740)	5,200 (740)
Decompression ratio		0.4	0.4
Front brakes			
Type		Floating caliper, single-piston, ventilated disc (AD54*1 or M-R44V*2)	Floating caliper, single-piston, ventilated disc (AD54*1 or M-R44V*2)
Disc O.D.	mm (in.)	266 (10.5)	266 (10.5)
Disc thickness	mm (in.)	24 (.94)	24 (.94)
Pad thickness	mm (in.)	15.5 (.61)*1 or 16 (.63)*2	15.5 (.61)*1 or 16 (.63)*2
Wheel cylinder I.D.	mm (in.)	53.9 (2 1/8)	53.9 (2 1/8)
Clearance adjustment		Automatic	Automatic
Rear disc brakes			
Type		Floating caliper, single-piston, non-ventilated disc (AD30P)	Floating caliper, single-piston, non-ventilated disc (AD30P)
Disc O.D.	mm (in.)	265 (10.4)	265 (10.4)
Disc thickness	mm (in.)	10 (.39)	10 (.39)
Pad thickness	mm (in.)	14.5 (.57)	14.5 (.57)
Wheel cylinder I.D.	mm (in.)	30.1 (1 3/16)	30.1 (1 3/16)
Clearance adjustment		Automatic	Automatic
Rotor teeth			
Front wheel side		–	86
Rear wheel side			43
Speed sensor			Magnet coil type

NOTE
*1: <Up to 1990 models>
*2: <1990.5 models>

GENERAL SPECIFICATIONS [Up to 1992 models]

<FWD>

Items	Vehicles without A.B.S.		Vehicles with A.B.S.
	SOHC	DOHC	
Master cylinder			
Type	Tandem type (with level sensor)	Tandem type (with level sensor)	Tandem type (with level sensor)
I.D. mm (in.)	22.2 (7/8)	23.8 (15/16)	25.4 (1)
Brake booster			
Type	Vacuum type	Vacuum type	Vacuum type
Effective dia. of power cylinder mm (in.)	230 (9.0)	230 (9.0)	Front side: 178 (7.0) Rear side: 203 (8.0)
Boosting ratio [Brake pedal depressing force]	4.0 [at 280 N (62 lbs.)]	5.0 [at 220 N (48 lbs.)]	5.5 [at 250 N (55 lbs.)]
Proportioning valve			
Split point kPa (psi)	4,200 (597)	3,700 (526)	3,700 (526)
Decompression ratio	0.4	0.3	0.3
Front brakes			
Type	Floating caliper, single-piston, ventilated disc (MR44V)	Floating caliper, single-piston, ventilated disc (MR46V)	Floating caliper, single piston, ventilated disc (MR46V)
Disc O.D. mm (in.)	256 (10.1)	256 (10.1)	256 (10.1)
Disc thickness mm (in.)	24 (.94)	24 (.94)	24 (.94)
Pad thickness mm (in.)	16 (.63)	16 (.63)	16 (.63)
Wheel cylinder I.D. mm (in.)	53.9 (2 1/8)	60.3 (2 3/8)	60.3 (2 3/8)
Clearance adjustment	Automatic	Automatic	Automatic
Rear disc brakes			
Type	–	Floating caliper, single-piston, non-ventilated disc (AD35P)	Floating caliper, single piston, non-ventilated disc (AD35P)
Disc O.D. mm (in.)	–	265 (10.4)	265 (10.4)
Disc thickness mm (in.)	–	10 (.39)	10 (.39)
Pad thickness mm (in.)	–	14.5 (.57)	14.5 (.57)
Wheel cylinder I.D. mm (in.)	–	34.9 (1 3/8)	34.9 (1 3/8)
Clearance adjustment	–	Automatic	Automatic
Rear drum brakes			
Type	Leading-trailing	–	
Drum I.D. mm (in.)	203 (8.0)		
Wheel cylinder I.D. mm (in.)	17.4 (11/16)	–	–
Clearance adjustment	Automatic	–	–
Rotor teeth			
Front wheel side			98*1, 43*2
Rear wheel side	–	–	98*1, 43*2
Speed sensor	–	–	Magnet coil type

NOTE
- *1: 1991 models
- *2: 1992 models

TSB **Revision**

<AWD>

Items	Vehicles without A.B.S.	Vehicles with A.B.S.	
		DOHC (Non-Turbo)	DOHC (Turbo)
Master cylinder			
Type	Tandem type (with level *sensor)*	Tandem type (with level sensor)	Tandem type (with level sensor)
I.D. mm (in.)	25.4 (1)	25.4 (1)	25.4 (1)
Brake booster			
Type	Vacuum type	Vacuum type	Vacuum type
Effective dia. of power cylinder mm (in.)	Front side: 178 (7.0) Rear side: 203 (8.0)	Front side: 203 (8.0) Rear side: 230 (9.0)	Front side: 203 (8.0) Rear side: 230 (9.0)
Boosting ratio [Brake pedal depressing force]	5.5 [at 250 N (55 lbs.)]	6.0 [at 280 N (62 lbs.)]	6.0 [at 280 N (62 lbs.)]
Proportioning valve			
Split point kPa (psi)	5,200 (740)	5,200 (740)	5,200 (740)
Decompression ratio	0.4	0.4	0.4
Front brakes			
Type	Floating caliper, single-piston, ventilated disc (MR46V)	Floating caliper, single-piston, ventilated disc (MR46V)	Floating caliper, double-piston, ventilated disc (MR56W)
Disc O.D. mm (in.)	256 (10.1)	256 (10.1)	276 (10.9)
Disc thickness mm (in.)	24 (.94)	24 (.94)	24 (.94)
Pad thickness mm (in.)	16 (.63)	16 (.63)	16 (.63)
Wheel cylinder I.D. mm (in.)	60.3 (2⅜)	60.3 (2⅜)	41.3 (1⅝) x 2
Clearance adjustment	Automatic	Automatic	Automatic
Rear disc brakes			
Type	Floating caliper, single-piston, non-ventilated disc (AD35P)	Floating caliper, single-piston, non-ventilated disc (AD35P)	Floating caliper. single-piston, non-ventilated disc (AD35P)
Disc O.D. mm (in.)	265 (10.4)	265 (10.4)	265 (10.4)
Disc thickness mm (in.)	10 (.39)	10 (.39)	10 (.39)
Pad thickness mm (in.)	14.5 (.57)	14 . 5 (.57)	14.5 (.57)
Wheel cylinder I.D. mm (in.)	34.9 (1⅜)	34.9 (1⅜)	34.9 (1⅜)
Clearance adjustment	Automatic	Automatic	Automatic
Rotor teeth			
Front wheel side	–	86*1, 43*2	86*1, 43*2
Rear wheel side	–	43	43
Speed sensor	–	Magnet coil type	Magnet coil type

NOTE
*1: 1991 models
*2: 1992 models

GENERAL SPECIFICATIONS [1993 models]

Items	SOHC	DOHC	
		Vehicles without A.B.S.	Vehicles with A.B.S.
Master cylinder			
Type	Tandem type (with level sensor)	Tandem type (with level sensor)	Tandem type (with level sensor)
I.D. mm (in.)	22.2 (7/8)	23.8 (15/16)	25.4 (1)
Brake booster			
Type	Vacuum type	Vacuum type	Vacuum type
Effective dia. of power cylinder mm (in.)	230 (9.0)	230 (9.0)	Front side: 178 (7.0) Rear side: 203 (8.0)
Boosting ratio [Brake pedal depressing force]	4.0 [at 280 N (62 lbs.)]	5.0 [at 220 N (48 lbs.)]	5.5 [at 250 N (55 lbs.)]
Proportioning valve			
Split point kPa (psi)	4,200 (597)	3,700 (526)	3,700 (526)
Decompression ratio	0.4	0.3	0.3
Front brakes			
Type	Floating caliper, single-piston, ventilated disc (MR44V)	Floating caliper, single-piston, ventilated disc (MR46V)	Floating caliper, single-piston, ventilated disc (MR46V)
Disc O.D. mm (in.)	256 (10.1)	256 (10.1)	256 (10.1)
Disc thickness mm (in.)	24 (.94)	24 (.94)	24 (.94)
Pad thickness mm (in.)	16 (.63)	16 (.63)	16 (.63)
Wheel cylinder I.D. mm (in.)	53.9 (2 1/8)	60.3 (2 3/8)	60.3 (2 3/8)
Clearance adjustment	Automatic	Automatic	Automatic
Rear disc brakes			
Type	–	Floating caliper, single-piston, non-ventilated disc (AD35P)	Floating caliper, single-piston, non-ventilated disc (AD35P)
Disc O.D. mm (in.)	–	265 (10.4)	265 (10.4)
Disc thickness mm (in.)	–	10 (.39)	10 (.39)
Pad thickness mm (in.)		14.5 (.57)	14.5 (.57)
Wheel cylinder I.D. mm (in.)	–	34.9 (1 3/8)	34.9 (1 3/8)
Clearance adjustment	–	Automatic	Automatic
Rear drum brakes			
Type	Leading-trailing	–	
Drum I.D. mm (in.)	203 (8.0)	–	
Wheel cylinder I.D. mm (in.)	17.4 (11/16)	–	
Clearance adjustment	Automatic	–	
Rotor teeth			
Front wheel side	–	–	43
Rear wheel side	–	–	43
Speed sensor	–	–	Magnet coil type

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SERVICE SPECIFICATIONS [Up to 1990.5 models]

M35CB--

Items		FWD	AWD
Standard value			
Brake pedal height	mm (in.)	176-181 (6.9-7.1)	176-181 (6.9–7.1)
Brake pedal free play	mm (in.)	3-8 (.1–.3)	3-8 (.1–.3)
Brake pedal to floorboard clearance	mm (in.)	80 (3.1) or more	80 (3.1) or more
Proportioning valve pressure	MPa (psi)		
Split point		3.95-4.45 (561-633)	4.95–5.45 (704–775)
Output pressure [input pressure]		5.15-5.65 (732–804)*1 5.55–6.05 (789–861)*2 [8.2 (1,163)]	6.55–7.05 (931–1,003) [9.2 (1.309)]
Booster push rod to master cylinder piston clearance	mm (in.)		
9 inch brake booster		0.8–1.0 (.031–.039)	–
7 + 8 inch brake booster		0.5–0.7 (.020–.028)	–
8+9 inch brake booster			0.6–0.8 (.024–.031)
Disc brake drag force (tangential force of wheel mounting bolts)	N (lbs.)	70 (15.4) or less	70 (15.4) or less
Speed sensor's internal resistance	kΩ	0.8–1 .2*3	0.8–1.2*3
Clearance between the speed pole piece and the toothed rotor	mm (in.)	0.3–0.9 (.012–.035)*3	0.3–0.9 (.012–.035)*3
Limit			
Left/right proportioning valve output pressure difference	MPa (psi)	0.4 (57)	0.4 (57)
Front disc runout	mm (in.)	0.10 (.0039)*1, *3 0.08 (.0031)	0.08 (.0031)
Pad thickness	mm (in.)	2.0 (.08)	2.0 (.08)
Front disc thickness	mm (in.)	22.4 (.882)	22.4 (.882)
Rear disc thickness	mm (in.)	8.4 (.331)	8.4 (.331)
Rear disc runout	mm (in.)	0.08 (.0031)	0.08 (.0031)
Rear drum lining thickness	mm (in.)	1.0 (.04)	
Rear drum inside diameter	mm (in.)	205 (8.1)	–

NOTE
*1: <1989 models>
*2: <1990, 1990.5 models>
*3: Vehicles with A.B.S.

SERVICE SPECIFICATIONS [Up to 1992 models]

Items	FWD		AWD
	SOHC	DOHC	
Standard value			
Brake pedal height mm (in.)	176-181 (6.9-7.1)	176-181 (6.9–7.1)	176-181 (6.9–7.1)
Brake pedal free play mm (in.)	3-8 (.1–.3)	3-8 (.1–.3)	3-8 (.1–.3)
Brake pedal to floorboard clearance mm (in.)	80 (3.1) or more	80 (3.1) or more	80 (3.1) or more
Proportioning valve pressure MPa (psi)			
Split point	3.95-4.45 (561–633)	3.45-3.95 (491–561)	4.95-5.45 (704–775)
Output pressure [input pressure]	5.55–6.05 (789-861) (8.2 (1,163)]	4.65-5.15 (661–732) [7.7 (1,095)]	6.55–7.05 (931–1,003) [9.2 (1,309)]
Booster push rod to master cylinder piston clearance mm (in.)			
9 inch brake booster	0.8–1.0 (.031–.039)	0.8–1.0 (.031–.039)	–
7 + 8 inch brake booster		0.5–0.7 (.020–.028)	0.5–0.7 (.020–.028)
8 + 9 inch brake booster	–	–	0.6–0.8 (.024–.031)
Disc brake drag force (tangential force of wheel mounting bolts) N (lbs.)	70 (15.4) or less	70 (15.4) or less	70 (15.4) or less
Speed sensor's internal resistance kΩ	–	0.8–1.2*	0.8–1.2*
Clearance between the speed pole piece and the toothed rotor mm (in.)	–	0.3–0.9 (.012–.035)*	0.3–0.9 (.012–.035)*
Limit			
Left/right proportioning valve output pressure difference MPa (psi)	0.4 (57)	0.4 (57)	0.4 (57)
Front disc runout mm (in.)	0.08 (.0031), 0.07 (.0028)**	0.08 (.0031), 0.07 (.0028)**	0.08 (.0031), 0.07 (.0028)**
Pad thickness mm (in.)	2.0 (.08)	2.0 (.08)	2.0 (.08)
Front disc thickness mm (in.)	22.4 (.882)	22.4 (.882)	22.4 (.882)
Rear disc thickness mm (in.)	–	8.4 (.331)	8.4 (.331)
Rear disc runout mm (in.)	–	0.08 (.0031)	0.08 (.0031)
Rear drum lining thickness mm (in.)	1.0 (.04)		–
Rear drum inside diameter mm (in.)	205 (8.1)	–	

NOTE
- : Vehicles with A.B.S
- *: 1992 models

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SERVICE SPECIFICATIONS [1993 models]

Items		SOHC	DOHC
Standard value			
Brake pedal height	mm (in.)	176-181 (6.9–7.1)	176-181 (6.9-7.1)
Brake pedal free play	mm (in.)	3-8 (.1–.3)	3-8 (.1–.3)
Brake pedal to floorboard clearance	mm (in.)	80 (3.1) or more	80 (3.1) or more
Proportioning valve pressure	MPa (psi)		
Split point		3.95-4.45 (561–633)	3.45-3.95 (491–561)
Output pressure [input pressure]		5.55–6.05 (789–861) [8.2 (1,163)]	4.65-5.15 (661-732) [7.7 (1,095)]
Booster push rod to master cylinder piston clearance	mm (in.)		
9 inch brake booster		0.8–1.0 (.031–.039)	0.8–1.0 (.031–.039)
7 + 8 inch brake booster			0.5–0.7 (.020–.028)
Disc brake drag force (tangential force of wheel mounting bolts)	N (lbs.)	70 (15.4) or less	70 (15.4) or less
[Disc brake dragging torque]	Nm (ft.lbs.)	[4 (3) or less]	[4 (3) or less]
Speed sensor's internal resistance	kΩ	–	0.8–1.2*
Clearance between the speed pole piece and the toothed rotor	mm (in.)	–	0.3–0.9 (.012–.035)*
Limit			
Left/right proportioning valve output pressure difference	MPa (psi)	0.4 (57)	0.4 (57)
Front disc runout	mm (in.)	0.07 (.0028)	0.07 (.0028)
Pad thickness	mm (in.)	2.0 (.08)	2.0 (.08)
Front disc thickness	mm (in.)	22.4 (.882)	22.4 (.882)
Rear disc thickness	mm (in.)	–	8.4 (.331)
Rear disc runout	mm (in.)	–	0.08 (.0031)
Rear drum lining thickness	mm (in.)	1.0 (.04)	
Rear drum inside diameter	mm (in.)	205 (8.1)	

NOTE
*: Vehicles with A.B.S.

TORQUE SPECIFICATIONS

M35CC–

Items	Nm	ft.lbs.
Pedal support bracket installation bolts	8–12	6-9
Pedal support bracket installation nut	10–15	7-11
Pedal rod to pedal support bracket	17-26	12-19
Pedal rod to clutch pedal bracket	17-26	12-19
Stop light switch mounting nut	10–15	7–11
Clutch master cylinder installation nuts	10–15	7-11
Clutch pedal installation nut	25–35*1 [20–25]*2	18–25*1 [14–18]*2
Lever assembly (A) installation nut	25–35*1 [20–25]*2	18–25*1 [14–18]*2
Lever assembly (B) installation nut	20–25	14-18
Master cylinder to brake booster	8-12	6-9
Reservoir installation bolt	1.5–3.0	1–2
Piston stopper bolt	1.5–3.0	1–2
Nipple installation screw	1.5–3.0	1–2
Brake booster installation nuts	11–17	8-12
❑ itting	15-18	11-13
Flared brake line nuts	13-17	9-12
Brake hose bracket installation bolts	17-26	12-19
Front disc brake assembly installation bolts	80–100	58-72
Lock pin (front)	22–32*3 [64–86]*4	16–23*3 [46–62]*4
Guide pin (front)	22–32*3 [64–86]*4	16–23*3 [46–62]*4
Bleeder screw	7-9	5-7
Backing plate to axle beam	50–60	36-43
Wheel bearing nut (vehicles with rear drum brakes)	20→0→10	14→0→7
Wheel cylinder installation bolts	8-12	6-9
Wheel bearing nut (vehicles with rear disc brakes)	200–260	144-188
Dust shield to axle beam	9-14	7–10
Rear disc brake assembly installation bolts	50–60	36-43
Brake hose to caliper body (rear)	25-35	18-25
Lock pin (rear)	22-32	16-23
Guide pin (rear)	22-32	16-23
Drive shaft to companion flange	55-65	40–47
Axle shaft installation nut	160–220	116-159
Rear brake assembly installation bolt	50–60	36-43
Parking brake lever installation nut	40–55	29–40
Rear speed sensor installation bolt	9-14	7–10
Hydraulic unit mounting bolts	17-26	12-19
Reserve tank bracket (upper)	9-14	7–10
Bracket A installation bolts	17-26	12-19
Speed sensor bracket installation bolt	9-14	7–10
Rotor to front hub	9-14	7–10
Rotor to rear hub	9-14	7–10
G-sensor installation bolt and nut	9-14	7–10

NOTE
*1: <1989 models>
*2: <From 1990 models>
*3: <Up to 1990 models>
*4: <From 1990.5 models>

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LUBRICANTS

M35CD--

Items	Specified lubricant
Brake fluid	Conforming to DOT3 or DOT4
Brake piston seal Brake piston boot inner surfaces Brake lock pin boot inner surfaces Guide pin boot inner surfaces Lock pin sleeve Guide pin and caliper support contact surface Lock pin and caliper support contact surface Rear drum brake wheel cylinder ends Spindle lever, lever boot, connecting link, O-ring and auto adjuster spindle	Repair kit grease (orange)
Pad and outer shim contact surface and inner shim and inner shim contact surface and inner shim and pad Rear drum brake backing plate contact surfaces Rear drum brake anchor plates and piston ends	Brake grease SAE J310, NLGI No. 1

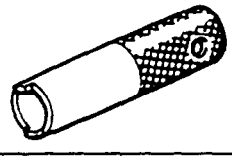
SEALANT AND ADHESIVES

M35CE--

Items	Specified sealant
Thread part fitting	3M ATD Part No. 8663 or equivalent
Wheel cylinder mounting surfaces	3M ATD Part No. 8513 or equivalent

SPECIAL TOOLS

M35DA--

Tool	Number	Name	Use
	MB991008-(F)	Piston cup installer	Installation of the rear brake wheel cylinder piston cap
	MB990652	Rear disc brake piston driver	Pressing of the rear disc brake pistons

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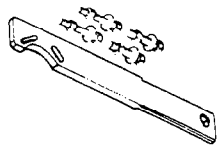
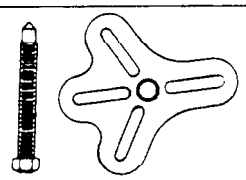
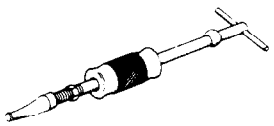
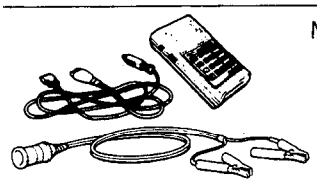
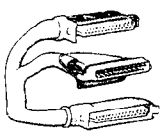
Tool	Number	Name	Use
	MB990766-01	End yoke holder	Removal of the rear axle shaft
	GENERAL SERVICE TOOL	Axle puller	
	MB990211-01	Sliding hammer with adapter	
	MB991341	Scan tool (Multi-use tester <MUT>)	Checking of the on-board diagnostic output
	(For the number, refer to GROUP 00– Precautions before service.)	ROM pack (for Scan tool)	
	MB991377	Adapter harness	
	MB991356	Adapter harness	For checking of A.B.S.

TROUBLESHOOTING

M35EAAS

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

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Symptom	Probable cause	Remedy
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 floor-board clearance)	Air in brake system	Bleed air'
	Worn lining or pad	Replace
	Broken vacuum hose	
	Faulty master cylinder	
	Brake fluid leaks	Correct
	Auto adjuster malfunction	Adjust
	Excessive push rod to master cylinder clearance	
Brake drag	Incomplete release of parking brake	Correct
	Clogged master cylinder return port	
	Incorrect parking brake adjustment	Adjust
	Improper push rod to master cylinder clearance	
	Faulty master cylinder piston return spring	Replace
	Worn brake pedal return spring	
	Broken rear drum brake shoe return spring	
	Lack of lubrication in sliding parts	Lubricate
Insufficient parking brake function	Worn brake lining or pad	Replace
	Grease or oil on lining or pad surface	
	Parking brake cable sticking	
	Stuck wheel cylinder or caliper piston	
	Excessive parking brake lever stroke	Adjust the parking brake lever stroke or check the parking brake cable routing
	Auto adjuster malfunction	Adjust

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Symptom	Probable cause	Remedy
Scraping or grinding noise when brakes are applied	Worn brake lining or pad	Replace
	Caliper to wheel interference	Correct or replace
	Dust cover to disc interference	
	Bent brake backing plate	
	Cracked drums or brake disc	
Squealing, groaning or chattering noise when brakes are applied	Disc brakes-missing or damaged brake pad anti-squeak shim	Replace
	Brake drums and linings, discs and pads worn or scored	Correct or replace
	Improper lining parts	
	Disc brake-burred or rusted calipers	Clean or deburr
	Dirty, greased, contaminated or glazed linings	Clean or replace
	Drum brakes-weak, damaged or incorrect shoe hold-down springs, loose or damaged shoe hold-down pins and springs	Correct or replace
	Incorrect brake pedal or booster push rod	Adjust
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	
Squealing noise when brakes are not applied	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

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ANTI-LOCK BRAKING SYSTEM TROUBLESHOOTING M35EBAE

PARTICULAR CHARACTERISTICS OF THE ANTI-LOCK BRAKING SYSTEM

Models equipped with the anti-lock braking system (A.B.S.) may exhibit one or more of the following characteristics from time to time, but none of these is abnormal.

(1) A pulsing feeling in the brake pedal, or vibration of the body or the steering wheel, when the anti-lock braking system is activated by sudden braking or by braking on a slippery road surface. Actually, this phenomenon is an indication that the anti-lock braking system is functioning normally.

(2) When the vehicle speed reaches approximately 6 km/h (4 mph) after the engine is started and the vehicle starts off (for the first time), a whining motor noise may be heard from the engine compartment if the vehicle is traveling in a quiet place. This noise is simply the result of a self-check being made of the anti-lock braking system operation.

TROUBLESHOOTING METHODS

Problems related to the anti-lock braking system (A.B.S.) can be classified into two general categories: problems in the electrical system and those in the hydraulic system.

For problems in the electrical system, the on-board diagnostic is built into the electronic control unit (E.C.U.) causing the A.B.S. warning light to illuminate as a warning to the driver. In this instance, checks can be made by using the scan tool and oscilloscope.

Problems in the hydraulic system (poor braking, etc.) can be located in the same way as for ordinary brakes. There is, however, the necessity to check to determine whether the problem is related to ordinary brake components or to the components related to the A.B.S. To make this check, use the scan tool.

HOW TO USE THE TROUBLESHOOTING FLOW CHART

(1) Using the flow chart, check the ABS warning light light-up sequence. Read the diagnostic trouble codes and check the condition of braking operation.

(2) Following the check chart listed in the remedy column, perform the checks. There are [Explanation] and [Hint] in each check chart. Refer to them when troubleshooting.

NOTE
ECU: Electronic control unit
HU: Hydraulic unit

TROUBLESHOOTING (ABS-FWD)

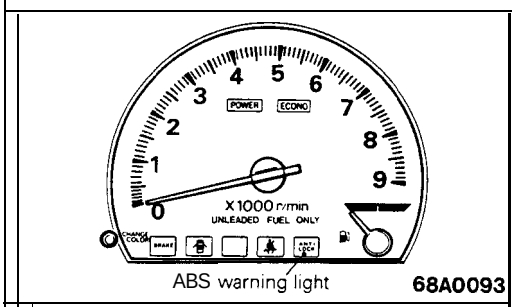
Confirm condition in the following way and diagnose accordingly.

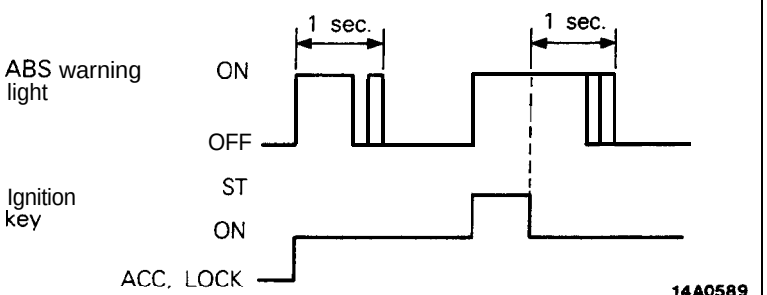
Does the ABS warning light illuminate as described below up to the time the engine starts?

(1) When the ignition key is turned to the "ON" position, the ABS warning light blinks twice for approximately 1 second due to the ABS ECU (as a self check of the valve relays is performed), and goes out and stays out.

2) With the ignition key in the "START" position, power to the ABS ECU is interrupted and the ABS warning light remains lit because the valve relay is OFF.

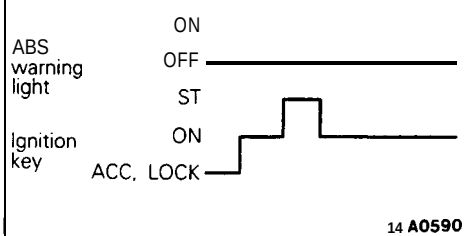
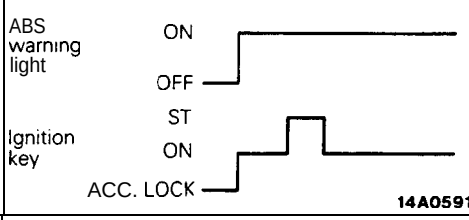
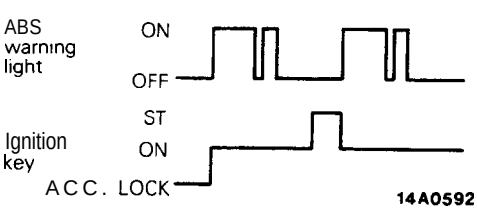
(3) When the ignition key is turned from the "START' position to the "ON" position, the ABS warning light blinks twice for approximately 1 second (during this time a recheck of the valve relays is performed), and then goes out and stays out.





Yes → CONTINUE TO NEXT PAGE

No

No.	Trouble condition	Major causes	Remedy
1	ABS warning light does not light up at all. 	• ABS warning light bulb is burnt out. • Open in ABS warning light electrical circuit (check for blown fuse)	Check, using flow chart A (Refer to P.35-21.)
2	When the ignition key is turned to the "ON" position, it remains lighted. 	• Fail safe is functioning due to ECU on-board diagnostic • Short in ECU warning light drive circuit • Malfunction of ECU	Check, using flow chart B (Refer to P.35-24.)
3	Does not illuminate when ignition key is in "START" position. 	• Malfunction of valve relay • Break in harness between ABS warning light and HU • Break in harness between HU and body ground	Check, using flow chart C (Refer to P.35-26.)

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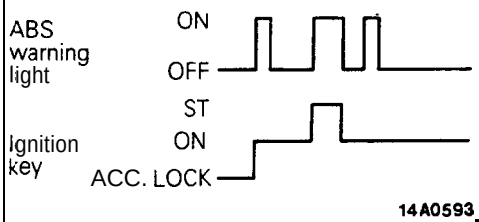
No.	Trouble condition	Major causes	Remedy
4	After the ignition key is turned to the "ON" position, it blinks once and then illuminates when it is turned to the "START" position. When the key is returned to the "ON" position, the light blinks again. (Blinking with the ignition key in the "ON" position is synchronized with operation noise of the valve relay.) 	• Break in harness for ECU warning light drive circuit • Malfunction of ECU	Check, using flow chart D. (Refer to P.35-27.)

CONTINUED FROM PREVIOUS PAGE

Does the ABS warning light illuminate when starting to drive the car?

Yes → Trouble with the motor relay, solenoid valve [due to self test when driving above 6 km/h (4 mph)] or malfunction of wheel speed sensor

No

Is there one-sided braking, insufficient braking force or malfunction of ABS operation?

No → CONTINUE TO NEXT PAGE

Yes

Trouble condition	Major causes	Remedy
One-sided braking Insufficient braking force	• Mechanical lock of HU solenoid valve • Hydraulic line in HU is clogged.	Check HU operation (Refer to P.35-20.) and, if necessary, replace HU. If HU is normal, check structural parts for normal braking. (Refer to P.35-12.)
Decline in ABS function (Wheels easily lock when there is sudden braking.)	• Malfunction in HU solenoid valve operation • Hydraulic line in HU is clogged.	
ABS sometimes functions even when there is no sudden braking. (ABS operation vibration is transmitted.)	• Insufficient wheel speed sensor output voltage (sensor malfunction, too large a gap between sensor rotor or missing rotor teeth or temporarily broken wire in sensor harness) • Malfunction of ABS ECU	Check wheel speed sensor (Refer to P.35-126.) and, if necessary. replace sensor, adjust gap or replace rotor. If tests indicate that there are no mechanical or electrical failures, replace the ECU.

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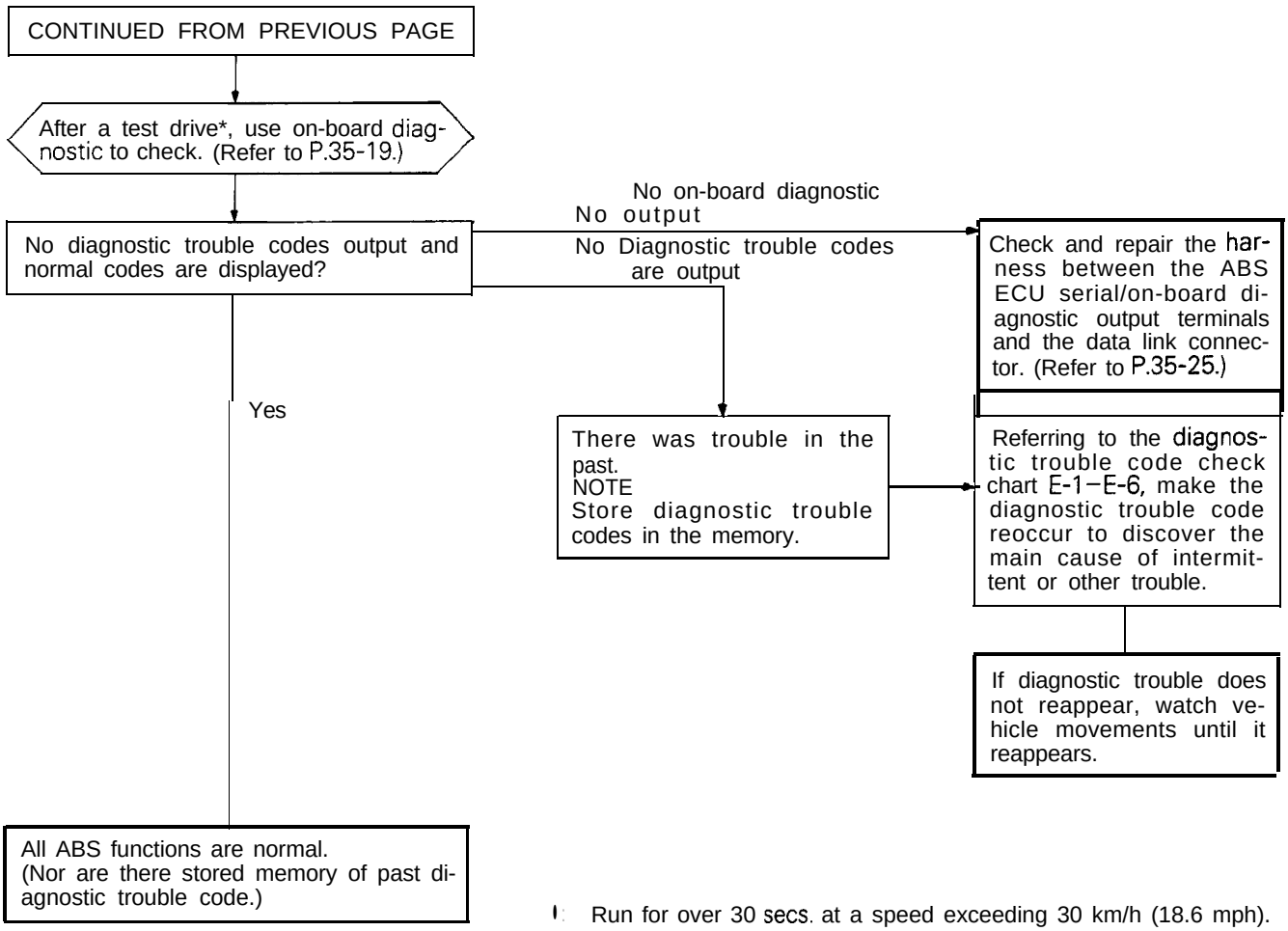
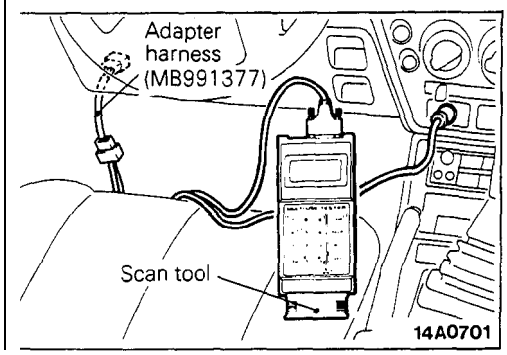


* Run for over 30 secs. at a speed exceeding 30 km/h (18.6 mph).



(1) With the ignition switch OFF, connect the adapter harness and scan tool, turn the ignition ON and select the ABS system. (The ABS warning light lights up, it goes into the scan tool mode. **In the scan tool mode, ABS does not function.)**
If it does not go into the scan tool mode, check the ECU power circuit and the harness between the ECU and data link connector.
(2) Read the on-board diagnostic output codes from the ECU memory.
(3) Cancel the diagnostic trouble codes once from memory. (Refer to P.35-20.)
If the memory can not be canceled, the ECU is currently detecting the trouble. If it can be cleared, the trouble is either temporary or appears only when driving.
(4) When the diagnostic trouble codes are cleared, or when the ABS system goes into fail safe during another test drive and diagnostic trouble codes are outputed, check according to diagnostic trouble code check charts (E-l –E-6).

DIAGNOSTIC TROUBLE CODE CHART

Diagnostic trouble code		Check chart name or remedy	Reference page	Diagnostic trouble code		Check chart name or remedy	Reference page
No.	Scan tool display letters			No.	Scan tool display letters		
11	FL SPD SENSOR	E-l	P.35-28	41	SOL V FRONT L	E-4	P.35-31
12	FR SPD SENSOR			42	SOL V FRONT R		
13	RL SPD SENSOR			43	SOL V REAR		
14	RR SPD SENSOR			51	VALVE RLY	E-5	P.35-32
15	SENSOR FAULT	E-2	P.35-28	52	MOTOR RLY	E-6	P.35-33
22	STOP SW	E-3	P.35-30	55	ECU	ECU replacement	–

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METHOD OF CLEARING DIAGNOSTIC TROUBLE CODE MEMORY

Caution

- **When servicing is finished, clear the diagnostic trouble code memory.**

Diagnostic trouble codes cannot be cleared from memory when the ABS ECU system in fail safe. Proceed to diagnosis and repair.

(1) Clear memory using scan tool.
(For details, refer to the scan tool instruction manual.)

(2) After clearing, recheck the diagnostic trouble codes, and check that memory is cleared.

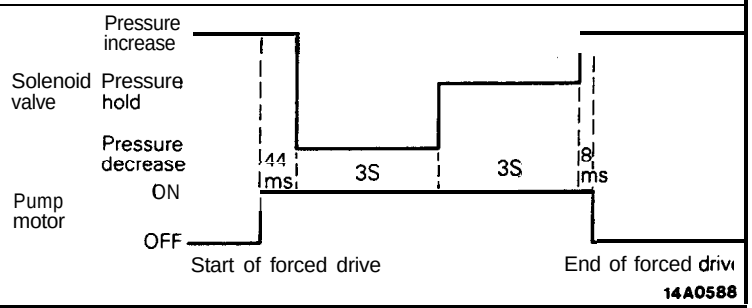
ACTUATOR TEST FUNCTION

The actuator can be forcibly driven in the following way by using the scan tool.

NOTE

- The actuator test cannot be carried out when the ABS ECU system is fail safe.
- When using forced drive using the scan tool, the vehicle must be stopped.
- During forced drive using the scan tool, forced drive operation is stopped when any wheel speed reaches 10 km/h (6 mph).

Actuator test specifications

No.	Scan tool display letters	Drive solenoid valve and motor	Drive pattern
01	FR VALVE A	Solenoid valve and pump motor for each HU corresponding channel. <Auto pattern>	Not used
02	FL VALVE A		
03	REAR VALVE A		
04	FR VALVE M	Solenoid valve and pump motor for each HU corresponding channel. <Manual pattern>	
05	FL VALVE M		
06	REAR VALVE M		

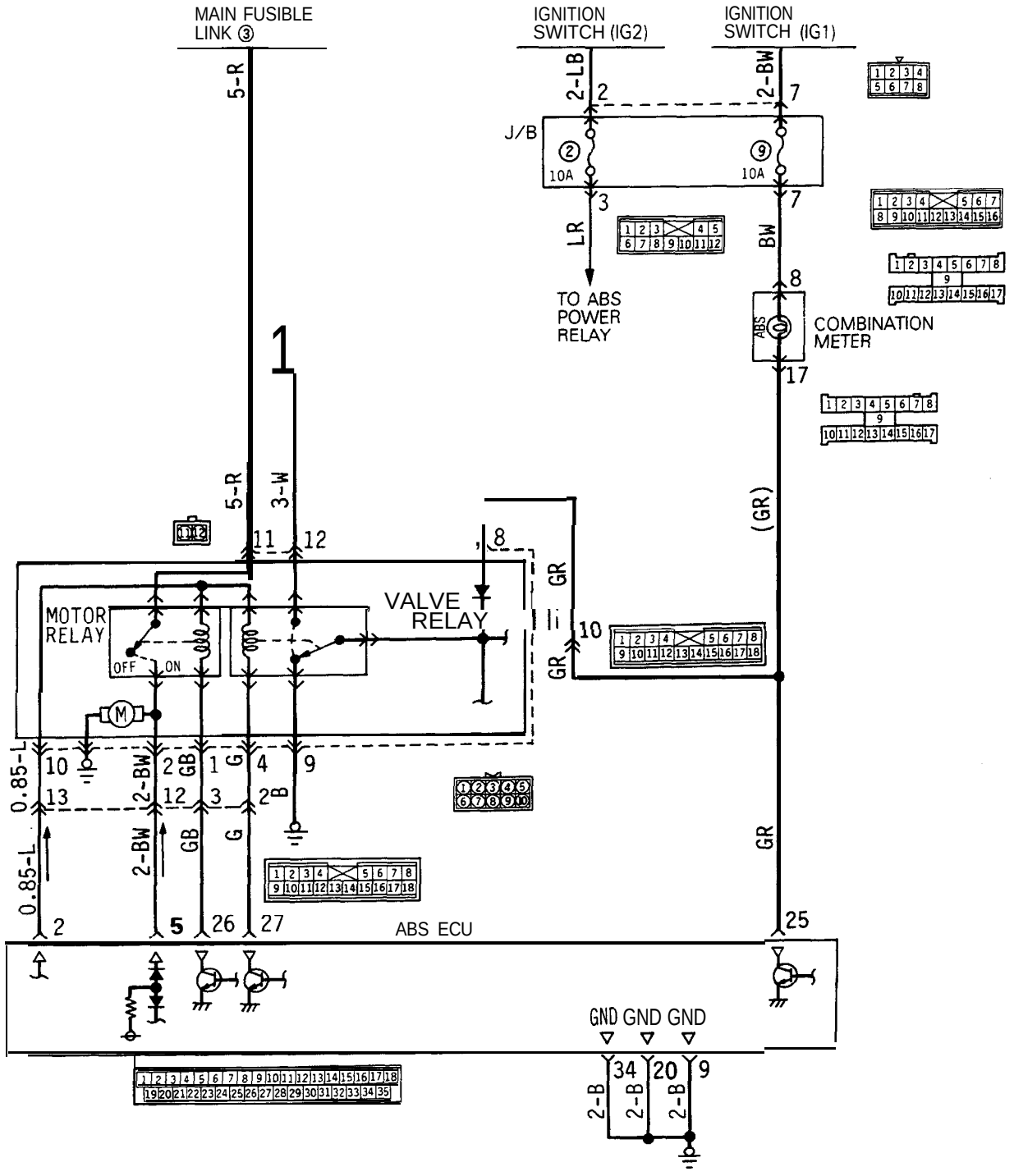
A ABS warning light does not light at all.

[Explanation]

When it does not light up at all, there is a strong possibility that there is trouble with ABS warning light or with power to the light.

[Hint]

If other warning lights do not light up either, fuse is probably blown.



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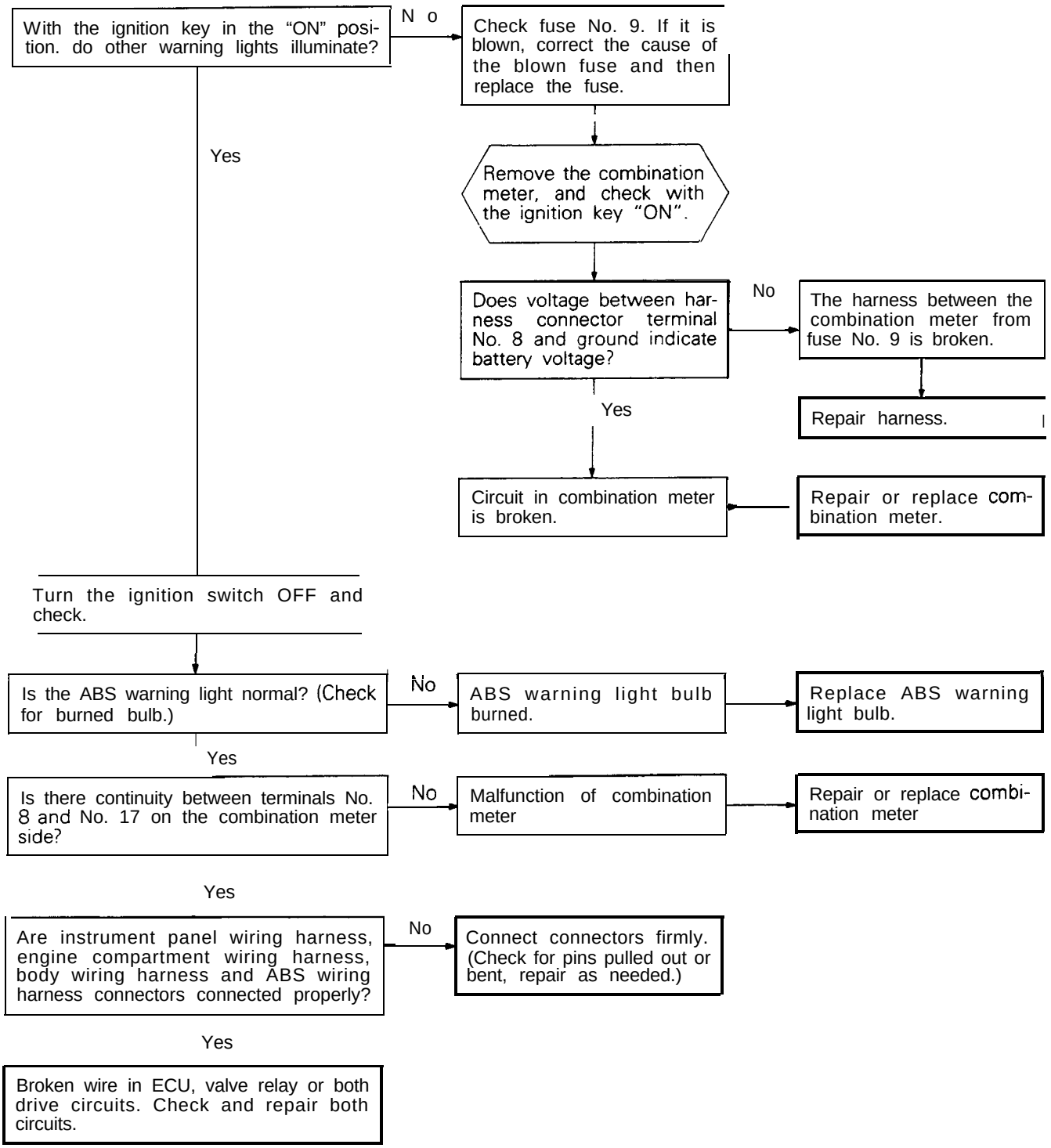

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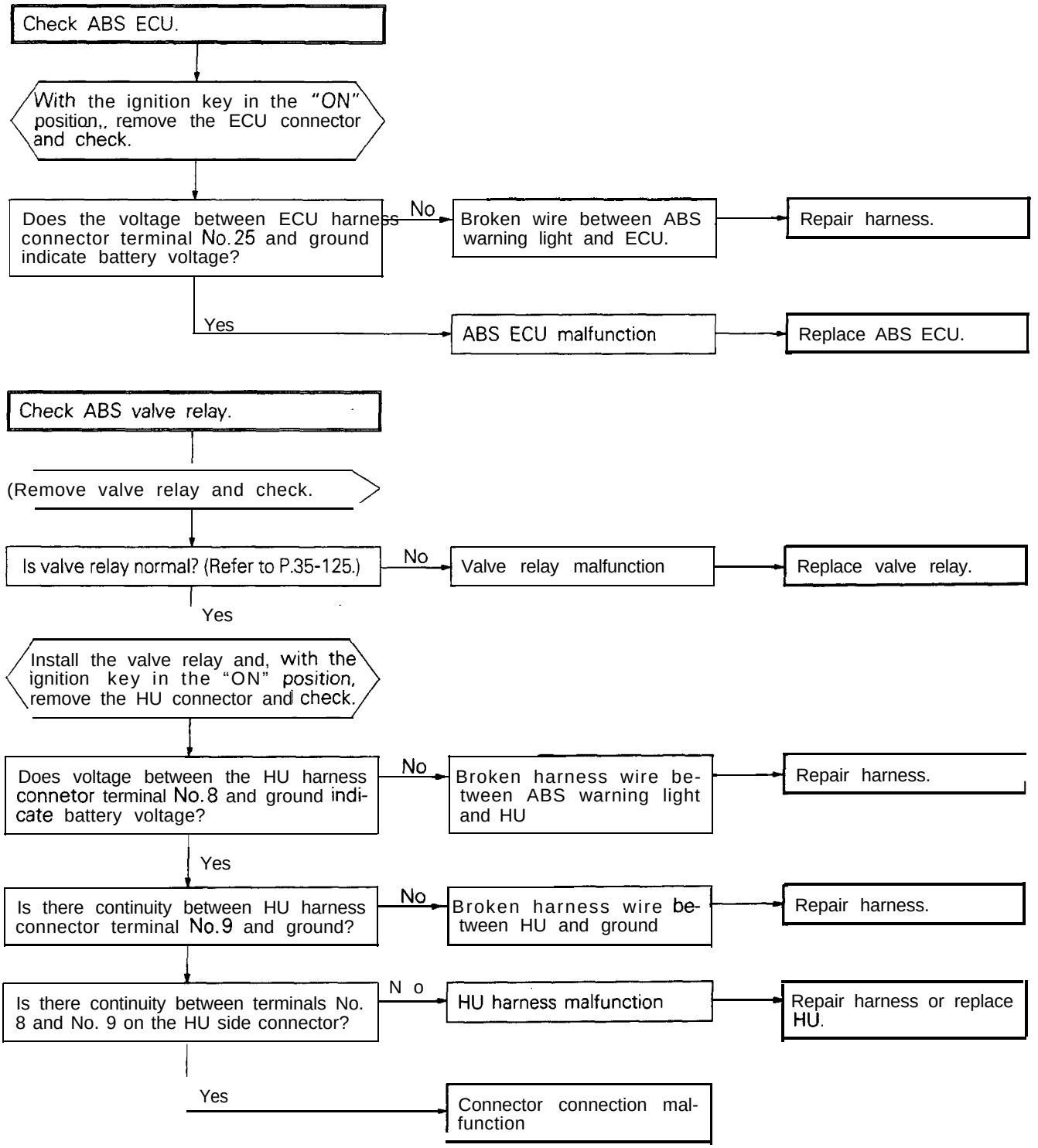

NOTE
When inspecting the parts marked with ● , take care to the diode polarity. (Refer to the circuit diagram on P.35-21.)

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B ABS warning light illuminated after the engine is started and remains on.

[Explanation]

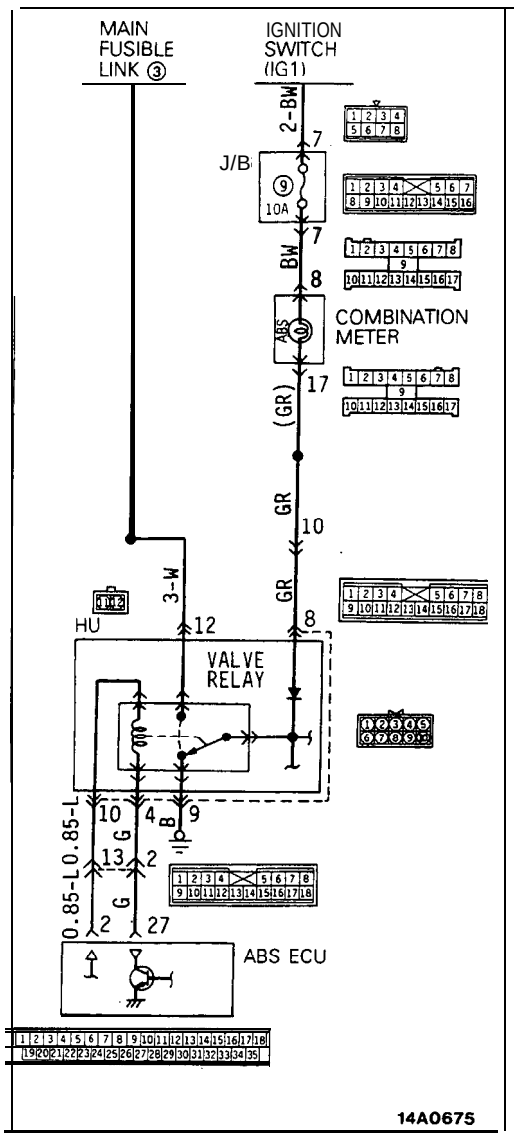
This is the symptom when the ABS ECU does not power up due to broken ECU power circuit, etc., when the fail safe function operates and isolates the system or when the warning light drive circuit is short circuited.

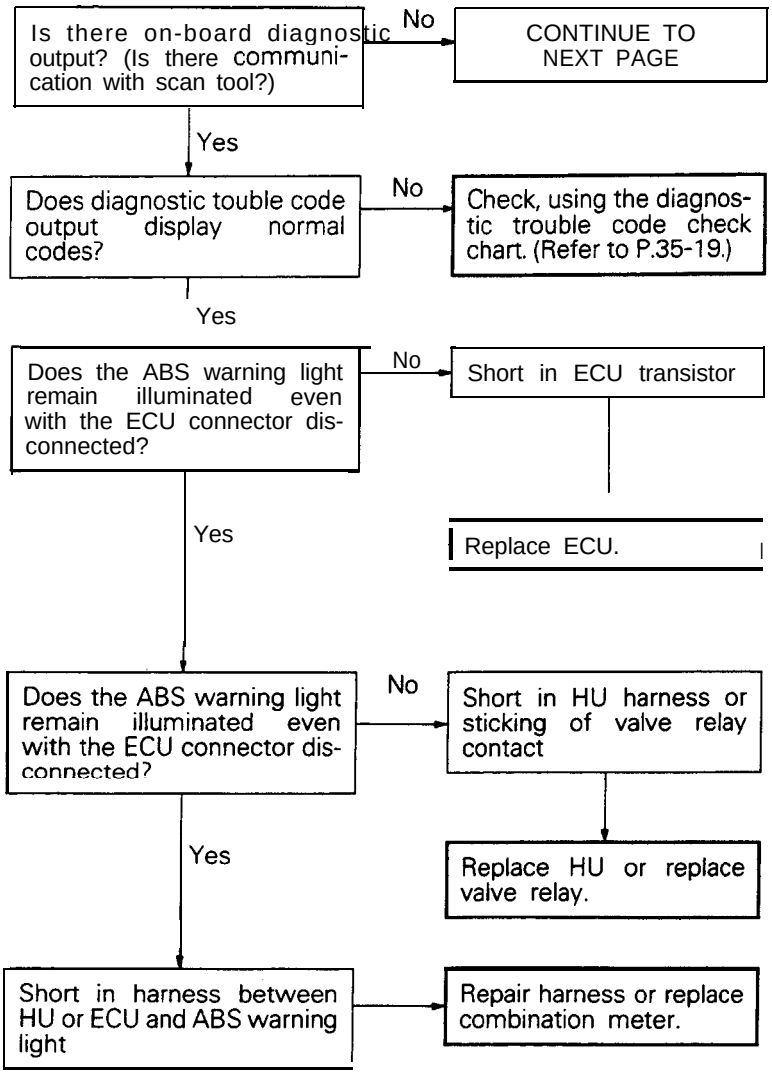
[Hint]

Check the on-board diagnostic output and if there is no output voltage or if the scan tool and ABS ECU cannot communicate, there is a good possibility that power is not flowing to the ECU.

Caution

- **If there is no output of diagnostic trouble codes, there is a good possibility that the fail safe is functioning.**





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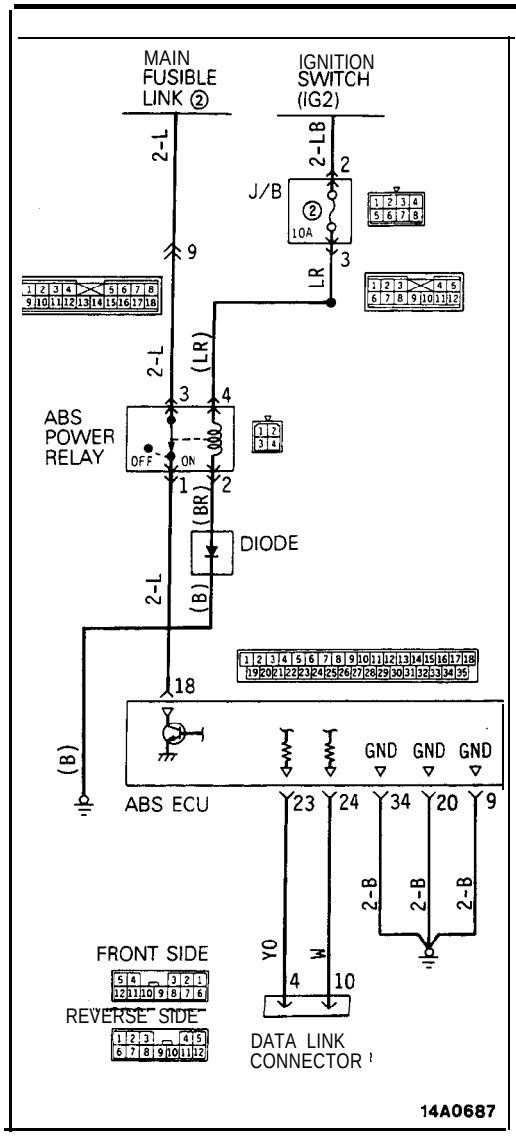

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Can other electronic control systems communicate with scan tool?
- No → Scan. tool related malfunction. Repair and recheck.
- Yes ↓

Is fuse No. 2 normal?
- No → Correct cause of blown fuse and replace fuse.
- Yes ↓

With the ignition key in the "ON" position, does the power relay make a "click" noise?
- No → Is power relay normal? (Refer to P.35-74.)
  - Yes → ↓
  - No → Replace power relay.
- Yes ↓

Disconnect ECU connector and check harness connector. ↓

With the ignition key in the "ON" position, does voltage between ECU connector terminal No. 18 and ground indicate the battery voltage?
- No → Harness wire between power relay and ECU is broken. → Repair harness.
- Yes ↓

Is there continuity between body harness terminals No. 9, No. 20 and No. 34, and ground?
- No → ECU ground line broken. → Repair harness.
- Yes ↓

Is there continuity between body harness connector terminals No.23 and No.24, and data link connectors No.4 & No.10?
- No → Harness wire between data link connector and ABS ECU is broken. → Repair harness.
- Yes ↓

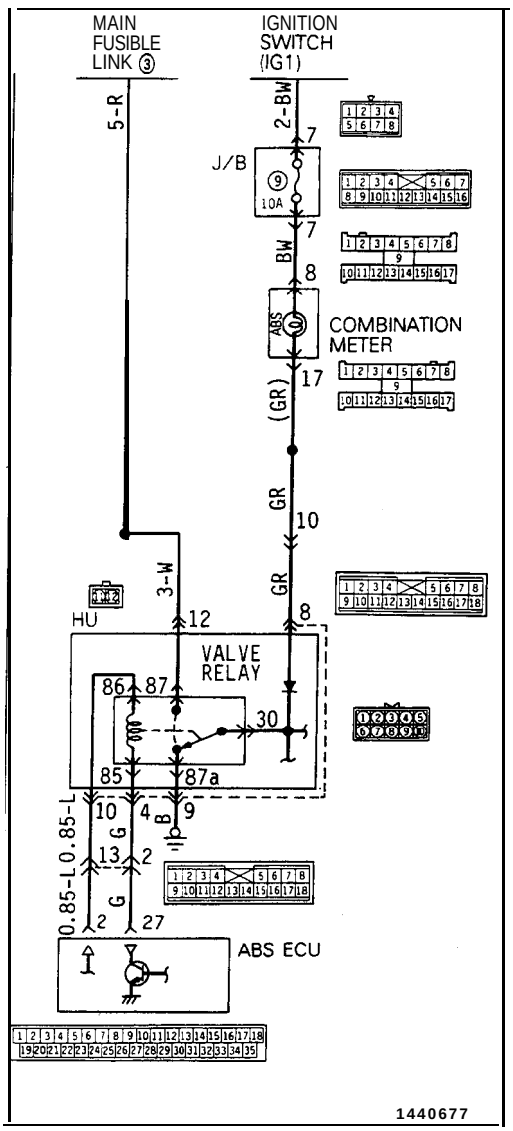
Malfunction of ABS ECU → Replace ABS ECU.

TSB Revision

C	ABS warning light does not illuminate when ignition key is in “START” position.

[Explanation]

The ABS ECU uses the IG2 power source which is turned off in the “START” position. The ABS warning light uses the IG1 power source which is not turned off even in the “START” position. Consequently, in the “START” position, power is off and the ECU turns the valve relay OFF. If the warning light does not illuminate at this time, there is trouble in the warning light circuit on the valve relay side.



- Remove the fuse for power source of the ABS power relay in the junction block and switch off ABS-ECU.
- Remove and inspect 10 pin connectors of the hydraulic unit.

With the ignition key in the “ON” position, does voltage between body connector terminal No.8 and ground indicate the battery voltage?
- No → Harness wire between HU and warning light is broken.
- Yes ↓

Is there continuity between body connector terminal No.9 and ground?
- No → Broken line between HU and body ground
- Yes ↓

Remove the valve relay. Is there continuity between terminal No. 87a and No. 30?
- No → Valve relay malfunction → Replace valve relay.
- Yes → HU harness malfunction → Replace HU.

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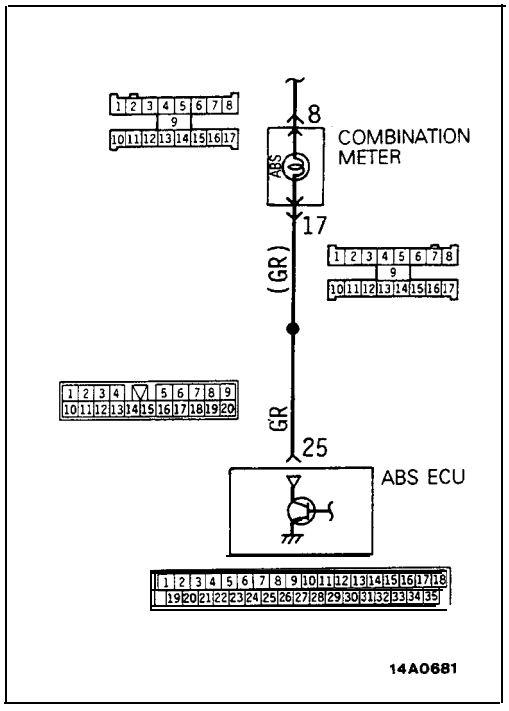
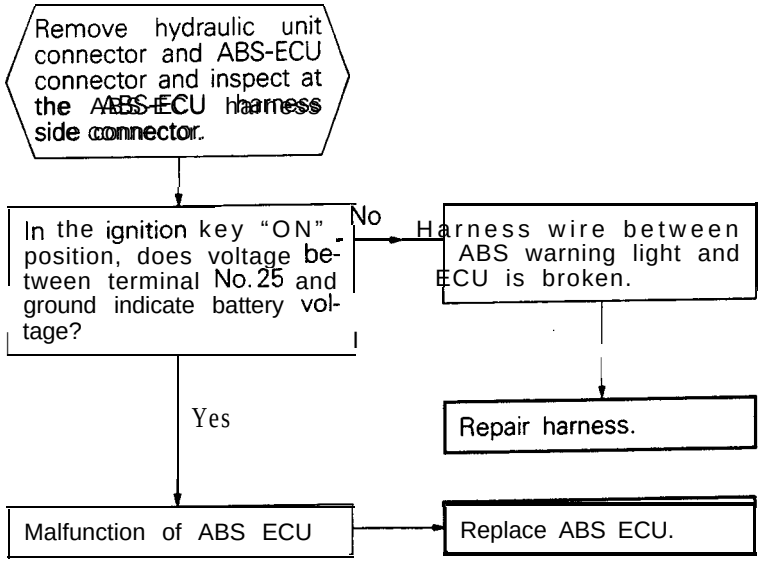
D | **ABS warning light blinks once after the ignition key is turned to the "ON" position. It illuminates in the "START" position and blinks once again when turned to the "ON" position.**

[Explanation]

When power flows, the ABS ECU turns on the warning light for approximately 1 sec. while it performs a valve relay test. If there is a break in the harness between the ECU and the warning light, the light illuminates only when the valve relay is off in the valve relay test, etc.





TSB Revision

E-1 When the following diagnostic trouble codes are displayed "11 FL SPD SENSOR" "12 FR SPD SENSOR" "13 RL SPD SENSOR" "14 RR SPD SENSOR"

[Explanation]

The ABS ECU detects breaks in the wheel speed sensor wire. This diagnostic trouble 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 a broken wire/short circuit in the wheel speed sensor, also check whether the sensor gap is too large, rotor teeth are missing, sensor harness wire is temporarily broken, or sensor harness and body connector are not properly inserted.

E-2 When diagnostic trouble code "15 SENSOR FAULT" is displayed

[Explanation]

This diagnostic trouble code is output when there is an abnormality (other than broken wire or short circuit) in the wheel speed sensor output signal while driving.

[Hint]

The following can be considered as the cause of the wheel speed sensor output abnormality.

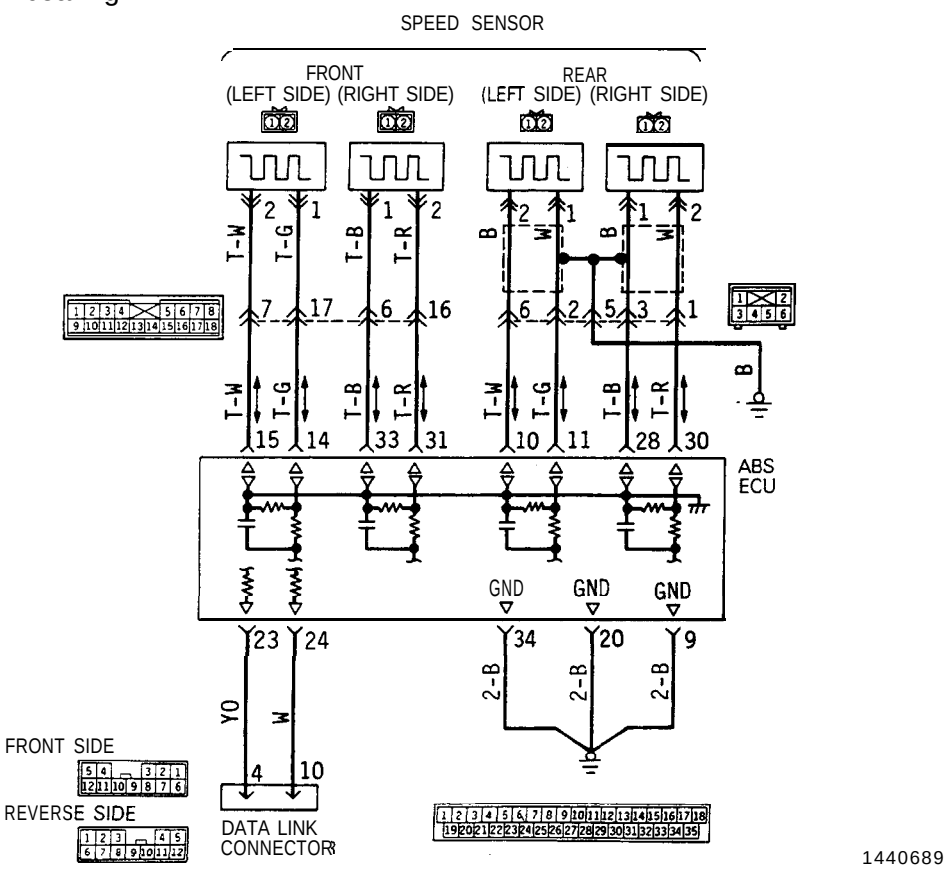
- Distortion of rotor, teeth missing
- Low frequency noise interference when sensor harness wire is broken
- Noise interference in sensor signal
- When the sensor output signal is below the standard value or when amplitude modulation is over the standard value, using an oscilloscope to measure the wave shape of the wheel speed sensor output signal is very effective.
- Loose wheel bearing
- Temporarily broken wire in sensor harness
- Sensor harness and body connector are not properly inserted.

NOTE

(1) If contact is poor, check the sensor cable by bending and lightly stretching it.

(2) If there is currently no trouble and if abnormality in the displayed sensor circuit cannot be discovered since values are normal even when checked, turn the ignition switch OFF and re-execute the driving test. Try replacing the ABS ECU only if the same diagnostic trouble code is output at this time.

(If it is difficult to recreate the trouble, there is a possibility of speed sensor trouble recurring even if the ECU is replaced.)



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Check flow connected with wheel speed sensor

NOTE:
When checking with an oscilloscope. first measure voltage variations in the wheel speed sensor output. (Refer to P.35-69.)

Is the resistance value of the wheel speed sensor part, which the displayed diagnostic trouble code indicates, normal?
Standard value: 0.8–1.2 kΩ

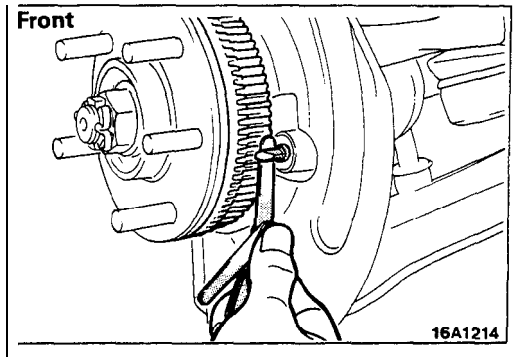
No → Malfunction of wheel speed sensor → Replace wheel speed sensor.

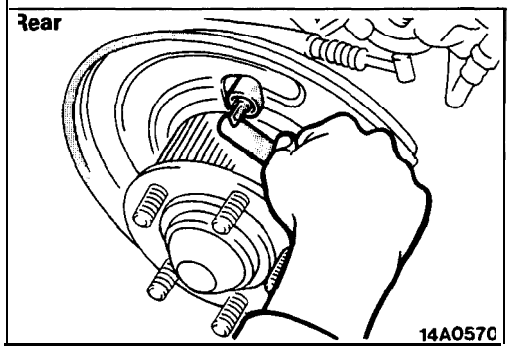
Yes

Is the resistance value with the ECU connector normal?
Standard value: 0.8 – 1.2 kΩ

No → Harness wire for wheel speed sensor circuit is broken. → Repair harness.

Yes





Is the standard value for the gap between the wheel speed sensor and rotor, which the output diagnostic trouble code indicates, within the range?
Standard value: 0.3–0.9 mm (.012–.035 in.)

No → Adjust the gap between the wheel speed sensor and rotor.

Yes

Is the wheel speed sensor rotor that the diagnostic trouble code indicates, normal and with no missing or damaged teeth?

No → Replace rotor that has missing or damaged teeth.

Yes

Check the output of each wheel speed sensor with an oscilloscope, including the wave form. (Refer to measurement of wheel speed sensor output voltage variations on P.35-69.) Is the output voltage for each wheel speed sensor over the standard value and is the wave form normal?

No → Recheck if below the standard value or if the sensor has a poor wave form. Replace sensor or rotor.

Yes

Can the abnormality be found even if the sensor harness and connection between sensor harness and body harness are bent and stretched?

No → Repair harness.

Yes

All the above checks are normal. There is a malfunction of ABS ECU when this diagnostic trouble code reoccurs often. → Replace the ABS ECU and check that the diagnostic trouble code does not reoccur.

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E-3 When diagnostic trouble code "22 STOP SW" is displayed

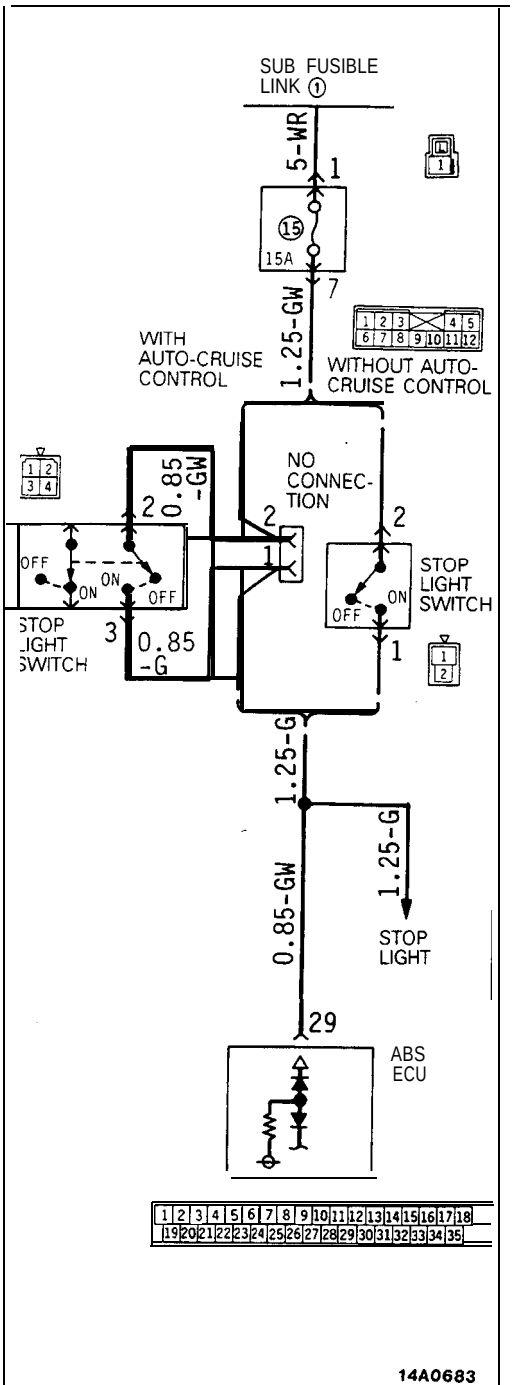
[Explanation]

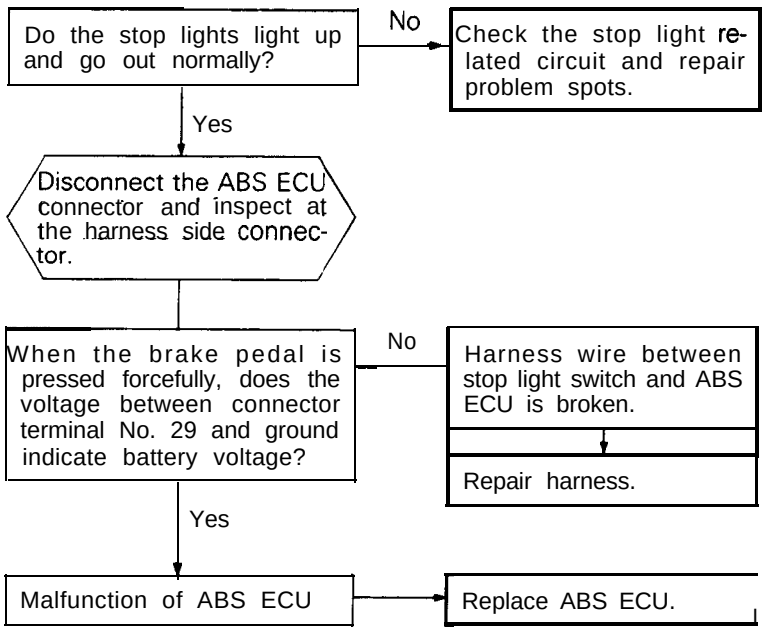
The ABS ECU outputs this diagnostic trouble code in the following cases.

- Stop light switch may remain on for more than 15 minutes without the ABS functions.
- The harness wire for the stop light switch may be open.

[Hint]

If the stop light operates normal, the ABS harness wire for the stop light switch input circuit to the ECU is broken or there is a malfunction in the ABS ECU.



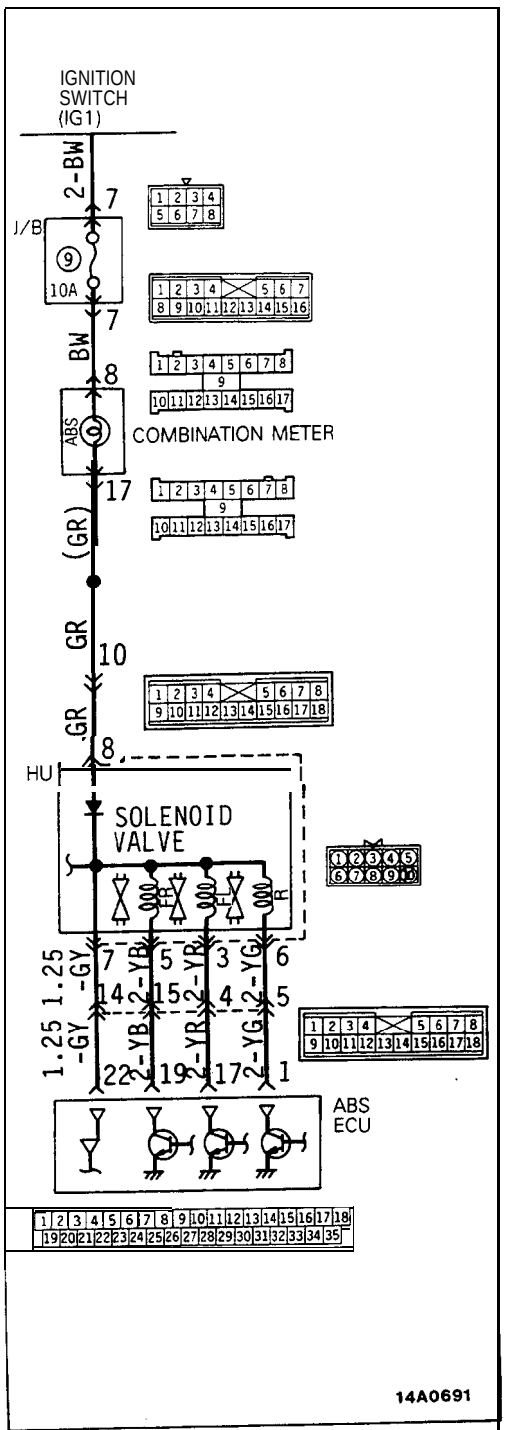


TSB Revision

E-4 When diagnostic trouble codes "41 SOL V FRONT L", "42 SOL V FRONT R" OR "43 SOL V REAR" are displayed

[Explanation]

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 diagnostic trouble codes are output.



Remove HU 10P connector and check with the HU side connector.

Is the resistance value for the solenoid valve, that the displayed diagnostic trouble code indicates, within the range of the standard values?
Standard value: 1.07–1.17 Ω

No → Replace HU.

Yes

Connect HU 10P connector, disconnect ECU connector and check.

Is the solenoid valve resistance value, that the output diagnostic trouble code displays, within the range of the standard values when measured at the ECU connector?
Standard value: 1.07–1.17 Ω

No → The harness wire for the solenoid valve circuit whose resistance value is outside the range of the standard value is broken or short circuited.

Repair ABS harness.

Yes

Malfunction of ABS ECU → Replace ABS ECU.

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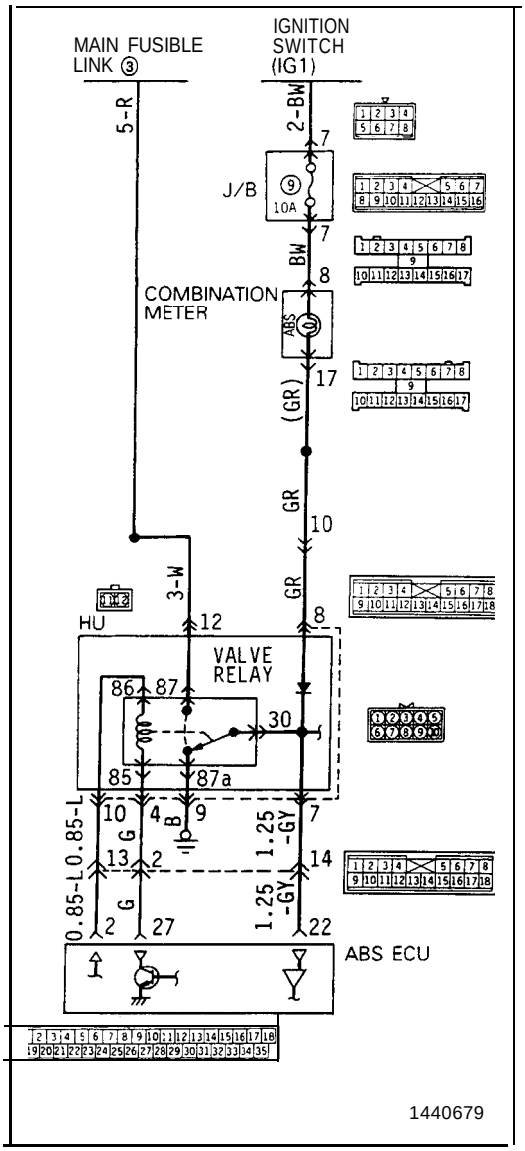
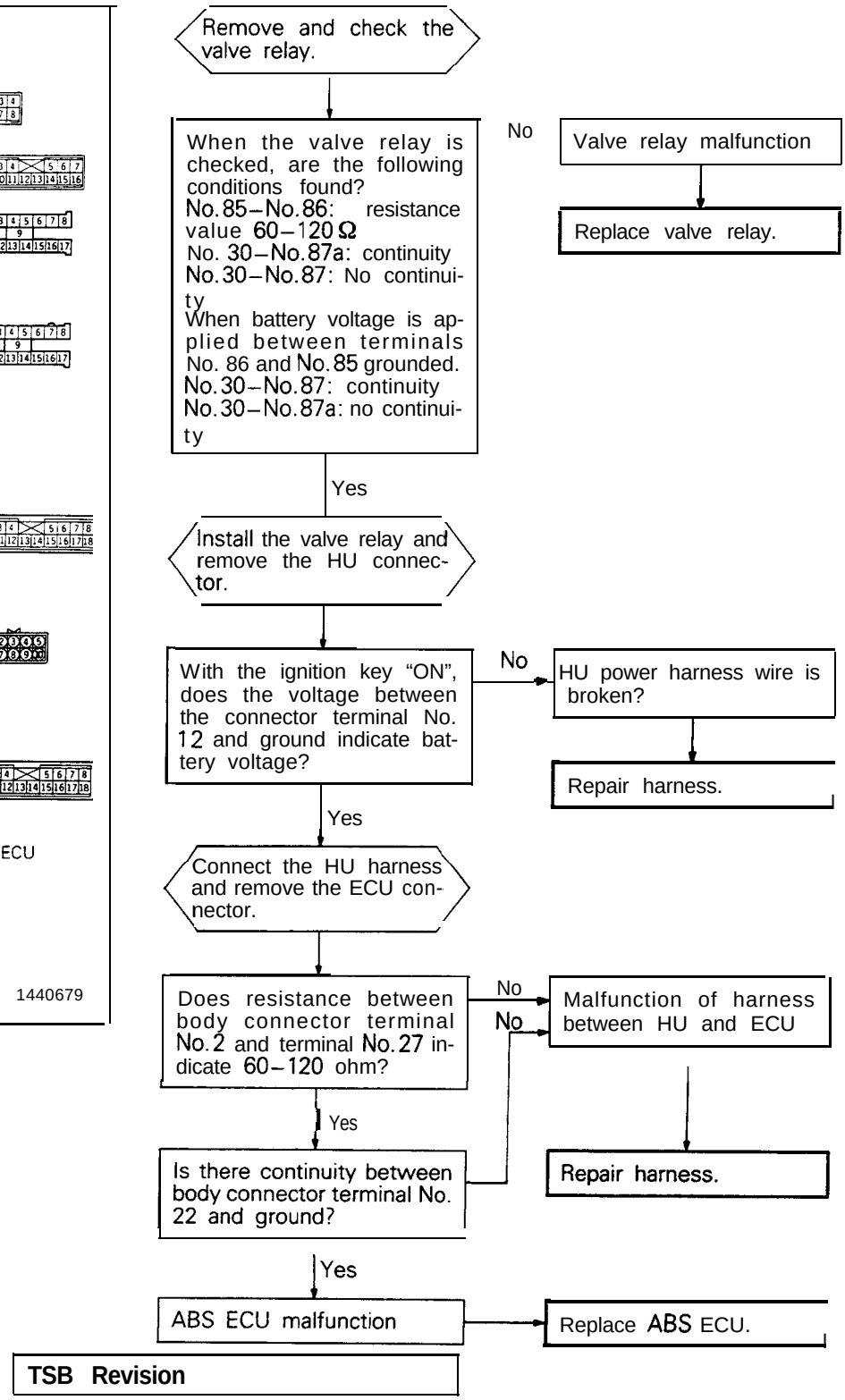
E-5 When diagnostic trouble code "51 VALVE RLY" is displayed

[Explanation]

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. Then, if the supply of power to the valve power monitor line is interrupted, this diagnostic trouble code will output.





TSB Revision

E-6 When diagnostic trouble code "52 MOTOR RLY" is displayed

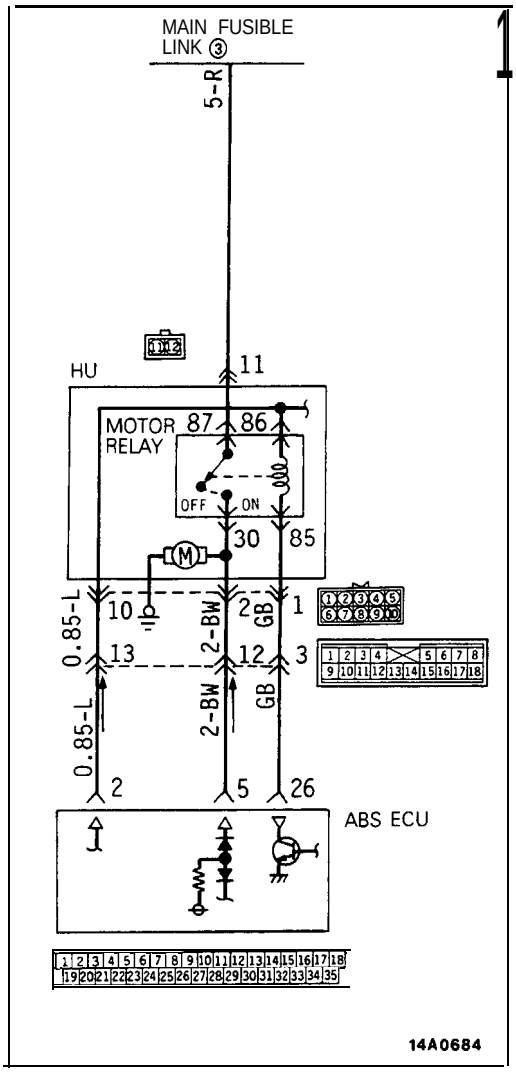
[Explanation]

The ABS ECU outputs this diagnostic trouble code for the motor relay and motor in the following cases.

- When the motor relay does not function
- When there is trouble with the motor itself and it does not revolve
- When the motor ground line is disconnected and the motor does not revolve
- When the motor continues to revolve

[Hint]

If there is motor operation noise when wheel speed exceeds 6km/h (4mph) when starting up after the engine is started, or when there is forced scan tool drive, there is a broken or short circuited motor monitor wire.



Does the motor make a noise when wheel speed exceeds 6 km/h (4 mph) or when there is forced scan tool drive?
- Yes → Broken wire or short circuit in motor monitor line → Repair the harness between HU and ECU.
- No → Remove the motor relay.

Remove the motor relay and check resistance values.
No. 85–No. 86: resistance value 30–60 Ω
No. 30–No. 87: no continuity
Battery voltage is applied on terminals No. 85 and No. 86 grounded.
No. 30–No. 87: continuity
- No → Motor relay malfunction → Replace motor relay.
- Yes →

Is pump motor ground connected normally?
- No → Connect ground wire.
- Yes → Install motor relay and remove HU connector.

Does voltage between body connector terminal 11 and ground indicate battery voltage?
- No → Broken wire in pump motor power circuit → Repair the harness.
- Yes → Connect the HU connector and remove the ECU connector.

Is resistance between body connector terminal No. 2 and No. 26 30–60 ohms?
- No → Malfunction of harness between HU and ECU → Repair harness.
- Yes →

Is resistance between ECU harness side connector terminal No. 5 and ground 0.1 – 0.3 ohm?
- No → Malfunction of harness between HU and ECU → Repair harness.
- Yes →

ABS ECU malfunction → Replace ABS ECU.

TSB Revision

TROUBLESHOOTING (ABS-AWD)

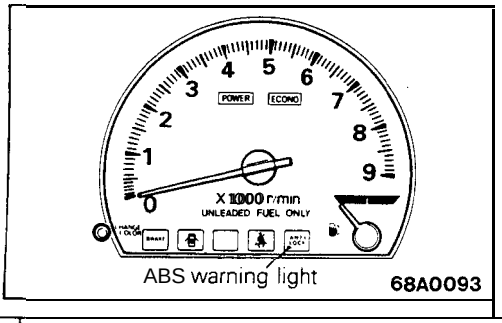
Confirm condition in the following way and diagnose accordingly.

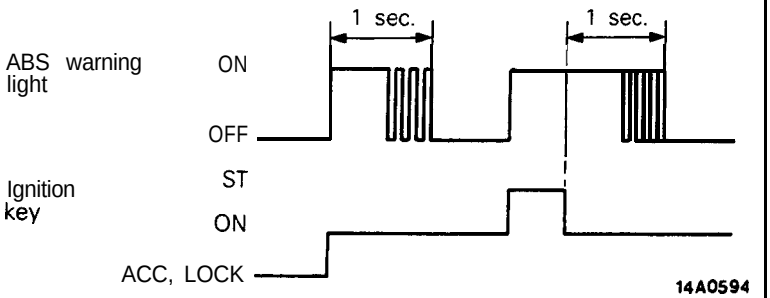
Does the ABS warning light illuminate as described below up to the time the engine starts?

(1) When the ignition key is turned to the "ON" position, the ABS warning light blinks four times for approximately 1 second due to the ABS ECU (as a self check of the valve relays is performed), and goes out and stays out.

(2) With the ignition key in the "START" position, power to the ABS ECU is interrupted and the ABS warning light remains lit because the valve relay is OFF.

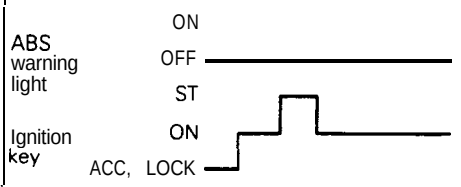
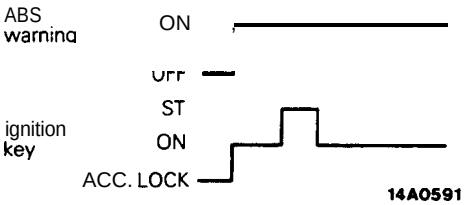
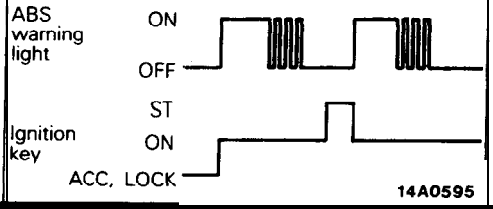
(3) When the ignition key is turned from the "START' position to the "ON" position, the ABS warning light blinks four times for approximately 1 second (during this time a recheck of the valve relays is performed), and then goes out and stays out.





Yes → CONTINUE TO NEXT PAGE

No

No.	Trouble condition	Major causes	Remedy
1	ABS warning light does not light up at all. 	• ABS warning light bulb is burnt out. • Open in ABS warning light electrical circuit (check for blown fuse)	Check, using flow chart A (Refer to P.35-39.)
2	When the ignition key is turned to the "ON" position, it remains lighted. 	• Fail safe is functioning due to ECU on-board diagnostic • Short in ECU warning light drive circuit • Malfunction of ECU	Check, using flow chart B (Refer to P.35-42.)
3	Does not illuminate when ignition key is in "START" position. 	• Malfunction of valve relay • Break in harness between ABS warning light and HU • Break in harness between HU and body ground	Check, using flow chart C (Refer to P.35-44.)

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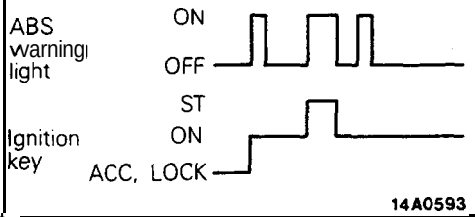
No.	Trouble condition	Major causes	Remedy
4	After the ignition key is turned to the "ON" position, it blinks once and then illuminates when it is turned to the "START" position. When the key is returned to the "ON" position, the light blinks again. (Blinking with the ignition key in the "ON" position is synchronized with operation noise of the valve relay.) 	• Break in harness for ECU warning light drive circuit • Malfunction of ECU	Check, using flow chart D. (Refer to P.35-45.)

CONTINUED FROM PREVIOUS PAGE

Does the ABS warning light illuminate when starting to drive the car?

Yes → Trouble with the motor relay, solenoid valve [due to self test when driving above 6 km/h (4 mph)] or malfunction of wheel speed sensor

No

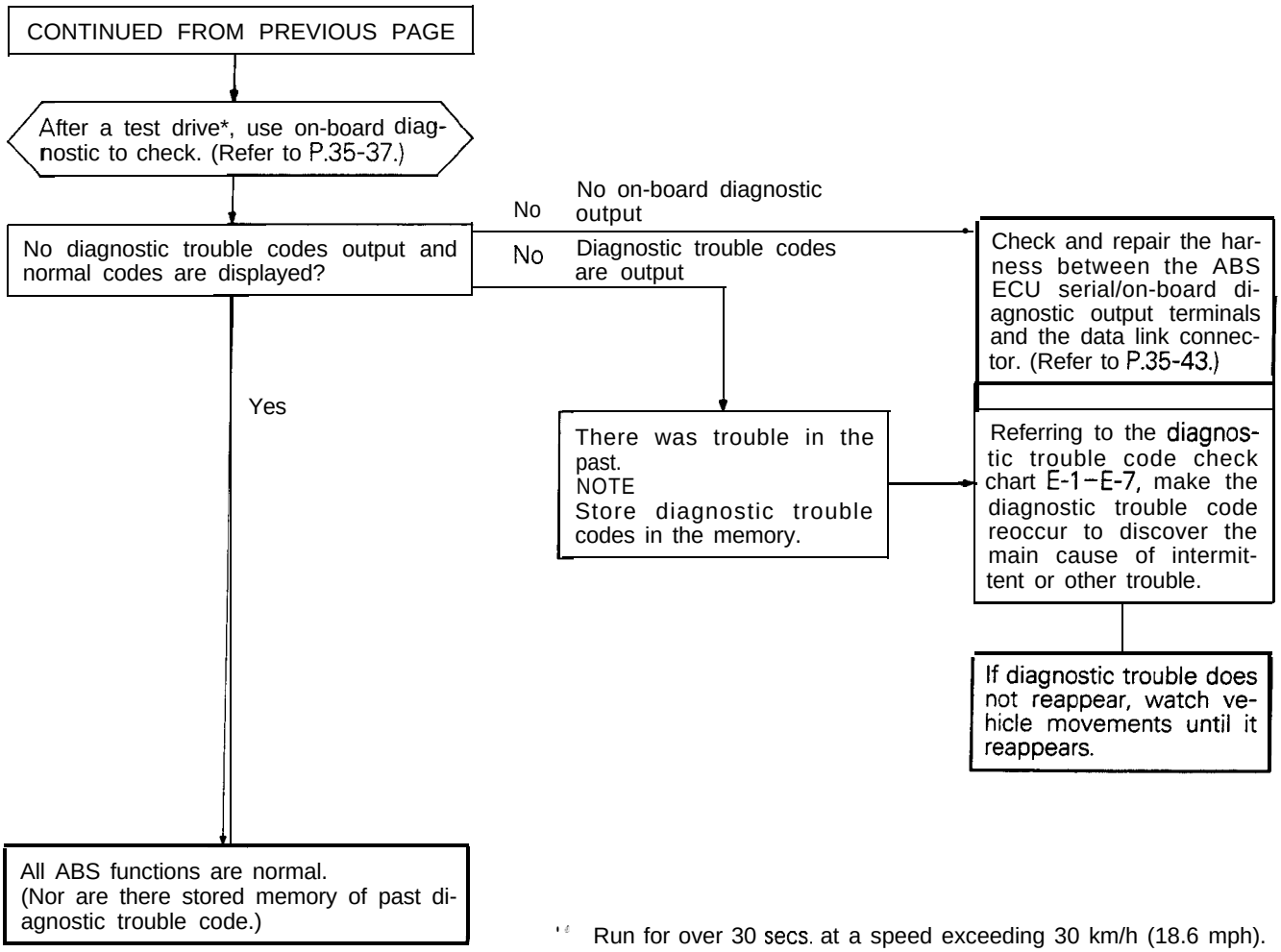
Is there one-sided braking, insufficient braking force or malfunction of ABS operation?

No → CONTINUE TO NEXT PAGE

Yes

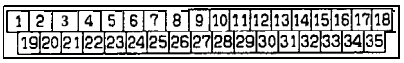
Trouble condition	Major causes	Remedy
One-sided braking Insufficient braking force	• Mechanical lock of HU solenoid valve • Hydraulic line in HU is clogged.	Check HU operation (Refer to P.35-36.) and, if necessary, replace HU. If HU is normal, check structural parts for normal braking. (Refer to P.35-12.)
Decline in ABS function (Wheels easily lock when there is sudden braking.)	• Malfunction in HU solenoid valve operation • Hydraulic line in HU is clogged.	
ABS sometimes functions even when there is no sudden braking. (ABS operation vibration is transmitted.)	• Insufficient wheel speed sensor output voltage (sensor malfunction, too large a gap between sensor rotor or missing rotor teeth or temporarily broken wire in sensor harness) • Malfunction of ABS ECU	Check wheel speed sensor (Refer to P.35-126.) and, if necessary, replace sensor, adjust gap or replace rotor. If tests indicate that there are no mechanical or electrical failures, replace the ECU.

TSB Revision

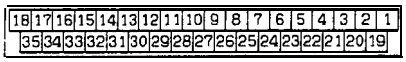


* Run for over 30 secs. at a speed exceeding 30 km/h (18.6 mph).

Connector terminal arrangement for troubleshooting



Terminal arrangement shown on the special tool connector



ABS–AWD

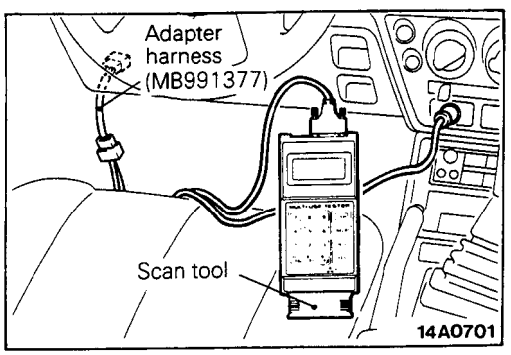
Caution

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



CHECK, USING ON-BOARD DIAGNOSTIC

(1) With the ignition switch OFF, connect the adapter harness and scan tool, turn the ignition ON and select the ABS system. (The ABS warning light lights up, it goes into the scan tool mode. **In the scan tool mode, ABS does not function.)**
If it does not go into the scan tool mode, check the ECU power circuit and the harness between the ECU and data link connectors.

(2) Read the on-board diagnostic output codes from the ECU memory.

(3) Cancel the diagnostic trouble codes once from memory. (Refer to P.35-38.)
If the memory can not be canceled, the ECU is currently detecting the trouble. If it can be cleared, the trouble is either temporary or appears only when driving.

(4) When the diagnostic trouble codes are cleared, or when the ABS system goes into fail safe during another test drive and diagnostic trouble codes are outputed, check according to diagnostic trouble code check charts (E-l –E-7).

DIAGNOSTIC TROUBLE CODE CHART

Diagnostic trouble code		Check chart name or remedy	Reference page	Diagnostic trouble code		Check chart name or remedy	Reference page
No.	Scan tool display letters			No.	Scan tool display letters		
11	FL SPD SENSOR	E-l	P.35-46	41	SOL V FRONT L	E-5	P.35-50
12	FR SPD SENSOR			42	SOL V FRONT R		
13	RL SPD SENSOR			43	SOL V DRIFT		
14	RR SPD SENSOR			51	VALVE RLY	E-6	P.35-51
15	SENSOR FAULT	E-2	P.35-46	52	MOTOR RLY	E-7	P.35-52
21	G SENSOR	E-3	P.35-48	55	ECU	ECU replacement	–
22	STOP SW	E-4	P.35-49				

METHOD OF CLEARING DIAGNOSTIC TROUBLE CODE MEMORY

Caution

- **When servicing is finished, clear the diagnostic trouble code memory.**

Diagnostic trouble codes cannot be cleared from memory when the ABS ECU system in fail safe. Proceed to diagnosis and repair.

(1) Clear memory using scan tool.
(For details, refer to the scan tool instruction manual.)

(2) After clearing, recheck the diagnostic trouble codes, and check that memory is cleared.

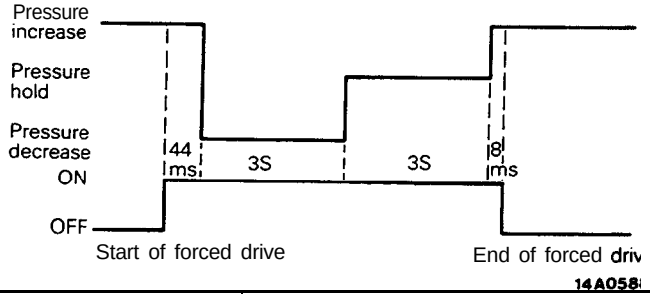
ACTUATOR TEST FUNCTION

The actuator can be forcibly driven in the following way by using the scan tool.

NOTE

- The actuator test cannot be carried out when the ABS ECU system is fail safe.
- When using forced drive using the scan tool, the vehicle must be stopped.
- During forced drive using the scan tool, forced drive operation is stopped when any wheel speed reaches 10 km/h (6 mph).

Actuator test specifications

No.	Scan tool display letters	Drive solenoid value and motor	Drive pattern
01	FR VALVE A	Solenoid valve and pump motor for each HU corresponding channel. <Auto pattern>	Not used
02	FL VALVE A		
04	FR VALVE M	Solenoid valve and pump motor for each HU corresponding channel. <Manual pattern>	
05	FL VALVE M		

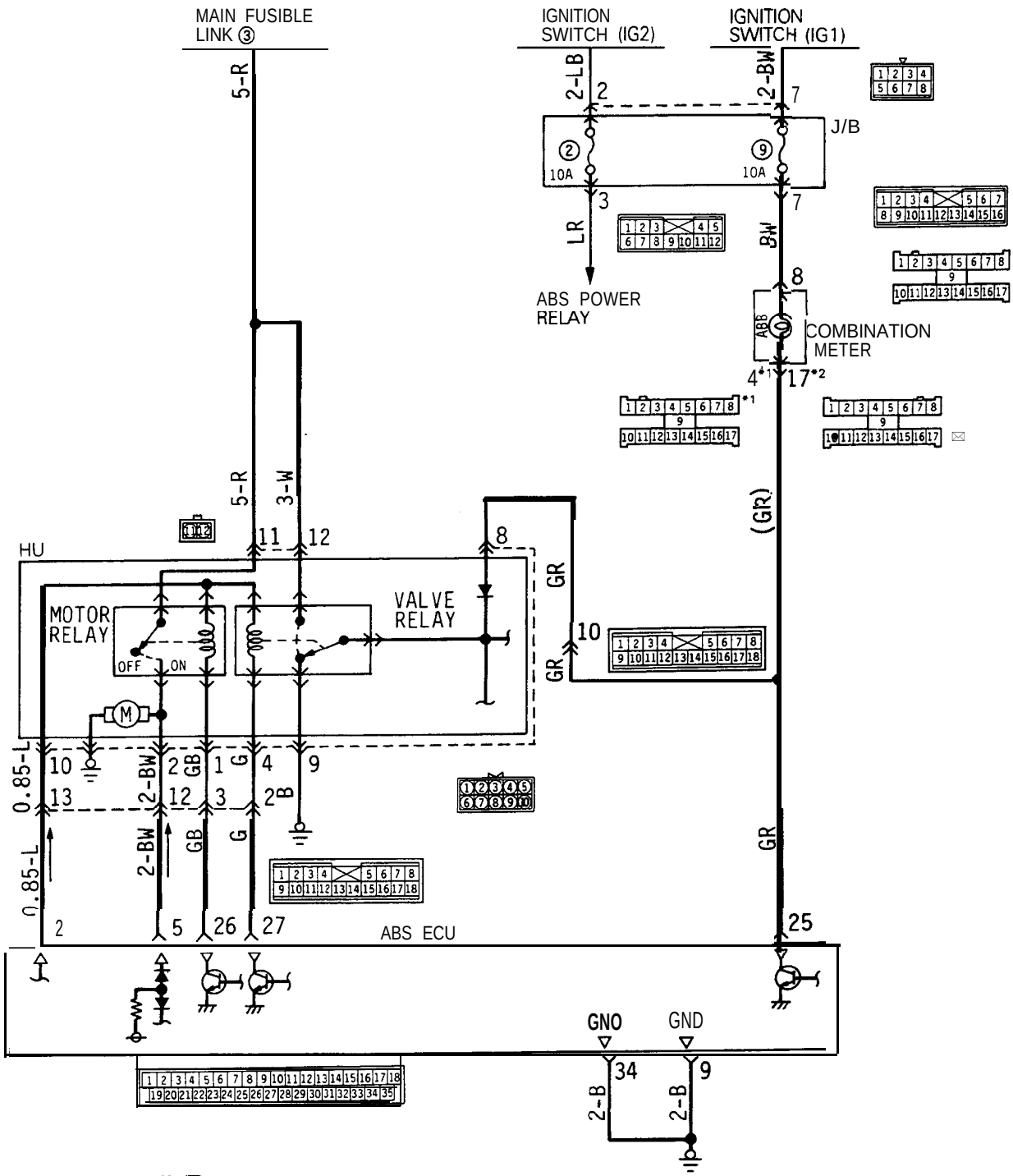
A | ABS warning light does not light at all.

[Explanation]

When it does not light up at all, there is a strong possibility that there is trouble with ABS warning light or with power to the light.

[Hint]

If other warning lights do not light up either, fuse is probably blown.



*1: Non-Turbo <A/T>, Turbo
*2: Non-Turbo <M/T>

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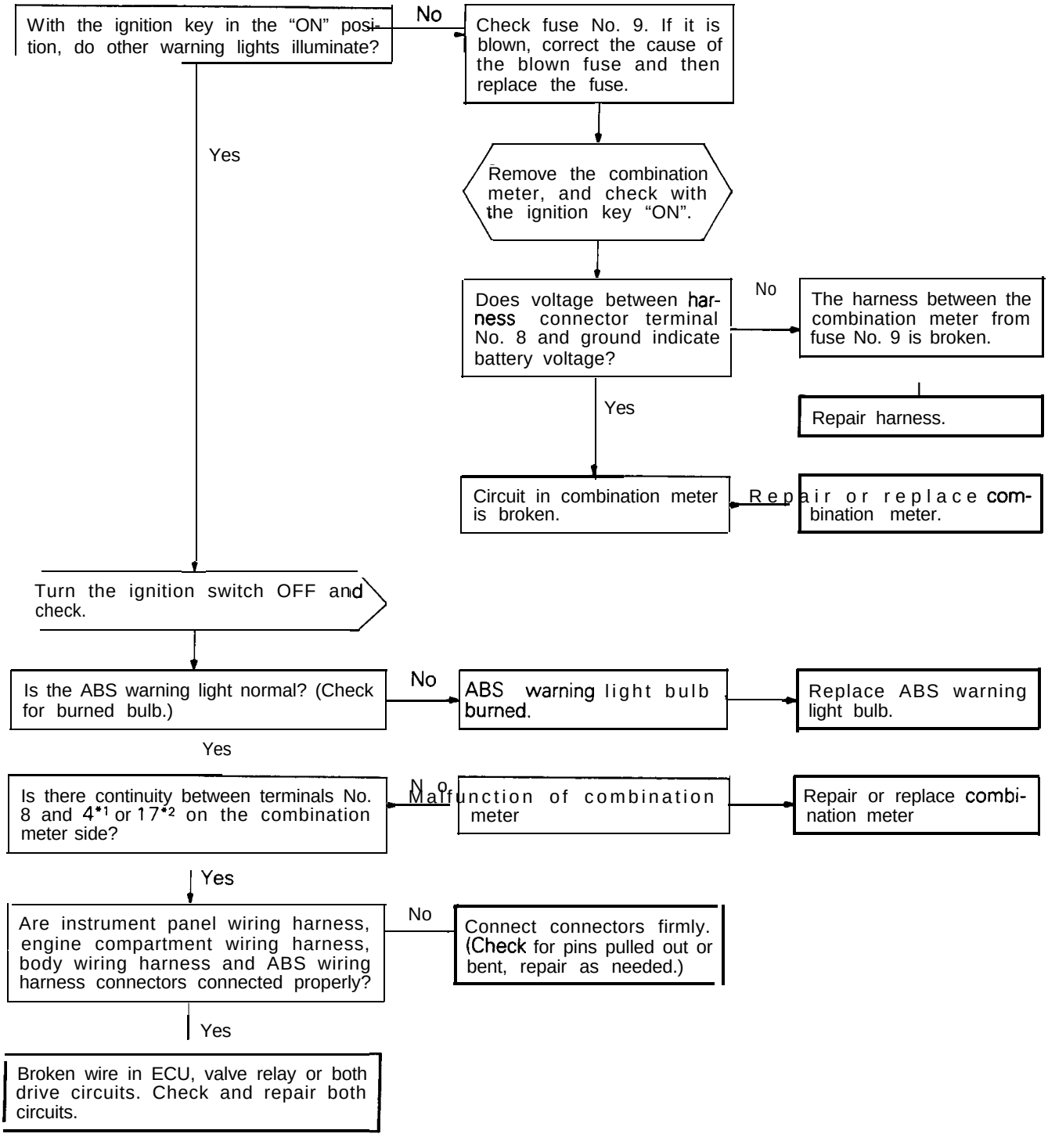


NOTE
*1: Non-Turbo <A/T>, Turbo
*2: Non-Turbo <M/T>

TSB Revision

B ABS warning light illuminated after the engine is started and remains on.

[Explanation]

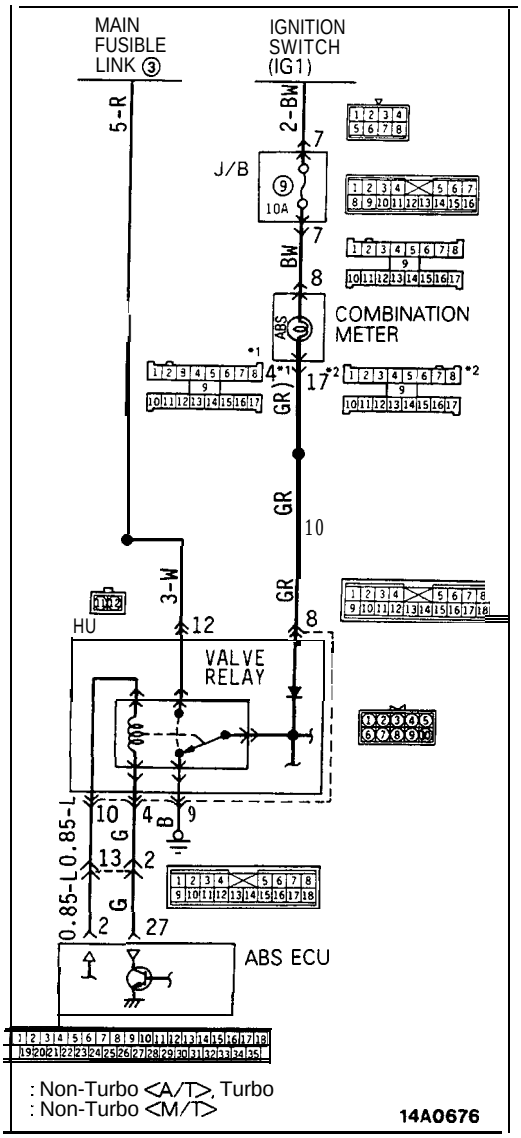
This is the symptom when the ABS ECU does not power up due to broken ECU power circuit, etc., when the fail safe function operates and isolates the system or when the warning light drive circuit is short circuited.

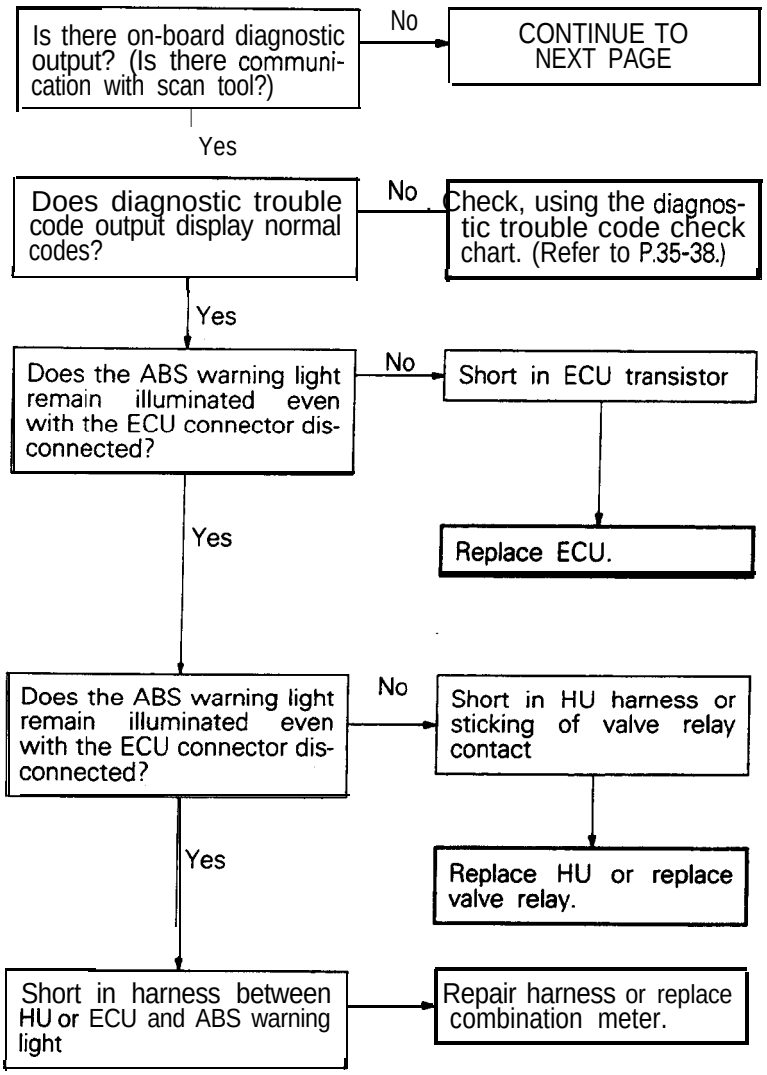
[Hint]

Check the on-board diagnostic output and if there is no output voltage or if the scan tool and ABS ECU cannot communicate, there is a good possibility that power is not flowing to the ECU.

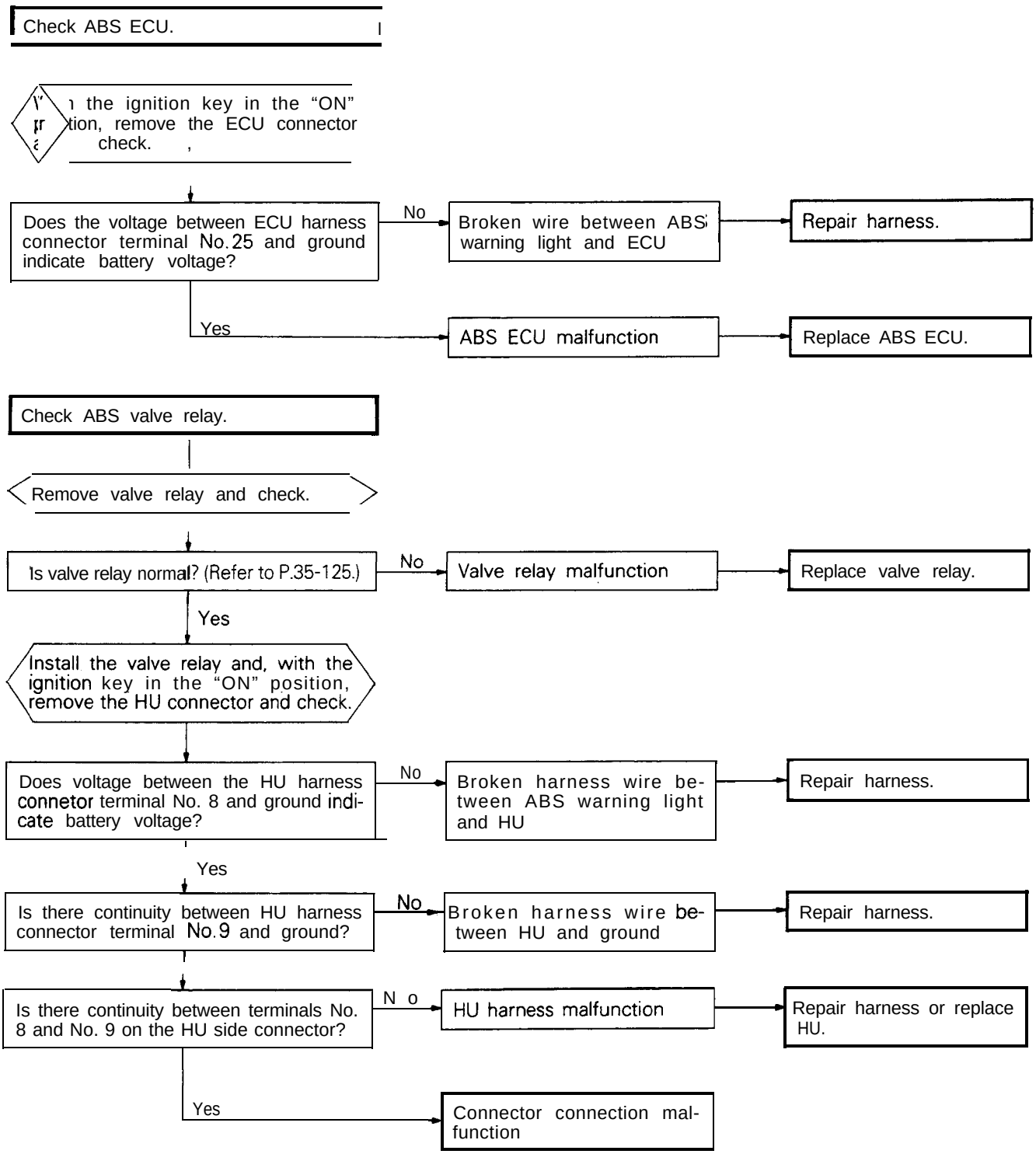
Caution

- **If there is no output of diagnostic trouble codes, there is a good possibility that the fail safe is functioning.**



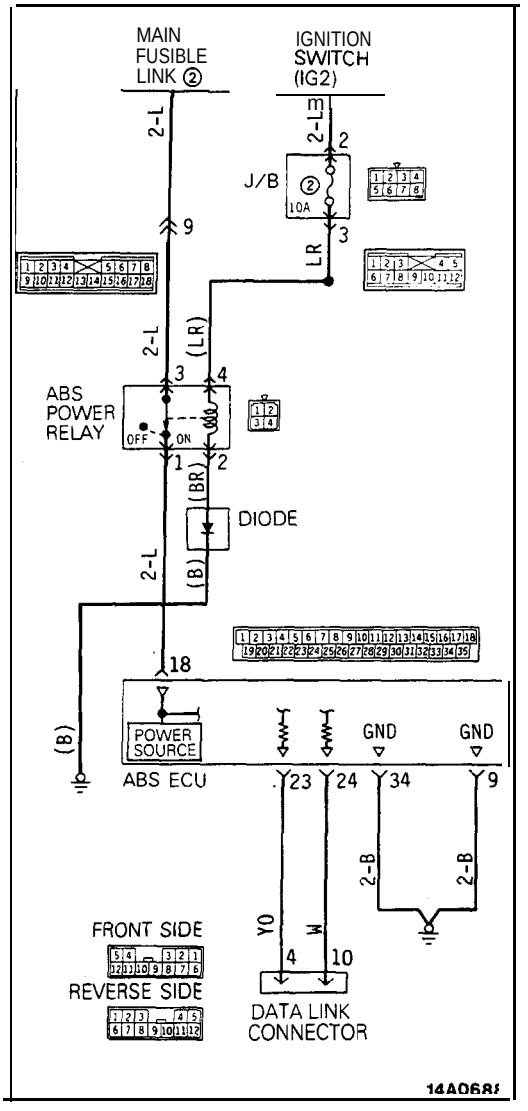


TSB Revision



NOTE
When inspecting the parts marked with ● , take care to the diode polarity. (Refer to the circuit diagram on P.35-39.)

TSB Revision



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Can other electronic control systems communicate with scan tool?
- No → Scan tool related malfunction. Repair and recheck.
- Yes ↓

Is fuse No. 2 normal?
- No → Correct cause of blown fuse and replace fuse.
- Yes ↓

With the ignition key in the "ON" position, does the power relay make a "click" noise?
- No → Is power relay normal? (Refer to P.35-74.)
  - Yes → ↓
  - No → Replace power relay.
- Yes ↓

Disconnect ECU connector and check harness connector.

↓

With the ignition key in the "ON" position, does voltage between ECU connector terminal No. 18 and ground indicate the battery voltage?
- No → Harness wire between power relay and ECU is broken. → Repair harness.
- Yes ↓

Is there continuity between body harness terminals No. 9 and No. 34, and ground?
- No → ECU ground line broken → Repair harness.
- Yes ↓

Is there continuity between body harness connector terminals No. 23 and No. 24, and data link connectors No. 4 & No. 10?
- No → Harness wire between data link connector and ABS ECU is broken. → Repair harness.
- Yes ↓

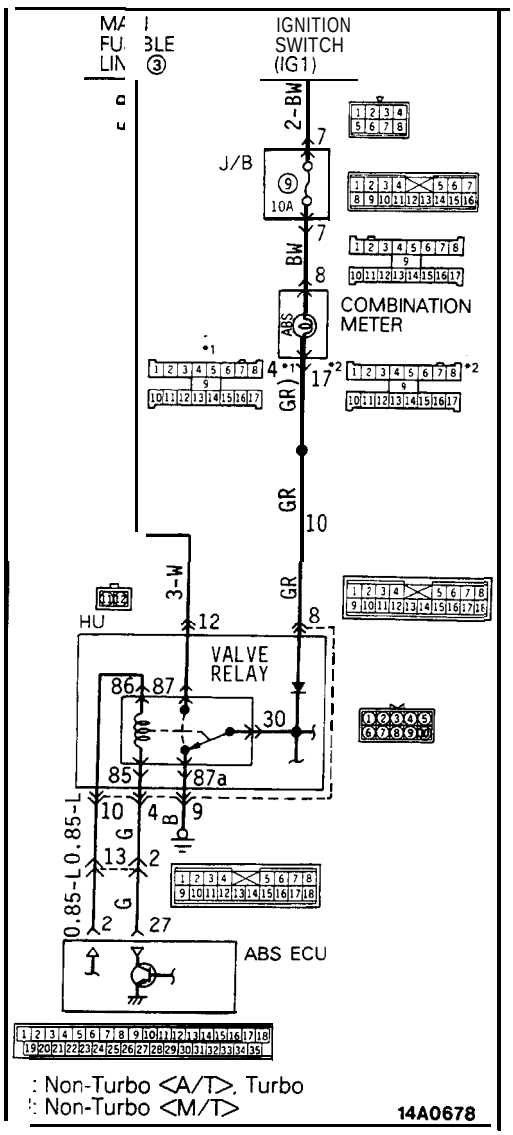
Malfunction of ABS ECU → Replace ABS ECU.

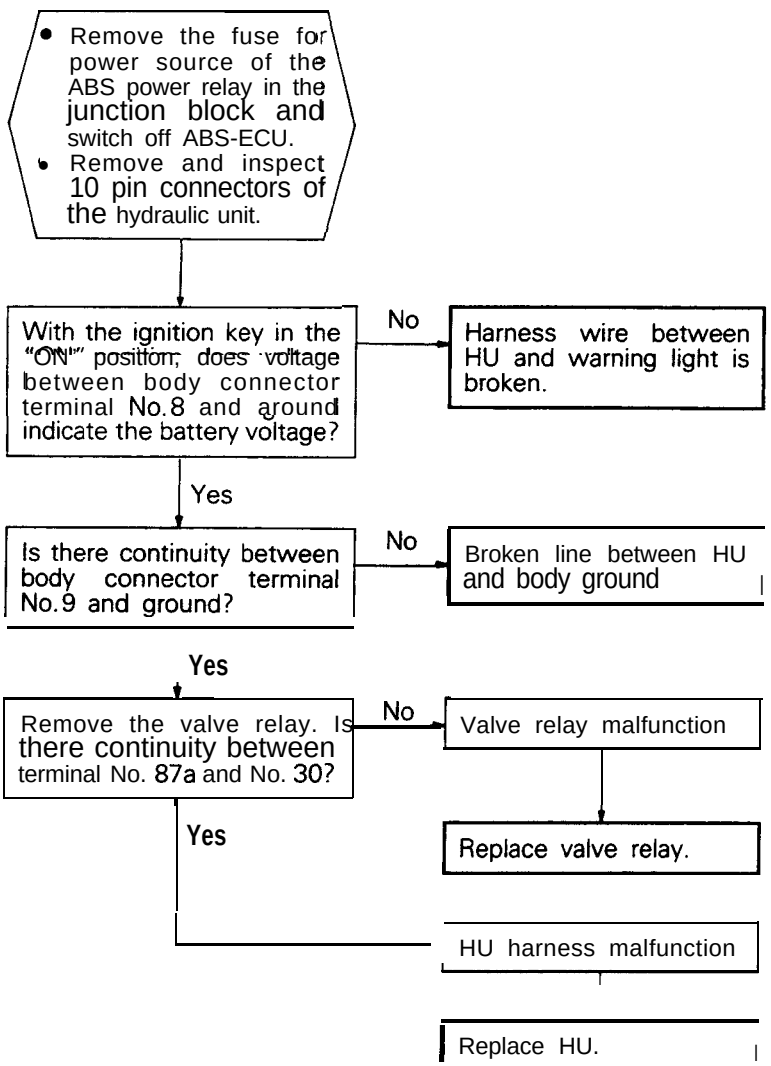
TSB Revision

C ABS warning light does not illuminate when ignition key is in "START" position.

[Explanation]

The ABS ECU uses the IG2 power source which is turned off in the "START" position. The ABS warning light uses the IG1 power source which is not turned off even in the "START" position. Consequently, in the "START" position, power is off and the ECU turns the valve relay OFF. If the warning light does not illuminate at this time, there is trouble in the warning light circuit on the valve relay side.



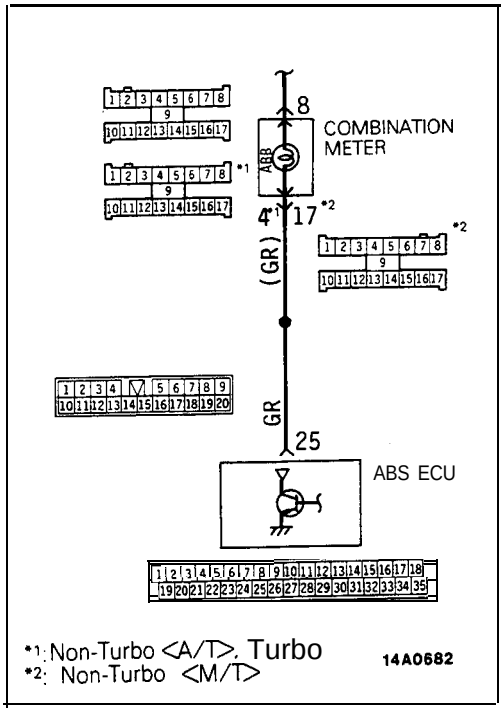


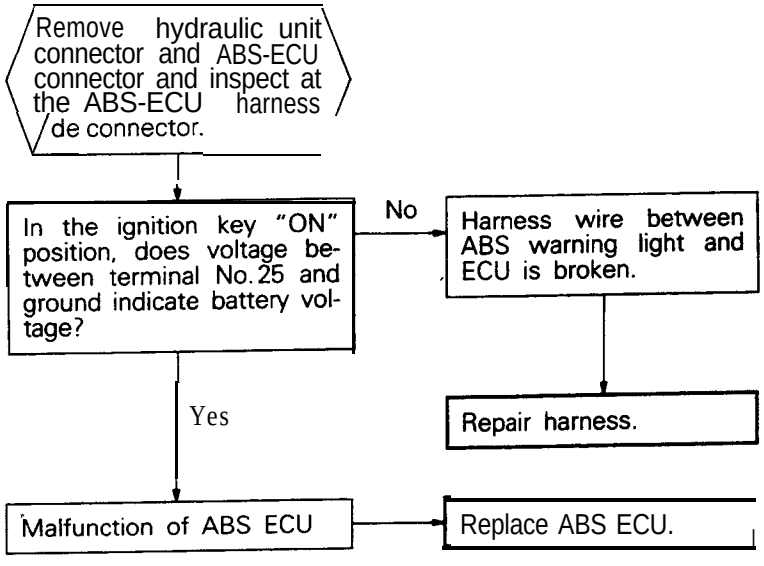
TSB Revision

D **ABS warning light blinks once after the ignition key is turned to the "ON" position. It illuminates in the "START" position and blinks once again when turned to the "ON" position.**

[Explanation]

When power flows, the ABS ECU turns on the warning light for approximately 1 sec. while it performs a valve relay test. If there is a break in the harness between the ECU and the warning light, the light illuminates only when the valve relay is off in the valve relay test, etc.





E-1	When the following diagnostic trouble codes are displayed “11 FL SPD SENSOR” “12 FR SPD SENSOR” “13 RL SPD SENSOR” “14 RR SPD SENSOR”

[Explanation]

The ABS ECU detects breaks in the wheel speed sensor wire. This diagnostic trouble 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 a broken wire/short circuit in the wheel speed sensor, also check whether the sensor gap is too large, rotor teeth are missing, sensor harness wire is temporarily broken, or sensor harness and body connector are not properly inserted.

E-2	When diagnostic trouble code "15 SENSOR FAULT” is displayed

[Explanation]

This diagnostic trouble code is output when there is an abnormality (other than broken wire or short circuit) in the wheel speed sensor output signal while driving.

[Hint]

The following can be considered as the cause of the wheel speed sensor output abnormality.

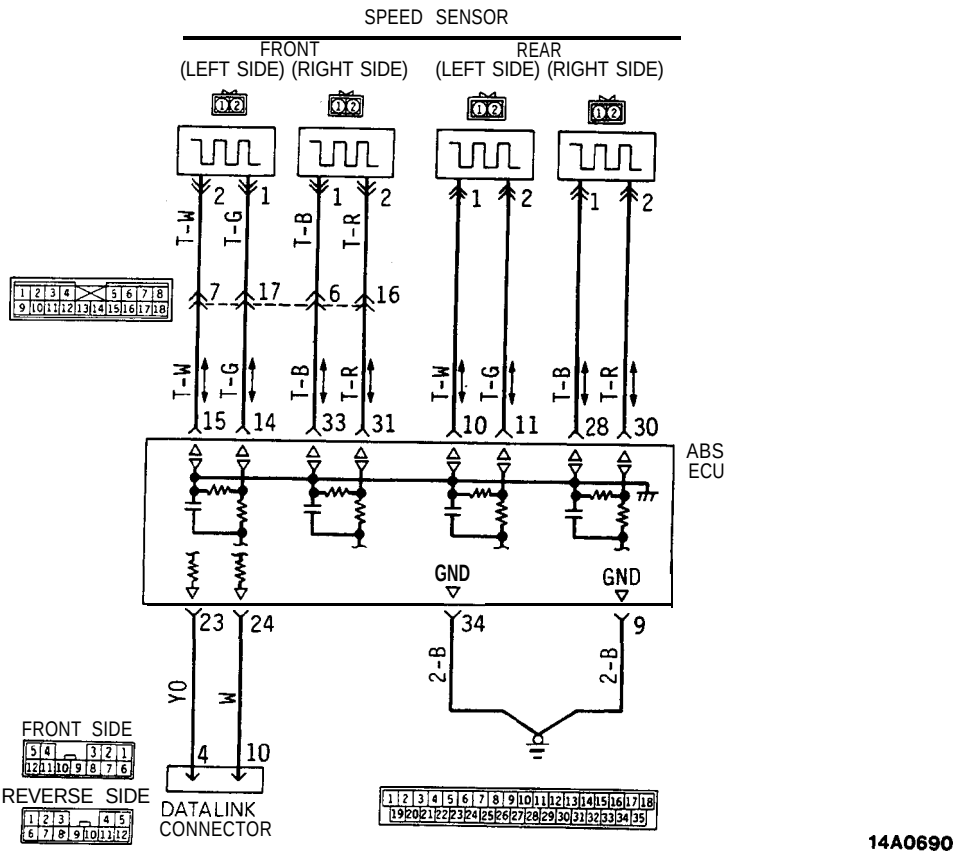
- Distortion of rotor, teeth missing
- Low frequency noise interference when sensor harness wire is broken
- Noise interference in sensor signal
- When the sensor output signal is below the standard value or when amplitude modulation is over the standard value., using an oscilloscope to measure the wave shape of the wheel speed sensor output signal is very effective.
- Loose wheel bearing
- Temporarily broken wire in sensor harness
- Sensor harness and body connector are not properly inserted.

NOTE

(1) If contact is poor, check the sensor cable by bending and lightly stretching it.

(2) If there is currently no trouble and if abnormality in the displayed sensor circuit cannot be discovered since values are normal even when checked, turn the ignition switch OFF and re-execute the driving test. Try replacing the ABS ECU only if the same diagnostic trouble code is output at this time.

(If it is difficult to recreate the trouble, there is a possibility of speed sensor trouble recurring even if the ECU is replaced.)



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TSB Revision

Check flow connected with wheel speed sensor

NOTE:
When checking with an oscilloscope, first measure voltage variations in the wheel speed sensor output. (Refer to P.35-69.)

Is the resistance value of the wheel speed sensor part, which the displayed diagnostic trouble code indicates, normal?
Standard value: 0.8–1.2 kΩ

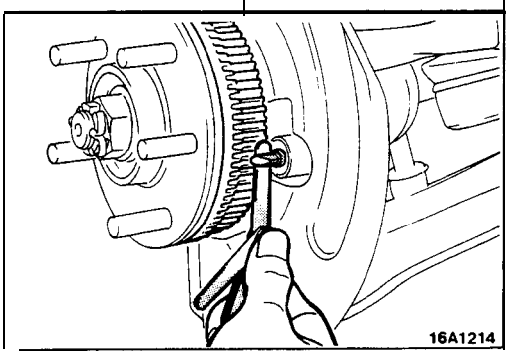
No → Malfunction of wheel speed sensor → Replace wheel speed sensor.

Yes

Is the resistance value with the ECU connector normal?
Standard value: 0.8– 1.2 kΩ

No → Harness wire for wheel speed sensor circuit is broken. → Repair harness.

Yes



Is the standard value for the gap between the wheel speed sensor and rotor, which the output diagnostic trouble code indicates, within the range?
Standard value: 0.3–0.9 mm (.012–.035 in.)

No → Adjust the gap between the wheel speed sensor and rotor.

Yes

Is the wheel speed sensor rotor that the diagnostic trouble code indicates, normal and with no missing or damaged teeth?

No → Replace rotor that has missing or damaged teeth.

Yes

Check the output of each wheel speed sensor with an oscilloscope, including the wave form. (Refer to measurement of wheel speed sensor output voltage variations on P.35-69.) Is the output voltage for each wheel speed sensor over the standard value and is the wave form normal?

No → Recheck if below the standard value or if the sensor has a poor wave form. Replace sensor or rotor.

Yes

Can the abnormality be found even if the sensor harness and connection between sensor harness and body harness are bent and stretched?

No → Repair harness.

Yes

All the above checks are normal. There is a malfunction of ABS ECU when this diagnostic trouble code reoccurs often. → Replace the ABS ECU and check that the diagnostic trouble code does not reoccur.

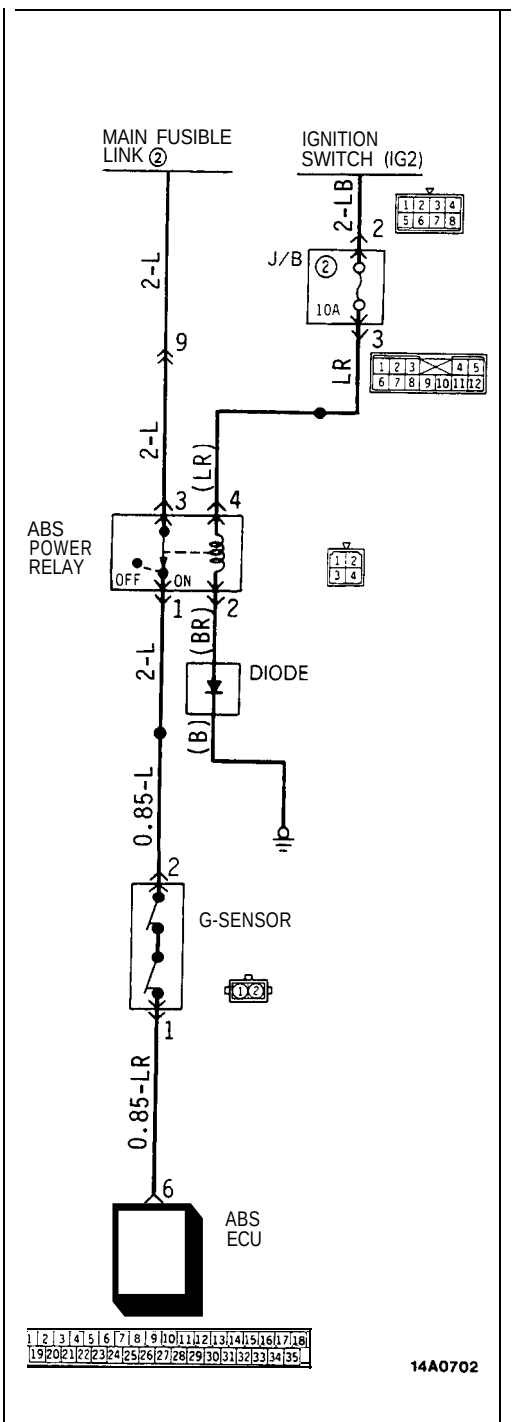
TSB Revision

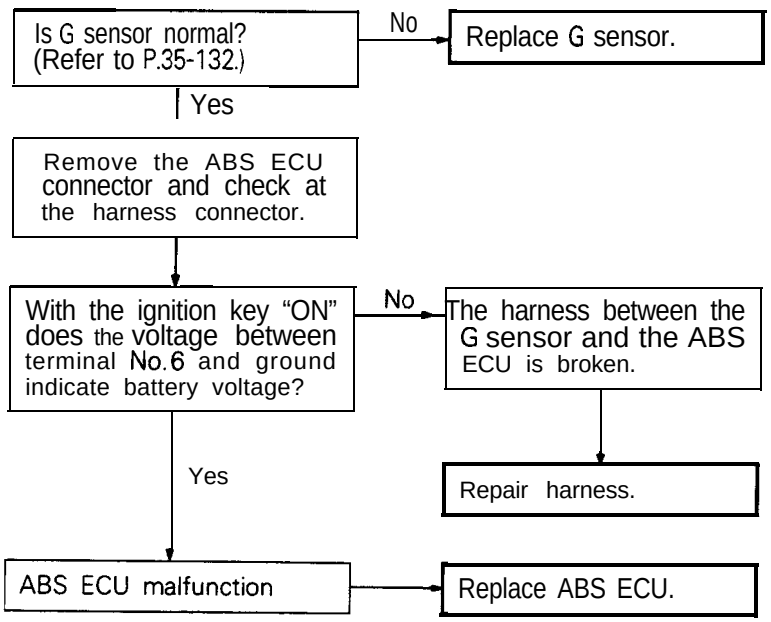
E-3 When diagnostic trouble code "21 G SENSOR" is displayed

[Explanation]

The ABS ECU outputs this diagnostic trouble code in the following cases.

- OFF trouble turning G sensor OFF (It is judged that the G sensor continues to be OFF for more than approximately 13 seconds except when the vehicle is stopped or when there is stop light switch input.
- When there is a broken wire or short circuit in the harness for the G sensor system.





TSB Revision

E-4 When diagnostic trouble code "22 STOP SW" is displayed

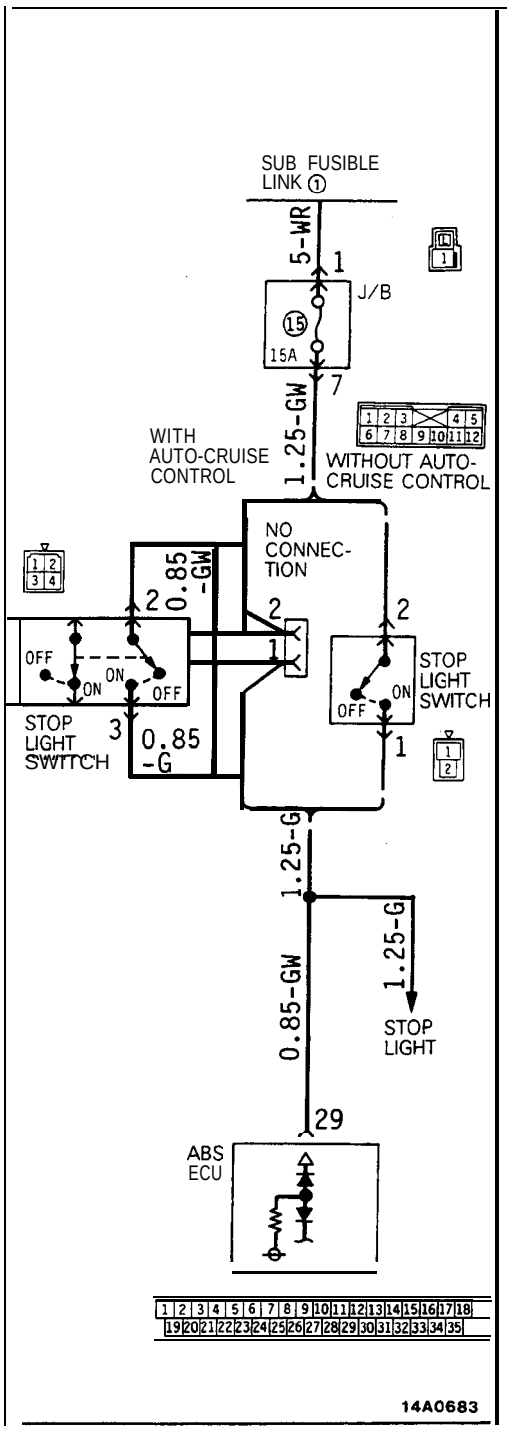
[Explanation]

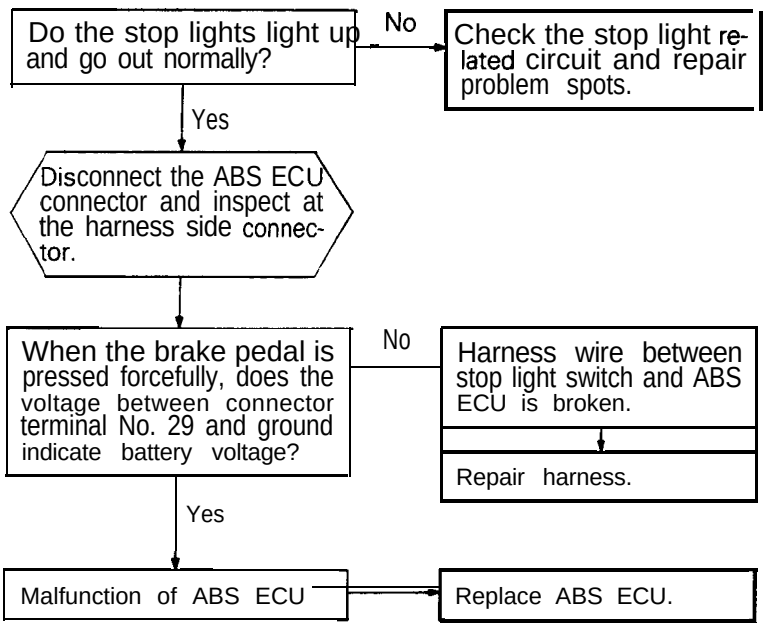
The ABS ECU outputs this diagnostic trouble code in the following cases.

- Stop light switch may remain on for more than 15 minutes without the ABS functions.
- The harness wire for the stop light switch may be open.

[Hint]

If the stop light operates normal, the ABS harness wire for the stop light switch input circuit to the ECU is broken or there is a malfunction in the ABS ECU.



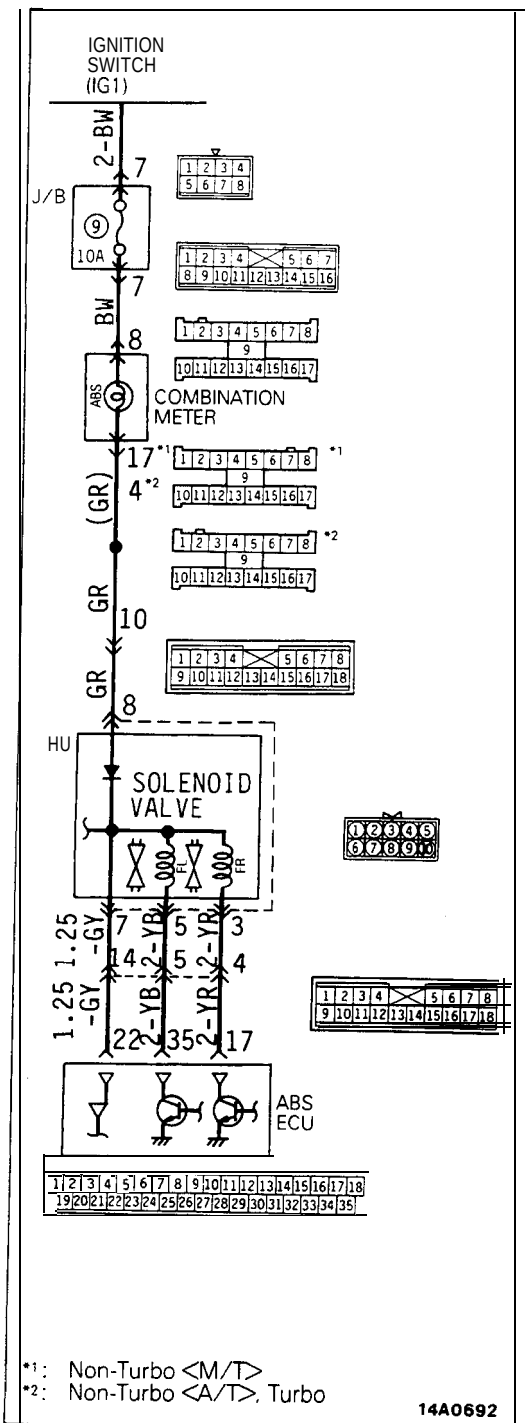


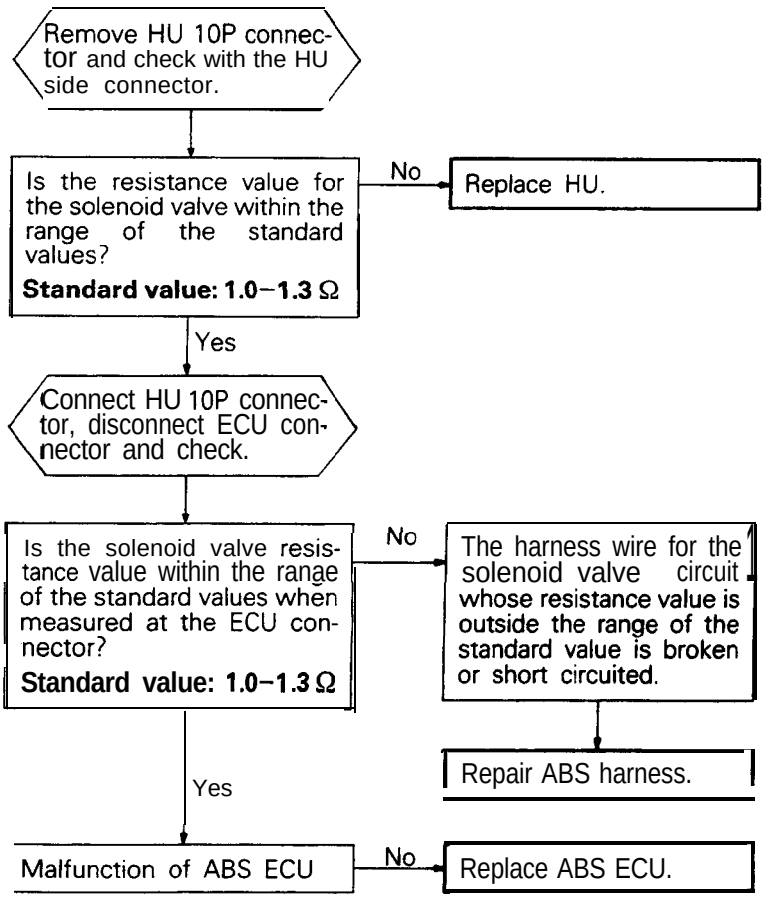
TSB Revision

E-5 When diagnostic trouble codes "41 SOL V FRONT L", "42 SOL V FRONT R" OR "43 SOL V DRIFT" are displayed

[Explanation]

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 diagnostic trouble codes are output.



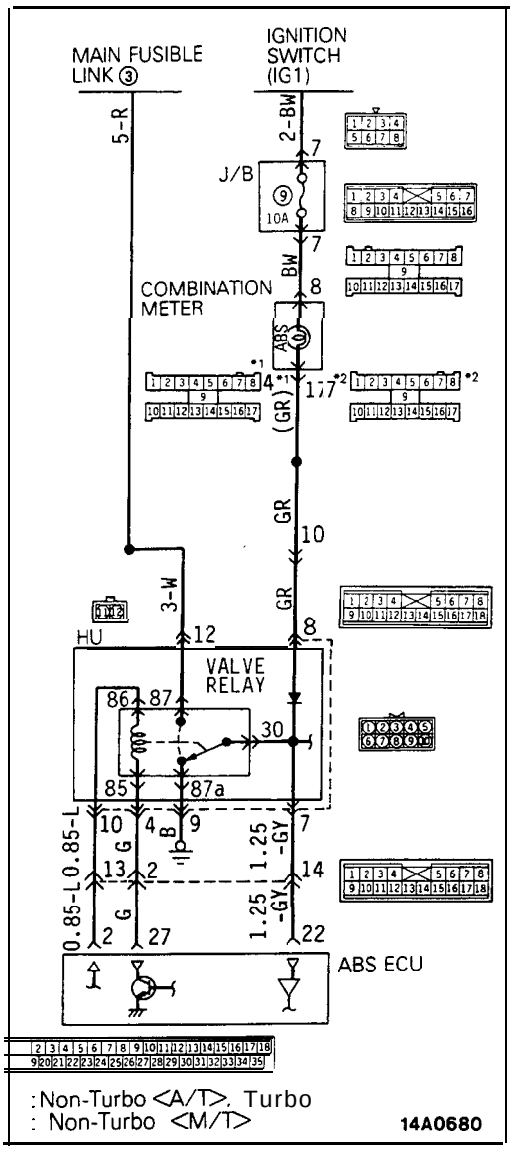


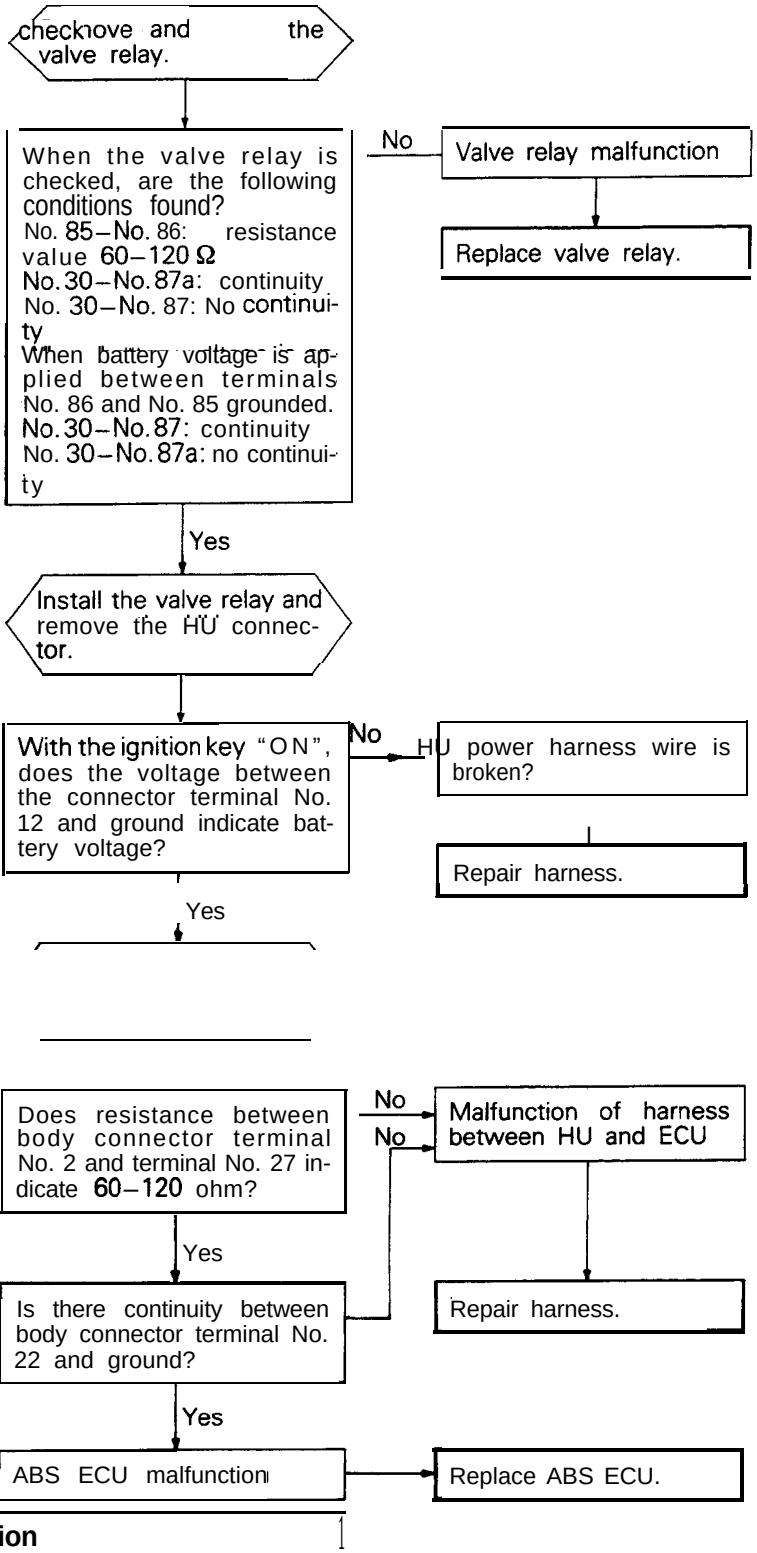
TSB Revision

E-6 When diagnostic trouble code "51 VALVE RLY" is displayed

[Explanation]

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. Then, if the supply of power to the valve power monitor line is interrupted, this diagnostic trouble code will output.





E-7 When diagnostic trouble code "52 MOTOR RLY" is displayed

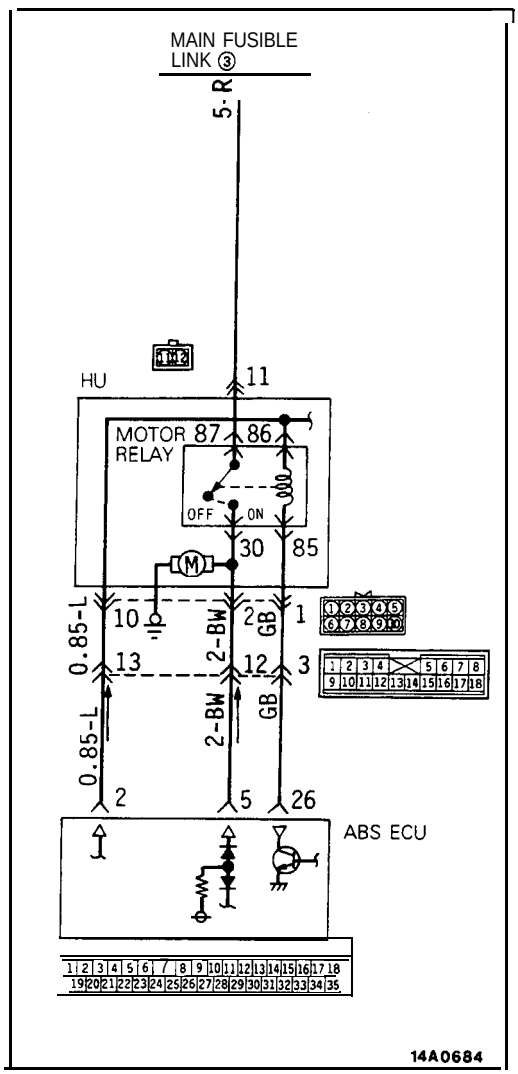
[Explanation]

The ABS ECU outputs this diagnostic trouble code for the motor relay and motor in the following cases.

- When the motor relay does not function
- When there is trouble with the motor itself and it does not revolve
- When there is trouble with the motor itself and it the motor does not revolve
- When the motor continues to revolve

[Hint]

If there is motor operation noise when wheel speed exceeds 6km/h(4mph) when starting up after the engine is started, or when there is forced scan tool drive, there is a broken or short circuited motor monitor wire.



Does the motor make a noise when wheel speed exceeds 6 km/h (4 mph) or when there is forced scan tool drive?

Yes → Broken wire or short circuit in motor monitor line → Repair the harness between HU and ECU.

No

(Remove the motor relay>

Remove the motor relay and check resistance values.
No. 85–No. 86: resistance value 30–60 Ω
No. 30–No. 87: no continuity
Battery voltage is applied on terminals No. 86 and No. 85 grounded
No. 30–No. 87: continuity

No → Motor relay malfunction → Replace motor relay.

Yes

Is pump motor ground connected normally?

No → Connect ground wire.

Yes

Install motor relay and remove HU connector.

Does voltage between body connector terminal 11 and ground indicate battery voltage?

No → Broken wire in pump motor power circuit → Repair the harness.

Yes

Connect the HU connector and remove the ECU connector.

Is resistance between body connector terminal No. 2 and No. 26 30–60 ohms?

No → Malfunction of harness between HU and ECU → Repair harness.

Yes

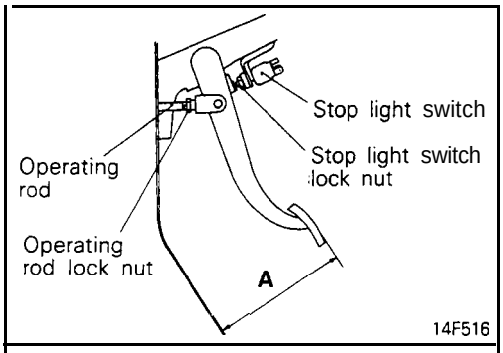
Is resistance between ECU harness side connector terminal No. 5 and ground 0.1–0.3 ohm?

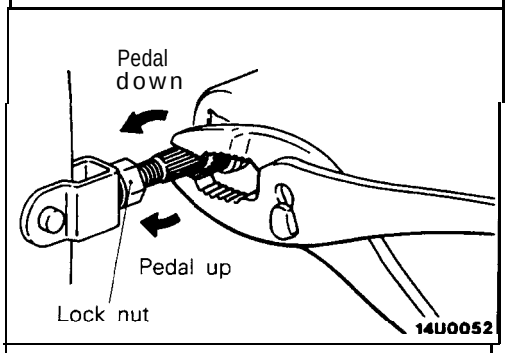
No → Malfunction of harness between HU and ECU → Repair harness.

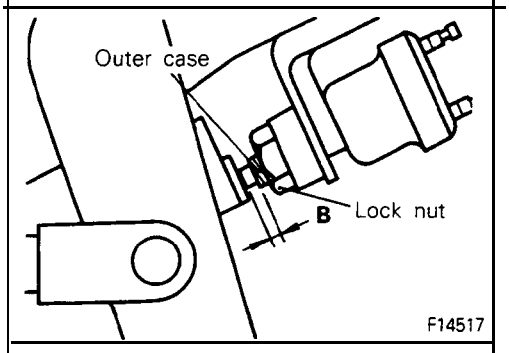
Yes

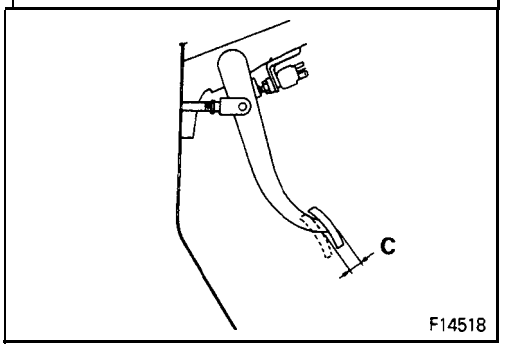
ABS ECU malfunction → Replace ABS ECU.

TSB Revision









SERVICE ADJUSTMENT PROCEDURES

BRAKE PEDAL INSPECTION AND ADJUSTMENT

M35FAAHa

1. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, adjust as follows.

   Standard value (A): 176–181 mm (6.9–7.1 in.)

   (1) Disconnect the stop light switch connector, loosen the lock nut, and move the stop light switch to a position where it does not contact the brake pedal arm.
   (2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosened), until the correct brake pedal height is obtained.
   (3) After screwing in the stop light switch until it contacts the brake pedal stopper (just before the brake pedal is caused to move), return the stop light switch 1/2 to 1 turn and secure by tightening the lock nut.

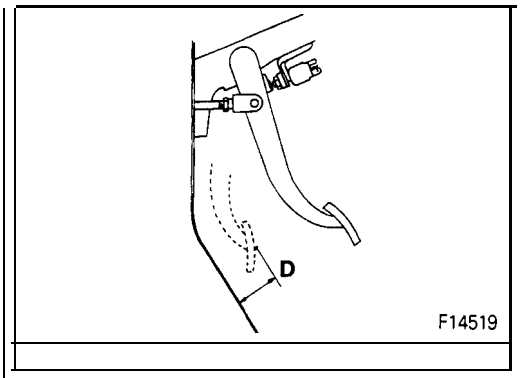
   (4) Connect the connector of the stop light switch.
   (5) Check to be sure that the stop light is not illuminated with the brake pedal unpressed.

   Reference value (B): 0.5–1.0 mm (.02–.04 in.)

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 (C): 3-8 mm (.1–.3 in.)

   If the free play is less than the standard value, confirm that the clearance between the stop light switch and brake pedal is within the standard value.
   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 500 N (110 lbs.) of force, and measure the clearance between the brake pedal and the floorboard.

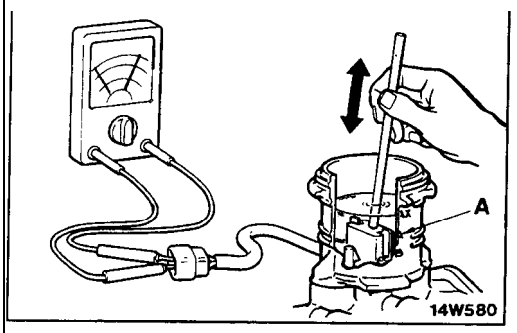
Standard value(D): 80 mm (3.1 in.) or more

If the clearance is less than the standard value, check for air trapped in the brake line and for brake fluid leaks. If necessary, check the brake system mechanism (excessive shoe clearance due to faulty auto adjuster) and repair faulty parts as required.

<From 1990 models>

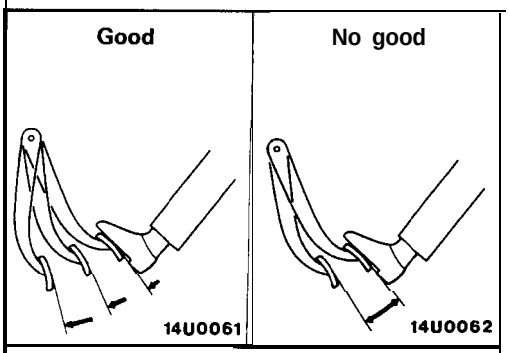
4. After adjusting the height of the brake pedal, inspect the shift lock device.
5. If there is any trouble in the functioning of the shift lock device, adjust the shift lock cable.

NOTE
Refer to GROUP 23 for details about inspection and adjustment of the shift lock device.



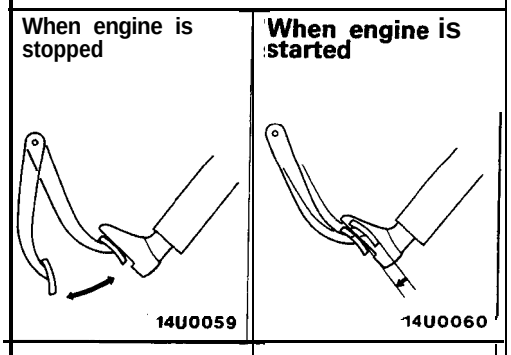
BRAKE FLUID LEVEL SENSOR CHECK M35FBAB

(1) Connect a circuit tester to the brake fluid level sensor.
(2) Move the float from top to bottom and check for continuity.
(3) The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "A", and if there is continuity when the float surface is below "A".

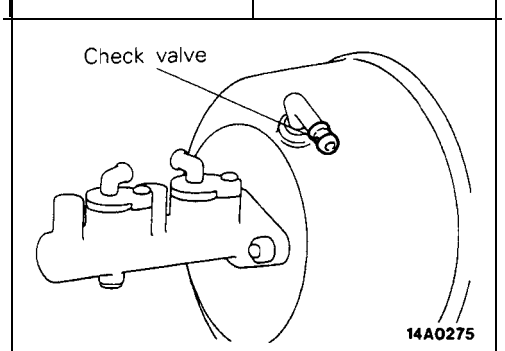


BRAKE BOOSTER OPERATING INSPECTION M35FCAJ

For simple checking of brake booster operation, carry out the following tests.
(1) Run the engine for one or two minutes, and then stop it.
(2) Step on the brake pedal several' times with normal pressure.
If the pedal depressed 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 faulty.
(3) With the engine stopped, step on the brake pedal several times with the same foot pressure to make sure that the pedal height will not change.
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 faulty.
(4) 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 faulty.



If the above three tests are okay, the booster performance can be determined as gooa.
If one of the above three tests is not okay at last, the check valve, vacuum hose, or booster will be faulty.

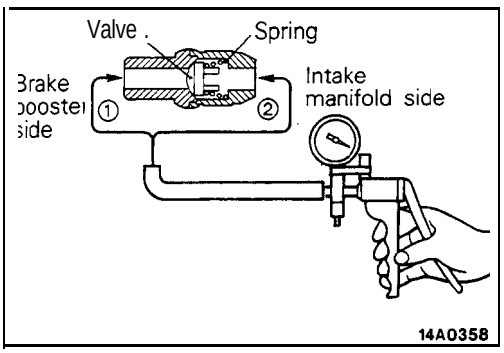


CHECK VALVE OPERATION CHECK M35FNAK

<1989 models>

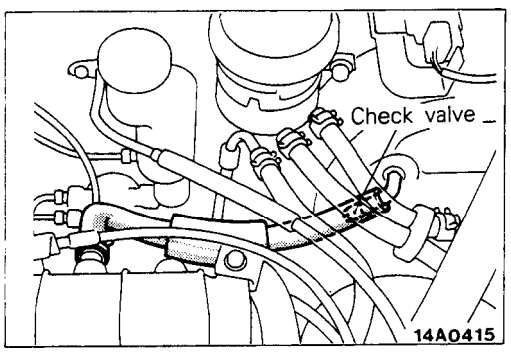
1. Remove the vacuum hose at the brake booster side.
2. Remove the check valve from the brake booster.

TSB Revision



3. Check the operation of the check valve by using a vacuum pump.

Vacuum pump connection	Accept/reject criteria
Connection at the brake booster side ①	A negative pressure (vacuum) is created and held.
Connection at the intake mainfold side ②	A negative pressure (vacuum) is not created.



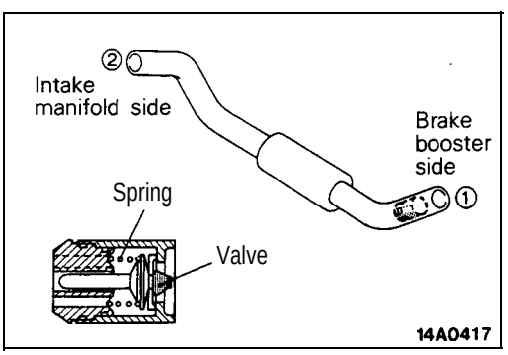
<From 1990 models>

When checking the check valve, keep the check valve fit in the vacuum hose.

1. Remove the vacuum hose.

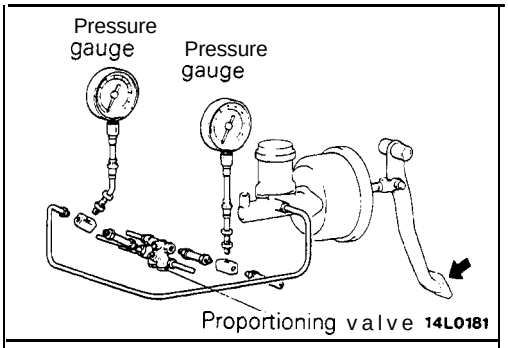
Caution
The check valve is press-fit inside the vacuum hose and do not remove the check valve from the vacuum hose.

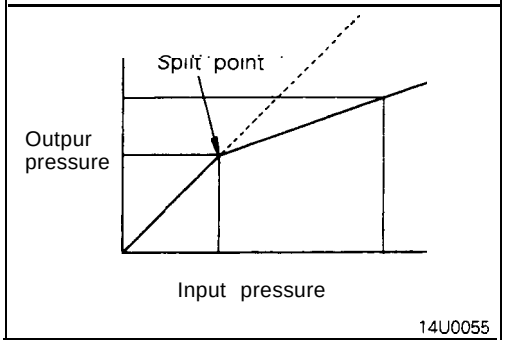
2. Check the operation of the check valve by using a vacuum pump.



Vacuum pump connection	Accept/reject criteria
Connection at the brake booster side ①	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side ②	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 M35FKAK

1. Connect two pressure gauges, one each to the input side and output side of the proportioning valve, as shown.
2. Bleed the air from 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).

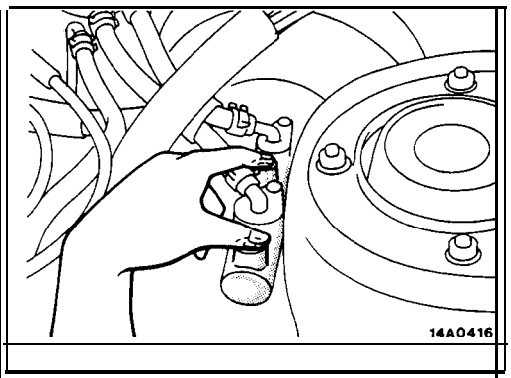
   Standard value:
   <Up to 1990.5 models>
   FWD 3.95-4.45 Mpa (561-633 psi)
   AWD 4.95-5.45 Mpa (704–775 psi)
   <1991 models>
   FWD-SOHC 3.95-4.45 Mpa (561-633 psi)
   FWD-DOHC 3.45-3.95 Mpa (491-561 psi)
   AWD 4.95-5.45 Mpa (704–775 psi)

   (2) Output fluid pressure when input fluid pressure are as follows

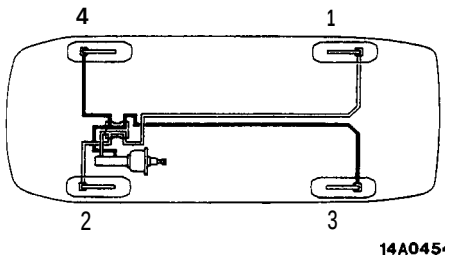
   Standard value:
   < 1989 models>
   FWD 5.15-5.65 Mpa (732–804 psi) [at 8.2 Mpa (1,163 psi)]
   <1990, 1990.5 models>
   FWD 5.55–6.05 Mpa (789-861 psi) [at 8.2 Mpa (1,163 psi)]
   AWD 6.55–7.05 Mpa (931– 1,003 psi) [at 9.2 Mpa (1,309 psi)]
   <From 1991 models>
   FWD-SOHC 5.55–6.05 Mpa (789-861 psi) [at 8.2 Mpa (1,163 psi)]
   FWD-DOHC 4.65-5.15 Mpa (661-732 psi) [at 7.7 Mpa (1,095 psi)]
   AWD 6.55–7.05 Mpa (931–1,003 psi) [at 9.2 Mpa (1,309 psi)]

   (3) Output pressure difference between left and right brake lines

   Limit: 0.4 MPa (57 psi)
4. If the measured pressures are not within the permissible ranges, replace the proportioning valve.

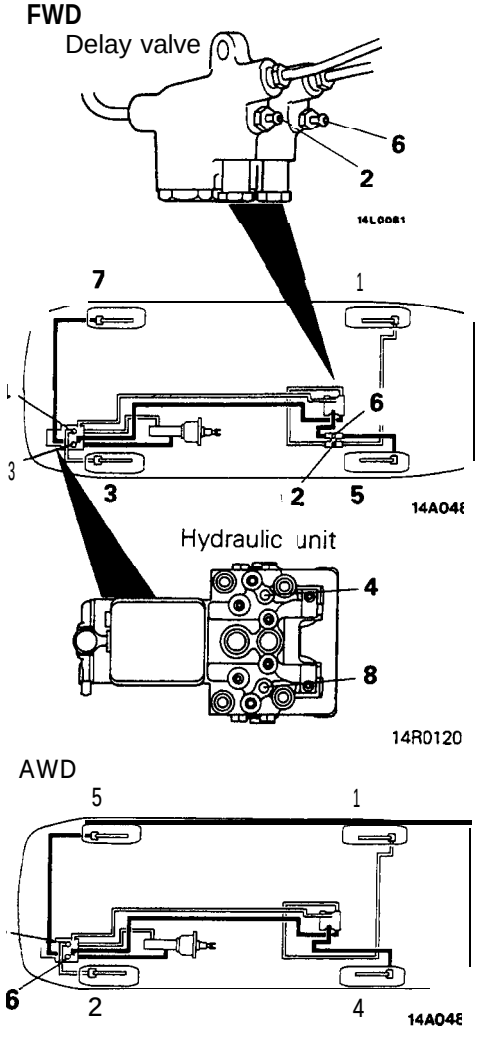


<Vehicles without A.B.S.>



<Vehicles with A.B.S.>

FWD



AWD

BLEEDING <Up to 1991 models> M35FYAM

Because the master cylinder employed is the type without the check valve, air should be bled from the master cylinder by following the procedures described below (if there is no brake fluid in the master cylinder).

(1) Disconnect the brake tube from the master cylinder.
(2) Two persons' should conduct the air bleeding, one person slowly depressing the brake pedal and holding the pedal depressed.
(3) In this condition, the other person should use a finger to close the outlet part of the master cylinder, and then the first person should release the brake pedal.
(4) Steps (2) and (3) should be repeated three or four times, and then the master cylinder should be filled with brake fluid to the specified level.

NOTE
The air is completely bled from the master cylinder by steps (1) to (4).

(5) Connect the brake tube to the master cylinder.
(6) Start the engine; then, in the sequence shown in the illustration, bleed the air from each wheel cylinder, delay valve and hydraulic unit.

Specified brake fluid: Confoming to DOT3 or DOT4

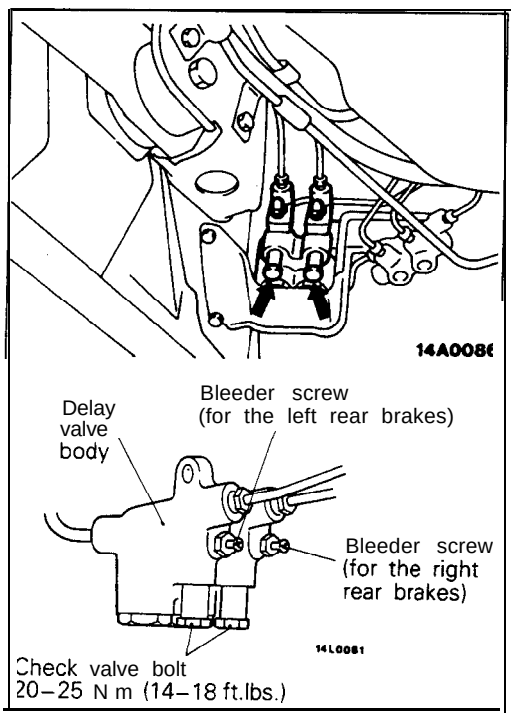
Caution

1. **Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.**
2. **If brake fluid is exposed to the air, it will absorb moisture; as water is absorbed from the atmosphere, the boiling point of the brake fluid will decrease and the braking performance will be seriously impaired. For this reason, use a hermetically sealed 1 dm^3 (1.06 qt.) or 0.5 dm^3 (0.52 qt.) brake fluid container.**
3. **Firmly close the cap of the brake fluid container after use.**
4. **For vehicles with the anti-lock braking system, be** sure to install a filter to the **master cylinder reservoir tank when supplying brake fluid.**

NOTE
For FWD-vehicles with the anti-lock braking system, the brake pedal will have a "heavier" feeling for air bleeding of the rear brakes than for the front brakes, but this is the result of the constriction of fluid pressure within the delay valve, and is not a malfunction.

ORDINARY AIR-BLEEDING PROCEDURES

(1) Depress the brake pedal several times until resistance is felt; then, with the pedal depressed, loosen the bleeder screw 1/3 to 1/2 turn and then tighten it before the fluid pressure is all gone.
(2) Release the brake pedal. Repeat this procedure until there are no more air bubbles in the brake fluid.

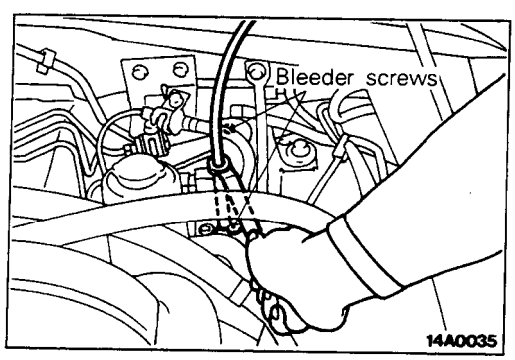


AIR BLEEDING FROM DELAY VALVE <FWD-ABS>

(1) Return the check valve bolt of the delay valve by about one turn and then bleed the air by following the steps described above in "Ordinary air-bleeding procedures".

Caution
There is a delay valve bleeder screw for the left rear wheel brake and for the right rear wheel brake, ensure the correct one is used.

(2) Be sure to tighten the check valve bolt at the specified torque after completing the air bleeding.

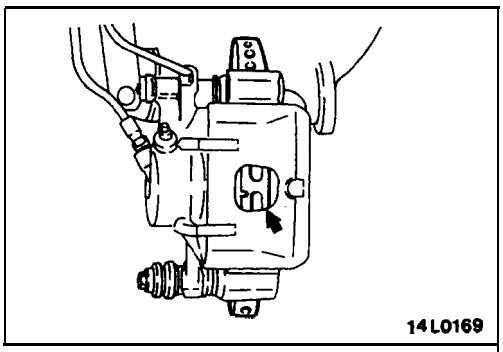


AIR BLEEDING FROM HYDRAULIC UNIT <VEHICLES WITH A.B.S. >

(1) Attach the brake bleeder wrench to the bleeder screw.
(2) Using an offset (box) wrench [14 mm (.55 in.)], loosen the bleeder screw.

Caution
Use an offset (box) wrench to open and close the bleeder, not a spanner wrench, because a spanner wrench might cause deformation of the hexagonal part.

(3) Bleed the air by following the steps described above in "Ordinary air-bleeding procedures".

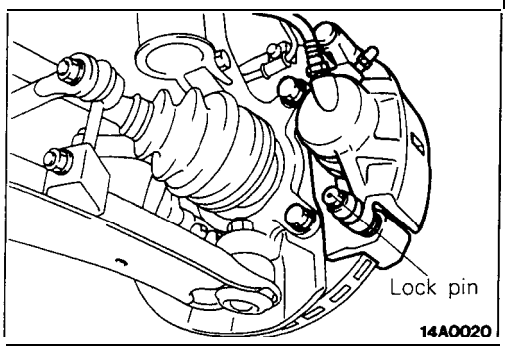

14L0169

FRONT DISC BRAKE PAD CHECK AND REPLACEMENT <Up to 1990 models> M35FQAG

1. Check brake pad thickness through caliper body check port.

   Limit: 2.0 mm (.08 in.)

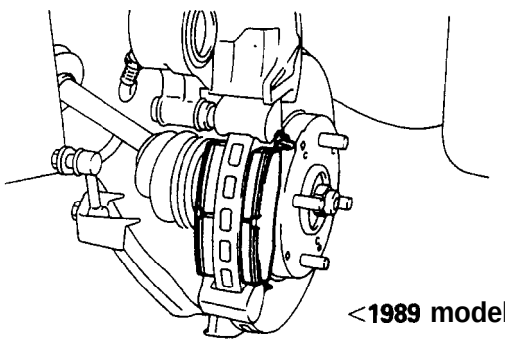
   Caution
   1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
   2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin sleeve and guide pin sleeve.**



14A0020

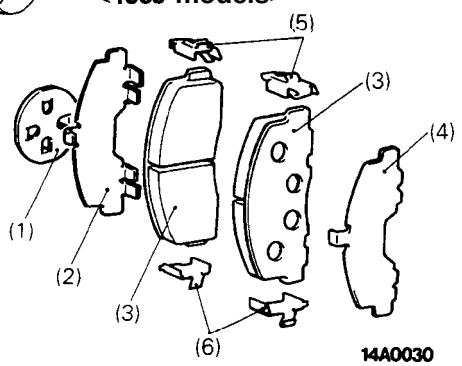
2. Remove lock pin. Lift caliper assembly and retain with wires.

   Caution
   Do not wipe off the special grease that is on the lock pin or allow it to contaminate the lock pin.


14A0023

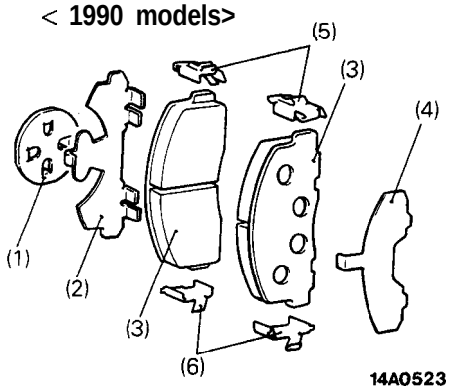
3. Remove the following parts from caliper support.
   (1) Shim holder
   (2) Inner shim
   (3) Pad assembly
   (4) Outer shim
   (5) Pad clips B
   (6) Pad clips C

<1989 models>

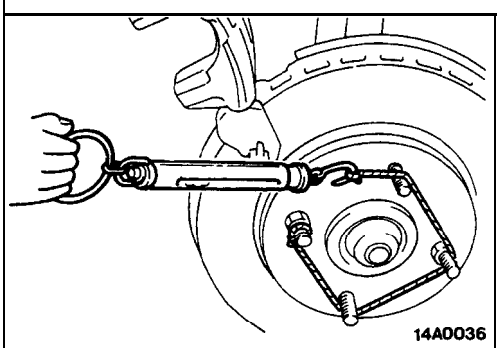


14A0030

< 1990 models>



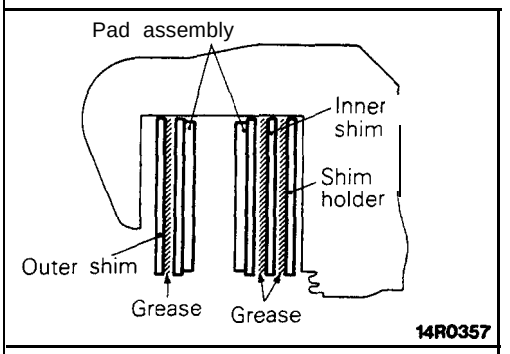
14A0523

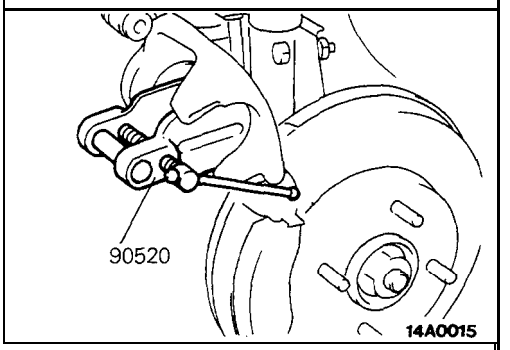

14A0036

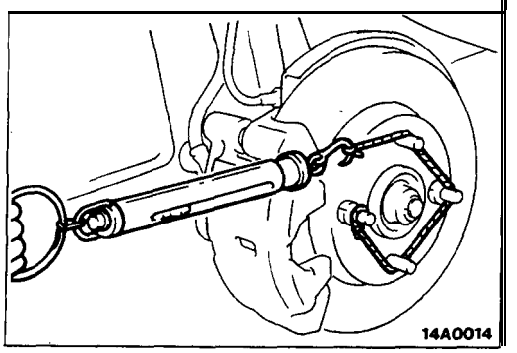
4. Measure hub torque with pad removed to measure brake drag torque after pad installation.

   NOTE
   Tighten the nuts in order to secure the disc to the hub.

TSB Revision







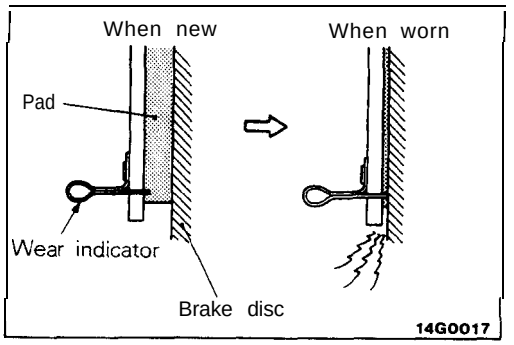
5. Securely attach the pad clip to the caliper support.
6. Apply a coating of the specified grease to the pad, shim and shim holder installation surfaces, and then install the shim and shim holder.
   Apply the grease so that the grease doesn't ooze out from the edges.

   Specified grease: Brake grease SAE J310, NLGI No. 1

   Caution
   Do not deposit grease or other dirt on pad or brake disc friction surfaces.
7. Be careful that the piston boot does not become caught, when lowering the caliper assembly and install the lock pin.
8. Check brake drag torque as follows.
   (1) Start engine and hold brake pedal down for 5 seconds.
   (2) Stop engine.
   (3) Turn brake disc forward 10 times.
   (4) Check brake drag torque with spring scale.

   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 sleeve and guide pin sleeve.

   Standard value: 70 N (15.4 lbs.) or less [4 Nm (3 ft.lbs.)] or less



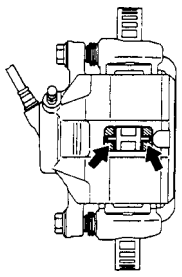
FRONT DISC BRAKE PAD CHECK AND REPLACEMENT <From 1990.5 models> M35FQAH

NOTE

The brake pads have been equipped with wear indicators, so that when the brake pad thickness reached 2 mm (.08 in.), the wear indicator touches the brake discs and produces a warning squeaking sound.

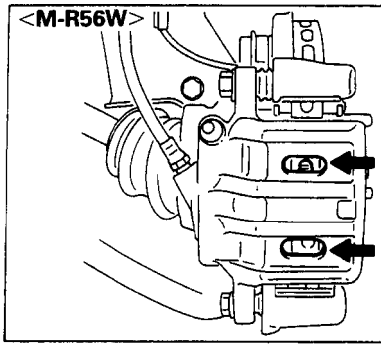
TSB Revision

<M-R44V, M-R46V>



14A0563

<M-R56W>



14L0290

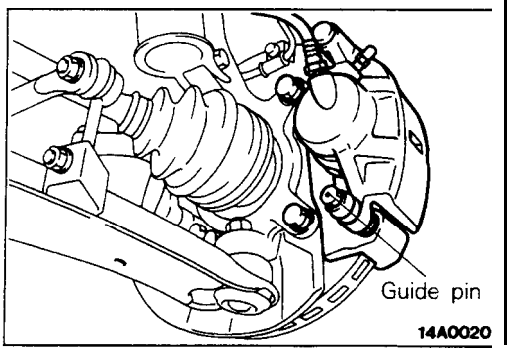
1. Check brake pad thickness through caliper body check port.

Limit: 2.0 mm (.08 in.)

Caution

1. When the limit is exceeded, replace the pads on 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.

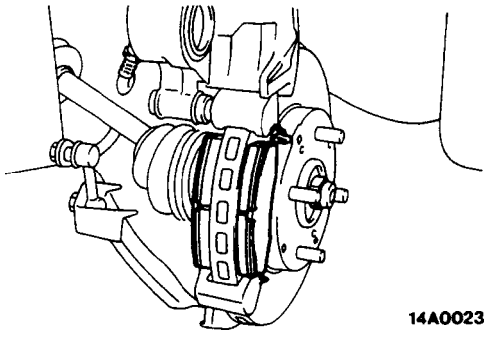


14A0020

2. Remove guide pin. Lift caliper assembly and retain with wire.

Caution

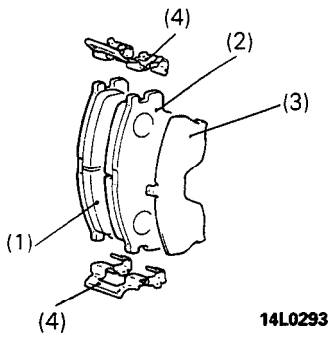
Do not wipe off the special grease that is on the guide pin or allow it to contaminate the guide pin.



14A0023

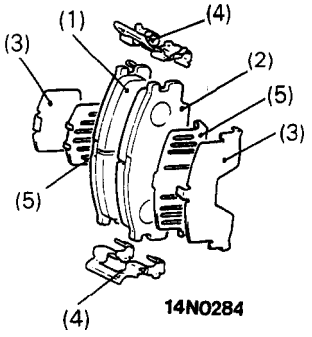
3. Remove the following parts from caliper support.

<One-shim type>



14L0293

<Four-shim type>



14N0284

(1) Pad and wear indicator assembly
(2) Pad assembly
(3) Outer shim
(4) Pad clips
(5) Inner shim

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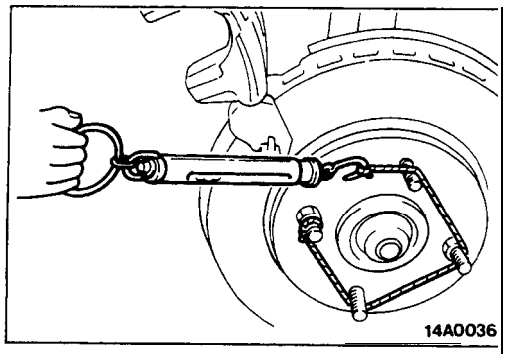
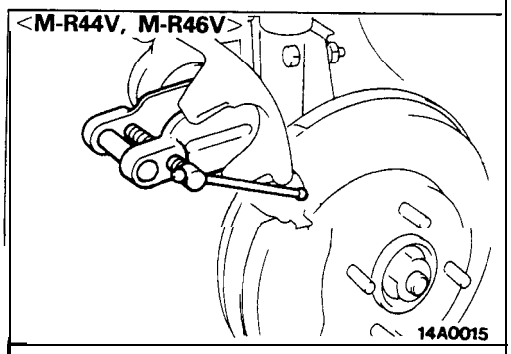


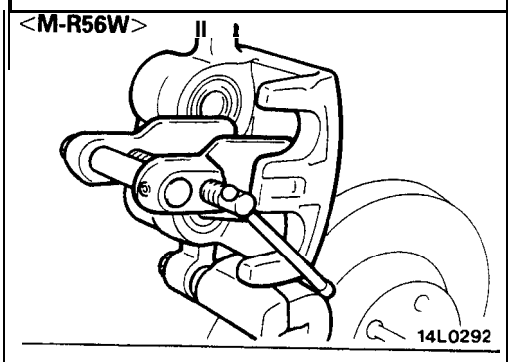
4. With the pad removed, use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.

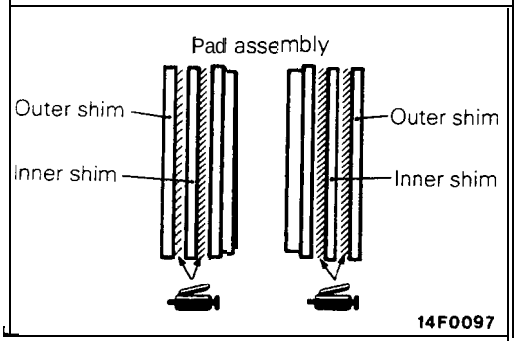
NOTE
Tighten the nuts in order to secure the disc to the hub.

5. Securely attach the pad clip to the caliper support.



6. Clean piston and insert into cylinder with tool.
7. Be careful that the piston boot does not become caught, when lowering the caliper assembly and install the guide pin.

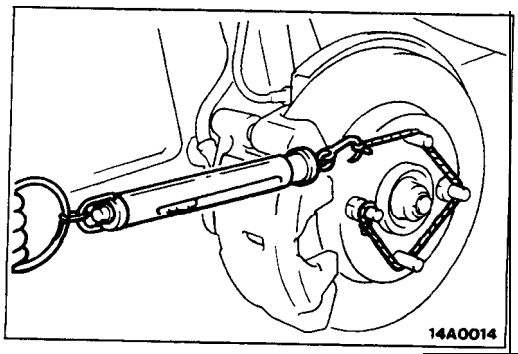




8. Apply repair kit grease to both sides of the inner shims.

Specified grease: Brake grease SAE J310, NLGI No.1

Caution
1. Make sure that the friction surfaces of pads and **brake discs and free of grease and other contaminants.**
2. The grease should never squeeze out from around the shim.



9. Check the disc brake drag force as follows.
   (1) Start the engine, and after depressing the brake pedal hard two or three times, stop the engine.
   (2) Turn brake disc forward 10 times.
   (3) Use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.

(4) Calculate the drag torque of the disc brake (difference between measured values in 3 and 4).

Standard value: 70 N (15.4 lbs.) or less

10. If the disc brake drag force exceeds the standard value, disassemble piston and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.

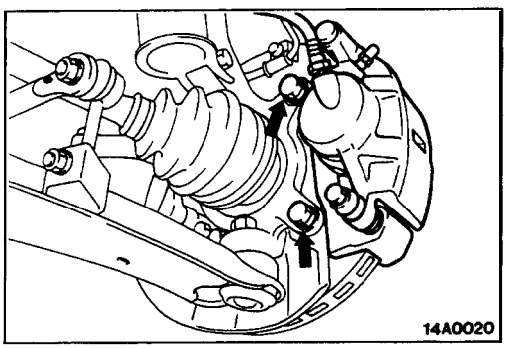
Front Disc Brake Rotor Inspection

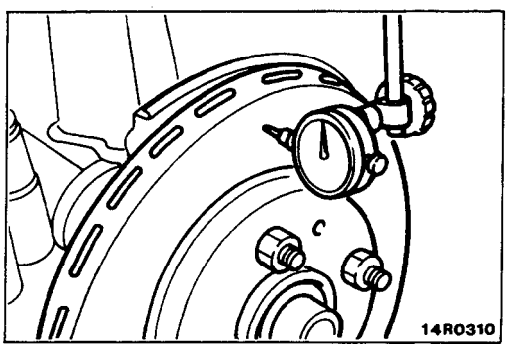
CAUTION

When servicing disc brakes, it is necessary to exercise caution to keep the disc brakes within the allowable service values in order to maintain normal brake operation.

Before re-finishing or re-processing the brake disc surface, the following conditions should be checked.

Inspection items	Remarks
Scratches, rust, saturated lining materials and wear	• If the vehicle is not driven for a certain period, the sections of the discs that are not in contact with lining will become rusty, causing noise and shuddering. • If grooves resulting from excessive disc wear and scratches are not removed prior to installing a new pad assembly, there will momentarily be inappropriate contact between the disc and the lining (pad).
Run-out or drift	Excessive run-out or drift of the discs will increase the pedal depression resistance due to piston knock-back.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Inset or warping (flatness)	Overheating and improper handling while servicing will cause inset or warping.





RUN-OUT CHECK M35FSAB

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 throughly and remove all rust.
3. Place a dial gauge approximately 5 mm (.2 in.) from the outer circumference of the brake disc, and measure the run-out of the disc.

Limit:

<Vehicles without A.B.S.>	
Up to 1991 models	**0.08 mm (.0031 in.)**
From 1992 models	**0.07 mm (.0028 in.)**
<Vehicles with A.B.S.>	
1989 models	**0.10 mm (.0039 in.)**
Up to 1991 models	**0.08 mm (.0031 in.)**
From 1992 models	**0.07 mm (.0028 in.)**

NOTE

Tighten the nuts in order to secure the disc to the hub.

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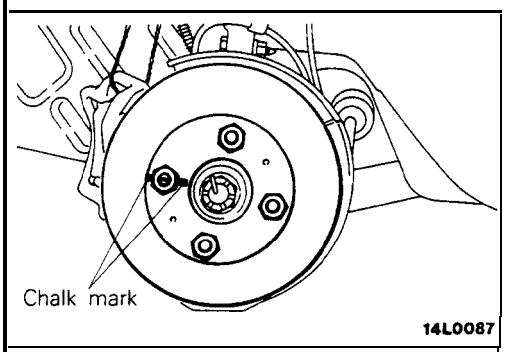
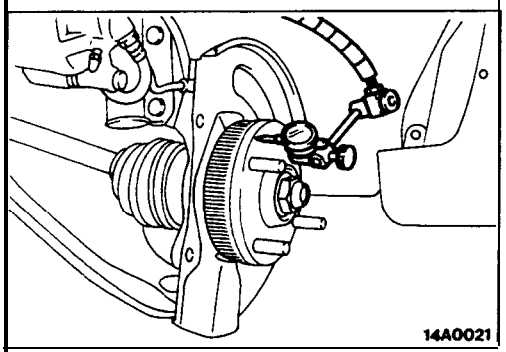


RUN-OUT CORRECTION

M35FTAB

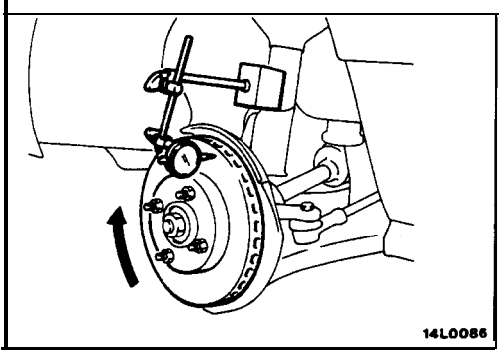
1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.
   (1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.



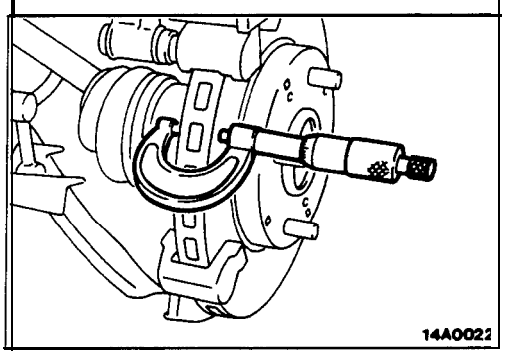
   (2) Remove the brake disc, and then place a dial gauge as shown in the illustration; then move the hub in the axial direction and measure the play.

   Limit: 0.2 mm (.008 in.)

   If the play is equivalent to or exceeds the limit, disassemble the hub knuckle and check each part.



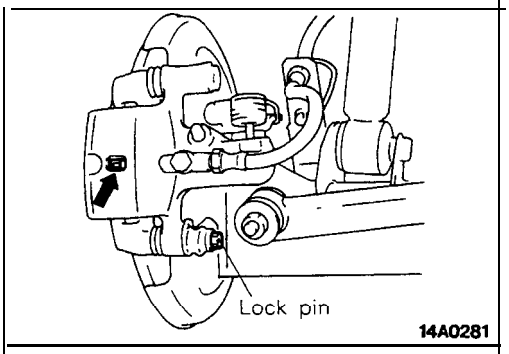
   (3) If the play does not exceed the limit specification, and then check the run-out of the brake disc once again. Mount the brake disc on the position dislocated from the chalk mark.
2. If the run-out cannot be corrected by changing the phase of the brake disc, replace the disc or turn rotor with on the car type brake lathe (MAD DL-8700PF or equivalent).

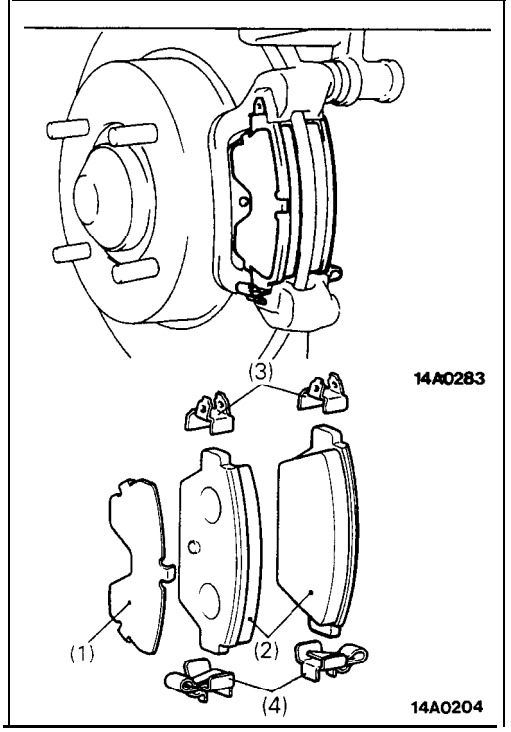


THICKNESS CHECK

1. Using a micrometer, measure disc thickness at eight positions, approximately 45" apart and 10 mm (.39 in.) in from the outer edge of the disc.

   Brake Disc Thickness
   Standard value: 24 mm (.94 in.)
   Limit: 22.4 mm (.882 in.)
   Thickness Variation (At least 8 position)
   The difference between any thickness measurements should not be more than 0.015 mm (.0006 in.).
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 disc or turn rotor with on the car type brake lathe (MAD, DL-8700PF or equivalent).





REAR DISC BRAKE PAD CHECK AND REPLACEMENT

M35FUAE

1. Check brake pad thickness through caliper body check port.

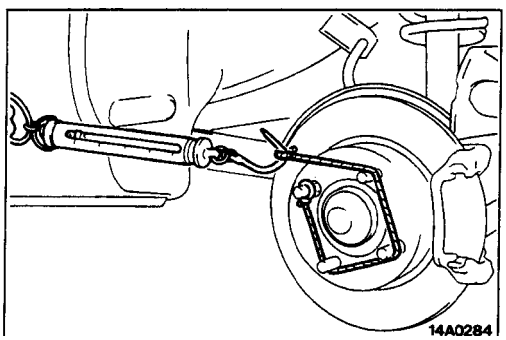
   Limit: 2.0 mm (.08 in.)

   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. Loosen the parking brake cable (from the vehicle interior), and disconnect the parking brake end installed to the rear brake assembly.
3. Remove lock pin. Lift caliper assembly and retain with wires.

   Caution
   Do not wipe off the special grease that is on the lock pin or allow it to contaminate the lock pin.

   Remove the following parts from caliper support.
   (1) Outer shim
   (2) Pad assembly
   (3) Pad clips C
   (4) Pad clips B



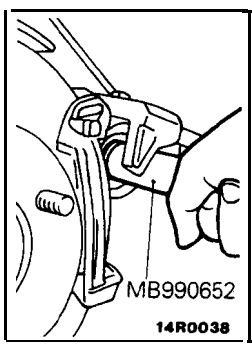
4. Measure hub torque with pad removed to measure brake drag torque after pad installation.

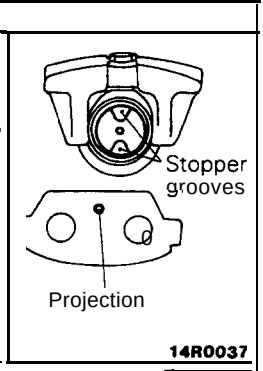
   N O T E
   To secure the disc to the hub, tighten the nuts.

5. Securely attach the pad clip to the caliper support.

   Caution
   Do not deposit grease or other dirt on pad or brake disc friction surfaces.

6. Clean the piston; then use the special tool to thread the piston into the cylinder.
   Be sure, at this time, that the stopper groove of the piston, correctly fits to the projection on the pad's rear surface.
7. Be careful that the piston boot does not become caught, when lowering the caliper assembly and install the lock pin.
   With the engine running, forcefully depress the brake pedal five or six times, and then check whether or not the stroke of the parking brake lever is within the standard value.
   If there is a deviation from the standard value, adjust the stroke of the parking brake lever.
   (Refer to GROUP 36–Service Adjustment Procedures.)





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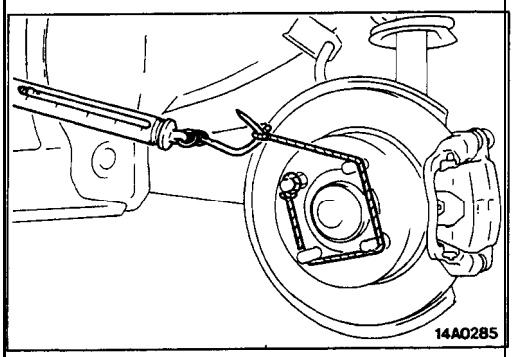
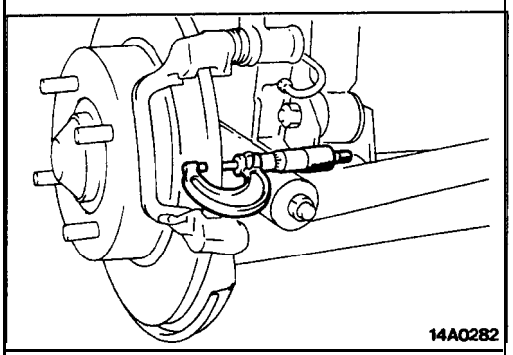


8. Check brake drag torque as follows.
   (1) Start engine and hold brake pedal down for 5 seconds.
   (2) Stop engine.
   (3) Turn brake disc forward 10 times.
   (4) Check brake drag torque with spring scale.

   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 sleeve and guide pin sleeve.

   Standard value: 70 N (15.4 lbs.) or less [4 Nm (3 ft.lbs.)] or less

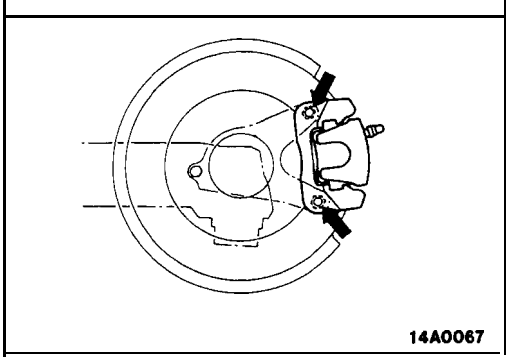


REAR BRAKE DISC THICKNESS CHECK M35FVAB

1. Remove dirt and rust from brake disc surface.
2. Measure disc thickness at 4 locations or more.

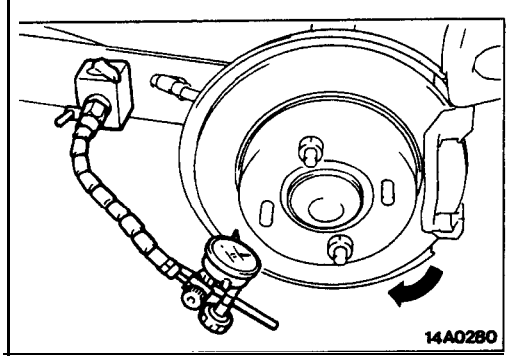
   Limit: 8.4 mm (.331 in.)

   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 M35FWAB

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 (.2 in.) from the outer circumference of the brake disc, and measure the run-out of the disc.

   Limit: 0.08 mm (.0031 in.)

   NOTE
   To secure the disc to the hub, tighten the nuts.

REAR BRAKE DISC RUN-OUT CORRECTION M35FXAA

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. (Refer to P.35-64.)

2. If the problem cannot be corrected by changing the phase of the brake disc, replace the disc.

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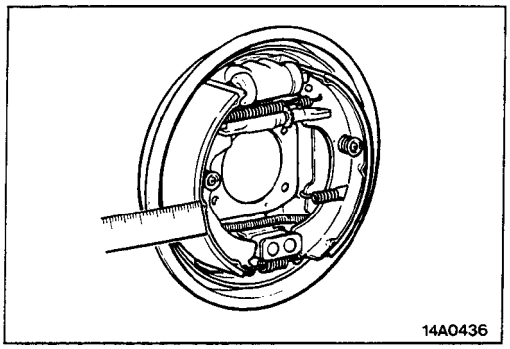


BRAKE LINING THICKNESS CHECK M35FIAA

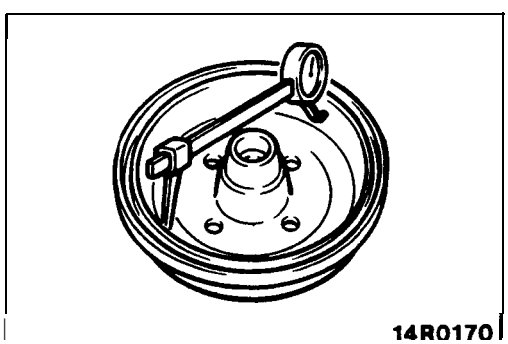
1. Remove the brake drum.
2. Measure the wear of the brake lining at the place worn the most.

Limit: 1.0 mm (.04 in.)

Replace the shoe and lining assembly if brake lining thickness is less than the limit and/or if it is not worn evenly. For information concerning the procedures for installation of the shoe and lining assembly, refer to P.35-108.

Caution

1. **Whenever the shoe and lining assembly is replaced, replace both RH and LH assemblies as a set to prevent car from pulling to one side when braking.**
2. **If there is a significant difference in the. thicknesses of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.**

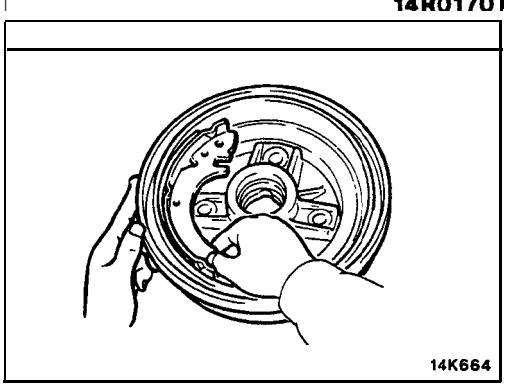


BRAKE DRUM INSIDE DIAMETER CHECK M35FJAA

Remove the brake drum.
Measure the inside diameter of the hub and drum at two or more locations.

Limit: 205 mm (8.1 in.)

Replace brake drums and shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.



BRAKE LINING AND BRAKE DRUM CONNECTION CHECK M35FPAA

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P.35-108.)
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.
   For information concerning the procedures for installation of the shoe and lining assembly, refer to P.35-108.

   NOTE
   Clean off chalk after check.

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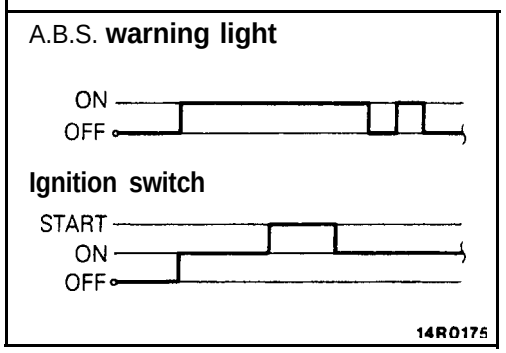


ANTI-LOCK BRAKING SYSTEM (A.B.S.) CHECK (CHECKING BY THE A.B.S. WARNING LIGHT) <Up to 1991 models> M35F0AK

By following the procedures described below, check whether the system is good or not by checking the illumination and non-illumination of the A.B.S. warning light.

(1) Check to be sure that the A.B.S. warning light illuminates when the ignition key is turned to the ON position, and that it again illuminates two times during a short period of time (approximately 0.5 second) after the engine is started, and that it then stops illumination.

(2) After checking that the A.B.S. warning light does not illuminate during a period of approximately 2 minutes while the engine is left idling, test drive at a vehicle speed of approximately 30 km/h (18.6 mph) or more for about 30 seconds or longer and check that the A.B.S. warning light does not illuminate during that time.

(3) If any abnormal condition is discovered during steps (1) and (2) above, check the system by following the anti-skid brake system troubleshooting procedures.

Caution
Before checking the anti-lock braking system by the A.B.S. warning light as described above, first check the ordinary brake system that there are no problems such as leakage of the brake fluid, incorrect connections of the brake tubes, etc.

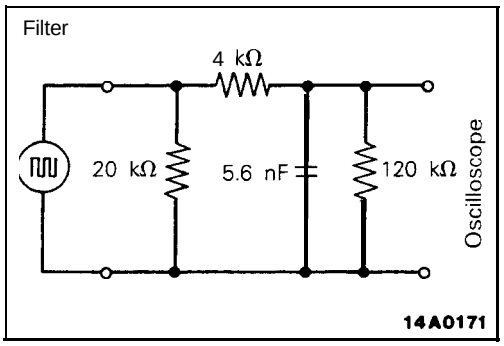
WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK <Up to 1991 models> M35F0AB

(1) Jack up the vehicle and release the parking brake.

(2) Disconnect the electronic control unit harness connector, and measure the speed sensor output voltage at the vehicle side harness connector.

(3) Rotate the wheel to be measured at a speed of about one-half to one rotation per second and while doing so measure the speed sensor output voltage by using a voltmeter or oscilloscope.

(4) If an oscilloscope is used, use the filter shown in the figure at the left.



Speed sensor	E.C.U. terminal No.		Standard value
	FWD	AWD	
Front left	5–4	22–4	50 mV or more
Front right	23-21	23-21	
Rear right	24-26	24-26	
Rear left	7-9	8–9	

NOTE
1. A voltmeter with AC mV range indication should be used for measurement.
2. When disconnecting the adaptor from the body harness connector, attach a cord to the male connector and then pull to disconnect.

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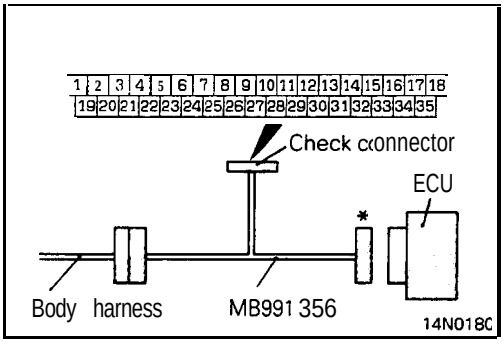
(5) The probable cause if the output voltage is 50 mV or lower, or if the one-side deflection width of the oscilloscope's waveform is 70 mV or lower

Probable causes	Remedy
Excessive clearance between the speed sensor pole piece and rotor	Adjust to the standard value.
Foreign material attached to the speed sensor pole piece	Remove the foreign material.
Damaged speed sensor pole piece	Replace the speed sensor.
Damaged rotor teeth	Replace the rotor.
Loose speed sensor or rotor installation bolt	Tighten to the specified torque.

NOTE
The speed sensor internal resistance and harness side are normal.

Caution
It is conceivable, because the movement of a speed-sensor cable "follows" the movement of the front or rear suspension, that the damaged wiring condition may be apparent only during travel on poor road surfaces, and may be normal on better road surfaces. Therefore, when measuring the output voltage of a speed sensor, recheck the condition of the cable connections by removing the clamp and pulling the cable and bending it near the clamp position in order to check for the existence of damaged wiring.



MEASUREMENT OF WHEEL SPEED SENSOR OUTPUT VOLTAGE <From 1991 models> M35F0AQ

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ECU harness connector and measure with the adapter harness (MB991 356) connected to the harness side connector.

Caution
1. Never insert a probe, etc. into the connector as it may result in poor contact later.
2. 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.

Terminal No. (same for AWD and FWD)			
FL	RR	FR	RL
4	24	21	8
5	26	23	9

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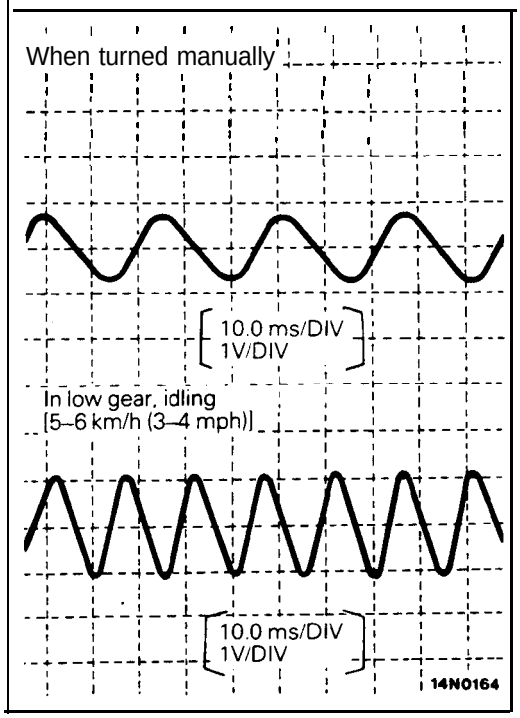


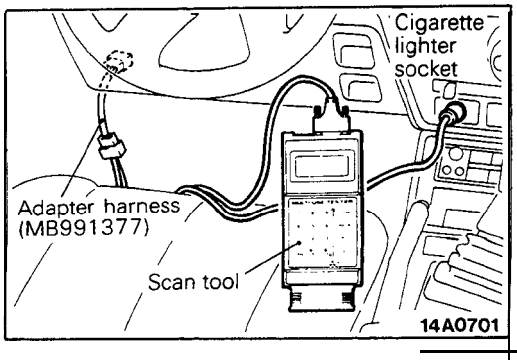
3. Manually turning the wheel to be measured by 1/2 to 1 turn/second, measure the output voltage with a circuit tester or oscilloscope.
   Output voltage:
   When measured with circuit tester: 70 mV or more
   When measured with oscilloscope (max. voltage): 100 mV or more
   Probable causes of low output voltage
   - Speed sensor pole piece-to-rotor clearance too large
   - Faulty speed sensor
4. Then, in order to observe the output state of the wheel speed sensors, shift into low gear (AWD vehicle) and drive the wheels, observe the output voltage waveform of each wheel speed sensor with an oscilloscope.
   In the case of the FWD vehicle, observe the waveform with an oscilloscope; for the front wheels, shift into low gear and drive the wheels; for the rear wheels, turn the wheels manually at a constant speed.

NOTE
1. Waveform may also be observed by actually driving the vehicle.
2. The output voltage is low when the wheel speed is low and increases as the wheel speed increases.

POINTS IN WAVEFORM MEASUREMENT

Symptom	Probable causes	Remedy
Too small or zero waveform amplitude	Faulty wheel speed sensor	Replace sensor
	Incorrect pole piece-to-rotor clearance	Adjust clearance
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.



INSPECTION OF HYDRAULIC UNIT

INSPECTION BY FEEL

(1) Jack up the vehicle and support the vehicle with rigid racks placed at the specified jack-up points.
(2) Release the parking brake and determine the drag force (drag torque) of each wheel by feel.
(3) Set the scan tool through the adapter harness (MB991 377) as illustrated.
(4) After confirming that the shift lever or selector lever is in the neutral position, start the engine.
   The ABS warning light lights up, it goes into the scan tool mode. In the scan tool mode, ABS does not function.

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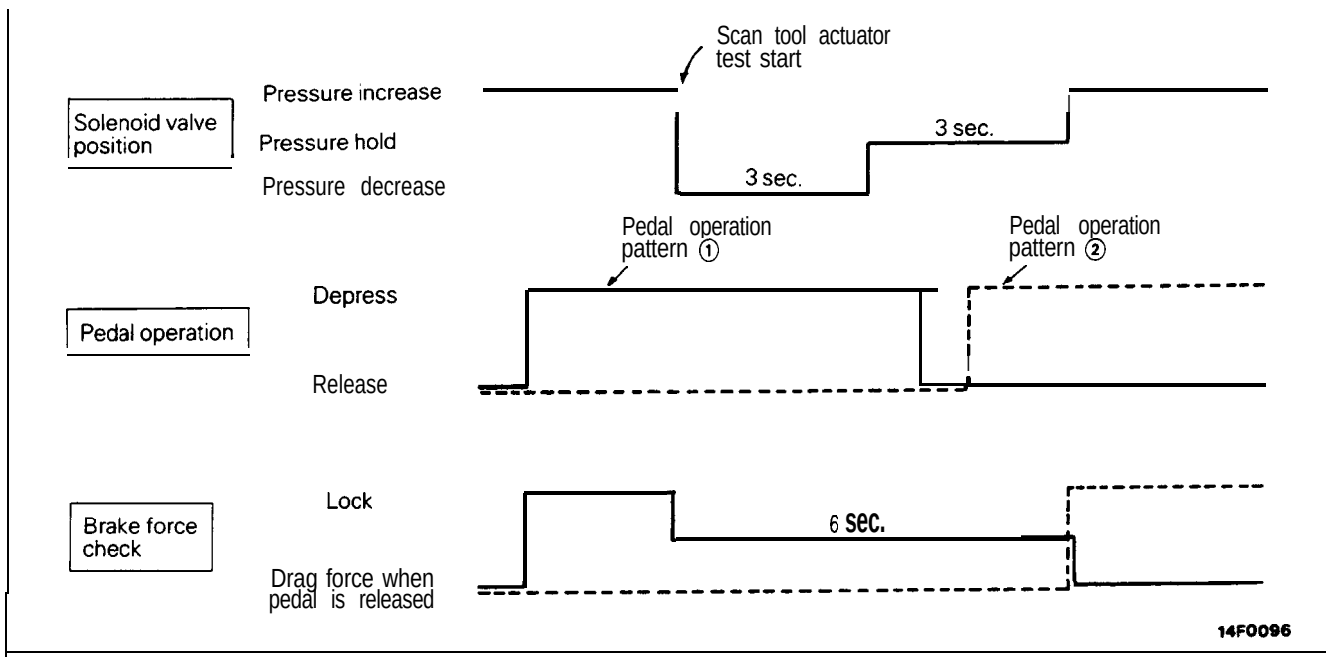
(5) Operate the scan tool to force the actuator to operate (item No.04, **05, 06).**

(6) Turning the wheel manually, check the change of the braking force when the brake pedal is depressed.
The change should be as shown in the following illustration.

NOTE
While the ABS is in the fail safe mode, the scan tool actuator test cannot be made.



(7) If any abnormality is found in the check, take corrective action according to the following "Judgement in Inspection by Feel" table:

Judgement in Inspection by Feel

No.	Scan tool display	Operation	Judgement		Probable cause	Remedy
			Normal	Abnormal		
04	FR VALVE M	(1) Depress brake pedal to lock wheel. (2) Using the scan tool, 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 •	FL VALVE M			Brake force is not released	Incorrect HU brake tube connection	Connect correctly
06"	Rear VALVE M*				HU solenoid valve not functioning correctly	Replace HU assembly

NOTE
• : FWD

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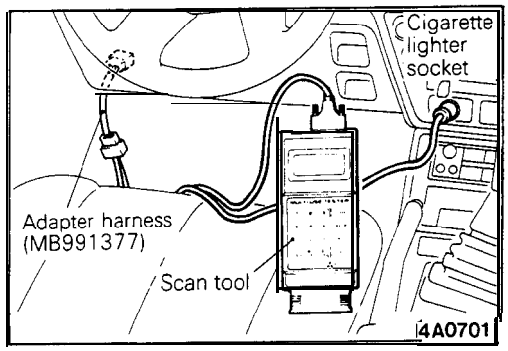
INSPECTION BY USING BRAKE FORCE TESTER

NOTE
(1) The brake force tester roller and tire must be dry during the test.
(2) When testing the front brakes, apply the parking brake and when testing the rear brakes, apply chocks to the front wheels to lock them.



(1) Place the front or rear wheels on the brake force tester roller.
(2) Set the scan tool through the adapter harness (MB991377) as illustrated.
(3) After confirming that the shift lever or selector lever is in the neutral position, start the engine.
(The ABS warning light lights up, it goes into the scan tool mode. In the scan tool mode, ABS does not function.)
(4) Operate the brake force tester roller.
(5) Depress the brake pedal until the brake force tester indicates the following value and keep the brake force at this level during the test.

Front wheels: 800 – 1,000N (176 – 220 lbs.)
Rear wheels: 600 – 800N (132 – 176 lbs.)

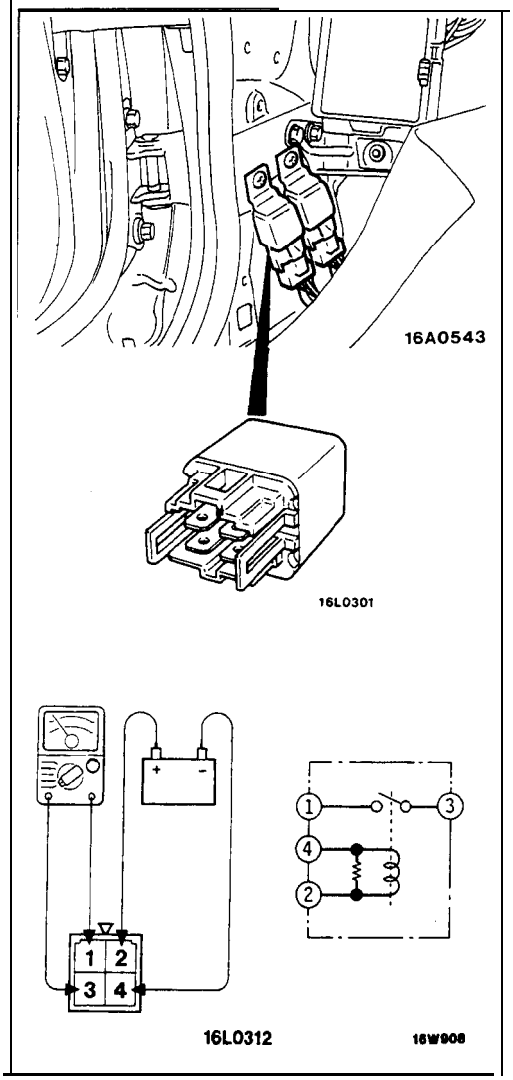
(6) Allow the brake tester indication to stabilize before operating the scan tool to perform actuator test (Item No.01, 02, 03). Then, read change of tester indication.
Referring to the following "Judgement in Inspection by Using Brake Force Tester" table, judge and take corrective action if necessary.

NOTE
While the ABS is in the fail safe mode, the scan tool actuator test cannot be made.

Judgement in Inspection by Using Brake Force Tester

No	Scan tool display	Operation	Judgement (reading of brake force tester)		Probable cause	Remedy
			Normal	Abnormal		
04	FR VALVE M	After brake force tester indication has stabilized, operate scan tool to force the actuator to operate and check the change in brake force.	(1) When the actuator is driven by scan tool, brake force changes as shown below. Front wheels: N (lbs.) 800 – 1,000 (176 – 220) Step 1 FWD: 150 – 350 (33 – 77) AWD: 350 – 550 (77 – 121) Step 2 (In approx. 6 s) 700 – 1,000 (154 – 220) Rear wheels: 600 – 800 (132 – 176) Step 1 FWD: 50 – 200 (11 – 44) AWD: 200 – 400 (44 – 88) Step 2 (In approx. 6 s) 600 – 800 (132 – 176)	Brake force in Step 1 shows very little or almost no decrease.	Incorrect HU brake tube connection	Connect correctly
					Faulty HU	Replace HU assembly
05	FL VALVE M					
				Brake force decreases in Step but in Step 2, it shows very little or almost no increase	Clogged brake line other than HU	Check and clean brake line
06	REAR VALVE M				Faulty HU	Replace HU assembly
			(2) Immediately after checking Step 2 value (in approx. 3 s), increasing brake pedal depression force does not increase brake force	Increasing brake pedal depression force increases brake force	Fluid leaking in HU (poor sealing)	Replace HU assembly

NOTE
(1) During forced drive using the scan tool, forced drive operation is stopped when any wheel speed reaches 10 km/h (6 mph)
(2) Failure to keep the brake pedal depression force constant can result in misjudgement.
Even if the judgement has resulted in NG, it might be that the depression force was not kept constant Therefore, repeat the same check again as necessary.
(3) The probable causes given above all assume that all the other brake parts are normal



A.B.S. POWER RELAY CHECK M35FOAD

(1) Remove the A.B.S. power relay from the left cowl side trim.

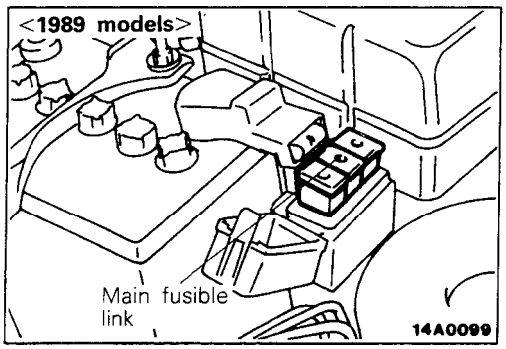
(2) Connect battery to terminal 2 and check continuity between terminals with terminal 4 grounded.

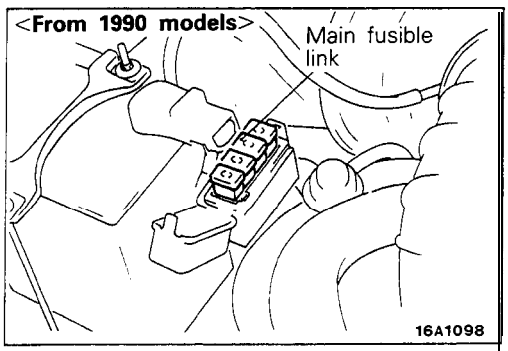
Power is supplied	1–3 terminals	Continuity
Power is not supplied	1–3 terminals	No continuity
	2–4 terminals	Continuity

DELAY VALVE CHECK <FWD-A.B.S.: Up to 1991 models> M35FOAE

In the same way as for other hydraulic circuits, the delay valve has little effect upon the operation of the A.B.S. unless dirt, etc. get into the oil passage and clog it. Moreover, there are almost no malfunctions other than clogging.
Consequently, a gauge is not used when checking the delay valve; a simple check is made as described below.

1) Loosen the bleeder for air beeding of the rear brakes, and then remove the brake fluid by following the method used for air bleeding. (Do this for the left and right wheels.)
2) If, after the brake fluid is removed, the force required to depress the brake pedal is more than that required for vehicles with ordinary brakes, the condition is normal.
3) If the brake fluid doesn't come out, remove the delay valve and check for clogging. If brake fluid comes out but the brake pedal depressing force doesn't feel "heavy", the delay valve is malfunctioning and must be replaced.



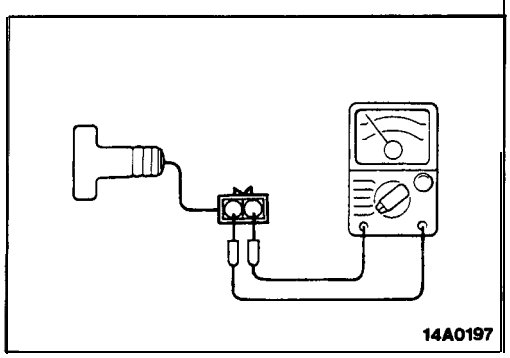


FLAT BATTERY REMEDY M35FOAF

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 A.B.S. 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 fuse for A.B.S. circuit, thus disabling A.B.S.

The A.B.S. warning light will illuminate when the main fusible link (for A.B.S.) is removed.

After the battery has sufficiently charged, install the main fusible link (for A.B.S.) and restart the engine; then check to be sure the A.B.S. warning light is not illuminated.



BRAKE FLUID PRESSURE SWITCH CHECK <AWD-A.B.S.: Up to 1991 models> M35FOAL

(1) Disconnect the hydraulic pressure switch connector.
(2) Check the continuity between the terminals of hydraulic pressure switch.

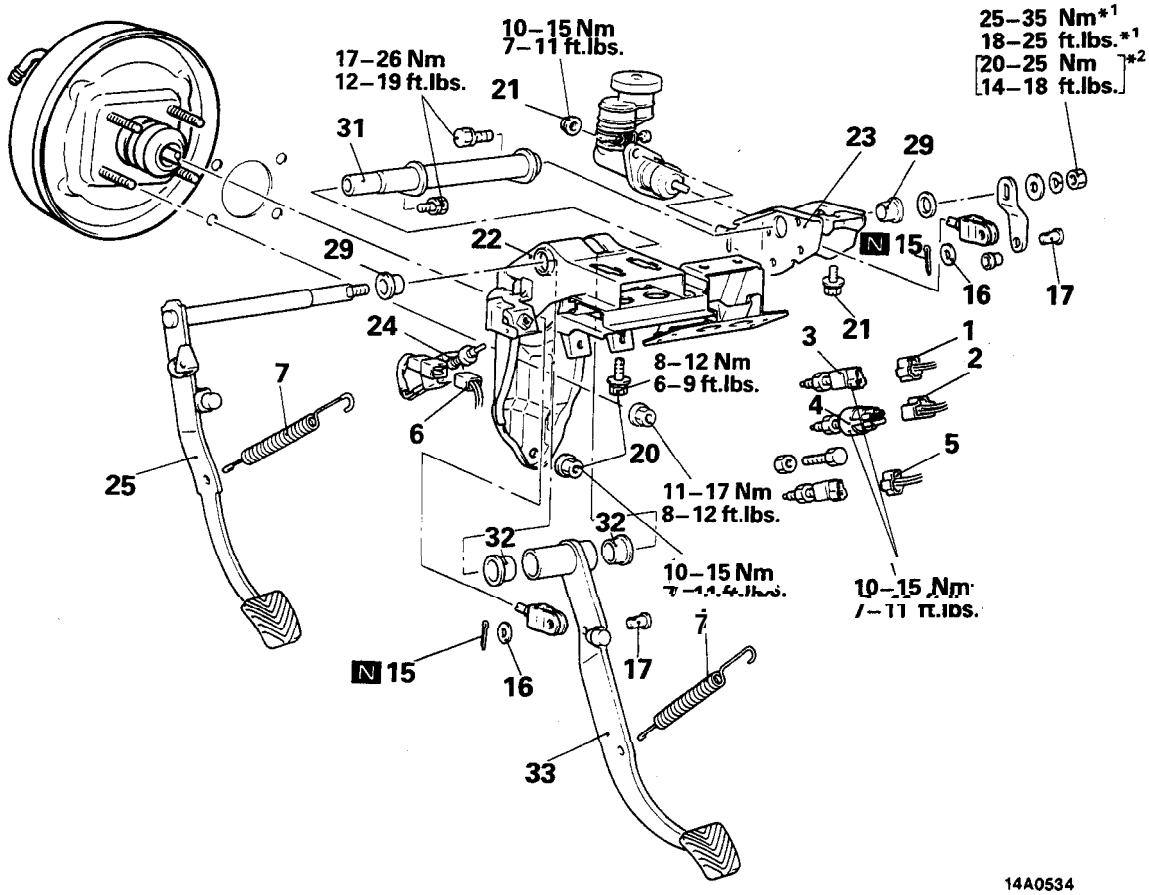
Condition	Between terminals
Brake pedal not depressed	No conductance
Brake pedal depressed lightly	No conductance
Brake pedal depressed strongly	Conductance

BRAKE PEDAL

M35GA--

REMOVAL AND INSTALLATION

<M/T (Non-Turbo)>



Removal steps

1. Stop light switch connector <Vehicles with auto-cruise control system>
2. Stop light switch connector <Vehicles without auto-cruise control system>
3. Stop light switch <Vehicles with auto-cruise control system>
4. Stop light switch <Vehicles without auto-cruise control system>
5. Clutch pedal position switch connector <Vehicles with auto-cruise control system>
6. Interlock switch connector
- ◆◆ 7. Return spring
15. Cotter pin
16. Washer
17. Clevis pin
20. Pedal support bracket installation bolt and nut
21. Clutch pedal bracket installation bolt and nut
22. Pedal support bracket
23. Clutch pedal bracket
24. Interlock switch
25. Clutch pedal
29. Bushing
31. Pedal rod
32. Bushing
33. Brake pedal

Pre-removal Operation
- Removal of Instrument Under Cover (Refer to GROUP 52–Instrument Panel.)
- Removal of Steering Column Assembly (Refer to GROUP 37A–Steering Wheel and Shaft.)

Post-installation Operation
- Installation of Steering Column Assembly (Refer to GROUP 37A–Steering Wheel and Shaft.)
- Installation of Instrument Under Cover (Refer to GROUP 52–Instrument Panel.)
- *Brake Pedal Adjustment (Refer to P.35-53.)

NOTE
*1: <1989 models>
*2: <From 1990 models>

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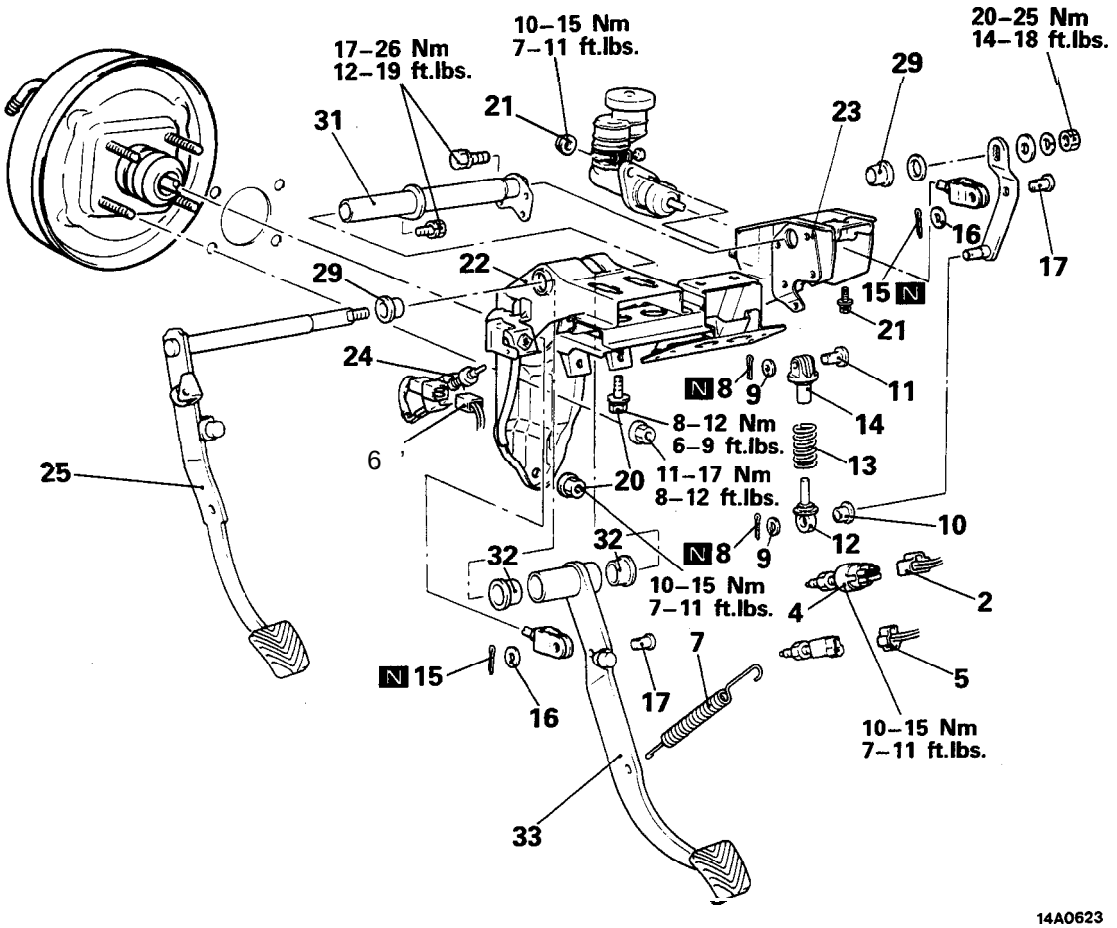
<M/T (Turbo)>



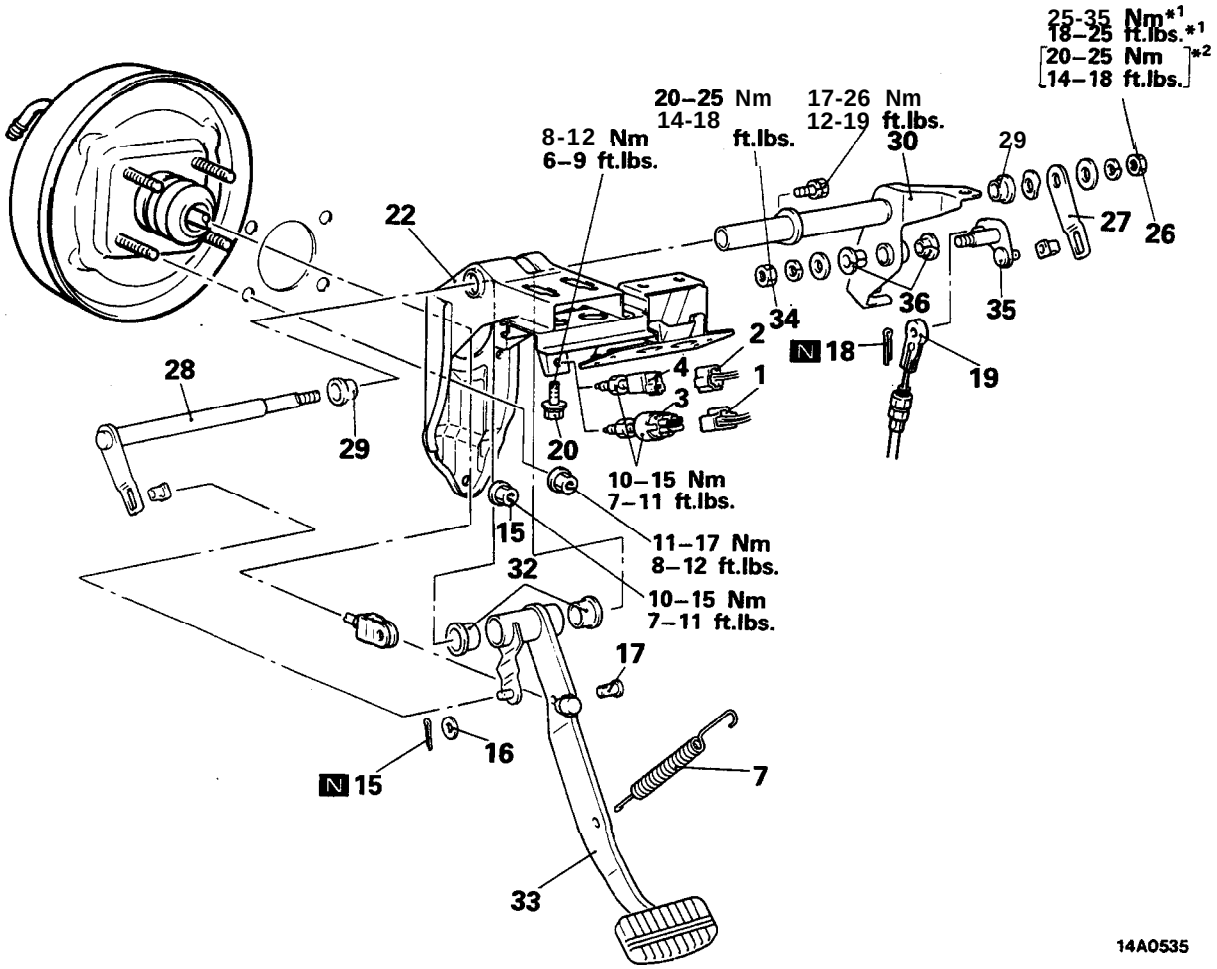
Removal steps
- 2. Stop light switch connector
- 4. Stop light switch
- 5. Clutch pedal position switch connector
- 6. Interlock switch connector
- ◆◆ 7. Return spring
- 8. Cotter pin
- 9. Washer
- 10. Busing
- 11. Clevis pin
- 12. Rod B
- 13. Turn over spring
- 14. Rod A
- 15. Cotter pin
- 16. Washer
- 17. Clevis pin
- 20. Pedal support bracket installation bolt and nut
- 21. Clutch pedal bracket installation bolt and nut
- 22. Pedal support bracket
- 23. Clutch pedal bracket
- 24. Interlock switch
- 25. Clutch pedal
- 29. Bushing
- 31. Pedal rod
- 32. Bushing
- 33. Brake pedal

Pre-removal Operation
- Removal of Instrument Under Cover (Refer to GROUP 52–Instrument Panel.)
- Removal of Steering Column, Assembly (Refer to GROUP 37A–Steering Wheel and Shaft.)

Post-installation Operation
- installation of Steering Column Assembly (Refer to GROUP 37A–Steering Wheel and Shaft.)
- Installation of Instrument Under Cover (Refer to GROUP 52–Instrument Panel.)
- Brake Pedal Adjustment (Refer to P.35-53.)

TSB **Revision**

<A/T>



Removal steps

1. Stop light switch connector <Vehicles with auto-cruise control system>
2. Stop light switch connector <Vehicles without auto-cruise control system>
3. Stop light switch <Vehicles with auto-cruise control system>
4. Stop light switch <Vehicles without auto-cruise control system>

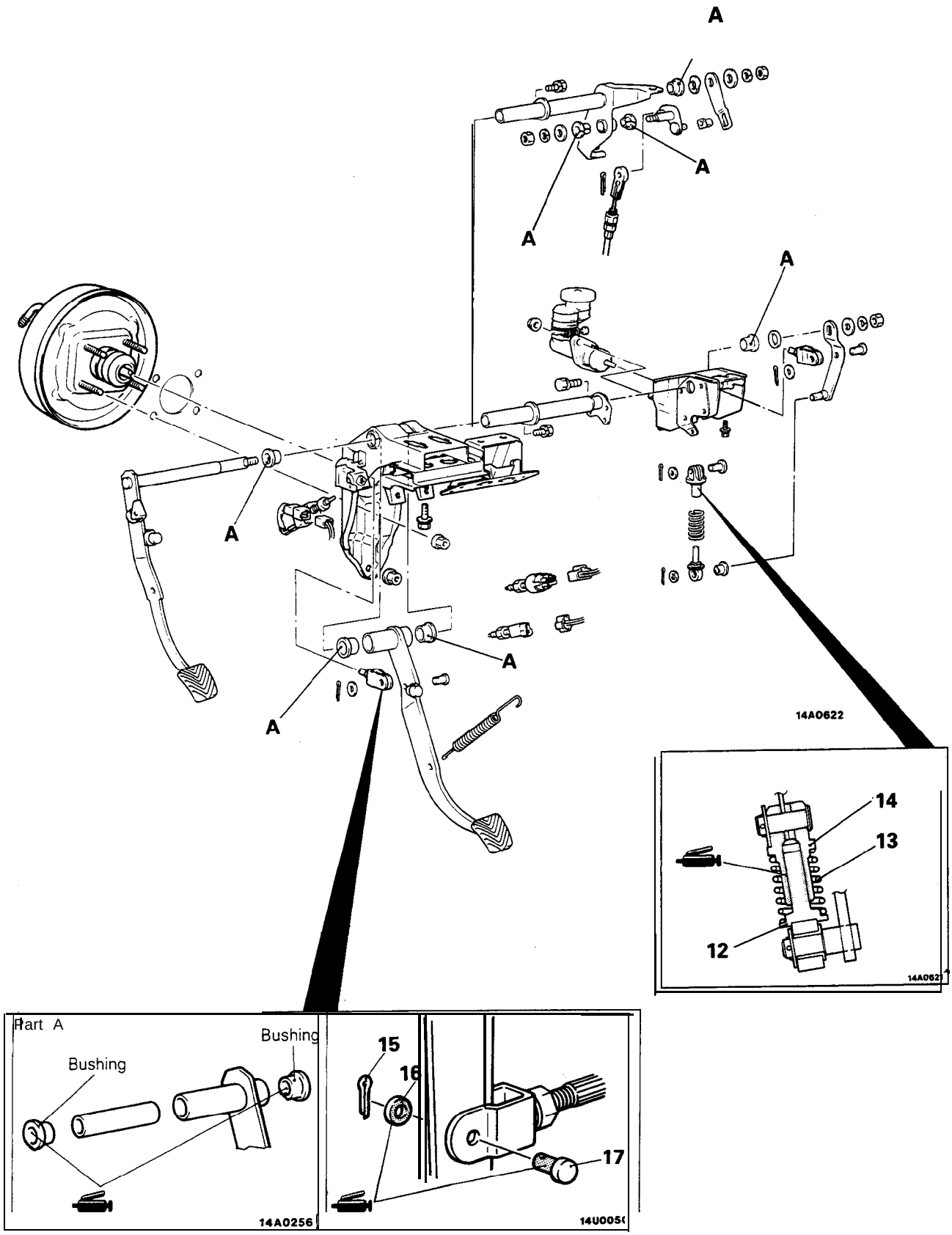
◆◆ 7. Return spring

15. Cotter pin
16. Washer
17. Clevis pin
18. Cotter pin
19. Shift lock cable connection
20. Pedal support bracket installation bolt and nut
22. Pedal support bracket
26. Lever assembly (A) mounting nut
27. Lever
28. Lever assembly (A)
29. Bushing
30. Pedal rod
32. Bushing
33. Brake pedal
34. Lever assembly (B) mounting nut
35. Lever assembly (B)
36. Bushing

NOTE
*1: <1989 models>
*2: <From 1990 models>

TSB Revision

Lubrication points



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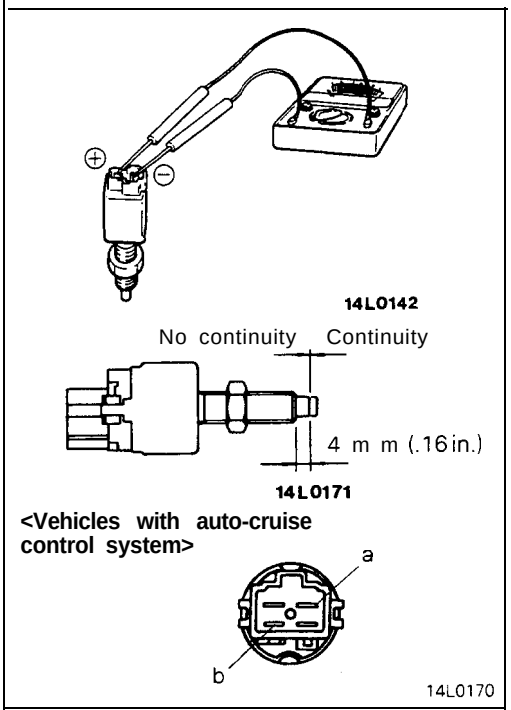
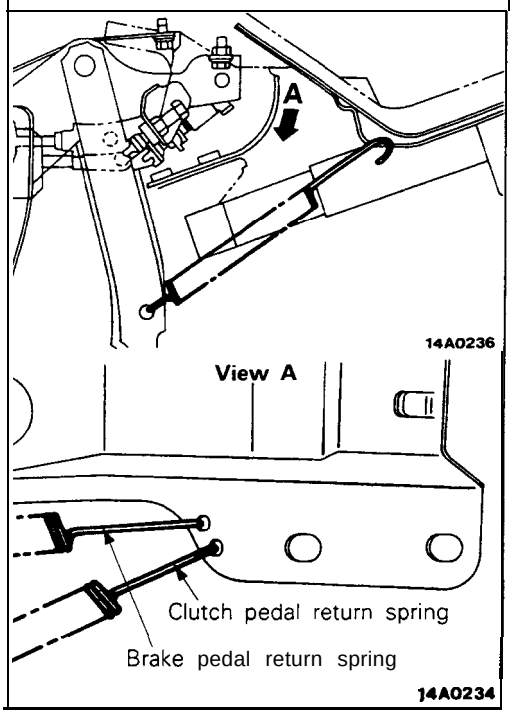


INSPECTION M35GCAJ

- Check the bushing for wear.
- Check the brake pedal for bend or twisting.
- Check the brake pedal return spring for damage.

STOP LIGHT SWITCH

Connect a circuit tester to the stop light switch, and check whether or not there is continuity when the plunger of the stop light switch is pushed in and when it is released.
The stop light switch is in good condition if there is no continuity when the plunger is pushed in to a depth of within 4 mm (.16 in.) from the outer case edge surface, and if there is continuity when it is released.
For vehicles with the auto-cruise control system, the check for continuity should be made at connectors “a” and “b” of the stop light switch.



SERVICE POINTS OF INSTALLATION M35GDBF

7. INSTALLATION OF RETURN SPRING

Install the return spring in the direction indicated in the illustration.

TSB Revision

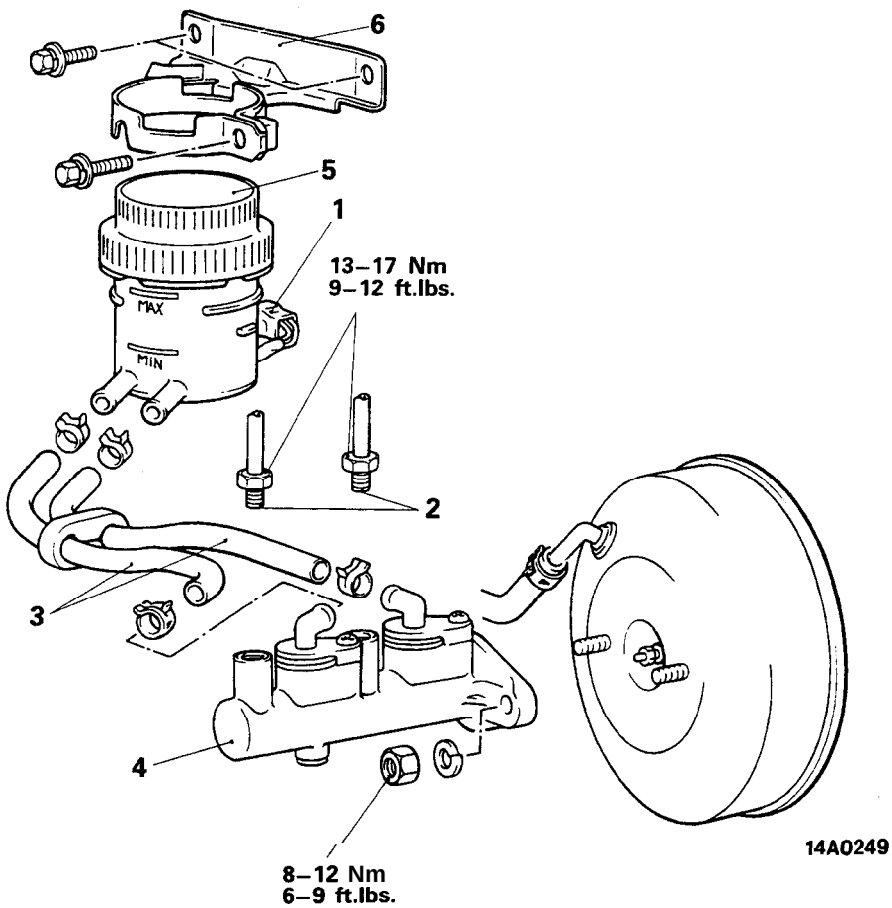
MASTER CYLINDER

M35IA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Supplying Brake Fluid
- *Bleeding (Refer to P.35-57.)
- @Adjustment of Brake Pedal (Refer to P.35-53.)

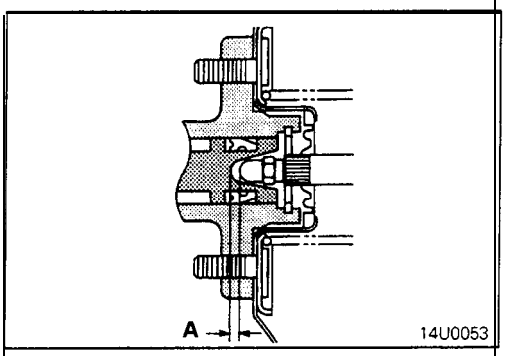


Removal steps

1. Fluid level sensor connector
2. Brake tubes
3. Reservoir hoses.
4. Master cylinder
5. Reservoir
6. Bracket

• Adjustment of clearance between brake booster push rod and primary piston

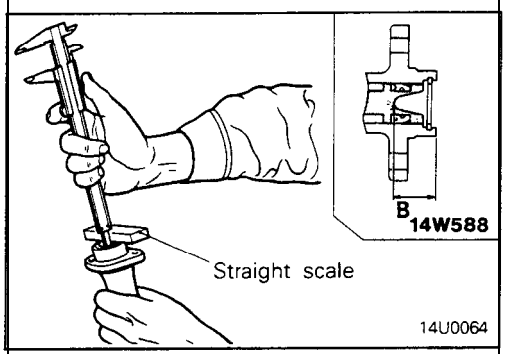
TSB Revision



SERVICE POINTS OF INSTALLATION M35IDAOa

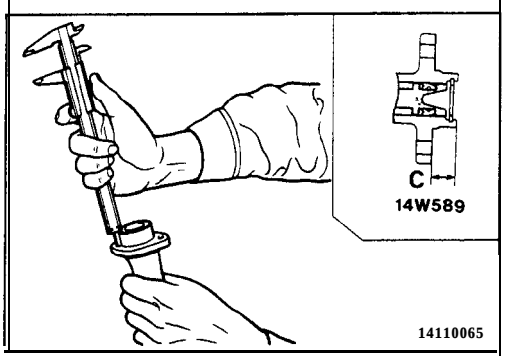
. ADJUSTMENT OF CLEARANCE BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

Adjust the clearance (A) between the brake booster push rod and primary piston as follows:

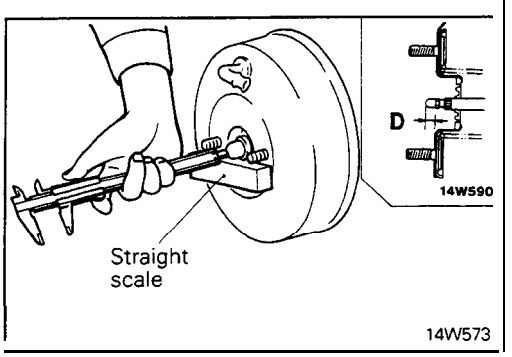


(1) Measure the dimension (B) between the master cylinder end face and piston.

NOTE
To obtain (B), first take measurement with a square placed on the master cylinder end face. Then, subtract the thickness of the square to arrive at (B).



(2) Obtain the dimension (C) between the brake booster mounting surface on the master cylinder and the end face.

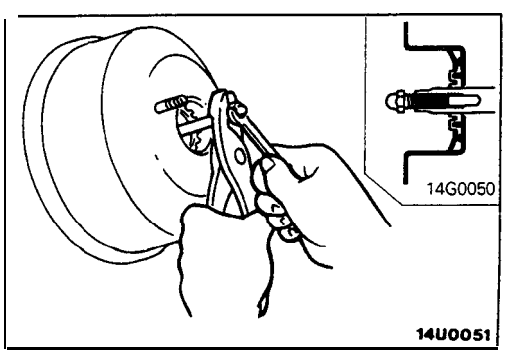


(3) Measure the dimension (D) between the master cylinder mounting surface on brake booster and the push rod end.

NOTE
To obtain (D), first take measurement with a square placed on the brake booster. Then, subtract the thickness of the square to arrive at (D).

(4) Using the measured values obtained in (1) through (3). obtain the clearance (A) between the brake booster push rod and primary piston.

Standard value: [A (A= B-C-D)]
9 inch brake booster
0.8–1.0 mm (.031–.039 in.)
7+8 inch brake booster
0.5–0.7 mm (.020–.028 in.)
8+9 inch brake booster
0.6–0.8 mm (.024–.031 in.)



(5) If the clearance is not within the standard value range, adjust by changing the push rod length by turning the adjustable end of the push rod.

Caution
Improper clearance may cause excessive brake drag.

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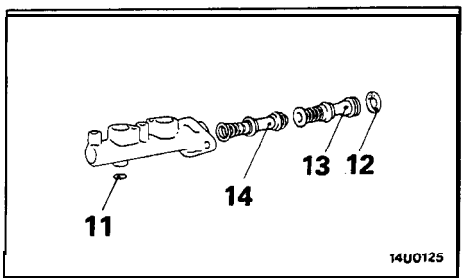
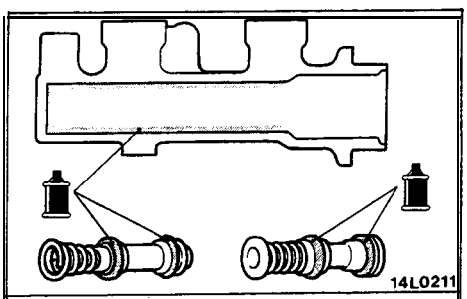
DISASSEMBLY AND REASSEMBLY

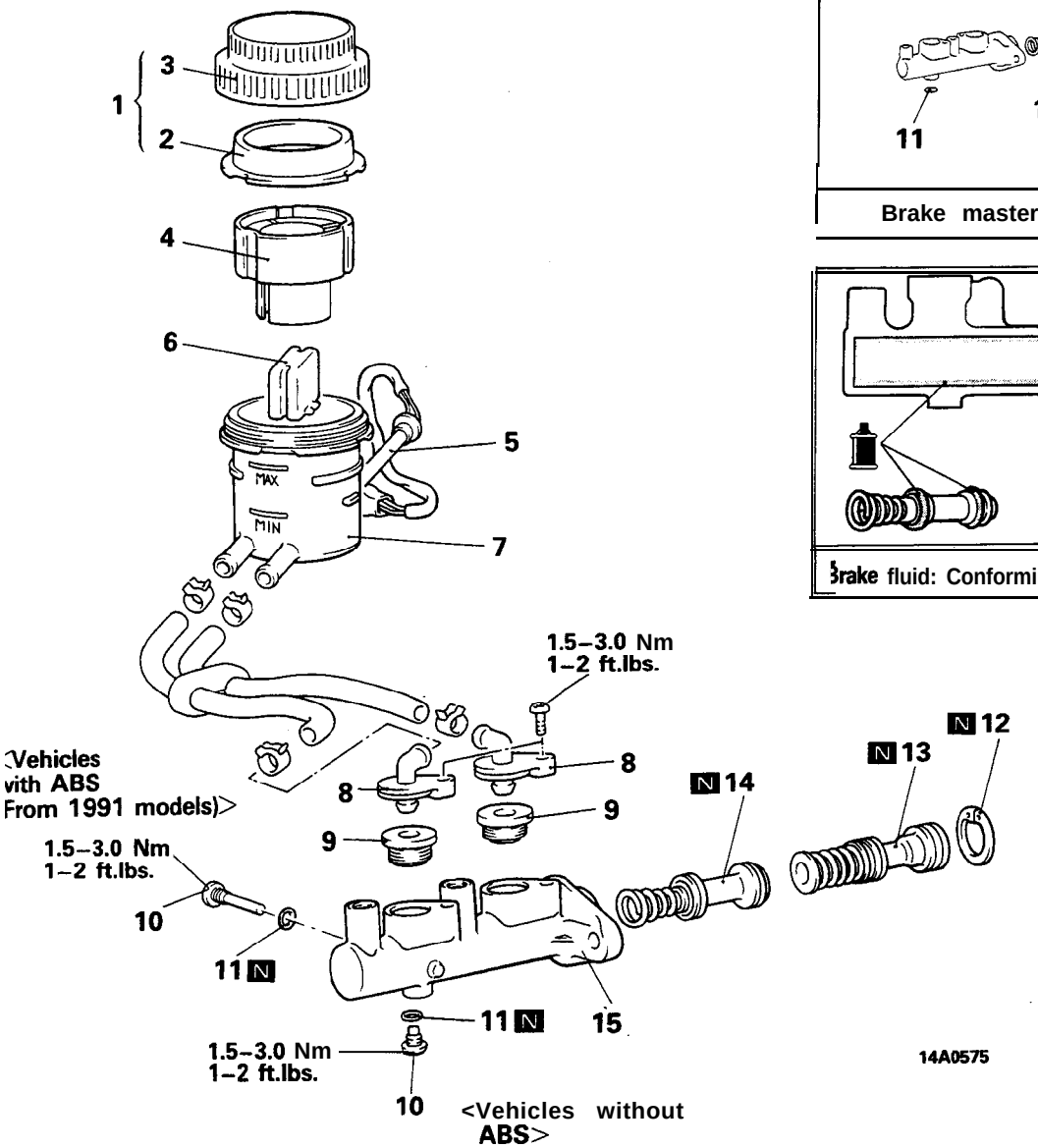
M35HA--



Brake master cylinder kit



Brake fluid: Conforming to DOT3 or DOT4



Disassembly steps

1. Reservoir cap assembly
2. Diaphragm
3. Reservoir cap
4. Filter
   <Vehicles with A.B.S.>
5. Brake fluid level sensor
6. Float
7. Reservoir
8. Nipples
9. Reservoir seals
10. Piston stopper bolt
11. Gasket
12. Piston stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body

Caution
Do not disassemble the primary and secondary piston assembly.

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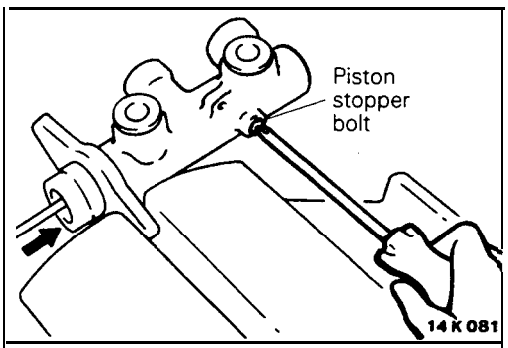
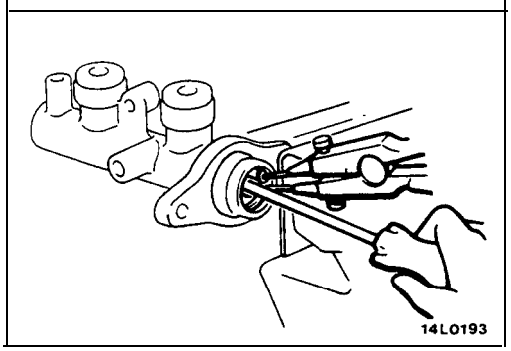




SERVICE POINTS OF DISASSEMBLY M35HBAAa

10. DISASSEMBLY OF PISTON STOPPER BOLT

Remove the piston stopper bolt, while depressing the piston.

12. DISASSEMBLY OF PISTON STOPPER RING

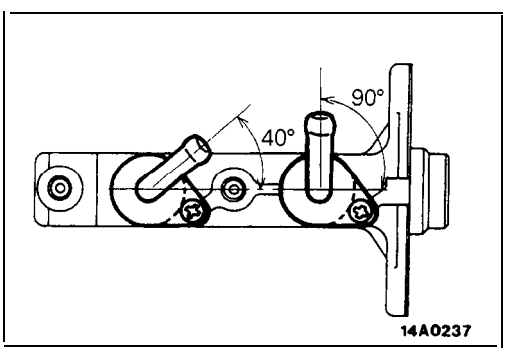
Remove the piston stopper ring, while depressing the piston.

14. DISASSEMBLY OF SECONDARY PISTON ASSEMBLY

NOTE
If it is hard to remove the secondary piston from the cylinder, gradually apply compressed air from the outlet port on the secondary end of the master cylinder.

INSPECTION M35HDAC

- 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.



SERVICE POINTS OF REASSEMBLY M35HCAK

8. INSTALLATION OF NIPPLE

Be sure that the primary side nipple and secondary side nipple are not mistaken one for the other when installed.

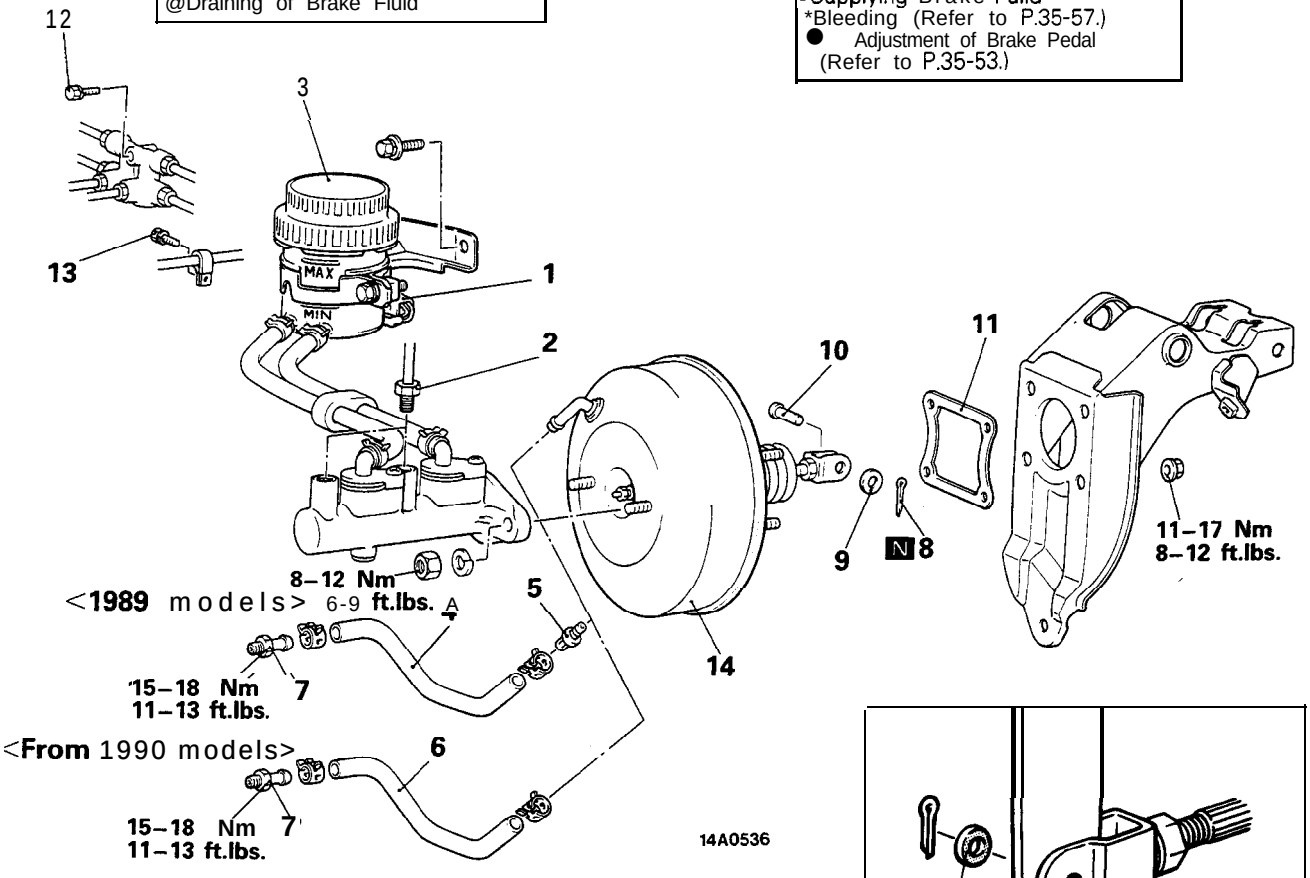
BRAKE BOOSTER

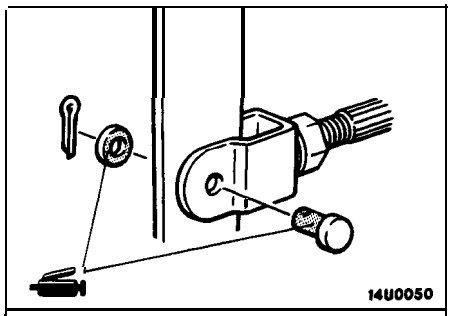
M35JA--

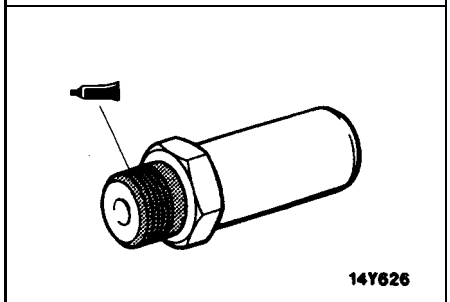
REMOVAL AND INSTALLATION

Pre-removal Operation
@Draining of Brake Fluid

Post-installation Operation
●Supplying Brake Fulid
*Bleeding (Refer to P.35-57.)
● Adjustment of Brake Pedal (Refer to P.35-53.)







Sealant: 3M ATD Part No.8663 or equivalent

Removal steps
1. Brake fluid level sensor connector
2. Brake tube
3. Master cylinder, hose, reservoir assembly
◆■● + 4. Vacuum hose
5. Check valve
◆■● + 6. Vacuum hose with check valve
7. Fitting
8. Cotter pin
9. Washer
10. Clevis pin
11. Sealer
12. Proportioning valve installation bolt
13. Brake tube (front left) installation bolt
◆■ 14. Brake booster

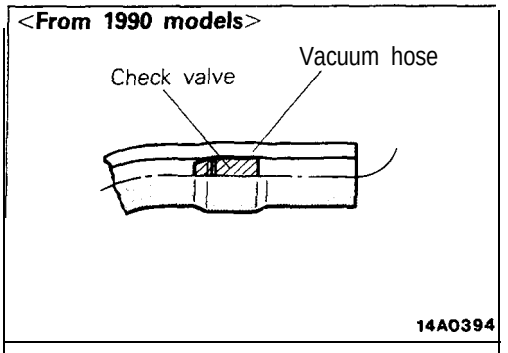
TSB Revision

SERVICE POINTS OF REMOVAL M35JBAK

4. REMOVAL OF VACUUM HOSE

To remove the vacuum hose from the brake booster, pull it straight upward.

Caution
Prying off the vacuum hose could damage the check valve installed in the brake booster.



6. REMOVAL OF VACUUM HOSE WITH CHECK VALVE

NOTE
Since the check valve is fit to the vacuum hose, replace the check valve as an assembly unit together with the vacuum hose if the check valve is defective.

14. REMOVAL OF BRAKE BOOSTER

Caution
Be careful not to damage the body or bend the air-conditioner's high-pressure hose.

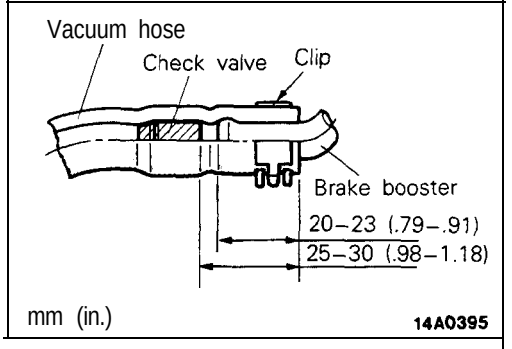
SERVICE POINTS OF INSTALLATION M35JDBB

6. INSTALLATION OF VACUUM HOSE WITH CHECK VALVE

(1) Attach the vacuum hose so that it may be inserted to a dimension illustrated.

Caution
Prevent interference between the check valve and brake booster.

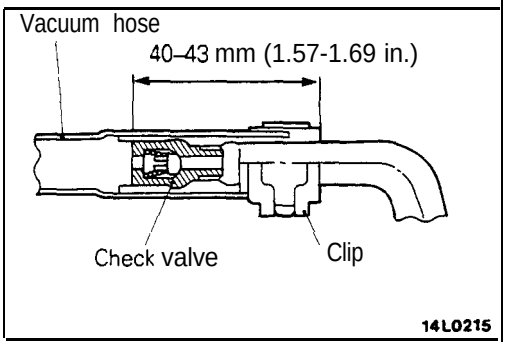
(2) The vacuum hose at the engine should be securely connected until it contacts the hexagonal edge of the fitting, and then should be secured by the hose clip.



4. CONNECTION OF VACUUM HOSE

(1) The vacuum hose at the brake booster should be connected for the distance shown in the illustration, and should be secured by the hose clip so that there is no contact with the check valve.

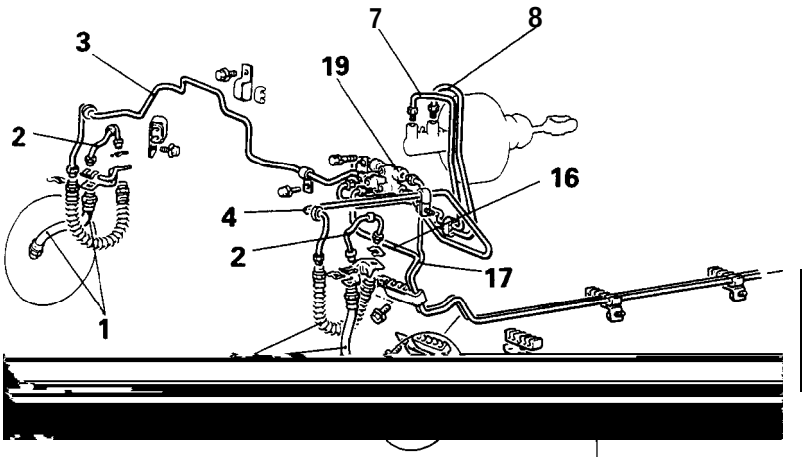
(2) The vacuum hose at the engine should be securely connected until it contacts the hexagonal edge of the fitting, and then should be secured by the hose clip.

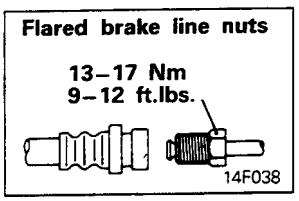


BRAKE LINE

REMOVAL AND INSTALLATION

Vehicles without A.B.S.

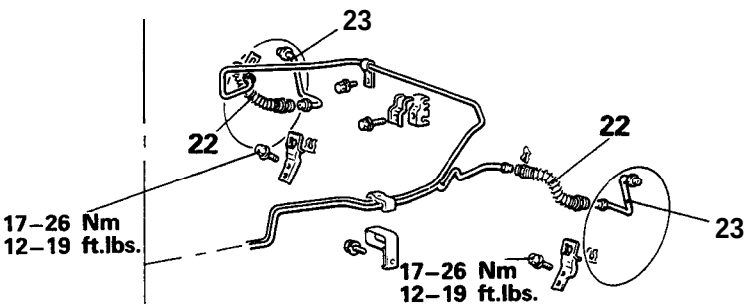




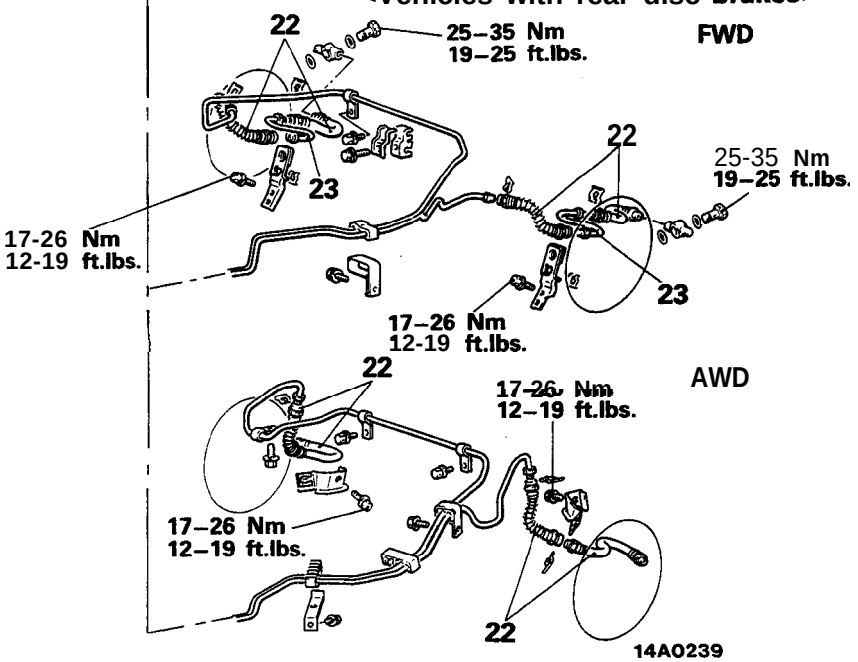
Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Supplying Brake Fluid
- Bleeding (Refer to P.35-57.)

<Vehicles with rear drum brakes>



<Vehicles with rear disc brakes>



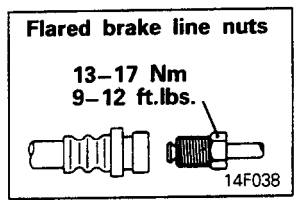
◆▶ ● 4 1. Front brake hose
2. Strut brake tube
3. Front brake tube (R.H.)
4. Front brake tube (L.H.)
7. Brake tube (A)
8. Brake tube(B)
16. Main brake tube (R.H.)
17. Main brake tube (L.H.)
◆▶ 19. Proportioning valve
◆▶ ● 22. Rear brake hose
23. Rear brake tube

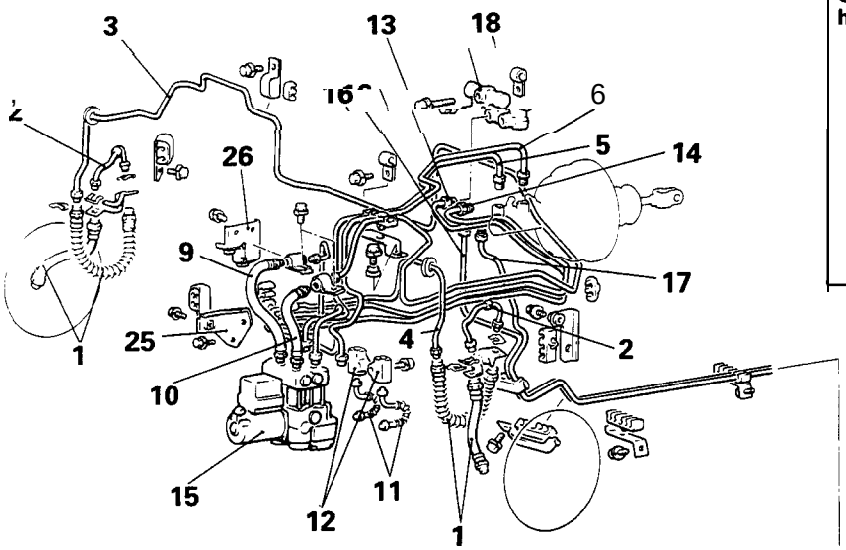
TSB Revision

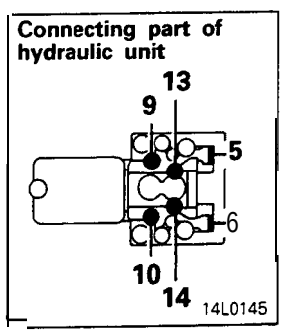
FWD-A.B.S. <Up to 1991 **models**>

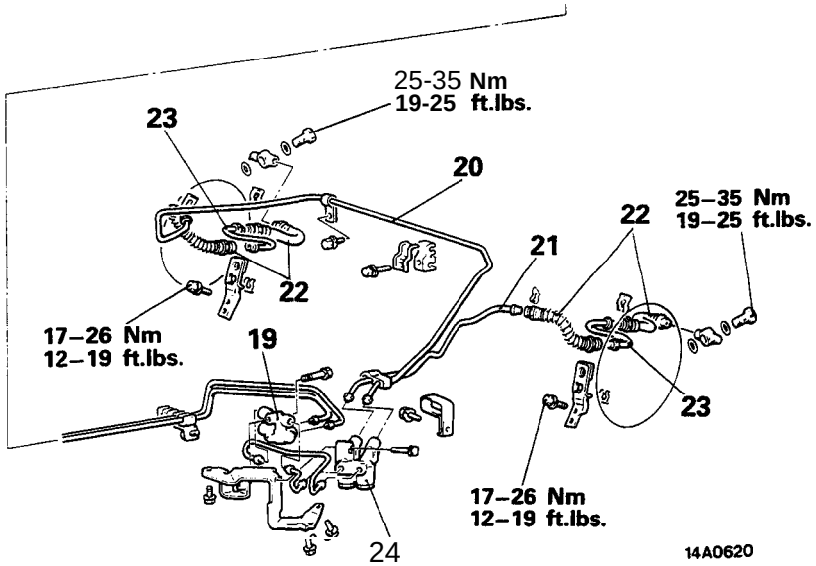
Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Supplying Brake Fluid
- Bleeding (Refer to P.35-57.)









◆◆ ● a 1. Front brake hose
2. Strut brake tube
3. Front brake tube (R.H.)
4. Front brake tube (L.H.)
5. Brake tube (A)
6. Brake tube (B)
9. Front brake hose (L.H.)
10. Front brake hose (R.H.)
11. Brake tube
12. Connector (2 way type)
◆◆ 13. Rear brake tube (R.H.)
● * 14. Rear brake tube (L.H.)
◆◆ 15. Hydraulic unit
16. Main brake tube (R.H.)
17. Main brake tube (L.H.)
18. Connector (6 way type)
◆◆ 19. Proportioning valve
20. Rear brake tube (R.H.)
21. Rear brake tube (L.H.)
◆◆ ● * 22. Rear brake hose
23. Rear brake tube
◆◆ 24. Delay valve
25. Brake tube bracket
26. Brake hose bracket

TSB Revision

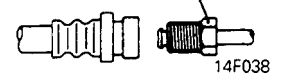
FWD-A.B.S. <From 1992 models>

Pre-removal Operation
- Draining of Brake Fluid

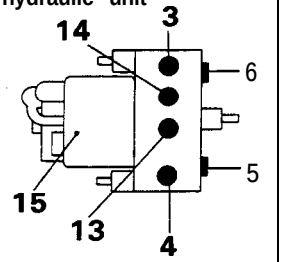
Post-installation Operation
- Supplying Brake Fluid
- Bleeding (Refer to P.35-57.)

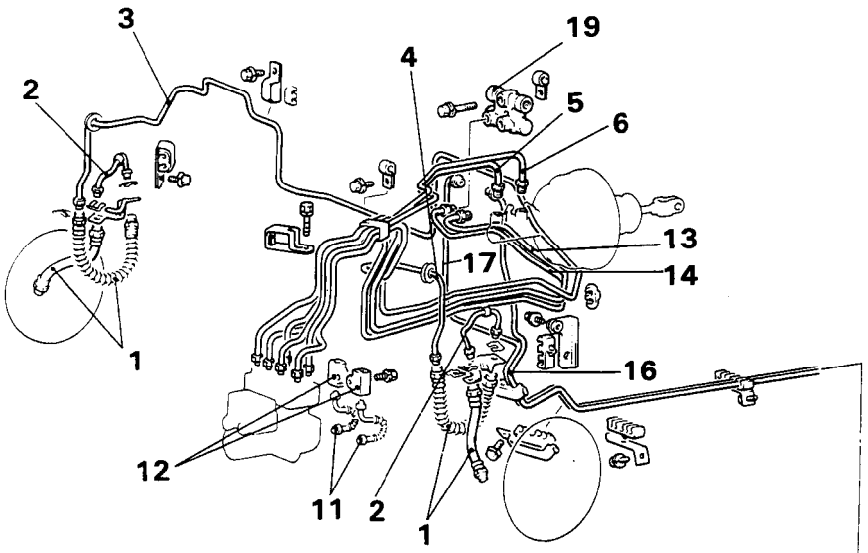
Flared brake line nuts

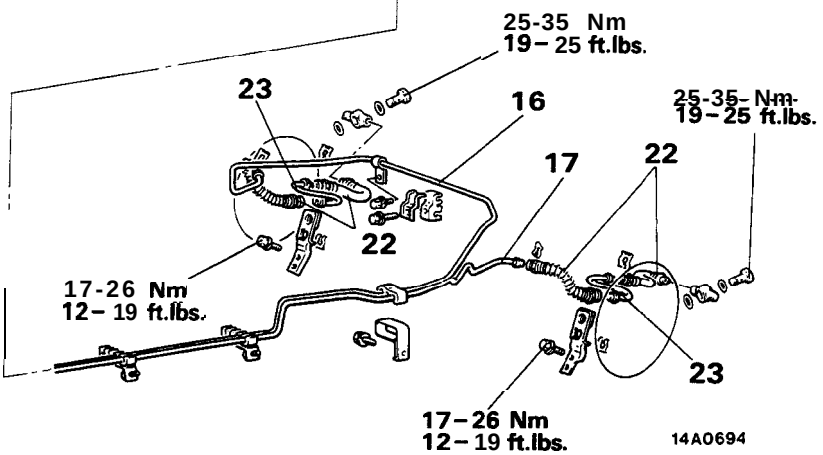
13–17 Nm
9–12 ft.lbs.



Connection part of hydraulic unit







◆◆▶◆ 1. Front brake hose
2. Strut brake tube
3. Front brake tube (R.H.)
4. Front brake tube (L.H.)
5. Brake tube (A)
6. Brake tube (B)
11. Brake tube
12. Connector (2 way type)
● 4 13. Rear brake tube (R.H.)
● * 14. Rear brake tube (L.H.)
● a 15. Hydraulic unit
16. Main brake tube (R.H.)
17. Main brake tube (L.H.)
◆◆ 19. Proportioning valve
◆◆▶◆ 22. Rear brake hose
23. Rear brake tube

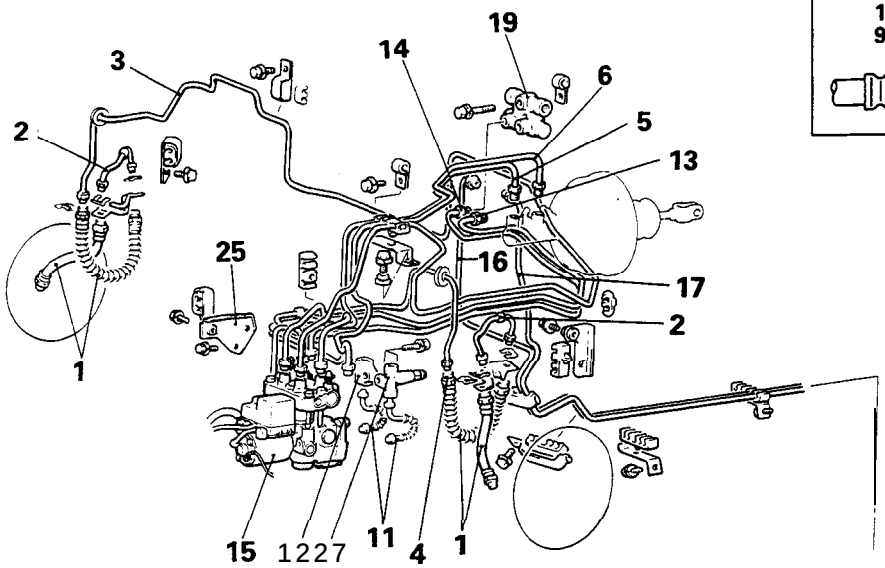
TSB Revision

AWD-A.B.S. <Up to 1990.5 **models**>

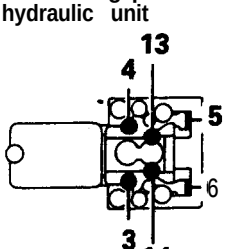
Pre-removal Operation
● Draining of Brake Fluid

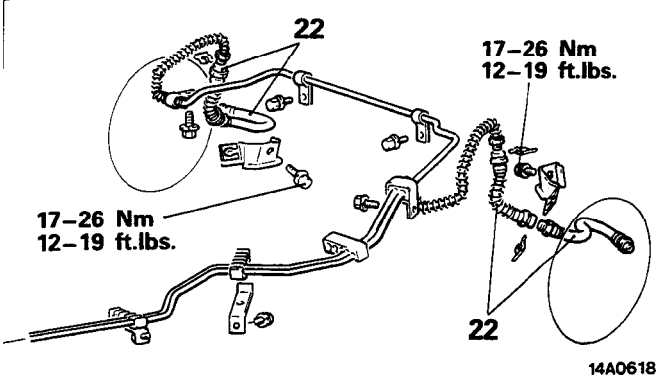
Post-installation Operation
•Supplying Brake Fluid
•Bleeding (Refer to P.35-57.)

Flared brake line nuts
13–17 Nm
9–12 ft.lbs.



Connecting part of hydraulic unit





◆◆ ▶◀ 1. Front brake hose
2. Strut brake tube
3. Front brake tube (R.H.)
4. Front brake tube (L.H.)
5. Brake tube (A)
6. Brake tube (B)
11. Brake tube
12. Connector (2 way type)
◖ * 13. Rear brake tube (R.H.)
▶◀ 14. Rear brake tube (L.H.)
● + 15. Hydraulic unit
16. Main brake tube (R.H.)
17. Main brake tube (L.H.)
◖ ☒ 19. Proportioning valve
◆◆ ▶◀ 22. Rear brake hose
25. Brake tube bracket
27. Brake fluid pressure switch

TSB Revision

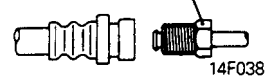
AWD-A.B.S. <Up to 1991 models>

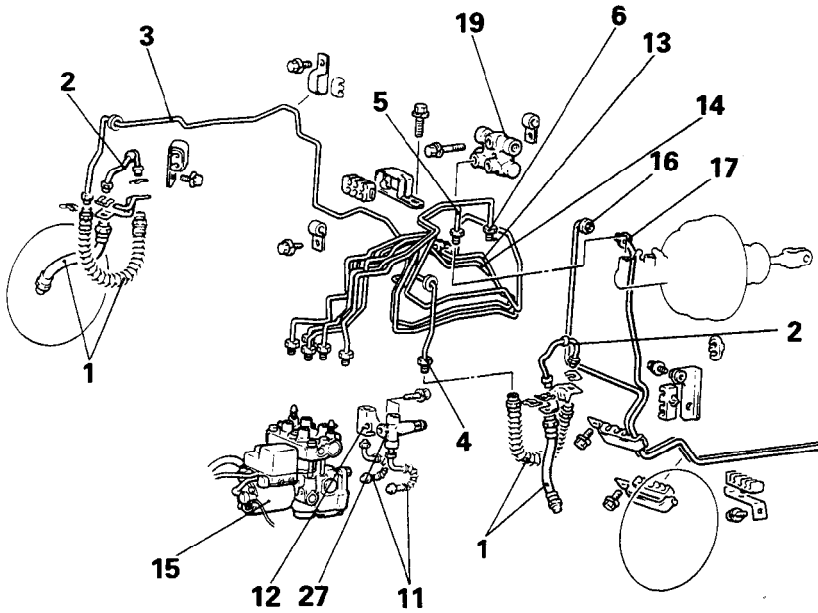
Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Supplying Brake Fluid
- Bleeding (Refer to P.35-57.)

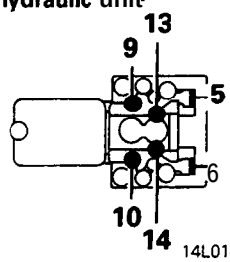
Flared brake line nuts

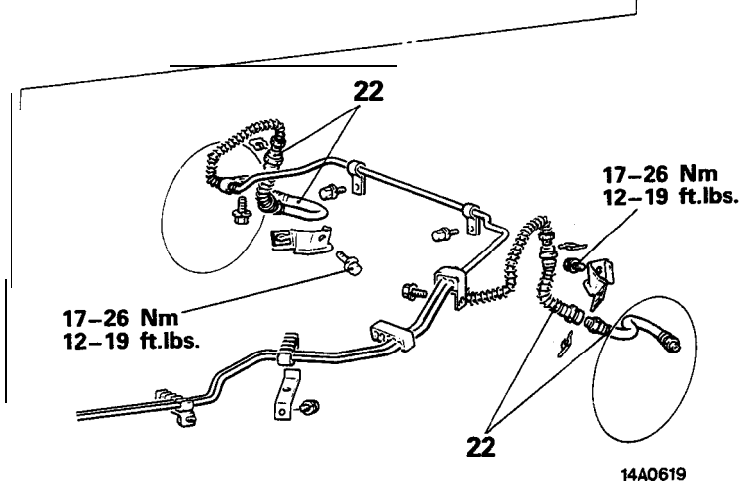
13-17 Nm
9–12 ft.lbs.





Connecting part of hydraulic unit





◆◆ ● 4 1. Front brake hose
2. Strut brake tube
3. Front brake tube (R.H.)
4. Front brake tube (L.H.)
5. Brake tube (A)
6. Brake tube (B)
11. Brake tube
12. Connector (2 way type)
◆◆ 13. Rear brake tube (R.H.)
● * 14. Rear brake tube (L.H.)
● 4 15. Hydraulic unit
16. Main brake tube (R.H.)
17. Main brake tube (L.H.)
◆◆ 19. Proportioning valve
◆◆ ● 22. Rear brake hose
27. Brake fluid pressure switch

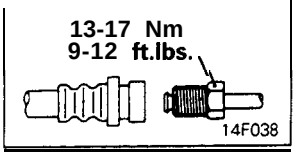
TSB Revision

AWD-A.B.S. < 1992 models>

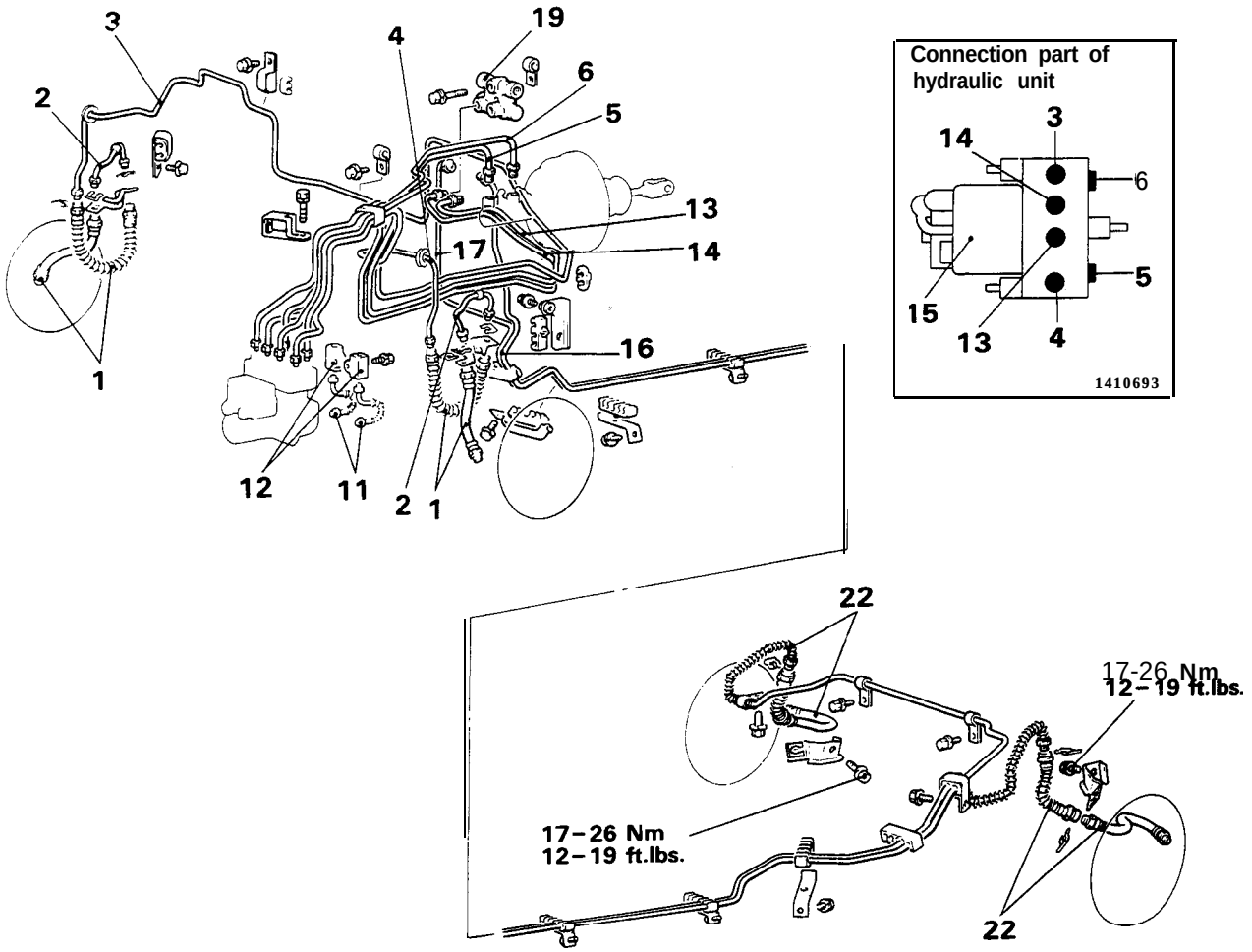
Pre-removal Operation
- Dramng of Brake Fluid

Post-installation Operation
- Supplying Brake Fluid
- Bleeding (Refer to P.35-57.)

Flared brake line nuts

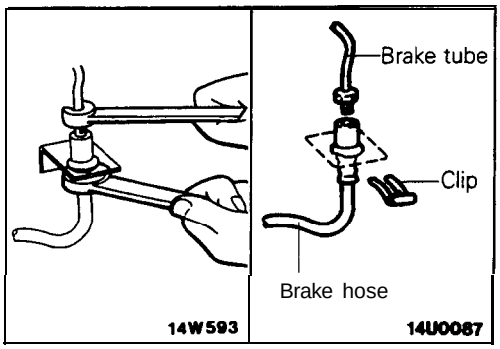


Connection part of hydraulic unit



◆▶ ● a 1. Front brake hose
2. Strut brake tube
3. Front brake tube (R.H.)
4. Front brake tube (L.H.)
5. Brake tube (A)
6. Brake tube (B)
11. Brake tube
12. Connector (2 way type)
● a 13. Rear brake tube (R.H.)
● a 14. Rear brake tube (L.H.)
◆▶◆ 15. Hydraulic unit
16. Main brake tube (R.H.)
17. Main brake tube (L.H.)
◆▶ 19. Proportioning valve
◆▶◆▶◆ 22. Rear brake hose

TSB Revision



SERVICE POINTS OF REMOVAL M35KBAla

1. REMOVAL OF FRONT BRAKE **HOSE/22.** REAR BRAKE **HOSE**
   (1) Holding the lock nut on the brake hose side, loosen the flared brake line nut.
   (2) Pull off the brake hose clip and remove the brake hose from the bracket.

19. REMOVAL OF PROPORTIONING **VALVE/24.** DELAY VALVE

Do not disassemble the proportioning valve and delay valve because its performance depends on the set load of the spring.

INSPECTION M35KCAA

- Check the brake tubes for cracks, crimps and corrosion.
- Check the brake hoses for cracks, damage and leakage.
- Check the flared brake line nuts for damage and leakage.

SERVICE POINTS OF INSTALLATION M35KDAGa

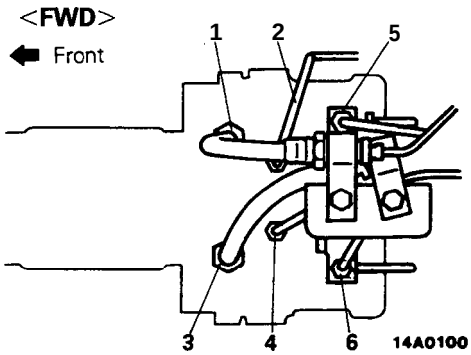
15. CONNECTION OF TUBE AND HOSE TO HYDRAULIC UNIT

Connect the tubes and hoses to the hydraulic unit as shown in the illustration.

NOTE
Connect each tube to the hydraulic unit in accordance with the identification colour codes.

<Up to 1991 models>

<FWD>



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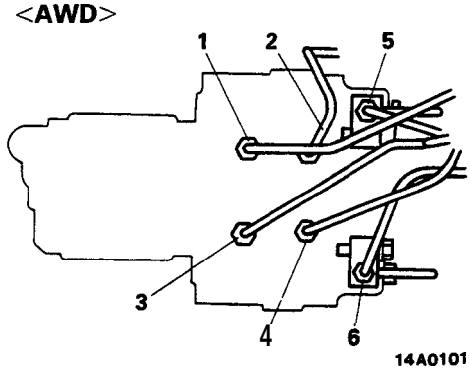
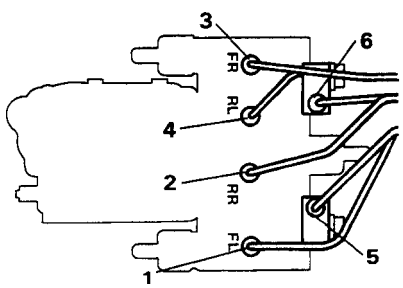


<From 1992 models>



1. From the hydraulic unit to the front brake (L.H.)
2. From the hydraulic unit to the rear brake (R.H.)
3. From the hydraulic unit to the front brake (R.H.)
4. From the hydraulic unit to the rear brake (L.H.)
5. From the master cylinder (for left front and right rear)
6. From the master cylinder (for riaht front and left rear)

TSB Revision

14./13. CONNECTION OF BRAKE TUBE

Arrange the brake tubes so that there is no contact with edges, weld "beats", etc., and make the connections securely.

22. INSTALLATION OF REAR BRAKE HOSE/I. FRONT BRAKE HOSE

Install the brake hoses without twisting them.

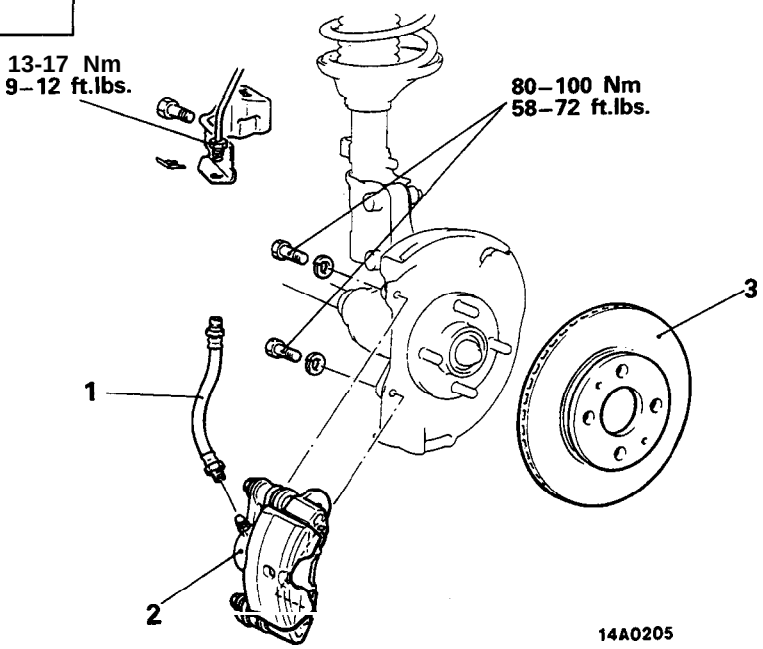
FRONT DISC BRAKE

M35LA--

REMOVAL AND INSTALLATION

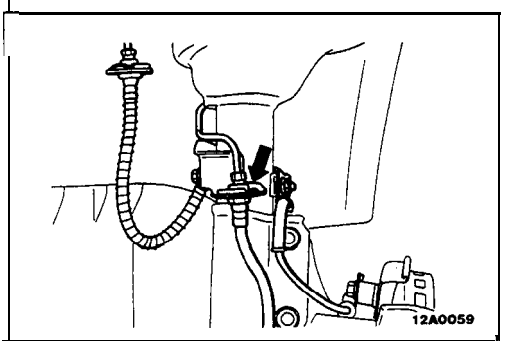
Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Supplying Brake Fluid
- *Bleeding (Refer to P.35-57.)



Removal steps

◆◆ 1. Connection for the brake hose
● * 2. Front brake assembly
3. Brake disc



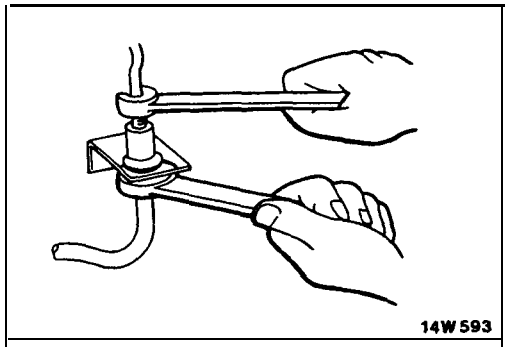
SERVICE POINTS OF REMOVAL

M35LBAF

1. DISCONNECTION OF BRAKE HOSE

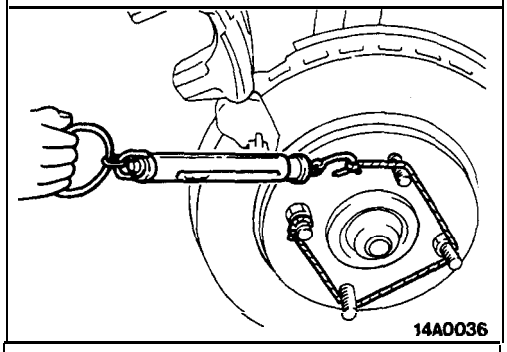
Holding the nut on the brake hose side. Loosen the flared brake line nut.

TSB Revision



INSPECTION M35LCAD

- Check disc for wear. (Refer to P.35-64, Thickness Check.)
- Check disc for runout. (Refer to P.35-63, Run-out Check.)
- Check disc for damage.



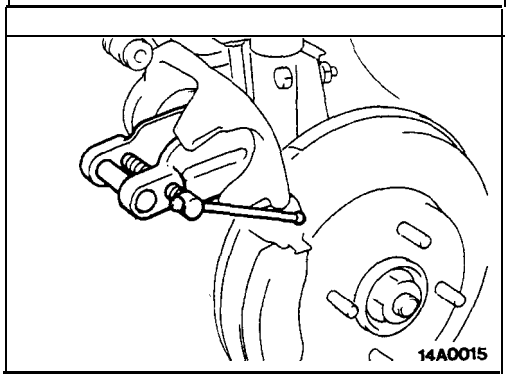
SERVICE POINTS OF INSTALLATION M35LDAG

2. INSTALLATION OF FRONT BRAKE ASSEMBLY

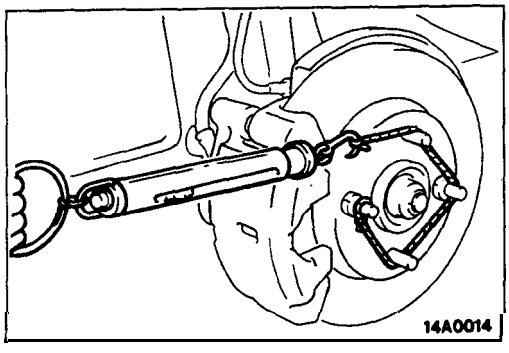
Measure the disc brake drag force after installation of the brake assembly by the following procedure.

(1) With the brake assembly removed, use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.

NOTE
Tighten the nuts in order to secure the disc to the hub.



(2) After installing the caliper support to the knuckle, expand the piston, and then install the caliper body.



(3) Start the engine, and after depressing the brake pedal hard two or three times, stop the engine.
(4) Turn brake disc forward 10 times.
(5) Use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.
(6) Calculate the drag torque of the disc brake (difference between measured values in 5 and 1).

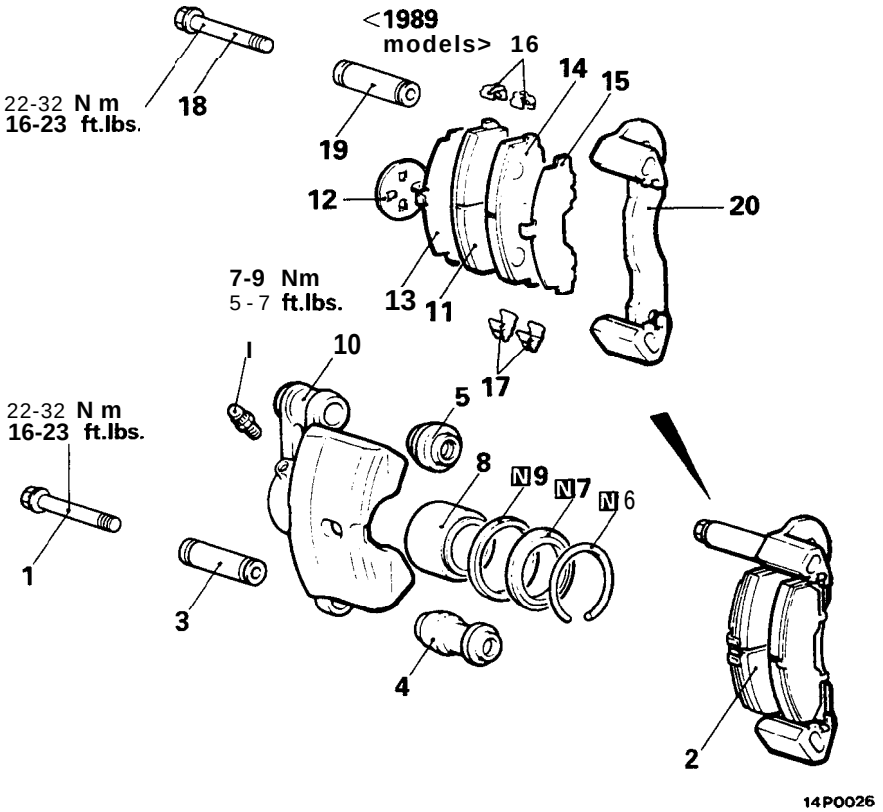
Standard value: 70 N (15.4 lbs.) or less

(7) If the disc brake drag force exceeds the standard value, disassemble piston and clean the piston. Check for corrosion or worn piston seal.

DISASSEMBLY AND REASSEMBLY

M35LE--a

<Up to 1990 models>



Caliper assembly disassembly steps

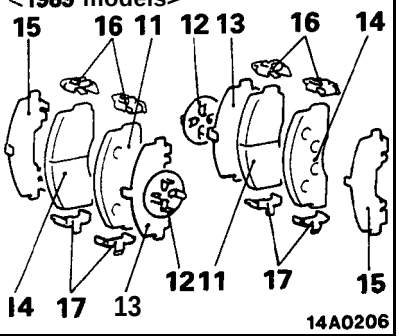
- 1. Lock pin
- ◆◆ 2. Caliper support (Pad, clip, shim).
- 3. Lock pin sleeve
- 4. Lock pin boot
- 5. Guide pin boot
- ◆◆ 6. Boot ring
- ◆◆ 7. Piston boot
- ◆◆ 8. Piston
- ● * ◆◆ 9. Piston seal
- 10. Caliper body

Pad assembly disassembly steps

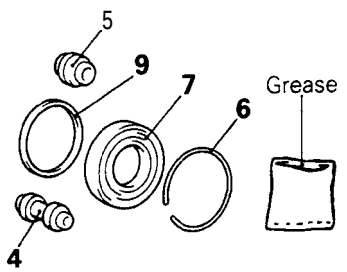
- 1. Lock pin
- ◆◆ 2. Caliper support (Pad, clip, shim)
- 11. Pad assembly
- ● # 12. Shim holder
- ● + 13. Inner shim
- 14. Pad assembly
- ◆◆ 15. Outer shim
- 16. Pad clips B
- 17. Pad clips C
- 18. Guide pin
- 19. Guide pin sleeve
- 20. Support mounting

Pad repair kit

<1989 models>

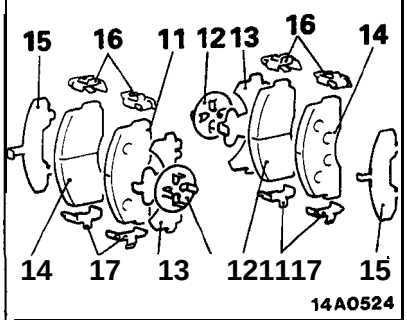


Seal and boots repair kit

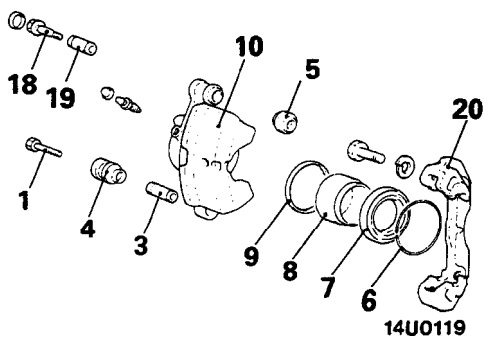


Pad repair kit

<1990 models>

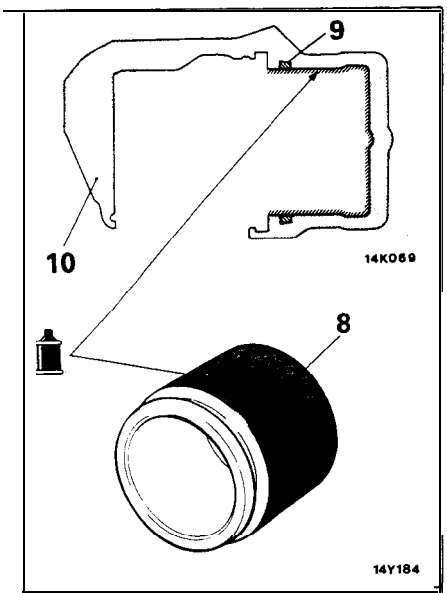


Ehake caliper kit

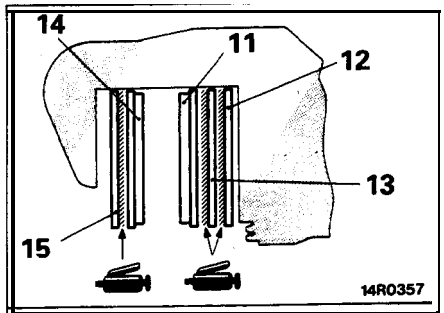


TSB Revision

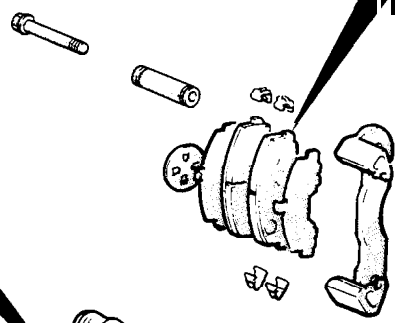
Lubrication points

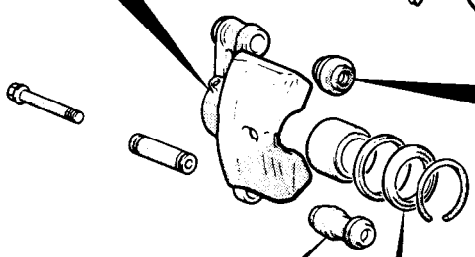


Brake fluid: Conforming to DOT3



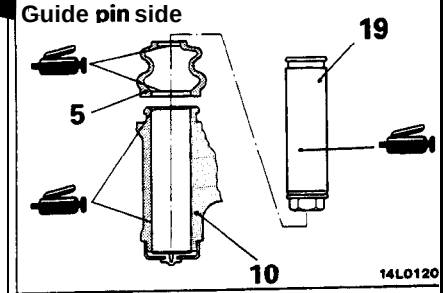
Grease: Repair kii grease (orange)





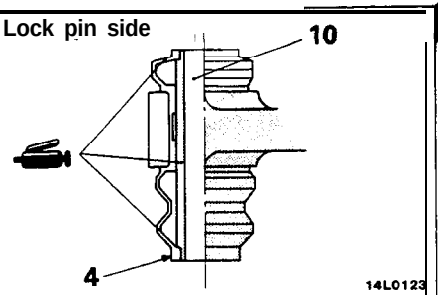
14P0026

Guide pin side

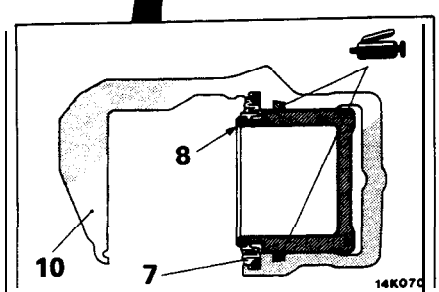


Grease: Repair kii grease (orange)

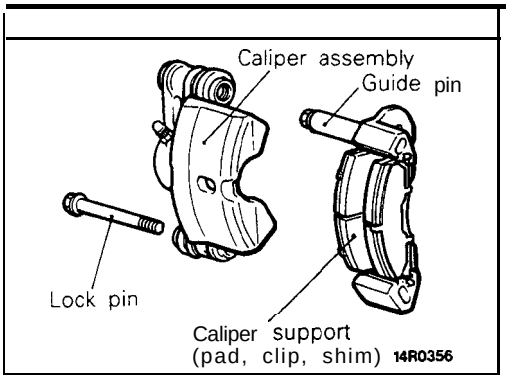
Lock pin side



Grease: Repair kit grease (orange)



Grease: Repair kit grease (orange)

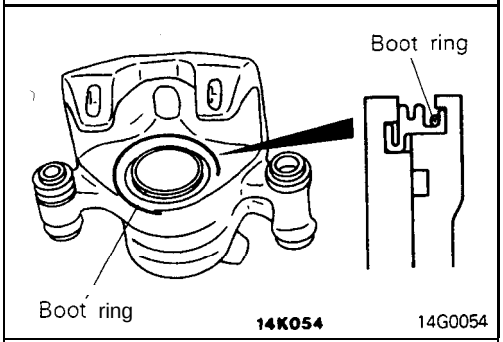


SERVICE POINTS OF DISASSEMBLY M35LFAH

When disassembling the front disc brakes, disassemble both sides (left and right) as a set.

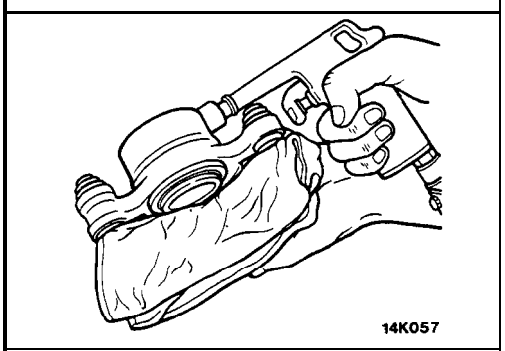
2. REMOVAL OF CALIPER SUPPORT (PAD, CLIP, SHIM)

Remove caliper support from caliper body.



6. REMOVAL OF BOOT RING

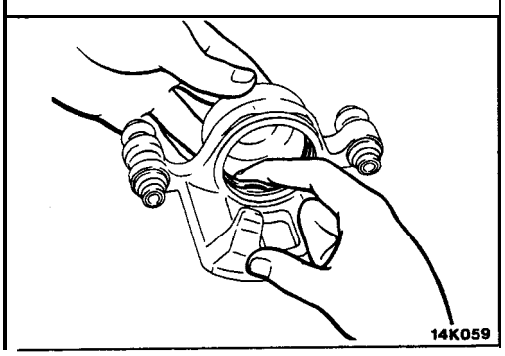
Remove boot ring with (–) screwdriver



7. REMOVAL OF PISTON BOOT/8. PISTON

Protect caliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

Caution
Blow compressed air gently.



9. REMOVAL OF PISTON SEAL

(1) Remove piston seal with finger tip.

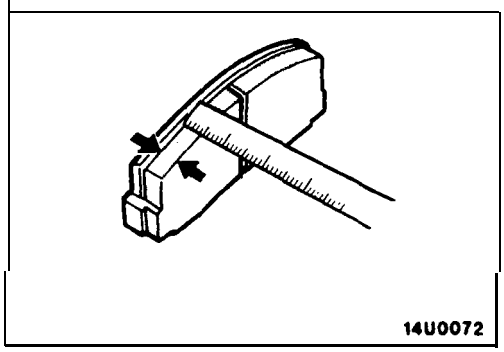
Caution
Do not use (–) screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloroethylene, alcohol or specified brake fluid.

Specified brake fluid: Conforming to DOT3 or DOT4

INSPECTION M35LGAH

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.



PAD WEAR CHECK

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly when pad thickness is less than the limit value.

Limit value: 2.0 mm (.08 in.)

SERVICE POINTS OF REASSEMBLY M35LHAN

15. APPLICATION OF BRAKE GREASE TO OUTER SHIM/ 13. INNER SHIM/ 12. SHIM HOLDER

Caution

1. **Do not deposit grease or other dirt on pad or brake disc friction surfaces.**
2. **Apply grease so that it does not seep out from the edges of the shim and shim holder.**

9. INSTALLATION OF PISTON SEAL

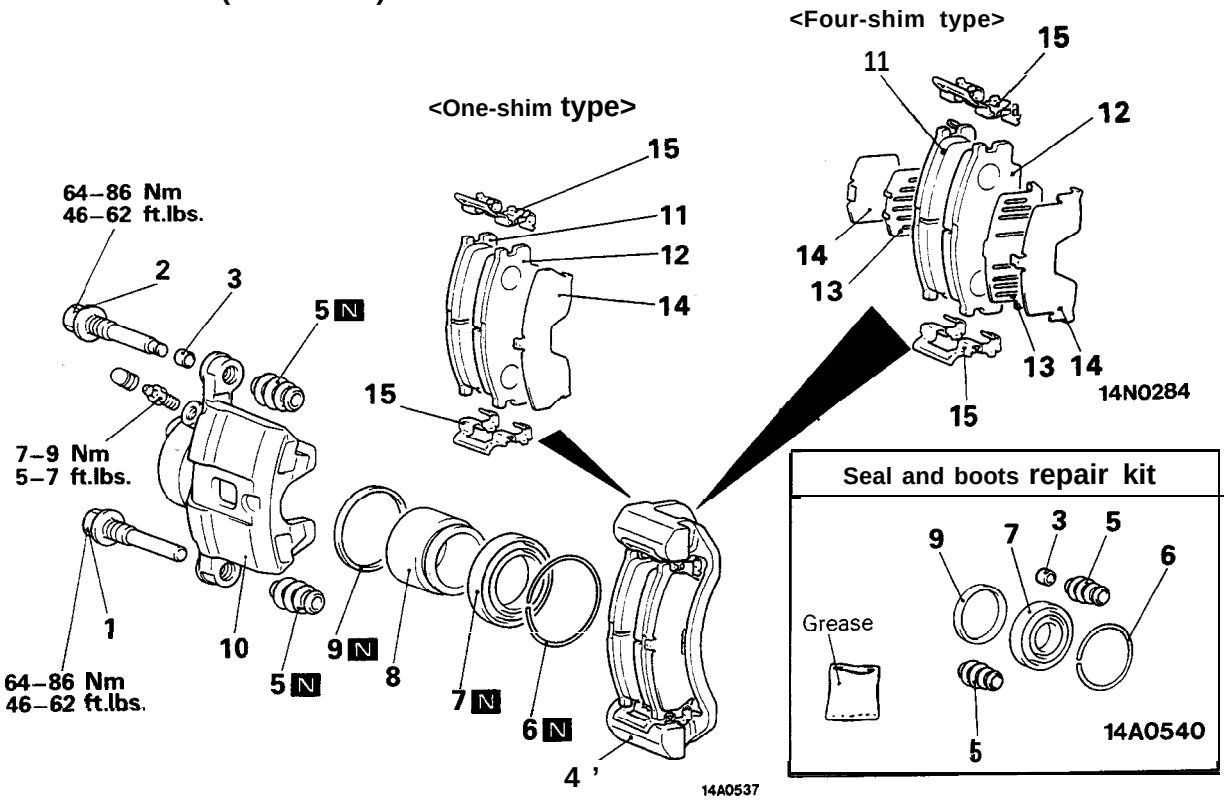
Install piston seal in cylinder groove.

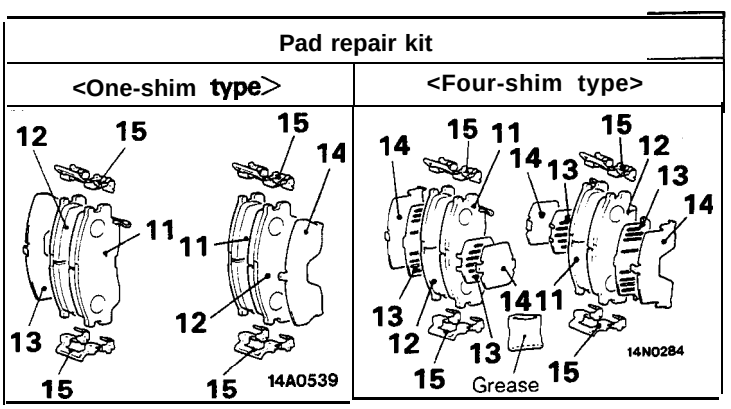
Caution

Do not wipe special grease on piston seal.

<1990.5 models>
<From 1991 models (Non-Turbo)>

M35LE--b



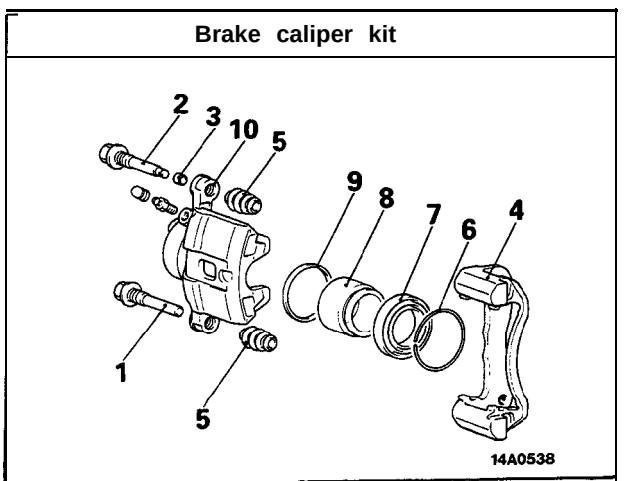


Caliper assembly disassembly steps

- ◆◆ 1. Guide pin
- ● + 2. Lock pin
- 3. Bush
- 4. Caliper support (Pad, clip, shim)
- 5. Boot
- ◆◆ 6. Boot ring
- ◆◆ 7. Piston boot
- ◆◆ 8. Piston
- ◆◆ ● * 9. Piston seal
- 10. Caliper body

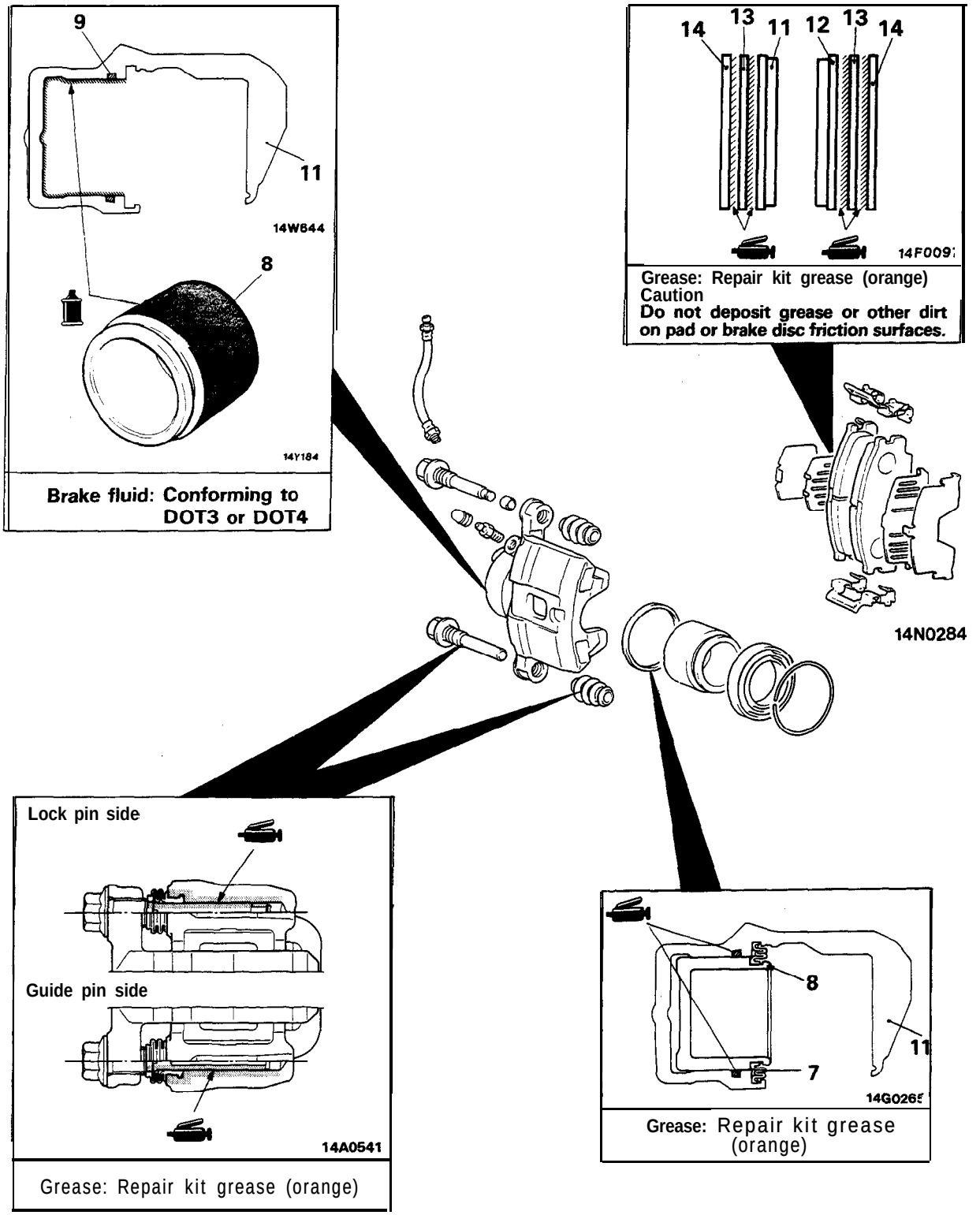
Pad assembly disassembly steps

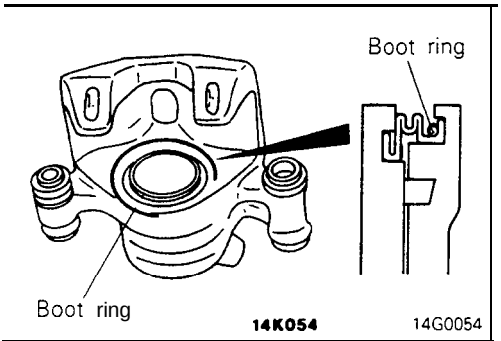
- ● + 1. Guide pin
- ◆◆ 2. Lock pin
- 3. Bush
- 4. Caliper support (Pad, clip, shim)
- 11. Pad and wear indicator assembly
- 12. Pad assembly
- 13. Inner shim
- 14. Outer shim
- 15. Clip



TSB Revision

Lubrication points



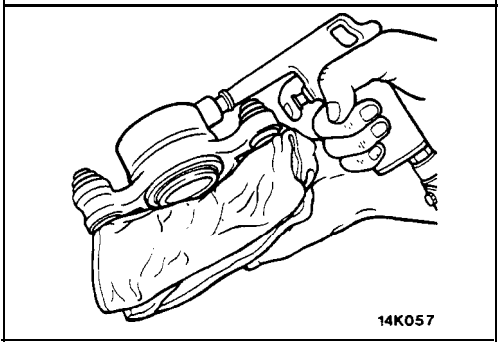


SERVICE POINTS OF DISASSEMBLY M35LFAK

When disassembling the front disc brakes, disassemble both sides (left and right) as a set.

6. REMOVAL OF BOOT RING

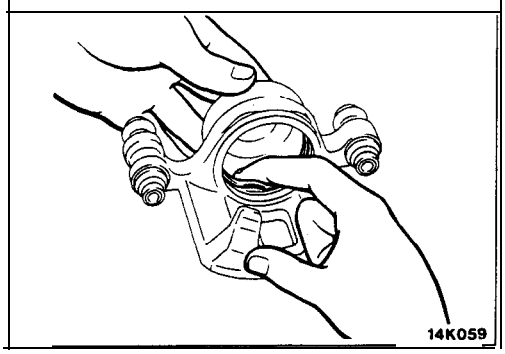
Remove boot ring with a small flat blade screwdriver.



7. REMOVAL OF PISTON BOOT/8. PISTON

Protect caliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

Caution
Blow compressed air gently.
Keep hands away from piston area and cover with shop towels!



9. REMOVAL OF PISTON SEAL

(1) Remove piston seal with finger tip.

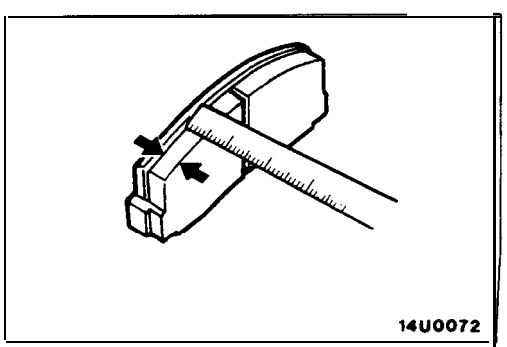
Caution
Do not use a small flat blade screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloroethylene, alcohol or specified brake fluid.

Specified brake fluid: Conforming to **DOT3** or **DOT4**

INSPECTION M35LGAK

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body, guide pin and lock pin for Wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.



PAD WEAR CHECK

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly when pad thickness is less than the limit value.

Limit value: 2.0 mm **(.08** in.)

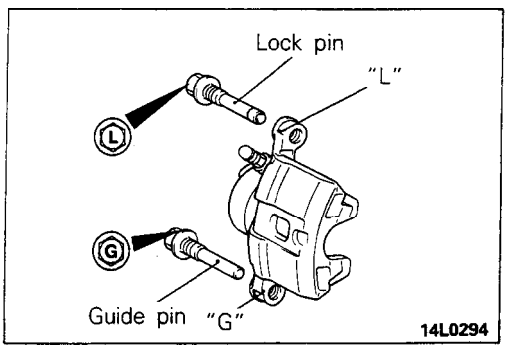
TSB **Revision**

SERVICE POINTS OF REASSEMBLY M35LHAR

9. INSTALLATION OF PISTON SEAL

Install piston seal in cylinder groove.

Caution
Do not wipe special grease on piston seal.

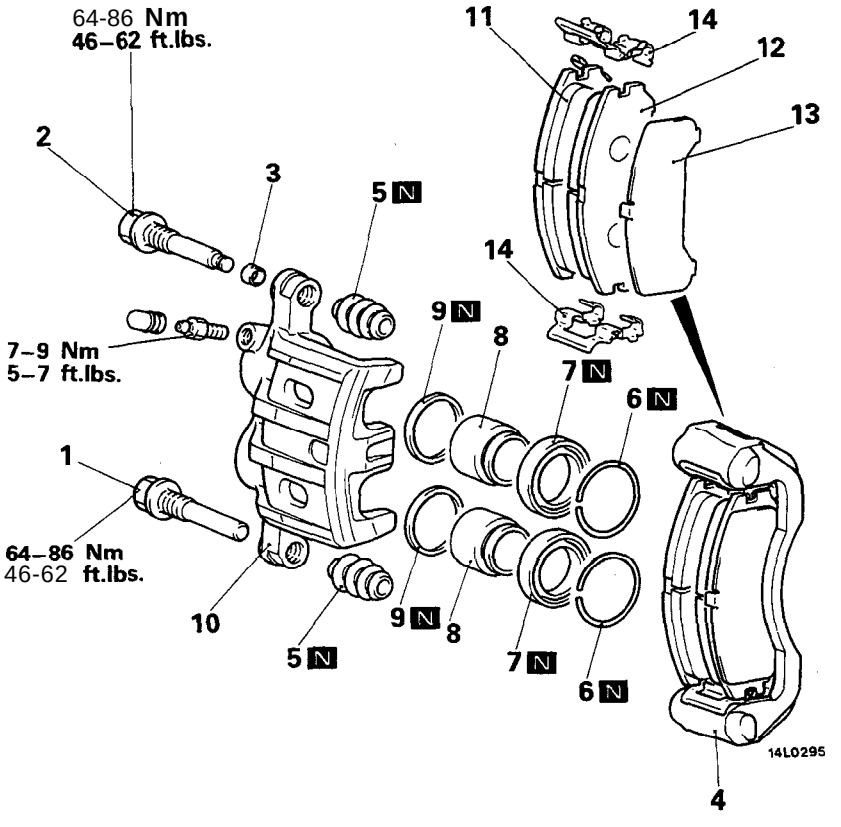


2. INSTALLATION OF LOCK PIN/ 1. GUIDE PIN

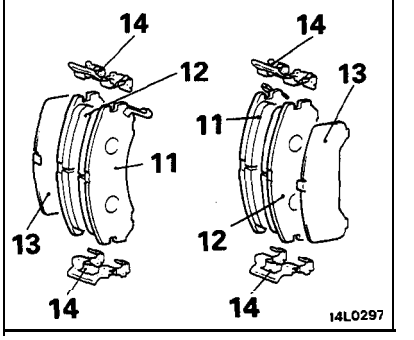
Install the guide pin and lock pin so that the guide pin and lock pin head mark match the identification mark ("G" or "L") on the caliper body.

M35LE--C

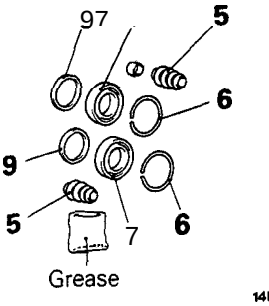
<From 1991 models (Turbo)>



Pad repair kit



Seal and boots repair kit



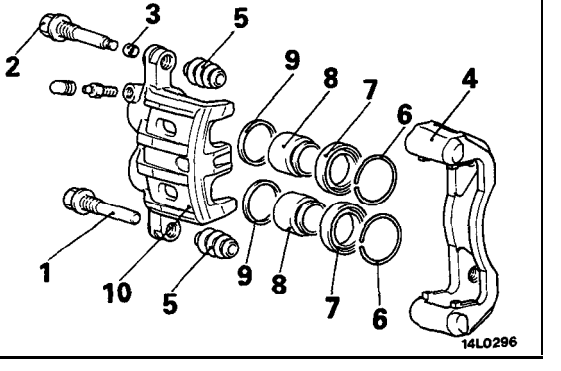
Caliper assembly disassembly steps

- ◆◆ 1. Guide pin
- ◆◆ 2. Lock pin
- 3. Bush
- 4. Caliper support (Pad, clip. shim)
- 5. Boot
- ◆◆ 6. Boot ring
- ◆◆ 7. 8. Piston Piston boot
- ● *◆◆ 9. Piston seal
- 10. Caliper body

Pad assembly disassembly steps

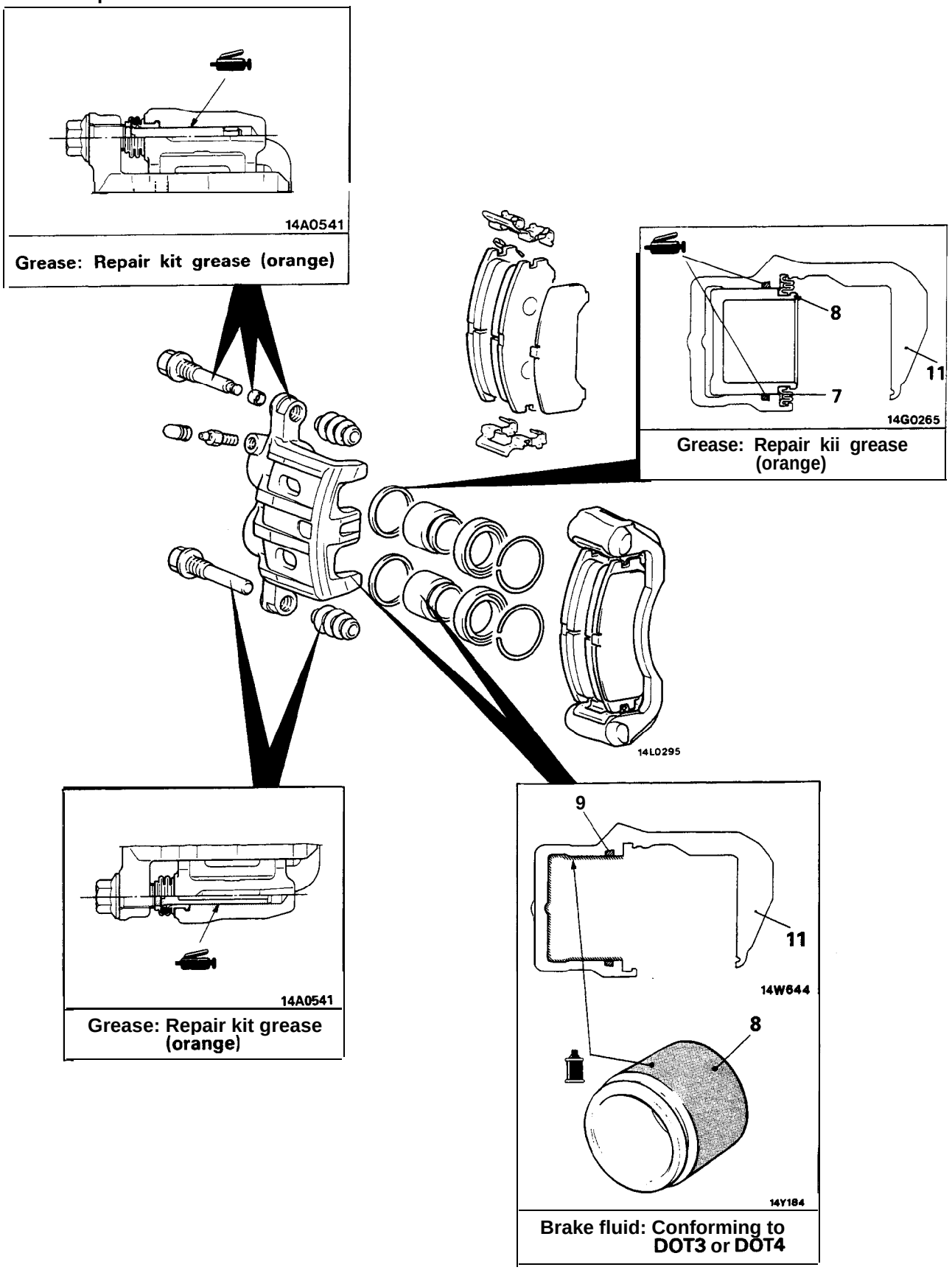
- ◆◆ 1. Guide pin
- ◆◆ 2. Lock pin
- 3. Bush
- 4. Caliper support (Pad, clip, shim)
- 11. Pad and wear indicator assembly
- 12. Pad assembly
- 13. Outer shim
- 14. Clip

Brake caliper kit



TSB Revision

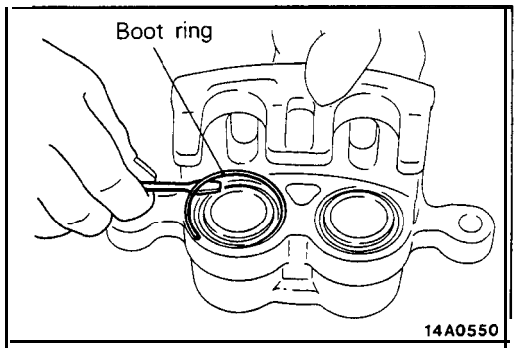
Lubrication points



TSB Revision

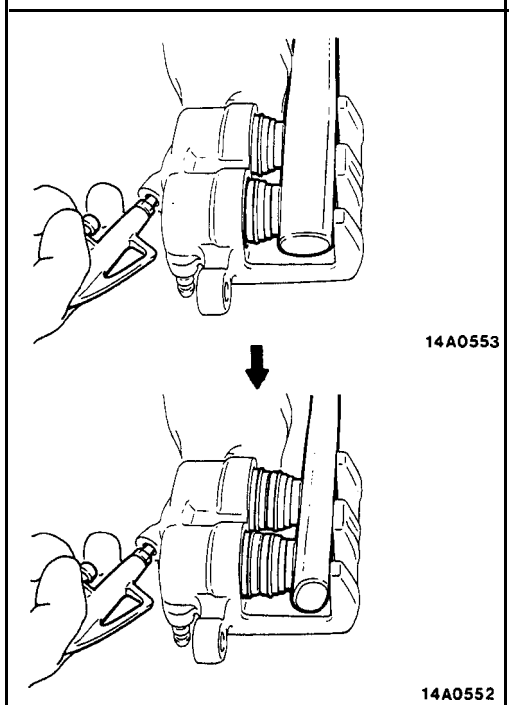
SERVICE POINTS OF DISASSEMBLY M35LFAL

When disassembling the front disc brakes, disassemble both sides (left and right) as a set.



6. REMOVAL OF BOOT RING

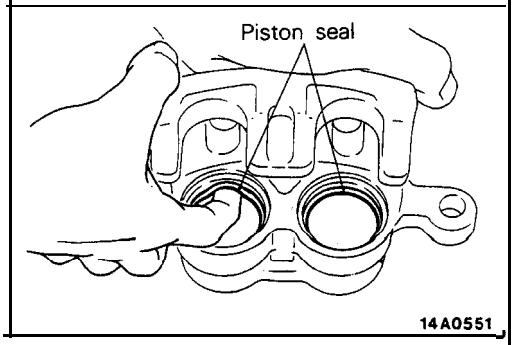
Remove boot ring with (–) screwdriver



7. REMOVAL OF PISTON BOOT/8. PISTON

Blow compressed air through brake hose to remove piston boot and piston.

Caution
Blow air gradually to remove the pistons while adjusting with a plastic hammer, etc. so that the two pistons come out equably together.
If only one piston is pulled out, it will be impossible to remove the other.



9. REMOVAL OF PISTON SEAL

(1) Remove piston seal with finger tip.

Caution
Do not use (–) screwdriver or other tool to prevent damage to inner cylinder.

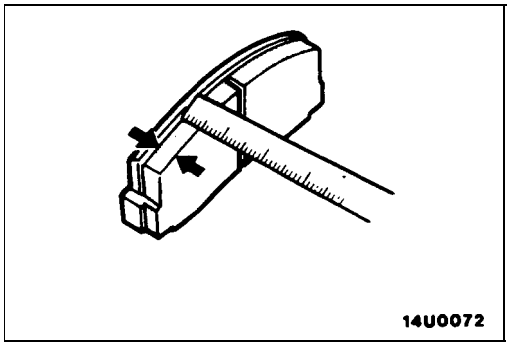
(2) Clean piston surface and inner cylinder with trichloroethylene, alcohol or specified brake fluid.

Specified brake fluid: Conforming to DOT3 or DOT4

TSB Revision

INSPECTION M35LGAK

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body, guide pin and lock pin for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.


14U0072

PAD WEAR CHECK

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly when pad thickness is less than the limit value.

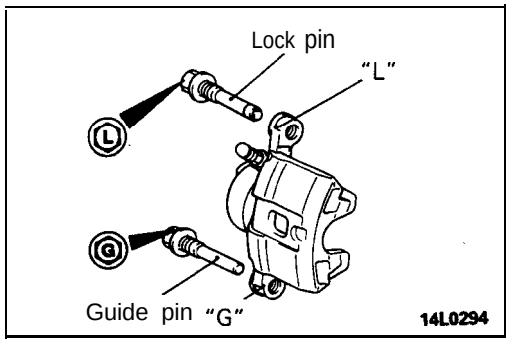
Limit value: 2.0 mm (.08 in.)

SERVICE POINTS OF REASSEMBLY M35LHAR

9. INSTALLATION OF PISTON SEAL

Install piston seal in cylinder groove.

Caution
Do not wipe special grease on piston seal.



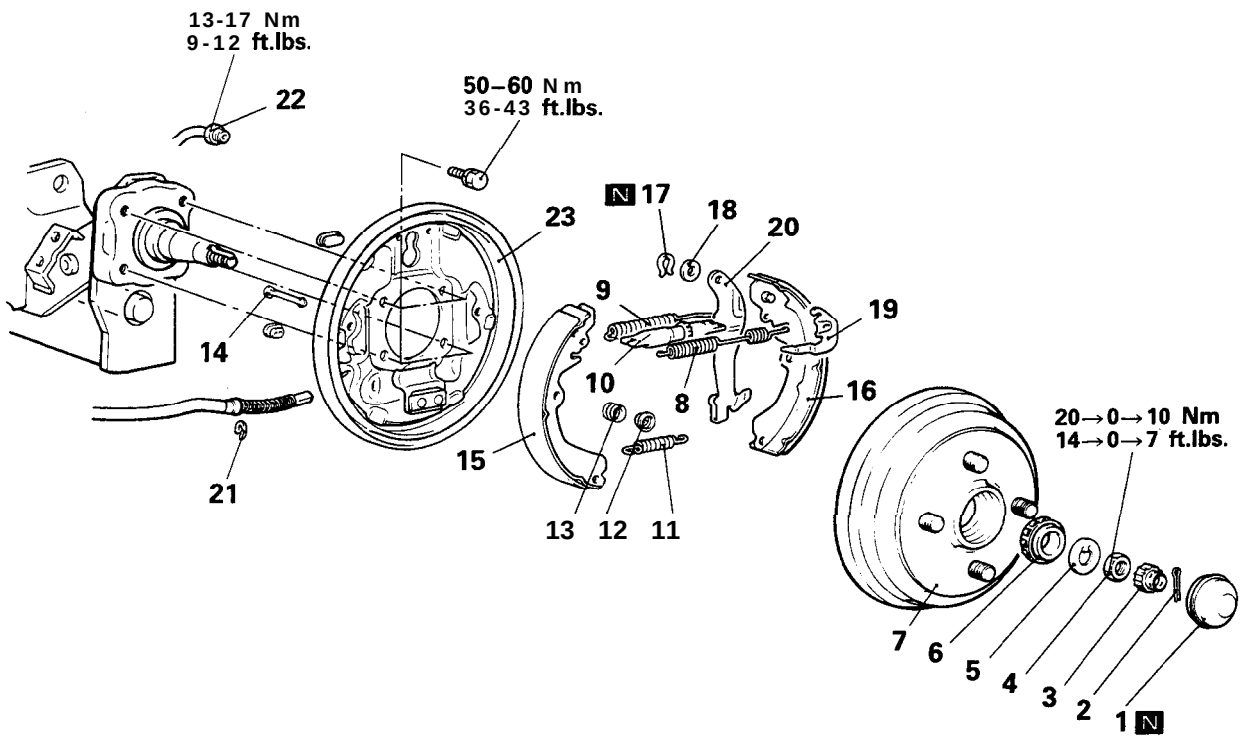
2. INSTALLATION OF LOCK PIN/ 1. GUIDE PIN

Install the guide pin and lock pin so that the guide pin and lock pin head mark match the identification mark ("G" or "L") on the caliper body.

REAR DRUM BRAKE

M35UA--

REMOVAL AND INSTALLATION



14A0359

Removal steps

Adjustment of wheel bearing end play (Refer to GROUP 27–Service Adjustment Procedures.)

1. Hubcap
2. Cotter pin
3. Lock cap
4. Wheel bearing nut
5. Tongued washer
6. Outer bearing inner race
7. Brake drum

Adjustment of shoe outside diameter

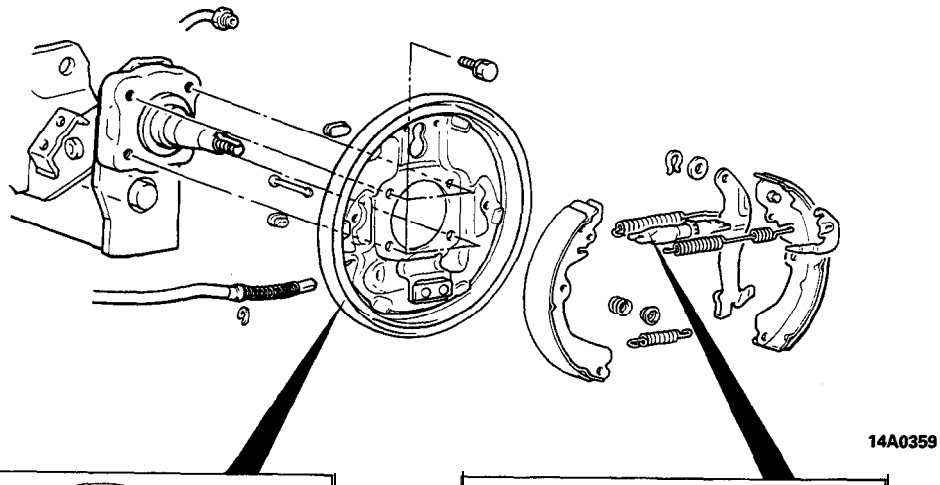
8. Shoe-to-lever spring
9. Shoe-to-shoe spring
10. Auto adjuster assembly
11. Retainer spring
12. Shoe hold down cups
13. Shoe hold down springs
14. Shoe hold down pins
15. Shoe and lining assembly
16. Shoe and lever assembly
17. Retainer
18. Wahser
19. Auto adjuster lever
20. Parking brake lever
21. Snap ring
22. Brake tube
23. Backing plate

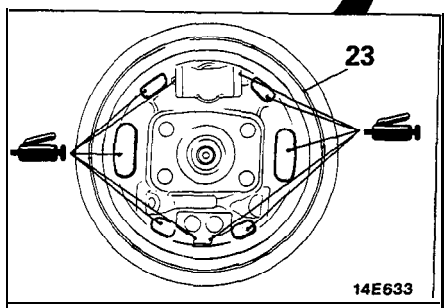
Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Filling of Brake Fluid
- Bleeding (Refer to P.35-57.)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 36–Service Adjustment Procedures.)

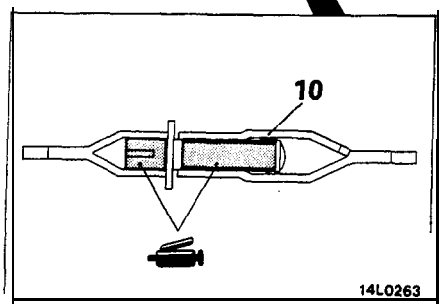
TSB Revision

Lubrication points

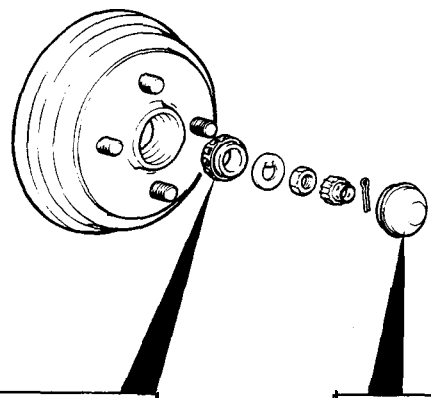


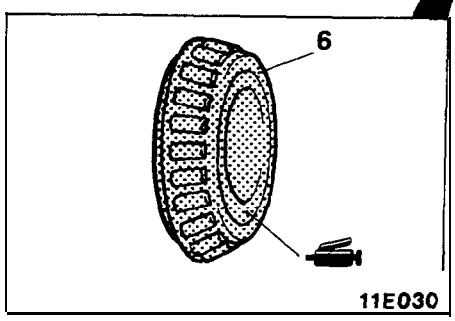


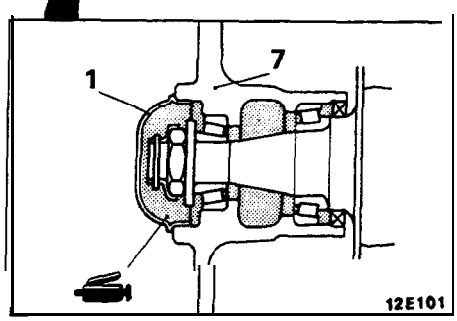
Grease: Brake grease SAE J310, NLGI No.1



Grease: Brake grease SAE J310, NLGI No.1







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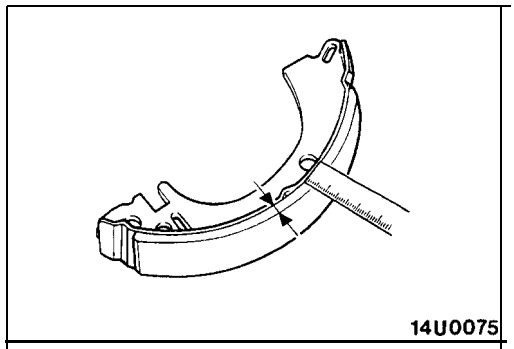
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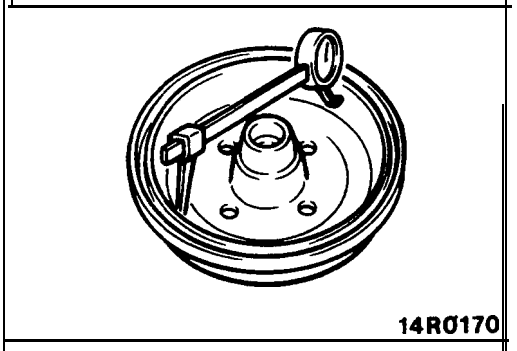
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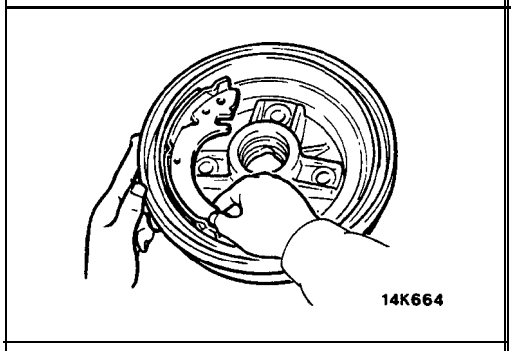
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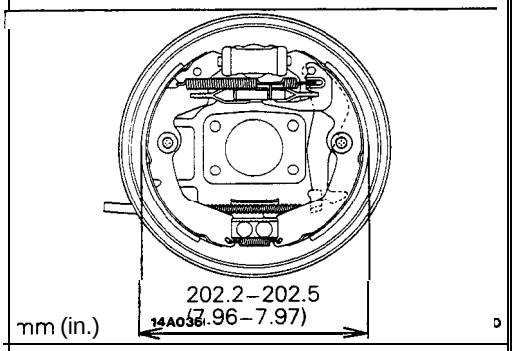
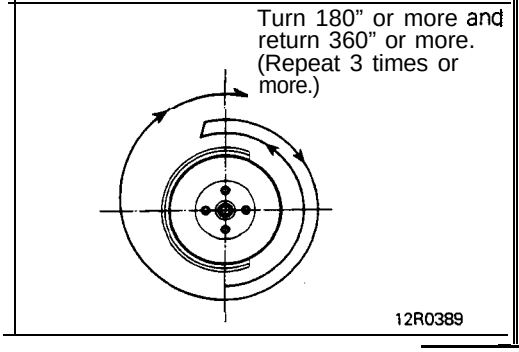




INSPECTION M35UCAM

BRAKE LINING THICKNESS CHECK

(1) Measure the wear of the brake lining at the place worn the most.

Limit: 1.0 mm (.04 in.)

(2) Replace the shoe assembly if brake lining thickness is less than the limit if it is not worn evenly.

Caution
Whenever the shoe assembly is replaced, replace both RH and LH assemblies as a set to prevent car from pulling to one side when braking.
If there is a significant difference in the thicknesses of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.

BRAKE DRUM INSIDE DIAMETER CHECK

(1) Measure the inside diameter of the brake drum at two or more locations.

Limit : 205 mm (8.1 in.)

(2) If the measured diameter is the limit value or higher, or if wear is unusually irregular, replace the brake drum and shoe-and-lining assembly as a set for both sides.

BRAKE LINING AND BRAKE DRUM CONNECTION CHECK

Chalk inner surface of brake drum and rub with shoe and lining assembly.
Replace shoe and lining assembly or brake drum if very irregular contact area.

NOTE
Clean off chalk after check.

SERVICE POINTS OF INSTALLATION M35UDAV

. ADJUSTMENT OF SHOE OUTSIDE DIAMETER

Adjust the shoe outside diameter to the specified measurement by turning the adjuster screw.

Caution
Release the parking brake lever and confirm that the parking brake cable is not pulling the lever inside the brake. If the lever is being pulled by the cable, the automatic shoe clearance adjustment will not function.

4. INSTALLATION OF WHEEL BEARING NUT

(1) After tightening the wheel bearing nut to 20 Nm (14 ft.lbs.), turn the hub a few times to seat the bearing.
(2) In order to seat the bearing properly, turn the hub (brake drum) 180" or more and then return it 360" or more; repeat this procedure again three or more times.
(3) Return the wheel bearing nut to 0 Nm (0 ft.lbs.).
(4) After tightening the wheel bearing nut at a torque of 10 Nm (7 ft.lbs.), rotate the hub again in the same way as described in step (2) so as to seat the bearina.

(5) Then once again tighten the wheel bearing nut to 10 Nm (7 ft.lbs.).
(6) Install the lock cap and split pin.
(7) If the position of the cotter pin is not matched with the holes of the lock cap, reposition the lock cap so that the holes align. If this can not be accomplished, back off the nut by not more than 15".

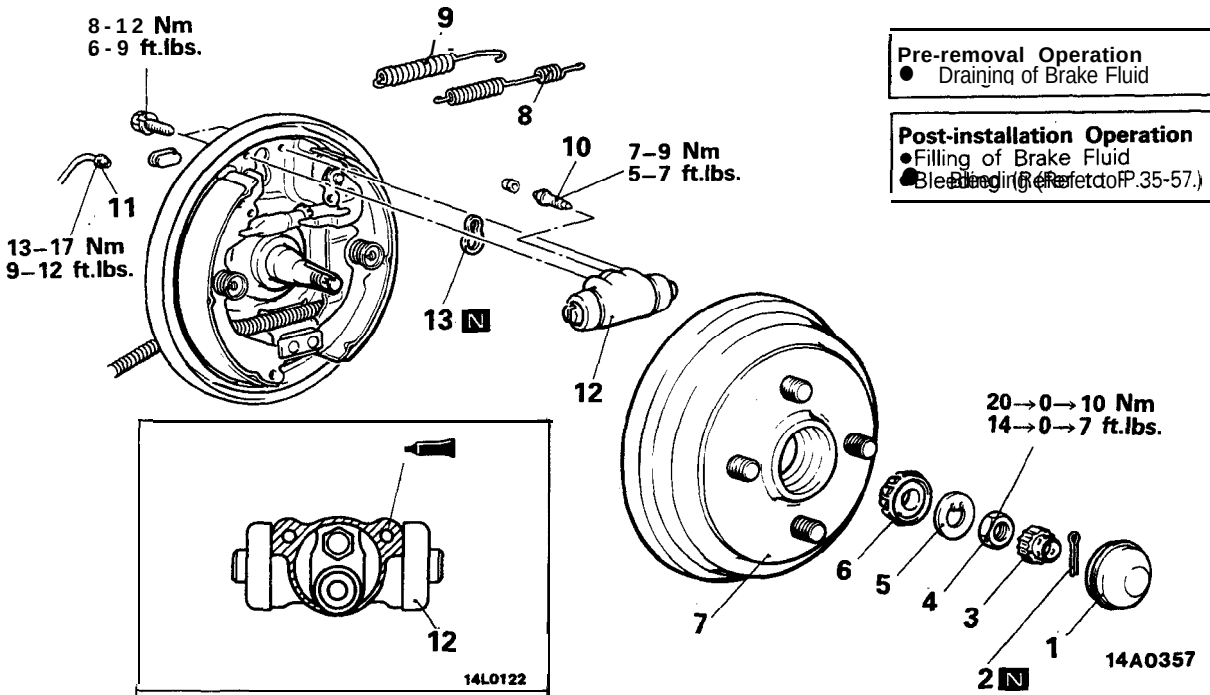
Caution
Check to be sure that the lock nut cannot be loosened manually.

(8) After setting the split pin in place, seat the bearing in the same manner as in step (2).

REAR BRAKE WHEEL CYLINDER

M35VA--

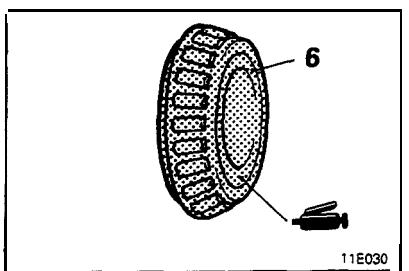
REMOVAL AND INSTALLATION

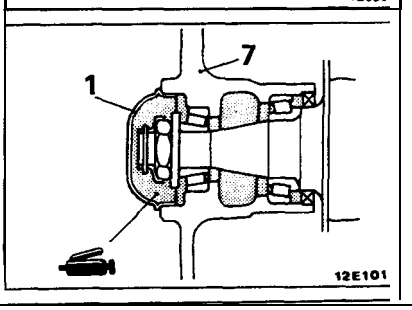


Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Filling of Brake Fluid
- Bleeding (Refer to P.35-57.)

Sealant: 3M ATD Part No.8513 or equivalent





Removal steps

Adjusting of wheel bearing end play (Refer to GROUP 27–Service Adjustment Procedures.)
1. Hub cap
2. Cotter pin
3. Lock cap
◆◆ 4. Wheel bearing nut
5. Tongued washer
6. Outer wheel bearing inner race
7. Brake drum
8. Shoe-to-lever spring
9. Shoe-to-shoe spring
10. Bleeder screw
11. Brake tube
12. Wheel cylinder assembly
13. Seal

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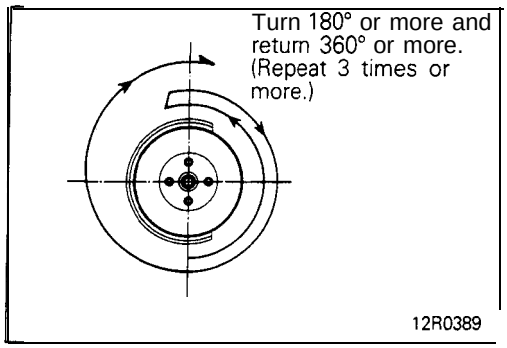


SERVICE POINTS OF INSTALLATION M34GDAS

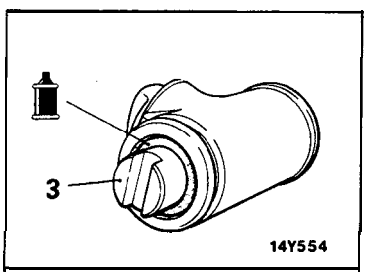
4. INSTALLATION OF WHEEL BEARING NUT

(1) After tightening the wheel bearing nut to 20 Nm (14 ft.lbs.), turn the hub a few times to seat the bearing.
(2) In order to seat the bearing properly, turn the hub (brake drum) 180° or more and then return it 360" or more; repeat this procedure again three or more times.
(3) Return the wheel bearing nut to 0 Nm (0 ft.lbs.).
(4) After tightening the wheel bearing nut at a torque of 10 Nm (7 ft.lbs.), rotate the hub again in the same way as described in step (2) so as to seat the bearing.
(5) Then once again tighten the wheel bearing nut to 10 Nm (7 ft.lbs.).
(6) Install the lock cap and cotter pin.
(7) If the position of the cotter pin is not matched with the holes of the lock cap, reposition the lock cap so that the holes align. If this cannot be accomplished, back off the nut by not more than 15".

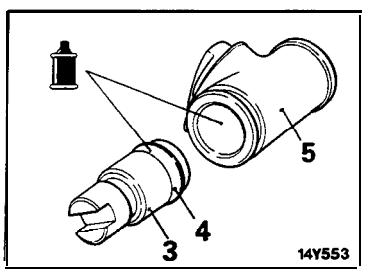
Caution
Check to be sure that the lock nut cannot be loosened manually.

(8) After setting the split pin in place, seat the bearing in the same manner as in step (2).

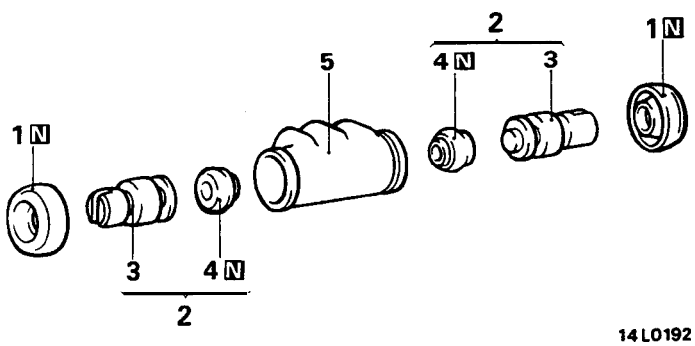
DISASSEMBLY AND REASSEMBLY M35VE--

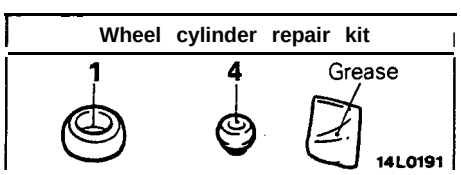


Grease: Repair kit grease (orange)



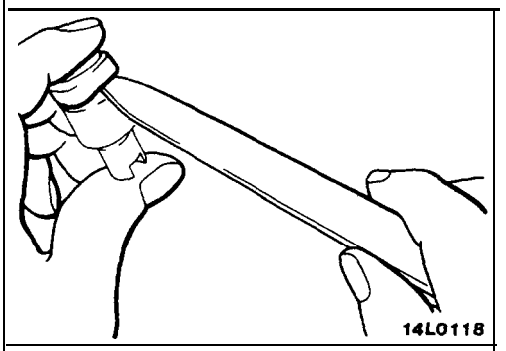
Brake fluid: Conforming to DOT3 o r DOT4

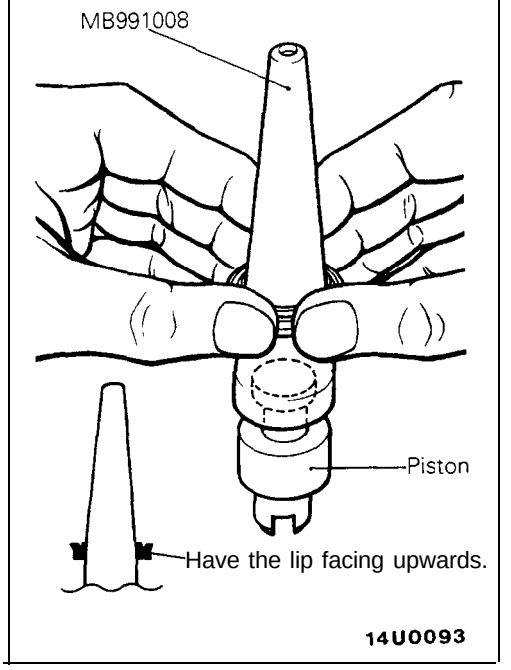




Disassembly steps

1. Boots
2. Piston assembly
● * 3. Pistons
◆◆ ● * 4. Piston cups
5. Wheel cylinder body





SERVICE POINTS OF DISASSEMBLY M35VFAE

When disassembling the wheel cylinders, disassemble both sides (left and right) as a set.

4. REMOVAL OF PISTON CUPS

Remove the piston cup, being careful not to damage the piston.

INSPECTION M35VGAD

Check the piston and wheel cylinder walls for rust or damage, and if there is any abnormality, replace the entire wheel cylinder assembly.

SERVICE POINTS OF REASSEMBLY M35VHAK

4. REASSEMBLY OF PISTON CUPS/3. PISTONS

(1) Use alcohol or the 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: Conforming to 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.

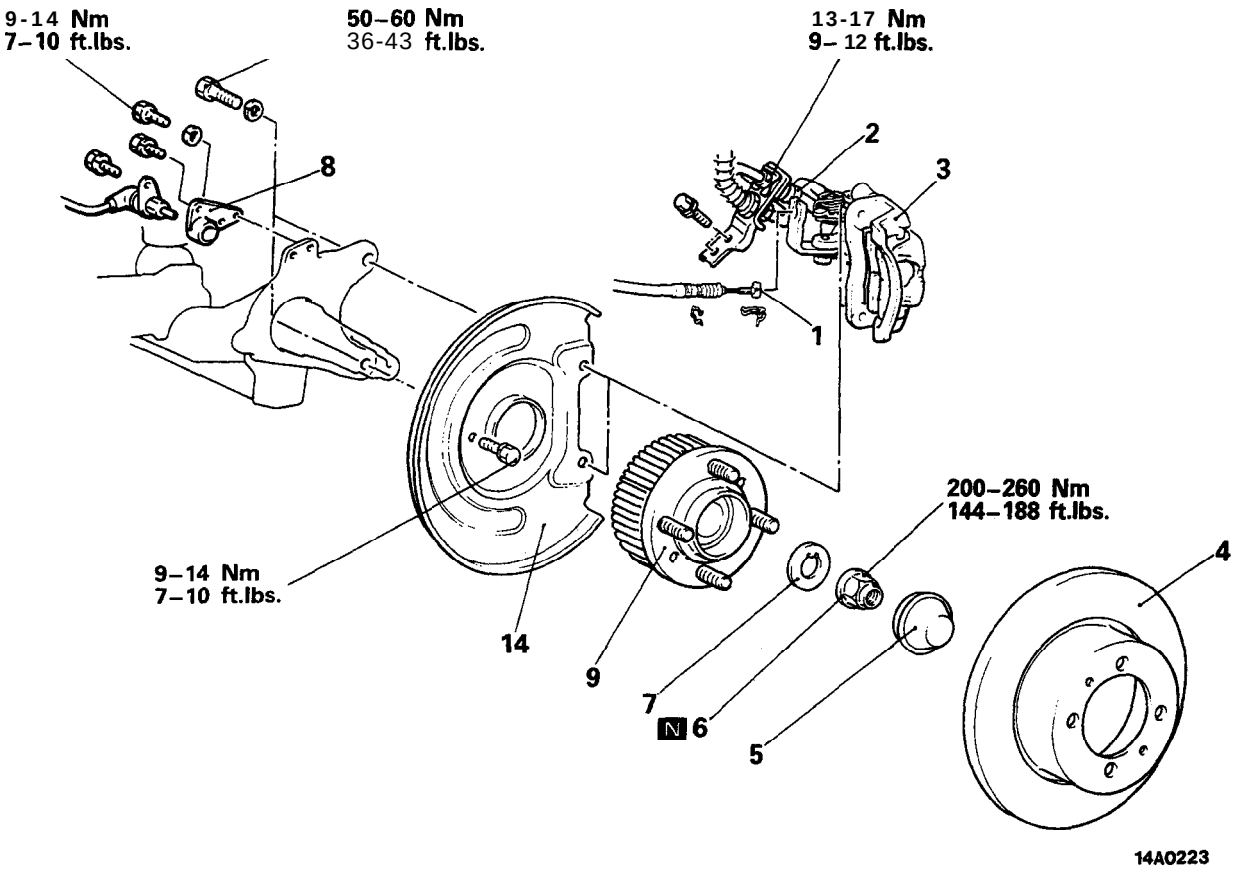
Caution
In order to keep the piston cup from becoming twisted or slanted, slide the piston cup down the tool slowly and carefully, without stopping.

REAR DISC BRAKE

M35MA–

REMOVAL AND INSTALLATION

<FWD>



14A0223

Removal steps

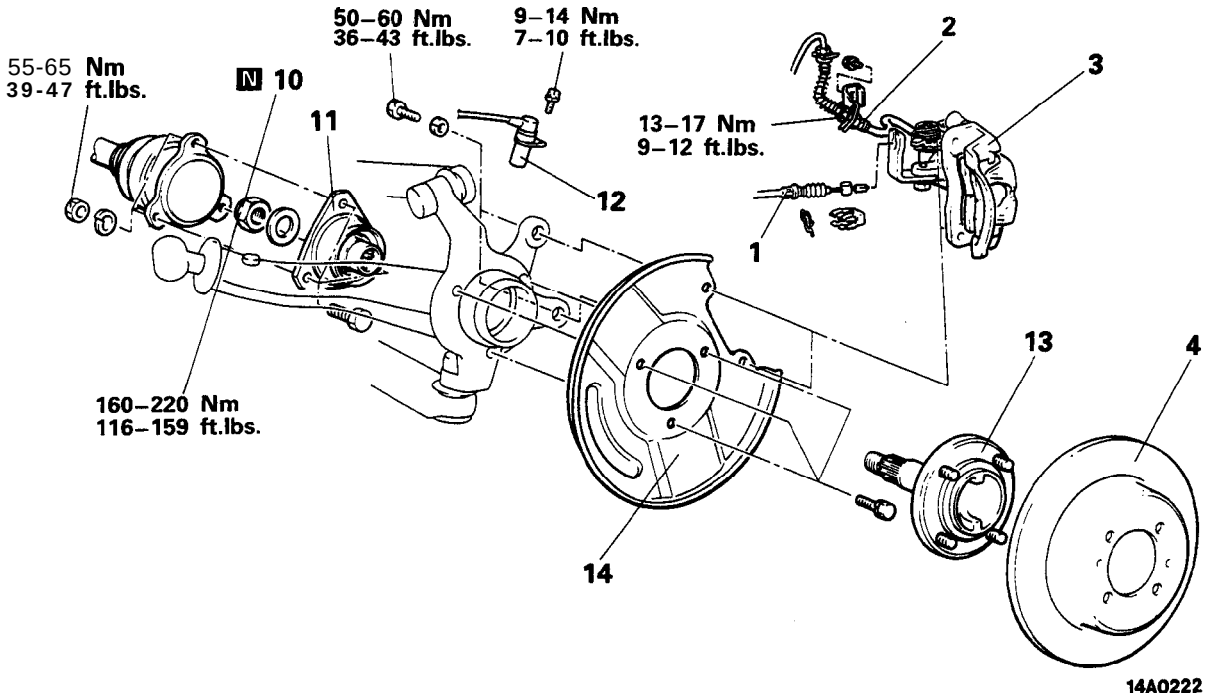
1. Parking brake cable connection
◆◆ 2. Brake hose connection
3. Rear brake assembly
4. Rear brake disc
5. Hub cap
● * 6. Wheel bearing nut
7. Washer
8. Rear speed sensor bracket <Vehicles with A.B.S.>
9. Rear hub assembly
14. Dust shield

Pre-removal Operation
*Draining of Brake Fluid

Post-installation Operation
- Filling of Brake Fluid
- Bleeding (Refer to P.35-57.)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 36–Service Adjustment Procedures.)

TSB Revision

<AWD–UP TO 1992 MODELS>



Removal steps

1. Parking brake cable connection
2. Brake hose connection
3. Rear brake assembly
4. Rear brake disc
10. Self locking nut
11. Companion flange
12. Rear speed sensor <Vehicles with A.B.S.>
13. Rear axle shaft
14. Dust shield

Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Filling of Brake Fluid and Air Bleeding (Refer to P.35-57.)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 36–Service Adjustment Procedures.)

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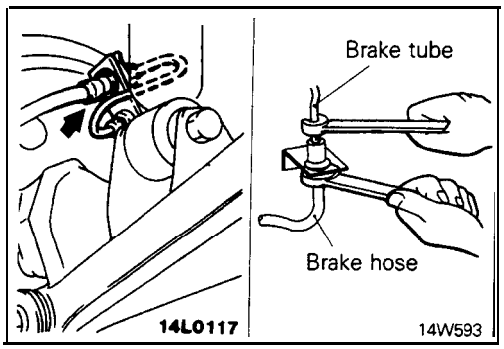
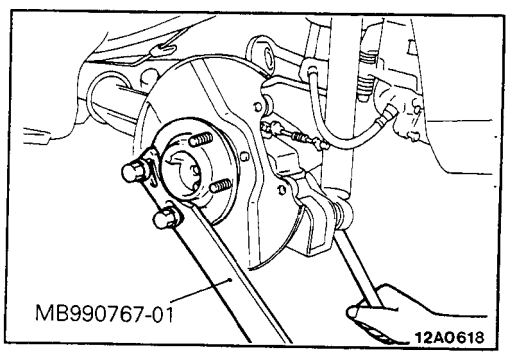


SERVICE POINTS OF REMOVAL M35MBAE

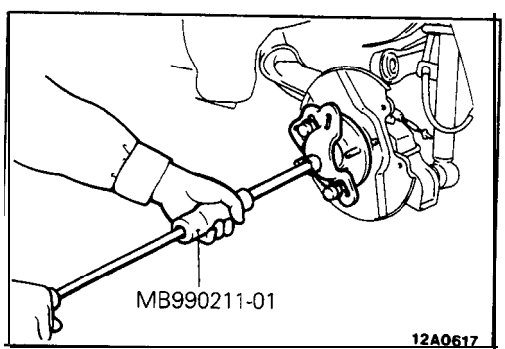
2. DISCONNECTION OF BRAKE HOSE

Holding the locking nut on the brake hose side. Loosen the flared brake line nut.



10. REMOVAL OF SELF LOCKING NUT

Using the special tool, secure and hold the rear axle shaft, and remove the self locking nut.

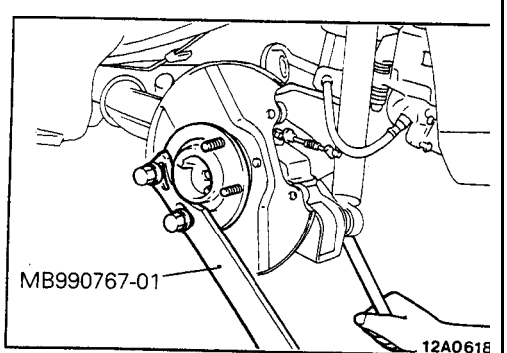


13. REMOVAL OF REAR AXLE SHAFT

Using the special tool, remove the rear axle shaft.

INSPECTION M35MDABa

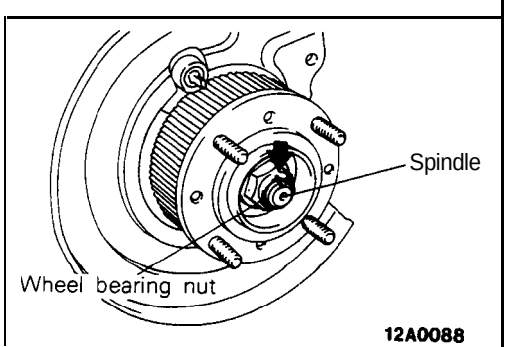
- Check disc for wear. (Refer to P.35-66, Rear Brake Disc Thickness Check.)
- Check disc for runout. (Refer to P.35-66, Rear Brake Disc Run-out Check.)
- Check disc for damage.



SERVICE POINTS OF INSTALLATION M35MCAF

13. INSTALLATION OF REAR AXLE SHAFT/ 11. COMPANION FLANGE/ 10. SELF LOCKING NUT

(1) Provisionally install the rear axle shaft to the trailing arm.
(2) Install the companion flange to the rear axle shaft, and install the self locking nut.
(3) Then, using the special tool, secure and hold the rear axle shaft, and tighten the self locking nut.



6. INSTALLATION OF WHEEL BEARING NUT

After tightening the wheel bearing nut, align with the indentation in the spindle, and then crimp.

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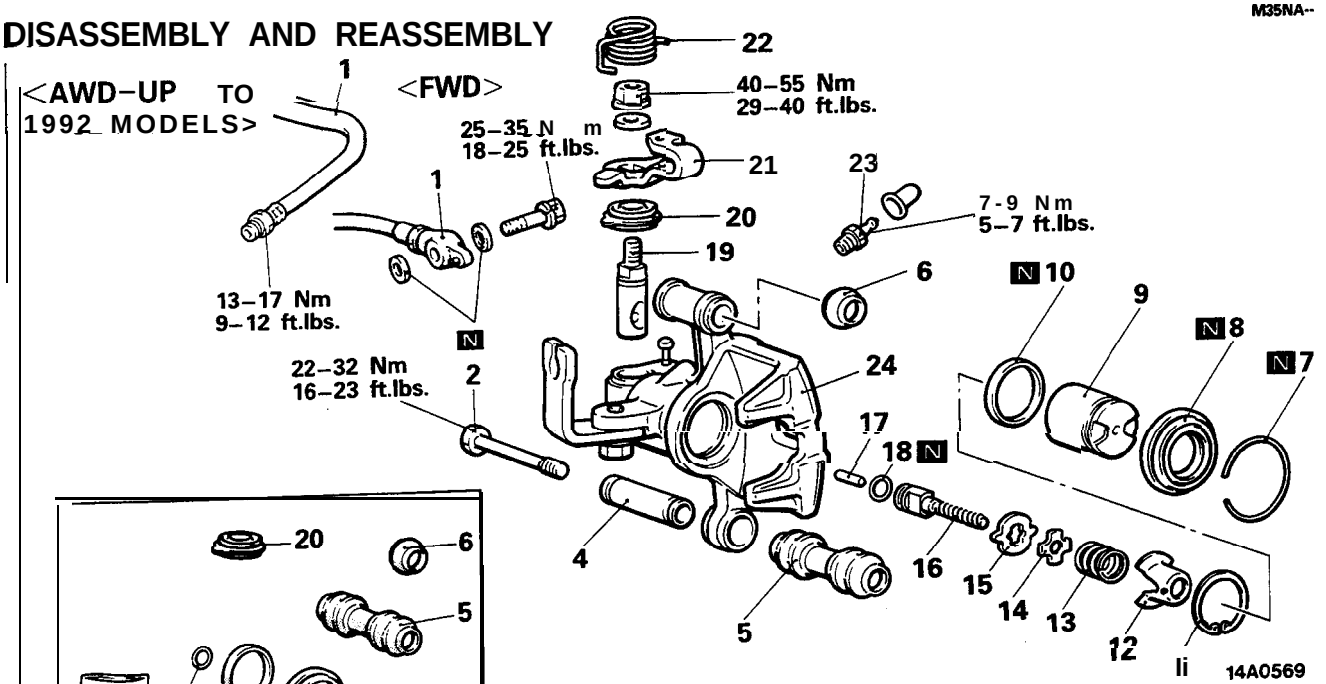
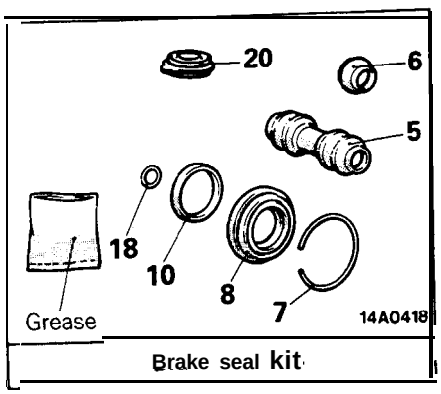
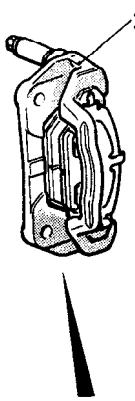
M35NA--

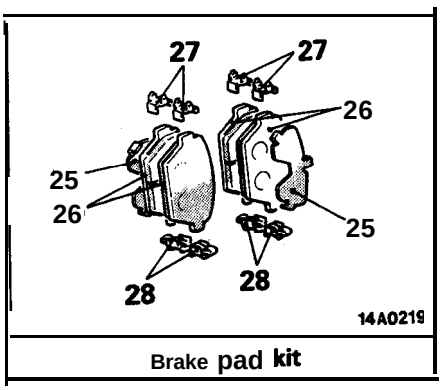
DISASSEMBLY AND REASSEMBLY





Brake seal kit

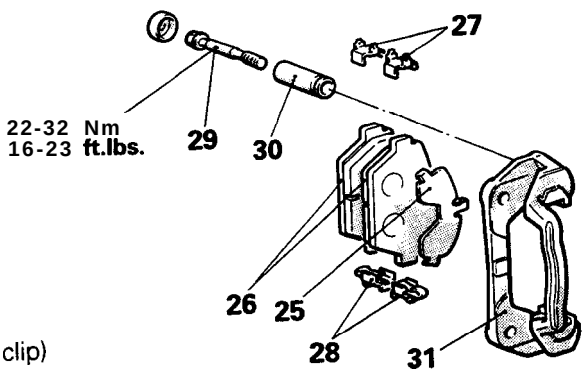




Brake pad kit

Caliper assembly disassembly steps

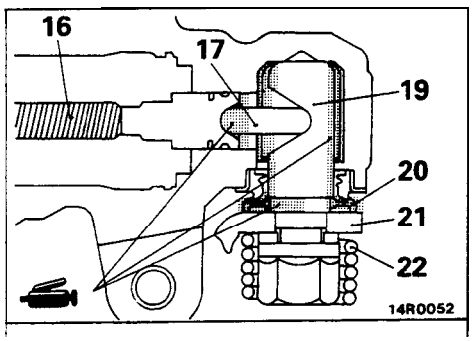
1. Connection for brake hose
2. Lock pin
4. Lock pin sleeve
5. Lock pin boot
6. Guide pin boot
7. Boot ring
8. Piston boot
9. Piston assembly
10. Piston seal
11. Snap ring
12. Spring case
13. Return spring
14. Stopper plate
15. Stopper
16. Auto-adjuster spindle
17. Connecting link
18. O-ring
19. Spindle lever
20. Lever boot
21. Parking brake lever
22. Return spring
23. Bleeder screw
24. Caliper body



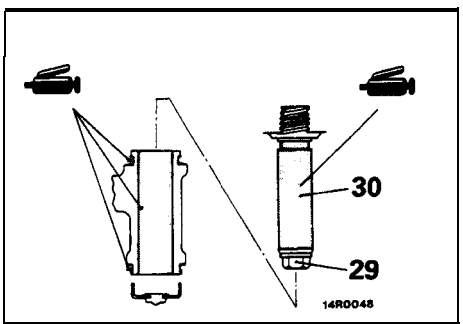
Pad assembly disassembly steps

2. Lock pin
3. Support mounting (pad. shim. clip)
25. Outer shim
26. Pad assembly
27. Pad clips C
28. Pad clips B
29. Guide pin
30. Guide pin sleeve
31. Support mounting

Lubrication points



Grease: Repair kit grease (Orange)



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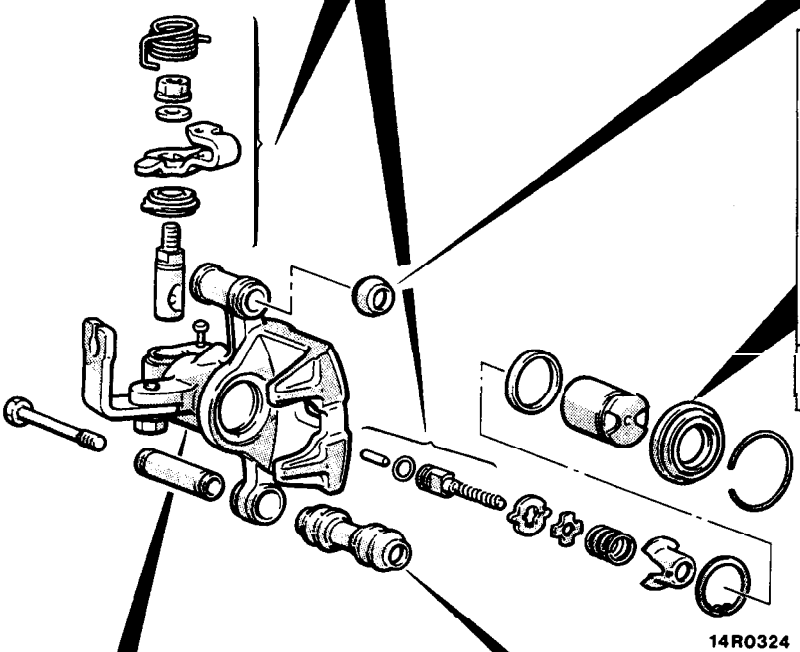

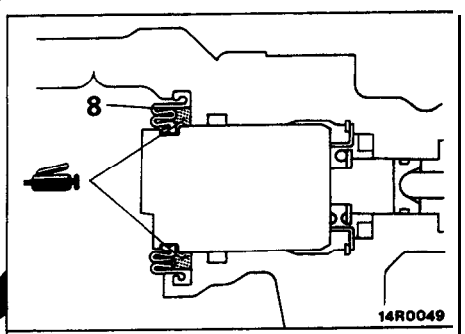

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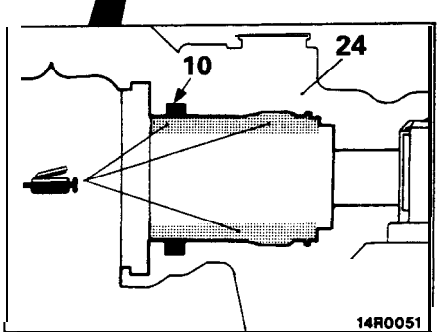
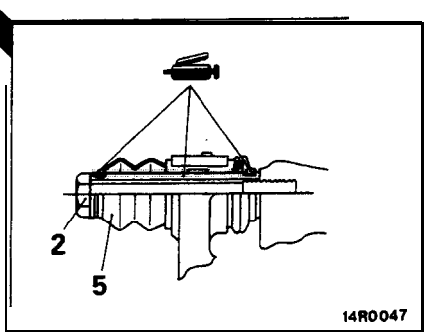
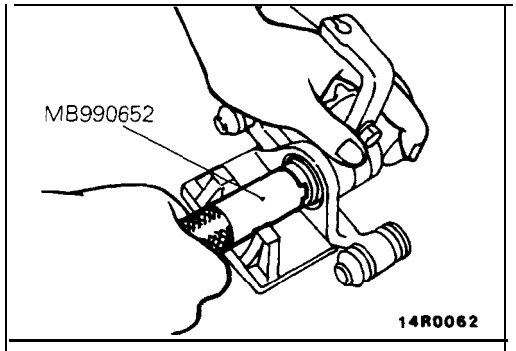


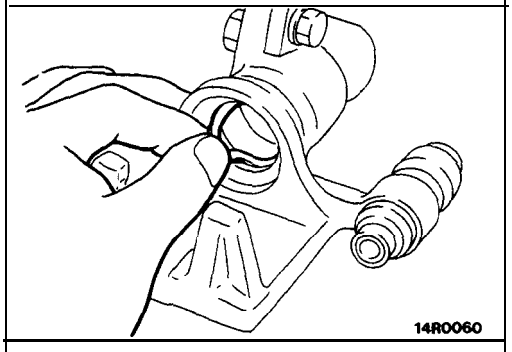
Grease: Repair kit grease (Orange)

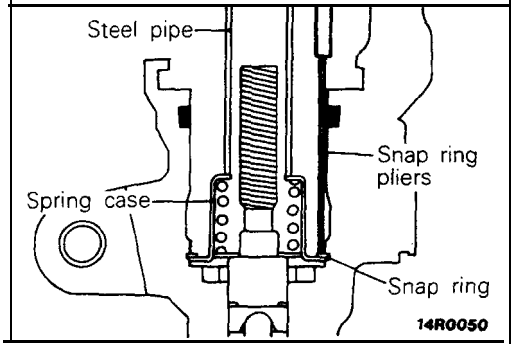


Grease: Repair kii grease (Grange)

TSB Revision







SERVICE POINTS OF DISASSEMBLY M35NBAE

When disassembling the rear disc brakes, disassemble both sides (left and right) as a set.

3. REMOVAL OF SUPPORT MOUNTING

With the lock pin removed, pull the support mounting off from the caliper body.

9. DISASSEMBLY OF PISTON ASSEMBLY

Use the special tool to twist the piston out of the caliper body.

10. DISASSEMBLY OF PISTON SEAL

(1) Remove piston seal with finger tip.

Caution
Do not use (–) screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloroethylene, alcohol or specified brake fluid.

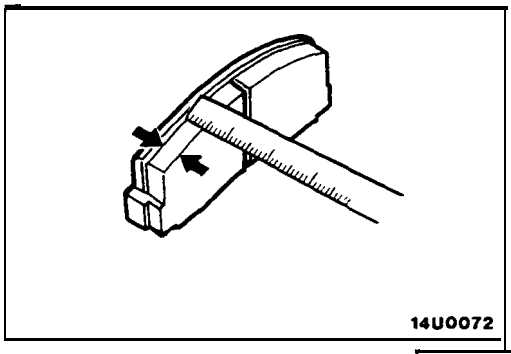
Specified brake fluid: Conforming to DOT3 or DOT4

11. DISASSEMBLY OF SNAP RING

While using a 19 mm (.75 in.) diameter steel pipe to press the spring case into the caliper body, use the snap ring pliers to remove the snap ring from the caliper body.

INSPECTION M35NCAAa

- Check the connecting link and the spindle for wear or damage.
- Check the caliper body for cracks or rust.
- Check the spindle lever shaft for rust.
- Check the bearing for wear.
- Check the piston for rust.
- Check the piston seal for wear or deterioration.
- Check the piston boot for cracks or deterioration.



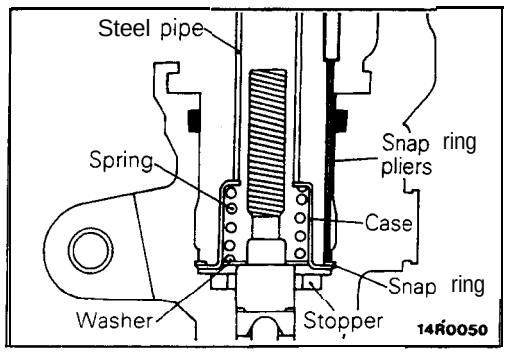
PAD WEAR CHECK

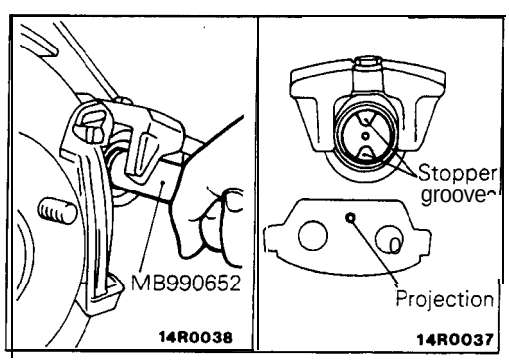
(1) Measure the thickness of the pad at the thinnest place.

Limit: 2.0 mm (.08 in.)

(2) If the pad assemblies are worn beyond the limit, replace them.

TSB Revision





SERVICE POINTS OF REASSEMBLY M35NDAH

11. REASSEMBLY OF SNAP RING

While using a 19 mm (.75 in.) diameter steel pipe to press in the spring case, use the snap ring pliers to attach the snap ring to the caliper body.

Caution
Attach the snap ring to the caliper body with the opening facing the bleeder.

9. REASSEMBLY OF PISTON ASSEMBLY

(1) Push the piston into the caliper with special tool.

NOTE
Align the grooves as illustrated.

(2) The pins on the back side of the brake pad must be placed in the grooves in the position.

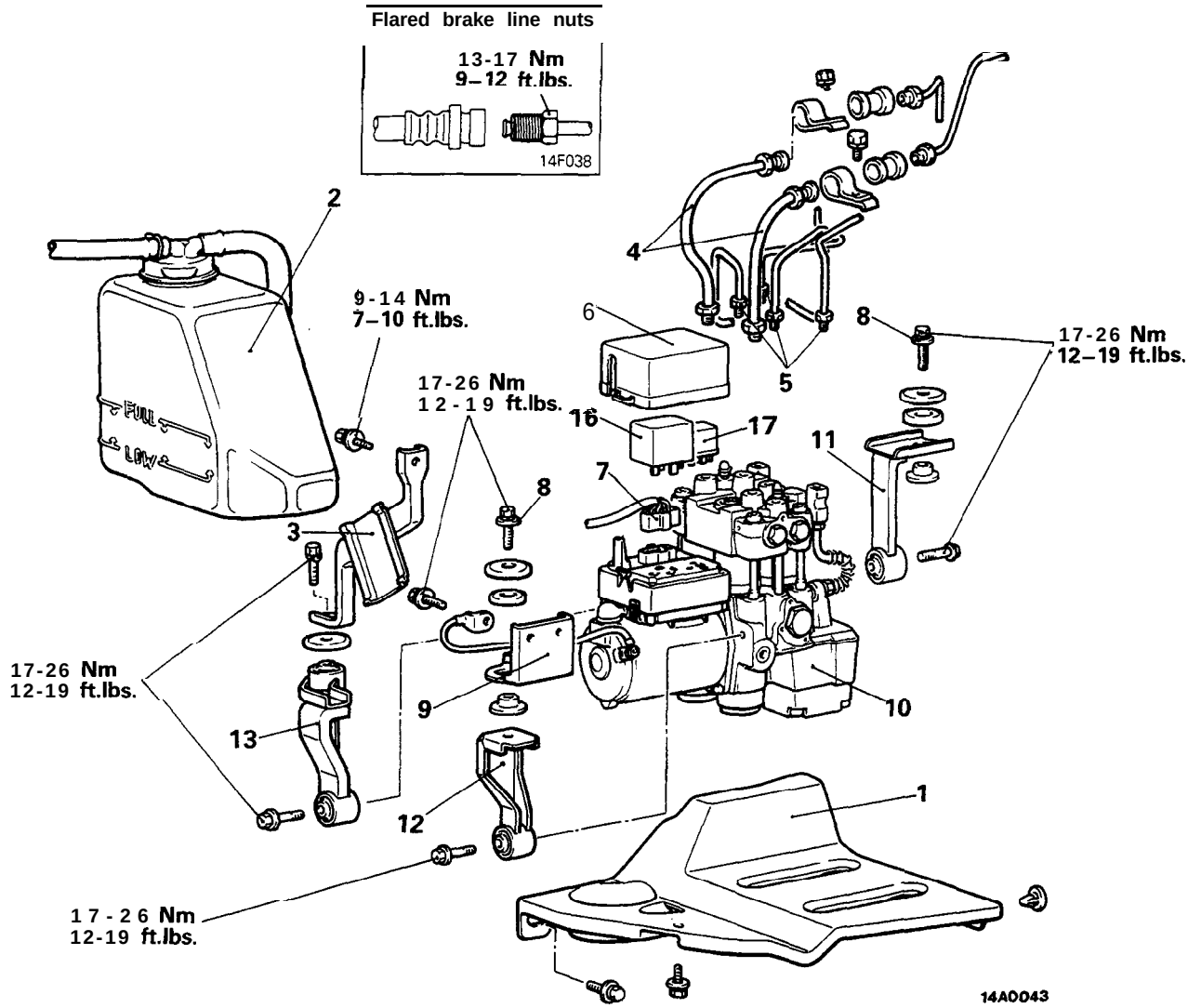
HYDRAULIC UNIT <VEHICLES WITH A.B.S.>

M350XAB

REMOVAL AND INSTALLATION

<Up to 1991 models>

<FWD>



Removal Steps

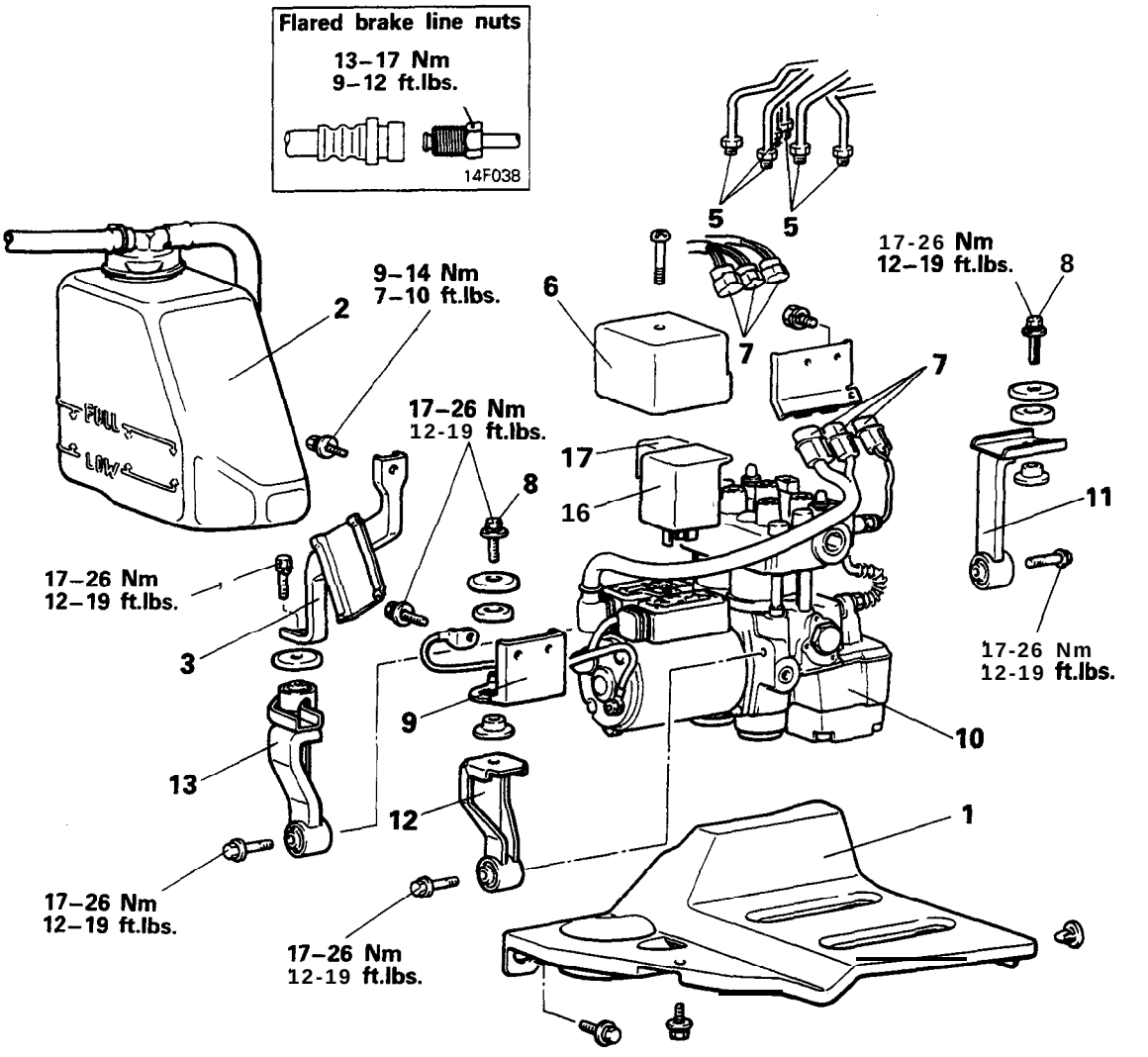
1. Dust shield
2. Engine coolant reservoir
3. Engine coolant reservoir bracket
- ◆◆ 4. Brake hose connection
- ◆◆ 5. Brake tube connection
- ◆◆ 6. Relay box cover
7. Connector
8. Bracket installation bolt
- ● + 9. Bracket A
- ◆◆ 10. Hydraulic unit
11. Bracket D
12. Bracket B
13. Bracket C
16. Motor relay
17. Valve relay

Pre-removal and Post-installation Operation

- Draining and Supplying of Brake Fluid
- Removal and Installation of the Splash Shield (Refer to GROUP 42–Fender.)

TSB Revision

<AWD>



Removal Steps

1. Dust shield
2. Engine coolant reservoir
3. Engine coolant reservoir bracket
4. Brake hose connection
5. Brake tube connection
6. Relay box cover
7. Connector
8. Bracket installation bolt
9. Bracket A
10. Hydraulic unit
11. Bracket D
12. Bracket B
13. Bracket C
16. Motor relay
17. Valve relay

Pre-removal and Post-installation Operation

- Draining and Supplying of Brake Fluid
- *Removal and Installation of the Splash Shield (Refer to GROUP 42–Fender.)

TSB Revision

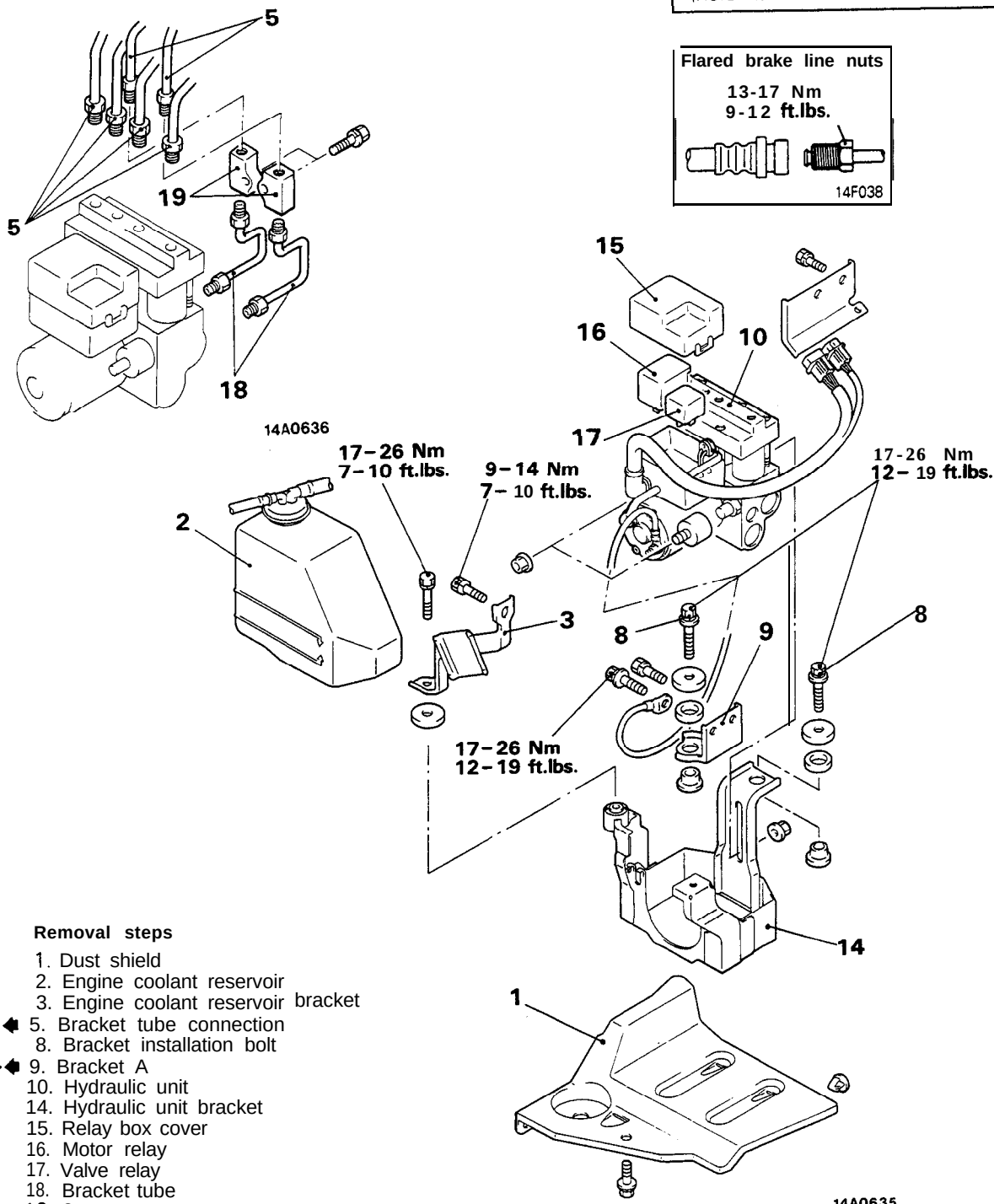
<From 1992 models>

Pre-removal and Post-installation Operation
- Draining and Supplying of Brake Fluid
- Removal and Installation of the Splash Shield
  (Refer to GROUP 42–Fender.)

Flared brake line nuts

13-17 Nm
9-12 ft.lbs.

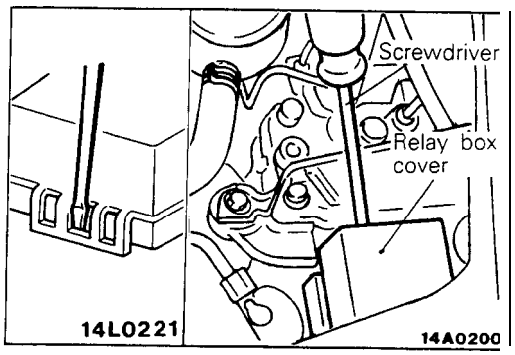
14F038



Removal steps

1. Dust shield
2. Engine coolant reservoir
3. Engine coolant reservoir bracket
◆◆ 5. Bracket tube connection
8. Bracket installation bolt
◆◆ 9. Bracket A
◆◆ 10. Hydraulic unit
14. Hydraulic unit bracket
15. Relay box cover
16. Motor relay
17. Valve relay
18. Bracket tube
19. 2 way connector

TSB Revision



SERVICE POINTS OF REMOVAL

6. REMOVAL OF RELAY BOX COVER <FWD>

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.

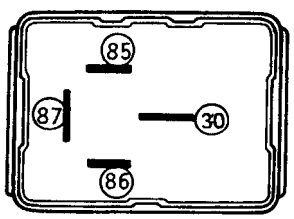
10. REMOVAL OF HYDRAULIC UNIT

Remove the bracket B, C and D installation bolts, and then take out the hydraulic unit downward.

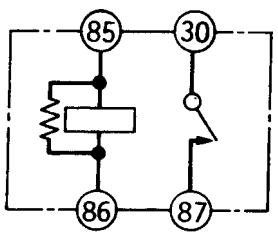
Caution

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.**

Motor relay



16R0670



16R1773

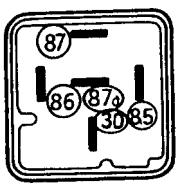
INSPECTION

Check whether there is continuity between terminals when there is no current flow at each relay and when there is current flow.

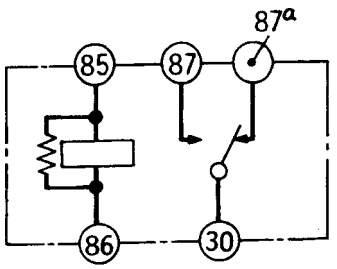
MOTOR RELAY

Between terminals (85) – (86)	30 – 60 Ω	
Between terminals (30) – (87)	No continuity (∞ Ω)	
When current flows between terminal (85) – (86)	Between terminals (30) – (87)	Continuity (approx. 0 Ω)

Valve relay



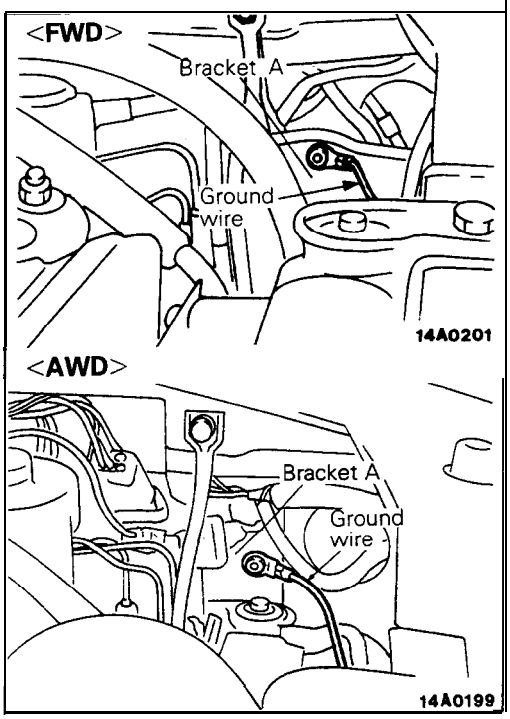
16R0670



16R1772

VALVE RELAY

	Between terminals (85) – (86)	60 – 120 Ω
When no current flows	Between terminals (30) – (87a)	Continuity (approx. 0 Ω)
	Between terminals (30) – (87)	No continuity (∞ Ω)
When current flows between terminal (85) – (86)	Between terminals (30) – (87a)	No continuity (∞ Ω)
	Between terminals (30) – (87)	Continuity (approx. 0 Ω)



5. CONNECTION OF BRAKE TUBE / 4. CONNECTION OF BRAKE HOSE

When connecting the tubes and hoses to the hydraulic unit, be sure they are connected correctly.
(Refer to P.35-93.)

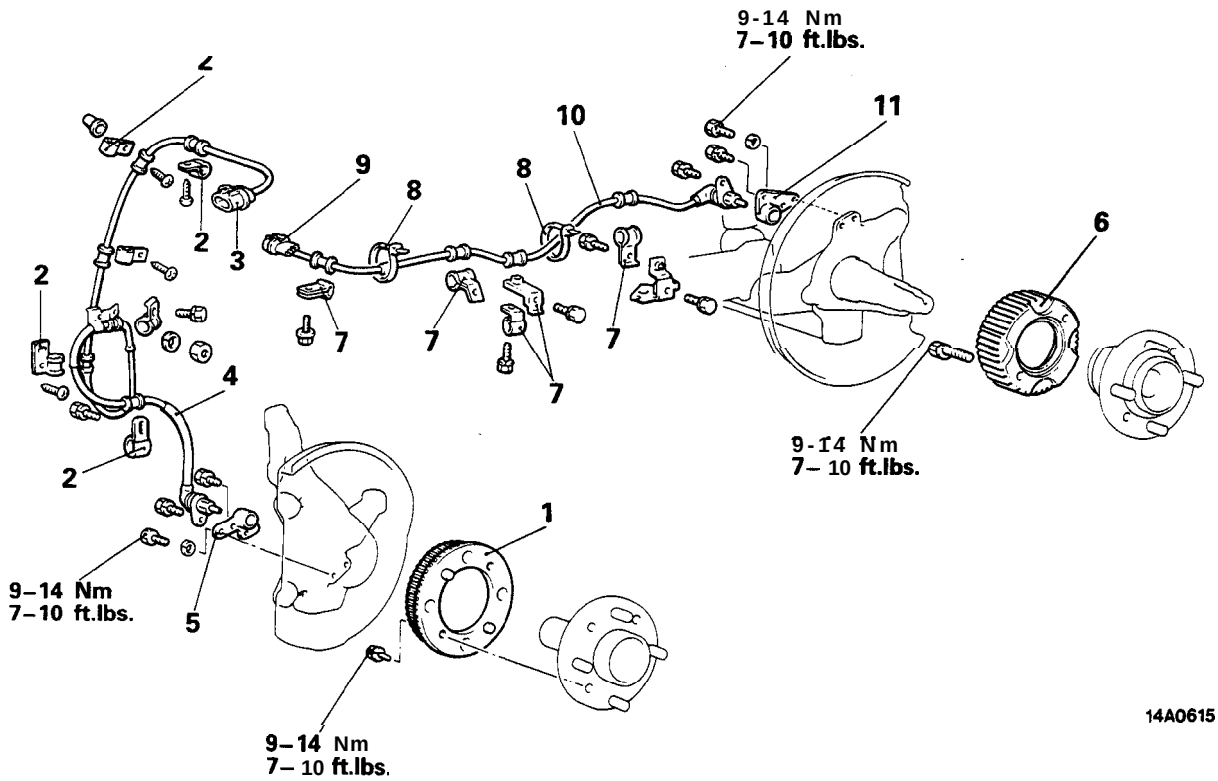
TSB Revision

WHEEL SPEED SENSOR <VEHICLES WITH A.B.S.>

M350YAE

REMOVAL AND INSTALLATION

<FWD>



Pre-removal and Post-installation Operation
- Removal and Installation of the Splash Shield (Refer to GROUP 42–Fender.)

Front speed sensor removal steps

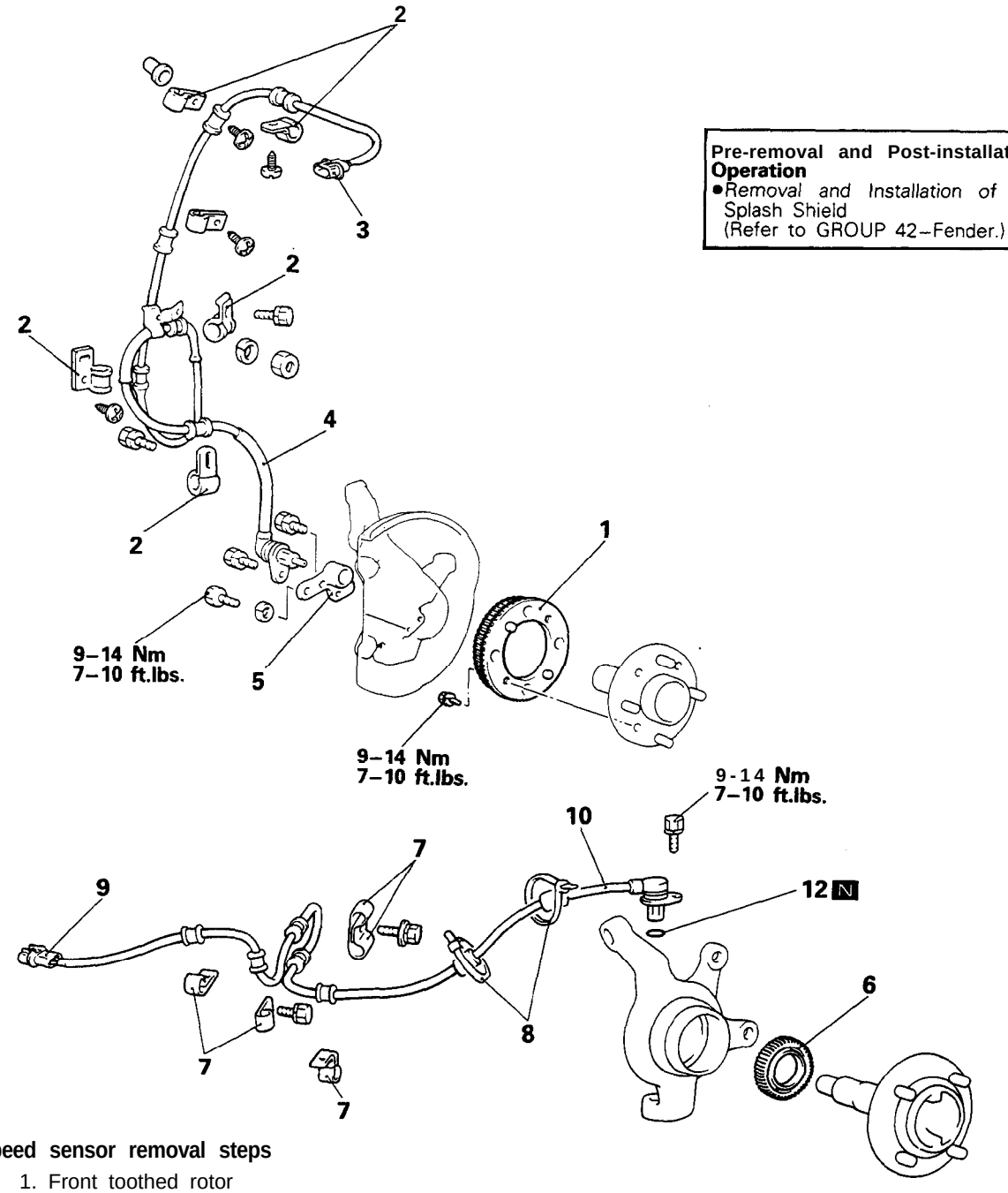
1. Front toothed rotor
2. Clip
3. Connection for front speed sensor
4. Front speed sensor
5. Front speed sensor bracket

Rear speed sensor removal steps

6. Rear toothed rotor
7. Clip
8. Cable band
9. Connection for rear speed sensor
10. Rear speed sensor
11. Rear speed sensor bracket

TSB Revision

<AWD–UP TO 1992 MODELS>



Pre-removal and Post-installation Operation
- *Removal and Installation of the Splash Shield*
  (Refer to GROUP 42–Fender.)

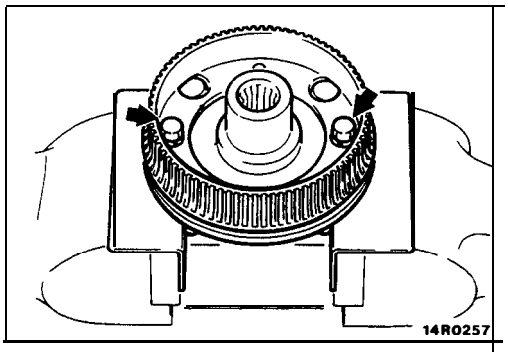
Front speed sensor removal steps

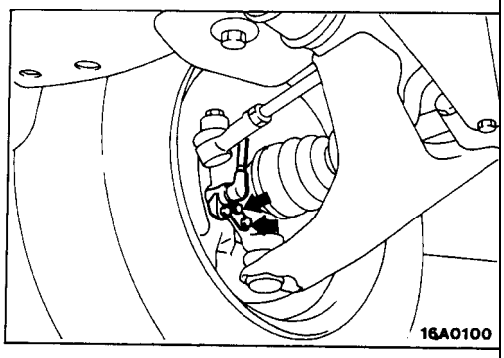
◆◆ 1. Front toothed rotor
2. Clip
3. Front speed sensor connection
◆◆ ● a 4. Front speed sensor
◆◆ 5. Front speed sensor bracket

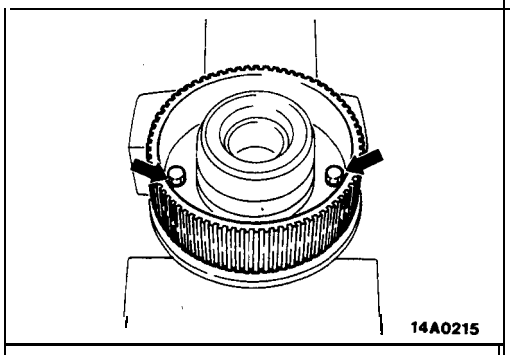
Rear speed sensor removal steps

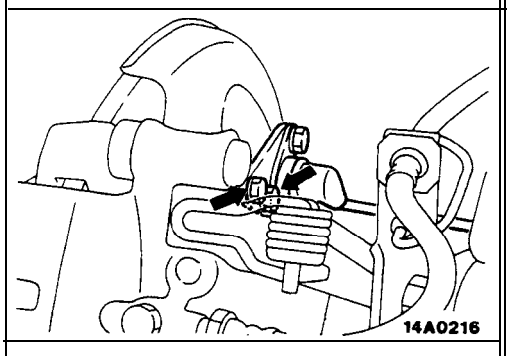
6. Rear toothed rotor
(Refer to GROUP 27–Rear Axle Hub)
7. Clip
8. Cable band
9. Rear speed sensor connection
● *◆◆ 10. Rear speed sensor
12. O-ring

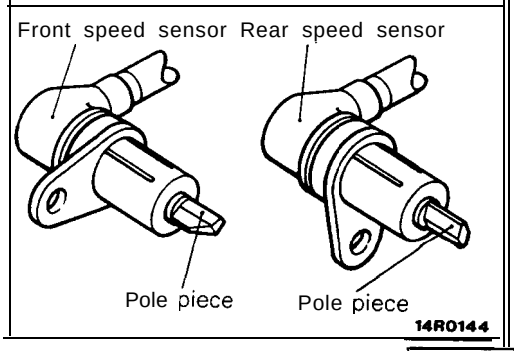
TSB Revision











SERVICE POINTS OF REMOVAL

1. REMOVAL OF THE FRONT TOOTHED ROTOR

Refer to GROUP 26–Hub and Knuckle.

Caution
Care must be taken not to scratch or scar the rotor's toothed surface, and not to drop it.
If the rotor's toothed surface is chipped or the rotor is deformed, it might not be able to accurately sense the wheel rotation speed and the system as a result might not perform normally.

4. REMOVAL OF FRONT SPEED SENSOR

Remove the mounting bolts which hold the speed sensor bracket to the knuckle, and then remove. the speed sensor.

Caution
Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.

6. REMOVAL OF REAR TOOTHED ROTOR

For FWD vehicles, remove together with the rear axle assembly, as shown in the figure, and then remove the rear toothed rotor from the rear axle assembly.

Caution
Care must be taken not to scratch or scar the rotor's toothed surface, and not to drop it.
If the rotor's toothed surface is chipped or the rotor is deformed, it might not be able to accurately sense the wheel rotation speed and the system as a result might not perform normally.

10. REMOVAL OF REAR SPEED SENSOR

Remove the speed sensor bracket and rear axle spindle installation nut, and then remove the speed sensor.

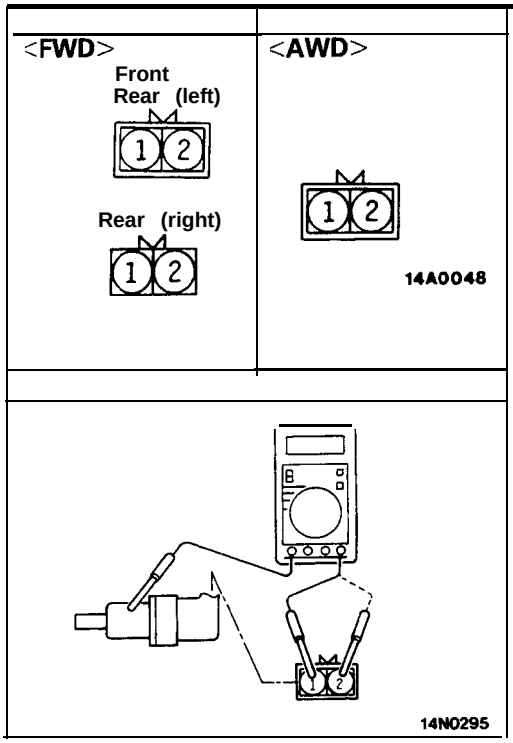
Caution
Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.

INSPECTION

SPEED SENSOR CHECK

(1) Check whether any metallic foreign material has adhered to the pole piece at the speed sensor tip, and, is so, remove it.
Also check whether the pole piece is damaged, and, if so, replace it with a new one.

TSB Revision



NOTE
The pole piece can become magnetized because of the magnet built into the speed sensor, with the result that metallic foreign material easily adheres to it. Moreover, the pole piece may not be able to function to correctly sense the wheel rotation speed if it is damaged.

(2) Measure the resistance between the speed sensor terminals.

Standard value: 0.8–1.2 kΩ

If the internal resistance of the speed sensor is not within the standard value, replace it with a new speed sensor.

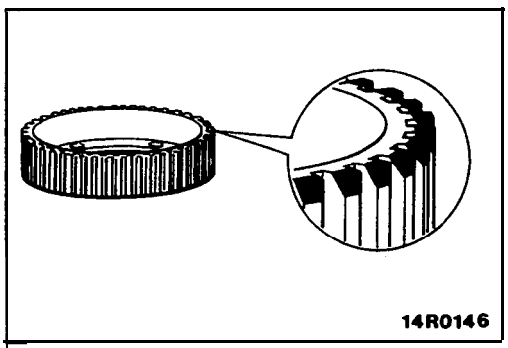
(3) Measure the resistance between each terminal on the speed sensor and the sensor body.

Standard value: 100 kΩ or more

When the insulated resistance is not within the standard value, replace the sensor.

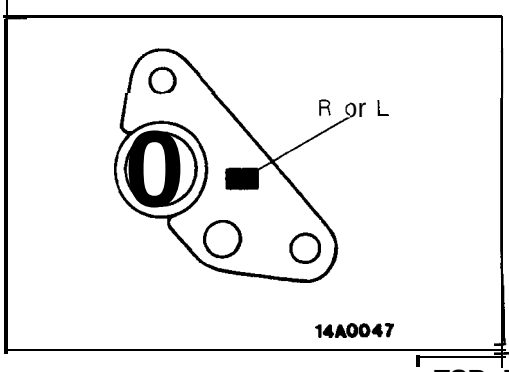
(4) Check the speed sensor cable for breakage, damage or disconnection; replace with a new one if a problem is found.

NOTE
When checking for cable damage, remove the cable clamp part from the body and then bend and pull the cable near the clamp to check whether or not temporary disconnection occurs.



TOOTHED ROTOR CHECK

Check whether rotor teeth are broken or deformed, and, if so. replace the rotor.



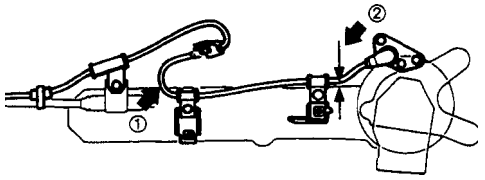
SERVICE POINTS OF INSTALLATION

11. INSTALLATION OF REAR SPEED SENSOR BRACKET

Assemble the speed sensor and the speed sensor bracket.

NOTE
The shape is different for the left and right speed sensor brackets. Each bracket has an identification symbol, so be sure to note these symbols and install correctly.
R: Indicates that the bracket is for the right wheel.
L: Indicates that the bracket is for the left wheel.

Left side view
Right side



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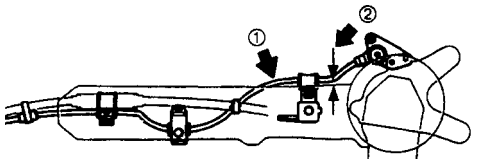
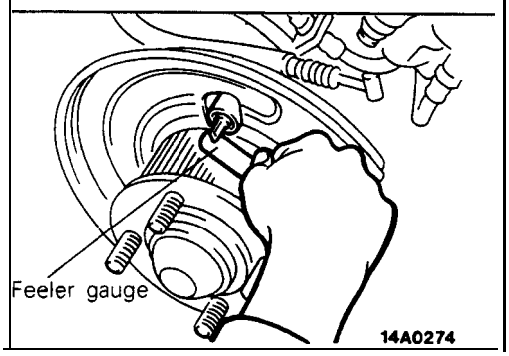
Left side view
Left side



14A0046



14A0274

10. INSTALLATION OF REAR SPEED SENSOR <FWD>

(1) Temporarily install the speed sensor to the rear axle spindle.

Caution
Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against metal objects.

(2) Note the following points when connecting the speed sensor cable, and secure the cable by the clip.
① Secure the clip so that the white-painted part (shaded in the illustration) of the speed sensor cable is not twisted.
② Be sure that there is space (where shown in the illustration) so that the trailing arm and speed sensor cable do not contact, and then secure by the clip.

Caution
Because there is the possibility of damage to the cable during driving if the speed sensor cable and the trailing arm come into contact, or if the speed sensor cable is twisted, care must be taken regarding this point.

(3) Insert a feeler gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensors at the position where the clearance is the standard value.

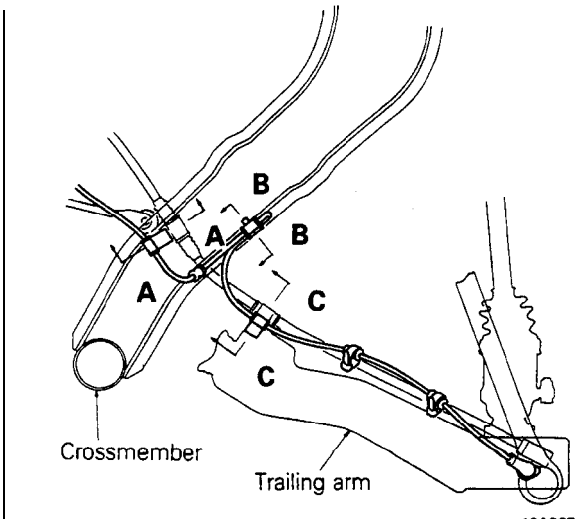
Standard value: 0.3–0.9 mm (.012–.035 in.)

NOTE
Check to be sure that there is no contact of the speed sensor's pole piece and the rotor's toothed surface when the rear hub assemlby is slowly rotated one time.

If there is contact, it is probable that the rotor or the rear hub is installed incorrectly, recheck installation.

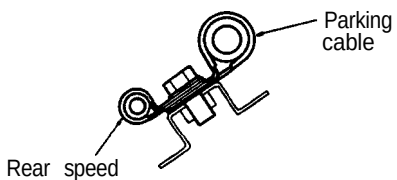
10. INSTALLATION OF REAR SPEED SENSOR <AWD>

Install the rear speed sensors as shown in the illustration.



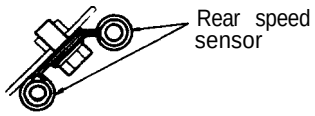
12A0074

Cross-section A-A



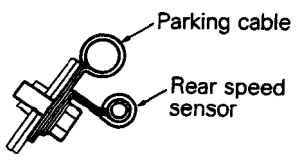
12A0075

Cross-section B-B



12A0076

Cross-section C-C



12A0077

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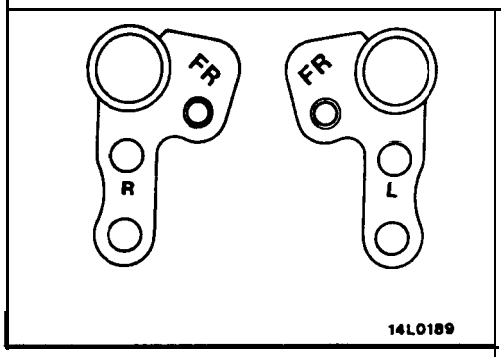
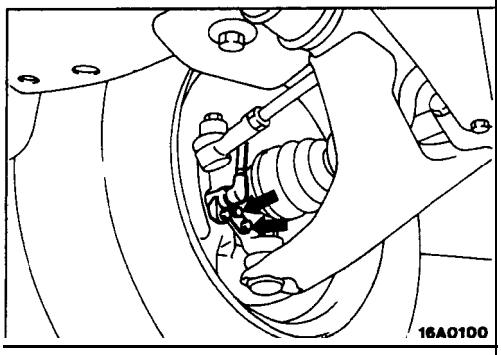
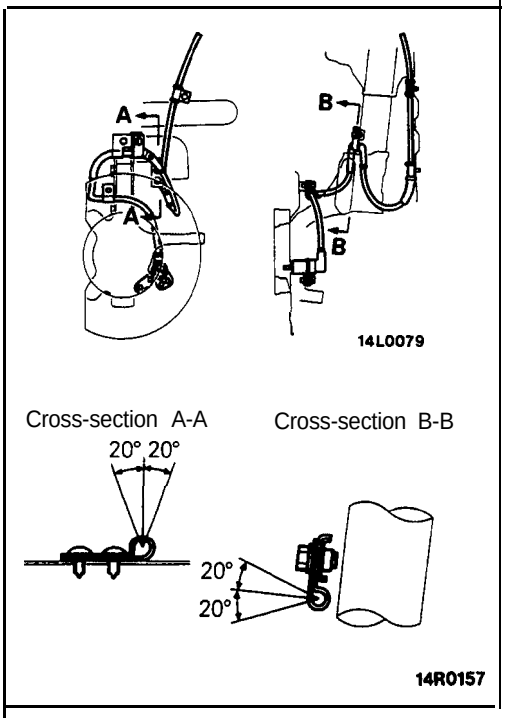
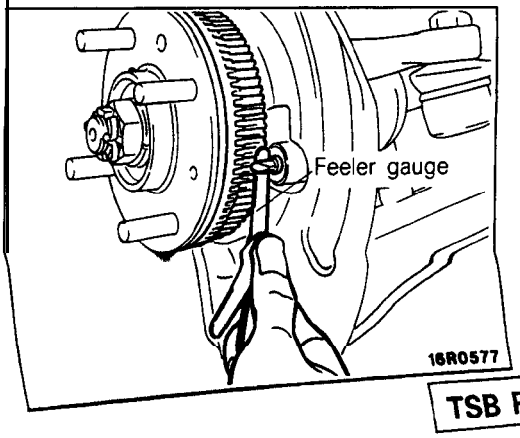








5. INSTALLATION OF FRONT SPEED SENSOR BRACKET

Assemble the speed sensor and the speed sensor bracket.

NOTE

(1) The shape is different for the left and right speed sensor brackets. Each bracket has an identification symbol, so be sure to note these symbols and install correctly.
FR: Indicates that the bracket is for the front speed sensor.
R: Indicates that the bracket is for the right wheel.
L: Indicates that the bracket is for the left wheel.

(2) Check to be sure, when installing the speed sensor to the bracket, that the letters "FR" are visible.

4. INSTALLATION OF FRONT SPEED SENSOR

(1) Temporarily install the speed sensor to the knuckle.

Caution
Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.

(2) Note the following points when connecting the speed sensor cable, and secure the cable by the clip.
① Secure the cable by the clip so that the whitepainted parts of the blackened parts (in the illustration) of the speed sensor cable are within the range of the angles indicated by cross-section A-A and cross-section B-B in the illustration.
② Check to be sure that the white-painted part (shaded in the illustration) of the speed sensor cable is not twisted.

Caution
Because there is the possibility of damage to the cable during driving if the speed sensor cable is twisted, care must be taken regarding this point.

(3) Insert a feeler gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensor at the position where the clearance is the standard value all around.

Standard value: 0.3–0.9 mm (.012–.035 in.)

NOTE

If the clearance between the speed sensor's pole piece and the rotor's toothed surface is not within the standard value range, it is probable that the rotor is incorrectly installed, recheck installation.

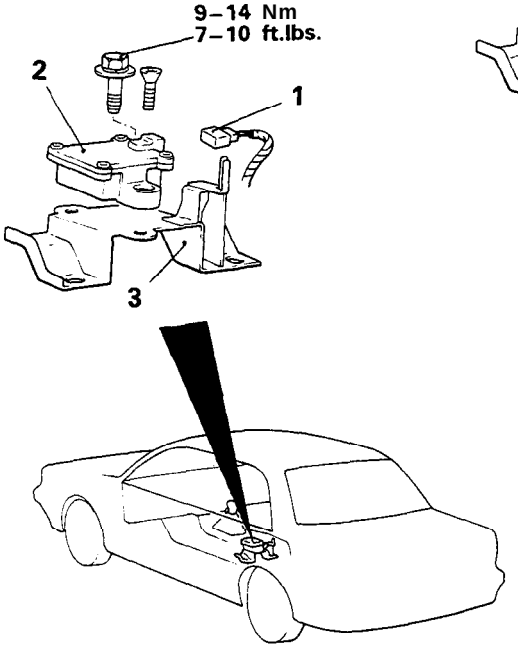
G-SENSOR <AWD-A.B.S.>

REMOVAL AND INSTALLATION

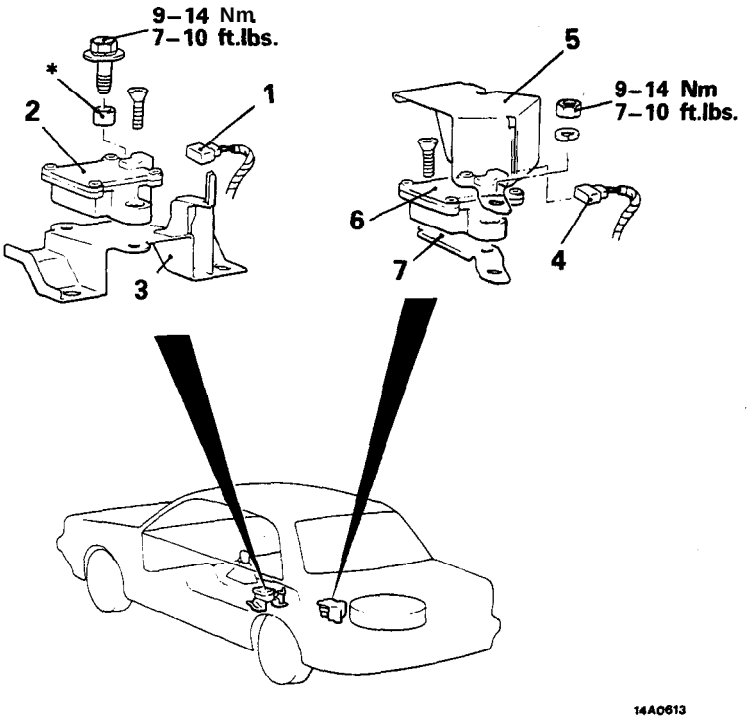
M350VAA

Pre-removal and Post-installation Operation
*Removal and Installation of Floor Console (Refer to GROUP 52–Floor Console.)
● Removal and Installation of Trunk Room Floor Mat

<1991, 1992 models>



<Up to 1991 models>



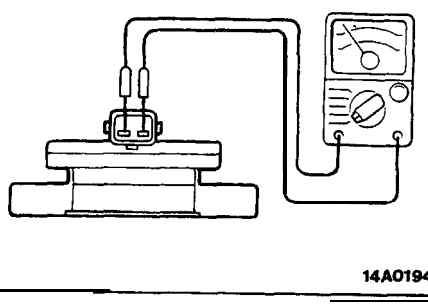
G-sensor (front) removal steps

1. Wiring harness connector
2. G-sensor (front)
3. G-sensor bracket

G-sensor (rear) removal steps

4. Wiring harness connector
5. G-sensor cover
6. G-sensor (rear)
7. G-sensor bracket

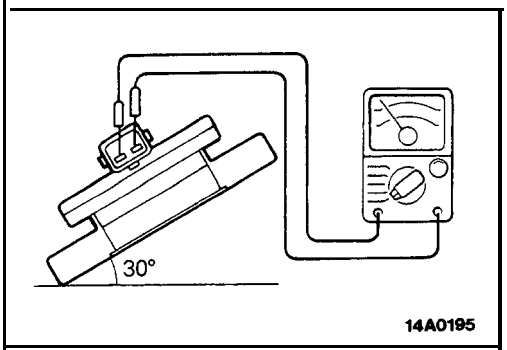
NOTE
The * symbol indicates with automatic transaxle.



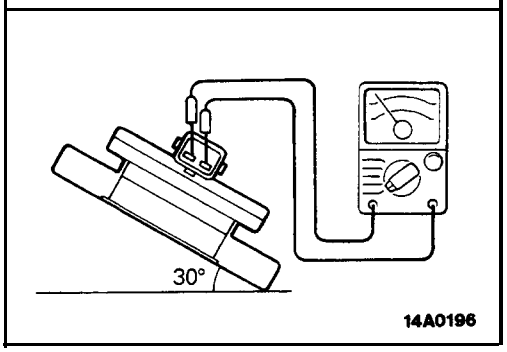
INSPECTION

(1) Place the sensor on a level surface, then check that there is conductance between the terminals.

TSB Revision



(2) Slowly inclining the G-sensor in the direction of forward vehicle travel, check that there is no conductance above a sensor angle of 30 degrees.



(3) Slowly inclining the G-sensor in the direction of reverse vehicle travel, check that there is no conductance above a sensor angle of 30 degrees.

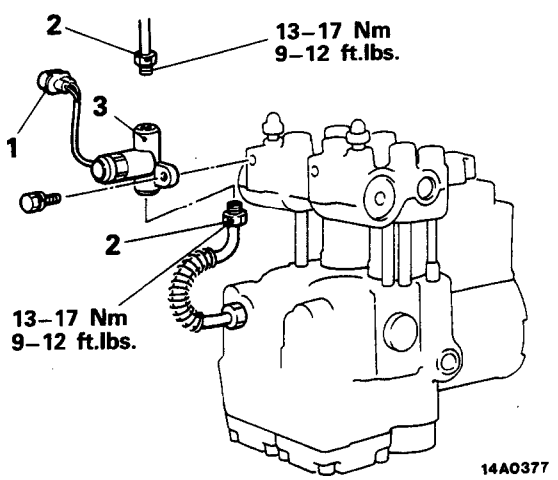
BRAKE FLUID PRESSURE SWITCH <AWD-A.B.S.: Up to 1991 models>

REMOVAL AND INSTALLATION

M350WAA

Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Filling of Brake Fluid
- Bleeding
(Refer to P.35-57.)

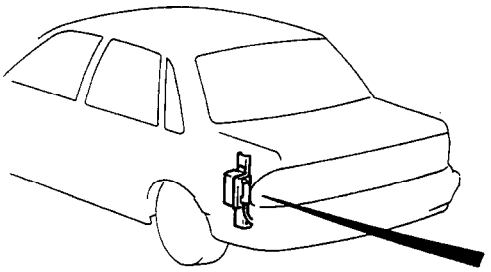


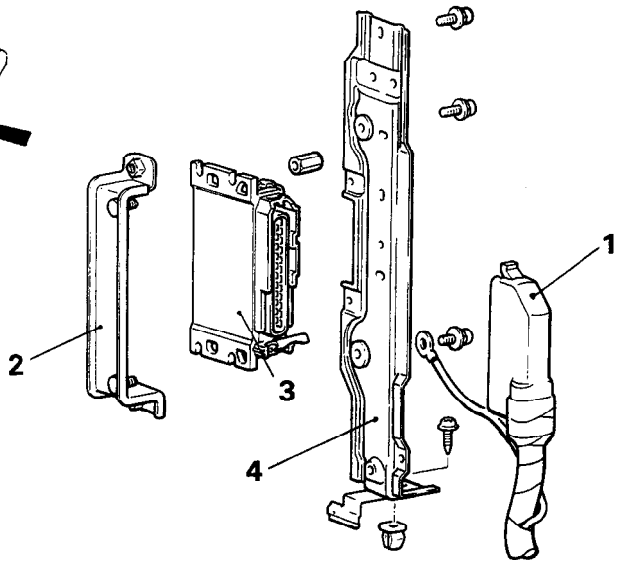
Removal steps
1. Wiring harness connector
2. Brake tubes connection
3. Brake fluid pressure switch

ELECTRONIC CONTROL UNIT <VEHICLES WITH A.B.S.>

M350ZAB

REMOVAL AND INSTALLATION



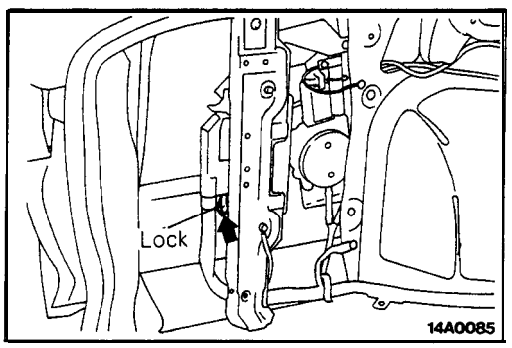


14A0698

Removal steps

◆◆ 1. Electronic control unit connection
2. ABS bracket
● + 3. Electronic control unit
4. Bracket

Pre-removal and Post-installation Operation
- Removal and Installation of the Trunk Side Trim (L.H.) (Refer to GROUP 52–Trim.)

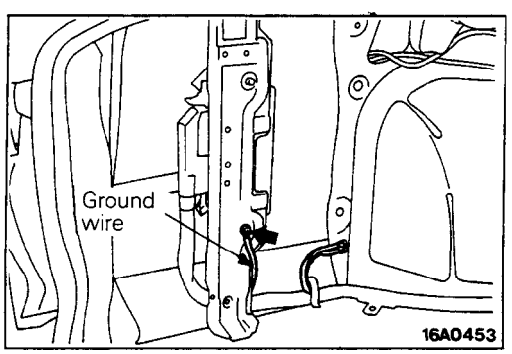


14A0085

SERVICE POINTS OF REMOVAL

1. DISCONNECTION OF ELECTRONIC CONTROL UNIT

Unlock the connector and take the connector out.



16A0453

SERVICE POINTS OF INSTALLATION

3. INSTALLATION OF ELECTRONIC CONTROL UNIT

When installing the electronic control unit to the bracket, fasten the connector's ground wire to the bracket.

After connecting the connector to the electronic control unit, secure the connector by the holding spring.

TSB Revision

PARKING BRAKES

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M36AA--

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PARKING BRAKE LEVER 4

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Parking Brake Lever Stroke Check 2

Parking Brake Switch Check 3

SPECIFICATIONS 2

General Specifications 2

Service Specification 2

TROUBLESHOOTING 2

SPECIFICATIONS

GENERAL SPECIFICATIONS

M36CA--

Items	Specifications
Type	Mechanical brake acting on rear wheels
Parking brake lever type	Lever type
Cable arrangement	V-type

SERVICE SPECIFICATION

M36CB--

Items	Specifications
Standard value Parking brake lever stroke	5-7 notches

TROUBLESHOOTING

M36EAAQ

Symptom	Probable cause	Remedy
Poor parking brake function	Worn brake pad	Replace
	Poor condition of brake pad surface	
	Parking brake cable sticking	
	Auto-adjuster malfunction	Adjust
	Excessive parking brake lever stroke	Adjust the parking brake lever stroke or check the parking brake cable arrangement

SERVICE ADJUSTMENT PROCEDURES

PARKING BRAKE LEVER STROKE CHECK

M36FEAJ

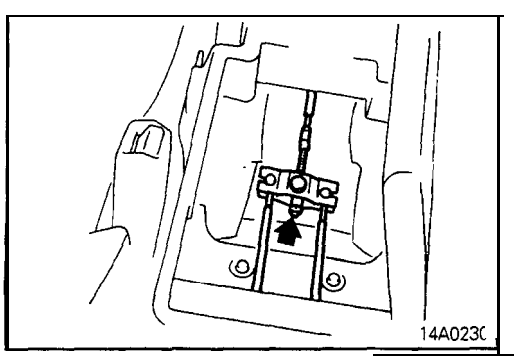
1. Pull the parking brake lever with a force of approx. 200 N (45 lbs.), and count the number of notches.

   Caution
   The 200 N (45 lbs.) force of the parking brake lever must be strictly observed.

   Standard value: 5-7 notches

2. If the parking brake lever stroke is not the standard value, adjust as described below.
   (1) Remove the carpet in the floor console.
   (2) Loosen the adjusting nut to the end of the cable rod, thus freeing the parking brake cable.
   (3) With the engine idling, firmly depress the brake pedal five or six times and confirm that the pedal stroke stops changing.

   NOTE
   If the pedal stroke stops changing, it indicates that the automatic adjusting mechanism has functioned properly to adjust the clearance between the pads and the disc to the correct value.



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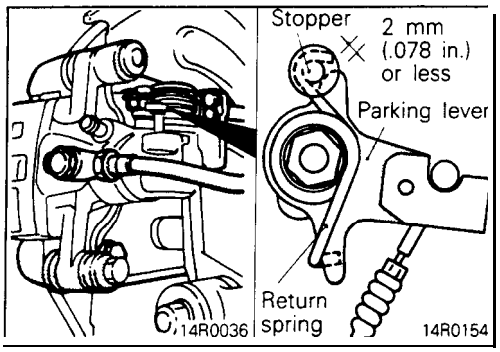
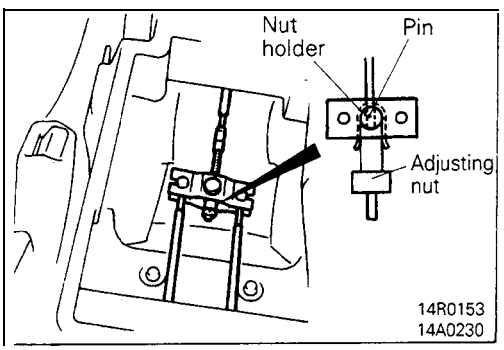


(4) Check to be sure that the clearance between the stopper and the parking brake lever at the caliper side is as shown in the figure.

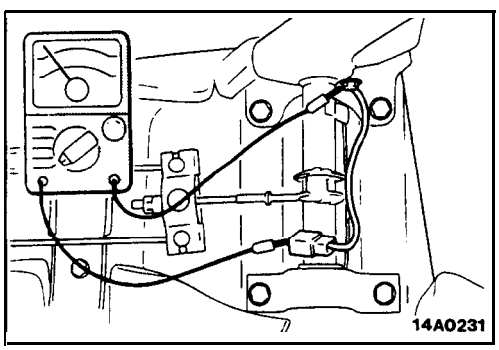
NOTE
If the clearance between the parking brake lever and the stopper exceeds 2 mm (.078 in.), the probable causes are brake cable sticking, improper wiring, or a malfunction of the automatic adjuster (within the rear brake caliper), so it is necessary to check the parking brake cable and to disassemble and check the rear brake caliper.

(5) 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, and failure of the automatic adjuster mechanism will result. Be sure to adjust it to within the standard value.



(6) After making the adjustment, check to be sure that there is no play between the adjusting nut and the pin. Also check to be sure that the adjusting nut is securely held at the nut holder.
(7) After adjusting the lever stroke, jack up the rear of the vehicle.
(8) 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 M36FDAB

(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.

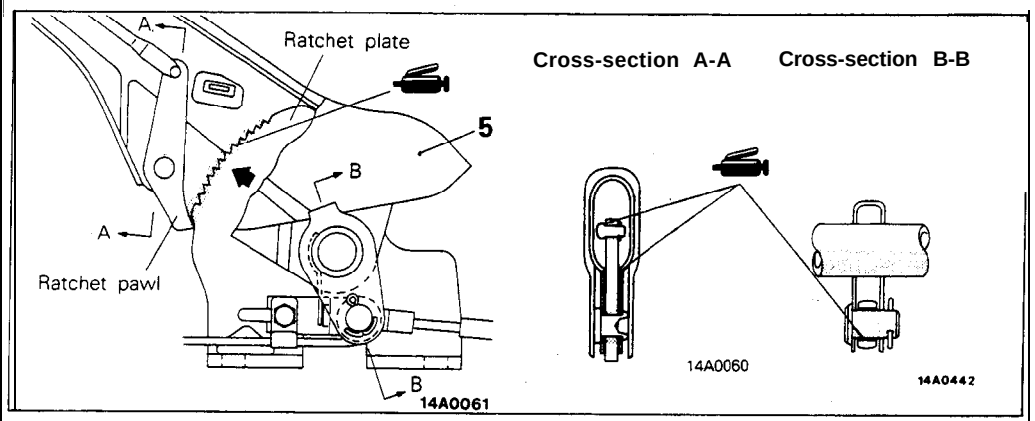
PARKING BRAKE LEVER

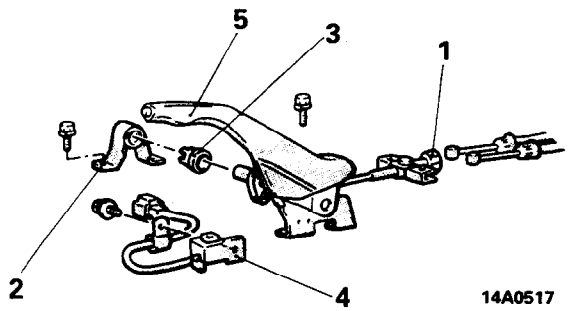
REMOVAL AND INSTALLATION

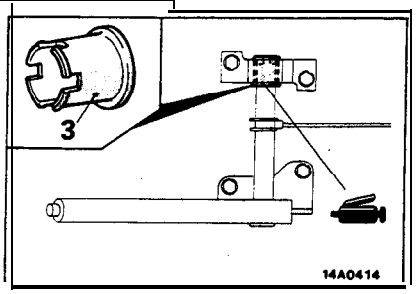
M36WA--

Pre-removal Operation
- Removal of Floor Console
  (Refer to GROUP 52–Floor Console.)

Post-installation Operation
- Parking Brake Lever Stroke Adjustment (Refer to P.36-2.)
- Installation of Floor Console
  (Refer to GROUP 52–Floor Console.)







INSPECTION

M36YCAI

- Check the parking brake lever ratchet for wear.
- Check the parking brake lever for damage and operation.

TSB Revision

PARKING BRAKE CABLE

M36XA--

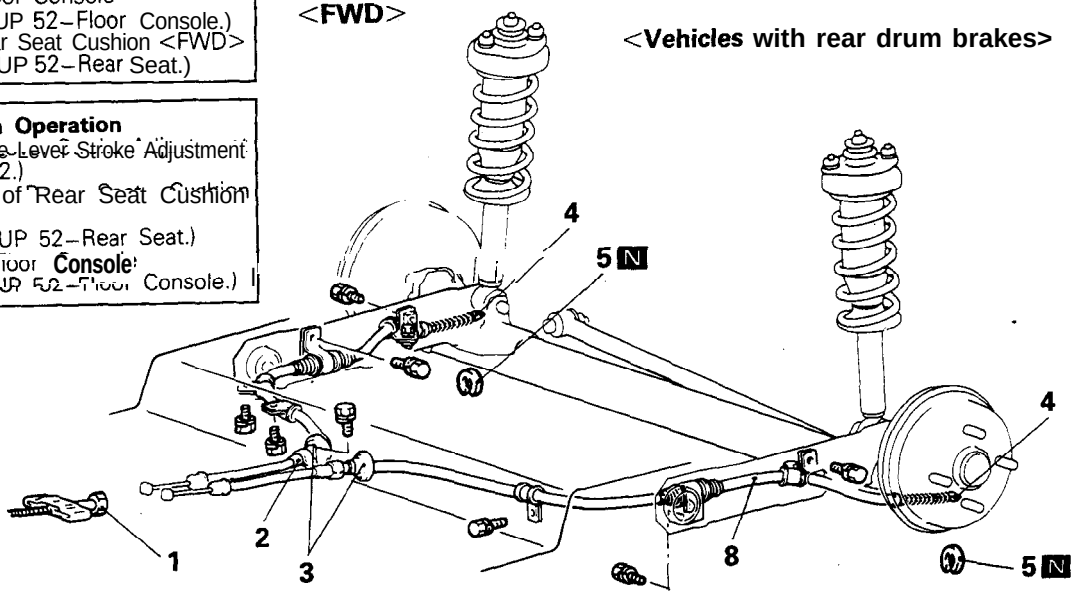
REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of Floor Console
  (Refer to GROUP 52–Floor Console.)
- *Removal of Rear Seat Cushion <FWD>
  (Refer to GROUP 52–Rear Seat.)

Post-installation Operation
- Parking Brake Lever Stroke Adjustment
  (Refer to P.36-2.)
- Installation of Rear Seat Cushion <FWD>
  (Refer to GROUP 52–Rear Seat.)
- Installation of Floor Console
  (Refer to GROUP 52–Floor Console.)

<FWD>

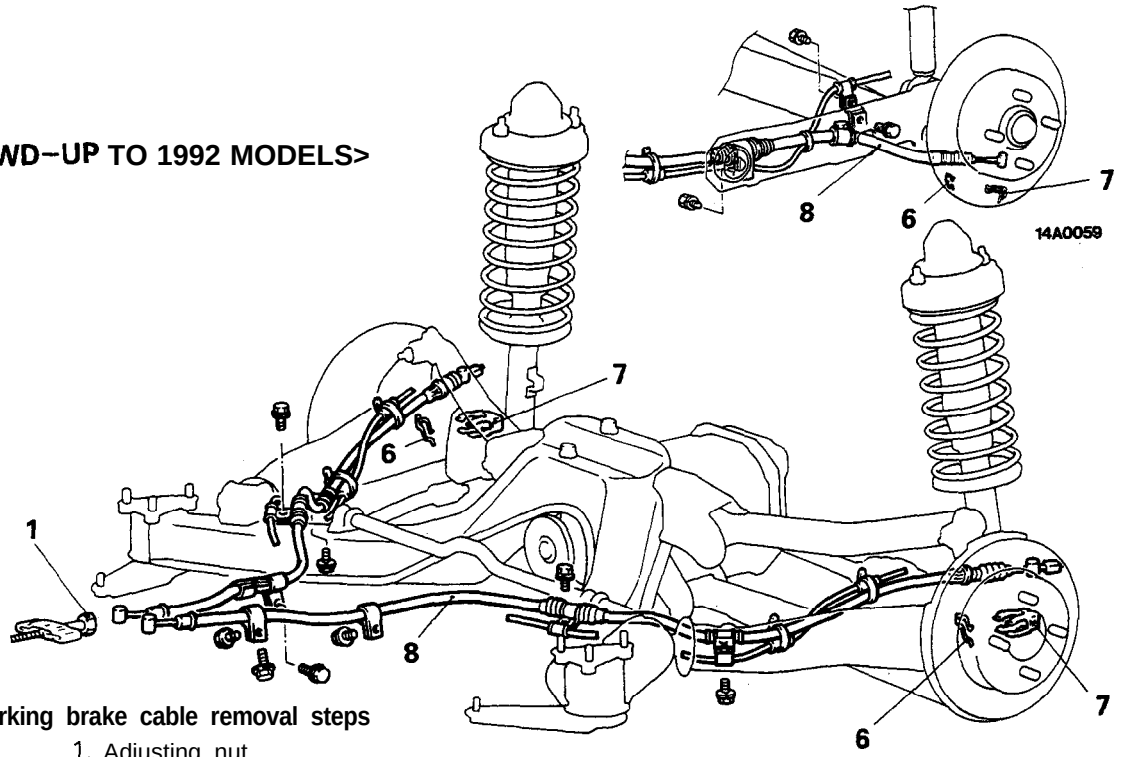
<Vehicles with rear drum brakes>



<Vehicles with rear disc brakes>

14A0529

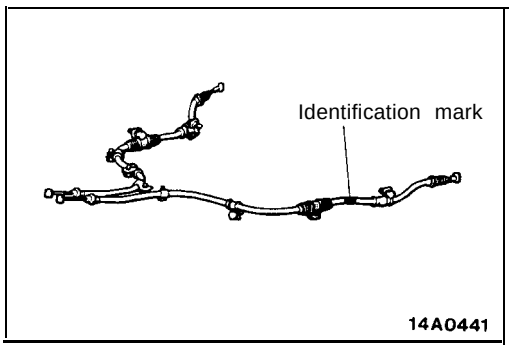
<AWD–UP TO 1992 MODELS>



14A0544

Parking brake cable removal steps

1. Adjusting nut
2. Clamp
3. Grommet
◆◆ 4. Cable end
5. Snap ring
6. Parking clip
7. Retainer spring
◆◆ 8. Parking brake **cable**



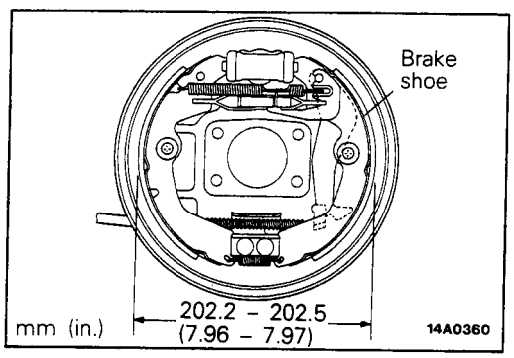
SERVICE POINTS OF INSTALLATION M36XDAE

8. INSTALLATION OF PARKING BRAKE CABLE

Check the parking brake cables for an identification mark and install as appropriate on the left and right sides.

Item		FWD		AWD
		Rear drum brakes	Rear disc brakes	
Identification mark	Left	Yellow	Green	None
		Red*		Blue*
	Right	Orange	Brown	White
		Yellow green*		Green*

NOTE
*: Vehicles with automatic seat belt



4. INSTALLATION OF CABLE END

(1) Connect the cable end to the brake shoe assembly.
(2) Install the brake shoe assembly.
(3) Turn the brake shoe adjuster to adjust the outside diameter of brake shoe to the specified value.

NOTE
Adjusting the outside diameter of brake shoe to the specified value will facilitate adjustment of the shoe clearance.

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