1996 Mazda MPV Workshop Manual

PRINTED IN THE U.S.A. SEP '95
Form No. 1501-10-95I
Part No. 9999-95-038B-96

WARNING

Servicing a vehicle can be dangerous. If you have not received service-related training, the risks of injury and property damage increase. The recommended servicing procedures for the vehicle in this workshop manual were developed with Mazda-trained technicians in mind. This manual may be useful to non-Mazda trained technicians, but a technician with our service-related training and experience will be at less risk when performing servicing operations. However, all users of this manual are expected to know general safety procedures.

This manual contains "Warnings" and "Cautions" applicable to risks not normally encountered in a general technician's experience. They should be followed to reduce the risk of injury and the risk that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that the "Warnings" and "Cautions" are not exhaustive. It is impossible to warn of all the hazardous consequences that might result from failure to follow the procedures.

The procedures recommended and described in this manual are effective methods of performing service and repair. Some require tools specifically designed for a specific purpose. Nonrecommended procedures and tools should include consideration for safety of the technician and continued safe operation of the vehicle.

Parts should be replaced with genuine Mazda replacement parts, not parts of lesser quality. Use of a nonrecommended replacement part should include consideration for safety of the technician and continued safe operation of the vehicle.

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FOREWORD

For proper repair and maintenance, a thorough familiarization with this manual is important, and it should always be kept in a handy place for quick and easy reference.

All the contents of this manual, including drawings and specifications, are the latest available at the time of printing. As modifications affecting repair or maintenance occur, relevant information supplementary to this volume will be made available at Mazda dealers. This manual should be kept up-to-date.

Mazda Motor Corporation reserves the right to alter the specifications and contents of this manual without obligation or advance notice.

WARRANTY

The manufacturer's warranty on Mazda vehicles and engines can be voided if improper service or repairs are performed by persons other than those at an Authorized Mazda Dealer.

Mazda Motor Corporation
HIROSHIMA, JAPAN

APPLICATION:
This manual is applicable to vehicles beginning with the Vehicle Identification Numbers (VIN) shown on the following page.

VEHICLE IDENTIFICATION NUMBERS (VIN)

2WD WAGON
JM3 LV522*T0 800001—

4WD WAGON
JM3 LV523*T0 800001—

GENERAL INFORMATION

SAFETY INFORMATION

LUBRICANTS

Avoid prolonged and repeated contact with petroleum-based oils. Used oil may irritate the skin, and can cause skin cancer and other skin disorders.
Wash thoroughly after working with oil. We recommend water-soluble hand cleaners. Do not use kerosene, gasoline, or any other solvent to remove oil from your skin.
If repeated or prolonged contact with oil is necessary, wear protective clothing. Soiled clothing, particularly those soiled with used oils and greases containing lead, should be cleaned at regular intervals.

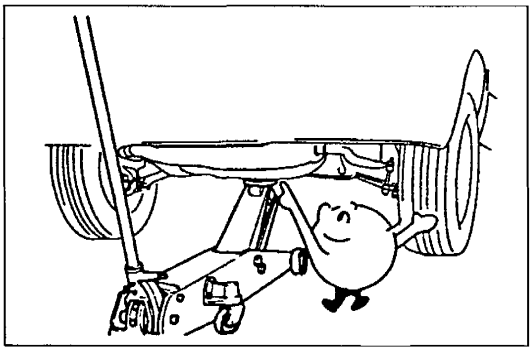
JACKING POSITIONS

Warning

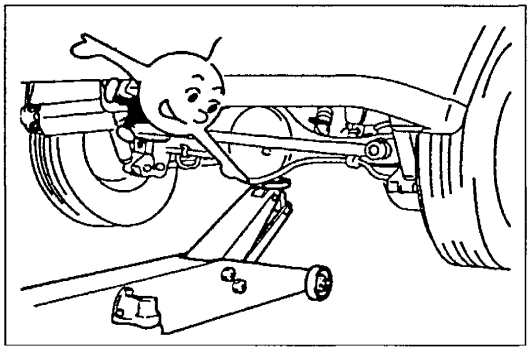
- **Improperly jacking a vehicle is dangerous. The vehicle can slip off the jack and cause serious injury. Use only the correct front and rear jacking positions and block the wheels.**

Use safety stands to support the vehicle after it has been lifted.

Front
At the center of the crossmember

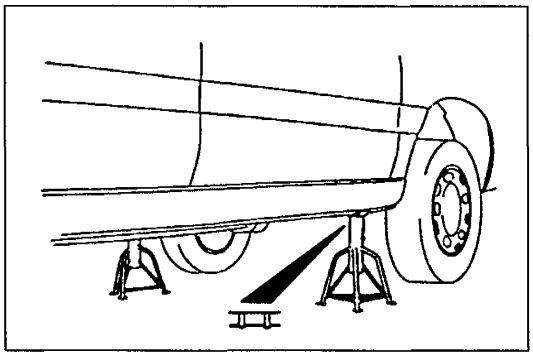


Rear
At the center of the crossmember

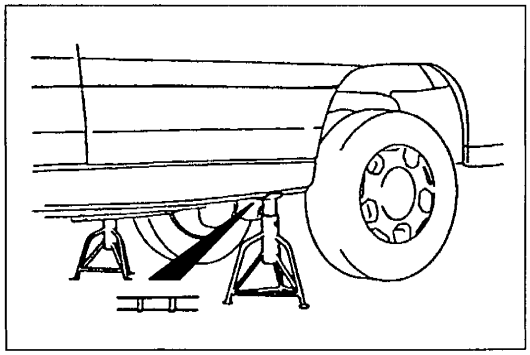


SAFETY STAND AND VEHICLE LIFT POSITIONS

Front
Both sides of the vehicle



Rear
Both sides of the vehicle



DYNAMOMETER
When test-running a vehicle on a dynamometer:
- Place a fan, preferably a vehicle-speed proportional type, in front of the vehicle.
- Connect an exhaust gas ventilation unit.
- Cool the exhaust pipes with a fan.
- Keep the area around the vehicle uncluttered.
- Watch the water temperature gauge.

COMPRESSED AIR
When using compressed air to clean or remove parts:
- Wear protective eye wear.
- Hold a rag over the opening to prevent parts from shooting out.
- Take precautions so that people around you are not struck by flying debris.

HOW TO USE THIS MANUAL

ADVISORY MESSAGES
You'll find several **Warnings**, **Cautions**, and **Notes** in this manual.

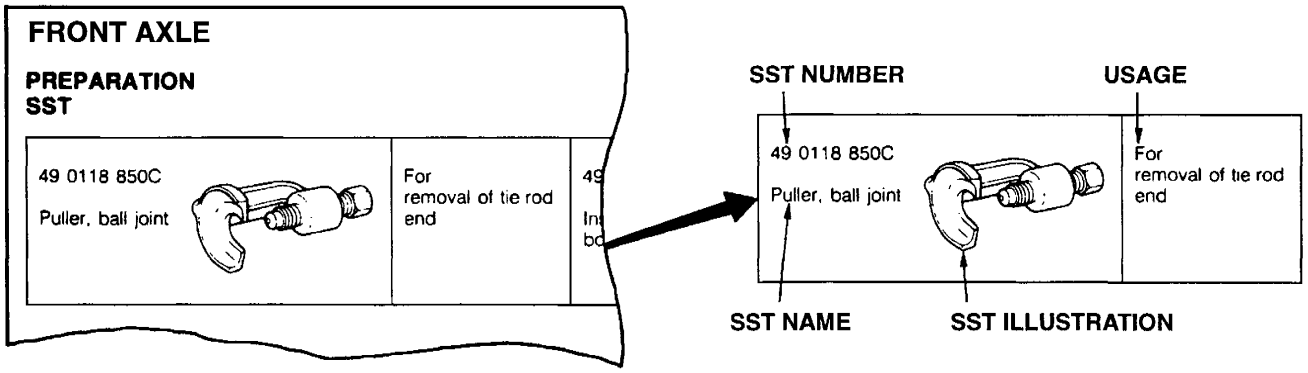
Warning
- **A Warning indicates a situation in which serious injury or death could result if the warning is ignored.**

Caution
- **A Caution indicates a situation in which damage to the vehicle could result if the caution is ignored.**

Note
- A **Note** provides added information that will help you to complete a particular procedure.

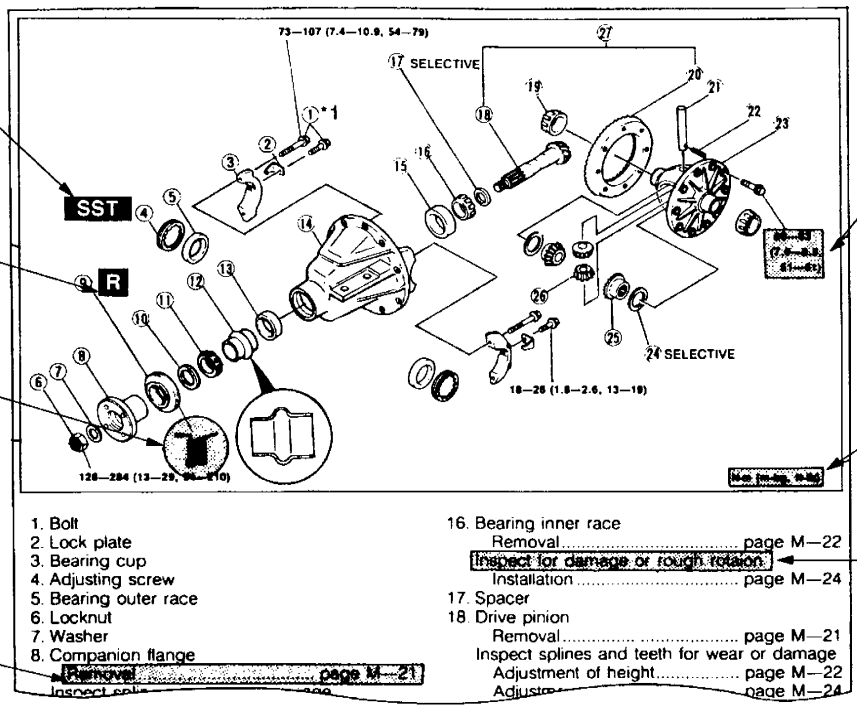
PREPARATION
This points out the needed **SSTs** for the service operation. It is best to gather all necessary **SSTs** before beginning work.

Example:



REPAIR PROCEDURE
1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual part inspection. If a damaged or worn part is found, repair or replace it as necessary.
2. Expendable parts, tightening torques, and symbols for oil, grease, and sealant are shown in the overview illustration.
3. Pages related to service procedures are shown under the illustration. Refer to this information when servicing the related part.

Example:



*1: The numbers (①, etc.) refer to part identification and servicing procedures.

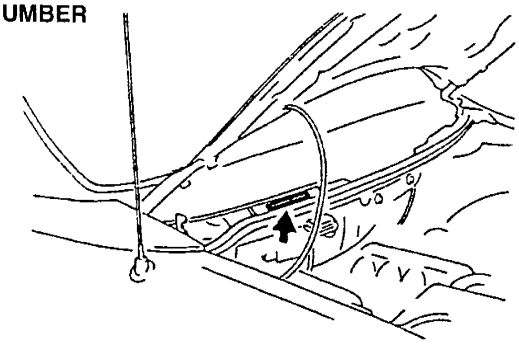
SYMBOLS

There are six symbols indicating oil, grease, and sealant. These symbols show the points of applying such materials during service.

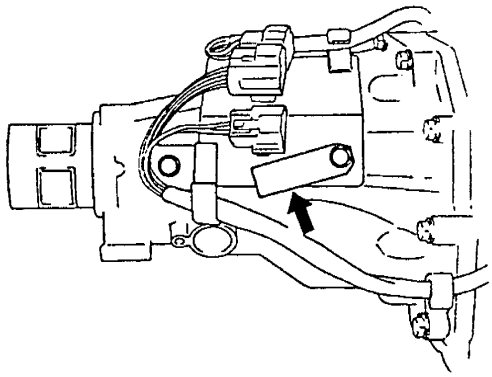
Symbol	Meaning	Kind
OIL	Apply oil	New engine oil or gear oil as appropriate
BRAKE FLUID	Apply brake fluid	FMVSS116: DOT-3
ATF	Apply automatic transaxle fluid	M-III or Dexron®II
GREASE	Apply grease	Appropriate grease
SEALANT	Apply sealant	Appropriate sealant
P	Apply petroleum jelly	Appropriate petroleum jelly

IDENTIFICATION NUMBER LOCATIONS

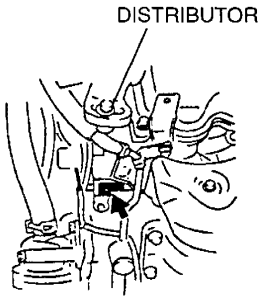
VEHICLE IDENTIFICATION NUMBER



AUTOMATIC TRANSMISSION MODEL AND NUMBER



ENGINE MODEL AND NUMBER



UNITS

Electrical current	A (ampere)
Electric potential	V (volt)
Electric power	W (watt)
Length	mm (millimeter) in (inch)
Negative pressure	kPa (kilo Pascal) mmHg (millimeters of mercury) inHg (inches of mercury)
Positive pressure	kPa (kilo Pascal) kgf/cm^2 (kilogram force per square centimeter) psi (pounds per square inch)
Resistance	Ω (ohm)
Speed	revolution per minute
Torque	N·m (Newton meter) kgf·m (kilogram force per meter) kgf·cm (kilogram force per centimeter) ft·lbf (foot pound) in·lbf (inch pound)
Volume	L (liter) US qt (U.S. quart) Imp qt (Imperial quart) ml (milliliter) cc (cubic centimeter) cu in (cubic inch) fl oz (fluid ounce)
Weight	g (gram) oz (ounce)

Conversion to SI Units (Systèm International d'Unités)

All numerical values in this manual are based on SI units. Numbers shown in conventional units are converted from these values.

Rounding off

Converted values are rounded off to the same number of places are the SI unit value. For example, if the SI unit value is 17.2 and the value after conversion is 37.84, the converted value will be rounded off to 37.8.

Upper and lower limits

When the data indicates upper and lower limits, the converted values are rounded down if the SI unit value is an upper limit and rounded up if the SI unit value is a lower limit. Therefore, converted values for the same SI unit value may differ after conversion. For example, consider 2.7 kgf/cm^2 in the following specifications:

- 210—260 kPa { 2.1—2.7 kgf/cm^2 , 30—38 psi }
- 270—310 kPa { 2.7—3.2 kgf/cm^2 , 39—45 psi }

The actual converted values for 2.7 kgf/cm^2 are 264 kPa and 38.4 psi. In the top specification, 2.7 is used as an upper limit, so its converted values are rounded down to 260 and 38. In the bottom specification, 2.7 is used as a lower limit, so its converted values are rounded up to 270 and 39.

ABBREVIATIONS

ABDC	After bottom dead center
ABS	Antilock brake system
ACC	Accessories
AFW	Automatic freewheel
ALL	Automatic load leveling
AT	Automatic transmission
ATDC	After top dead center
ATF	Automatic transmission fluid
BAC	Bypass air control
BARO V	Barometric pressure signal voltage
BAROTCM	Barometric pressure signal (TCM)
BBDC	Before bottom dead center
B/L	Bi-level
BRK SW	Brake switch
BTDC	Before top dead center
CDCV	Canister drain cut valve
CM	Control module
CPU	Central processing unit
D	Drive
DEF	Defrost
DRL	Daytime running lights
EC-AT	Electronically controlled automatic transmission
ECT V	Engine coolant temperature signal voltage
E/L	Electrical load
EX	Exhaust
FAT	FAT terminal (data link connector)
FHO2S	Heated oxygen sensor (front)
FHO2SH	Heated oxygen sensor heater (front)
FTL V	Fuel tank level signal voltage
FTP	Fuel tank pressure
FTP V	Fuel tank pressure signal voltage
H/D	Heat/Def
HEAT	Heater
HI	High
HLA	Hydraulic lash adjuster
HU	ABS hydraulic unit
IACV	Idle air control valve
IAT V	Intake air temperature signal voltage
IATDC	Intake air temperature (dynamic chamber)
IATDC V	Intake air temperature signal voltage (dynamic chamber)
IC	Integrated circuit
IGN	Ignition
IG SW	Ignition switch
IGT	Ignition timing
IN	Intake
INJ	Fuel injection duration
INJ#1	Fuel injector (cylinder No.1)
INT	Intermittent
LH	Left hand
LO	Low
M	Motor
N	Neutral
OFF	Switch off
ON	Switch on
P	Park
PCV	Positive crankcase ventilation
PRC	Pressure regulator control
PRCV	PRC solenoid valve
PRGV	Purge solenoid valve
P/S	Power steering
R	Reverse
RABS	Rear-wheel antilock brake system
REC	Recirculate
RH	Right hand
RHO2S	Heated oxygen sensor (rear)
RLY	relay
RPM	Engine speed
SAS	Sophisticated air bag sensor
SST	Special service tool
ST	Start
SW	Switch
TAT	TAT terminal (data link connector)
TEN	TEN terminal (data link connector)
TDC	Top dead center
TNS	Tail-, parking, and license plate lights
TPCV	Tank pressure control valve
TP V	Throttle position sensor signal voltage
TR SW	Transmission range switch
VAF V	Volume air flow signal voltage
VRIS	Variable resonance induction system
VRISV1	VRIS solenoid valve No.1
VS	Vehicle speed
2WD	2-wheel drive
4WD	4-wheel drive

SAE STANDARDS

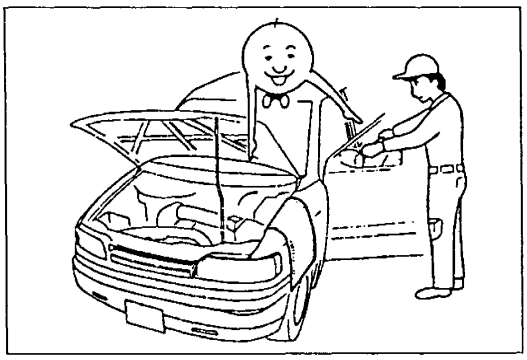
In accordance with new regulations, SAE (Society of Automotive Engineers) standard names and abbreviations are now used in this manual. The table below lists the names and abbreviations that have been used in Mazda manuals up to now and their SAE equivalents.

Previous Standard		SAE Standard		
Abbreviation	**Name**	**Abbreviation**	**Name**	**Remark**
—	Accelerator Pedal	AP	Accelerator Pedal	
—	Air Cleaner	ACL	Air Cleaner	
—	Air Conditioning	A/C	Air Conditioning	
—	Airflow Meter	VAF	Volume Air Flow Sensor	
—	Airflow Sensor	MAF	Mass Air Flow Sensor	
—	Alternator	GEN	Generator	
—	ATF Thermosensor	—	Transmission (Transaxle) Fluid Temperature Sensor	
—	Atmospheric Pressure	BARO	Barometric Pressure	
VB	Battery Voltage	B+	Battery Positive Voltage	
—	Catalytic Converter	OC	Oxidation Catalytic Converter	
		TWC	Three-Way Catalytic Converter	
		WU-TWC	Warm Up Three-Way Catalytic Converter	#1
—	Circuit Opening Relay	FPR	Fuel Pump Relay	#2
—	Clutch Position	CPP	Clutch Pedal Position	
—	Crank Angle Sensor	CMP	Camshaft Position Sensor	
—	Crank Angle Sensor 2	CKP	Crankshaft Position Sensor	
—	Diagnosis Connector	DLC	Data Link Connector	
—	Diagnosis/Self-Diagnosis	OBD	On-Board Diagnostic	
—	Direct Ignition	DLI	Distributorless Ignition	
—	EC-AT Control Unit	TCM	Transmission (Transaxle) Control Module	
EGI	Electronic Gasoline Injection System	CIS	Continuous Fuel Injection System	
—	Electronic Spark Ignition	EI	Electronic Ignition	#3
ECU	Engine Control Unit	PCM	Powertrain Control Module	#4
		ECM	Engine Control Module	
—	Engine Modification	EM	Engine Modification	
—	Engine RPM Signal	—	Engine Speed Input Signal	
—	Evaporative Emission	EVAP	Evaporative Emission	
—	Exhaust Gas Recirculation	EGR	Exhaust Gas Recirculation	
—	Fan Control	FC	Fan Control	
—	Feedback System	CLS	Closed Loop System	
—	Flexible Fuel	FF	Flexible Fuel	
—	Fuel Pump	FP	Fuel Pump	
—	Fully Closed	CTP	Closed Throttle Position	
—	Fully Open	WOT	Wide Open Throttle	
—	Ground/Earth	GND	Ground	

#1: Directly connected to exhaust manifold.
#2: In some models, there is a fuel pump relay that controls pump speed. That relay is now called the fuel pump relay (speed).
#3: Controlled by the ECM (PCM).
#4: Device that controls engine and powertrain.

Previous Standard		SAE Standard		
Abbreviation	Name	Abbreviation	Name	Remark
—	IC Regulator	VR	Voltage Regulator	
—	Idle Speed Control	IAC	Idle Air Control	
—	Idle Switch	—	Closed Throttle Position Switch	
—	Igniter	ICM	Ignition Control Module	
—	Inhibitor Position	TR	Transmission (Transaxle) Range	
—	Intake Air Pressure	MAP	Manifold Absolute Pressure	
—	Intake Air Thermo	IAT	Intake Air Temperature	
—	Intercooler	CAC	Charge Air Cooler	
—	Knock Sensor	KS	Knock Sensor	
—	Line Pressure Solenoid Valve	—	Pressure Control Solenoid	
—	Lock-up Position	TCC	Torque Converter Clutch	
—	Malfunction Indicator Light	MIL	Malfunction Indicator Lamp	
—	Multiport Fuel Injection	MFI	Multiport Fuel Injection	
—	Open Loop	OL	Open Loop	
—	Overdrive	4GR	Fourth Gear	
—	Oxygen Sensor	HO2S	Heated Oxygen Sensor	With heater
		O2S	Oxygen Sensor	
—	Park/Neutral Range	PNP	Park/Neutral Position	
—	Power Steering Pressure	PSP	Power Steering Pressure	
—	Pulse Generator	—	Input/Turbine Speed Sensor	
—	Reed Valve	SAPV	Secondary Air Pulse Valve	
—	Secondary Air Injection System	PAIR	Pulsed Secondary Air Injection	Pulsed injection
		AIR	Secondary Air Injection	Inject with compressor
—	Sequential Fuel Injection	SFI	Sequential Multipoint Fuel Injection	
—	Service Code(s)	DTC	Diagnostic Trouble Code(s)	
—	Spark Ignition	DI	Distributor Ignition	
—	Stoplight Switch	—	Brake Switch	
—	Test Mode	DTM	Diagnostic Test Mode	#5
—	Throttle Body	TB	Throttle Body	
—	Throttle Sensor	TP	Throttle Position Sensor	
—	Turbocharger	TC	Turbocharger	
—	Vehicle Speed Sensor	VSS	Vehicle Speed Sensor	
—	Vehicle Speed Sensor 1	—	Output Speed Sensor	
—	Water Thermo	ECT	Engine Coolant Temperature	
—	1–2 Shift Solenoid Valve	—	Shift Solenoid A	
	Shift A Solenoid Valve			
—	2–3 Shift Solenoid Valve	—	Shift Solenoid B	
	Shift B Solenoid Valve			
—	3–4 Shift Solenoid Valve	—	Shift Solenoid C	
—	3rd Gear	3GR	Third Gear	
—	—	—	Incorrect Gear Ratio	

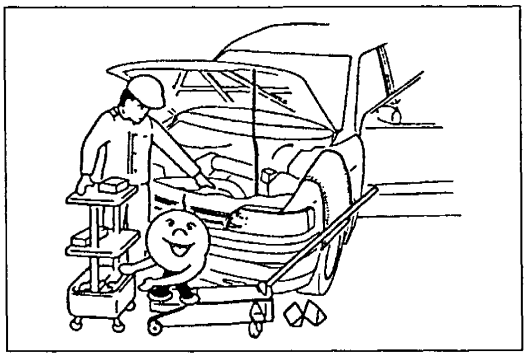
#5: Diagnostic trouble codes depend on the diagnostic test mode.



FUNDAMENTAL PROCEDURES

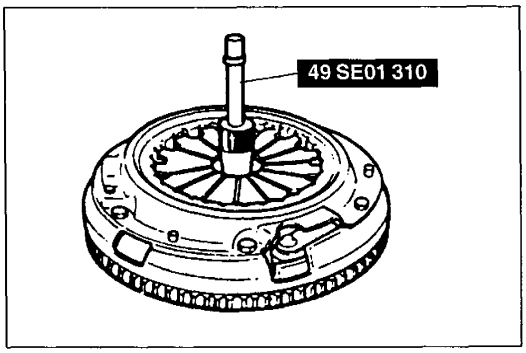
PROTECTION OF THE VEHICLE

Always be sure to cover fenders, seats, and floor areas before starting work.



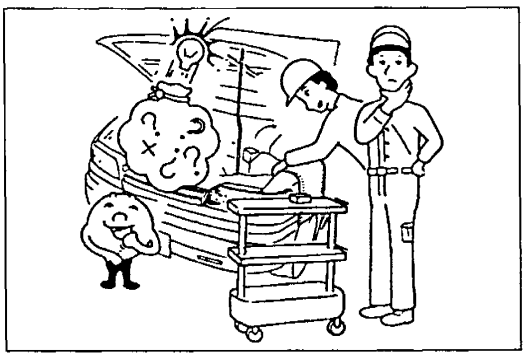
PREPARATION OF TOOLS AND MEASURING EQUIPMENT

Be sure that all necessary tools and measuring equipment are available before starting any work.



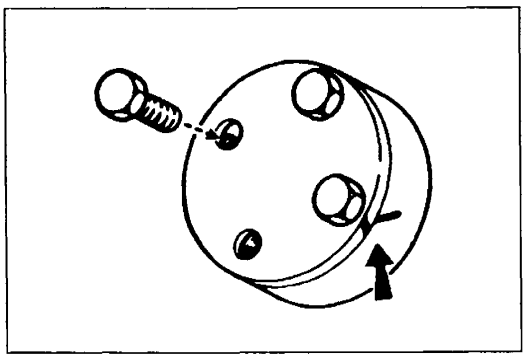
SPECIAL TOOLS

Use special tools when they are required.



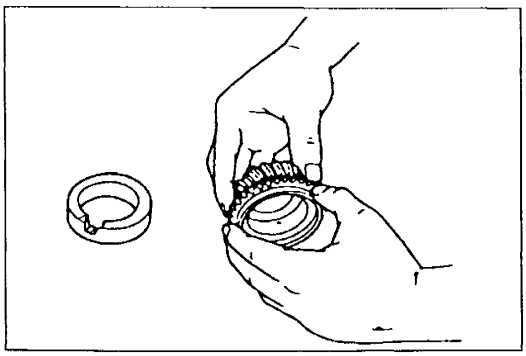
REMOVAL OF PARTS

While correcting a problem, try also to determine its cause. Begin work only after first learning which parts and subassemblies must be removed and disassembled for replacement or repair. After removing the part, plug all holes and ports to prevent foreign material from entering.

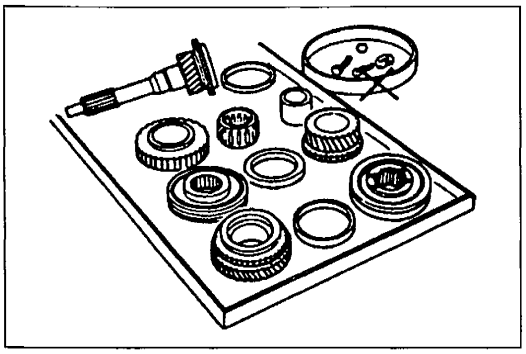


DISASSEMBLY

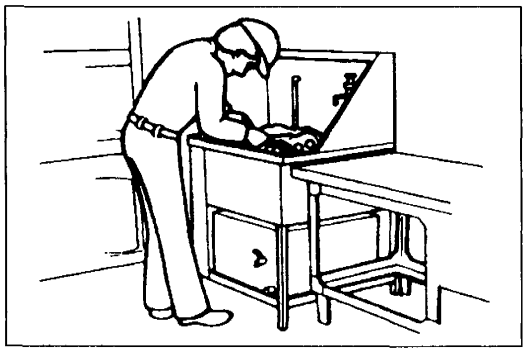
If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be disassembled in a way that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.



1. Inspection of parts
When removed, each part should be carefully inspected for malfunctioning, deformation, damage, and other problems.

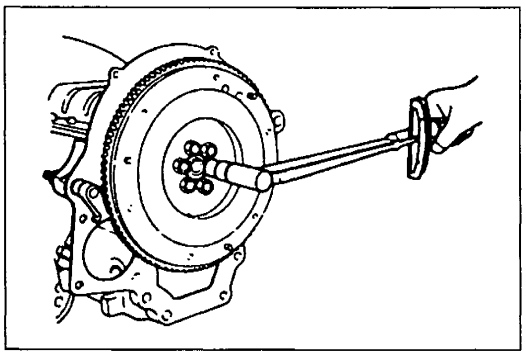


2. Arrangement of parts
All disassembled parts should be carefully arranged for reassembly.
Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.



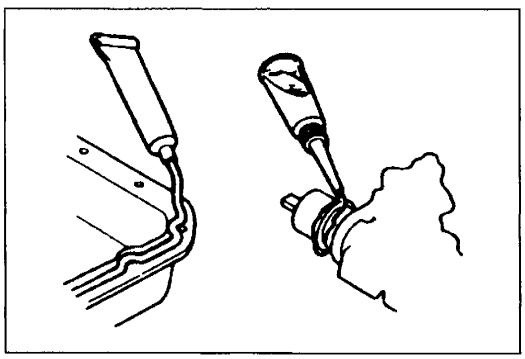
3. Cleaning parts for reuse
All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.

Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

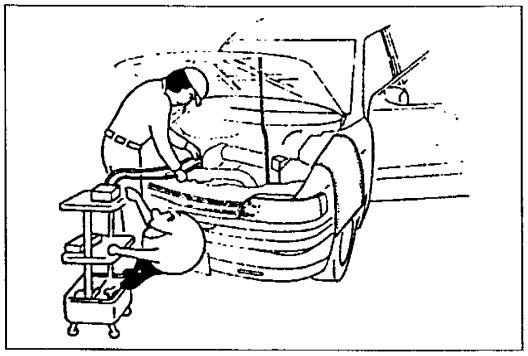


REASSEMBLY
Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.

If removed, these parts should be replaced with new ones:
1. Oil seals
2. Gaskets
3. O-rings
4. Lock washers
5. Cotter pins
6. Nylon nuts

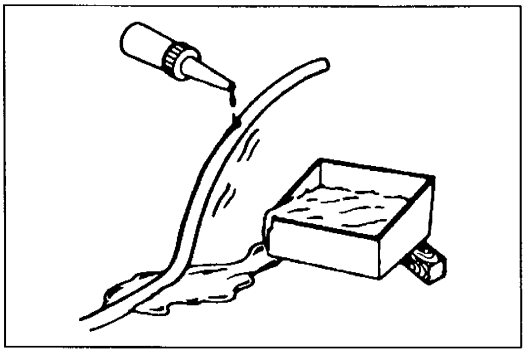


Depending on location:
1. Sealant should be applied to gaskets.
2. Oil should be applied to the moving components of parts.
3. Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



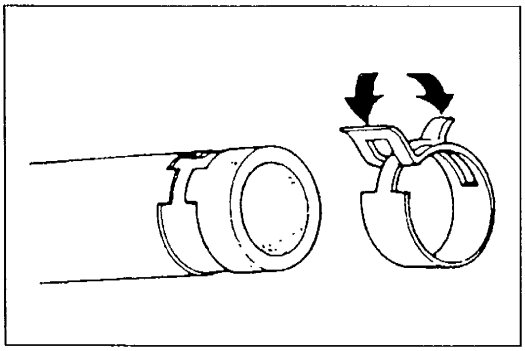
ADJUSTMENTS

Use suitable gauges and testers when making adjustments.



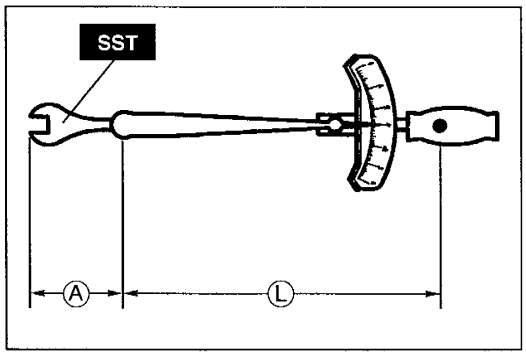
RUBBER PARTS AND TUBING

Prevent gasoline or oil from getting on rubber parts or tubing.



HOSE CLAMPS

When reinstalling, position the hose clamp in the original location on the hose, and squeeze the clamp lightly with large pliers to ensure a good fit.

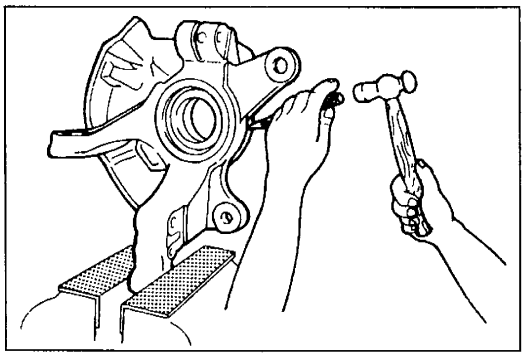


TORQUE FORMULAS

When using a torque wrench-**SST** combination, the written torque must be recalculated due to the extra length that the **SST** adds to the torque wrench. Recalculate the torque by using the following formulas. Choose the formula that applies to you.

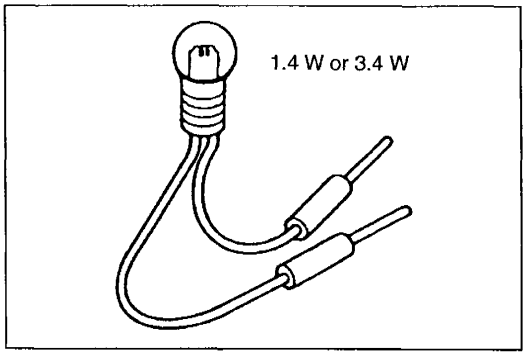
Torque Unit	Formula
N·m	N·m × [L/(L+A)]
kgf·m	kgf·m × [L/(L+A)]
kgf·cm	kgf·cm × [L/(L+A)]
ft·lbf	ft·lbf × [L/(L+A)]
in·lbf	in·lbf × [L/(L+A)]

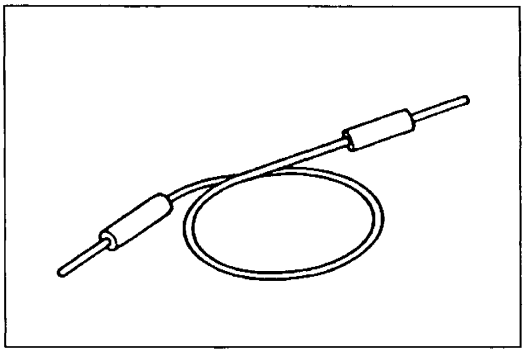
A = The length of the **SST** past the torque wrench drive.
L = The length of the torque wrench.

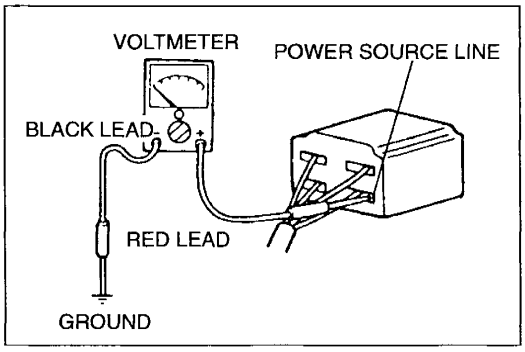


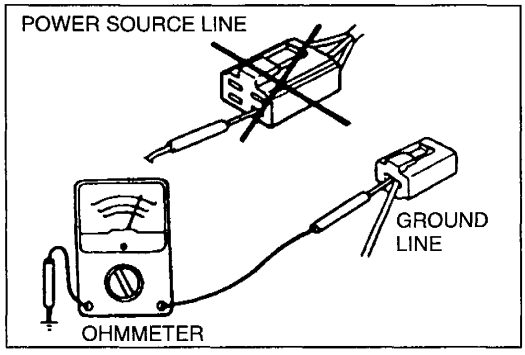
VISE

When using a vise, put protective plates in the jaws of the vise to prevent damage to parts.









ELECTRICAL TROUBLESHOOTING TOOLS

TEST LIGHT

The test light, as shown in the figure, uses a 12 V bulb. The two lead wires should be connected to probes. The test light is used for simple voltage checks and for checking for short circuits.

Caution

- **Using a bulb over 3.4 W when checking the control module may damage the control module.**

JUMPER WIRE

A jumper wire is used to create a temporary circuit. Connect the jumper wire between the terminals of a circuit to bypass a switch.

Caution

- **Do not connect a jumper wire from the power source line to a body ground. This may cause burning or other damage to wiring harnesses or electronic components.**

VOLTMETER

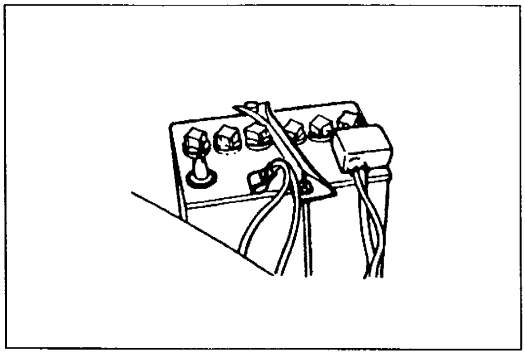
The DC voltmeter is used to measure circuit voltage. A voltmeter with a range of 15 V or more is used by connecting the positive (+) probe (red lead wire) to the point where voltage is to be measured and the negative (–) probe (black lead wire) to a body ground.

OHMMETER

The ohmmeter is used to measure the resistance between two points in a circuit, and to check for continuity and short circuits.

Caution

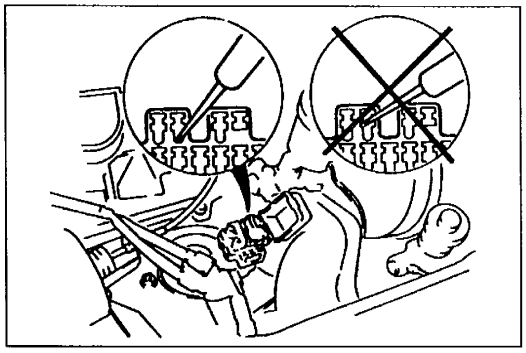
- **Do not connect the ohmmeter to any circuit to which voltage is applied. This will damage the ohmmeter.**



ELECTRICAL PARTS

BATTERY CABLE

Before disconnecting connectors or removing electrical parts, disconnect the negative battery cable.



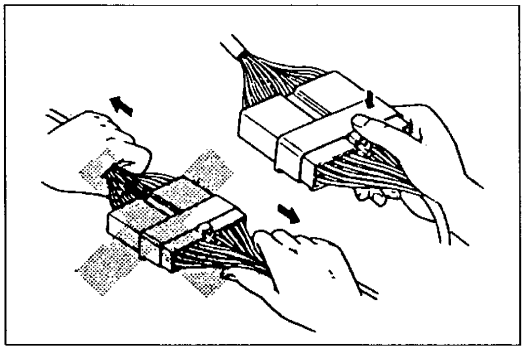
CONNECTORS

Data Link Connector

Insert the probe into the service hole when connecting a jumper wire to the data link connector.

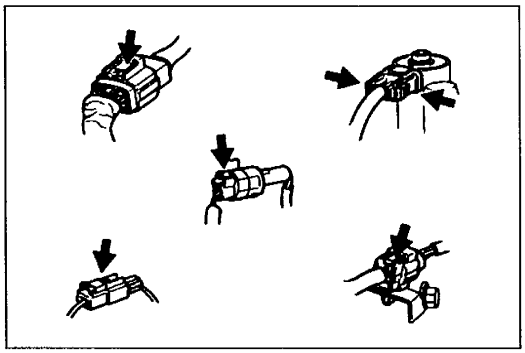
Caution

- **Inserting a jumper wire probe into the data link connector terminal may damage the terminal.**

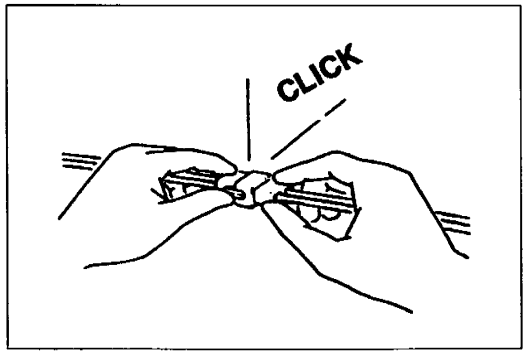


Disconnecting Connectors

When disconnecting two connectors, grasp the connectors, not the wires.

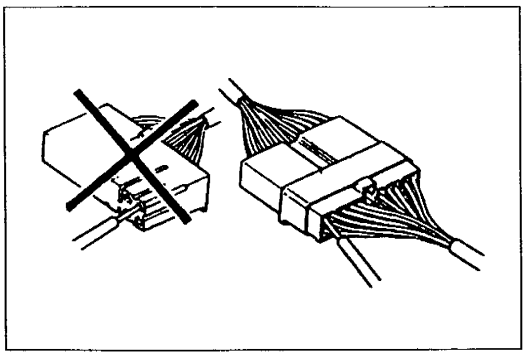


Connectors can be disconnected by pressing or pulling the lock lever as shown.



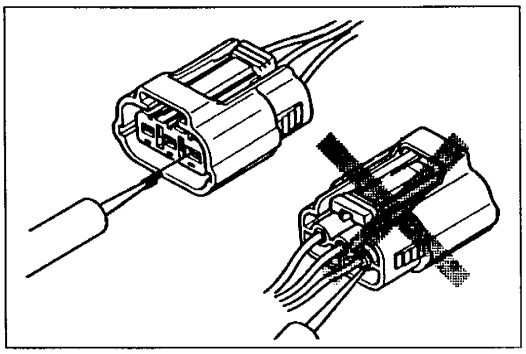
Locking Connector

When locking connectors, listen for a click that will indicate they are securely locked.



Inspection

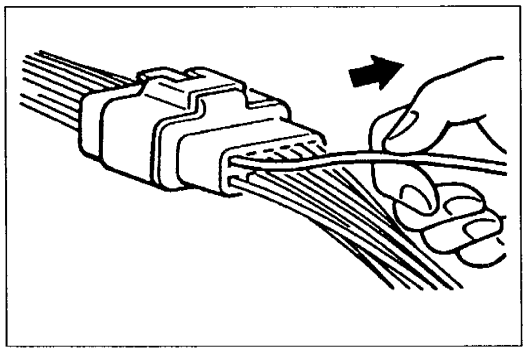
1. When a tester is used to check for continuity or to measure voltage, insert the tester probe from the wiring harness side.



2. Check the terminals of waterproof connectors from the connector side, as they cannot be accessed from the wiring harness side.

Caution

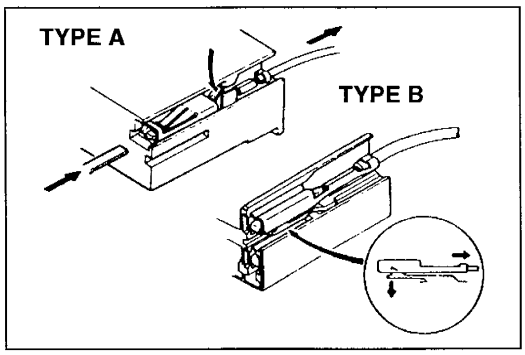
- **To prevent damage to the terminal, wrap a thin wire around the lead before inserting it into the terminal.**



TERMINALS

Inspection

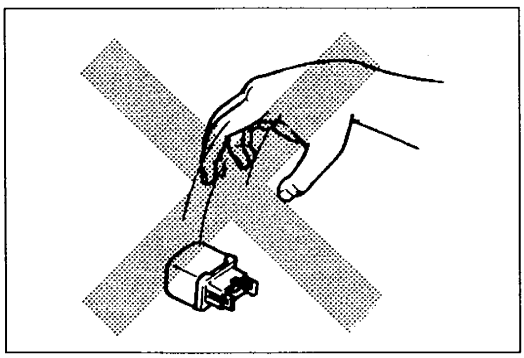
Pull lightly on individual wires to check that they are secured in the terminal.



Replacement

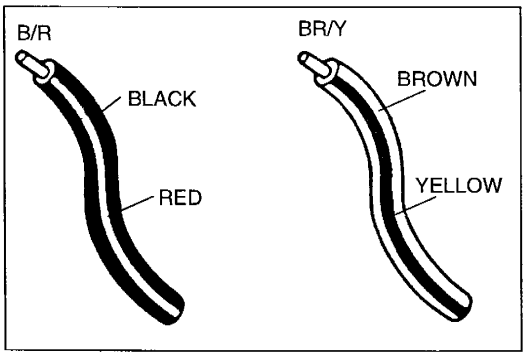
Use the appropriate tools to remove a terminal as shown. When installing a terminal, be sure to insert it until it locks securely.

Insert a thin piece of metal from the terminal side of the connector, and then, with the terminal locking tab pressed down, pull the terminal out from the connector.



SENSORS, SWITCHES, AND RELAYS

Handle sensors, switches, and relays carefully. Do not drop them or strike them against other objects.



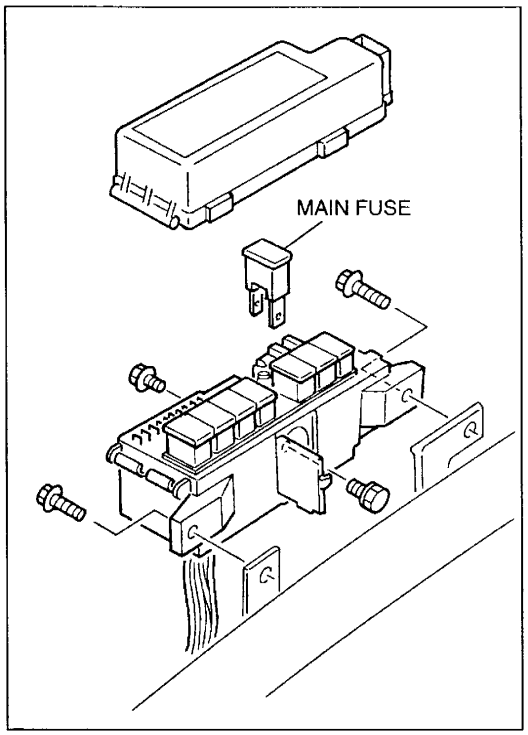
WIRING HARNESS

Wiring Color Codes

Two-color wires are indicated by a two-color code symbol.

The first letter indicates the base color of the wire and the second the color of the stripe.

CODE	COLOR		CODE	COLOR
B	Black		O	Orange
BR	Brown		P	Pink
G	Green		R	Red
GY	Gray		V	Violet
L	Blue		W	White
LB	Light Blue		Y	Yellow
LG	Light Green		—	—



MAIN FUSE

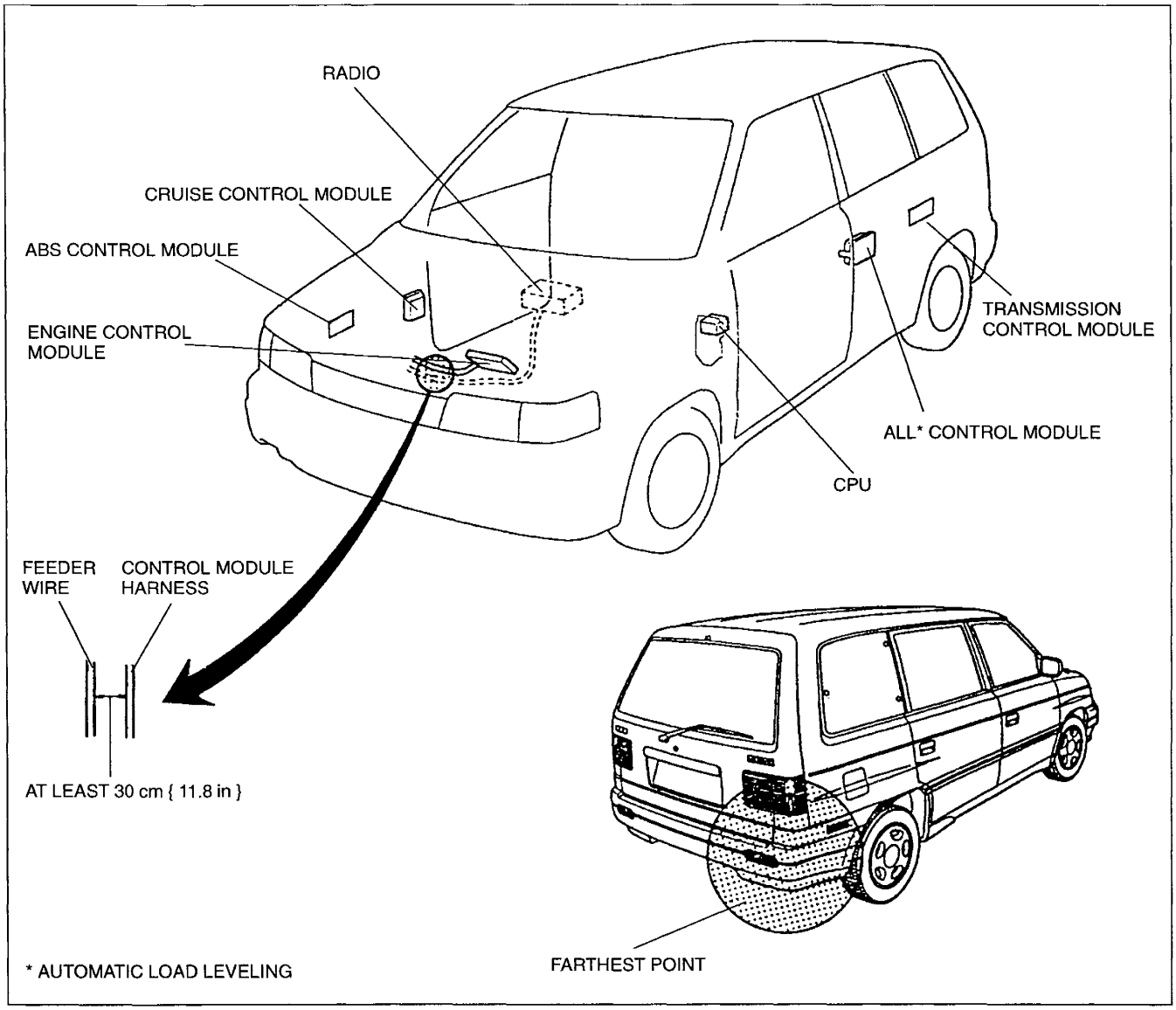
Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the main fuse block cover.
3. Remove the main fuse block mounting nuts.
4. Remove the main fuse mounting bolts.
5. Remove the MAIN fuse.
6. Install in the reverse order of removal.

INSTALLATION OF A RADIO SYSTEM

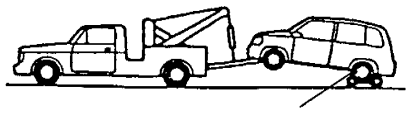
If a radio system is installed improperly or if a high-powered type is used, the CIS and other systems may be affected.
When the vehicle is to be equipped with a radio, observe the following precautions:

1. Install the antenna at the farthest point from control modules.
2. Install the antenna feeder as far as possible away from the control module harnesses **(at least 30 cm { 11.8 in })**.
3. Ensure that the antenna and feeder are properly adjusted.
4. Do not install a high-powered radio system.



4-WHEEL DRIVE (4WD)

1. Shifting from 2WD to 4WD must be done **below 120 km/h { 65 MPH }**.
2. Shifting from 4WD to 2WD must be done with the center differential in **FREE** mode.
3. Shifting shock may occur when shifting 2WD↔4WD while turning tight circle.
4. Shifting 2WD↔4WD may not be completed if shift is made while the vehicle is stopped. Drive the vehicle to complete the shift.
5. Shifting 2WD↔4WD may take extra time during acceleration or while ascending grades. It is a good practice to release the accelerator slightly when shifting.
6. Shifting 2WD↔4WD may take extra time in extremely cold weather because of the high viscosity of the transfer case oil.



4WD MODELS:
SET CENTER DIFFERENTIAL UNLOCKED AND DRIVING MODE TO 2WD.

AUTOMATIC TRANSMISSION:
DO NOT EXCEED 56 km/h { 35 mph } OR 56 km { 35 miles }.

TOWING

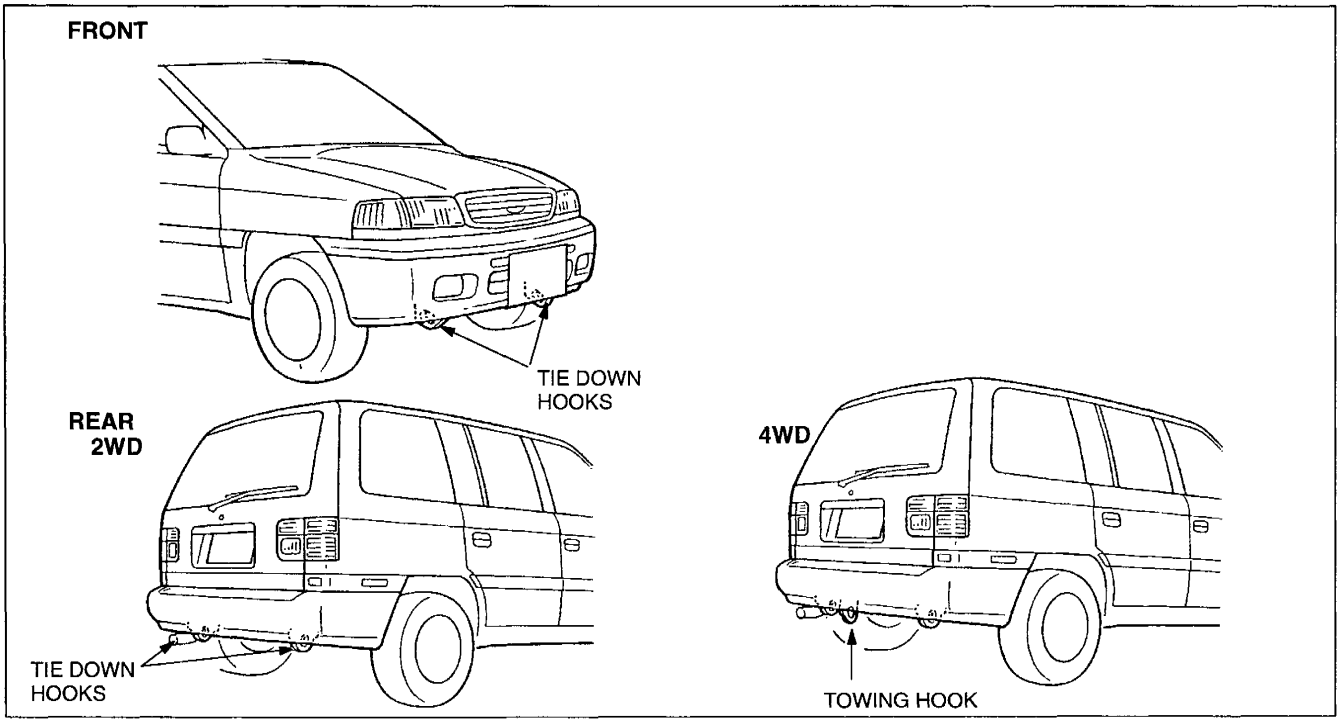
Proper towing equipment is necessary to prevent damage to the vehicle.
Laws and regulations applicable to vehicles in tow must always be observed.
As a general rule, towed vehicles should be pulled with the driving wheels off the ground. If excessive damage or other conditions prevent towing the vehicle with the driving wheels off the ground, use wheel dollies.

With either automatic or manual transmission:
1. Set the ignition switch in the ACC position.
2. Place the selector lever or shift lever in N (Neutral).
3. Release the parking brake.

Caution
- **Do not tow the vehicle backward with driving wheels on the ground. This may cause internal damage to the transmission.**

Caution
- **Don't use the hook loops under the front and rear for towing. They are designed ONLY for tying down the vehicle when it's being transported. Using them for towing will damage the bumper.**

Caution
- **The power assist for the brakes and steering are inoperable while the engine is off.**
- **Do not use the tie down hook under the front or rear of the vehicle for towing. These hooks are designed ONLY for transport tie down. If tie down hook are used for towing the front or rear skirt and bumper will be damaged.**



Trailer Towing Load Table

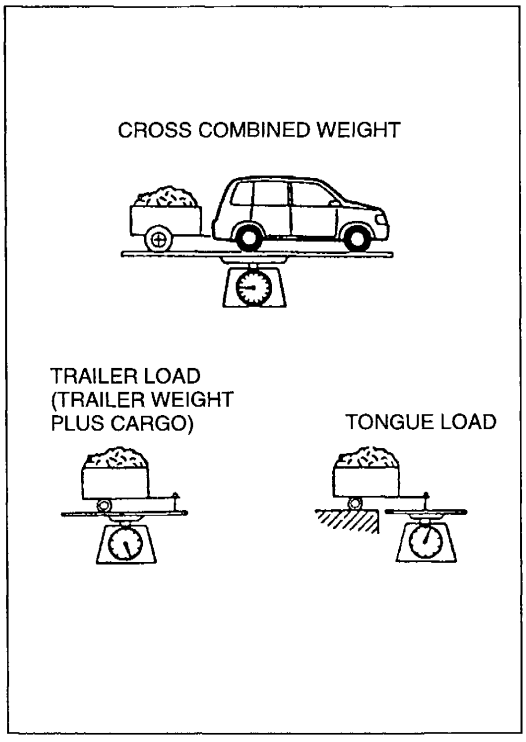
kg { lb }

Model	Vehicle equipment	Max. TTW	Max. GCWR	Max frontal area
2WD	With towing package	1,950 { 4,300 }	3,674 { 8,100 }	4.65 m^2 { 50 ft^2 }
	Without towing package	1,179 { 2,600 }	2,903 { 6,400 }	2.97 m^2, { 32 ft^2 }
4WD	With towing package	1,814 { 4,000 }	3,688 { 8,130 }	4.65 m^2 { 50 ft^2 }
	With towing package	1,905 { 4,200 }	3,688 { 8,130 }	2.97 m^2 { 32 ft^2 }
	Without towing package	1,179 { 2,600 }	3,053 { 6,730 }	

Towing package (if equipped): The optional towing package includes the Automatic load Leveling (ALL) system, an automatic transmission oil cooler, a heavy-duty cooling fan, and a standard size spare tire. Vehicles with the towing package can tow a heavier trailer and carry more cargo weight than standard equipped vehicles.

TTW: Total trailer Weight. (TTW: Sum of weights of the trailer, its cargo load, trailer hitch, vehicle passengers, and load)

GCWR: Gross combined Weight Rating.



TRAILER TOWING

WEIGHT LIMITS

Before towing, make sure the total trailer weight, gross combined weight rating, gross axle weight ratings, trailer load, and trailer tongue load are all within the prescribed limits.

- **The total trailer weight is the sum of the weights of the trailer load (trailer weight plus cargo), trailer hitch, vehicle passengers, and vehicle load.**
  Never allow the total trailer weight to exceed the specifications in the Trailer Towing Load Table.
- **The maximum GCWR (Gross Combined Weight Rating) is the combined weight of the trailer and load plus towing vehicle (including trailer hitch, vehicle passengers, and load). The maximum GCWR must not exceed the specifications in the Trailer Towing Load Table.**

Calculating the maximum permissible trailer load

The maximum permissible trailer load is the value obtained by subtracting the towing vehicle weight (including trailer hitch, vehicle passengers, and vehicle load) from the Max GCWR in the Trailer Towing Load Table.
In a high altitude operation environment, a gasoline engine loses power at a rate of 3% to 4% per 304 m { 1,000 ft } elevation. For these high altitude conditions, a reduction in gross vehicle weight and gross combined weight is recommended. Such a reduction will result in improved vehicle performance.

Warning

- **Attempting to tow loads greater than those specified may cause serious handling and performance problems that could result in personal injury and/or vehicle damage.**

TONGUE LOAD

Trailer tongue load is considered part of the vehicle passenger, luggage, and gear load.
The trailer tongue load must be 10—15 % of the trailer load (sum of the weights of the trailer and cargo.) Always try to load the trailer with the weight about 60 % toward the front and 40 % toward the rear. Never load the trailer with more weight in the rear than in the front.
The front and rear GAWR (Gross Axle Weight Rating) and the GVWR (Gross Vehicle Weight Rating) must not be exceeded because vehicle handling, braking, and performance will be adversely affected.
The GAWR and GVWR values are found on the vehicle's Motor Vehicle Safety Certification label posted on the driver side door pillar and also in section 7 of the Owner's Manual.

Note

- The total trailer weight and tongue load can be determined by weighing the trailer, as illustrated, on platform scales located at, for example, a highway weighing station, trucking company, junkyard, etc.

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SCHEDULED MAINTENANCE

SCHEDULED MAINTENANCE TABLE (EXCEPT CANADA)

Schedule 1 (Normal driving conditions):

The vehicle is mainly operated where none of the "unique driving conditions" apply.

Schedule 2 (Unique driving conditions):

- Repeated short distance driving
- Driving in dusty conditions
- Driving with extended use of brakes
- Driving in areas where road salt or other corrosive materials are used
- Driving on rough or muddy roads
- Extended periods of idling or low-speed operation
- Driving for long prolonged periods in cold temperatures or extremely humid climates

Schedule 1 (Normal driving conditions)

Chart symbols:

I : Inspect and repair, clean, or replace if necessary.
R : Replace
L : Lubricate

Remarks:

- After 48 months or 60,000 miles { 96,000 km }, continue to follow the described maintenance at the recommended intervals.
  *1 This maintenance is required for all states except California.
  However, we recommend that it also be performed on California vehicles.
  *2 This maintenance is recommended by Mazda. However, it is not necessary for emission warranty coverage or manufacturer recall liability.

Schedule 1 (Normal driving conditions)

Maintenance Interval / Maintenance Item	Number of months or miles { km }, whichever comes first								Service data and inspection point	Page
	Months	6	12	18	24	30	36	42	48	
	×1,000 Km	12	24	36	48	60	72	84	96	
	×1,000 Miles	7.5	15	22.5	30	37.5	45	52.5	60	
ENGINE										
Engine oil		R	R	R	R	R	R	R	R	Oil pan capacity: 4.5 L { 4.8 US qt , 4.0 Imp qt }	D–4
Oil filter		R	R	R	R	R	R	R	R	0.22 L { 0.23 US qt , 0.19 Imp qt }	D–4
Drive belts (tension)					I				I	• Cracks or damage • Tension	B–4
Engine timing belt (except California)	Replace every 60,000 miles { 96,000 km }									—	B–7
Engine timing belt (California)	Inspect at 60,000 miles { 96,000 km } and again at 90,000 miles { 144,000 km }*2									—	
	Replace every 105,000 miles { 168,000 km }										
PCV valve									I*2	Function	F–28
Hoses and tubes for emission	Replace every 80,000 miles {128,000 km}								I*2	—	F–23
AIR CLEANER											
Air cleaner element					R				R	—	F–5
IGNITION SYSTEM											
Spark plugs					R				R	• Plug gap: 1.0—1.1 mm { 0.040—0.043 in } • Recommended spark plugs: NGK: BKR5E-11, BKR6E-11 NIPPONDENSO: K16PR-U11, K20PR-U11	G–3
Initial ignition timing									I*1	Ignition timing BTDC 10—12° (11 ± 1°)	F–3

Schedule 1 (Normal driving conditions) (Cont'd)

Maintenance Interval / Maintenance Item	Number of months or miles { km }, whichever comes first								Service data and inspection point	Page
Months	6	12	18	24	30	36	42	48		
×1,000 Km	12	24	36	48	60	72	84	96		
×1,000 Miles	7.5	15	22.5	30	37.5	45	52.5	60		
FUEL SYSTEM										
Idle speed		I*2				I*2			Idle speed 760—800 (780 ± 20) rpm—AT (P range)	F–3
Fuel filter								R*1	—	F–15
Fuel lines and hoses				I*2				I*1	Fittings, connections and components for leaks	F–9 F–23
Fuel hoses (California)	Inspect every 105,000 miles { 168,000 km }								—	
COOLING SYSTEM										
Cooling system				I				I	• Hoses for cracks or wear • Coolant level	E–5
Engine coolant	Replace at first 45,000 miles { 72,000 km } or 36 months; after that, every 30,000 miles { 48,000 km } or 24 months								—	E–5
CHASSIS AND BODY										
Brake lines, hoses, and connections				I				I	Proper attachment and connections	P–6
Brake fluid				R				R	Brake fluid: FMVSS 116 DOT–3	P–3
Disc brakes				I				I	• Disc plate thickness: Front: 26.0 mm { 1.02 in }—Minimum Rear: 16.0 mm { 0.63 in }—Minimum • Pad thickness: Front: 2.0 mm { 0.08 in }—Minimum Rear: 1.0 mm { 0.04 in }—Minimum	P–18 P–23 P–16 P–20

Schedule 1 (Normal driving conditions) (Cont'd)

Maintenance Interval / Maintenance Item	Number of months or miles { km }, whichever comes first								Service data and inspection point	Page
Months	6	12	18	24	30	36	42	48		
×1,000 Km	12	24	36	48	60	72	84	96		
×1,000 Miles	7.5	15	22.5	30	37.5	45	52.5	60		
CHASSIS AND BODY										
Automatic transmission fluid								R	• Replacement fluid capacity: Approx. 4.0 L { 4.2 US qt , 3.5 Imp qt }	K1–30
Steering operation and linkages				I				I	• Free play: 0—30 mm { 0—1.18 in } • Operation and looseness • Fluid leakage or oozing	—
Front suspension ball joints				I				I	Damage, looseness, and grease leakage	R–16 R–18
Front axle oil (4WD) Rear axle oil								R	Oil capacity Front: 1.7 L { 1.8 US qt , 1.5 Imp qt } Rear: 1.5 L { 1.6 US qt , 1.3 Imp qt }	M–36 M–58
Transfer case oil (4WD)								R	Oil capacity: 1.5 L { 1.6 US qt , 1.3 Imp qt }	K2–29
Drive shaft dust boots (4WD)				I				I	Cracks, grease leakage, and looseness of band	M–24
Bolts and nuts on chassis and body				I				I	Retighten all loose bolts and nuts	—
Exhaust system heat shields				I				I	Insulator clearance to body and exhaust system	F–22
All locks and hinges	L	L	L	L	L	L	L	L	Check for damage	S—6, 7, 9, 10
AIR CONDITIONER SYSTEM (IF EQUIPPED)										
A/C compressor operation		I		I		I		I	—	—

Schedule 2 (Unique driving conditions)
Chart symbols:
I : Inspect and repair, clean, or replace if necessary.
(Inspect, and if necessary replace...Air cleaner element JE engine only)
R : Replace
L : Lubricate

Remarks:
- After 48 months or 60,000 miles { 96,000 km }, continue to follow the described maintenance at the recommended intervals.
  *1 This maintenance is required for all states except California.
  However, we recommend that it also be performed on California vehicles.
  *2 This maintenance is recommended by Mazda. However, it is not necessary for emission warranty coverage or manufacturer recall liability.

Schedule 2 (Unique driving conditions)

Maintenance Interval / Maintenance Item	Number of months or miles { km }, whichever comes first												Service data and inspection point	Page
	Months	4	8	12	16	20	24	28	32	36	40	44	48	
	×1,000 Km	8	16	24	32	40	48	56	64	72	80	88	96	
	×1,000 Miles	5	10	15	20	25	30	35	40	45	50	55	60	
ENGINE														
Engine oil		R	R	R	R	R	R	R	R	R	R	R	R	Oil pan capacity: 4.5 L { 4.8 US qt , 4.0 Imp qt }	D–4
(Puerto Rico)		Replace every 3,000 miles { 5,000 km } or 3 months												
Oil filter		R	R	R	R	R	R	R	R	R	R	R	R	Oil filter capacity 0.22 L { 0.23 US qt , 0.19 Imp qt }	D–4
Drive belts (tension)							I						I	• Cracks or damage • Tension	B–4
Engine timing belt (except California)		Replace every 60,000 miles { 96,000 km }												—	B–7
Engine timing belt (California)		*2 Inspect at 60,000 miles { 96,000 km }, and against 90,000 miles { 144,000 km }												—	
		Replace every 105,000 miles { 168,000 km }													
PCV valve													I*2	Function	F–28
Hoses and tubes for emission		Replace every 80,000 miles { 128,000 km }											I*2	—	F–23
AIR CLEANER															
Air cleaner element				I*2			R			I*2			R	—	F–5
IGNITION SYSTEM															
Spark plugs				I*2			R			I*2			R	• Plug gap: 1.0—1.1 mm { 0.040—0.043 in } Recommended spark plugs: NGK: BKR5E-11, BKR6E-11; NIPPONDENSO: K16PR-U11, K20PR-U11	G–3
Initial ignition timing													I*1	Ignition timing BTDC 10—12 ° (11 ± 1°)	F–3

Schedule 2 (Unique driving conditions) (Cont'd)

Maintenance Interval / Maintenance Item	Number of months or miles { km }, whichever comes first												Service data and inspection point	Page
Months	4	8	12	16	20	24	28	32	36	40	44	48		
×1,000 Km	8	16	24	32	40	48	56	64	72	80	88	96		
×1,000 Miles	5	10	15	20	25	30	35	40	45	50	55	60		
FUEL SYSTEM														
Idle speed			I*2						I*2				Idle speed 760—800 (780 ± 20) rpm—AT (P range)	F–3
Fuel filter												R*1	—	F–15
Fuel lines and hoses						I*2						I*1	Fittings, connections and components for leaks	F–9 F–23
Fuel hoses (California)	Inspect every 105,000 miles { 168,000 km }												—	
COOLING SYSTEM														
Cooling system						I						I	• Hoses for cracks or wear • Coolant level	E–5
Engine coolant	Replace at first 45,000 miles { 72,000 km } or 36 months; after that, every 30,000 miles { 48,000 km } or 24 months												—	E–5
CHASSIS AND BODY														
Brake lines, hoses, and connections						I						I	Proper attachment and connections	P–6
Brake fluid						R						R	Brake fluid: FMVSS 116 DOT–3	P–3
Disc brakes			I			I			I			I	• Disc plate thickness: Front: 26.0 mm { 1.02 in }—Minimum Rear: 16.0 mm { 0.63 in }—Minimum • Pad thickness: Front: 2.0 mm { 0.08 in }—Minimum Rear: 1.0 mm { 0.04 in }—Minimum	 P–18 P–23 P–16 P–20

Schedule 2 (Unique driving condition) (Cont'd)

Maintenance Interval / Maintenance Item	Number of months or miles { km }, whichever comes first												Service data and inspection point	Page
Months	4	8	12	16	20	24	28	32	36	40	44	48		
×1,000 Km	8	16	24	32	40	48	56	64	72	80	88	96		
×1,000 Miles	5	10	15	20	25	30	35	40	45	50	55	60		
CHASSIS AND BODY														
Steering operation and linkages						I						I	• Free play: 0—30 mm { 0—1.18 in } • Operation and looseness • Fluid leakage or oozing	—
Front suspension ball joints						I						I	Damage, looseness and grease leakage	R–16 R–18
Front axle oil (4WD) Rear axle oil						R						R	Oil capacity Front: 1.7 L { 1.8 US qt, 1.5 Imp qt } Rear: 1.5 L { 1.6 US qt, 1.3 Imp qt }	M–36 M–58
Automatic transmission fluid						R						R	Replacement fluid capacity: Approx. 4.0 L { 4.2 US qt , 3.5 Imp qt }	K1–30
Transfer case oil (4WD)						R						R	Oil capacity: 1.5 L { 1.6 US qt , 1.3 Imp qt }	K2–29
Drive shaft dust boots (4WD)						I						I	Cracks, grease leakage and looseness of band	M–24
Bolts and nuts on chassis and body			I			I			I			I	Retighten all loose bolts and nuts	—
Exhaust system heat shields						I						I	Insulator clearance to body and exhaust system	F–22
All locks and hinges	L	L	L	L	L	L	L	L	L	L	L	L	Check for damage	S—6, 7, 9, 10
AIR CONDITIONER SYSTEM (IF EQUIPPED)														
A/C compressor operation			I			I			I			I	—	—

SCHEDULED MAINTENANCE

SCHEDULED MAINTENANCE TABLE (CANADA)

Schedule

Chart symbols:

I : Inspect and repair, clean, or replace if necessary.
(Inspect, and if necessary replace...Air cleaner element JE engine only)
R : Replace
L : Lubricate
Rt : Rotation (tires)

Remarks:

After 60 months or 60,000 miles { 96,000 km }, continue to follow the described maintenance at the recommended intervals.

*1: Replacement of the timing belt is required every 60,000 miles { 96,000 km }.
Failure to replace this belt may result in damage to the engine.

*2: This maintenance is recommended by Mazda. However, it is not necessary for emission warranty coverage or manufacturer recall liability.

Schedule (Cont'd)

Maintenance Interval / Maintenance Item	Number of months or miles { km }, whichever comes first												Service data and inspection point	Page
	Months	5	10	15	20	25	30	35	40	45	50	55	60	
	×1,000 Km	8	16	24	32	40	48	56	64	72	80	88	96	
	×1,000 Miles	5	10	15	20	25	30	35	40	45	50	55	60	
ENGINE														
Engine oil	R	R	R	R	R	R	R	R	R	R	R	R	Oil pan capacity: 4.5 L { 4.8 US qt , 4.0 Imp qt }	D–4
Oil filter	R	R	R	R	R	R	R	R	R	R	R	R	Oil filter capacity 0.22 L { 0.23 US qt , 0.19 Imp qt }	D–4
Tension of all drive belts	I	I	I	I	I	I	I	I	I	I	I	I	• Cracks or damage • Tension	B–4
Engine timing belts *1												R	—	B–7
FUEL SYSTEM														
Idle speed			I			I			I			I	• Idle speed 760—800 (780 ± 20) rpm—AT (P range)	F–3
Fuel filter						R						R	—	F–15
Fuel lines and hoses						I*2						I	• Fittings, connections and components for leaks	F–9 F–23
PCV valve *2												I	Function	F–28
Emission hoses and tubes												I	—	F–23
AIR CLEANER														
Air cleaner element			I			R			I			R	—	F–5

Schedule (Cont'd)

Maintenance Interval / Maintenance Item	Number of months or miles { km }, whichever comes first												Service data and inspection point	Page
	Months	5	10	15	20	25	30	35	40	45	50	55	60	
	×1,000 Km	8	16	24	32	40	48	56	64	72	80	88	96	
	×1,000 Miles	5	10	15	20	25	30	35	40	45	50	55	60	
IGNITION SYSTEM														
Spark plugs							R						R	• Plug gap: 1.0—1.1 mm { 0.040—0.043 in } • Recommended spark plugs: NGK: BKR5E-11, BKR6E-11 NIPPONDENSO: K16PR-U11, K20PR-U11	G–3
COOLING SYSTEM														
Engine coolant level and strength	I	I	I	I	I	I	I	I	I	I	I	I	I	—	E–5
Cooling system for leaks			I			I			I			I		• Hoses for cracks or wear • Coolant level	E–5
Engine coolant	Replace at first 45,000 miles { 72,000 km } or 45 months; after that, every 30,000 miles { 48,000 km } or 30 months													—	E–5
CHASSIS AND BODY														
Brake lines, and hoses							I						I	Proper attachment and connections	P–6
Brake fluid							R						R	Brake fluid: FMVSS 116 DOT–3	P–3
Disc brakes			I				I			I			I	• Disc plate thickness: Front: 26.0 mm { 1.02 in }—Minimum Rear: 16.0 mm { 0.63 in }—Minimum • Pad thickness: Front: 2.0 mm { 0.08 in }—Minimum Rear: 1.0 mm { 0.04 in }—Minimum	P–18 P–23 P–16 P–20
Automatic transmission fluid level	I	I	I	I	I	I	I	I	I	I	I	I	I	Oil type Dexron®II or M–III	K1–30

Schedule (Cont'd)

Maintenance Interval / Maintenance Item	Number of months or miles { km }, whichever comes first												Service data and inspection point	Page
	Months	5	10	15	20	25	30	35	40	45	50	55	60	
	×1,000 Km	8	16	24	32	40	48	56	64	72	80	88	96	
	×1,000 Miles	5	10	15	20	25	30	35	40	45	50	55	60	
CHASSIS AND BODY														
Automatic transmission fluid							R						R	• Replacement fluid capacity Approx. 4.0 L { 4.2 US qt , 3.5 Imp qt }	K1–30
Oil level in differential and transfer case (in models so equipped)	I	I	I	I	I	I	I	I	I	I	I	I	I	• Oil type Front differential Above –18 °C { 0 °F }: API GL-5, SAE 90 Below –18 °C { 0 °F }: API GL-5, SAE 80W Rear differential Above –18 °C { 0 °F }: API GL-5, SAE 90 Below –18 °C { 0 °F }: API GL-5, SAE 80W • Transfer case API service GL-4 or GL-5, SAE 75W-90	M–36 M–57 K2–29
Front differential oil (4WD)							R						R	Oil capacity 1.7 L { 1.8 US qt , 1.5 Imp qt }	M–36
Rear differential oil							R						R	Oil capacity 1.5 L { 1.6 US qt , 1.3 Imp qt }	M–58
Transfer case oil (4WD)							R						R	Oil capacity 1.5 L { 1.6 US qt , 1.3 Imp qt }	K2–29
Driveshaft dust boots (4WD)							I						I	—	M–26
Brake fluid level	I	I	I	I	I	I	I	I	I	I	I	I	I	Fluid specification FMVSS 116 DOT-3	—
Tire inflation pressure and tire wear	I	I	I	I	I	I	I	I	I	I	I	I	I	Tire size / Tires air pressure: P195/75R15, P215/65R15: 240 kPa { 2.4 kgf/cm^2 , 35 psi } P215/70R15: 220 kPa { 2.2 kgf/cm^2 , 32 psi }	Q–2
Tires			Rt			Rt			Rt			Rt		—	Q–5
Power steering fluid level	I	I	I	I	I	I	I	I	I	I	I	I	I	Fluid specification ATF Dexron ®II or M–III	N–37
Steering operation and linkage (Includes four wheel alignment)						I						I		—	N–6 R–7
Suspension components front and rear						I						I		—	—
All chassis and body nuts and bolts			I			I			I			I		—	—

Schedule (Cont'd)

Maintenance Interval / Maintenance Item	Number of months or miles { km }, whichever comes first												Service data and inspection point	Page
	Months	5	10	15	20	25	30	35	40	45	50	55	60	
	×1,000 Km	8	16	24	32	40	48	56	64	72	80	88	96	
	×1,000 Miles	5	10	15	20	25	30	35	40	45	50	55	60	
CHASSIS AND BODY														
Exhaust system heat shields							I						I	—	—
All locks and hinges		L	L	L	L	L	L	L	L	L	L	L	L	—	S–6, 7, 9, 10
Washer fluid level		I	I	I	I	I	I	I	I	I	I	I	I	—	—
Function of all lights		I	I	I	I	I	I	I	I	I	I	I	I	—	—
AIR CONDITIONER SYSTEM (IF EQUIPPED)														
A/C compressor operation			I		I		I		I		I		I	—	—

Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

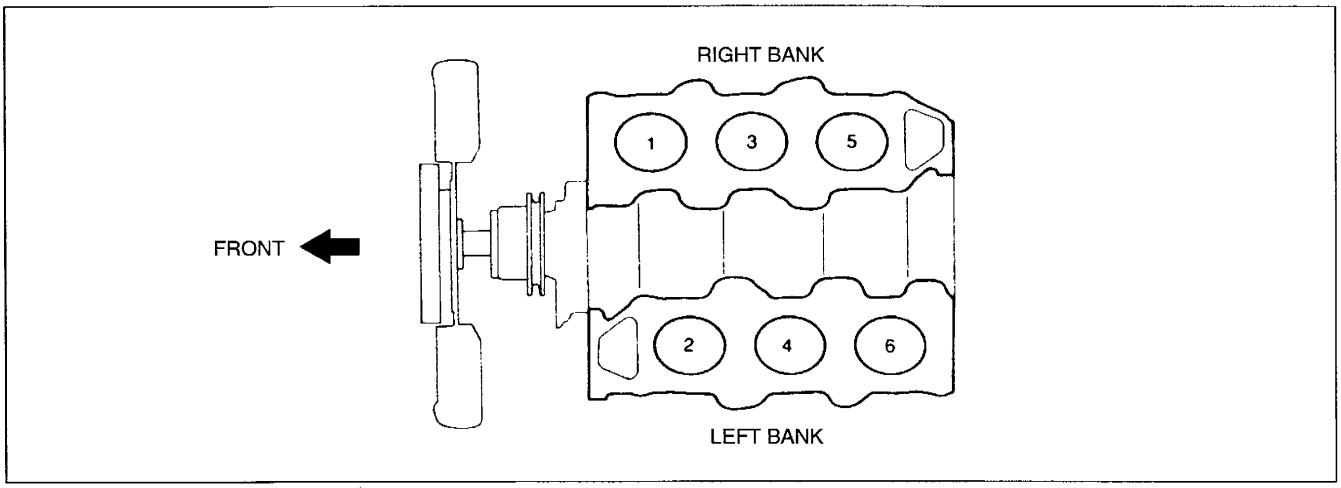
ENGINE

OUTLINE

SPECIFICATIONS

Item \ Engine				JE
Type				Gasoline, 4-cycle
Cylinder arrangement and number				60°-V configuration, 6-cylinder
Combustion chamber				Pentroof
Valve system				OHC, belt-driven
Displacement			ml { cc , cu in }	2,954 { 2,954 , 180.2 }
Bore × stroke			mm { in }	90.0×77.4 { 3.54×3.05 }
Compression ratio				8.5 : 1
Compression pressure			kPa { kgf/cm^2 , psi } - rpm	1,128 { 11.5 , 164 } - 300
Valve timing	IN	Open	BTDC	9 °
		Close	ABDC	53 °
	EX	Open	BBDC	51 °
		Close	ATDC	11 °
Valve clearance		IN	mm { in }	0 { 0 }: Maintenance-free
		EX	mm { in }	0 { 0 }: Maintenance-free

Cylinder Arrangement



TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Difficult starting	**Malfunction of engine-related components**		
	Burned valve	Replace	B–55
	Worn piston, piston ring, or cylinder	Replace or repair	B–62
	Failed cylinder head gasket	Replace	B–12
	Malfunction of fuel system	Refer to section F	
	Malfunction of electrical system	Refer to section G	
Poor idling	**Malfunction of engine-related components**		
	Malfunction of HLA*	Replace	B–15
	Poor valve-to-valve seat contact	Repair or replace	B–57
	Failed cylinder head gasket	Replace	B–12
	Malfunction of fuel system	Refer to section F	

* Tappet noise may occur if the engine is not operated for an extended period. The noise should disappear after the engine has reached normal operating temperature. (HLA troubleshooting guide: Refer to page B–17.)

Problem	Possible Cause	Action	Page
Insufficient power	**Insufficient compression**		
	Malfunction of HLA*	Replace	B–15
	Compression leakage from valve seat	Repair	B–57
	Stuck valve	Replace	B–55
	Weak or broken valve spring	Replace	B–58
	Damaged cylinder head gasket	Replace	B–12
	Cracked or distorted cylinder head	Replace	B–54
	Stuck, damaged, or worn piston ring	Replace	B–62
	Cracked or worn piston	Replace	B–62
	Malfunction of fuel system	Refer to section F	
	Others		
	Dragging brakes	Refer to section P	
	Wrong size tires	Refer to section Q	
Abnormal combustion	**Malfunction of engine-related components**		
	Malfunction of HLA*	Replace	B–15
	Stuck or burned valve	Replace	B–55
	Weak or broken valve spring	Replace	B–58
	Carbon accumulation in combustion chamber	Eliminate carbon	—
	Malfunction of fuel system	Refer to section F	
Excessive oil consumption	**Oil working up**		
	Worn piston ring groove or stuck piston ring	Replace	B–62
	Worn piston or cylinder	Replace or repair	B–62
	Oil working down		
	Worn valve seal	Replace	B–36
	Worn valve stem or guide	Replace	B–55
	Oil leakage	Refer to section D	
Engine noise	**Crankshaft- or bearing-related parts**		
	Excessive main bearing oil clearance	Replace or repair	B–47
	Main bearing heat-damaged	Replace	B–47
	Excessive crankshaft end play	Replace or repair	B–49
	Excessive connecting rod bearing oil clearance	Replace or repair	B–52
	Connecting rod bearing heat-damaged	Replace	B–52
	Piston-related parts		
	Worn cylinder	Replace or repair	B–60
	Worn piston or piston pin	Replace	B–62
	Damaged piston ring	Replace	B–62
	Bent connecting rod	Replace	B–63
	Valve-related parts		
	Malfunction of HLA*	Replace	B–15
	Broken valve spring	Replace	B–58
	Excessive valve guide clearance	Replace	B–55
	Malfunction of timing belt auto tensioner	Replace	B–64
	Malfunction of cooling system	Refer to section E	
	Malfunction of fuel system	Refer to section F	
	Others		
	Malfunction of water pump bearing	Replace	—
	Improper drive belt tension	Adjust	B–4
	Malfunction of generator bearing	Replace	—
	Exhaust gas leakage	Repair	—

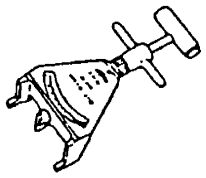
* Tappet noise may occur if the engine is not operated for an extended period. The noise should disappear after the engine has reached normal operating temperature. (HLA troubleshooting guide: Refer to page B–17.)

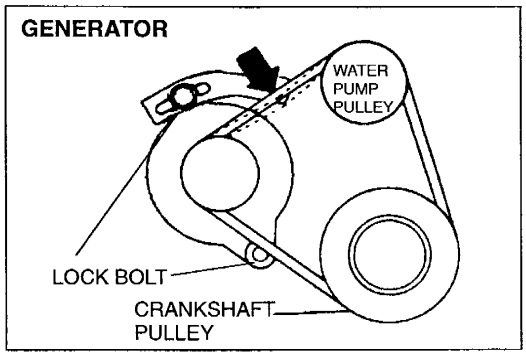
Warning

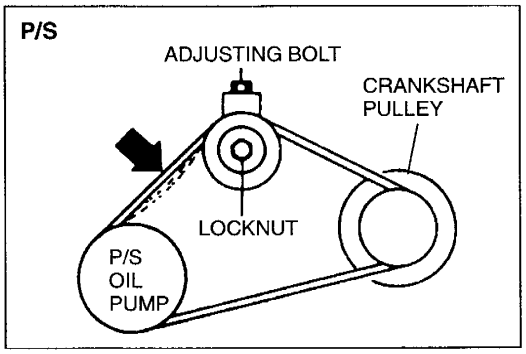
- **Continuous exposure with USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after this work.**

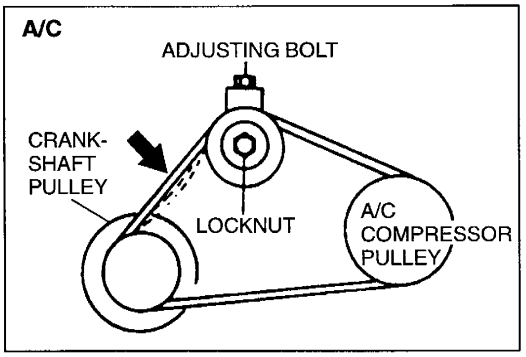
DRIVE BELT

PREPARATION
SST

49 9200 020A Tension gauge, belt		For inspection of drive belt tension







INSPECTION / ADJUSTMENT
Inspection

1. Check the drive belt deflection when the engine is cold, or at least 30 minutes after the engine has stopped. Apply moderate pressure **98 N { 10 kgf , 22 lbf }** midway between the specified pulleys.

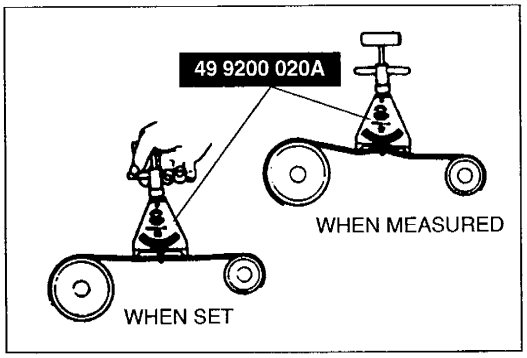
Deflection

mm { in }

Drive belt	*New	Used	Limit
Generator	9—10 { 0.36—0.39 }	10—12 { 0.40—0.47 }	18 { 0.71 }
P/S oil pump	7.0—7.5 { 0.28—0.29 }	7.5—8.2 { 0.30—0.32 }	13.5 { 0.53 }
A/C compressor	4.0—4.5 { 0.16—0.17 }	4.5—5.5 { 0.18—0.21 }	8.5 { 0.33 }

*A belt that has been on a running engine for less than five minutes.

2. If the deflection is not within the specification, adjust it. (Refer to page B–5.)



Drive Belt Tension Check

1. Belt tension can be checked in place of belt deflection. Check the drive belt tension when the engine is cold, or at least 30 minutes after the engine has stopped. Using the **SST**, check the belt tension between any two pulleys.

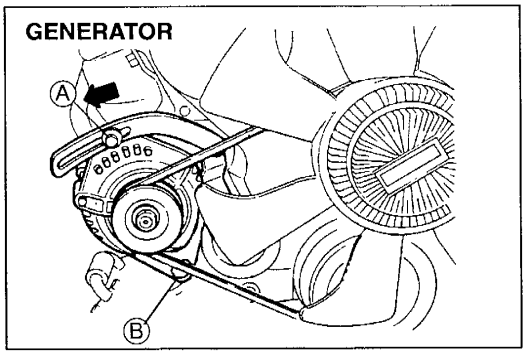
Tension

N { kgf , lbf }

Drive belt	*New	Used	Limit
Generator	550—637 { 56—65 , 124—143 }	461—549 { 47—56 , 104—123 }	265 { 27 , 59 }
P/S oil pump	344—382 { 35—39 , 77—85 }	295—333 { 30—34 , 66—74 }	245 { 25 , 55 }
A/C compressor	540—617 { 55—63 , 121—138 }	452—539 { 46—55 , 102—121 }	245 { 25 , 55 }

*A belt that has been on a running engine for less than five minutes.

2. If the tension is not within the specification, adjust it. (Refer to below.)

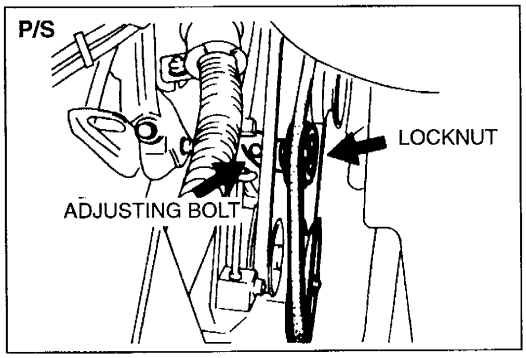


Adjustment

Generator

1. Loosen generator bolts Ⓐ and Ⓑ.
2. Lever the generator outward and apply tension to the belt.

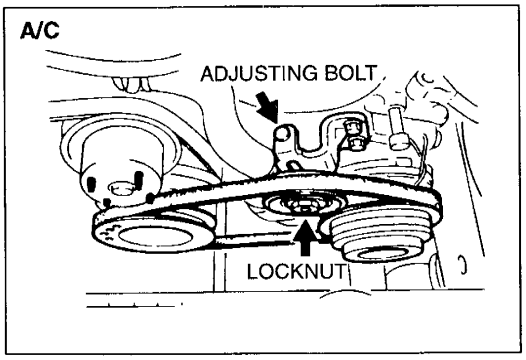
Tightening torque
Ⓐ: 19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }
Ⓑ: 38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }



P/S oil pump

Loosen the locknut and adjust the belt deflection by turning the adjusting bolt.

Tightening torque:
38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }

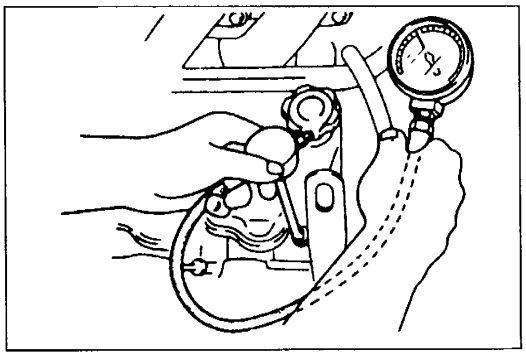


A/C compressor

Loosen the locknut and adjust the belt deflection by turning the adjusting bolt.

Tightening torque:
38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }

COMPRESSION



INSPECTION

1. Verify that the battery is fully charged. Recharge it if necessary. (Refer to section G.)
2. Warm up the engine to the normal operating temperature.
3. Turn it off for about 10 minutes to allow the exhaust manifold to cool.
4. Remove the all spark plugs.
5. Disconnect the distributor connector.
6. Install a compression gauge to the No.1 spark plug hole.
7. Fully depress the accelerator pedal and crank the engine.
8. Record the maximum gauge reading.
9. Check each cylinder as above.

Compression

kPa { kgf/cm^2 , psi }–rpm

Standard	1,128 { 11.5 , 164 }–300
Minimum	834 { 8.5 , 121 }–300
Maximim difference between cylinders	196 kPa { 2.0 kgf/cm^2 , 28 psi }

10. If the compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder and recheck the compression.
    (1) If the compression increases, the piston, piston rings, or cylinder wall may be worn.
    (2) If the compression stays low, the valve may be stuck or improperly seated.
    (3) If the compression in adjacent cylinders stays low, the cylinder head gasket may be damaged or the cylinder head distorted.
11. Connect the distributor connector.
12. Install the all spark plugs.

Tightening torque:
15—22 N·m { 1.5—2.3 kgf·m , 11—16 ft·lbf }

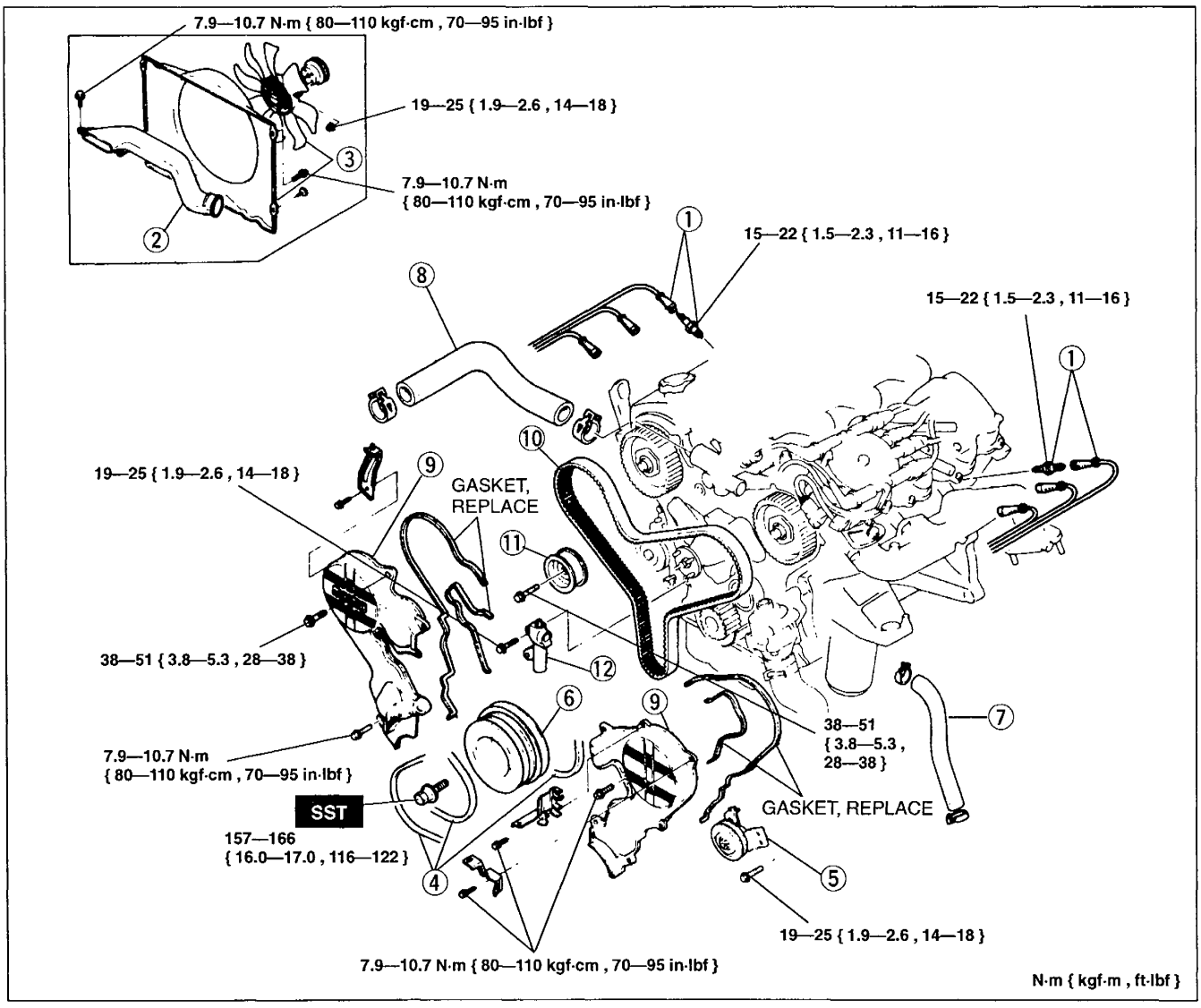
TIMING BELT

PREPARATION
SST

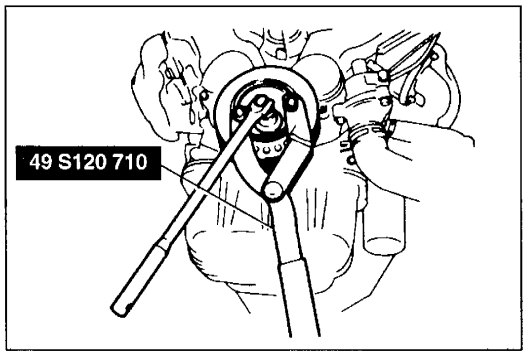
49 S120 710 Holder, coupling flange		For removal / installation of crankshaft pulley

REMOVAL / INSTALLATION

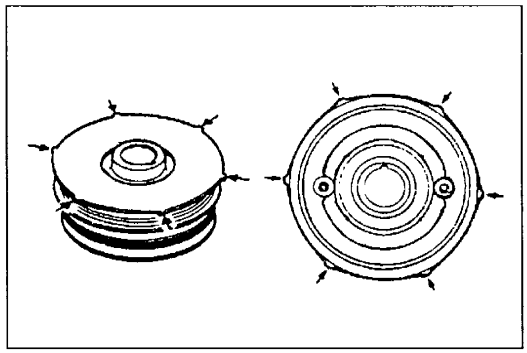
1. Disconnect the negative battery cable.
2. Drain the engine coolant. (Refer to section E.)
3. Remove in the order shown in the figure, referring to **Removal Note**.
4. Install in the reverse order or removal, referring to **Installation Note**.
5. Fill the radiator and coolant reservoir with the specified amount and type of engine coolant. (Refer to section E.)
6. Connect the negative battery cable.
7. Start the engine and
   (1) check the engine oil and engine coolant leakage.
   (2) check the ignition timing and idle speed. (Refer to section F.)



1. High-tension lead and spark plug
2. Fresh-air duct
3. Cooling fan and radiator cowling
4. Drive belt
5. A/C compressor idler pulley
6. Crankshaft pulley
   Removal Note ..... below
   Installation Note ..... page B–11
7. Coolant bypass hose
8. Upper radiator hose
9. Timing belt cover
   Installation Note ..... page B–10
10. Timing belt
    Removal Note ..... below
    Installation Note ..... page B– 9
11. Upper idler pulley
12. Timing belt auto tensioner
    Installation Note ..... page B– 9

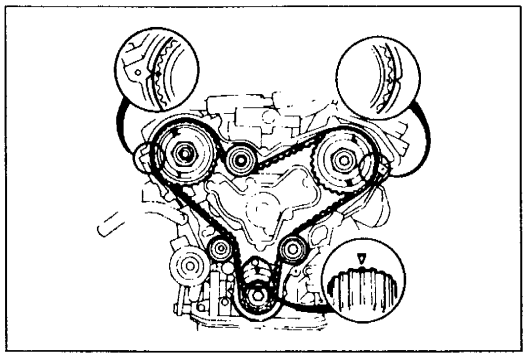


Removal Note
Crankshaft pulley
1. Mount the **SST** on the crankshaft pulley to hold the crankshaft.
2. Remove the crankshaft pulley bolt.

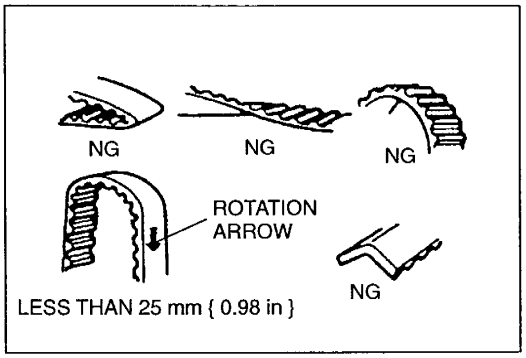


Caution
- **The crankshaft position sensor rotor is on the rear of the crankshaft pulley, and can be damaged easily.**

3. Remove the crankshaft pulley.



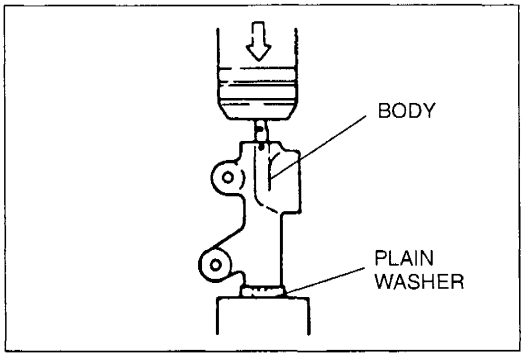
Timing belt
1. Install the crankshaft pulley lock bolt and hand tighten it.
2. Turn the crankshaft to align the timing marks on the pulleys.



3. Mark the timing belt rotation for proper reinstallation.
4. Remove the timing belt.

Caution
- **The following will damage the belt and shorten its life; Forcefully twisting it, turning it inside out, bending it, or allowing oil or grease on it.**

5. Remove the crankshaft pulley lock bolt.

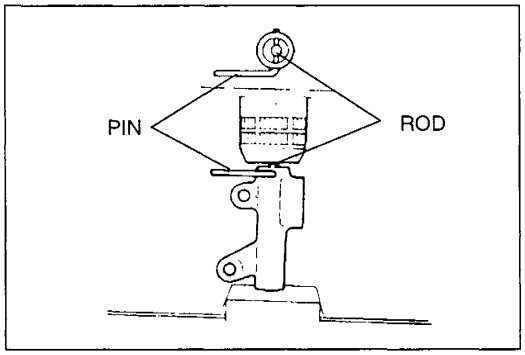


Installation Note
Timing belt auto tensioner

1. Set a plain washer at the bottom of the tensioner body to prevent damage to the body plug.

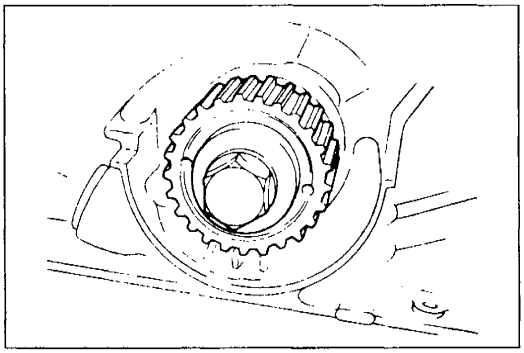
Caution
- **Pressing the tensioner rod with more than 9,807 N { 1,000 kgf , 2,200 lbf } can damage the tensioner spring.**

2. Press in the tensioner rod slowly by using a press.



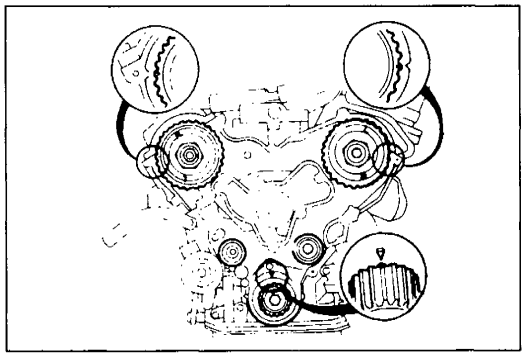
3. Insert a pin to hold the tensioner rod in the body as shown.
4. Install the auto tensioner to the cylinder block.

Tightening torque:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }



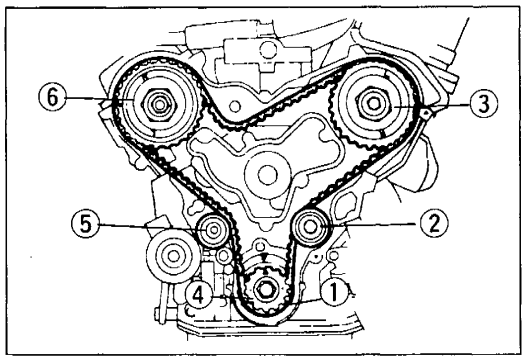
Timing belt

1. Install the crankshaft pulley lock bolt and hand tighten it.

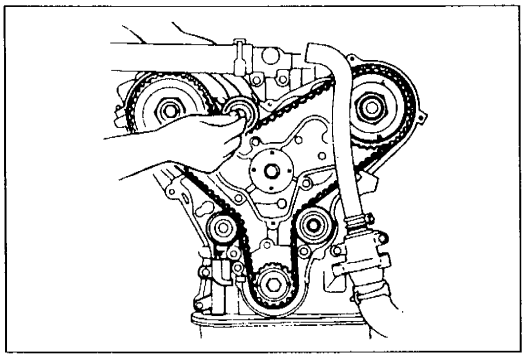


2. Turn the camshaft pulleys clockwise and align the timing marks.

Caution
- **The following will damage the belt and shorten its life; Forcefully twisting it, turning it inside out, bending it, or allowing oil or grease on it.**



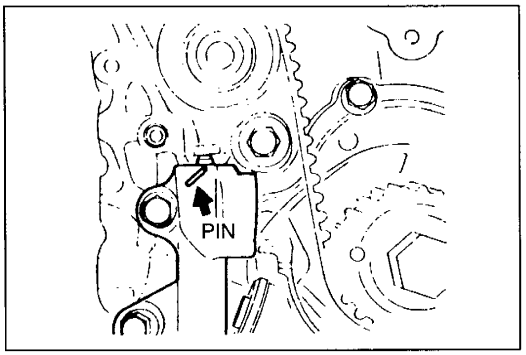
3. Position the timing belt in the original direction, and hang it on each pulley in the order shown.



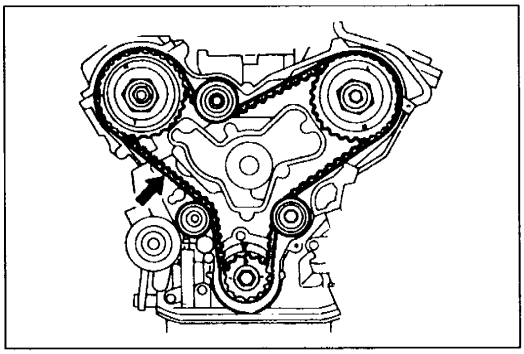
4. Install the upper idler pulley.

Tightening torque:
38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }

5. Turn the crankshaft clockwise twice and align the timing marks.
6. Check that the timing marks are correctly aligned. If not, repeat steps 2—5.

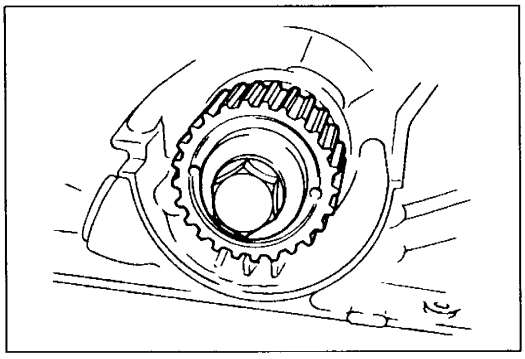


7. Remove the pin from the auto tensioner.
8. Turn the crankshaft clockwise twice and align the timing marks.
9. Reconfirm that the timing marks are correctly aligned.

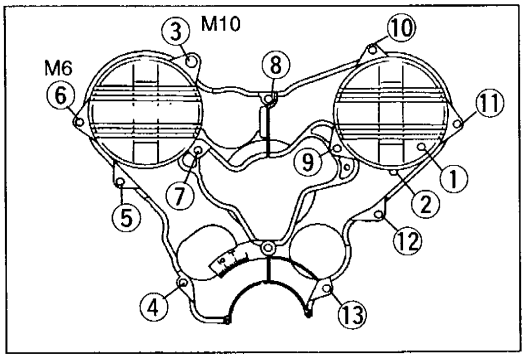


10. Check the timing belt deflection by applying moderate pressure **98 N { 10 kgf , 22 lbf }** midway between the timing belt pulley and the auto tensioner. If not correct, repeat the adjustment from step 4.

Timing belt deflection: 5—7 mm { 0.20—0.27 in }

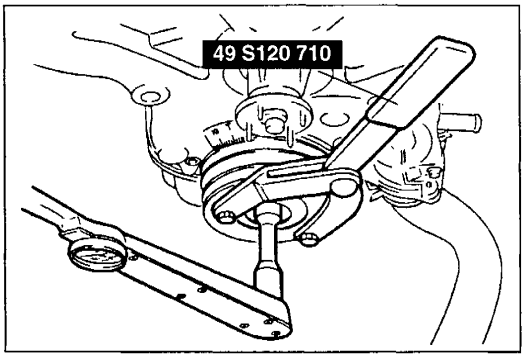


11. Remove the crankshaft pulley lock bolt.



Timing belt cover
1. Install the timing belt covers along with new gaskets.
2. Tighten the bolts in the order shown.

Tightening torque
M6: 7.9—10.7 N·m { 80—110 kgf·cm , 70—95 in·lbf }
M10: 38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }



Crankshaft pulley

Caution
- **The crankshaft position sensor rotor is on the rear of the crankshaft pulley, and can be damaged easily.**

1. Install the crankshaft pulley and hand tighten the pulley lock bolt.
2. Mount the **SST** on the crankshaft pulley to hold the crankshaft.
3. Tighten the crankshaft pulley lock bolt.

Tightening torque: 157—166 N·m
{ 16.0—17.0 kgf·m , 116—122 ft·lbf }

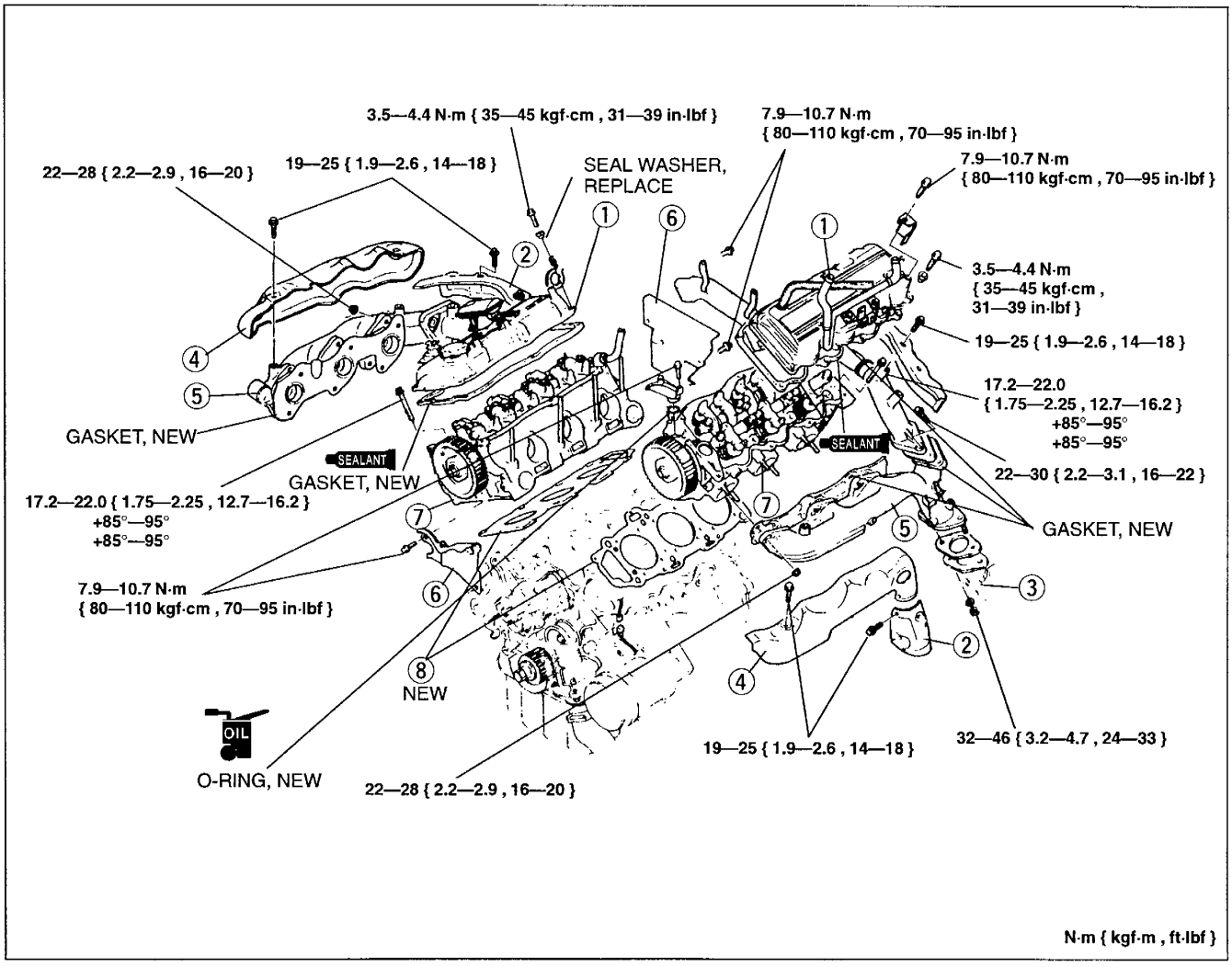
CYLINDER HEAD GASKET

REPLACEMENT

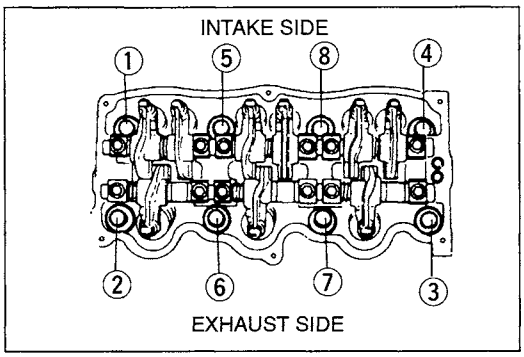
Warning

- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on section F.**

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (Refer to section E.)
3. Remove the timing belt. (Refer to page B–7.)
4. Remove the intake manifold assembly. (Refer to section F.)
5. Remove in the order shown in the figure, referring to **Removal Note**.
6. Install in the reverse order of removal, referring to **Installation Note**.
7. Install the intake manifold assembly. (Refer to section F.)
8. Install the timing belt. (Refer to page B–7.)
9. Fill the radiator and coolant reservoir with the specified amount and type of engine coolant. (Refer to section E.)
10. Connect the negative battery cable.
11. Start the engine and
    (1) check the engine oil and engine coolant leakage.
    (2) check the ignition timing and idle speed. (Refer to section F.)
12. Check the compression. (Refer to page B–6.)

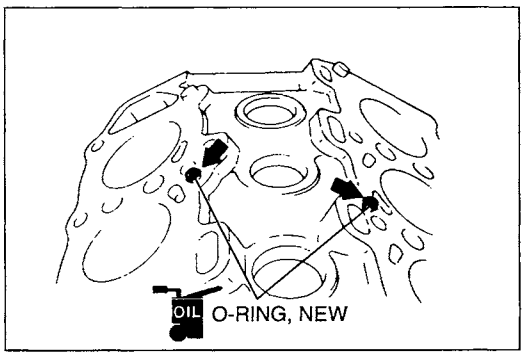


1. Cylinder head cover
   Installation Note ..... page B–14
2. Center exhaust pipe insulator
3. Center exhaust pipe
4. Exhaust manifold insulator
5. Exhaust manifold
6. Seal plate
7. Cylinder head
   Removal Note ..... below
   Installation Note ..... below
8. Cylinder head gasket



Removal Note
Cylinder head

1. Loosen the cylinder head bolts in two or three steps in the order shown.
2. Remove the cylinder head.

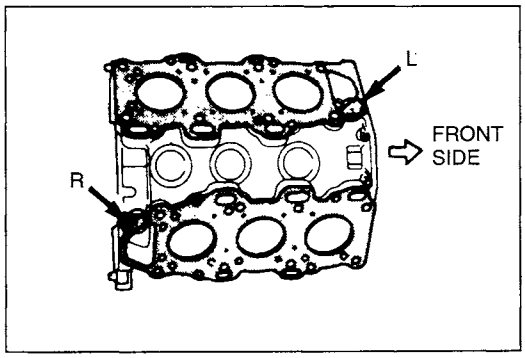


Installation Note
Cylinder head

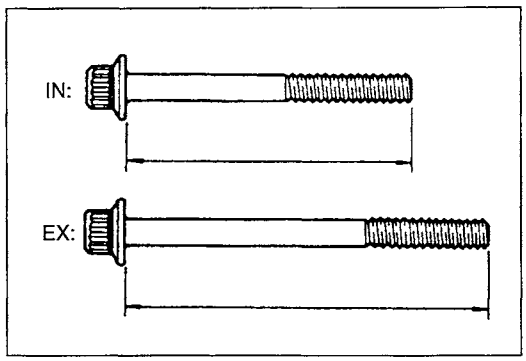
1. Measure the amount of oil control plug projection from the deck of the cylinder block.

   Projection: 5.3—5.7 mm { 0.209—0.224 in }

2. Apply clean engine oil to new O-rings; and install them to the oil control plugs.

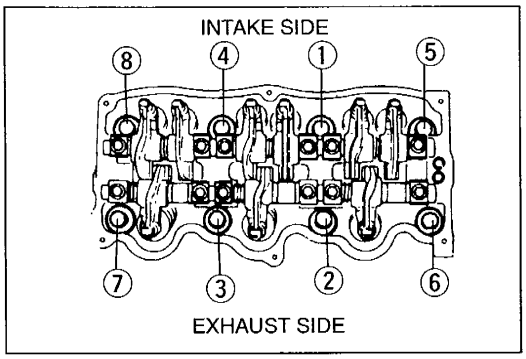


3. Thoroughly remove all dirt, oil, and other material from the top of the cylinder block.
4. Turn the crankshaft clockwise and apply engine oil to the cylinder walls.
5. Place a new cylinder head gasket on the left bank with the L mark facing upward.
6. Place a new cylinder head gasket on the right bank with the R mark facing upward.



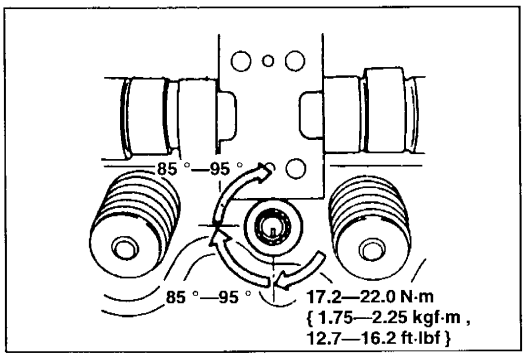
7. Install the cylinder head to the cylinder block.
8. Tighten the cylinder head bolts.
   (1) Before installation, measure each bolt length. Replace if necessary.

Length	**IN : 107.7—108.3 mm { 4.25—4.26 in }**
	EX: 137.7—138.3 mm { 5.43—5.44 in }
Maximum	**IN : 109 mm { 4.29 in }**
	EX: 139 mm { 5.47 in }

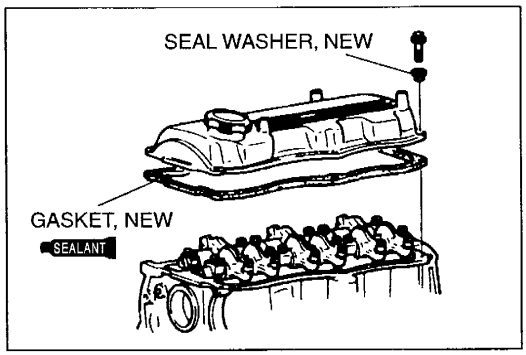


(2) Tighten the bolts in the order shown.

Tightening torque: 17.2—22.0 N·m
{ 1.75—2.25 kgf·m , 12.7—16.2 ft·lbf }



(3) Put a paint mark on each bolt head.
(4) Using the mark as a reference, tighten the bolts **85 °—95 °** in the sequence shown.
(5) Retighten each bolt another **85 °—95 °** in the sequence shown.



Cylinder head cover

1. Remove all old silicone sealant from the cylinder head and cylinder head cover.
2. Coat a new gasket with silicone sealant, and install it onto the cylinder head cover.
3. Install the cylinder head cover along with new seal washers.

Tightening torque:
3.5—4.4 N·m { 35—45 kgf·cm , 31—39 in·lbf }

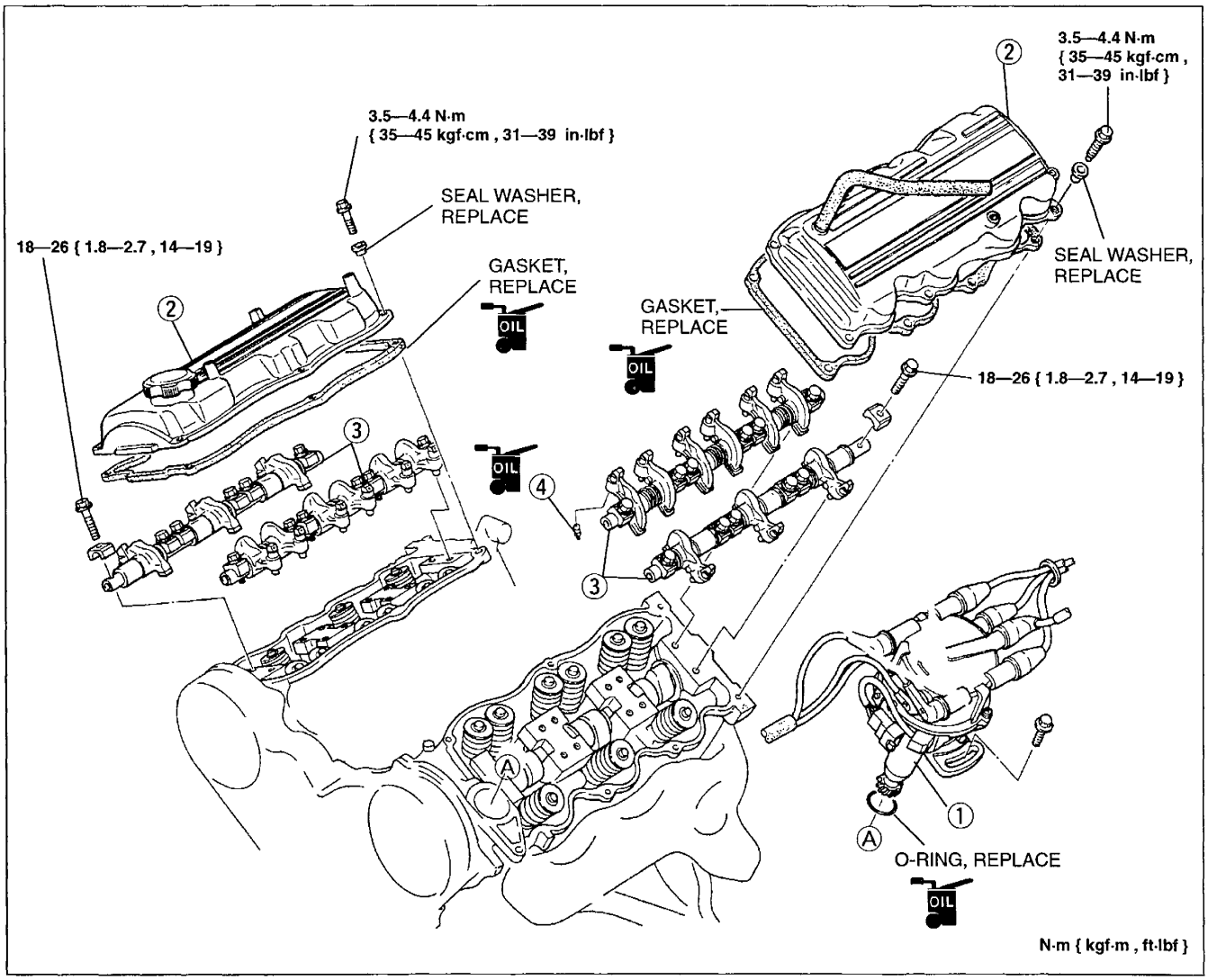
HLA

REMOVAL / INSTALLATION

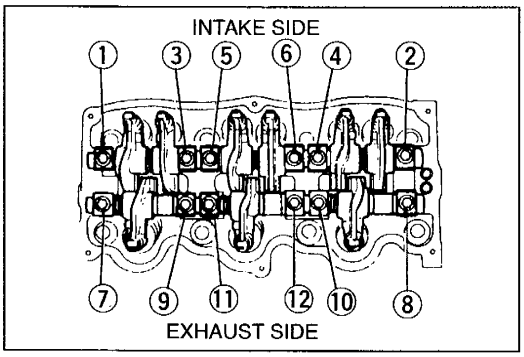
Caution

- **Removal and installation of the HLA must be carried out only when the problem cannot be solved by the HLA troubleshooting guide. (Refer to page B–17.)**

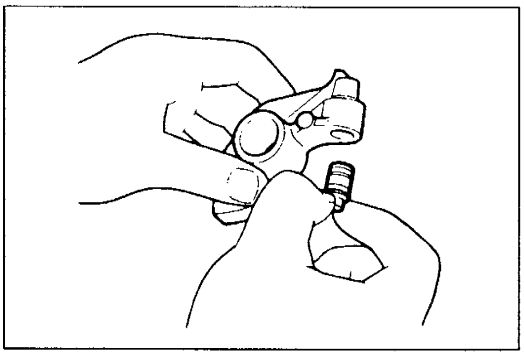
1. Disconnect the negative battery cable.
2. Remove the air intake hose and dynamic chamber. (Refer to section F.)
3. Remove the timing belt. (Refer to page B–7.)
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Install the dynamic chamber and air intake hose. (Refer to section F.)
7. Install the timing belt. (Refer to page B–7.)
8. Fill the engine with the specified amount and type of engine oil. (Refer to section D.)
9. Fill the radiator and coolant reservoir with the specified amount and type of engine coolant. (Refer to section E.)
10. Connect the negative battery cable.
11. Start the engine and
    (1) check the engine oil and engine coolant leakage.
    (2) check the ignition timing and idle speed. (Refer to section F.)
12. Turn off the engine and check the drive belt deflection. (Refer to page B–4.)
13. Perform a road test.
14. Recheck the engine oil and coolant levels.



1. Distributor
   Removal / Installation ..... section G
2. Cyliner head cover
   Installation Note ..... page B–14
3. Rocker arm and rocker arm shaft assembly
   Removal Note ..... below
   Installation Note ..... below
4. HLA
   Removal Note ..... below
   Installation Note ..... below



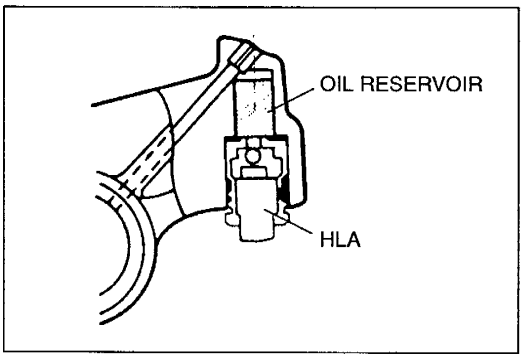
Removal Note
Rocker arm and rocker arm shaft assembly
1. Loosen the bolts in two or three steps in the order shown.
2. Remove the rocker arm and rocker arm shaft assembly together with the bolts. Do not mix up the parts of the rocker arm and rocker arm shaft assembly.



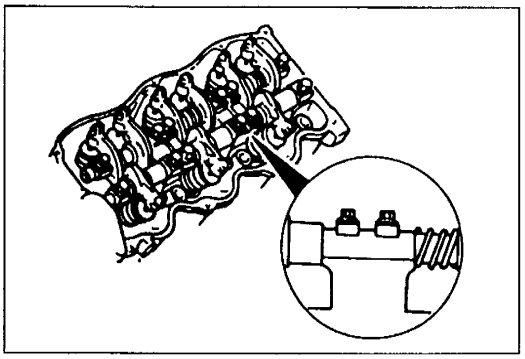
HLA

Caution
- **Do not remove the HLA unless necessary because oil leakage will occur if the O-ring is damaged.**

Remove the HLA by hand. If this is difficult, remove it with pliers.

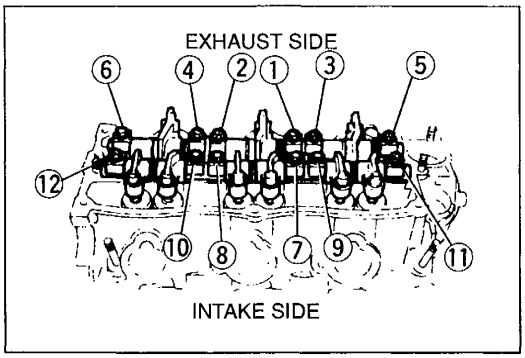


Installation Note
HLA
1. Pour engine oil into the oil reservoir in the rocker arm.
2. Apply engine oil to the HLA.
3. Carefully install the HLA into the rocker arm.



Rocker arm and rocker arm shaft assembly

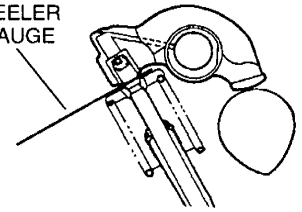
Caution
- **Be careful that the rocker arm shaft spring does not get caught between the shaft and mounting boss during installation.**

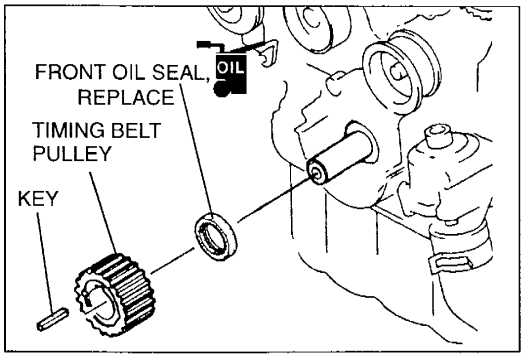


1. Install the rocker arm and rocker arm shaft assembly.
2. Tighten the bolts in two or three steps in the order shown.

Tightening torque:
18—26 N·m { 1.8—2.7 kgf·m , 14—19 ft·lbf }

HLA TROUBLESHOOTING GUIDE

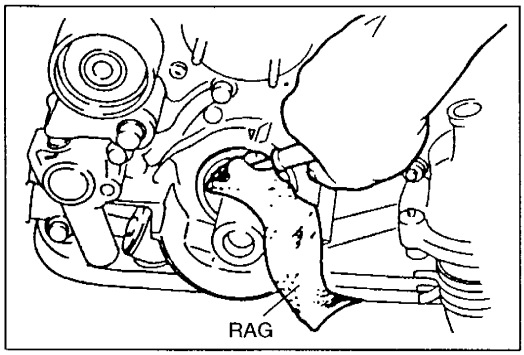
Problem	Possible cause	Action
1. Noise when engine is first started after oil is changed.	Oil leakage in oil passage or in HLA	Run engine at 2,000—3,000 rpm. If noise stops within 20 minutes*, HLA is normal. If not, replace HLA. * Time required for engine oil to circulate within HLA includes tolerance for engine oil condition and ambient temperature.
2. Noise when engine is started after setting one day or more.		
3. Noise when engine is started after new HLA is installed.	Oil leakage in HLA	
4. Noise during idle after warm up.	Insufficient oil pressure	Check oil pressure. If lower than specification, check for cause. (Refer to section D)
	Faulty HLA	Press down HLA by hand. If it does not move, HLA is normal. If it moves, replace HLA. Measure valve clearance. If more than 0.15 mm { 0.0059 in }, replace HLA. 
5. Noise during idle after high speed running.	Incorrect oil amount	Check oil level. Drain or add oil as necessary.
	Deteriorated oil	Check oil quality. If deteriorated, replace with specified type and amount of oil.



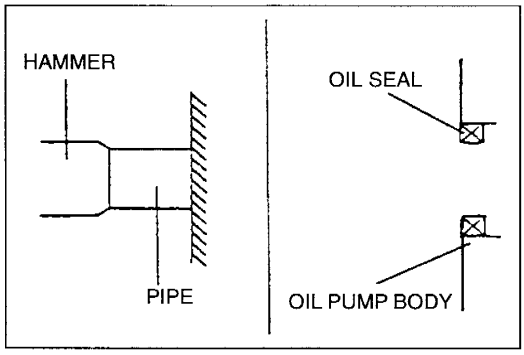
FRONT OIL SEAL

REPLACEMENT

1. Disconnect the negative battery cable.
2. Remove the timing belt. (Refer to page B–7.)
3. Remove the timing belt pulley.
4. Remove the key.



5. Cut the oil seal lip by using a razor knife.
6. Remove the oil seal by using a screwdriver protected with a rag.



7. Apply clean engine oil to the new oil seal.
8. Push the oil seal slightly in by hand.
9. Tap the oil seal in evenly by using a pipe and a hammer.

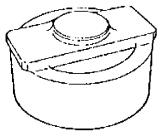
Note

- Oil seal outer diameter: 55.0 mm { 2.17 in }
- Oil seal inner diameter: 43.0 mm { 1.69 in }

10. Install the timing belt pulley, aligning the key groove.
11. Insert the key with the tapered side toward to the oil pump body.
12. Install the timing belt. (Refer to page B–7.)
13. Connect the negative battery cable.
14. Start the engine and check the ignition timing. (Refer to section F.)

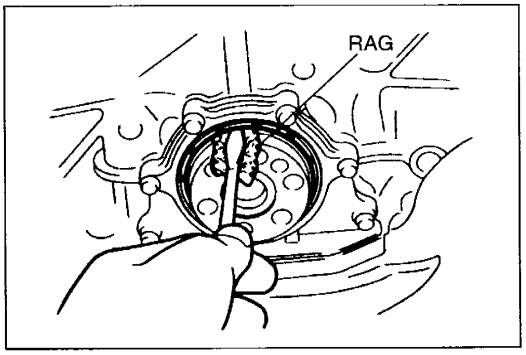
REAR OIL SEAL

PREPARATION
SST

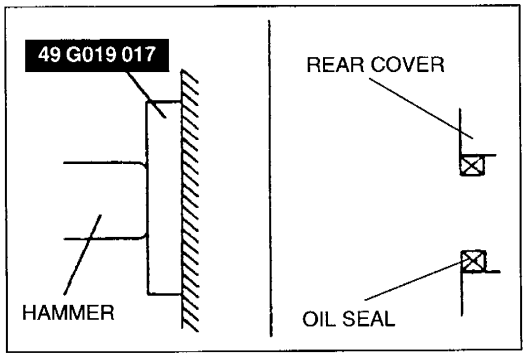
49 G019 017 Installer, oil seal		For installation of rear oil seal

REPLACEMENT

1. Disconnect the negative battery cable.
2. Remove the transmission assembly. (Refer to section K.)
3. Remove the drive plate. (Refer to section K.)



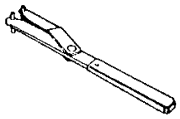
4. Cut the oil seal lip by using a razor knife.
5. Remove the oil seal by using a screwdriver protected with a rag.



6. Apply clean engine oil to the new oil seal.
7. Push the oil seal slightly in by hand.
8. Tap the oil seal in evenly by using the **SST** and a hammer.
9. Install the drive plate. (Refer to section K.)
10. Install the transmission assembly. (Refer to section K.)
11. Connect the negative battery cable.

ENGINE

PREPARATION
SST

49 G032 354 Adjust wrench		For removal / installation of P/S oil pump

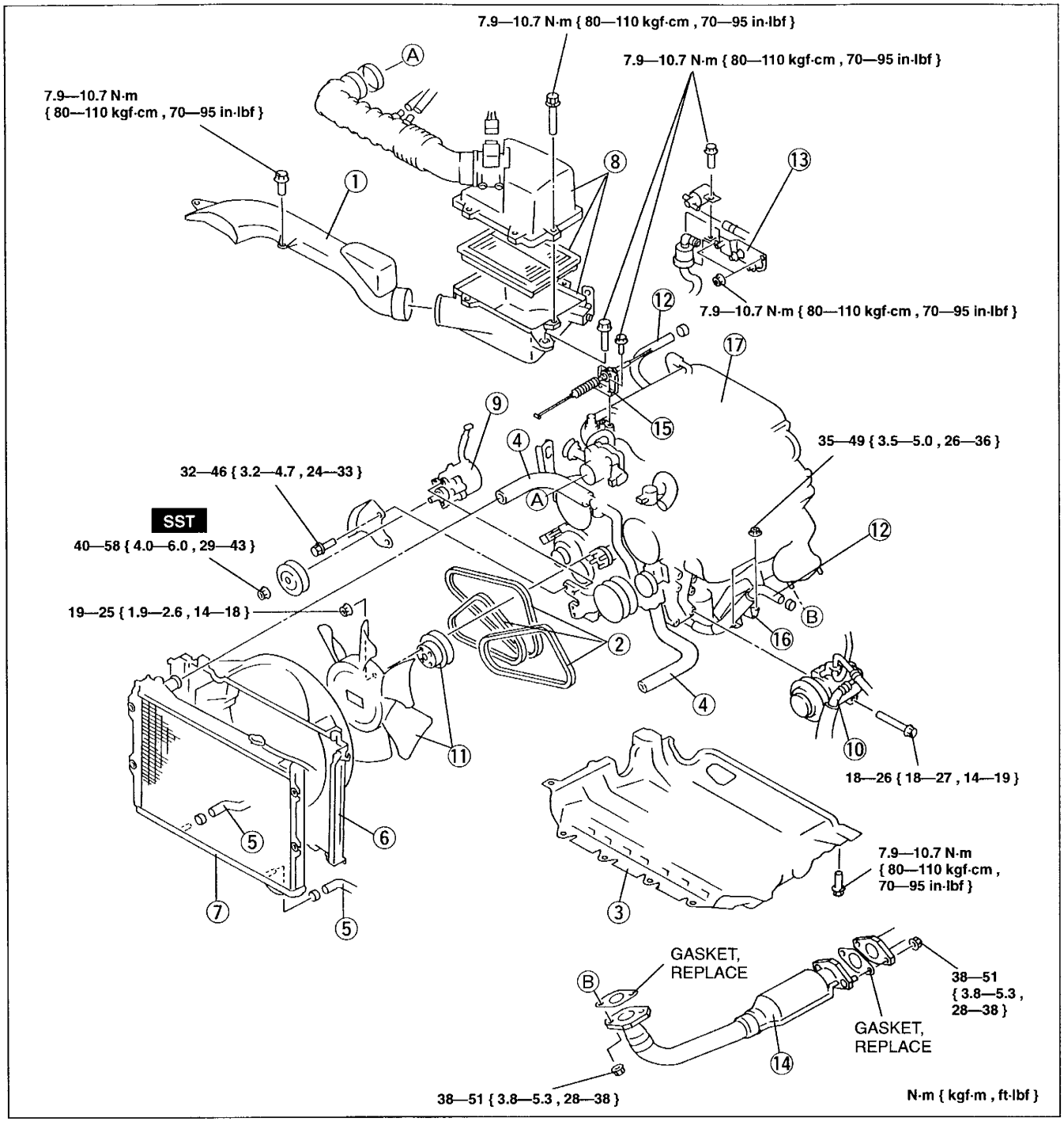
REMOVAL / INSTALLATION
Procedure

Warning
- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on section F.**
- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**

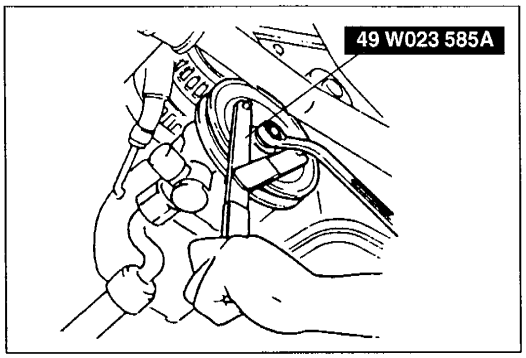
Caution
- **Cover the fuel hoses with a rag because fuel will spray out when disconnected.**

Note
- Plug the disconnected fuel hoses to prevent fuel leakage.

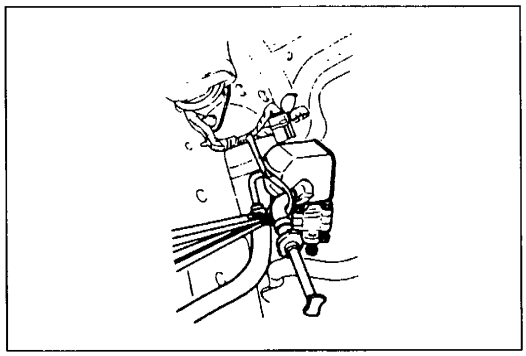
1. Disconnect the negative battery cable.
2. Drain the engine coolant. (Refer to section E.)
3. Remove the hood.
4. Drain the transmission oil. (Refer to section K.)
5. Remove in the order shown in the figure, referring to **Removal Note**.
6. Install in the reverse order of removal, referring to **Installation Note**.
7. Fill the transmission with the specified amount and type of transmission oil. (Refer to section K.)
8. Fill the radiator and coolant reservoir with the specified amount and type of engine coolant. (Refer to section E.)
9. Install the hood.
10. Connect the negative battery cable.
11. Start the engine and
    (1) check the engine oil, transmission oil, and engine coolant leakage.
    (2) check the ignition timing and idle speed. (Refer to section F.)
12. Turn off the engine and check the drive belt deflection. (Refer to page B–4.)
13. Perform a road test.
14. Recheck the engine oil, transmission oil, and engine coolant levels.



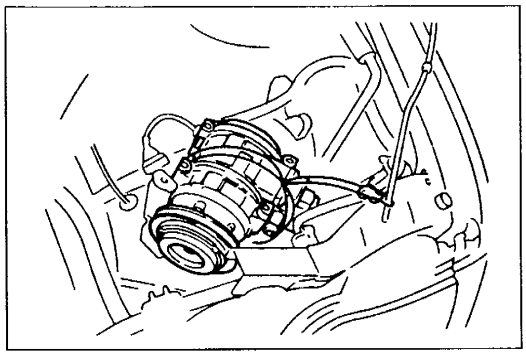
1. Fresh-air duct
2. Drive belt
3. Splash shield
4. Upper and lower radiator hose
5. Oil cooler hose
6. Radiator cowling
7. Radiator
8. Air cleaner and air duct
9. P/S oil pump
   - Removal Note ..... page B–22
   - Installation Note ..... page B–23
10. A/C compressor
    - Removal Note ..... page B–22
11. Cooling fan and water pump pulley
12. Heater hose
13. Solenoid and bracket
14. Front pipe
15. Accelerator cable
    - Adjustment ..... section F
16. Engine mount
17. Engine assembly
    - Removal Note ..... page B–22
    - Installation Note ..... page B–23



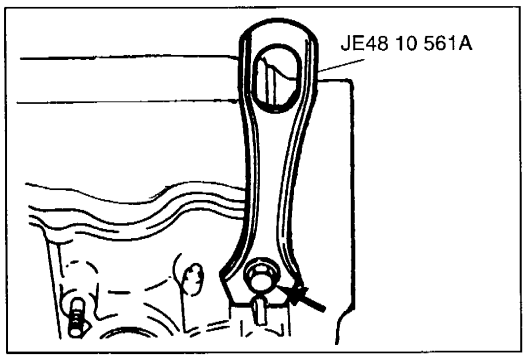
Removal Note
P/S oil pump
1. Remove the P/S oil pump pulley by using the **SST**.



2. Remove the P/S oil pump with the hoses still connected to them; secure the pump and compressor as shown in the figure.



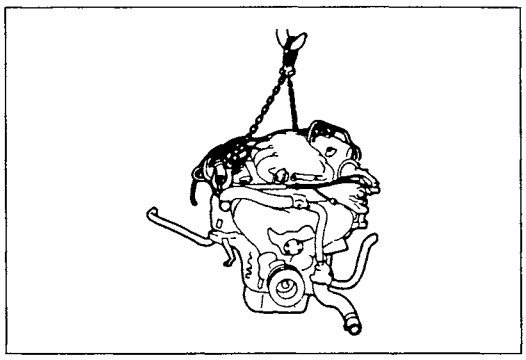
A/C compressor
Remove the A/C compressor with the hoses still connected to them; secure the pump and compressor as shown in the figure.



Engine assembly
1. Install the front engine hanger. (JE48 10 561A)

   Tightening torque:
   38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }

2. Set the chain block.
3. Remove the engine mount nuts.
4. Suspend the engine assembly horizontally.
5. Removal the engine in the engine compartment being careful not to damage the piping.

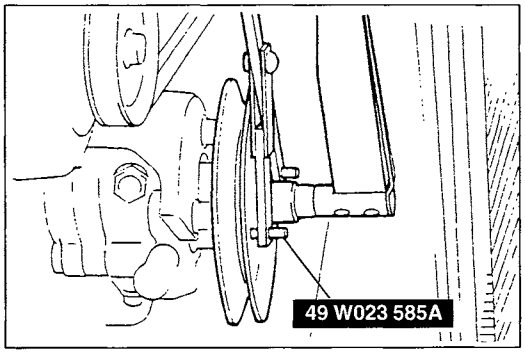


Installation Note
Engine assembly
1. Suspend the engine assembly.
2. Slowly lower the engine. Keep it from swinging or bumping into components in the engine compartment.

3. Tighten the engine mount nuts.

   Tightening torque:
   35—49 N·m { 3.5—5.0 kgf·m , 26—36 ft·lbf }

4. Removal the front engine hanger. (JE48 10 561A)



P/S oil pump
1. Install the P/S oil pump.

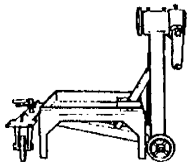
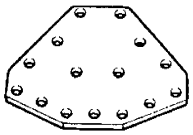
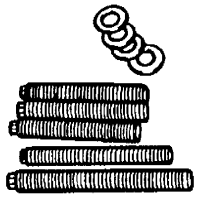
   Tightening torque:
   32—46 N·m { 3.2—4.7 kgf·m , 24—33 ft·lbf }

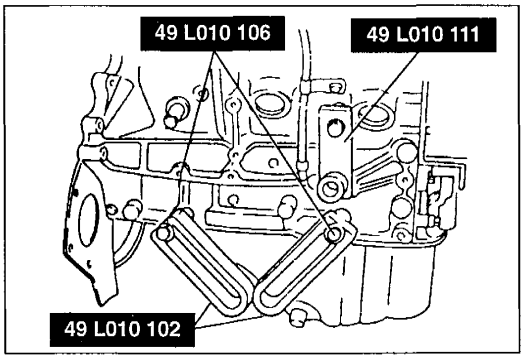
2. Install the P/S oil pump pulley by using the **SST**.

   Tightening torque:
   40—58 N·m { 4.0—6.0 kgf·m , 29—43 ft·lbf }

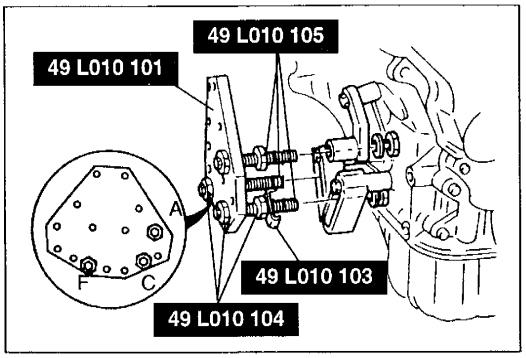
ENGINE STAND MOUNTING/DISMOUNTING

PREPARATION
SST

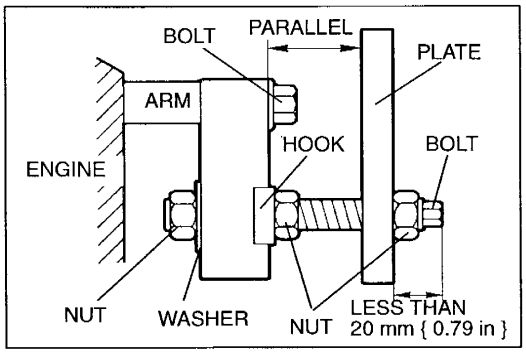
49 0107 680A Engine stand 	For disassembly / assembly of engine	49 L010 1A0 Hanger set, engine stand 	For disassembly / assembly of engine
49 L010 101 Plate (Part of 49 L010 1A0) 	For disassembly / assembly of engine	49 L010 102 Arms (Part of 49 L010 1A0) 	For disassembly / assembly of engine
49 L010 103 Hooks (Part of 49 L010 1A0) 	For disassembly / assembly of engine	49 L010 104 Nuts (Part of 49 L010 1A0) 	For disassembly / assembly of engine
49 L010 105 Bolts (Part of 49 L010 1A0) 	For disassembly / assembly of engine	49 L010 106 Bolts (Part of 49 L010 1A0) 	For disassembly / assembly of engine
49 L010 111 Attachment and bolt (Part of 49 L010 1A0) 	For disassembly / assembly of engine	—	—



PROCEDURE
Mounting
1. Remove the engine mount (RH).
2. Remove the generator and P/S oil pump bracket.
3. Install the **SST** (arms) as shown and hand tighten the **SST** (bolts).



4. Assemble the **SST** (bolts, nuts, hooks, and plate) in the specified positions marked A, C, and F.
5. Install the **SST** assembly to the respective arms.



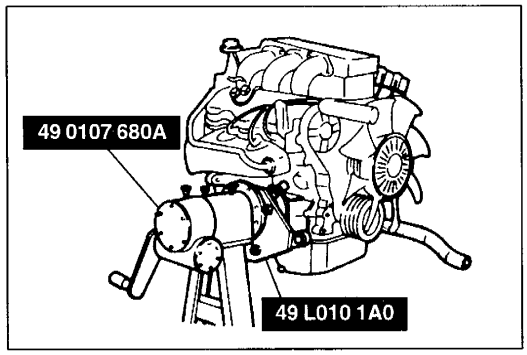
6. Adjust the **SST** (bolts) so that less than 20 mm { 0.79 in } of thread is exposed.
7. Make the **SST** (plate and arms) parallel by adjusting the **SST** (bolts and nuts).
8. Tighten the **SST** (bolts and nuts) to affix the **SST** firmly.
9. Install the engine on the **SST** (engine stand).

Warning

- **Although the engine stand has a self-locking brake system, there is a possibility that the brake may not be effective in the following situations:**

  1. **When the engine is held in an unbalanced position.**
  2. **While rotating the engine, if it passes through an unbalanced position.**

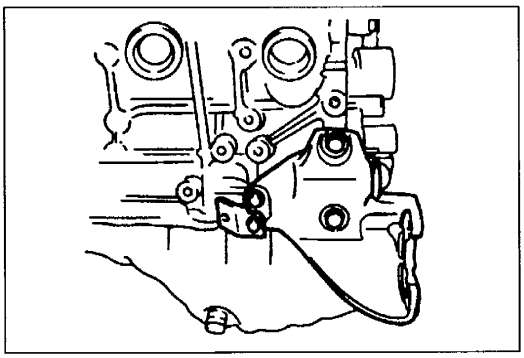
  Either of these situations could lead to sudden, rapid movement of the engine and mounting stand handle and cause serious injury. Never keep the engine in an unbalanced position, and always hold the rotating handle firmly when turning the engine.

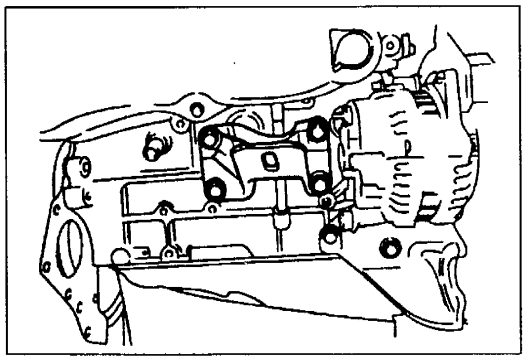


Dismounting

1. Remove the engine from the **SST** (engine stand).
2. Remove the **SST** (plate and arms) from the engine. (Refer to page B–24.)
3. Install the generator and P/S oil pump bracket.

   Tightening torque:
   38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }



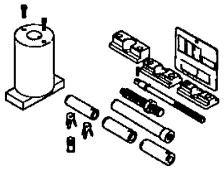
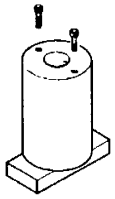
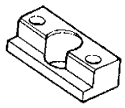
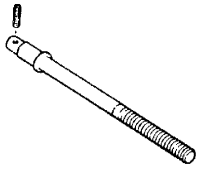
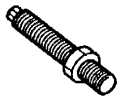
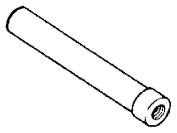
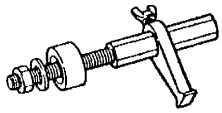
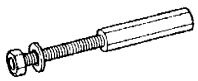
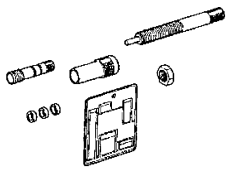
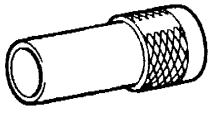


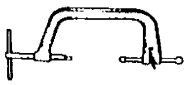
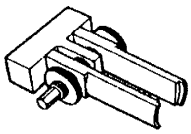
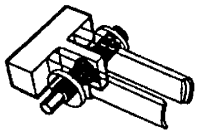
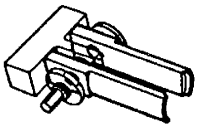
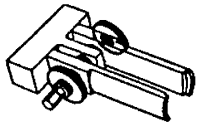
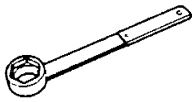
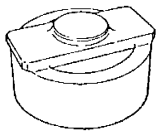
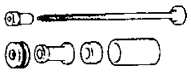
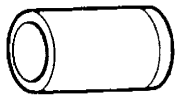
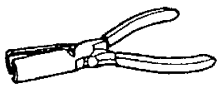
4. Install the engine mount (RH).

   Tightening torque:
   40—56 N·m { 4.0—5.8 kgf·m , 29—41 ft·lbf }

DISASSEMBLY / ASSEMBLY

PREPARATION
SST

49 L011 0A0B Piston pin setting tool set 	For removal / installation of piston pins	49 L011 001 Support block body (Part of 49 L011 0A0B) 	For removal / installation of piston pins
49 L011 002 Support block head (Part of 49 L011 0A0B) 	For removal / installation of piston pins	49 L011 004 Screw (Part of 49 L011 0A0B) 	For removal / installation of piston pins
49 L011 005 Stopper bolt (Part of 49 L011 0A0B) 	For removal / installation of piston pins	49 L011 006 Puller & installer (Part of 49 L011 0A0B) 	For removal / installation of piston pins
49 L011 009 Guide (Part of 49 L011 0A0B) 	For removal / installation of piston pins	49 L011 010 Centering tool (Part of 49 L011 0A0B) 	For removal / installation of piston pins
49 L011 011 Holder (Part of 49 L011 0A0B) 	For removal / installation of piston pins	49 E011 1A0 Ring gear brake set 	For prevention of engine rotation
49 E011 105 Stopper (Part of 49 E011 1A0) 	For prevention of engine rotation	49 E011 103 Shaft (Part of 49 E011 1A0) 	For prevention of engine rotation
49 E011 104 Collar (Part of 49 E011 1A0) 	For prevention of engine rotation	49 L012 0A0 Installer set, valve seal, & valve guide 	For installation of valve seals
49 L012 001 Installer (Part of 49 L012 0A0) 	For installation of valve seals	49 L012 002 Body (Part of 49 L012 0A0) 	For installation of valve seals

49 L012 005 Spacer (Part of 49 L012 0A0) 	For installation of valve seals	49 0636 100B Arm, valve spring lifter 	For removal / installation of valves
49 B012 0A2 Pivot 	For removal / installation of valves	49 B012 012 Body (Part of 49 B012 0A2) 	For removal / installation of valves
49 B012 013 Foot (Part of 49 B012 0A2) 	For removal / installation of valves	49 B012 014 Lock nut (Part of 49 B012 0A2) 	For removal / installation of valves
49 H012 010 Box wrench 	For removal / installation of camshaft pulley	49 G019 017 Installer, oil seal 	For installation of rear oil seal
49 G034 2A0 Replace set, rubber bush 	For installation of front oil seal/ camshaft oil seal	49 G034 202 Support block (Part of 49 G034 2A0) 	For installation of front oil seal/ camshaft oil seal
49 S120 170 Remover, valve seal 	For removal of valve seals	—	—

1. Code or arrange all identical parts (such as pistons, piston rings, connecting rods, and valve springs etc.) so that they can be reinstalled in the cylinder from which they were removed.
2. Clean the parts by using a steam cleaner. Blower dry with compressed air.
3. Clean all parts before reinstallation.
4. Apply clean engine oil to all sliding and rotating parts.
5. Replace plain bearings if they are peeled, burned, or otherwise damaged.
6. Tighten all bolts and nuts to the specified torque.

Warning

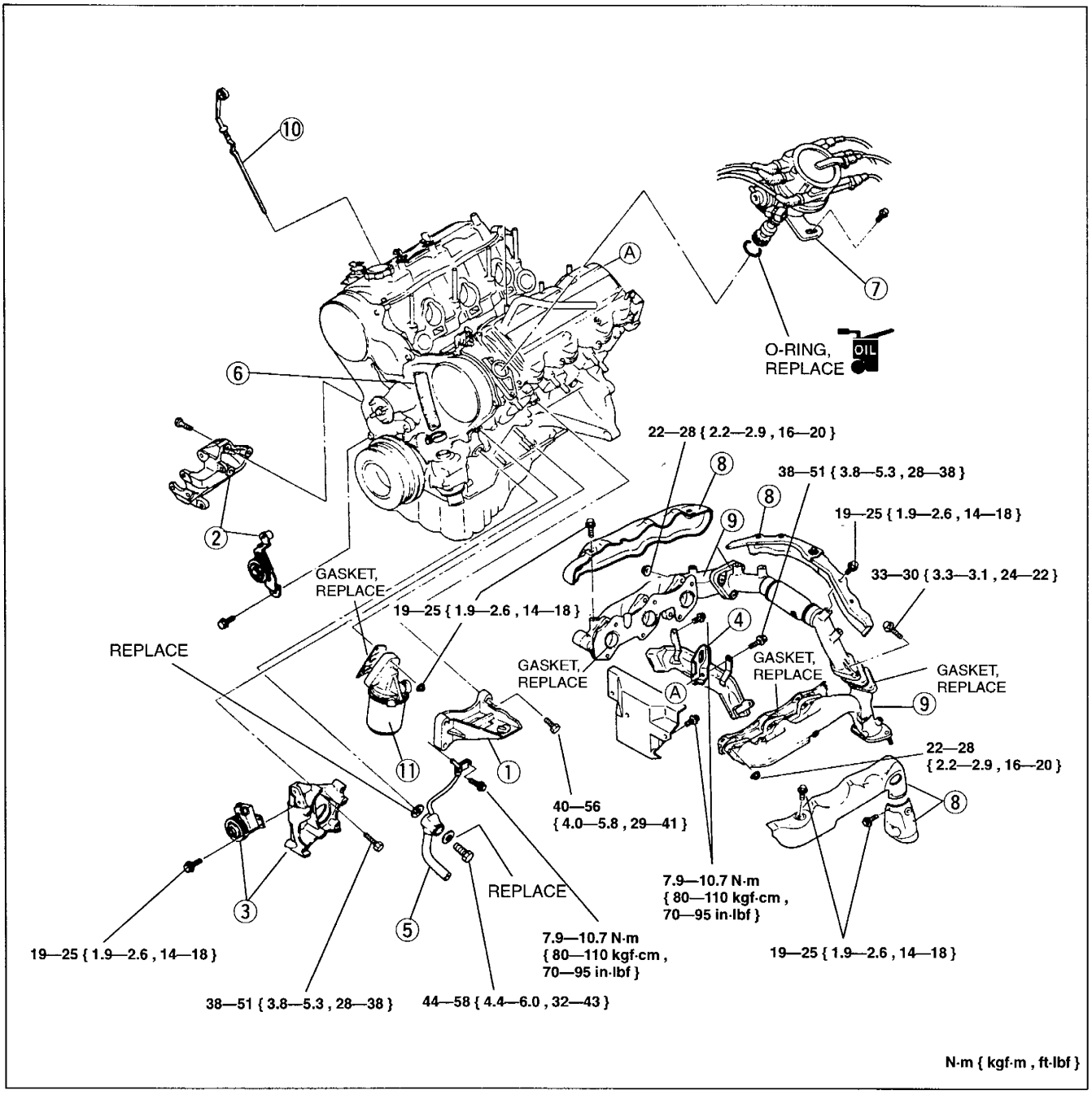
- **Continuous exposure with USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after this work.**

AUXILIARY PARTS

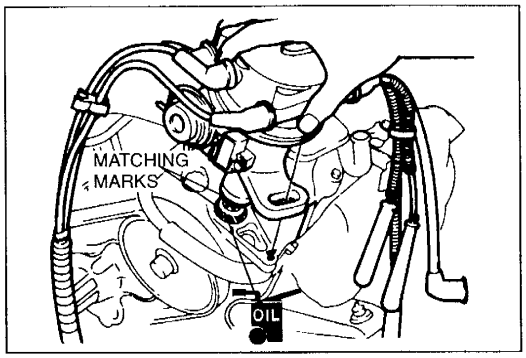
1. Remove the oil drain plug and drain the engine oil. After draining the engine oil, install the oil drain plug.

   Tightening torque: 30—41 N·m { 3.0—4.2 kgf·m , 22—30 ft·lbf }

2. Remove the intake manifold assembly. (Refer to section F.)
3. Disassemble in the order shown in the figure.
4. Assemble in the reverse order of disassembly, referring to **Assembly Note**.
5. Install the intake manifold assembly. (Refer to section F.)



1. Engine mount (LH)
2. P/S idler pulley and bracket
3. A/C idler pulley and compressor bracket
4. Engine hanger
5. Water inlet pipe
6. Water bypass hose
7. Distributor
   Assembly Note ..... page B–29
8. Exhaust manifold insulator
9. Exhaust manifold assembly
10. Dipstick
11. Oil filter assembly

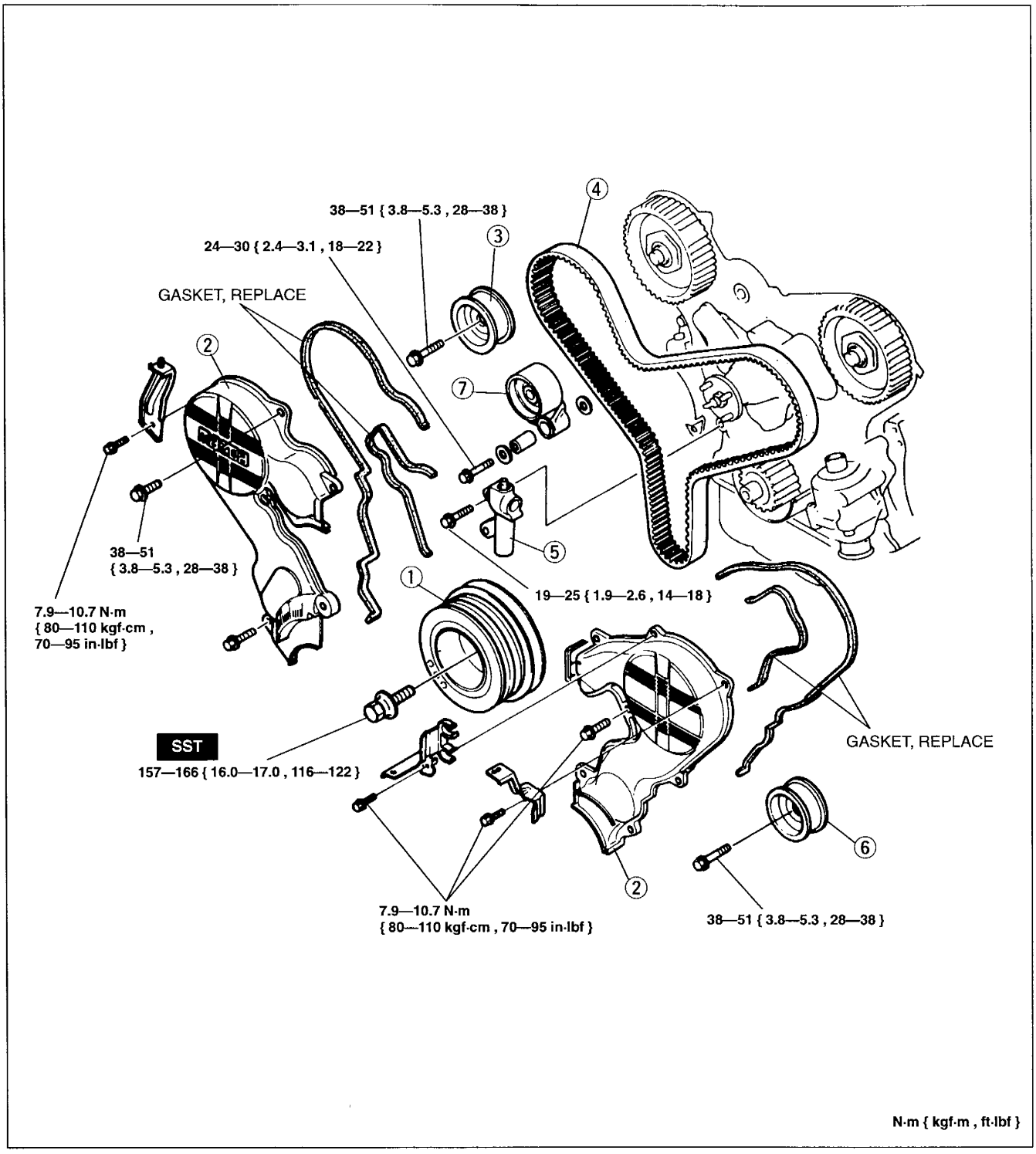


Assembly Note
Distributor

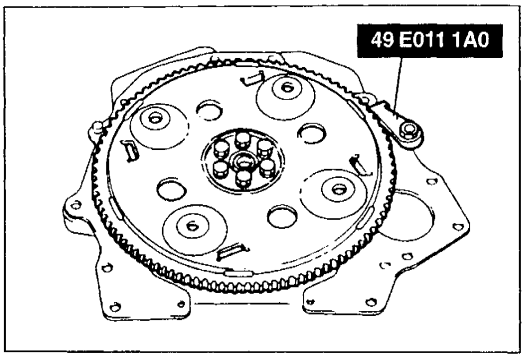
1. Apply clean engine oil to the new O-ring, and position it on the distributor.
2. Apply clean engine oil to the drive gear, and match the matching marks as shown.
3. Install the distributor into the cylinder head with the marks facing straight up.
4. Hand tighten the distributor mounting bolt.

TIMING BELT

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



1. Crankshaft pulley
   - Disassembly Note ..... page B–31
   - Assembly Note ..... page B–33
2. Timing belt cover
   - Assembly Note ..... page B–32
3. Upper idler pulley
4. Timing belt
   - Disassembly Note ..... page B–31
   - Assembly Note ..... page B–31
5. Timing belt auto tensioner
   - Assembly Note ..... page B–31
6. Lower idler pulley
7. Tensioner pulley

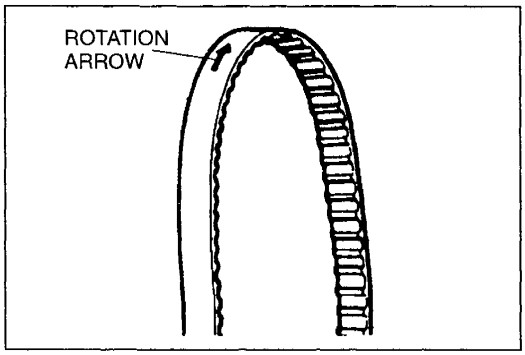


Disassembly Note
Crankshaft pulley

1. Hold the drive plate by using the **SST**.

Caution
- **The crankshaft position sensor rotor is on the rear of the pulley, and can be damaged easily.**

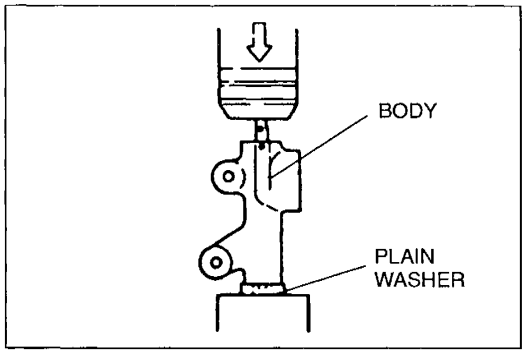
2. Remove the crankshaft pulley lock bolt.
3. Remove the crankshaft pulley.



Timing belt

1. Mark the timing belt rotation for proper reinstallation if it is reused.
2. Remove the timing belt.

Caution
- **The following will damage the belt and shorten its life; Forcefully twisting it, turning it inside out, bending it, or allowing oil or grease on it.**

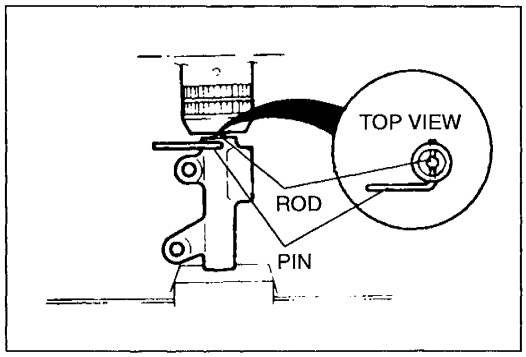


Assembly Note
Timing belt auto tensioner

1. Set a plain washer at the bottom of the tensioner body to prevent damage to the body plug.

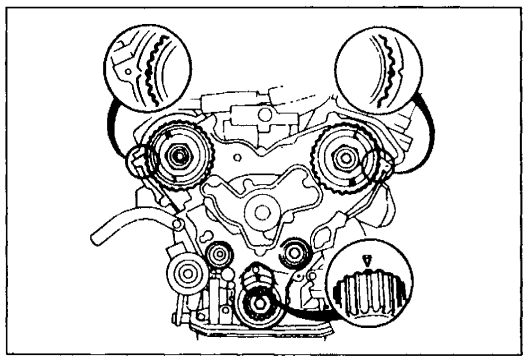
Caution
- **Pressing the tensioner rod with more than 9,807 N { 1,000 kgf , 2,200 lbf } can damage the tensioner spring.**

2. Press in the tensioner rod slowly by using a press.



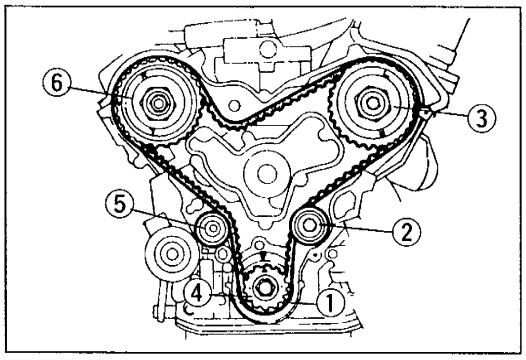
3. Insert a pin to hold the tensioner rod in the body as shown.
4. Install the timing belt auto tensioner to the cylinder block.

Tightening torque:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }



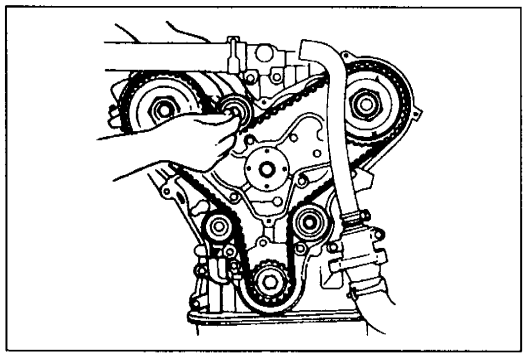
Timing belt

1. Install the crankshaft pulley lock bolt and hand tighten it.
2. Verify that the timing marks on the pulleys are aligned.



Caution
- **The following will damage the belt and shorten its life; Forcefully twisting it, turning it inside out, bending it, or allowing oil or grease on it.**

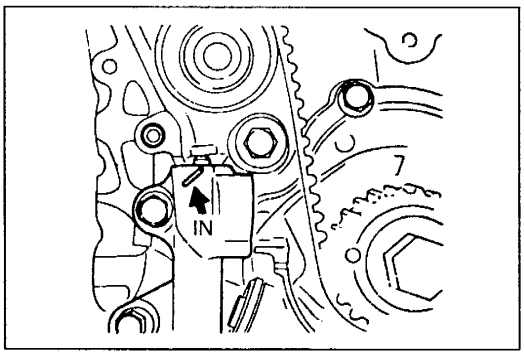
3. Position the timing belt in the original direction, and hang it on each pulley in the order shown.



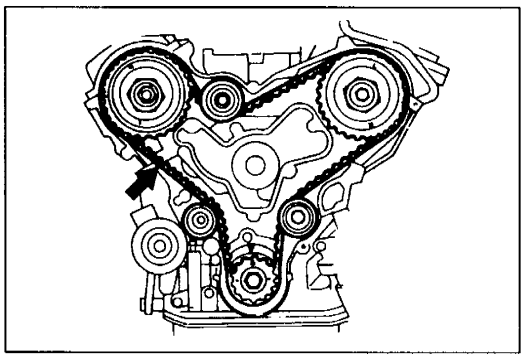
4. Install the upper idler pulley.

Tightening torque:
38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }

5. Turn the crankshaft clockwise twice and align the timing marks.
6. Check that the timing marks are correctly aligned. If not, repeat steps 3—6.

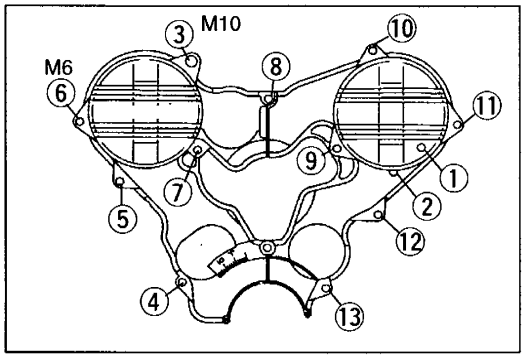


7. Remove the pin from the auto tensioner.
8. Turn the crankshaft clockwise twice and align the timing marks.
9. Reconfirm that the timing marks are correctly aligned.



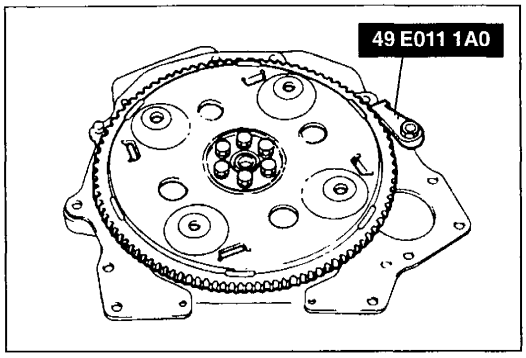
10. Check the timing belt deflection by applying moderate pressure **98 N { 10 kgf , 22 lbf }** midway between the timing belt pulley and the auto tensioner. If not correct, repeat the adjustment starting from step 4 above.

Timing belt deflection: 5—7 mm { 0.20—0.27 in }



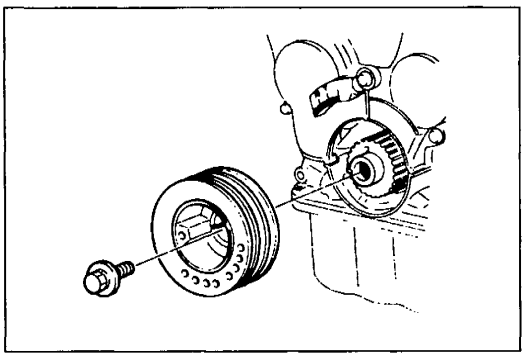
Timing belt cover
1. Install the timing belt covers with new gaskets.
2. Tighten the bolts in the order shown.

Tightening torque
M6: 7.9—10.7 N·m { 80—110 kgf·cm , 70—95 in·lbf }
M10: 38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }



Crankshaft pulley

1. Hold the drive plate by using the **SST.**



2. Remove the crankshaft pulley lock bolt.

Caution

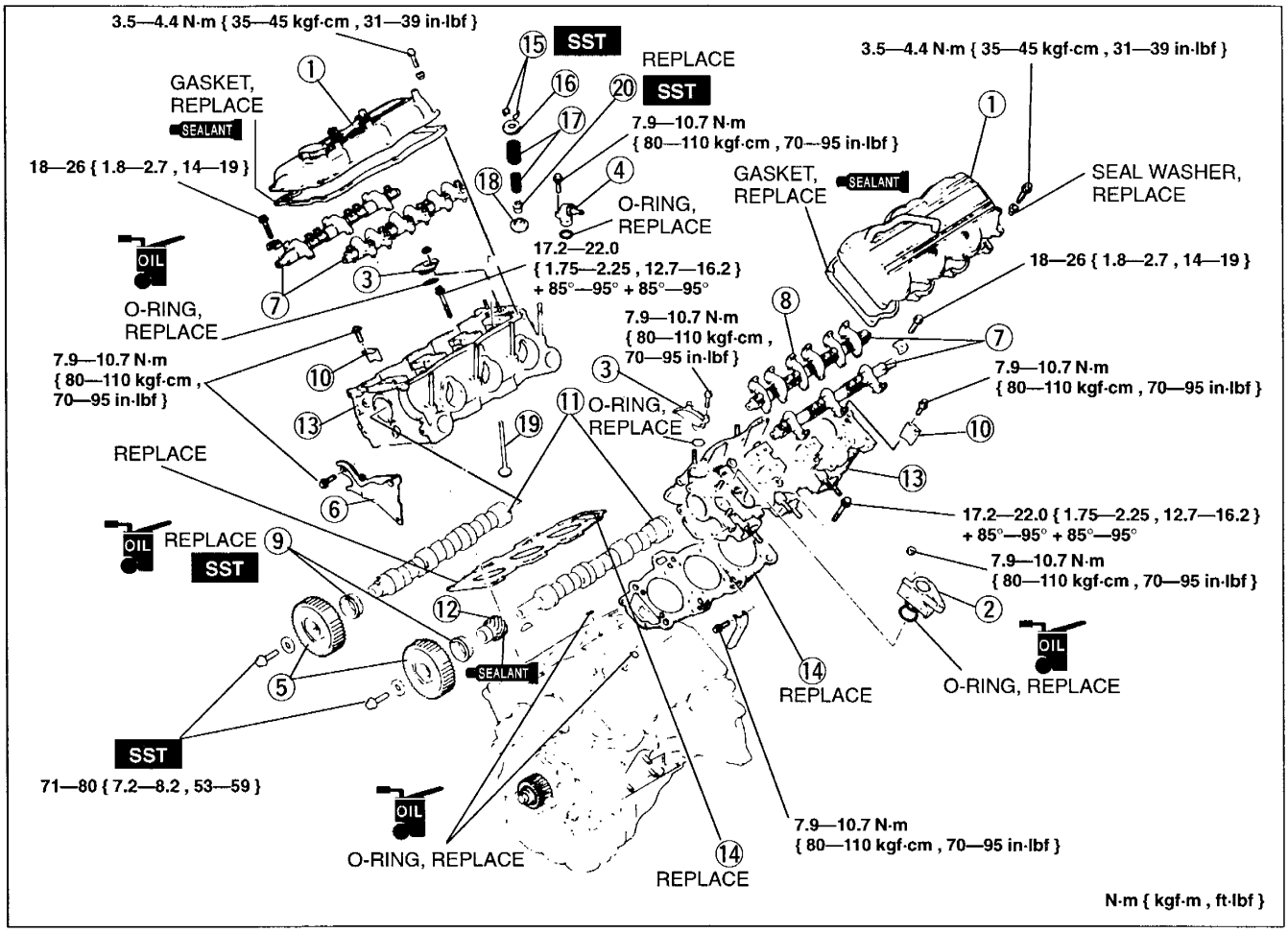
- **The crankshaft position sensor rotor is on the rear of the pulley, and can be damaged easily.**

3. Install the crankshaft pulley onto the crankshaft.
4. Tighten the crankshaft pulley lock bolt.

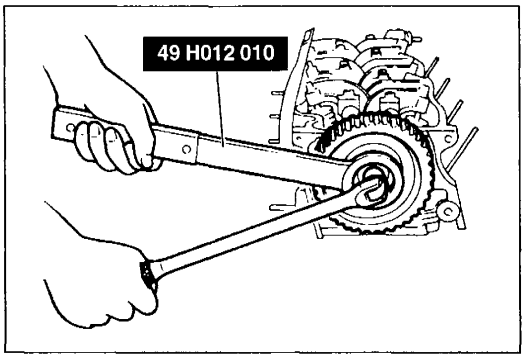
Tightening torque: 157—166 N·m
{ 16.0—17.0 kgf·m , 116—122 ft·lbf }

CYLINDER HEAD

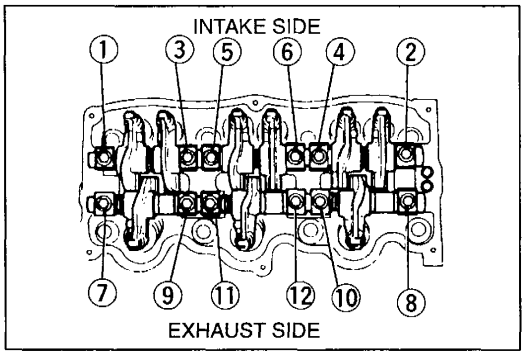
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



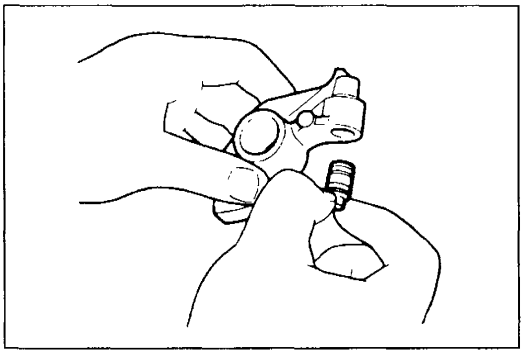
1. Cylinder head cover
   Assembly Note ..... page B–40
2. Distributor spacer
3. Brind cover
4. PCV valve
5. Camshaft pulley
   Disassembly Note ..... page B–35
   Assembly Note ..... page B–39
6. Seal plate
7. Rocker arm and rocker arm shaft
   Disassembly Note ..... page B–35
   Inspection ..... page B–60
   Assembly Note ..... page B–39
8. HLA
   Disassembly Note ..... page B–35
   Inspection ..... page B–60
   Assembly Note ..... page B–38
9. Camshaft oil seal
   Assembly Note ..... page B–38
10. Thrust plate
11. Camshaft
    Disassembly Note ..... page B–35
    Inspection ..... page B–59
    Assembly Note ..... page B–38
12. Distributor drive gear
    Assembly Note ..... page B–38
13. Cylinder head
    Disassembly Note ..... page B–35
    Inspection ..... page B–54
    Assembly Note ..... page B–37
14. Cylinder head gasket
    Assembly Note ..... page B–37
15. Valve keeper
    Disassembly Note ..... page B–35
    Assembly Note ..... page B–37
16. Upper valve spring seat
17. Outer and inner valve spring
    Inspection ..... page B–58
    Assembly Note ..... page B–36
18. Lower valve spring seat
19. Valve
    Inspection ..... page B–55
20. Valve seal
    Disassembly Note ..... page B–36
    Assembly Note ..... page B–36



Disassembly Note
Camshaft pulley
Loosen the camshaft pulley lock bolt by using the **SST**.



Rocker arm and rocker arm shaft
1. Loosen the bolts in two or three steps in the order shown.
2. Identify the rocker arm and rocker arm shaft assembly parts so that they can be reinstalled in the same locations from which they were removed.
3. Remove the rocker arm and rocker arm shaft assembly together with the bolts.

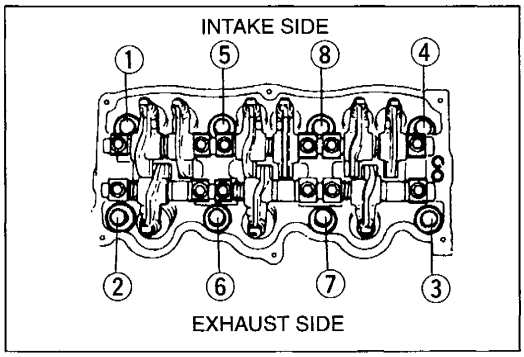


HLA

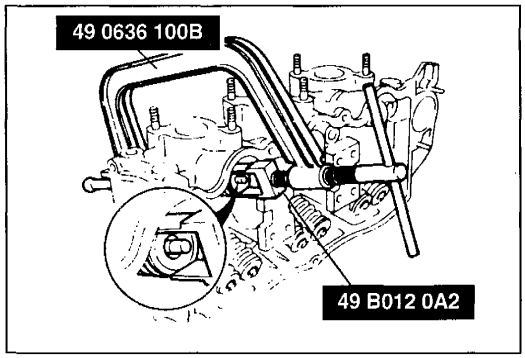
Caution
- **The HLA must be reinstalled in the same positions from which they were removed. If they are not, it can cause premature and uneven wear.**

Remove the HLA only for inspection. Remove by hand or use pliers protected with a rag.

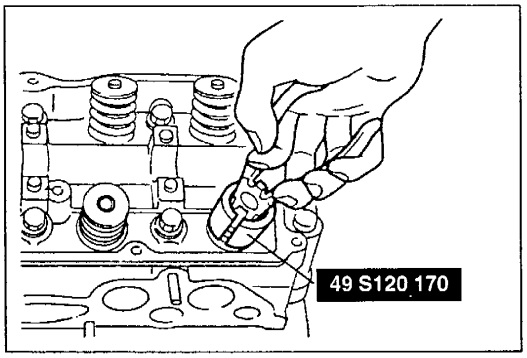
Camshaft
Before removing the thrust plate, measure the camshaft end play. (Refer to page B–60.)



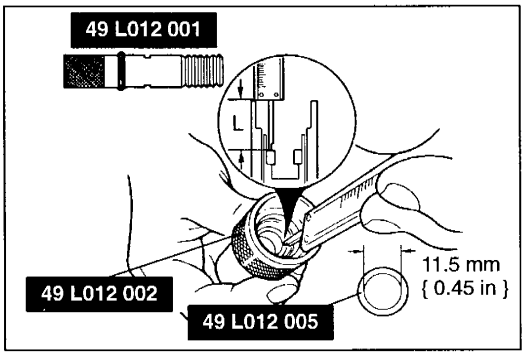
Cylinder head
1. Loosen the cylinder head bolts in two or three steps in the order shown.
2. Remove the cylinder head bolts.
3. Remove the cylinder heads.



Valve keeper
1. Set the **SST** against the upper valve spring seat as shown.
2. Compress the spring and remove the valve keepers.

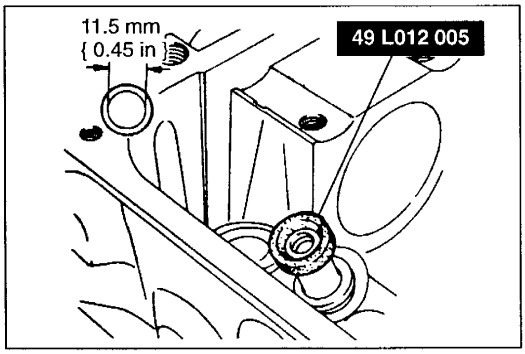


Valve seal
Remove the valve seal by using the **SST**.

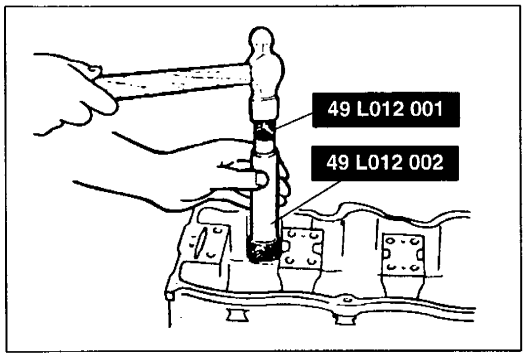


Assembly Note
Valve seal
1. Assemble the **SST** as shown so that depth **L** is specified.

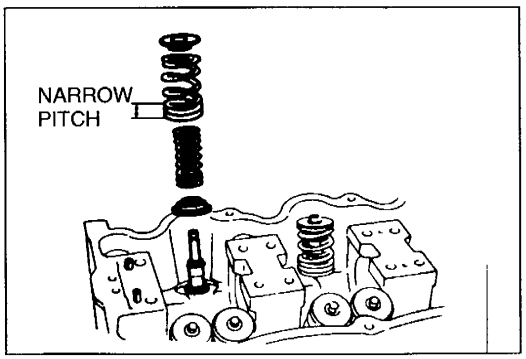
Depth L
IN : 17.8—18.6 mm { 0.701—0.732 in }
EX : 24.2—25.0 mm { 0.953—0.984 in }



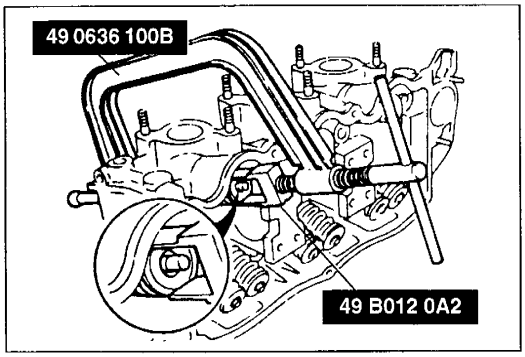
2. Install the valve seal onto the valve guide.
3. Install the **SST** onto the valve seal.



4. Tap the valve seal in until the **SST** contacts the cylinder head.

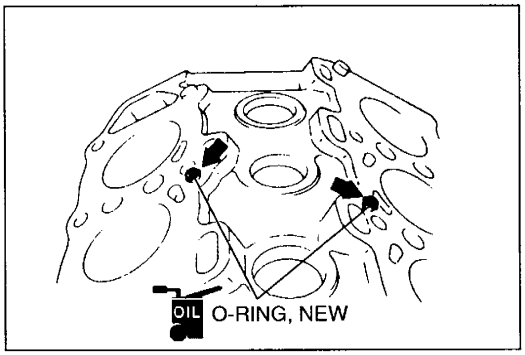


Outer and inner valve spring
1. Install the lower spring seat.
2. Install the valve.
3. Install the outer valve spring with the closer pitch toward the cylinder head.
4. Install the inner valve spring.
5. Install the upper spring seat.



Valve keeper

1. Compress the valve spring with the **SST**; then install the valve keepers.
2. Tap the end of the valve stem lightly two or three times with a plastic hammer to confirm that the valve keepers are all fully seated.

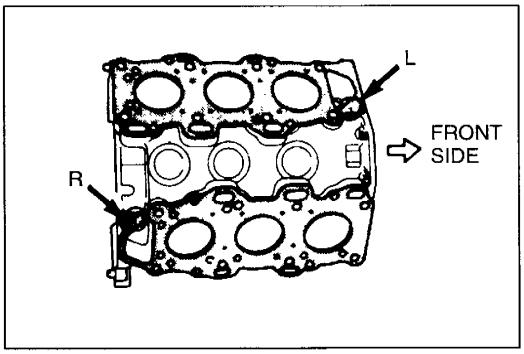


Cylinder head gasket

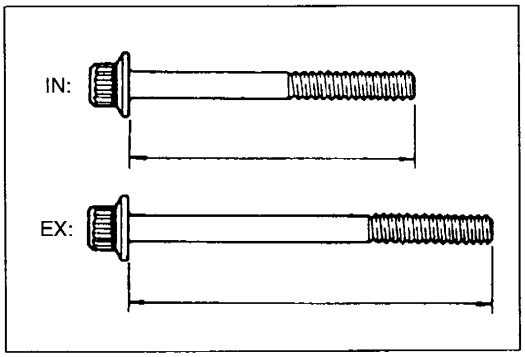
1. Measure the amount of oil control plug projection from the deck of the cylinder block.

   Projection: 5.3—5.7 mm { 0.209—0.224 in }

2. Apply clean engine oil to the new O-rings and install them to the oil control plug.



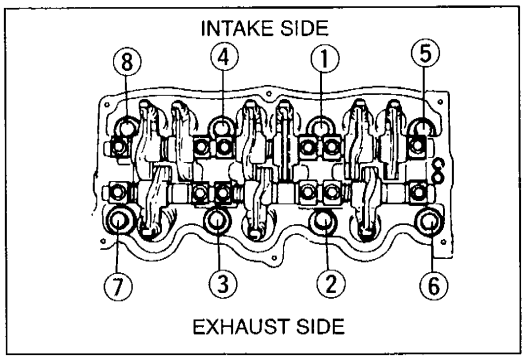
3. Thoroughly remove all dirt, oil, and other material from the top of the cylinder block.
4. Turn the crankshaft clockwise and apply engine oil to the cylinder walls.
5. Place a new cylinder head gasket on the left bank with the L mark facing upward.
6. Place a new cylinder head gasket on the right bank with the R mark facing upward.



Cylinder head

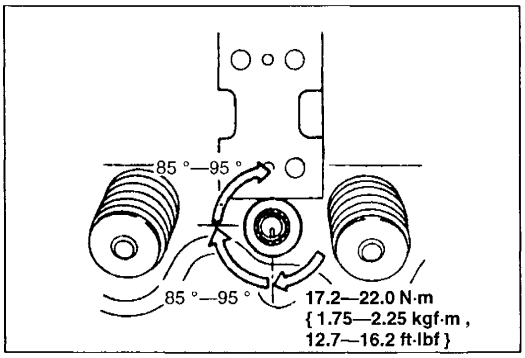
1. Install the cylinder head to the cylinder block.
2. Tighten the cylinder head bolts.
   (1) Before installation, measure each bolt length. Replace if necessary.

Length	**IN:**	**107.7—108.3 mm { 4.25—4.26 in }**
	EX:	**137.7—138.3 mm { 5.43—5.44 in }**
Maximum	**IN:**	**109 mm { 4.29 in }**
	EX:	**139 mm { 5.47 in }**

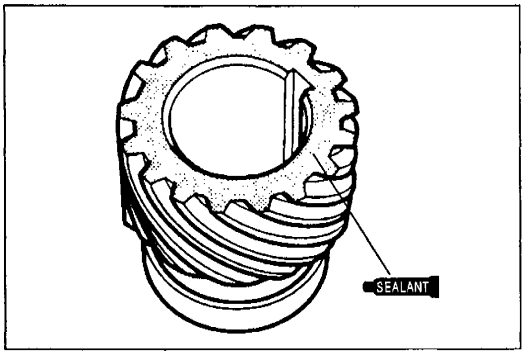


(2) Tighten the bolts in the order shown.

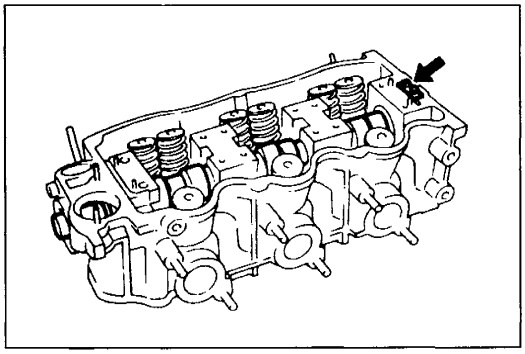
Tightening torque:
17.2—22.0 N·m { 1.75—2.25 kgf·m , 12.7—16.2 ft·lbf }



(3) Put a paint mark on each bolt head.
(4) Using the mark as a reference, tighten the bolts by turning each **85°—95°** in the sequence shown.
(5) Further tighten each bolt by turning another **85°—95°**.

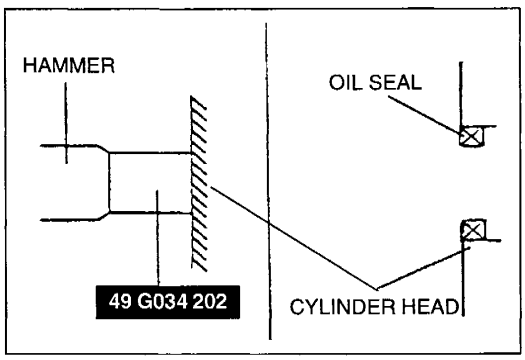


Distributor drive gear
1. Remove all old sealant from the drive gear.
2. Apply silicone sealant to the shaded area shown.
3. Seat the drive gear fully onto the left camshaft.

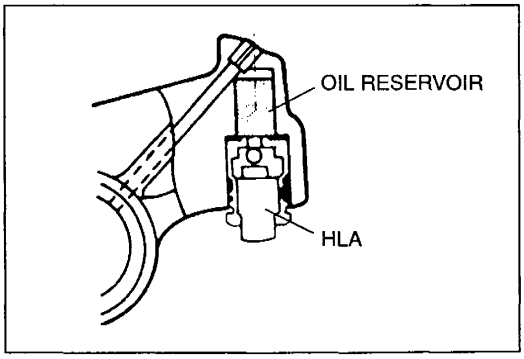


Camshaft
1. Apply clean engine oil to the journals, lobes, and bearings.
2. Set the camshaft into the cylinder head.
3. Install the thrust plate.

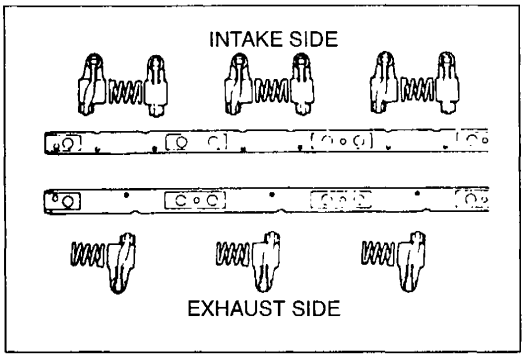
Tightening torque:
7.9—10.7 N·m { 80—110 kgf·cm , 70—95 in·lbf }



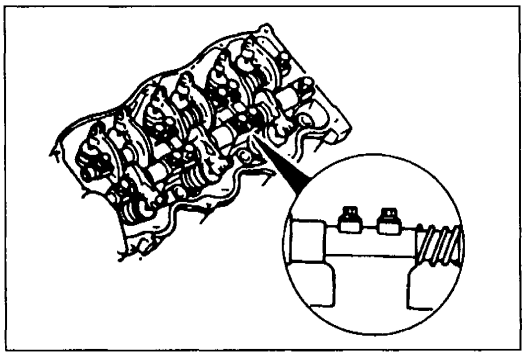
Camshaft oil seal
1. Apply clean engine oil to the lip of the new camshaft oil seal.
2. Push the oil seals slightly in by hand.
3. Tap the oil seal in evenly by using the **SST** and a hammer.



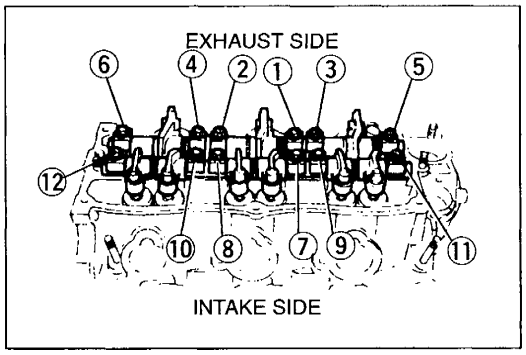
HLA
1. Pour engine oil into the oil reservoir in the rocker arm.
2. Apply clean engine oil to the HLA.
3. Carefully install the HLA into the rocker arm.



Rocker arm and rocker arm shaft
The intake side shaft has twice as many oil holes as the exhaust side shaft.
1. Apply clean engine oil to the rocker arm shafts and rocker arm bearing surface.
2. Assemble the rocker arm and rocker arm shaft assembly as shown in the figure.

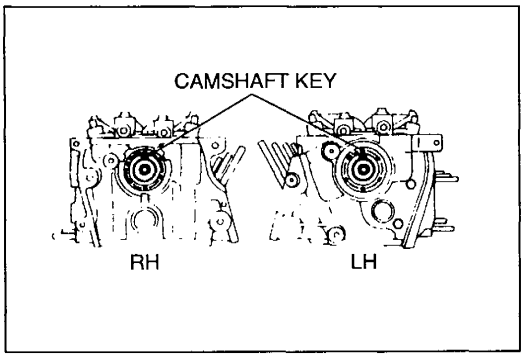


3. Install the rocker arm and rocker arm shaft assembly.
4. Verify that the rocker arm shaft spring is not caught between the rocker arm shaft and the mounting boss.

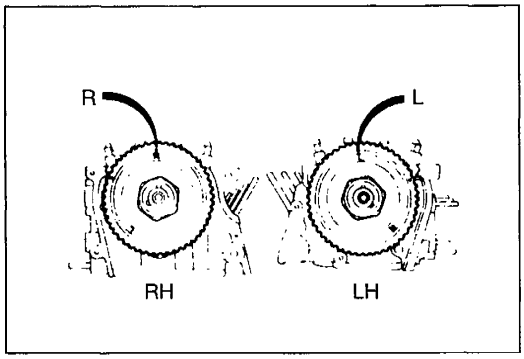


5. Tighten the bolts in two or three steps in the order shown.

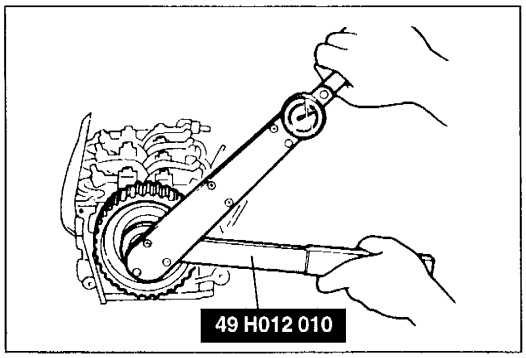
Tightening torque:
18—26 N·m { 1.8—2.7 kgf·m , 14—19 ft·lbf }



Camshaft pulley
1. Verify that the camshaft keys face upward as shown.

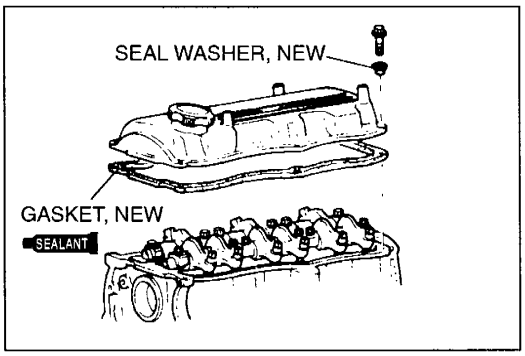


2. Install the camshaft pulleys with the **L** mark (left bank) or the **R** mark (right bank) face upward as shown.



3. Tighten the camshaft pulley by using the **SST**.

Tightening torque:
71—80 N·m { 7.2—8.2 kgf·m , 53—59 ft·lbf }



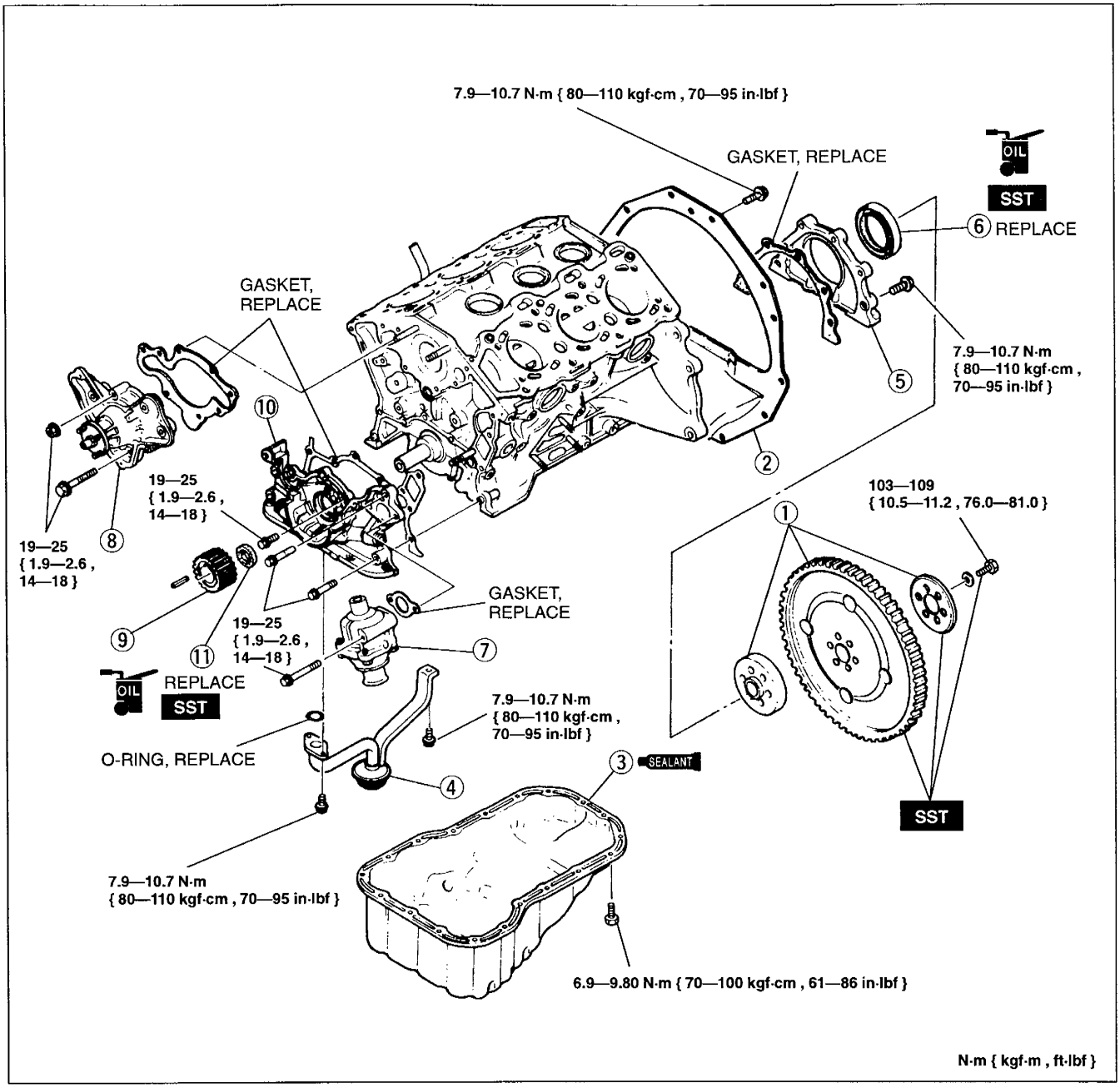
Cylinder Head Cover

1. Remove all old silicone sealant from the cylinder head and cover.
2. Coat a new gasket with silicone sealant, and install it onto the cylinder head cover.
3. Install the cylinder head cover with new seal washers.

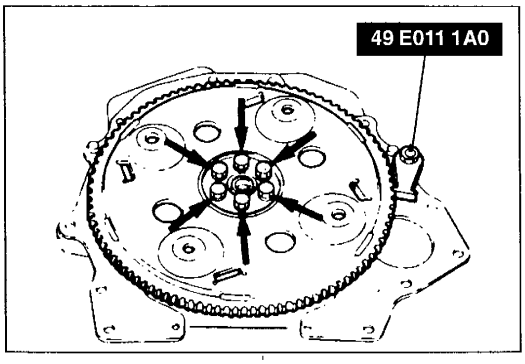
Tightening torque:
3.5—4.4 N·m { 35—45 kgf·cm , 31—39 in·lbf }

CYLINDER BLOCK (EXTERNAL PARTS)

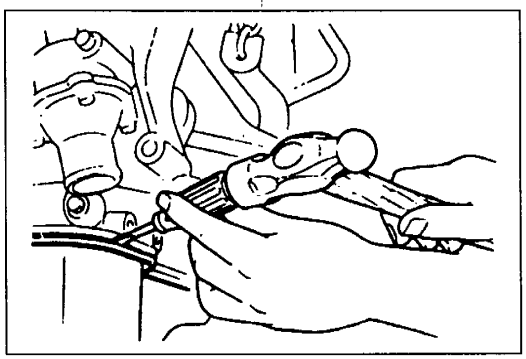
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of assembly, referring to **Assembly Note**.



1. Backing plate, drive plate, adapter
   - Disassembly Note ..... page B–42
   - Assembly Note ..... page B–44
2. End plate
3. Oil pan
   - Disassembly Note ..... page B–42
   - Assembly Note ..... page B–44
4. Oil strainer
5. Rear cover
   - Assembly Note ..... page B–43
6. Rear oil seal
   - Disassembly Note ..... page B–42
   - Assembly Note ..... page B–43
7. Thermostat assembly
8. Water pump
9. Timing belt pulley
10. Oil pump
    - Assembly Note ..... page B–43
    - Disassembly / Inspection / Assembly ..... section D
11. Front oil seal
    - Disassembly Note ..... page B–42
    - Assembly Note ..... page B–42



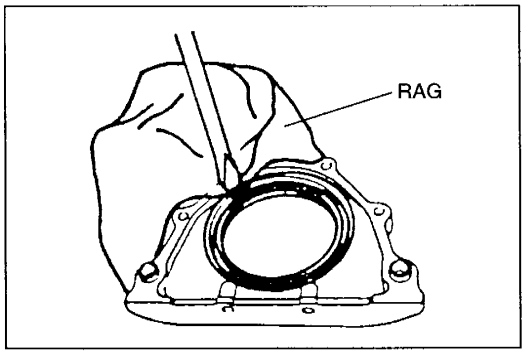
Disassembly Note
Backing plate, drive plate, adapter
1. Hold the drive plate by using the **SST**.
2. Remove the drive plate bolts.
3. Remove the backing plate, drive plate, and adapter.
4. Remove the **SST**.



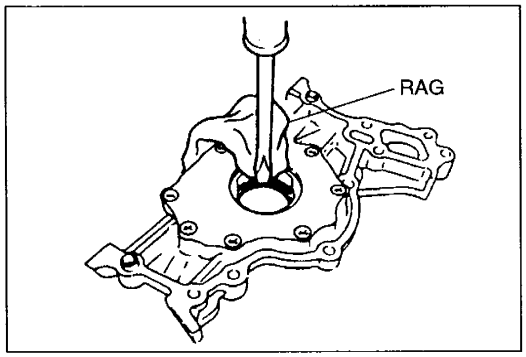
Oil pan

Caution
- **Pry tools can easily scratch the oil pan and cylinder block contact surfaces. prying off the oil pan can also easily bend the oil pan flange.**

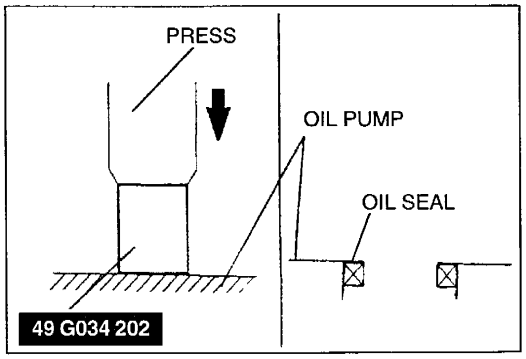
1. Remove the oil pan mounting bolts.
2. Insert a screwdriver between the oil pan and the cylinder block to separate them.



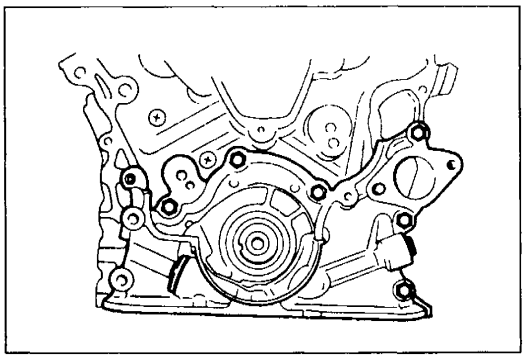
Rear oil seal
Remove the oil seal using a screwdriver protected with a rag.



Front oil seal
Remove the oil seal using a screwdriver protected with a rag.



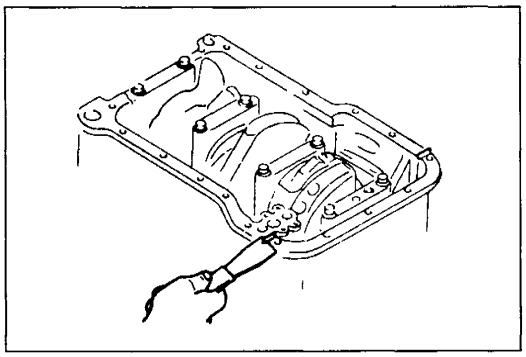
Assembly Note
Front oil seal
1. Apply clean engine oil to the lip of the new oil seal.
2. Push the oil seal into the oil pump body by hand.
3. Press the oil seal into the oil pump body by using the **SST**.



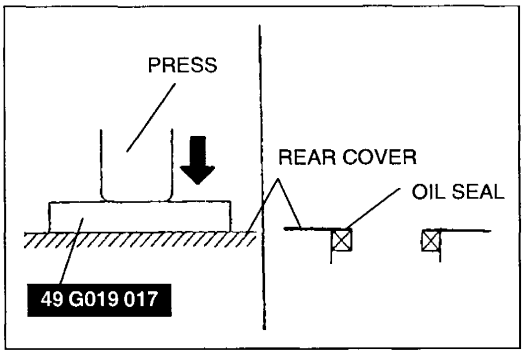
Oil pump

1. Install the oil pump with a new gasket.

   Tightening torque:
   19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }

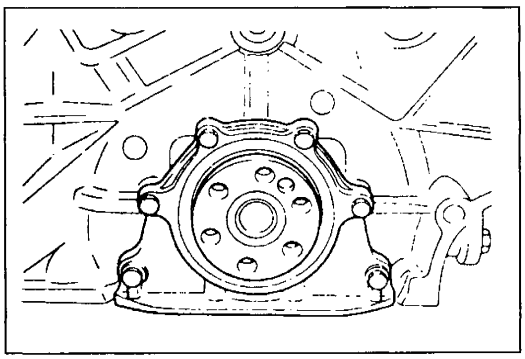


2. Cut away the portion of the gasket that projects from the body toward the oil pan side.



Rear oil seal

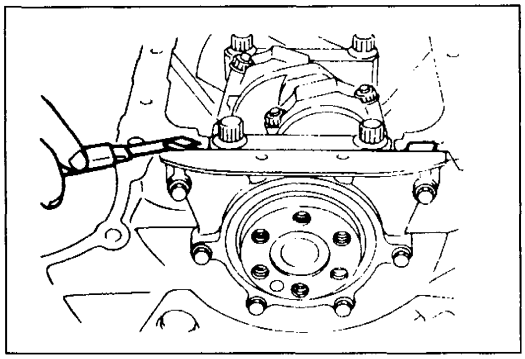
1. Apply clean engine oil to the lip of new oil seal.
2. Push the oil seal into the rear cover by hand.
3. Press the oil seal into the rear cover by using the **SST**.



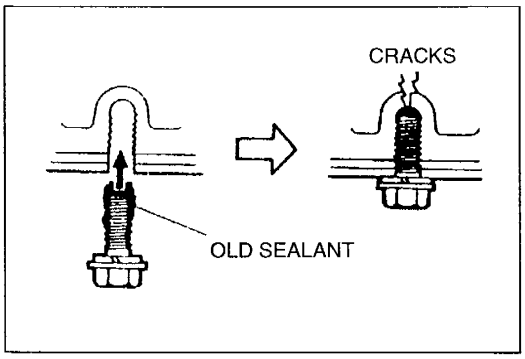
Rear cover

1. Install the rear cover and a new gasket.

   Tightening torque:
   7.9—10.7 N·m { 80—110 kgf·cm , 70—95 in·lbf }



2. Cut away the portion of the gasket that projects from the body toward the oil pan side.

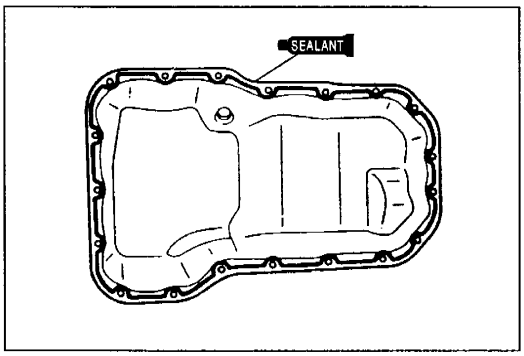


Oil pan

1. Remove the old sealant from the oil pan bolts and bolt holes in the cylinder block.

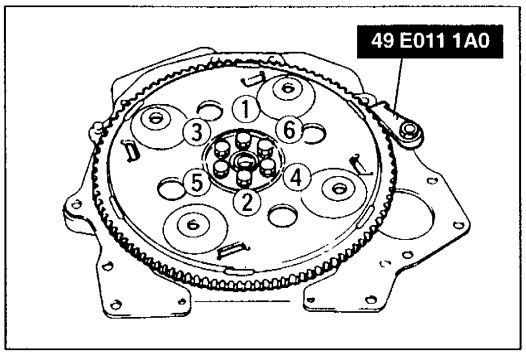
Caution

- **If the bolts are reused, remove the old sealant from the bolt threads. Tightening a bolt that has old sealant on it can cause thread damage.**



2. Apply silicone sealant and install oil pan.
3. Apply silicone sealant to the oil pan along the inside of the bolt holes, overlap the ends, and install the oil pan within five minutes.
4. Tighten the oil pan bolts.

Tightening torque:
6.9—9.80 N·m { 70—100 kgf·cm , 61—86 in·lbf }



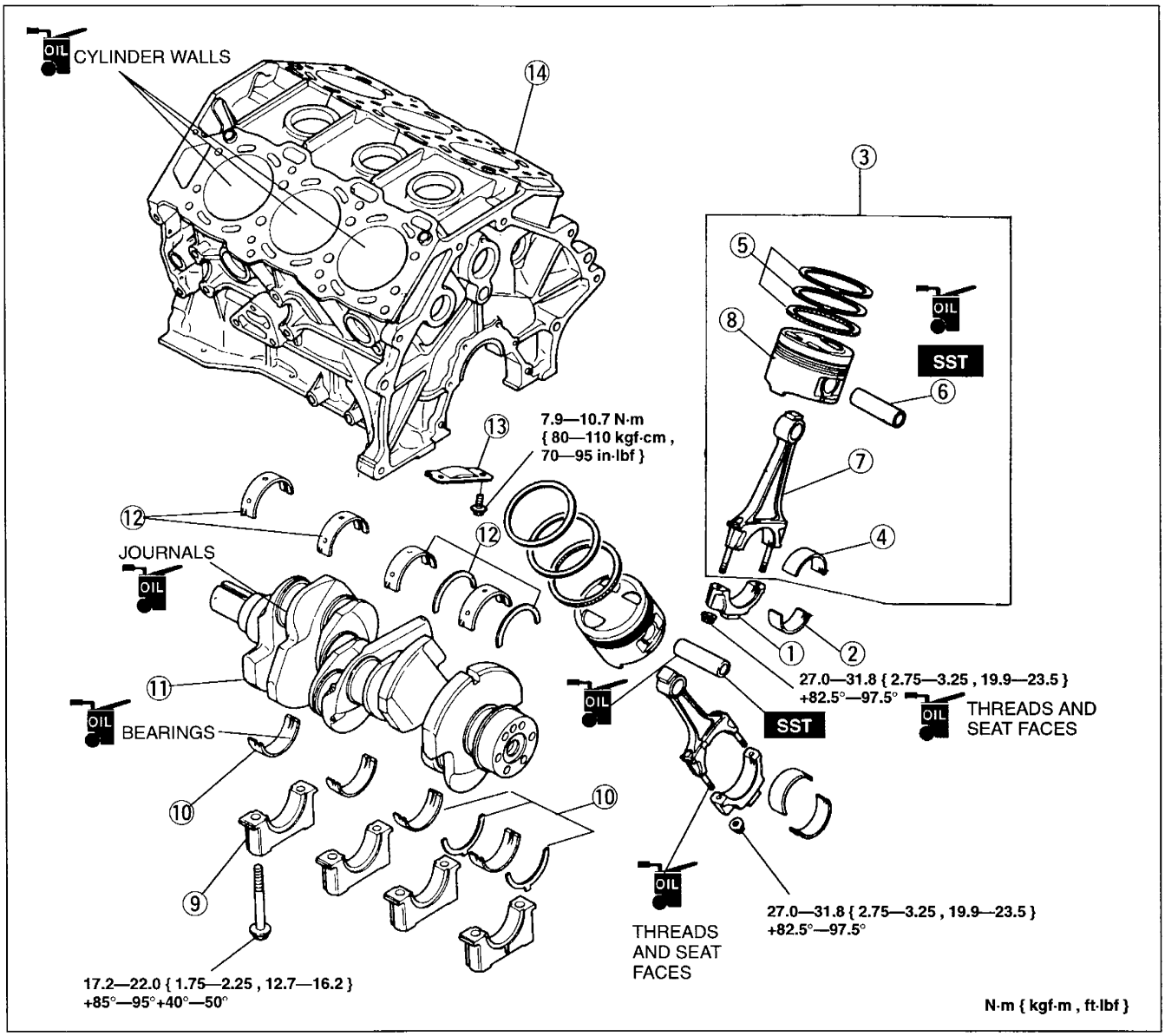
Backing plate, drive plate, adapter

Install, and tighten the backing plate, adapter, drive plate, and plate by using the **SST**.

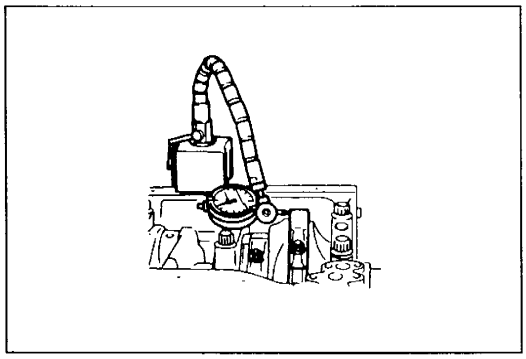
Tightening torque:
103—109 N·m { 10.5—11.2 kgf·m , 76.0—81.0 ft·lbf }

CYLINDER BLOCK (INTERNAL PARTS)

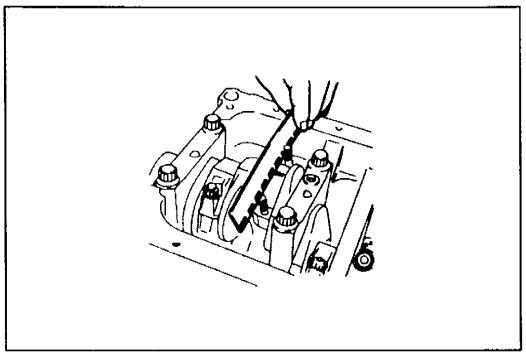
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



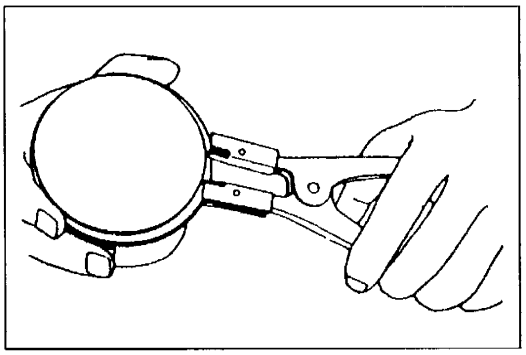
1. Connecting rod cap
   - Disassembly Note ..... page B–46
   - Assembly Note ..... page B–52
2. Lower connecting rod bearing
3. Piston and connecting rod assembly
   - Disassembly Note ..... page B–46
   - Assembly Note ..... page B–51
4. Upper connecting rod bearing
5. Piston ring
   - Disassembly Note ..... page B–46
   - Inspection ..... page B–62
   - Assembly Note ..... page B–51
6. Piston pin
   - Disassembly Note ..... page B–46
   - Inspection ..... page B–63
7. Connecting rod
   - Inspection ..... page B–63
   - Assembly Note ..... page B–50
8. Piston
   - Inspection ..... page B–62
9. Main bearing cap
   - Disassembly Note ..... page B–47
   - Assembly Note ..... page B–47
10. Lower main bearing and lower thrust bearing
11. Crankshaft
    - Inspection ..... page B–63
12. Upper main bearing and upper thrust bearing
13. Oil baffle plate
    - Assembly Note ..... page B–47
14. Cylinder block
    - Inspection ..... page B–60



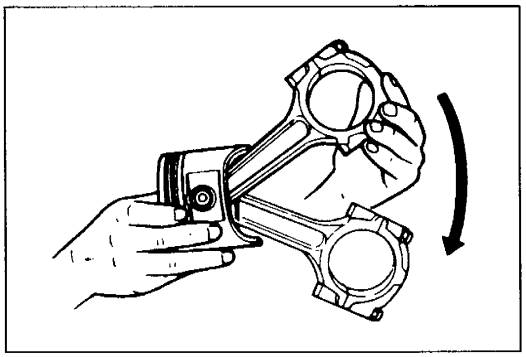
Disassembly Note
Connecting rod cap
Before removing the connecting rod caps, measure the connecting rod side clearance. (Refer to page B–52.)



Piston and connecting rod assembly
1. Before removing the piston and connecting rod assembly, measure the connecting rod bearing oil clearance by using Plastigage. (Refer to page B–52.)
2. Remove the Plastigage from journals and bearings.



Piston ring
Remove the piston rings by using a piston ring expander (commercially available).



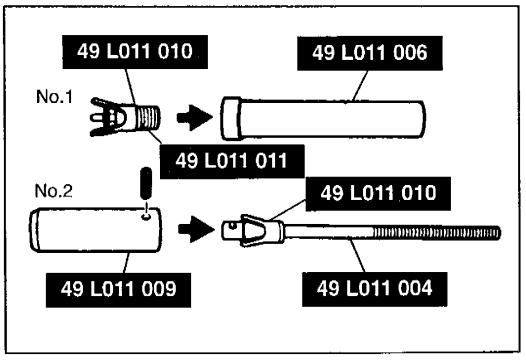
Piston pin

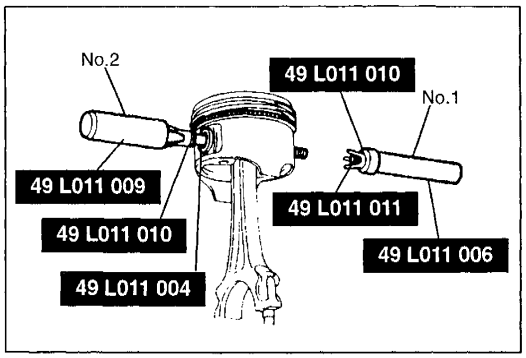
Caution
- **The connecting rods must be reinstalled in the same positions from which they were removed. If they are not, it can cause premature and uneven wear.**

1. Before disassembling the piston and connecting rod, check the oscillation torque as shown. If the large end does not drop by its own weight, replace the piston or the piston pin.

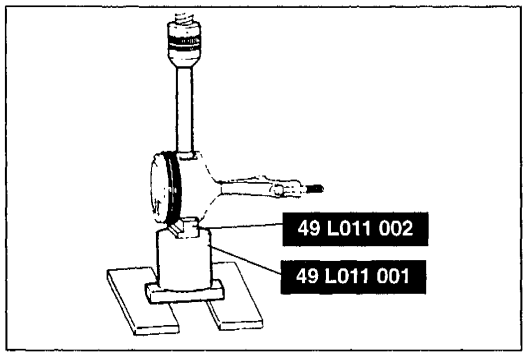
Note
- Mark the connecting rods to show their original positions.

2. Assemble the **SST** as shown.

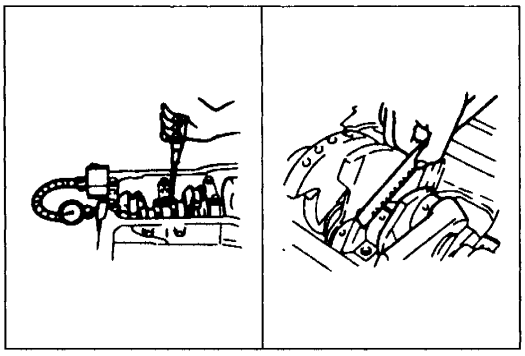




3. Insert the **SST** No.2 into the piston pin as shown and fully screw in the **SST** No.1.

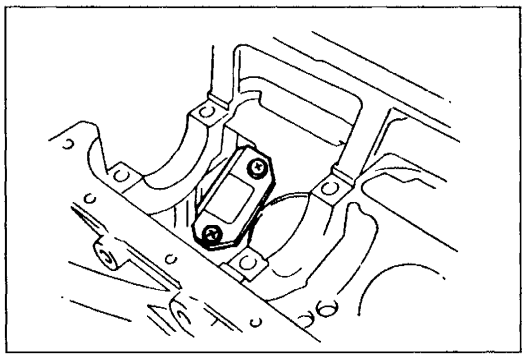


4. Mount the piston and connecting rod on the **SST** as shown.
5. Verify that the **SST** fits squarely into the piston before pressing.
6. Press out the piston pin.
   While removing the piston pin, check the pressure. If it is lower than **4,903 N { 500 kgf , 1,100 lbf }**, replace the piston pin or connecting rod.



Main bearing cap

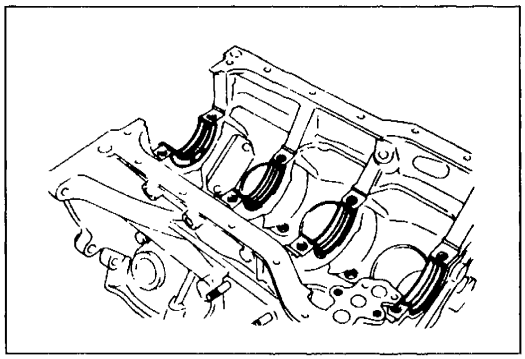
1. Before removing the main bearing cap, measure the crankshaft end play. (Refer to page B–49.)
2. After removing the main bearing cap, measure the main journal oil clearance. (Refer to below.)



Assembly Note
Oil baffle plate

Apply locking agent to the baffle plate screws; then install the baffle plate to the cylinder block.

Tightening torque:
7.9—10.7 N·m { 80—110 kgf·cm , 70—95 in·lbf }

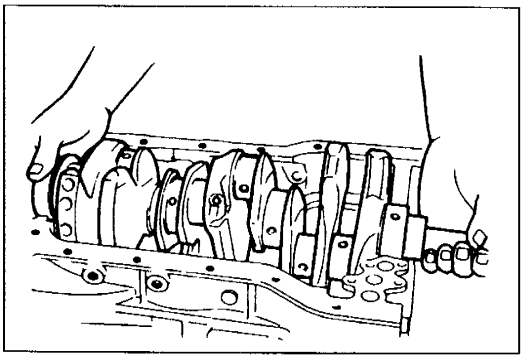


Main bearing cap

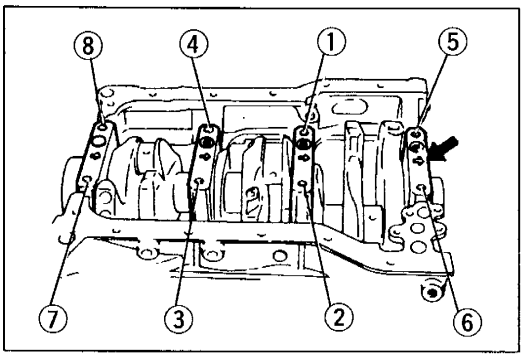
1. Before installing the crankshaft, inspect the main bearing oil clearances as described.

Oil clearance inspection

(1) Remove any foreign material and oil from the journals and bearings.
(2) Install the upper main bearings and thrust bearings.
(3) Install the grooved upper main bearings.
(4) Install the thrust bearings so that the oil groove contacts the crankshaft.

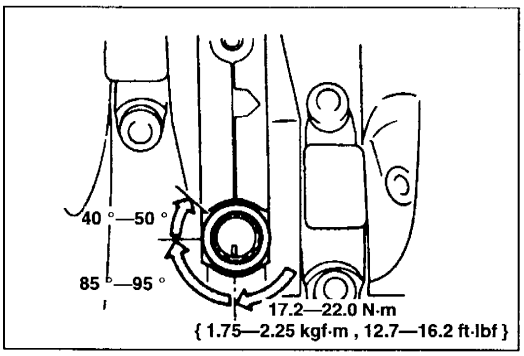


(5) Set the crankshaft in the cylinder block.
(6) Position Plastigage on top of the journals in the axial direction.

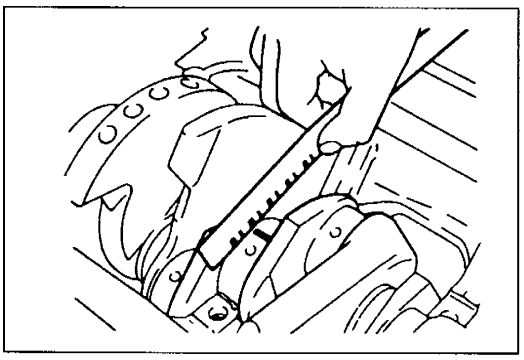


(7) Install the main bearing caps along with the lower main bearings according to the cap number and ◁ mark.
(8) Tighten the bolts in two or three steps in the order shown.

Tightening torque:
17.2—22.0 N·m { 1.75—2.25 kgf·m , 12.7—16.2 ft·lbf }

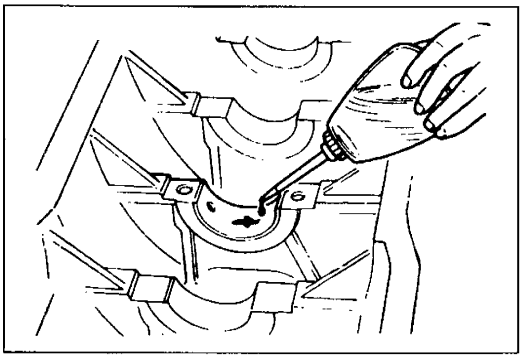


(9) Put a paint mark on each bolt head.
(10) Using this mark as a reference, tighten the bolts by turning each **85°—95°** in the sequence.
(11) Further tighten each bolt by turning another **40°—50°**.

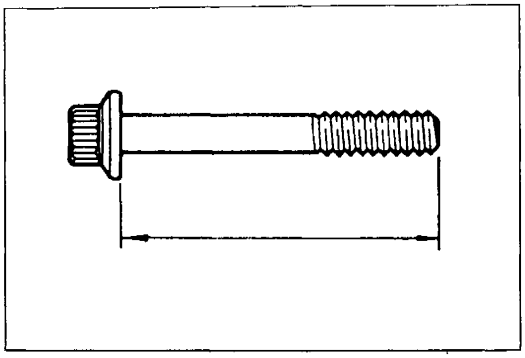


(12) Do not rotate the crankshaft when measuring the oil clearances.
(13) Remove the main bearing caps, and measure the Plastigage at each journal at the widest point for the smallest clearance, and at the narrowest point for the largest clearance.
(14) If the oil clearance exceeds the maximum, grind the crankshaft and use the undersize main bearings. (Refer to page B1–64.)

Oil clearance: 0.025—0.037 mm { 0.0010—0.0014 in }
Maximum: 0.08 mm { 0.0031 in }

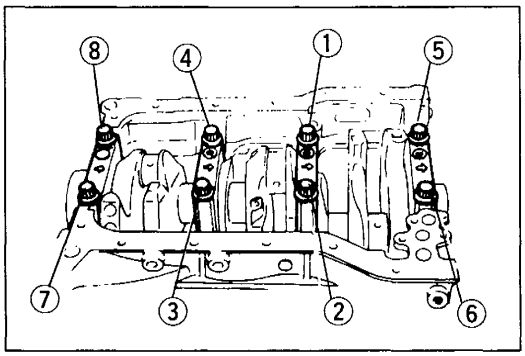


2. Apply clean engine oil to the main bearings, thrust bearings and main journals.
3. Install the crankshaft and the main bearing caps according to the cap number and ◁ mark.



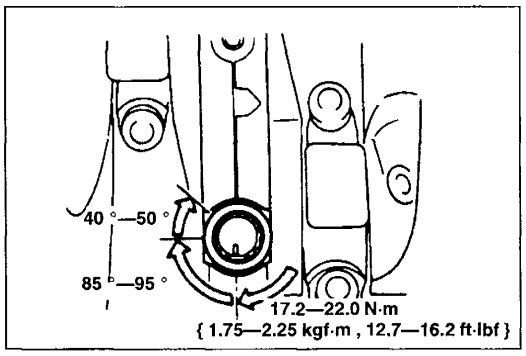
4. Tighten the main bearing cap bolts.
   (1) Measure each bolt length. Replace if necessary.

Length: 84.7—85.3 mm { 3.34—3.35 in }
Maximum: 85.5 mm { 3.37 in }

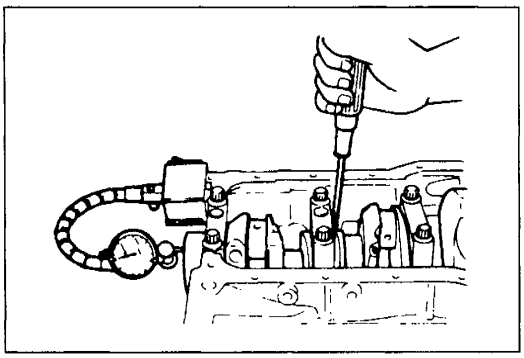


(2) Tighten the bolts in two or three steps in the order shown.

Tightening torque:
17.2—22.0 N·m { 1.75—2.25 kgf·m , 12.7—16.2 ft·lbf }

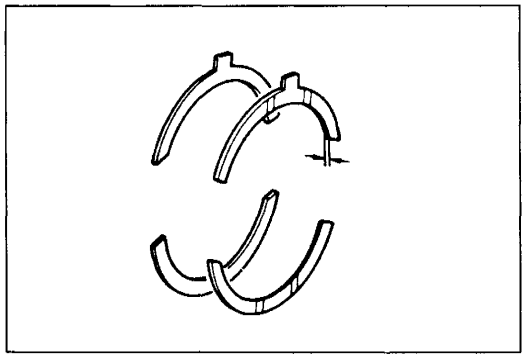


(3) Put a paint mark on each bolt head.
(4) Using this mark as a reference, tighten the bolts by turning each **85°—95°** in the sequence.
(5) Further tighten each bolt by turning another **40°—50°**.
(6) Verify that the crankshaft rotates smoothly by hand.



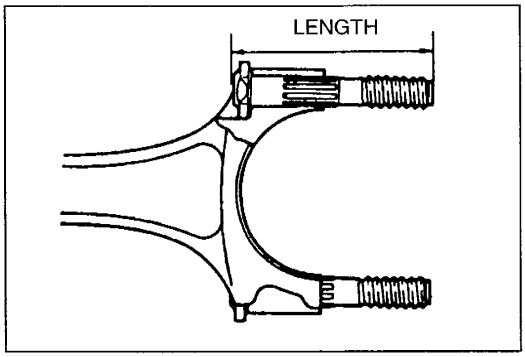
5. Inspect the crankshaft end play.

End play: 0.080—0.282 mm { 0.0032—0.0111 in }
Maximum: 0.30 mm { 0.0118 in }



6. If the end play exceeds the maximum, grind the crankshaft and install an oversize thrust bearing or replace the crankshaft and thrust bearing.

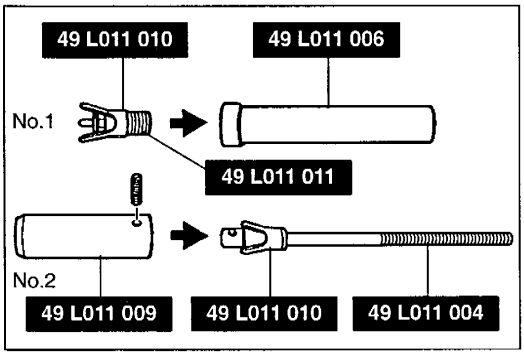
Thrust bearing width
Standard:
2.000—2.050 mm { 0.0788—0.0807 in }
0.25 mm { 0.01 in } oversize:
2.125—2.175 mm { 0.0837—0.0856 in }
0.50 mm { 0.02 in } oversize:
2.250—2.300 mm { 0.0886—0.0905 in }



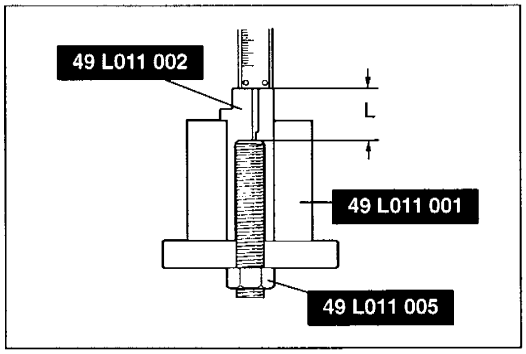
Connecting rod

1. Measure each connecting rod bolt length. Replace the connecting rod assembly if necessary.

   Length: 66.7—67.3 mm { 2.63—2.64 in }
   Maximum: 67.5 mm { 2.66 in }



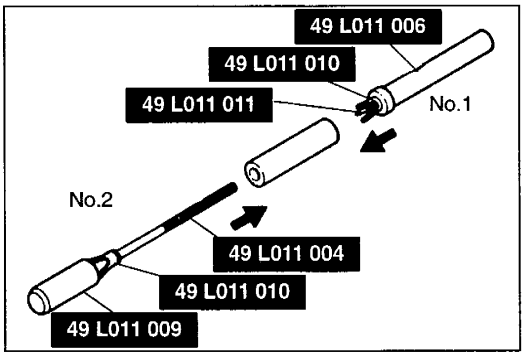
2. Assemble the **SST** as shown.



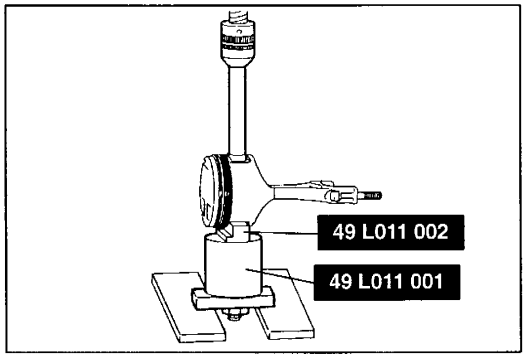
3. Set the stopper bolt so that depth **L** is as specified.

   Depth L: 61.35—61.5 mm { 2.416—2.421 in }

4. Tighten the locknut.



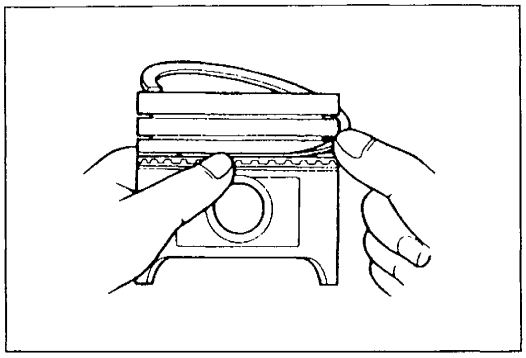
5. Insert the **SST** No.2 into the piston pin as shown and fully screw in the **SST** No.1.
6. Apply clean engine oil to the piston pin.
7. Set the piston on the **SST** with the **R** mark or **L** mark facing upward.
8. Verify that the **SST** fits squarely into the piston before pressing.

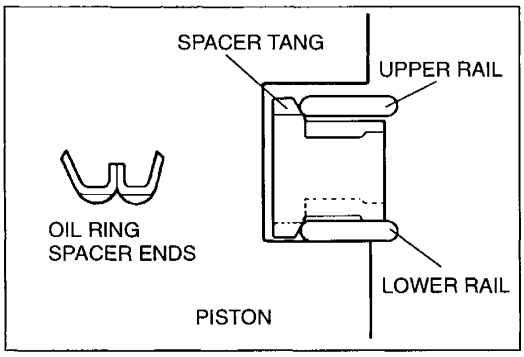


9. Press the piston pin into the piston and connecting rod until the **SST** contacts the stopper bolt.
10. While inserting the piston pin, check the pressure force. If it is less than the specification, replace the piston pin or the connecting rod.

    Pressure force:
    4,904—14,709 N { 500—1,500 kgf , 1,100—3,300 lbf }

11. Check the connecting rod oscillation torque. (Refer to page B–46.)





Piston ring

1. Install the three-piece oil rings on the pistons.
   (1) Apply clean engine oil to the oil ring spacer and rails.
   (2) Install the oil ring spacer so that the opening faces upward.
   (3) Install the upper rail and lower rail.

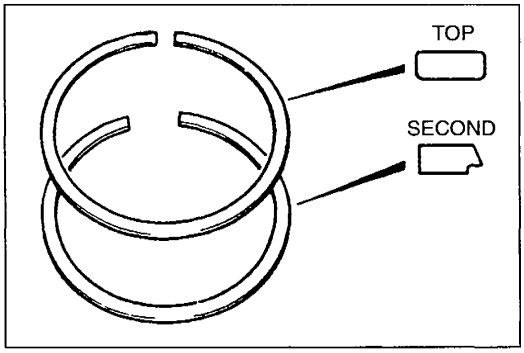
Caution

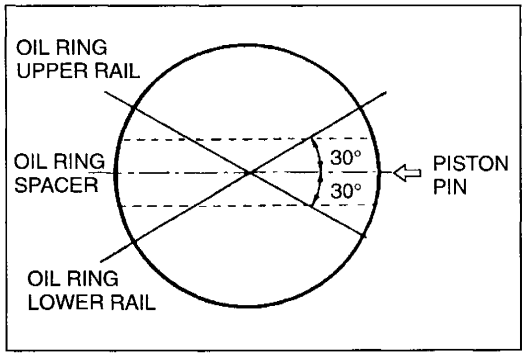
- **If reusing an oil ring, it must be reinstalled in the same place and face the same direction as when removed. If this is not done, it can cause premature and uneven wear.**

Note

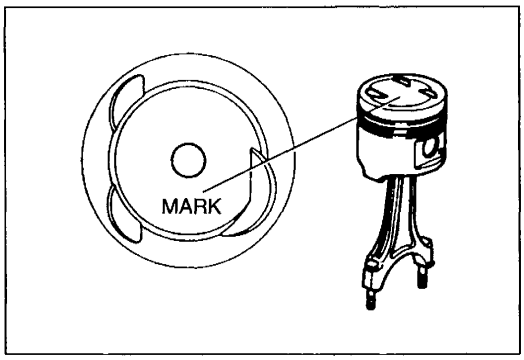
- The upper and lower rails are the same. They can be installed with either face upward.

2. Verify that the spacer tang separates the rails, and that the rails turn smoothly in both directions.
3. Using a piston ring expander, install the second ring with the scraper face downward.
4. Using a piston ring expander, install the top ring.
5. Apply clean engine oil to the second and top piston rings.





6. Position the opening of each ring as shown.

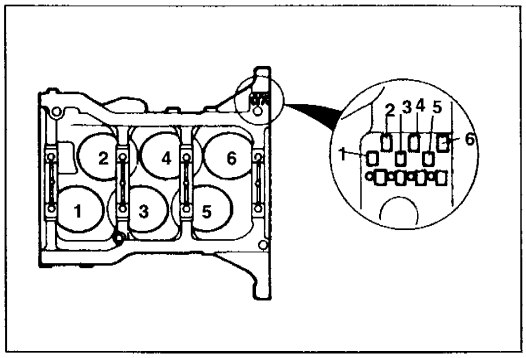


Piston and connecting rod assembly

1. There are three standard cylinder bore and matching piston sizes. The pistons and bores must agree if installing new pistons in a standard size bore.

Cylinder block	Piston
A	A
No mark	No mark
C	C

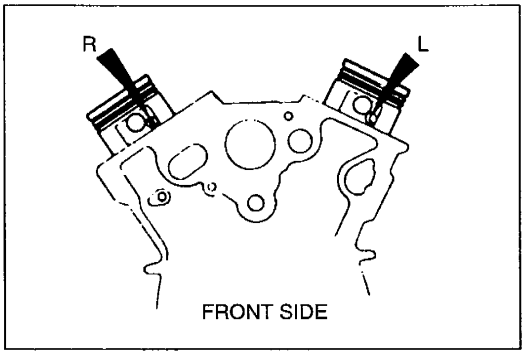
2. The pistons and cylinder block are marked as shown in the figures. Refer to the charts for piston and bore sizes.



Cylinder block (Bore size)

mm { in }

Mark	Size
A	90.015—90.022 { 3.5439—3.5441 }
No mark	90.007—90.015 { 3.5436—3.5438 }
C	90.000—90.007 { 3.5433—3.5435 }

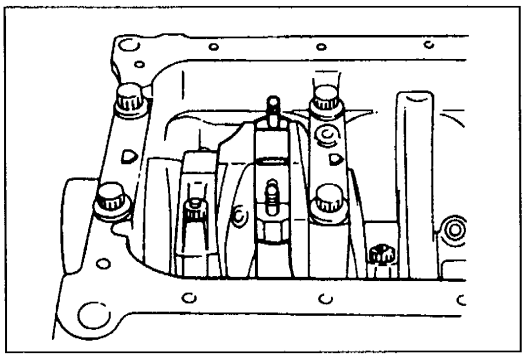


Piston (Measured at 90 ° to pin bore axis and 22.0 mm { 0.866 in } below oil ring groove)

mm { in }

Mark	Size
A	89.971—89.990 { 3.5422—3.5429 }
No mark	89.965—89.983 { 3.5420—3.5426 }
C	89.958—89.977 { 3.5417—3.5423 }

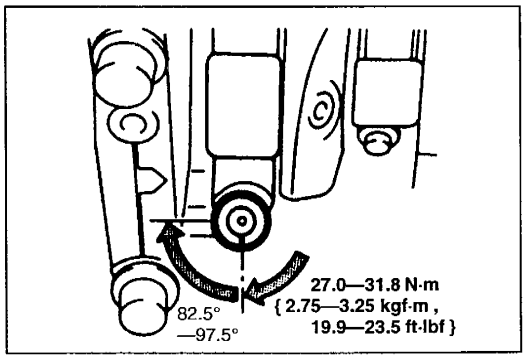
3. Apply clean engine oil to the cylinder walls, piston, and piston rings.
4. Check the piston rings for the end gap alignment.
5. Insert each piston assembly into the cylinder block with the **L** mark (left bank) or the **R** mark (right bank) facing the front of the engine. Use a piston installer tool to install.



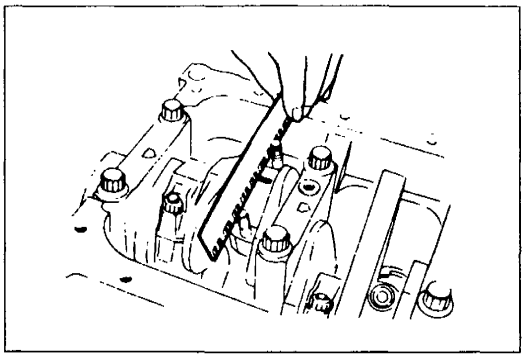
Connecting rod cap

1. Check the connecting rod bearing oil clearances using the same procedure as for the main bearing oil clearance.
2. Align the marks on the cap and the connecting rod when installing the connecting rod cap.
   (1) Tighten the nuts.

Tightening torque:
27.0—31.8 N·m { 2.75—3.25 kgf·m , 19.9—23.5 ft·lbf }

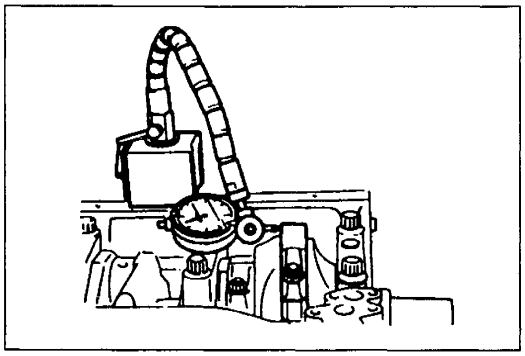


(2) Put a paint mark on each nut head.
(3) Using the paint mark as a reference, tighten the nuts **82.5°—97.5°**.



3. If the oil clearance exceeds the maximum, grind the crankshaft and use undersize bearings.
(Refer to page B–64.)

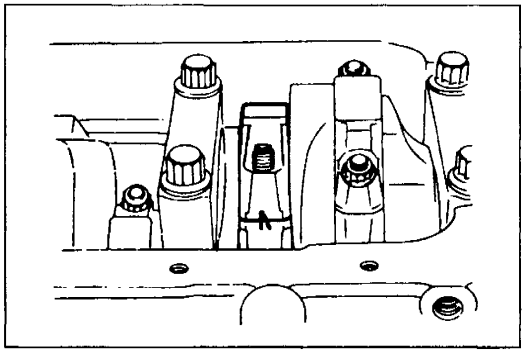
Oil clearance:
0.023—0.064 mm { 0.0010—0.0025 in }
Maximum: 0.10 mm { 0.004 in }



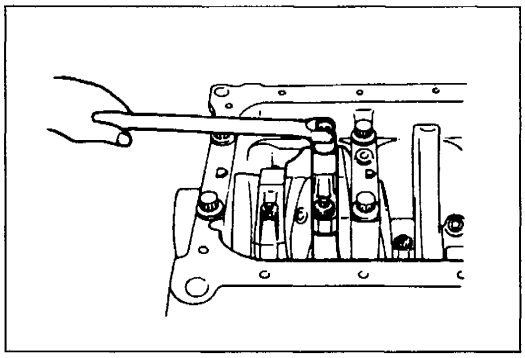
4. Check each connecting rod side clearance.

Side clearance:
0.178—0.330 mm { 0.0071—0.0129 in }
Maximum: 0.40 mm { 0.016 in }

If the clearance exceeds the maximum, replace the connecting rod and cap.

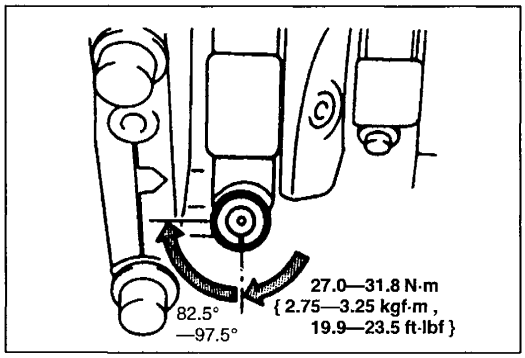


5. Apply clean engine oil to the crankpin journal and connecting rod bearing.
6. Install the connecting rod cap with the alignment marks aligned.



7. Tighten the connecting rod cap nuts.
(1) Tighten the nuts.

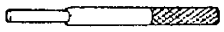
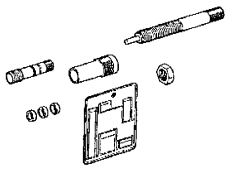
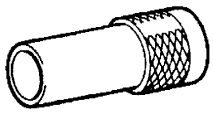
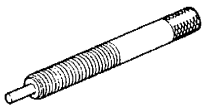
Tightening torque:
27.0—31.8 N·m { 2.75—3.25 kgf·m , 19.9—23.5 ft·lbf }



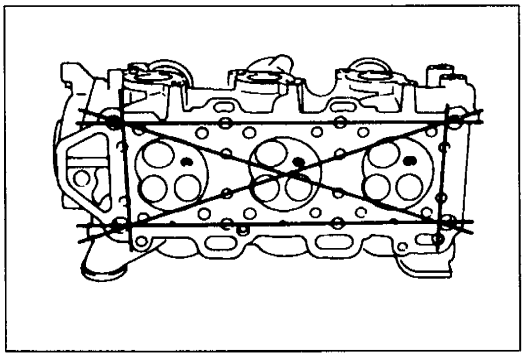
(2) Put a paint mark on each nut head.
(3) Using the paint mark as a reference, tighten the nuts **82.5°—97.5°**.
(4) Verify that the crankshaft rotates smoothly by hand.

INSPECTION / REPAIR

PREPARATION
SST

49 0249 010A Remover & installer, valve guide 	For removal of valve guides	49 L012 0A0 Installer set, valve seal & valve guide 	For installation of valve guides
49 L012 002 Body (Part of 49 L012 0A0) 	For installation of valve guides	49 L012 003 Installer (Part of 49 L012 0A0) 	For installation of valve guides
49 L012 004 Nut (Part of 49 L012 0A0) 	For installation of valve guides	—	—

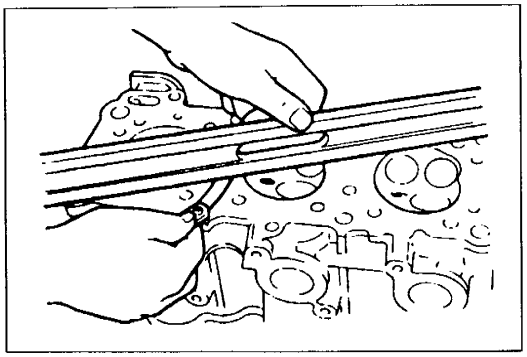
1. Clean all parts, being sure to remove all gasket fragments, dirt, oil or grease, carbon, moisture residue, and other foreign materials.
2. Inspection and repairs must be performed in the order specified.

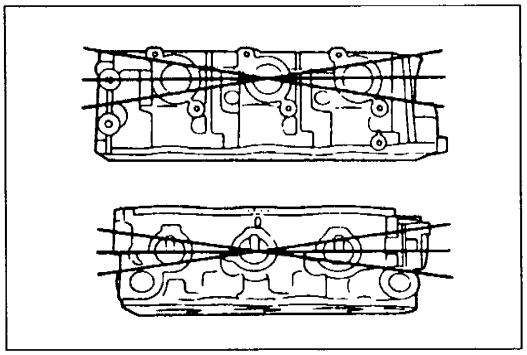


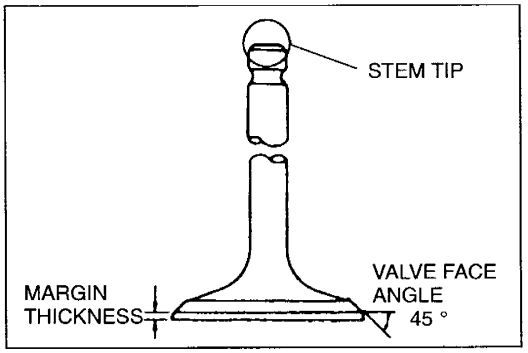
CYLINDER HEAD

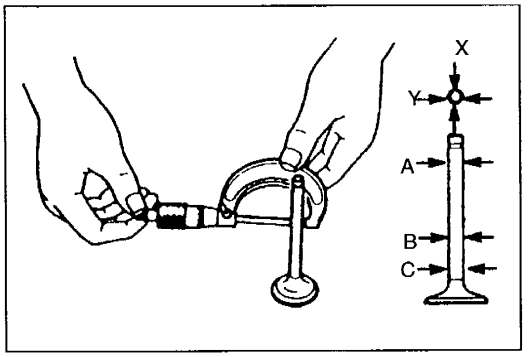
1. Inspect the cylinder head for damage, cracks, and leakage of water or oil. Replace if necessary.
2. Using a straightedge, measure the cylinder head for distortion in the six directions as shown.

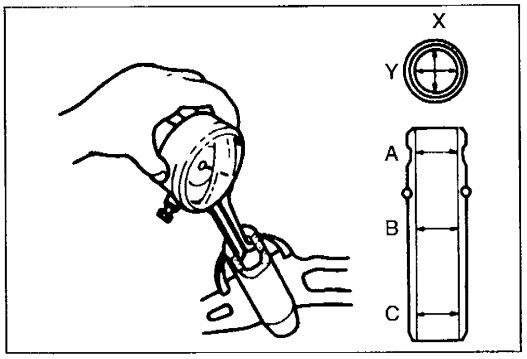
Distortion: 0.10 mm { 0.004 in } max.











3. Inspect for the following and repair or replace.
   (1) Sunken valve seats
   (2) Damaged intake and exhaust manifold contact surfaces
   (3) Excessive camshaft oil clearances and end play
4. If the cylinder head distortion exceeds the specification, grind the cylinder head surface.

   Grinding: 0.15 mm { 0.006 in } max.

5. If the cylinder head height is not within the specification, replace it.

   Height: 125.25—125.35 mm { 4.932—4.935 in }

6. Using a straightedge, measure the manifold contact surface distortion in the six directions as shown.

   Distortion: 0.10 mm { 0.004 in } max.

7. If distortion exceeds the specification, grind the surface or replace the cylinder head.

   Grinding: 0.15 mm { 0.006 in } max.

VALVE MECHANISM
Valve and Valve Guide

1. Inspect each valve for the following. Replace or resurface if necessary.
   (1) Damaged or bent stem
   (2) Roughness or damage to face
   (3) Damage or uneven wear of stem tip
2. Check the valve head margin thickness. Replace the valve if necessary.

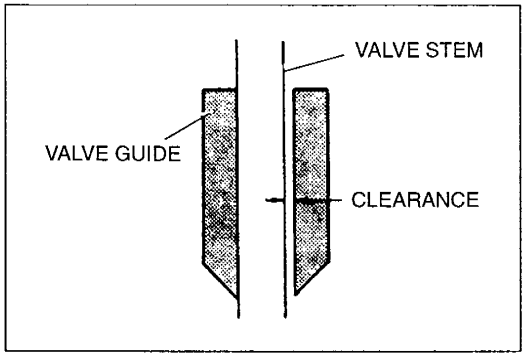
   Margin thickness
   IN: 0.75—1.25 mm { 0.030—0.049 in }
   EX: 1.2—1.8 mm { 0.048—0.070 in }

3. Measure the valve length. Replace the valve if necessary.

   Length
   Standard
   IN: 121.31 mm { 4.7760 in }
   EX: 122.63 mm { 4.8279 in }
   Minimum
   IN: 120.91 mm { 4.7602 in }
   EX: 122.23 mm { 4.8122 in }

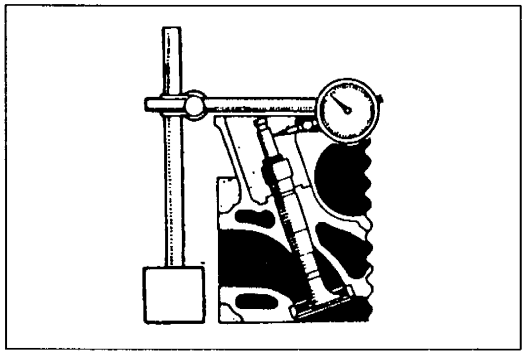
4. Measure the valve stem diameter in X and Y directions at three points (A, B and C) as shown. Replace the valve if necessary.

   Diameter
   IN: 6.970—6.985 mm { 0.2745—0.2750 in }
   EX: 8.025—8.040 mm { 0.3160—0.3165 in }



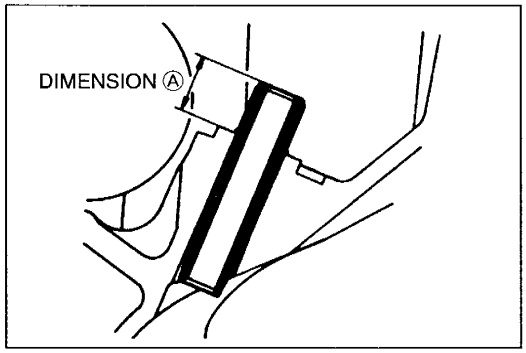
5. Measure the valve guide inner diameter in X and Y directions at three points (A, B and C) as shown. Replace the guide if necessary.

Inner diameter
IN: 7.01—7.03 mm { 0.2752—0.2767 in }
EX: 8.07—8.09 mm { 0.3178—0.3185 in }



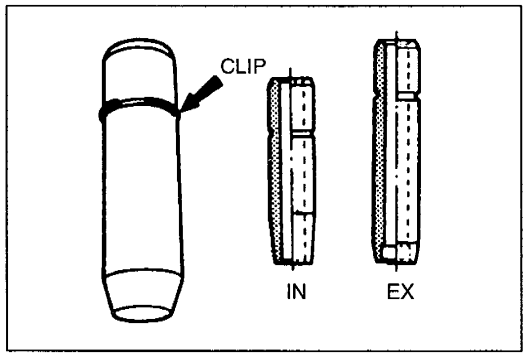
6. Measure the valve stem-to-guide clearance.
(1) Method No.1
Subtract the valve stem outer diameter from the inner diameter of the corresponding valve guide.
(2) Method No.2
Measure the valve stem play at a point close to the valve guide with the valve lifted slightly off the valve seat.

Clearance
IN: 0.025—0.060 mm { 0.0010—0.0023 in }
EX: 0.030—0.065 mm { 0.0012—0.0025 in }
Maximum: 0.20 mm {0.008 in}

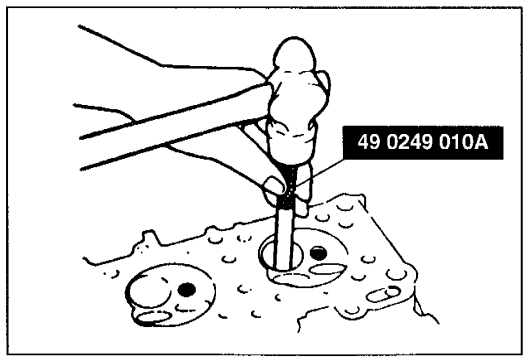


7. If the clearance exceeds the maximum, replace the valve and/or valve guide.
8. Measure each valve guide projection height (dimension Ⓐ in the figure). Replace the guide if necessary.

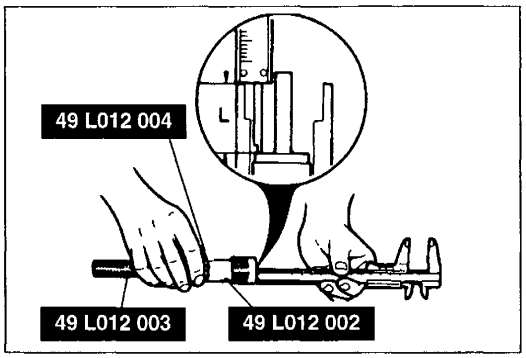
Height
IN: 13.2—13.8 mm { 0.520—0.543 in }
EX: 19.6—20.2 mm { 0.772—0.795 in }



Replacement of Valve Guide
Although the intake and exhaust valve guides are different, use the exhaust valve guide to replace the intake valve guide.



Removal
Remove the valve guide from the combustion chamber side by using the **SST**.

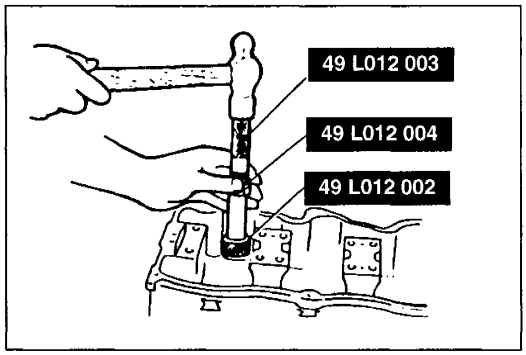


Installation

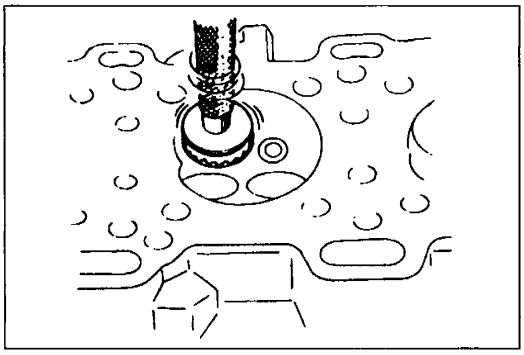
1. Assemble the **SST** so that depth **L** is as specified.

   Depth L
   IN: 13.2—13.8 mm { 0.520—0.543 in }
   EX: 19.6—20.2 mm { 0.772—0.795 in }

2. Tighten the locknut.

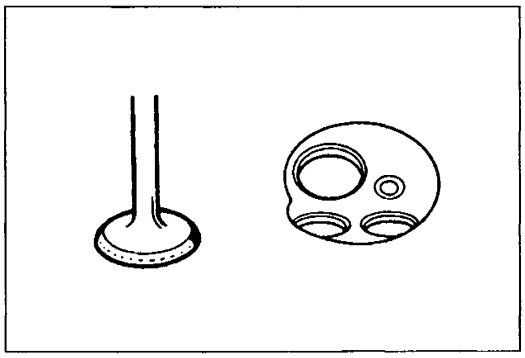


3. Tap the valve guide in from the side opposite the combustion chamber until the **SST** contacts the cylinder head.
4. Vefify that the valve guide projection height is within the specification. (Refer to page B–56.)
5. If not, repeat steps 1—4.

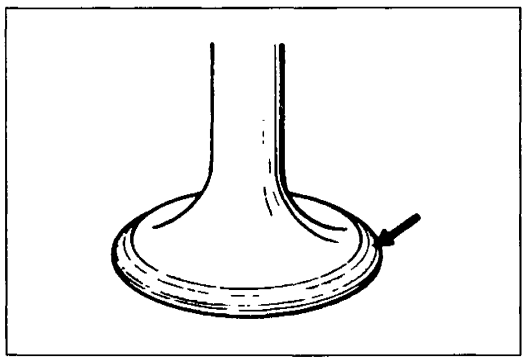


Valve Seat

1. Inspect the contact surface of the valve seat and valve face for the following:
   (1) Roughness
   (2) Damage
2. If necessary, resurface the valve seat with a **45°** valve seat cutter and/or resurface the valve face.

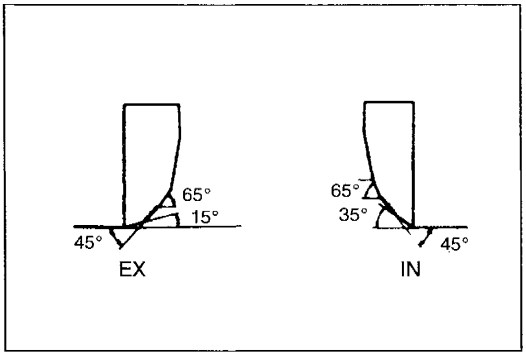


3. Apply a thin coat of prussian blue to the valve face.
4. Check the valve seating by pressing the valve against the seat.
   (1) If blue does not appear **360°** around the valve face, replace the valve.
   (2) If blue does not appear **360°** around the valve seat, resurface the seat.



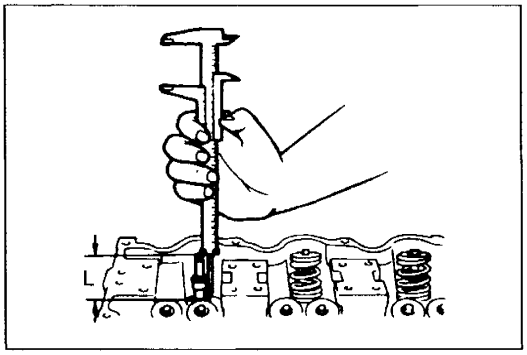
5. Measure the seat contact width.

   Width: 1.2—1.6 mm { 0.048—0.062 in }



(1) If the valve seating position on the valve face is too high, correct the valve seat with a **65°** cutter.
(2) If the valve seating position on the valve face is too low, correct the valve seat with a **35° (IN)** or **15° (EX)** cutter.

6. Seat the valve to the valve seat with a lapping compound.

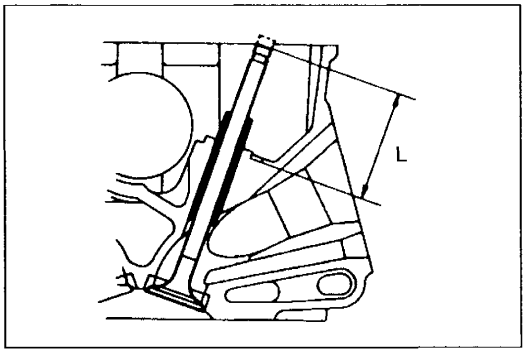


7. Check the sinking of the valve seat.
Measure the protruding length (dimension **L**) of the valve stem.

Dimension L
IN: 50.5 mm { 1.988 in }
EX: 49.5 mm { 1.949 in }

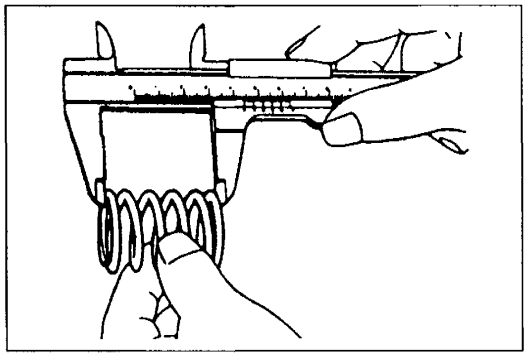
(1) If **L** is as below, it can be used as it is.

IN: 50.5—51.0 mm { 1.989—2.007 in }
EX: 49.5—50.0 mm { 1.949—1.968 in }



(2) If **L** is more than below, replace the cylinder head.

IN: 51.1 mm { 2.012 in }
EX: 50.1 mm { 1.972 in }

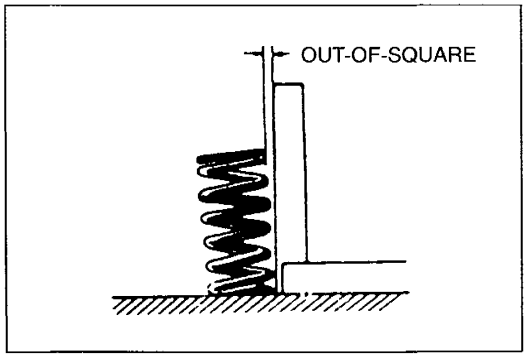


Valve Spring
1. Inspect each valve spring for cracks and damage.
2. Check the free length and out-of-square. Replace if necessary.

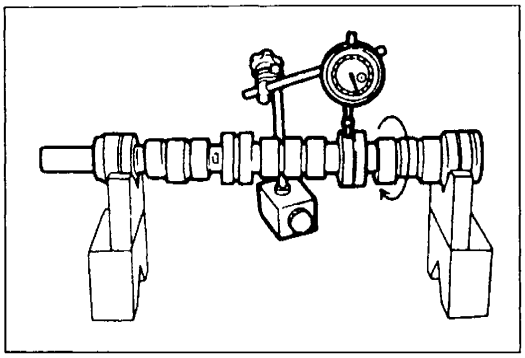
Free length and out-of-square

mm { in }

			Outer	Inner
Free length	Standard	IN	50.9 { 2.004 }	46.73 { 1.840 }
		EX	58.33 { 2.296 }	53.14 { 2.092 }
	Minimum	IN	①	②
		EX	③	④
Maximum out-of-square		IN	1.78 { 0.070 }	1.63 { 0.064 }
		EX	2.04 { 0.080 }	1.86 { 0.073 }



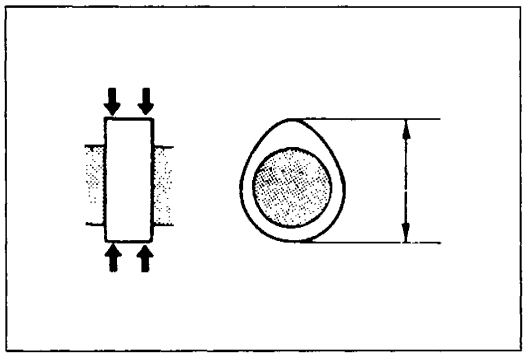
N { kgf , lbf }/mm { in }
① 138—147 { 14.0—15.05 , 31—33 } with a set load of 44.0 { 1.732 }
② 93—99 { 9.4—10.11 , 21—22 } with a set load of 39.5 { 1.555 }
③ 232—261 { 23.56—26.66 , 52—58 } with a set load of 45.0 { 1.772 }
④ 148—166 { 15.01—16.99 , 33—37 } with a set load of 40.5 { 1.594 }



CAMSHAFT

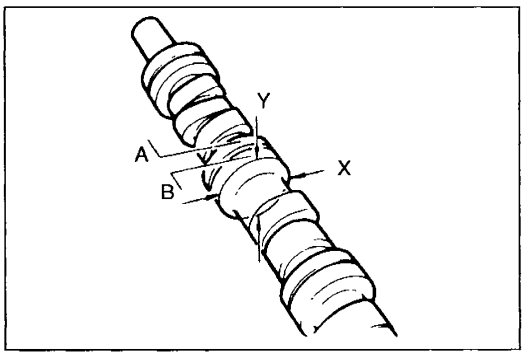
1. Set the front and rear journals on V-blocks.
   Measure the camshaft runout. Replace if necessary.

   Runout: 0.03 mm { 0.0012 in } max.



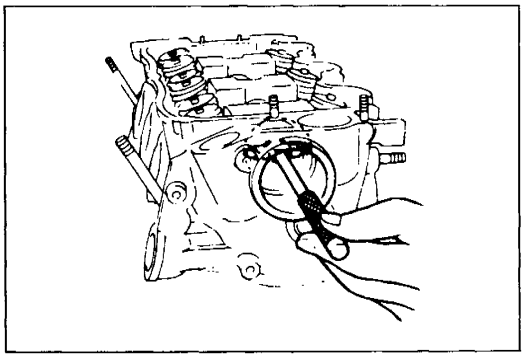
2. Inspect the cam for wear and damage. Replace if necessary.
3. Measure the cam lobe height at the two points shown.

   Height
   IN: 41.054 mm { 1.6163 in }
   EX: 41.293 mm { 1.6257 in }
   Minimum
   IN: 40.854 mm { 1.6084 in }
   EX: 41.093 mm { 1.6178 in }



4. Measure the journal diameters in X and Y directions at the two points (A and B) shown.

   Diameter
   No.1 and No.4:
   48.923—48.938 mm { 1.9261—1.9266 in }
   No.2 and No.3:
   48.915—48.935 mm { 1.9258—1.9265 in }
   Out-of-round: 0.03 mm { 0.0012 in } max.



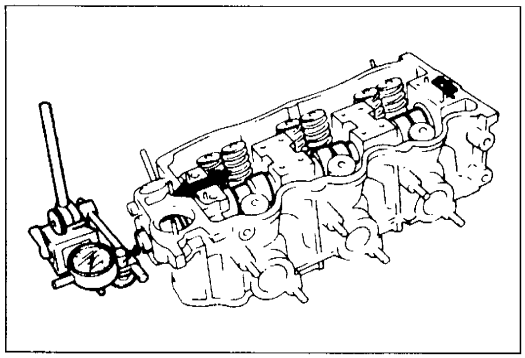
5. Measure the camshaft and cylinder head oil clearance.
   (1) Remove any oil or dirt from the journals and the camshaft bore.
   (2) Measure the camshaft bore diameter.

   Diameter: 49.015—49.035 mm { 1.9298—1.9305 in }

   (3) Subtract the journal diameter from the bore diameter.

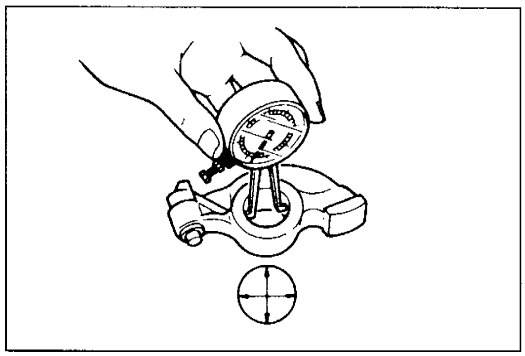
   Oil clearance
   No.1 and No.4:
   0.077—0.112 mm { 0.0031—0.0044 in }
   No.2 and No.3:
   0.080—0.120 mm { 0.0031—0.0047 in }
   Maximum: 0.15 mm { 0.006 in }

   (4) If the clearance exceeds the maximum, replace the camshaft or cylinder head.



6. Install the thrust plate and measure the camshaft end play. If it exceeds the maximum, replace the thrust plate or camshaft.

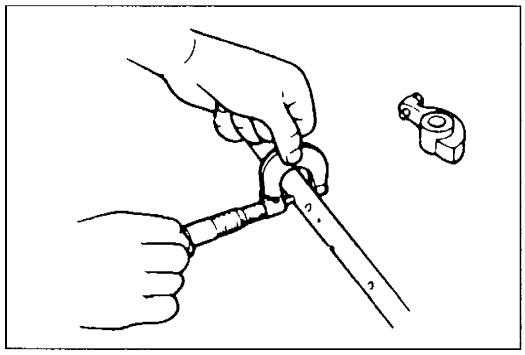
End play: 0.05—0.18 mm { 0.0020—0.0070 in }
Maximum: 0.20 mm { 0.008 in }



ROCKER ARM AND ROCKER ARM SHAFT

1. Check for wear and damage to the contact surfaces of the rocker arm shaft and the rocker arm. Replace if necessary.
2. Check the oil clearance between the rocker arm and rocker arm shaft. Replace if necessary.
   (1) Measure the rocker arm inner diameter.

Diameter: 19.000—19.033 mm { 0.7481—0.7493 in }

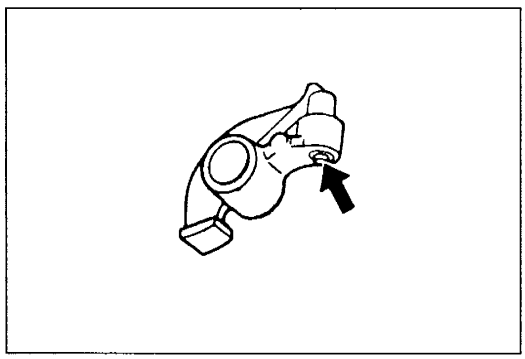


(2) Measure the rocker arm shaft diameter.

Diameter: 18.959—18.980 mm { 0.7465—0.7472 in }

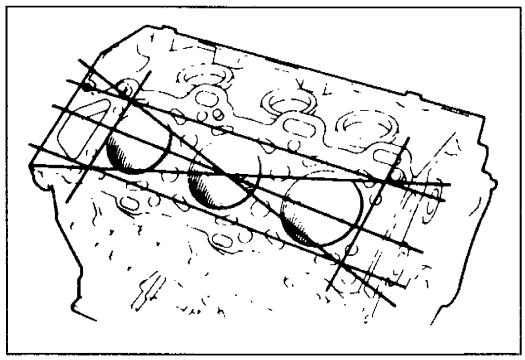
(3) Subtract the rocker arm shaft diameter from the inner diameter.

Oil clearance:
0.020—0.074 mm { 0.0008—0.0029 in }
Maximum: 0.10 mm { 0.004 in }



HLA

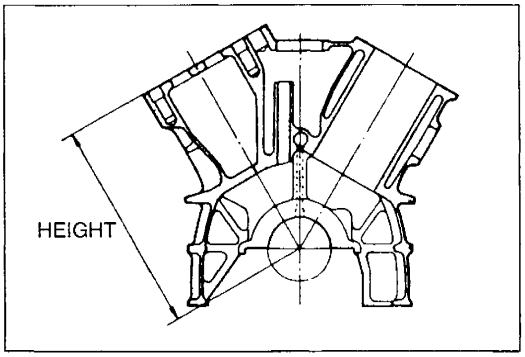
Check the HLA face for wear and damage. Replace if necessary.
Remove the HLA only for inspection. Remove by hand or use pliers protected by a rag.



CYLINDER BLOCK

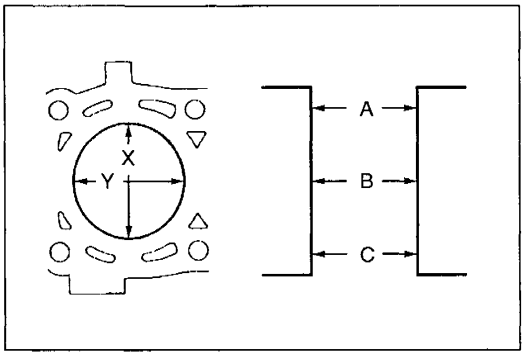
1. Check the cylinder block. Repair or replace if necessary.
   (1) Leakage damage
   (2) Cracks
   (3) Scoring of wall
2. Measure the distortion of the top surface of the cylinder block in the seven directions as shown.

Distortion: 0.15 mm { 0.006 in } max.



3. If the distortion exceeds the specification, repair by grinding or replace the cylinder block.

Height: 220.0 mm { 8.66 in }
Grinding: 0.20 mm { 0.008 in } max.

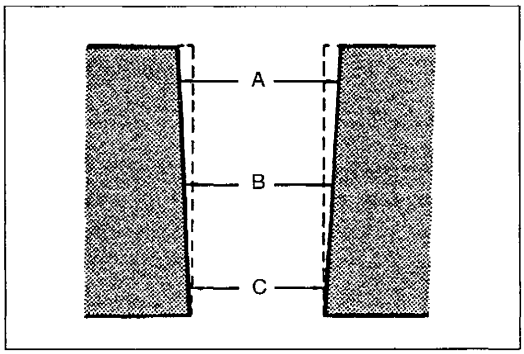


4. Measure the cylinder bore in X and Y directions at three points (A, B, and C) in each cylinder as shown.

Cylinder bore
Base the boring diameter on the diameter of an oversize piston. All cylinders must be the same diameter.

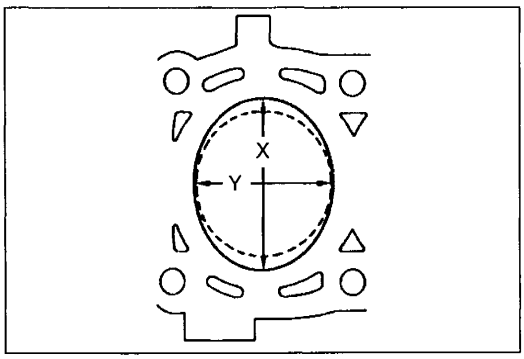
mm { in }

Bore / Size	Diameter
Standard	90.000—90.022 { 3.5433—3.5441 }
0.25 { 0.01 } oversize	90.250—90.272 { 3.5532—3.5540 }
0.50 { 0.02 } oversize	90.500—90.522 { 3.5630—3.5638 }



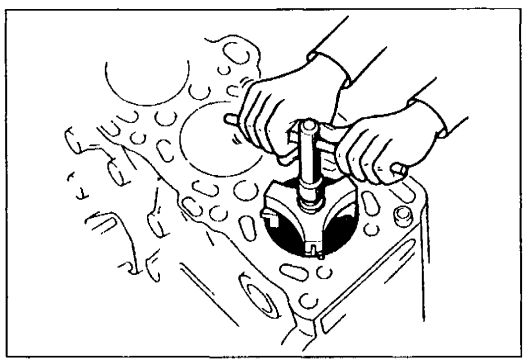
(1) If the cylinder bore exceeds the maximum, rebore the cylinder to oversize.
(2) If the difference between the measurements A and C exceeds the maximum taper, rebore the cylinder to oversize.

Taper: 0.019 mm { 0.0007 in } max.

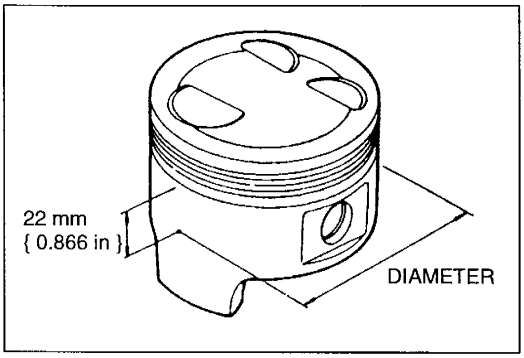


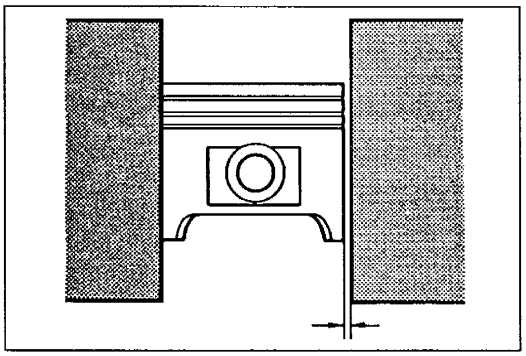
(3) If the difference between the measurements X and Y exceeds the maximum out-of-round, rebore the cylinder to oversize.

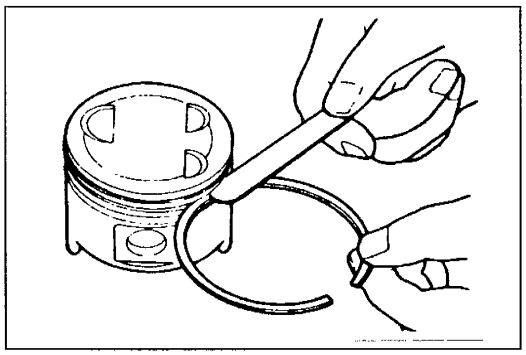
Out-of-round: 0.019 mm { 0.0007 in } max.

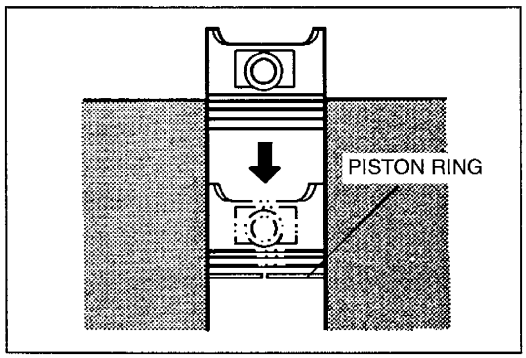


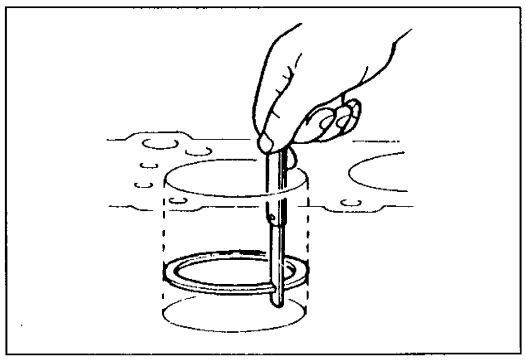
5. If the upper part of the cylinder wall shows uneven wear, remove the ridge with a ridge reamer.











PISTON, PISTON RING, AND PISTON PIN

Piston

1. Inspect the outer circumferences of all pistons for seizure or scoring. Replace if necessary.
2. Measure the outer diameter of each piston at a right angle **90°** to the piston pin, **22 mm { 0.866 in }** below the oil ring groove lower edge.

Piston diameter

mm { in }

Size \ Bore	Diameter
Standard	89.958—89.990 { 3.5417—3.5429 }
0.25 { 0.01 } oversize	90.208—90.240 { 3.5515—3.5527 }
0.50 { 0.02 } oversize	90.458—90.490 { 3.5614—3.5625 }

3. Measure the piston-to-cylinder clearance.

   Clearance: 0.023—0.051 mm { 0.0010—0.0020 in }
   Maximum: 0.15 mm { 0.006 in }

4. If the clearance exceeds the maximum, replace the piston or rebore the cylinders to fit oversize pistons.
5. If the piston is replaced, the piston rings must also be replaced.

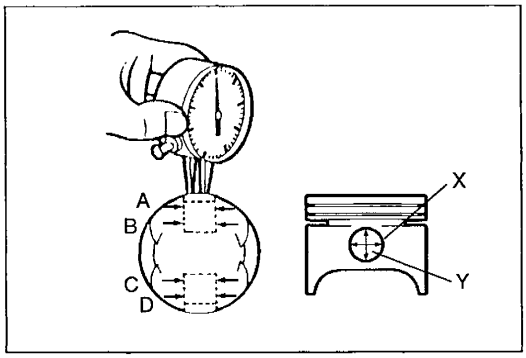
Piston and Piston ring

1. Measure the piston ring-to-ring land clearance around the entire circumference by using a new piston ring.

   Clearance (Top and Second):
   0.03—0.07 mm { 0.0012—0.0027 in }
   Maximum: 0.15 mm { 0.006 in }

2. If the clearance exceeds the maximum, replace the piston.
3. Inspect the piston rings for damage, abnormal wear, or breakage. Replace if necessary.
4. Insert the piston ring into the cylinder by hand and use the piston to push it to the bottom of the ring travel.
5. Measure each piston ring end gap with a feeler gauge. Replace if necessary.

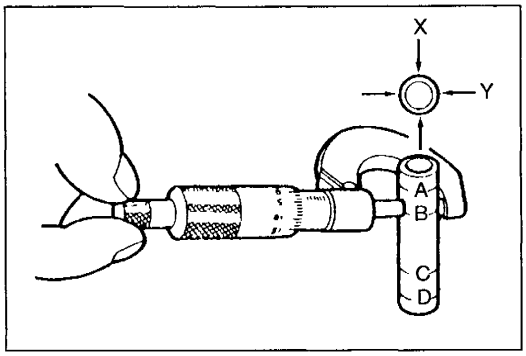
   End gap
   Top : 0.20—0.35 mm { 0.008—0.013 in }
   Second : 0.15—0.30 mm { 0.006—0.011 in }
   Oil rail : 0.20—0.70 mm { 0.008—0.027 in }
   Maximum: 1.0 mm { 0.039 in }



Piston and Piston Pin

1. Measure the piston pin hole diameter in X and Y directions at four points (A, B, C and D).

   Diameter: 22.988—23.000 mm { 0.9051—0.9055 in }



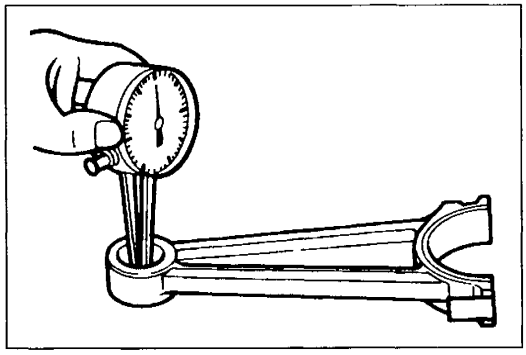
2. Measure the piston pin diameter in X and Y directions at four points (A, B, C and D).

   Diameter: 22.974—22.980 mm { 0.9045—0.9047 in }

3. Calculate the related piston pin-to-piston clearance.

   Clearance: 0.008—0.026 mm { 0.0004—0.0010 in }

4. If the clearance exceeds the specification, replace the piston and/or piston pin.



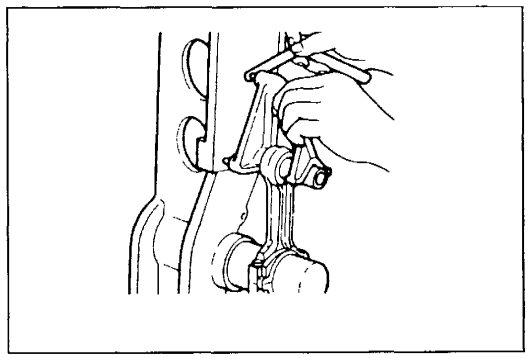
CONNECTING ROD

1. Measure the connecting rod small end bore.

   Diameter: 22.943—22.961 mm { 0.9033—0.9039 in }

2. Calculate the interference between the small end bore and piston pin.

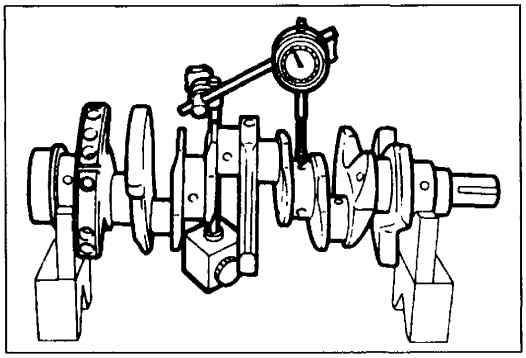
   Interference:
   0.013—0.037 mm { 0.0005—0.0014 in }



3. Mesure each connecting rod for bend. Replace the connecting rod if necessary.

   Bend: 0.08 mm { 0.0031 in }/50 mm { 1.9685 in } max.
   Distortion:
   0.18 mm { 0.0071 in }/50 mm { 1.9685 in } max.
   Length (Center to Center):
   146.25—146.35 mm { 5.758—5.761 in }

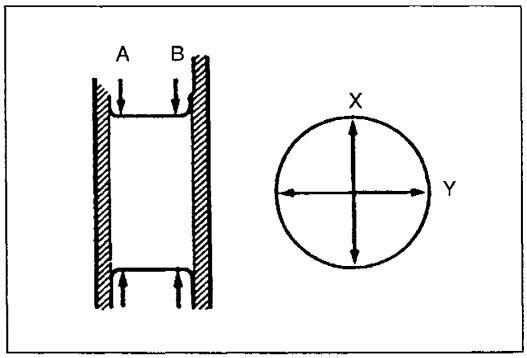
4. If the connecting rod is replaced, the connecting rod cap, bolts, and nuts must also be replaced because they are a matched set.



CRANKSHAFT

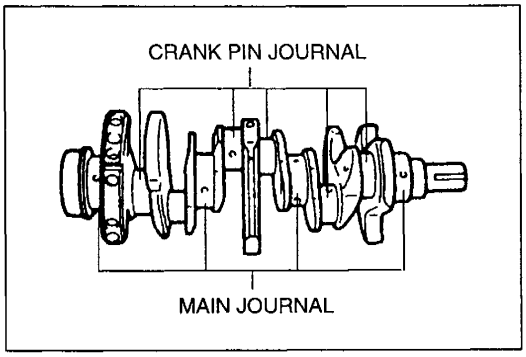
1. Check the journals and pins for damage, scoring, or oil hole clogging.
2. Set the crankshaft on V-blocks.
3. Mesure the crankshaft runout at the center journal. Replace if necessary.

   Runout: 0.03 mm { 0.0012 in } max.



4. Measure each journal diameter in X and Y directions at two points as shown.

Main journal
Diameter:
61.937—61.955 mm { 2.4385—2.4391 in }
Out-of-round: 0.05 mm { 0.0020 in } max.
Crankpin journal
Diameter:
52.940—52.955 mm { 2.0843—2.0848 in }
Out-of-round: 0.05 mm { 0.0020 in } max.



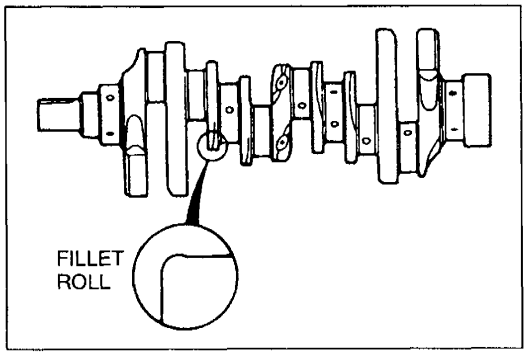
5. If the diameter is less than the specification, grind the journals to match an undersize bearing.

Undersize bearing: 0.25 mm { 0.01 in }

Main journal diameter undersize

mm { in }

Bearing size	Journal diameter
0.25 { 0.01 } undersize	61.687—61.705 { 2.4287—2.4293 }

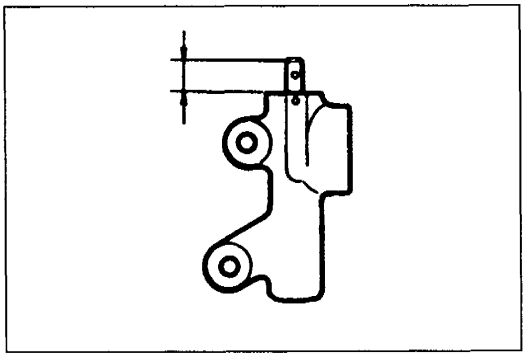


Crankpin journal diameter undersize

mm { in }

Bearing size	Journal diameter
0.25 { 0.01 } undersize	52.690—52.705 { 2.0745—2.0749 }

Caution
- **Do not remove the fillet roll area when grinding.**



TIMING BELT AUTO TENSIONER

Check the tensioner rod projection. Replace if necessary.

Projection (free length): 12—14 mm { 0.48—0.55 in }

Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

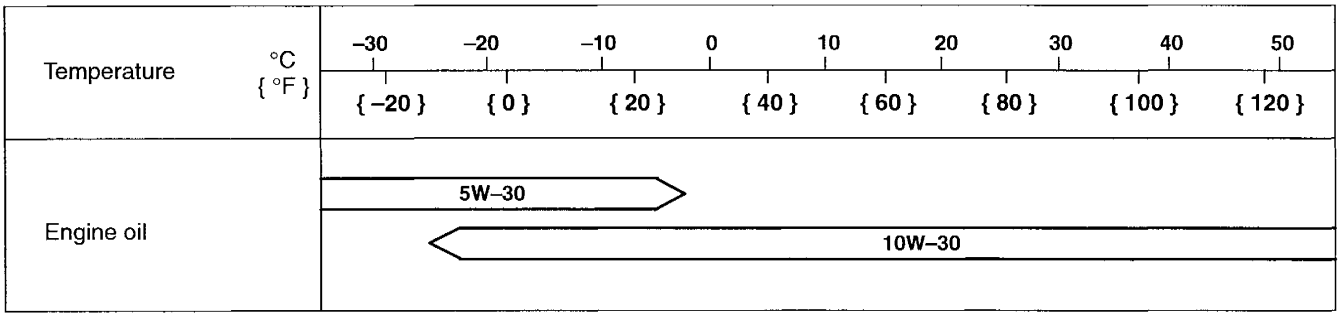
LUBRICATION SYSTEM

OUTLINE

SPECIFICATIONS

Item \ Engine		JE
Lubrication system		Force-fed type
Oil pump	Type	Trochoid gear
	Relief pressure kPa { kgf/cm^2 , psi }	383—480 { 3.9—4.9 , 56—69 }
Oil filter	Type	Full-flow, paper element
	By-pass pressure differential kPa { kgf/cm^2 , psi }	79—117 { 0.8—1.2 , 12—17 }
Oil pressure switch activation pressure kPa { kgf/cm^2 , psi }		2—24 { 0.02—0.25 , 0.29—3.55 }
Oil capacity	Total (dry engine) L { US qt , Imp qt }	5.2 { 5.5 , 4.6 }
	Oil replacement L { US qt , Imp qt }	4.5 { 4.8 , 4.0 }
	Oil and oil filter replacement L { US qt , Imp qt }	4.8 { 5.1 , 4.2 }
	Engine oil	API Service SG, SH (ECII) ILSAC

Recommended SAE Viscosity



Anticipated ambient temperature range before succeeding oil change, °C { °F }

TROUBLESHOOTING GUIDE

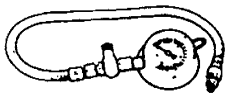
Problem	Possible Cause	Action	Page
Engine hard starting	Improper engine oil	Replace	D–4
	Insufficient engine oil	Add oil	D–4
Excessive oil consumption	Oil working up or down	Refer to section B	
	Oil leakage	Repair	D–6
Oil pressure drop	Insufficient oil	Add oil	D–4
	Oil leakage	Repair	D–4
	Worn and/or damaged oil pump rotor	Replace	D–9, 10
	Worn plunger (inside oil pump) or weak spring	Replace	D–11
	Clogged oil strainer	Clean	—
	Excessive main bearing or connecting rod bearing clearance	Refer to section B	
Warning light illuminates while engine is running	Oil pressure drop	As described above	—
	Malfunction of oil pressure switch	Refer to section T	
	Malfunction of electrical system	Refer to section T	

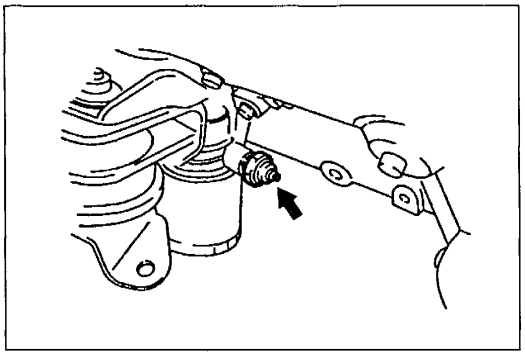
Warning

- **Continuous exposure with USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after this work.**

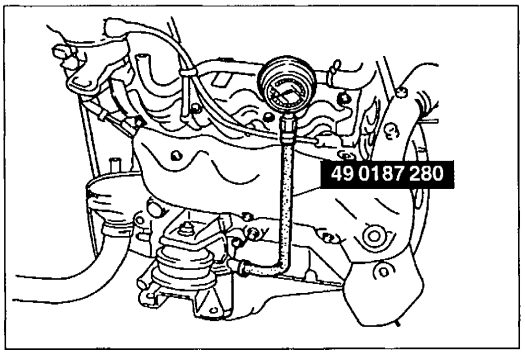
OIL PRESSURE

PREPARATION
SST

49 0187 280 Gauge, oil pressure		For inspection of oil pressure

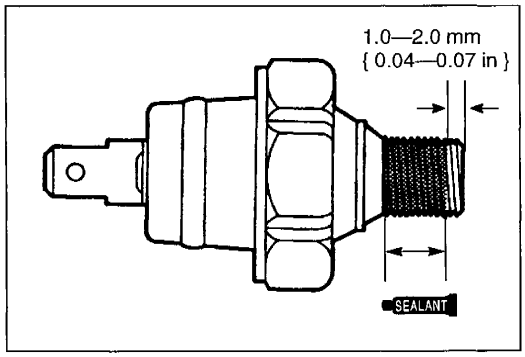


INSPECTION
1. Remove the oil pressure switch.



2. Screw the **SST** into the oil pressure switch installation hole.
3. Warm up the engine to normal operating temperature.
4. Run the engine at the specified speed, and note the gauge readings.

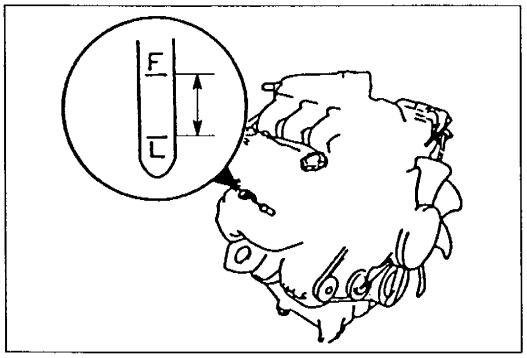
Oil pressure
1,000 rpm:
89—245 kPa { 0.9—2.5 kgf/cm^2 , 13—35 psi }
3,000 rpm:
363—519 kPa { 3.7—5.3 kgf/cm^2 , 53—75 psi }



5. If the pressure is not as specified, check for the cause and repair as necessary.
6. Apply silicone sealant to the oil pressure switch threads as shown.
7. Remove the **SST** and install the oil pressure switch.

Tightening torque:
12—17 N·m { 1.2—1.8 kgf·m , 9—13 ft·lbf }

8. Start the engine and check for oil leaks.



ENGINE OIL

INSPECTION

1. Position the vehicle on level ground.
2. Warm up the engine to normal operating temperature and stop it.
3. Wait for five minutes.
4. Remove the dipstick and check the oil level and condition.
5. Add or replace oil if necessary.

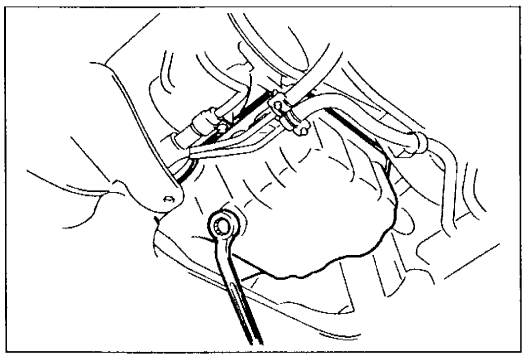
Note

- The distance between the L and F marks on the dipstick represents 1.0 L { 1.1 US qt , 0.9 Imp qt }.

REPLACEMENT

Warning

- **When the engine and the engine oil are hot, they can badly burn. Don't burn yourself with either.**
- **A vehicle that is lifted but not securely supported on safety stands is dangerous. It can slip or fall, causing death or serious injury. Never work around or under a lifted vehicle if it is not securely supported on safety stands.**
- **Continuous exposure with USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after this work.**



1. Remove the oil filler cap and the oil drain plug.
2. Drain the oil into a container.
3. Install the oil drain plug.

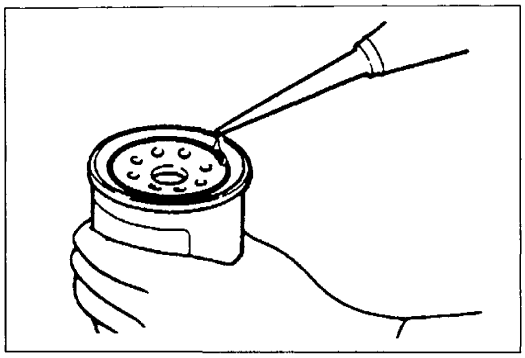
Tightening torque:
30—41 N·m { 3.0—4.2 kgf·m , 22—30 ft·lbf }

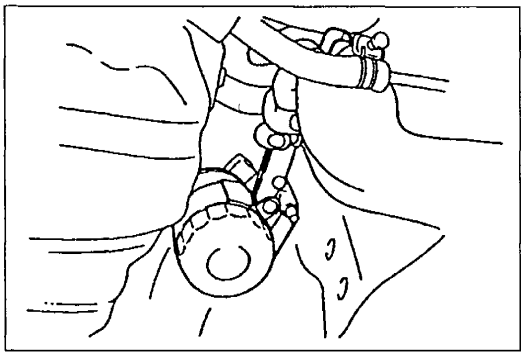
4. Refill the engine with the specified type and amount of engine oil.

Oil capacity L {US qt, Imp qt}

Total (dry engine)	5.2 { 5.5 , 4.6 }
Oil replacement	4.5 { 4.8 , 4.0 }
Oil and oil filter replacement	4.8 { 5.1 , 4.2 }

5. Refit the oil filler cap.
6. Run the engine and check for oil leaks.
7. Check the oil level and add oil if necessary.





OIL FILTER

REPLACEMENT

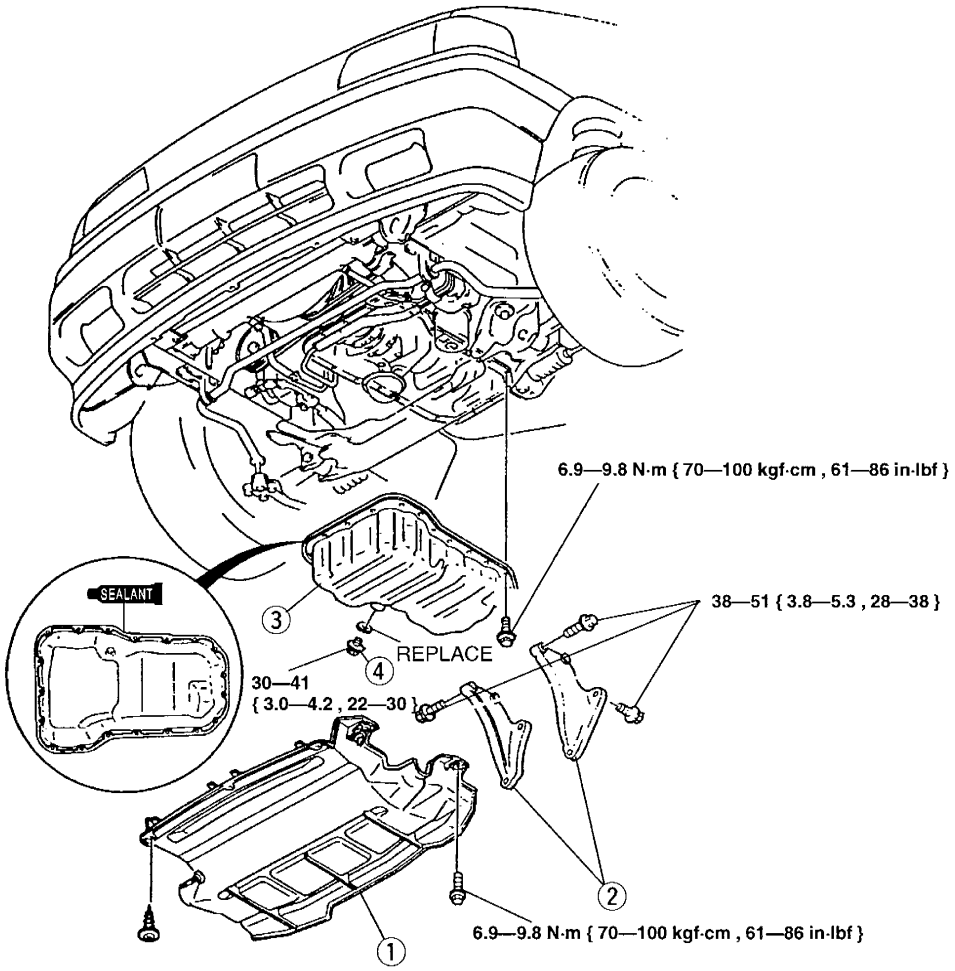
1. Remove the oil filter by using a wrench.
2. Use a clean rag to wipe off the mounting surface on the engine.
3. Apply clean engine oil to the rubber seal of the new filter.
4. Install the oil filter until the rubber seal contacts the base, and then tighten the filter 1 and 1/6 turns by using the wrench.
5. Start the engine and inspect for leaks around the filter seal.
6. Check the oil level and add oil if necessary.

OIL PAN

REMOVAL / INSTALLATION

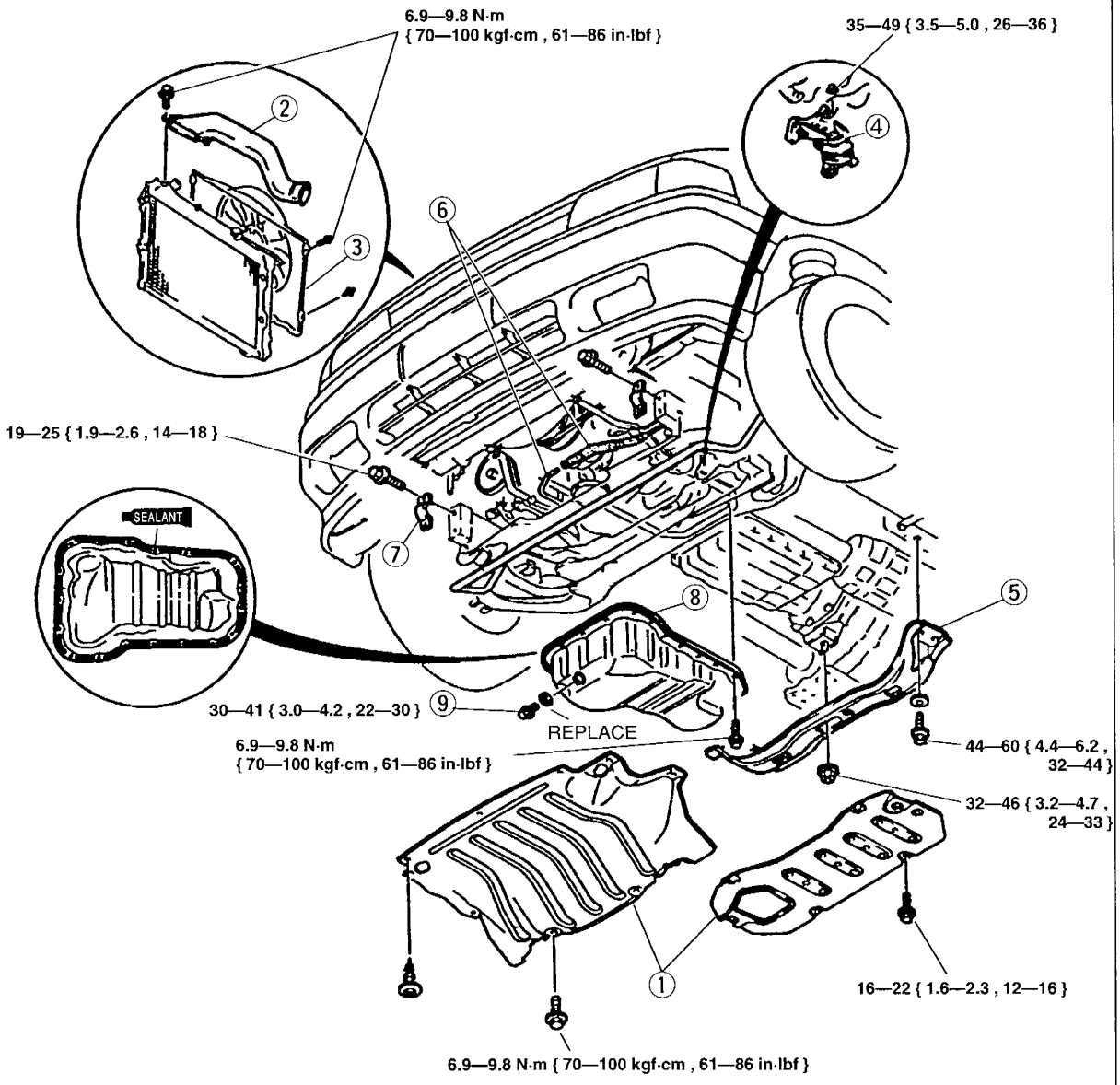
1. Disconnect the negative battery cable.
2. Drain the engine oil. (Refer to page D–4.)
3. Remove in the order shown in the figure, referring to **Removal Note**.
4. Install in the reverse order of removal, referring to **Installation Note**.
5. Fill with the specified amount and type of engine oil. (Refer to page D–4.)
6. Start the engine and check for oil leaks.
7. Check the oil level and add oil if necessary.

4×2



1. Splash shield
2. Gusset plate
3. Oil pan
   Removal Note ..... page D–8
   Installation Note ..... page D–8
4. Drain plug

4×4



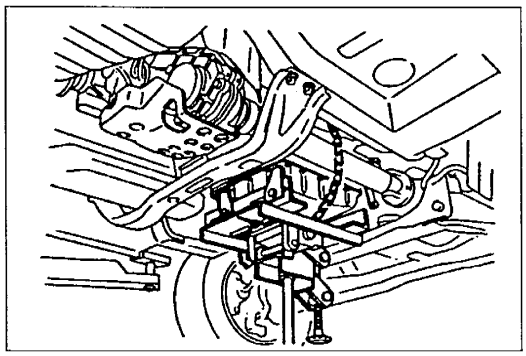
Before removing the parts below, suspend the engine slightly.

1. Splash shield
2. Fresh-air duct
3. Fan cowling
4. Engine mount
   Removal Note ..... page D–8
5. Transmission lower mount
   Removal Note ..... page D–8
6. Oil cooler hose and pipe
7. Stabilizer bracket
8. Oil pan
   Removal Note ..... page D–8
   Installation Note ..... page D–8
9. Drain plug

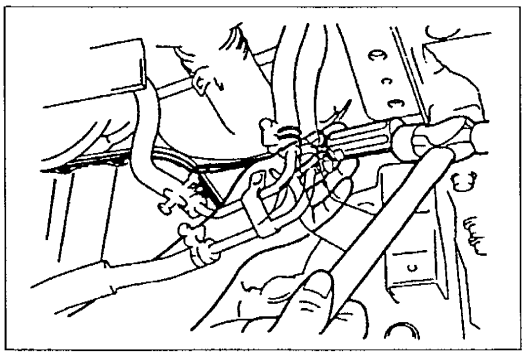
Removal Note
Engine mount (4 × 4)
1. Install the front engine hanger (JE48 10 561A).

   Tightening torque:
   32—46 N·m { 3.2—4.7 kgf·m , 24—33 ft·lbf }

2. Suspend the engine. Remove the engine mount nuts and lift the engine to gain removal clearance.



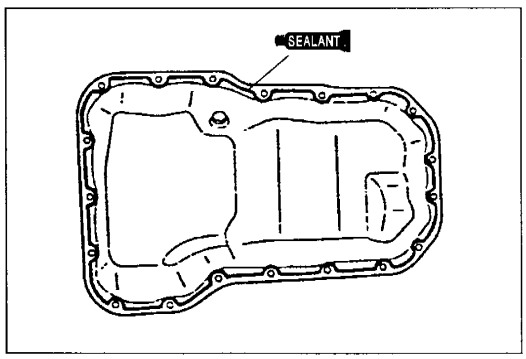
Transmission lower mount (4 × 4)
Support the transmission with a transmission jack before removing the transmission lower mount.



Oil pan
1. Remove the oil pan mounting bolts.

   Caution
   - **Pry tools can easily scratch the oil pan contact surfaces. Prying off the oil pan can also easily bend the oil pan flange.**

2. Insert a screwdriver between the oil pan and the cylinder block to separate them.
3. Remove the oil pan.



Installation Note
Oil pan
1. Apply silicone sealant to the oil pan along the inside of the bolt holes, overlap the ends, and install the oil pan within five minutes.

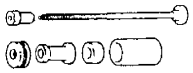
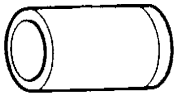
   Caution
   - **If the bolts are reused, remove the old sealant from the bolt threads. Tightening a bolt that has old sealant on it can cause thread damage.**

2. Tighten the oil pan bolts.

   Tightening torque:
   6.9—9.8 N·m { 70—100 kgf·cm , 61—86 in·lbf }

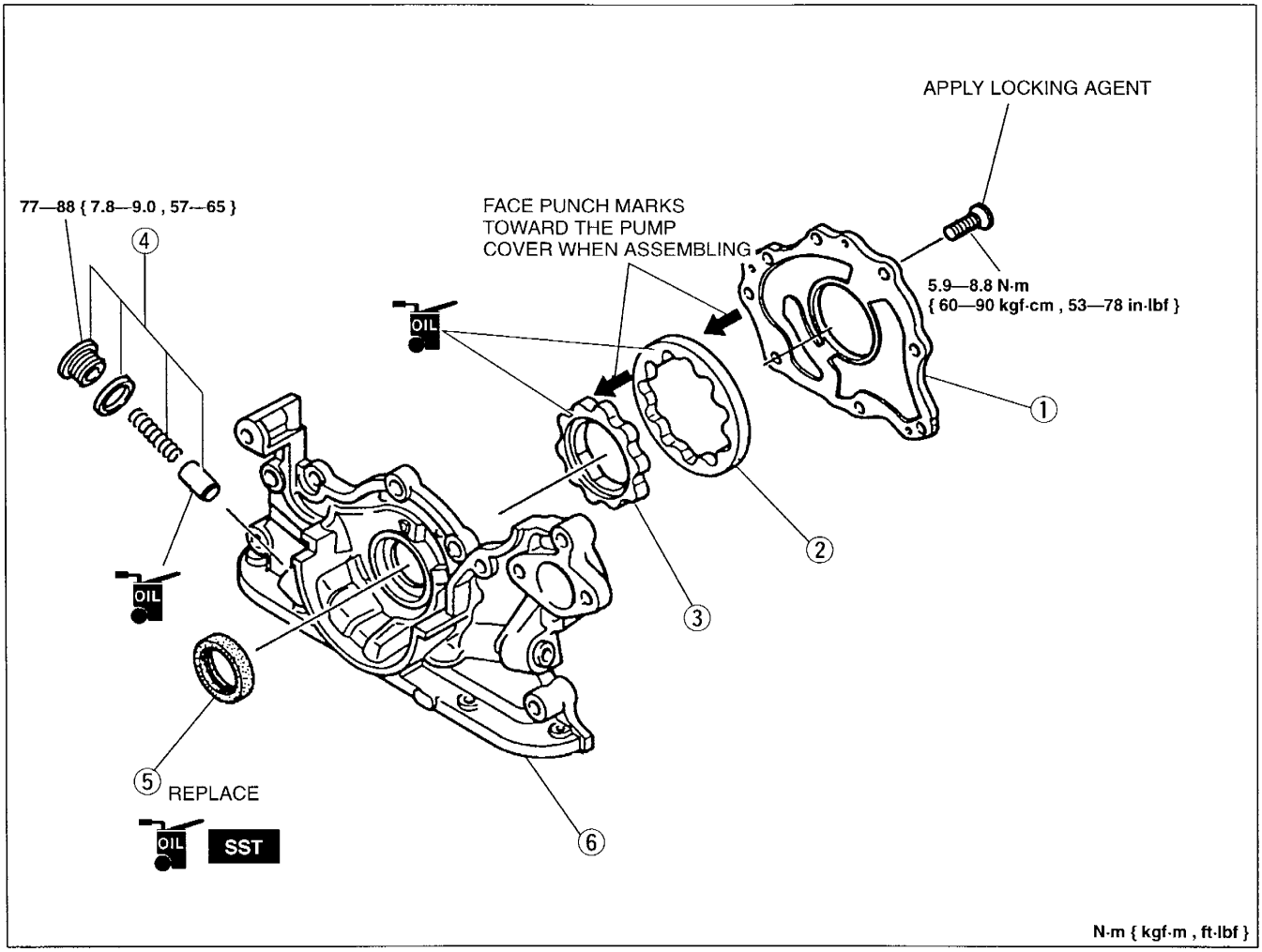
OIL PUMP

PREPARATION
SST

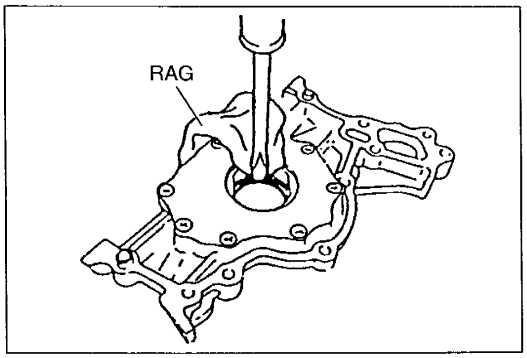
49 G034 2A0 Replacer set, rubber bush 	For installation of front oil seal	49 G034 202 Support block (Part of 49 G034 2A0) 	For installation of front oil seal

DISASSEMBLY / INSPECTION / ASSEMBLY

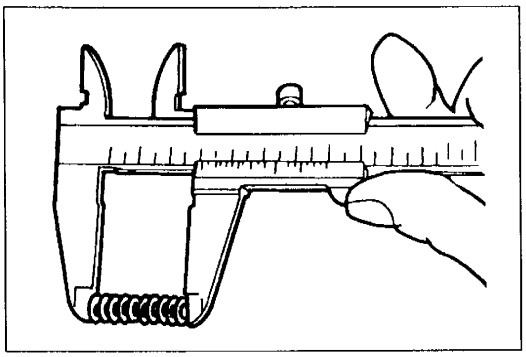
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



1. Pump cover
2. Outer rotor
3. Inner rotor
4. Pressure relief valve
5. Oil seal
   Disassembly Note ..... page D–10
   Assembly Note ..... page D–11
6. Oil pump body

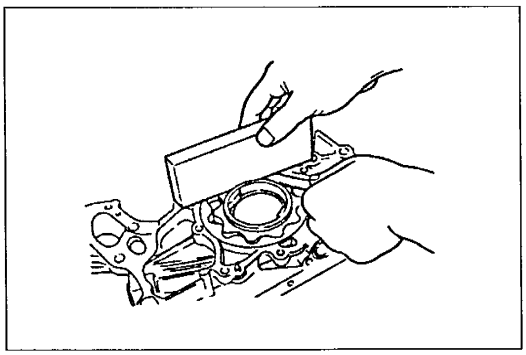


Disassembly Note
Oil seal
Remove the oil seal by using a screwdriver protected with a rag.



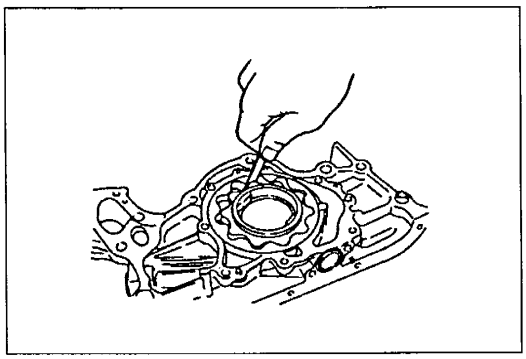
Inspection
1. Check the following and replace any faulty parts.
   (1) Distorted or damaged oil pump body or cover
   (2) Worn or damaged plunger
   (3) Weak or broken plunger spring

Free length: 46.4 mm { 1.827 in }

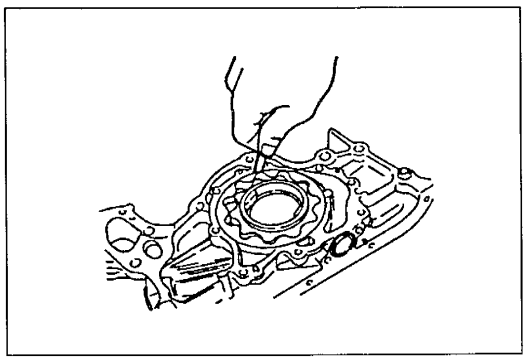


2. Measure the following clearances.

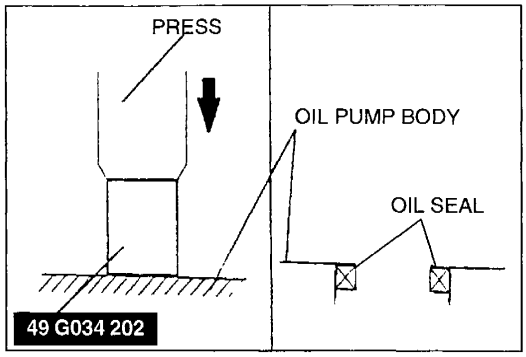
Side clearance
Standard: 0.035—0.085 { 0.0014—0.0033 in }
Maximum: 0.13 mm { 0.0051 in }



Tooth tip clearance
Standard: 0.04—0.20 mm { 0.0016—0.0078 in }
Maximum: 0.24 mm { 0.0094 in }



Outer rotor to pump body
Standard: 0.010—0.196 mm { 0.0004—0.0077 in }
Maximum: 0.23 mm { 0.0091 in }



Assembly Note
Oil seal

1. Apply clean engine oil to the lip of the new oil seal.
2. Push the oil seal slightly in by hand.
3. Press the oil seal into the oil pump body by using the **SST**.

Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

COOLING SYSTEM

OUTLINE

SPECIFICATIONS

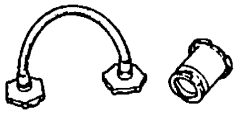
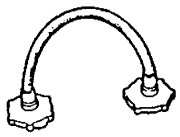
Item \ Engine		JE
Cooling system		Water-cooled, forced circulation
Coolant capacity	L { US qt , Imp qt }	9.4 { 9.9 , 8.3 }
Water pump	Type	Centrifugal
	Water seal	Unified mechanical seal
Thermostat	Type	Wax, bottom-bypass
	Opening temperature °C { °F }	81.5—84.5 { 179—184 }
	Full-open temperature °C { °F }	96 { 205 }
	Full-open lift mm { in }	9.0 { 0.35 } min.
Radiator	Type	Corrugated fin
	Cap valve opening pressure kPa { kgf/cm^2 , psi }	74—102 { 0.75—1.05 , 10.7—14.9 }
Cooling fan	Type	Thermo-modulated
	Switching temperature OFF→ON °C { °F }	82—88 { 180—190 } . . . . . linear
	Number of blades	7
	Outer diameter of blade mm { in }	430 { 16.9 }

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Overheating	Insufficient coolant	Add	E–3
	Coolant leakage	Repair	—
	Radiator fins clogged	Repair	—
	Radiator cap malfunction	Replace	E–6
	Cooling fan malfunction	Replace	E–9
	Thermostat malfunction	Replace	E–8
	Water passage clogged	Clean	E–4
	Water pump malfunction	Replace	E–9
Corrosion	Impurities in coolant	Replace	E–3

ENGINE COOLANT

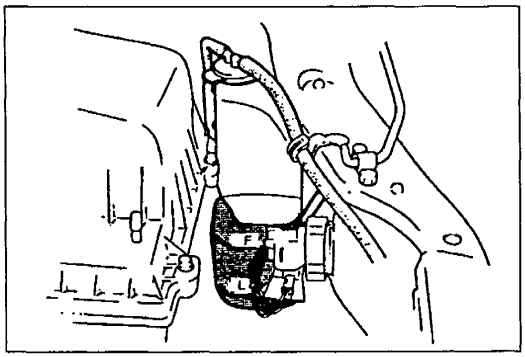
PREPARATION
SST

49 9200 145 Adapter set, radiator cap tester 	For inspection of cooling system	49 9200 146 Adapter B (Part of 49 9200 145) 	For inspection of cooling system
49 9200 147 Adapter A (Part of 49 9200 145) 	For inspection of radiator cap valve	—	—

INSPECTION

Warning

- **Removing the radiator cap or the radiator drain plug while the engine is running, or when the engine and radiator are hot is dangerous. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system.**
- **Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counterclockwise to the first stop. Step back while the pressure escapes.**
- **When you're sure all the pressure is gone, press down on the cap—still using a cloth—turn it, and remove it.**

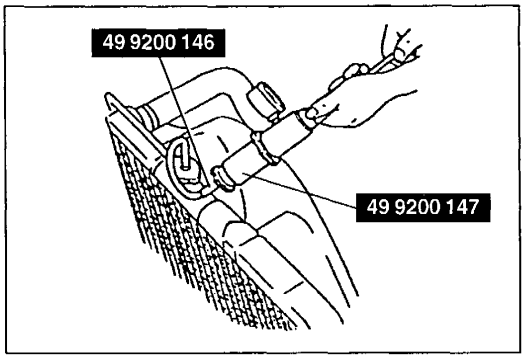


Coolant Level (Engine cold)

1. Check that the coolant level is near the radiator inlet port.
2. Check that the coolant level in the coolant reservoir is between the F and L marks. Add coolant if necessary.

Note

- The distance between the L and F marks on the coolant reservoir represents 0.55 L { 0.6 US qt , 0.5 Imp qt }.



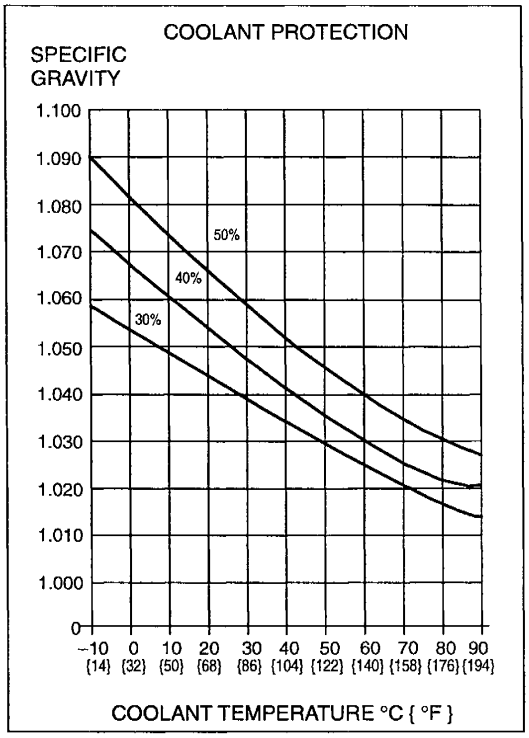
Coolant Leakage

1. Remove the radiator cap.
2. Connect a radiator tester and the **SST** to the radiator inlet port.

Caution

- **Applying more than 103 kPa { 1.05 kgf/cm^2 , 14.9 psi } can damage the hoses, fittings, and other components, and cause leaks.**

3. Apply **103 kPa { 1.05 kgf/cm^2 , 14.9 psi }** pressure to the system.
4. Verify that the pressure is held. If not, check for coolant leakage.



Coolant Protection

Caution

- **The engine has aluminum parts that can be damaged by alcohol or methanol antifreeze. Do not use alcohol or methanol in the cooling system. Use only ethylene-glycol-based coolant.**
- **Use only soft (demineralized) water in the coolant mixture. Water that contains minerals will cut down on the coolant's effectiveness.**

1. Measure the coolant temperature and specific gravity with a thermometer and a hydrometer.
2. Determine the coolant protection by referring to the graph shown.
3. If the coolant protection is not proper, add water or coolant as necessary.

Antifreeze solution mixture percentage

Coolant protection	Volume percentage		Gravity at 20 °C { 68 °F }
	Water	Coolant	
Above –16 °C { 3 °F }	65	35	1.054
Above –26 °C { –15 °F }	55	45	1.066
Above –40 °C { –40 °F }	45	55	1.078

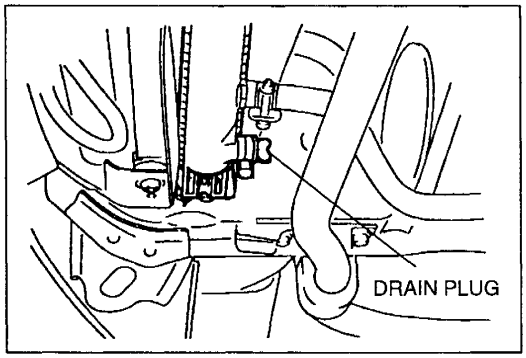
REPLACEMENT

Draining

Warning

- **Removing the radiator cap or the radiator drain plug while the engine is running, or when the engine and radiator are hot is dangerous. Scalding coolant and steam may shoot out and cause serious injury. It can also damage the engine and cooling system.**
- **Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counterclockwise to the first stop. Step back while the pressure escapes.**
- **When you're sure all the pressure is gone, press down on the cap—still using a cloth—turn it, and remove it.**

1. Remove the radiator cap.
2. Loosen the radiator drain plug by hand.
3. Drain the coolant into a container.



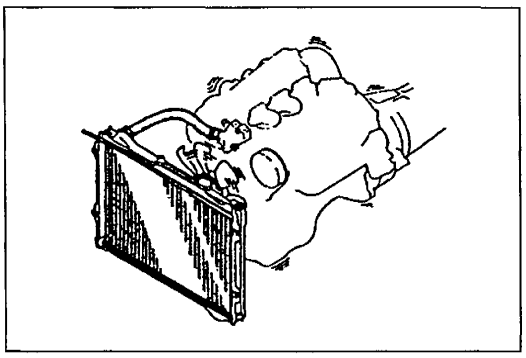
4. Flush the cooling system with water until all traces of color are gone.
5. Let the system drain completely.
6. Tighten the drain plug by hand.

Refilling

Use the proper amount and mixture of ethylene-glycol-based coolant. (Refer to Coolant Protection, page E–4.)

1. Slowly pour the coolant into the radiator up to the coolant filler port.

   Filling pace: 2 L { 2.1 US qt , 1.8 Imp qt }/min. max.



2. Fill the coolant reservoir up to the F mark.
3. Fully install the radiator cap.
4. Start the engine and let it idle until it warms up.
5. If the temperature increases beyond normal, there is excessive air in the system. Stop the engine and allow it to cool; then repeat steps 1—3.
6. Run the engine at 2,200—2,800 rpm for five seconds; repeat several times.
7. Stop the engine and allow it to cool.

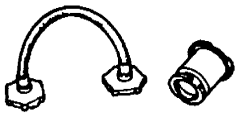
   Warning

   - **Removing the radiator cap or the radiator drain plug while the engine is running, or when the engine and radiator are hot is dangerous. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system.**
   - **Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counterclockwise to the first stop. Step back while the pressure escapes.**
   - **When you're sure all the pressure is gone, press down on the cap—still using a cloth—turn it, and remove it.**

8. Remove the radiator cap and check the coolant level. If the coolant level has dropped, repeat the procedure from step 1.

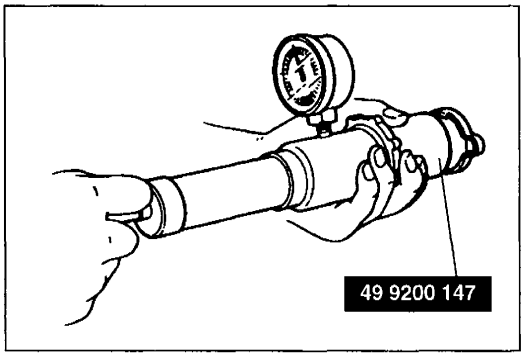
RADIATOR CAP

PREPARATION
SST

49 9200 145 Adapter set, radiator cap tester 	For inspection of radiator cap	49 9200 147 Adapter A (Part of 49 9200 145) 	For inspection of radiator cap

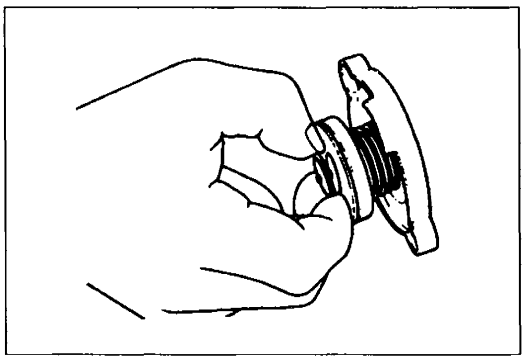
Warning

- **Removing the radiator cap or the radiator drain plug while the engine is running, or when the engine and radiator are hot is dangerous. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system.**
- **Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counterclockwise to the first stop. Step back while the pressure escapes.**
- **When you're sure all the pressure is gone, press down on the cap—still using a cloth—turn it, and remove it.**



INSPECTION
Radiator Cap Valve

1. Remove the radiator cap.
2. Attach the radiator cap to a radiator cap tester with the **SST**. Apply pressure gradually to **74—102 kPa { 0.75—1.05 kgf/cm^2 , 10.7—14.9 psi }**.
3. Verify that the pressure is held at least **10 seconds**.



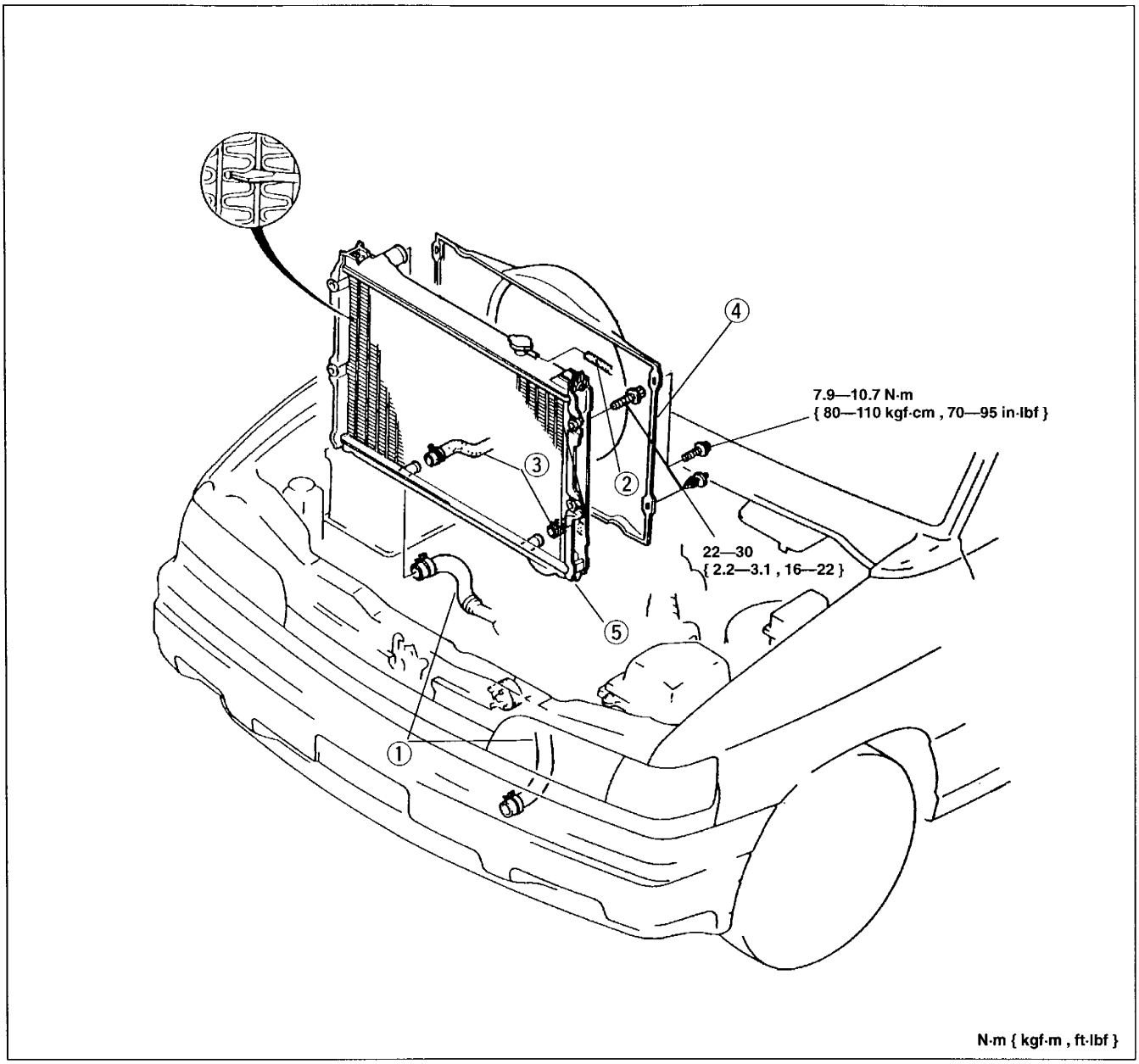
Negative Pressure Valve

1. Pull the negative pressure valve to open it. Verify that it closes completely when released.
2. Check for damage on the contact surfaces and for cracked or deformed seal packing.
3. Replace the radiator cap if necessary.

RADIATOR

REMOVAL / INSTALLATION

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (Refer to page E–4.)
3. Remove the fresh-air duct. (Refer to section F.)
4. Remove in the order shown in the figure.
5. Install in the reverse order of removal.
6. Install the fresh-air duct. (Refer to section F.)



1. Upper and lower radiator hoses
2. Coolant reservoir hose
3. Oil cooler hose
4. Radiator cowling
5. Radiator

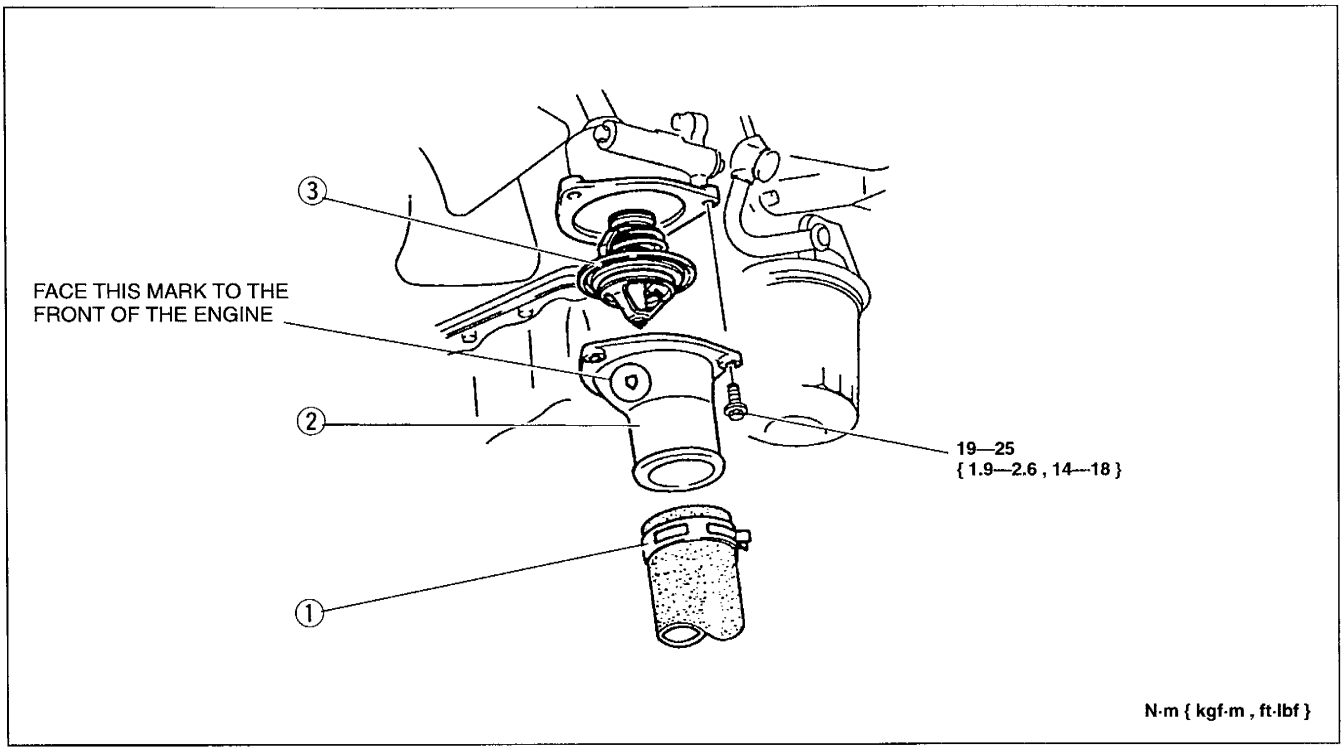
Steps After Installation

1. Fill the radiator and coolant reservoir with the specified amount and type of engine coolant. (Refer to page E–5.)
2. Check the ATF level and add ATF if necessary. (Refer to section K.)
3. Check the ATF and coolant leaks.

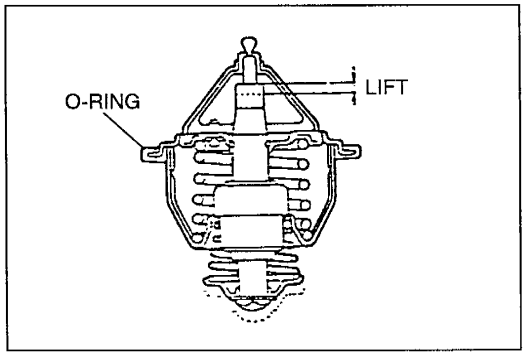
THERMOSTAT

REMOVAL / INSPECTION / INSTALLATION

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (Refer to page E–4.)
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.



1. Lower radiator hose
2. Thermostat cover
3. Thermostat
   Inspection ..... below



Inspection

Check the thermostat and replace if necessary.

1. Check the O-ring for damage.
2. Visually check that the valve is airtight.
3. Place the thermostat and a thermometer in water. Heat the water and check the following.

Initial-opening temperature:
81.5—84.5 °C { 179—184 °F }
Full-open temperature: 96 °C { 205 °F }
Full-open lift: 9.0 mm { 0.35 in } min.

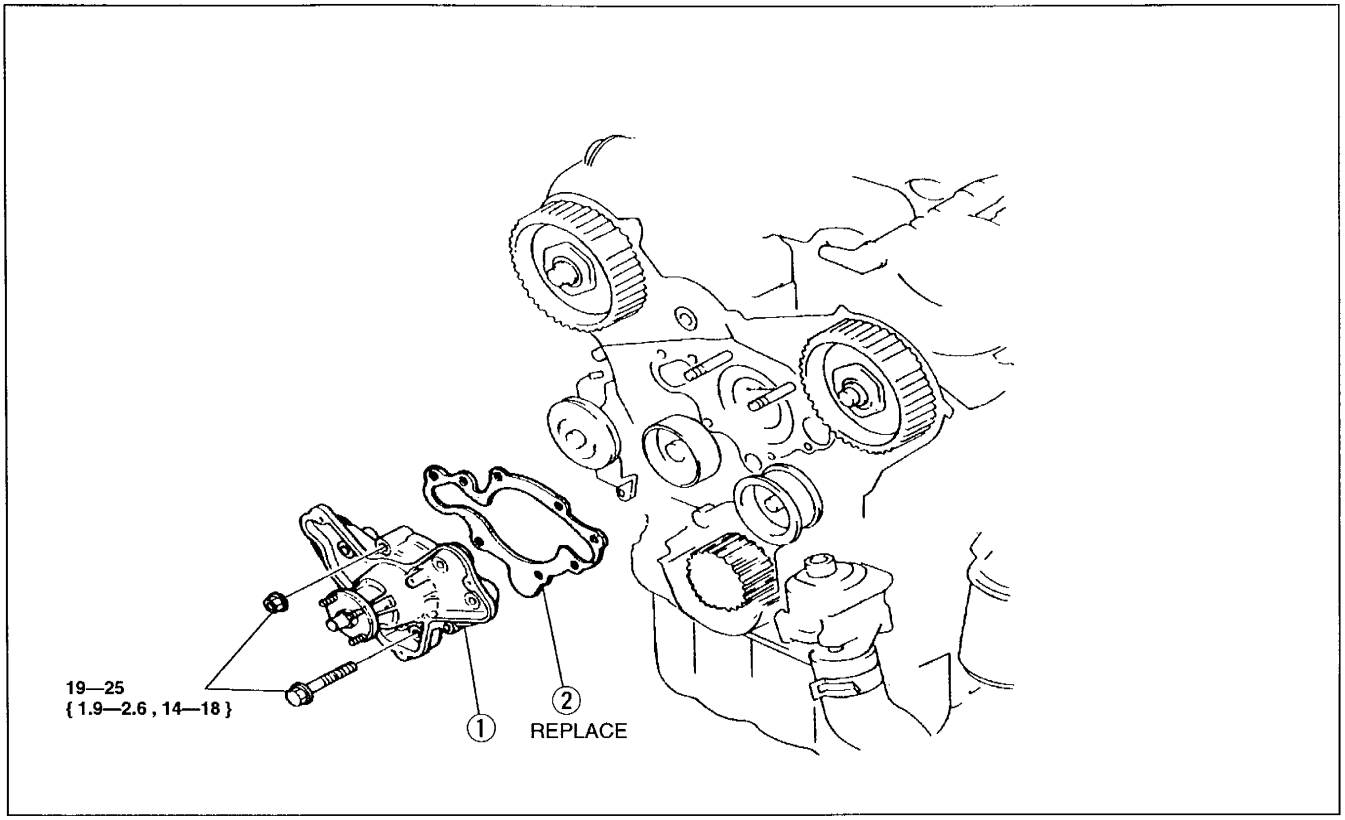
Steps After Installation

1. Fill the radiator and coolant reservoir with the specified amount and type of engine coolant. (Refer to page E–5.)
2. Start the engine and check for coolant leaks.

WATER PUMP

REMOVAL / INSTALLATION

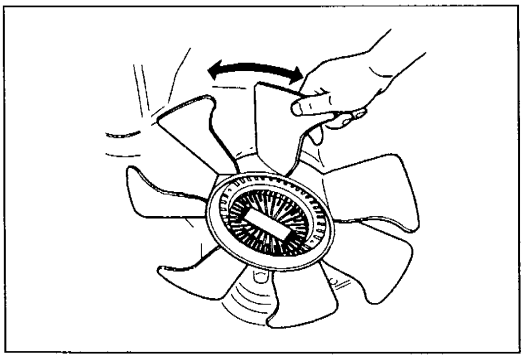
1. Disconnect the negative battery cable.
2. Turn the crankshaft so that the No.1 cylinder is at TDC of compression.
3. Drain the engine coolant. (Refer to page E–4.)
4. Remove the timing belt. (Refer to section B.)
5. Remove in the order shown in the figure.
6. Install in the reverse order of removal.



1. Water pump
   Inspect for cracks, damaged mounting surface, bearing condition, and leakage. If the water pump is damaged, replace ti. Do not repair it.
2. Water pump gasket

Steps After Installation

1. Fill the radiator and coolant reservoir with the specified amount and type of engine coolant. (Refer to page E–5.)
2. Start the engine and check for coolant leaks.



COOLING FAN

INSPECTION

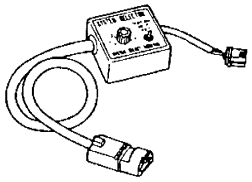
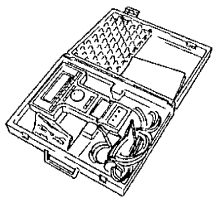
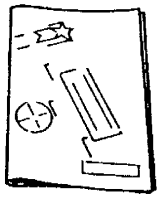
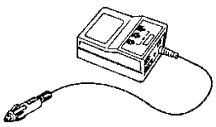
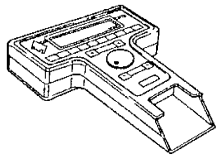
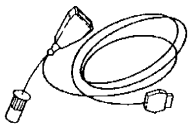
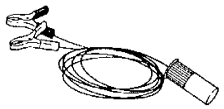
1. Inspect the following items. Replace if necessary.
   (1) Fluid leakage from the fan-drive clutch
   (2) Deformation of the bimetal
   (3) Excessive play of the cooling fan bearing
   (4) Grease leakage from the cooling fan bearing
2. While the engine is warm, turn the cooling fan by hand and check that resistance is felt. Replace the cooling fan-drive clutch if necessary.

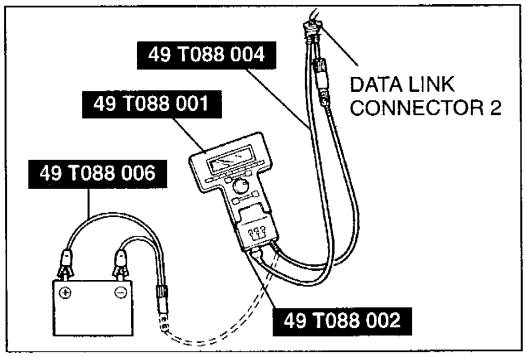
Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

FUEL AND EMISSION CONTROL SYSTEMS

ENGINE TUNE-UP

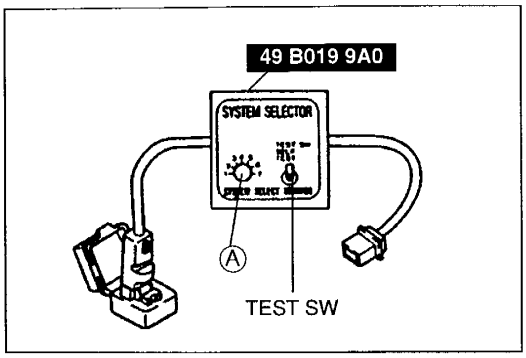
PREPARATION
SST

49 B019 9A0 System Selector 	For inspection of ignition timing and idle speed	49 T088 0A0 NGS set 	For inspection of ignition timing and idle speed
49 T088 010B Program Card 	For inspection of ignition timing and idle speed	49 D088 008A Instruction Manual 	For inspection of ignition timing and idle speed
49 T088 002 Vehicle Interface Module (Part of 49 T088 0A0) 	For inspection of ignition timing and idle speed	49 T088 001 Control Unit (Part of 49 T088 0A0) 	For inspection of ignition timing and idle speed
49 T088 004 NGS OBD II Adapter (Part of 49 T088 0A0) 	For inspection of ignition timing and idle speed	49 T088 006 Battery Hookup Adapter (Part of 49 T088 0A0) 	For inspection of ignition timing and idle speed



ADJUSTMENT
Preparation

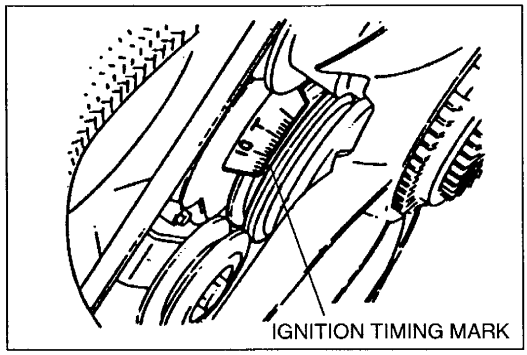
1. Warm up the engine to normal operating temperature.
2. Shift the transmission into P position.
3. Turn off all loads.
   - Headlight
   - Blower motor
   - Rear window defroster
   - Power steering
4. Connect the **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard and select the "PID/DATA MONITOR AND RECORD" function.
5. Select "RPM" on the NGS display.



Ignition Timing

1. Perform "Preparation". (Refer to page F–2.)
2. Connect a timing light to the high-tension lead No.1.
3. Connect the **SST** (System Selector) to the data link connector.
4. Set switch Ⓐ to position 1.
5. Set the test switch to SELF TEST.
6. Verify that the idle speed is with in the specification; if not, adjust it.

   Specification: 500—900 rpm

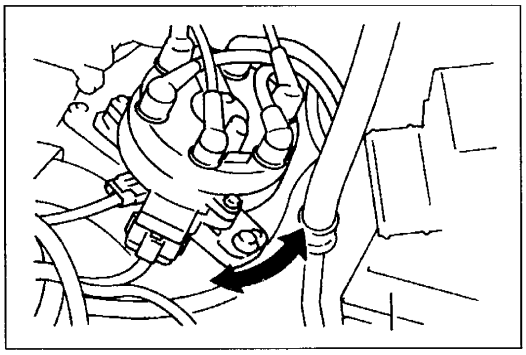


7. Verify that the timing mark (yellow) is within the specification.

   Specification: BTDC 10—12° (11 ± 1°)

8. If not as specified, loosen the distributor lock bolts and turn the distributor to make the adjustment.
9. Tighten the distributor lock bolts to the specified torque.

   Tightening torque:
   19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }



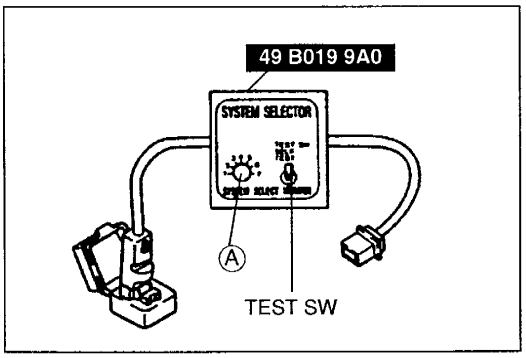
10. Disconnect the **SST** (System Selector).
11. Verify that the timing mark (yellow) is within the specification.

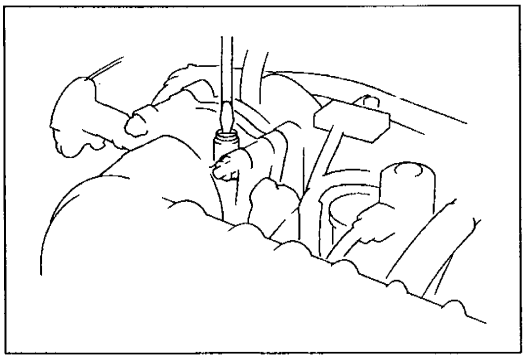
    Specification: ATDC 2—BTDC 34°

Idle Speed

1. Perform "Preparation". (Refer to page F–2.)
2. Connect the **SST** (System Selector) to the data link connector.
3. Set switch Ⓐ to position 1.
4. Set the test switch to SELF TEST.
5. Verify that the idle speed is within the specification.

   Specification: 760—800 (780 ± 20) rpm





Caution

- **The throttle adjusting screw is set at the factory and must not be adjusted. Any adjustment will negatively effect the engine performance.**

6. If not within the specification, adjust the idle speed by turning the air adjusting screw.
7. Disconnect the **SST** (System Selector).

Idle-up Speed

1. Perform "Preparation". (Refer to page F–2.)
2. Verify that the idle speed is within the specification.

   Specification: 760—800 (780 ± 20) rpm

3. If not as specified, adjust the idle speed.
   (Refer to page F–3.)
4. Check the idle speed with the following load conditions.

Specification

Load condition	Idle speed (rpm)
Fan switch ON at max. speed	730—830
Headlight switch ON	730—830
Rear window defroster switch ON	730—830
P/S ON	730—830
A/C ON	750—850

Note

- Excludes temporary idle speed drop just after the electrical loads are turned on.

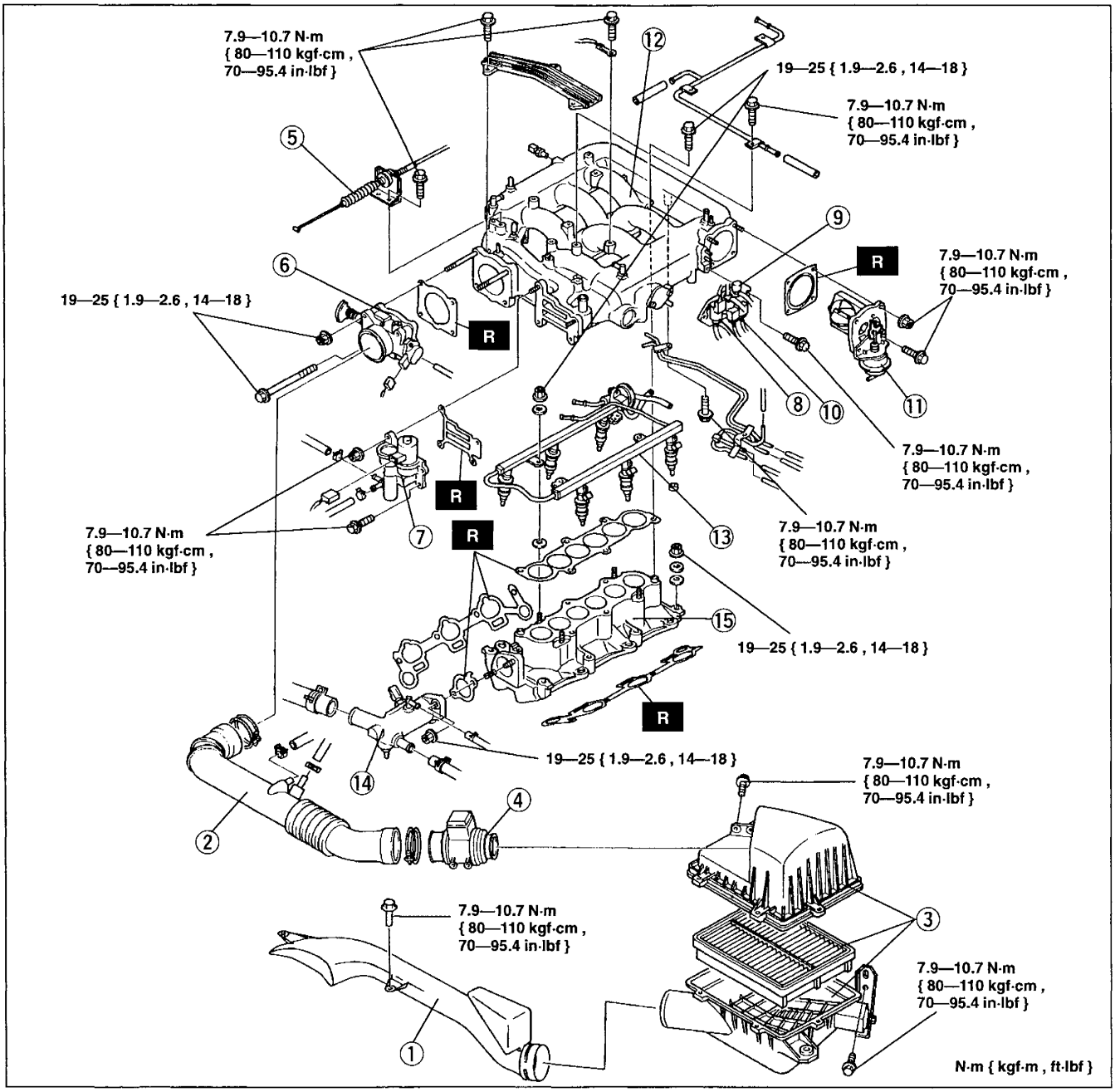
5. If not as specified with all load conditions, inspect the idle air control valve. (Refer to page F–7.)
   If not as specified with some load condition, check related input switches, harnesses and connectors.

INTAKE-AIR SYSTEM

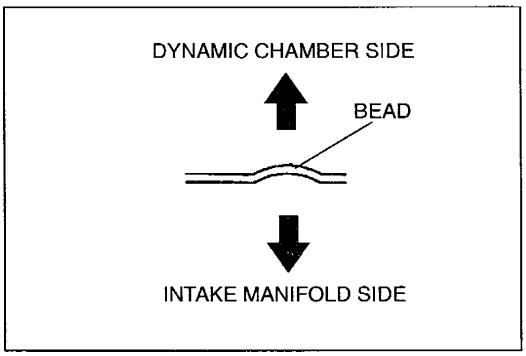
COMPONENT PARTS
Removal / Installation

Warning
- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**

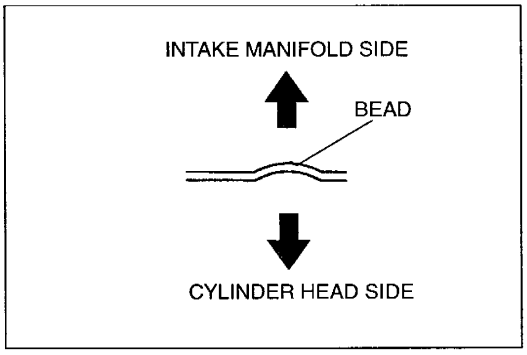
1. Disconnect the negative battery cable.
2. Drain the engine coolant from the radiator. (Refer to section E.)
3. Remove in the order shown in the figure, referring to **Removal note**.
4. Install in the reverse order of removal, referring to **Installation note**.
5. Refill the radiator with the specified engine coolant. (Refer to section E.)



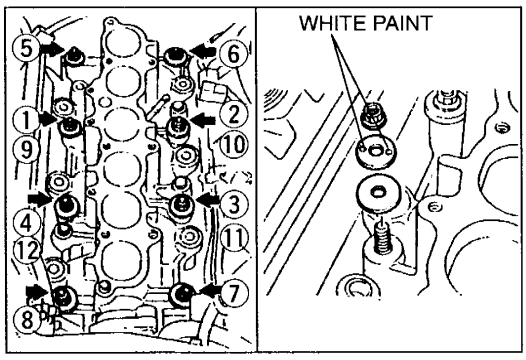
1. Fresh-air duct
2. Air intake hose
3. Air cleaner
4. Mass air flow sensor
5. Accelerator cable
   Inspection / Adjustment ..... page F–8
6. Throttle body
7. BAC valve
   Inspection ..... below
8. VRIS solenoid valve
   Inspection ..... page F–7
9. PRC solenoid valve No.1
10. PRC solenoid valve No.2
11. VRIS shutter valve actuator
    Inspection ..... page F–7
12. Dynamic chamber
    Installation note ..... below
13. Fuel distributor
14. Water outlet pipe
15. Intake manifold
    Installation note ..... below



Installation note
Dynamic chamber
Face the bead of the gasket as shown, and install the dynamic chamber.

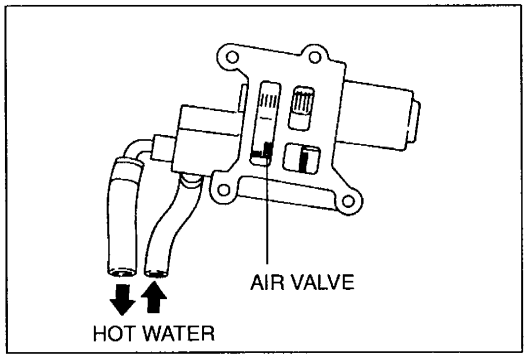


Intake manifold
1. Face the bead of the gasket toward the intake manifold as shown, and install the intake manifold.

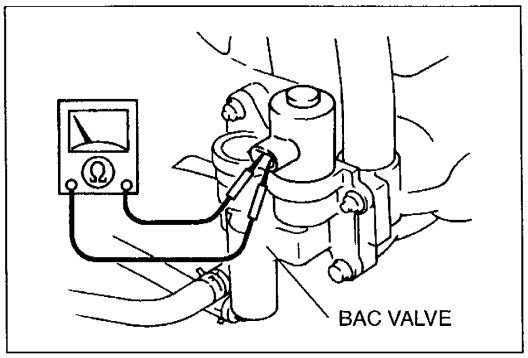


2. Install the intake manifold washers with the white paint mark upward.
3. Tighten the nuts to the specification in two steps in the sequence shown in the figure.

Tightening torque
Intake manifold and delivery pipes:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }



AIR VALVE
Inspection
1. Remove the BAC valve. (Refer to page F–5.)
2. Circulate water in the BAC valve coolant passage to cool the air valve.
3. Circulate hot water in the BAC valve coolant passage and verify that the air valve operates.
4. If not, replace the BAC valve.



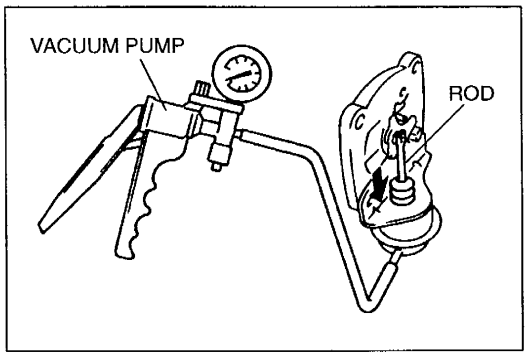
IDLE AIR CONTROL VALVE

Inspection

1. Verify that the ignition switch is OFF.
2. Disconnect the idle air control valve connector.
3. Measure the resistance of the idle air control valve by using an ohmmeter.

   Specification: 10.7—12.3 Ω [20 °C { 68 °F }]

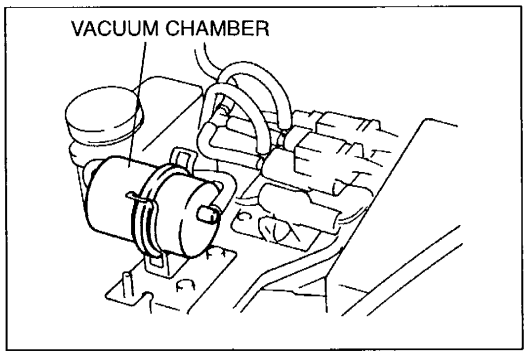
4. If not as specified, replace the BAC valve. (Refer to page F–5.)



SHUTTER VALVE ACTUATOR

Inspection

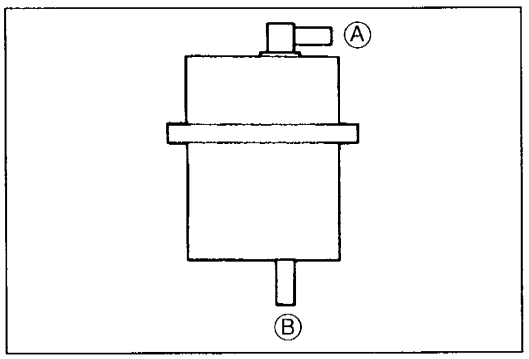
1. Connect a vacuum pump to the shutter valve actuator as shown.
2. Apply vacuum of 4.0 kPa { 30 mmHg } and verify that the rod is pulled into the actuator.
3. Apply vacuum of 25.3 kPa { 190 mmHg } and verify that the actuator opens completely (rod fully pulled in).
4. Is not as specified, replace the shutter valve actuator. (Refer to page F–5.)



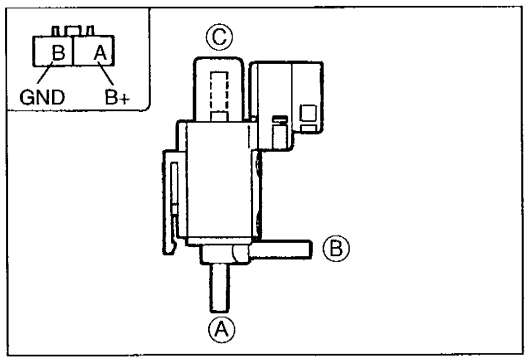
VACUUM CHAMBER

Inspection

1. Remove the vacuum chamber.
2. Visually inspect the outer surface for damage.



3. Blow air from port Ⓐ and verify that there is no airflow.
4. Blow air from port Ⓑ and verify that there is airflow.
5. If not as specified, replace the vacuum chamber.



VRIS SOLENOID VALVE

Inspection

1. Remove the VRIS solenoid valve. (Refer to page F–5.)
2. Check for airflow between ports of the solenoid valve.

O—O: Continuity O═O: Airflow B+: Battery positive voltage

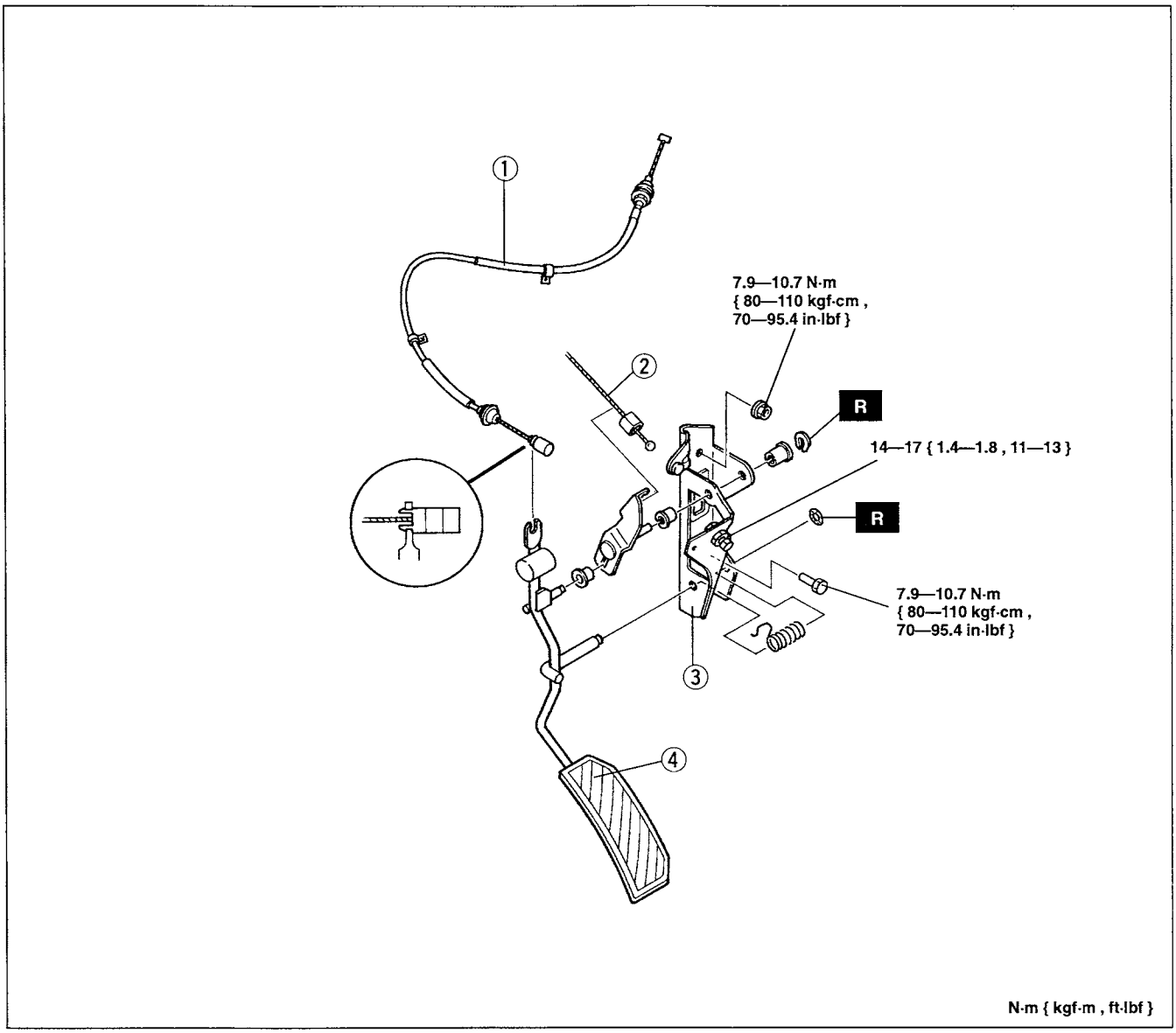
Step	Terminal		Port		
	A	B	A	B	C
1	O—O			O═O	
2	B+	Ground	O═O		

3. If not as specified, replace the VRIS solenoid valve.

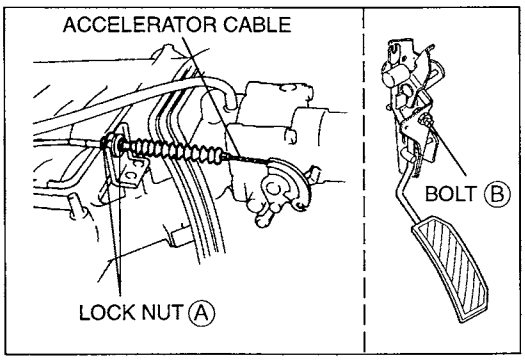
ACCELERATOR PEDAL

Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Accelerator cable
   Inspection / Adjustment ..... below
2. Actuator cable (with cruise control)
3. Retainer
4. Accelerator pedal



ACCELERATOR CABLE

Inspection / Adjustment

1. Verify that the throttle valve is at the closed throttle position.
2. Measure the free play of the accelerator cable.

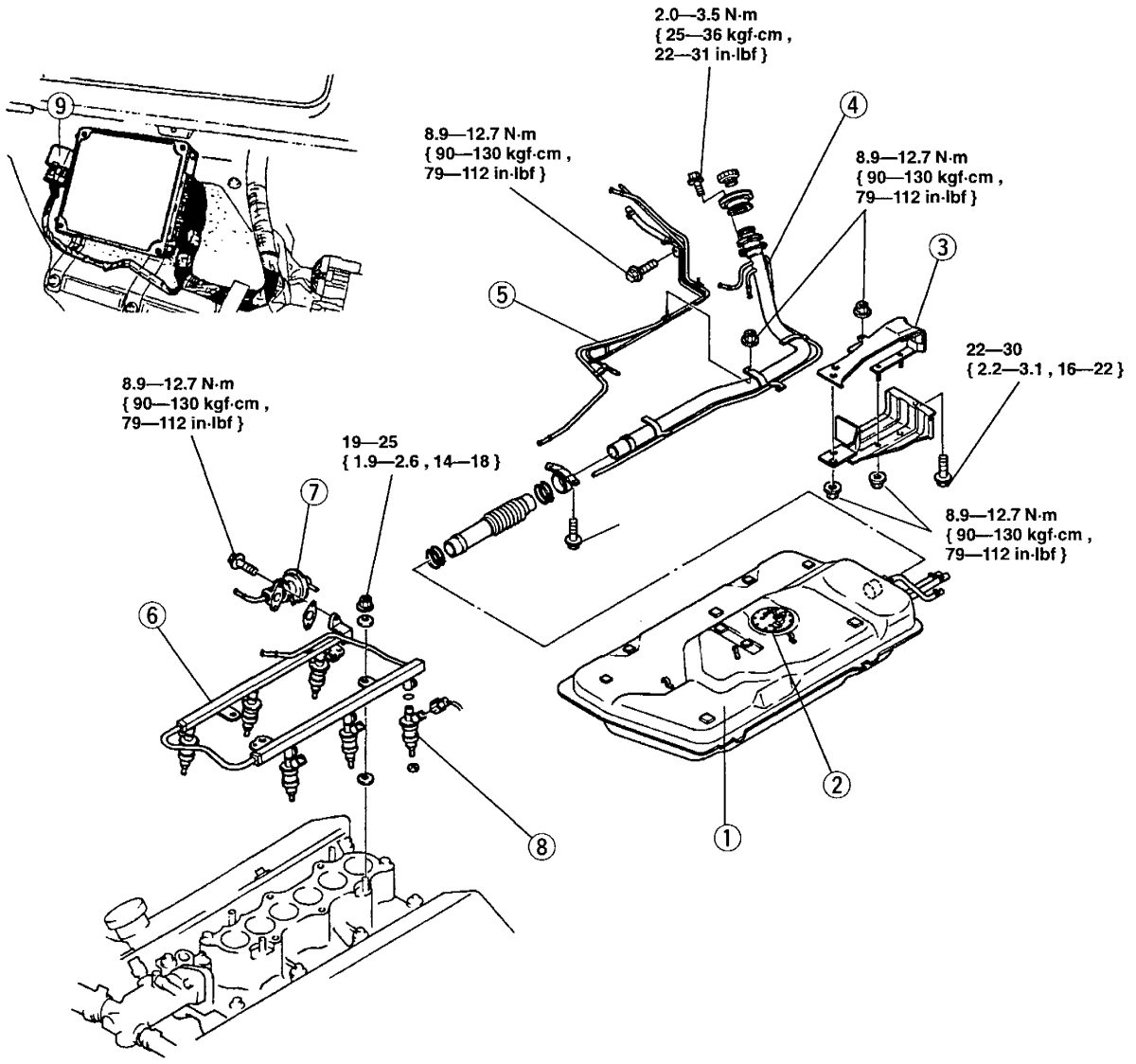
   Free play: 1—3 mm { 0.04—0.11 in }

3. If not as specified, adjust by turning locknut Ⓐ.
4. Depress the accelerator pedal to the floor and check that the throttle valve is fully opened. Adjust with bolt Ⓑ, if necessary.

FUEL SYSTEM

COMPONENT PARTS

This system supplies the necessary fuel for combustion at a constant pressure to the fuel injectors. Fuel is metered and injected into intake manifold according to the injection control signals from the engine control module. It consists of the fuel tank, the fuel pump, the fuel filters, the delivery pipe, the pulsation damper, the pressure regulator, the fuel injectors, and the fuel pump relay.



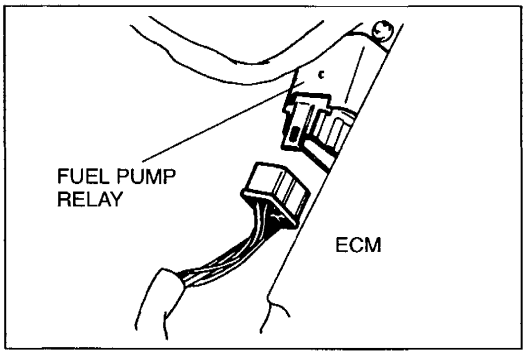
1. Fuel tank
2. Fuel pump
3. Fuel hose protect
4. Fuel hose
5. Evaporative hose
6. Delivery pipe
7. Pressure regulator
8. Fuel injector
9. Fuel pump relay

PRECAUTION
Fuel Pressure Release and Servicing Fuel System

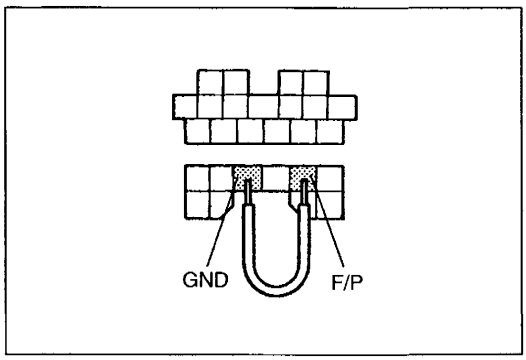
Warning
- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**

Fuel in the fuel system is under high pressure when the engine is not running.

Warning
- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the following "Fuel Line Safety Procedures".**



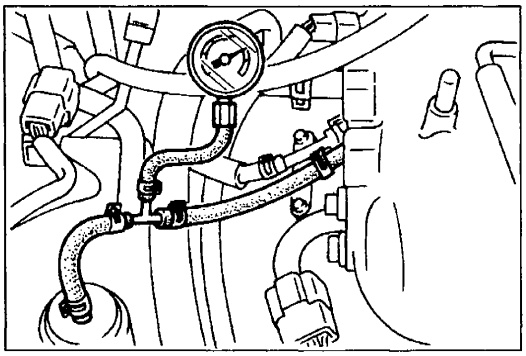
Fuel Line Safety Procedures
1. Release the fuel pressure before disconnecting a fuel line.
   (1) Start the engine.
   (2) Disconnect the fuel pump relay connector.
   (3) After the engine stalls, turn the ignition switch to OFF.
   (4) Connect the fuel pump relay connector.
2. Avoid leakage.
   (1) When disconnecting a fuel line hose, wrap a rag around it to protect against fuel leakage.
   (2) Plug the hoses after removal.
3. Install hose clamps to secure the fuel pressure gauge connections.



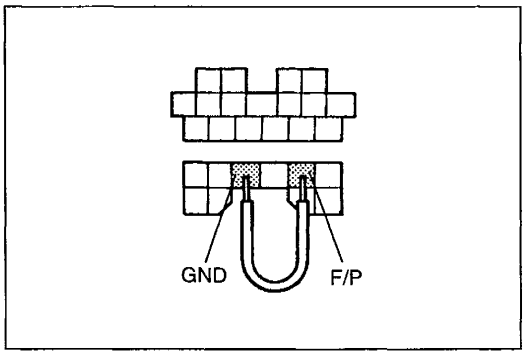
Priming Fuel System
After the fuel pressure has been released for repairs or inspection, the system must be primed to avoid excessive cranking when the engine is first started. Follow the steps below.
1. Connect the data link connector terminals F/P and GND with a jumper wire.
2. Turn the ignition switch to ON for **approx. 10 sec.** and check for fuel leaks.
3. Turn the ignition switch to OFF and remove the jumper wire.

SYSTEM INSPECTION
Fuel System Pressure Drop

Warning
- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**



1. Disconnect the negative battery cable.
2. Install a fuel pressure gauge between the fuel filter and the delivery pipe.
3. Connect the negative battery cable.



4. Connect the data link connector terminals F/P and GND with a jumper wire.
5. Turn the ignition switch to ON for **10 sec.** to operate the fuel pump.
6. Turn the ignition switch to OFF and disconnect the jumper wire.
7. Observe the fuel pressure after **5 min.**

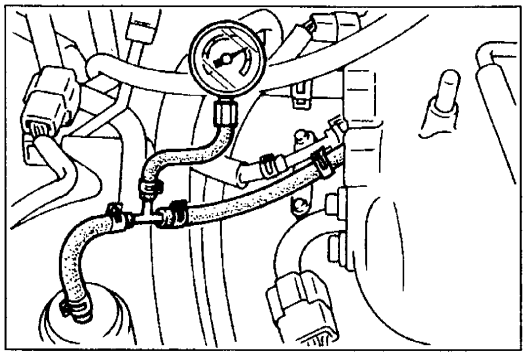
   Fuel pressure:
   More than 147 kPa { 1.5 kgf/cm^2 , 21 psi }

8. If not as specified, perform the following inspection.
   - Fuel pump fuel pressure drop (Refer to page F–15.)
   - Pressure regulator fuel pressure drop (Refer to page F–19.)
   - Fuel injector fuel leakage (Refer to page F–21.)

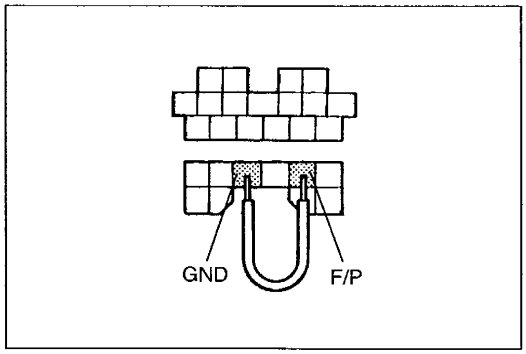
Fuel Line Pressure

Warning

- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**



1. Disconnect the negative battery cable.
2. Install the fuel pressure gauge between the fuel filter and the pulsation damper.
3. Connect the negative battery cable.



4. Connect the data link connector terminals F/P and GND with a jumper wire.
5. Turn the ignition switch to ON.
6. Measure the fuel line pressure.

Fuel line pressure:
265—313 kPa { 2.7—3.2 kgf/cm^2 , 39—45 psi }

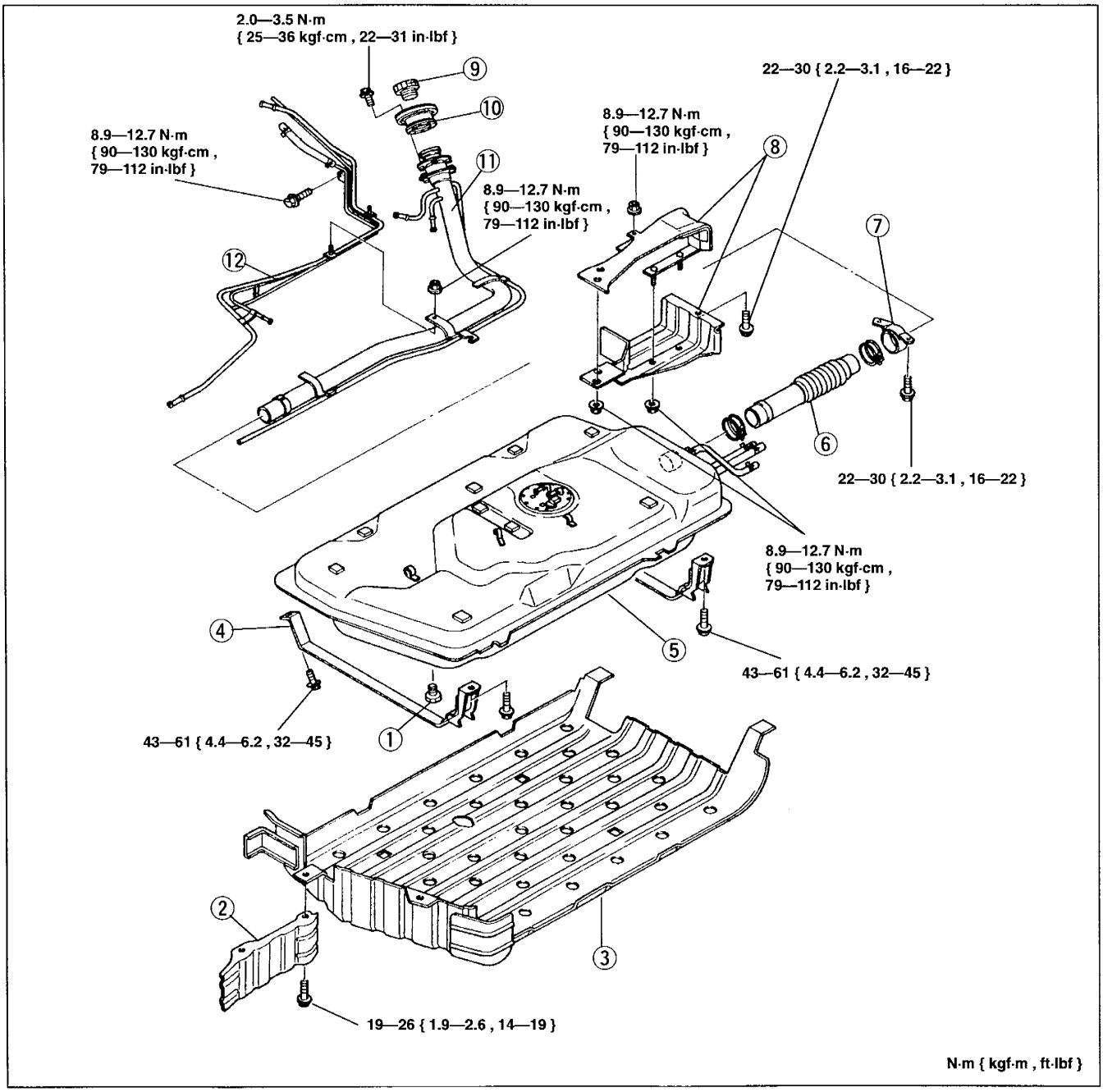
Low pressure—	Check fuel pump maximum pressure. (Refer to page F–16.)
High pressure—	Replace the pressure regulator. (Refer to page F–20.)

FUEL TANK
Removal / Inspection / Installation

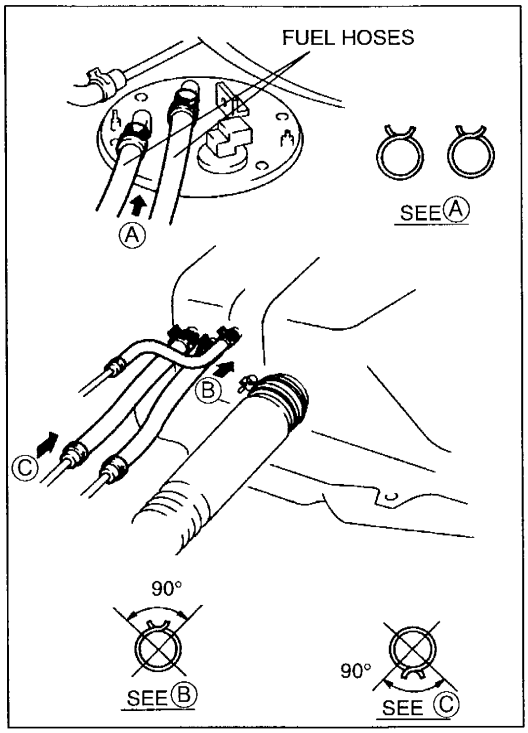
Warning

- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**
- **Repairing a fuel tank that has not been properly steam cleaned can be dangerous. Explosion or fire may cause death or serious injury. Always properly steam clean a fuel tank before repairing it.**

1. Drain the fuel from the fuel tank.
2. Remove in the order shown in the figure.
3. Inspect all parts and repair or replace as necessary.
4. Install in the reverse order of removal, referring to **Installation Note**.



1. Drain plug
2. Pipe protect
3. Under guard
4. Tank strap
5. Fuel tank
6. Fuel hose
7. Fuel hose bracket
8. Fuel hose protect
9. Fuel filler cap
10. Dust cover
11. Fuel filler hose
12. Evaporative hose

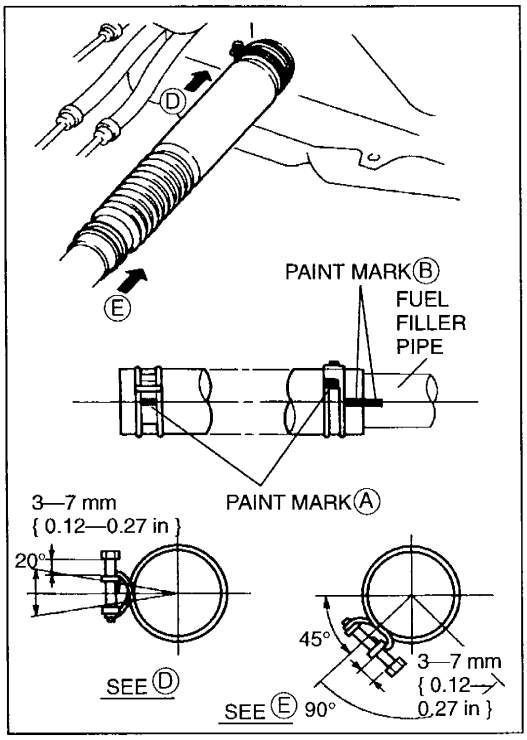


Installation note
Fuel hose, evaporative hose, breather hose

- Push the ends of the fuel hoses, evaporative hose, and breather hose onto the respective fittings.

  Specification: 25—30 mm { 0.99—1.18 in }

- Install the clip on the fuel hoses with its tongues facing upward.
- Install the clip on the evaporative hose and breather hose as shown.
- Be sure the hoses are not bent or twisted.

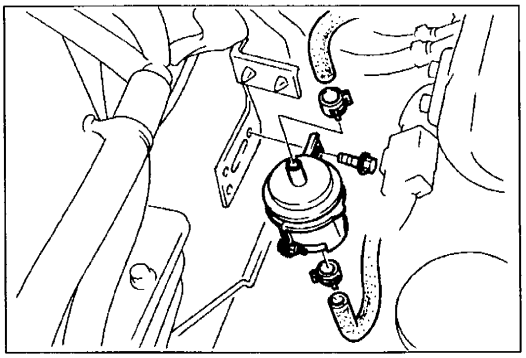


Joint hose

- Push the ends of the joint hose onto the fitting.

  Specification: 35—40 mm { 1.38—1.57 in }

- Install the clamp on the joint hose. Position the clamp so that paint mark Ⓐ is visible under it as shown.
- Install the joint hose onto the fuel filler pipe. Align paint marks Ⓑ on the hose and on the pipe.
- Be sure the hose is not bent or twisted.



FUEL FILTER (HIGH PRESSURE SIDE)

Replacement

The fuel filter must be replaced at the intervals outlined in the maintenance schedule.

Warning

- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**

1. Disconnect the fuel hoses from the fuel filter.
2. Remove the fuel filter and bracket.
3. Install in the reverse order of removal.
4. Verify that the fuel hoses are pushed fully onto the fuel filter nipples.

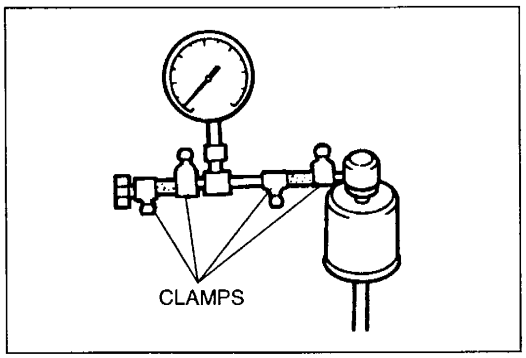
FUEL PUMP

Inspection

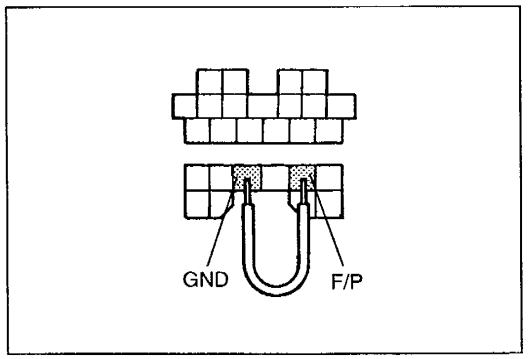
Fuel pressure drop

Warning

- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**



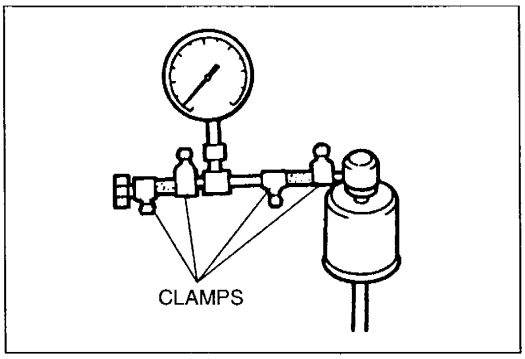
1. Disconnect the negative battery cable.
2. Install a fuel pressure gauge to the outlet of the fuel filter and plug the outlet of the fuel pressure gauge as shown. (Install clamps as shown.)
3. Connect the negative battery cable.



4. Connect the data link connector terminals F/P and GND with a jumper wire.
5. Turn the ignition switch to ON for **10 sec.** to operate the fuel pump.
6. Turn the ignition switch to OFF and disconnect the jumper wire.
7. Observe the fuel pressure after **5 min.**.

Fuel pressure:
More than 343 kPa { 3.5 kgf/cm^2 , 50 psi }

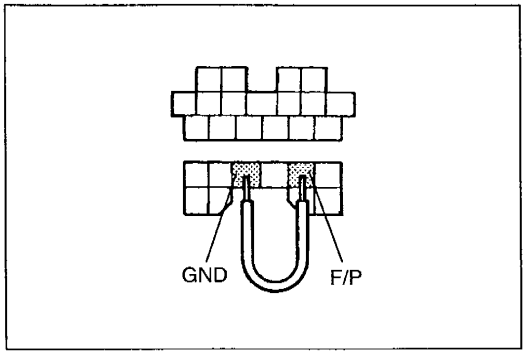
8. If not as specified, replace the fuel pump.



Fuel pump maximum pressure

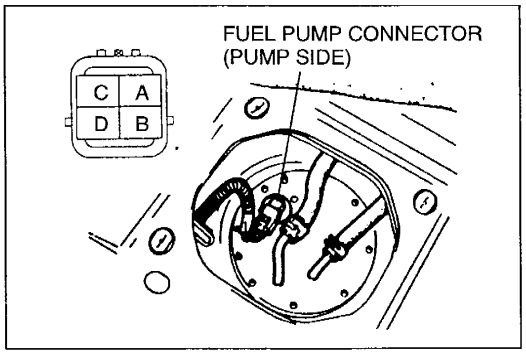
Warning

- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**



1. Disconnect the negative battery cable.
2. Install a fuel pressure gauge to the outlet of the fuel filter and plug the outlet of the fuel pressure gauge as shown. (Install clamps as shown.)
3. Connect the negative battery cable.
4. Connect the data link connector terminals F/P and GND with a jumper wire.
5. Turn the ignition switch to ON to operate the fuel pump.
6. Measure the fuel pump maximum pressure.

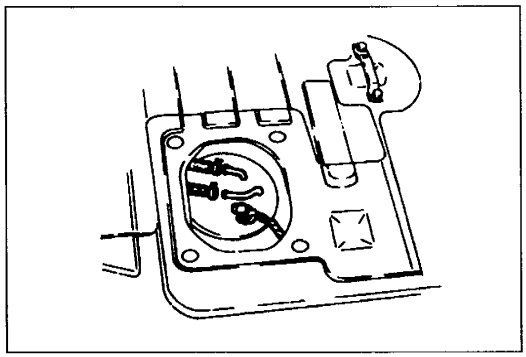
Fuel pump maximum pressure:
442—637 kPa { 4.5—6.5 kgf/cm^2 , 64—92 psi }



7. Turn the ignition switch OFF and disconnect the jumper wire.
8. If not as specified, replace the fuel pump.

Fuel pump continuity

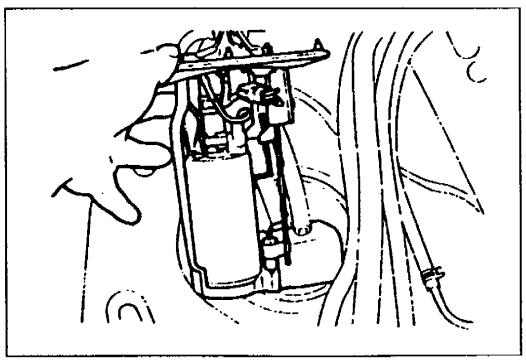
1. Remove the No.2 rear seat.
2. Lift up the rear floormat.
3. Remove the fuel pump cover.
4. Disconnect the fuel pump connector, and check for continuity between fuel pump connector (pump side) terminals C and D.
5. If there is no continuity, replace the fuel pump. (Refer to below.)



Removal / Installation

Warning

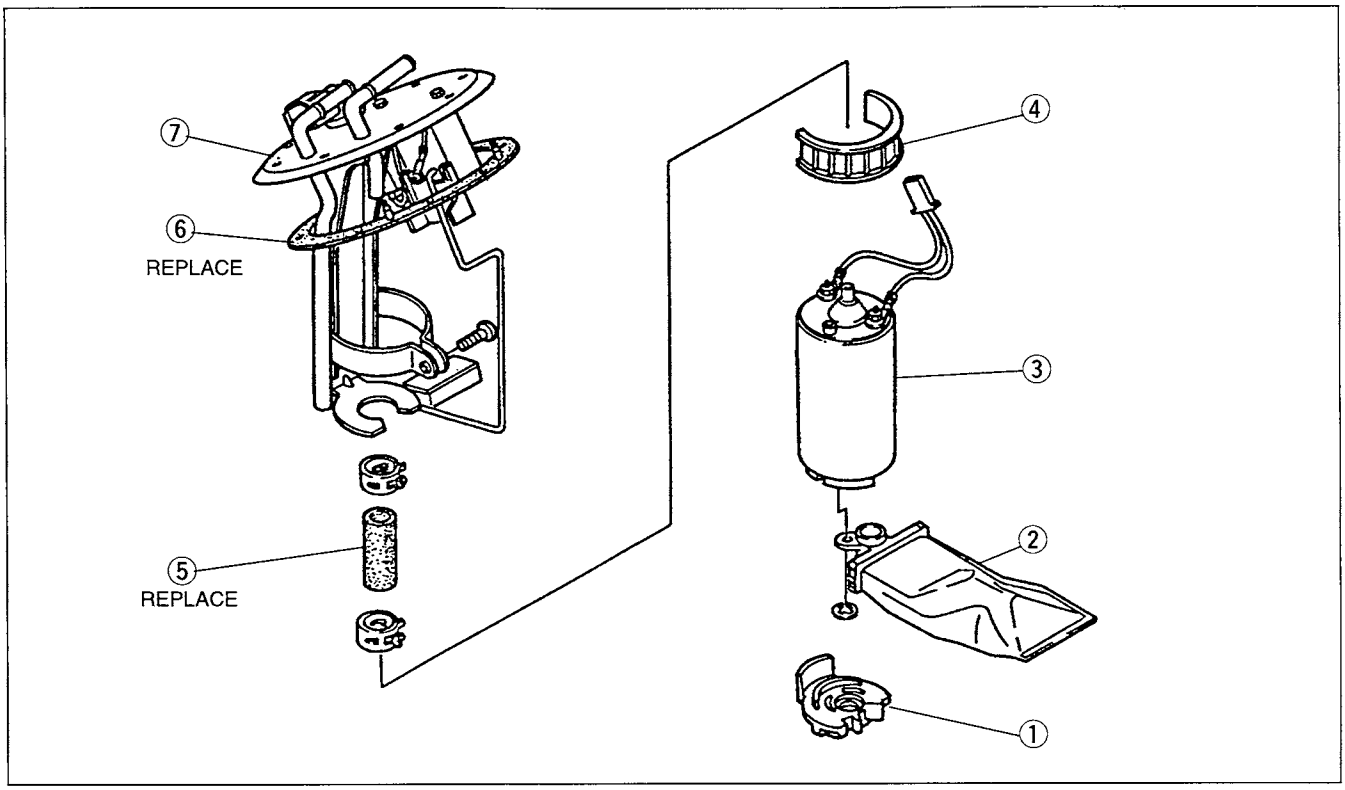
- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**



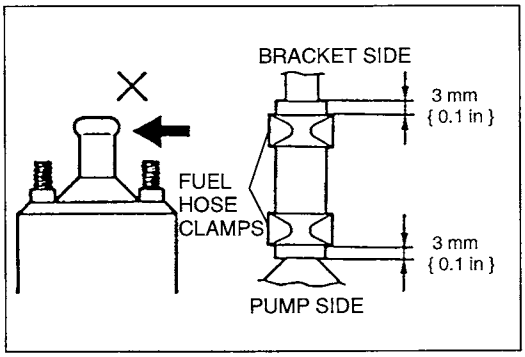
1. Remove the No.2 rear seat.
2. Lift up the rear floormat.
3. Remove the fuel pump cover.
4. Disconnect the fuel pump connector.
5. Disconnect the fuel hoses.
6. Remove the fuel pump and fuel tank gauge unit assembly.
7. Use a new rubber seal, and install in the reverse order of removal.

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.

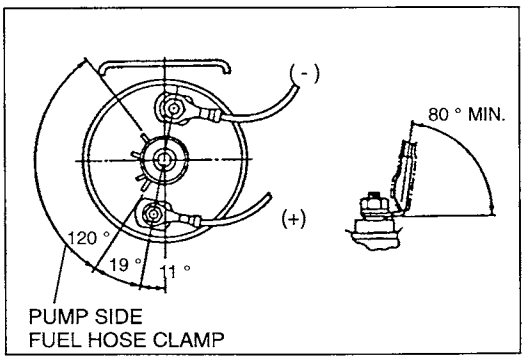


1. Mounting rubber
2. Fuel filter (low pressure side)
3. Fuel pump
   Assembly Note ..... below
4. Mount
5. Fuel hose
   Assembly Note ..... below
6. Seal rubber
7. Fuel tank gauge sender unit

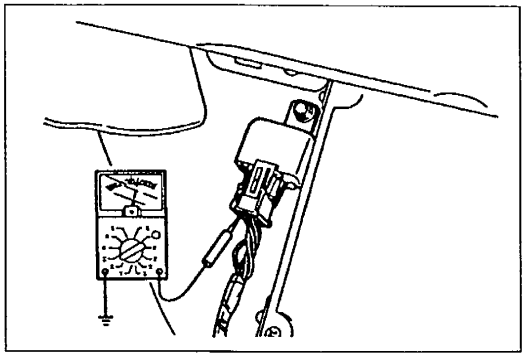


Assembly Note

1. Do not apply excessive side force when pushing the fuel hose onto the fuel pump nipple.
2. Install the clamps as shown.



3. Install the pump side fuel hose clamp and terminals in the range and direction shown in the figure.



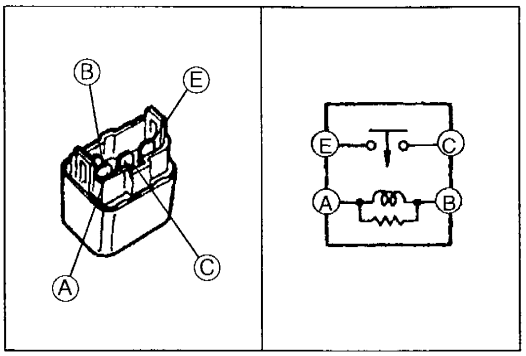
FUEL PUMP RELAY

Inspection

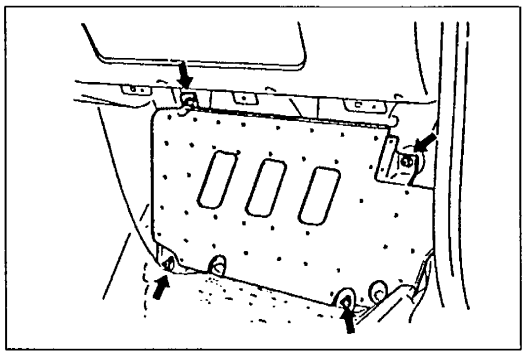
1. Remove the fuel pump relay. (Refer to below.)
2. Check for continuity between terminals of the fuel pump relay by using an ohmmeter.

O—O: Continuity B+: Battery positive voltage

Step \ Terminal	A	B	C	E
1	O	O		
2	B+	Ground	O	O

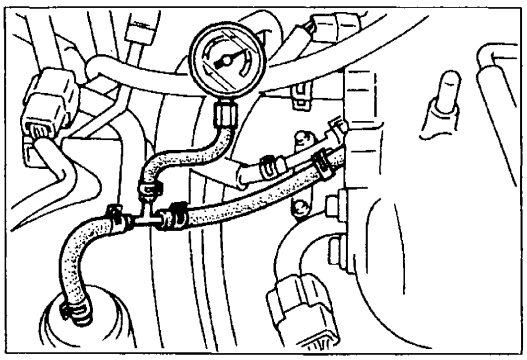


3. If not as specified, replace the fuel pump relay.



Removal / Installation

1. Lift up the floormat in front of the passenger's seat.
2. Remove the protector cover.
3. Remove the fuel pump relay.
4. Install in the reverse order of removal.



PRESSURE REGULATOR

Inspection

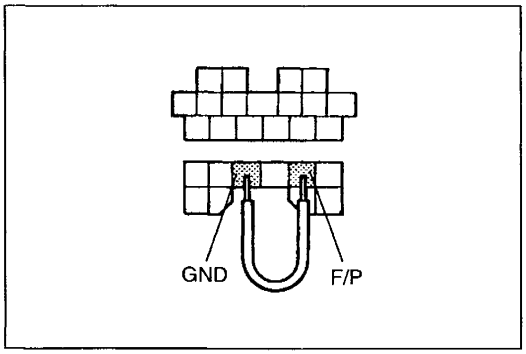
Fuel line pressure

Warning

- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**

1. Disconnect the negative battery cable.
2. Install a fuel pressure gauge between the fuel filter and pulsation damper.
3. Connect the negative battery cable.
4. Start the engine and run it at idle.
5. Measure the fuel line pressure.

Fuel line pressure:
206—254 kPa { 2.1—2.6 kgf/cm^2 , 30—36 psi }



Fuel pressure drop

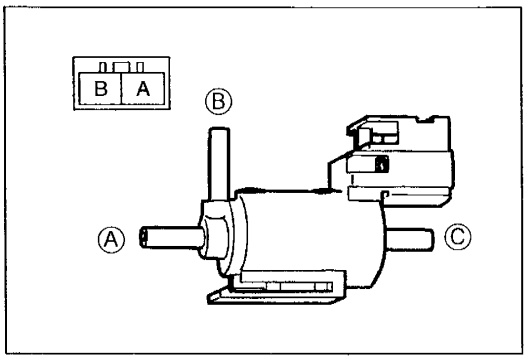
Warning

- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**

1. Disconnect the negative battery cable.
2. Install a fuel pressure gauge between the fuel filter and the pulsation damper.
3. Connect the negative battery cable.
4. Connect the data link connector terminals F/P and GND with a jumper wire.
5. Turn the ignition switch to ON for **10 sec.** to operate the fuel pump.
6. Turn the ignition switch to OFF and disconnect the jumper wire.
7. Observe the fuel pressure for **5 min.**.

Fuel pressure:
More than 147 kPa { 1.5 kgf/cm^2 , 21 psi }

8. If not as specified, replace the pressure regulator.



PRC SOLENOID VALVE (No.1, No.2)
Inspection

1. Remove the PRC solenoid valve. (Refer to page F–5.)
2. Check for airflow between ports of the solenoid valve.

○—○: Continuity ○═○: Airflow B+: Battery positive voltage

Step	Terminal		Port		
	A	B	A	B	C
1	B+	Ground	○═○		
2	○—○			○═○	

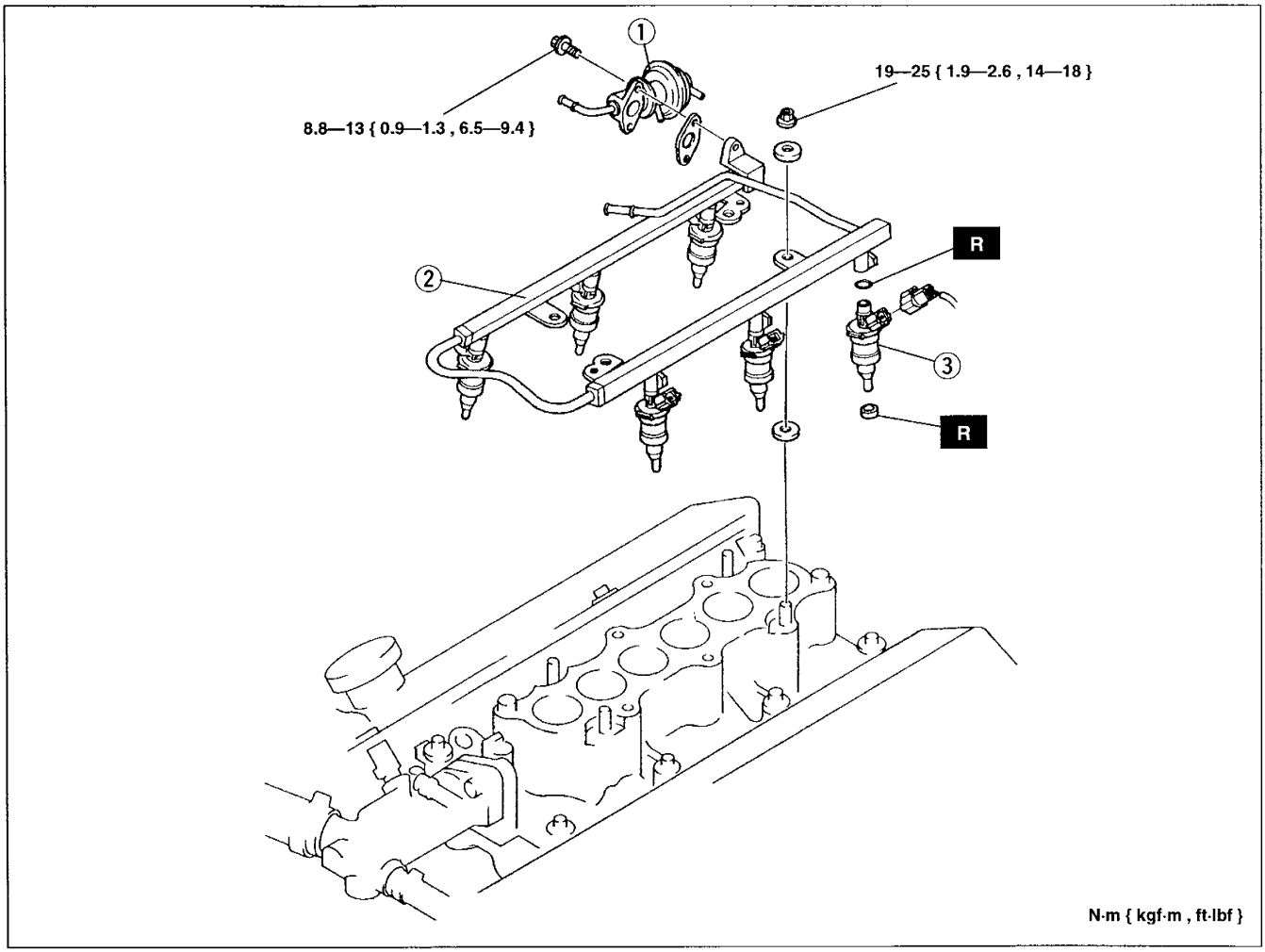
3. If not as specified, replace the PRC solenoid valve.

FUEL INJECTOR
Removal / Installation

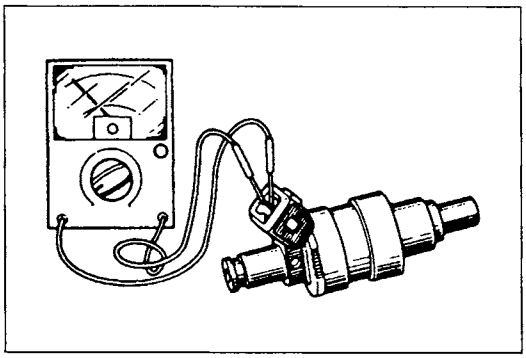
Warning

- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



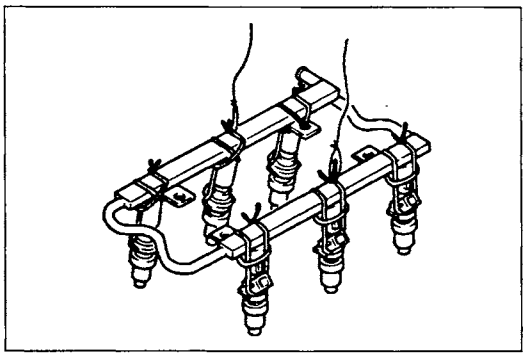
1. Pressure regulator
2. Delivery pipe
3. Fuel injector



Inspection
Resistance
1. Remove the fuel injector. (Refer to page F–20.)
2. Check resistance of the fuel injector with an ohmmeter.

   Resistance: 12—16 Ω

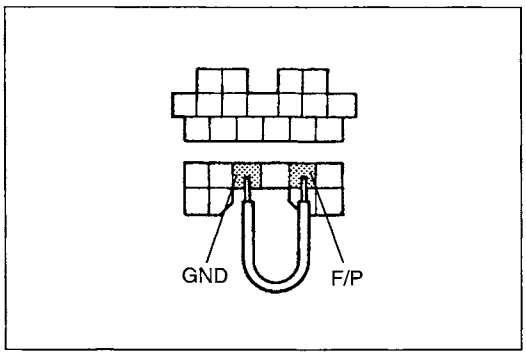
3. If not as specified, replace the fuel injector.



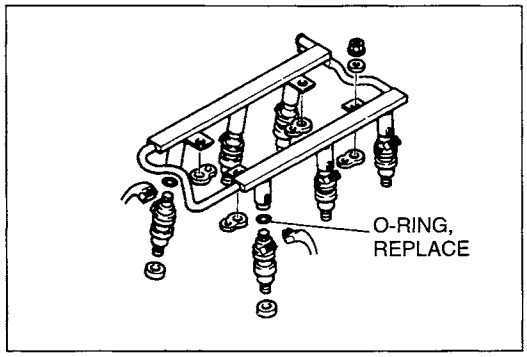
Fuel leakage test

Warning
- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**

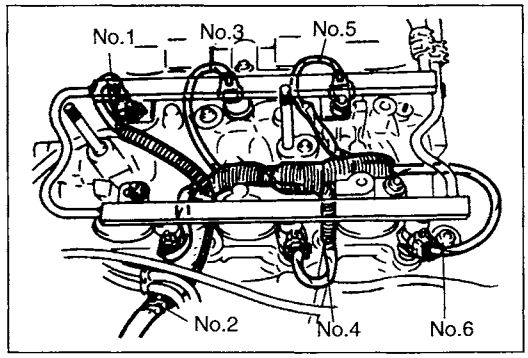
1. Fasten the fuel injectors firmly to the delivery pipe. (Refer to page F–20.)



2. Connect the data link connector terminals F/P and GND with a jumper wire. Keep the delivery pipe level. Turn the ignition switch to ON.
3. Check for fuel leaks. If there is more than one drop per minute, replace the fuel injector.
4. Turn the ignition switch to OFF and remove the jumper wire.



Installation Note
1. Use new fuel injector O-rings.
2. Apply a small amount of engine oil to the O-rings before installing.



3. Check for leaks in the fuel lines.

EXHAUST SYSTEM

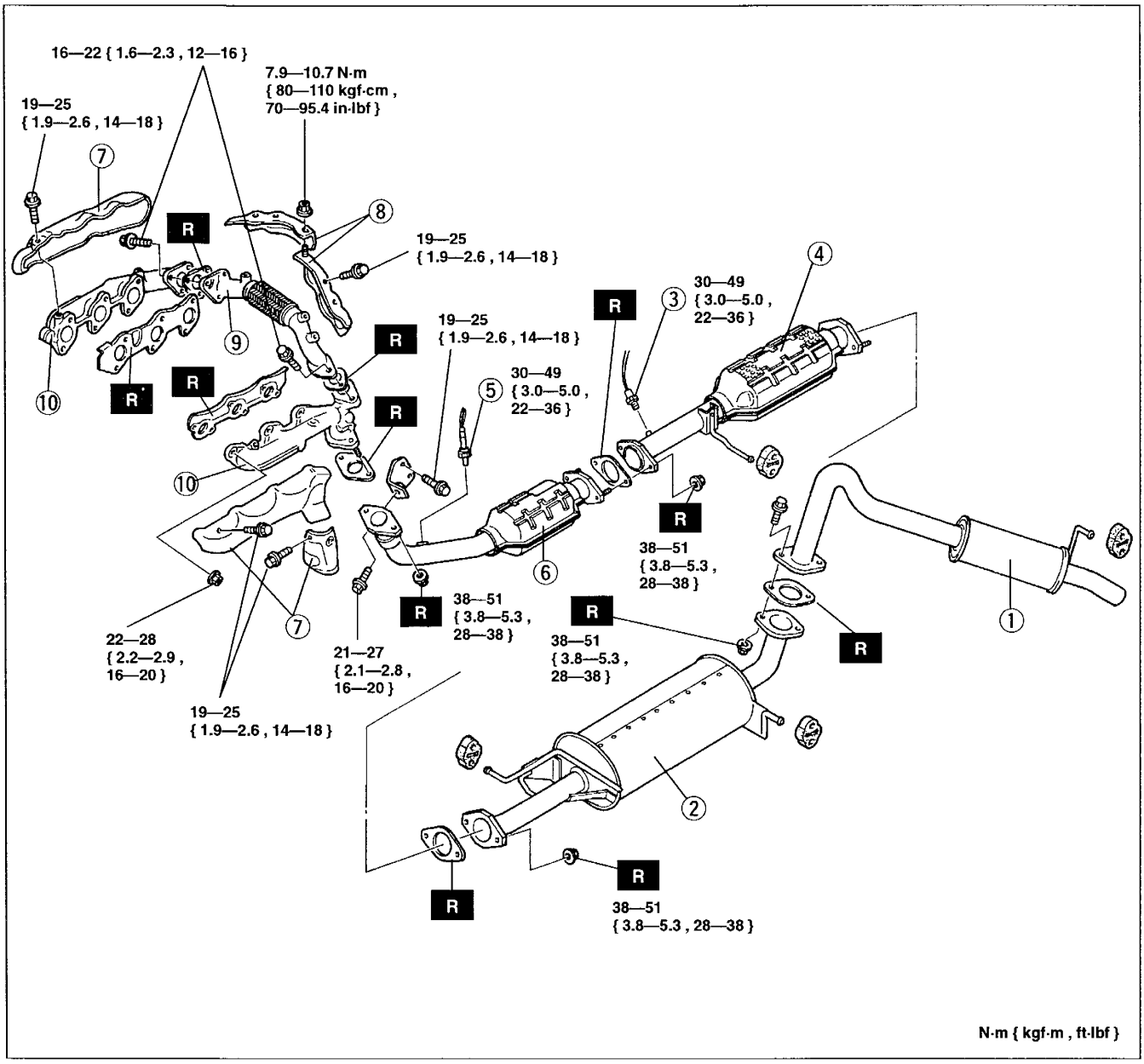
COMPONENT PARTS

Inspection

1. Start the engine and check for exhaust gas leakage from each exhaust system components.
2. If leakage is found, repair or replace as necessary.

Removal / Installation

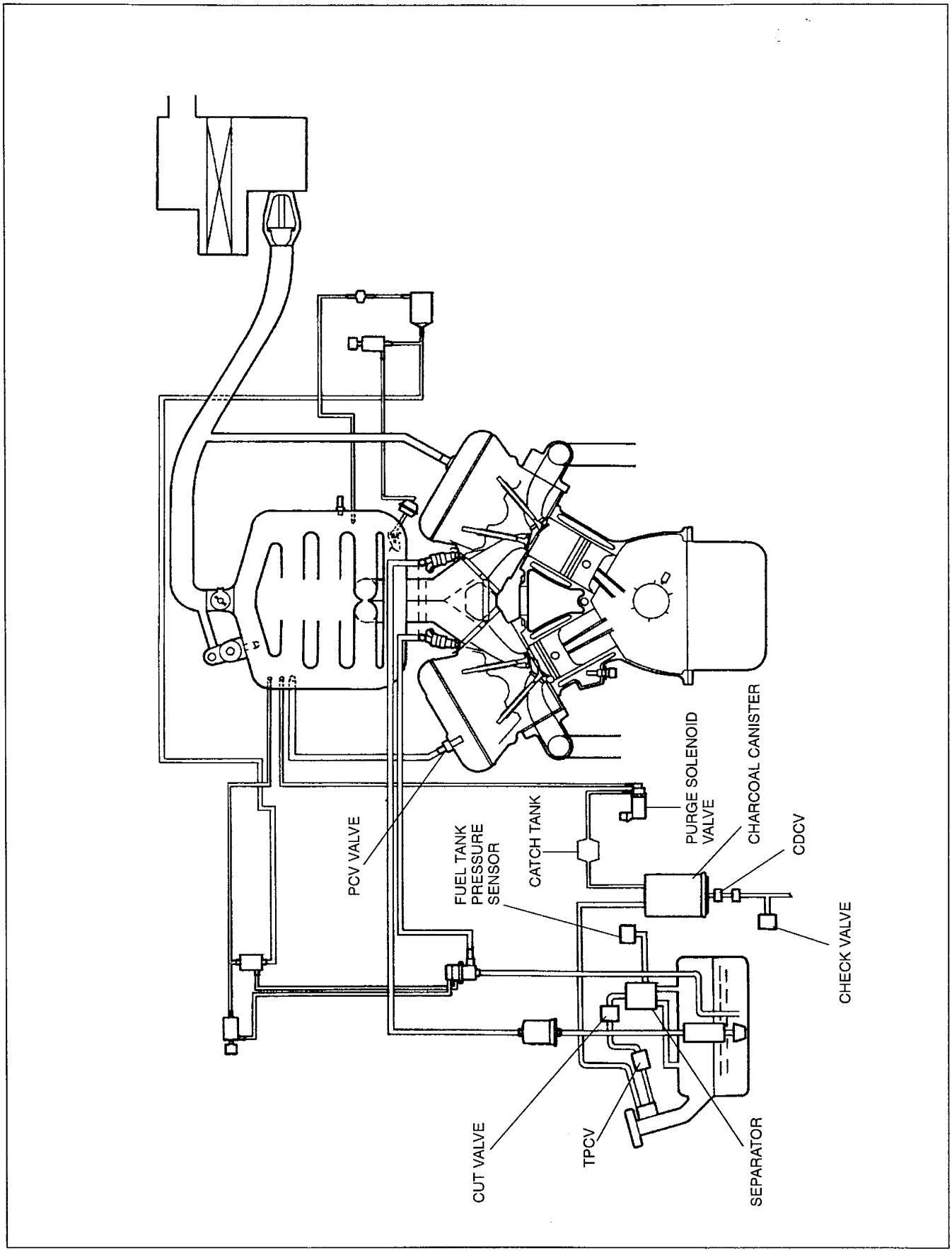
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.

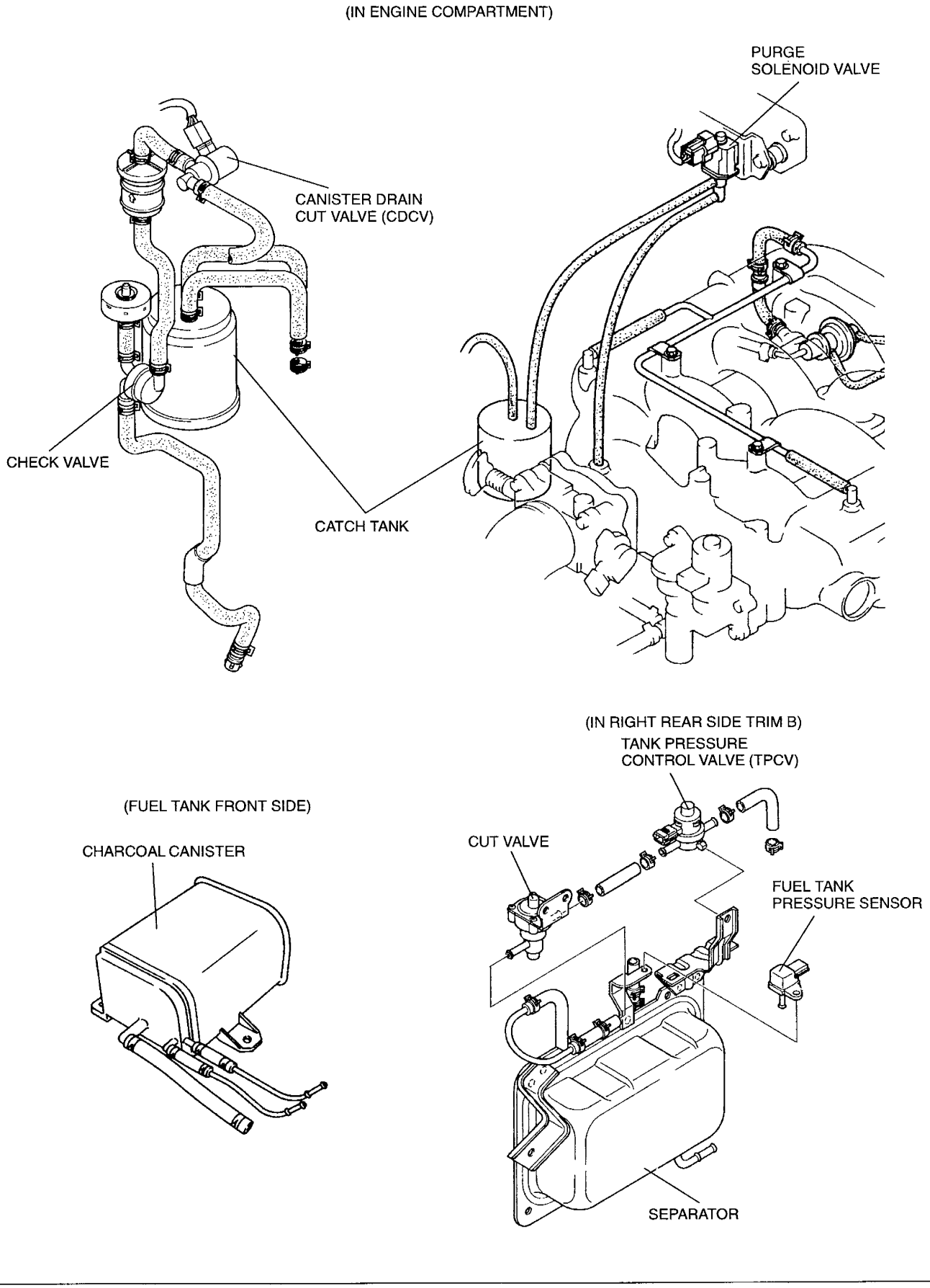


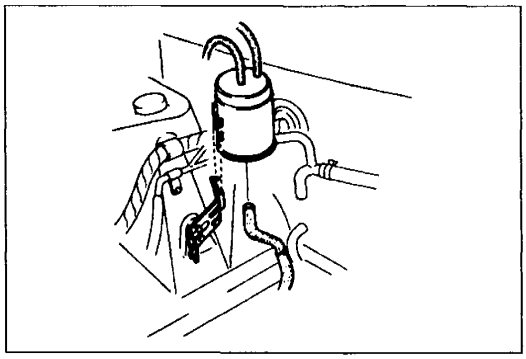
1. After-silencer
2. Main silencer
3. Heated oxygen sensor (rear)
   Inspection ..... page F–43
4. Three way catalytic converter (Main)
5. Heated oxygen sensor (front)
   Inspection ..... page F–43
6. Three way catalytic converter (pre)
7. Exhaust manifold insulator
8. Insulator
9. Center exhaust pipe
10. Exhaust manifold

EMISSION SYSTEM

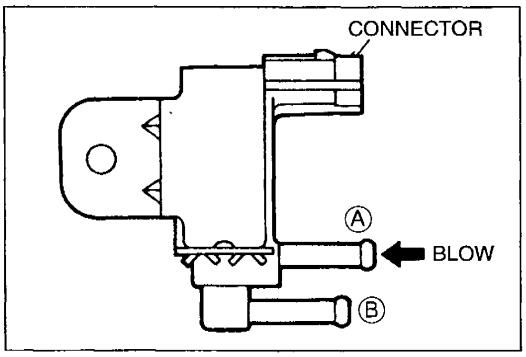
COMPONENTS PARTS




(IN ENGINE COMPARTMENT)
PURGE SOLENOID VALVE
CANISTER DRAIN CUT VALVE (CDCV)
CHECK VALVE
CATCH TANK
(IN RIGHT REAR SIDE TRIM B)
TANK PRESSURE CONTROL VALVE (TPCV)
(FUEL TANK FRONT SIDE)
CHARCOAL CANISTER
CUT VALVE
FUEL TANK PRESSURE SENSOR
SEPARATOR

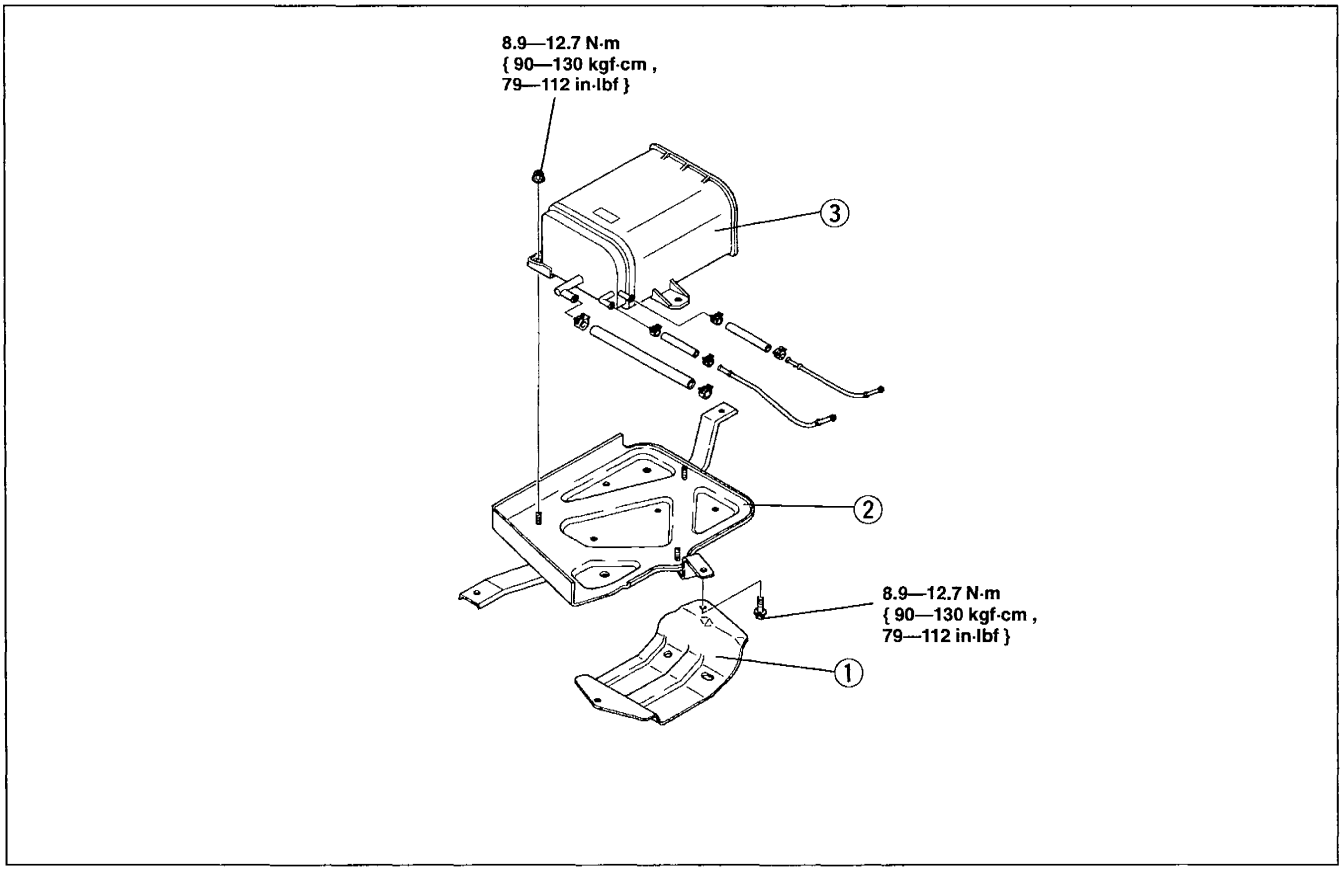


CATCH TANK
Replacement
1. Slide the catch tank out of the bracket.
2. Disconnect the three hoses.
3. Remove the catch tank.
4. Install in the reverse order of removal.

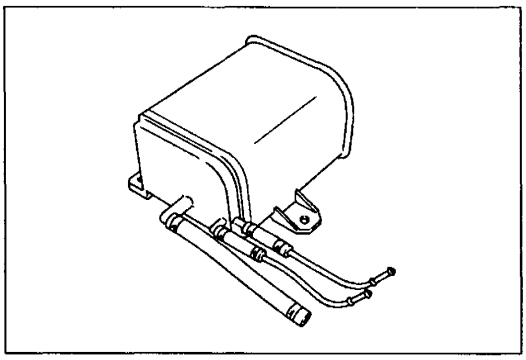


PURGE SOLENOID VALVE
Inspection (On-vehicle)
1. Warm up the engine to normal operating temperature.
2. Run the engine at idle.
3. Disconnect the vacuum hose from the charcoal canister and check that there is no vacuum.
4. If not as specified, disconnect the vacuum hose from the solenoid valve.
5. Blow through the solenoid valve from hose Ⓐ and check that air does not flow from Ⓑ.
6. If not as specified, replace the solenoid valve.

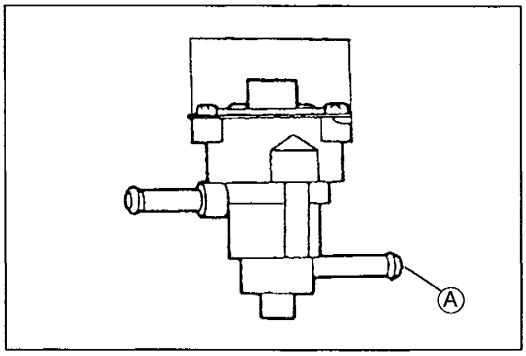
CHARCOAL CANISTER
Removal / Installation
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Pipe protector
2. Charcoal canister bracket
3. Charcoal canister

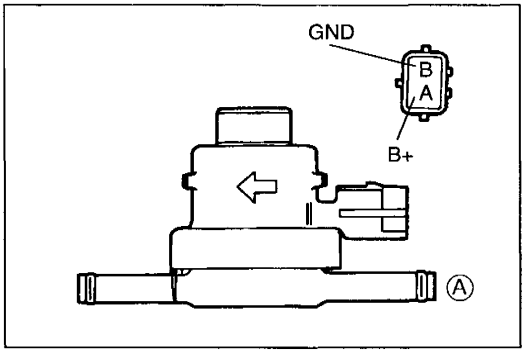


Inspection
1. Remove the charcoal canister. (Refer to page F–25.)
2. Plug the charcoal canister vent side port and purge solenoid valve side port.
3. Blow air into the charcoal canister and verify that no air leaks.
4. If air leaks, replace the charcoal canister.

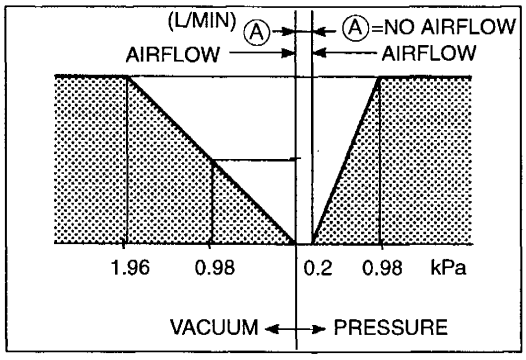


CUT VALVE
Inspection
1. Remove the cut valve. (Refer to page F–27.)
2. Blow air into the valve and check for the airflow.

Blow air into port Ⓐ while holding valve horizontally	Air flow
Blow air into port Ⓐ while holding valve tilted	No air flow



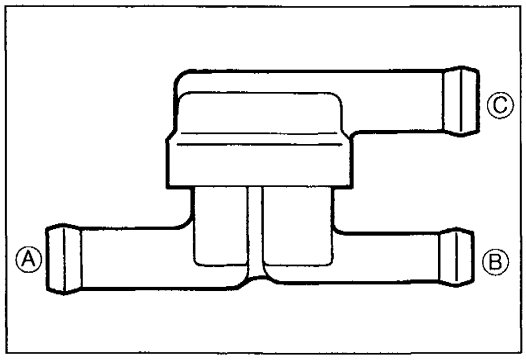
TANK PRESSURE CONTROL VALVE (TPCV)
Inspection
1. Remove the TPCV. (Refer to page F–27.)
2. Apply pressure or vacuum to port Ⓐ of the valve by using a vacuum pump, and check for the airflow.



Specification

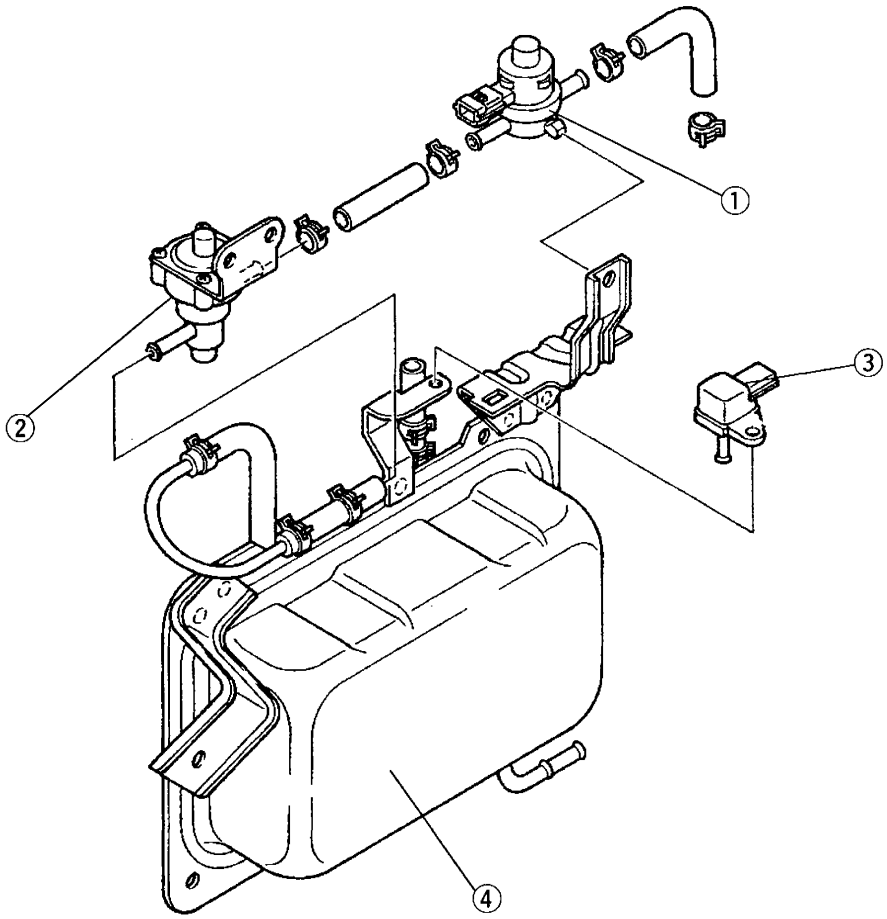
Condition	kPa { mmHg, inHg }	Airflow
Pressure	Below 1.96 { 1.47, 0.06 }	No
	Above 9.81 { 7.36, 0.29 }	Yes
Vacuum	Below 9.81 { 7.36, 0.29 }	Yes

3. Apply battery positive voltage to the valve connector and apply pressure to port Ⓐ, and verify that air flows smoothly.
4. If not as specified, replace the TPCV.

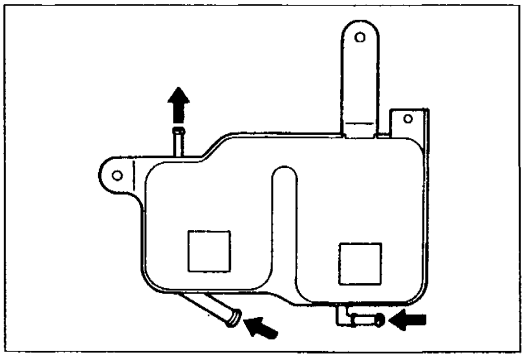


CHECK VALVE
Inspection
1. Remove the check valve (two-way). (Refer to page F–24.)
2. Blow air into port Ⓑ and verify that air smoothly flows from port Ⓒ.
3. Blow air into port Ⓒ and verify that air smoothly flows from port Ⓐ.
4. If not as specified, replace the check valve (two-way).

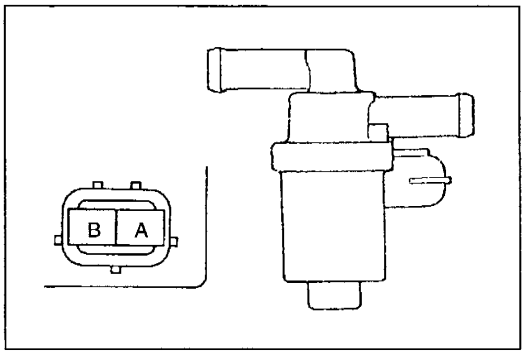
SEPARATOR
Removal / Installation
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Tank pressure control valve
2. Cut valve
3. Fuel tank pressure sensor
4. Separator



Inspection
1. Pull back the right rear side trim B. (Right side)
2. Remove the cover.
3. Visually check the separator for cracks or leaking.
4. Replace it if necessary.

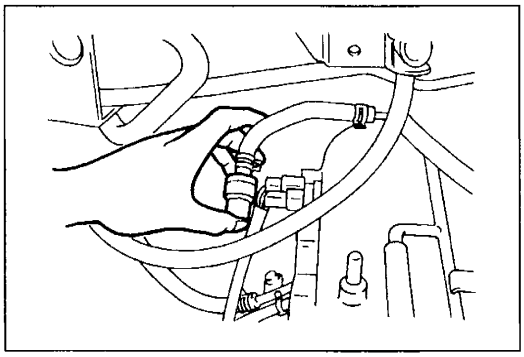


CANISTER DRAIN CUT VALVE (CDCV)
Inspection
1. Remove the valve. (Refer to page F–24.)
2. Check for airflow between ports of the solenoid valve.

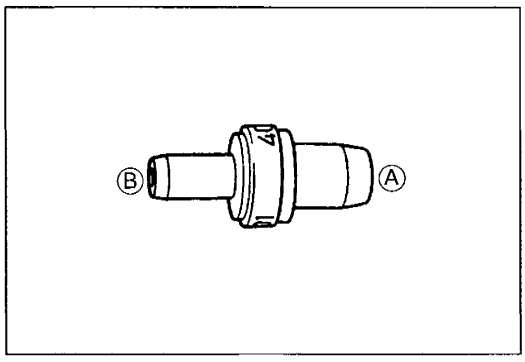
○—○: Continuity ○═○: Airflow B+: Battery positive voltage

Step	Terminal		Port	Port
	A	B	A	B
1	○—○		○═○	
2	B+	Ground		

3. If not as specified, replace the canister drain cut valve.



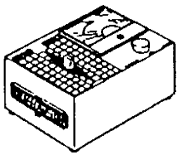
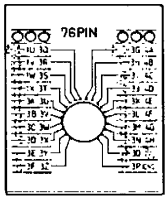
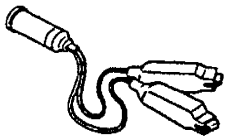
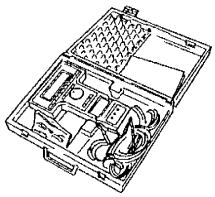
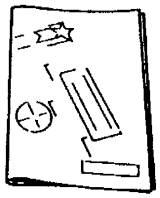
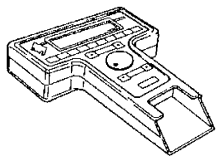
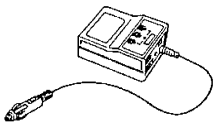
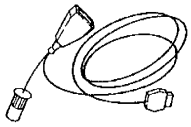
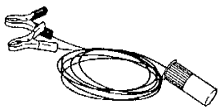
PCV VALVE
Inspection
1. Warm up the engine to the normal operating temperature and run it at idle.
2. Disconnect the PCV valve with the ventilation hose from the cylinder head cover.
3. Block the valve opening and check that there is vacuum. Replace the valve, if necessary.



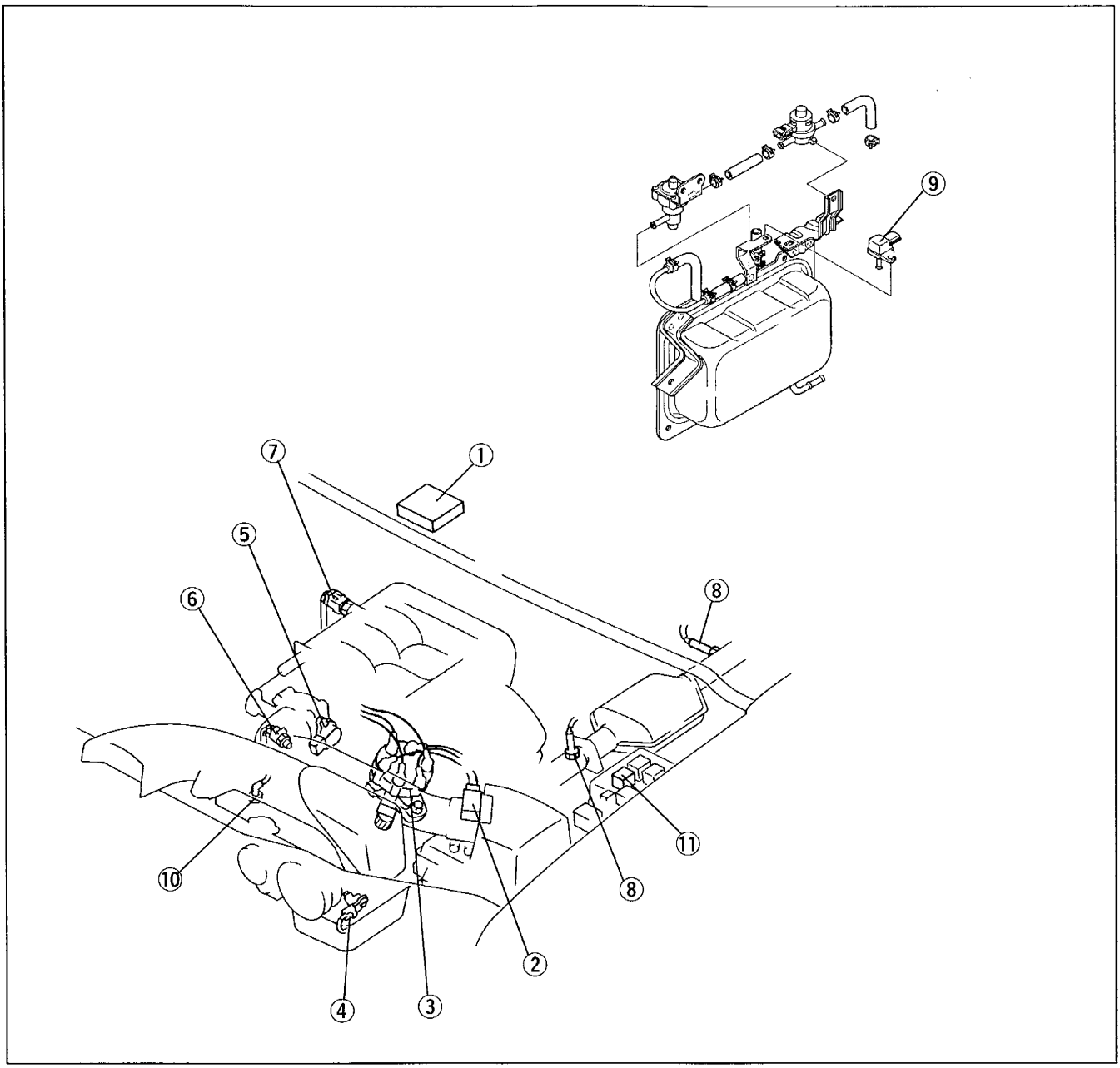
4. Remove the PCV valve.
5. Blow through the valve from port Ⓐ and verify that air comes out of port Ⓑ.
6. Blow through the valve form port Ⓑ and verify that no air comes out of port Ⓐ.
7. Replace the PCV valve if necessary.

CONTROL SYSTEM

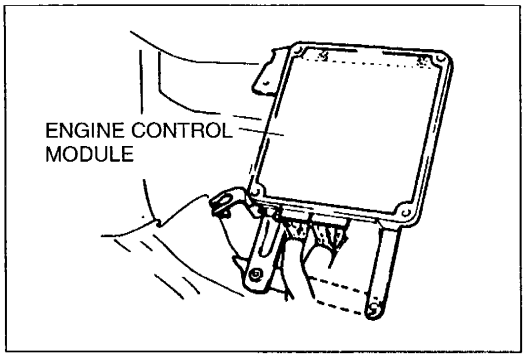
PREPARATION
SST

49 9200 162A Monitor, Engine Signal 	For inspection of ECM terminal voltage	49 T018 902 Adapter harness 	For inspection of ECM terminal voltage
49 F018 903 Sheet 	For inspection of ECM terminal voltage	49 D088 008 Harness adapter, Power 	For inspection of ECM terminal voltage
49 T088 0A0 NGS set 	For inspection of ECM terminal voltage and input/output devices	49 T088 008A Instruction manual 	For inspection of ECM terminal voltage and input/output devices
49 T088 010B Program Card 	For inspection of ECM terminal voltage and input/output devices	49 T088 001 Control Unit (Part of 49 T088 0A0) 	For inspection of ECM terminal voltage and input/output devices
49 T088 002 Vehicle Interface Module (Part of 49 T088 0A0) 	For inspection of ECM terminal voltage and input/output devices	49 T088 004 NGS OBD II Adapter (Part of 49 T088 0A0) 	For inspection of ECM terminal voltage and input/output devices
49 T088 006 Battery Hookup Adapter (Part of 49 T088 0A0) 	For inspection of ECM terminal voltage and input/output devices	—	—

STRUCTURAL VIEW



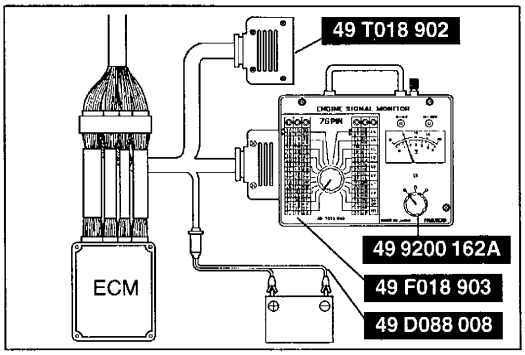
1. Engine control module
   - Removal / Installation ..... page F–31
   - Inspection ..... page F–31
2. Mass air flow sensor
   - System inspection ..... page F–37
   - Inspection ..... page F–38
3. Camshaft position sensor
   - System inspection ..... page F–38
4. Crankshaft position sensor
   - Inspection ..... page F–39
   - Replacement ..... page F–39
5. Throttle position sensor
   - Inspection ..... page F–40
   - Adjustment ..... page F–41
   - Replacement ..... page F–42
6. Engine coolant temperature sensor
   - Inspection ..... page F–42
7. Intake air temperature sensor (Dynamic chamber)
   - Inspection ..... page F–43
8. Heated oxygen sensor
   - System inspection ..... page F–43
   - Inspection ..... page F–44
9. Fuel tank pressure sensor
   - Inspection ..... page F–44
10. Power steering pressure switch
    - Inspection ..... page F–45
11. Main relay
    - System inspection ..... page F–45
    - Inspection ..... page F–45



ENGINE CONTROL MODULE (ECM)

Removal / Installation

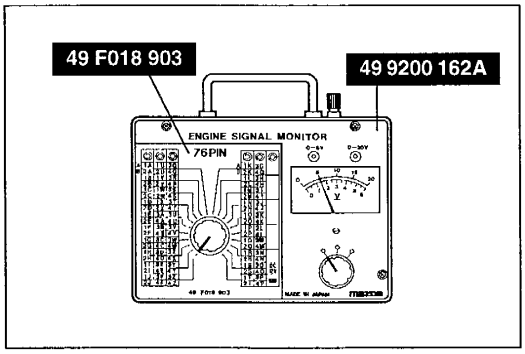
1. Remove the scuff plate (right side) and front side trim (right side).
2. Lift up the front mat.
3. Remove the protector cover.
4. Disconnect the engine control module connector.
5. Remove the engine control module.
6. Install in the reverse order of removal.



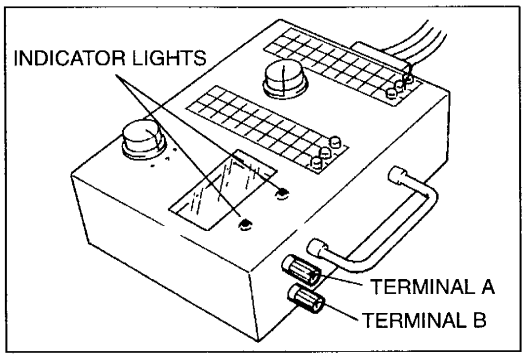
Inspection

Caution

- **The ECM terminal voltages vary with change in measuring conditions and vehicle conditions. Always carry out a total inspection of the input systems, output systems, and ECM to determine the cause of trouble. Otherwise, a wrong diagnosis will be made.**



1. Disconnect the negative battery cable.
2. Remove the ECM.
3. Connect the **SST** (Adapter harness) to the ECM.
4. Connect the **SSTs** (Monitor, Engine Signal and Harness adapter, power) to the **SST** (Adapter harness). Use connector A of the adapter harness for ECM terminals 1A through 1V and 3A through 3P. Use connector B for ECM terminals 2A through 2L and 4A through 4Z.
5. Place the **SST** (Sheet) on the **SST** (Monitor, Engine Signal).
6. Measure the voltage at each ECM terminal by switching the selector switch and the monitor switch.
7. If any incorrect voltage is detected, check related systems, wiring harnesses and connectors referring to the possible malfunction in the terminal voltage list.



Caution

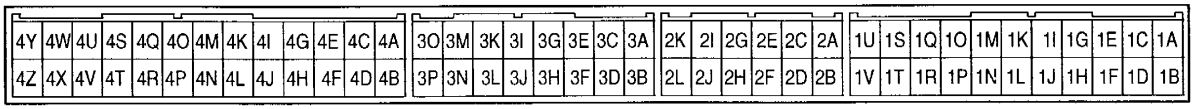
- **Disconnecting the connectors of the ECM and the SST (Adapter harness) while the battery is connected can damage the ECM and the SST (Monitor, Engine Signal). Disconnect the negative battery cable and the SST (Harness adapter, power) before disconnecting the connectors.**
- **Applying voltage to terminals A and B of the SST (Monitor, Engine Signal) can damage the SST (Monitor, Engine Signal).**

Note

- The indicator lights of the **SST** (Monitor, Engine Signal), provided for confirmation of the voltmeter range, is also used for detection of the pulse such as the fuel injector control signal, which is difficult to detect by using the voltmeter.
- Terminals A and B of the **SST** (Monitor, Engine Signal) are for connection of an external instrument. By connecting an external instrument such as a circuit tester or an oscilloscope, various inspections in addition to the measurement of the ECM terminal voltages are made possible.

Terminal voltage (Reference)

B+: Battery positive voltage



Terminal	Signal	Connection to	Test condition		Voltage (V)	Possible malfunction
1A	—	—	—		—	—
1B	—	—	—		—	—
1C	Start	Ignition switch (START)	While cranking		Approx. 10	• ECM terminal 1C — Ignition switch harness
			Ignition switch ON		0	
1D	Serial communication signal	Data link connector 2 terminal KLN	Carry out inspection according to diagnostic trouble code Diagnostic trouble code output is a part of serial communication Judgement by terminal voltage is not possible		—	• On-board diagnostic system
1E	MIL	Malfunction indicator lamp	Malfunction indicator lamp OFF		B+	• ECM terminal 1E — MIL
			Malfunction indicator lamp ON		Below 1.0	
1F	—	—	—		—	—
1G	A/C control	A/C relay	Idle	A/C operating	Below 1.0	• A/C relay
				A/C stop	B+	
1H	—	—	—		—	—
1I	Diagnostic test mode	Data link connector (Terminal TEN)	Ignition switch ON	Open terminal TEN	B+	• ECM terminal 1I — Data link connector terminal TEN harness
				Short terminal TEN	Below 1.0	
1J	—	—	—		—	—
1K	Barometric pressure	TCM	Ignition switch ON		repeat B+ and 0	• ECM terminal 1K — TCM terminal 2G harness
1L	Load/No load distinction	Transmission range switch	Ignition switch ON	Other than park/neutral position	B+	• Transmission range switch (Refer to section K1)
				Park/neutral position	Below 1.0	
1M	Vehicle speed	Vehicle speed sensor	Ignition switch ON		0 or 5.0	• Vehicle speed sensor (Refer to section T)
			Driving		Approx. 2.5	
1N	4WD distinction	Ground (4WD)	Constant		Below 1.0	• ECM terminal 1N harness (Open)
		— (2WD)	Constant		B+	

B+: Battery positive voltage

Terminal	Signal	Connection to	Test condition		Voltage (V)	Possible malfunction
1O	A/C	A/C amplifier	Idle	A/C switch ON and fan switch ON	Below 1.0	• A/C amplifier (Refer to section U)
				A/C switch OFF	B+	
1P	Electrical load	CPU	Ignition switch ON	Electrical load OFF	B+	• Headlight switch • DRL relay • Rear window defroster relay • Fan switch (Refer to section U)
				Electrical load ON*	Below 1.0	
1Q	Brake	Brake switch	Brake pedal released		Below 1.0	• Brake switch (Refer to section T)
			Brake pedal depressed		B+	
1R	—	—	—		—	—
1S	—	—	—		—	—
1T	Heated oxygen sensor (front) heater control	Heated oxygen sensor (front)	Ignition switch ON		B+	• Heated oxygen sensor (Refer to page F–43)
			Idle		Below 1.0	
1U	—	—	—		—	—
1V	—	—	—		—	—
2A	—	—	—		—	—
2B	—	—	—		—	—
2C	Evaporative check	Tank pressure control valve/canister drain cut valve	Ignition switch ON		B+	• Tank pressure control valve (Refer to page F–26) • Canister drain cut valve (Refer to page F–28)
			Diagnosis executed		Below 1.0	
2D	—	—	—		—	—
2E	—	—	—		—	—
2F	—	—	—		—	—
2G	TCM diagnostic test mode	TCM	Ignition switch ON	Open terminal TEN	B+	• ECM terminal 2G — TCM terminal 2K harness
				Short terminal TEN	Below 1.0 or repeat B+ and 0	
2H	On-board diagnostic system signal input (From TCM)	TCM	Ignition switch ON (Terminal TEN ground)	No diagnostic trouble code output	repeat B+ and 0	• ECM terminal 2H — TCM terminal 2N harness
				Diagnostic trouble code output	B+	
2I	—	—	—		—	—
2J	—	—	—		—	—
2K	Heated oxygen sensor (rear)	Heated oxygen sensor (rear)	Ignition switch ON		Below 1.0	• Heated oxygen sensor (Refer to page F–43)
			Idle	Engine cold	Below 0.5	
				After warms up	0—1.0	
2L	Fuel level	Fuel gauge sender unit	Ignition switch ON	Full fuel	Approx. 0	• Fuel gauge sender unit (Refer to section T)
				Low fuel	Approx. 3.0	
3A	Fuel tank pressure	Fuel tank pressure sensor	Ignition switch ON	Fuel tank pressure 0 kPa { 0 mmHg , 0 inHg }	Approx. 2.5	• Fuel tank pressure sensor (Refer to page F–44)

*: When all following conditions are satisfied
- Fan switch ON at 2nd or higher, rear window defroster switch ON, headlights ON

B+: Battery positive voltage

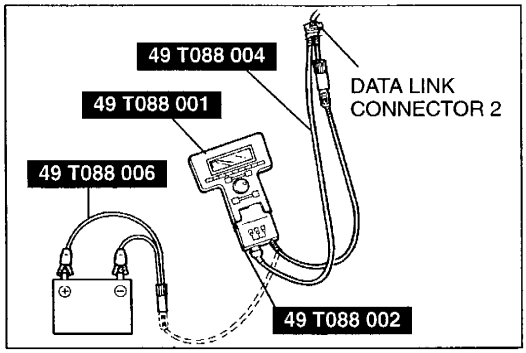
Terminal	Signal	Connection to	Test condition		Voltage (V)	Possible malfunction
3B	Mass air flow sensor (VGP)	Mass air flow sensor	Idle		1.0—2.0	• Mass air flow sensor (Refer to page F–37)
3C	Heated oxygen sensor (front)	Heated oxygen sensor (front)	Ignition switch ON		Below 1.0	• Heated oxygen sensor (Refer to page F–43)
			Idle	Engine cold	Below 0.5	
				After warms up	0—1.0	
			Acceleration (After warms up)		0.5—1.0	
			Deceleration (After warms up)		0—0.5	
3D	—	—	—		—	—
3E	Engine coolant temperature	Engine coolant temperature sensor	Ignition switch ON	Engine coolant temp 20 °C { 68 °F }	Approx. 2.4	• Engine coolant temperature sensor (Refer to page F–42)
				After warms up	Approx. 0.4	
3F	Throttle position sensor (TVO)	Throttle position sensor	Ignition switch ON	Closed throttle position	0.1—1.1	• Throttle position sensor (Refer to page F–40) • ECM terminal 3I voltage
				Wide open throttle	2.8—4.5	
3G	DRL (CANADA)	DRL relay	Daytime running light ON		Below 2.0	• DRL relay (Refer to section T)
			Daytime running light OFF		B+	
3H	—	—	—		—	—
3I	Constant voltage (Vref)	Throttle position sensor Fuel tank pressure sensor	Ignition switch ON		Approx. 5.0	• ECM terminal 4B voltage
3J	—	—	—		—	—
3K	Intake-air temperature	Intake air temperature sensor (In mass air flow sensor)	Ignition switch ON	Intake-air temperature 20 °C { 68 °F }	Approx. 2.4	• Intake air temperature sensor (Refer to page F–38)
3L	Closed throttle position	Closed throttle position switch (In throttle position sensor)	Ignition switch ON	Accelerator pedal released	Below 1.0	• Throttle position sensor (Refer to page F–40) • ECM terminal 3I voltage
				Accelerator pedal depressed	B+	
3M	Intake air temperature	Intake air temperature sensor (dynamic chamber)	Ignition switch ON	Intake air temperature 20 °C { 68 °F }	Approx. 3.0	• Intake air temperature sensor (dynamic chamber) (Refer to page F–43)
3N	—	—	—		—	—
3O	Analogue sensor ground	Ground	Constant		Below 1.0	• ECM terminal 3O harness (Open)
3P	Power steering pressure	Power steering pressure switch	Ignition switch ON		B+	• Power steering pressure switch (Refer to page F–45)
			Idle	P/S not operating		
				P/S operating	Below 1.0	

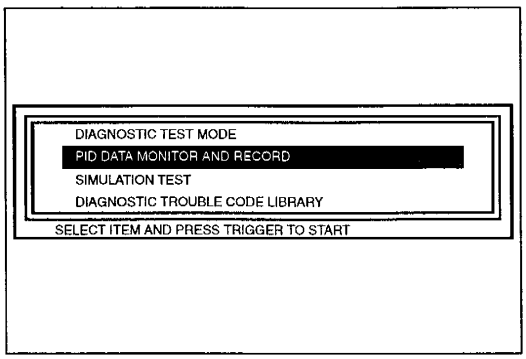
B+: Battery positive voltage

Terminal	Signal	Connection to	Test condition		Voltage (V)	Possible malfunction
4A	ECM ground	Ground	Constant		Below 1.0	• ECM terminal 4A harnesn (Open)
4B	Power supply	Main relay	Ignition switch OFF		Below 1.0	• Main relay (Refer to page F–45)
			Ignition switch ON		B+	
4C	Fuel injector ground	Ground	Constant		Below 1.0	• ECM terminal 4C harness (Open)
4D	Output device ground	Ground	Constant		Below 1.0	• ECM terminal 4D hanress (Open)
4E	NE⊖	Crankshaft position sensor	Constant		0	• Crankshaft position sensor (Refer to page F–39)
4F	—	—	—		—	—
4G	SGC	Camshaft position sensor (In distributor)	Ignition switch ON		0 or Approx. 5.0	Camshaft position sensor (Refer to page F–38)
			Idle		Approx. 2.5	
4H	NE⊕	Crankshaft position sensor	Ignition switch ON		0	• Crankshaft position sensor (Refer to page F–39)
			Idle		Approx. 0	
4I	Back-up power supply	Battery	Constant		B+	• ECM terminal 4I — Battery harness and connector
4J	Pressure regulator control	PRC solenoid valve No.1	Idle (Hot condition)		Below 1.0	• PRC solenoid valve No.1 (Refer to page F–20)
			Other		B+	
4K	VRIS control	VRIS solenoid valve	Ignition switch ON		B+	• VRIS solenoid valve (Refer to page F–7)
			Engine speed	3625—5125 rpm	B+	
				Others	Below 1.0	
4L	Pressure regulator control	PRC solenoid valve No.2	Idle (Hot condition)		Below 1.0	• PRC solenoid valve No.2 (Refer to page F–20)
			Other		B+	
4M	—	—	—		—	—
4N	IGT control	Ignition control module (Distributor)	Ignition switch ON		Approx. 0	• Ignition control module (Refer to section G)
			Idle		Approx. 0.5	
4O	—	—	—		—	—
4P	—	—	—		—	—
4Q	Idle air control	Idle air control valve	Ignition switch ON		B+	• Idle air control valve (Refer to page F–7)
			Idle (After warms up)		Approx. 10	
4R	Engine speed	Tachometer TCM	Ignition switch ON		Approx. 10	• ECM terminal 4R — TCM terminal 1G harness
			Idle		Approx. 8	
4S	Fuel pump control	Fuel pump relay	Ignition switch ON		B+	• Fuel pump relay (Refer to page F–18)
			Cranking		Below 1.0	
			Idle			
4T	Purge control	Purge solenoid valve	Ignition switch ON		B+	• Purge solenoid valve (Refer to page F–25)
			Idle			

B+: Battery positive voltage

Terminal	Signal	Connection to	Test condition	Voltage (V)	Possible malfunction
4U	Fuel injector control No.1	Fuel injector (No.1 cylinder)	Ignition switch ON/Idle	B+	• Fuel injector (Refer to page F–21)
4V	Fuel injector control No.2	Fuel injector (No.2 cylinder)			
4W	Fuel injector control No.3	Fuel injector (No.3 cylinder)			
4X	Fuel injector control No.4	Fuel injector (No.4 cylinder)			
4Y	Fuel injector control No.5	Fuel injector (No.5 cylinder)			
4Z	Fuel injector control No.6	Fuel injector (No.6 cylinder)			





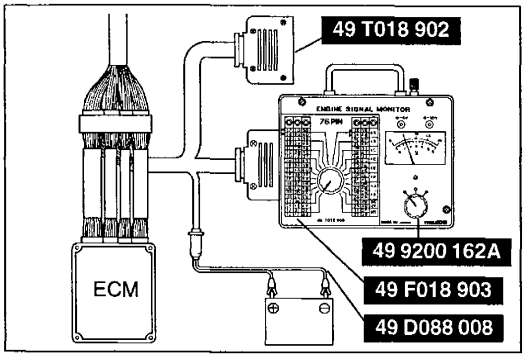
Using SST (NGS)

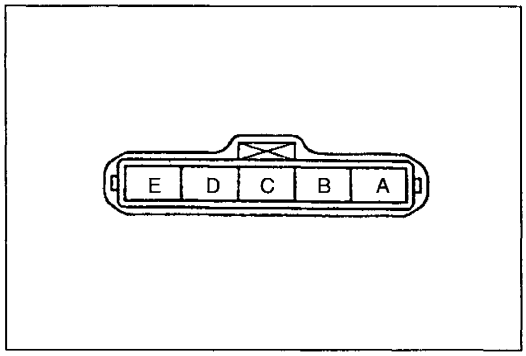
1. In the passenger compartment, connect the **SST** (NGS), to the data link connector 2 located under the driver side dashboard.
2. Referring to the NGS operational manual, select the "PID/DATA MONITOR AND RECORD" function.
3. Referring to the 1996 Service Highlights, inspect each ECM input/output signal.

Note

- The "PID/DATA MONITOR AND RECORD" function is to monitor the calculation value of input/output signals in the ECM. Deviation in the value does not always indicate malfunction in the related input/output devices (sensors and solenoids).

4. If normal output signal cannot be detected when all input signals are normal, replace the ECM. (Refer to page F–31.)





MASS AIR FLOW SENSOR

System Inspection

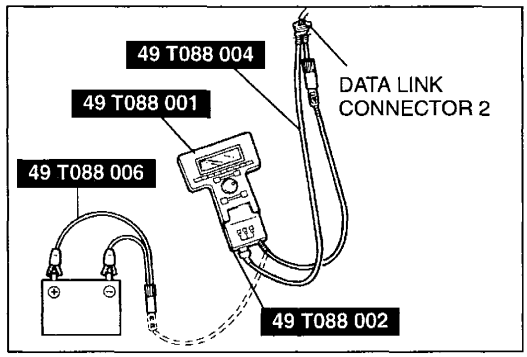
1. Check the mass air flow sensor for damage and cracks.
2. Remove the ECM. (Refer to page F–31.)
3. Connect the **SSTs** (Monitor, Engine Signal and Adapter Harness) to the ECM.
4. Measure the voltage at the ECM terminals as shown in the table.

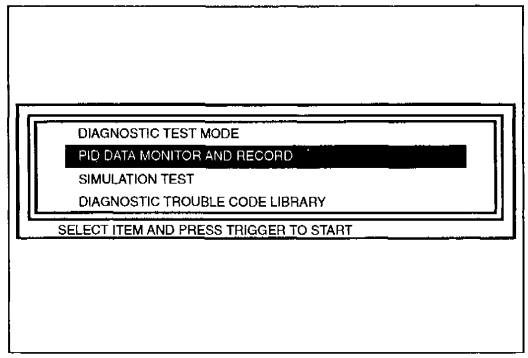
Specification

Terminal	Ignition switch ON	Idle
3B	Approx 1.0 V	1.0—2.0 V
4A	Below 1.0 V	Below 1.0 V

5. If not as specified, inspect following.
   Harness continuity
   - Between ECM terminal 3B and mass air flow sensor terminal B
   - Between ECM terminal 4A and mass air flow sensor terminal E
   - Between main relay terminal D and mass air flow sensor terminal A

   Terminal voltage
   - Mass air flow sensor terminal A: Battery positive voltage
6. If there is incorrect terminal voltage or harness continuity, replace the mass air flow sensor.
   (Refer to page F–5.)





Using SSTs (NGS)

1. Check the mass air flow sensor for damage and cracks.
2. Warm up the engine to normal operating temperature.
3. Shift the selector lever to P.
4. Turn off all electric loads.
   - Headlight
   - Blower motor
   - Rear window defroster
   - Power steering
5. Wait until the cooling fan stops.
6. Connect the **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard.
7. Select the "PID/DATA MONITOR AND RECORD" function on the NGS display.
8. Select "MAF V" on the NGS display. NGS measures and shows the voltage.

Specification

	Ignition switch ON	Idle
Voltage (V)	Approx. 1.0	1.0—2.0

9. If not as specified, perform following inspection.
   Harness continuity
   - Between ECM terminal 3B and mass air flow sensor terminal B
   - Between ECM terminal 4A and mass air flow sensor terminal E
   - Between main relay terminal D and mass air flow sensor terminal A

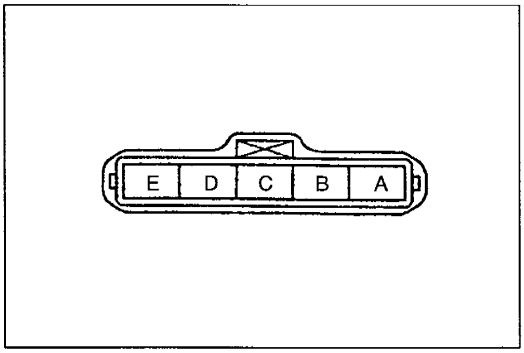
   Terminal voltage
   - Mass air flow sensor terminal A voltage: Battery positive voltage
10. If there is incorrect terminal voltage or harness continuity, replace the mass air flow sensor. (Refer to page F–5.)

Note
- The scan tool shows the mass air flow rate and load value.

Specification

Engine speed (rpm)	Intake mass air flow (g/s)	Load (%)
Idle at 730—830	3.9—5.7	17.2—22.0
2,500*	11.3—14.8	15.4—19.4

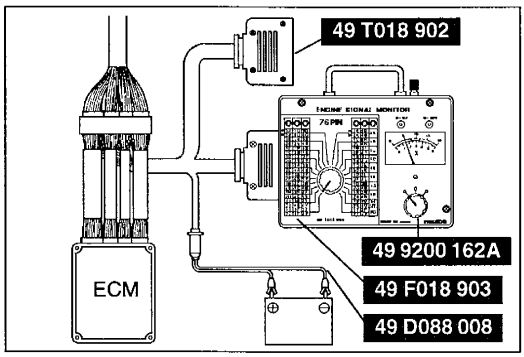
* No load, in neutral or park



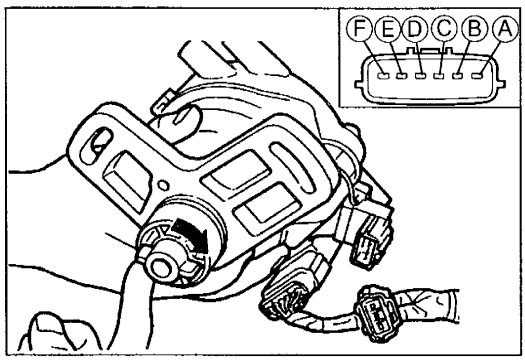
Inspection
Intake air temperature sensor
1. Disconnect the mass air flow sensor connector.
2. Measure the resistance between terminals C and D by using an ohmmeter.

Specification: 2.21—2.69 kΩ [20 °C { 68 °F }]

3. If not as specified, replace the mass air flow sensor. (Refer to page F–5.)



CAMSHAFT POSITION SENSOR
System Inspection
1. Remove the distributor. (Refer to section G.)



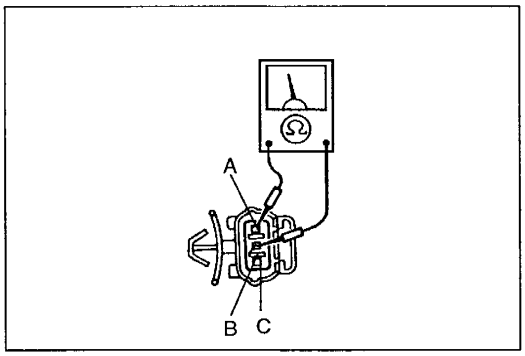
2. Remove the ECM. (Refer to page F–31.)
3. Connect the **SSTs** (Monitor, Engine signal and Adapter Harness) to the ECM.
4. Turn the ignition switch to ON.
5. Rotate the distributor drive by hand and check the output signal.

Specification

Signal	Terminal	Voltage
SGC	4G	Approx. 5 V (1 pulse/rev)

6. If not as specified, inspect following.
   Harness continuity
   - Between ECM terminal 4G and distributor (6-pin) terminal D
   - Between ECM terminal 4A and distributor (6-pin) terminal A
   - Between main relay terminal D and distributor (6-pin) terminal B

   Terminal voltage
   - Distributor (6-pin) terminal B: Battery positive voltage
7. If there is incorrect terminal voltage or harness continuity, replace the distributor. (Refer to section G.)



CRANKSHAFT POSITION SENSOR

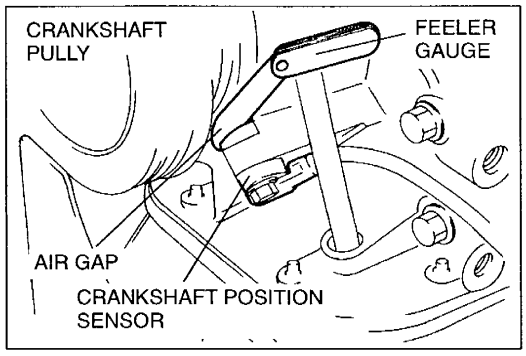
Inspection

Resistance

1. Disconnect the crankshaft position sensor connector.
2. Measure the resistance between terminals A and B by using an ohmmeter.

   Specification: 950—1250 Ω [20 °C { 68 °F }]

3. If not as specified, replace the crankshaft position sensor.



Air gap

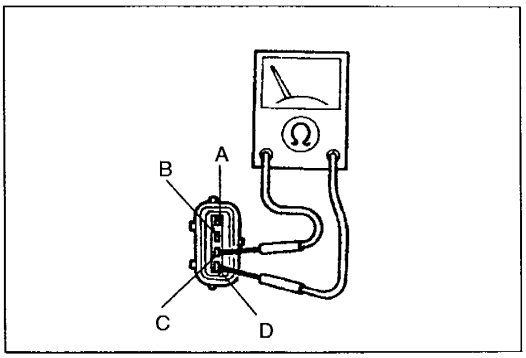
1. Measure the air gap between crankshaft pulley and crankshaft position sensor by using a feeler gauge.

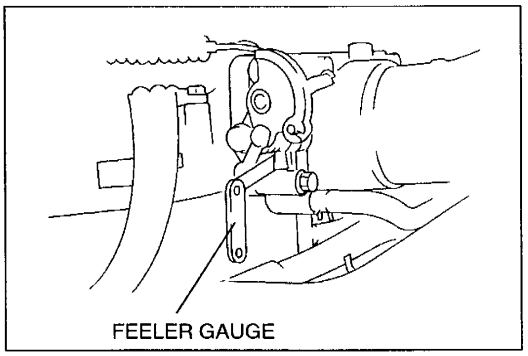
   Specification: 0.5—1.5 mm { 0.020—0.059 in }

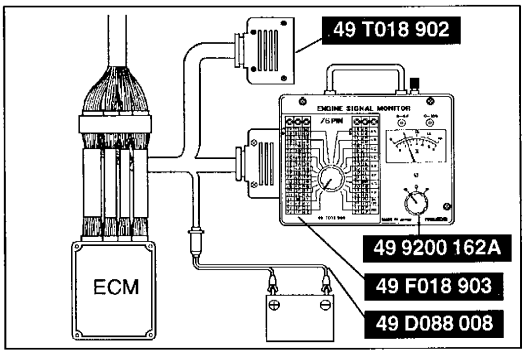
2. If not as specified, replace the crankshaft pulley or the crankshaft position sensor. (Refer to below.)

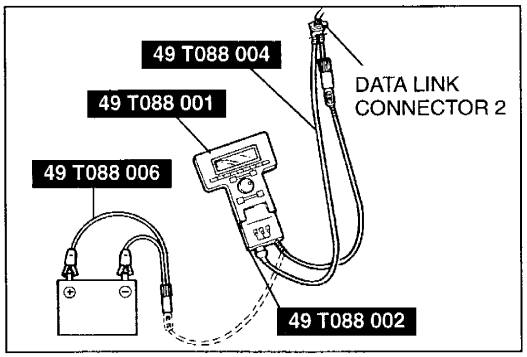
Replacement

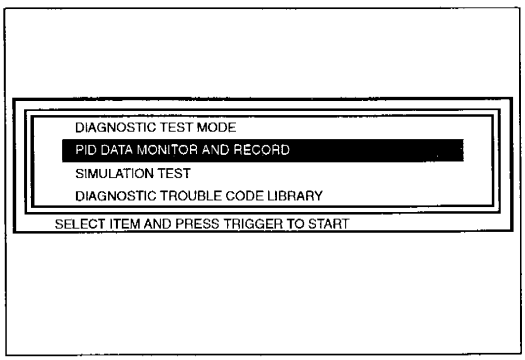
1. Disconnect the negative battery cable.
2. Disconnect the crankshaft position sensor connector.
3. Remove the crankshaft position sensor.
4. Install in the reverse order of removal.











THROTTLE POSITION SENSOR

Inspection

Closed throttle position switch

1. Verify that the throttle valve is at the closed throttle position.
2. Disconnect the throttle position sensor connector.
3. Check for continuity between throttle position sensor connector terminals C and D by using an ohmmeter.
4. If no continuity, adjust the throttle position sensor.
5. Insert a 0.50 mm {0.020 in} feeler gauge between the throttle adjusting screw (TAS) and the throttle lever. Verify that there is no continuity.
6. If there is continuity, adjust the throttle position sensor. (Refer to page F–41.)

Throttle position sensor

1. Remove the ECM. (Refer to page F–31.)
2. Connect the **SSTs** (Monitor, Engine Signal and Adapter Harness) to the ECM.
3. Verify that the throttle valve is closed throttle position.
4. Turn the ignition switch to ON.
5. Measure the ECM terminal 3F voltage by using a voltmeter.

Specification

Closed throttle position: 0.1—1.1 V
Wide open throttle: 2.8—4.5 V
(Verify that the voltage increase is directly proportioned to the throttle valve opening angle.)

6. If not as specified, adjust the throttle position sensor. (Refer to page F–41.)

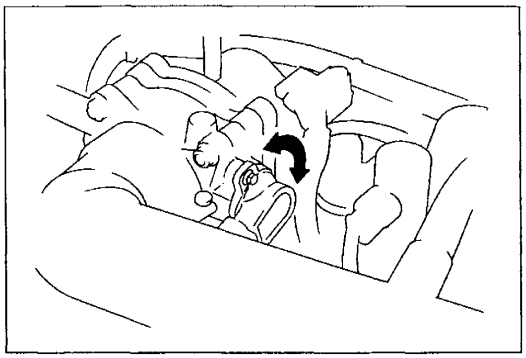
Using SSTs (NGS)

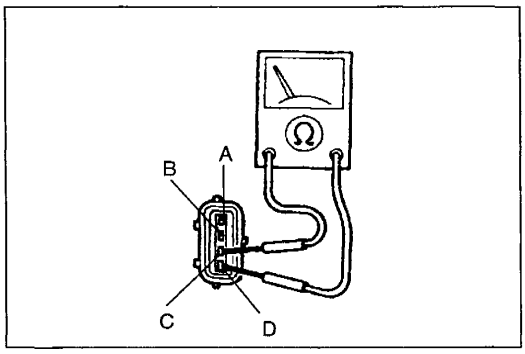
1. Connect the **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard.
2. Verify that the throttle valve is at the closed throttle position.
3. Turn the ignition switch to ON.
4. Select the "PID/DATA MONITOR AND RECORD" function on the NGS display.
5. Select "TP V" on the NGS display. NGS measures and shows the voltage.

Specification

Closed throttle position: 0.1—1.1 V
Wide open throttle: 2.8—4.5 V
(Verify that the voltage increase is directly proportioned to the throttle valve opening angle.)

6. If not as specified, adjust the throttle position sensor. (Refer to page F–41.)





Adjustment

Caution
- **The throttle position sensor is adjusted at the factory before shipment. Unnecessaly adjustment will negatively effect the engine performance.**
- **Adjusting the throttle position sensor by using the throttle adjusting screw (TAS) will negatively effect the engine performance.**

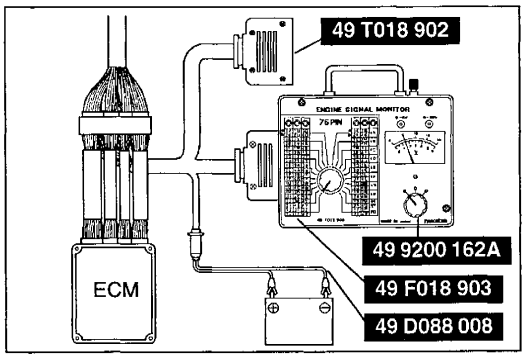
1. Verify that the throttle valve is at the closed throttle position.
2. Disconnect the throttle position sensor connector.
3. Loosen the attaching screws.
4. Insert a feeler gauge between the throttle adjusting screw (TAS) and the throttle lever. Adjust the continuity between the closed throttle position switch terminals C and D by using an ohmmeter.

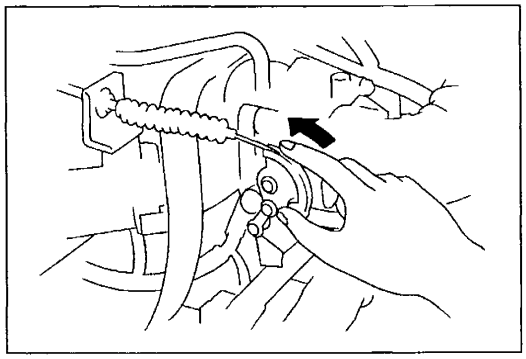
Specification

Clearance	Continuity
0.15 mm { 0.006 in }	Yes
0.50 mm { 0.020 in }	No

5. Tighten the attaching screws.

Tighining torque:
1.6—2.3 N·m { 16—24 kgf·cm , 14—20 in·lbf }

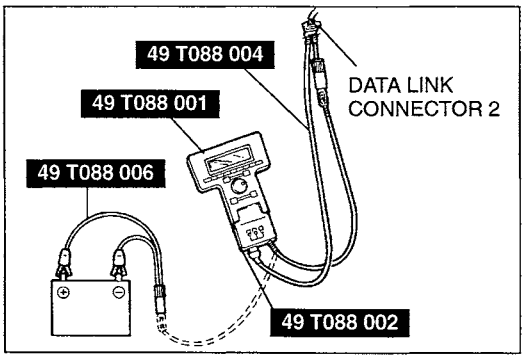


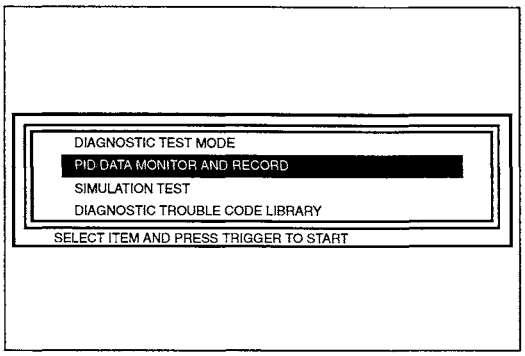


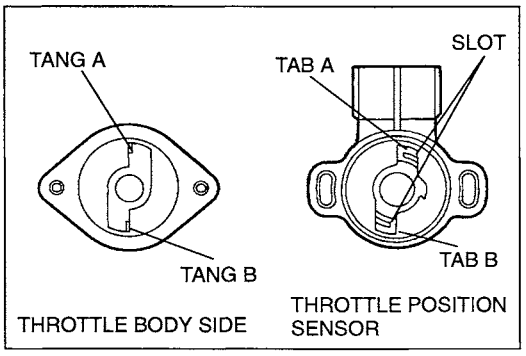
6. If using the **SSTs** (Monitor, Engine Signal and Adapter Harness), do as follows.
   (1) Remove the ECM. (Refer to page F–31.)
   (2) Connect the **SSTs** (Monitor, Engine Signal and Adapter Harness) to the ECM.
   (3) Verify that the throttle valve is at the closed throttle position.
   (4) Turn the ignition switch to ON.
   (5) Rotate the throttle link by hand and verify that the ECM terminal 3F voltage is as specified.

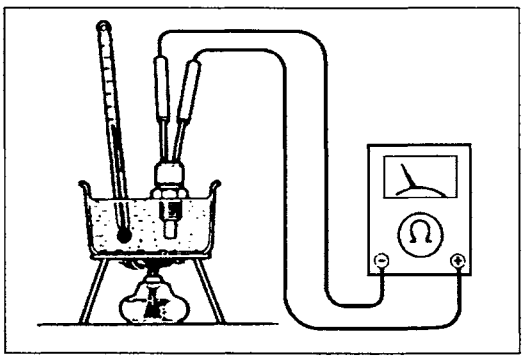
Specification
Closed throttle position: 0.1—1.1 V
Wide open throttle: 2.8—4.5 V
(Verify that the voltage increase is directly proportioned to the throttle valve opening angle.)

   (6) If not as specified, replace the throttle position sensor.









7. If using the **SSTs** (NGS), do as follows.
   (1) Connect the **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard.
   (2) Verify that the throttle valve is at the closed throttle position.
   (3) Turn the ignition switch to ON.
   (4) Select the "PID/DATA MONITOR AND RECORD" function of the NGS display.
   (5) Select "TP V" on the NGS display. NGS measures and shows the voltage.

   Specification
   Closed throttle position: 0.1—1.1 V
   Wide open throttle: 2.8—4.5 V
   (Verify that the voltage increase is directly proportioned to the throttle valve opening angle.)

   (6) If not specified, replace the throttle position sensor.

Replacement
1. Disconnect the throttle position sensor connector.
2. Remove the attaching screws.
3. Remove the throttle position sensor.
4. Verify that the throttle valve is at the closed throttle position.
5. Open the throttle valve slightly and catch the tang of the throttle body on the throttle position sensor plastic tabs. Align tang A on throttle body with tab A on throttle position sensor. Note tangs on the throttle body mate with the tab on the throttle position sensor on the side of the tab without a slot.
6. Position the throttle position sensor on the throttle body so that the mounting holes align.
7. Install and hand tighten the attaching screws.
8. Release the throttle.
9. Adjust the throttle position sensor output voltage and closed throttle position switch. (Refer to page F–41.)

ENGINE COOLANT TEMPERATURE SENSOR

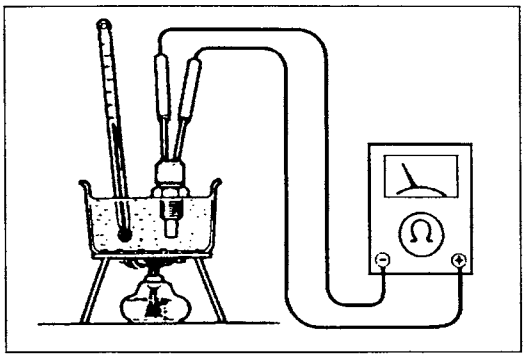
Inspection
1. Remove the engine coolant temperature sensor.
2. Place the sensor in water with a thermometer, and heat the water gradually.
3. Measure the resistance of the sensor by using an ohmmeter.

Spcification

Temperature (°C { °F })	Resistance (kΩ)
20 { 68 }	2.2—2.7
80 { 176 }	0.29—0.35

4. If not as specified, replace the engine coolant temperature sensor.

   Tighting torque:
   16—23 N·m { 1.6—2.4 kgf·m , 12—17 ft·lbf }



INTAKE AIR TEMPERATURE SENSOR (DYNAMIC CHAMBER)

Inspection

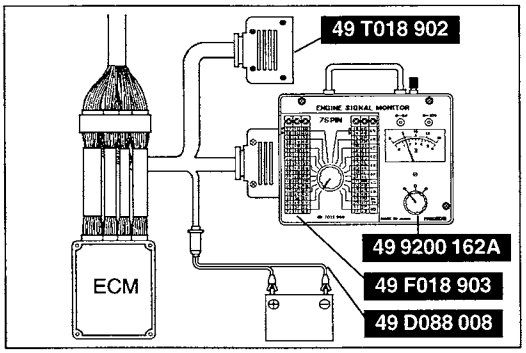
1. Remove the intake air temperature sensor (dynamic chamber).
2. Place the sensor in water with a thèrmometer, and heat the water gradually.
3. Measure the resistance of the sensor by using an ohmmeter.

Specification

Temperature (°C { °F })	Resistance (kΩ)
25 { 77 }	30—36
85 { 185 }	3.3—3.7

4. If not as specified, replace the intake air temperature sensor.

Tightening torque:
7.9—11.7 N·m { 80—120 kgf·cm , 70—104 in·lbf }



HEATED OXYGEN SENSOR

System Inspection

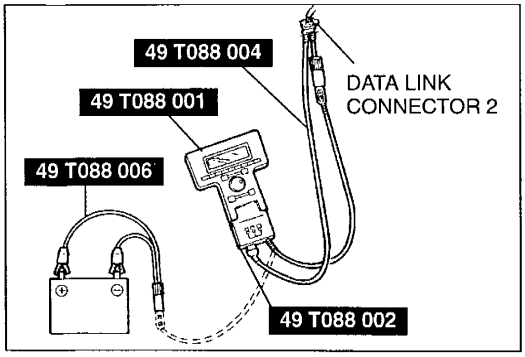
1. Remove the ECM. (Refer to page F–31.)
2. Connect the **SSTs** (Monitor, Engine Signal and Adapter Harness) to the ECM.
3. Warm up the engine to normal operating temperature.
4. Measure the voltage at ECM terminal 2K, and 3C.

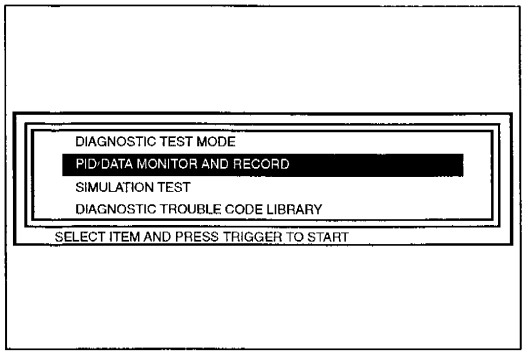
Specification

Engine condition	ECM terminal voltage (V)	
	3C	2K
	Heated oxygen sensor (front)	Heated oxygen sensor (rear)
IG-ON	Below 1.0	
Idle	0—1.0	
Deceleration	0—0.5	0—1.0
Acceleration	0.5—1.0	0—1.0

5. If not as specified, inspect following.
   - Intake-air system
   - Fuel system
   - On-board diagnostic system

   If these systems are OK, replace the heated oxygen sensor. (Refer to page F–22.)





Using the SSTs (NGS)

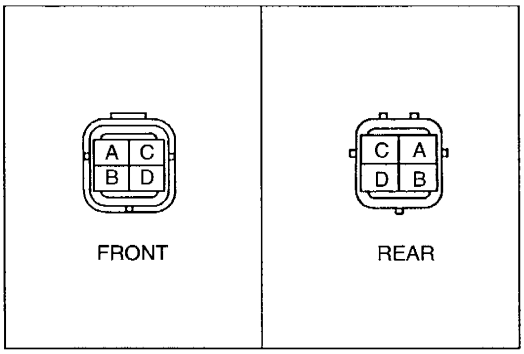
1. Connect the **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard.
2. Select the "PID/DATA MONITOR AND RECORD" function on the NGS display.
3. Select "FHO2S", and "RHO2S", on the NGS display. NGS measures and shows the voltage.

Specification

Engine condition	Voltage (V)	
	FHO2S	RHO2S
IG-ON	Below 1.0	
Idle	0—1.0	
Deceleration	0—0.5	0—1.0
Acceleration	0.5—1.0	0—1.0

4. If not as specified, inspect following.
   - Intake-air system
   - Fuel system
   - On-Board diagnostic system

   If these systems are OK, replace the heated oxygen sensor. (Refer to page F–22.)

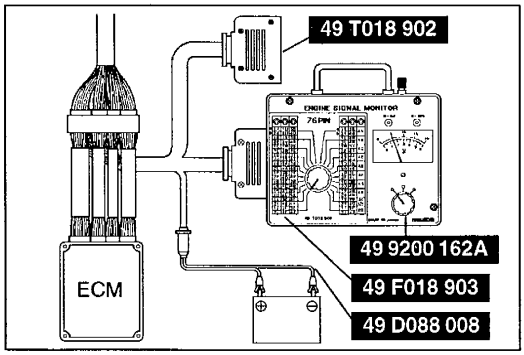


Inspection
Heater

1. Disconnect the heated oxygen sensor connector,
2. Measure the resistance between heated oxygen sensor terminals C and D by using an ohmmeter.

   Specification: Approx. 13 Ω (20 °C { 68 °F })

3. If not as specified, replace the heated oxygen sensor. (Refer to page F–22.)



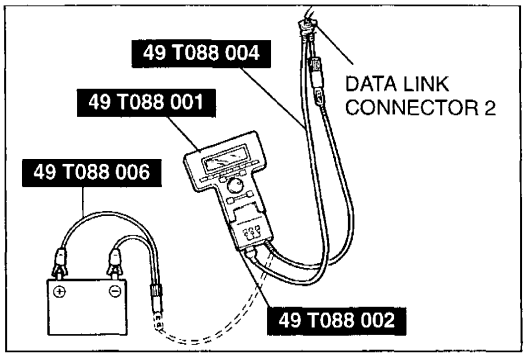
FUEL TANK PRESSURE SENSOR
Inspection

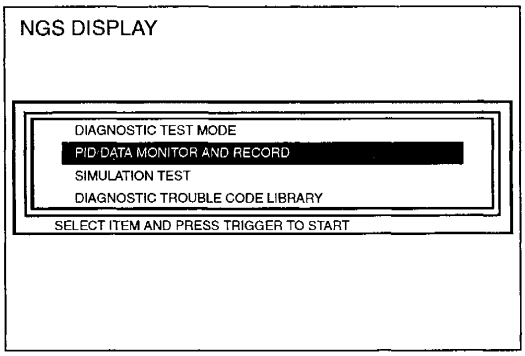
1. Connect the **SSTs** (Monitor, Engine Signal and Adapter Harness) to the ECM. (Refer to page F–31.)
2. Apply vacuum to the fuel tank pressure sensor by using a vacuum pump. Measure the pressure at ECM terminal 3A.

Spcification

Vacuum	ECM terminal 3A voltage (V)
0 kPa { 0 mmHg , 0 inHg }	Approx. 2.5
6.7 kPa { 50 mmHg , 2.0 inHg }	Approx. 0.5

3. If not as specified, replace the fuel tank pressure sensor. (Refer to page F–27.)





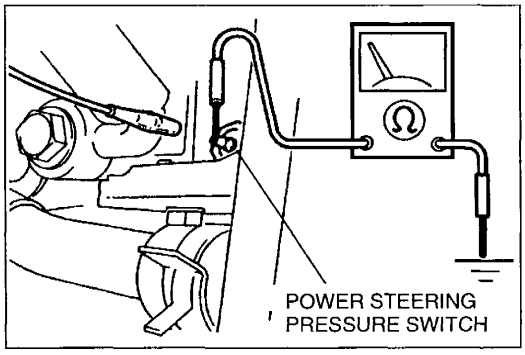
Using the SSTs (NGS)

1. Connect the **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard.
2. Select the "PID/DATA MONITOR AND RECORD" function on the NGS display.
3. Apply vacuum to the fuel tank pressure sensor by using a vacuum pump.
4. Select "FTP V" on the NGS display. The NGS measures and shows the voltage.

Specification

Vacuum	Fuel tank pressure signal voltage (V)
0 kPa { 0 mmHg , 0 inHg }	Approx. 2.5
6.7 kPa { 50 mmHg , 2.0 inHg }	Approx. 0.5

5. If not as specified, replace the fuel tank pressure sensor. (Refer to page F–27.)



POWER STEERING PRESSURE SWITCH

Inspection

1. Disconnect the power steering pressure switch connector.
2. Start the engine.
3. Check continuity of the switch by using an ohmmeter.

Specification

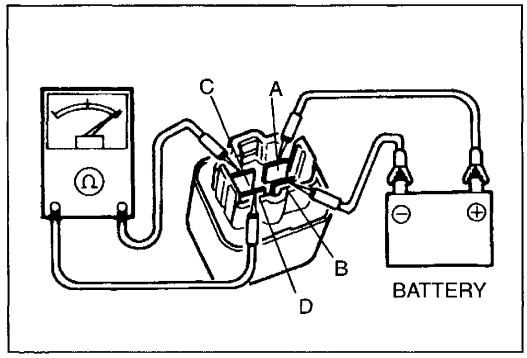
Steering wheel condition	Continuity
Turned	Yes
Straight ahead	No

4. If not as specified, replace the power steering pressure switch. (Refer to section N.)

MAIN RELAY

System Inspection

1. Listen for main relay operation sound while turning the ignition switch to ON and OFF.
2. If no sound was heard, inspect following.
   - Main relay
   - Harness and connector between ignition switch and main relay



Inspection

1. Remove the main relay.
2. Apply battery positive voltage and check continuity between terminals of the relay by using ohmmeter.

Specification

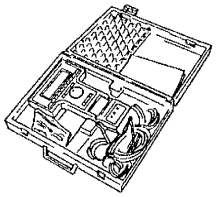
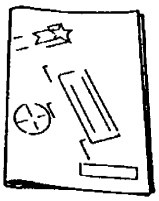
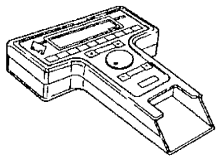
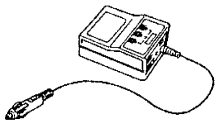
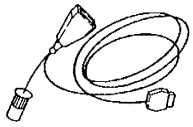
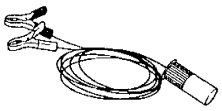
B+: Battery positive voltage

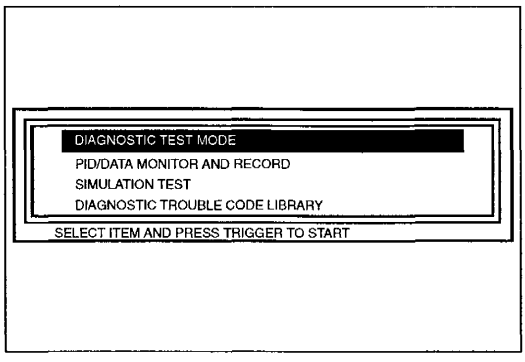
Terminal A—B	Terminal C—D
B+ applied	Yes
B+ not applied	No

3. If not as specified, replace the main relay.

ON-BOARD DIAGNOSTIC SYSTEM

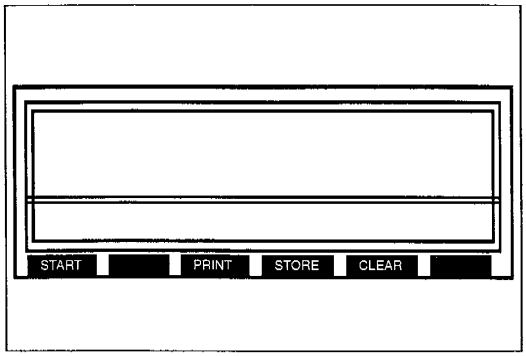
PREPARATION
SST

49 T088 0A0 NGS set 	For diagnosis of ECM	49 T088 010B Program Card 	For diagnosis ECM
49 T088 008A Instruction Manual 	For diagnosis of ECM	49 T088 001 Control Unit (Part of 49 T088 0A0) 	For diagnosis ECM
49 T088 002 Vehicle Interface Module (Part of 49 T088 0A0) 	For diagnosis of ECM	49 T088 004 NGS OBDII Adapter (Part of 49 T088 0A0) 	For diagnosis of ECM
49 T088 006 Battery Hookup Adapter (Part of 49 T088 0A0) 	For diagnosis of ECM	—	—



DIAGNOSTIC TROUBLE CODE NUMBER
Inspection

1. Connect the **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard.
2. Refer to the manufacturer-provided instruction manual for the NGS operation.
3. Select "DIAGNOSTIC TEST MODES" function and press trigger.
4. When "NO CODES RECEIVED/SYSTEM PASSED" is displayed, all systems monitord are judged OK.
5. When any of the diagnostic trouble codes is displayed, carry out troubleshooting according to the code.
6. When "LINK MONITOR ERROR" is displayed, check connection of the NGS.
7. After all problems have been repaired, carry out After-repair Procedure. (Refer to page F–47.)



After-repair Procedure

1. After repairs, connect the NGS to the data link connector 2 located under the driver side dashboard.
2. Select "CLEAR" function and erase diagnostic trouble codes from the NGS memory.
3. Perform diagnostic trouble code inspection again and verify that no diagnostic trouble codes are displayed.

Diagnostic Trouble Code Numbers

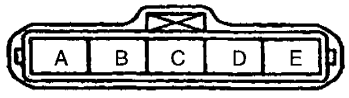
Code No.	Display on the NGS	Condition	Page
P0100	MAF/VAF-CIRCUIT MALFUNCTION	Mass or Volume air flow circuit malfunction	F–49
P0110	IAT–CIRCUIT MALFUNCTION	Intake air temperature circuit malfunction	F–50
P0115	ECT–CIRCUIT MALFUNCTION	Engine coolant temperature circuit malfunction	F–51
P0120	TP–CIRCUIT MALFUNCTION	Throttle position circuit malfunction	F–52
P0125	EXCESSIVE TIME TO ENTER CLOSED LOOP	Excessive time to enter closed loop fuel control	F–52
P0130	O2S 11–CIRCUIT MALFUNCTION	O_2 sensor circuit malfunction	F–53
P0134	O2S 11–CIRCUIT NO ACTIVITY DETECTED	O_2 sensor circuit no activity detected	F–53
P0135	O2S 11–HEATER CIRCUIT MALFUNCTION	O_2 sensor heater circuit malfunction	F–54
P0140	O2S 12–CIRCUIT NO ACTIVITY DETECTED	O_2 sensor circuit no activity detected	F–55
P0170	BANK 1–FUEL TRIM MALFUNCTION	Fuel trim malfunction	F–56
P0300	RANDOM MISFIRE DETECTED	Random misfire detected	F–57
P0301	CYLINDER 1 MISFIRE DETECTED	Cylinder 1 misfire detected	F–58
P0302	CYLINDER 2 MISFIRE DETECTED	Cylinder 2 misfire detected	F–59
P0303	CYLINDER 3 MISFIRE DETECTED	Cylinder 3 misfire detected	F–60
P0304	CYLINDER 4 MISFIRE DETECTED	Cylinder 4 misfire detected	F–61
P0305	CYLINDER 5 MISFIRE DETECTED	Cylinder 5 misfire detected	F–62

Code No.	Display on the NGS	Condition	Page
P0306	CYLINDER 6 MISFIRE DETECTED	Cylinder 6 misfire detected	F–63
P0335	CRANKSHAFT POS SENSOR–CKT MALFUNCTION	Crankshaft position sensor circuit malfunction	F–64
P0420	BANK1 CAT EFFICIENCY BELOW LIMIT	Catalyst system efficiency below threshold	F–64
P0440	EVAP SYSTEM–MALFUNCTION	Evaporative emission control system malfunction	F–65
P0443	EVAP SYSTEM–PURGE CTRL VALVE CKT MALF	Evaporative emission control system purge control valve circuit malfunction	F–66
P0450	EVAP PRESSURE SENSOR–MALFUNCTION	Evaporative emission control system pressure sensor malfunction	F–67
P0500	VEHICLE SPEED SENSOR–MALFUNCTION	Vehicle speed sensor malfunction	F–68
P0505	IDLE CONTROL SYSTEM–MALFUNCTION	Idle control system malfunction	F–68
P0510	CLOSED THROTTLE POS SWITCH–MALFUNCTION	Closed throttle position switch malfunction	F–69
P0703	TORQUE CONV/BRAKE SW–MALFUNCTION	Brake switch input malfunction	F–69
P1000	MORE DRIVING NEEDED TO COMPLETE TEST	Check of all OBD-II systems is not complete since last memory clear	F–70
P1110	IATS (D/C)–OPEN OR SHORT	Intake air temperature sensor (dynamic chamber) open or short	F–71
P1170	HO2S 11–INVERSION	O_2 sensor stuck	F–72
P1195	EGRBS–OPEN OR SHORT	Barometric pressure sensor open or short	F–72
P1196	STA SW–OPEN OR SHORT	Ignition switch (Start) open or short	F–73
P1250	PRC–OPEN OR SHORT	PRC solenoid valve No.1 open or short	F–73
P1252	PRC2–OPEN OR SHORT	PRC solenoid valve No.2 open or short	F–74
P1345	SGC SIGNAL–NO SGC SIGNAL	No SGC signal	F–74

Code No.	Display on the NGS	Condition	Page
P1449	CANISTER DRAIN CUT VALVE–OPEN OR SHORT	Canister drain cut valve open or short	F–75
P1455	FUEL TANK LEVEL SENSOR–OPEN OR SHORT	Fuel gauge sender unit open or short	F–76
P1521	VRIS1–OPEN OR SHORT	VRIS solenoid valve No.1 open or short	F–77
P1601	COMM LINE (AT)–COMM ERROR	Communication error	F–77
P1608	PCME (CPU)–MALFUNCTION	ECM malfunction	F–78
P1794	BAT–BAT OR CIRCUIT FAIL	Battery or circuit fail	F–78
P1797	PNS–OPEN OR SHORT	No P or N range signal	F–78

Diagnostic trouble code No. P0100	**MAF/VAF–CIRCUIT MALFUNCTION**
Symptom	Input voltage from Mass air flow sensor is below 0.2 V or above 4.9 V when ignition switch is turned on
Possible cause	• Mass air flow sensor malfunction • Open or short circuit wiring from main relay terminal D to mass air flow sensor terminal A • Open or short circuit in wiring from ECM terminal 3B to mass air flow sensor terminal B • Open or short circuit in wiring from ECM terminal 4A to mass air flow sensor terminal E

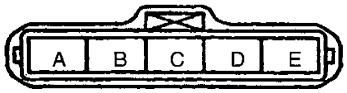
STEP	INSPECTION		ACTION
1	Does mass air flow sensor connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 3B voltage OK? ☞ page F–31	Yes	Go to step 6
		No	Go to next step
3	Disconnect mass air flow sensor connector. Turn ignition switch to ON. Is there battery positive voltage at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (Main relay terminal D — Mass air flow sensor terminal A)
4	Is there continuity between connector terminal E and ECM terminal 4A?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is there continuity between connector terminal B and ECM terminal 3B?	Yes	Go to next step
		No	Repair or replace wiring harness
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P0110	IAT–CIRCUIT MALFUNCTION
Symptom	Input from intake air temperature sensor is below 0.1 V or above 4.8 V when ignition switch is turned on
Possible cause	• Intake air temperature sensor malfunction • Open or short circuit in wiring from mass air flow sensor terminal C to ECM terminal 3K • Open or short circuit in wiring from mass air flow sensor terminal D to ECM terminal 3O

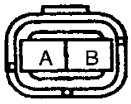
STEP	INSPECTION		ACTION
1	Does mass air flow sensor connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 3K voltage OK? ☞ **page F–31**	Yes	Go to step 6
		No	Go to next step
3	Disconnect mass air flow sensor connector. Turn ignition switch to ON. Is there 5 V at connector terminal C?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (ECM terminal 3K — Mass air flow sensor terminal C)
4	Is there continuity between mass air flow sensor connector terminal D and ECM terminal 3O?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is intake air temperature sensor OK? ☞ **page F–38**	Yes	Go to next step
		No	Replace mass air flow sensor ☞ **page F–5**
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P0115	ECT–CIRCUIT MALFUNCTION
Symptom	Input voltage from engine coolant temperature sensor is below 0.1 V or above 4.8 V when ignition switch is turned on
Possible cause	• Engine coolant temperature sensor malfunction • Open or short circuit in wiring from engine coolant temperature sensor terminal A to ECM terminal 3E • Open or short circuit in wiring from engine coolant temperature sensor terminal B to ECM terminal 3O

STEP	INSPECTION		ACTION
1	Does engine coolant temperature sensor or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 3E voltage OK? ☞ **page F–31**	Yes	Go to step 6
		No	Go to next step
3	Disconnect engine coolant temperature sensor connector. Turn ignition switch to ON. Is there 5 V at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (ECM terminal 3E — Engine coolant temperature sensor terminal A)
4	Is there continuity between connector terminal B and ECM terminal 3O?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is engine coolant temperature sensor OK? ☞ **page F–42**	Yes	Go to next step
		No	Replace engine coolant temperature sensor ☞ **page F–30**
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P0120	TP–CIRCUIT MALFUNCTION
Symptom	Input voltage from throttle position sensor is below 0.1 V or above 4.7 V when ignition switch is turned on
Possible cause	• Throttle position sensor malfunction • Open or short circuit in wiring from throttle position sensor terminal A to ECM terminal 3I • Open or short circuit in wiring from throttle position sensor terminal B to ECM terminal 3F • Open or short circuit in wiring from throttle position sensor terminal D to ECM terminal 3O

STEP	INSPECTION		ACTION
1	Does throttle position sensor connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 3F voltage OK? ☞ **page F–31**	Yes	Go to next step
		No	Go to step 4
3	Is voltage increase linear according to the throttle valve opening angle?	Yes	Go to step 7
		No	Replace throttle position sensor ☞ **page F–42**
4	Disconnect throttle position sensor connector. Turn ignition switch to ON. Is there 5 V at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (ECM terminal 3I — Throttle position sensor terminal A)
5	Is there continuity between connector terminal B and ECM terminal 3F?	Yes	Go to next step
		No	Repair or replace wiring harness
6	Is there continuity between connector terminal D and ECM terminal 3O?	Yes	Replace throttle position sensor ☞ **page F–42**
		No	Repair or replace wiring harness
7	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

HARNESS SIDE CONNECTOR

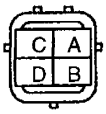
Diagnostic trouble code No. P0125	EXCESSIVE TIME TO ENTER CLOSED LOOP
Symptom	Engine coolant temperature sensor signal does not rise normally because of engine coolant system malfunction
Possible cause	• Engine coolant temperature sensor malfunction • Thermostat malfunction • Engine cooling fan system malfunction • Water pump malfunction • Engine coolant passage clogged or leaking • Engine coolant level and protection incorrect

STEP	INSPECTION		ACTION
1	Is engine coolant temperature sensor OK? ☞ **page F–42**	Yes	Go to next step
		No	Replace engine coolant temperature sensor
2	Is cooling system OK? ☞ **section E**	Yes	Go to next step
		No	Repair or replace
3	Erase diagnostic trouble code from memory. Is same code No. present after *rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Temporary system malfunction

* During normal driving

Diagnostic trouble code No. P0130	O2S 11–CIRCUIT MALFUNCTION		
Symptom	• Heated oxygen sensor (Front) deterioration • Leakage in exhaust system		
STEP	INSPECTION		ACTION
1	Is heated oxygen sensor (Front) OK? ☞ page F–43	Yes	Replace ECM ☞ page F–31
		No	Repair or replace heated oxygen sensor (Front) ☞ page F–22

Diagnostic trouble code No. P0134	O2S 11–CIRCUIT NO ACTIVITY DETECTED		
Symptom	When heated oxygen sensor (Front) signal does not exceed 0.5 V after the engine is started, or stays below 0.5 V for 80 seconds after the engine has reached normal operating temperature and running at 1,500 rpm or over		
Possible cause	• Heated oxygen sensor (Front) malfunction • Open or short circuit in wiring from heated oxygen sensor (Front) terminal A to ECM terminal 3C • Open circuit in wiring from heated oxygen sensor (Front) terminal B to ECM terminal 3O • Intake-air system, fuel system, ignition system malfunction		
STEP	INSPECTION		ACTION
1	Does heated oxygen sensor (Front) connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 3C voltage OK? ☞ page F–31	Yes	Go to step 5
		No	Go to next step
3	Disconnect heated oxygen sensor (Front) connector. Is there continuity between connector terminal A and ECM terminal 3C?	Yes	Go to next step
		No	Repair or replace wiring harness
4	Are following units OK? • Fuel injector ☞ page F–21 • Pressure regulator ☞ page F–19 • Mass air flow sensor ☞ page F–37 • Engine coolant temperature sensor ☞ page F–42 • Spark plug ☞ section G • Air suction ☞ page F–5 (Air/fuel ratio rich or lean)	Yes	Replace heated oxygen sensor (Front) ☞ page F–22
		No	Repair or replace
5	Erase diagnostic trouble code from memory. Run the engine at 1,500—2,000 rpm for more than 3 minutes to activate heated oxygen sensor. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

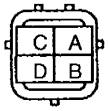
Diagnostic trouble code No. P0135	O2S 11–HEATER CIRCUIT MALFUNCTION
Symptom	Open or short circuit is observed in heated oxygen sensor heater (Front) system
Possible cause	• Heated oxygen sensor heater (Front) malfunction • Open or short circuit in wiring from heated oxygen sensor (Front) terminal C to main relay • Open or short circuit in wiring from heated oxygen sensor (Front) terminal D to ECM terminal 1T

STEP	INSPECTION		ACTION
1	Does heated oxygen sensor (Front) connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 1T voltage OK? ☞ page F–31	Yes	Go to step 6
		No	Go to next step
3	Disconnect heated oxygen sensor (Front) connector and turn ignition switch to ON. Is there battery positive voltage at connector terminal C?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (Main relay terminal D — Heated oxygen sensor (Front) terminal C)
4	Is there continuity between connector terminal D and ECM terminal 1T?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is there continuity between connector terminals C and D?	Yes	Go to next step
		No	Replace heated oxygen sensor (Front) ☞ page F–22
6	Erase diagnostic trouble code from memory. Run the engine at 1,500—2,000 rpm for more than 3 minutes to activate heated oxygen sensor. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P0140	**O2S 12–CIRCUIT NO ACTIVITY DETECTED**
Symptom	When heated oxygen sensor (Rear) signal does not exceed 0.5 V after the engine is started, or stays below 0.5 V for 80 seconds after the engine has reached normal operating temperature and running at 1,500 rpm or over
Possible cause	• Heated oxygen sensor (Rear) malfunction • Open or short circuit in wiring from heated oxygen sensor (Rear) terminal A to ECM terminal 2K • Open circuit in wiring from heated oxygen sensor (Rear) terminal B to ECM terminal 3O • Intake-air system, fuel system, ignition system malfunction

STEP	INSPECTION		ACTION
1	Does heated oxygen sensor (Rear) connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 2K voltage OK? ☞ **page F–31**	Yes	Go to step 6
		No	Go to next step
3	Disconnect heated oxygen sensor (Rear) connector. Is there continuity between connector terminal B and ECM terminal 3O?	Yes	Go to next step
		No	Repair or replace wiring harness
4	Is there continuity between connector terminal A and ECM terminal 2K?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Are following units OK? • Fuel injector ☞ **page F–21** • Pressure regulator ☞ **page F–19** • Mass air flow sensor ☞ **page F–37** • Engine coolant temperature sensor ☞ **page F–42** • Spark plug ☞ **section G** • Air suction (Air/fuel ratio rich) ☞ **page F–5**	Yes	Replace heated oxygen sensor (Rear) ☞ **page F–22**
		No	Repair or replace
6	Erase diagnostic trouble code from memory. Run the engine at 1,500—2,000 rpm for more than 3 minutes to activate heated oxygen sensor. Is same code No. present after rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P0170	BANK 1–FUEL TRIM MALFUNCTION
Symptom	Air/fuel ratio stays rich or lean longer than specified period because of system malfunction
Possible cause	• Pressure regulator malfunction • Fuel injector malfunction • Fuel pump malfunction • Engine coolant temperature sensor malfunction • Mass air flow sensor malfunction • Heated oxygen sensor malfunction • Purge solenoid valve malfunction • Leakage in intake-air system • ECM malfunction • Open or short circuit in wiring between ECM terminals 4U, 4V, 4W, 4X, 4Y, 4Z to fuel injector • Intake air temperature sensor malfunction • PCV valve malfunction

STEP	INSPECTION		ACTION
1	Is there air leakage in intake-air system components? ☞ **page F–5**	Yes	Repair or replace intake air device system
		No	Go to next step
2	Is fuel line pressure OK? ☞ **page F–12**	Yes	Go to step 5
		No	Go to next step
3	Is fuel pump maximum pressure OK? ☞ **page F–16**	Yes	Go to next step
		No	Repair or replace fuel pump ☞ **page F–17**
4	Is pressure regulator OK? ☞ **page F–19**	Yes	Go to next step
		No	Repair or replace pressure regulator ☞ **page F–20**
5	Is fuel injector OK? ☞ **page F–21**	Yes	Go to next step
		No	Replace fuel injector ☞ **page F–20**
6	Is engine coolant temperature sensor OK? ☞ **page F–42**	Yes	Go to next step
		No	Replace engine coolant temperature sensor ☞ **page F–30**
7	Is mass air flow sensor OK? ☞ **page F–37**	Yes	Go to next step
		No	Replace mass air flow sensor ☞ **page F–5**
8	Is throttle position sensor OK? ☞ **page F–40**	Yes	Go to next step
		No	Adjust throttle position sensor ☞ **page F–41**
9	Is closed throttle position switch OK? ☞ **page F–40**	Yes	Go to next step
		No	Adjust throttle position sensor ☞ **page F–41**
10	Is intake air temperature sensor OK? ☞ **page F–38**	Yes	Go to next step
		No	Replace mass air flow sensor ☞ **page F–5**
11	Is purge solenoid valve OK? ☞ **page F–25**	Yes	Go to next step
		No	Replace purge solenoid valve
12	Is PCV valve OK? ☞ **page F–28**	Yes	Go to next step
		No	Replace PCV valve
13	Erase diagnostic trouble code from memory. Is same code No. present after *rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Temporary system malfunction

* During idling

Diagnostic trouble code No. P0300	RANDOM MISFIRE DETECTED
Symptom	ECM input signal from crankshaft position sensor signal is irregular
Possible cause	• Ignition system malfunction • Low fuel • Low battery voltage • Fuel system malfunction • Insufficient compression • Crankshaft position sensor air gap incorrect

STEP	INSPECTION		ACTION
1	Is ignition system OK? ☞ **section G**	Yes	Go to next step
		No	Repair or replace as necessary
2	Is ignition timing within specification? **Ignition timing: 10—12°** [TEN terminal grounded with **SST**] ☞ **page F–3**	Yes	Go to next step
		No	Adjust ignition timing ☞ **page F–3**
3	Is crankshaft position sensor air gap OK? ☞ **page F–39**	Yes	Go to next step
		No	Repair or replace crankshaft position sensor ☞ **page F–39**
4	Is fuel system OK? ☞ **page F–11**	Yes	Go to next step
		No	Repair or replace as necessary
5	Is compression at all cylinders normal? ☞ **section B**	Yes	Go to next step
		No	Repair or replace as necessary
6	Erase diagnostic trouble code from memory. Is same code No. present after *rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Temporary system malfunction

* During normal driving

Diagnostic trouble code No. P0301	CYLINDER 1 MISFIRE DETECTED
Symptom	ECM input signal from crankshaft position sensor signal for cylinder No.1 is irregular
Possible cause	• Ignition system of cylinder No.1 malfunction • Low fuel • Low battery voltage • Fuel system malfunction • Insufficient compression in cylinder No.1 • Crankshaft position sensor air gap incorrect

STEP	INSPECTION		ACTION
1	Is ignition system of cylinder No.1 OK? ☞ **section G**	Yes	Go to next step
		No	Repair or replace as necessary
2	Is ignition timing within specification? **Ignition timing: 10—12°** [TEN terminal grounded with **SST**] ☞ **page F–3**	Yes	Go to next step
		No	Adjust ignition timing ☞ **page F–3**
3	Is crankshaft position sensor air gap OK? ☞ **page F–39**	Yes	Go to next step
		No	Repair or replace crankshaft position sensor ☞ **page F–39**
4	Is fuel injector at cylinder No.1 OK? ☞ **page F–21**	Yes	Go to next step
		No	Repair or replace fuel injector at cylinder No.1 ☞ **page F–20**
5	Is fuel system OK? ☞ **page F–11**	Yes	Go to next step
		No	Repair or replace as necessary
6	Is compression at cylinder No.1 normal? ☞ **section B**	Yes	Go to next step
		No	Repair or replace as necessary
7	Erase diagnostic trouble code from memory. Is same code No. present after *rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Temporary system malfunction

* During normal driving

Diagnostic trouble code No. P0302	CYLINDER 2 MISFIRE DETECTED
Symptom	ECM input signal from crankshaft position sensor signal for cylinder No.2 is irregular
Possible cause	• Ignition system of cylinder No.2 malfunction • Low fuel • Low battery voltage • Fuel system malfunction • Insufficient compression in cylinder No.2 • Crankshaft position sensor air gap incorrect

STEP	INSPECTION		ACTION
1	Is ignition system of cylinder No.2 OK? ☞ **section G**	Yes	Go to next step
		No	Repair or replace as necessary
2	Is ignition timing within specification? **Ignition timing: 10—12°** [TEN terminal grounded with **SST**] ☞ **page F–3**	Yes	Go to next step
		No	Adjust ignition timing ☞ **page F–3**
3	Is crankshaft position sensor air gap OK? ☞ **page F–39**	Yes	Go to next step
		No	Repair or replace crankshaft position sensor ☞ **page F–39**
4	Is fuel injector at cylinder No.2 OK? ☞ **page F–21**	Yes	Go to next step
		No	Repair or replace fuel injector at cylinder No.2 ☞ **page F–20**
5	Is fuel system OK? ☞ **page F–11**	Yes	Go to next step
		No	Repair or replace as necessary
6	Is compression at cylinder No.2 normal? ☞ **section B**	Yes	Go to next step
		No	Repair or replace as necessary
7	Erase diagnostic trouble code from memory. Is same code No. present after *rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Temporary system malfunction

* During normal driving

Diagnostic trouble code No. P0303	CYLINDER 3 MISFIRE DETECTED
Symptom	ECM input signal from crankshaft position sensor signal for cylinder No.3 is irregular
Possible cause	• Ignition system of cylinder No.3 malfunction • Low fuel • Low battery voltage • Fuel system malfunction • Insufficient compression in cylinder No.3 • Crankshaft position sensor air gap incorrect

STEP	INSPECTION		ACTION
1	Is ignition system of cylinder No.3 OK? ☞ **section G**	Yes	Go to next step
		No	Repair or replace as necessary
2	Is ignition timing within specification? **Ignition timing: 10—12°** [TEN terminal grounded with **SST**] ☞ **page F–3**	Yes	Go to next step
		No	Adjust ignition timing ☞ **page F–3**
3	Is crankshaft position sensor air gap OK? ☞ **page F–39**	Yes	Go to next step
		No	Repair or replace crankshaft position sensor ☞ **page F–39**
4	Is fuel injector at cylinder No.3 OK? ☞ **page F–21**	Yes	Go to next step
		No	Repair or replace fuel injector at cylinder No.3 ☞ **page F–20**
5	Is fuel system OK? ☞ **page F–11**	Yes	Go to next step
		No	Repair or replace as necessary
6	Is compression at cylinder No.3 normal? ☞ **section B**	Yes	Go to next step
		No	Repair or replace as necessary
7	Erase diagnostic trouble code from memory. Is same code No. present after *rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Temporary system malfunction

* During normal driving

Diagnostic trouble code No. P0304	CYLINDER 4 MISFIRE DETECTED
Symptom	ECM input signal from crankshaft position sensor signal for cylinder No.4 is irregular
Possible cause	• Ignition system of cylinder No.4 malfunction • Low fuel • Low battery voltage • Fuel system malfunction • Insufficient compression in cylinder No.4 • Crankshaft position sensor air gap incorrect

STEP	INSPECTION		ACTION
1	Is ignition system of cylinder No.4 OK? ☞ **section G**	Yes	Go to next step
		No	Repair or replace as necessary
2	Is ignition timing within specification? **Ignition timing: 10—12°** [TEN terminal grounded with **SST**] ☞ **page F–3**	Yes	Go to next step
		No	Adjust ignition timing ☞ **page F–3**
3	Is crankshaft position sensor air gap OK? ☞ **page F–39**	Yes	Go to next step
		No	Repair or replace crankshaft position sensor ☞ **page F–39**
4	Is fuel injector at cylinder No.4 OK? ☞ **page F–21**	Yes	Go to next step
		No	Repair or replace fuel injector at cylinder No.4 ☞ **page F–20**
5	Is fuel system OK? ☞ **page F–11**	Yes	Go to next step
		No	Repair or replace as necessary
6	Is compression at cylinder No.4 normal? ☞ **section B**	Yes	Go to next step
		No	Repair or replace as necessary
7	Erase diagnostic trouble code from memory. Is same code No. present after *rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Temporary system malfunction

* During normal driving

Diagnostic trouble code No. P0305	CYLINDER 5 MISFIRE DETECTED
Symptom	ECM input signal from crankshaft position sensor signal for cylinder No.5 is irregular
Possible cause	• Ignition system of cylinder No.5 malfunction • Low fuel • Low battery voltage • Fuel system malfunction • Insufficient compression in cylinder No.5 • Crankshaft position sensor air gap incorrect

STEP	INSPECTION		ACTION
1	Is ignition system of cylinder No.5 OK? ☞ **section G**	Yes	Go to next step
		No	Repair or replace as necessary
2	Is ignition timing within specification? **Ignition timing: 10—12°** [TEN terminal grounded with **SST**] ☞ **page F–3**	Yes	Go to next step
		No	Adjust ignition timing ☞ **page F–3**
3	Is crankshaft position sensor air gap OK? ☞ **page F–39**	Yes	Go to next step
		No	Repair or replace crankshaft position sensor ☞ **page F–39**
4	Is fuel injector at cylinder No.5 OK? ☞ **page F–21**	Yes	Go to next step
		No	Repair or replace fuel injector at cylinder No.5 ☞ **page F–20**
5	Is fuel system OK? ☞ **page F–11**	Yes	Go to next step
		No	Repair or replace as necessary
6	Is compression at cylinder No.5 normal? ☞ **section B**	Yes	Go to next step
		No	Repair or replace as necessary
7	Erase diagnostic trouble code from memory. Is same code No. present after *rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Temporary system malfunction

* During normal driving

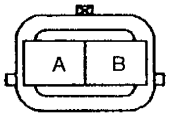
Diagnostic trouble code No. P0306	CYLINDER 6 MISFIRE DETECTED
Symptom	ECM input signal from crankshaft position sensor signal for cylinder No.6 is irregular
Possible cause	• Ignition system of cylinder No.6 malfunction • Low fuel • Low battery voltage • Fuel system malfunction • Insufficient compression in cylinder No.6 • Crankshaft position sensor air gap incorrect

STEP	INSPECTION		ACTION
1	Is ignition system of cylinder No.6 OK? ☞ **section G**	Yes	Go to next step
		No	Repair or replace as necessary
2	Is ignition timing within specification? **Ignition timing: 10—12°** [TEN terminal grounded with **SST**] ☞ **page F–3**	Yes	Go to next step
		No	Adjust ignition timing ☞ **page F–3**
3	Is crankshaft position sensor air gap OK? ☞ **page F–39**	Yes	Go to next step
		No	Repair or replace crankshaft position sensor ☞ **page F–39**
4	Is fuel injector at cylinder No.6 OK? ☞ **page F–21**	Yes	Go to next step
		No	Repair or replace fuel injector at cylinder No.6 ☞ **page F–20**
5	Is fuel system OK? ☞ **page F–11**	Yes	Go to next step
		No	Repair or replace as necessary
6	Is compression at cylinder No.6 normal? ☞ **section B**	Yes	Go to next step
		No	Repair or replace as necessary
7	Erase diagnostic trouble code from memory. Is same code No. present after *rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Temporary system malfunction

* During normal driving

Diagnostic trouble code No. P0335	CRANKSHAFT POS SENSOR–CKT MALFUNCTION
Symptom	No NE signal input from crankshaft position sensor for 1.1 seconds while engine running
Possible cause	• Crankshaft position sensor malfunction • Open or short circuit in wiring from ECM terminal 4E to crankshaft position sensor terminal B • Open or short circuit in wiring from ECM terminal 4H to crankshaft position sensor terminal A

STEP	INSPECTION		ACTION
1	Does crankshaft position sensor connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Disconnect crankshaft position sensor connector. Is there continuity between connector terminal B and ECM terminal 4E? Is there continuity between connector terminal A and ECM terminal 4H?	Yes	Go to next step
		No	Repair or replace wiring harness
3	Is crankshaft position sensor air gap OK? ☞ page F–39	Yes	Go to next step
		No	Replace crankshaft position sensor or crankshaft pulley ☞ page F–39
4	Is crankshaft position sensor OK? ☞ page F–39	Yes	Go to next step
		No	Replace crankshaft position sensor ☞ page F–39
5	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P0420	BANK 1 CAT EFFICIENCY BELOW LIMIT
Symptom	• Three way catalytic converter (pre) deterioration • Leakage in exhaust system

STEP	INSPECTION		ACTION
1	Is heated oxygen sensor (Rear) OK? ☞ page F–43	Yes	Replace three way catalytic converter (pre) ☞ page F–22
		No	Replace heated oxygen sensor (Rear) ☞ page F–22

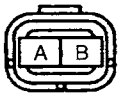
Diagnostic trouble code No. P0440	EVAP SYSTEM–MALFUNCTION
Symptom	Evaporative emission control system does not function normally because of mechanical trouble
Possible cause	• Purge solenoid valve malfunction • Canister drain cut valve malfunction • Fuel tank pressure sensor malfunction • Fuel gauge sender unit malfunction • Charcoal canister malfunction • Cut valve malfunction • Catch tank malfunction • Separator malfunction • Tank pressure control valve malfunction • Clogs or leakage in piping connecting following units Intake manifold and purge solenoid valve Purge solenoid valve and catch tank Catch tank and charcoal canister Charcoal canister and tank pressure control valve Tank pressure control valve, cut valve, separator, fuel tank pressure sensor and fuel tank Charcoal canister and canister drain cut valve

STEP	INSPECTION		ACTION
1	Is ECM terminal 4T voltage OK? ☞ **page F–31**	Yes	Go to next step
		No	Inspect purge solenoid valve ☞ **page F–25**
2	Is ECM terminal 2C voltage OK? ☞ **page F–31**	Yes	Go to next step
		No	Inspect canister drain cut valve and tank pressure control valve ☞ **page F–26, 28**
3	Is ECM terminal 3A voltage OK? ☞ **page F–31**	Yes	Go to next step
		No	Inspect fuel tank pressure sensor ☞ **page F–44**
4	Is ECM terminal 2L voltage OK? ☞ **page F–31**	Yes	Go to next step
		No	Inspect fuel gauge sender unit ☞ **section T**
5	Is charcoal canister OK? ☞ **page F–26**	Yes	Go to next step
		No	Repair or replace as necessary
6	Is cut valve OK? ☞ **page F–26**	Yes	Go to next step
		No	Repair or replace as necessary
7	Is catch tank OK?	Yes	Go to next step
		No	Repair or replace as necessary
8	Is separator OK? ☞ **page F–28**	Yes	Go to next step
		No	Repair or replace as necessary
9	Erase diagnostic trouble code from memory. Is same code No. present after *rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Temporary system malfunction

* During driving after engine warm-up

Diagnostic trouble code No. P0443	EVAP SYSTEM–PURGE CTRL VALVE CKT MALF
Symptom	Open or short circuit is observed in purge solenoid valve system when ignition switch is turned on
Possible cause	• Purge solenoid valve malfunction • Open or short circuit in wiring from purge solenoid valve terminal A to main relay terminal D • Open or short circuit in wiring from purge solenoid valve terminal B to ECM terminal 4T

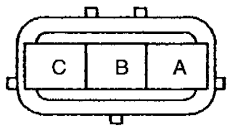
STEP	INSPECTION		ACTION
1	Does purge solenoid valve connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 4T voltage OK? ☞ page F–31	Yes	Go to step 6
		No	Go to next step
3	Disconnect purge solenoid valve connector. Turn ignition switch to ON. Is there battery positive voltage at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (Main relay terminal D — Purge solenoid valve terminal A)
4	Is there continuity between connector terminal B and ECM terminal 4T?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is there continuity between purge solenoid valve connector terminals A and B?	Yes	Go to next step
		No	Replace purge solenoid valve
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P0450	EVAP PRESSURE SENSOR–MALFUNCTION
Symptom	Input voltage from fuel tank pressure sensor is below 0.1 V or above 4.8 V when ignition switch is turned on
Possible cause	• Fuel tank pressure sensor malfunction • Open or short circuit in wiring from ECM terminal 3I to fuel tank pressure sensor terminal C • Open or short circuit in wiring from ECM terminal 3A to fuel tank pressure sensor terminal A • Open circuit in wiring from ECM terminal 3O to fuel tank pressure sensor terminal B

STEP	INSPECTION		ACTION
1	Does fuel tank pressure sensor connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 3A voltage OK? ☞ page F–31	Yes	Go to step 6
		No	Go to next step
3	Are fuel tank pressure sensor and connecting hose free of freezing, breakage, and clogs?	Yes	Repair or replace
		No	Go to next step
4	Disconnect fuel tank pressure sensor connector. Turn ignition switch to ON. Is there 5 V at connector terminal C?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (ECM terminal 3I — Fuel tank pressure sensor terminal C)
5	Is there continuity between connector terminal B and ECM terminal 3O?	Yes	Replace fuel tank pressure sensor
		No	Repair or replace wiring harness
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

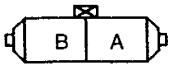
Diagnostic trouble code No. P0500	VEHICLE SPEED SENSOR–MALFUNCTION
Symptom	No vehicle speed sensor signal input from vehicle speed sensor while driving
Possible cause	• Speedometer sensor malfunction • Open or short circuit in wiring from ignition switch to speedometer sensor • Open or short circuit in wiring from speedometer sensor to GND • Open or short circuit in wiring from speedometer sensor to vehicle speed sensor • Open or short circuit in wiring from vehicle speed sensor to ECM terminal 1M

STEP	INSPECTION		ACTION
1	Does vehicle speed sensor connector and ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 1M voltage OK? ☞ page F–31	Yes	Go to step 5
		No	Go to next step
3	Is there continuity between vehicle speed sensor terminal and ECM terminal 1M?	Yes	Go to next step
		No	Repair or replace wiring harness
4	Is there continuity between vehicle speed sensor and speedometer sensor terminals? ☞ section T	Yes	Go to next step
		No	Repair or replace speedometer sensor and wiring harness ☞ section K1
5	Erase diagnostic trouble code from memory. Is same code No. present after* rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

* During driving after engine warm-up

Diagnostic trouble code No. P0505	IDLE CONTROL SYSTEM–MALFUNCTION
Symptom	• Mechanical trouble is observed in idle air control system • Open or short circuit is observed in idle air control system
Possible cause	• Idle air control valve malfunction • Leakage in intake-air system • Open or short circuit in wiring from idle air control valve terminal A to main relay terminal D • Open or short circuit in wiring from idle air control valve terminal B to ECM terminal 4Q

STEP	INSPECTION		ACTION
1	Does idle air control valve connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 4Q voltage OK? ☞ page F–31	Yes	Go to step 6
		No	Go to next step
3	Disconnect idle air control valve connector. Turn ignition switch to ON. Is there battery positive voltage at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (Main relay terminal D — Idle air control valve terminal A)
4	Is there continuity between connector terminal B and ECM terminal 4Q?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is there continuity between idle air control valve connector terminals A and B?	Yes	Go to next step
		No	Replace BAC valve ☞ page F–5
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P0510	CLOSED THROTTLE POS SWITCH–MALFUNCTION
Symptom	Input signal from closed throttle position switch (in throttle position sensor) and throttle position sensor do not match for more than 33 seconds
Possible cause	• Closed throttle position switch (in throttle position sensor) malfunction • Throttle position sensor malfunction • Open or short circuit in wiring from throttle position sensor terminal C to ECM terminal 3L • Open or short circuit in wiring from throttle position sensor terminal D to ECM terminal 3O

STEP	INSPECTION		ACTION
1	Does throttle position sensor connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 3L voltage OK? ☞ page F–31	Yes	Go to step 6
		No	Go to next step
3	Is there continuity between connector terminal C and ECM terminal 3L?	Yes	Go to next step
		No	Repair or replace wiring harness
4	Is there continuity between connector terminal D and ECM terminal 3O?	Yes	Replace throttle position sensor
		No	Repair or replace wiring harness
5	Is closed throttle position switch (in throttle position sensor) OK? ☞ page F–40	Yes	Go to next step
		No	Repair or replace throttle position sensor ☞ page F–42
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

HARNESS SIDE CONNECTOR

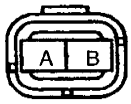
Diagnostic trouble code No. P0703	TORQUE CONV/BRAKE SW–MALFUNCTION
Symptom	No signal input from brake switch to ECM when brake pedal is kept depressed for more than 33 seconds, or signal input when brake pedal is not depressed
Possible cause	• Brake switch malfunction • Open or short circuit in wiring from ECM terminal 1Q to brake switch terminal • Open or short circuit in wiring from brake switch terminal to battery terminal

STEP	INSPECTION		ACTION
1	Does brake switch connector or ECM connector have poor connection?	Yes	Repair or replace
		No	Go to next step
2	Is ECM terminal 1Q voltage OK? ☞ page F–31	Yes	Go to step 4
		No	Go to next step
3	Is there continuity between brake switch and ECM terminal 1Q?	Yes	Check for open or short circuit in wiring harness (Battery — Brake switch) and check brake switch.
		No	Repair or replace wiring harness
4	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

<table>
<tr><td>Diagnostic trouble code No. P1000</td><td>MORE DRIVING NEEDED TO COMPLETE TEST</td></tr>
<tr><td>Possible cause</td><td>Following diagnostic trouble code detection conditions not satisfied
<table>
<tr><th>Diagnosed circuit</th><th>Code No.</th></tr>
<tr><td>Excessive time to enter closed loop fuel control</td><td>P0125</td></tr>
<tr><td>O_2 sensor circuit malfunction</td><td>P0130</td></tr>
<tr><td>O_2 sensor heater circuit malfunction</td><td>P0135</td></tr>
<tr><td>Fuel trim malfunction</td><td>P0170</td></tr>
<tr><td>Misfire detected</td><td>P0300, P0301
P0302, P0303
P0304, P0305
P0306</td></tr>
<tr><td>Catalyst system efficiency below threshold</td><td>P0420</td></tr>
<tr><td>Evaporative emission control system malfunction</td><td>P0440</td></tr>
</table>
Note
• DTC No.P1000 will be deleted while the MIL is illuminated</td></tr>
<tr><td>ACTION</td><td>Carry out troubleshooting according to symptom</td></tr>
</table>

Diagnostic trouble code No. P1110	**IATS (D/C)–OPEN OR SHORT**
Symptom	Input from intake air temperature sensor (Dynamic chamber) is below 0.1 V or above 4.9 V when ignition switch is turned on
Possible cause	• Intake air temperature sensor malfunction • Open or short circuit in wiring from intake air temperature sensor (Dynamic chamber) terminal A to ECM terminal 3M • Open or short circuit in wiring from intake air temperature sensor (Dynamic chamber) terminal B to ECM terminal 3O

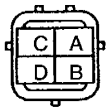
STEP	INSPECTION		ACTION
1	Does intake air temperature sensor (Dynamic chamber) connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 3M voltage OK? ☞ **page F–31**	Yes	Go to step 6
		No	Go to next step
3	Disconnect intake air temperature sensor (Dynamic chamber) connector. Turn ignition switch to ON. Is there 5 V at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (ECM terminal 3M — Intake air temperature sensor (Dynamic chamber) terminal A)
4	Is there continuity between connector terminal B and ECM terminal 3O?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is intake air temperature sensor (Dynamic chamber) OK? ☞ **page F–43**	Yes	Go to next step
		No	Repair intake air temperature sensor (Dynamic chamber) ☞ **page F–30**
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P1170	HO2S 11–INVERSION
Symptom	Heated oxygen sensor (Front) signal remains unchanged for more than 20 seconds after engine control has entered feedback zone
Possible cause	• Heated oxygen sensor (Front) malfunction • Open or short circuit in wiring from heated oxygen sensor (Front) terminal A to ECM terminal 3C • Intake-air system, fuel system, ignition system malfunction

STEP	INSPECTION		ACTION
1	Does heated oxygen sensor (Front) connector or ECM connector have poor connection?	Yes	Repair or replace
		No	Go to next step
2	Is ECM terminal 3C voltage OK? ☞ **page F–31**	Yes	Go to step 5
		No	Go to next step
3	Disconnect heated oxygen sensor (Front) connector. Is there continuity between connector terminal A and ECM terminal 3C?	Yes	Go to next step
		No	Repair or replace wiring harness
4	Are following units OK? • Fuel injector ☞ **page F–21** • Pressure regulator ☞ **page F–19** • Mass air flow sensor ☞ **page F–37** • Engine coolant temperature sensor ☞ **page F–42** • Spark plug ☞ **section G** • Air suction (Air/Fuel ratio rich or lean) ☞ **page F–5**	Yes	Replace heated oxygen sensor (Front) ☞ **page F–22**
		No	Repair or replace
5	Erase diagnostic trouble code from memory. Run the engine at 1,500—2,000 rpm for more than 3 minutes to activate heated oxygen sensor. Is same code No. present after rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P1195	EGRBS–OPEN OR SHORT
Symptom	ECM's barometric pressure integrated circuit is damaged
Possible cause	• ECM malfunction

STEP	INSPECTION	ACTION
—	—	Replace ECM ☞ **page F–31**

Diagnostic trouble code No. P1196	STA SW–OPEN OR SHORT
Symptom	Input signal from starter to ECM continues for more than 20 seconds
Possible cause	• Starter malfunction • Open or short circuit in wiring from starter terminal S and ECM terminal 1C

STEP	INSPECTION		ACTION
1	Does starter connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 1C voltage OK? ☞ page F–31	Yes	Go to step 4
		No	Go to next step
3	Disconnect starter connector. Is there continuity between connector terminal S and ECM terminal 1C?	Yes	Replace starter ☞ section G
		No	Repair or replace
4	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

Diagnostic trouble code No. P1250	PRC–OPEN OR SHORT
Symptom	Open or short circuit is observed in PRC solenoid valve No.1 system when ignition switch is turned on
Possible cause	• PRC solenoid valve malfunction • Open or short circuit in wiring from PRC solenoid valve No.1 terminal A to main relay terminal D • Open or short circuit in wiring from PRC solenoid valve No.1 terminal B to ECM terminal 4J

STEP	INSPECTION		ACTION
1	Does PRC solenoid valve No.1 connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 4J voltage OK? ☞ page F–31	Yes	Go to step 6
		No	Go to next step
3	Disconnect PRC solenoid valve No.1 connector. Turn ignition switch to ON. Is there battery positive voltage at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (Main relay terminal D — PRC solenoid valve No.1 terminal A)
4	Is there continuity between connector terminal B and ECM terminal 4J?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is there continuity between PRC solenoid valve No.1 terminals A and B?	Yes	Go to next step
		No	Replace PRC solenoid valve No.1
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P1252	PRC2–OPEN OR SHORT
Symptom	Open or short circuit is observed in PRC solenoid valve No.2 system when ignition switch is turned on
Possible cause	• PRC solenoid valve malfunction • Open or short circuit in wiring from PRC solenoid valve No.2 terminal A to main relay terminal D • Open or short circuit in wiring from PRC solenoid valve No.2 terminal B to ECM terminal 4L

STEP	INSPECTION		ACTION
1	Does PRC solenoid valve No.2 connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 4L voltage OK? ☞ page F–31	Yes	Go to step 6
		No	Go to next step
3	Disconnect PRC solenoid valve No.2 connector. Turn ignition switch to ON. Is there battery positive voltage at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (Main relay terminal D — PRC solenoid valve No.2 terminal A)
4	Is there continuity between connector terminal B and ECM terminal 4L?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is there continuity between PRC solenoid valve No.2 terminals A and B?	Yes	Go to next step
		No	Replace PRC solenoid valve No.2
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

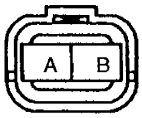
Diagnostic trouble code No. P1345	SGC SIGNAL–NO SGC SIGNAL
Symptom	No SGC signal input from camshaft position sensor while engine rotates nine cycles
Possible cause	• Camshaft position sensor malfunction • Open or short circuit in wiring from distributor 6-pin connector terminal B to main relay terminal D • Open or short circuit in wiring from ECM terminal 4G to distributor 6-pin connector terminal D

STEP	INSPECTION		ACTION
1	Does distributor 6-pin connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Disconnect distributor 6-pin connector. Turn ignition switch to ON. Is there battery positive voltage at connector terminal B?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (Main relay terminal D — Distributor 6-pin connector terminal B)
3	Is there continuity between connector terminal D and ECM terminal 4G?	Yes	Go to next step
		No	Repair or replace wiring harness
4	Is ECM terminal 4G voltage OK? ☞ page F–31	Yes	Go to step 6
		No	Go to next step
5	Is camshaft position sensor OK? ☞ page F–38	Yes	Go to next step
		No	Replace distributor ☞ section G
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P1449	CANISTER DRAIN CUT VALVE–OPEN OR SHORT
Symptom	Open or short circuit is observed in canister drain cut valve or tank pressure control valve system when ignition switch is turned on
Possible cause	• Canister drain cut valve malfunction • Tank pressure control valve malfunction • Open or short circuit in wiring from canister drain cut valve terminal A to main relay terminal D • Open or short circuit in wiring from canister drain cut valve terminal B to ECM terminal 2C • Open or short circuit in wiring from tank pressure control valve terminal A to main relay terminal D • Open or short circuit in wiring from tank pressure control valve terminal B to ECM terminal 2C

STEP	INSPECTION		ACTION
1	Does canister drain cut valve connector, tank pressure control valve connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 2C voltage OK? ☞ page F–31	Yes	Go to step 9
		No	Go to next step
3	Disconnect canister drain cut valve connector. Turn ignition switch to ON. Is there battery positive voltage at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (Main relay terminal D — Canister drain cut valve terminal A)
4	Disconnect tank pressure control valve connector. Turn ignition switch to ON. Is there battery positive voltage at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (Main relay terminal D — Tank pressure control valve terminal A)
5	Is there continuity between canister drain cut valve connector terminal B and ECM terminal 2C?	Yes	Go to next step
		No	Repair or replace wiring harness
6	Is there continuity between tank pressure control valve connector terminal B and ECM terminal 2C?	Yes	Go to next step
		No	Repair or replace wiring harness
7	Is there continuity between canister drain cut valve terminals A and B?	Yes	Go to next step
		No	Replace canister drain cut valve
8	Is there continuity between tank pressure control valve terminals A and B?	Yes	Go to next step
		No	Replace tank pressure control valve
9	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)



HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P1455	FUEL TANK LEVEL SENSOR–OPEN OR SHORT
Symptom	Input voltage from fuel gauge sender unit is above 3.2 V when ignition switch is turned on
Possible cause	• Fuel gauge sender unit malfunction • Open or short circuit in wiring from ECM 2L to fuel pump terminal A • Open circuit in wiring from fuel pump terminal C to ground

STEP	INSPECTION		ACTION
1	Does fuel pump connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 2L voltage OK? ☞ **page F–31**	Yes	Go to step 6
		No	Go to next step
3	Is there continuity between fuel pump connector terminal A and ECM terminal 2L?	Yes	Go to next step
		No	Repair or replace wiring harness
4	Is there continuity between fuel pump connector terminal C and ground?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is fuel gauge sender unit OK? ☞ **section T**	Yes	Go to next step
		No	Replace fuel gauge sender unit
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ **page F–31**
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

Diagnostic trouble code No. P1521	VRIS1–OPEN OR SHORT
Symptom	Open or short circuit is observed in VRIS solenoid valve system
Possible cause	• VRIS solenoid malfunction • Open or short circuit in wiring from VRIS solenoid valve terminal A to main relay terminal D • Open or short circuit in wiring from VRIS solenoid valve terminal B to ECM terminal 4K

STEP	INSPECTION		ACTION
1	Does VRIS solenoid valve connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 4K voltage OK? ☞ page F–31	Yes	Go to step 6
		No	Go to next step
3	Disconnect VRIS solenoid valve connector. Turn ignition switch to ON. Is there battery positive voltage at connector terminal A?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness. (Main relay terminal D — VRIS solenoid valve terminal A)
4	Is there continuity between connector terminal B and ECM terminal 4K?	Yes	Go to next step
		No	Repair or replace wiring harness
5	Is there continuity between VRIS solenoid valve terminals A and B?	Yes	Go to next step
		No	Replace VRIS solenoid valve ☞ page F–5
6	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

HARNESS SIDE CONNECTOR

Diagnostic trouble code No. P1601	COMM LINE (AT)–COMM ERROR
Symptom	Open or short circuit in ECM—TCM communication line
Possible cause	• Open or short circuit in wiring from ECM terminal 2H to TCM terminal 2N • Open or short circuit in wiring from ECM terminal 2G to TCM terminal 2K

STEP	INSPECTION		ACTION
1	Does TCM connector or ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is there continuity between ECM terminal 2H and TCM terminal 2N?	Yes	Go to next step
		No	Repair or replace wiring harness
3	Is there continuity between ECM terminal 2G and TCM terminal 2K?	Yes	Go to next step
		No	Repair or replace wiring harness
4	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Replace TCM ☞ section K1

Diagnostic trouble code No. P1608	PCME (CPU)–MALFUNCTION
Symptom	ECM does not read diagnostic trouble codes from output devices
Possible cause	• ECM malfunction • Short circuit in wiring output device

STEP	INSPECTION	ACTION
—	—	Replace ECM

Diagnostic trouble code No. P1794	BAT–BAT OR CIRCUIT FAIL
Symptom	Battery positive voltage is not constantly applied to ECM terminal 4I
Possible cause	• Battery malfunction • Open or short circuit in wiring from ECM terminal 4I to batterry positive cable • Burnt fuse

STEP	INSPECTION		ACTION
1	Is battery fully charged? ☞ section G	Yes	Go to next step
		No	Charge the battery ☞ section G
2	Does battery positive voltage present at ECM terminal 4I?	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (ECM terminal 4I — Battery)
3	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

Diagnostic trouble code No. P1797	PNS–OPEN OR SHORT
Symptom	ECM judges N range for more than 33 seconds when shift lever is in D range
Possible cause	• Transmission range switch malfunction • Open or short circuit in wiring from transmission range switch terminal B to ECM terminal 1L

STEP	INSPECTION		ACTION
1	Does transmission range switch connector and ECM connector have poor connection?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECM terminal 1L voltage OK? ☞ page F–31	Yes	Go to step 4
		No	Go to next step
3	Is there continuity between transmission range switch terminal B and ECM terminal 1L?	Yes	Go to next step
		No	Repair or replace wiring harness
4	Erase diagnostic trouble code from memory. Is same code No. present after rechecking?	Yes	Replace ECM ☞ page F–31
		No	Intermittent poor connection of harness or connector (Repair connector and/or harness)

TROUBLESHOOTING GUIDE

RELATIONSHIP CHART
Output Device and Input Device

○: Related
×: Not related

INPUT DEVICES \ OUTPUT DEVICES	FUEL INJECTION AMOUNT (FUEL INJECTOR)	FUEL INJECTION TIMING (FUEL INJECTOR)	PRESSURE REGULATOR CONTROL SOLENOID VALVES	AIR VALVE (BAC VALVE)	IDLE AIR CONTROL VALVE (BAC VALVE)	VRIS SOLENOID VALVE	IGNITION CONTROL MODULE	PURGE SOLENOID VALVE	HEATED OXYGEN SENSOR	A/C RELAY (A/C CUT-OFF)
E/L SIGNAL	×	×	×	×	○	×	×	×	×	×
POWER STEERING PRESSURE SWITCH	×	×	×	×	○	×	×	×	×	×
TRANSMISSION RANGE SWITCH	○	×	○	×	○	×	○	○	×	○
DATA LINK CONNECTOR TERMINAL TEN	○	×	×	×	○	×	○	×	×	○
BAROMETORIC PRESSURE SENSOR (IN-ECM)	○	×	×	×	○	×	○	○	×	×
HEATED OXYGEN SENSOR	○	×	×	×	×	×	×	○	×	×
INTAKE AIR TEMPERATURE SENSOR — DYNAMIC CHAMBER	○	×	○	×	○	×	×	×	×	×
INTAKE AIR TEMPERATURE SENSOR — MASS AIR FLOW SENSOR	○	×	×	×	○	×	×	○	×	×
IGNITION SWITCH (START)	○	○	○	×	○	×	○	×	○	○
ENGINE COOLANT TEMPERATURE SENSOR	○	×	○	×	○	×	○	○	○	×
THROTTLE POSITION SENSOR — THROTTLE POSITION SENSOR	○	×	○	×	○	×	×	○	×	○
THROTTLE POSITION SENSOR — CLOSED THROTTLE POSITION SWITCH	○	×	×	×	○	×	×	○	×	×
MASS AIR FLOW SENSOR	○	×	×	×	×	×	○	○	○	×
SGC SIGNAL	×	○	×	×	×	×	○	×	×	×
NE SIGNAL	○	○	○	×	○	○	○	○	○	×

ENGINE CONTROL OPERATION CHART
Input Devices and Engine Conditions

B+: Battery positive voltage

INPUT DEVICES / ENGINE CONDITION	APPROXIMATE TIME (BASED ON 10—16 °C {50—60 °F} AMBIENT)	INPUT DEVICE							
		CRANKSHAFT POSITION SENSOR	THROTTLE POSITION SENSOR		ENGINE COOLANT TEMPERATURE SENSOR	HEATED OXYGEN SENSOR	MASS AIR FLOW SENSOR		BAROMETRIC PRESSURE SENSOR
			CLOSED THROTTLE POSITION SWITCH	THROTTLE POSITION SENSOR			MASS AIR FLOW SENSOR	INTAKE AIR TEMPERATURE SENSOR	
CRANKING —COLD ENGINE • COLD AIR • COLD COOLANT	ZERO	SENDS NO.1 CYLINDER TDC SIGNAL TO ECM	SIGNAL HAS NO EFFECT ON ECM	SIGNAL HAS NO EFFECT ON ECM	COOL TO WARM: MEDIUM VOLTAGE (3V AND DROPPING)	SIGNAL HAS NO EFFECT ON ECM	SIGNAL HAS NO EFFECT ON ECM	SIGNAL HAS NO EFFECT ON ECM	SENDS VOLTAGE SIGNAL TO ECM THAT VARIES WITH ALTITUDE: VOLTAGE (APPROX. 4 V)
COLD START FAST IDLE • COLD AIR • COLD COOLANT	ONE MINUTE	LOW VOLTAGE SIGNAL TO ECM (BELOW 1.5 V)	CLOSED THROTTLE: LOW VOLTAGE (0.1—1.1 V)			SENSOR COLD: LOW TO HIGH VOLTAGE (0—0.8 V)	LOW MASS AIR FLOW: LOW-TO MEDIUM VOLTAGE (1.0—2.0 V)	COOL TO WARM: MEDIUM VOLTAGE (1.4—3 V)	
COLD DRIVE AWAY PART THROTTLE • COLD AIR • COLD COOLANT	TWO MINUTES	HIGH VOLTAGE SIGNAL TO ECM (B+)	PART THROTTLE: MEDIUM VOLTAGE (1—2.5 V)				MODERATE MASS AIR FLOW: LOW-TO MEDIUM VOLTAGE (2.0—3.0 V)		
WARM DRIVE AWAY-PART THROTTLE (25%) • WARM INTAKE AIR • WARM COOLANT	THREE MINUTES				WARM: MEDIUM VOLTAGE (APPROX. 0.7 V AND DROPPING)	SENSOR WARM: HIGH VOLTAGE (ABOVE 0.6 V)			
HOT CRUISE • WARM INTAKE AIR • HOT COOLANT	MORE THAN FOUR MINUTES				HOT: LOW VOLTAGE (APPROX. 0.5 V)	SENSOR HOT SWITCHING FROM HIGH VOLTAGE (ABOVE 0.6 V RICH)TO LOW VOLTAGE (BELOW. 0.4 V LEAN)	MODERATE-TO HIGH MASS AIR FLOW: (3.0—4.0 V)		
HOT ACCELERATION • 60% THROTTLE									
HOT ACCELERATION • WIDE OPEN THROTTLE			WIDE OPEN THROTTLE (2.8—4.5 V)			HIGH VOLTAGE (ABOVE 0.6 V RICH)	HIGH MASS AIR FLOW: (4.0—5.0 V)		
DECELERATION • CLOSED THROTTLE POSITION		LOW VOLTAGE SIGNAL TO ECM (BELOW 1.5 V)	CLOSED THROTTLE: LOW VOLTAGE (0.1—1.1 V)			LOW VOLTAGE (BELOW 0.4 V LEAN)	LOW MASS AIR FLOW: (1.0—2.0 V)		
HOT CURB IDLE (EXTENDED)						SWITCHING FROM HIGH TO LOW VOLTAGE (0.4—0.6 V)			
HOT ENGINE SHUT-DOWN		OFF	OFF	OFF	OFF	SENSOR HOT: LOW VOLTAGE (0.1 V LEAN) UNTIL SENSOR COOLS DOWN	OFF	OFF	OFF

B+: Battery positive voltage

INPUT DEVICES							
DISTRIBUTOR (SGC SIGNAL)	TRANSMISSION RANGE SWITCH	A/C SWITCH	POWER STEERING PRESSURE SWITCH	CPU (E/L SIGNAL)	IGNITION SWITCH		TEN TERMINAL
					START POSITION	ON POSITION	
	SIGNAL HAS NO EFFECT ON ECM	SIGNAL HAS NO EFFECT ON ECM	SIGNAL HAS NO EFFECT ON ECM	SIGNAL HAS NO EFFECT ON ECM	SENDS SIGNAL TO ECM (B+)	SIGNAL HAS NO EFFECT ON ECM	SIGNAL HAS NO EFFECT ON ECM
	PARK/ NEUTRAL POSITION: SENDS SIGNAL TO ECM (B+)						
SENDS NO.1CYLINDER TDC SIGNAL TO ECM	IN OTHER PARK/ NEUTRAL POSITION: NO VOLTAGE SIGNAL TO ECM (BELOW 1.5 V)	A/C SWITCH ON: SENDS SIGNAL TO ECM (B+) A/C SWITCH OFF: NO SIGNAL TO ECM (BELOW 1.5 V)	STEERING WHEEL TURNED: LOW VOLTAGE SIGNAL TO ECM (BELOW 1.5 V) STEERING WHEEL STRAIGHT AHEAD: HIGH VOLTAGE SIGNAL TO ECM (B+)	HEADLIGHT OR FAN OR REAR WINDOW DEFROSTER SWITCH ON: LOW VOLTAGE SIGNAL TO ECM (BELOW 1.5 V) HEADLIGHT AND BLOWER AND REAR WINDOW DEFROSTER SWITCHES OFF: HIGH VOLTAGE SIGNAL TO ECM (B+)	NO SIGNAL TO ECM (BELOW 1.5 V)	SENDS SIGNAL TO ECM (B+)	CONNECTOR NOT GROUNDED: HIGH VOLTAGE SIGNAL TO ECM (B+)
	PARK/ NEUTRAL POSITION: SENDS SIGNAL TO ECM (B+)						LOW VOLTAGE SIGNAL TO ECM WHEN TEN TERMINAL GROUNDED (BELOW 1.5 V)
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Output Devices and Engine Conditions

<table>
<tr><th rowspan="3">OUTPUT DEVICES / ENGINE CONDITION</th><th rowspan="3">APPROXIMATE TIME (BASED ON 10—16 °C {50—60 °F} AMBIENT TEMPERATURE</th><th colspan="8">OUTPUT DEVICES</th></tr>
<tr><th colspan="2">FUEL INJECTOR</th><th colspan="2">BAC VALVE</th><th rowspan="2">A/C CUT RELAY</th><th rowspan="2">PURGE SOLENOID VALVE</th><th rowspan="2">PRC SOLENOID VALVES</th><th rowspan="2">MAIN RELAY</th></tr>
<tr><th>INJECTION</th><th>INJECTION TIMING</th><th>AIR VALVE</th><th>IDLE AIR CONTROL VALVE</th></tr>
<tr><td>CRANKING
COLD ENGINE
• COLD AIR
• COLD COOLANT</td><td>ZERO</td><td rowspan="3">RICH</td><td rowspan="6">SEQUENTIAL INJECTION</td><td rowspan="4">OPEN (COOLANT TEMP: BELOW 60 °C {140 °F}</td><td rowspan="3">LARGE AMOUNT OF BY-PASS AIR</td><td>OFF (A/C ON)</td><td rowspan="2">OFF (PURGE CUT)</td><td rowspan="6">OFF (VACUUM TO PRESSURE REGULATOR)</td><td rowspan="11">ON</td></tr>
<tr><td>COLD START FAST IDLE
• COLD AIR
• COLD COOLANT</td><td>ONE MINUTE</td><td rowspan="5">ON(A/C ON)</td></tr>
<tr><td>COLD DRIVE AWAY PART THROTTLE
• COLD AIR
• COLD COOLANT</td><td>TWO MINUTES</td><td rowspan="4">OPERATES (DUTY VALUES) (PURGE GAS AMOUNT CHANGES)</td></tr>
<tr><td>WARM DRIVE AWAY-PART THROTTLE (25%)
• WARM INLET AIR
• WARM COOLANT</td><td>THREE MINUTES</td><td rowspan="2">RICH and LEAN</td><td rowspan="3">SMALL AMOUNT OF BY-PASS AIR</td></tr>
<tr><td>HOT CRUISE
• WARM INLET AIR
• HOT COOLANT</td><td rowspan="4">MORE THAN FOUR MINUTES</td><td rowspan="6">CLOSE</td></tr>
<tr><td>HOT ACCELERATION
• 60% THROTTLE</td><td rowspan="2">RICH</td></tr>
<tr><td>HOT ACCELERATION
• WIDE OPEN THROTTLE</td><td>OFF (A/C OFF)</td><td>OFF (PURGE-CUT)</td></tr>
<tr><td>DECELERATION
• CLOSED THROTTLE-POSITION</td><td colspan="2">FUEL CUT</td><td>LARGE AND SMALL AMOUNT OF BY-PASS AIR</td><td rowspan="2">ON (A/C ON)</td><td>ON (SMALL)</td><td rowspan="2">AFTER STARTING ON (DURING HOT START ONLY)
PRC SOL. V. NO.1–VACUUM CUT
PRC SOL. V. NO.2–VACUUM</td></tr>
<tr><td>HOT CURB IDLE (EXTENDED)</td><td>RICH and LEAN</td><td>SEQUENTIAL INJECTION</td><td>SMALL AMOUNT OF BY-PASS AIR</td><td>OFF (PURGE CUT)</td></tr>
<tr><td>HOT ENGINE SHUT-DOWN</td><td></td><td colspan="2">NOT INJECTION</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
</table>

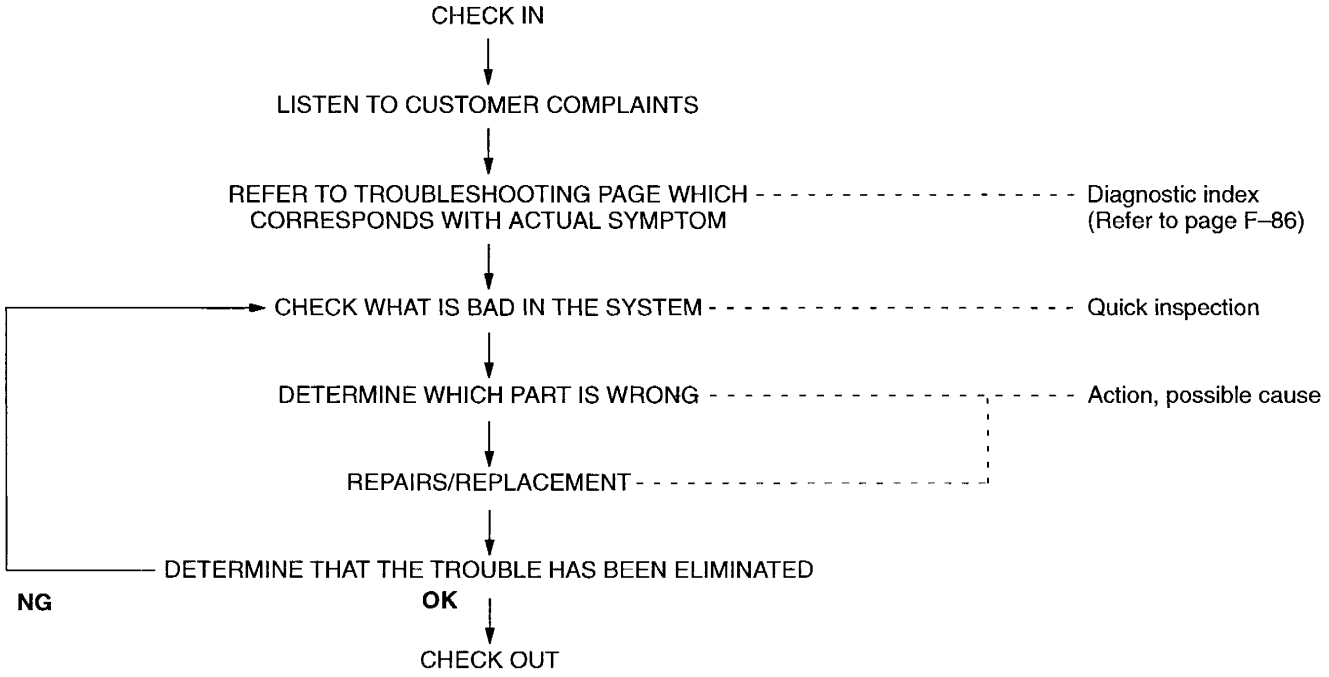
OUTPUT DEVICES		
IGNITION CONTROL MODULE	**VRIS SOLENOID VALVE**	**HEATED OXYGEN SENSOR (HEATER)**
IGNITION TIMING BTDC 7°	OFF (VRIS-OFF)	OFF
IGNITION SPARK ADVANCE SIGNAL	OFF (VRIS-OFF)	ON (BELOW 2,250 rpm)
	ON (VRIS ON, 3,600—5,100 rpm ONLY)	
	ON (VRIS OFF)	OFF
	ON (VRIS ON, 3,600—5,100 rpm ONLY)	
	OFF (VRIS-OFF)	
OFF	OFF	OFF

HOW TO USE THIS SECTION

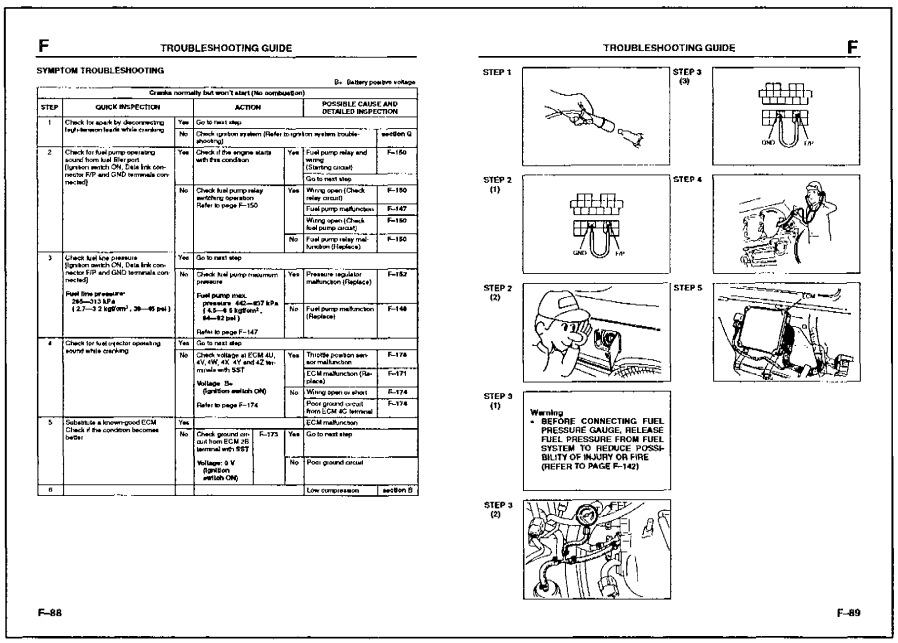
Introduction

Most of the fuel and emission system is electrically controlled. Thus, it is sometimes difficult to diagnose a problem in the system, especially intermittent problems. Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a drivability complaint. The customer is often a good source of information on such problems, especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Work flow



How to read the troubleshooting chart



Left page shows the troubleshooting procedure
- QUICK INSPECTION
- ACTION
- POSSIBLE CAUSE AND DETAILED INSPECTION

Right page illustrates how to perform QUICK INSPECTION

Cranks normally but won't start (No combustion)						
STEP	QUICK INSPECTION		ACTION		POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check for spark by disconnecting high-tension leads while cranking	Yes	Go to next step			
		No	Check ignition system (Refer to ignition system trouble-shooting)			section G
2	Check for fuel pump operating sound from fuel filler port [Ignition switch ON, Data link connector F/P and GND terminals connected]	Yes	Check if the engine starts with this condition	Yes	Fuel pump relay and wiring (Starting circuit)	F–150
					Go to next step	
		No	Check fuel pump relay switching operation Refer to page F–150	Yes	Wiring open (Check relay circuit)	F–150
					Fuel pump malfunction	F–147
					Wiring open (Check fuel pump circuit)	F–150
				No	Fuel pump relay malfunction (Replace)	F–150
3	Check fuel line pressure [Ignition switch ON, Data link connector	Yes	Go to next step			
		No	Check fuel pump maximum pressure mp max. e: 442—637 kPa kgf/cm²,	Yes	Pressure regulator malfunction (Replace)	F–152
				No	Fuel pump malfunction (Replace)	F–14

STEP:
This shows the order of the troubleshooting. Proceed with the troubleshooting by the steps.

QUICK INSPECTION:
This describes an easy inspection necessary to presume the malfunction parts quickly.

ACTION:
This recommends the appropriate action to take as a result (Yes or No) of the QUICK INSPECTION. How to perform the action is shown on the reference page.

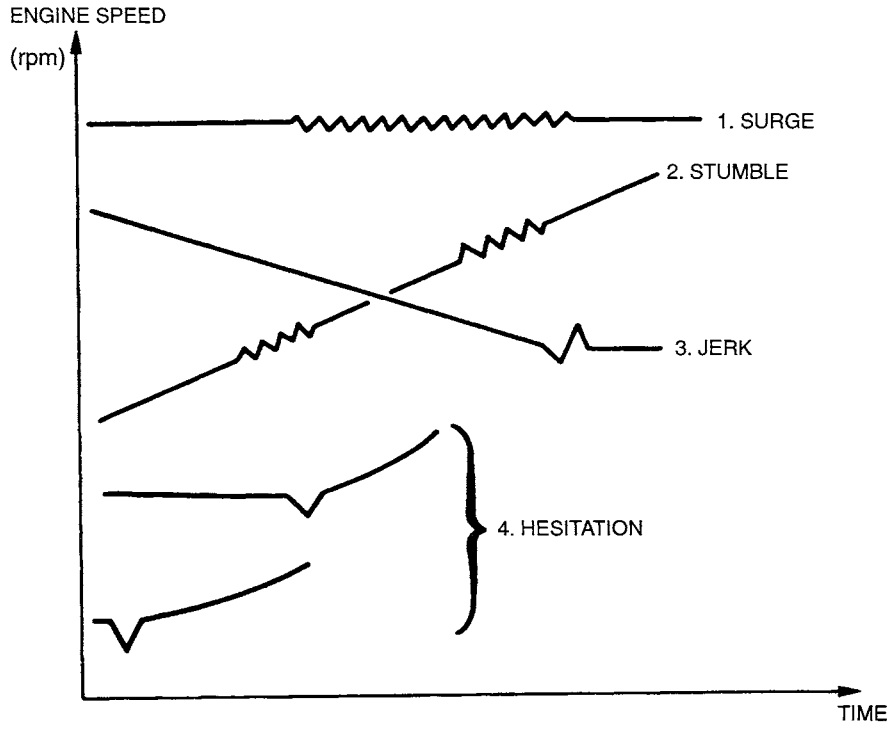
POSSIBLE CAUSE AND DETAILED INSPECTION:
This shows the possible point of malfunction.
The detailed inspection is shown on the reference page.

DIAGNOSTIC INDEX

No.	TROUBLESHOOTING ITEMS	REMARKS	PAGE
1	No cranks	Refer to section G	section G
2	Cranks normally but won't start	No combustion	F- 88
3	Cranks normally but hard to start (Always)		F- 90
4	Cranks normally but hard to start (Only when engine is cold)		F- 92
5	Cranks normally but hard to start (Only when engine is warm)		F- 94
6	Cranks normally but hard to start (Only after heat soak)		F- 96
7	Cranks normally but won't start (Intermittent)	No combustion	F- 97
8	Rough idle (Always)		F- 98
9	Rough idle (Only when engine is cold)		F-100
10	Rough idle (Only when engine is warm)		F-102
11	Rough idle (Only after heat soak)		F-103
12	Rough idle just after starting		F-104
13	Low idle speed (When A/C, P/S, E/L is ON)	Idle speed down and keeps low speed	F-104
14	High idle speed after warm up		F-106
15	Idle hunting or surging		F-108
16	Engine stall at idle (Always)		F-110
17	Engine stall at idle (Only when engine is cold)		F-112
18	Engine stall at idle (Only when engine is warm)		F-112
19	Engine stall at idle (Only after heat soak)		F-113
20	Engine stall at idle (When A/C, P/S, E/L is ON)		F-114
21	Engine stall at idle (in "D" range)		F-114
22	Engine stall during start up		F-115
23	Engine stall on deceleration (Only when engine is cold)		F-116
24	Engine stall on deceleration (Only after warm up)		F-117
25	Engine stall at idle (Intermittent)		F-117
26	Hesitates/Stumbles on acceleration	Includes start up	F-118
27	Hesitates at steady speed		F-120
28	Knocking		F-122
29	Poor acceleration		F-124
30	Bucking at high speed		F-126
31	Bucking on deceleration		F-128
32	Poor fuel economy		F-130
33	High oil consumption/White exhaust smoke		F-132
34	Afterburn on deceleration		F-132
35	Rotten egg smell		F-134
36	Black exhaust smoke		F-134
37	Gasoline fumes		F-135
38	Fails emission test	Engine condition is OK	F-136
39	MIL always ON	Engine condition is OK	F-138
40	MIL never ON	Engine condition is not OK	F-138
41	A/C does not work		F-138

Description of Drivability

(1) SURGE: Continuous soft jerking during cruise.
(2) STUMBLE: Mild jerking during acceleration.
(3) JERK: Shock occurring when the accelerator pedal is depressed just after deceleration.
(4) HESITATION: Flat spot occurring just after the accelerator pedal is depressed.

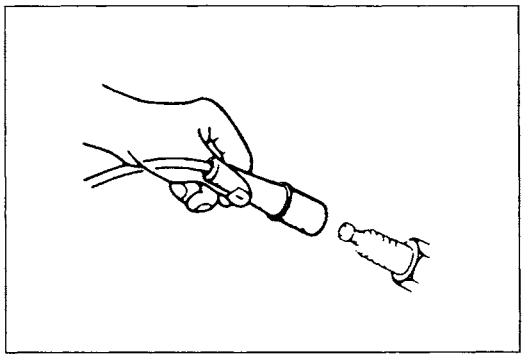


SYMPTOM TROUBLESHOOTING

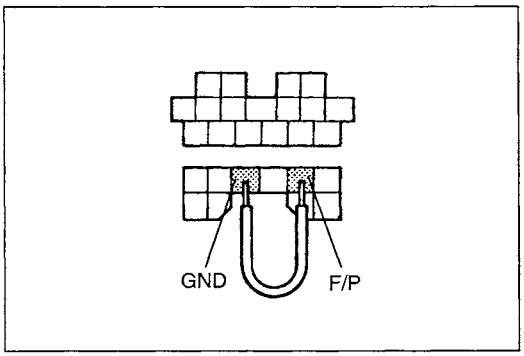
B+: Battery positive voltage

Cranks normally but won't start (No combustion)							
STEP	**QUICK INSPECTION**		**ACTION**			**POSSIBLE CAUSE AND DETAILED INSPECTION**	
1	Check for spark by disconnecting high-tension leads while cranking	Yes	Go to next step				
		No	Check ignition system (Refer to ignition system trouble-shooting)				**section G**
2	Check for fuel pump operating sound from fuel filler port [Ignition switch ON, Data link connector F/P and GND terminals connected]	Yes	Check if the engine starts with this condition	Yes	Fuel pump relay and wiring		**F–18**
					Go to next step		
		No	Check fuel pump relay switching operation Refer to page F–18	Yes	Wiring open (Check relay circuit)		
					Fuel pump malfunction		**F–17**
					Wiring open (Check fuel pump circuit)		
				No	Fuel pump relay malfunction (Replace)		**F–18**
3	Check fuel line pressure [Ignition switch ON, Data link connector F/P and GND terminals connected] **Fuel line pressure: 265—313 kPa { 2.7—3.2 kgf/cm², 39—45 psi }**	Yes	Go to next step				
		No	Check fuel pump maximum pressure **Fuel pump max. pressure: 442—637 kPa { 4.5—6.5 kgf/cm², 64—92 psi }** Refer to page F–16	Yes	Pressure regulator malfunction (Replace)		**F–20**
				No	Fuel pump malfunction (Replace)		**F–17**
4	Check for fuel injector operating sound while cranking	Yes	Go to next step				
		No	Check voltage at ECM 4U, 4V, 4W, 4X, 4Y and 4Z terminals with **SST** **Voltage: B+ (Ignition switch ON)** Refer to page F–31	Yes	Throttle position sensor malfunction		**F–42**
					ECM malfunction (Replace)		**F–31**
				No	Wiring open or short		
					Poor ground circuit from ECM 4C terminal		
5	Substitute a known-good ECM Check if the condition becomes better	Yes			ECM malfunction		
		No	Check ground circuit from ECM 4A terminal with **SST** **Voltage: 0 V (Ignition switch ON)**	**F–31**	Yes	Go to next step	
					No	Poor ground circuit	
6					Low compression		**section B**

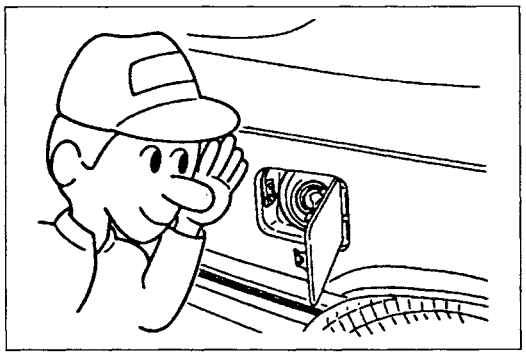
STEP 1



STEP 2
(1)



STEP 2
(2)

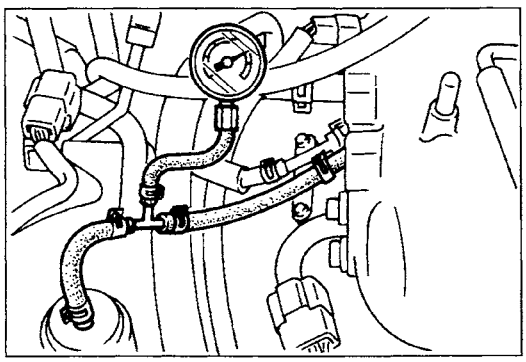


STEP 3
(1)

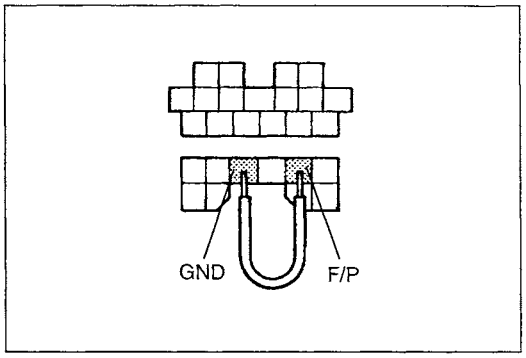
Warning

- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

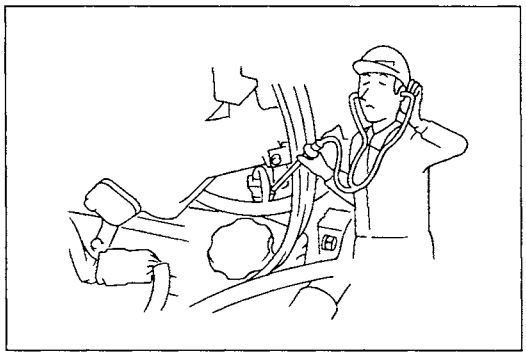
STEP 3
(2)



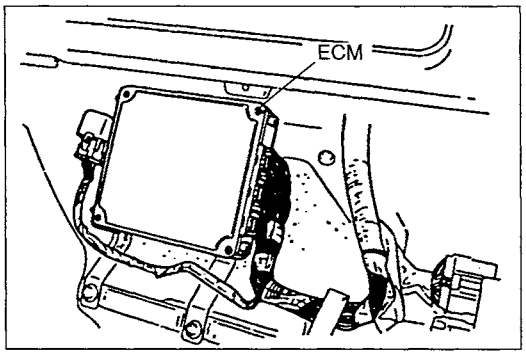
STEP 3
(3)



STEP 4

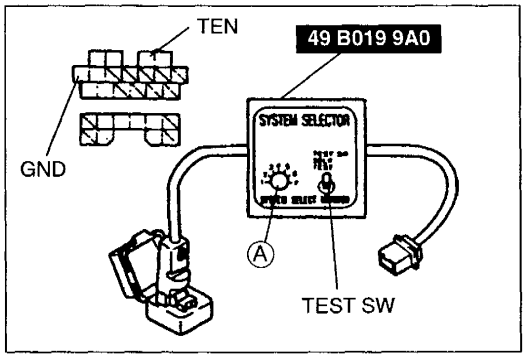


STEP 5

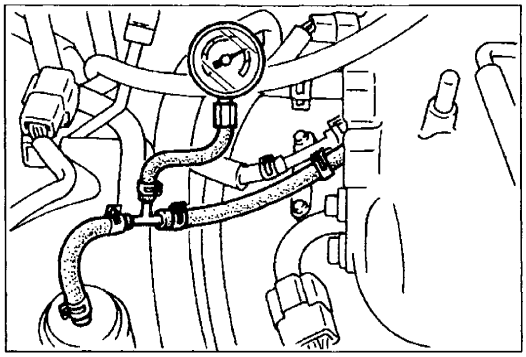


Cranks normally but hard to start (Always)							
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check ignition timing at idle after warm up **Ignition timing: 10—12° BTDC** [TEN terminal grounded with **SST**]	Yes	Go to next step				
		No	Adjust ignition timing				**F–3**
2	Disconnect high-tension lead of each cylinder at idle Check if the engine condition changes	Yes	Go to next step				
		No	Check ignition system [Refer to ignition system troubleshooting (Misfire)]	**section G**	Yes	Fuel injector clogging (Replace)	**F–20**
					No	Spark plug	**section G**
						High-tension lead	**section G**
						Distributor cap	**section G**
3	Check fuel injector operating sound at idle	Yes	Go to next step				
		No	Check fuel injector resistance	**F–21**	Yes	Wiring short or open	
					No	Fuel injector malfunction (Replace)	**F–20**
4	Check fuel line pressure [Ignition switch ON, Data link connector F/P and GND terminals connected] **Fuel line pressure:** **265—313 kPa** **{ 2.7—3.2 kgf/cm^2 , 39—45 psi }**	Yes	Go to next step				
		No	Check fuel pump max. pressure **Fuel pump max. pressure:** **442—637 kPa** **{ 4.5—6.5 kgf/cm^2 ,** **64—92 psi }**	**F–16**	Yes	Pressure regulator malfunction (Replace)	**F–20**
					No	Fuel pump malfunction (Replace)	**F–17**
5	Operate the fuel pump [Ignition switch ON, Data link connector F/P and GND terminals connected] Turn the ignition switch OFF and observe fuel pressure for 5 minutes **Fuel pressure:** **More than** **147 kPa { 1.5 kgf/cm^2 , 21 psi }**	Yes	Go to next step				
		No	Check fuel pump pressure drop	**F–15**	No	Fuel pump malfunction (Replace)	**F–17**
			Check pressure regulator pressure drop	**F–19**	Yes	Fuel injector fuel leaks	**F–20**
					No	Pressure regulator malfunction (Replace)	**F–20**
6	Check voltage at ECM terminal 1C with **SST**	Yes	Go to next step				
		No	Check STA fuse	**section T**	Yes	Wiring short or open	
					No	Replace	**section T**
7						Low compression	**section B**
8	Substitute a known-good ECM						

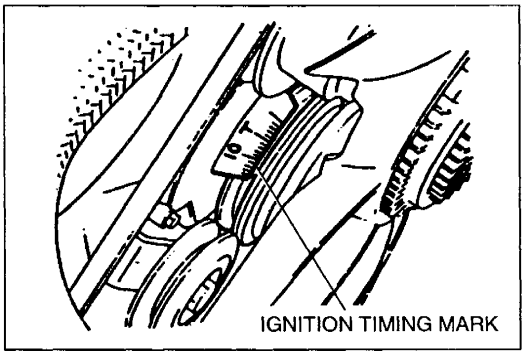
STEP 1
(1)



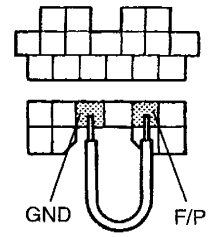
STEP 4
(2)



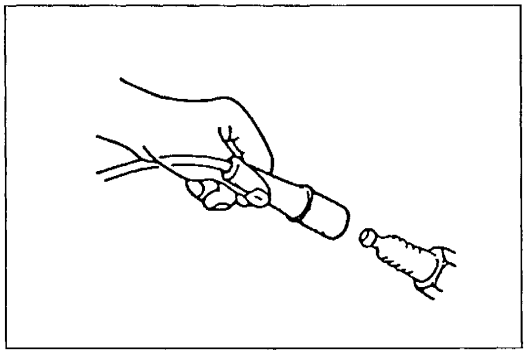
STEP 1
(2)



STEP 4
(3)



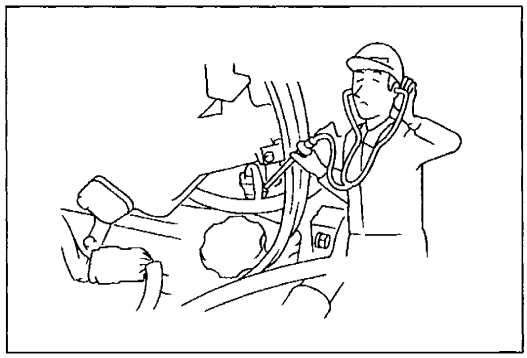
STEP 2



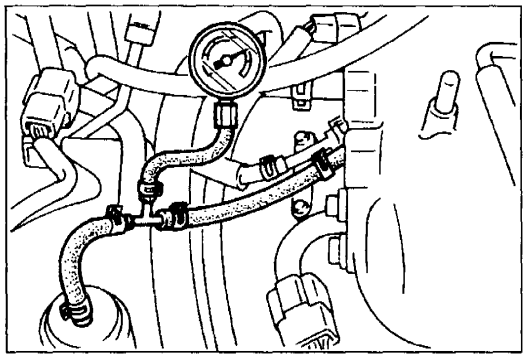
STEP 5
(1)

Warning
- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

STEP 3



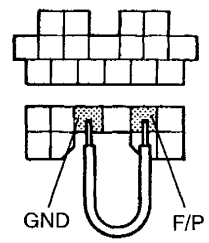
STEP 5
(2)



STEP 4
(1)

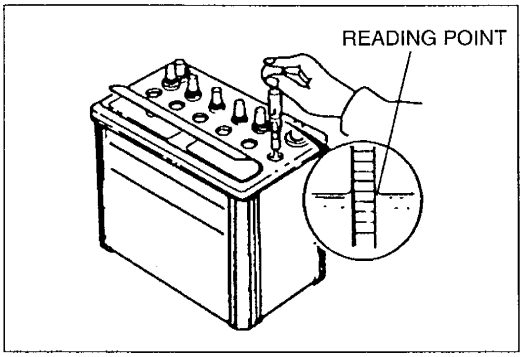
Warning
- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

STEP 5
(3)

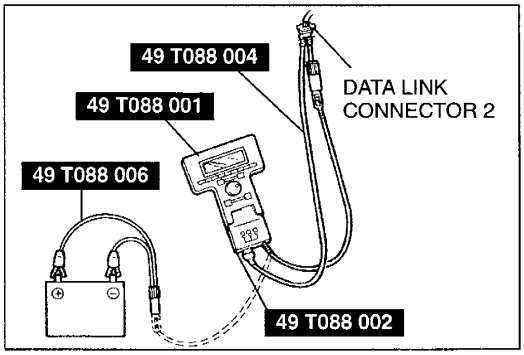


Cranks normally but hard to start (only when engine is cold)							
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check gravity of battery by using a hydrometer **Specific gravity: Above 1.200**	Yes	Go to next step				
		No	Recharge the battery				**section G**
2	Check diagnostic trouble code No.P0115 with **SST**	Yes	Check for the cause by referring to the check sequence				**F–46**
		No	Go to next step				
3	Disconnect high-tension lead of each cylinder at idle Check if the engine condition changes	Yes	Go to next step				
		No	Check ignition system [Refer to ignition system troubleshooting (Misfire)]	**section G**	Yes	Fuel injector clogging (Replace)	**F–20**
					No	Spark plug	**section G**
						High-tension lead	**section G**
						Distributor cap	**section G**
4	Check fuel line pressure [Ignition switch ON, Data link connector F/P and GND terminals connected] **Fuel line pressure:** **265—313 kPa** **{ 2.7—3.2 kgf/cm^2 , 39—45 psi }**	Yes	Go to next step				
		No	Check fuel pump max. pressure **Fuel pump max. pressure:** **442—637 kPa** **{ 4.5—6.5 kgf/cm^2 ,** **64—92 psi }**	**F–16**	Yes	Pressure regulator malfunction (Replace)	**F–20**
					No	Fuel pump malfunction (Replace)	**F–17**
5	Disconnect the idle air control valve connector Check idle speed during warm up	Yes	Go to next step				
		No				BAC valve stuck close	**F–5**
6	Substitute a known-good ECM						

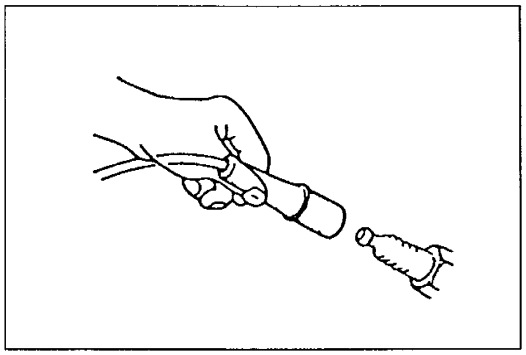
STEP 1



STEP 2



STEP 3

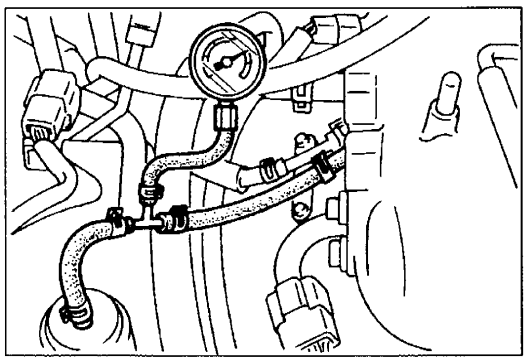


STEP 4 (1)

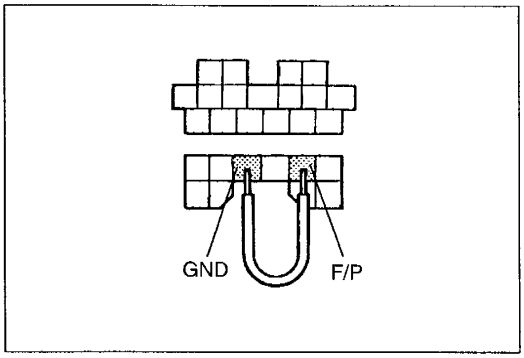
Warning

- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

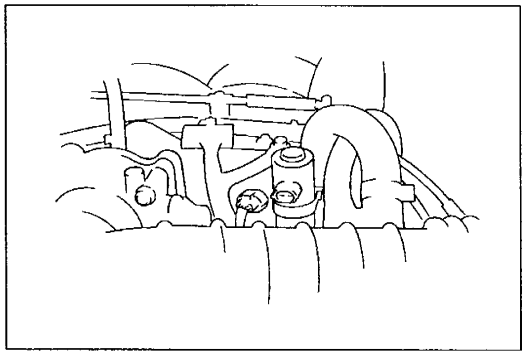
STEP 4 (2)



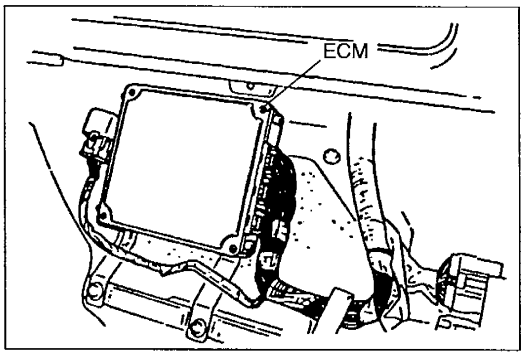
STEP 4 (3)



STEP 5



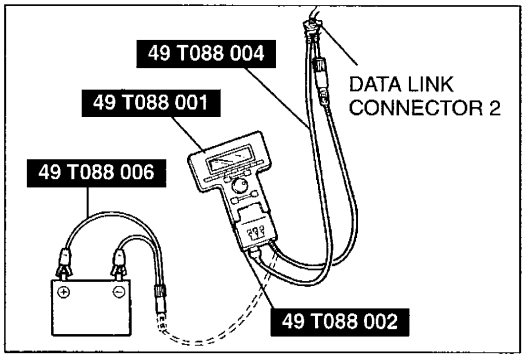
STEP 6



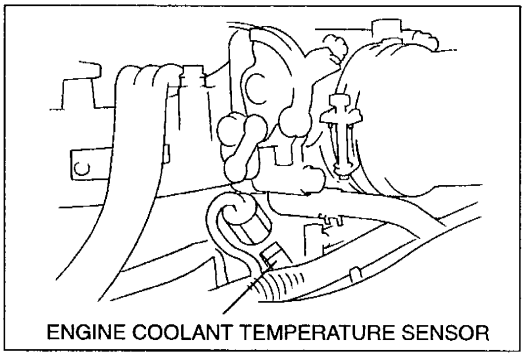
<table>
<tr><th colspan="9">Cranks normally but hard to start (only when engine is warm)</th></tr>
<tr><th>STEP</th><th colspan="2">QUICK INSPECTION</th><th colspan="3">ACTION</th><th colspan="2">POSSIBLE CAUSE AND DETAILED INSPECTION</th><th></th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Check diagnostic trouble code No.P0443 with SST</td><td>Yes</td><td colspan="5">Check for the cause by referring to the check sequence</td><td>F–46</td></tr>
<tr><td>No</td><td colspan="6">Go to next step</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Disconnect engine coolant temperature sensor connector
Check if the condition becomes better</td><td rowspan="2">Yes</td><td rowspan="2" colspan="3">Check engine coolant temperature sensor connector for connecting condition as follows
1. Shake connector and check if the condition changes
2. Check condition of terminal (burning or damaged)
3. Connect a male terminal to the connector and check for connection condition</td><td>Yes</td><td>Engine coolant temperature sensor malfunction</td><td>F–30</td></tr>
<tr><td>No</td><td colspan="2">Poor contact at engine coolant temperature sensor connector</td></tr>
<tr><td>No</td><td colspan="6">Go to next step</td></tr>
<tr><td>3</td><td>Operate the fuel pump
[Ignition switch ON, Data link connector F/P and GND terminals connected]
Turn the ignition switch OFF and observe fuel pressure for 5 minutes

Fuel pressure:
More than
147 kPa { 1.5 kgf/cm^2 , 21 psi }</td><td>Yes</td><td colspan="6">Go to next step</td></tr>
<tr><td rowspan="3">No</td><td rowspan="2">Check fuel pump pressure drop</td><td>F–15</td><td>No</td><td>Fuel pump malfunction (Replace)</td><td>F–17</td></tr>
<tr><td rowspan="2">Check pressure regulator pressure drop</td><td rowspan="2">F–19</td><td>Yes</td><td>Fuel injector fuel leaks</td><td>F–20</td></tr>
<tr><td>No</td><td>Pressure regulator malfunction (Replace)</td><td>F–20</td></tr>
<tr><td>4</td><td>Substitute a known-good ECM</td><td></td><td colspan="6"></td></tr>
</table>

STEP 1



STEP 2

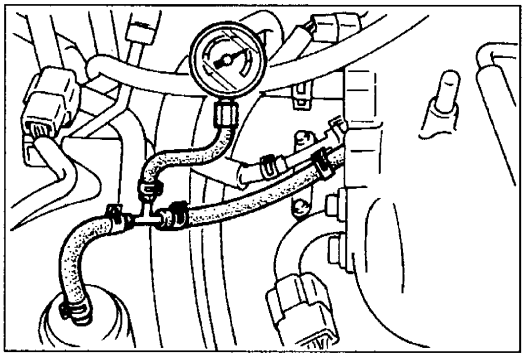


STEP 3 (1)

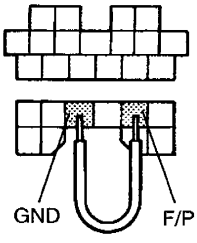
Warning

- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

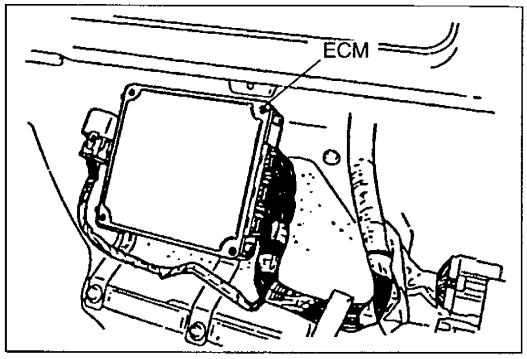
STEP 3 (2)



STEP 3 (3)

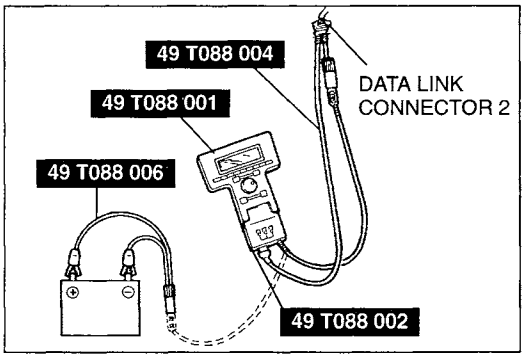


STEP 4

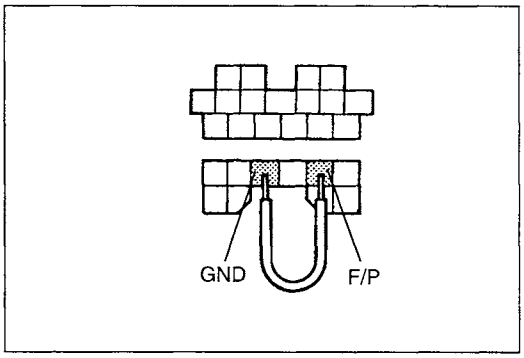


Cranks normally but hard to start (only after heat soak)								
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE AND DETAILED INSPECTION		
1	Check diagnostic trouble code No.P0110, P0115, P1250, P1252 with **SST**	Yes	Check for the cause by referring to the check sequence					**F–46**
		No	Go to next step					
2	Circulate the fuel by operating fuel pump **for 20 sec.** [Ignition switch ON, Data link connector F/P and GND terminals connected] Check if the condition becomes better	Yes	Go to step 4					
		No	Go to next step					
3	Check the PRC system Is system normal? Refer to page F–141	Yes	Go to next step					
		No	Repair or replace					
4	Operate the fuel pump [Ignition switch ON, Data link connector F/P and GND terminals connected] Turn the ignition switch OFF and observe fuel pressure **for 5 min.** **Fuel pressure: More than 147 kPa { 1.5 kgf/cm², 21 psi }**	Yes	Go to next step					
		No	Check fuel pump pressure drop	**F–15**	No	Fuel pump malfunction (Replace)		**F–17**
			Check pressure regulator pressure drop	**F–19**	Yes	Fuel injector fuel leaks		**F–20**
					No	Pressure regulator malfunction (Replace)		**F–20**
5	Change fuel with specified one Check if the condition becomes better	Yes				Poor fuel quality		
		No	Go to next step					
6	Substitute a known-good ECM							

STEP 1



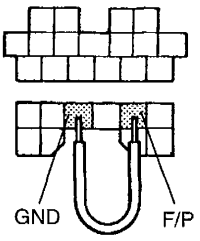
STEP 2



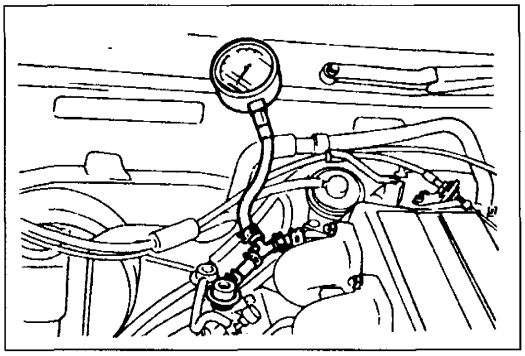
STEP 4 (1)

Warning
- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

STEP 4 (3)

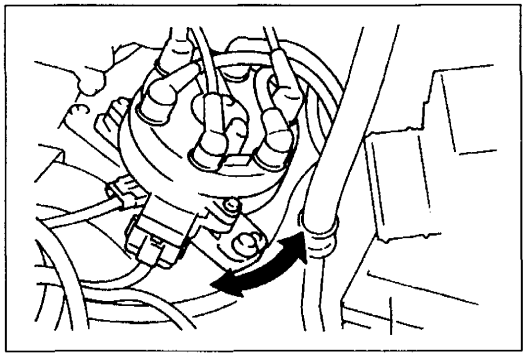


STEP 4 (2)

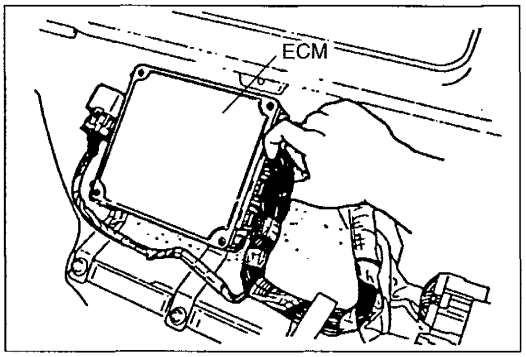


Cranks normally but won't start (Intermittent)				
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE AND DETAILED INSPECTION
1	Shake connector of distributor, main relay and ECM while cranking Check if the engine starts	Yes	There may be a poor contact at the connector Repair or replace the wiring	
		No	Go to troubleshooting "Cranks normally but hard to start (always)"	F–90

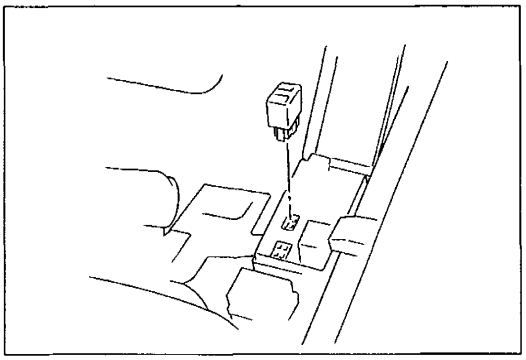
STEP 1 (1)



STEP 1 (3)

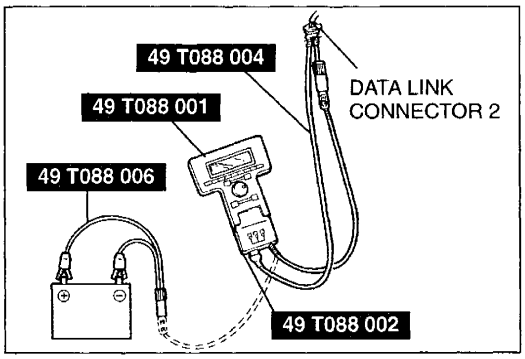


STEP 1 (2)

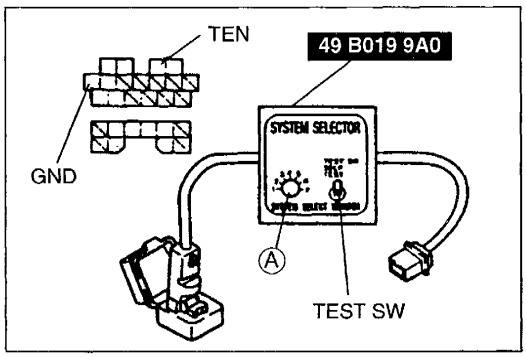


Rough idle (Always)							
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check diagnostic trouble code No.P0110, P0115, P0443, P0505 with **SST**	Yes	Check for the cause by referring to the check sequence				**F–46**
		No	Go to next step				
2	Check ignition timing at idle after warm up **Ignition timing: 10—12° BTDC** [TEN terminal grounded with **SST**]	Yes	Go to next step				
		No	Adjust ignition timing (If possible)				**F–3**
3	Disconnect high-tension lead of each cylinder at idle Check if the condition changes	Yes	Go to next step				
		No	Check ignition system [Refer to ignition system troubleshooting (Misfire)]	**section G**	Yes	Fuel injector clogging (Replace)	**F–20**
					No	Spark plug	**section G**
						High-tension lead	**section G**
						Distributor cap	**section G**
4	Check idle speed after warm up **Idle speed:** **760—800 rpm (P range)** [TEN terminal grounded with **SST**]	Yes	Go to next step				
		No	Adjust idle speed (If possible) If not possible check if idle air control system is OK				**F–3** **F–139**
5	Check fuel injector operating sound at idle	Yes	Go to next step				
		No	Check fuel injector resistance	**F–21**	Yes	Wiring short or open	
					No	Fuel injector malfunction (Replace)	**F–20**
6	Check fuel line pressure [Ignition switch ON, Data link connector F/P and GND terminals connected] **Fuel line pressure:** **265—313 kPa** **{ 2.7—3.2 kgf/cm^2 , 39—45 psi }**	Yes	Go to next step				
		No				Fuel leaks	
						Fuel filter clogging	**F–15**
			Check fuel pump max. pressure **Fuel pump max. pressure:** **442—637 kPa** **{ 4.5—6.5 kgf/cm^2 ,** **64—92 psi }**	**F–16**	Yes	Pressure regulator malfunction (Replace)	**F–20**
					No	Fuel pump malfunction (Replace)	**F–17**
7	Check intake manifold vacuum at idle **Vacuum: 61.4—66.6 kPa** **{ 460—500 mmHg ,** **18.2—19.6 inHg }**	Yes	Go to next step				
		No	Check for air leaks	**F–5**	Yes	Throttle valve	**F–5**
					No	Vacuum hoses	**F–5**
						Gaskets	
						Bolts or nuts	
						Component broken	
8	Substitute a known-good ECM Check if the condition becomes better	Yes				ECM malfunction	
		No	Check voltage at ECM 4A terminal with **SST** **Voltage:** **0 V (Ignition switch ON)**	**F–31**	Yes	Go to next step	
					No	Poor ground circuit	
9						Check compression	**section B**

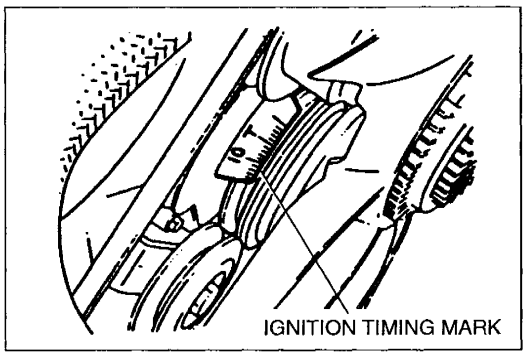
STEP 1



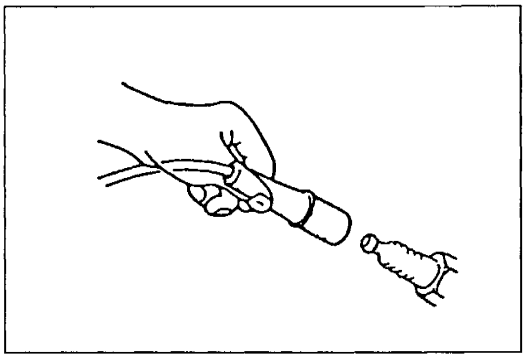
STEP 2 (1)



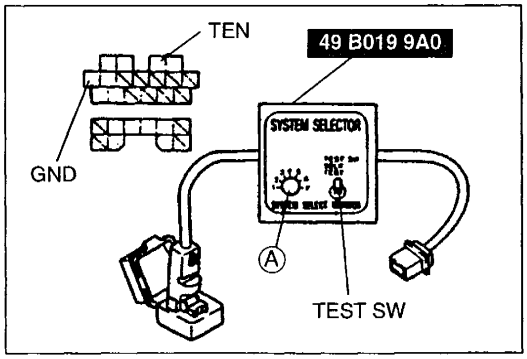
STEP 2 (2)



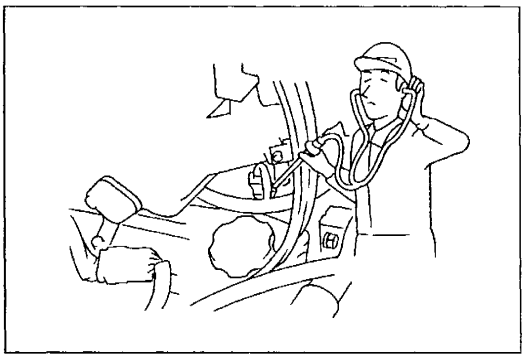
STEP 3



STEP 4



STEP 5

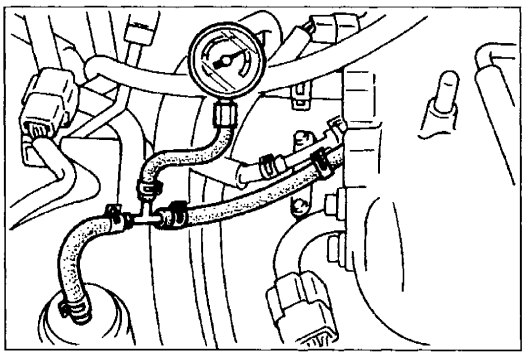


STEP 6 (1)

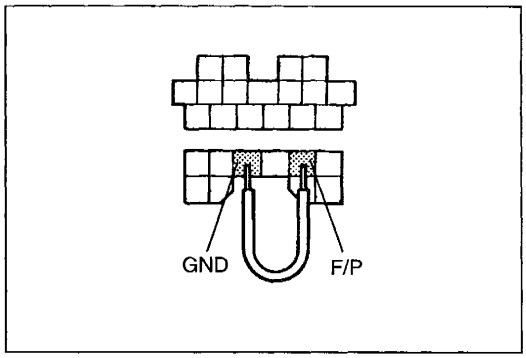
Warning

- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

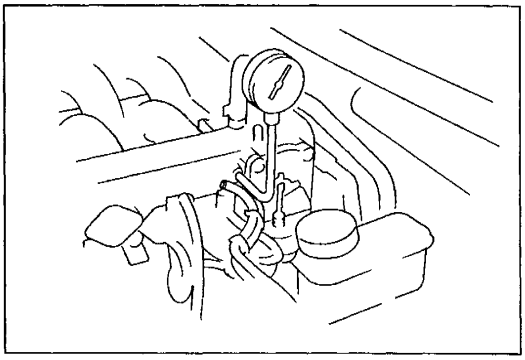
STEP 6 (2)



STEP 6 (3)

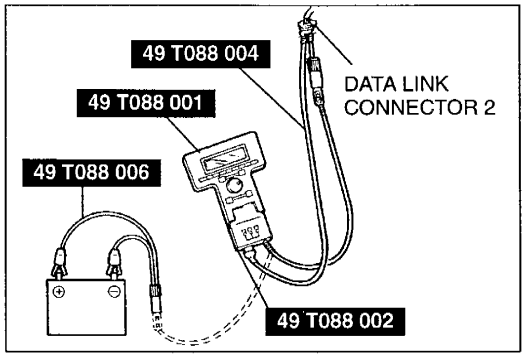


STEP 7

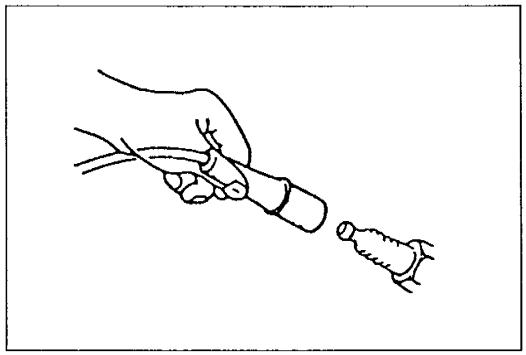


Rough idle (only when engine is cold)							
STEP	QUICK INSPECTION	ACTION				POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check diagnostic trouble code NoP0100, P0115 with **SST**	Yes	Check for the cause by referring to the check sequence				**F–46**
		No	Go to next step				
2	Disconnect high-tension lead of each cylinder at idle Check if the engine condition changes	Yes	Go to next step				
		No	Check ignition system [Refer to ignition system troubleshooting (Misfire)]	**section G**	Yes	Fuel injector clogging	**F–20**
					No	Spark plug	**section G**
						High-tension lead	**section G**
						Distributor cap	**section G**
3	Check fuel injector operating sound at idle	Yes	Go to next step				
		No	Check fuel injector resistance	**F–21**	Yes	Wiring short or open	
					No	Fuel injector malfunction (Replace)	**F–20**
4	Disconnect idle air control valve connector and check idle speed during warm up	Yes	Go to next step				
		No				BAC valve stuck close	**F–5**
5	Disconnect engine coolant temperature sensor connector Check if the condition becomes better	Yes	Check engine coolant temperature sensor connector for connecting condition as follows 1. Shake connector and check if the condition changes 2. Check condition of terminal (burning or damaged) 3. Connect a male terminal to the connector and check for connection condition		Yes	Engine coolant temperature sensor malfunction	**F–30**
					No	Poor contact at engine coolant temperature sensor connector	
		No	Go to next step				
6	Check if idle air control system is OK Refer to page F–139	Yes	Go to next step				
		No	Repair or replace				
7	Check if the specified engine oil is used	Yes	Go to next step				
		No	Change engine oil with specified one				
8	Substitute a known-good ECM Check if the condition becomes better	Yes				ECM malfunction	
		No				Mass air flow sensor malfunction	**F–5**

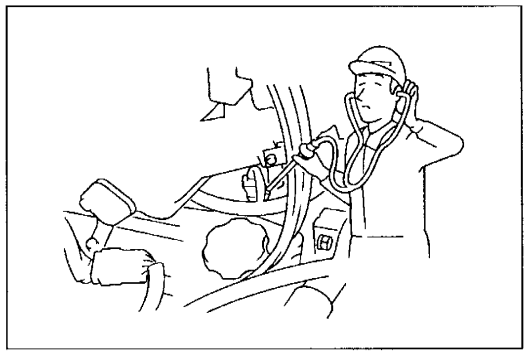
STEP 1



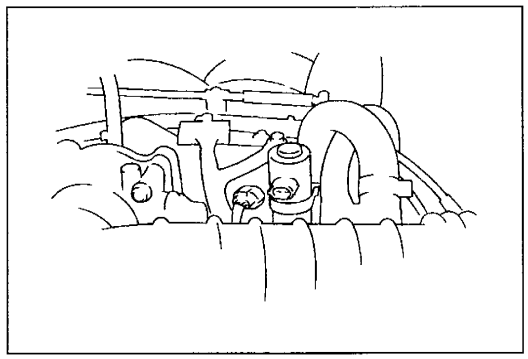
STEP 2



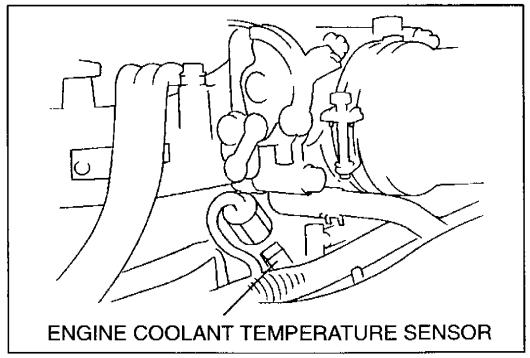
STEP 3



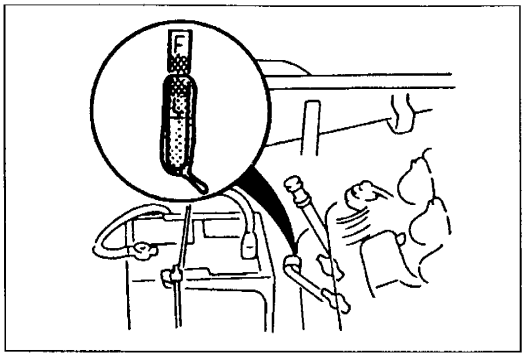
STEP 4



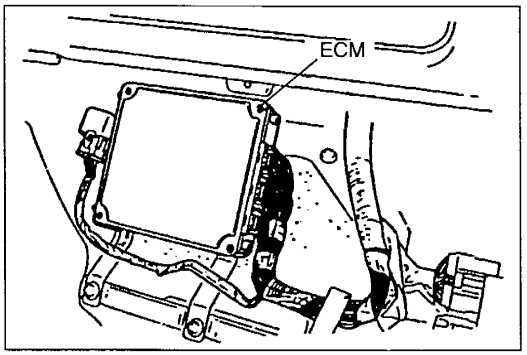
STEP 5



STEP 7

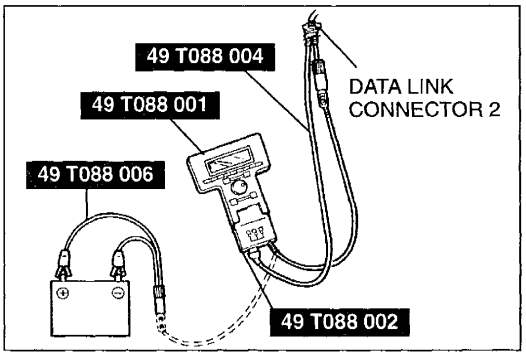


STEP 8

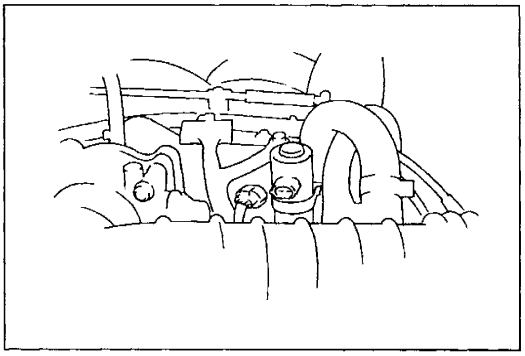


Rough idle (only when engine is warm)						
STEP	QUICK INSPECTION		ACTION		POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Run the engine at **2,000 rpm for more than 20 sec.** Check diagnostic trouble code No.P0100, P0110, P0115, P0134 with **SST**	Yes	Check for the cause by referring to the check sequence			**F–46**
		No	Go to next step			
2	Check idle speed after warm up **Idle speed: 760—800 rpm (P range)** [TEN terminal grounded with **SST**]	Yes	Go to next step			
		No	Adjust idle speed (if possible)			**F–3**
3	Disconnect idle air control valve connector Check if the engine speed drops	Yes	Go to next step			
		No			Idle air control valve malfunction	**F–5**
4	Disconnect engine coolant temperature sensor connector Check if the condition becomes better	Yes	Check engine coolant temperature sensor connector for connecting condition as follows 1. Shake connector and check if the condition changes 2. Check condition of terminal (burning or damaged) 3. Connect a male terminal to the connector and check for connection condition	Yes	Engine coolant temperature sensor malfunction	**F–30**
				No	Poor contact at engine coolant temperature sensor connector	
		No	Go to next step			
5	Substitute a known-good ECM				ECM malfunction	

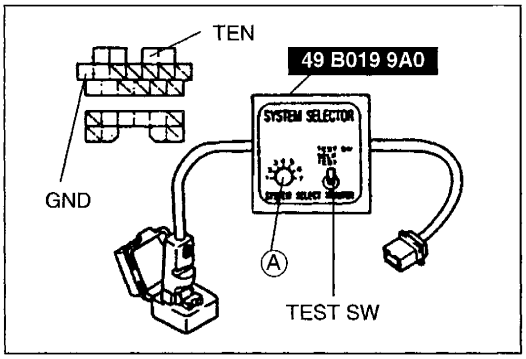
STEP 1



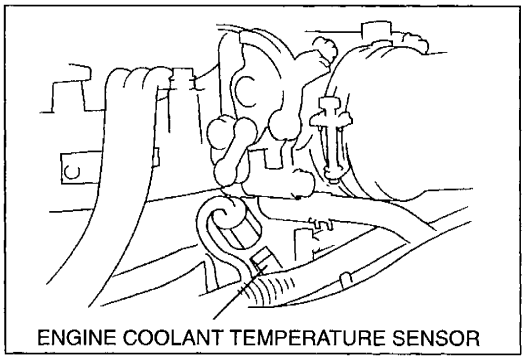
STEP 3



STEP 2

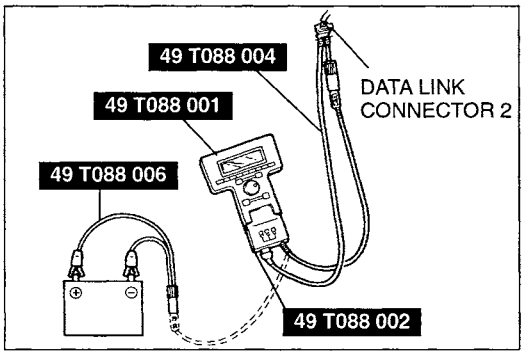


STEP 4



Rough idle (only after heat soak)					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Run the engine at **2,000 rpm for more than 20 sec.** Check diagnostic trouble code No.P0115, P0134, P0154, P1250, P1252 with **SST**	Yes	Check for the cause by referring to the check sequence		**F–46**
		No	Go to next step		
2	Check pressure regulator control system Is system normal? Refer to page F–141	Yes	Go to next step		
		No	Repair on replace		
3	Change fuel to specified one			Poor fuel quality	

STEP 1



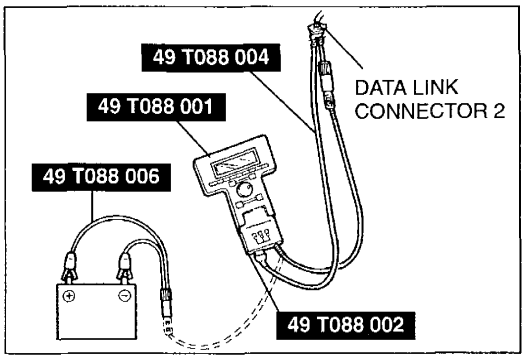
Rough idle just after starting							
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check Diagnostic trouble code No.P0110, P0115 with **SST**	Yes	Check for the cause by referring to the check sequence				**F–46**
		No	Go to next step				
2	Check closed throttle position switch with **SST**	Yes	Go to next step				
		No	Closed throttle position switch malfunction				**F–42**
3	Check ignition timing at idle after warm up **Ignition timing: 10—12° BTDC** [TEN terminal grounded with **SST**]	Yes	Go to next step				
		No	Adjust ignition timing				**F–3**
4	Check idle speed after warm up **Idle speed: 760—800 rpm (P range)** [TEN terminal grounded with **SST**]	Yes	Go to next step				
		No	Try to adjust idle speed	**F–3**	Yes	Idle speed misadjustment	
					No	Accelerator cable free play	**F–8**
						Idle air control valve stuck close	**F–5**
						Throttle valve	**F–5**
5	Substitute a known-good ECM Check if the condition becomes better	Yes				ECM malfunction	
		No	Check voltage at ECM 1C terminal with **SST** **Voltage: Approx. 10 V (While cranking)**	**F–31**	Yes	Go to next step	
					No	Transmission range switch	
						Related wiring open	
6						Poor quality engine oil	

Low idle speed (when A/C, P/S, E/L is ON)					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check diagnostic trouble code No.P0505 with **SST**	Yes	Check for the cause by referring to the check sequence		**F–46**
		No	Go to next step		
2	Disconnect idle air control valve connected at idle Check if the condition does not change	Yes	Go to next step		
		No		Low coolant level	**section E**
				Engine oil poor quality	**section D**
3	Check if idle air control system is OK Refer to page F–139	Yes	Go to next step		
		No	Repair or replace		
4	Check the continuity between TEN terminal and ground			Wiring short to ground	

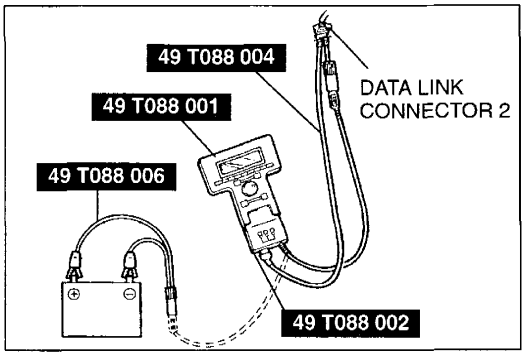
Note

- In case of low idle speed with A/C ON, if the problem can not be solved by the above steps, it may be an A/C compressor malfunction. (Refer to section U.)

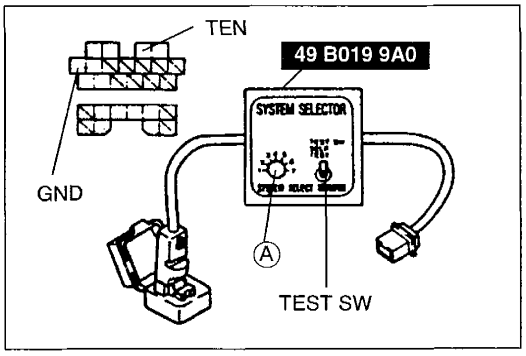
STEP 1



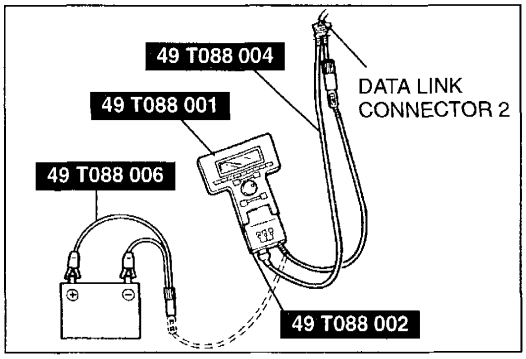
STEP 2



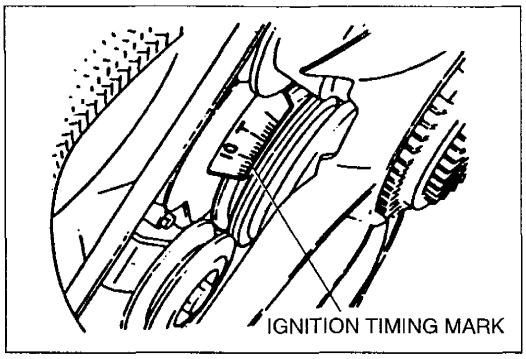
STEP 3 (1)



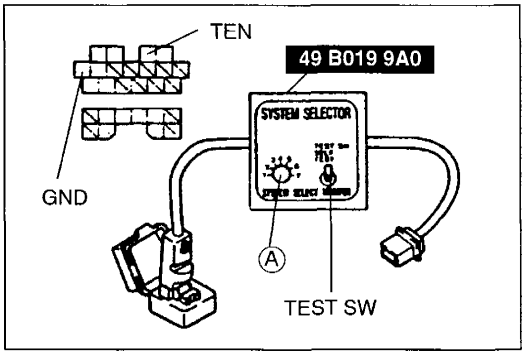
STEP 1



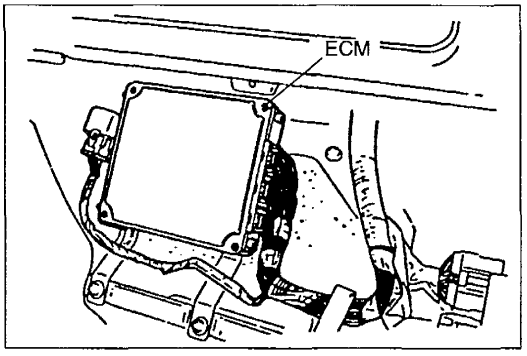
STEP 3 (2)



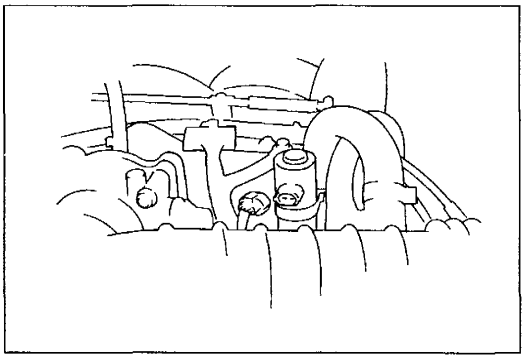
STEP 4



STEP 5

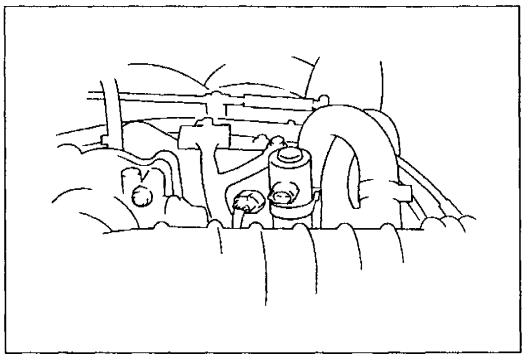


STEP 2

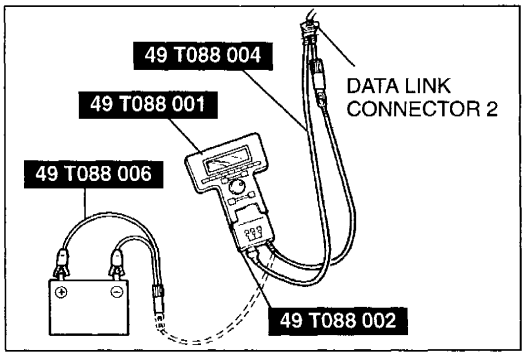


High idle speed after warm up							
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Disconnect idle air control valve connector and check idle speed decrease during warm up	Yes	Go to next step				
		No				Air valve stuck open	F–5
2	Check if idle air control system is ok Refer to page F–139 [TEN terminal grounded with **SST**]	Yes	Go to next step				
		No	Repair or replace				
3	Check diagnostic trouble code No.P0115, P0505 with **SST**	Yes	Check for the cause by referring to the check sequence				F–46
		No	Go to next step				
4	Check ignition timing at idle after warm up **Ignition timing: 10—12° BTDC** [TEN terminal grounded with **SST**]	Yes	Go to next step				
		No	Adjust ignition timing				F–3
5	Check intake manifold vacuum at idle **Vacuum: 61.4—66.6 kPa { 460—500 mmHg , 18.2-19.6 inHg }**	Yes	Go to next step				
		No	Check for air leak	F–5	Yes	Vacuum hose misrouting	
						Throttle valve open	F–5
					No	Vacuum hoses	F–5
						Gaskets	
						Bolts or nuts loose	
						Intake air system components	
6	Disconnect engine coolant temperature sensor connector and check if the condition becomes better	Yes	Check for engine coolant temperature sensor connector condition as follows 1. Shake the connector and check if the engine condition become better 2. Check pin condition (burning or broken) 3. Connect the male pin to the connector and check for connector condition		Yes	Engine coolant temperature sensor malfunction	F–30
					No	Poor contact at engine coolant temperature sensor connector	
		No	Go to next step				
7	Substitute a known-good ECM						

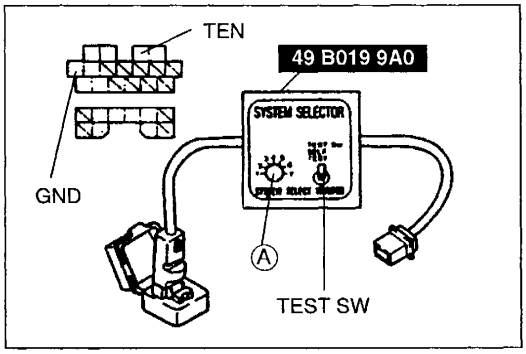
STEP 1



STEP 3



STEP 4 (1)



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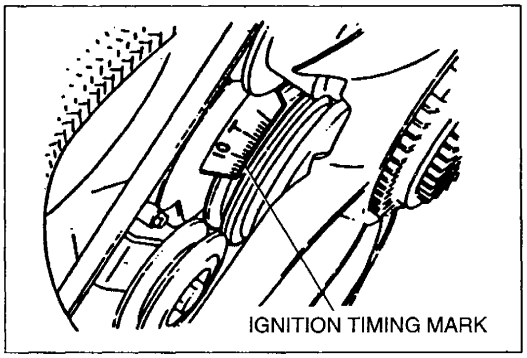
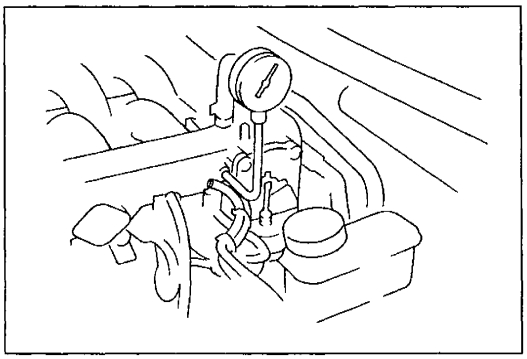
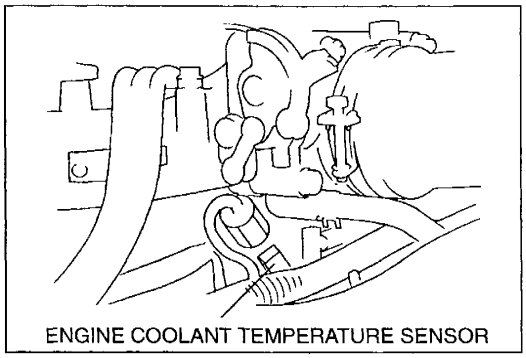


STEP 5

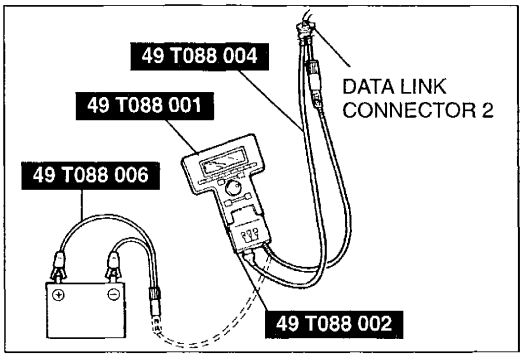


STEP 6

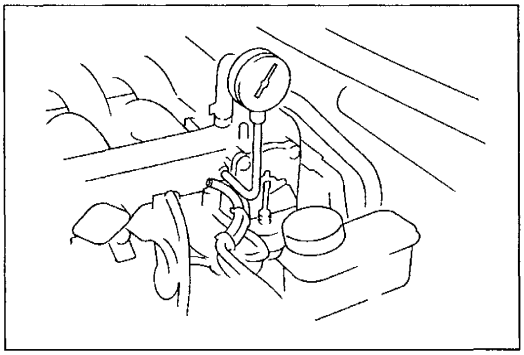


Idle hunting or surging					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE	
1	(If trouble occurs at warm condition) Check diagnostic trouble code No.P0134, P0443, P0505 with **SST**	Yes	Check for the cause by referring to the check sequence		**F–46**
		No	Go to next step		
2	Check for intake manifold vacuum at idle **Vacuum: 61.4—66.6 kPa { 460—500 mmHg , 18.2—19.6 inHg }**	Yes	Go to next step		
		No		Air leakage	**F–5**
3	Pinch PCV hose Check if the engine condition changes	Yes		PCV valve malfunction	
		No	Go to next step		
4	Disconnect the engine coolant temperature sensor connector Check if the engine condition changes	Yes		Engine coolant temperature sensor malfunction	**F–30**
		No	Go to next step		
5	Check fuel line pressure at idle **Fuel line pressure: 206—254 kPa { 2.1—2.6 kgf/cm^2 , 30—36 psi }**	Yes	Go to next step		
		No	Check if pressure regulator control system		**F–141**
6	Substitute a known-good ECM			ECM malfunction	

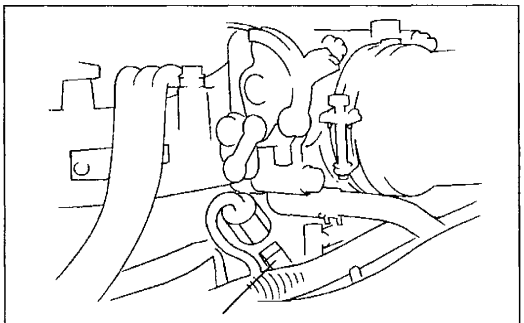
STEP 1



STEP 2



STEP 4



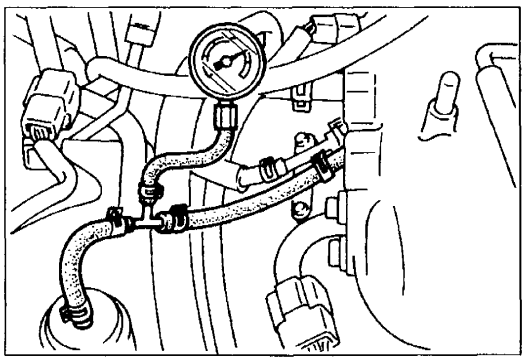
ENGINE COOLANT TEMPERATURE SENSOR

STEP 5 (1)

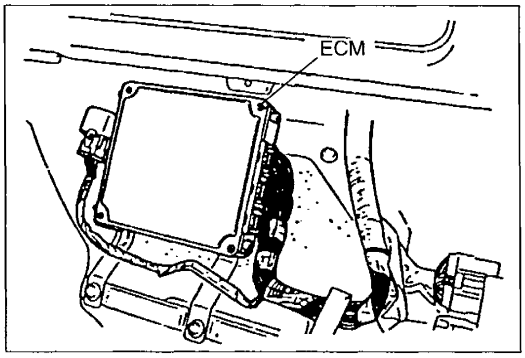
Warning

- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

STEP 5 (2)

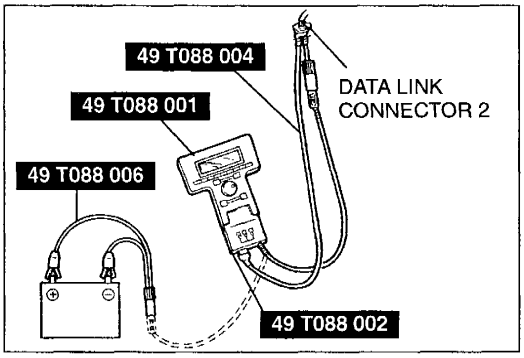


STEP 6



Engine stall at idle (Always)						
STEP	QUICK INSPECTION		ACTION		POSSIBLE CAUSE	
1	Check diagnostic trouble code with **SST**	Yes	Check the cause by referring to the check sequence			**F–46**
		No	Go to next step			
2	Shake connectors of distributor, main relay and ECM while idle Check if the engine stalls	Yes	There may be a poor contact at the connector Repair or replace the harness and connector			
		No	Go to next step			
3	Check the vacuum hoses and the air funnel for sucking air	Yes	Shut the air leak part			
		No	Go to next step			
4	Check fuel line pressure [Ignition switch ON, Data link connector F/P and GND terminals connected] **Fuel line pressure: 265—313 kPa { 2.7—3.2 kgf/cm^2 , 39—45 psi }**	Yes	Go to next step			
		No			Fuel leaks	
					Fuel filter clogging	**F–15**
			Check fuel pump maximum pressure **Fuel pump maximum pressure: 442—637 kPa { 4.5—6.5 kgf/cm^2 , 64—92 psi }**	Yes	Pressure regulator malfunction (Replace)	**F–20**
				No	Fuel pump malfunction (Replace)	**F–17**
5					ECM malfunction	

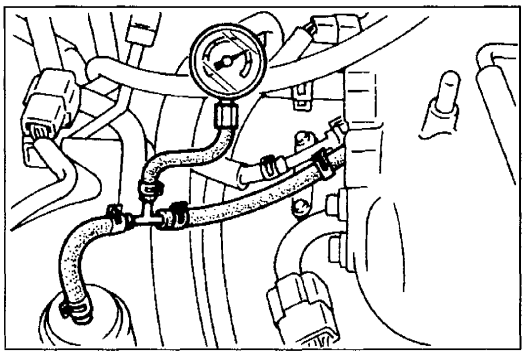
STEP 1



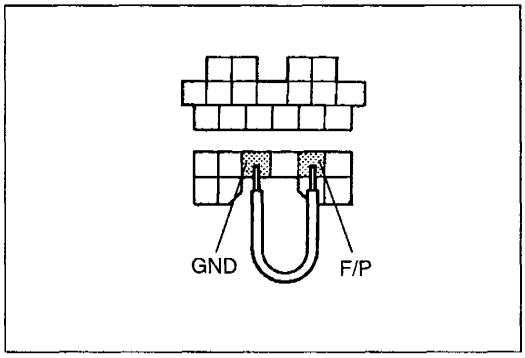
STEP 4
(1)

Warning
- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

STEP 4
(2)

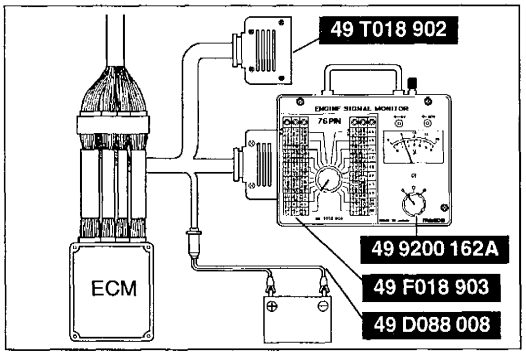


STEP 4
(3)

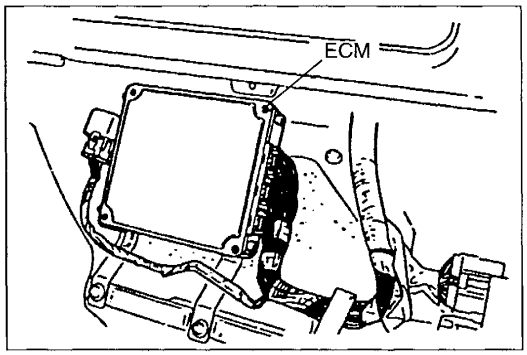


Engine stall at idle (Only when engine is cold)					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE	
1	Check voltage at ECM terminal 3E Refer to page F–31	Yes	Go to next step		
		No	Replace engine coolant temperature sensor	Engine coolant temperature sensor malfunction	F–30
2	Blow the air valve (cold condition) Check the air flow	Yes	Go to next step		
		No	Replace the BAC valve	BAC valve malfunction (Replace)	F–5
3	Substitute a known-good ECM			ECM malfunction (Replace)	

STEP 1

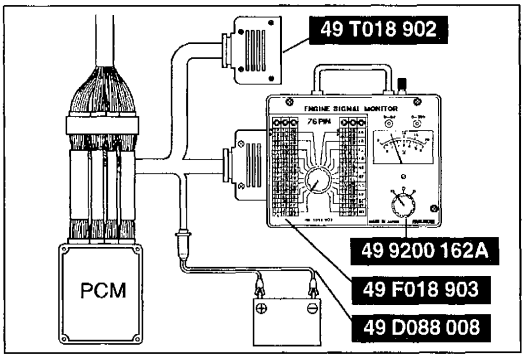


STEP 3

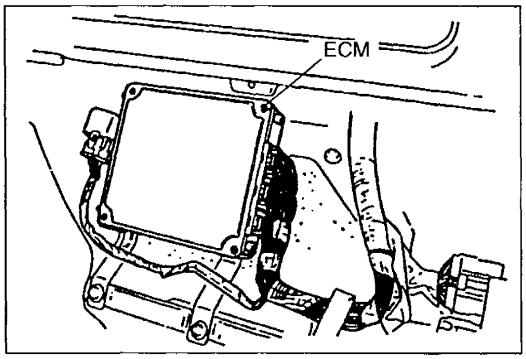


Engine stall at idle (only when engine is warm)					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE	
1	Check voltage at ECM terminal 3E Refer to page F–31	Yes	Go to next step		
		No	Replace engine coolant temperature sensor	Engine coolant temperature sensor malfunction	F–30
2	Substitute a known-good ECM			ECM malfunction	

STEP 1

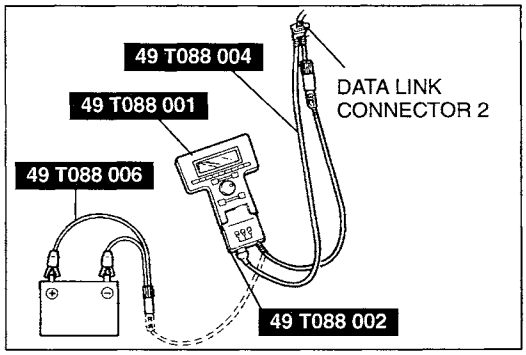


STEP 2



Engine stall at idle (Only after heat soak)				
STEP	**QUICK INSPECTION**		**ACTION**	**POSSIBLE CAUSE**
1	Run the engine at **2,000 rpm for more than 20 sec.** Check diagnostic trouble code No.P0115, P0134, P1250, P1252 with **SST**	Yes	Check for the cause by referring to the check sequence	**F–46**
		No	Go to next step	
2	Check if pressure regulator control system Is system normal? Refer to page F–141	Yes	Go to next step	
		No	Repair or replace	
3	Change fuel to specified one			

STEP 1

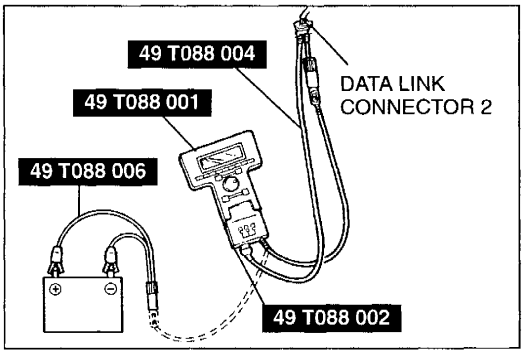


Engine stall at idle (When A/C, P/S, E/L is ON)					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE	
1	Check diagnostic trouble code No.P0505 with **SST**	Yes	Check for the cause by referring to the check sequence		**F–46**
		No	Go to next step		
2	Disconnect idle air control valve connecter at idle Check if the condition does not change	Yes	Go to next step		
		No		Low coolant level	**section E**
				Engine oil poor quality	**section B**
3	Check if idle air control system is OK Refer to page F–139	Yes	Go to next step		
		No	Repair or replace		
4	Check the continuity between TEN terminal and ground			Wiring short to ground	

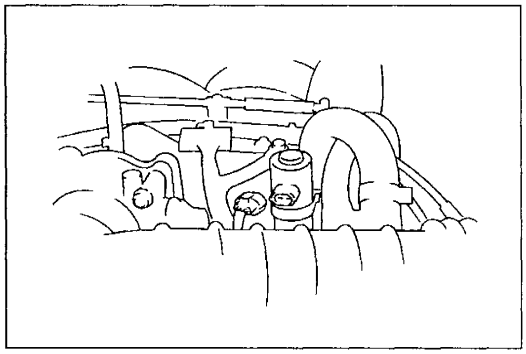
Note

- In case of engine stall at idle with A/C ON, if the trouble can not be fixed after checking above steps, it may be A/C compressor malfunction. (Refer to section U.)

STEP 1

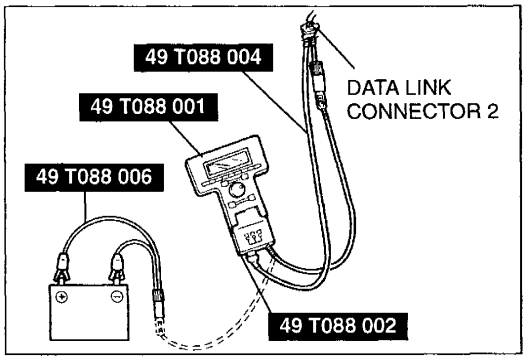


STEP 2

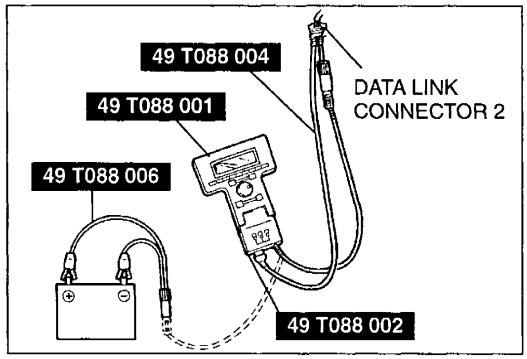


Engine stall at idle (in "D" range)					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE	
1	Check diagnostic trouble code with **SST**	Yes	Check the cause by referring to the check sequence		
		No	Go to next step		
2	Check voltage at ECM terminal 1L Refer to page F–31	Yes	Go to next step		
		No	Adjustment or replacement	Transmission range switch malfunction	
3	Substitute a known-good ECM			ECM malfunction (Replace)	**F–31**

STEP 1

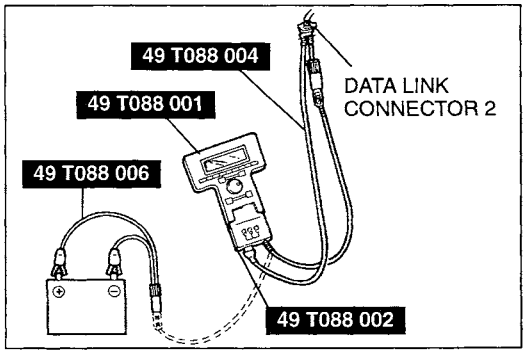


STEP 2

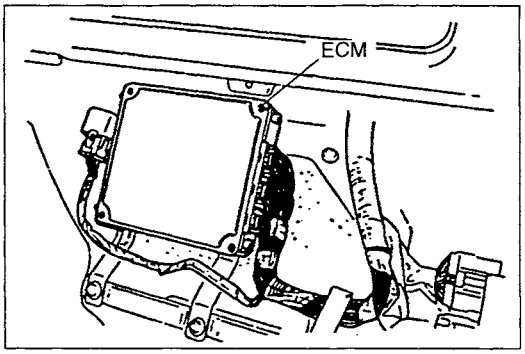


Engine stall during start up							
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE	
1	Check diagnostic trouble code No.P0100, P0115 with **SST**	Yes	Check the cause by referring to the check sequence				**F–46**
		No	Go to next step				
2	Check intake manifold vacuum at idle **Vacuum: 61.4—66.6 kPa { 460—500 mmHg , 18.2—19.6 inHg }**	Yes	Go to next step				
		No	Check for air leaks	**F–132**	Yes	Throttle valve	**F–5**
					No	Vacuum hoses	**F–5**
						Gaskets	
						Bolts or nuts	
						Component broken	
3	Check if idle air control system is OK Refer to page F–139	Yes	Go to next step				
		No	Repair or replace				
4	Check for correct ignition timing advance	Yes	Go to next step				
		No	Adjust or replace			Distributor malfunction	**section G**
5	Substitute a known-good ECM					ECM malfunction	**F–30**

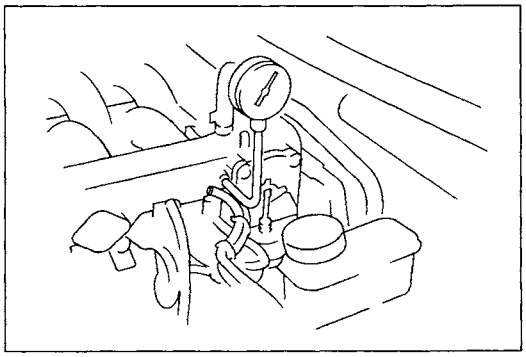
STEP 1



STEP 5

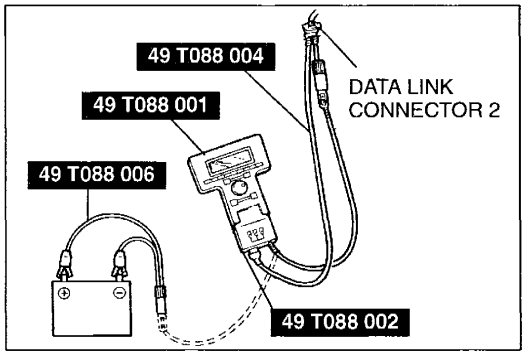


STEP 2

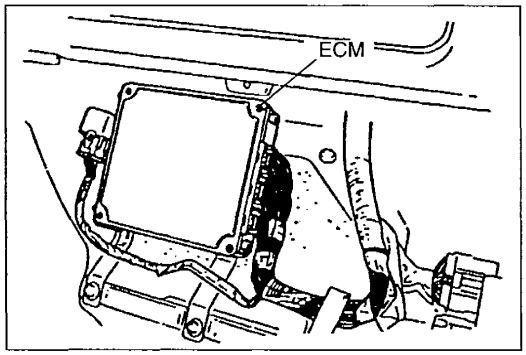


Engine stall on deceleration (only when engine is cold)					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE	
1	Check diagnostic trouble code with **SST**	Yes	Check the cause by referring to the check sequence		
		No	Go to next step		
2	Check volatge at ECM terminal 3E Refer to page F–31	Yes	Go to next step		
		No	Replace the engine coolant temperature sensor	Engine coolant temperature sensor malfunction	**F–30**
3	Substitute a known-good ECM			ECM malfunction	**F–31**

STEP 1

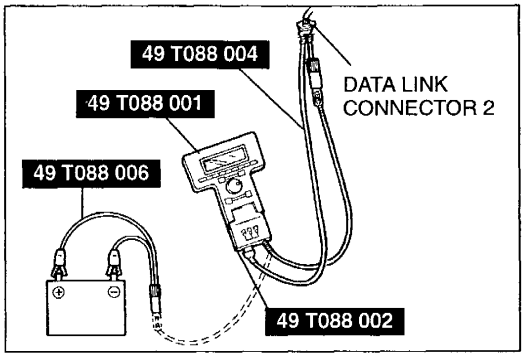


STEP 3

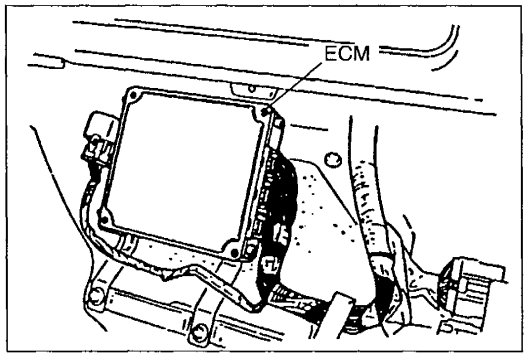


Engine stall on deceleration (Only after warm up)					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE	
1	Check diagnostic trouble code with SST	Yes	Check the cause by referring to the check sequence		F–46
		No	Go to next step		
2	Substitute a known-good ECM			ECM malfunction	F–31

STEP 1

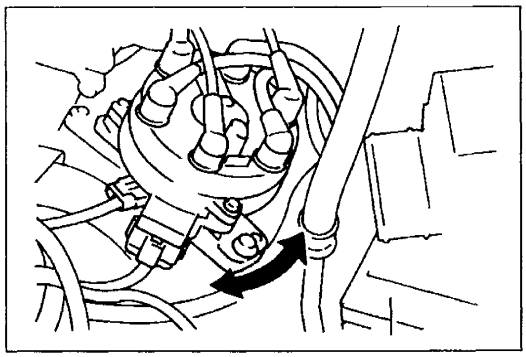


STEP 2

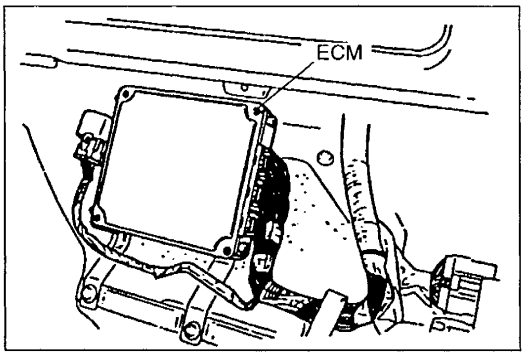


Engine stall at idle (Intermittent)				
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE AND DETAILED IMSPECTION
1	Shake connectors of distributor, main relay, and ECM while cranking Check if the engine starts	Yes	There may be a poor contact at the connector. Repair or replace the wiring	
		No	Go to troubleshooting "Engine stall at idle (always)"	F–110

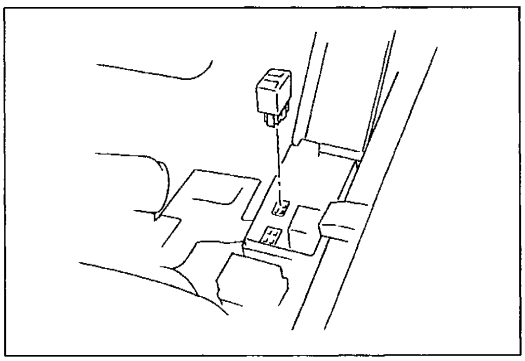
STEP 1 (1)



STEP 1 (3)

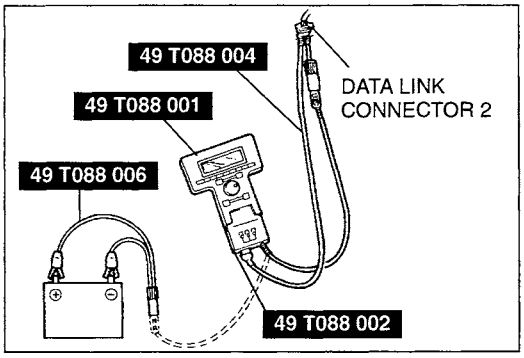


STEP 1 (2)

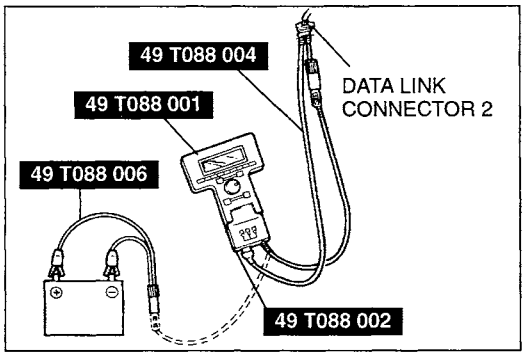


Hesitates/Stumbles on acceleration						
STEP	QUICK INSPECTION		ACTION		POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Run the engine at **2,000 rpm for 20 sec.** and stop it Check diagnostic trouble code No.P0100, P0115, P0120, P0134 with **SST**	Yes	Check for the cause by referring to the check sequence			**F–46**
		No	Go to next step			
2	Check voltage at ECM terminal 3F Refer to page F–31	Yes	Go to next step			
		No	Adjust or replace throttle position sensor			
3	Disconnect heated oxygen sensor connector Check if the condition becomes better	Yes			Heated oxygen sensor	**F–43**
		No	Go to next step			
4	Check fuel line pressure while acceleration **Fuel line pressure:** **206—254 kPa** **{ 2.1—2.6 kgf/cm², 30—36 psi }**	Yes	Go to next step			
		No	Check if pressure regulator control system			**F–141**
5	Check for air leaks with throttle valve open by listening for sucking noise	Yes	Go to next step			
		No			Vacuum hoses	**F–5**
					Gaskets	
					Nuts or bolts loose	
					Damaged components	
6	Disconnect engine coolant temperature sensor connector Check if the condition improves	Yes	Check engine coolant temperature sensor connector for connecting condition as follows 1. Shake connector and check if the condition changes 2. Check condition of terminal (burning or damaged) 3. Connect a male terminal to the connector and check for connection condition	Yes	Engine coolant temperature sensor malfunction	**F–30**
				No	Poor contact at engine coolant temperature sensor connector	
		No	Go to next step			
7	Check if VRIS control system is ok Refer to page F–140	Yes	Go to next step			
		No	Repair or replace			
8	Substitute a known-good ECM Check if the condition becomes better	Yes			ECM malfunction	
		No			Mass air flow sensor	**F–37**
					Throttle valve	**F–5**
					Spark plug	**section G**
9	Check other systems				Automatic transmission	**section K1**

STEP 1



STEP 2

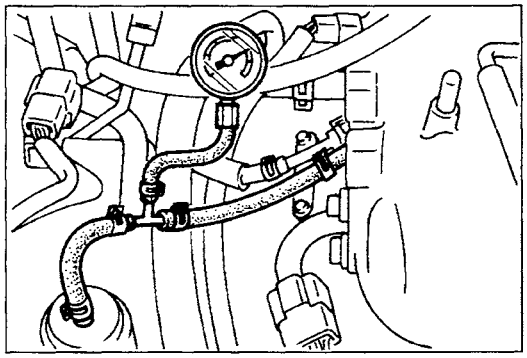


STEP 4 (1)

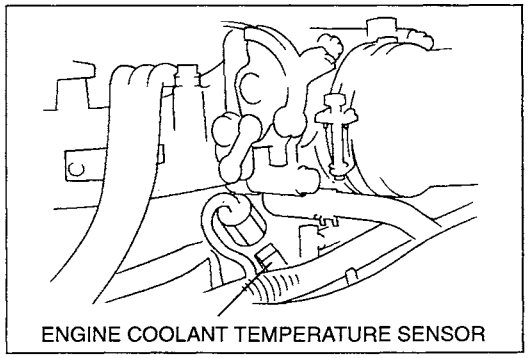
Warning

- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

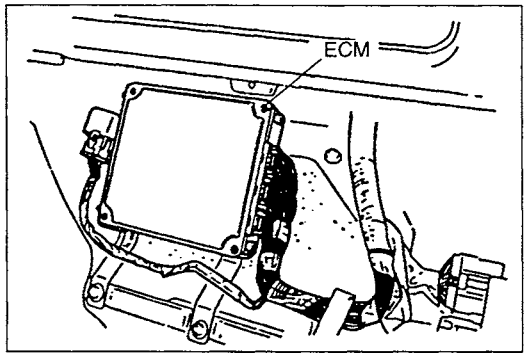
STEP 4 (2)



STEP 6

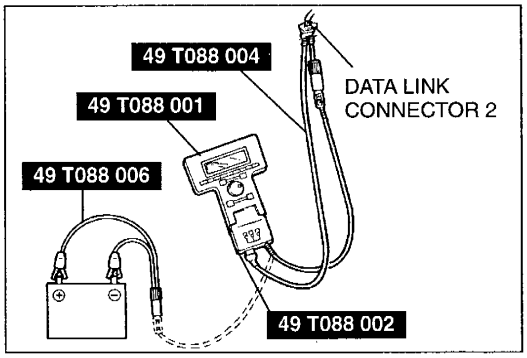


STEP 8



Hesitates at steady speed					
STEP	**QUICK INSPECTION**		**ACTION**	**POSSIBLE CAUSE AND DETAILED INSPECTION**	
1	Run the engine at **2,000 rpm for 20 sec.** and stop it Check diagnostic trouble code No.P0100, P0115, P0120, P0134 with **SST**	Yes	Check for the cause by referring to the check sequence		**F–46**
		No	Go to next step		
2	Disconnect heated oxygen sensor connector Check if the condition becomes better	Yes		Heated oxygen sensor deterioration	**F–43**
		No	Go to next step		
3	Check for air leaks with throttle valve open by listening for sucking noise	Yes	Go to next step		
		No		Vacuum hoses	**F–5**
				Gaskets	
				Nuts or bolts loosen	
				Damaged components	
4	Check fuel line pressure while acceleration **Fuel line pressure:** **206—254 kPa** **{ 2.1—2.6 kgf/cm^2 , 30—36 psi }**	Yes	Go to next step		
		No	Check if pressure regulator control system		**F–141**
5	Gradually open the throttle valve Check if engine speed increases smoothly	Yes	Go to next step		
		No		Mass air flow sensor	**F–37**
				Throttle valve	**F–5**
				Throttle position sensor	**F–40**
6	Are all spark plugs ok?	Yes	Go to next step		
		No	Clean or replace spark plug(s)		
7	Change fuel with specified one Check if the condition becomes better	Yes		Poor fuel quality	
		No	Go to next step		
8	Substitute a known-good ECM				

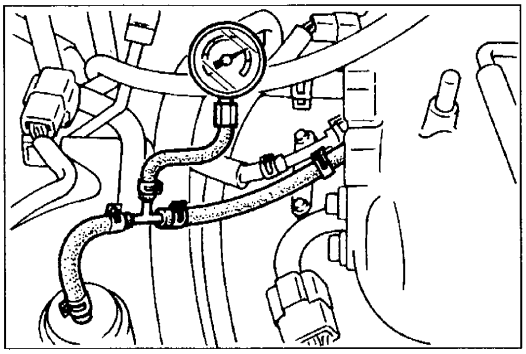
STEP 1



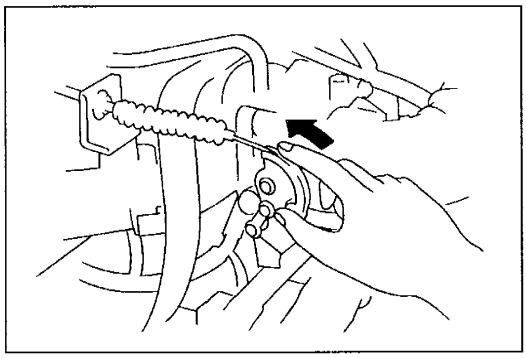
STEP 4 (1)

Warning
- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

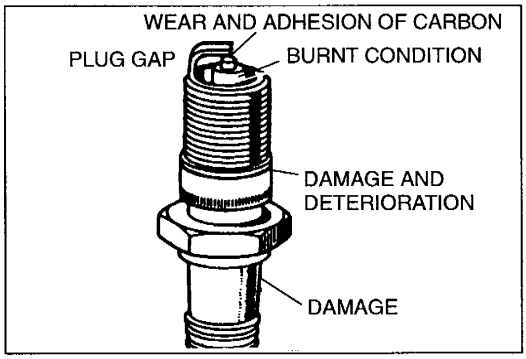
STEP 4 (2)



STEP 5

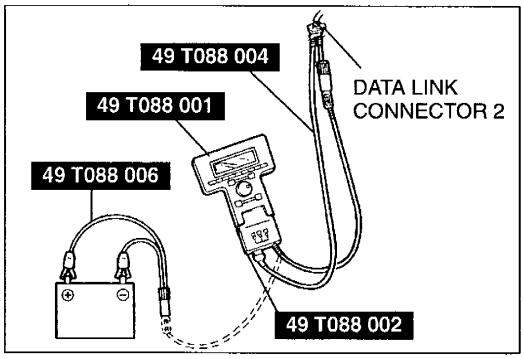


STEP 6

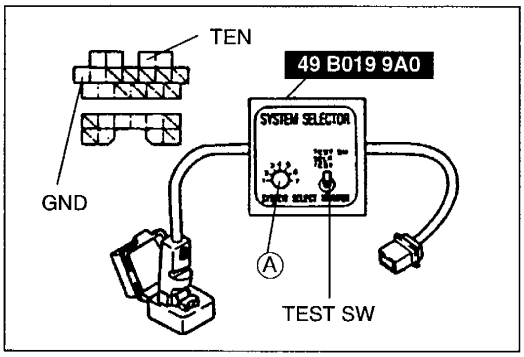


Knocking					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check diagnostic trouble code No.P0100, P0115 with **SST**	Yes	Check for cause by referring to check sequence		**F–46**
		No	Go to step 2 (at sea level) Go to step 3 [at high-altitude (1,000 m { 3,280 ft })]		
2	Check ignition timing after warm up **Ignition timing 10—12 ° BTDC** [TEN terminal grounded with **SST**]	Yes	Go to next step		
		No	Adjust ignition timing		
3	Check fuel line pressure at idle **Fuel line pressure:** **206—254 kPa** **{ 2.1—2.6 kgf/cm^2 , 30—36 psi }**	Yes	Go to next step		
		No	Check if pressure regulator control system		**F–141**
4	Check the mass air flow sensor Refer to page F–37	Yes	Go to next step		
		No	Replace the mass air flow sensor	Mass air flow sensor malfunction	**F–5**
5	Change fuel with specified one Check if the condition becomes better **Fuel spec:** **(R+M)/2 method 87 or higher**	Yes		Poor fuel quality	
		No	Go to next step		
6	Substitute a known-good ECM			ECM malfunction	**F–31**

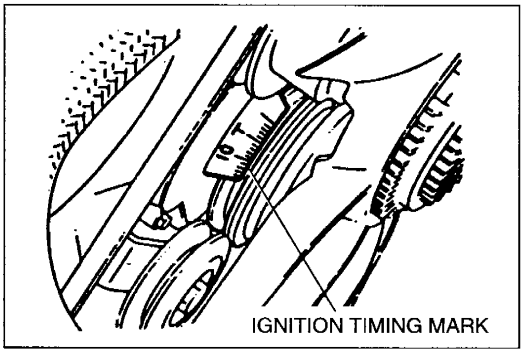
STEP 1



STEP 2 (1)



STEP 2 (2)

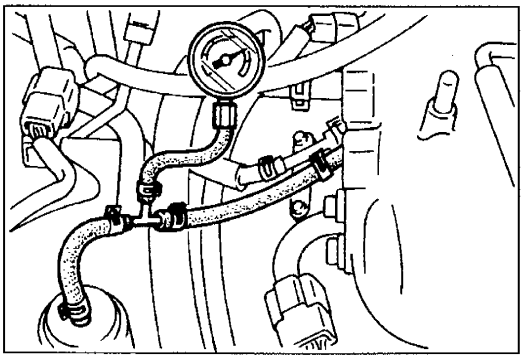


STEP 3 (1)

Warning

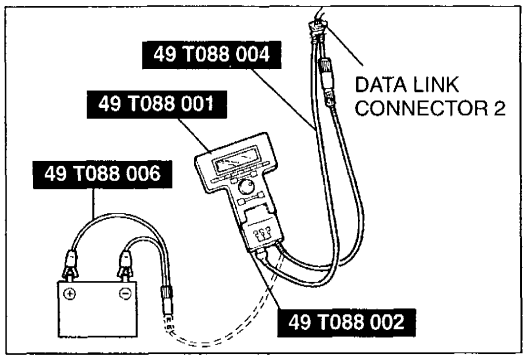
- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

STEP 3 (2)

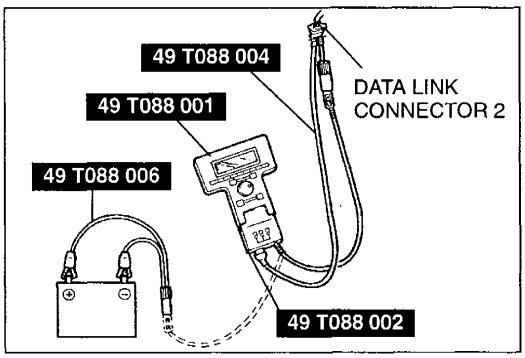


Poor acceleration							
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check diagnostic trouble code with **SST**	Yes	Check the cause by referring to the check sequence				**F–46**
		No	Go to next step				
2	Check voltage at ECM terminal 3F Refer to page F–31	Yes	Go to next step				
		No	Adjust or replace throttle position sensor				
3	Disconnect high-tension lead of each cylinder at idle Check if the engine condition changed	Yes	Go to next step				
		No	Check ignition system Refer to section G	Yes	Fuel injector malfunction		**F–20**
				No	Ignition system malfunction		**section G**
4	Check air cleaner element for clogging	Yes	Go to next step				
		No	Replace air cleaner element				
5	Check ignition timing at idle after warm up **Ignition timing: 10—12 ° BTDC** [Data link connector TEN terminal grounded]	Yes	Go to next step				
		No	Adjust ignition timing				**F–3**
6	Check the vacuum hoses and the air funnel for sucking air	Yes	Shut the air leak part				
		No	Go to next step				
7	Check fuel line pressure at idle **Fuel line pressure:** **206—254 kPa** **{ 2.1—2.6 kgf/cm^2 , 30—36 psi }**	Yes	Go to next step				
		No	Check if pressure regulator control system				**F–141**
8	Check if VRIS control system is OK Refer to page F–140	Yes	Go to next step				
		No	Repain or replace				
9	When the accelerator pedal is depressed, engine speed increases smoothly	Yes	Go to next step				
		No	Mass air flow sensor malfunction				**F–5**
10	Change the fuel with specified one Check if the condition becomes better **Fuel spec:** **(R+M)/2 method 87 or higher**	Yes			Poor fuel quality		
		No	Go to next step				
11	Check other systems				Automatic transmission		**section K1**
12	Substitute a known-good ECM				ECM malfunction		**F–31**

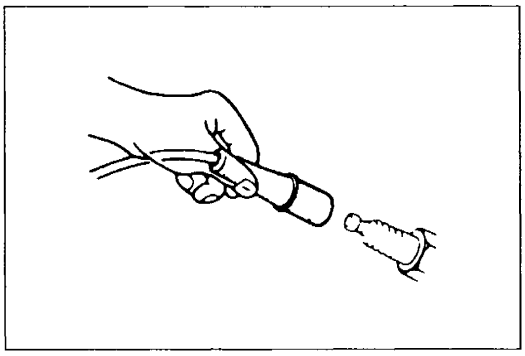
STEP 1



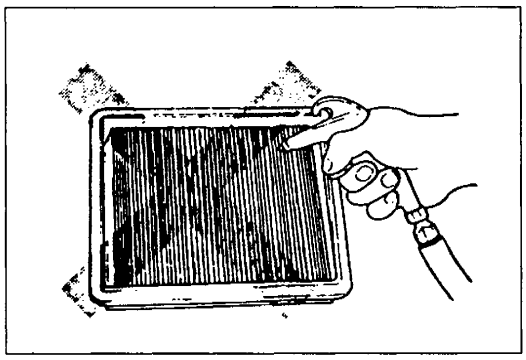
STEP 2



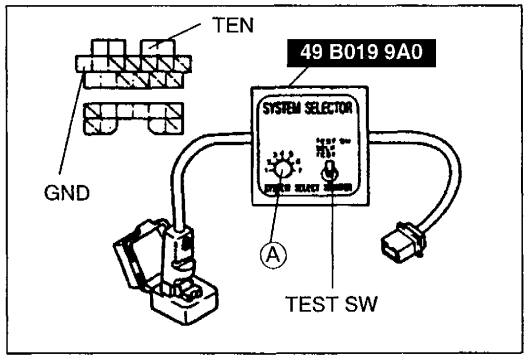
STEP 3



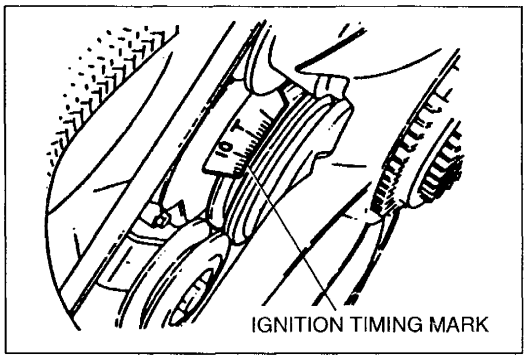
STEP 4



STEP 5 (1)



STEP 5 (2)

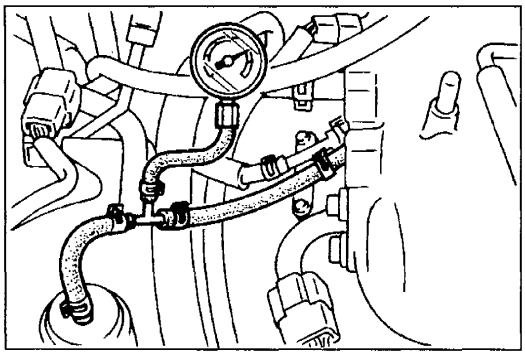


STEP 7 (1)

Warning

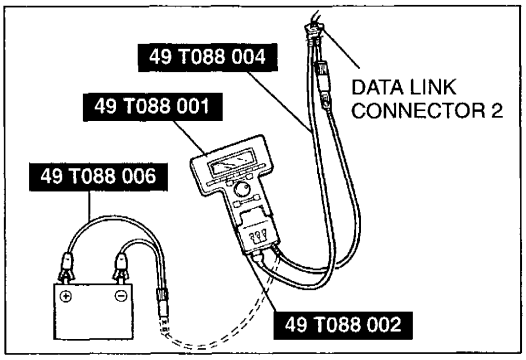
- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

STEP 7 (2)

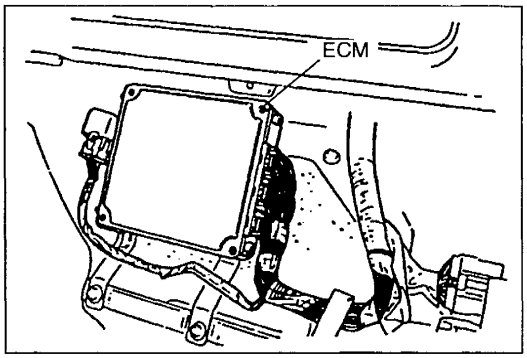


Bucking at high speed					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check diagnostic trouble code with **SST**	Yes	Check for the cause by referring to the check sequence		**F–46**
		No	Go to next step		
2	Disconnect the heated oxygen sensor connector Check if the engine condition becomes better	Yes	Replace the heated oxygen sensor		
		No	Go to next step		
3	Check fuel line pressure at idle **Fuel line pressure:** **206—254 kPa** **{ 2.1—2.6 kgf/cm^2 , 30—36 psi }**	Yes	Go to next step		
		No	Check if pressure regulator control system		**F–141**
4	Check the vacuum hoses and the air funnel for sucking air	Yes	Shut the air leak part		
		No	Go to next step		
5	Check ignition timing at idle after warm up **Ignition timing: 10—12 ° BTDC**	Yes	Go to next step		
		No	Adjust ignition timing		**F–3**
6	When the accelerator pedal is depressed, engine speed increases smoothly	Yes	Go to next step		
		No	Mass air flow sensor malfunction		**F–5**
7	Substitute a known-good ECM			ECM malfunction	**F–31**

STEP 1



STEP 7

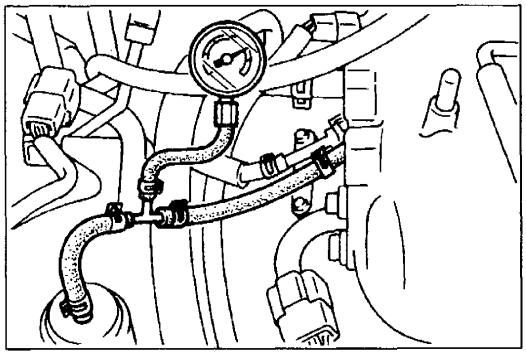


STEP 3 (1)

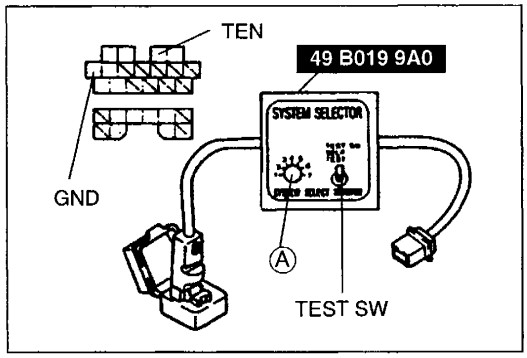
Warning

- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

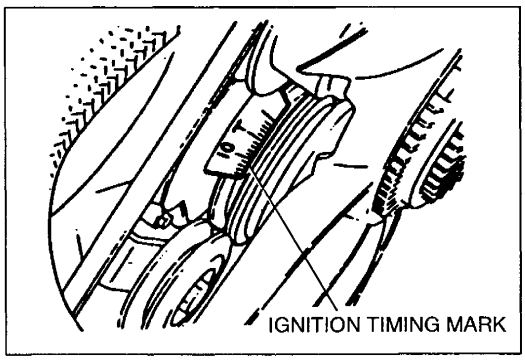
STEP 3 (2)



STEP 5 (1)

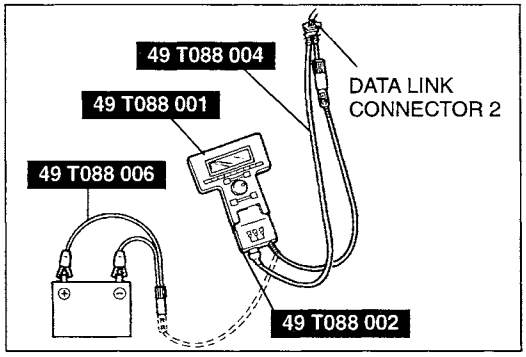


STEP 5 (2)

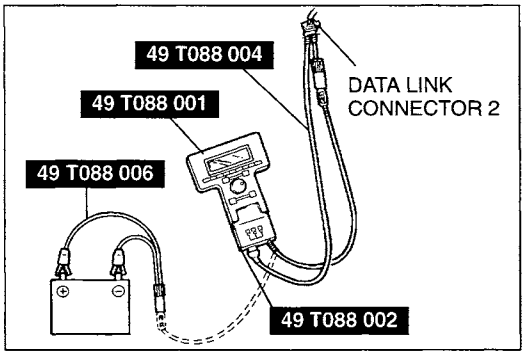


Bucking on deceleration					
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check diagnostic trouble code No.P0100, P0115, P0505, P0510 with **SST**	Yes	Check for the cause by referring to the check sequence		**F–46**
		No	Go to next step		
2	Check voltage at ECM terminal 3L	Yes	Go to next step		
		No	Adjust or replace throttle position sensor		**F–41**
3	Substitute a known-good ECM Check if the condition becomes better	Yes	ECM malfunction		
		No	Go to next step		
4	Check other system			Spark plug gap	**section G**
				Compression differs between cylinders	**section B**

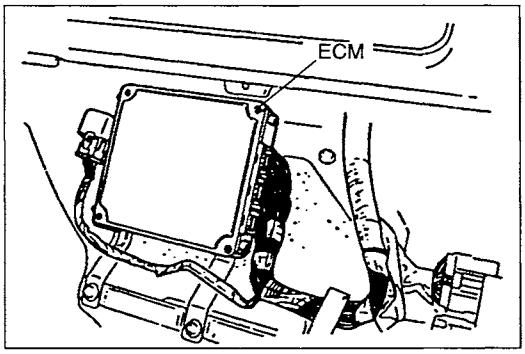
STEP 1



STEP 2

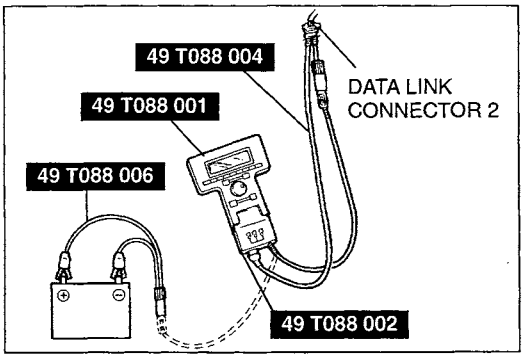


STEP 3

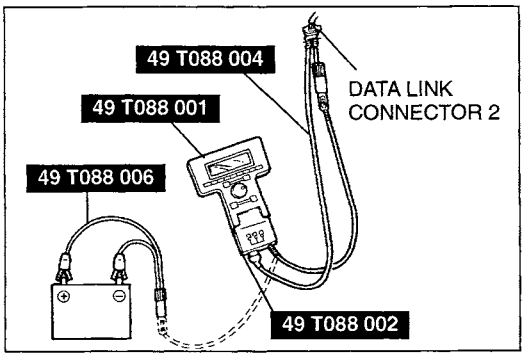


Poor fuel economy							
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Run the engine at **2,000—3,000 rpm for more than 20 sec.** after warm up and stop it Check diagnostic trouble code No.P0134 with **SST**	Yes	Check for the cause by referring to the check sequence				**F–46**
		No	Go to next step				
2	Check voltage at ECM terminal 3L Refer to page F–31	Yes	Go to next step				
		No	Adjust or replace throttle position sensor				**F–41**
3	Check fuel line pressure at idle **Fuel line pressure:** **206—254 kPa** **{ 2.1—2.6 kgf/cm², 30—36 psi }**	Yes	Go to next step				
		No	Check vacuum line to pressure regulator for clogging or air leak		Yes	Vacuum line (Replace)	
					No	Check PRC system	**F–141**
4	Check for fuel cut operation while deceleration **Fuel cut:** **Until approx. 1,000 rpm** **After warm up**	Yes	Go to next step				
		No	Check engine coolant temperature sensor	**F–42**	Yes	ECM malfunction	**F–31**
					No	Engine coolant temperature sensor malfunction/Replace	**F–30**
5	Check ignition timing advance	Yes	Go to next step				
		No	Check ignition system				**section G**
6	Check other systems					TCM malfunction	**section K1**
						Brake wear	**section P**
						Tire air pressure	**section Q**

STEP 1



STEP 2

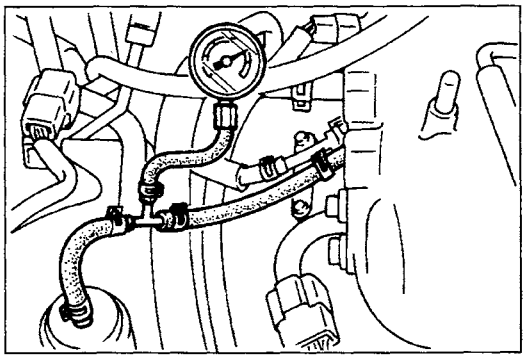


STEP 3 (1)

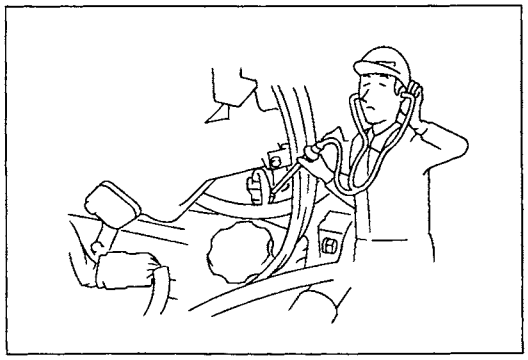
Warning

- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

STEP 3 (2)



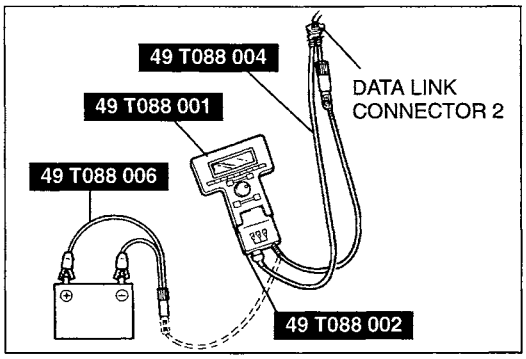
STEP 4



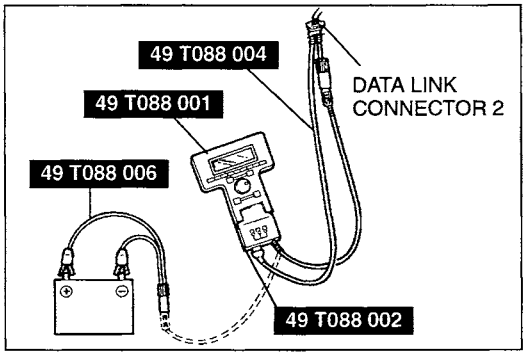
High oil consumption/White exhaust smoke							
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check for oil leak from engine	Yes	Repair or replace				
		No	Go to next step				
2	Disconnect PCV valve from engine Check if there is vacuum at idle	Yes	Go to next step				
		No	Check PCV valve	F–28	Yes	PCV hose clogging	
					No	PCV valve malfunction	
3	Check that the ventilation hose is installed correctly	Yes	Go to next step				
		No	Install ventilation hose correctly				
4	It may be a malfunction of the engine Check for the cause by referring to the check sequence of section B						

Afterburn on deceleration							
STEP	QUICK INSPECTION		ACTION			POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check diagnostic trouble code No.P0505, P0510 with **SST**	Yes	Check for the cause by referring to the check sequence				F–46
		No	Go to next step				
2	Check voltage at ECM terminal 3L Refer to page F–31	Yes	Go to next step				
		No	Adjust or replace throttle position sensor				F–41
3	Check ignition timing at idle after warm up **Ignition timing: 10—12 ° BTDC** [TEN terminal grounded with **SST**]	Yes	Go to next step				
		No	Check for the distributor				section G
4	Check air cleaner element for clogging	Yes	Go to next step				
		No	Replace air cleaner element				
5	Check fuel cut operation while deceleration **Fuel cut: Above approx. 1,000 rpm after warm up**	Yes	Go to next step				
		No	Check engine coolant temperature sensor	F–180	Yes	ECM terminal 3E malfunction	F–31
					No	Engine coolant temperature sensor (Replace)	F–30
6	Run the engine at idle and stop the engine (Ignition switch OFF) Check if fuel pressure drops	Yes	Go to next step				
		No	Check fuel pump for pressure drop		Yes	Check pressure regulator for pressure drop	
					No	Fuel pump malfunction (Replace)	F–17
			Check pressure regulator for pressure drop		Yes	Fuel injector leak	F–20
					No	Pressure regulator malfunction (Replace)	F–20
7						Low compression	section B
						Valve timing	section B

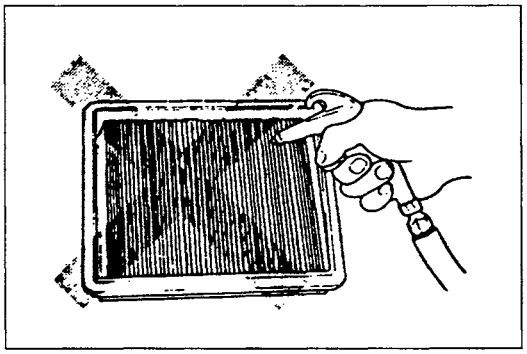
STEP 1



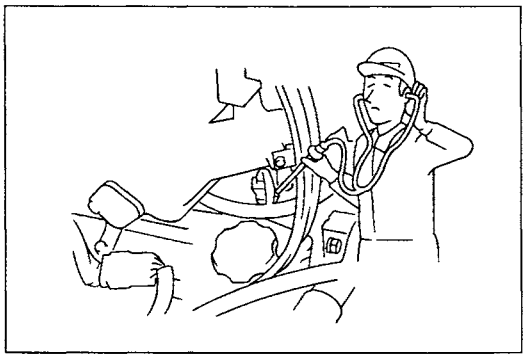
STEP 2



STEP 4



STEP 5

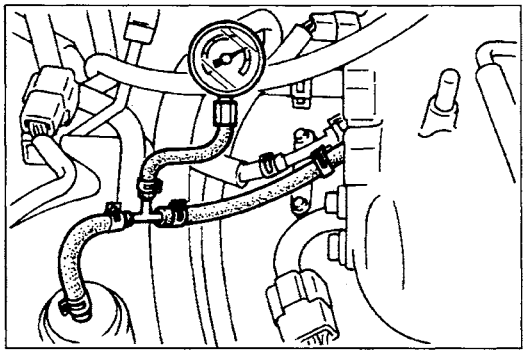


STEP 6 (1)

Warning

- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

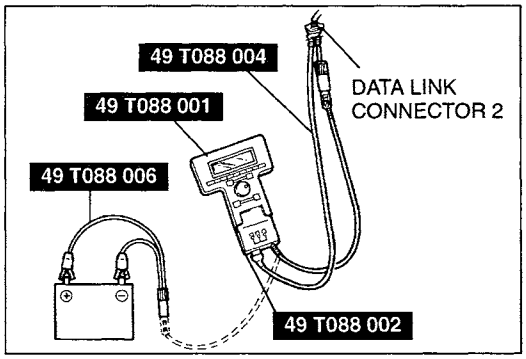
STEP 6 (2)



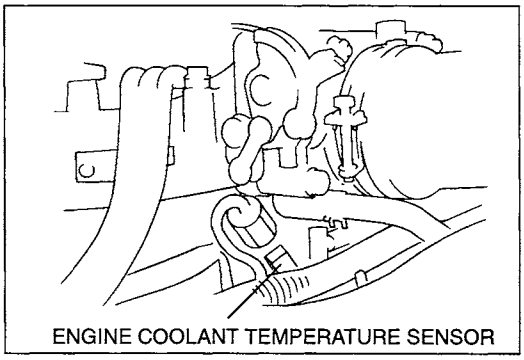
Rotten egg smell			
STEP	QUICK INSPECTION	ACTION	POSSIBLE CAUSE AND DETAILED INSPECTION
1	Change fuel with specified one		Poor fuel quality

Black exhaust smoke						
STEP	QUICK INSPECTION		ACTION		POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Run the engine at **2,000 rpm for more than 20 sec.** check for diagnostic trouble code No.P1170 with **SST**	Yes	Check for the cause by referring to the check sequence			**F–46**
		No	Go to next step			
2	Check if pressure regulator control system Is system OK? Refer to page F–141	Yes	Go to next step			
		No	Repair or replace			
3	Disconnect engine coolant temperature sensor connector Check if the condition improves	Yes	Check engine coolant temperature sensor connector for connecting condition as follows 1. Shake connector and check if the condition changes 2. Check condition of terminal (burning or damaged) 3. Connect a male terminal to the connector and check for connection condition	Yes	Engine coolant temperature sensor malfunction	**F–30**
				No	Poor contact at engine coolant temperature sensor connector	
		No	Go to step 4 [at high-altitude (1,000 m { 3,280 ft })] Go to step 5 (at sea level)			
4					Barometric pressure sensor malfunction (Replace the ECM)	**F–31**
5					Mass air flow sensor malfunction (Replace)	
6	Substitute a known-good ECM				ECM malfunction	**F–31**

STEP 1

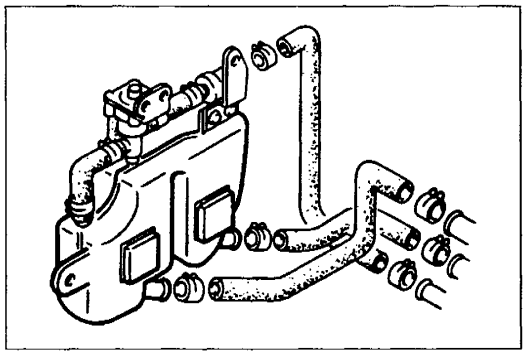


STEP 3

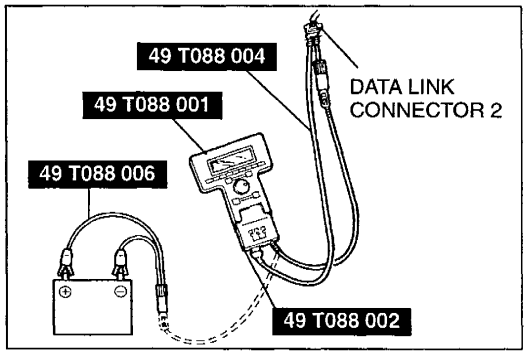


Gasoline fumes						
STEP	**QUICK INSPECTION**		**ACTION**		**POSSIBLE CAUSE AND DETAILED INSPECTION**	
1	Check for fuel leaks	Yes	Go to next step			
		No	Repair or replace			
2	Check if the evaporative fume is emitted from the cut valve	Yes	Check cut valve Is it OK?	Yes	Two-way check valve	
					Purge line clogging (Replace)	
				No	Cut valve malfunction (Replace)	
		No	Go to next step			
3	Check diagnostic trouble code No.P0440, P0443, P0450 with **SST**	Yes	Check for the cause by referring to the check sequence			**F–46**
		No	Go to next step			
4	Check if purge control system is OK Refer to page F–143	Yes	Check charcoal canister			
		No	Repair or replace			

STEP 2

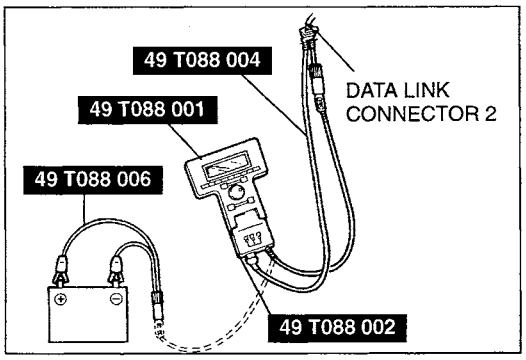


STEP 3

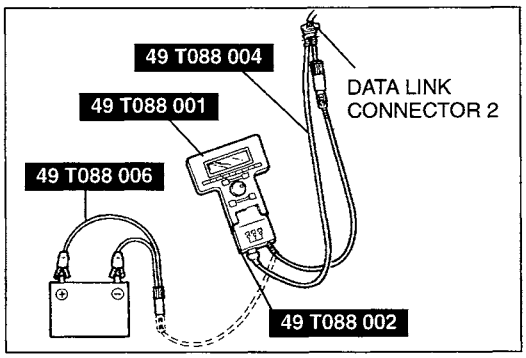


Fails emission test (Engine condition is OK)							
STEP	**QUICK INSPECTION**		**ACTION**			**POSSIBLE CAUSE AND DETAILED INSPECTION**	
1	Run the engine at **2,000 rpm for 20 sec.** and stop it Check diagnostic trouble code No.P0100, P0115, P0134, P0443 with **SST**	Yes	Check for the cause by referring to the check sequence				**F–46**
		No	Go to next step				
2	Check voltage at ECM terminal 3C Refer to page F–31	Yes	Go to next step				
		No	Adjust or replace throttle position sensor				**F–41**
3	Check for air leaks by hearing sucking noise • At idle • Throttle valve open	Yes	Go to next step				
		No	Repair or replace				
4	Check fuel line pressure at idle **Fuel line pressure:** **206—254 kPa** **{ 2.1—2.6 kgf/cm^2 , 30—36 psi }**	Yes	Go to next step				
		No	Check if pressure regulator control system				**F–141**
5	Check fuel cut operation while decelerating **Fuel cut:** **Above approx. 1,000 rpm after warm up**	Yes	Go to next step				
		No	Check engine coolant temperature sensor	**F–42**	Yes	ECM malfunction (Replace)	**F–31**
					No	Engine coolant temperature sensor malfunction/Replace	**F–30**
6	Check for fuel fumes	Yes	Check for the cause by referring to troubleshooting "Gasoline fumes"				**F–135**
		No	Go to next step				
7	Check PCV valve and hose	Yes	Go to next step				
		No	PCV valve or hose malfunction (Replace)				
8	Check spark plug • Gap • Damage	Yes	Poor fuel quality				
		No	Spark plug malfunction (Repair or Replace)				

STEP 1



STEP 2

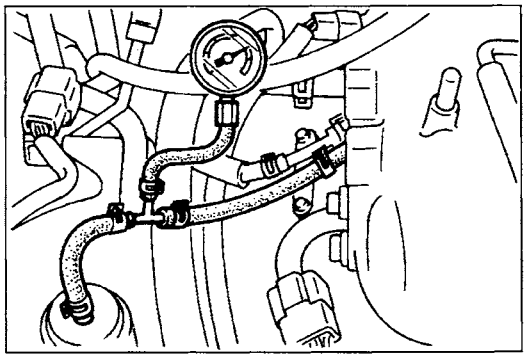


STEP 4 (1)

Warning

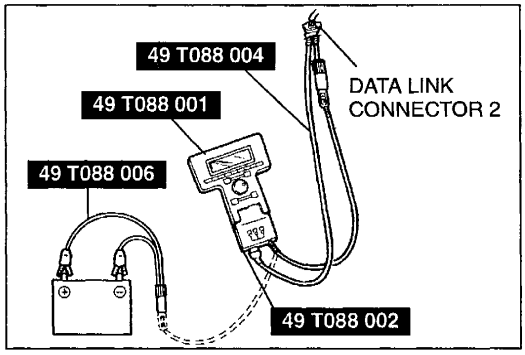
- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

STEP 4 (2)



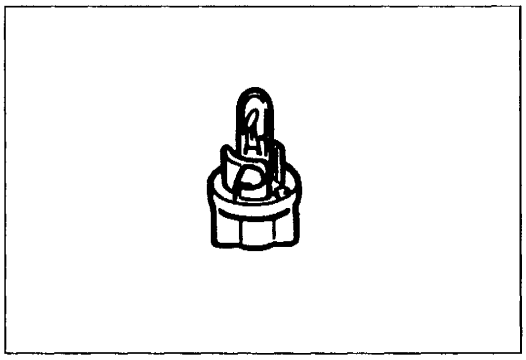
MIL always ON (Engine condition is OK)			
STEP	QUICK INSPECTION	ACTION	POSSIBLE CAUSE AND DETAILED INSPECTION
1	Check diagnostic trouble code with **SST**	"LINK COMMUNICATION ERROR" ① Open or short circuit in wiring between DLC2 KLN terminal and ECM terminal 1D ② ECM • Vref terminal voltage malfunction • Open or short circuit in wiring between main relay and PCM terminal 4B • Open circuit in ground terminals of ECM	
		"NO DTCS RECEIVED" Wiring between ECM 1E terminal and MIL short to ground	

STEP 1
(1)



MIL never ON (Engine condition is not OK)						
STEP	QUICK INSPECTION		ACTION		POSSIBLE CAUSE AND DETAILED INSPECTION	
1	Check if other indicator lights illuminate	Yes	Go to next step			
		No	Check power supply circuit to combination meter			**section T**
2	Check MIL	Yes	Ground the ECM terminal 1E Check if the MIL illuminates	Yes	ECM malfunction	**F–31**
				No	Wiring between ECM and MIL open	
		No	Replace bulb			

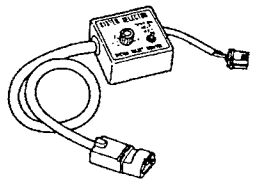
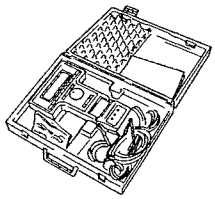
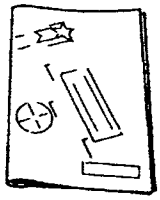
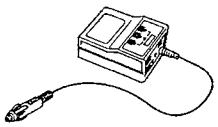
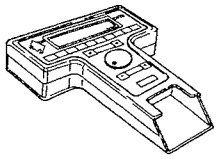
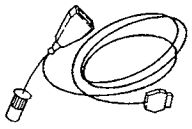
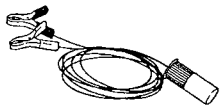
STEP 2

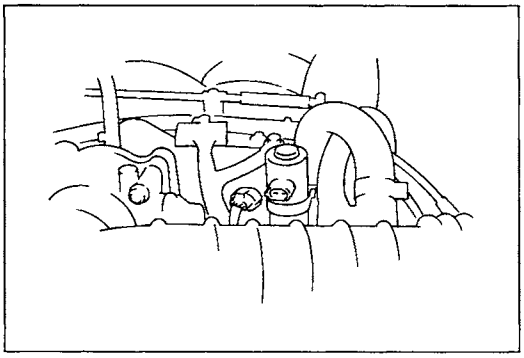


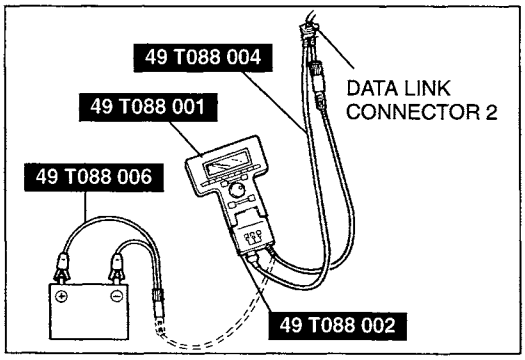
A/C does not work				
STEP	QUICK INSPECTION		ACTION	POSSIBLE CAUSE AND DETAILED INSPECTION
1	Check if A/C cut system is OK Refer to page F–144	Yes	Check A/C system	**section U**
		No	Repair or replace	

SYSTEM INSPECTION

PREPARATION
SST

49 B019 9A0 System Selector 	For each system inspection	49 T088 0A0 NGS set 	For each system inspection
49 T088 010B Program Card 	For each system inspection	49 T088 008A Instruction Manual 	For each system inspection
49 T088 002 Vehicle Interface Module (Part of 49 T088 0A0) 	For each system inspection	49 T088 001 Control Unit (Part of 49 T088 0A0) 	For each system inspection
49 T088 004 NGS OBD II Adapter (Part of 49 T088 0A0) 	For each system inspection	49 T088 006 Battery Hookup Adapter (Part of 49 T088 0A0) 	For each system inspection





IDLE AIR CONTROL INSPECTION

1. Start the engine and run it at idle.
2. Disconnect the IAC valve connector and verify that the engine rotation changes.
3. If the engine condition will not change, do as follows.
   (1) Connect the **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard.
   (2) Verify that diagnostic trouble code No. P0505 is not displayed. If code No. P0505 is shown, carry out troubleshooting of the code No. P0505.
   (3) Select the "SIMULATION TEST" function on the NGS display.
   (4) Change the duty value of the IAC valve to 100% by using the "IACV" and verify that the idle speed increases.
      a. If the idle speed increases, replace the ECM, (Refer to page F–31.)
      b. If the idle speed does not change, replace the BAC valve. (Refer to page F–5.)
4. Warm up the engine to normal operating temperature and run it at idle.

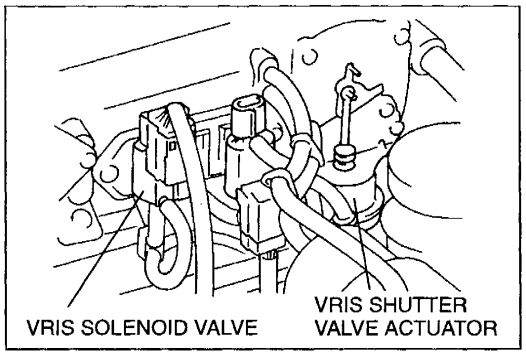
5. Turn the electrical loads ON and verify that the engine speed is within the specification.

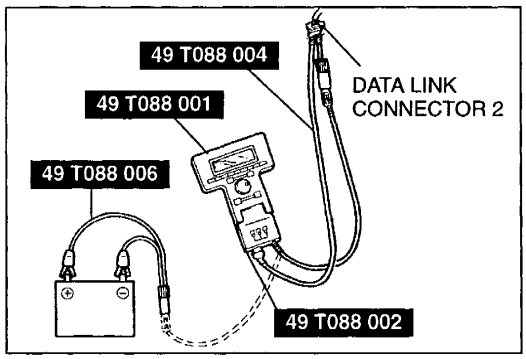
Engine speed (rpm)

No load	760—800
E/L operated	730—830
A/C operated	750—850
P/S operated	730—830

Note
- Excludes temporary idle speed drop just after the electrical loads are turned on.

6. If not as specified, check the related switches and wiring harnesses.

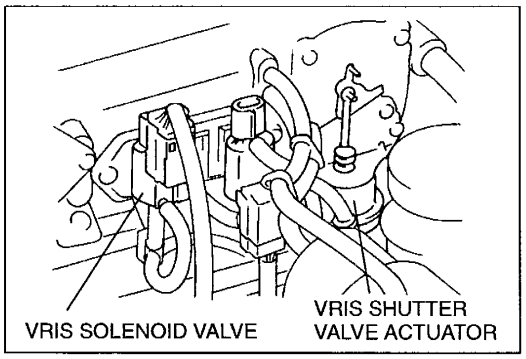




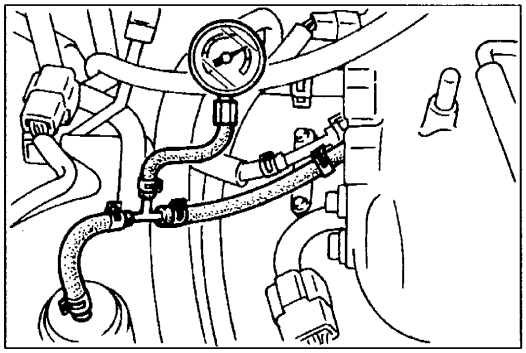
VRIS INSPECTION
1. Start the engine.
2. Verify that the rod of the shutter valve actuator is pulled.
3. If the rod is not pulled, do as follows.
   (1) Stop the engine.
   (2) Install the **SST** to the data link connector 2 located under the driver side dashboard.
   (3) Verify that diagnostic trouble code No. P1521 is not displayed. If code No. P1521 is shown, carry out troubleshooting of the code No. (Refer to page F–46.)
   (4) If diagnostic trouble code P1521 is not shown, do as follows.
      I. Start the engine and run it at idle.
      II. Turn the VRIS solenoid valve from ON to OFF by using the simulation function and check if operation sound of the valve is heard.
      III. If the operation sound is not heard, check the following.
         • Shutter valve actuator (Refer to page F–7.)
      IV. If the operation sound is heard, check the following.
         • VRIS solenoid valve (Refer to page F–7.)
4. Check the rod operation under the following conditions.

Rod operation

Engine speed (rpm)	0 3600		5100 7500
Shutter valve actuator	Operate	Not operate	Operate



5. If the rod operation is not as specified, do as follows.
   (1) Stop the engine.
   (2) Connect the **SST** to the data link connector 2 located under the driver side dashboard.
   (3) Verify that diagnostic trouble code No. P1521 is not displayed. If code No. P1521 is shown, carry out troubleshooting of the code No.1521.
   (Refer to page F–46.)
   (4) If diagnostic trouble code is not shown, do as follows.
      I. Start the engine and run it at idle.
      II. Turn the VRIS solenoid valve from ON to OFF by using the simulation function and check if operation sound of the valve is heard.
      III. If the operation sound is not heard, check the following.
         • Shutter valve actuator (Refer to page F–7.)
      IV. If the operation sound is heard, check the following.
         • VRIS solenoid valve (Refer to page F–7.)



PRESSURE REGULATOR CONTROL INSPECTION

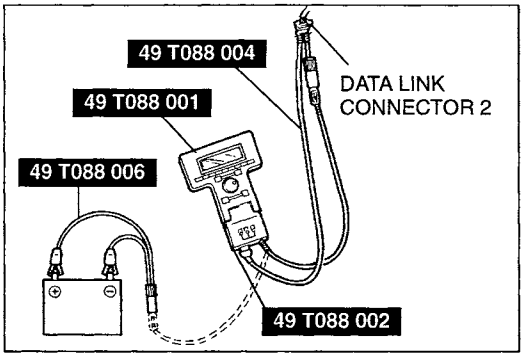
Warning
- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures" on page F–10.**

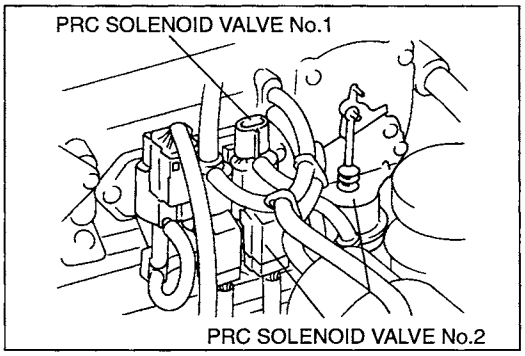
1. Install the fuel pressure gauge.
2. Measure the fuel pressure under the following conditions.

Specifications

	Fuel pressure [kPa { kgf cm^2 , psi }]		
Idling	206—254 { 2.1—2.6, 30—36 }	206—254 { 2.1—2.6, 30—36 }	304—382 { 3.1—3.9, 44—55 }
During 60 (180) sec. of hot (super hot) start	304—382 { 3.1—3.9, 44—55 }		
After 60 (180) sec. of hot (super hot) start	206—254 { 2.1—2.6, 30—36 }	206—254 { 2.1—2.6, 30—36 }	304—382 { 3.1—3.9, 44—55 }
Judgement	Normal	Not normal (Perform Inspection 1)	Not normal (Perform Inspection 2)

3. If the fuel pressure is not within the specification, carry out either Inspection 1 or Inspection 2 as required.



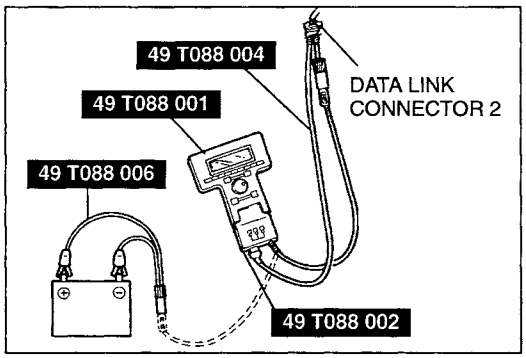


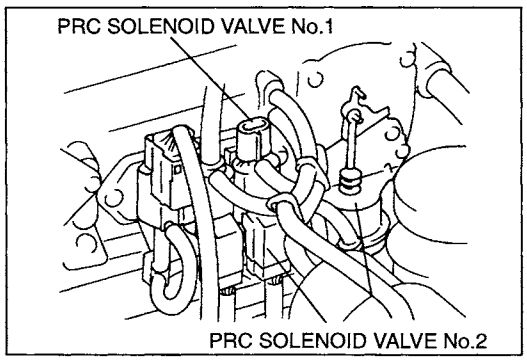
Inspection 1

1. Stop the engine.
2. Connect the **SSTs** to the data link connector 2 located under the driver side dashboard.
3. Verify that diagnostic trouble code No. P1250, P1252 is not displayed. If code No. P1250, P1252 is shown, carry out troubleshooting of the code No. P1250, P1252. (Refer to page F–46.)
4. Start the engine and run it at idle.
5. Select the "SIMULATION TEST" function on the NGS display.
6. Turn the PRC solenoid valve No.1 from OFF to ON by using the "PRC V" and check if the fuel pressure changes (from normal to high).
   (1) If the pressure changes, check the following.
   - ECM terminal voltage (Refer to page F–31.)
     - Engine coolant temperature signal
     - Intake air temperature signal
     - Throttle valve TVO signal

   (2) If the pressure does not change, do as follows.
   a. Stop the engine.
   b. Turn the ignition switch to ON.
   c. Select the "SIMULATION TEST" function on the NGS display.
   d. Turn the PRC solenoid valve No.1 from OFF to ON by using the "PRC V" and check if the operation sound of the valve is heard.
      i. If the operation sound is heard, check the following.
      - Pressure regulator (Refer to page F–19.)
      - Loose or damaged vacuum hose

      ii. If the operation sound is not heard, check the following.
      - PRC solenoid valve No.1 (Refer to page F–20.)

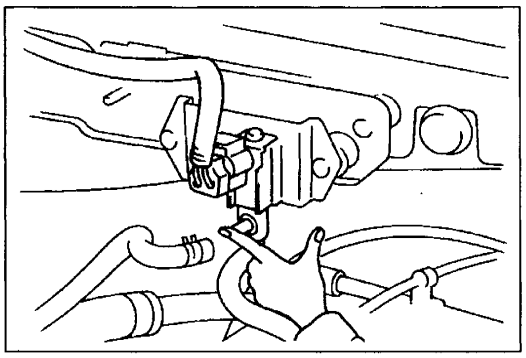


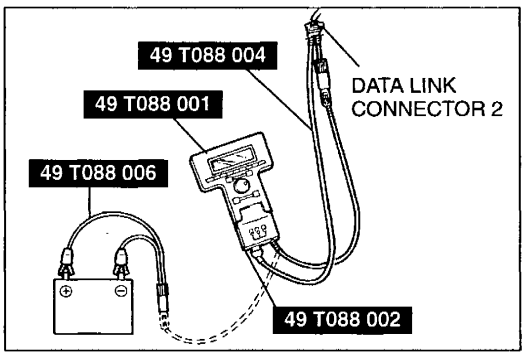


Inspection 2

1. Stop the engine.
2. Connect the **SSTs** to the data link connector 2 located under the driver side dashboard.
3. Verify that diagnostic trouble code No. P1250, P1252 is not displayed. If code No. P1250, P1252 is shown, carry out troubleshooting of the code No. P1250, P1252. (Refer to page F–46.)
4. Start the engine and let it idle.
5. Select the "PID/DATA MONITOR AND RECORD" function on the NGS display after 3 minutes from the engine start.
6. By using the "PRC V2", verify that the PRC solenoid valve No.2 is OFF.
7. If the PRC solenoid valve No.2 is ON, check the following.
   - ECM terminal voltage (Refer to page F–31.)
     - Engine coolant temperature signal
     - Intake air temperature signal
8. Select the "SIMULATION TEST" function on the NGS display.

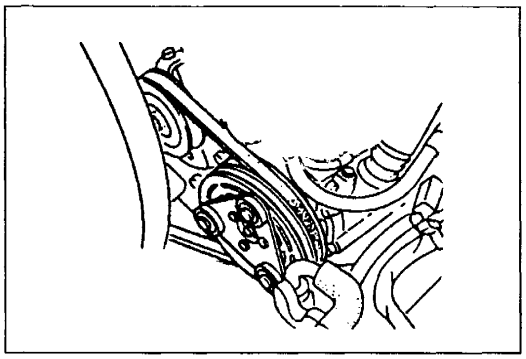
9. Turn the PRC solenoid valve No.2 from OFF to ON by using the "PRC V2" and check if the operation sound of the valve is heard.
   - If the operation sound is heard, check the following.
     - Loose or damaged vacuum hose
     - Pressure regulator (Refer to page F–19.)
   - If the operation sound is not heard, check the following.
     - PRC solenoid valve No.2 (Refer to page F–20.)

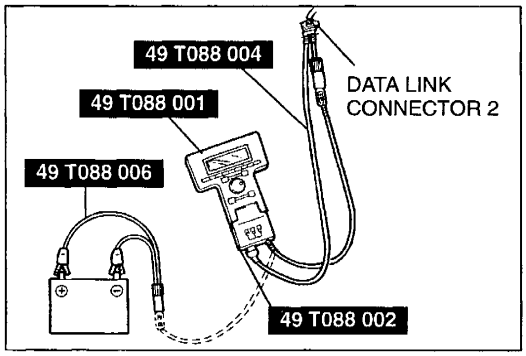




PURGE CONTROL INSPECTION

1. Start and warm up the engine to the normal operating temperature.
2. Let the engine idle.
3. Disconnect the vacuum hose between the purge solenoid valve and the charcoal canister.
4. Put a finger to the purge solenoid valve and verify that there is no vacuum applied.
5. If there is vacuum, do as follows.
   (1) Connect the **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard.
   (2) Verify that diagnostic trouble code No. P0443 is not displayed. If code No. P0443 is shown, carry out troubleshooting of the code No. P0443 (Refer to page F–46.)
   (3) If diagnostic trouble code is not shown, check the following.
     - Purge solenoid valve (Refer to page F–25.)
6. Reconnect the vacuum hose.
7. Connect the **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard.
8. Select the "SIMULATION TEST" function on the NGS display.
9. Increase the duty value of the purge solenoid valve from 0% to 100% by using the "PRG V". Operate the purge solenoid valve and check if the idle condition changes.
10. If the condition does not change, do as follows.
    (1) Turn the ignition switch to ON.
    (2) Verify that diagnostic trouble code No. P0443 is not displayed. If code No. P0443 is shown, carry out troubleshooting of the code No. P0443.
    (Refer to page F–46.)
    (3) Increase duty valve of the purge solenoid valve from 0% to 100% by using the "PRG V". Operate the purge solenoid valve and check if the operation sound of the valve is heard.
    a. If the operation sound is heard, check the following.
      - Loose or damaged vacuum hose
    b. If the operation sound is not heard, check the following
      - Purge solenoid valve (Refer to page F–25.)





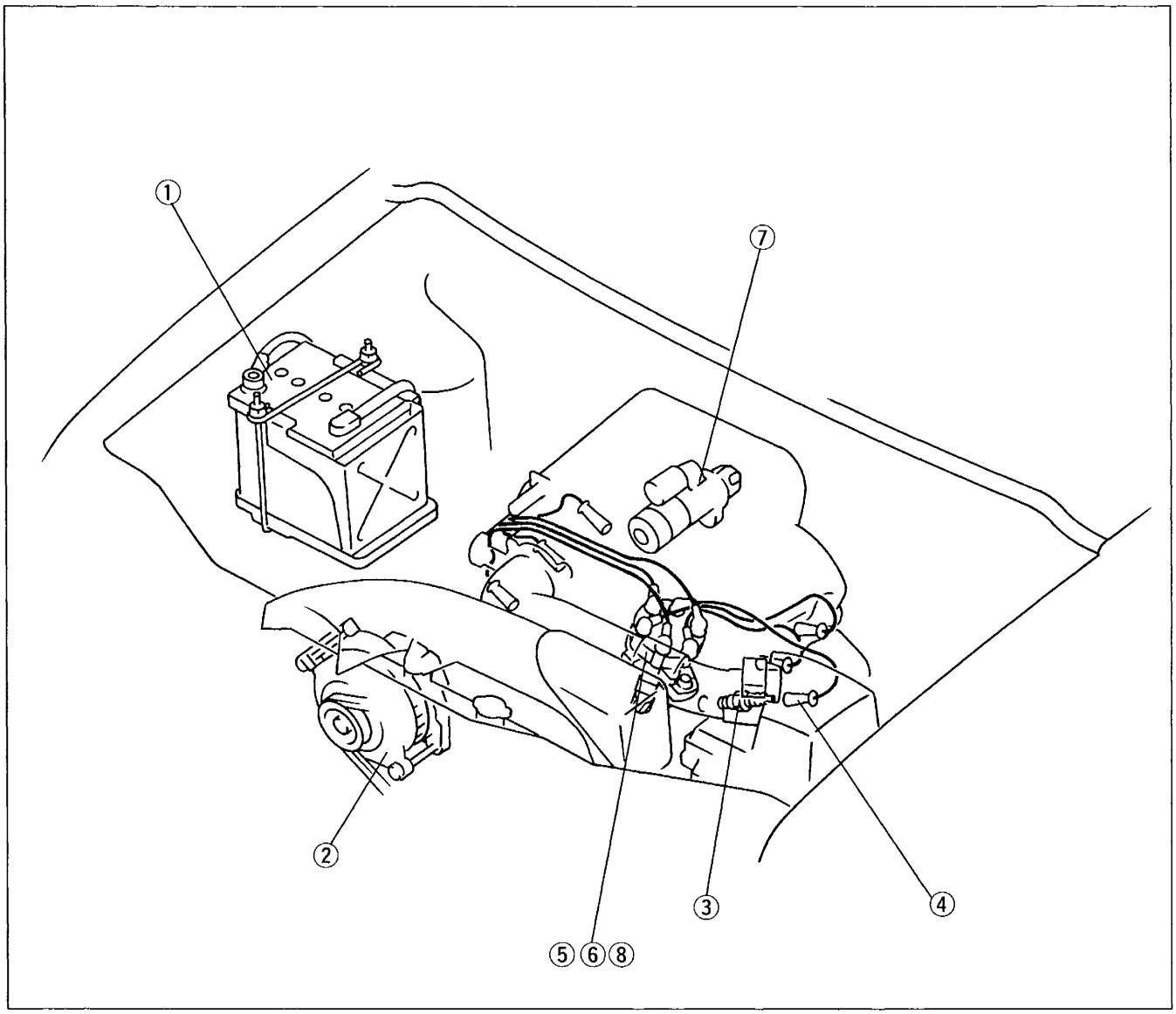
A/C CUT CONTROL INSPECTION

1. Turn the ignition switch to ON.
2. Shift the selector lever into other than P and N.
3. Turn the A/C switch and the blower switch on.
4. Fully open the throttle valve. Then 3—6 seconds after, check if the operation sound of the A/C compressor electromagnetic clutch is heard.
5. If the operation sound is not heard, do as follows.
   (1) Connect **SSTs** (NGS) to the data link connector 2 located under the driver side dashboard.
   (2) Select the "SIMULATION TEST" function on the NGS display.
   (3) Turn the A/C relay from OFF to ON by using the "A/C RLY" and check for the operation sound of the relay.
      I. If the operation sound is heard, check the following.
         - ECM terminal voltage (Refer to page F–31.)
           - Load/no load distinction signal
           - Throttle position sensor TVO signal
      II. If the operation sound is not heard, check the following.
         - A/C relay (Refer to section U)
         - Open circuit in wiring harnesses and connectors (Ignition switch–A/C relay–ECM)

Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

ENGINE ELECTRICAL SYSTEM

INDEX



OUTLINE

SPECIFICATIONS

Item \ Engine			JE
Battery	Voltage V		12, Negative ground
	Type and capacity (5-hour rate Ah)		55D23L (48), 75D26L (52)*2 Maintenance-free
Dark current*1 mA			Max. 20.0
Generator	Type		A.C.
	Output V–A		12–70
	Regulator type		Transistorized (built-in voltage regulator)
	Regulated voltage V		14.1—14.7 [20 °C { 68 °F }]
	Brush length mm { in }	Standard	21.5 { 0.846 }
		Minimum	8.0 { 0.315 }
Starter	Type		Reduction
	Output V–kW		12–1.0, 12–1.7*2
	Brush length mm { in }	Standard	12.3 { 0.48 } , 16.5 { 0.65 }*2
		Minimum	7.0 { 0.28 } , 7.0 { 0.28 }*2
Distributor	Type		Electronic spark advance
Ignition timing BTDC			11 ° (TEN terminal grounded)
Spark plug	Type	NGK	BKR5E-11*3 BKR6E-11
		NIPPON-DENSO	K16PR-U11*3 K20PR-U11
	Plug gap mm { in }		1.0—1.1 { 0.040—0.043 }
	Firing order		1—2—3—4—5—6

*1 Dark current is the constant flow of current while the ignition switch is (i.e. audio unit, clock, etc.)
*2 Cold area
*3 Standard plug

TROUBLESHOOTING GUIDE

Will Not Crank

On-vehicle check

"Clicks" when ignition switch turned ON.
(Ignition switch OK.)
Check battery and starter.

Possible cause	Remedy	Page
Battery and related parts		
Poor contact of battery terminal(s)	Clean and tighten	G–6
Poor ground of negative cable	Clean and repair	G–6
Insufficient voltage caused by battery malfunction	Replace	G–6, 7
Voltage drop caused by discharged battery	Repair or recharge	G–4
Ignition switch and related parts		
Poor contact at ignition switch	Repair or replace	section T
Loose connector(s)	Repair	section T
Broken wire between ignition switch and magnetic switch	Repair or replace	section T
Starter		
Loose wiring and/or connectors	Repair or replace	G–23
Burnt or improper contact of magnetic switch contact plate	Replace	G–23
Worn parts	Replace	G–23
Others	Repair or replace	G–23

Discharged Battery

* Numbers show checking order.

Condition \ Related parts		Battery	Generator	Drive belt
Vehicle not operated for extended period		1		
Electrical load	Heavy use	1	2	
	Load left on	1		
Normal use		3	2	1

Part	Remedy	Page
Battery	Recharge or replace	G–6, 7
Generator	Repair or replace	G–11, 12
Drive belt	Adjust or replace	section B

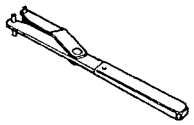
Cranks Slowly

Possible cause	Remedy	Page
Battery and related parts		
Poor contact of battery terminal(s)	Clean and tighten	G–6
Poor ground of negative cable	Clean and repair	G–6
Insufficient voltage caused by battery malfunction	Replace	G–6, 7
Voltage drop caused by discharged battery	Repair or recharge	G–4
Starter		
Loose wiring and/or connectors	Repair or replace	G–23
Burnt or improper contact of magnetic switch contact plate	Replace	G–23
Worn parts	Replace	G–23
Others	Repair or replace	G–23

	Refer to	Page
Misfire No spark, weak spark	Ignition system troubleshooting	G–16

CHARGING SYSTEM

PREPARATION
SST

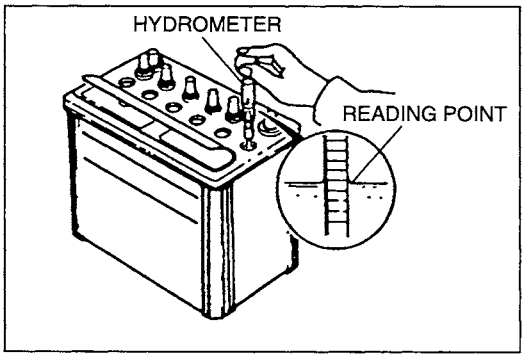
49 G032 354 Adjust wrench		For removal and installation of P/S pulley

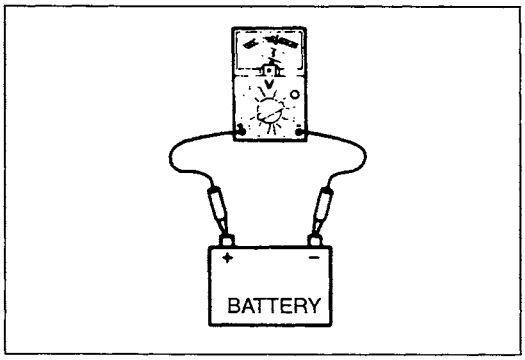
BATTERY
Inspection

Warning
- **Hydrogen gas is produced during normal battery operation. A battery-related explosion can cause serious injury. Keep all flames (including cigarettes), heat, and sparks away from the top and surrounding area of open battery cells.**

Caution
- **To prevent damage to electrical components or the battery, turn all accessories off and stop the engine before performing maintenance or recharging the battery.**

Temperature (°C { °F })	Specific gravity of electrolyte
–40 { –40 }	1.322
–30 { –22 }	1.315
–20 { –4 }	1.308
–10 { 14 }	1.301
0 { 32 }	1.294
10 { 50 }	1.287
20 { 68 }	1.280
30 { 86 }	1.273
40 { 104 }	1.266
50 { 122 }	1.259
60 { 140 }	1.252
Charged rate : 100%	





Electrolyte level and specific gravity
1. Verify that the electrolyte level is between the "Upper" and "Lower" level marks.
2. Add distilled water if necessary, but do not overfill.
3. Check the specific gravity with a hydrometer. If 1.200 or less, recharge the battery.

Terminal and cable
1. Remove any corrosion on the clamps or battery posts, and coat them with grease.
2. Verify that the battery top is clean. If necessary, clean with baking soda and water.
3. Verify that cables are not frayed or corroded. Repair or replace if necessary.
4. Verify that cable clamps are tight.
5. Verify that the rubber protector completely covers the positive terminal and clamp.

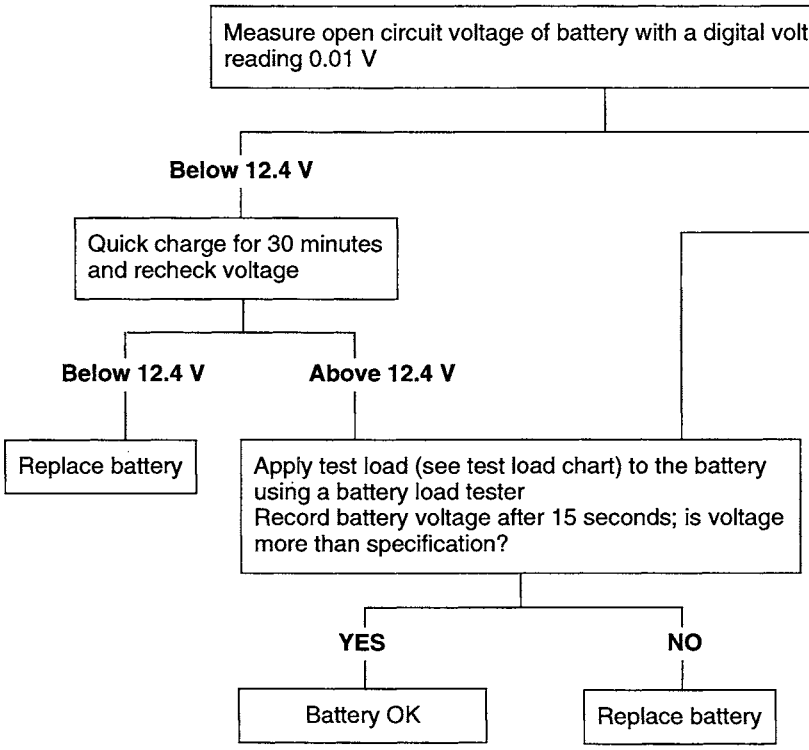
Recharging

Caution
- **When disconnecting the battery, remove the negative cable first and install it last to prevent damage to electrical components or the battery.**
- **Do not quick charge for over 30 minutes. It will damage the battery.**

Battery	Slow charge (A)	Quick charge (A)
55D23L	4.5—5.5	Max. 30
75D26L	5.0—6.0	Max. 35

Diagnosis
Voltage check
1. Disconnect the battery terminals from the battery.
2. Connect a voltmeter to the battery.

Battery discharge test



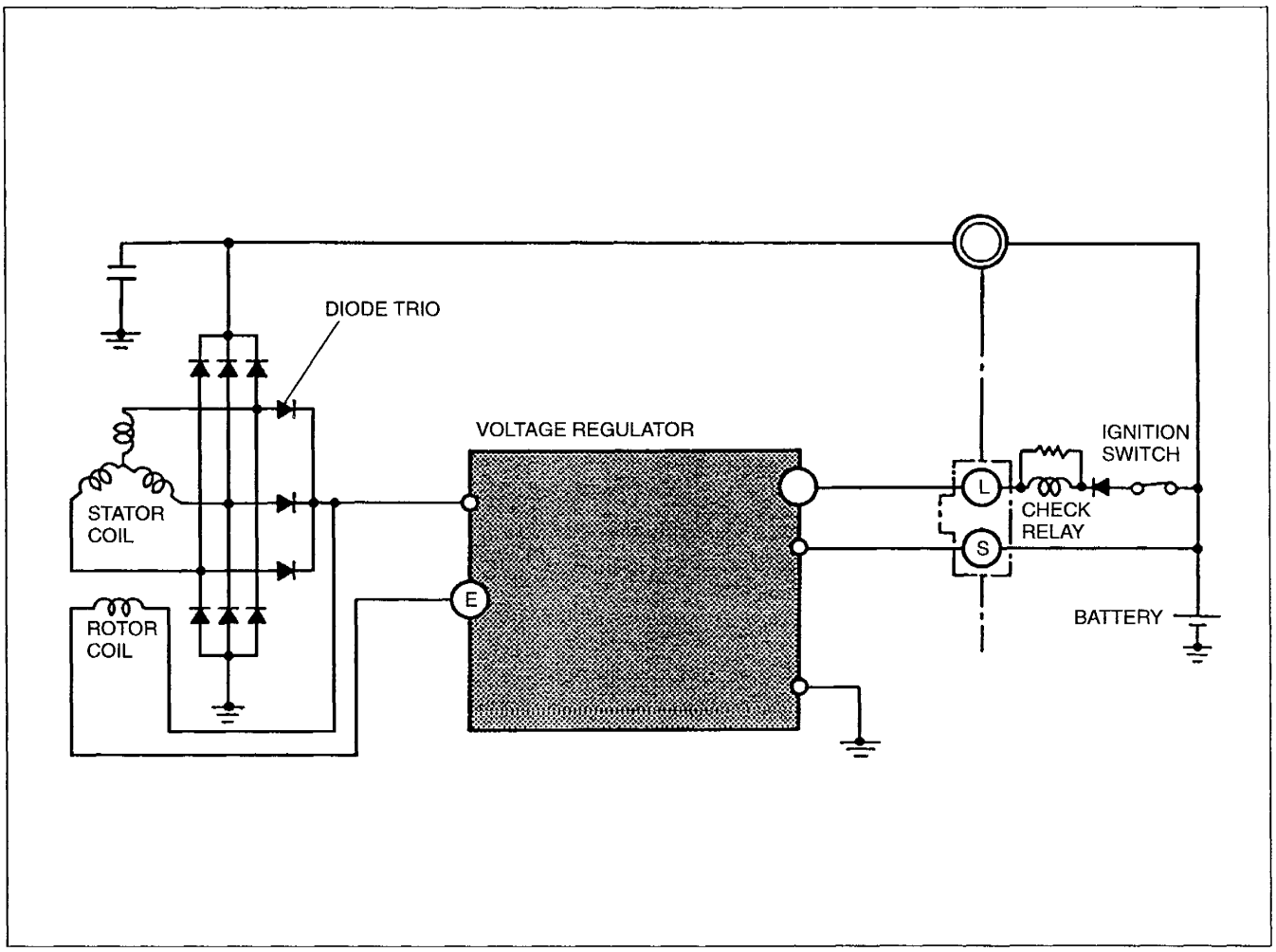
Test load chart

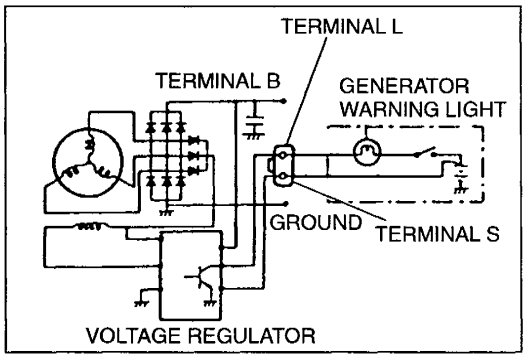
Battery	Load (A)
55D23L	180
75D26L	195

Battery voltage with load

Approximate battery temp.	Minimum voltage (V)
21 °C { 70 °F }	9.6
15 °C { 60 °F }	9.5
10 °C { 50 °F }	9.4
4 °C { 40 °F }	9.3
–1 °C { 30 °F }	9.1
–7 °C { 20 °F }	8.9
–12 °C { 10 °F }	8.7
–18 °C { 0 °F }	8.5

GENERATOR
Charging System





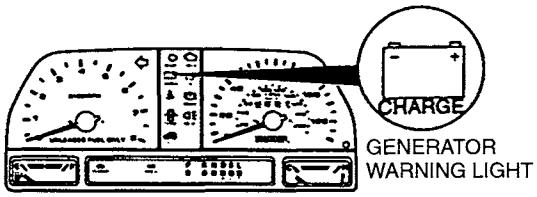
On-board Diagnosis System

The generator has an on-board diagnostic function to warn the driver of the following problems in the charging system. If a problem arises, the generator warning light illuminates.

1. S circuit open
2. No voltage output
3. Field circuit open
4. B circuit open
5. Voltage output too high

Troubleshooting
Preliminary check

1. Turn the ignition switch to ON, and check that the generator warning light illuminates.
2. Start the engine, and check that the generator warning light goes out.



1. Generator warning light will not illuminate

Do other warning lights illuminate with ignition switch ON?
- NO → Repair wiring harness or replace fuse
- YES ↓

Is there battery positive voltage at terminal L?
- NO → Repair wiring harness or replace bulb
- YES ↓

Replace brush holder assembly

2. Generator warning light illuminates when engine running

Is battery positive voltage correct at idle? **(Specification: 14.1—14.7 V)**
- YES → Check wiring harness between generator terminal L and generator warning light
- NO ↓

Perform MAXIMUM OUTPUT TEST; is output current 70 A or more at 2,500—3,000 rpm? (Refer to page G–10)
- NO ↓

Is drive belt tension OK?
- NO → • Adjust drive belt tension • Replace drive belt
- YES ↓

Replace generator

3. Battery discharged

Does generator warning light illuminate when engine running?

YES → Perform Troubleshooting No.2 (Refer to page G–9)

NO ↓

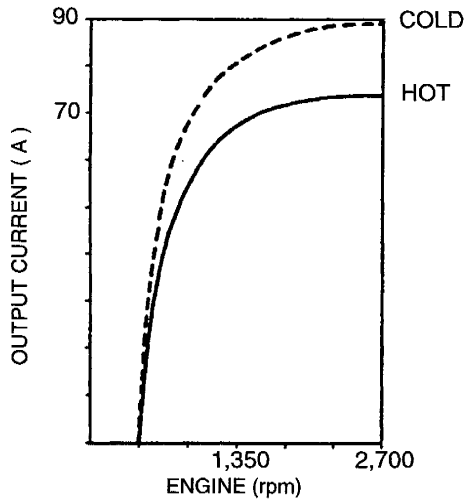
- Check generator warning light circuit
- Check other electrical components

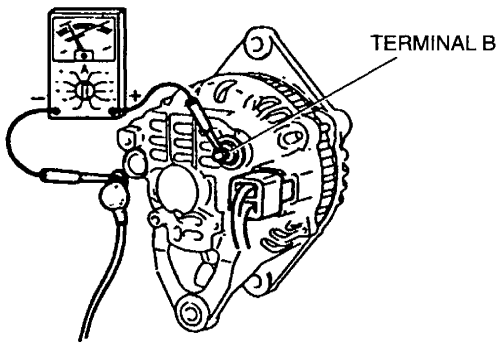
MAXIMUM OUTPUT TEST

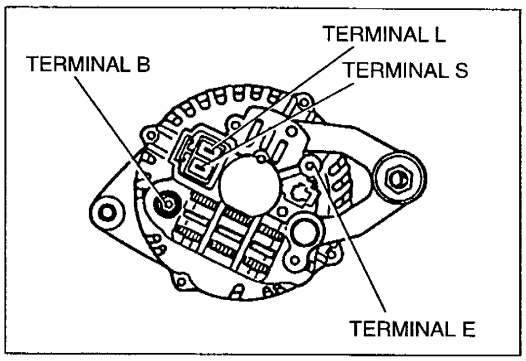
1. Connect an ammeter **(75 A min.)** between terminal B wire and terminal B.
2. Turn all headlights and accessories on and depress the brake pedal.
3. Start the engine and verify that the output current is **70 A or more** at **2,500—3,000 rpm.**

Caution

- **Grounding terminal B can damage the generator and other electrical components.**







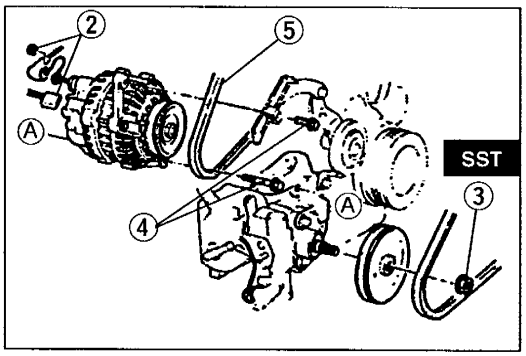
Removal

Caution

- **Reversing the battery connections or using high-voltage testers will damage the rectifier.**
- **Do not start the engine while the connector is disconnected from terminals L and S. It can damage the generator.**
- **When the battery cables are connected, touching the vehicle body with generator terminal B will generate sparks. This can cause personal injury, fire, and damage to the electrical components. Always disconnect the battery before performing the following operation.**

Note

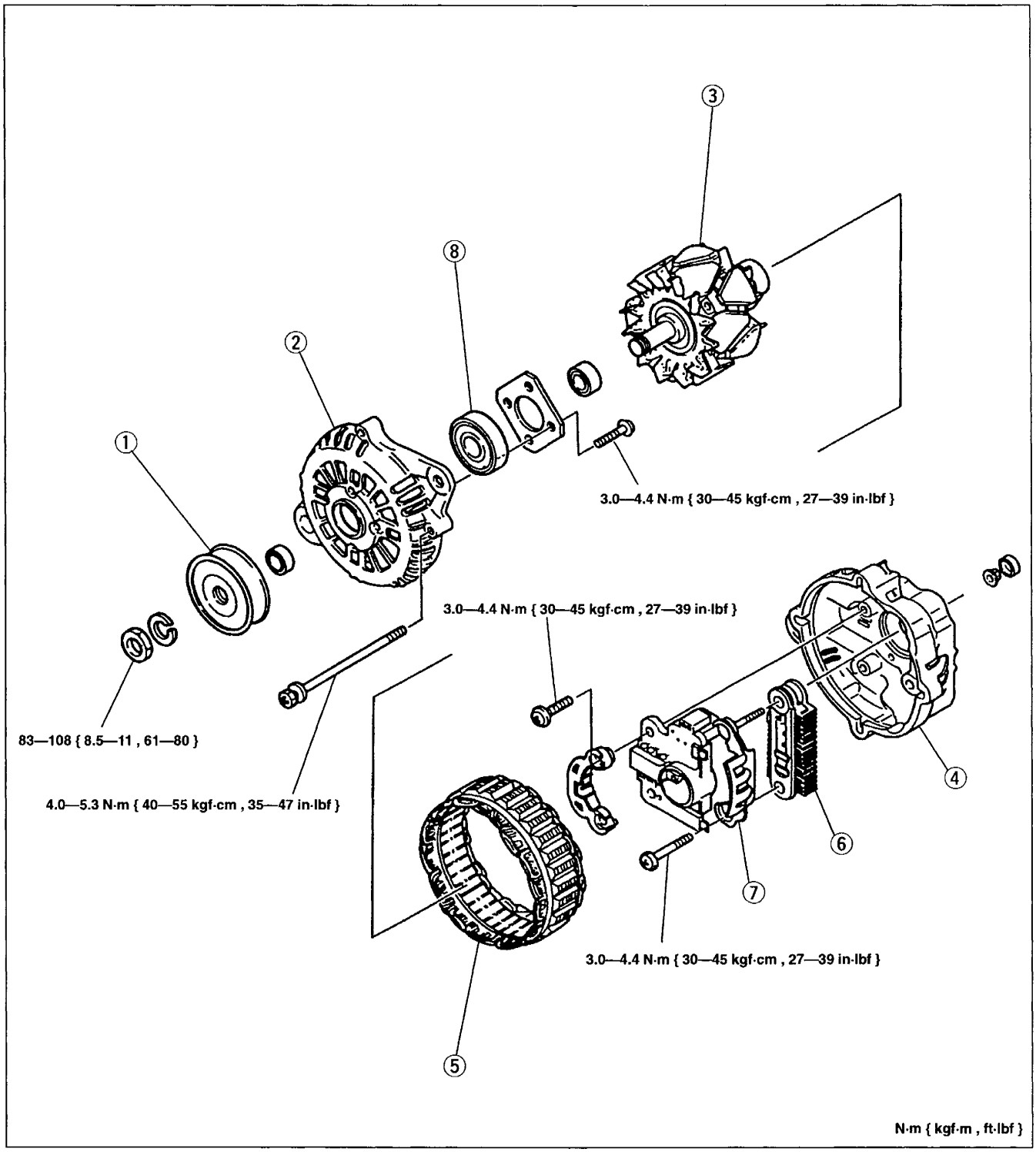
- Battery positive voltage is always present at generator terminal B when the battery is connected.



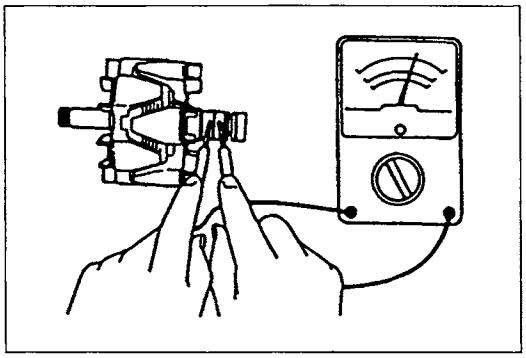
1. Disconnect the negative battery cable.
2. Disconnect the wire and connector from the generator.
3. Remove the power steering pulley by using the **SST**. (Refer to page G–22.)
4. Remove the generator bolts.
5. Remove the drive belt.
6. Remove the generator.

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



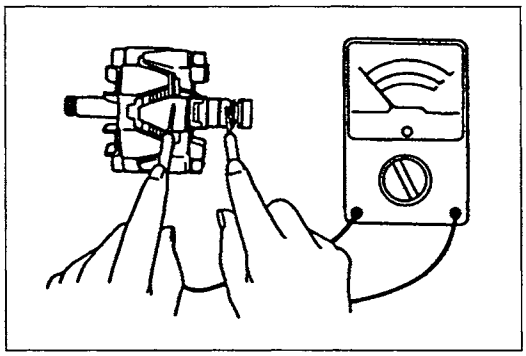
1. Pulley
2. Front cover
3. Rotor
   Inspection . . . . . page G–13
4. Rear bracket
5. Stator
   Inspection . . . . . page G–13
6. Rectifier
   Inspection . . . . . page G–14
7. Brush holder assembly
   Inspection . . . . . page G–13
8. Bearing
   Inspection . . . . . page G–14



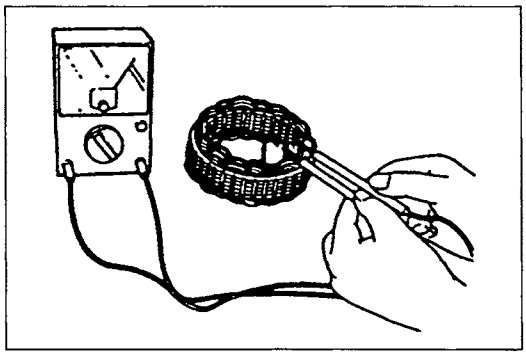
Inspection
Rotor
1. Wiring damage
   (1) Measure the resistance between the slip rings by using an ohmmeter.

   Specification: 2.4—2.9 Ω [20 °C { 68 °F }]

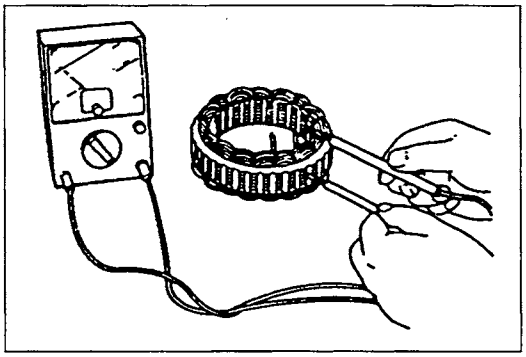
   (2) If it is not within the specification, replace the rotor.



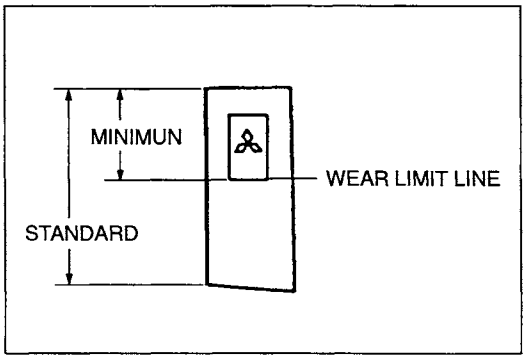
2. Ground of field coil
   (1) Check continuity between the slip ring and the core by using an ohmmeter.
   (2) Replace the rotor if there is continuity.
3. Slip ring surface
   If the slip ring surface is rough, use a lathe or fine sandpaper to repair it.



Stator
1. Wiring damage
   (1) Check for continuity between the stator coil leads by using an ohmmeter.
   (2) Replace the stator if there is no continuity.

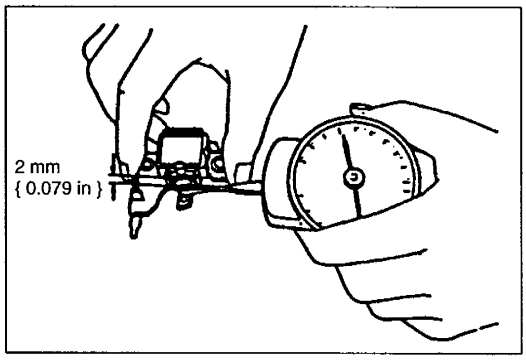


2. Ground of stator coil
   (1) Check continuity between the stator coil leads and the core by using a circuit tester.
   (2) Replace the stator if there is continuity.



Brush
If any brush is worn almost to or beyond the limit, replace all of the brushes.

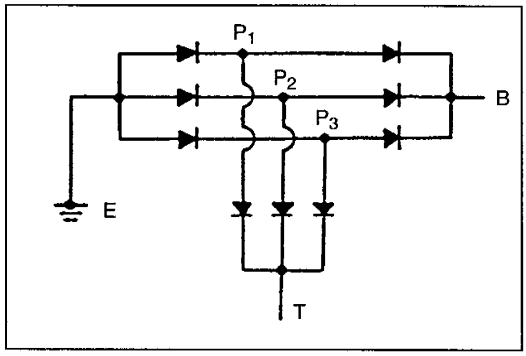
Standard: 21.5 mm { 0.846 in }
Minimum: 8.0 mm { 0.315 in }



Brush spring

1. Measure the force of the brush spring by using a spring pressure gauge. Read the spring pressure gauge at the brush tip projection of **2 mm { 0.079 in }**.
2. Replace the spring if necessary.

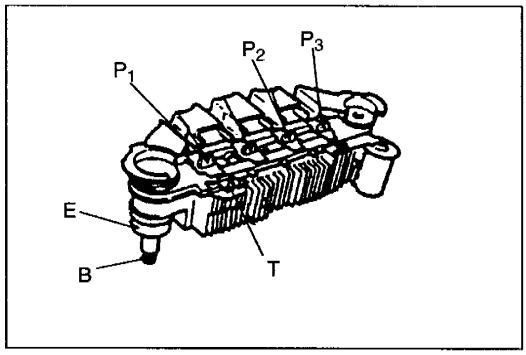
Standard force:
3.2—4.3 N { 0.32—0.44 kgf , 0.71—0.96 lbf }
Minimum: 1.8 N { 0.18 kgf , 0.4 lbf }



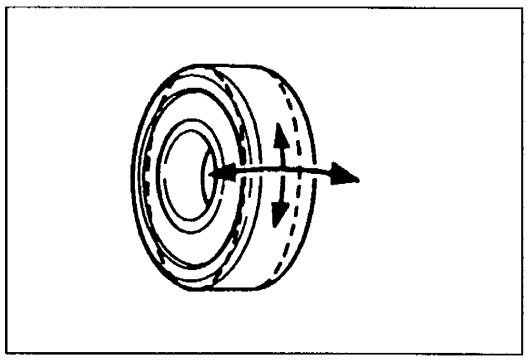
Rectifier

1. Check continuity of the diodes by using an ohmmeter.

Negative (Black)	Positive (Red)	Continuity
E	P1, P2, P3	Yes
B		No
T		No
P1, P2, P3	E	No
	B	Yes
	T	Yes

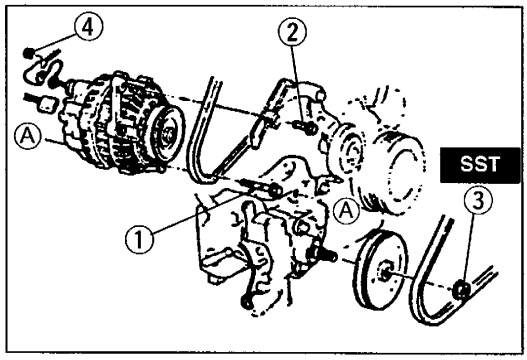


2. Replace the rectifier if not as specified.



Bearing

1. Check for abnormal noise, looseness, and sticking.
2. Replace if necessary.



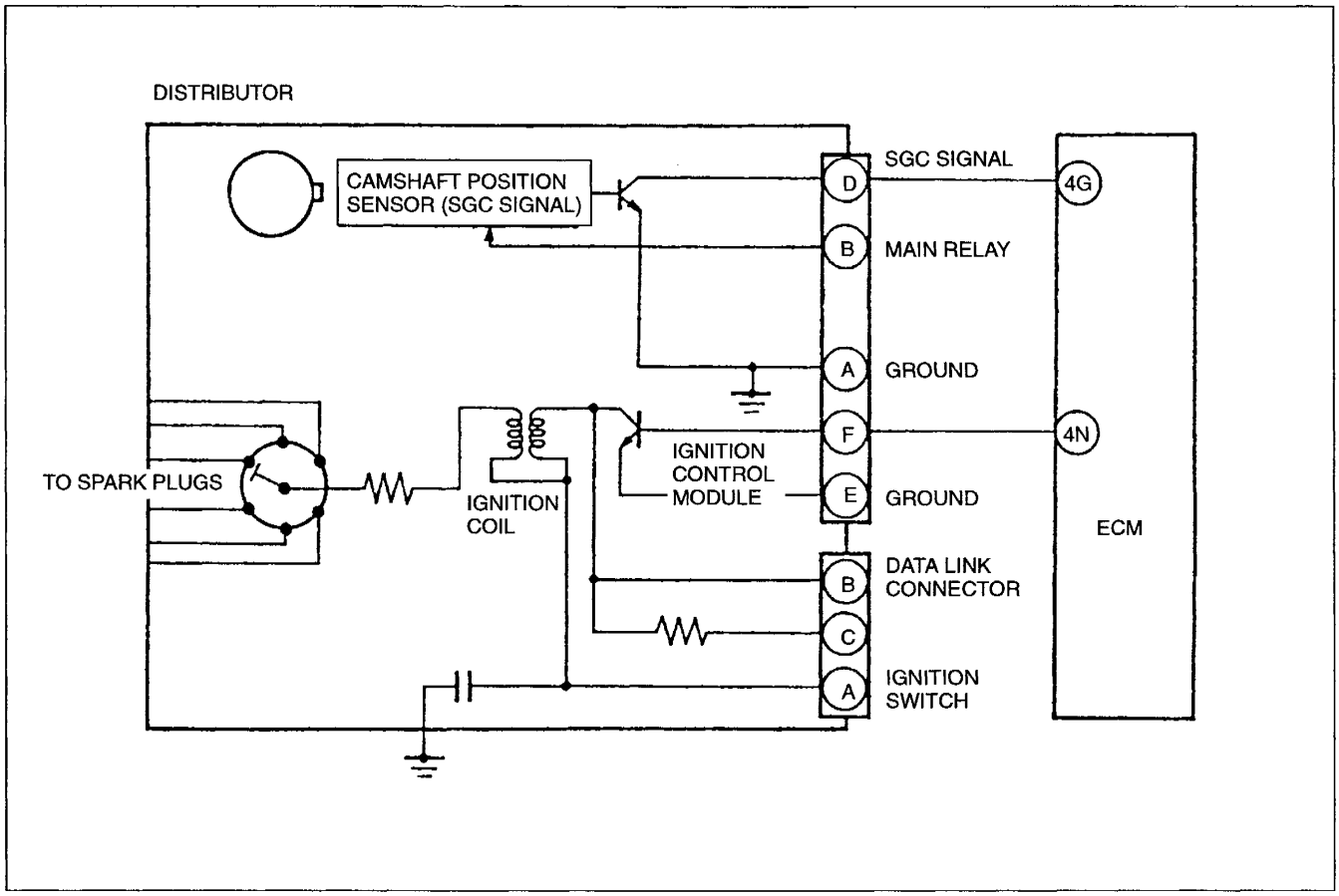
Installation

1. Install the generator, and tighten the bolts to the specified torque.
2. Install in the reverse order of removal.

Tightening torque
Bolt ①:
32—46 N·m { 3.2—4.7 kgf·m , 23—33 ft·lbf }
Bolt ②:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }
Nut ③:
40—58 N·m { 4.0—6.0 kgf·m , 29—43 ft·lbf }
Nut ④:
9.9—14.7 N·m
{ 100—150 kgf·cm , 86—130 in·lbf }

IGNITION SYSTEM

CIRCUIT DIAGRAM

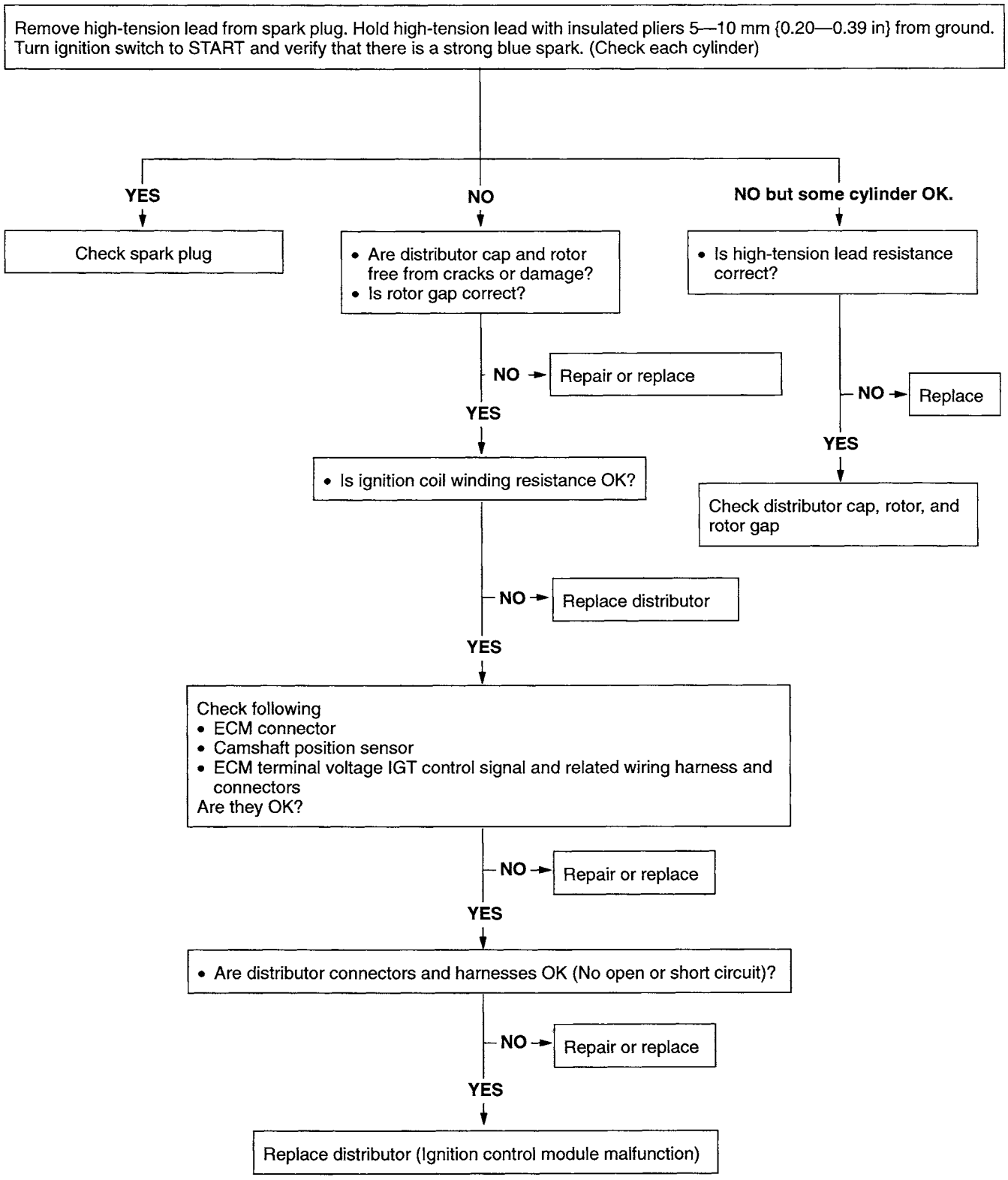


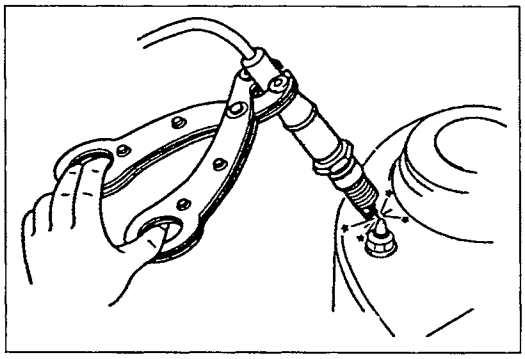
Troubleshooting

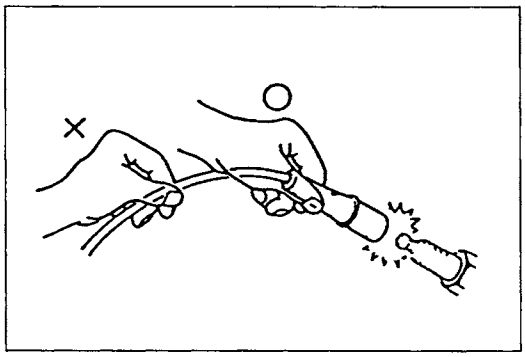
1. Disconnect the fuel pump relay. (Refer to section F.)
2. Verify that each high-tension lead and connector is connected properly.
3. Inspect the ignition system in the following procedure.

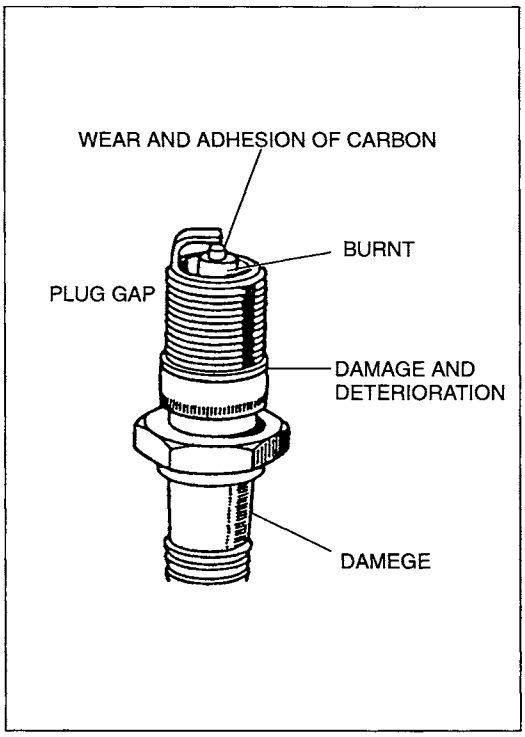
Warning

- **High voltage in the ignition system can cause strong electrical shock. Avoid direct contact to the vehicle body during the following spark test.**









SPARK PLUG

Spark Test

1. Disconnect the high-tension lead from the spark plug.
2. Connect a new spark plug to the high-tension lead.
3. Hold it with insulated pliers **approx. 5—10 mm { 0.20—0.39 in }** from a ground.
4. Crank the engine and verify that a strong blue spark is visible.

Removal / Installation

Caution

- **Pulling on the wire part of the spark plug lead may break it. To remove the lead, pull only on the boot.**
- **To avoid breaking the spark plug, be sure to fit the socket squarely over it.**

Tighten to the specified torque.

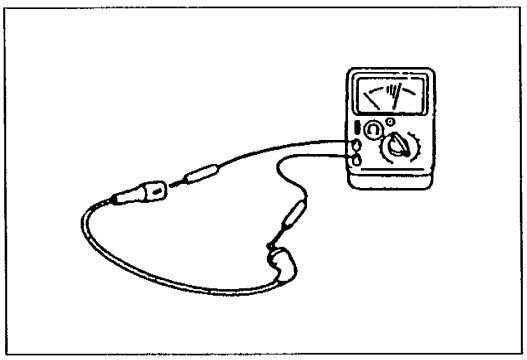
Spark plug tightening torque:
15—22 N·m { 1.5—2.3 kgf·m , 11—16 ft·lbf }

Inspection

Check the following points. If a problem is found, replace the spark plug.

1. Damaged insulation
2. Worn electrodes
3. Carbon deposits
   If cleaning is necessary, use a plug cleaner or a wire brush. Clean the upper insulator also.
4. Damaged gasket

Plug gap: 1.0—1.1 mm { 0.040—0.043 in }



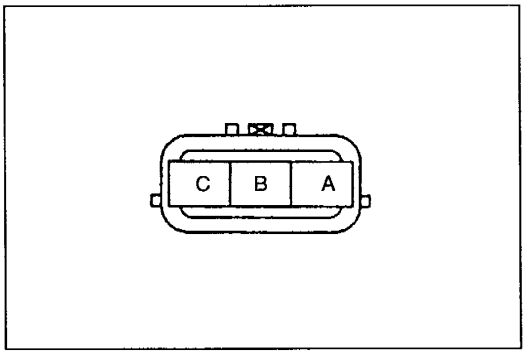
HIGH-TENSION LEAD
Removal / Installation

Caution
- **Incorrect installation can damage the leads and cause power loss, and negatively effect electronic components.**

Reinstall the high-tension leads to their original positions.

Inspection
Use an ohmmeter to measure the resistance.

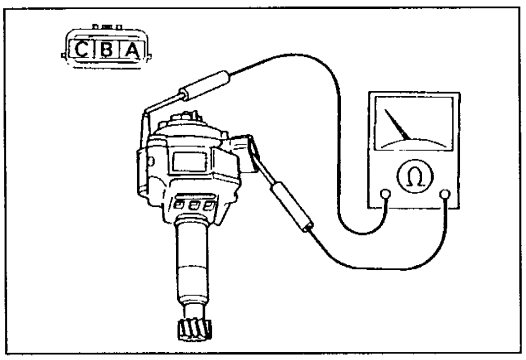
Resistance: 16 kΩ/1.00 m { 3.28 ft }



IGNITION COIL
Inspection
Primary coil winding
1. Disconnect the distributor 3-pin connector.
2. Measure the resistance between terminals A and B by using an ohmmeter.

   Specification: 0.49—0.74 Ω [20 °C { 68 °F }]

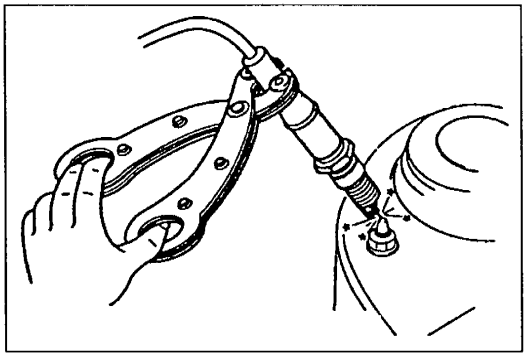
3. If not as specified, replace the distributor.



Secondary coil winding
1. Disconnect the distributor 3-pin connector.
2. Remove the distributor cap.
3. Measure the resistance as shown in the figure by using an ohmmeter.

   Specification: 20—31 kΩ [20 °C { 68 °F }]

4. If not as specified, replace the distributor.

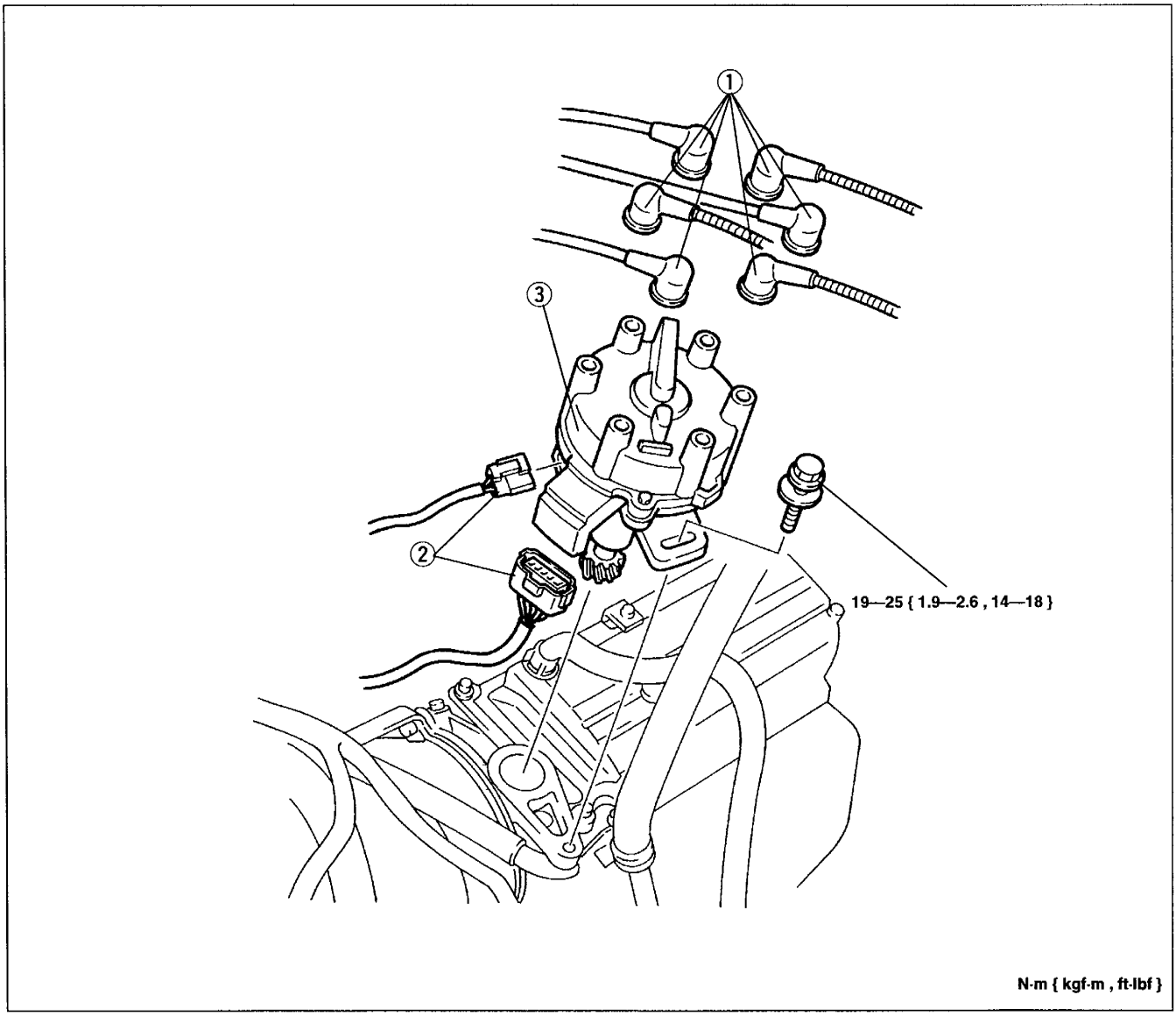


DISTRIBUTOR
Spark Test

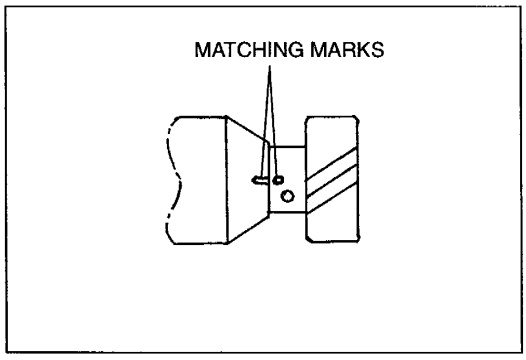
Warning
- **High voltage in the ignition device system can cause strong electrical shock. Avoid direct contact to the vehicle body during the following spark test.**

1. Remove the spark plug.
2. Connect the spark plug to a high-tension lead.
3. Hold the high-tension lead with insulated pliers **5—10 mm { 0.20—0.39 in }** from a ground.
4. Crank the engine and verify that there is a strong blue spark. If not, replace the spark plug or high-tension lead as necessary.

Removal / Installation
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal, referring to **Installation note**.



1. High-tension leads
2. Connect
3. Distributor
   Installation note ..... below

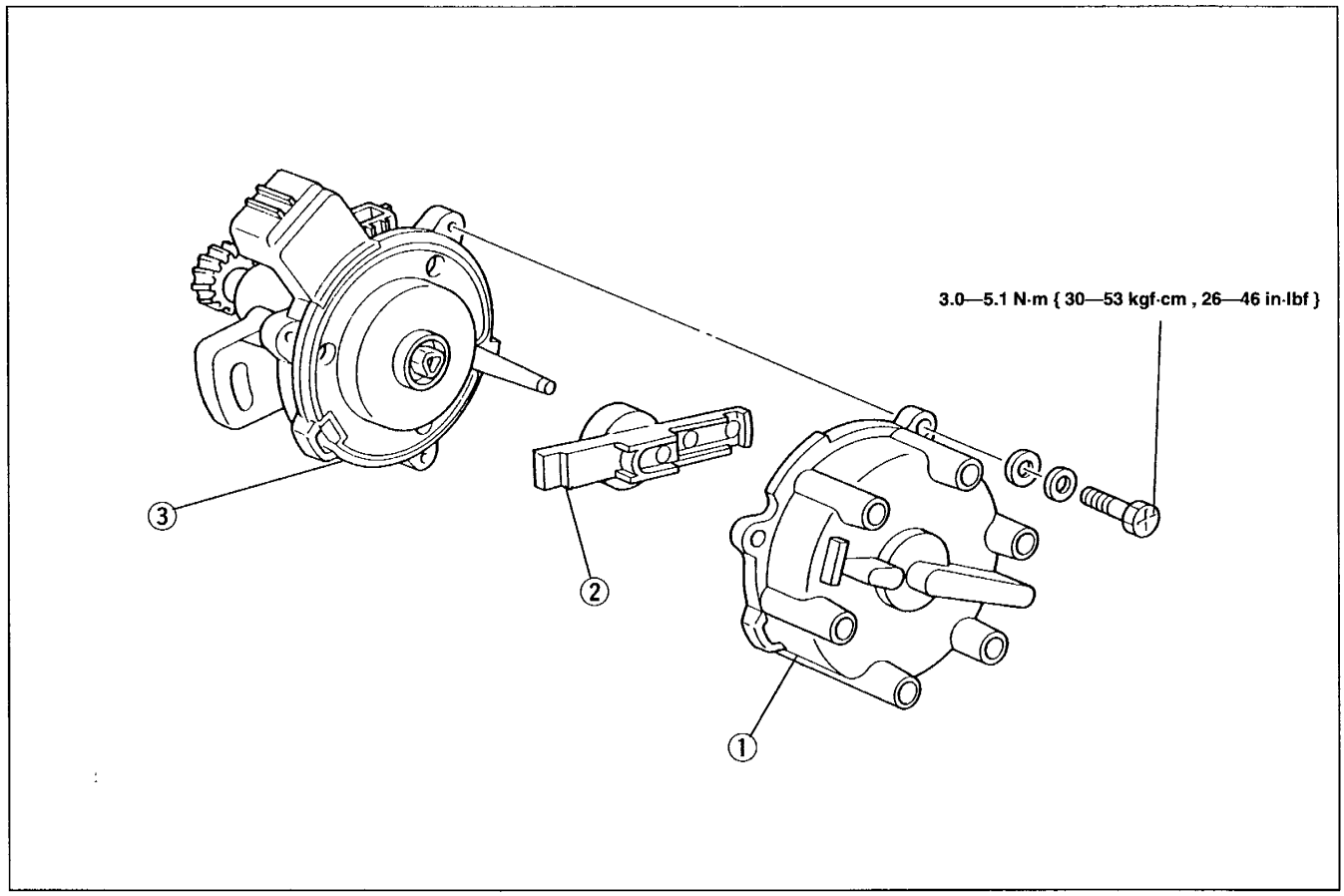


Installation Note

Verify that the No.1 cylinder is at top dead center and align the distributor matching marks.
After installing the distributor, adjust the ignition timing. (Refer to section F.)

Disassembly / Assembly

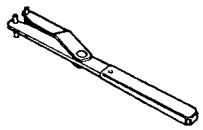
1. Disassembly in the order shown in the figure.
2. Assembly in the reverse order of disassembly.



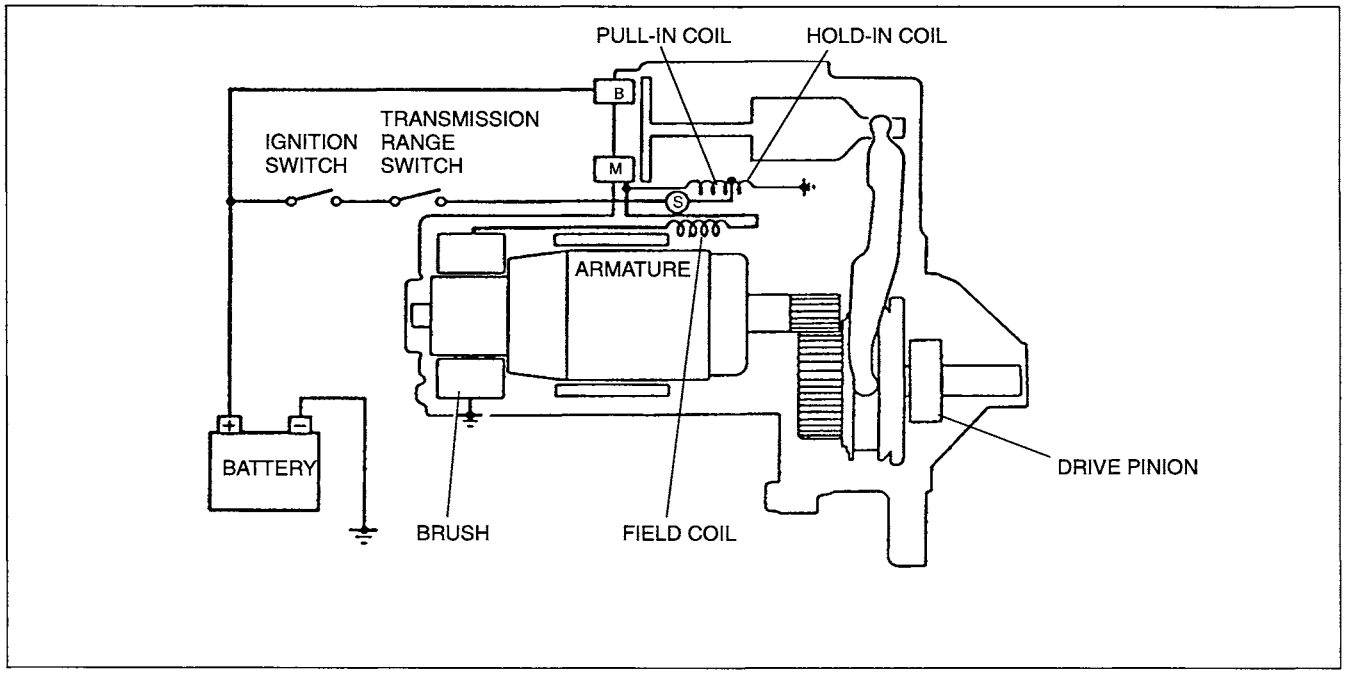
1. Cap
2. Rotor
3. Distributor set

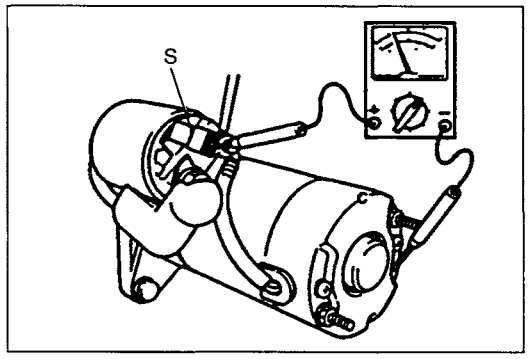
STARTING SYSTEM

PREPARATION
SST

49 G032 354 Adjust wrench		For removal and installation of P/S pulley

CIRCUIT DIAGRAM





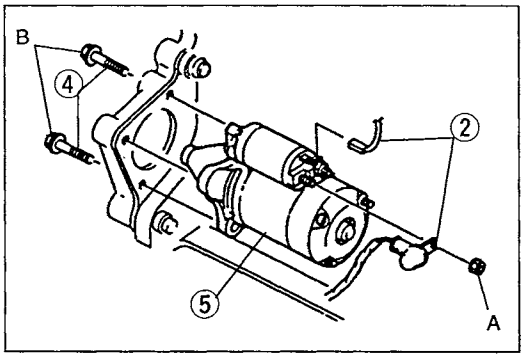
STARTER
On-Vehicle Inspection

Charge the battery fully before starting the following inspection.

1. Turn the ignition switch to START.
2. Verify that the starter motor operates.
3. If the starter does not operate, measure the voltage between terminal S and a ground.
4. If the voltage is 8 V or more, the starter is malfunctioning.
5. If less than 8 V, the wire harness is defective.

Note

- If the magnetic switch is hot, it may not function even though the voltage is standard voltage or more.



Removal / Installation

2WD

1. Disconnect the negative battery cable.
2. Disconnect the wiring from the starter.
3. Raise the front of the vehicle and support it with safety stands.
4. Remove the starter bolts; remove the lower bolt last.
5. Draw out the starter from under side of the vehicle.
6. Install in the reverse order of removal.

Tightening torque

Nut (A):

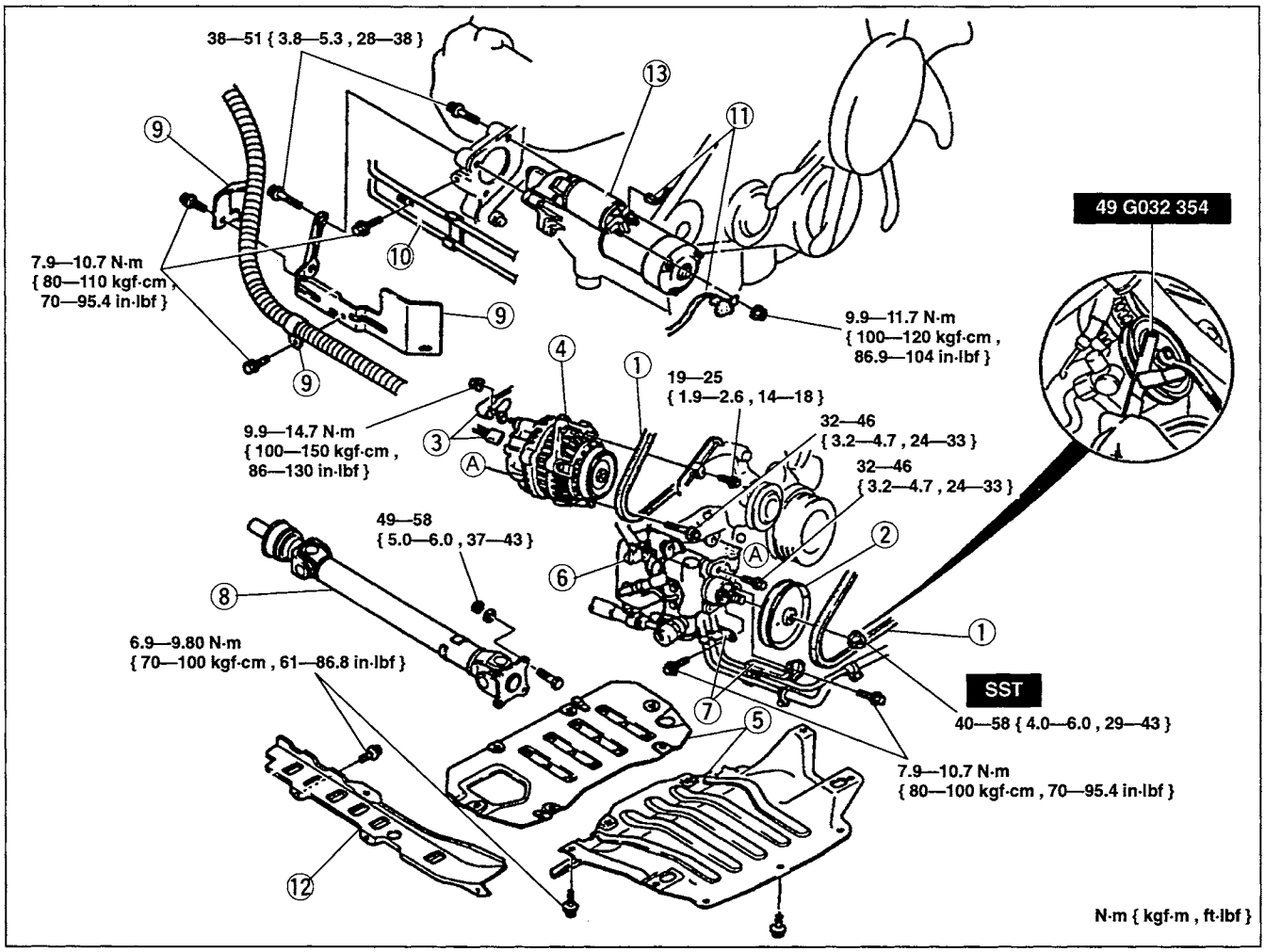
9.9—11.7 N·m { 1.0—1.2 kgf·m , 7.3—8.6 ft·lbf }

Bolt (B):

32—46 N·m { 3.2—4.7 kgf·m , 24—33 ft·lbf }

4WD

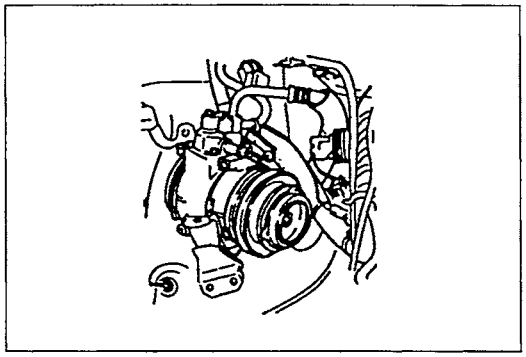
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal.



1. Drive belt
2. P/S pulley
3. Wire and connector
4. Generator
5. Undercover
6. P/S oil pump

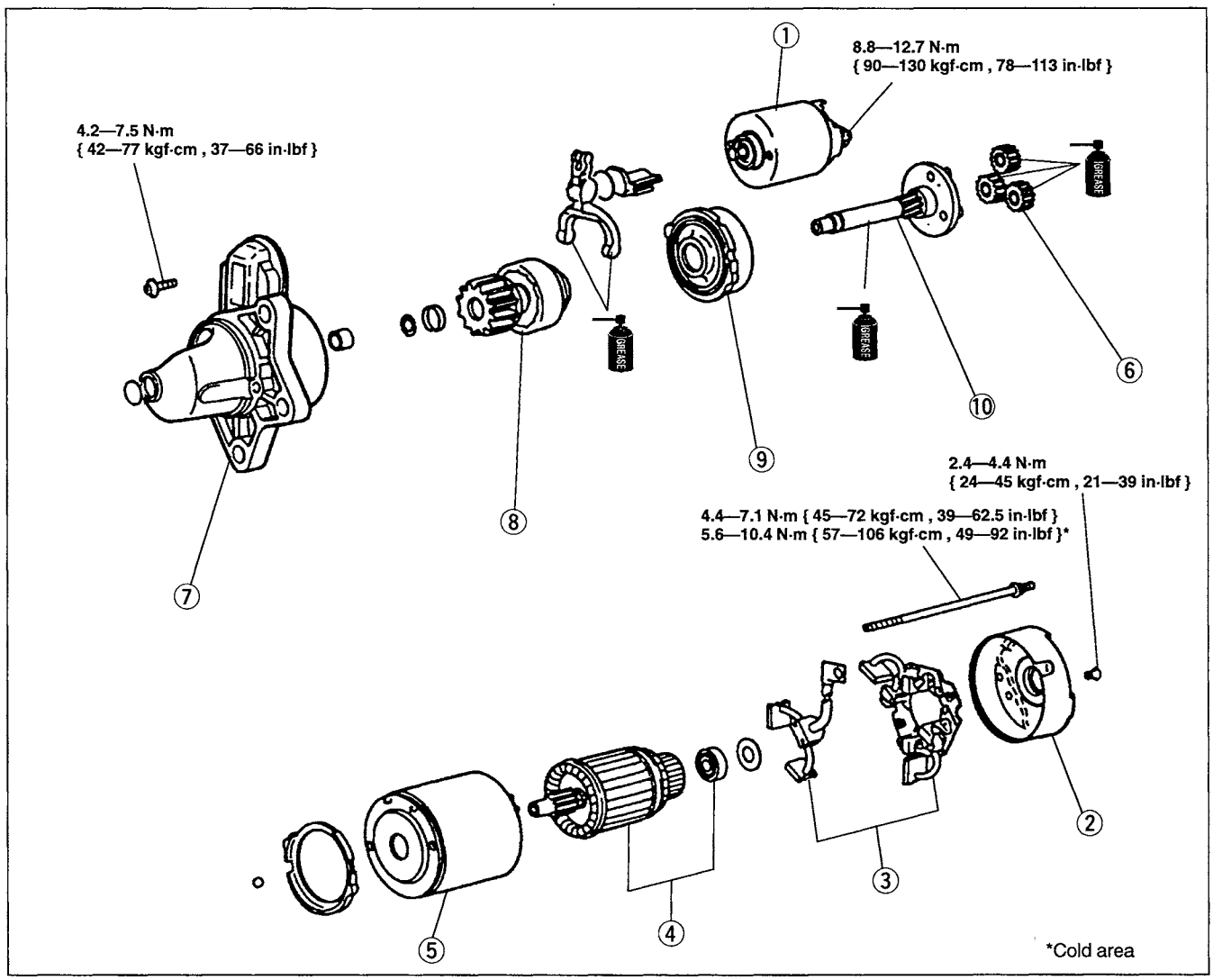
Removal Note ..... page G–23

7. AT oil pipe bracket
8. Front propeller shaft
9. Wiring harness bracket
10. AT oil pipe bracket
11. Wire and connector
12. Fuel and brake pipe cover
13. Starter

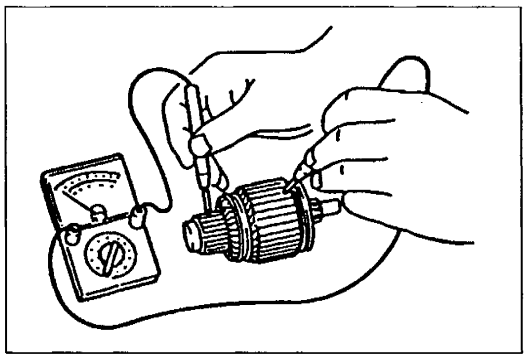


Removal note
P/S oil pump
Remove the P/S oil pump with the hoses still connected to it to remove the AT oil pipe brackets.

Disassembly / Assembly
1. Disassemble in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly.

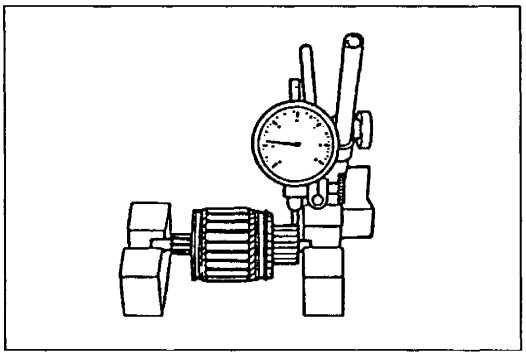


1. Magnetic switch
   Inspection ..... page G–25
2. Rear housing
3. Brush holder assembly
   Inspection ..... page G–26
4. Armature
   Inspection ..... page G–24
5. Yoke
   Inspection ..... page G–25
6. Planetary gear
7. Front cover
8. Drive pinion
9. Internal gear
10. Gear shaft



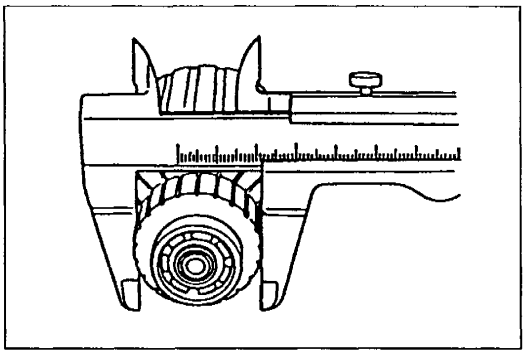
Inspection
Armature

1. Ground of armature coil
   Check continuity between the commutator and the core by using a circuit tester. Replace the armature if there is continuity.



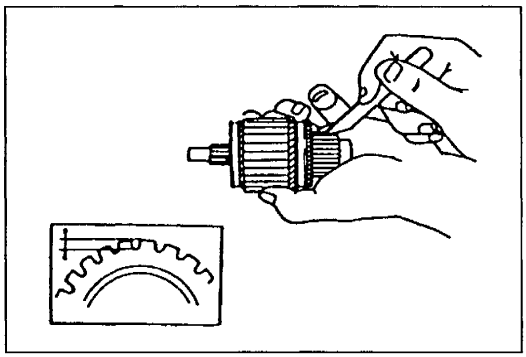
2. Runout of commutator
   (1) Place the armature on V-blocks, and measure the runout by using a dial indicator.
   (2) If the runout is at the limit or more, repair by using a lathe or replace the armature.

   Standard runout: 0.05 mm { 0.002 in }
   Limit: 0.1 mm { 0.004 in }



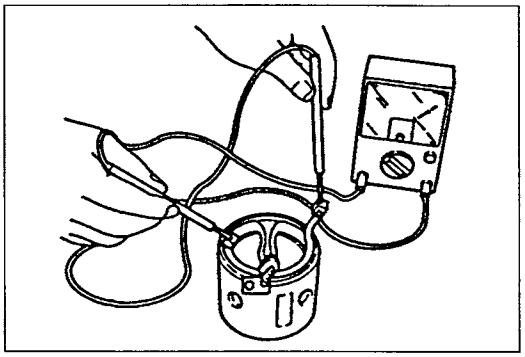
3. Outer diameter of commutator
   Replace the armature if the outer diameter of the commutator is at the wear limit or less.
4. Roughness of commutator surface
   If the commutator surface is dirty, wipe it with a cloth; if it is rough, repair by using a lathe or fine sandpaper.

   Wear limit: 28.8 mm { 1.14 in }

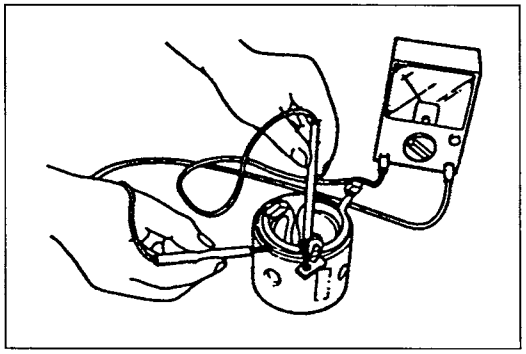


5. Segment groove depth
   If the depth of the mold between segments is at the minimum depth or less, undercut the grooves to the standard depth.

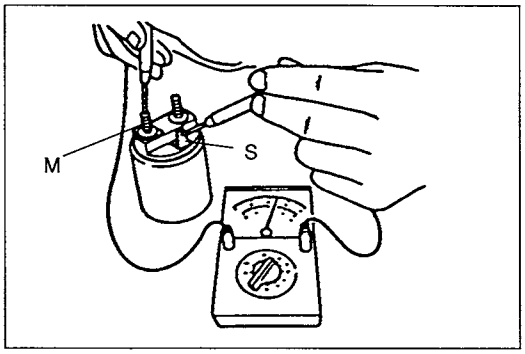
   Standard depth: 0.5 mm { 0.020 in }
   Minimum depth: 0.2 mm { 0.008 in }



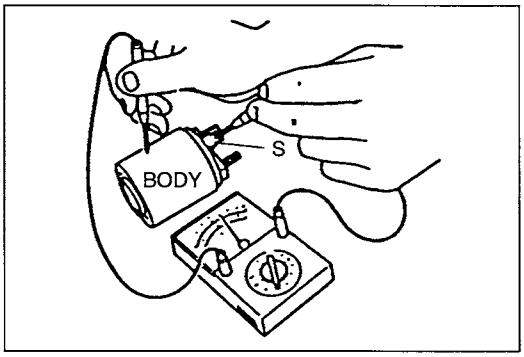
Yoke
Field coil
1. Wiring damage
   (1) Check for continuity between the connector and the brushes by using a circuit tester.
   (2) Replace the yoke assembly if there is no continuity.



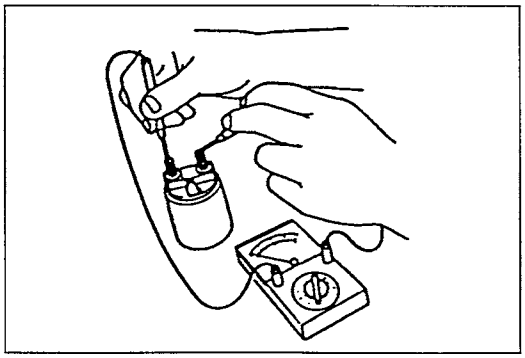
2. Ground of field coil
   (1) Check continuity between the connector and the yoke by using a circuit tester.
   (2) Repair or replace the yoke assembly if there is continuity.
3. Installation of field coil
   Replace the yoke assembly if the field coil is loose.



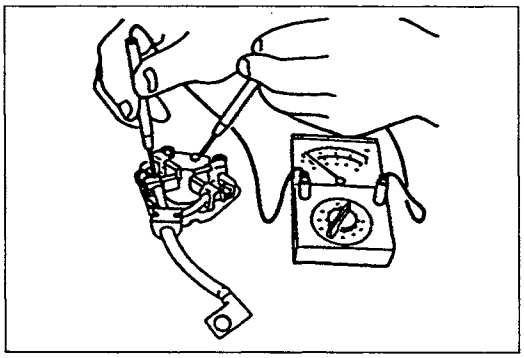
Magnetic switch
1. Wiring damage (terminal S — terminal M)
   Check for continuity between terminals S and M by using a circuit tester. Replace the magnetic switch if there is no continuity.



2. Wiring damage (terminal S — body)
   Check for continuity between terminal S and the body by using a circuit tester. Replace the magnetic switch if there is no continuity.

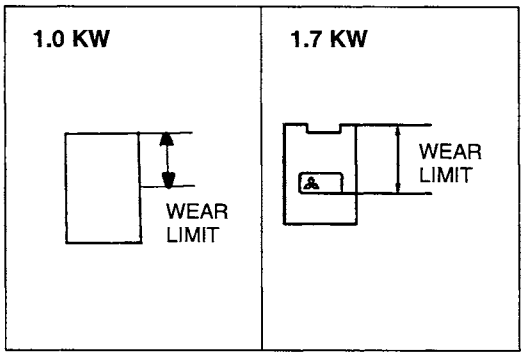


3. Ground of magnetic switch
   Check continuity between terminals M and B by using a circuit tester. Replace the magnetic switch if there is continuity.



Brush holder assembly

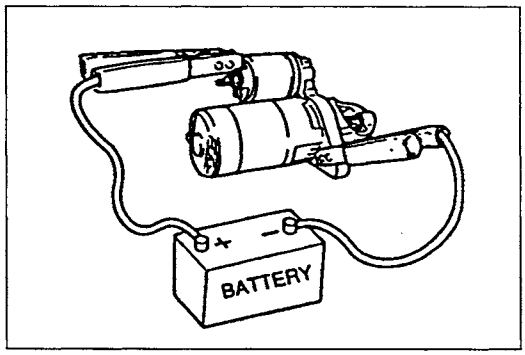
Check continuity between the insulated brush and the plate by using a circuit tester. Replace the brush holder if there is continuity.



Brush

If any brush is worn almost to or beyond the wear limit, replace all of the brushes.

Type	kw	1.0	1.7
Standard	mm { in }	2.3 { 0.48 }	16.5 { 0.65 }
Minimum	mm { in }	7.0 { 0.28 }	7.0 { 0.28 }

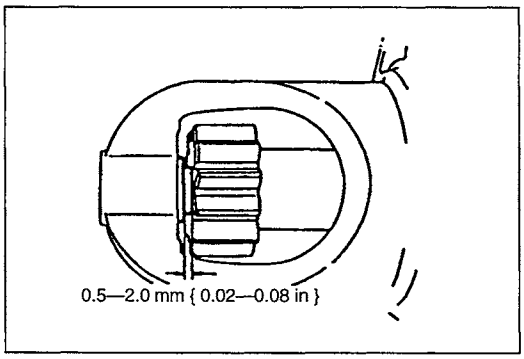


Checking Operation
Magnetic switch

Make the following tests:

Pull-out test

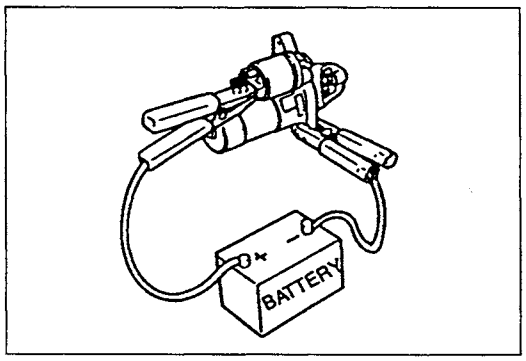
Apply battery positive voltage to terminal S and ground the body, and verify that the pinion is pulled out.



Measure the pinion gap while the pinion is pulled out.

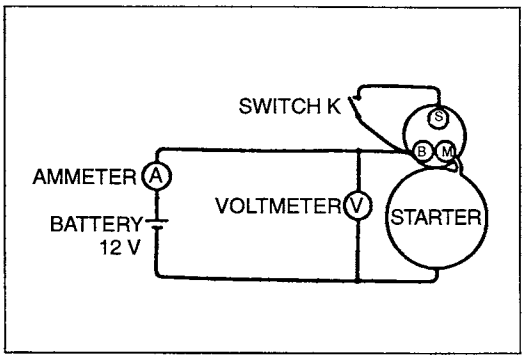
Specification: 0.5—2.0 mm { 0.02—0.08 in }

If not within the specification, adjust with an adjustment washer (drive housing front cover—magnetic switch).



Return test

1. Disconnect the motor wire from terminal M, and then connect the battery power to terminal M and ground the body.
2. Pull out the drive pinion by using a screwdriver. Verify that the drive pinion returns to its original position when released.



No-load test

1. After adjusting the pinion gap, form a test circuit with a voltmeter and an ammeter.
2. Close switch K to run the starter.
3. Check for the following:

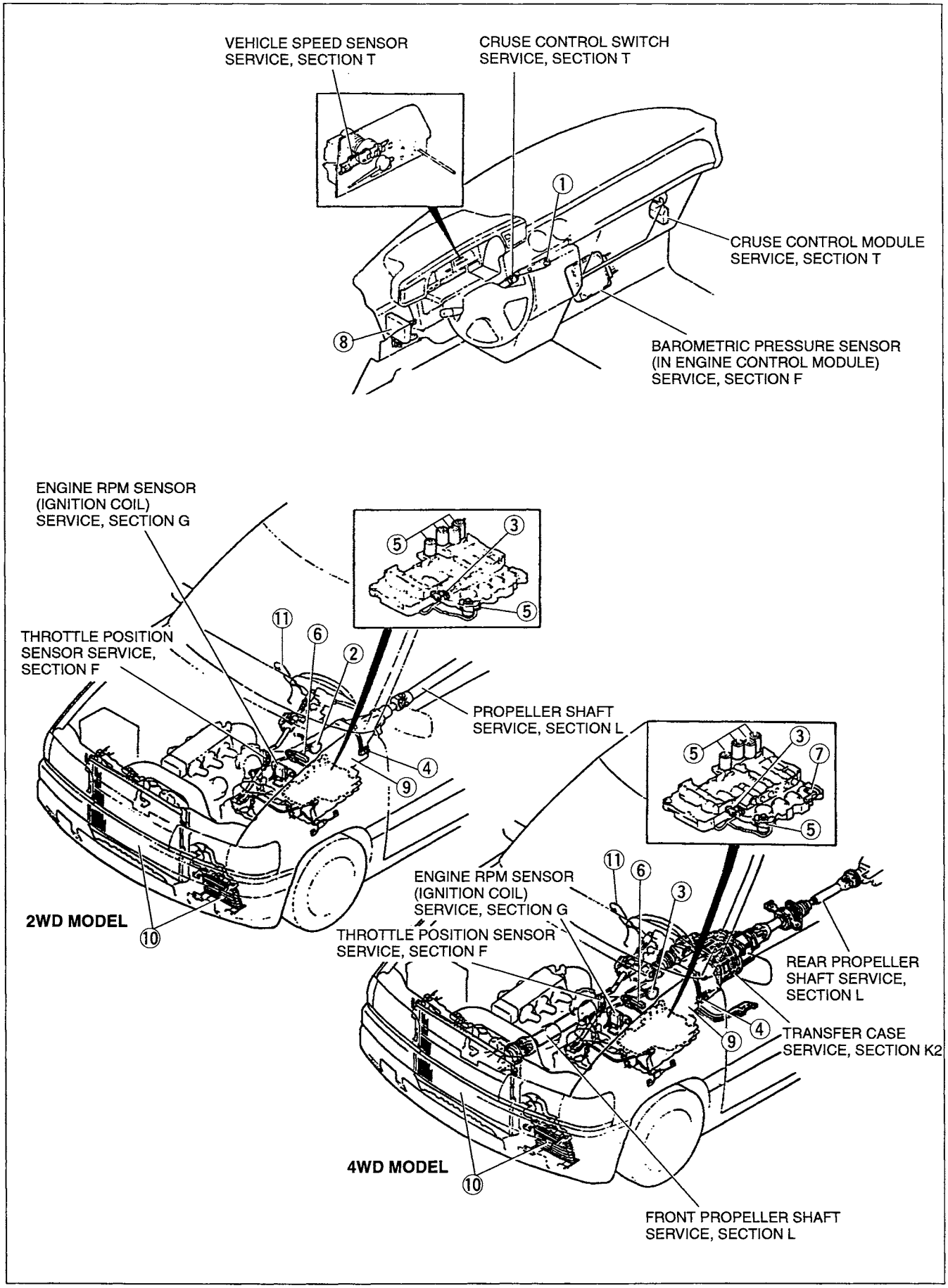
Type	kW	1.0	1.7
Voltage	V	11.0	11.0
Current	A	90 max.	90 max.
Gear shaft speed	rpm	2,800 min.	3,600 min.

4. If not as specified, check for the cause according to "Inspection". (Refer to page G–24.)

Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

AUTOMATIC TRANSMISSION (Electronically-Controlled)

INDEX

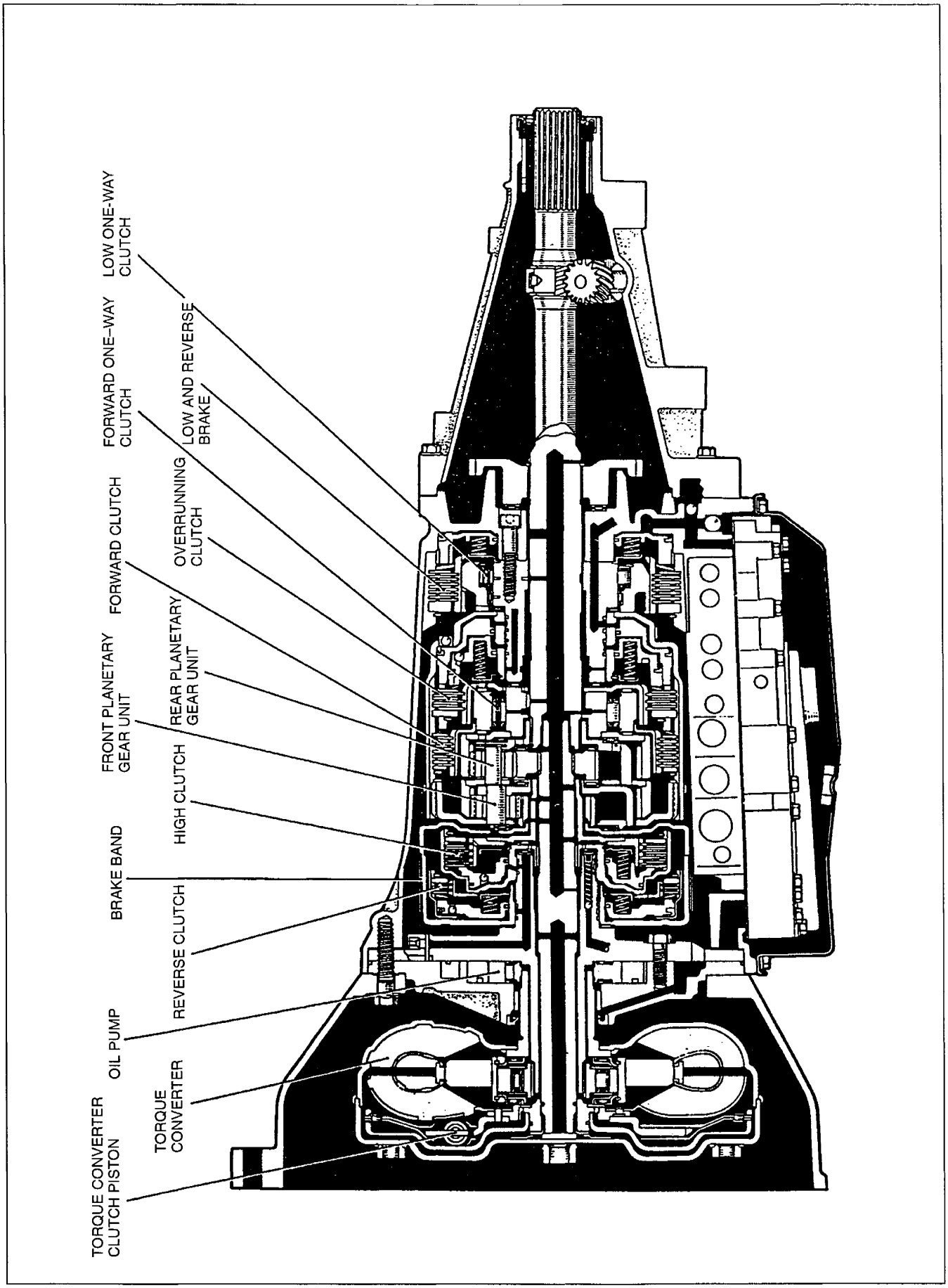

VEHICLE SPEED SENSOR
SERVICE, SECTION T
CRUSE CONTROL SWITCH
SERVICE, SECTION T
CRUSE CONTROL MODULE
SERVICE, SECTION T
BAROMETRIC PRESSURE SENSOR
(IN ENGINE CONTROL MODULE)
SERVICE, SECTION F
ENGINE RPM SENSOR
(IGNITION COIL)
SERVICE, SECTION G
THROTTLE POSITION
SENSOR SERVICE,
SECTION F
PROPELLER SHAFT
SERVICE, SECTION L
2WD MODEL
ENGINE RPM SENSOR
(IGNITION COIL)
SERVICE, SECTION G
THROTTLE POSITION SENSOR
SERVICE, SECTION F
REAR PROPELLER
SHAFT SERVICE,
SECTION L
TRANSFER CASE
SERVICE, SECTION K2
4WD MODEL
FRONT PROPELLER SHAFT
SERVICE, SECTION L

OUTLINE

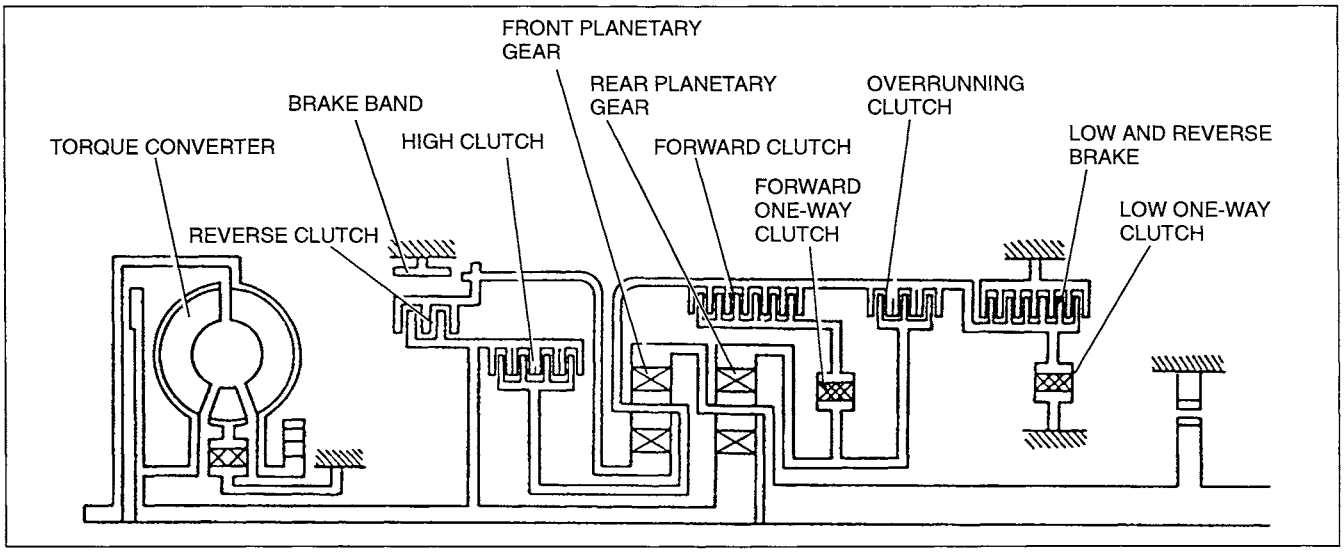
SPECIFICATIONS

Item \ Model			RA4A-EL	RA4AX-EL
			2WD	4WD
Torque converter stall torque ratio			2.000	
Gear ratio	First gear		3.027	2.786
	Second gear		1.619	1.546
	Third gear		1.000	
	Fourth gear		0.694	
	Reverse		2.272	
Number of drive/ driven plates	Reverse clutch		2/2	
	High clutch		4/7	
	Forward clutch		6/6	
	Overrunning clutch		3/5	
	Low and reverse brake		6/6	
Automatic transmission fluid (ATF)	Type		Dexron®II or M-III	
	Capacity L { US qt , Imp qt }	Total	8.6 { 9.1 , 7.6 }	
		Oil pan	4.0 { 4.2 , 3.5 }	

CROSS-SECTIONAL VIEW



POWER FLOW DIAGRAM

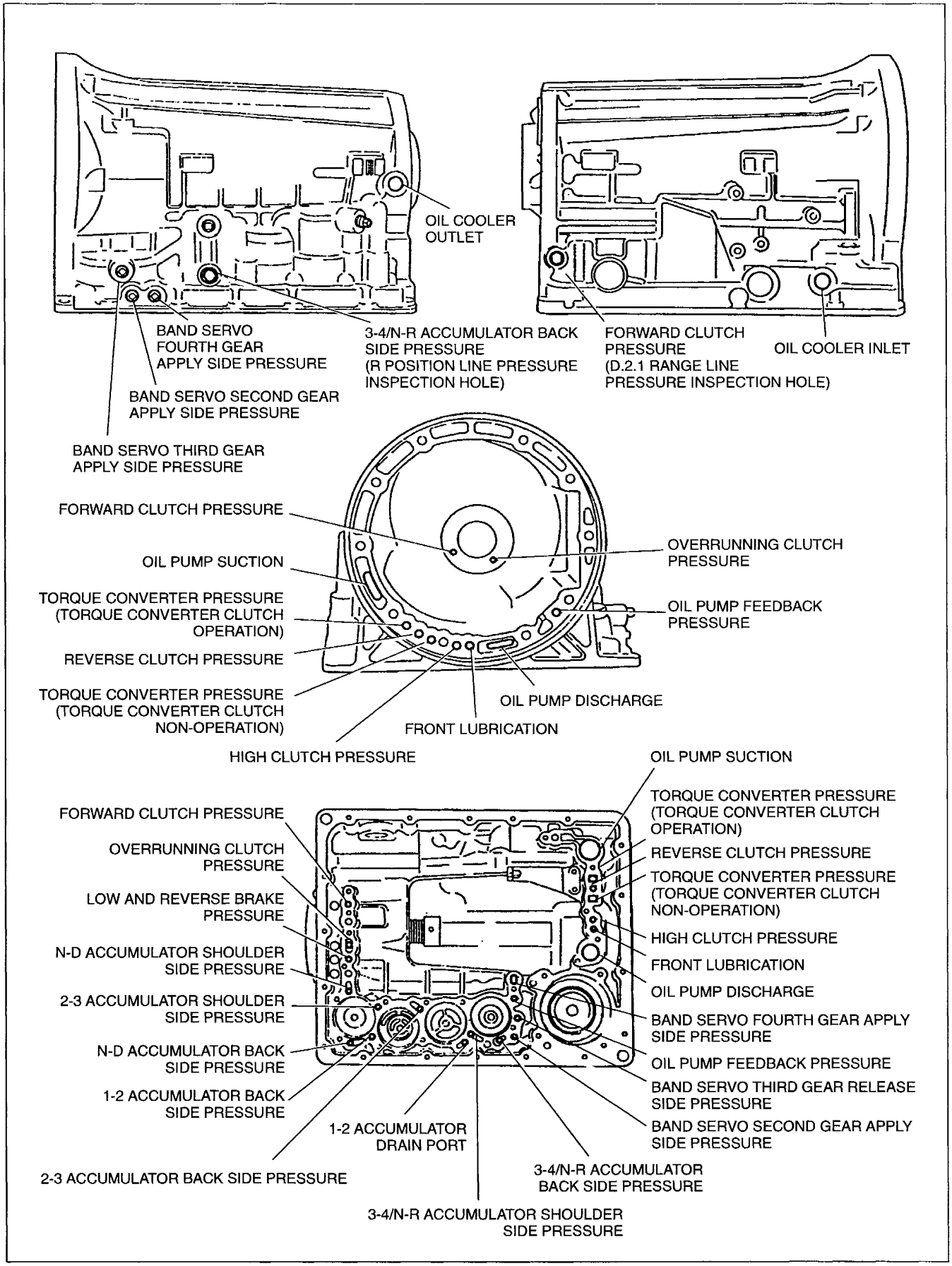


OPERATION OF COMPONENTS

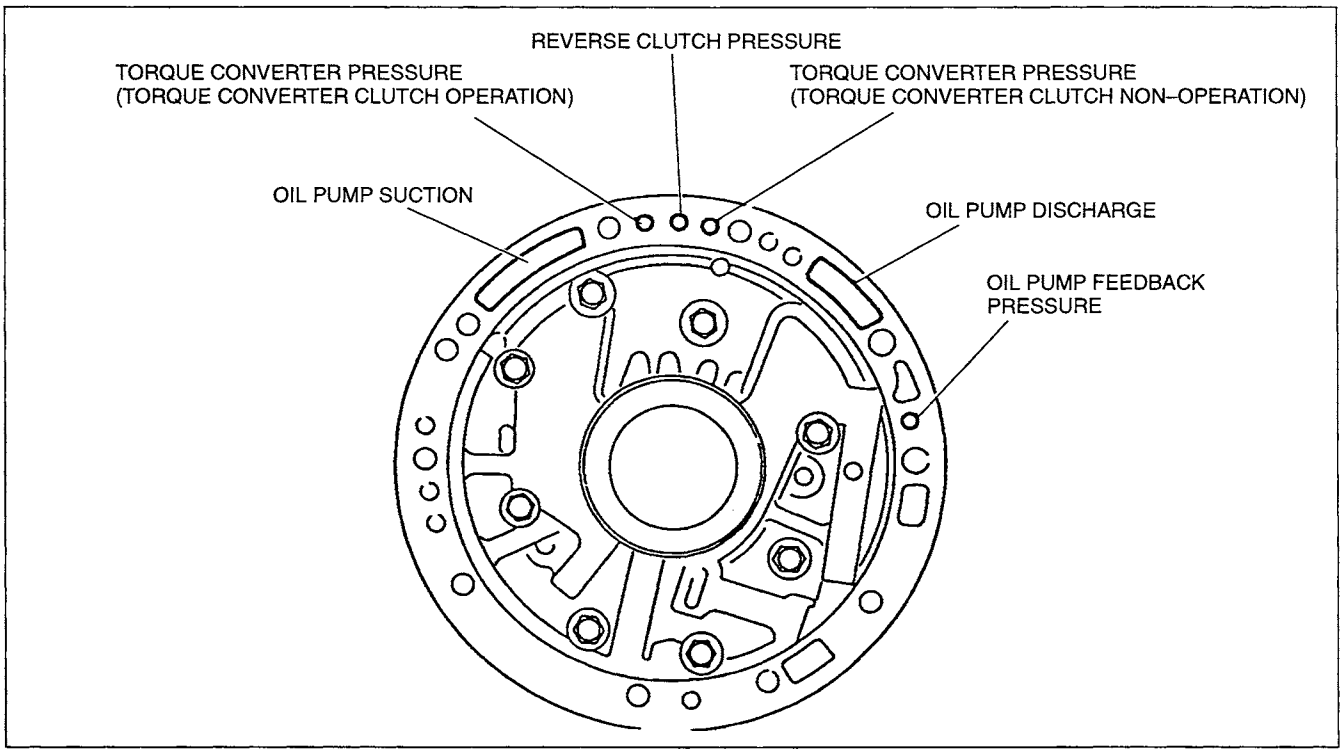
Position/ Range	Mode	Gear	Reverse clutch	High clutch	Forward clutch	Over-running clutch	Brake band			Forward one-way clutch	Low one-way clutch	Low and reverse brake
							2GR applied	3GR released	4GR applied			
P	—	—										
R	—	Reverse	○									○
N		—										
D	Except O/D OFF	1			○	■				●	●	
		2			○	□	○			●		
		3		○	○	□	⊗*1	⊗		●		
		4		○	⊗		⊗*2	⊗	○			
	O/D OFF	1			○	■				●	●	
		2			○	◎	○			●		
		3		○	○	◎	⊗*1	⊗		●		
2	—	2			○	◎	○			●		
1	—	1			○	○				●		○

*1 : Hydraulic pressure is applied to both second gear applied side and third gear released side of band servo piston. However, because the area of the third gear released side is larger than the second gear applied side, the brake band does not operate.
*2 : Hydraulic pressure is applied to fourth gear applied side, plus condition *1 above. Brake band is applied.
○ : Operates.
◎ : Operates when throttle opening is less than 1/8. Engine braking effect available.
□ : Operates when the engine control module receives 4GR inhibit signal from the cruise control module and throttle opening is less than 1/8. Engine braking effect available.
■ : Operates when the engine control module receives 4GR inhibit signal from the cruise control module and throttle opening is less than 1/8. Engine braking effect not available.
⊗ : Operates but does not transmit power.
● : Operates during acceleration and cruising.

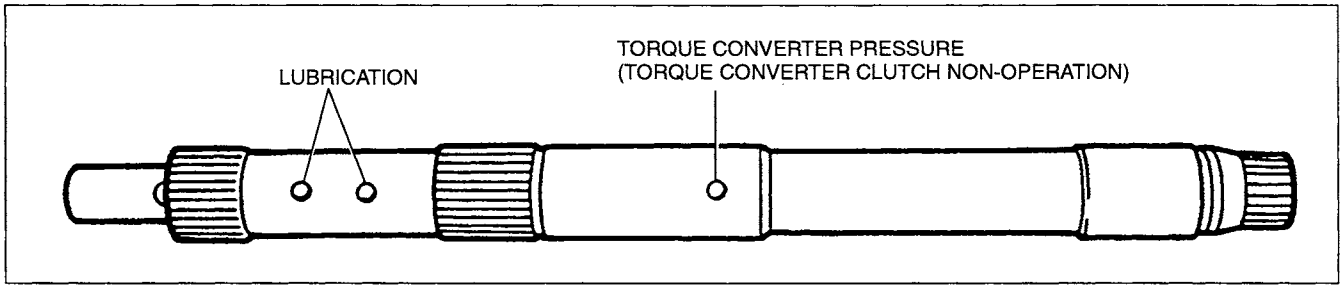
FLUID PASSAGE LOCATION
Transmission Case



Oil Pump

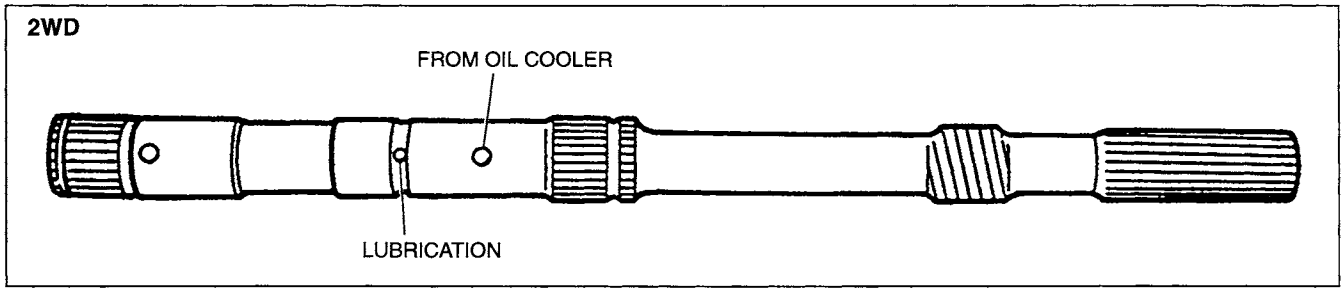


Input Shaft

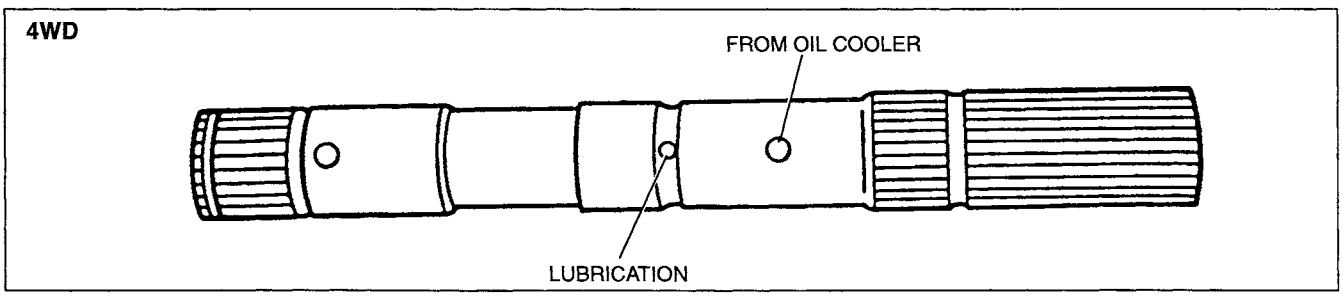


Output Shaft

2WD

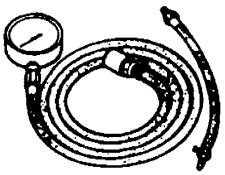


4WD



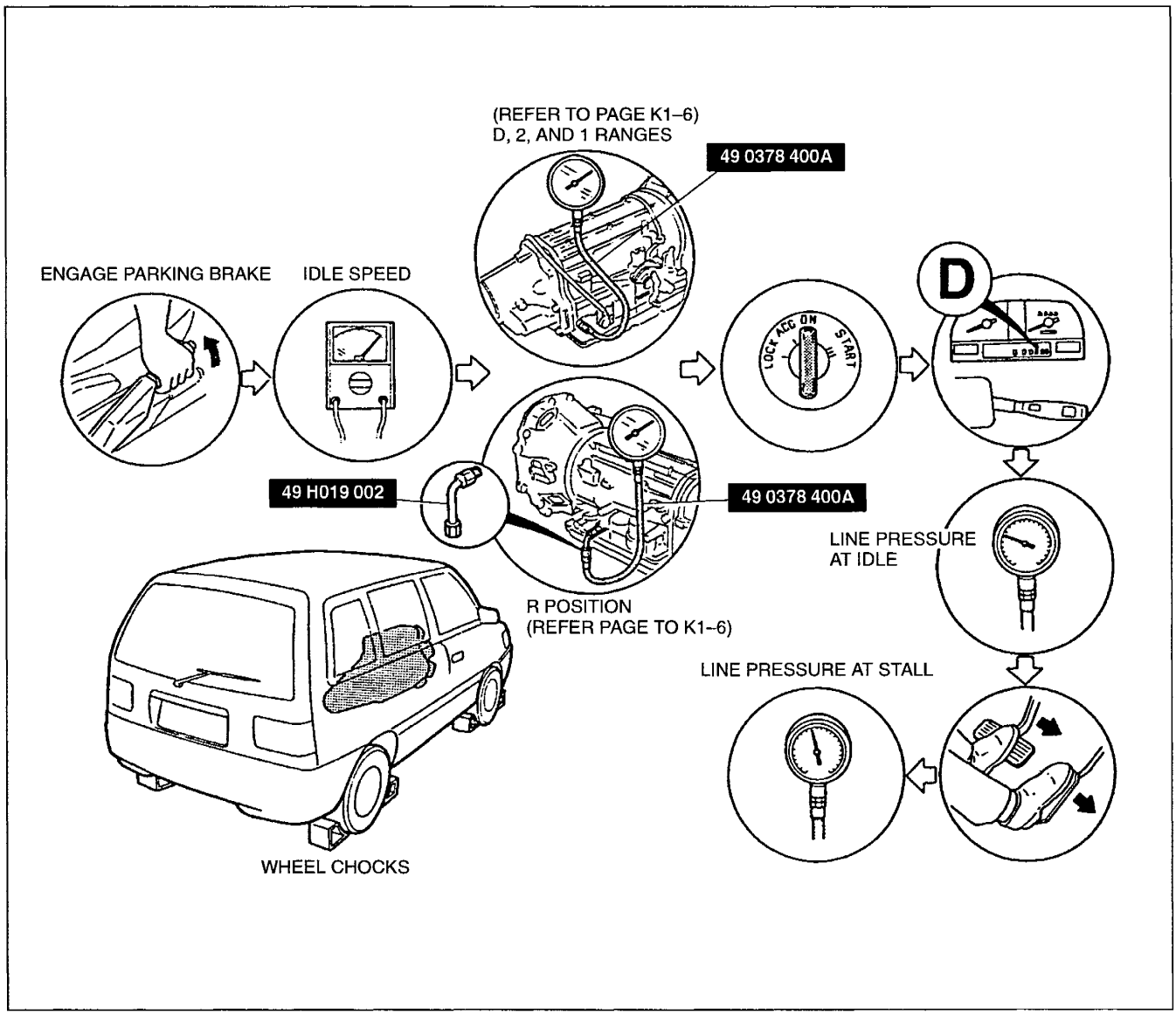
MECHANICAL SYSTEM TEST

PREPARATION
SST

49 0378 400A Gauge set, oil pressure 	For oil pressure test	49 H019 002 Adapter 	For oil pressure test

MECHANICAL SYSTEM TEST PREPARATION
1. Engage the parking brake and use wheel chocks at the front and rear of the wheels.
2. Check the engine coolant. (Refer to section E.)
3. Check the engine oil. (Refer to section B.)
4. Check the ATF level. (Refer to page K1–30.)
5. Check the idle speed and ignition timing in P position. (Refer to section F.)

LINE PRESSURE TEST
Procedure



1. Connect the **SST** to the line pressure inspection hole.
2. Shift the selector lever to D range and read the line pressure at idle.

Caution
- **If the accelerator pedal is pressed for longer than 5 seconds while the brake pedal is pressed, the transmission could be damaged. Therefore, do steps 3 and 4 within 5 seconds of each other.**

3. Depress the brake pedal firmly with the left foot and gradually depress the accelerator pedal with the right foot.
4. Read the line pressure as soon as the engine speed becomes constant, then release the accelerator pedal.
5. Shift the selector lever to N position and let the engine idle for one minute or more to cool the ATF.
6. Read the line pressure at idle and at the engine stall speed for each range in the same manner.

Specified line pressure:
(2WD)

Position /Range	Line pressure kPa { kgf/cm², psi }	
	Idle	Stall
D, 2, 1	500—530 { 5.0—5.4 , 71—77 }	1,200-1,270 { 12.2—13.0 , 174—185 }
R	620—650 { 6.3—6.7 , 89—95 }	1,510—1,570 { 15.3—16.1 , 217—229 }

(4WD)

Position /Range	Line pressure kPa { kgf/cm², psi }	
	Idle	Stall
D, 2, 1	440—470 { 4.4—4.8 , 63—68 }	1,040—1,110 { 10.6—11.4 , 150—162 }
R	600—630 { 6.1—6.5 , 87—92 }	1,460—1,530 { 14.8—15.6 , 210—222 }

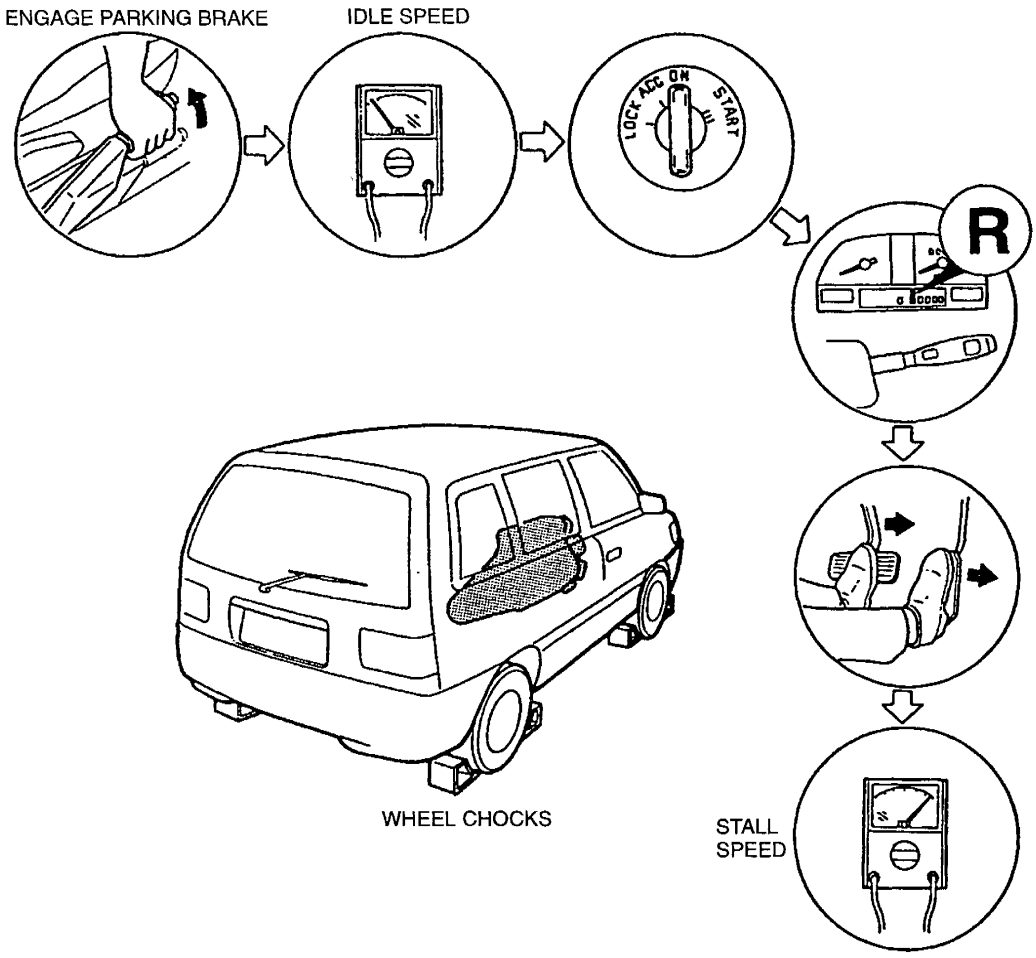
1. Install new plugs in the inspection ports.

Tightening torque: 4.9—9.8 N·m { 50—100 kgf·cm , 43—87 in·lbf }

Evaluation of Line Pressure Test

Condition		Possible cause
When idling	Low pressure in every range	Worn oil pump Damaged control piston (in oil pump) Pressure regulator valve or plug sticking Damaged pressure regulator valve spring Fluid leaking between oil strainer and pressure regulator valve
	Low pressure in forward ranges	Fluid leaking from hydraulic circuit of forward clutch
	Low pressure in 2 ranges	Fluid leaking from hydraulic circuit of band servo second gear apply side
	Low pressure in R position only	Fluid leaking from hydraulic circuit of reverse clutch
	Low pressure in R position and 1 ranges only	Fluid leaking from hydraulic circuit of low and reverse brake
	Higher than specification	Throttle position sensor out of adjustment Damaged transmission fluid temperature sensor Pressure control solenoid sticking Short circuit of pressure control solenoid circuit Pressure modifier valve sticking Pressure regulator valve or plug sticking
At stall speed	Low pressure	Throttle position sensor out of adjustment Damaged control piston (in oil pump) Pressure control solenoid sticking Short circuit of pressure control solenoid circuit Pressure regulator valve or plug sticking Pressure modifier valve sticking Pilot valve sticking

STALL TEST
Procedure



1. Shift the selector lever to R position.

Caution
- **If the accelerator pedal is pressed for longer than 5 seconds while the brake pedal is pressed, the transmission could be damaged. Therefore, do steps 4 and 5 within 5 seconds of each other.**

2. Firmly depress the foot brake with the left foot, and gently depress the accelerator pedal with the right.
3. When the engine speed no longer increases, quickly read the engine speed and release the accelerator.
4. Shift the selector lever to N position and let the engine idle for one minute or more to cool the ATF.

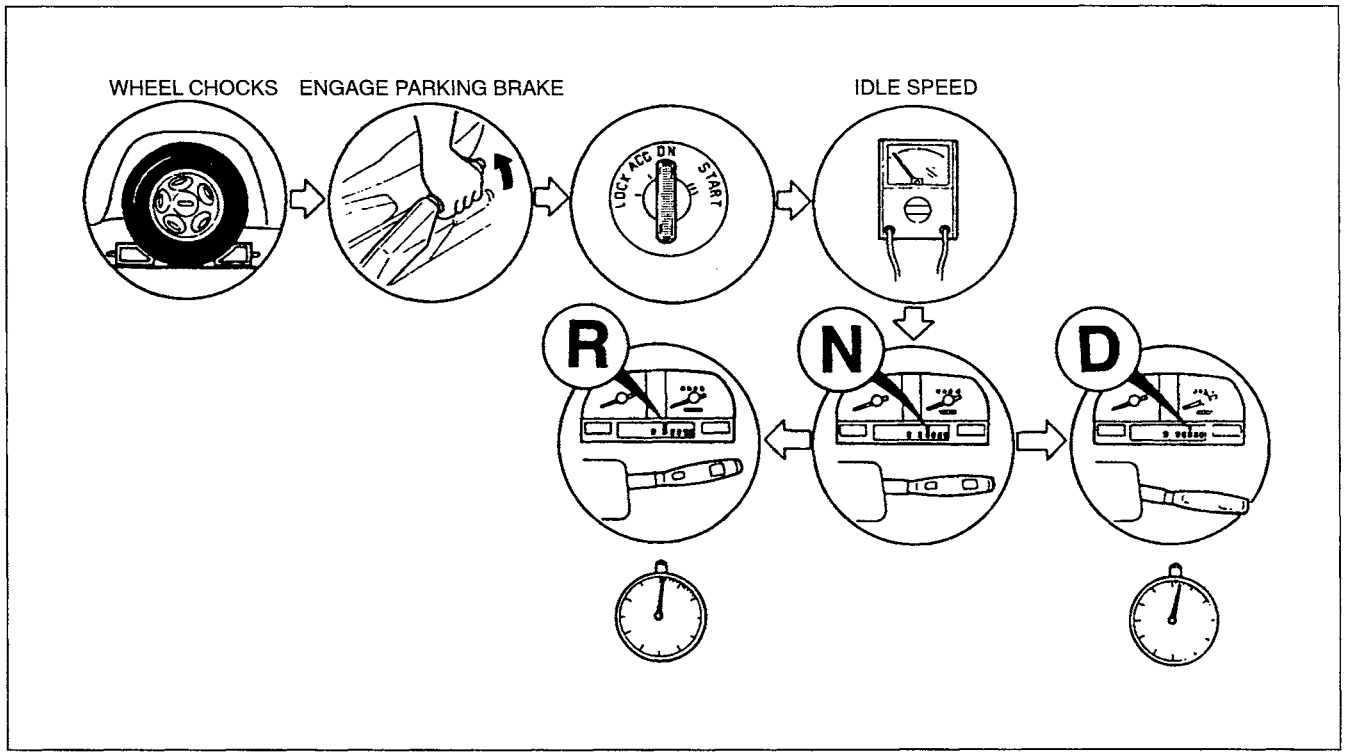
5. Perform the stall test for the following ranges in the same manner.
   (1) D range
   (2) 2 range
   (3) 1 range

Engine stall speed: 2,300—2,600 rpm

Evaluation of Stall Test

Condition		Possible cause	
Above specification	In all ranges and R position	Insufficient line pressure	Worn oil pump
			Oil leakage from oil pump, control valve, and/or transmission case
			Stuck pressure regulator valve
	In D and 2 ranges	Forward clutch slipping Forward one-way clutch slipping Low one-way clutch slipping	
	In R position	Low and reverse brake slipping Reverse clutch slipping Perform road test to determine whether problem is in low and reverse brake or in reverse clutch a) Engine brake applied in 1 range first gear ...Reverse clutch b) Engine brake not applied in 1 range first gear ...Low and reverse brake	
Within specification		All shift control elements within transmission are functioning normally	
Below specification		Engine out of tune	
		One-way clutch slipping within torque converter	

TIME LAG TEST
Procedure



1. Shift the selector lever from N position to D range.
2. Use a stopwatch to measure the time it takes from shifting until shock is felt.
3. Shift the selector lever to N position and let the engine idle for one minute or more to cool the ATF.
4. Do the time lag test for the following shifts in the same manner. Make three measurements for each test and average the results.
   (1) N position→D range
   (2) N position→D range (O/D OFF mode)
   (3) N position→R position

Specified time lag
N position→D range ..... 0.5—1.5 second
N position→R position ..... 0.7—1.7 second

Evaluation of Time Lag Test

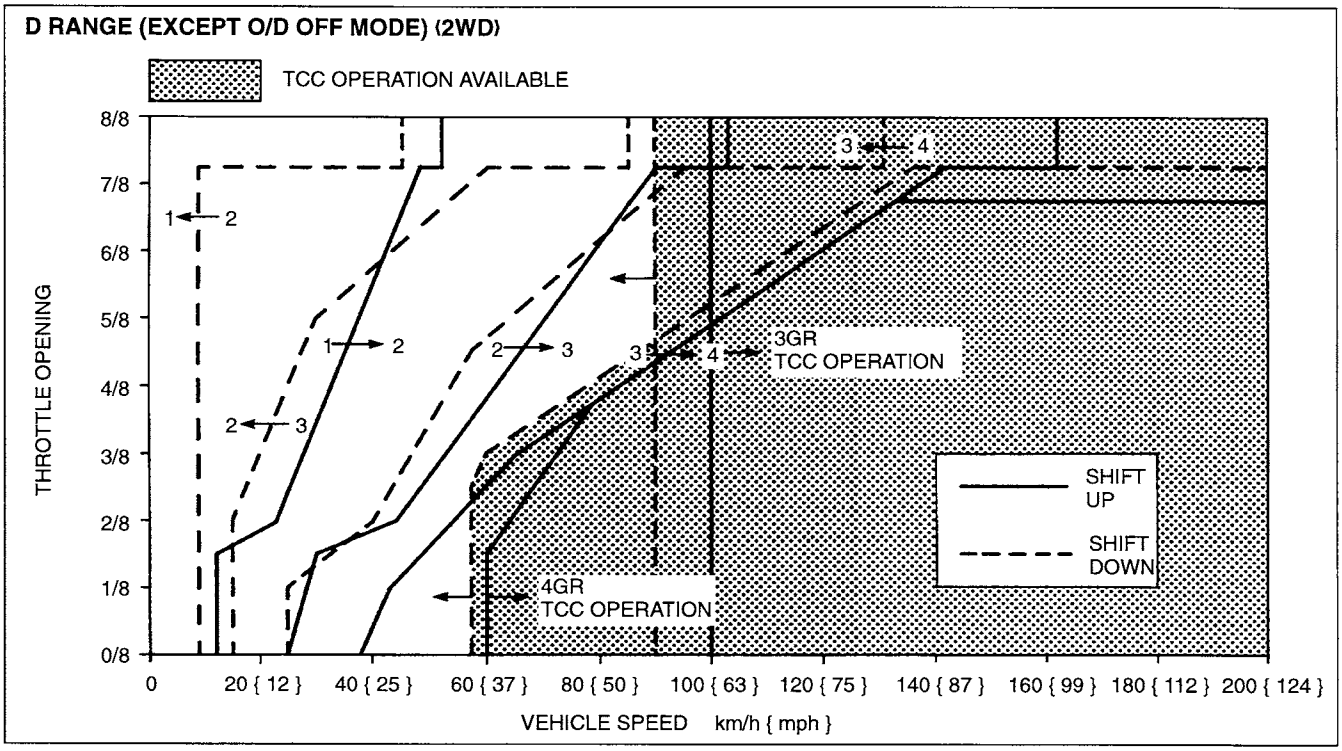
Condition		Possible cause
Above specification	N→D and N→D (O/D OFF mode) shift	Insufficient line pressure Forward clutch slipping Forward one-way clutch slipping
	N→D shift	Insufficient line pressure Low one-way clutch slipping N-D accumulator not operating properly
	N→D (O/D OFF mode) shift	Insufficient line pressure Brake band slipping 1-2 accumulator not operating properly
	N→R shift	Insufficient line pressure Reverse clutch slipping Low and reverse brake slipping 3-4/N-R accumulator not operating properly

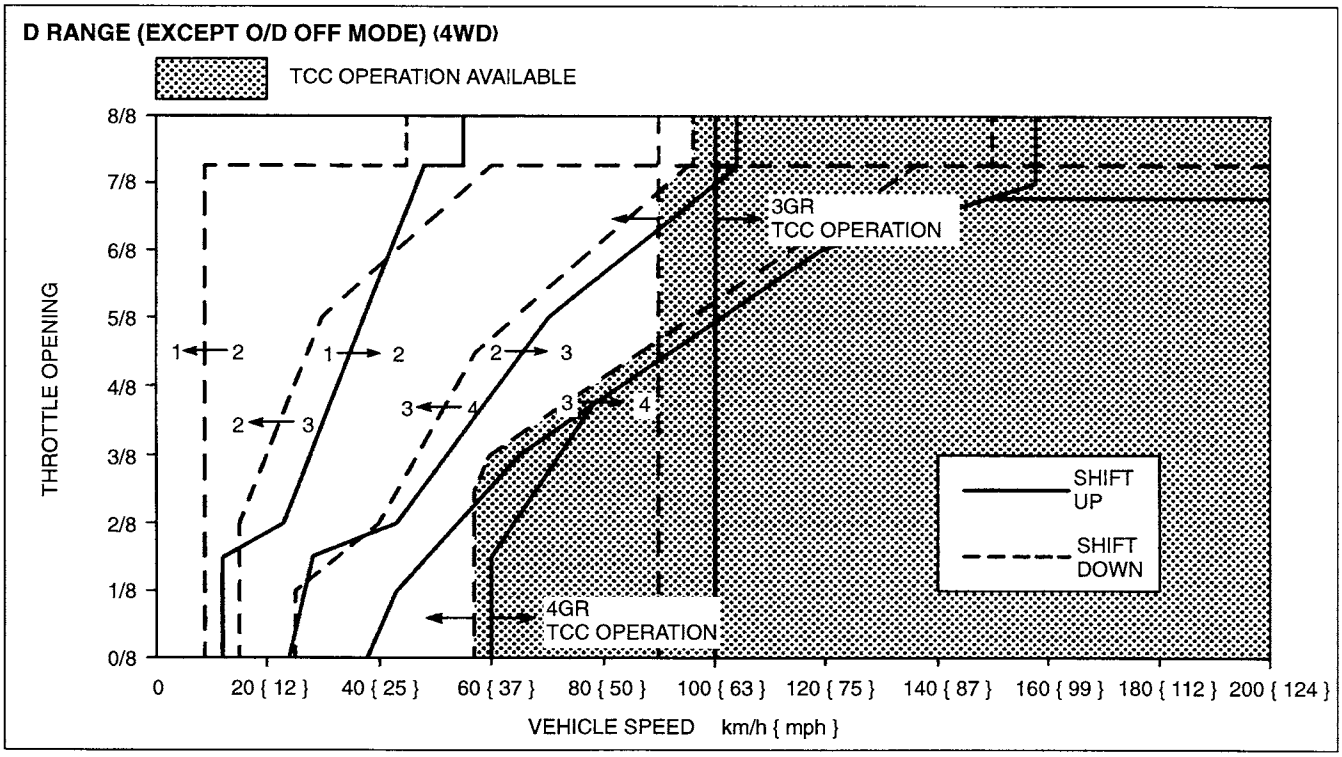
ROAD TEST

ROAD TEST PREPARATION

1. Check the engine coolant. (Refer to section E.)
2. Check the engine oil. (Refer to section B.)
3. Check the ATF level. (Refer to page K1–30.)
4. Check the idle speed and ignition timing in P position. (Refer to section F.)

SHIFT DIAGRAM





D RANGE TEST

D range (Except O/D OFF mode)

Note
- The POWER mode and the NORMAL mode are automatically selected by the transmission control module.

1. Shift the selector lever to D range.
2. Accelerate the vehicle to half throttle and wide open throttle.
3. Verify that 1–2, 2–3, and 3–4 upshifts and downshifts are obtained. The shift points must be as shown in the table in the next page.
4. Drive the vehicle in fourth, third, and second gears and verify that kickdown occurs for 4→3, 4→2, 3→2, 3→1, 2→1, and that the shift points are as shown in the table in the following page.
5. Decelerate the vehicle and verify that engine braking effect is felt in fourth and third gears.

Note
- There is torque converter clutch non-operation in the following conditions.
  1. The ATF temperature is below 10 °C { 50 °F }.
  2. The accelerator pedal is at the closed throttle position (closed throttle position switch ON) while the vehicle is being driven below 120 km/h { 74 mph }.

6. Drive the vehicle and verify that torque converter clutch operation is obtained.

D range (O/D OFF mode)

1. Turn the O/D OFF switch from OFF to ON.
2. Accelerate the vehicle to half throttle and wide open throttle, and verify that 1–2 and 2–3 upshift and downshift are obtained. The shift points must be as shown in the table below.
3. Drive the vehicle in third and second gears and verify that kickdown occurs for 3→2, 3→1, 2→1, and that the shift points are as shown in the table in the following page.
4. Decelerate the vehicle and verify that engine braking effect is felt in third gear.

Noise and vibration

Drive the vehicle in fourth gear (torque converter clutch operation), fourth gear (torque converter clutch non-operation), and second gear (O/D OFF mode), and listen closely for any out of the ordinary noise or vibration. The torque converter, propeller shaft, and differential can be sources of abnormal noise and vibration if they are not functioning properly. Check these when searching for sources of noise and vibration.

Shift Point

Range	Mode		Throttle condition (Throttle position sensor voltage)	Shift	Vehicle speed km/h { mph }	
					2WD	4WD
D	Except O/D OFF	POWER	Wide open throttle	$D_1 \rightarrow D_2$	51—57 { 32—35 }	54—60 { 34—37 }
				$D_2 \rightarrow D_3$	101—109 { 63—67 }	102—110 { 64—68 }
				TCC ON (D_3)	98—106 { 61—65 }	98—106 { 61—65 }
				$D_3 \rightarrow D_4$	159—169 { 99—104 }	155—165 { 97—102 }
			Half throttle	$D_1 \rightarrow D_2$	39—49 { 25—30 }	39—49 { 25—30 }
				$D_2 \rightarrow D_3$	62—79 { 39—48 }	63—81 { 40—50 }
				TCC ON (D_3)	94—106 { 59—65 }	94—106 { 59—65 }
				$D_3 \rightarrow D_4$	102—131 { 64—81 }	102—131 { 64—81 }
				TCC ON (D_4)	126—154 { 79—95 }	126—154 { 79—95 }
			Closed throttle position	$D_4 \rightarrow D_3$	44—50 { 28—31 }	44—50 { 28—31 }
				$D_3 \rightarrow D_2$	22—28 { 14—17 }	22—28 { 14—17 }
				$D_2 \rightarrow D_1$	6—12 { 4—7 }	6—12 { 4—7 }
			Kickdown	$D_4 \rightarrow D_3$	149—159 { 93—98 }	145—155 { 90—96 }
				$D_3 \rightarrow D_2$	87—95 { 54—58 }	92—100 { 58—62 }
				$D_2 \rightarrow D_1$	42—48 { 27—29 }	42—48 { 27—29 }
		NORMAL	Wide open throttle	$D_1 \rightarrow D_2$	51—57 { 32—35 }	54—60 { 34—37 }
				$D_2 \rightarrow D_3$	101—109 { 63—67 }	102—110 { 64—68 }
				TCC ON (D_3)	98—106 { 61—65 }	98—106 { 61—65 }
				$D_3 \rightarrow D_4$	159—169 { 99—104 }	155—165 { 97—102 }
			Half throttle	$D_1 \rightarrow D_2$	28—36 { 18—22 }	29—38 { 18—23 }
				$D_2 \rightarrow D_3$	54—70 { 34—43 }	52—69 { 33—42 }
				TCC ON (D_3)	94—106 { 59—65 }	94—106 { 59—65 }
				$D_3 \rightarrow D_4$	70—98 { 44—60 }	69—96 { 43—59 }
				TCC ON (D_4)	70—97 { 44—60 }	70—96 { 44—59 }
			Closed throttle position	$D_4 \rightarrow D_3$	22—28 { 14—17 }	22—28 { 14—17 }
				$D_3 \rightarrow D_2$	11—19 { 7—11 }	12—18 { 8—11 }
				$D_2 \rightarrow D_1$	6—12 { 4—7 }	6—12 { 4—7 }
			Kickdown	$D_4 \rightarrow D_3$	126—136 { 79—84 }	145—155 { 90—96 }
				$D_3 \rightarrow D_2$	81—89 { 51—55 }	92—100 { 58—62 }
				$D_2 \rightarrow D_1$	42—48 { 27—29 }	42—48 { 27—29 }
	O/D OFF	POWER	Wide open throttle	$D_1 \rightarrow D_2$	51—57 { 32—35 }	54—60 { 34—37 }
				$D_2 \rightarrow D_3$	101—109 { 63—67 }	102—110 { 64—68 }
				TCC ON (D_3)	98—106 { 61—65 }	98—106 { 61—65 }
			Half throttle	$D_1 \rightarrow D_2$	39—49 { 25—30 }	39—49 { 25—30 }
				$D_2 \rightarrow D_3$	62—79 { 39—48 }	63—81 { 40—50 }
				TCC ON (D_3)	94—106 { 59—65 }	94—106 { 59—65 }
			Closed throttle position	$D_3 \rightarrow D_2$	22—28 { 14—17 }	22—28 { 14—17 }
				$D_2 \rightarrow D_1$	6—12 { 4—7 }	6—12 { 4—7 }
			Kickdown	$D_3 \rightarrow D_2$	87—95 { 54—58 }	92—100 { 58—62 }
				$D_2 \rightarrow D_1$	42—48 { 27—29 }	42—48 { 27—29 }
		NORMAL	Wide open throttle	$D_1 \rightarrow D_2$	51—57 { 32—35 }	54—60 { 34—37 }
				$D_2 \rightarrow D_3$	101—109 { 63—67 }	102—110 { 64—68 }
				TCC ON (D_3)	98—106 { 61—65 }	98—106 { 61—65 }
			Half throttle	$D_1 \rightarrow D_2$	28—36 { 18—22 }	29—38 { 18—23 }
				$D_2 \rightarrow D_3$	54—70 { 34—43 }	52—69 { 33—42 }
				TCC ON (D_3)	94—106 { 59—65 }	94—106 { 59—65 }
			Closed throttle position	$D_3 \rightarrow D_2$	11—19 { 7—11 }	12—18 { 8—11 }
				$D_2 \rightarrow D_1$	6—12 { 4—7 }	6—12 { 4—7 }
			Kickdown	$D_3 \rightarrow D_2$	81—89 { 51—55 }	92—100 { 58—62 }
				$D_2 \rightarrow D_1$	42—48 { 27—29 }	42—48 { 27—29 }

2 RANGE TEST
1. Shift the selector lever to 2 range.
2. Accelerate the vehicle with half throttle and wide open throttle, and verify that second gear is held.
3. Decelerate the vehicle and verify that engine braking effect is felt.

Noise and vibration
Drive the vehicle in second gear and listen closely for any out of the ordinary noise or vibration. The torque converter, propeller shaft, and differential can be sources of abnormal noise and vibration if they are not functioning properly. Check these when searching for sources of noise and vibration.

Shift point

Range	Throttle condition (Throttle position sensor voltage)	Shift	Vehicle speed km/h { mph }	
			2WD	4WD
2	—	TCC ON (2_3)	95—105 { 59—65 }	95—105 { 59—65 }
		$2_3 \rightarrow 2_2$	100—106 { 63—65 }	101—107 { 63—66 }

1 RANGE TEST
1. Shift the selector lever to 1 range.
2. Accelerate the vehicle with half throttle and wide open throttle, and verify that first gear is held.
3. Decelerate the vehicle and verify that engine braking effect is felt.

Noise and vibration
Drive the vehicle in second gear and listen closely for any out of the ordinary noise or vibration. The torque converter, propeller shaft, and differential can be sources of abnormal noise and vibration if they are not functioning properly. Check these when searching for sources of noise and vibration.

Shift point

Range	Throttle condition (Throttle position sensor voltage)	Shift	Vehicle speed km/h { mph }	
			2WD	4WD
1	—	$1_2 \rightarrow 1_1$	43—49 { 27—30 }	45—51 { 28—31 }

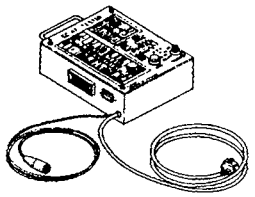
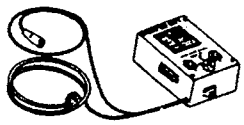
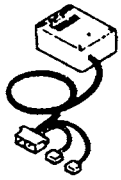
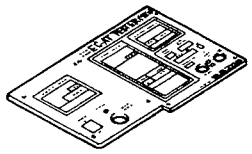
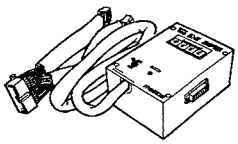
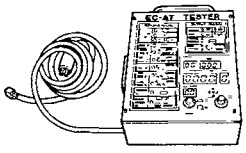
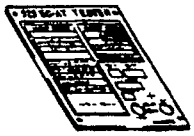
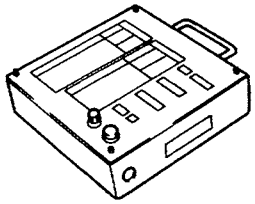
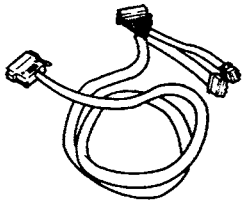
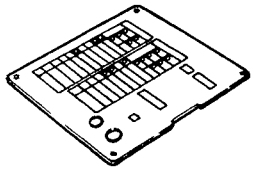
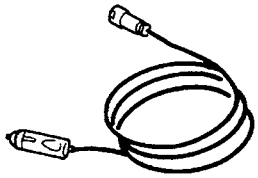
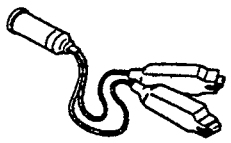
P POSITION TEST
Shift the selector lever into P position on a gentle slope, release the brake, and verify that the vehicle does not roll.

Evaluation

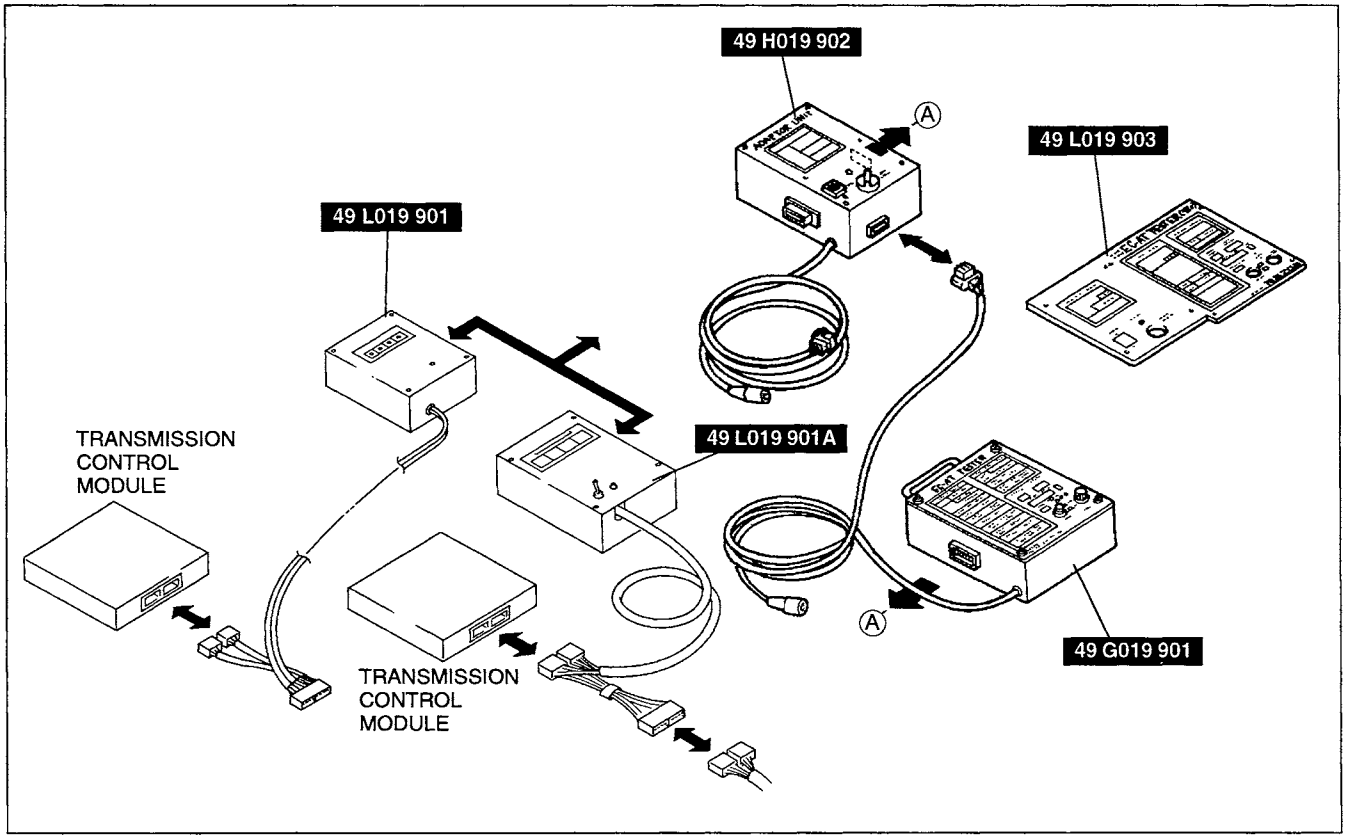
Condition		Possible Cause
Shifting	Starts in second gear or shifts directly from first gear to fourth gear	Stuck shift solenoid A Stuck shift valve A
	Starts in fourth gear	Stuck shift solenoid B Stuck shift valve B
	No shift	Stuck shift solenoid A and/or B Stuck shift valve A and/or B
	Incorrect shift points	Throttle position sensor out of adjustment Output speed sensor not operating properly
Shift shock felt or slipping		Stuck pressure control solenoid Accumulators not operating properly Throttle position sensor out of adjustment Output speed sensor not operating properly Transmission fluid temperature sensor not operating properly Worn clutches, one-way clutches, and/or brakes
No engine braking		Stuck overrunning clutch solenoid Worn clutches and/or brakes
Torque converter clutch non-operation		Stuck torque converter clutch solenoid Stuck torque converter clutch control valve

ELECTRICAL SIGNAL INSPECTION

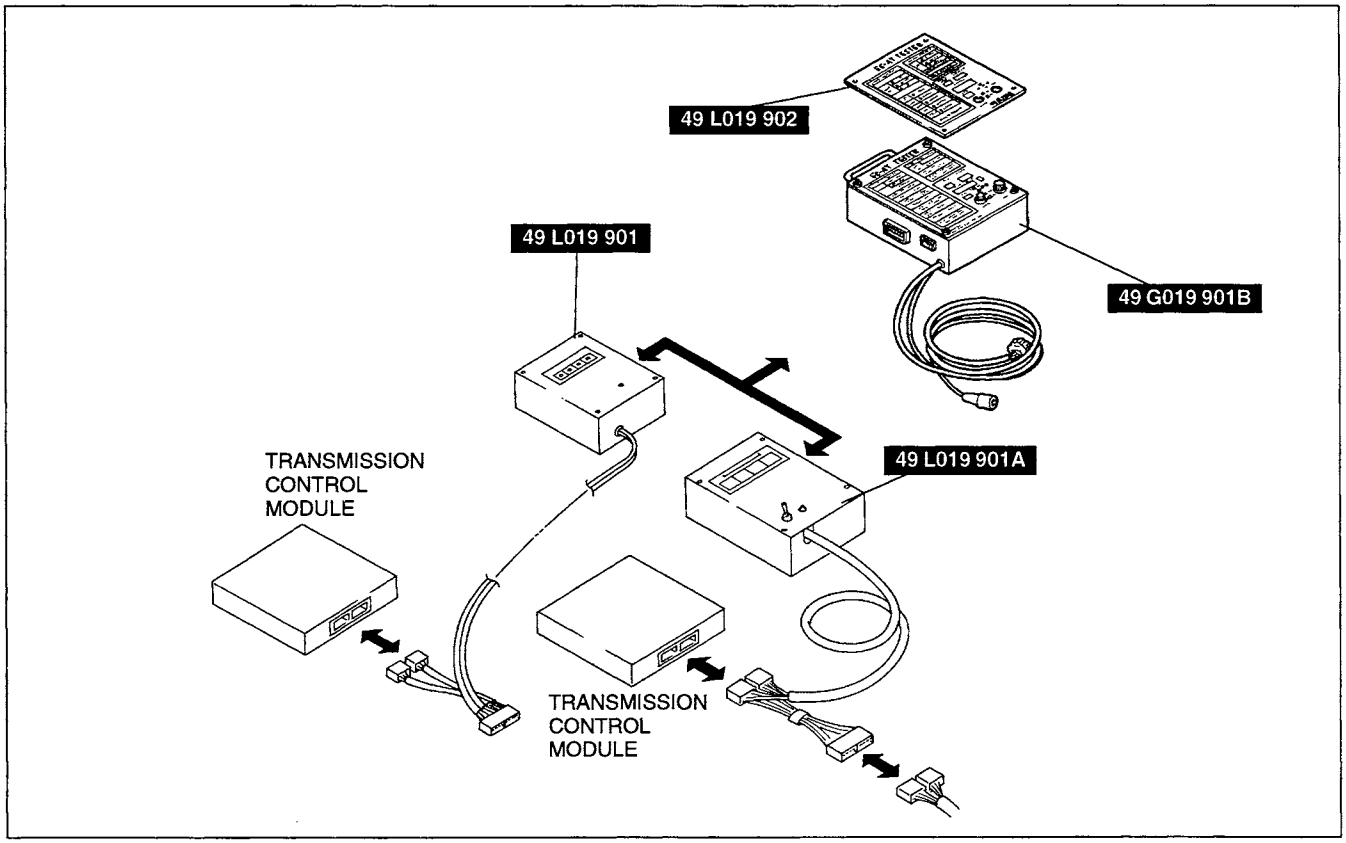
PREPARATION
SST

49 G019 901 EC-AT Tester 	For inspection of electrical signal	49 H019 902 Adapter 	For inspection of electrical signal
49 L019 901 Adapter 	For inspection of electrical signal	49 L019 903 Panel 	For inspection of electrical signal
49 L019 901A Adapter 	For inspection of electrical signal	49 G019 901B EC-AT Tester 	For inspection of electrical signal
49 L019 902 Panel 	For inspection of electrical signal	49 G019 901C EC-AT Tester 	For inspection of electrical signal
49 L019 906 Adapter Harness 	For inspection of electrical signal	49 H019 913 Panel 	For inspection of electrical signal
49 G019 929 Power Harness 	For inspection of electrical signal	49 D088 008 Harness Adapter, Power 	For inspection of electrical signal

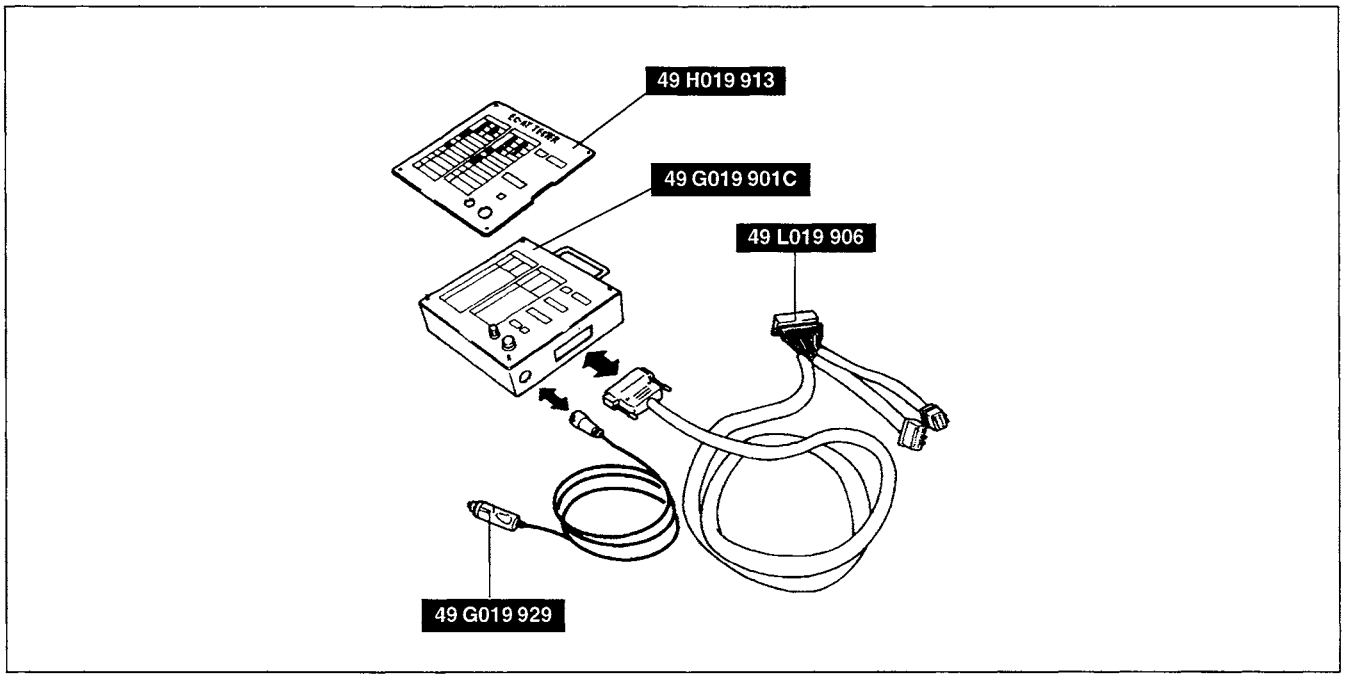
ELECTRICAL SIGNAL INSPECTION
Assembly of SST
EC-AT tester (49 G019 901) and Adapter (49 H019 902)

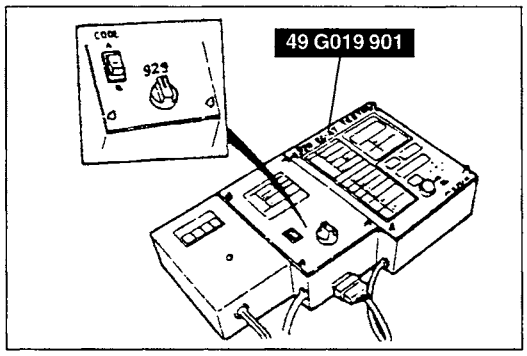


EC-AT tester (49 G019 901B)



EC-AT tester (49 G019 901C)



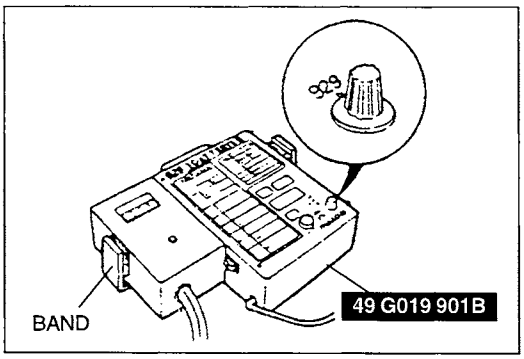


Inspection Procedure

Caution
- **Do not connect the NGS to the data link connector 2 when EC-AT tester is connected to the transmission control module.**
  Doing so can cause incorrect test results.

When using the EC-AT tester (49 G019 901) and adapter (49 L019 901)
1. Assemble the **SST**. (Refer to page K1–18.)
2. Set the **SST** (49 H019 902) vehicle switch to 929 position.
3. Turn the ignition switch and EC-AT tester main switch to ON.
4. Check indication of the respective light or digital display in each condition referring to the indication table on page K1–21.

When using the EC-AT tester (49 G019 901) and adapter (49 L019 901A)
1. Assemble the **SST**. (Refer to page K1–18.)
2. Set he **SST** (49 H019 902) vehicle switch to 929 position and **SST** (49 L019 901A) vehicle switch to MPV position.
3. Turn the ignition switch and EC-AT tester main switch to ON.
4. Check indication of the respective light or digital display in each condition referring to the indication table on page K1–21.

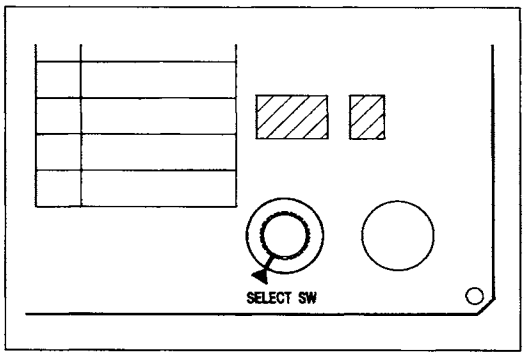


When using the EC-AT tester (49 G019 901B) and adapter unit (49 L019 901)

1. Assemble the **SST**. (Refer to page K1–18.)
2. Set the **SST** (49 G019 901B) vehicle switch to 929 position.
3. Turn the ignition switch and the EC-AT tester main switch to ON.
4. Check indication of the respective light or digital display in each condition, referring to the indication table on page K1–21.

When using the EC-AT tester (49 G019 901B) and adapter unit (49 L019 901A)

1. Assemble the **SST**. (Refer to page K1–18.)
2. Set the **SST** (49 G019 901B) vehicle switch to 929 position and **SST** (49 L019 901A) vehicle switch to MPV position.
3. Turn the ignition switch and the EC-AT tester main switch to ON.
4. Check indication of the repsective light or digital display in each condition, referring to the indication table on page K1–21.



When using the EC-AT tester (49 G019 901C)

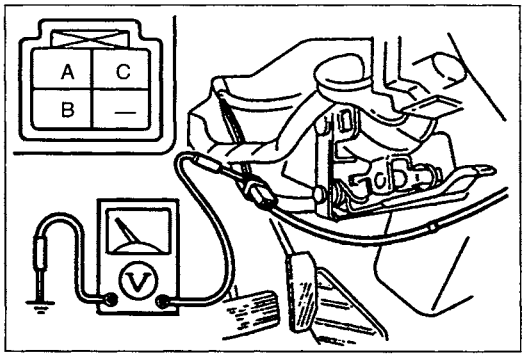
1. Assemble the **SST**. (Refer to page K1–19.)
2. Turn the **SST** select switch to the ▲ mark on the panel.
3. Turn the ignition switch and the **SST** main switch to ON.
4. Check indication of the respective light or digital display in each condition, referring to the indication table on page K1–22.

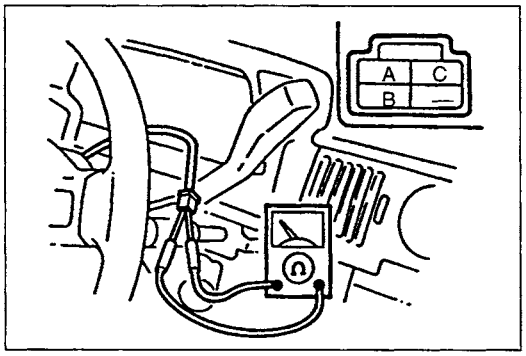
Indication Table
Indication table of light and digital display
EC-AT tester (49 G019 901 or 49 G019 901B)

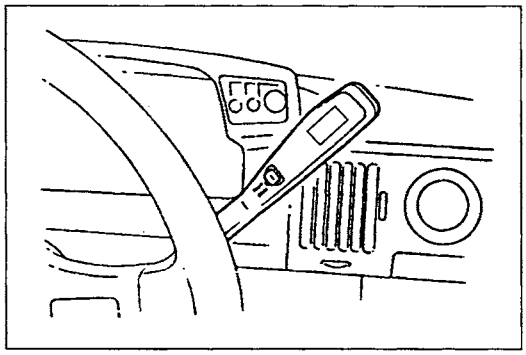
Item		Indication	Condition	Possible cause
Input (Light)				
Transmission range switch (INHIBITOR SW)	P, N	ON	P or N position	Transmission range switch or wiring
		OFF	R position, all ranges	
	D	ON	D position	
		OFF	Other ranges, all positions	
	2 (S)	ON	2 range	
		OFF	Other ranges, all positions	
	1 (L)	ON	1 range	
		OFF	Other ranges, all positions	
	R	ON	R position	
		OFF	Other positions, all ranges	
MODE SW		Not used		
HOLD SW		Not used		
Transmission fluid temperature sensor (ATF THERMOSENSOR)		ON	ATF temperature above 40 °C { 140 °F }	Transmission fluid temperature sensor
		OFF	ATF temperature below 40 °C { 140 °F }	
Closed throttle position switch (IDLE SW)		ON	Closed throttle position	Closed throttle position switch or wiring
		OFF	Other position	
Barometric pressure sensor (ATMOSPHERIC PRESSURE SENSOR)		OFF	Normal condition	Barometric pressure sensor wiring
		ON	Atmospheric pressure below 89.5 kPa { 672 mmHg , 26.4 inHg } at 1,500 m { 4,921 ft }	
4GR inhibit signal (CRUISE CONTROL SW)		ON	Normal condition	Cruise control module or wiring
		OFF	Set or resume switch ON or vehicle speed 8 km/h { 5 mph } lower than preset speed	
Input (Digital Display)				
Throttle position sensor voltage (THROTTLE SENSOR V.)		TCM terminal voltage	Constant	Throttle position sensor or wiring
VEHICLE SPEED km/h		Vehicle speed	Vehicle moving	Vehicle speedometer sensor, vehicle speed sensor, or wiring
ENGINE RPM		Engine rpm	Constant	Engine control module or wiring
Output (Light)				
SOLENOID	Shift solenoid A (SHIFT A)	ON	1GR and 4GR position	Transmission control module, shift solenoid A, or wiring
		OFF	2GR and 3GR position	
	Shift solenoid B (SHIFT B)	ON	1GR and 2GR position	Transmission control module, shift solenoid B, or wiring
		OFF	3GR and 4GR position	
	Overrunning clutch	ON	Other than below	Transmission control module, overrunning clutch solenoid valve, or wiring
		OFF	Engine braking and 3–2 timing control applied	
	TCC (LOCKUP)	Bright	TCC operation	Transmission control module, torque converter clutch solenoid valve, or wiring
		Dim	TCC non-operation	
	Pressure control (LINE PRESSURE)	ON (Bright↔Dim)	While driving (Accelerator released↔depressed)	Transmission control module, pressure control solenoid, or wiring
HOLD INDICATOR		Not used		
MODE INDICATOR		Not used		
GEAR	1	ON	First gear	—
	2	ON	Second gear	
	3	ON	Third gear	
	4	ON	Fourth gear	

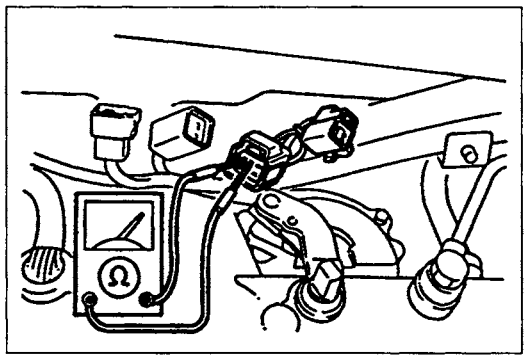
EC-AT tester (49 G019 901 C)

Item		Indication	Condition	Possible cause
Input (Light)				
TRANSMISSION RANGE SWITCHW	P/N	ON	P or N position	Transmission range switch or wiring
		OFF	R position, all ranges	
	R	ON	R position	
		OFF	Other positions, all ranges	
	D	ON	D range	
		OFF	Other ranges, all positions	
	2 (S)	ON	2 range	
		OFF	Other ranges, all positions	
	1 (L)	ON	1 position	
		OFF	Other ranges, all positions	
HOLD/O/D OFF SWITCH		ON	O/D OFF switch ON	O/D OFF switch or wiring
		OFF	O/D OFF switch OFF	
CLOSED THROTTLE POSITION SWITCH		ON	Closed throttle position	Closed throttle position switch or wiring
		OFF	Other position	
Input (Digital Display)				
THROTTLE POSITION SENSOR (V)		TCM terminal voltage	Constant	Throttle position sensor or wiring
VEHICLE SPEED (km/h)		Vehicle speed	Vehicle moving	Vehicle speedometer sensor, vehicle speed sensor, or wiring
TURBINE SPEED (rpm)		Not used		
TFT SENSOR (V)		TCM terminal voltage	Constant	Transmission fluid temperature sensor or wiring
Output (Light)				
SOLENOID	SHIFT A	ON	1GR and 4GR position	Transmission control module, shift solenoid A, or wiring
		OFF	2GR and 3GR position	
	SHIFT B	ON	1GR and 2GR position	Transmission control module, shift solenoid B, or wiring
		OFF	3GR and 4GR position	
	TCC CONTROL	Bright	TCC operation	Transmission control module, torque converter clutch solenoid valve, or wiring
		Dim	TCC non-operation	
	PRESSURE CONTROL	ON (Bright↔Dim)	While driving (Accelerator released↔depressed)	Transmission control module, pressure control solenoid, or wiring
	OVERRUNNING	ON	Other than below	Transmission control module, overrunning clutch solenoid valve, or wiring
		OFF	Engine braking and 3–2 timing control applied	
HOLD/O/D OFF INDICATOR LIGHT		Not used		
Output (Digital Display)				
GEAR POSITION		1	First gear	—
		2	Second gear	
		3	Third gear	
		4	Fourth gear	









ELECTRONIC SYSTEM COMPONENTS

O/D OFF SWITCH

Inspection

Terminal voltage

1. Remove the column covers.
2. Turn the ignition switch to ON.
3. Check the voltage between terminal C and a ground.

B+: Battery positive voltage

Terminal voltage	Switch
B+	Released
0 V	Depressed

4. If not correct, go to the next step.

Continuity

1. Disconnect the connector.
2. Check continuity between terminals A and C.

Continuity	Switch
Yes	Released
No	Depressed

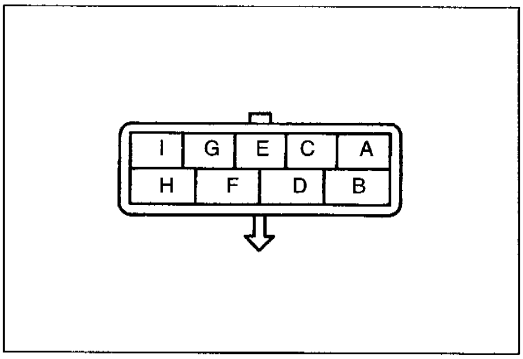
3. If not correct, replace the change knob as an assembly.

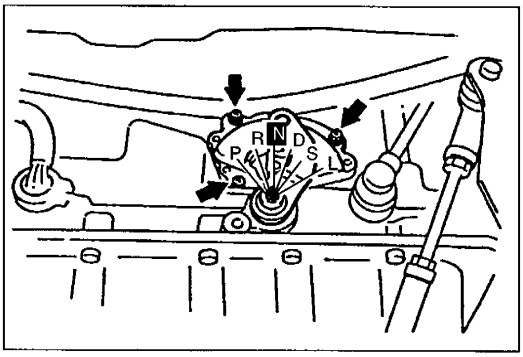
TRANSMISSION RANGE SWITCH

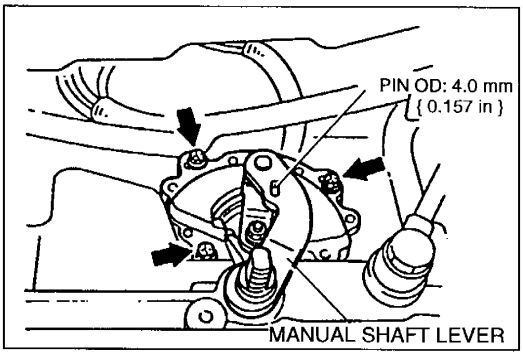
Inspection

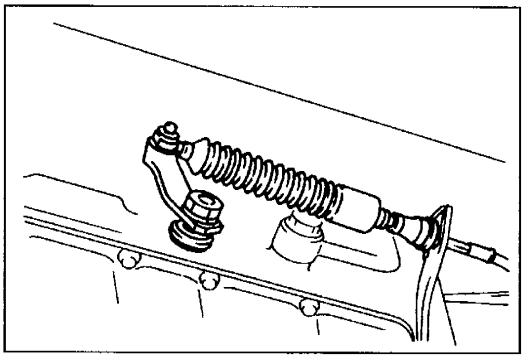
Operation

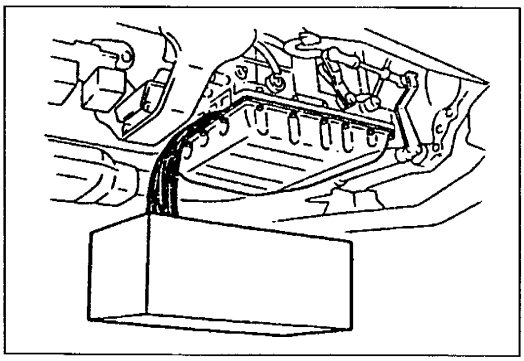
1. Verify that the starter operates with the ignition switch at the START position and the selector lever in P or N position only, and that it does not operate in any other position.
2. Verify that the back-up lights illuminate when the selector lever is shifted to R position with the ignition switch in the ON position.
3. Check the transmission range switch if not as specified.











Continuity

1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Remove the selector cable.
3. Remove the manual shaft nut and lever.
4. Disconnect the transmission range switch connector.
5. Check continuity of the terminals.

Position	Connector terminal								
	A	B	C	D	E	F	G	H	I
P	○				○			○	
		○							
R	○		○						
N	○					○			
		○						○	
D	○						○		
2	○			○					
1	○								○

○—○: Indicates continuity

6. If not correct, adjust the transmission range switch.
7. If correct, check or adjust the selector lever and selector cable. (Refer to page K1–138.)

Adjustment

1. Move the manual shaft to N position.
2. Loosen the transmission range switch mounting bolts.
3. Align the holes of the transmission range switch and the manual shaft lever and insert an **approx. 4.0 mm { 0.157 in }** outer diameter pin through the holes.
4. Tighten the mounting bolts, and remove the pin.

Tightening torque:
2.5—3.9 N·m { 25—40 kgf·cm , 22—34 in·lbf }

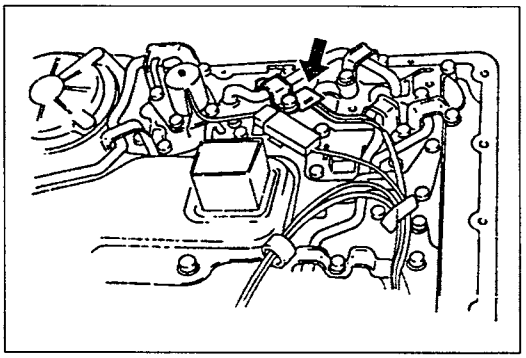
5. Recheck the continuity of the transmission range switch.
6. If not correct, replace the transmission range switch.
7. Install the lever and manual shaft nut.

Tightening torque:
30—39 N·m { 3.0—4.0 kgf·m , 22—28 ft·lbf }

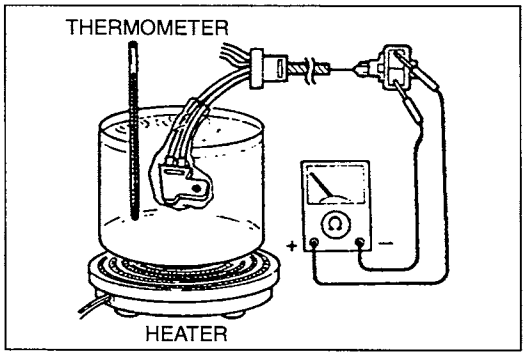
8. Install the selector cable.

TRANSMISSION FLUID TEMPERATURE SENSOR
Inspection

1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Loosen the oil pan mounting bolts, and drain the ATF into a container.

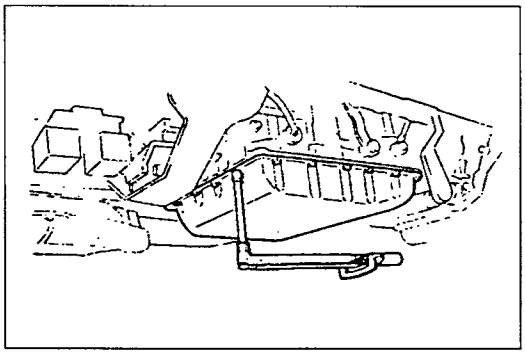


3. Remove the oil pan. (Refer to page K1–30.)
4. Remove the control valve body and solenoid connector. (Refer to page K1–112.)

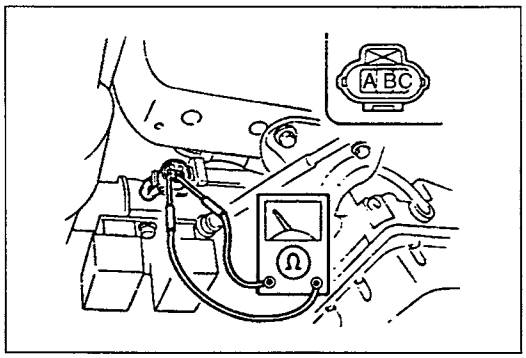


5. Place the transmission fluid temperature sensor in water with a thermometer as shown and heat the water gradually.
6. Measure the resistance between the terminals. If necessary, replace the transmission fluid temperature sensor.

Water temperature	Resistance
20 °C { 68 °F }	Approx. 2.5 kΩ
80 °C { 176 °F }	Approx. 0.3 kΩ



7. Install the solenoid connector and control valve body. (Refer to page K1–114.)
8. Install the oil pan. (Refer to pege K1–30.)
9. Pour in ATF, and with the engine idling, check the ATF level and check for leaks. (Refer to page K1–30.)
10. Carry out the time lag test and the line pressure test. (Refer to page K1–8.)
11. Carry out the road test. (Refer to page K1–13.)

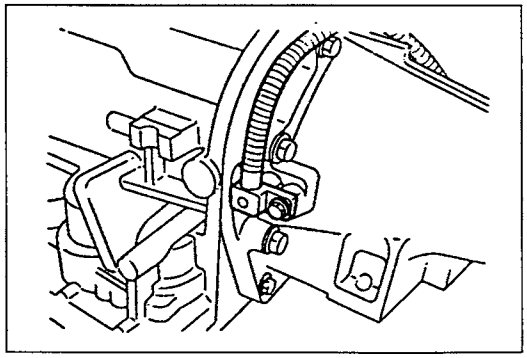


OUTPUT SPEED SENSOR

Inspection

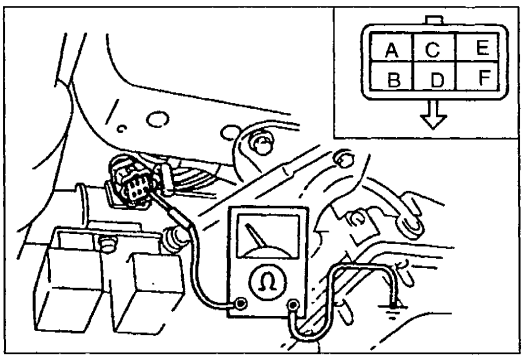
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Disconnect the connector.
3. Measure the resistance between the terminals.

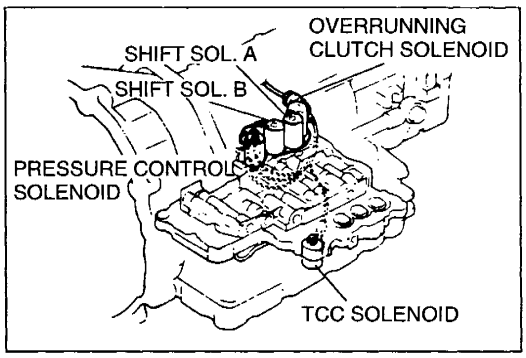
Terminal	Resistance
A and B	504—616 Ω
B and C	∞
A and C	∞



4. If not correct, replace the output speed sensor.

Tightening torque:
5.0—6.8 N·m { 50—70 kgf·cm , 44—60 in·lbf }





SOLENOID VALVES

Inspection

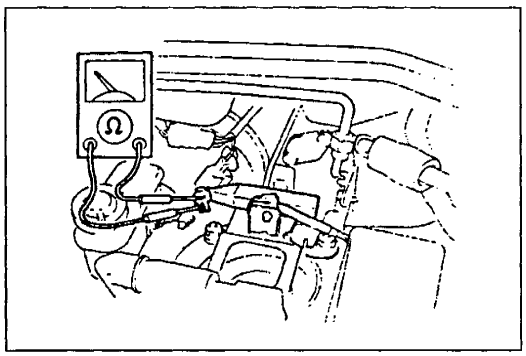
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Disconnect the connector.
3. Measure the resistance between the terminals.

Note

- Terminal A is for the transmission fluid temperature switch (4WD).

Terminal	Connected to	Resistance
B	Shift solenoid A	20—40 Ω
C	Shift solenoid B	20—40 Ω
D	Overrunning clutch solenoid	20—40 Ω
E	Pressure control solenoid	2.5— 5 Ω
F	TCC solenoid	10—20 Ω

4. If the resistance is not within the specification, replace the solenoid. If the shift A, shift B, overrunning clutch, or pressure control solenoid resistance is not correct, then replace those 4 solenoids as an assembly.



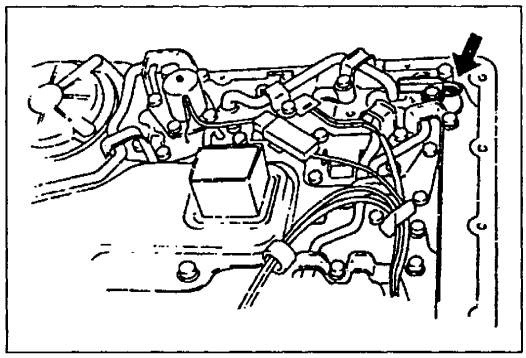
DROPPING RESISTOR

Inspection

1. Disconnect the dropping resistor connector.
2. Measure the resistance of the terminals.

Resistance: 10—14 Ω

3. If not correct, replace the dropping resistor.



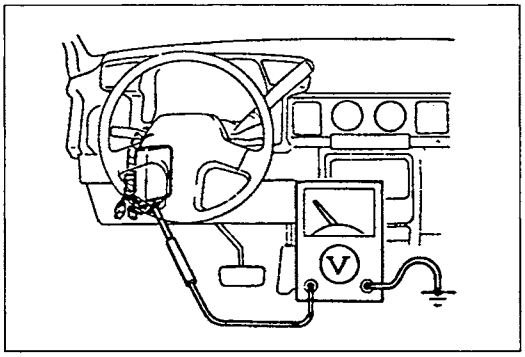
TRANSMISSION FLUID TEMPERATURE SWITCH (4WD)

Inspection

1. Drain the ATF. (Refer to transmission fluid temperature sensor inspection; page K1–24, steps 1—3.)
2. Remove the control valve body and disconnect the solenoid connector. (Refer to page K1–112.)
3. Place the transmission fluid temperature switch in ATF with a thermometer as shown, and heat the fluid gradually.
4. Measure the continuity between terminal and bracket.

Fluid temperature	Continuity
Above 150 °C { 302 °F }	Yes
Below 145 °C { 293 °F }	No

5. If not correct, replace the transmission fluid temperature switch.
6. Install the solenoid connector and control valve body. (Refer to page K1–114.)
7. Add ATF to the correct level. (Refer to transmission fluid temperature sensor inspection; page K1–24, steps 8, 9.)
8. Carry out the time lag test and line pressure test. (Refer to page K1–8.)
9. Carry out the road test. (Refer to page K1–13.)



TRANSMISSION CONTROL MODULE

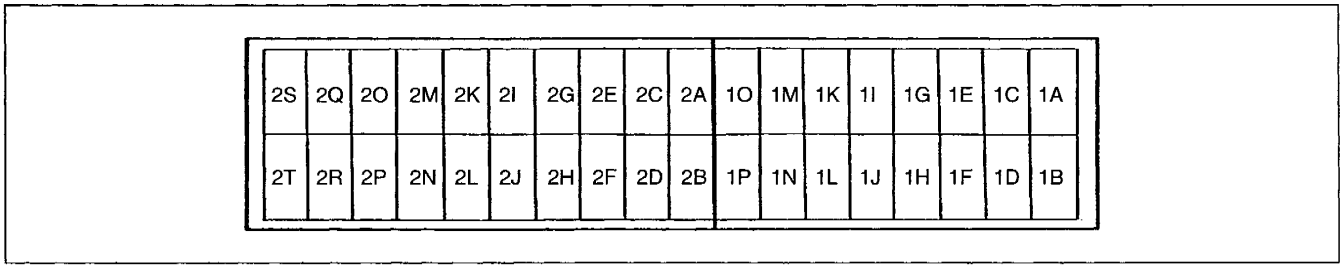
Inspection

1. Turn the ignition switch to ON, and check the transmission control module terminal voltage, referring to the Terminal Voltage Chart.
2. If not correct, check or replace the component(s), wiring, and/or transmission control module.

Terminal Voltage Chart (Reference Data)

Note

- Use the ground of terminal 1J of the transmission control module when measuring terminal voltage, as an error may occur when the negative (–) lead of the circuit tester is connected to ground.



B+: Battery positive voltage

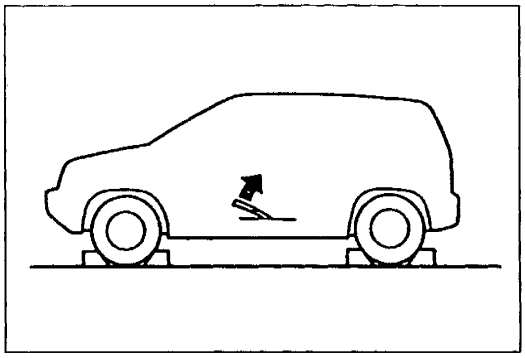
Terminal	Connected to	Voltmeter		Voltage	Condition
		+ terminal	– terminal		
1A	Battery	1A	Ground	B+	Constant
1B	Shift solenoid B	1B		B+	Solenoid ON in following condition: • 1GR and 2GR positions
				0 V	Solenoid OFF in following condition: • 3GR and 4GR positions
1C	—	—	—	—	—
1D	Shift solenoid A	1D	Ground	B+	Solenoid ON in following condition: • 1GR and 4GR positions
				0 V	Solenoid OFF in following condition: • 2GR and 3GR positions
1E	Transmission range switch (R position)	1E		B+	R position
				0 V	Other positions and all ranges
1F	Pressure control solenoid	1F		Below 1.5 V	Accelerator pedal depressed (After ATF warm, engine stopped)
				1.7—4.5 V	Accelerator pedal fully released (After ATF warm, engine stopped)
1G	Engine speed input signal*	1G		Above 1 V **(AC)**	Engine running
				Below 0.5 V **(AC)**	Engine stopped
1H	Dropping resistor	1H		B+	Accelerator pedal fully released (After ATF warm, engine stopped)
				Below 1.5 V	Accelerator pedal depressed (After ATF warm, engine stopped)
1I	Vehicle speed sensor	1I		2—3 V	While driving
				0 V or 4.5—5.5 V	Vehicle stopped
1J	—	1J		0 V	Constant
1K	O/D OFF indicator light	1K		B+	Except O/D OFF mode
				0 V	O/D OFF mode
1L	—	1L		0 V	Constant
1M	TCC solenoid	1M		B+	Solenoid ON, TCC operation
				Below 1.5 V	Solenoid OFF, TCC non-operation
1N	—	—	—	—	—
1O	Overrunning clutch solenoid	1O	Ground	B+	Solenoid ON in following condition: • D range (Engine stopped)
				0 V	Solenoid OFF in following condition: • Except D range (Engine stopped)
1P	Battery	1P		B+	Ignition switch ON
				0 V	Ignition switch OFF

* Checked with AC range

B+: Battery positive voltage

Terminal	Connected to	Voltmeter		Voltage	Condition
		+ terminal	– terminal		
2A	Throttle position sensor	2A	2L	4.5—5.5 V	Ignition switch ON
				0 V	Ignition switch OFF
2B	Transmission range switch (D range)	2B	Ground	B+	D range
				0 V	Other ranges and all positions
2C	—	—	—	—	—
2D	Transmission range switch (N and P positions)	2D	Ground	B+	R position and all ranges
				0 V	P or N position
				Below 7 V	P or N position and engine crank
2E	Cruise control module	2E		Above 6 V	Normal conditions
				Below 1.5 V	Set or resume switch ON or vehicle speed 8 km/h (5 mph) lower than preset speed (Driving vehicle cruise control operation)
2F	—	—	—	—	—
2G	Engine control module	2G	Ground	Above 6 V	Normal condition
				Below 1.5 V	Atmospheric pressure below 89.5 kPa { 672 mmHg , 26.4 inHg } at 1,500 m { 4,921 ft }
2H	—	—	—	—	—
2I	O/D OFF switch	2I	Ground	Above 6 V	Switch released
				0 V	Switch depressed
2J	Output speed sensor	2J		Above 1 V **(AC)**	Vehicle speed above 25 km/h { 16 mph }
				Approx. 0 V **(AC)**	Vehicle stopped
2K	TEST signal	2K		B+	Ignition switch ON
				Below 1.0 V or repeat B+ and 0 V	TEST mode
2L	Ground (For sensors)	2L		0 V	Constant
2M	Closed throttle position switch	2M		B+	Closed throttle position switch OFF (Throttle valve open)
				0 V	Closed throttle position switch ON (Throttle valve wide open throttle)
2N	FAIL signal	2N		Below 1.0 V or repeat B+ and 0 V	Other modes
				B+	TEST mode
2O	—	—	—	—	—
2P	—	—	—	—	—
2Q	Transmission range switch (L range)	2Q	Ground	B+	L range
				0 V	Other ranges and all positions
2R	Transmission fluid temperature sensor	2R	2L	Approx. 2.4—0.4 V	While warming up ATF Note Approx. 1.8 V: ATF temp. 10 °C { 50 °F } Approx. 1.1 V: ATF temp. 40 °C { 104 °F }
2S	Transmission range switch (S range)	2S	Ground	B+	S range
				0 V	Other ranges and all positions
2T	Throttle position sensor	2T	2L	Approx. 0.4—4.4 V	Throttle valve moved from closed throttle position to wide open throttle

* Checked with AC range

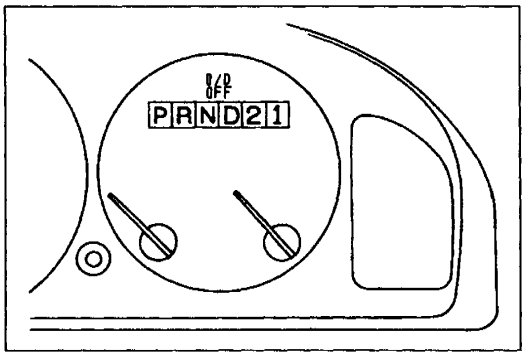


AUTOMATIC TRANSMISSION FLUID (ATF)

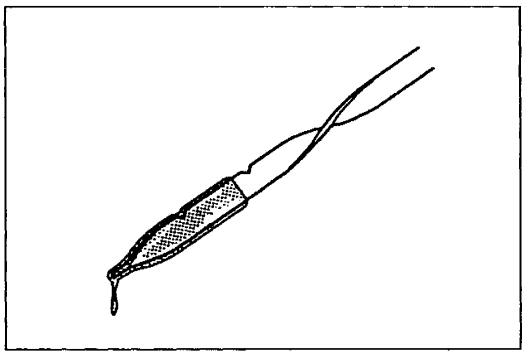
INSPECTION

Level

1. Park the vehicle on level ground.
2. Apply the parking brake and position wheel chocks securely to prevent the vehicle from rolling.
3. Warm up the engine until the ATF reaches **60—70 °C { 140—158 °F }**.

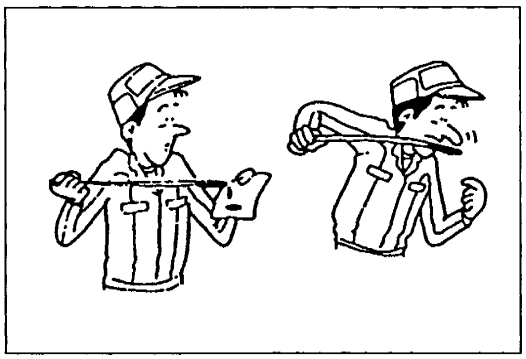


4. While the engine is idling, shift the selector lever from P position to 1 range and back again.
5. Let the engine idle.
6. Shift the selector lever to P position.



7. Ensure that the ATF level is between the notches on the transmission level gauge. Add ATF to specification if necessary.

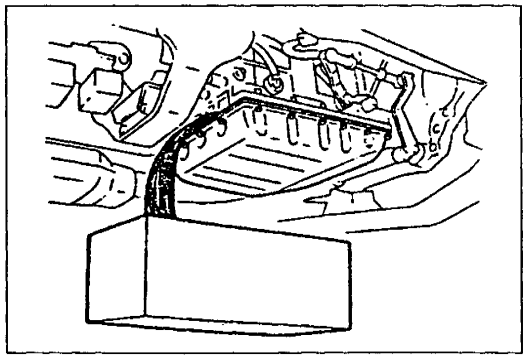
   ATF type: Dexron®II or M-III



Condition

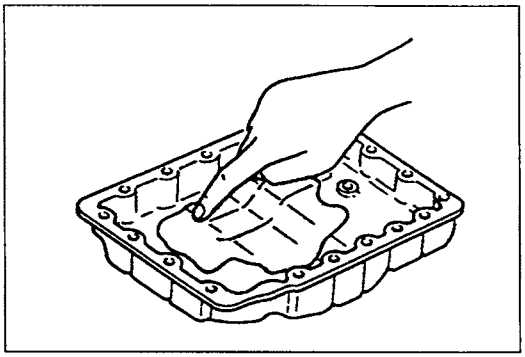
One way of determining whether the transmission should be disassembled is by noting;

1. If the ATF is muddy or varnished.
2. If the ATF smells strange or unusual.

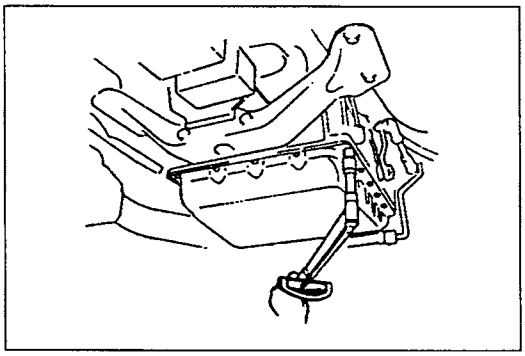


REPLACEMENT

1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Loosen the oil pan mounting bolts, and drain the ATF into a container.



3. Remove the oil pan and gasket.
4. Clean the oil pan and the magnet.



5. Remove any old locking compound from the bolt holes.
6. Install the oil pan along with a new gasket.
7. Tighten new oil pan mounting bolts evenly and quickly.

   Tightening torque:
   6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }

8. Lower the vehicle and add **approx. 4.0 L { 4.2 US qt , 3.5 Imp qt }** ATF.

   ATF type: Dexron®II or M-III

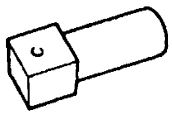
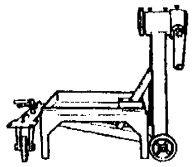
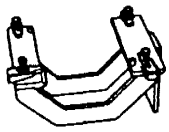
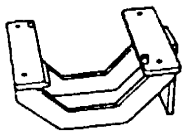
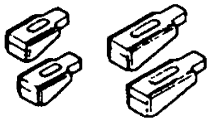
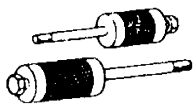
9. Check the ATF level. (Refer to page K1–30.)

TRANSMISSION

TRANSMISSION UNIT (REMOVAL)

Preparation

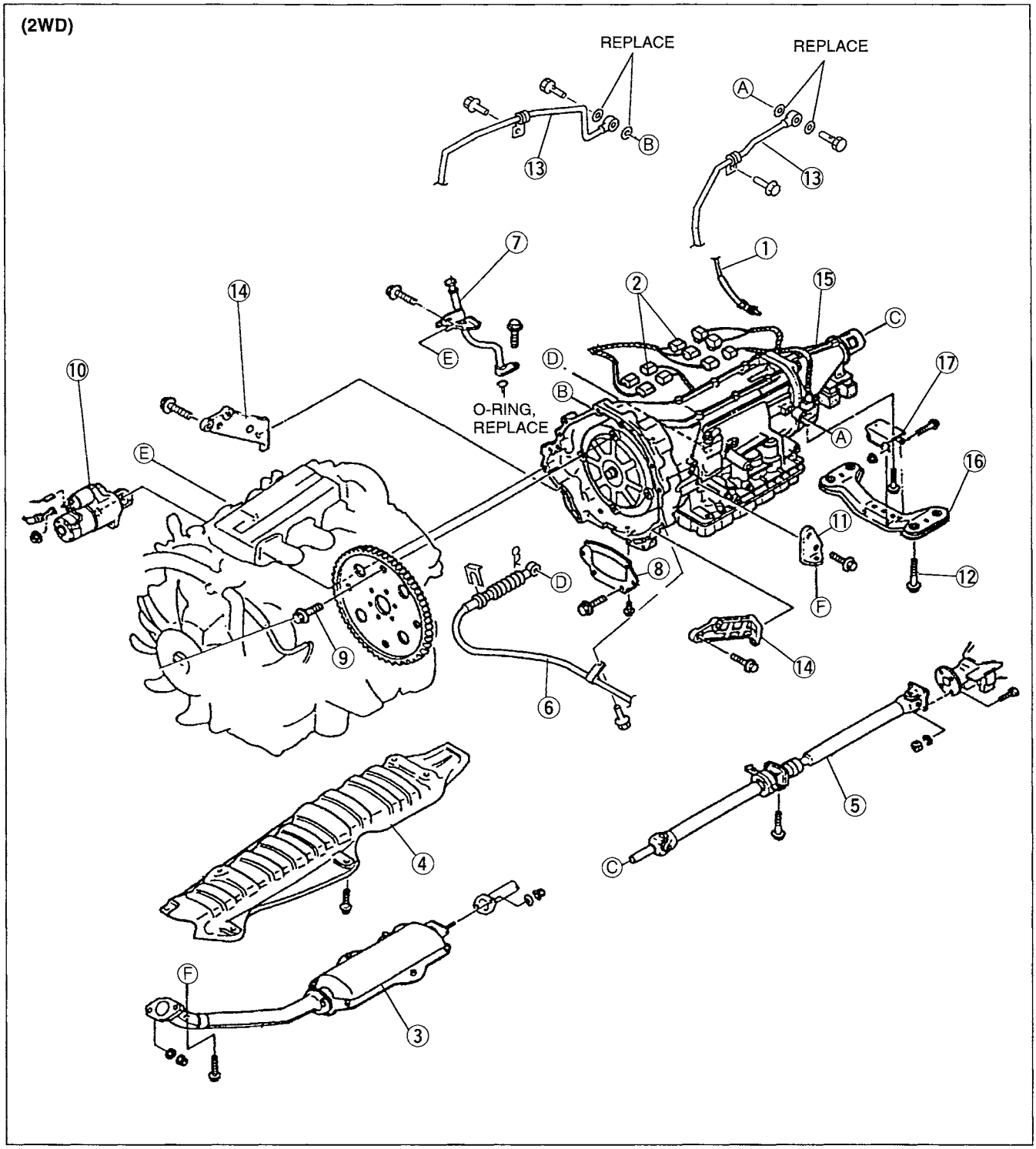
SST

49 S120 440 Holder, mainshaft 	For prevention of ATF leakage	49 0107 680A Engine stand 	For disassembly of transmission
49 U019 0A0A Transmission hanger 	For disassembly of transmission	49 H075 495B Body (Part of 49 U019 0A0A) 	For disassembly of transmission
49 U019 003 Holder (Part of 49 U019 0A0A) 	For disassembly of transmission	49 0378 390 Puller, oil pump 	For disassembly of transmission

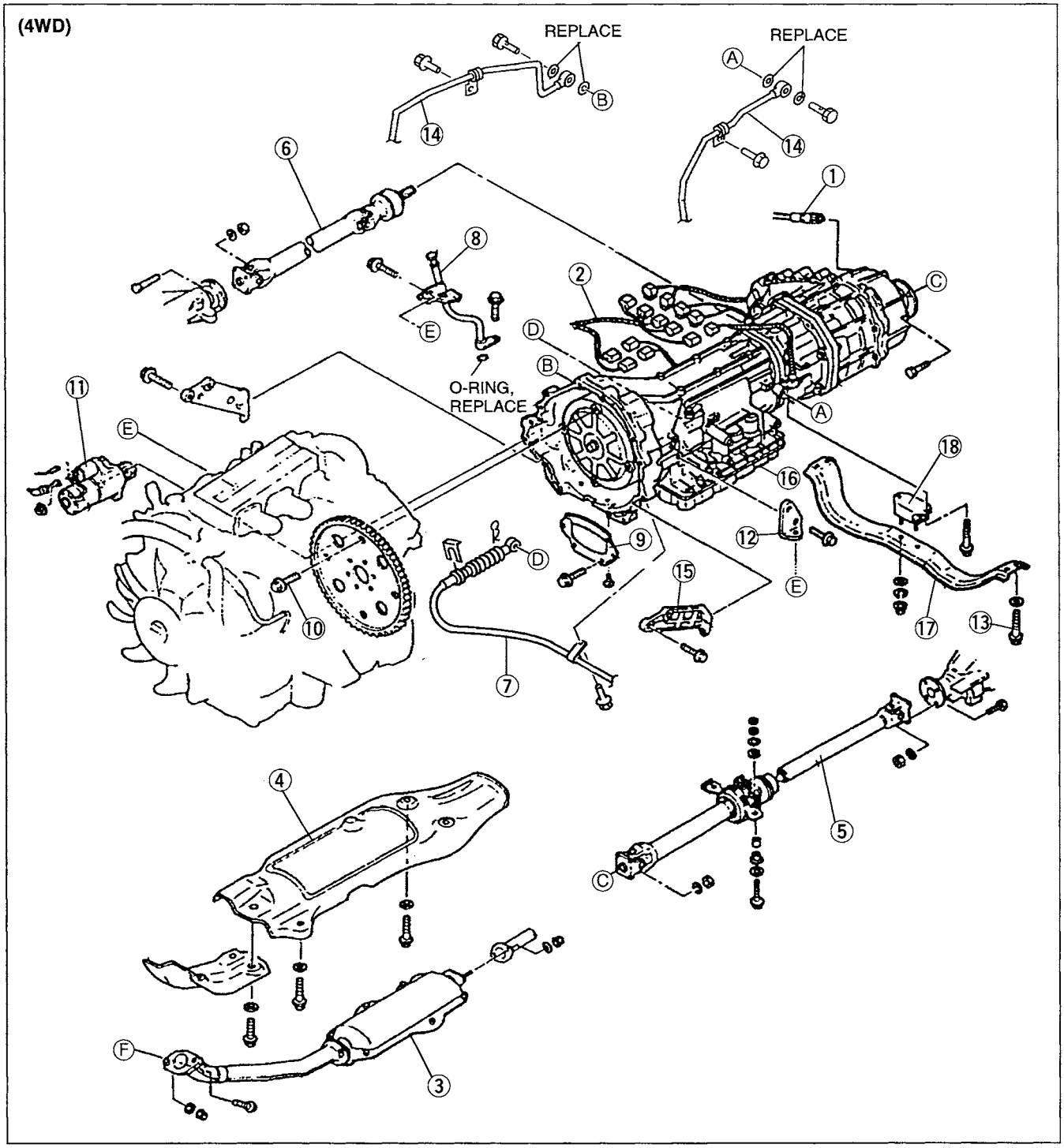
Removal

The oil pan could contain small chips, shavings, and other particles helpful in checking the condition of the transmission and diagnosing certain problems. To ensure that all foreign particles stay in the oil pan, make sure that the transmission is never tipped completely over while the oil pan is still installed.

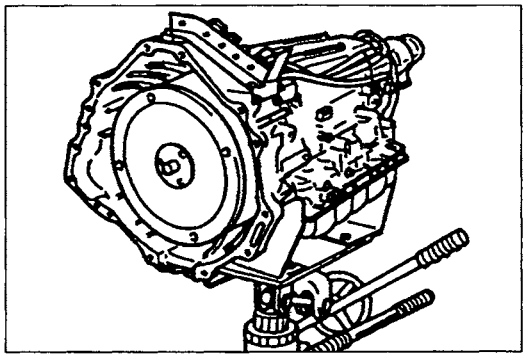
1. Disconnect the negative battery cable.
2. On level ground, jack up the vehicle and support it evenly on safety stands.
3. Drain the ATF into a container.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. After removal, remove the oil pan to check condition of the transmission.



1. Speedometer cable
2. Connector
3. Exhaust pipe
4. Heat insulator
5. Propeller shaft
   Removal ..... section L
6. Selector cable
7. Filler tube
8. Undercover
9. Torque converter mounting bolt
10. Starter
11. Exhaust pipe bracket
12. Transmission mount mounting bolt
13. Oil pipe
14. Gusset plate
15. Transmission
    Disassembly ..... page K1– 35
    Assembly ..... page K1–116
16. Transmission lower mount
17. Transmission upper mount



1. Speedometer cable
2. Connector
3. Exhaust pipe
4. Heat insulator
5. Rear propeller shaft
   Removal ..... section L
6. Front propeller shaft
   Removal ..... section L
7. Selector cable
8. Filler tube
9. Undercover
10. Torque converter mounting bolt
11. Starter
12. Exhaust pipe bracket
13. Transmission mount mounting bolt
14. Oil pipe
15. Gusset plate
16. Transmission
    Disassembly ..... page K1– 35
    Assembly ..... page K1–116
17. Transmission lower mount
18. Transmission upper mount



Removal note
Transmission

Set the transmission onto the transmission jack, paying special attention not to damage the oil pipes. Make sure that the torque converter side of the transmission is tilted slightly upward during removal. Carefully lower the transmission from the vehicle.

TRANSMISSION UNIT (DISASSEMBLY)

Precaution
General notes:

The oil pan could contain small chips, shavings, and other particles helpful in checking the condition of the transmission and diagnosing certrain problems. To ensure that all foreign particles stay in the oil pan, make sure that the transmision is never tipped completely over while the oil pan is still installed.

1. Disassemble the transmission in a clean area (dustproof work space) to prevent entry of dust into the mechanisms.
2. Inspect the individual transmission components in accordance with the QUICK DIAGNOSIS CHART during disassembly.
3. Use only plastic hammers when applying force to separate the light alloy case joints.
4. Never use rags during disassembly; they may leave particles that can clog fluid passages.
5. Several parts resemble one another; arrange them so that they do not get mixed up.
6. Disassemble the control valve assembly and thoroughly clean it when the clutch or brake band has burned or when the ATF has degenerated.

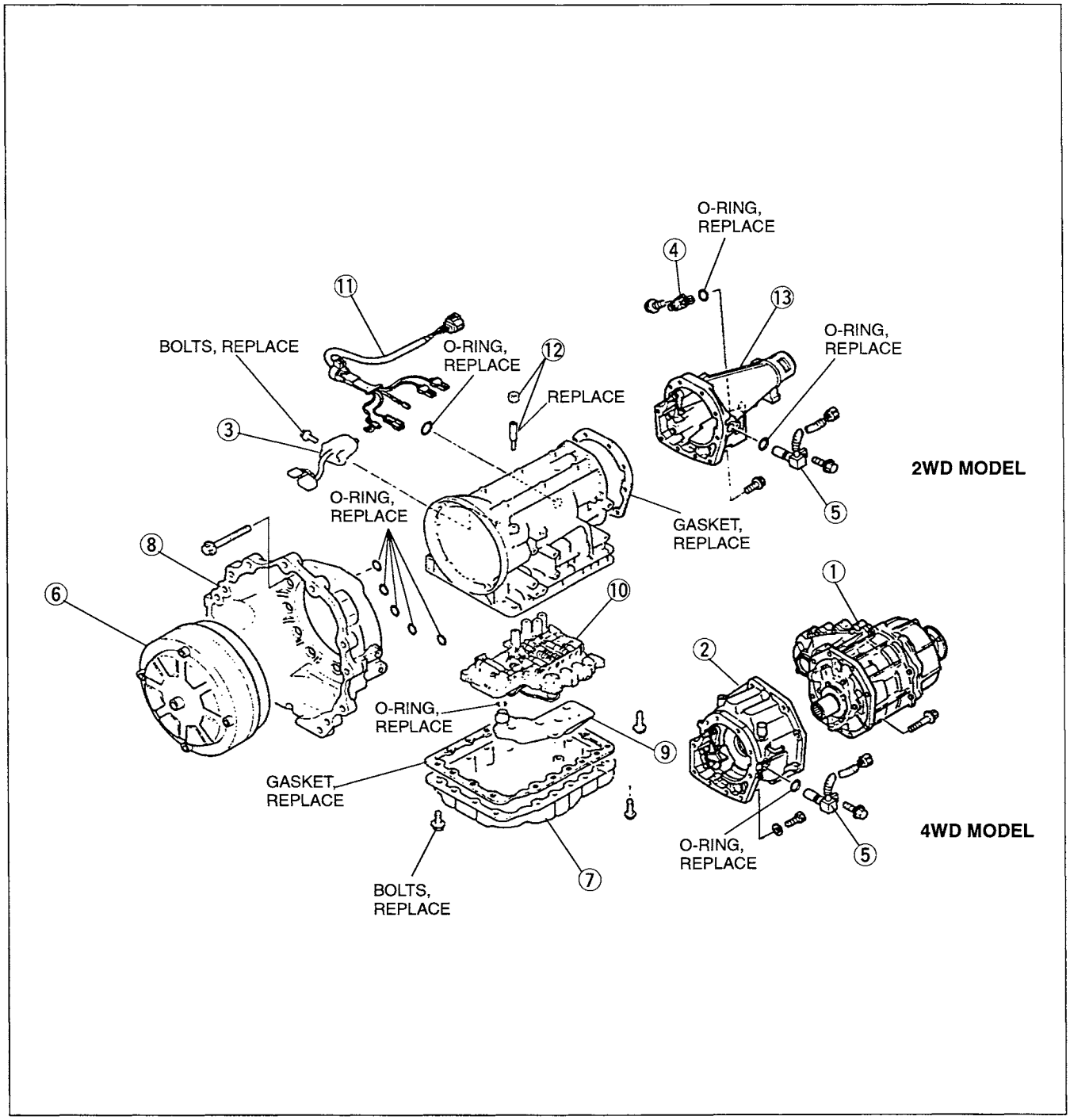
Cleaning notes:

1. Clean the transmission exterior thoroughly with steam or cleaning solvents, or both, before disassembly.

   Warning
   - **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

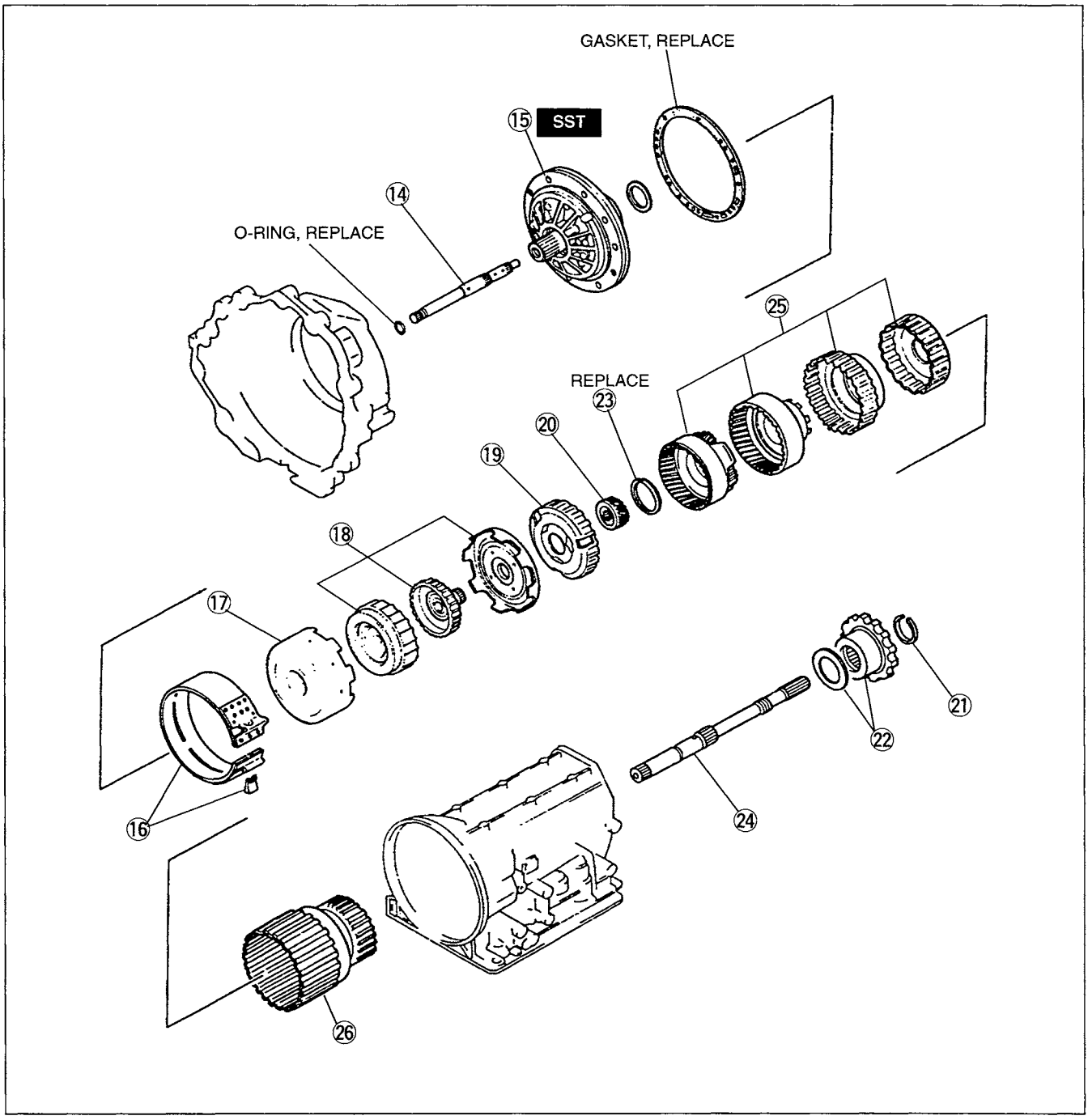
2. Clean the removed parts with cleaning solvent, and dry with compressed air. Clean out all holes and passages with compressed air, and verify that there are no obstructions.

Component



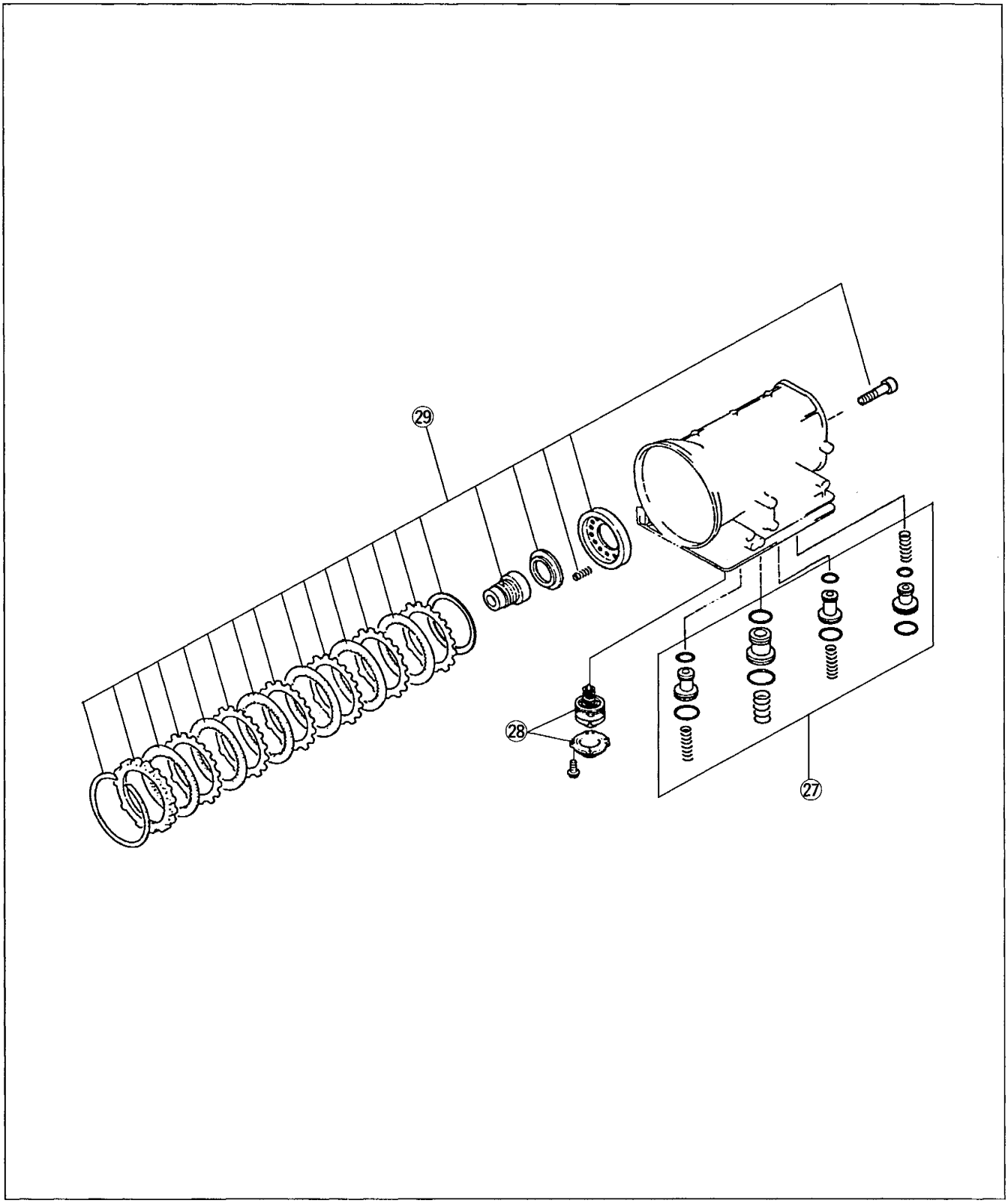
1. Transfer case (4WD)
2. Adapter case (4WD)
   Disassembly / Inspection / Assembly ..... page K1–85
3. Transmission range switch
   Inspection ..... page K1–23
   Adjustment ..... page K1–24
4. Speedometer driven gear (2WD)
5. Output speed sensor
   Inspection ..... page K1–25
6. Torque converter
   Inspection ..... page K1–46
7. Oil pan
8. Converter housing
9. Oil strainer
10. Control valve body
    Disassembly / Inspection .... page K1– 91
    Assembly ..... page K1–109
11. Solenoid valve connectors
12. Anchor end bolt and nut
13. Extension housing
    Disassembly / Inspection / Assembly ..... page K1– 85

Components (cont'd)

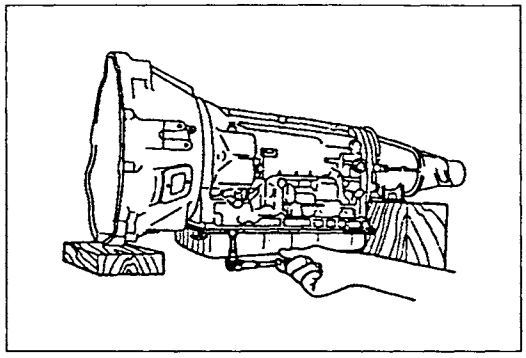


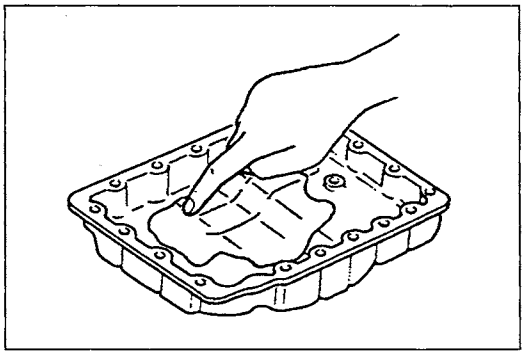
14. Input shaft
15. Oil pump
    Disassembly / Inspection / Assembly ..... page K1–49
16. Brake band and strut
17. Reverse clutch
    Disassembly / Inspection / Assembly ..... page K1–53
18. High clutch and front sun gear
    Disassembly / Inspection / Assembly ..... page K1–59
19. Front planetary carrier
20. Rear sun gear
21. Snap ring
22. Parking gear and bearing
23. Snap ring
24. Output shaft
25. Front internal gear, rear internal gear, forward clutch hub, overrunning clutch hub
    Disassembly / Inspection / Assembly ..... page K1–68
26. Forward clutch drum (forward clutch, overrunning clutch, low one-way clutch)
    Disassembly / Inspection / Assembly ..... page K1–71

Components (cont'd)



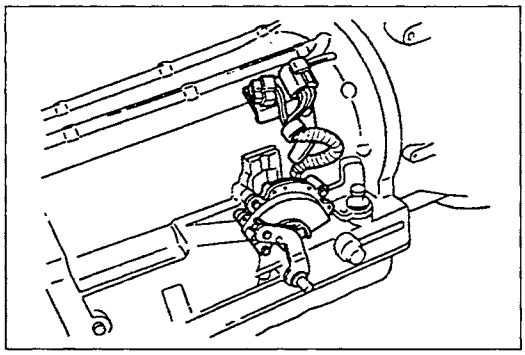
27. Accumulator spring and piston
    Disassembly / Inspection / Assembly ..... page K1–47
28. Band servo
    Disassembly / Inspection / Assembly ..... page K1–64
29. Low and reverse brake piston and spring
    Disassembly / Inspection / Assembly ..... page K1–79



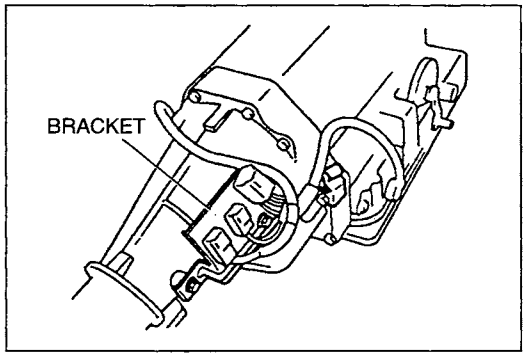


Procedure

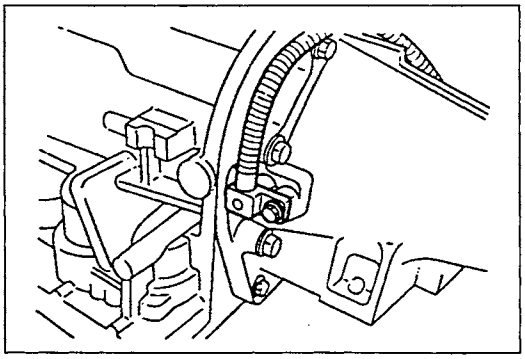
1. Support the transmission by placing wooden blocks under the converter housing and the extension housing.
2. Remove the oil pan and gasket.
   Examine any material found in the pan or on the magnet to determine the condition of the transmission.
   Clutch facing material ..... Drive plate and brake band wear
   Steel (magnet) ..... Bearing, gear, and driven-plate wear
   Aluminum (nonmagnetic) .. Bushings or cast aluminum parts wear
   If large amounts of material are found, replace the torque converter and carefully check the transmission for the cause.
3. Install the oil pan with a few bolts to protect the valve body.



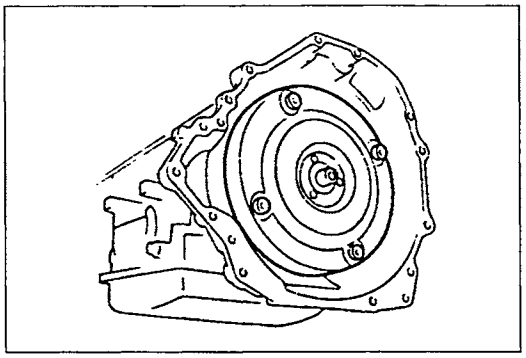
4. Remove the connector bracket from the transmission case.
5. Remove the transmission range switch.



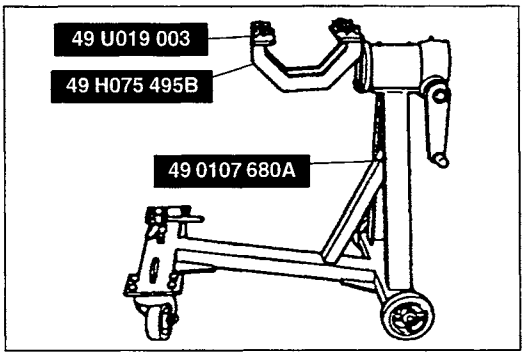
6. Remove the connector bracket from the extension housing.
7. Disconnect the harness from the harness bracket.



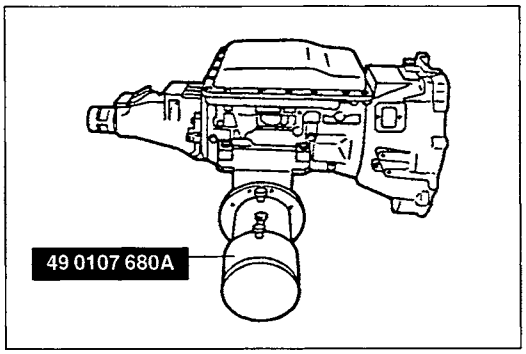
8. Remove the speedometer driven gear from the extension housing. (2WD)
9. Remove the O-ring from the speedometer driven gear. (2WD)
10. Remove the output speed sensor.
11. Remove the O-ring from the output speed sensor.



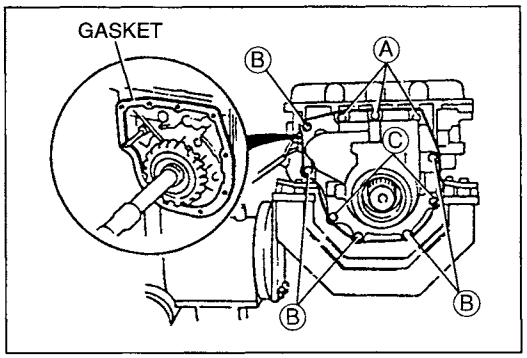
12. Remove the torque converter and immediately turn it so that the hole faces upward. This will help to keep any remaining fluid from spilling.



13. Assemble the **SSTs** as shown.

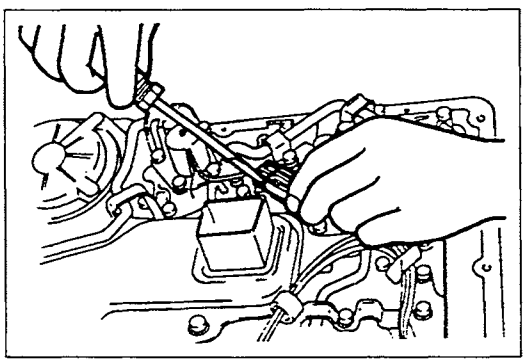


14. Mount the transmission to the **SST**.
15. Remove the oil pan.

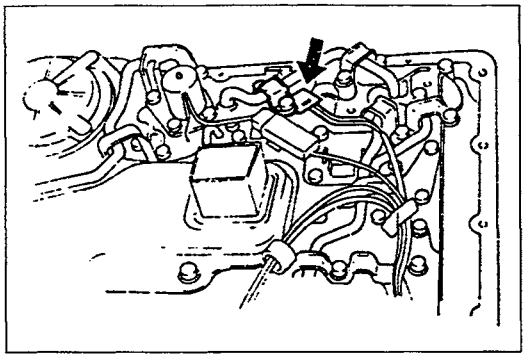


16. Remove the extension housing and gasket. For 4WD models, do not reuse bolts Ⓒ.

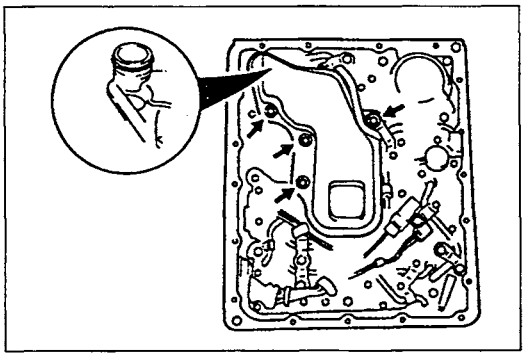
Bolt length (Measured from below the head)
Ⓐ: 30 mm { 1.181 in }
Ⓑ: 45 mm { 1.772 in }
Ⓒ: 45 mm { 1.772 in }



17. Remove the clip by carefully prying with a small flathead screwdriver.
18. Disconnect the torque converter clutch solenoid valve connector.

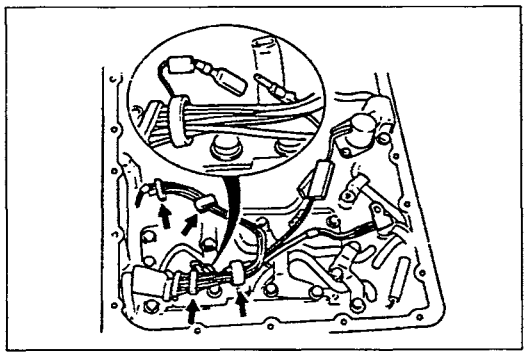


19. Remove the transmission fluid temperature sensor.

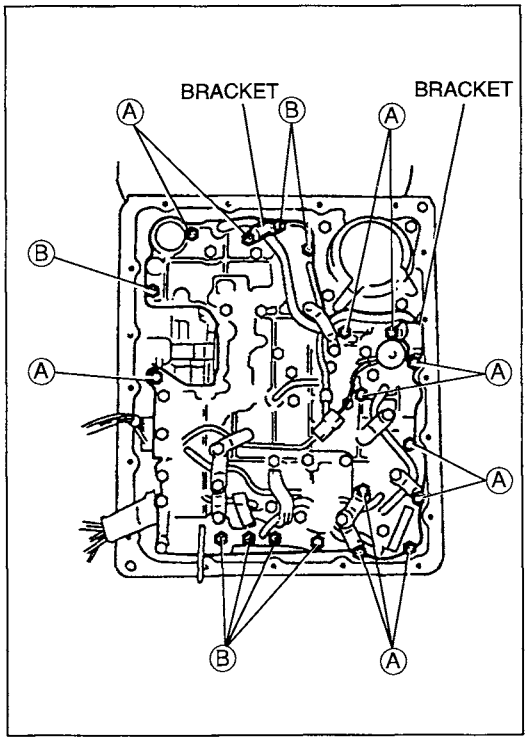


20. Remove the oil strainer.
21. Remove the O-ring from the oil strainer.

Bolt length (Measured from below the head):
50 mm { 1.969 in }

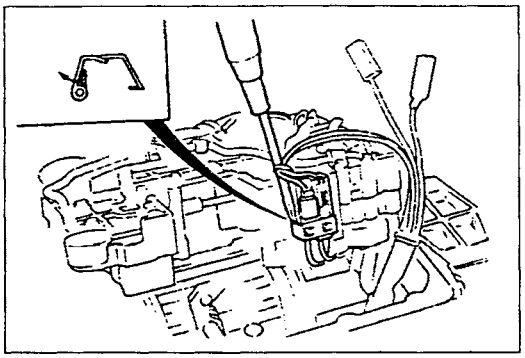


22. Separate the solenoid harness from the harness clip.
23. Remove the clip by carefully prying with a small flathed screwdriver.
24. Remove the transmission fluid temparature switch. (4WD)

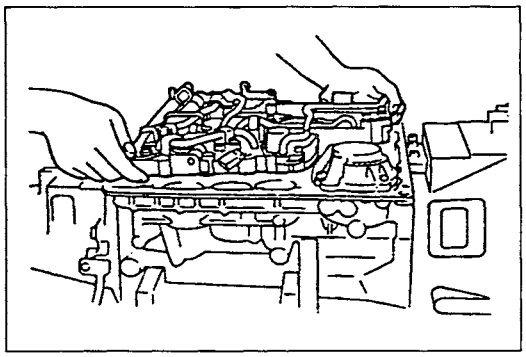


25. Remove bolts A and B, and the brackets shown in the figure.

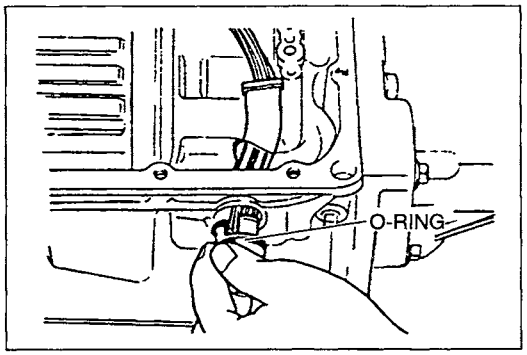
Bolt length (Measured from below the head)
Ⓐ: 33 mm { 1.299 in }
Ⓑ: 45 mm { 1.772 in }



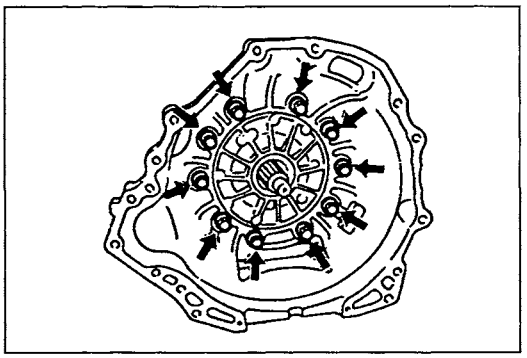
26. Remove the clip by carefully prying with a small flathead screwdriver.
27. Disconnect the solenoid connectors.



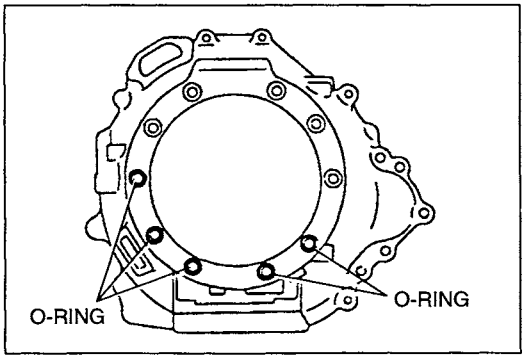
28. Remove the control valve body and the oil pipes.



29. Remove the solenoid connector from the transmission case.
30. Remove the O-ring from the solenoid connector.



31. Remove the converter housing from the transmission case.

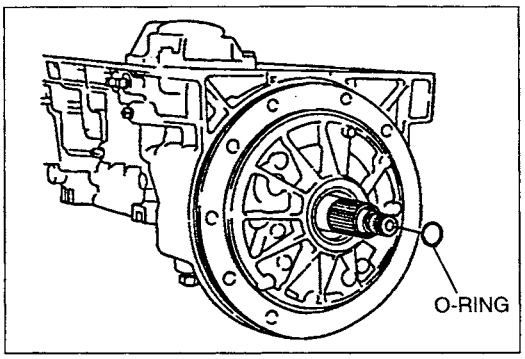


32. Remove the O-rings from the converter housing.

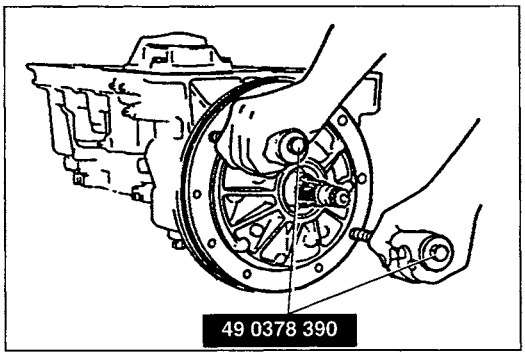
Caution

- **The converter housing is made of aluminum, and is therefore easily dented and scratched by metal tools. When removing old sealant, do not gouge or strike the sealing surface of the converter housing.**

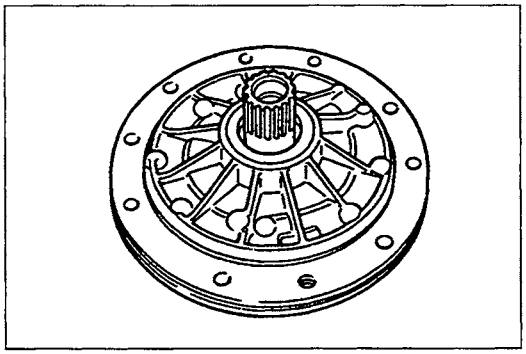
33. Remove the sealing compound from the converter housing.



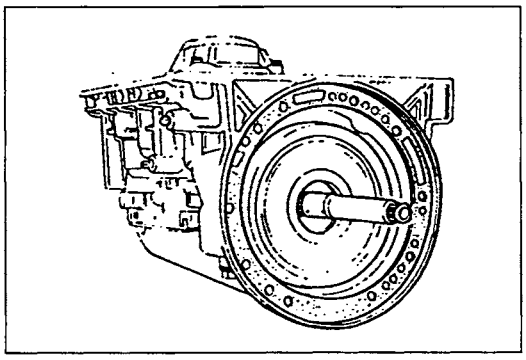
34. Remove the O-ring from the input shaft.



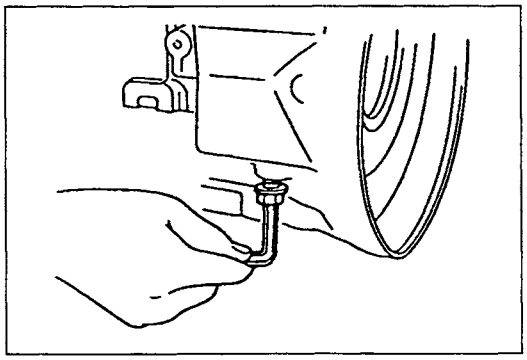
35. Install the **SST** to the oil pump assembly.
36. Slowly remove the oil pump from the transmission case by evenly sliding the weights of the **SST**.
37. Remove the **SST** from the oil pump.



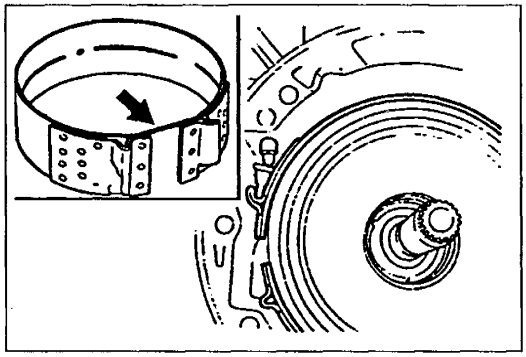
38. Clean the sealant from the oil pump housing, being careful not to scratch or dent the machined surface.



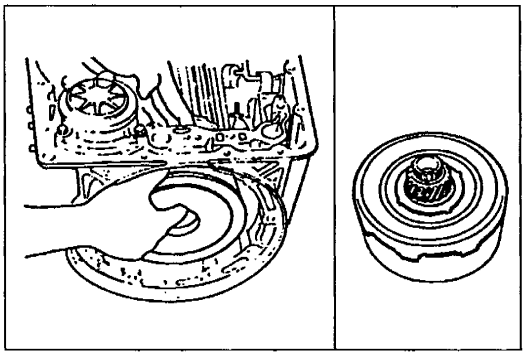
39. Remove the oil pump gasket.
40. Pull out the input shaft while holding the reverse clutch drum.



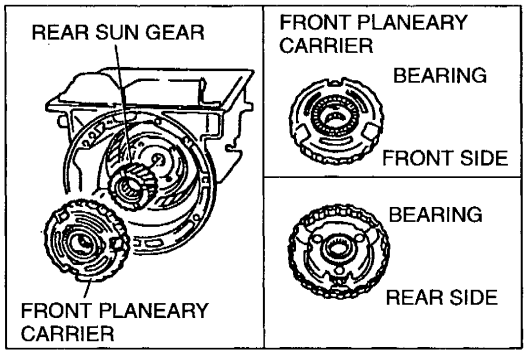
41. While holding the anchor end bolt, loosen the locknut.
42. Remove the locknut from the anchor end bolt.
43. Remove the anchor end bolt.
44. Clean the sealing compound from the transmission case threads.



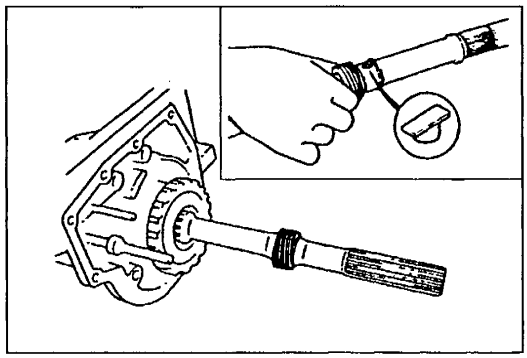
45. Remove the brake band, and hold it together with a piece of wire as shown in the figure.
46. Remove the band strut.



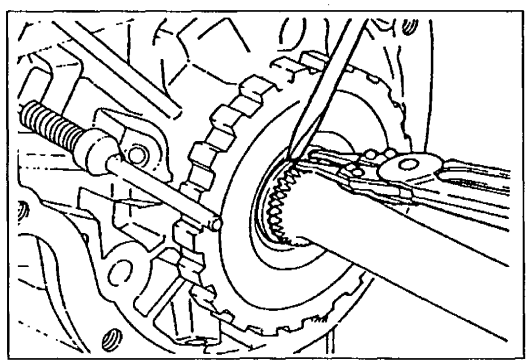
47. Remove the reverse clutch, high clutch, and the front sun gear from the transmission case as an assembly.



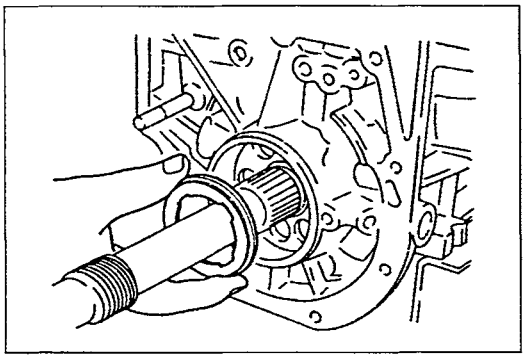
48. Remove the front planetary carrier, bearings, and the rear sun gear.
    Inspect the following parts, and repair or replace as necessary.
    1) Front planetary carrier
       Inspect individual gear teeth for damage, wear, and cracks, and check the rotation of the pinion gears
    2) Rear sun gear
       Inspect individual gear teeth for damage, wear, and cracks
    3) Bearing
       Inspect for damage and rough rotation



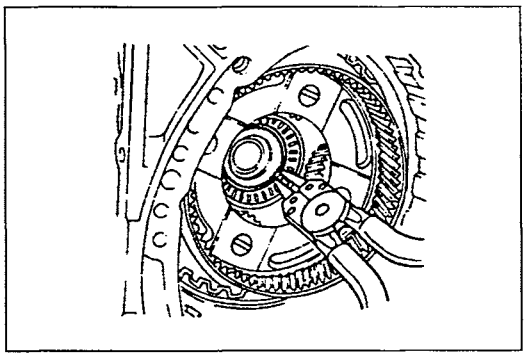
49. Remove the rear snap ring and the speedometer drive gear. (2WD)
50. Remove the key and the front snap ring. (2WD)



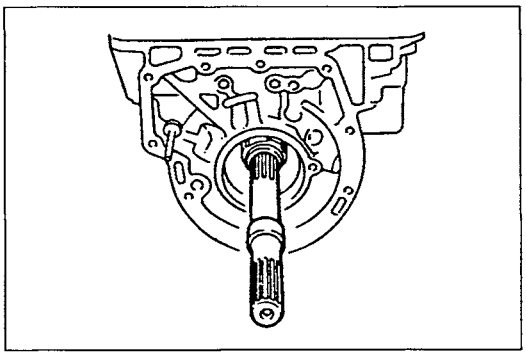
51. Remove the snap ring (rear) from the output shaft.
52. Remove the parking gear.



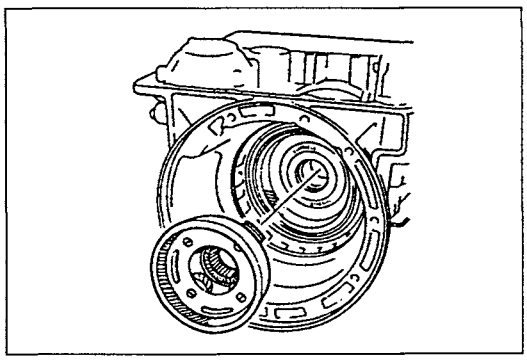
53. Remove the bearing from behind the transmission case.



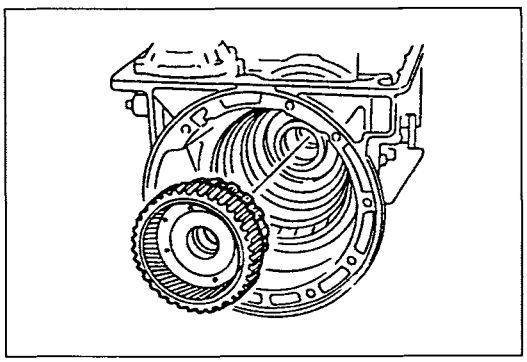
54. While pushing the output shaft slightly forward, remove the snap ring (front) from the output shaft.



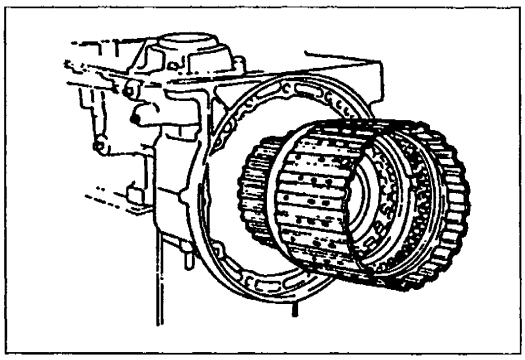
55. Pull out the output shaft.



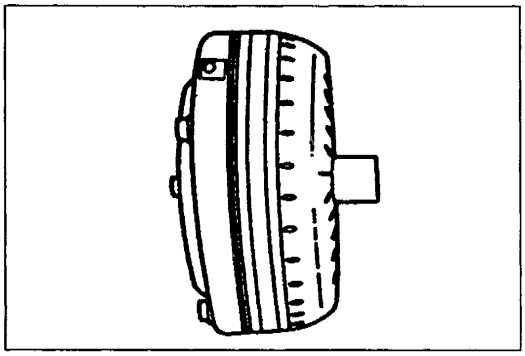
56. Remove the front internal gear (with rear planetary carrier).



57. Remove the rear internal gear, forward clutch hub, and overrunning clutch hub as an assembly.



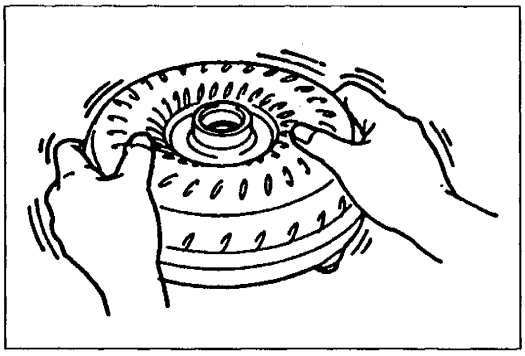
58. Remove the forward clutch drum (forward clutch, overrunning clutch, low one-way clutch) from the transmission case.



TORQUE CONVERTER

Inspection

1. Check the outside of the converter for damage and cracks, and replace the torque converter if there is any problem.
2. Check for rust on the pilot hub on the boss, and remove it completely if there is any.



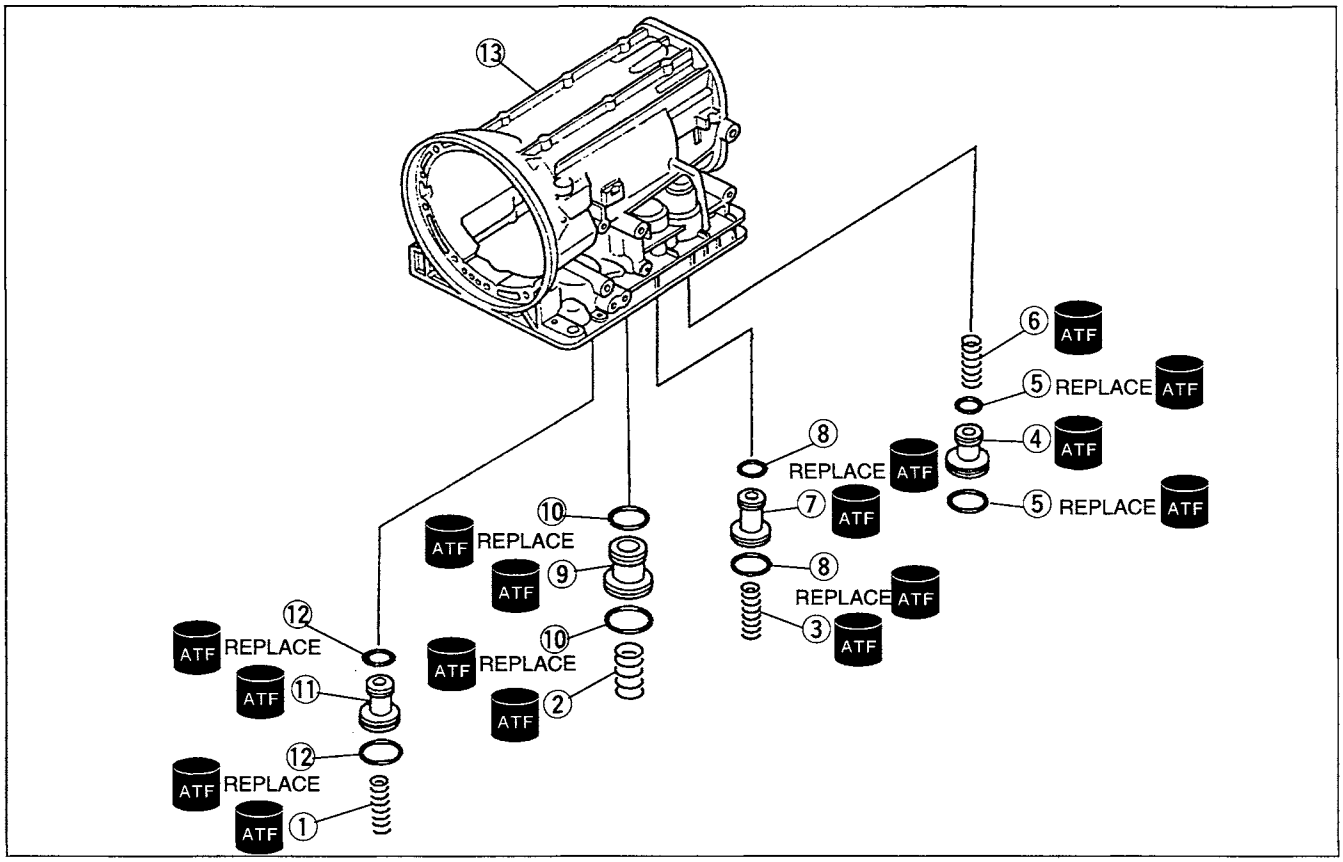
Washing Inside the Converter

1. Drain any ATF remaining in the converter.
2. Pour in solvent **(0.5 L { 0.5 US qt , 0.4 Imp qt }).**
3. Shake the converter to clean the inside. Pour out the solvent.
4. Pour in ATF.
5. Shake the converter to clean the inside. Pour out the ATF.

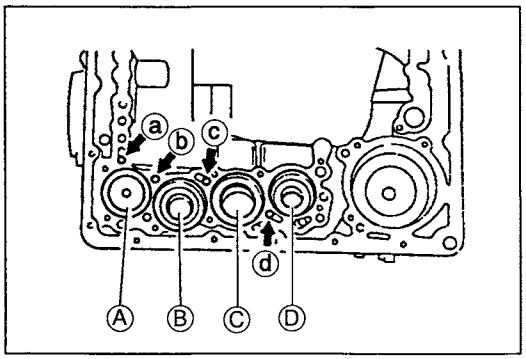
ACCUMULATORS

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly procedure**.



1. 3-4/N-R accumulator spring
   Inspection ..... page K1–48
2. 1-2 accumulator spring
   Inspection ..... page K1–48
3. 2-3 accumulator spring
   Inspection ..... page K1–48
4. N-D accumulator piston
   Disassembly note ..... page K1–47
5. O-rings
6. N-D accumulator spring
   Inspection ..... page K1–48
7. 2-3 accumulator piston
   Disassembly note ..... page K1–47
8. O-rings
9. 1-2 accumulator piston
   Disassembly note ..... page K1–47
10. O-rings
11. 3-4/N-R accumulator piston
    Disassembly note ..... page K1–47
12. O-rings
13. Transmission case



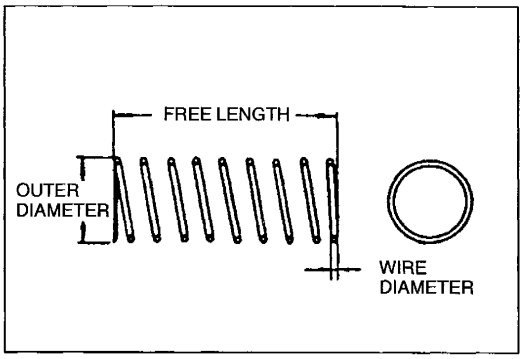
Disassembly note

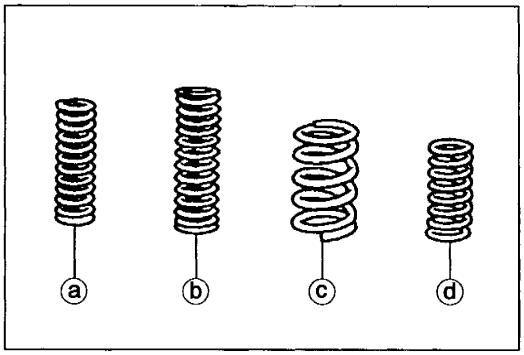
Accumulator piston

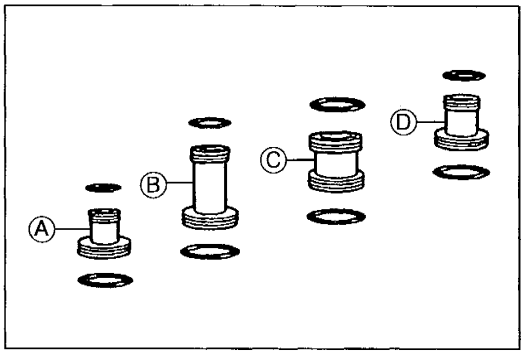
Remove the accumulator pistons and springs from the transmission case by applying compressed air through the oil passage as shown in the figure.

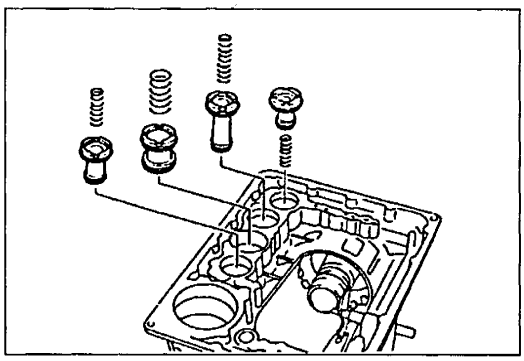
Item / Accumulator	Location	Oil passage
N-D accumulator	A	a
2-3 accumulator	B	b
1-2 accumulator	C	c
3-4/N-R accumulators	D	d

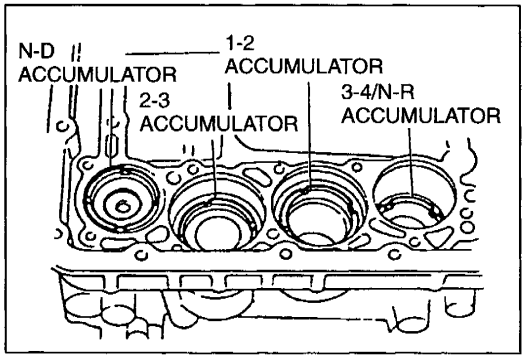
Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.











Inspection

Accumulator, spring

1. Measure the spring free length.

Item / Spring	Outer dia. mm { in }	Free length mm { in }	No. of coil	Wire dia. mm { in }
N-D accumulator position	18.0 { 0.709 }	43.0 { 1.693 }	12.3	2.3 { 0.091 }
2-3 accumulator position	20.0 { 0.787 }	66.0 { 2.598 }	11.4	3.5 { 0.138 }
1-2 accumulator position	29.3 { 1.154 }	45.0 { 1.772 }	3.6	4.0 { 0.157 }
3-4/N-R accumulator position	17.3 { 0.681 }	58.4 { 2.299 }	12.3	2.3 { 0.091 }

2. If not within the specification, replace the spring.

Assembly procedure

Outer diameter of spring

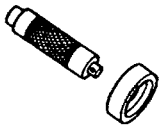
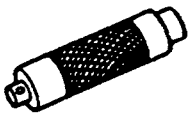
Spring		Outer dia. mm { in }
a	N-D accumulator	18.0 { 0.709 }
b	2-3 accumulator	20.0 { 0.787 }
c	1-2 accumulator	29.3 { 1.154 }
d	3-4/N-R accumulator	17.3 { 0.681 }

1. Apply ATF to the new O-rings and install them onto the accumulator pistons.
2. Apply even pressure to the perimeter of the accumulator pistons and install them into the transmission case.
3. Install each spring into its own accumlator piston.

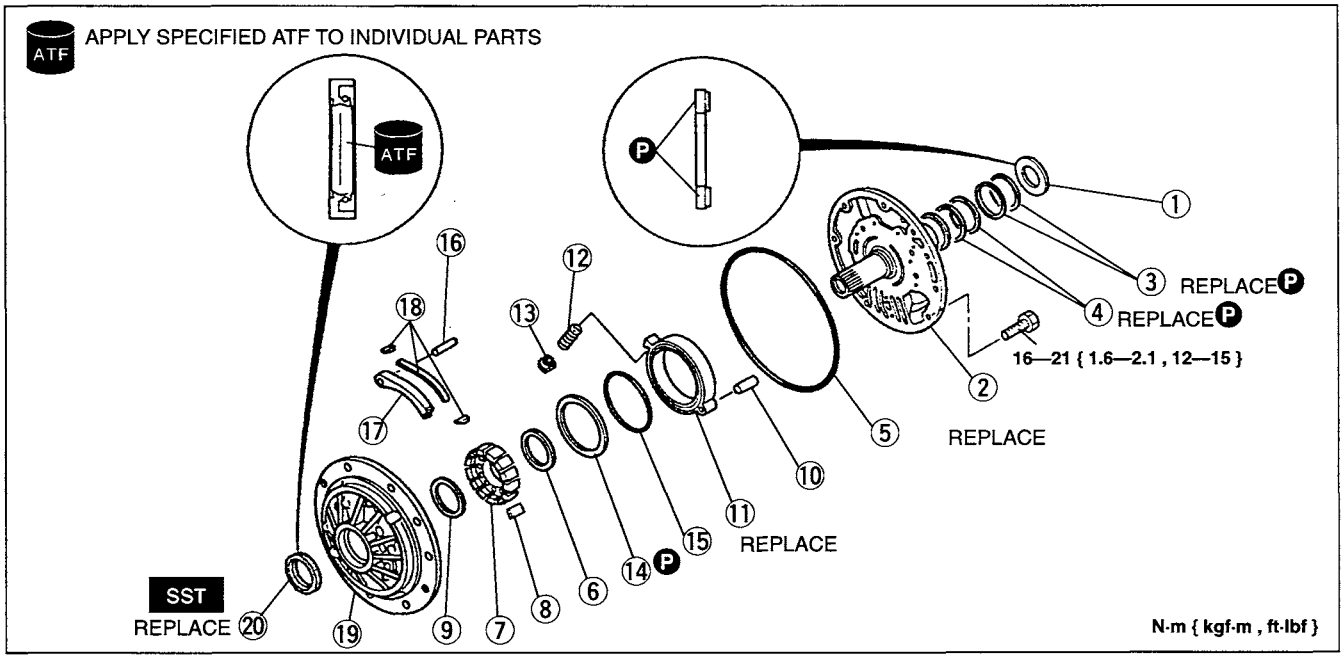
Piston / O-ring		Large mm { in }	Small mm { in }	Installation order
A	N-D accumulator	45.0 { 1.772 }	29.0 { 1.142 }	spring, pisiton
B	2-3 accumulator	50.0 { 1.969 }	32.0 { 1.260 }	piston, spring
C	1-2 accumulator	50.0 { 1.969 }	45.0 { 1.772 }	piston, spring
D	3-4/N-R accumulator	45.0 { 1.772 }	29.0 { 1.142 }	piston, spring

4. Install the accumulator pistons and springs.

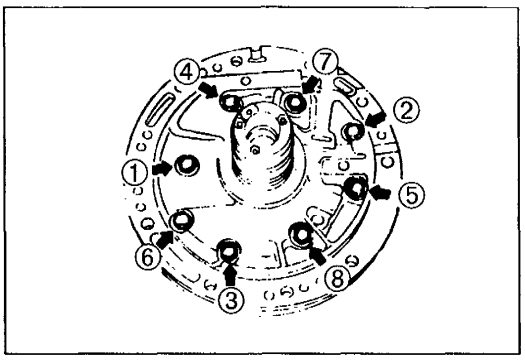
OIL PUMP
Preparation
SST

49 G030 795 Installer, oil seal 	For installation of oil seal	49 G030 796 Body (Parts of 49 G030 795) 	For installation of oil seal
49 G030 797 Handle (Parts of 49 G030 795) 	For installation of oil seal	—	—

Disassembly / Inspection / Assembly
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly procedure**.

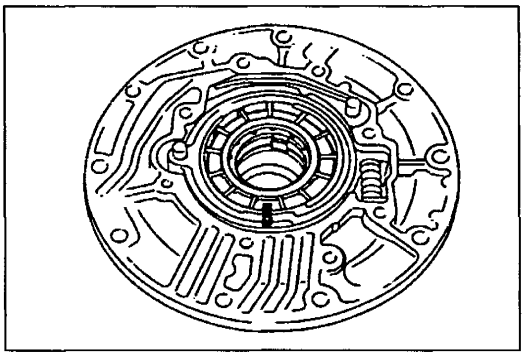


1. Bearing
2. Oil pump cover
   - Disassembly Note ..... page K1–50
   - Inspection ..... page K1–50
3. Seal ring (small diameter)
4. Seal ring (large diameter)
5. Seal ring
6. Vane ring
7. Rotor
   - Disassembly Note ..... page K1–50
   - Inspection ..... page K1–51
8. Vane
   - Inspection ..... page K1–51
9. Vane ring
10. Pivot pin
    - Disassembly Note ..... page K1–50
11. Cam ring
    - Disassembly Note ..... page K1–50
    - Inspection ..... page K1–51
12. Cam ring spring
    - Inspection ..... page K1–51
13. Spring seat
14. Friction ring
15. O-Ring
16. Pivot pin
17. Control piston
    - Inspection ..... page K1–51
18. Side seal
19. Oil pump housing
    - Inspection ..... page K1–51
20. Oil seal



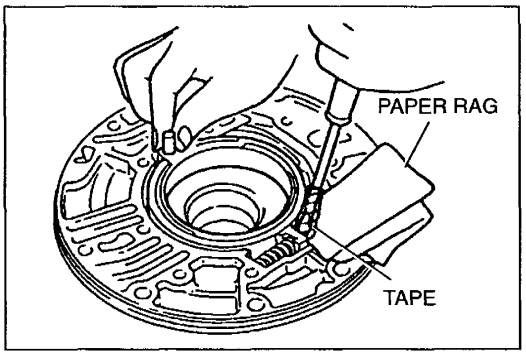
Disassembly note
Oil pump cover

Loosen the mounting bolts evenly in the pattern shown and remove the oil pump cover from the oil pump housing.



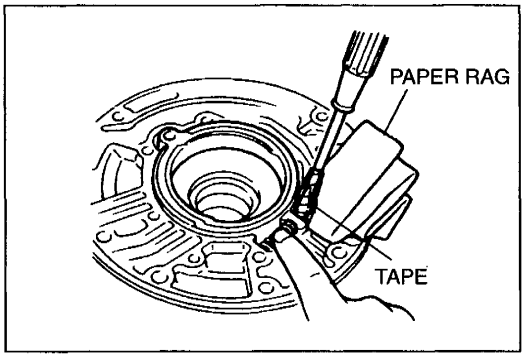
Rotor

1. Mark the rotor and cam ring without scratching or denting them.
2. Remove the rotor and vanes from the cam ring.



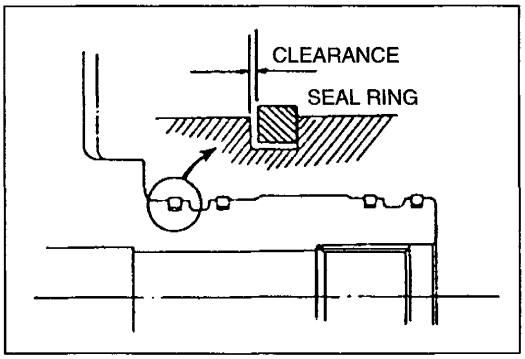
Pivot pin

Hold the cam ring back with a tape-wrapped screwdriver, and remove the pivot pin.



Cam ring

1. Hold the cam ring spring back and remove the cam ring.
2. Remove the cam ring spring.

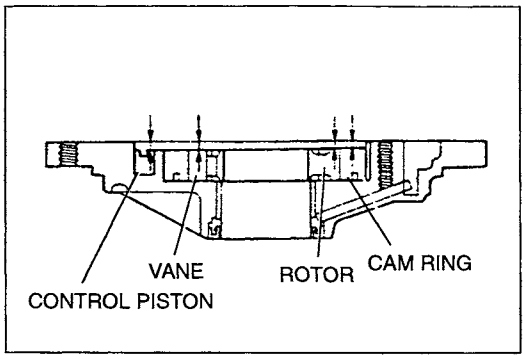


Inspection
Oil pump cover

1. Apply petroleum jelly to new seal ring.
2. Measure the clearance between the seal ring and the ring groove.

   Clearance: 0.10—0.25 mm { 0.0039—0.0098 in }

3. If not within the specification, replace the oil pump as an assembly.



Oil pump housing, cam ring, rotor, vane, and control piston

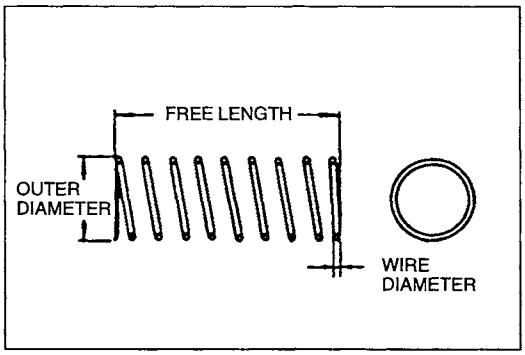
1. Install the cam ring, vanes, rotor, and control piston. Do not install the friction ring, O-ring, control piston side seals, and cam ring spring yet.
2. Measure the clearance between the end of the oil pump housing and cam ring, rotor, vanes and control piston in at least four places along their circumferences.

Clearance

mm { in }

Port \ Clearance	Standard	Maximum
Cam ring	0.010—0.024 { 0.0004—0.0009 }	0.030 { 0.0012 }
Rotor, vane, control piston	0.030—0.044 { 0.0012—0.0017 }	0.050 { 0.0020 }

3. If not within the specification, replace the oil pump as an assembly.



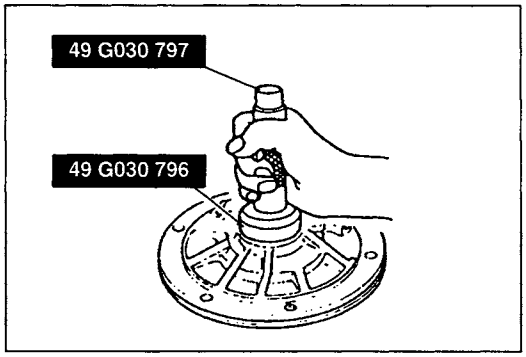
Cam ring spring

1. Measure the spring specification.

Specification

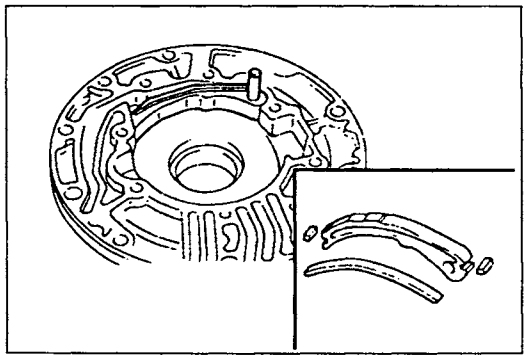
Outer dia. mm { in }	Free length mm { in }	No. of coil	Wire dia. mm { in }
13.7 { 0.539 }	39.8 { 1.567 }	7.8	2.3 { 0.091 }

2. If not correct, replace the cam ring spring.

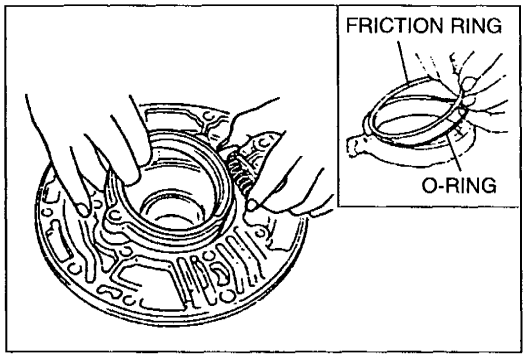


Assembly procedure

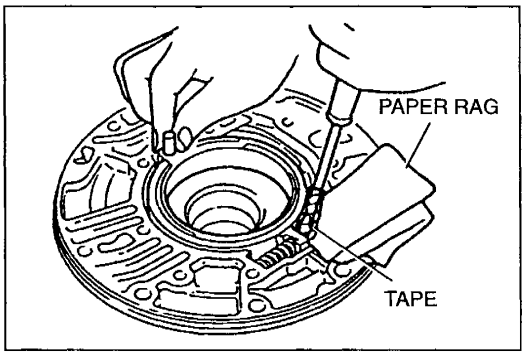
1. Apply ATF to the new oil seal. Install the oil seal by using the **SSTs**.



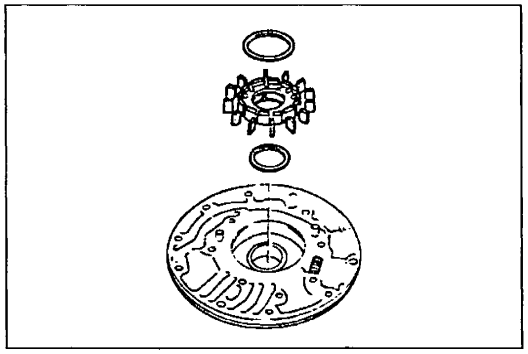
2. Apply ATF to the side seals, and install them on the control piston with the black surface facing toward the control piston.
3. Install the control piston and pivot pin.



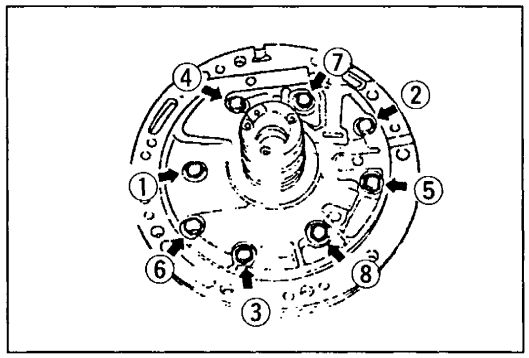
4. Apply petroleum jelly to the cam ring groove and install a new O-ring and friction ring into the cam ring.
5. Install the cam ring and spring while compressing the spring against the oil pump housing.



6. Hold the cam ring with a tape-wrapped screwdriver, and install the pivot pin.
7. While pushing on the cam ring, install the pivot pin.

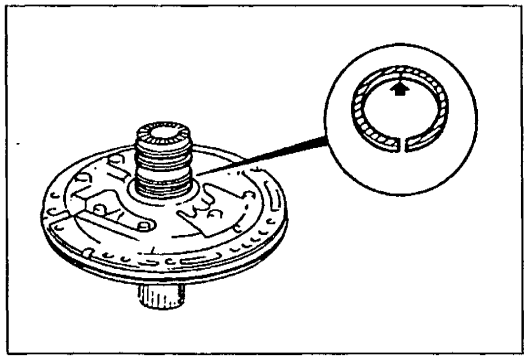


8. Confirm the marks and install the rotor, vanes, and vane rings.

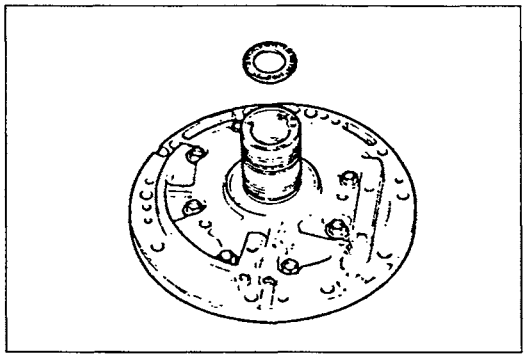


9. Carefully install the oil pump cover onto the oil pump housing.
10. Tighten the bolts evenly and gradually in the order shown.

Tightening torque:
16—20 N·m { 1.6—2.1 kgf·m , 12—15 ft·lbf }



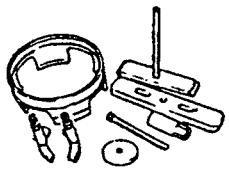
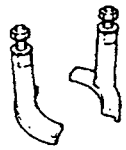
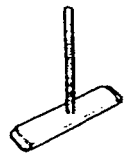
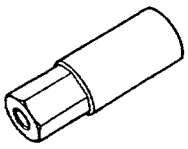
11. Apply petroleum jelly to the seal rings. Fit the large seal ring (yellow mark) into the bottom ring groove and the small seal ring (no mark) into the top ring groove.
12. Apply ATF to a new O-ring , and install it on the oil pump.

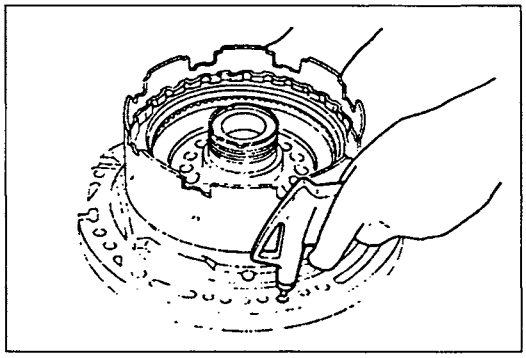


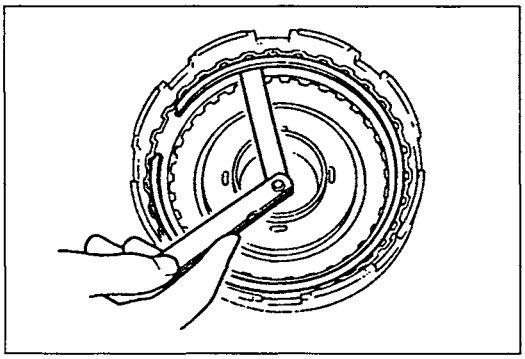
13. Apply petroleum jelly to the bearing, and set it on the oil pump.

Bearing outer diameter: 47.0 mm { 1.850 in }

REVERSE CLUTCH
Preparation
SST

49 G019 0A7A Compressor set, return spring 	For disassembly / assembly of snap ring	49 G019 025 Body B (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring
49 G019 026 Plate (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring	49 G019 027 Attachment A (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring
49 G019 029 Nut (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring	—	—





Preinspection
Reverse clutch operation

1. Install the reverse clutch onto the oil pump along with the seal rings. Apply compressed air to the oil passage as shown.

Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

2. Verify that the retaining plate moves to the snap ring. If not, the D-ring or the oil seal may be damaged or fluid may be leaking at the piston check ball. Inspect them and replace when assembling.

Clearance between retaining plate and snap ring

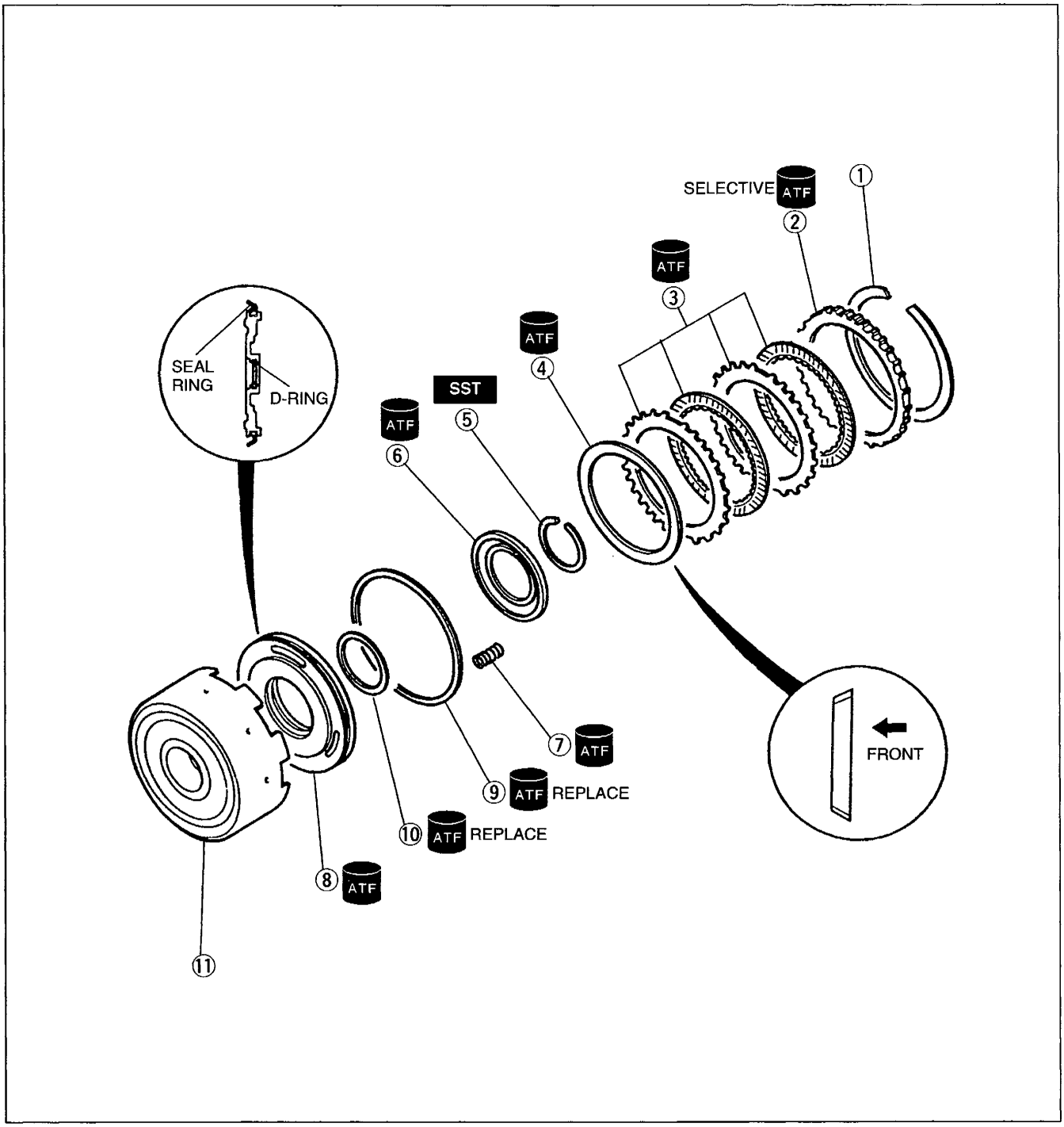
Measure the clearance between the retaining plate and the snap ring.

Standard clearance:
0.50—1.20 mm { 0.020—0.047 in }

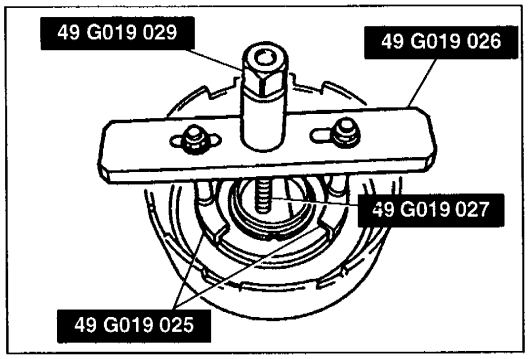
Select the correct retaining plate when assembling.

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly procedure**.



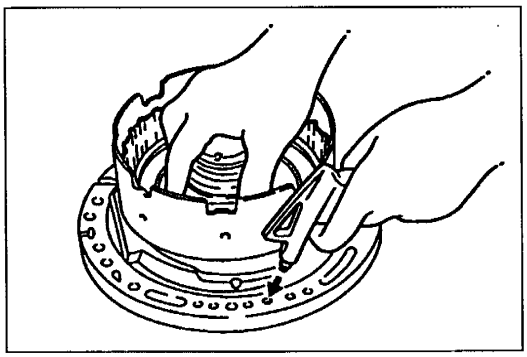
1. Snap ring
2. Retaining plate
3. Drive plates and driven plates
   Inspection ..... page K1–55
4. Dished plate
5. Snap ring
   Disassembly Note ..... page K1–55
6. Spring retainer
7. Return spring
   Inspection ..... page K1–55
8. Clutch piston
   Disassembly Note ..... page K1–55
   Inspection ..... page K1–55
9. Seal ring
10. D-ring
11. Reverse clutch drum



Disassembly note
Snap ring

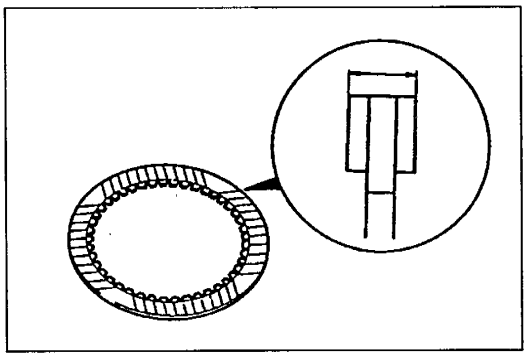
Caution
- **Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer assembly edges.**

1. Compress the spring by using the **SSTs**, then remove the snap ring with snap ring pliers.
2. Remove the spring retainer and spring.



Piston
1. Install the reverse clutch onto the oil pump along with the seal rings.
2. Remove the piston by applying compressed air to the oil passage.

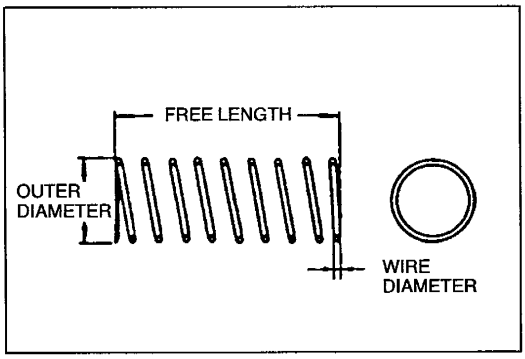
Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.



Inspection
Drive plates
1. Measure the facing thickness in three places, and determine the average of the three readings.

Standard thickness: 2.0 mm { 0.079 in }
Minimum thickness: 1.8 mm { 0.071 in }

2. If it is less than the minimum, replace the drive plates.

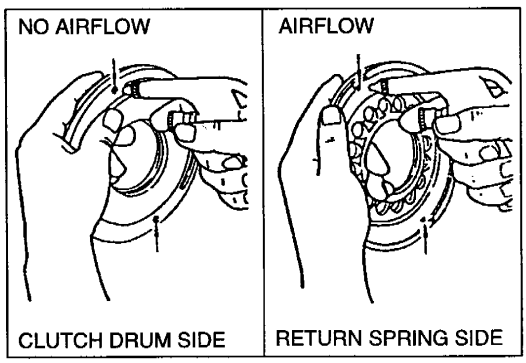


Return spring
1. Measure the spring specifications.

Specification

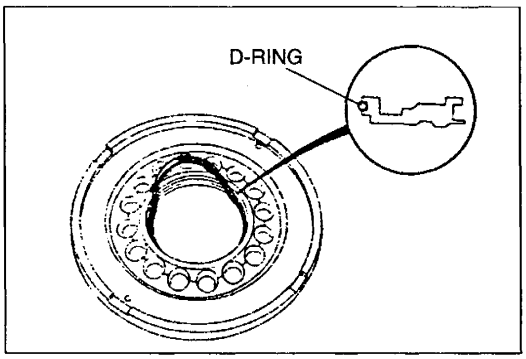
Outer dia. mm { in }	Free length mm { in }	No. of coil	Wire dia. mm { in }
11.6 { 0.457 }	19.69 { 0.775 }	4.0	1.3 { 0.051 }

2. If not correct, replace the return spring.



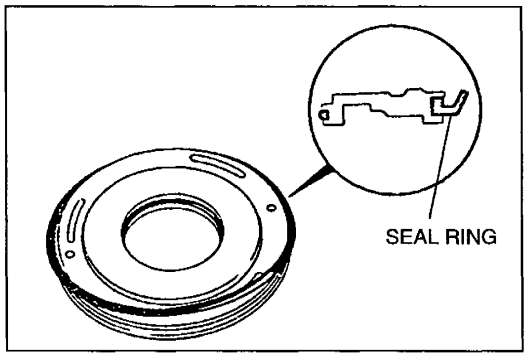
Clutch piston
1. Verify that there is no air leakage when applying compressed air through the oil hole opposite the return spring.
2. Verify that there is airflow when applying compressed air through the oil hole on the return spring side.

Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

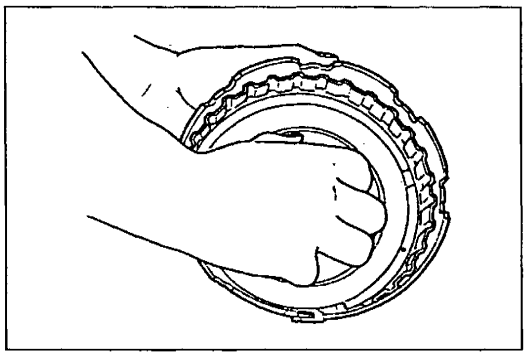


Assembly procedure

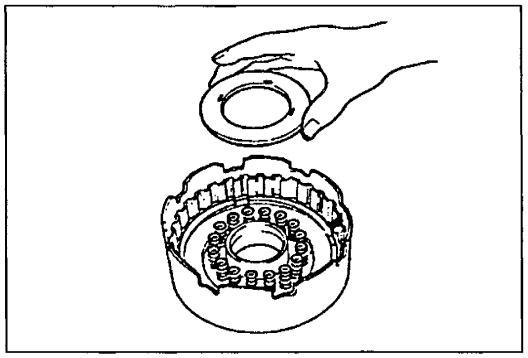
1. Apply ATF to the new D-ring and install it into the clutch piston.



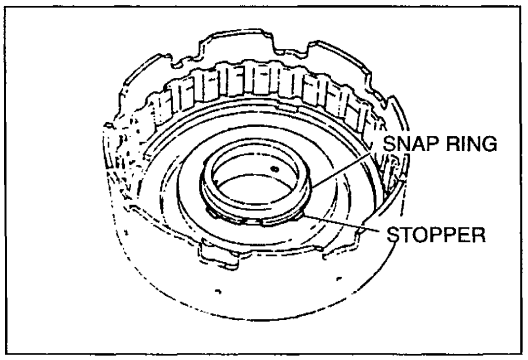
2. Apply ATF to the new seal ring and install it into the clutch piston.



3. Apply ATF to the inner surface of the reverse clutch drum.
4. Apply even pressure to the perimeter of the clutch piston, and install it into the reverse clutch drum by turning it evenly and gradually.
5. Verify that the piston can be turned by hand. If it cannot, then remove it and check for damage to the seal ring.

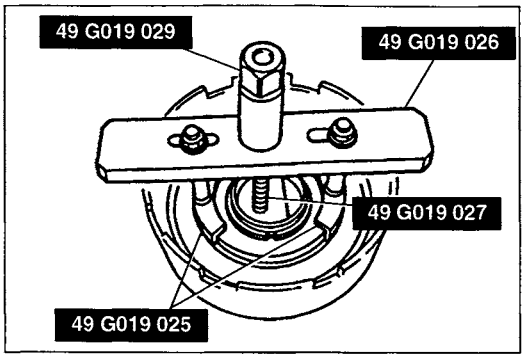


6. Install the return springs and spring retainer.

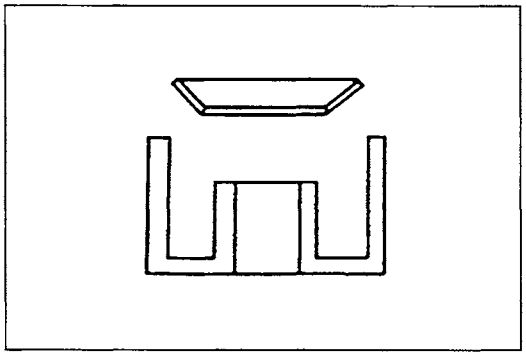


Caution

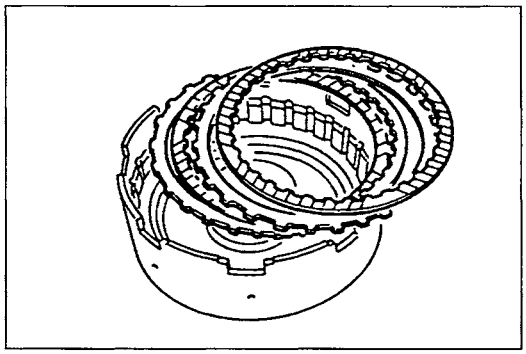
- **Depress the spring retainer only enough to install the snap ring. Overpressing will damage the retainer assembly edges.**



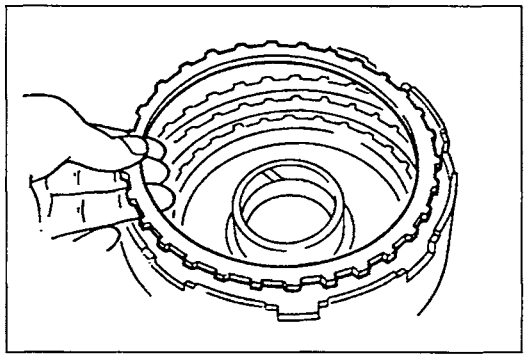
7. Install the snap ring while compressing the springs by using the **SSTs**.



8. Install the dished plate as shown in the figure.

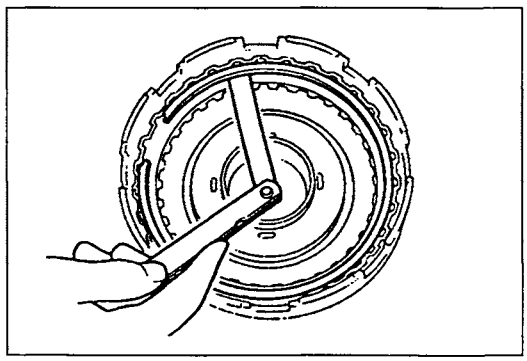


9. Soak new drive plates in ATF for at least two hours.
10. Apply ATF to the driven plates immediately before assembly.
11. Install the drive and driven plates into the reverse clutch drum in the following order.
    Driven-Drive-Driven-Drive



12. Install the retaining plate.
13. Install the snap ring.
14. Measure the clearance between the retaining plate and snap ring with a feeler gauge. If not within the specification, adjust the clearance by installing the correct retaining plate.

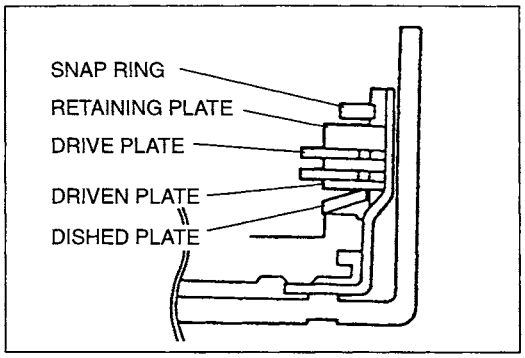
    Standard clearance:
    0.50—1.20 mm { 0.020—0.047 in }

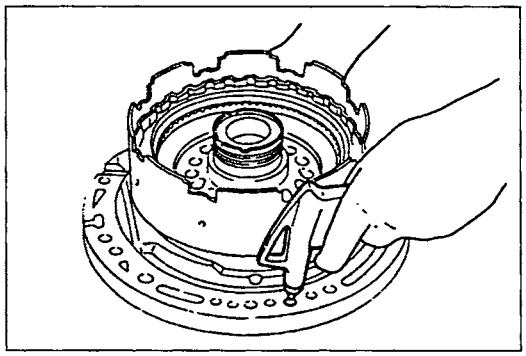


Retaining plate sizes

mm { in }

4.6 { 0.181 }	4.8 { 0.189 }	5.0 { 0.197 }	5.2 { 0.205 }
5.4 { 0.213 }	5.6 { 0.220 }	5.8 { 0.228 }	





15. If the clearance cannot be brought to within specification after installation of the thickest retaining plate, replace the dished plate, driven plates and drive plates.
Adjust the clearance by installing the correct retaining plate.

Standard Clearance:
0.50—0.80 mm { 0.020—0.031 in }

Retaining plate sizes

mm { in }

4.6 { 0.181 }	4.8 { 0.189 }	5.0 { 0.197 }	5.2 { 0.205 }
5.4 { 0.213 }	5.6 { 0.220 }	5.8 { 0.228 }	

Caution
- **Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal.**

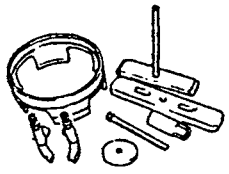
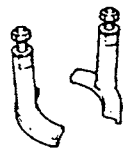
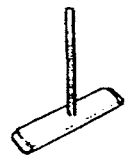
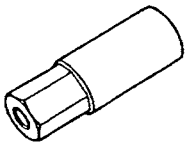
16. Install the reverse clutch onto the oil pump along with the seal rings. Apply compressed air to the oil passage and check the clutch operation.

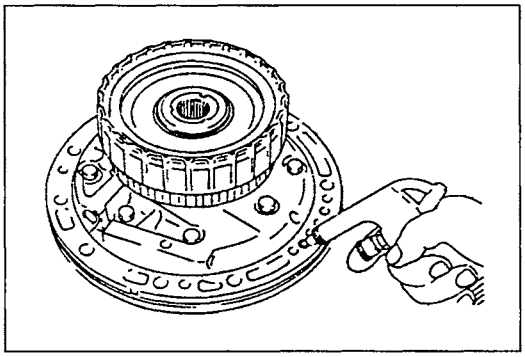
Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

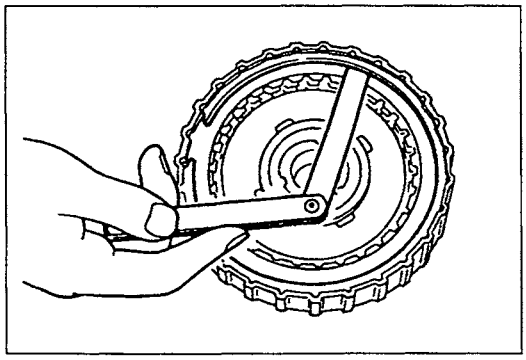
HIGH CLUTCH AND FRONT SUN GEAR

Preparation

SST

49 G019 0A7A Compressor set, return spring 	For disassembly / assembly of snap ring	49 G019 025 Body B (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring
49 G019 026 Plate (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring	49 G019 027 Attachment A (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring
49 G019 029 Nut (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring	—	—





Preinspection

High clutch operation

1. Install the high clutch onto the oil pump along with the seal rings. Apply compressed air to the oil passage as shown.

   Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

2. Verify that the retaining plate moves toward the snap ring.
   If not, the D-ring may be damaged or fluid may be leaking at the piston check ball.
   Inspect them and replace when assembling.

Clearance between retaining plate and snap ring

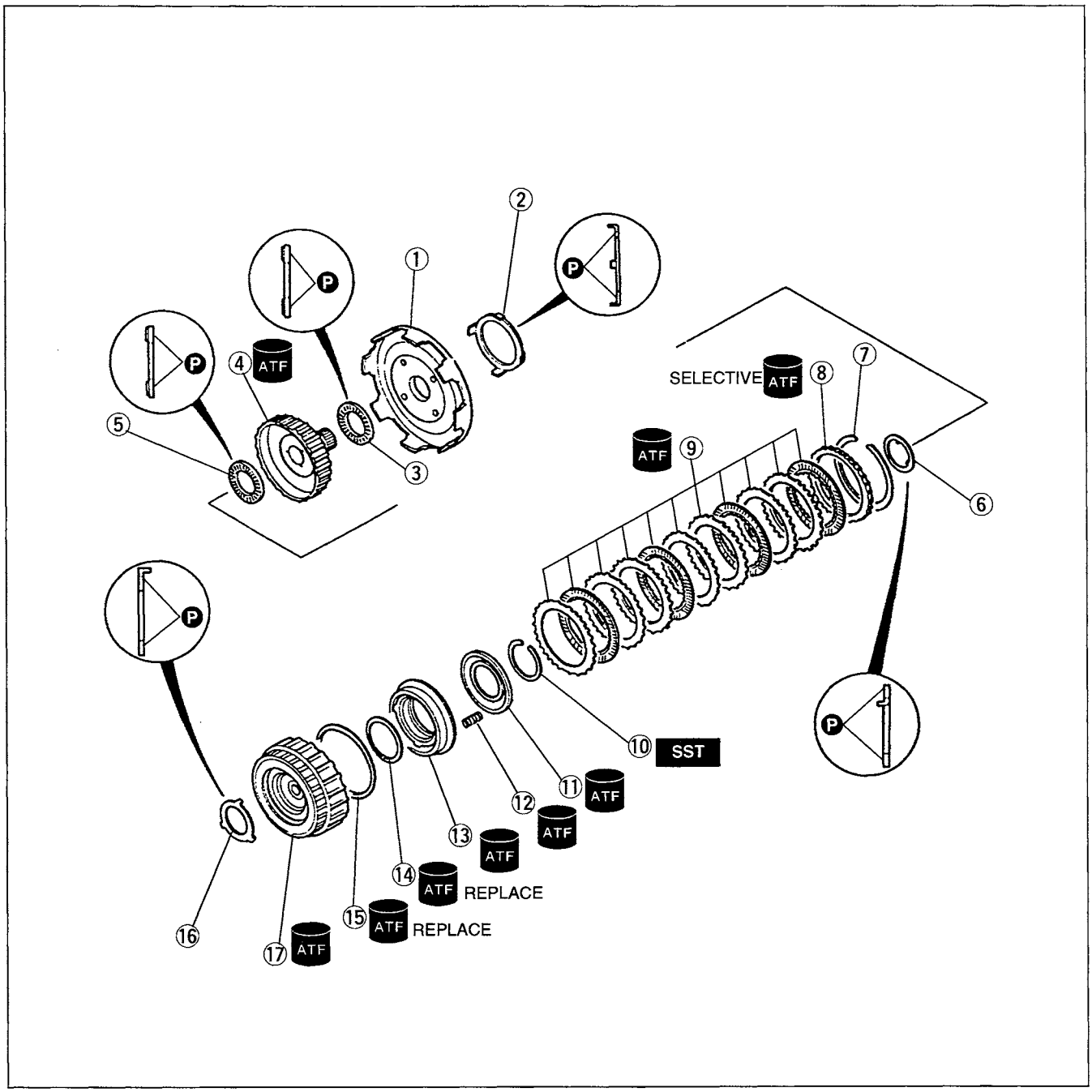
Measure the clearance between the retaining plate and the snap ring.

Standard clearance:
1.8—3.0 mm { 0.071—0.118 in }

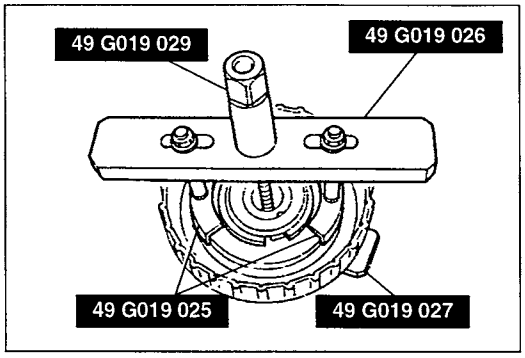
Select and install the correct retaining plate when assembling.

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly procedure**.



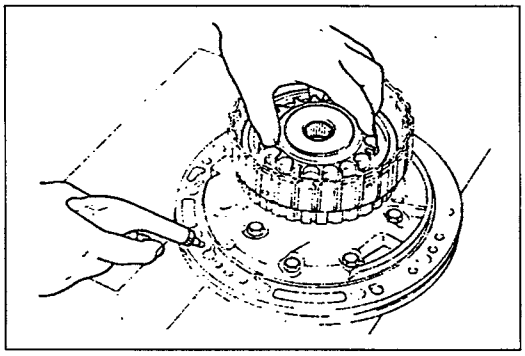
1. Front sun gear
2. Bearing race
3. Bearing
4. High clutch hub
5. Bearing
6. Bearing race
7. Snap ring
8. Retaining plate
9. Drive plates and driven plates
   Inspection ..... page K1–61
10. Snap ring
    Disassembly Note ..... page K1–61
11. Spring retainer
12. Return spring
    Inspection ..... page K1–61
13. Clutch piston
    Disassembly Note ..... page K1–61
    Inspection ..... page K1–61
14. D-ring
15. D-ring
16. Bearing race
17. High clutch drum



Disassembly note
Snap ring

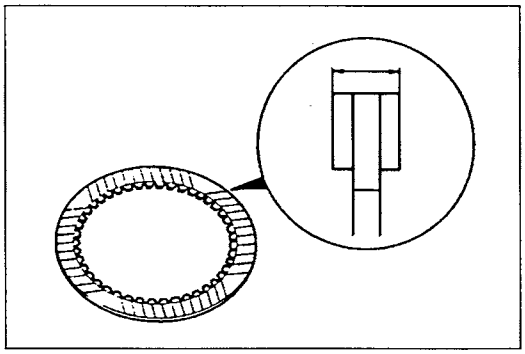
Caution
- **Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer assembly edges.**

1. While holding the spring retainer down by using the **SSTs**, remove the snap ring by using snap ring pliers.
2. Remove the spring retainer and spring.



Piston
1. Install the high clutch onto the oil pump along with the seal rings.
2. Remove the piston by applying compressed air through the oil passage.

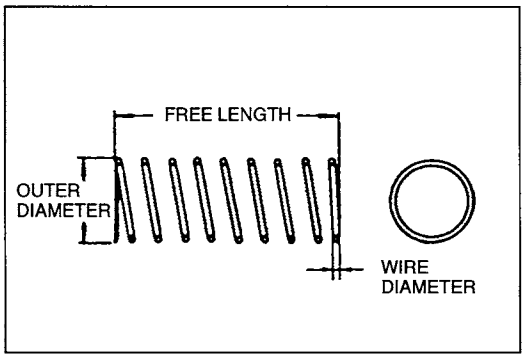
Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.



Inspection
Drive plates
1. Measure the facing thickness in three places, and determine the average of the three readings.

Standard thickness: 1.6 mm { 0.063 in }
Minimum thickness: 1.4 mm { 0.055 in }

2. If not within specification, replace the drive plates.

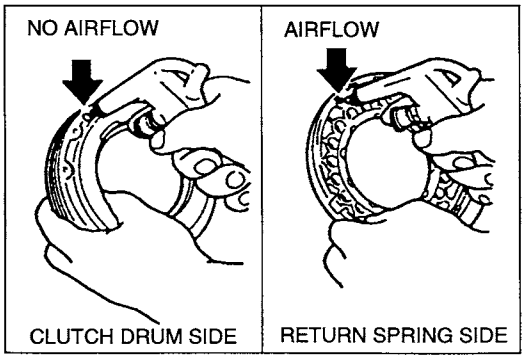


Return spring
1. Check the spring specifications.

Specifications

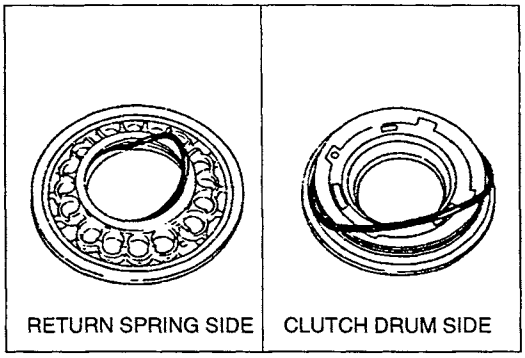
Outer dia. mm { in }	Free length mm { in }	No. of coil	Wire dia. mm { in }
11.6 { 0.457 }	22.1 { 0.870 }	6.0	1.3 { 0.051 }

2. If not within specification, replace the return spring.



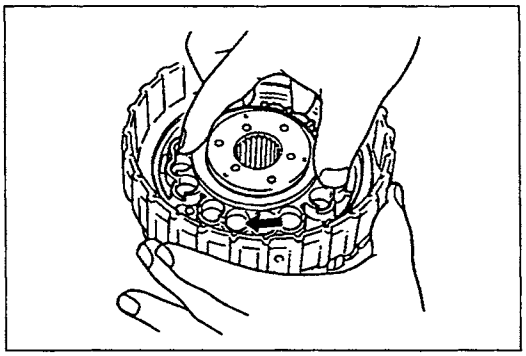
Clutch piston
1. Verify that there is no air leakage when applying compressed air through the oil hole opposite the return spring.
2. Verify that there is air flow when applying compressed air through the oil hole on the return spring side.

Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

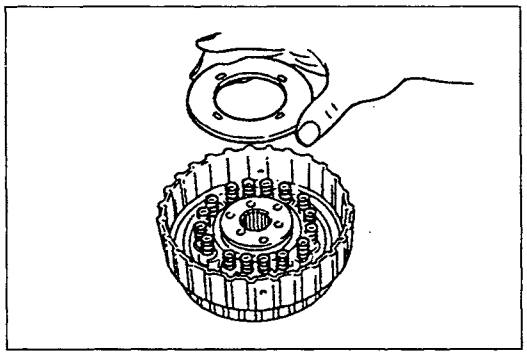


Assembly procedure
High clutch

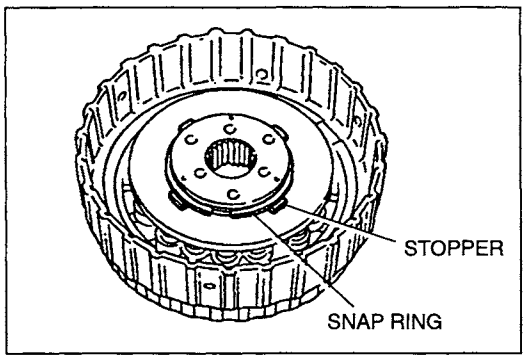
1. Apply ATF to the new D-rings and install them into the clutch piston.



2. Apply ATF to the inner surface of the high clutch drum.
3. Apply even pressure to the perimeter of the clutch piston, and install it into the reverse clutch drum by turning it evely and gradually.
4. Verify that the piston can be turned by hand. If it cannot, then remove it and check for damage to the seal ring.

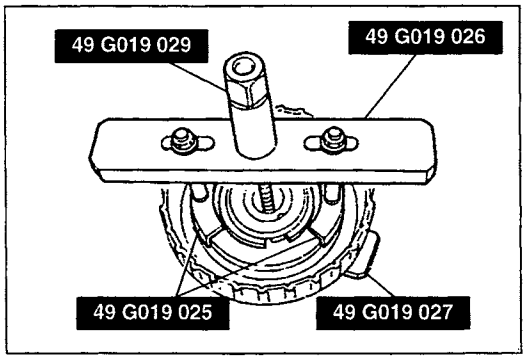


5. Install the return springs and spring retainer.

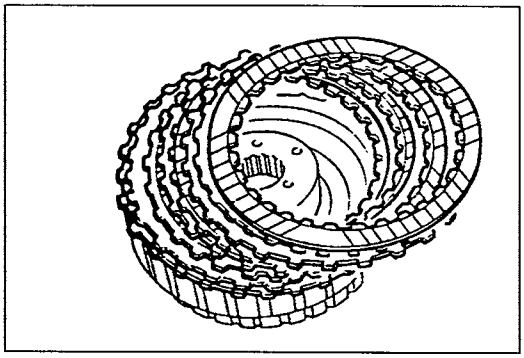


Caution

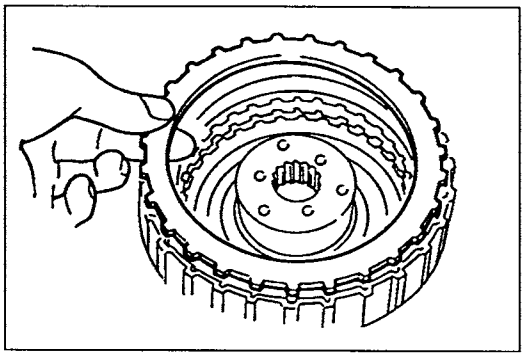
- **Depress the spring retainer only enough to install the snap ring. Overpressing will damage the retainer assembly edges.**



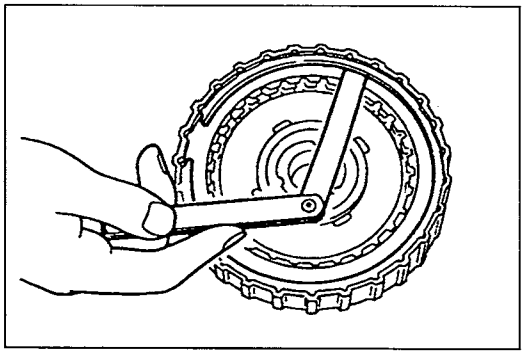
6. While holding the spring retainer down by using the **SSTs**, install the snap ring into the spring retainer stopper.



7. Soak new drive plates in ATF for at least two hours.
8. Apply ATF to the driven plates immediately before assembly.
9. Install the drive and driven plates into the high clutch drum in the following order.
   Driven-Drive-Driven-Driven-Drive-Driven-Driven-Drive Driven-Driven-Drive



10. Install the retaining plate.
11. Install the snap ring.



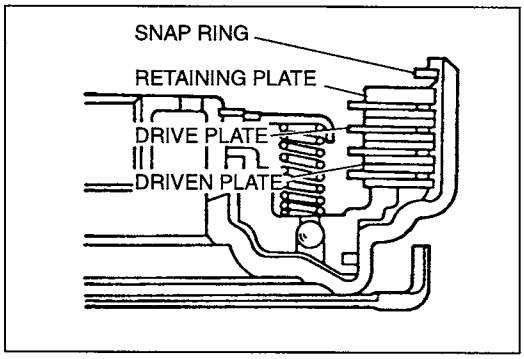
12. Measure the clearance between the retaining plate and the snap ring with a feeler gauge. If not within the specification, adjust the clearance by installing the correct retaining plate.

    Standard clearance:
    1.8—3.0 mm { 0.071—0.118 in }

Retaining plate sizes

mm { in }

3.0 { 0.118 }	3.2 { 0.126 }	3.4 { 0.134 }	3.6 { 0.142 }
3.8 { 0.150 }	4.0 { 0.157 }	4.2 { 0.165 }	4.4 { 0.173 }



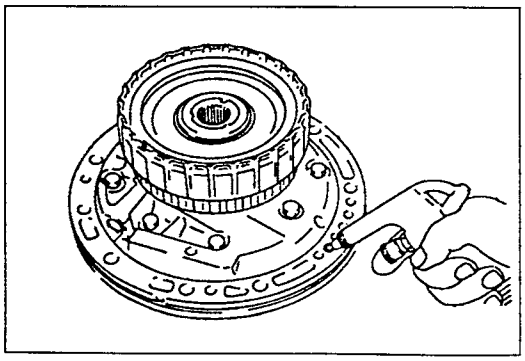
13. If the clearance cannot be brought to within specification after installation of the thickest retaining plate, replace the dished plate, driven plates and drive plates.
    Adjust the clearance by installing the correct retaining plate.

    Standard clearance:
    1.8—2.2 mm { 0.071—0.087 in }

Retaining plate sizes

mm { in }

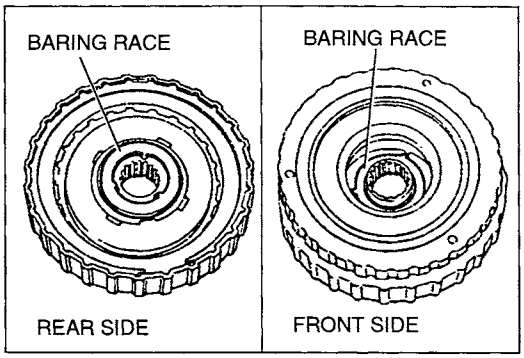
3.0 { 0.118 }	3.2 { 0.126 }	3.4 { 0.134 }	3.6 { 0.142 }
3.8 { 0.150 }	4.0 { 0.157 }	4.2 { 0.165 }	4.4 { 0.173 }



Caution
- **Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal.**

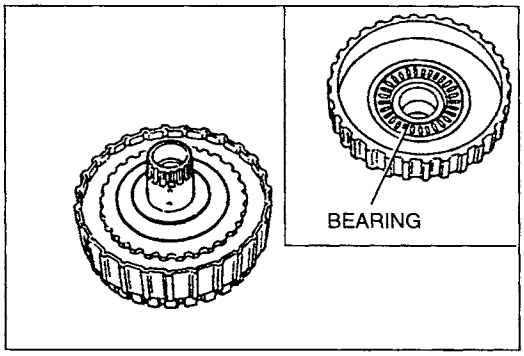
14. Install the high clutch onto the oil pump along with the seal rings. Apply compressed air to the oil passage and check the clutch operation.

    Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.



15. Apply petroleum jelly to the bearing races and install them in the high clutch as shown.

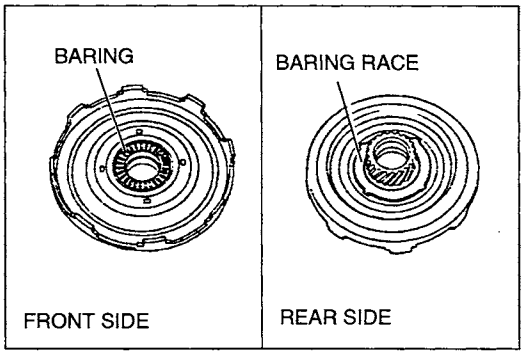
Bearing race outer diameter
Front side: 43.5 mm { 1.713 in }
Rear side : 51.5 mm { 2.028 in }



16. Apply petroleum jelly to the bearing and install it in the high clutch hub.

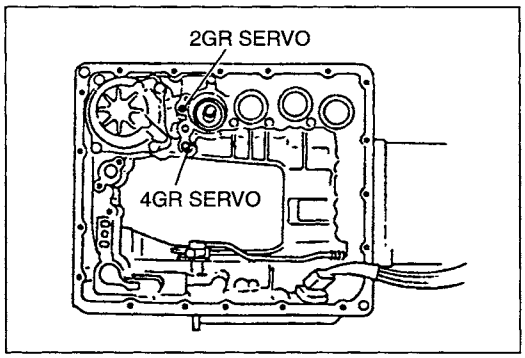
Bearing outer diameter: 53.0 mm { 2.087 in }

17. Apply ATF to the high clutch hub, and install it in the high clutch by turning it evenly and gradually.



Front sun gear
Apply petroleum jelly to the bearing and bearing race, and install them to the front sun gear.

Bearing outer diameter: 53.0 mm { 2.087 in }
Bearing race outer diameter: 75.0 mm { 2.953 in }



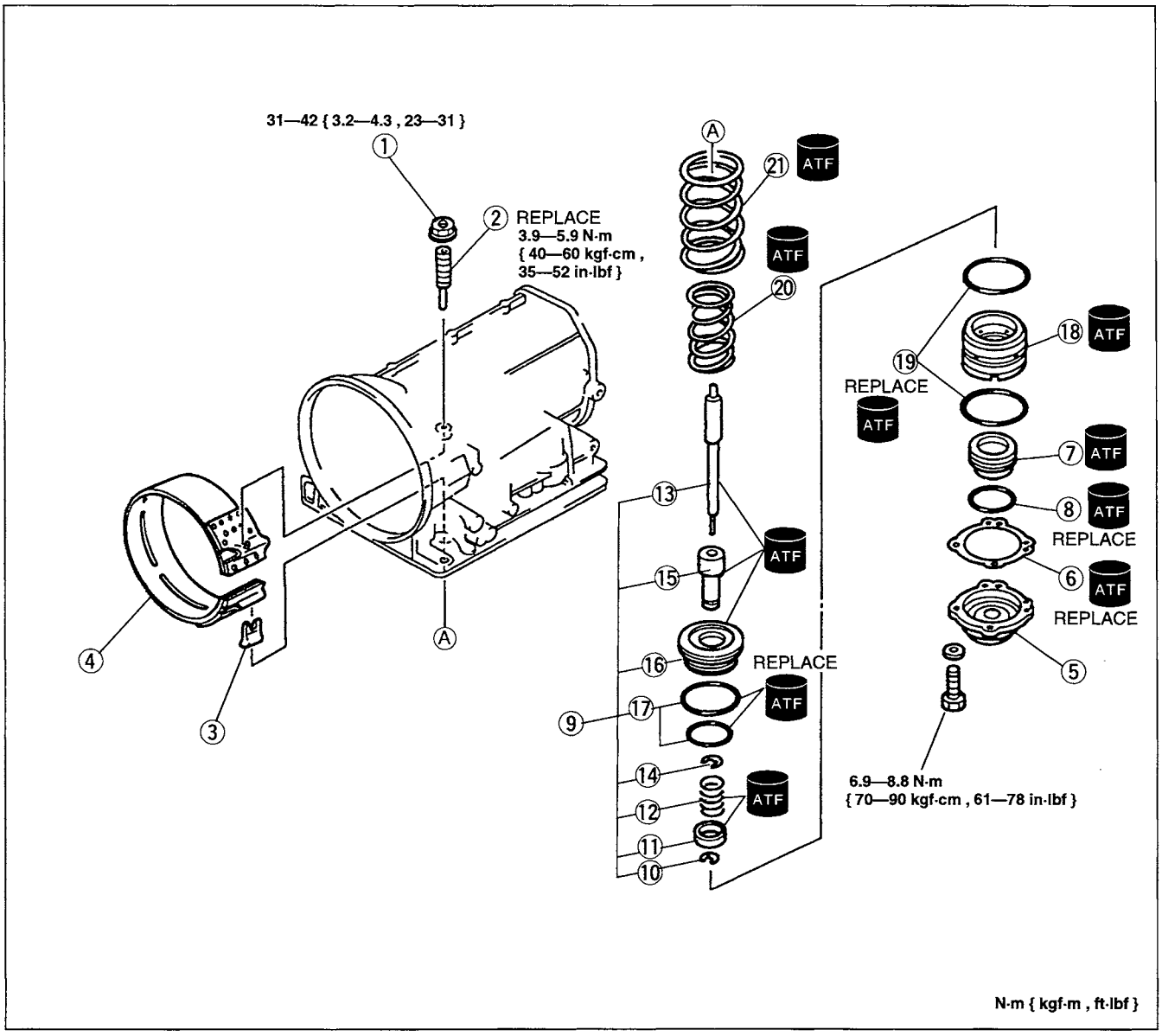
BAND SERVO
Preinspection
Band servo
1. Apply compressed air to the oil passage as shown.

Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

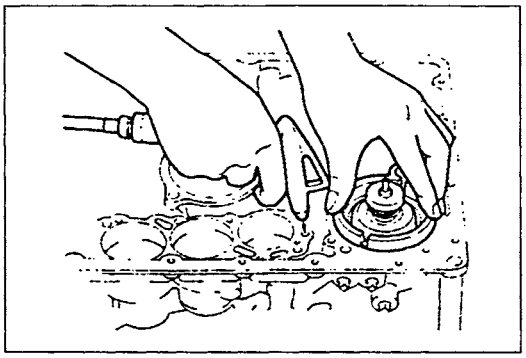
2. Verify that the piston stem moves to the brake band.
If not, the D-ring or the oil seal may be damaged or fluid may be leaking at the piston assembly.
Inspect them, and replace when assembling.

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note.**
2. Assemble in the reverse order of disassembly, refeering to **Assembly procedure.**



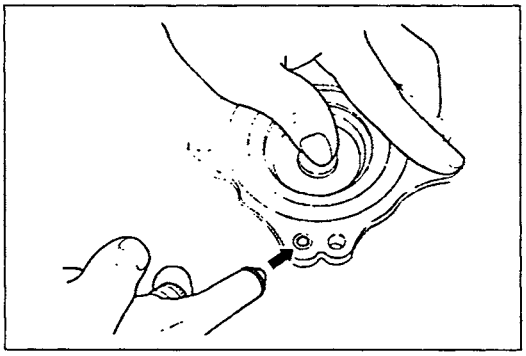
1. Locknut
2. Anchor end bolt
3. Band strut
4. Brake band
5. Band servo retainer
6. Gasket
7. 4GR band servo piston
   Disassembly Note ..... page K1–66
8. D-ring
9. Piston assembly and servo piston retainer
10. Retaining ring (small)
11. Spring retainer
12. Return spring C
    Inspection ..... page K1–66
13. Piston stem
14. Retaining ring (large)
15. Servo cushion retainer
16. Band servo piston
17. D-ring
18. Servo piston retainer
    Disassembly Note ..... page K1–66
19. O-ring
20. Return spring B
    Inspection ..... page K1–66
21. Return spring A
    Inspection ..... page K1–66



Disassembly note
Piston assembly and servo piston retainer

Apply compressed air to the oil hole in the transmission case to remove the piston assembly and servo piston retainer from the transmission case.

Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

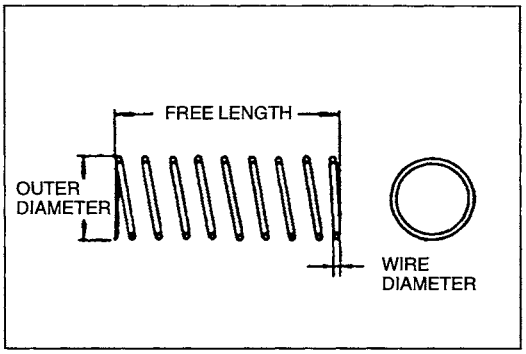


4GR band servo piston

1. Block one oil hole in the 4GR servo piston retainer, and block the center hole in the 4GR band servo piston.
2. Apply compressed air to the other oil hole in the 4GR servo piston retainer to remove 4GR band servo piston from the 4GR servo piston retainer.

Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

3. Remove the D-ring from the 4GR band servo piston.



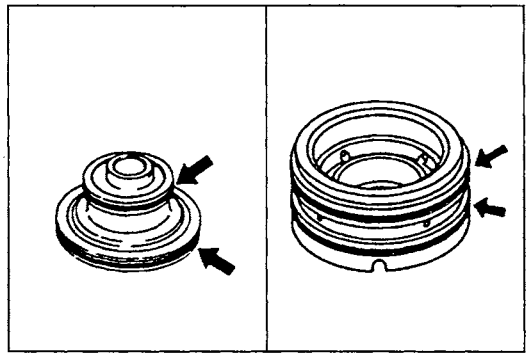
Inspection
Return spring

1. Measure the spring specifications.

Specifications

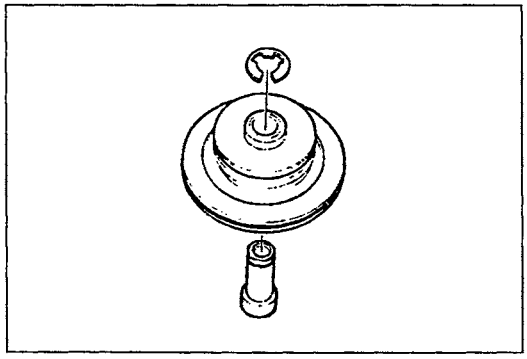
	Outer dia. mm { in }	Free length mm { in }	No. of coil	Wire dia. mm { in }
Return A	40.3 { 1.587 }	53.8 { 2.118 }	3.0	2.3 { 0.091 }
Return B	34.3 { 1.350 }	45.6 { 1.795 }	3.0	2.3 { 0.091 }
Return C	27.6 { 1.087 }	29.7 { 1.169 }	3.2	2.6 { 0.102 }

2. If not correct, replace the return spring.

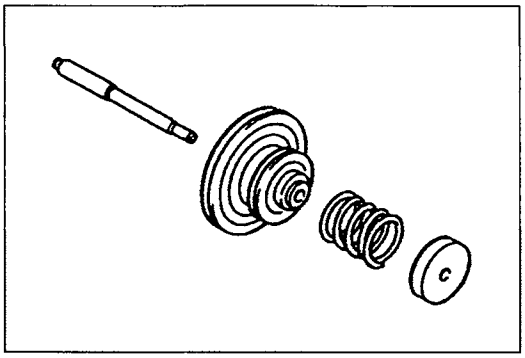


Assembly procedure

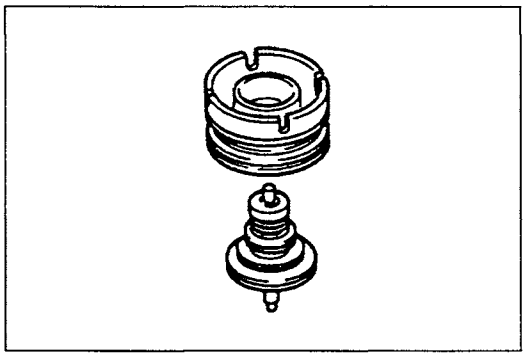
1. Apply ATF to the new O-rings and install them onto the servo piston retainer.
2. Apply ATF to the new D-rings and install them onto the band servo piston.



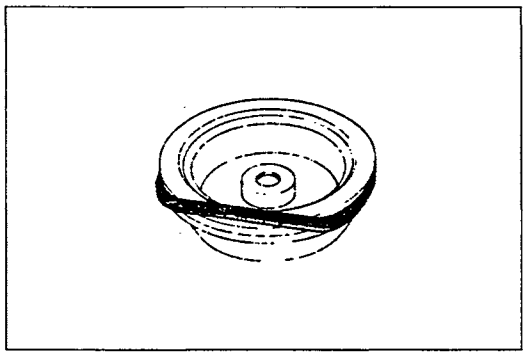
3. Apply ATF to the servo cushion spring retainer and retaining ring, and assemble them in the band servo piston.



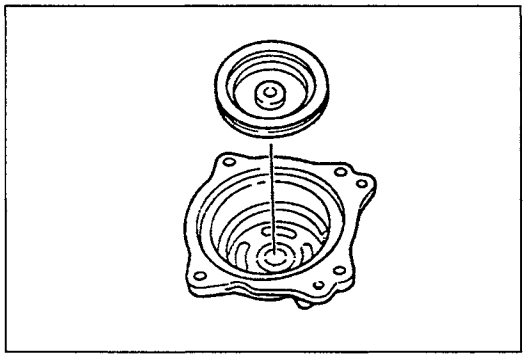
4. Apply ATF to the band servo piston assembly.
5. Apply even pressure to the perimeter of the piston and install it onto the servo piston retainer.



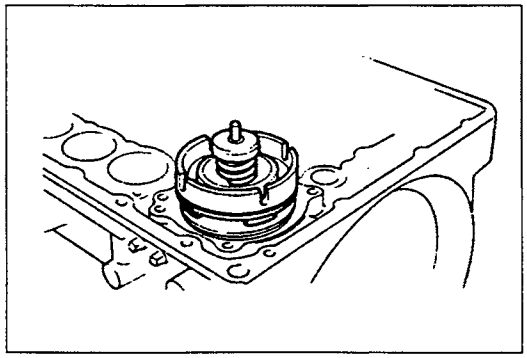
6. Apply ATF to the piston stem return spring and spring retainer, and assemble them in the band servo piston.
7. Install the retaining ring.



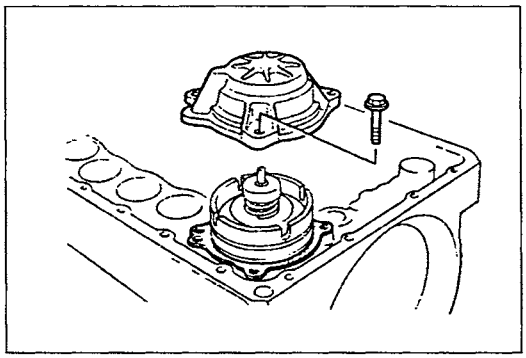
8. Apply ATF to the new D-ring, and install it onto the 4GR band servo piston.



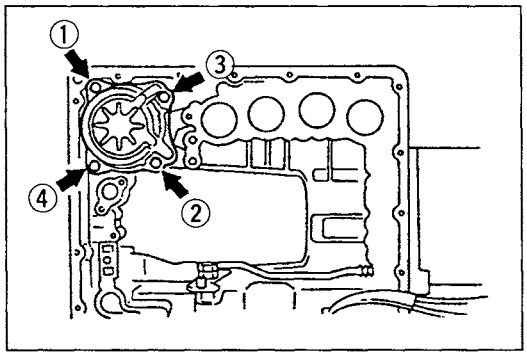
9. Apply ATF to the 4GR band servo piston.
10. Apply even pressure to the perimeter of the piston, and install it into the band servo retainer.



11. Install return springs A and B.
12. Apply ATF to the piston assembly.
13. Apply even pressure to the perimeter of the piston assembly, and install it into the transmission case.

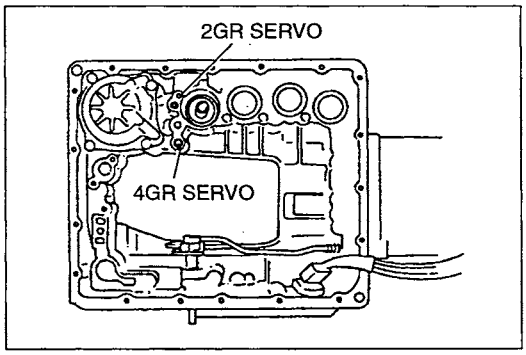


14. Apply ATF to the band servo retainer and a new gasket, and install them onto the transmission case.



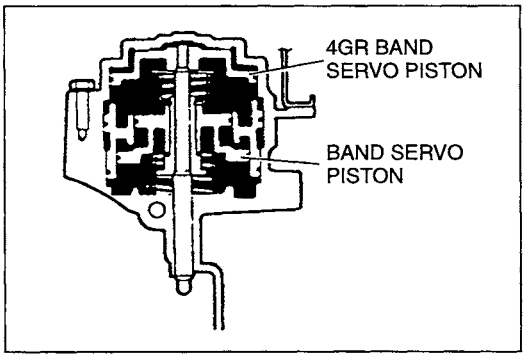
15. Tighten the bolts evenly and gradually in the order shown.

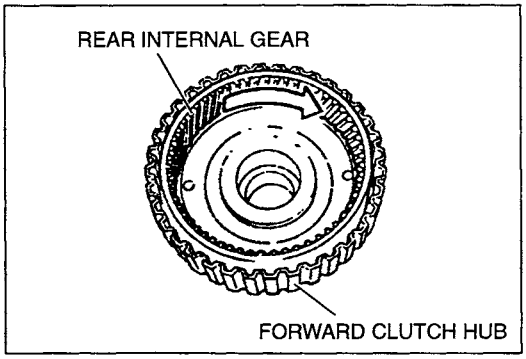
Tightening torque:
6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }



16. Check the servo piston operation by applying compressed air through the oil holes.

Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.





FRONT INTERNAL GEAR, REAR INTERNAL GEAR, FORWARD CLUTCH HUB, OVERRUNNING CLUTCH HUB

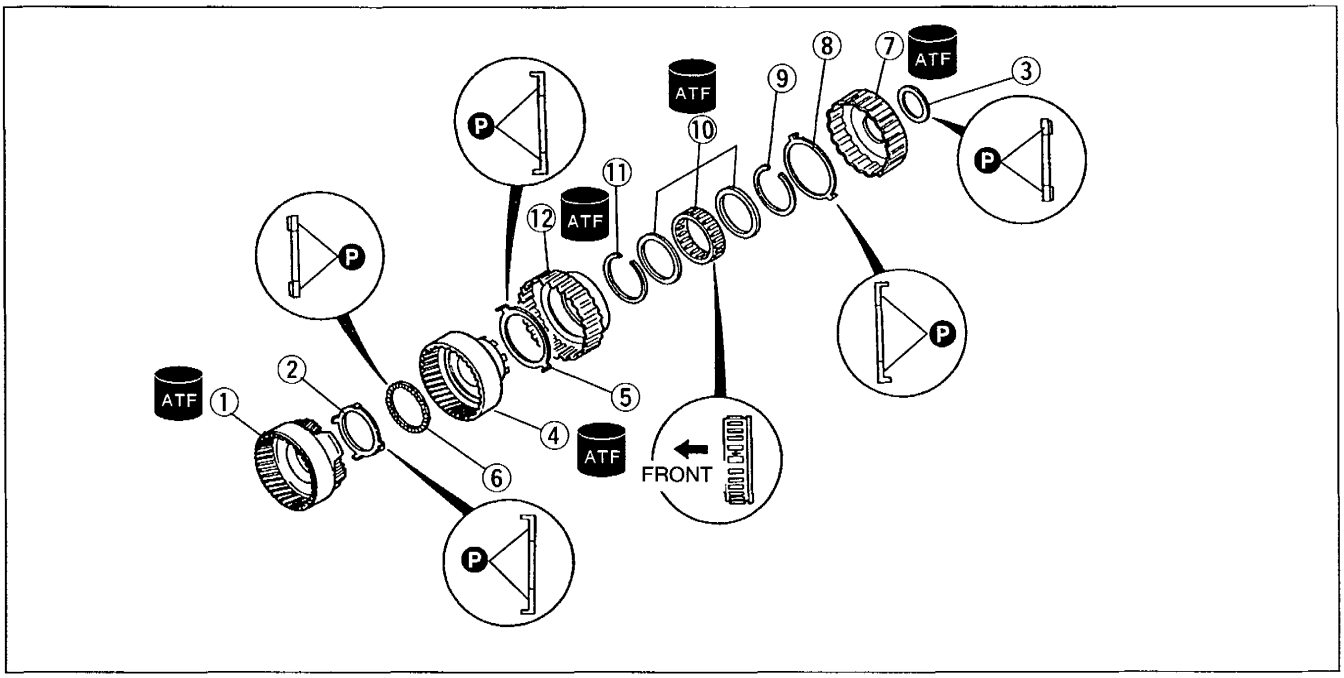
Preinspection

Forward one-way clutch operation

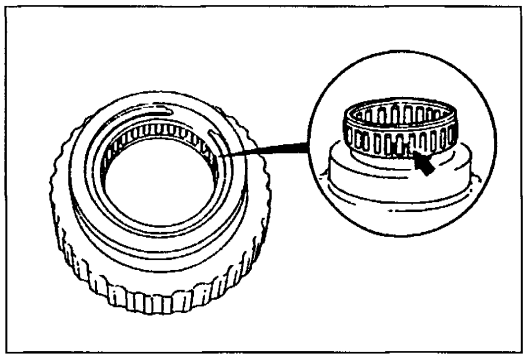
While holding the forward clutch hub, verify that the rear internal gear rotates smoothly when turned clockwise, and locks when turned counterclockwise.
If not, replace the one-way clutch.

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly, referring to **Assembly procedure**.

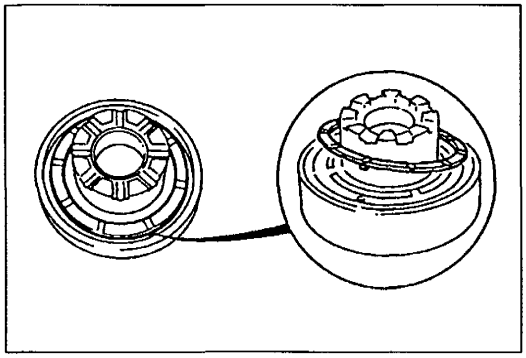


1. Front internal gear (with rear planetary carrier)
2. Bearing race
3. Bearing
4. Rear internal gear
5. Thrust washer
6. Bearing
7. Overrunning clutch hub
8. Thrust washer
9. Snap ring
10. Forward one-way clutch
    Inspection . . . . . page K1–69
11. Snap ring
12. Forward clutch hub

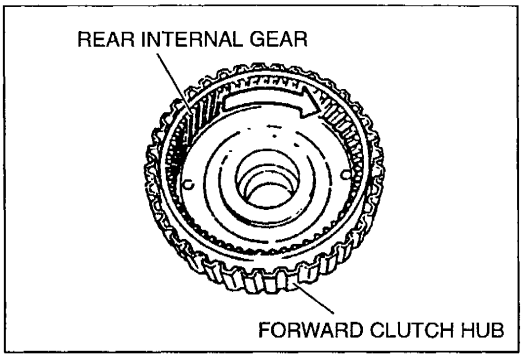


Assembly procedure

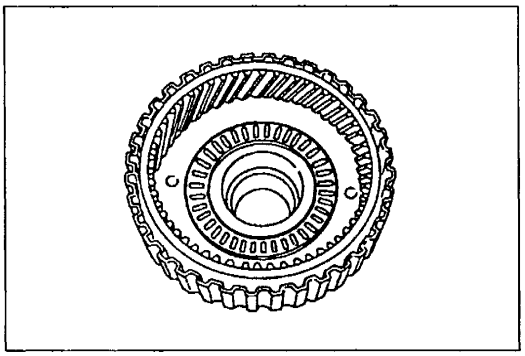
1. Install the snap ring into the forward clutch hub.
2. Apply ATF to the forward one-way clutch. Install it into the forward clutch hub, with the flange facing upward.



3. Apply petroleum jelly to the thrust washer, and set it so that the tabs fit in the holes of the rear internal gear.

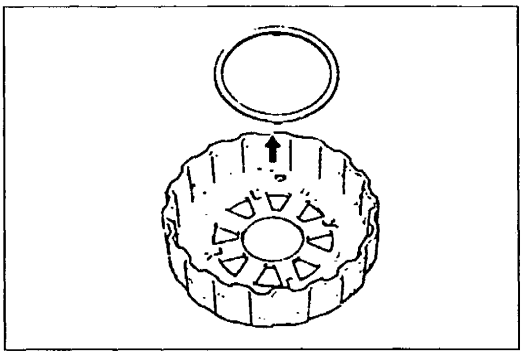


4. Apply ATF to the rear internal gear, and install it in the forward clutch hub by turning it evenly and gradually.
5. Hold the forward clutch hub and verify that the rear internal gear turns counterclockwise. If it does not, then the one way clutch is installed upside down.

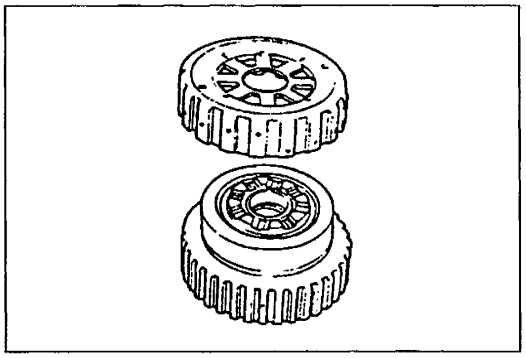


6. Apply petroleum jelly to the bearing, and install it on the rear internal gear.

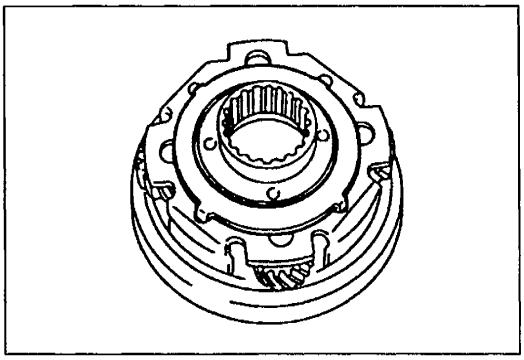
   Bearing outer diameter: 78.0 mm { 3.071 in }



7. Apply petroleum jelly to the thrust washer, and set it so that the tabs fit in the holes of the overrunning clutch hub.



8. Set the overrunning clutch hub on the rear internal gear.



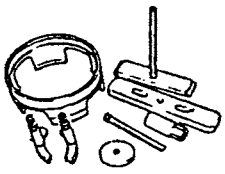
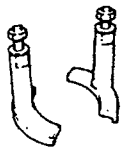
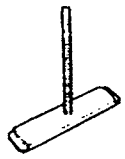
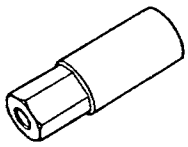
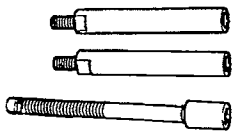
9. Apply petroleum jelly to the bearing race, and set it on the front internal gear.

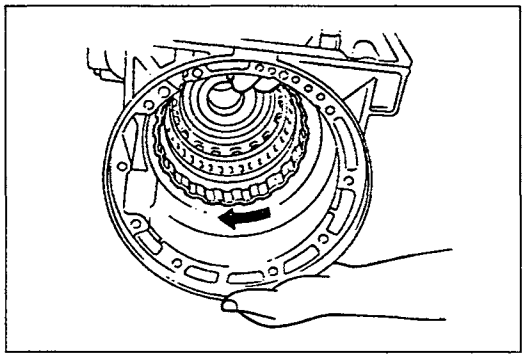
   Bearing race outer diameter: 75.0 mm { 2.953 in }

FORWARD CLUTCH DRUM (FORWARD CLUTCH, OVERRUNNING CLUTCH, LOW ONE-WAY CLUTCH)

Preparation

SST

49 G019 0A7A Compressor set, return spring 	For disassembly / assembly of snap ring	49 G019 025 Body B (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring
49 G019 026 Plate (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring	49 G019 027 Attachment A (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring
49 G019 029 Nut (Part of 49 G019 0A7A) 	For disassembly / assembly of snap ring	49 L019 001 Bolts 	For disassembly / assembly of snap ring

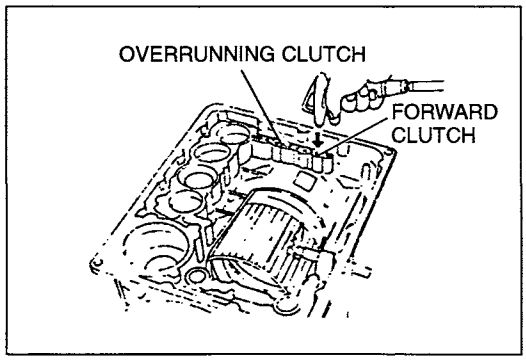


Preinspection

Low one-way clutch operation

Install the forward clutch drum into the transmission case, and verify that the forward clutch drum rotates smoothly when turned clockwise and locks when turned counterclockwise.

If not, replace the one-way clutch.

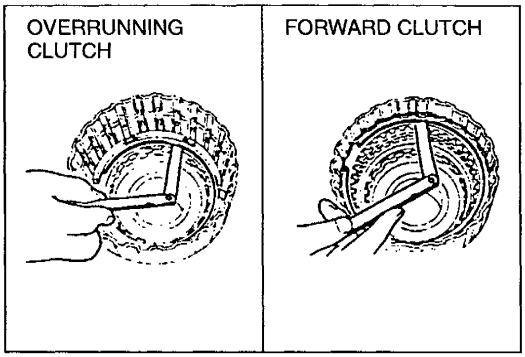


Forward clutch and overrunning clutch operation

1. Install the forward clutch drum and low one-way clutch inner race into the transmission case. Apply compressed air through the oil passage as shown.

   Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

2. Verify that the retaining plates move toward the snap ring. If not, the D-ring or the seal ring may be damaged or fluid may be leaking at the piston check ball. Inspect the parts, and replace if necessary when assembling.



Clearance between retaining plate and snap ring

Measure the clearance between the retaining plate and the snap ring of the forward clutch and the overrunning clutch.

Standard clearance

Forward clutch:

0.45—2.05 mm { 0.018—0.081 in }

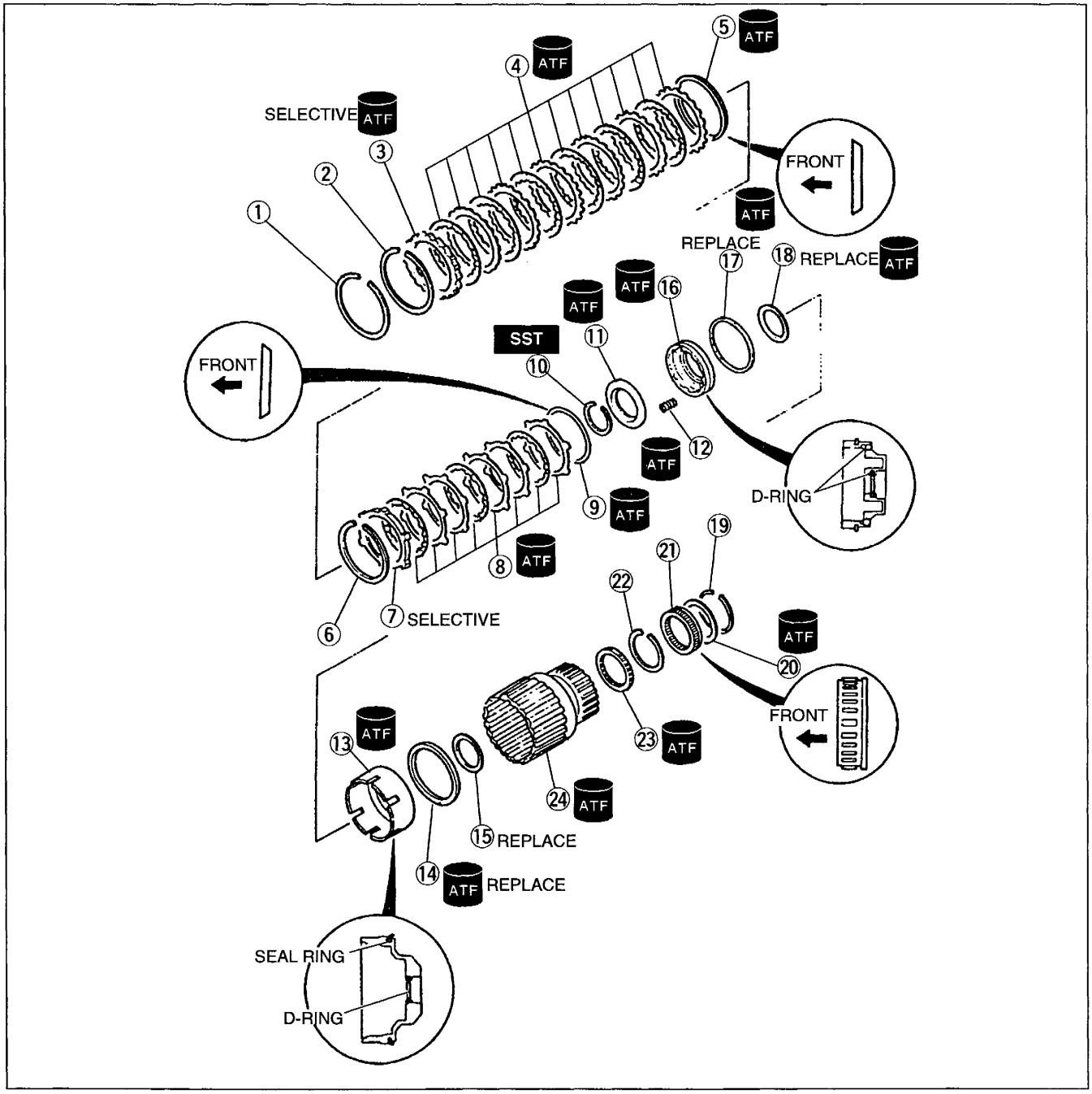
Overrunning clutch:

1.0—2.0 mm { 0.039—0.079 in }

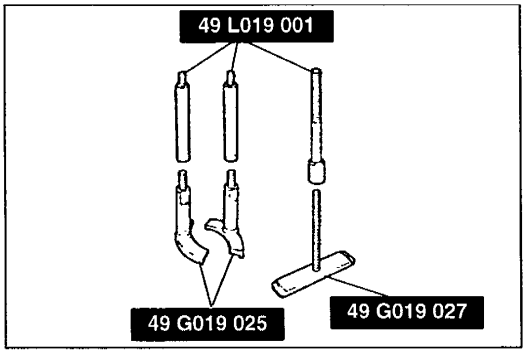
Select the correct retaining plate when assembling if not within the specification.

Disassembly / Inspection / Assembly

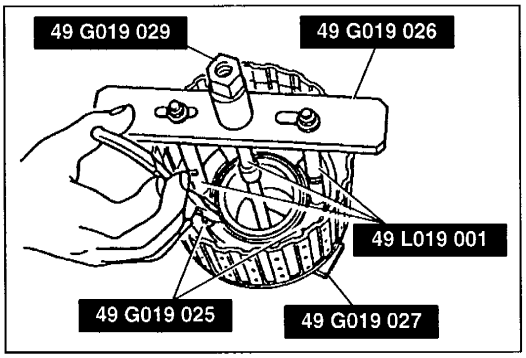
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly procedure**.



1. Snap ring
2. Snap ring
3. Retaining plate
4. Drive plates and driven plates
   Inspection ..... page K1–74
5. Dished plate
6. Snap ring
7. Retaining plate
8. Drive plates and driven plates
   Inspection ..... page K1–74
9. Dished plate
10. Snap ring
    Disassembly Note ..... page K1–73
11. Spring retainer
12. Return spring
    Inspection ..... page K1–74
13. Forward clutch piston
    Disassembly Note ..... page K1–73
14. Seal ring
15. D-ring
16. Overrunning clutch piston
    Disassembly Note ..... page K1–73
    Inspection ..... page K1–74
17. D-ring
18. D-ring
19. Snap ring
20. Side plate
21. Low one-way clutch
22. Snap ring
23. Bearing (radial bearing)
24. Forward clutch drum
    Inspection ..... page K1–74

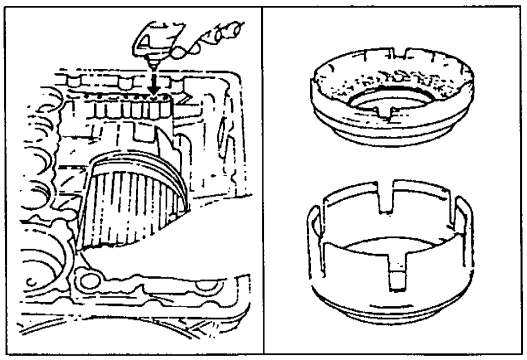


Disassembly note
Snap ring
1. Assemble the **SSTs**.



Caution
- **Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer assembly edges.**

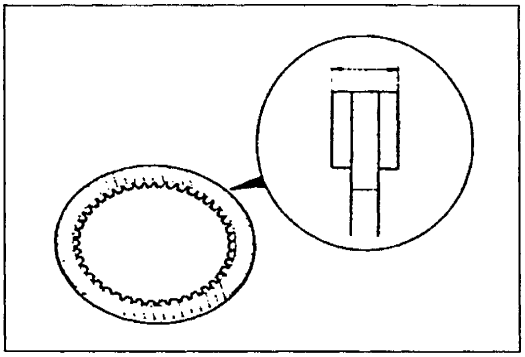
2. While holding the spring retainer down by using the **SSTs**, remove the snap ring by using snap ring pliers.
3. Remove the spring retainer and springs.



Piston
1. Set the forward clutch drum in the transmission case.
2. Remove the piston by applying compressed air through the oil passage.

   Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

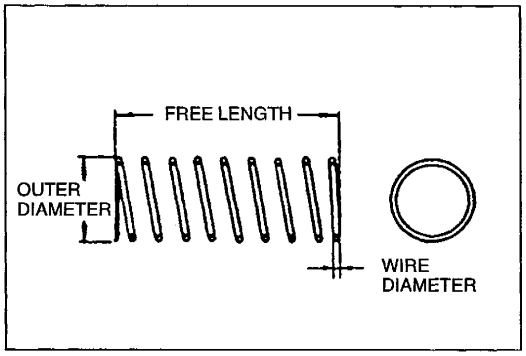
3. Remove the overrunning clutch piston from the forward clutch piston.



Inspection
Drive plates
1. Measure the facing thickness in three places, and determine the average of the three readings.

   Standard thickness: 2.0 mm { 0.079 in }
   Minimum thickness: 1.8 mm { 0.071 in }

2. If it is less than the minimum, replace the drive plates.

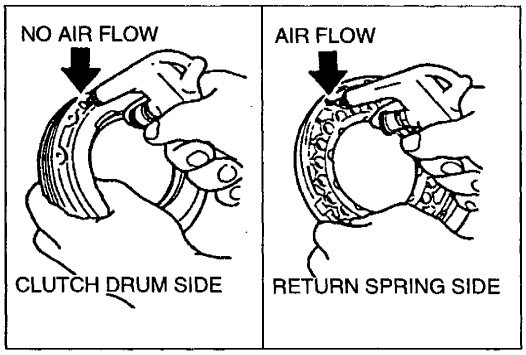


Return spring
1. Measure the spring specifications.

Specifications

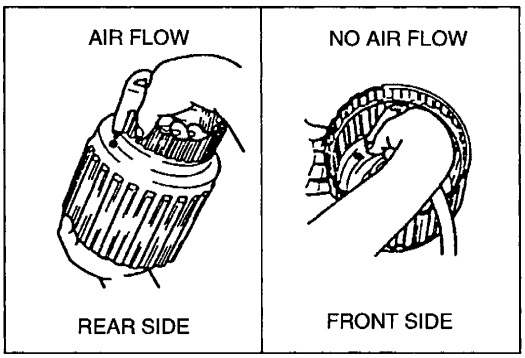
Outer dia. mm { in }	Free length mm { in }	No. of coil	Wire dia. mm { in }
9.7 { 0.382 }	35.8 { 1.409 }	10.3	1.3 { 0.051 }

2. If not correct, replace the spring.



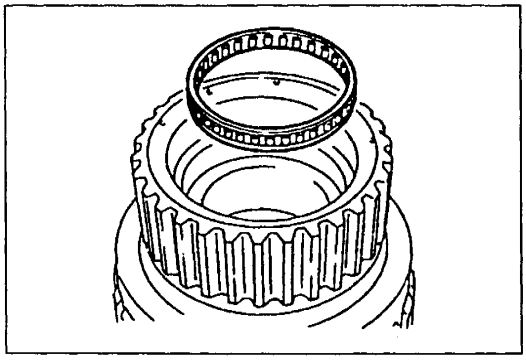
Clutch piston
1. Verify that there is no air leakage when applying compressed air through the oil hole opposite the return spring.
2. Verify that there is airflow when applying compressed air through the oil hole on return spring side.

   Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

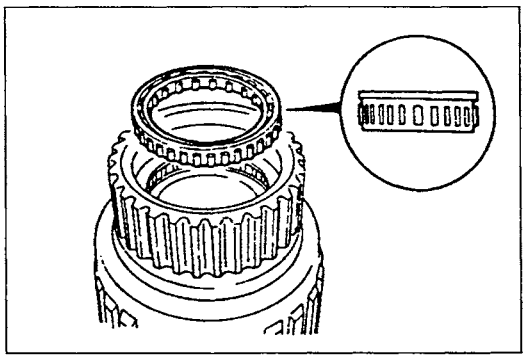


Forward clutch drum
1. Verify that there is no air leakage when applying compressed air through the oil hole opposite the low and reverse brake.
2. Verify that there is air flow when applying compressed air through the oil hole on the low and reverse brake side.

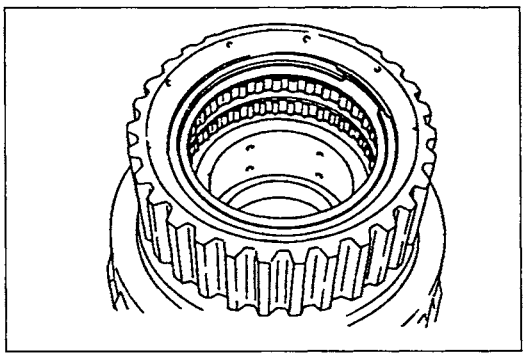
   Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.



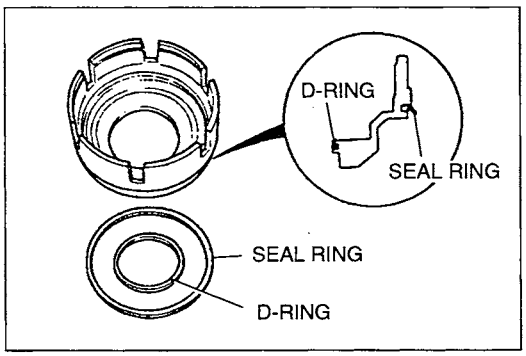
Assembly procedure
1. Apply ATF to the bearing, and install it into the forward clutch drum.
2. Install the snap ring.



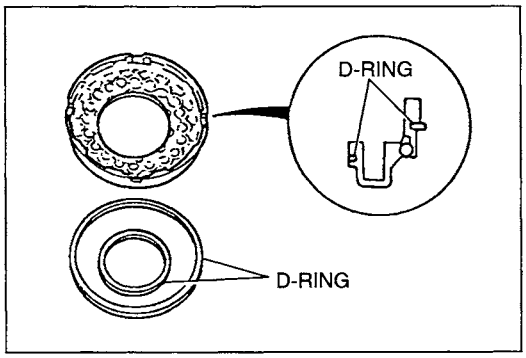
3. Apply ATF to the low one-way clutch. Install it carefully into the forward clutch drum with the flange facing upward.



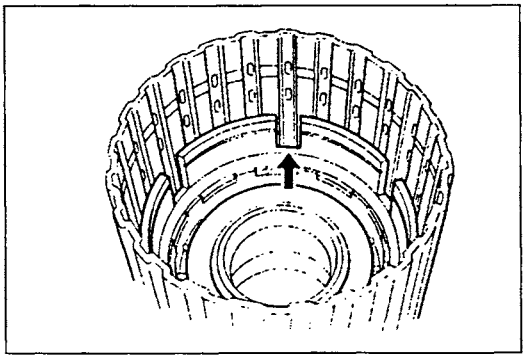
4. Apply ATF to the side plate and snap ring, and install them into the forward clutch drum.



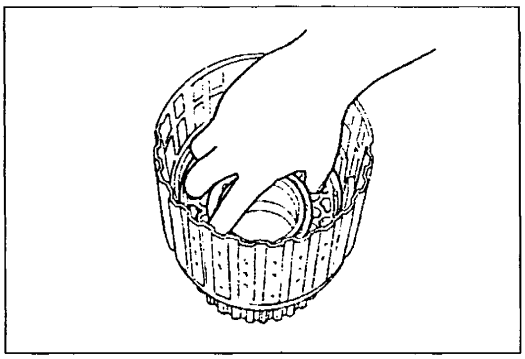
5. Apply ATF to the new D-ring and seal ring, and install them into the forward clutch as shown.



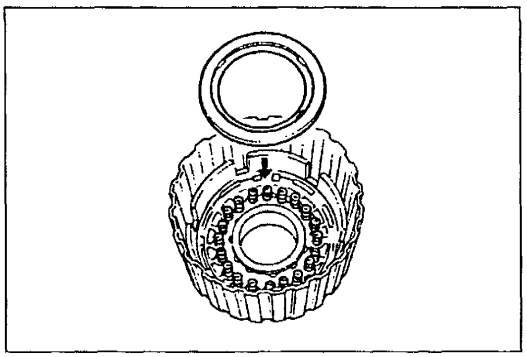
6. Apply ATF to the new D-ring and seal ring, and install them into the overrunning clutch piston as shown.



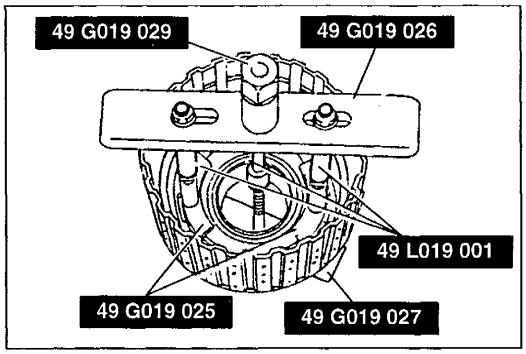
7. Apply ATF to the inner surface of the forward clutch drum and overrunning clutch piston.
8. Apply even pressure to the perimeter of the forward clutch piston, and install it into the forward clutch drum by turning it evenly and gradually. Align the notches in the forward clutch piston with the grooves in the forward clutch drum.
9. Verify that the piston can be turned by hand. If it cannot, then remove it and check for damage to the seal ring.



10. Apply ATF to the inner surface of the forward clutch piston and overrunning clutch piston.
11. Apply even pressure to the perimeter of the overrunning clutch piston, and install it into the forward clutch piston by turning it evenly and gradually.



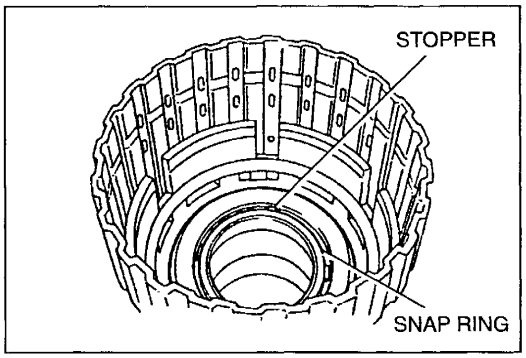
12. Install the springs and spring retainer.

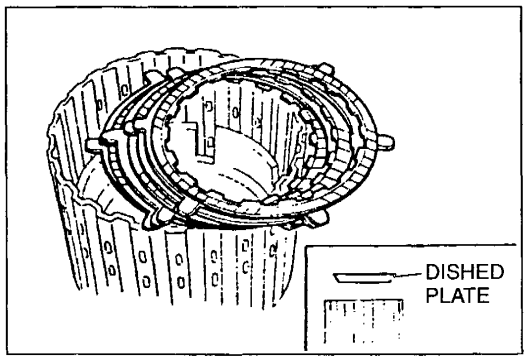


Caution

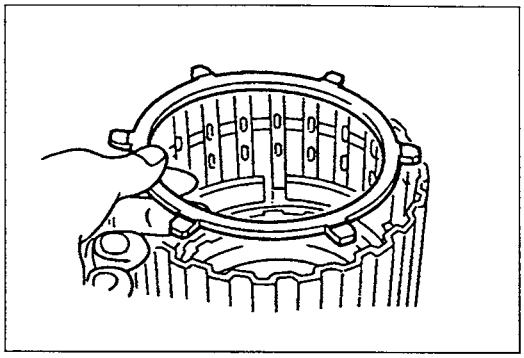
- **Depress the spring retainer only enough to install the snap ring. Overpressing will damage the retainer assembly edges.**

13. While holding the spring retainer down by using the **SSTs**, install the snap ring into the spring retainer stopper.

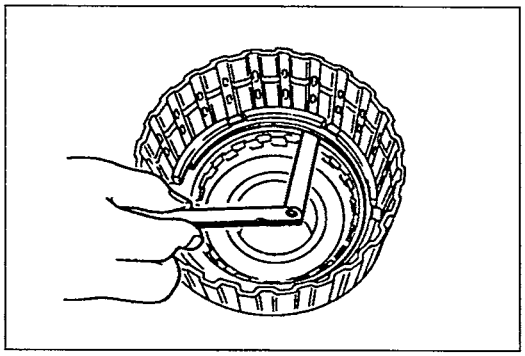




14. Install the dished plate as shown.
15. Soak new drive plates in ATF for at least two hours.
16. Apply ATF to the driven plates immediately before assembly.
17. Install the drive and driven plates into the forward clutch piston in the following order.
    Driven-Drive-Driven-Driven-Drive-Driven-Driven-Drive



18. Install the retaining plate.
19. Install the snap ring.



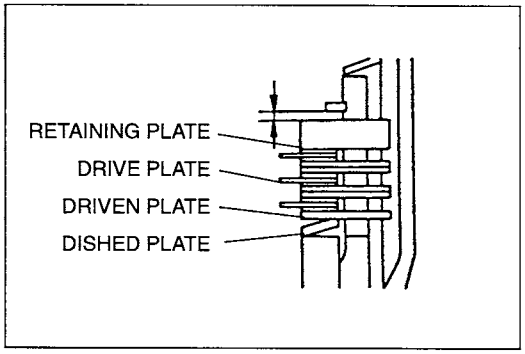
20. Measure the clearance between the retaining plate and the snap ring with a feeler gauge. If not within specification, adjust the clearance by installing the correct retaining plate.

Standard clearance:
1.0—2.0 mm { 0.039—0.079 in }

Retaining plate sizes

mm { in }

4.0 { 0.157 }	4.2 { 0.165 }	4.4 { 0.173 }	4.6 { 0.181 }
4.8 { 0.189 }	5.0 { 0.197 }	5.2 { 0.205 }	



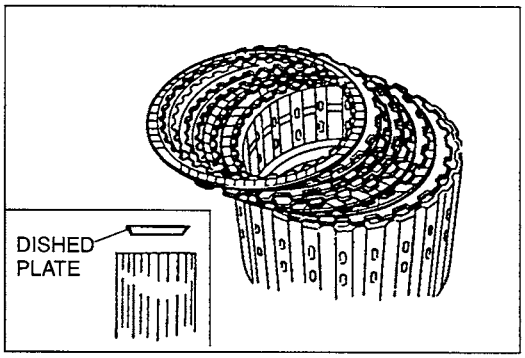
21. If the clearance cannot be brought to within specification after installation of the thickest retaining plate, replace the dished plate, driven plates and drive plates.
Adjust the clearance by installing the correct retaining plate.

Standard clearance:
1.0—1.4 mm { 0.039—0.055 in }

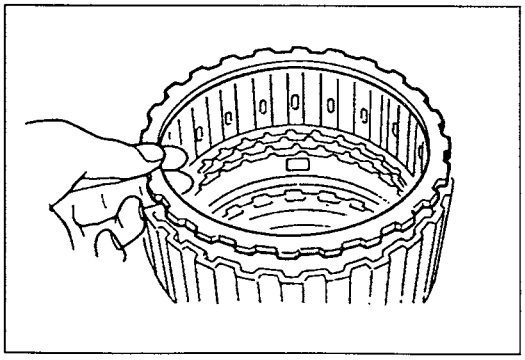
Retaining plate sizes

mm { in }

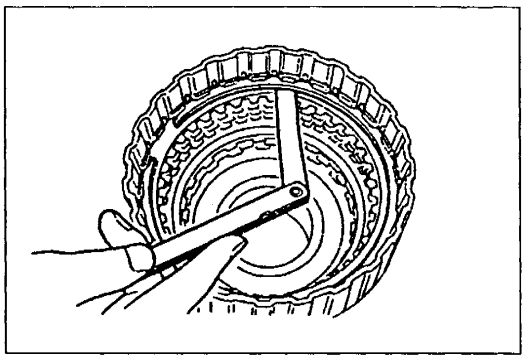
4.0 { 0.157 }	4.2 { 0.165 }	4.4 { 0.173 }	4.6 { 0.181 }
4.8 { 0.189 }	5.0 { 0.197 }	5.2 { 0.205 }	



22. Install the dished plate as shown.
23. Soak new drive plates in ATF for at least two hours.
24. Apply ATF to the driven plates immediately before assembly.
25. Install the drive and driven plates into the forward clutch piston in the following order.
Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven Drive-Driven-Drive



26. Install the retaining plate.
27. Install the snap ring.



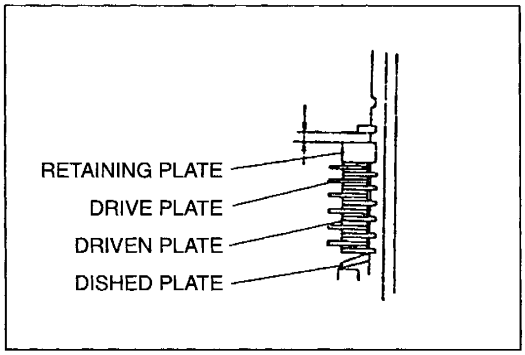
28. Measure the clearance between the retaining plate and the snap ring with a feeler gauge. If not within the specification, adjust the clearance by installing the correct retaining plate.

Standard clearance:
0.45—2.05 mm { 0.018—0.081 in }

Retaining plate sizes

mm { in }

4.0 { 0.157 }	4.2 { 0.165 }	4.4 { 0.173 }	4.6 { 0.181 }
4.8 { 0.189 }	5.0 { 0.197 }	5.2 { 0.205 }	—



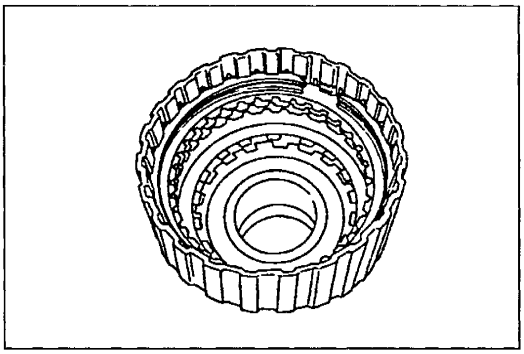
29. If the clearance cannot be brought to within specification after installation of the thickest retaining plate, replace the dished plate, driven plates and drive plates.
Adjust the clearance by installing the correct retaining ring.

Standard clearance:
0.45—0.85 mm { 0.018—0.033 in }

Retaining plate sizes

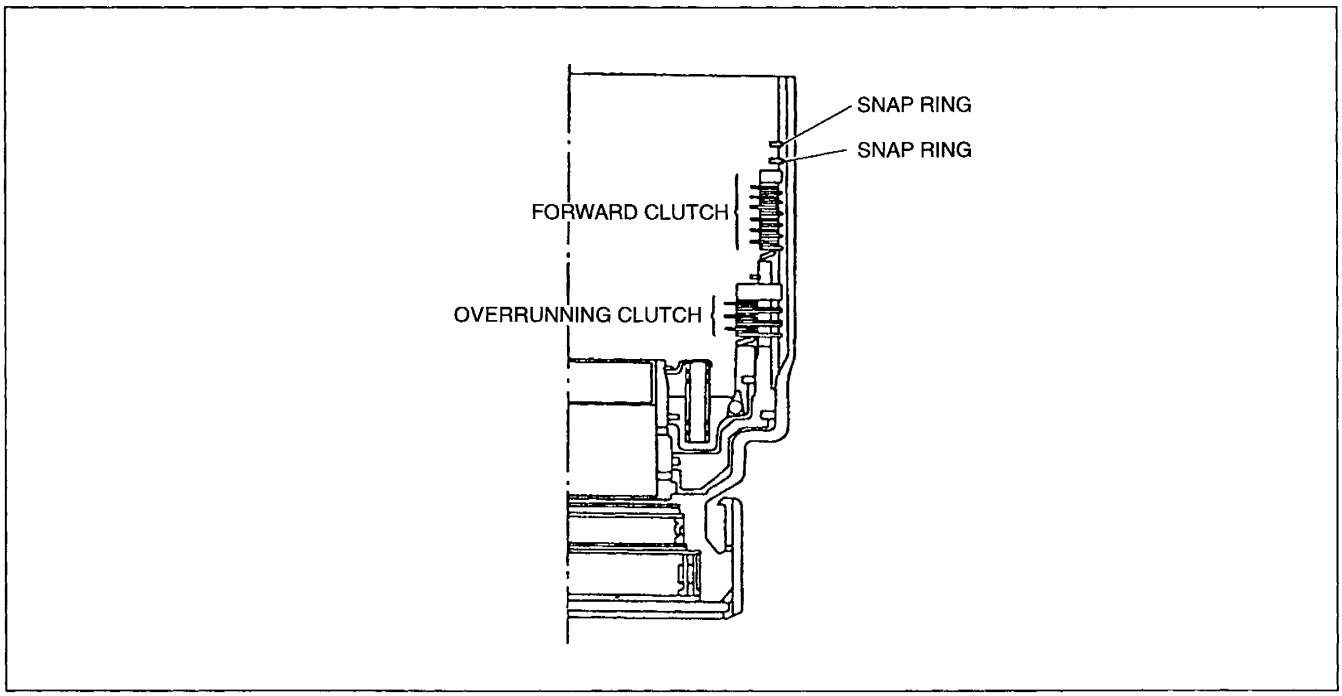
mm { in }

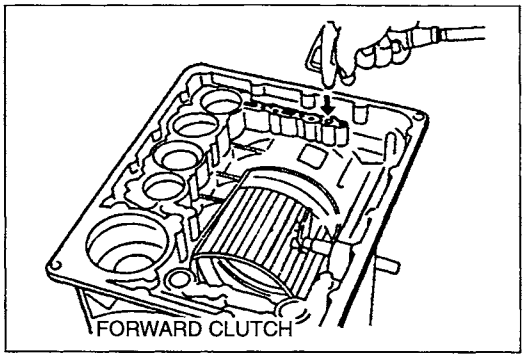
4.0 { 0.157 }	4.2 { 0.165 }	4.4 { 0.173 }	4.6 { 0.181 }
4.8 { 0.189 }	5.0 { 0.197 }	5.2 { 0.205 }	—



30. Install the snap ring.

Installation of proper assembly

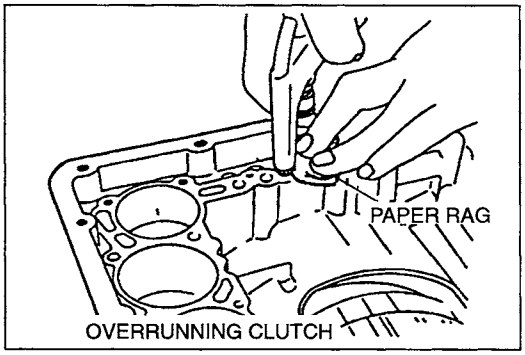


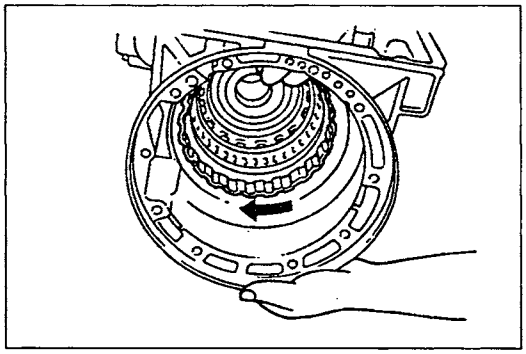


Caution
- **Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal.**

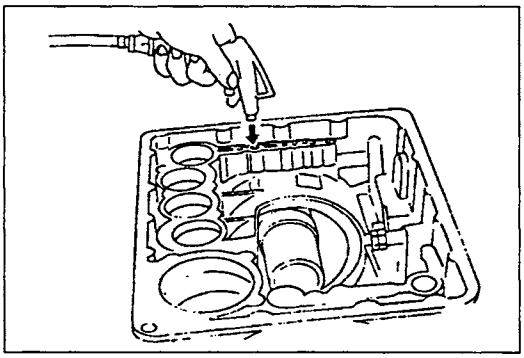
1. Set the forward clutch drum in the transmission. Apply compressed air through the oil passage, and check the forward clutch and overrunning clutch operation.

   Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.





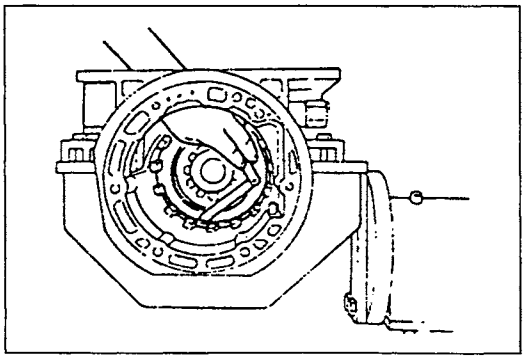
2. Verify that the forward clutch drum turns clockwise only. If it turns conterclockwise, the one-way clutch is installed upside down.



LOW AND REVERSE BRAKE
Preinspection
Low and reverse brake operation
1. Apply compressed air through the oil passage as shown.

   Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

2. Verify that the retaining plates move toward the snap ring. If not, the D-ring or the seal ring may be damaged or fluid may be leaking at the piston check ball. Inspect them, and replace when assembling.



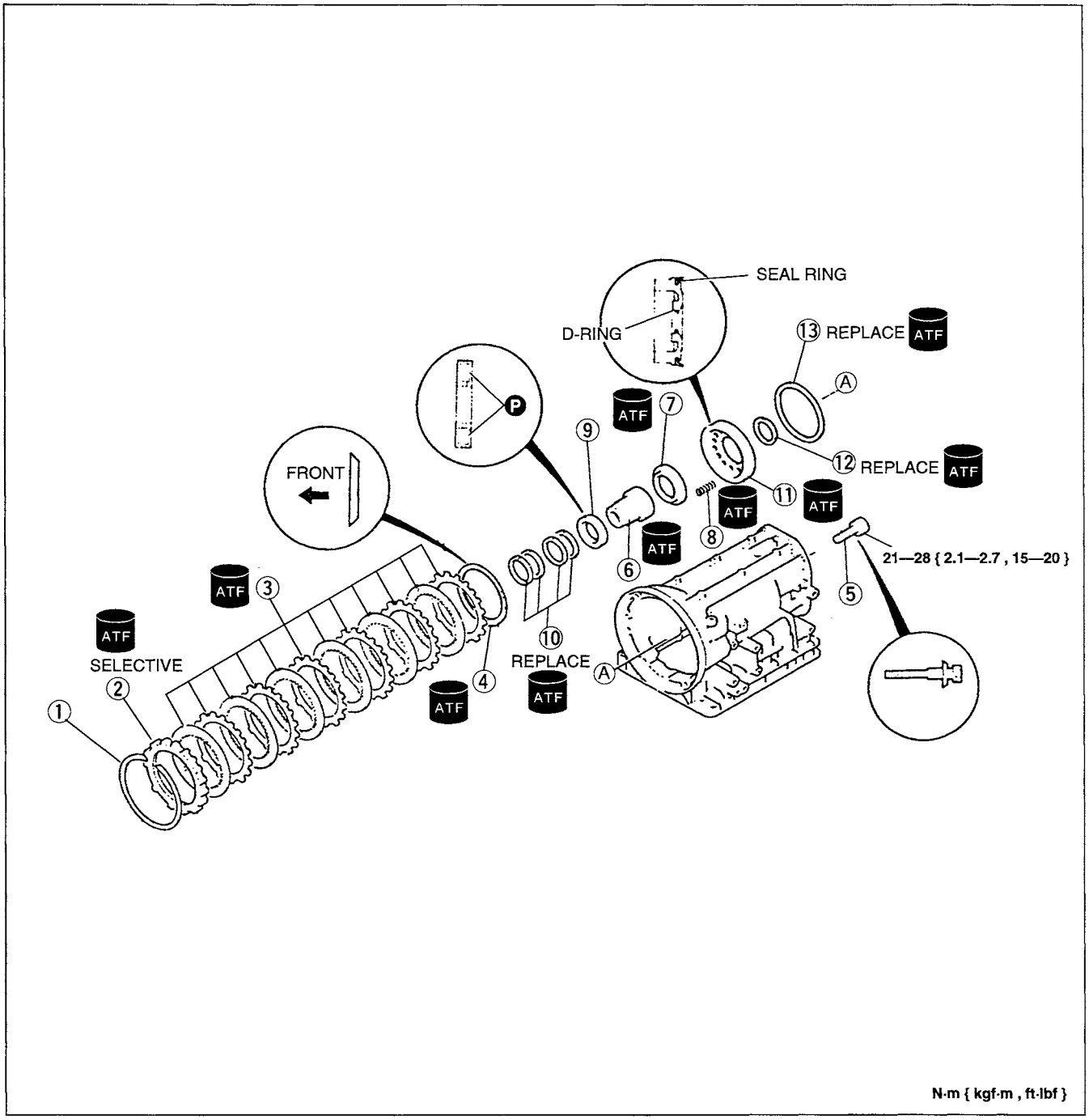
Clearance between retaining plate and snap ring
Measure the clearance between the retaining plate and the snap ring to the forward clutch and the overrunning clutch.

Standard clearance: 0.7—2.3 mm { 0.028—0.091 in }

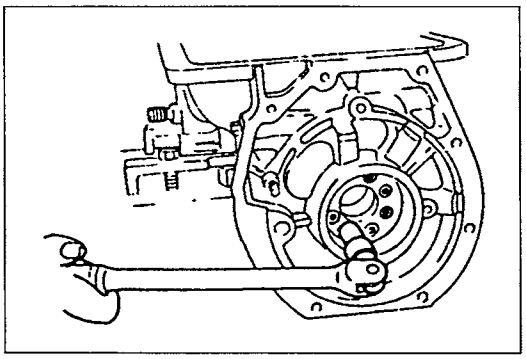
Select the correct retaining plate when assembling if not within the specification.

Disassembly / Inspection / Assembly

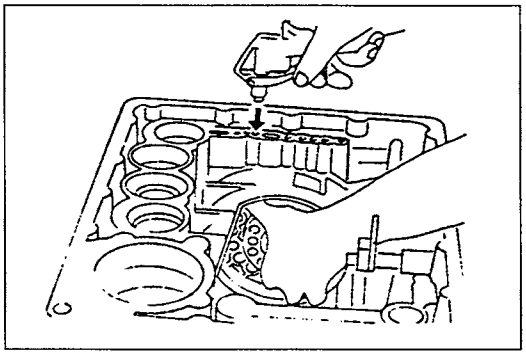
1. Disassemble in the order shown in the figure, referring to **Disassembly Note.**
2. Assemble in the reverse order of disassemly, referring to **Assembly procedure.**



1. Snap ring
2. Retaining plate
3. Drive plates and driven plates
   Inspection ..... page K1–81
4. Dished plate
5. Allen head bolts
6. Low one-way clutch inner race
   Disassembly Note ..... page K1–81
   Inspection ..... page K1–81
7. Spring retainer
8. Return spring
   Inspection ..... page K1–99
9. Bearing
10. Seal rings
11. Low and reverse brake piston
    Disassembly Note ..... page K1–81
12. D-ring
13. Seal ring

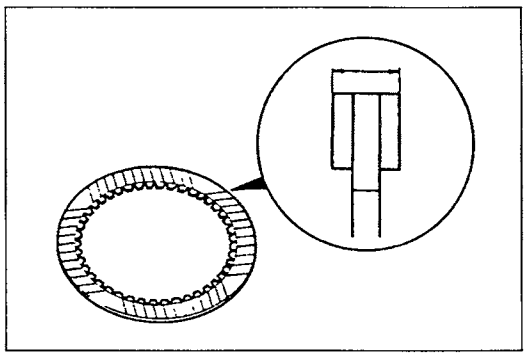


Disassembly note
Low one-way clutch inner race
1. Loosen the bolts gradually in a crisscross pattern. Hold the inner race with your free hand so that it doesn't spring out.
2. Remove the low one-way clutch inner race, spring retainer, and return springs.



Low and reverse brake piston
Remove the low and reverse brake piston by applying compressed air through the oil passage as shown in the figure.

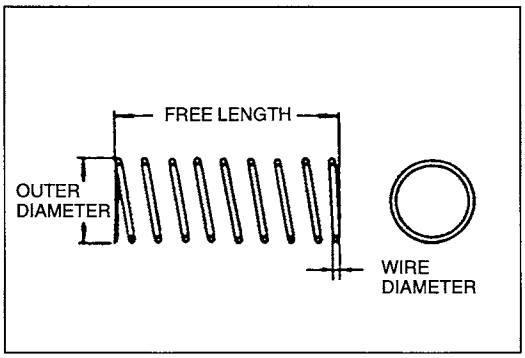
Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.



Inspection
Drive plates
1. Measure the facing thickness in three places, and determine the average of the three readings.

Standard thickness: 2.0 mm { 0.079 in }
Minimum thickness: 1.8 mm { 0.071 in }

2. If it is less than the minimum, replace the drive plates.

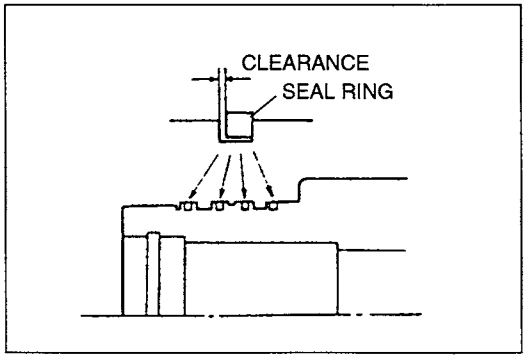


Return spring
1. Measure the spring specifications.

Specifications

Outer dia. mm { in }	Free length mm { in }	No. of coil	Wire dia. mm { in }
11.6 { 0.457 }	23.7 { 0.933 }	5.0	1.1 { 0.043 }

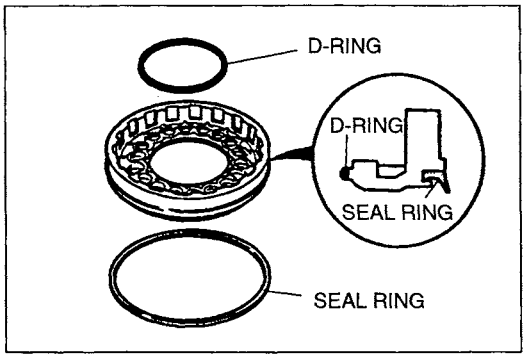
2. If not correct, replace the spring.



Low one-way clutch inner race
1. Apply petroleum jelly to a new seal ring and install the seal ring.
2. Measure the clearance between the seal ring and the ring groove.

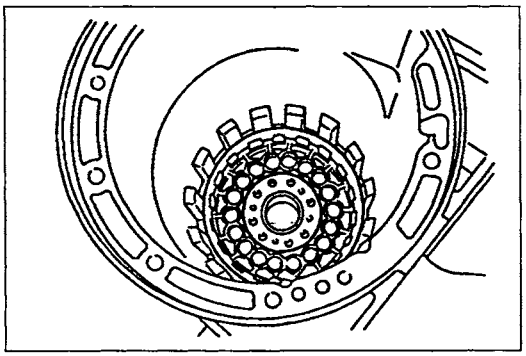
Clearance: 0.10—0.25 mm { 0.0039—0.0098 in }

3. If not within the specification, replace the low one-way clutch inner race.

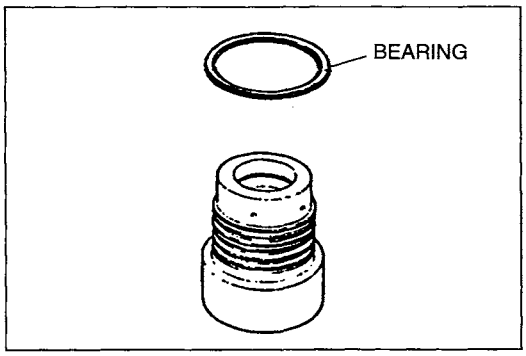


Assembly procedure

1. Apply ATF to the new D-ring and seal ring and install them to the low and reverse brake piston.

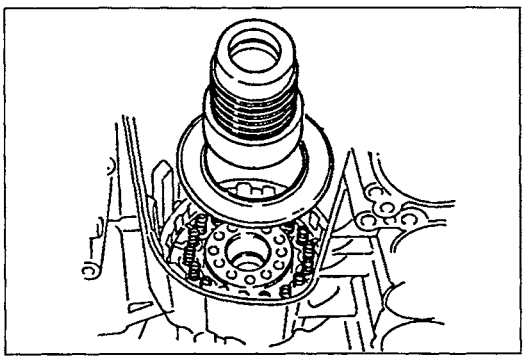


2. Apply ATF to the inner surface of the transmission case.
3. Apply even pressure to the perimeter of the low and reverse brake piston, and install it into the transmission case by turning it evenly and gradually.
4. Verify that the piston can be turned by hand. If it cannot, then remove it and check for damage to the seal ring.

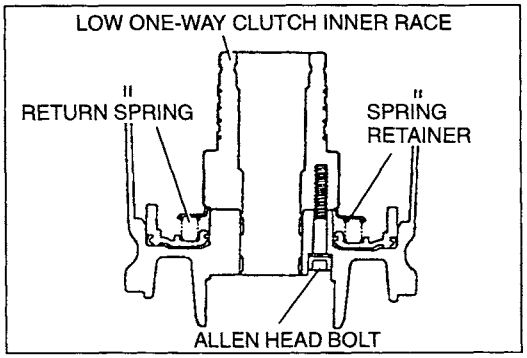


5. Apply petroleum jelly to the bearing, and install it on the low one-way clutch inner race.

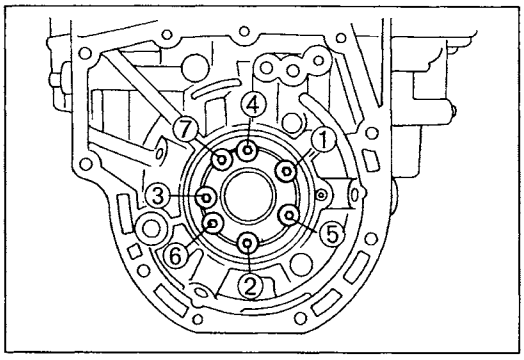
   Bearing outer diameter: 78.0 mm { 3.071 in }



6. Assemble the return spring, spring retainer and low one way clutch inner race to the low and reverse brake piston.

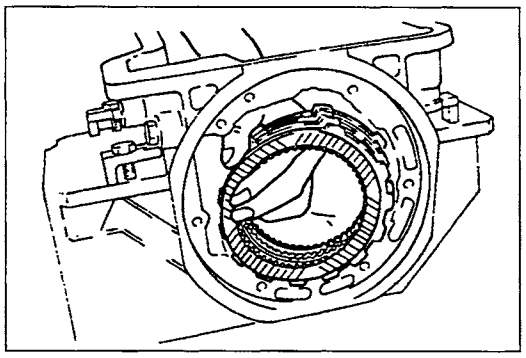


7. Check that the return spring, spring retainer, and low one way clutch inner race are properly positioned before securing them with the Allen head bolts.

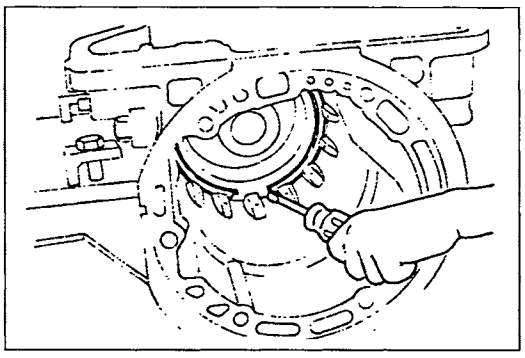


8. Tighten the Allen head bolts evenly and gradually in the order shown.

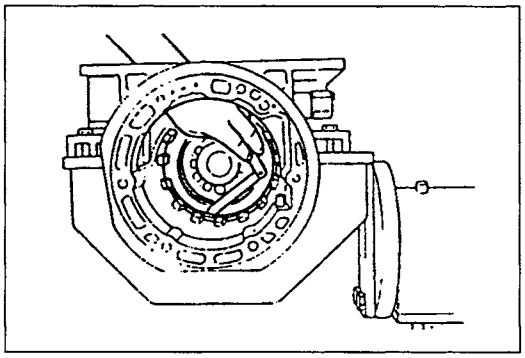
Tightening torque:
21—26 N·m { 2.1—2.7 kgf·m , 15—20 ft·lbf }



9. Soak new drive plates in ATF for at least two hours.
10. Apply ATF to the driven plates immediately before assembly.
11. Install the drive and driven plates into the transmission case in the following order.
Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven Drive-Driven-Drive



12. Install the retaining plate.
13. Install the snap ring.



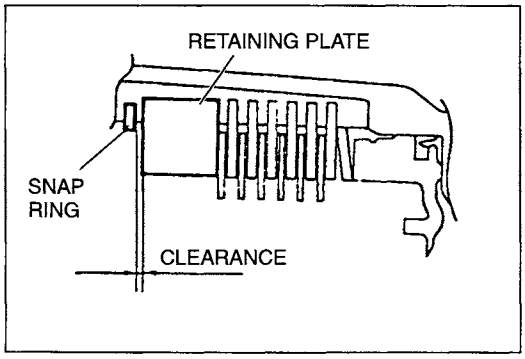
14. Measure the clearance between the retaining plate and the snap ring with a feeler gauge. If not within specification, adjust the clearance by installing the correct retaining plate.

Standard clearance: 0.7—2.3 mm { 0.028—0.091 in }

Retaining plate sizes

mm { in }

9.0 { 0.354 }	9.2 { 0.362 }	9.4 { 0.370 }	9.6 { 0.378 }
9.8 { 0.386 }	10.0 { 0.394 }	—	—



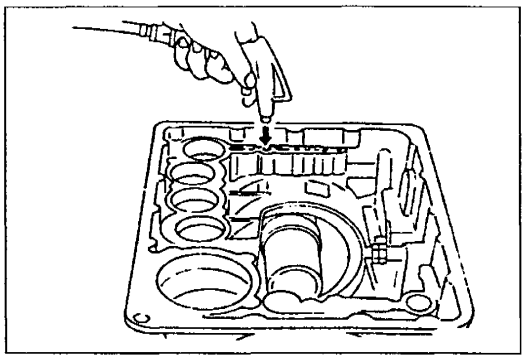
15. If the clearance cannot be brought to within specification after installation of the thickest retaining plate, replace the dished plate, driven plates and drive plates.
Adjust the clearance by installing the correct retaining plate.

Standard clearance: 0.7—1.1 mm { 0.028—0.043 in }

Retaining plate sizes

mm { in }

9.0 { 0.354 }	9.2 { 0.362 }	9.4 { 0.370 }	9.6 { 0.378 }
9.8 { 0.386 }	10.0 { 0.394 }	—	—

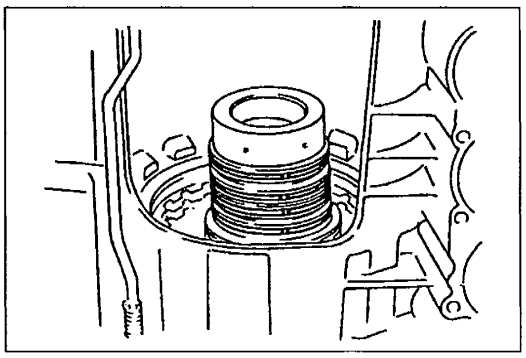


Caution

- **Applying compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal.**

16. Check operation of the piston by applying compressed air through the oil passage of the low and reverse brake.

    Air pressure: 392 kPa { 4.0 kgf/cm^2 , 57 psi } max.

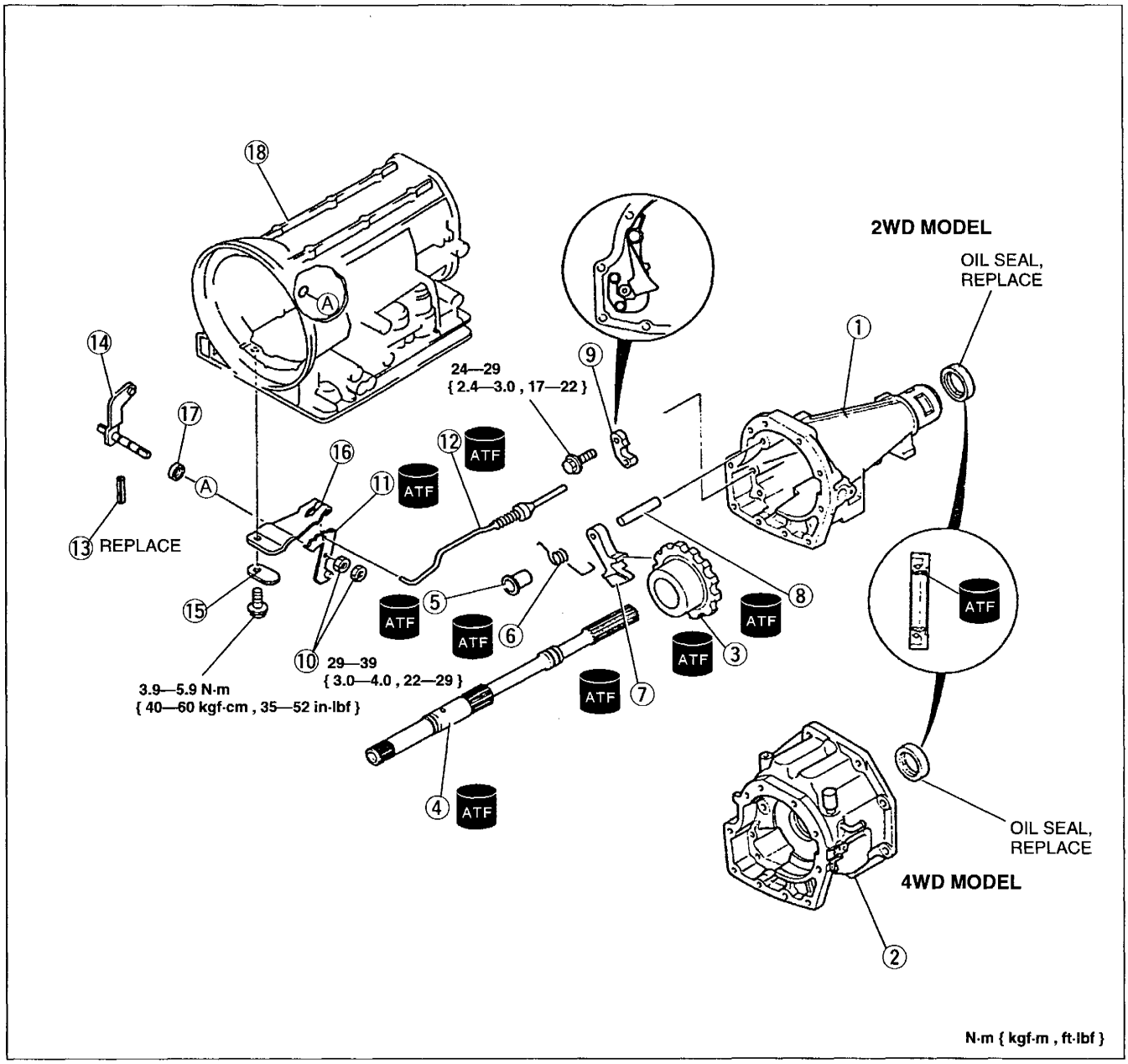


17. Apply petroleum jelly to the seal rings and fit them into the ring grooves of the low one-way clutch inner race.

EXTENSION HOUSING AND PARKING MECHANISM

Disassembly / Inspection / Assembly

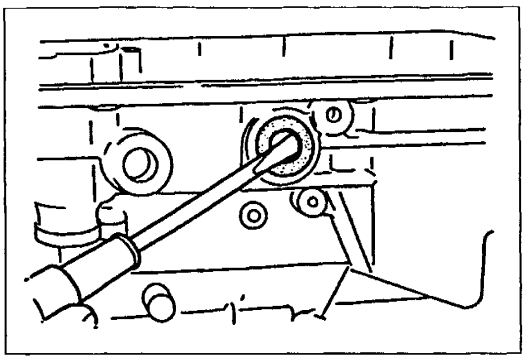
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly procedure**.



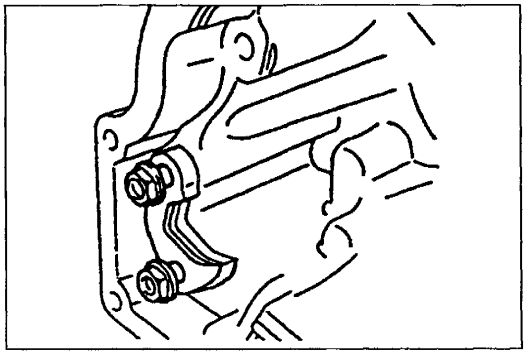
1. Extension housing (2WD)
2. Adapter case (4WD)
3. Parking gear
4. Output shaft
5. Parking pawl spacer
6. Return spring
7. Parking pawl
8. Parking pawl shaft
9. Parking actuator
10. Locknut
11. Manual plate
12. Parking rod
13. Roll pin
14. Manual shaft
15. Spacer
16. Detent spring
17. Oil seal

Disassembly Note ..... page K1–86

18. Transmission case

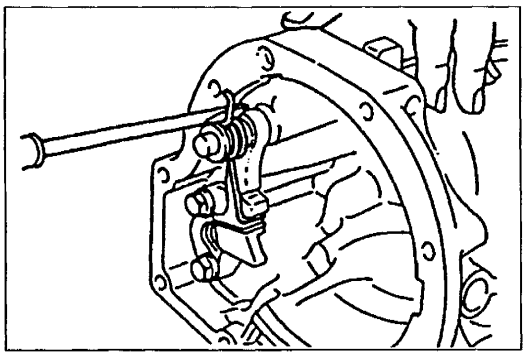


Disassembly note
Oil seal (Transmission side)
Remove the oil seal.

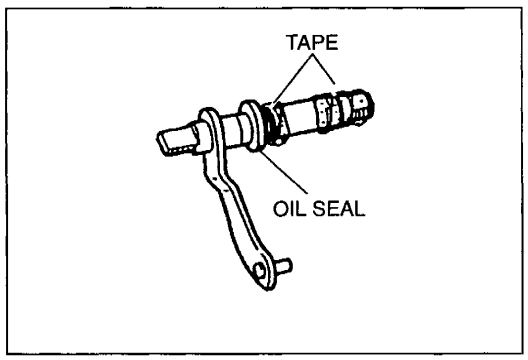


Assembly procedure
Extension housing
1. Apply ATF to the parking actuator, and install it in the extension housing.

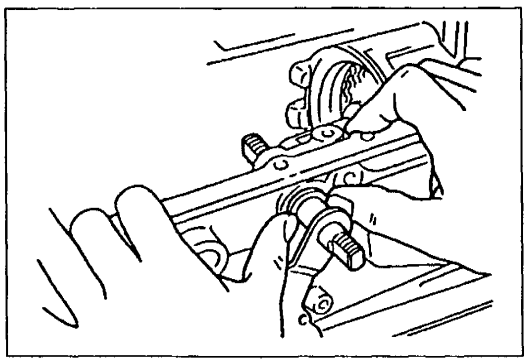
Tightening torque:
24—29 N·m { 2.4—3.0 kgf·m , 18—21 ft·lbf }



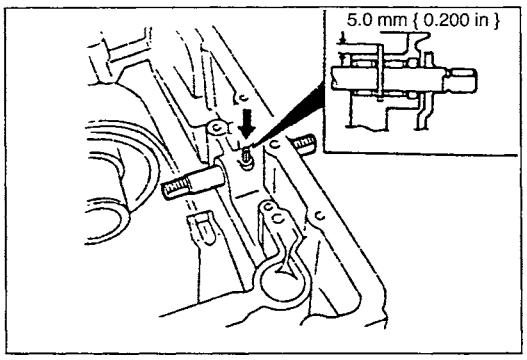
2. Apply ATF to the parking pawl shaft and install it in the extension housing.
3. Apply ATF to the parking pawl, return spring and spacer, and install them in the extension housing.



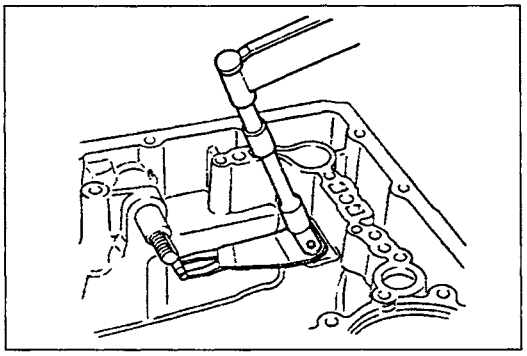
Manual shaft
1. Apply ATF to the lip surface of a new oil seal and install it onto the manual shaft.
2. Wrap the threads of the manual shaft with tape.



3. Apply ATF to the bearing in the transmission case.
4. Install the manual shaft into the transmission case.
5. Push the oil seal squarely into the transmission case.
6. Remove the tape.

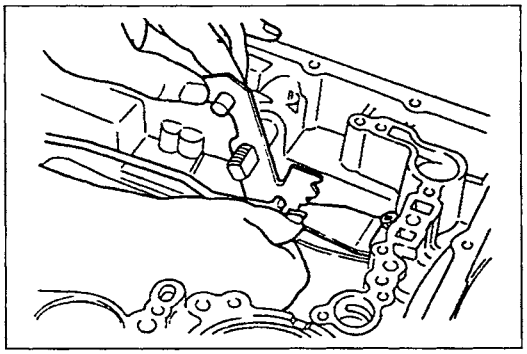


7. Align the groove in manual shaft with the roll pin hole, then tap the roll pin into the case as shown in the figure.

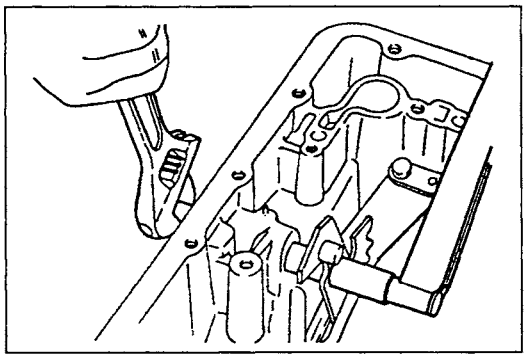


8. Install the detent spring and spacer.

Tightening torque:
4.0—5.8 N·m { 40—60 kgf·cm , 35—52 in·lbf }

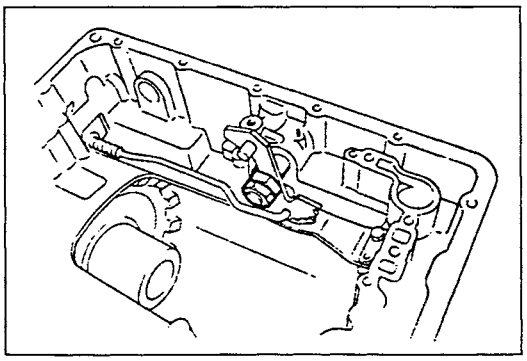


9. Install the manual plate and parking rod.

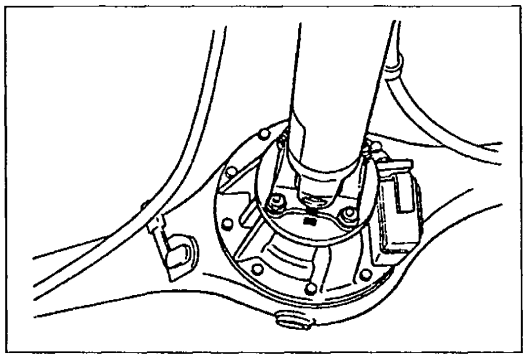


10. Tighten the locknuts.

Tightening torque:
30—39 N·m { 3.0—4.0 kgf·m , 22—28 ft·lbf }

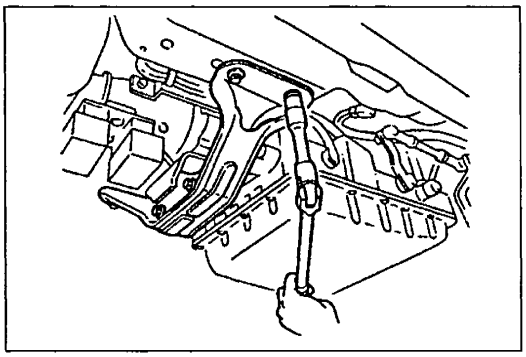


11. Check the parking mechanism operation.

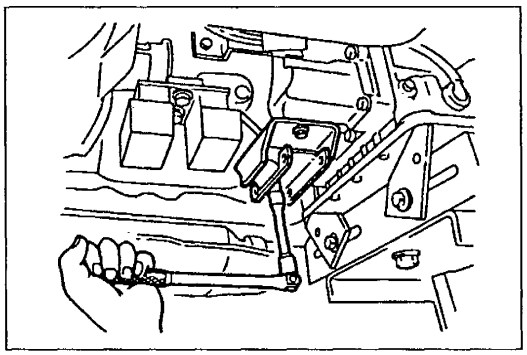


On-vehicle Removal

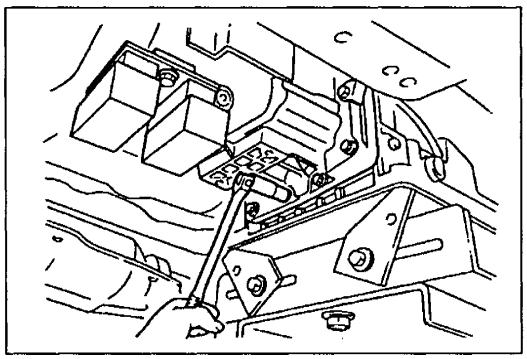
1. Disconnect the negative battery terminal.
2. On level ground, jack up the vehicle and support it evenly on safety stands.
3. Remove the propeller shaft. (Refer to section L.)
4. Disconnect the speedometer cable.
5. Disconnect the output speed sensor.
6. Support the transmission with a transmission jack.



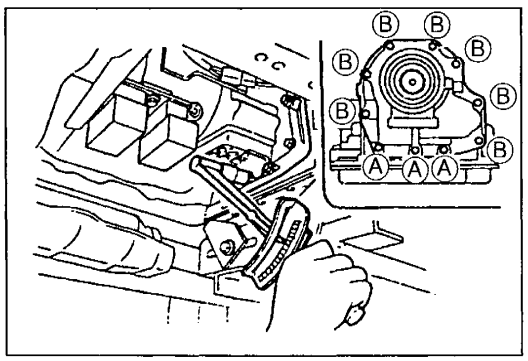
7. Remove the lower transmission mount.



8. Remove the upper transmission mount.



9. Remove the extension housing and gasket, making sure to catch any draining ATF in a container.

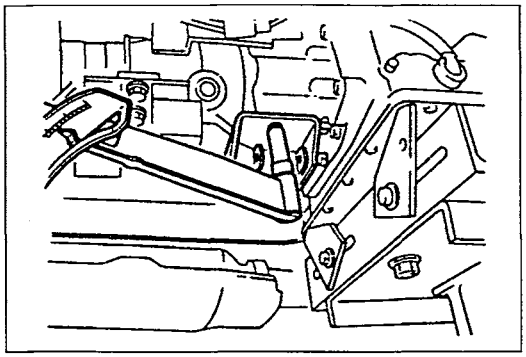


On-vehicle Installation

1. Install a new gasket on the transmission case.
2. Install the extension housing.

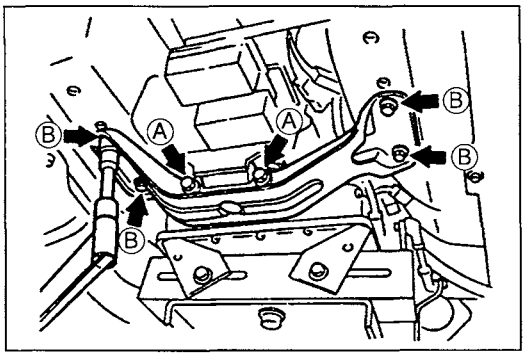
Bolt length (Measured from below the head)
Ⓐ : 30 mm { 1.181 in }
Ⓑ : 45 mm { 1.772 in }

Tightening torque:
20—25 N·m { 2.0—2.5 kgf·m , 14—18 ft·lbf }



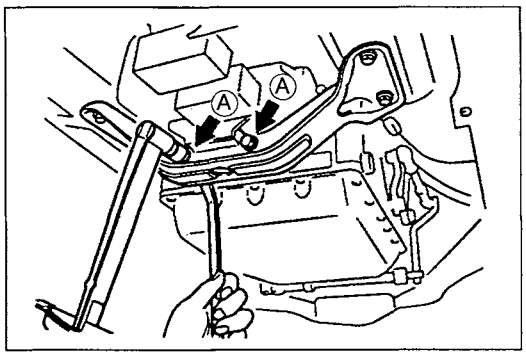
3. Install the transmission upper mount.

Tightening torque:
44—60 N·m { 4.4—6.2 kgf·m , 32—44 ft·lbf }



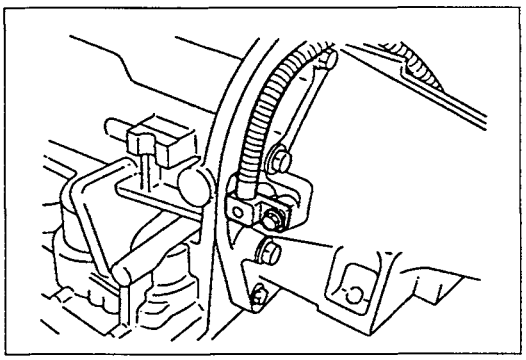
4. Install the transmission lower mount.
   (1) Temporarily install bolts and nuts Ⓐ.
   (2) Tighten bolts Ⓑ.

Tightening torque:
43—60 N·m { 4.4—6.2 kgf·m , 32—44 ft·lbf }



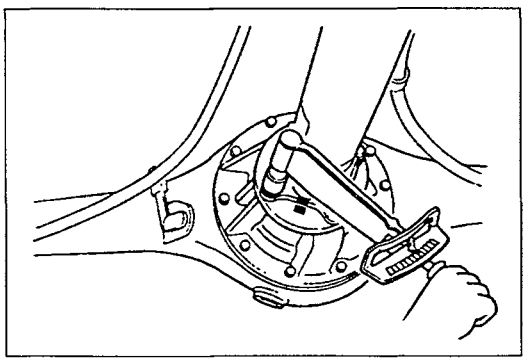
5. Remove the transmission jack, and tighten bolts and nuts Ⓐ.

Tightening torque:
43—60 N·m { 4.4—6.2 kgf·m , 32—44 ft·lbf }



6. Connect the speedometer cable. (2WD)
7. Connect the output speed sensor.

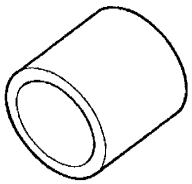
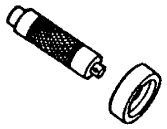
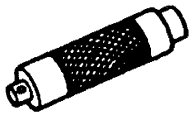
Tightening torque:
5.0—6.8 N·m { 50—70 kgf·cm , 44—60 in·lbf }

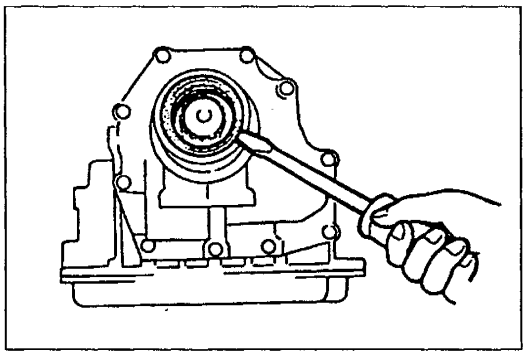


8. Install the propeller shaft. (Refer to section L.)
9. Add ATF, and check the ATF level.
   (Refer to page K1–30.)

OIL SEAL
Preparation
SST

The following **SSTs** are used for the 4WD model.

49 U027 003 Installer, oil seal 	For installation of oil seal	49 G030 795 Installer, oil seal 	For installation of oil seal
49 G030 797 Handle (Part of 49 G030 795) 	For installation of oil seal	—	—

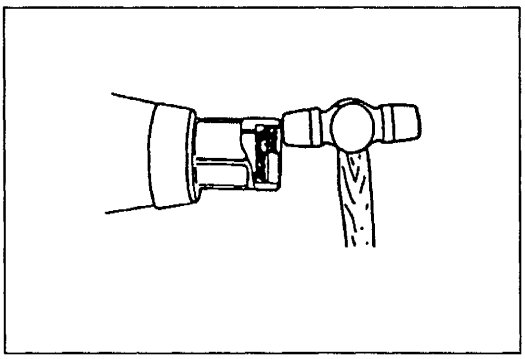


Inspection

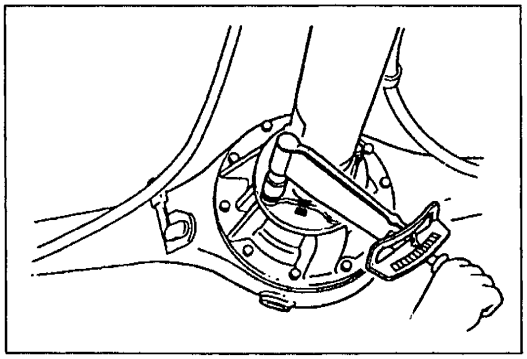
Check for damage, wear, and oil leakage. Replace if necessary.

On-vehicle Replacement
2WD model

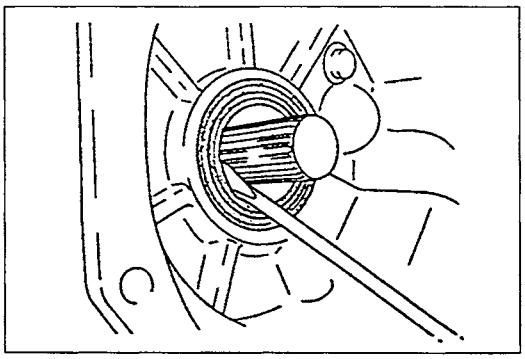
1. Remove the propeller shaft. (Refer to section L.)
2. Remove the oil seal from the extension housing.



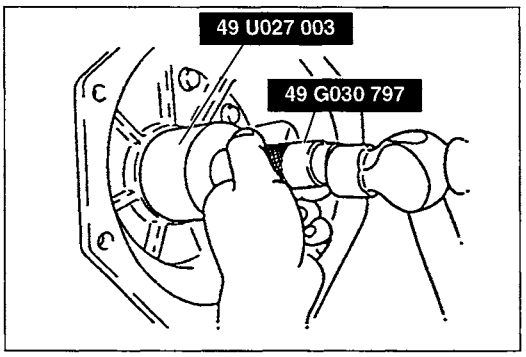
3. Apply ATF to the oil seal lip.
4. Install the new oil seal with a plastic hammer.



5. Install the propeller shaft. (Refer to section L.)



4WD model
1. Remove the transfer case. (Refer to section K2.)
2. Remove the oil seal from the adapter case.



3. Apply ATF to the oil seal lip.
4. Install the new oil seal with the **SSTs**.
5. Install the transfer case. (Refer to section K2.)

CONTROL VALVE BODY
Disassembly / Inspection

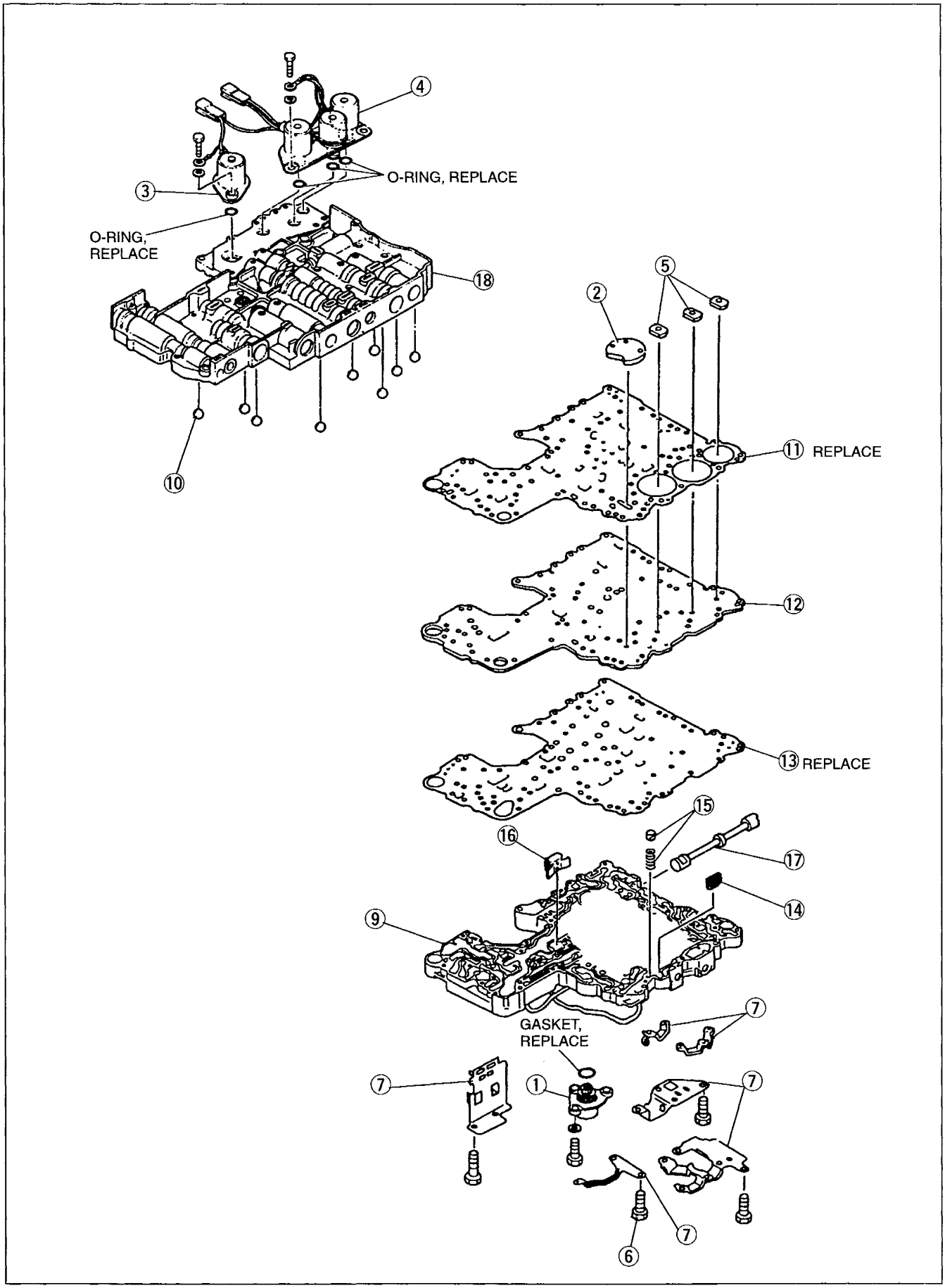
Caution
- **Denting or scratching these presicely machined components will reduce the ability of the transmission to shift properly. When handing these components or the valve body that contains them, be careful not to drop or hit them.**

1. Disassemble in the order shown in the figure, referring to **Disassembly Procedure**.
2. Neatly arrange the removed parts to avoid confusing similar parts.
3. Inspect all parts and repair or replace as necessary.

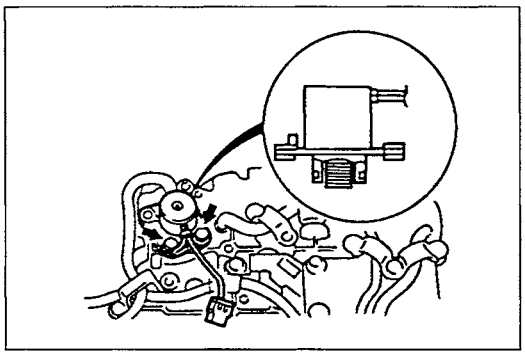
Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

4. Clean the removed parts with cleaning solvent, and dry them with compressed air. Clean out all holes and passages with compressed air.

Components

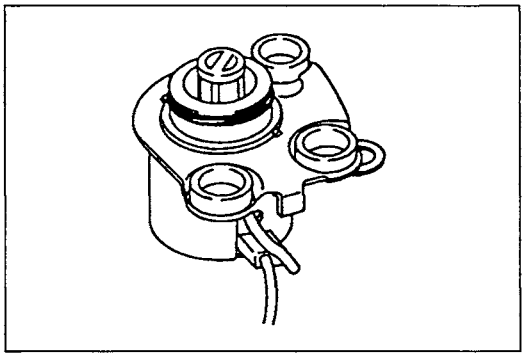

④
O-RING, REPLACE
③
O-RING, REPLACE
⑱
⑩
⑤
②
⑪ REPLACE
⑫
⑬ REPLACE
⑮
⑯
⑰
⑭
⑨
⑦
GASKET, REPLACE
⑦
①
⑦
⑦
⑥

1. Torque converter clutch solenoid
   Inspection ..... page K1– 26
2. Side plate
3. Pressure control solenoid
   Inspection ..... page K1– 26
4. Overrunning clutch solenoid, shift solenoid A, and shift solenoid B
   Inspection ..... page K1– 26
5. Support plate
6. Retaining bolts and nuts
   Installation position ..... page K1–108
7. Bracket
   Installation position ..... page K1–109
8. Lower valve body
   Disassembly / Inspection / Installation ..... page K1–104
9. Steel ball
   Installation position ..... page K1–107
10. Upper gasket
11. Separator plate
12. Lower gasket
13. Accumulator filter
14. Orifice check valve and spring
15. Pilot filter
16. Manual valve
17. Upper valve body
    Disassembly / Inspection / Assembly ..... page K1– 96

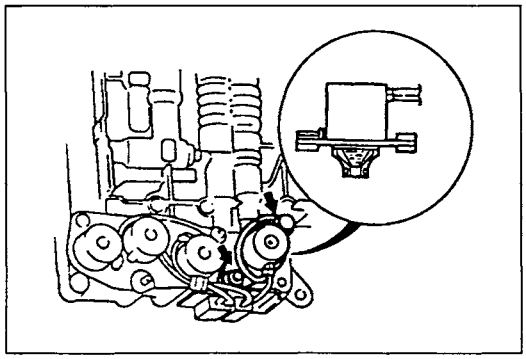


Procedure

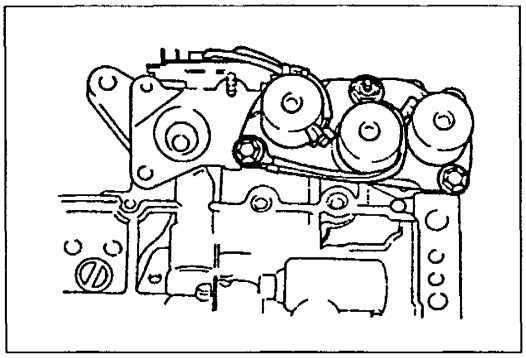
1. Remove the torque converter clutch solenoid and side plate.



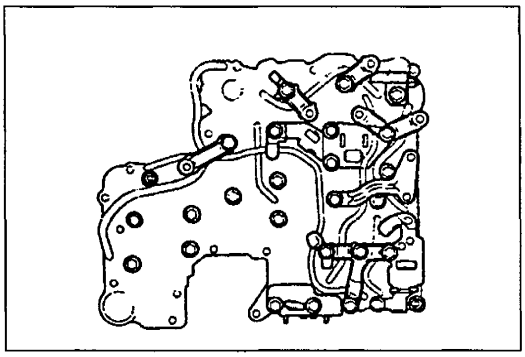
2. Remove the O-ring from the torque converter clutch solenoid.



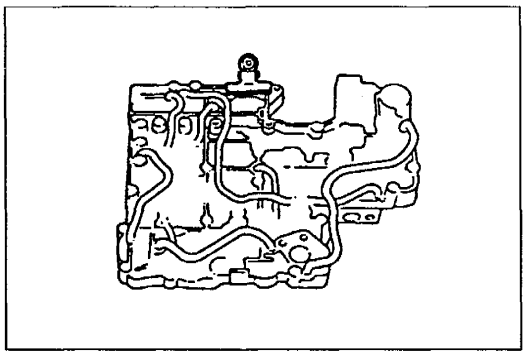
3. Remove the clip and pressure control solenoid.
4. Remove the O-ring from the pressure control solenoid.



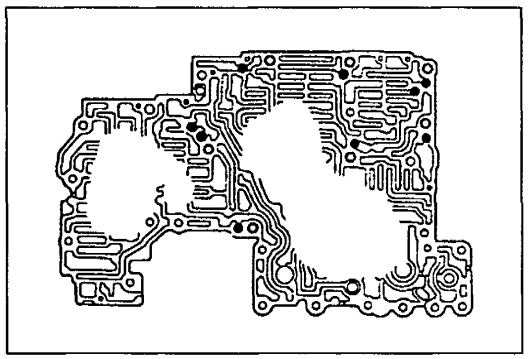
5. Remove the solenoids.
6. Remove the O-rings from the solenoids.



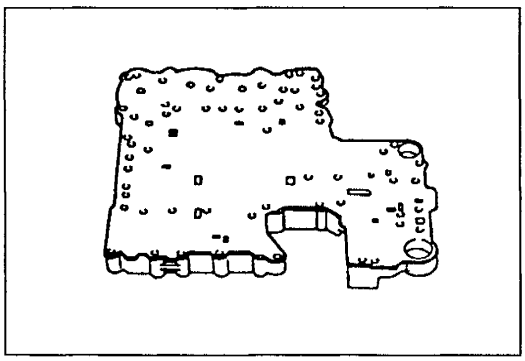
7. Remove the support plate.



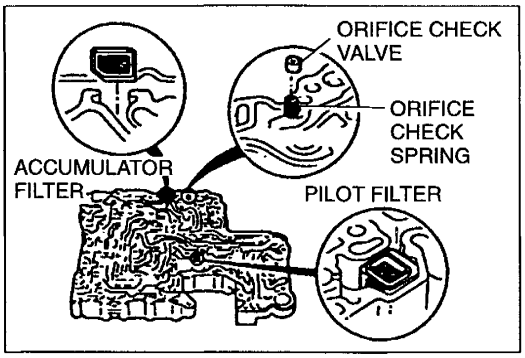
8. Hold the lower valve body, lower and upper gaskets, and separator plate with a large clip.
9. Separate the lower valve body from the upper valve body.



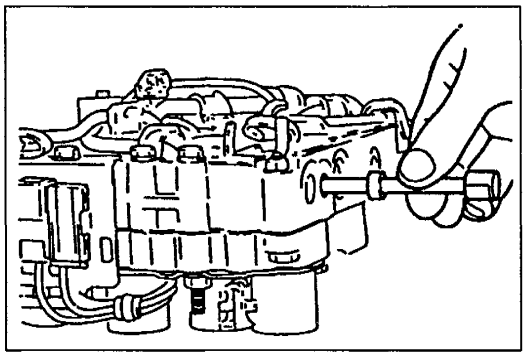
10. Remove the steel balls from the upper valve body.



11. Face the lower valve body downward, and remove the holding clip.
12. Remove the separator plate and gaskets.



13. Remove the orifice check valve, orifice check spring, pilot filter and accumulator filter.



14. Remove the manual valve from the upper valve body.

UPPER VALVE BODY
Disassembly / Inspection / Assembly

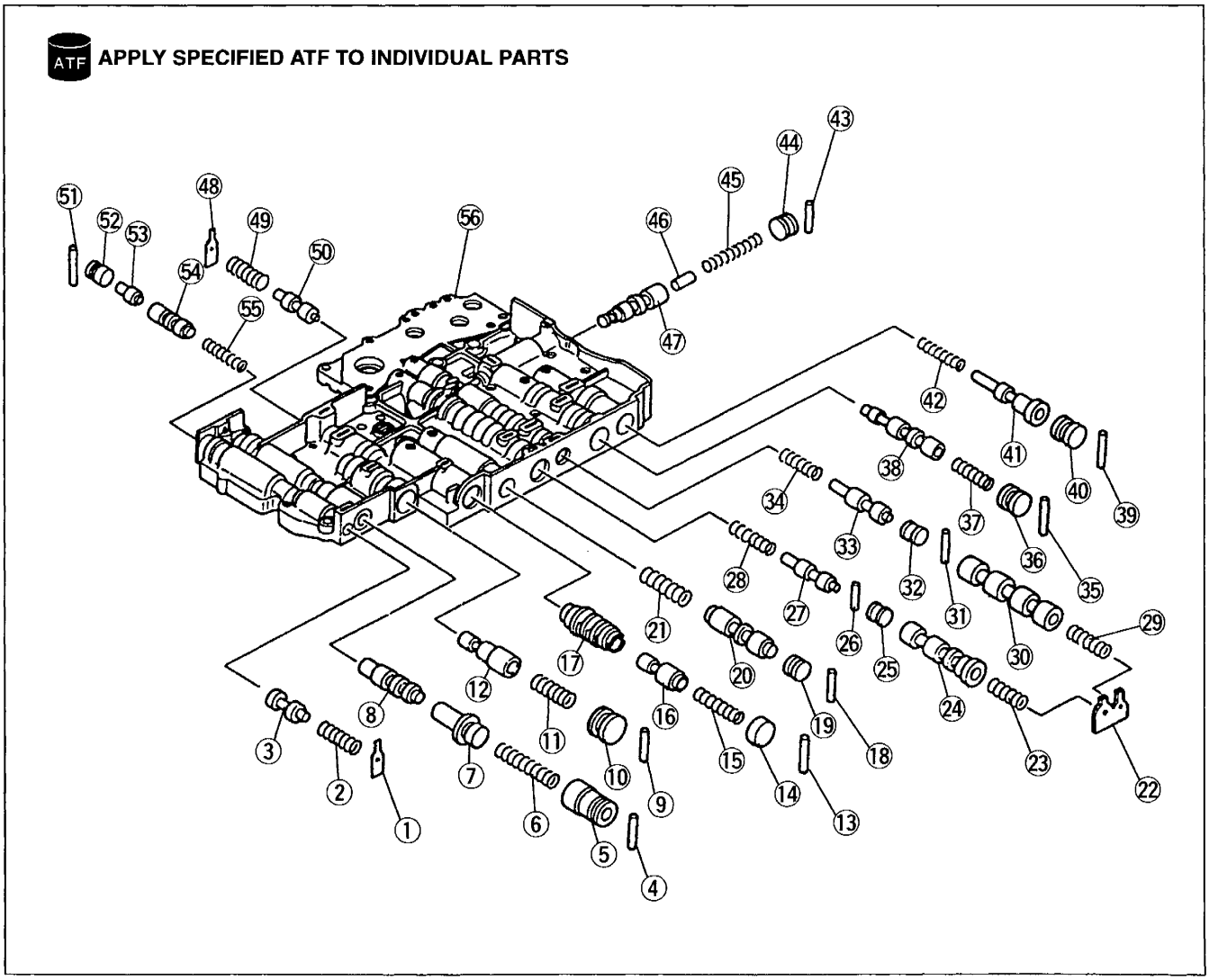
Caution
- **Denting or scratching these precisely machined components will reduce the ability of the transmission to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.**
- **Using a magnet in this procedure could magnetize the valve body inner components, reducing the ability of the transmission to shift properly.**

Note
- If a valve does not slide out under its own weight, place the valve body open-side down and tap on the valve body lightly with a plastic hammer.

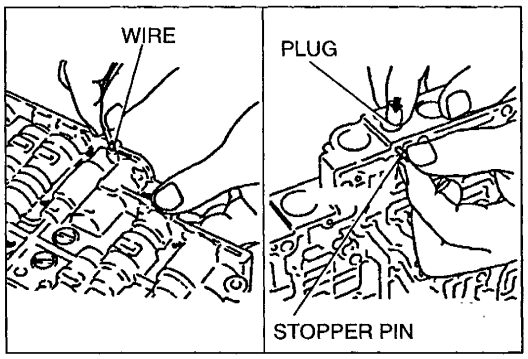
1. Disassemble in the order shown in the figure, noting the proper reassembly direction of the valves and internal parts.
2. Inspect all parts and repair or replace as necessary.

Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

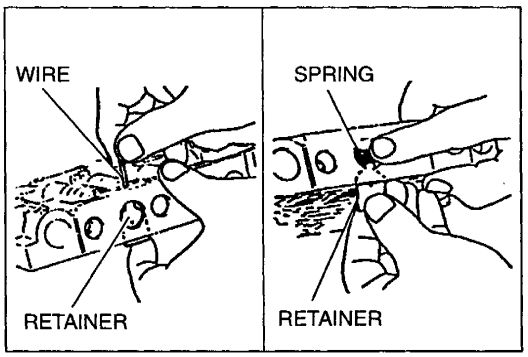
3. Clean all parts and bores with compressed air and apply ATF to them immediately before assembly.
4. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



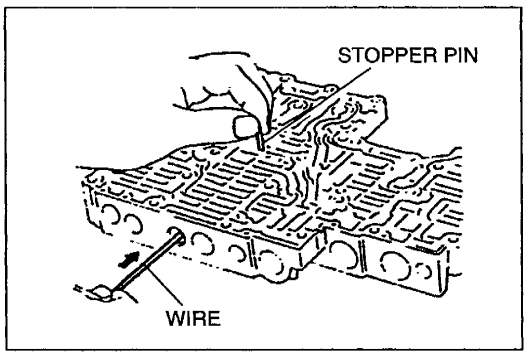
1. Retainer
   Disassembly Note ..... page K1–98
2. Torque converter relief spring
   Inspection ..... page K1–98
3. Torque converter relief valve
4. Stopper pin
   Disassembly Note ..... page K1–98
5. Pressure regulator sleeve
6. Pressure regulator spring
   Inspection ..... page K1–98
7. Pressure regulator plug
8. Pressure regulator valve
9. Stopper pin
   Disassembly Note ..... page K1–98
10. Pressure modifier plug
11. Pressure modifier spring
    Inspection ..... page K1–98
12. Pressure modifier valve
13. Stopper pin
    Disassembly Note ..... page K1–98
14. Accumulator control plug
15. Accumulator control spring (2WD)
    Inspection ..... page K1–98
16. Accumulator control valve
17. Accumulator control sleeve
18. Stopper pin
    Disassembly Note ..... page K1–98
19. Shuttle shift valve D plug
20. Shuttle shift valve D
21. Shuttle shift valve D spring
    Inspection ..... page K1–98
22. Retainer
    Disassembly Note ..... page K1–98
23. Shift valve B spring
    Inspection ..... page K1–98
24. Shift valve B
25. Stopper pin
    Disassembly Note ..... page K1–98
26. 4-2 sequence plug
27. 4-2 sequence valve
28. 4-2 sequence spring
    Inspection ..... page K1–98
29. Shift valve A spring
    Inspection ..... page K1–98
30. Shift valve A
31. Stopper pin
    Disassembly Note ..... page K1–98
32. 4-2 relay plug
33. 4-2 relay valve
34. 4-2 relay spring
    Inspection ..... page K1–98
35. Stopper pin
    Disassembly Note ..... page K1–98
36. Overrunning clutch control plug
37. Overrunning clutch control spring
    Inspection ..... page K1–98
38. Overrunning clutch control valve
39. Stopper pin
    Disassembly Note ..... page K1–98
40. Overrunning clutch reducing plug
41. Overrunning clutch reducing valve
42. Overrunning clutch reducing spring
    Inspection ..... page K1–98
43. Stopper pin
    Disassembly Note ..... page K1–98
44. Shuttle shift valve S plug
45. Shuttle shift valve S spring
    Inspection ..... page K1–98
46. Plug (2WD)
47. Shuttle shift valve S
48. Retainer
    Disassembly Note ..... page K1–98
49. Pilot spring
    Inspection ..... page K1–98
50. Pilot valve
51. Stopper pin
    Disassembly Note ..... page K1–98
52. Torque converter clutch control sleeve
53. Torque converter clutch control plug
54. Torque converter clutch control valve
55. Torque converter clutch control spring
    Inspection ..... page K1–98
56. Upper valve body



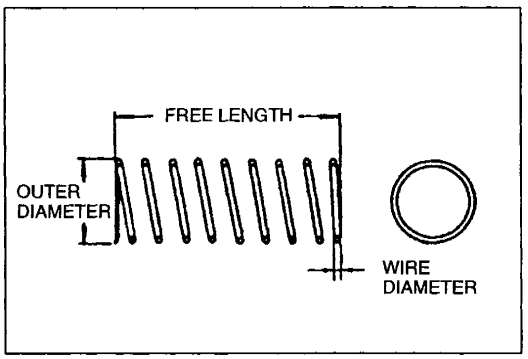
Disassembly note
Stopper pin
1. Push the stopper pin way out with a wire.
2. Depress and hold the plug or sleeve with a finger to prevent the valve from jumping out.
3. Remove the stopper pin, and remove the valve and internal parts.



Retainer
1. Push the retainer way out with a wire.
2. Hold the inside parts with a finger to prevent the valve from popping out.
3. Remove the retainer, the valve, and the internal parts.



4-2 sequence valve and 4-2 relay valve
1. Push the stopper pin way out with a wire.
2. Depress the plug with a vinyl tape wrapped **1.5 mm { 0.059 in }** around the diameter rod to prevent the valve from popping out.
3. Remove the stopper pin, the valve, and the internal parts.



Inspection
1. Measure the spring specifications.
2. If not as specified, replace the spring(s).

(2WD)

Spring \ Item		Outer dia. mm { in }	Free length mm { in }	No. of coils	Wire dia. mm { in }
Torque converter relief valve		9.0 { 0.354 }	38.0 { 1.496 }	12.7	1.4 { 0.055 }
Pressure regulator valve		31.5 { 1.240 }	14.0 { 0.551 }	5.64	1.6 { 0.063 }
Pressure modifier valve*	A	6.8 { 0.268 }	31.95 { 1.258 }	15.5	0.8 { 0.031 }
	B	6.9 { 0.272 }	32.60 { 1.283 }	13.2	0.8 { 0.031 }
	C	6.9 { 0.272 }	32.80 { 1.291 }	15.6	0.9 { 0.035 }
Accumulator control plug		10.5 { 0.413 }	17.0 { 0.669 }	4.3	0.5 { 0.020 }
Shuttle shift valve D		6.0 { 0.236 }	26.5 { 1.043 }	12.0	0.7 { 0.028 }

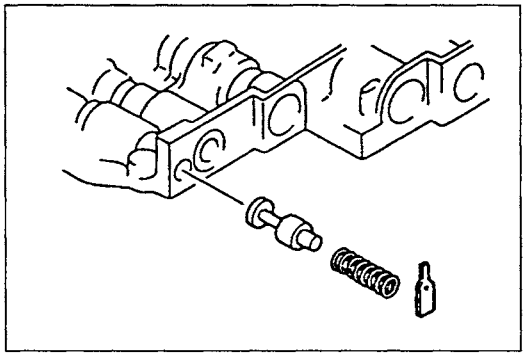
*: Either A, B or C type spring is installed before shipment. Only A type spring is available for replacement.

Spring \ Item	Outer dia. mm { in }	Free length mm { in }	No. of coils	Wire dia. mm { in }
4-2 sequence valve	6.95 { 0.274 }	29.1 { 1.146 }	11.0	0.55 { 0.022 }
Shift valve B	7.0 { 0.276 }	25.0 { 0.984 }	9.5	0.65 { 0.026 }
4-2 relay valve	6.95 { 0.274 }	29.1 { 1.146 }	11.0	0.55 { 0.022 }
Shift valve A	7.0 { 0.276 }	25.0 { 0.984 }	9.5	0.65 { 0.026 }
Overrunning clutch control valve	7.0 { 0.276 }	23.6 { 0.929 }	7.9	0.6 { 0.024 }
Overrunning clutch reducing valve	7.1 { 0.279 }	32.7 { 1.287 }	14.1	1.1 { 0.043 }
Shuttle shift valve S	6.0 { 0.236 }	27.1 { 1.067 }	15.0	0.9 { 0.035 }
Pilot valve	9.1 { 0.358 }	25.7 { 1.012 }	8.3	1.1 { 0.043 }
Torque converter clutch control valve	13.0 { 0.512 }	18.5 { 0.728 }	3.5	0.75 { 0.030 }

(4WD)

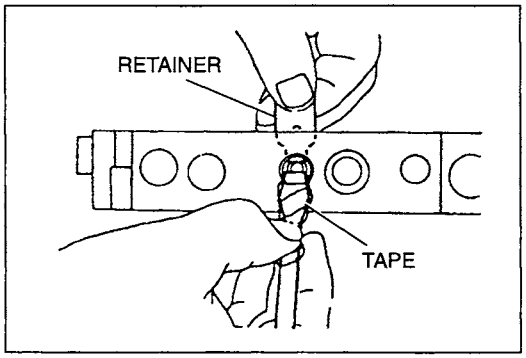
Spring \ Item		Outer dia. mm { in }	Free length mm { in }	No. of coils	Wire dia. mm { in }
Torque converter relief valve		9.0 { 0.354 }	38.0 { 1.496 }	12.7	1.4 { 0.055 }
Pressure regulator valve		14.0 { 0.551 }	44.0 { 1.732 }	7.9	1.4 { 0.055 }
Pressure modifier valve*	A	6.8 { 0.268 }	31.95 { 1.258 }	15.5	0.8 { 0.031 }
	B	6.9 { 0.272 }	32.60 { 1.283 }	13.2	0.8 { 0.031 }
	C	6.9 { 0.272 }	32.80 { 1.291 }	15.6	0.9 { 0.035 }
Shuttle shift valve D		6.0 { 0.236 }	26.5 { 1.043 }	12.0	0.7 { 0.028 }
4-2 sequence valve		6.95 { 0.274 }	29.1 { 1.146 }	11.0	0.55 { 0.022 }
Shift valve B		7.0 { 0.276 }	25.0 { 0.984 }	9.5	0.65 { 0.026 }
4-2 relay valve		6.95 { 0.274 }	29.1 { 1.146 }	11.0	0.55 { 0.022 }
Shift valve A		7.0 { 0.276 }	25.0 { 0.984 }	9.5	0.65 { 0.026 }
Overrunning clutch control valve		7.0 { 0.276 }	23.6 { 0.929 }	7.9	0.6 { 0.024 }
Overrunning clutch reducing valve		7.1 { 0.279 }	34.7 { 1.366 }	15.2	1.1 { 0.043 }
Shuttle shift valve S		5.5 { 0.217 }	43.0 { 1.693 }	22.2	0.85 { 0.033 }
Pilot valve		9.1 { 0.358 }	25.7 { 1.012 }	8.3	1.1 { 0.043 }
Torque converter clutch control valve		13.0 { 0.512 }	18.5 { 0.728 }	3.5	0.75 { 0.030 }

*: Either A, B or C type spring is installed before shipment. Only A type spring is available for replacement.

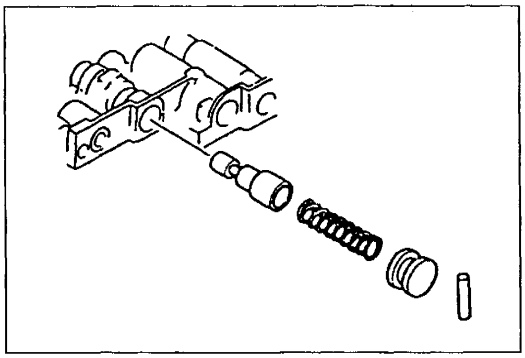


Assembly procedure

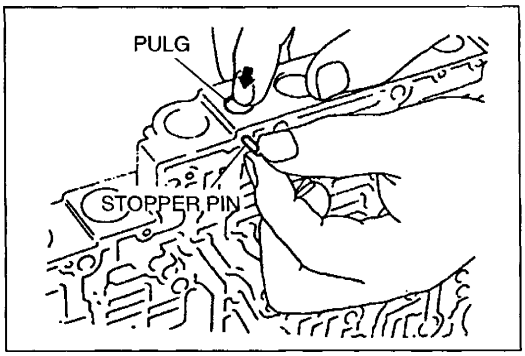
1. Insert the torque converter relief valve and spring.



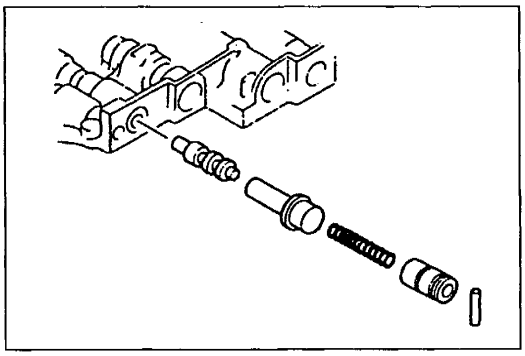
2. Install the retainer while compressing the spring.



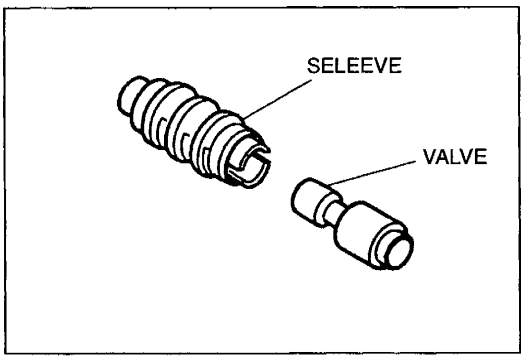
3. Center the plug so that it fits onto the sleeve. While turning the sleeve slightly, insert the pressure regulator valve, plug, spring, and sleeve.



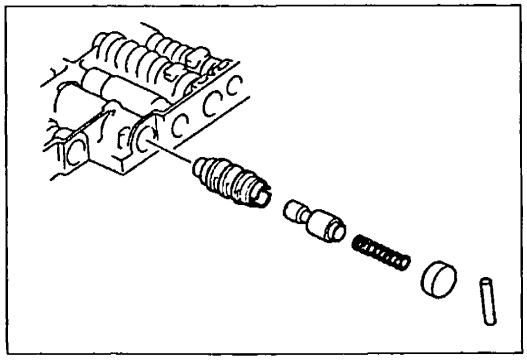
4. Insert the stopper pin while pushing the sleeve.



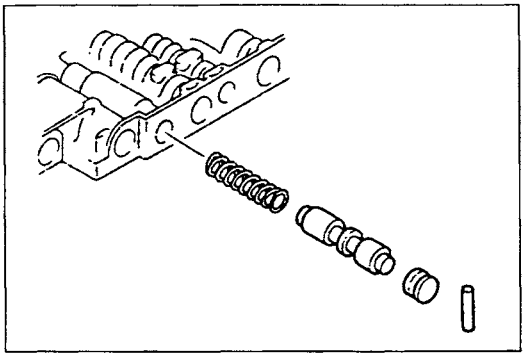
5. Insert the pressure modifier valve, spring, and plug.
6. Insert the stopper pin while pushing the sleeve.



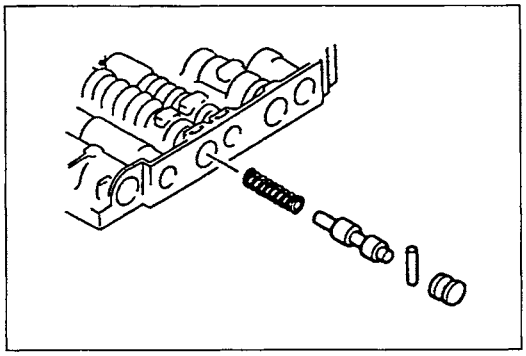
7. Align the tab of the sleeve with the plug notch.



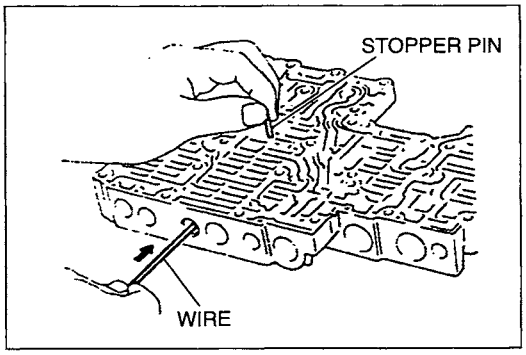
8. Insert the accumulator control valve, sleeve, spring (2WD), and plug.
9. Insert the stopper pin while pushing the plug.



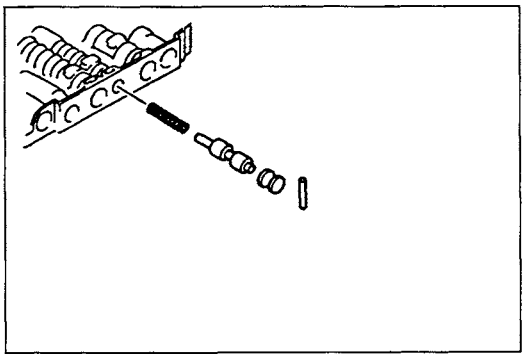
10. Insert the shuttle valve D, spring, and plug.
11. Insert the stopper pin while pushing the plug.



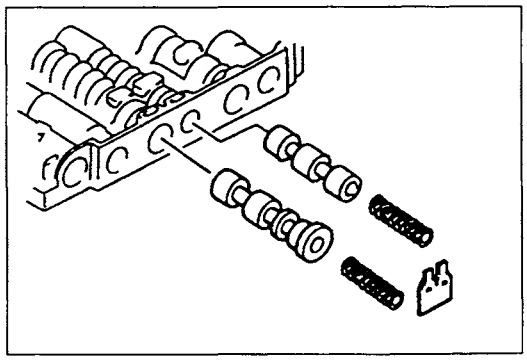
12. Insert the 4-2 sequence valve, spring, and plug.



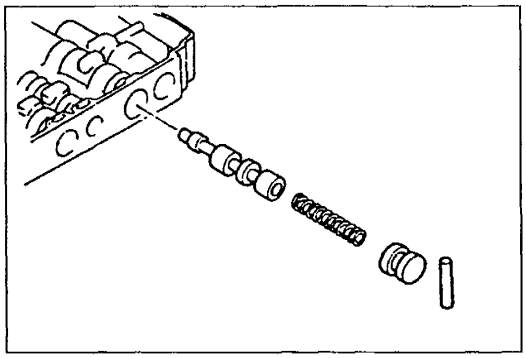
13. Push in the plug with a vinyl tape-wrapped **1.5 mm { 0.059 in }** diameter rod.
14. Insert the stopper pin.



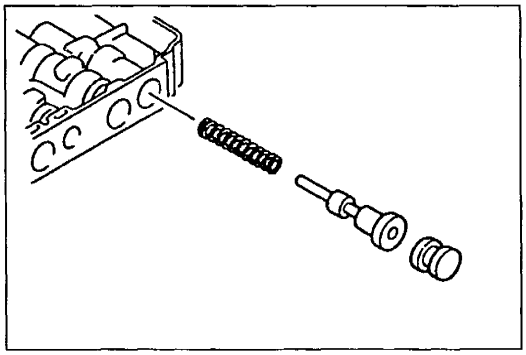
15. Insert the 4-2 relay valve and spring.
16. Push in the plug with a vinyl tape-wrapped **1.5 mm { 0.059 in }** diameter rod.
17. Insert the stopper pin.



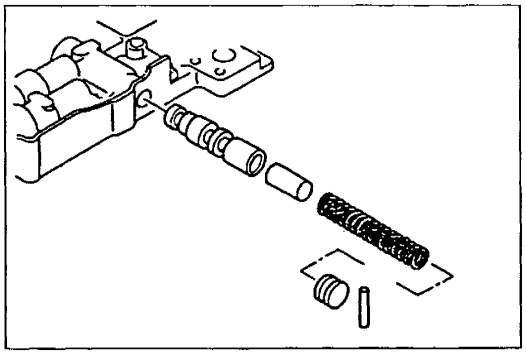
18. Insert the shift valve B and spring.
19. Insert the shift valve A and spring.
20. Insert the retainer while compressing the springs.



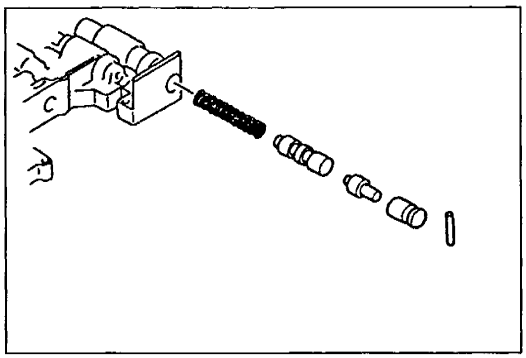
21. Insert the overrunning clutch control valve, spring, and plug.
22. Insert the stopper pin while pushing the plug.



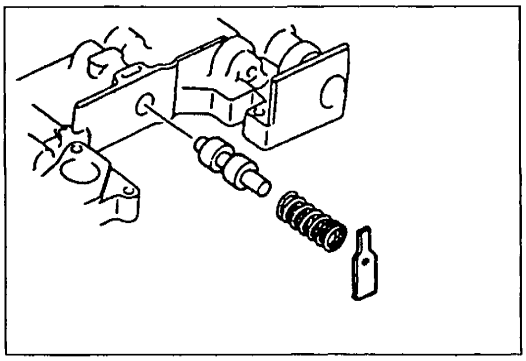
23. Insert the overrunning clutch reducing valve, spring, and plug.
24. Insert the stopper pin while pushing the plug.



25. Insert the shuttle shift valve S, plug (2WD), spring, and plug.
26. Insert the stopper pin while pushing the plug.



27. Insert the torque converter clutch control valve, spring, plug, and sleeve.
28. Insert the stopper pin while pushing the sleeve.



29. Insert the pilot valve and spring.
30. Insert the retainer while pushing the spring.

MEMO

LOWER VALVE BODY
Disassembly / Inspection / Assembly

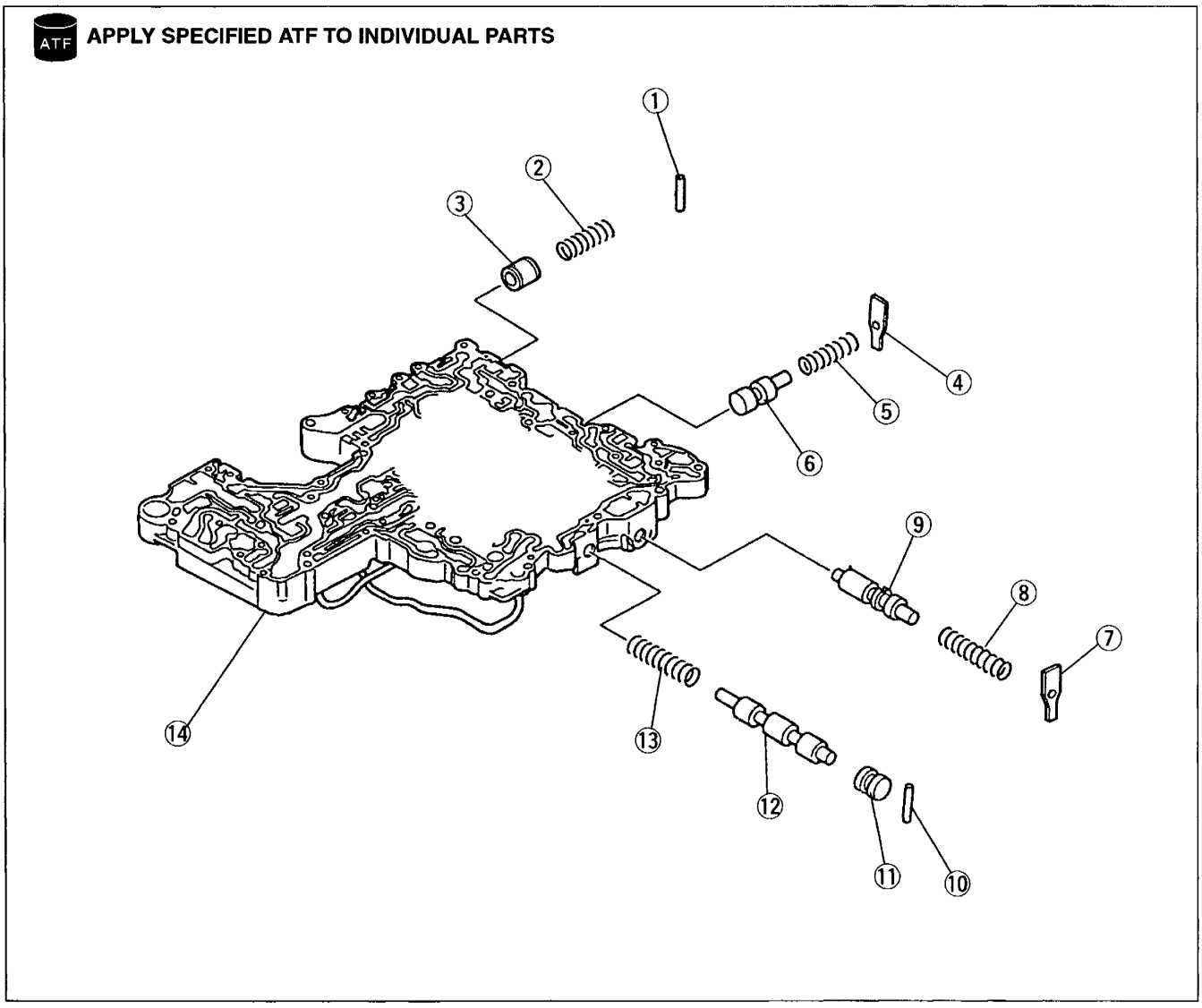
Caution
- **Denting or scratching these precisely machined components will reduce the ability of the transmission to shift properly. When handing these components or the valve body that contains them, be careful not to drop or hit them.**
- **Using a magnet in this procedure could magnetize the valve body inner components, reducing the ability of the transmission to shift properly.**

1. Disassemble in the order shown in the figure.
2. Inspect all parts, repair or replace as necessary.

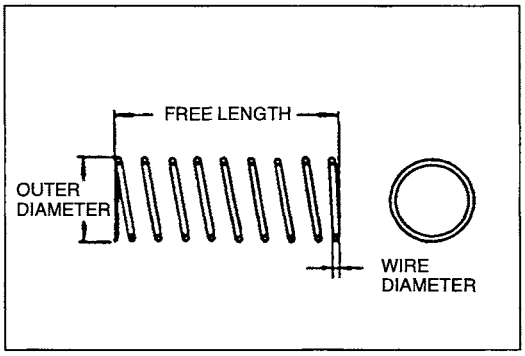
Note
- **If a valve does not slide out under its own weight, place the valve body open-side down and tap on the valve body lightly with a plastic hammer.**

Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

3. Clean all parts and bores with compressed air and apply ATF to them immediately before assembly.
4. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.

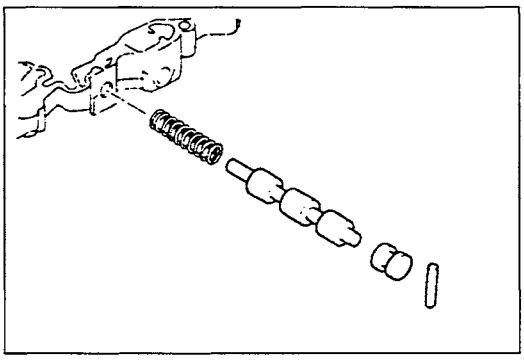


1. Stopper key
   Disassembly Note ..... page K1– 98
2. Modifier accumulator spring
   Inspection ..... page K1–105
3. Modifier accumulator valve
4. Retainer
5. First reducing spring
   Inspection ..... page K1–105
6. First reducing valve
7. Retainer
   Disassembly Note ..... page K1– 98
8. 3-2 timing spring
   Inspection ..... page K1–105
9. 3-2 timing valve
10. Stopper pin
    Disassembly Note ..... page K1– 98
11. Servo charger plug
12. Servo charger valve
13. Servo charger spring
    Inspection ..... page K1–105
14. Lower valve body

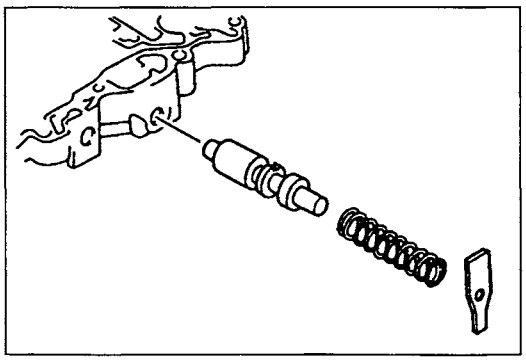


Inspection
1. Measure the spring specifications.
2. If not as specified, replace the spring(s).

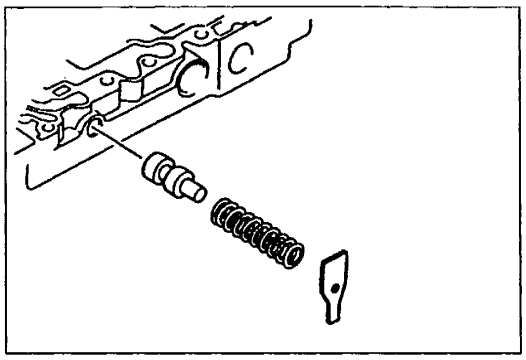
Item / Spring	Outer dia. mm { in }	Free length mm { in }	No. of coils	Wire dia. mm { in }
Modifier accumulator piston	9.8 { 0.386 }	30.5 { 1.201 }	8.8	1.3 { 0.051 }
First reducing valve	6.75 { 0.266 }	25.4 { 1.0 }	12.5	0.75 { 0.030 }
3-2 timing	6.75 { 0.266 }	20.55 { 0.809 }	7.5	0.75 { 0.030 }
Servo charger valve	6.5 { 0.256 }	33.2 { 1.307 }	12.0	0.5 { 0.020 }



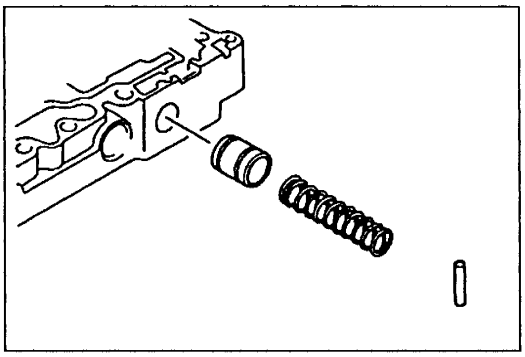
Assembly procedure
1. Insert the servo charger valve, spring, and plug.
2. Insert the stopper pin while pushing the plug.



3. Insert the 3-2 timing valve and spring.
4. Insert the retainer while compressing the spring.

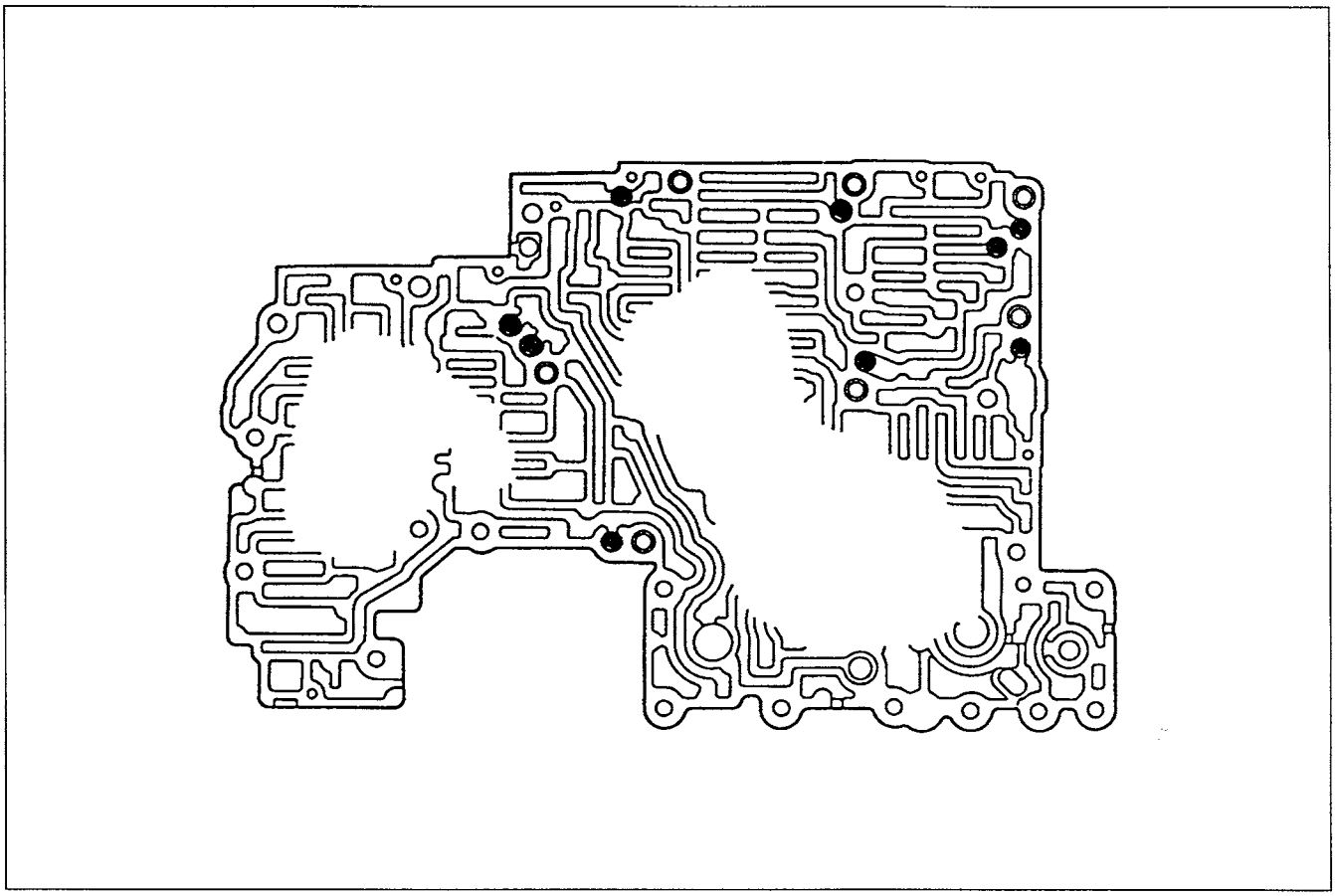


5. Insert the first reducing valve and spring.
6. Insert the retainer while compressing the spring.

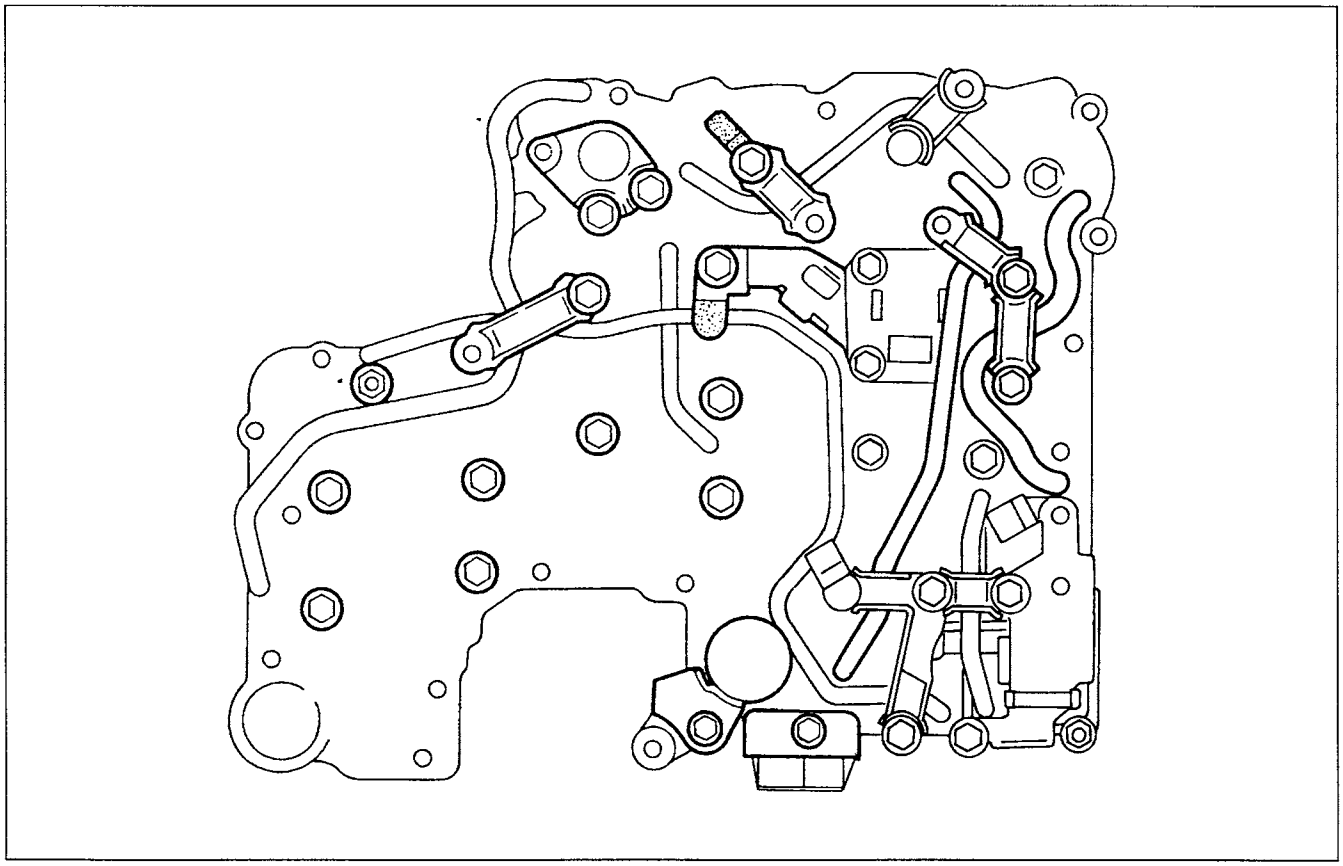


7. Insert the modifier accumulator valve, spring.
8. Insert the stopper pin.

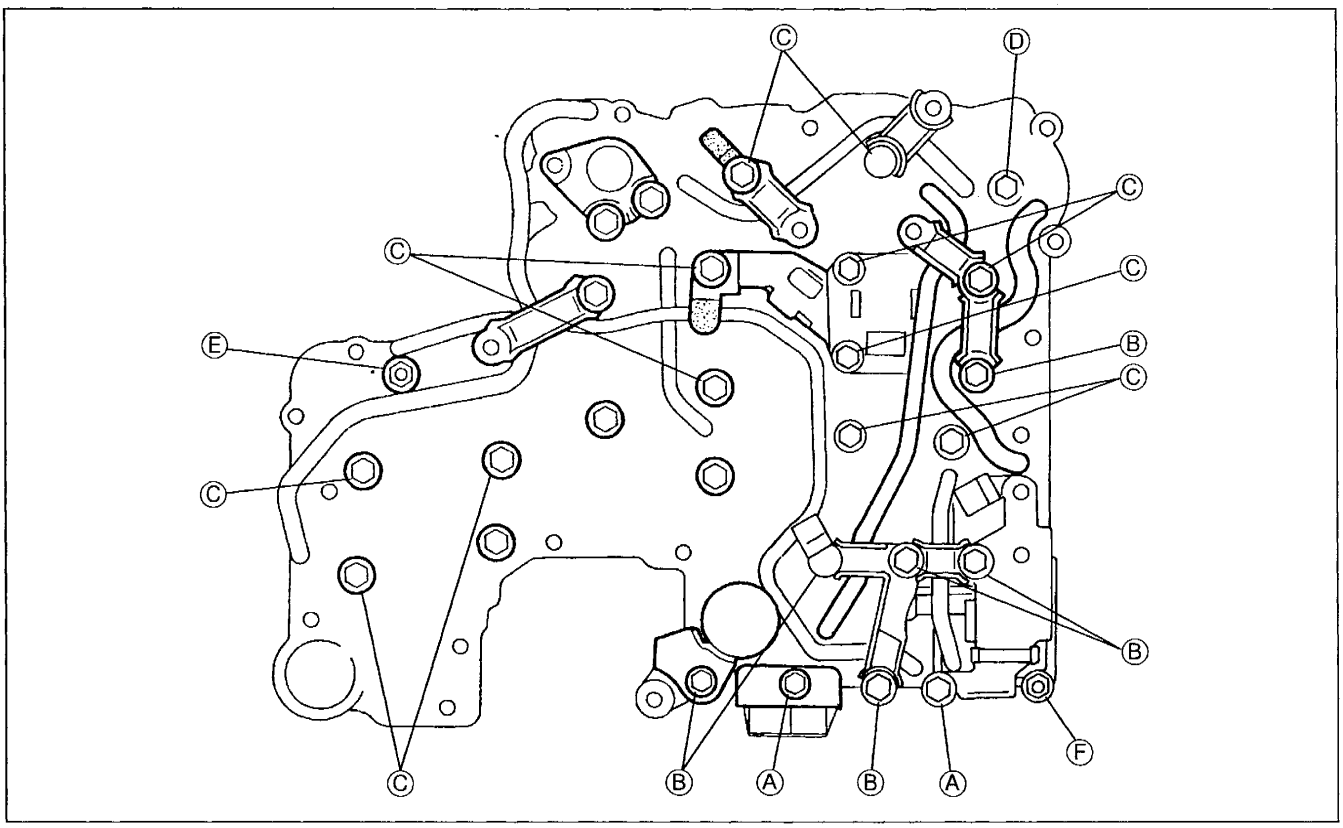
Steel ball installation positions

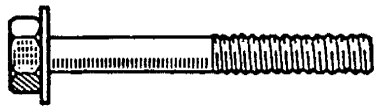
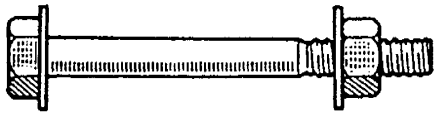
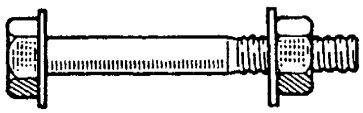


Bracket installation positions



Bolts and nuts installation positions

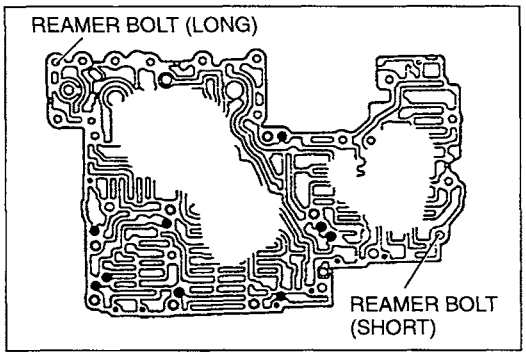


Identification letter	Bolts and nuts	Length mm { in }	Torque specification N·m { kgf·cm , in·lbf }
A		70 { 2.756 }	6.9—8.8 { 70—90 , 61—78 }
B		50 { 1.969 }	
C		33 { 1.299 }	
D		27 { 1.063 }	
E		55 { 2.165 }	
F		45 { 1.772 }	

CONTROL VALVE BODY

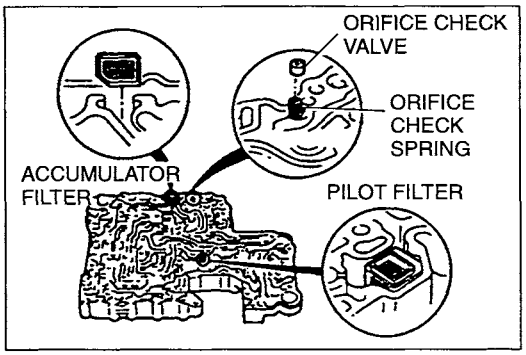
Assembly

1. Verify that all parts are clean and free of dust and other small particles.
2. Apply ATF to all O-ring and gaskets.

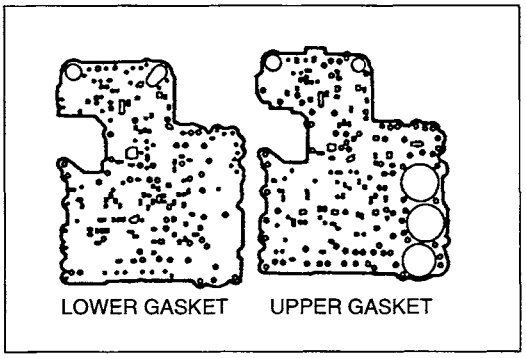


Assembly procedure

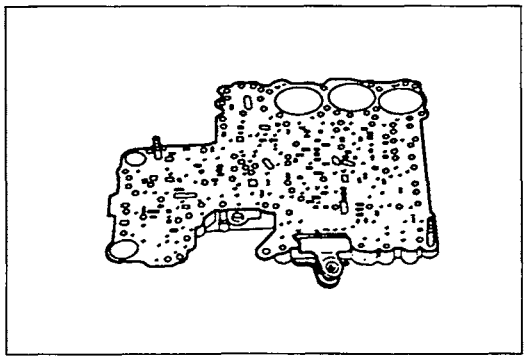
1. Install the steel balls and reamer bolts into their proper positions of the upper valve body.
   (Refer to page K1–108 for installation positions.)

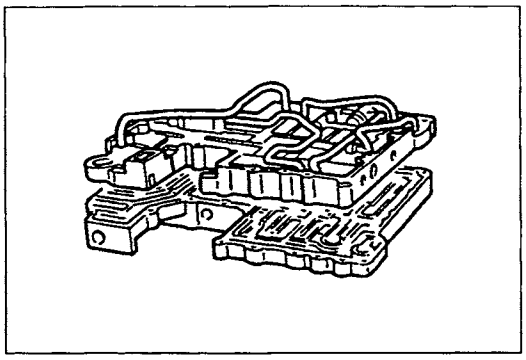


2. Install the pilot filter, orifice check spring, orifice check valve and accumulator filter into their proper positions in the lower valve body.

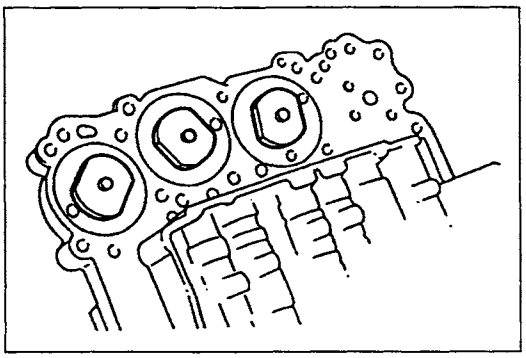


3. Set the new upper and lower gaskets and the separator plate onto the lower valve body. Refer to the figure to distinguish the two gaskets.

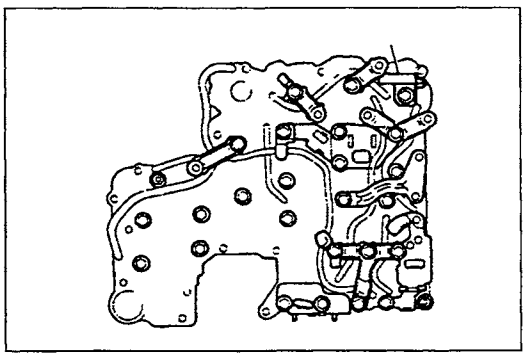




4. Set the lower valve body onto the upper valve body.
5. Remove the holding clip.

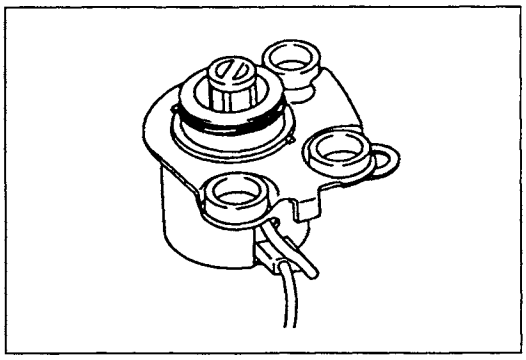


6. The support plate locations are as shown.

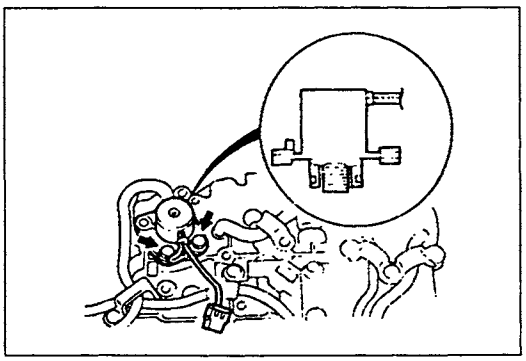


7. Install the bolts, nuts, support plates, and brackets in their proper positions. (Refer to page K1–107 for installation positions.) Tighten the fasteners evenly and gradually.

Tightening torque:
6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }

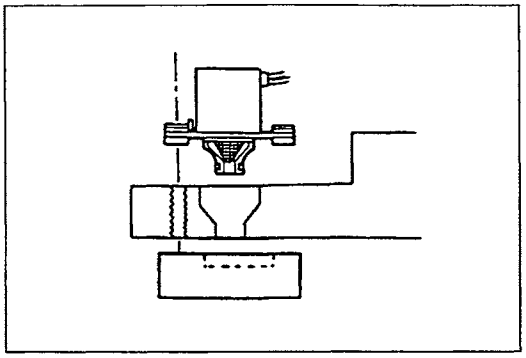


8. Install a new O-ring onto the torque converter clutch solenoid.

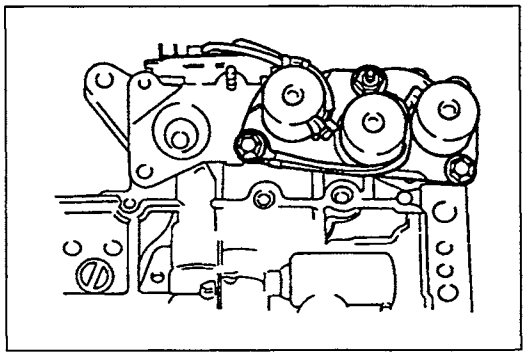


9. Install the torque converter clutch solenoid and side plate to the control valve body assembly.

Tightening torque:
9.8—12.7 N·m { 100—130 kgf·cm , 87—112 in·lbf }

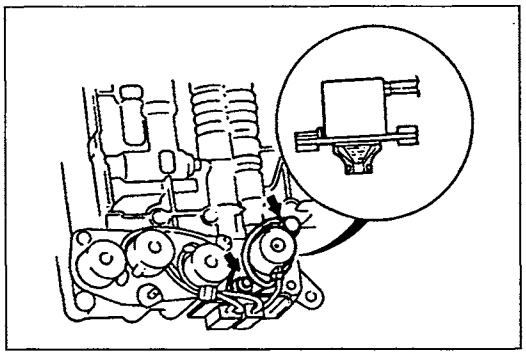


10. Install the side plate as shown.



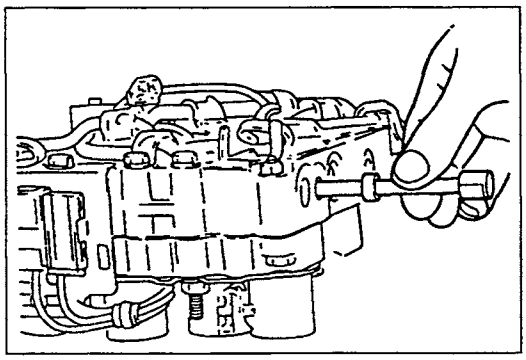
11. Install the new O-rings onto the solenoids.
12. Install the solenoids into the control valve body assembly.

Tightening torque:
6.9—9.8 N·m { 70—100 kgf·cm , 61—87 in·lbf }

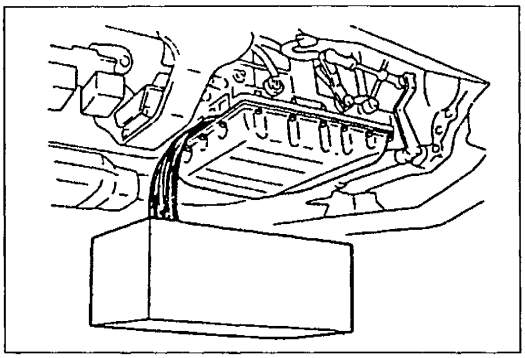


13. Install a new O-ring onto the pressure control solenoid.
14. Install the pressure control solenoid and clip into the control valve body assembly.

Tightening torque:
6.9—9.8 N·m { 70—100 kgf·cm , 61—87 in·lbf }

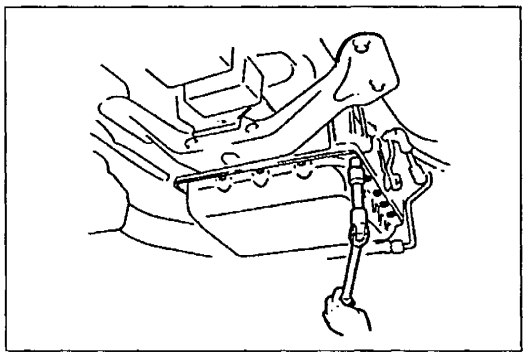


15. Insert the manual valve.

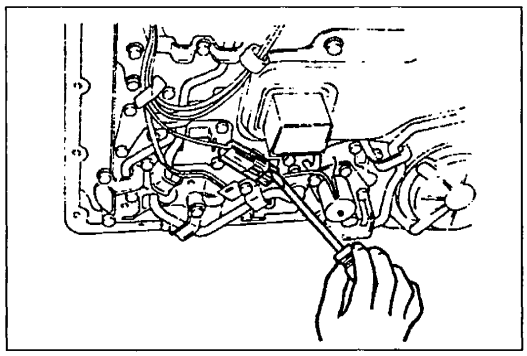


ON-VEHICLE REMOVAL

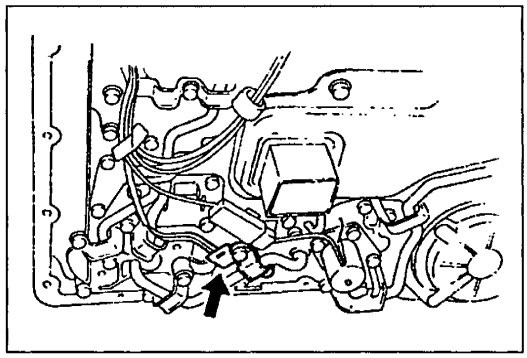
1. Disconnect the negative battery cable.
2. On level ground, jack up the vehicle and support it evenly on safety stands.
3. Loosen the oil pan installation bolts, and drain the ATF into a container.



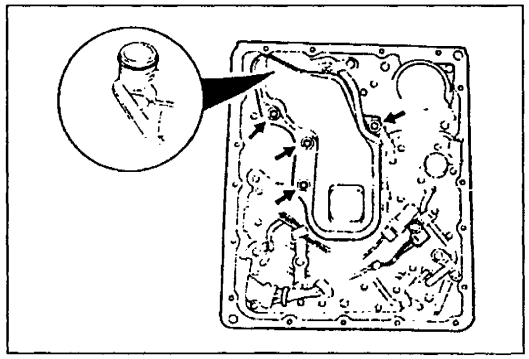
4. Install the new oil pan installation bolts.
5. Remove the oil pan and gasket.
6. Remove the magnet from the oil pan.



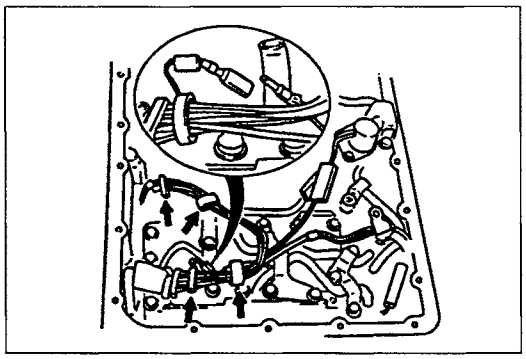
7. Remove the clip by using a small flathead screwdriver.
8. Disconnect the torque converter clutch solenoid connector.



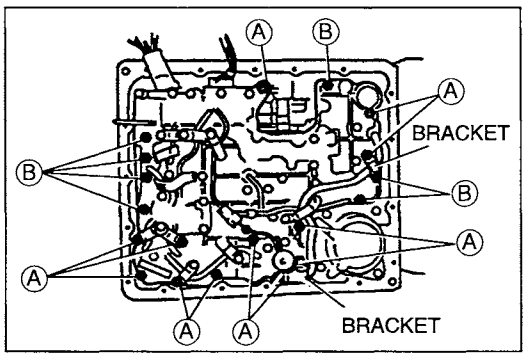
9. Remove the transmission fluid temperature sensor.



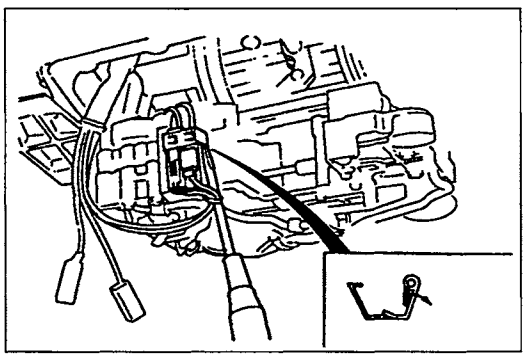
10. Remove the oil strainer.
11. Remove the O-ring from the oil strainer.



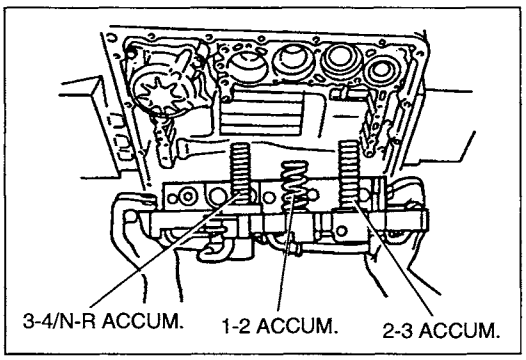
12. Separate the solenoid harness from the harness clip.
13. Remove the transmission fluid temperature switch. (4WD)



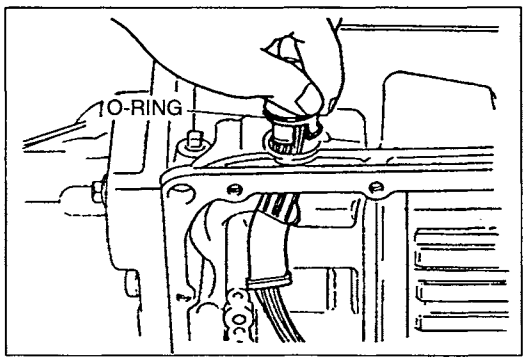
14. Remove bolts Ⓐ and Ⓑ and the bracket shown in the figure.



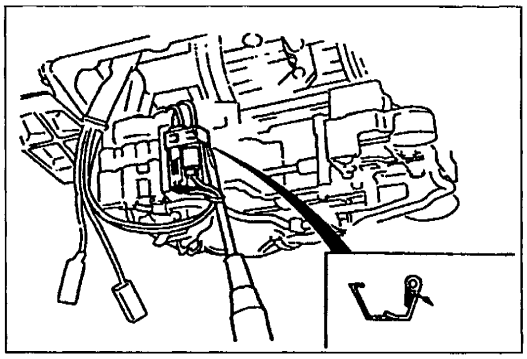
15. Remove the clip.
16. Separate the solenoid connectors.



17. Carefully remove the control valve body assembly and accumulator springs.

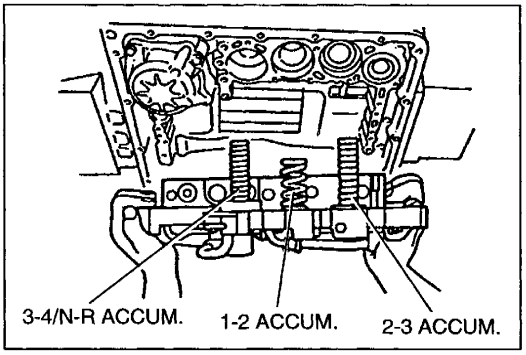


18. If necessary, remove the solenoid connector from the transmission case.



ON-VEHICLE INSTALLATION

1. Install the solenoid connector into the transmission case if removed.
2. Connect the solenoid connector to the solenoids.
3. Install the clip.

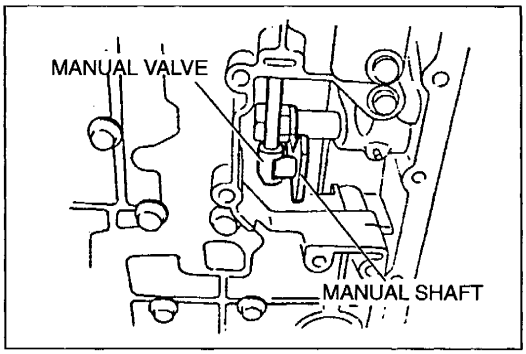


4. Set the accumulator springs into the control valve body as shown.

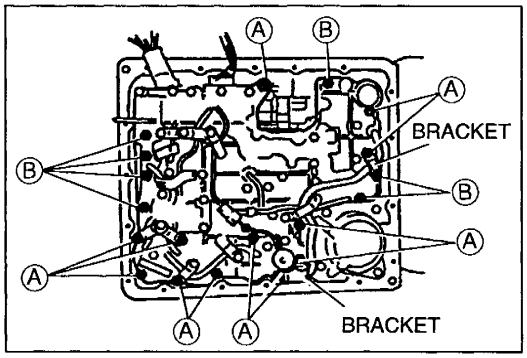
Spring specifications

mm { in }

Item / Spring	Outer dia.	Free length	No. of coil	Wire dia.
3-4/N-R accumulator piston	17.3 { 0.681 }	58.4 { 2.299 }	12.3	2.3 { 0.091 }
1-2 accumulator piston	29.3 { 1.154 }	45.0 { 1.772 }	3.6	4.0 { 0.157 }
2-3 accumulator piston	20.0 { 0.787 }	66.0 { 2.598 }	11.4	3.5 { 0.138 }



5. Verify that the manual valve and manual shaft are assembled correctly.
6. Set the control valve body into the transmission case and secure it.

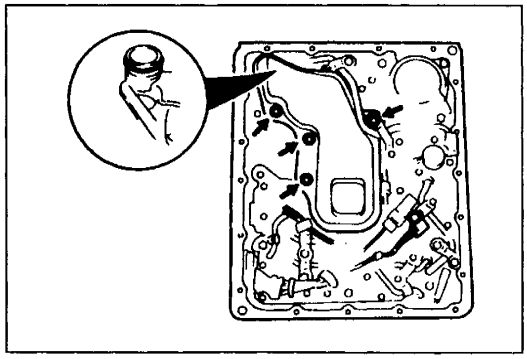


7. Install bolts Ⓐ and Ⓑ and the brackets as shown.

Bolt length (Measured from below the head)
Ⓐ: 33 mm { 1.299 in }
Ⓑ: 45 mm { 1.772 in }

8. Tighten the bolts in sequence.

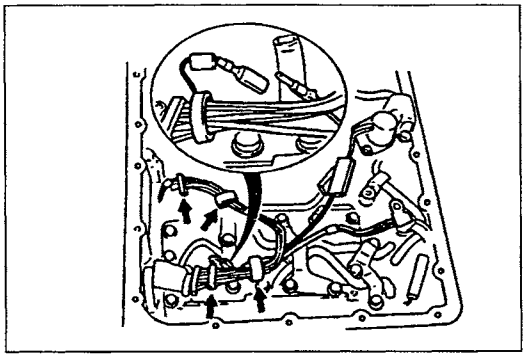
Tightening torque:
6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }



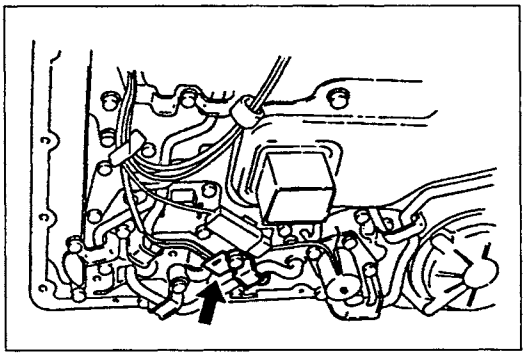
9. Apply ATF to the new O-ring and install it onto the oil strainer.
10. Install the oil strainer.

Bolt length (Measured from below the head):
50 mm { 1.969 in }

Tightening torque:
6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }

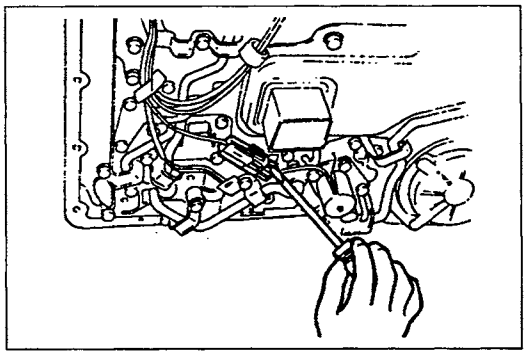


11. Mount the solenoid harness with the harness clip.
12. Install the transmission fluid temperature switch. (4WD)

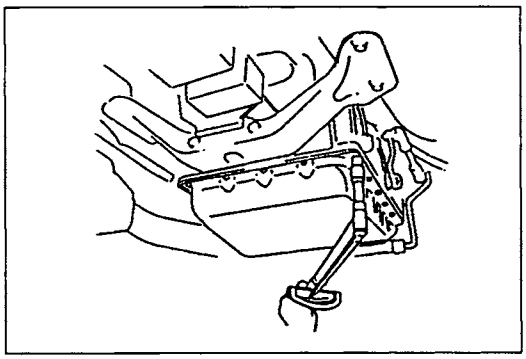


13. Install the transmission fluid temperature sensor.

Tightening torque:
6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }

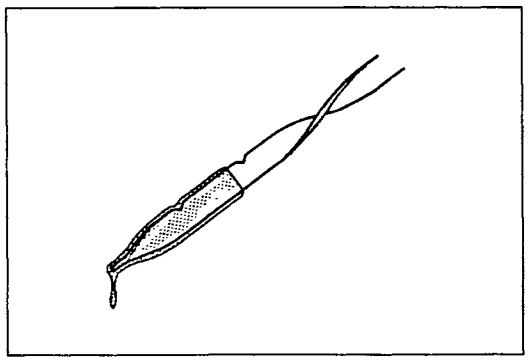


14. Connect the torque converter clutch solenoid connector.
15. Install the clip.



16. Remove any old locking compound from the bolt holes.
17. Set the magnet into the oil pan.
18. Install the oil pan along with a new gasket.
19. Tighten the new bolts evenly and quickly.

Tightening torque:
6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }

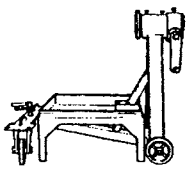
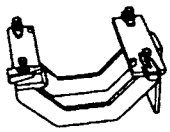
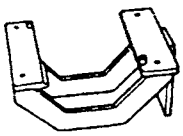
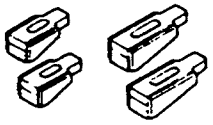


20. Add approximately **4.0 L { 4.2 US qt , 3.5 Imp qt }** ATF, and check the ATF level. (Refer to page K1–30.)

TRANSMISSION UNIT (ASSEMBLY)

Preparation

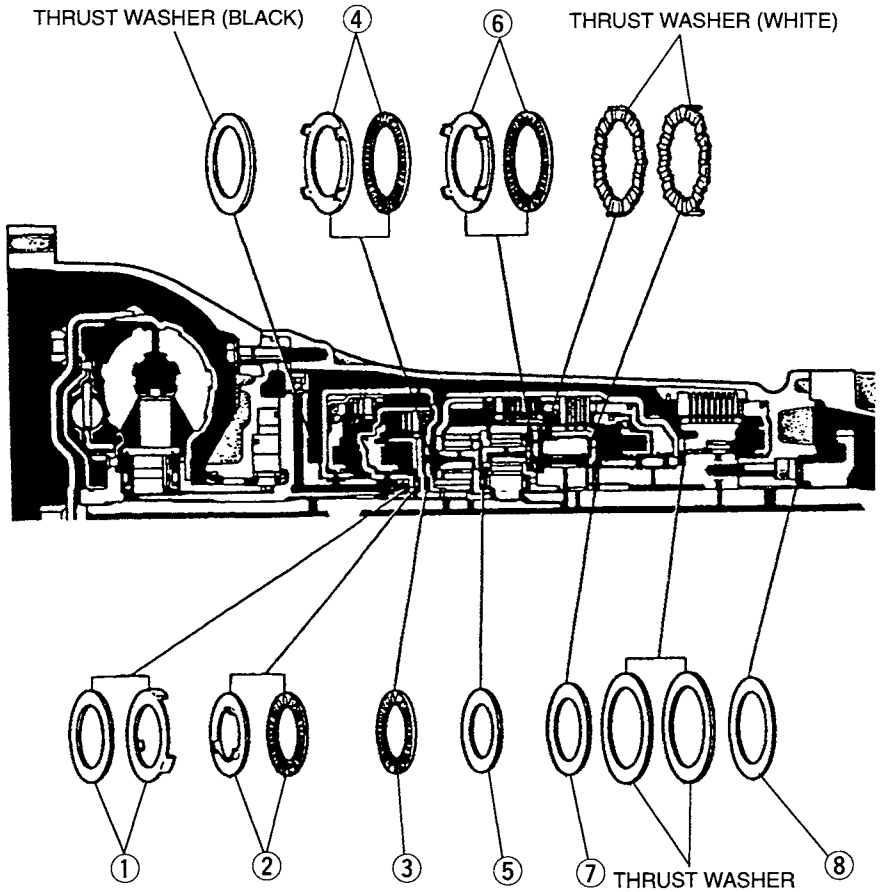
SST

49 0107 680A Engine stand 	For assembly of transmission	49 U019 0A0A Transmission hanger 	For assembly of transmission
49 H075 495B Body (Part of 49 U019 0A0A) 	For assembly of transmission	49 U019 003 Holder (Part of 49 U019 0A0A) 	For assembly of transmission

Precaution

1. If the drive plates or brake band are replaced with new ones, soak in ATF for at least 2 hours before installation.
2. Before assembly, apply ATF to all seal rings, rotating parts, O-rings, D-rings and sliding parts.
3. All O-rings, D-rings, seals, and gaskets must be replaced with new ones included in the overhaul kit.
4. Use petroleum jelly, not grease, during reassembly.
5. When it is necessary to replace a bushing, replace the subassembly that includes that bushing.
6. Assemble the housing within 10 minutes after applying sealant, and allow it to cure at least 30 minutes after assembly before filling the transmission with ATF.

Thrust washer, bearing, and race locations

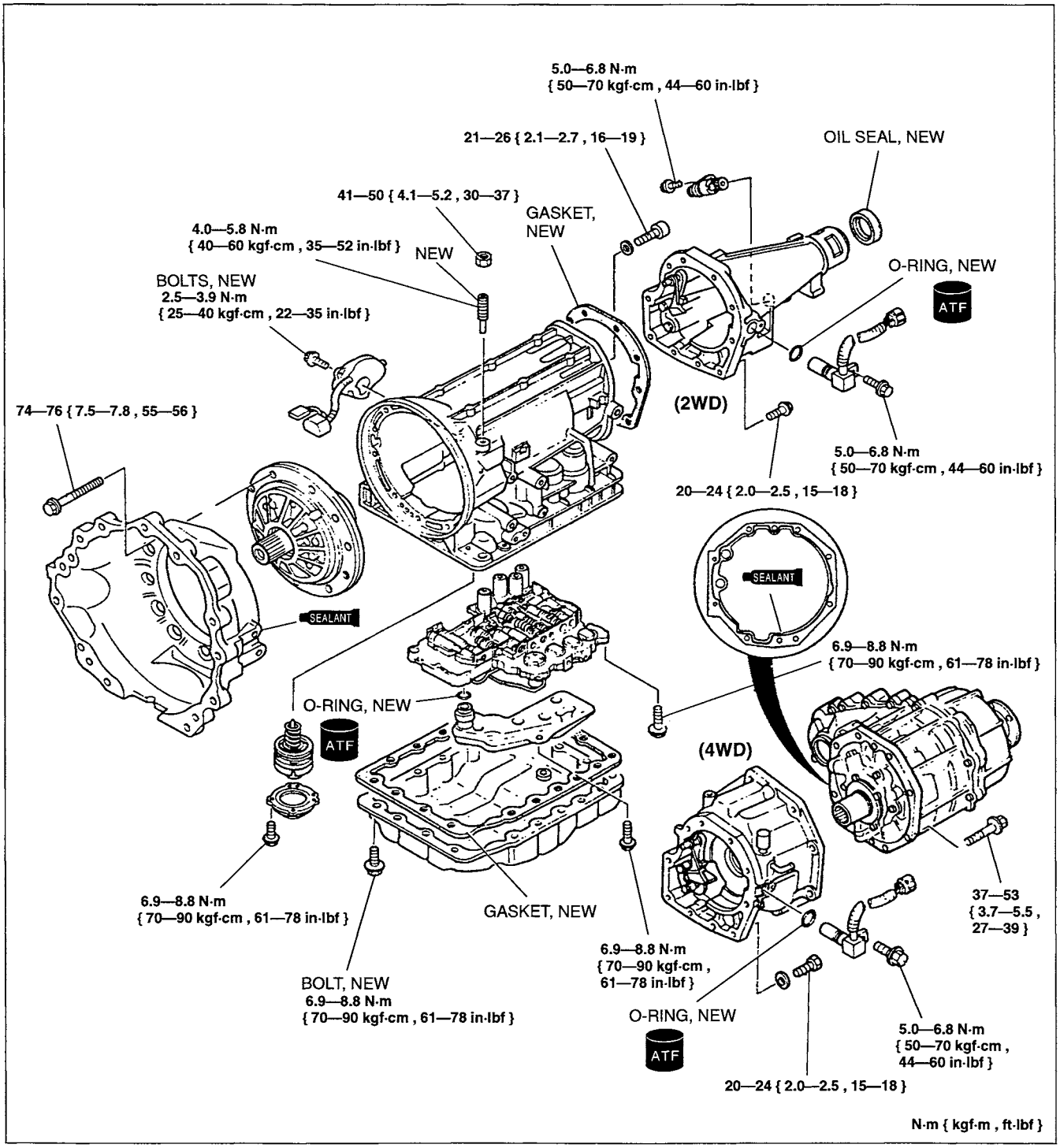


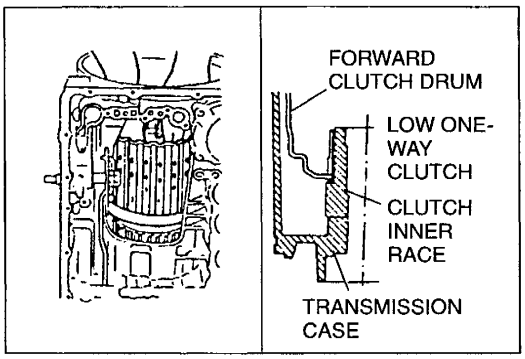
Outer diameter of bearing and race

		1	2	3	4	5	6
Bearing	mm { in }	47.0 { 1.850 }	53.0 { 2.087 }	53.0 { 2.087 }	78.0 { 3.071 }	53.0 { 2.087 }	78.0 { 3.071 }
Race	mm { in }	43.5 { 1.713 }	51.5 { 2.028 }	—	75.0 { 2.953 }	—	75.0 { 2.953 }

		7	8
Bearing	mm { in }	59.0 { 2.323 }	64.0 { 2.520 }
Race	mm { in }	—	—

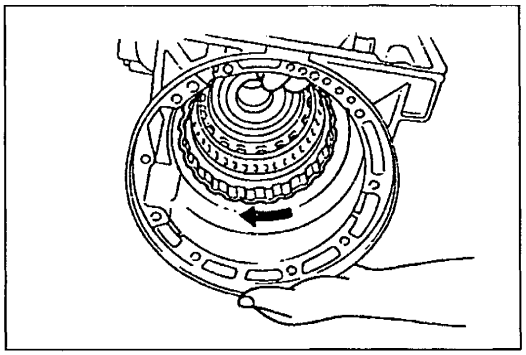
Torque specifications



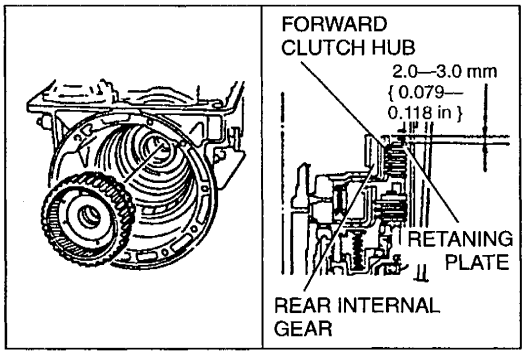


Procedure

1. Install the forward clutch drum while slowly turning it clockwise until its hub passes fully over the clutch inner race.

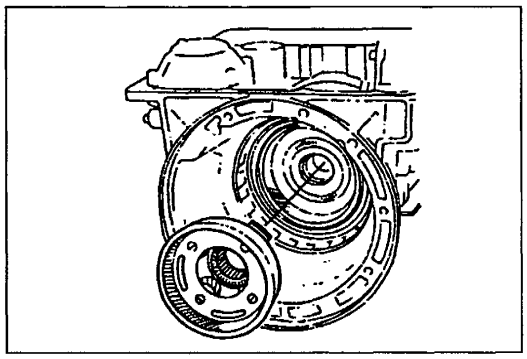


2. Verify that the forward clutch assembly will turn only clockwise.

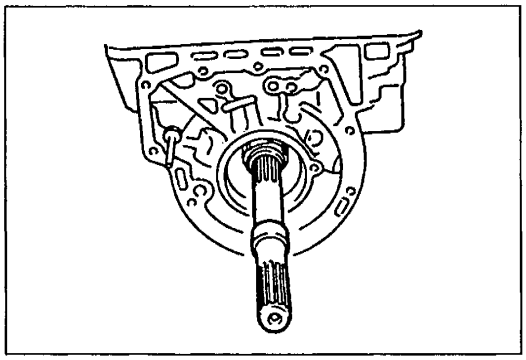


3. Install the rear internal gear, forward clutch hub, and overrunning clutch hub in the forward clutch assembly.
4. Measure the height difference between forward clutch retaining plate and top of the forward clutch drum.

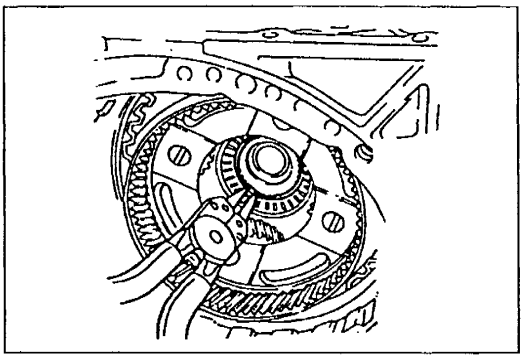
   Height: Approx. 2.0—3.0 mm { 0.079—0.118 in }



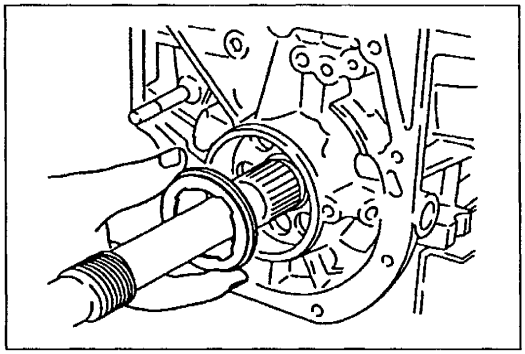
5. Install the front internal gear and rear planetary carrier into the forward clutch assembly.



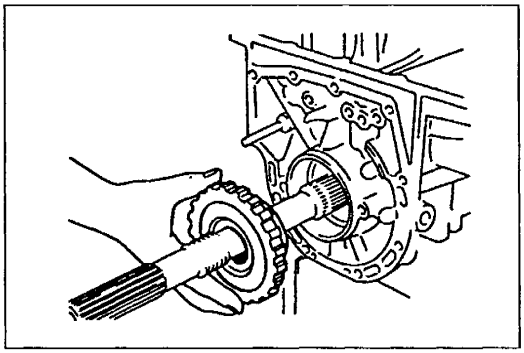
6. Insert the output shaft.



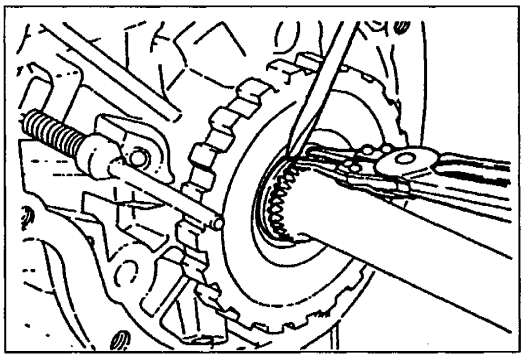
7. Push the output shaft forward slightly, and install a new snap ring on it. Verify that the output shaft cannot be removed from the rear.



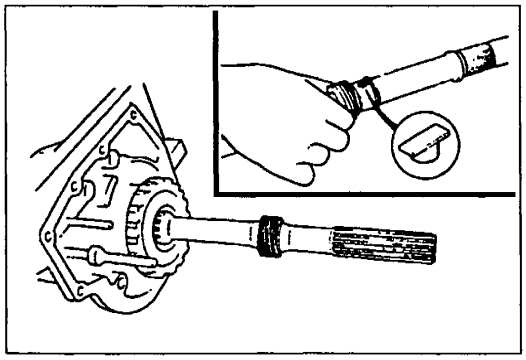
8. Apply petroleum jelly to the bearing and install it to the transmission case with the black surface facing toward the rear.



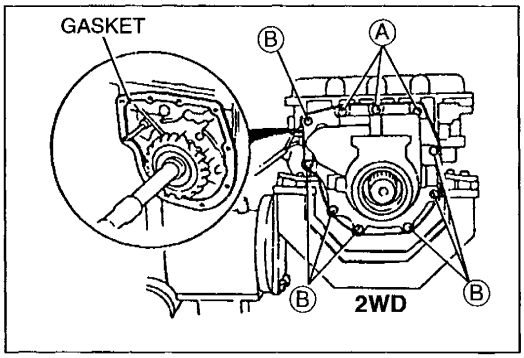
9. Install the parking gear.



10. Pull the output shaft back slightly, and install a new snap ring on it. Verify that the output shaft does not move forward.



11. Install the front snap ring, key, and speedometer drive gear onto the output shaft. (2WD)
12. Secure the speedometer drive gear with the rear snap ring. (2WD)



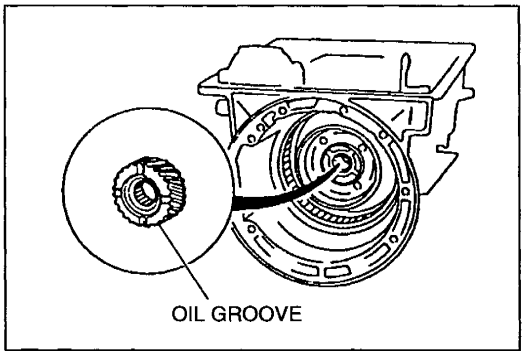
13. Install the gasket and extension housing.

Bolt length (Measured from below the head)
Ⓐ: 30 mm { 1.181 in }
Ⓑ: 45 mm { 1.772 in }

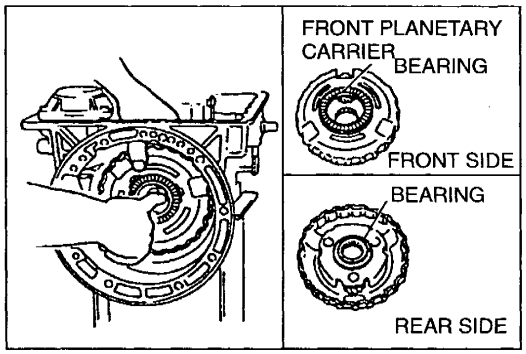
Tightening torque:
20—24 N·m { 2.0—2.5 kgf·m , 15—18 ft·lbf }

14. Install the O-ring onto the speedometer driven gear. (2WD)
15. Install the speedometer driven gear into the extension housing. (2WD)

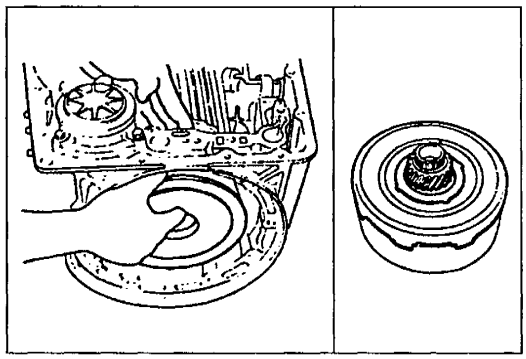
Tightening torque:
5.0—6.8 N·m { 50—70 kgf·cm , 44—60 in·lbf }



16. Install the rear sun gear into the front internal gear, with the oil groove facing as shown.



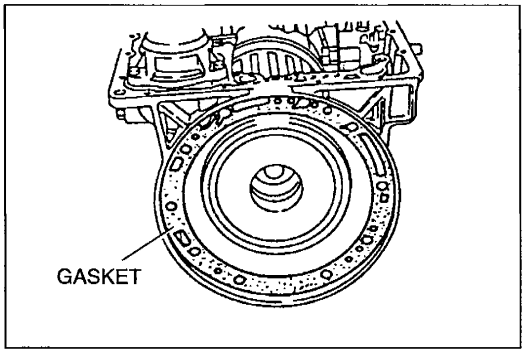
17. Verify that the bearing and bearing race are installed correctly.
18. While rotating the forward clutch drum clockwise, install the front planetary carrier into the forward clutch assembly.



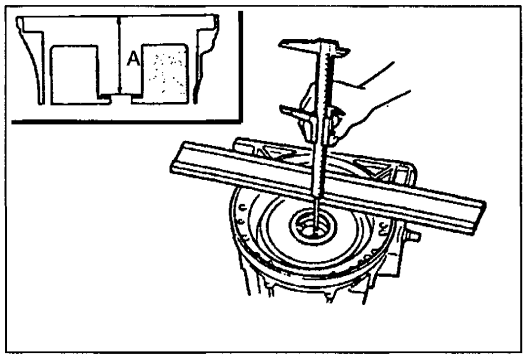
19. Install the reverse clutch, high clutch, and front sun gear into the transmission case as an assembly.

When any part in the following table is replaced, the total end play and/or reverse end play must be adjusted.

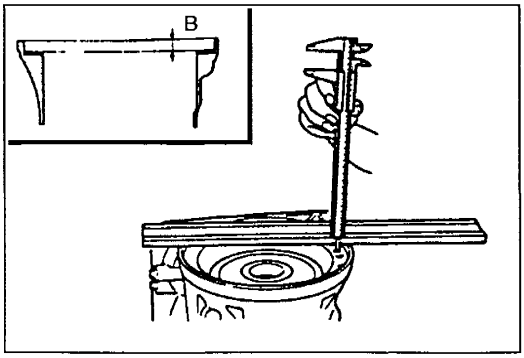
Part name \ Item	Total end play	Reverse end play
Transmission case	○	○
Low one-way clutch inner race	○	○
Overrunning clutch hub	○	○
Rear internal gear	○	○
Rear planetary carrier	○	○
Rear sun gear	○	○
Front planetary carrier	○	○
Front sun gear	○	○
High clutch hub	○	○
High clutch drum	○	○
Oil pump cover	○	○
Reverse clutch drum	—	○



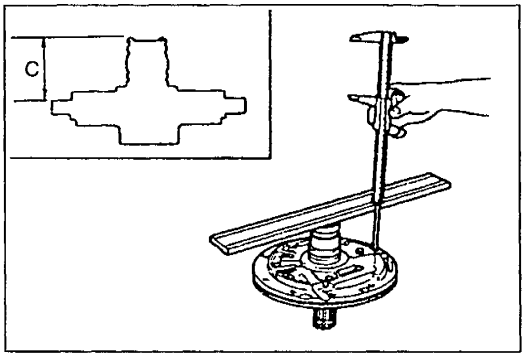
20. Adjust total end play.
    (1) Install the oil pump gasket.



(2) Measure height A with vernier calipers and a straight edge.

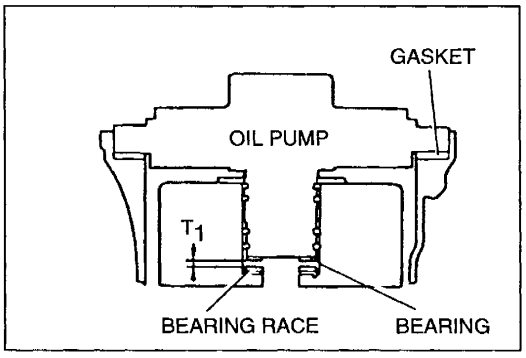


(3) Measure height B with vernier calipers.



(4) Install the needle bearing on the oil pump.
(5) Measure height C with vernier calipers and a straight edge.
(6) Calculate the total end play by using the formula below.

Formula: T1 = A—B—C—0.1 mm { 0.0039 in }



T1: Total end play
A : Distance between bearing race of front side of transmission case and reverse clutch
B : Distance between front side of transmission case and oil pump gasket
C : Distance between upper surface of needle bearing of oil pump and oil pump gasket contact surface
0.1: Amount of compression of new oil pump gasket

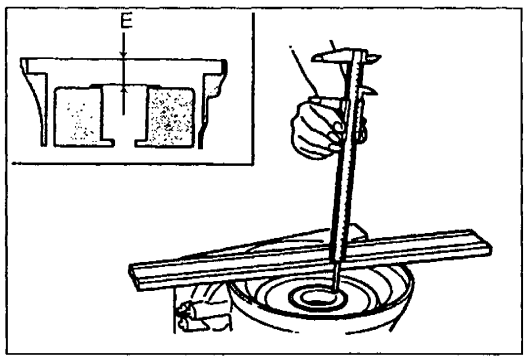
Total end play specification:
0.25—0.55 mm { 0.010—0.022 in }

(7) If the total end play is not within the specification, adjust it by selecting and installing the proper bearing race.

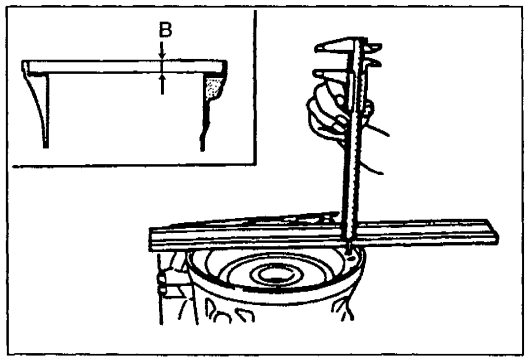
Bearing race size

mm { in }

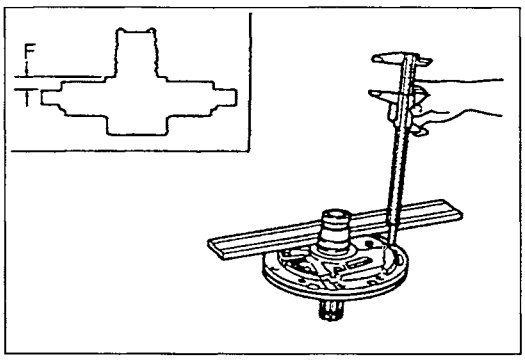
0.8 { 0.031 }	1.0 { 0.039 }	1.2 { 0.047 }	1.4 { 0.055 }
1.6 { 0.063 }	1.8 { 0.071 }	2.0 { 0.079 }	—



21. Adjust reverse clutch end play.
(1) Install the thrust washer on the reverse clutch.
(2) Measure height E with vernier calipers and a straight edge.

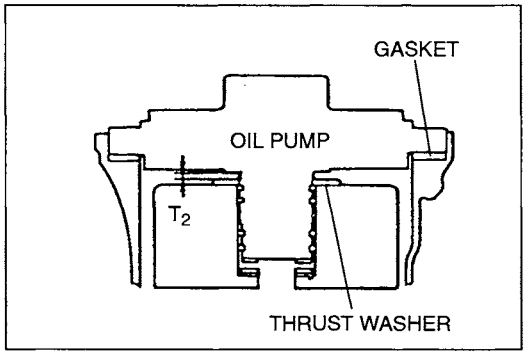


(3) Measure height B with vernier calipers and a straight edge.



(4) Measure height F with vernier calipers and a straight edge.
(5) Calculate the reverse clutch end play by using the formula below.

Formula: T2 = E—B—F—0.1 mm { 0.0039 in }



T2: Reverse clutch end play
B : Distance between front side of transmission case and oil pump gasket
E : Distance between thrust washers of front side of transmission case and reverse clutch
F : Distance between reverse clutch thrust washer contact surface of oil pump and oil pump gasket contact surface
0.1: Amount of compression of new oil pump gasket

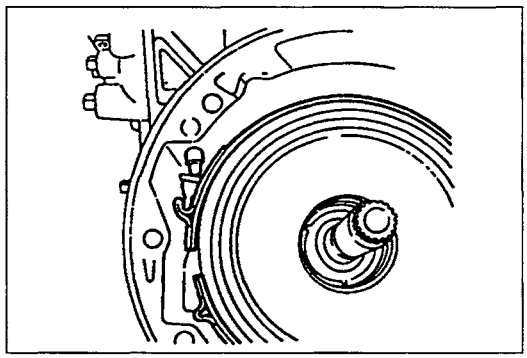
Reverse clutch end play specification:
0.55—0.90 mm { 0.022—0.035 in }

(6) If the reverse clutch end play is not within specification, adjust it by selecting and installing the proper reverse clutch thrust washer.

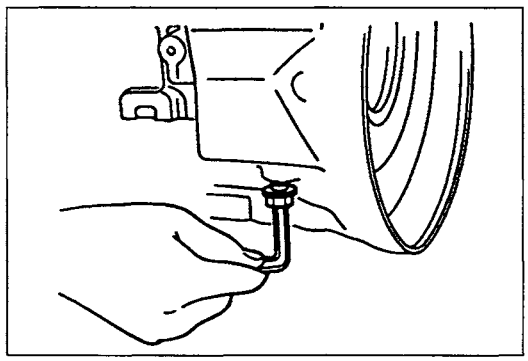
Thrust washer size

mm { in }

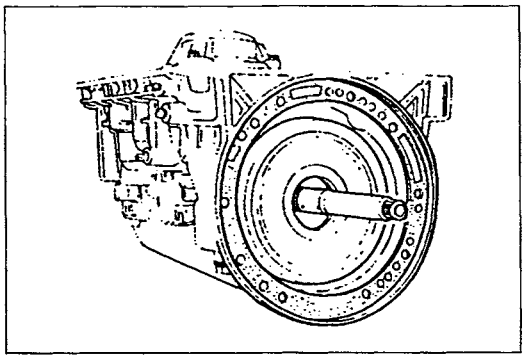
0.7 { 0.028 }	0.9 { 0.035 }	1.1 { 0.043 }	1.3 { 0.051 }
1.5 { 0.059 }	1.7 { 0.067 }	1.9 { 0.075 }	—



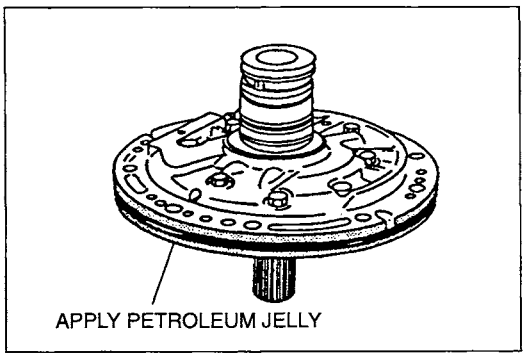
22. Apply ATF to the brake band and band strut, and install them into the transmission.



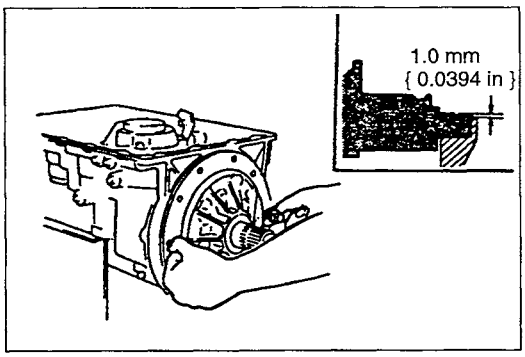
23. Install a new anchor end bolt.



24. Apply ATF to the input shaft, and install it into the transmission case.

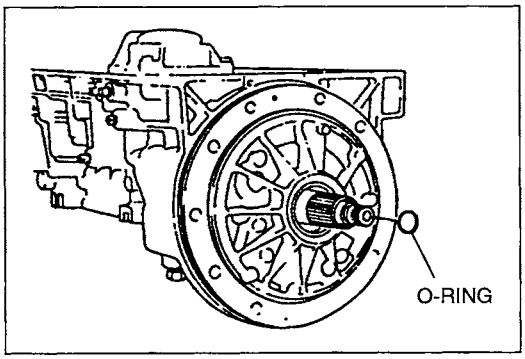


25. Apply petroleum jelly to the oil pump assembly as shown.

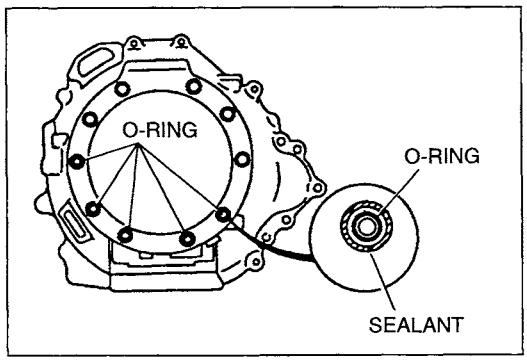


26. Turn the transmission as shown.
Install the oil pump assembly into the transmission case by hand only, using two converter housing bolts as guides.
Measure the height difference between the top of the transmission case and oil pump.

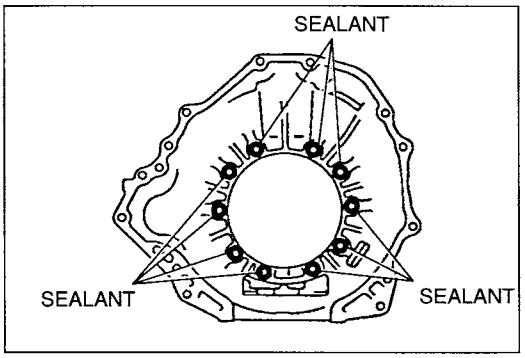
Height: Approx. 1.0 mm { 0.039 in }



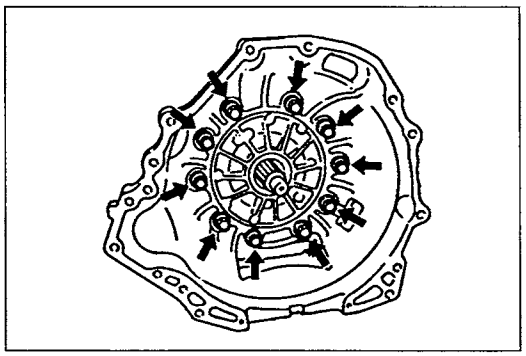
27. Apply ATF to a new O-ring, and install it onto the input shaft.



28. Apply ATF to the new O-rings, and install them into the converter housing, as shown.

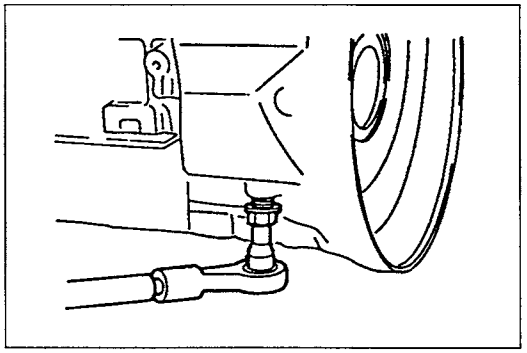


29. Apply sealant lightly as shown.



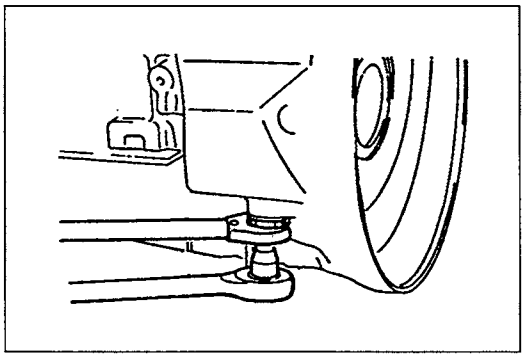
30. Remove the converter housing bolts used as guides.
31. Install the converter housing onto the transmission case, and tighten the bolts evenly in a crisscross pattern.

Tightening torque:
74—76 N·m { 7.5—7.8 kgf·m , 55—56 ft·lbf }



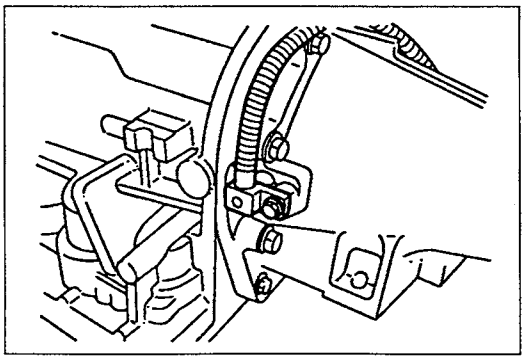
32. Adjust the brake band.
    (1) Tighten the anchor end bolt with a hex wrench.

Tightening torque:
4.0—5.8 N·m { 40—60 kgf·cm , 35—52 in·lbf }



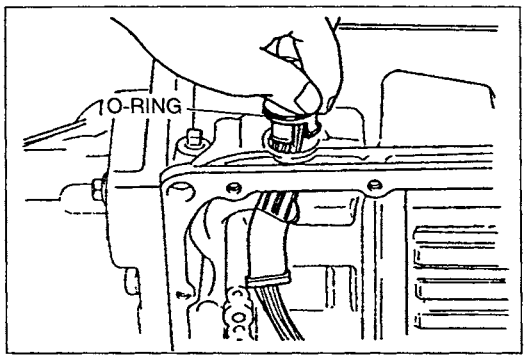
    (2) Loosen the anchor end bolt **2.5** turns.
    (3) Install the locknut.
    (4) Hold the anchor end bolt with a hex wrench and tighten the locknut.

Tightening torque:
41—50 N·m { 4.1—5.2 kgf·m , 30—37 ft·lbf }

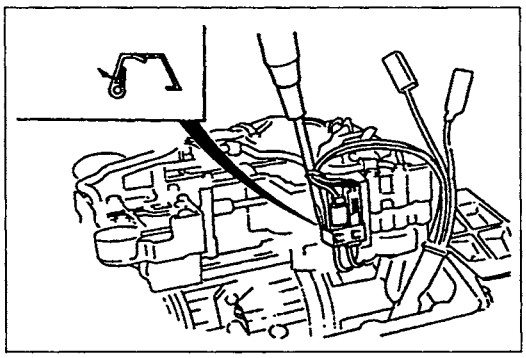


33. Apply ATF to a new O-ring, and install it onto the output soeed sensor.
34. Mount the output speed sensor into the extension housing.

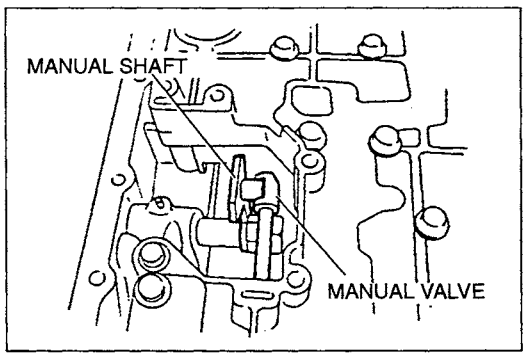
Tightening torque:
5.0—6.8 N·m { 50—70 kgf·cm , 44—60 in·lbf }



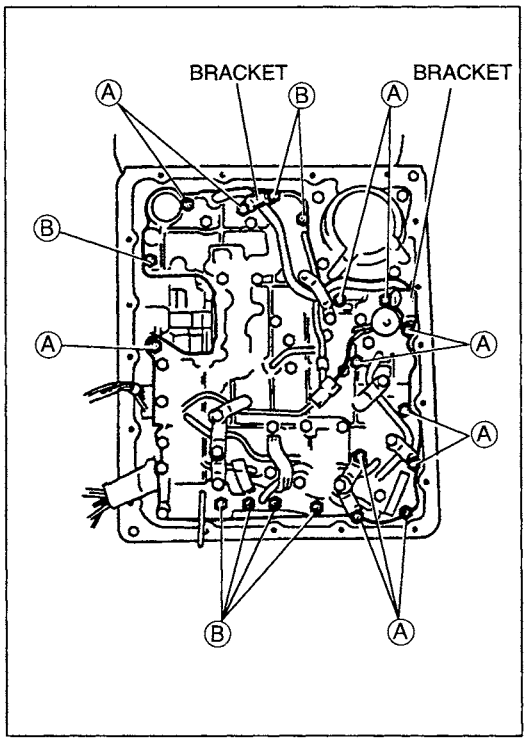
35. Apply ATF to a new O-ring, and install it onto the solenoid connector.
36. Install the solenoid connector into the transmission case.



37. Connect the solenoid connector to the solenoids.
38. Install the clip.



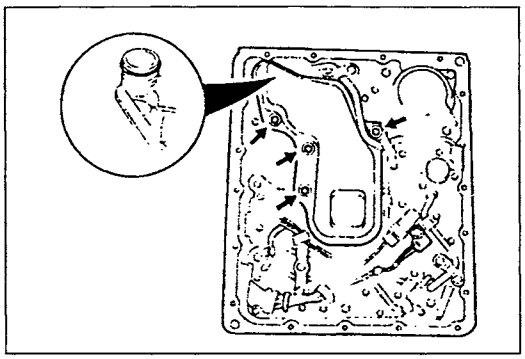
39. Verify that the manual valve and manual shaft are assembled correctly.
40. Set the control valve body into the transmission case and secure it.



41. Install the bolts Ⓐ and Ⓑ and the brackets as shown.

Bolt length (Measured from below the head)
Ⓐ: 33 mm { 1.299 in }
Ⓑ: 45 mm { 1.772 in }

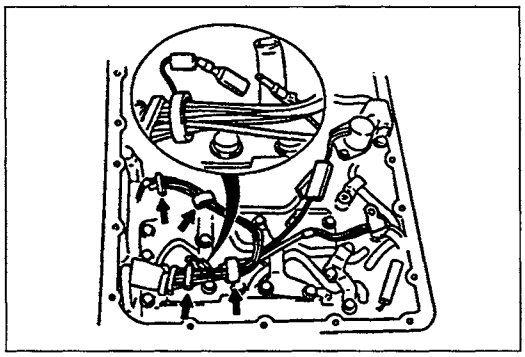
Tightening torque:
6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }



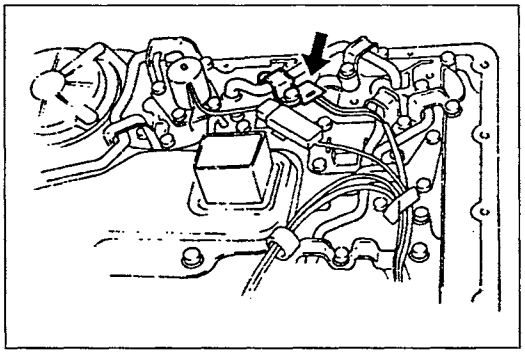
42. Apply ATF to a new O-ring, and install it onto the oil strainer.
43. Install the oil strainer.

Bolt length (Measured from below the head):
50 mm { 1.969 in }

Tightening torque:
6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }

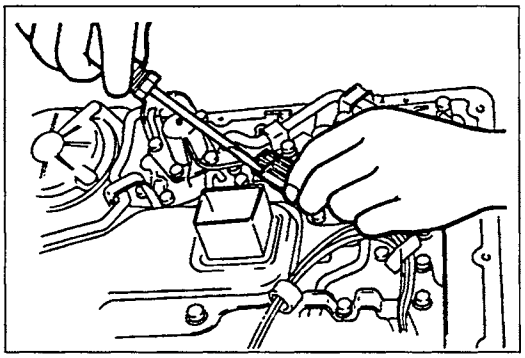


44. Mount the solenoid harness with the harness clips.
45. Install the transmission fluid temperature switch. (4WD)

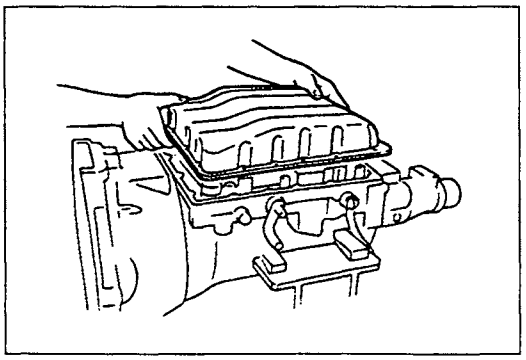


46. Install the transmission fluid temperature sensor as shown in the figure.

Tightening torque:
6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }

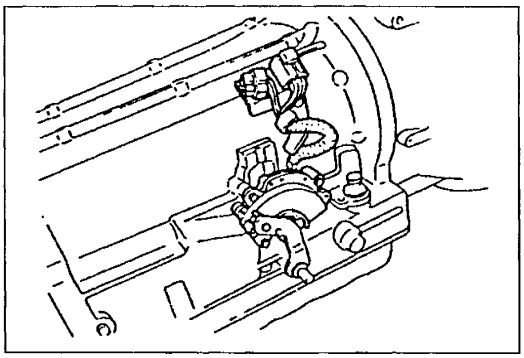


47. Connect the torque converter clutch solenoid connector.
48. Install the clip.



49. Remove any old locking compound from the bolt holes.
50. Set the magnet into the oil pan.
51. Install the oil pan along with the new gasket.
52. Tighten the new bolts evenly and quickly.

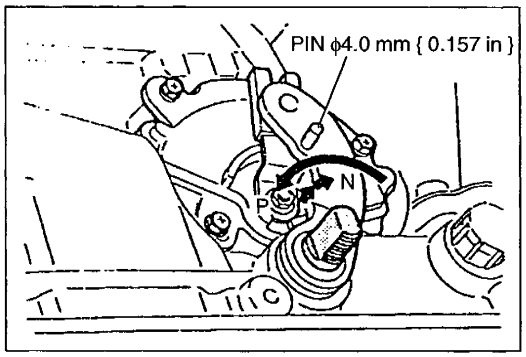
Tightening torque:
6.9—8.8 N·m { 70—90 kgf·cm , 61—78 in·lbf }



53. Install the transmission range switch.
    (1) Install the bracket.

    Tightening torque:
    7.8—12 N·m { 80—120 kgf·cm , 69—104 in·lbf }

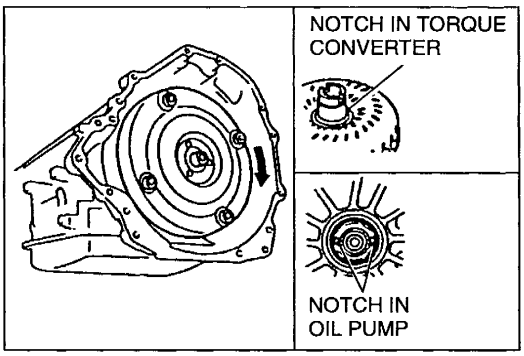
    (2) Verify that the manual shaft is positioned at the L position (fully forward).
    (3) Install the transmission range switch over the manual shaft.



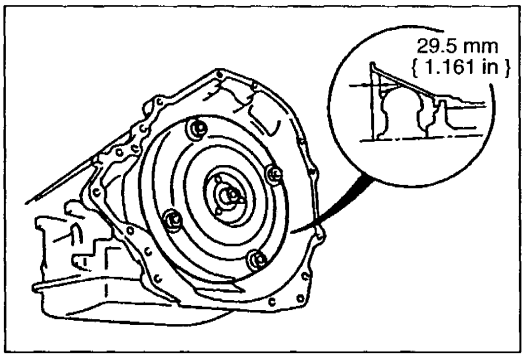
    (4) Turn the manual shaft fully rearward, then return it two (2) notches (N position).
    (5) Insert a **4.0 mm { 0.157 in }** pin through the holes of the transmission range switch and the manual shaft lever.
    (6) Tighten the transmission range switch retaining bolts.

    Tightening torque:
    2.5—3.9 N·m { 25—40 kgf·cm , 22—34 in·lbf }

    (7) Remove the pin.



54. If the torque converter is completely empty, hold it upright and fill it with **2.0 L { 2.1 US qt , 1.81 Imp qt }** of ATF. If the torque converter has not been completely drained, add the same amount of ATF that was drained out.
55. Install the torque converter into the transmission.



56. Measure the installation depth of the torque converter with vernier calipers and a straight edge.

    Specification: 29.5 mm { 1.161 in }

TRANSMISSION UNIT (INSTALLATION)

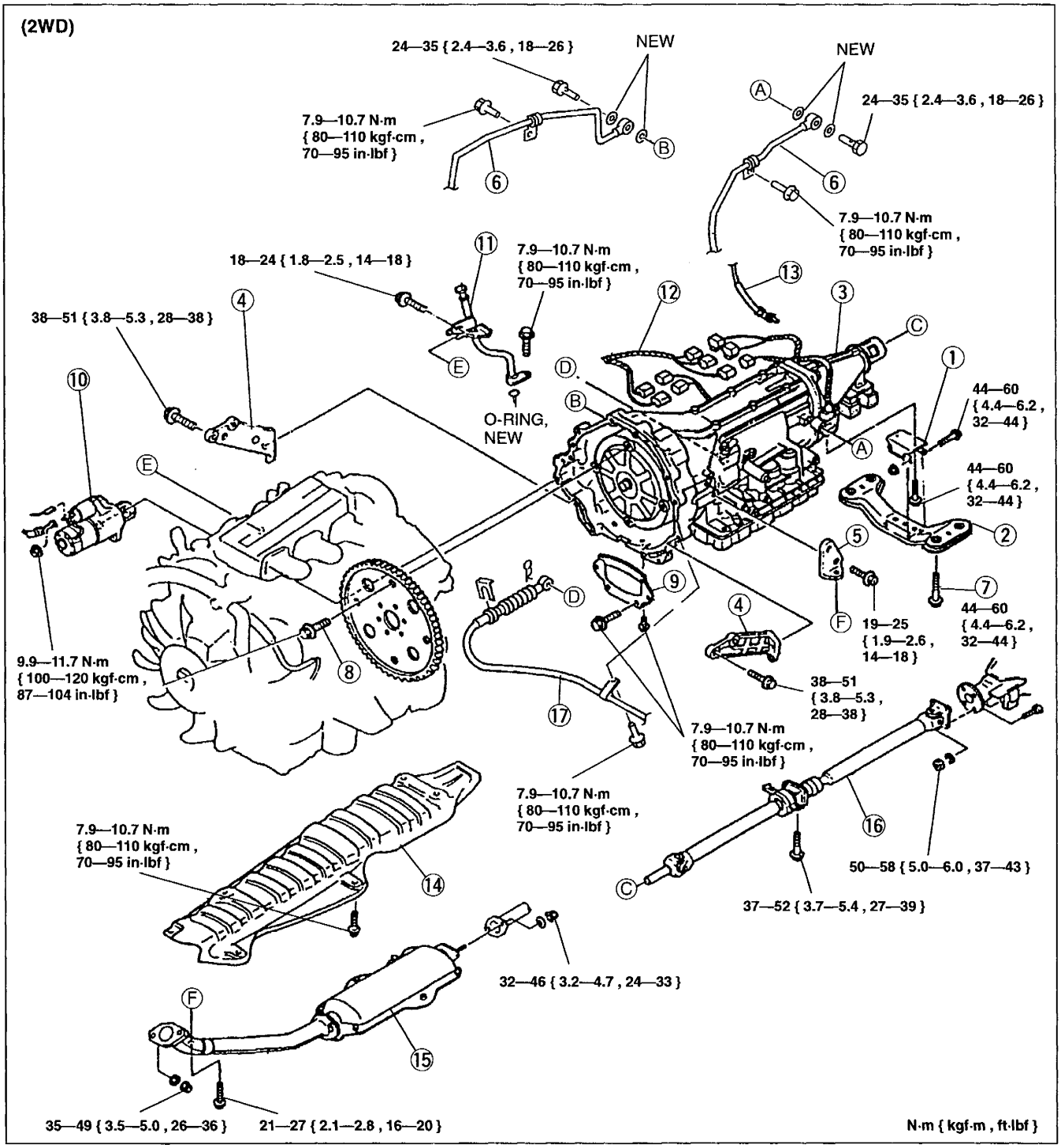
Installation

1. Install in the order shown in the figure, referring to **Installation Note**.
2. Fill the transmission with the specified ATF after installation. (Refer to page K1–30.)
3. Check for leakage of ATF from all connecting points.
4. Connect the negative battery cable.
5. Check operation of the transmission range switch. (Refer to page K1–23.)
6. Check operation of the selector lever. (Refer to page K1–138.)
7. Carry out the mechanical system test. (Refer to page K1–8.)

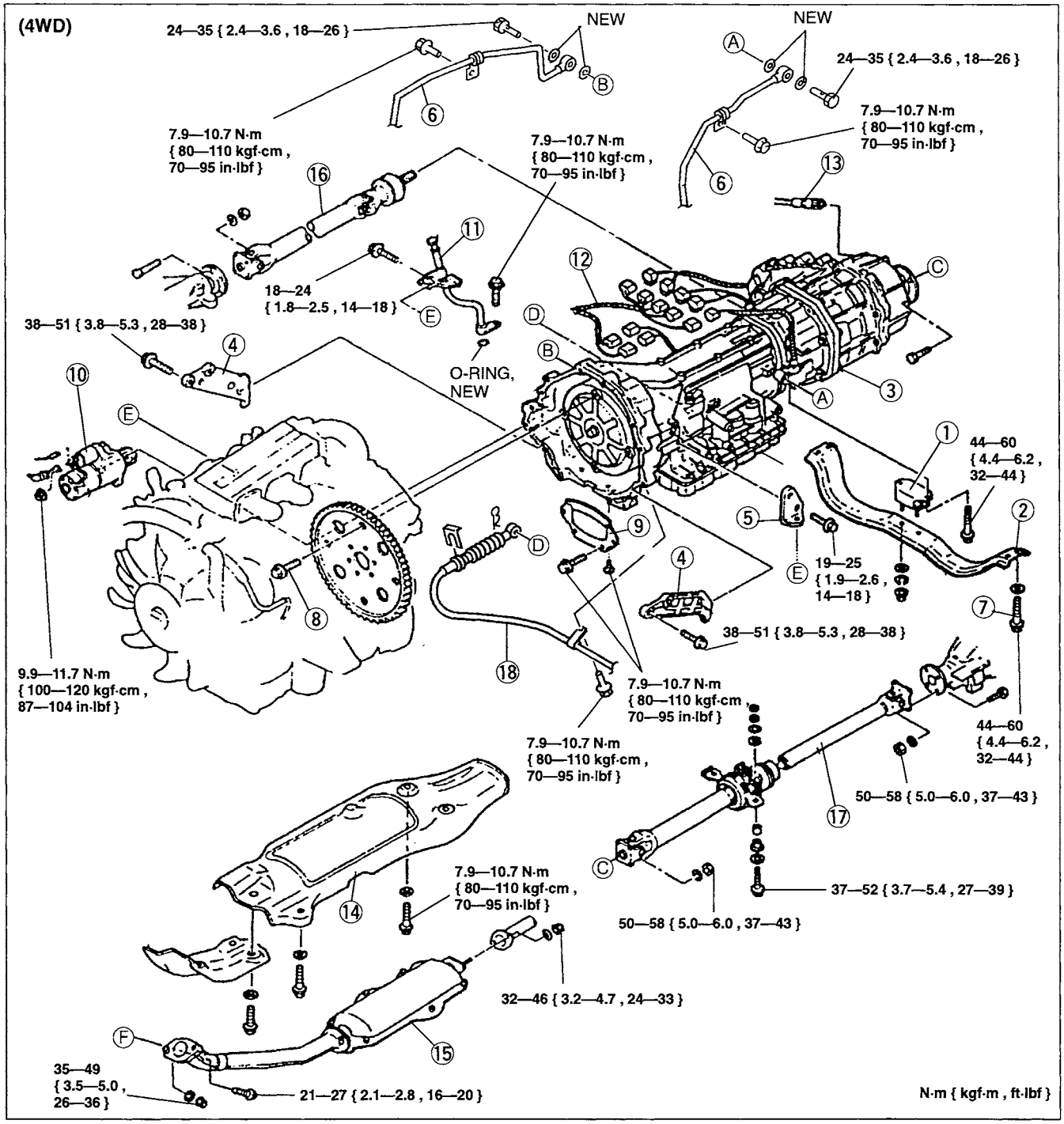
Service item \ Test item	Line pressure test	Stall test	Time lag test
Automatic transmission replacement	○		
Automatic transmission overhaul	○	○	○
Torque converter replacement	○	○	
Oil pump replacement	○		
Clutch system replacement	○		

○: Test to be performed after work

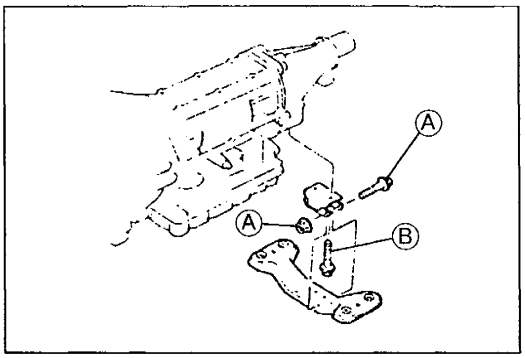
8. Carry out the road test. (Refer to page K1–13.)



1. Transmission upper mount
   Installation Note ..... page K1–132
2. Transmission lower mount
   Installation Note ..... page K1–132
3. Transmission
   Installation Note ..... page K1–132
4. Gusset plate
5. Exhaust pipe bracket
6. Oil pipe
7. Transmission mount mounting bolt
8. Torque converter mounting bolt
   Installation Note ..... page K1–132
9. Undercover
10. Starter
11. Filler tube
12. Connector
13. Speedometer cable
14. Heat insulator
15. Exhaust pipe
16. Propeller shaft
    Installation ..... section L
17. Selector cable



1. Transmission upper mount
   Installation Note ..... page K1–132
2. Transmission lower mount
   Installation Note ..... page K1–132
3. Transmission
   Installation Note ..... page K1–132
4. Gusset plate
5. Exhaust pipe bracket
6. Oil pipe
7. Transmission mount mounting bolt
8. Torque converter mounting bolt
   Installation Note ..... page K1–132
9. Undercover
10. Starter
11. Filler tube
12. Connector
13. Speedometer cable
14. Heat insulator
15. Exhaust pipe
16. Front propeller shaft
    Installation ..... section L
17. Rear propeller shaft
    Installation ..... section L
18. Selector cable

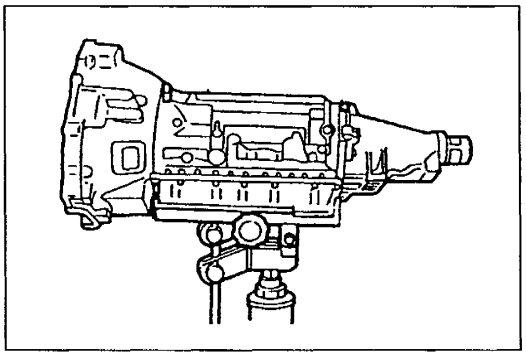


Installation note
Transmission upper mount, Transmission lower mount

1. Install the transmission upper mount on the transmission.

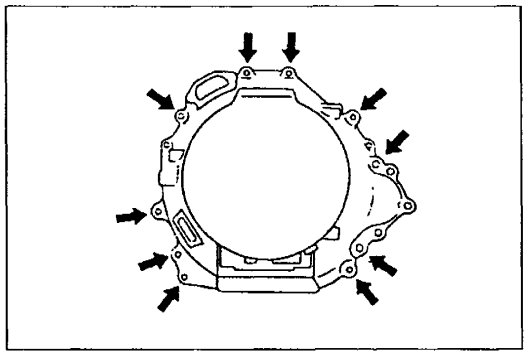
Tightening torque
Ⓑ: 44—60 N·m { 4.4—6.2 kgf·m , 32—44 ft·lbf }

2. Hand tighten bolts and nuts Ⓐ.



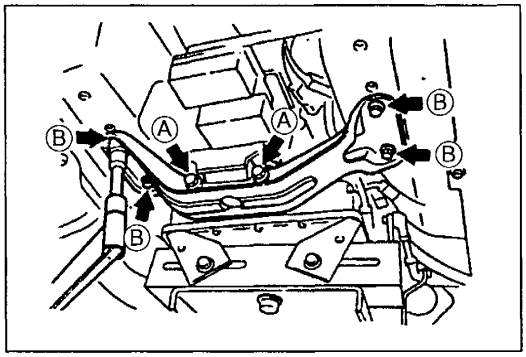
Transmission

1. Set the transmission onto the transmission jack, paying special attention not to damage the oil pipes. Make sure that the torque converter side of the transmission is tilted slightly upward.



2. Install the exhaust pipe bracket.
3. Raise the transmission into place and tighten the installation bolts.

Tightening torque:
38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }

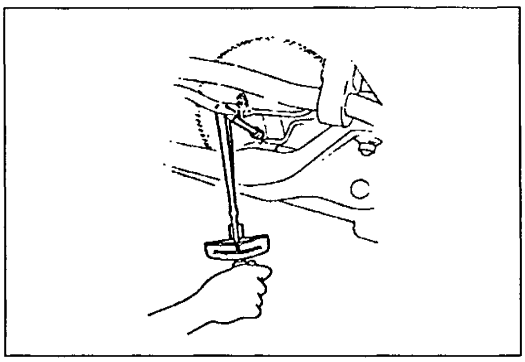


4. Tighten bolts Ⓑ.

Tightening torque
Ⓑ: 44—60 N·m { 4.4—6.2 kgf·m , 32—44 ft·lbf }

5. Tighten bolts and nuts Ⓐ (transmission lower mount and transmission upper mount).

Tightening torque
Ⓐ: 44—60 N·m { 4.4—6.2 kgf·m , 32—44 ft·lbf }



Torque converter mounting bolts

Loosely and equally tighten the torque converter bolts, then further tighten them to the specified tightening torque.

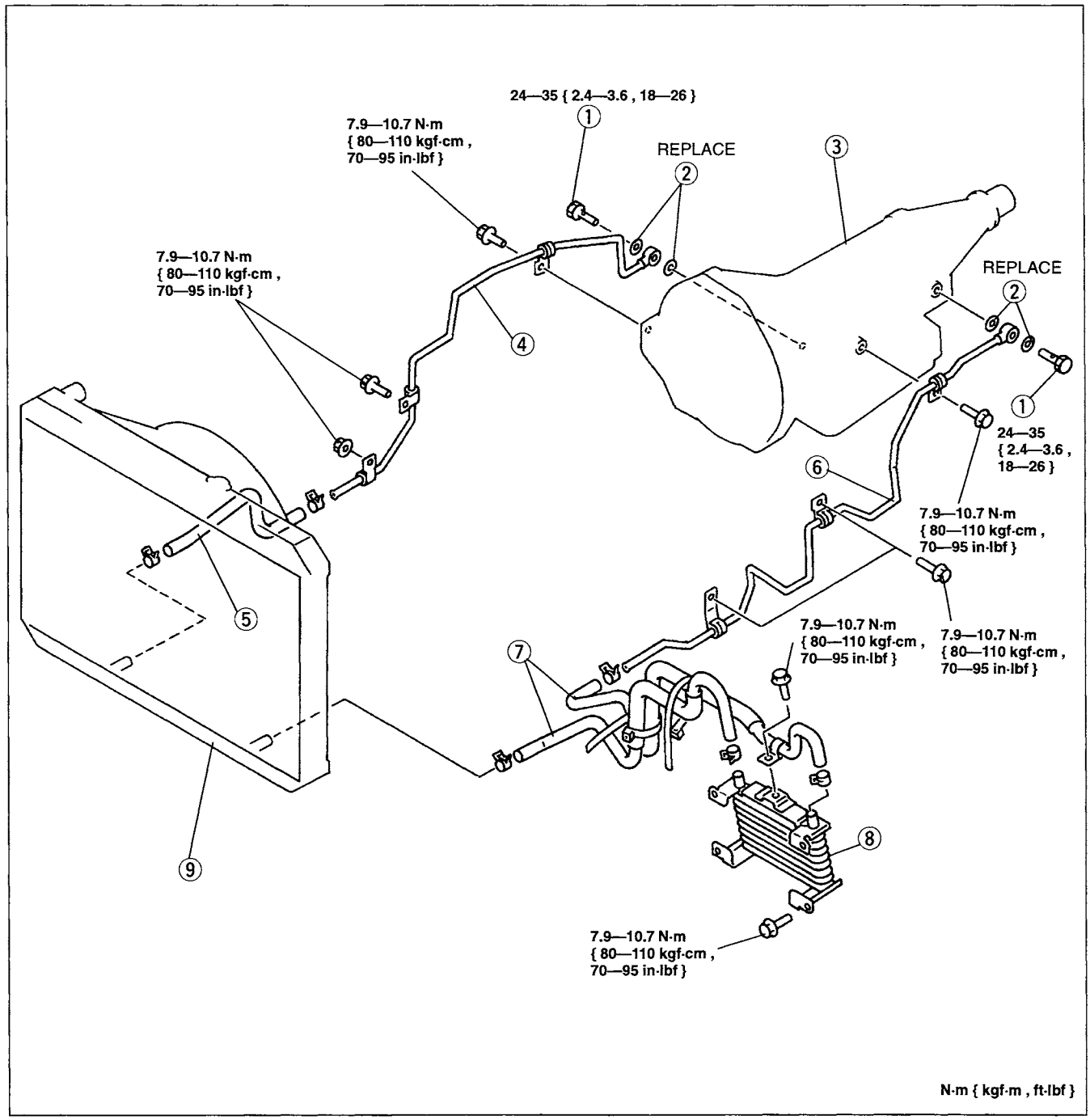
Tightening torque:
37—53 N·m { 3.7—5.5 kgf·m , 27—39 ft·lbf }

OIL COOLER

Removal / Installation

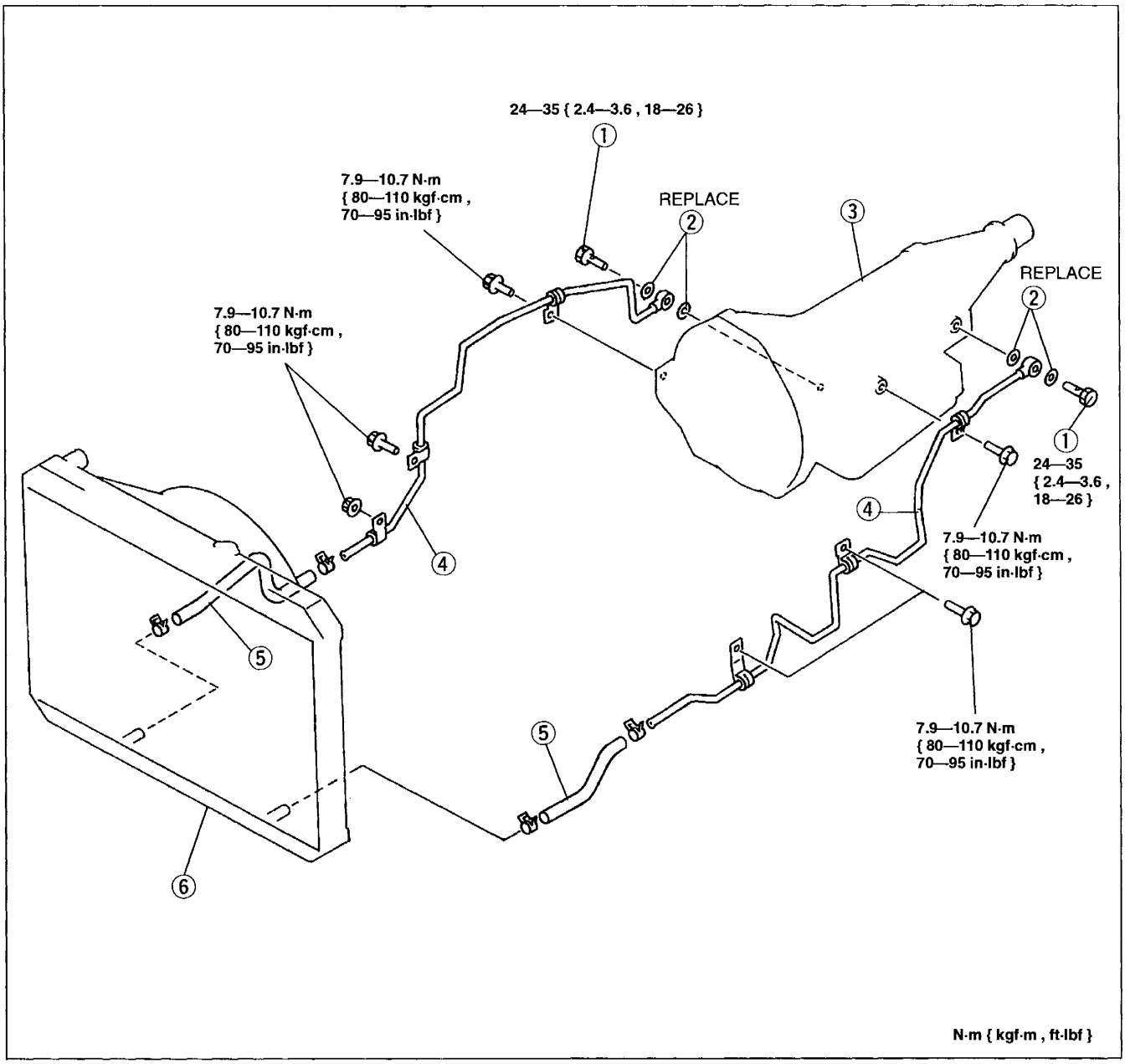
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal, referring to **Installation Note**.

Components (With towing package)

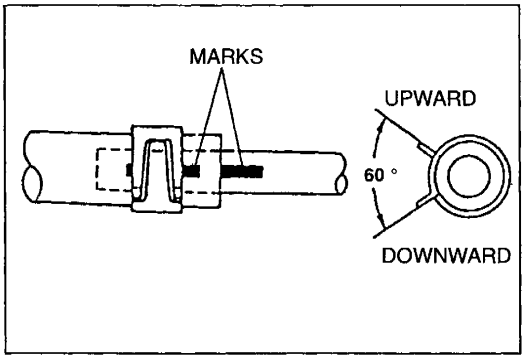


1. Connector bolts
2. Packing
3. Transmission
4. Oil pipe
5. Oil hose
   Installation Note ..... page K1–134
6. Oil pipe
7. Oil hose
   Installation Note ..... page K1–134
8. Oil cooler
9. Radiator
   Refer to section E

Components (Without towing package)



1. Connector bolts
2. Packing
3. Transmission
4. Oil pipe
5. Oil hose
   Installation Note ..... page K1–134
6. Radiator
   Refer to section E

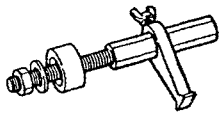
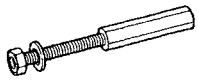


Installation note
Oil hose

1. Align the marks, and slide the oil cooler hose onto the oil cooler pipe until it is fully seated against the ridge.
2. Install the hose clamp onto the hose at the center of the mark and at the angle shown.
3. Verify that the hose clamp does not interfere with any other part.

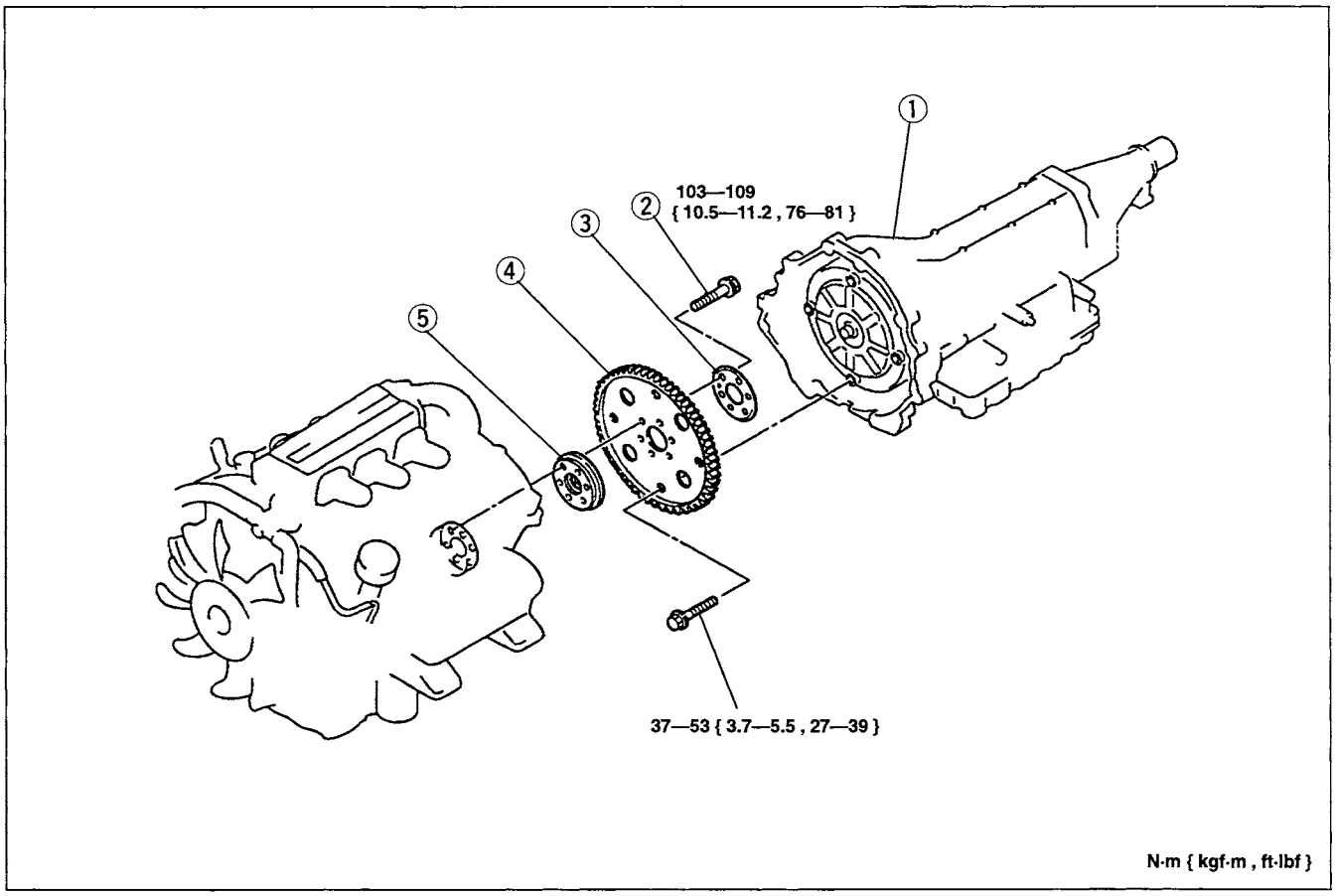
DRIVE PLATE

Preparation
SST

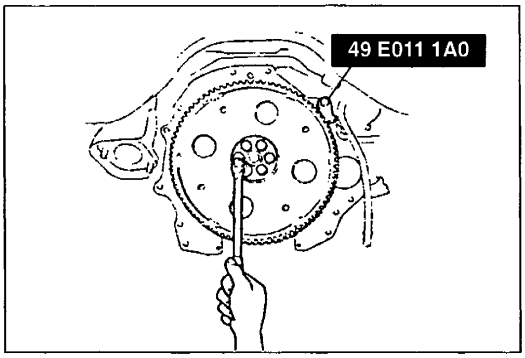
49 E011 1A0 Brake, Ring gear 	For prevention of engine rotation	49 E011 103 Shaft (Part of 49 E011 1A0) 	For prevention of engine rotation
49 E011 104 Collar (Part of 49 E011 1A0) 	For prevention of engine rotation	49 E011 105 Stopper (Part of 49 E011 1A0) 	For prevention of engine rotation

Removal / Installation

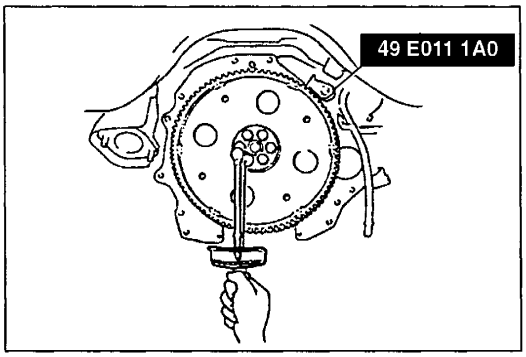
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.



1. Transmission
   - Removal ..... page K1– 32
   - Installation ..... page K1–129
2. Bolts
3. Backing plate
4. Drive plate
   - Removal note ..... page K1–136
   - Installation note ..... page K1–136
5. Adapter

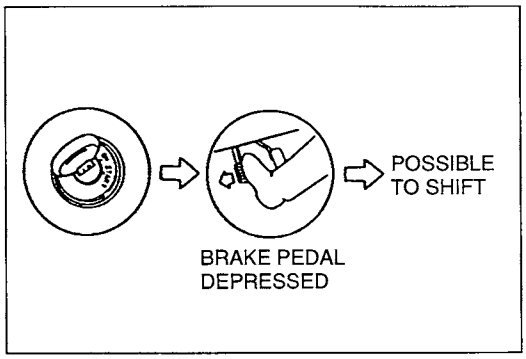


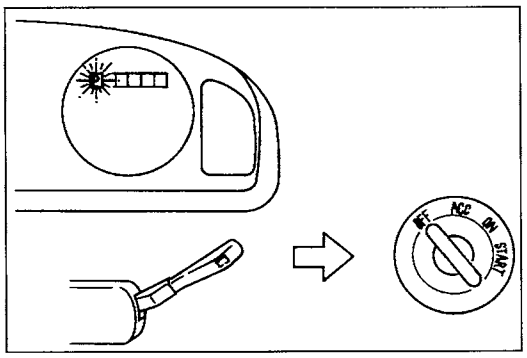
Removal note
Drive plate
Remove the drive plate by using the **SST**.

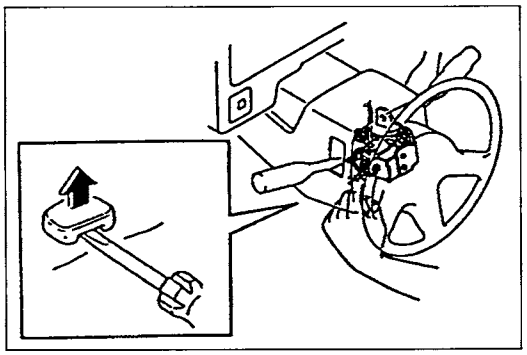


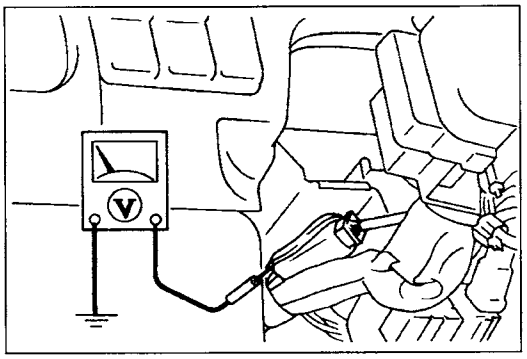
Installation note
Drive plate
1. Assemble the adapter, drive plate and backing plate.
2. Install the **SST** and tighten the bolts.

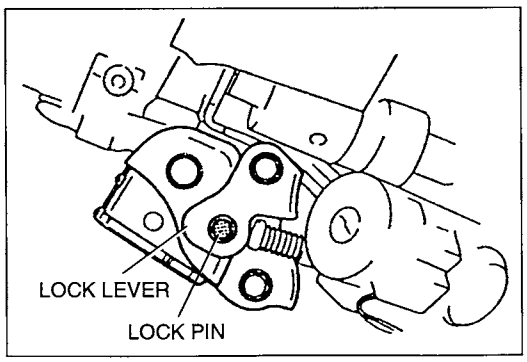
Tightening torque:
103—109 N·m { 10.5—11.2 kgf·m , 76—81 ft·lbf }











SHIFT MECHANISM

SHIFT-LOCK AND KEY INTERLOCK SYSTEM

Inspection

Shift-lock system operation

Shift-lock system

1. Verify that the selector lever is in P position.
2. Turn the ignition switch to ON (engine off).
3. Without the brake pedal depressed, verify that the selector lever cannot be shifted from P position.
4. Depress the brake pedal. Verify that the selector lever can be shifted from P position.
5. If not as specified, check or adjust the shift-lock system.

Key-interlock system

1. Shift the selector lever to R position.
2. Verify that the ignition key cannot be turned to the LOCK position.
3. Shift the selector lever to P position.
4. Verify that the ignition key can be turned to the LOCK position.
5. If not as specified, check or replace the key cylinder.

Emergency override link

1. Verify that the selector lever is locked in P position.
2. Depress and hold the emergency override link. Verify that the selector lever can be shifted from P position.
3. If not as specified, check or replace the shift-lock actuator.

Terminal voltage

1. Remove the column covers.
2. Turn the ignition switch to ON.
3. Measure the voltage between terminal-wire (O) and a ground.

B+: Battery positive voltage

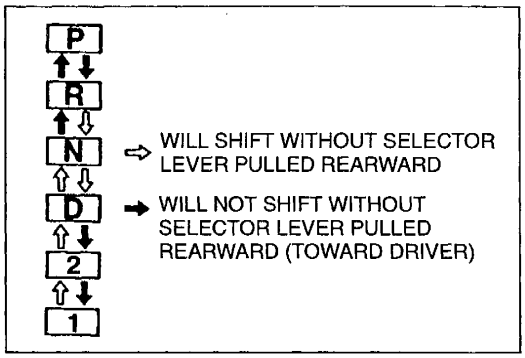
Terminal voltage	Selector lever	Brake pedal
B+	P position (P position switch ON)	Depressed (Brake switch ON)
Below 1.5 V	Other conditions	

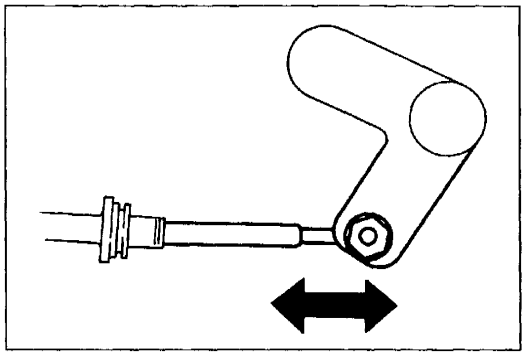
4. If not as specified, check the transmission range switch, brake switch, and CPU.

Adjustment

1. Remove the column covers.
2. Verify that the lock pin of the actuator is in the center of the lock lever.
3. If not, loosen the shift-lock actuator mounting bolts and adjust the lock pin position.

Tightening torque:
16—22 N·m { 1.6—2.3 kgf·m , 12—16 ft·lbf }





SELECTOR LEVER

Inspection

1. Verify that the selector lever can be shifted only as shown in the figure.
2. Make sure there is a click at each range when shifted from P position↔1 range.
3. Verify that the positions of the selector lever and the indicator align.
4. Verify that the selector lever moves smoothly.
5. If not correct, adjust or repair the selector lever.

Adjustment

Selector cable

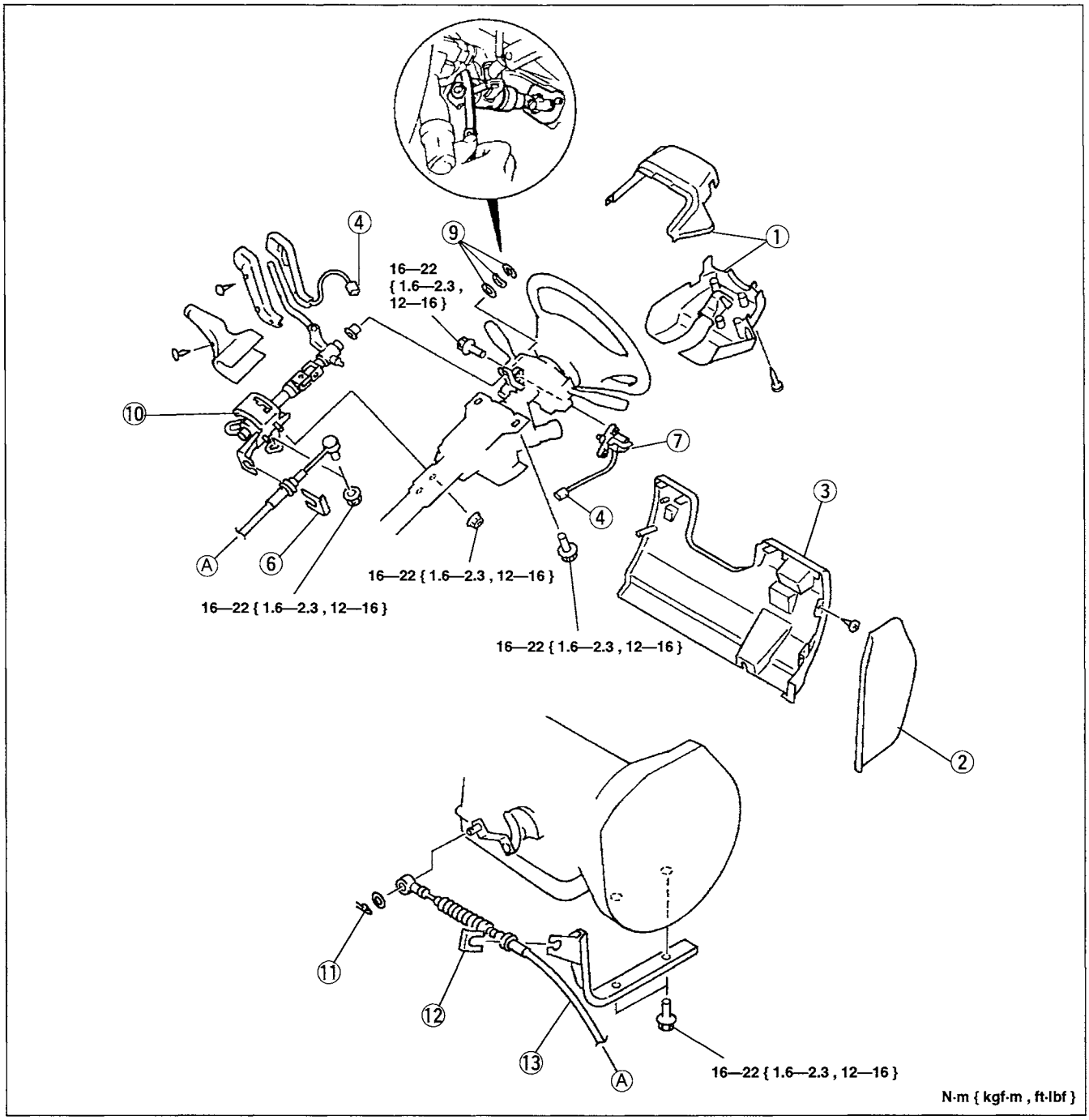
1. Shift the selector lever to P position.
2. Loosen nut Ⓐ as shown in the figure.
3. Position the selector cable so that there is no load in the direction of the arrows, and tighten the nut.

   Tightening torque:
   16—22 N·m { 1.6—2.3 kgf·m , 12—16 ft·lbf }

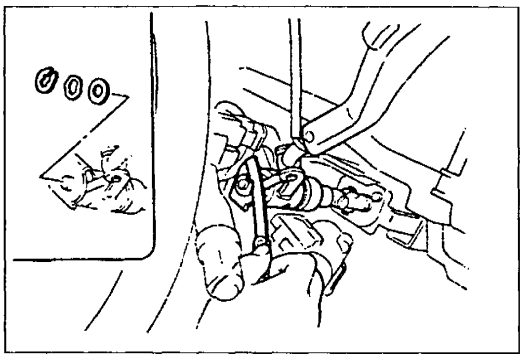
4. Shift the selector lever from P position to 1 range, and make sure that there is no interference from other components in that area.

Removal / Inspection / Installation

1. Remove in the order shown in the figure.
2. Inspect all parts, and replace or repair as necessary.
3. Install in the reverse order of removal, referring to **Installation Note**.



1. Column cover
2. Side cover
3. Lower panel
4. Connector
5. Nut
   Installation Note ..... page K1–140
6. Clip
7. Shift-lock actuator
   Installation Note ..... page K1–140
8. Gear shift mounting
9. Retaining ring, wave washer, adjustment washer
   Installation Note ..... page K1–140
10. Selector lever
    Installation Note ..... page K1–140
11. Clip
12. Clip
13. Selector cable



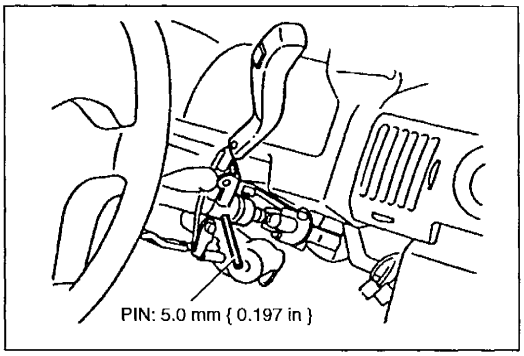
Installation note
Retaining ring, wave washer, adjustment washer

1. Measure the clearance between the bracket of the steering shaft and the adjustment washer.

   Clearance: 0.3 mm { 0.012 in } max.

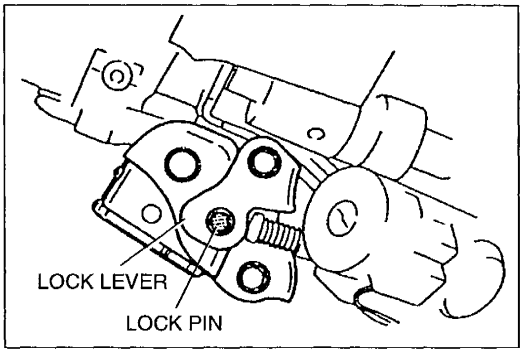
2. If not within the specification, adjust the clearance by installing the correct adjustment washer(s).

   Adjustment washer size:
   1.0 mm { 0.039 in }, 1.2 mm { 0.047 in },
   1.4 mm { 0.055 in }



Selector lever

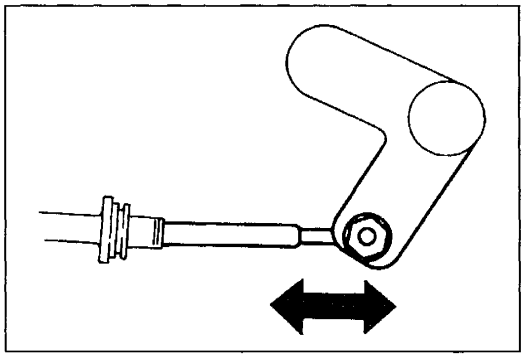
1. Shift the selector lever to P position.
2. Pull the selector lever rearward (toward driver) and insert a **5.0 mm { 0.197 in }** outer diameter pin into the selector lever assembly as shown.



Shift-lock actuator

1. Install the lock pin of the actuator in the center of the lock lever.

   Tightening torque:
   16—22 N·m { 1.6—2.3 kgf·m , 12—16 ft·lbf }



Nut

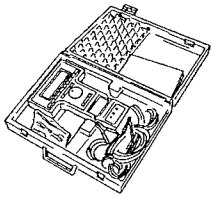
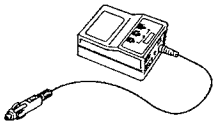
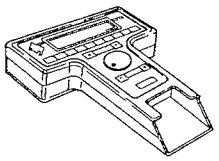
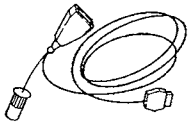
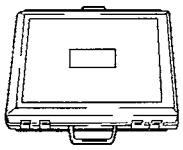
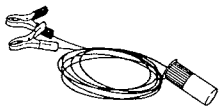
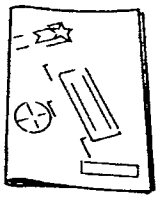
1. Position the selector cable so that there is no load in the direction of the arrows, and tighten the nut.

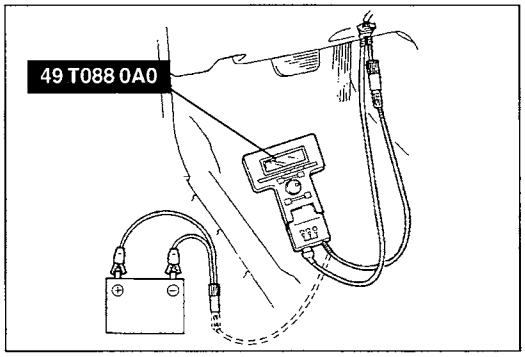
   Tightening torque:
   16—22 N·m { 1.6—2.3 kgf·m , 12—16 ft·lbf }

2. Remove the pin from the selector lever assembly.

ON-BOARD DIAGNOSTIC SYSTEM

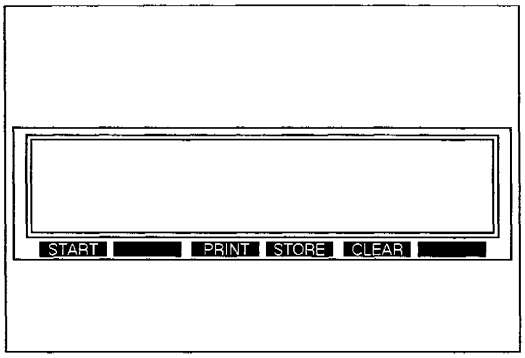
PREPARATION
SST

49 T088 0A0 NGS set 	For diagnosis of EC-AT	49 T088 010B Program Card 	For diagnosis of EC-AT
49 T088 002 Vehicle Interface Module (Part of 49 T088 0A0) 	For diagnosis of EC-AT	49 T088 001 Control Unit (Part of 49 T088 0A0) 	For diagnosis of EC-AT
49 T088 004 NGS OBDII Adapter (Part of 49 T088 0A0) 	For diagnosis of EC-AT	49 T088 009 Case (Part of 49 T088 0A0) 	For diagnosis of EC-AT
49 T088 006 Battery Hookup Adapter (Part of 49 T088 0A0) 	For diagnosis of EC-AT	49 T088 008 Instruction Manual 	For diagnosis of EC-AT



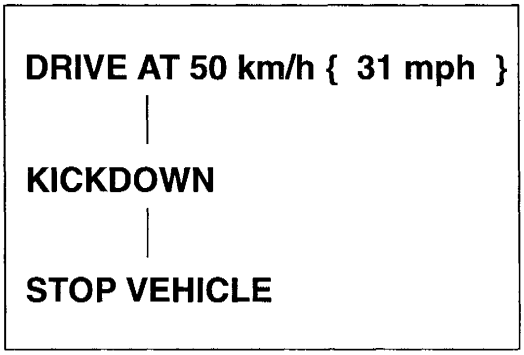
DIAGNOSTIC TROUBLE CODE
Inspection Procedure

1. Connect the **SST** (NGS) to the data link connector 2 and battery.
2. Turn the ignition switch to ON.
3. Check the diagnostic trouble code(s), referring to the **SST** (NGS). (Refer to section F.)
4. If a diagnostic trouble code(s) is displayed, check for the cause by using the number on the diagnostic trouble code table. (Repair as necessary.)
5. Following repairs, do the After-repair Procedure to verify that there are no remaining codes.

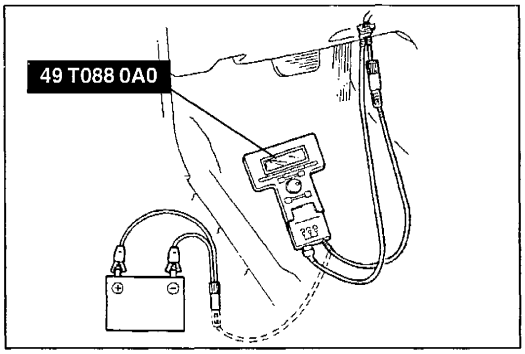


After-repair Procedure

1. Cancel the diagnostic trouble code memory by using the **SST** (NGS). (Refer to section F.)
2. Remove the **SST** (NGS) from the data link connector 2.



3. Drive the vehicle at 50 km/h { 31 mph }, and depress the accelerator pedal fully to activate kickdown. Stop the vehicle gradually.



4. Connect the **SST** (NGS) to the data link connector 2 and battery.
5. Turn the ignition switch to ON.
6. Verify that no diagnostic trouble codes are displayed. (Refer to section F.)
7. Remove the **SST** from the data link connector 2.

Troubleshooting

If a diagnostic trouble code is shown on the **SST**, check for the cause by using the chart related to the code shown.

Diagnostic trouble code

Code No.	Display on the NGS	Condition	Page
P0705	TRANS RANGE SENSOR — CKT MALFUNCTION	Transmission range switch	K1–144
P0710	TRANS FLUID TEMP SENS — CKT MALFUNCTION	Transmission fluid temperature sensor	K1–145
P0720	OUTPUT SPEED SENSOR — CKT MALFUNCTION	Output speed sensor	K1–146
P0725	ENGINE SPEED INPUT — CKT MALFUNCTION	Engine speed input signal	K1–147
P0731	GEAR 1 INCORRECT RATIO	Gear 1 incorrect ratio	K1–148
P0732	GEAR 2 INCORRECT RATIO	Gear 2 incorrect ratio	K1–149
P0733	GEAR 3 INCORRECT RATIO	Gear 3 incorrect ratio	K1–150
P0734	GEAR 4 INCORRECT RATIO	Gear 4 incorrect ratio	K1–151
P0740	TORQUE CONV CLUTCH SYS — MALFUNCTION	Torque converter clutch system	K1–152
P0745	PRESSURE CTRL SOLENOID — MALFUNCTION	Pressure control solenoid	K1–153
P0750	SHIFT SOLENOID A — MALFUNCTION	Shift solenoid A	K1–154
P0755	SHIFT SOLENOID B — MALFUNCTION	Shift solenoid B	K1–155
P1720	VSS2 — No VSS2 SIGNAL	Vehicle speedometer sensor	K1–156
P1743	SOLENOID TCC — OPEN OR SHORT	Torque converter clutch solenoid valve	K1–157
P1770	OVRCSOL. — OPEN OR SHORT	Overrunning clutch solenoid valve	K1–158
P1790	TPS — OPEN OR SHORT	Throttle position sensor	K1–159
P1792	BARO — CIRCUIT MALFUNCTION	Barometric pressure sensor	K1–160

DIAGNOSTIC TROUBLE CODE P0705	TRANS RANGE SENSOR—CKT MALFUNCTION (Transmission range switch)
DETAILS	No input signal or input of two or more signals from transmission range switch
POSSIBLE CAUSE	• Transmission range switch malfunction • Damaged wiring or connectors between transmission range switch and transmission control module • Transmission control module malfunction

STEP	INSPECTION		ACTION
1	Are transmission control module and transmission range switch connections at the connector and connector pins OK?	**Yes**	Go to next step
		No	Repair or replace connector(s) Go to step 6 • When **Yes**, go to next step • When **No**, end of flowchart
2	Check EC-AT tester display • Connect the EC-AT tester to transmission control module • Are transmission range switch range and EC-AT tester display correct? ☞ **page K1–17**	**Yes**	Go to step 6
		No	Go to next step
3	Check for continuity between terminals of transmission range switch and transmission control module • Disconnect negative battery cable • Disconnect transmission range switch and transmission control module connectors • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 6 • When **No**, go to next step
4	Check for continuity between terminal of the transmission range switch as follows • Disconnect negative battery cable • Disconnect transmission range switch connector • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or adjust transmission range switch ☞ **page K1–23** Go to step 2 • When **Yes**, go to step 6 • When **No**, go to next step
5	Check for continuity between terminal of transmission range switch and main relay • Disconnect negative battery cable • Disconnect transmission range switch and main relay • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring
6	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace the transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

Item	Indication	Condition
P/N	ON	P or N position
	OFF	R position, all ranges
R	ON	R position
	OFF	Other positions, all ranges
D	ON	D range
	OFF	Other ranges, all positions
2	ON	2 range
	OFF	Other ranges, all positions
1	ON	1 range
	OFF	Other ranges, all positions

DIAGNOSTIC TROUBLE CODE P0710	TRANS FLUID TEMP SENS—CKT MALFUNCTION (Transmission fluid temperature sensor)
DETAILS	Transmission control module input voltage is less than 0.09V or over 5.0V
POSSIBLE CAUSE	• Transmission fluid temperature sensor malfunction • Damaged wiring or connectors between transmission fluid temperature sensor and transmission control module • Transmission control module malfunction

STEP	INSPECTION		ACTION
1	Are transmission control module and transmission fluid temperature sensor connections at the connector and connector pins OK?	Yes	Go to next step
		No	Repair or replace connector Go to step 6 • When **Yes**, go to next step • When **No**, end of flowchart
2	Check EC-AT tester display • Connect EC-AT tester to transmission control module • Is transmission fluid temperature sensor voltage correct? **Voltage** **ATF temp. 10 °C { 50 °F }: Approx. 1.8 V** **40 °C { 104 °F }: Approx. 1.1 V** ☞ **page K1–17**	Yes	Go to step 5
		No	Go to next step
3	Check for continuity between terminals of transmission fluid temperature sensor and transmission control module • Disconnect negative battery cable • Disconnect transmission fluid temperature sensor and transmission control module connectors • Is there continuity between terminals?	Yes	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 5 • When **No**, go to next step
4	Measure resistance between transmission fluid temperature sensor terminals • Disconnect negative battery cable • Disconnect transmission fluid temperature sensor connector • Is resistance between terminals correct? **Resistance** **ATF temp. 20 °C { 68 °F }: Approx. 2.5 kΩ** **80 °C { 176 °F }: Approx. 0.3 kΩ** ☞ **page K1–24**	Yes	Go to next step
		No	Replace transmission fluid temperature sensor ☞ **page K1–24**
5	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	Yes	Replace the transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

DIAGNOSTIC TROUBLE CODE P0720	OUTPUT SPEED SENSOR—CKT MALFUNCTION (Output speed sensor)
DETAILS	Signal from output speed sensor is not input to transmission control module when vehicle is moving
POSSIBLE CAUSE	• Output speed sensor malfunction • Damaged harness or connectors between output speed sensor and transmission control module • Transmission control module malfunction

STEP	INSPECTION		ACTION
1	Are transmission control module and output speed sensor connection at the connector and connector pins OK?	Yes	Go to next step
		No	Repair or replace connector Go to step 5 • When **Yes**, go to next step • When **No**, end of flowchart
2	Measure terminal voltage at terminals 2J and 2L of transmission control module as follows • Start engine • Connect a circuit tester • Is terminal voltage as specified? **Standard voltage** **Vehicle speed above 25 km/h { 16 mph }: Above 1 V** **Vehicle stopped: 0 V** ☞ **page K1–27**	Yes	Go to step 5
		No	Go to next step
3	Check for continuity between terminals of output speed sensor and transmission control module • Disconnect negative battery cable • Disconnect output speed sensor and transmission control module connectors • Is there continuity between terminals?	Yes	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 5 • When **No**, go to next step
4	Measure resistance between output speed sensor terminals • Disconnect negative battery cable • Disconnect output speed sensor connector • Is resistance between terminals correct? **Resistance: 504—616 Ω** ☞ **page K1–25**	Yes	Go to next step
		No	Replace output speed sensor ☞ **page K1–25**
5	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	Yes	Replace transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

DIAGNOSTIC TROUBLE CODE P0725	ENGINE SPEED INPUT—CKT MALFUNCTION (Engine speed input circuit)
DETAILS	Engine speed input signal is not input to the transmission control module
POSSIBLE CAUSE	• Crank angle sensor–2 malfunction • Damaged wiring or connector between engine control module and transmission control module • Engine control module • Transmission control module

STEP	INSPECTION		ACTION
1	Is diagnostic trouble code P0335 indicated? ☞ **section F**	**Yes**	Refer to flowchart for diagnostic trouble code P0335, and perform troubleshooting ☞ **section F**
		No	Go to next step
2	Are transmission control module and engine speed input signal connection at the connector and connector pins OK?	**Yes**	Go to next step
		No	Repair or replace connector Go to step 7 • When **Yes**, go to next step • When **No**, end of flowchart
3	Check EC-AT tester display • Connect EC-AT tester to transmission control module • Is speed indicated on EC-AT tester after engine is started and vehicle is idling? ☞ **page K1–17**	**Yes**	Go to step 7
		No	Go to next step
4	Check for continuity between terminals of transmission control module and engine control module • Disconnect negative battery cable • Disconnect transmission control module and engine control module connectors • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring Go to step 3 • When **Yes**, go to step 7 • When **No**, go to next step
5	Measure voltage at terminal 4R of engine control module • Connect a circuit tester to terminal 4R of engine control module • Is voltage at terminal correct? **Voltage** **Idling: Approx. 8 V** **Ignition switch ON: Approx. 10 V** ☞ **section F**	**Yes**	Go to next step
		No	Check for engine control module or crankshaft position sensor ☞ **section F** Go to step 2 • When **Yes**, go to step 7 • When **No**, go to next step
6	Measure resistance between terminals 1N and 2P of transmission control module • Disconnect negative battery cable • Disconnect transmission control module connector • Is resistance correct? **Resistance: 7.2—8.0 Ω**	**Yes**	Go to next step
		No	Replace transmission control module
7	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

DIAGNOSTIC TROUBLE CODE P0731	GEAR 1 INCORRECT RATIO (Gear 1 incorrect ratio)
DETAILS	Transmission control module outputs solenoid pattern of first gear when gear ratio is other than first gear
POSSIBLE CAUSE	• ATF level low • Solenoid valve malfunction • Line pressure low • Control valve stuck • Transmission control module malfunction

STEP	INSPECTION		ACTION
1	Is diagnostic trouble code P0750 or P0755 indicated? ☞ **page K1–141**	**Yes**	Refer to flowchart for diagnostic trouble code P0750 or P0755 and perform troubleshooting ☞ **page K1–154, 155**
		No	Go to next step
2	Are amount and condition (color) of ATF OK? Check for ATF leakage at transmission connection and gasket Color ① Transparent red: Normal ② Black: Defective part in powertrain ③ Light red: Water mixed in fluid ④ Reddish brown: Deteriorated ATF ☞ **page K1–30**	**Yes**	Go to next step
		No	Adjust ATF amount or replace ATF if necessary • If ATF color is ②, measure line pressure at idle When pressure is less than specification, go to step 3 • If ATF color is ③ or ④, replace ATF
3	Check line pressure in D range (O/D OFF SW OFF) • Is line pressure OK? **Line pressure when in D range (O/D OFF SW OFF)** **(2WD)** **Idling: 491—530 kPa {5.0—5.4 kgf/cm², 71—77 psi}** **Stalled: 1,197—1,275 kPa {12.2—13.0 kgf/cm², 174—185 psi}** **(4WD)** **Idling: 432—471 kPa {4.4—4.8 kgf/cm², 63—68 psi}** **Stalled: 1,040—1,118 kPa {10.6—11.4 kgf/cm², 150—162 psi}** ☞ **page K1–8**	**Yes**	Go to next step
		No	Repair or replace any defective parts • Line pressure is low only when in D or 2 range: ATF leakage in forward clutch circuit
4	Check stall speed in D range (O/D OFF SW OFF) • Is stall speed OK? **Stall speed when in D range (O/D OFF SW OFF): 2,300—2,600 rpm** ☞ **page K1–10**	**Yes**	Go to next step
		No	Repair or replace any defective parts • High in D range: shifting of forward clutch, forward one-way clutch, or low one-way clutch
5	Inspect operation of shift solenoid A and B • Disconnect negative battery cable • Disconnect solenoid connector • Is it operating OK? ☞ **page K1–26**	**Yes**	Go to next step
		No	Replace shift solenoid A and/or B ☞ **page K1–26** Go to step 7 • When **Yes**, go to next step • When **No**, end of flowchart
6	Check operation of each valve and inspect return spring • Is each valve operating OK and is return spring OK?	**Yes**	Go to next step
		No	Repair or replace control valve and replace return spring
7	After diagnostic trouble code has been cleared, re-check if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace transmission control module
		No	Problem is a temporary slip of clutch, and should be investigated further

DIAGNOSTIC TROUBLE CODE P0732	GEAR 2 INCORRECT RATIO (Gear 2 incorrect ratio)
DETAILS	Transmission control module output solenoid pattern of second gear when gear ratio is other than second gear
POSSIBLE CAUSE	• ATF level low • Forward clutch slippage • Brake band slippage • Solenoid valve malfunction • Line pressure low • Forward one-way clutch slippage • Control valve stuck • Transmission control module malfunction

STEP	INSPECTION		ACTION
1	Is diagnostic trouble code P0750 or P0755 indicated? ☞ page K1–141	Yes	Refer to flowchart for diagnostic trouble code P0750 or P0755 and perform troubleshooting ☞ page K1–154, 155
		No	Go to next step
2	Are amount and condition (color) of ATF OK? Check for ATF leakage at transmission connection and gasket Color ① Transparent red: Normal ② Black: Defective part in powertrain ③ Light red: Water mixed in fluid ④ Reddish brown: Deteriorated ATF ☞ page K1–30	Yes	Go to next step
		No	Adjust ATF amount or replace ATF if necessary • If ATF color is ②, measure line pressure at idle When pressure is less than specification, go to step 3 • If ATF color is ③ or ④, replace ATF
3	Check line pressure in D, 2 range • Is line pressure OK? **Line pressure when in D, 2 range** **(2WD)** **Idling: 491—530 kPa { 5.0—5.4 kgf/cm², 71—77 psi }** **Stalled: 1,197—1,275 kPa { 12.2—13.0 kgf/cm², 174—185 psi }** **(4WD)** **Idling: 432—471 kPa { 4.4—4.8 kgf/cm², 63—68 psi }** **Stalled: 1,040—1,118 kPa { 10.6—11.4 kgf/cm², 150—162 psi }** ☞ page K1–8	Yes	Go to next step
		No	Repair or replace any defective parts • ATF leakage in brake band circuit • ATF leakage in forward clutch circuit
4	Check stall speed in D, 2 range • Is stall speed OK? **Stall speed when in D, 2 range: 2,300—2,600 rpm** ☞ page K1–10	Yes	Go to next step
		No	Repair or replace any defective parts • Brake band slipping • Forward clutch slipping • Forward one-way clutch slipping • Low one-way clutch slipping
5	Inspect operation of shift solenoid A and B • Disconnect negative battery cable • Disconnect solenoid connector • Is it operating OK? ☞ page K1–26	Yes	Go to next step
		No	Replace shift solenoid A and/or B ☞ page K1–26 Go to step 7 • When **Yes**, go to next step • When **No**, end of flowchart
6	Check operation of each valve and inspect return spring • Is each valve operating OK and is return spring OK?	Yes	Go to next step
		No	Repair or replace control valve and replace return spring
7	After diagnostic trouble code has been cleared, re-check if diagnostic trouble code is shown ☞ page K1–141	Yes	Replace the transmission control module
		No	Problem is a temporary slip of clutch, and should be investigated further

DIAGNOSTIC TROUBLE CODE P0733	GEAR 3 INCORRECT RATIO (Gear 3 incorrect ratio)
DETAILS	Transmission control module output solenoid pattern of third gear when gear ratio is other than third gear
POSSIBLE CAUSE	• ATF level low • Forward clutch slippage • High clutch slippage • Solenoid valve malfunction • Line pressure low • Forward one-way clutch slippage • Control valve stuck • Transmission control module malfunction

STEP	INSPECTION		ACTION
1	Is diagnostic trouble code P0750 or P0755 indicated? ☞ page K1–141	Yes	Refer to flowchart for diagnostic trouble code P0750 or P0755 and perform troubleshooting ☞ page K1–154, 155
		No	Go to next step
2	Are amount and condition (color) of ATF OK? Check for ATF leakage at transmission connection and gasket Color ① Transparent red: Normal ② Black: Defective part in powertrain ③ Light red: Water mixed in fluid ④ Reddish brown: Deteriorated ATF ☞ page K1–30	Yes	Go to next step
		No	Adjust ATF amount or replace ATF if necessary • If ATF color is ②, measure line pressure at idle When pressure is less than specification, go to step 3 • If ATF color is ③ or ④, replace ATF
3	Inspect operation of shift solenoid A and B • Disconnect negative battery cable • Disconnect solenoid connector • Is it operating OK? ☞ page K1–26	Yes	Go to next step
		No	Replace shift solenoid A and/or B ☞ page K1–26 Go to step 5 • When **Yes**, go to next step • When **No**, end of flowchart
4	Check operation of each valve and inspect return spring • Is each valve operating OK and is return spring OK?	Yes	Go to next step
		No	Repair or replace control valve and replace return spring
5	After diagnostic trouble code has been cleared, re-check if diagnostic trouble code is shown ☞ page K1–141	Yes	Replace transmission control module
		No	Problem is a temporary slip of clutch, and should be investigated further

DIAGNOSTIC TROUBLE CODE P0734	GEAR 4 INCORRECT RATIO (Gear 4 incorrect ratio)
DETAILS	Transmission control module output solenoid pattern of fourth gear when gear ratio is other than fourth gear
POSSIBLE CAUSE	• ATF level low • Brake band slippage • Control valve stuck • Transmission control module malfunction • Line pressure low • High clutch slippage • Solenoid valve malfunction

STEP	INSPECTION		ACTION
1	Is diagnostic trouble code P0750 or P0755 indicated? ☞ page K1–141	Yes	Refer to flowchart for diagnostic trouble code P0750 or P0755 and perform troubleshooting ☞ page K1–154, 155
		No	Go to next step
2	Are amount and condition (color) of ATF OK? Check for ATF leakage at transmission connection and gasket Color ① Transparent red: Normal ② Black: Defective part in powertrain ③ Light red: Water mixed in fluid ④ Reddish brown: Deteriorated ATF ☞ page K1–30	Yes	Go to next step
		No	Adjust ATF amount or replace ATF if necessary • If ATF color is ②, measure line pressure at idle When pressure is less than specification, repair or replace any defective parts • If ATF color is ③ or ④, replace ATF
3	Is diagnostic trouble code P0732 (Gear 2 incorrect ratio) indicated? ☞ page K1–141	Yes	Refer to flowchart for diagnostic trouble code P0732 (Gear 2 incorrect ratio), and perform troubleshooting ☞ page K1–149
		No	Go to next step
4	Is diagnostic trouble code P0733 (Gear 3 incorrect ratio) indicated? ☞ page K1–141	Yes	Refer to flowchart for diagnostic trouble code P0733 (Gear 3 incorrect ratio), and perform troubleshooting ☞ page K1–150
		No	Go to next step
5	Inspect operation of shift solenoid A and B • Disconnect negative battery cable • Disconnect solenoid connector • Is it operating OK? ☞ page K1–26	Yes	Go to next step
		No	Replace shift solenoid A and/or B ☞ page K1–26 Go to step 7 • When **Yes**, go to next step • When **No**, end of flowchart
6	Check operation of each valve and inspect return spring • Is each valve operating OK and is return spring OK?	Yes	Go to next step
		No	Repair or replace control valve and replace return spring
7	After diagnostic trouble code has been cleared, re-check if diagnostic trouble code is shown ☞ page K1–141	Yes	Replace transmission control module
		No	Problem is a temporary slip of clutch, and should be investigated further

DIAGNOSTIC TROUBLE CODE P0740	TORQUE CONV CLUTCH SYS—MALFUNCTION (Torque converter clutch system)
DETAILS	Transmission control module outputs torque converter clutch signal, but no torque converter clutch obtained
POSSIBLE CAUSE	• ATF level low • Torque converter clutch slippage • Torque converter clutch solenoid valve malfunction • Transmission control module malfunction • Line pressure low • Control valve stuck

STEP	INSPECTION		ACTION
1	Are amount and condition (color) of ATF OK? Check for ATF leakage at transmission connection and gasket Color ① Transparent red: Normal ② Black: Defective part in powertrain ③ Light red: Water mixed in fluid ④ Reddish brown: Deteriorated ATF ☞ page K1–30	Yes	Go to next step
		No	Adjust ATF amount or replace ATF if necessary • If ATF color is ②, disassemble transmission and repair or replace any defective parts as necessary • If ATF color is ③ or ④, replace ATF
2	Check line pressure in D range (O/D OFF SW OFF) • Is line pressure OK? **Line pressure when in D range (O/D OFF SW OFF)** **(2WD)** **Idling: 491—530 kPa { 5.0—5.4 kgf/cm², 71—77 psi }** **Stalled: 1,197—1,275 kPa { 12.2—13.0 kgf/cm², 174—185 psi }** **(4WD)** **Idling: 432—471 kPa { 4.4—4.8 kgf/cm², 63—68 psi }** **Stalled: 1,040—1,118 kPa { 10.6—11.4 kgf/cm², 150—162 psi }** ☞ page K1–8	Yes	Go to next step
		No	Repair or replace any defective parts • ATF leakage in transmission case, oil pump, control valve
3	Inspect operation of solenoid valve • Disconnect negative battery cable • Disconnect solenoid connector • Is it operating OK? ☞ page K1–26	Yes	Go to next step
		No	Replace torque converter clutch solenoid valve ☞ page K1–26
4	Check operation of each valve and inspect return spring • Is each valve operating OK and is return spring OK?	Yes	Go to next step
		No	Repair or replace control valve and replace return spring
5	After diagnostic trouble code has been cleared, re-check if diagnostic trouble code is shown ☞ page K1–141	Yes	Replace transmission control module
		No	Problem is a temporary slip of clutch, and should be investigated further

DIAGNOSTIC TROUBLE CODE P0745	PRESSURE CTRL SOLENOID—MALFUNCTION (Pressure control solenoid)
DETAILS	• Damaged wiring or connectors between pressure control solenoid and transmission control module • Short or open circuit in pressure control solenoid • Short or open circuit in transmission control module internal transistors
POSSIBLE CAUSE	• Damaged wiring or connectors between pressure control solenoid and transmission control module • Short or open circuit in pressure control solenoid • Short or open circuit in transmission control module internal transistors

STEP	INSPECTION		ACTION
1	Are transmission control module and pressure control solenoid connections at connector and connector pins OK?	**Yes**	Go to next step
		No	Repair or replace connector(s) Go to step 8 • When **Yes**, go to next step • When **No**, end of flowchart
2	Check EC-AT tester display • Connect EC-AT tester to transmission control module • Does indication on EC-AT tester display change according to throttle opening angle? **Indication** **Pressure control solenoid: Light (Wide open throttle)—Dark (Closed throttle position)** ☞ **page K1–17**	**Yes**	Go to step 8
		No	Go to next step
3	Check for continuity between terminals of pressure control solenoid and transmission control module • Disconnect negative battery cable • Disconnect solenoid connector and transmission control module connectors • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 8 • When **No**, go to next step
4	Measure resistance between pressure control solenoid terminals • Disconnect negative battery cable • Disconnect solenoid connector • Is resistance between terminals correct? **Resistance: 2.5—5 Ω** ☞ **page K1–26**	**Yes**	Go to next step
		No	Replace pressure control solenoid ☞ **page K1–26**
5	Check for continuity between terminals of dropping resistor and transmission control module • Disconnect negative battery cable • Disconnect dropping resistor and transmission control module connector • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 8 • When **No**, go to next step
6	Measure resistance between dropping resistor terminals • Disconnect negative battery cable • Disconnect dropping resistor connector • Is resistance between terminals correct? **Resistance: 10—14 Ω** ☞ **page K1–26**	**Yes**	Go to next step
		No	Replace dropping resistor Go to step 2 • When **Yes**, go to step 8 • When **No**, go to next step
7	Check for continuity between terminals of dropping resistor and pressure control solenoid • Disconnect negative battery cable • Disconnect dropping resistor and pressure control solenoid connector • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring
8	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace the transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

DIAGNOSTIC TROUBLE CODE P0750	SHIFT SOLENOID A—MALFUNCTION (Shift solenoid A)
DETAILS	• Damaged wiring or connectors between shift solenoid A and transmission control module • Short or open circuit in shift solenoid A • Short or open circuit in transmission control module internal transistor
POSSIBLE CAUSE	• Damaged wiring or connectors between shift solenoid A and transmission control module • Short or open circuit in shift solenoid A • Short or open circuit in transmission control module internal transistor

STEP	INSPECTION		ACTION
1	Are transmission control module and shift solenoid A connections at connector and connector pins OK?	**Yes**	Go to next step
		No	Repair or replace connector(s) Go to step 6 • When **Yes**, go to next step • When **No**, end of flowchart
2	Check EC-AT tester display • Connect EC-AT tester to transmission control module • Is light for shift solenoid A normally off and illuminated when valve is on? ☞ **page K1–17**	**Yes**	Go to step 5
		No	Go to next step
3	Check for continuity between terminals of shift solenoid A and transmission control module • Disconnect negative battery cable • Disconnect solenoid connector and transmission control module connector • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 6 • When **No**, go to next step
4	Measure resistance at shift solenoid A terminal • Disconnect negative battery cable • Disconnect solenoid connector • Is resistance correct? **Resistance: 20—40 Ω** ☞ **page K1–26**	**Yes**	Go to next step
		No	Replace shift solenoid A ☞ **page K1–26**
5	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

DIAGNOSTIC TROUBLE CODE P0755	SHIFT SOLENOID B—MALFUNCTION (Shift solenoid B)
DETAILS	• Damaged wiring or connectors between shift solenoid B and transmission control module • Short or open circuit in shift solenoid B • Short or open circuit in transmission control module internal transistors
POSSIBLE CAUSE	• Damaged wiring or connectors between shift solenoid B and transmission control module • Short or open circuit in shift solenoid B • Short or open circuit in transmission control module internal transistors

STEP	INSPECTION		ACTION
1	Are transmission control module and shift solenoid B connections at connector and connector pins OK?	Yes	Go to next step
		No	Repair or replace connector(s) Go to step 6 • When **Yes**, go to next step • When **No**, end of flowchart
2	Check EC-AT tester display • Connect EC-AT tester to transmission control module • Is light for shift solenoid B normally off and illuminated when valve is on? ☞ **page K1–17**	Yes	Go to step 5
		No	Go to next step
3	Check for continuity between terminals of shift solenoid B and transmission control module • Disconnect negative battery cable • Disconnect solenoid connector and transmission control module connector • Is there continuity between terminals?	Yes	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 5 • When **No**, go to next step
4	Measure resistance at shift solenoid B terminal • Disconnect negative battery cable • Disconnect solenoid connector • Is resistance correct? **Resistance: 20—40 Ω** ☞ **page K1–26**	Yes	Go to next step
		No	Replace shift solenoid B ☞ **page K1–26**
5	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	Yes	Replace transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

DIAGNOSTIC TROUBLE CODE P1720	VSS2—NO VSS2 SIGNAL (Vehicle speed sensor)
DETAILS	Signal from vehicle speed sensor is not input to transmission control module when vehicle is moving
POSSIBLE CAUSE	• Vehicle speed sensor malfunction • Damaged wiring or connectors between vehicle speed sensor and transmission control module • Transmission control module malfunction

STEP	INSPECTION		ACTION
1	Are transmission control module and vehicle speed sensor connectors at connector and connector pins OK?	**Yes**	Go to next step
		No	Repair or replace connector(s) Go to step 5 • When **Yes**, go to next step • When **No**, end of flowchart
2	Check EC-AT tester display • Connect EC-AT tester to transmission control module • Is vehicle speed indicated on EC-AT tester when vehicle is being driving? ☞ **page K1–17**	**Yes**	Go to step 5
		No	Go to next step
3	Check for continuity between terminals of vehicle speed sensor and transmission control module • Disconnect negative battery cable • Remove instrument cluster • Is there continuity between terminal 1G of instrument cluster and terminal 1I of transmission control module?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 5 • When **No**, go to next step
4	Check for continuity between terminals of vehicle speed sensor • Disconnect negative battery cable • Remove instrument cluster • Is there continuity between terminals 1H and 1G of instrument cluster?	**Yes**	Go to next step
		No	Replace vehicle speed sensor
5	After diagnostic trouble code has been cleared, re-check if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

DIAGNOSTIC TROUBLE CODE P1743	SOLENOID TCC—OPEN OR SHORT (Torque converter clutch solenoid valve)
DETAILS	• Damaged wiring or connectors between torque converter clutch solenoid valve and transmission control module • Short or open circuit in torque converter clutch solenoid valve • Short or open circuit in transmission control module internal transistors
POSSIBLE CAUSE	• Damaged wiring or connectors between torque converter clutch solenoid valve and transmission control module • Short or open circuit in torque converter clutch solenoid valve • Short or open circuit in transmission control module internal transistors

STEP	INSPECTION		ACTION
1	Are transmission control module and torque converter clutch solenoid valve connections at connector and connector pins OK?	**Yes**	Go to next step
		No	Repair or replace connector(s) Go to step 5 • When **Yes**, go to next step • When **No**, end of flowchart
2	Check EC-AT tester display • Connect EC-AT tester to transmission control module • Is light for torque converter clutch solenoid valve normally off and illuminated when valve is on? ☞ **page K1–17**	**Yes**	Go to step 5
		No	Go to next step
3	Check for continuity between terminals of torque converter clutch solenoid valve and transmission control module • Disconnect negative battery cable • Disconnect solenoid connector and transmission control module connector • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 5 • When **No**, go to next step
4	Measure resistance at torque converter clutch solenoid valve terminal • Disconnect nagative battery cable • Disconnect solenoid connector • Is resistance correct? **Resistance: 10—20 Ω** ☞ **page K1–26**	**Yes**	Go to next step
		No	Replace torque converter clutch solenoid valve ☞ **page K1–26**
5	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

DIAGNOSTIC TROUBLE CODE P1770	OVRCSOL.—OPEN OR SHORT (Overrunning clutch solenoid valve)
DETAILS	• Damaged wiring or connectors between overrunning clutch solenoid valve and transmission control module • Short or open circuit in overrunning clutch solenoid valve • Short or open circuit in transmission control module internal transistors
POSSIBLE CAUSE	• Damaged wiring or connectors between overrunning clutch solenoid valve and transmission control module • Short or open circuit in overrunning clutch solenoid valve • Short or open circuit in transmission control module internal transistors

STEP	INSPECTION		ACTION
1	Are transmission control module and overrunning clutch solenoid valve connections at connector and connector pins OK?	**Yes**	Go to next step
		No	Repair or replace connector(s) Go to step 5 • When **Yes**, go to next step • When **No**, end of flowchart
2	Check EC-AT tester display • Connect EC-AT tester to transmission control module • Is light for overrunning clutch solenoid valve normally off and illuminated when valve is on? ☞ **page K1–17**	**Yes**	Go to step 5
		No	Go to next step
3	Check for continuity between terminals of overrunning clutch solenoid valve and transmission control module • Disconnect negative battery cable • Disconnect solenoid connector and transmission control module connector • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 5 • When **No**, go to next step
4	Measure resistance at overrunning clutch solenoid valve terminal • Disconnect negative battery cable • Disconnect solenoid connector • Is resistance correct? **Resistance: 20—40 Ω** ☞ **page K1–26**	**Yes**	Go to next step
		No	Replace overrunning clutch solenoid valve ☞ **page K1–26**
5	After diagnostic trouble code has been cleared, re-check if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

DIAGNOSTIC TROUBLE CODE P1790	TPS—OPEN OR SHORT (Throttle position sensor)
DETAILS	Throttle position sensor voltage is less than 0.09 V or greater than 4.95 V
POSSIBLE CAUSE	• Throttle position sensor malfunction • Damaged wiring or connectors between throttle position sensor and engine control module • Damaged wiring or connectors between throttle position sensor and transmission control module

STEP	INSPECTION		ACTION
1	Is diagnostic trouble code P0120 indicated? ☞ **section F**	**Yes**	Refer to flowchart for diagnostic trouble code P0120 and perform troubleshooting ☞ **section F**
		No	Go to next step
2	Are transmission control module and throttle position sensor connections at connector and connector pins OK?	**Yes**	Go to next step
		No	Repair or replace connector(s) Go to step 7 • When **Yes**, go to next step • When **No**, end of flowchart
3	Measure throttle position sensor output voltage • Connect EC-AT tester to transmission control module • Is throttle position sensor voltage OK? **Voltage** **Wide open throttle: 0.1—1.1 V** **Closed throttle position: 3.1—4.4 V** ☞ **page K1–17**	**Yes**	Go to step 7
		No	Go to next step
4	Measure voltage at terminal 2A of transmission control module • Is voltage at terminal OK? **Voltage** **Ignition switch at ON: 4.4—5.5 V** **Ignition switch at OFF: 0 V** ☞ **page K1–27**	**Yes**	Go to next step
		No	Repair or replace connectors or wiring Go to step 3 • When **Yes**, go to step 7 • When **No**, go to next step
5	Check for continuity between terminals of transmission control module and throttle position sensor • Disconnect negative battery cable • Disconnect transmission control module and throttle position sensor connectors • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors or wiring Go to step 3 • When **Yes**, go to step 7 • When **No**, go to next step
6	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

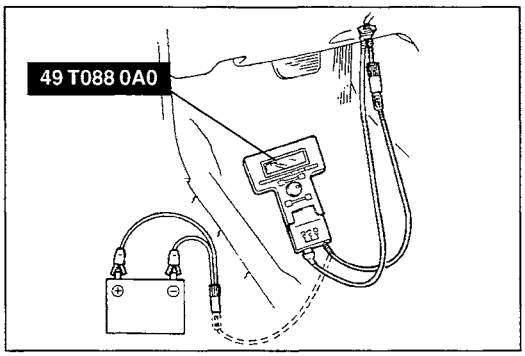
DIAGNOSTIC TROUBLE CODE P1792	BARO—CIRCUIT MALFUNCTION (Barometric pressure sensor)
DETAILS	• Damaged wiring or connectors between engine control module and transmission control module • Short or open circuit transmission control module internal transistor
POSSIBLE CAUSE	• Damaged wiring or connectors between engine control module and transmission control module • Short or open circuit in transmission control module internal transistor

STEP	INSPECTION		ACTION
1	Are transmission control module and engine control module connections at connector and connector pins OK?	**Yes**	Go to next step
		No	Repair or replace connector(s) Go to step 4 • When **Yes**, go to next step • When **No**, end of flowchart
2	Check EC-AT tester display • Connect EC-AT tester to transmission control module • Are barometric pressure sensor and EC-AT tester display correct? **Barometric pressure** **Below 90 kPa { 672 mmHg , 26.47 inHg }: ON** **Above 90 kPa { 672 mmHg , 26.47 inHg }: OFF** ☞ **page K1–17**	**Yes**	Go to step 4
		No	Go to next step
3	Check for continuity between terminals of engine control module and transmission control module • Disconnect negative battery cable • Disconnect engine control module and transmission control module connector • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 4 • When **No**, go to next step
4	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

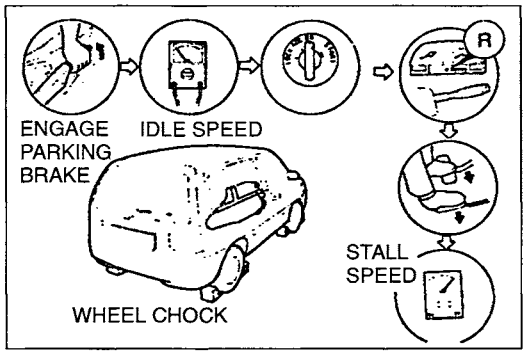
TROUBLESHOOTING

GENERAL NOTES

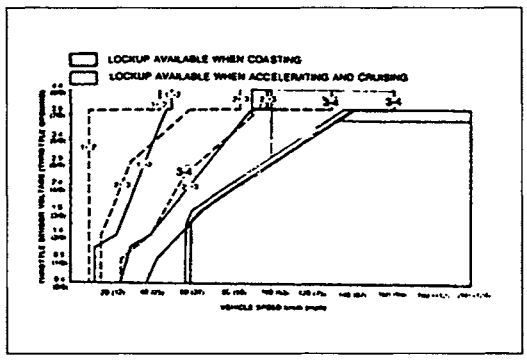
A problem with the EC-AT may be caused by the engine, the EC-AT powertrain, the hydraulic control system, or the electronic control system.
When troubleshooting, begin from these points, which can be inspected quickly and easily. The recommended troubleshooting sequence is described below.



Step 1: On-Board Diagrosis System Inspection
Check for diagnostic trouble code(s) memorized in the Transmission control module with the NGS.
(Refer to page K1–141.)



Step 2: Mechanical System Test
Check the engine stall speed, time lag, and line pressure. (Refer to page K1–8.)



Step 3: Road Test
Check the shift point, shift schedule, and shift shock. (Refer to page K–13.)
Use the EC-AT tester when checking vehicle speed, engine speed, throttle opening (throttle position sensor voltage), and gear position.

If the 4 steps on page K1–162 are followed, the cause of the problem should be located.
Another guide to faster location of the causes of problems, the QUICK DIAGNOSIS CHART, is on pages K1–163 to 166.
In this chart, numbers are used to indicate the components that may be the cause of 51 possible problems. It is necessary to check only those components indicated by numbers during each step of the troubleshooting process to locate the cause of the problem quickly.

QUICK DIAGNOSIS CHART

The QUICK DIAGNOSIS CHART shows different problems and the relationship of components that might be the cause.

1. Components indicated in the "Adjustment" row indicate the possibility that the problem may result from an incorrect adjustment.
   Check the adjustment of each component, and readjust if necessary.
2. Components indicated in the "On-bord Diagnosis" row are diagnosed by the Transmission control module On-board diagrostic system.
   The NGS can be used for easy retrieval of the these signals.
3. Components indicated in the "Mechanical System Test" row can be checked for malfunction by the results of the oil pressure test.
4. Components indicated in the "Road Test" row can be checked for malfunction by the results of the road test.
5. The numbers in the chart indicate the order of inspection for detecting malfunctions.
6. Circled numbers indicate that the transmission must be removed from the vehicle.
7. The checking, adjusting, repair, and replacement procedures for components are described in the page(s) shown in the "Reference page" column.

	ON VEHICLE																						OFF VEHICLE											
Inspection point and reference page	Preliminary				Electronic system															Hydraulic control system							Powertrain								
Item	K1–30	K1–138	section F	section G	K1–23	K1–23	section T	section F	section F	section F	K1–25	K1–24	section F	K1–26	K1–26	K1–26	K1–26	K1–26	K1–26	K1–8	K1–91	K1–47	K1–47	K1–47	K1–47	K1–49	K1–46	K1–53	K1–59	K1–71	K1–35	K1–71	K1–71	K1–79	K1–64	K1–85
	ATF level and condition	Selector lever and selector cable	Idle speed and engine condition	Ignition switch and starter	Transmission range switch	O/D OFF switch	Cruise control switch	Barometric pressure sensor	Closed throttle position switch	Throttle position sensor	Output speed sensor	Transmission fluid temperature sensor	Engine rpm	Shift solenoid A	Shift solenoid B	Pressure control solenoid	Dropping resistor	Torque converter clutch solenoid	Overrunning clutch solenoid	Line pressure	Control valve body	N-D accumulator	1-2 accumulator	2-3 accumulator	3-4/N-R accumulator	Oil pump	Torque converter	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrunning clutch	Low one-way clutch	Low and reverse brake	Brake band and band servo	Parking mechanism
Adjustment		×	×		×				×	×																										
On-board diagnosis										×	×	×	×	×	×	×	×	×	×																	
Mechanical System Test																					×	×		×	×	×			×	×	×	×	×			
Road Test														×	×	×		×	×		×	×	×	×	×				×	×	×	×	×	×	×	×

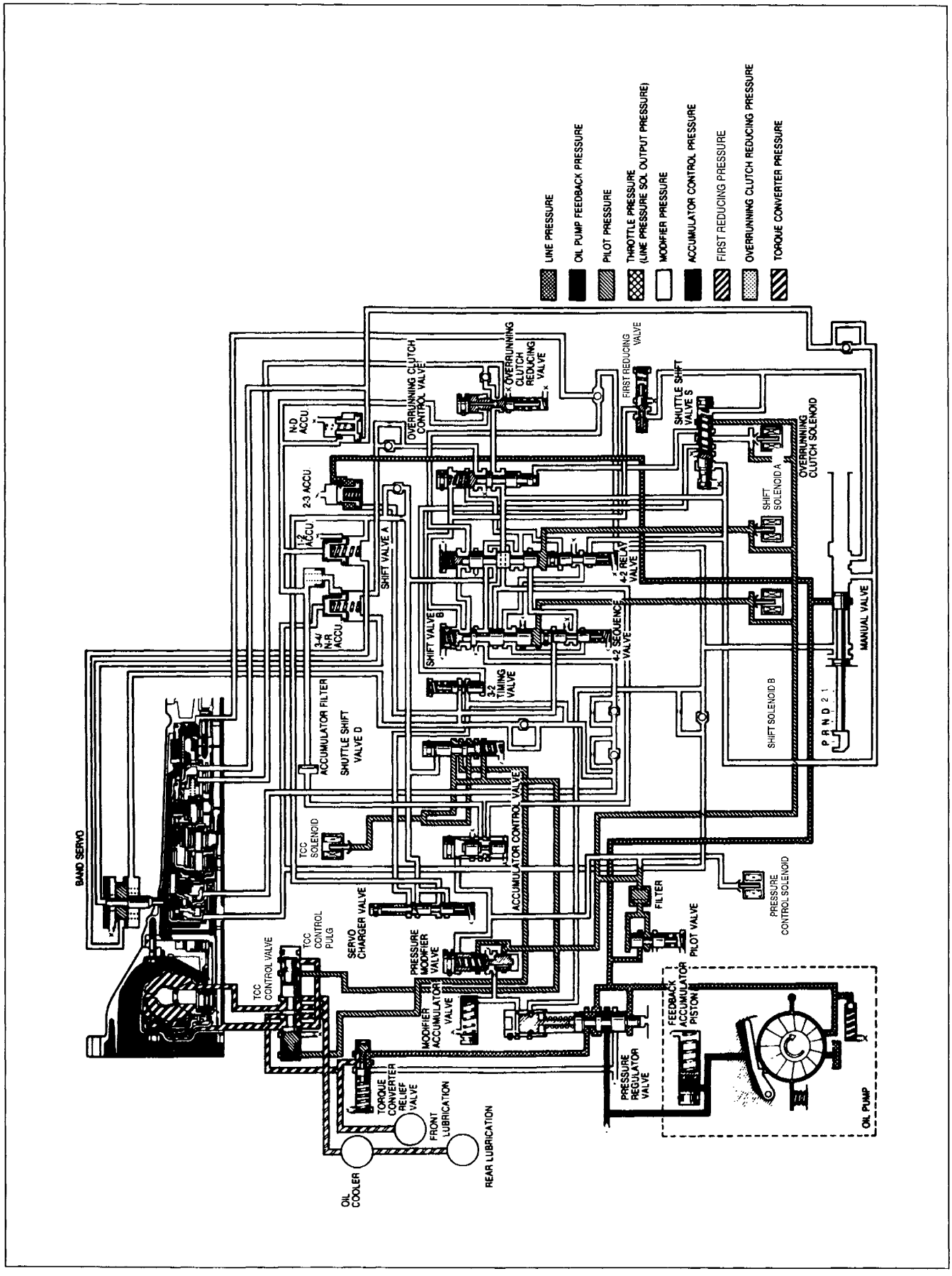
		ON VEHICLE																								OFF VEHICLE									
	Inspection point and reference page	Preliminary				Electronic system															Hydraulic control system						Powertrain									
		K1–30	K1–138	section F	section G	K1–23	K1–23	section T	section F	section F	section F	K1–25	K1–24	section F	K1–26	K1–26	K1–26	K1–26	K1–26	K1–26	K1–8	K1–91	K1–47	K1–47	K1–47	K1–47	K1–49	K1–46	K1–53	K1–59	K1–71	K1–35	K1–71	K1–71	K1–79	K1–64	K1–85
	Item	ATF level and condition	Selector lever and control linkage	Idle speed and engine condition	Ignition switch and starter	Transmission range switch	O/D OFF switch	Cruise control switch	Barometric pressure sensor	Closed throttle position switch	Throttle position sensor	Output speed sensor	Transmission fluid temperature sensor	Engine rpm	Shift solenoid A	Shift solenoid B	Pressure control solenoid	Dropping resistor	Torque converter clutch solenoid	Overrunning clutch solenoid	Line pressure	Control valve body	N-D accumulator	1-2 accumulator	2-3 accumulator	3-4/N-R accumulator	Oil pump	Torque converter	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrunning clutch	Low one-way clutch	Low and reverse brake	Brake band and band servo	Parking mechanism
Engine starting	Engine does not start in N and/or P position		2		1	3																													
	Engine starts in all ranges and R position		1			2																													
Accelerating	Vehicle does not move in D range (moves in 1, 2 ranges and R position)		1																														②		
	Vehicle does not move in forward ranges (moves in R position) Extremely poor acceleration	1															3				2	4	5						⑥	⑦	⑧	⑨		⑩			
	Vehicle does not move in R position (moves in forward position) Extremely poor acceleration		1														3				2	4							⑤	⑥	⑦		⑧		⑨		
	Vehicle does not move in any range and position	1	2														4				3						⑤	⑨		⑥					⑧	⑦	⑩
	Slippage felt when accelerating	1	2								3						5				4	6	7			8	⑫	⑬	⑩		⑨				⑪		
	Vehicle moves in N position		1																							4			③		②		⑤				
	Excessive creep			1																																	
	No creep	1																			2	3					⑤	⑥			④						
	Low maximum speed and poor accelerating	1	*			2									3	4						5					⑩	⑪	⑥	⑦					⑨	⑧	
No shift	Does not shift from 1GR to 2GR		3			2	1				6				4							5													⑦	
	Does not shift from 2GR to 3GR		3			2	1				6					4						5								⑦					⑧	
	Does not shift from 3GR to 4GR		4			3	1	2			6	7			5																				⑧	
	TCC operation does not occur					4				1	2	3	6	5					8		7	9					⑩									
	Does not shift from 4GR to 3GR	1									2				4		5			3		6										⑧		⑦		
	Does not shift from 3GR to 2GR, or from 4GR to 2GR	1									2				3	4						5								⑥					⑦	
	Does not shift from 2GR to 1GR or from 3GR to 1GR	1					3				2				4	5						6								⑧			⑦		⑨	

Item	Inspection point and reference page	Preliminary				Electronic system														Hydraulic control system							Powertrain										
		ON VEHICLE																									OFF VEHICLE										
		K1–30	K1–138	section F	section G	K1–23	K1–23	section T	section F	section F	section F	K1–25	K1–24	section F	K1–26	K1–26	K1–26	K1–26	K1–26	K1–8	K1–91	K1–47	K1–47	K1–47	K1–47	K1–49	K1–46	K1–53	K1–59	K1–71	K1–35	K1–71	K1–71	K1–79	K1–64	K1–85
		ATF level and condition	Selector lever and control linkage	Idle speed and engine condition	Ignition switch and starter	Transmission range switch	O/D OFF switch	Cruise control switch	Barometric pressure sensor	Closed throttle position switch	Throttle position sensor	Output speed sensor	Transmission fluid temperature sensor	Engine rpm	Shift solenoid A	Shift solenoid B	Pressure control solenoid	Dropping resistor	Torque converter clutch solenoid	Overrunning clutch solenoid	Line pressure	Control valve body	N-D accumulator	1-2 accumulator	2-3 accumulator	3-4/N-R accumulator	Oil pump	Torque converter	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrunning clutch	Low one-way clutch	Low and reverse brake	Brake band and band servo	Parking mechanism
No shift	Does not kickdown when accelerator is depressed in 4GR within kickdown range										1	2			3	4																				
No shift	Excessive engine speed when accelerated in 4GR due to delayed kickdown										2	1			3	4																				
No shift	Does not shift from 2GR to 1GR in 1 range					1						2			3					5		4										⑥		⑦		
shift shock	Excessive N position to D range shift shock			1					5		2		4	7			8	6			3	9	10							⑪						
shift shock	Excessive 1GR to 2GR shift shock								6		1		5					7			2	4		3											⑧	
shift shock	Excessive 2GR to 3GR shift shock								6		1		5					7			2	4			3					⑧					⑨	
shift shock	Excessive 3GR to 4GR shift shock								5		1							6			2	4			3							⑧			⑦	
shift shock	Vehicle brakes when shifted from 1GR to 2GR	1																										②	④				⑤	③		
shift shock	Vehicle brakes when shifted from 2GR to 3GR	1																																	②	
shift shock	Vehicle brakes when shifted from 3GR to 4GR	1																										④			③	②				
shift shock	Shift shock felt when accelerator released and deceleration occurs								3		1							4		5	2	6														
shift shock	Excessively large 2GR to 1GR shift shock in L range																					1												②		
shift shock	Vehicle brakes when shifted to R position	1	2														4				3	5							⑥	⑧		⑨			⑦	
Shift point	Excessively high 1GR to 2GR, 2GR to 3GR, and 3GR to 4GR shift points						3				1	2			4	5																				
Shift point	Excessively high 4GR to 3GR, 3GR to 2GR, and 2GR to 1GR shift points										1	2																								
Shift point	Excessively high or low TCC point										1	2							3			4														
Shift point	Shifts directly from 1GR to 3GR	1																						2											③	

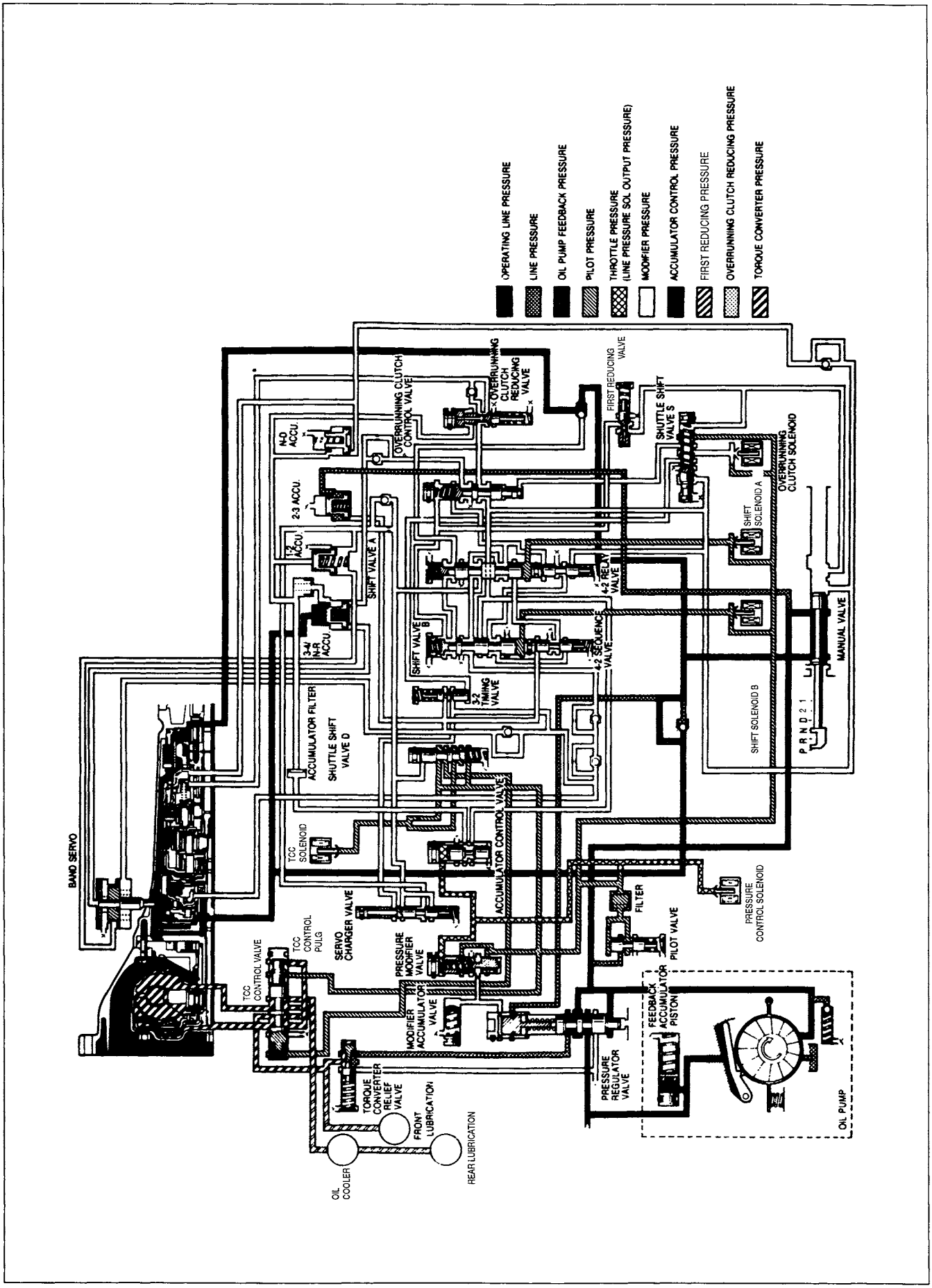
		ON VEHICLE																						OFF VEHICLE											
	Inspection point and reference page	Preliminary				Electronic system														Hydraulic control system						Powertrain											
		K1–30	K1–138	section F	section G	K1–23	K1–23	section T	section F	section F	section F	K1–25	K1–24	section F	K1–26	K1–26	K1–26	K1–26	K1–26	K1–26	K1–26	K1–8	K1–91	K1–47	K1–47	K1–47	K1–47	K1–49	K1–46	K1–53	K1–59	K1–71	K1–35	K1–71	K1–71	K1–79	K1–64	K1–85
	Item	ATF level and condition	Selector lever and control linkage	Idle speed and engine condition	Ignition switch and starter	Transmission range switch	O/D OFF switch	Cruise control switch	Barometric pressure sensor	Closed throttle position switch	Throttle position sensor	Output speed sensor	Transmission fluid temperature sensor	Engine rpm	Shift solenoid A	Shift solenoid B	Pressure control solenoid	Dropping resistor	Torque converter clutch solenoid	Overrunning clutch solenoid	Line pressure	Control valve body	N-D accumulator	1-2 accumulator	2-3 accumulator	3-4/N-R accumulator	Oil pump	Torque converter	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrunning clutch	Low one-way clutch	Low and reverse brake	Brake band and band servo	Parking mechanism
Slipping	Almost no shift shock or excessive slippage at 1GR to 2GR shift	1									2									3	5			4					⑥						⑦	
Slipping	Almost no shift shock or excessive slippage at 3GR to 4GR shift	1									2									3	5				4				⑥						⑦	
Slipping	Engine overruns or slips when shifting 4GR to 3GR	1									2						4			3	5								⑥	⑦						
Slipping	Engine overruns or slips when shifting 4GR to 2GR	1									2				5		4			3	6									⑧					⑦	
Slipping	Engine overruns or slips when shifting 3GR to 2GR	1									2						4		8	3	5			10					⑨	⑦					⑥	
Slipping	Engine overruns or slips when shifting 4GR to 3GR, or 4GR to 2GR	1									2						4			3	5									⑥	⑦		⑧			
Slipping	TCC (in torque converter) slips when locking	1									2						5		4	3	6						⑦									
Noise	Transmission noisy in P and N positions	1									3	4		5						2						⑥	⑦									
Noise	Transmission noisy in all ranges and R position	1																									②									
Others	No engine braking in 1 range		2			1					3	4			5				7		6											⑧		⑨		
Others	Vehicle moves in P or parking gear not disengaged when P is disengaged		1																																	②
Others	Transmission overheats	1		2							3						5			4	6					⑦	⑭	⑧	⑨	⑪		⑫		⑬	⑩	
Others	White smoke discharged from exhaust while running	1																										②	③	⑤		⑥		⑦	④	
Others	Abnormal odor from dipstick pipe	1																								③	②	④	⑤	⑦		⑧		⑨	⑥	
Others	Engine stalls when shifting to all ranges or R position			1															2		3						④									

HYDRAULIC CIRCUIT

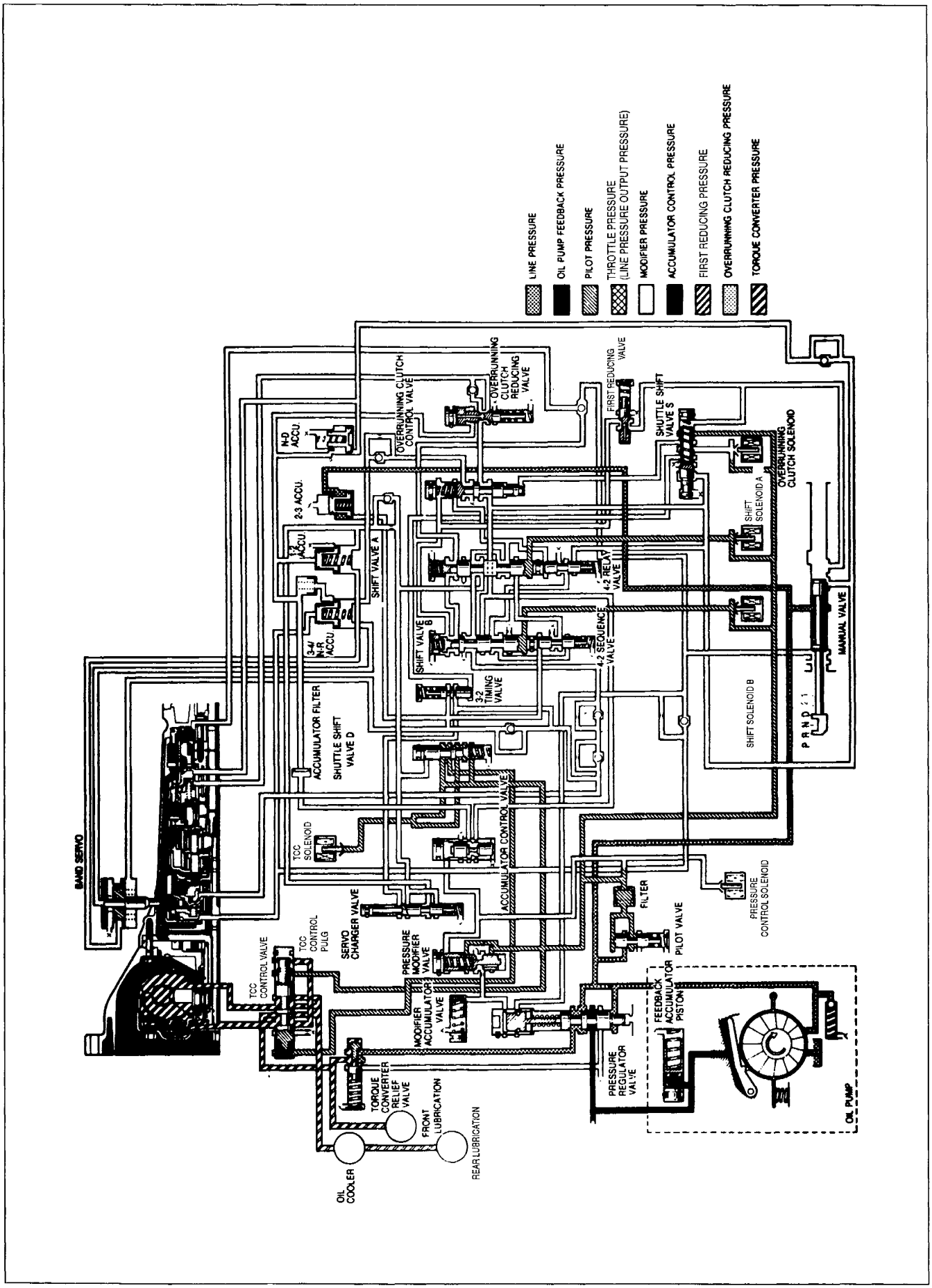
P POSITION



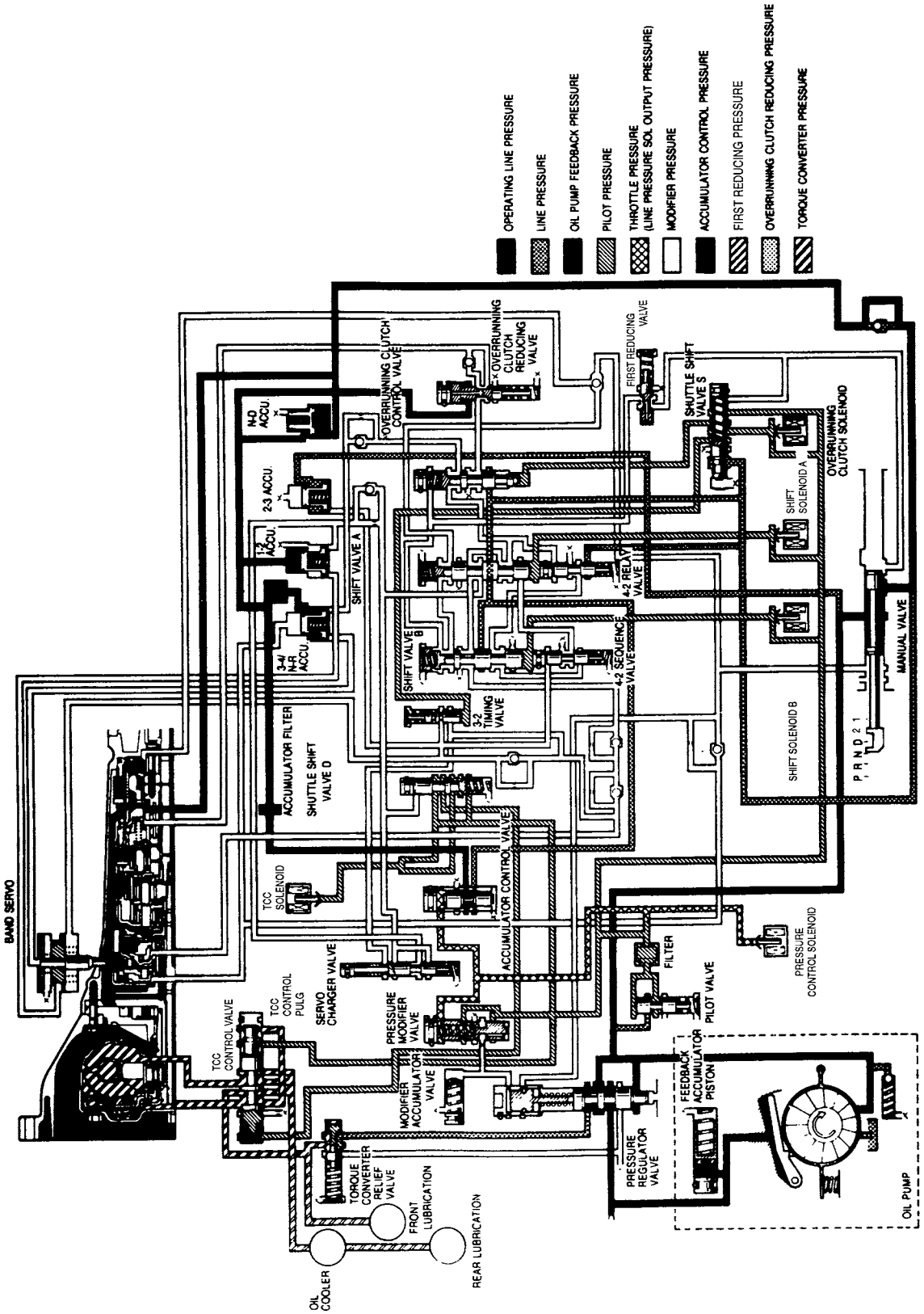
R POSITION


OPERATING LINE PRESSURE
LINE PRESSURE
OIL PUMP FEEDBACK PRESSURE
PILOT PRESSURE
THROTTLE PRESSURE (LINE PRESSURE SOL OUTPUT PRESSURE)
MODIFIER PRESSURE
ACCUMULATOR CONTROL PRESSURE
FIRST REDUCING PRESSURE
OVERRUNNING CLUTCH REDUCING PRESSURE
TORQUE CONVERTER PRESSURE
BAND SERVO
TCC CONTROL VALVE
TCC CONTROL PULG
TCC SOLENOID
ACCUMULATOR FILTER
SHUTTLE SHIFT VALVE D
N-D ACCU.
2-3 ACCU.
1-2 ACCU.
3-4/ N-R ACCU.
SHIFT VALVE A
SHIFT VALVE B
3-2 TIMING VALVE
OVERRUNNING CLUTCH CONTROL VALVE
OVERRUNNING CLUTCH REDUCING VALVE
FIRST REDUCING VALVE
SHUTTLE SHIFT VALVE S
SHIFT SOLENOID A
OVERRUNNING CLUTCH SOLENOID
4-2 RELAY VALVE
4-2 SEQUENCE VALVE
MANUAL VALVE
P R N D 2 1
SHIFT SOLENOID B
ACCUMULATOR CONTROL VALVE
SERVO CHARGER VALVE
PRESSURE MODIFIER VALVE
MODIFIER ACCUMULATOR VALVE
FILTER
PILOT VALVE
PRESSURE CONTROL SOLENOID
FEEDBACK ACCUMULATOR PISTON
PRESSURE REGULATOR VALVE
TORQUE CONVERTER RELIEF VALVE
FRONT LUBRICATION
REAR LUBRICATION
OIL COOLER
OIL PUMP

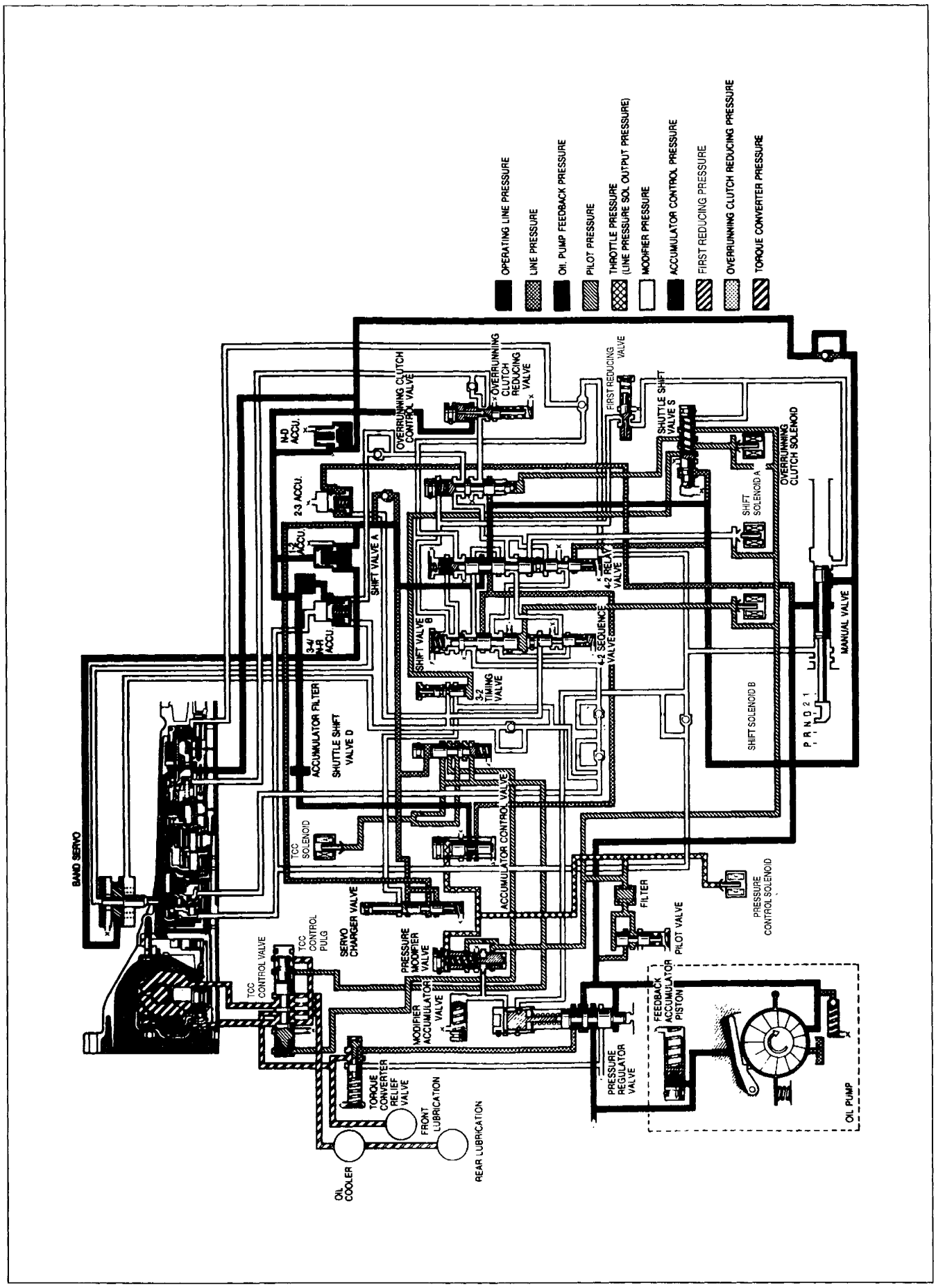
N POSITION


LINE PRESSURE
OIL PUMP FEEDBACK PRESSURE
PILOT PRESSURE
THROTTLE PRESSURE (LINE PRESSURE OUTPUT PRESSURE)
MODIFIER PRESSURE
ACCUMULATOR CONTROL PRESSURE
FIRST REDUCING PRESSURE
OVERRUNNING CLUTCH REDUCING PRESSURE
TORQUE CONVERTER PRESSURE
BAND SERVO
TCC CONTROL VALVE
TCC SOLENOID
TCC CONTROL PLUG
ACCUMULATOR FILTER
SHUTTLE SHIFT VALVE D
N-D ACCU.
2-3 ACCU.
1-2 ACCU.
3-4 N-R ACCU
SHIFT VALVE A
OVERRUNNING CLUTCH CONTROL VALVE
OVERRUNNING CLUTCH REDUCING VALVE
FIRST REDUCING VALVE
SHUTTLE SHIFT VALVE S
SHIFT VALVE B
3-2 TIMING VALVE
4-2 SEQUENCE VALVE
4-2 RELAY VALVE
SHIFT SOLENOID A
OVERRUNNING CLUTCH SOLENOID
SHIFT SOLENOID B
MANUAL VALVE
P R N D 2 1
ACCUMULATOR CONTROL VALVE
SERVO CHARGER VALVE
PRESSURE MODIFIER VALVE
MODIFIER ACCUMULATOR VALVE
FILTER
PILOT VALVE
PRESSURE CONTROL SOLENOID
FEEDBACK ACCUMULATOR PISTON
PRESSURE REGULATOR VALVE
OIL PUMP
TORQUE CONVERTER RELIEF VALVE
FRONT LUBRICATION
REAR LUBRICATION
OIL COOLER

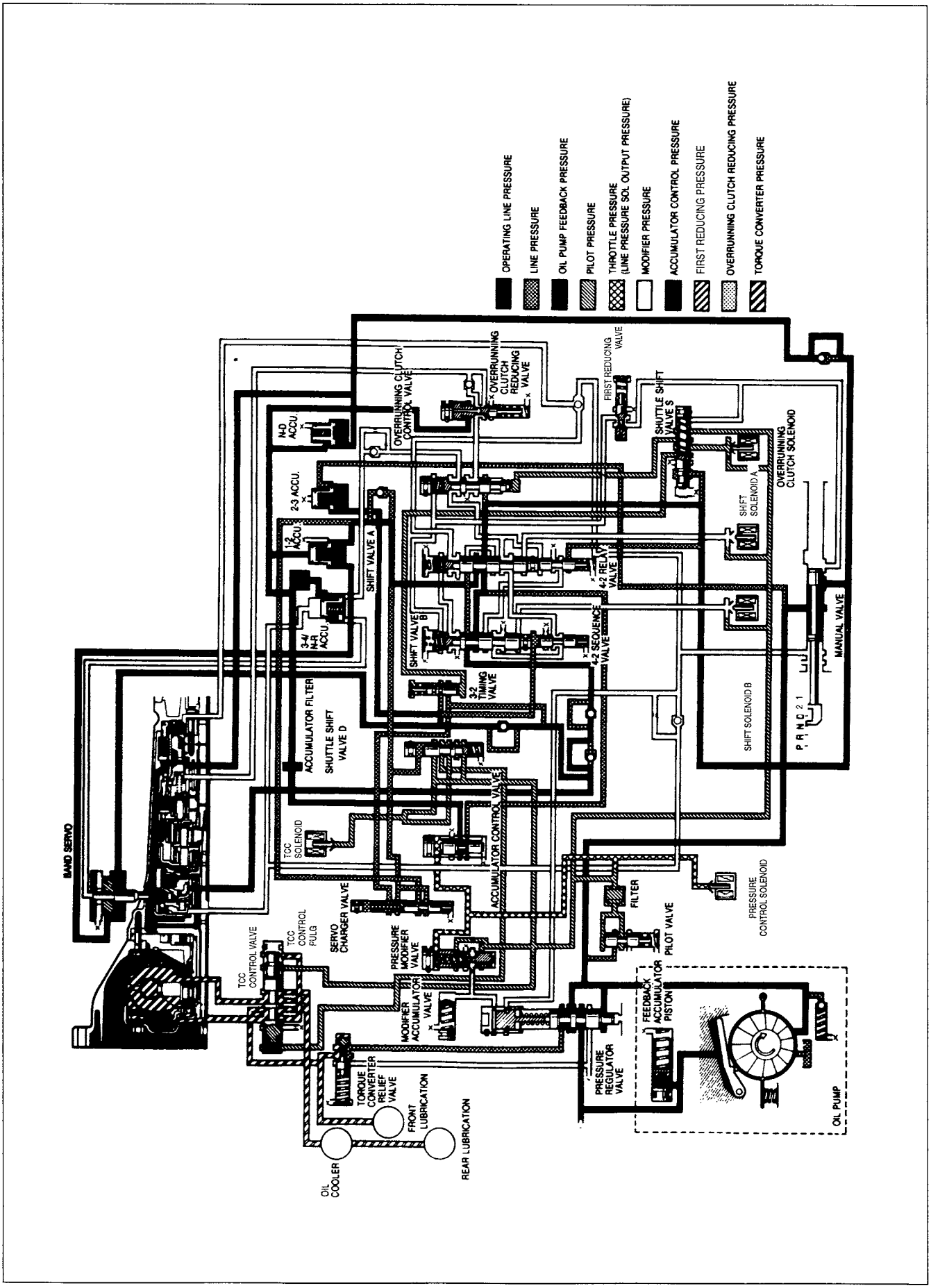
D RANGE; FIRST GEAR



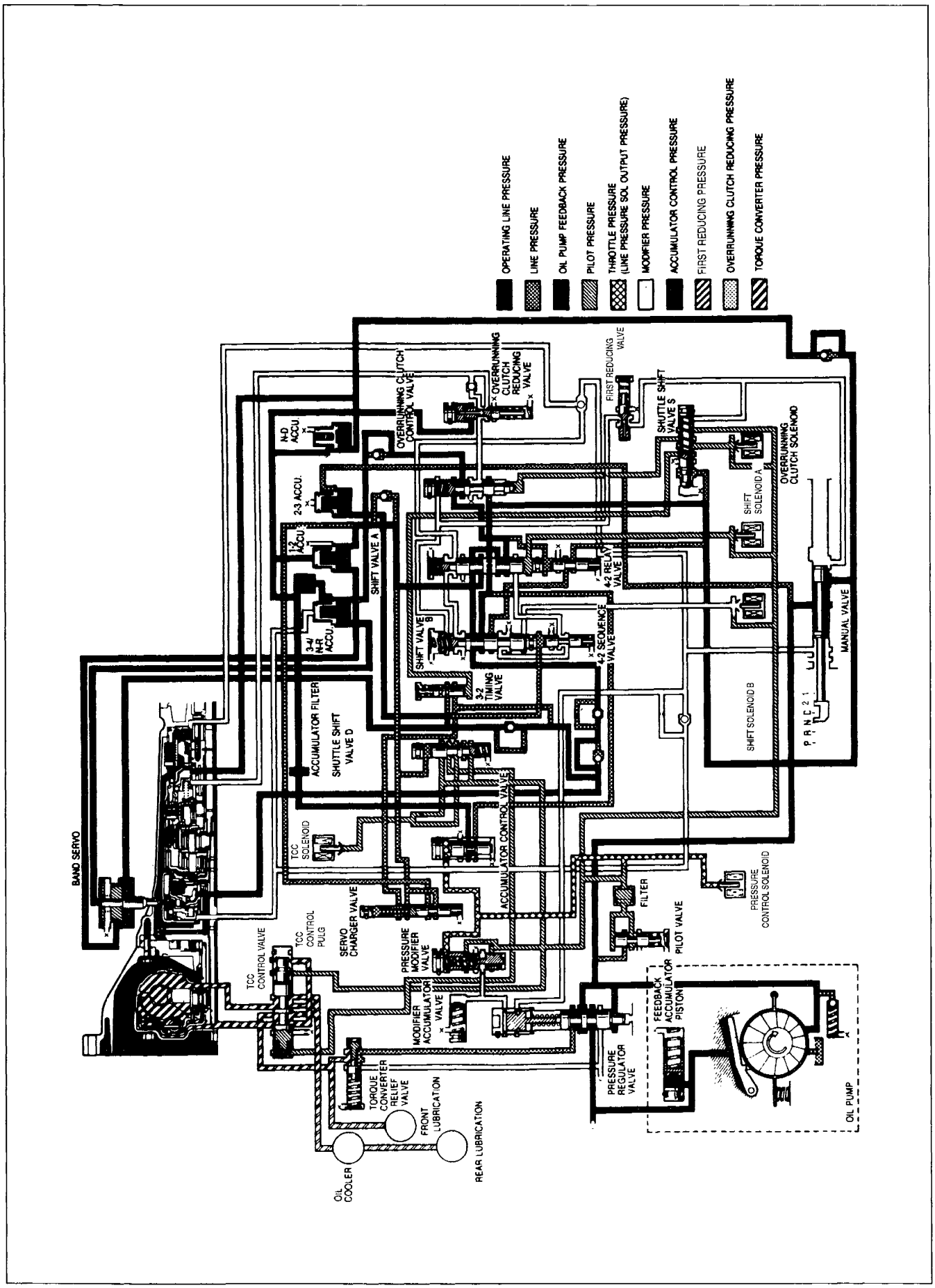
D RANGE; SECOND GEAR



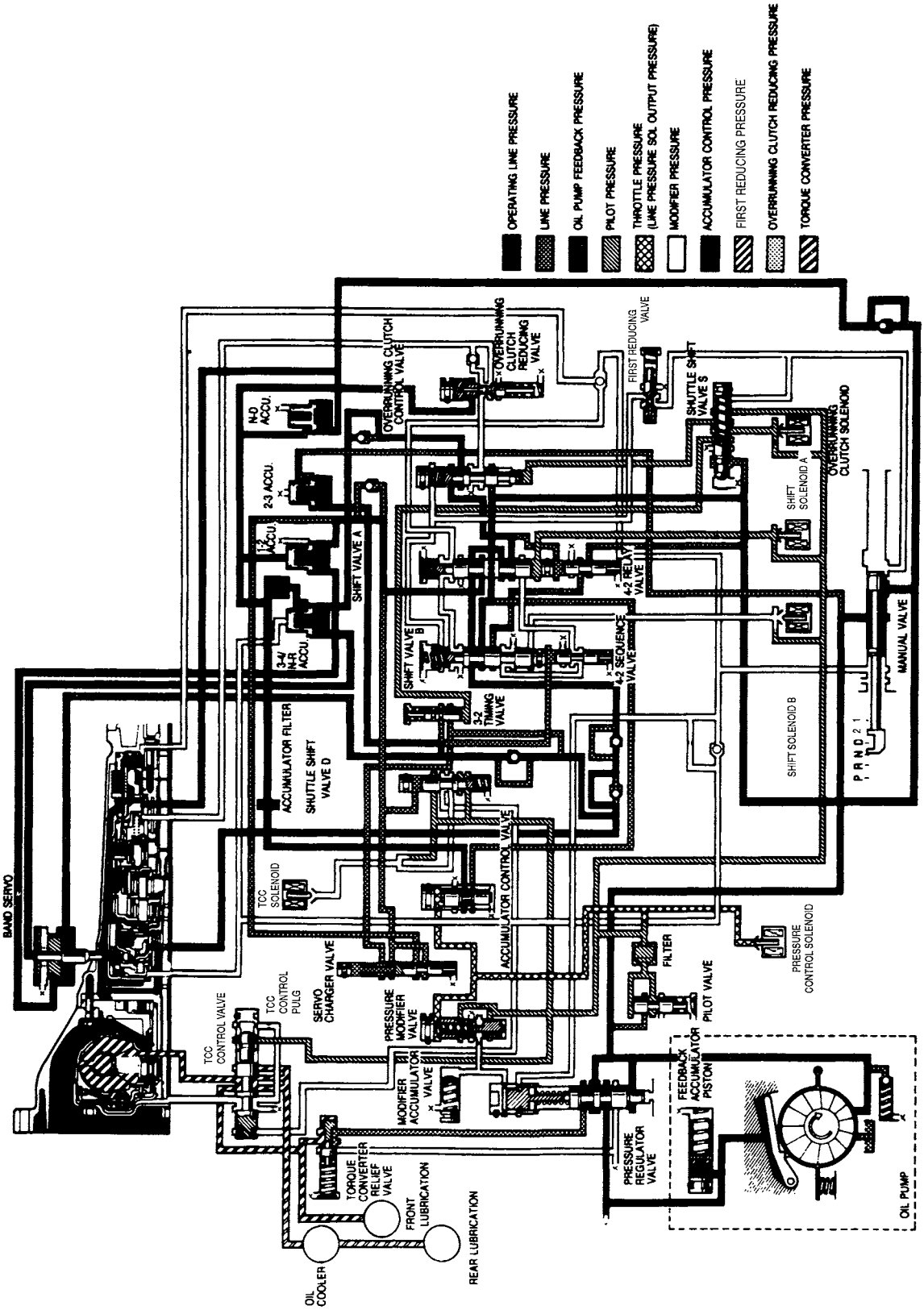
D RANGE; THIRD GEAR



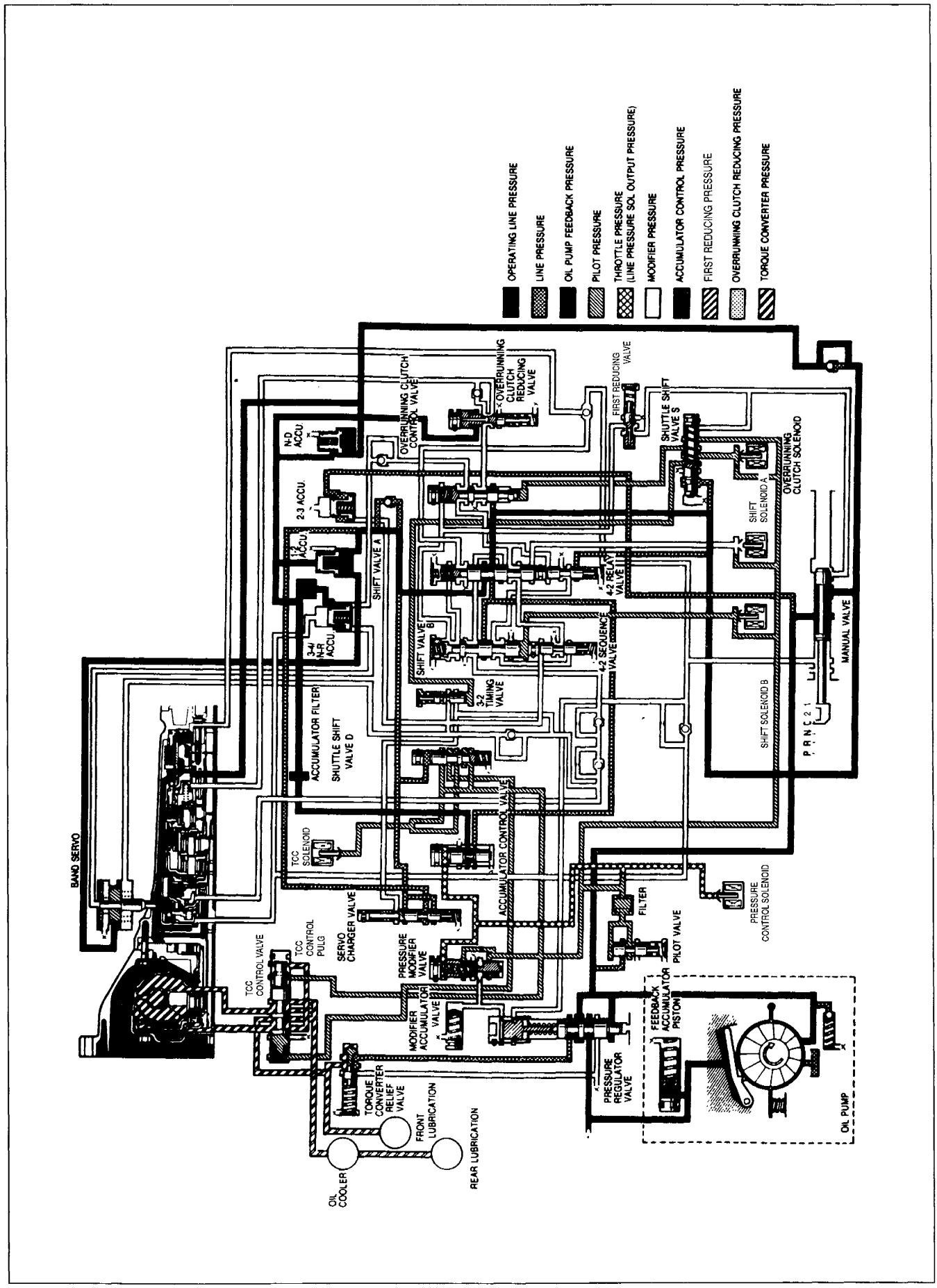
D RANGE; FOURTH GEAR, TORQUE CONVERTER CLUTCH OFF



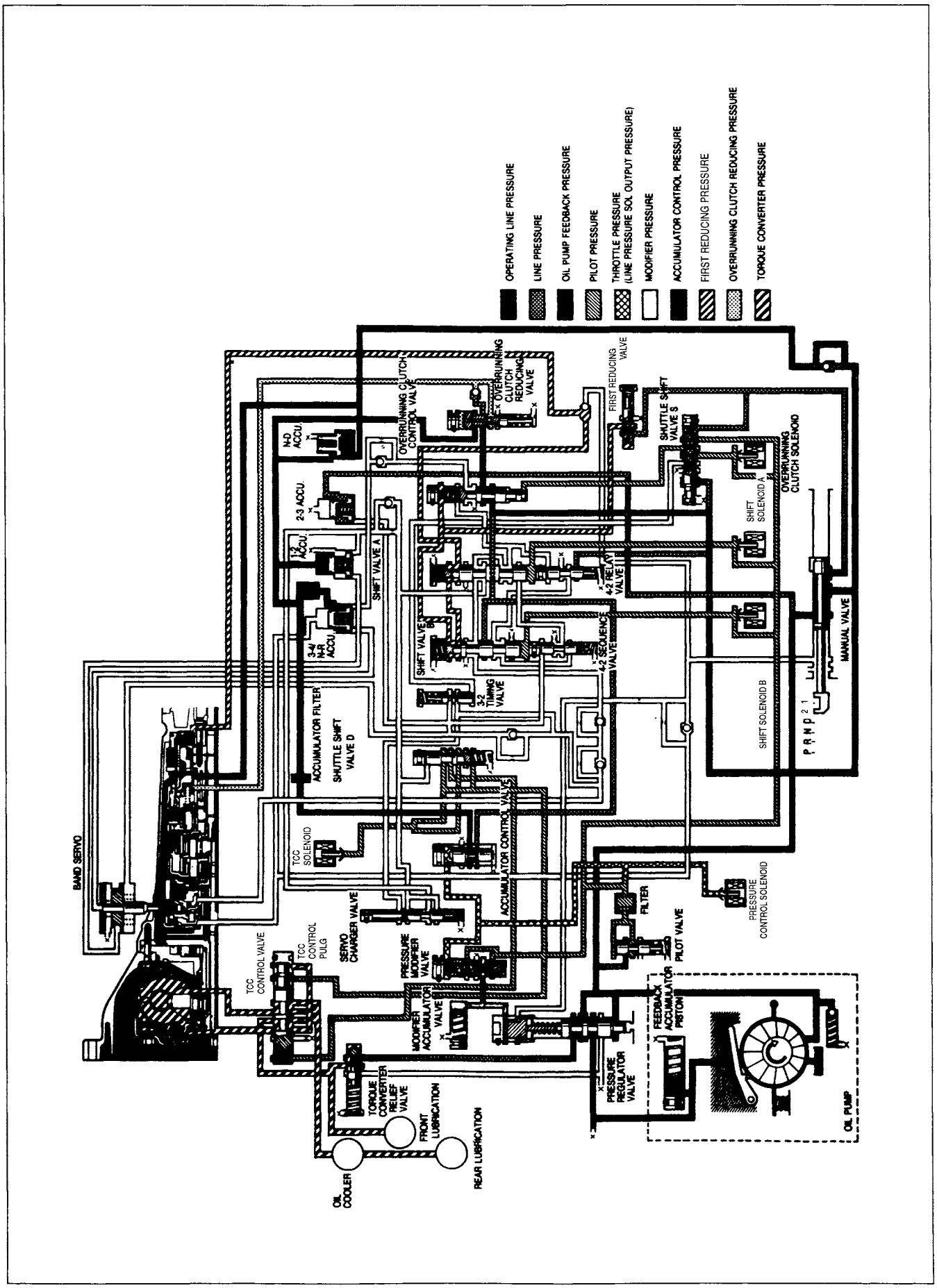
D RANGE; FOURTH GEAR, TORQUE CONVERTER CLUTCH ON



2 RANGE; SECOND GEAR



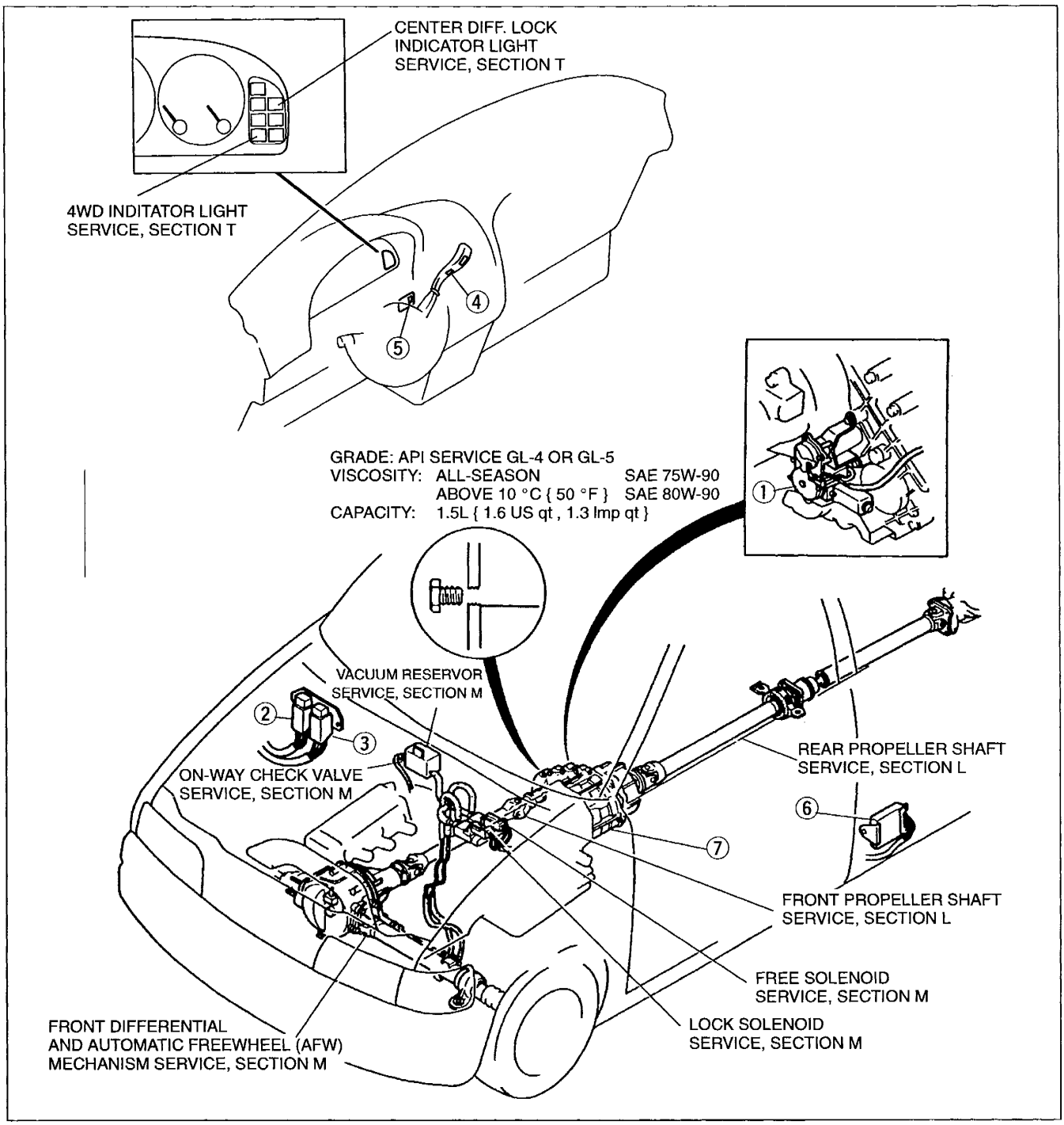
1 RANGE; FIRST GEAR



Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

AUTOMATIC TRANSMISSION (Transfer Case)

INDEX

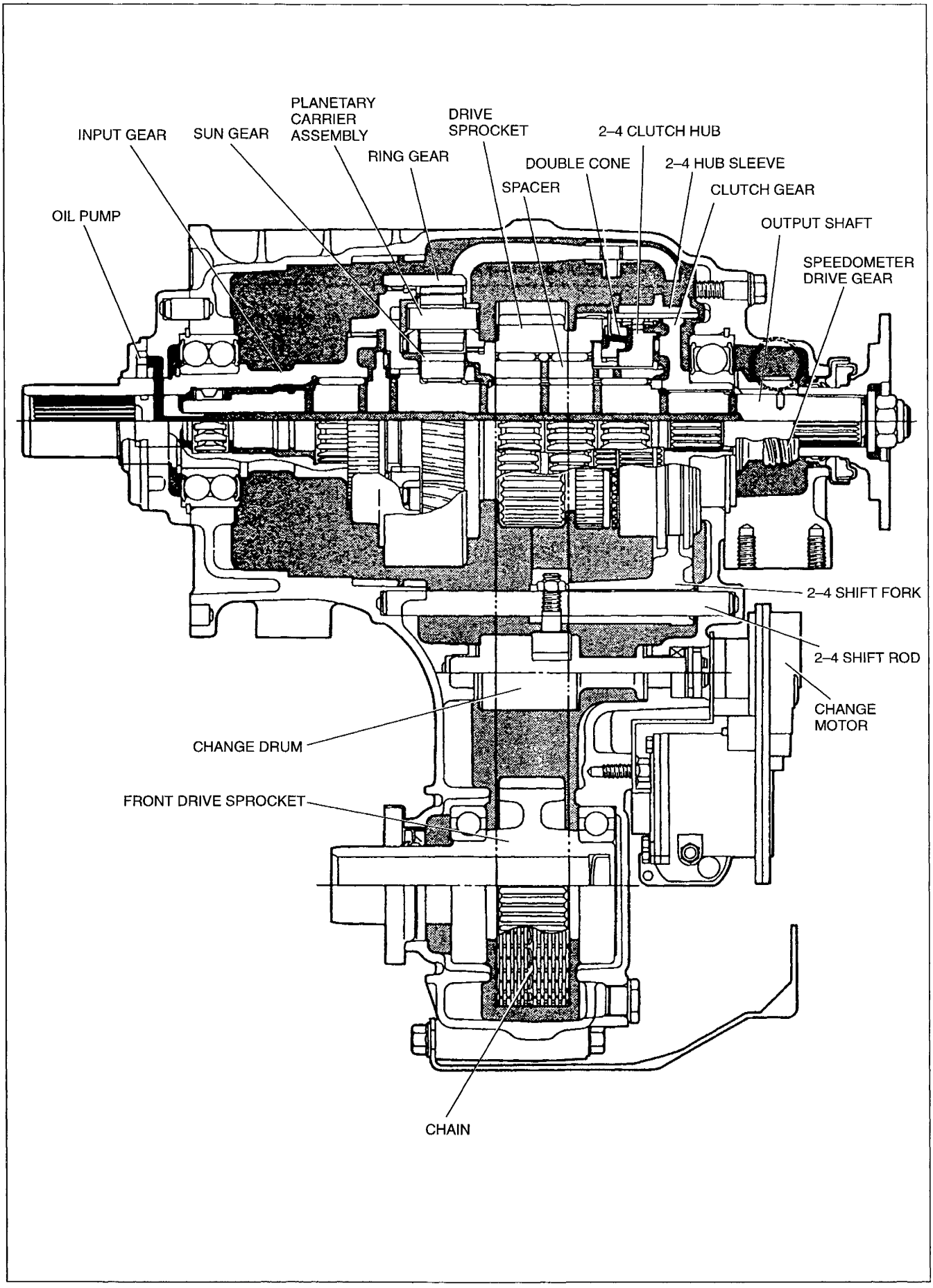


OUTLINE

SPECIFICATIONS

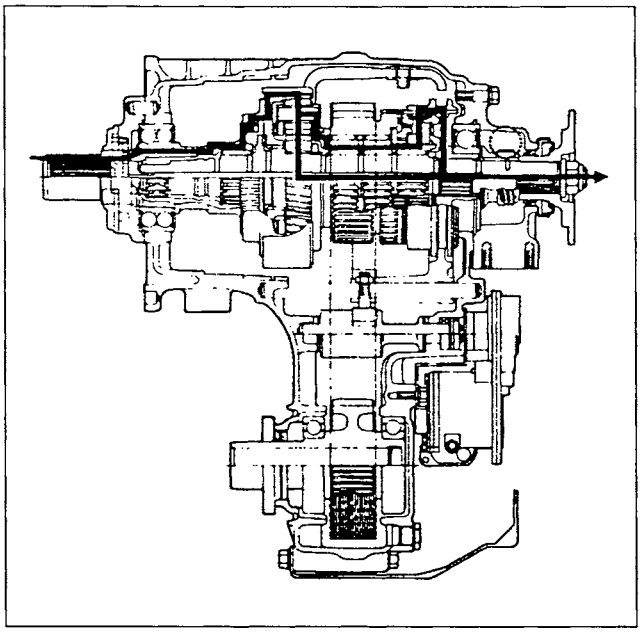
Item \ Transmission			RA4AX-EL
Mesh system			Double cone synchromesh
Gear ratio			1.000
Oil	Grade		API service GL-4 or GL-5
	Viscosity	All-season	SAE 75W–90
		Above 10 °C { 50 °F }	SAE 80W–90
	Capacity	L { US qt , Imp qt }	1.5 { 1.6 , 1.3 }

CROSS-SECTIONAL VIEW

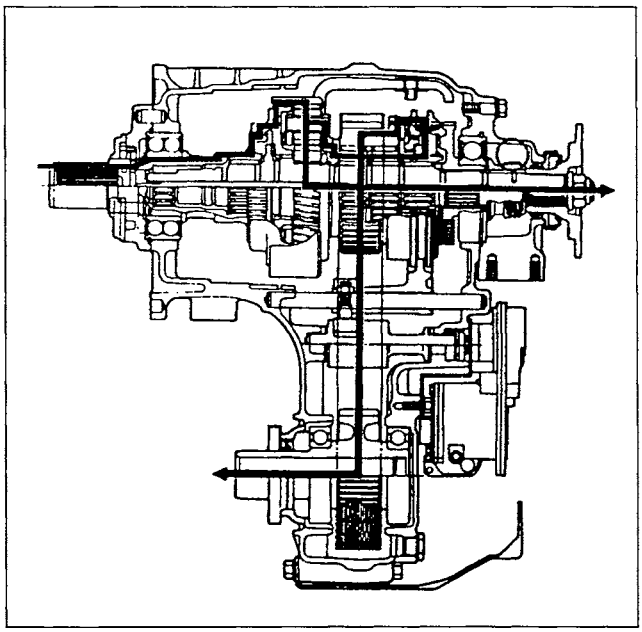


POWERFLOW

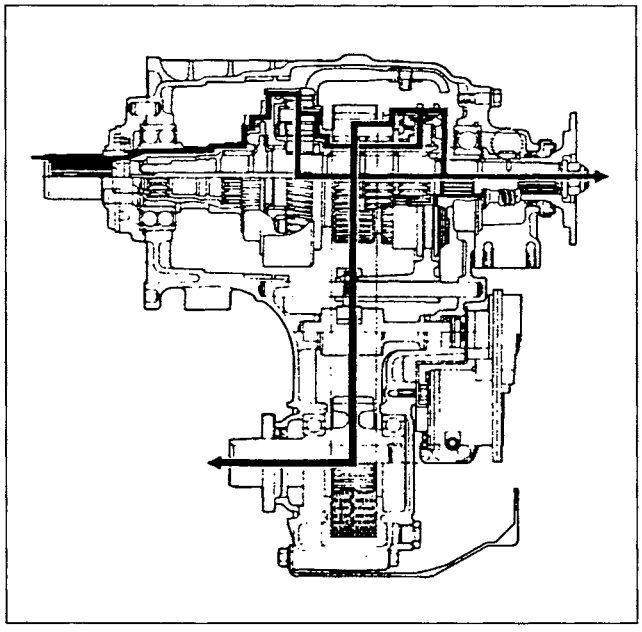
2WD



4WD (Free) [Center differential free]



4WD (Locked) [Center differential lock]

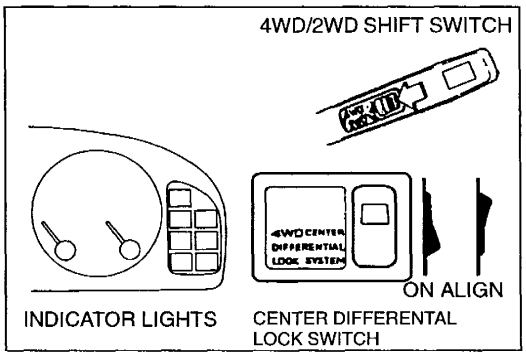


TROUBLESHOOTING

GENERAL NOTES

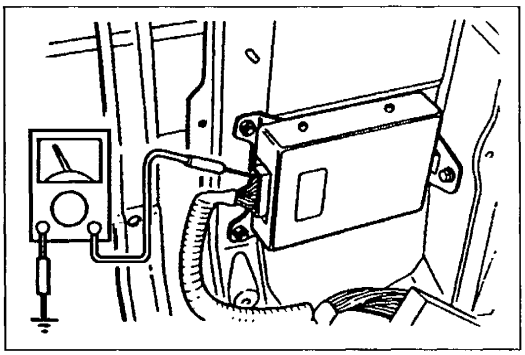
A problem with the transfer case may be caused by the engine, the driving conditions, the transfer case itself, or the electrical control system.

When troubleshooting, therefore, begin with the points that can be inspected quickly and easily. The recommended troubleshooting sequence is described below.



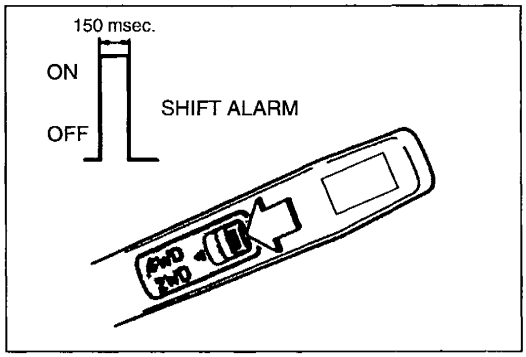
Step 1: On-board Diagnostic System Inspection

Check the warning alarm for operation. When the ignition switch is turned to OFF, the warning alarm is canceled because there is no memory in the 4WD control module. When the ignition switch is turned to ON, the warning alarm will reappear only if the problem still exists. (Refer to page K2–8.)



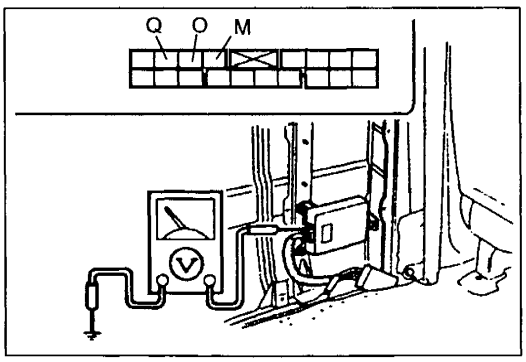
Step 2: Electrical Signal Inspection

Check the signals to/from the 4WD control module. (Refer to pages K2–8, 26.)



Step 3: System Operation Inspection

Check the operation of the Multi-Mode 4WD system. (Refer to page K2–9.)



Step 4: Symptom Troubleshooting

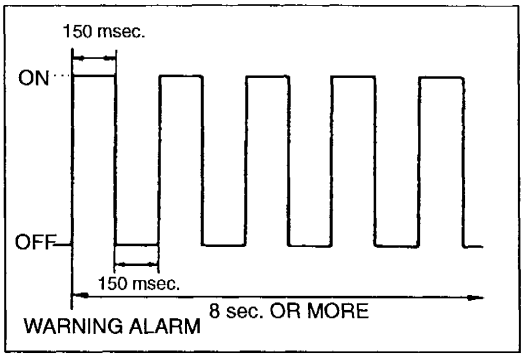
Check the Multi-Mode 4WD system for malfunctions. (Refer to page K2–13.)

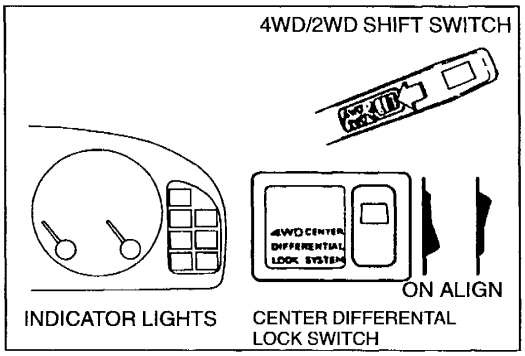
QUICK DIAGNOSIS CHART

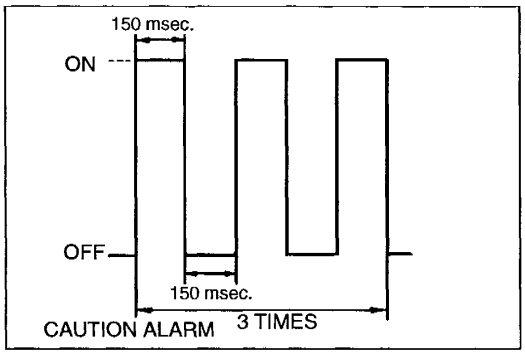
The quick diagnosis chart shows problems and the components that may be the cause.

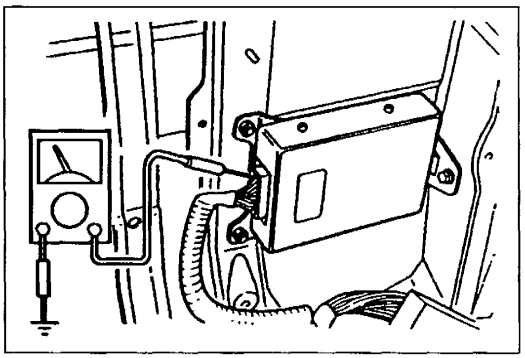
1. Problems indicated by "×" in the Exclusion column may be normal operation.
2. The numbers in the chart indicate the order of inspection for easy detection of malfunctions.

Problem		Possible cause	Exclusion								Pre-liminary					Electrical system								Transfer case unit																RFW unit			
			Stopping/Low speed (Less than 15 km/h { 9 mph })	Ascending hill/Accelerating (More than 1/4 throttle)	Turning (Up to 3/4 max. steering wheel turn; Less than full circle)	Turning (Up to 3/4 max. steering wheel turn; More than full circle)	Extremely low temperature (Less than −15 °C { 5 °F })	Spinning rear wheel	Spinning front wheel		section G	K2–29	section M	section Q	K2–29	K2–25	K2–25	K2–22	K2–26	K2–25	K2–26	section T	section M	section M	K2–34, 50, 51	K2–34	K2–34	K2–56	K2–56	K2–56	K2–56	K2–56	K2–56	K2–34	K2–56	K2–56	K2–34, 56	K2–34	K2–34	section M	section M	section M	section M
											Battery voltage	Connector connection	Vacuum hose connection	Tire inflation pressure	Transfer case oil	4WD relay (Change motor relay No.	4WD relay (Change motor relay No.	Change motor	4WD control module	4WD/2WD shift switch	Center differential lock switch	Indicator lamps	AFW switch	Solenoids	Oil seals	Change drum	Thrust washer	Cam roller	2–4 shift rod	2–4 shift fork	2–4 hub sleeve	Double cone	Key springs	Clutch gear	2–4 clutch hub	Drive sprocket	Bearings	Oil strainer	Oil pump	Actuator	Control box connection	Shift fork	Hub sleeve
2WD → 4WD (Free)	2WD → 4WD (Locked)	No shift									3	1	2			6		5	7	4			9	8		12	16	15	13	14	17	18		20	19					10	11		
		Excessive time lag	×	×			×				3		1		2	5		4												8	9								6	7	10	11
		Abnormal noise						×			2				1	4		3												6	5	7										
		No illumination of 4WD indicator light										1							4	3		2																				
	4WD (Locked)→ 4WD (Free)	No shift									2	1				4		3	5						12	6	9	8			7			10	11								
		Excessive time lag	×	×	×	×	×				1					3		2							12	4	9	8	6	7	5			10	11								
		Excessive shift shock		×	×	×								1		3		2	4																								
		Abnormal noise													1	3		2	4							5				6	7	8		9	10	11	12	14	13				
4WD (Free)→ 2WD	4WD (Free)→ 4WD (Locked)	No shift									2	1					5	4	6	3																						
		Excessive time lag	×	×							1						3	2	4						13	5	10	9	7	8	6			11	12								
		Abnormal noise						×	×								3	2	4												1												
		No cancelation of 4WD indicator light										1							3	2																							
	4WD (Locked)→ 2WD	No shift									2	1					4	3	5							6				7												
		Excessive time lag	×	×	×	×	×				1						3	2								4				5												
		Excessive shift shock		×	×	×								1			3	2	4											5												
		Abnormal noise													1																											
4WD (Free)→ 4WD (Locked)		No shift										1					4	3	5		2																				
		Excessive time lag	×	×							1						3	2	4						13	5	10	9	7	8	6			11	12								
		Abnormal noise						×	×																																	
		No illumination of CENTER DIFF. LOCK indicator light										1							4		3	2																				
4WD (Locked)→ 4WD (Free)		No shift									2	1				5		4	6		3																				
		Excessive time lag	×	×	×	×	×				1					3		2								4				5												
		Excessive shift shock			×	×								1		3		2	4																							
		No cancelation of CENTER DIFF. LOCK indicator light										1							3		2																						
		Abnormal noise													1																											
2WD → 4WD (Locked)		No shift									3	1	2			6		5	7		4		9	8		12	16	15	13	14	17	18		20	19					10	11		
		Excessive time lag	×	×			×				3		1		2	5		4												8	9								6	7	10	11
		Abnormal noise						×			2				1	4		3												6	5	7										
		No illumination of 4WD and CENTER DIFF. LOCK indicator light										1							4		3	2																				









ON-BOARD DIAGNOSTIC SYSTEM INSPECTION

FAIL MODE FUNCTION

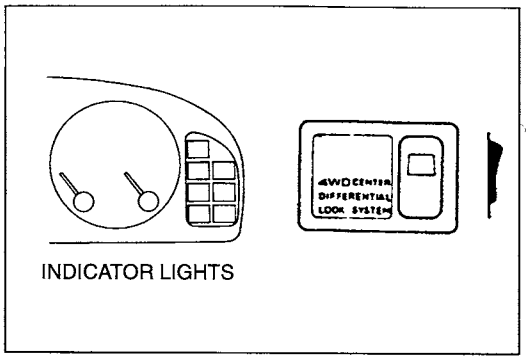
The warning alarm will sound if a malfunction is found in the change motor or electrical circuit. While in the fail mode, the warning alarm will sound whenever the 4WD/2WD shift switch or differential lock switch is activated. The fail mode function is canceled when the ignition switch is turned to OFF. If a malfunction occurs in either of the position switches while the change motor is running, the 4WD control module sets the mode to 2WD. If a malfunction occurs in either of the limit switches while shifting, the 4WD control module sets the motor step position.

CAUTION MODE FUNCTION

The caution alarm will sound as shown if the 4WD/2WD switch is activated while driving in 4WD (Locked) mode. The proper sequence is to first turn off the center differential lock switch to set 4WD (Free) mode; then activate the 4WD/2WD shift switch to set 2WD mode.

ELECTRICAL SIGNAL INSPECTION

Check the electrical signals to/from the 4WD control module. (Refer to page K2–26.)



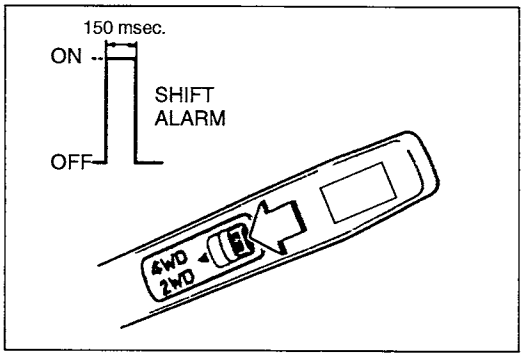
INDICATOR LIGHTS

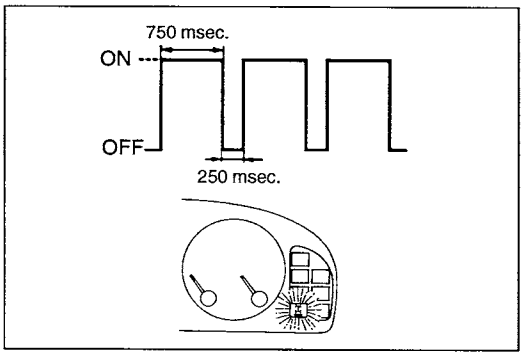
SYSTEM OPERATION INSPECTION

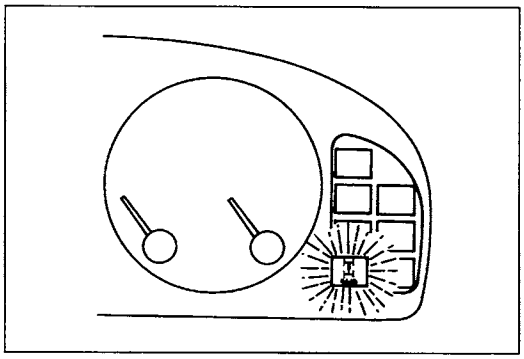
For each of the inspections, do the following:
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Shift the transmission to N position.
3. Start the engine and let it idle. Turn it off when indicated.

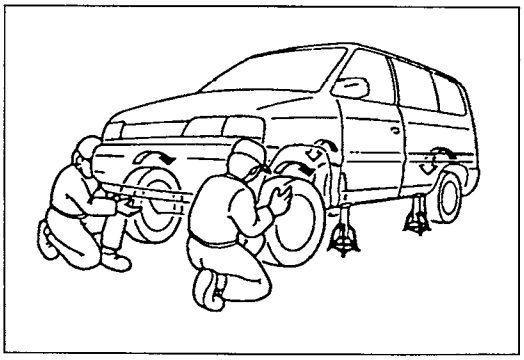
2WD TO 4WD (FREE) MODE SHIFT

Turn the center differential lock switch to the OFF position. Verify that the CENTER DIFF. LOCK indicator light is OFF, and that the 4WD indicator light is OFF.









Activate 4WD/2WD shift switch

Does shift alarm sound as shown? — NO → Check 4WD/2WD shift switch (Refer to page K2–25)

YES

Does 4WD indicator light flash as shown? — NO → Check 4WD indicator light (Refer to section T)

YES

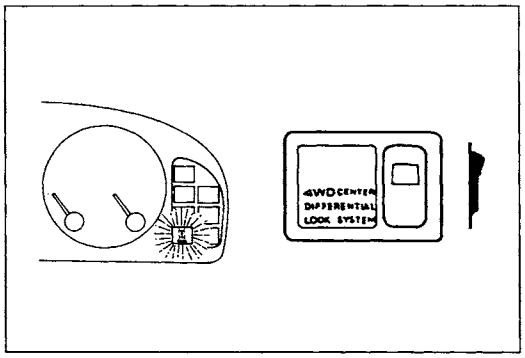
Does 4WD indicator light illuminate? — YES → Vehicle in 4WD (Free) mode Selection is complete OR Vehicle still in 4WD (Locked) mode

NO

4WD (Locked)

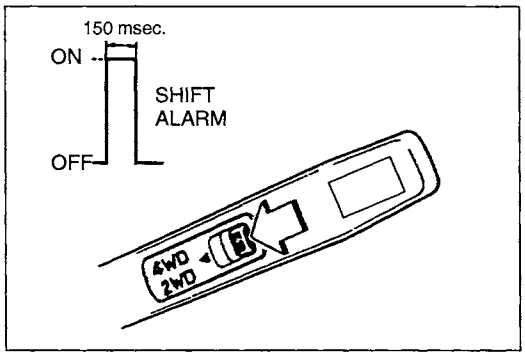
Turn engine OFF
Turn front tires clockwise
Do rear tires rotate counterclockwise? — YES → Check AFW switch (Refer to section M)

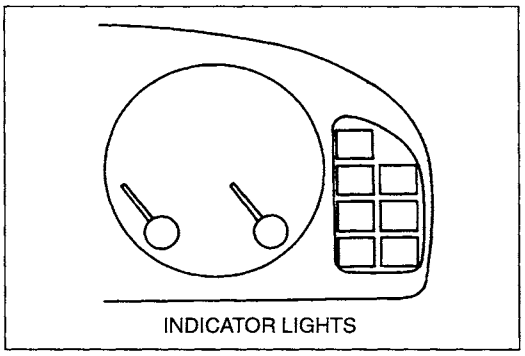
NO → Check lock solenoid, actuator, change motor, 4WD relay (change motor relay No.1), and 4WD control module (Refer to section M, page K2–22, 25, 26)



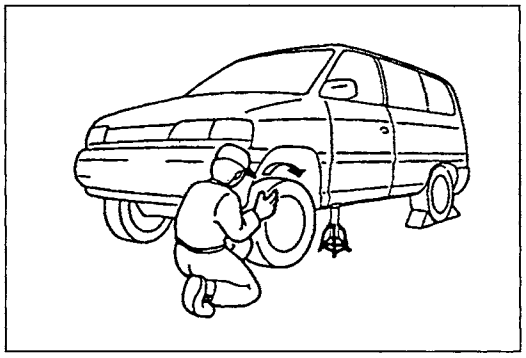
4WD (FREE) TO 2WD MODE SHIFT

Turn the center differential lock switch to the OFF position. Verify that the CENTER DIFF. LOCK indicator light is OFF, and that the 4WD indicator light is ON.





INDICATOR LIGHTS



Activate 4WD/2WD shift switch

↓

Does shift alarm sound as shown? — NO → Check 4WD/2WD shift switch (Refer to page K2–25)

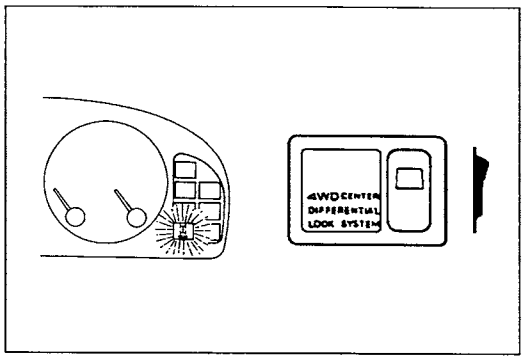
↓ YES

Does 4WD indicator light flash as shown? — NO → Check 4WD indicator light (Refer to section T)

↓ YES

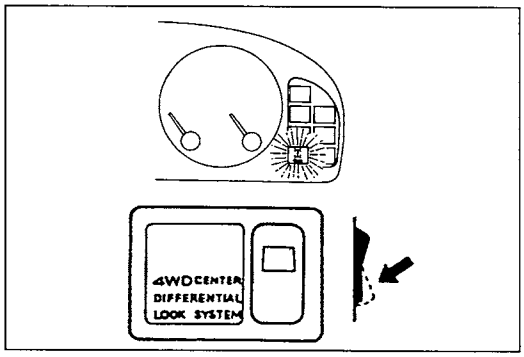
Turn engine OFF
Jack up front of vehicle and turn driver side tire clockwise
Does passenger side tire rotate?

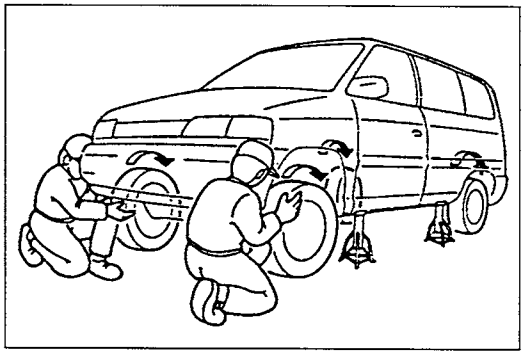
- NO → Vehicle in 2WD mode Selection completed
- YES → Check free solenoid, actuator, change motor, 4WD relay (change motor relay No.2), and 4WD control module (Refer to section M, page K2–22, 25, 26)



4WD (FREE) TO 4WD (LOCKED) MODE SHIFT

Turn the center differential lock switch to the OFF position. Verify that the CENTER DIFF. LOCK indicator light is OFF, and that the 4WD indicator light is ON.





Turn the center differential lock switch to ON

Does CENTER DIFF. LOCK indicator light come ON?

NO → Check center differential lock switch and indicator light (Refer to page K2–26, section T)

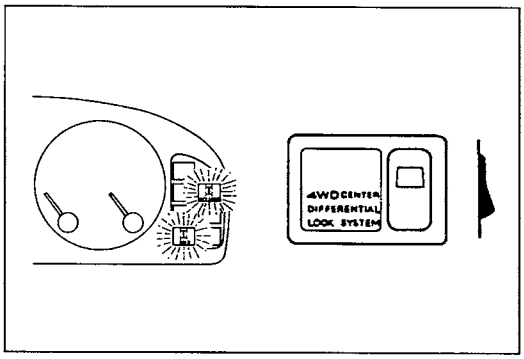
YES

OK

Turn engine OFF
Turn front tires clockwise
Do rear tires rotate clockwise?

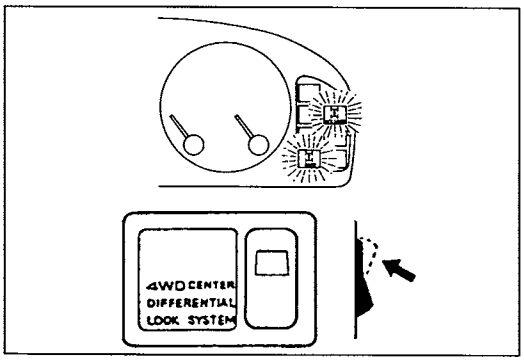
YES → Vehicle in 4WD (Locked) mode
Selection completed

NO → Check actuator, change motor, 4WD relay (change motor relay No.2), and 4WD control module
(Refer to section M, page K2–22, 25, 26)



4WD (LOCKED) TO 4WD (FREE) MODE SHIFT

Turn the center differential lock switch to the ON position. Verify that the CENTER DIFF. LOCK indicator light is ON, and that the 4WD indicator light is ON.



Turn the center differential lock switch to ON

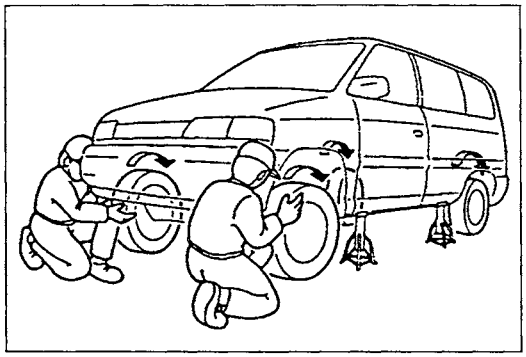
Does CENTER DIFF. LOCK indicator light go OFF?

NO → Check center differential lock switch and indicator light (Refer to page K2–26, section T)

YES

OK

Cont'd



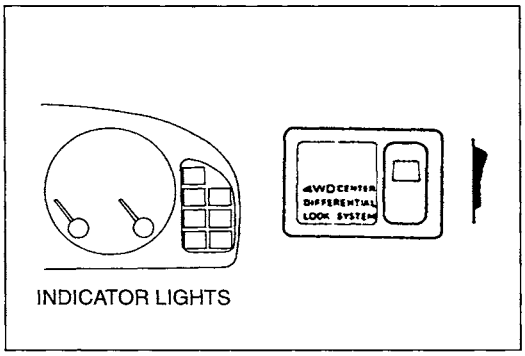
Cont'd

YES

Turn engine OFF
Turn front tires clockwise
Do rear tires rotate clockwise?

YES → Vehicle in 4WD (Free) mode
Selection completed

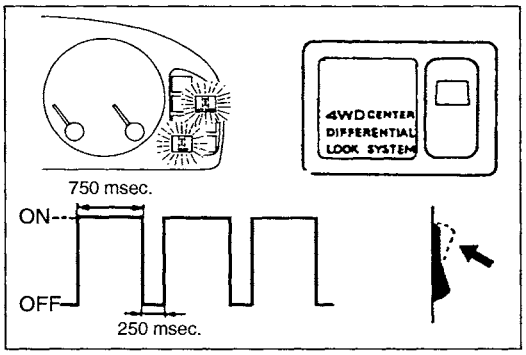
NO → Check actuator, change motor, 4WD relay (change motor relay No.1), and 4WD control module
(Refer to section M, page K2–22, 25, 26)



INDICATOR LIGHTS

2WD TO 4WD (LOCKED) MODE SHIFT

Turn the center differential lock switch to the OFF position. Verify that the CENTER DIFF. LOCK INDICATOR LIGHT is OFF, and that 4WD indicator light is OFF.

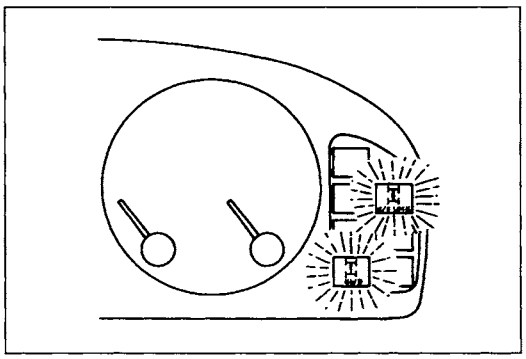


Activate center differential lock switch

Do 4WD and CENTER DIFF. LOCK indicator lights flash as shown?

NO → Check center differential lock switch and indicator light (Refer to page K2–26, section T)

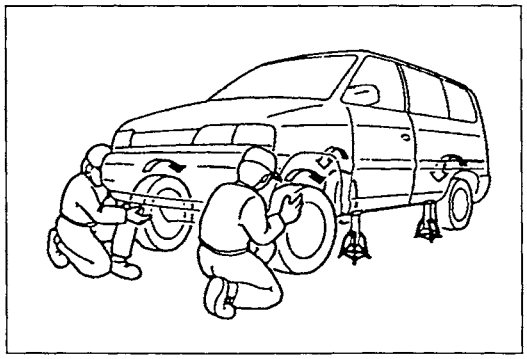
YES



Do 4WD and CENTER DIFF. LOCK indicator lights come ON?

YES → Vehicle in 4WD (Locked) mode
Selection completed

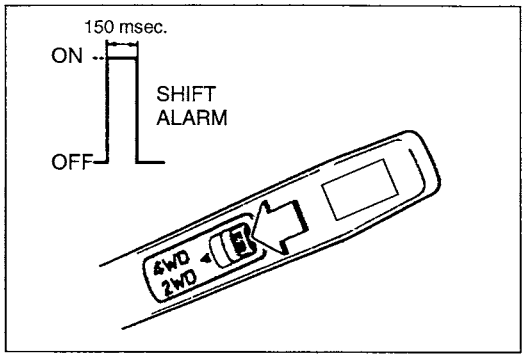
NO

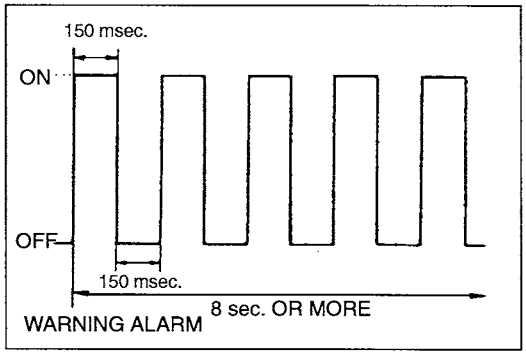


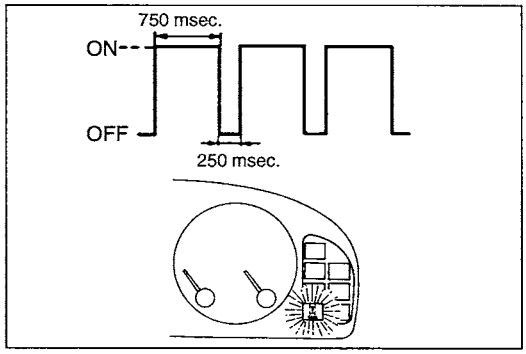
Turn engine OFF
Turn front tires clockwise
Do rear tires rotate clockwise?

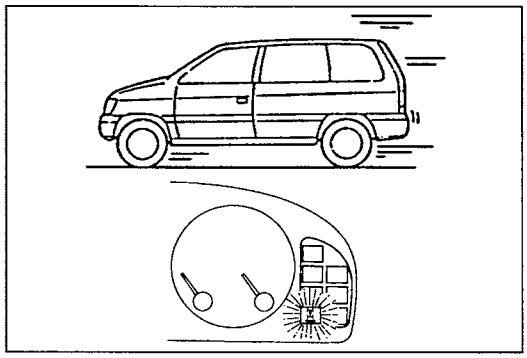
YES → Check RFW switch
(Refer to section M)

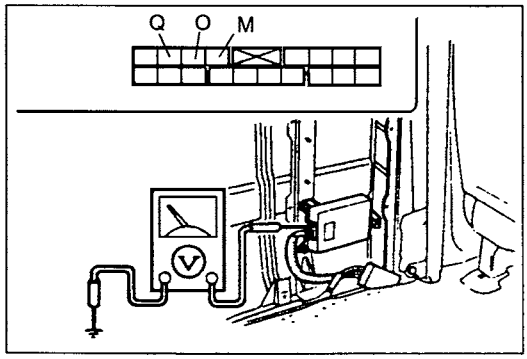
NO → Check free solenoid, actuator, change motor, 4WD relay (change motor relay No.1), and 4WD control module
(Refer to section M, page K2–22, 25, 26)











SYMPTOM TROUBLESHOOTING

Drive the vehicle when troubleshooting for any of the following problems.

NO SHIFT FROM 2WD TO 4WD (FREE) MODE

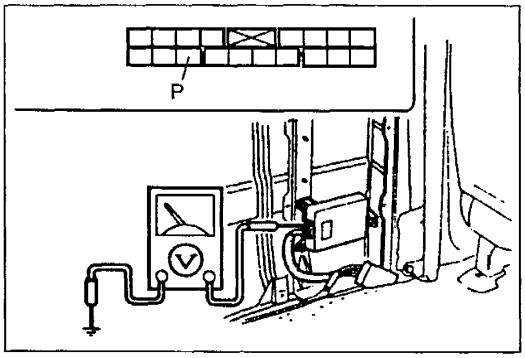
1. Are there any exclusion items?
   - NO → Retest
   - NO ↓
2. Does shift alarm sound when activating 4WD/2WD shift switch?
   - NO → Check wiring and connector from S terminal of 4WD control module to 4WD/2WD shift switch
     If OK, check 4WD/2WD shift switch and wiring (Refer to page K2–25)
   - YES ↓
3. Does warning alarm sound when activating 4WD/2WD shift switch?
   - YES → Check wiring and connector from F terminal of 4WD control module to 4WD relay (change motor relay No.1)
     - OK ↓ Check change motor, 4WD relay (change motor relay No.1) and wiring (Refer to pages K2–22, 25)
     - OK ↓ Check transfer case unit (Refer to page K2–30)
   - NO ↓
4. Does 4WD indicator light flash?
   - NO → Check 4WD indicator light and wiring (Refer to section T)
   - YES ↓
5. Does 4WD indicator light come ON after driving vehicle **approx. 0.5 km { 1/4 miles }**?
   - YES → Vehicle in 4WD (Free) mode Inspection completed
   - NO ↓
6. Check each wiring and connector below
   From M terminal of 4WD control module to position switch A
   From O terminal of 4WD control module to position switch B
   From Q terminal of 4WD control module to position switch C
   - OK ↓
7. Check change motor position by measuring 4WD control module terminal voltages

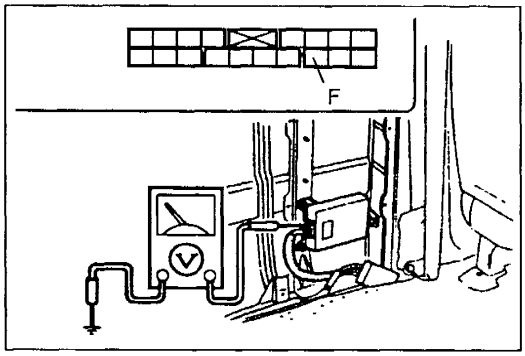
B+: Battery positive voltage

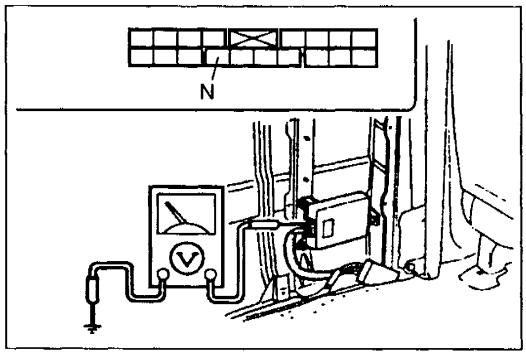
Terminal \ Position		2H	α	4HL	β	4HF
M and ground	(V)	B+	B+	0 V	0 V	0 V
O and ground	(V)	0 V	B+	B+	B+	0 V
Q and ground	(V)	0 V	0 V	0 V	B+	B+

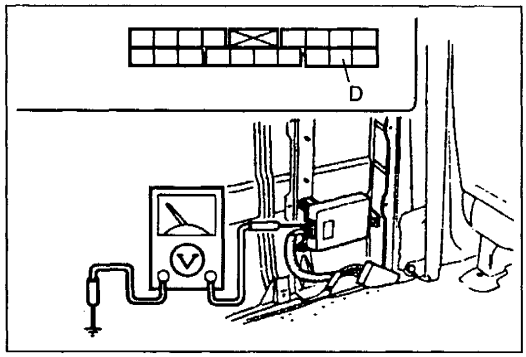
If position is 2H or α, go to step 8; if 4HL or β, go to step 10
If position is 4HF, replace change motor or 4WD control module

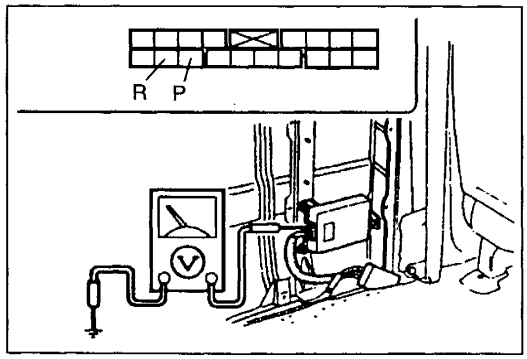
Cont'd











Cont'd

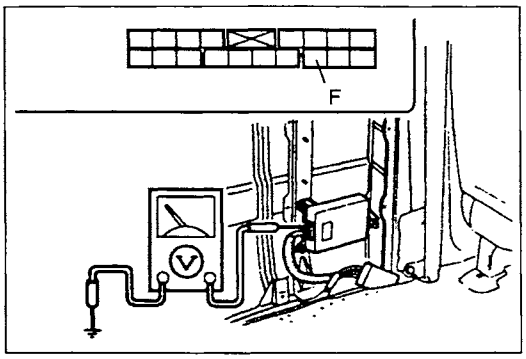
8. Is there 0 V at terminal P of 4WD control module?
- YES → Check wiring and connector from terminal P of 4WD control module to change motor
  - OK → Check change motor, 4WD relay (change motor relay No.1), and wiring (Refer to pages K2–22, 25)
    - OK → Check transfer case unit (Refer to page K2–30)
- NO

9. Is there battery voltage at terminal F of 4WD control module?
- NO → Replace 4WD control module
- YES → Check change motor, 4WD relay (change motor relay No.1), and wiring (Refer to pages K2–22, 25)
  - OK → Check transfer case unit (Refer to page K2–30)

10. Is there 0 V at terminal N of 4WD control module?
- NO
- YES

OK → 11. Is there 0 V at terminal D of 4WD control module?
- NO → Replace 4WD control module
- YES → Check wiring and connector from terminal D of 4WD control module to the lock solenoid (Refer to section M)
  - OK → Check lock solenoid (Refer to section M)
    - OK → Check AFW unit (Refer to section M)

12. Is there 0 V at terminals R and P of 4WD control module?
- YES → Check wiring and connector from terminals Q and P of 4WD control module to change motor
  - OK → Cont'd
- NO → 13. Check wiring and connector from terminal F of 4WD control module to 4WD relay (change motor relay No.1)
  - OK → Cont'd



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OK

14. Is there battery voltage at terminal F of 4WD control module?

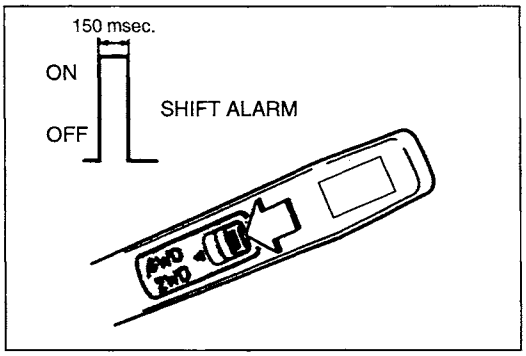
YES → Check change motor, 4WD relay (change motor relay No.1), and wiring (Refer to pages K2–22, 25)

NO → Replace 4WD control module

Cont'd

YES

OK → Check transfer case unit (Refer to page K2–30)



NO SHIFT FROM 4WD (FREE) TO 2WD MODE

1. Are there any exclusion items?
   - YES → Retest
   - NO ↓
2. Does shift alarm sound when activating 4WD/2WD shift switch?
   - NO → Check wiring and connector from terminal S of 4WD control module to 4WD/2WD shift switch
     If OK, check 4WD/2WD shift switch and wiring
     (Refer to page K2–25)
   - YES ↓
3. Does warning alarm sound when activating 4WD/2WD shift switch?
   - YES → Check wiring and connector from terminal C of 4WD control module to 4WD relay (change motor relay No.2)
     If OK, check change motor, 4WD relay (change motor relay No.2), and wiring
     (Refer to pages K2–22, 25)
   - NO ↓
4. Does 4WD indicator light go OFF?
   - NO → Check 4WD indicator light and wiring
     (Refer to section T)
   - YES ↓

Turn engine OFF

5. Jack up front of vehicle and turn driver side tire clockwise
   Does passenger side tire rotate?
   - NO → Vehicle in 2WD mode
     Inspection completed
   - YES ↓

6. Drive vehicle **approx. 0.5 km { 1/4 mile }** and recheck step 5
   - NO → Vehicle in 2WD mode
     Inspection completed
   - YES ↓

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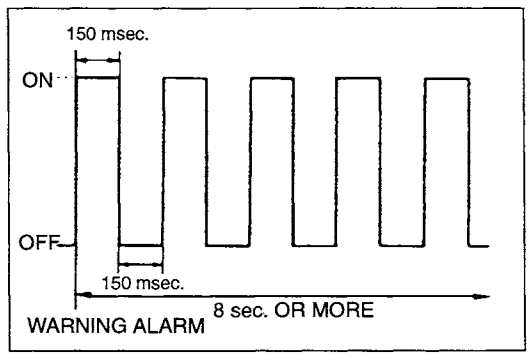
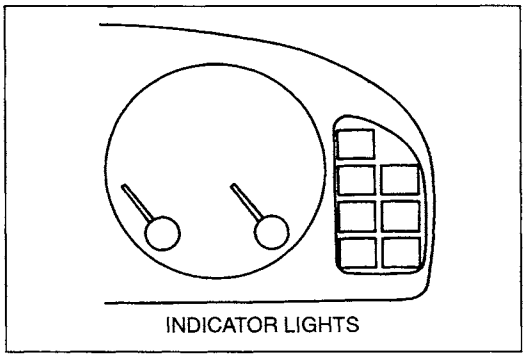
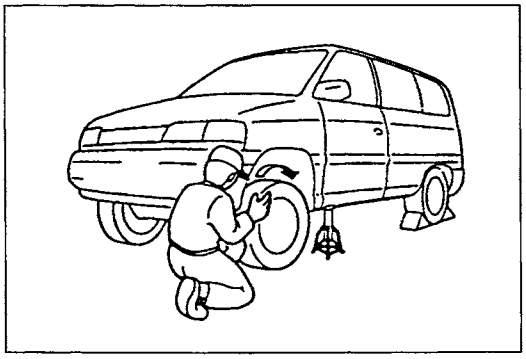
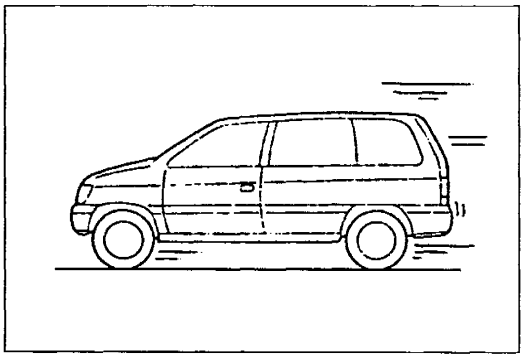
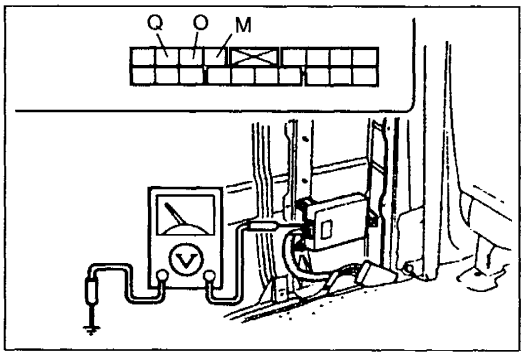
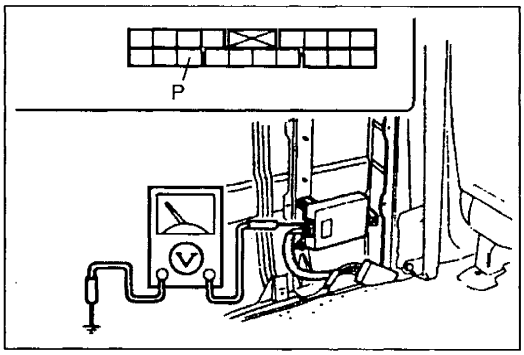


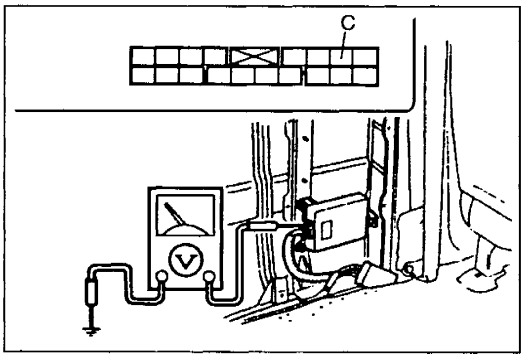


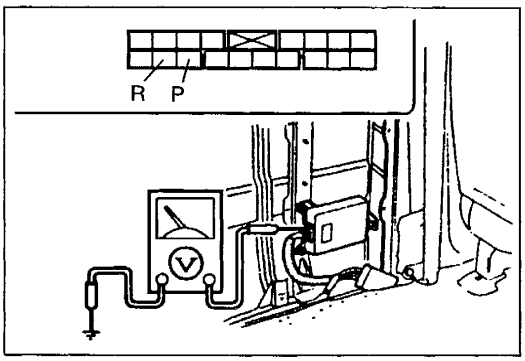












Cont'd

NO

7. Check each wiring and connector below
   From terminal M of 4WD control module to position switch A
   From terminal O of 4WD control module to position switch B
   From terminal Q of 4WD control module to position switch C

OK

8. Check change motor position by measuring 4WD control module terminal voltages

B+: Battery positive voltage

Terminal \ Position		2H	α	4HL	β	4HF
M and ground	(V)	B+	B+	0 V	0 V	0 V
O and ground	(V)	0 V	B+	B+	B+	0 V
Q and ground	(V)	0 V	0 V	0 V	B+	B+

If position is 4HF, go to step 9; if β, 4HL, or α, go to step 12; if 2H, go to step 15

9. Is there 0 V at terminal P of 4WD control module?

YES → Check wiring and connector from terminal P of 4WD control module to change motor

OK → Check change motor, 4WD relay (change motor relay No.2), and wiring (Refer to pages K2–22, 25)

NO → Check transfer case unit (Refer to page K2–32)

NO

10. Is there battery voltage at terminal C of 4WD control module?

NO → Replace 4WD control module

YES

11. Check wiring and connector from terminal C of 4WD control module to 4WD relay (change motor relay No.2)

OK → Check change motor, change motor relay No.2, and wiring (Refer to pages K2–22, 25)

OK → Check transfer case unit (Refer to page K2–30)

12. Is there 0 V at terminals R and P of 4WD control module?

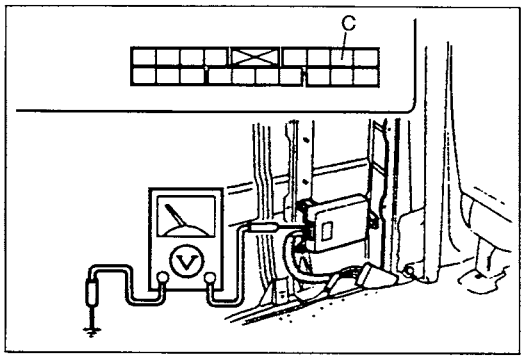
YES → Check wiring and connector from terminals R and P of 4WD control module to change motor

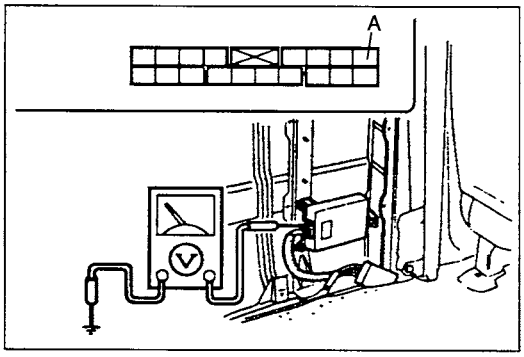
OK → Check change motor, change motor relay No.2, and wiring (Refer to pages K2–22, 25)

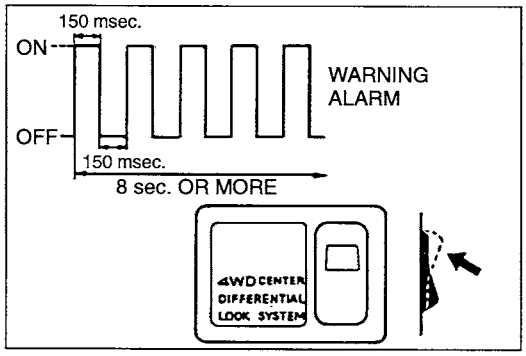
OK → Check transfer case unit (Refer to page K2–30)

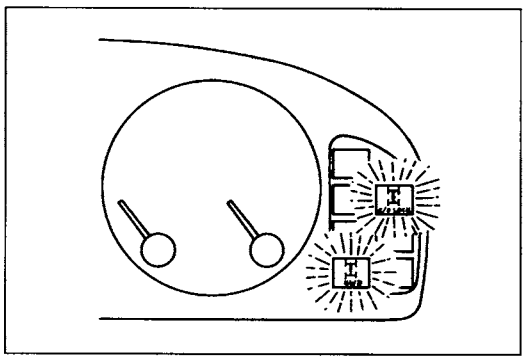
NO

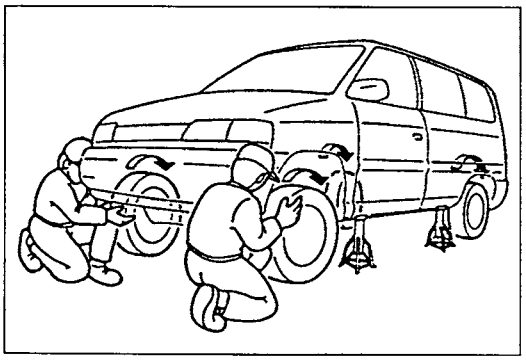
Cont'd











Cont'd

NO

13. Is there battery voltage at terminal C of 4WD control module? — NO → Replace 4WD control module

YES

14. Check wiring and connector from terminal C of 4WD control module to 4WD relay (change motor relay No.2) — OK → Check change motor, 4WD relay(change motor relay No.2), and wiring (Refer to pages K2–22, 25)

OK

Check transfer case unit (Refer to page K2–30)

15. Is there 0 V at terminal A of 4WD control module? — NO → Replace 4WD control module

YES

16. Check wiring and connector from terminal A of 4WD control module to free solenoid — OK → Check free solenoid and wiring (Refer to section M)

OK

Check AFW unit (Refer to section M)

NO SHIFT FROM 4WD (FREE) TO 4WD (LOCKED) MODE

1. Are there any exclusion items? — YES → Retest

NO

2. Does warning alarm sound when activating center differential lock switch? — YES → Check wiring and connector from terminals P and R to change motor

NO

3. Check wiring and connector from terminal T of 4WD control module to center differential

NO

Check change motor, 4WD relay (change motor relay No.2), and wiring (Refer to pages K2–22, 25)

OK

Check transfer case unit (Refer to page K2–30

OK

4. Does CENTER DIFF. LOCK indicator light come ON? — NO → Check CENTER DIFF. LOCK indicator light and wiring (Refer to section T)

YES

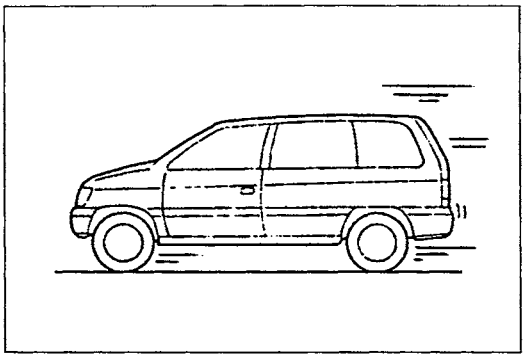
Turn engine OFF
5. Jack up vehicle and turn front tires clockwise
Do rear tires rotate clockwise? — YES → Vehicle in 4WD (Locked) mode Inspection completed

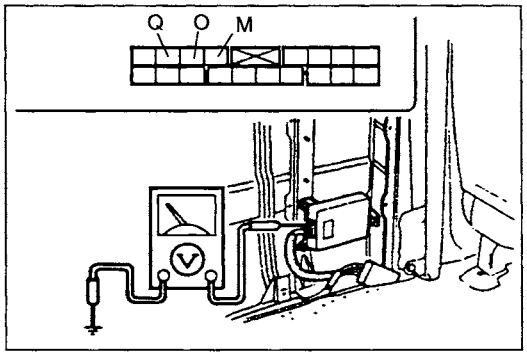
NO

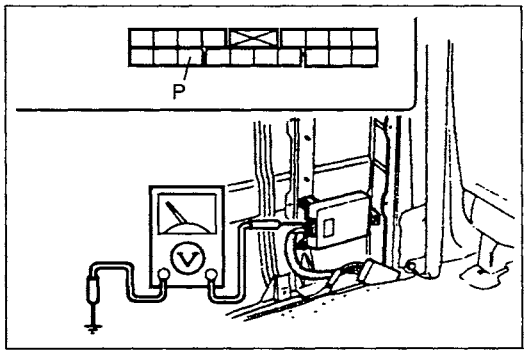
6. Drive vehicle **approx. 0.5 km { 1/4 miles }** and recheck step 5 — YES → Vehicle in 4WD (Locked) mode Inspection completed

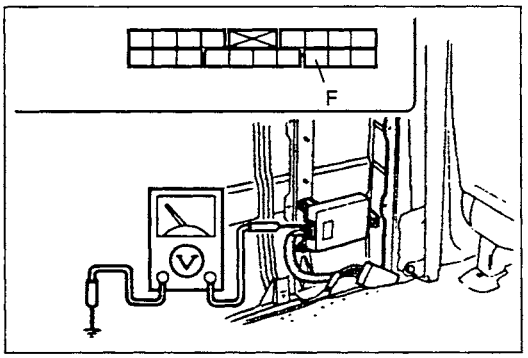
NO

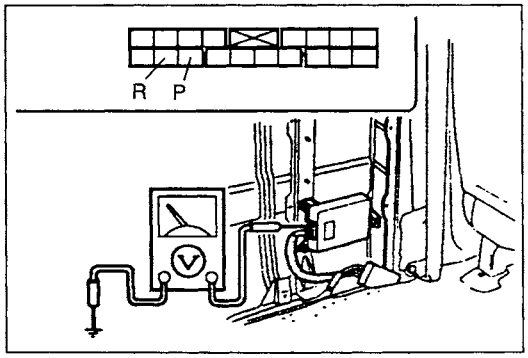
Cont'd











Cont'd

NO

7. Check each wiring and connector below
   From terminal M of 4WD control module to position switch A
   From terminal O of 4WD control module to position switch B
   From terminal Q of 4WD control module to position switch C

OK

8. Check change motor position by measuring 4WD control module terminal voltages

B+: Battery positive voltage

Terminal \ Position		2H	α	4HL	β	4HF
M and ground	(V)	B+	B+	0 V	0 V	0 V
O and ground	(V)	0 V	B+	B+	B+	0 V
Q and ground	(V)	0 V	0 V	0 V	B+	B+

If position is 4HF, go to step 9; if β, go to step 12
If position is 2H, α, or 4HL replace change motor or 4WD control module

9. Is there 0 V at terminal P of 4WD control module?

YES → Check wiring and connector from terminal P of 4WD control module to change motor

OK → Check change motor, 4WD relay (change motor relay No.2), and wiring (Refer to pages K2–22, 25)

NO → Check transfer case unit (Refer to page K2–30)

NO

10. Is there battery voltage at terminal F of 4WD control module?

NO → Replace 4WD control module

YES

11. Check wiring and connector from terminal F of 4WD control module to 4WD relay (change motor relay No.2)

OK → Check change motor, 4WD relay (change motor relay No.2), and wiring (Refer to pages K2–22, 25)

12. Is there 0 V at terminals R and P of 4WD control module?

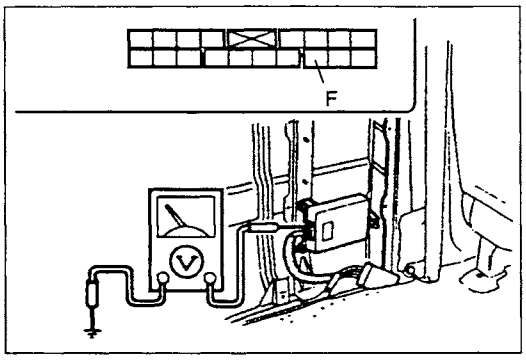
YES → Check wiring and connector from terminals R and P of 4WD control module to change motor

OK → Check change motor, 4WD relay (change motor relay No.2), and wiring (Refer to pages K2–22, 25)

NO

Cont'd

OK → Check transfer case unit (Refer to page K2–30)



Cont'd

NO

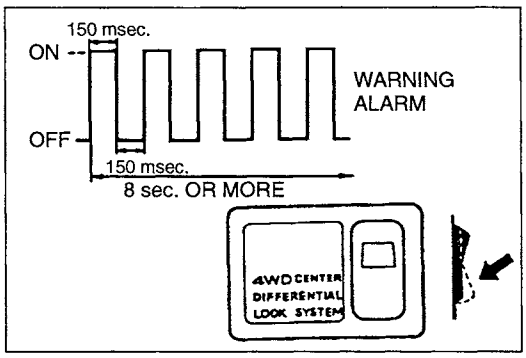
13. Is there battery voltage at terminal F of 4WD control module? — NO → Replace 4WD control module

YES

14. Check wiring and connector from terminal F of 4WD control module to 4WD relay (change motor No.1) — OK → Check change motor, 4WD relay (change motor relay No.2), and wiring (Refer to pages K2–22, 25)

OK

Check transfer case unit (Refer to page K2–30)



NO SHIFT FROM 4WD (LOCKED) TO 4WD (FREE) MODE

1. Are there any exclusion items? — YES → Retest

NO

2. Does warning alarm sound when activating center differential lock switch? — YES → Check wiring and connector from terminal F of 4WD control module to 4WD relay (change motor relay No.1)

NO

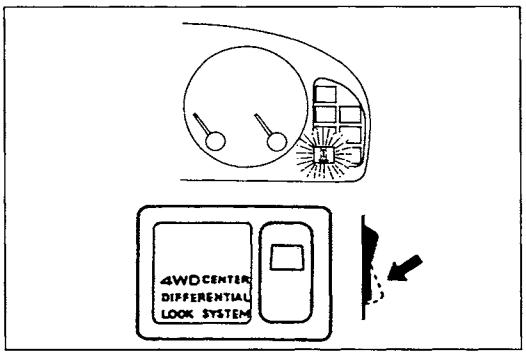
3. Check wiring and connector from terminal T of 4WD control module to center differential lock switch

OK

Check change motor, 4WD relay (change motor relay No.1), and wiring (Refer to pages K2–22, 25)

OK

Check transfer case unit (Refer to page K2–30)



OK

4. Does CENTER DIFF. LOCK indicator go OFF when center differential lock switch turned OFF? — NO → Check center differential lock switch, CENTER DIFF. LOCK indicator light, and wiring (Refer to page K2–25, section T)

YES

Turn engine OFF

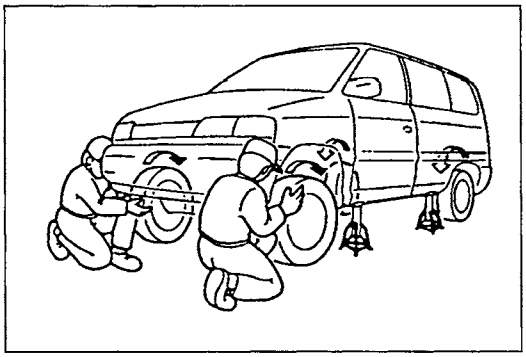
5. Jack up vehicle and turn front tires clockwise Do rear tires rotate counterclockwise? — YES → Vehicle in 4WD (Free) mode Inspection completed

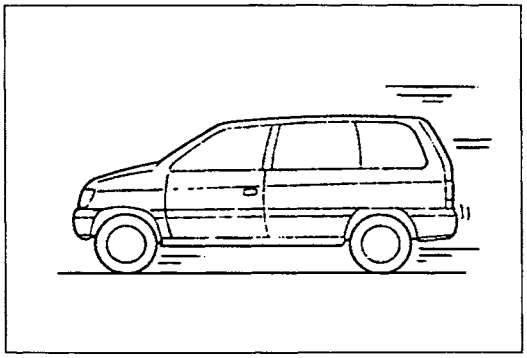
NO

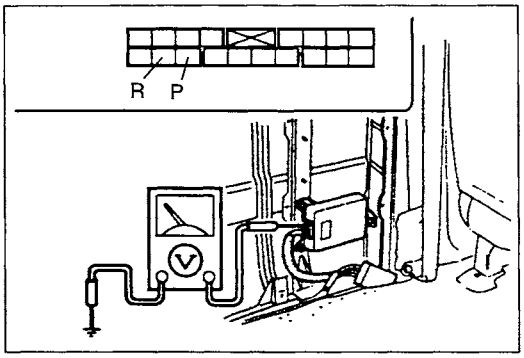
6. Drive vehicle **approx. 0.5 km { 1/4 miles }** and recheck step 5 — YES

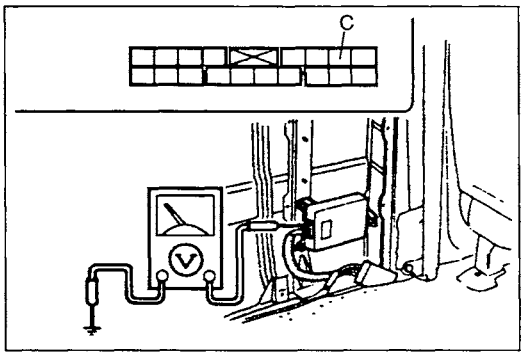
NO

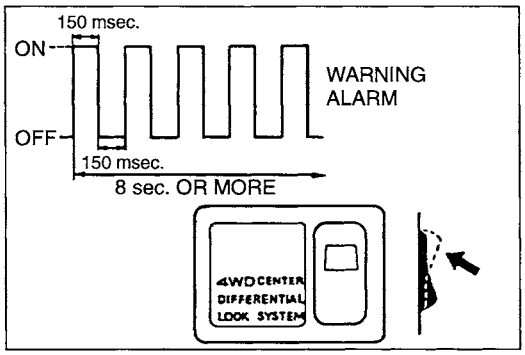
Cont'd

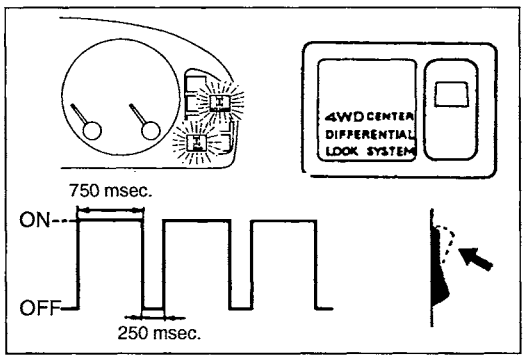


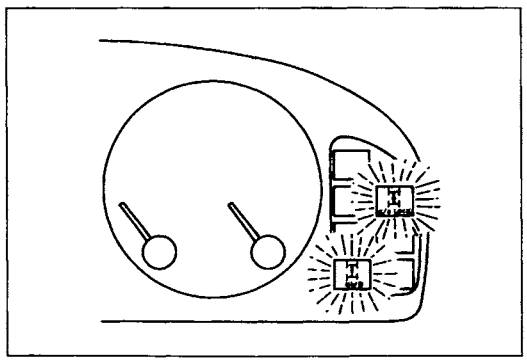












Cont'd

NO

7. Is there 0 V at terminals R and P of 4WD control module?
- NO → Check wiring and connector from terminals R and P of 4WD control module to change motor
- OK → Check change motor, 4WD relay (change motor relay No.1), and wiring (Refer to pages K2–22, 25)
- OK → Check transfer case unit (Refer to page K2–30)

8. Is there battery voltage at terminal C of 4WD control module?
- NO → Replace 4WD control module
- YES

9. Check wiring and connector from terminal C of 4WD control module to 4WD relay (change motor relay No.2)
- OK → Check change motor, 4WD relay (change motor relay No.1), and wiring (Refer to pages K2–22, 25)
- OK → Check AFW unit (Refer to section M)

NO SHIFT FROM 2WD TO 4WD (LOCKED) MODE

1. Are there any exclusion items?
- YES → Retest
- NO

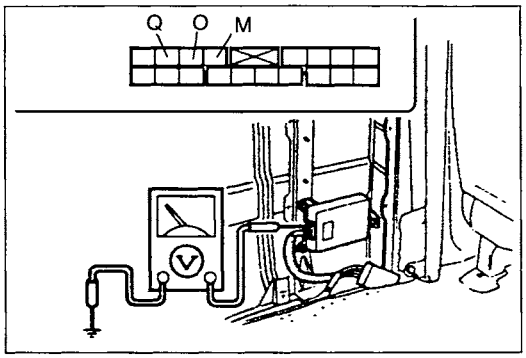
2. Does warning alarm sound when activating center differential lock shift switch?
- YES → Check wiring and connector from terminal F of 4WD control module to 4WD relay (change motor relay No.1)
- NO

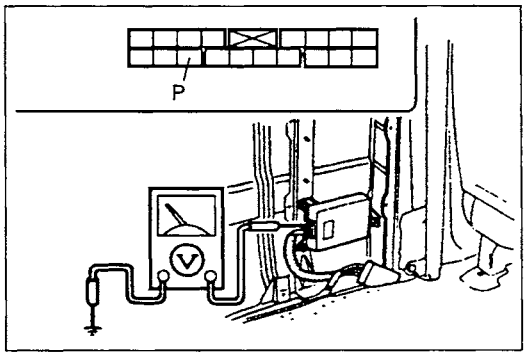
3. Check wiring and connector from terminal T of 4WD control module to center differential
- OK → Check change motor, 4WD relay (change motor relay No.1), and wiring (Refer to pages K2–22, 25)
- OK → Check transfer case unit (Refer to page K2–30)
- OK

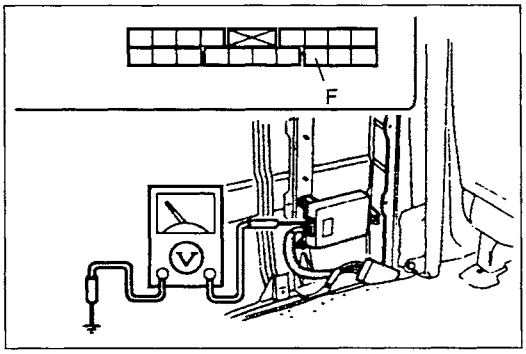
4. Do 4WD and CENTER DIFF. LOCK indicator lights flash?
- NO → Check 4WD and CENTER DIFF. LOCK indicator lights and wiring (Refer to section T)
- YES

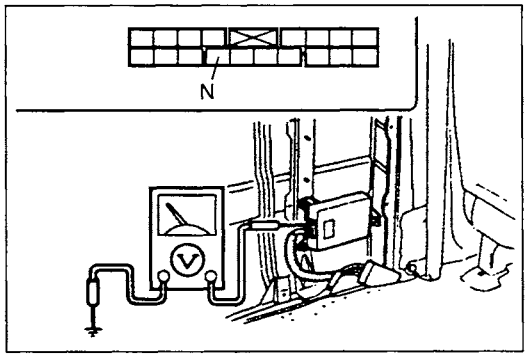
5. Do 4WD and CENTER DIFF. LOCK indicator lights come ON after driving vehicle **approx. 0.5 km { 1/4 miles }**?
- YES → Vehicle in 4WD (Locked) mode Inspection completed
- NO

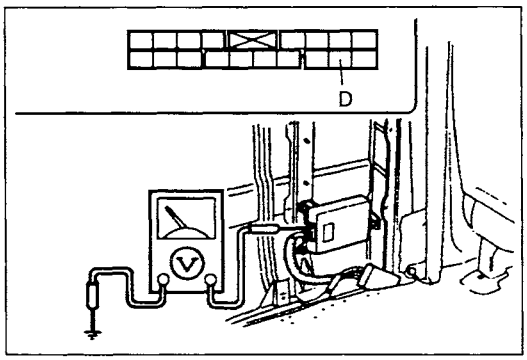
Cont'd











Cont'd

6. Check each wiring and connector below
   From terminal M of 4WD control module to position switch A
   From terminal O of 4WD control module to position switch B
   From terminal Q of 4WD control module to position switch C

OK

7. Check change motor position by measuring 4WD control module terminal voltages
   B+: Battery positive voltage

Terminal \ Position		2H	α	4HL	β	4HF
M and ground	(V)	B+	B+	0 V	0 V	0 V
O and ground	(V)	0 V	B+	B+	B+	0 V
Q and ground	(V)	0 V	0 V	0 V	B+	B+

If position is 2H or α, go to step 8 if 4HL, go to step 11
If position is β or 4HF, replace change motor or 4WD control module

8. Is there 0 V at terminal P of 4WD control module?
   YES → Check wiring and connector from terminal P of 4WD control module to change motor
   OK → Check change motor, 4WD relay (change motor relay No.1), and wiring (Refer to pages K2–22, 25)
   NO → Check transfer case unit (Refer to page K2–30)
   NO → Replace 4WD control module

9. Is there battery voltage at terminal F of 4WD control module?
   YES

10. Check wiring and connector from terminal F of 4WD control module to 4WD relay (change relay No.1)
    OK → Check change motor, 4WD relay (change motor relay No.1), and wiring (Refer to pages K2–22, 25)
    NO → Check transfer case unit (Refer to page K2–30)

11. Is there 0 V at terminal N of 4WD control module?
    YES → Check wiring and connector from terminal N of 4WD control module to AFW switch
    OK → Check AFW switch (Refer to section M)
    OK → Check the AFW unit (Refer to section M)

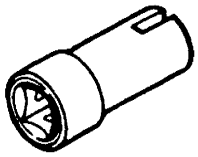
12. Is there 0 V at terminal D of 4WD control module?
    NO → Replace 4WD control module

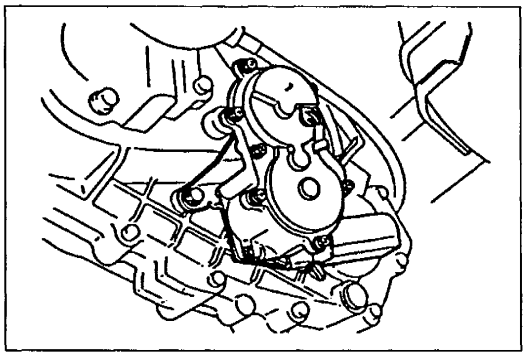
YES

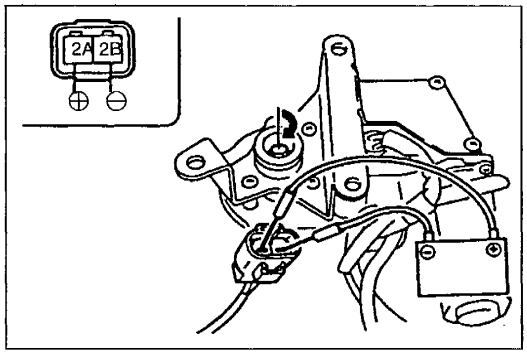
13. Check wiring and connector from terminal of 4WD control module to lock solenoid
    OK → Check lock solenoid (Refer to section M)
    OK → Check AFW unit (Refer to section M)

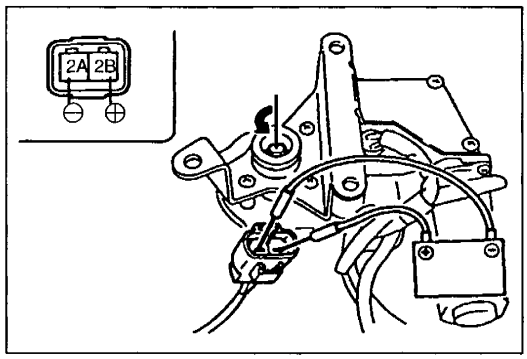
ELECTRICAL SYSTEM COMPONENTS

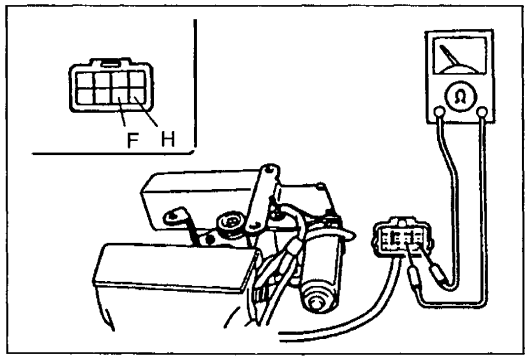
PREPARATION
SST

49 L017 302 Adapter, change motor		For inspection of change motor









CHANGE MOTOR
On-vehicle Inspection
1. Turn the ignition to ON.
2. Using a voltmeter at the change motor connector, check for the following voltages during the indicated mode shift operation.
   If not as specified, perform 4WD relay voltage inspection. (Refer to page K2–25.)

Terminal voltage

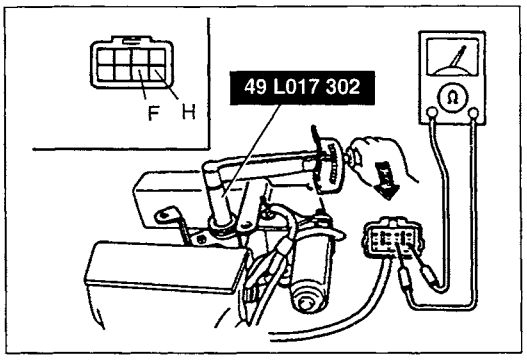
B+: Battery positive voltage

Mode shift	Terminal voltage	
	2A	2B
2WD→4WD FREE	Momentary B+	Ground 0 V
4WD FREE→2WD	Ground 0 V	Momentary B+
4WD FREE→4WD LOCKED	Ground 0 V	Momentary B+
4WD LOCKED→4WD FREE	Momentary B+	Ground 0 V
2WD→4WD LOCKED	Momentary B+	Ground 0 V

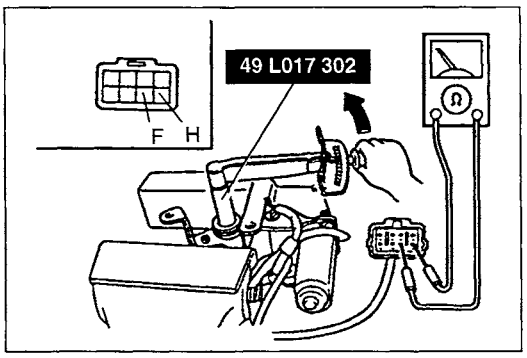
Removal
1. Disconnect the negative battery terminal.
2. On level ground, jack up the vehicle and support it evenly on safety stands.
3. Remove the protector plate.
4. Disconnect the change motor connector and remove the change motor.

Inspection
Motor
1. Connect battery voltage as shown and verify that the motor rotates clockwise.
2. Connect battery voltage as shown and verify that the motor rotates counterclockwise.
3. If not correct, replace the change motor.

Limit switch
1. Set the change motor in a vise.
2. Verify that there is no continuity between terminals F and H by using an ohmmeter.



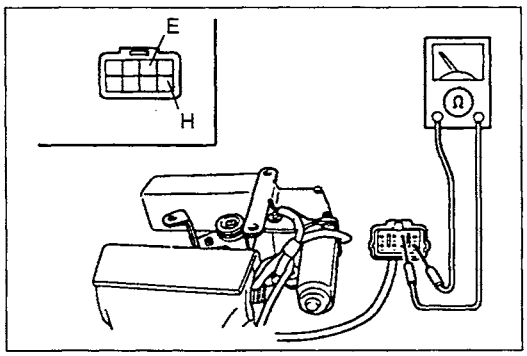
3. Turn the change motor shaft clockwise by using the **SST** until continuity is shown.



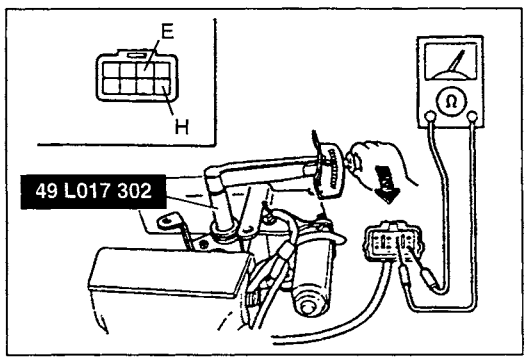
4. Allow the shaft to turn counterclockwise and note the torque when continuity is lost.

   Specified torque:
   2.5—4.9 N·m { 25—50 kgf·cm , 22—43 in·lbf }

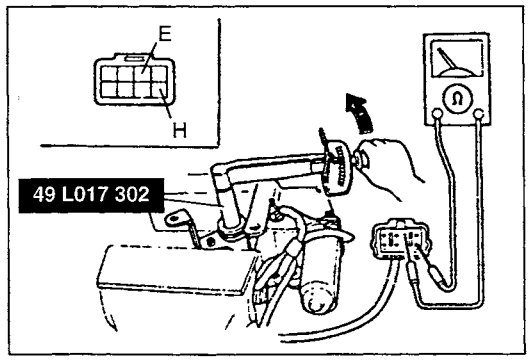
5. Turn the shaft counterclockwise as in steps 3 and 4, and check for continuity and torque reading.



6. Connect the ohmmeter between terminals E and H, and verify that there is no continuity.



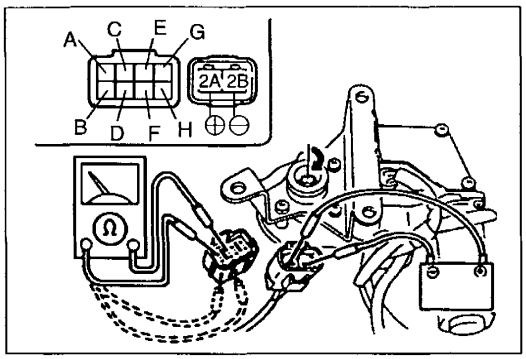
7. Turn the shaft clockwise by using the **SST** until continuity is shown.



8. Allow the shaft to turn counterclockwise and note the torque when continuity is lost.

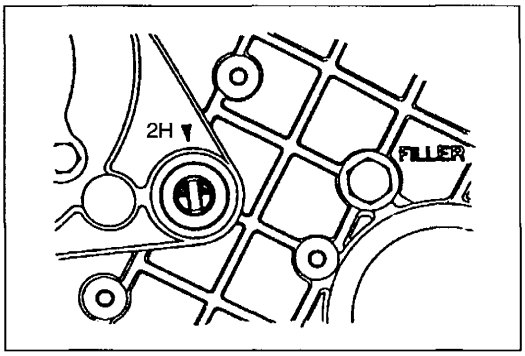
   Specified torque:
   6.9—12.7 N·m { 70—130 kgf·cm , 61—112 in·lbf }

9. Turn the shaft counterclockwise as in steps 7 and 8 and check for continuity and torque reading.
10. If not as specified, replace the change motor.



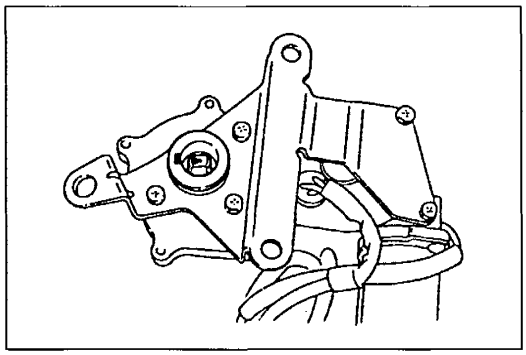
Position switch

1. Connect an ohmmeter to terminals A and D, B and D, and C and D of the change motor in order.
2. Connect battery voltage to terminals 2A and 2B as shown.
3. Verify that there is continuity at each set of terminals once per motor revolution.
4. If not as specified, replace the change motor.

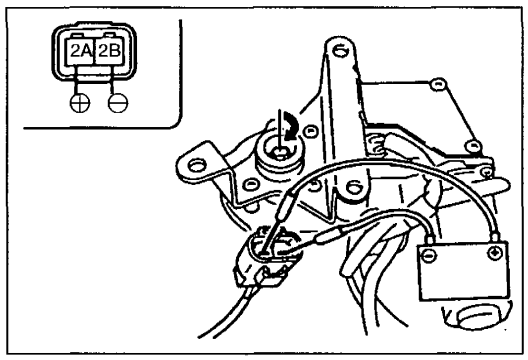


Installation

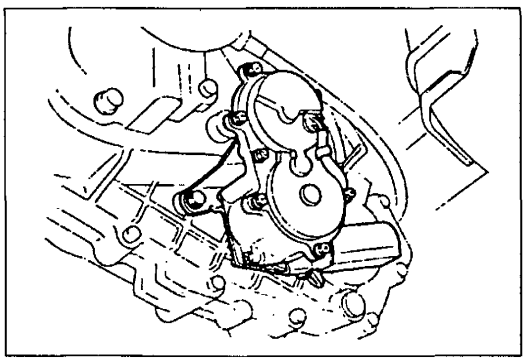
1. Align the mark on the change drum groove with the 2H mark.



2. Check that the marks on the change motor salient and the body are aligned.

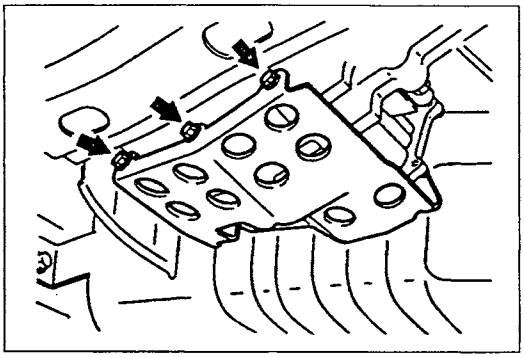


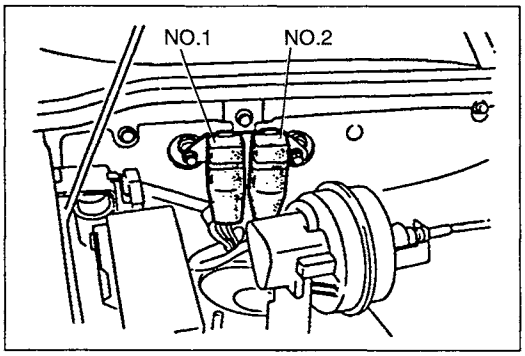
3. If not aligned, turn the shaft by applying battery voltage as shown.

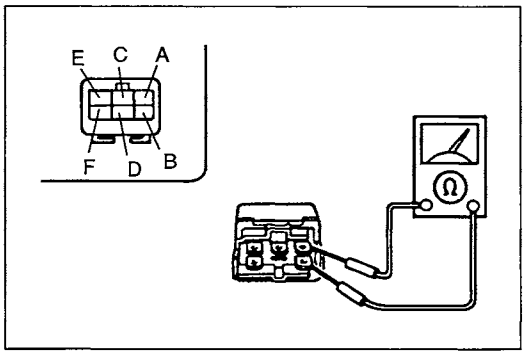


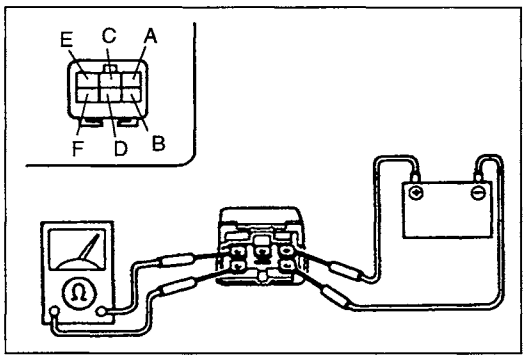
4. Apply oil to the new O-ring and install the change motor.

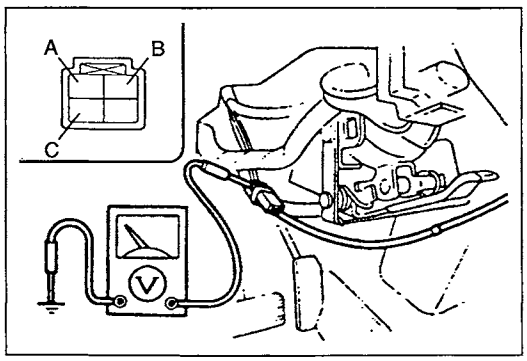
Tightening torque:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }











5. Install the protector plate.

Tightening torque:
44—54 N·m { 4.4—5.6 kgf·m , 32—40 ft·lbf }

4WD RELAY (CHANGE MOTOR RELAY No.1, No.2)

Inspection

Terminal voltage

1. Turn the ignition to ON.
2. Using a voltmeter, measure the voltage at each wire at the indicated connector during each mode shift of the 4WD system.
   If not as specified, perform 4WD Control Module Inspection.

4WD Relay No.1

B+: Battery positive voltage

Mode shift	Terminal voltage				
	E	C	A	F	B
2WD→4WD FREE	IGN. B+	MOM. B+	MOM. B+	0 V	0 V
4WD→2WD	IGN. B+	0 V	0 V	0 V	0 V
4WD→4WD LOCKED	IGN. B+	0 V	0 V	0 V	0 V
4WD LOCKED→4WD FREE	IGN. B+	MOM.	MOM.	0 V	0 V
2WD→4WD LOCKED	IGN. B+	MOM. B+	MOM. B+	0 V	0 V

4WD Relay No.2

B+: Battery positive voltage

Mode shift	Terminal voltage				
	E	C	A	F	B
2WD→4WD FREE	IGN. B+	0 V	0 V	0 V	0 V
4WD FREE→2WD	IGN. B+	MOM. B+	MOM. B+	0 V	0 V
4WD FREE→4WD LOCKED	IGN. B+	MOM. B+	MOM. B+	0 V	0 V
4WD LOCKED→4WD FREE	IGN. B+	0 V	0 V	0 V	0 V
2WD→4WD LOCKED	IGN. B+	0 V	0 V	0 V	0 V

Continuity

1. Remove the 4WD relay (change motor relay No.1, No.2).
2. Verify that there is continuity between terminals A and B, and C and F.
3. Connect battery voltage to terminals A and B as shown and verify that there is continuity between terminals C and E.
4. If not as specified, replace the 4WD relay (change motor relay No.1, No.2).

4WD/2WD SHIFT SWITCH

Inspection

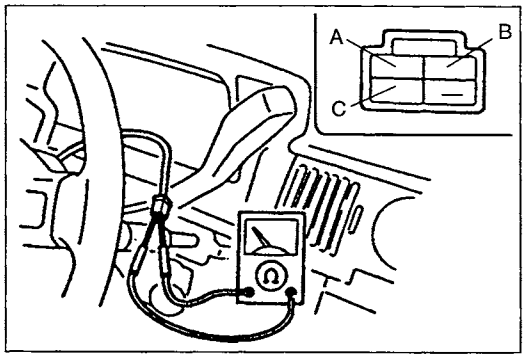
Terminal voltage

1. Remove the column covers.
2. Turn the ignition switch ON.
3. Measure the voltage between terminal C and a ground.

B+: Battery positive voltage

Terminal voltage	Switch
B+	Released
0 V	Activated (Held to left)

4. If not correct, go to the next step.

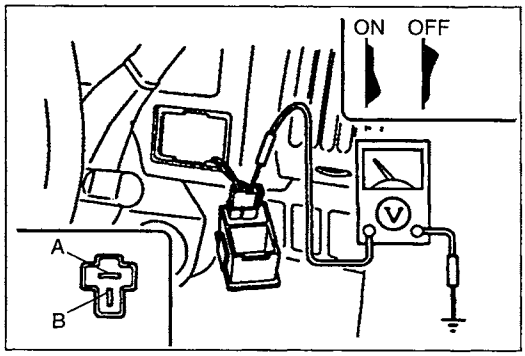


Continuity

1. Disconnect the connector.
2. Check for continuity between terminals A and C (switch side).

Continuity	Switch
Yes	Activated (Held to left)
No	Released

3. If not as specified, replace the change knob assembly.



CENTER DIFFERENTIAL LOCK SWITCH

Inspection

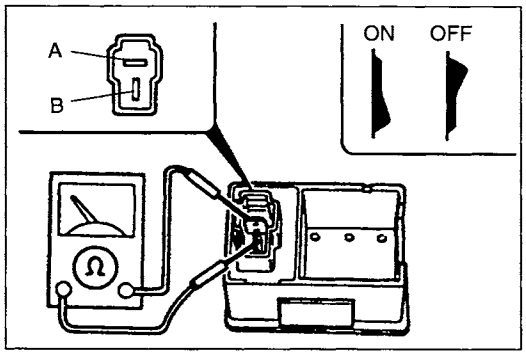
Terminal voltage

1. Disconnect the center differential lock switch.
2. Turn the ignition switch to ON.
3. Measure the voltage between terminal A and a ground.

B+: Battery positive voltage

Terminal voltage	Switch
B+	OFF (Bottom of rocker in)
0 V	ON (Top of rocker in)

4. If not correct, go to the next step.

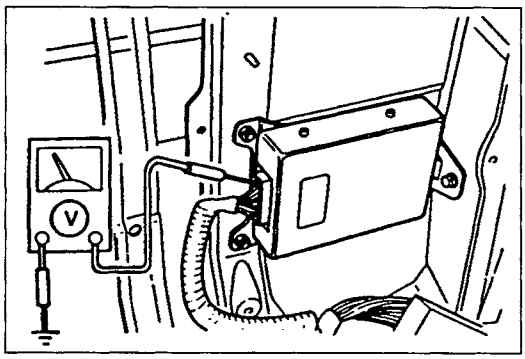


Continuity

1. Disconnect the connector.
2. Check for continuity between terminals A and B (switch side).

Continuity	Switch
Yes	ON (Top of rocker in)
No	OFF (Bottom of rocker in)

3. If not as specified, replace the switch assembly.

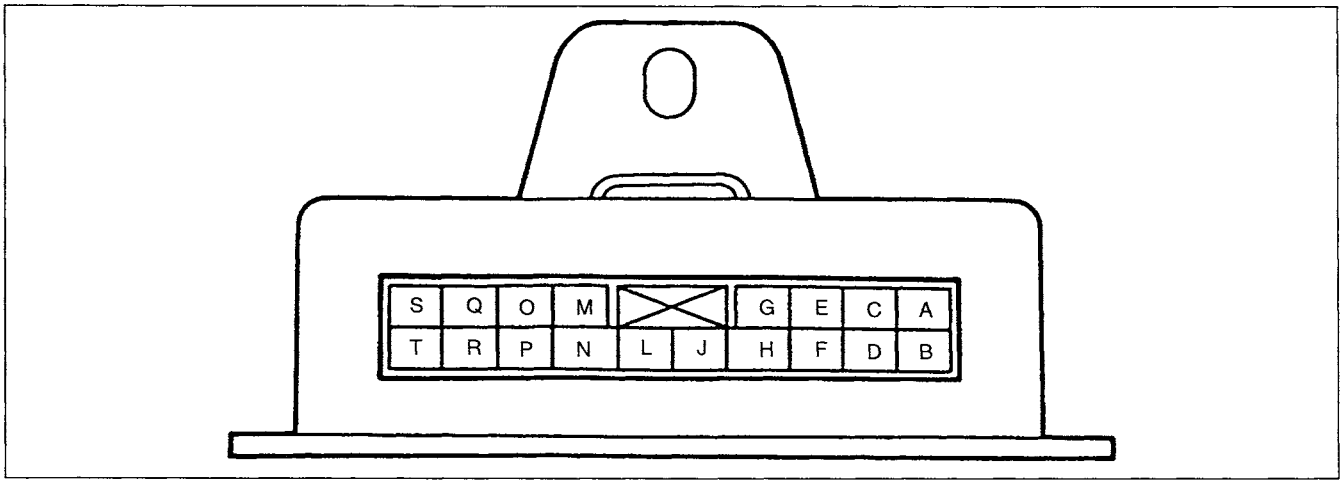


4WD CONTROL MODULE

Inspection

1. Turn the ignition switch to ON. Measure the 4WD control module terminal voltages, referring to the Terminal voltage chart (next page).
2. If not as specified, check, repair, or replace the component(s), wiring, and/or 4WD control module.

Terminal voltage chart

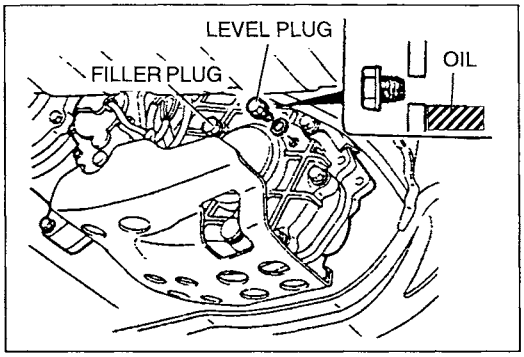


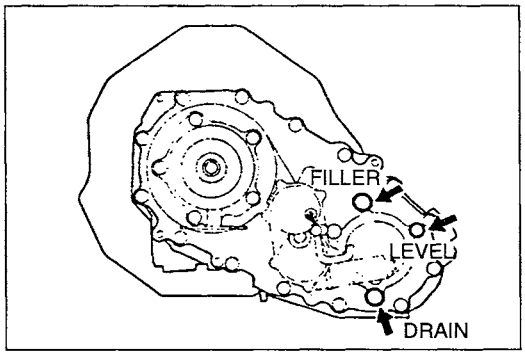
B+: Battery positive voltage

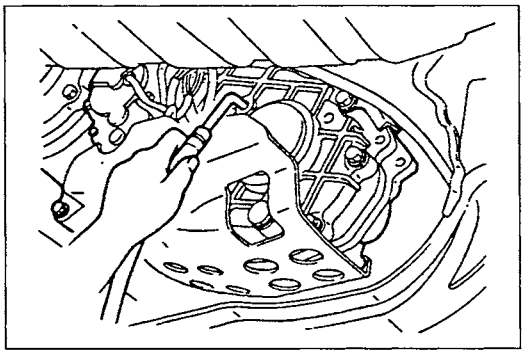
Terminal	Connected to	Voltage	Condition
A	Free solenoid	B+	Solenoid: OFF Vehicle in 4WD (Free) mode Vehicle in 4WD (Locked) mode
		Below 1.5 V	Solenoid: ON Vehicle in 2WD mode
B	Body	0 V	—
C	4WD relay (Change motor relay No.2)	B+	4WD relay (Change motor relay No.2): ON During 4WD (Free) mode to 2WD mode During 4WD (Free) mode to 4WD (Locked) mode shift
		Below 1.5 V	4WD relay (Change motor relay No.2): OFF Other than above conditions
D	Lock solenoid	B+	Solenoid: OFF Vehicle in 2WD mode
		Below 1.5 V	Solenoid: ON Vehicle in 4WD (Free) mode Vehicle in 4WD (Locked) mode
E	Battery	B+	Ignition switch ON
		0 V	Ignition switch OFF
F	4WD relay (Change motor relay No.1)	B+	4WD relay (Change motor relay No.1): ON During 2WD to 4WD (Free) mode shift During 2WD to 4WD (Locked) mode shift During 4WD (Locked) mode to 4WD (Free) mode shift
		Below 1.5 V	4WD relay (Change motor relay No.1): OFF Other than above conditions
G	Buzzer	B+	Buzzer: OFF Normal condition
		Below 1.5 V	Buzzer: ON 4WD/2WD shift switch activated Caution mode function Fail mode function (System failure)
H	4WD indicator light	B+	4WD indicator light: OFF Vehicle in 2WD mode
		Below 1.5 V	4WD indicator light: ON Vehicle in either 4WD mode
J	CENTER DIFF. LOCK indicator light	B+	CENTER DIFF. LOCK indicator light: OFF Vehicle in 2WD or 4WD (Free) mode
		Below 1.5 V	CENTER DIFF. LOCK indicator light: ON Vehicle in 4WD (Locked) mode
L	—	—	—

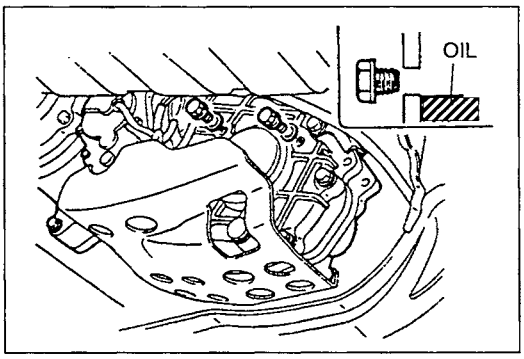
B+: Battery positive voltage

Terminal	Connected to	Voltage	Condition
M	Position switch A (In change motor)	B+	Position switch A: OFF Vehicle in 2WD mode Vehicle between 2WD mode and 4WD (Locked) mode
		0 V	Position switch A: ON Vehicle in 4WD (Free) mode Vehicle in 4WD (Locked) mode Vehicle between 4WD (Free) mode and 4WD (Locked) mode
N	AFW (Remote freewheel) switch	B+	RFW switch: OFF Vehicle in 2WD mode (AFW unit disengaged)
		0 V	RFW switch: ON Vehicle in either 4WD mode (AFW unit engaged)
O	Position switch B (In change motor)	B+	Position switch B: OFF Vehicle between 2WD mode and 4WD (Locked) mode Vehicle in 4WD (Locked) mode Vehicle between 4WD (Free) mode and 4WD (Locked) mode
		0 V	Position switch B: ON Vehicle in 2WD mode Vehicle in 4WD (Free) mode
P	Limit switch 1 (In change motor)	B+	Limit switch 1: OFF Normal condition
		0 V	Limit switch 1: ON High shift torque when shifting from 2WD to 4WD (Free) mode or vice-versa High shift torque when shifting from 2WD to 4WD (Locked) mode High shift torque when shifting from 4WD (Free) mode to 4WD (Locked) mode or vice-versa
Q	Position switch C (In change motor)	B+	Position switch C: OFF Vehicle between 4WD (Free) mode and 4WD (Locked) mode Vehicle in 4WD (Free) mode
		0 V	Position switch C: ON Vehicle in 2WD mode Vehicle between 2WD mode and 4WD (Locked) mode Vehicle in 4WD (Locked) mode
R	Limit switch 2 (In change motor)	B+	Limit switch 2: OFF Normal condition
		0 V	Limit switch 2: ON High shift torque when shifting from 2WD to 4WD (Free) mode or vice-versa High shift torque when shifting from 2WD to 4WD (Locked) mode High shift torque when shifting from 4WD (Free) mode to 4WD (Locked) mode or vice-versa
S	4WD/2WD shift switch	B+	4WD/2WD shift switch: OFF (released)
		0 V	4WD/2WD shift switch: ON (activated)
T	Center differential lock switch	B+	Center differential lock switch: OFF Bottom of rocker (Free position)
		0 V	Center differential lock switch: ON Top of rocker (Lock position)









TRANSFER CASE OIL

Inspection

1. Remove the level plug.
2. Verify that the oil is up to the brim of the level plug hole as shown.
   If it is low, add the specified oil through the filler plug port.
3. Install the plugs and new washers.

Tightening torque
Filler plug:
40—58 N·m { 4.0—6.0 kgf·m , 29—43 ft·lbf }
Level plug:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }

Replacement

1. Remove the filler and level plugs.
2. Remove the drain plug, and drain the oil into a container.
3. Wipe all plugs clean.
4. Install the drain plug and a new washer.

Tightening torque:
40—58 N·m { 4.0—6.0 kgf·m , 29—43 ft·lbf }

5. Add the specified oil through the filler plug port until the oil rises to the brim edge of the level plug hole.

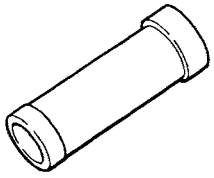
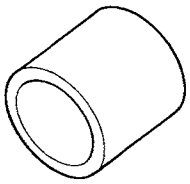
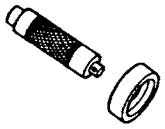
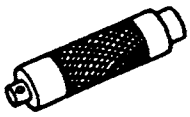
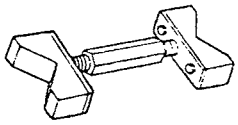
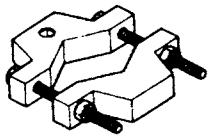
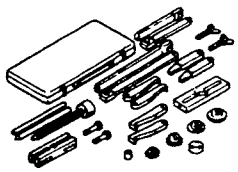
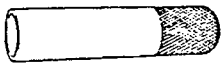
Specified oil
Grade: API service GL-4 or GL-5
Viscosity: All-season SAE 75W–90
Viscosity: Above 10 °C { 50 °F } SAE 80W–90
Capacity: 1.5 L { 1.6 US qt , 1.3 Imp qt }

6. Install the filler and level plugs and new washers.

Tightening torque
Filler plug:
40—58 N·m { 4.0—6.0 kgf·m , 29—43 ft·lbf }
Level plug:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }

TRANSFER CASE

PREPARATION
SST

49 S120 710 Holder, coupling flange 	For removal / installation of companion flange	49 U025 001 Installer, protector 	For removal / installation of bearing
49 U027 003 Installer, oil seal 	For installation of oil seal	49 G030 795 Installer, oil seal 	For installation of oil seal
49 G030 797 Handle (Part of 49 G030 795) 	For installation of bearing	49 B043 002 Installer, bearing 	For installation of oil seal
49 S231 395 Expansion tool, chain 	For expansion of chain	49 F017 1A0 Universal wrench 	For removal / installation of locknut
49 0839 425C Puller set, bearing 	For removal of bearing	49 0727 415 Installer, bearing 	For installation of bearing

PRECAUTION

1. Clean the exterior of the transmission and transfer case with steam and/or cleaning solvent before removal or disassembly.

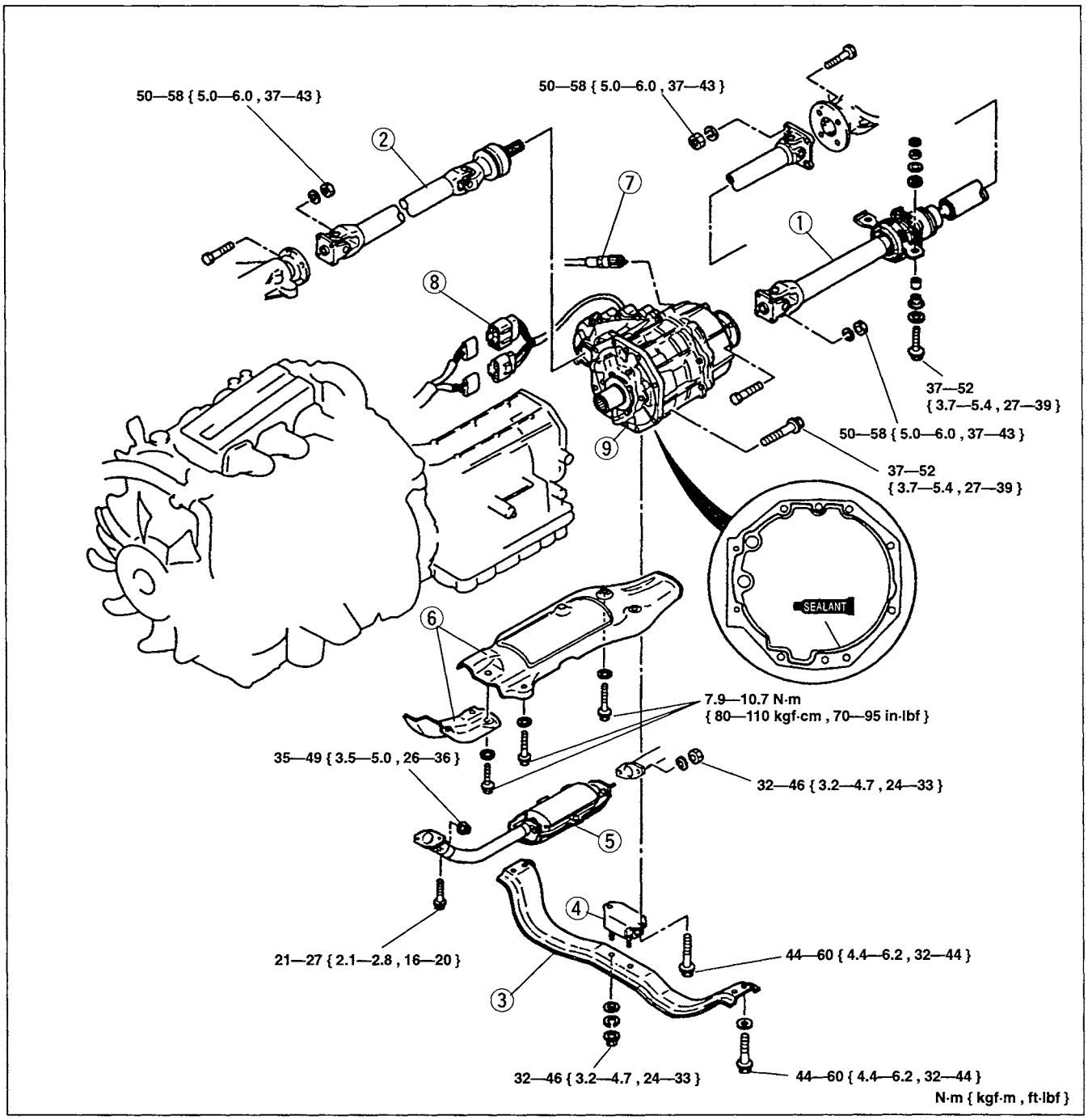
   Warning
   - **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

2. Clean all parts with cleaning solvent (except bearings). Dry with compressed air.
3. Clean out all holes and passages with compressed air. Check that there are no obstructions.
4. All O-rings must be replaced with new ones.
5. Assemble parts within 10 minutes after applying sealant. Allow all sealant to cure at least 30 minutes after assembly before filling the transfer case with oil.

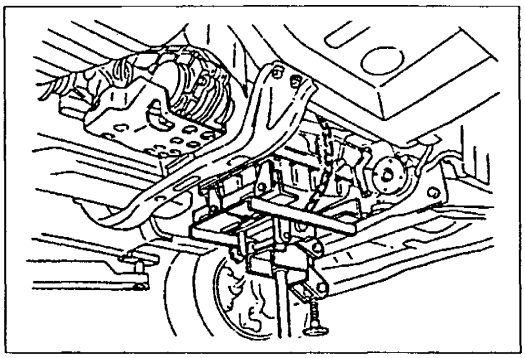
TRANSFER CASE UNIT (REMOVAL / INSTALLATION)

Removal / Installation

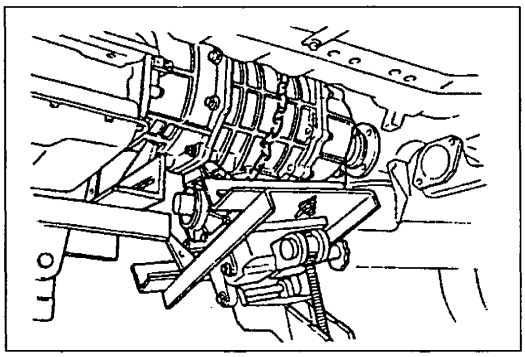
1. Before removing the transfer case, drain the transfer case oil. (Refer to page K2–29.)
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.
4. After installing the transfer case unit, add the transfer case oil. (Refer to page K2–29.)



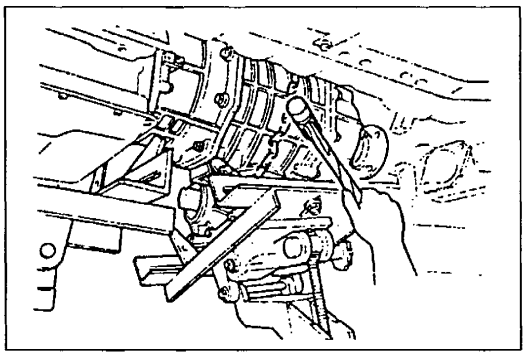
1. Rear propeller shaft
   Removal ..... section L
2. Front propeller shaft
   Removal ..... section L
3. Transmission lower mount
   Removal Note ..... page K2–32
   Installation Note ..... page K2–33
4. Transmission upper mount
5. Exhaust pipe
6. Heat insulator
7. Speedometer cable
8. Connectors
9. Transfer case
   Removal Note ..... page K2–32
   Installation Note ..... page K2–32



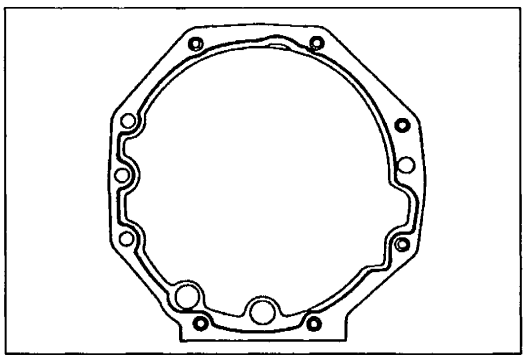
Removal note
Transmission lower mount
1. Support the transmission on a transmission jack.
2. Remove the transmission lower mount.



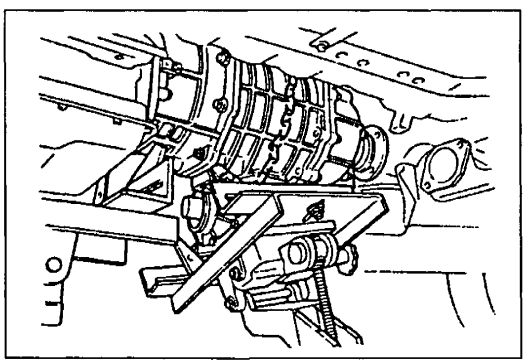
Transfer case
1. Support the transfer case on a transmission jack.



2. Remove the transfer case by using a plastic hammer.

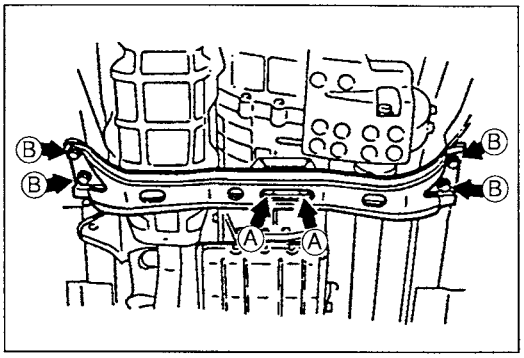


Installation note
Transfer case
1. Apply silicone sealant to the transfer case as shown.



2. Support the transfer case on a transmission jack.
3. Install the transfer case.

Tightening torque:
37—52 N·m { 3.7—5.5 kgf·m , 27—39 ft·lbf }



Transmission lower mount

1. Temporarily install washers and nuts Ⓐ.
2. Tighten bolts Ⓑ.

   Tightening torque:
   44—60 N·m { 4.4—6.2 kgf·m , 32—44 ft·lbf }

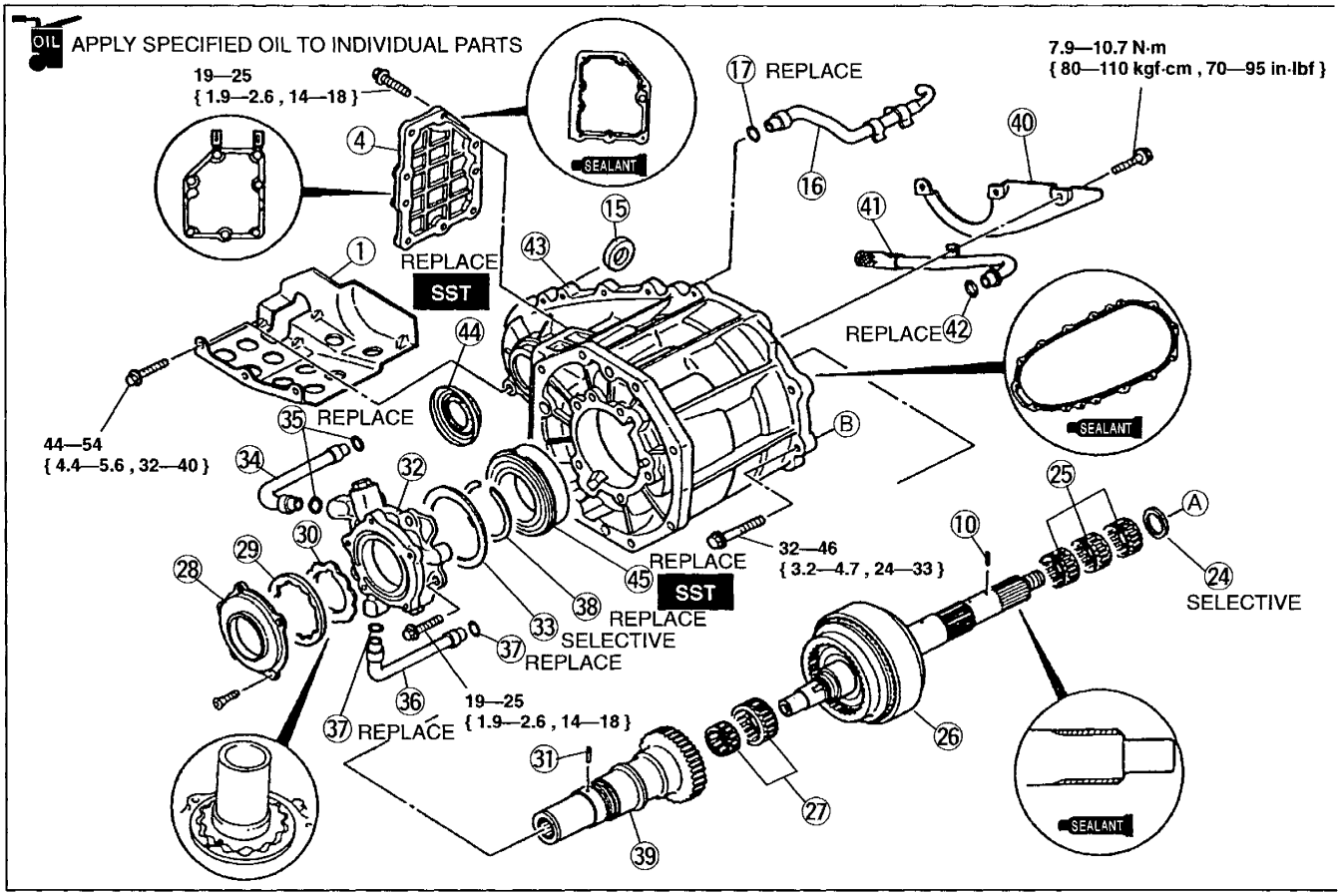
3. Tighten nuts Ⓐ.

   Tightening torque:
   32—46 N·m { 3.2—4.7 kgf·m , 24—33 ft·lbf }

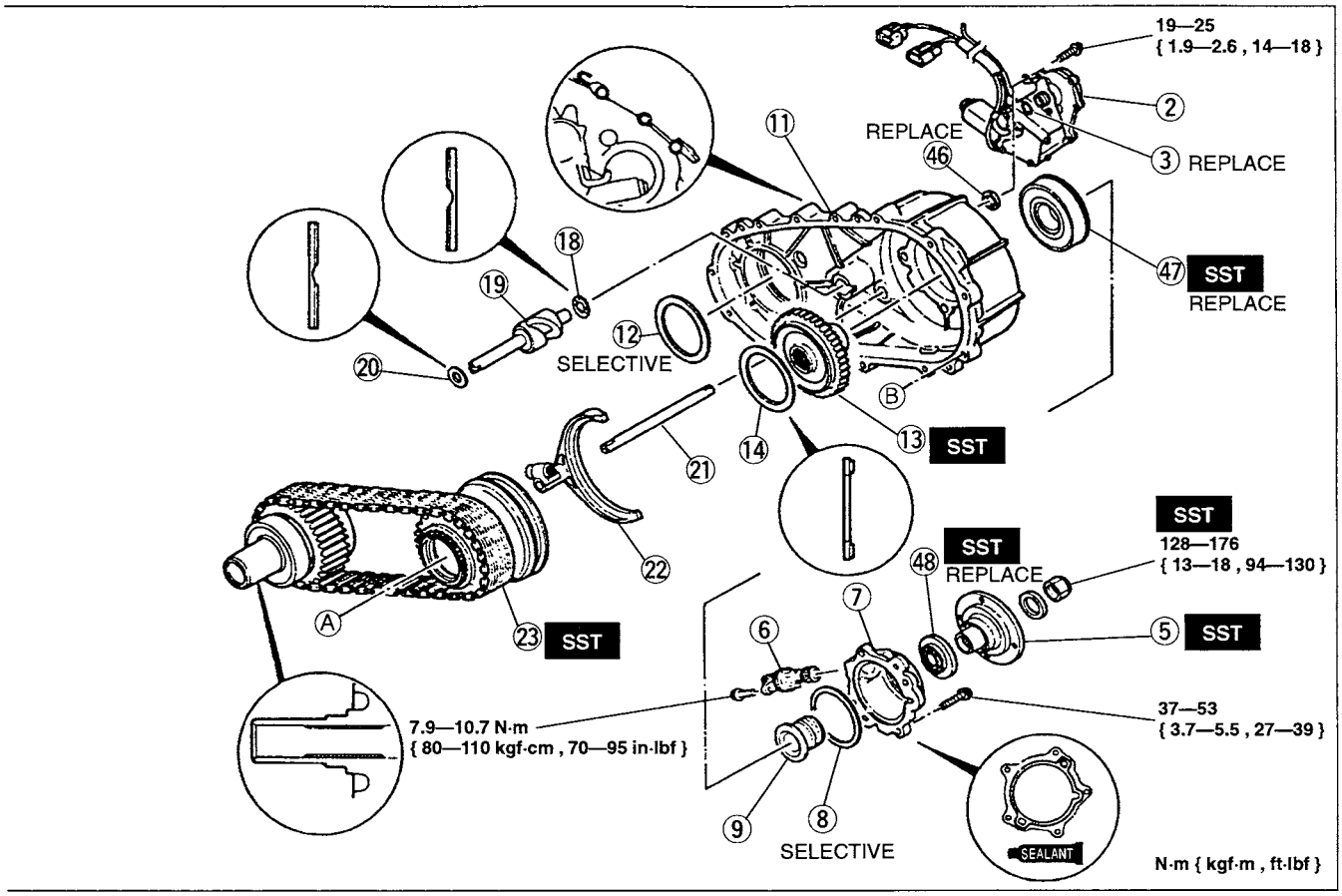
TRANSFER CASE UNIT (DISASSEMBLY / INSPECTION / ASSEMBLY)

Disassembly / Inspection / Assembly

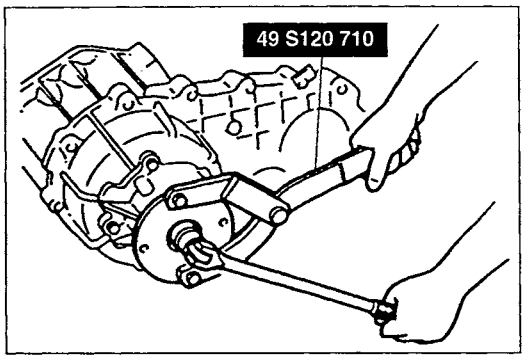
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



1. Protector plate
2. Change motor
   Inspection ..... page K2–22
3. O-ring
4. Control cover
5. Companion flange
   Disassembly Note ..... page K2–36
6. Speedometer driven gear
   Disassembly / Inspection / Assembly ..... page K2–53
7. Rear cover
   Disassembly Note ..... page K2–36
8. Adjustment shim(s)
9. Speedometer drive gear
10. Key
11. Rear chain cover
    Disassembly Note ..... page K2–37
12. Adjustment shim(s)
13. Clutch gear
    Disassembly Note ..... page K2–37
    Inspect for damage, wear, or cracks
14. Needle bearing
    Inspect for damage or rough rotation
15. Magnet
16. Rear oil pipe
17. O-ring
18. Thrust washer
    Inspection ..... page K2–39
19. Change drum
20. Thrust washer
    Inspection ..... page K2–39
21. 2–4 shift rod
    Disassembly Note ..... page K2–37
22. 2–4 shift fork
    Disassembly / Inspection / Assembly ..... page K2–56
23. Drive gear and chain assembly
    Disassembly Note ..... page K2–38
    Disassembly / Inspection / Assembly ..... page K2–56
24. Thrust washer
25. Needle bearings
    Inspect for damage or rough rotation
26. Center differential and output shaft assembly
    Disassembly / Inspection / Assembly ..... page K2–54
27. Needle bearings
    Inspect for damage or rough rotation

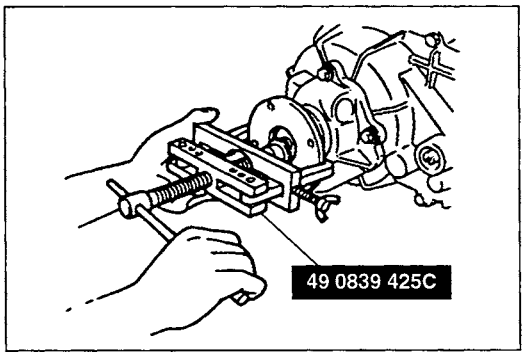


28. Pump cover
    Inspection ..... page K2–39
29. Outer pump rotor
    Disassembly Note ..... page K2–38
    Inspection ..... page K2–39
30. Inner pump rotor
    Disassembly Note ..... page K2–38
    Inspection ..... page K2–39
31. Key
32. Pump housing
    Disassembly Note ..... page K2–38
    Disassembly / Inspection / Assembly ..... page K2–60
33. Adjustment shim(s)
34. Front oil pipe
35. O-rings
36. Rear oil pipe
37. O-rings
38. Retaining ring
39. Input gear
    Disassembly Note ..... page K2–38
    Inspect for damage, wear, or cracks
40. Baffle plate
41. Rear oil pipe
    Inspect for clogging or damage
42. O-ring
43. Transfer case housing
44. Oil seal (front drive sprocket)
    Inspect for damage
    On-vehicle replacement ..... page K2–50
45. Bearing (input shaft)
    Inspect for sticking or rough rotation
    Disassembly Note ..... page K2–38
46. Oil seal (change drum)
    Inspect for damage
47. Bearing (output shaft)
    Inspect for sticking or rough rotation
    Disassembly Note ..... page K2–39
48. Oil seal (rear cover)
    Inspect for damage
    On-vehicle replacement ..... page K2–51

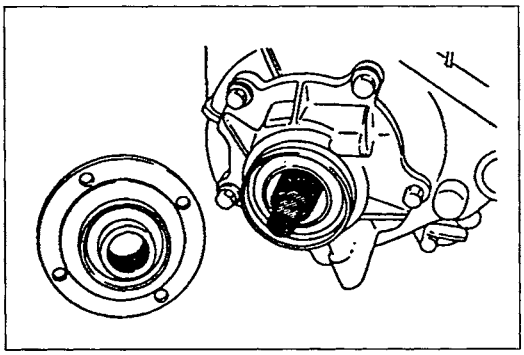


Disassembly note
Companion flange

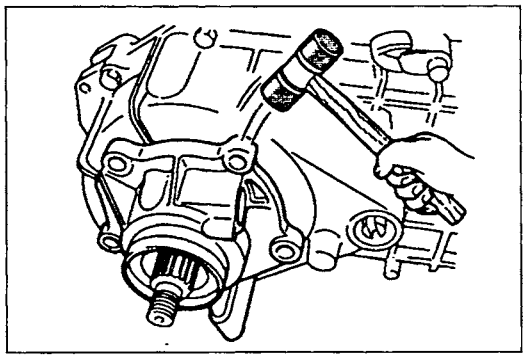
1. Hold the companion flange by using the **SST** and remove the companion flange nut.



2. Remove the companion flange by using the **SST**.

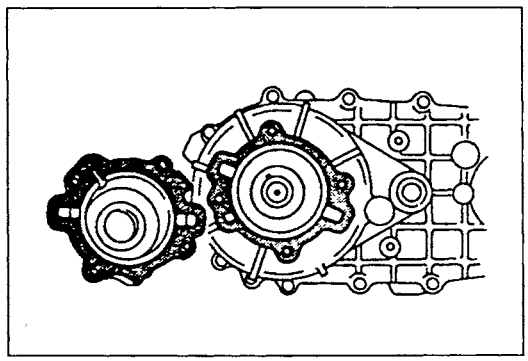


3. Clean the splines of the companion flange and output shaft.

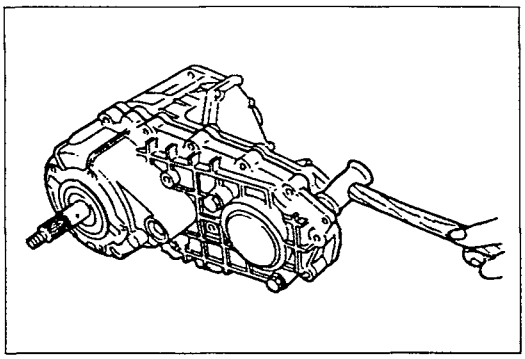


Rear cover

1. Remove the rear cover by lightly tapping with a plastic hammer.

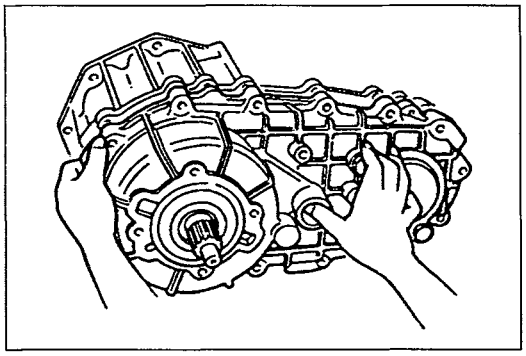


2. Remove the sealant from the rear cover and transfer case surfaces.

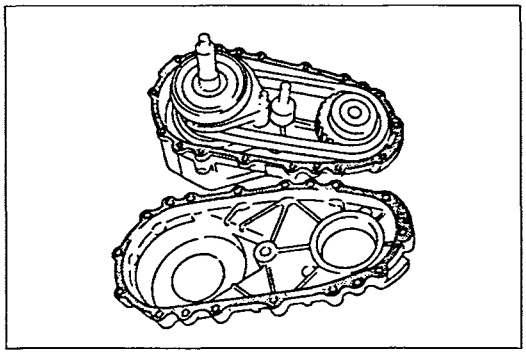


Rear chain cover

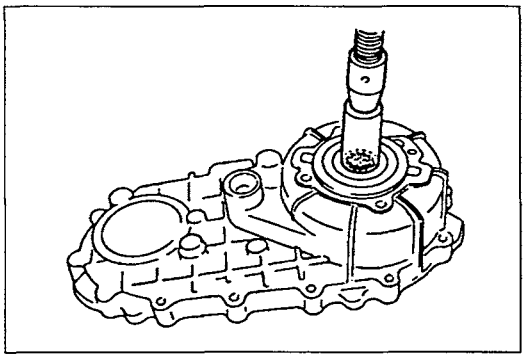
1. Separate the chain cover by lightly tapping with a plastic hammer.



2. Remove the rear chain cover while holding the shift rod.

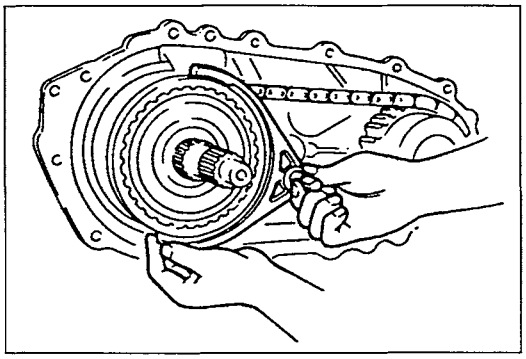


3. Remove the sealant from the chain cover and transfer case mounting surfaces.



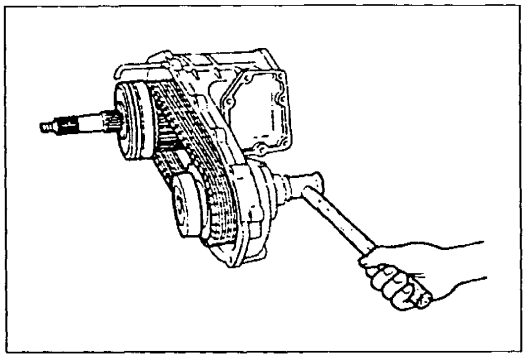
Clutch gear

Press out the clutch gear.



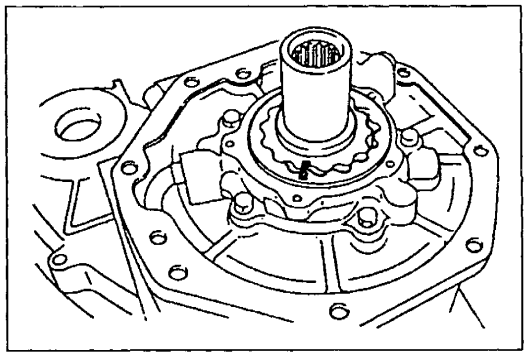
2–4 shift rod

Remove the 2–4 shift rod while holding the 2–4 shift fork.



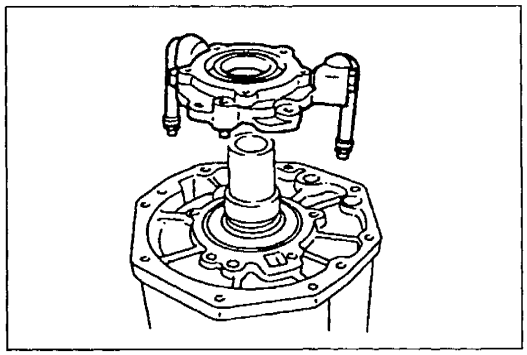
Drive gear and chain assembly

Remove the drive gear and chain assembly by lightly tapping the front drive sprocket.



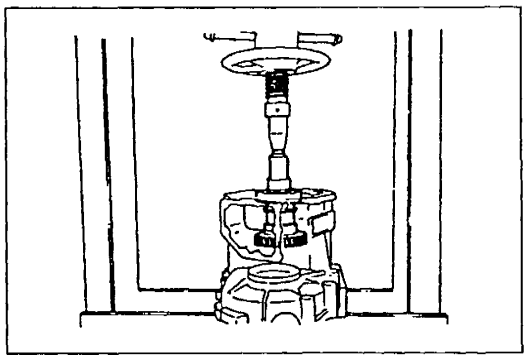
Outer pump rotor and inner pump rotor

1. Mark the inner and outer rotor positions without scratching or denting the rotors.
2. Remove the rotors from the housing.



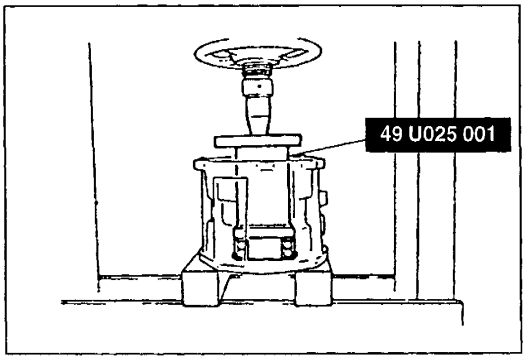
Pump housing

1. Pry off the pump housing while the oil pipes are connected.
2. Separate the oil pipes from the pump housing.



Input gear

Press out the input gear.

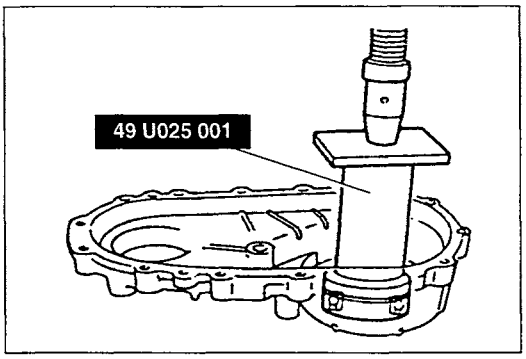


Bearing (input shaft)

Note

- The bearing does not need to be removed unless it is being replaced.

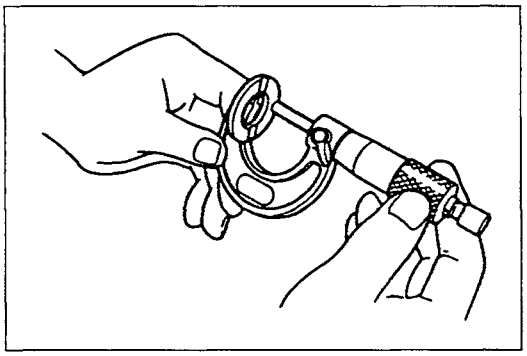
Press out the bearing by using the **SST**.



Bearing (output shaft)

Note
- The bearing does not need to be removed unless it is being replaced.

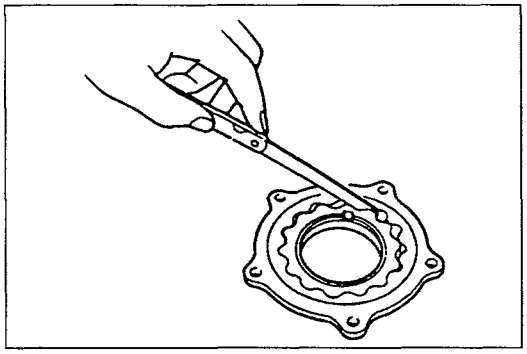
Press out the bearing by using the **SST**.



Inspection
Inspect the following and replace parts as necessary.

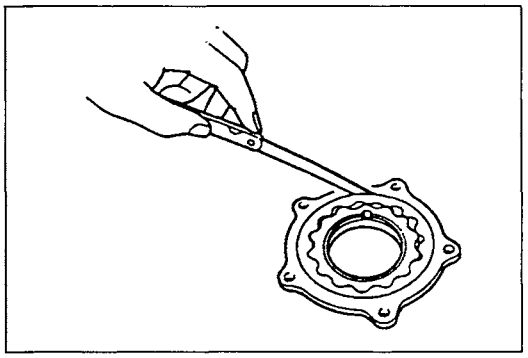
Thrust washer
Measure the thickness of the thrust washer all around its edge.

Thickness
Standard:
1.950—2.000 mm { 0.0768—0.0787 in }
Minimum: 1.900 mm { 0.0748 in }



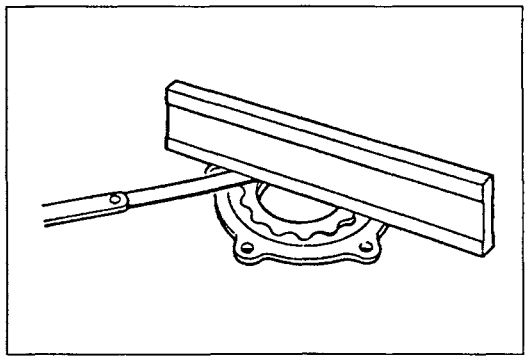
Oil pump
Assemble the inner and outer pump rotors, and measure the following clearances. Measure each clearance three times and average the results.
1. Tooth clearance.

Clearance
Standard: 0.02—0.18 mm { 0.001—0.007 in }
Maximum: 0.2 mm { 0.008 in }



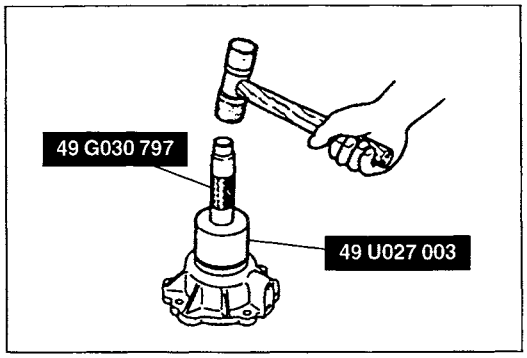
2. Side clearance.

Clearance
Standard: 0.17—0.26 mm { 0.007—0.010 in }
Maximum: 0.30 mm { 0.012 in }



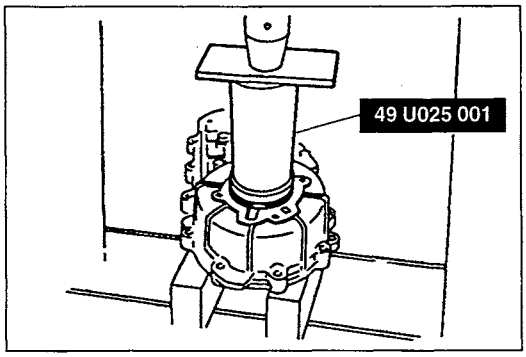
3. Body clearance.

Clearance
Standard: 0.02—0.08 mm { 0.001—0.003 in }
Maximum: 0.10 mm { 0.004 in }

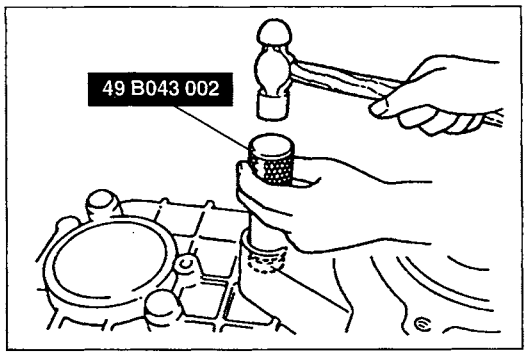


Assembly procedure

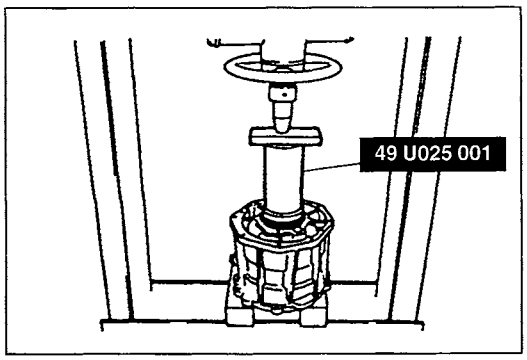
1. If the oil seal was removed, apply oil to the lip of a new oil seal and install it into the rear cover by using the **SST**.



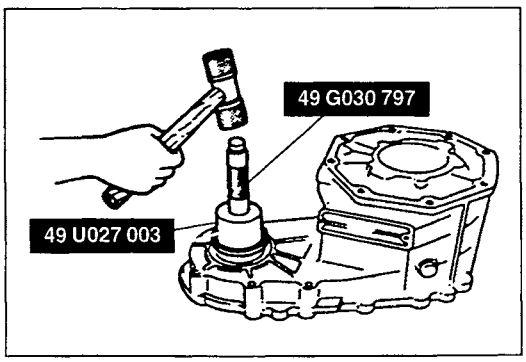
2. If the bearing was removed, install a new bearing into the rear chain cover by using the **SST**.



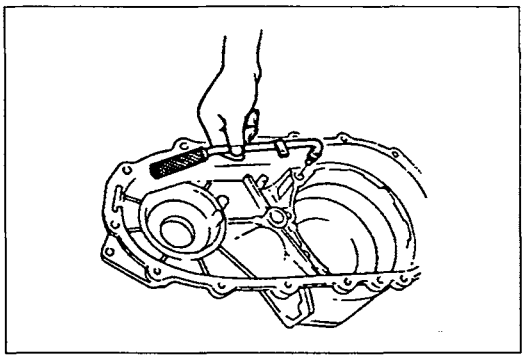
3. If the oil seal was removed, apply oil to the lip of a new oil seal and install it into the rear chain cover by using the **SST**.



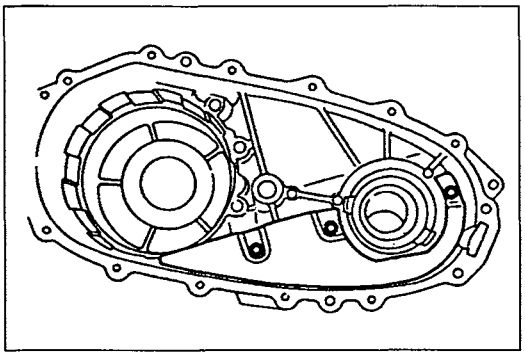
4. If the bearing was removed, install a new bearing into the transfer case housing by using the **SST**.



5. If the oil seal was removed, apply oil to the lip of a new oil seal and install it into the transfer case housing by using the **SST**.

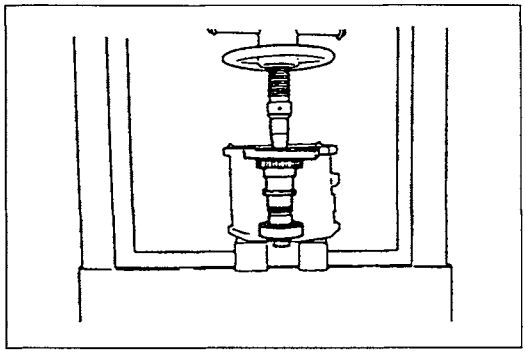


6. Apply oil to a new O-ring and install it onto the rear oil pipe.
7. Install the rear oil pipe assembly to the transfer case housing.

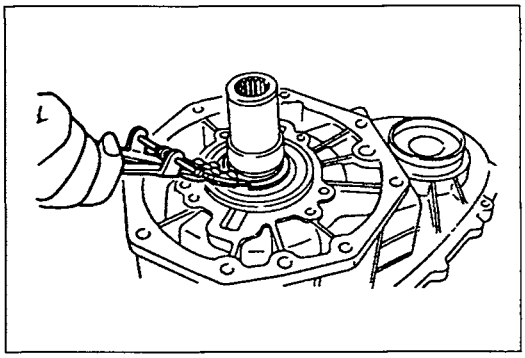


8. Install the baffle plate.

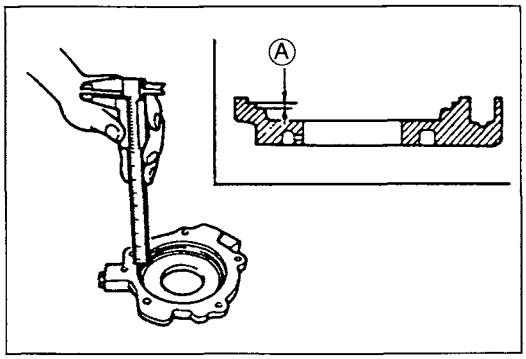
Tightening torque:
7.9—10.7 N·m { 80—110 kgf·cm , 70—95 in·lbf }



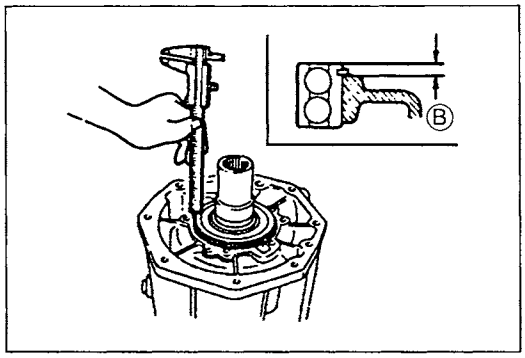
9. Install the input gear.



10. Fit a new retaining ring onto the input gear.



11. Adjust the input gear end play. When measuring A and B, measure 6 times in a crisscross pattern and average the results.
    (1) Measure depth Ⓐ of the input shaft bearing bore in the pump housing.



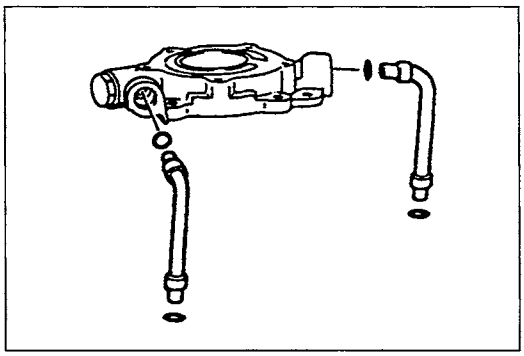
(2) Measure the input shaft bearing snap ring height Ⓑ.
(3) Select the proper adjustment shim(s) by using the formula below.

Formula: Ⓐ—Ⓑ = 0—0.1 mm { 0—0.004 in }

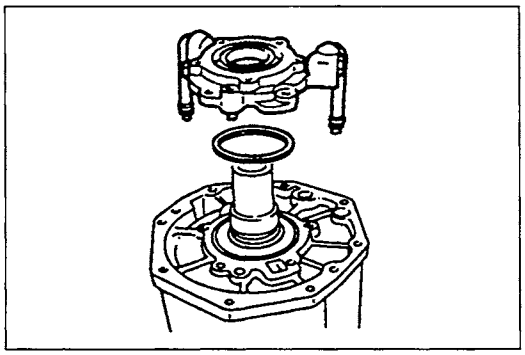
Adjustment shim thickness:

mm { in }

0.5 { 0.020 }	0.6 { 0.024 }	0.7 { 0.028 }
0.8 { 0.031 }	0.9 { 0.035 }	1.0 { 0.039 }

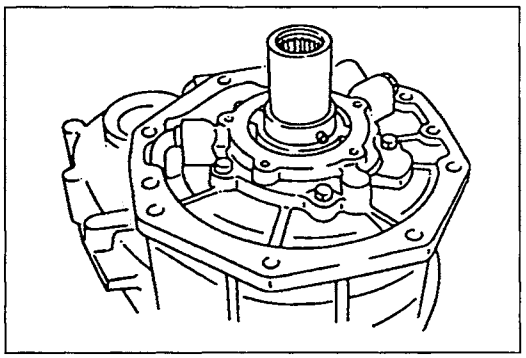


12. Apply oil to new O-rings and fit them onto the front and rear oil pipes.
13. Install the front and rear oil pipes into the pump housing.

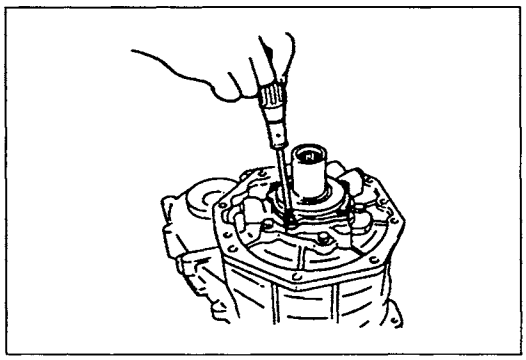


14. Install the adjustment shim(s) selected in step 11. Align the oil pipes with the holes in the transfer case and install the pump housing.

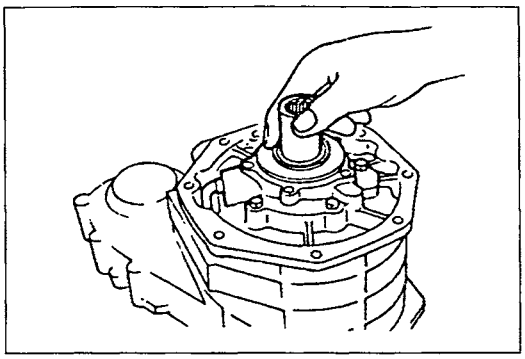
Tightening torque:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }



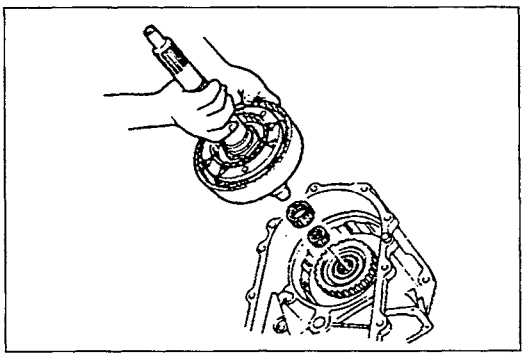
15. Fit the key to the input gear.



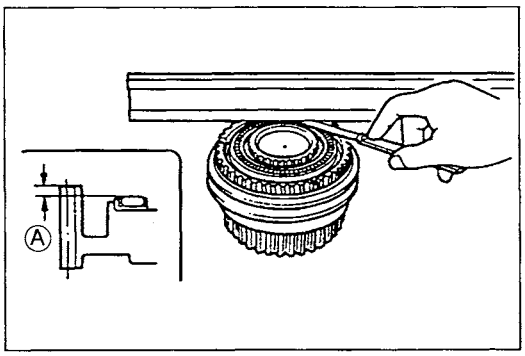
16. Install the inner and outer pump rotors. If reusing the inner and outer pump rotors, install them with the marks facing upward.
17. Install the pump cover.



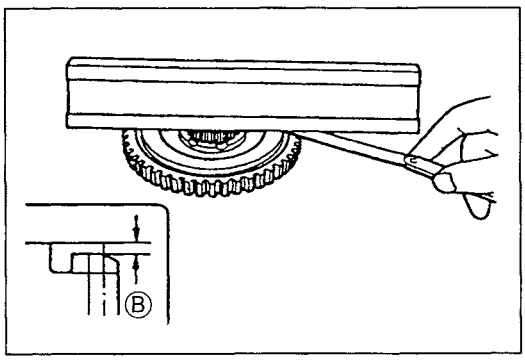
18. Verify that the input gear shaft rotates smoothly. If not, reinstall the pump cover.



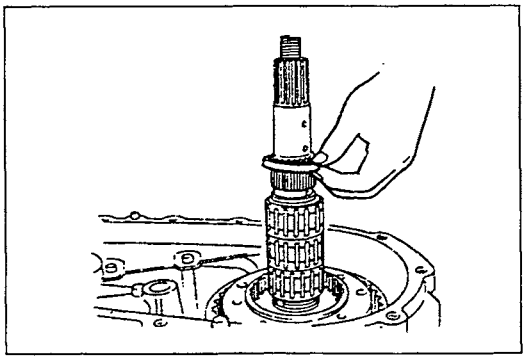
19. Apply oil to the needle bearings, and fit them onto the center differential assembly.
20. Install the center differential assembly into the input shaft.



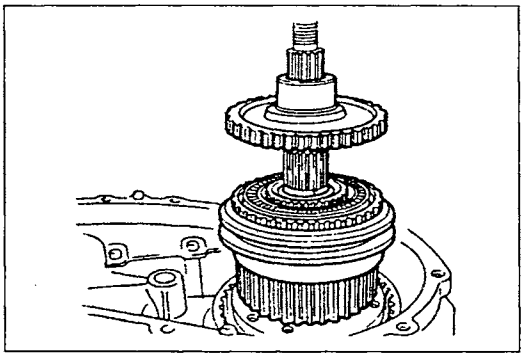
21. Adjust the center differential end play. When measuring A and B, measure 6 times in a crisscross pattern and average the results.
    (1) Set the needle bearing onto the 2–4 clutch hub.
    (2) Measure height A of the 2–4 clutch hub as shown.



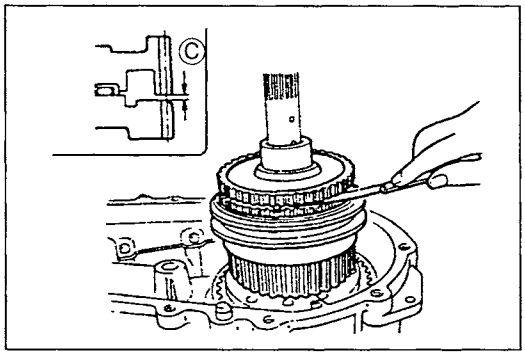
(3) Measure height B of the clutch gear as shown.



(4) Install the needle bearings and the removed thrust washer.



(5) Install the 2–4 clutch hub, needle bearing, and the clutch gear.



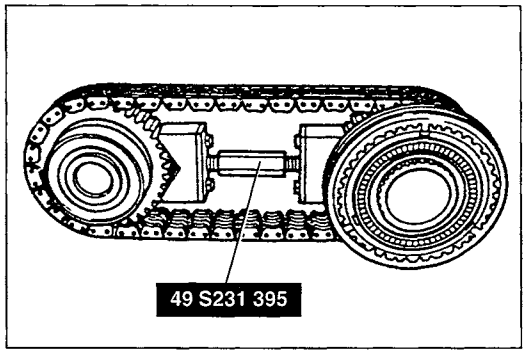
(6) Measure clearance C between the 2–4 clutch hub and clutch gear as shown.
(7) Select the proper thrust washer(s) by using the formula below.

Formula:
Ⓒ—Ⓐ—Ⓑ= 0.1—0.3 mm { 0.004—0.012 in }

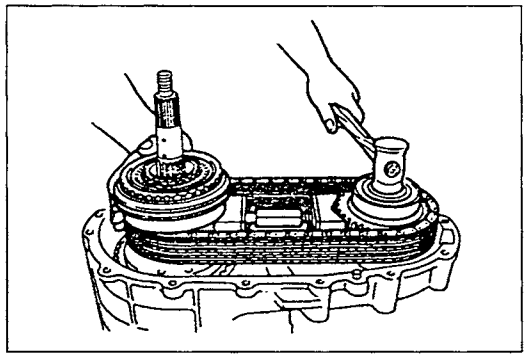
Thrust washer thickness:

mm { in }

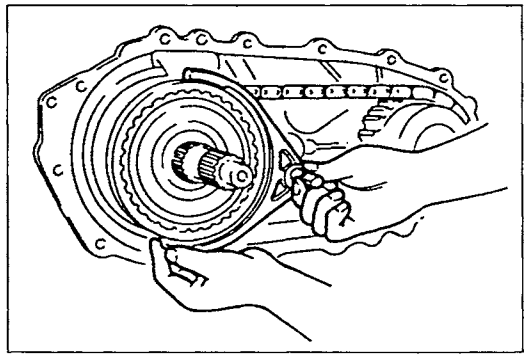
5.4 { 0.213 }	5.6 { 0.220 }	5.8 { 0.228 }
6.0 { 0.236 }	6.2 { 0.244 }	6.4 { 0.252 }
6.6 { 0.260 }	—	—



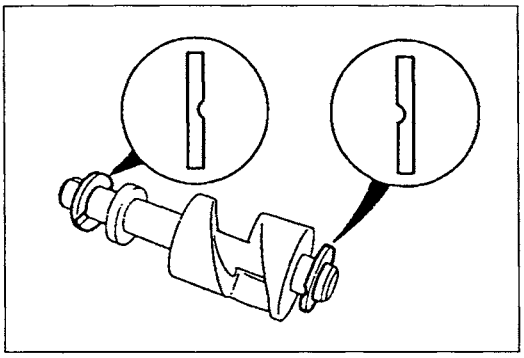
(8) Remove the clutch gear and 2–4 clutch hub.
(9) Install the proper thrust washer(s).
22. Assemble the 2–4 clutch hub assembly, front drive sprocket, and chain.
23. Using the **SST**, expand the chain without overtightening it.



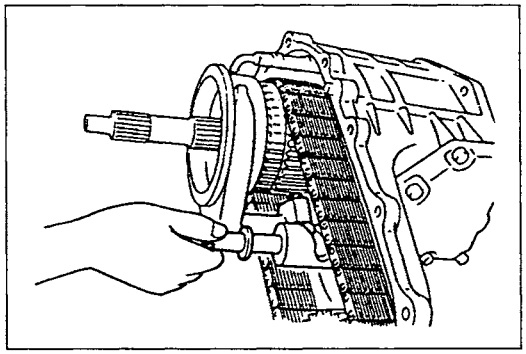
24. Install the drive gear and chain assembly into the transfer case by lightly tapping it with a plastic hammer. Keep the chain horizontal.
25. After installation, verify that the chain rotates smoothly.



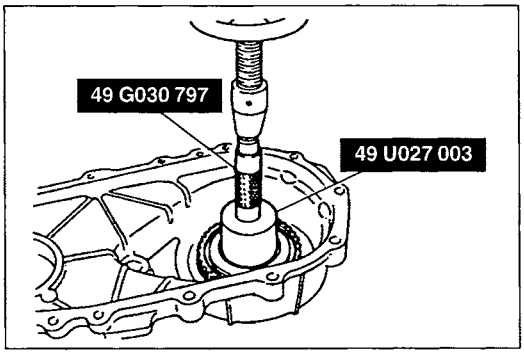
26. Set the 2–4 shift fork onto the 2–4 hub sleeve and hold it.
27. Install the 2–4 shift rod.



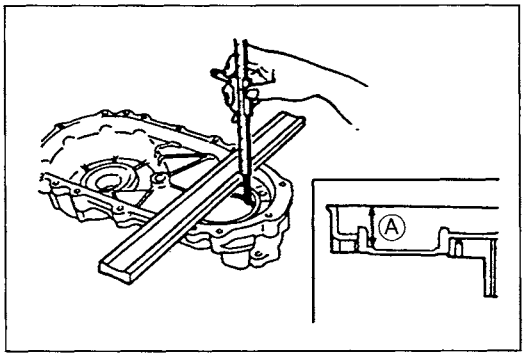
28. Apply oil to the thrust washers and fit them onto the change drum with the grooves inward.



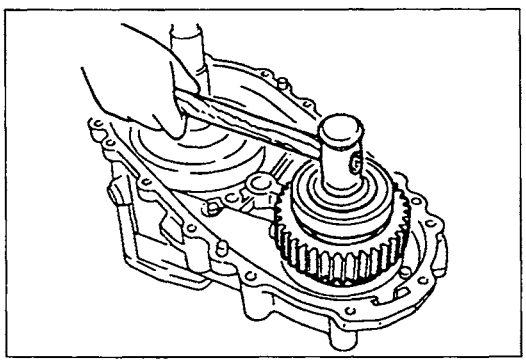
29. Align the change drum groove and cam roller of the 2–4 shift fork, then install the change drum.



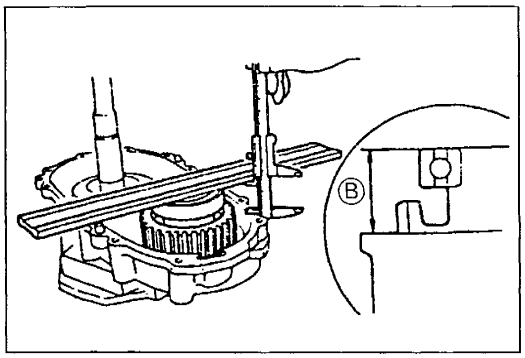
30. Install the clutch gear by using the **SST**.



31. Adjust the front drive sprocket end play. When measuring A and B, measure 6 times in a crisscross pattern and average the results.
    (1) Measure depth Ⓐ of the bearing bore in the rear chain cover.



    (2) Install the front sprocket into the transfer case by lightly tapping it with a plastic hammer.



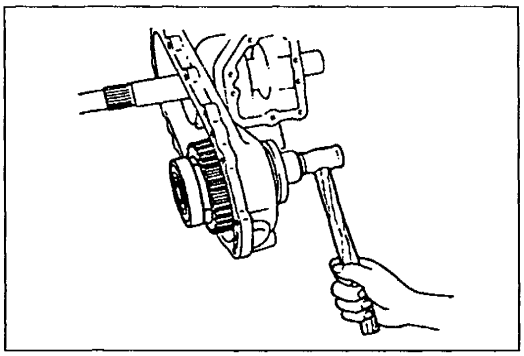
(3) Measure height Ⓑ between the transfer case and front sprocket rear bearing.
(4) Select the proper adjustment shim(s) by using the formula below.

Formula: A—B = 0—0.1 mm { 0—0.004 in }

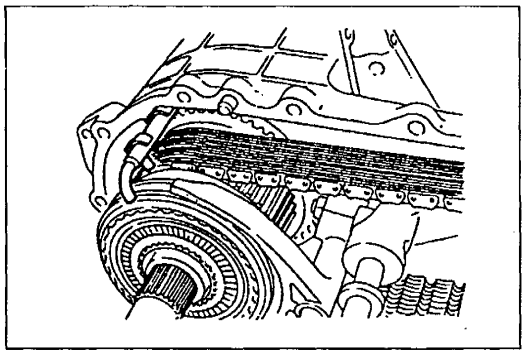
Adjustment shim thickness:

mm { in }

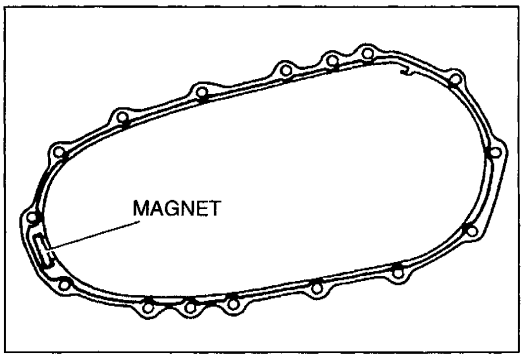
0.5 { 0.020 }	0.6 { 0.024 }	0.7 { 0.028 }
0.8 { 0.031 }	0.9 { 0.035 }	1.0 { 0.039 }
1.1 { 0.043 }	1.2 { 0.047 }	1.3 { 0.051 }
1.4 { 0.055 }	1.5 { 0.059 }	1.6 { 0.063 }



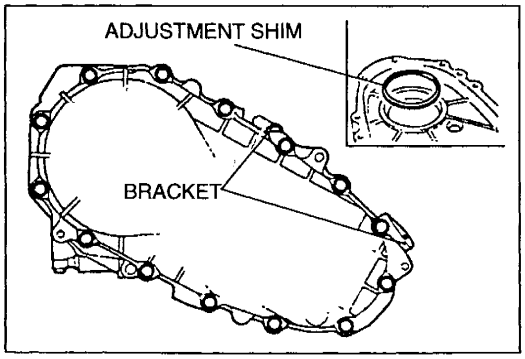
(5) Remove the front sprocket from the transfer case housing by lightly tapping it with a plastic hammer.



32. Apply oil to a new O-ring and fit it onto the rear oil pipe.
33. Install the rear oil pipe.

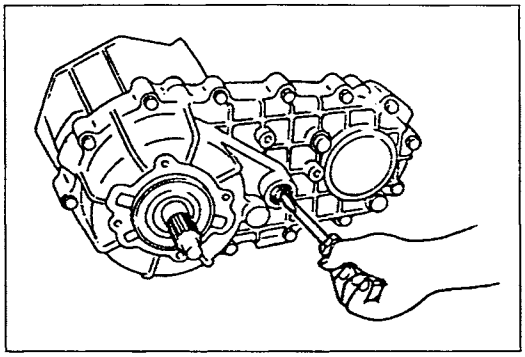


34. Set the magnet into the transfer case housing.
35. Apply sealant to the transfer case housing as shown.

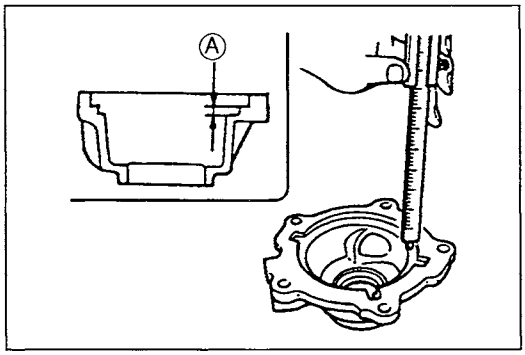


36. Set the adjustment shim(s) selected in step 31 into the rear chain cover.
37. Install the rear chain cover and brackets as shown.

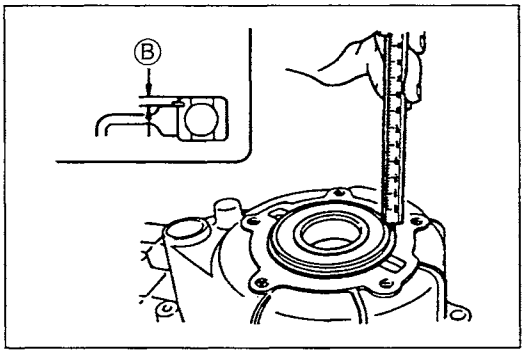
Tightening torque:
32—46 N·m { 3.2—4.7 kgf·m , 24—33 ft·lbf }



38. Verify that the change drum rotates smoothly. If not, reinstall the rear chain cover.



39. Adjust the output shaft end play. When measuring A and B, measure 6 times in a crisscross pattern and average the results.
    (1) Measure depth A of the bearing bore in the rear cover.



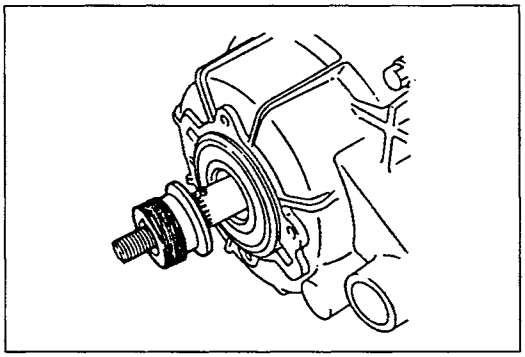
    (2) Measure bearing snap ring height B.
    (3) Select the proper adjustment shim(s) by using the formula below.

Formula: Ⓐ—Ⓑ = 0—0.1 mm { 0—0.004 in }

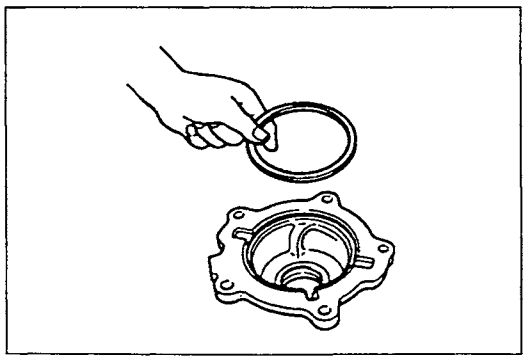
Adjustment shim thickness:

mm { in }

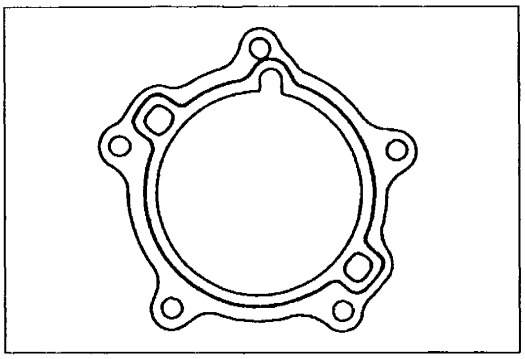
0.5 { 0.020 }	0.6 { 0.024 }	0.7 { 0.028 }
0.8 { 0.031 }	0.9 { 0.035 }	1.0 { 0.039 }



40. Install the key and speedometer drive gear onto the output shaft.

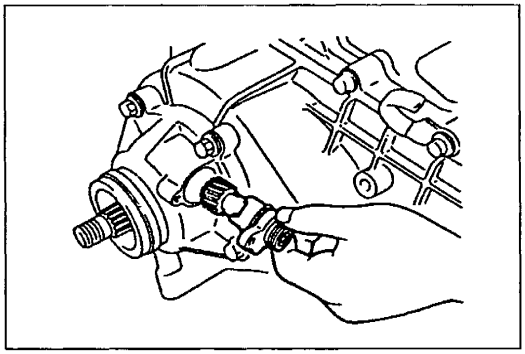


41. Set the adjustment shim(s) selected in step 39 into the rear cover.



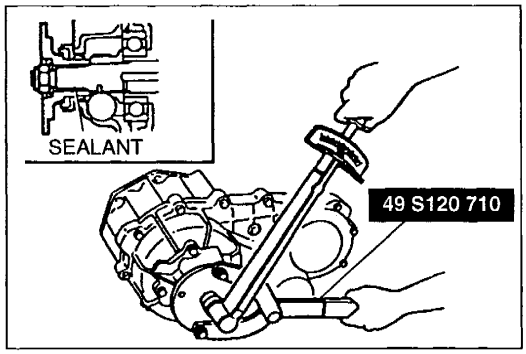
42. Apply sealant to the rear cover as shown.
43. Install the rear cover.

Tightening torque:
37—53 N·m { 3.7—5.5 kgf·m , 27—39 ft·lbf }



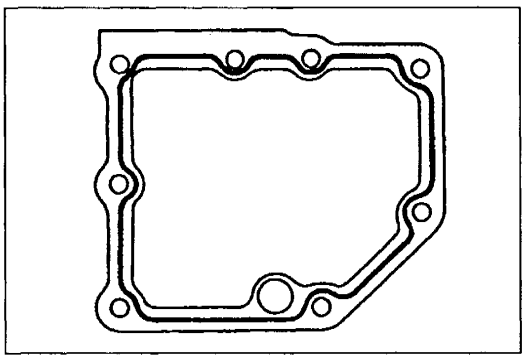
44. Install the speedometer driven gear.

Tightening torque:
7.9—10.7 N·m { 80—110 kgf·cm , 70—95 in·lbf }

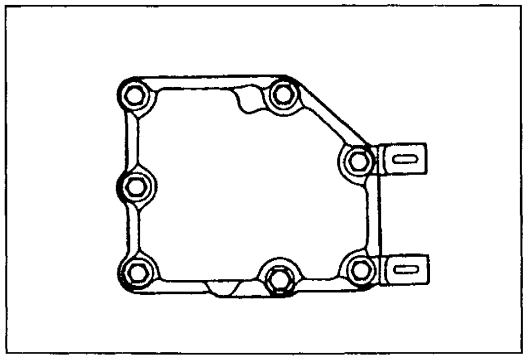


45. Apply sealant to the output shaft splines as shown.
46. Install the companion flange by using the **SST**.

Tightening torque:
128—176 N·m { 13—18 kgf·m , 94—130 ft·lbf }

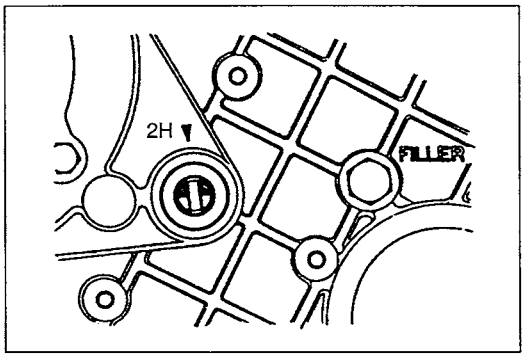


47. Apply sealant to the control cover as shown.

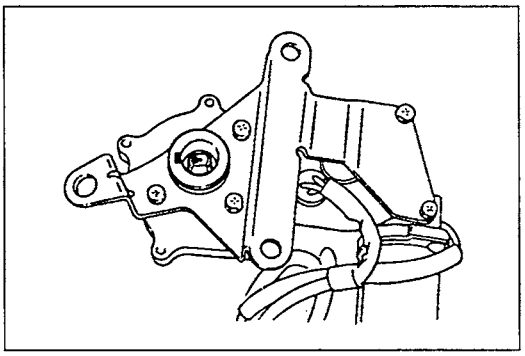


48. Install the control cover and brackets.

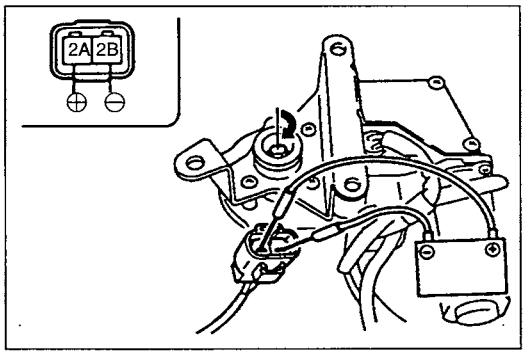
Tightening torque:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }



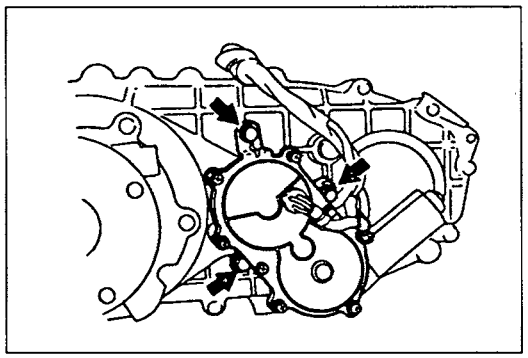
49. Align the mark on the change drum groove with the 2H mark.



50. Check that the marks on the change motor salient and body are aligned.

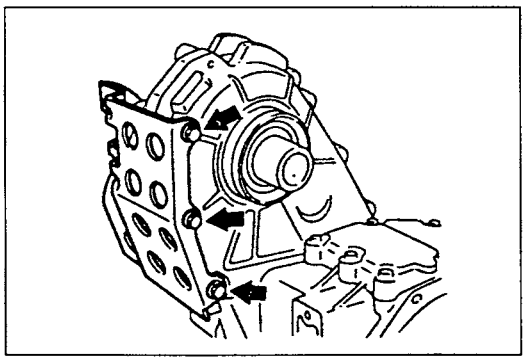


51. If not aligned, turn the shaft by applying 12 V as shown.



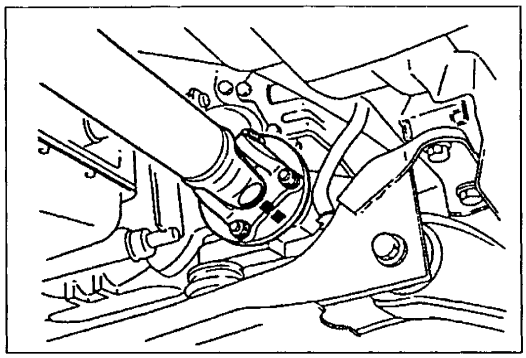
52. Apply oil to a new O-ring and install the change motor.

Tightening torque:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }



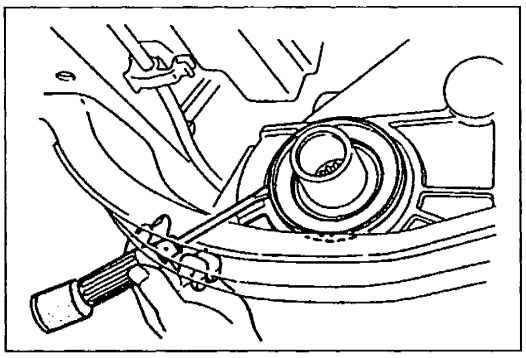
53. Install the protector plate.

Tightening torque:
44—54 N·m { 4.4—5.6 kgf·m , 32—40 ft·lbf }

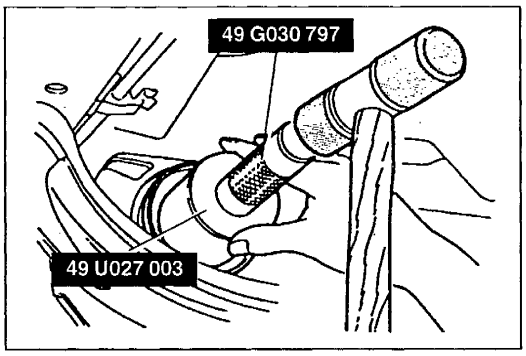


OIL SEAL (FRONT DRIVE SPROCKET)
On-vehicle Replacement

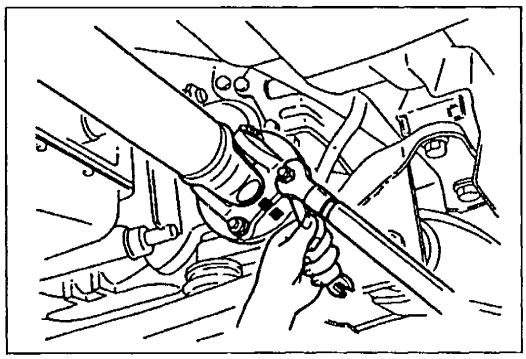
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Mark the flanges for proper reassembly.
3. Remove the front propeller shaft.



4. Remove the oil seal.

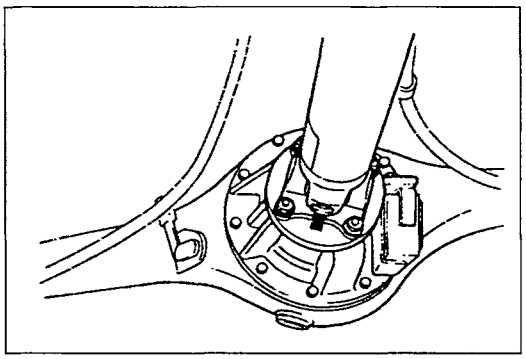


5. Apply oil to the lip of the new oil seal, and install it by using the **SST**.



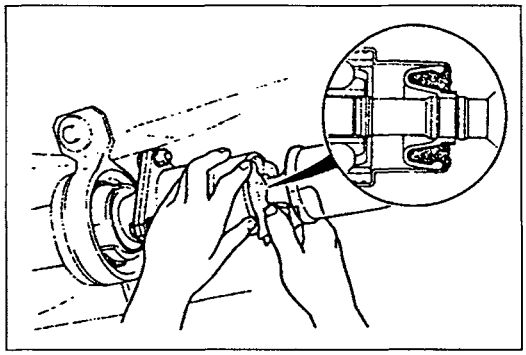
6. Align the marks and install the propeller shaft.

Tightening torque:
50—58 N·m { 5.0—6.0 kgf·m , 37—43 ft·lbf }

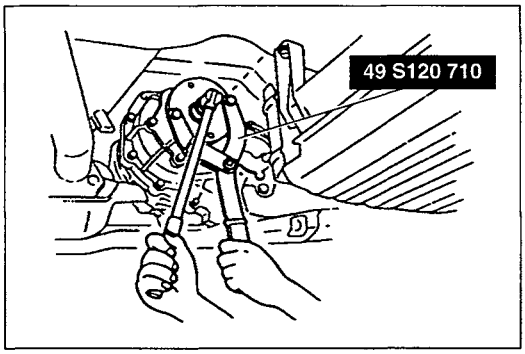


OIL SEAL (REAR COVER)
On-vehicle Replacement

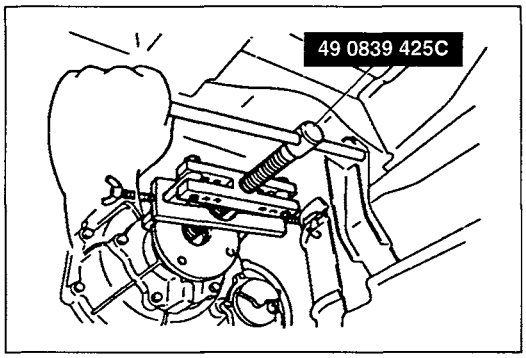
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Mark the flanges for proper reassembly.



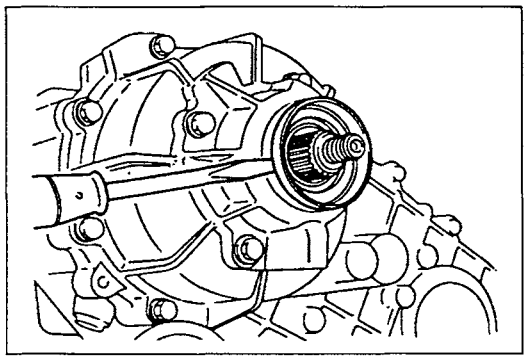
3. Push a rag into the double-offset joint to hold the rear propeller shaft straight to prevent damaging the boot.
4. Remove the rear propeller shaft.



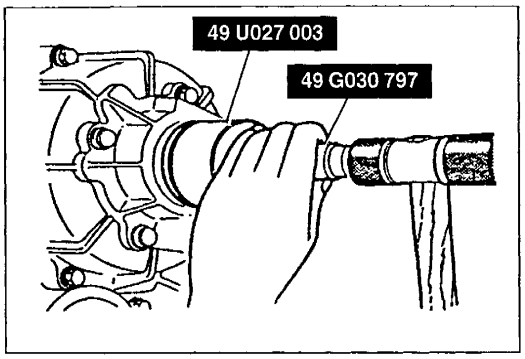
5. Hold the companion flange by using the **SST** and remove the companion flange nut.



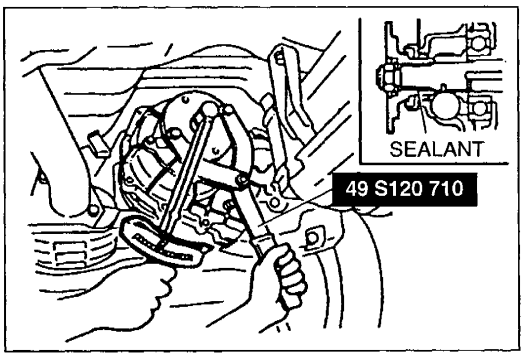
6. Remove the companion flange by using the **SST**. Clean the splines.



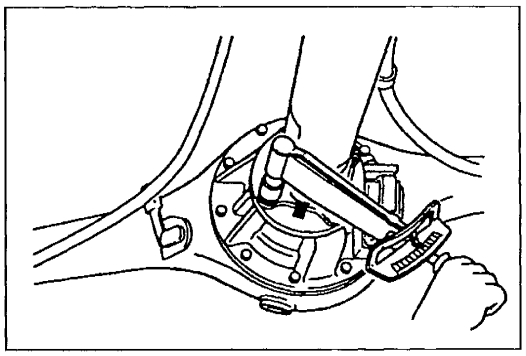
7. Remove the oil seal.



8. Apply oil to the lip of the new oil seal and install it by using the **SST**.

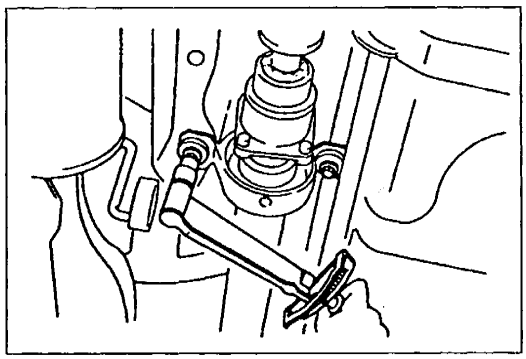


9. Apply sealant to the output shaft and install the companion flange by using the **SST**.



10. Align the marks and install the propeller shaft.

Tightening torque:
50—58 N·m { 5.0—6.0 kgf·m , 37—43 ft·lbf }



11. Install the center bearing support assembly by using the removed bolts and spacers.

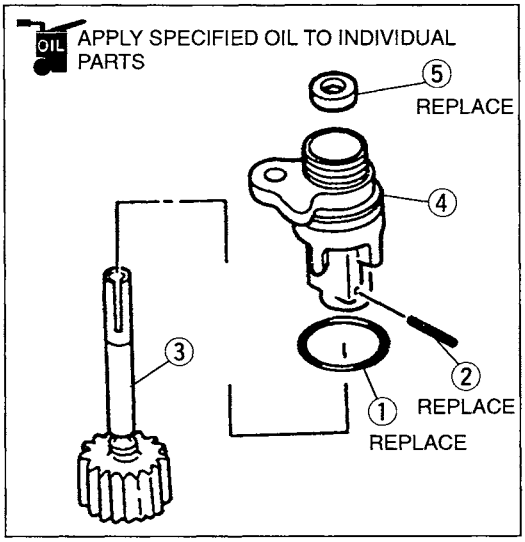
Tightening torque:
37—52 N·m { 3.7—5.4 kgf·m , 27—39 ft·lbf }

12. Remove the rag from the double-offset joint and check the boot for damage.

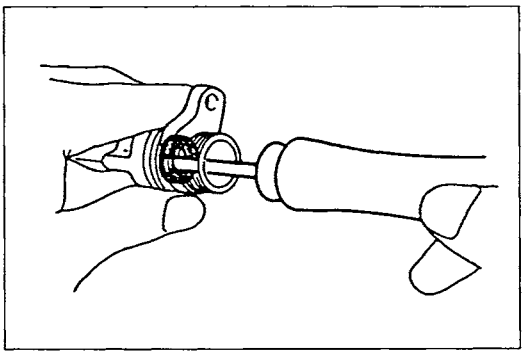
SPEEDOMETER DRIVEN GEAR

Disassembly / Inspection / Assembly

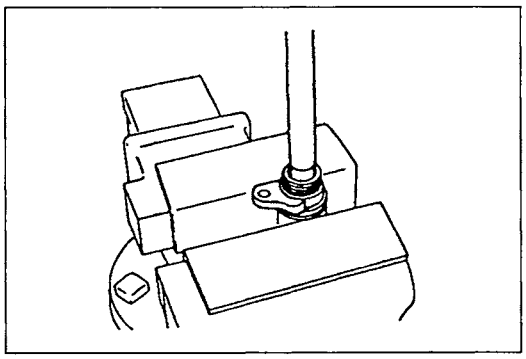
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



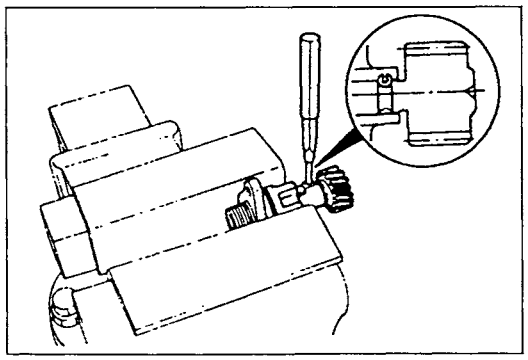
1. O-ring
2. Roll pin
   Assembly Note ..... below
3. Speedometer driven gear
   Inspect for damage, wear, or cracks
4. Speedometer gear sleeve
5. Oil seal
   Inspect for damage of oil seal lip
   Disassembly Note ..... below
   Assembly Note ..... below



Disassembly note
Oil seal
Remove the oil seal.



Assembly note
Oil seal
1. Apply oil to the lip of the new oil seal.
2. Install the oil seal by using a suitable pipe.

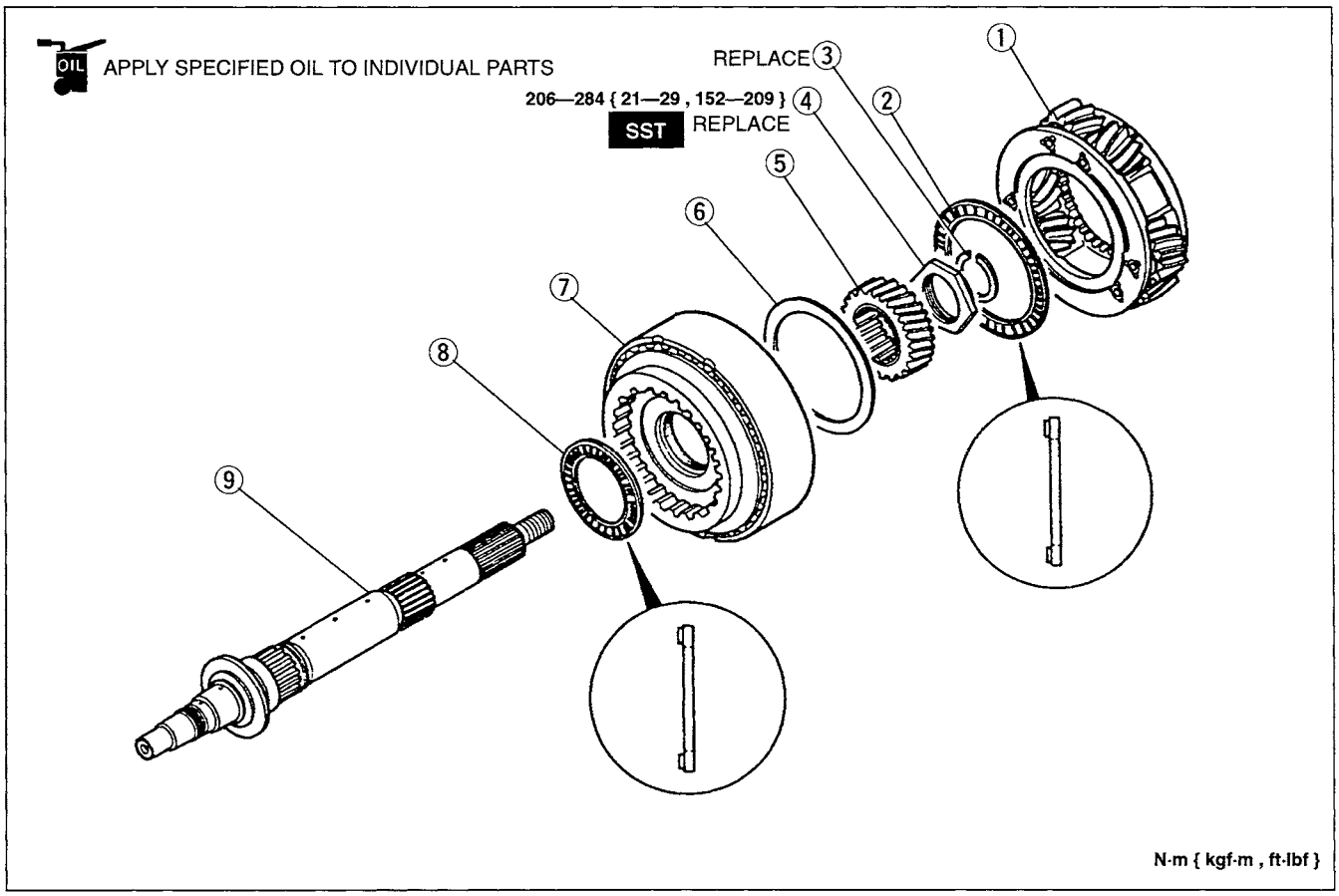


Roll pin
Install the new roll pin with the seam as shown.

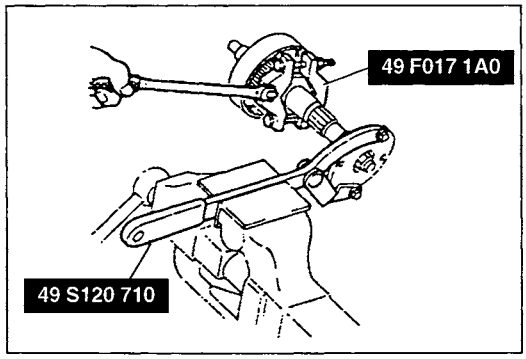
CENTER DIFFERENTIAL AND OUTPUT SHAFT ASSEMBLY

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



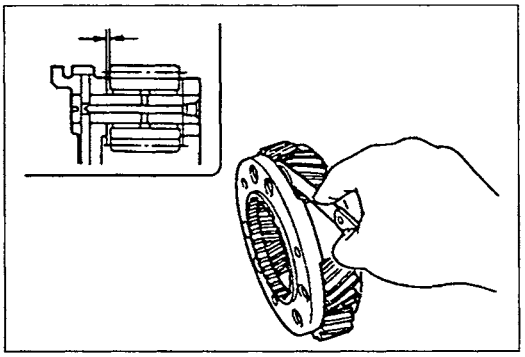
1. Planetary carrier assembly
   Inspection ..... page K2–55
2. Needle bearing
   Inspect for damage and rough rotation
3. Retaining ring
4. Locknut
   Disassembly Note ..... below
   Assembly Note ..... page K2–55
5. Sun gear
   Inspect for damage, wear, and cracks
6. Thrust washer
   Inspect bearing surface for scoring and scratches
7. Ring gear
   Inspect for damage, wear, and cracks
   Inspection ..... page K2–55
8. Needle bearing
   Inspect for damage and rough rotation
9. Rear output shaft
   Inspect for bearing surface scoring and scratches
   Inspection ..... page K2–55



Disassembly note

Locknut

Remove the locknut by using the **SST**.



Inspection

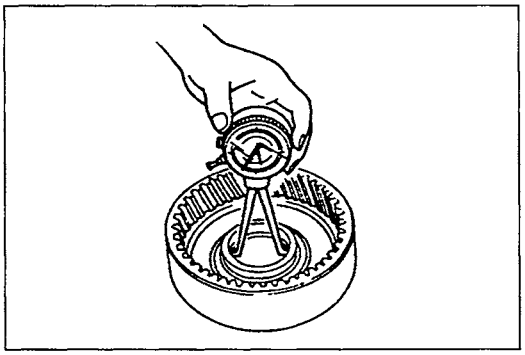
Inspect the following and replace parts as necessary.

Planetary carrier assembly

Measure the clearance between the pinion washer and the planetary pinion carrier all around the edge.

Clearance

Standard: 0.2—0.7 mm { 0.008—0.028 in }
Maximum: 0.8 mm { 0.031 in }

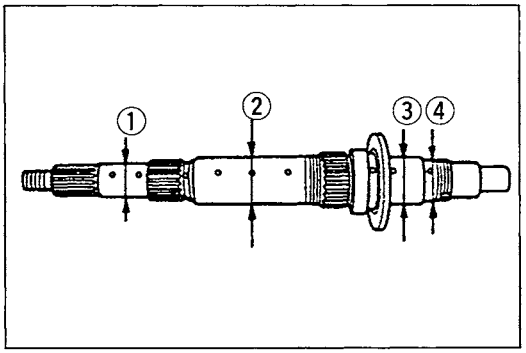


Ring gear

Measure the inner diameter of the bushing. Measure three times and average the results.

Inner diameter

Standard:
54.021—54.055 mm { 2.1268—2.1281 in }
Maximum: 54.100 mm { 2.1299 in }



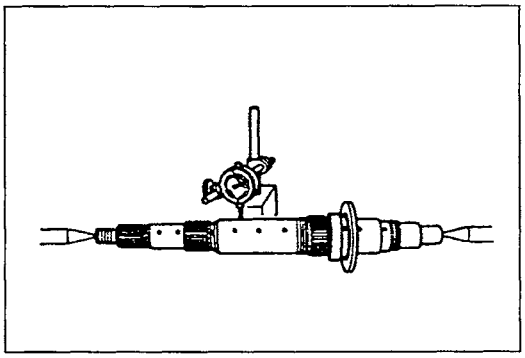
Rear output shaft

1. Measure the outer diameter of the output shaft at the points shown. Measure each point three times and average the results.

Outer diameter

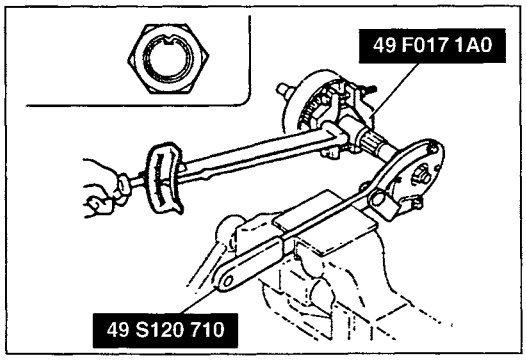
mm { in }

Position	Standard	Minimum
①	29.966—29.979 { 1.1798—1.1803 }	29.960 { 1.1795 }
②	41.975—41.991 { 1.6526—1.6532 }	41.970 { 1.6524 }
③	41.975—41.991 { 1.6526—1.6532 }	41.970 { 1.6524 }
④	35.975—36.000 { 1.4163—1.4173 }	35.970 { 1.4161 }



2. Measure the output shaft runout.

Maximum: 0.030 mm { 0.0012 in }



Assembly note
Locknut

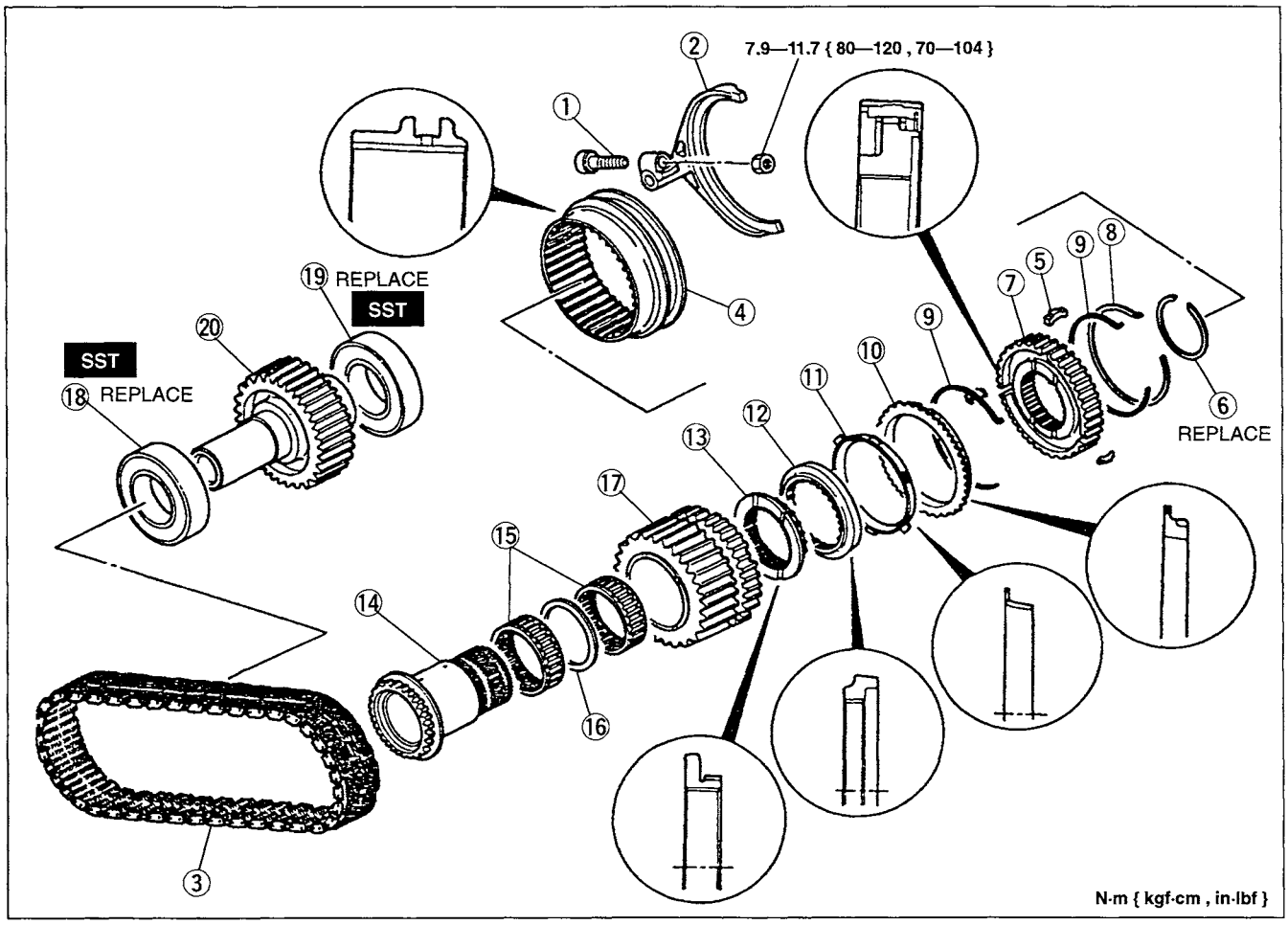
Install a new locknut by using the **SST**. Stake the locknut.

Tightening torque (without SST):
206—284 N·m { 21—29 kgf·m , 152—209 ft·lbf }
Tightening torque (with SST):
187—254 N·m { 19—26 kgf·m , 138—188 ft·lbf }

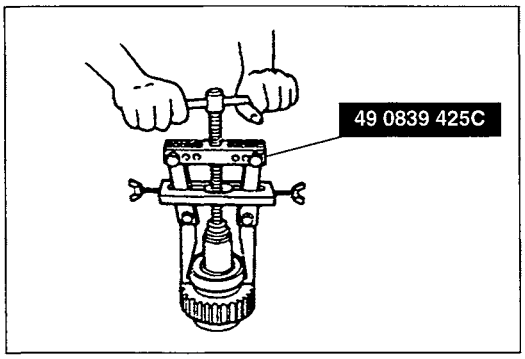
DRIVE GEAR AND CHAIN ASSEMBLY

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



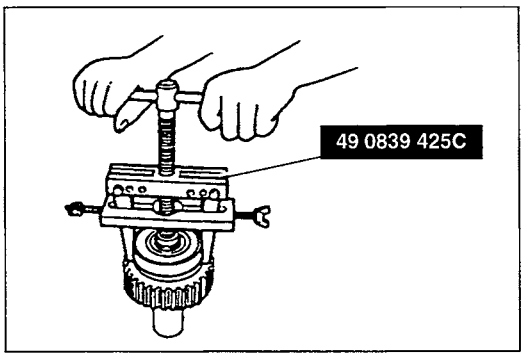
1. Cam roller
   Inspect for damage and rough rotation
   Assembly Note ..... pages K2–59
2. 2–4 shift fork
   Inspection ..... pages K2–57
3. Chain
4. 2–4 hub sleeve
   Inspection ..... pages K2–57, 58
5. Synchronizer keys
   Inspect for damage, wear, and cracks
6. Retaining ring
7. 2–4 clutch hub
   Inspect for damage, wear, and cracks
   Inspection ..... pages K2–58
   Assembly Note ..... pages K2–59
8. Retaining ring
9. Key springs
   Inspect for fatigue and damage
10. Outer cone
    Inspection ..... pages K2–58
11. Double cone
    Inspection ..... pages K2–58
12. Inner cone
    Inspect for damage, wear, and cracks
    Inspection ..... page K2–58
13. Inner cone hub
    Inspect for damage, wear, and cracks
14. Spacer
    Inspect splines for damage, wear, and cracks
    Inspection ..... page K2–58
15. Needle bearings
    Inspect for damage and rough rotation
16. Spacer
17. Drive sprocket
    Inspection ..... page K2–58
18. Bearing (front)
    Inspect for sticking and rough rotation
    Disassembly Note ..... page K2–57
    Assembly Note ..... page K2–59
19. Bearing (rear)
    Inspect for sticking and rough rotation
    Disassembly Note ..... page K2–57
    Assembly Note ..... page K2–59
20. Front drive sprocket
    Inspect for damage, wear, and cracks



Disassembly note
Bearing (front)

Note
- The bearing does not need to be removed unless it is being replaced.

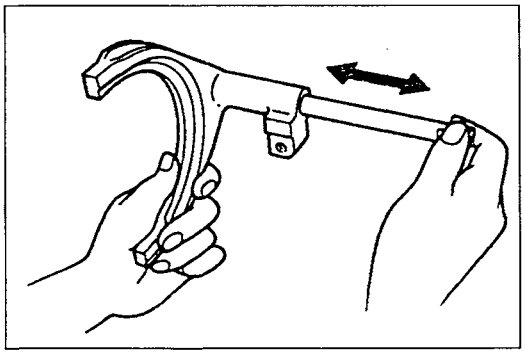
Remove the bearing by using the **SST**.



Bearing (rear)

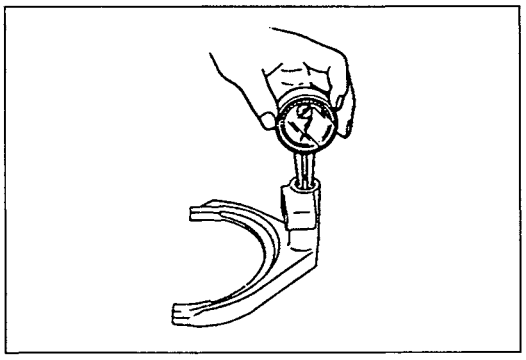
Note
- The bearing does not need to be removed unless it is being replaced.

Remove the bearing by using the **SST**.



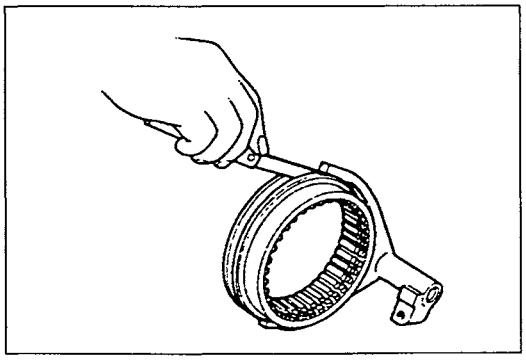
Inspection
Inspect the following and replace parts as necessary.

2–4 shift fork
1. Assemble the 2–4 shift fork and rod. Verify that the shift fork moves smoothly on the rod.



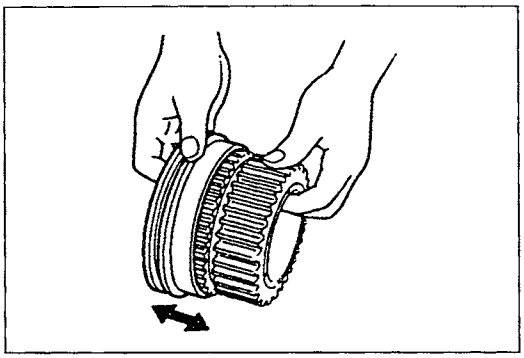
2. Measure the inner diameter of the bushing. Measure three times and average the results.

Inner diameter
Standard:
14.025—14.096 mm { 0.5522—0.5550 in }
Maximum: 14.100 mm { 0.5551 in }



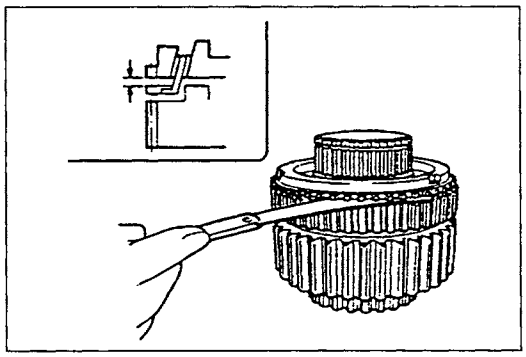
2–4 shift fork and 2–4 hub sleeve
Measure the clearance between the 2–4 shift fork and hub sleeve. Measure the clearance three times and average the results.

Clearance
Standard: 0.10—0.57 mm { 0.004—0.022 in }
Maximum: 0.80 mm { 0.031 in }



2–4 hub sleeve and 2–4 clutch hub

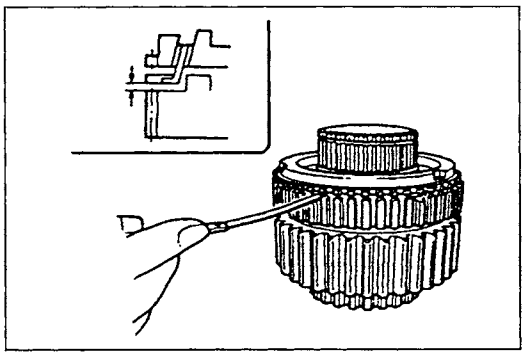
Check for smooth operation of the 2–4 hub sleeve and clutch hub.



Outer cone, double cone, and inner cone

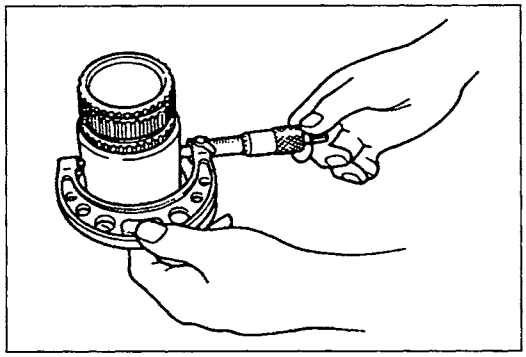
1. Set the outer cone, double cone, and inner cone squarely onto the drive sprocket.

Clearance
Standard: 0.72—1.59 mm { 0.028—0.063 in }
Minimum: 0.70 mm { 0.028 in }



2. Measure the clearance between the outer cone and the drive sprocket. Measure the clearance all around the edge.

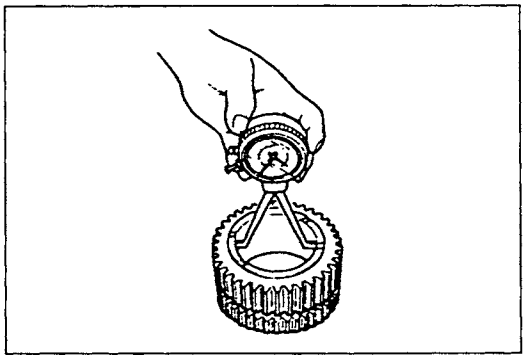
Clearance
Standard: 0.72—1.39 mm { 0.028—0.055 in }
Minimum: 0.70 mm { 0.028 in }



Spacer

Measure the outer diameter of the spacer. Measure three times and average the results.

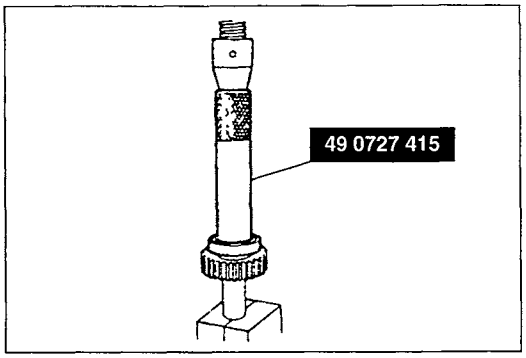
Outer diameter
Standard:
69.971—69.990 mm { 2.7548—2.7555 in }
Minimum: 69.970 mm { 2.7547 in }



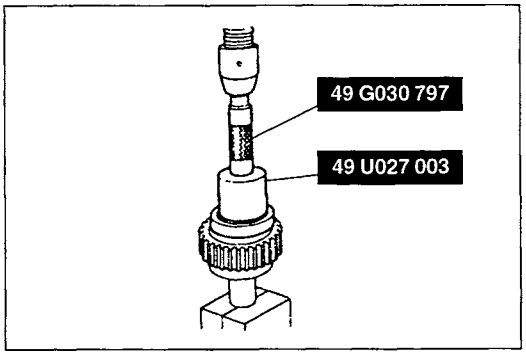
Drive sprocket

Measure the inner diameter of the drive sprocket. Measure three times and average the results.

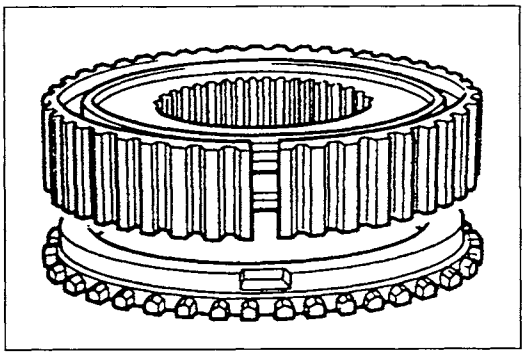
Inner diameter
Standard:
78.010—78.029 mm { 3.0713—3.0720 in }
Maximum: 78.030 mm { 3.0720 in }



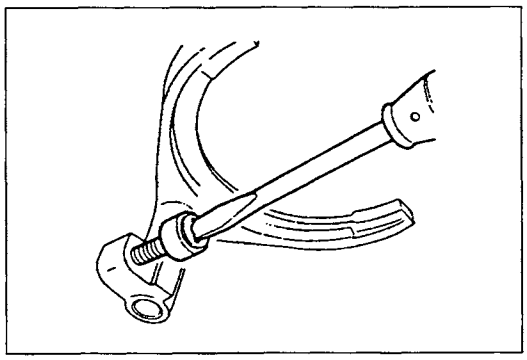
Assembly note
Bearing (rear)
Install the new bearing by using the **SST**.



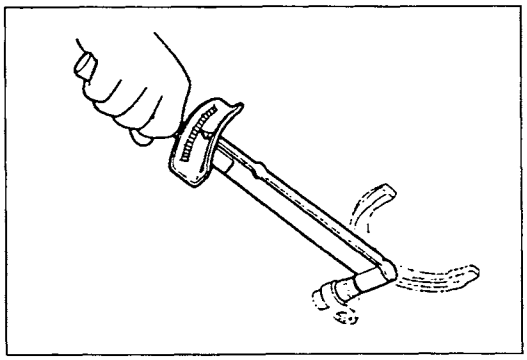
Bearing (front)
Install the new bearing by using the **SST**.



2–4 clutch hub
Align the outer cone grooves with the key grooves of the 2–4 clutch hub before assembly.



Cam roller
1. Mount the cam roller onto the 2–4 shift fork.



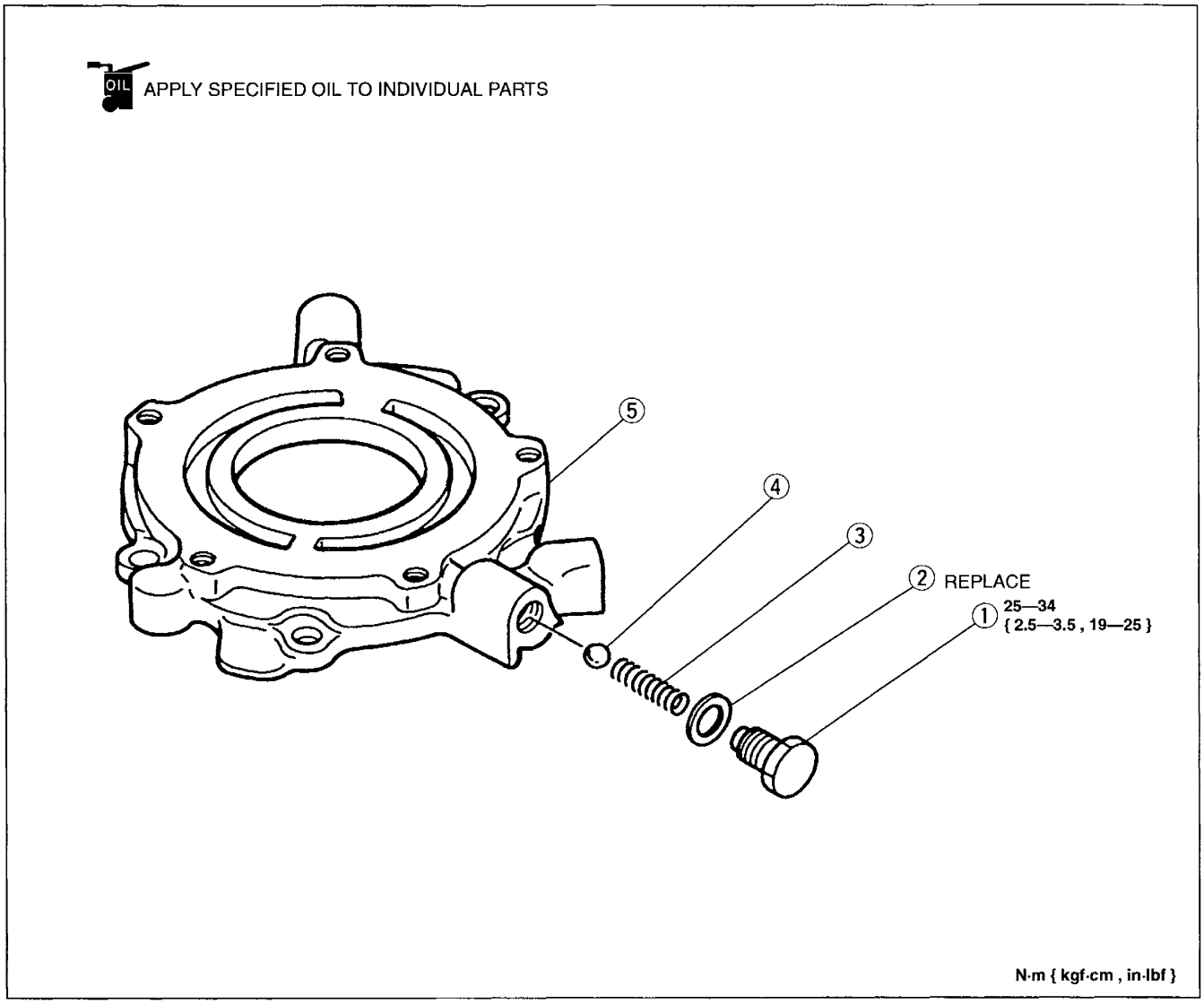
2. Tighten the locknut.

Tightening torque:
7.9—11.7 N·m { 80—120 kgf·cm , 70—104 in·lbf }

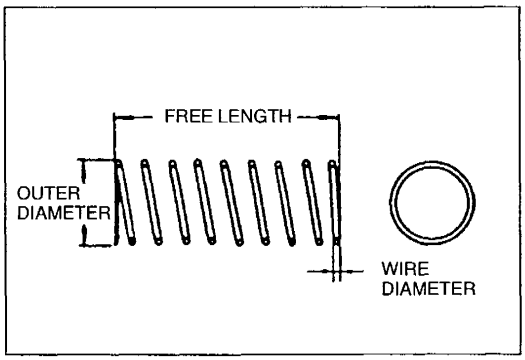
PUMP HOUSING

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly.



1. Spring cap
2. Gasket
3. Pressure spring
   Inspection ..... below
4. Steel ball
5. Pump housing



Inspection

Pressure spring

1. Measure the spring dimensions.

Specifications

Outer dia. mm { in }	Free length mm { in }	No. of coils	Wire dia. mm { in }
6.1 { 0.240 }	20.0 { 0.787 }	17.0	0.6 { 0.024 }

2. If not within the specification, replace the return spring.

PROPELLER SHAFT

OUTLINE

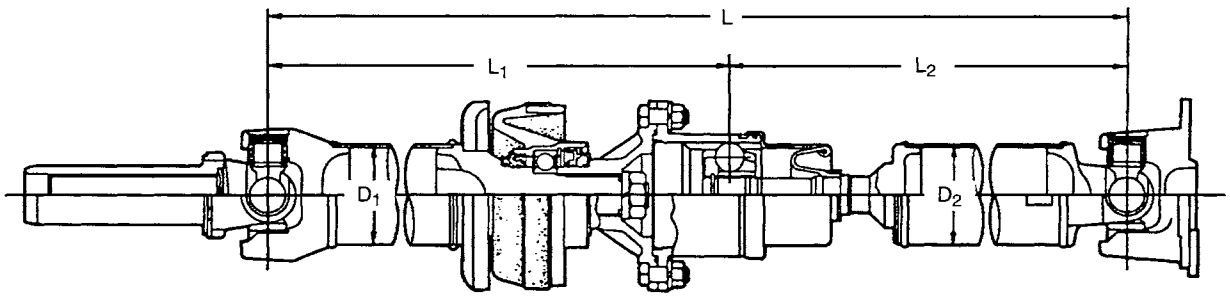
SPECIFICATIONS
(2WD)

Item		Engine	JE
Length	mm { in }	L	1474.3 { 58.04 }
		L1	718.3 { 28.28 }
		L2	756 { 29.76 }
Outer diameter	mm { in }	D1	65 { 2.56 }
		D2	65 { 2.56 }

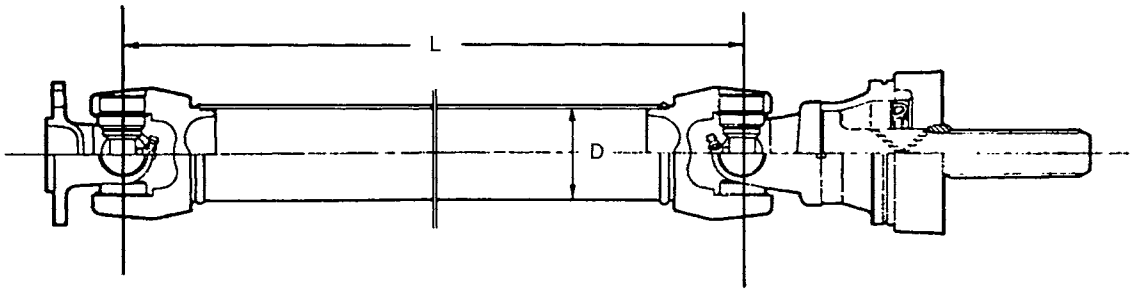
(4WD)

Item		Engine	JE
Front propeller shaft			
Length	mm { in }	L	510 { 20.08 }
Outer diameter	mm { in }	D	57 { 2.24 }
Rear propeller shaft			
Length	mm { in }	L	1271.3 { 50.05 }
		L1	515.3 { 20.29 }
		L2	756 { 29.76 }
Outer diameter	mm { in }	D1	65 { 2.56 }
		D2	65 { 2.56 }

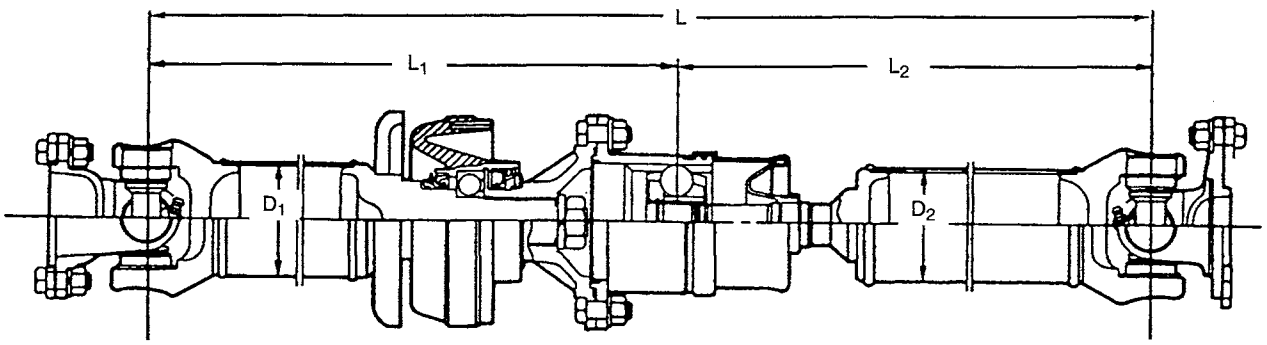
PROPELLER SHAFT (2WD)



FRONT PROPELLER SHAFT (4WD)



REAR PROPELLER SHAFT (4WD)



TROUBLESHOOTING GUIDE

(2WD)

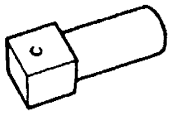
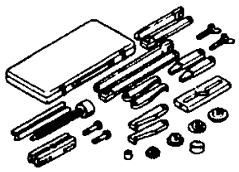
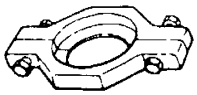
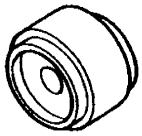
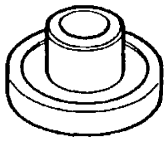
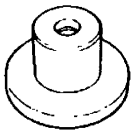
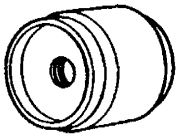
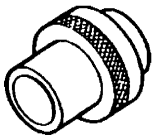
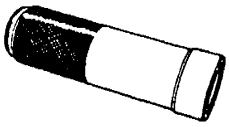
Problem	Possible Cause	Remedy	Page
Vibration	Worn universal joint	Replace	L–8
	Bent propeller shaft	Replace	L–8
	Worn slip yoke splines	Replace	L–8
	Runout of propeller shaft	Replace	L–8
	Imbalanced propeller shaft	Replace	L–8
	Incorrect propeller shaft alignment angle	Adjust	L–7
Abnormal noise	Worn or damaged universal joint	Replace	L–8
	Worn slip yoke splines	Replace	L–8
	Worn bearing	Replace	L–8
	Incorrect propeller shaft alignment angle	Adjust	L–7

(4WD)

Problem	Possible Cause	Remedy	Page
Vibration	Runout of propeller shaft	Replace	L–14, 17
	Imbalanced propeller shaft	Replace	L–14, 17
	Bent propeller shaft	Replace	L–14, 17
	Loose center support mounting bolts	Tighten	L–17
	Loose yoke mounting nut	Tighten	L–14, 17
	Worn slip yoke splines	Replace	L–14
	Incorrect rear propeller shaft alignment angle	Adjust	L–19
Abnormal noise	Worn or damaged universal joint bearing	Replace	L–14, 20
	Worn or damaged center support or bearing	Replace	L–20
	Worn slip yoke splines	Replace	L–14
	Incorrect rear propeller shaft alignment angle	Adjust	L–19

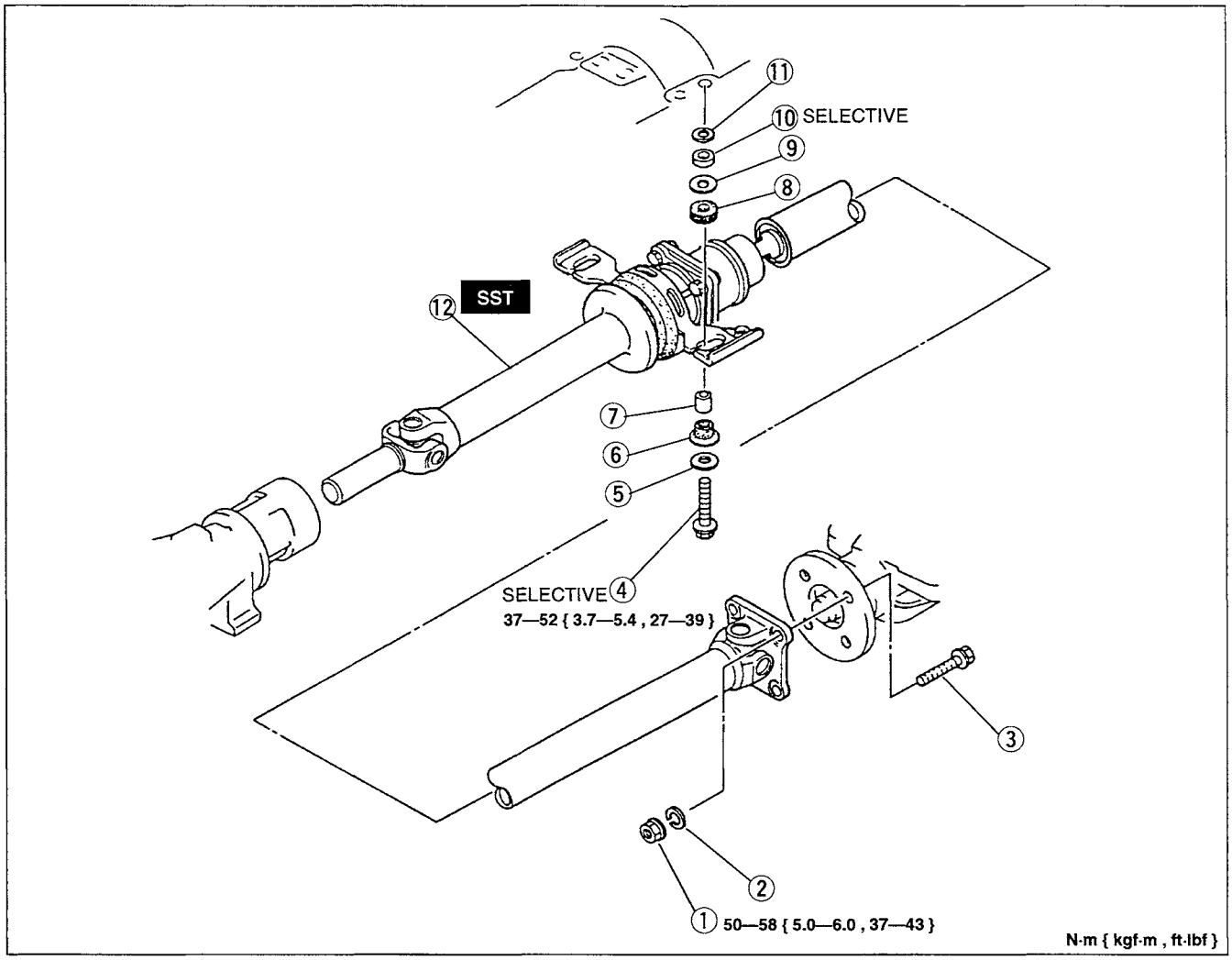
PROPELLER SHAFT (2WD)

PREPARATION
SST

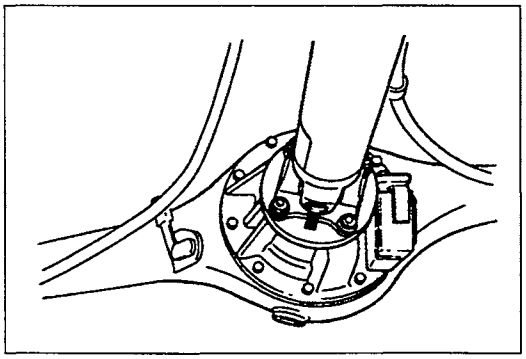
49 S120 440 Holder, main shaft 	For prevention of oil leakage	49 0839 425C Puller set, bearing 	For removal of center bearing support
49 0636 145 Puller, fan pulley boss 	For removal of center bearing support	49 B025 0A0 Installer, dust seal 	For removal / installation of bearing
49 B025 001 Body (Part of 49 B025 0A0) 	For removal / installation of bearing	49 H025 001 Installer, bearing 	For installation of oil seal
49 F026 102 Installer, bearing 	For removal of bearing	49 H025 002 Installer, dust seal 	For installation of oil seal
49 H025 004 Installer, bearing 	For installation of center bearing support	49 F401 331 Body 	For installation of center bearing support

REMOVAL / INSTALLATION

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal, referring to **Installation Note**.



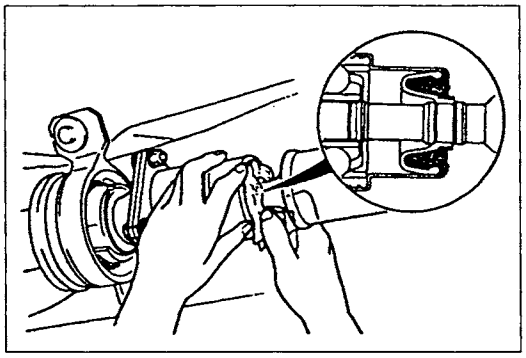
1. Nut
   Removal Note ..... below
2. Lock washer
3. Bolt
4. Bolt
5. Washer
6. Bushing
7. Spacer
8. Bushing
9. Washer
10. Spacer
11. Washer
12. Propeller shaft
    Removal Note ..... page L–6
    Installation Note ..... page L–6
    Check for oil leakage



Removal Note

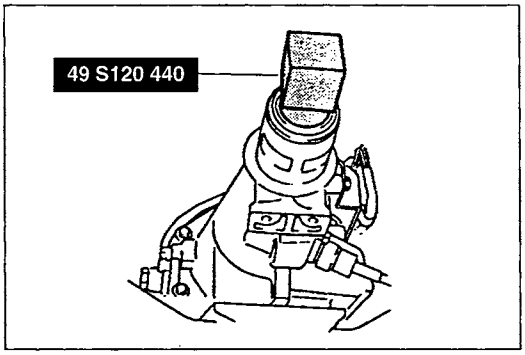
Nut

1. Mark the flanges for correct reassembly.
2. Remove the nuts.

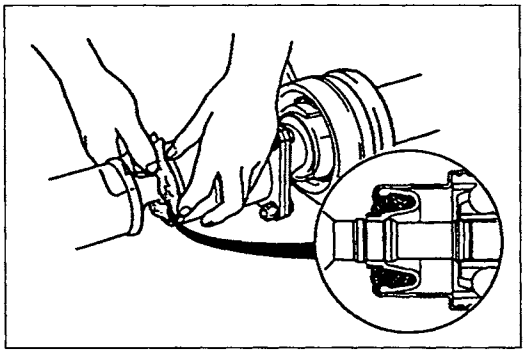


Propeller shaft

1. Push a rag into the double-offset joint to hold the propeller shaft straight and to prevent damage to the boot.



2. When the propeller shaft is removed from the extension housing, immediately install the **SST** into the extension housing to prevent oil leakage.

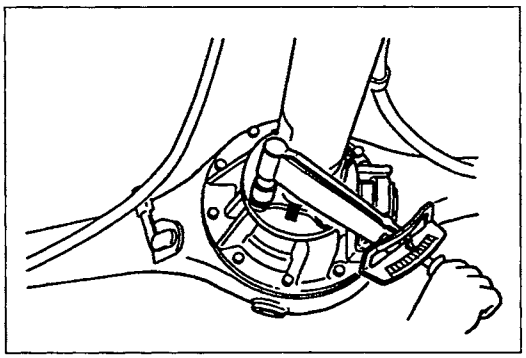


Installation Note
Propeller shaft

1. Push a rag into the double-offset joint to prevent damage to the boot.

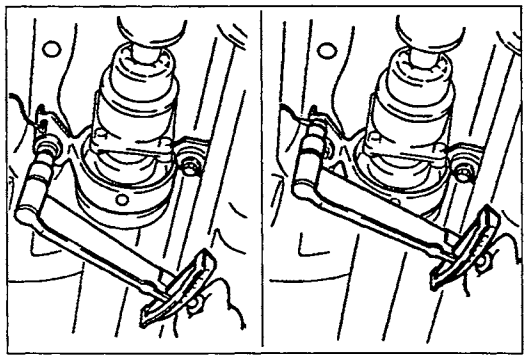
Note

- New propeller shafts are equipped with an insulator to prevent damage to the boot.



2. Align the marks and install the propeller shaft.

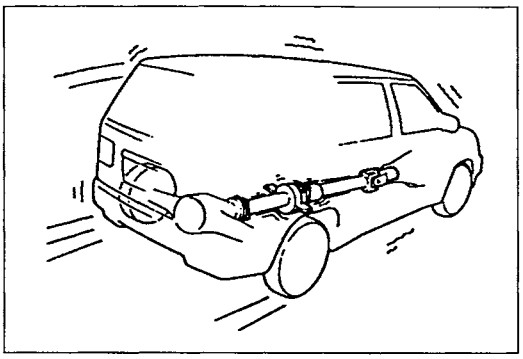
Tightening torque:
50—58 N·m { 5.0—6.0 kgf·m , 37—43 ft·lbf }



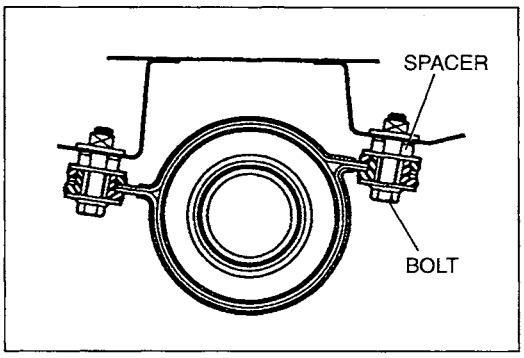
3. Install the center bearing support assembly by using the removed bolts and spacers.

Tightening torque:
37—52 N·m { 3.7—5.4 kgf·m , 27—39 ft·lbf }

4. Remove the rag or insulator from the double-offset joint, and check the boot for damage.



5. Verify that there is no abnormal noise or vibration when driving the vehicle.

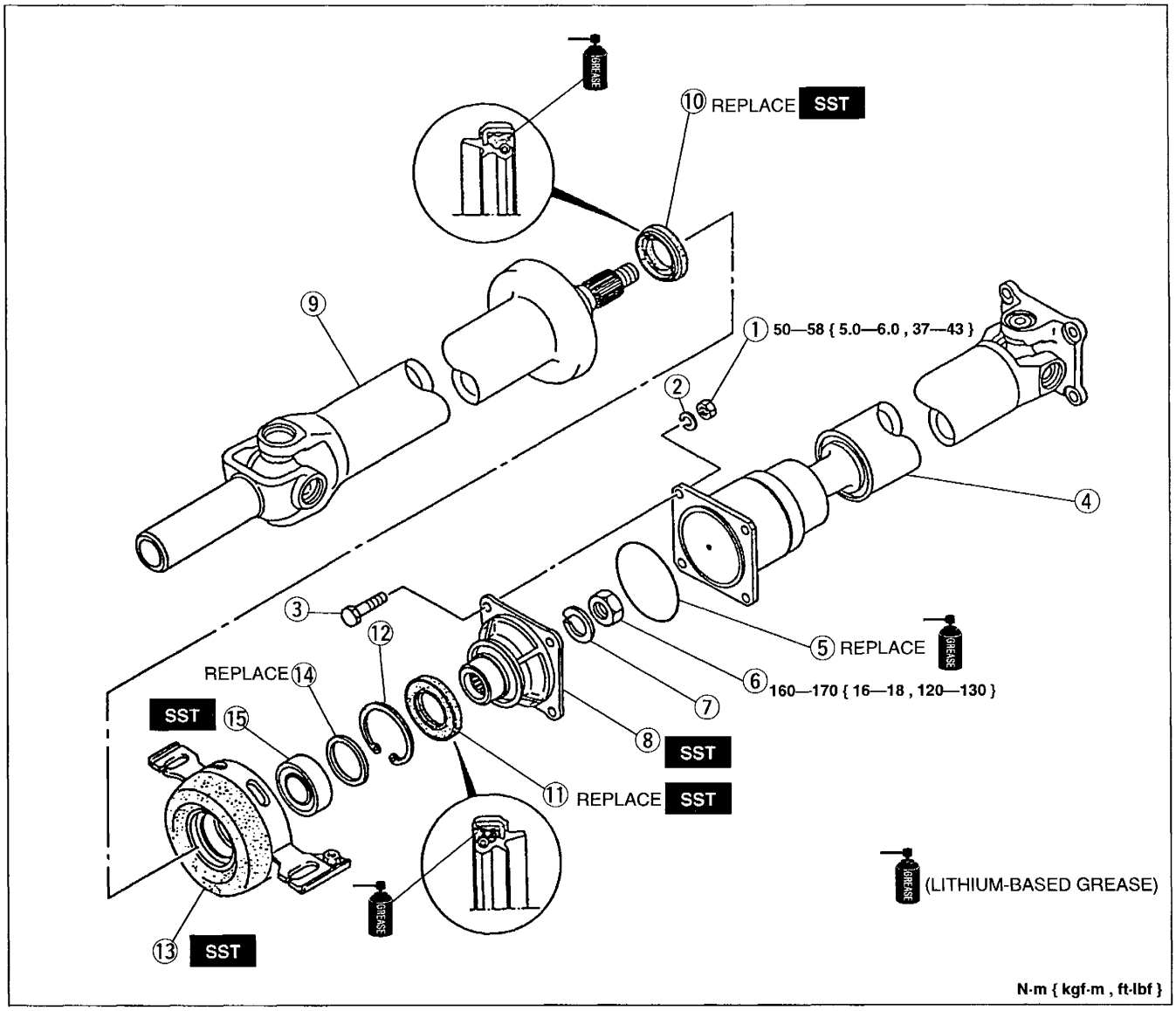


6. If noise or vibration seems to be the result of incorrect propeller shaft alignment angle, replace the bolts and spacers at the center bearing support with new ones. Bolts and spacers used on one side must have the same dimensions as those used on the other side.

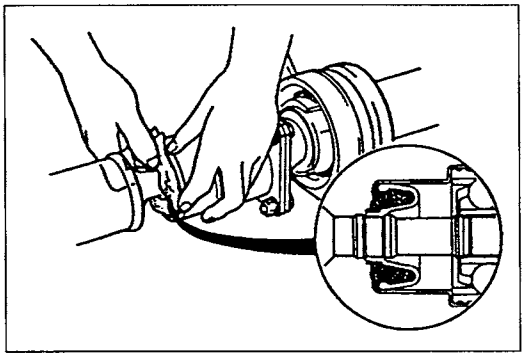
Bolt size mm { in }	Spacer size mm { in }
M10×40 { 1.59 }	3.2 { 0.13 }
M10×40 { 1.59 }	4.5 { 0.18 }
M10×45 { 1.77 }	6.0 { 0.24 }
M10×45 { 1.77 }	8.0 { 0.31 }
M10×50 { 1.97 }	10.0 { 0.39 }
M10×50 { 1.97 }	13.0 { 0.51 }
M10×50 { 1.97 }	16.0 { 0.63 }

OVERHAUL

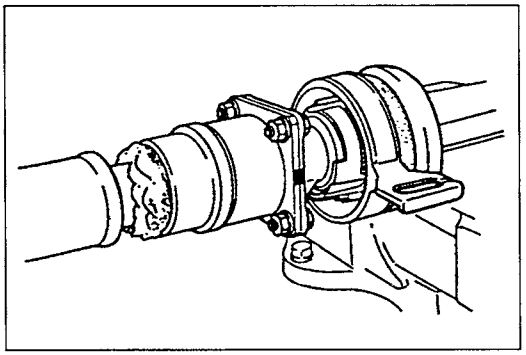
1. Remove all mud, dirt, and other foreign particles from the propeller shaft.
2. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
3. Inspect all parts and repair or replace as necessary.
4. Verify that all parts are completely free of dirt, dust, and other small particles.
5. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



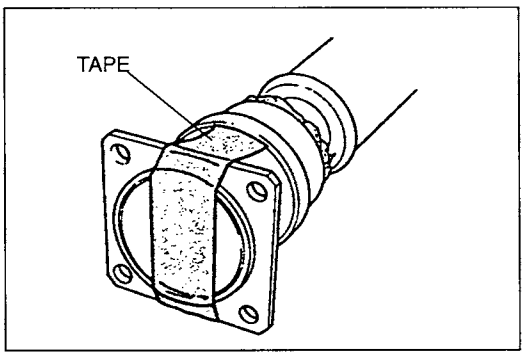
1. Nut
2. Lock washer
3. Bolt
4. Rear propeller shaft
   - Disassembly Note ..... page L– 9
   - Inspection ..... page L–10
   - Assembly Note ..... page L–12
5. O-ring
6. Flange nut
   - Disassembly Note ..... page L– 9
   - Assembly Note ..... page L–12
7. Lock washer
8. Center companion flange
   - Disassembly Note ..... page L– 9
9. Front propeller shaft
   - Inspection ..... page L–10
10. Front dust seal
    - Assembly Note ..... page L–11
11. Rear dust seal
    - Assembly Note ..... page L–11
12. Snap ring
13. Center bearing support assembly
    - Disassembly Note ..... page L–10
    - Assembly Note ..... page L–12
14. Spacer
15. Bearing
    - Disassembly Note ..... page L–10
    - Inspection ..... page L–11
    - Assembly Note ..... page L–11



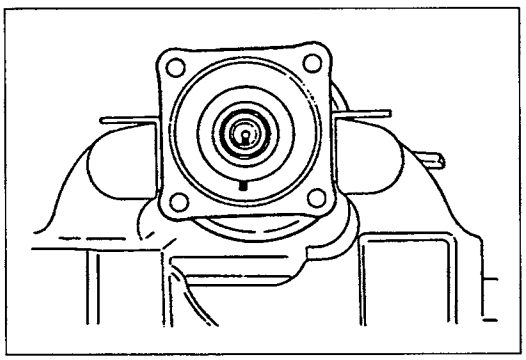
Disassembly Note
Rear propeller shaft
1. Push a rag into the double-offset joint to prevent damage to the boot.



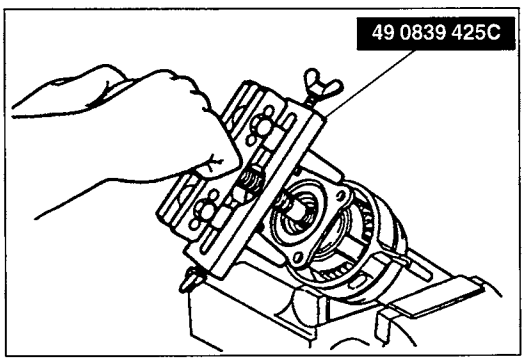
2. Mark the center companion flange and the yoke for proper reassembly.
3. Place the front propeller shaft in a vise and separate the front and rear shaft.



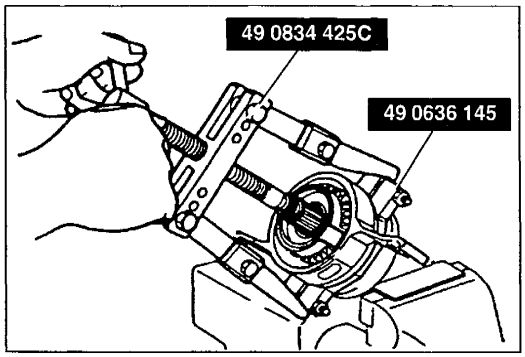
4. After removing the rear propeller shaft, clean the yoke surface, then seal the vent hole with tape.



Flange nut
1. Mark the flange and shaft for proper reassembly.
2. Place the center companion flange in a vise.
3. Remove the flange nut and lock washer.

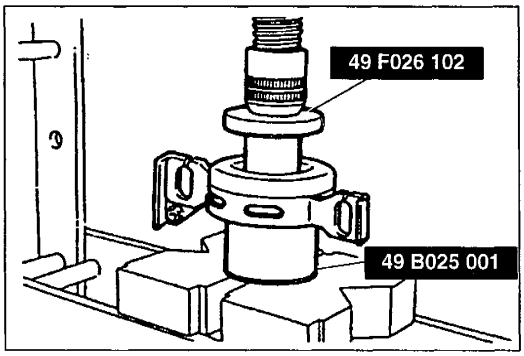


Center companion flange
1. Place the front propeller shaft in a vise.
2. Remove the center companion flange by using the **SST**.



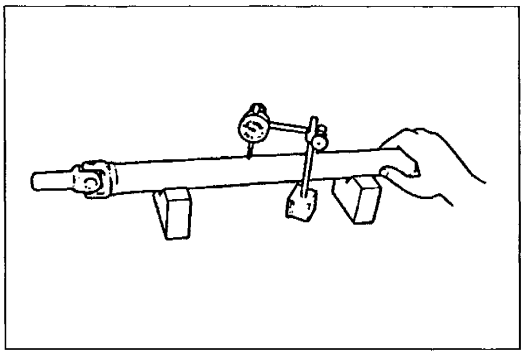
Center bearing support assembly

Remove the center bearing support assembly by using the **SSTs**.



Bearing

Press the bearing from the support assembly toward the rear side by using the **SSTs**.

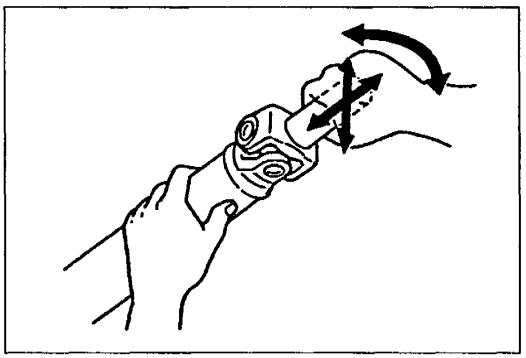


Inspection

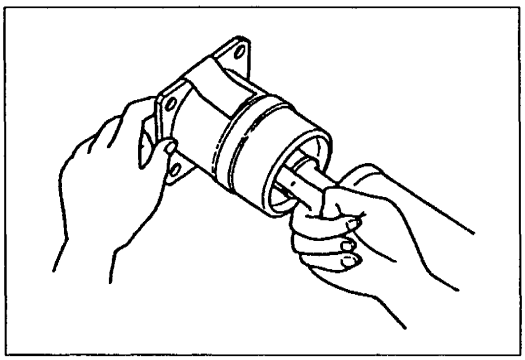
Front and rear propeller shaft

1. Measure the front and rear propeller shaft runout by using a dial indicator.
   Replace the front and rear propeller shaft assembly if runout is excessive.

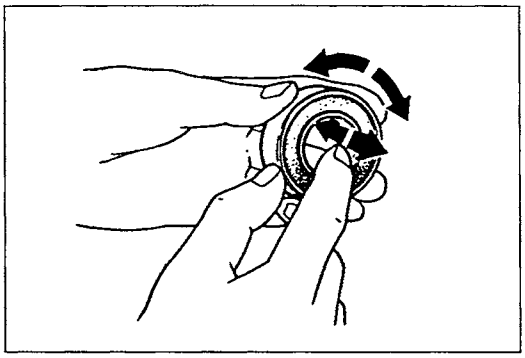
   Maximum runout: 0.4 mm { 0.016 in }



2. Move the universal joints in the direction shown and check for universal joint play.
   If there is play, replace the front and rear propeller shaft assembly.
3. Check the operation of the universal joint.
   If the universal joint has excessive resistance, replace the front and rear propeller shaft assembly.



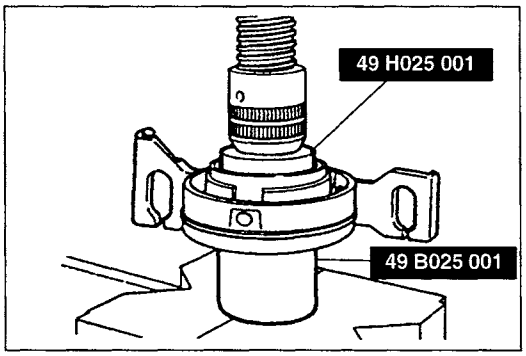
4. Check the double-offset joint boot for damage.
   If there is damage, replace the front and rear propeller shaft assembly.



Bearing

Turn the bearing while applying force in the axial direction.

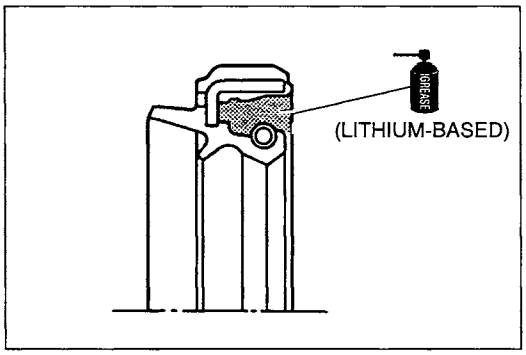
If the bearing sticks or has excessive resistance, replace it.



Assembly Note

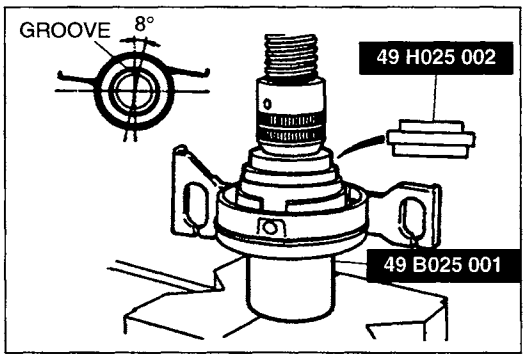
Bearing

Install the bearing into the bearing support assembly from the rear side by using the **SSTs**.

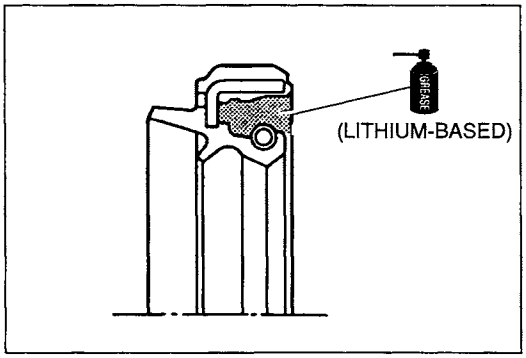


Rear dust seal

1. Before installing a new rear dust seal into the bearing support assembly, apply lithium-based grease to the shaded area.

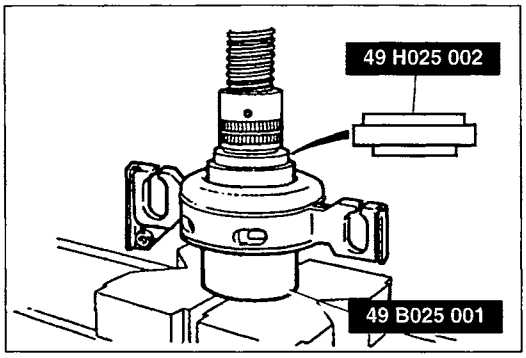


2. Install the rear dust seal into the support assembly from the rear side by using the **SSTs** as shown in the figure.

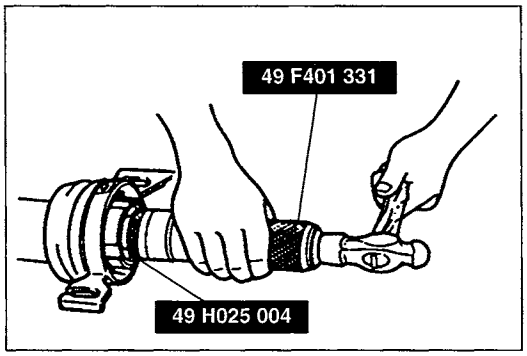


Front dust seal

1. Before installing a new front dust seal into the bearing support assembly, apply lithium-based grease to the shaded area.

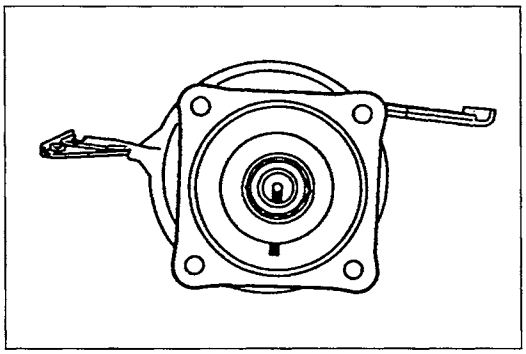


2. Install the front dust seal into the support assembly from the front side by using the **SSTs** as shown in the figure.



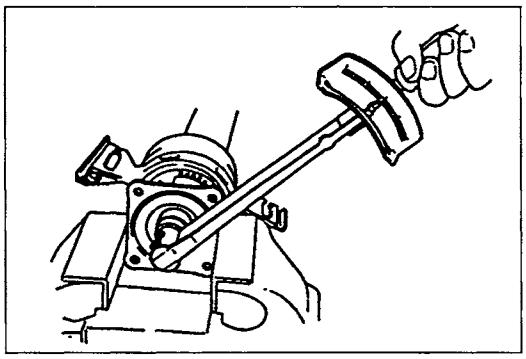
Center bearing support assembly

Install the center bearing support assembly onto the front propeller shaft by using the **SSTs**.



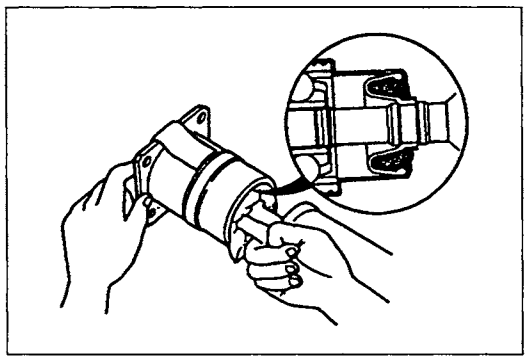
Flange nut

1. Align the marks on the flange and shaft.
2. Install the lock washer and temporarily tighten the flange nut.



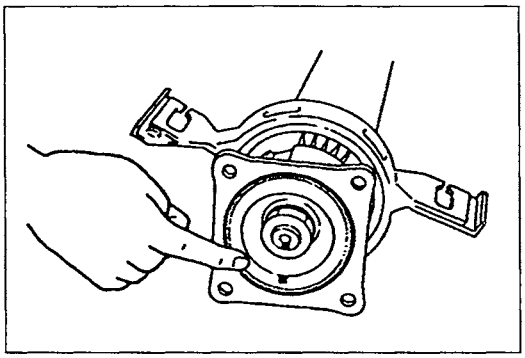
3. Place the center companion flange in a vise.
4. Tighten the flange nut to the specified torque.

Tightening torque:
160—170 N·m { 16—18 kgf·m , 120—130 ft·lbf }

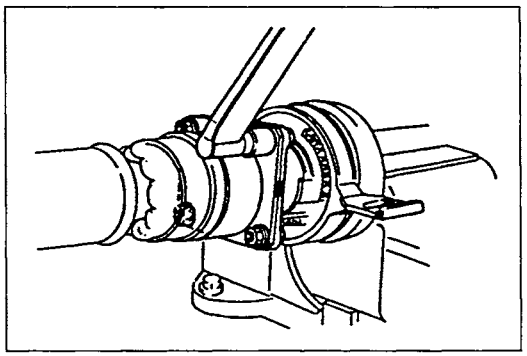


Rear propeller shaft

1. Push a rag into the double-offset joint to prevent damage to the boot.



2. Apply lithium-based grease to a new O-ring, and install the O-ring into the center companion flange.



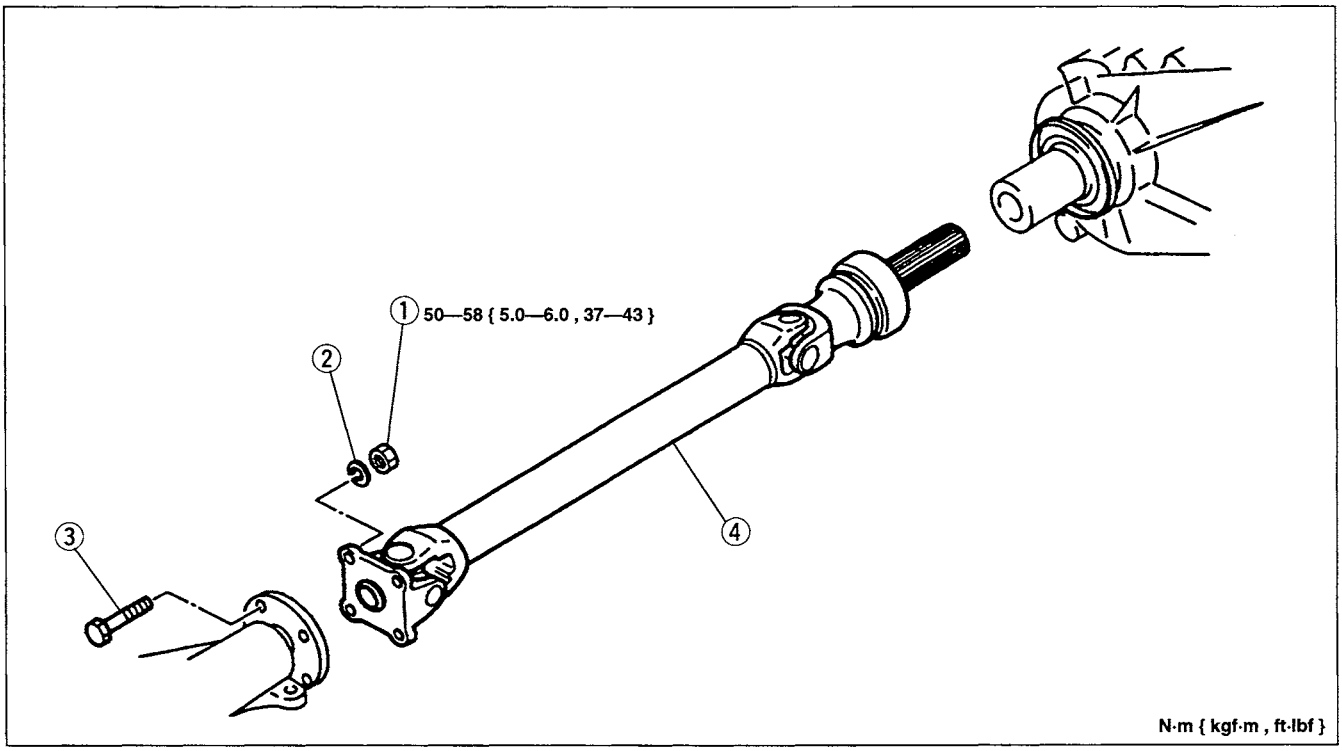
3. Place the front propeller shaft in a vise.
4. Align the marks on the center companion flange and the yoke, and install the rear propeller shaft.

Tightening torque:
50—58 N·m { 5.0—6.0 kgf·m , 37—43 ft·lbf }

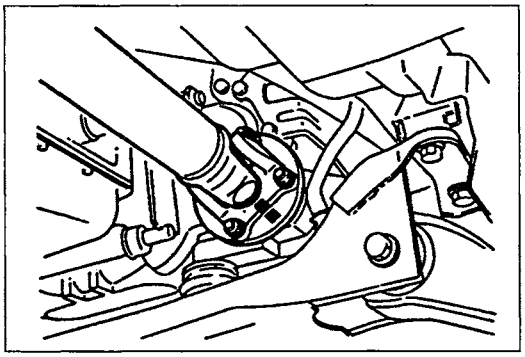
FRONT PROPELLER SHAFT (4WD)

REMOVAL / INSTALLATION

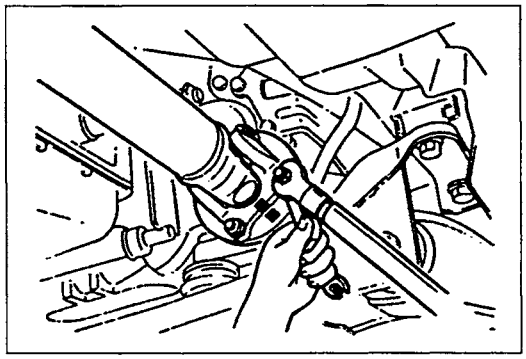
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note.**



1. Nut
   Removal Note ..... below
2. Lock washer
3. Bolt
4. Front propeller shaft
   Installation Note ..... below
   Inspection ..... page L–15

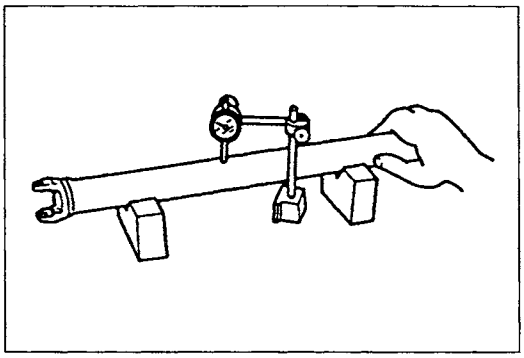


Removal Note
Nut
1. Mark the flanges for correct reassembly.
2. Remove the nuts.



Installation Note
Front propeller shaft
Align the marks and install the front propeller shaft.

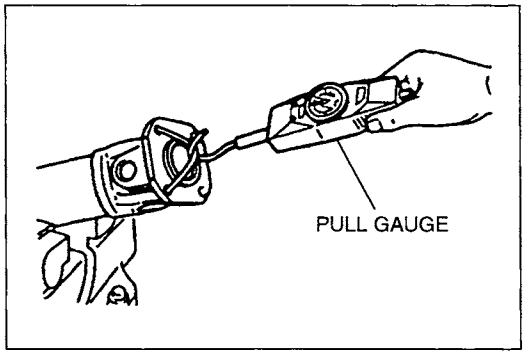
Tightening torque:
50—58 N·m { 5.0—6.0 kgf·m , 37—43 ft·lbf }



Inspection
Propeller shaft

1. Measure the front propeller shaft runout by using a dial indicator.
   Replace the front propeller shaft if runout is excessive.

   Maximum runout: 0.4 mm { 0.016 in }



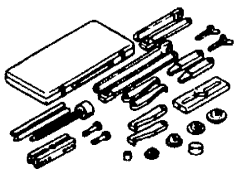
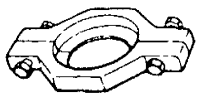
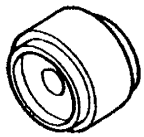
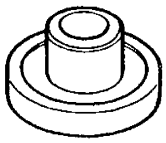
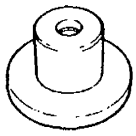
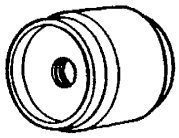
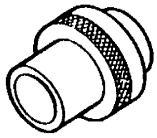
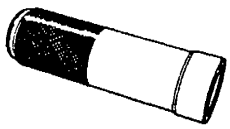
2. Measure the starting torque of the spider by using the pull gauge.

   Starting torque:
   0.3—0.7 N·m { 3—8 kgf·cm , 3—6 in·lbf }

3. Install different snap rings to adjust the starting torque if necessary.

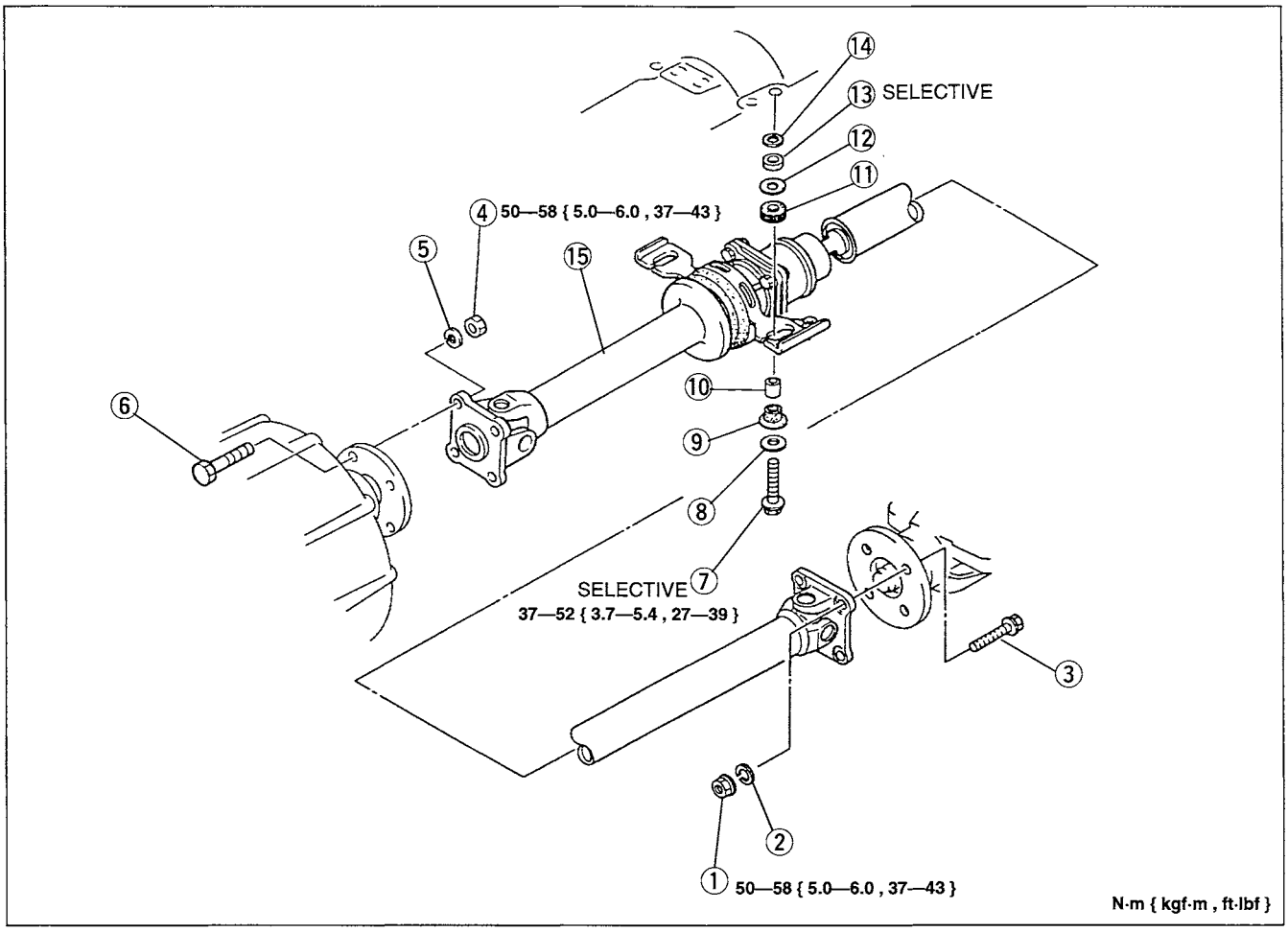
REAR PROPELLER SHAFT (4WD)

PREPARATION
SST

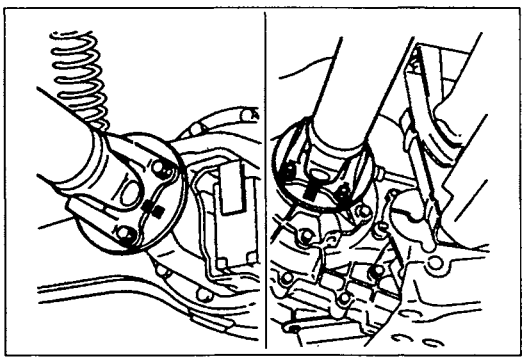
49 0839 425C Puller set, bearing 	For removal of center bearing support	49 0636 145 Puller, fan pulley boss 	For removal of center bearing support
49 B025 0A0 Installer, dust seal 	For removal / installation of bearing	49 B025 001 Body (Part of 49 B025 0A0) 	For removal / installation of bearing
49 H025 001 Installer, bearing 	For installation of oil seal	49 F026 102 Installer, bearing 	For removal of bearing
49 H025 002 Installer, dust seal 	For installation of oil seal	49 H025 004 Installer, bearing 	For installastion of center bearing support
49 F401 331 Body 	For installation of center bearing support	—	—

REMOVAL / INSTALLATION

1. Inspect the boots of the center bearing and the double-offset joint for damage, and repair or replace as necessary.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.



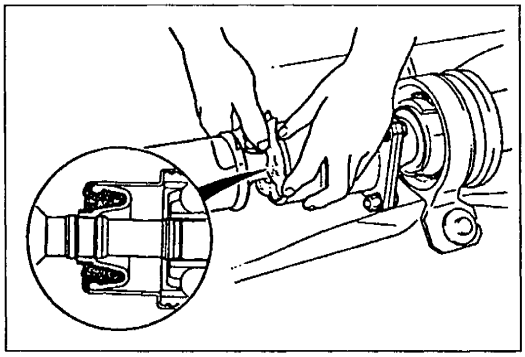
1. Nut
   Removal Note ..... below
2. Lock washer
3. Bolt
4. Nut
5. Lock washer
6. Bolt
7. Bolt
8. Washer
9. Bushing
10. Spacer
11. Bushing
12. Washer
13. Spacer
14. Washer
15. Propeller shaft
    Removal Note ..... page L–18
    Installation Note ..... page L–18
    Overhaul ..... page L–20



Removal Note

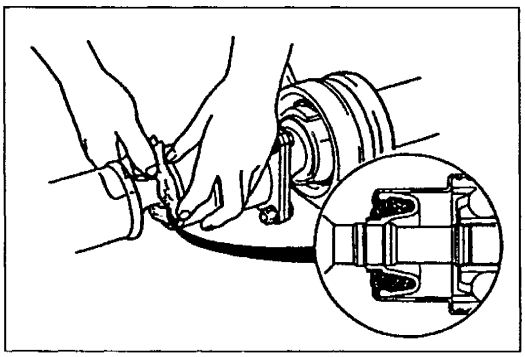
Nut

1. Mark the flanges for correct reassembly.
2. Remove the nuts.



Propeller shaft

1. Push a rag into the double-offset joint to hold the propeller shaft straight and to prevent damage to the boot.
2. Remove the rear propeller shaft.

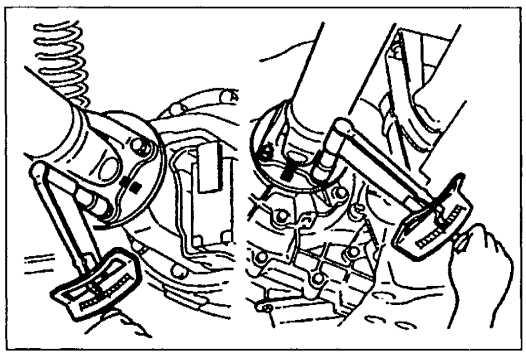


Installation Note
Propeller shaft

1. Push a rag into the double-offset joint to prevent damage to the boot.

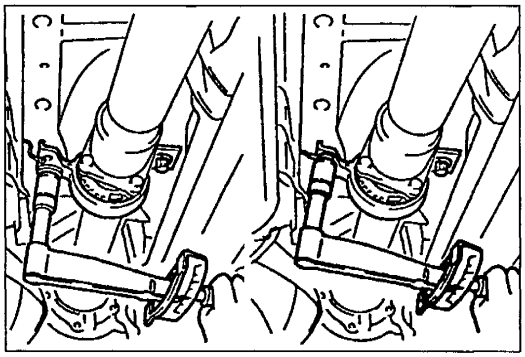
Note

- New propeller shafts are equipped with an insulator to prevent damage to the boot.



2. Align the marks and install the propeller shaft.

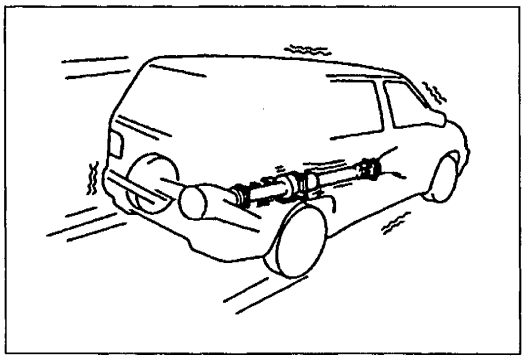
Tightening torque:
50—58 N·m { 5.0—6.0 kgf·m , 37—43 ft·lbf }



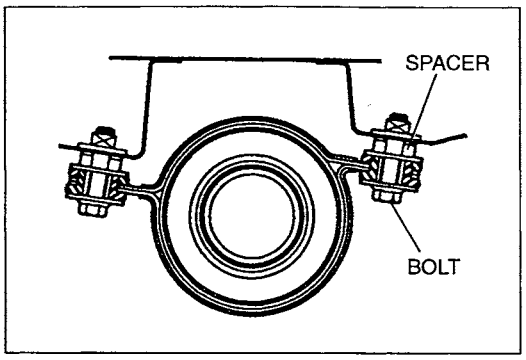
3. Install the center bearing support assembly by using the removed bolts and spacers.

Tightening torque:
37—52 N·m { 3.7—5.4 kgf·m , 27—39 ft·lbf }

4. Remove the rag or insulator from the double-offset joint, and check the boot for damage.



5. Verify that there is no abnormal noise or vibration when driving the vehicle.

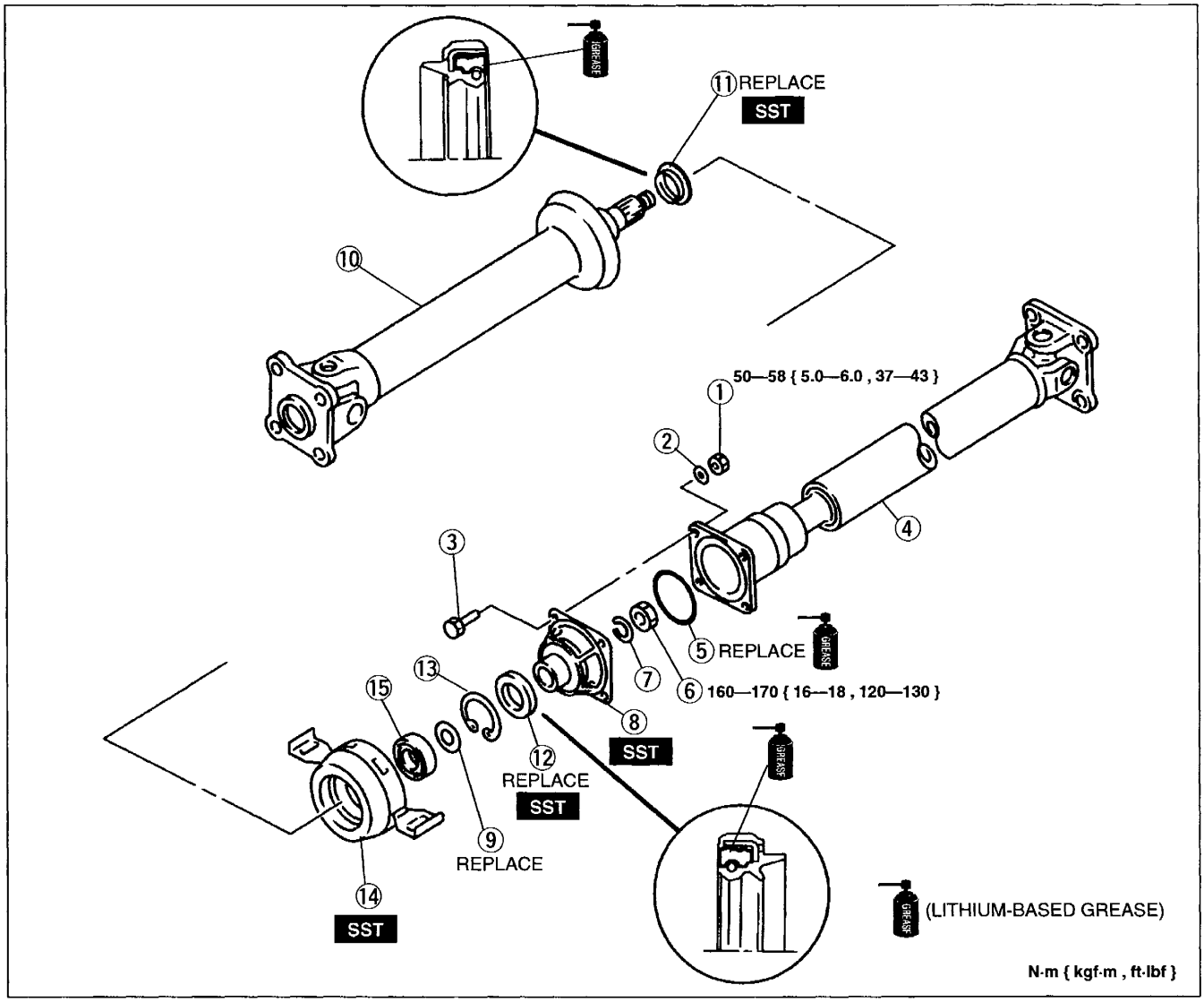


6. If noise or vibration seems to be the result of incorrect propeller shaft alignment angle, replace the bolts and spacers at the center bearing support with new ones. Bolts and spacers used on one side must have the same dimensions as those used on the other side.

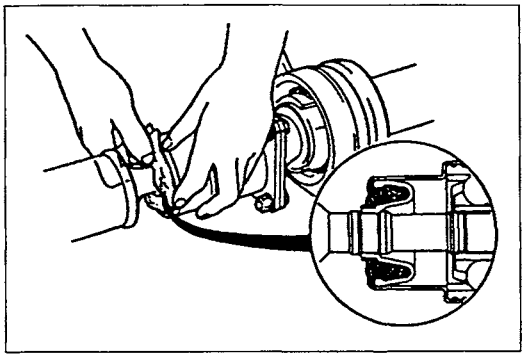
Bolt size mm { in }	Spacer size mm { in }
M10×40 { 1.59 }	3.2 { 0.13 }
M10×40 { 1.59 }	4.5 { 0.18 }
M10×45 { 1.77 }	6.0 { 0.24 }
M10×45 { 1.77 }	8.0 { 0.31 }
M10×50 { 1.97 }	10.0 { 0.39 }
M10×50 { 1.97 }	13.0 { 0.51 }
M10×50 { 1.97 }	16.0 { 0.63 }

OVERHAUL

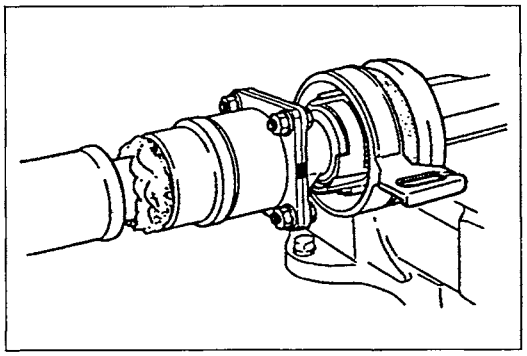
1. Remove all mud, dirt, and other foreign particles from the propeller shaft.
2. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
3. Inspect all parts and repair or replace as necessary.
4. Verify that all parts are completely free of dirt, dust, and other small particles.
5. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



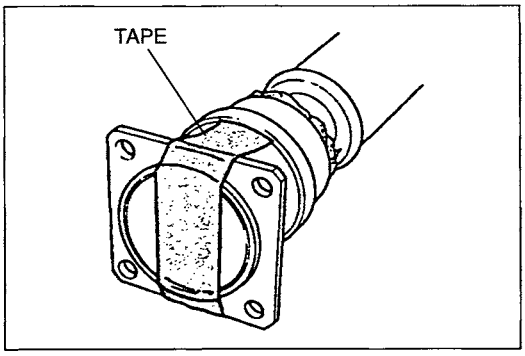
1. Nut
2. Lock washer
3. Bolt
4. No.2 propeller shaft assembly
   - Disassembly Note ..... page L–21
   - Inspection ..... page L–22
   - Assembly Note ..... page L–25
5. O-ring
6. Flange nut
   - Disassembly Note ..... page L–21
   - Assembly Note ..... page L–24
7. Lock washer
8. Center companion flange
   - Disassembly Note ..... page L–21
9. Spacer
10. No.1 propeller shaft
    - Insection ..... page L–22
11. Front dust seal
    - Assembly Note ..... page L–23
12. Rear dust seal
    - Assembly Note ..... page L–23
13. Snap ring
14. Center bearing support assembly
    - Disassembly Note ..... page L–22
    - Assembly Note ..... page L–24
15. Bearing
    - Disassembly Note ..... page L–22
    - Inspection ..... page L–23
    - Assembly Note ..... page L–23



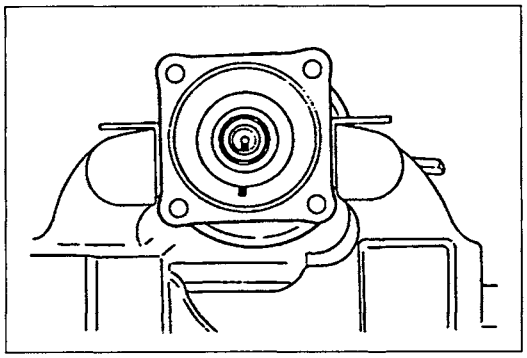
Disassembly Note
No.2 propeller shaft assembly
1. Push a rag into the double-offset joint to prevent damage to the boot.



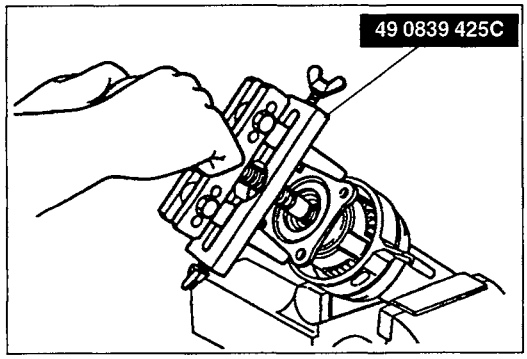
2. Mark the center companion flange and the yoke for proper reassembly.
3. Place the No.1 propeller shaft assembly in a vise and separate the propeller shaft.



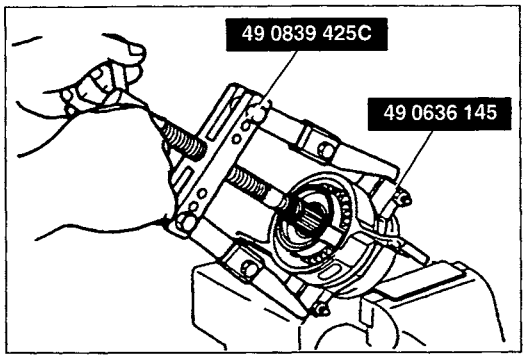
4. After removing the No.2 propeller shaft assembly, clean the yoke surface and seal the vent hole with tape.



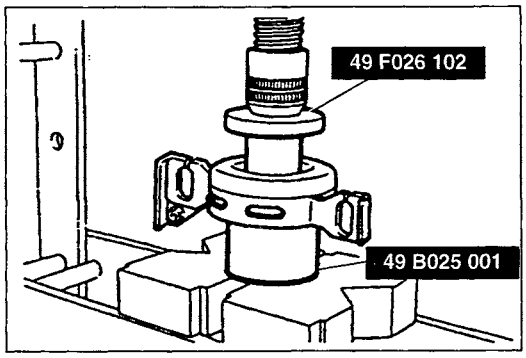
Flange nut
1. Mark the flange and shaft for proper reassembly.
2. Place the center companion flange in a vise.
3. Remove the flange nut and lock washer.



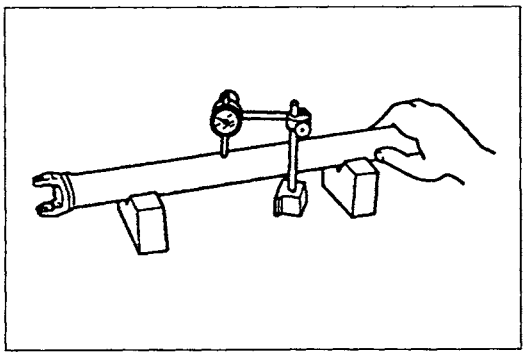
Center companion flange
1. Place the No.1 propeller shaft in a vise.
2. Remove the center companion flange by using the **SST**.



Center bearing support assembly
Remove the center bearing support assembly by using the **SSTs**.

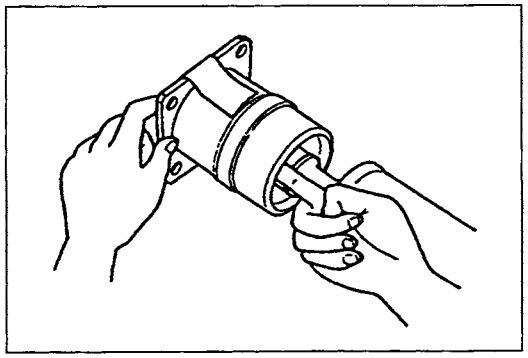


Bearing
Press the bearing out of the support assembly toward the rear by using the **SSTs**.

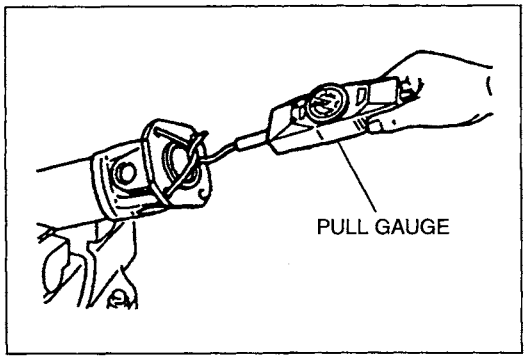


Inspection
No.1 propeller shaft, No.2 propeller shaft assembly
1. Measure the propeller shaft runout by using a dial indicator.
   Replace the propeller shaft assembly if runout is excessive.

   Maximum runout: 0.4 mm { 0.016 in }



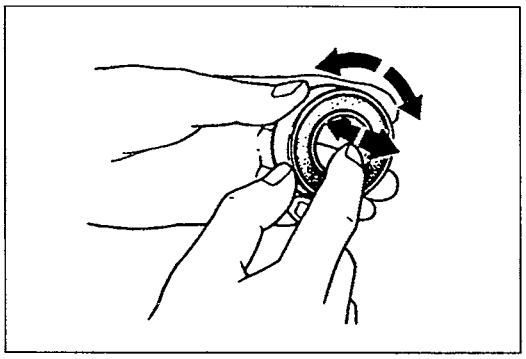
2. Check the double-offset joint boot for damage.
   If there is damage, replace the propeller shaft assembly.



3. Measure the starting torque of the spider.

   Starting torque:
   0.3—0.7 N·m { 3—8 kgf·cm , 3—6 in·lbf }

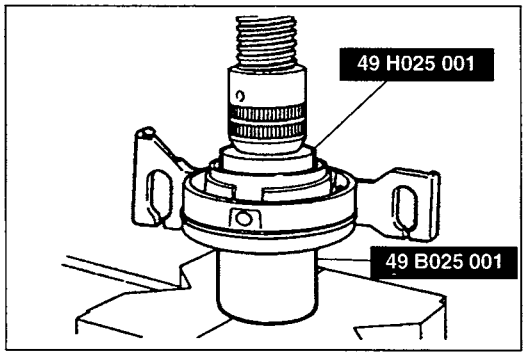
4. Install different snap rings to adjust the starting torque if necessary.



Bearing

Turn the bearing while applying force in the axial direction.

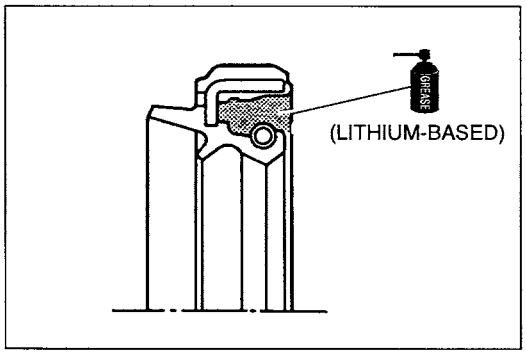
If the bearing sticks or has excessive resistance, replace it.



Assembly Note

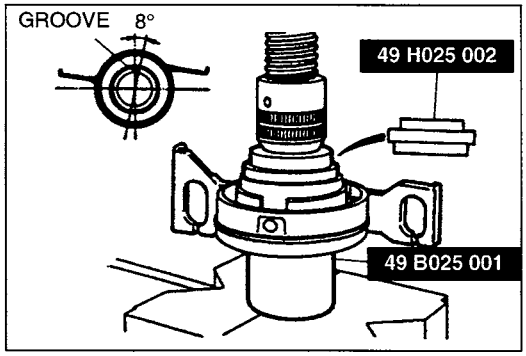
Bearing

Install the bearing into the bearing support assembly from the rear side by using the **SSTs**.

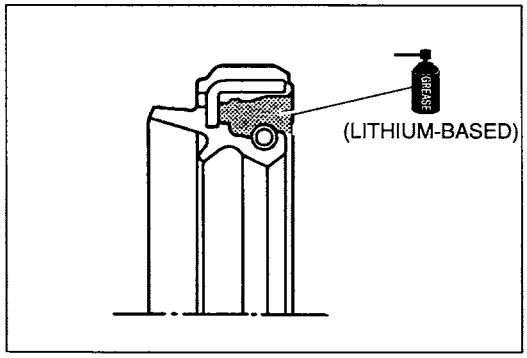


Rear dust seal

1. Before installing a new rear dust seal into the bearing support assembly, apply lithium-based grease to the shaded area.

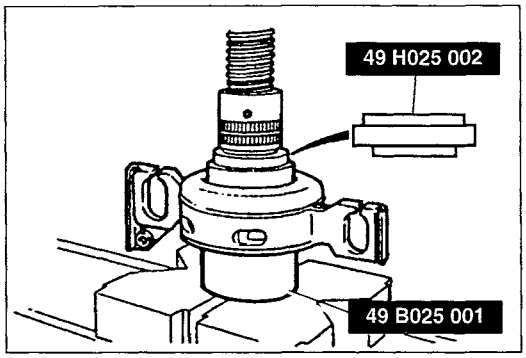


2. Install the rear dust seal into the support assembly from the rear side by using the **SSTs** as shown in the figure.

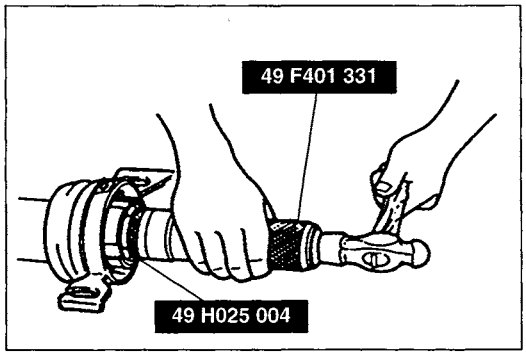


Front dust seal

1. Before installing a new front dust seal into the bearing support assembly, apply lithium-based grease to the shaded area.

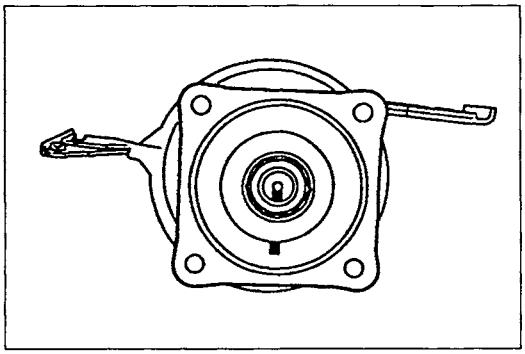


2. Install the front dust seal into the support assembly from the front side by using the **SSTs** as shown in the figure.



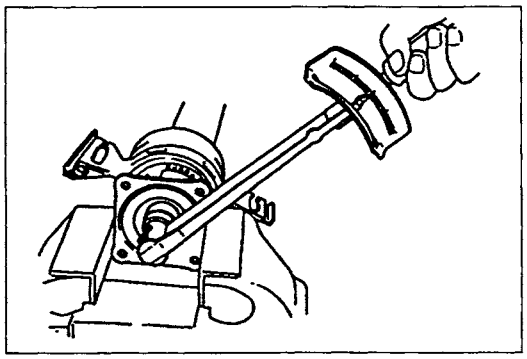
Center bearing support assembly

Install the center bearing support assembly onto the front propeller shaft by using the **SSTs**.



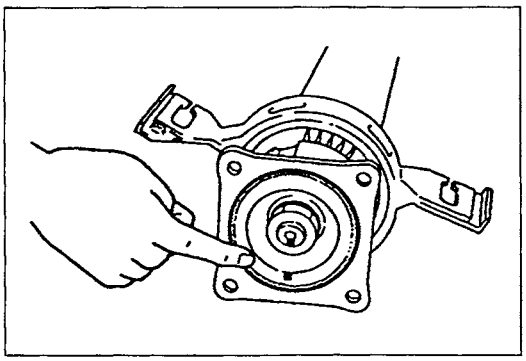
Flange nut

1. Align the marks on the flange and shaft.
2. Install the lock washer and hand-tighten the flange nut.

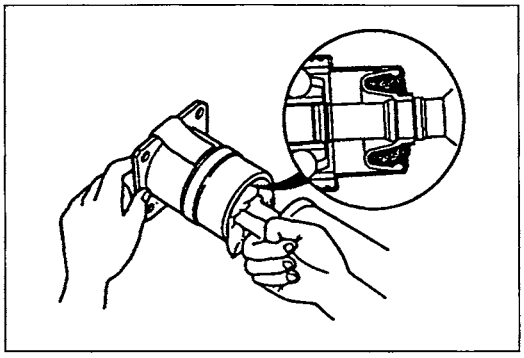


3. Place the center companion flange in a vise.
4. Tighten the flange nut to the specified torque.

Tightening torque:
160—170 N·m { 16—18 kgf·m , 120—130 ft·lbf }

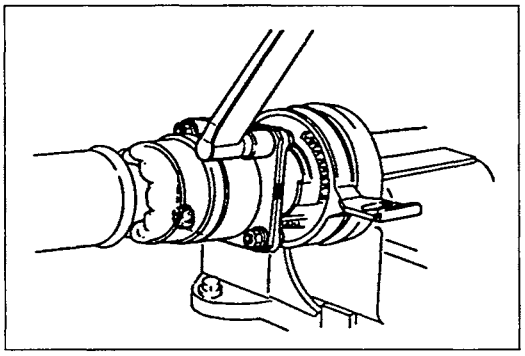


5. Apply lithium-based grease to a new O-ring. Install the O-ring into the center companion flange.



No.2 propeller shaft assembly

1. Push a rag into the double-offset joint to prevent damage to the boot.



2. Place the No.1 propeller shaft in a vise.
3. Align the marks on the center companion flange and the yoke. Mount the No.2 propeller shaft assembly.

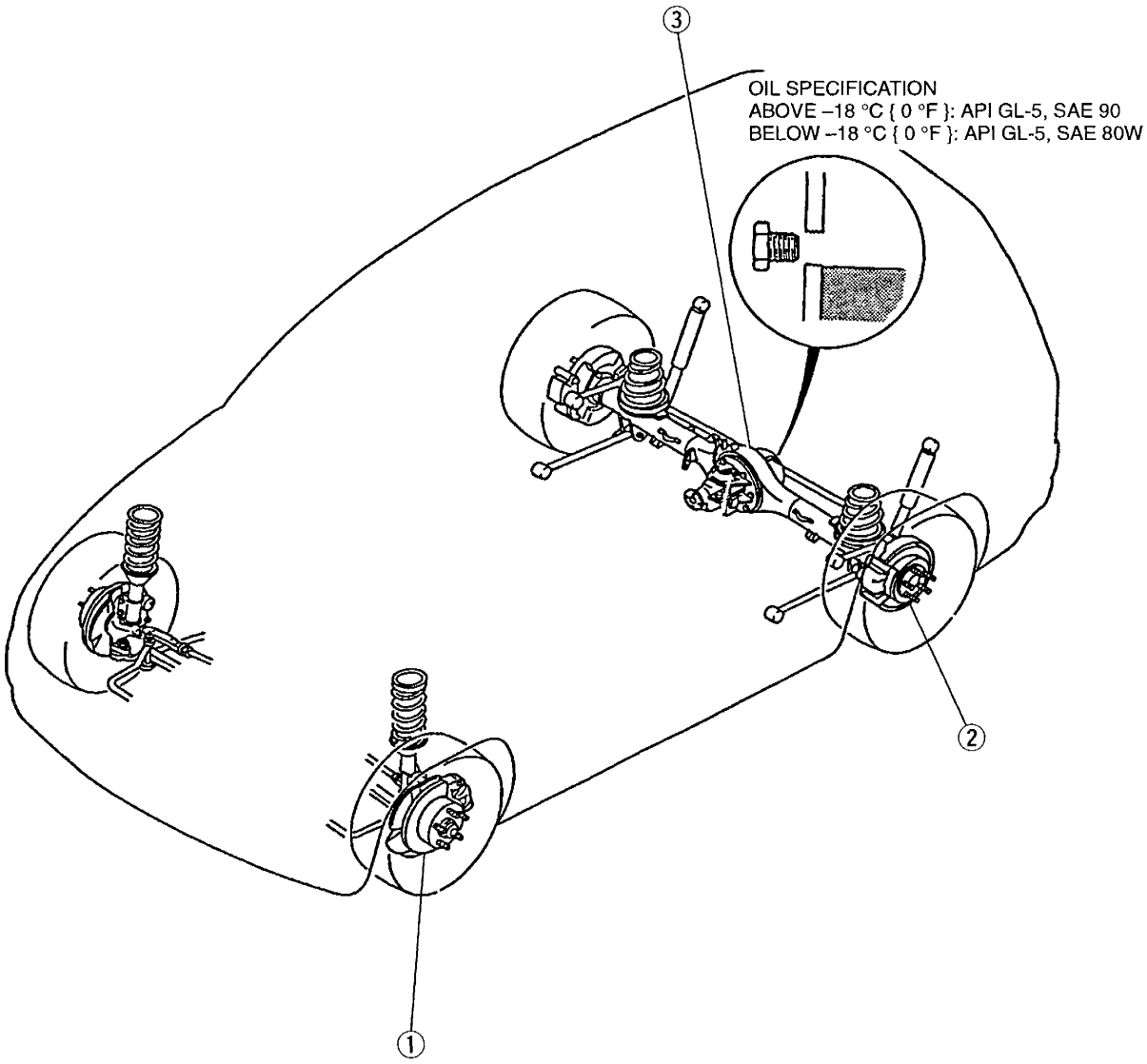
Tightening torque:
50—58 N·m { 5.0—6.0 kgf·m , 37—43 ft·lbf }

Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

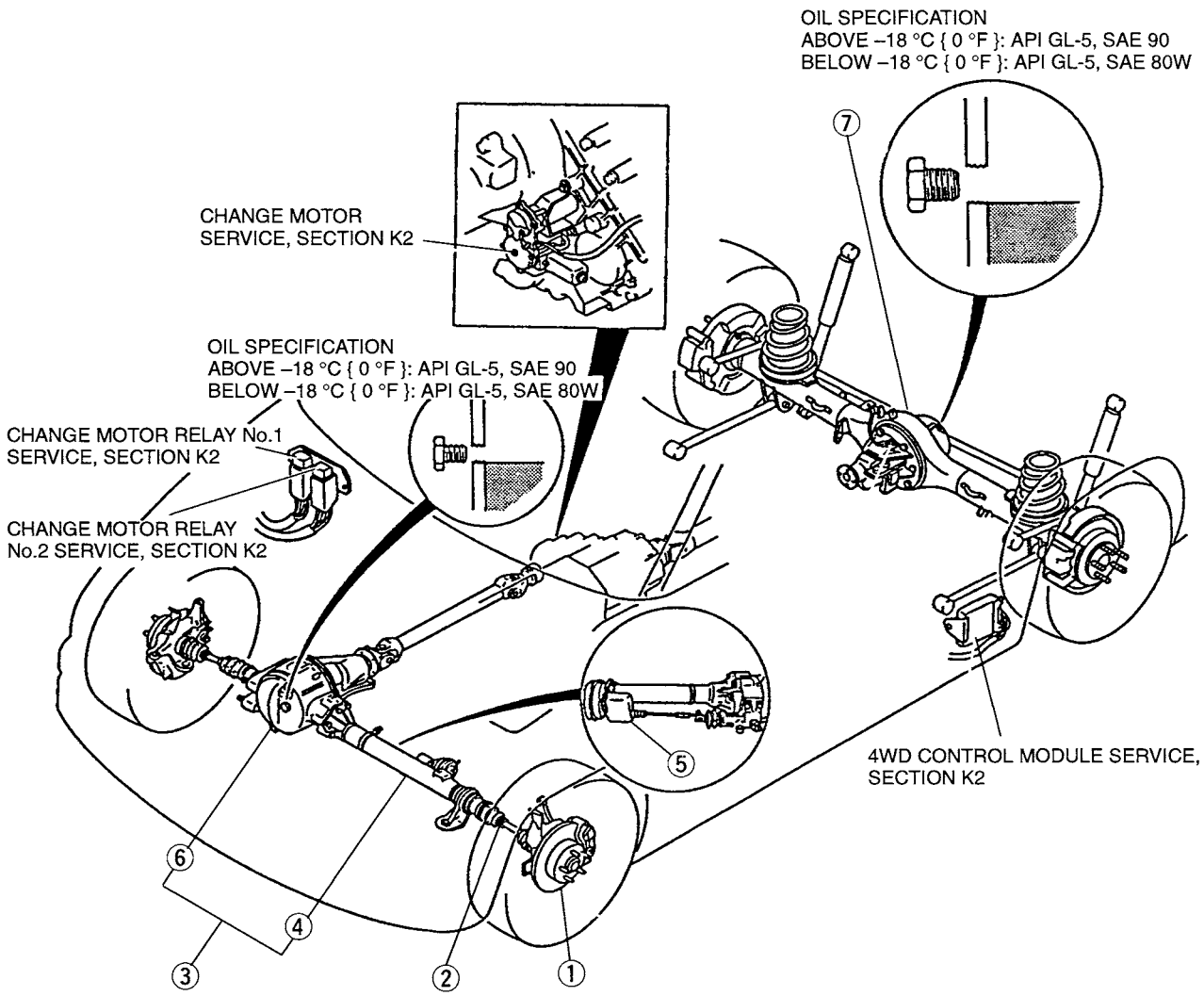
FRONT AND REAR AXLES

INDEX

(2WD)



(4WD)



OUTLINE

SPECIFICATIONS

Item \ Model/Transmission				2WD	4WD
Front axle	Type			Strut mounting	
	Bearing			Angular ball bearing	
	Maximum wheel bearing play mm { in }			0.05 { 0.002 }	
Rear axle	Type			5-link mounting	
	Axle shaft	Support type		Semifloating	
		Bearing		Ball bearing	
		Casing		Banjo type housing	
	Maximum wheel bearing play mm { in }			0.57 { 0.0224 }	
Front differential	Type			—	Standard
	Reduction gear			—	Hypoid gear
	Differential gear			—	Straight-bevel gear
	Ring gear size mm { in }			—	181.6 { 7.15 }
	Reduction ratio			—	4.100
	Number of teeth	Ring gear		—	41
		Drive pinion gear		—	10
	Oil	Grade		—	API Service GL-5
		Viscosity	Above –18 °C { 0 °F }	—	SAE 90
			Below –18 °C { 0 °F }	—	SAE 80W
		Capacity L { US qt , Imp qt }		—	1.7 { 1.8 , 1.5 }
Rear differential	Type			Standard	
	Reduction gear			Hypoid gear	
	Differential gear			Straight-bevel gear	
	Ring gear size mm { in }			203.2 { 8.00 }	
	Reduction ratio			3.909	4.100
	Number of teeth	Ring gear		43	41
		Drive pinion gear		11	10
	Oil	Grade		API service GL-5	
		Viscosity	Above –18 °C { 0 °F }	SAE 90	
			Below –18 °C { 0 °F }	SAE 80W	
		Capacity L { US qt , Imp qt }		1.5 { 1.6 , 1.3 }	

TROUBLESHOOTING GUIDE

FRONT AXLE

Problem	Possible Cause	Remedy	Page
Steering wheel vibration	Improperly adjusted wheel bearing play Worn or damaged wheel bearing	Tighten or replace Replace	M–12 M–8, 12
Steering wheel pulls or one-sided braking	Improperly adjusted wheel bearing play Worn or damaged wheel bearing	Adjust Replace	M–12 M–8, 12
Excessive steering wheel play	Improperly adjusted wheel bearing play	Tighten or replace	M–12
Abnormal noise	Bent axle casing Bent drive shaft Worn or damaged wheel bearing Worn drive shaft splines Insufficient grease in joint or on splines of drive shaft Worn double offset joint of drive shaft	Replace Replace Replace Replace Replenish or replace Replace	M–47 M–24 M–8, 12 M–24 M–24 M–24
Grease leakage from boot	Damaged or broken boot Faulty boot band Excessive grease	Replace Replace Repair	M–26 M–26 M–26

REAR AXLE

Problem	Possible Cause	Remedy	Page
Abnormal noise	Bent axle casing Bent axle shaft Worn or damaged wheel bearing Worn axle shaft spline	Replace Replace Replace Replace	— M–19 M–21 M–19
Oil leakage	Worn or damaged oil seal	Replace	M–19, 21

AUTOMATIC FREEWHEEL (AFW) UNIT

Problem		Possible Cause	Remedy	Page
No AFW operation	**Free to Lock**	Failed lock solenoid Failed actuator Air leak at vacuum reservoir or system Failed one-way check valve	Replace Replace Replace Replace	M–34 M–35, 45 M–35 M–34
	Lock to Free	Failed AFW switch Failed lock solenoid Failed actuator Air leak at vacuum reservoir or system Failed one-way check valve	Replace Replace Replace Replace Replace	M–33, 45 M–34 M–35, 45 M–35 M–34
Abnormal noise		Insufficient front differential oil Incorrect front differential oil Worn or damaged bearing Worn spline of AFW hub Worn joint shaft Improperly adjusted shaft end play Improperly adjusted gear end play Worn spline of output shaft	Add oil Replace Replace Replace Replace Adjust Adjust Replace	M–35 M–35 M–41 M–41 M–41 M–43 M–44 M–41
Heat buildup		Insufficient front differential oil Improperly adjusted end play Excessive front differential oil	Add oil Adjust Drain oil	M–35 M–43, 44 M–35
Oil leakage		Excessive front differential oil Poorly tightened AFW unit Worn or damaged oil seal	Drain oil Tighten or repair Replace	M–35 M–38 M–35

FRONT DIFFERENTIAL (4WD)

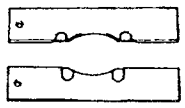
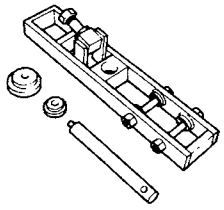
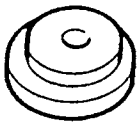
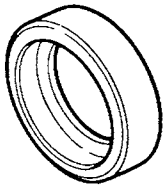
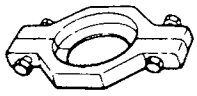
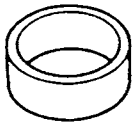
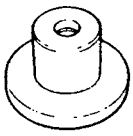
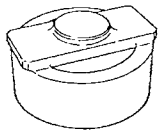
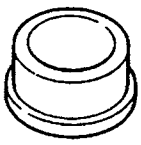
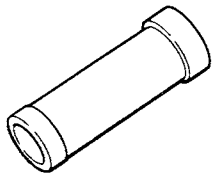
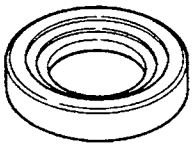
Problem	Possible Cause	Remedy	Page
Abnormal noise	Insufficient front differential oil	Add oil	M–35
	Incorrect front differential oil	Replace	M–35
	Improperly adjusted backlash of final gear	Adjust	M–53
	Poor contact of teeth of final gear	Adjust	M–54
	Worn or damaged side bearing	Replace	M–47
	Worn or damaged final gear	Replace	M–47
	Worn or damaged drive pinion bearing	Replace	M–47
	Worn or damaged pinion and side gear	Replace	M–47
	Seized side gear	Replace	M–47
	Worn spline of side gear	Replace	M–47
	Worn pinion shaft	Replace	M–47
	Loose companion flange nut	Tighten	M–52
	Worn side gear thrust washer	Replace	M–53
	Improperly adjusted side bearing preload	Adjust	M–54
	Improperly adjusted drive pinion bearing preload	Adjust	M–52
	Worn spline of output shaft	Replace	M–47
Heat buildup	Insufficient front differential oil	Add oil	M–35
	Insufficient backlash of gears	Adjust	M–53
	Excessive bearing preload	Adjust	M–52
Oil leakage	Cracked axle casing	Replace	M–47
	Excessive front differential oil	Drain oil	M–35
	Clogged differential housing breather	Repair	—
	Poorly tightened differential carrier	Tighten or repair	M–47
	Worn or damaged oil seal	Replace	M–35

REAR DIFFERENTIAL

Problem	Possible Cause	Remedy	Page
Abnormal noise	Insufficient differential oil	Add oil	M–57
	Incorrect differential oil	Replace	M–57
	Improperly adjusted ring gear backlash	Adjust	M–68
	Poor contact of ring gear teeth	Adjust	M–69
	Worn or damaged side bearing	Replace	M–62
	Worn or damaged ring gear	Replace	M–62
	Worn or damaged drive pinion bearing	Replace	M–62
	Worn or damaged pinion and side gear	Replace	M–62
	Seized side gear and case	Replace	M–62
	Worn side gear spline	Replace	M–62
	Worn pinion shaft	Replace	M–62
	Loose companion flange nut	Tighten	M–62
	Worn thrust washer	Replace	M–62
	Improperly adjusted side bearing preload	Adjust	M–67
	Improperly adjusted drive pinion bearing preload	Adjust	M–66
Heat buildup	Insufficient differential oil	Add oil	M–57
	Insufficient gear backlash	Adjust	M–67
	Excessive bearing preload	Adjust	M–66
Oil leakage	Excessive differential oil	Remove oil	M–57
	Clogged air breather	Repair	M–59
	Loose differential carrier	Tighten or repair	M–59
	Worn or damaged oil seal	Replace	M–61
No differential operation	Misassembled	Repair	M–62

FRONT AXLE

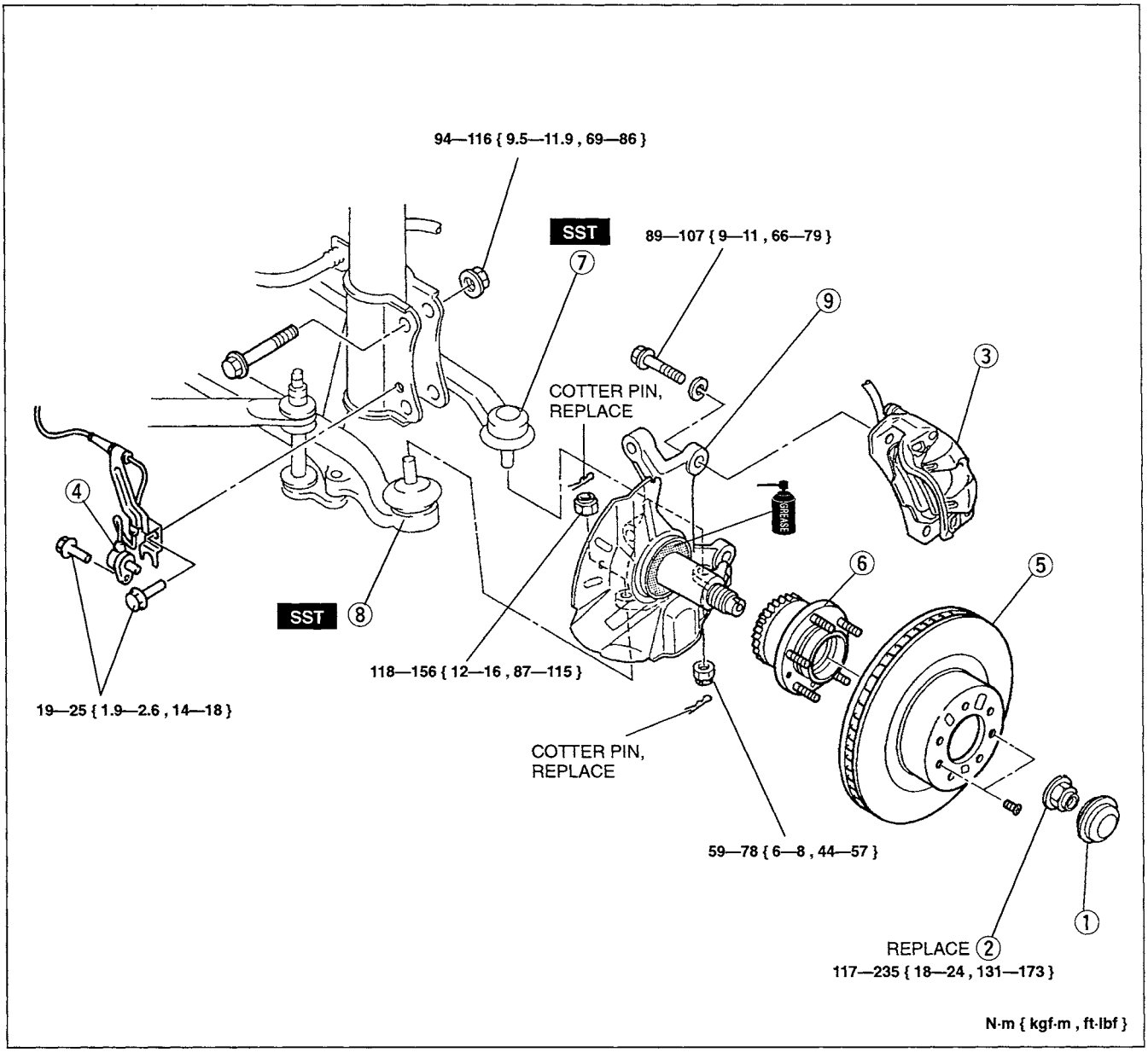
PREPARATION
SST

49 F026 103 Puller, wheel hub (4WD) 	For disassembly of wheel hub assembly, wheel bearing, and assembly of inner oil seal	49 G033 1A1 Puller set, wheel hub (4WD) 	For disassembly of wheel hub assembly and wheel bearing
49 G033 102 Handle (Part of 49 G033 1A1) (4WD) 	For disassembly of wheel hub assembly and wheel bearing	49 G033 105 Attachment (Part of 49 G033 1A1) (4WD) 	For disassembly / assembly of wheel hub assembly
49 G033 106 Attachment (Part of 49 G033 1A1) (4WD) 	For disassembly of wheel bearing	49 G033 107 Installer, dust cover (4WD) 	For assembly of dust cover
49 0636 145 Puller, fan pulley boss (4WD) 	For disassembly of wheel bearing	49 L033 101 Installer, oil seal (4WD) 	For assembly of dust cover, wheel bearing, outer oil seal, and inner oil seal
49 F026 102 Installer, bearing (4WD) 	For assembly of wheel bearing	49 G019 017 Installer, oil seal (4WD) 	For assembly of outer oil seal
49 F027 009 Attachment 68 & 77 (4WD) 	For assembly of wheel hub assembly	49 U025 001 Installer, protector 	For assembly of dust cover
49 L033 103 Installer, sensor rotor (2WD) 	For assembly of ABS sensor rotor	—	—

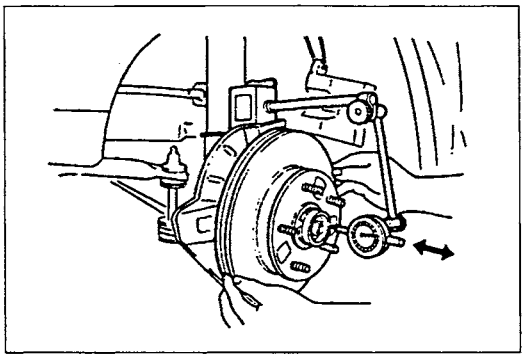
WHEEL HUB, STEERING KNUCKLE (2WD)

Inspection / Removal / Installation

1. Inspect the wheel bearing play, referring to **Inspection**.
2. Remove in the order shown in the figure.
3. Inspect all parts and repair or replace as necessary.
4. Install in the reverse order of removal, referring to **Installation Note**.



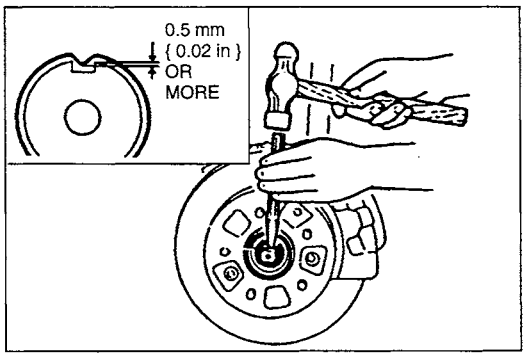
1. Hub cap
2. Locknut
   - Installation Note ..... page M–9
3. Brake caliper assembly
   - Service ..... section P
4. ABS wheel-speed sensor
5. Disc plate
   - Inspection ..... section P
6. Wheel hub assembly
   - Inspect for cracks or damage
   - Disassembly / Inspection / Assembly ..... page M–9
7. Tie-rod end
   - Service ..... section N
8. Lower arm
   - Service ..... section R
9. Knuckle spindle and dust cover
   - Inspect the knuckle spindle for cracks or damage
   - Inspect the dust cover for damage or distortion
   - Disassembly / Inspection / Assembly ..... page M–9



Inspection
Wheel bearing play

Position a dial indicator against the disc plate. Push and pull the disc plate by hand in the axial direction and measure the wheel bearing play.
If the bearing play exceeds the specification, check and adjust the hub nut torque or replace the wheel bearing and hub assembly if necessary.

Maximum wheel bearing play: 0.05 mm { 0.002 in }



Installation note
Locknut

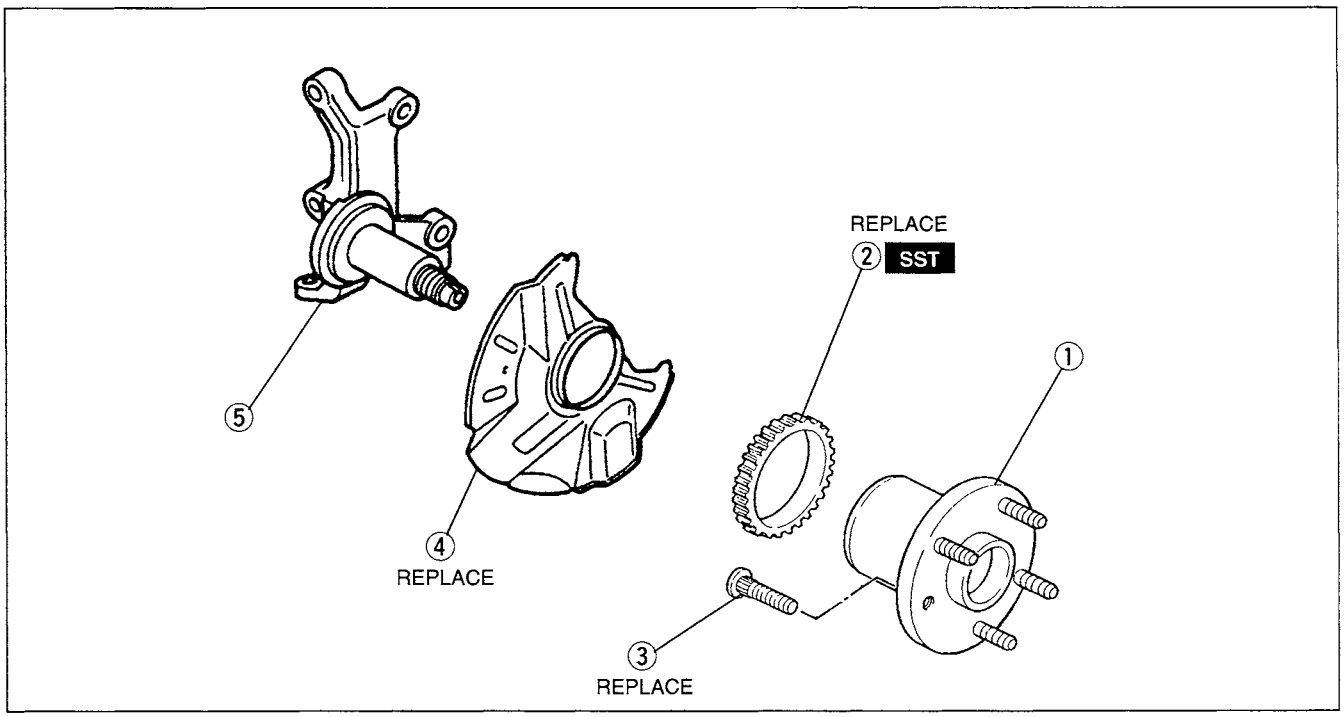
Install a new locknut and crimp it.

Tightening torque:
177—235 N·m { 18—24 kgf·m , 131—173 ft·lbf }

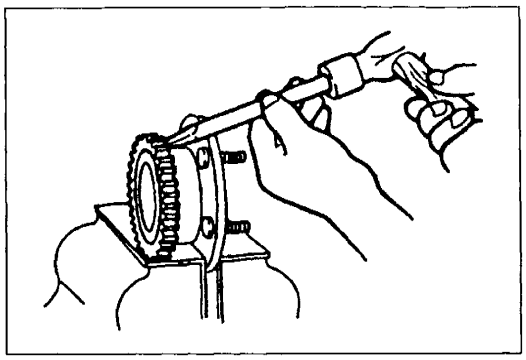
M

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



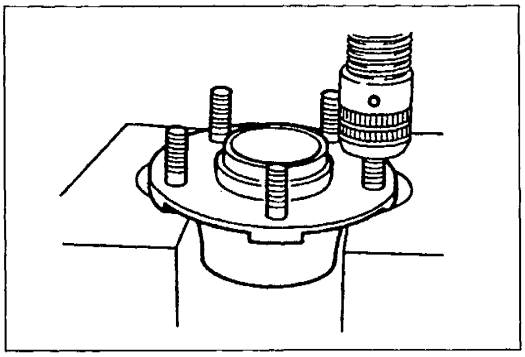
1. Wheel hub assembly
2. ABS sensor rotor (ABS)
   - Disassembly Note ..... page M–10
   - Assembly Note ..... page M–11
3. Hub bolt
   - Disassembly Note ..... page M–10
   - Assembly Note ..... page M–11
4. Dust cover
   - Disassembly Note ..... page M–10
   - Assembly Note ..... page M–10
5. Knuckle spindle



Disassembly Note
ABS sensor rotor (ABS)

Note
- The sensor rotor does not need to be removed unless you are replacing it.

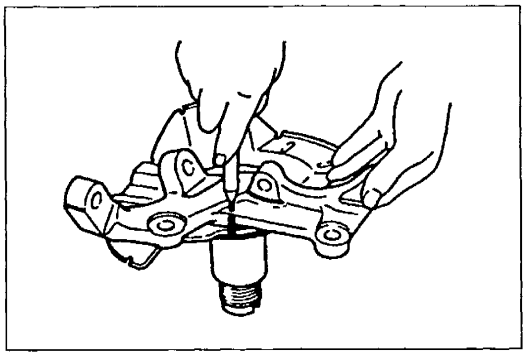
Remove the sensor rotor by using a chisel.



Hub bolts

Note
- The hub bolts do not need to be removed unless you are replacing them.

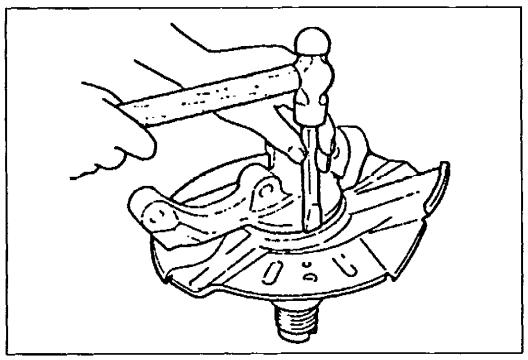
Remove the hub bolts by using a press if necessary.



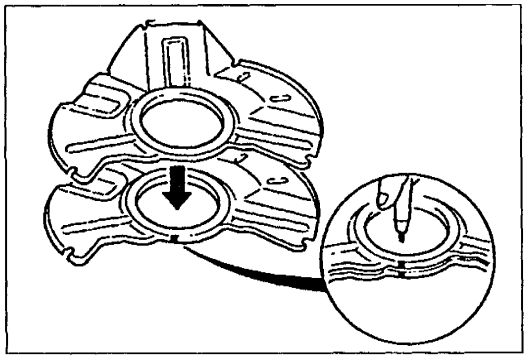
Dust cover

Note
- The dust cover does not need to be removed unless you are replacing it.

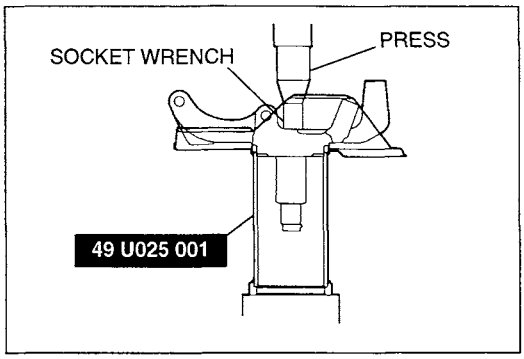
1. Mark the dust cover and knuckle spindle for proper reassembly.



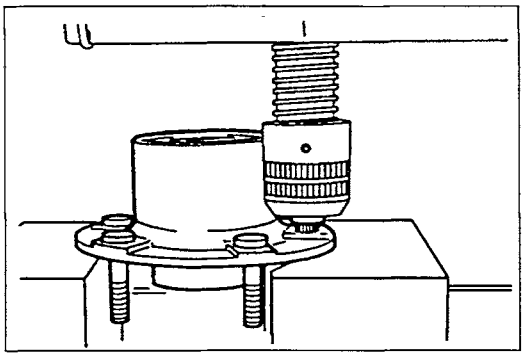
2. Remove the dust cover by using a chisel.



Assembly note
Dust cover
1. Mark the new dust cover as the removed one.

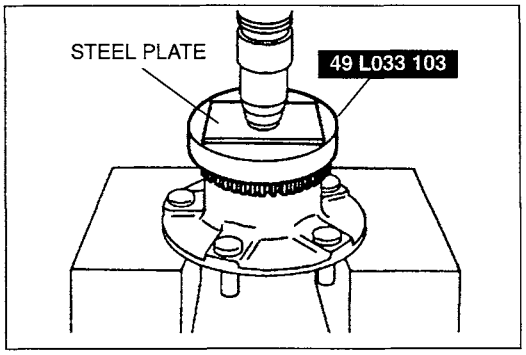


2. Align the marks of the new dust cover and the knuckle spindle.
3. Install the new dust cover by using the **SST**.



Hub bolts

Install the new hub bolts by using a press.



ABS sensor rotor (ABS)

1. Install a new ABS sensor rotor on to the wheel hub.

Note

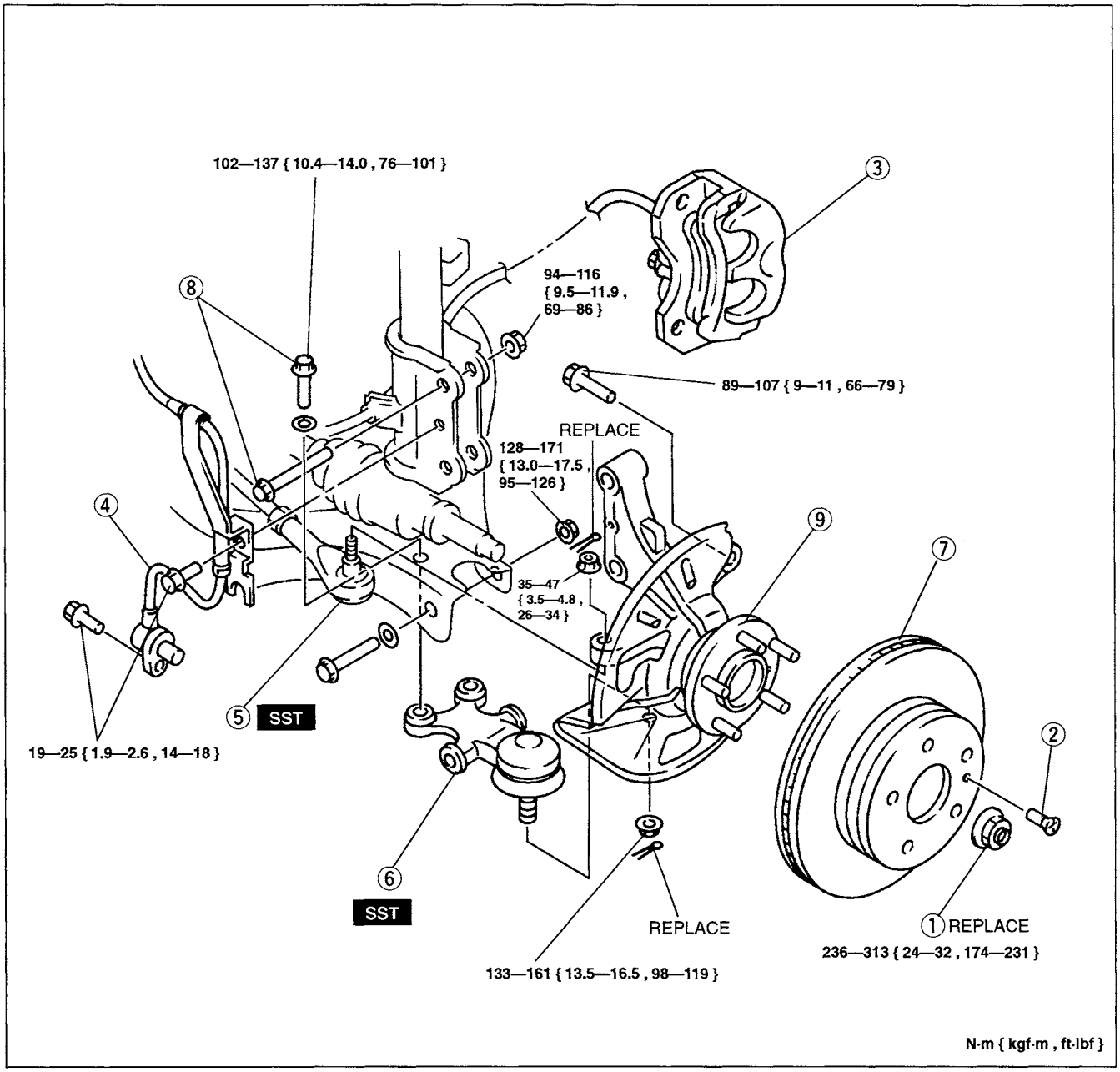
- The ABS sensor rotor can be installed in either direction.

2. Using a steel plate and the **SST**, press the rotor on until it is flush with the wheel hub.

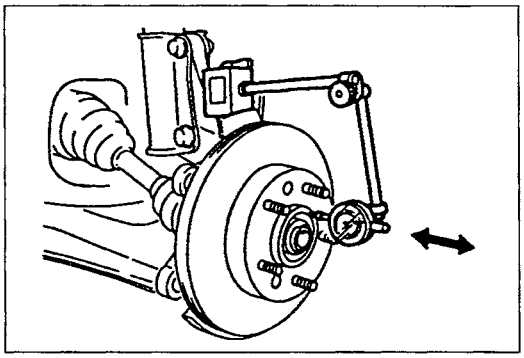
WHEEL HUB, STEERING KNUCKLE (4WD)

Inspection / Removal / Installation

1. Inspect the wheel bearing play, referring to **Inspection**.
2. Remove in the order shown in the figure.
3. Inspect all parts and repair or replace as necessary.
4. Install in the reverse order of removal, referring to **Installation Note**.
5. After installation, check the front wheel alignment and adjust it if necessary. (Refer to section R.)



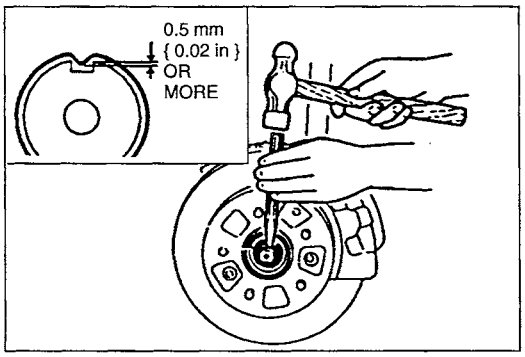
1. Locknut
   Installation Note ..... page M–13
2. Screws
3. Brake caliper assembly
   Service ..... section P
4. ABS wheel-speed sensor
5. Tie-rod end
   Service ..... section N
6. Lower ball joint
   Service ..... section R
7. Disc plate
   Inspection ..... section P
8. Bolts, washers, and nuts
9. Knuckle, wheel hub, and dust cover
   Inspect wheel hub for cracks or damage
   Inspect knuckle spindle for cracks or damage
   Inspect dust cover for damage or distortion
   Disassembly / Inspection / Assembly ..... page M–14



Inspection
Wheel bearing play

Position a dial indicator against the disc plate. Push and pull the disc plate by hand in the axial direction and measure the wheel bearing play.
If the bearing play exceeds the specification, check and adjust the hub nut torque or replace the wheel bearing if necessary.

Maximum wheel bearing play: 0.05 mm { 0.002 in }



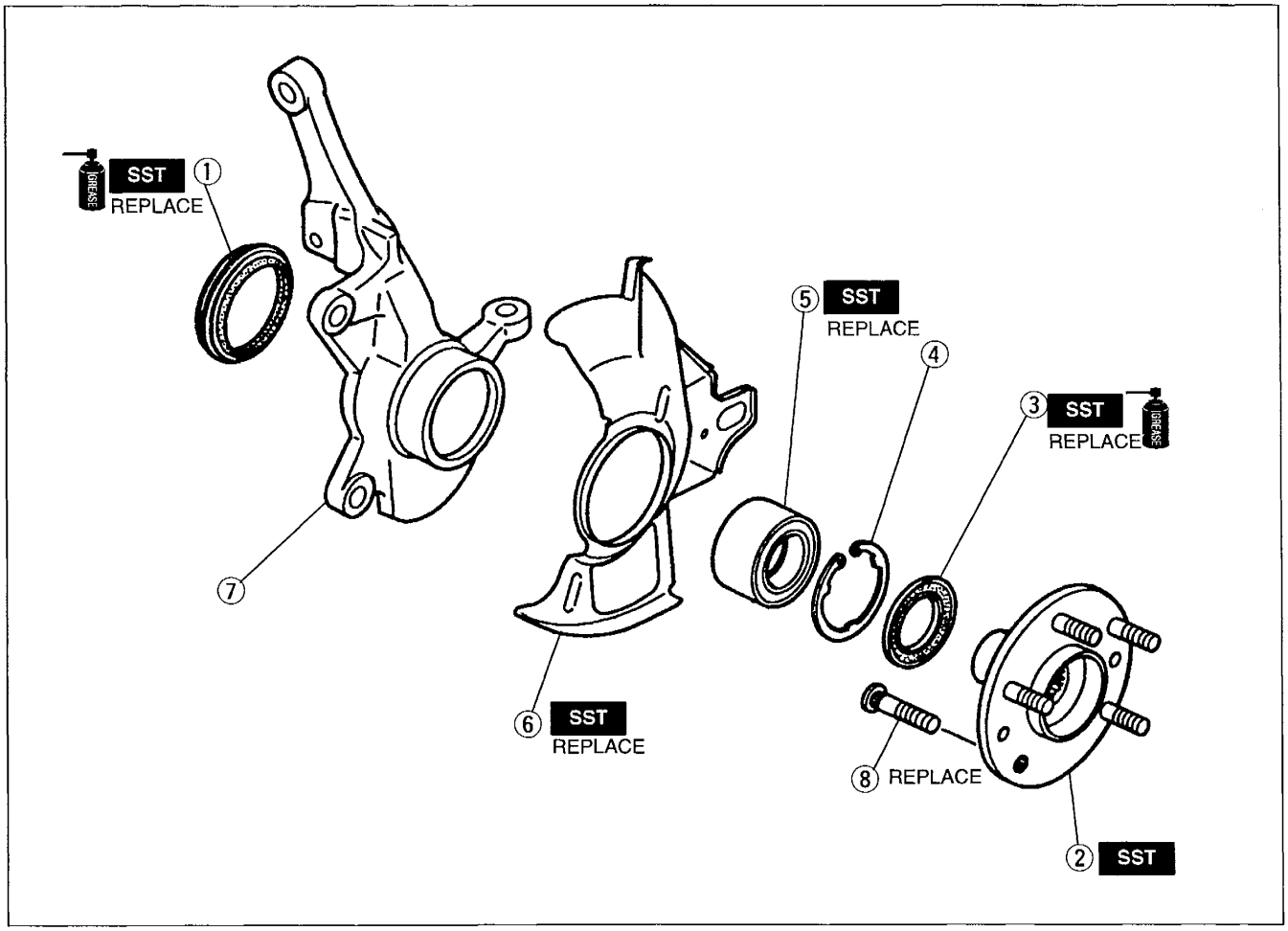
Installation note
Locknut

Install a new locknut and crimp it.

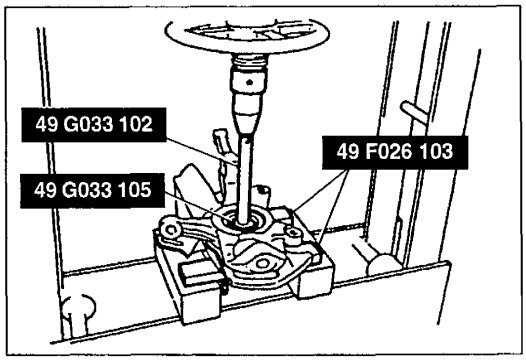
Tightening torque:
236—313 N·m { 24—32 kgf·m , 174—231 ft·lbf }

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note.**
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note.**

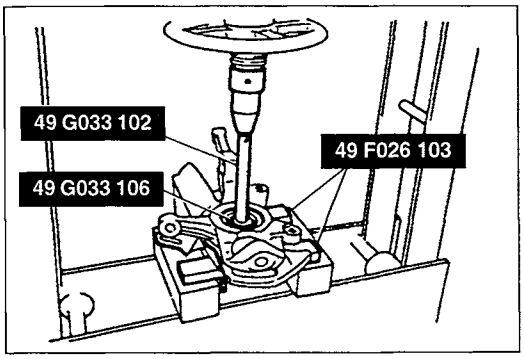


1. Inner oil seal
   Assembly Note ..... page M–17
2. Wheel hub assembly
   Disassembly Note ..... below
   Assembly Note ..... page M–17
3. Outer oil seal
   Assembly Note ..... page M–17
4. Retaining ring
5. Wheel bearing
   Disassembly Note ..... page M–15
   Assembly Note ..... page M–16
6. Dust cover
   Disassembly Note ..... page M–15
   Assembly Note ..... page M–16
7. Knuckle
8. Hub bolt
   Disassembly Note ..... page M–16
   Assembly Note ..... page M–16



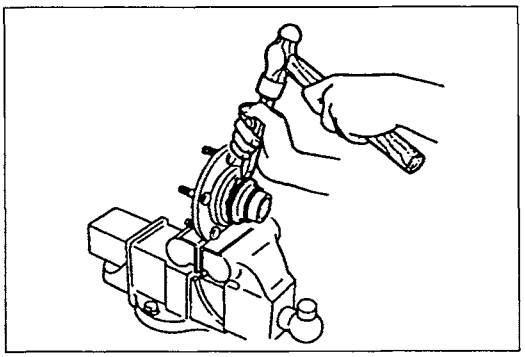
Disassembly note
Wheel hub assembly

Remove the wheel hub assembly by using the **SST.**

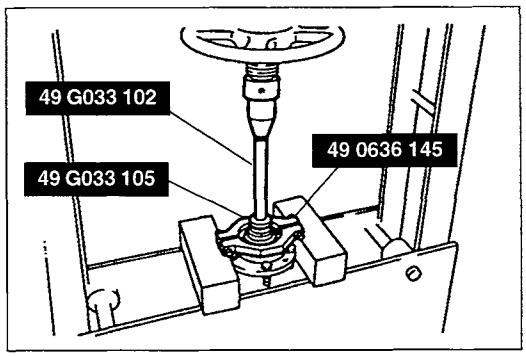


Wheel bearing

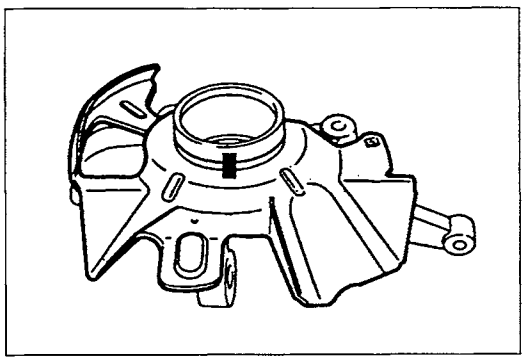
1. Remove the wheel bearing by using the **SST**.



2. Move the bearing inner race away from the wheel hub assembly by using a chisel.



3. Press the bearing inner race off the wheel hub by using the **SST**.

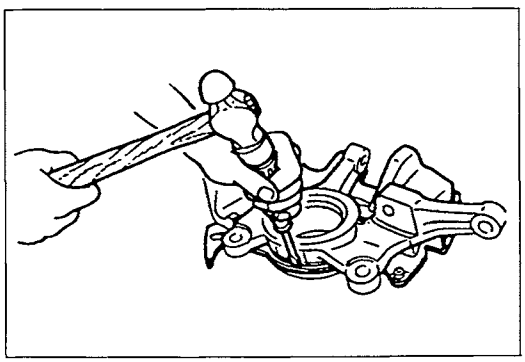


Dust cover

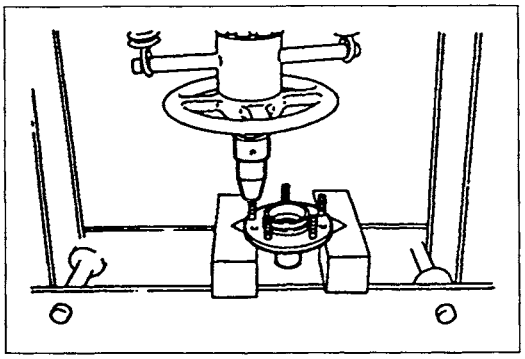
Note

- The dust cover does not need to be removed unless you are replacing it.

1. Mark the dust cover and knuckle spindle for proper reassembly.



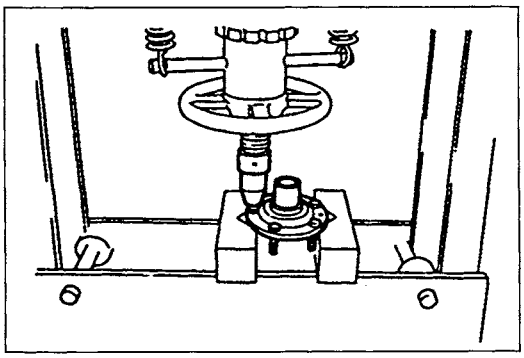
2. Remove the dust cover by using a chisel.



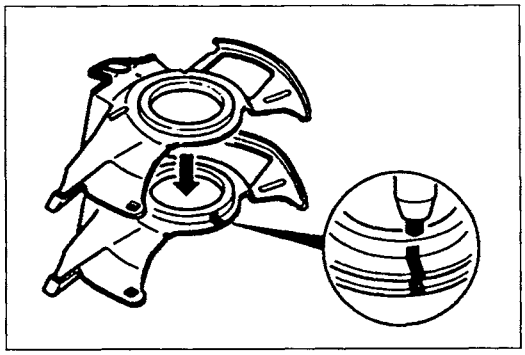
Hub bolt

Note
- The hub bolts do not need to be removed unless you are replacing them.

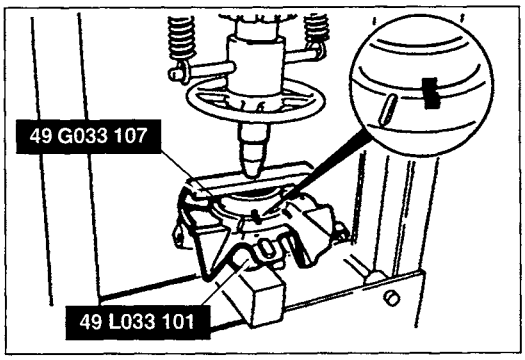
Remove the hub bolts by using a press.



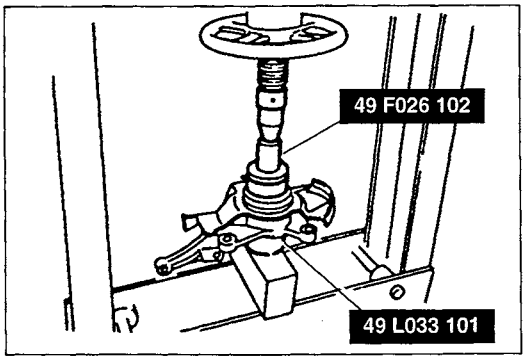
Assembly note
Hub bolt
Press in new hub bolts.



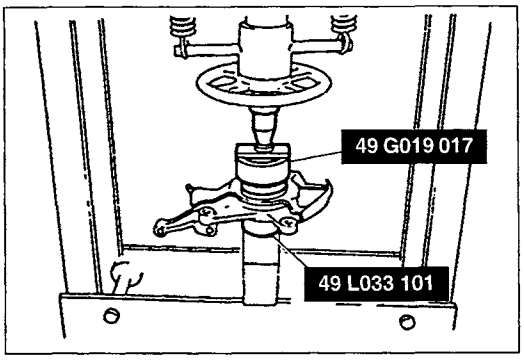
Dust cover
1. Mark the new dust cover as the one removed.



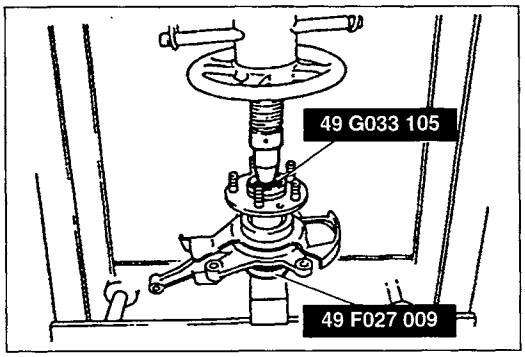
2. Align the marks of the new dust cover and the knuckle.
3. Install the new dust cover by using the **SST**.



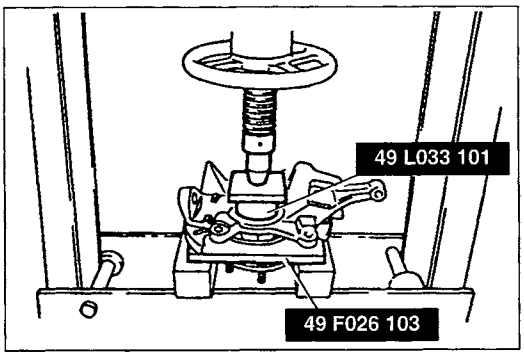
Wheel bearing
Install the new wheel bearing by using the **SST**.



Outer oil seal
Install the new outer oil seal by using the **SST**.



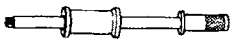
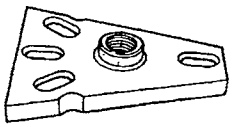
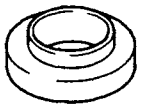
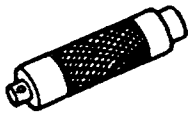
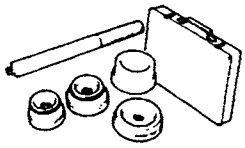
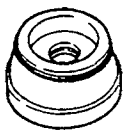
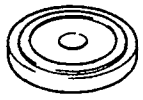
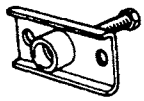
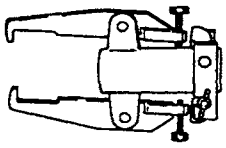
Wheel hub assembly
Install the wheel hub assembly by using the **SST**.



Inner oil seal
Install the new inner oil seal by using the **SST**.

REAR AXLE

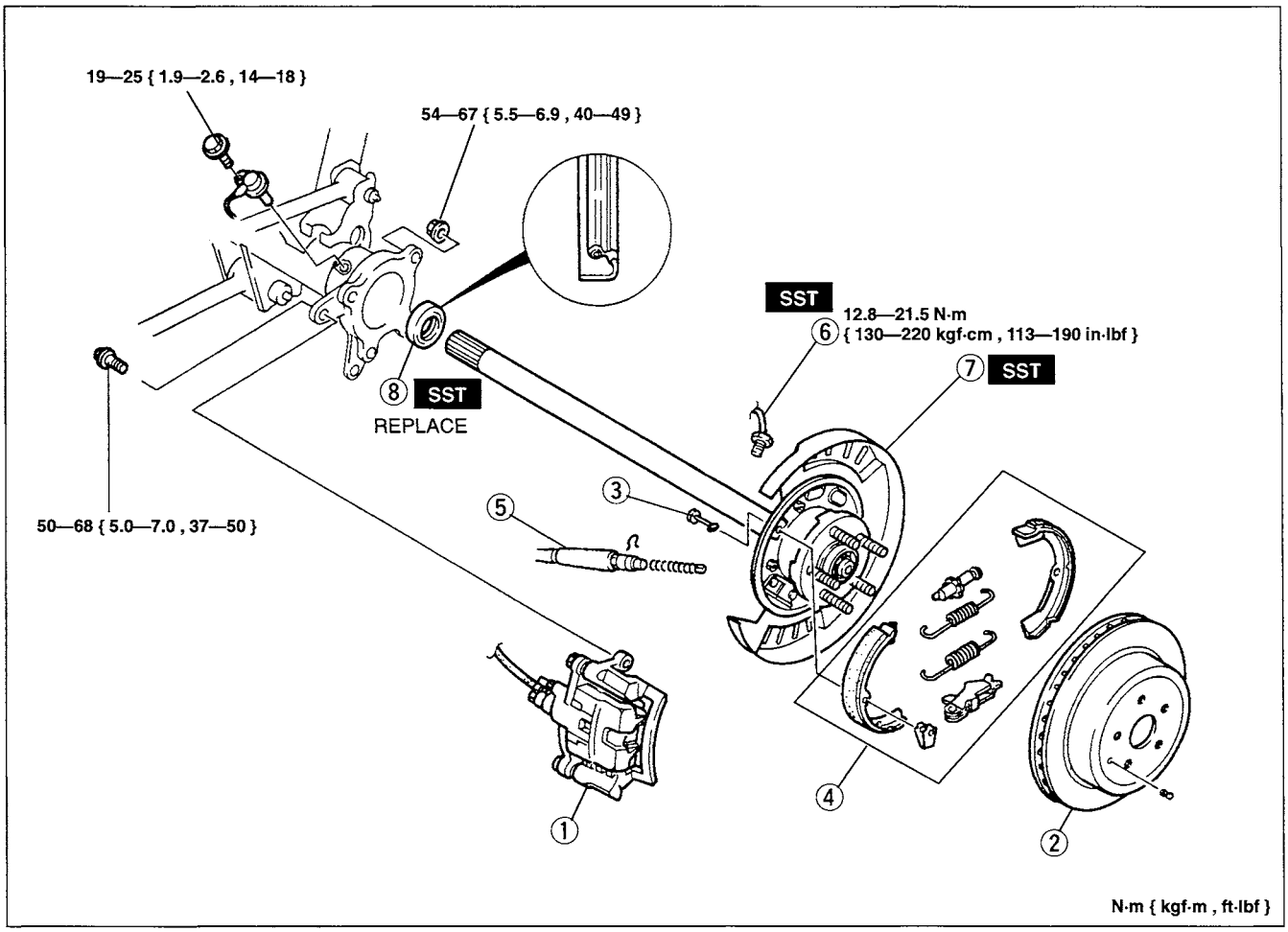
PREPARATION
SST

49 0223 630B Puller, rear axle shaft 	For removal / installation of dust cover and rear axle shaft assembly	49 8501 631A Attachment, rear axle shaft puller 	For removal / installation of dust cover and rear axle shaft assembly
49 0259 770B Wrench, flare nut 	For removal / installation of brake pipe	49 S026 201 Installer, bearing collar 	For assembly of bearing, ABS sensor rotor, and bearing collar
49 G030 797 Handle (Part of 49 B025 0A0) 	For installation of oil seal	49 F027 0A1 Installer set, bearing 	For installation of oil seal
49 F027 005 Attachment, for bearing ϕ62 (Part of 49 F027 0A1) 	For installation of oil seal (ABS)	49 S026 001 Installer 	For installation of oil seal (non ABS)
49 S121 520A Puller, rear axle shaft bearing 	For disassembly of bearing	49 S120 521 Plate (Part of 49 S121 520A) 	For disassembly of bearing
49 S120 522 Rod (Part of 49 S121 520A) 	For disassembly of bearing	49 S026 202 Attachment (Part of 49 S121 520A) 	For disassembly of bearing

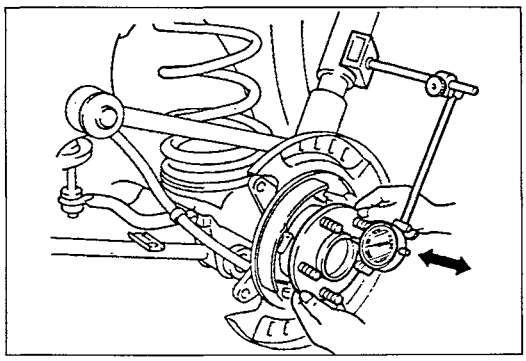
REAR AXLE SHAFT

Inspection / Removal / Installation

1. Inspect the wheel bearing play, referring to **Inspection**.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.



1. Brake caliper assembly
   Service ..... section P
2. Disc plate
   Inspection ..... section P
3. Hold pin
4. Parking brake shoe assembly
   Service ..... section P
5. Parking brake cable
   Service ..... section P
6. Brake pipe
   Removal Note ..... page M–20
   Installation Note ..... page M–21
7. Dust cover and rear axle shaft assembly
   Removal Note ..... page M–20
   Installation Note ..... page M–20
8. Oil seal
   Installation Note ..... page M–20



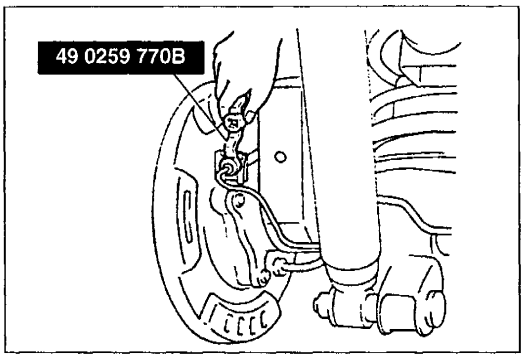
Inspection

Wheel bearing play

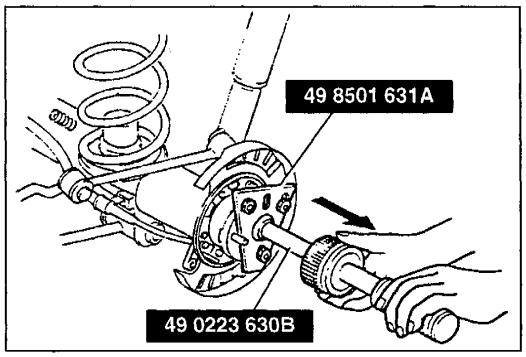
Position a dial indicator against the axle shaft. Push and pull the axle shaft by hand in the axial direction and measure the wheel bearing play.

If the play exceeds the specification, replace the wheel bearing.

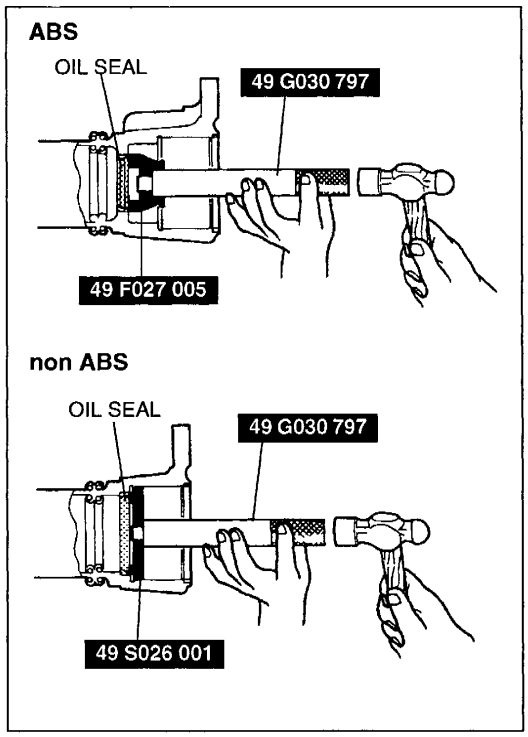
Maximum wheel bearing play: 0.57 mm { 0.0224 in }



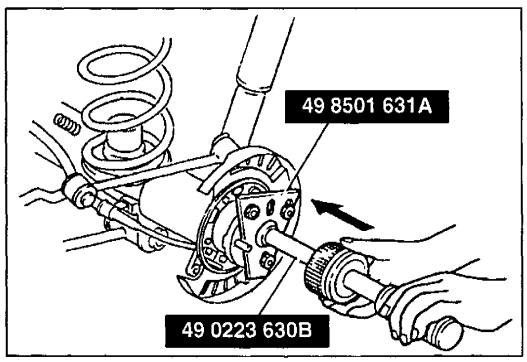
Removal note
Brake pipe
Disconnect the brake pipe by using the **SST**, and then plug it.



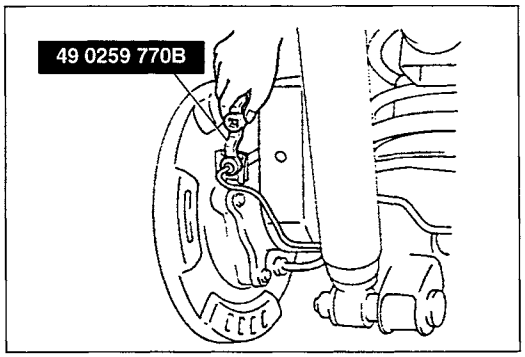
Dust cover and rear axle shaft assembly
Remove the dust cover and rear axle shaft assembly by using the **SST**.



Installation note
Oil seal
Apply grease to a new oil seal lip, and install it by using the **SST**.



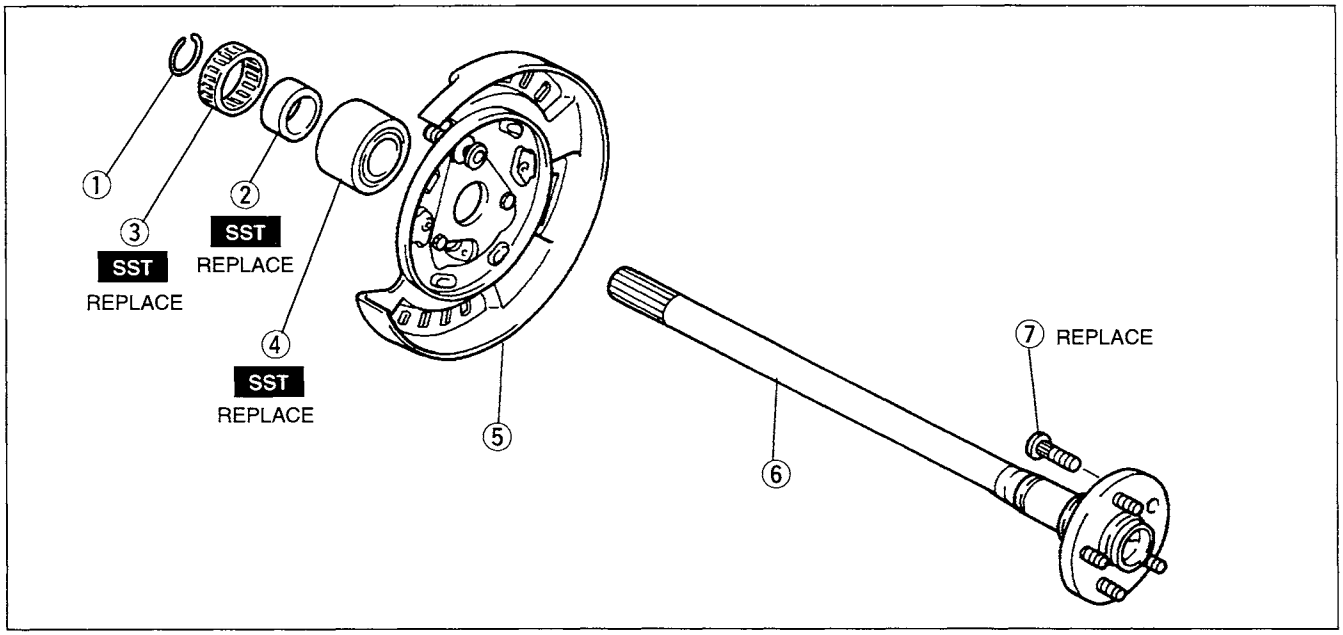
Dust cover and rear axle shaft assembly
Install the dust cover and rear axle shaft assembly by using the **SST**.



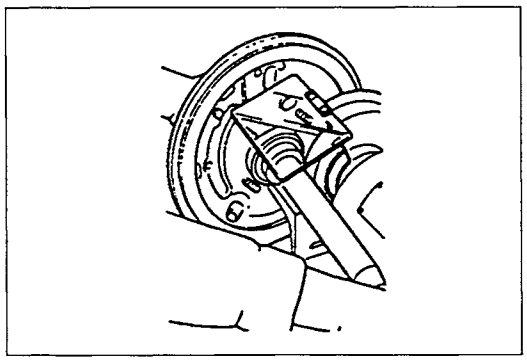
Brake pipe
1. Tighten the brake pipe by using the **SST**.
2. Bleed the brake system. (Refer to section P.)

Tightening torque: 12.8—21.5 N·m
{ 130—220 kgf·cm , 113—190 in·lbf }

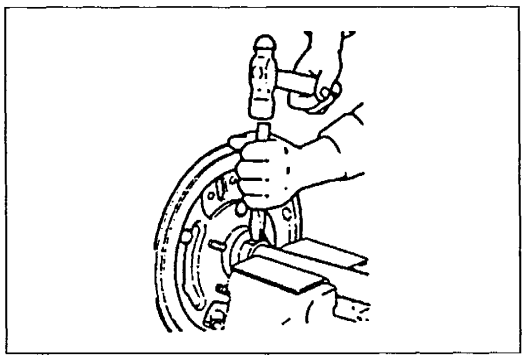
Disassembly / Inspection / Assembly
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



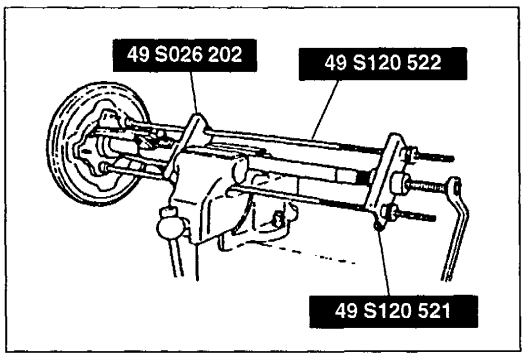
1. Retaining ring
2. Bearing collar
   Disassembly Note ..... below
   Assembly Note ..... page M–23
3. ABS sensor rotor (ABS)
   Assembly Note ..... page M–23
4. Bearing
   Disassembly Note ..... page M–22
   Inspect for damage and rough rotation
   Assembly Note ..... page M–23
5. Backing plate
6. Rear axle shaft
   Inspect the splines for damage or wear
   Inspection ..... page M–22
7. Hub bolt
   Disassembly Note ..... page M–22
   Assembly Note ..... page M–22



Disassembly note
Bearing collar
1. Grind a section of the bearing collar until about **0.5 mm { 0.0197 in }** remains. Be careful not to grind the backing plate and the rear axle shaft.

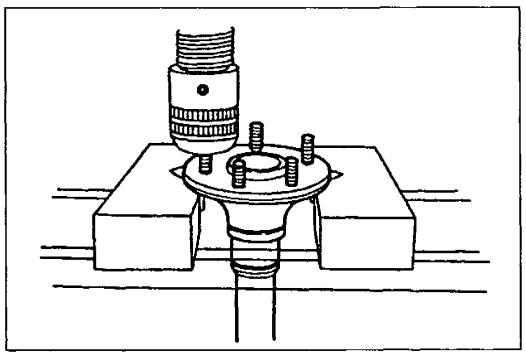


2. Being careful not to dent or scratch the rear axle shaft, hit the grinded section of the bearing collar with a chisel.
3. Remove the bearing collar.



Bearing

Remove the bearing by using the **SST**.

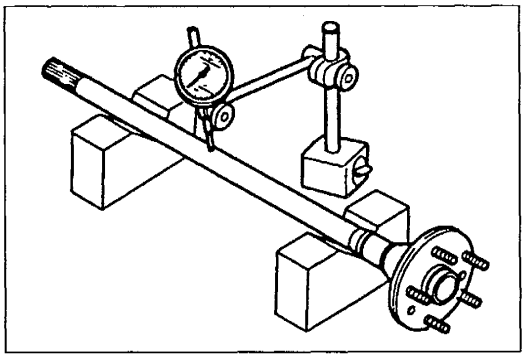


Hub bolt

Note

- The hub bolts do not need to be removed unless you are replacing them.

Remove the hub bolts by using a press if necessary.

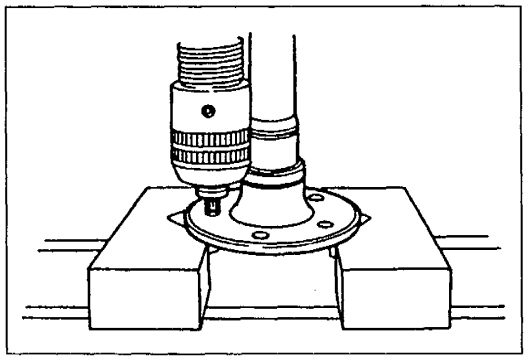


Inspection

Rear axle shaft

Measure the shaft runout by using a dial indicator.
If runout exceeds the specification, replace the axle shaft.

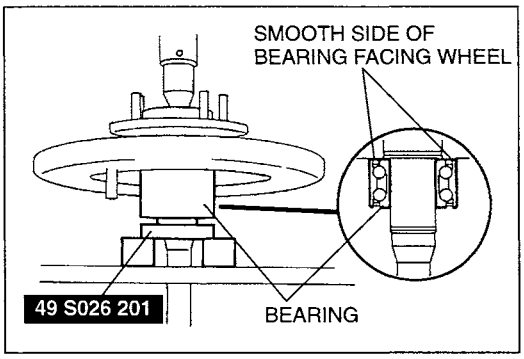
Maximum runout: 1.5 mm { 0.059 in }



Assembly note

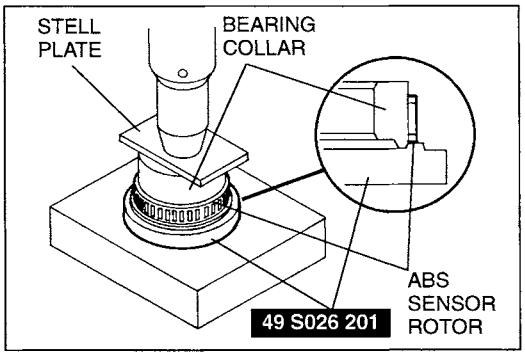
Hub bolt

Install the new hub bolts by using a press.



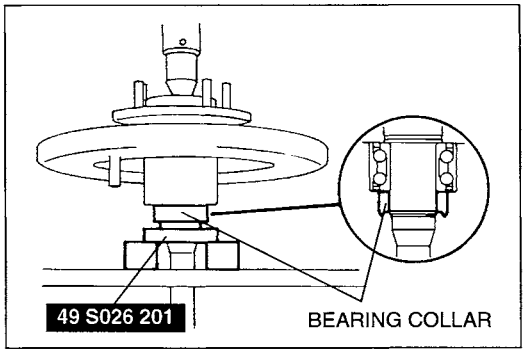
Bearing

Using the **SST** and a press, install a new bearing with the smooth side facing the wheel.



ABS sensor rotor (ABS)

Using a press, install a new ABS sensor rotor until it contacts the **SST**.

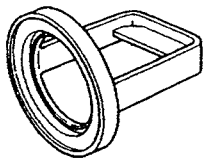


Bearing collar

1. Remove any grease or oil from the rear axle shaft and new bearing collar.
2. Install the bearing collar onto the rear axle shaft by using the **SST**. If **26,478 N { 2,700 kgf , 5,940 lbf }** or less is required to press the collar, replace the shaft.

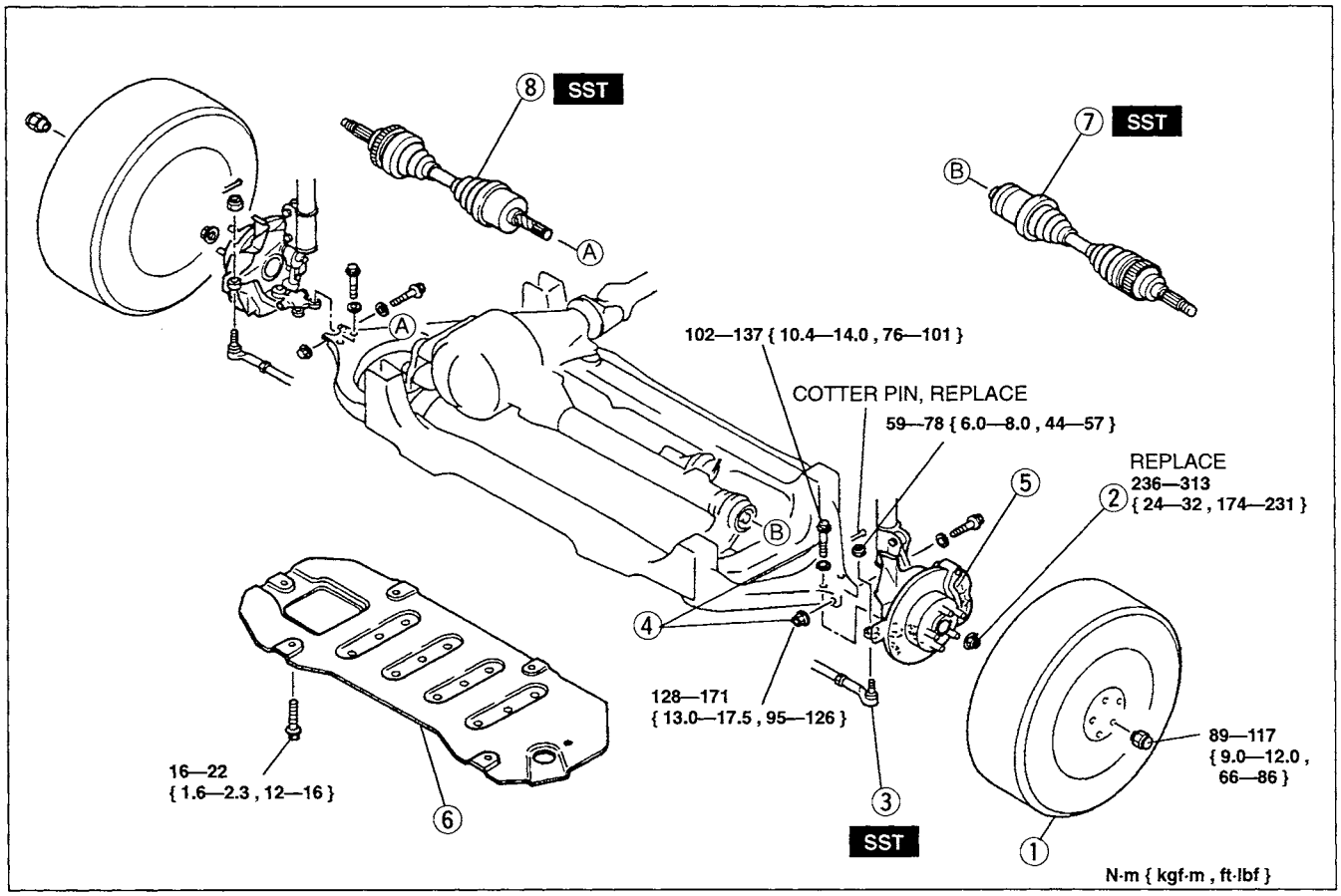
DRIVE SHAFT (4WD)

PREPARATION
SST

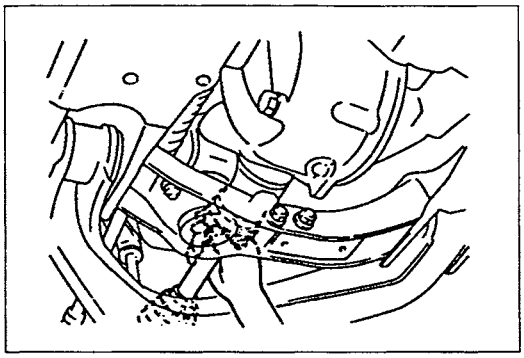
49 0180 321A Installer, main drive gear bearing 	For assembly of drive shaft	49 G025 001 Installer, sensor rotor 	For installation of sensor rotor

DRIVE SHAFT (DOUBLE OFFSET JOINT)
Inspection / Removal / Installation

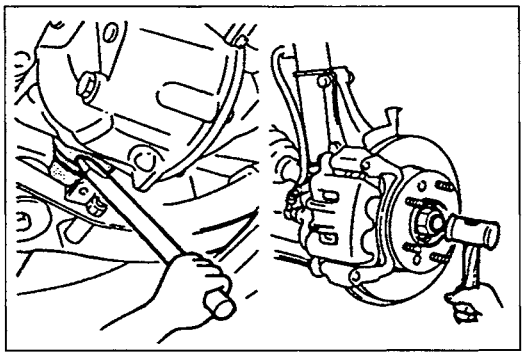
1. Drain the differential gear oil.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Inspect all parts and repair or replace as necessary.
4. Install in the reverse order of removal, referring to **Installation Note**.



1. Wheel and tire
2. Locknut
   Installation Note ..... page M–25
3. Tie-rod end
   Service ..... section N
4. Ball joint bolt and nut
5. Front axle
   Disassembly / Inspection / Assembly ..... page M– 8
6. Engine undercover
7. Left drive shaft
   Inspect splines for damage or wear
   Inspect drive shaft for cracks
   Removal Note ..... page M–25
   Overhaul ..... page M–26
8. Right drive shaft
   Inspect splines for damage or wear
   Inspect drive shaft for cracks
   Removal Note ..... page M–25
   Overhaul ..... page M–26

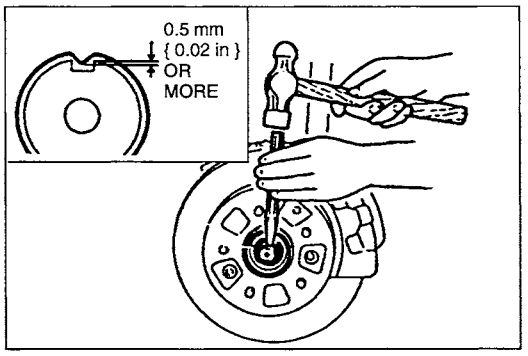


Inspection
Drive shaft
Check the boots on the drive shaft for cracks, damage, grease leakage, or loose boot bands. Replace if necessary.



Removal note
Left drive shaft, Right drive shaft
Separate the drive shaft from the differential by prying with a bar inserted between the outer ring and the differential.

Note
- If the drive shaft will not come out of the wheel hub easily, install a discarded nut onto the drive shaft so that the nut is flush with the end of the drive shaft, and tap the nut with a copper hammer.



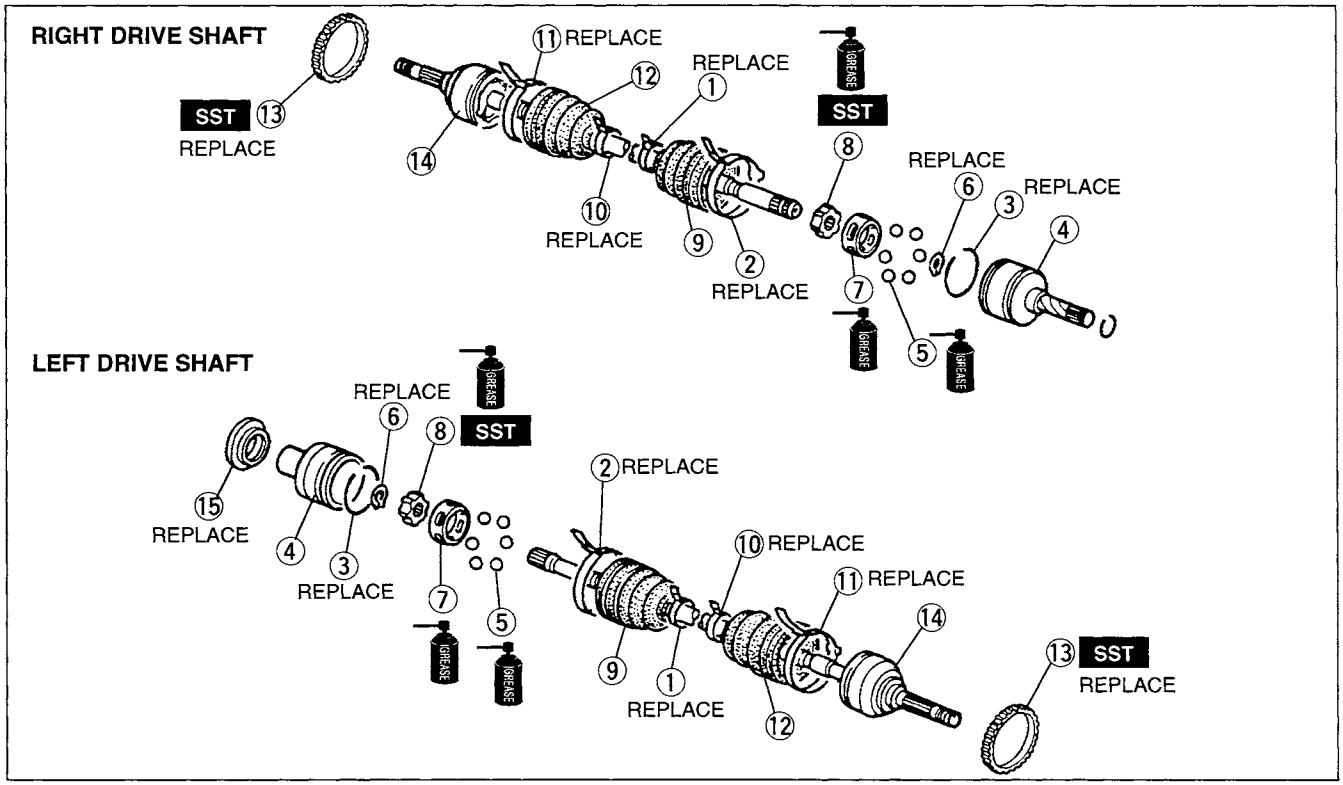
Installation note
Locknut
Install a new locknut and stake it as shown.

Tightening torque:
236—313 N·m { 24—32 kgf·m , 174—231 ft·lbf }

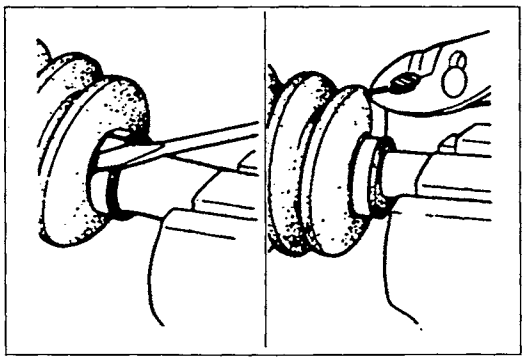
Overhaul

Caution
- **Secure the joint in a vise with protective material (such as copper plates) on the vise jaws.**
- **Be careful that dust or other foreign material does not enter the joint while the work is being performed.**
- **Do not disassemble the wheel side ball joint.**
- **Do not wash the joint unless it is being disassembled.**

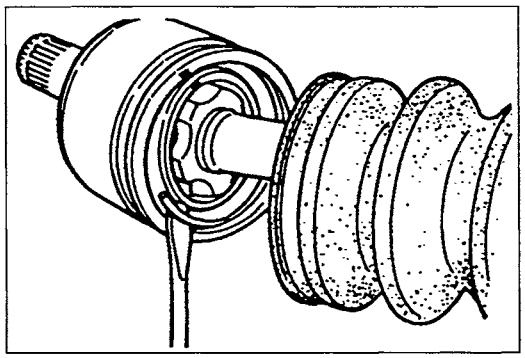
1. Disassemble in the order shown in the figure, referring to **Disassembly Procedure**.
2. Inspect all parts and repair or replace as necessary.
3. Verify that all parts are free of dust, dirt, and other foreign material immediately before reassembly.
4. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



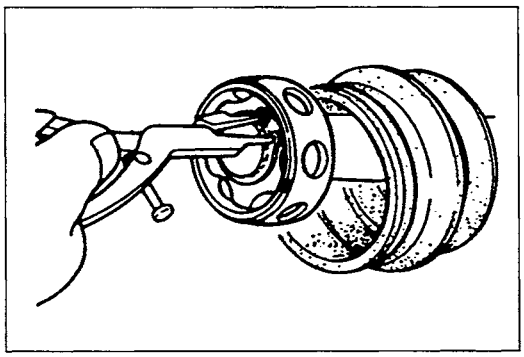
1. Boot band
2. Boot band
3. Clip
4. Outer ring
5. Ball
6. Snap ring
7. Cage
8. Inner ring
9. Boot
10. Boot band
11. Boot band
12. Boot
13. ABS sensor rotor
14. Shaft and ball joint assembly
    Inspection ..... page M–28
15. Dust cover



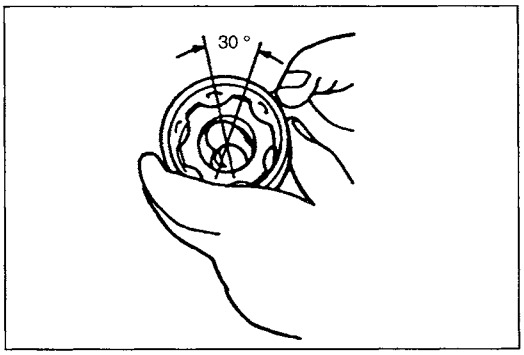
Disassembly procedure
1. Pry up the locking clip of the differential side boot by using a screwdriver.
2. Remove both bands by using pliers.
3. Slide the boot along the shaft to expose the joint.



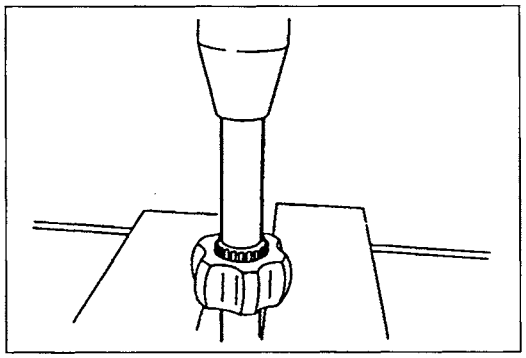
4. Mark the outer ring and the cage for proper reassembly.
5. Remove the clip by using a screwdriver.



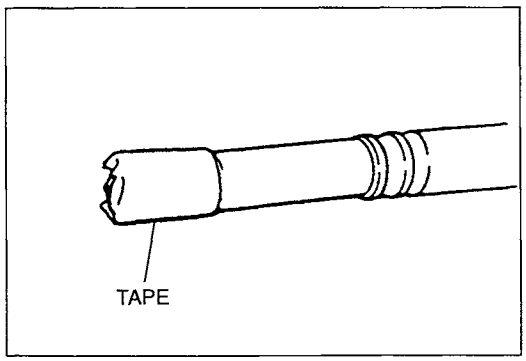
6. Remove the balls.
7. Mark the shaft, cage, and inner ring for proper reassembly.
8. Remove the snap ring by using snap-ring pliers.



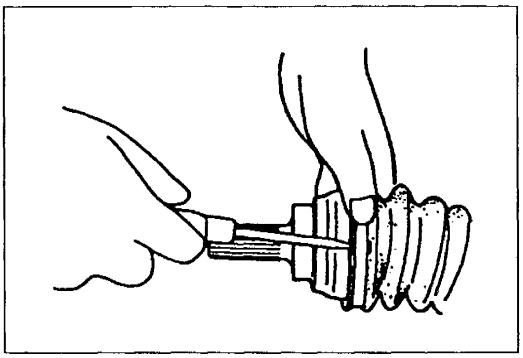
9. Turn the cage about **30 degrees.** Separate it from the inner ring.



10. Remove the inner ring by using a press.

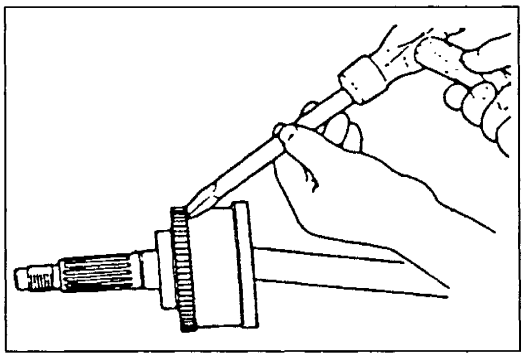


11. Wrap the splines of the shaft with tape to prevent damaging the boot. Remove the boot and small boot band.



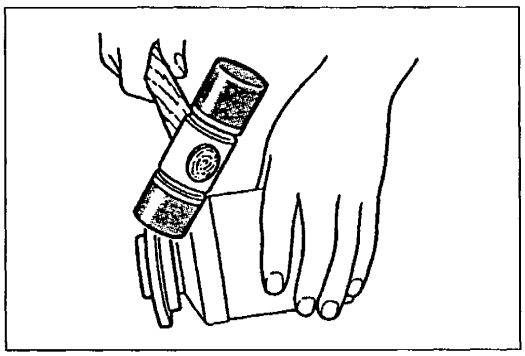
Note
- The wheel-side boot does not need to be removed unless you are replacing it.

12. Pry up the locking clips of the wheel side boot by using a screwdriver.
13. Remove both bands by using pliers. Remove the boot.

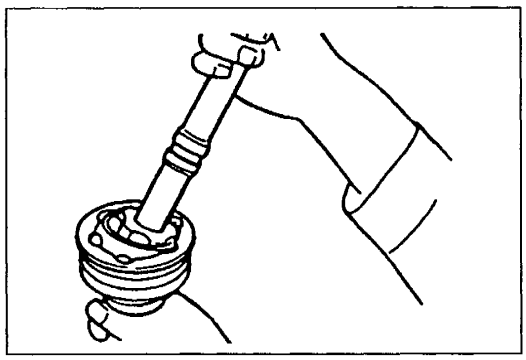


Note
- The sensor rotor does not need to be removed unless you are replacing it.

14. Tap the ABS sensor rotor off of the drive shaft by using a chisel.

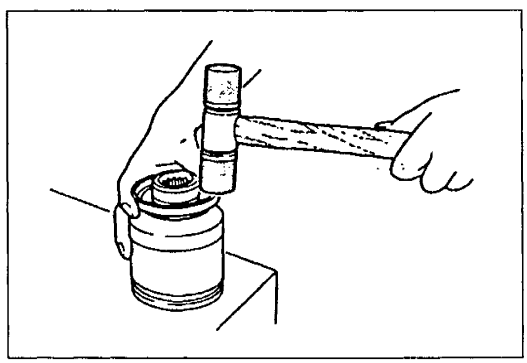


15. If necessary, remove the dust cover by using a plastic hammer.

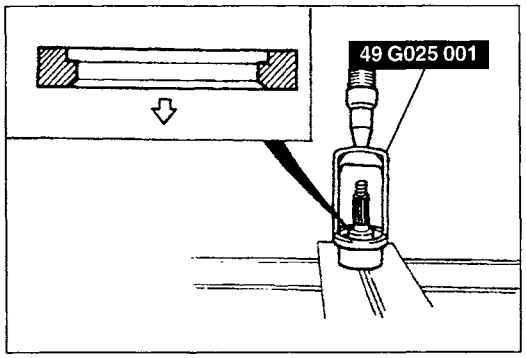


Inspection

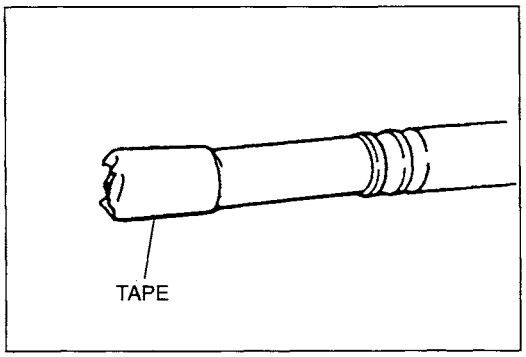
Check for the following and replace parts as necessary.
1. Bending, twisting, or other damage of the shaft.
2. Wear on the shaft splines.
3. Wear, excessive play, corrosion, or other damage to the joint on the differential side.
4. Excessive play, wear, corrosion, or other damage to the joint on the wheel side.



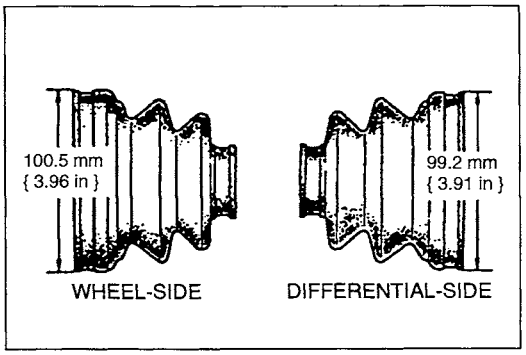
Assembly procedure
1. Install a new dust cover by using a plastic hammer, if it was removed.



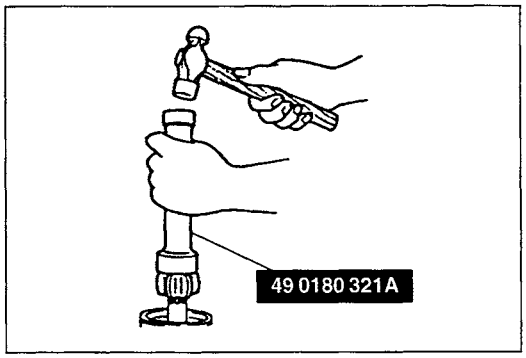
2. Set a new ABS sensor rotor on the drive shaft in the direction shown, and press it onto the shaft assembly by using the **SST**.



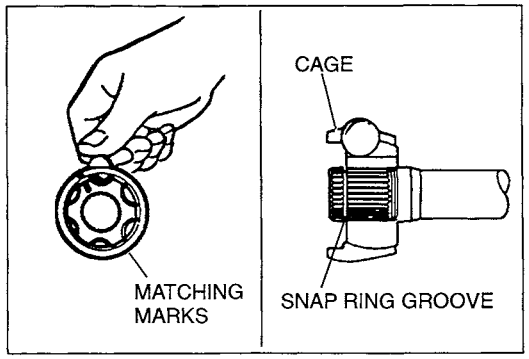
3. Wrap the shaft splines with tape.



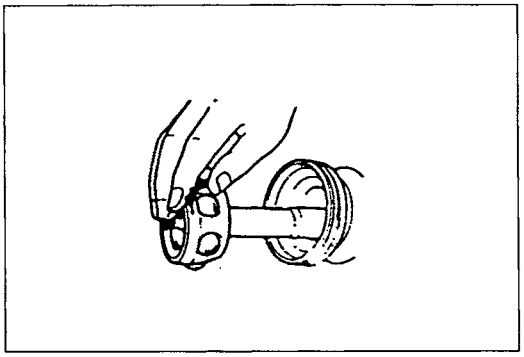
4. Install the wheel-side and differential-side boots, noting the shape and size of each one as in the figure.



5. Install the cage with the larger diameter facing the differential.
6. Align the marks, and install the inner ring on the shaft by using the **SST**.

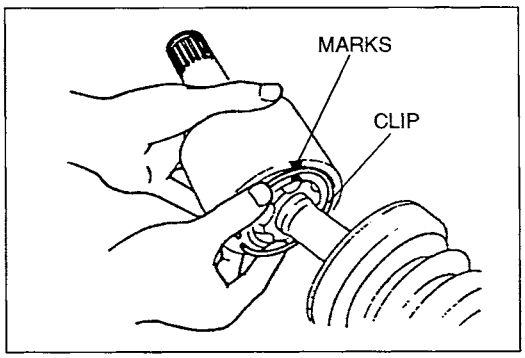


7. Align the marks and install the balls to the inner ring.
8. Install the cage, inner ring, and ball assembly to the drive shaft in the direction shown in the figure.
9. Fit a new snap ring into the ring groove in the shaft.

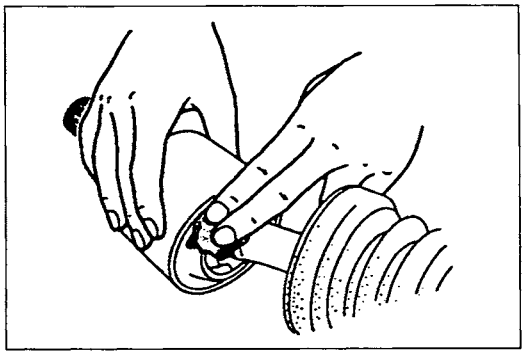


10. Install the cage on the inner ring, and turn the cage about **30 degrees** with respect to the inner ring.
11. Fit the balls through the cage into the ball grooves of the inner ring.
12. Apply the specified grease to the cage, inner ring, and balls.

Specified grease: Type joint grease (yellow)

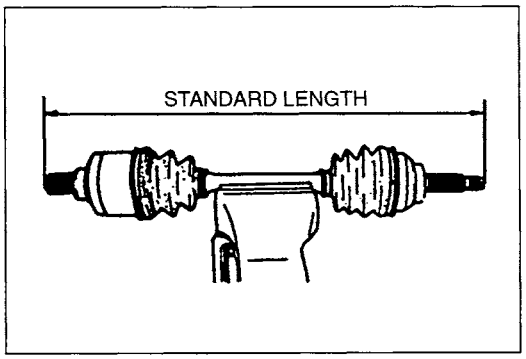


13. Align the marks, and install the outer ring on the shaft.
14. Install a new clip onto the outer ring.



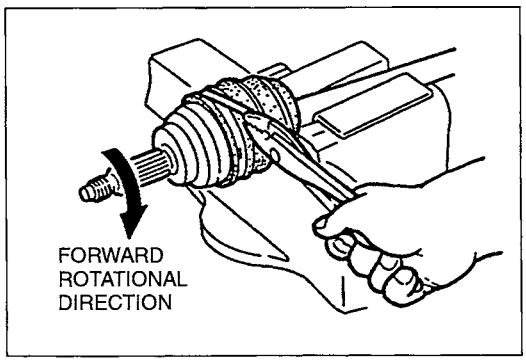
15. Fill the differential-side boot with the greases supplied in the boot kit.
    If the wheel-side boot was removed, apply specified grease to it also.

Grease amount
Differential-side: 105 ± 10 g { 3.71 ± 0.35 oz }
Wheel-side: 100 ± 10 g { 3.53 ± 0.35 oz }



16. Install the boot.
17. Carefully lift up the small end of the boot to release any trapped air.
18. Verify that the boot is not dented or twisted.

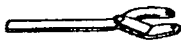
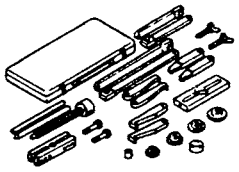
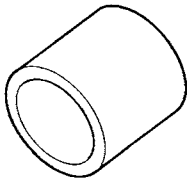
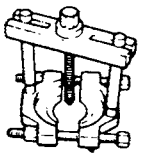
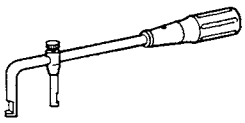
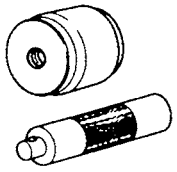
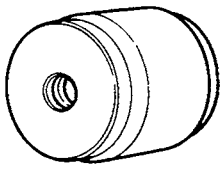
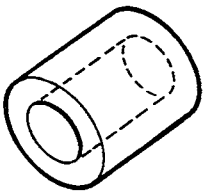
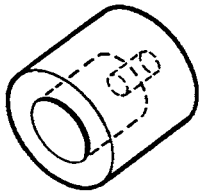
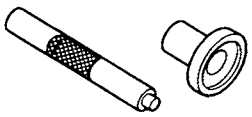
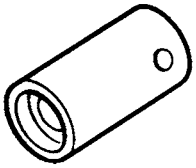
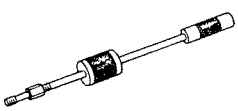
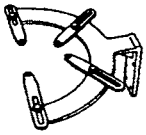
Standard length
Right side: 566.5 mm { 22.30 in }
Left side: 498.5 mm { 19.63 in }

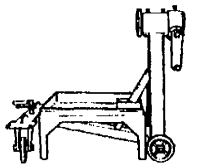
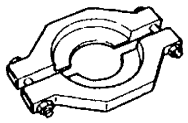
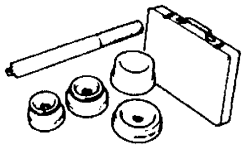
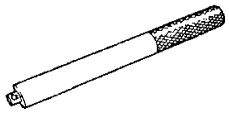
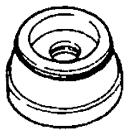
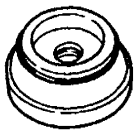
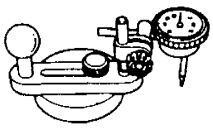
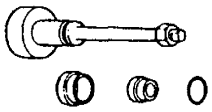
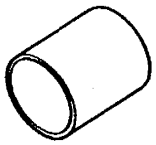
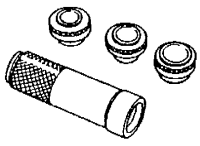
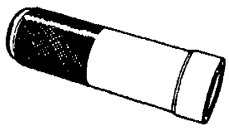
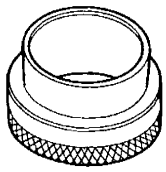
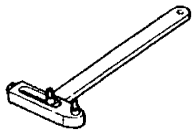


19. Install the bands in the direction shown in the figure.
20. Fold the bands back, and lock them by bending the locking clips over the band tips.

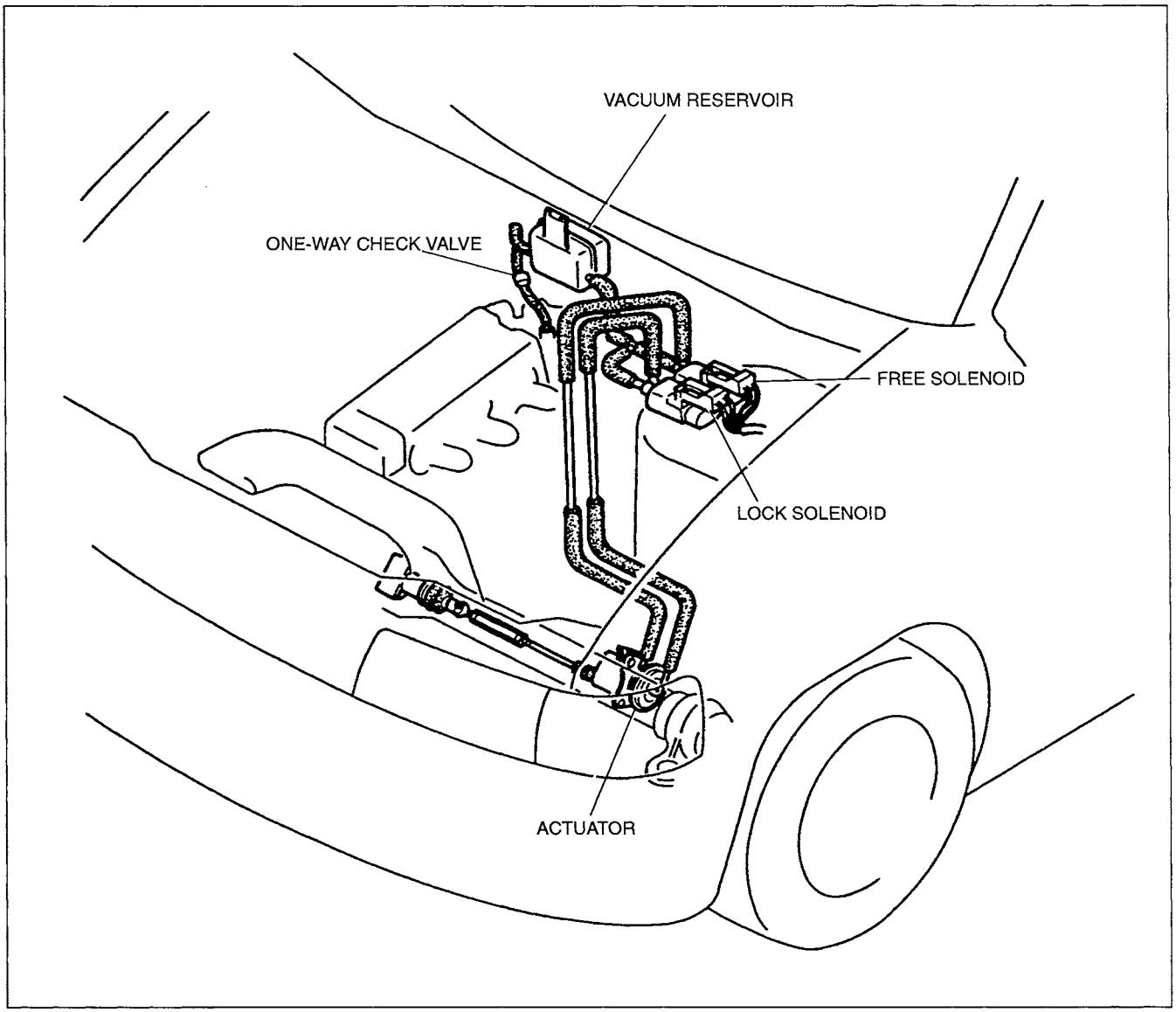
FRONT DIFFERENTIAL AND AUTOMATIC FREEWHEEL (AFW) MECHANISM (4WD)

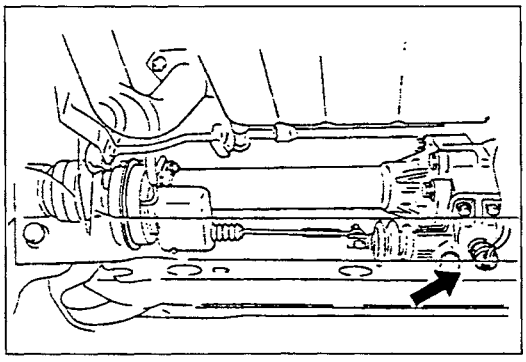
PREPARATION
SST

49 S120 710 Holder, coupling flange 	For disassembly / assembly of companion flange	49 0839 425C Puller set, bearing 	For disassembly of companion flange and side bearing
49 U027 003 Installer, oil seal 	For assembly of oil seal	49 G030 795 Installer, oil seal 	For installation of oil seal
49 G030 796 Body (Part of 49 G030 795) 	For installation of oil seal	49 0710 520 Puller, bearing 	For disassembly of hub
49 U027 004 Remover, oil seal 	For disassembly of oil seal	49 W027 0A0 Installer set, oil seal 	For disassembly of bearing
49 W027 001 Body (Part of 49 W027 0A0) 	For disassembly of bearing	49 U027 006 Installer, bearing & oil seal 	For assembly of oil seal, ball bearing, joint shaft, and bearing
49 U027 005 Installer, bearing 	For assembly of bearing, joint shaft, and hub	49 M005 795 Installer set, oil seal 	For assembly of dust seal
49 M005 796 Body (Part of 49 M005 795) 	For assembly of dust seal	49 U027 007 Installer, oil seal 	For assembly of oil seal
49 0813 215A Puller, tubular dowel 	For disassembly of output shaft	49 M005 561 Hanger, differential carrier 	For disassembly / assembly of differential assembly

49 0107 680A Engine stand 	For disassembly / assembly of differential assembly	49 H027 002 Remover, bearing 	for disassembly of rear bearing
49 F027 0A1 Installer set, bearing 	For assembly of front bearing race, rear bearing race, and oil seal	49 F027 003 Handle (Part of 49 F027 0A1) 	For assembly of front bearing race, rear bearing race, and oil seal
49 F027 005 Attachment ϕ62 (Part of 49 F027 0A1) 	For assembly of front bearing race	49 F027 007 Attachment ϕ72 (Part of 49 F027 0A1) 	For assembly of rear bearing race
49 0720 570 Gauge body, pinion height 	For adjustment of drive pinion height	49 8531 565 Pinion model 	For adjustment of drive pinion height
49 H027 001 Collar 	For adjustment of drive pinion height	49 U027 001 Collar 	For adjustment of drive pinion height
49 0305 555 Gauge block 	For adjustment of drive pinion height	49 F401 330B Installer set, bearing 	For assembly of rear bearing and side bearing
49 F401 331 Body (Part of 49 F401 330B) 	For assembly of rear bearing and side bearing	49 F401 337A Attachment C (Part of 49 F401 330B) 	For assembly of rear bearing
49 G030 338 Attachment E 	For assembly of side bearing	49 0259 720 Adjustment wrench, side bearing 	For adjustment of backlash

VACUUM HOSE ROUTING DIAGRAM

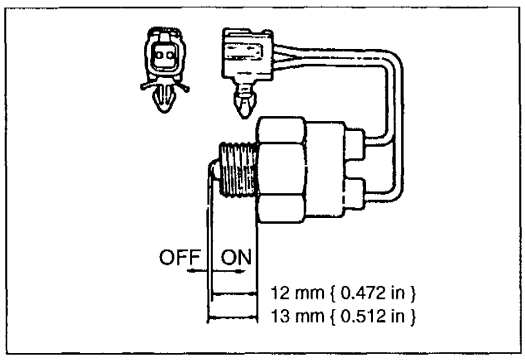




AFW SWITCH

Inspection

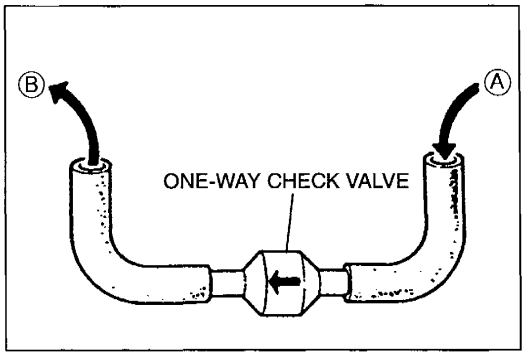
1. Disconnect the negative battery cable.
2. Jack up the vehicle and support it on safety stands.
3. Disconnect the AFW switch connector and remove the switch.



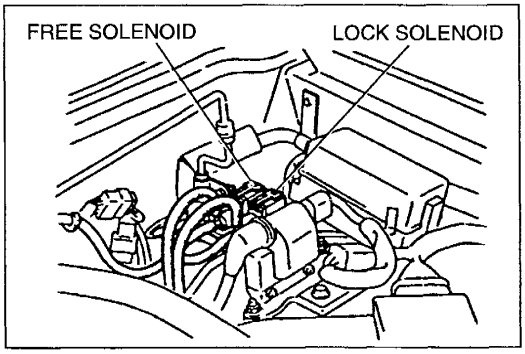
4. Check for continuity at the switch by using an ohmmeter.

Switch	Continuity
Depressed	Yes
Released	No

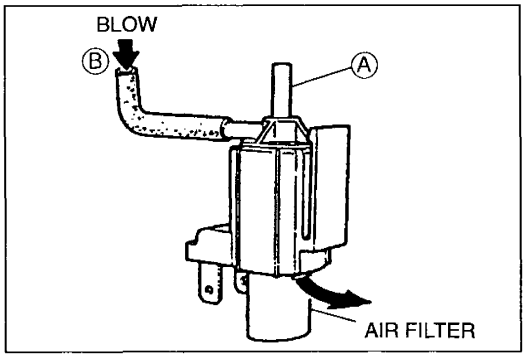
5. If not as specified, replace the switch.



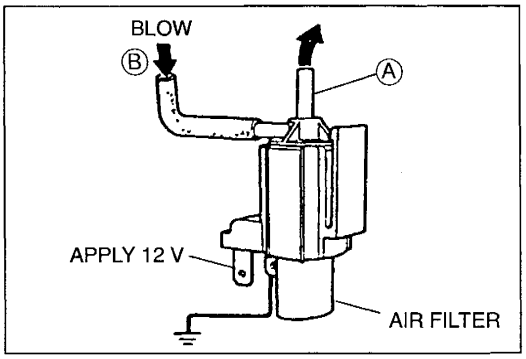
ONE-WAY CHECK VALVE
Inspection
1. Remove the one-way check valve.
2. Blow through Ⓐ and verify that air flows from Ⓑ.
3. Blow through Ⓑ and verify that air does not flow from Ⓐ.
4. If not as specified, replace the one-way check valve.



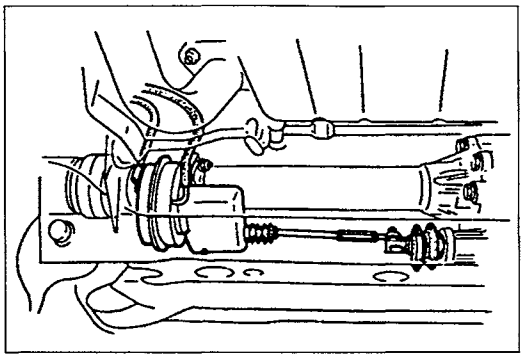
SOLENOID VALVE
Inspection
1. Disconnect the vacuum hoses and the connector from each solenoid valve.



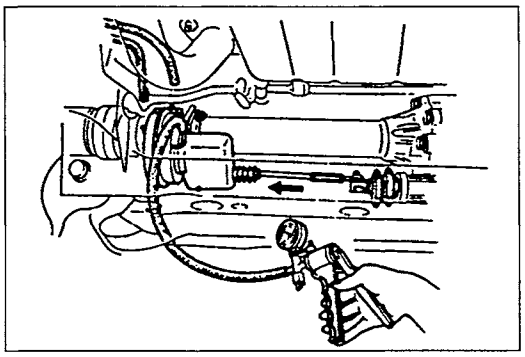
2. Blow through each valve from port Ⓑ.
3. Verify that air flows from the air filter.



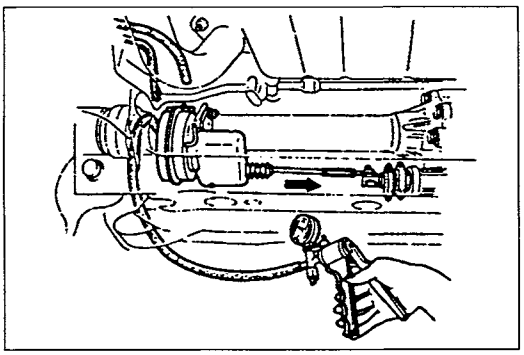
4. Connect 12 V and a ground to the terminals of each valve.
5. Blow through each valve from port Ⓑ.
6. Verify that air flows from port Ⓐ.
7. If not as specified, replace the solenoid valve(s).



ACTUATOR
Inspection
1. Jack up the vehicle and support it on safety stands.
2. Disconnect the vacuum hoses from the actuator.

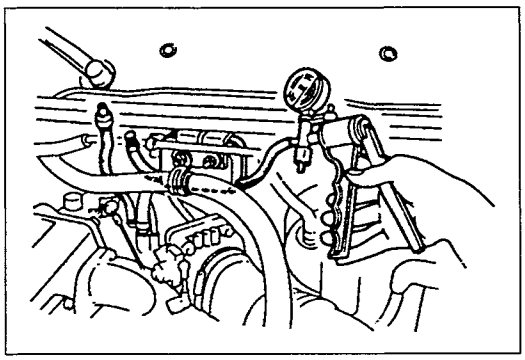


3. Connect a vacuum pump tester to the actuator (free side) as shown.
4. Apply 26.66 kPa { 200 mmHg , 7.87 inHg } vacuum, and verify that the rod moves inward.
5. Disconnect the vacuum pump.

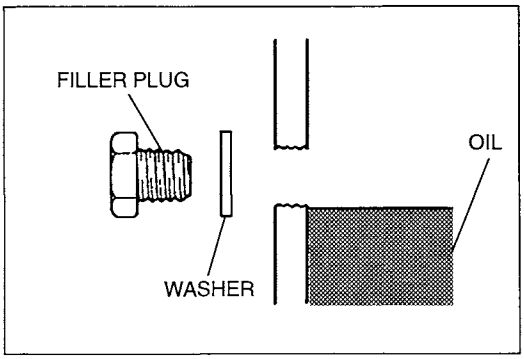


6. Connect the vacuum pump to the actuator (lock side) as shown.
7. Apply 26.66 kPa { 200 mmHg , 7.87 inHg } vacuum, and verify that the rod moves outward.
8. If not as specified, replace the actuator.

Tightening torque:
16—22 N·m { 1.6—2.3 kgf·m , 12—16 ft·lbf }

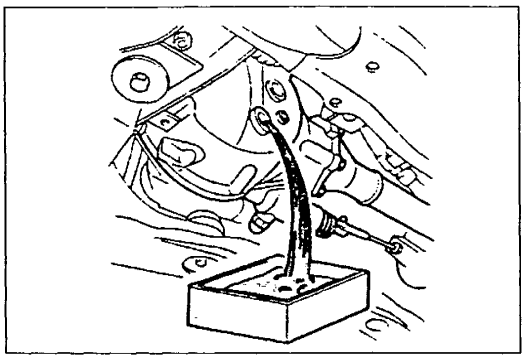


VACUUM RESERVOIR
Inspection
1. Disconnect the vacuum hoses.
2. Plug one hose fitting of the reservoir.
3. Connect a vacuum pump tester to the other fitting.
4. Apply 93.33 kPa { 700 mmHg , 27.56 inHg } vacuum, and verify that the vacuum is held.
5. If not as specified, replace the vacuum reservoir.



DIFFERENTIAL OIL
Inspection
1. Remove the filler plug and washer.
2. Verify that the oil is up to the brim of the filler plug hole, as shown.
   If it is low, add the specified oil.
3. Install the filler plug and a new washer.

Tightening torque:
40—53 N·m { 4.0—5.5 kgf·m , 29—39 ft·lbf }



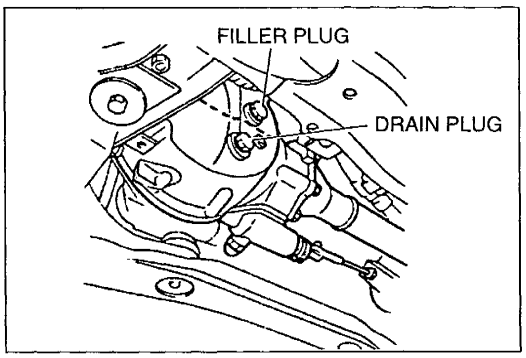
Replacement

1. Remove the drain plug, filler plug, and washers.
2. Drain the oil into a suitable container.
3. Wipe the plugs clean.
4. Install the drain plug and a new washer.

Tightening torque:
40—53 N·m { 4.0—5.5 kgf·m , 29—39 ft·lbf }

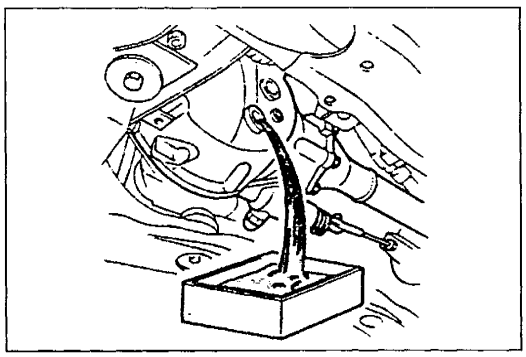
5. Add the specified oil through the filler plug hole until the level reaches the brim of the hole.

Specified oil
Type
Above –18 °C { 0°F }: API GL-5, SAE 90
Below –18 °C { 0°F }: API GL-5, SAE 80W
Capacity: 1.7 L { 1.8 US qt , 1.5 Imp qt }



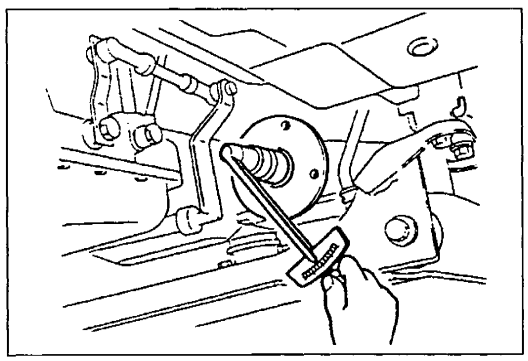
6. Install the filler plug and a new washer.

Tightening torque:
40—53 N·m { 4.0—5.5 kgf·m , 29—39 ft·lbf }

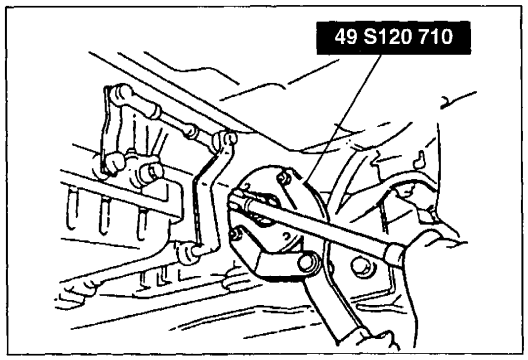


OIL SEAL
Replacement of Companion Flange Oil Seal

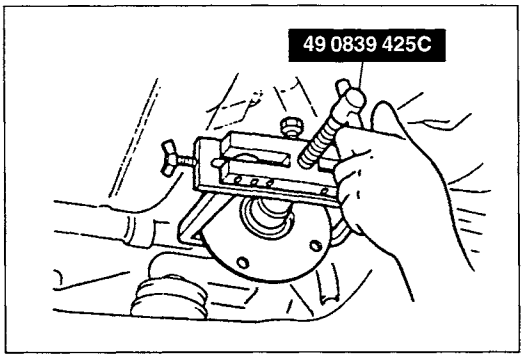
1. Jack up the vehicle and support it on safety stands.
2. Drain the differential oil. (Refer above.)



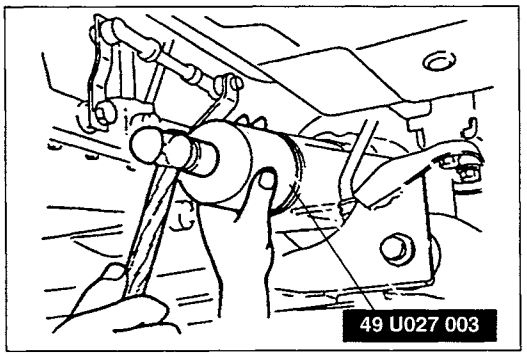
3. Remove the propeller shaft. (Refer to section L.)
4. Before loosening the locknut, measure the rotation starting torque of the drive pinion (within the range of the drive pinion and ring gear backlash).



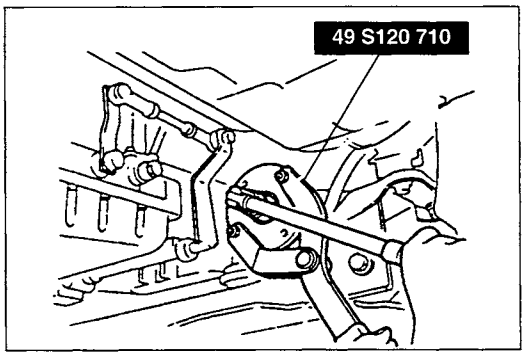
5. Hold the companion flange by using the **SST**, and remove the locknut.



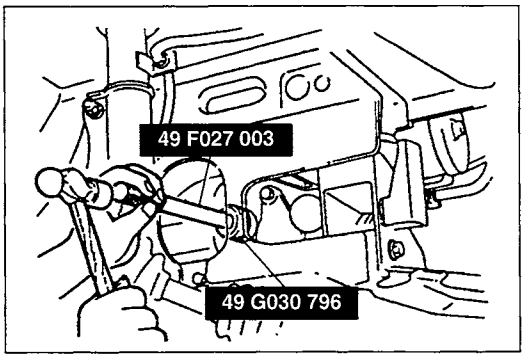
6. Remove the companion flange by using the **SST**.
7. Remove the oil seal.



8. Apply a thin coat of lithium-based grease to the lip of a new oil seal, and install it by using the **SST**.



9. Install the companion flange and tighten the locknut to get the starting torque measured in step 4.
10. Install the propeller shaft. (Refer to section L.)
11. Add differential oil to the specified level. (Refer to page M–35.)



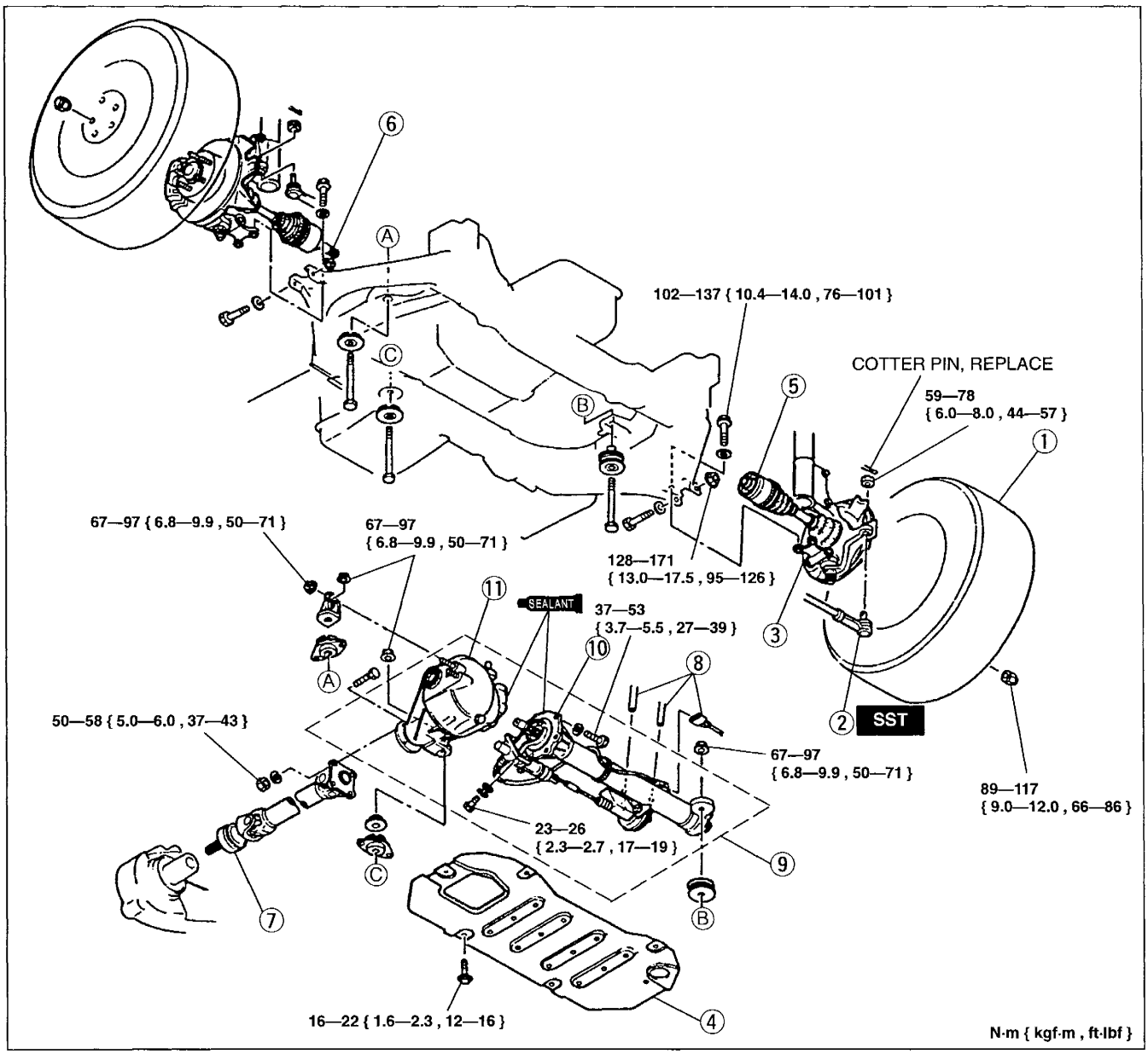
Replacement of Differential Oil Seal (right side)

1. Jack up the vehicle and support it on safety stands.
2. Drain the differential gear oil. (Refer to page M–35.)
3. Disconnect the front axle drive shaft. (Refer to page M–24.)
4. Remove the oil seal from the differential.
5. Tap the new oil seal into the differential by using the **SST**.
6. Install the front axle drive shaft. (Refer to page M–24.)
7. Add differential oil to the specified level. (Refer to page M–35.)

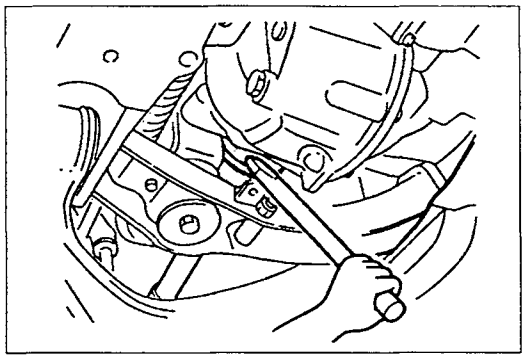
FRONT DIFFERENTIAL AND AUTOMATIC FREEWHEEL UNIT

Removal / Installation

1. Drain the differential gear oil. (Refer to page M–35.)
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.
4. After installation, check the front wheel alignment and adjust it if necessary. (Refer to section R.)

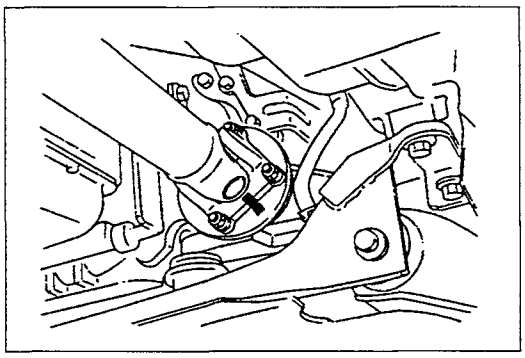


1. Wheel and tire
2. Tie-rod end
   Service ..... section N
3. Lower arm
4. Engine undercover
5. Left drive shaft and axle
   Removal Note ..... page M–39
6. Right drive shaft and axle
   Removal Note ..... page M–39
7. Front propeller shaft
   Removal Note ..... page M–39
   Installation Note ..... page M–40
   Service ..... section L
8. Connector and vacuum hoses
9. Front differential and AFW assembly
   Removal Note ..... page M–39
   Installation Note ..... page M–39
10. Automatic freewheel unit
    Disassembly / Inspection / Assembly ..... page M–41
11. Front differential
    Overhaul ..... page M–47



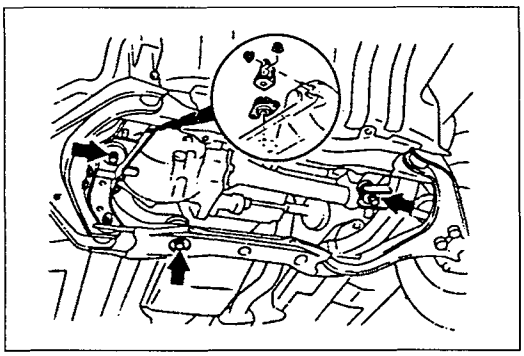
Removal note
Drive shaft and axle

Separate the drive shafts from the differential by prying with a bar inserted between the outer ring and the differential. Suspend the drive shafts by using a rope after removal.



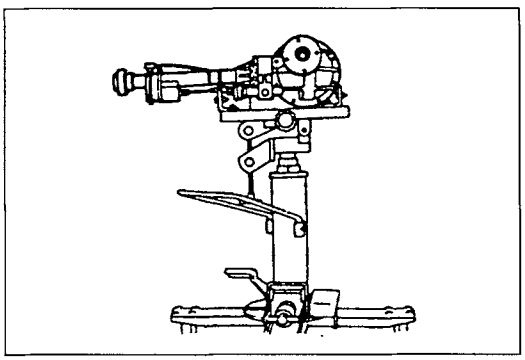
Front propeller shaft

Before removing the front propeller shaft, mark the flanges for proper reassembly.

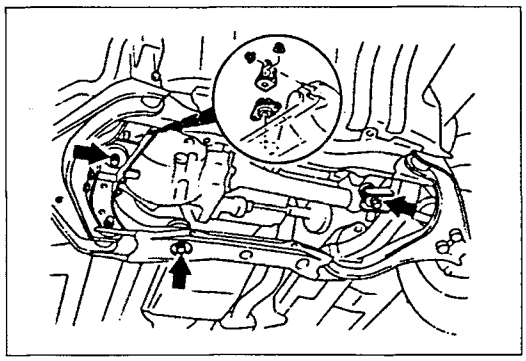


Front differential and AFW assembly

1. Support the differential on a transmission jack.
2. Remove the bolts and nuts indicated by the arrows.



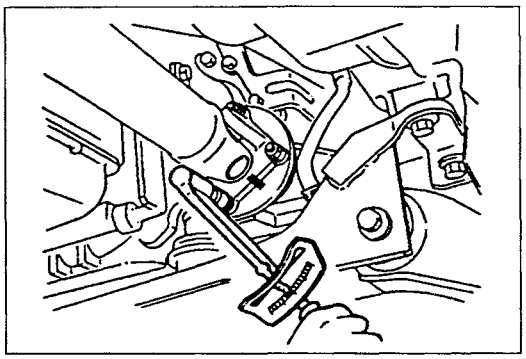
3. Remove the front differential and AFW assembly.



Installation note
Front differential and AFW assembly

1. Set the differential on a transmission jack.
2. Install the front differential and AFW assembly.

Tightening torque:
67—97 N·m { 6.8—9.9 kgf·m , 50—71 ft·lbf }



Front propeller shaft

Align the marks and install the front propeller shaft.

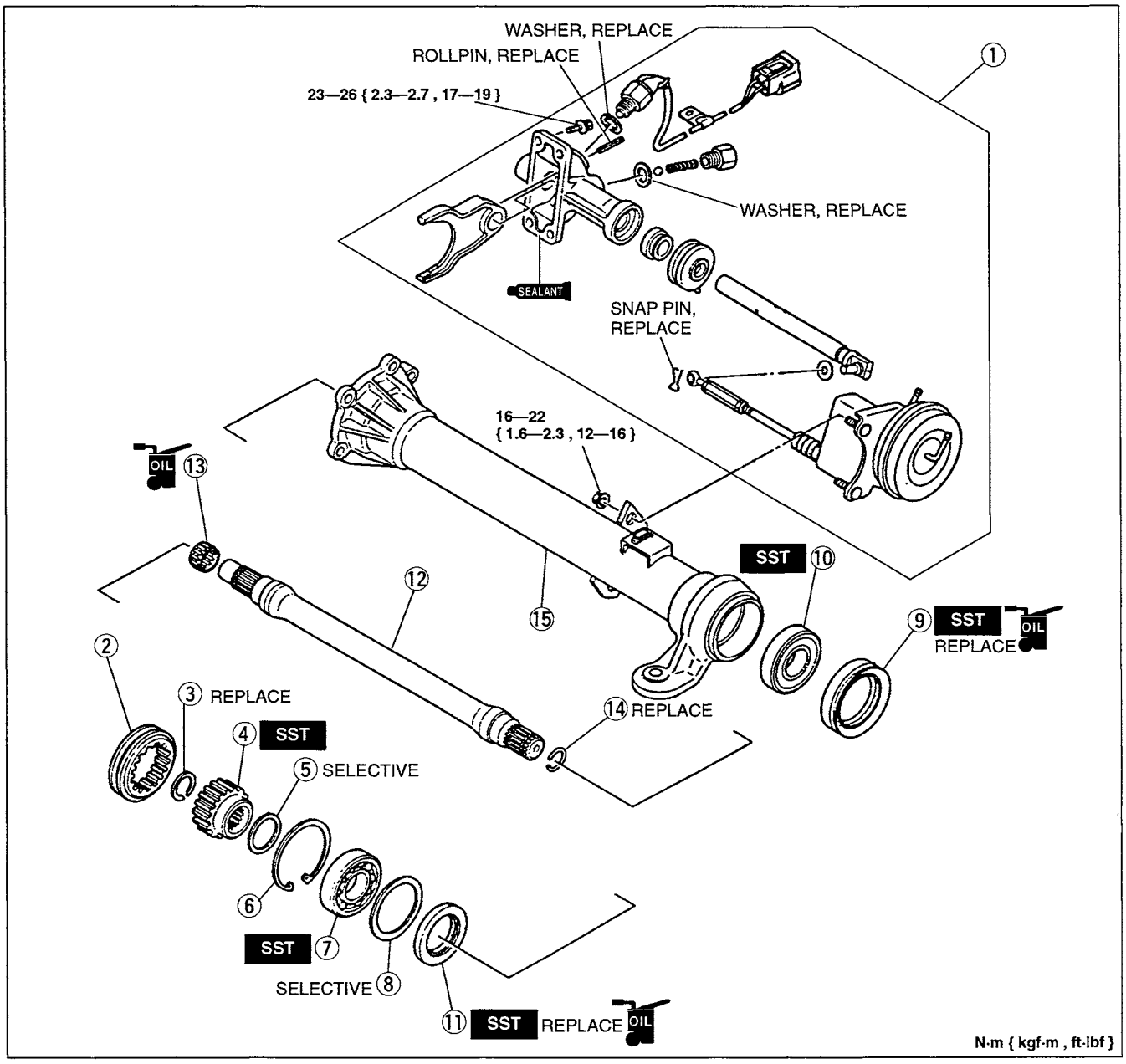
Tightening torque:

50—58 N·m { 5.0—6.0 kgf·m , 37—43 ft·lbf }

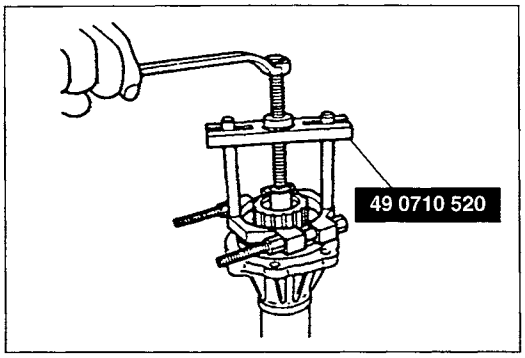
AUTOMATIC FREEWHEEL UNIT

Disassembly / Inspection / Assembly

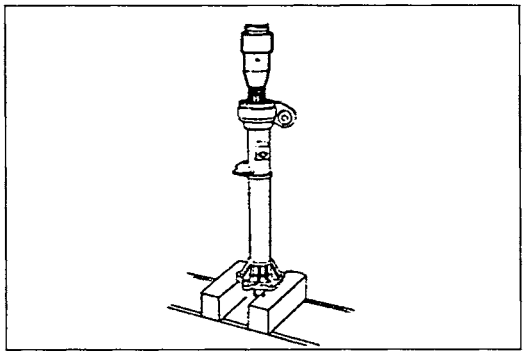
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



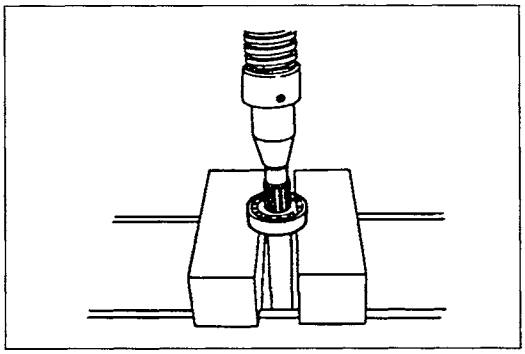
1. Control box assembly
   Overhaul ..... page M–45
2. Hub sleeve
3. Clip
4. Hub
   Disassembly Note ..... page M–42
   Inspect for damage, wear, or cracks
5. Spacer
6. Retaining ring
7. Ball bearing
   Disassembly Note ..... page M–42
   Inspect for damage or rough rotation
8. Adjustment shim(s)
9. Dust seal
10. Bearing
    Disassembly Note ..... page M–42
    Inspect for damage or rough rotation
11. Oil seal
    Disassembly Note ..... page M–43
12. Joint shaft
    Inspection ..... page M–43
13. Needle bearing
    Inspect for damage or rough rotation
14. Clip
15. Output shaft and gear sleeve



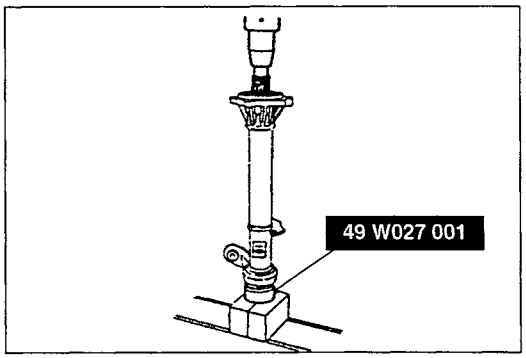
Disassembly note
Hub
Remove the hub by using the **SST**.



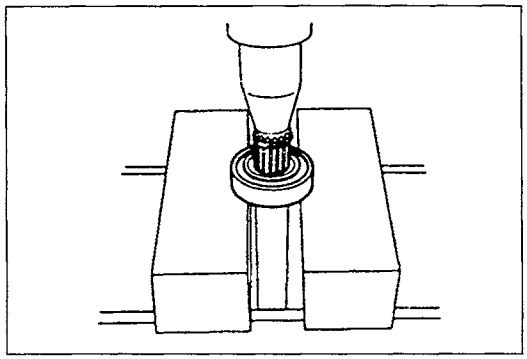
Ball bearing
1. Remove the ball bearing and the joint shaft by using a press.



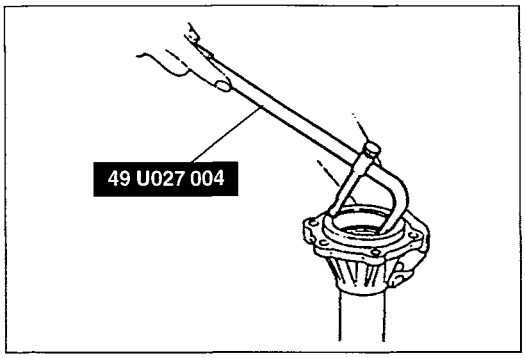
2. Remove the ball bearing by using a press.



Bearing
1. Remove the dust seal and bearing by using the **SST**.

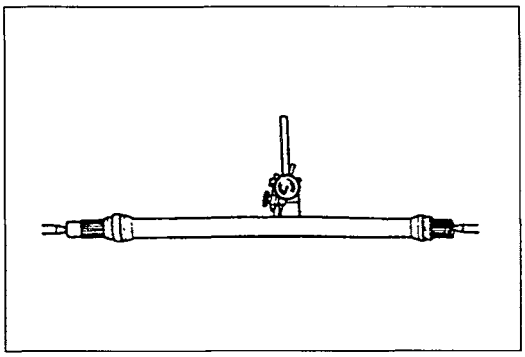


2. Remove the bearing by using a press.



Oil seal

Remove the oil seal by using the **SST**.

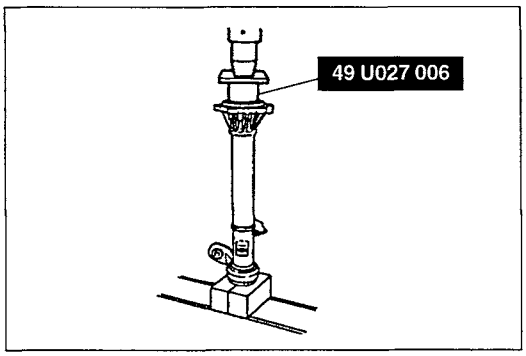


Inspection

Joint shaft

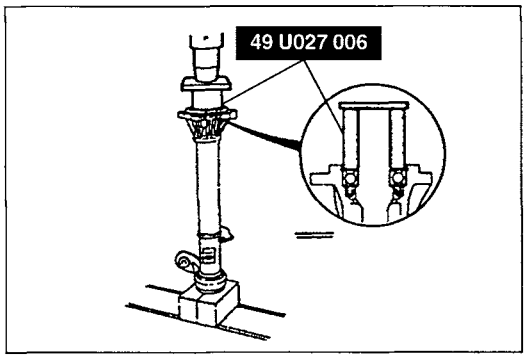
Measure the joint shaft runout.

Maximum runout: 0.03 mm { 0.0012 in }

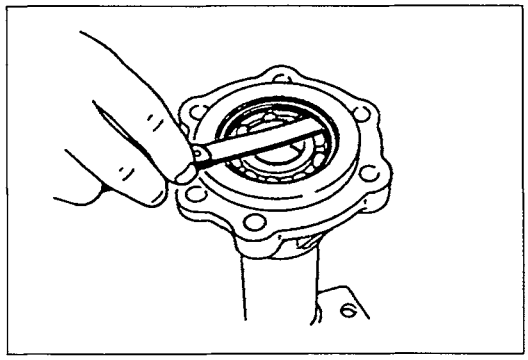


Assembly procedure

1. Apply front differential oil to the new oil seal.
2. Install the oil seal by using the **SST**.

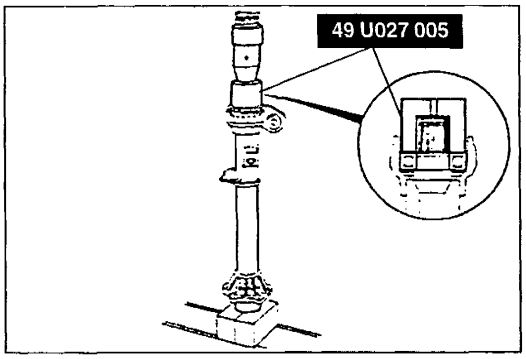


3. Set the removed shim(s) into the housing and install the ball bearing by using the **SST**.
4. Install the retaining ring.

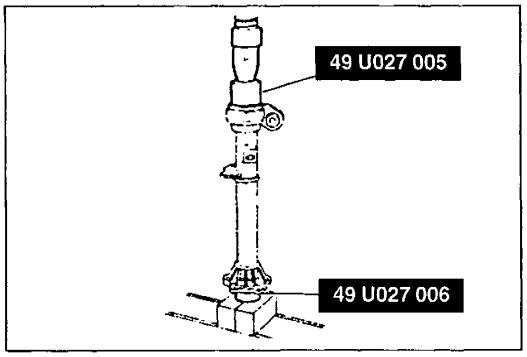


5. Measure the clearance between the ball bearing and the retaining ring.
   If not as specified, adjust by adding or removing shims. Use no more than two shims on either side.

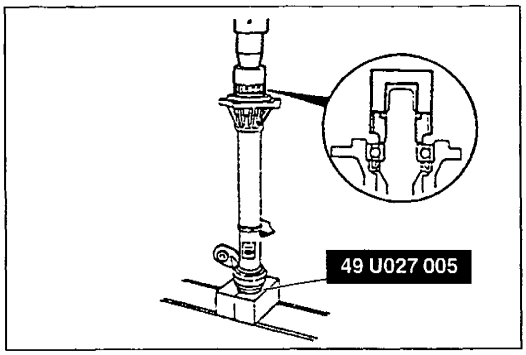
   Maximum clearance: 0.15 mm { 0.0059 in }
   Available shim thickness:
   0.15 mm { 0.0059 in }, 0.30 mm { 0.0118 in },
   0.35 mm { 0.0138 in }, 0.40 mm { 0.0157 in },
   0.50 mm { 0.0197 in }



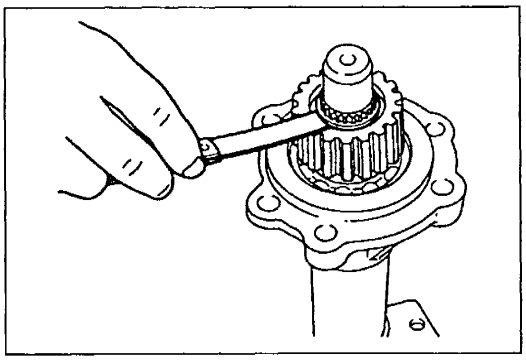
6. Install the bearing by using the **SST**.



7. Remove the retaining ring.
8. Using the **SST**, install the joint shaft and bearing, with the seal facing upward.
9. Install the retaining ring.

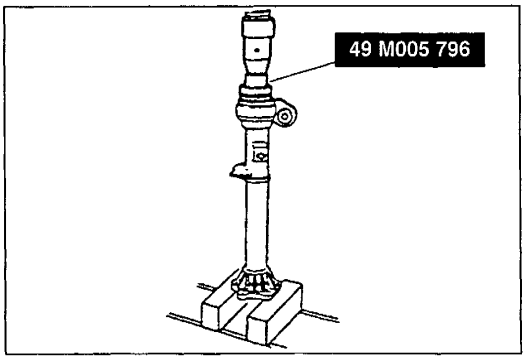


10. Install the spacer removed during disassembly and the hub by using a suitable pipe and the **SST**.
11. Install a new clip.



12. Measure the clearance between the hub and the new clip.
    If not as specified, adjust by adding or removing spacers. Use no more than two spacers on either side.

    Maximum clearance: 0.15 mm { 0.0059 in }
    Available spacer thickness:
    0.15 mm { 0.0059 in }, 0.30 mm { 0.0118 in }, 0.35 mm { 0.0138 in }, 0.40 mm { 0.0157 in }, 0.50 mm { 0.0197 in }

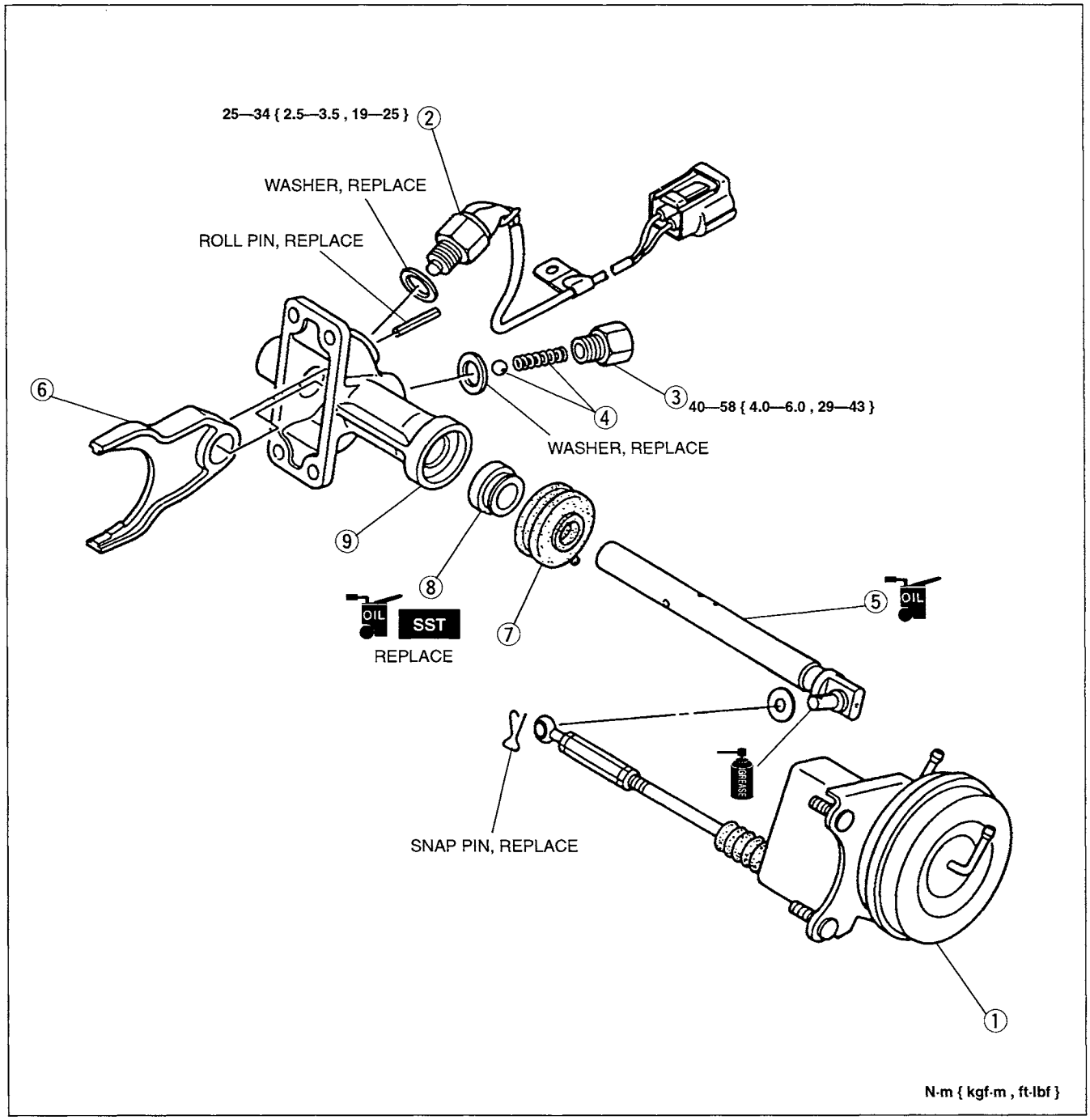


13. Install a new dust seal by using the **SST**.
14. Apply front differential oil to the needle bearing and install it.
15. Install a new clip onto the joint shaft.

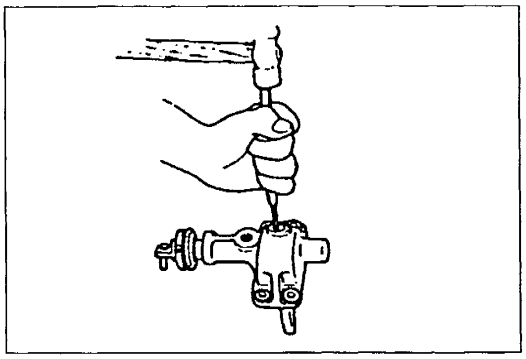
CONTROL BOX ASSEMBLY

Overhaul

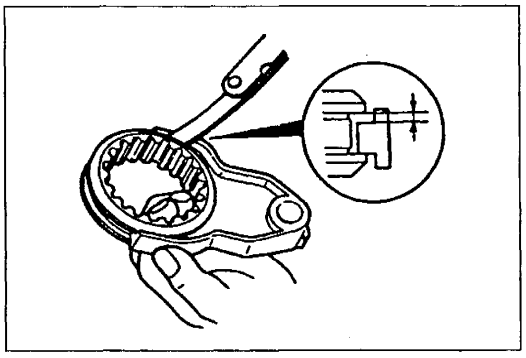
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



1. Actuator
   Inspection ..... page M–35
2. Automatic freewheel (AFW) switch
   Inspection ..... page M–33
3. Spring cap
4. Spring and ball
5. Change rod
   Disassembly Note ..... page M–46
   Assembly Note ..... page M–46
6. Shift fork
   Inspection ..... page M–46
7. Boot
   Assembly Note ..... page M–46
8. Oil seal
   Assembly Note ..... page M–46
9. Control box

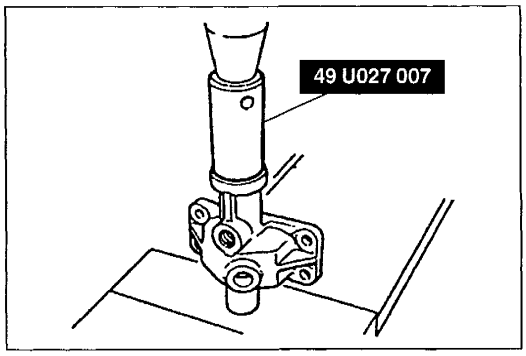


Disassembly note
Change rod
Remove the roll pin as shown in the figure.

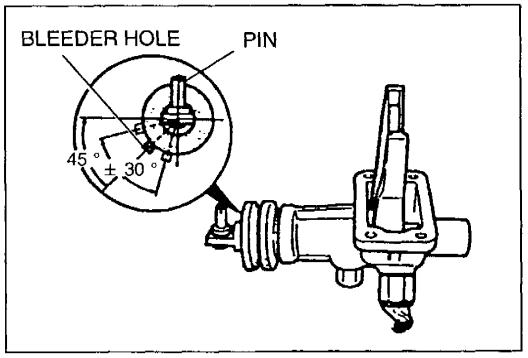


Inspection
Shift fork
Measure the clearance between the gear sleeve and shift fork.

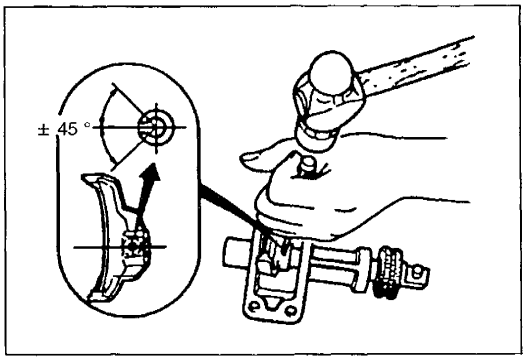
Standard clearance:
0.1—0.40 mm { 0.0040—0.0157 in }
Maximum clearance: 0.50 mm { 0.0197 in }



Assembly note
Oil seal
Install a new oil seal by using the **SST**.



Boot
Install the boot as shown in the figure.

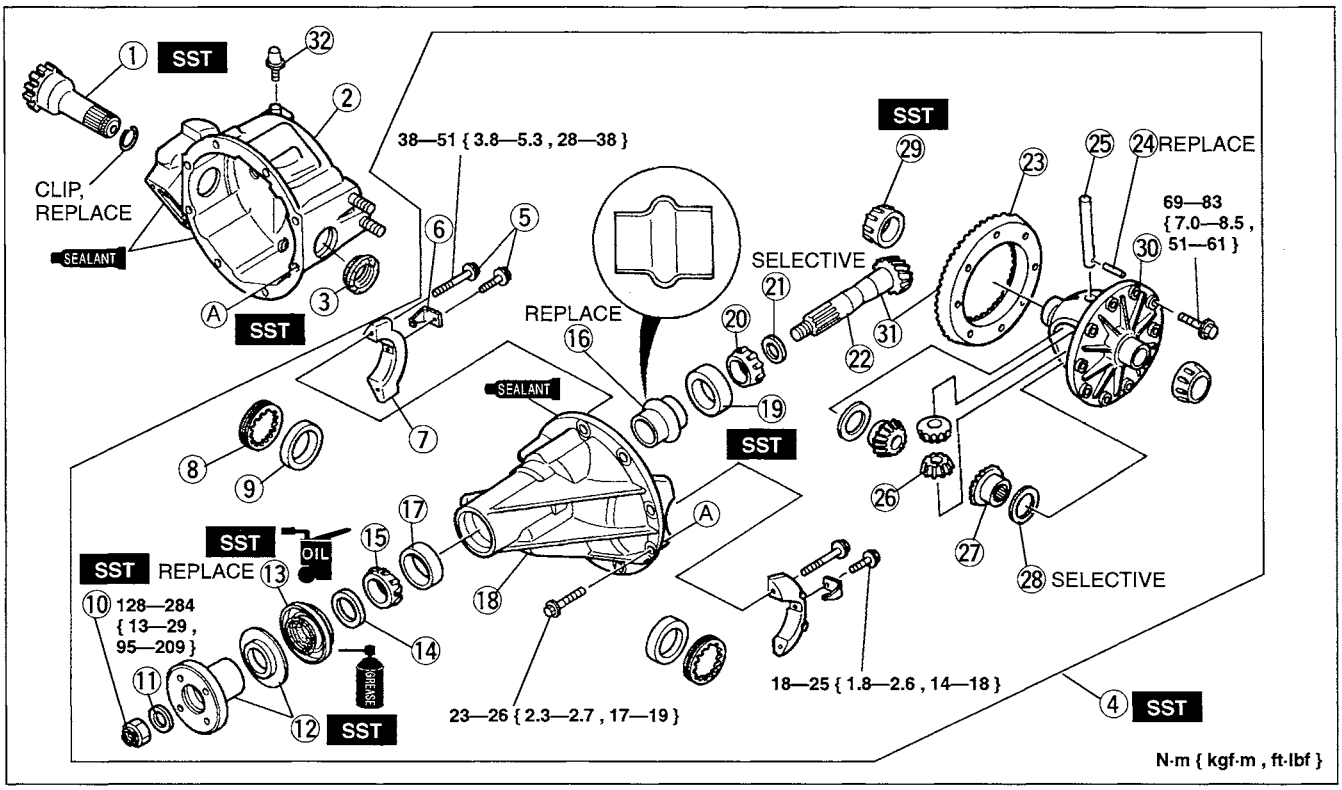


Change rod
Install a new roll pin as shown in the figure.

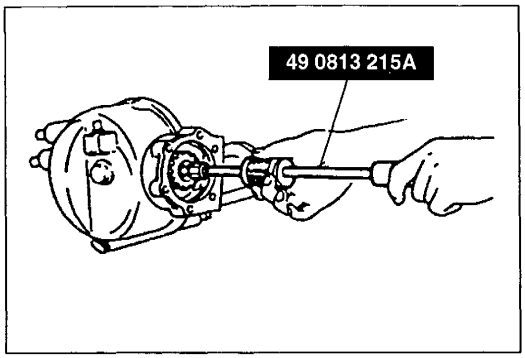
FRONT DIFFERENTIAL

Overhaul

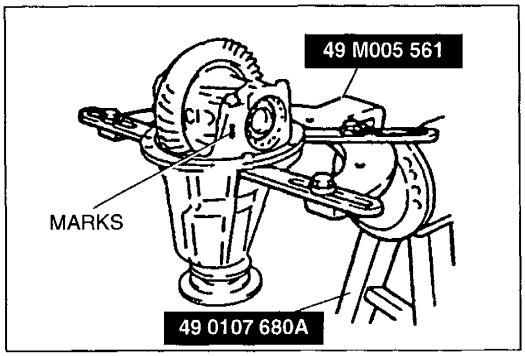
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



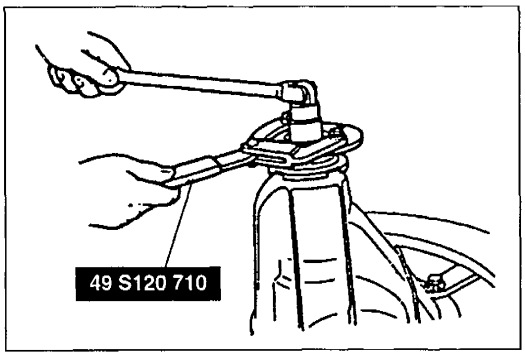
1. Output shaft
   - Disassembly Note ..... page M–48
   - Inspect for damage, wear, or cracks
2. Front axle casing
3. Oil seal
   - Installation Note ..... page M–55
4. Differential assembly
   - Disassembly Note ..... page M–48
5. Bolt
6. Lock plate
7. Bearing cap
8. Adjusting screw
9. Bearing race
10. Locknut
11. Washer
12. Companion flange
    - Disassembly Note ..... page M–48
    - Inspect splines for wear or damage
13. Oil seal
14. Washer
15. Front bearing
    - Inspect for damage or rough rotation
16. Collapsible spacer
17. Bearing race
    - Disassembly Note ..... page M–49
18. Differential carrier
    - Inspect for cracks
19. Bearing race
20. Rear bearing
    - Disassembly Note ..... page M–49
    - Inspect for damage or rough rotation
21. Spacer
22. Drive pinion
    - Disassembly Note ..... page M–48
    - Inspect for wear or damage
    - Adjustment of height ..... page M–50
    - Adjustment of preload ..... page M–52
23. Ring gear
    - Inspect for wear or damage
    - Inspection and adjustment of tooth contact ..... page M–54
24. Knock pin
    - Disassembly Note ..... page M–49
25. Pinion shaft
26. Pinion gear
    - Adjustment of backlash ..... page M–53
27. Side gear
    - Adjustment of backlash ..... page M–53
28. Thrust washer
29. Side bearing
    - Disassembly Note ..... page M–49
    - Inspect for damage or rough rotation
30. Gear case
31. Final gear set
32. Air bleeder
    - Inspect for clogging



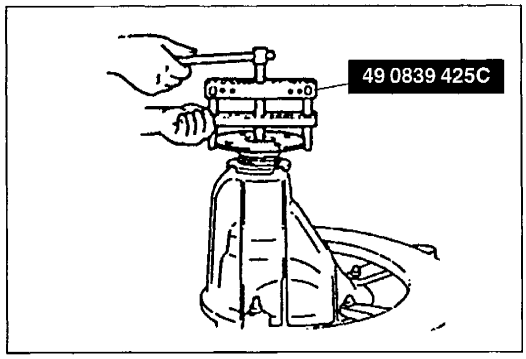
Disassembly Note
Output shaft
Remove the output shaft by using the **SST**.



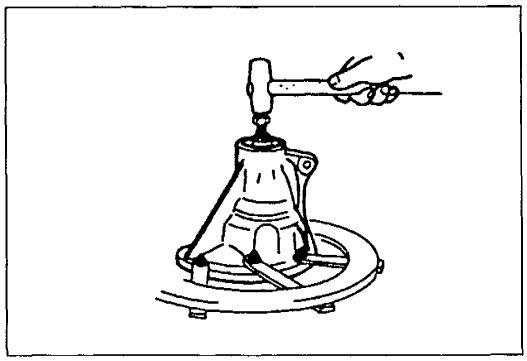
Differential assembly
1. Mount the differential assembly on the **SST**.
2. Mark one bearing cap and the carrier.
3. Mark the bearing adjusters for the right and left side.



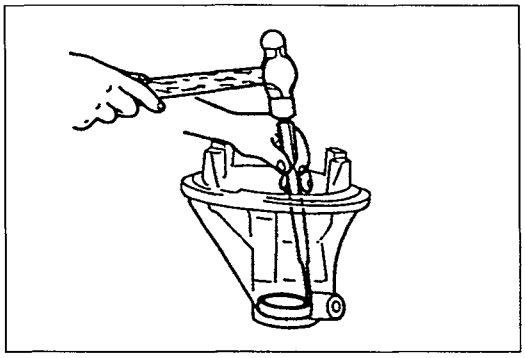
Companion flange
1. Hold the companion flange by using the **SST** and remove the locknut.



2. Remove the companion flange by using the **SST**.

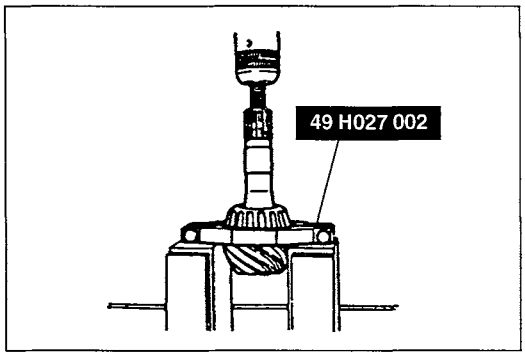


Drive pinion
Push the drive pinion out by attaching a miscellaneous locknut to it, and tapping it with a copper hammer.



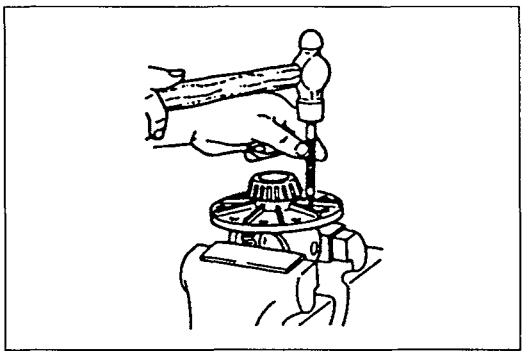
Bearing race

Mark the bearing races for proper reassembly, and remove them by alternately tapping through the two grooves in the carrier.



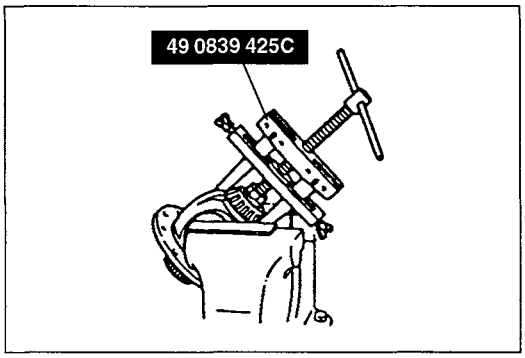
Rear bearing

While supporting the drive pinion, remove the rear bearing by using the **SST**.



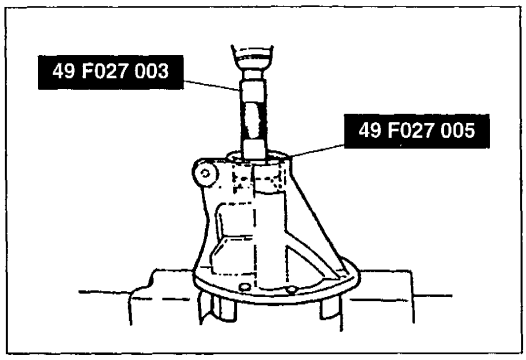
Knock pin

Secure the gear case in a vise and remove the knock pin.

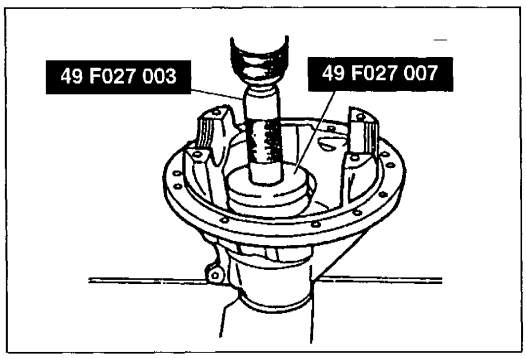


Side bearing

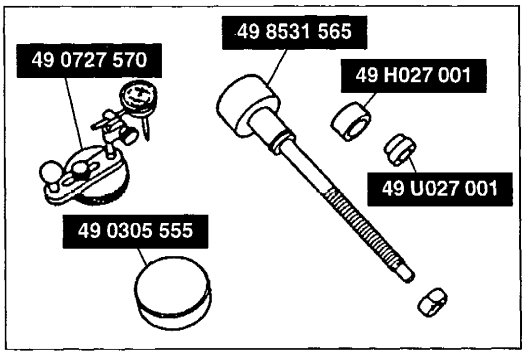
Mark the bearings for proper reassembly, and remove them by using the **SST**.



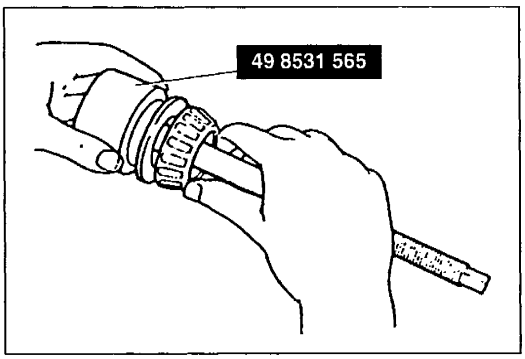
Assembly procedure
Adjustment of pinion height
1. Install the front bearing race by using the **SST**.



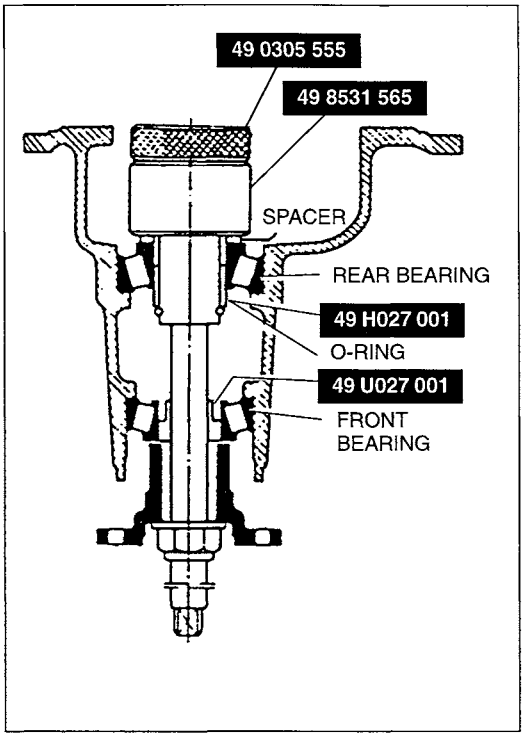
2. Install the rear bearing race by using the **SST**.



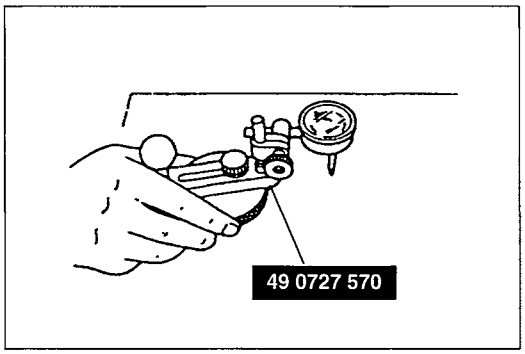
3. Adjust the drive pinion height as follows by using the **SST**.



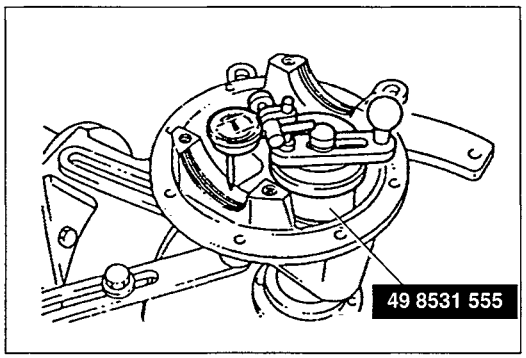
a) Slide the spacer and bearing onto the **SST**.



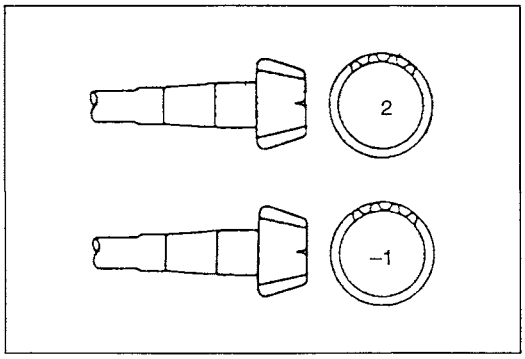
b) Assemble the spacer, rear bearing, and **SST**. Secure the **SST** with the O-ring. Install the assembly in the carrier.
c) Install the front bearing, **SST**, companion flange, washer, and nut.
d) Tighten the nut to the extent that the companion flange can still be turned by hand.



e) Place the **SST** on a surface plate and set the dial indicator to zero.



f) Place the **SST** atop the drive pinion model. Set the gauge body atop the gauge block.
g) Place the feeler of the dial indicator so that it contacts where the side bearing is installed in the carrier. Measure the lowest position on the left and right sides of the carrier.



h) Add the two (left and right) values obtained by the measurements taken in step (g), and then divide the total by 2. From this result, subtract the result obtained by dividing the number inscribed on the end surface of the drive pinion by 100. (If there is no figure inscribed, use 0.) This is the pinion height adjustment value.

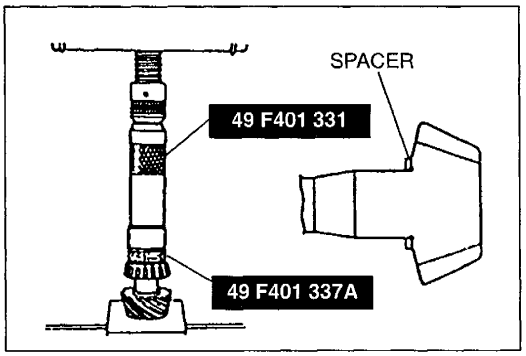
Caution
1. **The number is inscribed by an electric marking pen.**
2. **If, for example, the measured results obtained in step (g) are 0.06 mm and 0.04 mm, and the figure inscribed on the end of the drive pinion is –2.:**

Mark	Thickness	Mark	Thickness
08	3.08 mm { 0.1213 in }	29	3.29 mm { 0.1295 in }
11	3.11 mm { 0.1224 in }	32	3.32 mm { 0.1307 in }
14	3.14 mm { 0.1236 in }	35	3.35 mm { 0.1319 in }
17	3.17 mm { 0.1248 in }	38	3.38 mm { 0.1331 in }
20	3.20 mm { 0.1260 in }	41	3.41 mm { 0.1343 in }
23	3.23 mm { 0.1271 in }	44	3.44 mm { 0.1354 in }
26	3.26 mm { 0.1283 in }	47	3.47 mm { 0.1366 in }

$$\frac{0.06 + 0.04}{2} - \frac{-2}{100} = 0.07 = \text{pinion height adjustment value}$$

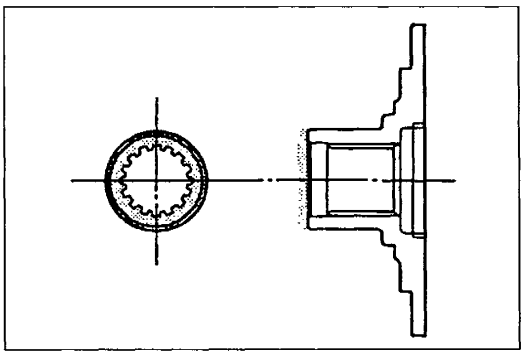
Thus, a spacer which is 0.07 mm thicker than the one now used should be used.

3. **Select the spacer thickness that is closest to that necessary.**

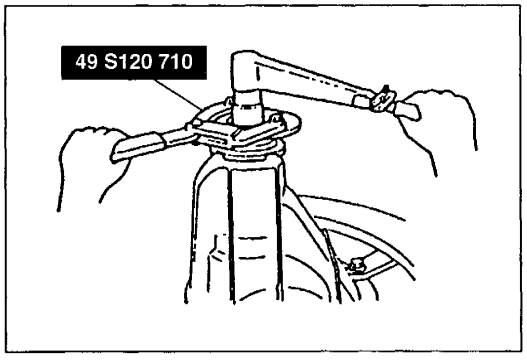


Adjustment of drive pinion preload

1. Install the spacer, selected in the procedure above, with the beveled side facing the drive pinion.
2. Using the **SST**, press the rear bearing onto the drive pinion until the force required starts to increase sharply.

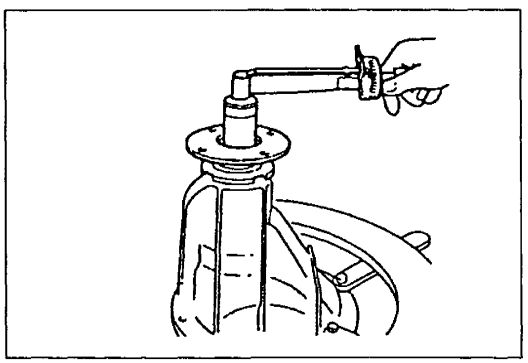


3. Apply a light coat of grease to the end face of the companion flange.



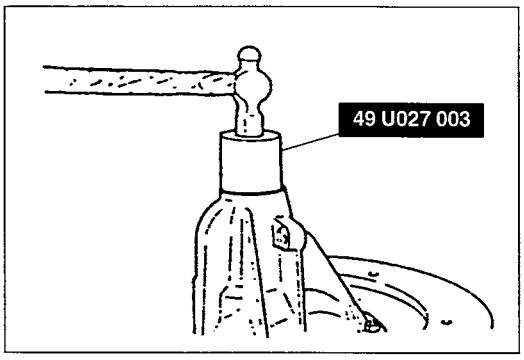
4. Install a new collapsible spacer.
5. Install the drive pinion assembly.
6. Install the companion flange without installing the oil seal, and tighten the locknut.

Tightening torque: 128 N·m { 13.0 kgf·m , 94 ft·lbf }

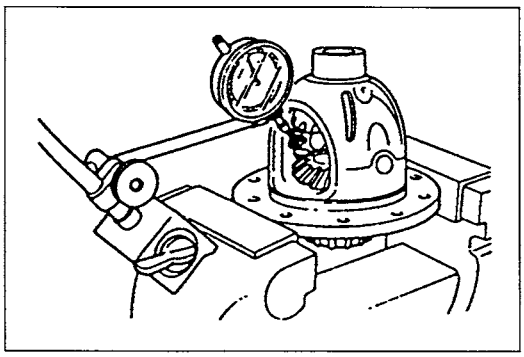


7. Turn the companion flange by hand to seat the bearing.
8. Measure the drive pinion preload. Adjust the preload by tightening the locknut and record the tightening torque.

Preload:
0.9—1.3 N·m { 9—14 kgf·cm , 7.9—12.1 in·lbf }
Tightening torque: 128—284 N·m
{ 13.0—29.0 kgf·m , 95—209 ft·lbf }



9. Remove the nut, washer, and companion flange.
10. Tap a new oil seal into the differential carrier by using the **SST**.
11. Install the companion flange and washer, and tighten the locknut to the tightening torque stated in step 8.

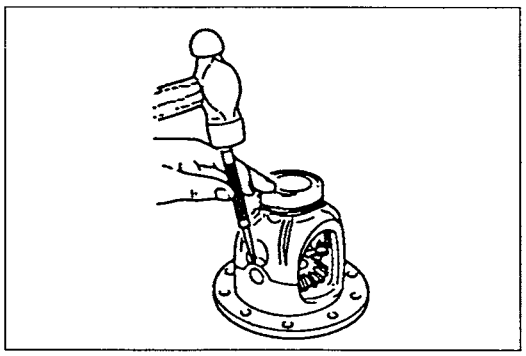


Adjustment of backlash

1. Adjust the backlash of the side gears and pinion gear as follows.
   (1) Set a dial gauge against the pinion gear as shown.
   (2) Secure one of the side gears.
   (3) Move the pinion gear and measure the backlash at the end of it.

   Standard backlash: 0—0.1 mm { 0—0.0039 in }

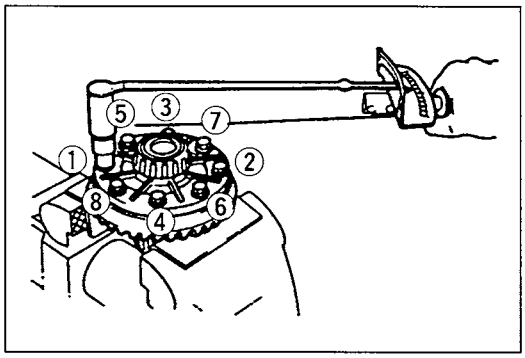
   (4) If the backlash exceeds the standard, use the selectable thrust washers for adjustment.

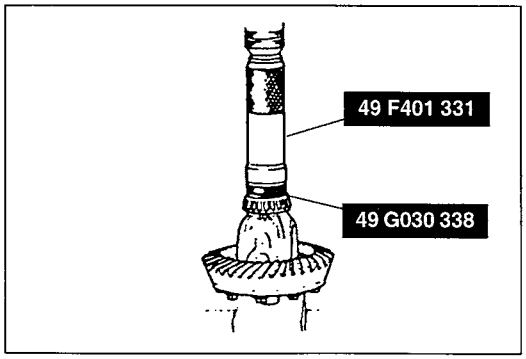


Identification mark	Washer thickness mm { in }
0	2.00 { 0.0787 }
05	2.05 { 0.0807 }
1	2.10 { 0.0827 }
15	2.15 { 0.0846 }
2	2.20 { 0.0866 }

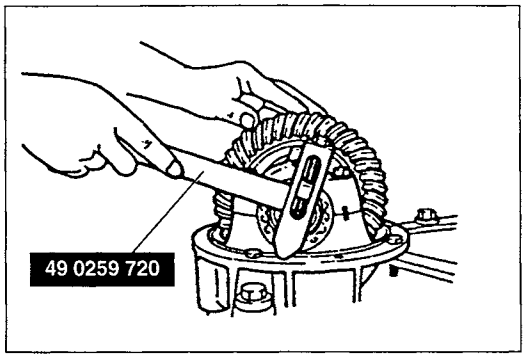
2. Install a new knock pin to secure the pinion shaft. Stake the pin by using a punch to prevent it from coming out of the case.
3. Install the ring gear onto the gear case.

   Tightening torque:
   69—83 N·m { 7.0—8.5 kgf·m , 51—61 ft·lbf }

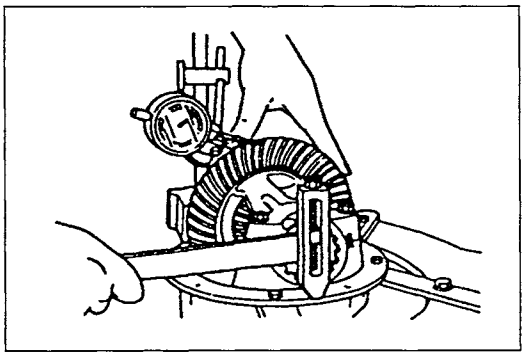




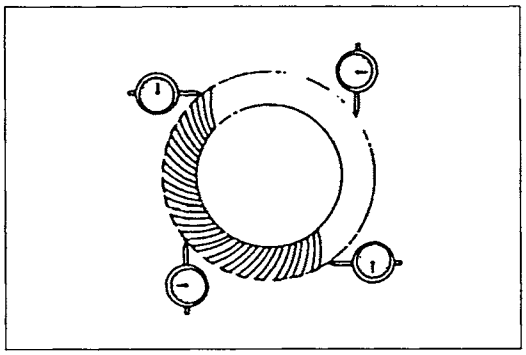
4. Press the bearing (side gear) on by using the **SST**.



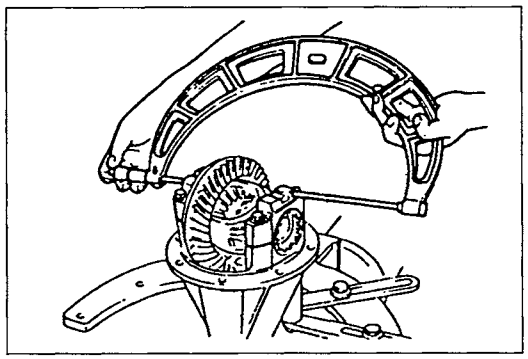
5. Install the differential gear assembly in the carrier.
6. Note the identification mark on the bearing adjusters, and install them to their respective side.
7. Install the differential bearing caps, making sure that the identification mark on the marked cap corresponds with the one on the carrier.



8. Mark the ring gear at four points at **approx. 90** ° intervals. Mount a dial indicator to the carrier so that the feeler comes into contact at right angle with one of the ring gear teeth.
9. Turn both bearing adjusters equally with the **SST** until the backlash is **0.09—0.11 mm { 0.0036—0.0043 in }**.

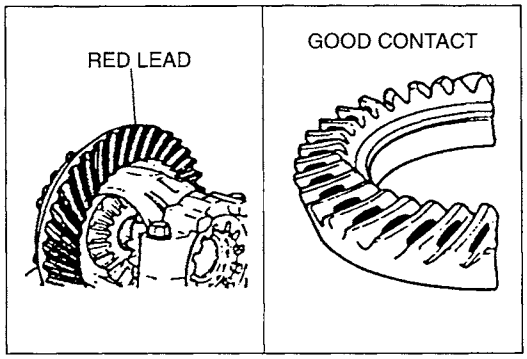


10. Check the backlash at the three other marked points, and verify that the minimum backlash is more than **0.05 mm { 0.002 in }** and the difference between the maximum and minimum is less than **0.07 mm { 0.0028 in }**.



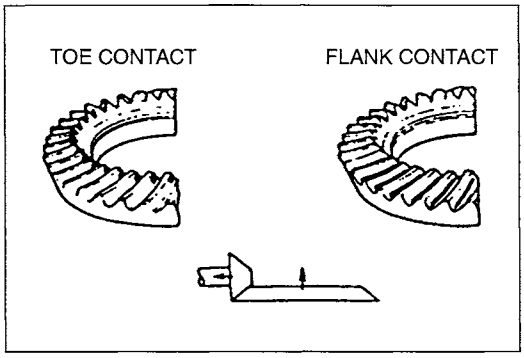
11. Tighten the adjusters equally until the distance between the pilot sections on the bearing caps is as specified. Make sure that the backlash of the drive pinion and ring gear does not become misadjusted.

    Specified distance:
    184.78—185.50 mm { 7.275—7.303 in }

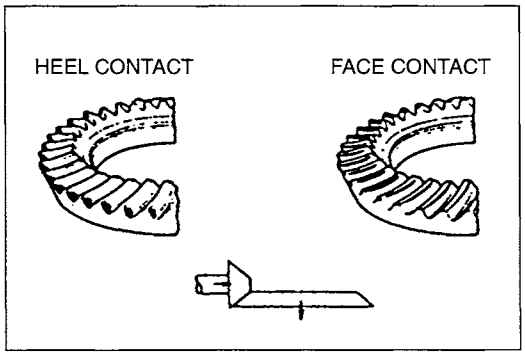


Inspection and adjustment of teeth contact

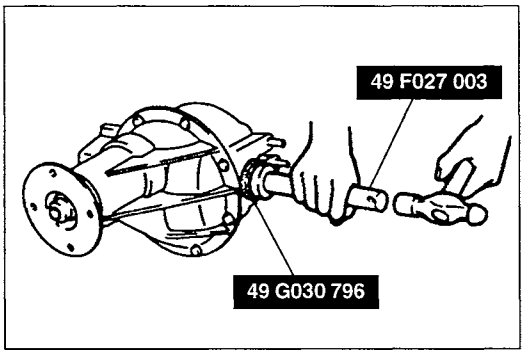
1. Coat both surfaces of 6—8 teeth of the ring gear with a uniformly thin coat of red lead.
2. While moving the ring gear back and forth by hand, rotate the drive pinion several times and check the tooth contact.
3. If the tooth contact is good, wipe off the red lead.
4. If it is not good, adjust the pinion height and readjust the backlash.



(1) Toe and flank contact
Replace the spacer with a thinner one to move the drive pinion outward.



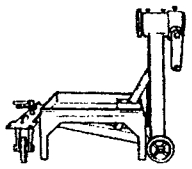
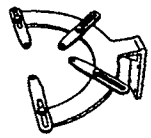
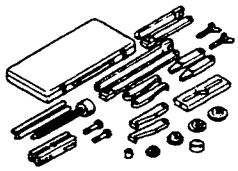
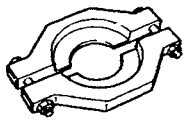
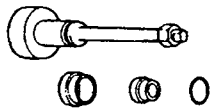
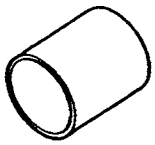
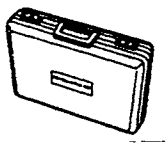
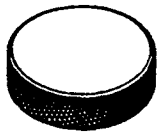
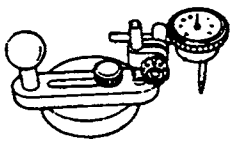
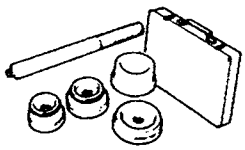
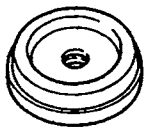
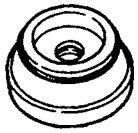
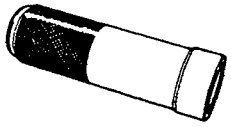
(2) Heel and face contact
Replace the spacer with a thicker one to bring the drive pinion inward.

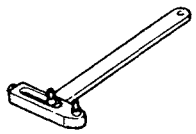
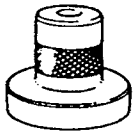
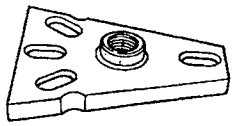
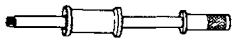
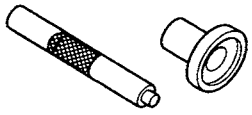


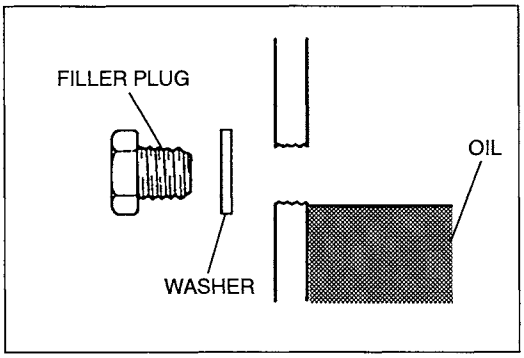
Installation note
Oil seal
Tap the new oil seal into the axle casing by using the **SST**.

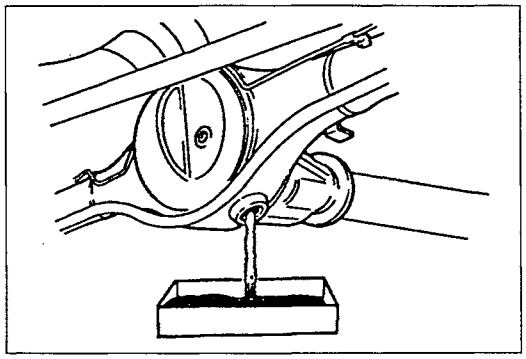
REAR DIFFERENTIAL

PREPARATION
SST

49 0107 680A Engine stand 	For disassembly / assembly of differential assembly	49 M005 561 Hanger, diff. carrier 	For disassembly / assembly of differential assembly
49 S120 710 Holder, coupling, flange 	For disassembly / assembly of companion flange	49 0839 425C Puller set, bearing 	For disassembly of companion flange and side bearing
49 H027 002 Remover, bearing 	For disassembly of rear bearing	49 8531 565 Pinion model 	For adjustment of pinion height
49 H027 001 Collar 	For adjustment of pinion height	49 U027 001 Collar 	For adjustment of pinion height
49 F027 0A0 Gauge set, pinion height adjust 	For adjustment of pinion height	49 0660 555 Gauge block (Part of 49 F027 0A0) 	For adjustment of pinion height
49 0727 570 Gauge body, pinion height (Part of 49 F027 0A0) 	For adjustment of pinion height	49 F027 0A1 Installer set, bearing 	For assembly of front bearing race and rear bearing race
49 F027 004 Attachment for bearing ϕ80 (Part of 49 F027 0A1) 	For assembly of rear bearing race	49 F027 007 Attachment for bearing ϕ72 (Part of 49 F027 0A1) 	For assembly of front bearing race
49 G030 338 Attachment E 	For assembly of rear bearing	49 F401 331 Body 	For assembly of rear bearing

49 UB71 525 Installer, bearing 	For assembly of side bearing	49 0259 720 Adjustment wrench, side bearing 	For adjustment of backlash
49 V001 795 Installer, oil seal 	For assembly of oil seal	49 0259 770B Wrench, flare nut 	For removal / installation of brake pipe
49 8501 631A Attachment, rear axle shaft puller 	For removal of dust cover and rear axle shaft assembly	49 0223 630B Puller, rear axle shaft 	For removal of dust cover and rear axle shaft assembly
49 M005 795 Installer set, oil seal 	For assembly of front bearing race and rear bearing race	49 M005 797 Handle (Part of 49 M005 795) 	For assembly of front bearing race and rear bearing race





DIFFERENTIAL OIL

Inspection

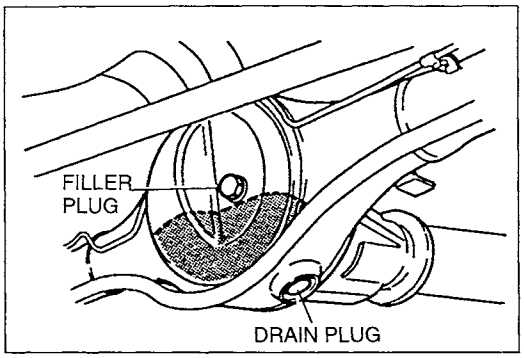
1. Remove the filler plug and washer.
2. Verify that the oil is up to the brim of the filler plug hole, as shown.
   If it is low, add the specified oil.
3. Install the filler plug and a new washer.

Tightening torque:
40—53 N·m { 4.0—5.5 kgf·m , 29—39 ft·lbf }

Replacement

1. Remove the plugs.
2. Drain the oil into a container.
3. Wipe the plugs clean.
4. Install the drain plug and a new washer.

Tightening torque:
40—53 N·m { 4.0—5.5 kgf·m , 29—39 ft·lbf }

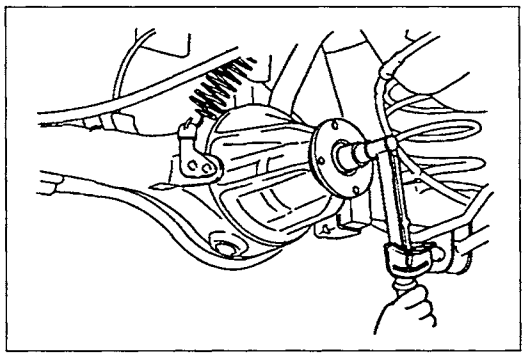


5. Add the specified oil from filler plug until the level reaches the brim of the plug hole.

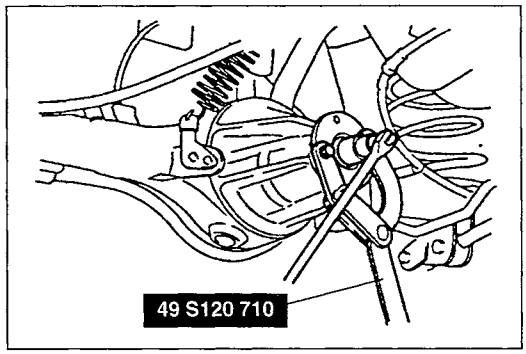
Specified oil
Type
Above —18 °C { 0 °F }: GL-5, SAE 90
Below —18 °C { 0 °F }: GL-5, SAE 80 W
Capacity: 1.5 L { 1.6 US qt , 1.3 Imp qt }

6. Install the filler plug and a new washer.

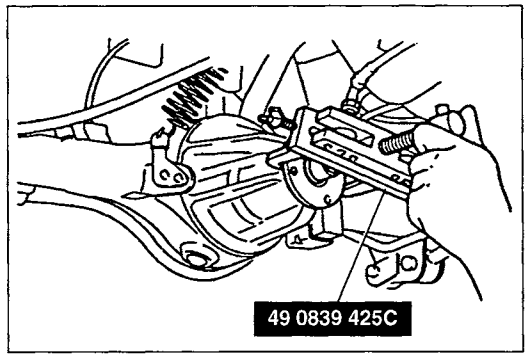
Tightening torque:
40—53 N·m { 4.0—5.5 kgf·m , 29—39 ft·lbf }



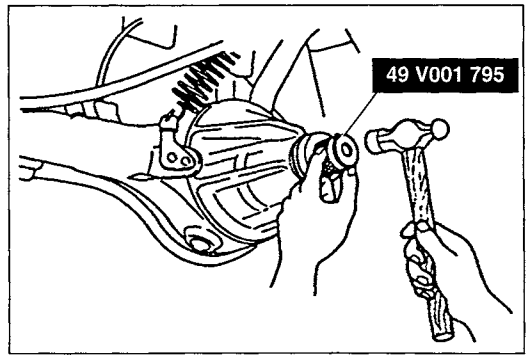
OIL SEAL
Replacement
1. Jack up the vehicle and support it on safety stands.
2. Drain the differential gear oil.
3. Remove the propeller shaft. (Refer to section L.)
4. Before loosening the flange locknut, measure and record the rotation starting torque of the drive pinion (within range of the drive pinion and ring gear backlash).



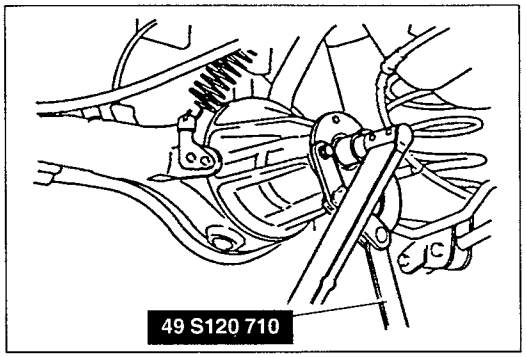
5. Hold the companion flange by using the **SST** and remove the locknut.



6. Remove the companion flange by using the **SST**.
7. Remove the oil seal.



8. Apply lithium base grease to a new oil seal lip and install it by using the **SST**.



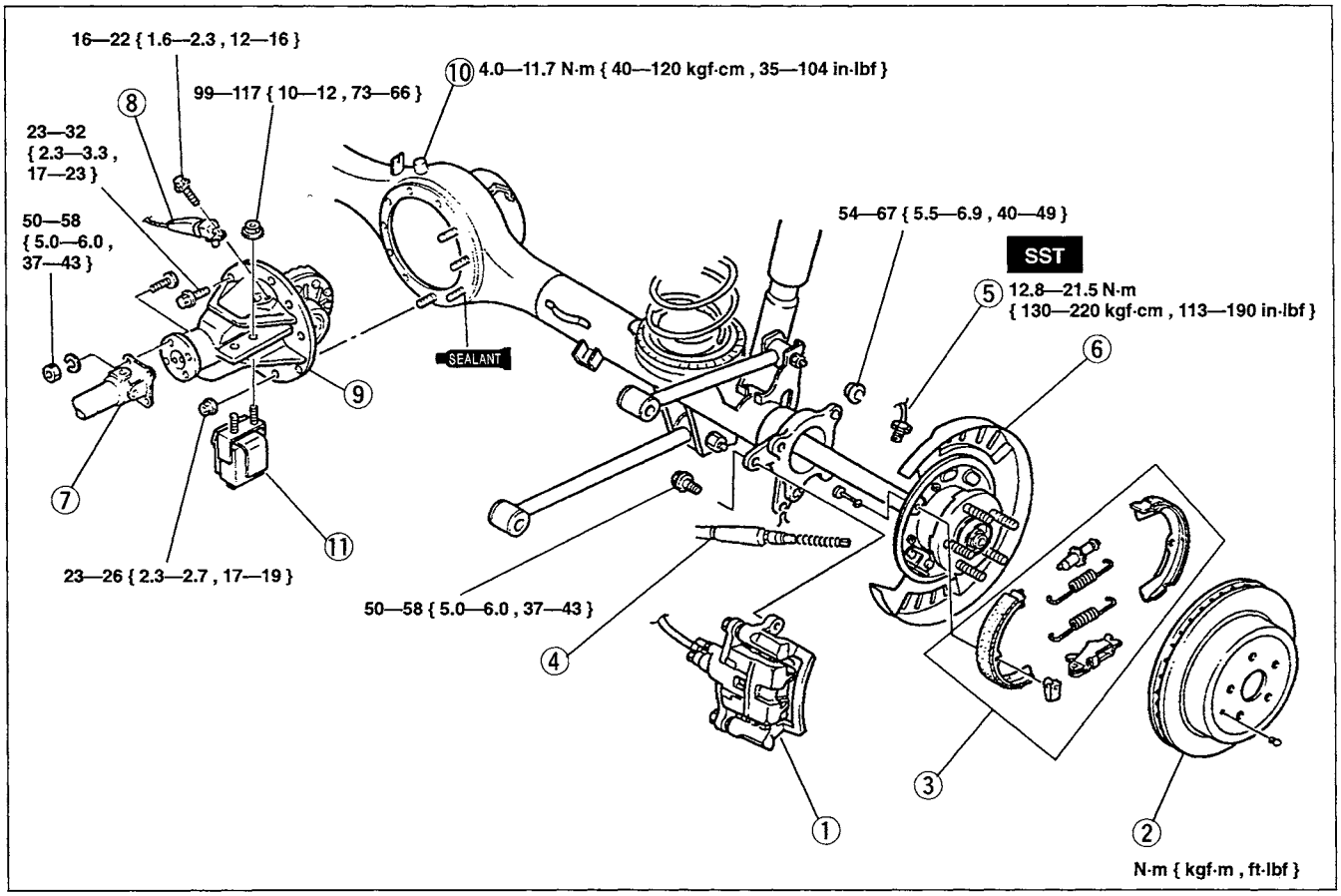
9. Tighten a new locknut using the **SST** to get the starting torque as stated in step 4.
10. Install the propeller shaft. (Refer to section L.)
11. Add the specified oil through the oil filler plug hole. (Refer to page M–57.)

DIFFERENTIAL (STANDARD)

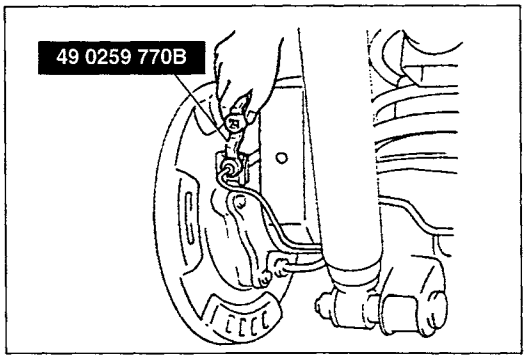
Removal / Installation

When installing the differential, install it within 10 minutes after applying sealant. Allow the sealant to set at least 30 minutes after installation before filling the differential with the specified oil.

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.



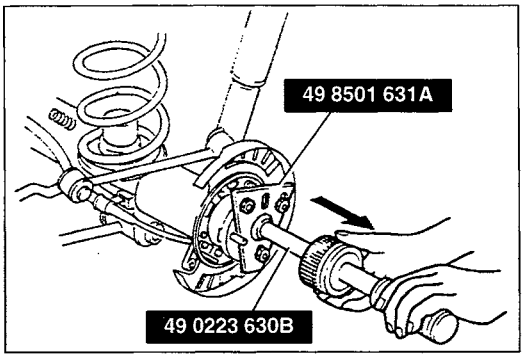
1. Brake caliper assembly
   Service ..... section P
2. Disc plate
   Inspection ..... section P
3. Parking brake shoes assembly
   Service ..... section P
4. Parking brake cable
   Service ..... section P
5. Brake pipe
   Removal Note ..... below
   Installation Note ..... page M–60
6. Dust cover and rear axle shaft assembly
   Removal Note ..... page M–61
7. Propeller shaft
   Service ..... section L
8. Rear-wheel ABS sensor
   Service ..... section P
9. Differential assembly
   Installation Note ..... page M–61
10. Air breather
    Inspect for clogging
11. Dynamic damper



Removal note

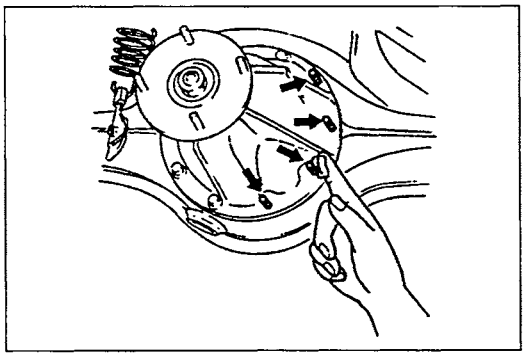
Brake pipe

Disconnect the brake pipe by using the **SST**, and then plug it.



Dust cover and rear axle shaft assembly

Remove the dust cover and rear axle shaft assembly by using the **SST**.

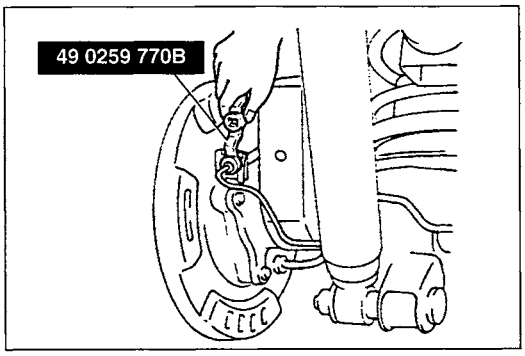


Installation note

Differential assembly

1. Apply sealant to the stud threads and carrier and housing faces.
2. Tighten the nuts and bolts.

Tightening torque:
23—26 N·m { 2.3—2.7 kgf·m , 17—19 ft·lbf }



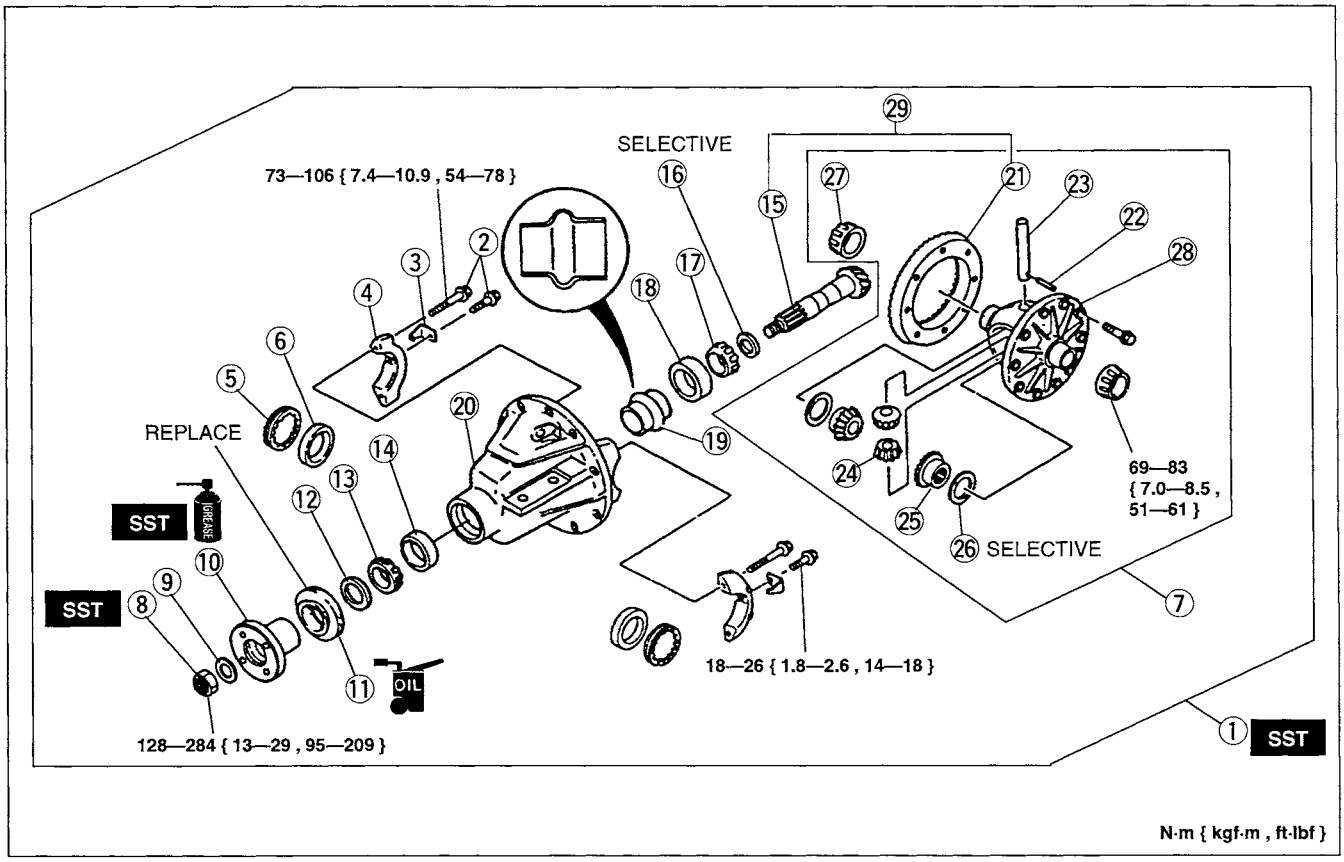
Brake pipe

1. Tighten the brake pipe by using the **SST**.
2. Bleed the brake system. (Refer to section P.)

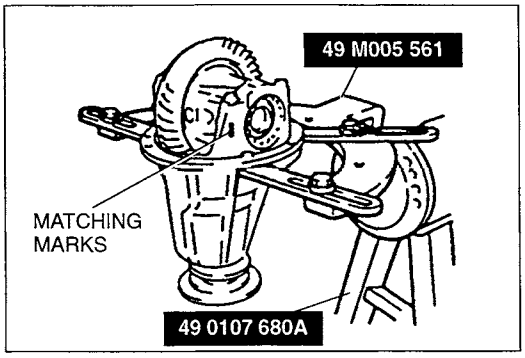
Tightening torque: 12.8—21.5 N·m
{ 130—220 kgf·cm , 113—190 in·lbf }

Overhaul

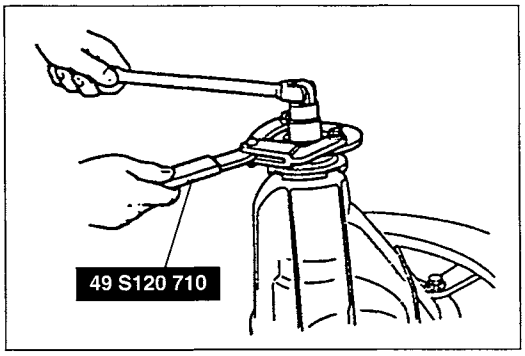
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts, repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



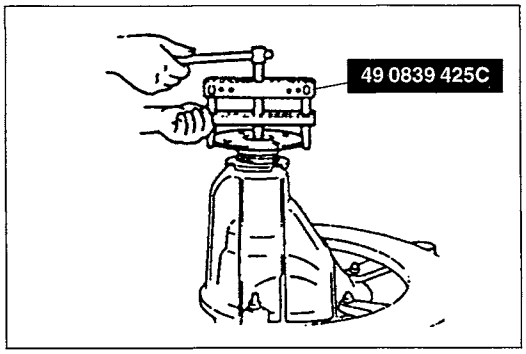
1. Differential assembly
   Disassembly Note ..... page M–63
2. Bolt
3. Lock plate
4. Bearing cup
5. Adjusting screw
6. Bearing race
7. Differential gear assembly
8. Locknut
9. Washer
10. Companion flange
    Disassembly Note ..... page M–63
    Inspect splines for wear or damage
11. Oil seal
12. Washer
13. Front bearing
    Inspect for damage or rough rotation
14. Bearing race
    Disassembly Note ..... page M–63
15. Drive pinion
    Disassembly Note ..... page M–63
    Inspect splines and teeth for wear or damage
    Adjustment of pinion height ... page M–64
    Adjustment of pinion preload . page M–66
16. Spacer
17. Rear bearing
    Disassembly Note ..... page M–64
    Inspect for damage or rough rotation
18. Bearing race
    Disassembly Note ..... page M–63
19. Collapsible spacer
20. Differential carrier
    Inspect for cracks
21. Ring gear
    Inspect teeth for wear or damage
    Inspection and adjustment of teeth contact ..... page M–69
22. Knock pin
    Disassembly Note ..... page M–64
23. Pinion shaft
24. Pinion gear
    Adjustment of backlash ..... page M–67
25. Side gear
    Adjustment of backlash ..... page M–67
26. Thrust washer
27. Side bearing
    Disassembly Note ..... page M–64
    Inspect for damage or rough rotation
28. Gear case
29. Final gear set



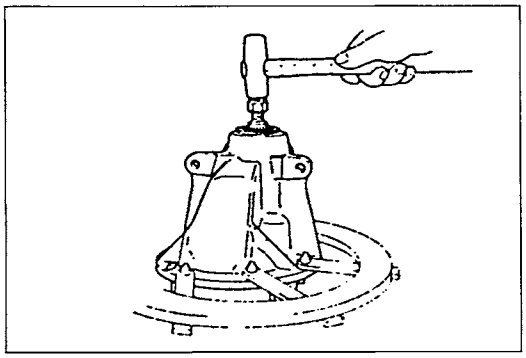
Disassembly note
Differential assembly
1. Mount the differential assembly on the **SST**.
2. Make matching marks on one bearing cap and the carrier.



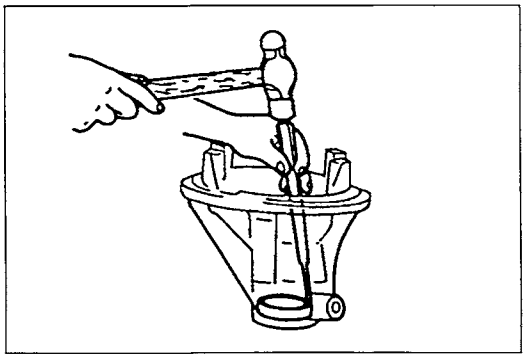
Companion flange
1. Hold the companion flange by using the **SST**, then remove the locknut.



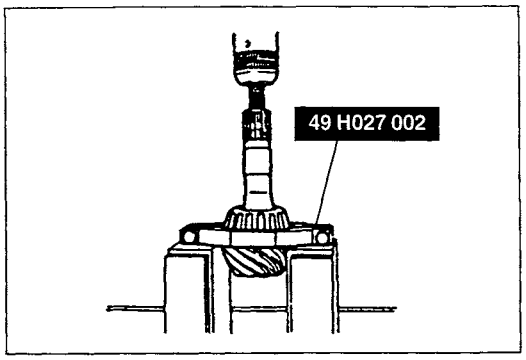
2. Remove the companion flange by using the **SST**.



Drive pinion
Push the drive pinion out by attaching a miscellaneous locknut to it, then tapping it with a brass hammer.

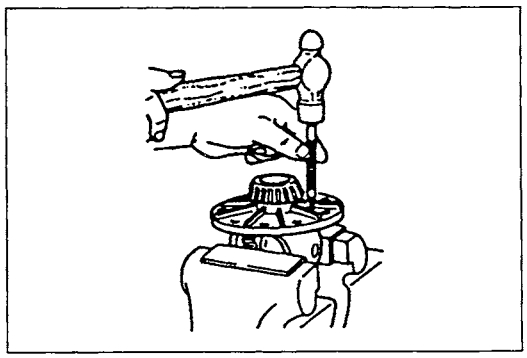


Bearing race
Mark the bearing races for proper reassembly, and remove them by alternately tapping through the two grooves in the carrier.



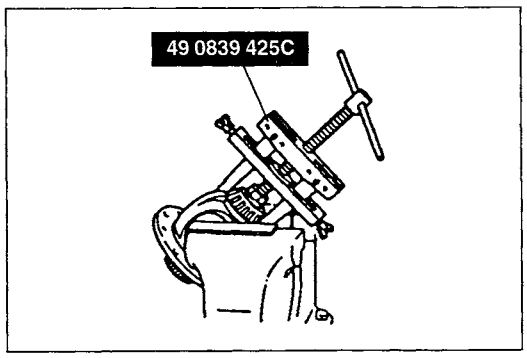
Rear bearing

While supporting the drive pinion, remove the rear bearing by using the **SST**.



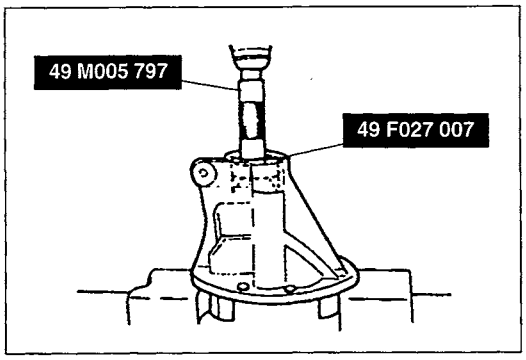
Knock pin

Secure the gear case in a vise and remove the knock pin.



Side bearing

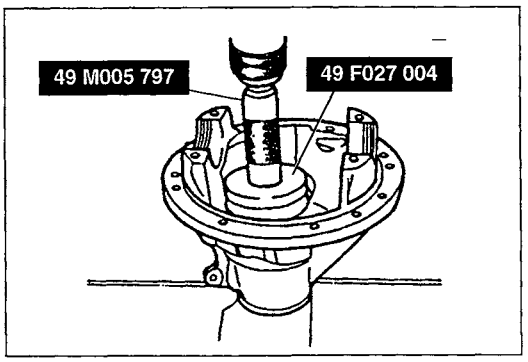
Mark the bearings for proper reassembly, and remove them by using the **SST**.



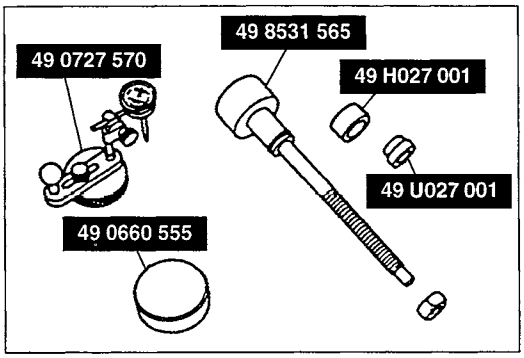
Assembly Procedure

Adjustment of pinion height

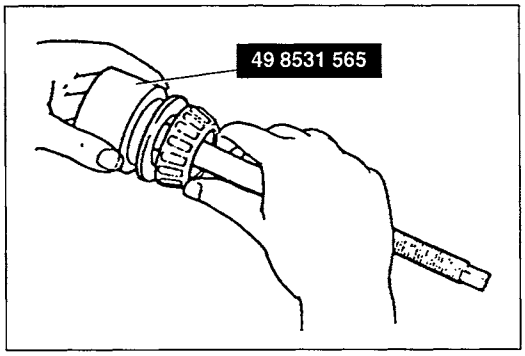
1. Install the front bearing race by using the **SST**.



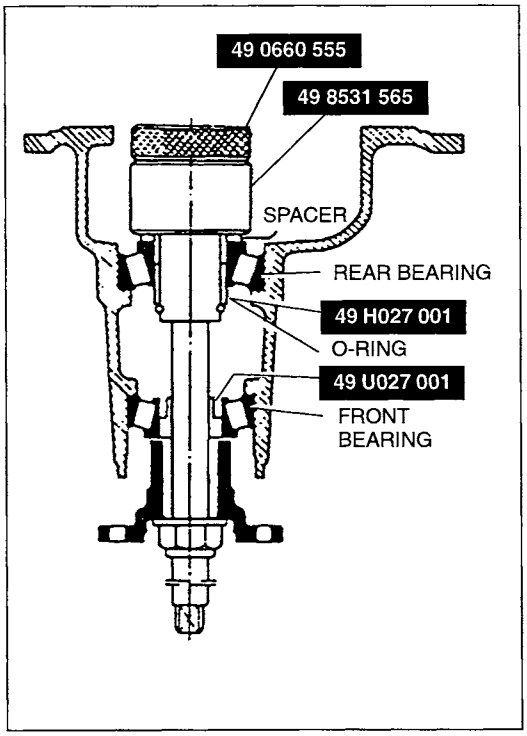
2. Install the rear bearing race by using the **SST**.



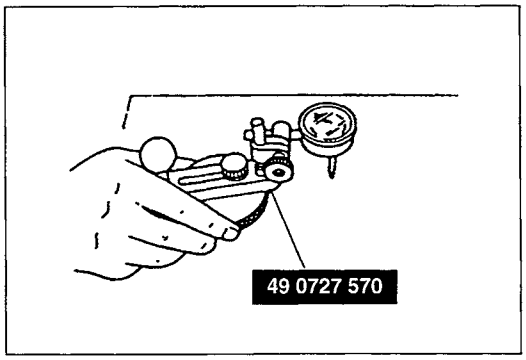
3. Adjust the drive pinion height as follows by using the **SST**.



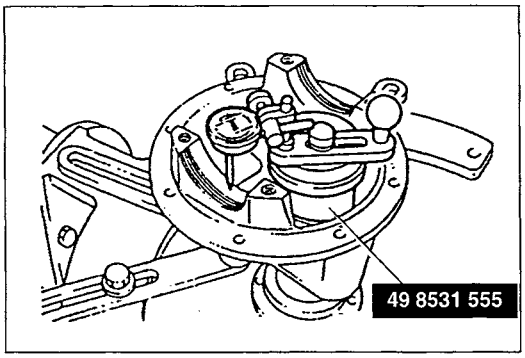
a) Install the spacer and bearing to the **SST**.



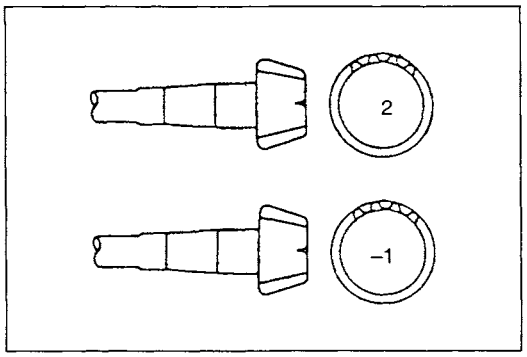
b) Assemble the spacer, rear bearing, and **SST**. Secure the **SST** with the O-ring. Install the assembly in the carrier.
c) Install the front bearing, **SST**, companion flange, washer, and nut.
d) Tighten the nut to the extent that the companion flange can still be turned by hand.



e) Place the **SST** on the surface plate and set the dial indicator to "Zero".



f) Place the **SST** atop the drive pinion model, then set the gauge body atop the gauge block.
g) Place the feeler of the dial indicator so that it contacts where the side bearing is installed in the carrier. Measure the lowest position on both the left and right sides.



h) Add the two (left and right) values obtained by the measurements taken in step (g), and then divide the total by 2. From this result, subtract the result obtained by dividing the number inscribed on the end surface of the drive pinion by 100. (If there is no figure inscribed, use 0.) This is the pinion height adjustment value.

Caution

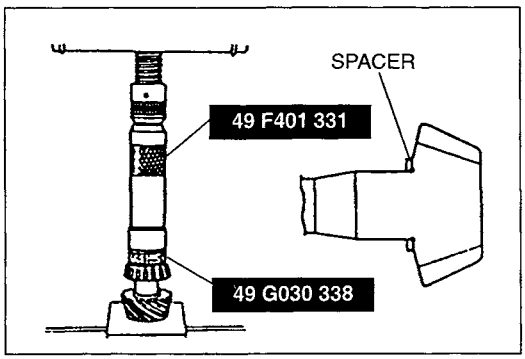
1. **The number is inscribed by an electric marking pen.**
2. **If, for example, the measured results obtained in step (g) are 0.06 mm and 0.04 mm, and the figure inscribed on the end of the drive pinion is –2.:**

$$\frac{0.06 + 0.04}{2} - \frac{-2}{100} = 0.07 = \text{pinion height adjustment value}$$

Thus, a spacer which is 0.07 mm thicker than the one now used should be used.

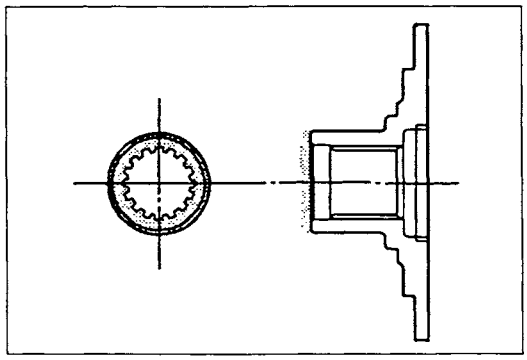
3. **Select the spacer thickness that is closest to that necessary.**

Mark	Thickness	Mark	Thickness
08	3.08 mm { 0.1213 in }	29	3.29 mm { 0.1295 in }
11	3.11 mm { 0.1224 in }	32	3.32 mm { 0.1307 in }
14	3.14 mm { 0.1236 in }	35	3.35 mm { 0.1319 in }
17	3.17 mm { 0.1248 in }	38	3.38 mm { 0.1331 in }
20	3.20 mm { 0.1260 in }	41	3.41 mm { 0.1343 in }
23	3.23 mm { 0.1271 in }	44	3.44 mm { 0.1354 in }
26	3.26 mm { 0.1283 in }	47	3.47 mm { 0.1366 in }

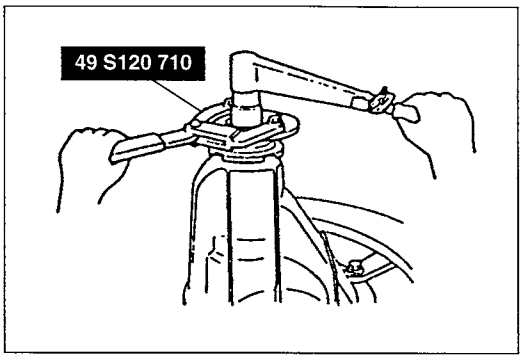


Adjustment of drive pinion preload

1. Install the spacer.
2. Using the **SST**, press the rear bearing onto the drive pinion until the force required starts to increase sharply.

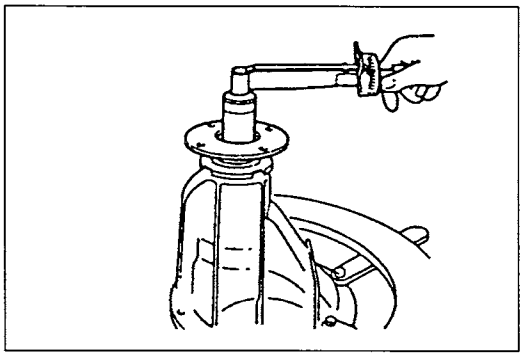


3. Apply a light coat of grease to the end face of the companion flange.



4. Install the collapsible spacer.
5. Install the drive pinion assembly.
6. Install the companion flange without installing the oil seal, and tighten the locknut.

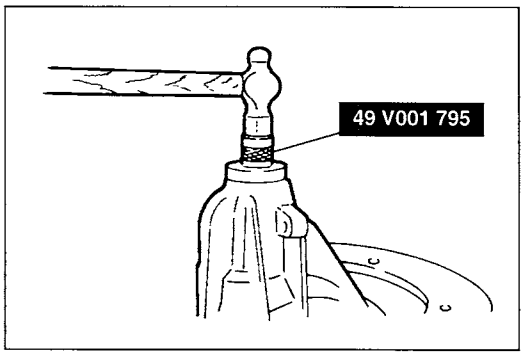
Tightening torque: 128 N·m { 13.0 kgf·m , 94 ft·lbf }



7. Turn the companion flange by hand to seat the bearing.
8. Measure the drive pinion preload.
   Adjust the preload by tightening the locknut.

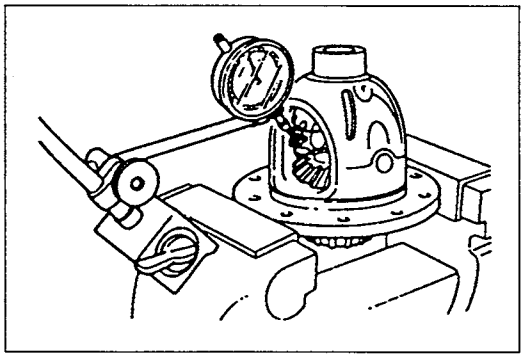
Preload:
1.3—1.7 N·m { 13—18 kgf·cm , 11.3—15.6 in·lbf }
Tightening torque:
128—284 N·m { 13—29 kgf·m , 95—209 ft·lbf }

If the specified preload cannot be obtained, replace the collapsible spacer with a new one and check again.



9. Remove the nut, washer, and companion flange.
10. Tap a new oil seal into the differential carrier by using the **SST**.
11. Install the companion flange and washer, and tighten the locknut to set the preload.

Preload:
1.6—2.0 N·m { 16—21 kgf·cm , 13.9—18.2 in·lbf }
Tightening torque:
128—284 N·m { 13.0—29.0 kgf·m , 95—209 ft·lbf }

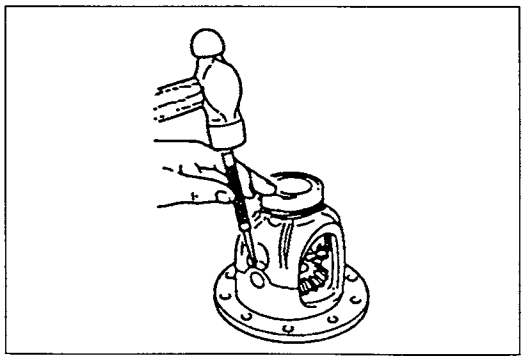


Adjustment of backlash

1. Adjust the backlash of the side gears and pinion gear as follows.
   (a) Set a dial gauge against the pinion gear as shown.
   (b) Secure one of the side gears.
   (c) Move the pinion gear and measure the backlash at the end of it.

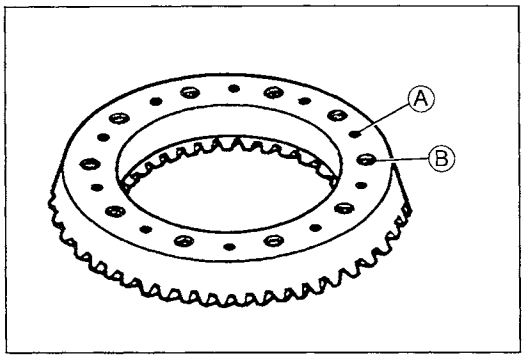
Standard backlash: 0—0.1 mm { 0—0.0039 in }

   (d) If the backlash exceeds the standard, use the selectable thrust washers for adjustment.



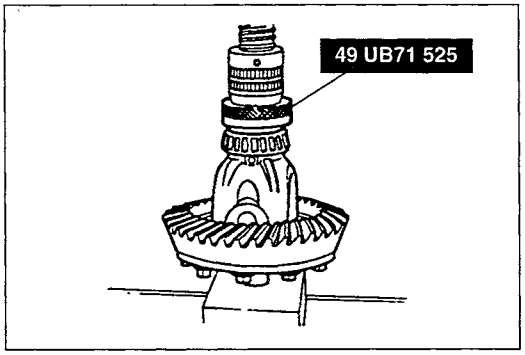
Identification mark	Washer thickness mm { in }
0	2.00 { 0.0787 }
05	2.05 { 0.0807 }
1	2.10 { 0.0827 }
15	2.15 { 0.0846 }
2	2.20 { 0.0866 }

2. Install a new knock-pin to secure the pinion shaft. Stake the knock-pin into position by using a punch to prevent it from coming out.

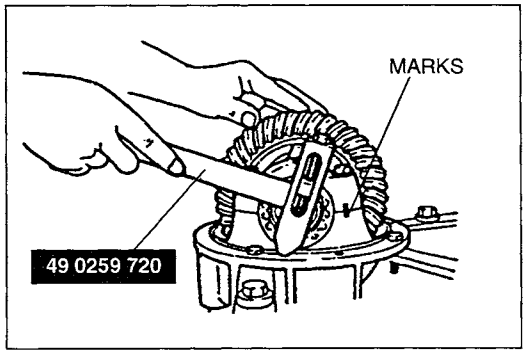


3. Apply about **0.04 cm^3 { 0.0024 cu in }** of threadlocking compound to each of the bolt threads Ⓐ and points Ⓑ.
4. Install the ring gear onto the gear case.

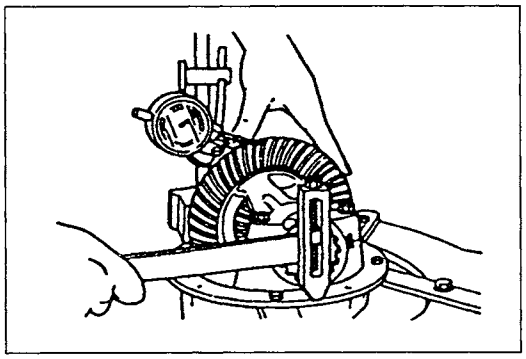
Tightening torque:
69—83 N·m { 7.0—8.5 kgf·m , 51—61 ft·lbf }



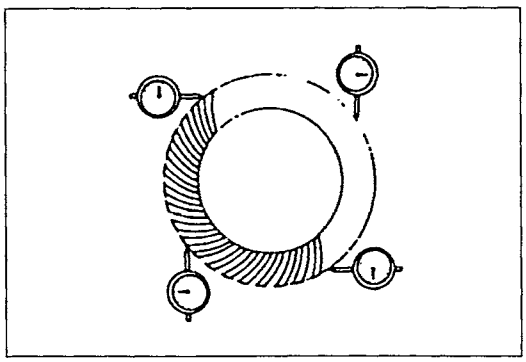
5. Press the bearing on by using the **SST**.



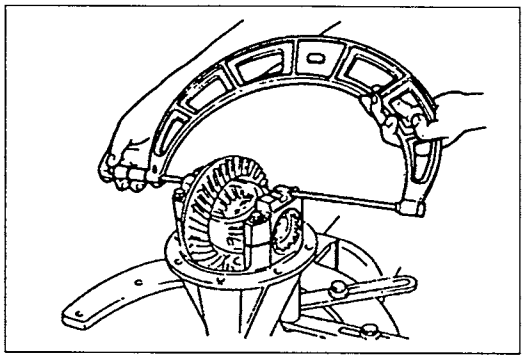
6. Install the differential gear assembly in the carrier.
7. Note the identification marks on the adjusters, and install the adjusters to their respective sides.
8. Install the differential bearing caps, making sure that the identification marks on the cap corresponds with the one on the carrier.



9. Mark the ring gear at four points at approx. **90°** intervals. Mount a dial indicator to the carrier so that the feeler comes into contact at a right angle with one of the ring gear teeth.
10. Turn both bearing adjusters equally by using the **SST** until the backlash is **0.09—0.11 mm { 0.0036—0.0043 in }**.

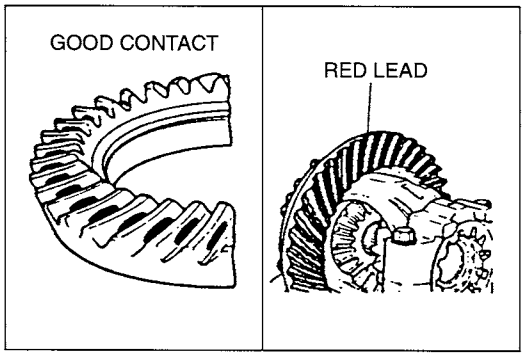


11. Check the backlash at the three other marked points, and make sure the minimum backlash is above **0.05 mm { 0.002 in }** and the difference between the maximum and minimum is less than **0.07 mm { 0.0028 in }**.



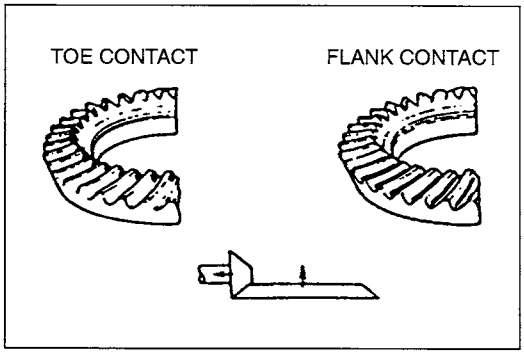
12. Tighten the adjusters equally until the distance between the pilot sections on the bearing caps is as specified. Make sure that the backlash of the drive pinion and ring gear does not become misadjusted.

Specified distance:
203.78—204.50 mm { 8.023—8.051 in }

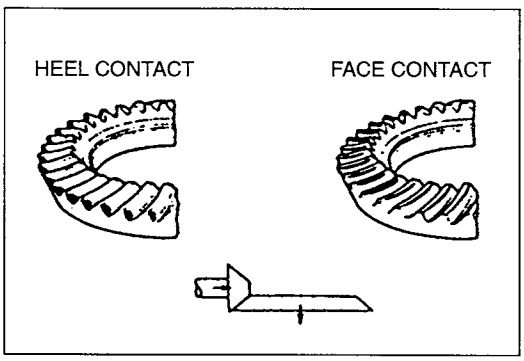


Inspection and adjustment of teeth contact

1. Coat both surfaces of 6—8 teeth of the ring gear with a uniformly thin coat of red lead.
2. While moving the ring gear back and forth by hand, rotate the drive pinion several times and check the tooth contact.
3. If the tooth contact is good, wipe off the red lead.
4. If it is not good, adjust the pinion height, and then adjust the backlash.



(1) Toe and flank contact
Replace the spacer with a thinner one to move the drive pinion outward.



(2) Heel and face contact
Replace the spacer with a thicker one to bring the drive pinion inward.

Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

STEERING SYSTEM

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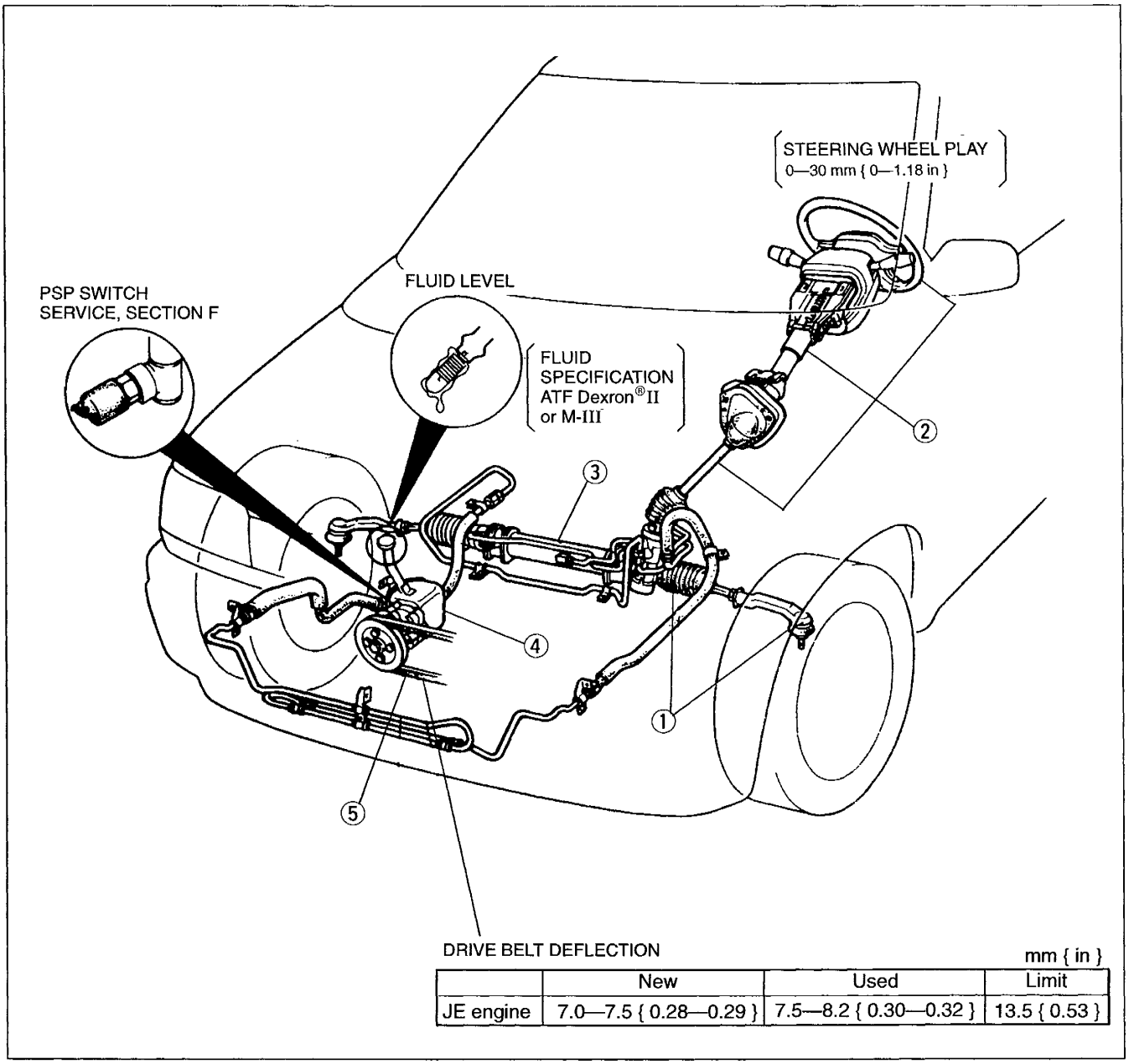


mm { in }

	New	Used	Limit
JE engine	7.0—7.5 { 0.28—0.29 }	7.5—8.2 { 0.30—0.32 }	13.5 { 0.53 }

OUTLINE

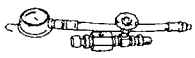
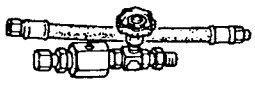
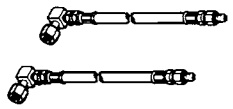
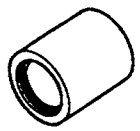
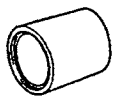
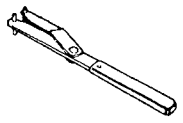
SPECIFICATIONS

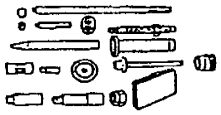
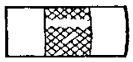
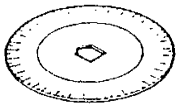
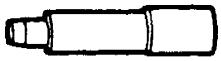
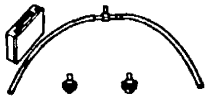
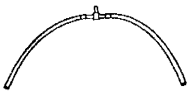
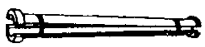
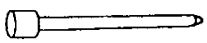
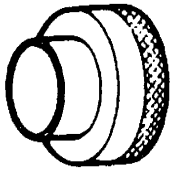
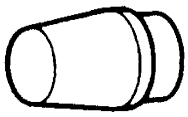
Item			Specification	
			2WD	4WD
Steering wheel	Outer diameter	mm { in }	380 { 15.0 }	
	Lock-to-lock	turns	3.9	3.6
Steering shaft and joint	Shaft type		Collapsible, tilt	
	Joint type		2-cross joint	
	Tilt stroke	mm { in }	69 { 2.72 }	
Power steering system	Power assist type		Engine speed sensing	
	Gear type		Rack and pinion	
	Rack stroke	mm { in }	136 { 5.35 }	
	Power steering fluid		ATF Dexron®II or M-III	
	Fluid capacity	L { US qt , Imp qt }	0.9 { 0.95 , 0.79 }	

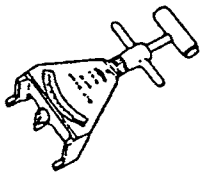
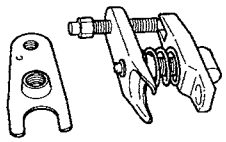
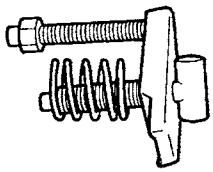
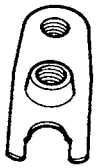
N

ENGINE SPEED SENSING POWER STEERING

PREPARATION

49 1232 670A Gauge set, power steering 	For inspection of power steering pressure	49 1232 672 Gauge (Part of 49 1232 670A) 	For inspection of power steering pressure
49 1232 673 Valve body (Part of 49 1232 670A) 	For inspection of power steering pressure	49 H002 671 Adapter, power steering gauge 	For inspection of power steering pressure
49 B032 302 Adapter, power steering gauge 	For inspection of power steering pressure	49 H028 301 Installer, boot 	For installation of tie rod end boot (2WD)
49 F034 201 Installer, boot 	For installation of tie rod end boot (4WD)	49 G032 354 Adjust wrench 	For removal and installation of oil pump

49 G032 3A0 Repair set, power steering 	For disassembly and assembly of steering gear	49 G032 302 Attachment (Part of 49 G032 3A0) 	For removal of oil seal and needle bearing
49 G032 303 Handle (Part of 49 G032 3A0) 	For removal of lower bearing, oil seal, and needle bearing	49 G032 308 Installer, oil seal (Part of 49 G032 3A0) 	For installation of oil seal
49 G032 309 Protector, Pinion shaft (Part of 49 G032 3A0) 	For installation of oil seal	49 D032 316 Protractor (Part of 49 G032 3A0) 	For installation of adjusting cover
49 H032 321A Hexagon wrench (Part of 49 G032 3A0) 	For removal and installation of adjusting cover	49 G032 312 Installer, bearing (Part of 49 G032 3A0) 	For installation of needle bearing
49 G032 313 Installer, oil seal (Part of 49 G032 3A0) 	For installation of oil seal	49 G032 3A1 Joint hose 	For hermetic inspection
49 G032 317 Hose (Part of 49 G032 3A1) 	For hermetic inspection	49 G032 319 Adapter (Part of 49 G032 3A1) 	For hermetic inspection
49 L032 301 Removal body, rod seal 	For removal of oil seal	49 L032 302 Remover shaft, rod seal 	For removal of oil seal
49 L032 303 Protector, rod seal 	For installation of oil seal	49 L032 304 Guide, rod seal 	For installation of oil seal

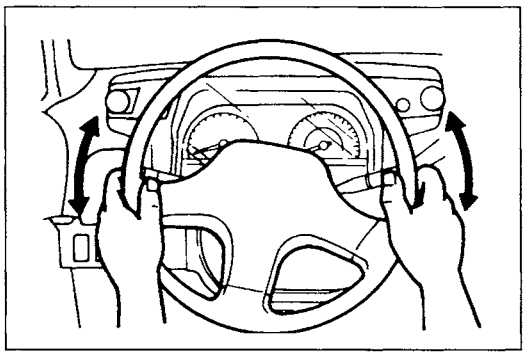
49 9200 020 Tension gauge, V-ribbed belt 	For inspection of oil pump drive belt	49 T028 3A0 Puller set, ball joint 	For removal of tie rod end
49 T028 303 Body (Part of 49 T028 3A0) 	For removal of tie rod end	49 T028 304 Attachment (Part of 49 T028 3A0) 	For removal of tie rod end

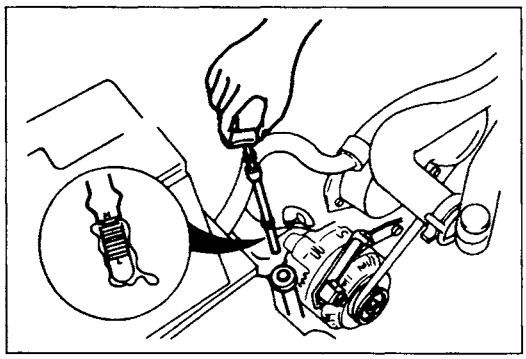
TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page/Section
Steering "heavy"	Poor lubrication, foreign material, or abnormal wear of steering ball joint	Lubricate or replace	N– 8, 10
	Stuck or damaged lower arm ball joints	Replace	section R
	Improper steering pinion preload	Adjust	N–28
	Damaged steering gear	Replace	N–18, 30
	Malfunction of steering shaft joint	Replace	N–13
	Improperly adjusted wheel alignment	Adjust	section R
	Malfunctioning steering gear	Replace	N–18, 30
	Incorrect tire pressure	Adjust	section Q
	Loose or damaged oil pump drive belt	Adjust or replace	section B
	Low fluid level or air in fluid	Add fluid or bleed air	N– 7
	Leakage of fluid	Repair or replace	—
	Insufficient oil pump pressure	Replace	N–32
Steering wheel pulls to one side	Incorrect tire pressure	Adjust	section Q
	Unevenly worn tires	Replace	section Q
	Weakened front coil spring	Replace	section R
	Worn or damaged stabilizer and/or lower arm bushing	Replace	section R
	Dragging brake	Repair	section P
	Loose lower arm	Tighten	section R
	Improperly adjusted wheel alignment	Adjust	section R
General instability while driving	Incorrect tire pressure	Adjust	section Q
	Damaged or unbalanced wheel	Adjust or replace	section Q
	Worn or damaged steering joints	Replace	N–13
	Improper steering pinion preload	Adjust	N–28
	Weakened front coil spring	Replace	section R
	Worn or damaged stabilizer and/or lower arm bushing	Replace	section R
	Malfunctioning shock absorber	Replace	section R
	Improperly adjusted wheel alignment	Adjust	section R
"Shake" occurs (Steering wheel vibrates up /down)	Excessive tire and wheel runout	Replace	section Q
	Loose lug nuts	Tighten	section Q
	Unbalanced wheel(s)	Adjust or replace	section Q
	Cracked or worn engine mount rubber	Replace	section B
	Cracked or worn transmission mount rubber	Replace	section K1
"Shimmy" occurs (Steering wheel vibrates circumferentially)	Cracked or worn steering gear mount rubber	Replace	N–18, 30
	Loose steering gear mounting bolts	Tighten	N–18, 30
	Stuck or damaged steering ball joint	Replace	N– 8, 10
	Excessive tire and wheel runout	Replace	section Q
	Loose lug nuts	Tighten	section Q
	Unbalanced wheel(s)	Adjust or replace	section Q
	Incorrect tire pressure	Adjust	section Q
	Unevenly worn tires	Replace	section Q
	Malfunction of shock absorber	Replace	section R
	Loose shock absorber mounting bolts	Tighten	section R
	Stuck or damaged lower arm ball joint	Replace	section R
	Cracked or worn suspension bushings	Replace	section R
	Damaged or worn front wheel bearing	Replace	section M
	Improperly adjusted front wheel alignment	Adjust	section R
Excessive steering wheel play	Worn steering gear	Replace	N–18, 30
	Worn or damaged steering joints	Replace	N–13
	Worn or damaged lower arm bushing	Replace	section R
	Loose steering gear mounting bolts	Tighten	N–18, 30
	Worn linkage or tie rod end	Replace	N– 8, 10
Poor steering wheel return	Incorrect tire pressure	Adjust	section Q
	Stuck or damaged steering joints	Replace	N–13
	Improperly adjusted front wheel alignment	Adjust	section R
	Improper steering pinion preload	Adjust	N–28
	Ball joint not operating smoothly	Replace	N– 8, 10
	Steering shaft contacting something	Repair	N–13

TROUBLESHOOTING GUIDE (Cont'd)

Problem	Possible Cause	Remedy	Page/Section
Abnormal noise from steering system	Loose oil pump	Tighten	N–32
	Loose steering gear box	Tighten	N–18, 30
	Loose oil pump bracket	Tighten	section B
	Loose oil pump pulley nut	Tighten	N–32
	Belt loose/tight	Adjust	N–35
	Air in system	Bleed air	below
	Malfunction inside steering gear	Replace	N–18, 30
	Malfunction of oil pump	Replace	N–32
	Obstruction near steering column or pressure hose	Repair or replace	N–13
	Loose steering ball joint	Tighten or replace	N– 8, 10
	Worn steering joints	Replace	N–13





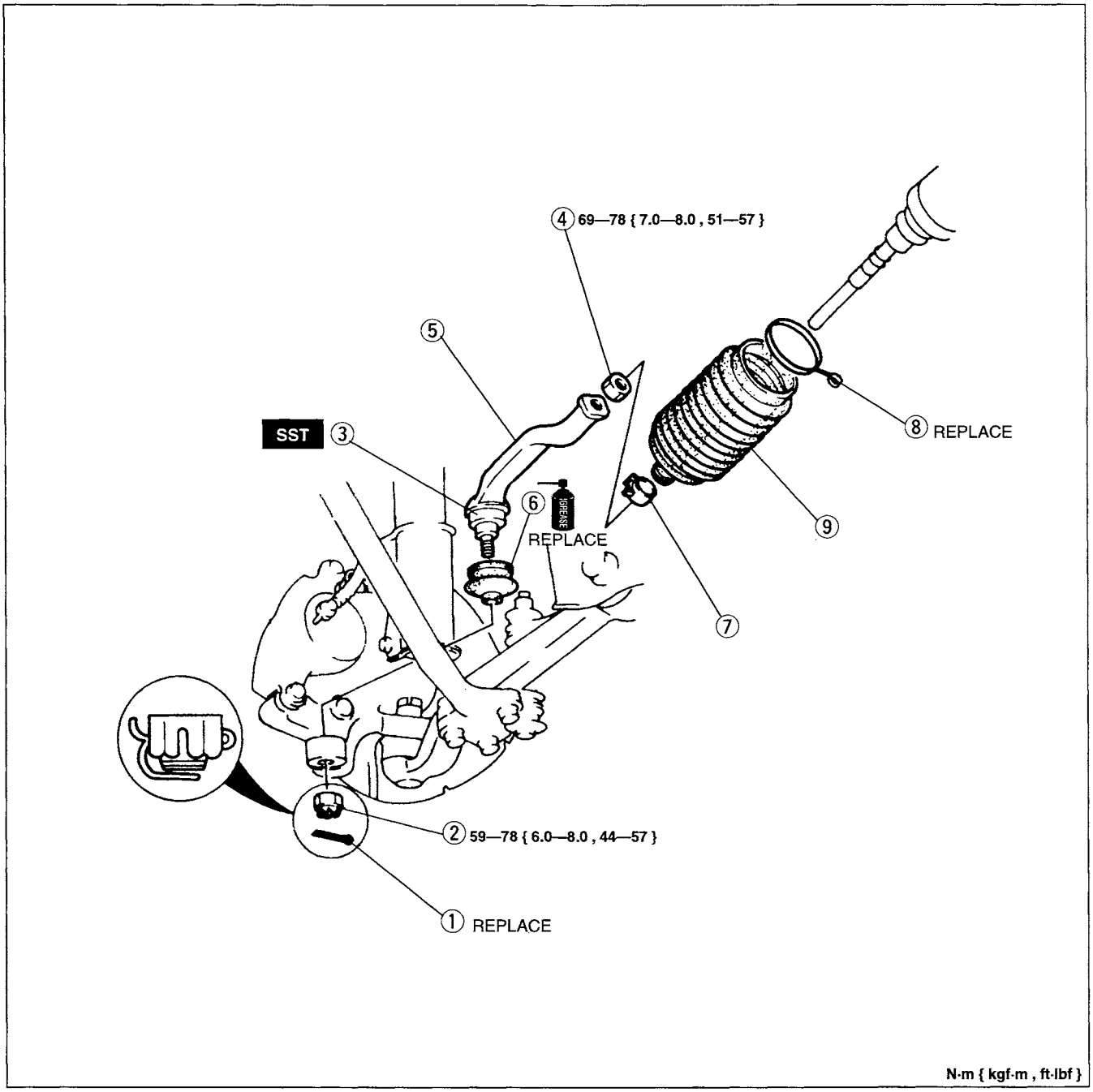
AIR BLEEDING

1. Check the fluid level. (Refer to page N–36.)
2. Turn the steering wheel fully to the left and right several times with the engine not running.
3. Recheck the fluid level. If the level has lowered, add fluid.
4. Repeat steps 2 and 3 until the fluid level stabilizes.
5. Start the engine and let it idle.
6. Turn the steering wheel fully to the left and right several times.
7. Check that the fluid is not foamy and that the fluid level has not dropped.
8. Add fluid if necessary and repeat steps 6 and 7.

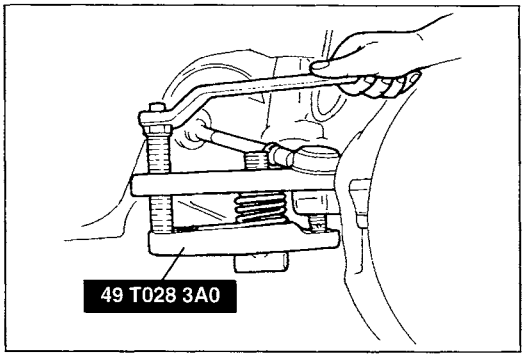
BOOTS (2WD)

Removal / Installation

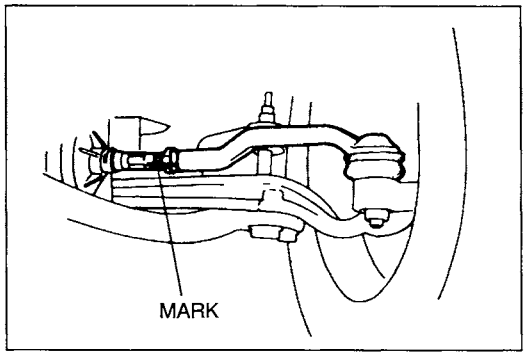
1. Loosen the wheel lug nuts.
2. Jack up the front of the vehicle and support it on safety stands.
3. Remove the wheel.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Tighten all necessary nuts to the specified torque.
7. After installation, check the steering angle and toe-in and adjust if necessary. (Refer to section R.)



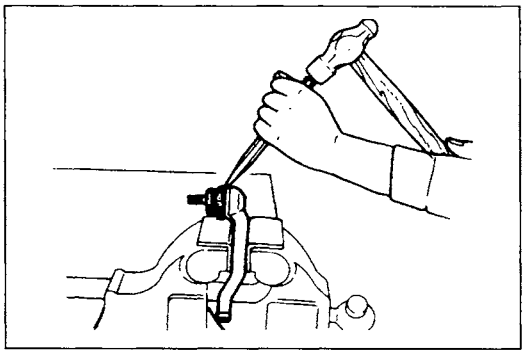
1. Cotter pin
2. Nut
3. Tie-rod end ball joint
   Removal Note ..... page N–9
4. Locknut
   Removal Note ..... page N–9
5. Tie-rod end
6. Tie-rod end boot
   Removal Note ..... page N–9
   Installation Note ..... page N–9
7. Boot clamp
8. Boot wire
9. Steering gear boot



Removal note
Tie-rod end ball joint
1. Remove the tie rod nut.
2. Separate the tie-rod end ball joint from the steering knuckle by using the **SST**.

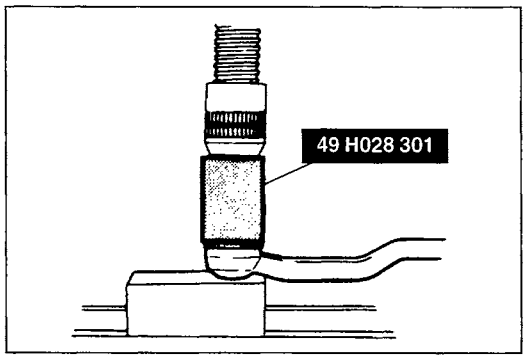


Locknut
Before loosening the locknut from the tie-rod end, make a mark for reference when tightening.



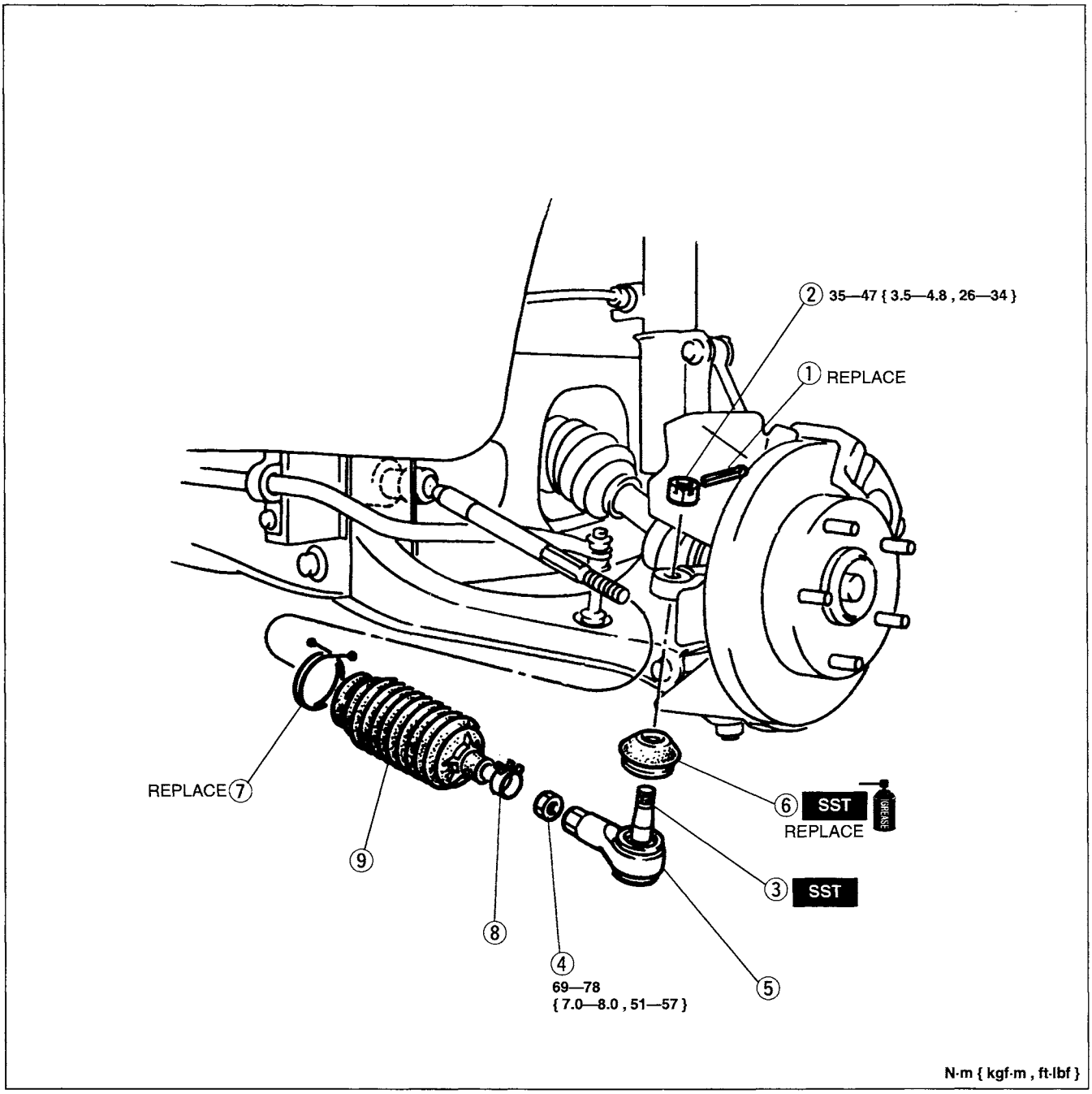
Tie-rod end boot
Secure the tie-rod end in a vise. Place a chisel against the boot and hold it at the angle shown. Remove the boot by tapping with a hammer.

Caution
- **Striking the tie-rod end with metal tools will cause raised areas, which could slice the new boot. When removing the old boot from the tie-rod end, always point the chisel away from the tie-rod end.**

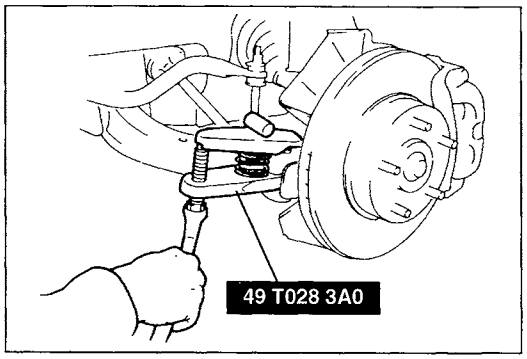


Installation note
Tie-rod end boot
1. Wipe away the grease on the ball joint.
2. Put a small amount of grease (lithium-based) into the new boot and set it onto the tie-rod end.
3. Press the boot onto the tie-rod end by using the **SST** and a press.
4. Wipe away any grease expelled from the dust boot.

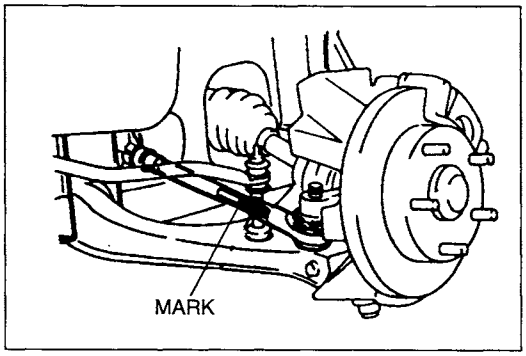
BOOTS (4WD)
Removal / Installation
1. Loosen the wheel lug nuts.
2. Jack up front of the vehicle and support it on safety stands.
3. Remove the wheel.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Tighten all necessary nuts to the specified torque.
7. After installation, check the steering angle and toe-in and adjust if necessary. (Refer to section R.)



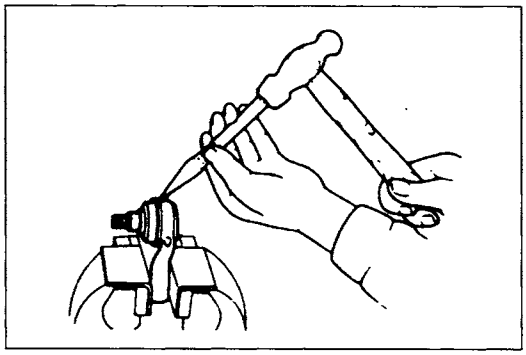
1. Cotter pin
2. Nut
3. Tie-rod end ball joint
   Removal Note ..... page N–11
4. Locknut
   Removal Note ..... page N–11
5. Tie-rod end
6. Tie-rod end boot
   Removal Note ..... page N–11
   Installation ..... page N–11
7. Boot wire
8. Boot clamp
9. Steering gear boot



Removal note
Tie-rod end ball joint
1. Remove the tie rod nut.
2. Separate the tie-rod end ball joint from the steering knuckle by using the **SST**.

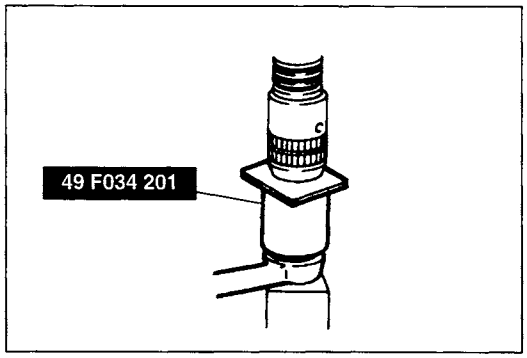


Locknut
Before loosening the locknut from the tie-rod end, make a mark for reference when tightening.

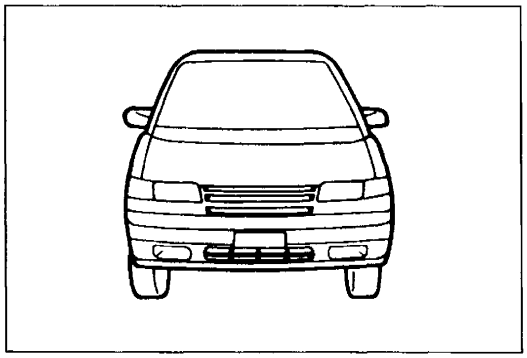


Tie-rod end boot
Secure the tie-rod end in a vise. Place a chisel against the boot and hold it at the angle shown. Remove the boot by tapping with a hammer.

Caution
- **Striking the tie-rod end with metal tools will cause raised areas, which could slice the new boot. When removing the old boot from the tie-rod end, always point the chisel away from the tie-rod end.**

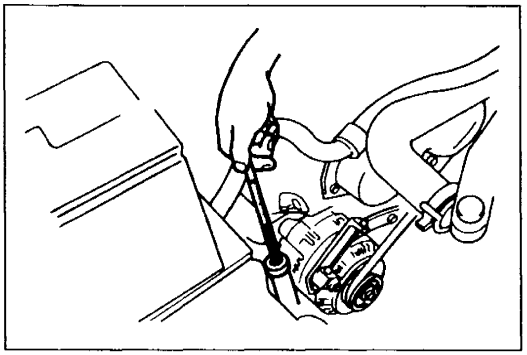


Installation note
Tie-rod end boot
1. Wipe away the grease on the ball joint.
2. Put a small amount of grease (lithium-based) into the new boot and set it onto the tie-rod end.
3. Press the boot onto the tie-rod end by using the **SST** and a press.
4. Wipe away any grease expelled from the dust boot.

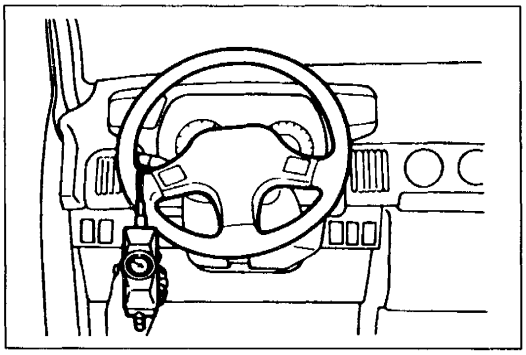


STEERING WHEEL AND COLUMN
On-vehicle Inspection
Inspection of steering effort

1. With the vehicle on a hard, level surface, move the steering wheel to put the wheels in the straight-ahead position.



2. Start the engine and warm the power steering fluid to **50—60 °C { 122—140 °F }**.

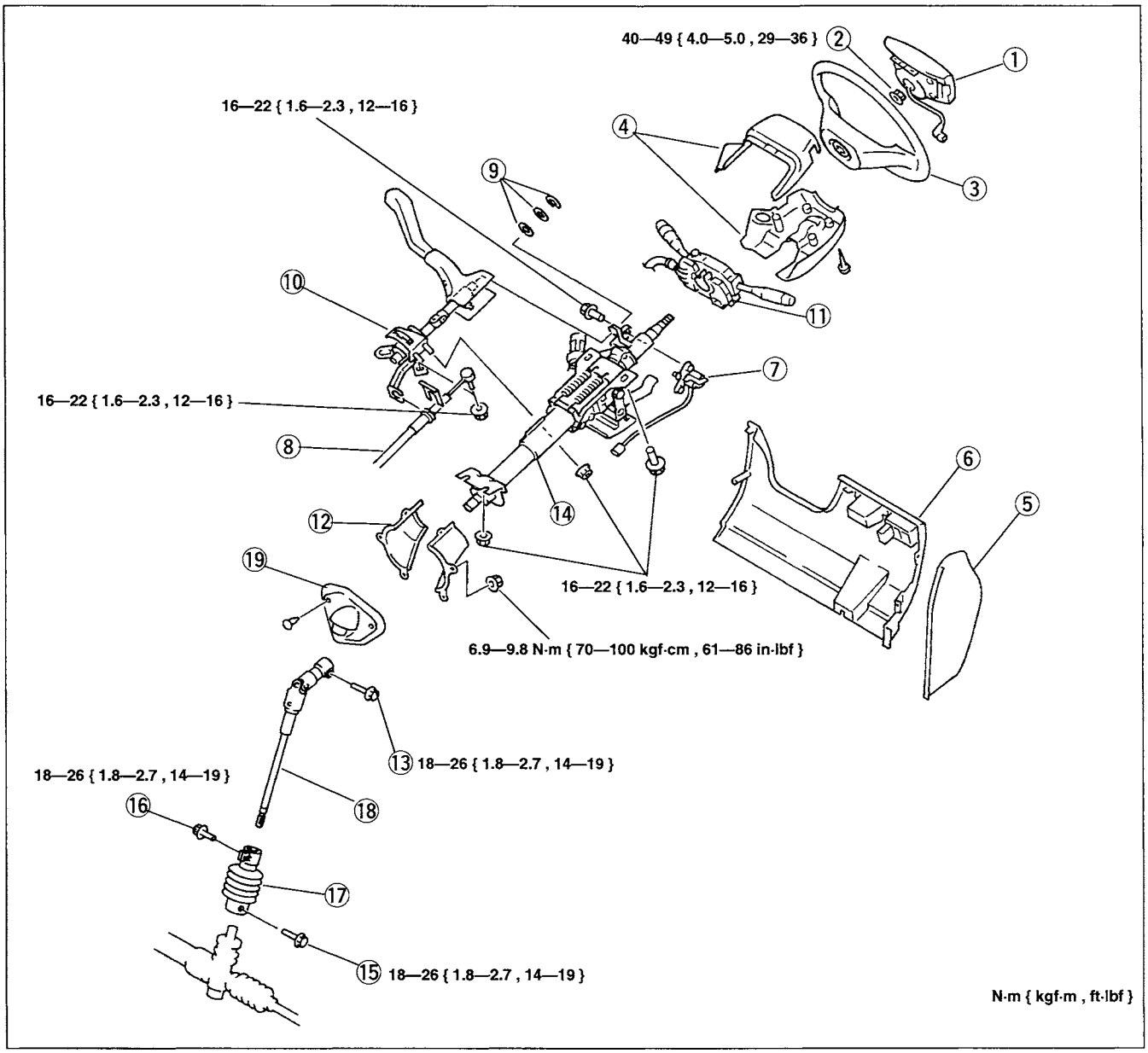


3. With the engine running at idle speed, attach a pull scale to the outermost point of the steering wheel spoke. Then, starting with the wheels in the straight-ahead position, check the steering effort required to turn the steering wheel to the left and to the right.
4. If the measured value exceeds the specification, check the following: fluid level, air in system, fluid leakage at hose or connections, function of oil pump and gearbox, and tire pressure.

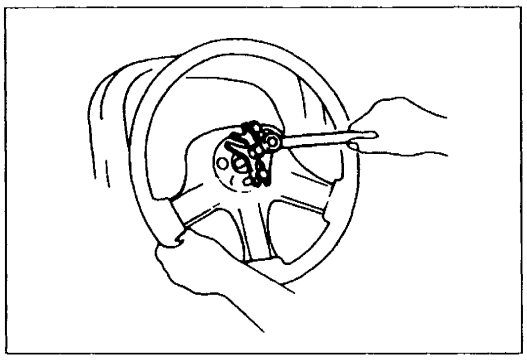
Steering wheel effort: 29 N { 3.0 kgf , 6.6 lbf } or less

Removal / Installation

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal.
3. Tighten all necessary nuts and bolts to the specified torque.
4. After installation, check the selector lever for correct operation. (Refer to section K1.)



1. Air bag module
   Service ..... section T
2. Locknut
3. Steering wheel
   Removal Note ..... page N–14
4. Column cover
5. Side panel
6. Lower panel
7. Shift-lock actuator
8. Selector cable
9. Retaining ring, wave washer, adjustment washer(s)
   Service ..... section K1
10. Selector lever assembly
    Service ..... section K1
11. Combination switch
    Service ..... section T
12. Joint cover
13. Fixing bolt (steering shaft/intermediate shaft)
14. Steering shaft
    Disassembly / Assembly / Inspection ..... page N–15
15. Fixing bolt (universal joint/pinion shaft)
16. Fixing bolt (intermediate shaft/universal joint)
17. Universal joint
18. Intermediate shaft
19. Dust cover

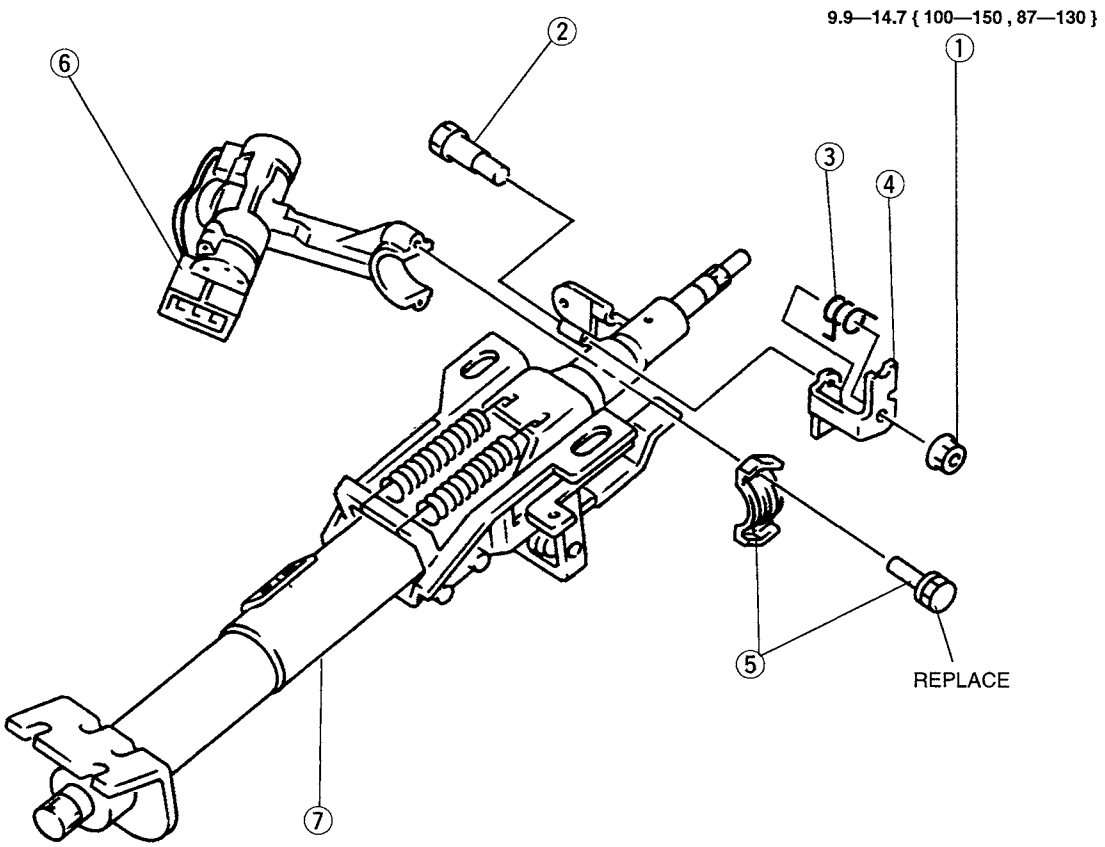


Removal note
Steering wheel
Remove the steering wheel by using a suitable puller.

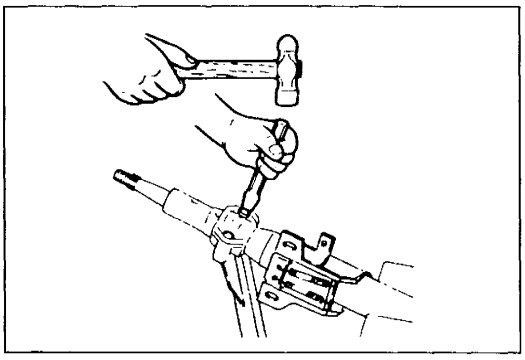
Caution
- **Do not try to remove the steering wheel by hitting the shaft with a hammer. The column will collapse.**

Disassembly / Assembly / Inspection

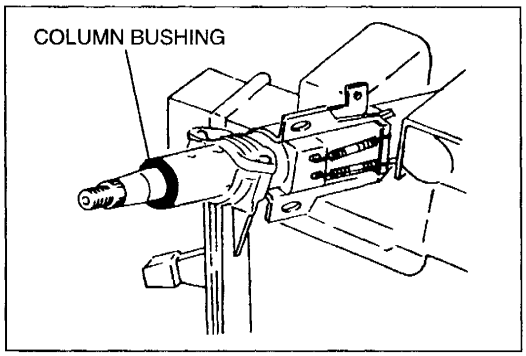
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



1. Nut
2. Bolt
3. Return spring
4. Lever
5. Steering lock mounting bolts and bracket
   Disassembly Note ..... page N–16
   Assembly Note ..... page N–17
6. Steering lock assembly
   Inspection ..... page N–16
7. Steering shaft
   Inspection ..... page N–16

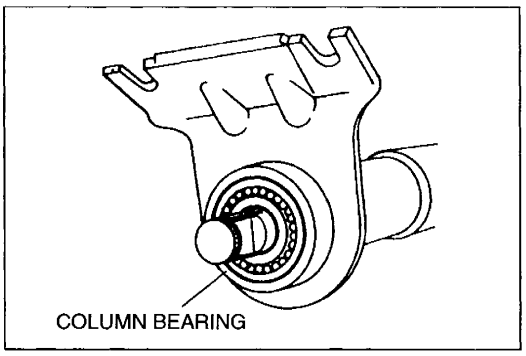


Disassembly note
Steering lock mounting bolts and bracket
Use a chisel to make a groove in the head of the steering lock mounting bolts. Remove the bolts by using a screwdriver; then remove the steering lock assembly.

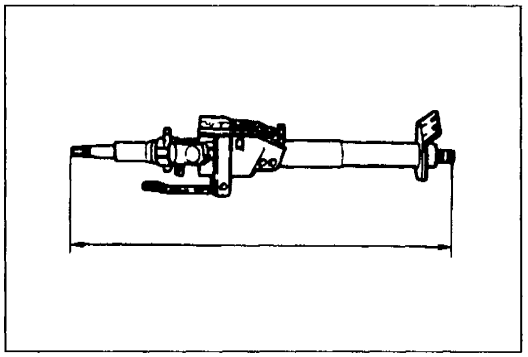


Inspection
Check for the following and replace the assembly if necessary.

Steering shaft
1. Column bushing wear

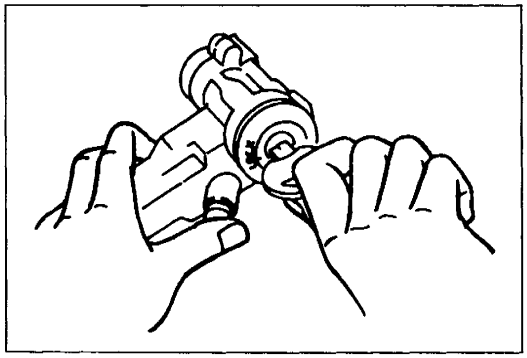


2. Column bearing damage

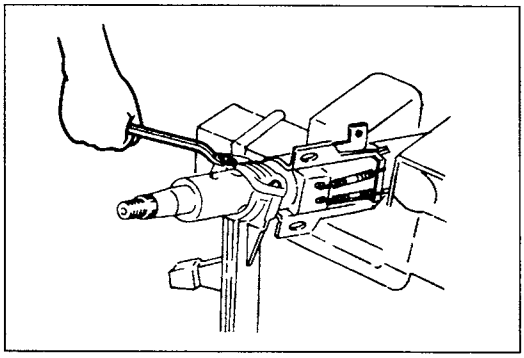


3. Steering shaft length

Specified length: 612—615 mm { 24.09—24.21 in }



Steering lock assembly
1. Turn the ignition switch to the LOCK position.
2. Verify that the key cannot be turned with the button pushed and can be turned with the button not pushed.



Assembly note

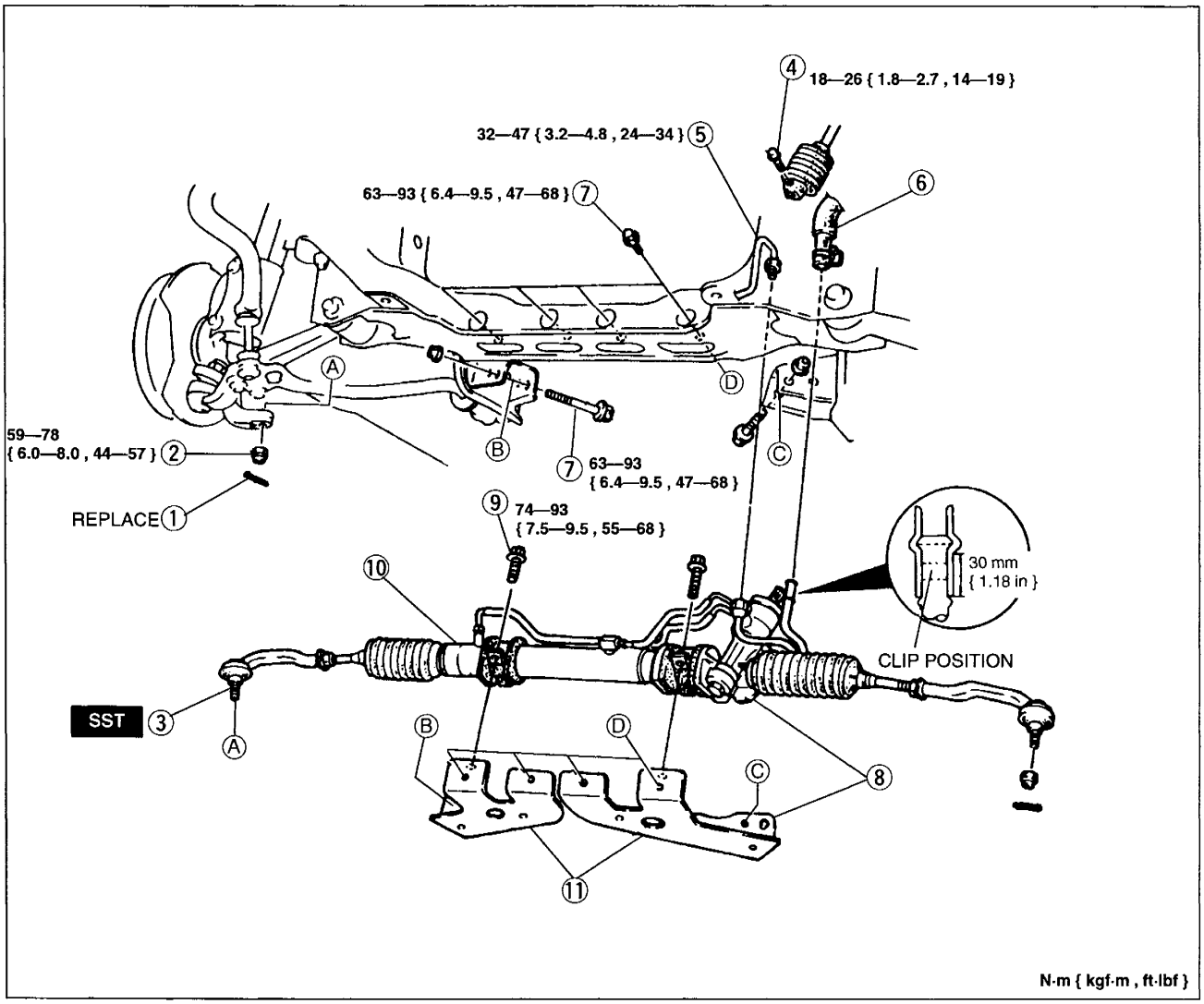
Steering lock mounting bolts and bracket

Install the steering lock assembly on the jacket. Install new steering lock mounting bolts, and tighten them until the heads break off.

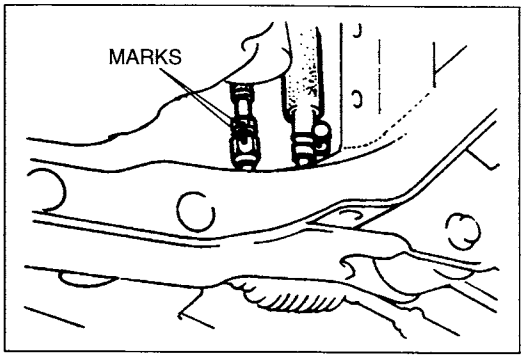
STEERING GEAR AND LINKAGE (2WD)

Removal / Inspection / Installation

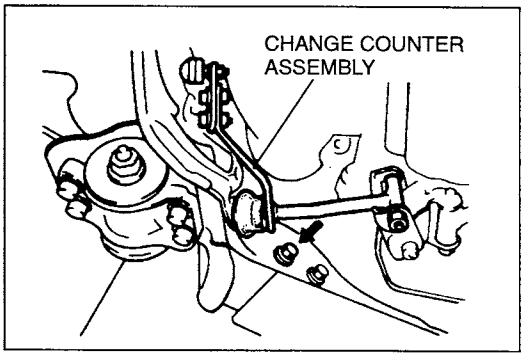
1. Loosen the wheel lug nuts.
2. Jack up the front of the vehicle and support it on safety stands.
3. Remove the wheel.
4. Remove the undercover
5. Remove in the order shown in the figure, referring to **Removal Note**.
6. Install in the reverse order of removal, referring to **Installation Note**.
7. After installation:
   (1) Bleed the air from the system. (Refer to page N–7.)
   (2) Check the power steering fluid level and add fluid if necessary. (Refer to page N–36.)
   (3) Check the system for fluid leakage. (Refer to page N–36.)
   (4) Check the toe-in and adjust it if necessary. (Refer to section R.)
8. Inspect all parts and repair or replace as necessary.



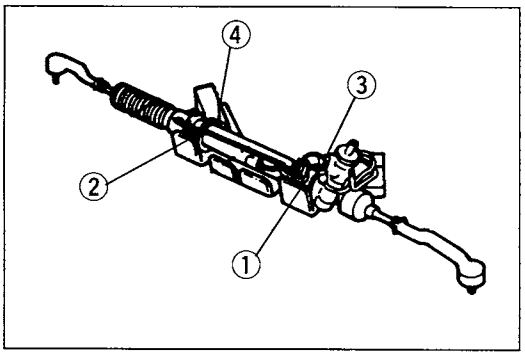
1. Cotter pin
2. Nut
3. Tie-rod end ball joint
   Removal Note ..... page N– 9
4. Fixing bolt (intermediate shaft/pinion shaft)
5. Pressure pipe
   Removal Note ..... page N–19
6. Return hose
7. Steering bracket mounting bolts
   Removal Note ..... page N–19
8. Steering gear, linkage, and steering brackets
9. Mounting bracket bolts
   Installation Note ..... page N–19
10. Steering gear and linkage
11. Steering brackets



Removal note
Pressure pipe
Before removing the pressure pipe, make marks for reference during installation.



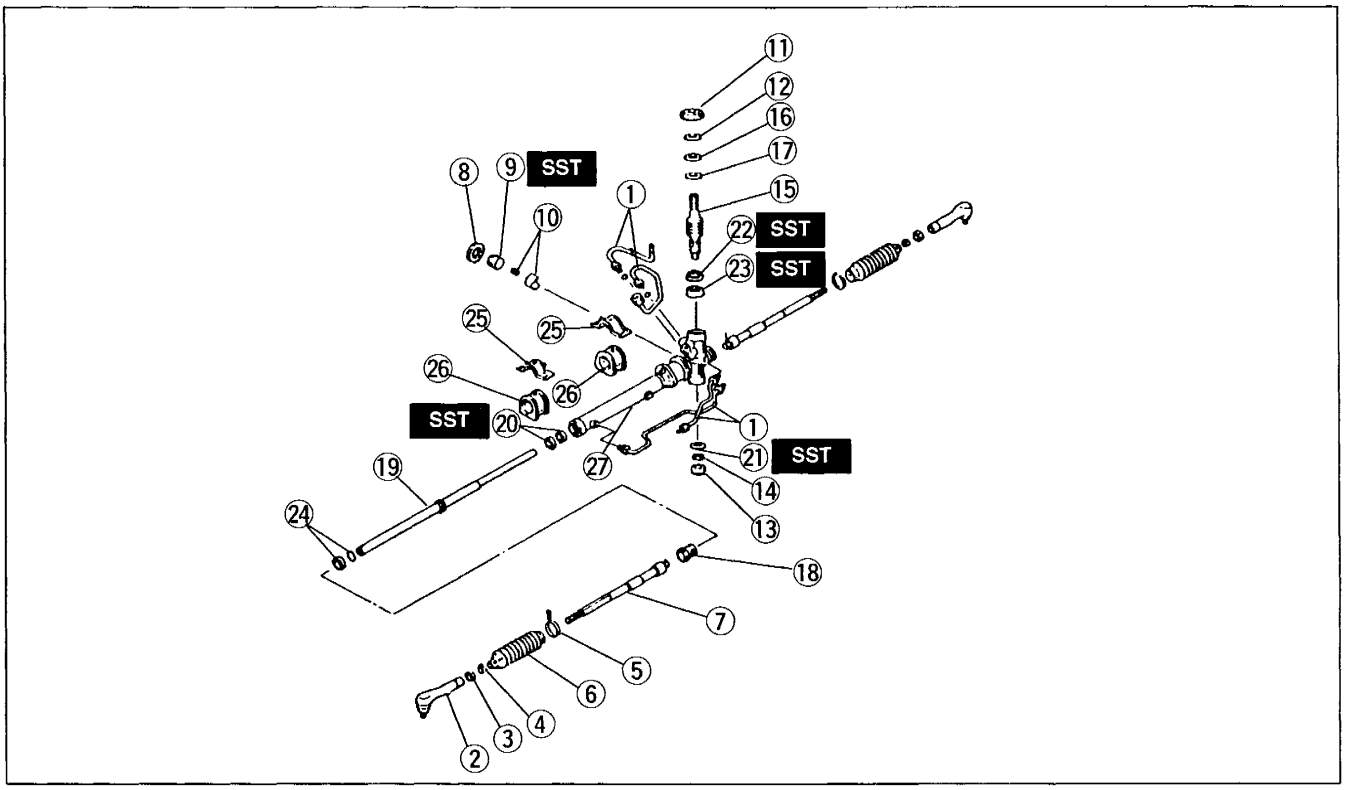
Steering bracket mounting bolt
Remove the change counter assembly to remove the protector plate mounting bolt indicated by the arrow. (Refer to section K1 for change counter assembly service.)



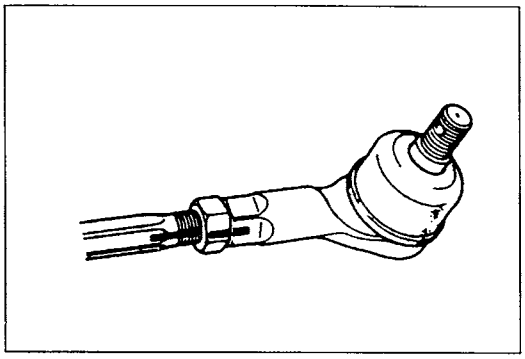
Installation note
Mounting bracket bolts
Tighten the mounting bracket bolts in the order shown in the figure.

Disassembly / Inspection (2WD), (4WD)

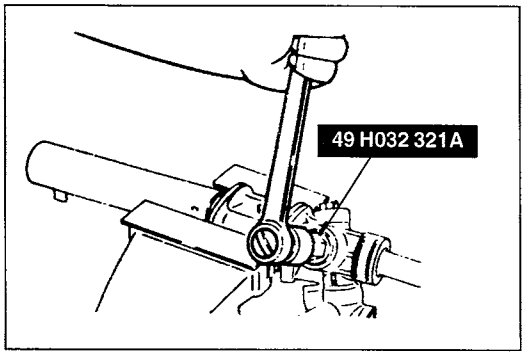
1. Plug all pipe fittings to prevent leakage.
2. Clean the steering gear and linkage.
3. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
4. Inspect all parts and repair or replace as necessary.



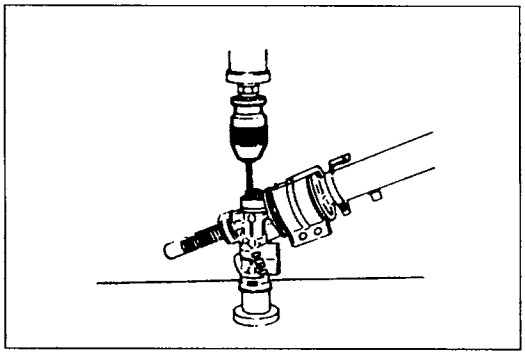
1. Oil pipe
   Inspect for clogging and damage
2. Tie-rod end
   Disassembly Note ..... page N–21
   Inspect for damage and operation
3. Tie-rod end locknut
4. Boot clamp
5. Boot wire
6. Boot
   Inspect for cracking and tearing
7. Tie rod
   Inspect for damage and operation
8. Adjusting cover locknut
9. Adjusting cover
   Disassembly Note ..... page N–21
10. Spring, pressure pad
    Inspect for damage
11. Dust cover
12. Snap ring
13. Housing cover
    Disassembly Note ..... page N–21
14. Lower bearing locknut
15. Pinion shaft and control valve assembly
    Disassembly Note ..... page N–21
    Inspect for wear and damage of pinion shaft teeth
    Inspect for damage, clogging, and wear of control valve
16. Oil seal
17. Upper bearing
    Inspect for wear, damage, and operation
18. Rack bushing assembly
    Disassembly Note ..... page N–21
19. Rack
    Inspect for cracking, damage, and wear of teeth
    Inspect for wear and damage of seal ring holder
    Inspect for corrosion of rack pinion side
20. Spacer, oil seal
    Disassembly Note ..... page N–22
21. Lower bearing
    Disassembly Note ..... page N–22
    Inspect for damage and operation
22. Oil seal
    Disassembly Note ..... page N–22
23. Needle bearing
    Disassembly Note ..... page N–22
    Inspect for damage and operation
24. Seal ring, O-ring
    Disassembly Note ..... page N–22
25. Mounting bracket
26. Mounting rubber mount
27. Gear housing
    Inspect for cracking and damage



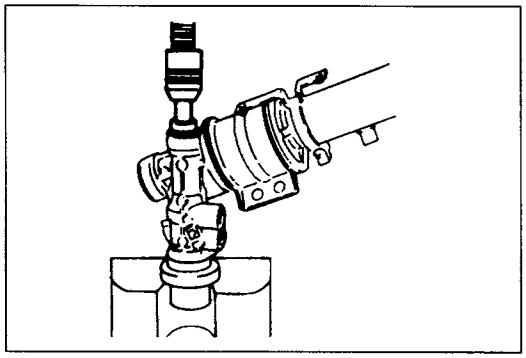
Disassembly note
Tie-rod end
Before removing the tie-rod end, make a marks for proper installation.



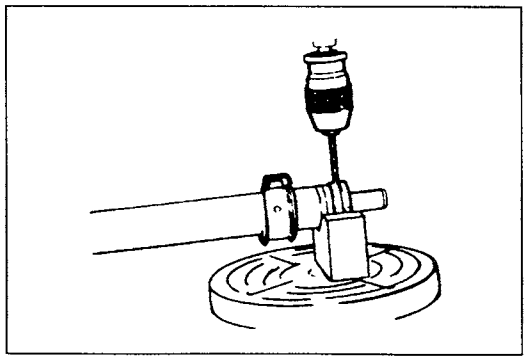
Adjusting cover
1. Remove the locknut from the adjusting cover.
2. Remove the adjusting cover by using the **SST**.
3. Remove the spring and pressure pad.



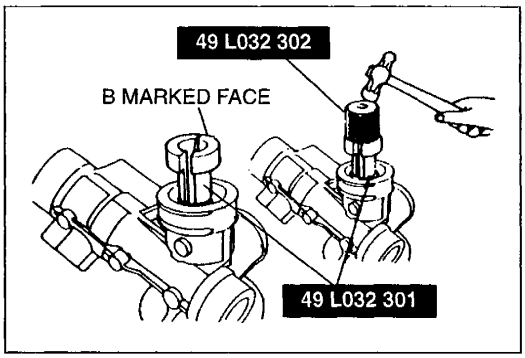
Housing cover
1. Cut away the staked areas by using a drill.
2. Remove the housing cover.



Pinion shaft and control valve assembly
1. Remove the locknut.
2. Set the gear housing assembly on a press and remove the pinion shaft and control valve assembly as shown in the figure.

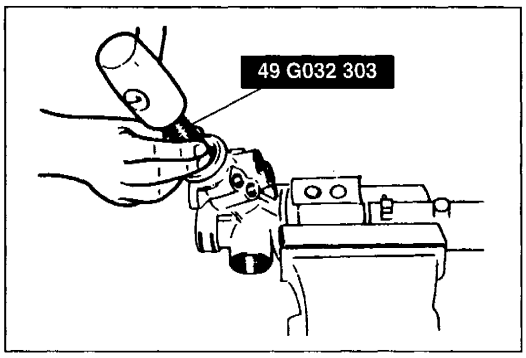


Rack bushing assembly
1. Cut away the staked areas by using a drill.
2. Remove the rack bushing.



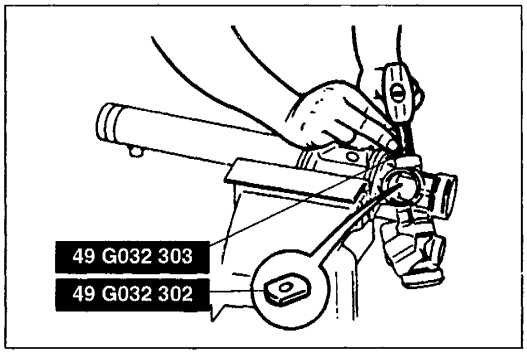
Spacer, oil seal

Remove the spacer and the oil seal by using the **SST**, being careful not to scratch the inner surfaces of the gear housing.



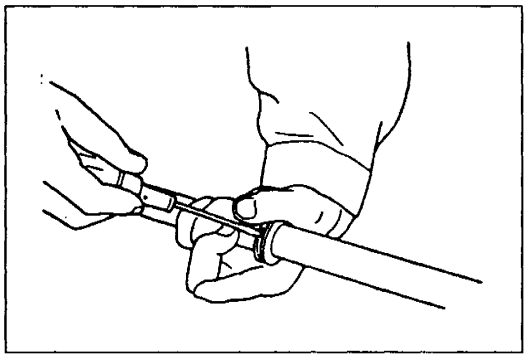
Lower bearing

Drive the lower bearing out of the housing by using the **SST**.



Oil seal, needle bearing

1. Insert the **SST** (49 G032 302) so that it contacts the needle bearing.
2. Drive the oil seal and needle bearing out by using the **SST** (49 G032 303) bar.

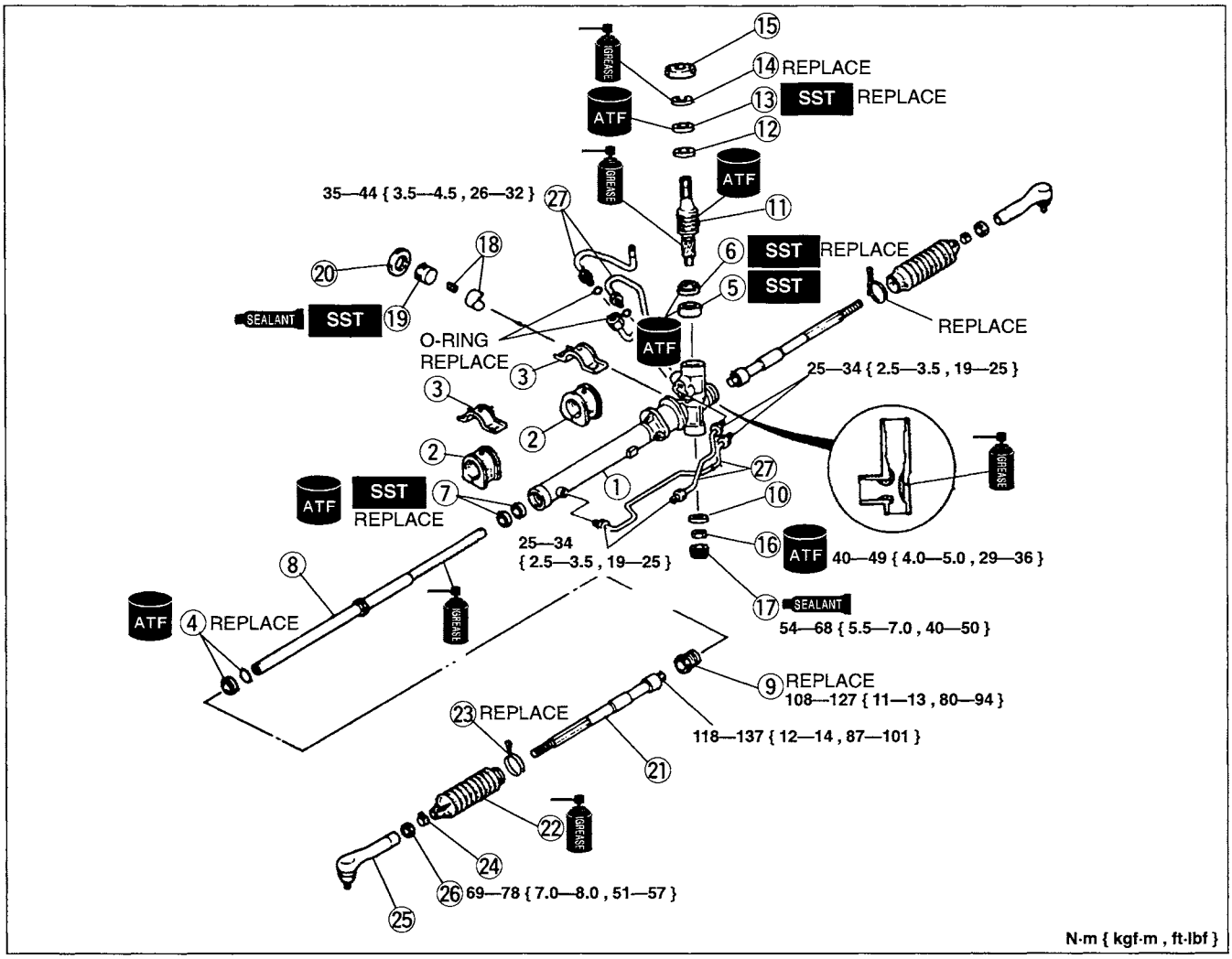


Seal ring, O-ring

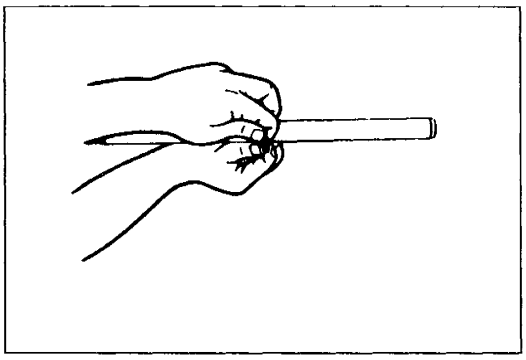
Remove the seal ring and the O-ring, being careful not to scratch the ring groove.

Assembly (2WD), (4WD)

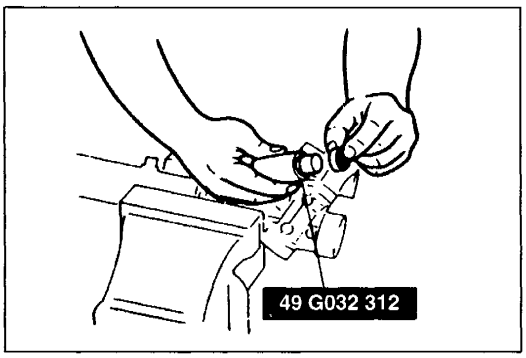
Assemble in the order shown in the figure, referring to **Assembly Note**.



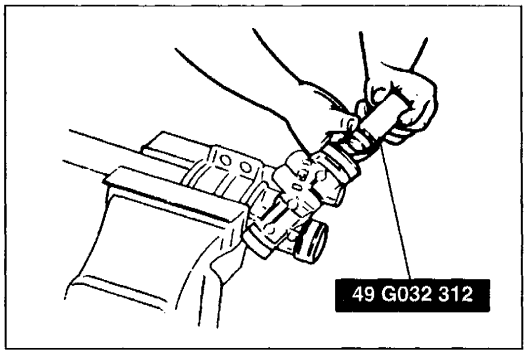
1. Gear housing
2. Mounting rubber mount
3. Mounting bracket
4. Seal ring, O-ring
   Assembly Note ..... page N–24
5. Needle bearing
   Assembly Note ..... page N–24
6. Oil seal
   Assembly Note ..... page N–24
7. Spacer, oil seal
   Assembly Note ..... page N–25
8. Rack
9. Rack bushing assembly
   Assembly Note ..... page N–26
10. Lower bearing
    Assembly Note ..... page N–26
11. Pinion shaft and control valve assembly
    Assembly Note ..... page N–26
12. Upper bearing
    Assembly Note ..... page N–27
13. Oil seal
    Assembly Note ..... page N–27
14. Snap ring
15. Dust cover
16. Lower bearing locknut
    Assembly Note ..... page N–27
17. Housing cover
    Assembly Note ..... page N–27
18. Spring, pressure pad
19. Adjusting cover
    Assembly Note ..... page N–28
20. Adjusting cover locknut
21. Tie rod
    Assembly Note ..... page N–28
22. Boot
    Assembly Note ..... page N–28
23. Boot wire
24. Boot clamp
25. Tie-rod end
    Assembly Note ..... page N–29
26. Tie-rod end locknut
27. Oil pipe



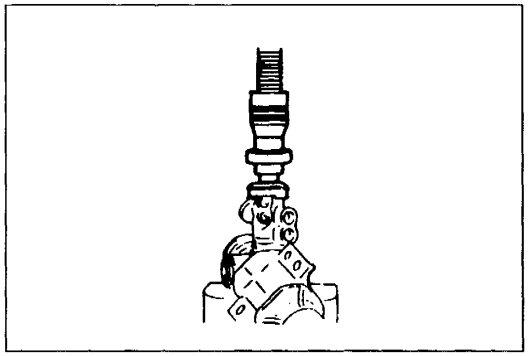
Assembly note
Seal ring, O-ring
1. Apply ATF to the seal ring and O-ring.
2. Install the O-ring in the ring groove of the rack.
3. Install the seal ring in the groove of the rack.
4. Compress the seal ring by hand to fit it into the groove.



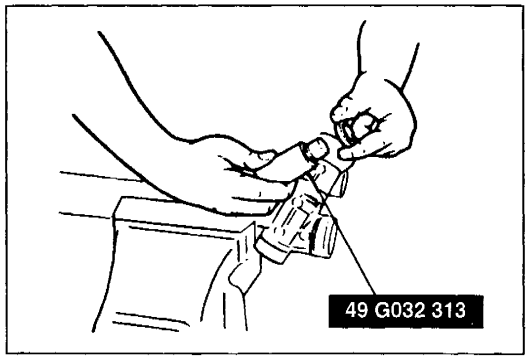
Needle bearing
1. Apply grease to the end of the **SST**.
2. Apply ATF to the needle bearing.
3. Set the needle bearing on the **SST** so that the marked side of the bearing faces toward the **SST** handle.



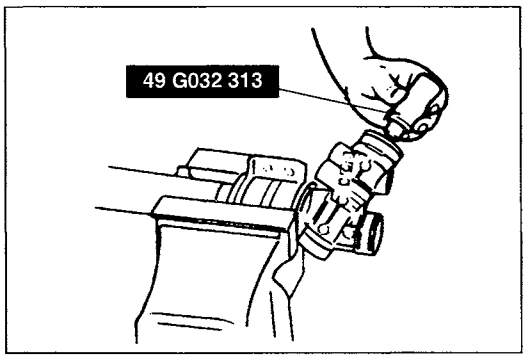
4. Insert the needle bearing and the **SST** into the housing.



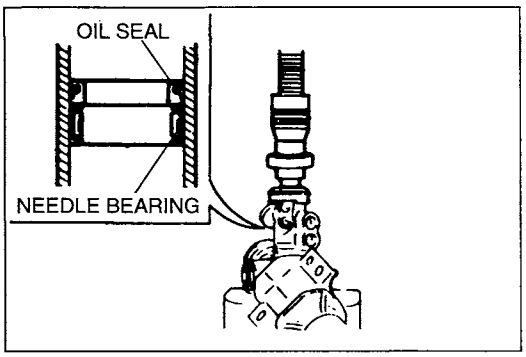
5. Set the housing on a press, and install the bearing into the housing.



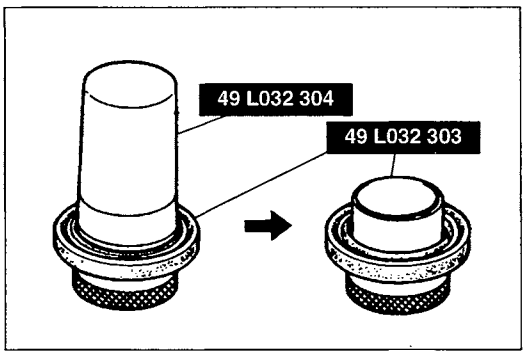
Oil seal
1. Apply grease to the end of the **SST**.
2. Apply ATF to the new oil seal.
3. Set the oil seal on the **SST**.



4. Insert the oil seal and the **SST** into the housing.

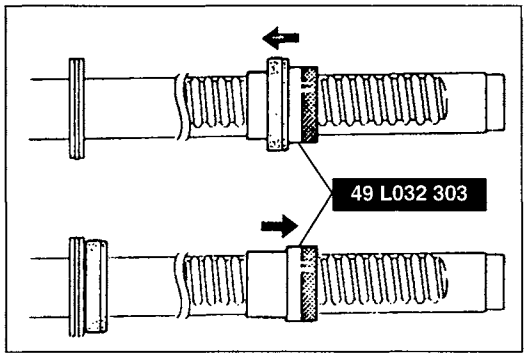


5. Set the housing on a press and press in the seal.

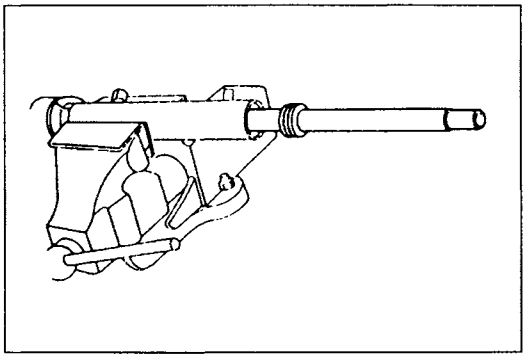


Spacer, oil seal

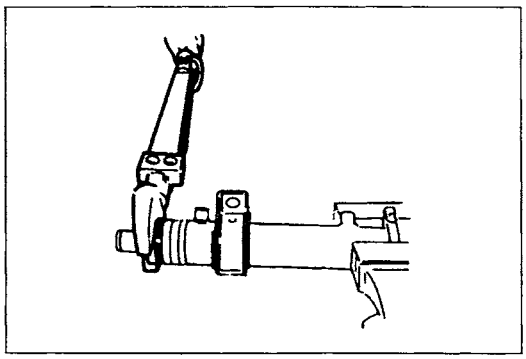
1. Set the new oil seal on the **SST** (49 L032 304 and 49 L032 303) as shown.
2. Remove the **SST** (49 L032 304).



3. Set the oil seal on the rack through the rack teeth by using the **SST** (49 L032 303) as shown.
4. Apply grease to flat surface of the spacer.
5. Set the spacer so that the grease coated surface contacts the oil seal.
6. Apply ATF to the spacer and the oil seal.



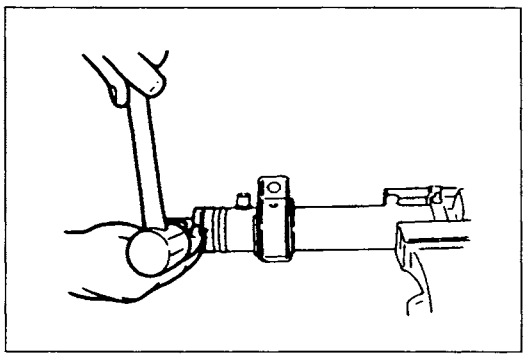
7. Insert the rack from the tube side.



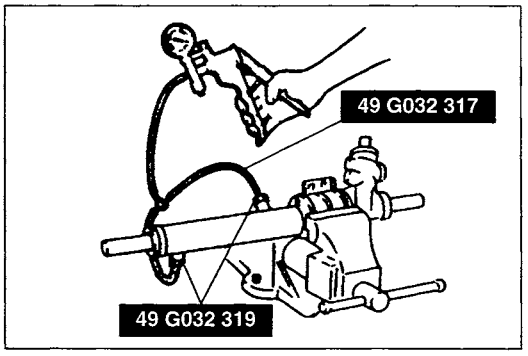
Rack bushing assembly

1. Install the rack bushing assembly in the rack housing.

   Tightening torque:
   108—127 N·m { 11—13 kgf·m , 80—94 ft·lbf }

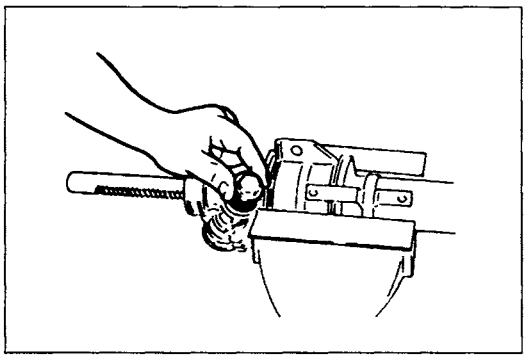


2. Stake the rack housing at two points **approx 1.5 mm { 0.06 in }** from the end by using a hammer and center punch.



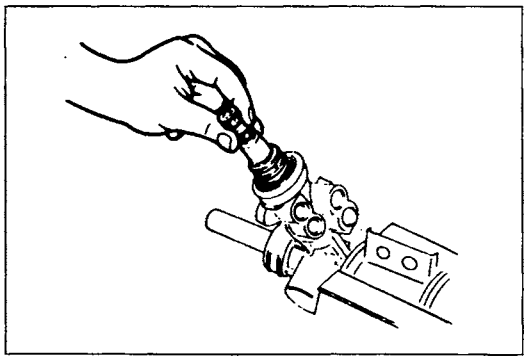
Hermetic inspection

1. Connect the **SST** to the cylinder housing.
2. Connect a vacuum pump to the **SST.**
3. Apply **53.3 kPa { 400 mmHg , 15.7 inHg }** vacuum.
4. Verify that the vacuum is held for at least **30 sec.** If not, check the seal and assembly.



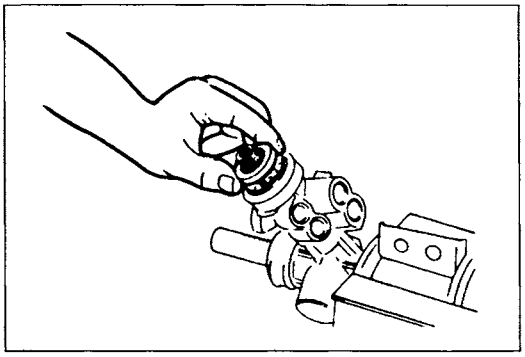
Lower bearing

1. Secure the gear housing in a vise so that the lower bearing bore faces upward.
2. Apply ATF to the lower bearing, then install it in the housing.
3. Press the bearing into the gear housing with the housing cover. Tighten the cover until the tightening force suddenly increases.



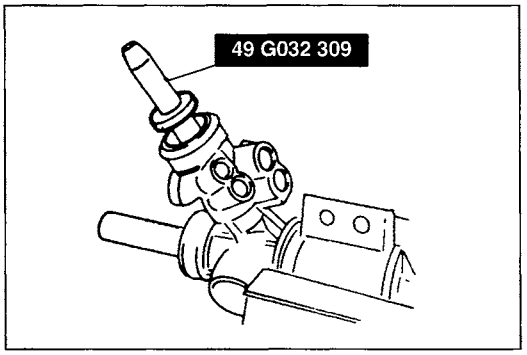
Pinion shaft and control valve assembly

1. Apply grease (lithium base, NLGI No.2) to the teeth of the pinion shaft.
2. Apply ATF to the seal ring and the friction surface of the control valve.
3. Install the pinion shaft into the housing without allowing the teeth of the pinion to touch the oil seal.



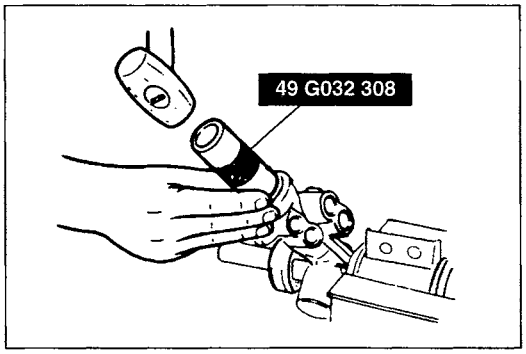
Upper bearing

Apply ATF to the upper bearing, then install it.

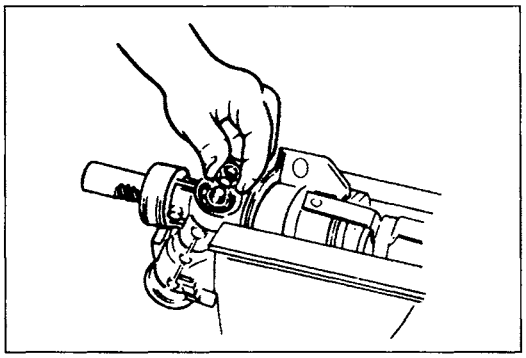


Oil seal

1. Apply ATF to the new oil seal, and fill inside the lip with grease (lithium base, NLGI No.2).
2. Slide the **SST** over the serrations of the pinion shaft assembly.
3. Slide the oil seal over the **SST** and position it in the housing.



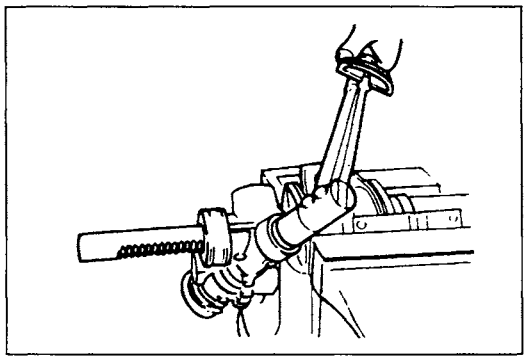
4. Tap the oil seal evenly into the housing by using the **SST** until the snap ring groove is just visible.
5. Install a new snap ring into the ring groove.



Lower bearing locknut

1. Temporarily install the tie rod on the tube side of the rack.
2. Invert the housing and install the locknut on the pinion shaft. Turn it until the tie rod contacts the tube.
3. Tighten the locknut.

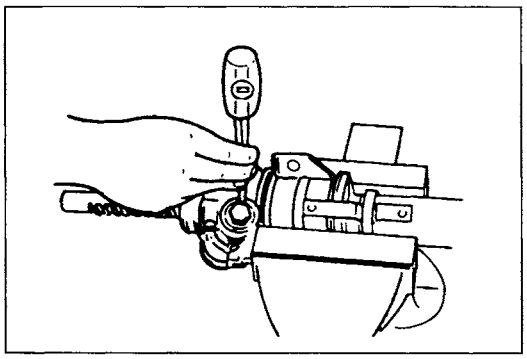
Tightening torque:
40—49 N·m { 4.0—5.0 kgf·m , 29—36 ft·lbf }



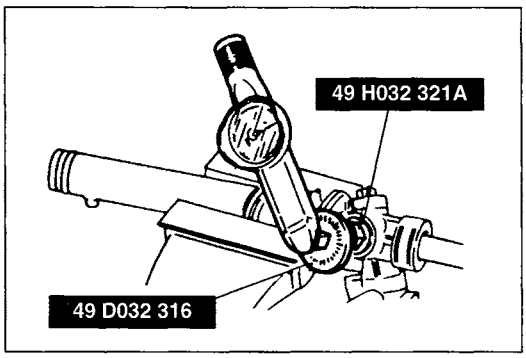
Housing cover

1. Apply thread sealant to the housing cover threads.
2. Install the housing cover.

Tightening torque:
54—68 N·m { 5.5—7.0 kgf·m , 40—50 ft·lbf }

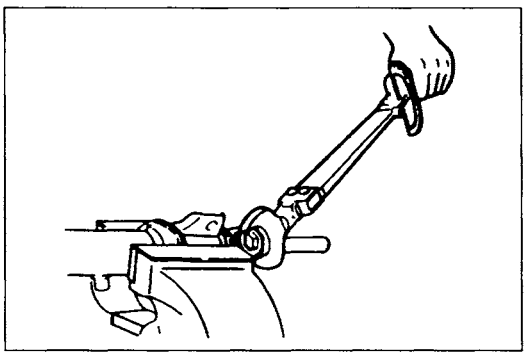


3. Stake between the rack housing and housing cover at two points with a center punch.



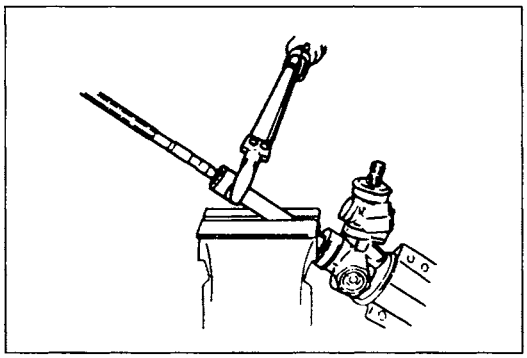
Adjusting cover

1. Set the rack in the center position.
2. Tighten the adjusting cover to **6.9—11.7 N·m { 70—120 kgf·cm , 61—104 in·lbf }**, then loosen it.
3. Tighten again to **5.0—6.3 N·m { 50—65 kgf·cm , 44—56 in·lbf }**, and then return it **35°—45°**.
4. Apply thread sealant to the exposed threads of the adjusting cover.



5. Install and tighten the locknut.

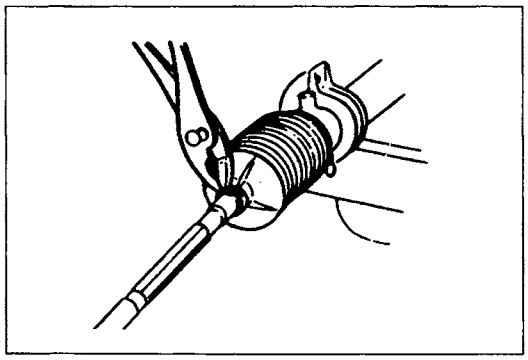
Tightening torque:
50—58 N·m { 5.0—6.0 kgf·m , 37—43 ft·lbf }



Tie rod

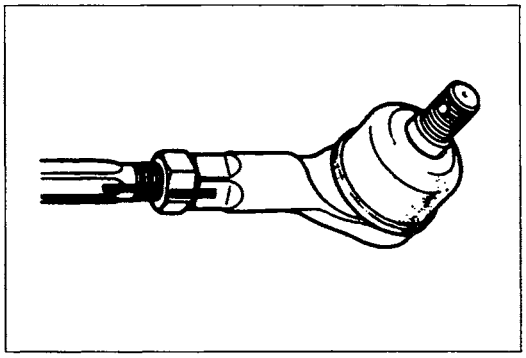
1. Secure the rack in a vise.
2. Install the tie rod onto the rack.

Tightening torque:
118—137 N·m { 12—14 kgf·m , 87—101 ft·lbf }



Boot

1. Apply grease to the inner surface of the small end of the boot.
2. Install the boot. Wrap a new boot wire around the large end of the boot two times and then twist it 4 to 4.5 times. Bend the twisted part toward the mounting bracket.
3. Install the boot clamp on the small end of the boot.



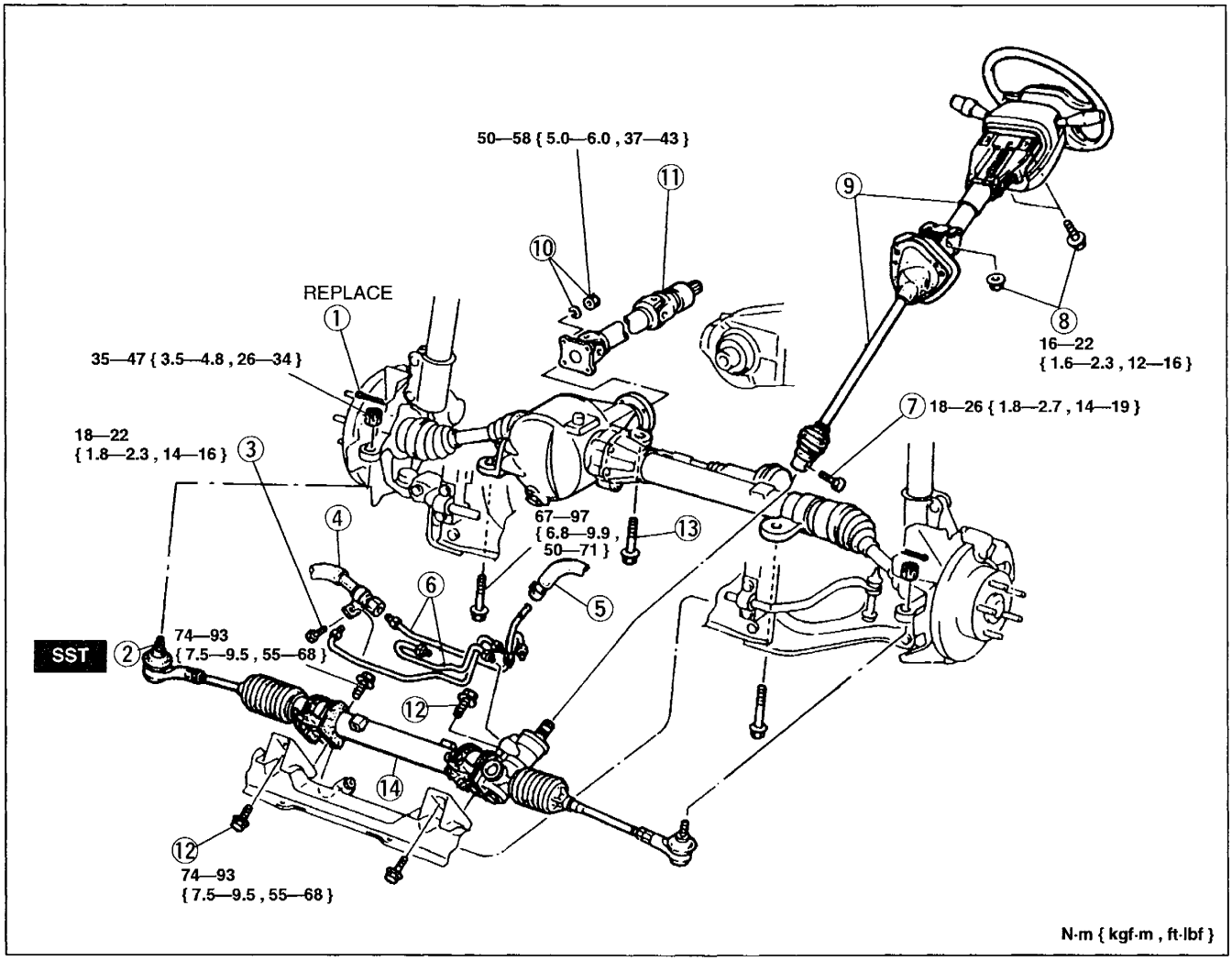
Tie-rod end

Align with the marks made before disassembly, and tighten the nut.

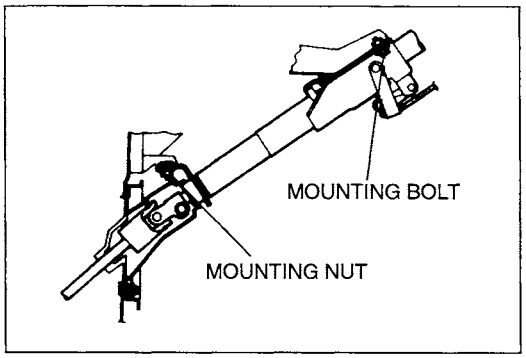
STEERING GEAR AND LINKAGE (4WD)

Removal / Inspection / Installation

1. Loosen the wheel lug nuts.
2. Jack up the front of the vehicle and support it on safety stands.
3. Remove the wheel.
4. Remove the undercover.
5. Remove in the order shown in the figure, referring to **Removal Note**.
6. Install in the reverse order of removal, referring to **Installation Note**.
7. After installation:
   (1) Bleed the air from the system. (Refer to page N–7.)
   (2) Check the power steering fluid level and add fluid if necessary. (Refer to page N–36.)
   (3) Check the system for fluid leakage. (Refer to page N–36.)
   (4) Check the toe-in and adjust it if necessary. (Refer to section R.)
8. Visually inspect all parts and repair or replace as necessary.

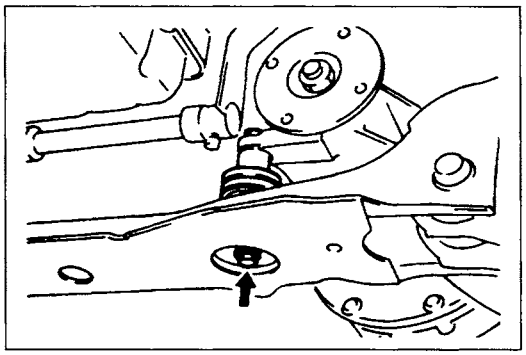


1. Cotter pin
2. Tie-rod end ball joint
   Removal Note ..... page N–11
3. Bolt
4. Pressure hose
5. Return hose
6. Pressure and return pipes
7. Fixing bolt (intermediate shaft/pinion shaft)
8. Bolt and nut
9. Intermediate shaft and steering shaft assembly
   Removal Note ..... page N–31
10. Nut and washer
11. Front propeller shaft
    Service ..... section L
12. Mounting bracket bolt
    Installation Note ..... page N–31
13. Front differential mounting bolt
    Removal Note ..... page N–31
14. Steering gear and linkage
    Removal Note ..... page N–31
    Disassembly / Inspection ..... page N–20
    Assembly ..... page N–23

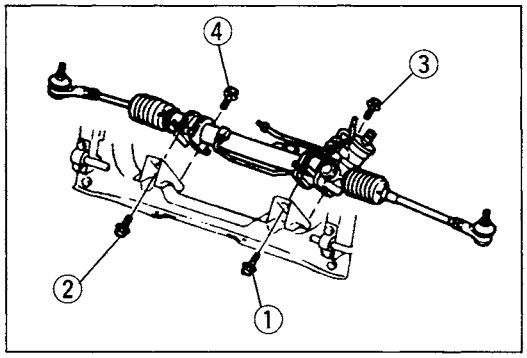


Removal note
Intermediate shaft and steering shaft assembly
1. Remove the lower panel.
2. Remove the column cover.
3. Remove the steering shaft mounting bolts and nuts.
4. Pull the steering shaft and intermediate shaft assembly to separate the intermediate shaft from the pinion shaft.

Front differential mounting bolt
1. Support the differential by using the transmission jack.
2. Remove the front differential mounting bolt.



Steering gear and linkage
1. Remove the pressure pipes and return pipes from the steering gear.
2. Remove the front propeller shaft.
3. Remove the bolts mounting the front differential and joint shaft assembly to the crossmember. Slide them rearward.
4. Slide the steering gear and linkage rearward and turn it **90°**.
5. Remove the steering shaft and linkage to the left.

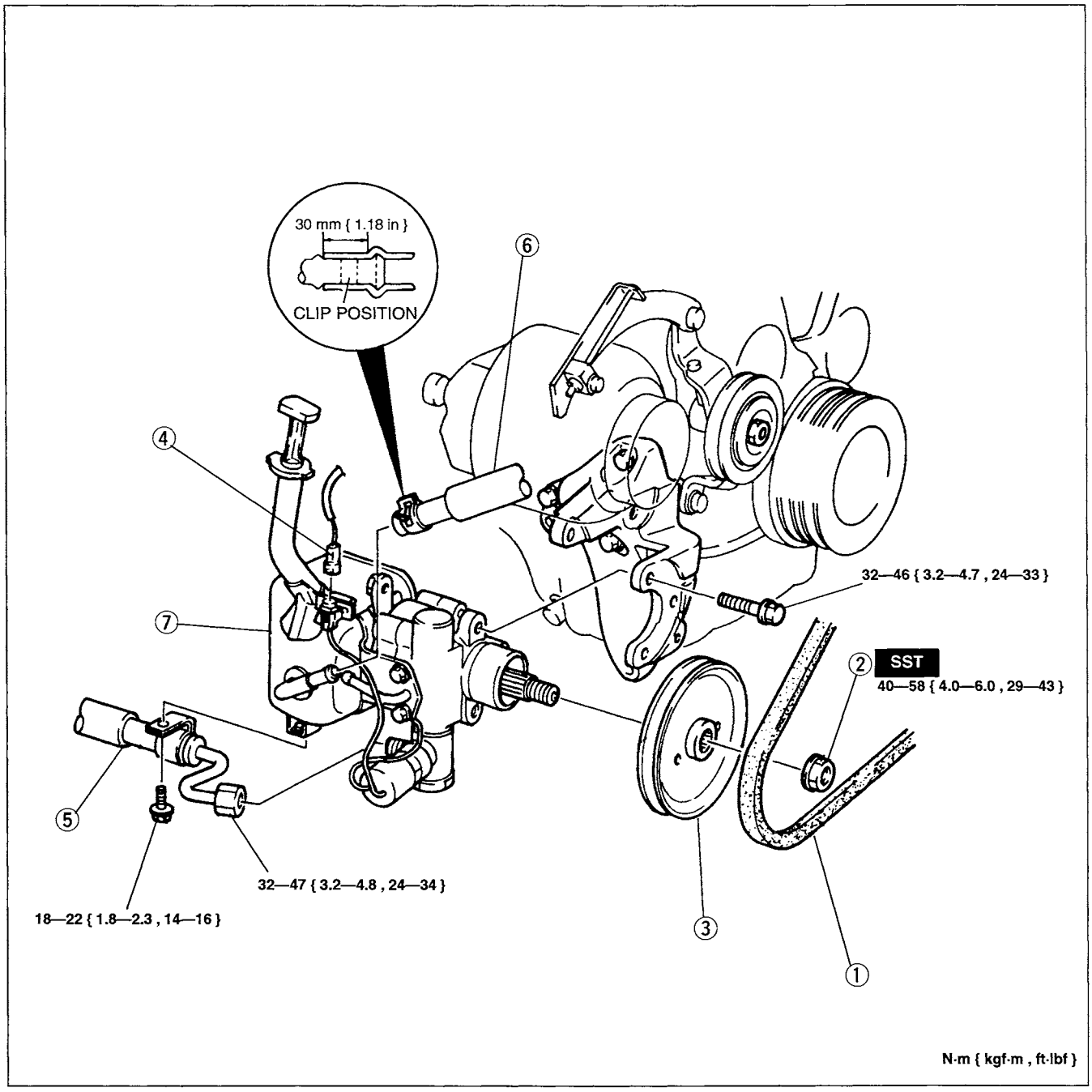


Installation note
Mounting bracket bolts
Tighten the gear housing mounting bracket bolts in the order shown in the figure.

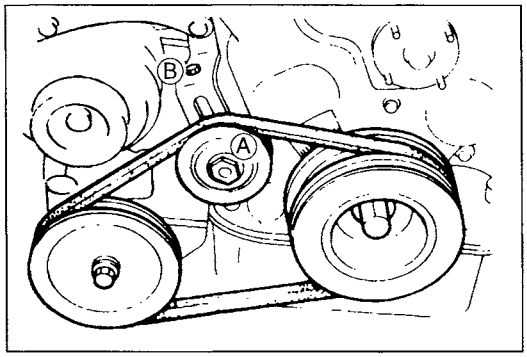
OIL PUMP

Removal / Installation

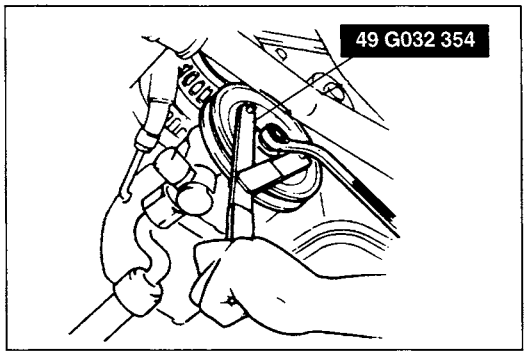
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal.
3. Tighten all necessary bolts and nuts to the specified torque.
4. After installation:
   (1) Check the connections for fluid leakage. (Refer to page N–36.)
   (2) Bleed the air from the system. (Refer to page N–7.)



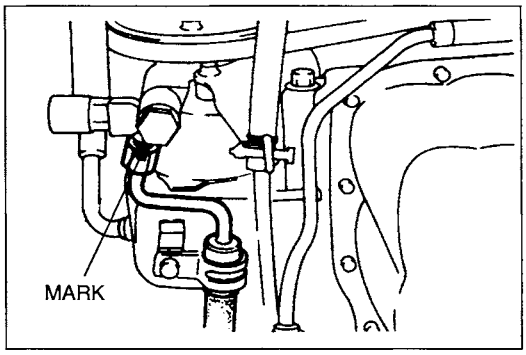
1. Drive belt
   Removal Note ..... page N–33
   Adjustment ..... page N–35
2. Locknut
   Removal Note ..... page N–33
3. Oil pump pulley
4. Power steering pressure switch connector
5. Pressure pipe
   Removal Note ..... page N–33
6. Return hose
7. Oil pump assembly
   Disassembly / Inspection / Assembly ..... page N–34



Removal note
Drive belt
Loosen idler pulley locknut A, then loosen adjusting bolt B to remove the drive belt.



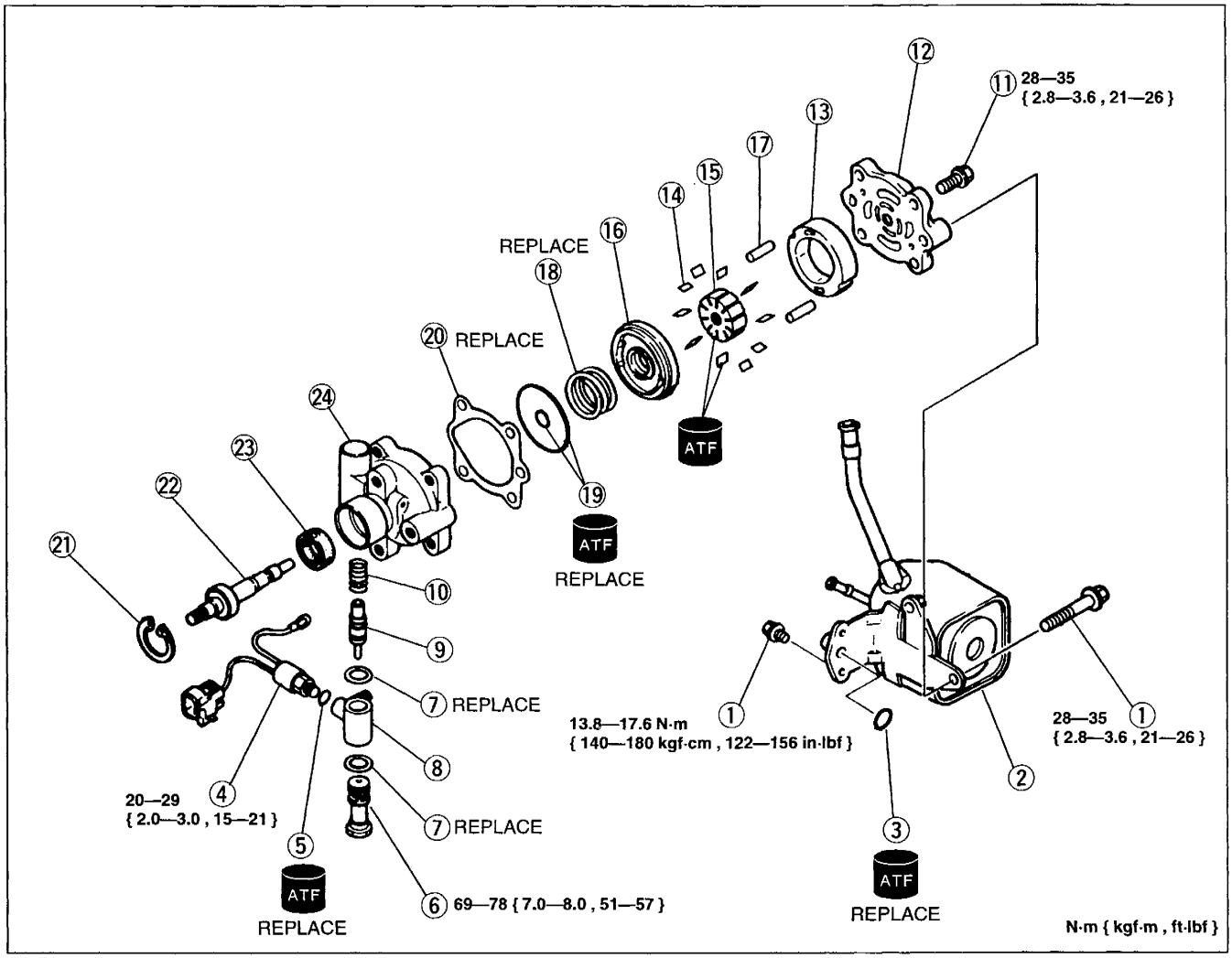
Locknut
Remove the locknut with the pulley held by using the **SST**.



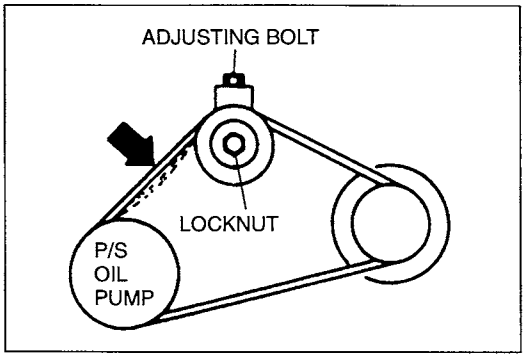
Pressure pipe
Before removing the pressure pipe, make a mark for reference during installation.

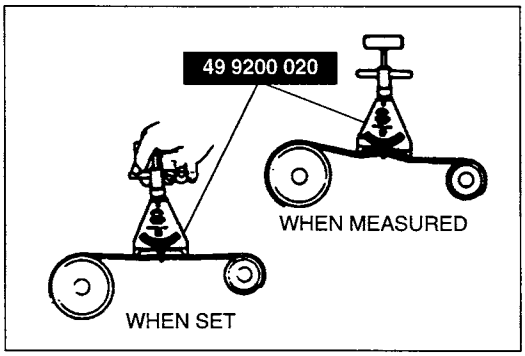
Disassembly / Inspection / Assembly

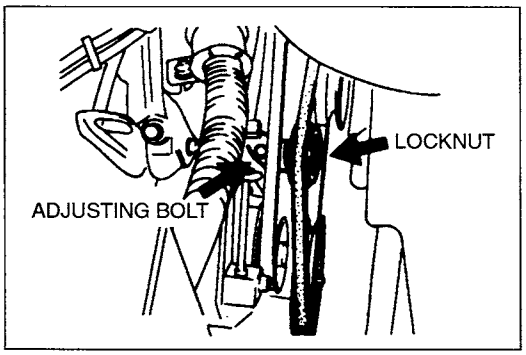
1. Disassemble in the order shown in the figure.
2. The following procedure is for replacement of the O-rings, gasket, and spring only. Replace the pump assembly if other repairs are necessary.
3. Assemble in the reverse order of disassembly.



1. Bolt
2. Reserve tank
   Inspect for damage or cracks
3. O-ring
4. Power steering pressure switch
   Inspection ..... section F
5. O-ring
6. Connector
7. O-ring
8. Joint
9. Control valve assembly
   Inspect for cracks, damage, clogged valve hole, or wear of thrust section
10. Spring
    Inspect for wear
11. Bolt
12. Rear body
    Inspect for damage
13. Cam ring
    Inspect for wear
14. Vane
    Inspect for wear
15. Rotor
    Inspect for wear
16. Side plate
    Inspect for wear
17. Pin
18. Spring
    Inspect for wear
19. O-ring
20. Gasket
21. Snap ring
22. Bearing and shaft assembly
    Inspect for wear of bearing and damage of shaft
23. Oil seal
24. Front body
    Inspect for damage







DRIVE BELT

On-vehicle Inspection

Inspection

1. Check the drive belt for looseness and damage.
2. Check the drive belt deflection (tension) by applying moderate pressure midway between the pulleys.

Deflection (Depressed at 98 N { 10 kgf , 22 lbf })

mm { in }

	New*	Used	Limit
JE engine	7.0—7.5 { 0.28—0.29 }	7.5—8.2 { 0.30—0.32 }	13.5 { 0.53 }

* A belt that has been on a running engine for less than five minutes.

Tension

N { kgf , lbf }

	New*	Used	Limit
JE engine	344—382 { 35—39 , 77—85 }	295—333 { 30—34 , 66—74 }	245 { 25 , 55 }

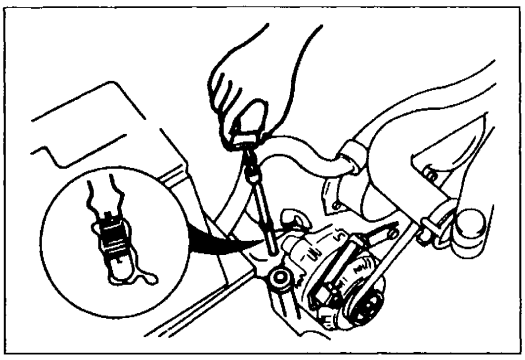
* A belt that has been on a running engine for less than five minutes.

Adjustment

After installation, adjust the deflection (tension) of the drive belt indicated by the arrow as follows:

(1) Loosen the idler pulley locknut.
(2) Adjust the deflection (tension) by turning the adjusting bolt.
(3) Tighten the locknut to the specified torque.

Tightening torque:
38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }



POWER STEERING FLUID

On-vehicle Inspection

Inspection of fluid level

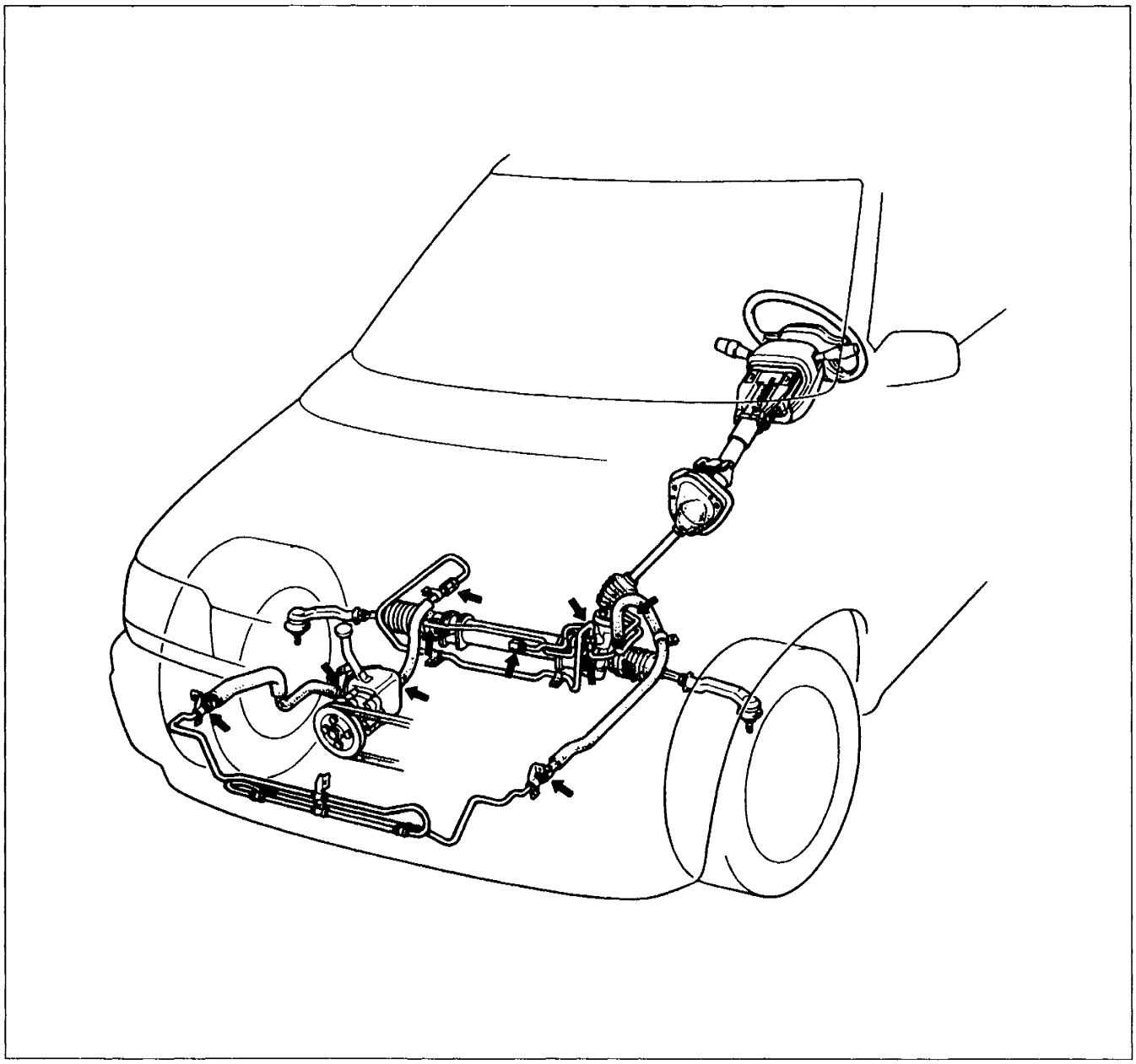
Pull the oil-level gauge from the reservoir filler tube and check the fluid level. The level should be between "H" and "L".

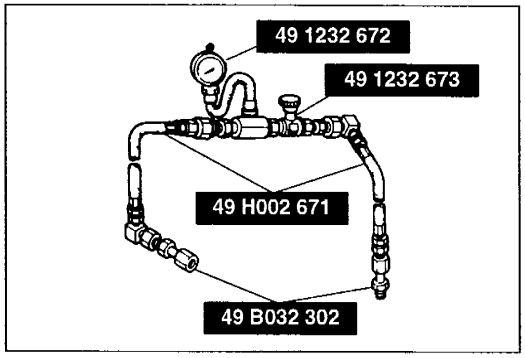
Inspection of fluid leakage

Start the engine and let it idle. Turn the steering wheel fully left and fully right to apply fluid pressure. Inspect the points shown in the figure for fluid leakage.

Caution

- **Never hold the steering wheel to the extreme left or right for more than 5 seconds with the engine running. This could damage the power steering pump.**

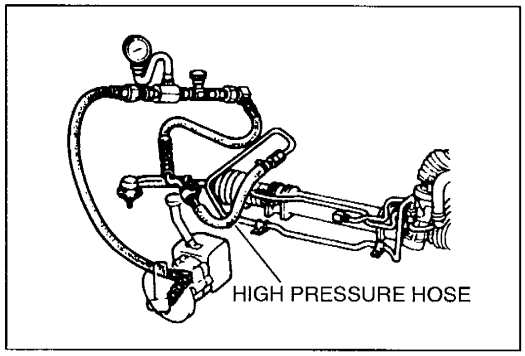




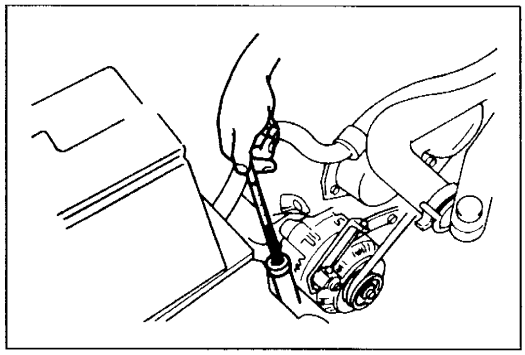
Inspection of fluid pressure

1. Assemble the **SST** as shown in the figure.

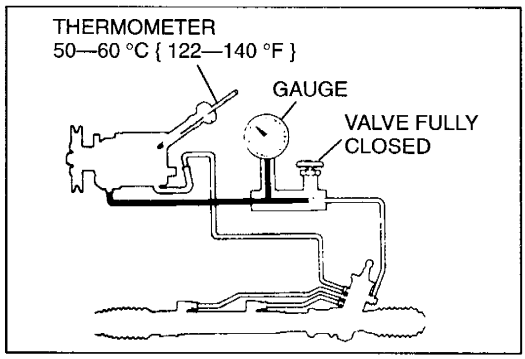
   Tightening torque:
   40—49 N·m { 4.0—5.0 kgf·m , 29—36 ft·lbf }



2. Mark both hose connections to ensure that the pipe is reinstalled in its original position.
3. Disconnect the pressure pipe from the oil pump, and attach the **SST**.
4. Bleed the air from the system. (Refer to page N–7.)



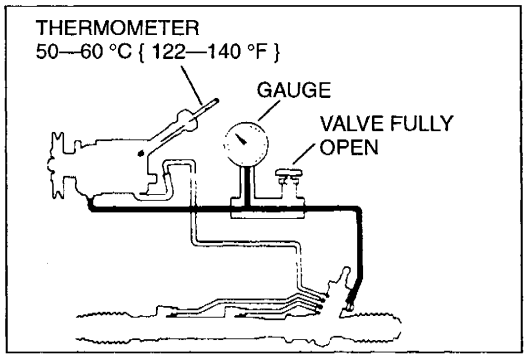
5. Open the gauge valve fully. Start the engine and turn the steering wheel fully left and right to raise the fluid temperature to **50—60 °C { 122—140 °F }**.

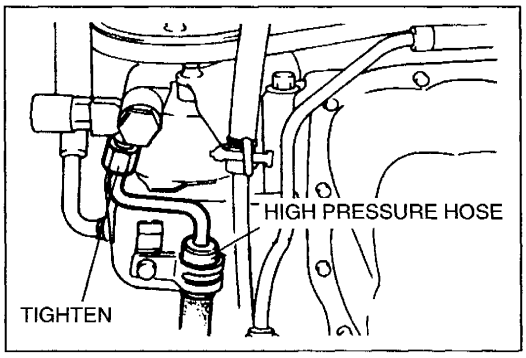


6. Close the gauge valve completely. Increase the engine speed to **1,000—1,500 rpm** and measure the fluid pressure generated by the oil pump. If the pressure is below the specification, replace the oil pump assembly.

   Oil pump fluid pressure: 7,601—8,335 kPa
   { 77.5—85.0 kgf/cm^2 , 1,103—1,208 psi }

   Caution
   - **Do not keep the valve closed for more than 5 seconds. The increase in fluid temperature will damage the oil pump.**





7. Open the gauge valve fully again and increase the engine speed to **1,000—1,500 rpm**.
8. Turn the steering wheel fully to the left and right and measure the fluid pressure generated by the gear housing. If the pressure is below the specification, replace the gear housing assembly.

   Gear housing fluid pressure: 7,601—8,335 kPa { 77.5—85.0 kgf/cm^2 , 1,103—1,208 psi }

   Caution
   - **Never hold the steering wheel to the extreme left or right for more than 5 seconds with the engine running. This could damage the power steering pump.**

9. Remove the gauge set. Install and tighten the high-pressure hose to the specified torque.

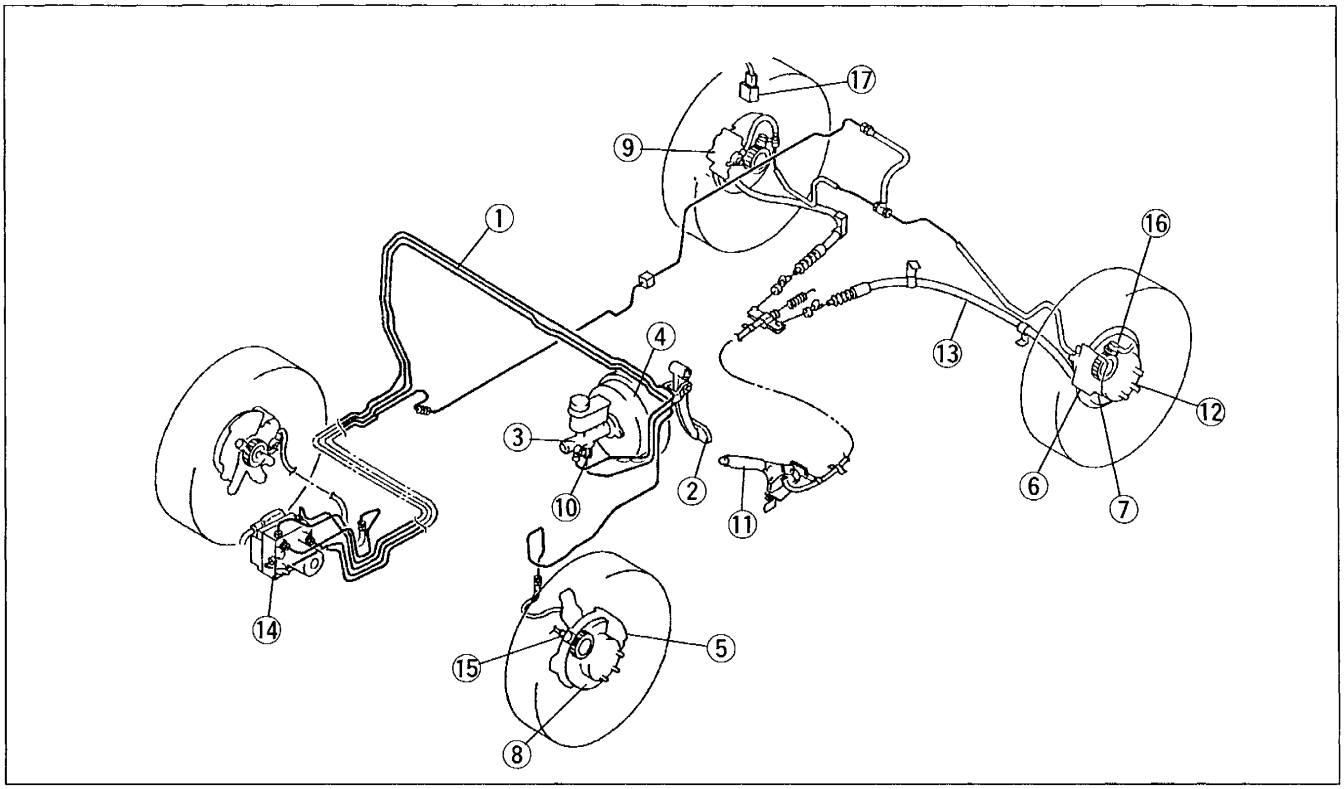
   Tightening torque:
   32—47 N·m { 3.2—4.8 kgf·m , 24—34 ft·lbf }

10. Bleed the air from the system. (Refer to page N–7.)

Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

BRAKING SYSTEM

INDEX



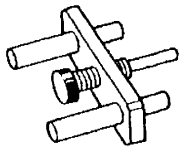
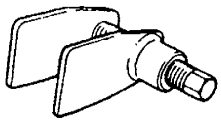
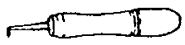
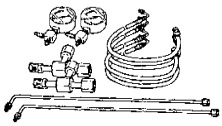
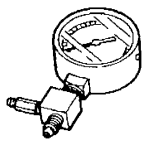
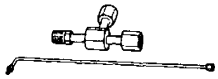
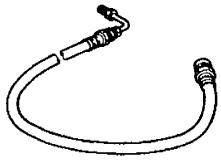
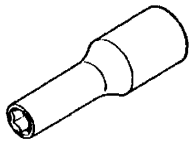
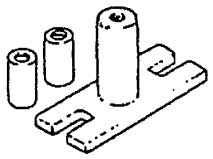
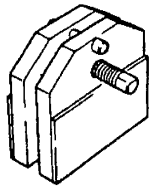
OUTLINE

SPECIFICATIONS

Item		Specification
Brake pedal	Type	Suspended
	Pedal lever ratio	4.01 : 1
	Maximum stroke mm { in }	130 { 5.12 }
Master cylinder	Type	Tandem (with level sensor)
	Cylinder inner diameter mm { in }	23.81 { 0.94 }
Front disc brake	Type	Ventilated disc
	Cylinder bore mm { in }	42.8 { 1.69 } × 2
	Pad dimensions (area × thickness) $mm^2 \times mm$ { $in^2 \times in$ }	6,000 × 10.5 { 9.30 × 0.41 }
	Disc plate dimensions mm { in } (outer diameter × thickness)	276 × 28 { 10.87 × 1.10 }
Rear disc brake	Type	Ventilated disc
	Cylinder bore	41.3 { 1.63 }
	Pad dimensions (area × thickness) $mm^2 \times mm$ { $in^2 \times in$ }	3,300 × 10 { 5.11 × 0.40 }
	Disc plate dimensions mm { in } (outer diameter × thickness)	286 × 18 { 11.3 × 0.71 }
Power brake unit	Type	Tandem diaphragm
	Size in	8 + 9
Rear wheel hydraulic control system	Type	Proportioning bypass valve
	Switching point (master cylinder pressure) kPa { kgf/cm^2 , psi }	2,940 { 30.0 , 427 }
Brake fluid		FMVSS116 DOT-3
Parking drum brake	Type	Mechanical, two rear wheel control
	Operation system	Center lever
	Drum brake type	Duo servo
	Lining dimensions (width × thickness) mm { in }	30 { 1.18 } × 3.1 { 0.12 }
	Drum inner diameter mm { in }	190 { 7.48 }

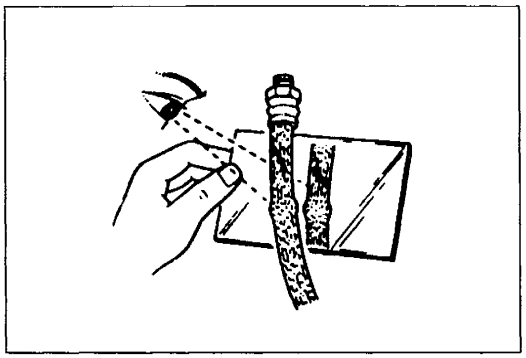
CONVENTIONAL BRAKE SYSTEM

PREPARATION
SST

49 0259 770B Wrench, flare nut 	For removal and installation of brake pipe	49 F043 001 Adjust gauge 	For adjustment of push rod clearance
49 0221 600C Expand tool, disc brake 	For installation of brake caliper	49 0208 701A Air out tool, boot 	For removal of piston seal
49 U043 0A0 Gauge set, oil pressure 	For inspection of brake fluid pressure	49 U043 004 Gauge, oil pressure (Part of 49 U043 0A0) 	For inspection of brake fluid pressure
49 U043 005 Joint (Part of 49 U043 0A0) 	For inspection of brake fluid pressure	49 U043 006 Hose (Part of 49 U043 0A0) 	For inspection of brake fluid pressure
49 B043 004 Socket wrench 	For adjustment of push rod clearance	49 E043 003A Lock tool, turning 	For adjustment of push rod clearance
49 T033 001A Stopper, disc brake piston 	For removal of piston	—	—

TROUBLESHOOTING GUIDE

Problem	Possible cause	Remedy	Page
Poor braking	Leakage of brake fluid	Repair	—
	Air in system	Air bleed	P–6
	Worn disc pad	Replace	P–16, 22
	Brake fluid, grease, oil, or water on disc pad	Clean or replace	P–16, 22
	Hardening of disc pad surface or poor contact	Grind or replace	P–16, 22
	Malfunction of disc brake piston	Replace	P–18, 24
	Malfunction of master cylinder	Repair or replace	P–9, 11
	Malfunction of power brake unit	Repair or replace	P–15
	Malfunction of check valve (vacuum hose)	Repair or replace	P–15
	Damaged vacuum hose	Replace	P–15
	Deterioration of flexible hose	Replace	—
	Malfunction of PBV	Replace	P–26
Brakes pull to one side	Worn disc pad	Replace	P–16, 22
	Brake fluid, grease, oil, or water on disc pad	Clean or replace	P–16, 22
	Hardening of disc pad surface or poor contact	Grind or replace	P–16, 22
	Abnormal wear, distortion, or runout of disc plate	Repair or replace	P–16, 22
	Malfunction of automatic adjuster	Repair or replace	—
	Looseness of backing plate mounting bolts	Tighten	P–22
	Malfunction of caliper piston	Repair or replace	P–16, 22
	Improperly adjusted wheel alignment	Adjust	section R
	Unequal tire air pressures	Repair or replace	section Q
Brakes do not release	No brake pedal play	Adjust	P–7
	Improperly adjusted push rod clearance	Adjust	P–10
	Clogged master cylinder return port	Clean	—
	Brake pad not returning properly	Repair	—
	Improper return or malfunction of caliper piston	Replace	P–18, 24
	Improper adjustment of wheel bearing preload	Adjustment or replace	section M
	Excessive runout of disc plate	Replace	P–17, 21
Pedal goes too far (too much pedal stroke)	Air in system because of insufficient brake fluid	Add fluid and bleed air	P–6
	Improperly adjusted pedal play	Adjust	P–7
	Worn disc pad	Replace	P–16, 22
	Air in system	Air bleed	P–6
Abnormal noise or vibration during braking	Worn disc pad	Replace	P–16, 22
	Deteriorated disc pad	Grind or replace	P–16, 22
	Brakes do not release	Repair	—
	Foreign material or scratches on disc plate contact surface	Clean	—
	Looseness of backing plate or caliper mounting bolts	Tighten	P–17, 21
	Damaged disc plate contact surface	Replace	P–17, 21
	Poor contact of disc pad	Repair or replace	P–17, 22
	Insufficient grease on sliding parts	Apply grease	—

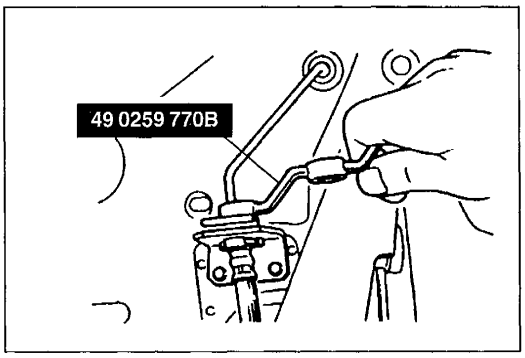


BRAKE HYDRAULIC LINE

On-vehicle Inspection

Check for the following and replace parts as necessary.

1. Cracking, damage, or corrosion of brake hose
2. Damage to brake hose threads
3. Scars, cracks, or swelling of flexible hose
4. All lines for fluid leakage

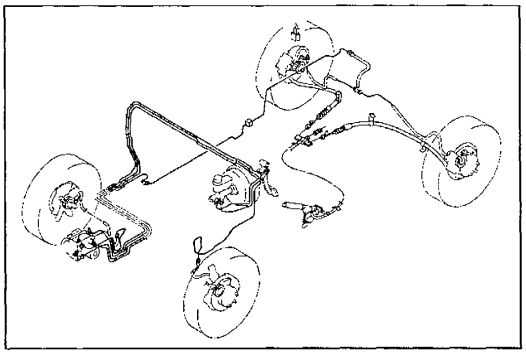


Removal / Installation

1. Loosen or tighten the flare nut by using the **SST**.

   Flare nut tightening torque:
   12.8—21.5 N·m { 130—220 kgf·cm , 113—190 in·lbf }

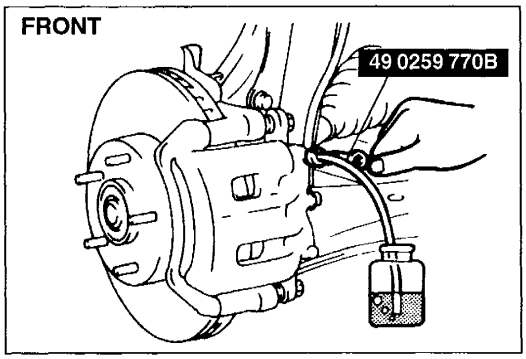
2. When connecting the flexible hose, do not overtighten or twist it.
3. After installation:
   (1) Check that the hose does not contact other parts when the vehicle bounces or when the steering wheel is turned fully right or left.
   (2) Bleed the air from the brake system.



Air Bleeding

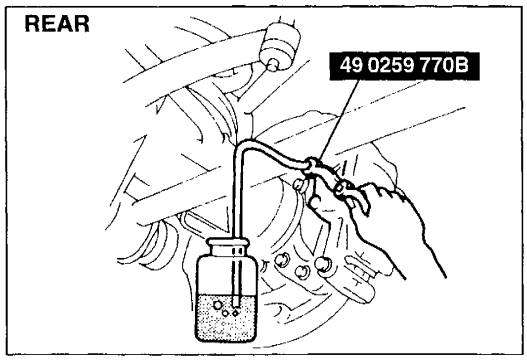
Note

- The brakes should be bled whenever a brake line is disconnected. If a hydraulic line is disconnected at the master cylinder, start at the master cylinder (Refer to page P–10.), and then the slave cylinder farthest from the brake master cylinder, and move to the next farthest slave cylinder until all four cylinders have been bled. If the disconnection point is anywhere except the master cylinder, start at the point closest to the disconnection, and move to the next closest slave cylinder until all four cylinders have been bled.

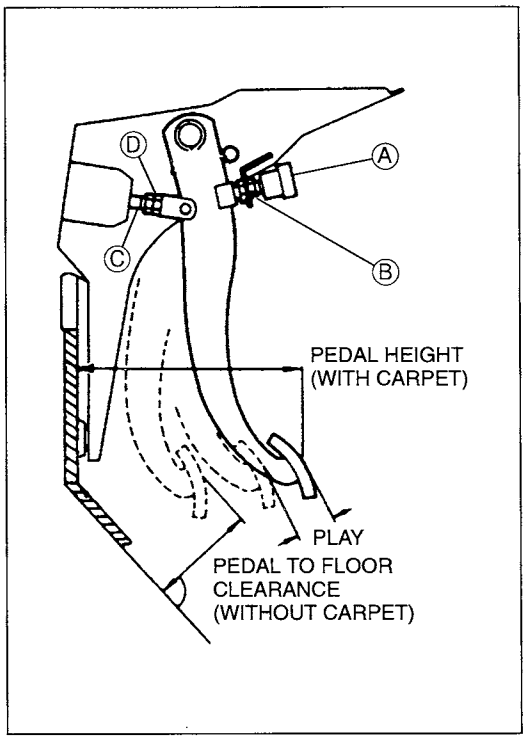


1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Remove the bleeder cap and attach a vinyl tube to the bleeder screw.
3. Place the other end of the venyl tube in a clear fluid-filled container.
4. One person should depress the brake pedal a few times, and then hold it in the depressed position.
5. A second person should loosen the bleeder screw, drain out the fluid, and close the screw by using the **SST**.
6. Repeat step 4 and 5 until no air bubbles are seen. The reservoir should be kept about 3/4 full during bleeding to prevent air from reentering the lines.

   Tightening torque:
   5.9—8.8 N·m { 60—90 kgf·cm , 53—78 in·lbf }



7. Check for correct brake operation.
8. Verify that there is no fluid leakage. Wipe off any spilled fluid immediately.
9. After bleeding the brakes, add brake fluid to MAX.



BRAKE PEDAL

On-vehicle Inspection

Pedal height

Inspection

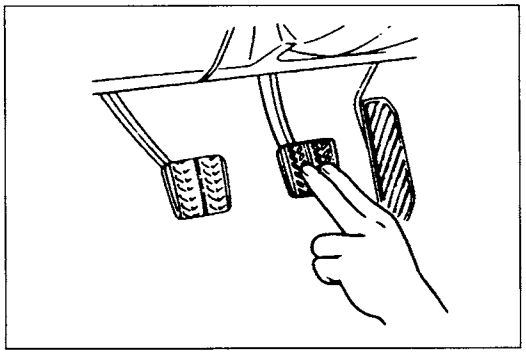
Check that the distance from the center of the upper surface of the pedal pad to the carpet is as specified.

Pedal height:
191—201 mm { 7.52—7.91 in } (With carpet)

Adjustment

1. Disconnect the brake switch connector.
2. Loosen locknut B and turn switch A until it does not contact the pedal.
3. Loosen locknut D and turn rod C to adjust the height.
4. Adjust the pedal free play and tighten locknut D.
5. Turn the brake switch until it contacts the pedal, then turn an additional 1/2 turn. Tighten locknut B.

Locknut B tightening torque:
13.8—17.6 N·m { 140—180 kgf·cm , 122—156 in·lbf }
Locknut D tightening torque:
24—34 N·m { 2.4—3.5 kgf·m , 18—25 ft·lbf }

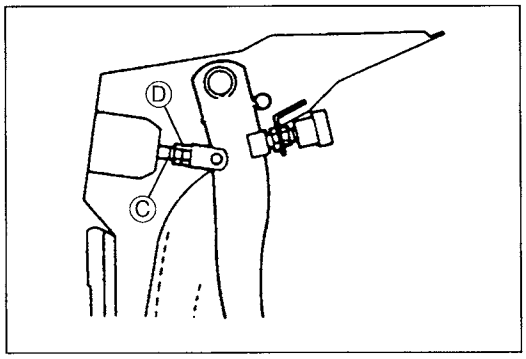


Pedal play

Inspection

1. Depress the pedal a few times to eliminate the vacuum in the system.
2. Gently depress the pedal again by hand and check the free play (until the valve plunger contacts the stopper plate = until the power piston begins to move).

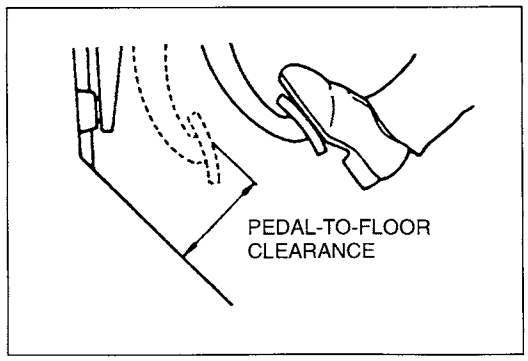
Pedal play: 4—7 mm { 0.16—0.27 in }



Adjustment

Loosen locknut D of operating rod C, then turn the rod to adjust the free play.

Locknut D tightening torque:
24—34 N·m { 2.4—3.5 kgf·m , 18—25 ft·lbf }



Pedal-to-floor clearance

Inspection

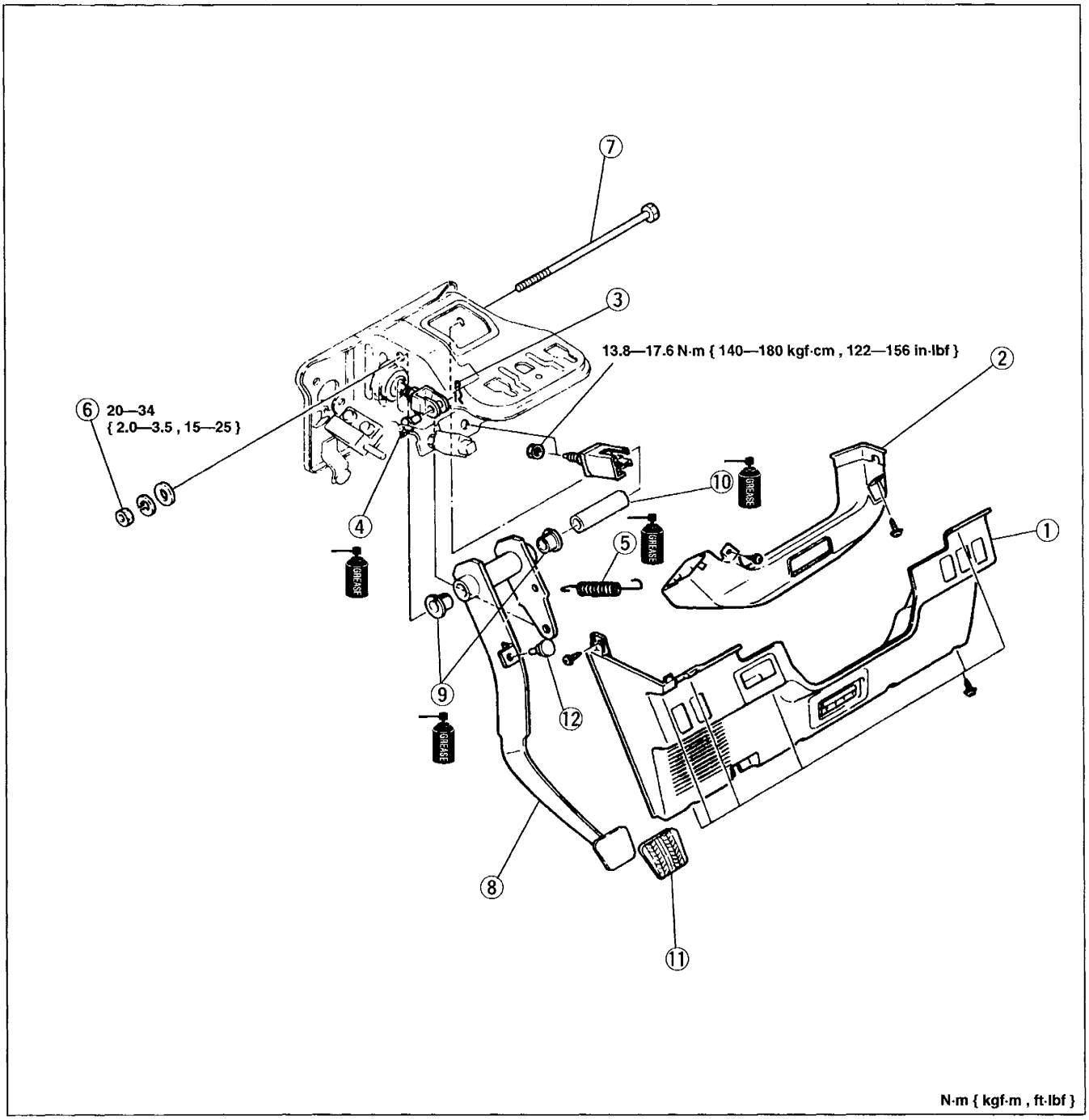
Check that the distance from the floor panel to the center of the upper surface of the pedal pad is as specified when the pedal is depressed with a force of **589 N { 60 kgf , 132 lbf }**.

Pedal-to-floor clearance:
85 mm { 3.3 in } min. (Without carpet)

If the distance is less than specified, check for the following problems:
1. Air in brake system
2. Worn pads

Removal / Installation / Inspection

1. Remove in the order shown in the figure.
2. Inspect all components and parts. Replace parts if necessary.
3. Install in the reverse order of removal.
4. After installation, check and adjust the pedal height and free play if necessary.



1. Lower panel
2. Duct No.3
3. Snap pin
4. Clevis pin
5. Return spring
   Inspect for weakness or damage
6. Nut
7. Bolt
   Inspect for bending
8. Brake pedal
   Inspect for bending
9. Bushing
   Inspect for wear
10. Guide pipe
11. Pedal pad
    Inspect for wear or damage
12. Stop rubber
    Inspect for wear or damage

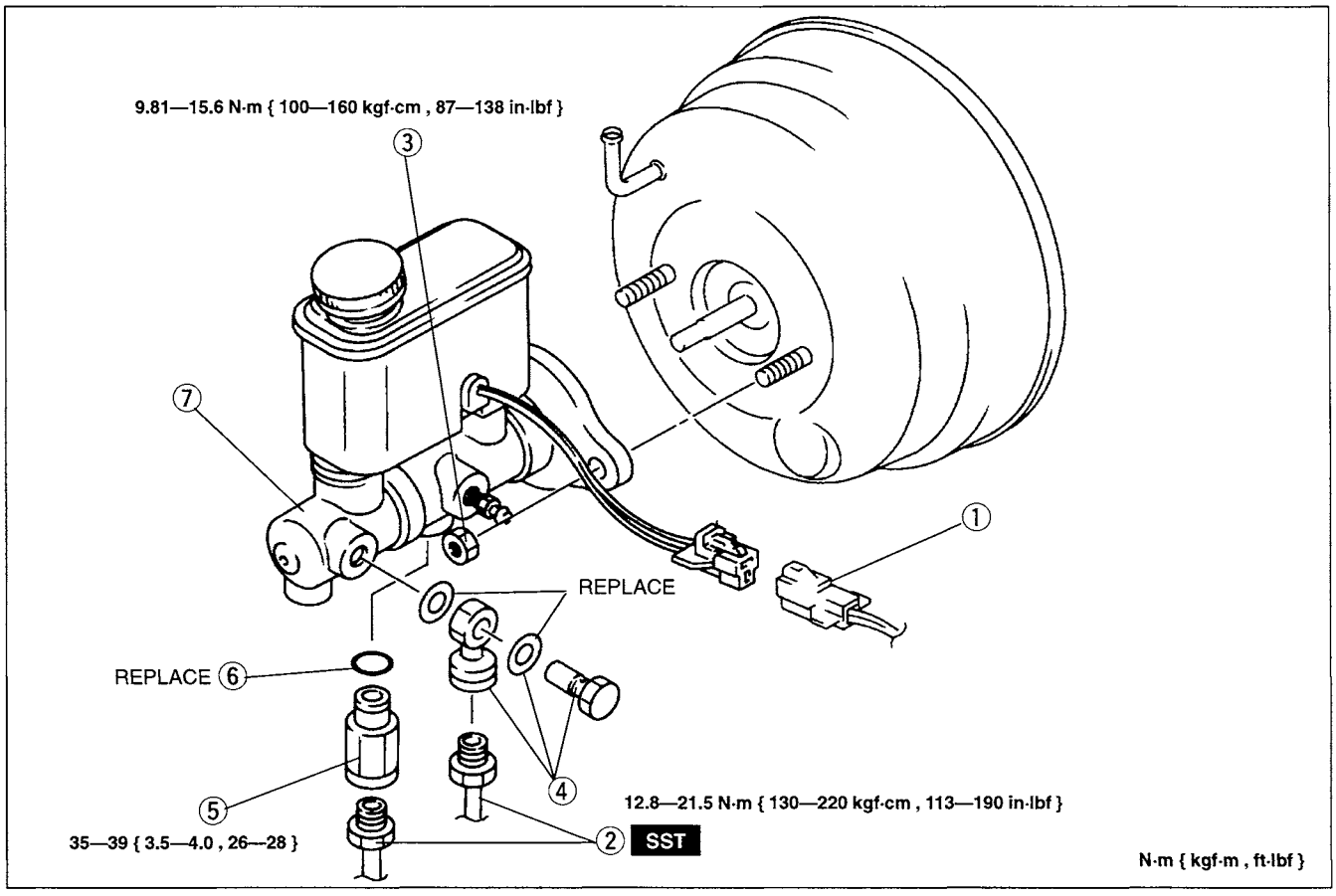
MASTER CYLINDER

Removal / Installation

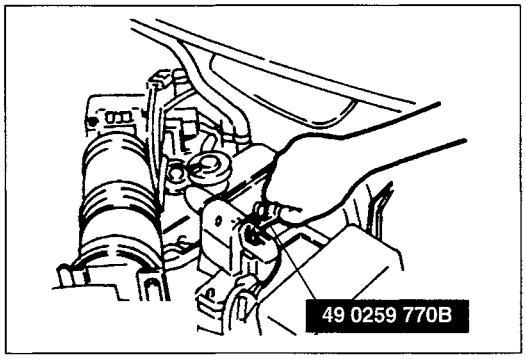
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.
3. After installation, add brake fluid, bleed the air, and check for fluid leakage.

Caution

- **Brake fluid will damage painted surfaces. If brake fluid does get on a painted surface, wipe it off immediately.**



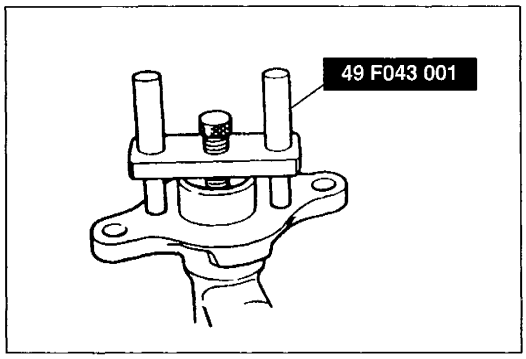
1. Fluid level sensor connector
2. Brake pipe
   Removal / Installation Note ..... below
3. Nut
4. Connector, bolt, and washers
5. Proportioning bypass valve (PBV)
   Inspection ..... page P–26
   Replace ..... page P–26
6. O-ring
7. Master cylinder
   Installation Note ..... page P–10
   Disassembly / Assembly / Inspection ..... page P–11



Removal / Installation note

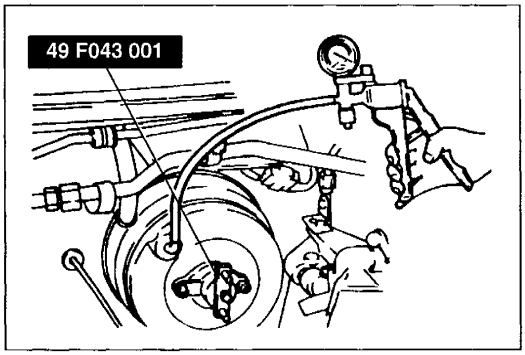
Brake pipe

Disconnect/connect the brake pipes from the master cylinder by using the **SST**.

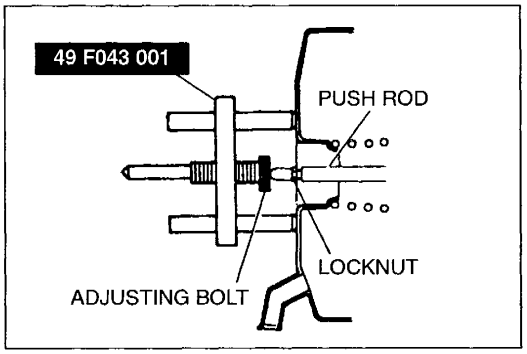


Installation note
Master cylinder
Push rod clearance
Check the clearance between the push rod of the power brake unit and the piston of the master cylinder.

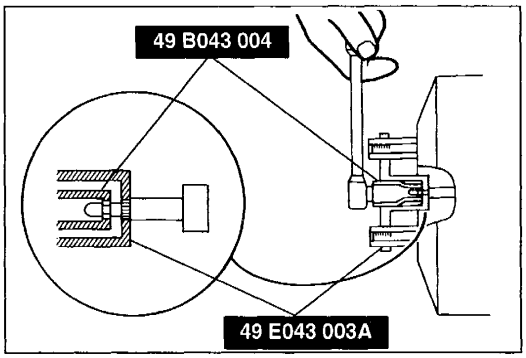
1. Place the **SST** atop the master cylinder. Turn the adjusting bolt until it contacts the bottom of the push rod hole in the piston.



2. Apply **66.7 kPa { 500 mmHg , 19.7 inHg }** vacuum to the power brake unit by using a vacuum pump.
3. Invert the **SST** used in step 1, and place it on the power brake unit.



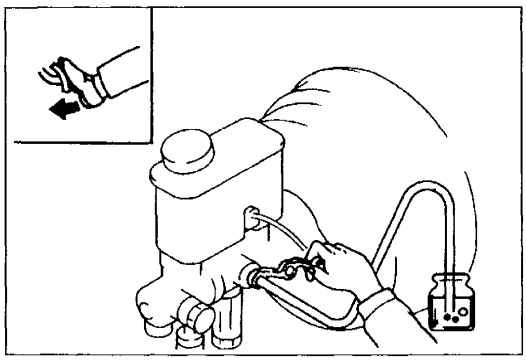
4. Check the clearance between the end of the adjusting bolt and the push rod of the power brake unit.



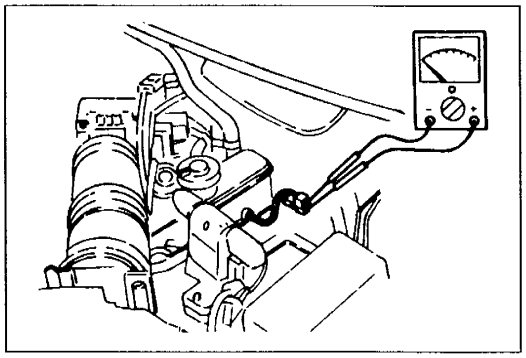
5. If it is not **0 mm { 0 in }** , loosen the push rod locknut and turn the push rod to make the adjustment by using the **SST**.

Note
- This adjustment produces the following clearance.

	Push rod-to-piston clearance
When vacuum applied to unit is approx. 66.7 kPa { 500 mmHg , 19.7 inHg }	0.1—0.4 mm { 0.004—0.015 in }



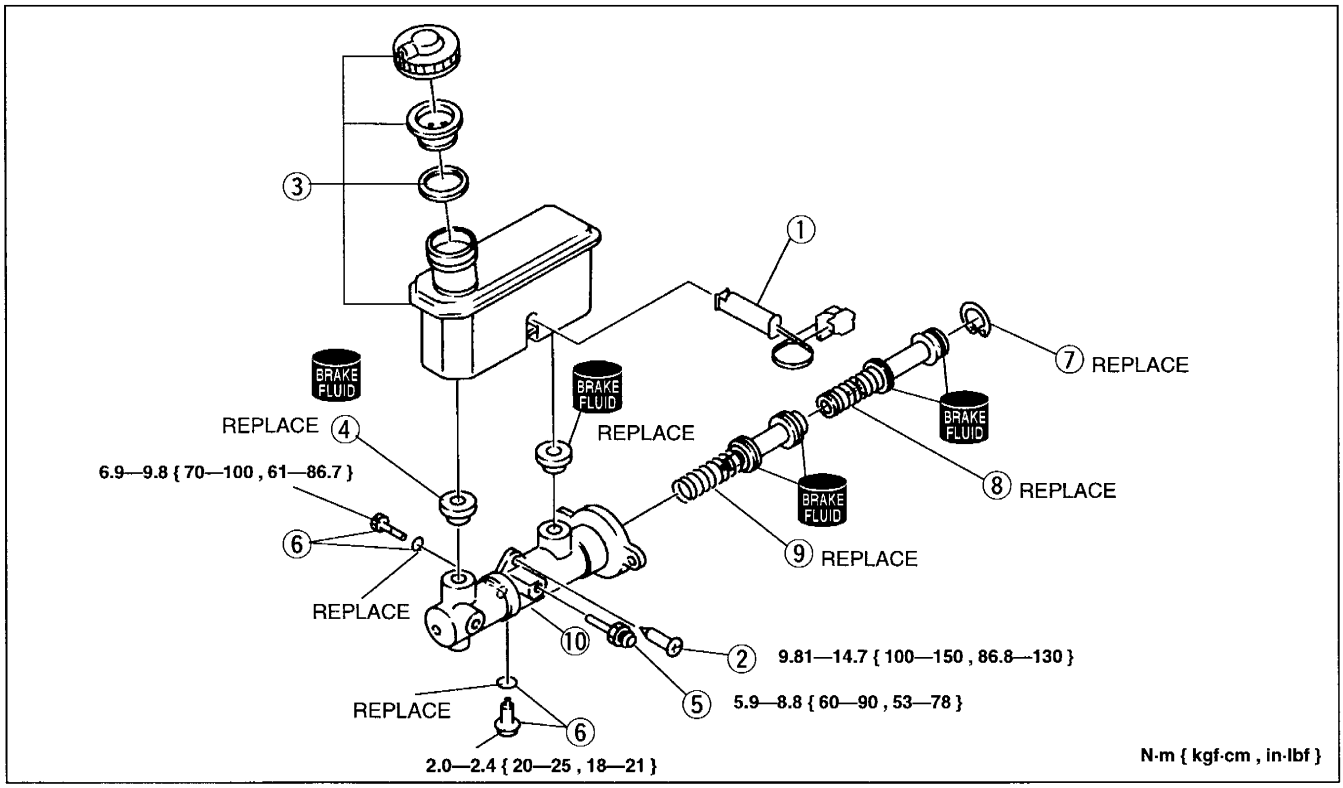
Air bleeding
When removing the master cylinder bleed the air from the area shown, then bleed the air from the wheel side. (Refer to page P–6.)



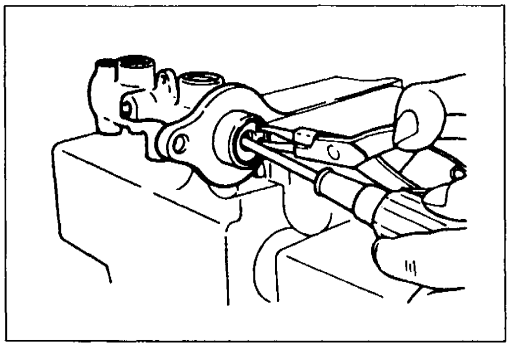
Inspection
Fluid level sensor
1. Disconnect the sensor connector.
2. Connect an ohmmeter to the connector.
3. Starting with the fluid level above the MIN mark on the reservoir, verify that there is no continuity.
4. Remove the brake fluid and verify continuity when the level is below the MIN mark.
5. Replace the sensor if necessary.

Disassembly / Assembly / Inspection
1. After removing the brake fluid, disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all components and parts.
3. Assemble in the reverse order of removal, referring to **Assembly Note**.

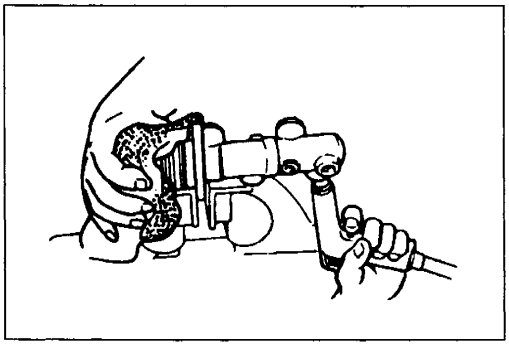
Caution
- **The brake master cylinder is made of aluminum, and can be easily damaged by tightening in a vise. When securing the master cylinder in a vise, tighten only the master cylinder flange.**
- **If the master cylinder body is damaged, replace the unit as an assembly.**
- **Since the proportioning bypass valve is easily damaged, remove it before disassembling the master cylinder.**



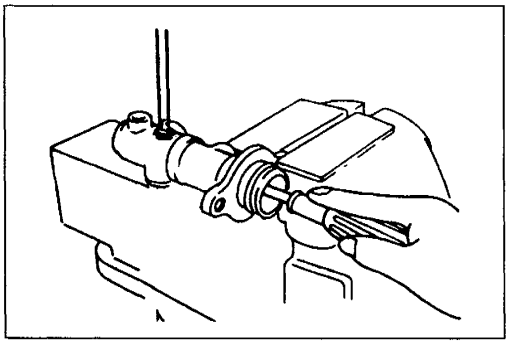
1. Fluid level sensor
   Inspection ..... above
2. Screw
3. Reservoir tank assembly
   Inspect for abnormal wear, rust, or damage
4. Bushings
5. Bleeder valve
6. Stopper screw and O-ring (non-ABS model)
   Assembly Note ..... page P–12
   Stop pin and O-ring (ABS model)
   Assembly Note ..... page P–12
7. Snap ring
   Disassembly Note ..... page P–12
8. Primary piston assembly
9. Secondary piston assembly
   Disassembly Note ..... page P–12
10. Master cylinder body
    Inspect for abnormal wear, rust, or damage



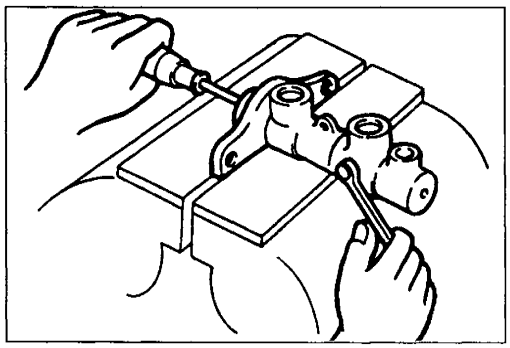
Disassembly note
Snap ring
Push the piston in to remove or install the snap ring by using snap-ring pliers.



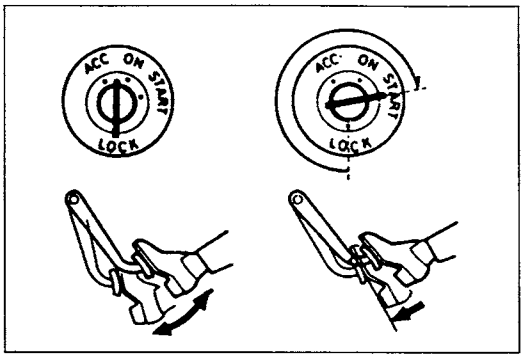
Secondary piston assembly
Remove the secondary piston assembly by gradually blowing compressed air into the cylinder.



Assembly note
Stopper screw and O-ring (non-ABS model)
1. Push the secondary piston assembly in fully.
2. Install and tighten the new O-ring and stopper screw.
3. Push and release the piston to verify that it is held by the stopper screw.



Stop pin and O-ring (ABS model)
1. Install the secondary piston assembly with the piston hole facing the stop pin.
2. Install and tighten a new O-ring and stop pin.
3. Push and release the piston to verify that it is held by the stop pin.



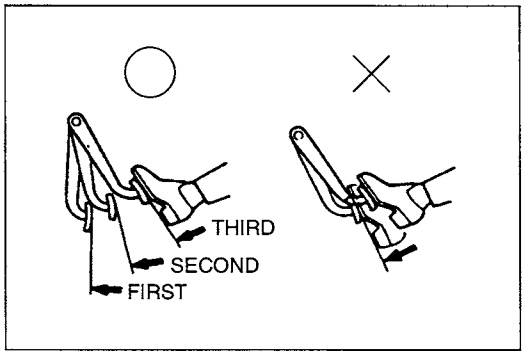
POWER BRAKE UNIT

On-vehicle Inspection

Power brake unit function check (Simple method)

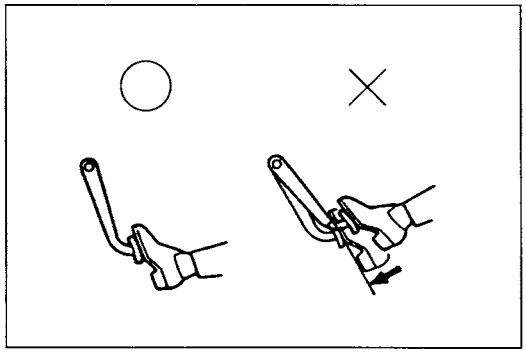
Step 1

1. With the engine stopped, depress the pedal a few times.
2. With the pedal depressed, start the engine.
3. If the pedal moves down slightly immediately after the engine starts, the unit is operating.



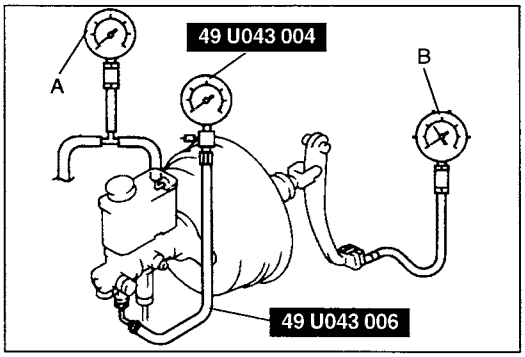
Step 2

1. Start the engine.
2. Stop the engine after it has run for **1 or 2 minutes**.
3. Depress the pedal with the usual force.
4. If the first pedal stroke is long and becomes shorter with subsequent strokes, the unit is operating.
5. If a problem is found, inspect for damage of the check valve or vacuum hose, and examine the installation. Repair if necessary, and inspect it once again.



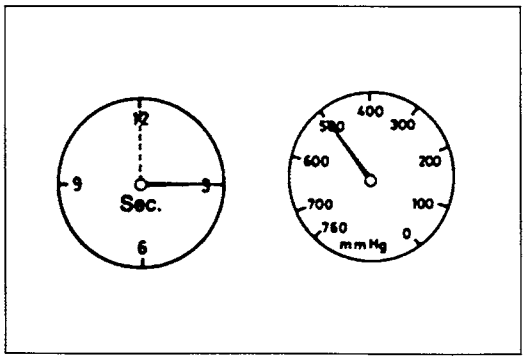
Step 3

1. Start the engine.
2. Depress the pedal with the usual force.
3. Stop the engine with the pedal held depressed.
4. Hold the pedal down for **about 30 seconds**.
5. If the pedal height does not change, the unit is operating.
6. If there is a problem, check for damage to the check valve or vacuum hose, and check the connection. Repair if necessary, and check once again.
   If the nature of the problem is still not clear after following the 3 steps above, follow the more detailed check described in "Inspection using testers," below.



(Inspection using the testers)

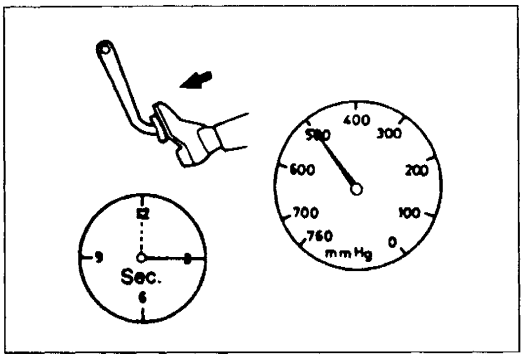
1. Connect the **SST** or equivalent, vacuum gauge(A), and pedal depression force gauge(B) as shown in the figure.
2. After bleeding the air from the **SST**, conduct the test as described in the steps below.



a) Checking for vacuum loss

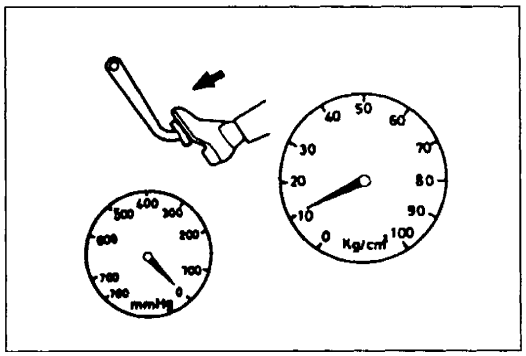
Unloaded condition

1. Start the engine.
2. Stop the engine when the vacuum gauge reading reaches **66.7 kPa { 500 mmHg , 19.7 inHg }**.
3. Observe the vacuum gauge for **15 seconds**. If the gauge shows **63.3—66.7 kPa { 475—500 mmHg , 18.7—19.7 inHg }**, the unit is operating.



Loaded condition

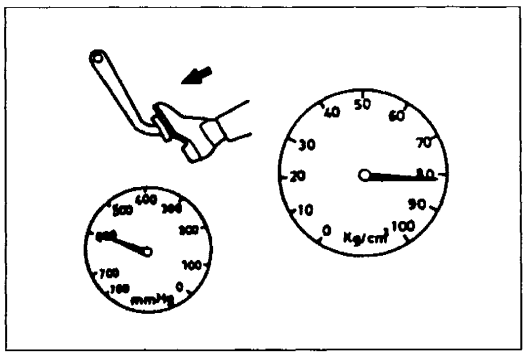
1. Start the engine.
2. Depress the brake pedal with a force of **196 N { 20 kgf , 44 lbf }**.
3. With the brake pedal depressed, stop the engine when the vacuum gauge reading reaches **66.7 kPa { 500 mmHg , 19.7 inHg }**.
4. Observe the vacuum gauge for **15 seconds**. If the gauge shows **63.3—66.7 kPa { 475—500 mmHg , 18.7—19.7 inHg }**, the unit is operating.



b) Checking for hydraulic pressure

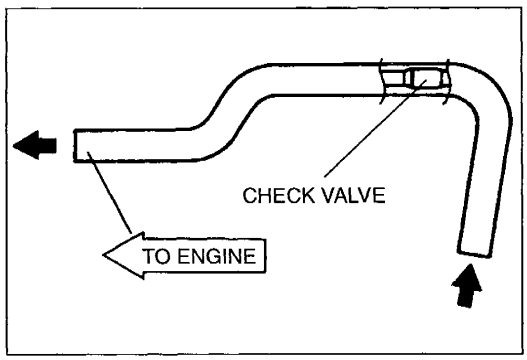
1. If with the engine stopped (vacuum **0 kPa { 0 mmHg , 0 inHg }**) the fluid pressure is within the specification, the unit is operating.

Pedal force	Fluid pressure
196 N { 20 kgf , 44 lbf }	1,128 kPa { 11.5 kgf/cm^2 , 164 psi } min



2. Start the engine. Depress the brake pedal when the vacuum reaches **66.7 kPa { 500 mmHg , 19.7 inHg }**. If the fluid pressure is within the specification, the unit is operating.

Pedal force	Fluid pressure
196 N { 20 kgf , 44 lbf }	8,044 kPa { 82 kgf/cm^2 , 1,166 psi } min



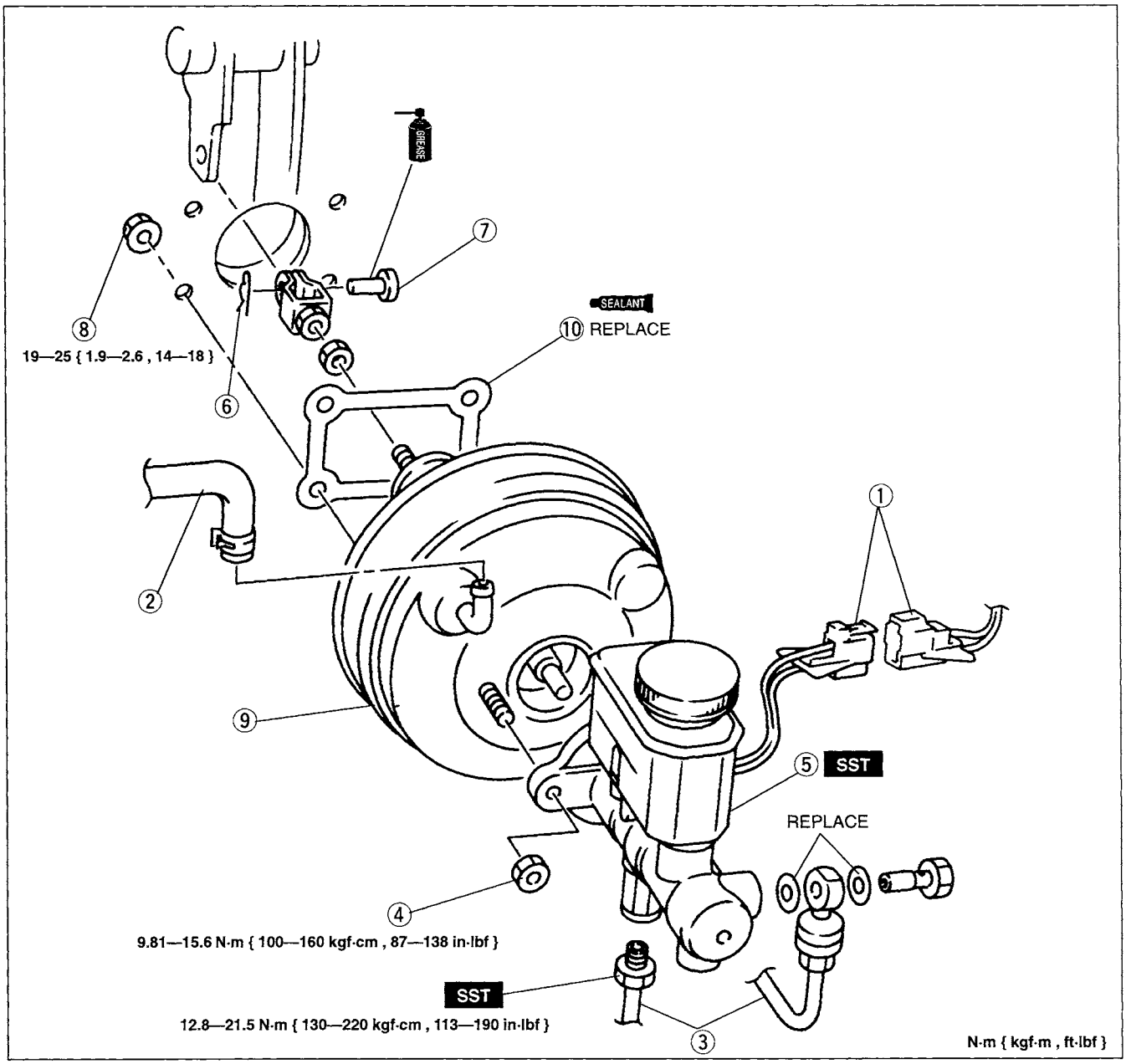
Inspection of check valve

Inspection

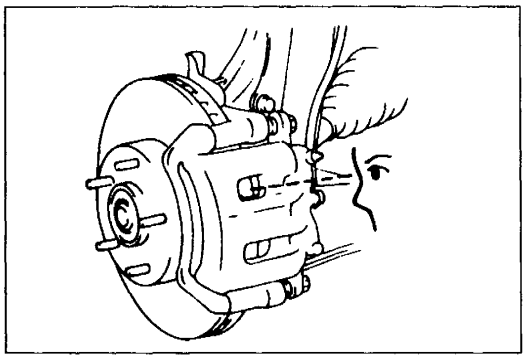
1. Disconnect the vacuum hose from the engine.
2. Install the hose with the arrow mark pointing toward the engine.
3. Apply suction and pressure to the hose from the engine side. Verify that air flows only toward the engine. If air passes in both directions or not at all, replace the check valve and hose.

Removal / Installation

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.
3. Perform the following steps after installation.
   (1) Check and adjust the push rod and piston clearance. (Refer to page P–10.)
   (2) Add fluid and bleed the air. (Refer to page P–6.)
   (3) Check all parts for fluid leakage.
   (4) Make an on-vehicle check of the unit. (Refer to page P–13.)
   (5) Check that the vacuum hose does not contact other parts.



1. Fluid level sensor connector
2. Vacuum hose
3. Brake pipe
   Removal / Installation Note .... page P– 9
4. Nuts
5. Reserve tank and master cylinder
   Installation Note ..... page P–10
6. Snap pin
7. Clevis pin
8. Nuts
9. Power brake unit
   Do not disassemble
10. Gasket

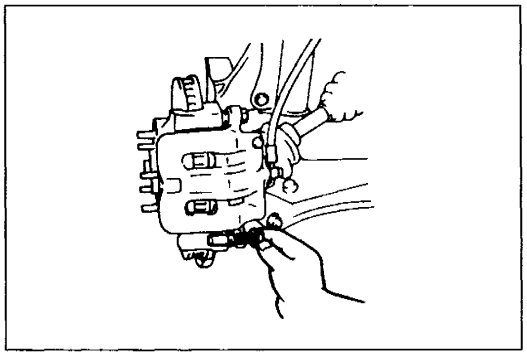


FRONT BRAKE (DISC)
On-vehicle Inspection
Disc pad

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheel and tire.
3. Look through the caliper inspection hole and inspect the remaining thickness of the pads.

   Thickness: 2.0 mm { 0.08 in } min.

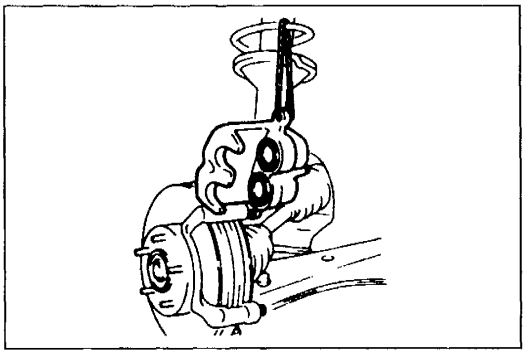
4. Replace the pads as a set (right and left wheels) if either is at or less than minimum thickness.



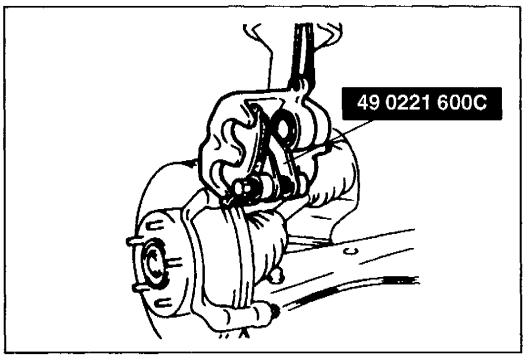
Replacement
Disc pad

Brake pads must be replaced for both the left and right side of the caliper as a set.

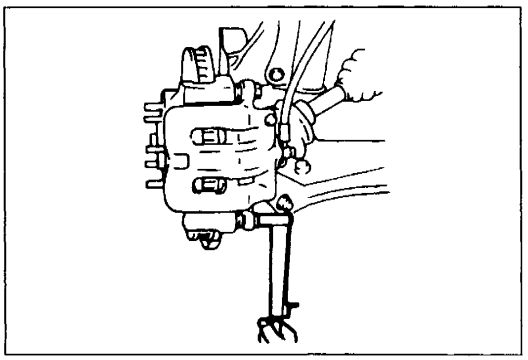
1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheel and tires.
3. Remove the lower lock-pin bolt, then lift the caliper and support it.



4. Remove the pads.



5. Push the piston inward by using the **SST**.
6. Install the new pads in the mounting support.



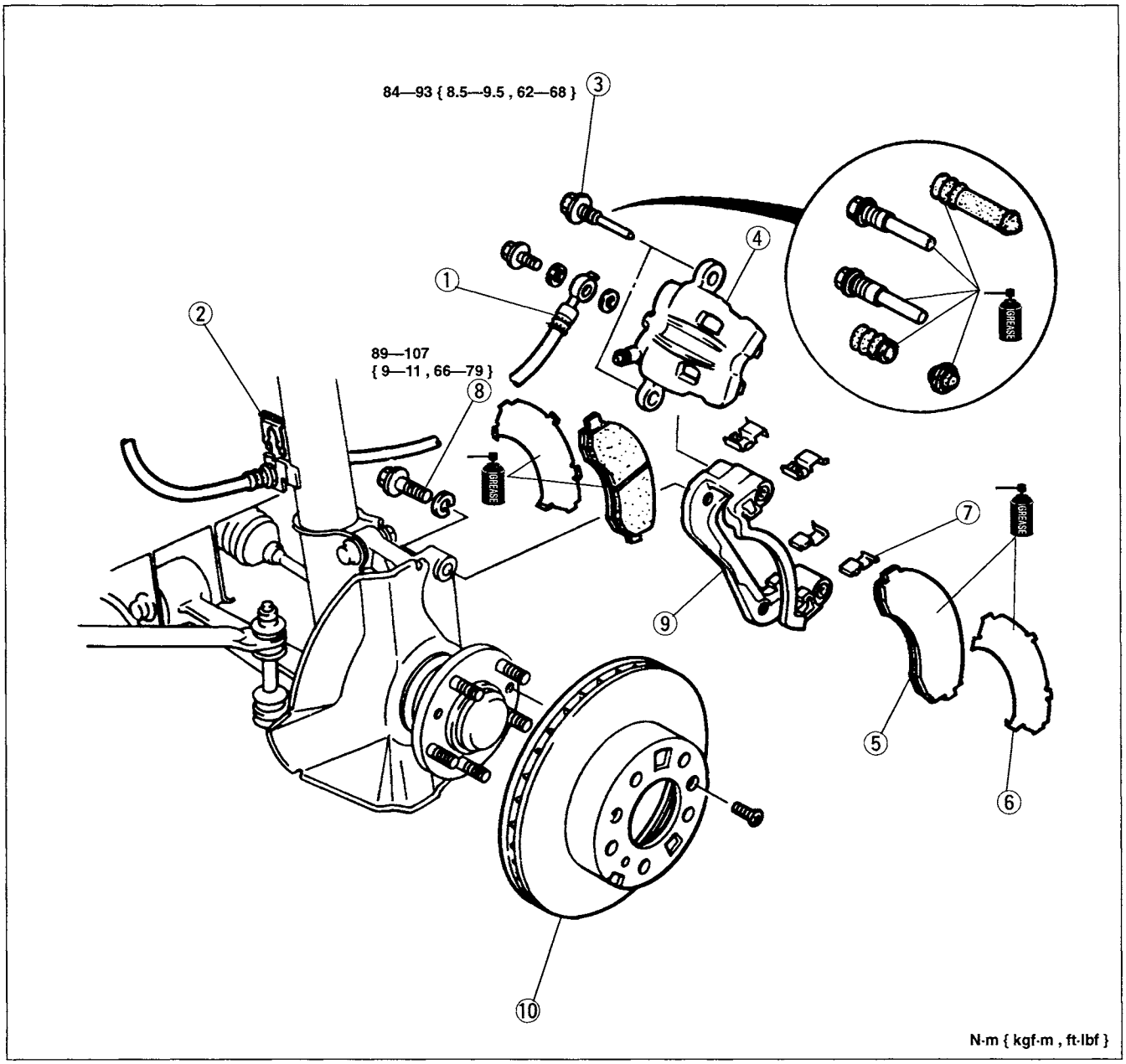
7. Lower the caliper assembly onto the mounting support.
8. Tighten the lock bolt to the specified torque.

   Tightening torque:
   84—93 N·m { 8.5—9.5 kgf·m , 62—68 ft·lbf }

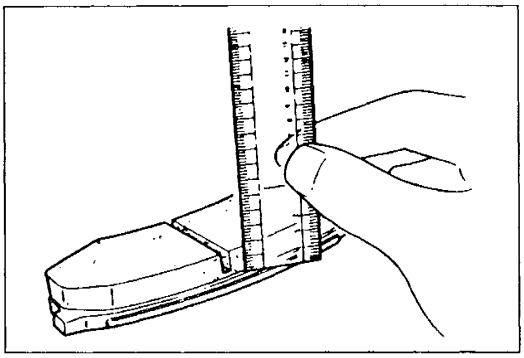
9. Mount the wheel and tires.
10. Apply the brakes 2 or 3 times and rotate the tires to see if the brakes drag.
11. Lower the vehicle.

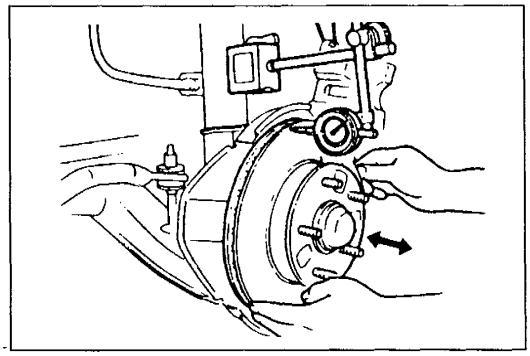
Removal / Installation

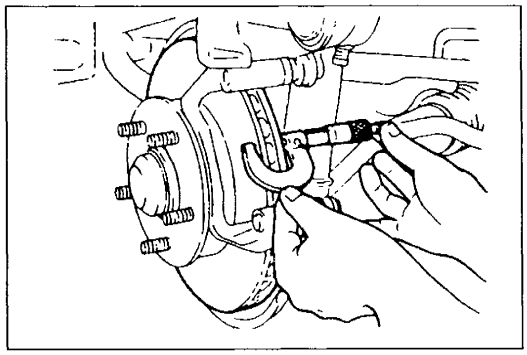
1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheels, then remove components in the order shown in the figure.
3. Install in the reverse order of removal.
4. Tighten all nuts and bolts to the specified torque, referring to the figure.
5. After installation, check the following.
   (1) Add fluid and bleed the air. (Refer to page P–6.)
   (2) Check for fluid leakage. (Refer to page P–6.)
   (3) Depress the pedal a few times, then verify that the brakes do not drag while rotating the wheel by hand.

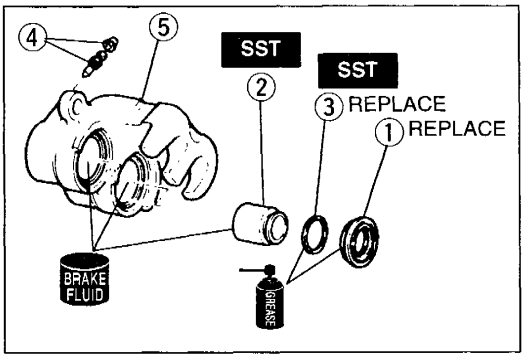


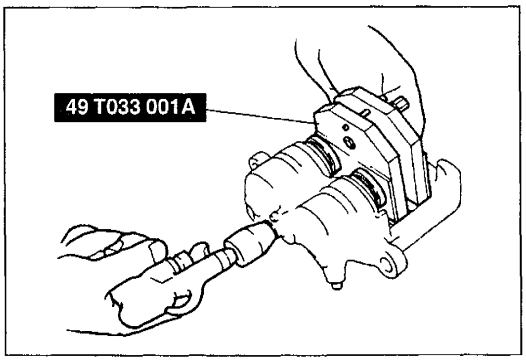
1. Brake hose
2. Clip
3. Lock bolt
4. Brake caliper assembly
   Disassembly ..... page P–18
   Assembly ..... page P–19
5. Disc pad
   Inspection ..... page P–18
6. Shim
7. Guide plate
8. Bolt
9. Mounting support
10. Disc plate
    Inspection ..... page P–18











Inspection

Check the following and replace parts as necessary.

Disc pad

1. Inspect for:
   (a) Oil or grease on facing
   (b) Abnormal wear or cracks
   (c) Deterioration or damage by heat
2. Check the lining thickness and make sure it is within the specifications.

Thickness

Standard: 10.5 mm { 0.41 in }
Minimum: 2.0 mm { 0.08 in }

Disc plate

1. Verify that there is no looseness in the wheel bearing.
2. Measure the runout from the outer edge of the disc plate surface.

Runout: 0.05 mm { 0.002 in } max.

3. Inspect the disc plate for wear and damage.
4. Inspect the disc plate thickness, and make sure it is within the specification.

Thickness

Standard: 28 mm { 1.10 in }
Minimum: 26 mm { 1.02 in }
Minimum thickness after machining by using an on-vehicle brake lathe: 26.8 mm { 1.06 in }

Caution

- **When it is necessary to machine the disc plate, if the disc plate is removed from the vehicle then machined, excessive runout may result. Machine the disc plate with it installed on the vehicle.**

Disassembly (Caliper)

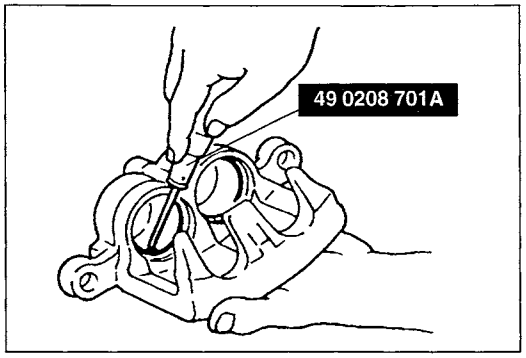
Disassemble in the order shown in the figure, referring to **Disassembly Note**.

1. Dust seal
2. Piston
3. Piston seal
4. Cap and bleeder screw
5. Caliper body

Disassembly note

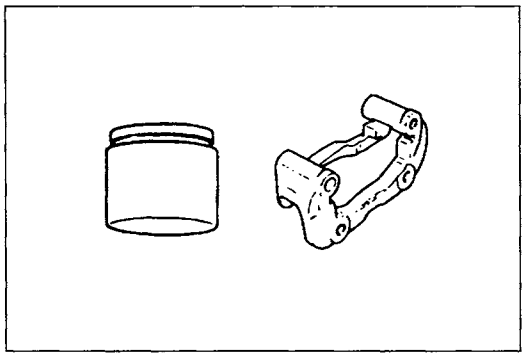
Piston

1. Place the **SST** in the caliper.
2. Gently blow compressed air through the pipe hole to force the piston out of the caliper.



Piston seal

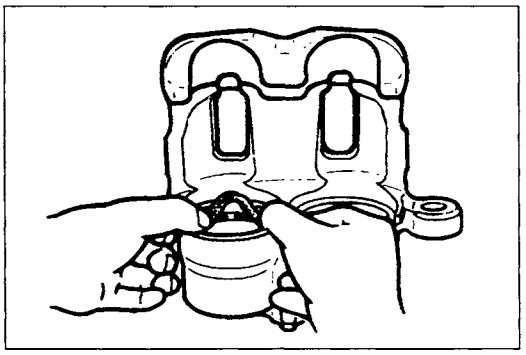
Remove the piston seal from the caliper by using the **SST**.



Inspection (Caliper)

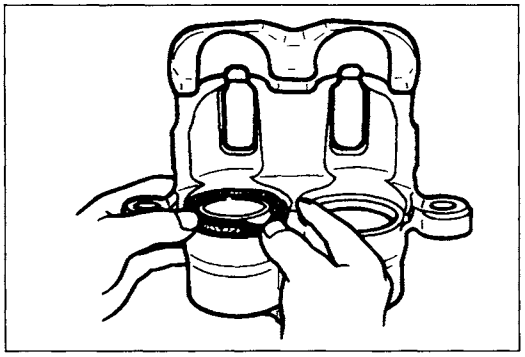
Inspect each part and replace if necessary.

1. Cylinder and piston for wear or rust
2. Caliper body for damage or cracks
3. Boot for damage or poor sealing

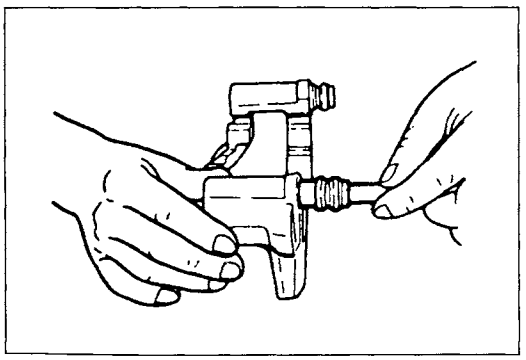


Assembly (Caliper)

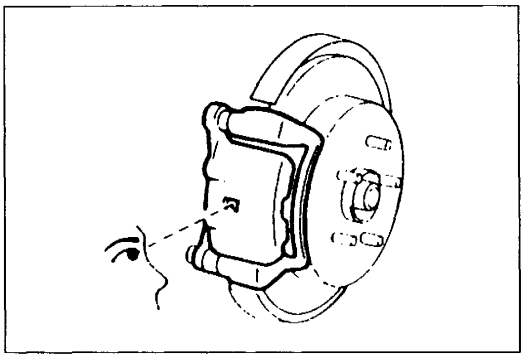
1. Coat the new piston seal with the grease supplied in the seal kit then install it in the caliper.



2. Coat the piston and the cylinder with brake fluid and insert the piston squarely into the cylinder.
3. Coat the new dust seal with the grease supplied in the seal kit then install it in the caliper.



4. Coat the following parts with grease supplied in the seal kit.
   (1) Lock bolt
   (2) Boot
5. Fit the boot to the caliper.



REAR BRAKE (DISC)
Inspection (on-vehicle)
Disc pad

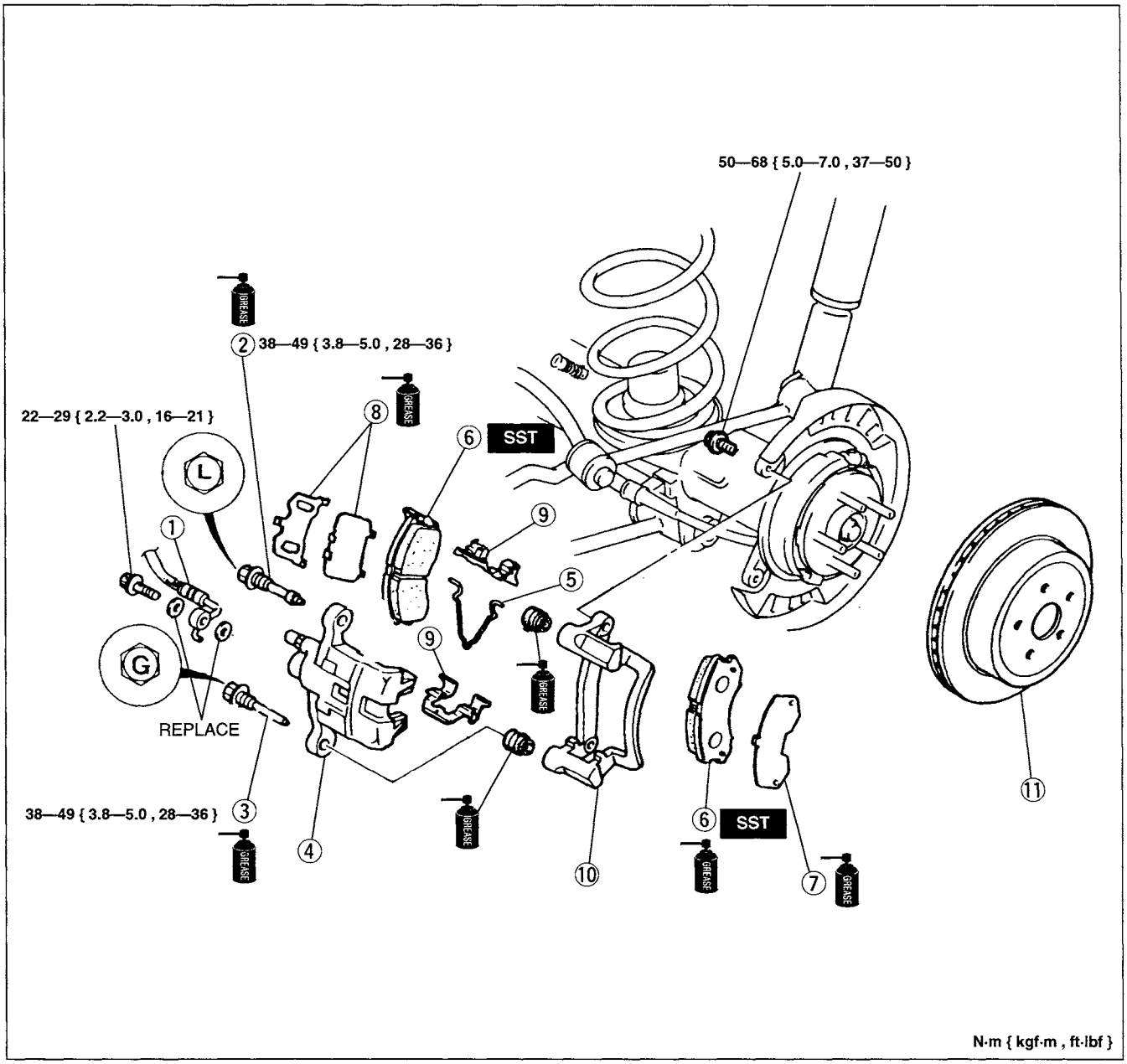
1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove the wheel.
3. Look through the caliper inspection hole and inspect the remaining thickness of the pads.

   Thickness: 1.0 mm { 0.04 in } min.

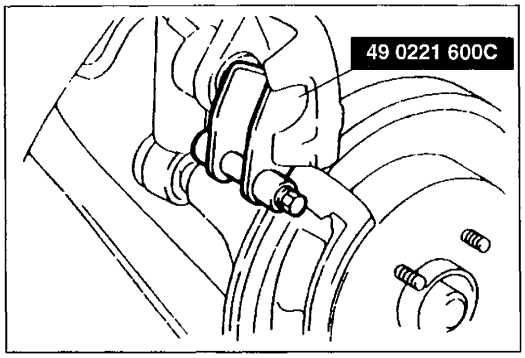
4. Replace the pads as a set (right and left wheels) if either is at or less than the minimum thickness.

Removal / Inspection / Installation

1. Remove in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal, referring to **Installation Note**.
4. After installation, check the following.
   (1) Add fluid and bleed the air. (Refer to page P–6.)
   (2) Check for fluid leakage. (Refer to page P–6.)
   (3) Depress the pedal a few time, then verify that the brake do not drag while rotating the wheel by hand.
   (4) If the disc plate has been replaced, settle the parking brake shoes. (Refer to page P–32.)

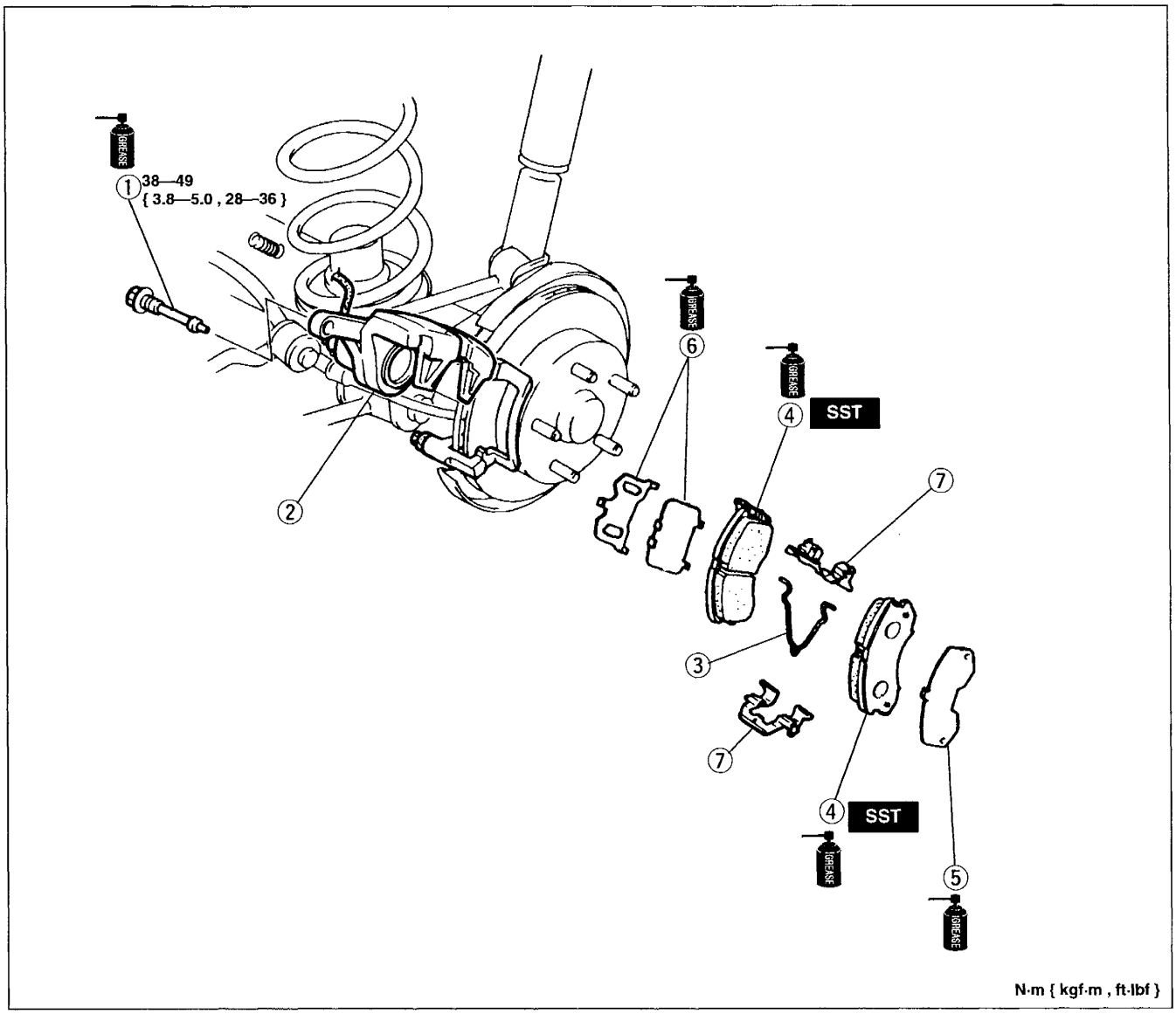


1. Flexible hose
2. Lock pin
3. Guide pin
4. Caliper
   Disassembly / Inspection / Assembly ..... page P–24
5. V-spring
6. Disc pad
   Inspection ..... page P–20
   Installation Note ..... page P–22
7. Outer shim
8. Inner shim
9. Guide plate
10. Mounting support
11. Disc plate
    Inspection ..... page P–23

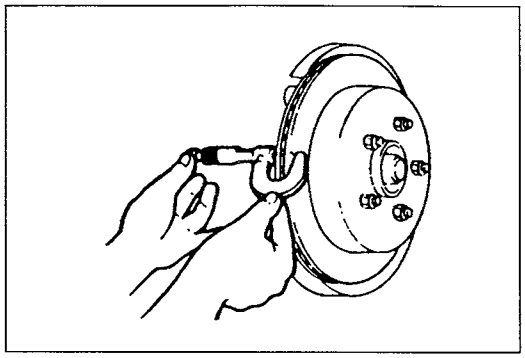


Installtion note
Disc pad
Before installing the disc pads, push the piston fully inward by using the **SST**.

DISC PAD
Replacement
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal, referring to **Installation Note**.



1. Guide pin
2. Caliper
3. V-spring
4. Disc pad
   Installation Note ..... above
5. Outer shim
6. Inner shim
7. Guide plate

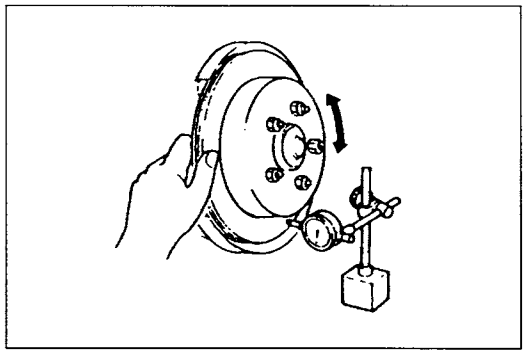


DISC PLATE
Inspection
Disc plate thickness
1. Measure the thickness of the disc plate.

   Standard: 18 mm { 0.71 in }
   Minimum: 16 mm { 0.63 in }
   Minimum thickness after machining by using an on-vehicle brake lathe: 16.8 mm { 0.66 in }

   Caution
   - **When it is necessary to machine the disc plate, if the disc plate is removed from the vehicle then machined, excessive runout may result. Machine the disc plate with it installed on the vehicle.**

2. If the thickness is not within the specification, replace the disc plate.



Disc plate runout
1. Verify that there is no looseness in the wheel bearing.
2. Measure the runout at the outer edge of the contact surface of the disc pad.

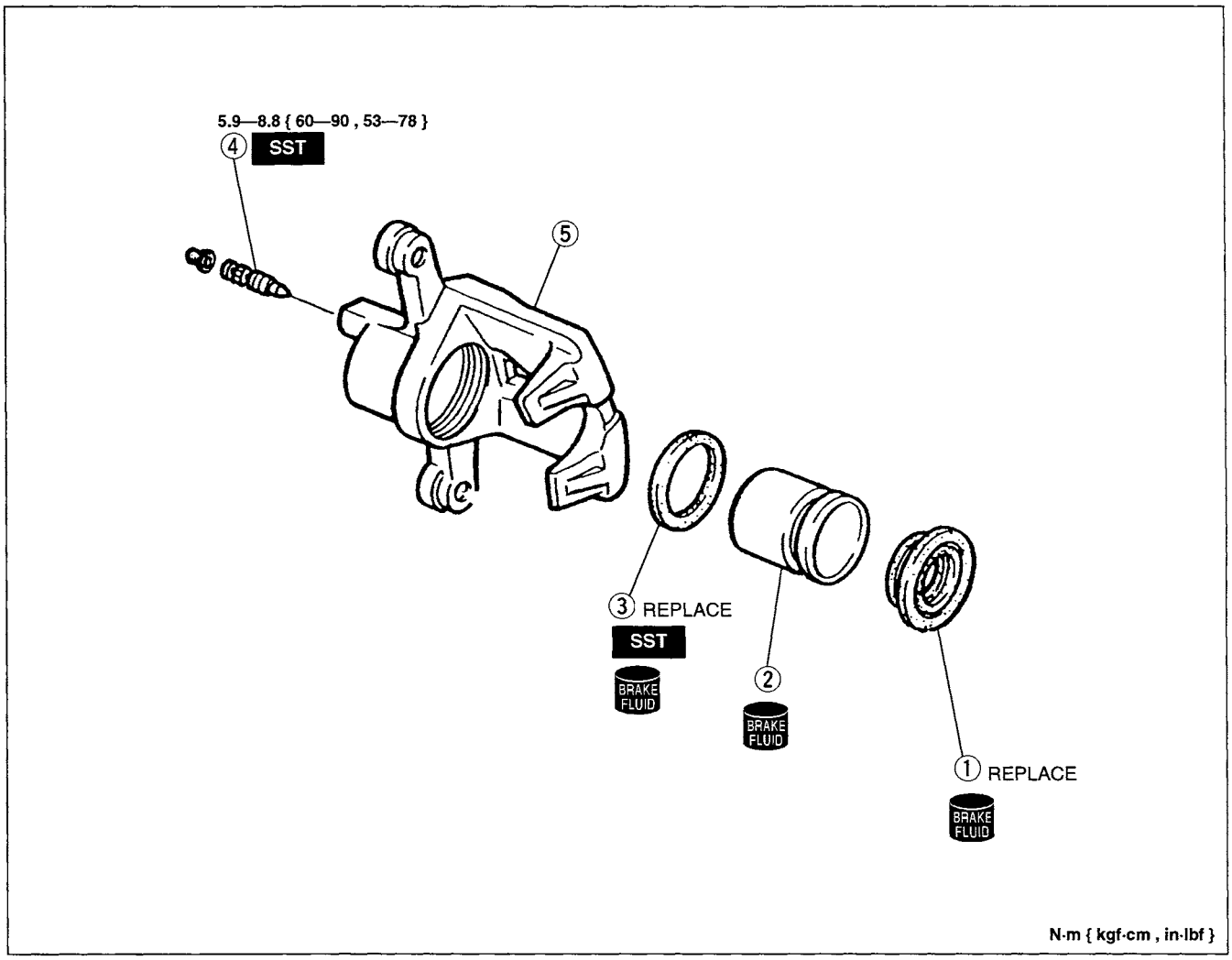
   Runout: 0.05 mm { 0.002 in } max.

3. If the runout is not within the specification, replace the disc plate.

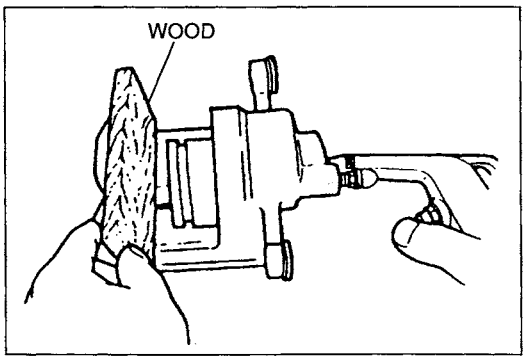
CALIPER

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



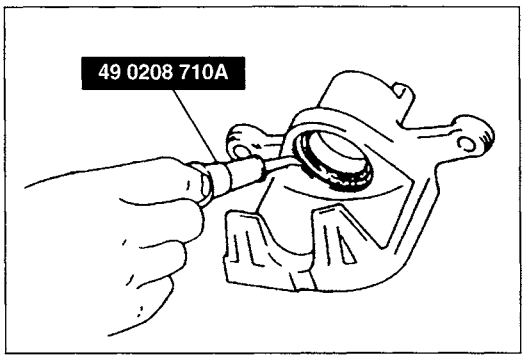
1. Dust seal
   Inspect for damage and poor sealing
2. Piston
   Disassembly Note ..... below
   Inspect for wear and rust
3. Piston seal
   Disassembly Note ..... page P–25
4. Bleeder screw
   Disassembly Note ..... page P–25
   Assembly Note ..... page P–25
5. Caliper body
   Inspect damage, wear and rust



Disassembly note

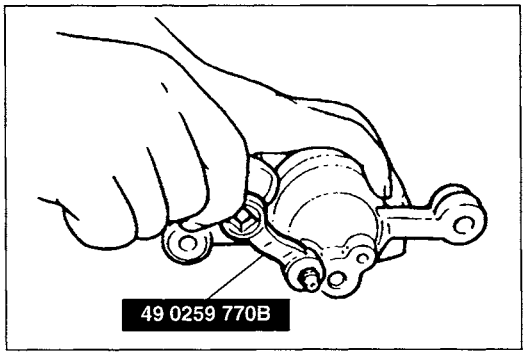
Piston

1. Place a piece of wood in the caliper.
2. Gently blow compressed air through the pipe hole to force the piston out of the caliper.



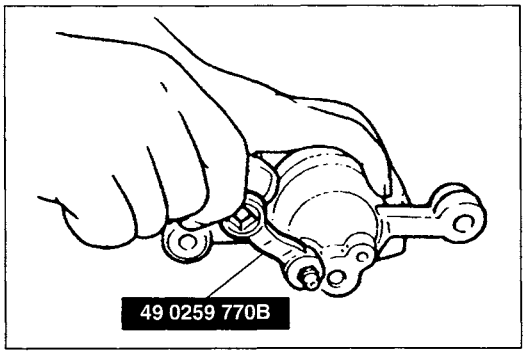
Piston seal

Remove the piston seal from the caliper by using the **SST**.



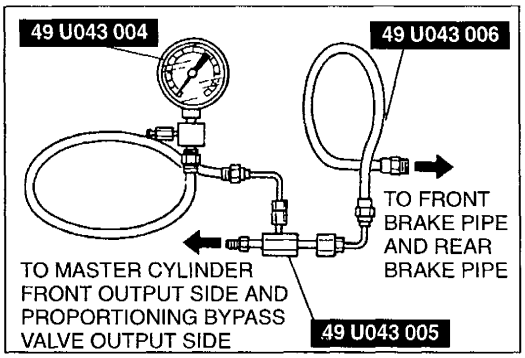
Bleeder screw

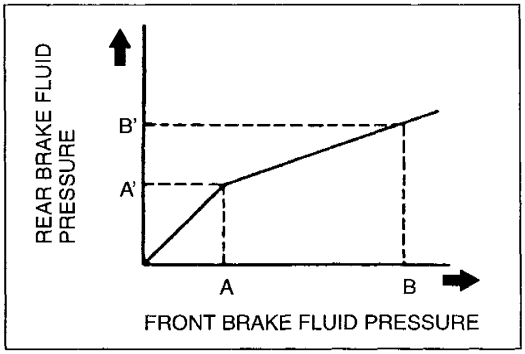
Loosen the bleeder screw by using the **SST**.



Assembly note
Bleeder screw

Tighten the bleeder screw by using the **SST**.





PROPORTIONING BYPASS VALVE (PBV)

Inspection

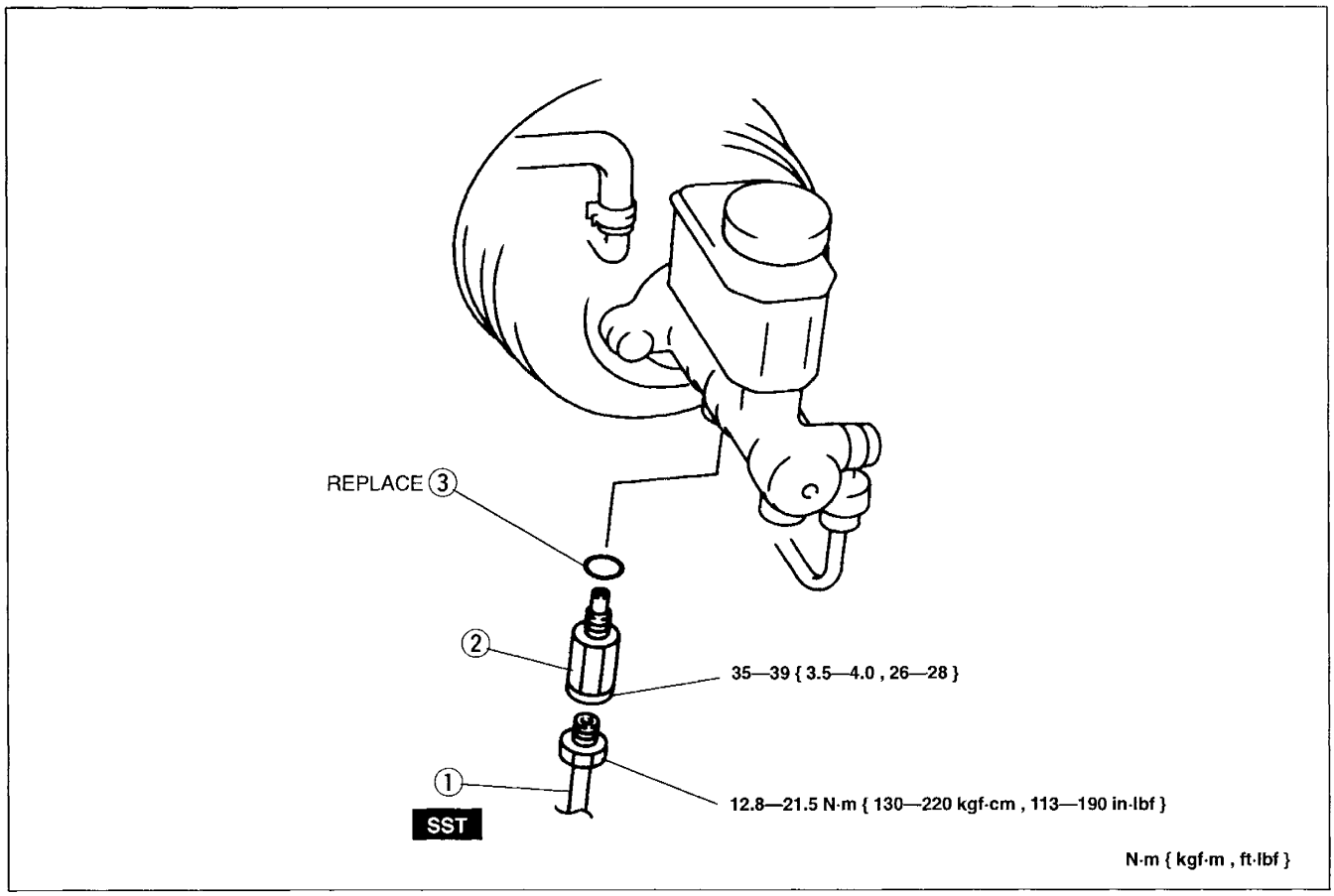
1. With the proportioning bypass valve installed to the master cylinder, connect the **SST** to the proportioning bypass valve output side and to the master cylinder front brake side.
2. Bleed the air from the front brake line and the **SST**.
3. Measure the fluid pressure of the proportioning bypass valve output for the front and the rear brake.

kPa { kgf/cm², psi }

A	A'	B	B'
2,940 { 30 , 427 }	2,940 ± 390 { 30 ± 4 , 427 ± 57 }	5,880 { 60 , 853 }	4,410 ± 390 { 45 ± 4 , 640 ± 57 }

4. If not as specified, replace the proportioning bypass valve assembly.
5. Add fluid and bleed the air. (Refer to page P–6.)
6. Check for fluid leakage.

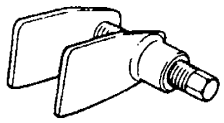
Replace



1. Brake pipe
2. Proportioning bypass valve
   Inspection ..... above
3. O-ring

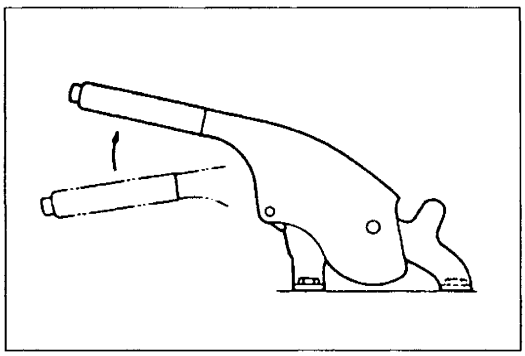
PARKING BRAKE SYSTEM

PREPARATION
SST

49 0221 600C Expand tool, disc brake		For installation of brake caliper

TROUBLESHOOTING GUIDE

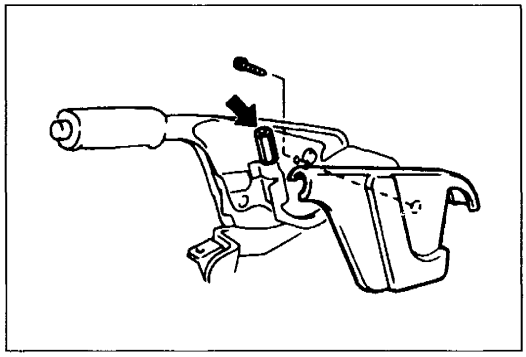
Problem	Possible cause	Action	Page
Brakes do not release	Improper return of parking brake cable or improper adjustment	Repair or adjust	P–33
Parking brake does not hold well	Excessive lever stroke	Adjust	P–27
	Brake cable stuck or damaged	Repair or replace	P–33
	Brake fluid or oil on lining	Clean or replace	—
	Hardening of lining surface or poor contact	Grind or replace	P–29



PARKING BRAKE LEVER
On-vehicle Inspection
Inspection

Check that the stroke is within the specification when the parking brake lever is pulled with a force of **98 N { 10 kgf , 22 lbf }**.

Stroke: 3—6 notches

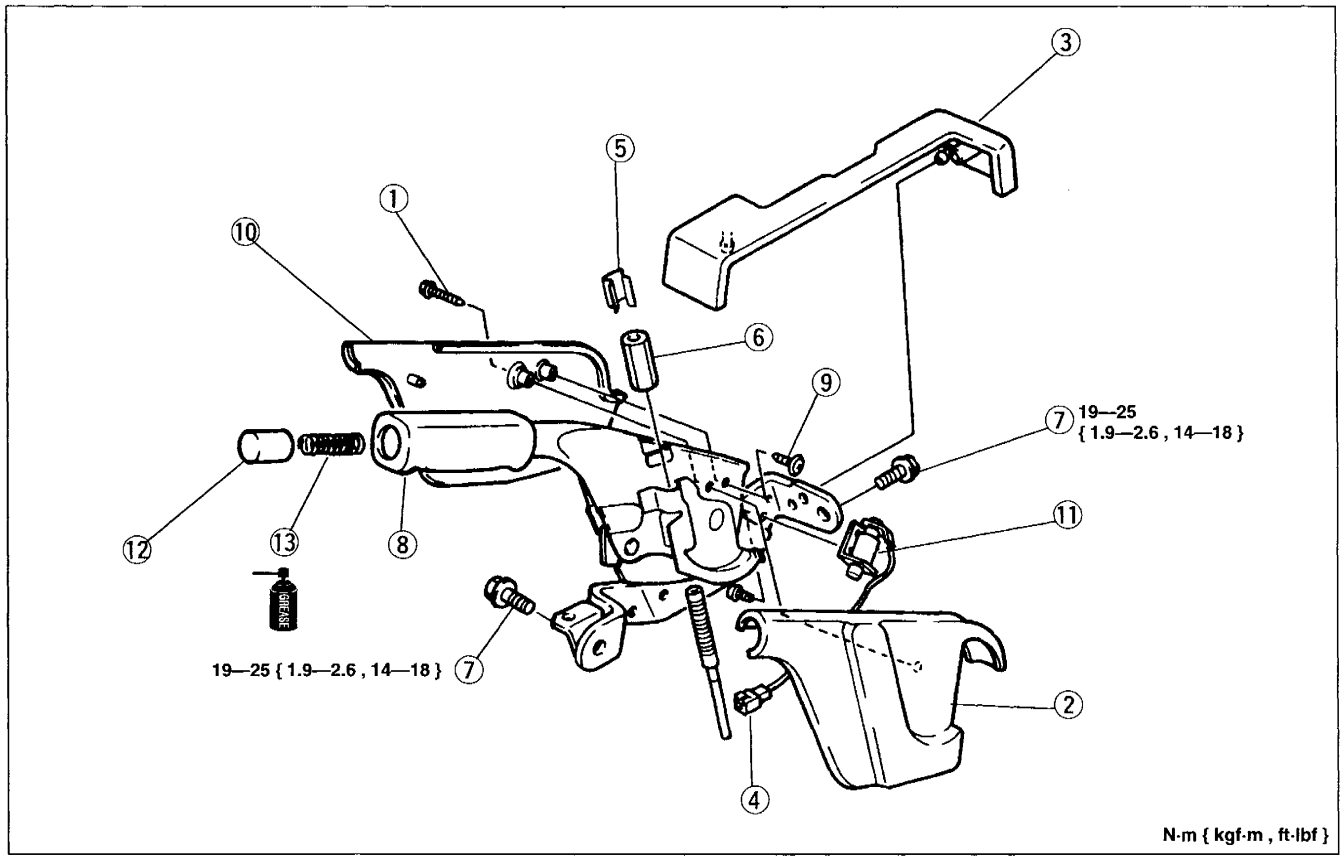


Adjustment

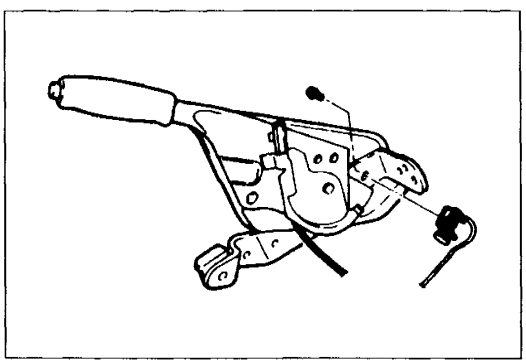
1. Remove the screw and remove the parking brake lever cover.
2. Remove the adjusting nut clip and turn the adjusting nut at the front of the parking cable.
3. After adjustment, check the following points.
   (1) Turn the ignition switch to ON, pull the parking brake lever one notch, and check that the parking brake warning light illuminates.
   (2) Verify that the rear brakes do not drag.

Removal / Installation / Inspection

1. Block the wheels firmly.
2. Release the parking brake.
3. Remove in the order shown in the figure.
4. Inspect all components and parts. Replace parts if necessary.
5. Install in the reverse order of removal, referring to **Installation Note.**
6. After installation:
   Adjust the parking brake lever stroke. (Refer to page P–27.)



1. Screw
2. Parking brake lever cover
3. Parking brake bracket cover
4. Parking brake switch connector
5. Clip
6. Adjusting nut
   Adjustment ..... page P–27
7. Bolt
8. Parking brake lever
   Inspect sector and ratchet pawl for wear or damage
9. Screw
10. Parking brake lever cover
11. Parking brake switch
    Installation Note ..... below
12. Button
13. Spring
    Inspect for weakness or breakage



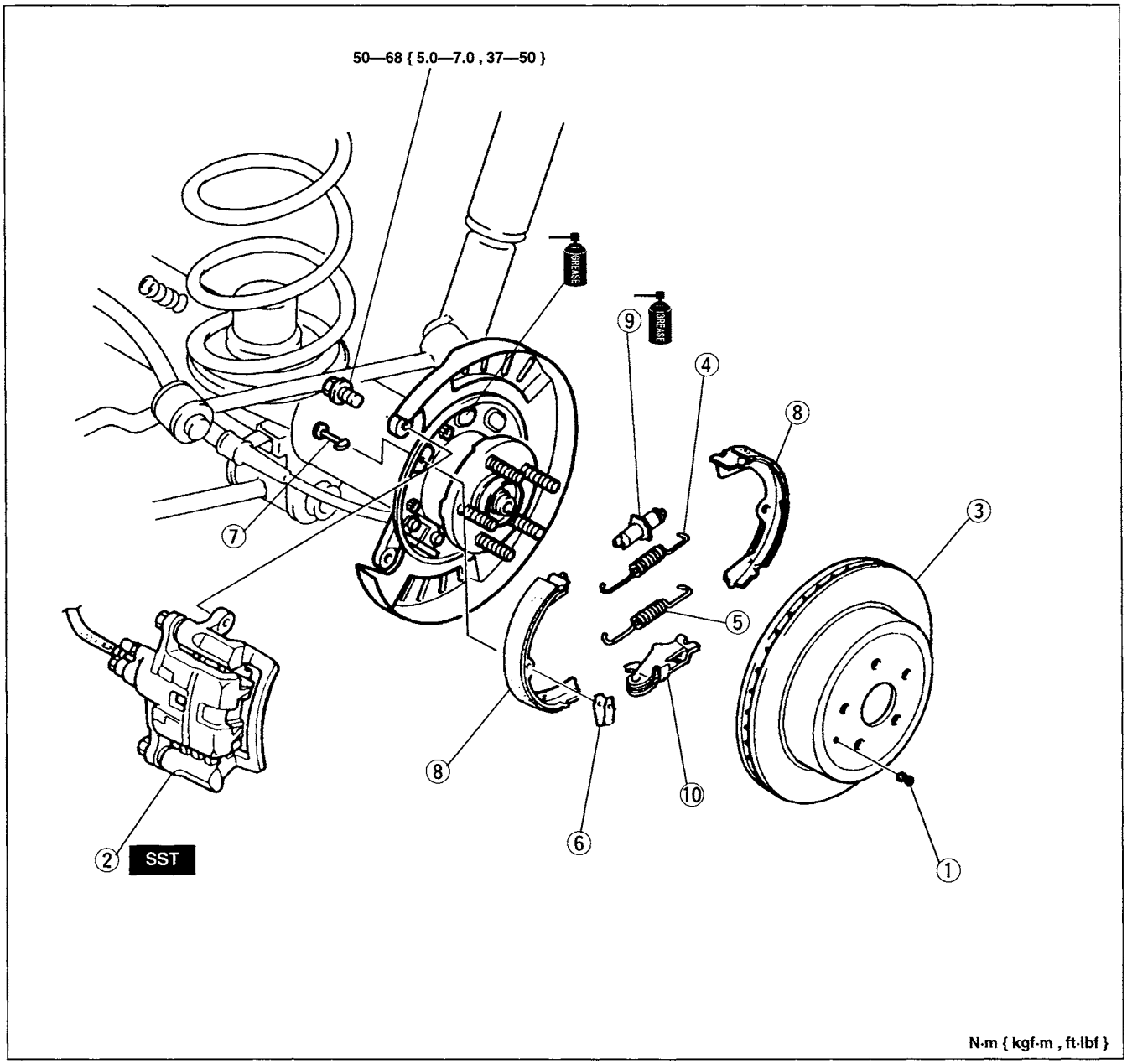
Installation note
Parking brake switch

1. Install the parking brake switch so that it contacts the parking brake lever when the lever is fully released.
2. Turn the ignition switch to ON, and check that the parking brake warning light illuminates with the lever pulled one notch.

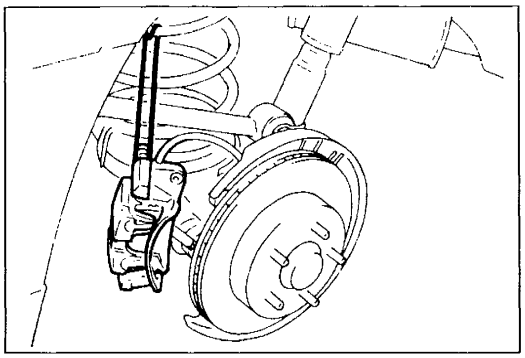
PARKING BRAKE SHOES

Removal / Inspection / Installation

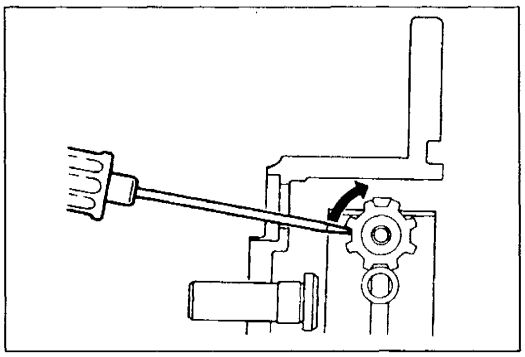
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal, referring to **Installation Note**.
4. After installation, check the following.
   (1) Check the parking brake lever stroke. (Refer to page P–27.)
   (2) Settle the parking brake shoes. (Refer to page P–32.)



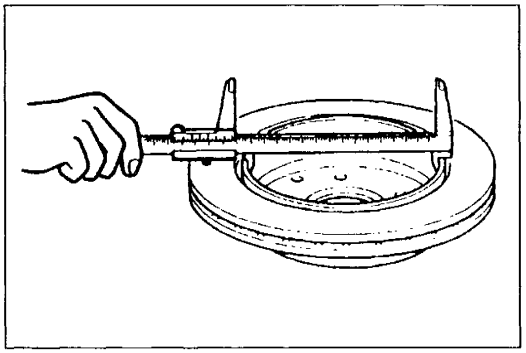
1. Service plug
2. Caliper
   - Removal Note ..... page P–30
   - Installation Note ..... page P–31
3. Disc plate
   - Removal Note ..... page P–30
   - Inspection ..... page P–30
   - Installation Note ..... page P–31
4. Upper return spring
5. Lower return spring
6. Hold springs
7. Hold pins
8. Parking brake shoes
   - Inspection ..... page P–30
   - Installation Note ..... page P–30
9. Adjuster
   - Installation Note ..... page P–31
10. Operating lever
    - Installation Note ..... page P–31



Removal note
Caliper
Support the caliper as shown in the figure.



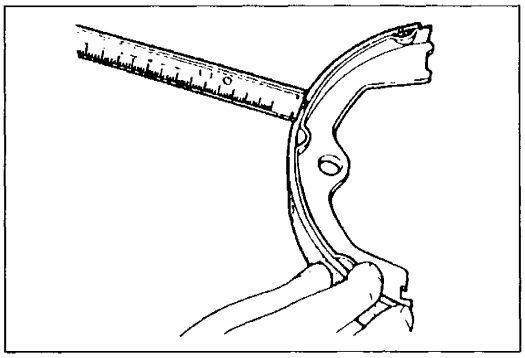
Disc plate
If the disc plate difficult to remove, loosen the parking brake shoes as described below.
1. Remove the service plug from the disc plate.
2. Insert a screwdriver into the hole, and turn the adjuster in the opposite direction of the arrow marked on the disc plate.



Inspection
Disc plate
1. Inspect the inside of disc plate for scratches and uneven or abnormal wear.
2. Measure the disc plate inner diameter.

   Standard: 190.0 mm { 7.48 in }
   Maximum: 191.0 mm { 7.51 in }

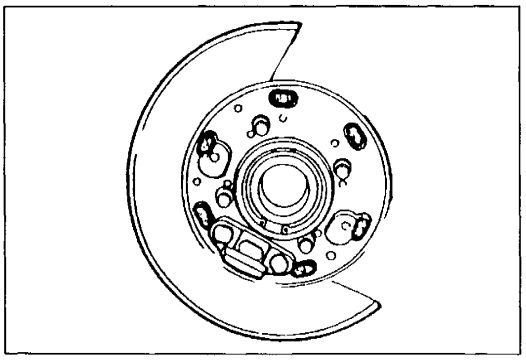
3. If the diameter is not within the specfication, replace the disc plate.



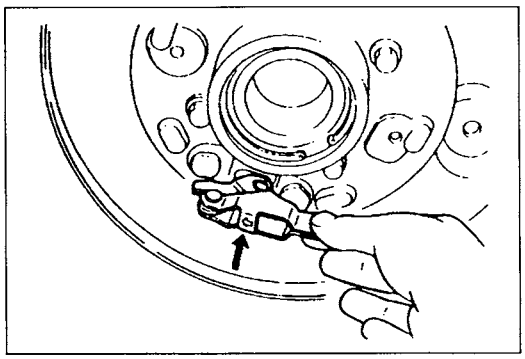
Parking brake shoes
1. Inspect the lining for peeling, cracking, and uneven wear.
2. Measure the lining thickness.

   Standard: 3.1 mm { 0.12 in }
   Minimum: 1.0 mm { 0.04 in }

3. If the thickness is not within the specification, replace the parking brake shoes on the right and left wheels.

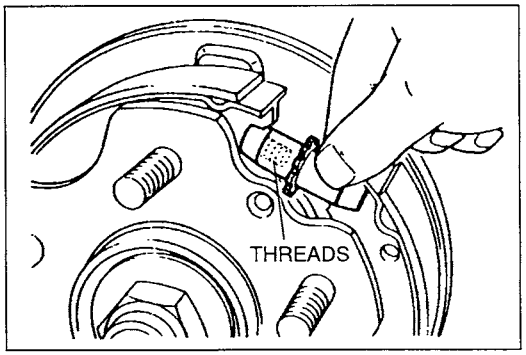


Installation note
Parking brake shoes
Before installing the parking brake shoes, apply grease to the shaded areas shown in the figure.



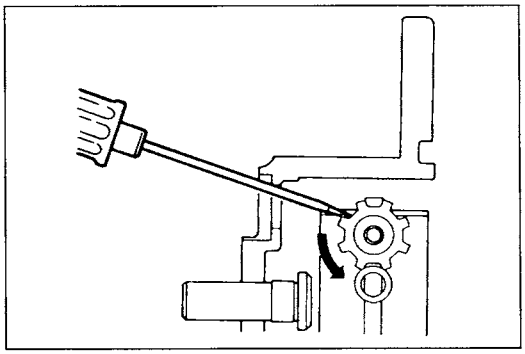
Operating lever

Connect the operating lever to the parking brake cable. The arrow mark on the operating lever should be facing the front.



Adjuster

1. Compress the adjuster to its smallest possible size by screwing the threaded part inward.
2. Install the adjuster between the brake shoes. For the left wheel, install the adjuster with the threaded part facing the front. For the right wheel, install the adjuster with the threaded part facing the rear.



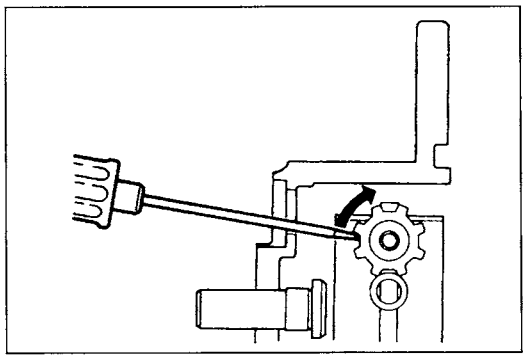
Disc Plate

After installation the disc plate, adjust the parking brake shoe clerance as described below.

1. Remove the service plug from the disc plate.
2. Insert a screwdriver into the hole and turn the adjuster in the direction of the arrow until the disc plate locks.

Note

- The arrow is marked on the disc plate.

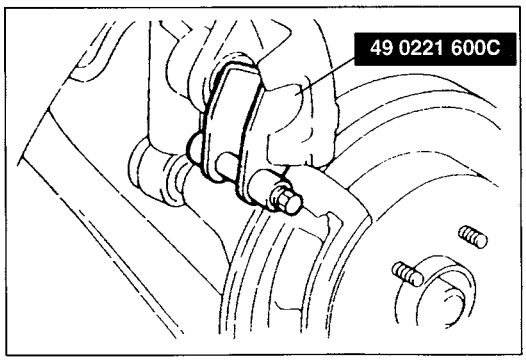


3. Turn the adjuster **3—5 notches** in the opposite direction to set the proper clearance.

Note

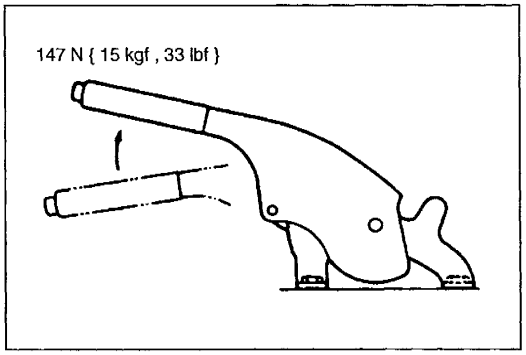
- When turning the adjuster **4 notches**, the shoe clearance will be **0.32 mm { 0.013 in }**.

4. Verify that the brakes do not drag when turning the disc plate by hand.
5. Install the disc plate service plug.



Caliper

1. Before installing the disc pads, push the piston fully inward by using the **SST**.
2. Install the caliper.



Settling the parking brake shoes

If the disc plate or parking brake shoes have been replaced or if the parking brake feels as if it is not working well, then do the following procedure.

Warning

- **Settling the brake shoes in a crowded area can cause traffic accidents, which can lead to death or serious injury.**
  Do this procedure only in a wide open area, or in an area with good overall visibility, and be extremely careful of people, vehicles, and other obstacles in the area.

Caution

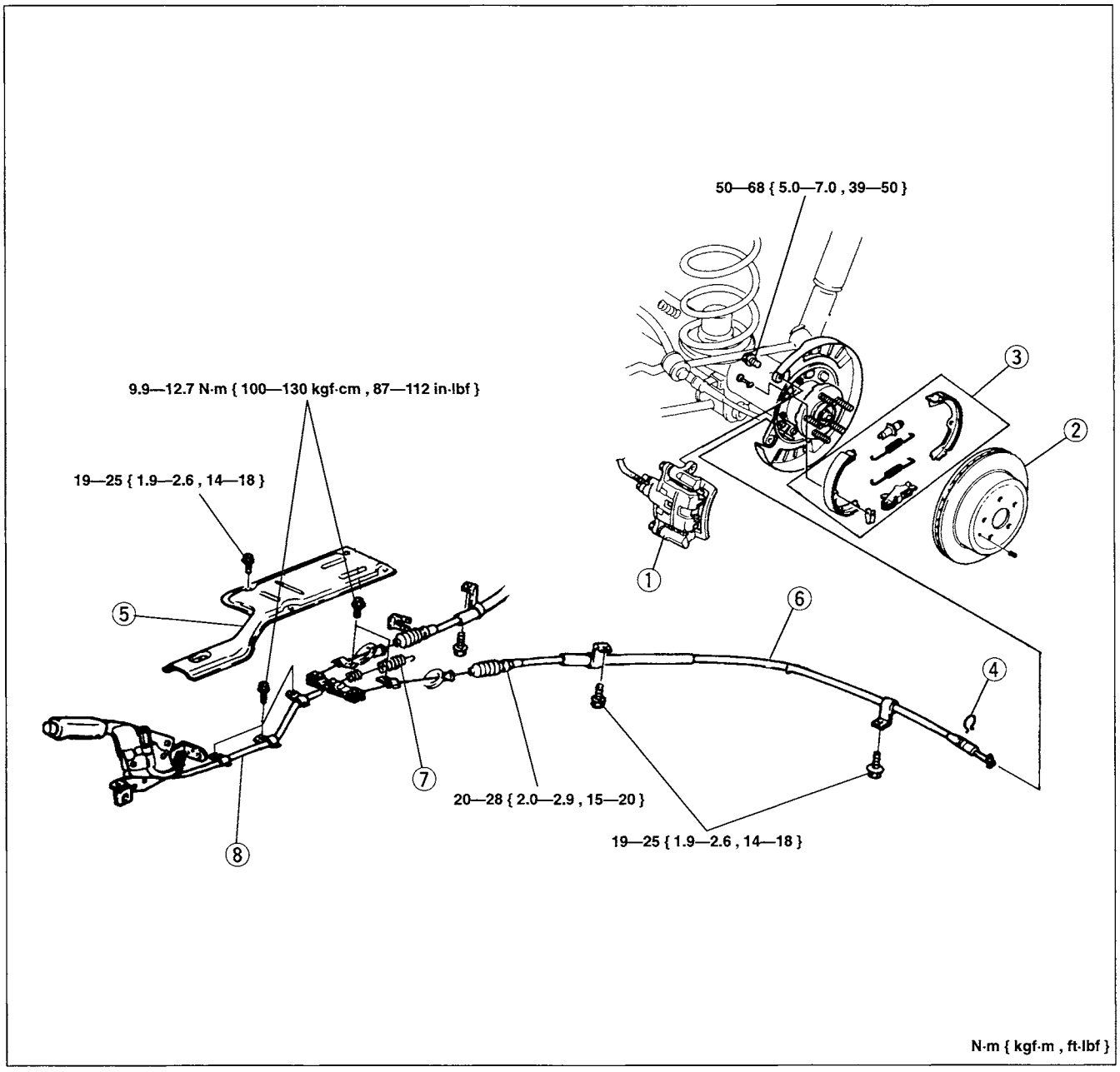
- **Doing this procedure more than 3 times during the life of the brake shoes will cause the lining to wear.**

1. Inspect the parking brake stroke, and adjust to specification if necessary.
2. Pull up the parking brake lever, with a force of **147 N { 15 kgf , 33 lbf }**.
3. With the lever pulled up, drive the vehicle for about 10 seconds at about **30 km/h { 19 MPH }**.
4. Stop the vehicle in a safe place, release the parking brake, and wait 5 minutes to cool the brakes.
5. Repeat steps 2 through 4 one or two more times.
6. After the procedure is completed, inspect the parking brake stroke, and adjust to the specification if necessary.

PARKING BRAKE CABLE

Removal / Inspection / Installation

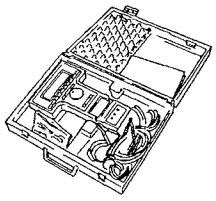
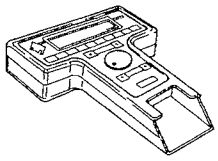
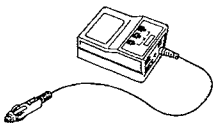
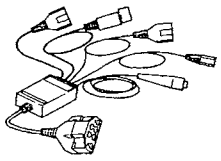
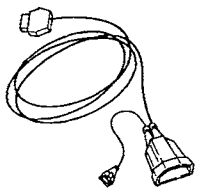
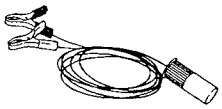
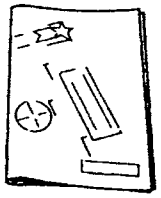
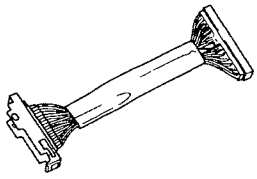
1. Block the wheels firmly.
2. Release the parking brake and remove the parking brake lever adjusting nut. (Refer to page P–28.)
3. Remove rear seat No.1, front floormat. (Refer to section S.)
4. Jack up the vehicle and support it on safety stands.
5. Remove the parking brake cable in the order shown in the figure.
6. Install in the reverse order of removal.
7. After installation, check the following.
   - Adjust the parking brake lever stroke. (Refer to page P–27.)



1. Caliper
   Removal Note ..... page P–30
2. Disc plate
3. Parking brake shoes
   Removal / Inspection / Installation ..... page P–29
4. Clip
5. Cover
6. Rear parking cable
   Inspect for damage and wear
7. Return spring
8. Front parking cable
   Inspect the damage and wear

ANTILOCK BRAKE SYSTEM (ABS)

PREPARATION
SST

49 0259 770B Wrench, flare nut 	For removal and installation of brake pipe	49 T088 0A0 NGS set 	For diagnosis
49 T088 001 Control Unit (Part of 49 T088 0A0) 	For diagnosis	49 T088 002 Vehicle Interface Module (Part of 49 T088 0A0) 	For diagnosis
49 T088 003 Super MECS Adapter (Part of 49 T088 0A0) 	For diagnosis	49 T088 005 STAR/DCL Adapter (Part of 49 T088 0A0) 	For diagnosis
49 T088 006 Battery Hookup Adapter (Part of 49 T088 0A0) 	For diagnosis	49 T088 008A Instruction Manual 	For diagnosis
49 T088 010B Program Card 	For diagnosis	49 L066 001 Harness adapter 	For inspection of wiring harness

TROUBLESHOOTING
Troubleshooting Notes

The ABS is composed of electrical components, mechanical components (ABS hydraulic unit), and the components of the standard system.
Fundamentally, malfunction of the ABS electrical or mechanical components is judged by the on-board diagnostic function within the ABS control module. Malfunctions are indicated by the warning light in the instrument panel. The technicians can locate a malfunction by switching the system to the diagnostic test mode.
The on-board diagnostic system must be used when diagnosing the ABS.

Precaution
Conditions that are not malfunctions

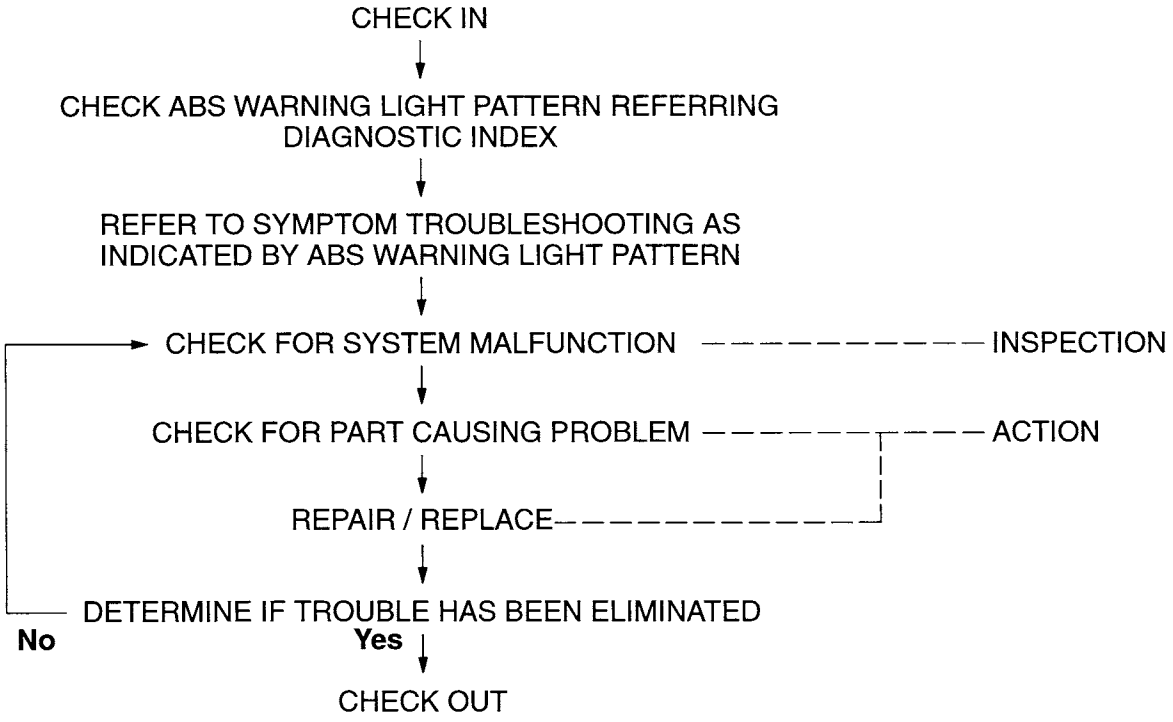
1. Vibrations can sometimes be felt in the steering wheel, body, and/or brake pedal when the ABS is functioning; such vibrations are simply an indication that the ABS functioning.
2. The ABS warning light may illuminate under any of the following conditions:
   - When the vehicle is traveling on snow or ice with the parking brake activated or a brake dragging at one wheel.
   - When different size tires are used.

- When tires of different gripping performance are used.
- When the vehicle is jacked up, stacked, or on a chassis roller with the front wheels locked, and the rear wheels are lotated according to the conditions below.
  (2WD) . . . Rotated at a speed of 30 km/h { 18.6 MPH } or more for 80 seconds or more.
  (4WD) . . . Rotated at a speed of 12 km/h { 7.4 MPH } or more for 20 seconds or more. (When in 2WD)
  If the ABS warning light illuminates for a few seconds then goes off when the ignition switch is turned to ON again, the ABS is functioning normally. However, diagnostic code 11 (front left wheel-speed sensor) and 12 (front right wheel-speed sensor) will be entered into the control module memory. Erase them from the memory by following the procedures below.

(1) Activate the on-board diagnostic system and check for diagnostic trouble codes. (Refer to page P–43.)
(2) If code 11 and 12 are memorized, erase it. (Refer to page P–44.)
If code 11, 12 and other codes are memorized, check for the causes by referring to the applicable diagnostic chart for the other codes. (Refer to page P–45.)

3. When battery voltage is insufficient, the warning light will illuminate and the ABS will not work. In this condition, at the moment battery voltage increases to the specified level, the warning light will go off and the system will return to normal control. There will also be no diagnostic trouble code entries made to the control module memory.
4. There are occasions when the ABS warning light does not go off when the ignition switch is turned to ON after repairs related to the ABS wheel speed sensor have been completed. If this should occur, drive the vehicle faster than 10 km/h { 6.2 MPH } and confirm that the service codes have been canceled after the ABS warning light has gone off.

Using This Section
Work flow



Diagnostic index

TROUBLESHOOTING ITEMS		DESCRIPTION	PAGE
No.	TROUBLE		
1	ABS warning light not illuminated when ignition switch turned ON	—	P–38
2	ABS warning light remains ON	ABS warning light remains ON, and ABS does not operate	P–39
3	[illegible] vehicle	ABS warning light goes off when vehicle started	P–39
	[illegible]	If IG SW turned ON again, ABS warning light [illegible] off after a few seconds illumination	

No.:
Each troubleshooting item is assigned a number.

TROUBLESHOOTING ITEM:
There are 6 troubleshooting items. Choose the item indicated by the ABS warning light.

DESCRIPTION:
Describes details of the symptom.

PAGE:
Shows the reference page.

Symptom troubleshooting

1	ABS WARNING LIGHT NOT ILLUMINATED WHEN IGNITION SWITCH TURNED ON		
DESCRIPTION	—		
[TROUBLESHOOTING HINTS] • Malfunction of meter • Failed warning lith or open in related wiring harness			
STEP	INSPECTION		ACTION
1	With IG ON, do other indicator illuminate?	Yes	Check if failure(s) is momorized Note and check it later if necessary Go to next step
		No	Inspect meter 15 A fuse
2	[illegible]	Yes	Go to next step
	[illegible]	[illegible]	[illegible] to step 6

DESCRIPTION:
Further describes the system. Confirm that the chart addresses the actual symptom before beginning troubleshooting.

TROUBLESHOOTING HINTS:
This describes the possible point of malfunction.

STEP:
This shows the order of troubleshooting. Proceed with troubleshooting as indicated.

INSPECTION:
This describes an inspection procedure to quickly determine where the faulty parts are. If a detailed procedure is necessary to perform the INSPECTION, refer to the page specified by the "☞" marks.

ACTION:
As a result of "Yes/No" answers given under INSPECTION, this section recommends the appropriate action to take. The "☞" marks indicates the relevant reference page.

Diagnostic Index

TROUBLESHOOTING ITEMS		DESCRIPTION	PAGE
No.	TROUBLE		
1	ABS warning light not illuminated when IG SW turned ON	—	P–38
2	ABS warning light remains ON	ABS warning light remains ON, and ABS does not operate	P–39
3	ABS warning light flashes with vehicle stopped	ABS warning light goes off when vehicle started	P–39
4	ABS warning light illuminates during driving till IG SW turned OFF	If IG SW turned ON again, ABS warning light goes off after a few seconds illumination	P–40
5	ABS warning light illuminates/goes off with vehicle stopped and during driving	—	P–40
6	ABS warning light indicates normal, however ABS does not operates correctly	—	P–40

Diagnostic Chart

Symptom \ Cause		ABS wheel-speed sensor	Brake switch	ABS hydraulic unit assembly: Valve relay	ABS hydraulic unit assembly: Motor relay	ABS hydraulic unit assembly: Solenoid valve	ABS hydraulic unit assembly: ABS motor	ABS hydraulic unit assembly: ABS control module	G sensor (4WD)	ABS warning light	Data link connector	Mechanical system	Power supply, ground
1	ABS warning light not illuminated when ignition switch turned ON							○		○			○
2	ABS warning light remains ON	○	○	○				○	○	○			○
3	ABS warning light flashes with vehicle stopped										○		○
4	ABS warning light illuminates during driving till IG SW turned OFF				○	○	○	○	○				
5	ABS warning light illuminates/goes off with vehicle stopped and during driving									○			○
6	ABS warning light indicates normal, however, ABS does not operate correctly											○	

Symptom Troubleshooting

1	ABS WARNING LIGHT NOT ILLUMINATED WHEN IGNITION SWITCH TURNED ON		
DESCRIPTION	—		
[TROUBLESHOOTING HINTS] • Malfunction of meter • Failed warning light or open in related wiring harness			
STEP	INSPECTION		ACTION
1	With IG ON, do other indicators illuminate?	Yes	Check if failure(s) is memorized Note and check it later if necessary Go to next step
		No	Inspect meter 15 A fuse
2	Disconnect ABS CM connector. Turn IG SW ON. Does ABS warning light illuminate?	Yes	Go to next step
		No	Go to step 6
3	Connect ABS CM connector. Turn IG SW ON. Does ABS warning light illuminate?	Yes	There was a temporarily poor contact in wiring harness or connector
		No	Go to next step
4	Is terminal AN of harness connector deformed?	Yes	Replace harness connector
		No	Replace ABS CM ☞ page P–52
5	With ABS CM connector disconnected, ground terminal AN of harness connector Does ABS warning light illuminate?	Yes	Go to next step
		No	Go to step 7
6	With ABS CM connector disconnected, is there continuity between A and body GND?	Yes	Replace harness connector
		No	Repair harness
7	Is ABS warning light bulb burnt?	Yes	Replace bulb
		No	Go to next step
8	Is there continuity between AN of harness connector and 2I of meter?	Yes	Inspect meter
		No	Repair harness

Caution

- **Disconnecting and connecting the ABS CM connector must be done with the ignition switch OFF.**
- **When attaching the tester lead to the terminal of the harness connector, the SST must be used. (Refer to page P–41.)**
- **After above procedures have been completed, recheck for DTC and repair if necessary.**

Note

- If the above symptom has appeared in the past and it is normal at present, the possible cause is a temporarily poor contact in the wiring harness or connector. The ABS CM is normal.

2	ABS WARNING LIGHT REMAINS ON
DESCRIPTION	—

[TROUBLESHOOTING HINTS]
- Low battery voltage at ABS CM
- Malfunction of ABS warning light harness (short to ground)
- Malfunction of meter
- ABS CM detects a failure

STEP	INSPECTION		ACTION
1	Is battery voltage as specified?	Yes	Check if failure(s) is memorized and note it if necessary Go to next step
		No	Charge or replace if necessary
2	Verify that ABS CM connector is correctly connected. Turn IG SW ON. Does ABS warning light go off?	Yes	There was a temporarily poor contact in wiring harness or connector
		No	Go to next step
3	Disconnect ABS CM connector. Is voltage between D (voltage supply) and A (GND) terminals of harness connector at B+?	Yes	Go to next step
		No	Repair voltage supply harness
4	Are there any codes in step 1?	Yes	Follow diagnostic chart ☞ **page P–37**
		No	Go to next step
5	Disconnect ABS CM connector. Connect the **SST** (49 L066 001) and turn IG SW ON. Does ABS warning light go off?	Yes	Replace ABS CM ☞ **page P–52**
		No	Repair shirt of ABS warning light drive harness or meter

Caution
- **Disconnecting and connecting the ABS CM connector must be done with the ignition switch OFF.**
- **When attaching the tester lead to the terminal of the harness connector, the SST must be used. (Refer to page P–41.)**

Note
- If voltage between terminal D (voltage supply) and GND at ABS CM is below approx. 10 V, the ABS warning light will illuminate.

3	ABS WARNING LIGHT FLASHES WITH VEHICLE STOPPED
DESCRIPTION	ABS warning light goes off when vehicle started

[TROUBLESHOOTING HINTS]
- Terminal TBS at data link connector grounded
- Low battery voltage at ABS CM

STEP	INSPECTION		ACTION
1	Is battery voltage as specified?	Yes	Go to next step
		No	Charge or replace if necessary
2	Is there jumper wire between TBS and GND at data link connector?	Yes	Remove jumper wire
		No	Go to next step
3	Disconnect ABS CM connector. Is there continuity between terminal AD of harness connector and GND?	Yes	Repair TBS harness
		No	Replace ABS CM ☞ **page P–52**

Caution
- **Disconnecting and connecting the ABS CM connector must be done with the ignition switch OFF.**
- **When attaching the tester lead to the terminal of the harness connector, the SST must be used. (Refer to page P–41.)**

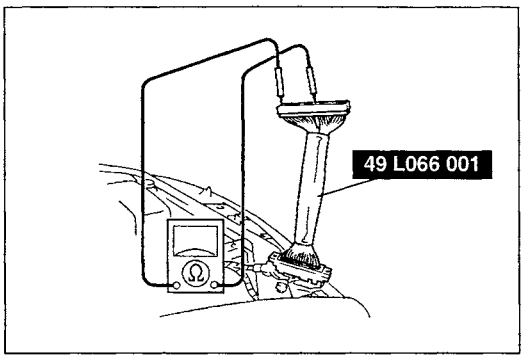
4	ABS WARNING LIGHT ILLUMINATED DURING DRIVING TILL IG SW TURNED OFF		
DESCRIPTION	If IG SW is turned ON again, ABS warning light goes off after illuminating for a few seconds		
[TROUBLESHOOTING HINTS]			
STEP	INSPECTION		ACTION
1	Activate OBD system and check for DTC. Are there any?	Yes	Read DTC and follow diagnostic chart ☞ page P–37
		No	Go to next step
2	Verify that ABS CM connector is correctly connected. Drive vehicle and recheck for symptom. Does it remain?	Yes	Replace ABS CM ☞ page P–52
		No	There was a temporarily poor contact in wiring harness or connector

5	ABS WARNING LIGHT ILLUMINATES/GOES OFF WITH VEHICLE STOPPED AND DURING DRIVING		
DESCRIPTION	—		
[TROUBLESHOOTING HINTS] • Low battery voltage at ABS CM • Malfunction of ground harness • Malfunction of ABS warning light harness (short to ground) • Malfunction of meter			
STEP	INSPECTION		ACTION
1	Check if failure(s) is memorized. Note and check if later if necessary. Disconnect ABS CM connector. Turn IG SW ON. Does ABS warning light illuminate?	Yes	Go to next step
		No	Repair ABS warning light harness or meter
2	Disconnect ABS CM connector. Is voltage between D (voltage supply) and A (GND) terminals of harness connector at B+?	Yes	Go to next step
		No	Repair voltage supply or ground harness
3	Connect ABS CM connector. Drive vehicle and recheck for symptom. Does it remain?	Yes	Replace ABS CM ☞ page P–52
		No	There was a temporarily poor contact in wiring harness or connector

Caution

- **Disconnecting and connecting the ABS CM connector must be done with the ignition switch OFF.**
- **When attaching the tester lead to the terminal of the harness connector, the SST must be used. (Refer to page P–41.)**

6	ABS WARNING LIGHT INDICATES NORMAL, HOWEVER, ABS DOES NOT OPERATE CORRECTLY		
DESCRIPTION	—		
[TROUBLESHOOTING HINTS] • Malfunction mechanical system			
STEP	INSPECTION		ACTION
1	Activate OBD system and check for DTC. Are there any?	Yes	Read DTC and follow diagnostic chart ☞ page P–37
		No	Inspect mechanical system

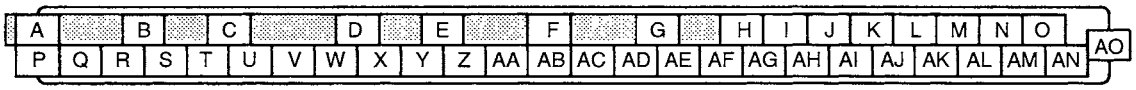


Inspection at ABS Control Module Harness Connector

Caution
- **Disconnecting and connecting the ABS CM connector must be done with the ignition switch OFF.**
- **When checking the harness connector, the SST must be used.**

1. Disconnect the ABS CM connector and connect the **SST** to the harness connector with the ignition switch OFF.
2. Attach the tester leads to the **SST** to check voltage, continuity or resistance, referring to the table below.

B+: Battery positive voltage



Terminal	Signal name	Connected to	Item	Condition	Specification	Possible cause
D	Power supply (system)	IG SW	Voltage	D—A (IG SW ON)	B+	Harness (IG SW — ABS CM connector)
				D—A (IG SW OFF)	0 V	
A	System ground	Ground point	Continuity	A—ground point	Yes	Harness (Each terminal — ground point)
				A—AN	Yes	Short plate of harness connector
V (W*) X	FR wheel speed	FR wheel-speed sensor	Voltage	V (W*)—X vehicle stopped	0 V (AC)	Harness (Sensor — ABS CM harness connector Sensor, Installation condition
				V (W*)—X when turned 1 revolution per second	0.25—1.2 V (AC)	
			Resistance	V (W*)—X	1.6 ± 0.2 kΩ	
P Q	FL wheel speed	FL wheel-speed sensor	Voltage	P—Q vehicle stopped	0 V (AC)	Harness (Sensor — ABS CM harness connector Sensor, Installation condition
				P—Q when turned 1 revolution per second	0.25—1.2 V (AC)	
			Resistance	P—Q	1.6 ± 0.2 kΩ	
T U	RR wheel speed	RR wheel-speed sensor	Voltage	T—U vehicle stopped	0 V (AC)	Harness (Sensor — ABS CM harness connector Sensor, Installation condition
				T—U when turned 1 revolution per second	0.25—1.2 V (AC)	
			Resistance	T—U	1.6 ± 0.2 kΩ	
R S	RL wheel speed	RL wheel-speed sensor	Voltage	R—S vehicle stopped	0 V (AC)	Harness (Sensor — ABS CM harness connector Sensor, Installation condition
				R—S when turned 1 revolution per second	0.25—1.2 V (AC)	
			Resistance	R—S	1.6 ± 0.2 kΩ	

*4WD

B+: Battery positive voltage

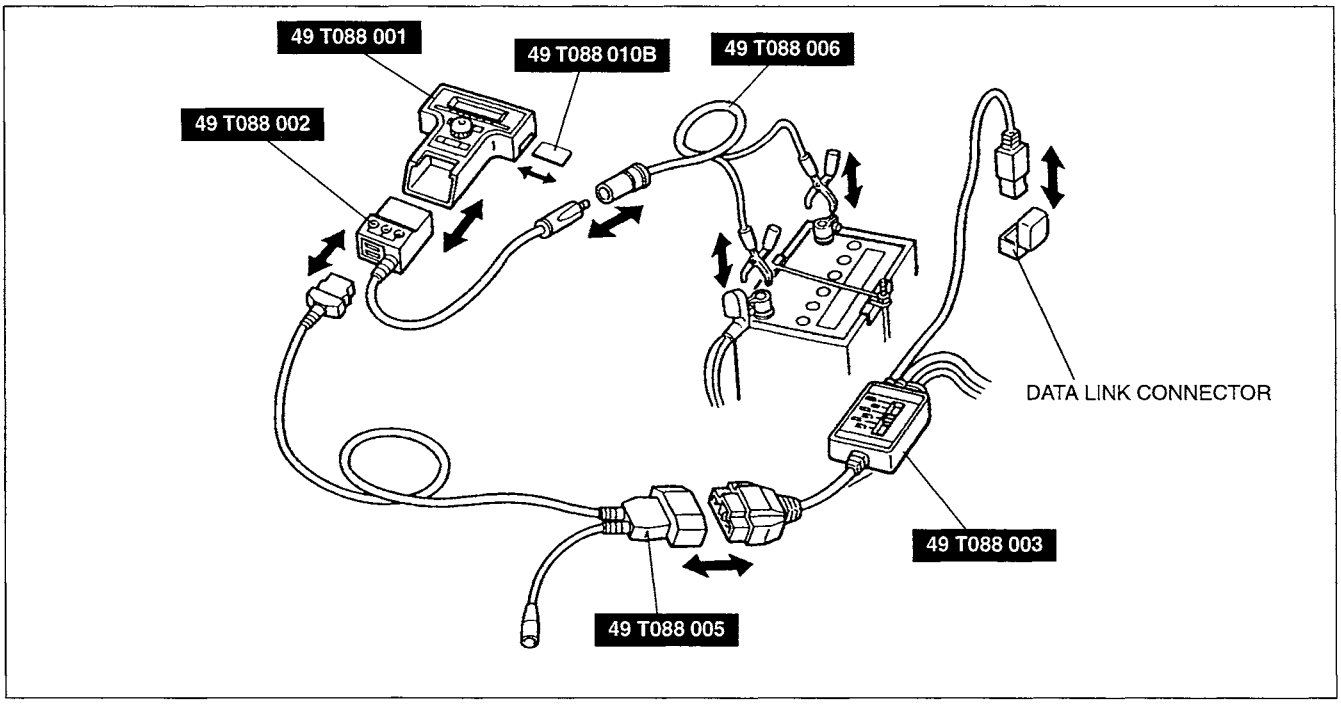
Terminal	Signal name	Connected to	Item	Condition	Specification	Possible cause
AD	On-board diagnosis TBS	Data link connector TBS	Continuity	AD—A	No	Harness (AD — TBS at DLC)
				AD—D (IG SW ON)	No	
				AD—TBS at DLC	Yes	
AC	On-board diagnosis FBS	Data link connector FBS	Continuity	AC—A	No	Harness (AC — FBS at DLC)
				AC—D (IG SW ON)	No	
				AC—FBS at DLC	Yes	
AN	Warning light	ABS warning light	Continuity	AN—A (IG SW OFF)	Yes	Harness (AN — meter, meter — IG SW) Meter
				AN—D (IG SW OFF)	No	
			Voltage	AN—A (IG SW ON)	B+	
AB	Brake switch	Brake switch	Voltage	When brake pedal depressed (IG SW ON)	B+	Harness (AV — brake sw) (when brake light normal) Brake switch
				When brake pedal released (IG SW ON)	0 V	
B	Motor (power supply)	Motor (power supply)	Voltage	B—A	B+	Harness (B — battery) ABS 60 A fuse
C	Solenoid valve (power supply)	Solenoid valve (power supply)	Voltage	C—A	B+	Harness (C — battery) ABS 20 A fuse
AF*	G sensor (power supply)	G sensor	Inspection not possible due to connection of connector end			—
H*	G sensor (ground)					
AG*	G sensor (signal)					

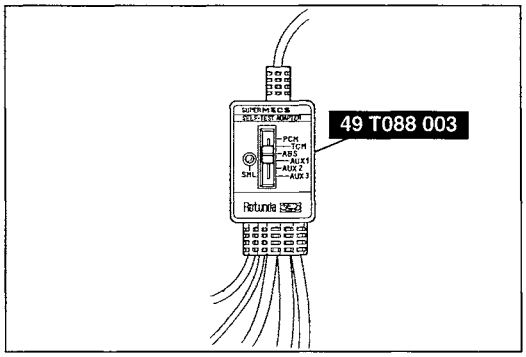
*4WD only

ON-BOARD DIAGNOSTIC FUNCTION
On-Board Diagnostic System
Inspection by diagnostic test mode
Outline

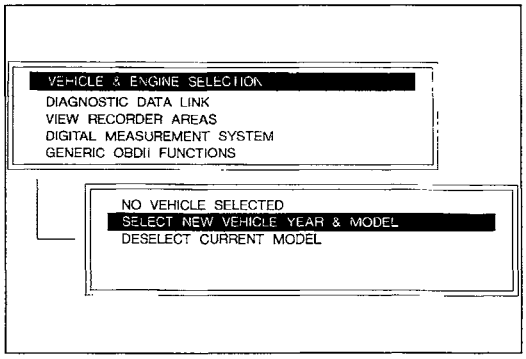
- The ABS control module contains an on-board diagnostic and memory functions to detect and indicate present and past failures.
  Read and note the diagnostic indications by using the **SST**, and take action according to the Diagnostic Trouble Code Table. (Refer to page P–45.)
- The ABS CM has a nonvolatile memory. Diagnostic trouble codes are not erased if the battery is disconnected. The memory should be cleared when servicing is finished. (Refer to page P–44.)

Inspection using NGS

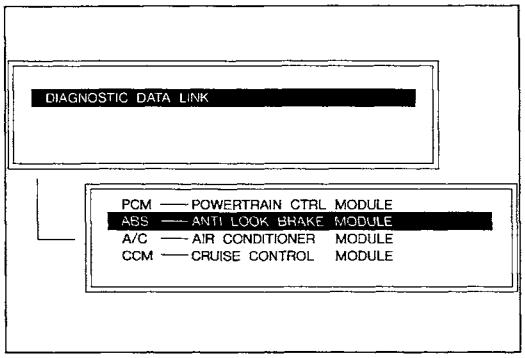




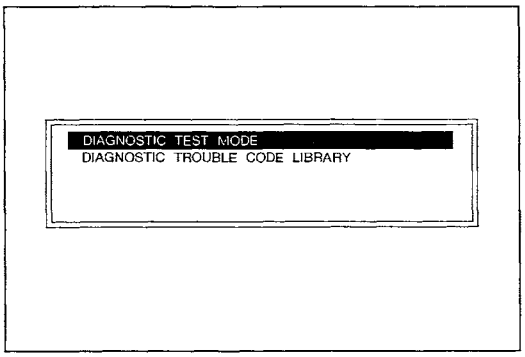
1. Connect the **SST** (NGS) to the data link connector and battery.
2. Set the **SST** (Super MECS Adapter) to ABS.



3. Select "VEHICLE & ENGINE SELECTION" on the **SST** (Control Unit) display, and then select the vehicle model, engine type, and model year.



4. Select "DIAGNOSTIC DATA LINK" on the **SST** (Control Unit) display.
5. Select "ANTI LOCK BRAKE MODULE" on the **SST** (Control Unit) display.



6. Select "DIAGNOSTIC TEST MODE" on the **SST** (Control Unit) display.
7. (1) If a trouble code is displayed, refer to the Diagnostic trouble code table (Refer to page P–47.) and inspect the appropriate system area.
   (2) If "No codes received" is displayed, the system areas shown in the Diagnostic trouble code table are okay. Inspect another system area.

Memory cancel

The ABS control module has a nonvolatile memory. Diagnostic trouble codes are not erased if the battery is disconnected. The memory should be cleared when servicing is finished.
Diagnostic trouble codes memorized in the ABS control module are canceled by performing the following steps.

1. Connect the TBS terminal to GND at the data link connector.
2. Turn the ignition switch ON.
3. Output all memorized codes.
4. After verifying that the first code is repeated, depress the brake pedal 10 times at intervals of less than **one second (1 sec.)**.
   Diagnostic trouble codes cannot be canceled if the following occur.
   - If intervals of depressing the brake pedal exceed **one second (1 sec.)**.
   - Brake switch has failed.

   While performing the memory cancel operation, the ABS warning light is not illuminated.
   When the memory cancel operation is completed, the ABS warning light comes on for **2—3 seconds**, then goes off.
   After the memory is canceled, the ABS control module performs on-board diagnosis.

Diagnostic Trouble Code Table

DTC	Display on the NGS	Diagnosis system component		page
03*1	G SENSOR — OPEN OR SHORT, DEFECT	G sensor		P–46
05	BRAKE SW, MONITOR LINE — OPEN OR SHORT	Brake switch		P–46
11	WSS (RH-FRONT) — OPEN OR SHORT	FR	ABS wheel-speed sensor	P–46
12	WSS (LH-FRONT) — OPEN OR SHORT	FL		
13	WSS (RH-REAR) — OPEN OR SHORT	RR		
14	WSS (LH-REAR) — OPEN OR SHORT	RL		
15	WSS, SR — OPEN OR SHORT	One of the four wheel-speed sensors and sensor rotors		P–47
22	AV SOL, V (RH-FRONT) — OPEN OR SHORT	FR (AV)*2	Solenoid valve	P–47
23	EV SOL, V (RH-FRONT) — OPEN OR SHORT	FR (EV)*3		
24	AV SOL, V (LH-FRONT) — OPEN OR SHORT	FL (AV)*2		
25	EV SOL, V (LH-FRONT) — OPEN OR SHORT	FL (EV)*3		
26	AV SOL, V (REAR) — OPEN OR SHORT	R (AV)*2		
27	EV SOL, V (REAR) — OPEN OR SHORT	R (EV)*3		
41	WSS, SR (RH-FRONT) — MALFUNCTION, GND SHORT	FR	ABS wheel-speed sensor ABS sensor rotor	P–48
42	WSS, SR (LH-FRONT) — MALFUNCTION, GND SHORT	FL		
43	WSS, SR (RH-REAR) — MALFUNCTION, GND SHORT	RR		
44	WSS, SR (LH-REAR) — MALFUNCTION, GND SHORT	RL		
51	FAIL SAFE RELAY — OPEN OR HSORT	Valve relay		P–48
53	MOTOR, MOTOR RELAY — OPEN OR SHORT	ABS motor, motor relay		P–49
61	ABS CONTROL UNIT — DEFECT	ABS control module		P–49
63	POWER SUPPLY, GROUND — MALFUNCTION	Power supply, ground		P–49

*1 4WD only
*2AV: Pressure retention valve
*3EV: Pressure reduction valve

Diagnostic chart

Diagnostic trouble code No.03	G sensor		
Possible cause	• Malfunction of G sensor • Malfunction of related wiring harness		
STEP	**INSPECTION**		**ACTION**
1	Is ABS CM connector connected properly?	Yes	Go to next step
		No	Correct as necessary
2	Is G sensor OK? ☞ **page P–55**	Yes	Repair harness
		No	Replace G sensor ☞ **page P–55**
3	Erase diagnostic trouble code, and recheck for diagnostic trouble codes Is diagnostic trouble code 03 obtained?	Yes	Replace ABS CM ☞ **page P–52**
		No	There was temporarily poor contact in wiring harness or connector

Diagnostic trouble code No.05	Brake switch		
Possible cause	• Malfunction of related wiring harness		
STEP	**INSPECTION**		**ACTION**
1	Inspect harness between brake light and ABS CM. • Open circuit Is harness normal?	Yes	Go to next step
		No	Repair harness
2	Erase diagnostic trouble code, and recheck for diagnostic trouble codes. Is diagnostic trouble code 05 obtained?	Yes	Replace ABS CM ☞ **page P–52**
		No	There was temporarily poor contact in wiring harness or connector

Diagnostic trouble codes No.11—14	ABS wheel-speed sensor (11: Right front 12: Left front 13: Right rear 14: Left rear)		
Possible cause	• Malfunction of related wiring harness		
STEP	**INSPECTION**		**ACTION**
1	Is ABS CM connector connected properly?	Yes	Go to next step
		No	Correct as necessary
2	Is wiring harness between ABS CM and wheel-speed sensor OK?	Yes	Go to next step
		No	Repair harness
3	Is ABS wheel-speed sensor OK? **Resistance: 1.4—1.8 kΩ** **Voltage: 0 V (AC) (When stopped)** ☞ **page P–53**	Yes	Go to next step
		No	Replace ABS wheel-speed sensor
4	Erase diagnostic trouble code, and recheck for diagnostic trouble codes. Is diagnostic trouble codes 11—14 obtained?	Yes	Replace ABS CM ☞ **page P–52**
		No	There was temporarily poor contact in wiring harness or connector

Diagnostic trouble code No.15	ABS wheel-sensor, sensor rotor
Possible cause	• There are missing or damaged teeth on sensor rotor • ABS wheel-speed sensor improperly installed • HU inoperable due to low pressure • Different size tires are used

STEP	INSPECTION		ACTION
1	Refer to Diagnostic trouble code 41—44 (step 3, 4, and 5) chart for each of the four wheel-speed sensors Is it OK?	Yes	Go to next step
		No	Inspect according to step for diagnostic trouble code 41—44
2	Inspect ABS HU assembly ☞ page P–51 Is ABS HU assembly and brake line OK?	Yes	Go to next step
		No	Replace ABS HU assembly or repair brake line
3	Repair malfunction, then erase diagnostic trouble code and recheck for diagnostic trouble codes after driving over 10 km/h { 6.2 MPH } Is diagnostic trouble code 15 obtained?	Yes	Replace ABS CM ☞ page P–52
		No	There was a temporarily poor contact in wiring harness or connector

Diagnostic trouble codes No.22—27	Solenoid valve (22: Right front AV 23: Right front EV 24: Left front AV 25: Left front EV 26: Rear AV 27: Rear EV)
Possible cause	• Malfunction of solenoid valve • Malfunction of related wiring harness

STEP	INSPECTION		ACTION
1	Is ABS CM connector connected properly?	Yes	Go to next step
		No	Correct as necessary
2	Erase diagnostic trouble code, and recheck for diagnostic trouble codes. Are diagnostic trouble codes 22—27 obtained?	Yes	Replace ABS HU assembly ☞ page P–50
		No	There was temporarily poor contact in wiring harness or connector

Diagnostic trouble codes No.41—44	ABS wheel-speed sensor, sensor rotor (41: Right front 42: Left front 43: Right rear 44: Left rear)
Possible cause	• Ground short in ABS wheel-speed sensor • There are missing or damaged teeth on sensor rotor • ABS wheel-speed sensor improperly installed

STEP	INSPECTION		ACTION
1	Is ABS CM connector connected properly?	Yes	Go to next step
		No	Correct as necessary
2	Is wiring harness between ABS CM and wheel-speed sensor OK?	Yes	Go to next step
		No	Correct as necessary
3	Is ABS wheel-speed sensor (resistance) OK? **Resistance: 1.4—1.8 kΩ** **☞ page P–53**	Yes	Go to next step
		No	Replace ABS wheel-speed sensor **☞ page P–53, 54**
4	Is ABS wheel-speed sensor (output voltage) OK? **Voltage: 0.25—1.2 V (AC)** **(When turned 1 revolution per second)** **☞ page P–53**	Yes	Go to next step
		No	Adjust the sensor installation and/or the sensor clearance
5	Are there missing or damaged teeth on sensor rotor?	Yes	Replace sensor rotor
		No	Go to next step
6	Erase diagnostic trouble code, and recheck for diagnostic trouble codes after driving over 10 km/h { 6.2 MPH } Are diagnostic trouble codes 41—44 obtained?	Yes	Replace ABS CM **☞ page P–52**
		No	There was temporarily poor contact in wiring harness or connector

Note

- There are occasions when the ABS warning light does not go off. When the ignition switch is turned to ON after a short to ground malfunction has been repaired. If this should occur, drive the vehicle faster than 10 km/h { 6.2 MPH } , clean the service codes, and verify that the ABS warning light has gone out.

Diagnostic trouble code No.51	Valve relay
Possible cause	• Malfunction of valve relay • Malfunction of related wiring harness

STEP	INSPECTION		ACTION
1	Is ABS fuse (20 A) OK?	Yes	Go to next step
		No	Replace fuse
2	Erase diagnostic trouble code, and recheck for diagnostic trouble codes. Is diagnostic trouble code 51 obtained?	Yes	Replace ABS CM **☞ page P–52**
		No	Check C and D terminal (power supply) of ABS CM, A terminal (ground) harness, and for poor connector connections

Diagnostic trouble code No.53	ABS motor, motor relay
Possible cause	• Malfunction of ABS motor or motor relay • Malfunction of related wiring harness

STEP	INSPECTION		ACTION
1	With IG SW OFF, is motor operating?	Yes	Replace ABS HU assembly ☞ page P–50
		No	Go to next step
2	Is ABS fuse (60 A) OK?	Yes	Go to next step
		No	Replace fuse
3	Inspect ABS motor ground harness Is it OK?	Yes	Go to next step
		No	Correct harness as necessary
4	Erase diagnostic trouble code, and recheck for diagnostic trouble codes after driving over 10 km/h { 6.2 MPH } Is diagnostic trouble code 53 obtained?	Yes	Replace ABS CM ☞ page P–52
		No	Check B and D terminal (power supply) of ABS CM, A terminal (ground) harness, and for poor connector connections

Diagnostic trouble code No.61	ABS control module
Possible cause	• Malfunction of ABS control module

STEP	INSPECTION		ACTION
1	Is ABS CM connector connected properly?	Yes	Go to next step
		No	Correct as necessary
2	Erase diagnostic trouble code, and recheck for diagnostic trouble codes. Is diagnostic trouble code 61 obtained?	Yes	Replace ABS CM ☞ page P–52
		No	There was temporarily poor contact in wiring harness or connector

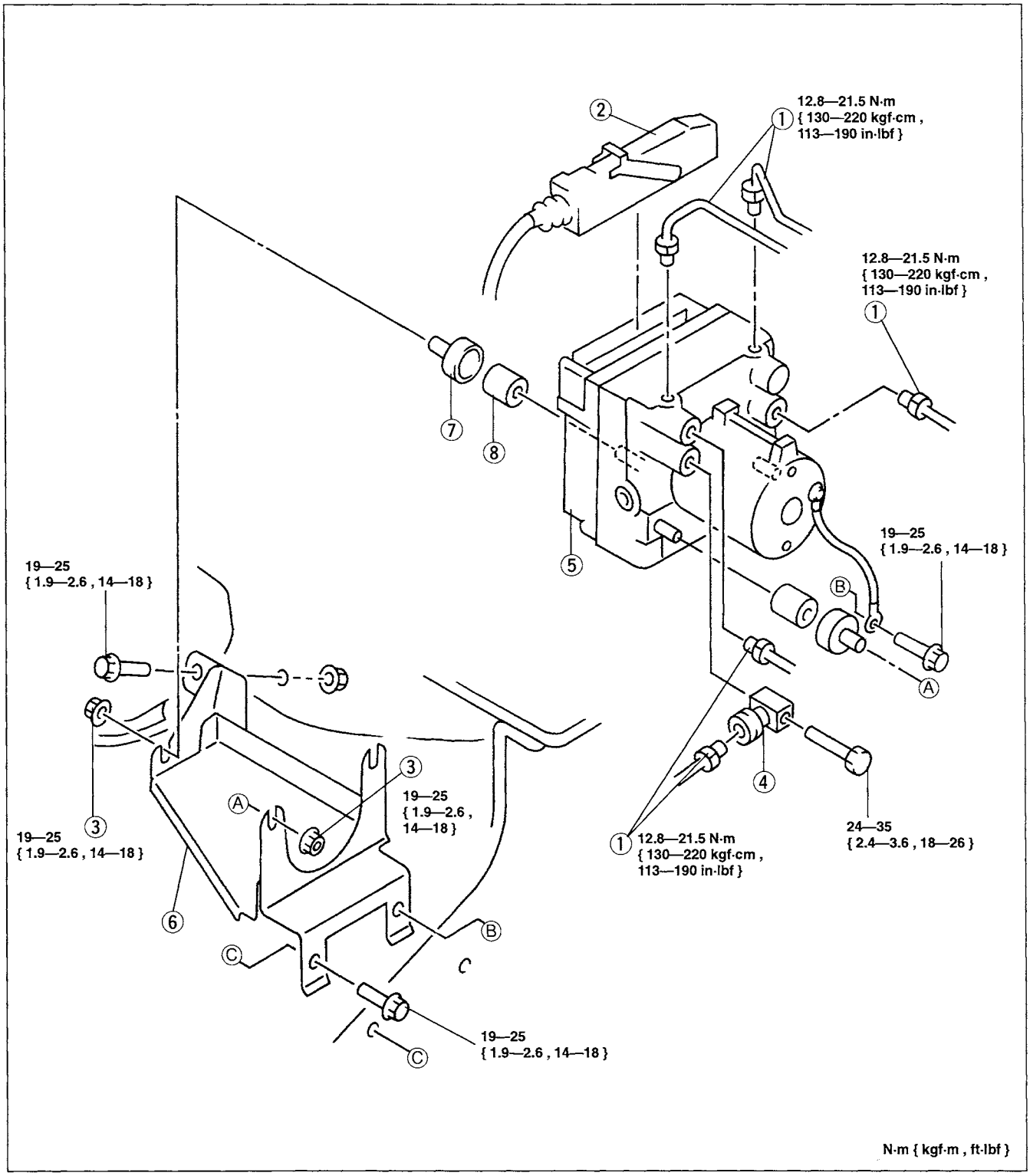
Diagnostic trouble code No.63	Power supply
Possible cause	• Trouble in harness between ground and ABS HU assembly • Trouble in harness between battery and ABS HU assembly • Deleted battery

STEP	INSPECTION		ACTION
1	Is battery terminal voltage OK?	Yes	Go to next step
		No	Charge or replace of battery
2	Is battery terminal connection OK? (When IG SW OFF)	Yes	Go to next step
		No	Tighten the battery terminal
3	Check connection of D terminal (power supply) and A terminal (ground) connector pins for ABS CM Is it OK?	Yes	Go to next step
		No	Repair ABS CM connector
4	Is voltage of ABS CM harness between D terminal (power supply) and A terminal (ground) 10—15 V when starting engine?	Yes	Go to next step
		No	Repair power supply harness or ground harness
5	Erase diagnostic trouble code, and recheck for diagnostic trouble codes after driving over 6 km/h { 3.7 MPH } Is diagnostic trouble code 63 obtained?	Yes	Replace ABS CM ☞ page P–52
		No	There was temporarily low battery voltage and battery capacity should be checked if this occurs frequently

ABS HYDRAULIC UNIT ASSEMBLY (ABS HU ASSEMBLY)

Removal / Inspection / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.

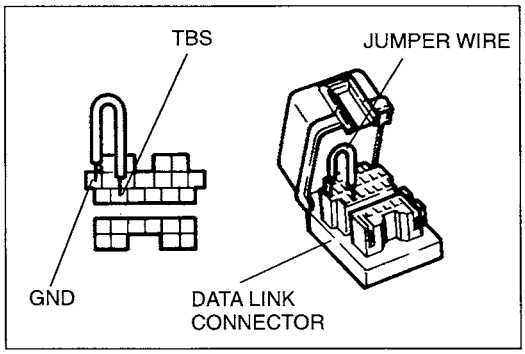


1. Brake pipes
2. Connector
3. Nuts
4. Brake pipe connector
5. ABS hydraulic unit assembly
   Inspection (on-vehicle) . . . . . page P–51
   Disassembly / Assembly . . . . . page P–52
6. Bracket
7. Casing
8. Mount rubber

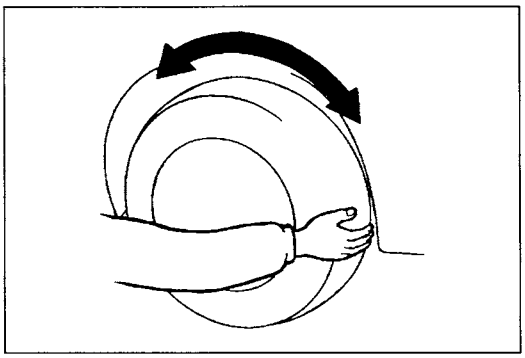
Inspection (on-vehicle)
ABS hydraulic unit assembly
System inspection

Note
- If a past diagnostic trouble code(s) is memorized, the system inspection mode will not work. Make sure that there is no code(s) in the ABS memory before doing this inspection

1. Verify that the battery is fully charged.
   With the ignition switch to ON, verify that the ABS warning light goes out after **2—4 seconds**.
2. If the light stays ON after **2—4 seconds** the ABS control module detects a failure and will not activate the ABS hydraulic unit. Follow the troubleshooting procedures.
3. Turn the ignition switch to OFF.

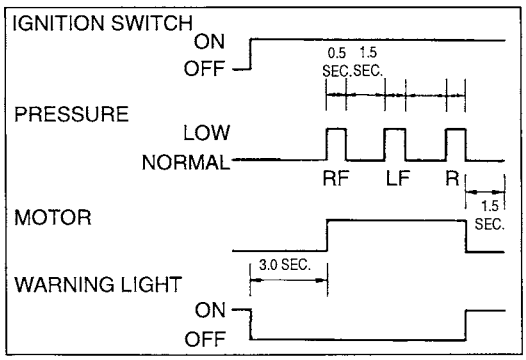


4. On level ground, jack up the vehicle and support it evenly on safety stands. Shift the transmission to neutral or N position.
5. Release the parking brake.
6. Rotate the wheels by hand, and inspect for brake drag.
7. Using a jumper wire, connect the TBS and GND terminals of the data link connector.
8. Depress the brake pedal, and have an assistant verify that the right front wheel will not turn.



9. With the brake pedal still depressed, turn the ignition switch to ON and verify that the brake is released momentarily (approx. **0.5 sec**.) and that the wheel turns when pressure-reduction operates.
10. Check the operation of the remaining wheels in order: left front, right rear, left rear.
11. If steps 9 and 10 show correct operation, the following systems are OK:
    - Brake piping to ABS hydraulic unit assembly
    - Braking system, including ABS hydraulic unit assembly
    - Electrical system in ABS hydraulic unit assembly (solenoid, ABS motor, etc.)
    - ABS control module, its output system (solenoid, relay, etc.) and harness.

    The following are not checked with the above steps.
    - Input system and harness of ABS hydraulic unit assembly
    - Intermittent failure
    - Fluid leakage



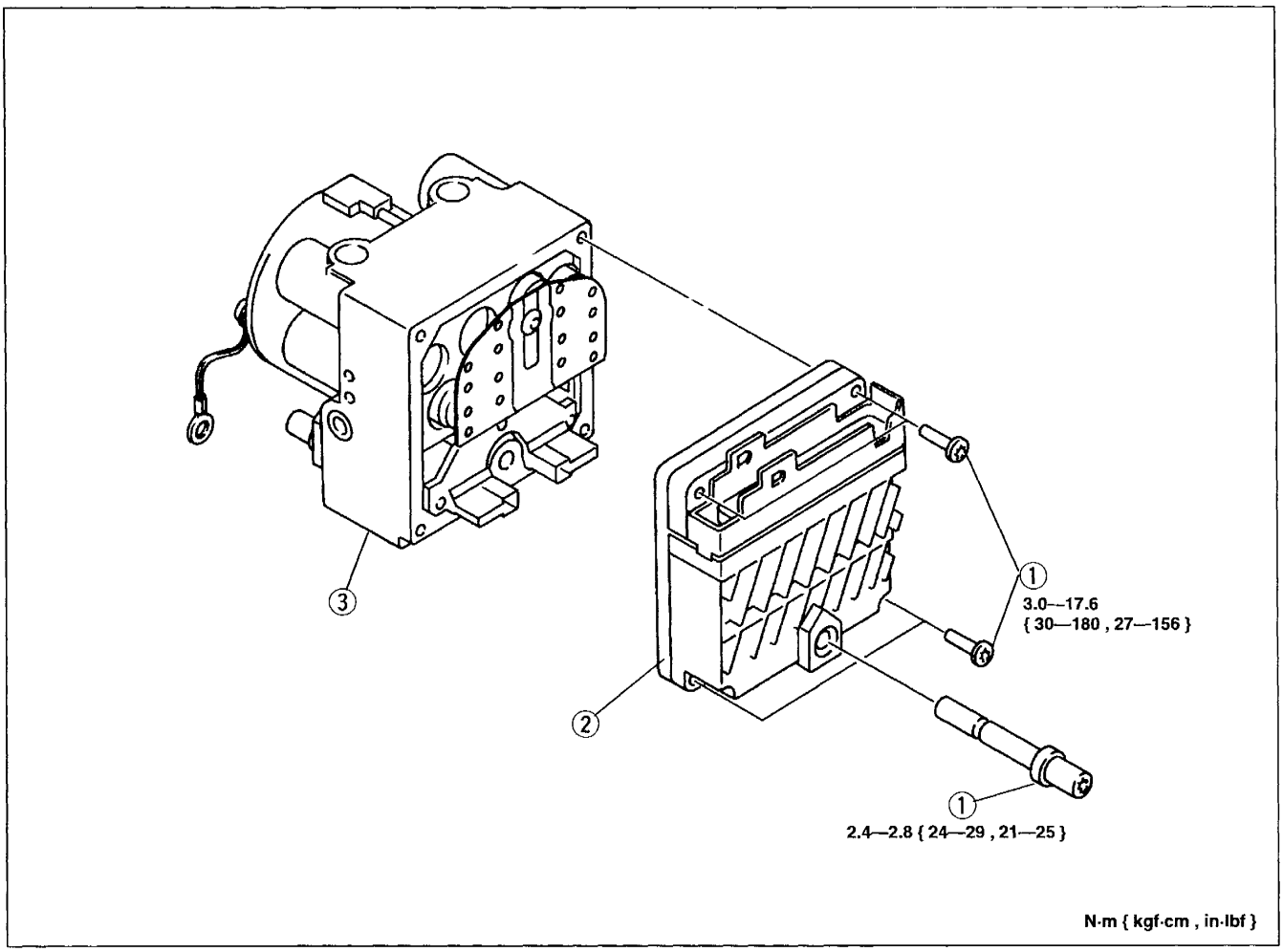
12. Replace the ABS hydraulic unit assembly if necessary.
13. Replace the jumper wire.

Disassembly / Assembly

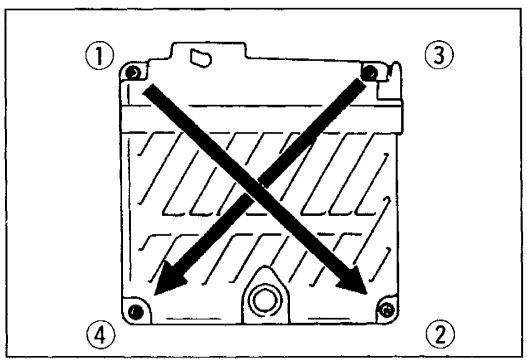
1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.

Caution

- **If the ABS control module is malfunctioning or is not operating properly, replace it with a new one. The precision parts are easily damaged and if any repairs to the module is attempted, other malfunctions in the system may result.**
- **Do not replace the ABS control module outside in rainy weather or when the humidity is high. Moisture and high humidity have a negative effect on the precision parts which could become the cause of malfunctions in the system.**



1. Bolts
2. ABS control module
   Assembly Note ..... Below
3. ABS hydraulic unit



Assembly note
ABS control module

Caution

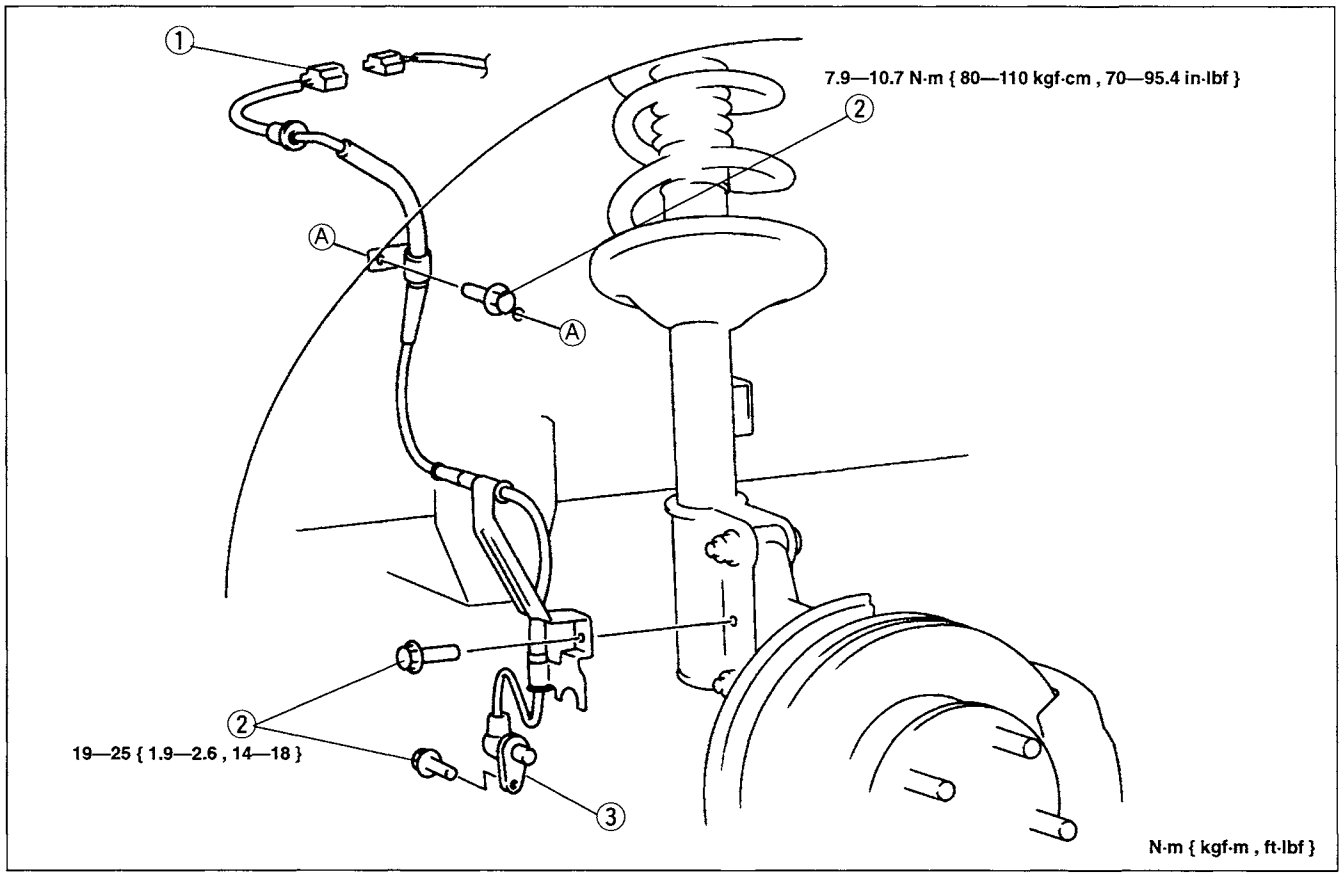
- **Handle the ABS hydraulic unit carefully. If any of the precision parts are damaged, if may become the cause of malfunctions in the system.**

1. Check that the two central connectors are securely connected, then install the ABS control module to the ABS hydraulic unit.
2. Tighten the bolts in the order shown in the figure.

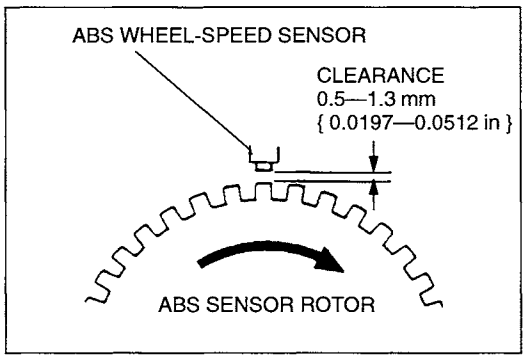
ABS WHEEL-SPEED SENSOR (FRONT)

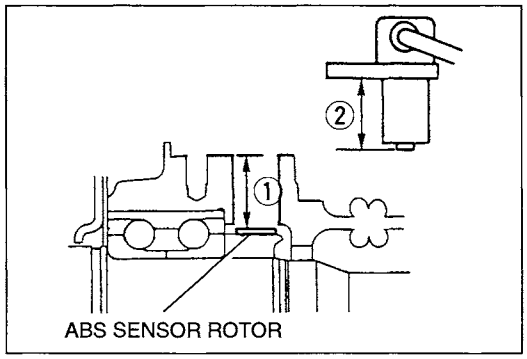
Removal / Inspection / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Connector
2. Bolt
3. ABS wheel-speed sensor
   Inspection (on-vehicle) ..... below





Inspection (on-vehicle)

Remove the wheel and tire, and inspect the sensor for looseness and damage. Replace the sensor if necessary.

Clearance inspection

Front

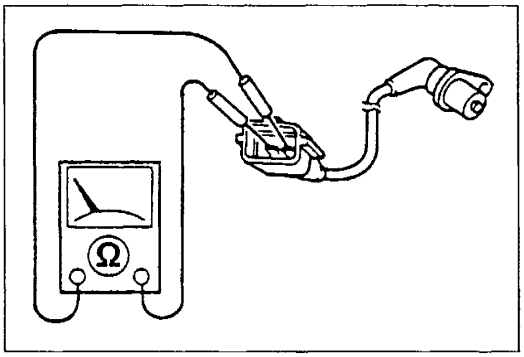
Check the clearance between the wheel-speed sensor and the sensor rotor.

Clearance: 0.5—1.3 mm { 0.0197—0.0512 in }

Rear

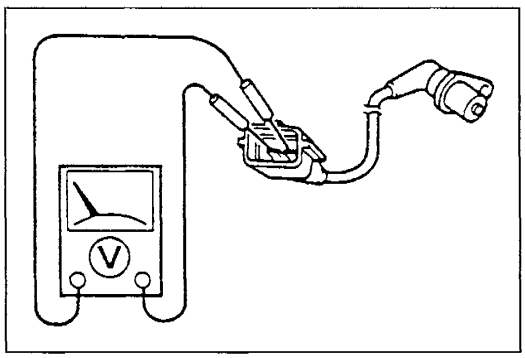
1. Remove the ABS wheel-speed sensor.
2. Measure ① and ② shown in the figure by using calipers.
3. Subtract ② from ①, then verify the clearance between the ABS wheel-speed sensor and the sensor rotor.

Clearance ①—②: 0.3—1.1 mm { 0.0119—0.0433 in }



Resistance of ABS wheel-speed sensor
1. Disconnect the ABS wheel-speed sensor connector.
2. Check the resistance at the ABS wheel-speed sensor.

Resistance: 1.4—1.8 kΩ

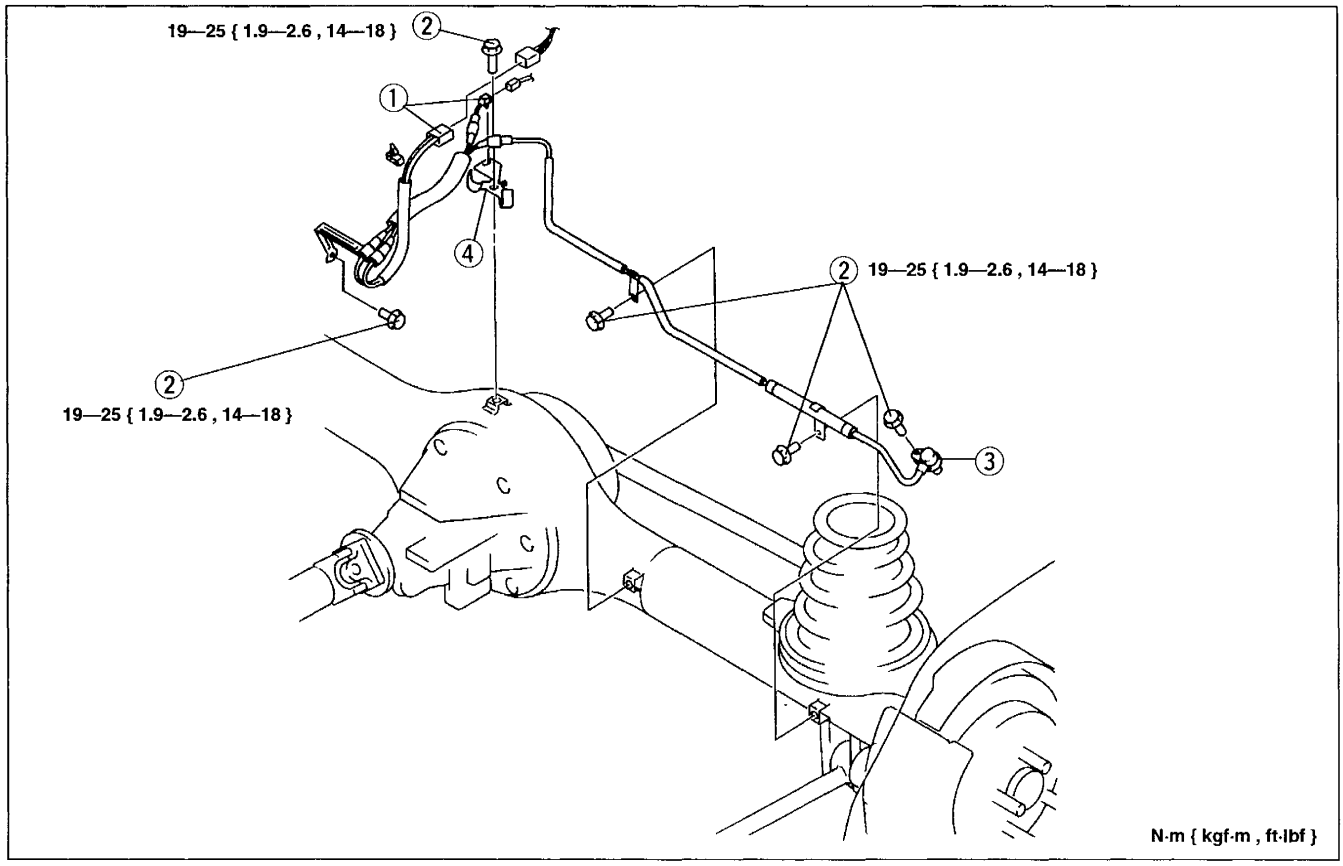


Voltage of ABS wheel-speed sensor
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Check each wheel by rotating it at one revolution per second.

Voltage: 0.25—1.2 V (AC)

4. If not as specified, replace the ABS wheel-speed sensor or sensor rotor as necessary.

ABS WHEEL-SPEED SENSOR (REAR)
Removal / Inspection / Installation
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Connector
2. Bolt
3. ABS wheel-speed sensor
   Inspection (on-vehicle) . . . . . page P–53
4. Bracket

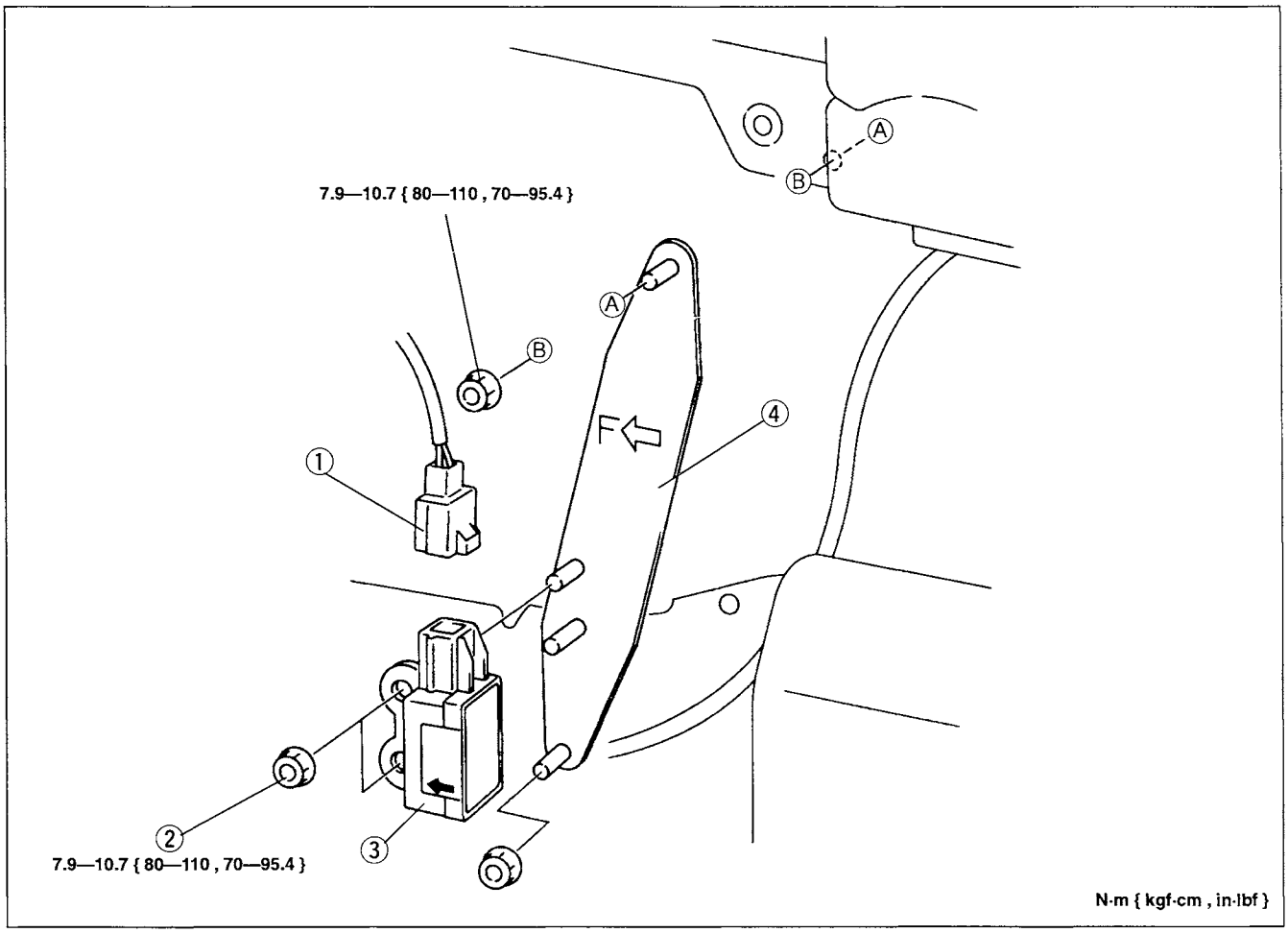
G SENSOR (4WD)

Removal / Inspection / Installation

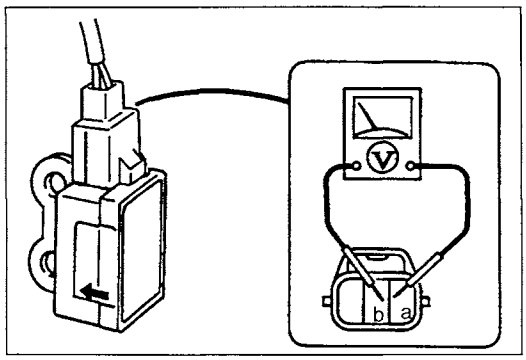
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.

Caution

- **Do not drop the G sensor or impose strong shock to it.**



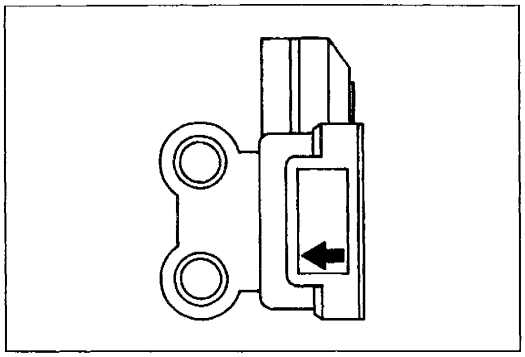
1. Connector
2. Nut
3. G sensor
   Inspection ..... below
4. Bracket



Inspection

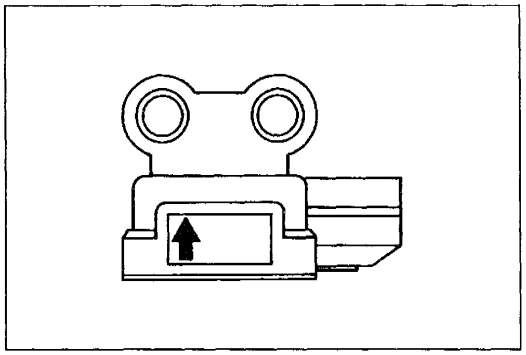
G sensor

Turn the ignition switch to ON, then measure the voltage between the output terminal (b) and ground terminal (a) of the G sensor connector as shown on the following page.



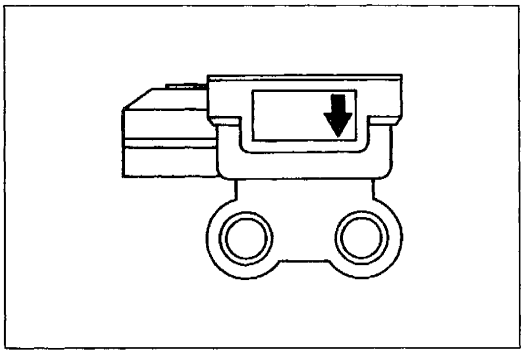
(1) Level condition

Voltage: 2.4—2.6 V



(2) G sensor vertical (arrow up)

Voltage: 1.3—1.7 V



(3) G sensor vertical (arrow down)

Voltage: 3.3—3.7 V

If not as specified, replace the G sensor.

WHEELS AND TIRES

OUTLINE

SPECIFICATIONS

Standard tire

Item			Specification		
Wheel	Size		15×5 1/2JJ	15×6JJ	
	Offset	mm { in }	40 { 1.57 }		
	Pitch circle diameter	mm { in }	114.3 { 4.50 }		
	Material		Steel	Steel or Aluminum alloy	
Tire	Size		P195/75R15	P215/65R15	P215/70R15
	Air pressure	kPa { kgf/cm^2 , psi }	240 { 2.4 , 35 }		220 { 2.2 , 32 }

Temporary spare tire

Item			Specification
Wheel	Size		15×4T
	Offset	mm { in }	45 { 1.77 }
	Pitch circle diameter	mm { in }	114.3 { 4.50 }
	Material		Steel
Tire	Size		T135/70D15
	Air pressure	kPa { kgf/cm^2 , psi }	415 { 4.2 , 60 }

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Excessive or irregular tire wear	Refer to page Q–4 for details.		
Premature tire wear	Incorrect tire pressure	Adjust	Q–2
Tire squeal	Incorrect tire pressure Tire deterioration	Adjust Replace	Q–2 —
Road noise or body vibration	Insufficient tire pressure Unbalanced wheel(s) Deformed wheel(s) or tire(s) Irregular tire wear	Adjust Adjust Repair or replace Replace	Q–2 Q–5 — —
"Shake" occurs (Steering wheel vibrates up/down)	Excessive tire and wheel runout Loose lug nuts Unbalanced wheel(s) Cracked or worn engine mount rubber Cracked or worn transmission mount rubber	Replace Tighten Adjust or replace Replace Replace	— Q–4 Q–5 section B section K1
"Shimmy" occurs (Steering wheel vibrates circumferentially)	Cracked or worn steering gear mount rubber Loose steering gear mounting bolts Stuck or damaged steering ball joint Excessive tire and wheel runout Loose lug nuts Unbalanced wheel(s) Insufficient tire pressure Unevenly worn tires Malfunction of shock absorber Loose shock absorber mounting bolts Struck or damaged lower arm ball joint Cracked or worn suspension bushings Damaged or worn front wheel bearing Improperly adjusted front wheel alignment	Replace Tighten Replace Replace Tighten Adjust or replace Adjust Replace Replace Tighten Replace Replace Replace Adjust	section N section N section N — Q–4 Q–5 Q–2 — section R section R section R section R section M section R
Uneven (one-sided) braking	Unequal tire pressures	Adjust	Q–2

Problem	Possible Cause	Remedy	Page
Steering wheel doesn't return properly or pulls to either left or right	Incorrect tire pressure Irregular tire wear (left/right) Unequal tire pressures Different types or brands of tires mixed (left/right) Loose lug nuts	Adjust Replace Adjust Replace Tighten	Q–2 — Q–2 — Q–4
General driving instability	Unequal tire pressures Damaged or unbalanced wheel(s) Loose lug nuts	Adjust Replace or adjust Tighten	Q–2 Q–5 Q–4
Excessive steering wheel play	Loose lug nuts	Tighten	Q–4

WHEELS AND TIRES

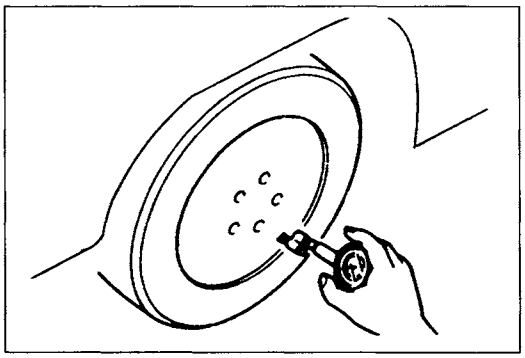
SPECIAL NOTES ABOUT WHEELS AND TIRES

1. Do not use wheels or tires other than the specified types.
2. Aluminum wheels are easily scratched. When washing them, use a soft cloth, never a wire brush. If the vehicle is steam cleaned, do not allow boiling water to contact the wheels.
3. If alkaline compounds (such as saltwater or road salts) get on aluminum wheels, wash them as soon as possible to prevent damage. Use only a neutral detergent.

NOTES REGARDING TIRE REPLACEMENT

Note the following points when the tires are to be removed from or mounted onto the wheels.

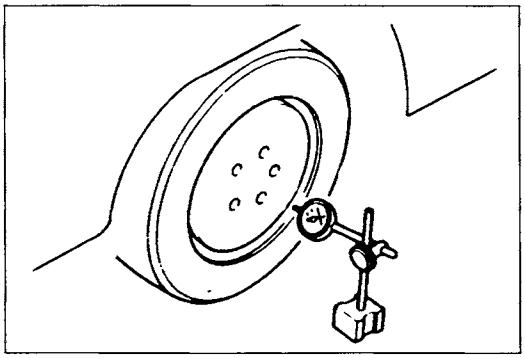
1. Be careful not to damage the tire bead, the rim bead, or the edge of the rim.
2. Apply a soapy solution to the tire bead and the edge of the rim.
3. Use a wire brush, sandpaper, or cloth to clean and remove all rust and dirt from the rim edge and the rim bead. For aluminum wheels, use only a cloth for this purpose; never use a wire brush or sandpaper.
4. Remove any pebbles, glass, nails, and other foreign items embedded in the tire tread.
5. Be sure the air valve is installed correctly.
6. After mounting a tire onto a wheel, inflate the tire to **250—300 kPa { 2.55—3.06 kgf/cm^2 , 36.27—43.51 psi }**. Check to be sure that the bead is seated correctly onto the rim and that there are no air leaks. Then reduce the pressure to the specified level.
7. If a tire iron is used to change a tire on an aluminum wheel, be sure to use a piece of rubber between the iron lever and the wheel to avoid damage to the wheel. Work should be done on a rubber mat, not on a hard or rough surface.



INSPECTION / ADJUSTMENT

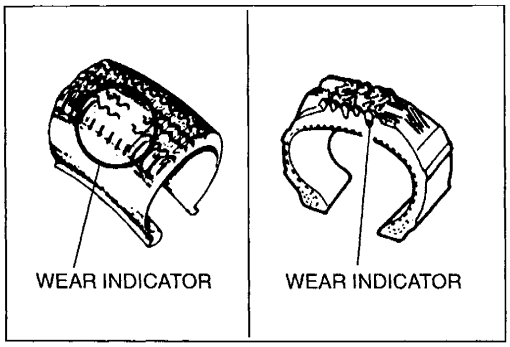
Perform the following inspection and adjust or replace as necessary.

1. Air pressure
   Check the air pressure of all tires when they are cold, including the spare tire, with an air pressure gauge.
   (Refer to page Q–2.)



2. Wheel runout
   Set a dial indicator against the wheel. Turn the wheel one full revolution and check wheel runout.

   Wheel runout limit: Horizontal 2.0 mm { 0.079 in }
   Vertical 1.5 mm { 0.059 in }

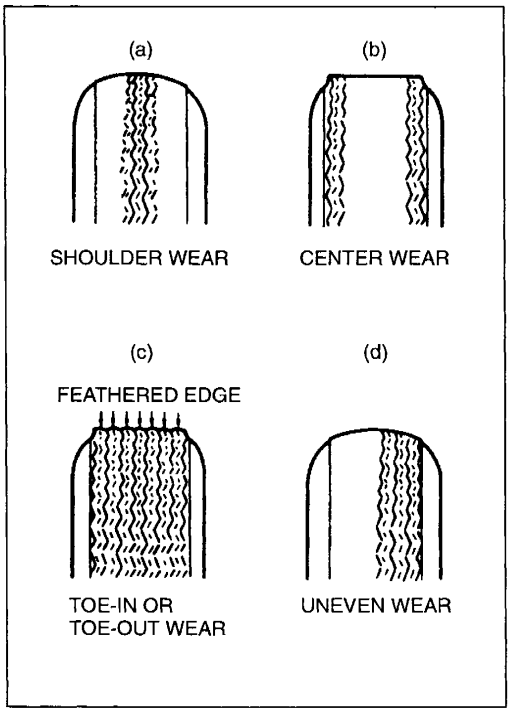


3. Inspect for tire wear

Specifications

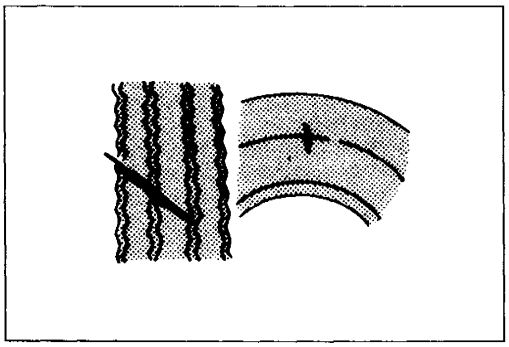
Remaining tread
Ordinary tires: 1.6 mm { 0.063 in } min.
(Tire should be replaced if wear indicators are exposed.)

Snow tires: 50% of tread
(Tire should be replaced if wear indicators are exposed.)

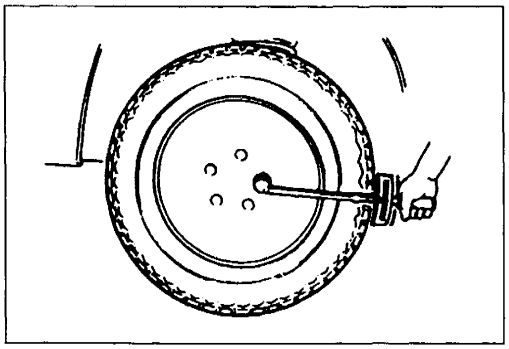


Troubleshooting guide
Abnormal tire wear patterns shown in the illustration can occur. Refer to the chart for the possible causes and remedies.

	Possible cause	Remedy
(a)	•Underinflation (both sides worn) •Incorrect camber (one side worn) •Hard cornering •Lack of rotation	•Measure and adjust pressure •Repair or replace axle and suspension parts •Reduce speed •Rotate tires
(b)	•Overinflation •Lack of rotation	•Measure and adjust pressure •Rotate tires
(c)	•Incorrect toe-in	•Adjust toe-in
(d)	•Incorrect camber or caster •Malfunctioning suspension •Unbalanced wheel •Out-of-round brake drum or disc •Other mechanical conditions •Lack of rotation	•Repair or replace axle and suspension parts •Repair or replace •Balance or replace •Correct or replace •Correct or replace •Rotate tires



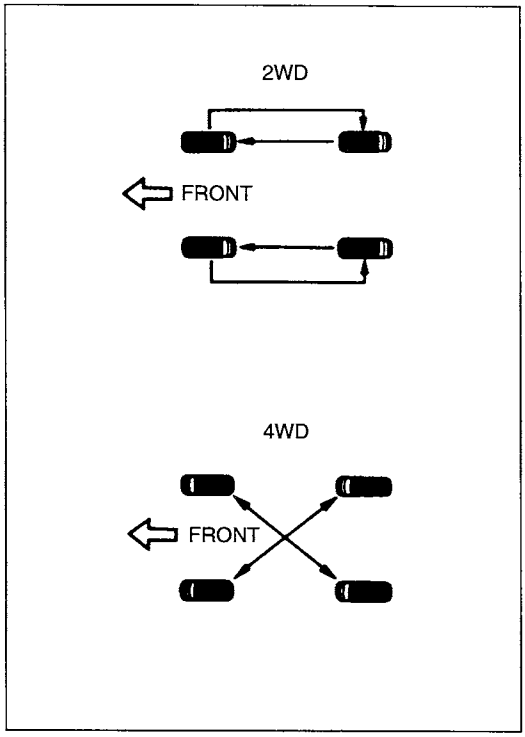
4. Cracks, damage, or foreign materials (such as metal pieces, nails, and stones) in the tire and cracks, deformation, and damage to the wheel
5. Loose wheel lug nut(s)
6. Air leaking from the valve stem



REMOVAL / INSTALLATION
After making sure that the wheel-to-hub contact sufaces are clean. Tighten the lug nuts to the specified torque in a crisscross pattern.

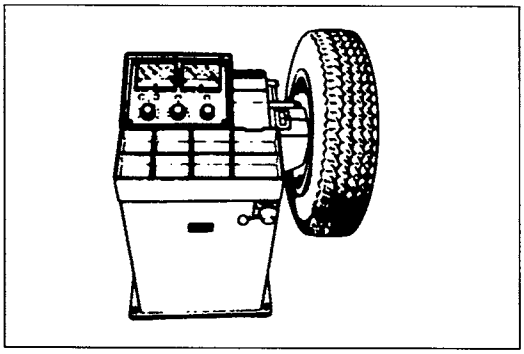
Tightening torque:
89—117 N·m { 9—12 kgf·m , 66—86 ft·lbf }

Caution
- **Applying oil to the lug nuts, studs, or wheels will cause the lug nuts to become loosened.**



TIRE ROTATION

To prolong tire life and assure uniform tire wear, rotate all tires except the "TEMPORARY USE ONLY" spare tire. For U.S.A., rotate the tires every 3,750 miles { 6,000 km } or 15 months. For Canada, rotate the tires every 15,000 miles { 24,000 km } or 15 months. After rotating the tires, adjust each to the specified air pressure.
(Refer to page Q–2.)



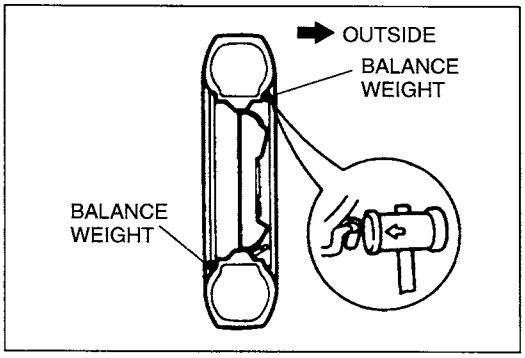
WHEEL BALANCE ADJUSTMENT

If a wheel has become unbalanced or if a tire has been repaired or replaced, rebalance the wheel.

Maximum unbalance at rim edge: 10 g { 0.35 oz }

When balancing a wheel:

(1) Use no more than two balance weights on the inner or outer side of the wheel.
(2) One balance weight; max. 60 g { 2.1 oz }
(3) If the total weight of all the balance weights on one side exceeds 100 g { 3.53 oz }, then rebalance after repositioning the tire on the rim.
(4) Attach the balance weights tightly so that they do not protrude more than 3 mm { 0.12 in } beyond the wheel edge.
(5) Select suitable balance weights for steel or aluminum alloy wheels.



Caution

- **Using an on-vehicle balance may cause damage to the transmission. Always use an off-vehicle balancer whenever balancing a wheel.**

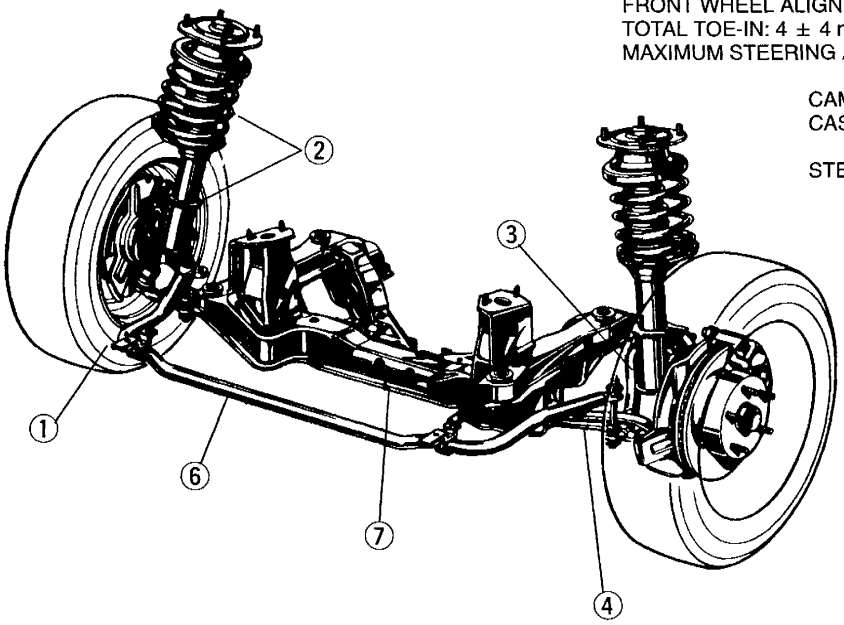
Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

SUSPENSION

INDEX

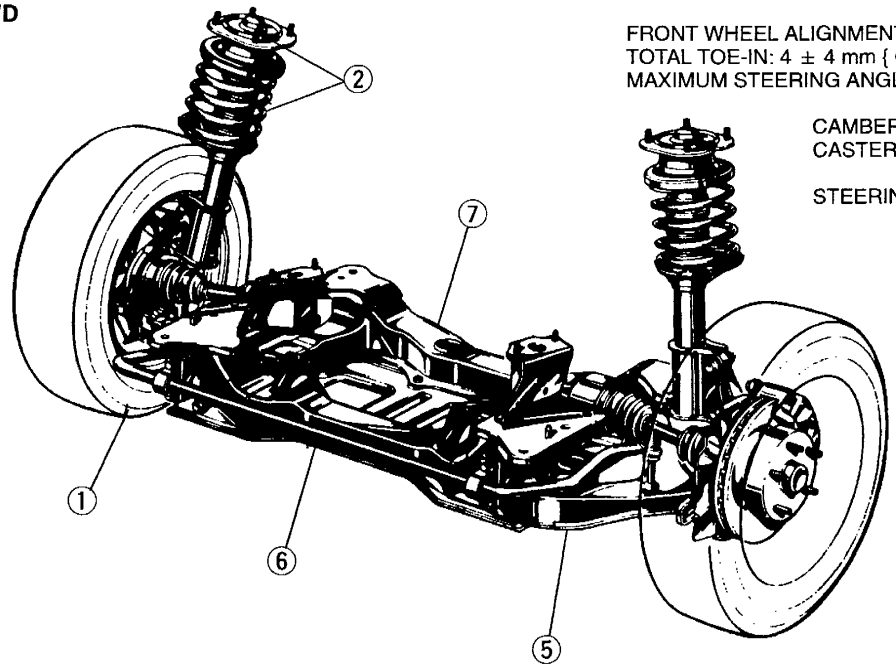
FRONT SUSPENSION

2WD



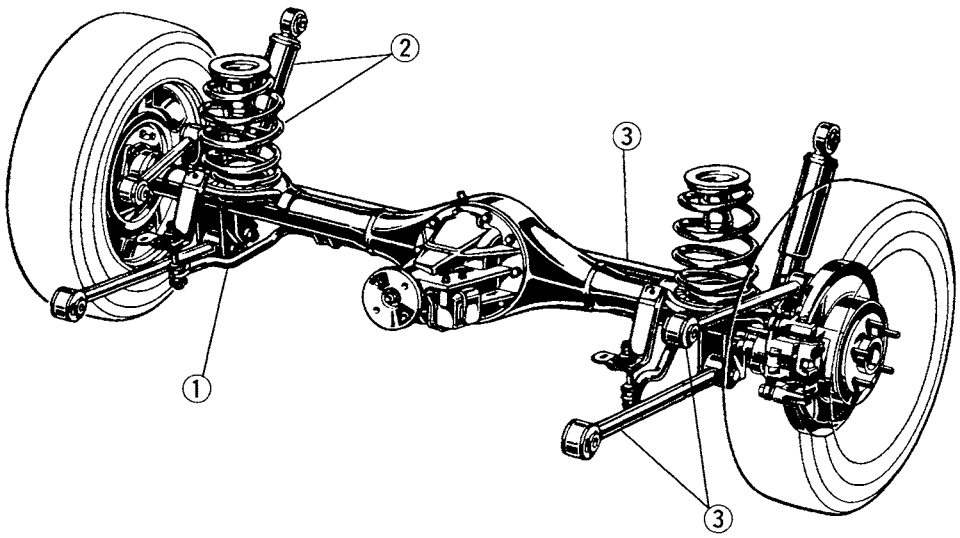
FRONT WHEEL ALIGNMENT
TOTAL TOE-IN: 4 ± 4 mm { 0.16 ± 0.15 in , 0.4 ° ± 0.4 ° }
MAXIMUM STEERING ANGLE: 40 °45' ± 2 ° (INNER)
31 °50' ± 2 ° (OUTER)
CAMBER ANGLE: 0 °22' ± 1 °
CASTER ANGLE: RIGHT SIDE: 5°27' ± 1 °
LEFT SIDE: 4°57' ± 1 °
STEERING AXIS INCLINATION: 12 °56'

4WD



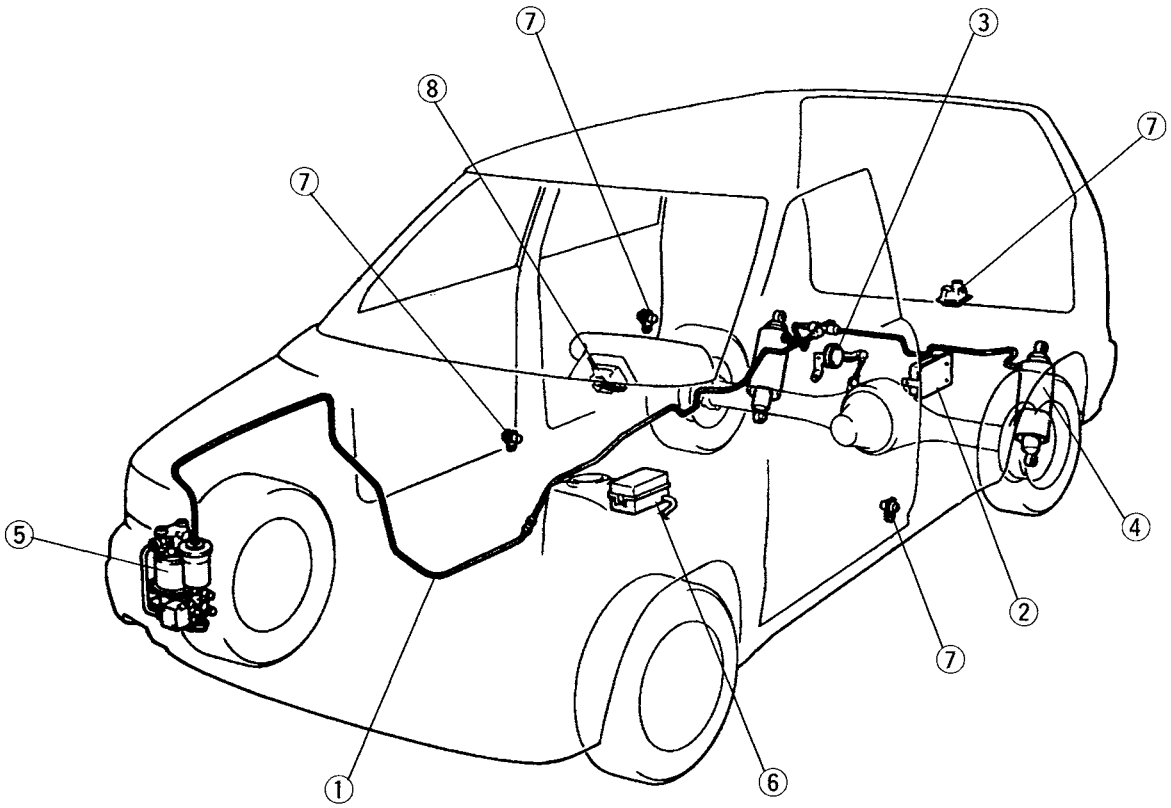
FRONT WHEEL ALIGNMENT
TOTAL TOE-IN: 4 ± 4 mm { 0.16 ± 0.15 in , 0.4 ° ± 0.4 ° }
MAXIMUM STEERING ANGLE: 33 °50' ± 2 ° (INNER)
31 °03' ± 2 ° (OUTER)
CAMBER ANGLE: 0 °10' ± 1 °
CASTER ANGLE: RIGHT SIDE: 5°31' ± 1 °
LEFT SIDE: 5°01' ± 1 °
STEERING AXIS INCLINATION: 11 °48'

REAR SUSPENSION



1. Rear stabilizer
   Removal / Inspection / Installation ..... page R–24
2. Rear shock absorber and spring
   Removal / Inspection / Installation ..... page R–26
3. Upper link, lower link, and lateral rod
   Removal / Inspection / Installation ..... page R–28

AUTOMATIC LOAD LEVELING (ALL)



1. Air pipe
   - Inspection ..... page R–36
   - Replacement ..... page R–37
2. ALL control module
   - Inspection ..... page R–38
3. Height sensor
   - Inspection ..... page R–40
   - Replacement ..... page R–40
   - Adjustment ..... page R–40
4. Rear shock absorber
   - Inspection ..... page R–41
   - Removal / Inspection / Installation ..... page R–26
5. Compressor assembly
   - Removal / Installation ..... page R–42
   - Inspection ..... page R–42
6. Compressor relay
   - Inspection ..... page R–43
7. Door switch
   - Inspection ..... section T
8. Vehicle speed sensor
   - Inspection ..... section T

OUTLINE

SPECIFICATIONS

Item			Specification
Front suspension			
Type			Strut
Stabilizer	Type		Torsion bar
	Diameter	mm { in }	2WD: 34.0 { 1.34 } 4WD: 24.0 { 0.94 }
Shock absorbers			Double-acting, oil-filled
Rear suspension			
Type			5-link
Stabilizer	Type		Torsion bar
	Diameter	mm { in }	2WD: 24.0 { 0.94 } 4WD: 26.0 { 1.02 }
Shock absorbers	Standard suspension		Double-acting, oil-filled
	Automatic load leveling equipped		Double-acting, oil-filled with air diaphragm
Wheel alignment			
Front wheel alignment (Unladen) *1	Total toe-in	mm { in }	4±4 { 0.16±0.15 }
		degree	0.4 °±0.4 °
	Maximum steering angle	Inner	2WD: 40°45' ± 2° 4WD: 33°50' ± 2°
		Outer	2WD: 31°50' ± 2° 4WD: 31°03' ± 2°
	Camber angle*2		2WD: 0°22' ± 1° 4WD: 0°10' ± 1°
	Caster angle*2	Right side	2WD: 5°27' ± 1° 4WD: 5°31' ± 1°
		Left side	2WD: 4°57' ± 1° 4WD: 5°01' ± 1°
	Steering axis inclination		2WD: 12°56' 4WD: 11°48'

*1 Fuel tank full; radiator coolant and engine oil at specified level; spare tire, jack, and tools in designated position. Adjust to the median when carrying out wheel alignment.
*2 Difference between left and right must not exceed 1.5°.

TROUBLESHOOTING GUIDE

Problem	Possible cause	Remedy	Page
General instability	Weak coil springs	Replace	R–11, 26
	Malfunction of shock absorber	Replace	R–10, 26
	Worn or deteriorated lower arm or stabilizer bushing	Replace	R–16, 18, 22, 24
	Worn or damaged lower arm ball joint	Replace	R–16, 18
	Improperly adjusted front wheel alignment	Adjust	R– 7
	Worn or deteriorated fluid-enclosed bushing	Replace	R–15
	Worn or deteriorated lateral rod bushing	Replace	R–28
	Looseness of upper or lower link	Tighten	R–28
	Worn or deteriorated upper or lower link bushing	Replace	R–28
	Deformation or damage of upper or lower link	Replace	R–28
Body "rolls"	Weak stabilizer	Replace	R–22, 24
	Worn or deteriorated stabilizer, lower link, upper link, or lateral rod bushing	Replace	R–22, 24, 26
"Heavy" steering wheel operation	Insufficiently lubricated or stuck lower arm ball joint	Replace	R–16, 18
	Worn or damaged strut bearing	Replace	R–11
	Improperly adjusted front wheel alignment	Adjust	R– 7
Steering wheel pulls to one side	Weak coil spring	Replace	R–11, 26
	Worn or damaged lower arm or stabilizer bushing	Replace	R–20, 22, 24
	Deformed lower arm or knuckle	Replace	R–16, 18
	Loosen lower arm bushing	Replace	R–16, 18
Excessive steering wheel play	Worn or damaged lower arm bushing	Replace	R–16, 18
	Worn or damaged lower arm ball joint	Replace	R–16, 18
Body leans	Weak coil spring	Replace	R–11, 26
	Weak stabilizer or lower arm bushing	Replace	R—16, 18, 22, 24
Abnormal noise from suspension system	Loose mounting component	Tighten	—
	Poorly lubricated or worn lower arm ball joint	Replace	R–16, 18
	Malfunction of shock absorber	Replace	R–10, 26
	Worn or deteriorated stabilizer or suspension arm bushing	Replace	R–15, 16, 18, 22, 24
	Worn or damaged front strut bearing	Replace	R–11
"Shake" occurs (Steering wheel vibrates up/down)	Excessive tire and wheel runout	Replace	—
	Loose lug nuts	Tighten	section Q
	Unbalanced wheel(s)	Adjust or replace	section Q
	Cracked or worn engine mount rubber	Replace	section B
	Cracked or worn transmission mount rubber	Replace	section K1
"Shimmy" occurs (Steering wheel vibrates circumferentially)	Cracked or worn steering gear mount rubber	Replace	section N
	Loose steering gear mounting bolts	Tighten	section N
	Stuck or damaged steering ball joint	Replace	section N
	Excessive tire and wheel runout	Replace	—
	Loose lug nuts	Tighten	section Q
	Unbalanced wheel(s)	Adjust or replace	section Q
	Insufficient tire pressure	Adjust	section Q
	Unevenly worn tires	Replace	section Q
	Malfunction of shock absorber	Replace	R–10
	Loose shock absorber mounting bolts	Tighten	R–10
	Stuck or damaged lower arm ball joint	Replace	R–16, 18
	Cracked or worn suspension bushings	Replace	R–15, 16, 18, 26
	Damaged or worn front wheel bearing	Replace	section M
	Improperly adjusted front wheel alignment	Adjust	R–7

WHEEL ALIGNMENT

PRE-INSPECTION

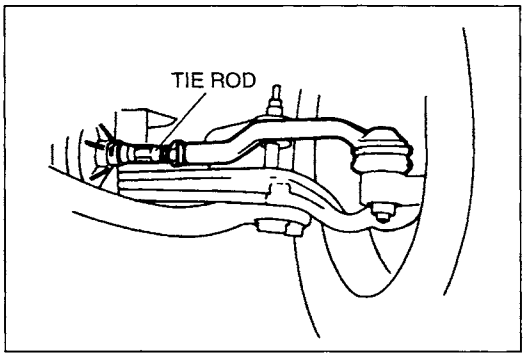
1. Check the tire inflations and set to the recommended pressure if necessary.
2. Inspect the front wheel bearing play and correct if necessary.
3. Inspect the wheel and tire runout.
4. Inspect the ball joints and steering linkage for any excessive looseness.
5. The vehicle must be on level ground and have no luggage or passenger load.
6. The difference in height between the left and right sides from the center of the wheel to the fender brim must not exceed **15 mm { 0.59 in }**.

FRONT WHEEL ALIGNMENT

Specifications

Item		Specification					
		2WD			4WD		
Front wheel alignment (Unladen)*1							
Total toe-in	mm { in }	4 ± 4 { 0.16 ± 0.16 }					
	degree	0.4° ± 0.4°					
Maximum steering angle	Inner	40°45' ± 2°			33°50' ± 2°		
	Outer	31°50' ± 2°			31°03' ± 2°		
Steering axis inclination		12°56'			11°48'		
Fuel gauge indication		Full	1/2	Empty	Full	1/2	Empty
Camber angle*2	Right side	0°22' ± 1°	0°25' ± 1°	0°28' ± 1°	0°10' ± 1°	0°13' ± 1°	0°16' ± 1°
	Left side	0°22' ± 1°	0°23' ± 1°	0°24' ± 1°	0°10' ± 1°	0°11' ± 1°	0°12' ± 1°
Caster angle*2	Right side	5°27' ± 1°	5°24' ± 1°	5°21' ± 1°	5°31' ± 1°	5°28' ± 1°	5°24' ± 1°
	Left side	4°57' ± 1°	4°56' ± 1°	4°54' ± 1°	5°01' ± 1°	5°00' ± 1°	4°58' ± 1°

*1 Radiator coolant and engine oil at specified level; spare tire, jack, and tools in designated position. Adjust to the median when carrying out wheel alignment.
*2 Difference between left and right must not exceed 1.5°.



Adjustments

Total toe-in

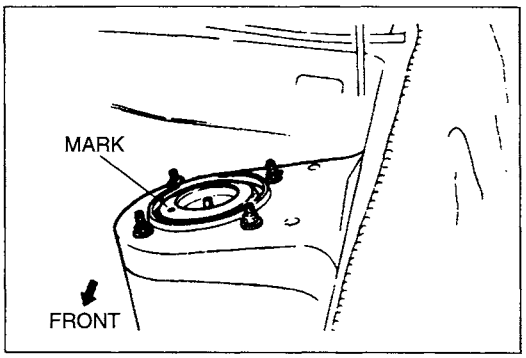
1. Adjust the steering angle.
2. Remove the steering gear boot clamp.
3. Loosen the left and right tie rod locknuts and turn the tie rods equally. Both tie rods are right-threaded, so turning the right tie rod toward the front of the vehicle and the left toward the rear increases toe-in.

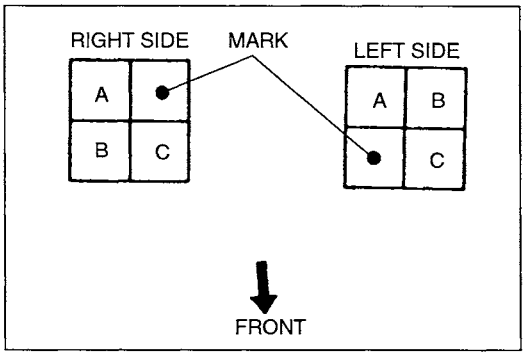
Note

- Turning both tie rods one complete turn changes toe-in by about 14.4 mm { 0.57 in }.

4. Tighten the tie rod locknuts to the specified torque.

Tightening torque:
69—78 N·m { 7.0—8.0 kgf·m , 51—57 ft·lbf }





Camber and caster

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the nuts that hold the mounting block to the fender.
3. Push the mounting block downward, and turn it to the desired position.
4. Retighten the nuts to the specified torque.

Tightening torque:
47—62 N·m { 4.7—6.4 kgf·m , 34—46 ft·lbf }

Note

- Changing the position of the mounting block changes the camber and caster about 26'.

Right side

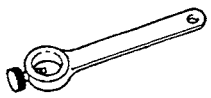
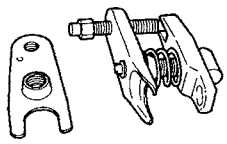
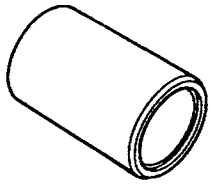
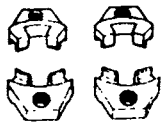
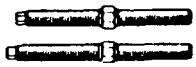
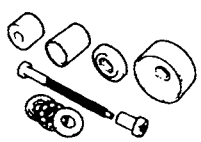
Mark	Difference from standard position	
	Camber angle	Caster angle
A	0°	+26'
B	+26'	+26'
C	+26'	0°

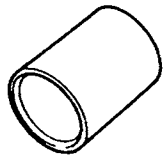
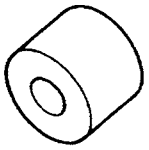
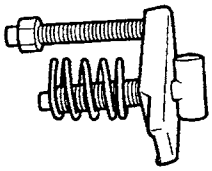
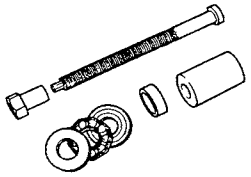
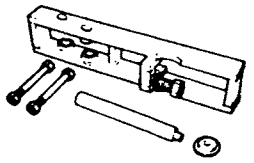
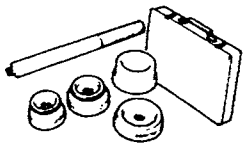
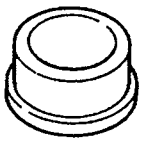
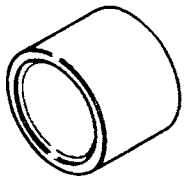
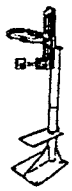
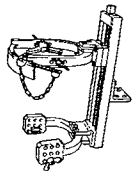
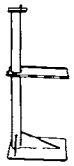
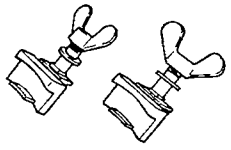
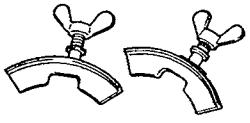
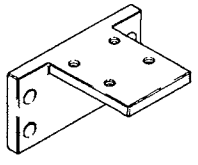
Left side

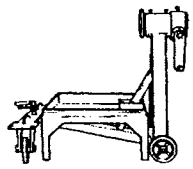
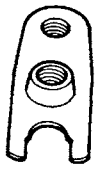
Mark	Difference from standard position	
	Camber angle	Caster angle
A	+26'	0°
B	+26'	−26'
C	0°	−26'

FRONT SUSPENSION (STRUT)

PREPARATION
SST

49 0180 510B Attachment, preload measuring 	For inspection of ball joint preload	49 T028 3A0 Puller set, ball joint 	For removal of lower arm
49 S120 785 Installer, dust boot 	For installation of dust boot	49 0223 640B Arm, coil spring compressor 	For disassembly and assembly of shock absorber and spring
49 G030 641 Screw 	For disassembly and assembly of shock absorber and spring	49 H028 2A0 Replacer set, rubber bush 	For removal and installation of crossmember bushing

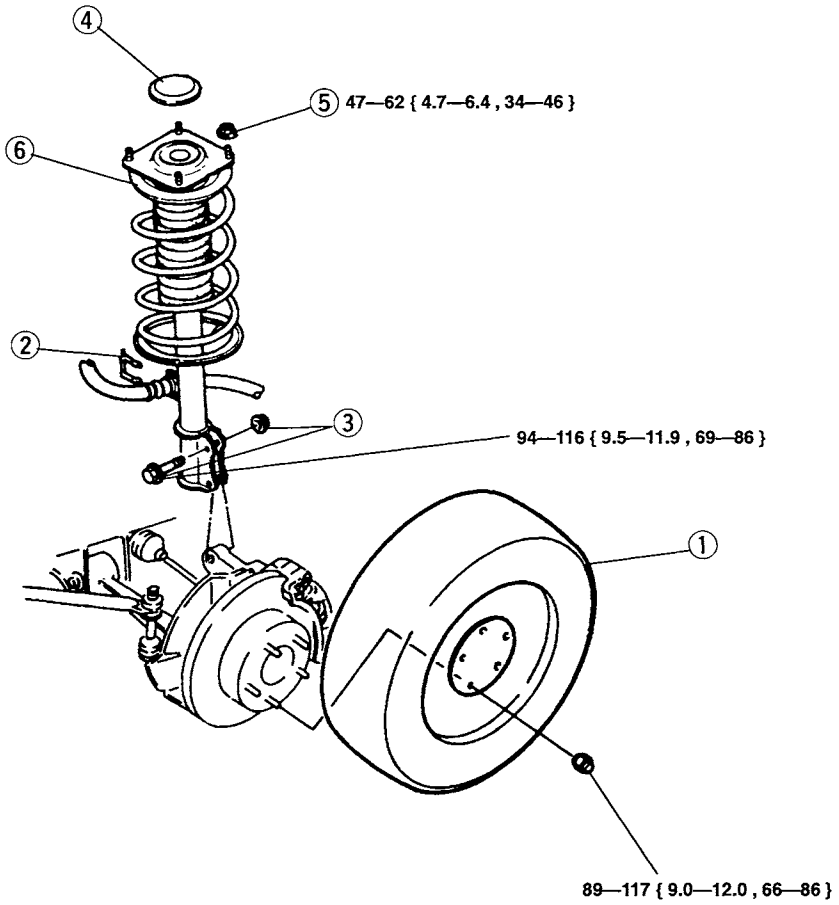
49 H028 201 Shaft (Part of 49 H028 2A0) 	For removal and installation of crossmember bushing	49 H028 202 Block L (Part of 49 H028 2A0) 	For removal of crossmember bushing
49 H028 203 Block S (Part of 49 H028 2A0) 	For installation of crossmember bushing	49 W034 305 Bearing (Part of 49 H028 2A0) 	For removal and installation of crossmember bushing
49 T028 303 Body (Part of 49 T028 3A0) 	For removal of lower arm	49 U034 2AO Lower arm bushing puller & installer 	For installation of lower arm bushing
49 U034 202 Support block (Part of 49 U034 2A0) 	For installation of lower arm bushing	49 D033 1A0 Puller, wheel hub 	For removal and installation of lower arm bushing
49 G033 102 Handle (Part of 49 D033 1A0) 	For removal and installation of lower arm bushing	49 F027 0A1 Installer set, bearing 	For removal and installation of lower arm bushing
49 F027 009 Attachment 68 & 77 (Part of 49 F027 0A1) 	For removal and installation of lower arm bushing	49 G026 103 Support block 	For removal and installation of lower arm bushing
49 T034 1A0 Compressor, coil spring 	For disassembly and assembly of shock absorber and spring	49 T034 101 Compressor, spring (Part of 49 T034 1A0) 	For disassembly and assembly of shock absorber and spring
49 T034 102 Stand (Part of 49 T034 1A0) 	For disassembly and assembly of shock absorber and spring	49 T034 103 Hook (Part of 49 T034 1A0) 	For disassembly and assembly of shock absorber and spring
49 T034 104 Support (Part of 49 T034 1A0) 	For disassembly and assembly of shock absorber and spring	49 T034 105 Attachment 	For disassembly and assembly of shock absorber and spring

49 0107 680A Engine stand 	For disassembly and assembly of shock absorber	49 T028 304 Attachment (Part of 49 T028 3A0) 	For removal of lower arm

FRONT SHOCK ABSORBER AND SPRING

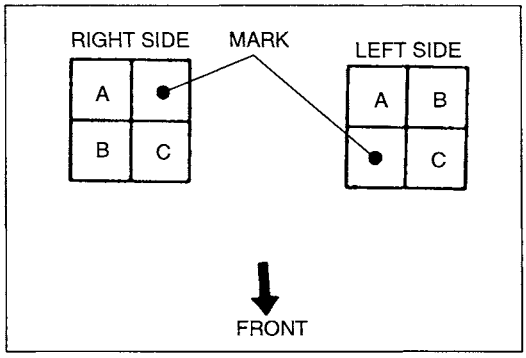
Removal / Installation

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal, referring to **Installation Note**.
4. Inspect the front wheel alignment and adjust it if necessary. (Refer to page R–7.)



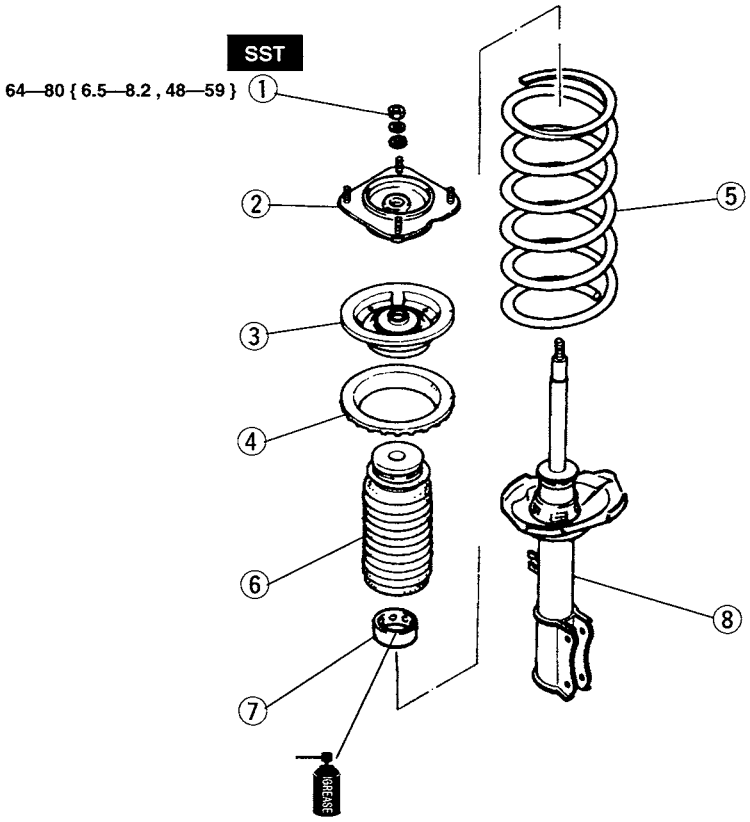
N·m { kgf·m , ft·lbf }

1. Wheel and tire
2. Hose clip
3. Bolt and nut
4. Rubber cap
5. Nut
6. Shock absorber assembly
   - Installation Note ..... page R–11
   - Disassembly / Inspection ..... page R–11
   - Assembly ..... page R–12



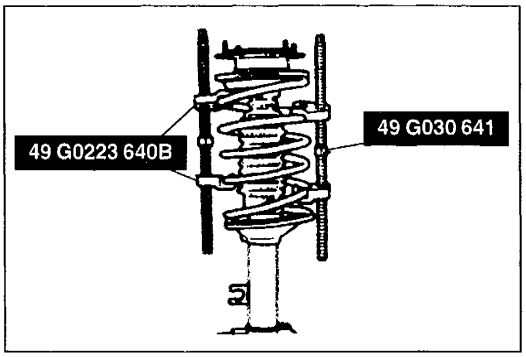
Installation note
Shock absorber assembly
Install the mounting block to the suspension tower with the white mark on the mounting block face as shown in the figure.

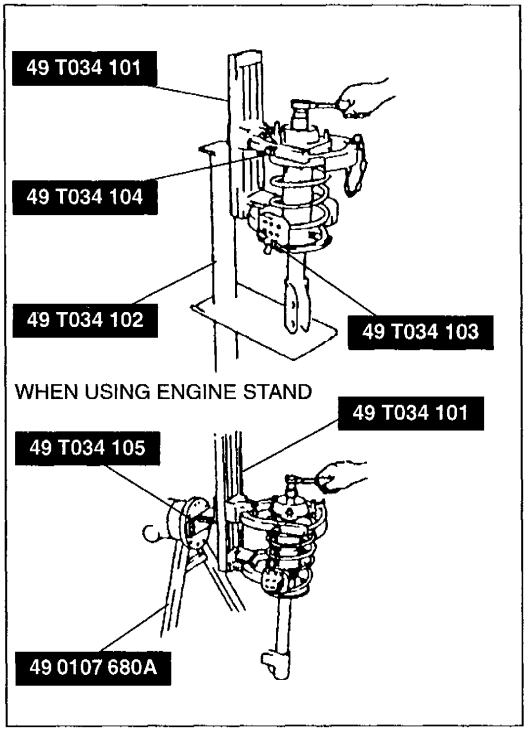
Disassembly / Inspection
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all components and parts. Replace parts if necessary.



N·m { kgf·m , ft·lbf }

1. Nut
   Disassembly Note . . . . . page R–12
2. Mounting block
3. Spring upper seat
4. Spring seat
5. Coil spring
6. Bump stopper
7. Ring rubber
8. Shock absorber
   Inspect for oil leakage or abnormal noise



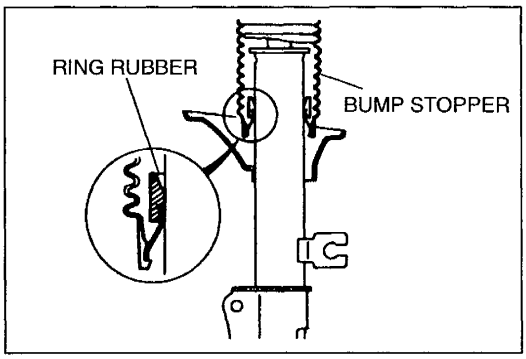


Disassembly note
Nut

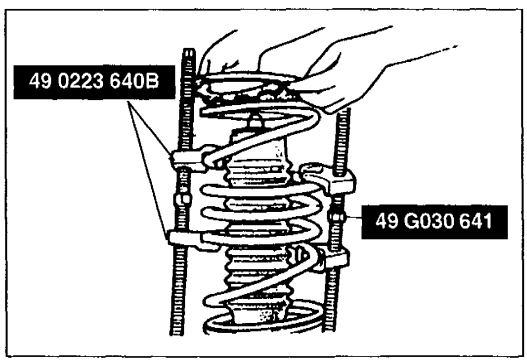
Warning
- **Removing the piston-rod nut is dangerous. The shock absorber and spring could fly off under tremendous pressure and cause serious injury or death. Secure the shock absorber in the SST before removing the piston-rod nut.**

When using 49 0223 640B and 49 G030 641
1. Loosen the piston rod upper nut several turns, but do not remove it.
2. Compress the coil spring with the **SST**, then remove the nut.
3. Remove the coil spring.

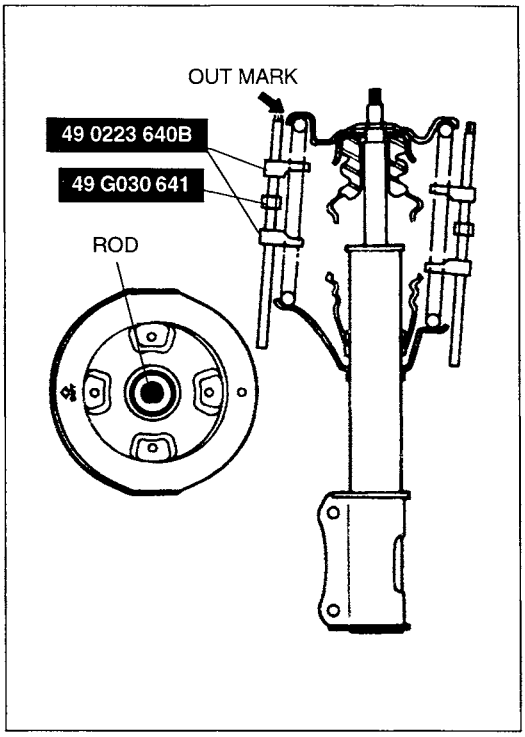
When using 49 T034 1A0
1. Secure the mounting block in a vise.
2. Loosen the nut several turns, but do not remove it.
3. Assemble the **SST**.
4. Secure the shock absorber in the **SST**.
5. Compress the coil spring by using the **SST** and remove the nut.



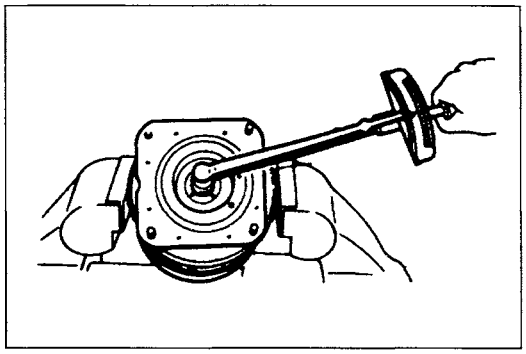
Assembly
When using 49 0223 640B and 49 G030 641
1. Secure the shock absorber in a vise.
2. Apply rubber grease to the ring rubber and install it onto the bump stopper.
3. Install the bump stopper in the shock absorber as shown in the figure.



4. Install the compressed coil spring (compressed with the **SST**).
5. Install the spring seat.



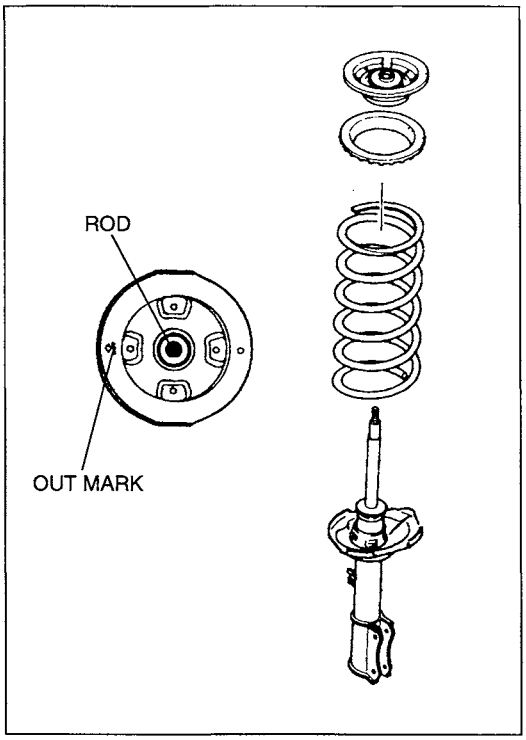
6. Install the spring upper seat so that the flat part of the shock absorber rod fits into the upper seat as shown.
7. Install the mounting block.
8. Loosely tighten the piston rod upper nut.
9. Remove the **SST**.



10. Secure the spring upper seat in a vise.
11. Tighten the piston rod upper nut.

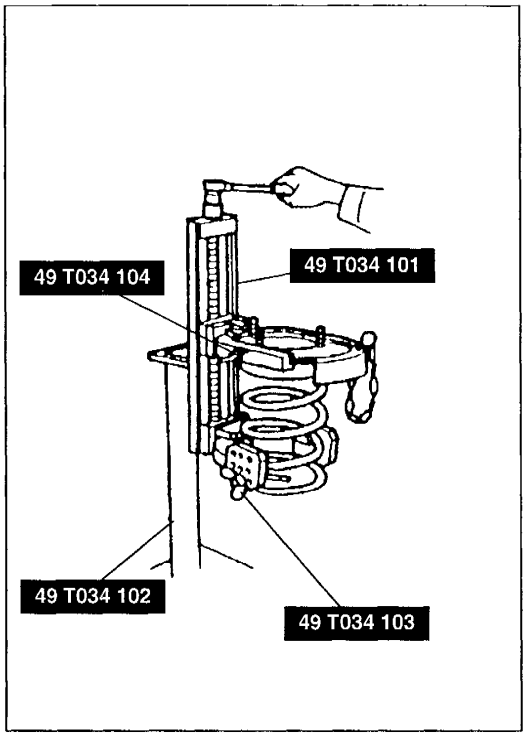
    Tightening torque:
    64—80 N·m { 6.5—8.2 kgf·m , 48—59 ft·lbf }

12. Verify that the spring is well seated.

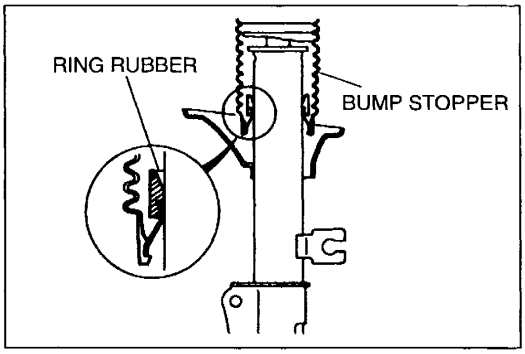


When using 49 T034 1A0

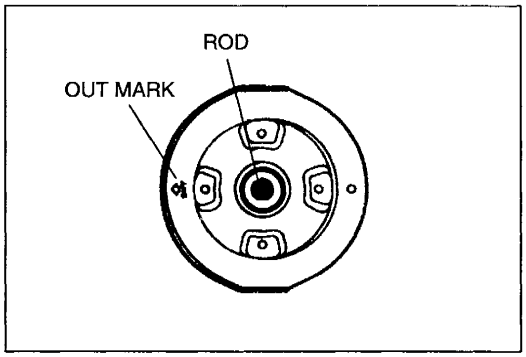
1. Temporarily assemble the spring upper seat, spring seat, and coil spring to the shock absorber so that the flat part of the shock absorber rod fits into the upper seat as shown.
2. Mark the upper spring seat and coil spring for proper reassembly.



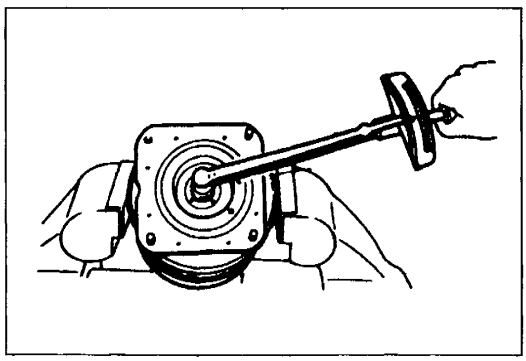
3. Align the marks of the upper spring seat and coil spring. Protect the upper spring seat and the coil spring with a piece of cloth, then assemble the **SST**.
4. Use the **SST** to compress the spring.



5. Apply rubber grease to the ring rubber and install it onto the bump stopper.
6. Install the bump stopper in the shock absorber as shown in the figure.



7. Install the shock absorber so that the flat part of the shock absorber rod fits into the upper seat as shown.
8. Install the mounting block.
9. Hand-tighten the piston rod nut.
10. Remove the **SST**.



11. Secure the spring upper seat in a vise.
12. Tighten the piston rod upper nut.

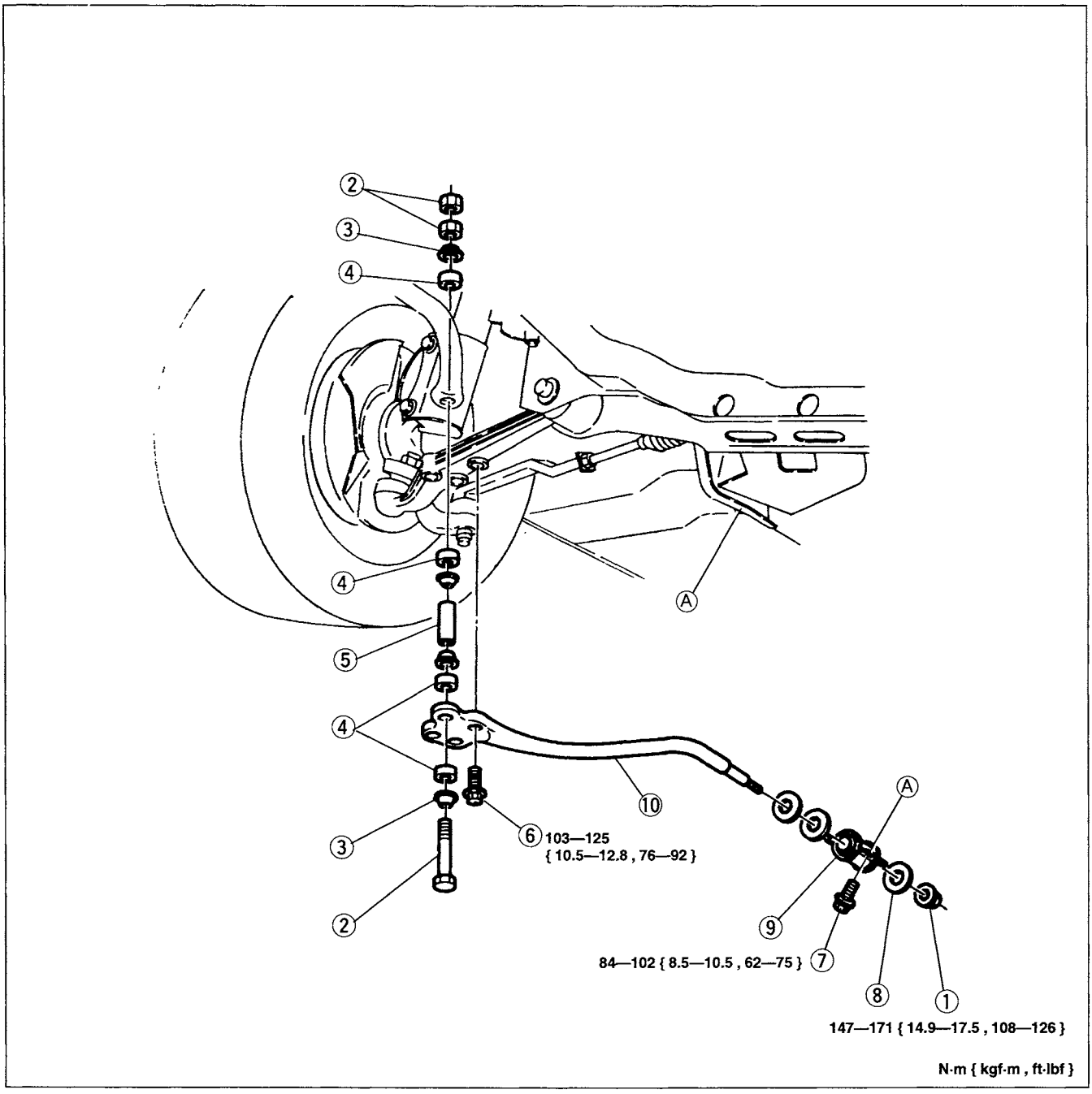
Tightening torque:
64—80 N·m { 6.5—8.2 kgf·m , 48—59 ft·lbf }

13. Verify that the spring is well seated.

COMPRESSION ROD (2WD)

Removal / Inspection / Installation

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove in the order shown in the figure.
3. Inspect all components and parts. Replace parts if necessary.
4. With the vehicle unloaded, tighten the compression rod nut to the specified torque.
5. Install in the reverse order of removal, referring to **Installation Note**.

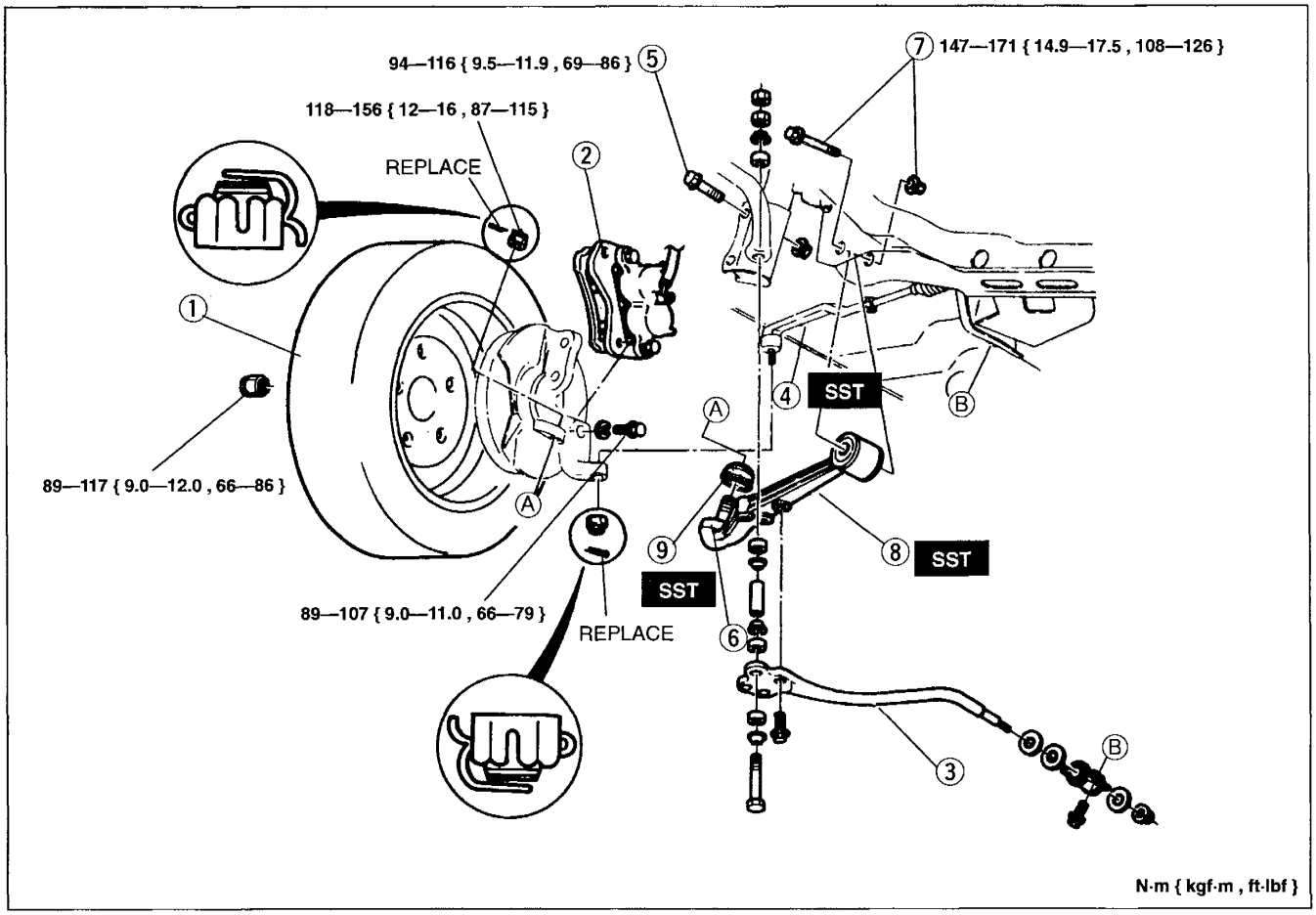


1. Nut
   Left side: left-threaded
   Right side: right-threaded
2. Stabilizer bolt and nuts
   Installation Note . . . . . page R–23
3. Retainer
4. Rubber bushing
5. Spacer
6. Bolt
7. Bolt
8. Washer
9. Fluid-enclosed rubber bushing
   Inspect for deterioration, wear, or fluid leakage
10. Compression rod
    Inspect for damage

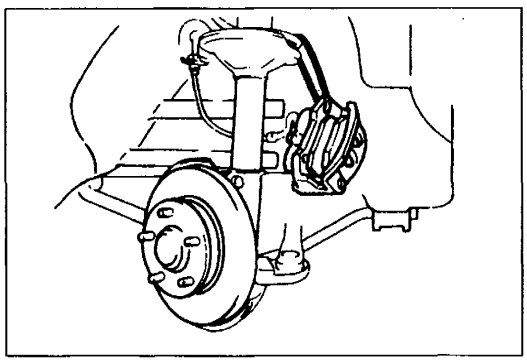
FRONT LOWER ARM (2WD)

Removal / Inspection / Installation

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Inspect all components and parts, and repair or replace as necessary.
4. Install in the reverse order of removal, referring to **Installation Note**.
5. Lower the vehicle and tighten the lower arm fasteners to the specified torque.



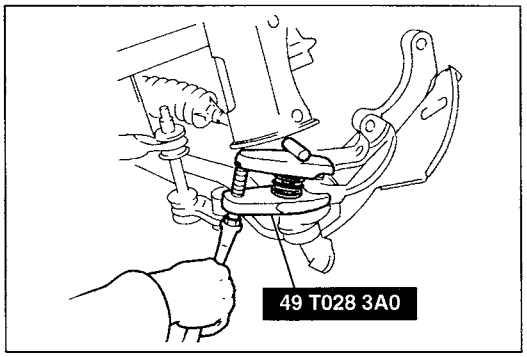
1. Wheel and tire
2. Caliper assembly
   Removal Note ..... below
3. Compression rod
   Removal / Installation ..... page R–15
4. Tie-rod end
   Service ..... section N
5. Bolt and nut
6. Lower arm ball joint
   Removal Note ..... page R–17
   Inspection ..... page R–17
7. Bolt and nut
8. Lower arm
9. Dust boot
   Removal Note ..... page R–17
   Installation Note ..... page R–17



Removal note

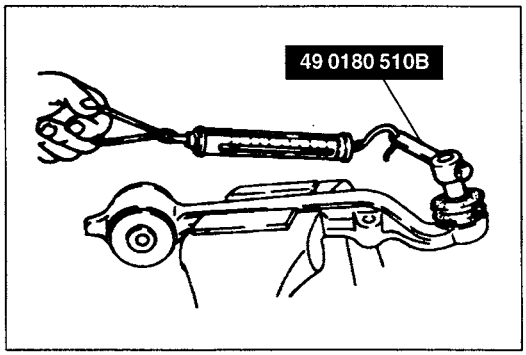
Caliper assembly

Remove the front disc caliper assembly and hang it from the shock absorber.



Lower arm ball joint
1. Remove the cotter pin and nut.
2. Separate the ball joint from the knuckle by using the **SST**.

Dust boot
Remove the dust boot by using a chisel.

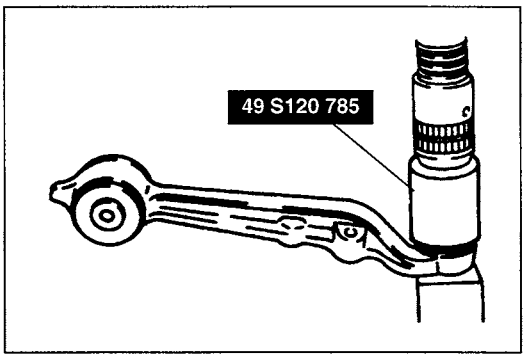


Inspection
Lower arm ball joint
Check for the following and if necessary replace the lower arm assembly.
1. Lower arm for damage or cracks
2. Bushing for deterioration or wear
3. Damage or poor operation of the ball joint
4. Rotation torque of ball joint

Measurement of ball joint rotation torque
Move the ball joint stud back and forth a few times, then attach the **SST** to the stud and measure the preload by using a pull scale.

Rotation torque:
2.0—3.4 N·m { 20—35 kgf·cm , 18—30 in·lbf }

Pull-scale reading:
20—34 N { 2.0—3.5 kgf , 4.4—7.7 lbf }

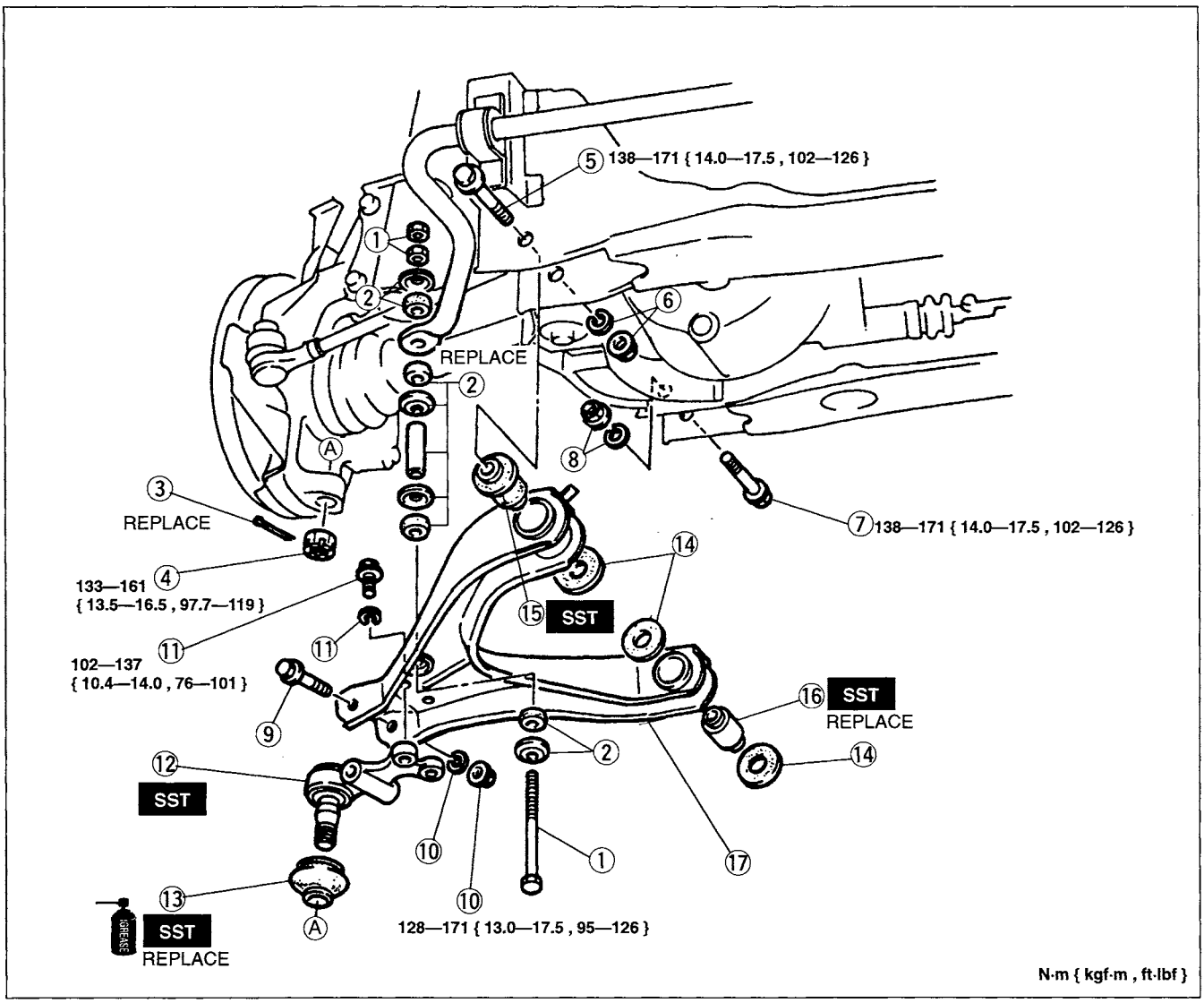


Installation note
Dust boot
1. Liberally coat the inside of the new dust boot with grease (lithium base, NLGI No.2).
2. Press the dust boot onto the ball joint by using the **SST**.

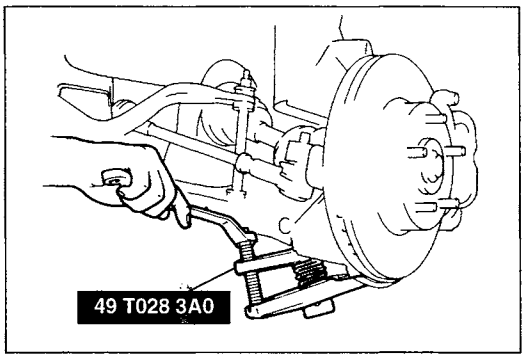
FRONT LOWER ARM (4WD)

Removal / Inspection / Installation

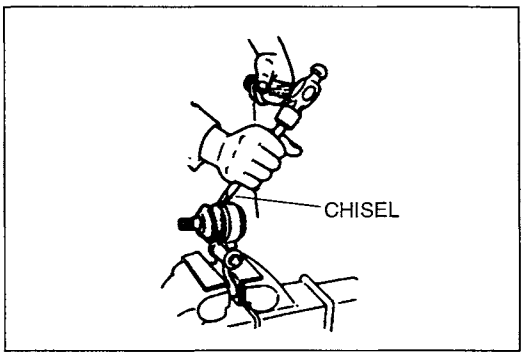
1. Loosen the wheel lug nuts.
2. Jack up the front of the vehicle and support it on safety stands.
3. Remove the wheel and tire.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Inspect all parts and repair or replace as necessary.
6. Install in the reverse order of removal, referring to **Installation Note**.
7. Lower the vehicle and tighten the lower arm fasteners to the specified torque.



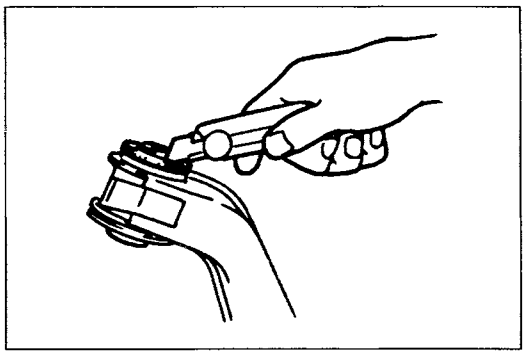
1. Stabilizer bolt and nuts
   Installation Note ..... page R–20
2. Retainer, bushing, and spacer
3. Cotter pin
4. Nut
5. Bolt
6. Nut and washer
7. Bolt
8. Nut and washer
9. Bolt
10. Nut and washer
11. Bolt and washer
12. Lower arm ball joint
    Removal Note ..... page R–19
    Inspection ..... page R–21
13. Dust boot
    Removal Note ..... page R–19
    Installation Note ..... page R–20
14. Rubber washer
15. Bushing (Front)
    Removal Note ..... page R–19
    Installation Note ..... page R–20
16. Bushing (Rear)
    Removal Note ..... page R–19
    Installation Note ..... page R–20
17. Lower arm



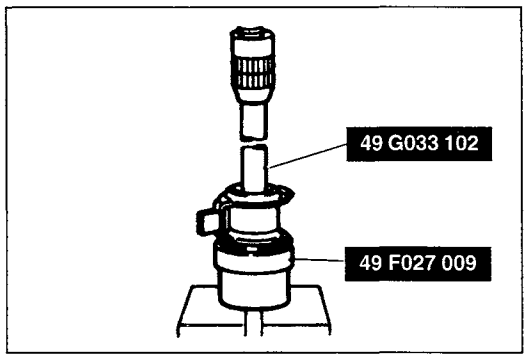
Removal note
Lower arm ball joint
1. Remove the cotter pin and nut.
2. Separate the ball joint from the knuckle by using the **SST**.



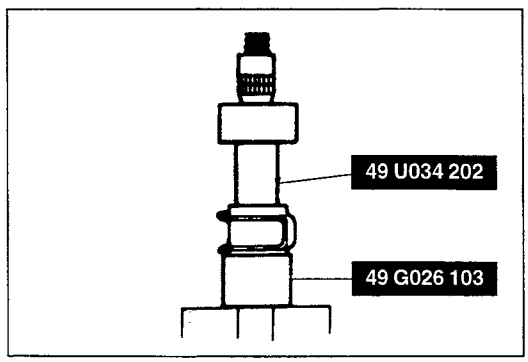
Dust boot
1. Secure the ball joint in a vise protected with brass pads.
2. Place a chisel against the boot and hold it at the angle shown.
3. Remove the boot by tapping with a hammer.



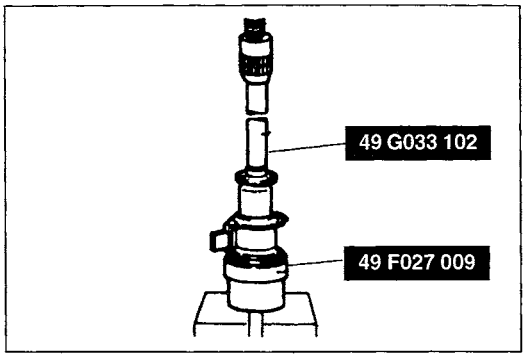
Bushing (front)
1. Secure the lower arm in a vise protected with brass pads.
2. Cut the rim section of the lower arm bushing.



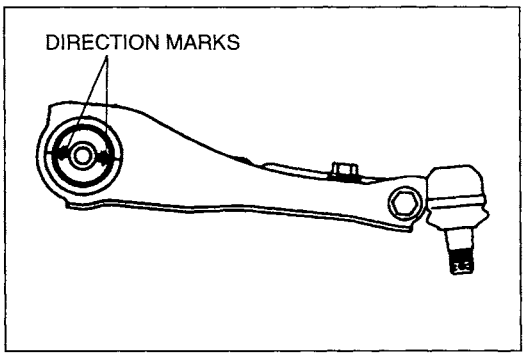
3. Remove the lower arm bushing from the lower arm by using the **SST** and a press.



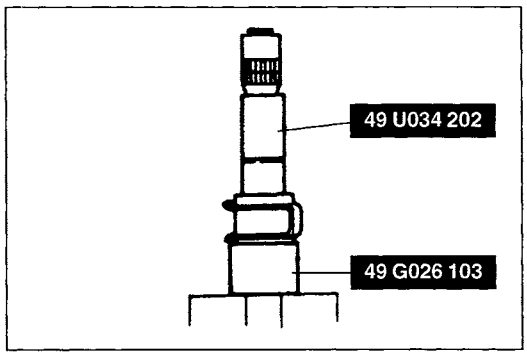
Bushing (rear)
Remove the lower arm bushing from the lower arm by using the **SST** and a press.



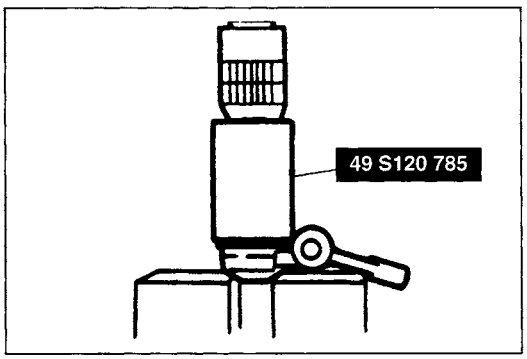
Installation note
Bushing (front)
1. Apply soapy water to the outside of the new bushing surface.
2. Install the bushing into the lower arm by using the **SST** and a press.



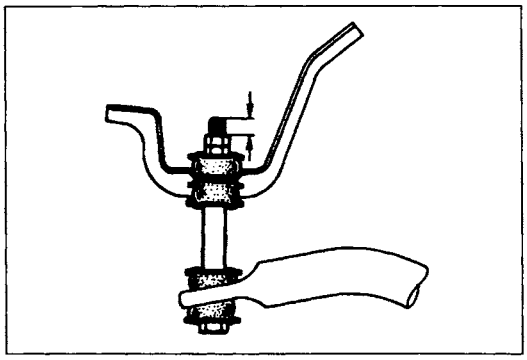
Bushing (rear)
1. Set a new bushing in the lower arm with the direction marks (arrows) on the bushing aligned with the marks on the lower arm.



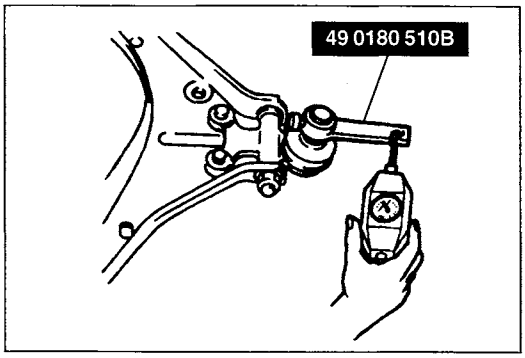
2. Install the new bushing into the lower arm by using the **SST** and a press.



Dust boot
1. Liberally coat the inside of the new dust boot with grease (lithium base, NLGI No.2).
2. Press the dust boot onto the ball joint by using the **SST**.



Stabilizer bolt and nuts
Tighten the stabilizer nuts so that **5—7 mm { 0.20—0.28 in }** of thread is exposed at the end of the bolt.



Inspection

Lower arm ball joint

Do the following inspection and replace lower arm ball joint as necessary.

1. Inspect for damage and poor operation of the ball joint.
2. Move the ball joint stud back and forth a few times, then attach the **SST** to the stud and measure the preload by using a pull scale.

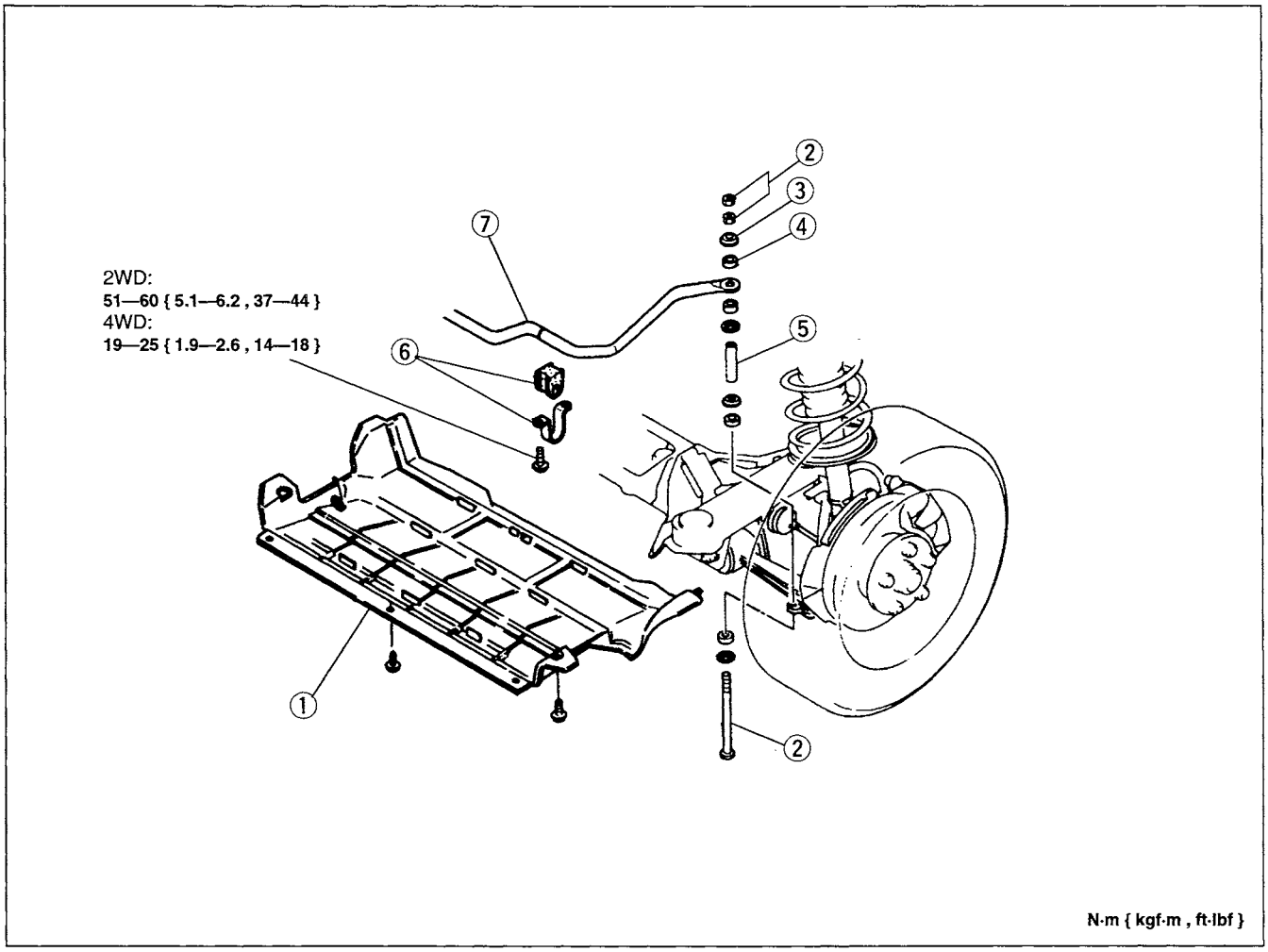
Rotation torque:
2.0—3.4 N·m { 20—35 kgf·cm , 18—30 in·lbf }

Pull scale reading:
20—34 N { 2.0—3.5 kgf , 4.4—7.7 lbf }

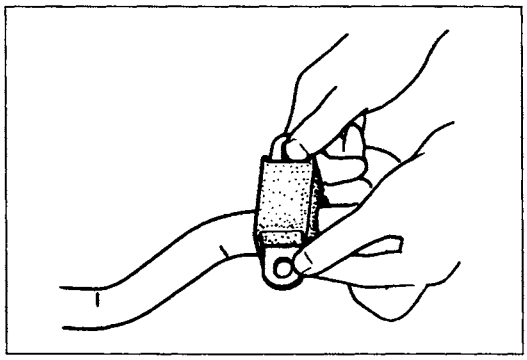
FRONT STABILIZER

Removal / Inspection / Installation

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove in the order shown in the figure.
3. Inspect all components and parts. Replace parts if necessary.
4. Install in the reverse order of removal, referring to **Installation Note**.



1. Undercover
2. Stabilizer bolt and nuts
   Installation Note (2WD) ..... page R–23
   Installation Note (4WD) ..... page R–20
3. Retainer
   Inspect for bending or damage
4. Rubber bushing
   Inspect for deterioration or wear
5. Spacer
   Inspect for bending or damage
6. Stabilizer bushing and bracket
   Installation Note ..... below
7. Stabilizer
   Inspect for bending or damage



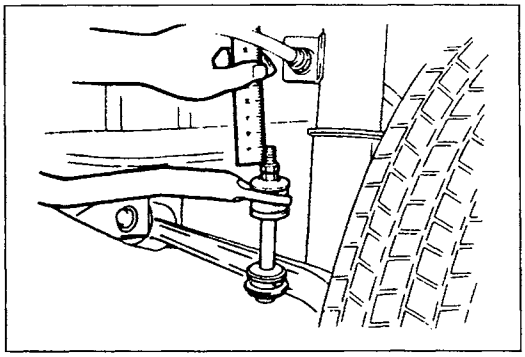
Installation note

Stabilizer bushing and bracket

1. Install the bushing.
2. Align the bushing with the stabilizer installation mark.
3. Install with the stabilizer brackets and hand-tighten the bolts.
4. Lower the vehicle, then tighten the bolts to the specified torque with the vehicle unloaded.

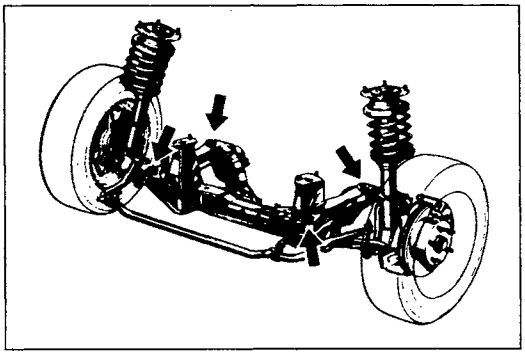
Tightening torque

2WD: 51—60 N·m { 5.1—6.2 kgf·m , 37—44 ft·lbf }
4WD: 19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }



Stabilizer bolt and nuts (2WD)

Tighten the nut so that **9—11 mm { 0.35—0.43 in }** of thread is exposed at the top of the bolt.

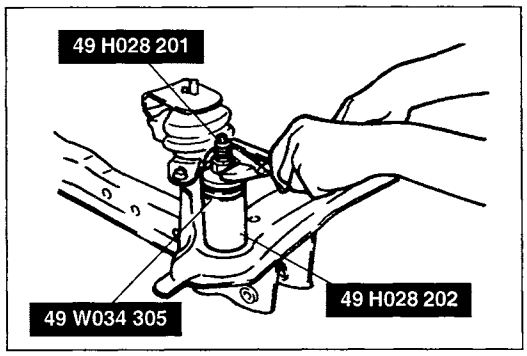


CROSSMEMBER

Inspection

Check for the following and replace parts as necessary.

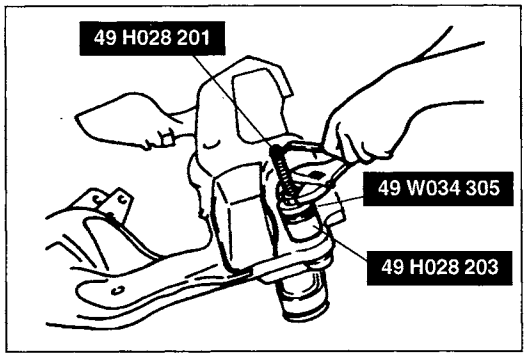
1. Crossmember for bending or damage.
2. Rubber bushings for damage.



Replacement of Crossmember Bushing

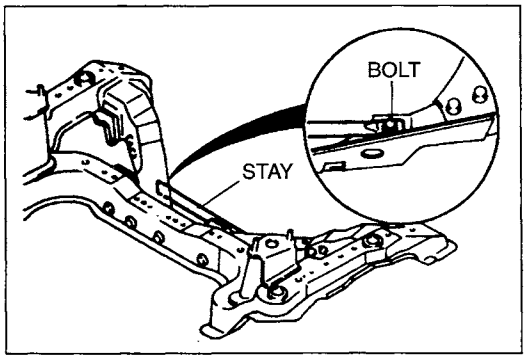
Removal

1. Set the **SST** on the crossmember.
2. Remove the rubber bushing.



Installation

Apply soapy water to the new bushing, then press it into the crossmember by using the **SST**.



Crossmember Stay

Inspection

Inspect for bending and damage, and replace as necessary.

Replacement

Remove the bolts and replace the crossmember stay.

Tightening torque:

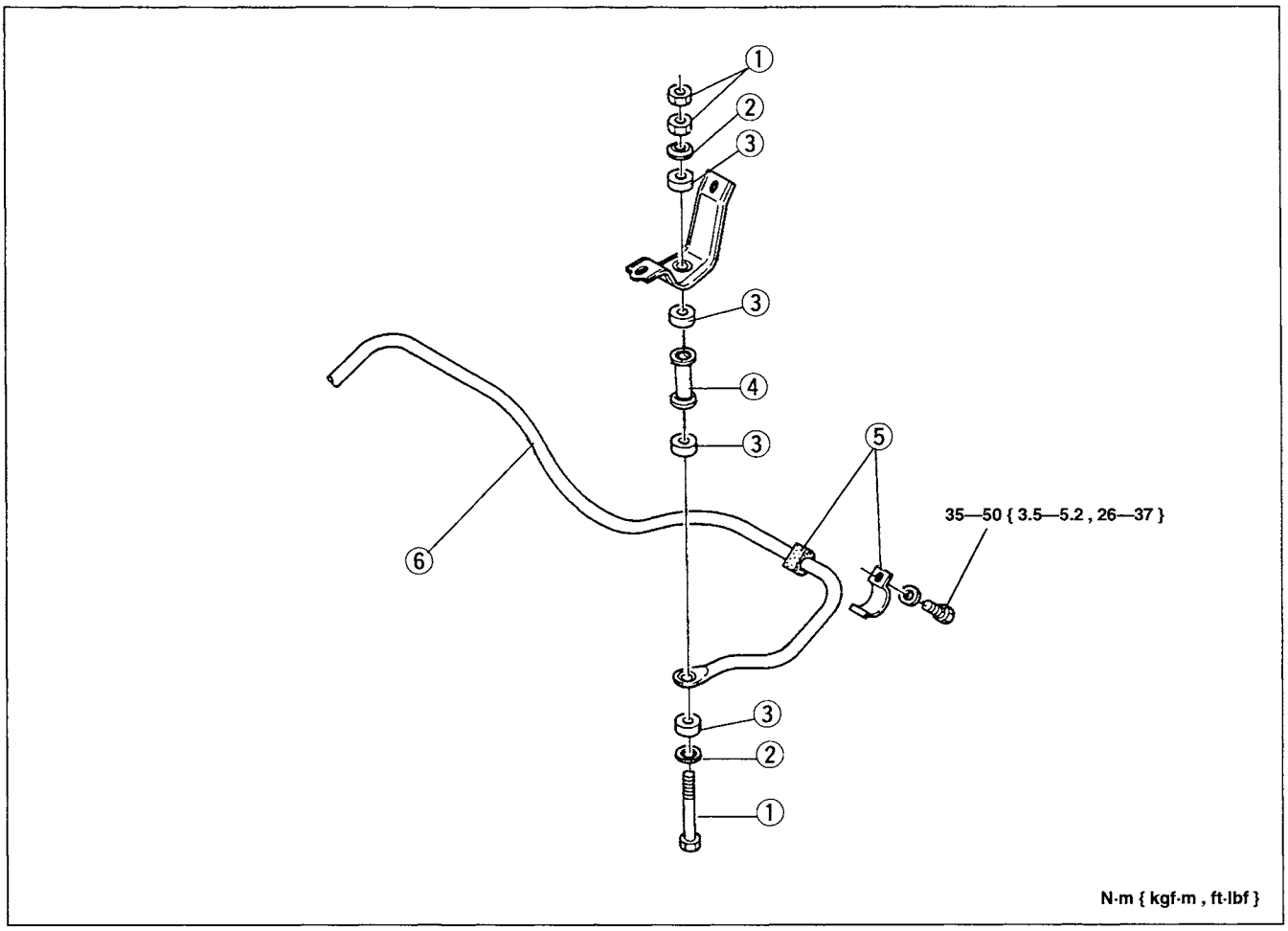
65—81 N·m { 6.6—8.3 kgf·m , 48—60 ft·lbf }

REAR SUSPENSION (5-LINK)

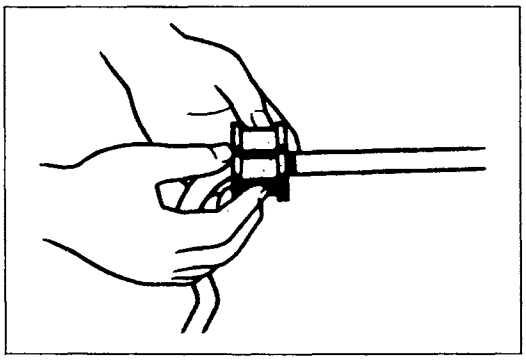
REAR STABILIZER

Removal / Inspection / Installation

1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove in the order shown in the figure.
3. Inspect all components and parts.
4. Install in the reverse order of removal, referring to **Installation Note**.



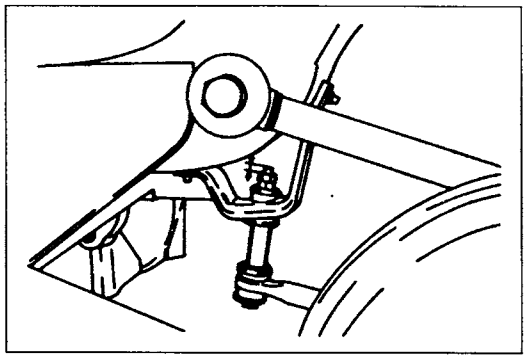
1. Stabilizer bolt and nuts
   Installation Note ..... page R–25
2. Retainer
   Inspect for bending or damage
3. Rubber bushing
   Inspect for deterioration or wear
4. Spacer
   Inspect for bending or damage
5. Stabilizer bushing and bracket
   Installation note ..... below
6. Stabilizer
   Inspect for bending or damage



Installation note
Stabilizer bushing and bracket

1. Install the bushing.
2. Align the bushing with the stabilizer installation mark.
3. Install with the stabilizer brackets and hand-tighten the bolts.
4. Lower the vehicle, then tighten the bolts to the specified torque with the vehicle unloaded.

Tightening torque:
35—50 N·m { 3.5—5.2 kgf·m , 26—37 ft·lbf }



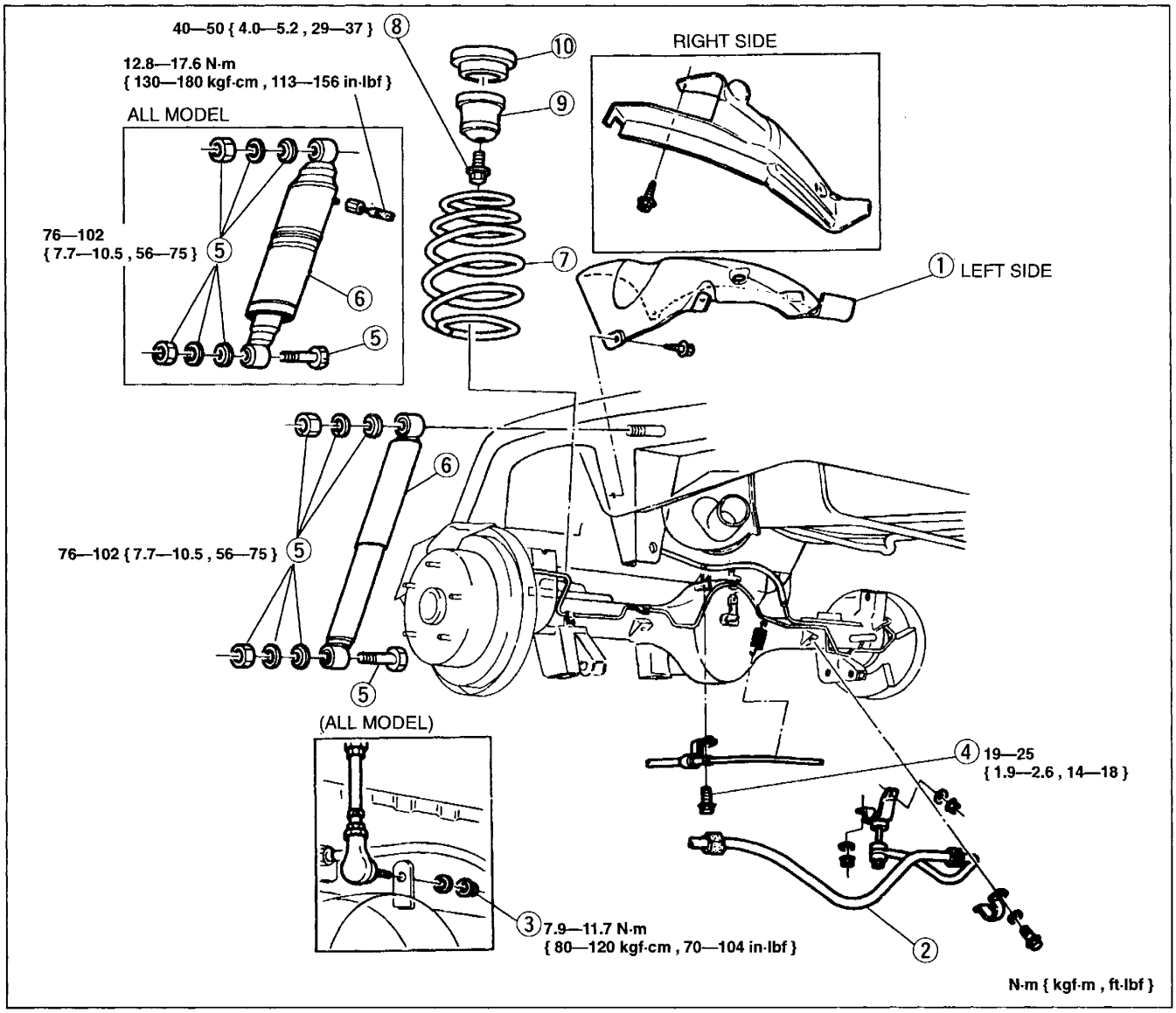
Stabilizer bolt and nuts

Tighten the nuts so that **6—8 mm { 0.24—0.31 in }** of thread is exposed at the top of the bolt.

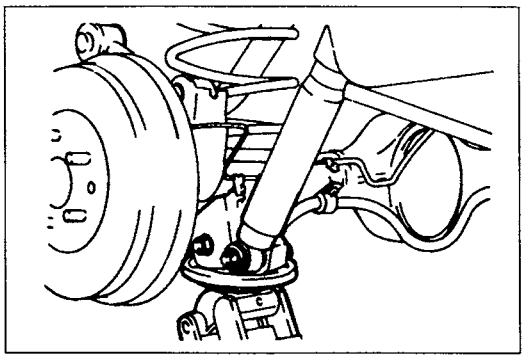
REAR SHOCK ABSORBER AND SPRING

Removal / Inspection / Installation

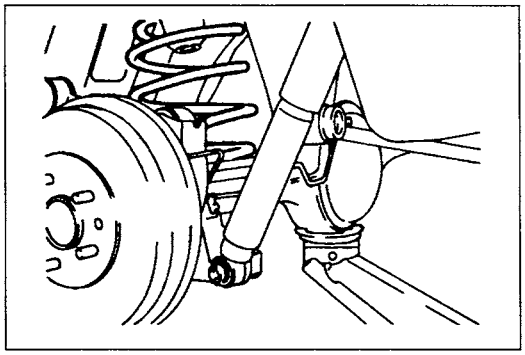
1. Jack up the rear of the vehicle and support it on safety stands.
2. For vehicles with ALL, remove the height sensor.
3. Remove in the order shown in the figure, referring to **Removal Note**.
4. Inspect all components and parts. Replace parts if necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Tighten the shock absorber bolts to just under the specified torque.
7. Lower the vehicle.
8. With the vehicle unloaded, tighten the shock absorber bolts to the specified torque.



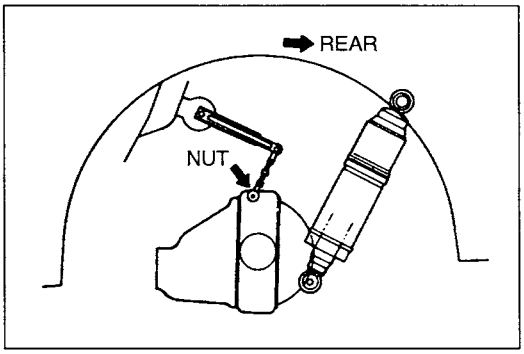
1. Splash shield
2. Stabilizer
   Removal / Inspection / Installation ..... page R–24
3. Nut (ALL model)
   Installation Note ..... page R–27
4. Bolt
5. Bolt, nuts, and washers
6. Shock absorber
   Removal Note ..... page R–27
   Inspect for oil leakage or abnormal noise
7. Coil spring
   Installation Note ..... page R–27
   Inspect for degeneration, cracking, or damage
8. Bolt
9. Bump stopper
10. Spring seat



Removal note
Shock absorber
1. Support the lower part of the shock absorber on a jack, and then raise the jack as necessary to lighten the load on the shock absorber.
2. Remove the shock absorber.



Installation note
Coil spring
Be sure that the larger diameter coil of the coil spring faces the axle case.

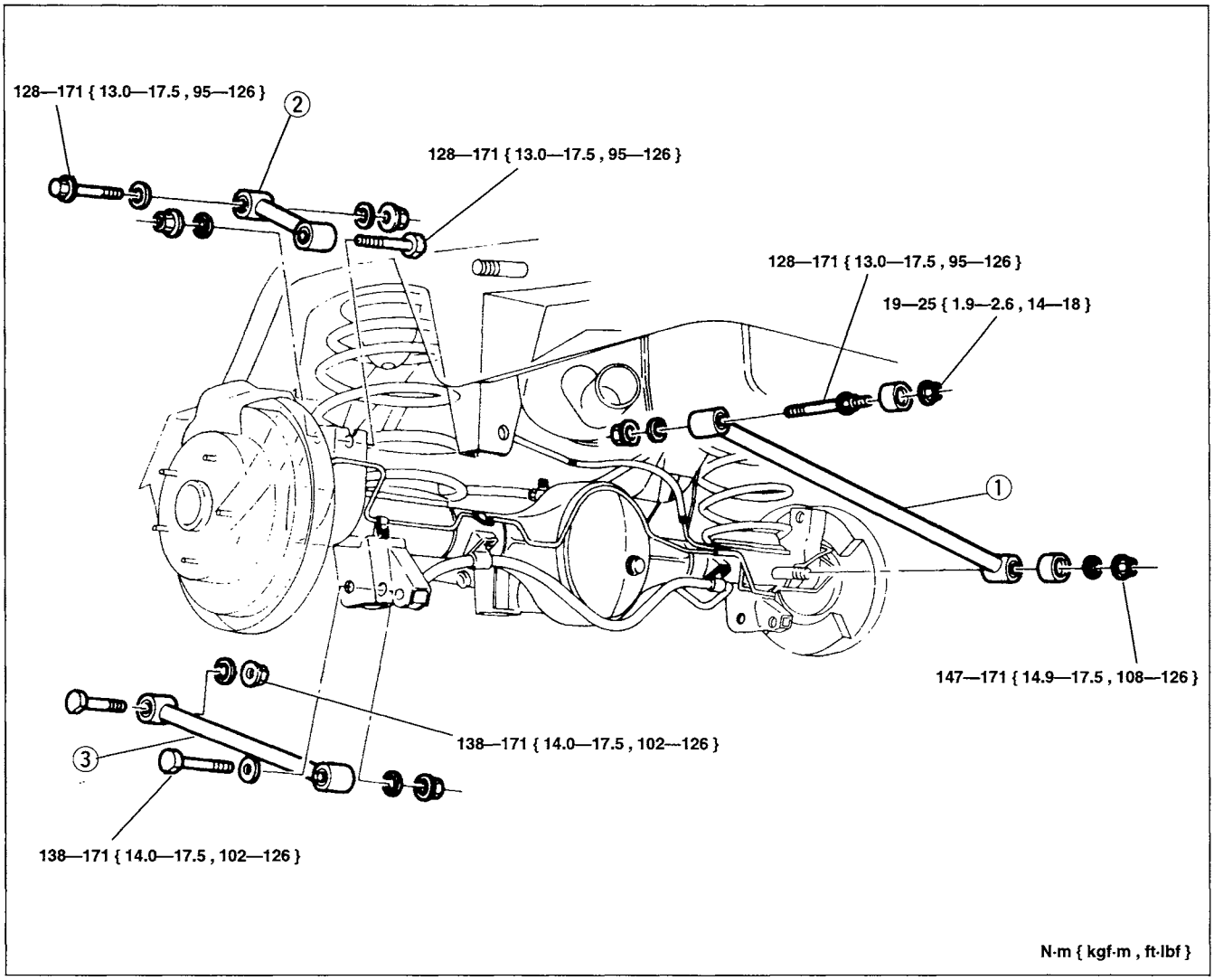


Nut (All model)
1. Install the nut.
2. Verify that the height sensor link is installed in the proper direction as shown.

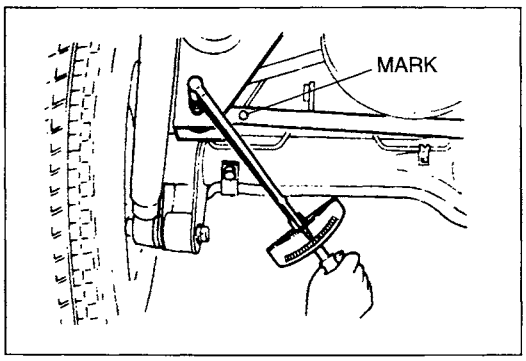
UPPER LINK, LOWER LINK, AND LATERAL ROD

Removal / Inspection / Installation

1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove in the order shown in the figure.
3. Inspect the links for bending or damage and the rubber bushings for deterioration or wear. Replace the link assembly if a problem is found.
4. Install in the reverse order of removal, referring to **Installation Note**.
5. Tighten all nuts and bolts to just under the specified torque, and then tighten to the specified torque after removing the safety stands and lowering the vehicle.



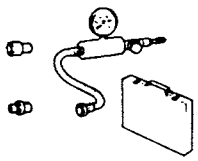
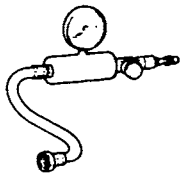
1. Lateral rod
   Installation Note ..... below
2. Upper link
3. Lower link



Installation note
Lateral rod
Install the lateral rod with the mark toward the body.

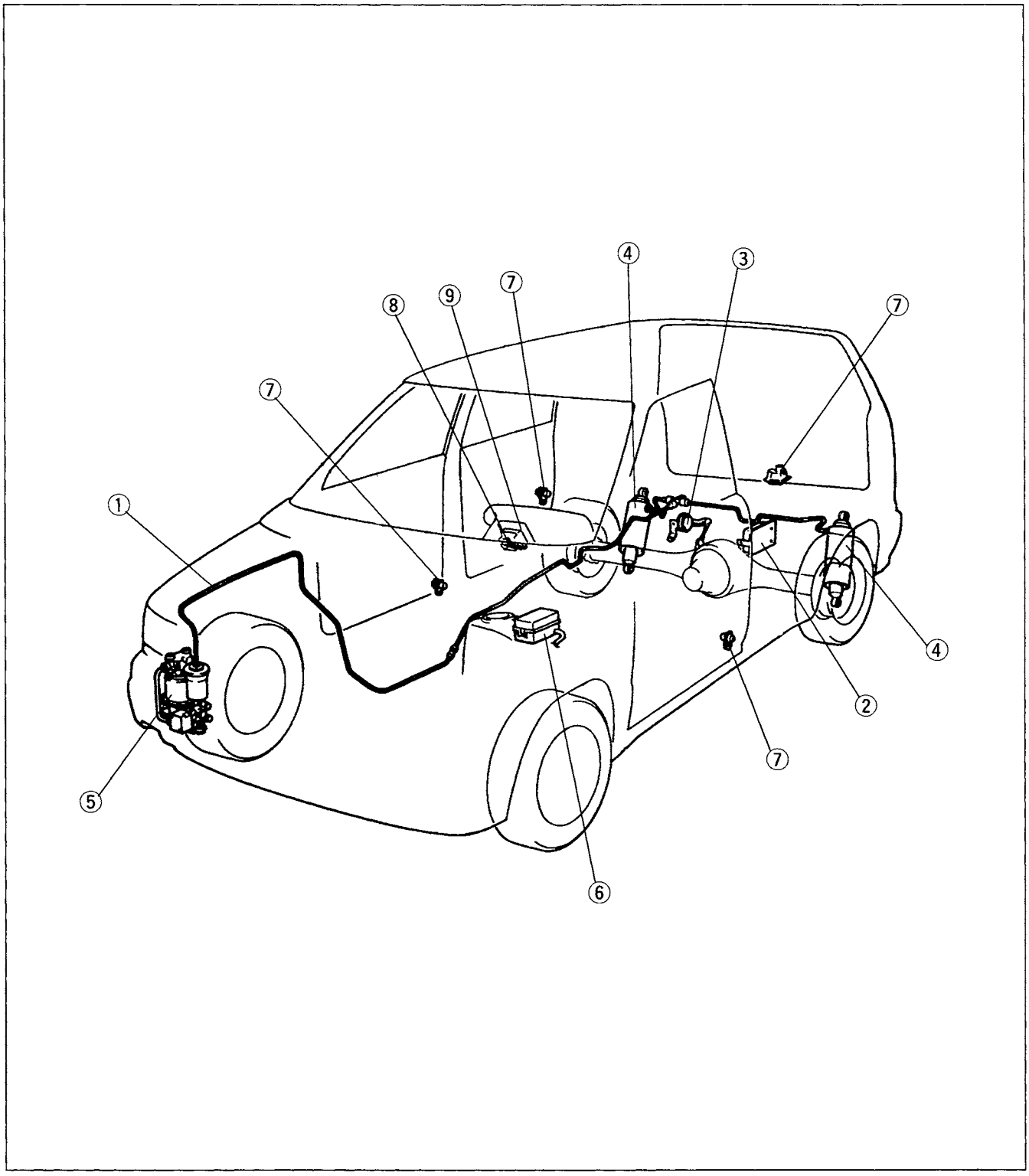
AUTOMATIC LOAD LEVELING (ALL)

PREPARATION
SST

49 L028 0A0 Gauge set, air pressure 	For inspection of shock absorber and compressor	49 B034 101 Gauge body (Part of 49 L028 0A0) 	For inspection of shock absorber and compressor
49 L028 001 Adapter (Part of 49 L028 0A0) 	For inspection of shock absorber and compressor	49 L028 002 Adapter (Part of 49 L028 0A0) 	For inspection of shock absorber

DESCRIPTION

The ALL found on towing package equipped models is installed to detect changes in height of the rear of the vehicle caused by load changes and to regulate the rear vehicle height to maintain the proper front-to-rear attitude.



1. Air pipes
2. ALL control module
3. Height sensor
4. Rear shock absorber
5. Compressor assembly
6. Compressor relay
7. Door switch
8. Vehicle speed sensor
9. ALL indicator light

TROUBLESHOOTING GUIDE

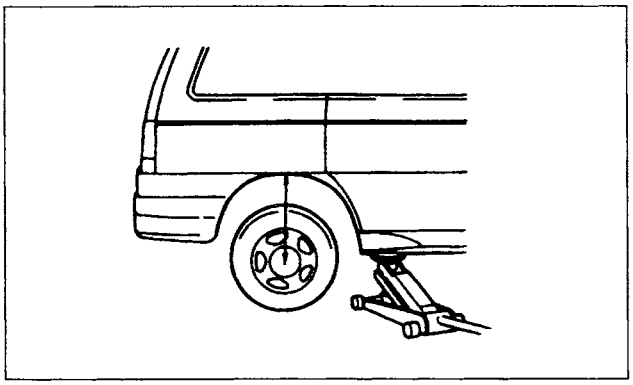
Problem	Engine	Symptom	Possible cause	Page
Abnormal vehicle height	**Running**	Vehicle higher than designated height	• Height sensor malfunction • Improperly adjusted height sensor rod • Exhaust valve stuck or damaged/ disconnected wiring • Exhaust valve passage clogged or damaged/disconnected harness • ALL control module malfunction • Air pipe clogged • Height sensor electrical circuit damaged/disconnected	R–40 R–40 R–42 R–42 R–38 R–36 R–40
		Vehicle lower than designated height	• Height sensor malfunction • Improperly adjusted height sensor rod • Poor contact of compressor relay or damaged/disconnected wiring • Insufficient output pressure of compressor • Compressor motor malfunction • ALL control module malfunction • Air pipe clogged or leaking • Air leakage from shock absorber • Damaged shock absorber rolling diaphragm • Height sensor electrical circuit damaged/disconnected	R–40 R–40 R–42 R–42 R–42 R–38 R–36 R–36, 41 R–41 R–40
		Vehicle occasionally changes (up or down)	• Improperly adjusted height sensor rod • ALL control module malfunction	R–40 R–38
	Stopped (ignition switch OFF)	Vehicle higher than designated height	• Exhaust valve passage clogged or damaged/disconnected harness • Air pipe clogged • Height sensor malfunction • Improperly adjusted height sensor rod	R–42 R–36 R–40 R–40
		Vehicle lower than designated height	• Damaged exhaust valve • Air leakage at air pipes or shock absorber connection	R–42 R–36, 41
Abnormal indication	**Running**	ALL indicator light remains illuminated	• Height sensor malfunction or damaged/disconnected wiring • Improperly adjusted height sensor rod • Generator harness damaged or disconnected • Generator malfunction • Exhaust valve stuck or damaged/disconnected wiring • Exhaust valve leakage • Insufficient compressor output pressure or compressor motor malfunction • ALL control module malfunction • Air leakage at air pipes or shock absorber connection • Damaged shock absorber rolling diaphragm	R–40 R–40 R–38 section G R–42 R–42 R–42 R–38 R–36, 41 R–41
		ALL indicator light does not stop flashing	• Exhaust valve leakage • Insufficient compressor output pressure • ALL control module malfunction • Air pipe clogged or air leakage from valve or shock absorber • Damaged shock absorber rolling diaphragm	R–42 R–42 R–38 R–36, 41, 42 R–41

Problem	Engine	Symptom	Possible cause	Page
Compressor operation abnormal	**Running**	Compressor operates too often	• Exhaust valve stuck or harness short circuit • Exhaust valve air leakage • Air leakage at air pipes or shock absorber connection • Damaged shock absorber rolling diaphragm • ALL control module malfunction • Door switch malfunction • Vehicle speed sensor malfunction	R–42 R–42 R–36, 41 R–41 R–38 section T section T
		Compressor does not stop	• Exhaust valve stuck or harness short circuit • Compressor relay malfunction • ALL control module malfunction • Air leakage at air pipes or shock absorber connection • Damaged shock absorber rolling diaphragm	R–42 R–43 R–38 R–36, 41 R–41
		Compressor does not start	• Generator malfunction • Compressor malfunction • Compressor motor internal wiring damaged/disconnected • ALL control module malfunction • Compressor relay malfunction • Door switch malfunction	section G R–42 R–42 R–38 R–43 section T
		Compressor speed too slow	• Compressor relay malfunction • Compressor motor malfunction	R–43 R–42

TROUBLESHOOTING MAIN FLOWCHART

Check ALL system
(On-board diagnostic system, refer to page R–34)

Check speed sensor
1. Drive vehicle at above 3.5 km/h { 2 mph }
2. Stop and remain in the vehicle
   Do not open any doors
3. Have assistant jack up vehicle at rear side sill to 450 mm { 17.7 in } (from center of wheel to center of wheel arch...2WD, to lower end of fender molding...4WD)
4. Wait 10 seconds and verify that ALL indicator light does not flash



OK

NG → Check vehicle speed sensor
(Refer to page R–38 and section T)

Check door switch
1. Open driver's door
2. Verify that ALL indicator light begins flashing within 10 seconds

NG → Check door switch (Refer to page R–38 and section T)

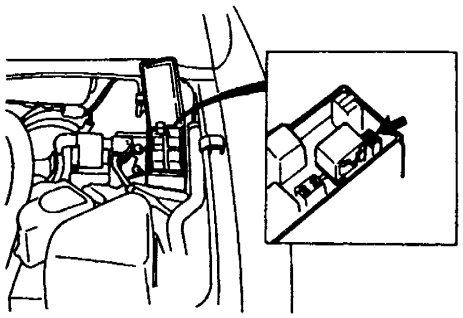
OK

Normal

If problem is suspected at other door switches, refer to section T and check remaining switches

On-board Diagnostic System

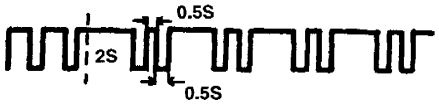
After the check terminal is grounded and the ignition switch is turned to ON, the ALL control module changes to the on-board diagnostic mode described below, which checks the operation of the air-intake system, the exhaust system, and the vehicle-height sensor. If the results indicate a problem, the ALL indicator light begins flashing, and the system with the problem is indicated by the pattern of the flashing. (Refer to page R–35 for procedure.)



Flashing Pattern

1) System OK

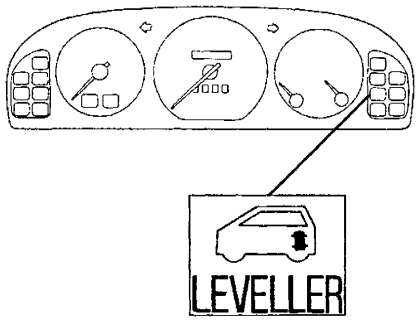
2) Malfunction of air-intake system



3) Malfunction of exhaust system

4) Malfunction of vehicle-height sensor

5) Combination malfunction (Example: Malfunction of air-intake system and exhaust system)



ALL INDICATOR LIGHT

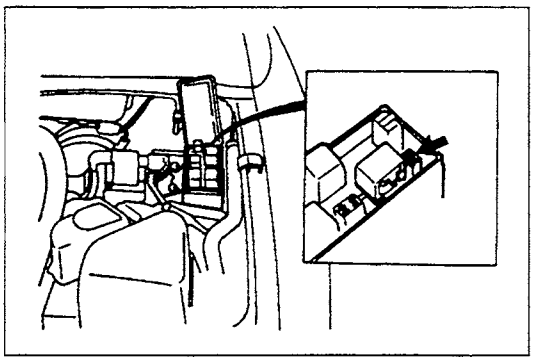
Reference

Check contents

① Air-intake system check
A check is made to determine if vehicle height increases to NGH (abnormally high) within 150 seconds.

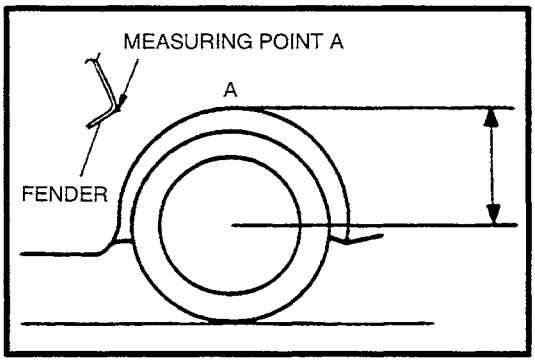
② Exhaust system check
A check is made to determine if vehicle height decreases from NGH (abnormally high) to L (low) within 110 seconds.

③ Vehicle-height sensor check
A check is made to determine if output is other than that specified from start of check to finish of check.



Preparations

- The work should be done on a surface that is smooth and flat.

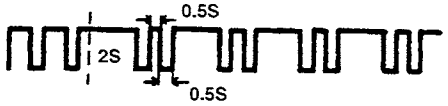


Checking vehicle-height adjustment function

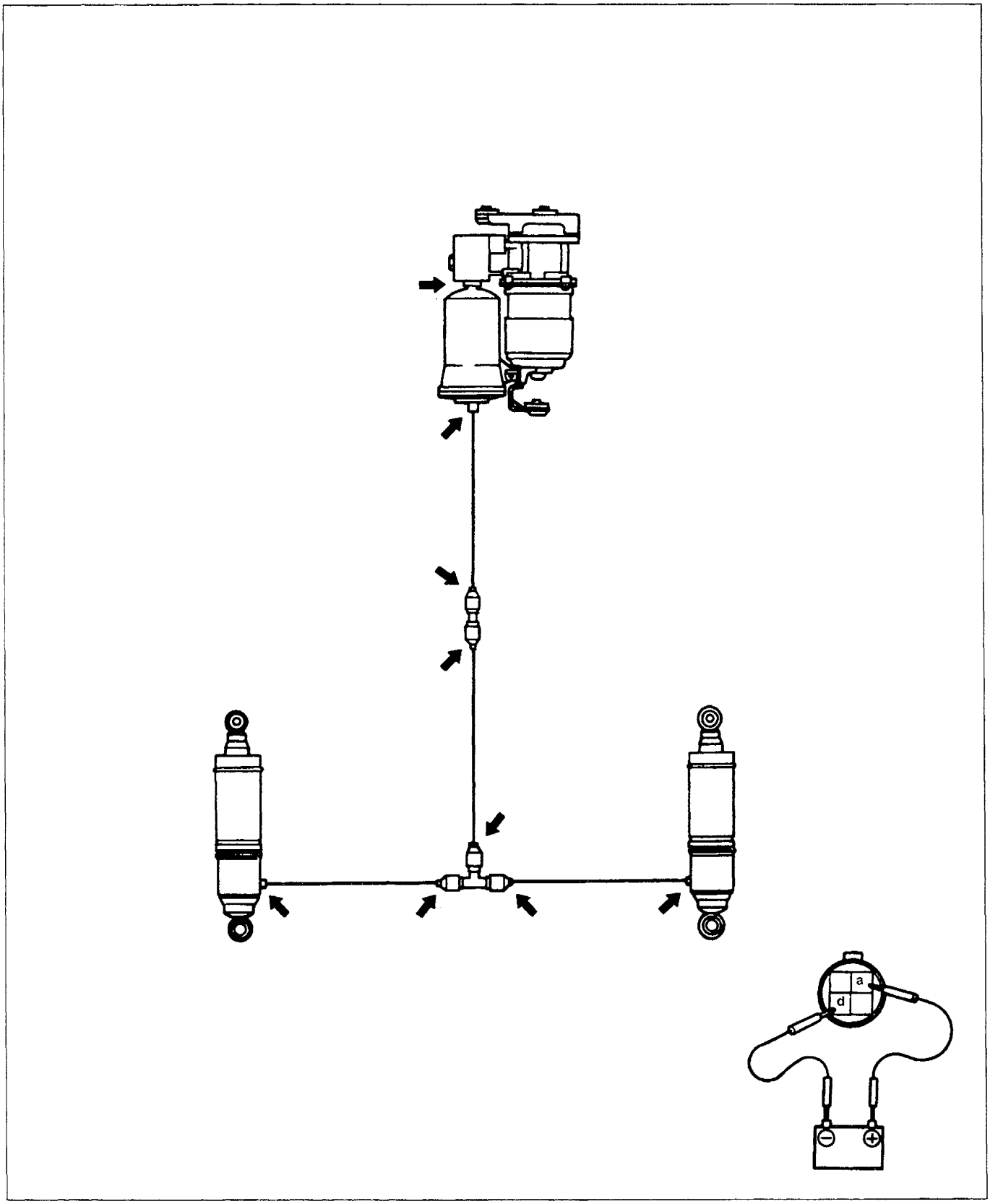
1. Ground the check connector.
2. To set the ALL system to the diagnostic test mode, turn the ignition switch to ON, but do not start the engine.
3. After returning to the standard height, look for flashing of the ALL indicator light.

Vehicle height*
Rear: 400 ± 20 mm { 15.7 ± 0.8 in }...2WD
465 ± 20 mm { 18.3 ± 0.8 in }...4WD
Difference between left and right : 15 mm { 0.6 in } or less

*** Indicates from center of wheel to lower end of fender brim**

Problem	Possible cause	Page
	• System OK	—
	• Improper contact of compressor relay contacts or damaged/disconnected wiring • Insufficient output pressure of compressor • Compressor motor malfunction • Air pipe clogged or air leakage from each joint • Damaged shock absorber rolling diaphragm • Height sensor malfunction • Improper adjustment of height sensor rod • ALL control module malfunction	R–43 R–42 R–42 R–36, 41 R–41 R–40 R–40 R–38
	• Exhaust valve passage clogged or damaged/disconnected harness • Air pipe clogged • Height sensor malfunction • Improper adjustment of height sensor rod • ALL control module malfunction	R–42 R–36 R–40 R–40 R–38
	• Height sensor internal circuitry malfunction or damaged/disconnected harness • Improper adjustment of height sensor rod	R–40 R–40

AIR PIPE
Inspection
Checking air pipes for air leakage
1. Apply a soap-and-water solution to the areas indicated by the arrows.
2. Apply battery voltage (12 V) between terminals (a) and (d) of the compressor connector to activate the compressor and build pressure in the pipes.
3. Check for bubbles.



Checking airflow through air pipes

1. Disconnect both ends of the air pipe to be checked.
2. Blow air through the pipe to verify clear passage.

Replacement

A Type

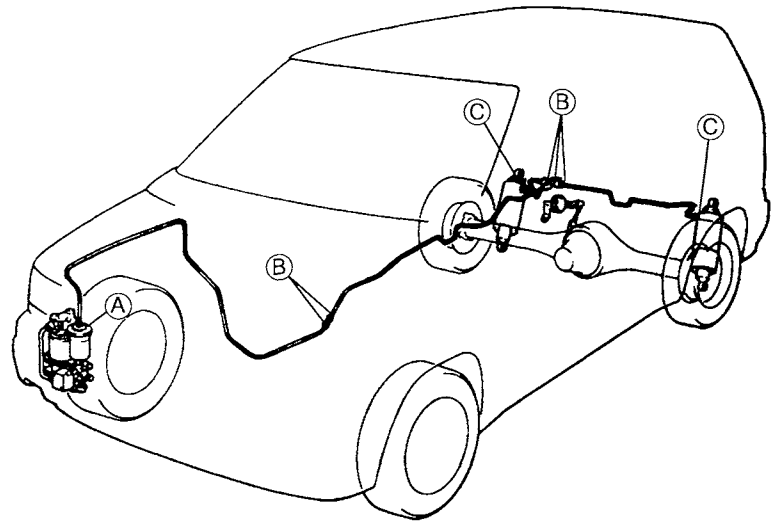
Disconnection .... Press at the base of the plug, and then pull the air pipe to disconnect it.
Connection ..... Push in until the air pipe's ridge catches on the tab on the plug.

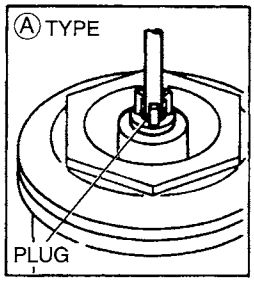
B Type

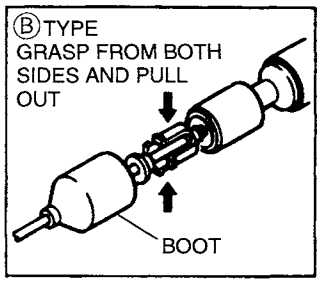
Disconnection .... 1. Remove the boot from the joint.
2. Firmly grasp the air pipe joint tabs and pull out.
Connection ..... 1. Push in until a click is heard, then pull slightly to be sure the connection is secure.
2. Cover the joint with the boot.

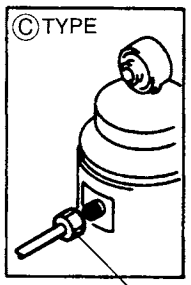
C Type

Disconnection .... Remove the pipe by removing the nut.
Connection ..... Install the pipe by tightening the nut.



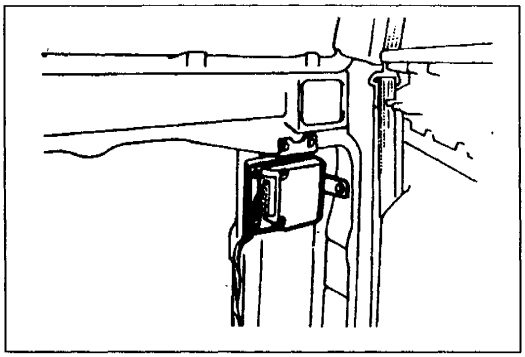






12.8—17.6 { 130—180 , 113—156 }

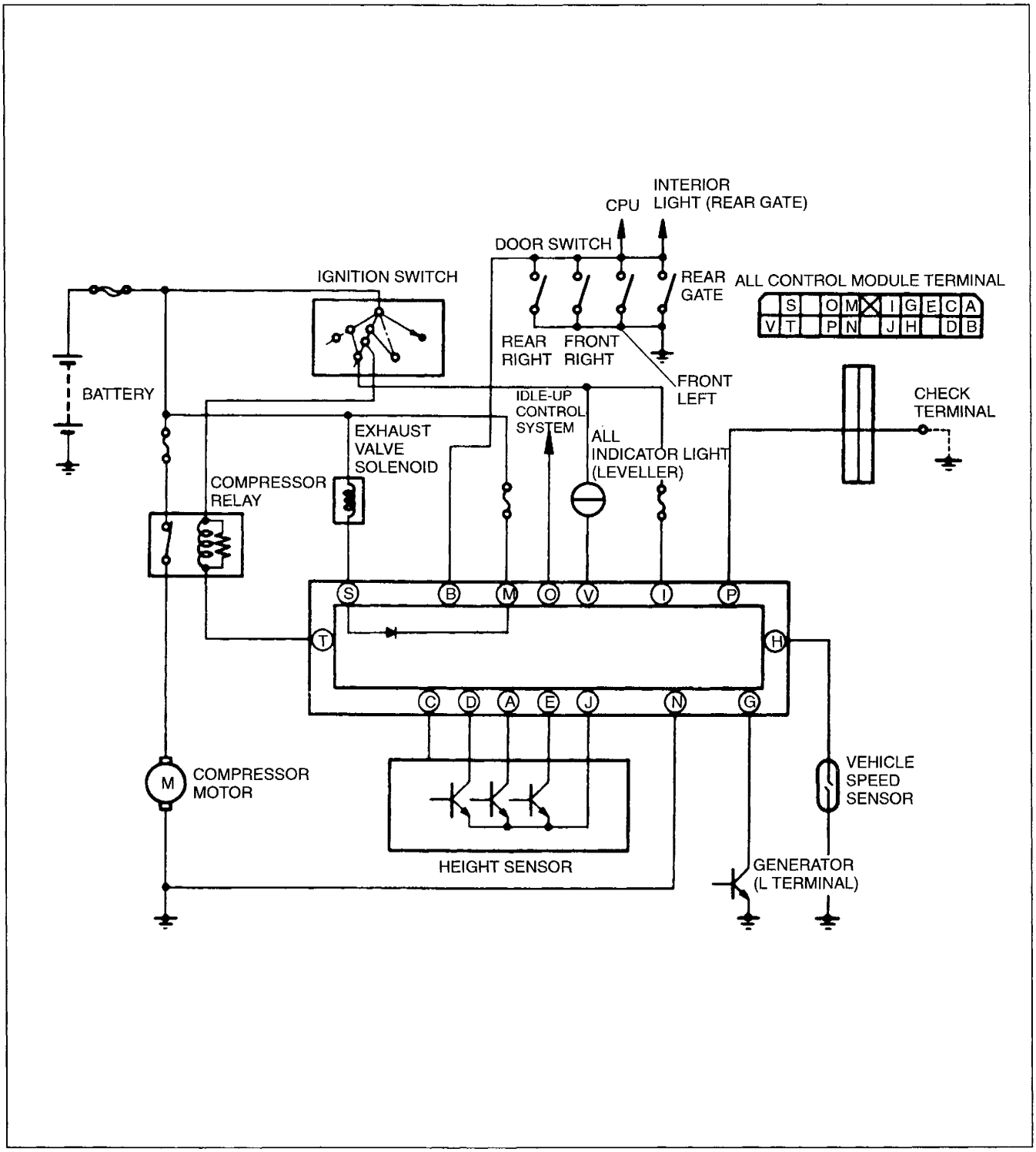
N·m { kgf·cm , in·lbf }



ALL CONTROL MODULE

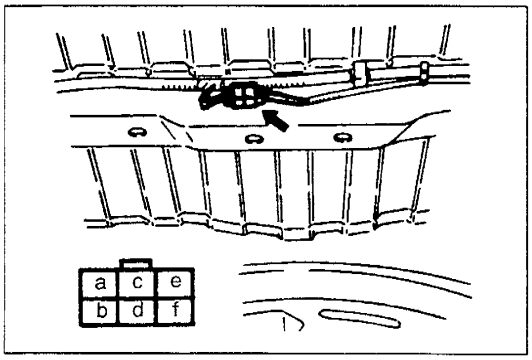
Inspection

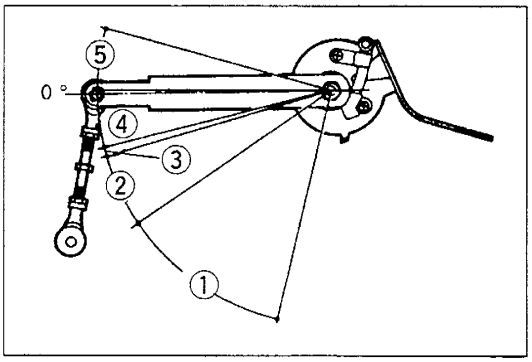
1. Remove the No.1 rear seat.
2. Remove rear side trim A.
3. With the ALL control module connector connected, check the voltage of the connector terminals as described on page R–39.

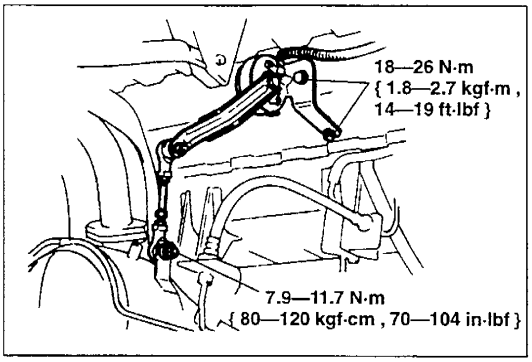


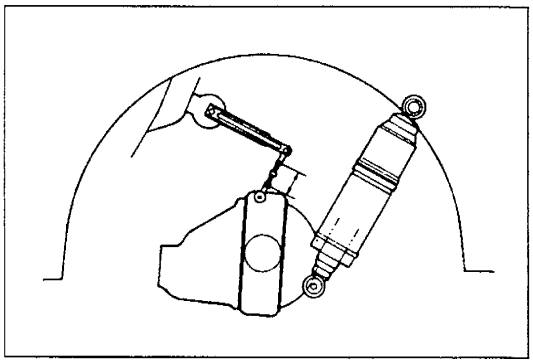
B+: Battery positive voltage

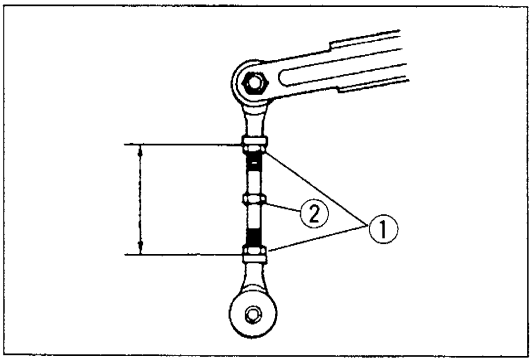
To	Terminal	Conditions and terminal voltage	
Height sensor	A D E	Varies according to vehicle height; Refer to "HEIGHT SENSOR" (Page R–40)	
Vehicle speed sensor	H	Vehicle running (10 km/h { 6.2 mph })	2—3 V
		Vehicle stopped	0 or B+
Generator (L terminal)	G	Engine running	B+
		Engine stopped	0—2.5 V
Door switch	B	Door open	0 V
		Door closed	B+
Exhaust valve	S	Valve ON	0 V
		Valve OFF	B+
Compressor relay	T	Compressor ON	0 V
		Compressor OFF	B+
Idle-up	O	Compressor ON	0—1 V
		Compressor OFF	B+
ALL indicator light	V	Ignition ON	0—2 V
		Engine running	B+
Battery power supply	M	Constant	B+
Ignition power supply	I	Ignition ON	B+
Height sensor power supply	C	Constant	5 V
Height sensor ground	J	Constant	0 V
Ground	N	Constant	0 V
Check terminal	P	Constant	10 V or more











HEIGHT SENSOR

Inspection

1. Use a screwdriver or similar tool to remove the cover from the height sensor connector.
2. Check for **5 V** at terminal (a) of the connector.
3. Disconnect the rod.
4. Check that the voltages shown in the table are present at terminals (c), (d), and (b) when the rod is moved.

Vehicle height	Sensor link position		Connector terminal		
	2WD	4WD	c (A*)	d (E*)	b (D*)
NGH*	①		0—0.5 V	4.5—5.5 V	4.5—5.5 V
	26.0—79.1°	31.5—77.7°			
H (high)	②		0—0.5 V	0—0.5 V	4.5—5.5 V
	17.3—29.0°	21.0—34.5°			
N (neutral)	③		0—0.5 V	0—0.5 V	0—0.5 V
	15.3—17.3°	19.1—21.1°			
L (low)	④		4.5—5.5 V	0—0.5 V	0—0.5 V
	-2.3—15.3°	3.3—19.1°			
NGL*	⑤		4.5—5.5 V	4.5—5.5 V	0—0.5 V
	-18.8—0.7°	-14.2—6.3°			

*NGH: (abnormally high)
*NGL: (abnormally low)
*: (A), (E), (D)....Control module terminal

Replacement

1. Jack up the rear of the vehicle and support it on safety stands.
2. Turn the spare tire carrier bolt counterclockwise and let the spare tire carrier down about 300 mm { 11.8 in }.
3. Disconnect the harness connector.
4. Remove the bolts, nuts, and the height sensor.
5. Install in the reverse order of removal. Tighten to the specified torque.

Bracket-to-body tightening torque:
18—26 N·m { 1.8—2.7 kgf·m , 14—19 ft·lbf }

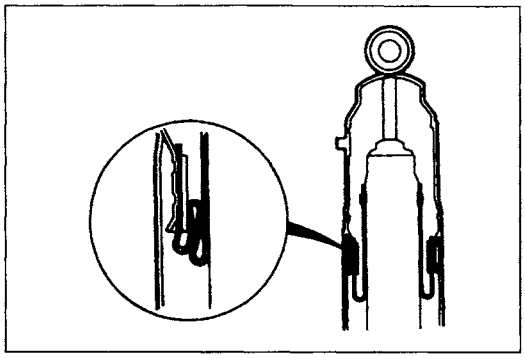
Adjustment

1. Measure the length of the height sensor rod as shown in the figure.

Specified length:
59.5—60.5 mm { 2.35—2.38 in }...2WD
99.5—100.5 mm { 3.92—3.95 in }...4WD

2. If the rod length is not as specified, adjust as described below. Lengthening the height sensor rod increases vehicle height, and shortening it decreases vehicle height.
   (1) Loosen the turn buckle by tightening nuts ①.
   (2) Adjust the length by turning the center bolt ②.
   (3) Tighten the nuts ①.

Tightening torque:
7.9—10.7 N·m { 80—110 kgf·cm , 70—95 in·lbf }



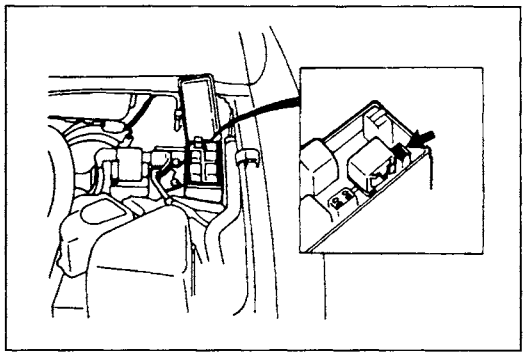
REAR SHOCK ABSORBER

Inspection

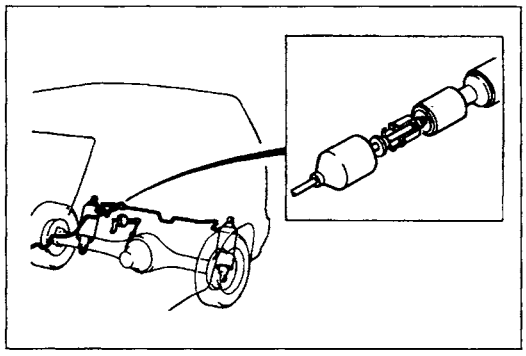
Checking rolling diaphragm for damage

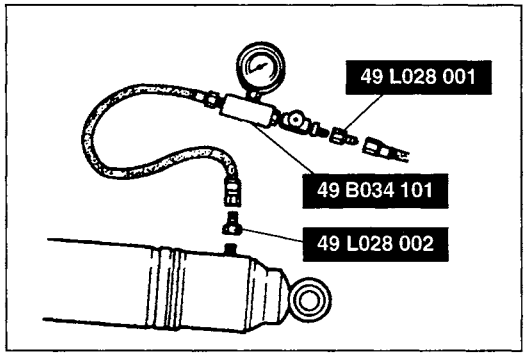
If no air is in the cylinders and the vehicle is jacked up and then lowered suddenly, the rolling diaphragm may be folded double, as shown.

If the vehicle is driven in this condition, the diaphragm will be damaged. Check for such damage visually or by feeling the diaphragm by hand. If it is folded, repair as described below.



1. Ground the check connector.
2. Set the ALL system to the diagnostic test mode by turning the ignition switch to ON, but do not start the engine.
3. Disconnect the check terminal.
4. Before lowering the vehicle:
   (a) Disconnect the air pipe if the pressure in the shock absorber air cylinders is abnormally low.
   (b) Verify that the ALL indicator light is not flashing.
5. Lower the vehicle.

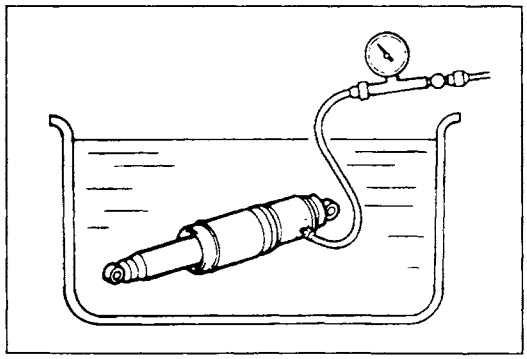




Checking for air leakage

If the location of an air leak cannot be found by using a soap and-water solution (Refer to page R–36.), check as described below.

1. Remove the shock absorber.
2. Visually check the diaphragm for damage.
3. Using the **SST**, make connections as shown in the figure.
4. Apply **approx. 490 kPa { 5 kgf/cm^2 , 71 psi }** air pressure.



5. Place the shock absorber in a tank of water and check for air leakage.

   Note
   - The shock absorber is coated with foam on its outer surface. Do not mistake it for leakage.

6. If the above check shows air leakage from the shock absorber, replace the shock absorber assembly.
   (Refer to page R–26.)
7. After the check is finished, remove all moisture by blowing with compressed air.

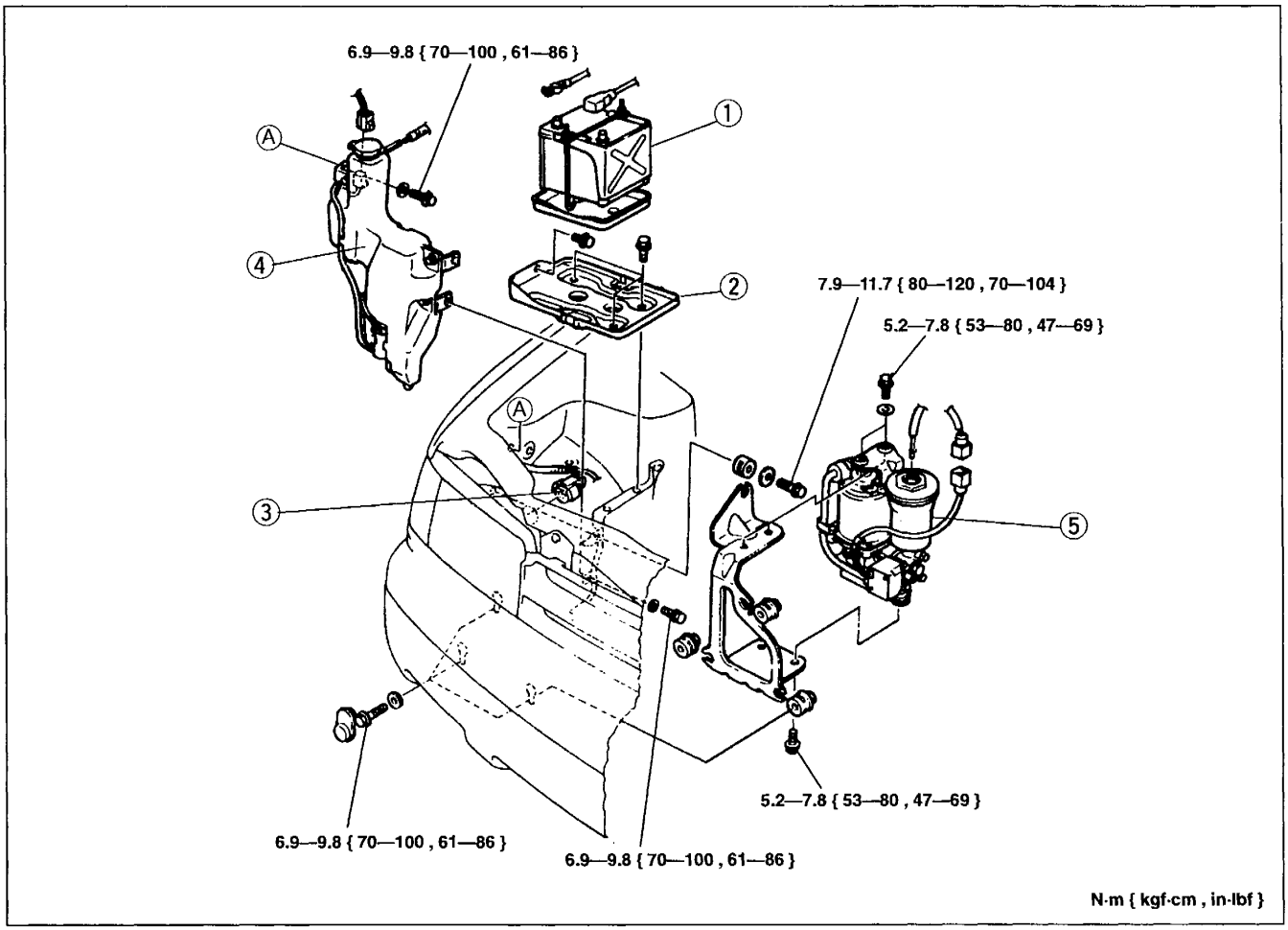
COMPRESSOR ASSEMBLY

Removal / Installation

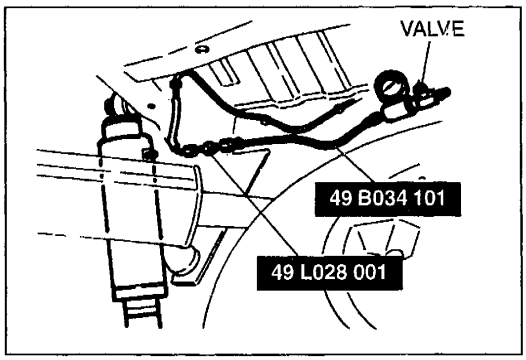
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Tighten all nuts and bolts to the specified torque, referring to the figure.

Note

- An internal circuit breaker is incorporated within the compressor.
  It opens to stop the motor if the motor temperature exceeds **approx. 150 °C { 302 °F }**. It automatically resets itself and restarts the motor when the temperature drops below approx. **100 °C { 212 °F }**.



1. Battery
2. Battery bracket
3. Headlight bulb
4. Washer tank
5. Compressor assembly
   Inspection ..... below

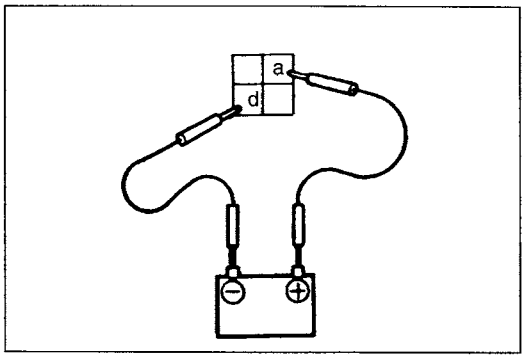


Inspection

Compressor assembly

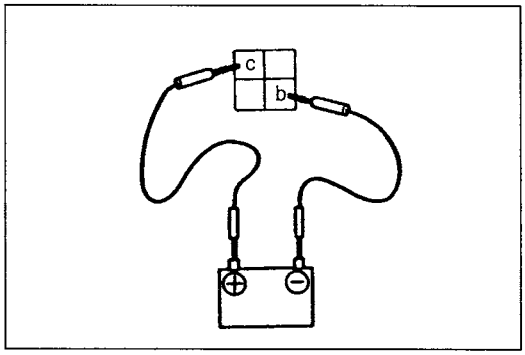
Checking compressor and exhaust valve

1. Jack up the rear of the vehicle and support it on safety stands.
2. Disconnect the air pipes from the shock absorbers (Refer to page R–37). Connect the **SST** as shown in the figure.



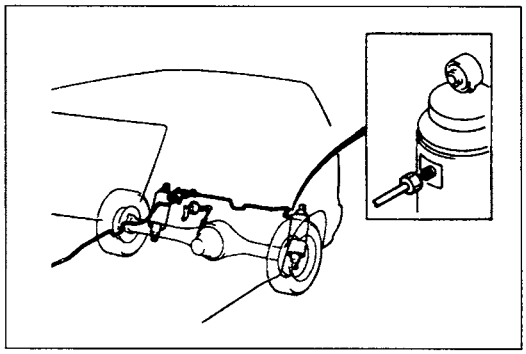
3. Apply battery voltage (12 V) between terminals (a) and (d) of the compressor connector to activate the compressor.
4. Close the valve on the pressure gauge, and check the output pressure.

Standard:
981—1,274 kPa { 10—13 kgf/cm^2 , 143—184 psi }



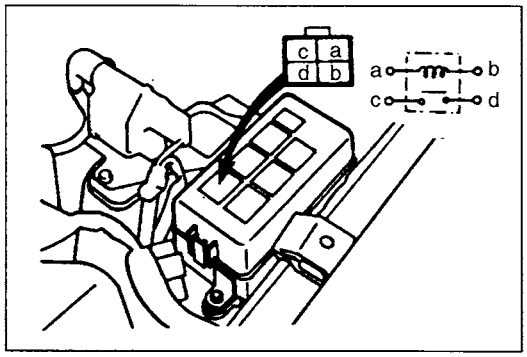
5. Stop the compressor.
6. While maintaining the compressor pressure, apply battery voltage (12 V) between terminals (c) and (b) of the compressor connector.
7. Verify that the exhaust valve operation sound is heard and that the pressure gradually decreases. Check that the following pressure is finally reached and held.

Standard:
20—78 kPa { 0.2—0.8 kgf/cm^2 , 3—11 psi }



8. Lower the jack slowly.
9. Connect the air pipe to the shock absorbers.

Tightening torque: 12.8—17.6 N·m
{ 130—180 kgf·cm , 113—156 in·lbf }



COMPRESSOR RELAY
Inspection
1. Remove the compressor relay.
2. Connect battery voltage (12 V) to terminal (b) and ground terminal (a).
3. Verify continuity between terminals (c) and (d).

Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

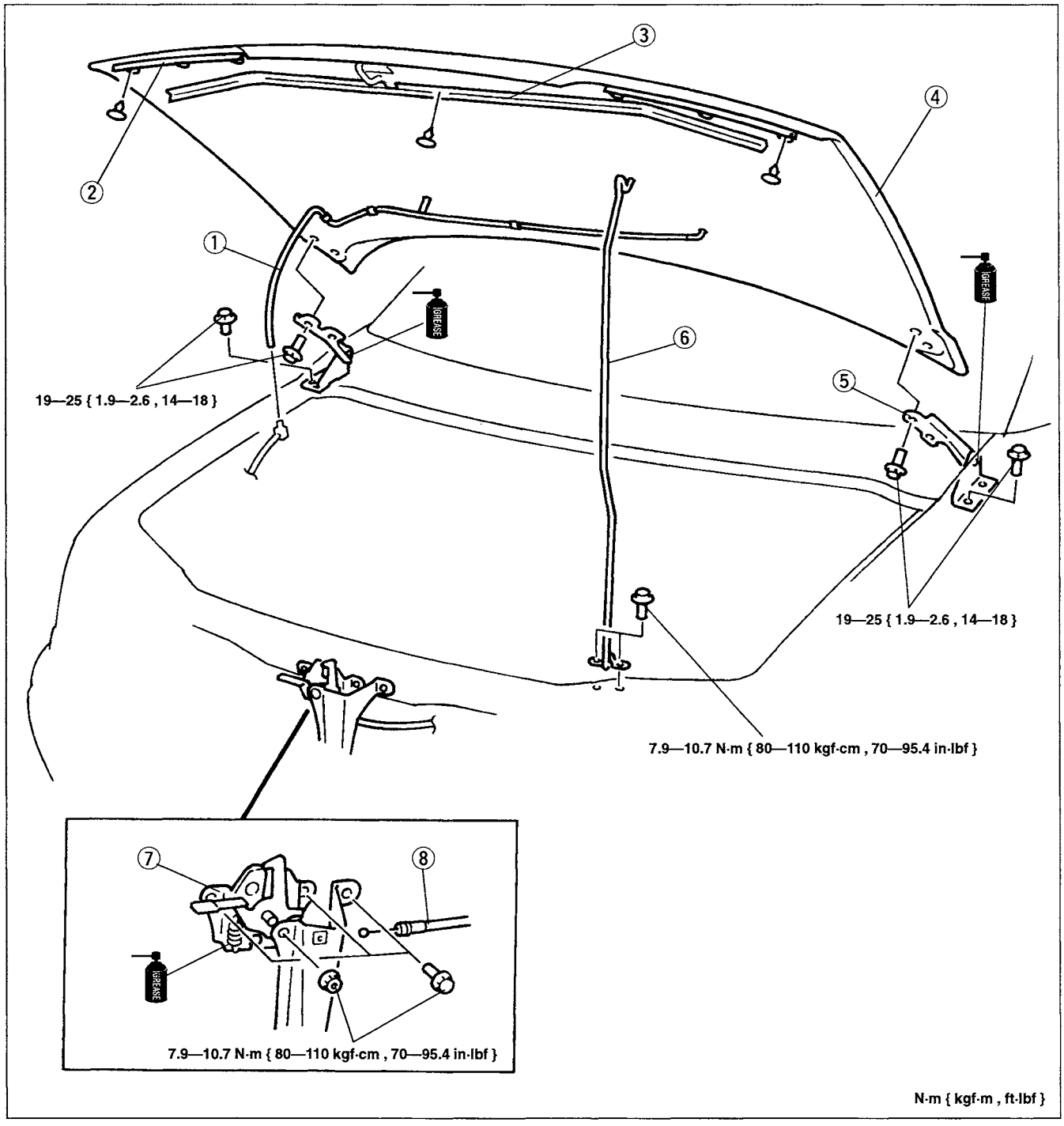
BODY

HOOD

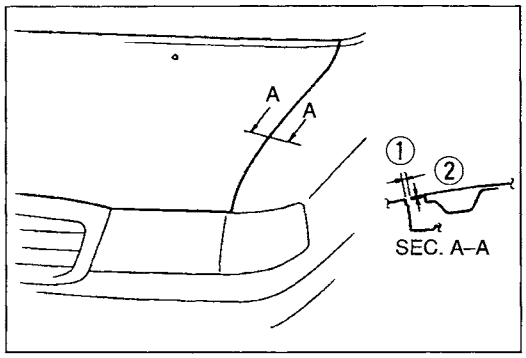
HOOD

Removal / Installation

1. Remove in the order shown in the figure. To remove the hood hinge, remove the front fender panel. (Refer to page S–5.) To remove the hood lock, remove the radiator grille. (Refer to page S–30.)
2. Install in the reverse order of removal.



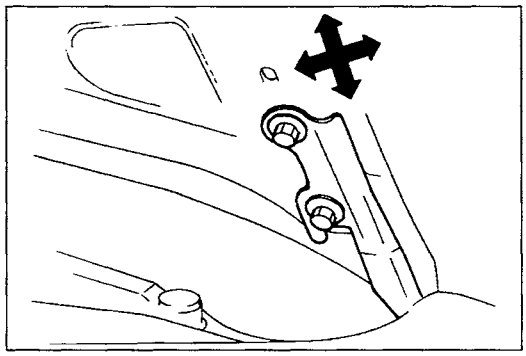
1. Windshield washer pipe
2. Deflector
3. Weatherstrip
4. Hood
   Adjustment ..... page S–4
5. Hood hinge
6. Hood stay
7. Hood lock
   Adjustment ..... page S–4
8. Hood release cable



Adjustment
Hood
1. Measure the gap and height between the hood and the front fender panel.

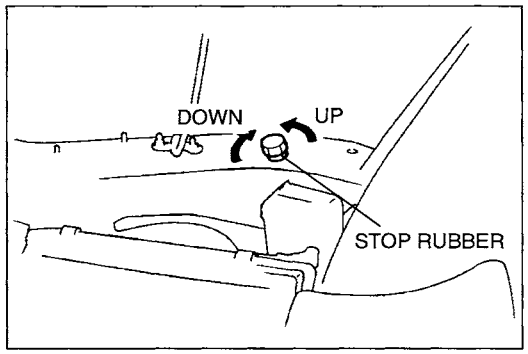
   Clearance ①: 4.0 ± 1.0 mm { 0.16 ± 0.04 in }
   ②: 0.8 ± 1.0 mm { 0.03 ± 0.04 in }

2. If not as specified, adjust the gap and height.
3. Adjust the hood lock after the hood has been aligned. (Refer below.)

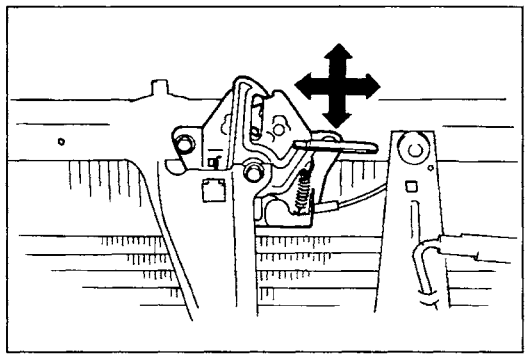


Gap
Loosen the hood-to-hinge installation bolts and reposition the hood.

Tightening torque:
19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }



Height
Turn the stop rubber to adjust the height of the hood.



Hood lock
1. Verify that the hood is properly aligned. (Refer above.)
2. Loosen the hood lock installation bolts and nut, and align the lock with the striker on the hood.

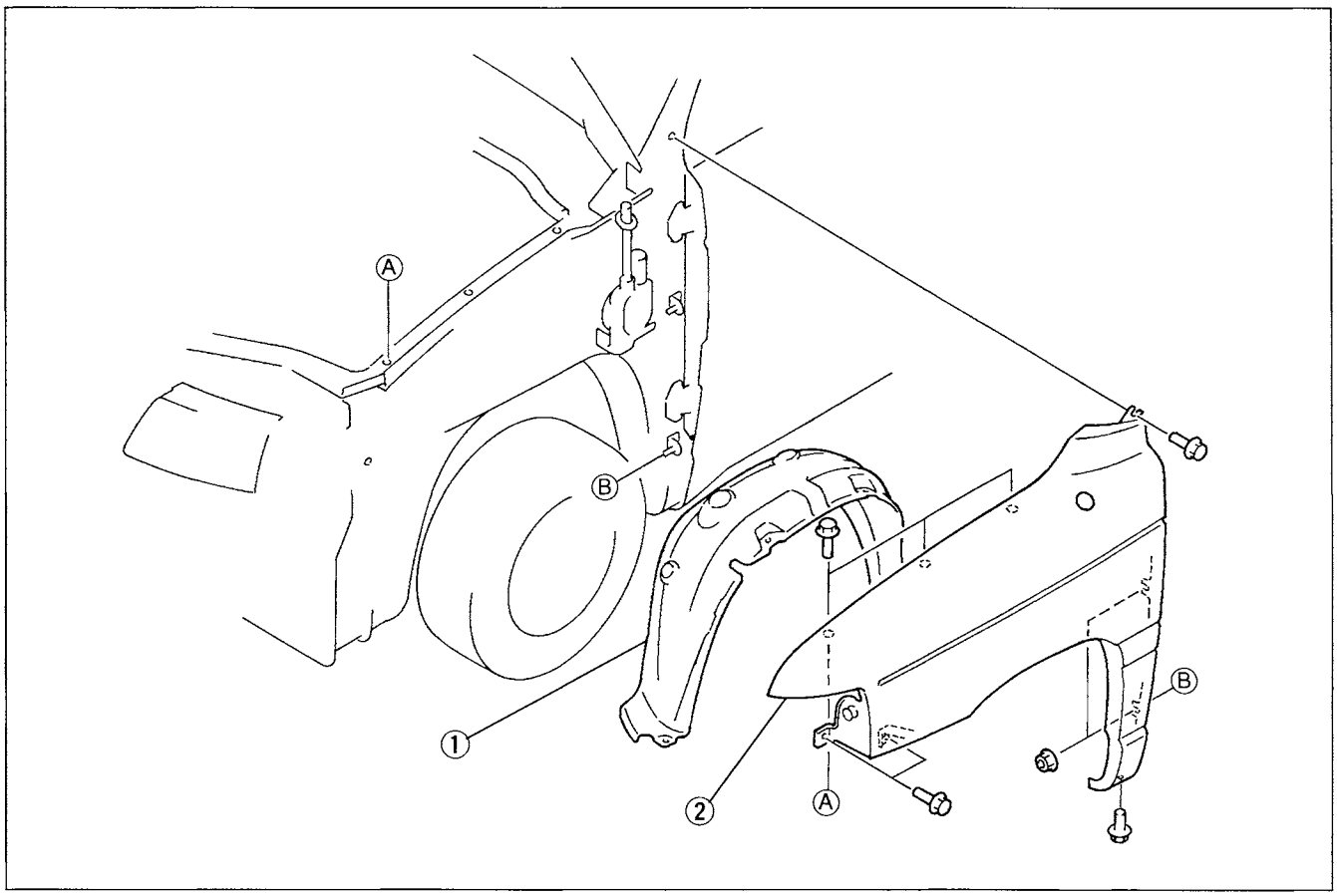
Tightening torque:
7.9—10.7 N·m { 80—110 kgf·cm , 70—95.4 in·lbf }

FRONT FENDER PANEL

FRONT FENDER PANEL

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the front bumper. (Refer to page S–29.)
3. Remove the windshield molding. (Refer to page S–31.)
4. Remove in the order shown in the figure.
5. Install in the reverse order of removal.



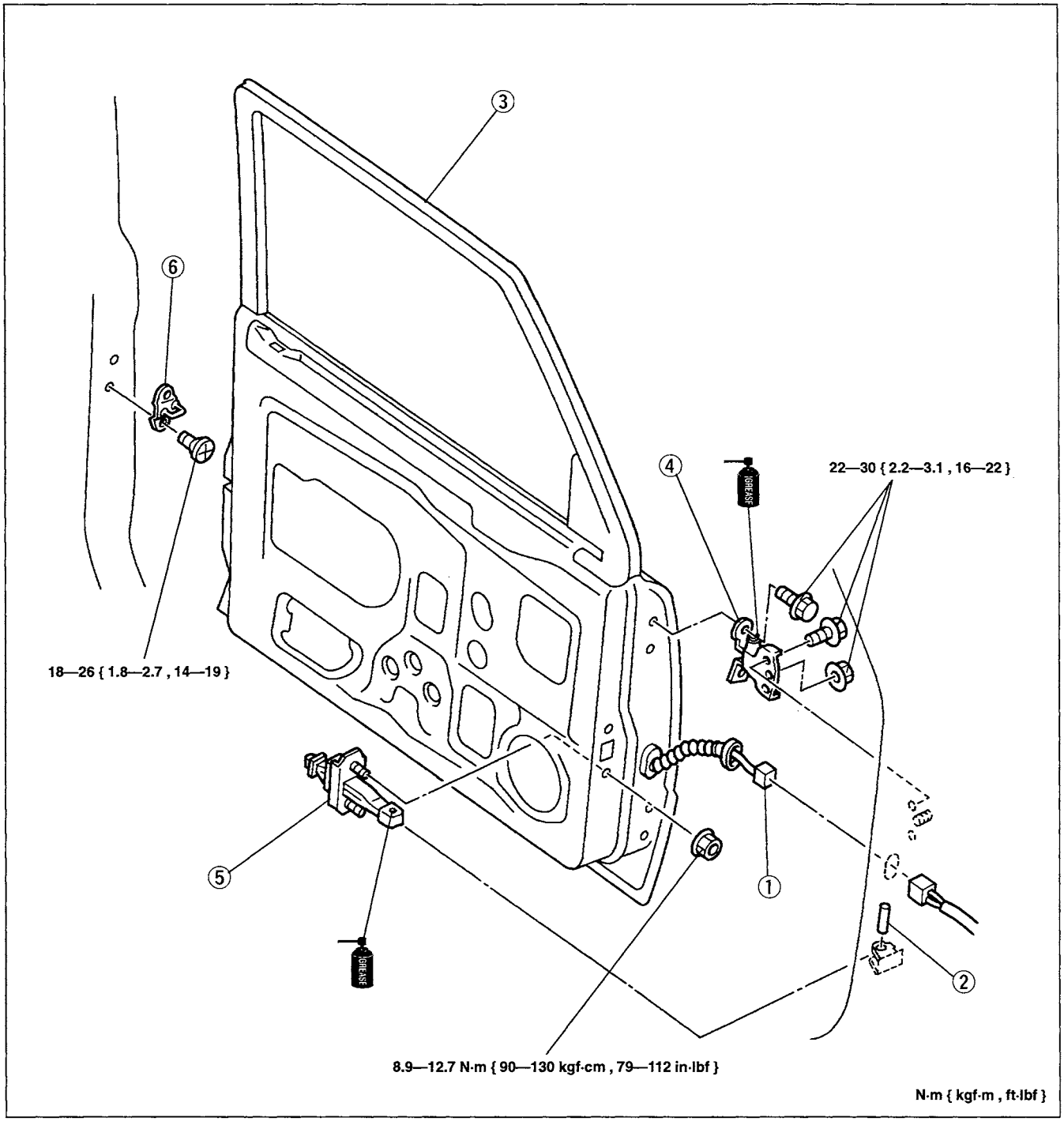
1. Mud guard
2. Front fender panel

DOOR

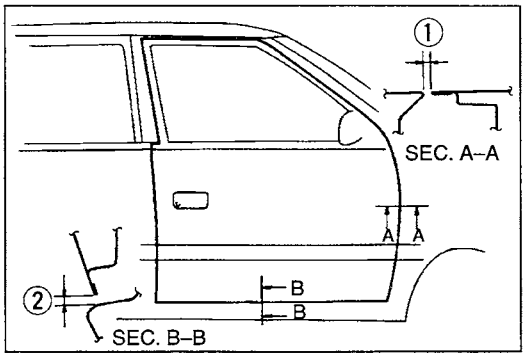
FRONT DOOR

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure. To remove the checker, remove the door speaker. (Refer to section T.)
3. Install in the reverse order of removal.



1. Harness connector
2. Checker pin
3. Front door
   Adjustment ..... page S–7
4. Door hinge
5. Checker
6. Door lock striker
   Adjustment ..... page S–7



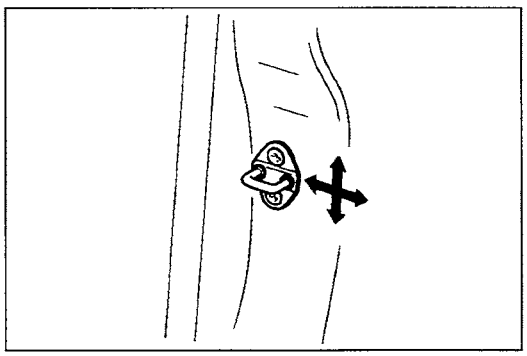
Adjustment
Front door

1. Verify that the front door can be closed easily and that there is no looseness or excessive clearance.

   Clearance ①: 5.0 + 1.0 mm { 0.2 + 0.04 in }
   ②: 5.8 ± 1.5 mm { 0.23 ± 0.06 in }

2. If not as specified, loosen the door-hinge-to-body installation bolts and nuts, and reposition the front door.

   Tightening torque:
   22—30 N·m { 2.2—3.1 kgf·m , 16—22 ft·lbf }



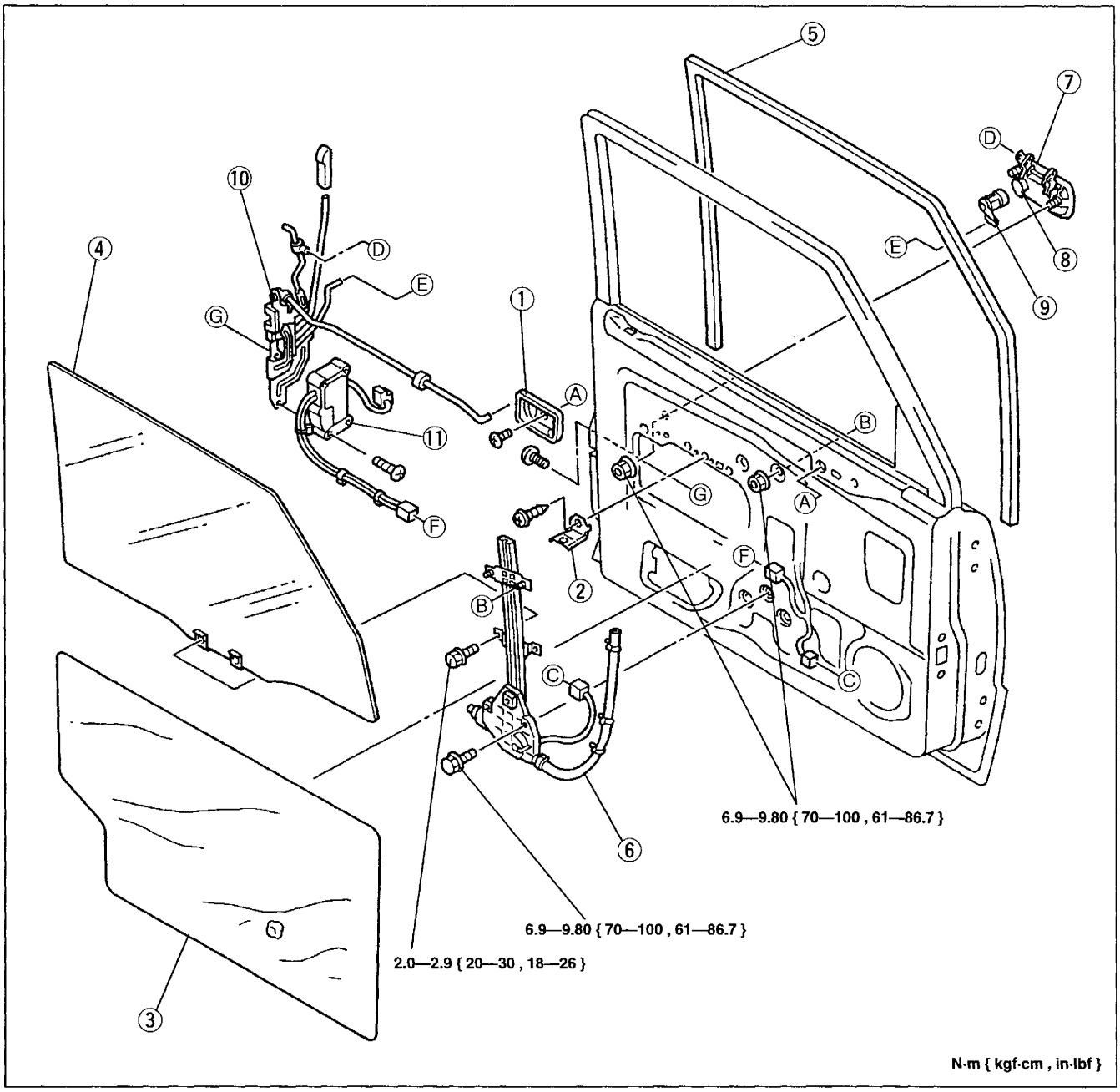
Door lock striker

1. Verify that the door can be closed easily and that there is no looseness.
2. If not correct, loosen the striker installation screws and move the striker horizontally or vertically.

   Tightening torque:
   18—26 N·m { 1.8—2.7 kgf·m , 14—19 ft·lbf }

Disassembly / Assembly

1. Raise the door glass **180 mm { 7.09 in }** from the fully lowered position.
2. Disconnect the negative battery cable.
3. Remove the front door trim. (Refer to page S–63.)
4. Disassemble in the order shown in the figure.
5. Assemble in the reverse order of disassembly.

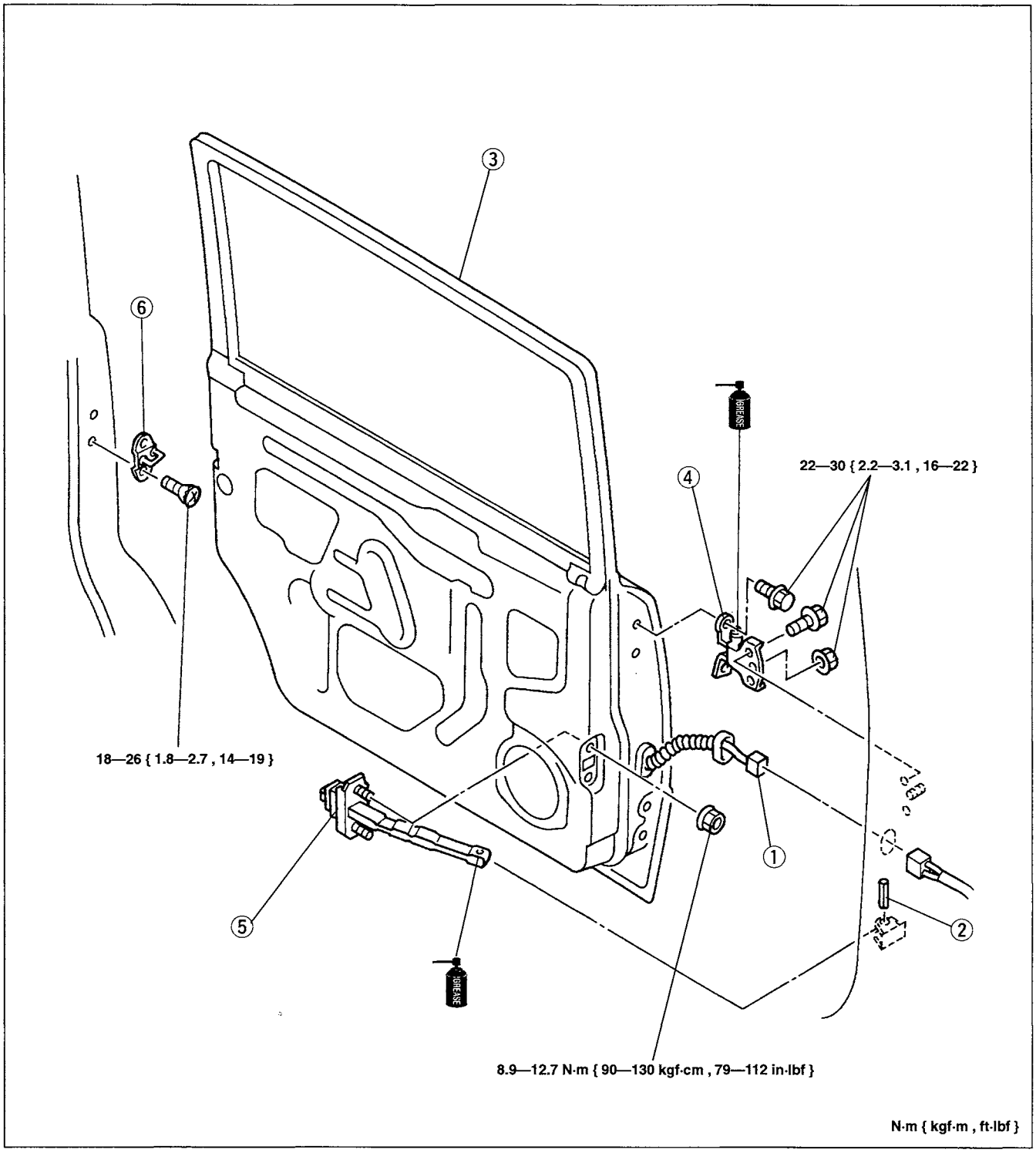


1. Inner handle
2. Bracket
3. Door screen
4. Front door glass
5. Glass run channel
6. Power window regulator
7. Front door outer handle
8. Front door key cylinder retainer
9. Front door key cylinder
10. Front door lock
11. Front door lock actuator

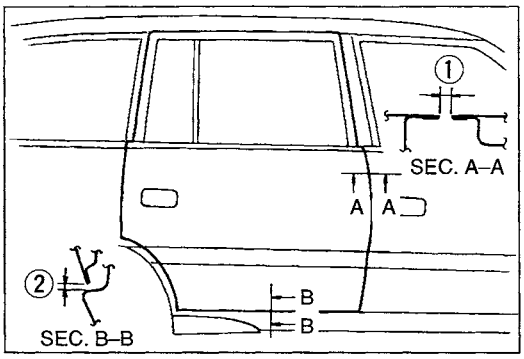
REAR DOOR

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure. To remove the checker, remove the door speaker. (Refer to section T.)
3. Install in the reverse order of removal.



1. Harness connector
2. Checker pin
3. Rear door
   Adjustment ..... page S–10
4. Door hinge
5. Checker
6. Door lock striker
   Adjustment ..... page S–10



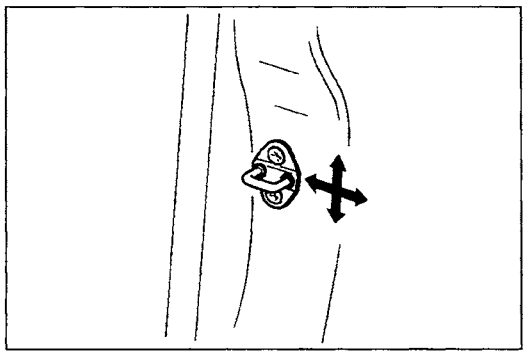
Adjustment
Rear door

1. Verify that the rear door can be closed easily and that there is no looseness or excessive clearance.

   Clearance ①: 5.0 ± 0.8 mm { 0.2 ± 0.03 in }
   ②: 5.8 ± 1.5 mm { 0.23 ± 0.06 in }

2. If not as specified, loosen the door-hinge-to-body installation bolts and nuts, and reposition the rear door.

   Tightening torque:
   22—30 N·m { 2.2—3.1 kgf·m , 16—22 ft·lbf }



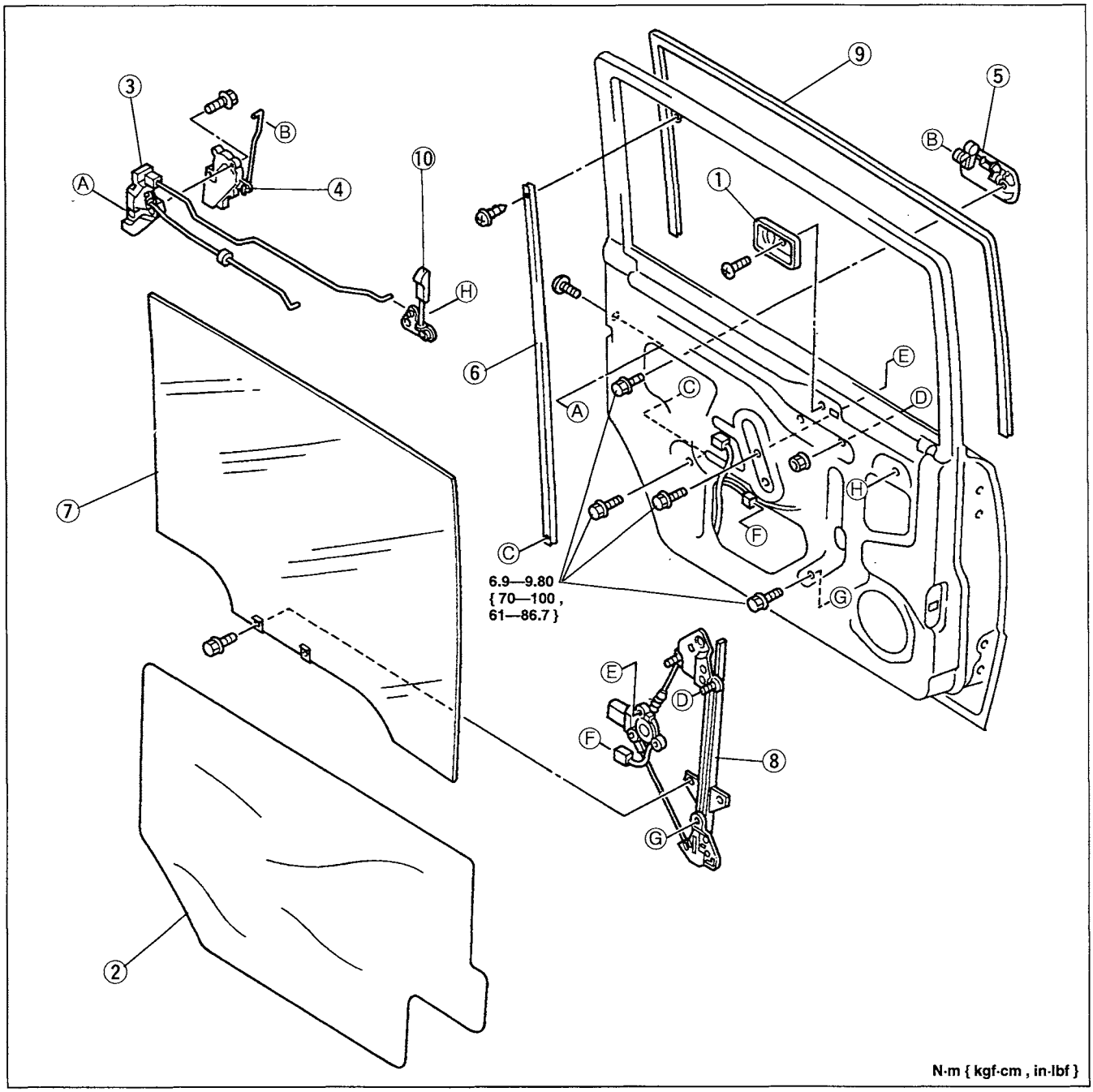
Door lock striker

1. Verify that the door can be closed easily and that there is no looseness.
2. If not correct, loosen the striker installation screws and move the striker horizontally or vertically.

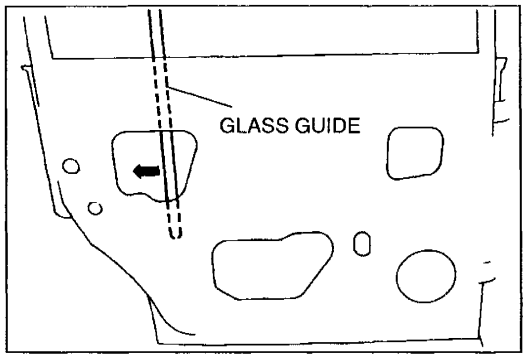
   Tightening torque:
   18—26 N·m { 1.8—2.7 kgf·m , 14—19 ft·lbf }

Disassembly / Assembly

1. Raise the door glass **85 mm { 3.35 in }** from the fully lowered position.
2. Disconnect the negative battery cable.
3. Remove the rear door trim. (Refer to page S–64.)
4. Disassemble in the order shown in the figure.
5. Assemble in the reverse order of disassembly, referring to **Assembly note**.



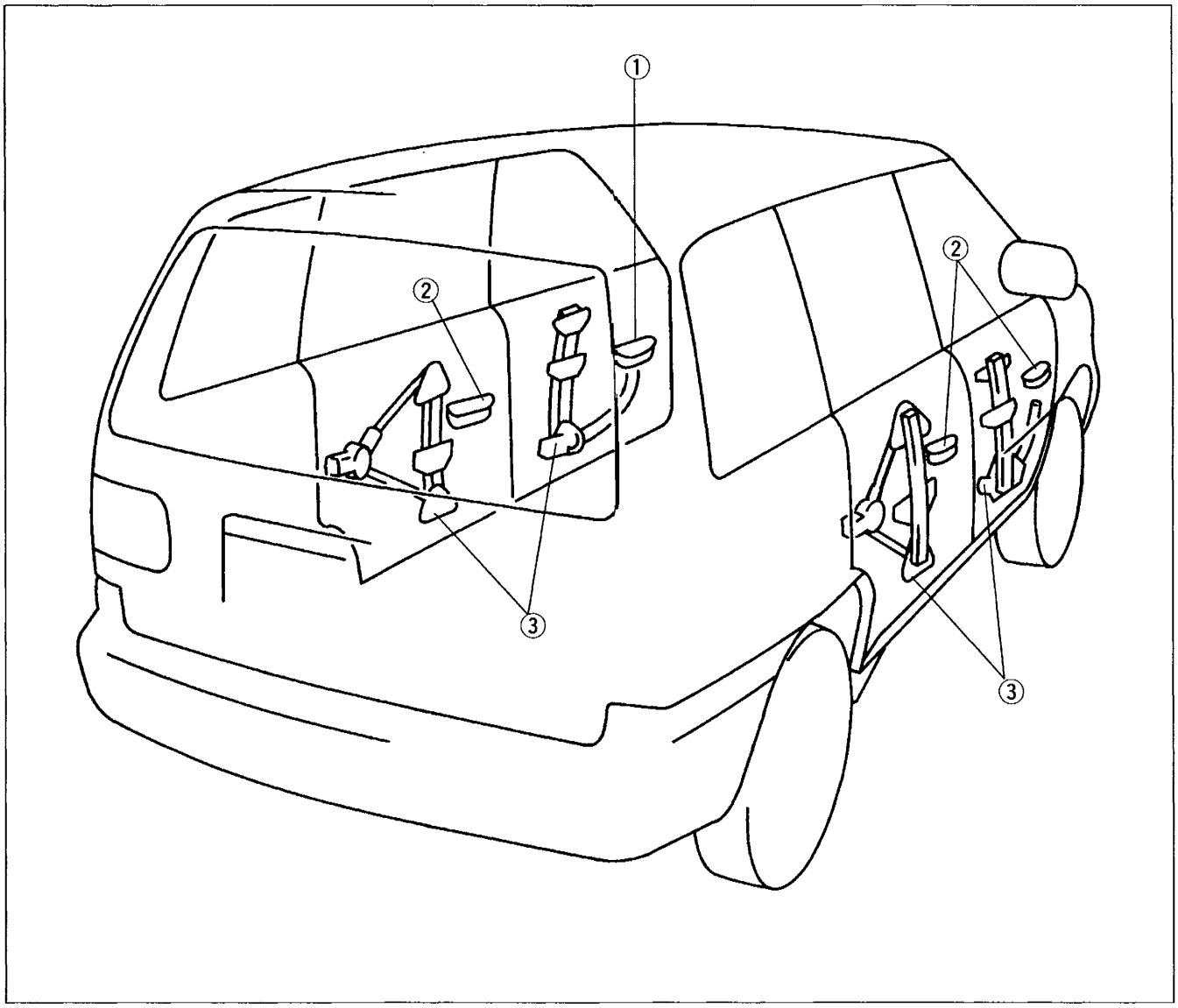
1. Inner handle
2. Door screen
3. Rear door lock
4. Rear door lock actuator
5. Rear door outer handle
6. Glass guide
   Assembly note ..... page S–12
7. Rear door glass
8. Power window regulator
9. Glass run channel
10. Inner lock knob



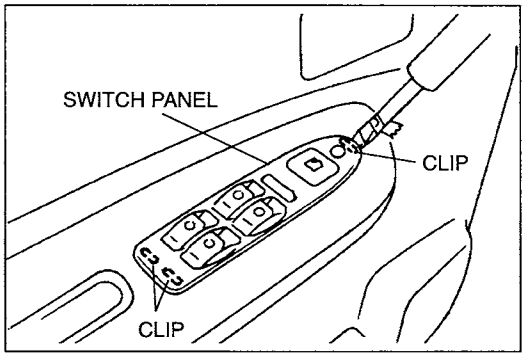
Assembly note
Glass guide
1. Install the glass guide installation screw.
2. Move the glass guide in the direction shown in the figure, the install the bolt.

POWER WINDOW SYSTEM

STRUCTURAL VIEW



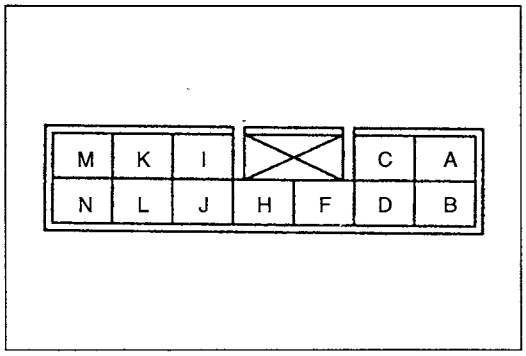
1. Power window main switch assembly
   Removal / Installation ..... page S–13
   Inspection ..... page S–13
2. Power window subswitch
   Removal / Installation ..... page S–14
   Inspection ..... page S–14
3. Power window regulator
   Removal / Installation ..... page S–14
   Inspection ..... page S–15



POWER WINDOW MAIN SWITCH ASSEMBLY

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the switch panel as shown.
3. Remove the power window main switch assembly installation screws.
4. Install in the reverse order of removal.

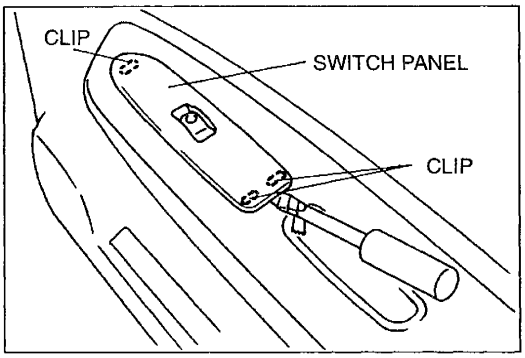


Inspection

1. Remove the power window main switch assembly. (Refer above.)
2. Check for continuity between the terminals of the main switch assembly connector by using an ohmmeter.
3. If not as specified, replace the power window main switch assembly.

○—○: Continuity

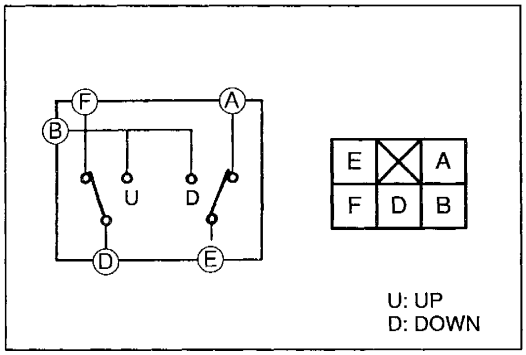
Switch / Terminal / Switch position	Driver				Passenger				Left rear				Right rear			
	L	N	H	F	D	B	H	F	M	K	J	F	A	C	J	F
UP	○		○		○		○		○		○		○		○	
		○		○		○		○		○		○		○		○
AUTO UP	○		○													
		○		○												
OFF (with power-cut switch at ON)	○	○		○	○	○		○	○	○		○	○	○		○
DOWN		○	○			○	○			○	○			○	○	
	○			○	○			○	○			○	○			○
AUTO DOWN		○	○													
	○			○												



POWER WINDOW SUBSWITCH

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the switch panel as shown.
3. Remove the power window subswitch installation screws.
4. Install in the reverse order of removal.



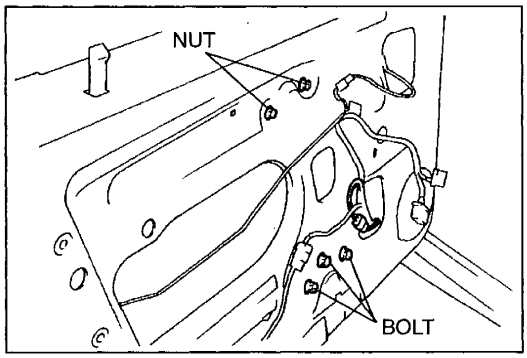
Inspection

1. Remove the power window subswitch. (Refer above.)
2. Check for continuity between the terminals of the subswitch connector by using an ohmmeter.

○—○: Continuity

Switch position \ Terminal	A	B	D	E	F
UP	○	○	○	○	
OFF	○			○	○
DOWN		○	○	○	○

3. If not as specified, replace the power window subswitch.

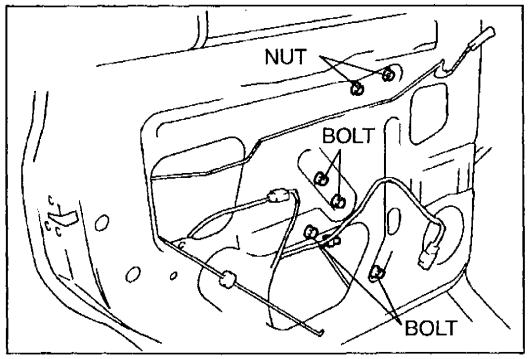


POWER WINDOW REGULATOR

Removal / Installation

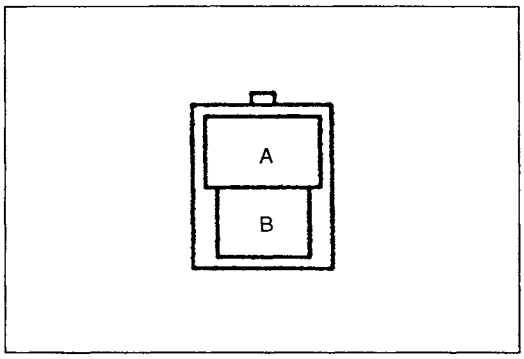
Front

1. Disconnect the negative battery cable.
2. Remove the front door glass. (Refer to page S–8.)
3. Disconnect the power window regulator connector.
4. Remove the power window regulator installation bolts and nuts.
5. Install in the reverse order of removal.



Rear

1. Disconnect the negative battery cable.
2. Remove the rear door glass. (Refer to page S–11.)
3. Disconnect the power window regulator connector.
4. Remove the power window regulator installation bolts and nuts.
5. Install in the reverse order of removal.



Inspection

1. Remove the power window regulator.
   (Refer to page S–14.)
2. Apply battery positive voltage to the power window regulator connector terminals and check the operation of the regulator.

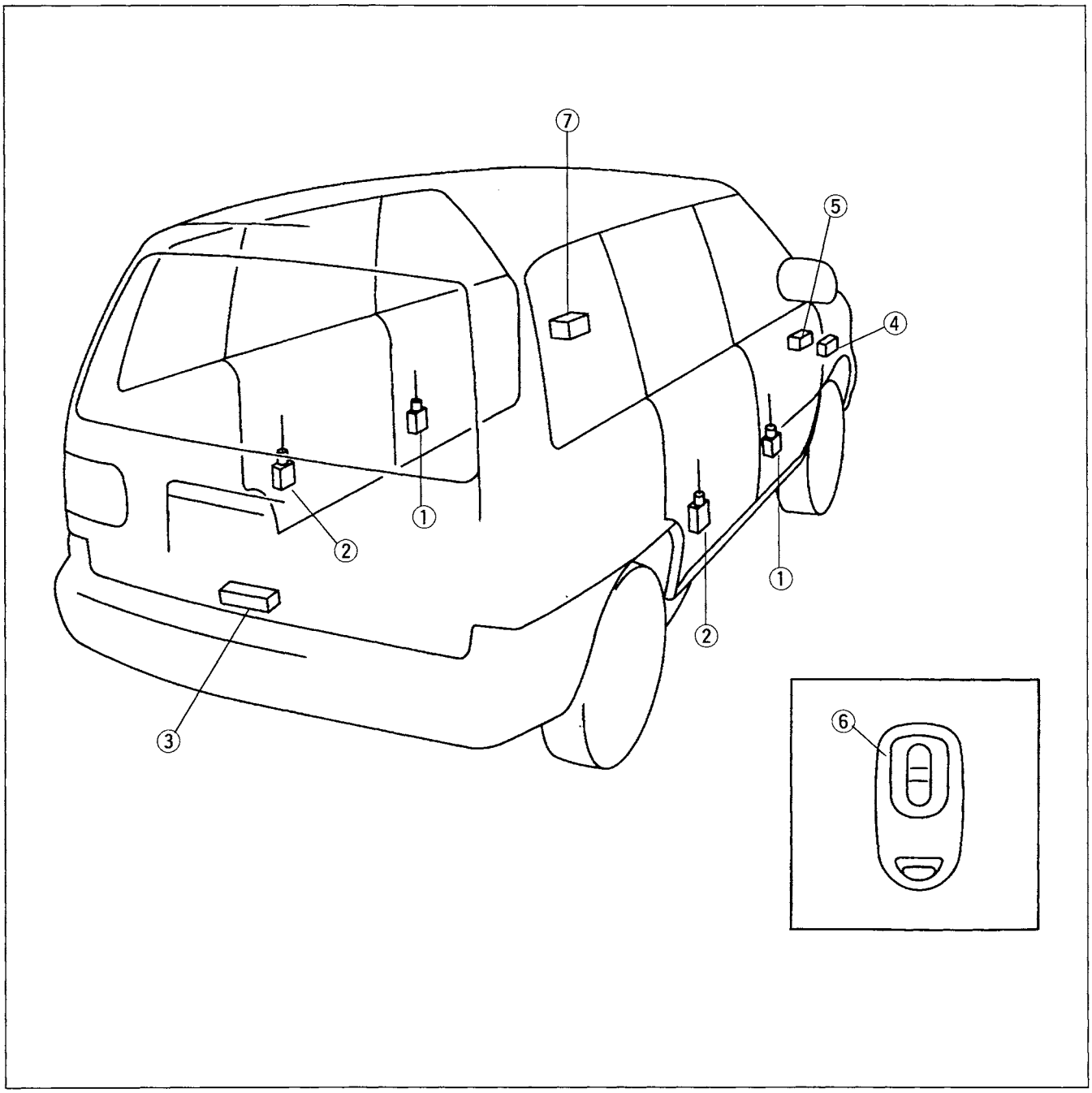
B+: Battery positive voltage

Connection		Regulator operation
B+	GND	
A	B	UP
B	A	DOWN

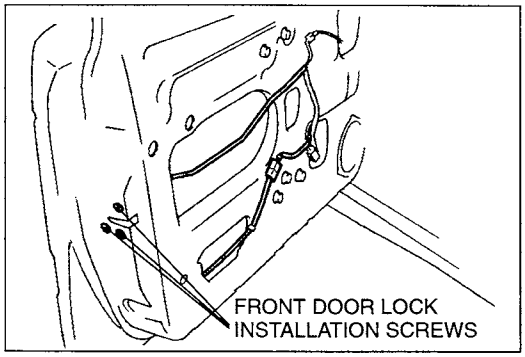
3. If not as specified, replace the power window regulator.

POWER DOOR LOCK SYSTEM

STRUCTURAL VIEW



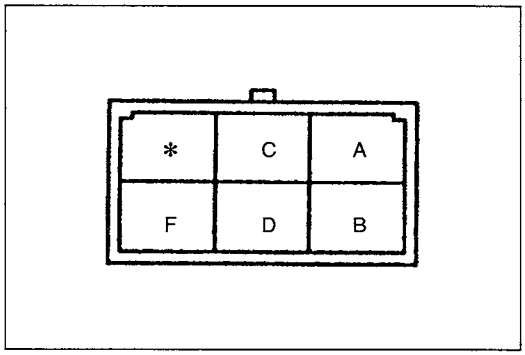
1. Front door lock actuator
   - Removal / Installation ..... page S–17
   - Inspection ..... page S–17
2. Rear door lock actuator
   - Removal / Installation ..... page S–17
   - Inspection ..... page S–17
3. Liftgate lock actuator
   - Removal / Installation ..... page S–18
   - Inspection ..... page S–18
4. Door lock timer unit
   - Removal / Installation ..... page S–19
   - Inspection ..... page S–19
5. Keyless unit
   - Removal / Installation ..... page S–21
   - Inspection ..... page S–21
   - Changing the ID code ..... page S–22
6. Transmitter
   - Battery replacement ..... page S–23
   - Inspection ..... page S–23
7. CPU
   - Removal / Installation ..... section T
   - Inspection ..... section T



FRONT DOOR LOCK ACTUATOR

Removal / Installation

1. Raise the front door glass fully.
2. Remove the door screen. (Refer to page S–8.)
3. Disconnect the front door lock actuator connector.
4. Remove the front door lock installation screws.
5. Remove the front door lock.
6. Remove the front door lock actuator instllation screws.
7. Install in the reverse order of removal.



Inspection

1. Remove the door screen. (Refer to page S–8.)
2. Disconnect the front door lock actuator connector.
3. Check for continuity between the terminals of the front door lock actuator connector with the lock rod in the following positions by using an ohmmeter.

O—O: Continuity

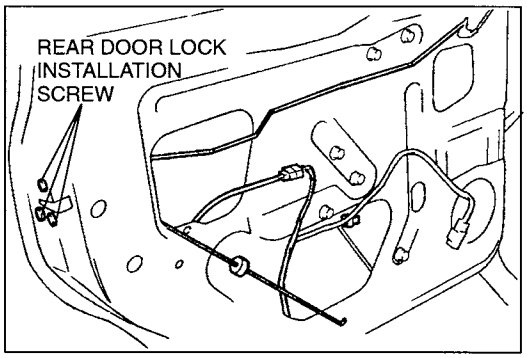
Terminal / Knob position	C	D	F
Lock	O		O
Unlock	O	O	

4. Apply battery positive voltage to the connector terminals and check the operation of the actuator.

B+: Battery positive voltage

Connection		Actuator operation
B+	GND	
B	A	Lock
A	B	Unlock

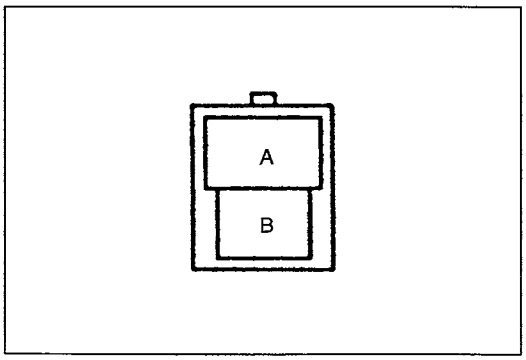
5. If not as specified, replace the front door lock actuator.



REAR DOOR LOCK ACTUATOR

Removal / Installation

1. Remove the door screen. (Refer to page S–11.)
2. Disconnect the rear door lock actuator connector.
3. Remove the rear door lock installation screws.
4. Remove the rear door lock.
5. Remove the rear door lock actuator instllation screws.
6. Install in the reverse order of removal.



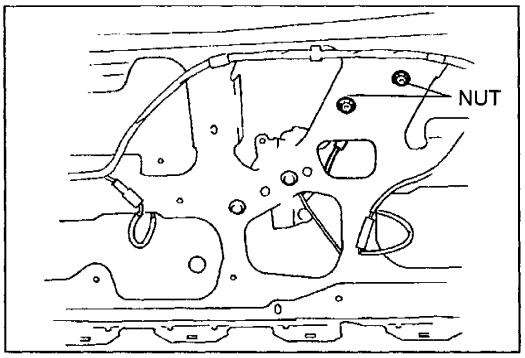
Inspection

1. Remove the door screen. (Refer to page S–11.)
2. Disconnect the rear door lock actuator connector.
3. Apply battery positive voltage to the connector terminals and check the operation of the actuator.

B+: Battery positive voltage

Connection		Actuator operation
B+	GND	
B	A	Lock
A	B	Unlock

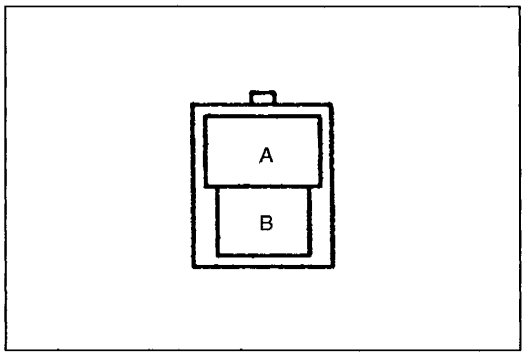
4. If not as specified, replace the door lock actuator.



LIFTGATE LOCK ACTUATOR

Removal / Installation

1. Remove the liftgate screen. (Refer to page S–27.)
2. Disconnect the liftgate lock actuator connector.
3. Remove the liftgate lock actuator installation nuts.
4. Install in the reverse order of removal.



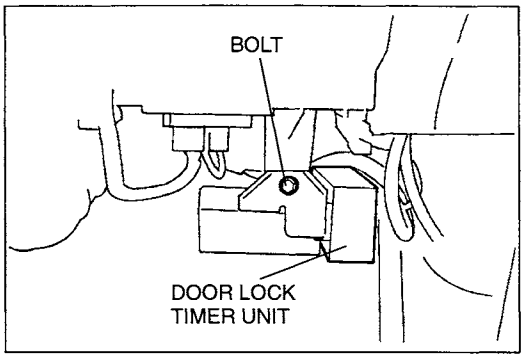
Inspection

1. Remove the liftgate screen. (Refer to page S–27.)
2. Disconnect the liftgate lock actuator connector.
3. Apply battery positive voltage to the connector terminals and check the operation of the actuator.

B+: Battery positive voltage

Connection		Actuator operation
B+	GND	
A	B	Lock
B	A	Unlock

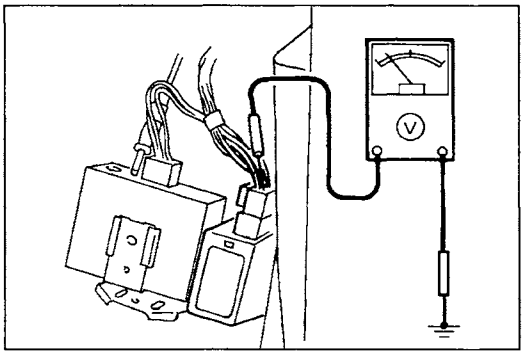
4. If not as specified, replace the liftgate lock actuator.



DOOR LOCK TIMER UNIT

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the glove compartment cover. (Refer to page S–59.)
3. Remove the door lock timer unit installation bolt.
4. Install in the reverse order of removal.

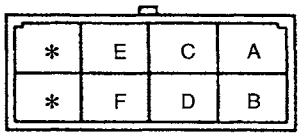


Inspection

1. Remove the glove compartment cover. (Refer to page S–59.)
2. Measure the voltage at the door lock timer unit terminals.
3. If not as specified, inspect the parts listed under "Inspection area" and the related wiring harnesses.
4. If the parts and wiring harnesses are OK but the system still does not work properly, replace the door lock timer unit.

Terminal voltage list (without keyless entry system)

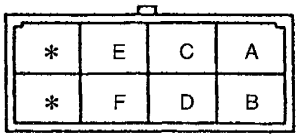
B+: Battery positive voltage



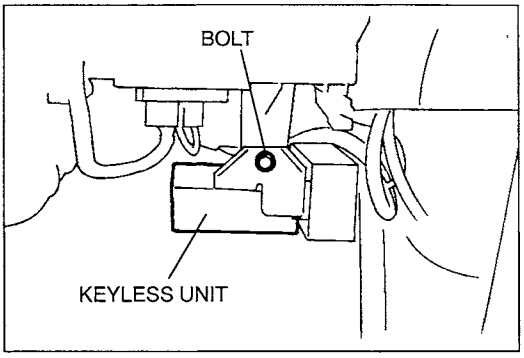
Terminal	Signal	Connection	Test condition	Voltage (V)	Inspection area
B	B+	Fuse (DOOR LOCK 30 A)	Constant	B+	Fuse (DOOR LOCK 30 A)
A	GND	Body ground	Constant: check for continuity to ground	0	GND
F	Actuator unlock control	Door lock actuator	Door lock actuator unlocked	0→B+ →0	Wiring harness (Door lock timer unit—Door lock actuator)
			Other	0	
C	Power door lock control	CPU	Door lock actuator unlocked	B+→0 →B+	Wiring harness (Door lock timer unit—CPU)
			Other	B+	
E	Actuator lock control	Door lock actuator	Door lock actuator locked	0→B+→0	Wiring harness (Door lock timer unit—Door lock actuator)
			Other	0	
D	Power door lock control	CPU	Door lock actuator locked	B+→0→B+	Wiring harness (Door lock timer unit—CPU)
			Other	B+	

(with keyless entry system)

B+: Battery positive voltage



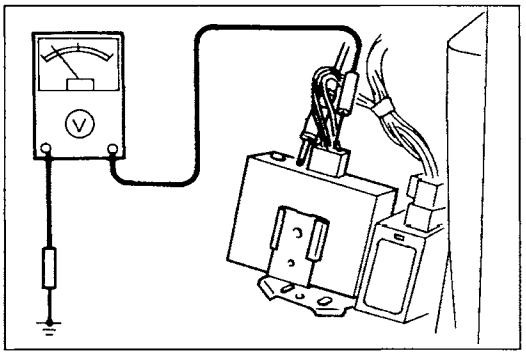
Terminal	Signal	Connection	Test condition	Voltage (V)	Inspection area
B	B+	Fuse (DOOR LOCK 30 A)	Constant	B+	Fuse (DOOR LOCK 30 A)
A	GND	Body ground	Constant: check for continuity to ground	0	GND
F	Actuator unlock control	Door lock actuator	Door lock actuator unlocked	0→B+ →0	Wiring harness (Door lock timer unit—Door lock actuator)
			Other	0	
C	Power door lock control	CPU	Door lock actuator unlocked	B+→0 →B+	Wiring harness (Door lock timer unit—CPU)
			Other	B+	
E	Actuator lock control	Door lock actuator	Door lock actuator locked	0→B+→0	Wiring harness (Door lock timer unit—Door lock actuator)
			Other	0	
D	Power door lock control	CPU	Door lock actuator locked	B+→0→B+	Wiring harness (Door lock timer unit—CPU)
			Other	B+	



KEYLESS UNIT

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the glove compartment cover. (Refer to page S–59.)
3. Remove the keyless unit installation bolt.
4. Install in the reverse order of removal.

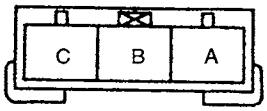


Inspection

1. Remove the glove compartment cover. (Refer to page S–59.)
2. Measure the voltage at the keyless unit terminals.
3. If not as specified, inspect the parts listed under "Inspection area" and the related wiring harnesses.
4. If the parts and wiring harnesses are OK but the system still does not work properly, replace the keyless unit.

Terminal voltage list

B+: Battery positive voltage



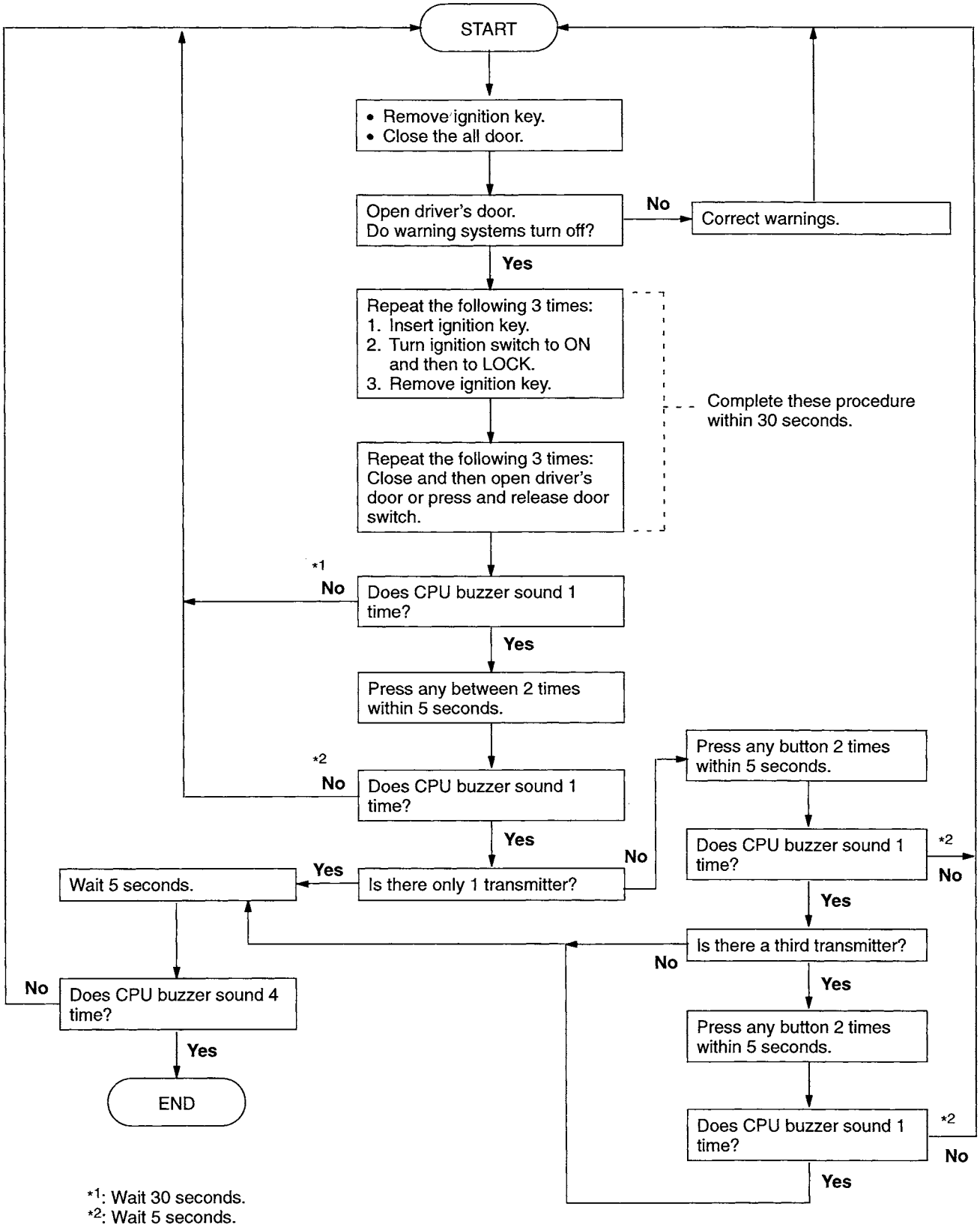
Terminal	Signal	Connection	Test condition	Voltage (V)	Inspection area
A	B+	Fuse (ROOM 15 A)	Constant	B+	Fuse (ROOM 15 A)
B	Lock/Unlock	CPU	Harness connector disconnected	5	Wiring harness (Keyless unit — CPU)
			Harness connector reconnected	Refer to *1 below	Replace the keyless unit
C	GND	Body ground	Constant: check for continuity to ground	0	GND

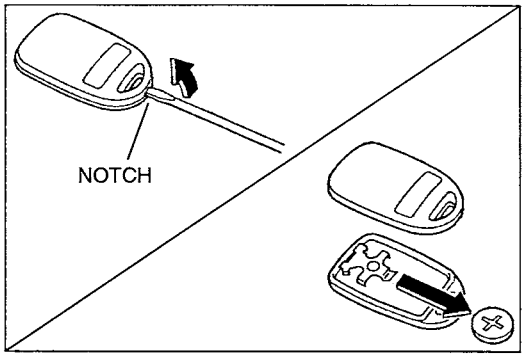
*1

Harness connector disconnected		Harness connector reconnected
4.5—4.6	→	1—4.4
4.6—4.7	→	1—4.5
4.7—4.8	→	1—4.6
4.8—4.9	→	1—4.7
4.9—5.0	→	1—4.8
5.0—5.1	→	1—4.9
5.1—5.2	→	1—5.0
5.2—5.3	→	1—5.1
5.3—5.4	→	1—5.2
5.4—5.5	→	1—5.3

Changing The ID Code

- Up to 3 transmitters can be used with the keyless entry system. If there are two, work with both of them when changing the ID code.





TRANSMITTER

Replacing the Battery

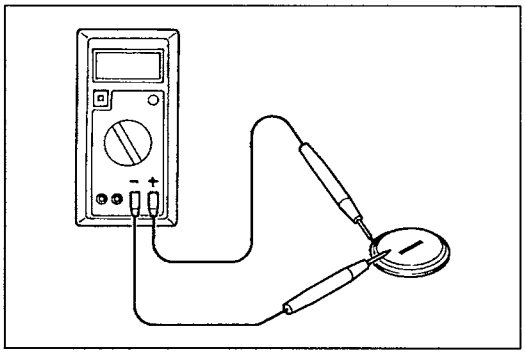
1. Insert a flathead screwdriver into the notch of the transmitter.
2. Remove the cover by using the screwdriver as shown.
3. Install the new batteries with the ⊕ side facing up.

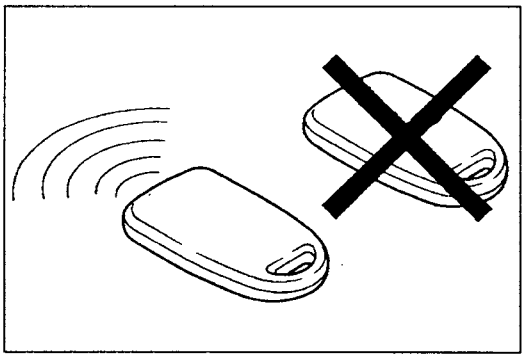
   Battery specification: Lithium CR 2025 ×1

4. Install the cover.

Note

- The batteries will last about 2 years when used 10 times a day.





Inspection

1. Remove the batteries.
2. Leave the batteries on a table for **30 minutes** and allow them to warm to room temperature (**20—30 °C { 65—85 °F}**).
3. Measure the voltage of each battery by using a digital circuit tester.

Voltage	Action
2.9 V or more	Install batteries and go to step 4
Less than 2.9 V	Replace transmitter batteries

4. Verify that the keyless entry system is functioning properly by operating the system with the second transmitter.

Voltage	Action
Yes	Replace the defective transmitter
No	Check antenna feeder — keyless unit

MEMO

LIFTGATE

LIFTGATE

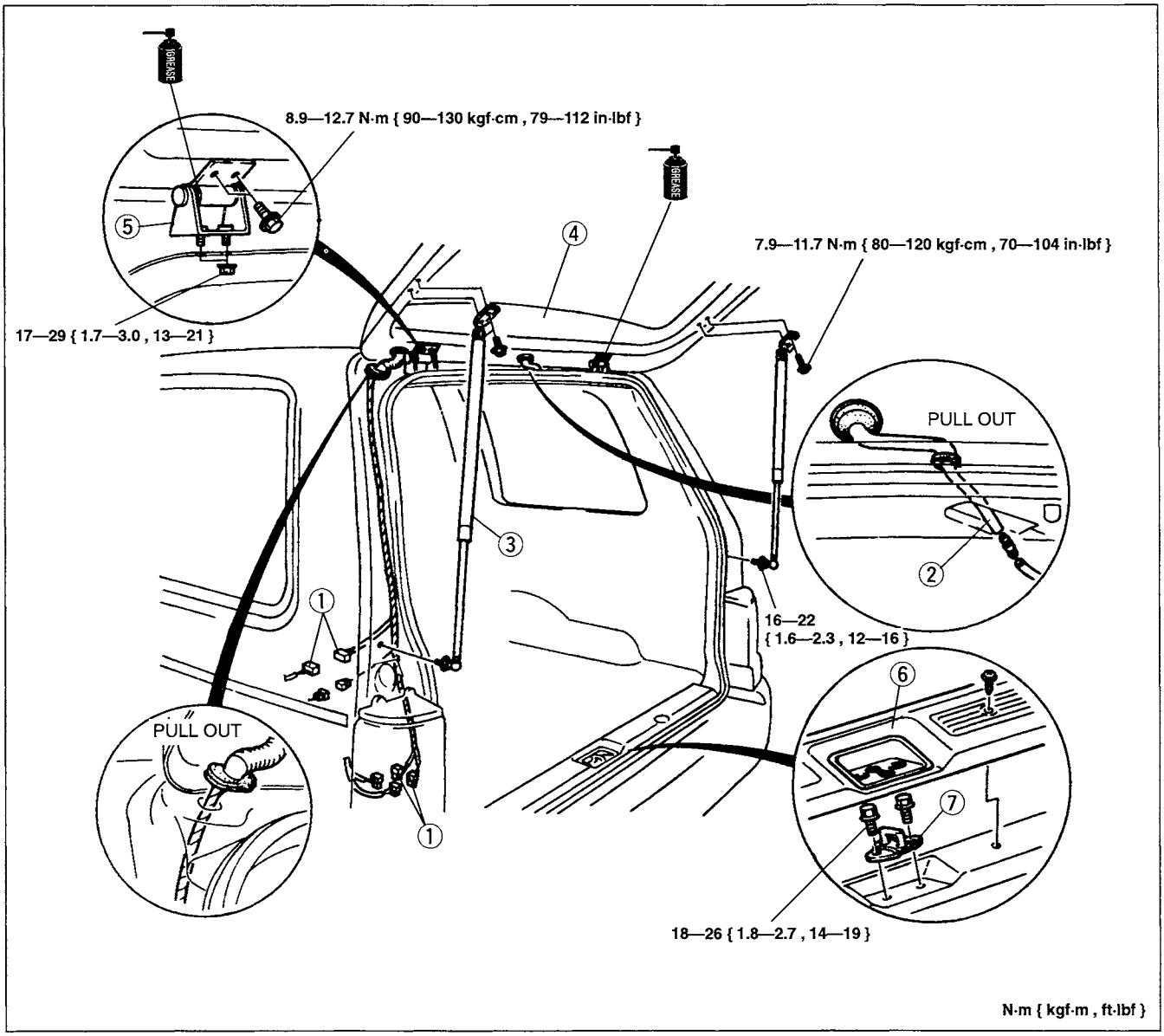
Removal / Installation

1. Disconnect the negative battery cable.

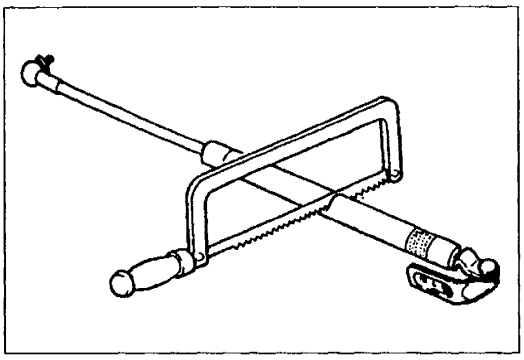
Warning

- **Removing the stay damper without supporting the liftgate can be dangerous. The liftgate may fall and injure you. Open the liftgate fully and support it before removing the stay damper.**

2. Remove in the order shown in the figure. To disconnect the harness connector, remove the rear side trim. (Refer to page S–65.) To remove the liftgate hinge, remove the rear edge of the rear headliner. (Refer to page S–68.)
3. Install in the reverse order of removal.



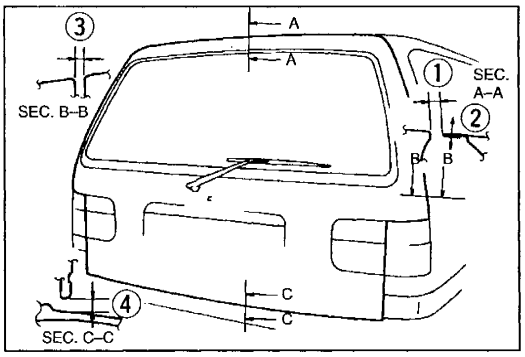
1. Harness connector
2. Washer pipe
3. Stay damper
   Disposal ..... page S–26
4. Liftgate
   Adjustment ..... page S–26
5. Liftgate hinge
6. Mat end set plate
7. Liftgate lock striker
   Adjustment ..... page S–26



Disposal
Stay damper

Note
- The gas in the stay damper is colorless, odorless, and non-toxic.

1. Lay the stay damper flat.
2. Saw throuth the stay damper body by using a hacksaw.
3. Allow the gas to escape from the stay damper.
4. Discard the stay damper.



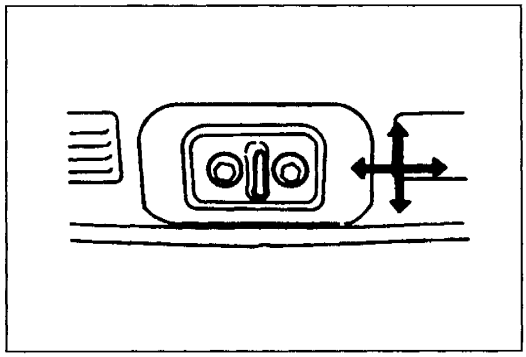
Adjustment
Liftgate

1. Verify that the liftgate can be closed easily and that there is no looseness or excessive clearance.

Clearance ①: 6.4 ± 1.5 mm { 0.25 ± 0.06 in }
②: 0.8 ± 1.0 mm { 0.03 ± 0.04 in }
③: 7.0 ± 2.0 mm { 0.28 ± 0.08 in }
④: 9.95 ± 3.0 mm { 0.39 ± 0.12 in }

2. If not as specified, loosen the liftgate-to-hinge installation bolts and reposition the liftgate.

Tightening torque:
8.9—12.7 N·m { 90—130 kgf·cm , 79—112 in·lbf }



Liftgate lock striker

1. Verify that the liftgate can be closed easily and that there is no looseness.
2. If the offset is excessive, loosen the striker installation bolts and adjust the striker.

Tightening torque:
18—26 N·m { 1.8—2.7 kgf·m , 14—19 ft·lbf }

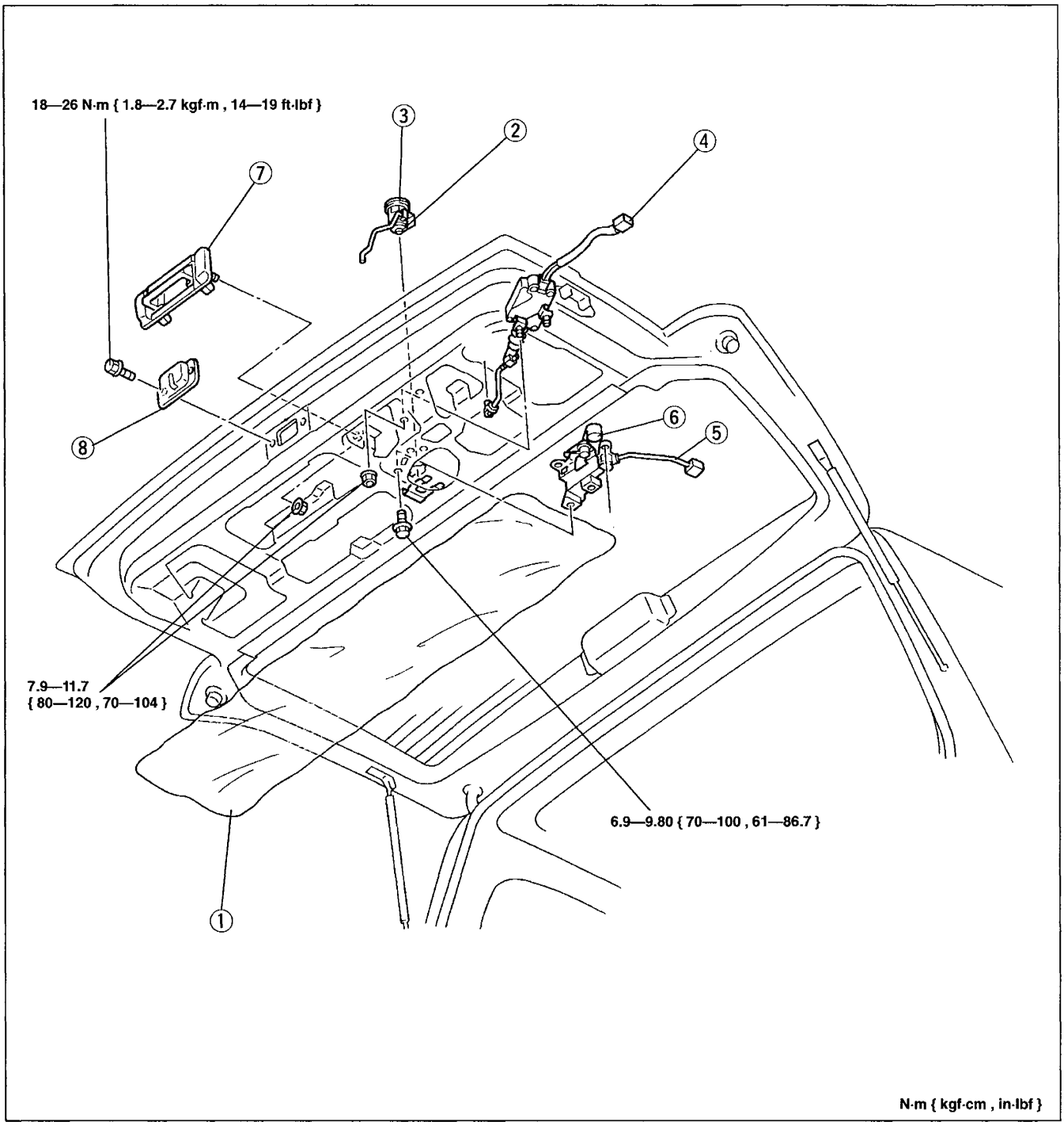
Disassembly / Assembly

1. Disconnect the negative battery cable.

Note

- Remove the liftgate screen carefully so that it may be reused.

2. Disassemble in the order shown in the figure. To remove the liftgate outer handle, remove the rear finisher. (Refer to page S–30.)
3. Assemble in the reverse order of disassembly.



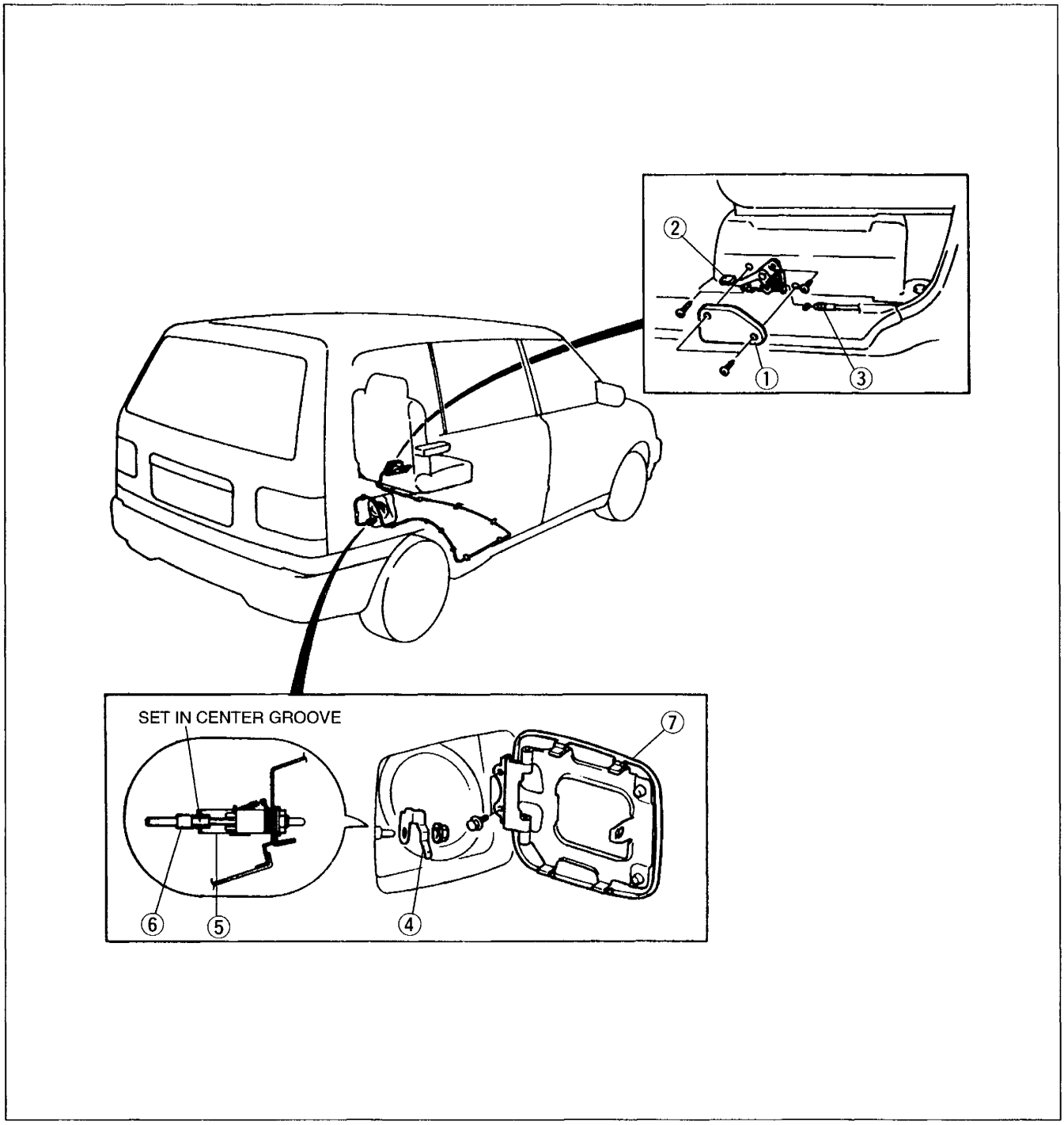
1. Liftgate screen
2. Liftgate key cylinder retainer
3. Liftgate key cylinder
4. Liftgate lock actuator
5. Liftgate lock knob
6. Remote controller
7. Liftgate outer handle
8. Liftgate lock

FUEL-FILLER LID AND OPENER

FUEL-FILLER LID AND OPENER

Removal / Installation

1. Remove in the order shown in the figure. To remove the fuel-filler lid opener cable and fuel-filler lid opener lever, remove the rear side trim (Refer to page S–65.) and front cabin carpet (Refer to page S–69.).
2. Install in the reverse order of removal.



Fuel-filler lid opener lever

1. Fuel-filler lid opener bezel
2. Fuel-filler lid opener lever
3. Fuel-filler lid opener cable

Fuel-filler lid and opener

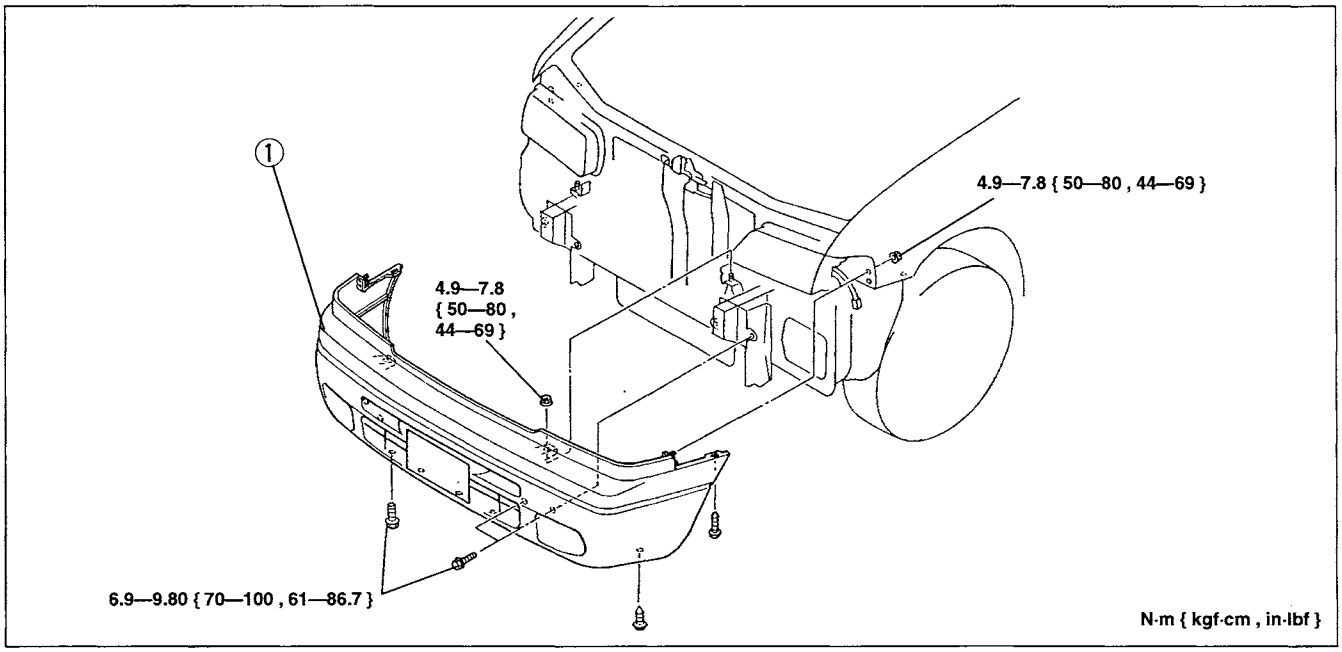
4. Lift spring
5. Fuel-filler lid opener
6. Fuel-filler lid opener cable
7. Fuel-filler lid

BUMPER

FRONT BUMPER

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the radiator grille. (Refer to page S–30.)
3. Remove as shown in the figure.
4. Install in the reverse order of removal.

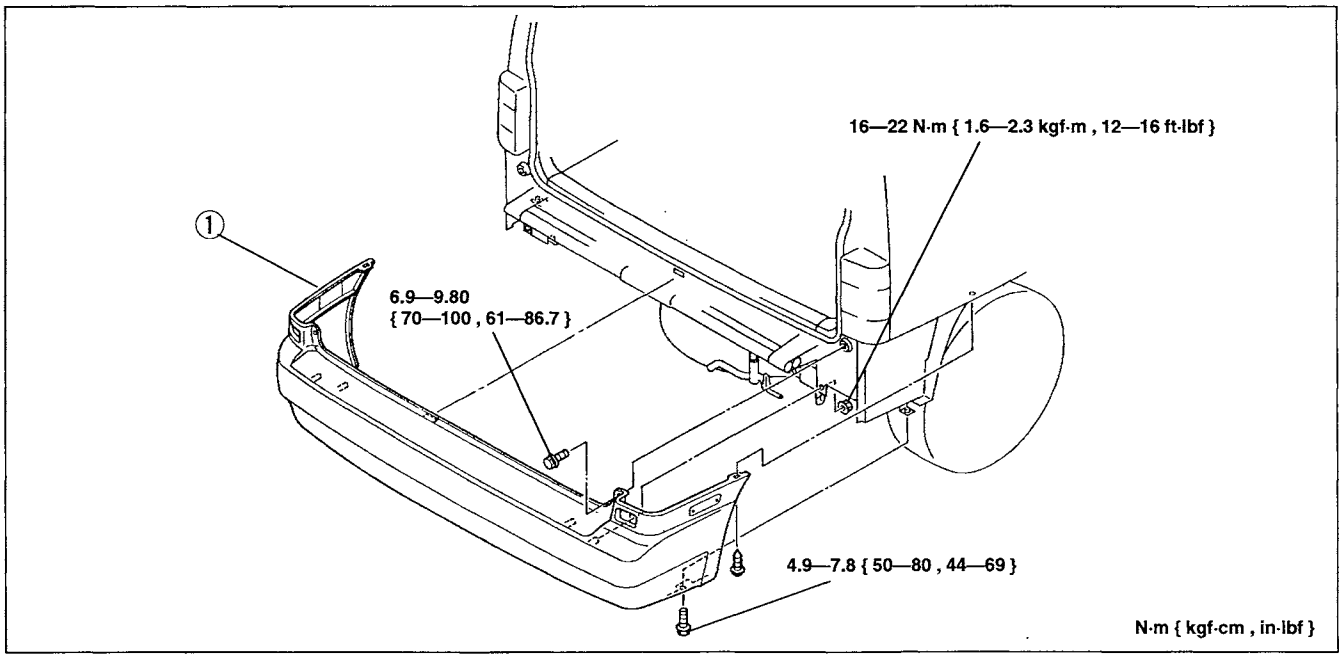


1. Front bumper

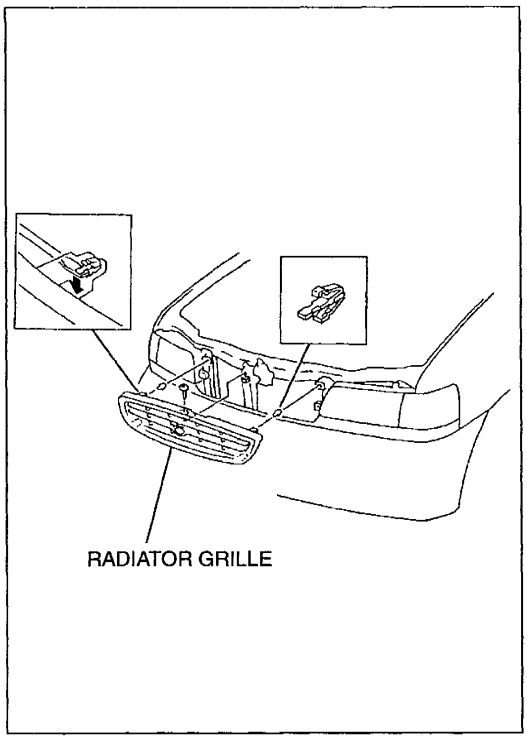
REAR BUMPER

Removal / Installation

1. Remove as shown in the figure.
2. Install in the reverse order of removal.

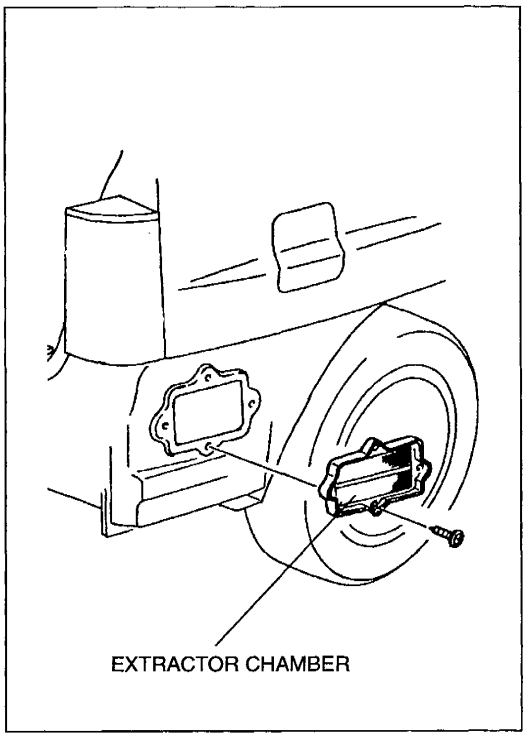


1. Rear bumper

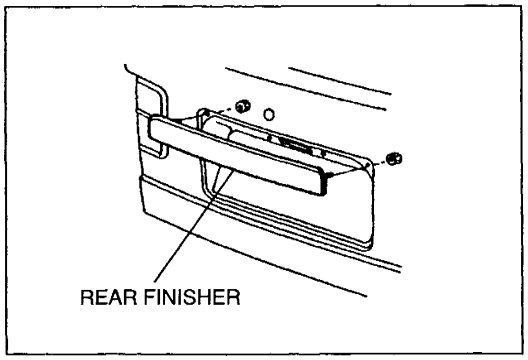


EXTERIOR ATTACHMENT

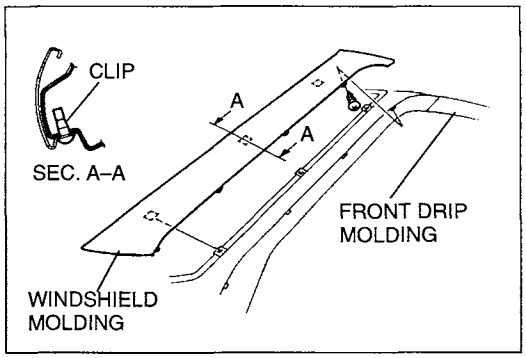
RADIATOR GRILLE
Removal / Installation
1. Remove as shown in the figure.
2. Install in the reverse order of removal.



EXTRACTOR CHAMBER
Removal / Installation
1. Remove the rear bumper. (Refer to page S–29.)
2. Remove as shown in the figure.
3. Install in the reverse order of removal.



REAR FINISHER
Removal / Installation
1. Remove the liftgate screen. (Refer to page S–27.)
2. Remove as shown in the figure.
3. Install in the reverse order of removal.



MOLDING

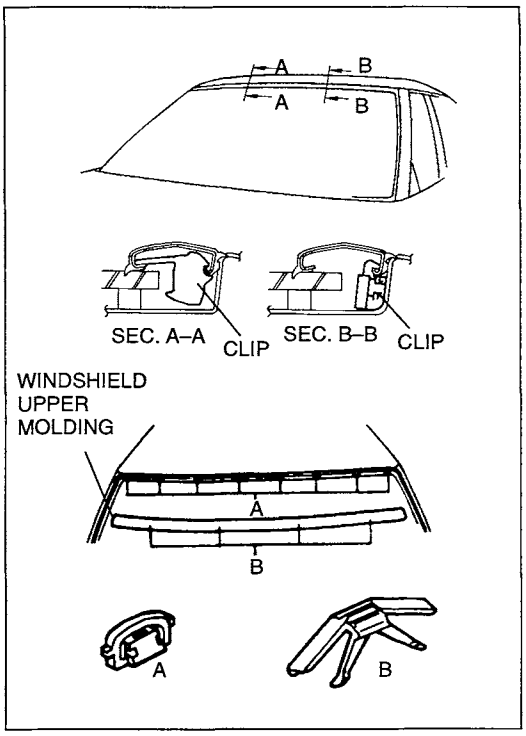
WINDSHIELD MOLDING

Removal

Remove the windshield molding installation screws and clips as shown.

Installation

1. Insert the windshield molding to the front drip molding.
2. Install in the reverse order of removal.



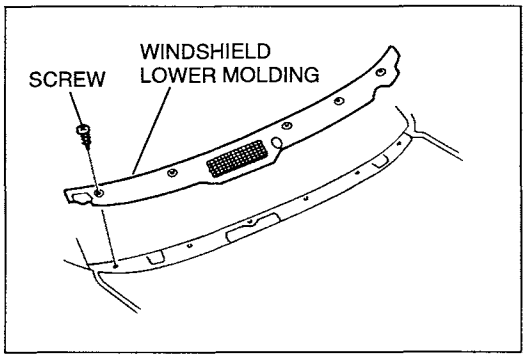
WINDSHIELD UPPER MOLDING

Removal

1. Remove the windshield molding. (Refer above.)
2. Remove the windshield upper molding.

Installation

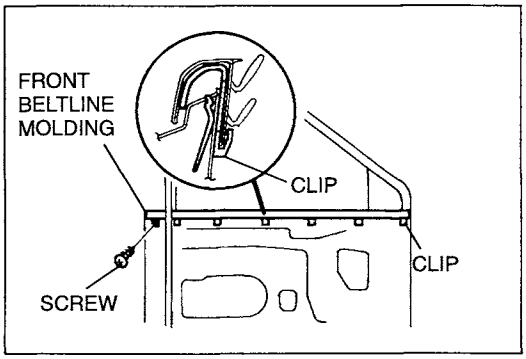
1. Install clip A to the body stud and clip B to the windshield upper molding as shown.
2. Install in the reverse order of removal.



WINDSHIELD LOWER MOLDING

Removal / Installation

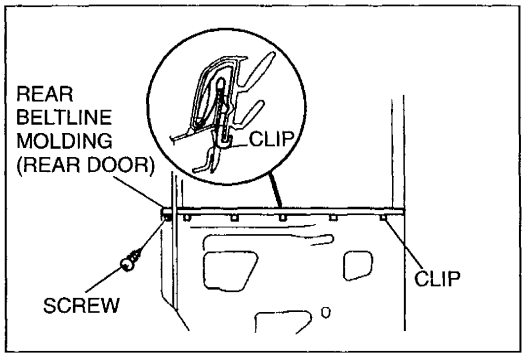
1. Remove the windshield wiper arm and blade. (Refer to section T.)
2. Remove the windshield lower molding installation screws.
3. Install in the reverse order of removal.



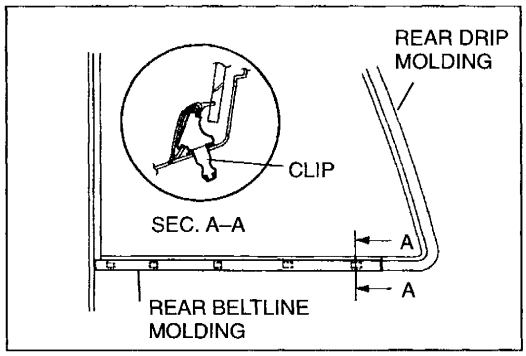
FRONT BELTLINE MOLDING

Removal / Installation

1. Remove the front door glass. (Refer to page S–8.)
2. Remove the power outside mirror. (Refer to page S–35.)
3. Remove the front beltline molding installation screw.
4. Insert a flathead screwdriver which has been wrapped in tape under the clip.
5. Lift the flathead screwdriver and pull up on the molding to remove it.
6. Install in the reverse order of removal.



REAR BELTLINE MOLDING (REAR DOOR)
Removal / Installation
1. Remove the rear door glass. (Refer to page S–11.)
2. Remove the door quarter window glass. (Refer to page S–42.)
3. Remove the rear beltline molding installation screw.
4. Insert a flathead screwdriver which has been wrapped in tape under the clip.
5. Lift the flathead screwdriver and pull up on the molding to remove it.
6. Install in the reverse order of removal.

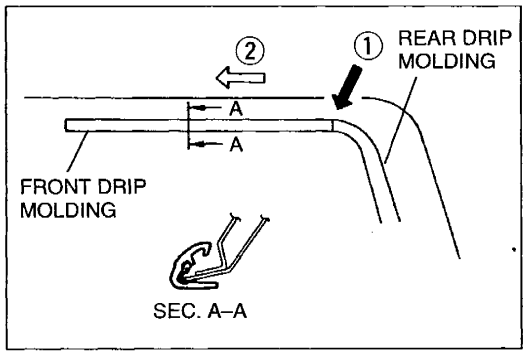


REAR BELTLINE MOLDING
Removal

Remove the rear beltline molding installation clips.

Installation

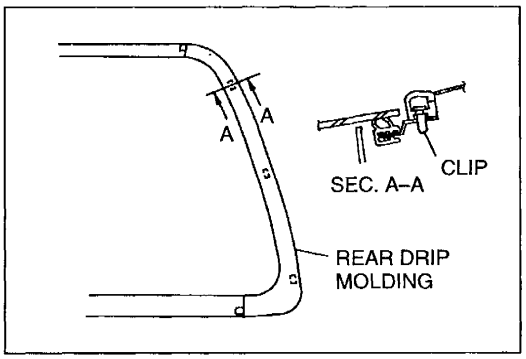
Align the rear end of the molding with the rear drip molding and install the molding from rear toward front end.



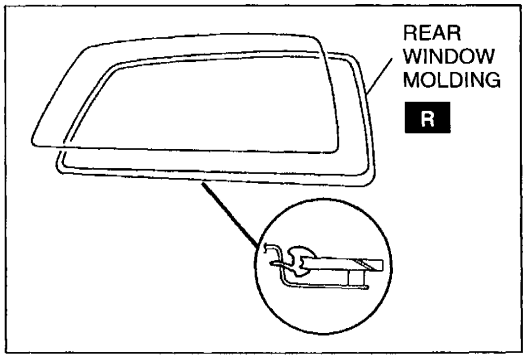
FRONT DRIP MOLDING
Removal

Remove the front drip molding by pulling on it.

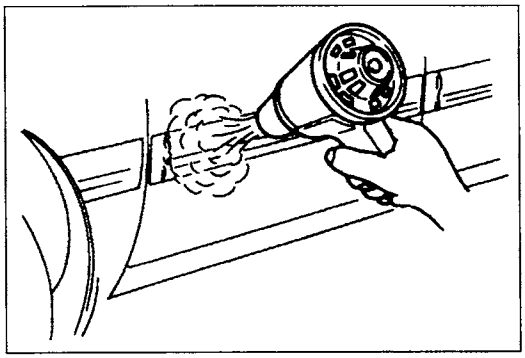
Installation
1. Align the rear end of the front drip molding with the front end of the rear drip molding (①).
2. Install the front drip molding from rear toward front end (②).



REAR DRIP MOLDING
Removal / Installation
1. Remove the rear beltline molding. (Refer above.)
2. Remove the front drip molding. (Refer above.)
3. Remove the rear drip molding installation clips as shown.
4. Install in the reverse order of removal.



REAR WINDOW MOLDING
Removal / Installation
1. Remove the rear window glass. (Refer to page S–43.)
2. Remove the rear window molding.
3. Install in the reverse order of removal.

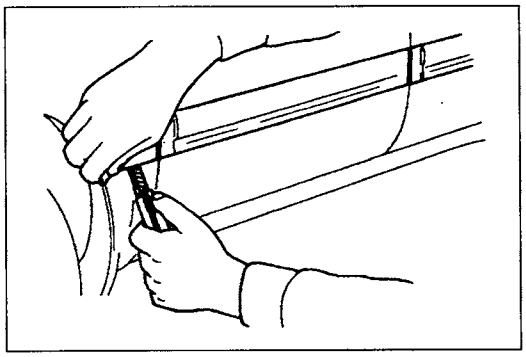


PROTECTOR

SIDE PROTECTOR No.1, No.2, No.3

Removal

1. Soften the adhesive by using a hot-air blower.

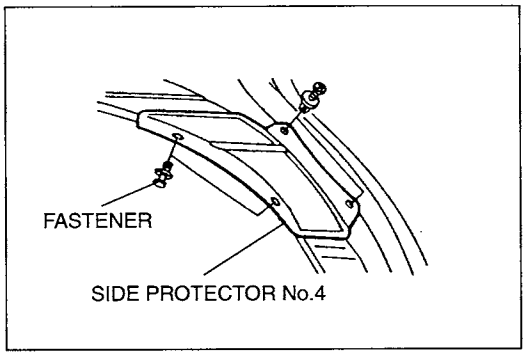


2. Pry the protector end **20—30 mm { 0.79—1.18 in }** by using a flathead screwdriver or razor knife, being careful not to damage the painted surface.
3. Pull the separated portion to remove the protector.

SIDE PROTECTOR No.4

Removal

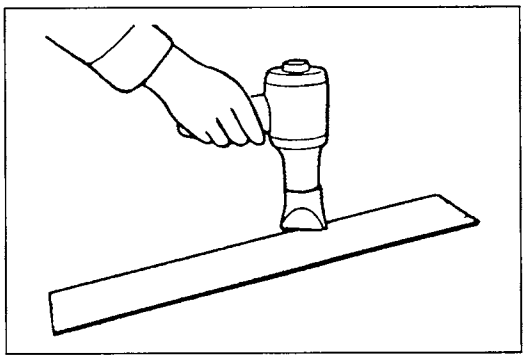
Remove the side protector No.4 installation fasteners.

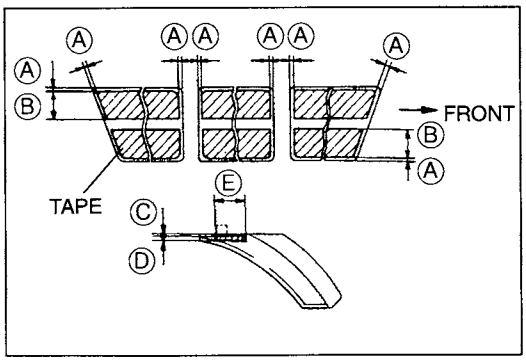


SIDE PROTECTOR No.1, No.2, No.3, No.4

Installation

1. Use a razor knife to remove the adhesive remaining on the body and protector (if the protector will be reused). Remove as much adhesive as possible without damaging the painted surface. If the adhesive is difficult to remove, soften it by using a hot-air blower.

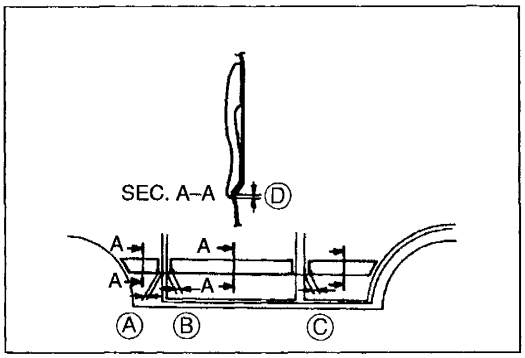




2. Remove any grease or dirt from the adhesion surface of the protector (if the protector will be reused) and body.
3. Attach double-sided adhesive tape to the protector as shown (if the protector will be reused.)

Clearance

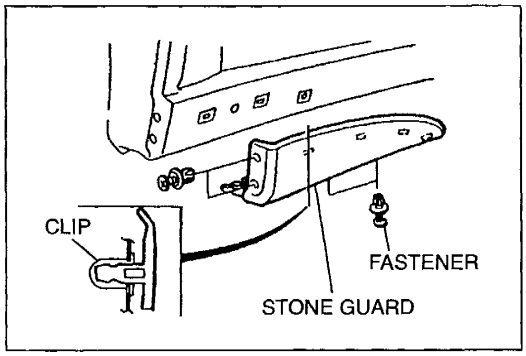
A: 1 ± 1 mm { 0.04 ± 0.04 in }
B: 30 mm { 1.18 in }
C: 2 ± 1 mm { 0.08 ± 0.04 in }
D: 8 mm { 0.31 in }
E: 35 mm { 1.38 in }



4. Align the protector on the body and press on it with a force of **5 kg**.

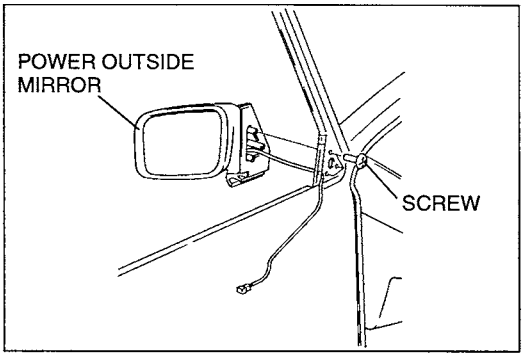
Clearance

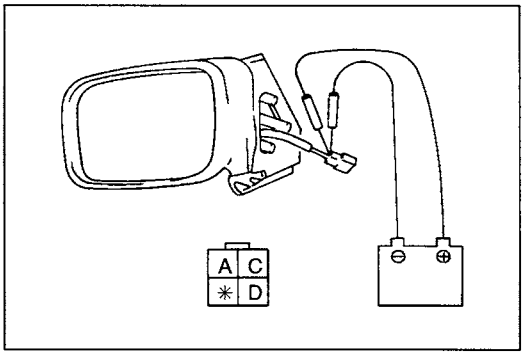
A: $0^{+1.0}_{-0}$ mm { $0^{+0.04}_{-0}$ in }
B: $2^{+1.0}_{-0}$ mm { $0.08^{+0.04}_{-0}$ in }
C: $2.5^{+1.0}_{-0}$ mm { $0.1^{+0.04}_{-0}$ in }
D: 3 ± 2.0 mm { 0.12 ± 0.08 in }

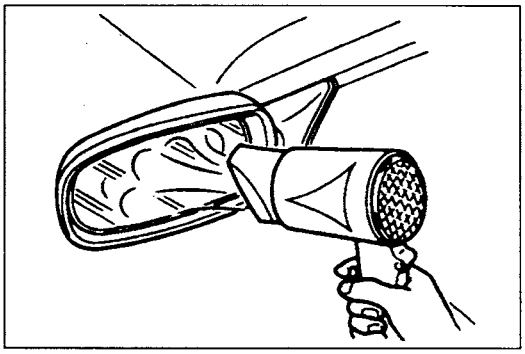


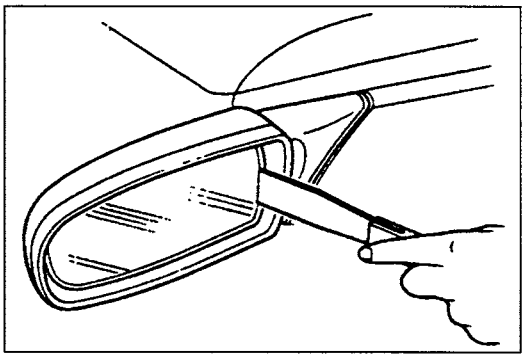
STONE GUARD
Removal / Installation

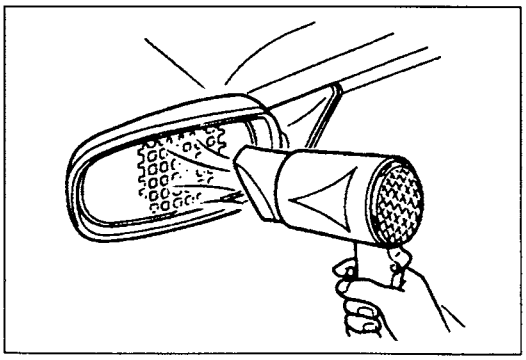
1. Remove the stone guard installation fasteners and clips.
2. Install in the reverse order of removal.











POWER OUTSIDE MIRROR

POWER OUTSIDE MIRROR

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the front door trim. (Refer to page S–63.)
3. Remove the power outside mirror installation screws.
4. Install in the reverse order of removal.

Inspection

1. Remove the power outside mirror. (Refer above.)
2. Apply battery positive voltage and check the operation of the power outside mirror.

B+: Battery positive voltage

Connection				Mirror operation
B+		GND		
LH	RH	LH	RH	
C	A	A	C	UP
A	C	C	A	DOWN
C		D		LEFT
D		C		RIGHT

3. If not as specified, replace the power outside mirror.

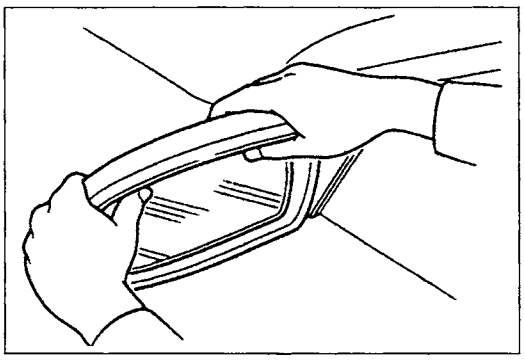
Replacement of Mirror Glass

Removal

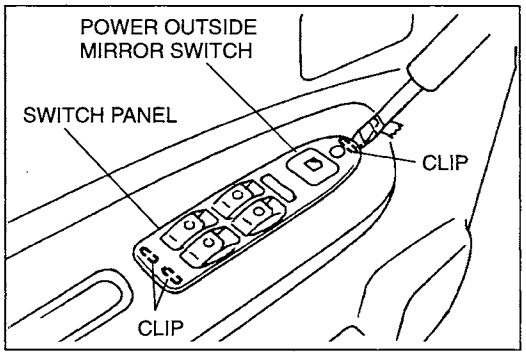
1. Warm the frame and the mirror glass by using a hot-air blower.
2. Insert a scraper between the mirror glass and the frame, and pry the glass loose.
3. Remove the remaining adhesive.

Installation

1. Warm the adhesive surface of the frame and the mirror by using a hot-air blower. If the frame is stained with oil, degrease it.
2. Peel off the wax paper from the double-sided adhesive tape on the rear side of the new mirror glass.



3. Install the glass in the mirror frame and gently press it in to secure it.



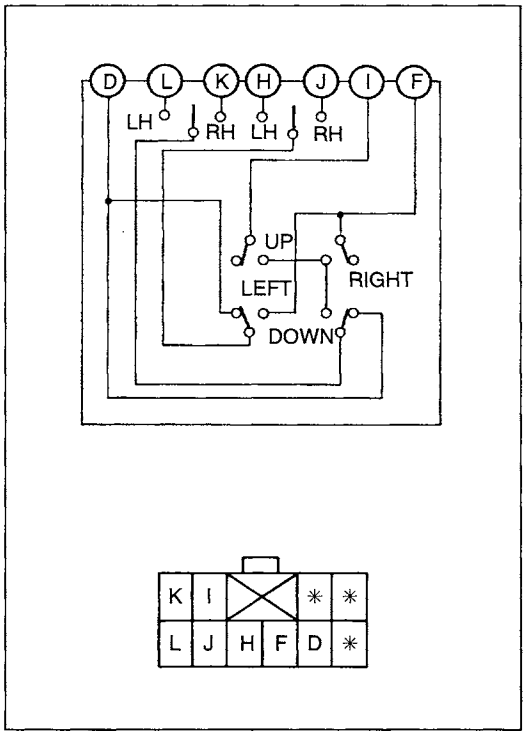
POWER OUTSIDE MIRROR SWITCH

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the switch panel as shown.
3. Remove the power outside mirror switch installation screws.
4. Install in the reverse order of removal.

Inspection

1. Remove the power outside mirror switch. (Refer above.)
2. Check for continuity between the switch terminals by using an ohmmeter

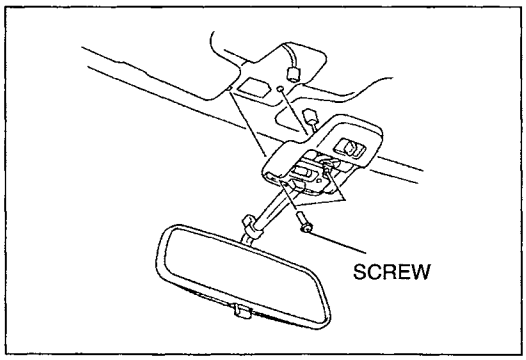


○—○: Continuity

Switch position \ Terminal		F	D	H	L	J	K	I
LH	UP	○	○	○	○			○
	DOWN	○		○				○
	LEFT	○		○	○			
	RIGHT	○	○	○	○			○
RH	UP	○	○			○	○	○
	DOWN	○	○			○		○
	LEFT	○	○			○	○	
	RIGHT	○	○			○	○	○

3. If not as specified, replace the power outside mirror switch.

REARVIEW MIRROR



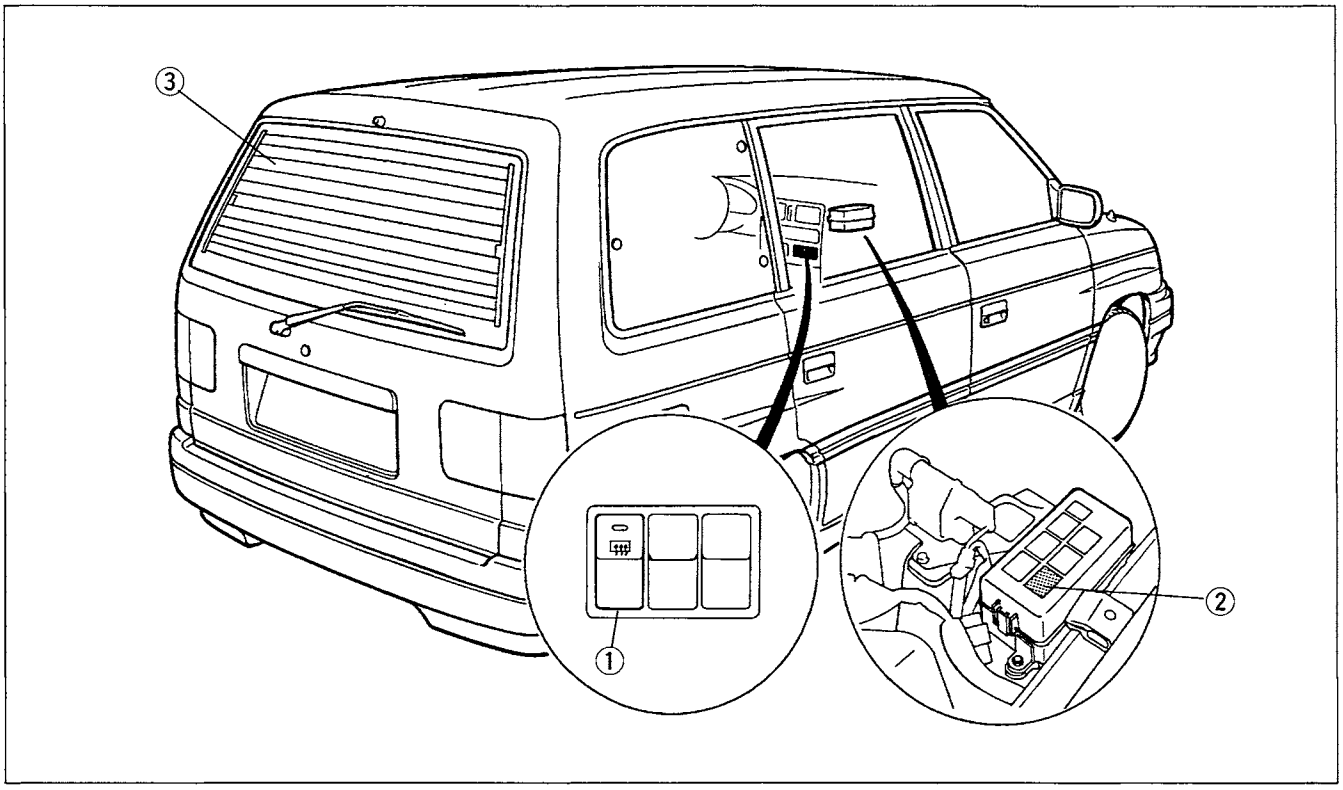
REARVIEW MIRROR

Removal / Installation

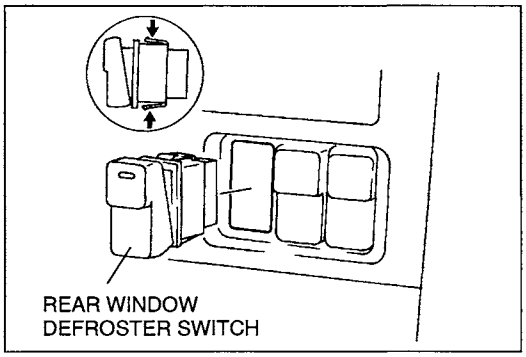
1. Remove the lens. (Refer to section T.)
2. Remove the rearview mirror installation screws.
3. Install in the reverse order of removal.

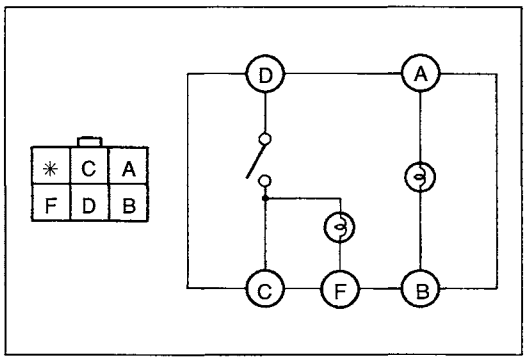
REAR WINDOW DEFROSTER

STRUCTURAL VIEW



1. Rear window defroster switch
   - Removal / Installation ..... below
   - Inspection ..... below
2. Rear window defroster relay
   - Removal / Installation ..... page S–38
   - Inspection ..... page S–38
3. Filament
   - Inspection ..... page S–38
   - Repair ..... page S–38





REAR WINDOW DEFROSTER SWITCH

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the center upper panel. (Refer to page S–60.)
3. Remove the rear window defroster switch.
4. Install in the reverse order of removal.

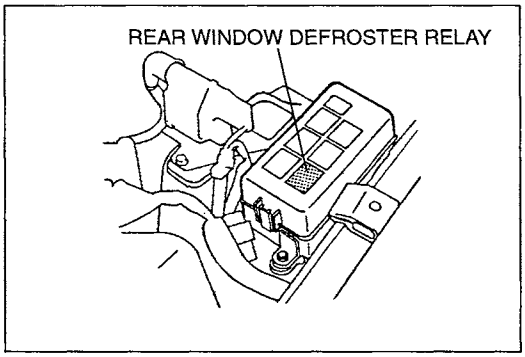
Inspection

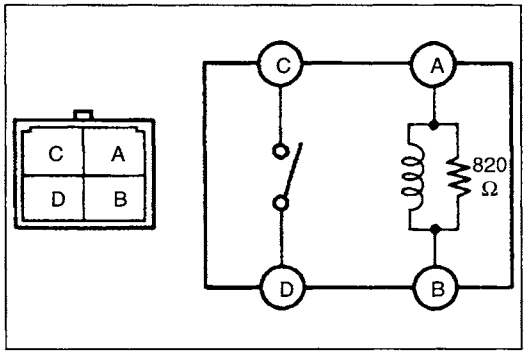
1. Remove the rear window defroster switch. (Refer above.)
2. Check for continuity between the relay terminals by using an ohmmeter.

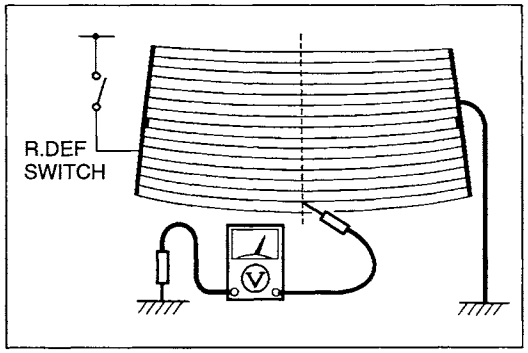
○—○: Continuity B+: Battery positive voltage

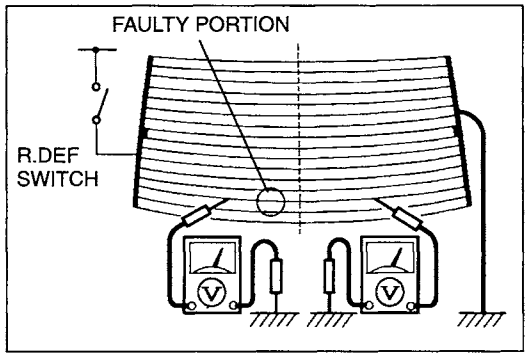
Terminal / Switch position	A	B	C	D	F
ON	○	○	○	○	○
OFF	○	○	○	○	○

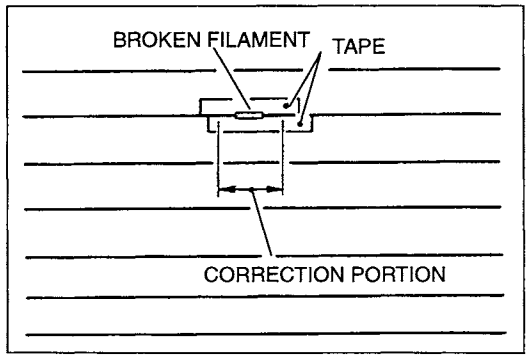
3. If not as specified, replace the rear window defroster switch.











REAR WINDOW DEFROSTER RELAY

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the joint box. (Refer to section T.)
3. Remove the rear window defroster relay.
4. Install in the reverse order of removal.

Inspection

1. Remove the rear window defroster relay. (Refer above.)
2. Check for continuity between the relay terminals by using an ohmmeter.

O—O: Continuity B+: Battery positive voltage

Connection		A	B	C	D
B+	GND				
—	—	O——	——O		
A	B			O——	——O

3. If not as specified, replace the rear window defroster relay.

FILAMENT

Inspection

1. Turn the rear window defroster switch on.
2. Connect the (+) terminal of a voltmeter to the center of each filament and the (–) terminal to the body and check the voltage.

Standard voltage: 5—7 V

Note

- If the meter indication is high, there is an open circuit between the center and the ground side of the filament.
- If the meter indication is low or zero, the malfunction is between the center and positive side of the filament.

3. If not as specified, repair the filament. (Refer below.)

Repair

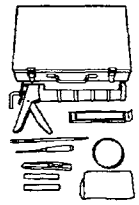
Caution

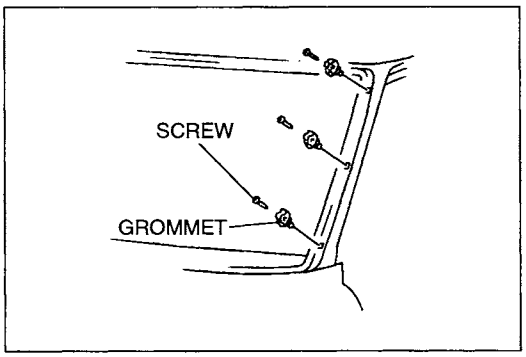
- **Use only white gasoline for cleaning. Other solvents can damage the surrounding filament.**

1. Use white gasoline to clean around the damaged section of the filament.
2. Attach tape above and below the damaged section of the filament.
3. Using a small brush or marking pen, repair the filament with silver paint or equivalent.
4. Use a hot-air blower heated to **150°C { 302°F }** for **30 minutes** or let the paint set for **24 hours** at **25°C { 77°F }** to allow it to dry completely. Do not use the defroster until the paint is dry.

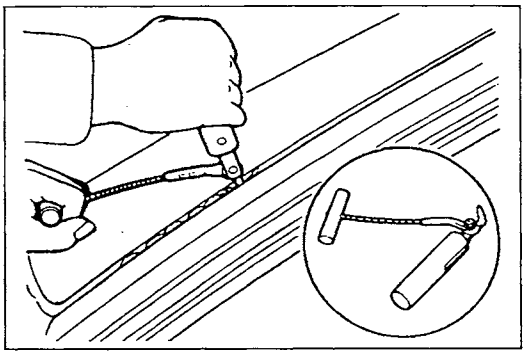
WINDOW GLASS

PREPARATION
SST

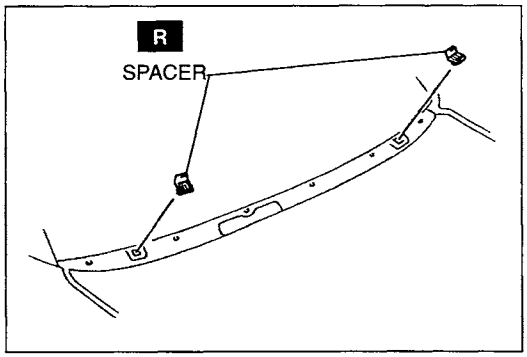
49 0305 870A Tool set, window		For removal / installation of glass



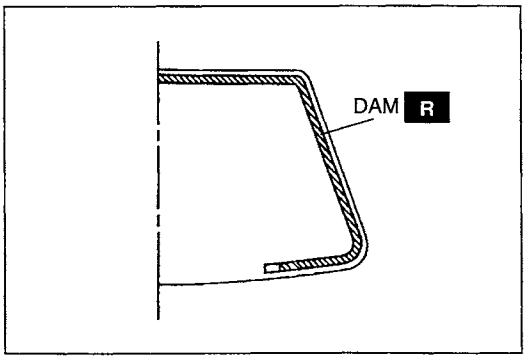
WINDSHIELD
Removal
1. Disconnect the negative battery cable.
2. Remove the following parts.
   (1) Windshield upper molding. (Refer to page S–31.)
   (2) Windshield lower molding. (Refer to page S–31.)
   (3) Rearview mirror. (Refer to page S–36.)
   (4) A-pillar trim. (Refer to page S–61.)
3. Remove the grommet as shown in the figure.
4. Apply protective tape along the edge of the body.



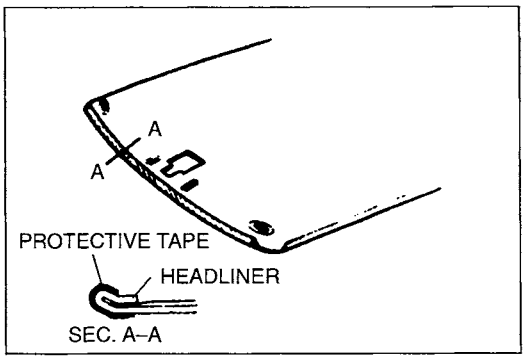
If the glass will not be reused
5. Use a tool like that shown in the figure and insert the blade into the sealant.
6. Pull throuth the sealant around the edge of the glass.
7. Remove the glass



8. Remove the spacers from the body.

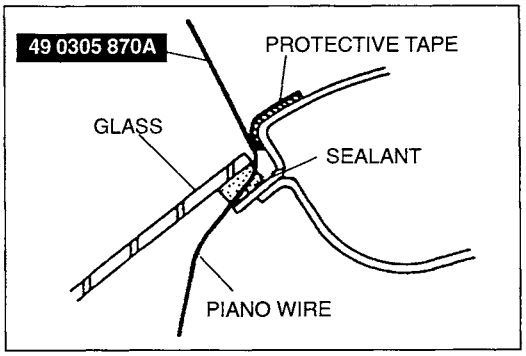


9. Remove the dam from the glass.

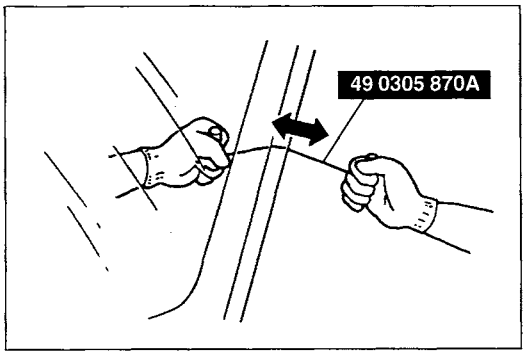


If the glass will be reused

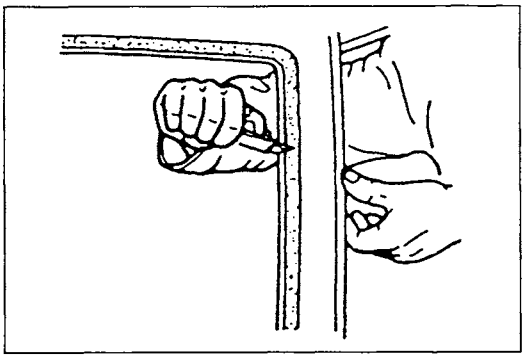
5. Use protective tape or cloth along the front edge of the headliner to protect it from damage.



6. Make a hole through the sealant from the inside of the vehicle by using an awl.
7. Pass piano wire through the hole.

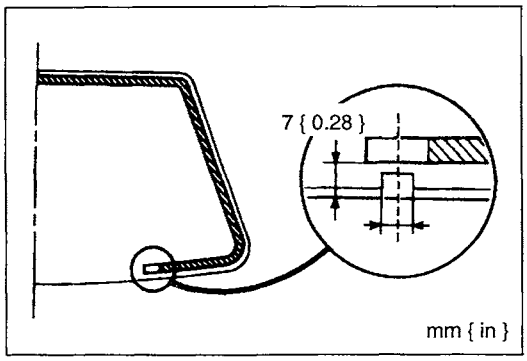


8. Wind each end of the wire around a bar.
9. Working with another person, saw through the sealant around the edge of the glass. Use a long sawing action to spread the work over the whole length of wire to prevent it from breaking.
10. Remove the glass.
11. Remove the spacers from the body.
12. Remove the dam from the glass.

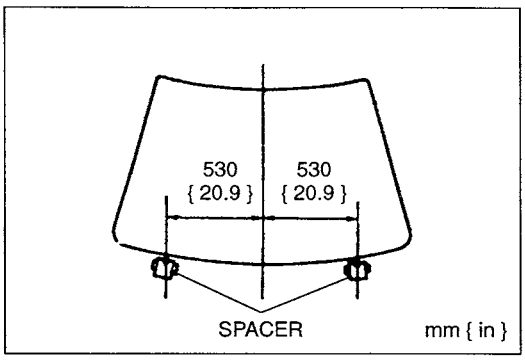


Installation

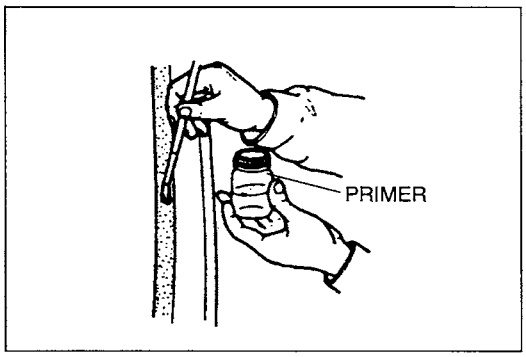
1. Cut away the old sealant by using a razor knife so that **1 to 2 mm { 0.04 to 0.08 in }** thickness of sealant remains around the circumference of the frame. If all the sealant has come off in any one place, apply some primer after degreasing, and allow it **30 minutes** to dry. Then put on new sealant to create a **2 mm { 0.08 in }** layer.
2. Clean and degrease around the circumference of the glass and the bonding area on the body.



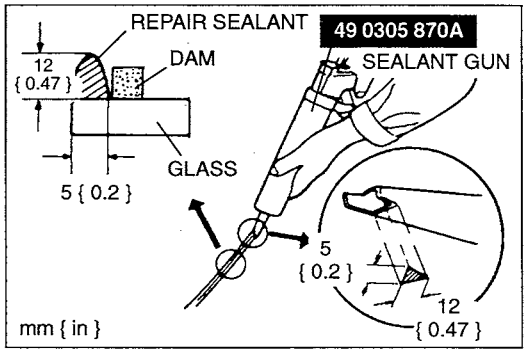
3. Securely bond a new dam along the circumference of the glass **7 mm { 0.28 in }** from the edge. Allow it to dry completely.



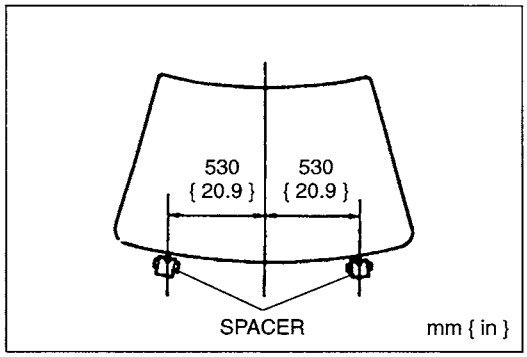
4. Install the spacers onto the body as shown. If a spacer is damaged, replace it.
5. Temporarily install the glass onto the body and make a mark on the glass directly above the V-notch of the spacers.
6. Remove the glass.



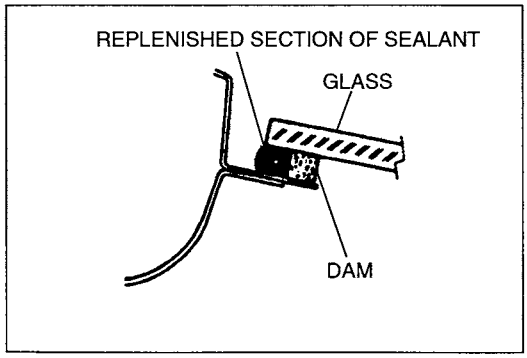
7. Use a brush to apply primer to the bonding area of the glass and the body. Keep the area free of dirt and grease, and do not touch the surface. Allow it to dry for approximately **30 minutes**.



8. Prepare the nozzle of the sealant tube so that it has a flange that can run along the edge of the glass and a V from which the sealant can flow. Once the primer is dry, apply repair sealant around the entire circumference to fill the gap bewteen the dam and the edge of the glass with a ridge of sealant **12 mm { 0.47 in }** high. Keep the bead of sealant smooth and even, reshaping it where necessary by using a spatula.



9. Align the glass marks with the V notches in the spacers and install the glass onto the body.
10. Press firmly inward on the glass to compress the sealant.
11. Use a scraper to smooth away any sealant that oozes out. Add more sealant to any points of poor contact.
12. To prevent the glass from being pushed out by air pressure if a door is closed, open all of the windows until the repair sealant has hardened.



Hardening time of repair sealant

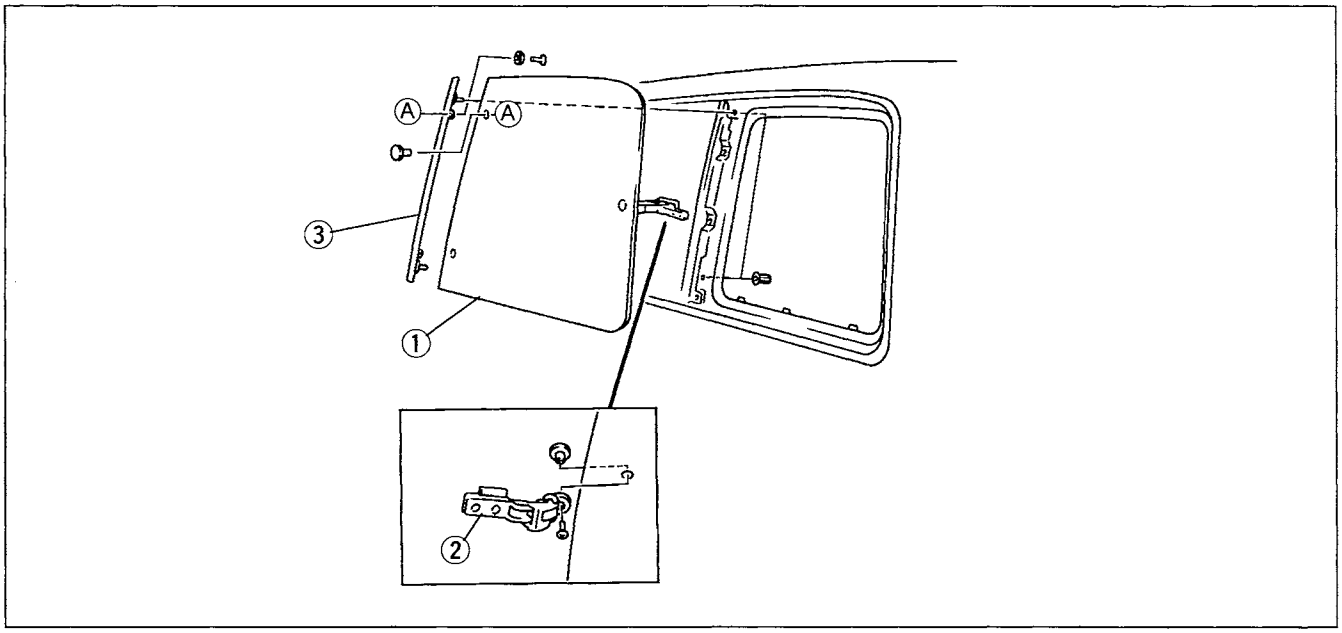
Temperature	Surface hardening time	Time required until car can be put into service
5 °C { 41 °F }	Approx. 1.5 hr	12 hr
20 °C { 68 °F }	Approx. 1 hr	4 hr
35 °C { 95 °F }	Approx. 10 min	2 hr

13. Check for water leaks. If a leak is found, wipe the water off well and add repair sealant where needed.
14. Install the following parts.
    a. A-pillar trim. (Refer to page S–61.)
    b. Rearview mirror. (Refer to page S–36.)
    c. Windshield lower molding. (Refer to page S–31.)
    d. Windshield upper molding. (Refer to page S–31.)

QUARTER WINDOW GLASS

Removal / Installation

1. Disconnect the negative battery cable (if equipped with a rear cooler).
2. Remove the B-pillar upper trim (Refer to page S–61.) and D-pillar trim (Refer to page S–61.).
3. Remove the rear cooler trim (Refer to page S–62.) (if equipped with a rear cooler).
4. Remove in the order shown in the figure.
5. Install in the reverse order of removal.

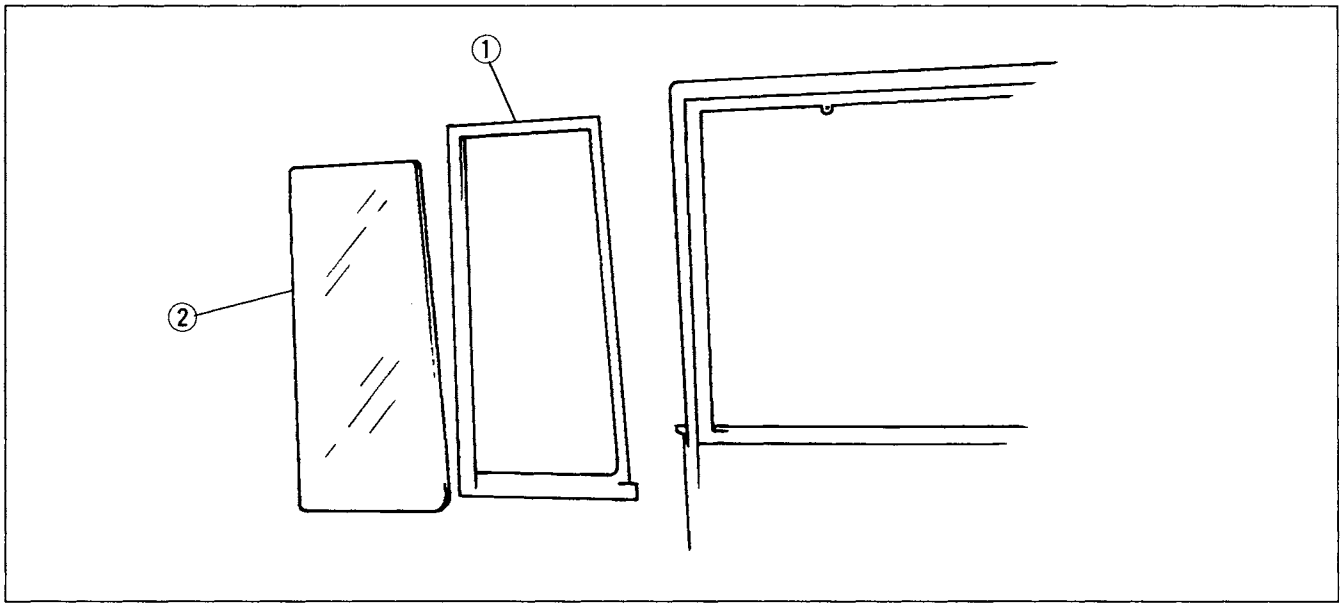


1. Quarter window
2. Quarter window lock
3. Quarter window hinge

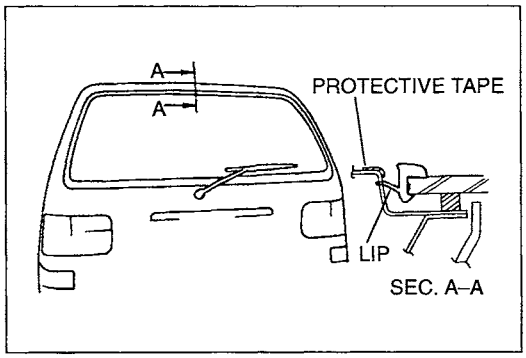
DOOR QUARTER WINDOW GLASS

Removal / Installation

1. Remove the glass guide. (Refer to page S–11.)
2. Remove the door quarter window glass with the door quarter window glass weatherstrip.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.



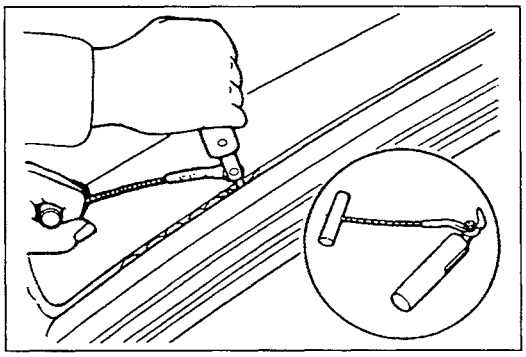
1. Door quarter window glass weatherstrip
2. Door quarter window glass



REAR WINDOW GLASS

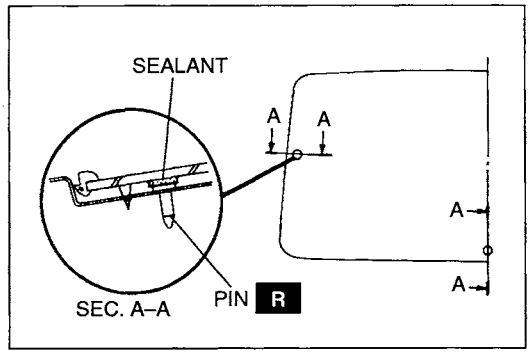
Removal

1. Disconnect the negative battery cable.
2. Remove the rear wiper arm. (Refer to section T.)
3. Apply protective tape along the edge of the body to protect it from damage.
4. Cut the lip of the rear window molding by using a razor knife, and remove the lip.



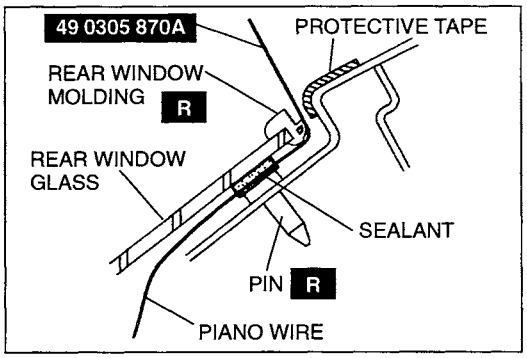
If the glass will not be reused

5. Use a tool like that shown in the figure and insert the blade into the sealant.
6. Pull through the sealant around the edge of the glass.

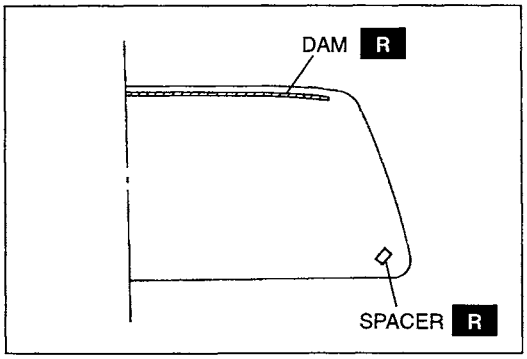


Note

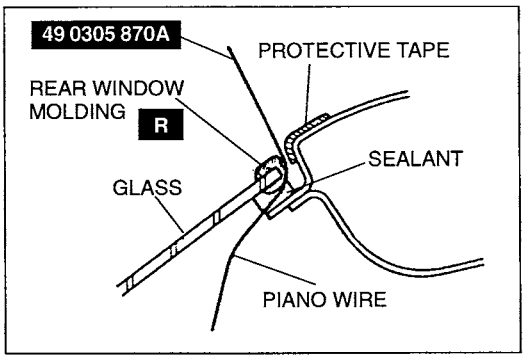
- The rear window glass has fastener-type pins as shown.



7. Make a hole through the sealant between the rear window glass and the pins from the inside of the vehicle by using an awl.
8. Pass piano wire through the hole.
9. Wind each end of the wire around a bar.
10. Working with another person, saw through the sealant around the edge of the glass. Use a long sawing action to spread the work over the whole length of wire to prevent it from breaking.
11. Remove the glass.
12. Turn the pin **90°** clockwise and remove it.

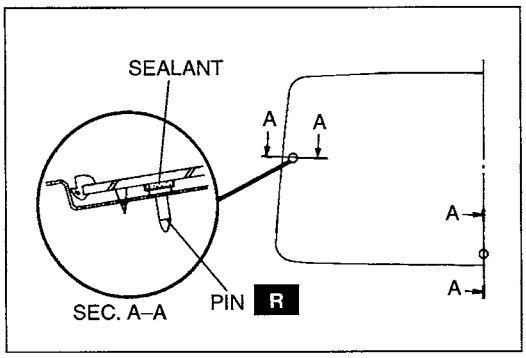


13. Remove the dam and spacers.



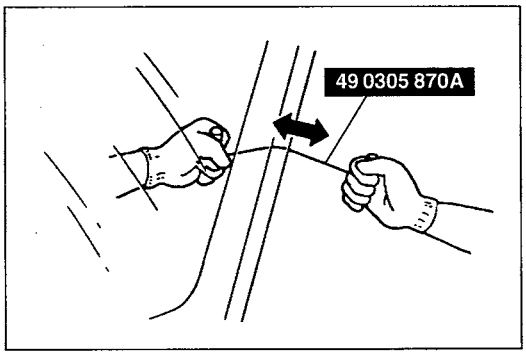
If the glass will reused

5. Make a hole through the sealant from the inside of the vehicle by using an awl.
6. Pass piano wire through the hole.

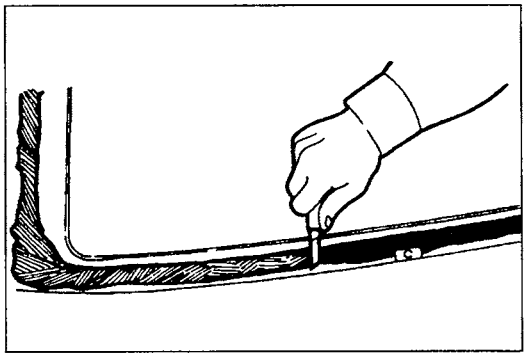


Note

- The rear window glass has fastener-type pins as shown.
- If it is difficult to cut the sealant with the piano wire, cut it by using a razor knife.

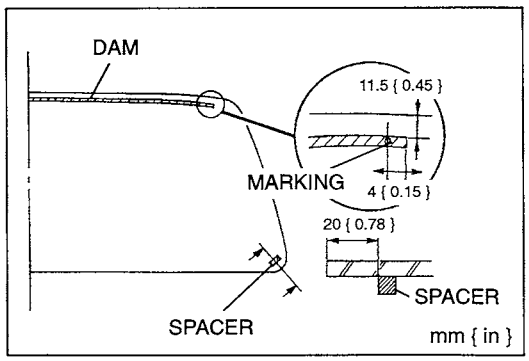


7. Wind each end of the wire around a bar.
8. Working with another person, saw through the sealant around the edge of the glass. Use a long sawing action to spread the work over the whole length of wire to prevent it from breaking. Make sure the wire does not rub on the body.
9. Remove the glass.
10. Turn the pin **90°** clockwise and remove it.
11. Remove the dam and spacers.

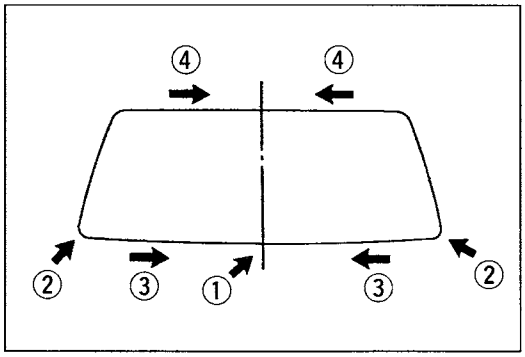


Installation

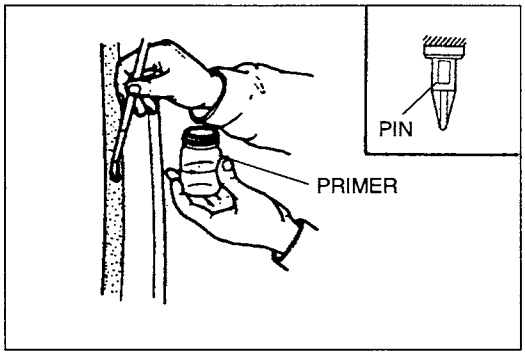
1. Cut away the old sealant by using a razor knife so that **1 to 2 mm { 0.04 to 0.08 in }** of sealant remains around the circumference of the frame. If all the sealant has come off in any one place, apply some primer after degreasing, and allow it **30 minutes** to dry. Then put on new sealant to create a **2 mm { 0.08 in }** layer.
2. Carefully clean an area **50 mm { 2.0 in }** wide around the circumference of the glass and clean the bonding area on the body.



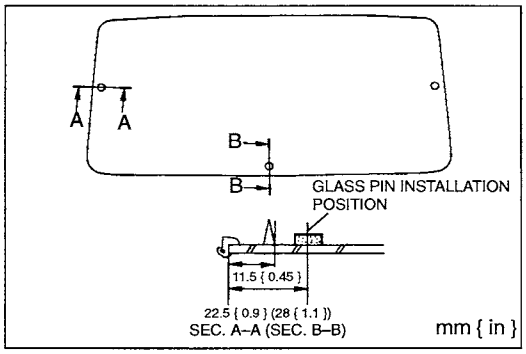
3. Securely bond a new dam along the circumference of the glass **11.5 mm { 0.45 in }** from the edge. Allow it to dry completely.
4. Securely bond new spacers to the glass as shown.



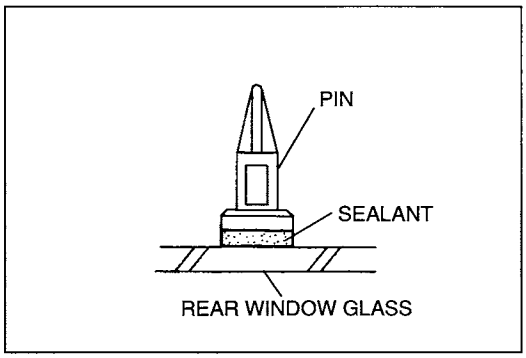
5. Install the rear window molding to the glass.
   (1) Align the molding to the center of the lower. (①)
   (2) Align the molding to the lower corners. (②)
   (3) Insall the molding from outside to inside. (③)
   (4) Install the molding from the sides to the top. (④)



6. Apply primer to the bonding area of the glass, body, and pin by using a brush. Use only glass primer on the glass, and body primer on the body and pin. Keep the area free of dirt and grease, and do not touch the surface. Allow it to dry for approximately **30 minutes**.



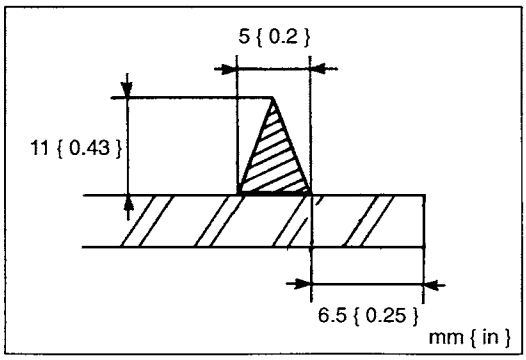
7. Apply the sealant to the glass pins installation positions as shown.
8. Keep the bead of sealant smooth and even, reshaping it where necessary by using a spatula.



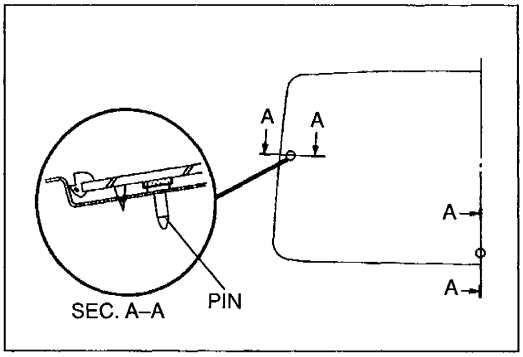
9. Install the pins.

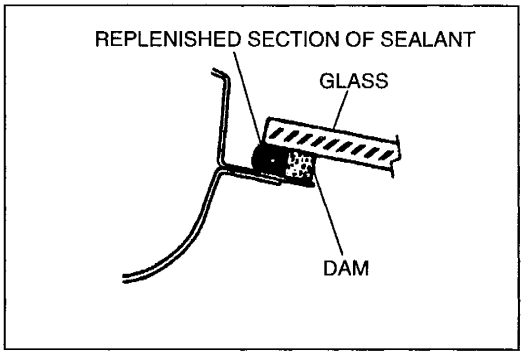
Hardening time of repair sealant

Temperature	Surface hardening time	Time required until car can be put into service
5 °C { 41 °F }	Approx. 1.5 hr	12 hr
20 °C { 68 °F }	Approx. 1 hr	4 hr
35 °C { 95 °F }	Approx. 10 min	2 hr



10. Apply an **11 mm { 0.43 in }** high bead of repair sealant around the circumstance of the glass as shown. Keep the bead of sealant smooth and even, reshaping it where necessary with a spatula.





11. Align the glass via the pins and install it onto the body.
12. Press firmly inward on the glass to compress the sealant.
13. To prevent the glass from being pushed out by air pressure if a door is closed, open all of the windows until the repair sealant hsa hardened.

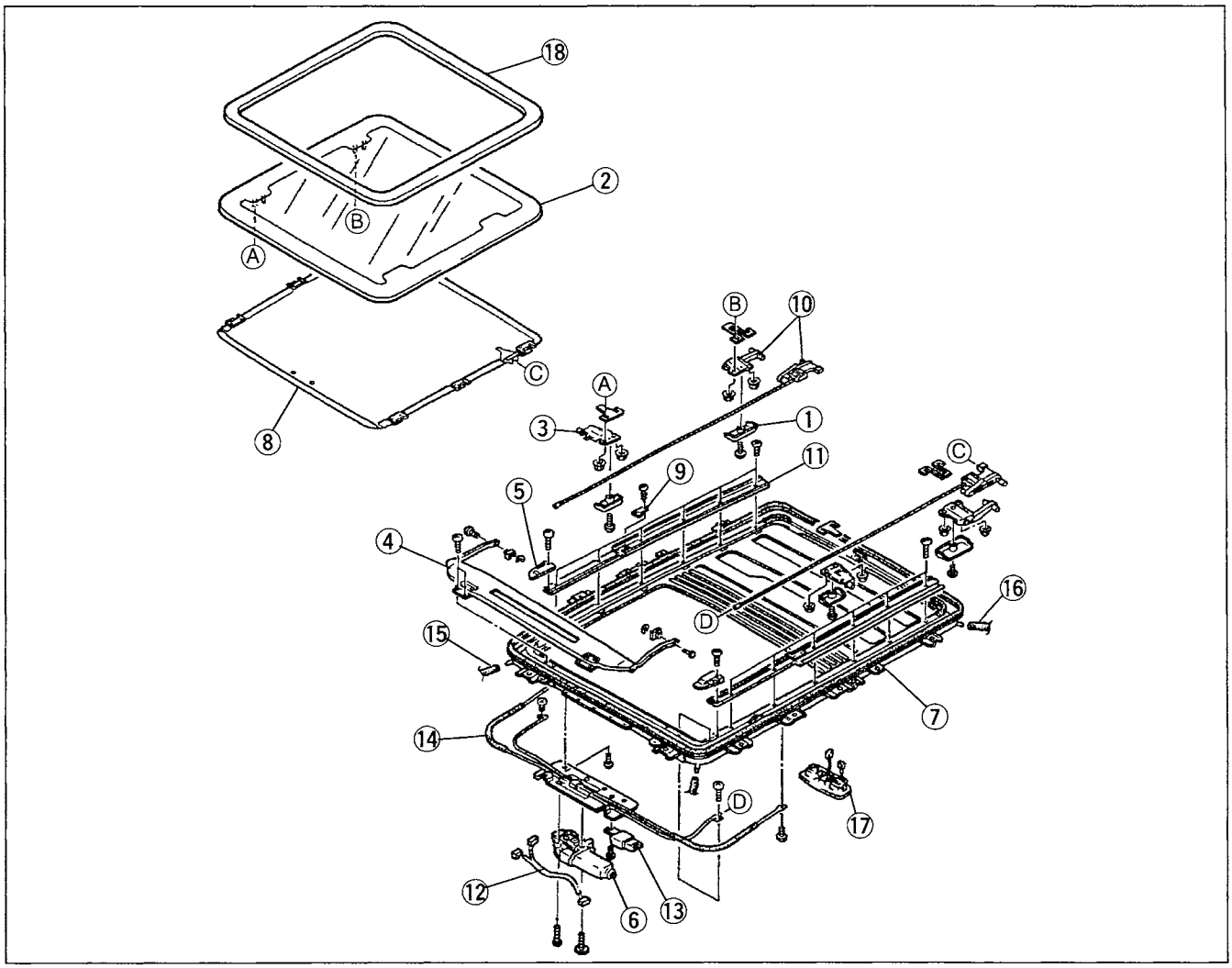
Hardening time of repair sealant

Temperature	Surface hardening time	Time required until car can be put into service
5 °C { 41 °F }	Approx. 1.5 hr	12 hr
20 °C { 68 °F }	Approx. 1 hr	4 hr
35 °C { 95 °F }	Approx. 10 min	2 hr

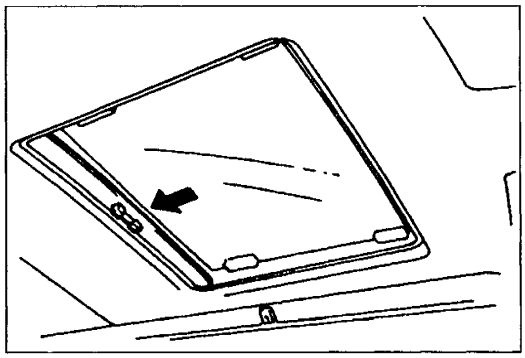
14. Use a scraper to smooth away any sealant that oozes out. Add more sealant to any points of poor contact.
15. Check for water leaks. If a leak is found, wipe the water off well and reinstall the rear window glass.
16. Install the rear wiper arm. (Refer to section T.)

SLIDING SUNROOF

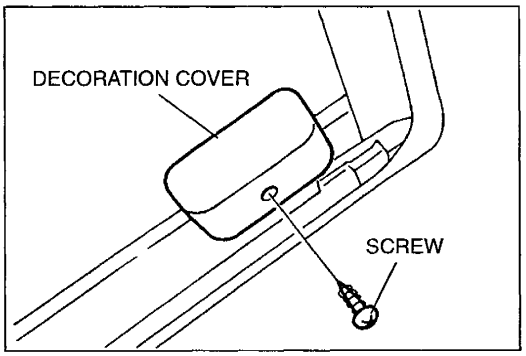
COMPONENTS



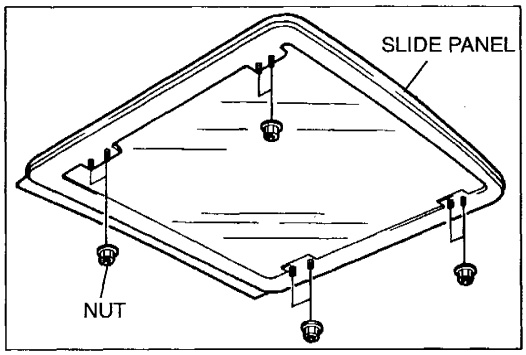
1. Decoration cover
   - Removal / Installation ..... page S–48
2. Slide panel
   - Removal / Installation ..... page S–48
   - Adjustment ..... page S–48
3. Front guide
   - Removal / Installation ..... page S–49
4. Deflector
   - Removal / Installation ..... page S–49
5. Guide rail cover
   - Removal / Installation ..... page S–49
6. Sunroof motor assembly
   - Removal / Installation ..... page S–49
   - Inspection ..... page S–50
7. Sunroof unit
   - Removal / Installation ..... page S–51
   - Disassembly / Assembly ..... page S–51
8. Sunshade
   - Removal / Installation ..... page S–51
9. Set plate
   - Removal / Installation ..... page S–51
10. Rear guide
    - Removal / Installation ..... page S–51
11. Guide rail
    - Removal / Installation ..... page S–51
12. Sunroof harness
    - Removal / Installation ..... page S–52
    - Inspection ..... page S–52
13. Sunroof relay
    - Removal / Installation ..... page S–52
    - Inspection ..... page S–52
14. Drive unit
    - Removal / Installation ..... page S–53
15. Front drain hose
    - Removal / Installation ..... page S–54
16. Rear drain hose
    - Removal / Installation ..... page S–54
17. Sunroof switch
    - Removal / Installation ..... page S–55
    - Inspection ..... page S–55
18. Weatherstrip
    - Removal / Installation ..... page S–55



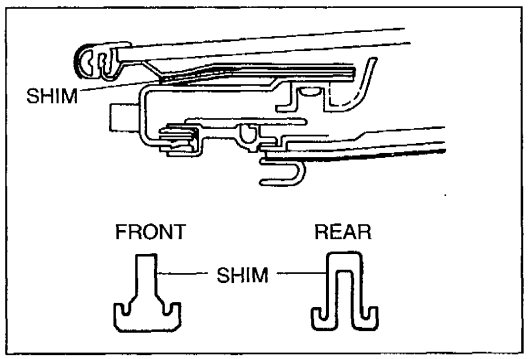
DECORATION COVER
Removal / Installation
1. Slide the sunshade all the way to the rear.
2. Fully close the slide panel.



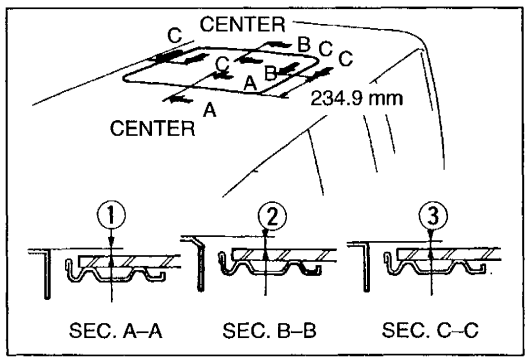
3. Remove the decoration cover mounting screws and remove the left and right decoration covers.
4. Install in the reverse order of removal.



SLIDE PANEL
Removal / Installation
1. Remove the decoration cover. (Refer above.)
2. Remove the six installation nuts from the slide panel and bracket.



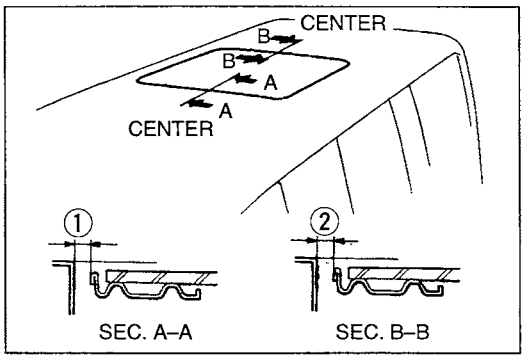
3. Remove the shims from between the slide panel and the bracket.
4. Remove the slide panel by pushing it upward from inside the vehicle.
5. Install in the reverse order of removal.



Adjustment
Height
1. Remove the decoration cover. (Refer above.)
2. Loosen the slide panel installation nuts and insert a shim(s) between the brackets and slide panel.

Allowable height clearance

①: $3.1^{+1.5}_{-0.5}$ mm { $0.12^{+0.06}_{-0.02}$ in }
②: $5.6^{+1.5}_{-0.5}$ mm { $0.22^{+0.06}_{-0.02}$ in }
③: $1.0^{+1.5}_{-0.5}$ mm { $0.04^{+0.06}_{-0.02}$ in }

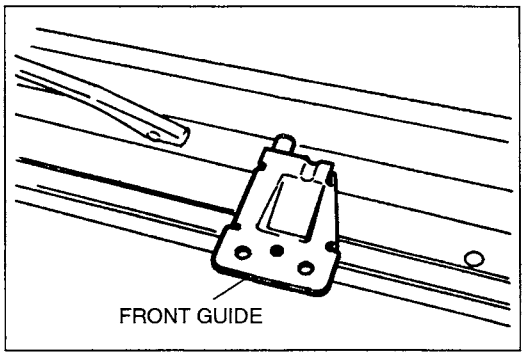


Gap

1. Open the sliding panel about **100 mm { 3.9 in }** from the fully closed position.
2. Pull up on the weatherstrip surrounding the section which is to be measured.
3. Fully close the slide panel.
4. Remove the decoration cover. (Refer to page S–48.)
5. Loosen the set plate mounting screws and adjust the gap.

Allowable gap clearance

①: 6.0 ± 0.3 mm { 0.24 ± 0.01 in }
②: 6.6 ± 0.3 mm { 0.26 ± 0.01 in }



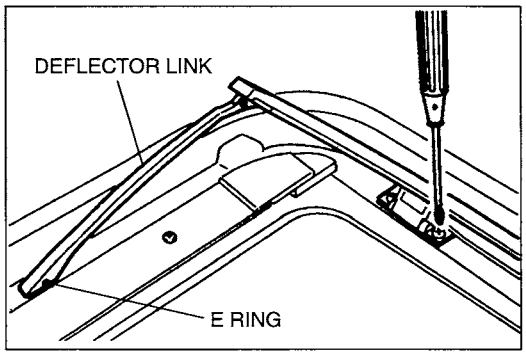
FRONT GUIDE

Removal

1. Remove the slide panel. (Refer to page S–48.)
2. Remove the front guide.

Installation

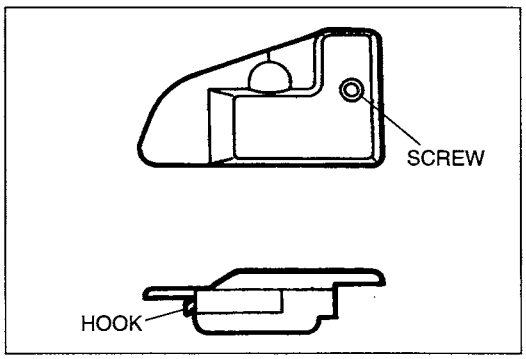
Insert the front guide into the guide rail, and set it to press the deflector link (sunroof at fully closed position).



DEFLECTOR

Removal / Installation

1. Fully open the slide panel.
2. Remove the E-ring at the rear of the deflector link, and remove the pin.
3. Remove the screws and remove the deflector.
4. Install in the reverse order of removal.



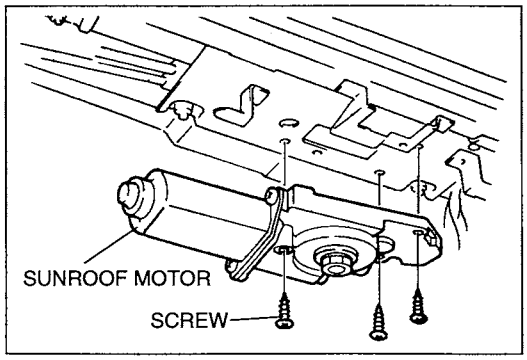
GUIDE RAIL COVER

Removal

1. Fully open the slide panel.
2. Remove the guide rail cover mounting screws and remove the guide rail cover.

Installation

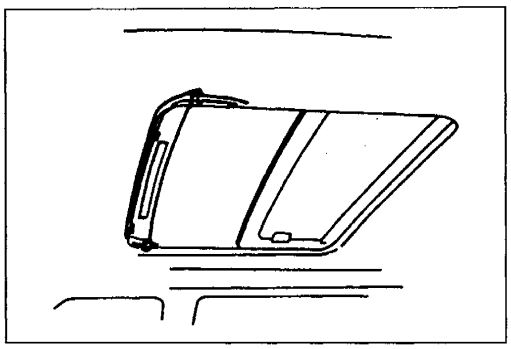
1. Insert the hook into the frame.
2. Install in the reverse order of removal.



SUNROOF MOTOR ASSEMBLY

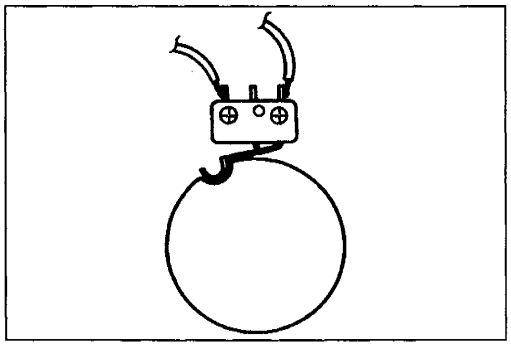
Removal

1. Disconnect the negative battery cable.
2. Remove the front headliner. (Refer to page S–67.)
3. Disconnect the harness connector from the sunroof motor assembly.
4. Remove the sunroof motor assembly mounting screws and remove the sunroof motor assembly.

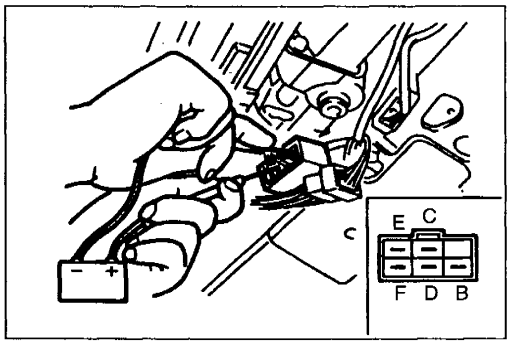


Installation

1. Open the slide panel **200 mm { 7.87 in }** from the front end of deflector.

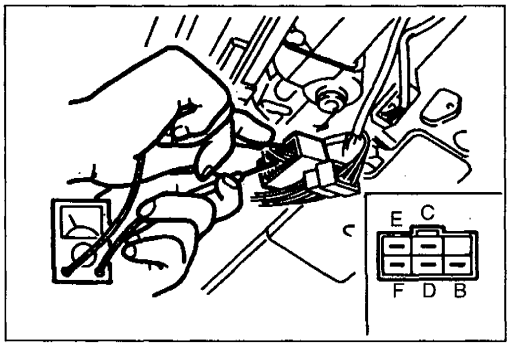


2. Turn the sunroof motor by using an allen wrench until the motor limit switch reaches the position shown in the figure.
3. Install the sunroof motor.
4. Connect the harness connector.
5. Install the front headliner. (Refer to page S–67.)



Inspection

1. Remove the front headliner. (Refer to page S–67.)
2. Disconnect the sunroof connector.
3. Connect battery positive voltage to terminal F and terminal E to ground. Verify that the motor rotates in the opening direction.
4. Reverse the above connections and verify that the motor rotates in the closing direcction.
5. If not as specified, replace the sunroof motor.



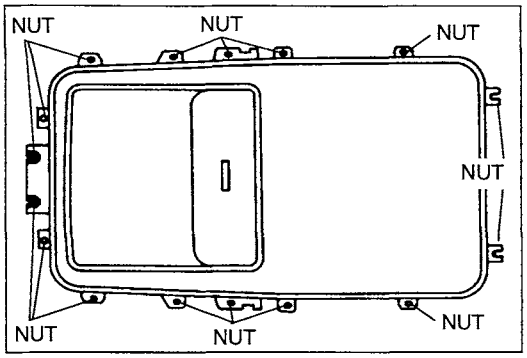
(Limit switch)

1. Remove the front headliner. (Refer to page S–67.)
2. Disconnect the sunroof harness connector.
3. Check for continuity between terminals C and D of the sunroof motor assembly harness connector with the slide panel in the following positions. Operate the slide panel by using an allen wrench.

O—O: Continuity

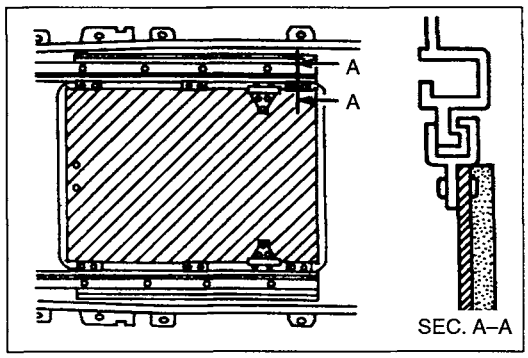
Terminal / Panel position	C	D
Open		
Close		
Close (200 mm { 7.87 in } from the front end of the defrector)	O	O

4. If not as specified, replace the sunroof motor.

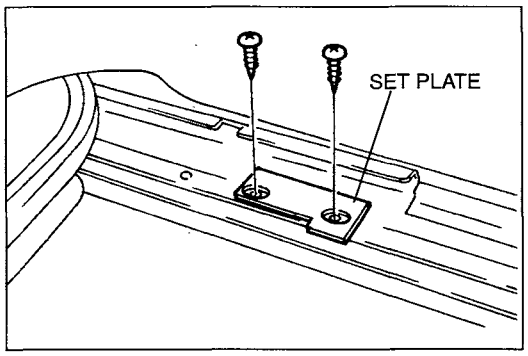


SUNROOF UNIT
Removal / Installation
1. Disconnect the negative battery cable.
2. Remove the front headliner. (Refer to page S–67.)
3. Remove the slide panel. (Refer to page S–48.)
4. Remove the sunroof unit mounting nuts and remove the sunroof unit.
5. Install in the reverse order of removal.

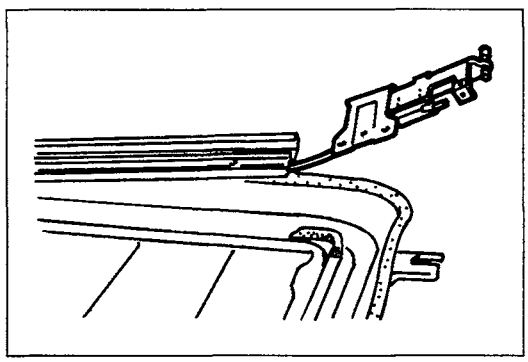
Disassembly / Assembly
1. Remove the sunshade. (Refer below.)
2. Remove the deflector. (Refer to page S–49.)
3. Remove the front guide. (Refer to page S–49.)
4. Remove the set plate. (Refer to page S–51.)
5. Remove the rear guide. (Refer to page S–51.)
6. Remove the drive unit. (Refer to page S–53.)
7. Assemble in the reverse order of disassembly.



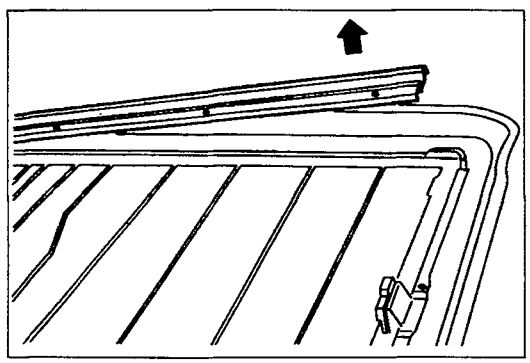
SUNSHADE
Removal / Installation
1. Remove the guide rail. (Refer below.)
2. Remove the sunshade.
3. Install in the reverse order of removal.



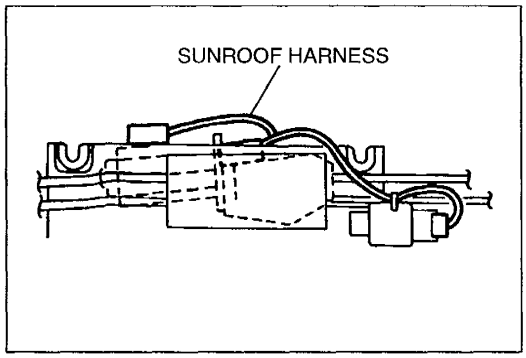
SET PLATE
Removal / Installation
1. Fully open the slide panel.
2. Remove the set plate mounting screws and remove the set plate.
3. Install in the reverse order of removal.



REAR GUIDE
Removal / Installation
1. Remove the sunroof unit. (Refer above.)
2. Remove the guide rail mounting screws.
3. Lift up the rear end of the guide rail and pull out the rear guide.
4. Install in the reverse order of removal.



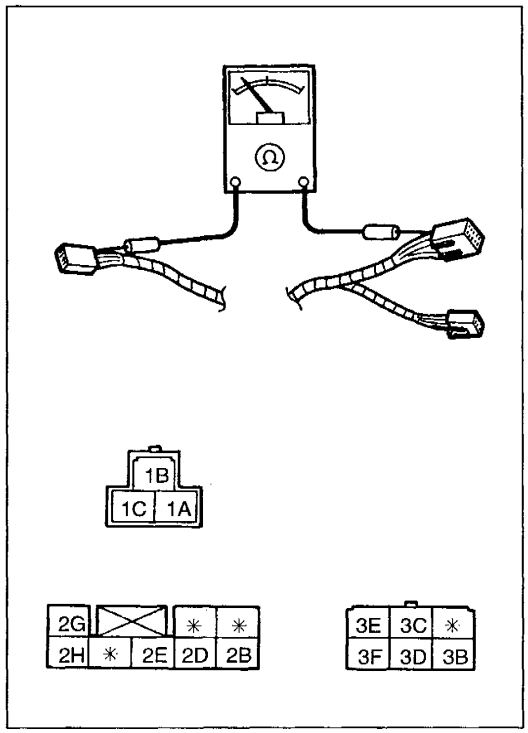
GUIDE RAIL
Removal / Installation
1. Remove the rear guide. (Refer above.)
2. Lift up the end of the guide rail and remove the guide rail.
3. Install in the reverse order of removal.



SUNROOF HARNESS

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the front headliner. (Refer to page S–67.)
3. Remove the sunroof harness installation clip and remove the sunroof harness.
4. Install in the reverse order of removal.



Inspection

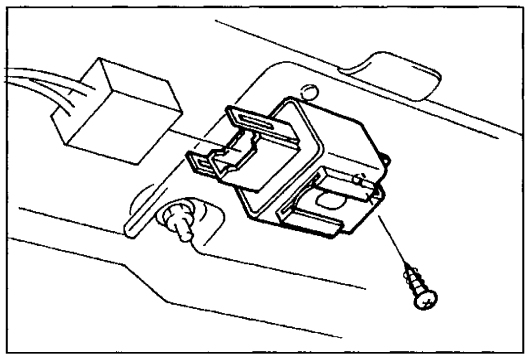
1. Remove the sunroof harnes. (Refer above.)
2. Check for continuity between the terminals of the sunroof harness connectors by using an ohmmeter.

○—○: Continuity

TERMINAL						
1A	1B	1C	2B	2E	3B	3F
○			○			
	○				○	
		○		○		○

TERMINAL					
2G	2H	2D	3D	3E	3C
○				○	
	○		○		
		○			○

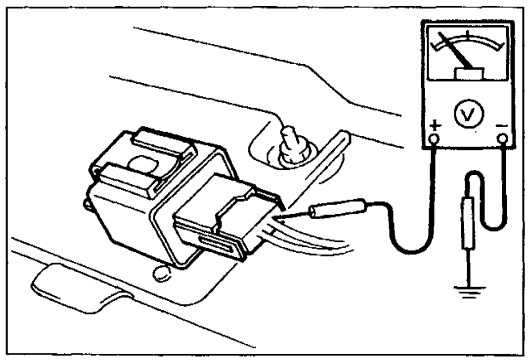
3. If not as specified, replace the sunroof harness.



SUNROOF RELAY

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the front headliner. (Refer to page S–67.)
3. Remove the sunroof relay bracket mounting screw and remove the sunroof relay.
4. Install in the reverse order of removal.

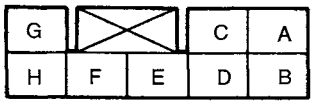


Inspection

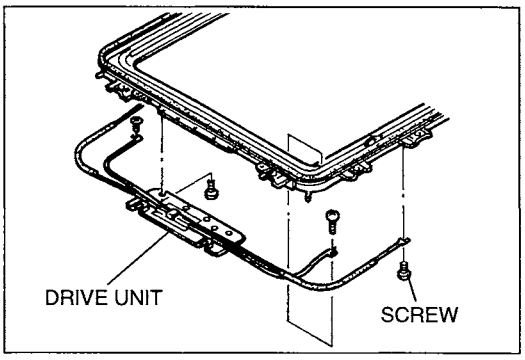
1. Measure the voltage at the sunroof relay terminals by using a voltmeter. (Refer to page S–53.)
2. If not as specified, replace the sunroof relay.

Terminal voltage list
Relay

B+: Battery positive voltage

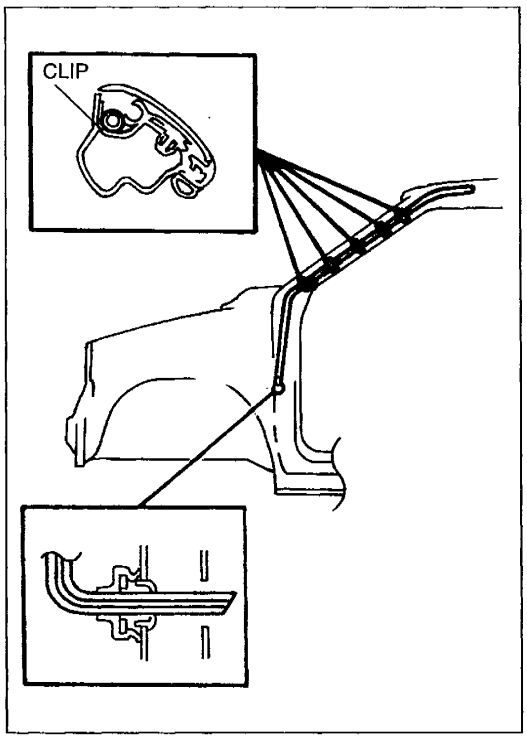


Terminal	Signal	Connection	Test condition	Voltage (V)	Inspection area
A	—	—	—	—	—
B	Sunroof open control	Sunroof switch	Sunroof opening	B+	Wiring harness (Sunroof switch — Sunroof relay)
			Other	0	
C	—	—	—	—	—
D	Limit switch ON	Sunroof motor (Limit switch)	Momentarily stops during sunroof closing (Limit switch ON)	0	Wiring harness (Sunroof relay — Sunroof motor)
			Other	0—B+	
E	Sunroof close control	Sunroof switch	Sunroof closing	B+	Wiring harness (Sunroof relay — Sunroof switch)
			Other	0	
F	—	—	—	—	—
G	Sunroof motor control	Sunroof motor	Sunroof opening	B+	Wiring harness (Sunroof relay — Sunroof motor)
			Sunroof closing	0	
H	Limit switch ON	Sunroof motor (Limit switch)	Momentarily stops during sunroof closing (Limit switch ON)	0	Wiring harness (Sunroof relay — Sunroof motor)
			Other	0—B+	



DRIVE UNIT
Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the sunroof unit. (Refer to page S–51.)
3. Remove the sunroof motor. (Refer to page S–49.)
4. Remove the guide rail cover. (Refer to page S–49.)
5. Remove the drive unit mounting screw and remove the drive unit.
6. Install in the reverse order of removal.



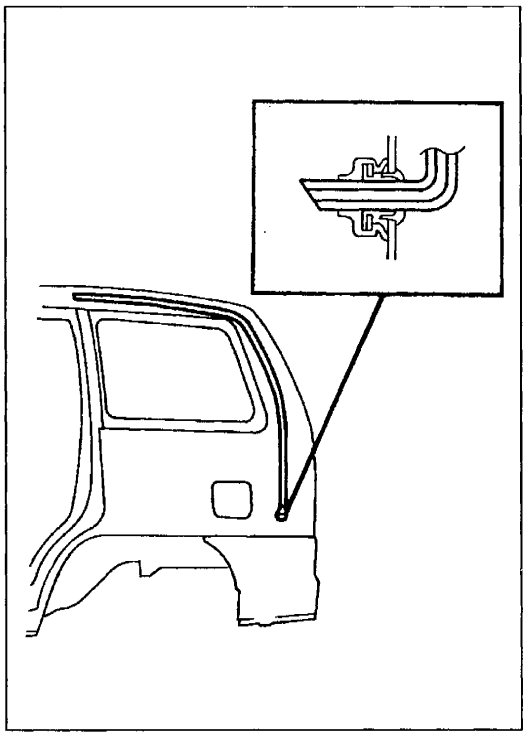
FRONT DRAIN HOSE

Removal

1. Remove the front headliner. (Refer to page S–67.)
2. Remove the front drain hose from the clips.
3. Pull the front drain hose into the room side and remove the front drain hose.

Installation

1. Apply soapy water to the drain hose.
2. Insert one end of the hose into the sunroof frame, set the hose along the clips, and insert the other end into the floor side panel hole.



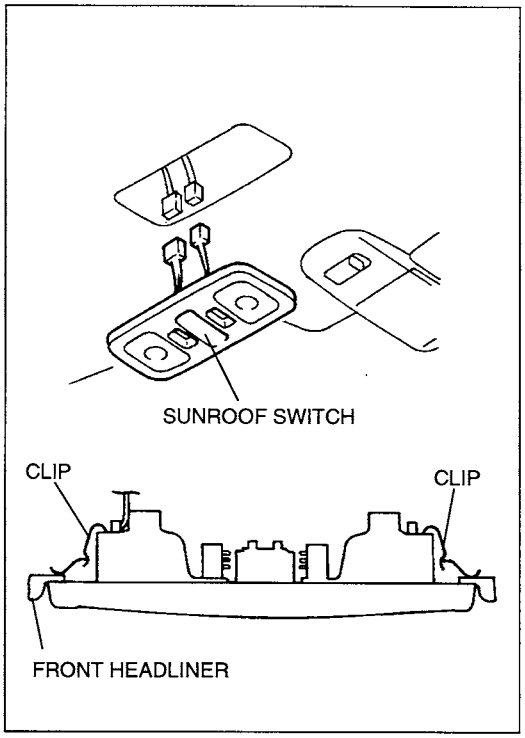
REAR DRAIN HOSE

Removal

1. Remove the rear headliner. (Refer to page S–68.)
2. Remove the rear drain hose from the clips.
3. Pull the rear drain hose into the room side and remove the rear drain hose.

Installation

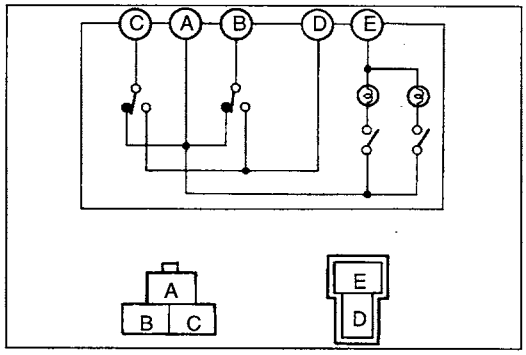
1. Apply soapy water to the rear drain hose.
2. Insert one end of the hose into the sunroof frame, set the hose along the clips, and insert the other end into the floor side panel.



SUNROOF SWITCH

Removal / Installation

1. Remove the negative battery cable.
2. Remove the sunroof switch installation clip and remove the sunroof switch.
3. Install in the reverse order of removal.



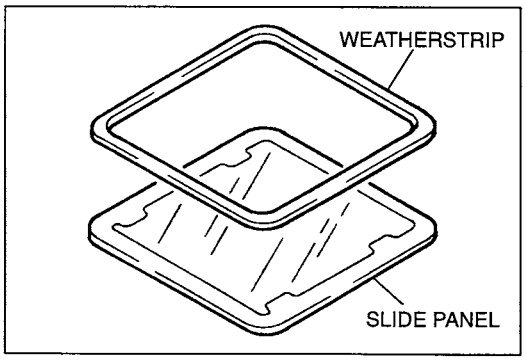
Inspection

1. Remove the sunroof switch. (Refer above.)
2. Check for continuity between the terminals with the sunroof switch in the following positions by using an ohmmeter.

○—○: Continuity

Switch position \ Terminal	A	B	C	D	E
Open		○		○	
Off	○	○	○		
Close			○	○	

3. If not as specified, replace the sunroof switch.



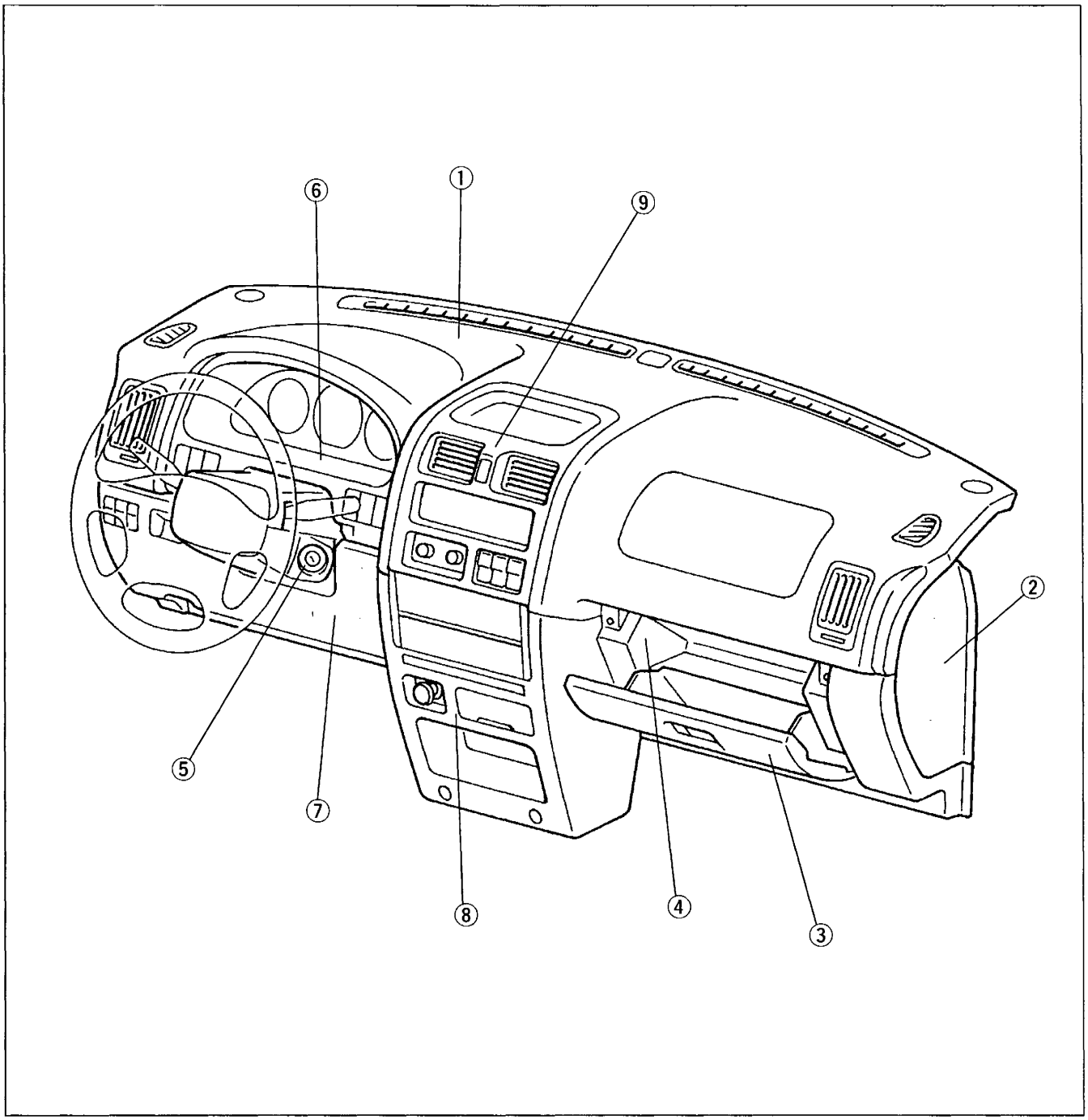
WEATHERSTRIP

Removal / Installation

1. Remove the slide panel. (Refer to page S–48.)
2. Peel the weatherstrip off the slide panel and remove the weatherstrip.
3. Install in the reverse order of removal.

DASHBOARD

STRUCTURAL VIEW

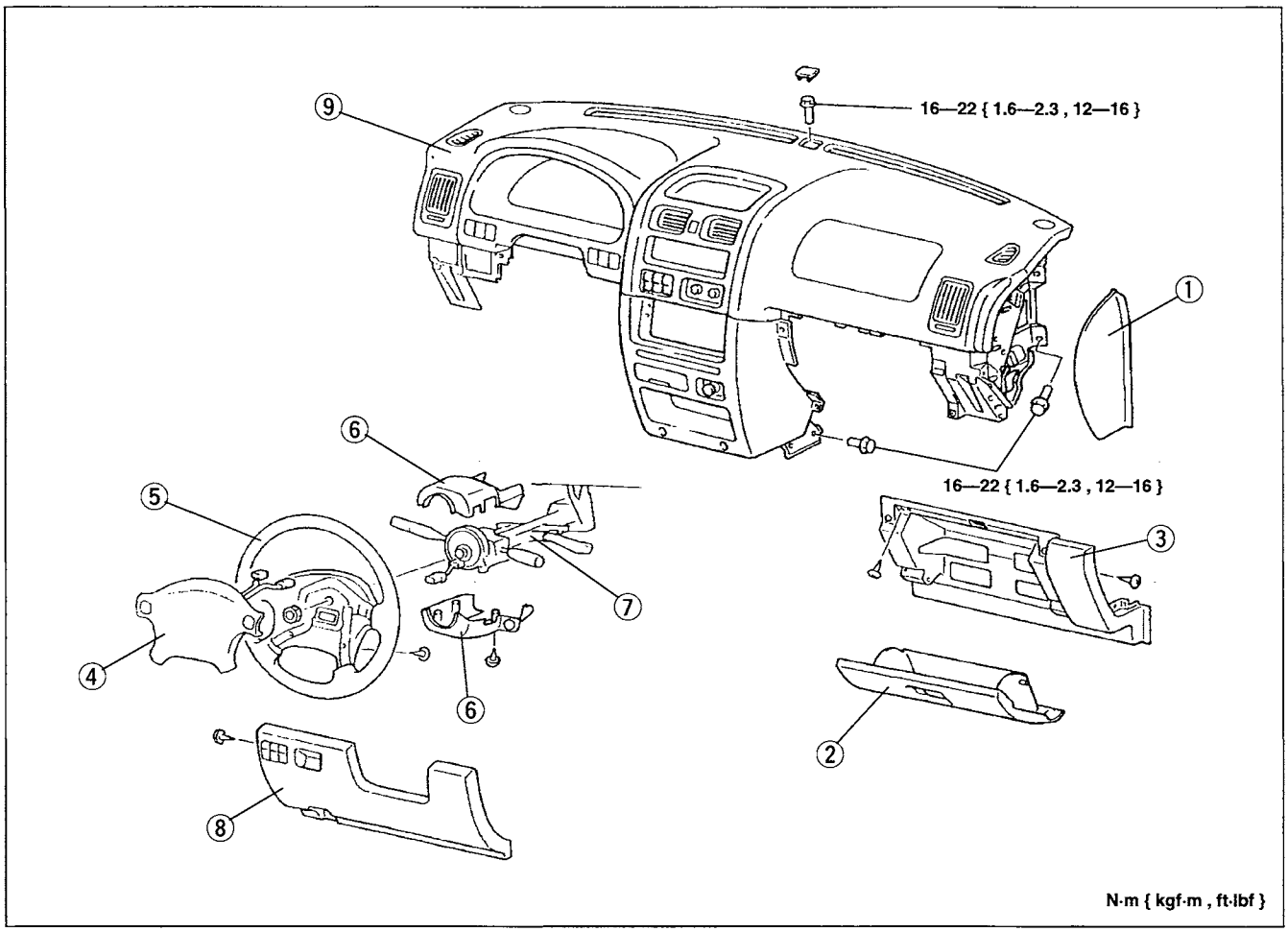


1. Dashboard
   Removal / Installation ..... page S–57
   Disassembly / Assembly ..... page S–58
2. Side panel
   Removal / Installation ..... page S–59
3. Glove compartment
   Removal / Installation ..... page S–59
   Disassembly / Assembly ..... page S–59
4. Glove compartment cover
   Removal / Installation ..... page S–59
5. Column cover
   Removal / Installation ..... page S–59
6. Meter hood
   Removal / Installation ..... page S–60
7. Lower panel
   Removal / Installation ..... page S–60
8. Center lower panel
   Removal / Installation ..... page S–60
9. Center upper panel
   Removal / Installation ..... page S–60

DASHBOARD
Removal / Installation
1. Disconnect the negative battery cable.

Warning
- **Handling the air bag module improperly can accidently deploy the air bag, which may seriously injure you. Read SERVICE WARNINGS, section T, before handling the air bag module.**

2. Remove the A-pillar trim. (Refer to page S–61.)
3. Remove the front side trim. (Refer to page S–63.)
4. Remove in the order shown in the figure.
5. Install in the reverse order of removal.

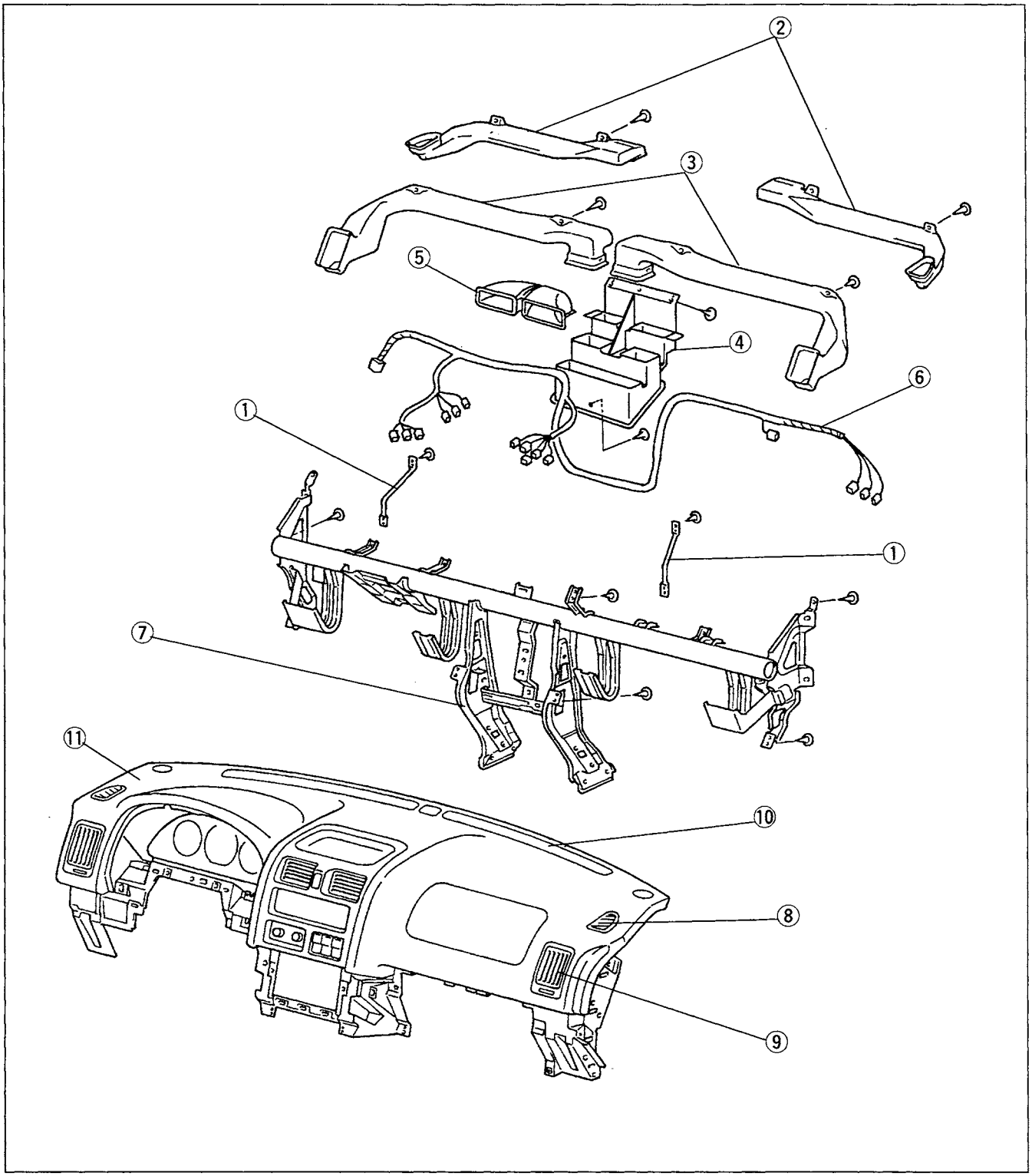


1. Side panel
   Removal / Installation ..... page S–59
2. Glove compartment
   Removal / Installation ..... page S–59
   Disassembly / Assembly ..... page S–59
3. Glove compartment cover
   Removal / Installation ..... section T
4. Driver-side air bag
   Removal / Installation ..... section T
5. Steering wheel
   Removal / Installation ..... section N
6. Column cover
   Removal / Installation ..... page S–59
7. Steering shaft
   Removal / Installation ..... section N
8. Lower panel
   Removal / Installation ..... page S–60
9. Dashboard
   Installation note ..... below
   Disassembly / Assembly ..... page S–58

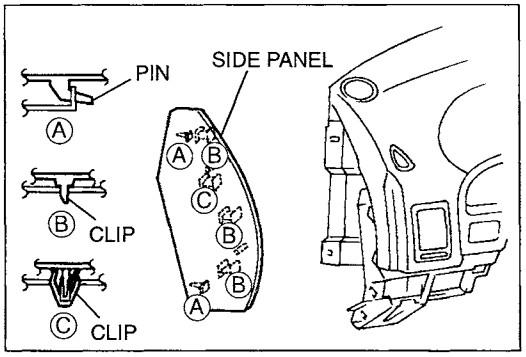
Installation note
Dashboard
On vehicles with a wire-type heater control unit, adjust each wire. (Refer to section U.)

Disassembly / Assembly

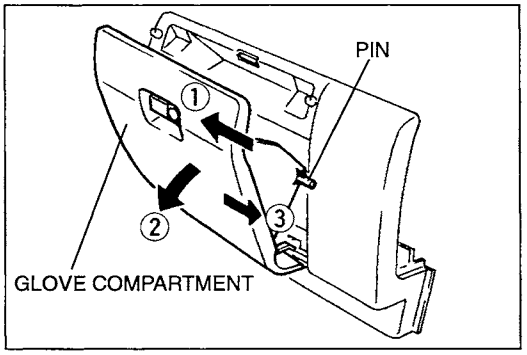
1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



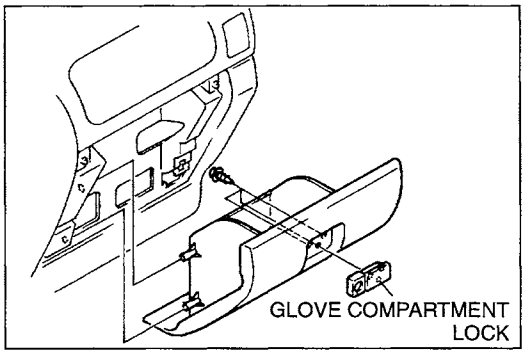
1. Pad bracket
2. Side demister duct
3. Duct
4. Center duct No.1
5. Center duct No.2
6. Dashboard harness
7. Dashboard member
8. Demister grille
9. Side ventilator
10. Defroster grille
11. Dashboard crush pad



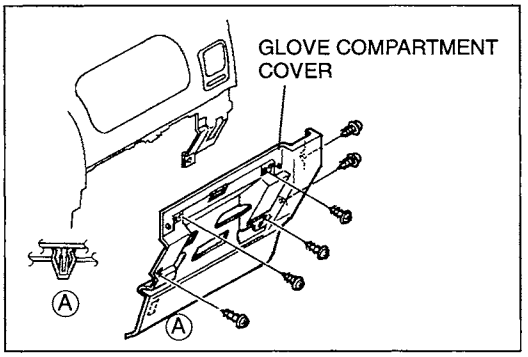
SIDE PANEL
Removal / Installation
1. Pull the front edge of the side panel forward to remove the clips from the body.
2. Pull the side panel forward to remove the pins from the body.
3. Install in the reverse order of removal.



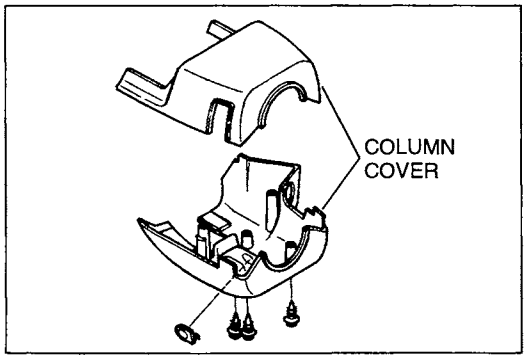
GLOVE COMPARTMENT
Removal / Installation
1. Slide the glove compartment to the left.
2. Pull the right side forward to release the pin.
3. Remove the glove compartment by sliding it to the right.
4. Install in the reverse order of removal.



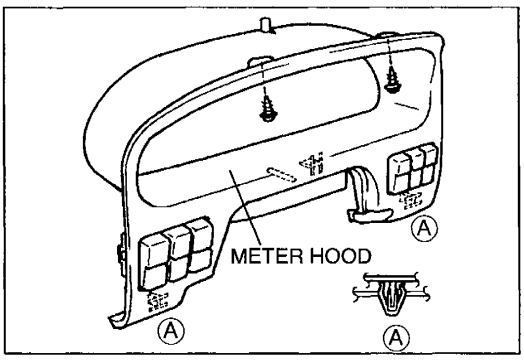
Disassembly / Assembly
1. Remove the glove compartment lock installation screws.
2. Install in the reverse order of removal.



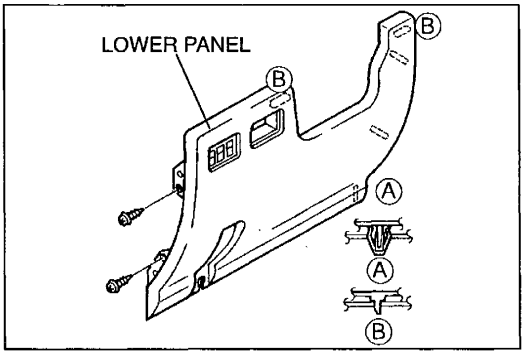
GLOVE COMPARTMENT COVER
Removal / Installation
1. Remove the side panel. (Refer above.)
2. Remove the glove compartment. (Refer above.)
3. Remove the glove compartment cover installation screws.
4. Pull the glove compartment cover forward to remove the clip from the body.
5. Install in the reverse order of removal.



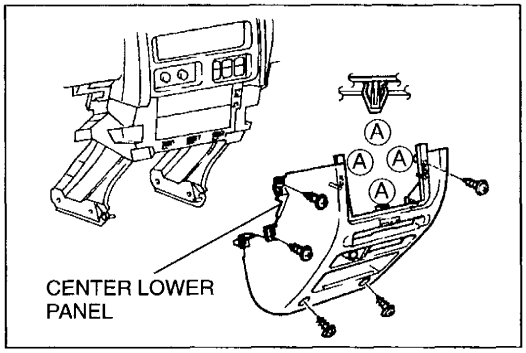
COLUMN COVER
Removal / Installation
1. Remove the column cover installation screws.
2. Install in the reverse order of removal.



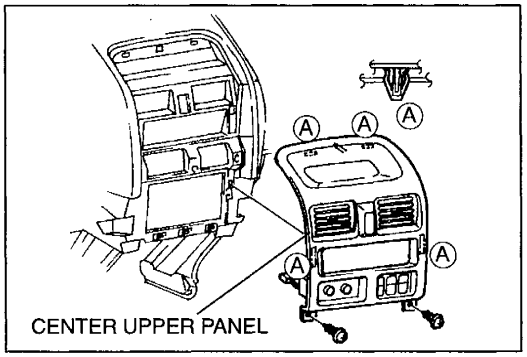
METER HOOD
Removal / Installation
1. Remove the meter hood installation screws.
2. Pull the meter hood forward to remove the clips from the body.
3. Install in the reverse order of removal.



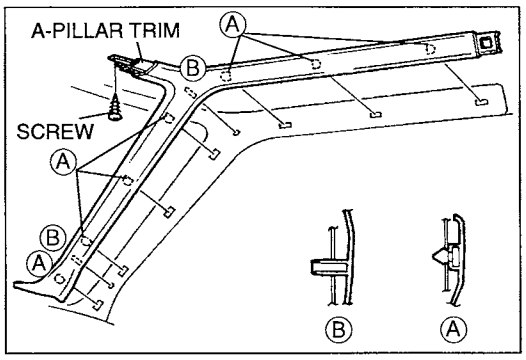
LOWER PANEL
Removal / Installation
1. Remove the hood release lever.
2. Remove the side panel. (Refer to page S–59.)
3. Remove the lower panel installation screws.
4. Pull the lower panel forward to remove the clips from the body.
5. Install in the reverse order of removal.



CENTER LOWER PANEL
Removal / Installation
1. Remove the lower panel. (Refer above.)
2. Remove the glove compartment cover. (Refer to page S–59.)
3. Remove the center lower panel installation screws.
4. Pull the center lower panel forward to remove the clips from the body.
5. Install in the reverse order of removal.



CENTER UPPER PANEL
Removal / Installation
1. Remove the center lower panel. (Refer above.)
2. Remove the center upper panel installation screws.
3. Pull the center upper panel forward to remove the clips from the body.
4. Install in the reverse order of removal.

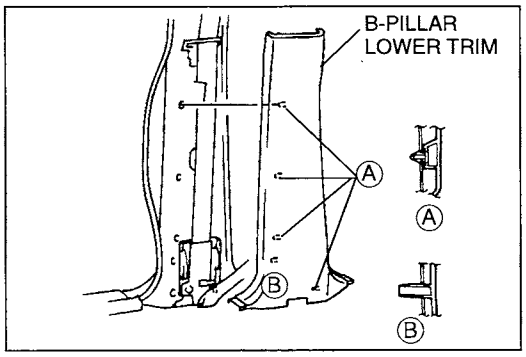


TRIM

A-PILLAR TRIM

Removal / Installation

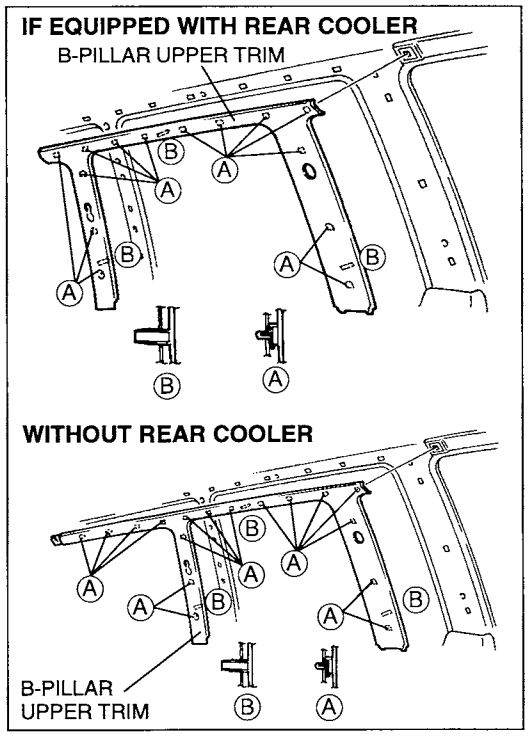
1. Remove the front header trim. (Refer to page S–64.)
2. Remove the B-pillar upper trim. (Refer below.)
3. Pull the A-pillar trim to disengage clips Ⓐ and pin Ⓑ from the body.
4. Install in the reverse order of removal.



B-PILLAR LOWER TRIM

Removal / Installation

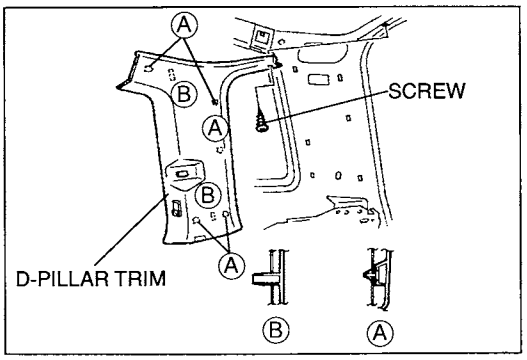
1. Remove the front scuff plate. (Refer to page S–63.)
2. Remove the rear scuff plate. (Refer to page S–63.)
3. Pull the B-pillar lower trim to disengage clips Ⓐ and pin Ⓑ from the body.
4. Install in the reverse order of removal.



B-PILLAR UPPER TRIM

Removal / Installation

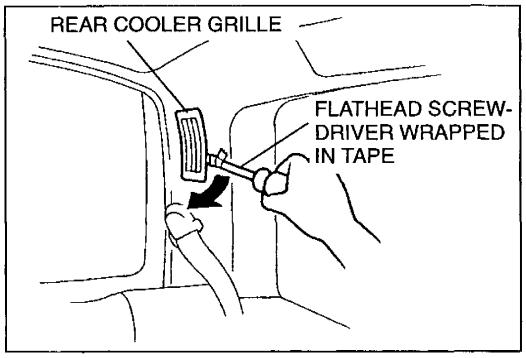
1. Remove the D-pillar trim. (Refer below.)
2. Remove the B-pillar lower trim. (Refer above.)
3. Remove the rear side trim. (Refer to page S–65.)
4. Remove the front seat belt upper anchor (page S–71) and the rear No.1 seat belt upper anchor (page S–73).
5. Pull the B-pillar upper trim to disengage clips Ⓐ and pins Ⓑ from the body.
6. Install in the reverse order of removal.



D-PILLAR TRIM

Removal / Installation

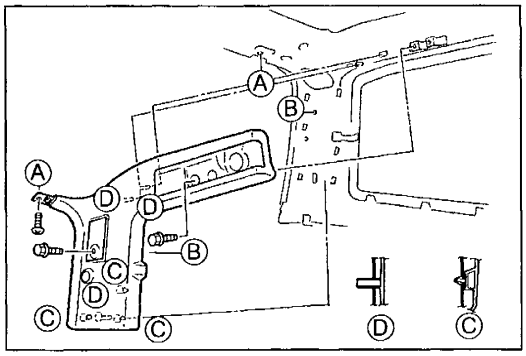
1. To remove the left side D-pilalr trim, disconnect the negative battery cable.
2. Remove the rear header trim. (Refer to page S–64.)
3. Remove the rear side trim. (Refer to page S–65.)
4. Remove the mat set end plate. (Refer to page S–66.)
5. Remove the installation bolts (left side only).
6. Remove the installation fasteners.
7. Pull the D-pillar trim to disengage clips Ⓐ from the body.
8. Install in the reverse order of removal.



REAR COOLER TRIM

Removal / Installation

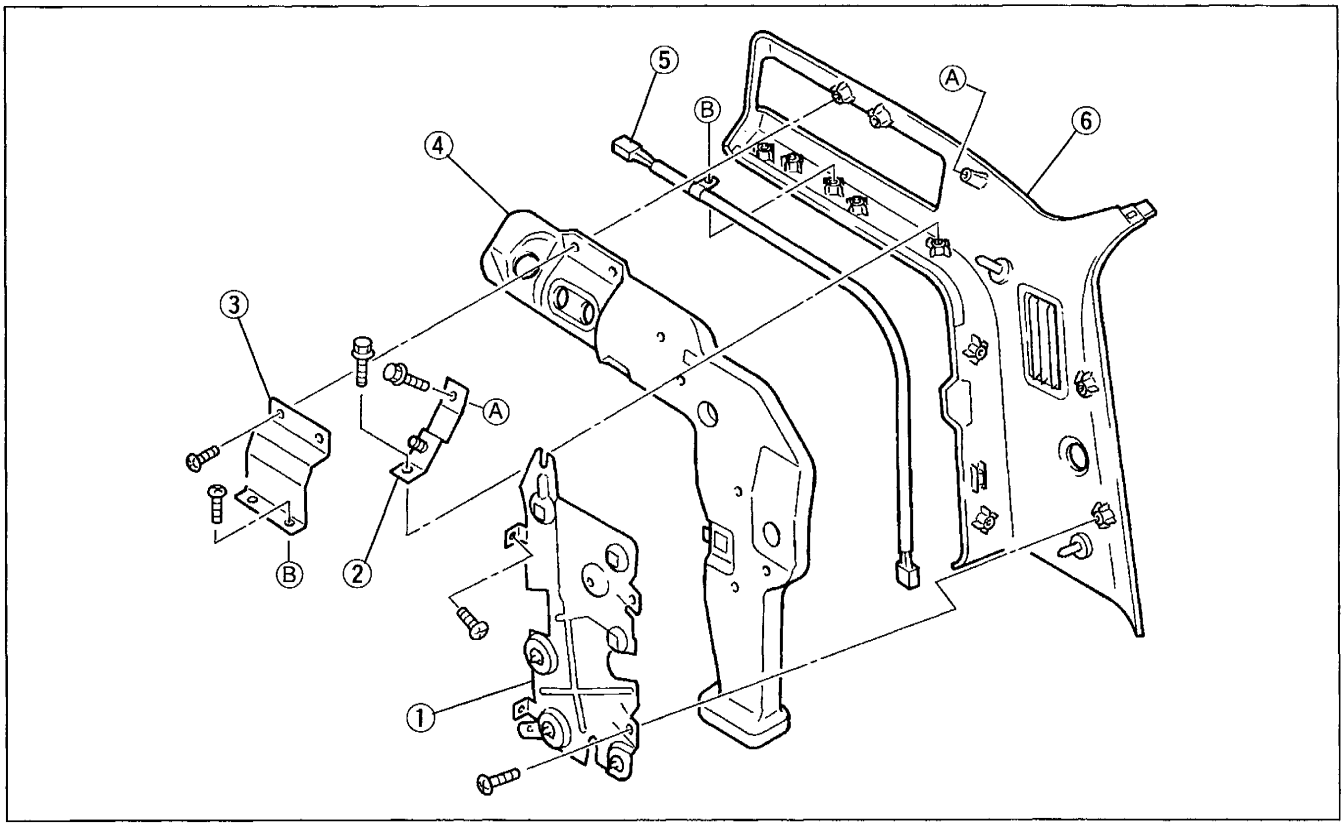
1. Disconnect the negative battery cable.
2. Remove the rear header trim. (Refer to page S–64.)
3. Remove the rear side trim. (Refer to page S–65.)
4. Remove the mat set end plate. (Refer to page S–66.)
5. Remove the rear heater control unit. (Refer to section U.)
6. Remove the rear cooler grille by using a flathead screw-driver wrapped in tape.



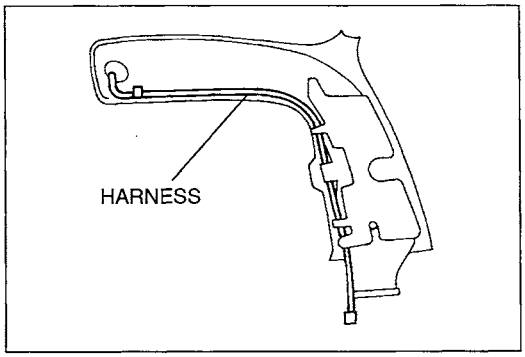
7. Remove the screws and bolts.
8. Pull the rear cooler trim to disengage clips Ⓒ and pins Ⓓ.
9. Install in the reverse order of removal.

Disassembly / Assembly

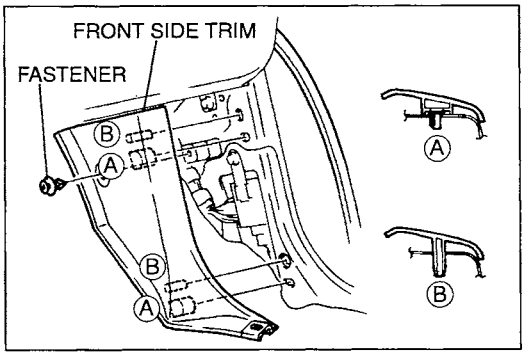
1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



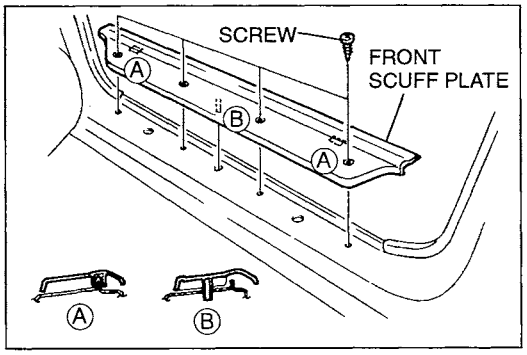
1. Bracket No.1
2. Bracket No.2
3. Bracket No.3
4. Rear cooler duct
5. Harness
   Assembly note ..... page S–63
6. Rear cooler trim



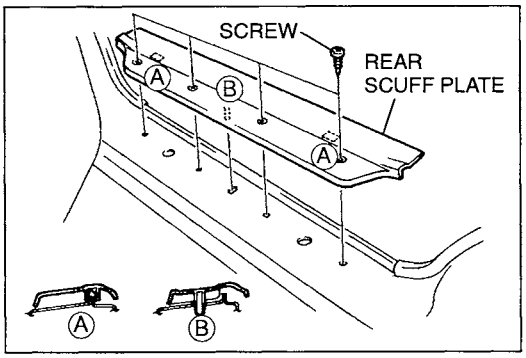
Assembly note
Harness
Assemble the harness as shown.



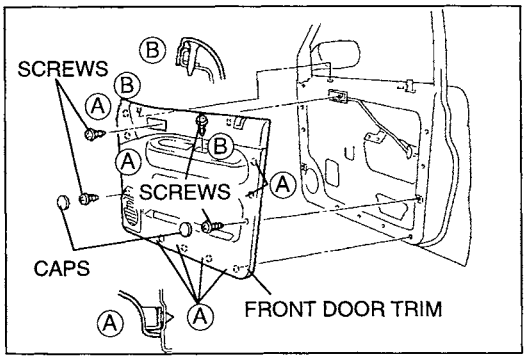
FRONT SIDE TRIM
Removal / Installation
1. Remove the fastener.
2. Pull the front side trim to disengage clips Ⓐ and pins Ⓑ from the body.
3. Install in the reverse order of removal.



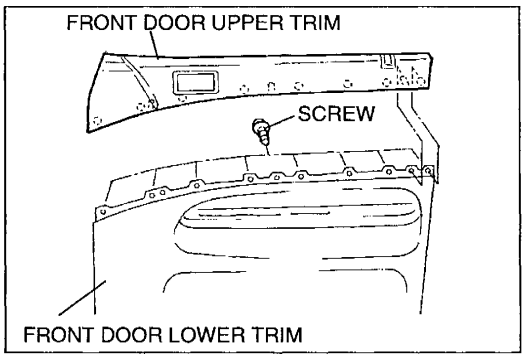
FRONT SCUFF PLATE
Removal / Installation
1. Remove the screws.
2. Pull the front scuff plate to disengage clips Ⓐ and pin Ⓑ from the body.
3. Install in the reverse order of removal.



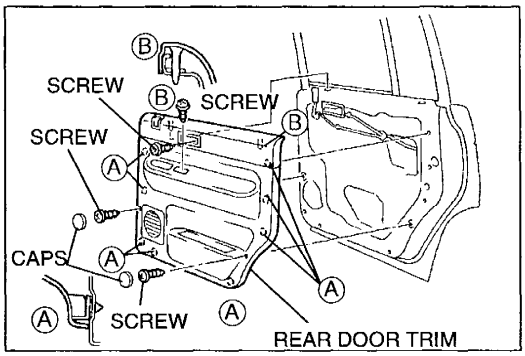
REAR SCUFF PLATE
Removal / Installation
1. Remove the screws.
2. Pull the rear scuff plate to disengage clips Ⓐ and pin Ⓑ from the body.
3. Install in the reverse order of removal.



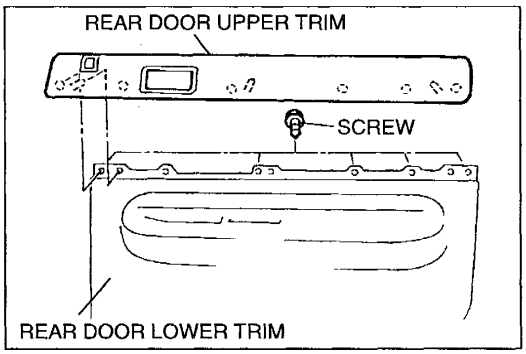
FRONT DOOR TRIM
Removal / Installation
1. Disconnect the negative battery cable.
2. Remove the switch panel. (Refer to page S–13.)
3. Remove the caps.
4. Remove the screws.
5. Pull the front door trim to disengage the clips Ⓐ from the body.
6. Lift the front door trim to disengage the pins Ⓑ from the body.
7. Disconnect the harness connectors.
8. Install in the reverse order of removal.



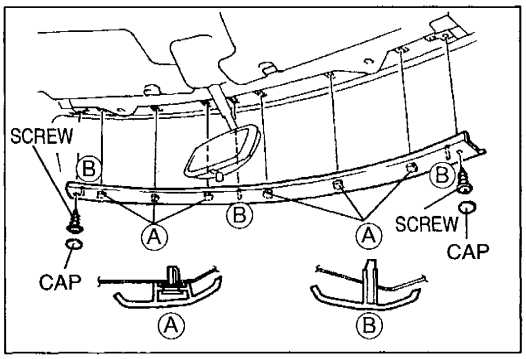
Disassembly / Assembly
1. Remove the screws.
2. Remove the front door upper trim.
3. Assemble in the reverse order of disassembly.



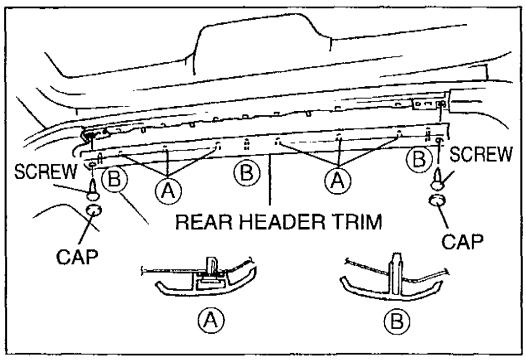
REAR DOOR TRIM
Removal / Installation
1. Disconnect the negative battery cable.
2. Remove the switch panel. (Refer to page S–14.)
3. Remove the caps.
4. Remove the screws.
5. Pull the rear door trim to disengage clips Ⓐ from the body.
6. Lift the rear door trim to disengage pins Ⓑ from the body.
7. Install in the reverse order of removal.



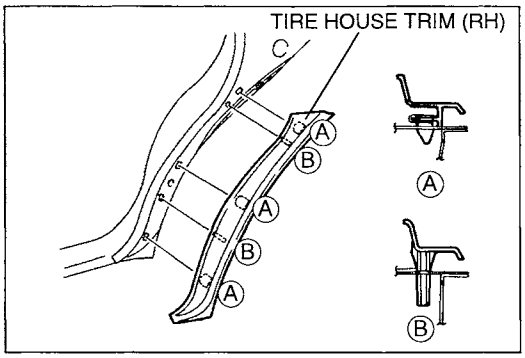
Disassembly / Assembly
1. Remove the screws.
2. Remove the rear door upper trim.
3. Assemble in the reverse order of removal.



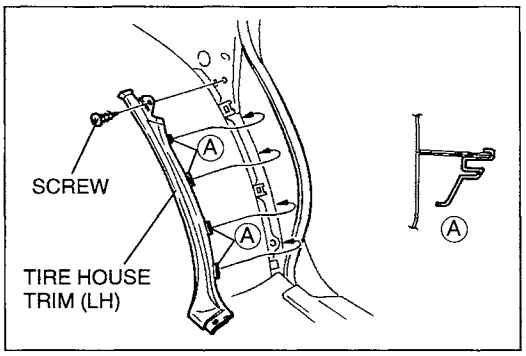
FRONT HEADER TRIM
Removal / Installation
1. Remove the caps.
2. Remove the screws.
3. Pull the front header trim to disengage clips Ⓐ and pins Ⓑ from the body.
4. Install in the reverse order of removal.



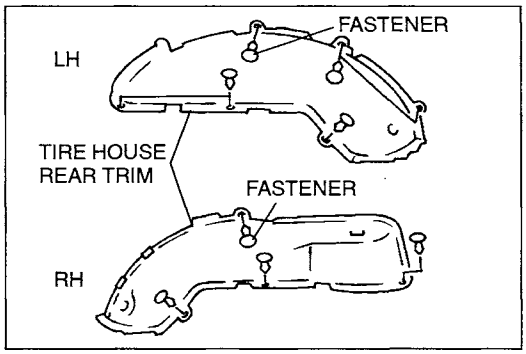
REAR HEADER TRIM
Removal / Installation
1. Remove the caps.
2. Remove the screws.
3. Pull the rear header trim to disengage clips Ⓐ and pins Ⓑ from the body.
4. Install in the reverse order of removal.



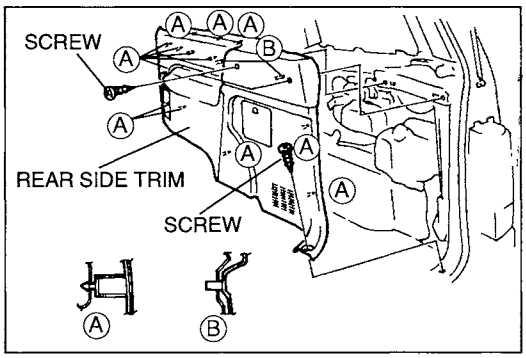
TIRE HOUSE TRIM (RH)
Removal / Installation
1. Remove the rear scuff plate. (Refer to page S–63.)
2. Pull the tire house trim to disengage clips Ⓐ and pins Ⓑ from the body.
3. Install in the reverse order of removal.



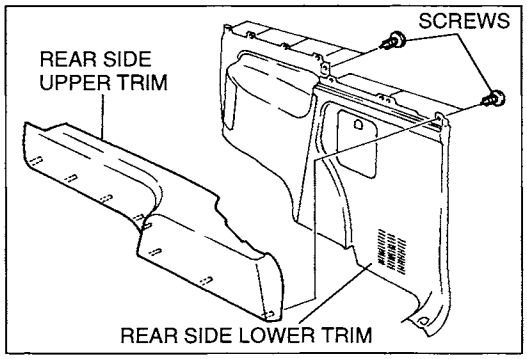
TIRE HOUSE TRIM (LH)
Removal / Installation
1. Remove the rear scuff plate. (Refer to page S–63.)
2. Remove the rear side trim. (Refer below.)
3. Remove the screws.
4. Remove the tire house trim.
5. Install in the reverse order of removal.



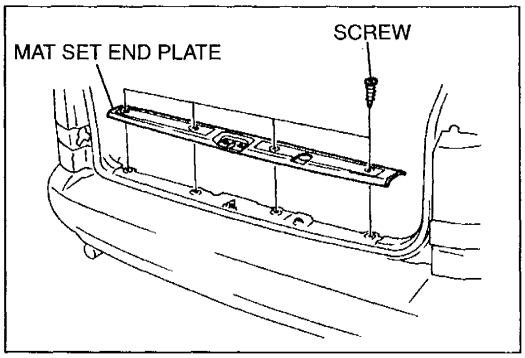
TIRE HOUSE REAR TRIM
Removal / Installation
1. Remove the rear side trim. (Refer below.)
2. Remove the tire house trim. (Refer above.)
3. Remove the fasteners.
4. Remove the tire house rear trim.
5. Install in the reverse order of removal.



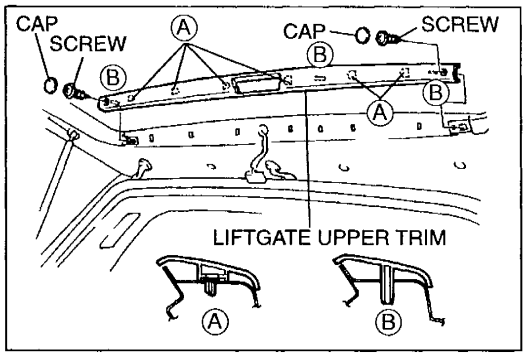
REAR SIDE TRIM
Removal / Installation
1. Remove the mat set end plate. (Refer to page S–66.)
2. Remove the screws.
3. Pull the rear side trim to disengage clips Ⓐ and pins Ⓑ from the body.
4. Install in the reverse order of removal.



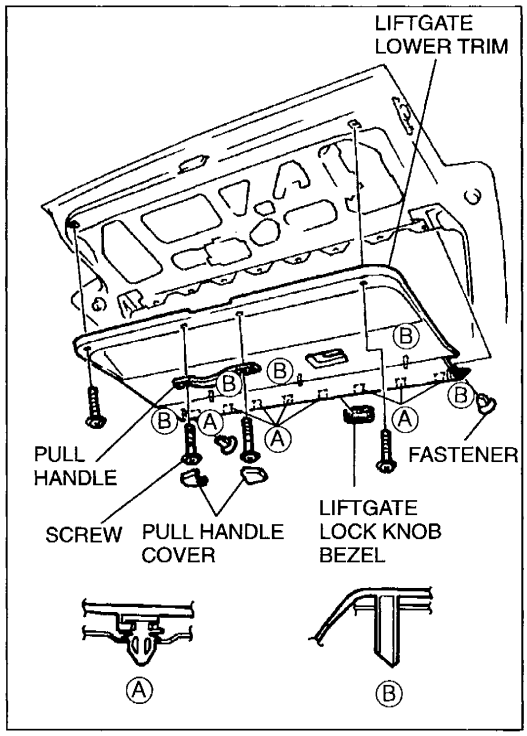
Disassembly / Assembly
1. Remove the screws to disassemble the rear side trim.
2. Assemble in the reverse order of disassembly.



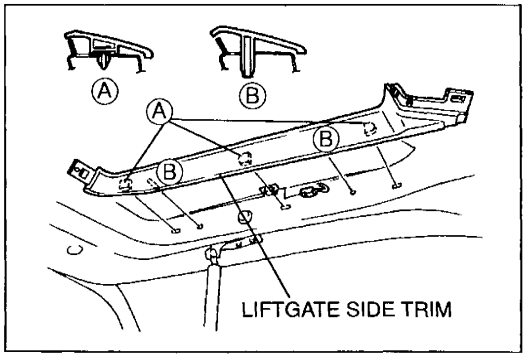
MAT SET END PLATE
Removal / Installation
1. Remove the screws.
2. Remove the mat set end plate.
3. Install in the reverse order of removal.



LIFTGATE UPPER TRIM
Removal / Installation
1. Disconnect the negative battery cable.
2. Remove the high-mount brake light. (Refer to section T.)
3. Remove the caps.
4. Remove the screws.
5. Pull the liftgate upper trim to disengage clips Ⓐ and pins Ⓑ from the body.
6. Install in the reverse order of removal.



LIFTGATE LOWER TRIM
Removal / Installation
1. Disconnect the negative battery cable.
2. Remove the cargo compartment light.
3. Remove the fasteners.
4. Remove the liftgate lock knob bezel.
5. Remove the pull handle cover.
6. Remove the screws.
7. Remove the pull handle.
8. Pull the liftgate to disengage clips Ⓐ and pins Ⓑ from the body.
9. Install in the reverse order of removal.



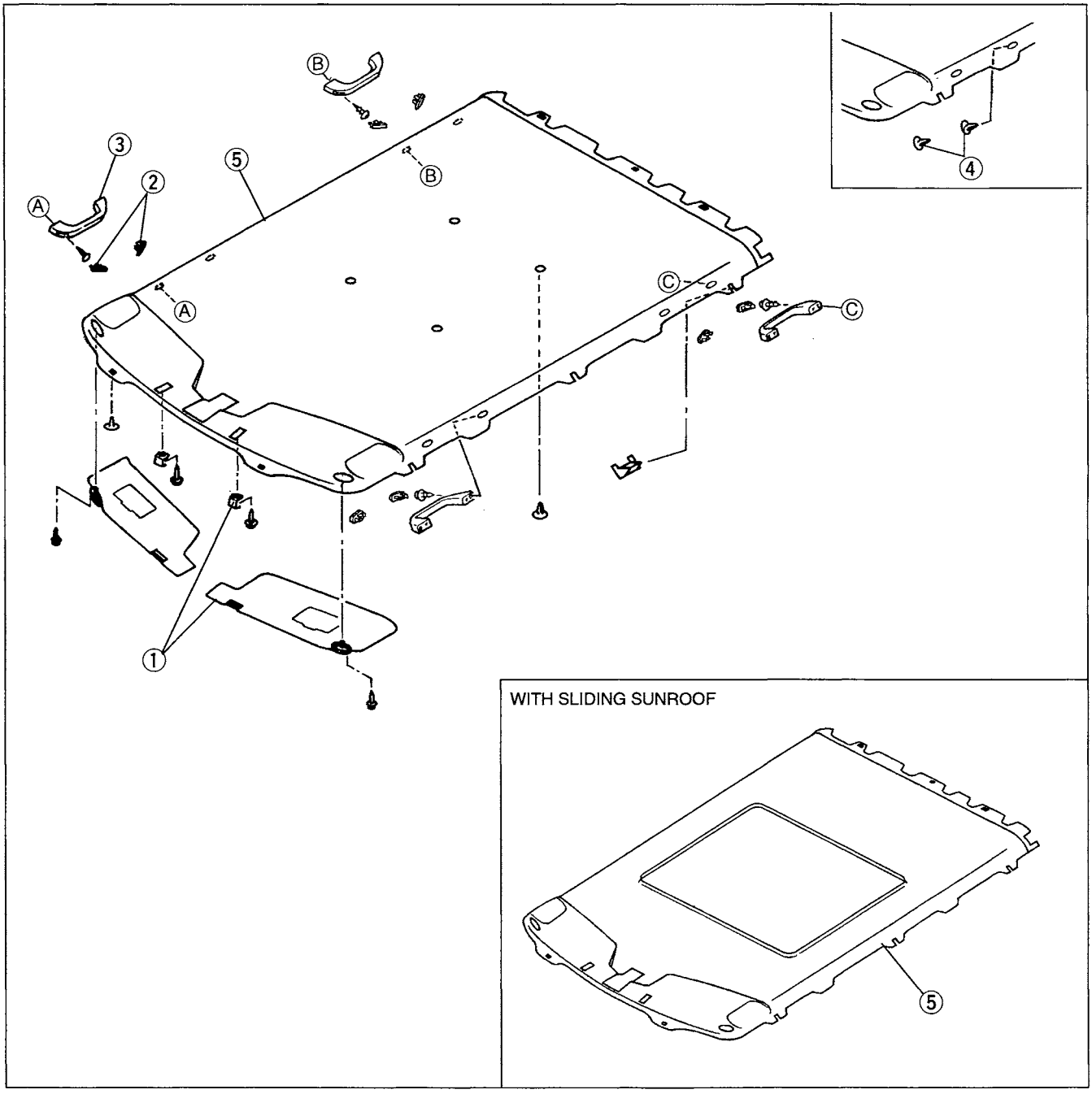
LIFTGATE SIDE TRIM
Removal / Installation
1. Remove the liftgate upper trim. (Refer above.)
2. Remove the lieftgate lower trim. (Refer above.)
3. Pull the liftgate to disengage clips Ⓐ and pins Ⓑ from the body.
4. Install in the reverse order of removal.

HEADLINER

FRONT HEADLINER

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the rear headliner. (Refer to page S–68.)
3. Remove the A-pillar trim. (Refer to page S–61.)
4. Remove the rearview mirror. (Refer to page S–36.)
5. Remove the interior light. (Refer to section T.)
6. Remove the overhead console, if equipped. (Refer to section T.)
7. Remove in the order shown in the figure.
8. Install in the reverse order of removal.

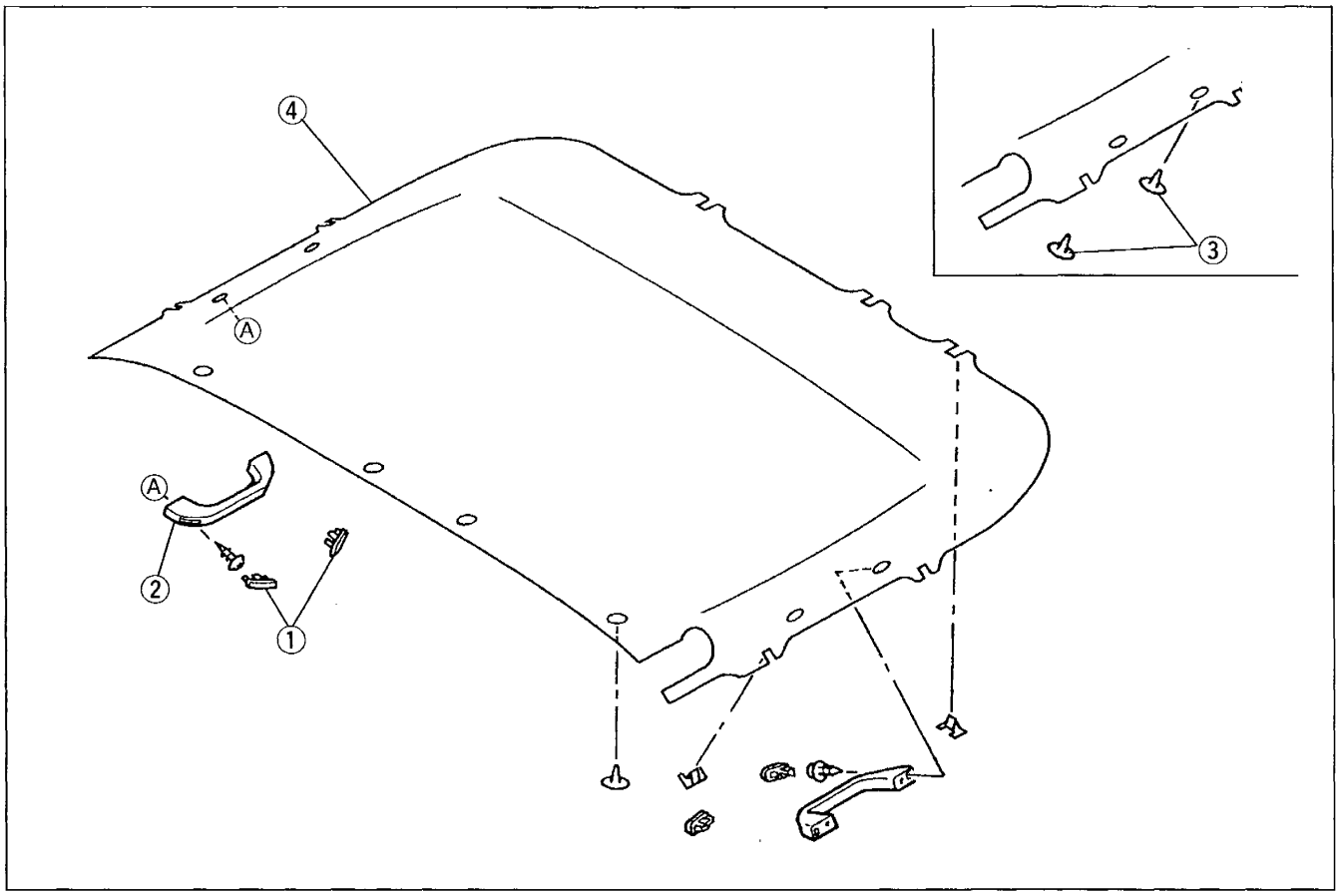


1. Sunvisor and adapter
2. Assist handle cover
3. Assist handle
4. Hole cover (without front side assist handle)
5. Front headliner
   Removal note ..... page S–68

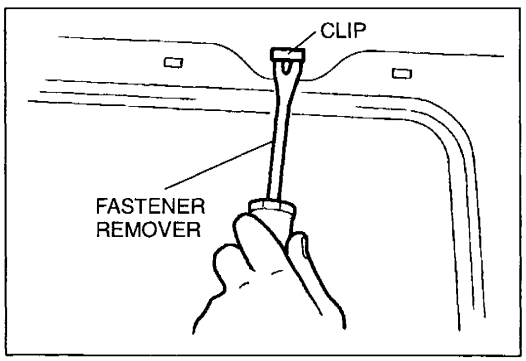
REAR HEADLINER

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the interior light. (Refer to section T.)
3. Remove the B-pillar upper trim. (Refer to page S–61.)
4. Remove the rear header trim. (Refer to page S–64.)
5. Remove in the order shown in the figure.
6. Install in the reverse order of removal.



1. Assist handle cover
2. Assist handle
3. Hole cover (Without assist handle)
4. Rear headliner
   Removal note ..... below



Removal note

Front headliner, rear headliner

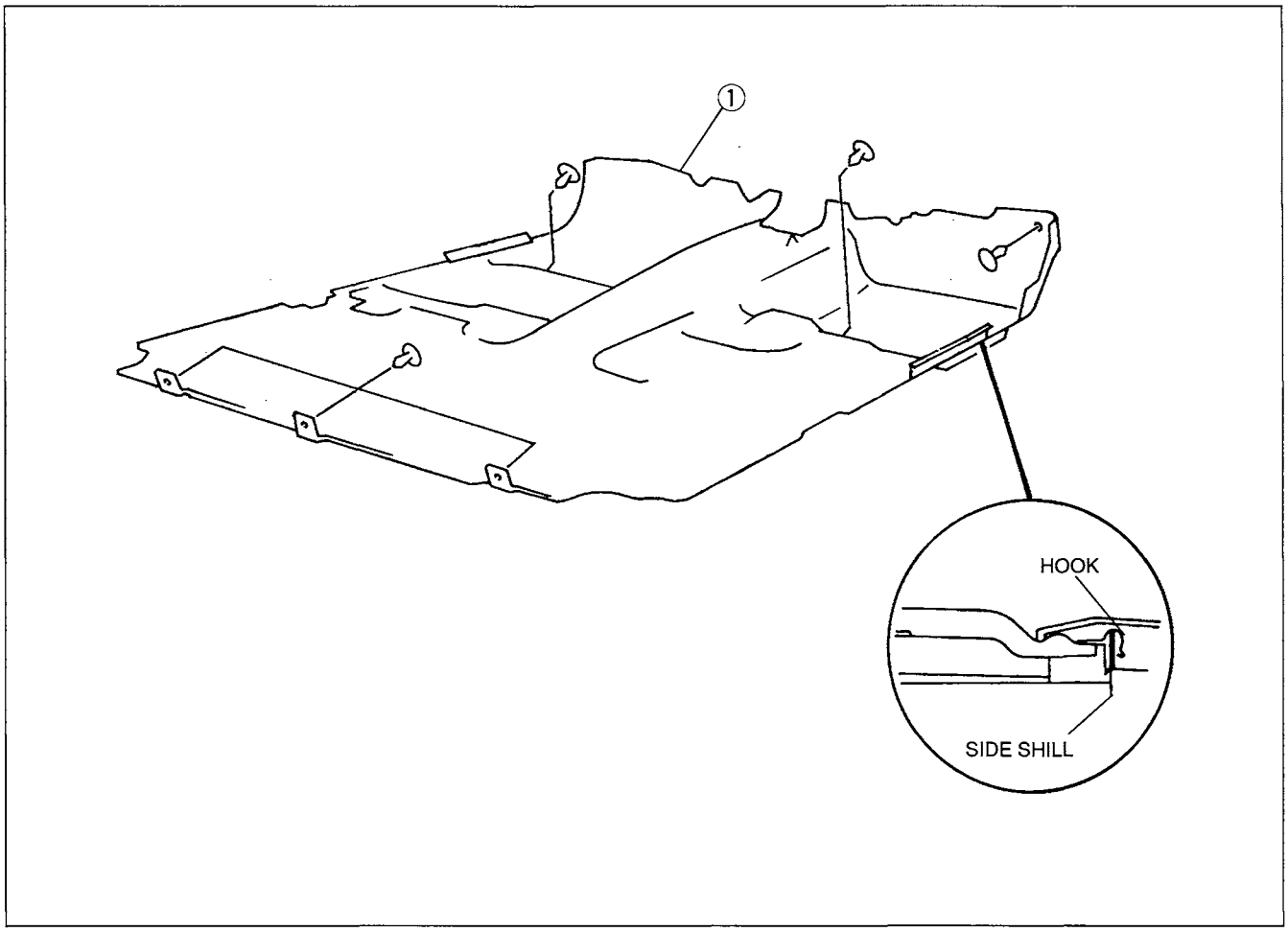
Remove the clips by using the fastener remover.

FLOOR COVERING

FRONT CABIN CARPET

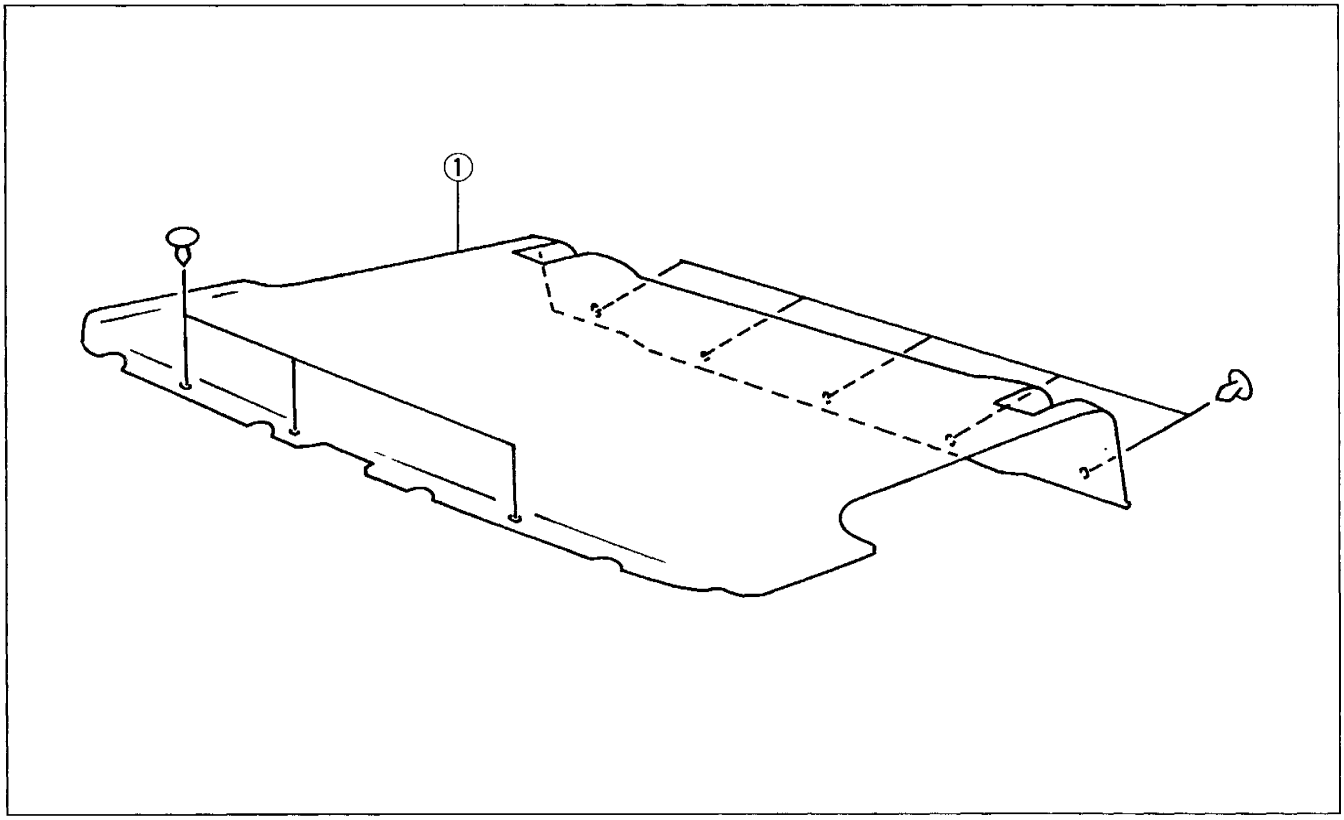
Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the following parts.
   a) Parking brake lever (Refer to section P.)
   b) Fuel-filler lid opener (Refer to page S–28.)
   c) Front seat (Refer to page S–77.)
   d) Rear seat No.1 (Refer to page S–78.)
   e) Dashboard center lower panel (Refer to page S–60.)
   f) Front side trim (Refer to page S–63.)
   g) Front scuff plate (Refer to page S–63.)
   h) Rear scuff plate (Refer to page S–63.)
   i) B-pillar lower trim (Refer to page S–61.)
   j) Rear No.1 seat belt lower anchor (Refer to page S–73.)
3. Remove as shown in the figure.
4. Install in the reverse order of removal.



1. Front cabin carpet

REAR CABIN CARPET
Removal / Installation
1. Remove the following parts.
   a) Rear side trim (Refer to page S–65.)
   b) Mat end set plate (Refer to page S–66.)
   c) Rear seat No.2 (Refer to page S–79.)
   d) Rear No.2 seat belt lower anchor (Refer to page S–75.)
2. Remove as shown in the figure.
3. Install in the reverse order of removal.



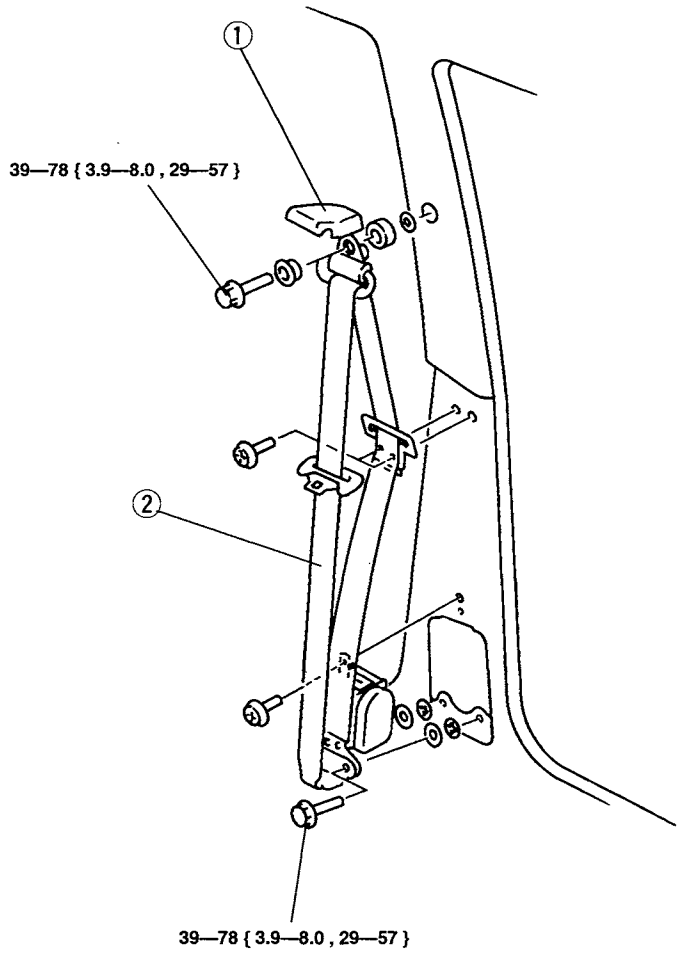
1. Rear cabin carpet

SEAT BELT

FRONT SEAT BELT
Removal / Installation

Caution
- **The ELR (emergency locking retractor) has a spring that will unwind if the retractor's cover is removed. The spring cannot be rewound by hand. If this occurs, the ELR will not work properly. Therefore, do not disassemble the retractor.**

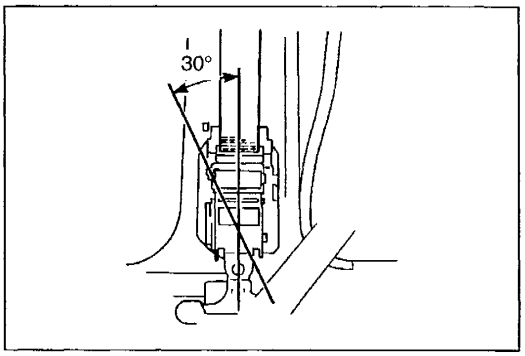
1. Remove the B-pillar lower trim. (Refer to page S–61.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



N·m { kgf·m , ft·lbf }

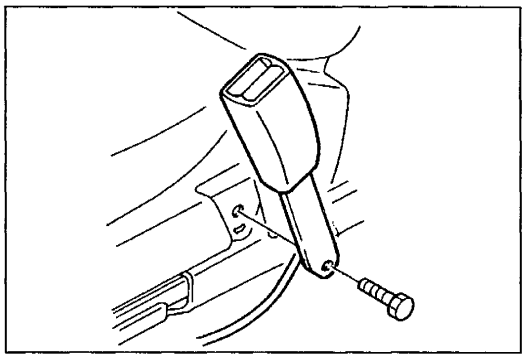
1. Anchor cover
2. Front seat belt
   Inspection ..... page S–72

Inspection
Front seat belt
1. Inspect the webbing for scars, tears, and wear.
2. Inspect the fittings for deformation and damage.
3. If a problem is found, replace the front seat belt.



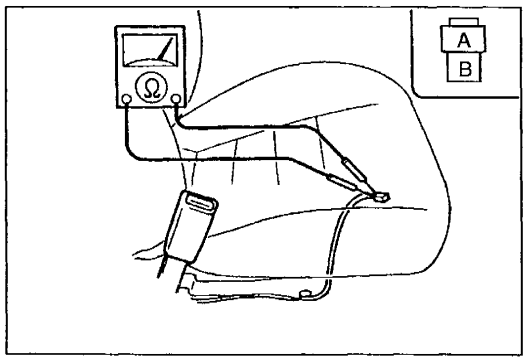
ELR (emergency locking retractor)
1. Verify that the belt can be pulled out smoothly, and that it moves smoothly when worn.
2. Verify that the retractor locks when the belt is quickly pulled.
3. Remove the retractor. (Refer to page S–71.)
4. Hold the retractor as it would be installed.
5. Slowly incline the retractor while pulling out the belt.
6. Verify that the retractor locks at approximately **30°** inclination.
7. If not as specified, replace the front seat belt.

ALR (Automatic locking retractor)
1. Pull the seat belt all the way out, insert the tongue into the buckle, and verify that the retractor locks after the slack is taken up.
2. Unfasten the tongue from the buckle and let the seat belt retract.
3. Verify that the belt can be pulled out smoothly and that it moves smoothly when worn.
4. Verify that the retractor locks when the belt is quickly pulled.



FRONT BUCKLE
Removal / Installation
1. Disconnect the negative battery cable.
2. Disconnect the driver's buckle switch connector.
3. Remove the front buckle installation bolt.
4. Install in the reverse order of removal.

Tightening torque:
39—78 N·m { 3.9—8.0 kgf·m , 29—57 ft·lbf }



Inspection
1. Disconnect the buckle switch connector.
2. Check for continuity between the connector terminals.

O—O: Continuity

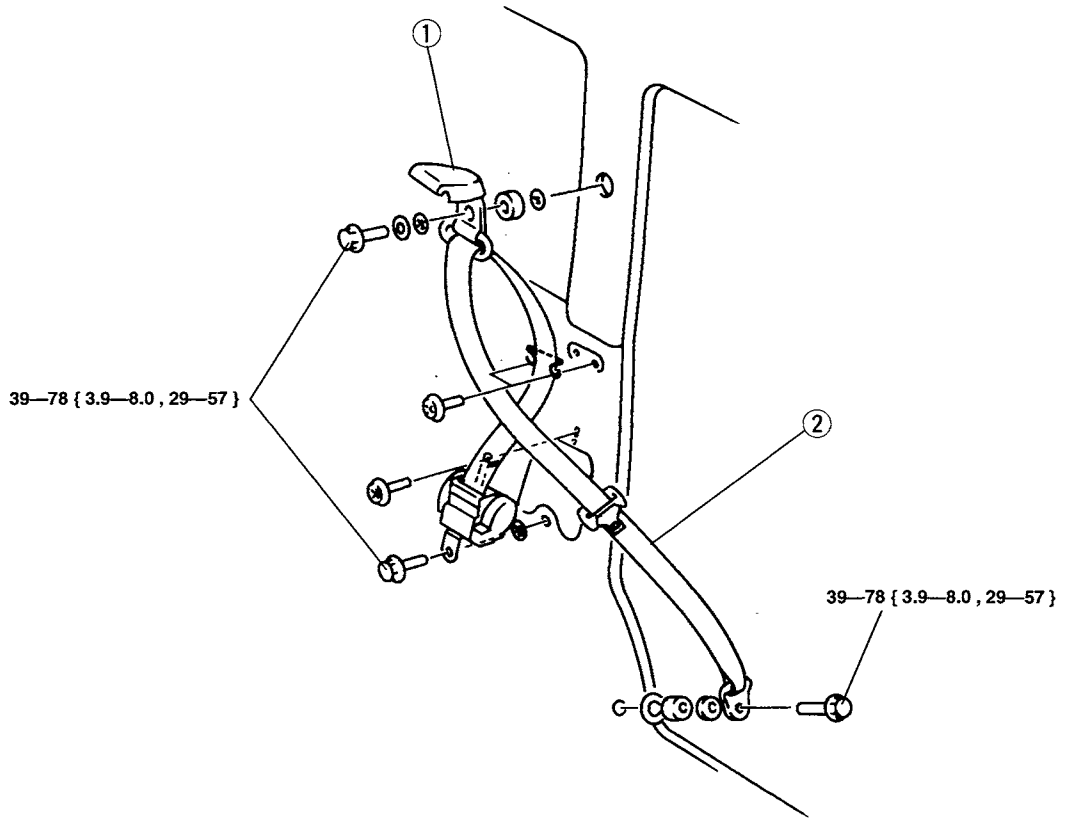
Terminal / Seat belt	Driver A	Driver B
Buckled		
Unbuckled	O	O

3. If not as specified, replace the front buckle.

REAR No.1 SEAT BELT
Removal / Installation

Caution
- **The ELR (emergency locking retractor) has a spring that will unwind if the retractor's cover is removed. The spring cannot be rewound by hand. If this occurs, the ELR will not work properly. Therefore, do not disassemble the retractor.**

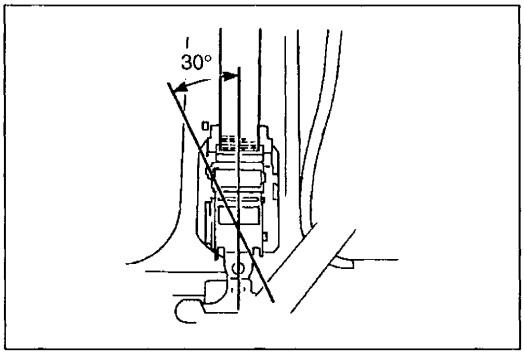
1. Remove the rear side trim. (Refer to page S–65.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



N·m { kgf·m , ft·lbf }

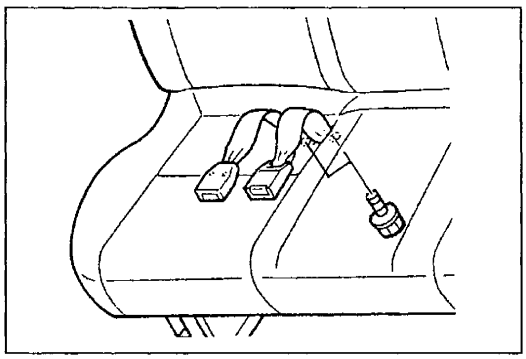
1. Anchor cover
2. Rear No.1 seat belt
   Inspection ..... page S–74

Inspection
Rear No.1 seat belt
1. Inspect the webbing for scars, tears, and wear.
2. Inspect the fittings for deformation or damage.
3. If a problem is found, replace the rear No.1 seat belt.



ELR (emergency locking retractor)
1. Verify that the belt can be pulled out smoothly, and that it moves smoothly when worn.
2. Verify that the retractor locks when the belt is quickly pulled.
3. Remove the retractor. (Refer to page S–73.)
4. Hold the retractor as it would be installed.
5. Slowly incline the retractor while pulling out the belt.
6. Verify that the retractor locks at approximately **30°** inclination.
7. If not as specified, replace the front seat belt.

ALR (Automatic locking retractor)
1. Pull the seat belt all the way out, insert the tongue into the buckle, and verify that the retractor locks after the slack is taken up.
2. Unfasten the tongue from the buckle and let the seat belt retract.
3. Verify that the belt can be pulled out smoothly and that it moves smoothly when worn.
4. Verify that the retractor locks when the belt is quickly pulled.



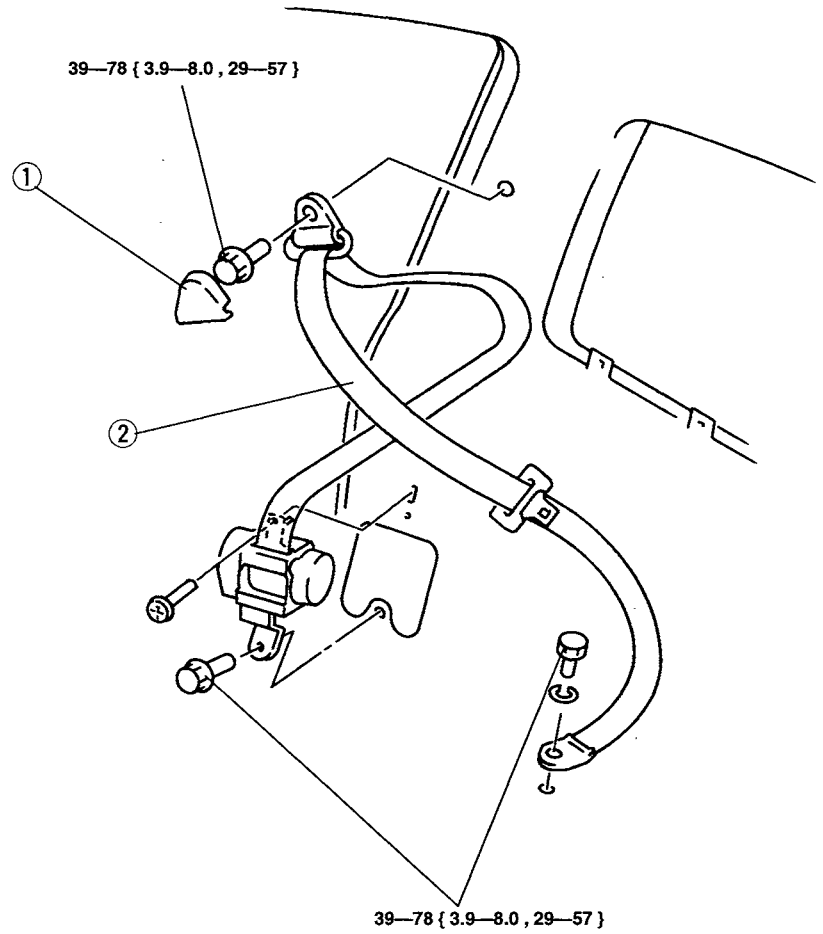
REAR No.1 BUCKLE
Removal / Installation
1. Remove the rear No.1 buckle installation bolt.
2. Install in the reverse order of removal.

Tightening torque:
39—78 N·m { 3.9—8.0 kgf·m , 29—57 ft·lbf }

REAR No.2 SEAT BELT
Removal / Installation

Caution
- **The ELR (emergency locking retractor) has a spring that will unwind if the retractor's cover is removed. The spring cannot be rewound by hand. If this occurs, the ELR will not work properly. Therefore, do not disassemble the retractor.**

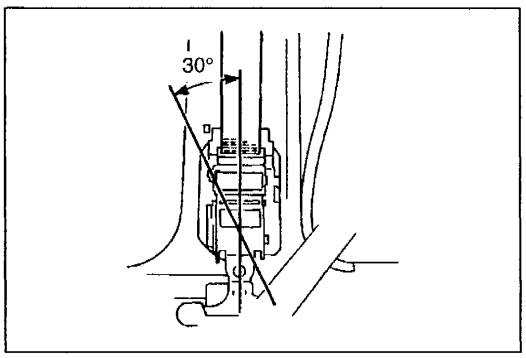
1. Remove the rear side trim. (Refer to page S–65.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



N·m { kgf·m , ft·lbf }

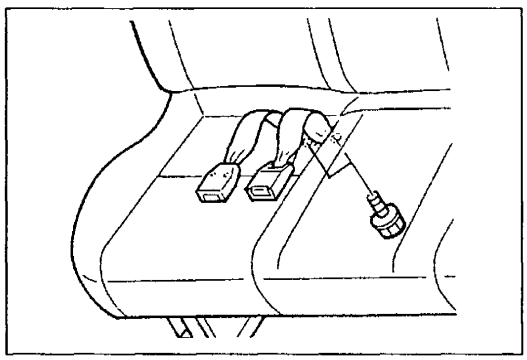
1. Anchor cover
2. Rear No.2 seat belt
   Inspection ..... page S–76

Inspection
Rear No.2 seat belt
1. Inspect the webbing for scars, tears, and wear.
2. Inspect the fittings for deformation and damage.
3. If a problem is found, replace the rear No.2 seat belt.



ELR (emergency locking retractor)
1. Verify that the belt can be pulled out smoothly, and that it moves smoothly when worn.
2. Verify that the retractor locks when the belt is quickly pulled.
3. Remove the retractor. (Refer to page S–75.)
4. Hold the retractor as it would be installed.
5. Slowly incline the retractor while pulling out the belt.
6. Verify that the retractor locks at approximately **30°** inclination.
7. If not as specified, replace the front seat belt.

ALR (Automatic locking retractor)
1. Pull the seat belt all the way out, insert the tongue into the buckle, and verify that the retractor locks after the slack is taken up.
2. Unfasten the tongue from the buckle and let the seat belt retract.
3. Verify that the belt can be pulled out smoothly and that it moves smoothly when being worn.
4. Verify that the retractor locks when the belt is quickly pulled.



REAR No.2 BUCKLE
Removal / Installation
1. Remove the rear No.2 buckle installation bolt.
2. Install in the reverse order of removal.

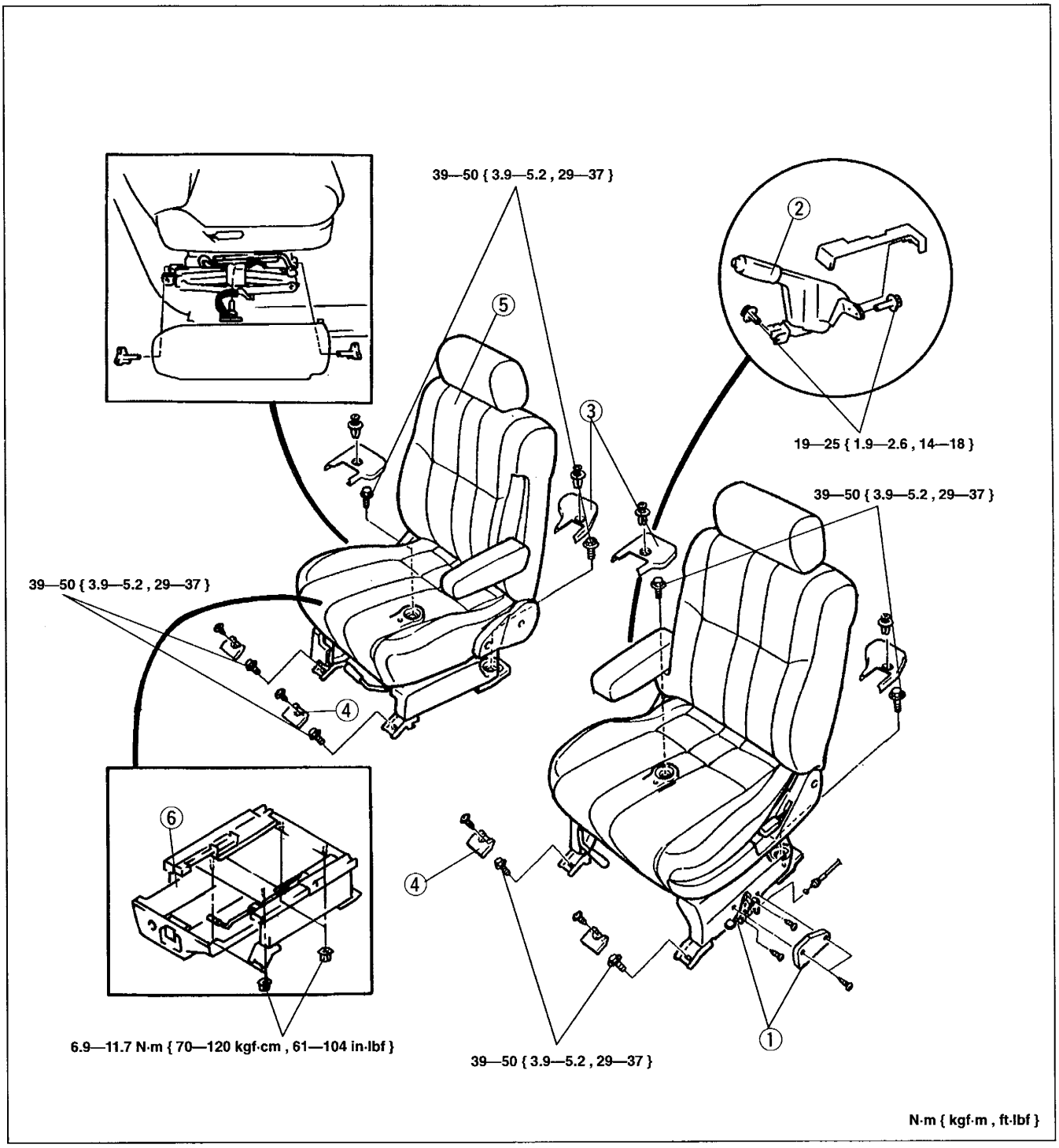
Tightening torque:
39—78 N·m { 3.9—8.0 kgf·m , 29—57 ft·lbf }

SEAT

FRONT SEAT

Removal / Installation

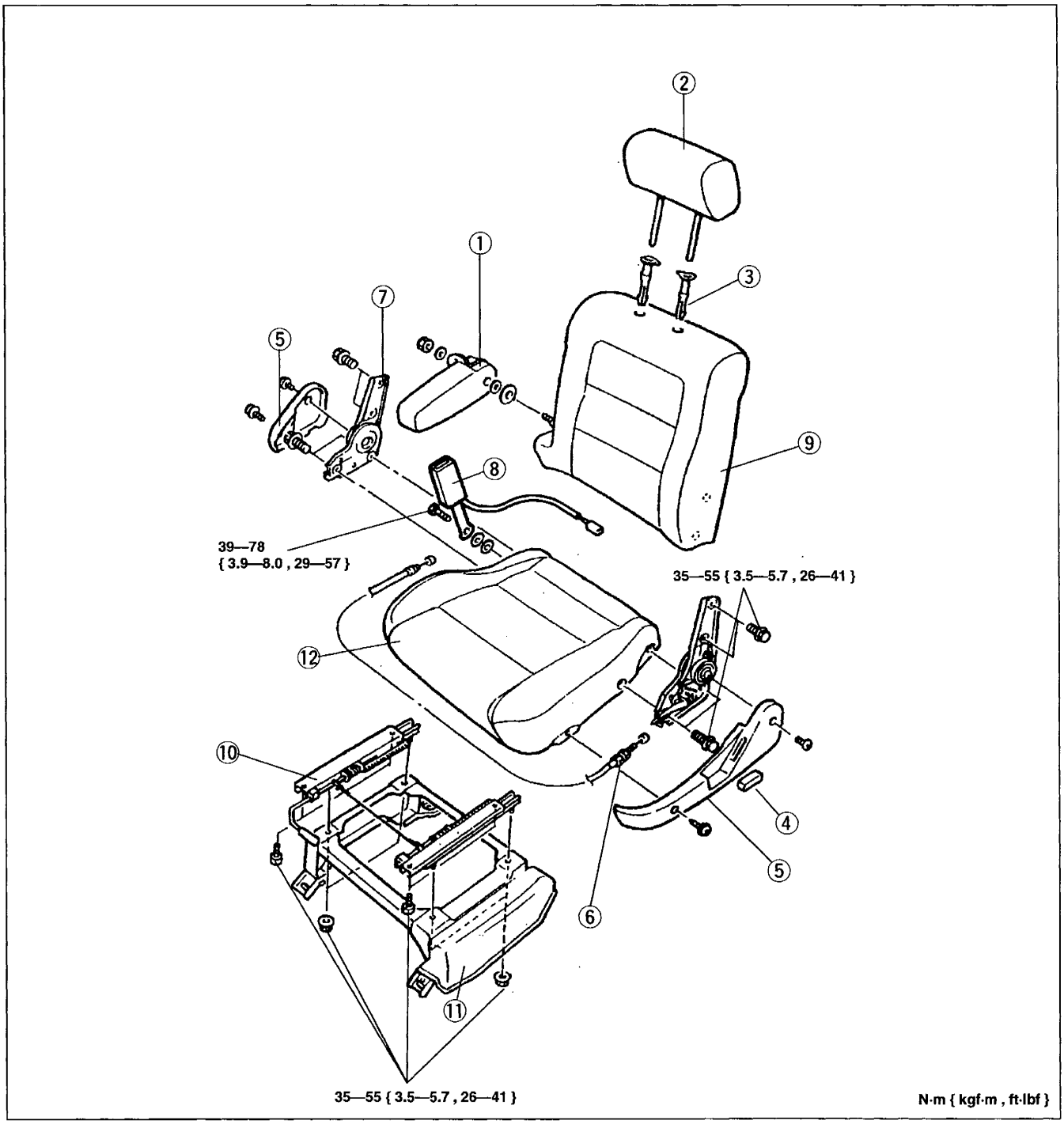
1. Disconnect the negative battery cable.
2. Disconnect the driver's buckle switch connector.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.



1. Fuel-filler lid opener
2. Parking brake lever
3. Seat set bracket cover
4. Leg cover
5. Front seat
   Disassembly / Assembly ..... page S–78
6. Seat under tray

Disassembly / Assembly

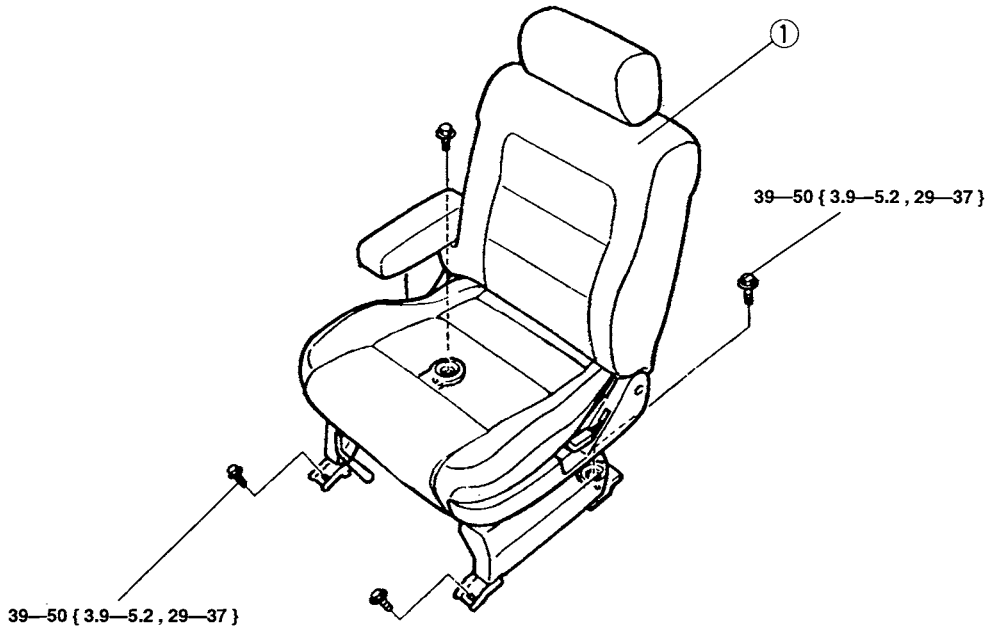
1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



1. Armrest
2. Headrest
3. Headrest guide
4. Knob
5. Side cover
6. Knuckle cable
7. Recliner knuckle
   Disassembly note ..... page S–84
8. Buckle
9. Seat back
10. Slide adjuster
11. Seat set bracket
12. Seat cushion

REAR SEAT No.1
Removal / Installation
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.

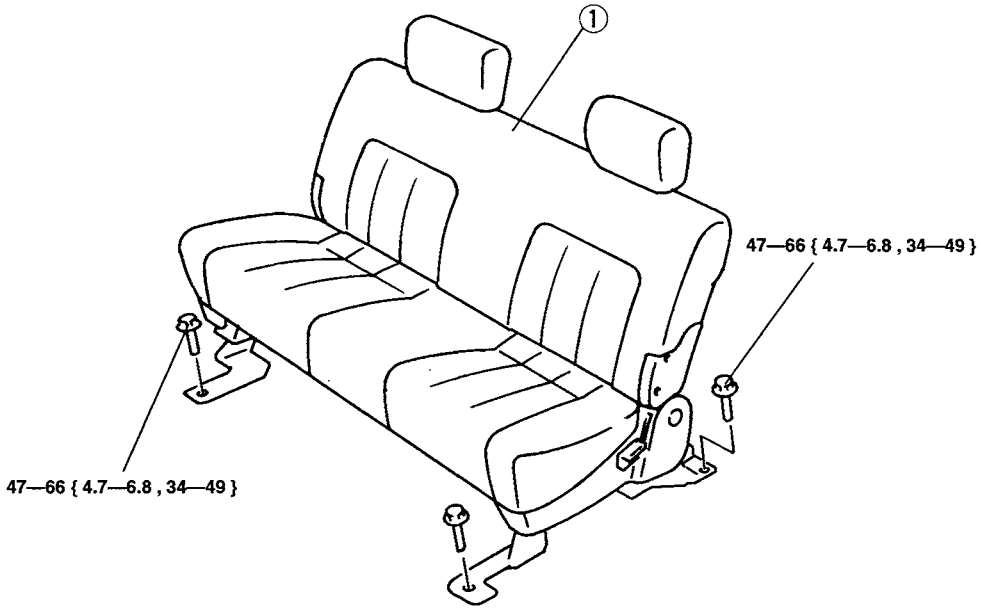
(7-PASSENGER MODEL)



N·m { kgf·m , ft·lbf }

1. Rear seat No.1
   Disassembly / Assembly ..... page S–80

(8-PASSENGER MODEL)



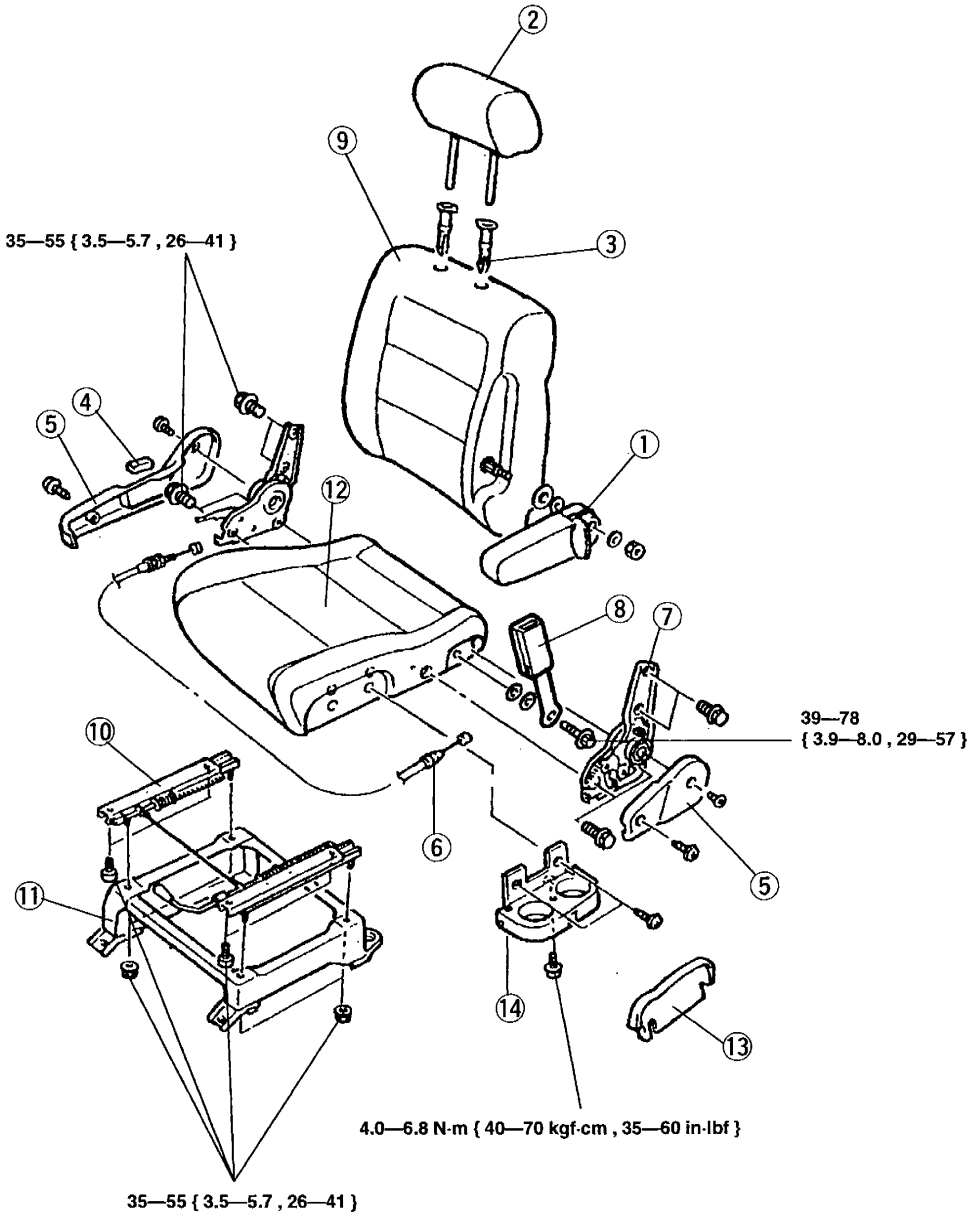
N·m { kgf·m , ft·lbf }

1. Rear seat No.1
   Disassembly / Assembly ..... page S–81

Disassembly / Assembly

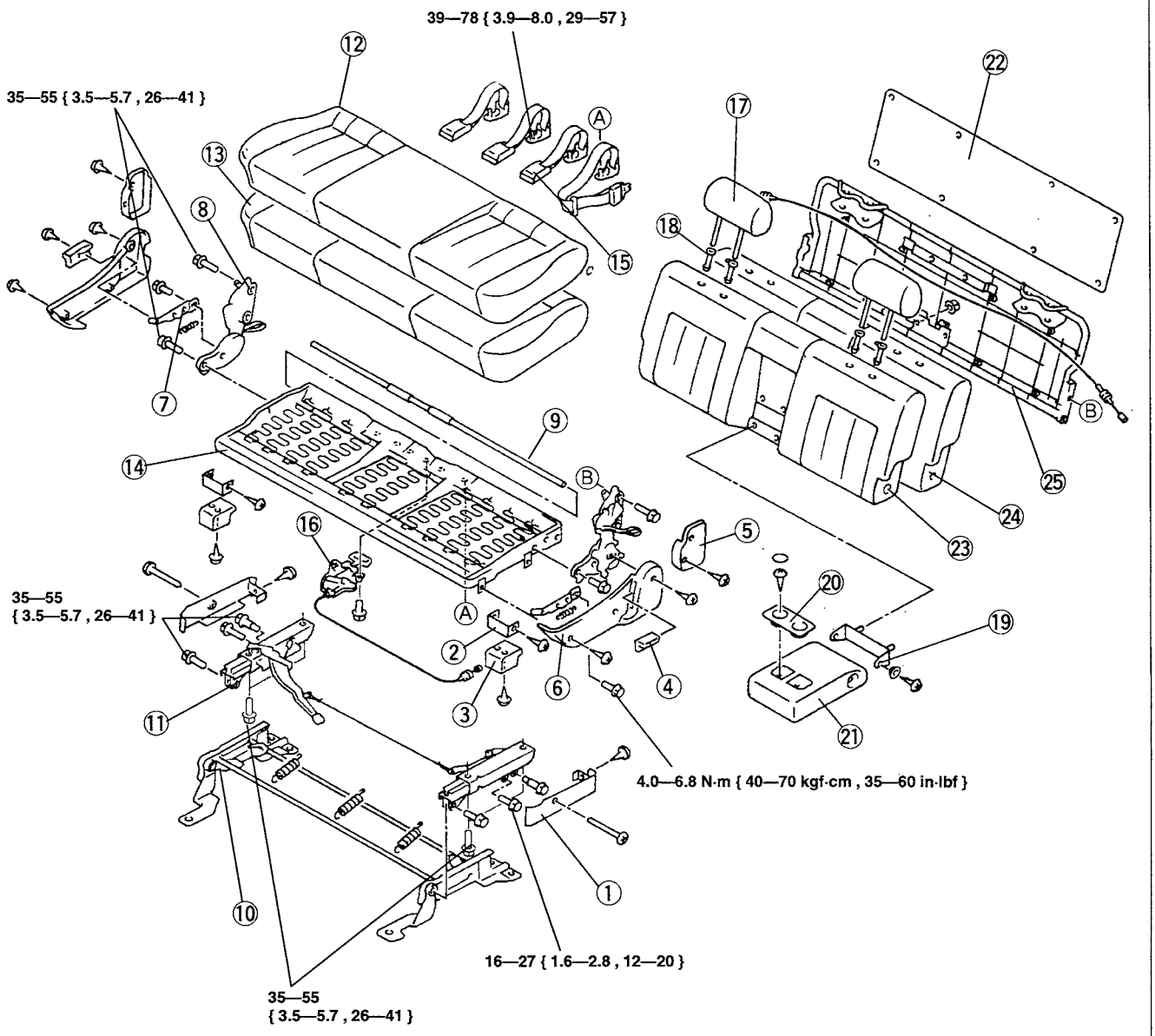
1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.

(7-PASSENGER MODEL)



1. Armrest
2. Headrest
3. Headrest guide
4. Knob
5. Side cover
6. Knuckle cable
7. Recliner knuckle
   Disassembly note ..... page S–84
8. Buckle
9. Seat back
10. Slide adjuster
11. Seat set bracket
12. Seat cushion
13. Cup stand cover (Rear seat No.1 RH)
14. Cup stand (Rear seat No.1 RH)

(8-PASSENGER MODEL)



Rear seat cushion

1. Lower side cover
2. Slide protector No.1
3. Slide protector No.2
4. Knob
5. Side cover No.1
6. Side cover No.2
7. Knuckle lever
8. Recliner knuckle
9. Connecting rod
10. Seat set bracket
11. Slide adjuster
12. Seat cushion trim
13. Seat cushion pad
14. Seat cushion frame
15. Rear No.1 buckle
16. Walk in lever

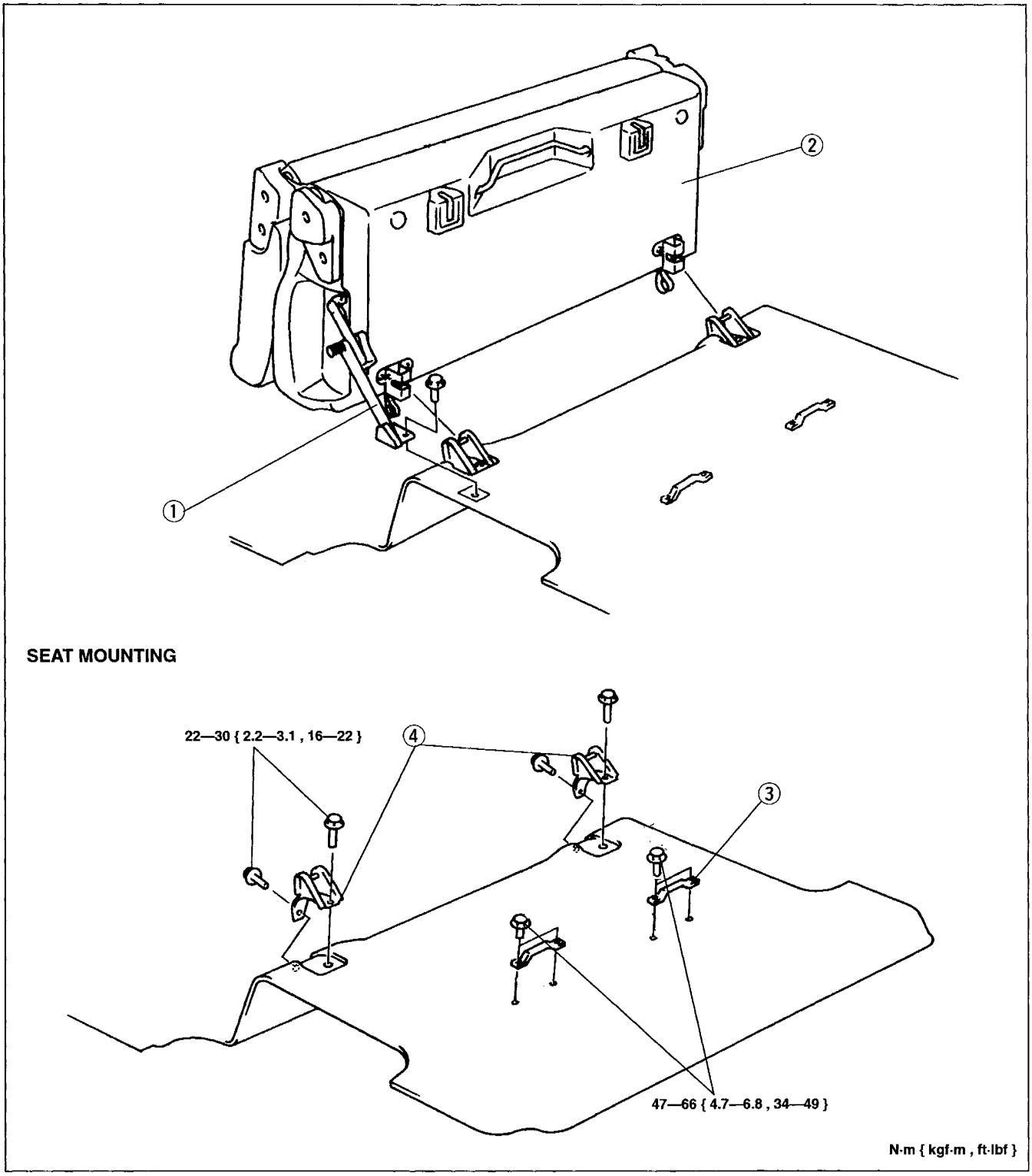
Rear seat back

17. Headrest
18. Headrest guide
19. Armrest bracket
20. Cup stand
21. Armrest
22. Seat back board
23. Seat back trim
24. Seat back pad
25. Seat back frame

REAR SEAT No.2

Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



Rear seat No.2

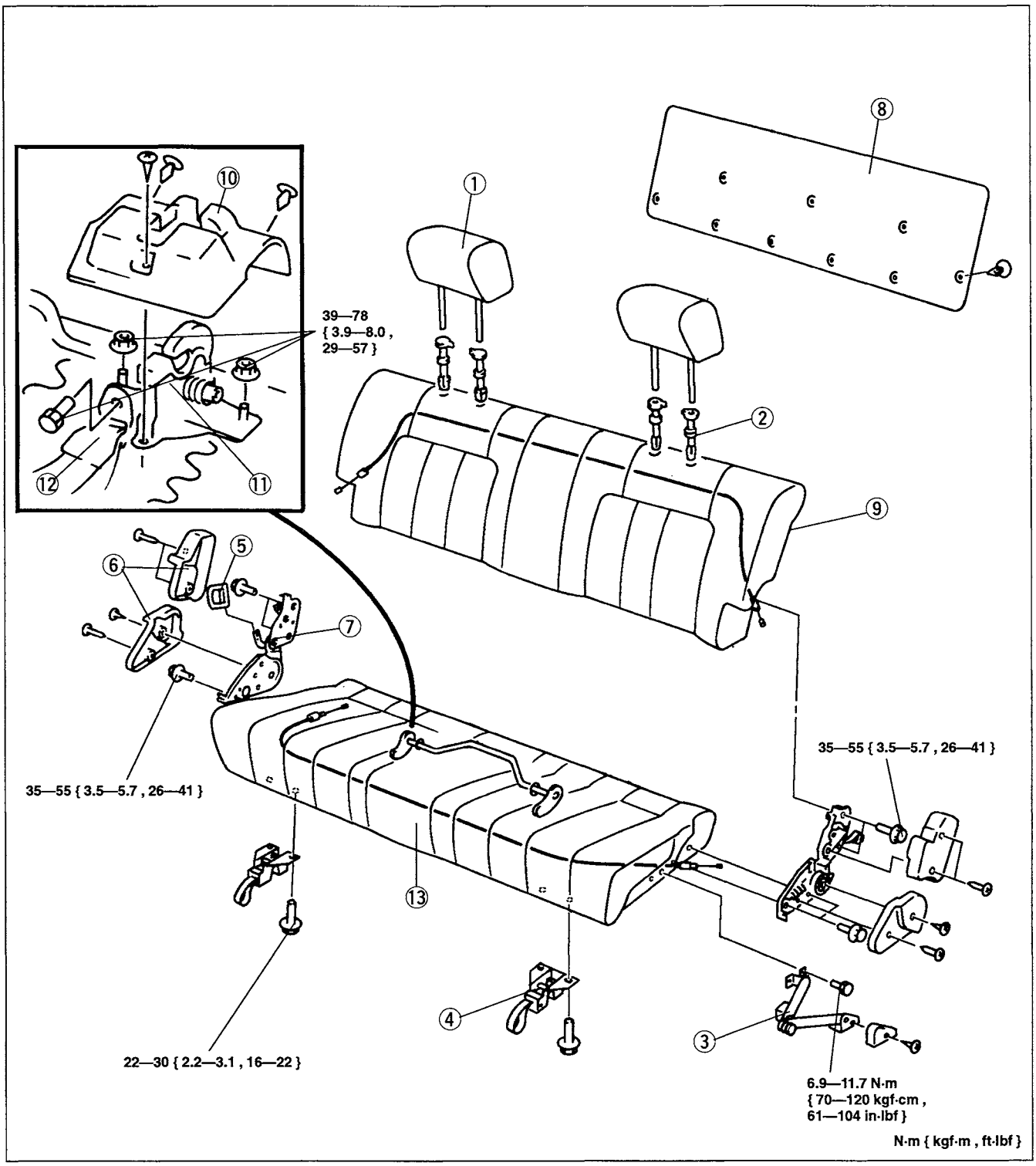
1. Safety stand
2. Rear seat No.2
   Disassembly / Assembly ..... page S–83

Seat mounting

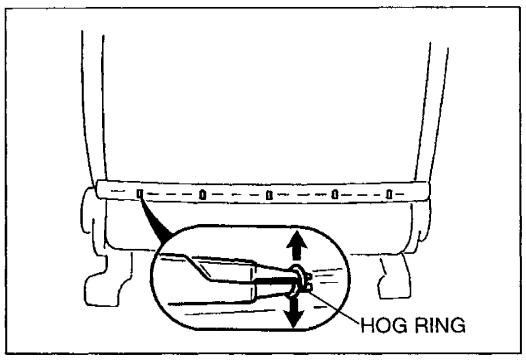
3. Seat mount bar
4. Front hinge

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.

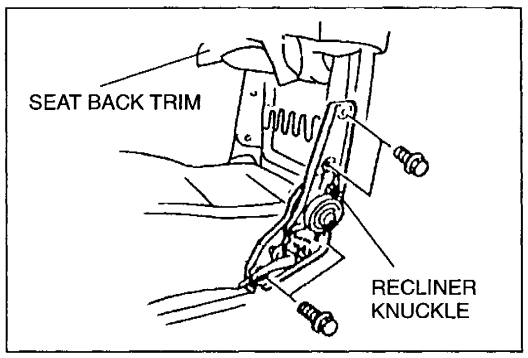


1. Headrest
2. Headrest guide
3. Safety stand
4. Front catch
5. Knuckle lever
6. Side cover
7. Recliner knuckle
8. Seat back board
9. Seat back
10. Rear catch cover
11. Rear catch
12. Rear No.2 buckle
13. Seat cushion trim and pad



Disassembly Note
Recliner knuckle

1. Remove the hog rings from the rear of the seat back.

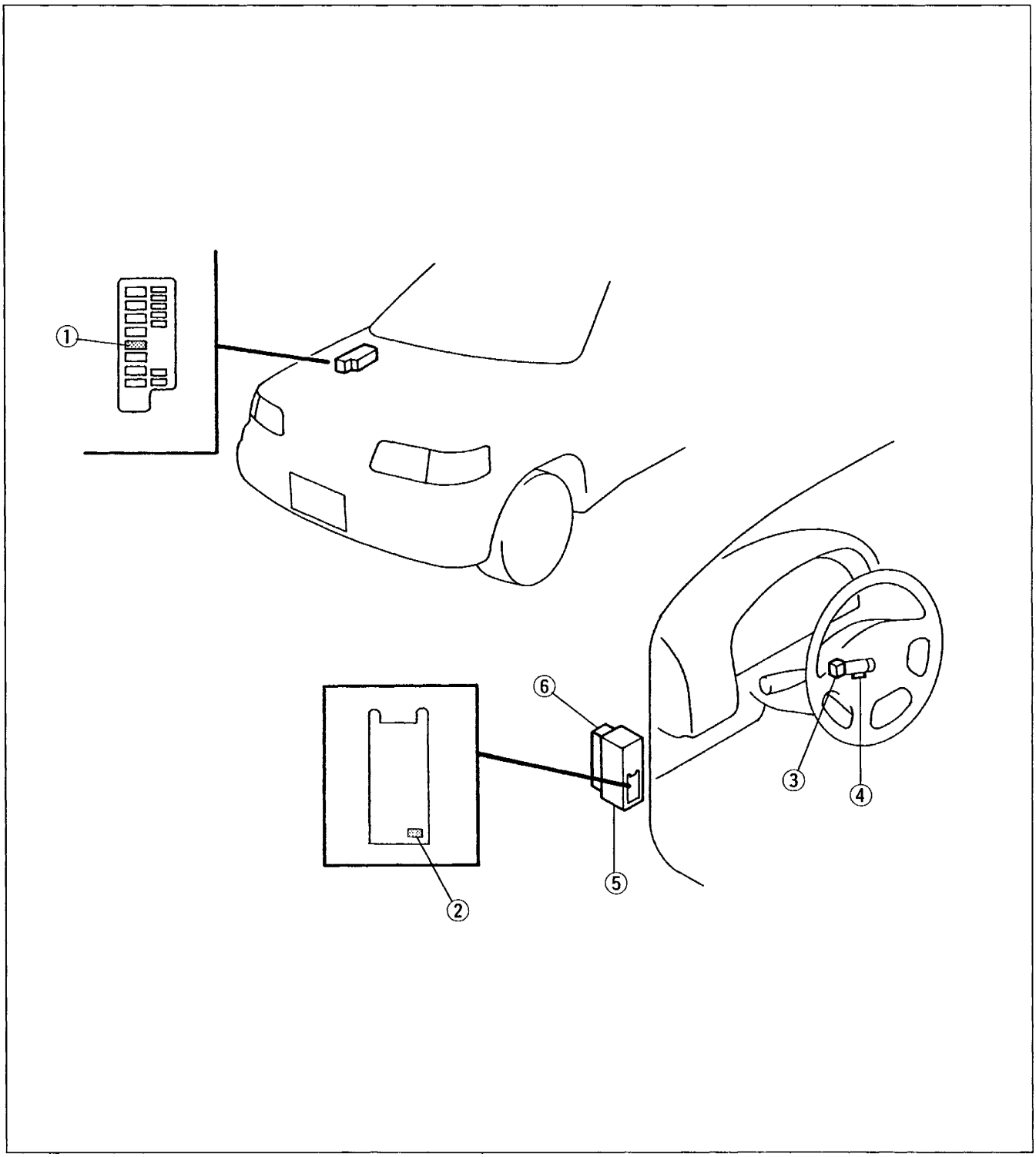


2. Lift the seat back trim until the recliner knuckle installation bolts are accessible.
3. Remove the recliner knuckle installation bolts and remove the recliner knuckle.

BODY ELECTRICAL SYSTEM

POWER SYSTEM

STRUCTURAL VIEW

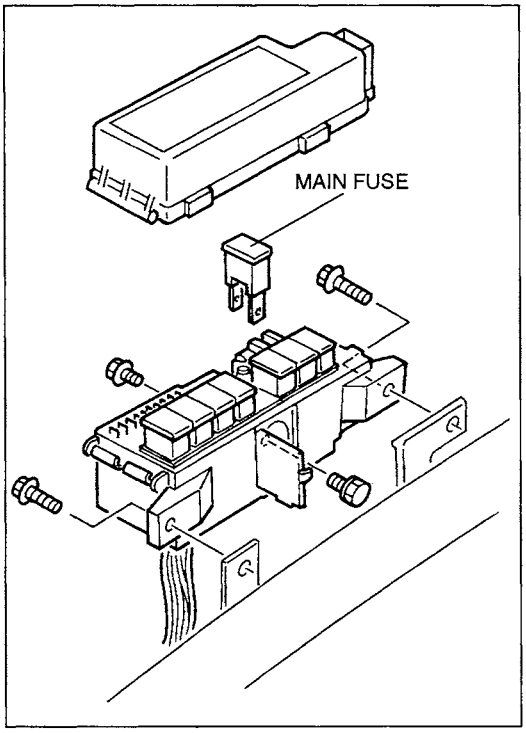


1. MAIN fuse
   Removal / Installation ..... page T–3
2. ROOM fuse
   Installation ..... page T–3
3. Ignition switch
   Removal / Installation ..... page T–4
   Inspection ..... page T–4
4. Key reminder switch
   Inspection ..... page T–4
5. Joint box
   Removal / Installation ..... page T–5
6. CPU
   Removal / Installation ..... page T–5
   Inspection ..... page T–6

FUSES

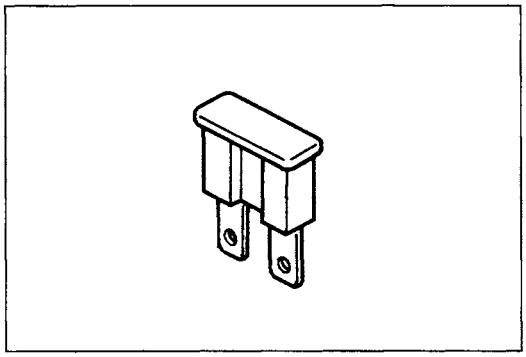
Caution

- **Determine and correct the cause of the burnt fuse before replacing it with the specified type. If the fuse is replaced before doing this, it may burn again.**



MAIN Fuse
Removal / Installation

1. Remove the main fuse block cover.
2. Remove the main fuse block mounting bolts.
3. Remove the main fuse mounting bolts.
4. Remove the MAIN fuse.
5. Install in the reverse order of removal.

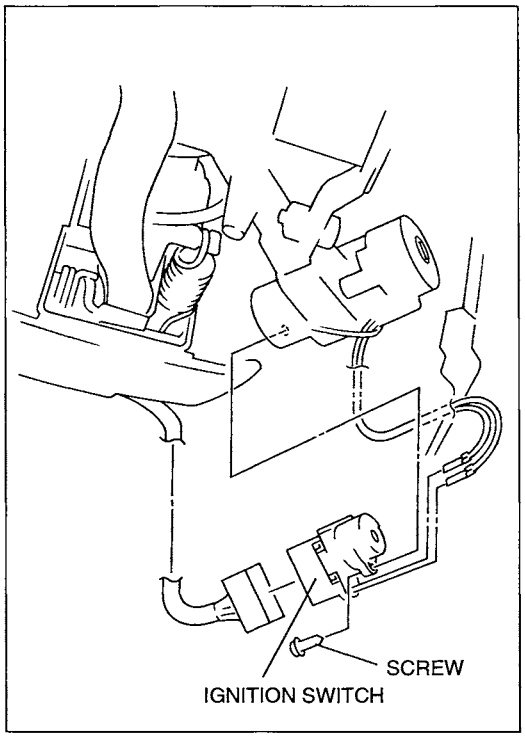


ROOM Fuse
Installation

Note

- When the ROOM fuse is burnt or removed, the malfunction indicator lamp illuminates. If the ROOM fuse is replaced or installed with the ignition switch at ON, the malfunction indicator lamp will continue to illuminate.

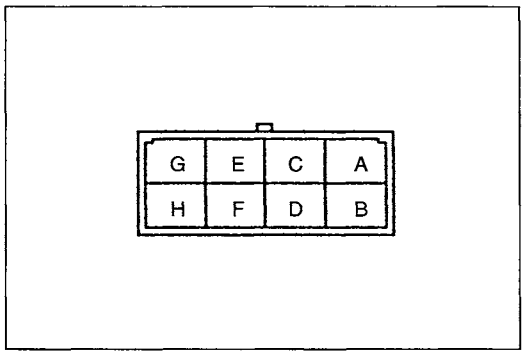
1. Turn the ignition switch to LOCK.
2. Install the ROOM fuse.



IGNITION SWITCH

Removal / Installation

1. Remove the column cover and lower panel. (Refer to section S.)
2. Remove the screw.
3. Disconnect the connector.
4. Extract the key reminder switch terminals from the ignition switch.
5. Remove the ignition switch.
6. Install in the reverse order of removal.



Inspection

1. Remove the column cover and lower panel. (Refer to section S.)
2. Disconnect the connector.
3. Check for continuity between the terminals of the ignition switch.

O—O : Continuity

Switch position \ Terminal	C	D	F	B	A	E
LOCK						
ACC	O		O			
ON	O		O	O		
		O			O	
START	O			O		
		O				O

4. If not as specified, replace the ignition switch.

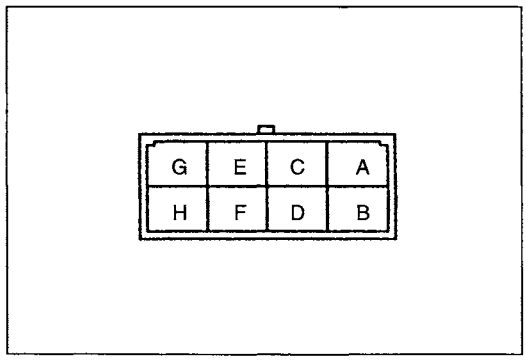
KEY REMINDER SWITCH

Inspection

1. Remove the column cover. (Refer to section S.)
2. Disconnect the connector.
3. Check for continuity between the terminals of the key reminder switch.

O—O : Continuity

Key condition \ Terminal	G	H
Key inserted	O	O
Key removed		

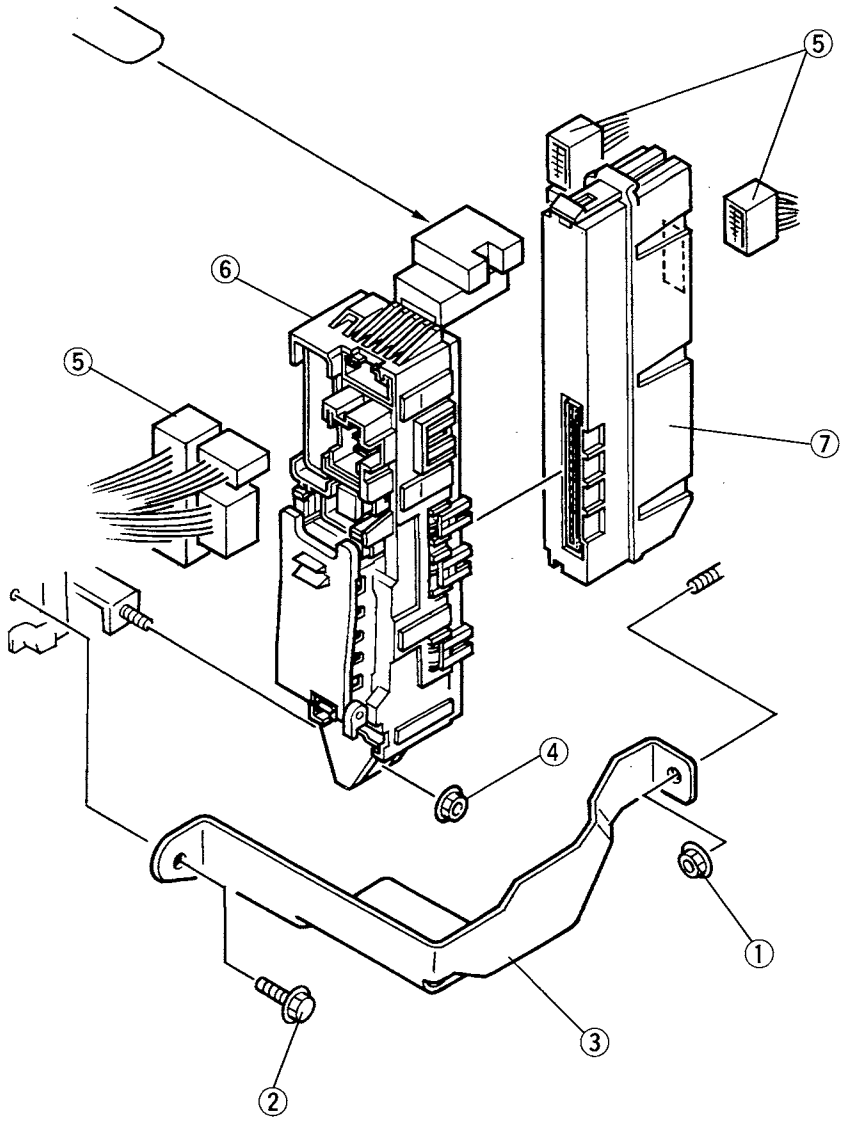


4. If not as specified, replace the steering lock assembly. (Refer to section N.)

CPU

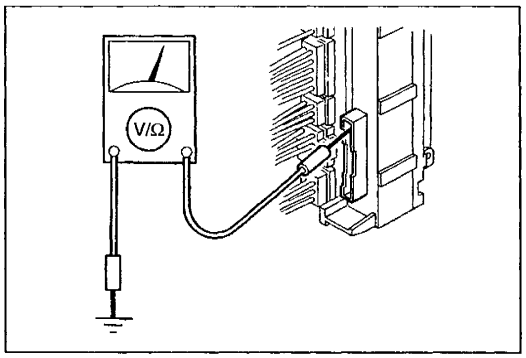
Removal / Installation

1. Remove the scuff plate and front side trim. (Refer to section S.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.

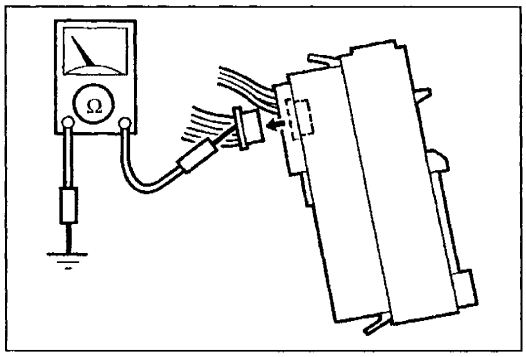


1. Nut
2. Bolt
3. Cover
4. Nut
5. Connectors
6. Joint box
7. CPU

Inspection ..... page T–6

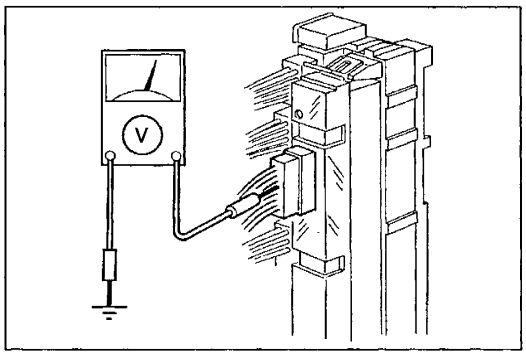


Inspection
Connector A
1. Remove the CPU from the joint box.
2. Measure the voltage at the CPU terminals from the joint box side, referring to the terminal voltage list on page T–7.
3. If not as specified, inspect the parts listed under "Inspection area" and the related wiring harnesses.
4. If the parts and wiring harnesses are OK but the system still does not work properly, replace the CPU.



Connector B
1. Follow the appropriate procedure, referring to the terminal voltage list on page T–8.

Terminals 2A, 2G, 2I, 2M, 2O
(1) Disconnect the CPU connector.
(2) Check for continuity between the terminals of the CPU connector and ground.



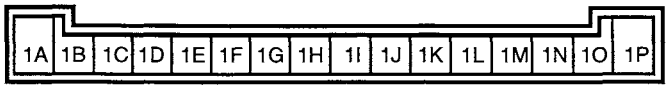
Terminals except 2A, 2G, 2I, 2M, 2O
(1) Install the CPU onto the joint box.
(2) Measure the voltage at the CPU terminals.

2. If not as specified, inspect the parts listed under "Inspection area" and the related wiring harnesses.
3. If the parts and wiring harnesses are OK but the system still does not work properly, replace the CPU.

Terminal voltage list (Reference)

B+: Battery positive voltage

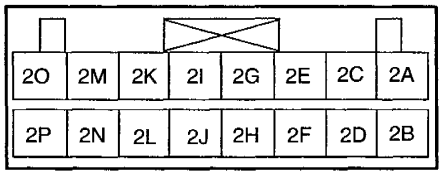
CONNECTOR A



Terminal	Signal	Connection	Test condition		Voltage/ Continuity	Inspection area
1A	Rear wiper	Rear wiper motor	IG switch at ON		B+	• R.WIP 15 A fuse • Rear wiper motor
1B	Idle-up input	Front fan switch	Continuity inspection	Front fan switch at OFF or 1st	No	Front fan switch
				Front fan switch at 2nd, 3rd, or 4th	Yes	
1C	ACC	CIGAR 15 A fuse	IG switch at ACC or ON		B+	CIGAR 15 A fuse
1D	Idle-up input	Combination switch	Headlight switch at 2nd position		B+	• HEAD 30 A fuse • Combination switch
1E	Shift lock	Shift-lock solenoid	IG switch at ON		B+	• METER 10 A fuse • Shift-lock solenoid
1F	Idle-up output	ECM	IG switch at ON		B+	ECM
1G	CPU ground	GND	Continuity inspection	Constant	Yes	—
1H	Brake	Brake switch	Brake switch on		B+	• STOP 20 A fuse • Brake switch
1I	P range	TR switch	IG switch at ON and selector lever at P range		B+	• METER 10 A fuse • TR switch
1J	+B	ROOM 15 A fuse	Constant		B+	ROOM 15 A fuse
1K	Key inserted	Key reminder switch	Key inserted into steering lock assembly		B+	• ROOM 15 A fuse • Key reminder switch
1L	TNS	Combination switch	Headlight switch at 1st position		B+	• TAIL 15 A fuse • Combination switch
1M	IG 1	METER 10 A fuse	IG switch at ON		B+	METER 10 A fuse
1N	Seat belt warning	• Seat belt warning light • Buckle switch	IG switch at ON	Seat belt fastened	B+	• METER 10 A fuse • Instrument cluster • Buckle switch
				Seat belt unfastened	0 V	
1O	Door open/closed	Door switch	IG switch at ON	Any door open	0 V	• ROOM 15 A fuse • Door switch • Cour tesy light
				All doors closed	B+	
1P	Idle-up input	• Rear window defroster relay • Rear window defroster switch	IG switch at ON	Rear window defroster switch on	0 V	• A/C 15 A fuse • Rear window defroster relay • Rear window defroster switch
				Rear window defroster switch off	B+	

B+: Battery positive voltage

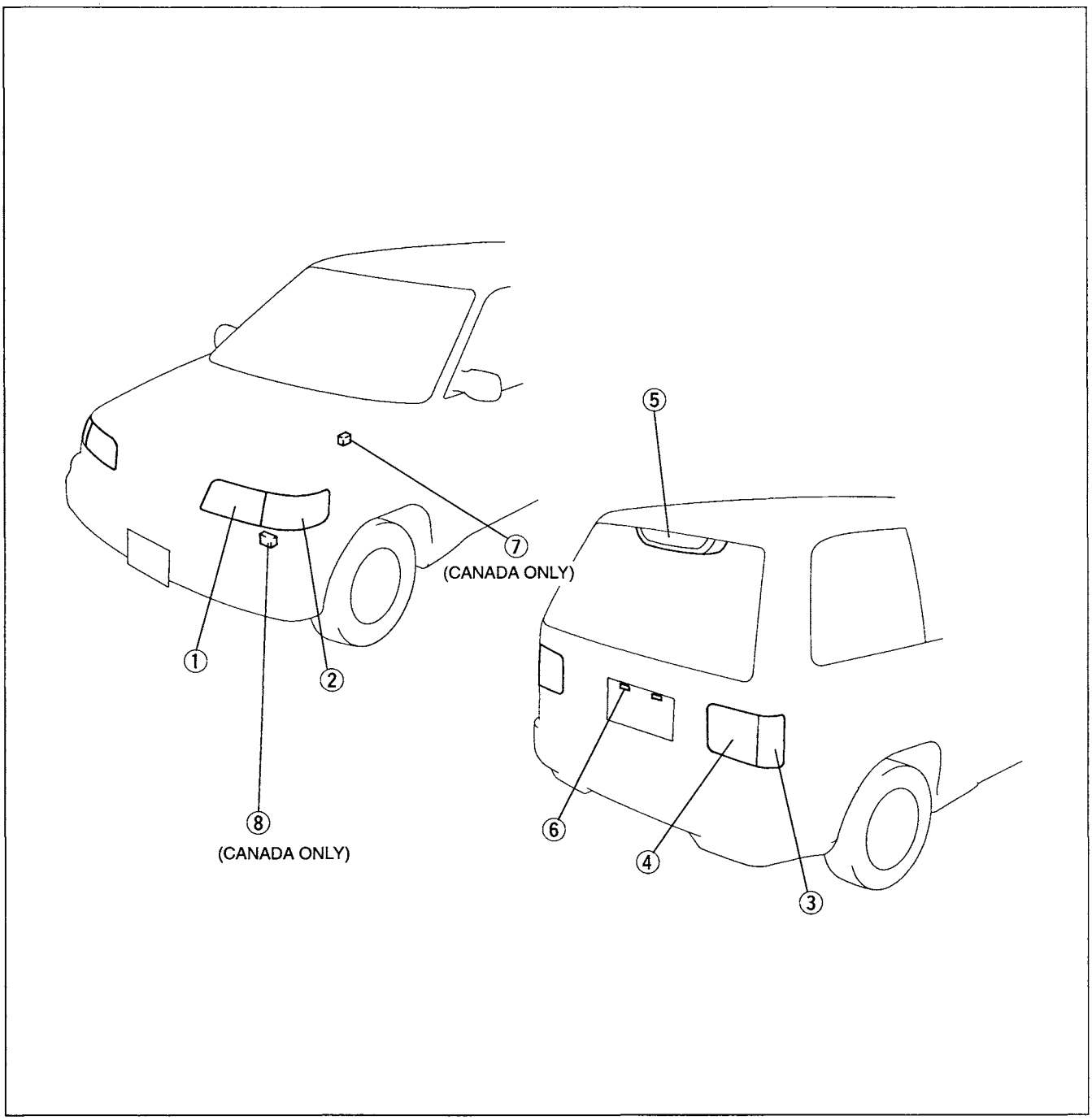
CONNECTOR B



Terminal	Signal		Connection	Test condition		Voltage/ Continuity	Inspection area
2A	Door lock input		Door lock-link switch (driver)	Continuity inspection	Locked	Yes	Door lock-link switch
					Unlocked	No	
2B	—		—	—		—	—
2C	Door lock output		Door lock timer unit	The moment door lock-link switch locks		0 V	Door lock timer unit
				Other		B+	
2D	DRL		DRL relay	IG switch at ON		0 V	DRL relay
2E	Door lock output		Door lock timer unit	The moment door lock-link switch unlocks		0 V	Door lock timer unit
				Other		B+	
2F	Horn output		Horn relay	Horn switch pushed		0 V	• HORN 10 A fuse • Horn relay
				Other		B+	
2G	Door lock input		Door lock-link switch (driver)	Continuity inspection	Locked	No	Door lock-link switch
					Unlocked	Yes	
2H	—		—	—		—	—
2I	USA	—	—	—		—	—
	Canada	Brake system warning	Parking brake switch	Continuity inspection	Parking brake switch on	Yes	Parking brake switch
					Parking brake switch off	No	
2J	—		—	—		—	—
2K	Brake system warning		Brake system warning light	IG switch at ON and parking brake switch off		B+	• METER 10 A fuse • Instrument cluster
2L	—		—	—		—	—
2M	Rear wiper		Rear wiper switch	Continuity inspection	Rear wiper switch on	Yes	Rear wiper switch
2N	Keyless		Keyless unit	No operation by keyless unit		5 V	keyless unit
2O	Rear washer		Rear washer switch	Continuity inspection	Rear washer switch on	Yes	Rear washer switch
2P	R range		TR switch	IG switch at ON and selector lever at R range		B+	• METER 10 A fuse • TR switch

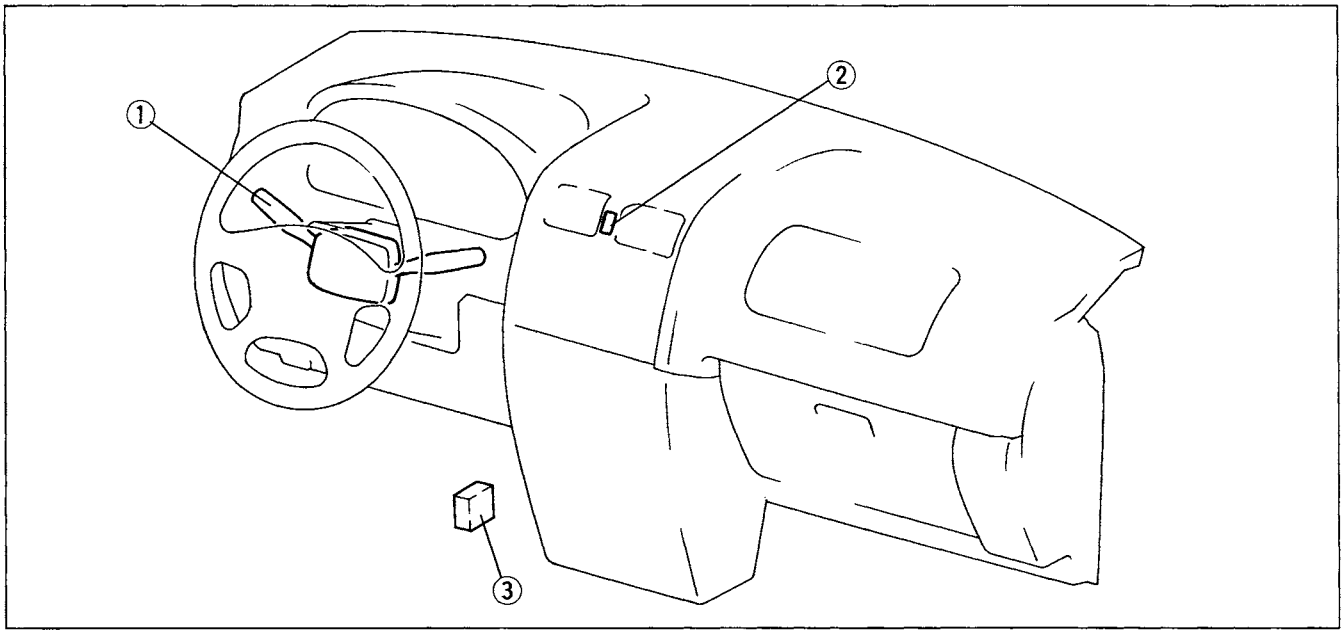
EXTERIOR LIGHTING SYSTEM

STRUCTURAL VIEW
Exterior



1. Headlight
   - Removal / Installation ..... page T–10
   - Aiming ..... page T–11
   - Bulb replacement ..... page T–11
2. Front combination light
   - Removal / Installation ..... page T–12
3. Rear combination light
   - Removal / Installation ..... page T–12
4. Back-up light
   - Removal / Installation ..... page T–13
5. High-mount brake light
   - Removal / Installation ..... page T–13
   - Bulb replacement ..... page T–13
6. Licence plate light
   - Removal / Installation ..... page T–13
7. DRL relay
   - Inspection ..... page T–19
8. DRL resistor
   - Removal / Installation ..... page T–19
   - Inspection ..... page T–19

Interior

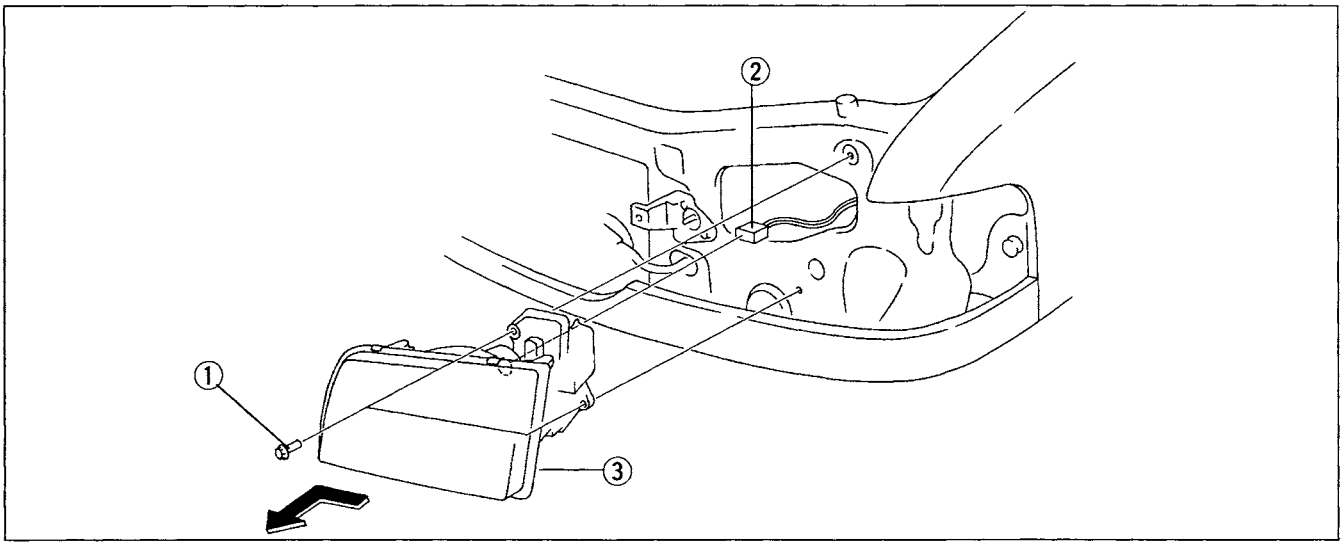


1. Combination switch
   - Removal / Installation ..... page T–14
   - Disassembly / Assembly ..... page T–14
   - Inspection ..... page T–15
   - Adjustment ..... page T–16
2. Hazard warning switch
   - Removal / Installation ..... page T–17
   - Inspection ..... page T–17
3. Flasher unit
   - Removal / Installation ..... page T–18
   - Inspection ..... page T–18

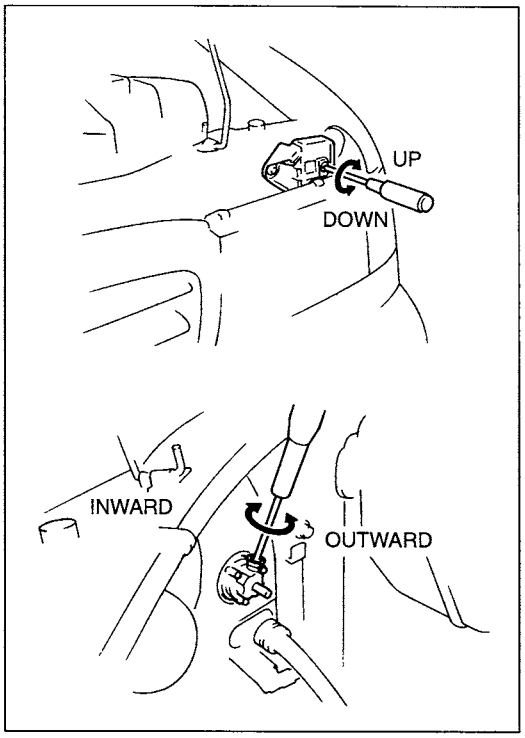
HEADLIGHT

Removal / Installation

1. Remove the radiator grille. (Refer to section S.)
2. Remove the front combination light. (Refer to page T–12.)
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.



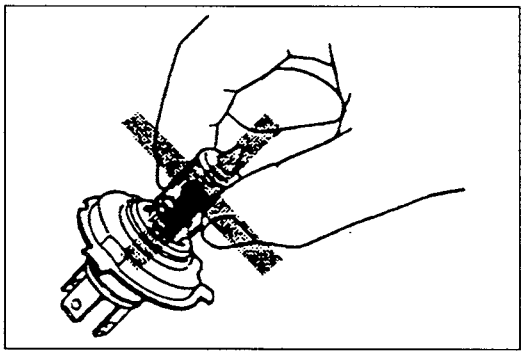
1. Bolt
2. Connector
3. Headlight
   - Aiming ..... page T–11
   - Bulb replacement ..... page T–11



Aiming

Vertical-horizontal aiming method

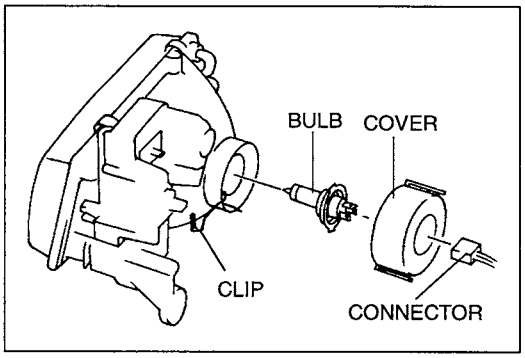
1. Adjust the tire air pressure to the specification. (Refer to section Q.)
2. Fill the fuel tank and remove excess cargo.
3. Position the unloaded vehicle on a flat, level surface.
4. Rock the vehicle by hand several times.
5. Turn the adjusting screws to adjust the headlights. Use a "HOPPY" brand aimer or equivalent to aim the headlights to specification numbers 10H14V.



Bulb Replacement

Warning

- **If the glass surface of a halogen bulb is touched with bare hands, natural body oil could cause the bulb to overheat when it is lit. Because a halogen bulb contains pressurized gas, this overheating will cause the bulb to burst. The flying glass may seriously injure you. Hold the metal flange, not the glass, when replacing the bulb.**



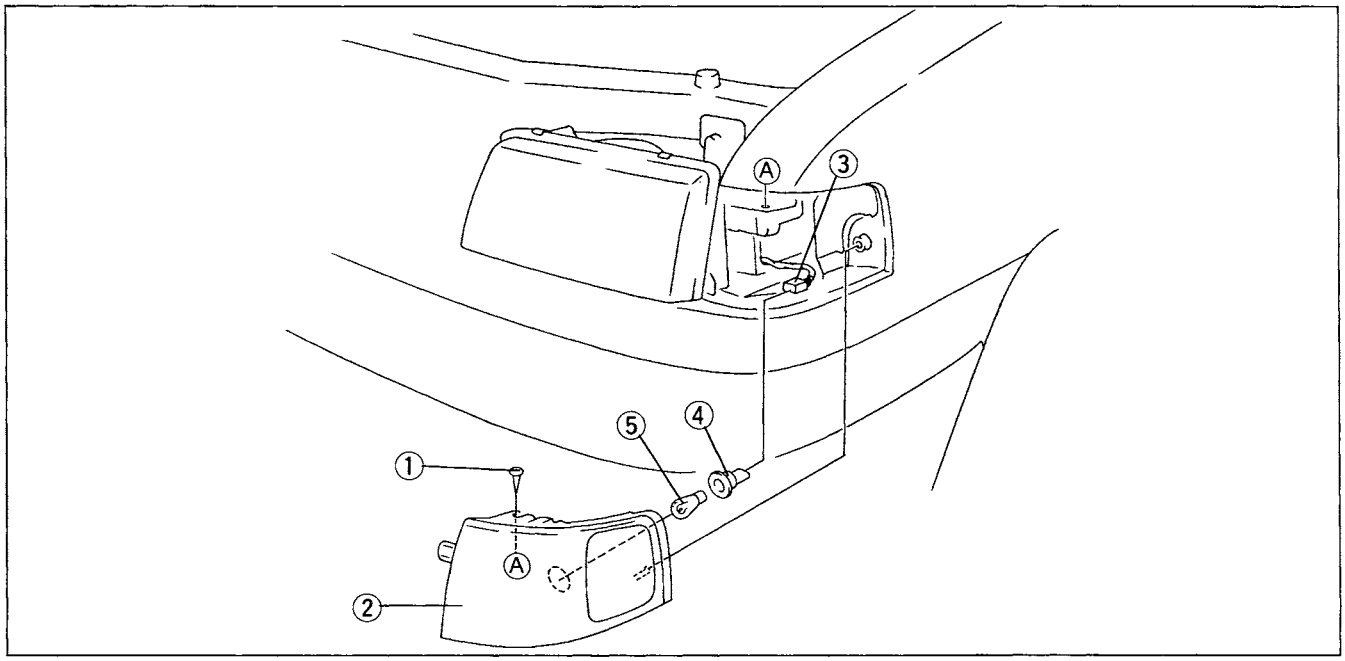
1. Disconnect the headlight connector.
2. Remove the cover.
3. Remove the clip to remove the headlight bulb.
4. Install in the reverse order of removal.

Headlight bulb: High/Low 60/55 W

FRONT COMBINATION LIGHT

Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.

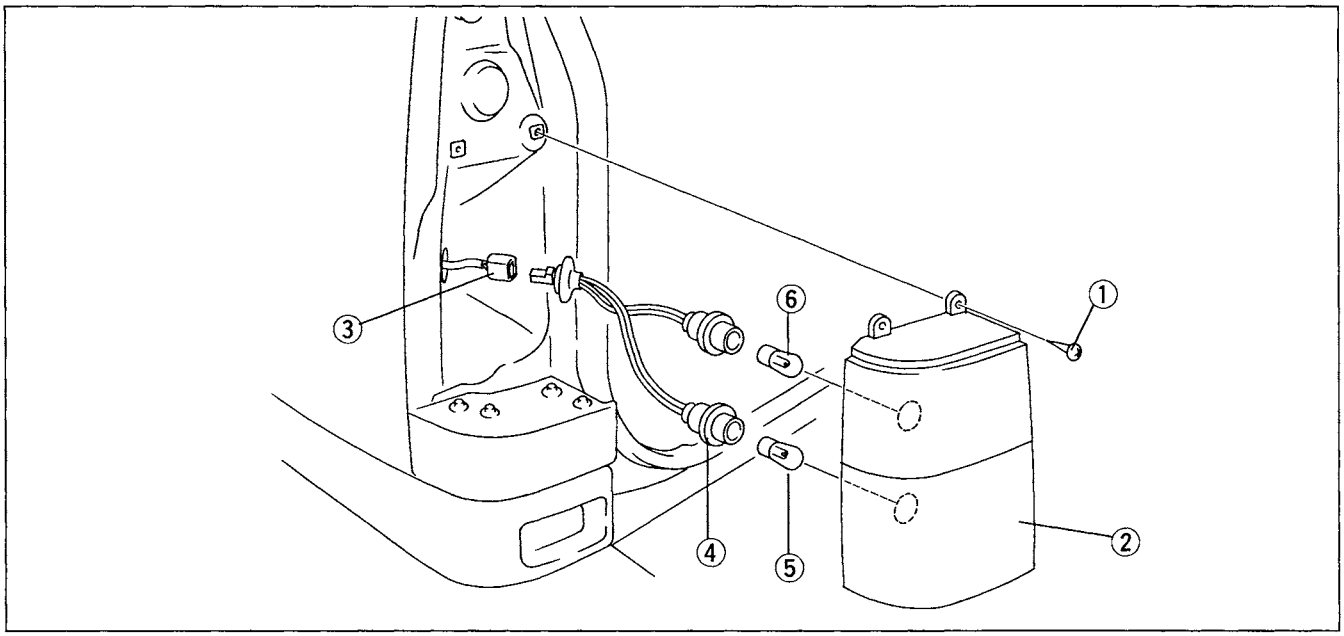


1. Screw
2. Front combination light
3. Connector
4. Socket
5. Bulb (front turn light/parking light): 27/8 W

REAR COMBINATION LIGHT

Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.

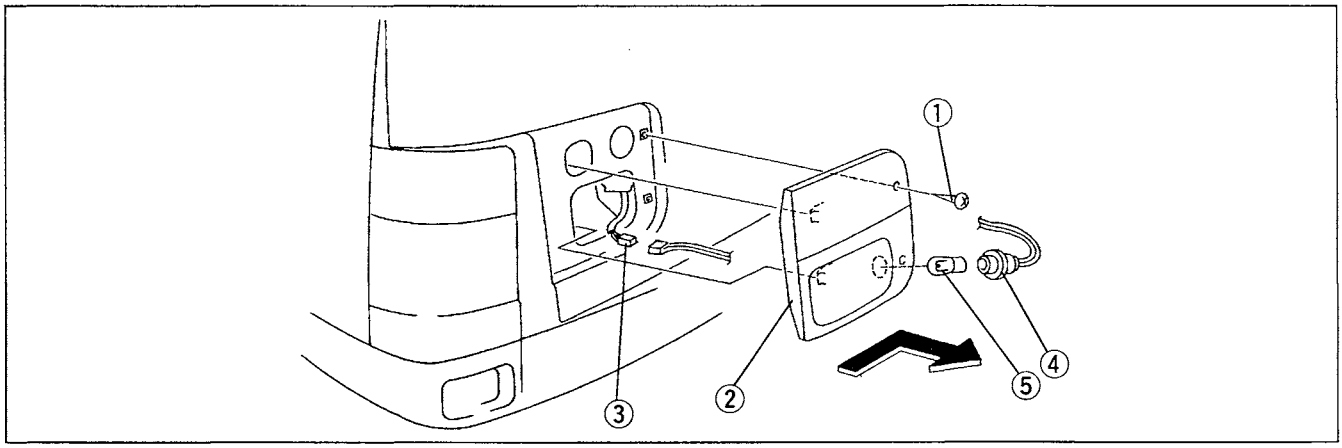


1. Screw
2. Rear combination light
3. Connector
4. Socket
5. Bulb (brake light/taillight): 27/8 W
6. Bulb (rear turn light): 27 W

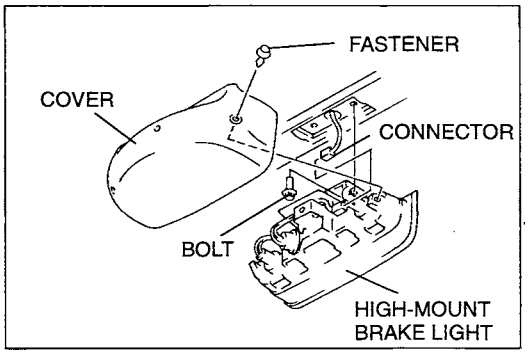
BACK-UP LIGHT

Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



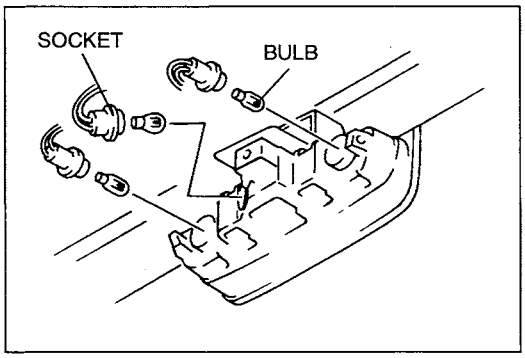
1. Screw
2. Back-up light
3. Connector
4. Socket
5. Bulb (27 W)



HIGH-MOUNT BRAKE LIGHT

Removal / Installation

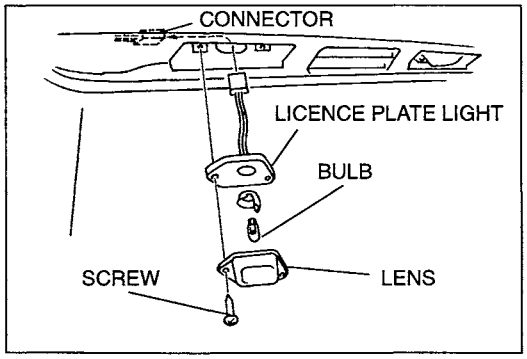
1. Remove the fasteners and cover.
2. Remove the bolts.
3. Disconnect the high-mount brake light connector and remove the high-mount brake light.
4. Install in the reverse order of removal.



Bulb Replacement

1. Remove the fasteners and cover.
2. Remove the sockets.
3. Remove the bulbs.
4. Install in the reverse order of removal.

High-mount brake light bulb: 21 W, 18 W × 2



LICENCE PLATE LIGHT

Removal / Installation

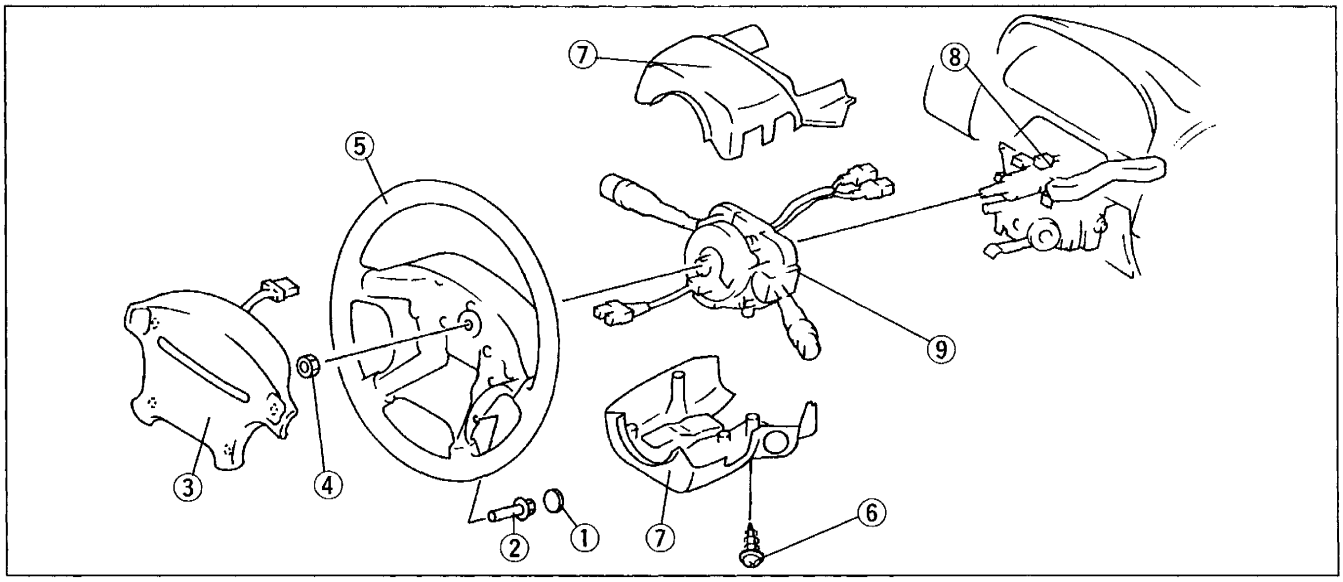
1. Remove the screws.
2. Remove the lens.
3. Disconnect the licence plate light connector.
4. Remove the licence plate light.
5. Remove the bulb.
6. Install in the reverse order of removal.

Licence plate light bulb: 5 W

COMBINATION SWITCH

Removal / Installation

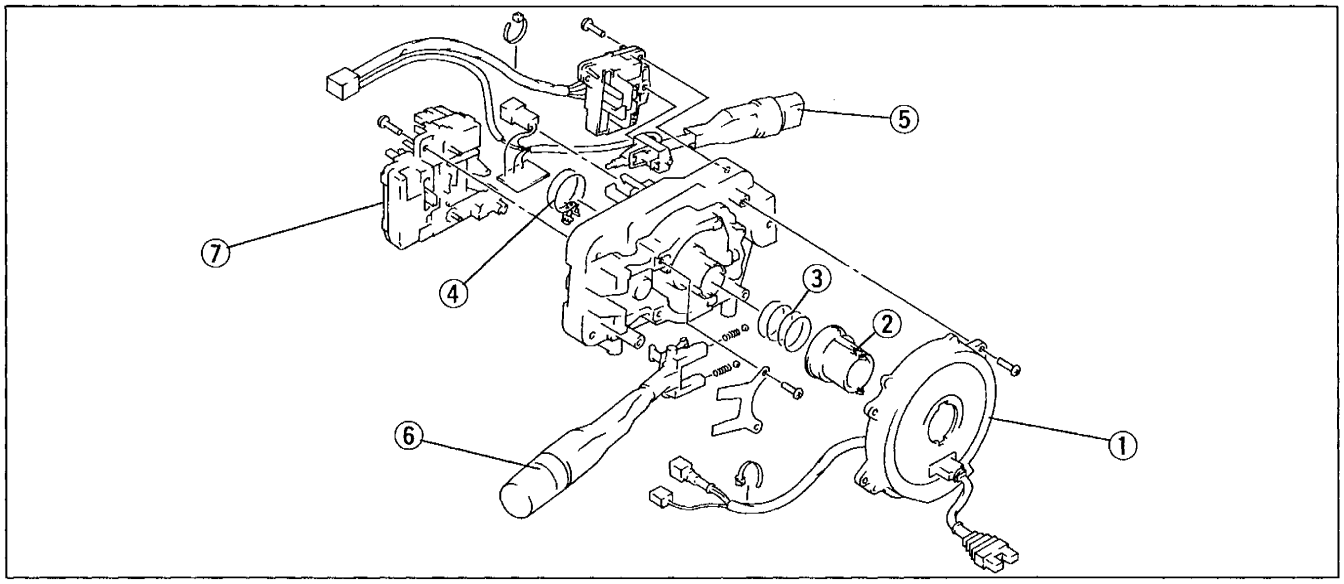
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Cap
2. Bolt
3. Air bag module
   Removal / Installation ..... page T–74
4. Nut
5. Steering wheel
   Removal / Installation ..... section N
6. Screw
7. Column cover
   Removal / Installation ..... section S
8. Connector
9. Combination switch
   Inspection ..... page T–15
   Adjustment ..... page T–16

Disassembly / Assembly

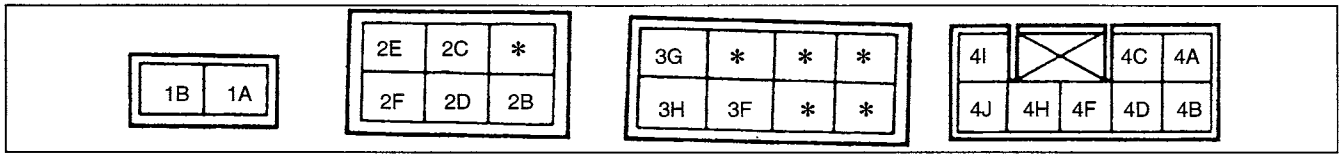
1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of removal.

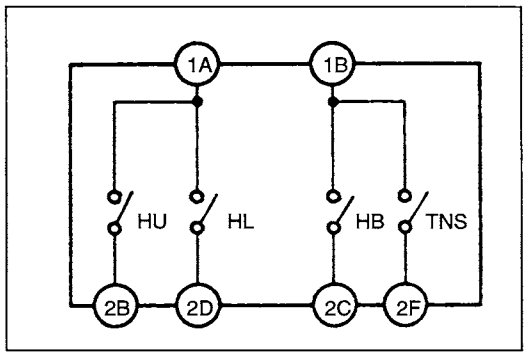


1. Clock spring
2. Cancel cam
3. Spring
4. Band
5. Wiper lever
6. Light lever
7. Light unit

Inspection

1. Remove the column cover.
   (Refer to section S.)
2. Disconnect combination switch connector.
3. Check for continuity or resistance between the terminals as indicated below.
4. If not as specified, replace the necessary parts.

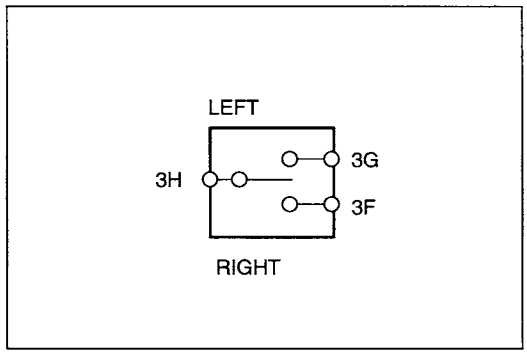




Headlight switch

○—○: Continuity

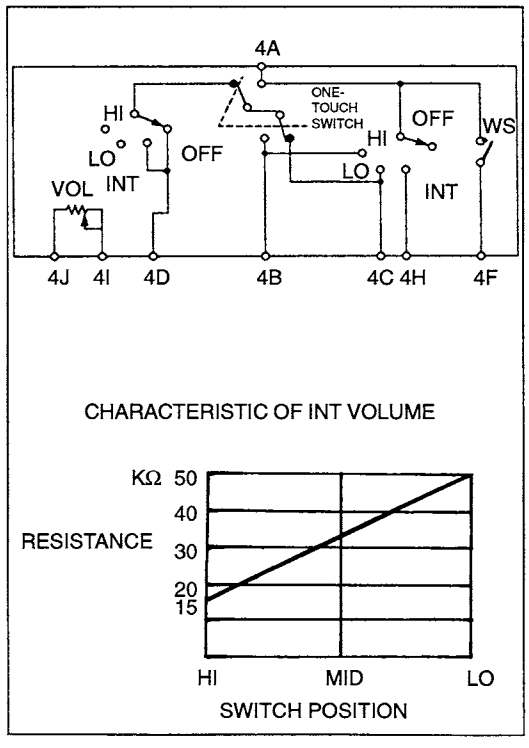
Light	Dimmer	Flash-to-pass	Terminal 1A	2B	2D	1B	2F	2C
OFF	—	OFF						
		ON	○	○				
Parking	—	OFF				○	○	
		ON	○	○		○	○	
Headlight	HL	OFF	○		○	○	○	○
		ON	○	○		○	○	○
	HU	—	○	○		○	○	○



Turn switch

○—○: Continuity

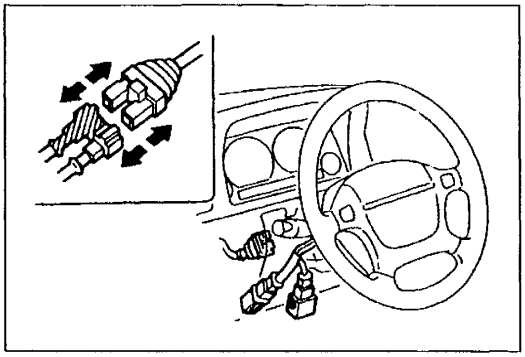
Switch position	Terminal 3H	3G	3F
Left	○	○	
OFF			
Right	○		○

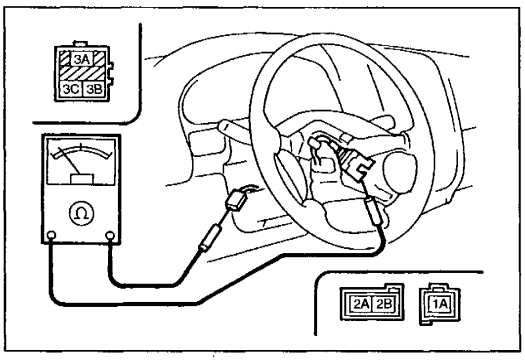


Windshield wiper and washer switch

○WW○: Resistance ○—○: Continuity

Switch position		Terminal 4A	4F	4H	4C	4B	4D	4I	4J
Wiper switch	OFF (One-touch switch OFF)				○		○		
	OFF (One-touch switch ON)	○				○			
	INT	○		○	○		○		
	LO	○			○				
	HI	○				○			
Washer switch	ON	○	○						
INT volume	LO position							○WW○ 50 kΩ	
	MID position							○WW○ 35 kΩ	
	HI position							○WW○ 15 kΩ	





Clock spring

Warning

- **Handling the air bag module improperly can accidently deploy the air bag, which may seriously injure you. Read SERVICE WARNINGS, page T–66, before handling the air bag module.**

1. Disconnect the negative battery cable.
2. Remove the lower panel.
   (Refer to section S.)
3. Disconnect the clock spring connectors.
4. Remove the air bag module.
   (Refer to page T–74.)
5. Check for continuity between the terminals of the clock spring connector.

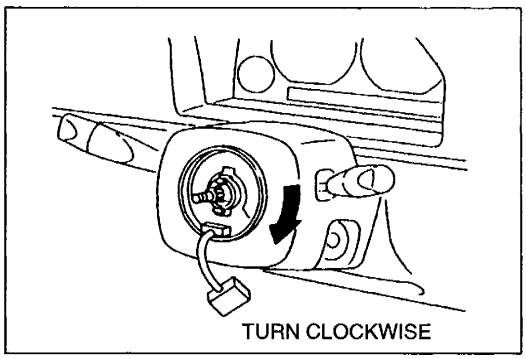
O—O: Continuity

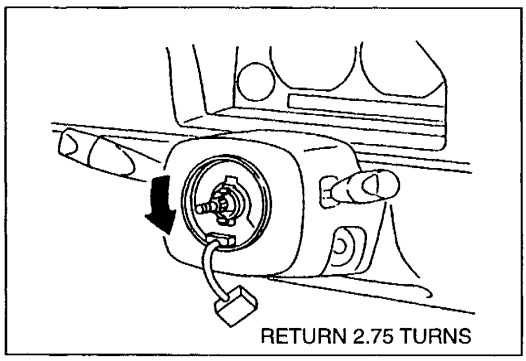
Step \ Terminal	1A	2A	2B	3A	3B	3C
1	O			O		
2		O			O	
3			O			O

Note

- When terminals 3A and 3B are disconnected from the vehicle's main harness, they are shorted to prevent unexpected air bag deployment.

6. If not as specified, replace the combination switch.
   (Refer to page T–14.)





Adjustment

Clock spring

Before installing the steering wheel, adjust the clock spring.

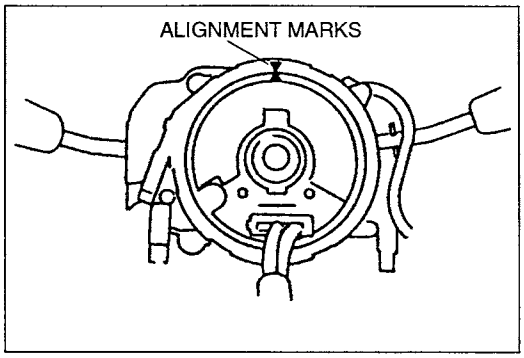
1. Set the front wheels straight ahead.

Caution

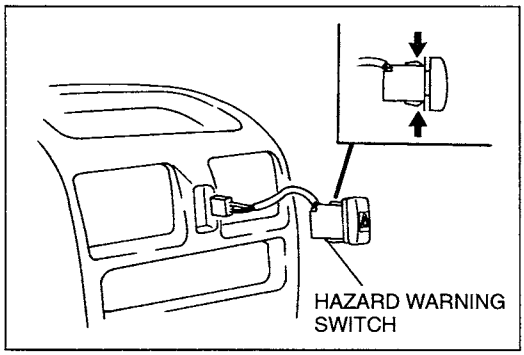
- **The clock spring will break if is over wound. Do not force the spring when furning it.**

2. Turn the clock spring clockwise until it stops.

3. Turn the clock spring counter clockwise 2.75 turns.



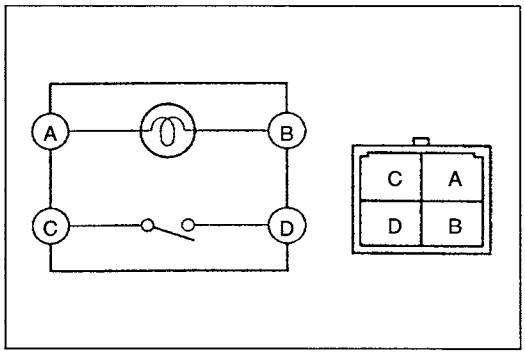
4. Align the marks on the clock spring connector with that on the outer housing.



HAZARD WARNING SWITCH

Removal / Installation

1. Remove the center upper panel. (Refer to section S.)
2. Remove the hazard warning switch.
3. Install in the reverse order of removal.



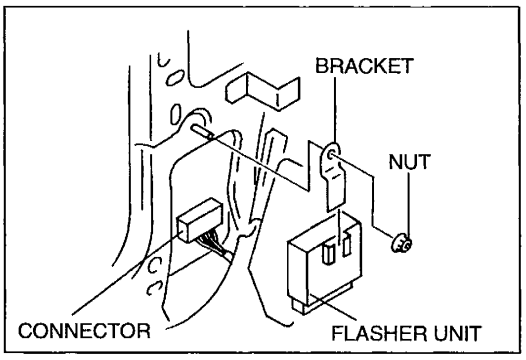
Inspection

1. Remove the hazard warning switch.
2. Check for continuity between the terminal of the hazard warning switch.

○—⊙—○ : Bulb ○—○ : Continuity

Switch position \ Terminal	A	B	C	D
OFF	○—⊙—○			
ON	○—⊙—○		○——	——○

3. If not as specified, replace the hazard warning switch.



FLASHER UNIT

Removal / Installation

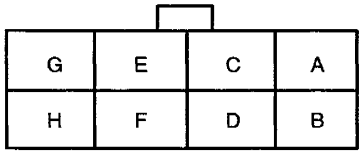
1. Remove the driver's-side front side trim. (Refer to section S.)
2. Disconnect the flasher unit connector.
3. Remove the nut.
4. Remove the bracket to remove the flasher unit.
5. Install in the reverse order of removal.

Inspection

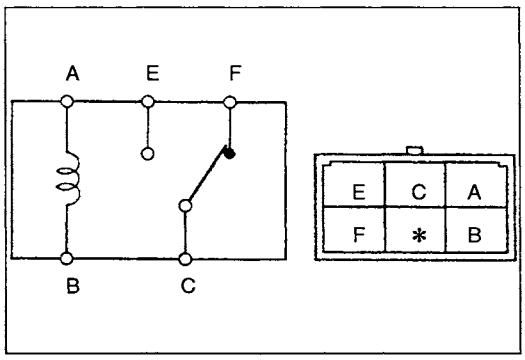
1. Remove the driver's-side front side trim. (Refer to section S.)
2. Measure the voltage at the flasher unit terminals as indicated below.
3. If not as specified, inspect the parts listed under "Inspection area" and the related wiring harnesses.
4. If the parts and wiring harnesses are OK but the system still does not work properly, replace the flasher unit.

Terminal voltage list (Reference)

B+: Battery positive voltage



Terminal	Signal	Connection	Test condition	Voltage/ Continuity	Inspection area
A	Flasher unit ground	GND	Constant: check for continuity to ground	Yes	Wiring harness (Flasher unit–GND)
B	—	—	—	—	—
C	Hazard warning on	Hazard warning switch	Hazard warning switch on	0 V	Hazard warning switch
			Hazard warning switch off	B+	
D	Turn signal flasher (LH)	Turn signal light (LH)	Turn signal light (LH) flashes	Alternates 0 V and B+	Turn signal light (LH)
			Other	0 V	
E	Turn switch on/ off (RH)	Combination switch	Ignition switch at ON and turn switch (RH) on	B+	• METER 10 A fuse • Combination switch
			Other	0 V	
F	Turn switch on/ off (LH)	Combination switch	Ignition switch at ON and turn switch (LH) on	B+	• METER 10 A fuse • Combination switch
			Other	0 V	
G	Turn signal flasher (RH)	Turn signal light (RH)	Turn signal light (RH) flashes	Alternates 0 V and B+	Turn signal light (RH)
			Other	0 V	
H	+B	HAZARD 10 A fuse	Constant	B+	HAZARD 10 A fuse

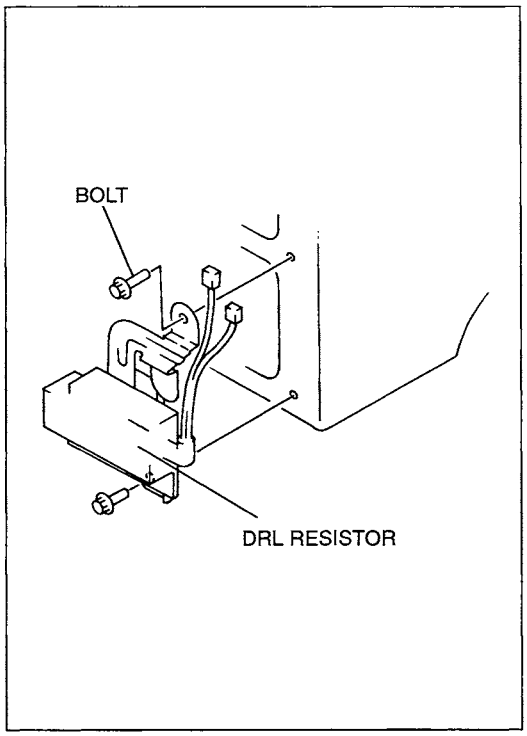


DRL RELAY
Canada Only
Inspection
1. Remove the DRL relay.
2. Apply battery positive voltage and check for continuity between the relay terminals.

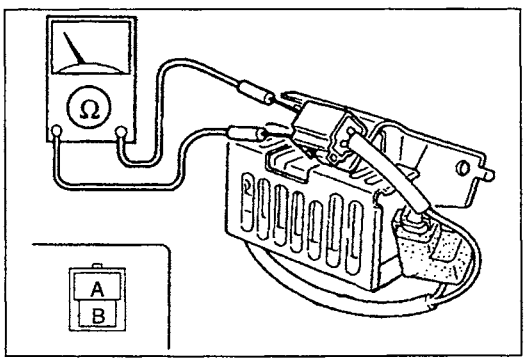
O—O: Continuity B+ : Battery positive voltage

Step \ Terminal	A	B	C	F	E
1	O	O	O	O	
2	B+	GND	O		O

3. If not as specified, replace the DRL relay.



DRL RESISTOR
Canada Only
Removal / Installation
1. Remove the left side headlight. (Refer to page T–10.)
2. Disconnect the DRL resistor connector.
3. Remove the bolts.
4. Remove the DRL resistor.
5. Install in the reverse order of removal.



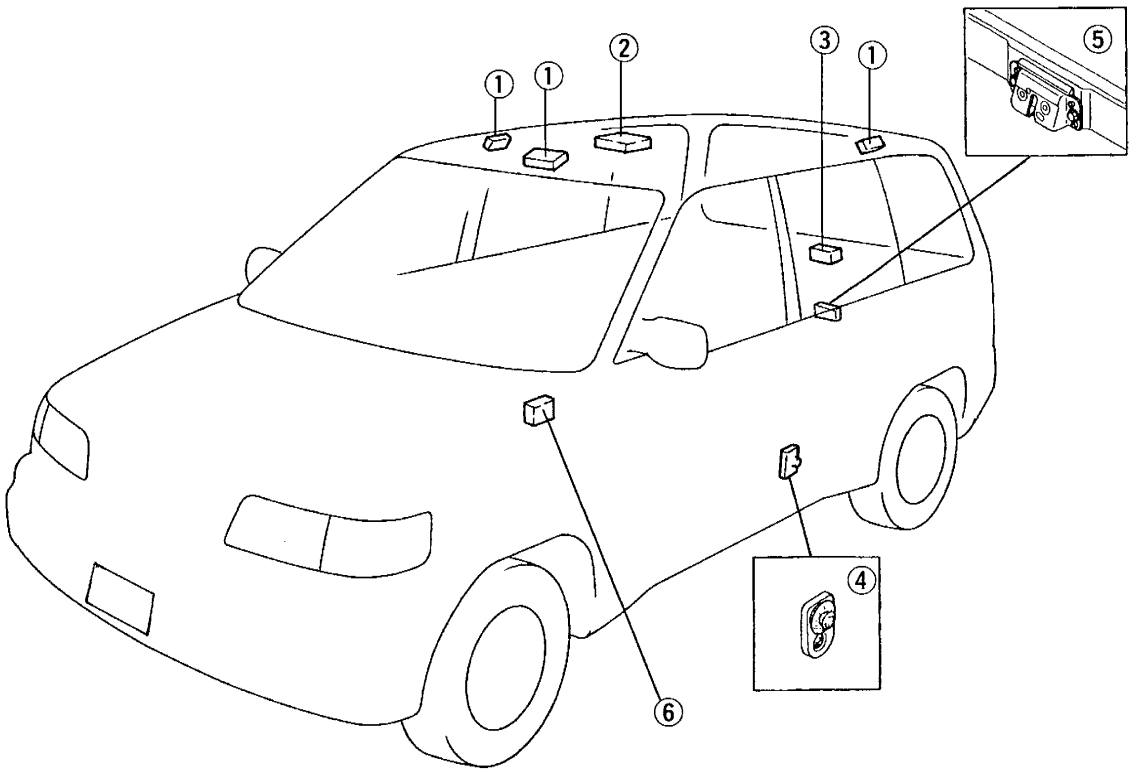
Inspection
1. Remove the left side headlight. (Refer to page T–10.)
2. Disconnect the DRL resistor connector.
3. Check for resistance between terminals A and B of the DRL resistor.

   Resistance: 0.3 Ω

4. Check the DRL resistor 10 A fuse.
5. If not as specified, replace the DRL resistor.

INTERIOR LIGHTING SYSTEM

STRUCTURAL VIEW



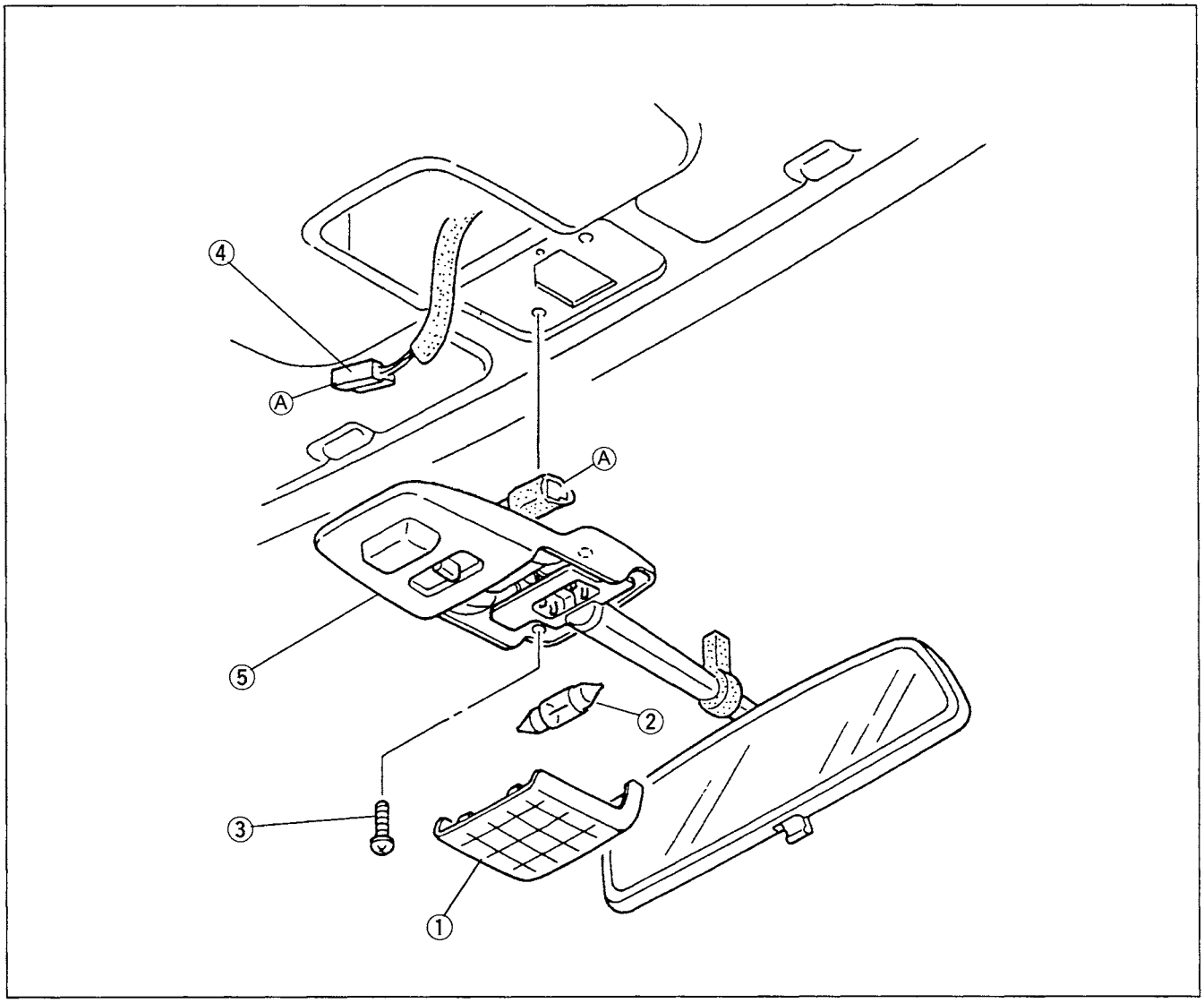
1. Interior light
   Removal / Installation ..... page T–21
2. Spot light
   Removal / Installation ..... page T–23
3. Cargo compartment light
   Removal ..... page T–24
   Installation ..... page T–24
   Bulb replacement ..... page T–24
4. Door switch
   Removal / Installation ..... page T–24
   Inspection ..... page T–24
5. Cargo compartment light switch
   Inspection ..... page T–25
6. Panel light control switch
   Removal / Installation ..... page T–25
   Inspection ..... page T–25

INTERIOR LIGHT

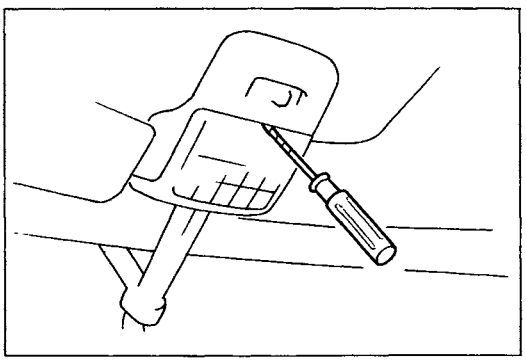
Removal / Installation

Center interior light

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Lens
   Removal note ..... below
2. Bulb (10 W)
3. Screw
4. Connector
5. Housing



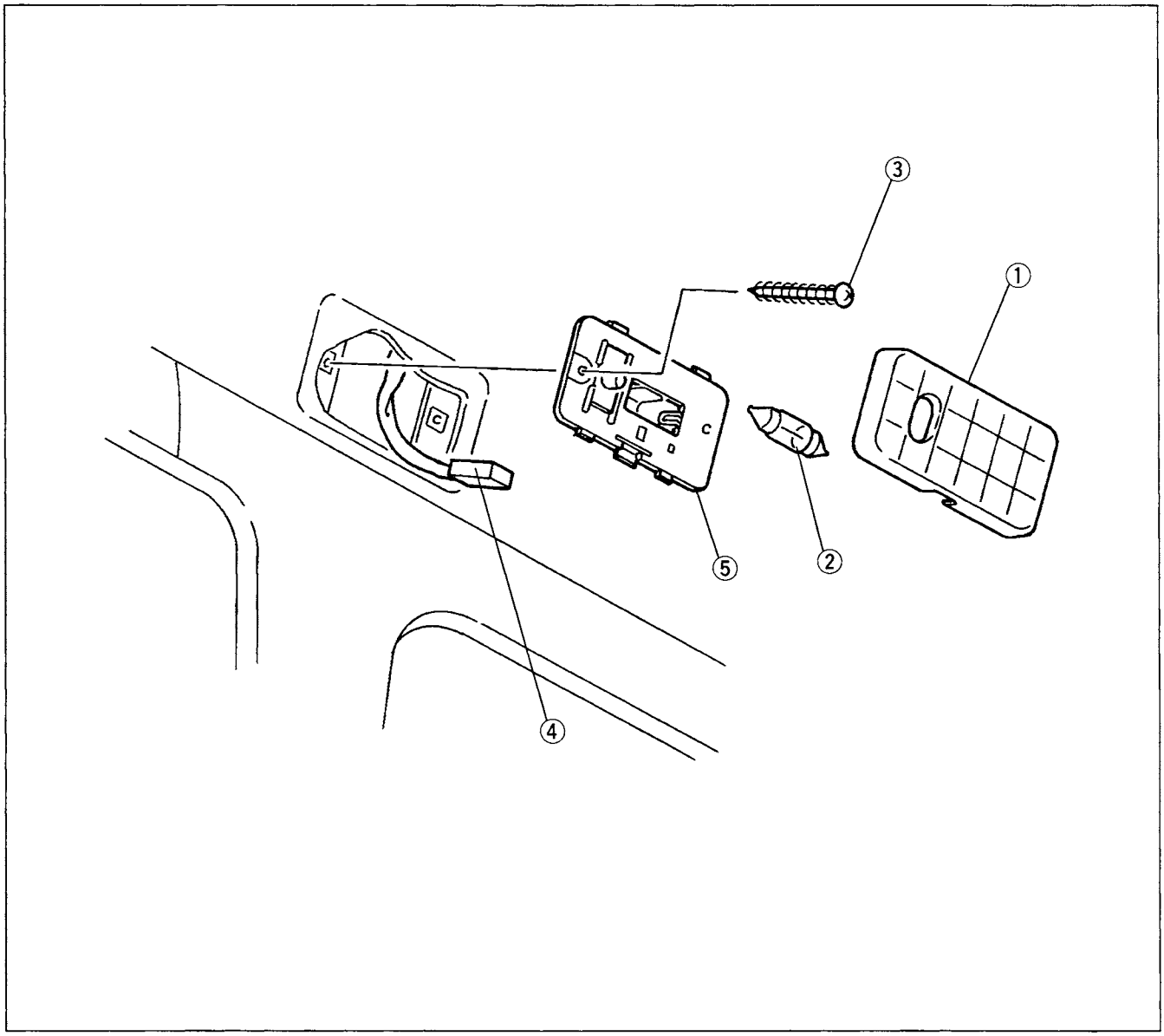
Removal note

Lens

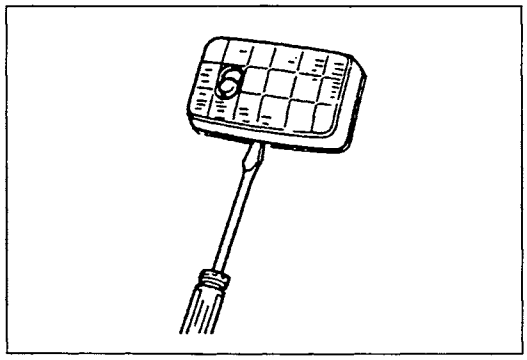
1. Insert a flathead screwdriver which has been wrapped in tape as shown in the figure.
2. Twist the screwdriver to remove the lens.

Right interior light, Left interior light

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Lens
   Removal note ..... below
2. Bulb (10 W)
3. Screw
4. Connector
5. Housing



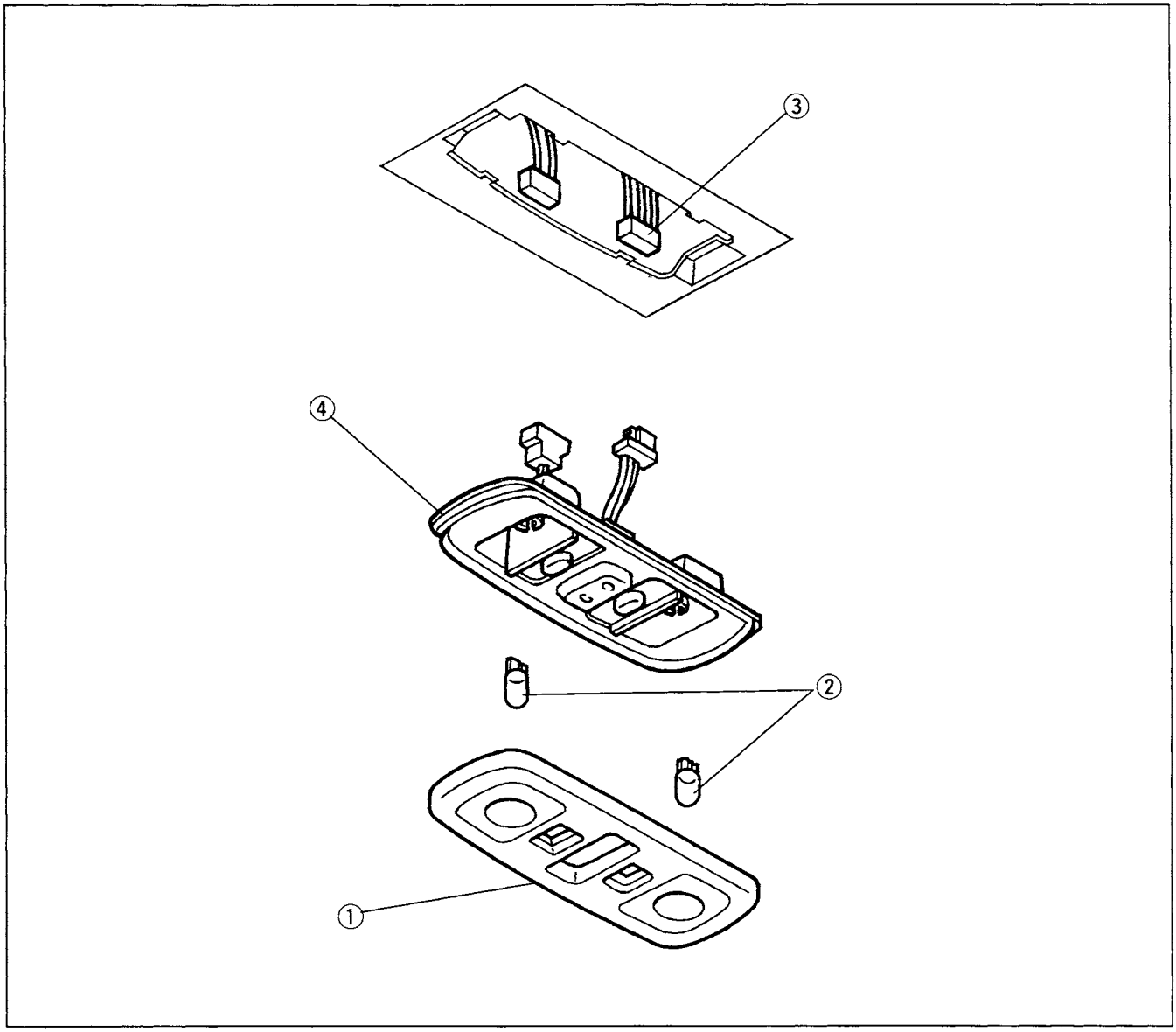
Removal note

Lens

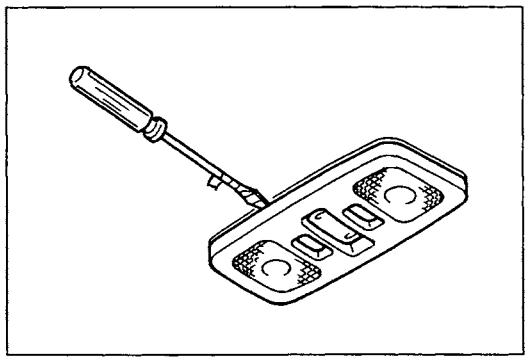
1. Insert a flathead screwdriver which has been wrapped in tape as shown in the figure.
2. Twist the screwdriver to remove the lens.

SPOT LIGHT
Removal / Installation
With sunroof

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.

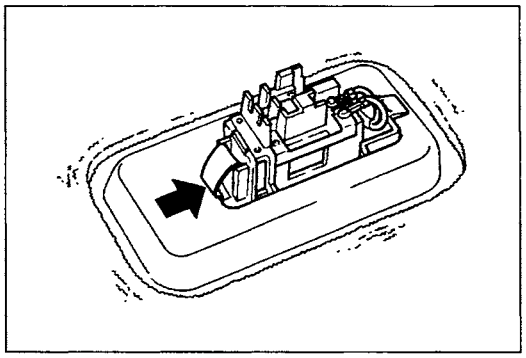


1. Lens
   Removal note ..... below
2. Bulbs (5 W × 2)
3. Connector
4. Housing



Removal note
Lens

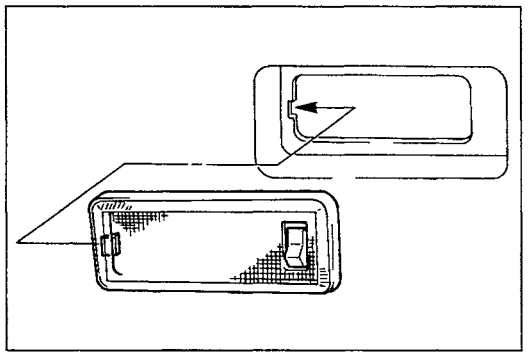
1. Insert a flathead screwdriver which has been wrapped in tape into the service hole between the lens and housing.
2. Twist the screwdriver to remove the lens.



CARGO COMPARTMENT LIGHT

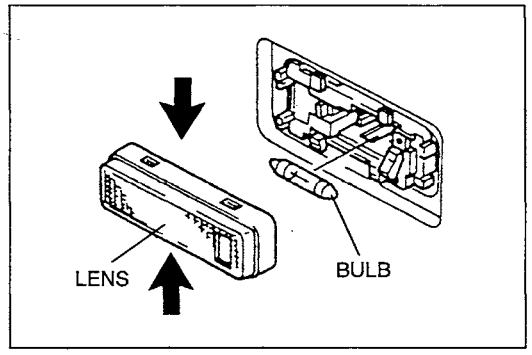
Removal

1. Remove the liftgate trim. (Refer to section S.)
2. Push the side of the housing and pull to remove it.



Installation

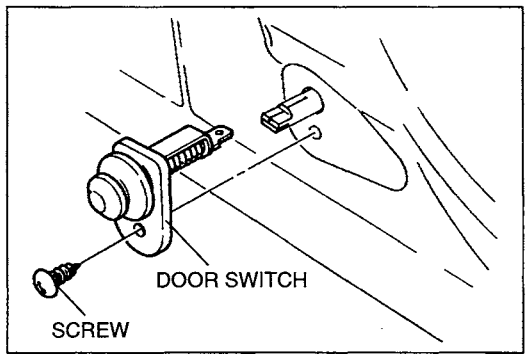
1. Connect the cargo compartment light connector.
2. Insert the side of the cargo compartment light as shown and push to install it.



Bulb Replacement

1. Push the sides of the lens as indicated by the arrows, and pull to remove it.
2. Remove the cargo compartment light bulb.
3. Install in the reverse order of removal.

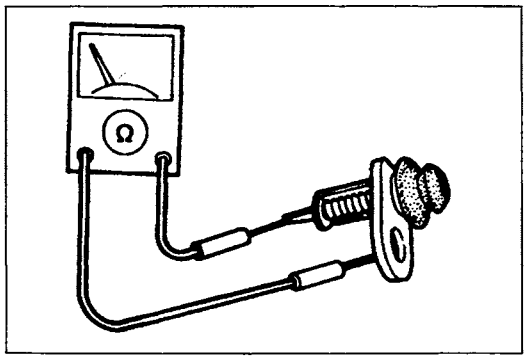
Cargo compartment light bulb: 8 W



DOOR SWITCH

Removal / Installation

1. Remove the screw.
2. Disconnect the door switch connector and remove the door switch.
3. Install in the reverse order of removal.

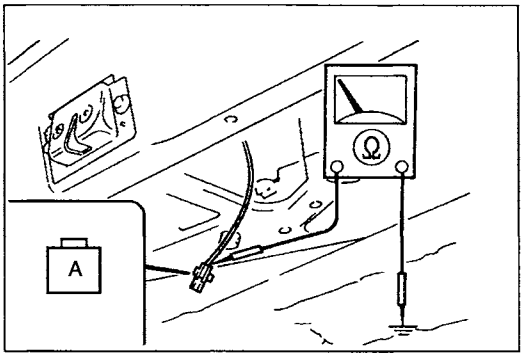


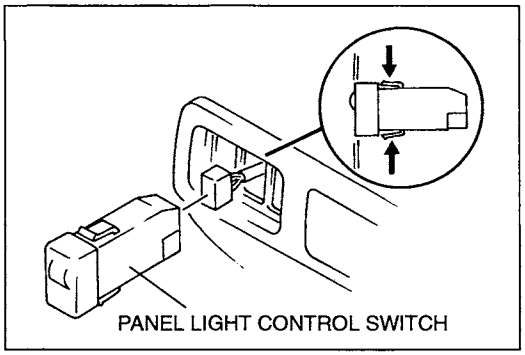
Inspection

1. Remove the door switch.
2. Check for continuity between the terminal and the switch body as shown in the figure.

Switch condition	Continuity
Pressed	No
Released	Yes

3. If not as specified, replace the door switch.





CARGO COMPARTMENT LIGHT SWITCH

Inspection

1. Remove the liftgate trim. (Refer to section S.)
2. Disconnect the cargo compartment light switch connector.
3. Check for continuity between the terminal of the cargo compartment light switch and ground.

Switch condition	Continuity
Pressed (liftgate closed)	No
Released (liftgate open)	Yes

4. If not as specified, replace the liftgate lock. (Refer to section S.)

PANEL LIGHT CONTROL SWITCH

Removal / Installation

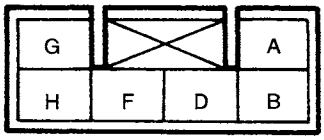
1. Remove the side panel. (Refer to section S.)
2. Disconnect the panel light control switch connector.
3. Remove the panel light control switch.
4. Install in the reverse order of removal.

Inspection

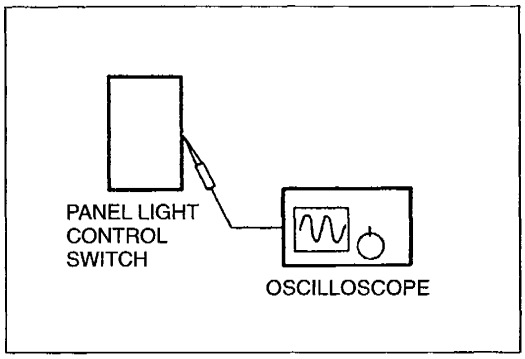
1. Remove the side panel. (Refer to section S.)
2. Measure the voltage at the panel light control switch as indicated below.
3. If not as specified, inspect the parts listed under "Inspection area" and the related wiring harnesses.
4. If the parts and wiring harnesses are OK but the system still does not work properly, replace the panel light control switch.

Terminal voltage list (Reference)

B+: Battery positive voltage



Terminal	Signal	Connection	Test condition	Voltage/ Continuity	Inspection area
A	Illumination	Each illumination	Inspect by using an oscilloscope (Refer to A terminal inspection)	—	—
B	—	—	—	—	—
D	TNS	Combination switch	Headlight switch at first or second position	B+	• Combination switch • TAIL 15 A fuse
			Other	0 V	
F	—	—	—	—	—
G	Ground	GND	Constant: check for continuity to ground	Yes	GND
H	—	—	—	—	—



A terminal inspection

1. Measure the wave pattern of the A terminal on the panel light control switch by using an oscilloscope.

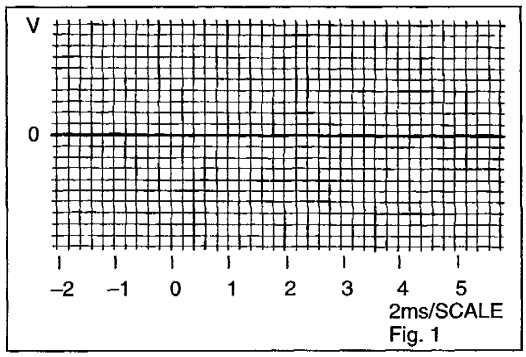


Fig. 1

2. Set the headlight switch to either the first or second position.
3. Set the panel light control switch to the brightest position.
4. Verify that the pattern on the screen is as shown in Fig. 1.

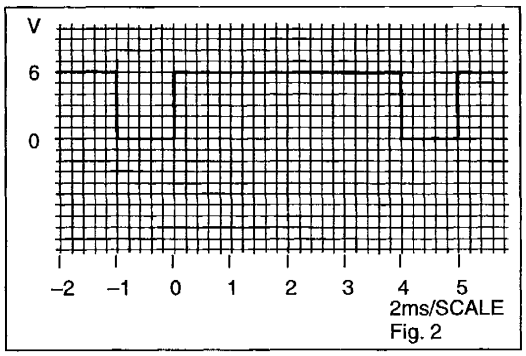
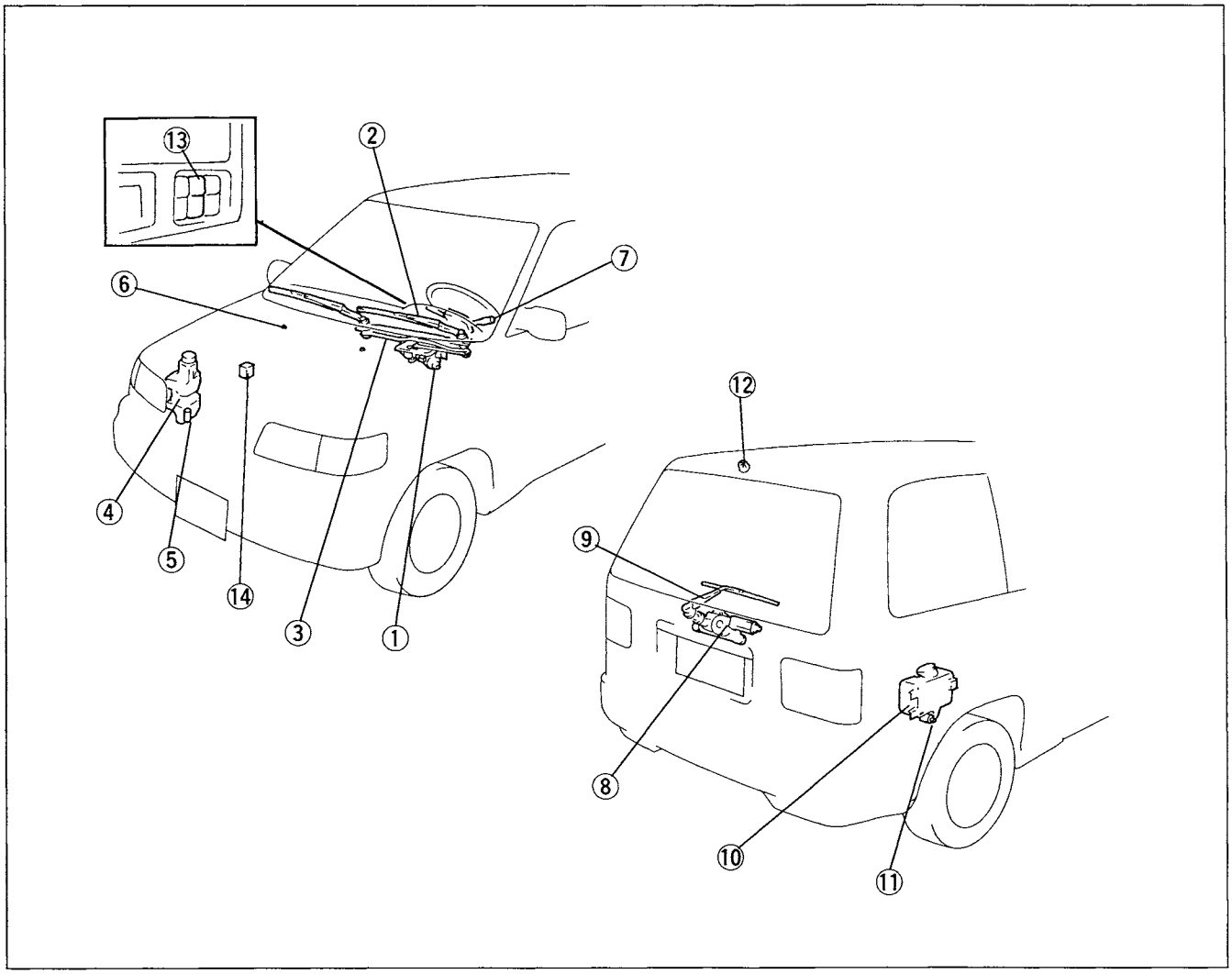


Fig. 2

5. Verify that the pattern on the screen changes to the pattern shown in Fig. 2 as the panel light control switch is gradually turned to the darkest position.
6. If the wave pattern is not as shown, replace the panel light control switch.

WIPER AND WASHER

STRUCTURAL VIEW

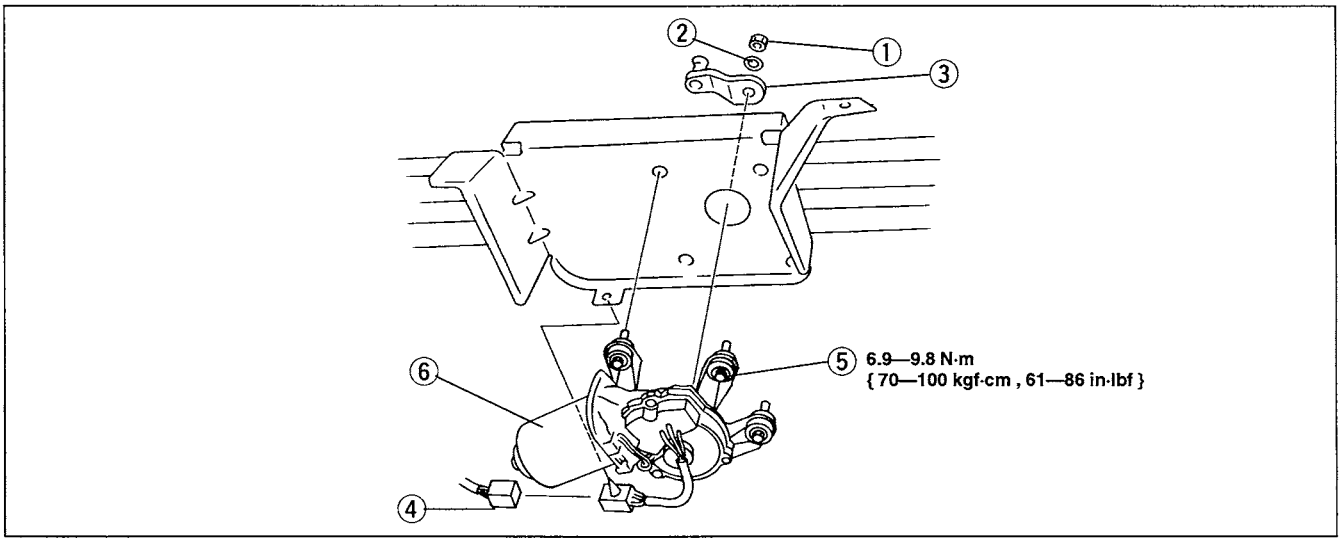


1. Windshield wiper motor
   - Removal / Installation ..... page T–28
   - Disassembly / Assembly ..... page T–28
   - Inspection ..... page T–29
2. Windshield wiper arm and blade
   - Removal / Installation ..... page T–30
   - Adjustment ..... page T–31
3. Windshield wiper link and frame
   - Removal / Installation ..... page T–31
4. Windshield washer tank
   - Removal / Installation ..... page T–32
5. Windshield washer motor
   - Removal / Installation ..... page T–32
   - Inspection ..... page T–32
6. Windshield washer nozzle
   - Adjustment ..... page T–32
7. Combination switch
   - Removal / Installation ..... page T–14
   - Inspection ..... page T–15
8. Rear wiper motor
   - Removal / Installation ..... page T–33
   - Disassembly / Assembly ..... page T–33
   - Inspection ..... page T–34
9. Rear wiper arm and blade
   - Removal / Installation ..... page T–35
   - Adjustment ..... page T–35
10. Rear washer tank
    - Removal / Installation ..... page T–36
11. Rear washer motor
    - Removal / Installation ..... page T–36
    - Inspection ..... page T–36
12. Rear washer nozzle
    - Removal ..... page T–37
    - Adjustment ..... page T–37
13. Rear wiper and washer switch
    - Removal / Installation ..... page T–37
    - Inspection ..... page T–37
14. Intermittent wiper relay
    - Removal / Installation ..... page T–38
    - Inspection ..... page T–38

WINDSHIELD WIPER MOTOR

Removal / Installation

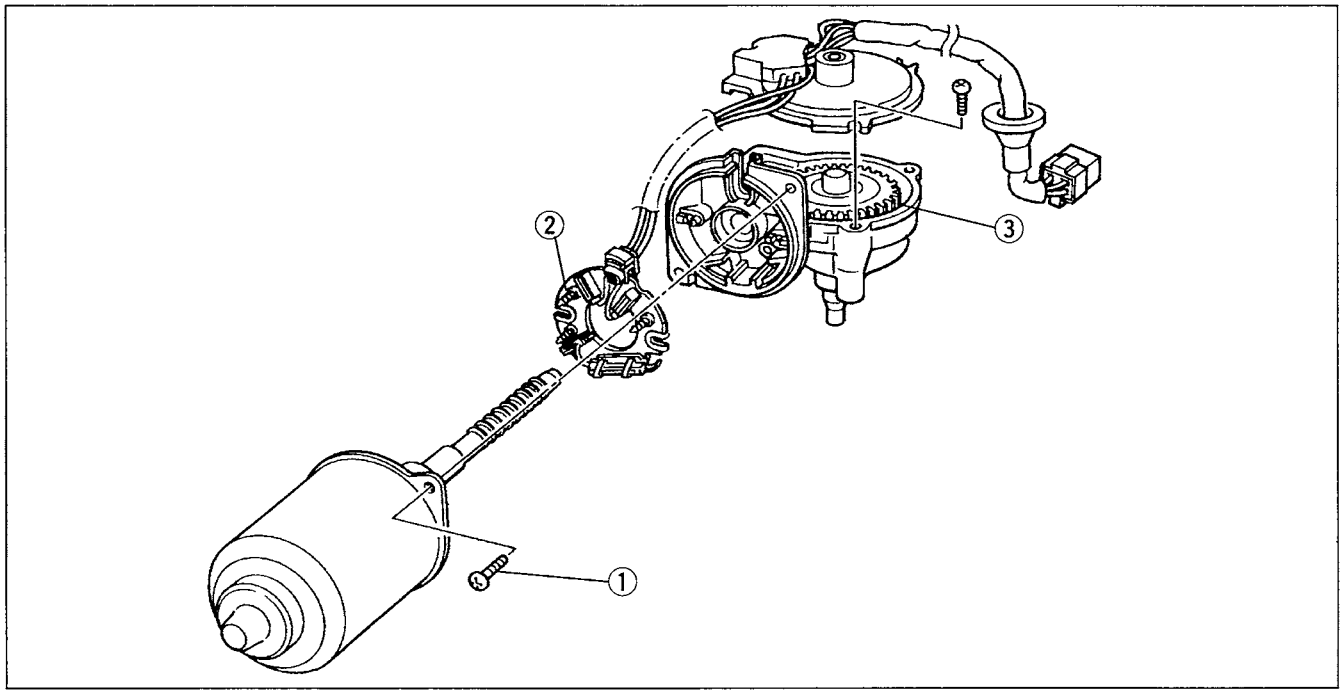
1. Remove the windshield wiper frame.
   (Refer to page T–31.)
2. Pry off the connection between the windshield wiper motor and windshield wiper link.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.



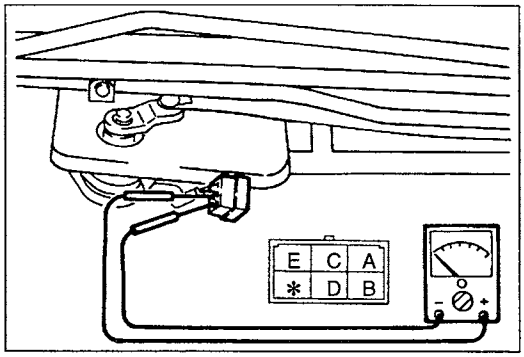
1. Nut
2. O-ring
3. Motor link
4. Connector
5. Bolt
6. Windshield wiper motor
   Disassembly / Assembly ..... below
   Inspection ..... page T–29

Disassembly / Assembly

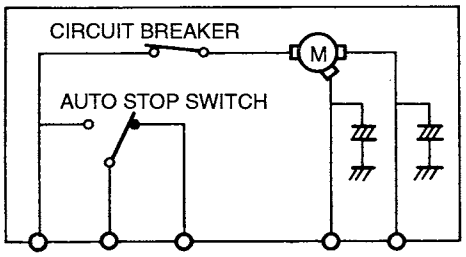
1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



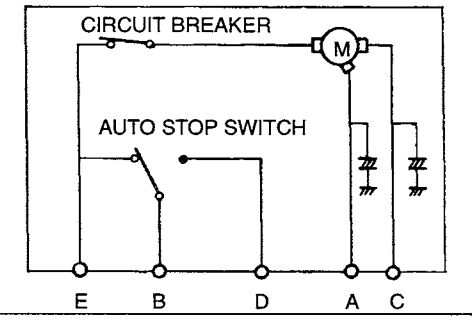
1. Screw
2. Brush plate holder
3. Motor gear shaft

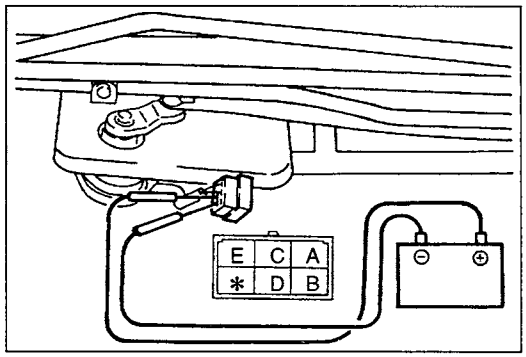


EXCEPT AUTO STOP



AUTO STOP





Inspection

1. Turn the ignition switch to LOCK while the windshield wiper is operating. Verify that the windshield wiper does not stop in the proper park position.
2. Disconnect the windshield wiper motor connector.
3. Check for continuity between the terminals of the windshield wiper motor.

O—O: Continuity

Windshield wiper motor position \ Terminal	A	B	C	D	E
Except autostop	O	O	O	O	O

4. Connect the windshield wiper motor connector.
5. Turn the wiper switch off while windshield wiper is operating. Verify that the windshield wiper stops in the park position.
6. Disconnect the windshield wiper motor connector.
7. Check for continuity between the terminals of the windshield wiper motor.

O—O: Continuity

Windshield wiper motor position \ Terminal	A	B	C	E
Auto stop	O	O	O	O

8. Apply battery positive voltage and check the operation of the wiper motor as indicated below.

B+: Battery positive voltage

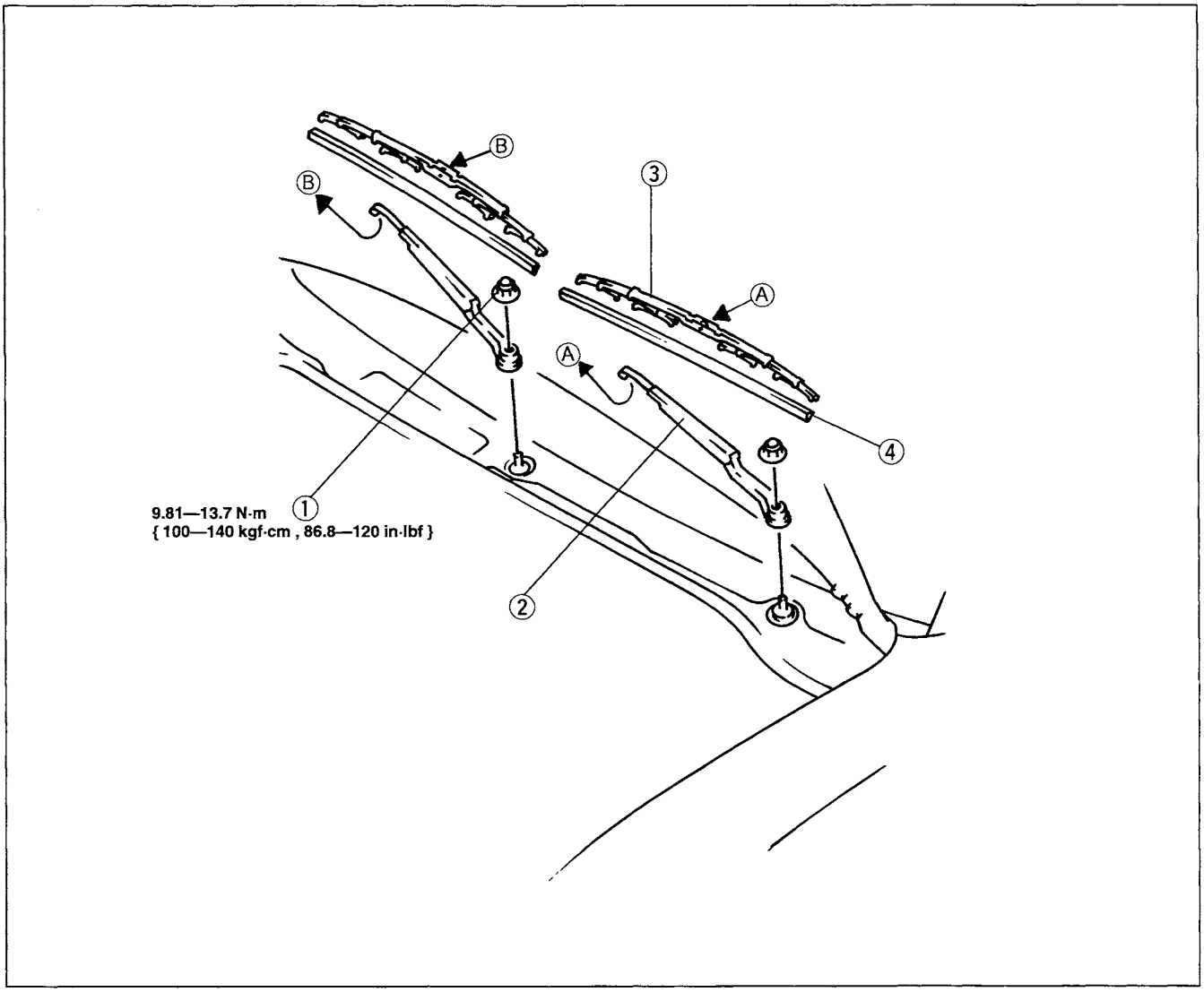
Connection		Operation speed
B+	GND	
C	E	Low
A		High

9. If not as specified, replace the necessary parts.

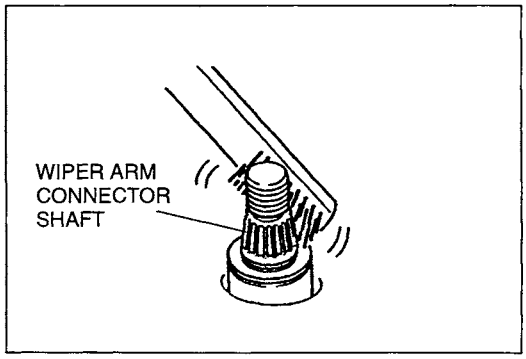
WINDSHIELD WIPER ARM AND BLADE

Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Adjust the windshield wiper arm.
   (Refer to page T–31.)



1. Nut
2. Windshield wiper arm
   Installation note ..... below
3. Windshield wiper blade
4. Rubber brush



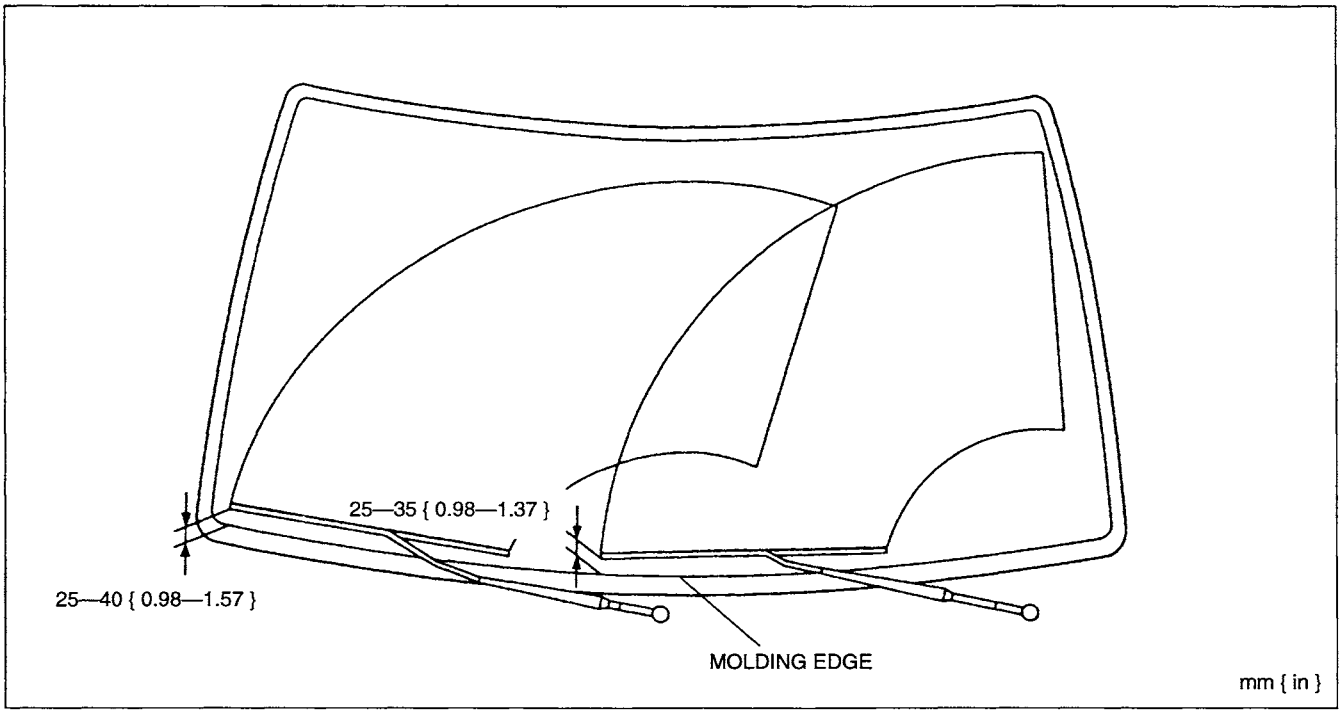
Installation note

Windshield wiper arm

Clean the wiper arm connector shafts with a wire brush before installing the wiper arms.

Adjustment

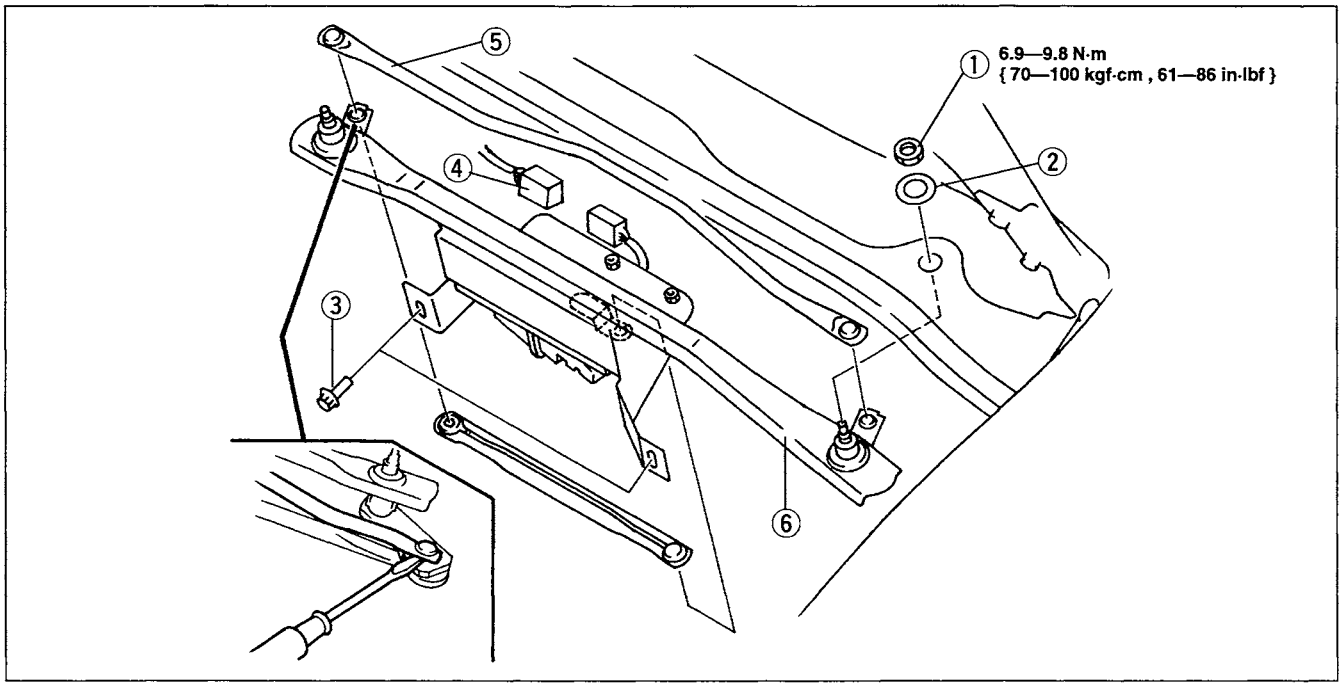
1. Operate the windshield wiper motor to set the wipers in the park position.
2. Set the windshield wiper arm height as shown.



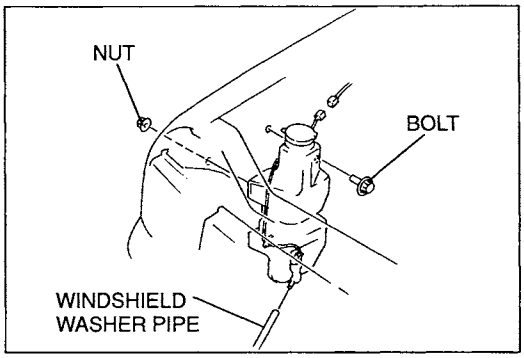
WINDSHIELD WIPER LINK AND FRAME

Removal / Installation

1. Remove the windshield wiper arm and blade. (Refer to page T–30.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



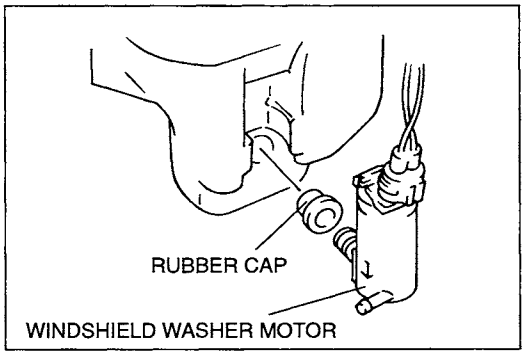
1. Nut
2. Seal ring
3. Bolt
4. Connector
5. Windshield wiper link
6. Windshield wiper frame



WINDSHIELD WASHER TANK

Removal / Installation

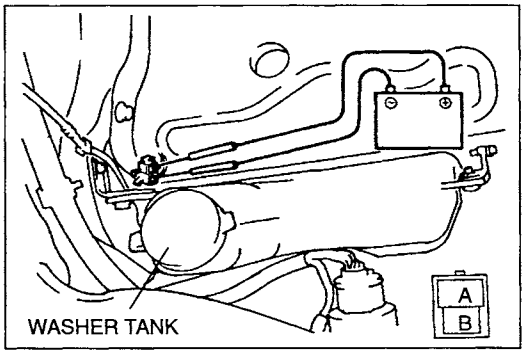
1. Remove the front combination light. (Refer to page T–12.)
2. Disconnect the windshield washer motor connector.
3. Remove the bolt and nut.
4. Disconnect the windshield washer pipe and remove the windshield washer tank.
5. Install in the reverse order of removal.



WINDSHIELD WASHER MOTOR

Removal / Installation

1. Remove the windshield washer tank.
2. Extract the washer fluid.
3. Remove the windshield washer motor and rubber cap.
4. Install in the reverse order of removal.



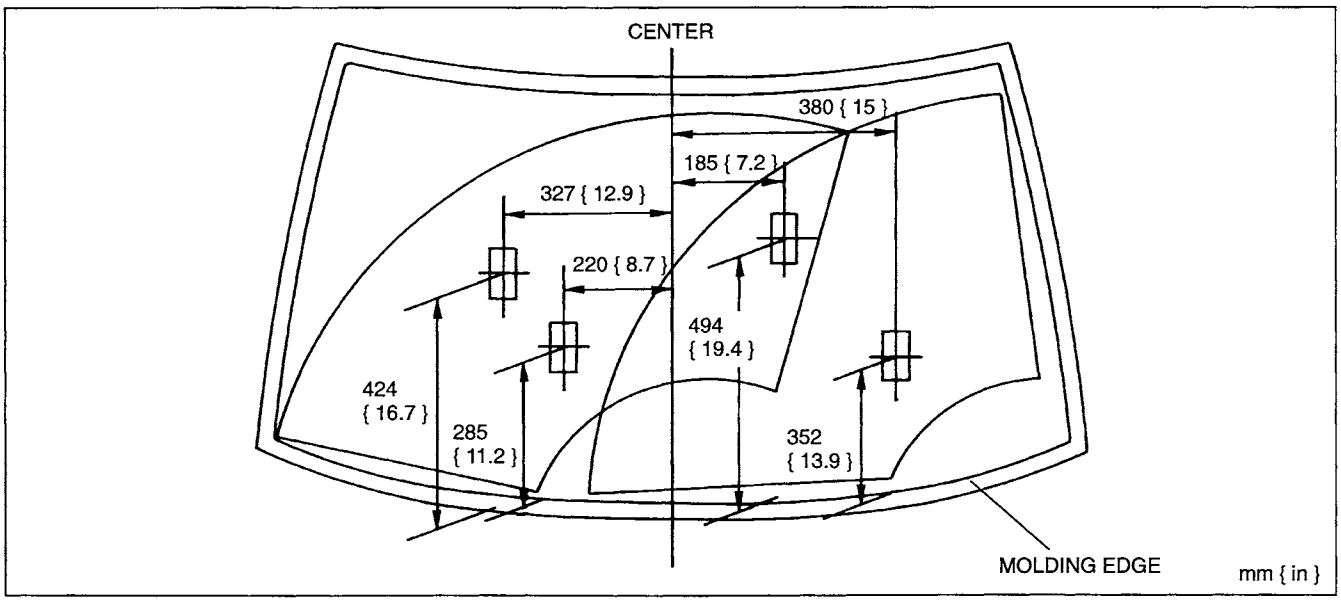
Inspection

1. Disconnect the windshield washer motor connector.
2. Connect battery positive voltage to terminal B and ground to terminal A of the windshield washer motor.
3. Verify that the windshield washer motor operates.
4. If the motor does not operate, replace it.

WINDSHIELD WASHER NOZZLE

Adjustment

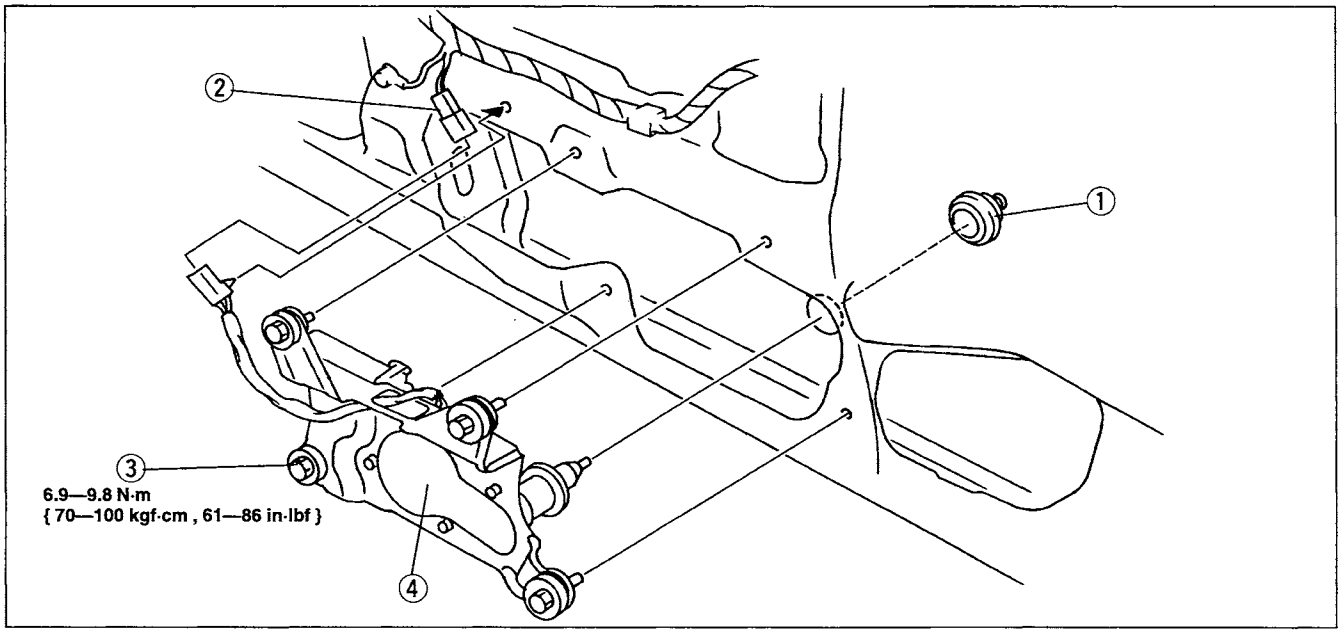
Adjust the windshield washer nozzle direction as shown in the figure by using a needle or equivalent tool.



REAR WIPER MOTOR

Removal / Installation

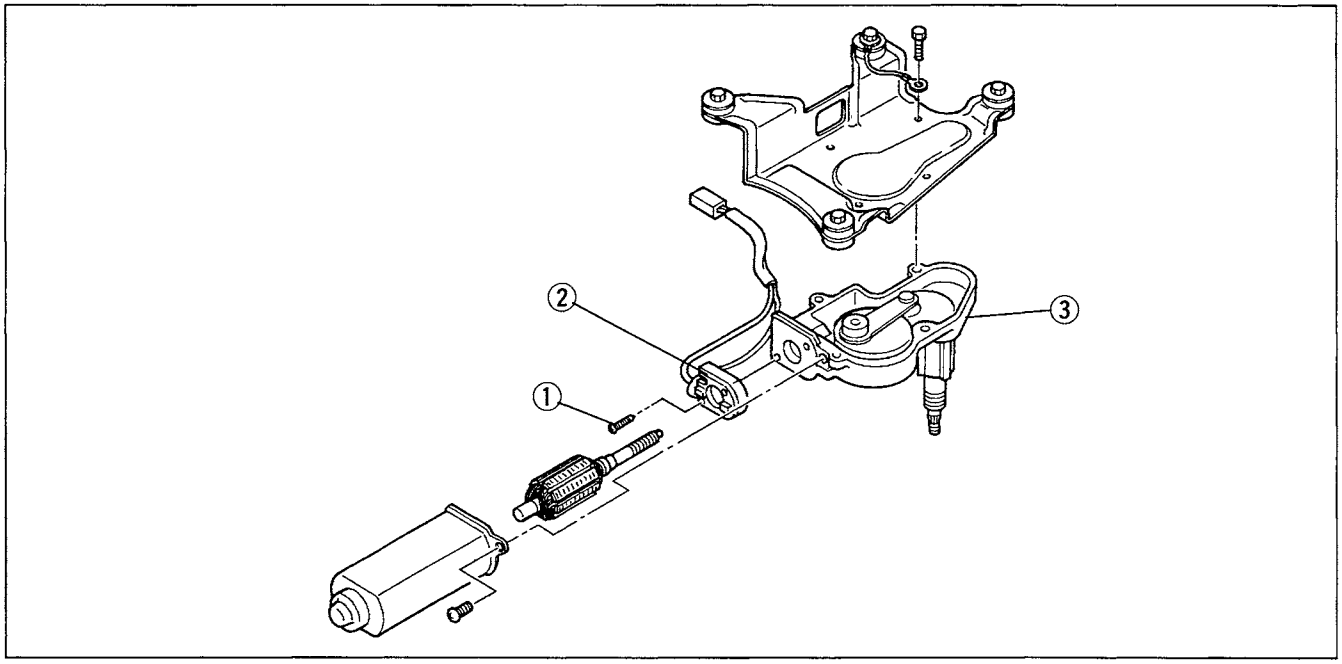
1. Remove the liftgate trim and liftgate screen. (Refer to section S.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



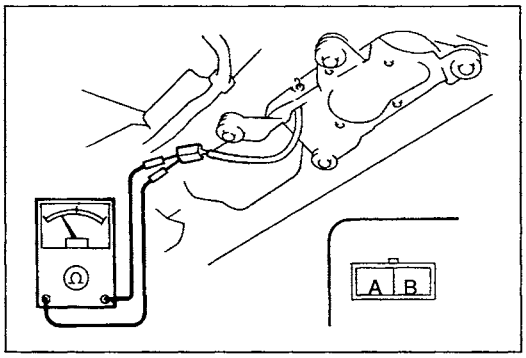
1. Outer bush
2. Connector
3. Bolt
4. Rear wiper motor
   Disassembly / Assembly ..... below
   Inspection ..... page T–34

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.

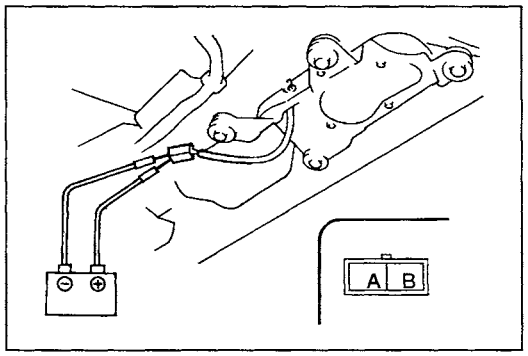


1. Screw
2. Brush plate holder
3. Motor gear shaft

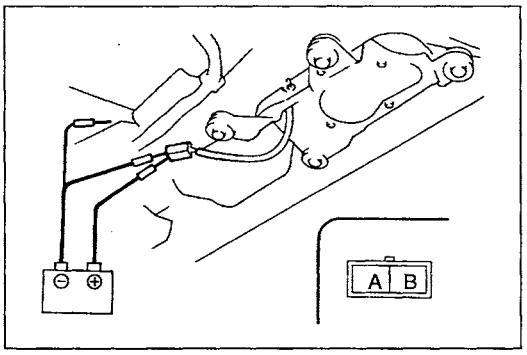


Inspection

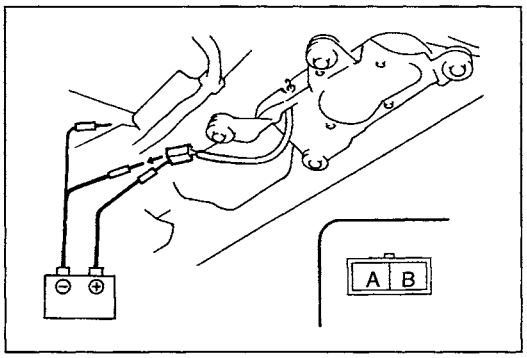
1. Remove the liftgate trim and liftgate screen. (Refer to section S.)
2. Disconnect the rear wiper motor connector.
3. Check for continuity between terminals A and B of the rear wiper motor.
4. If there is no continuity, replace the necessary parts. (Refer to page T–33.)



5. Connect battery positive voltage to terminal A and ground terminal B. Verify that the rear wiper motor operates.
6. If the rear wiper motor does not operate, replace the necessary parts. (Refer to page T–33.)



7. Connect battery positive voltage to terminal A and ground to terminal B and the rear wiper motor body to operate the motor.

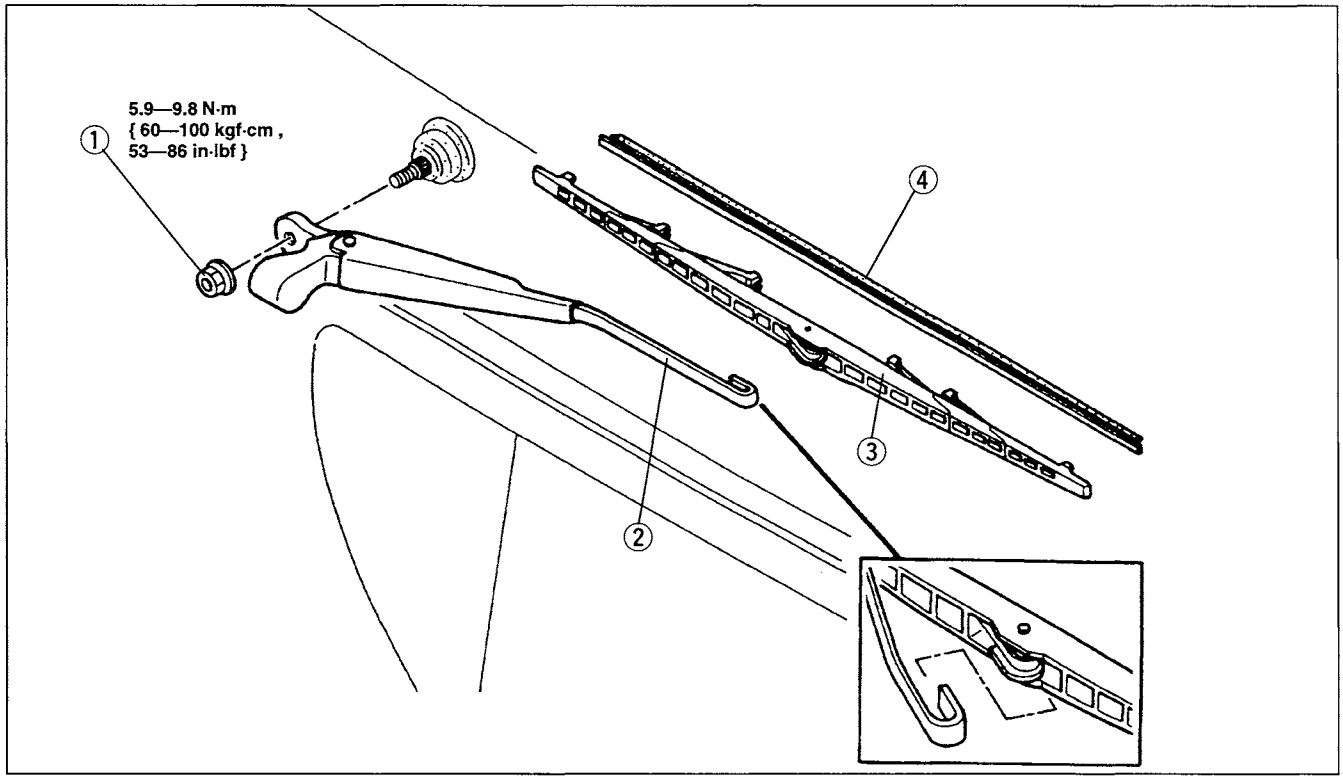


8. While the rear wiper motor is operating, remove the ground from terminal B. Verify that the auto stop function operates.
9. If not as specified, replace the necessary parts. (Refer to page T–33.)

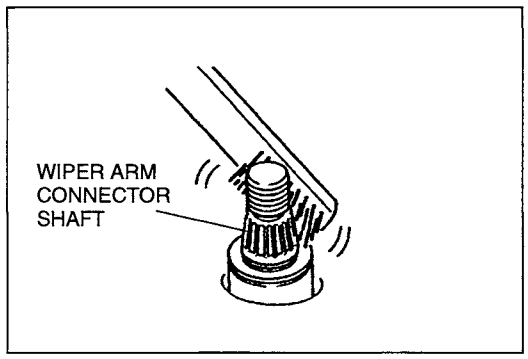
REAR WIPER ARM AND BLADE

Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Adjust the rear wiper arm.



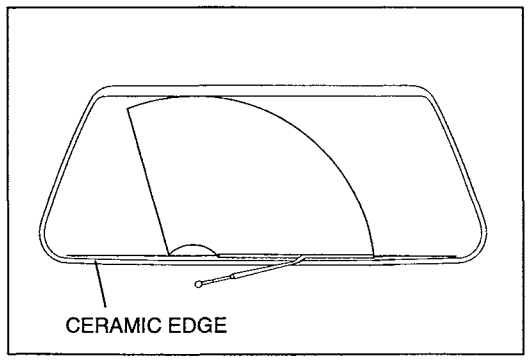
1. Nut
2. Rear wiper arm
   Installation note ..... below
3. Rear wiper blade
4. Rubber brush



Installation note

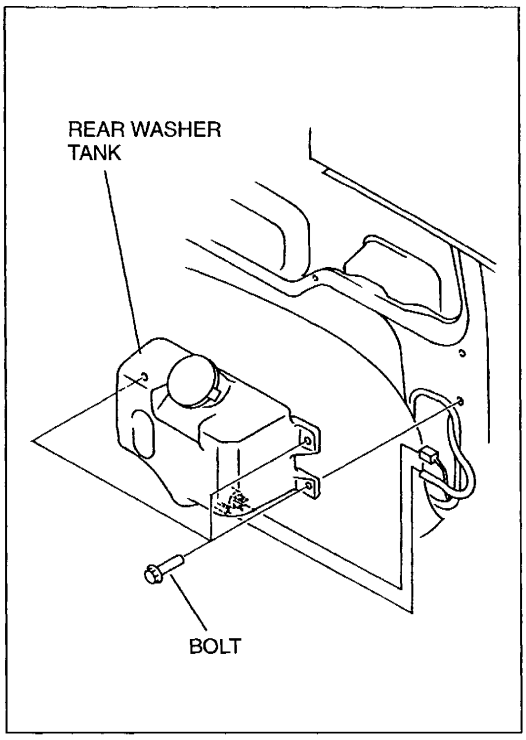
Rear wiper arm

Clean the wiper arm connector shafts with a wire brush before installing the wiper arms.

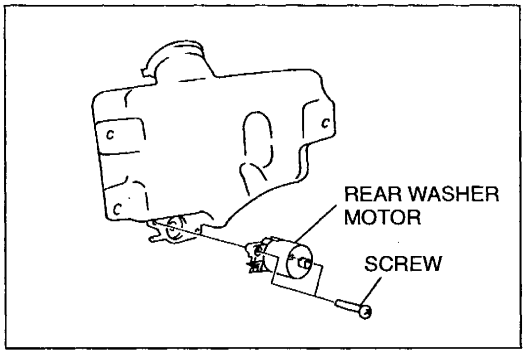


Adjustment

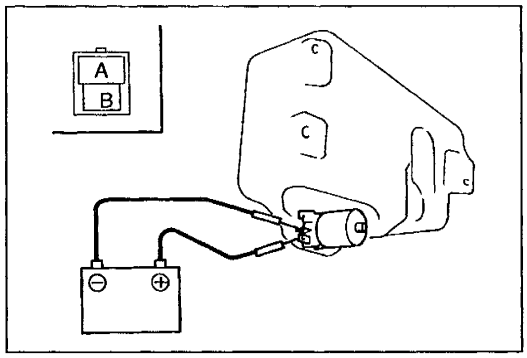
1. Operate the rear wiper motor to set the wiper in the park position.
2. Align the rear wiper with the bottom ceramic end line by moving the position of the wiper arm connector shaft.



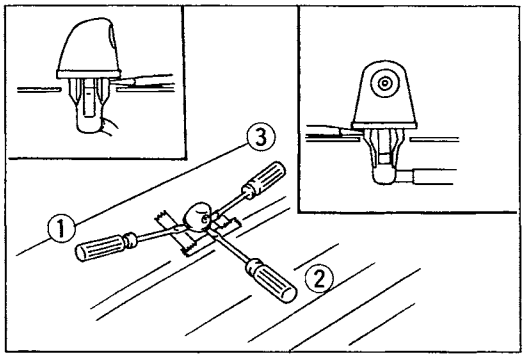
REAR WASHER TANK
Removal / Installation
1. Remove the rear side trim. (Refer to section S.)
2. Remove the bolts.
3. Disconnect the rear washer pipe and rear washer motor connector.
4. Remove the rear washer tank.
5. Install in the reverse order of removal.



REAR WASHER MOTOR
Removal / Installation
1. Remove the rear washer tank.
2. Extract the washer fluid.
3. Remove the screws.
4. Remove the rear washer motor.
5. Install in the reverse order of removal.



Inspection
1. Remove the rear washer tank.
2. Connect battery positive voltage to terminal B and ground to terminal A of the motor.
3. Verify that the rear washer motor operates.
4. If the rear washer motor does not operate, replace it.



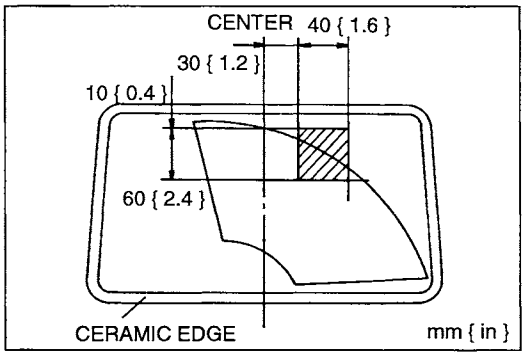
REAR WASHER NOZZLE

Removal

1. Apply protective tape to the body around the washer nozzle.
2. Insert a tape-wrapped, flathead screwdriver under the side ① of the nozzle and push the nozzle clip.
3. Insert another tape-wrapped, flathead screwdriver under the rear ② of the nozzle.
4. Remove the first screwdriver and insert it under the side ③ of the nozzle.
5. Disconnect the washer pipe from the washer nozzle to remove the nozzle.

Adjustment

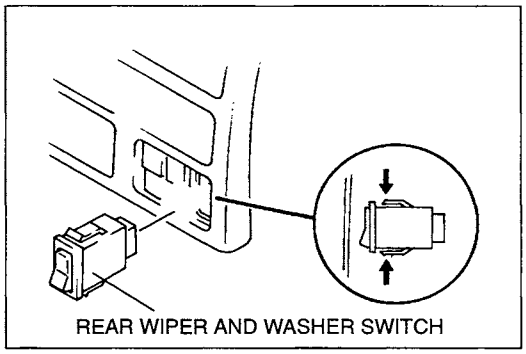
Adjust the rear washer nozzle direction as shown in the figure by using a needle or equivalent tool.



REAR WIPER AND WASHER SWITCH

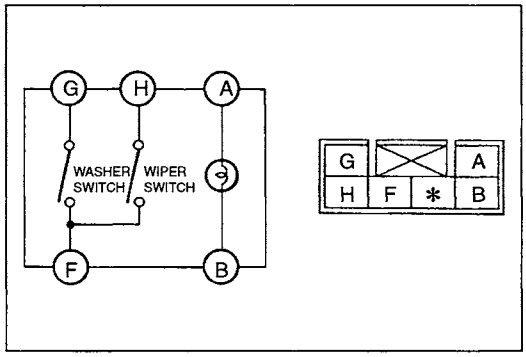
Removal / Installation

1. Remove the center upper panel. (Refer to section S.)
2. Remove the rear wiper and washer switch.
3. Install in the reverse order of removal.



Inspection

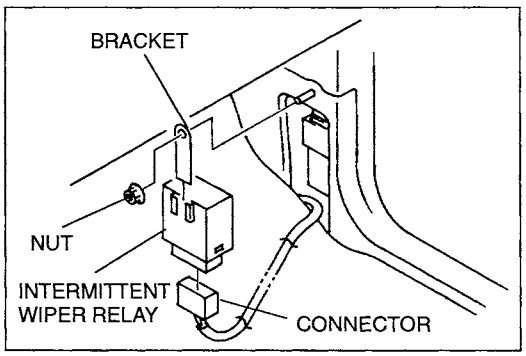
1. Remove the rear wiper and washer switch.
2. Check for continuity between the terminals of the rear wiper and washer switch.



○—⓪—○ : Bulb ○—○ : Continuity

Switch position \ Terminal	A	B	F	G	H
OFF	○—⓪—○				
Washer switch ON	○—⓪—○		○—○		
Wiper switch ON	○—⓪—○		○		○

3. If not as specified, replace the rear wiper and washer switch.



INTERMITTENT WIPER RELAY

Removal / Installation

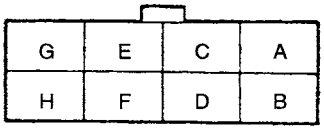
1. Remove the passenger's-side front side trim. (Refer to section S.)
2. Disconnect the intermittent wiper relay connector.
3. Remove the nut.
4. Remove the bracket to remove the intermittent wiper relay.
5. Install in the reverse order of removal.

Inspection

1. Remove the passenger's-side front side trim. (Refer to section S.)
2. Measure the voltage at the intermittent wiper relay as indicated below.
3. If not as specified, inspect the parts listed under "Inspection area" and the related wiring harnesses.
4. If the parts and wiring harnesses are OK but the system still does not work properly, replace the intermittent wiper relay.

Terminal voltage list (reference)

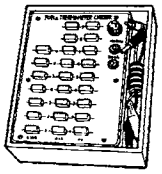
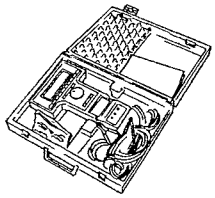
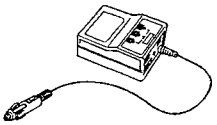
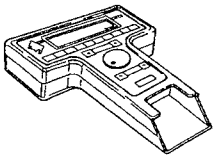
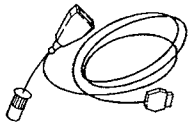
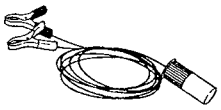
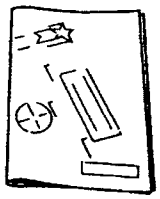
B+: Battery positive voltage



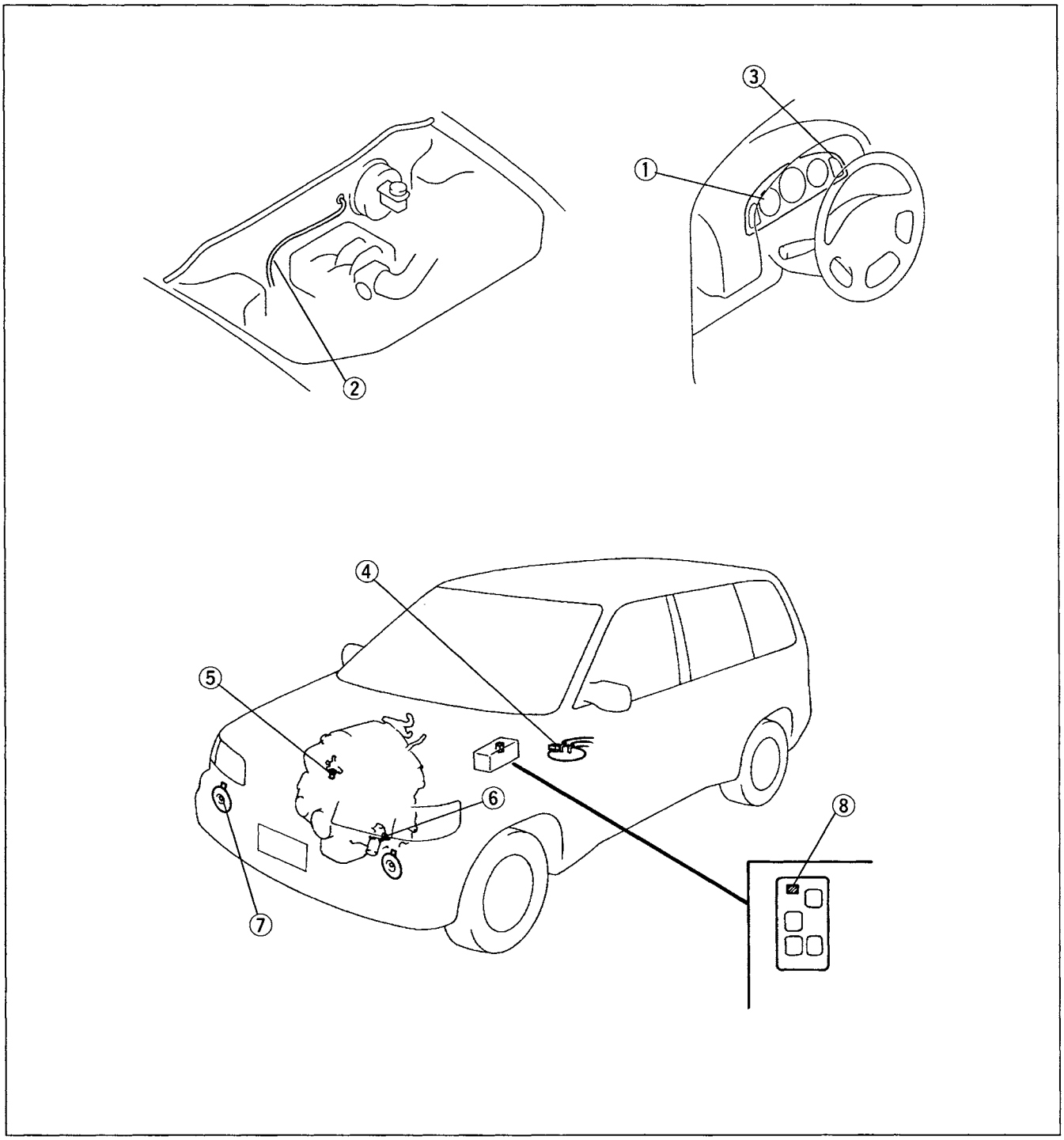
Terminal	Signal	Connection	Test condition		Voltage/ Continuity/ Resistance		Inspection area
A	Auto stop	Windshield wiper motor	Windshield wipers operate		Alternates 0 V and B+		Windshield wiper motor
			Other		0 V		
B	Windshield washer switch on	Windshield washer switch	Ignition switch at ON	Windshield washer switch on	B+		• WIPER 20 A fuse • Combination switch
				Windshield washer switch off	0 V		
C	INT	Windshield wiper switch	Ignition switch at ON	Windshield wiper switch INT	B+		• WIPER 20 A fuse • Combination switch
				Other	0 V		
D	IG 2	WIPER 20 A fuse	Ignition switch at ON		B+		WIPER 20 A fuse
E	INT speed	INT volume	Disconnect intermittent wiper relay connector	Measure the resistance between the H terminal at each speed setting of the INT volume	LO position	Approx 50 kΩ	• WIPER 20 A fuse • Combination switch
					MID position	Approx 35 kΩ	
					HI position	Approx 15 kΩ	
F	Auto stop	Windshield wiper switch	Ignition switch at ON	Intermittent wiper operate	Alternates 0 V and B+		• WIPER 20 A fuse • Combination switch
				Other	0 V		
G	Ground	GND	Constant: check for continuity to ground		Yes		GND
H	INT speed	INT volume	Disconnect intermittent wiper relay connector	Measure the resistance between the E terminal at each speed setting of the INT volume	LO position	Approx 50 kΩ	• WIPER 20 A fuse • Combination switch
					MID position	Approx 35 kΩ	
					HI position	Approx 15 kΩ	

WARNING AND INDICATOR SYSTEM

PREPARATION
SST

49 0839 285 Checker, fuel thermometer 	For inspection of fuel and water temperature gauges	49 T088 0A0 NGS set 	For inspection of tachometer
49 T088 002 Vehicle Interface Module (Part of 49 T088 0A0) 	For inspection of tachometer	49 T088 010B Program Card 	For inspection of tachometer
49 T088 001 Control unit (Part of 49 T088 0A0) 	For inspection of tachometer	49 T088 004 NGS OBD II Adapter (Part of 49 T088 0A0) 	For inspection of tachometer
49 T088 006 Battery Hookup Adapter (Part of 49 T088 0A0) 	For inspection of tachometer	49 T088 008A Instruction Manual 	For inspection of tachometer

STRUCTURAL VIEW

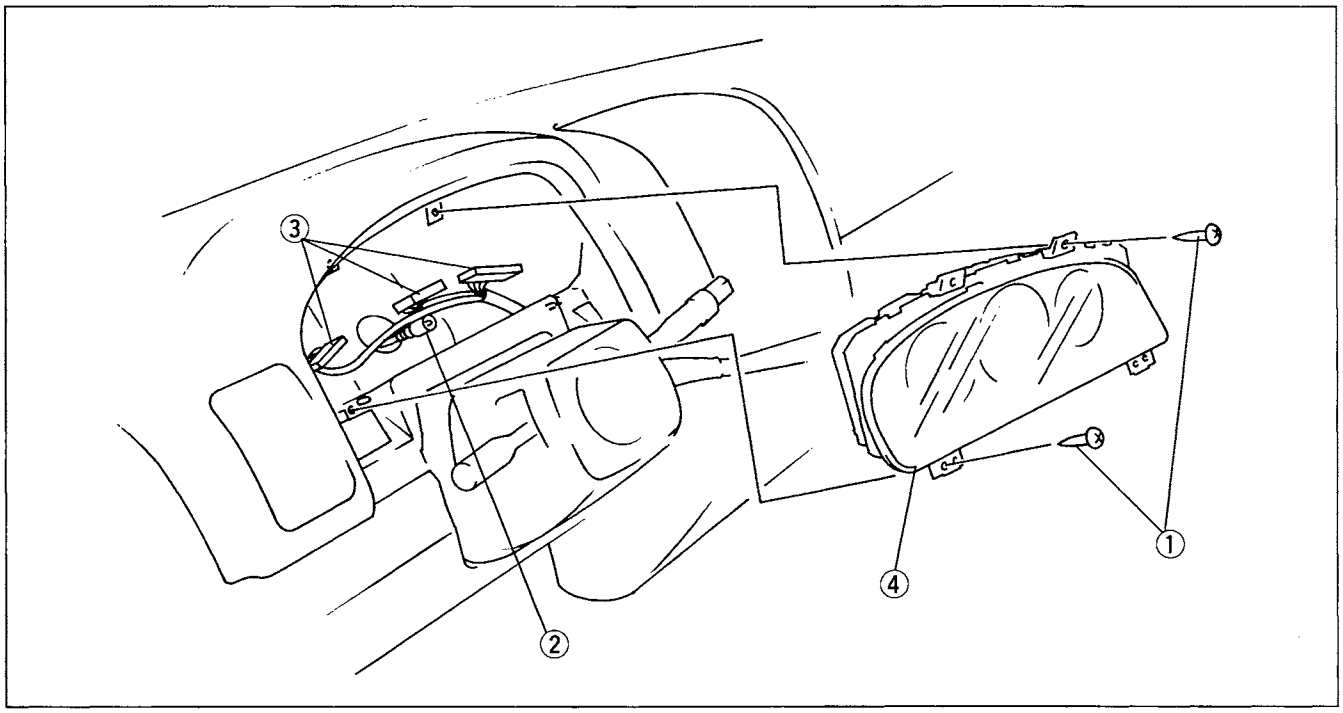


1. Instrument cluster
   - Removal / Installation ..... page T–41
   - Disassembly / Assembly ..... page T–42
   - Inspection ..... page T–43
2. Speedometer cable
   - Inspection ..... page T–44
3. Warning and indicator light
   - Structural view ..... page T–45
   - Bulb replacement ..... page T–45
4. Fuel gauge sender unit
   - Inspection ..... page T–46
5. Water temperature sender unit
   - Removal ..... page T–46
   - Installation ..... page T–46
   - Inspection ..... page T–46
6. Oil pressure switch
   - Inspection ..... page T–47
7. Horn
   - Removal / Installation ..... page T–47
   - On-vehicle inspection ..... page T–47
8. Horn relay
   - Inspection ..... page T–47

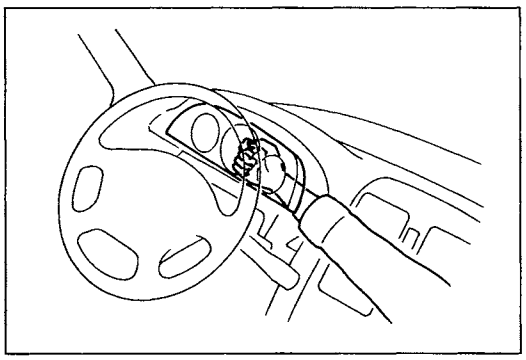
INSTRUMENT CLUSTER

Removal / Installation

1. Shift the selector lever to L range.
2. Remove the meter hood.
   (Refer to section S.)
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.



1. Screws
2. Speedometer cable
   Removal note ..... below
3. Connectors
4. Instrument cluster
   Disassembly / Assembly ..... page T–42
   Inspection ..... page T–43



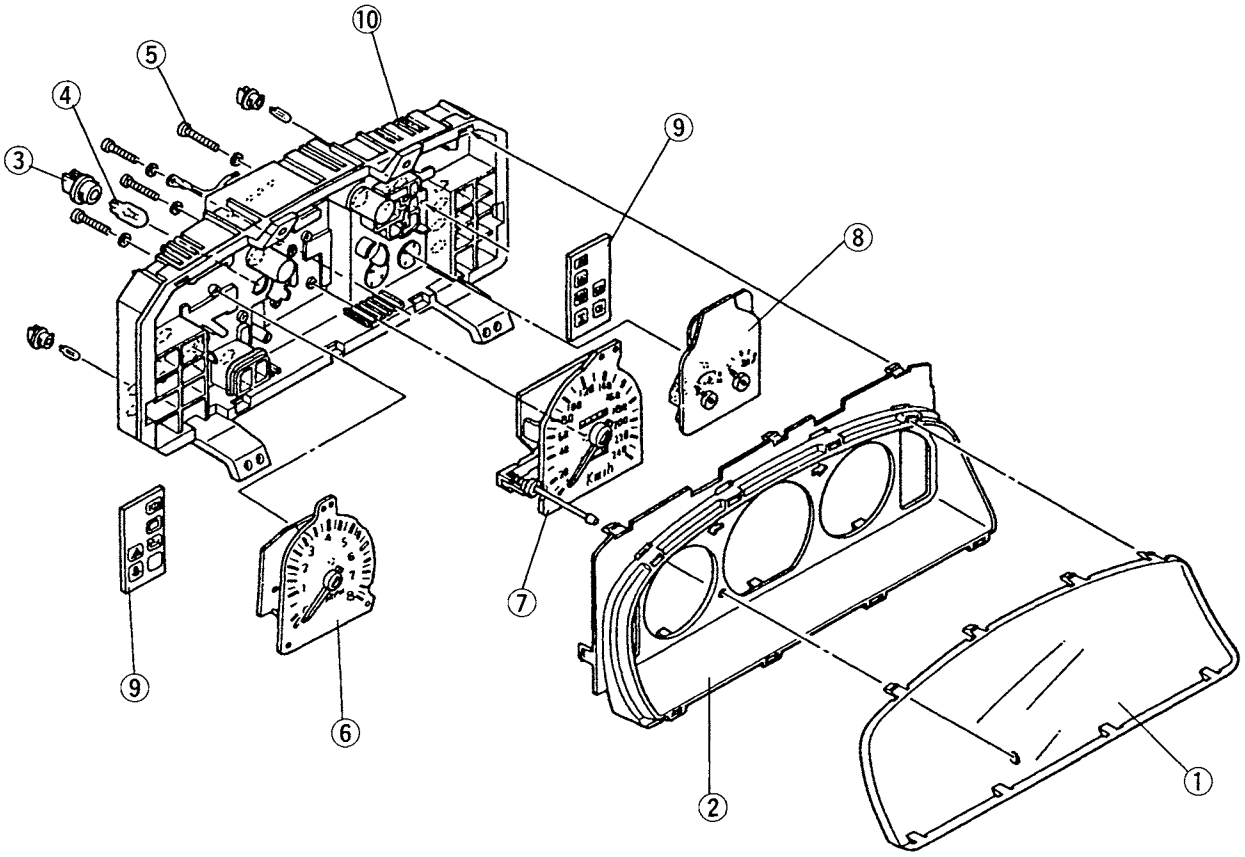
Removal note

Speedometer cable

1. Remove the speedometer cable from the clips.
2. Insert the speedometer cable into the cabin.
3. Insert your hand into the dashboard from the bottom right of the instrument cluster as shown.
4. Disconnect the speedometer cable.

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



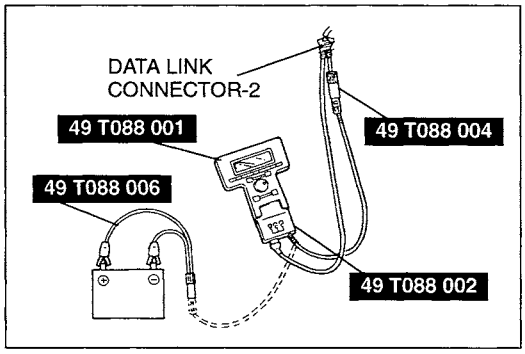
1. Glass
2. Window plate
3. Socket
4. Bulb
5. Screw
6. Tachometer
7. Speedometer
8. Fuel and water temperature gauges
9. Sheet warning
10. Case

Inspection
Speedometer
1. Using a speedometer tester, verify that the indication of speedometer is within the error can be permitted range shown below.

Indication of speedometer (km/h)	Error can be permitted (km/h)
40	36.0—46.0
90	81.0—103.5

Indication of speedometer (MPH)	Error can be permitted (MPH)
30	27.0—34.5
80	72.0—92.0

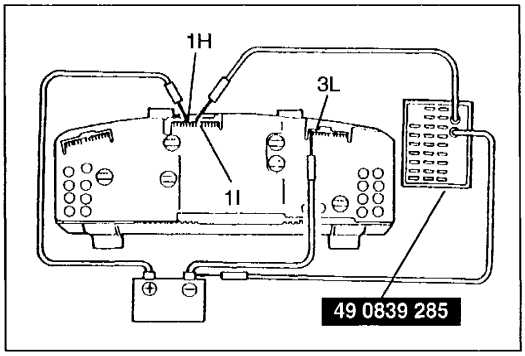
2. If the speedometer does not operate or the indication error is excessive, inspect the speedometer cable. (Refer to page T–41.)
3. If the speedometer cable is OK, replace the speedometer. (Refer to pages T–41, 42.)

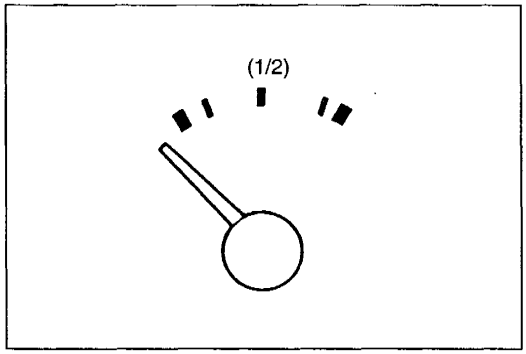


Tachometer
1. Connect the **SSTs** (NGS) to the data link connector–2, located under the dashboard on the driver's side, and to the battery.
2. Referring to NGS operation manual, select the PID DATA MONITOR function.
3. Using the PID DATA MONITOR function, measure the engine speed.
4. Compare the values of the vehicle tachometer and the **SST** (NGS).

Indication of tachometer (rpm)	Error can be permitted (rpm)
1000	880—1060
2000	1970—2150
3000	3000—3180
4000	4000—4240
5000	5000—5300

5. If the tachometer does not operate or the indication error is excessive, inspect the wiring harness.
6. If the wiring harness is OK, inspect the ECM. (Refer to section F.)
7. If the ECM is OK, replace the tachometer. (Refer to pages T–41, 42.)



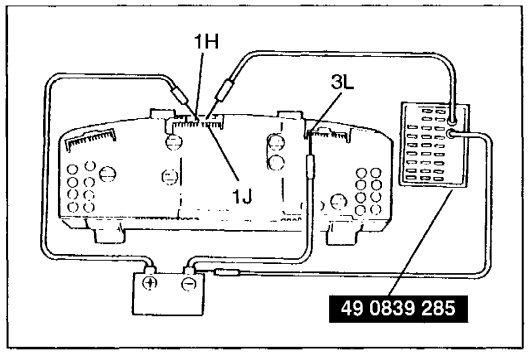


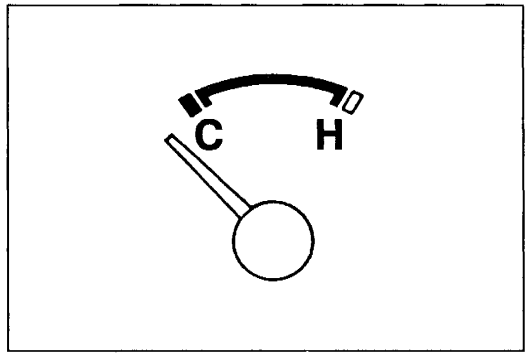
Fuel gauge

1. Remove the instrument cluster.
   (Refer to page T–41.)
2. Connect battery positive voltage to terminal 1H and ground to terminal 3L of the instrument cluster.
3. Connect the positive (+) lead of the **SST** to terminal 1I of the instrument cluster and the negative (–) lead to ground.
4. Verify that the fuel gauge indicates the values shown below.

Resistance of SST (Ω)	Indication of fuel gauge
95	E
32.5	(1/2)
7	F

5. If not as specified, replace the fuel and water temperature gauges.
   (Refer to page T–42.)



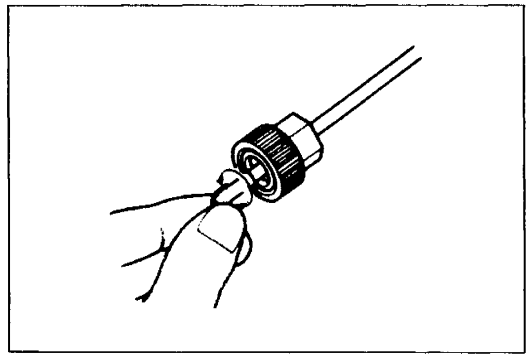


Water temperature gauge

1. Remove the instrument cluster.
   (Refer to page T–41.)
2. Connect battery positive voltage to terminal 1H and ground to terminal 3L of the instrument cluster.
3. Connect the positive (+) lead of the **SST** to terminal 1J of the instrument cluster and the negative (–) lead to ground.
4. Verify that the water temperature gauge indicates the values shown below.

Resistance of SST (Ω)	Indication of water temperature gauge
125.3	C
16.9	H

5. If not as specified, replace the fuel and water temperature gauges.
   (Refer to page T–42.)

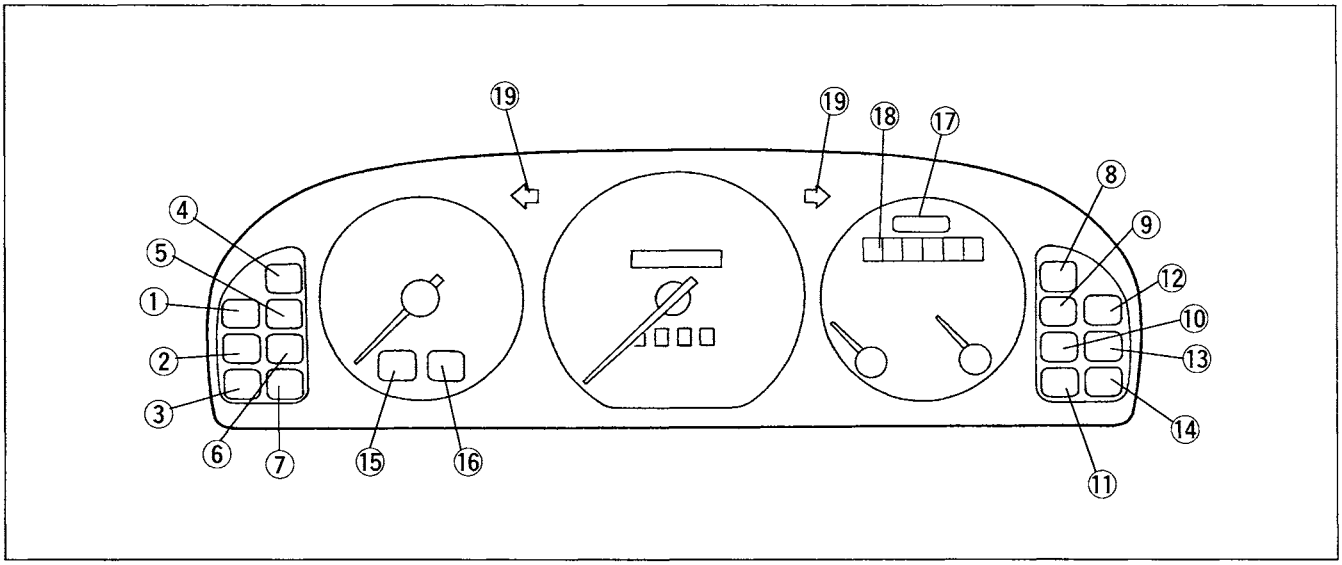


SPEEDOMETER CABLE

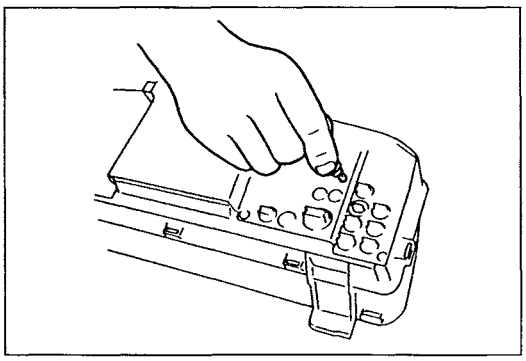
Inspection

1. Disconnect the speedometer cable from the instrument cluster and transmission case.
2. Verify that the cable spin easily when turned by hand.
3. If the cable is stiff, replace the speedometer cable.

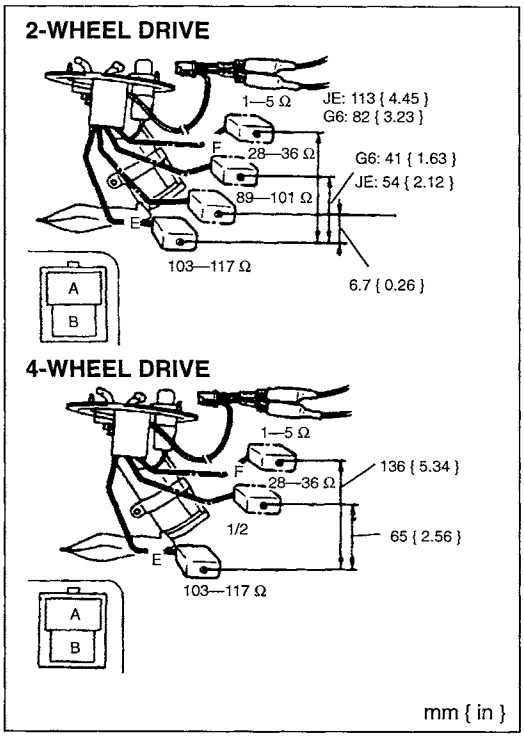
WARNING AND INDICATOR LIGHT
Structural View



	Bulb		Specification
1	Door ajar warning light		1.4W
2	Air bag system warning light		1.4W
3	Oil pressure warning light		1.4W
4	Generator warning light		1.4W
5	MIL		1.4W
6	Brake system warning light		1.4W
7	Seat belt warning light		1.4W
8	Fuel-level warning light		3.4W
9	ABS warning light		1.4W
10	ALL indicator light		1.4W
11	4WD indicator light	4WD only	3.4W
12	Center differential lock indicator light	4WD only	3.4W
13	Cruise set indicator light		1.4W
14	Rear window defroster indicator light		1.4W
15	AT oil temperature indicator light	4WD only	1.4W
16	High beam indicator light		1.4W
17	O/D OFF indicator light		1.4W
18	AT position indicator light		2.0W×6
19	Turn signal indicator light		3.0W×2
—	Instrument cluster illumination		3.4W×4



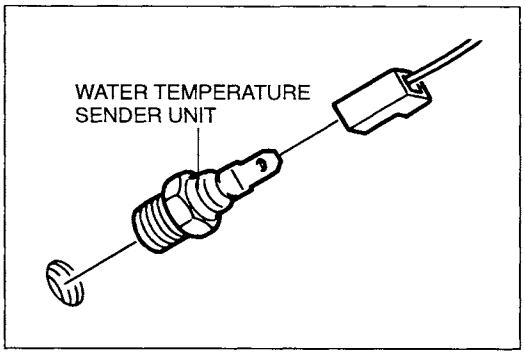
Bulb Replacement
1. Remove the instrument cluster.
   (Refer to page T–41.)
2. Replace the faulty bulbs. Use only the bulbs specified above.



FUEL GAUGE SENDER UNIT

Inspection

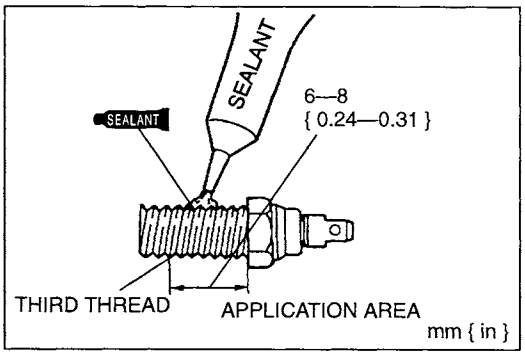
1. Remove the fuel gauge sender unit. (Refer to section F.)
2. Measure the resistance between terminals A and B while moving the unit arm from point F to point E.
3. If not as specified, replace the fuel gauge sender unit. (Refer to section F.)



WATER TEMPERATURE SENDER UNIT

Removal

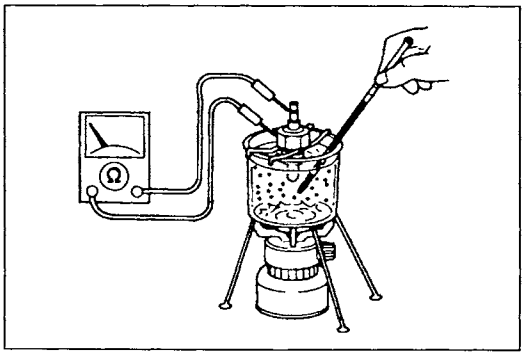
1. Disconnect the water temperature sender unit connector.
2. Remove the water temperature sender unit.



Installation

1. Apply sealant from the third thread to the top thread.
2. Install in the reverse order of removal.

Tightening torque:
6.4—9.3 N·m { 65—95 kgf·cm , 57—82 in·lbf }

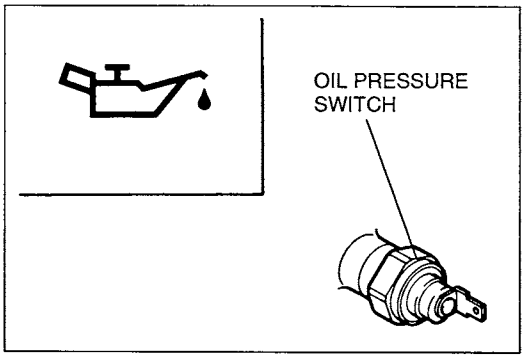


Inspection

1. Remove the water temperature sender unit.
2. Place the water temperature sender unit in a container of water.
3. Heat the water gradually, and measure the resistance of the water temperature sender unit.

Temperature	°C { °F }	50 { 122 }
Resistance	Ω	192.4—259.6

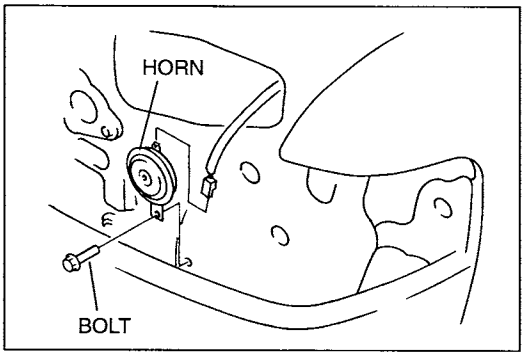
4. If not as specified, replace the water temperature sender unit.



OIL PRESSURE SWITCH

Inspection

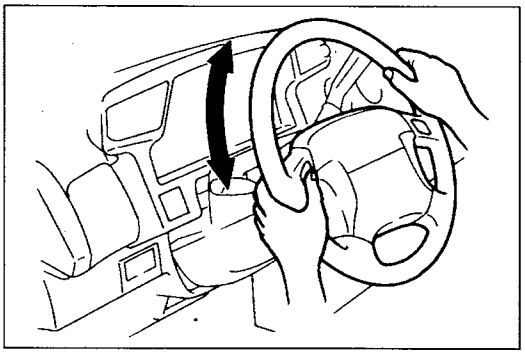
1. Turn the ignition switch to ON and verify that the oil pressure warning light illuminates.
2. Start the engine and verify that the warning light goes out.
3. If not as specified, inspect the oil pressure warning light bulb and wiring harness (Instrument cluster — Oil pressure switch).
4. If the bulb and wiring harness are normal, inspect the oil pressure.
   (Refer to section D.)
5. If the oil pressure is normal, replace the oil pressure switch.
   (Refer to section D.)



HORN

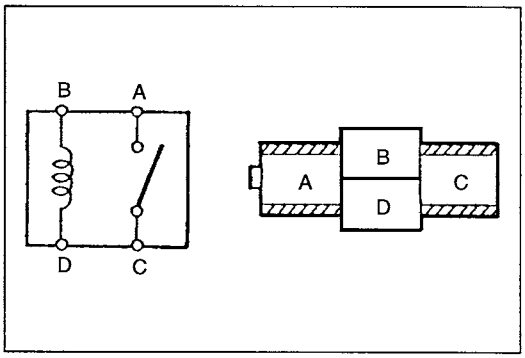
Removal / Installation

1. Remove the headlight.
   (Refer to page T–10.)
2. Disconnect the horn connector.
3. Remove the bolt and the horn.
4. Install in the reverse order of removal.



On-Vehicle Inspection

While turning the steering wheel, verify that the horn sounds when the horn switch is pressed.



HORN RELAY

Inspection

1. Remove the horn relay.
2. Apply battery positive voltage and check for continuity between the relay terminals.

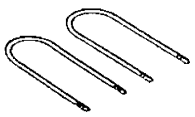
○—○: Continuity B+: Battery positive voltage

Step \ Terminal	A	C	B	D
1			○	○
2	○	○	B+	GND

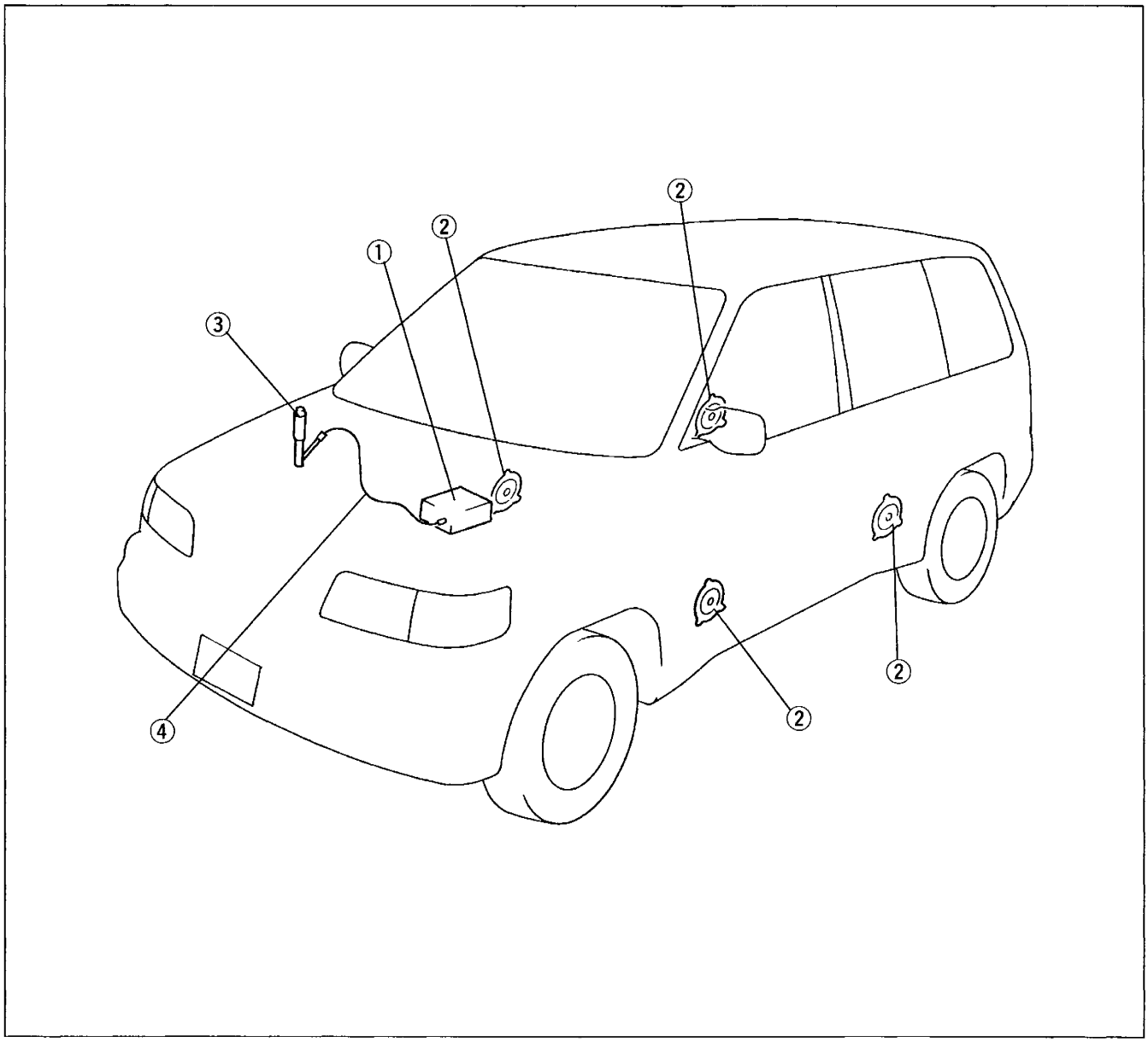
3. If not as specified, replace the horn relay.

AUDIO

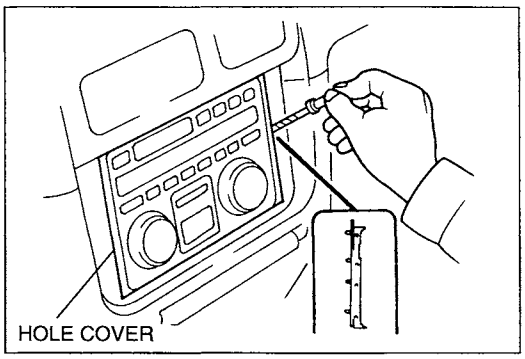
PREPARATION
SST

49 UN01 050 Radio removing tool		For removal of audio unit

STRUCTURAL VIEW



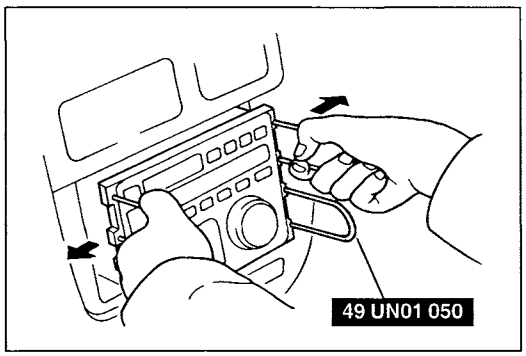
1. Audio unit, CD player
   - Removal ..... page T–49
   - Installation ..... page T–49
2. Door speaker
   - Removal / Installation ..... page T–49
   - Inspection ..... page T–50
3. Antenna
   - Removal / Installation ..... page T–50
   - Inspection ..... page T–51
4. Antenna feeder
   - Removal / Installation ..... page T–51
   - Inspection ..... page T–51



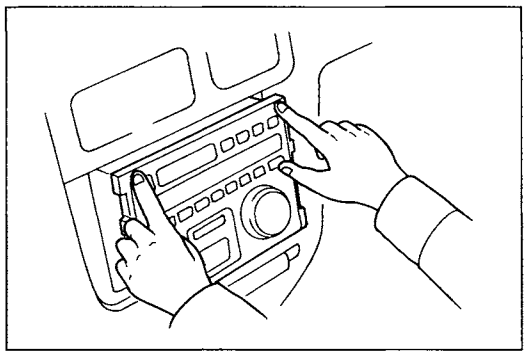
AUDIO UNIT, CD PLAYER

Removal

1. Remove the hole covers by inserting a small, tape-wrapped, flathead screwdriver into the slot and carefully prying them off without scratching the center panel. Pry up and pull off the covers carefully to prevent the posts from breaking off.



2. With the beveled parts of the **SST** facing inward, insert them into the audio unit.
3. Pull the **SST** outward and rearward to side out the unit.
4. Disconnect the connector and antenna jack.
5. Remove the audio unit and/or CD player.



Installation

Caution

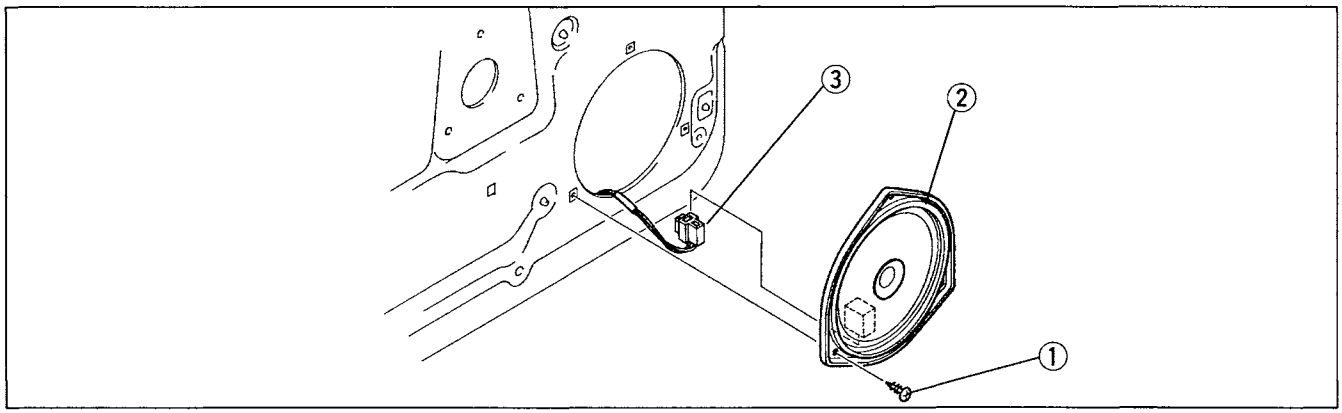
- **Make certain that the wiring harness and antenna feeder are not caught between the unit and center panel assembly. If the harness or the antenna feeder are caught between the unit and center panel assembly, it may become the cause of trouble or malfunctions.**

1. Connect the connector and antenna jack.
2. Insert and push in the unit each clip clicks.
3. Install the service hole covers.

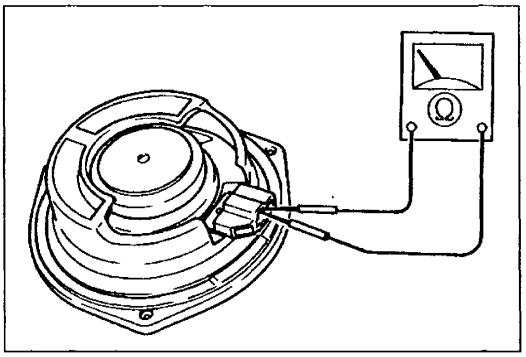
DOOR SPEAKER

Removal / Installation

1. Remove the front door trim or rear door trim. (Refer to section S.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



1. Screw
2. Door speaker
   Inspection ..... page T–50
3. Door speaker connector



Inspection

1. Remove the door speaker.
   (Refer to page T–49.)
2. Measure the resistance between the speaker terminals.

   Resistance: 4 Ω

3. Touch the leads of an ohmmeter to the speaker terminals and verify that the speaker clicks.

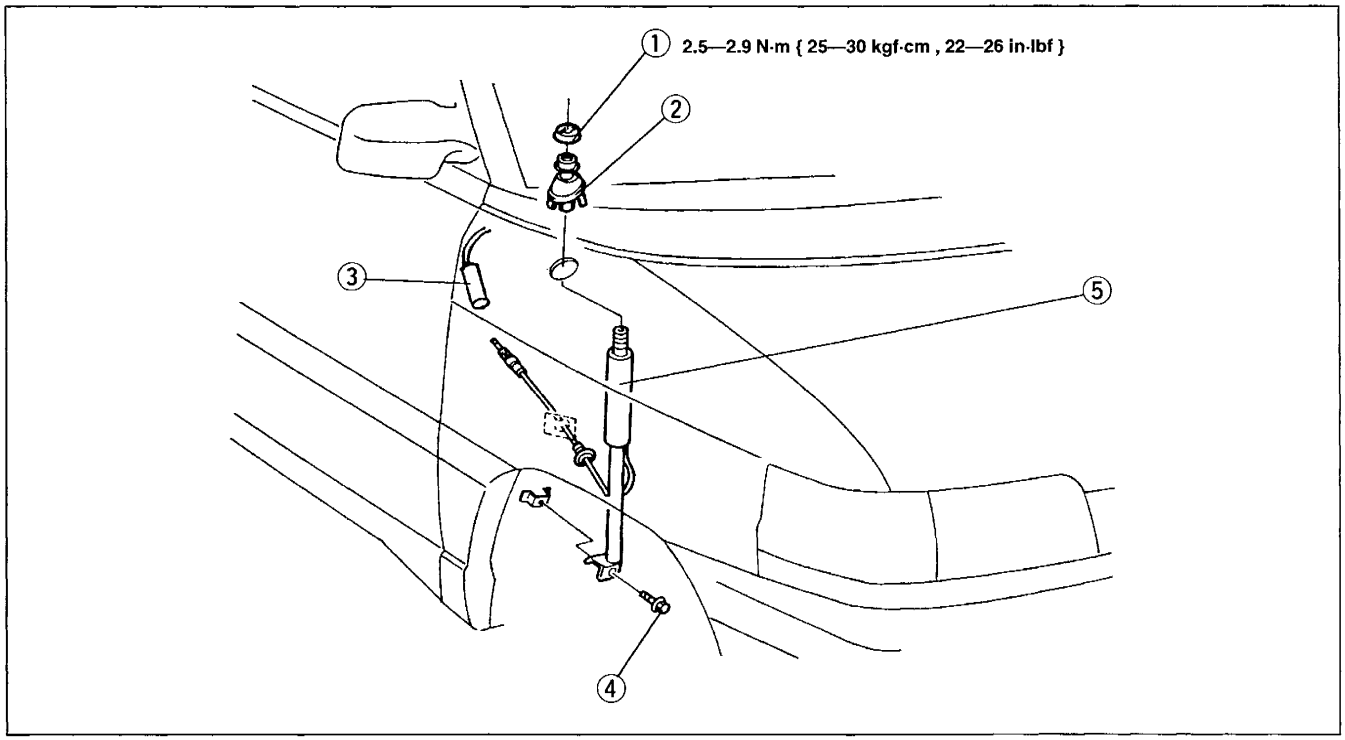
   Range: ×1 Ω

4. If not as specified, replace the door speaker.

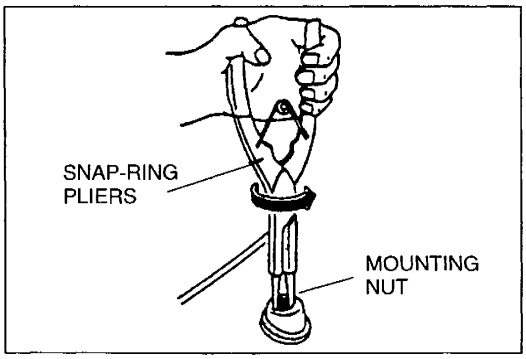
ANTENNA

Removal / Installation

1. Remove the mud guard.
   (Refer to section S.)
2. Remove in the order shown in the figure.
3. Install in the reverse of removal.



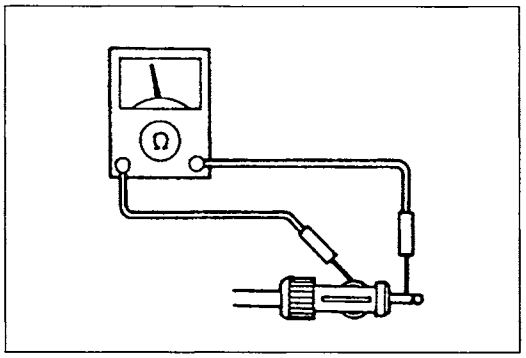
1. Mounting nut
   Removal note ..... below
2. Spacer
3. Antenna jack
4. Bolt
5. Antenna



Removal note

Mounting nut

Remove the mounting nut by using snap-ring pliers as shown.

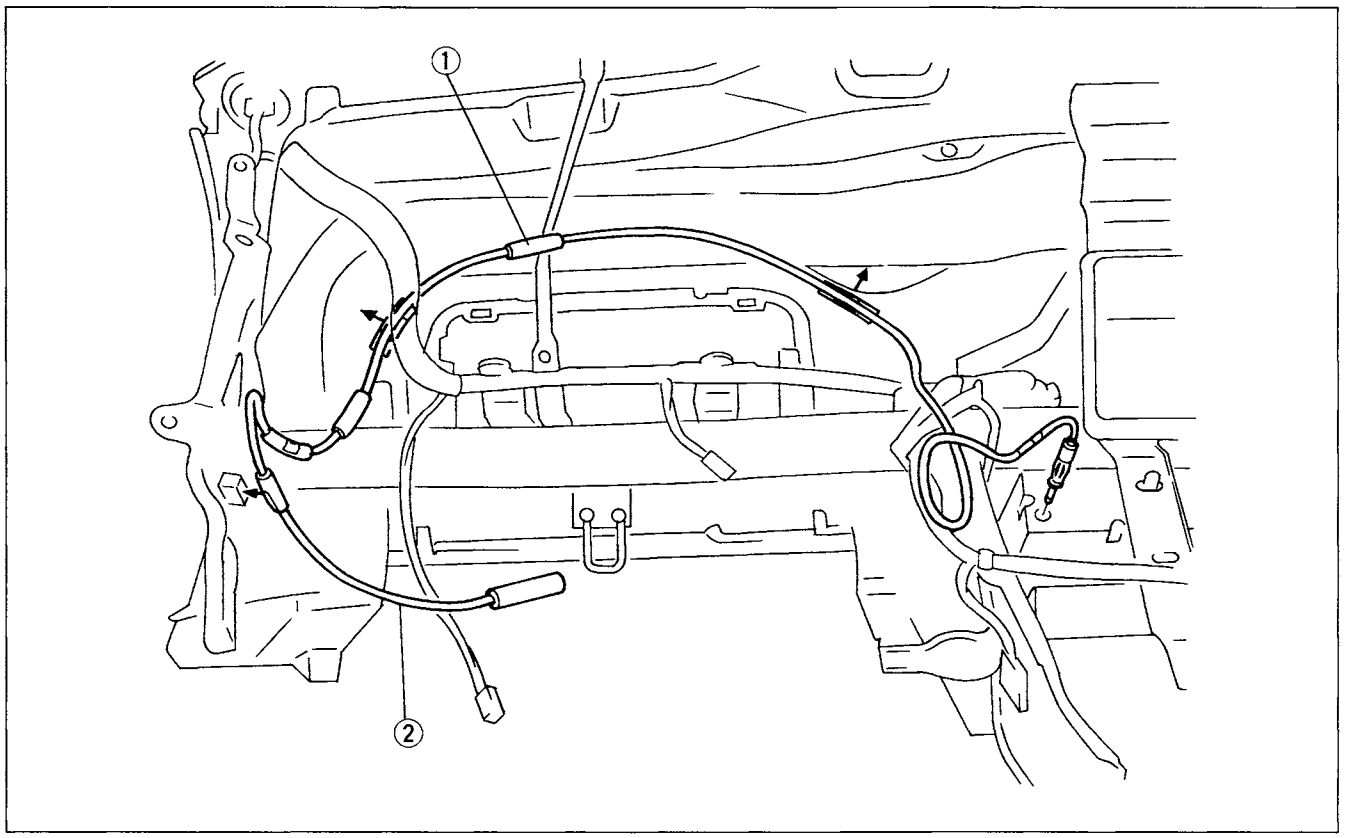


Inspection
1. Remove the audio unit.
   (Refer to page T–49.)
2. Disconnect the antenna jack.
3. Measure the resistance at the antenna jack terminal as shown.

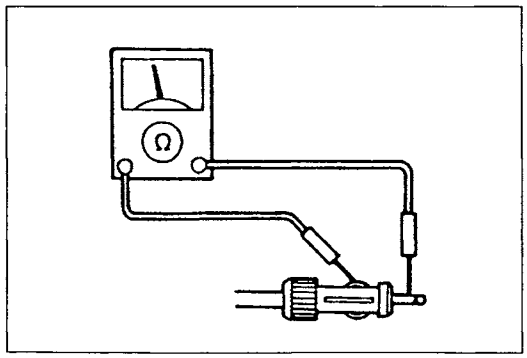
   Resistance: Infinite

4. If not as specified, replace the antenna feeder.

ANTENNA FEEDER
Removal / Installation
1. Remove the lower panel.
   (Refer to section S.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



1. Clip
2. Antenna feeder



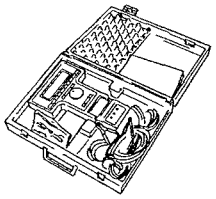
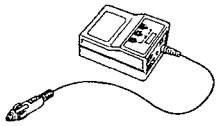
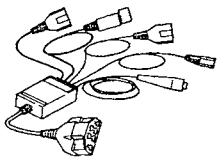
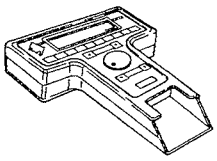
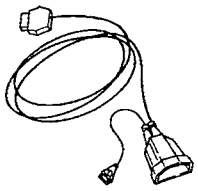
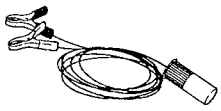
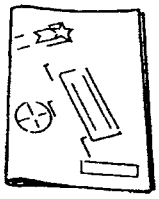
Inspection
1. Disconnect the antenna jack.
2. Measure the resistance at the antenna jack terminal as shown.

   Resistance: Infinite

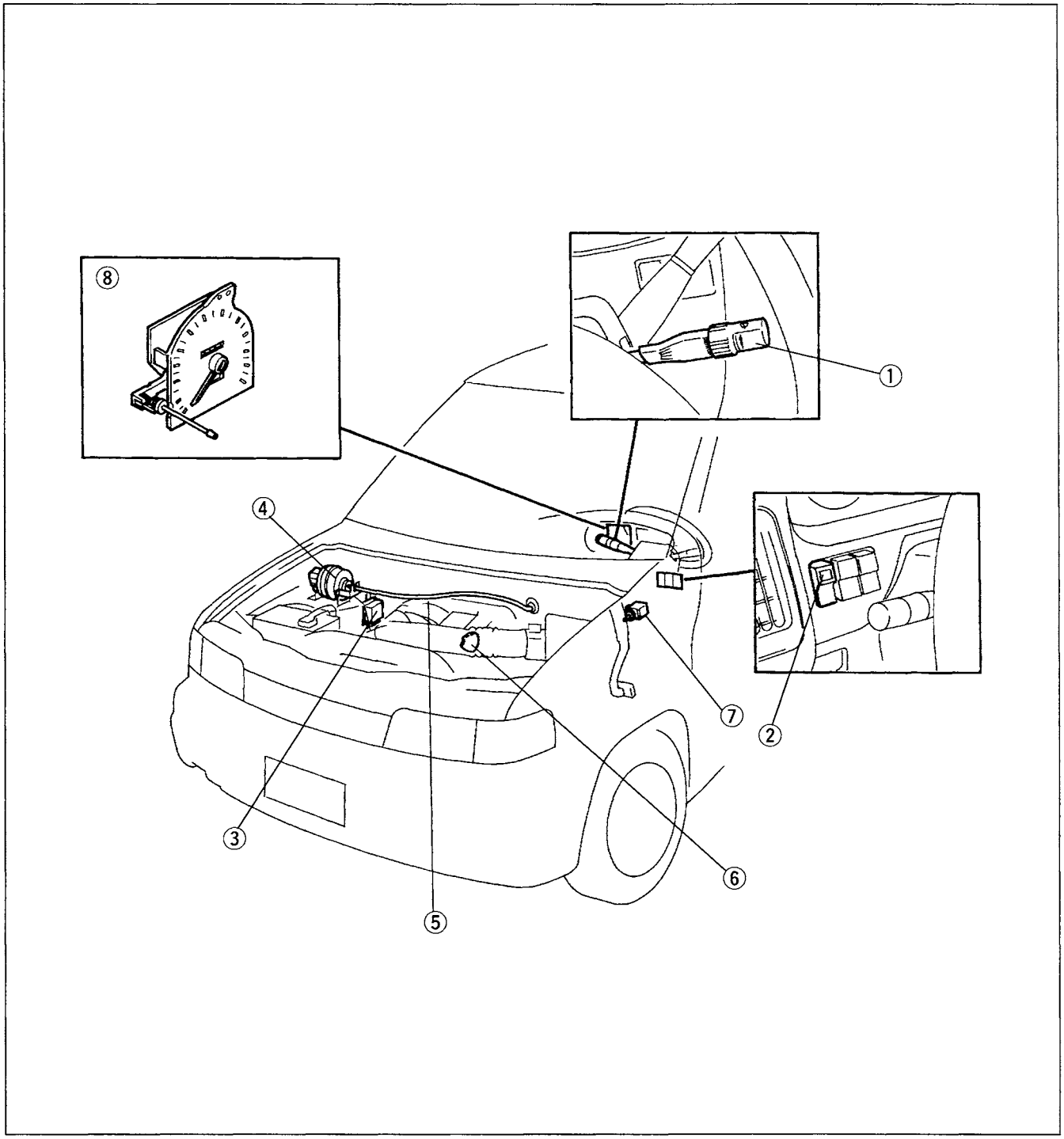
3. Check the antenna cable for continuity.
4. If not as specified, replace the antenna feeder.

CRUISE CONTROL SYSTEM

PREPARATION
SST

49 T088 0A0 NGS set 	For diagnosis of cruise control system	49 T088 002 Vehicle Interface Module (Part of 49 T088 0A0) 	For diagnosis of cruise control system
49 T088 003 Super MECS Adapter (Part of 49 T088 0A0) 	For diagnosis of cruise control system	49 T088 010B Program Card 	For diagnosis of cruise control system
49 T088 001 Control Unit (Part of 49 T088 0A0) 	For diagnosis of cruise control system	49 T088 005 STAR/DCL Adapter (5 pin) (Part of 49 T088 0A0) 	For diagnosis of cruise control system
49 T088 006 Battery Hookup Adapter (Part of 49 T088 0A0) 	For diagnosis of cruise control system	49 T088 008A Instruction Manual 	For diagnosis of cruise control system

STRUCTURAL VIEW



1. Cruise control switch
   Inspection ..... page T–64
2. Cruise control main switch
   Removal / Installation ..... page T–64
   Inspection ..... page T–64
3. Cruise control module
   Removal / Installation ..... page T–59
   Inspection ..... page T–60
4. Cruise actuator
   Removal / Installation ..... page T–62
   Inspection ..... page T–62
5. Actuator cable
   Removal / Installation ..... page T–63
   Adjustment ..... page T–64
6. Transmission range switch
   Inspection ..... section K
7. Brake switch
   Inspection ..... section P
8. Vehicle speed sensor
   Inspection ..... page T–44

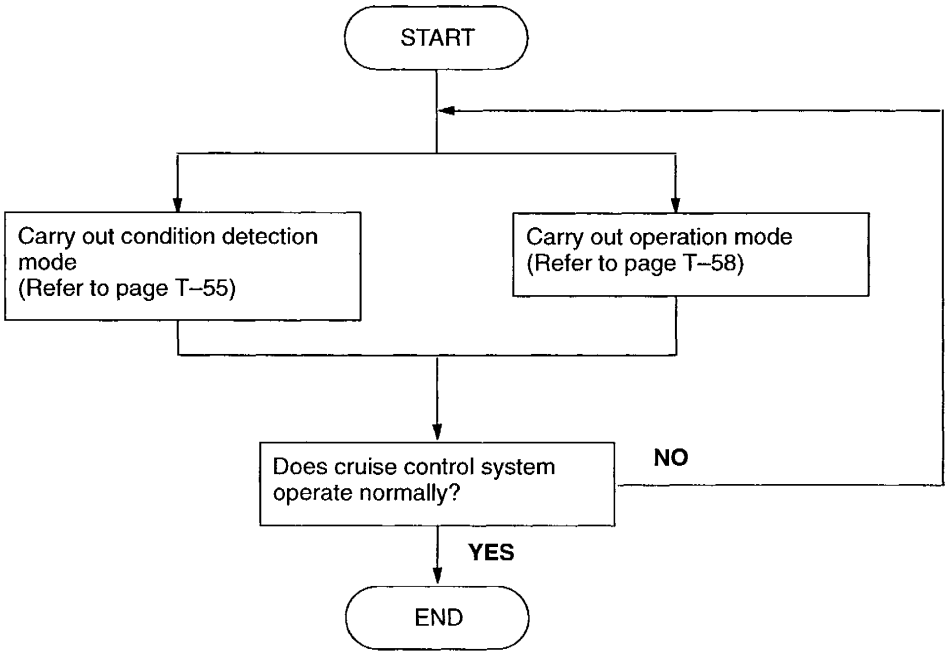
ON-BOARD DIAGNOSTIC

Outline

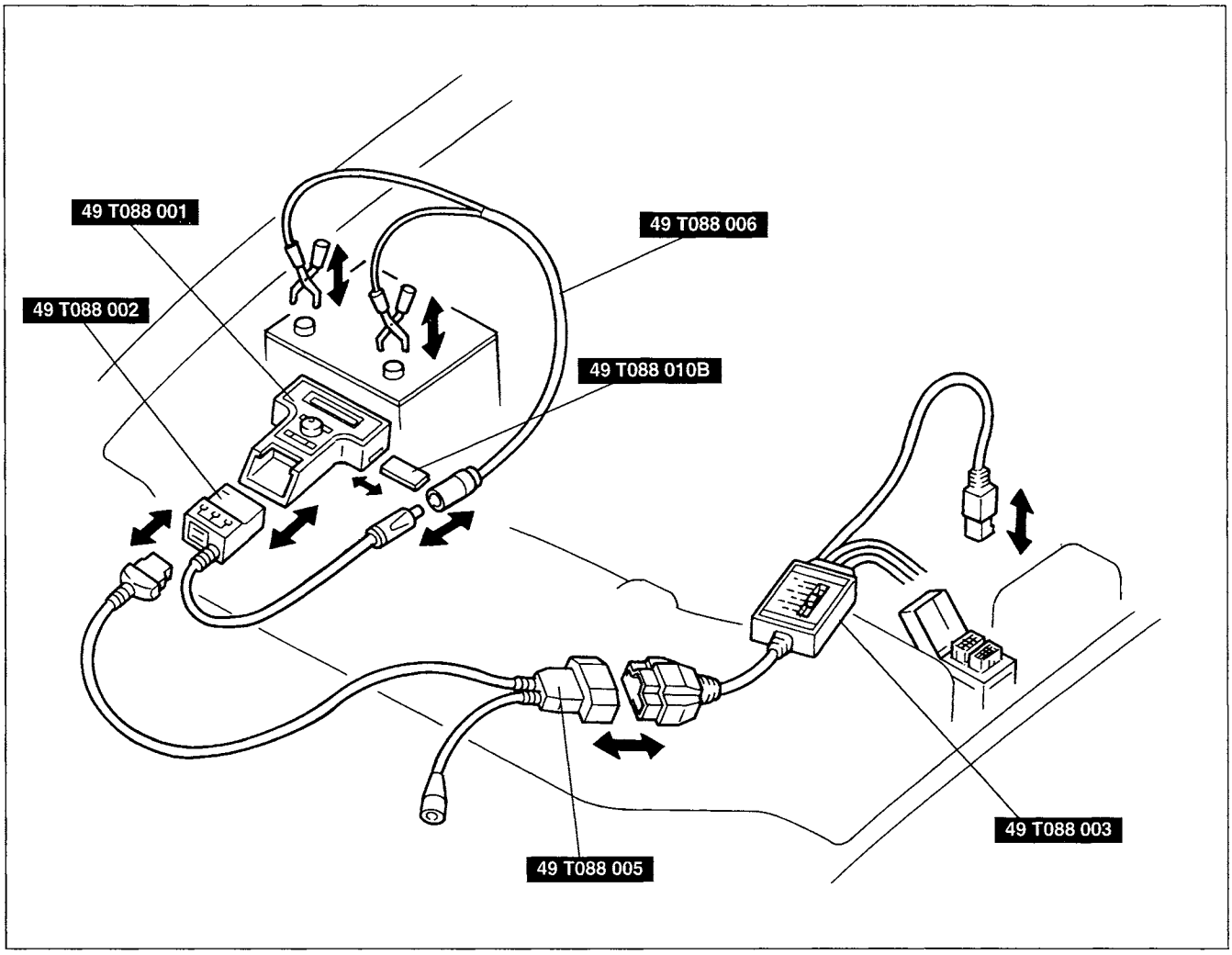
- There are two on-board diagnostic functions: Condition Detection Mode, which indicates troubles in the system; and Operation Mode, which checks for and indicates correct operation of the input signals to the control module.
- The two functions can be done by using either of the following methods:
  1) Checking the output of the data link connector by using the **SST** (NGS set)
  2) Checking the flashing pattern of the cruise set indicator light

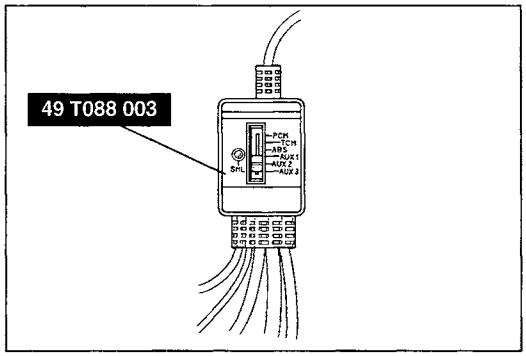
Operation Order

Use Condition Detection Mode or Operation Mode, or both, to inspect the cruise control system. Either diagnostic function can be done before the other. If one diagnostic function does not locate the trouble, carry out the other function.

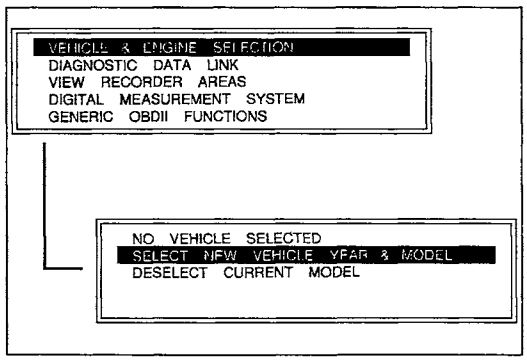


Condition Detection Mode Using NGS

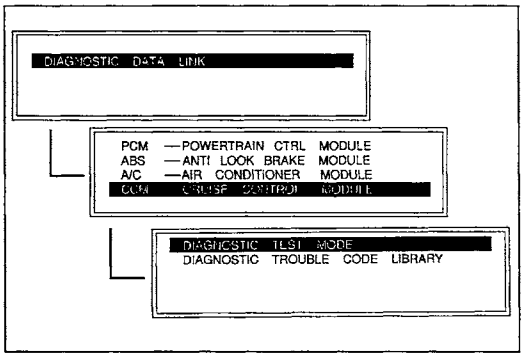




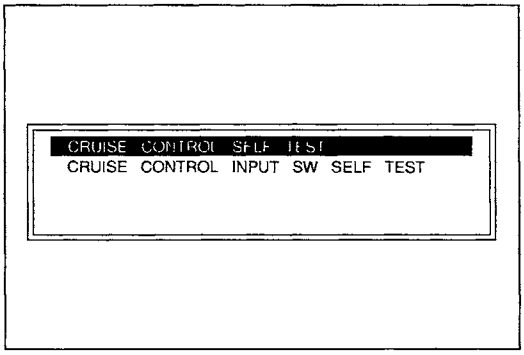
1. Position the vehicle on a chassis roller.
2. Connect the **SST** (NGS) to the data link connector and battery.
3. Set the **SST** (Super MECS Adapter) to AUX 2.



4. Select "VEHICLE & ENGINE SELECTION" on the **SST** (Control Unit) display, and then select the vehicle model, engine type, and model year.



5. Select "DIAGNOSTIC DATA LINK" on the **SST** (Control Unit) display.
6. Select "CCM-CRUISE CONTROL MODULE" on the **SST** (Control Unit) display, and then select the "DIAGNOSTIC TEST MODE".
7. Increase the vehicle speed to over 16 km/h { 10 MPH }.

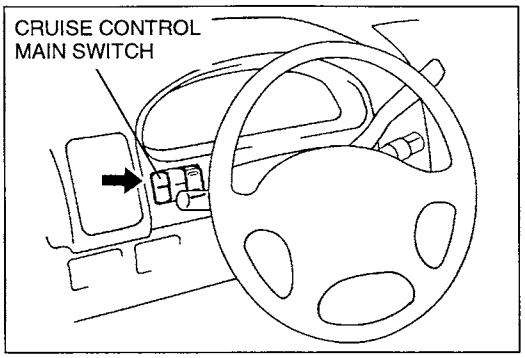


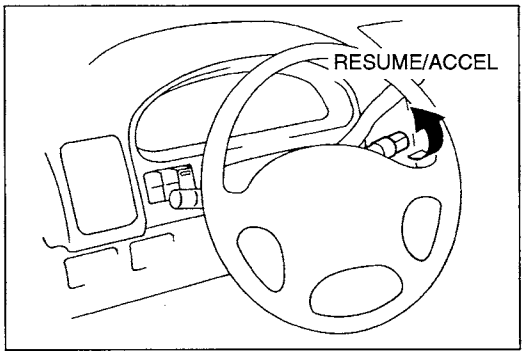
8. Select "CRUISE CONTROL SELF TEST" on the **SST** (Control Unit) display.
9. (1) If a diagnostic trouble code is displayed, refer to the diagnostic trouble code table (Refer to page T–57) and inspect the appropriate system area.
   (2) If "NO CODES RECEIVED" is displayed, the system areas shown in the diagnostic trouble code table are OK. Inspect another system area.
10. After the problems are corrected, repeat the condition detection mode procedure to verify that the system is operating normally.

Cancel

To cancel condition detection mode, do any one of the following:

- Turn the cruise control main switch off.
- Turn the ignition switch to LOCK.





Using cruise set indicator light

Reference

- If the RESUME/ACCEL switch on the cruise control switch is malfunctioning, the cruise set indicator light will not give a correct indication when you inspect the system. Use the **SST** (NGS set) to determine the cause of the malfunction.
  (Refer to page T–55.)

Inspection

1. Turn the ignition switch to ON.
2. Turn the cruise control main switch on.
3. Press and hold the RESUME/ACCEL switch for at least 3 seconds and drive the vehicle at less than 16 km/h { 10 MPH } to activate the on-board diagnostic. The cruise set indicator light will illuminate for 3 seconds and then go out for at least 2 seconds.
4. If a problem is present, the cruise set indicator light will flash in one of the patterns shown below. If there is no problem in the system, the light will not flash.

Cancel

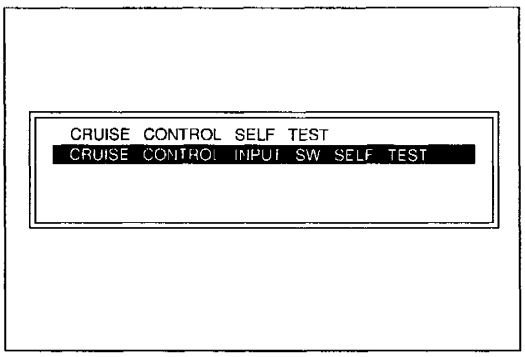
To cancel condition detection mode, do any one of the following:

- Turn the cruise control main switch off.
- Turn the ignition switch to LOCK.
- Drive the vehicle at over 16 km/h { 10 MPH }.

Diagnostic trouble code table

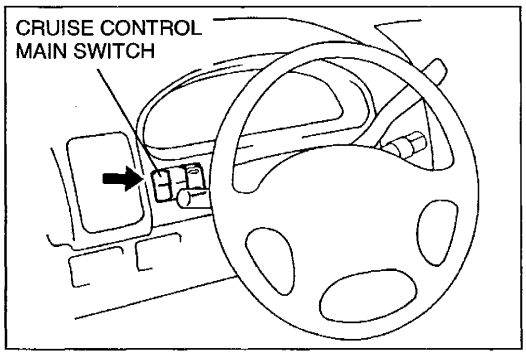
If there are two or more problems in the cruise control system, the problem with the highest priority will be indicated.

Priority	DTC	Display on the NGS	Possible cause	Action
1	1	ACTUATOR — CIRCUIT MALFUNCTION	Defective wiring (Actuator — Cruise control module) Defective cruise control module Defective actuator	Repair wiring harness Inspect actuator Replace cruise control module
2	5	STOP FUSE — CIRCUIT MALFUNCTION	Burnt STOP 20 A fuse Defective brake switch Defective wiring (Fuse — Brake switch — Cruise control module)	Inspect brake switch Replace fuse Repair wiring harness
3	7	BRAKE SW — DEFECT	Defective brake switch	Inspect brake switch
4	11	SET/COAST SW — DEFECT (ALWAYS ON)	Defective cruise control switch (SET/COAST) (always on)	Inspect cruise control switch
5	12	RESUME/ACCEL SW — DEFECT (ALWAYS ON)	Defective cruise control switch (RESUME/ACCEL) (always on)	Inspect cruise control switch
6	15	CRUISE CONTROL MODULE — DEFECT	Defective cruise control module	Replace cruise control module



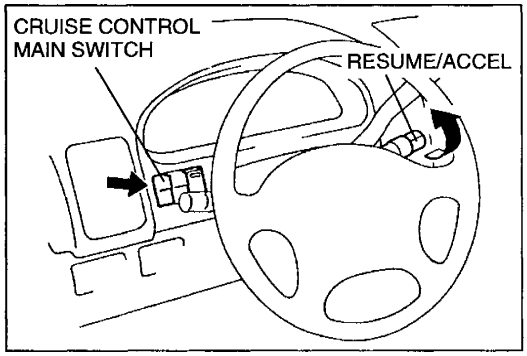
Operation Mode
Using NGS

1. Carry out steps 1—6 of the condition detection mode procedure.
2. Select "CRUISE CONTROL INPUT SW SELF TEST" on the **SST** (Control Unit) display.
3. Operate each switch as it is shown on the **SST** (Control Unit) display and note the diagnostic trouble code.
4. Refer to the diagnostic trouble code table on page T–59. If the diagnostic trouble code shown in the table does not appear on the **SST** (Control Unit) display, inspect the corresponding system area.
5. After the problems are corrected, repeat the operation mode procedure to verify that the system is operating normally.



Using cruise set indicator light
Inspection

1. Turn the ignition switch to ON.
2. Verify that the cruise control main switch is off.
3. Shift the transmission to D range.



4. Press the RESUME/ACCEL switch and the cruise control main switch simultaneously to activate the system inspection. (The cruise set indicator light will illuminate.)
5. Operate each switch as described and note the diagnostic trouble code pattern. If the cruise set indicator light does not flash, inspect the corresponding system area.

Canceling operation mode

To cancel the operation mode, do any one of the following:

- Turn off the cruise control main switch.
- Turn the ignition switch to LOCK.

Diagnostic trouble code table

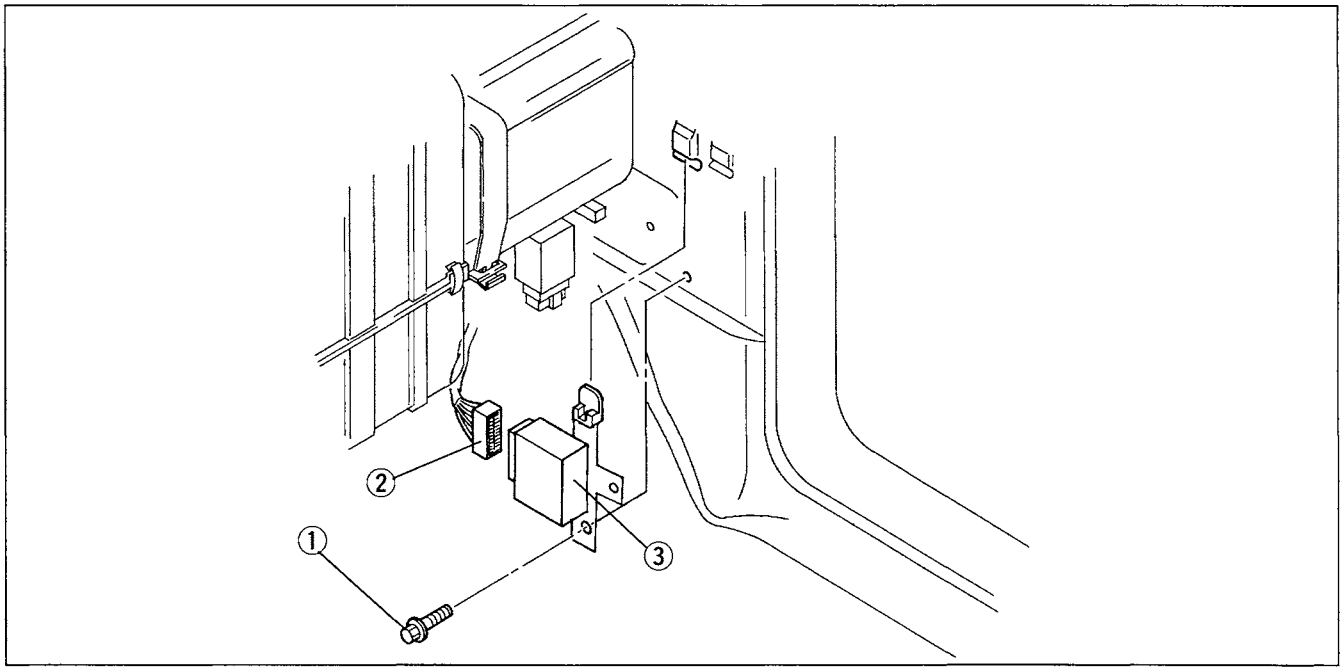
The table below shows the code numbers and flash patterns that will be indicated if the system is operating correctly.

Procedure	Normal		Malfunction	
	DTC	Display on the NGS	Possible cause	Action
Press SET/ COAST switch	21	SET/COAST SW — PRESS	Defective cruise control switch Defective wiring (Cruise control module — SET/COAST switch — GND)	Inspect cruise control switch Repair wiring harness
Press RESUME/ ACCEL switch	22	RESUME/ACCEL SW — PRESS	Defective RESUME/ACCEL switch Defective wiring (Cruise control module — RESUME/ACCEL switch — GND)	Inspect cruise control switch Repair wiring harness
Depress brake pedal	31	BRAKE PEDAL — DEPRESS	Defective brake switch Defective wiring (Cruise control module — Brake switch — GND)	Inspect brake switch Repair wiring harness
Shift transmission to P or N range	35	P OR N RANGE — SHIFT	Defective transmission range sensor Defective wiring (Cruise control module — Transmission range switch)	Inspect transmission range sensor Repair wiring harness
Drive vehicle above 40 km/h { 25 MPH }	37	VEHICLE SPEED — ABOVE 40 km/h { 25 MPH }	Defective vehicle speed sensor or speedometer Defective wiring (Cruise control module — Speedometer — Vehicle speed sensor)	Inspect vehicle speed sensor Inspect speedometer Repair wiring harness

CRUISE CONTROL MODULE

Removal / Installation

1. Remove the passenger-side front side trim. (Refer to section S.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



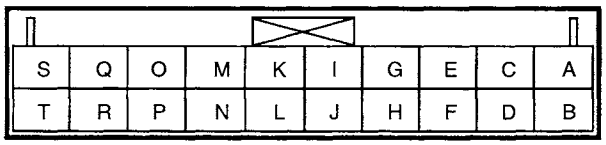
1. Bolt
2. Cruise control module connector
3. Cruise control module
   Inspection ..... page T–60

Inspection

1. Remove the passenger-side front side trim. (Refer to section S.)
2. Pull out the cruise control module with the cruise control module connector connected. (Refer to page T–59.)
3. Measure the voltage at the cruise control module terminals as indicated below.
4. If not as specified, inspect the parts listed under "Inspection area" and the related wiring harnesses.
5. If the parts and wiring harnesses are OK but the system still does not work properly, replace the cruise control module.

Terminal voltage list (Reference)

B+: Battery positive voltage



Terminal	Signal	Connection	Test condition		Voltage	Inspection area
A	Cruise actuator on	Cruise actuator (vent 1)	Ignition switch at ON	Cruise control main switch on	9 V	• METER 10 A fuse • Cruise control main switch • Cruise actuator
				Other	0 V	
B	Cruise actuator on	Cruise actuator (vac)	Ignition switch at ON	Cruise control main switch on	9 V	• METER 10 A fuse • Cruise control main switch • Brake switch • Cruise actuator
				Other	0 V	
C	Cruise actuator on	Cruise actuator (vent 2)	Ignition switch at ON	Cruise control main switch on	9 V	• METER 10 A fuse • Cruise control main switch • Brake switch • Cruise actuator
				Other	0 V	
D	IG1	Instrument cluster (cruise set indicator light)	Ignition switch at ON		B+	• METER 10 A fuse • Cruise set indicator light bulb
			Cruise set indicator light illuminated		0 V	
E	Cruise control main switch on/off	Cruise control main switch	Ignition switch at ON	Cruise control main switch off	0 V	• METER 10 A fuse • Cruise control main switch
				Cruise control main switch on	B+	
F	—	—	—		—	—
G	O/D off	ECM	Ignition switch at ON		B+	ECM
H	Brake on	Brake switch	Ignition switch at ON and cruise control main switch on		B+	• METER 10 A fuse • Cruise control main switch
I	TEST	Data link connector	—		—	—
J	Selector lever position	Transmission range switch	Ignition switch at ON	N or P range	0 V	Transmission range switch
				Other	B+	
K	—	—	—		—	—
L	—	—	—		—	—
M	Brake on	Brake switch	Depress brake pedal		B+	• STOP 15 A fuse • Brake switch
			Other		0 V	

Cont'd

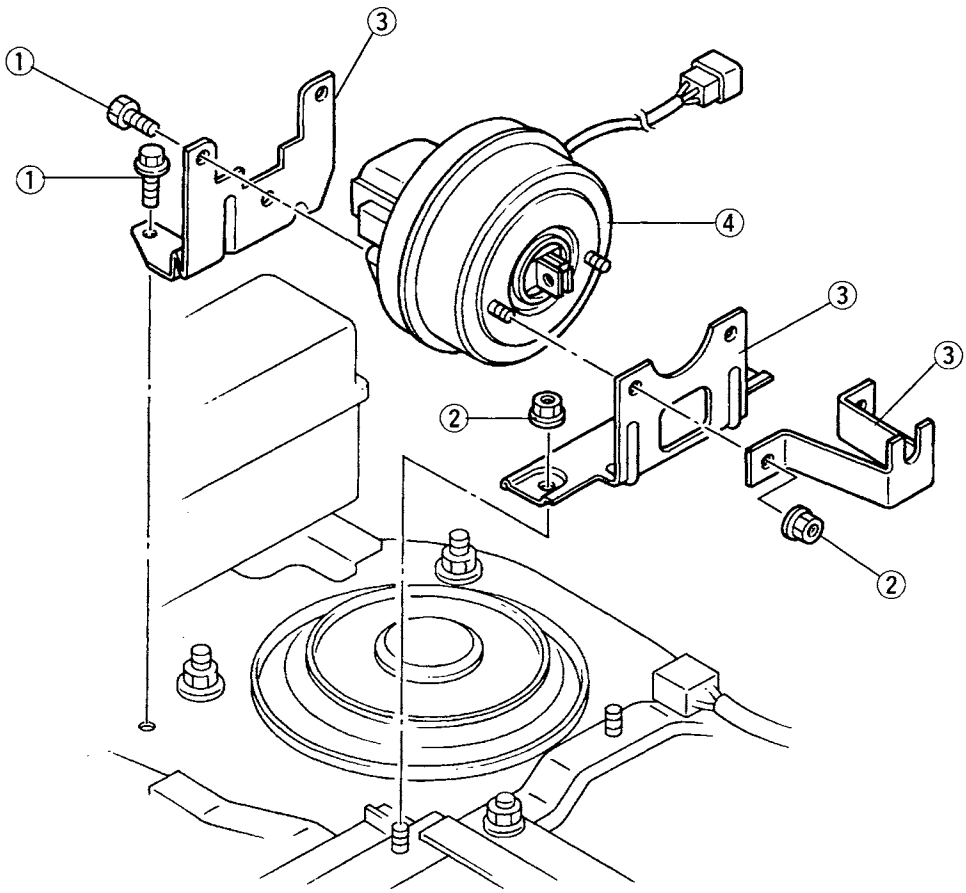
B+: Battery positive voltage

Terminal	Signal	Connection	Test condition		Voltage/ Continuity	Inspection area
N	Cruise control switch on	Cruise control switch	Ignition switch at ON and cruise control main switch on		5 V	• METER 10 A fuse • Cruise control main switch • Clock spring • Cruise control switch
			Ignition switch at ON and cruise control main switch on	SET/COAST switch pushed	1.5 V	
				RESUME/ACCEL switch pushed	3.1 V	
O	Brake on	Brake switch	Ignition switch at ON and cruise control main switch on	Release brake pedal	B+	• METER 10 A fuse • Cruise control main switch • Brake switch
				Depress brake pedal	0 V	
P	Vehicle speed sensor on	Vehicle speed sensor	Rear tires rotating		Alternates 0 V and 5 V	• Vehicle speed sensor • Instrument cluster
Q	—	—	—		—	—
R	—	—	—		—	—
S	—	—	—		—	—
T	GND	GND	Check for continuity to ground		Yes	GND

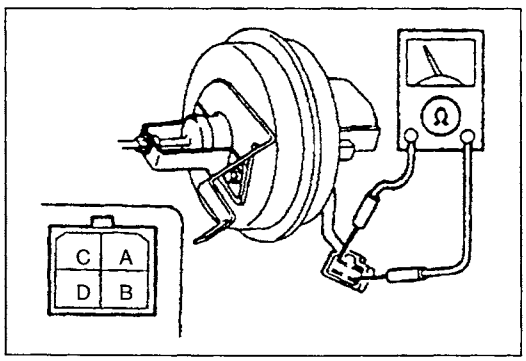
CRUISE ACTUATOR

Removal / Installation

1. Disconnect the cruise actuator connector.
2. Disconnect the actuator cable and vacuum hose from the cruise actuator.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.
5. Adjust the actuator cable.
   (Refer to page T–64.)



1. Bolt
2. Nut
3. Bracket
4. Cruise actuator

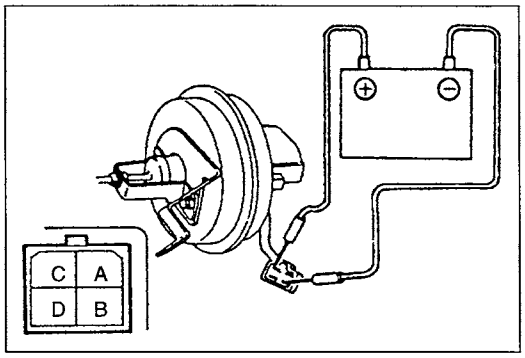


Inspection

1. Disconnect the cruise actuator connector.
2. Measure the cruise actuator resistance.

Terminal	Resistance
C—A	25—35 Ω
C—B	
C—D	

3. If not as specified, replace the cruise actuator.



4. Disconnect the actuator cable from the accelerator pedal.
5. Run the engine at idle speed.
6. Apply battery positive voltage to the following terminals, and check the actuator cable operation.

B+: Battery positive voltage

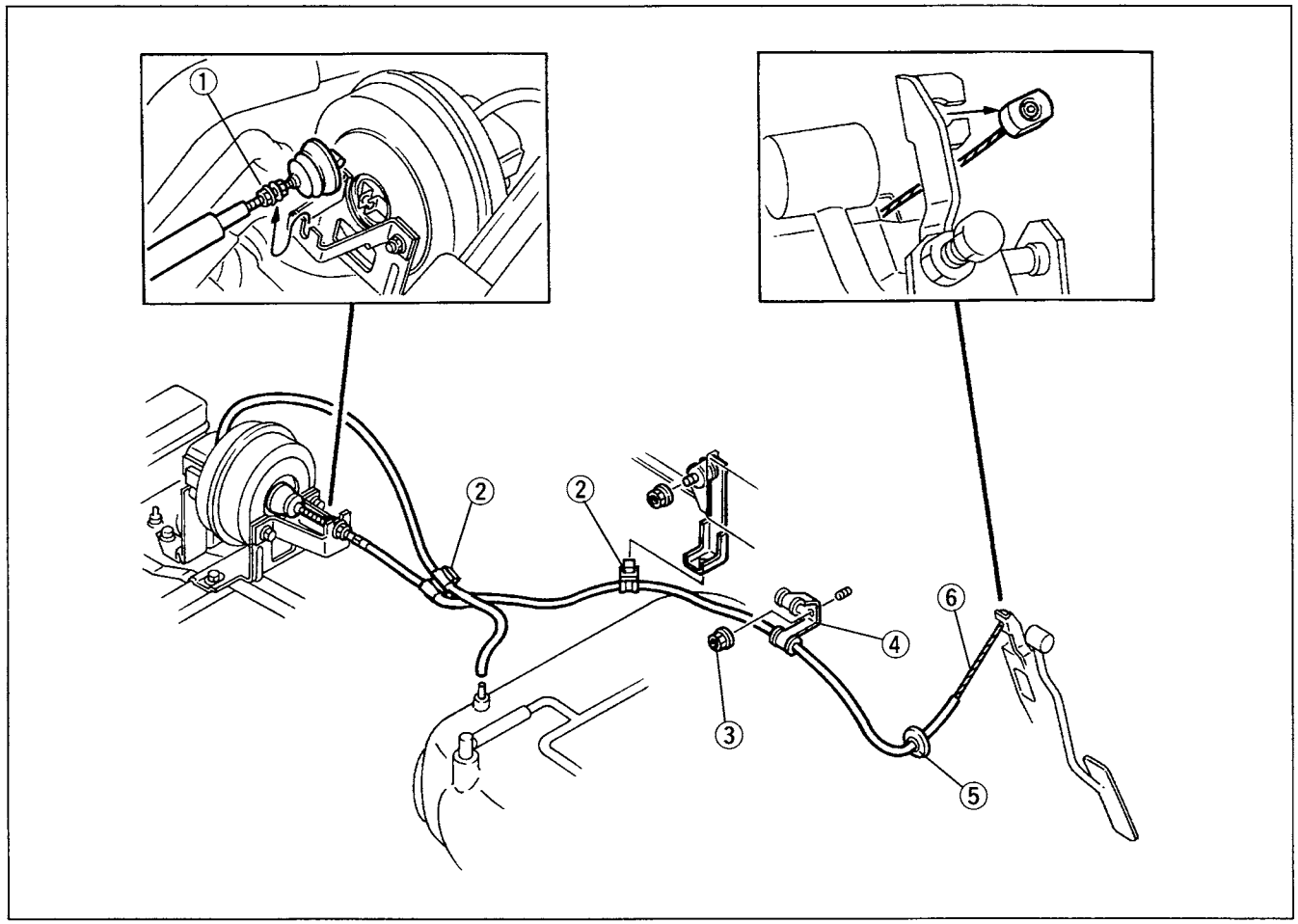
Connection				Actuator cable operation
A	B	C	D	
GND	GND	B+	GND	Pull
GND	—	B+	GND	Hold
GND	—	B+	—	Extend
—	—	—	—	Release

7. If not as specified, replace the cruise actuator. (Refer to page T–62.)

ACTUATOR CABLE

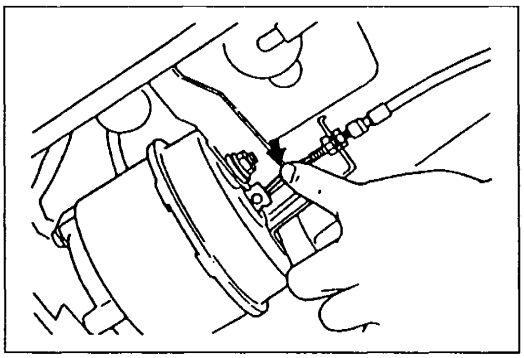
Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Nut
2. Clip
3. Nut
4. Bracket
5. Grommet
6. Actuator cable

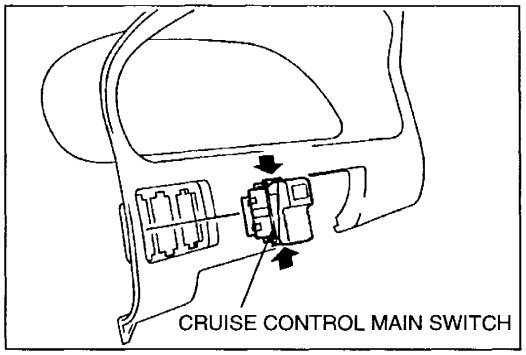
Adjustment ..... page T–64



Adjustment

Adjust the nut so that actuator cable free play is as shown when the actuator cable is pressed lightly.

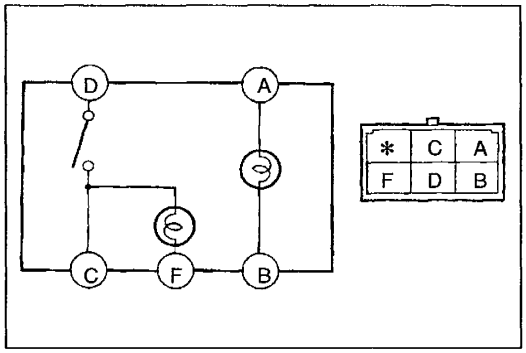
Cable play on both the cruise actuator side and throttle body side: 1.0—5.0 mm { 0.04—0.19 in }



CRUISE CONTROL MAIN SWITCH

Removal / Installation

1. Remove the meter hood. (Refer to section S.)
2. Press the stoppers of the switch and remove the cruise control main switch.
3. Install in the reverse order of removal.



Inspection

1. Remove the cruise control main switch.
2. Check for continuity between the terminals of the cruise control main switch.

O—O: Continuity O—⓪—O : Bulb

Switch position \ Terminal	A	B	C	D	F
OFF	O—⓪—O		O	⓪	O
ON	O—⓪—O		O	—O—⓪—O	

3. If not as specified, replace the cruise control main switch.

CRUISE CONTROL SWITCH

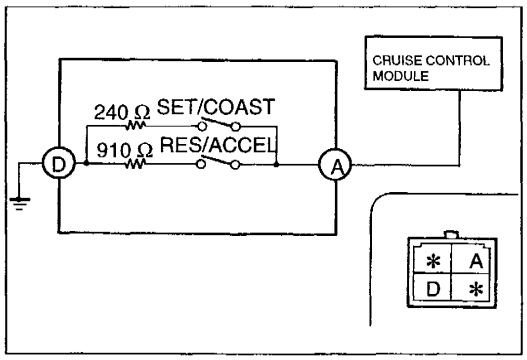
Inspection

1. Remove the combination switch. (Refer to page T–14.)
2. Check for continuity between the terminals of the combination switch connector.

O∿∿O : Resistance

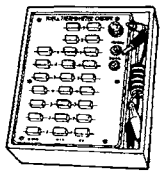
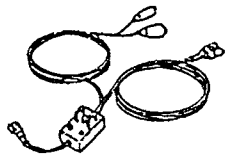
Switch position \ Terminal	A	D
SET/COAST	O—∿∿	—O 240 Ω
RES/ACCEL	O—∿∿	—O 910 Ω

3. If not as specified replace the combination switch. (Refer to page T–14.)

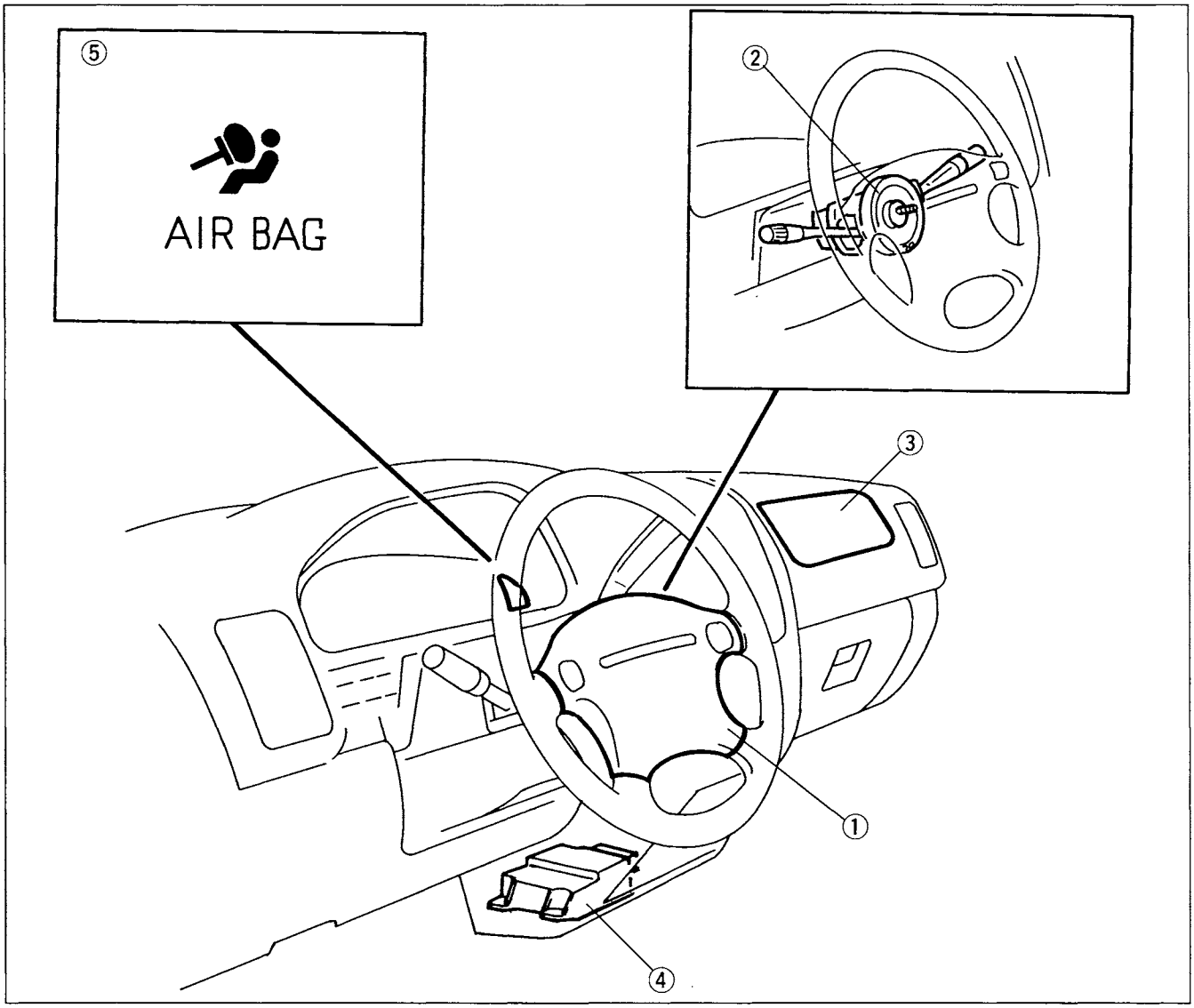


AIR BAG SYSTEM

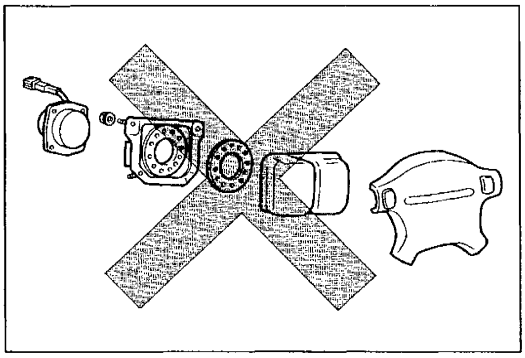
PREPARATION
SST

49 0839 285 Checker, fuel thermometer 	For inspection of air bag system	49 H066 002 Deployment tool 	For deployment of air bag module

STRUCTURAL VIEW



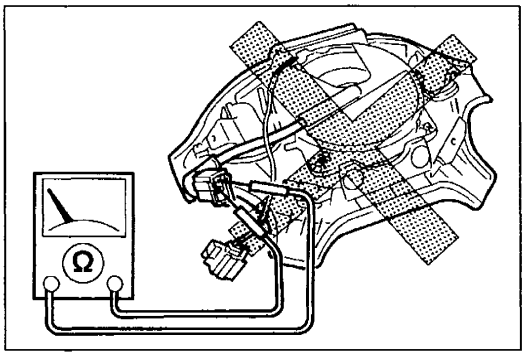
1. Driver-side air bag module
   - Removal / Installation ..... page T–74
   - Disposal procedure ..... page T–77
2. Clock spring
   - Inspection ..... page T–16
   - Adjustment ..... page T–16
3. Passenger-side air bag module
   - Removal / Installation ..... page T–75
   - Disposal procedure ..... page T–77
4. SAS unit
   - Removal / Installation ..... page T–76
   - Deployment Authorization procedure ..... page T–77
5. Air bag system warning light
   - Bulb replacement ..... page T–45



SERVICE WARNINGS

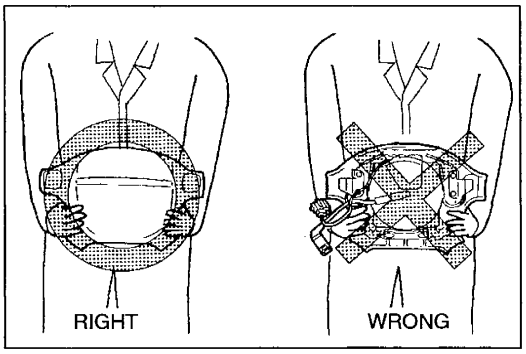
Component Disassembly

- **Disassembling and reassembling the components of the air bag system can render the system inoperative, which may result in serious injury or death in the event of an accident. Do not disassemble any air bag system components.**



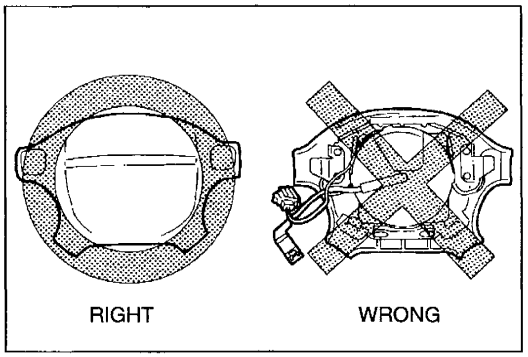
Air Bag Module Inspection

- **Inspecting the air bag module with an ohmmeter can deploy the air bag, which can cause serious injury. Do not use an ohmmeter to inspect the air bag module.**

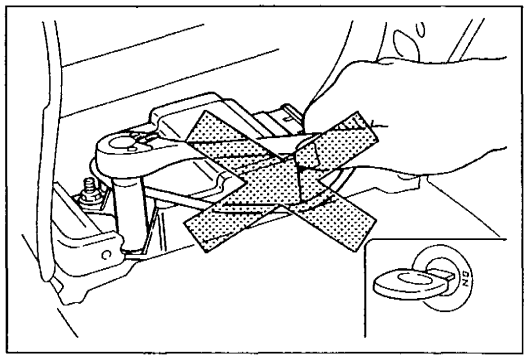


Air Bag Module Handling

- **A live (undeployed) air bag may accidently deploy when it is handled and cause serious injury. When carrying a live air bag module, point the trim cover away from your body to lesson the chance of injury in case it deploys.**

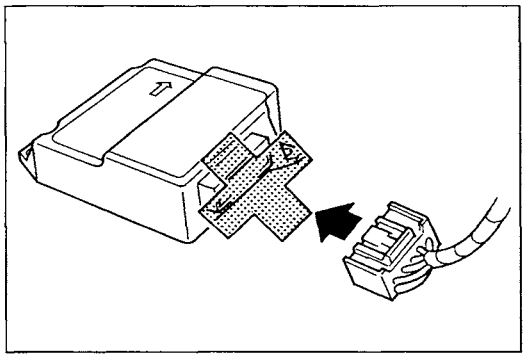


- **A live air bag placed face down on a surface is dangerous. If the air bag deploys, the motion of the module can cause serious injury. Always face the trim cover up to reduce the motion of the module in case it accidently deploys.**

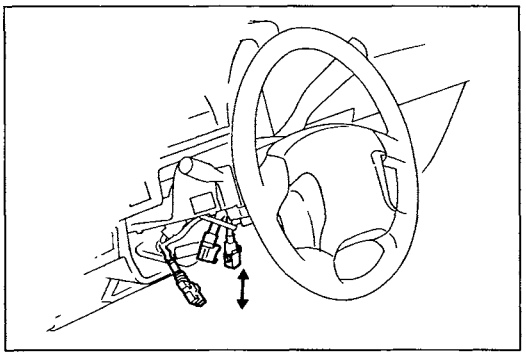


SAS Unit Handling

- **Disconnecting the SAS unit connector or removing the SAS unit with the ignition switch at ON can cause the air bags to deploy, which may seriously injure you. Before disconnecting the SAS unit connector or removing the SAS unit, turn the ignition switch to LOCK.**



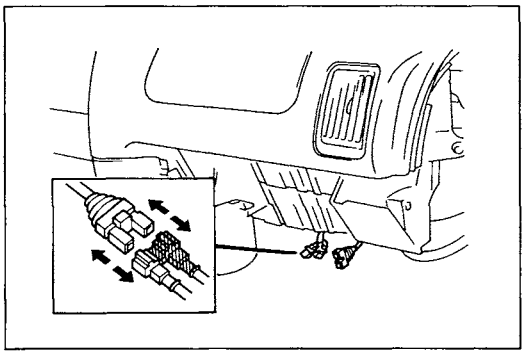
- **Connecting the SAS unit connector before installing the SAS unit is dangerous. The shock of installation can cause the air bags to deploy, which may seriously injure you. Before connecting the SAS unit connector, firmly mount the SAS unit to the vehicle.**



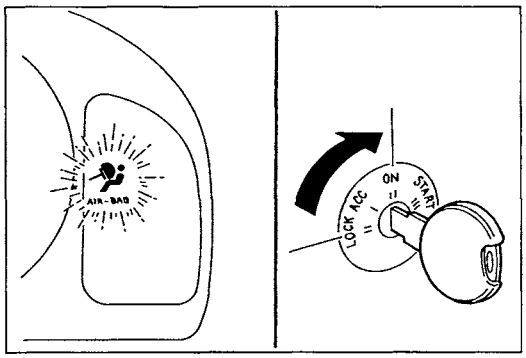
GENERAL PROCEDURES

Before Servicing

1. Turn the ignition switch to LOCK.
2. Disconnect the negative battery cable and wait for more than one minute to allow the backup power supply to deplete its stored power.
3. Remove the column cover.
   (Refer to section S.)
4. Disconnect the orange and blue clock spring connectors.



5. Remove the glove compartment cover.
   (Refer to section S.)
6. Disconnect the orange and blue passenger-side air bag module connector.



After Servicing

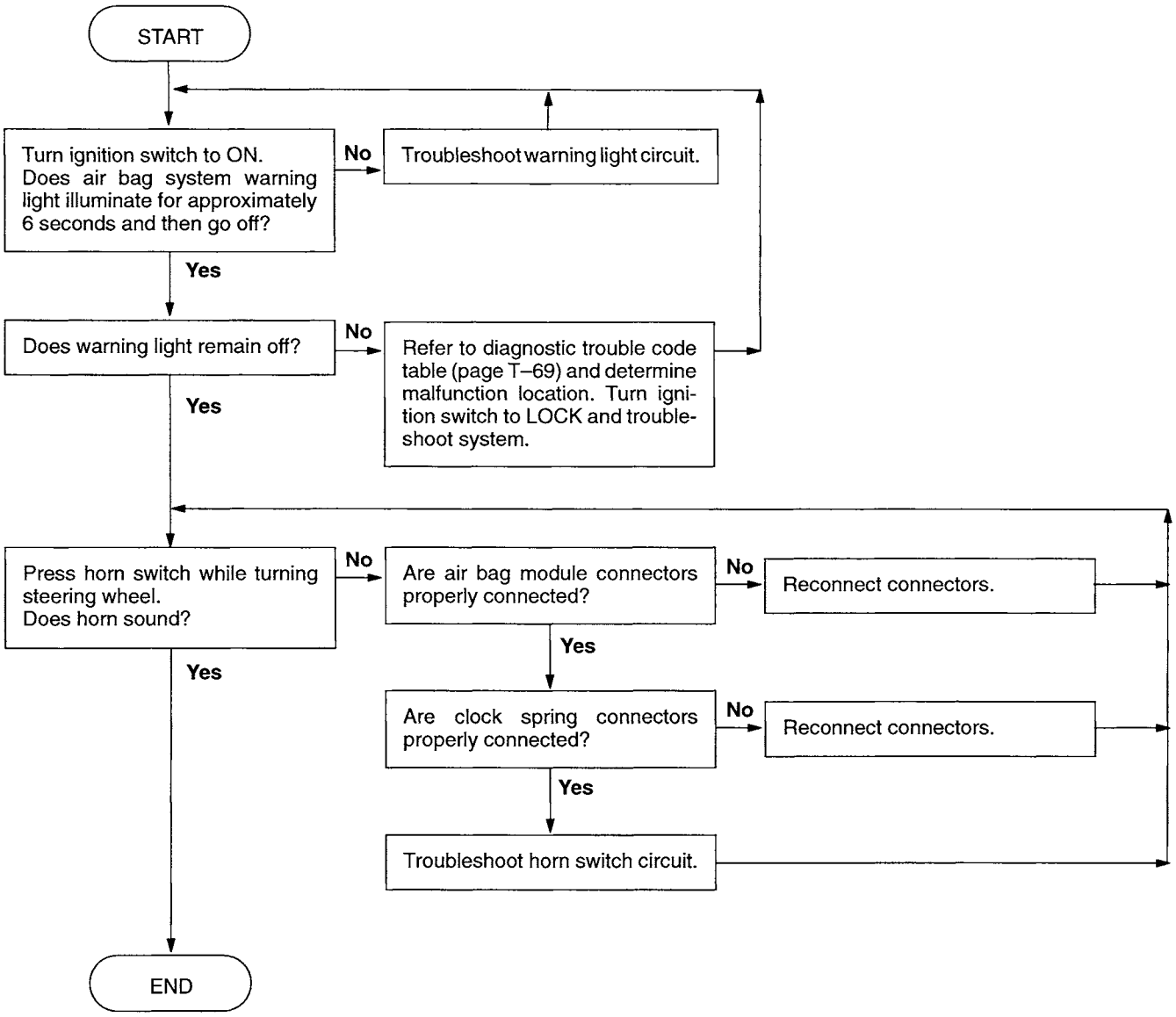
1. Connect the negative battery cable.
2. Turn the ignition switch to ON.
3. Verify that the air bag system warning light illuminates for approximately 6 seconds and then goes off.

TROUBLESHOOTING

Troubleshooting Procedure

The SAS unit has an on-board diagnostic function that flashes or illuminates the air bag system warning light to indicate trouble in the air bag system. The trouble can be determined by the warning light illumination or flashing pattern.

Flowchart



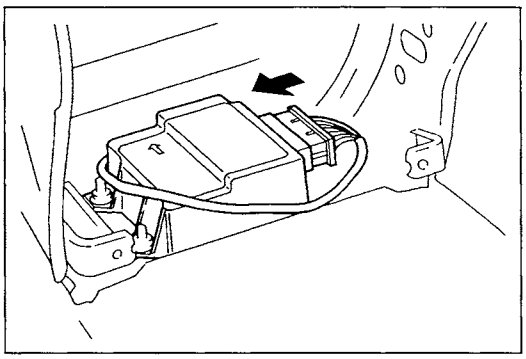
Diagnostic Trouble Code Table

Priority	Code No.	Warning light indication	Possible cause	Inspection area	Refer to page
1	0	Remains on	SAS unit	SAS unit connector	T–69
2	3		Battery	• Battery • Wiring harness (Battery — ENGINE 15 A fuse — SAS unit, Battery — METER 10 A fuse — SAS unit)	T–70
3	6		Driver-side air bag module	• Clock spring • Wiring harness (Clock spring — SAS unit)	T–71
4	7		Passenger-side air bag module	Wiring harness (Passenger-side air bag module — SAS unit)	T–73

Note
- If the air bag system warning light flashes continuously after the SAS unit is replaced, refer to the Deployment Authorization Procedures. (Refer to page T–77.)

Flowchart No.1	Symptom	Air bag system warning light remains on

Possible cause
- Damaged SAS unit
- Open or short circuit in wiring harness
- Poor connection of connector



Remedy

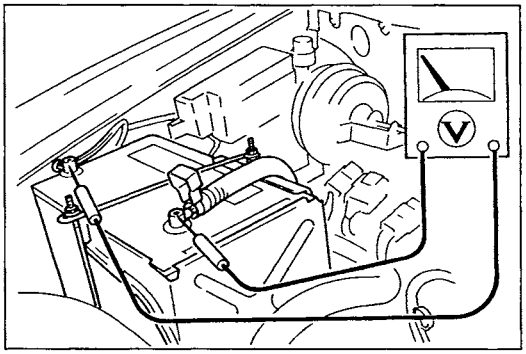
Warning
- **Handling the SAS unit improperly can accidently deploy the air bags, which may seriously injure you. Read SERVICE WARNINGS, page T–66, before handling the SAS unit.**

1. Carry out the "Before Servicing" procedure under GENERAL PROCEDURES, page T–67.
2. Remove the center lower panel. (Refer to section S.)
3. Make sure the SAS unit connector is securely connected to the SAS unit.

Connection	Action
OK	Replace SAS unit (Refer to page T–76)
Poor	Reconnect connector

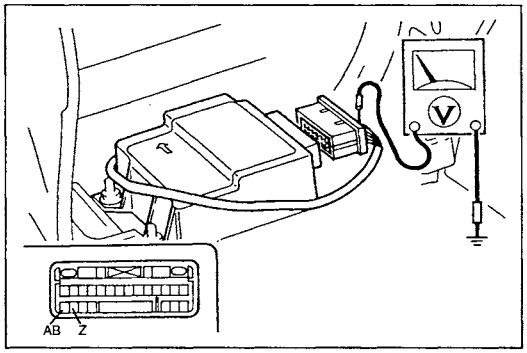
Flowchart No.2	Symptom	Diagnostic trouble code 3

Possible cause
- Weak battery
- Poor connection of connector



Step 1
Measure the battery voltage.

Voltage	Action
More than 8 V	Go to Step 2
Less than 8 V	Battery is weak Check charge/discharge system (Refer to section G)



Step 2

Warning
- **Handling the SAS unit improperly can accidently deploy the air bags, which may seriously injure you. Read SERVICE WARNINGS, page T–66, before handling the SAS unit.**

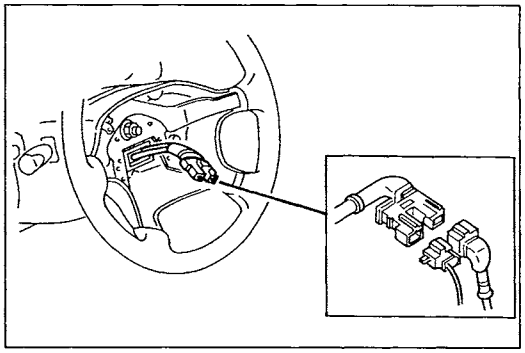
1. Carry out the "Before Servicing" procedure under GENERAL PROCEDURES, page T–67.
2. Remove the center lower panel. (Refer to section S.)
3. Disconnect the SAS unit connector.
4. Connect the negative battery cable.
5. Turn the ignition switch to ON.
6. Measure the voltage at the terminals of the SAS unit connector.

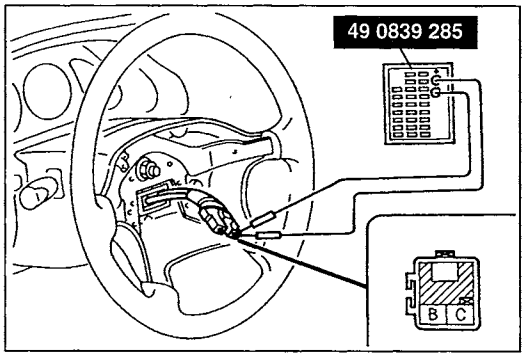
Terminal	Voltage	Action
Z (LG)	More than 8 V	Measure voltage at terminal AB
	Less than 8 V	Repair wiring harness (Battery — ENGINE 15 A fuse — SAS unit)
AB (B/Y)	More than 8 V	Replace SAS unit (Refer to page T–76)
	Less than 8 V	Repair wiring harness (Battery — METER 10 A fuse — SAS unit)

Flowchart No.3	Symptom	Diagnostic trouble code 6

Possible cause
- Damaged driver-side air bag module
- Damaged clock spring
- Damaged SAS unit
- Open or short circuit in wiring harness
- Poor connection of connector

Warning
- **Handling the air bag module and SAS unit improperly can accidently deploy the air bag, which may seriously injure you. Read SERVICE WARNINGS, page T–66, before handling the air bag module and SAS unit.**



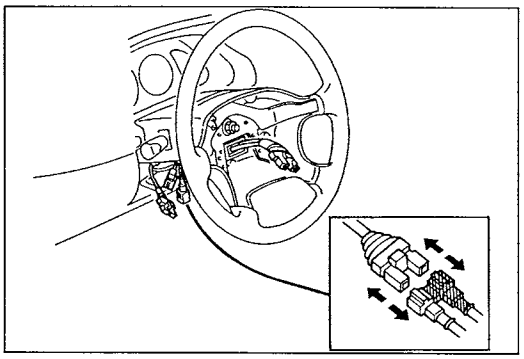


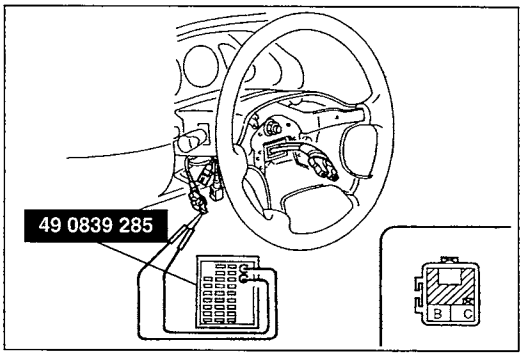
Step 1
1. Carry out the "Before Servicing" procedure under GENERAL PROCEDURES, page T–67.
2. Remove the driver-side air bag module. (Refer to page T–74.)
3. Verify that the driver-side air bag module connector pin is not broken.

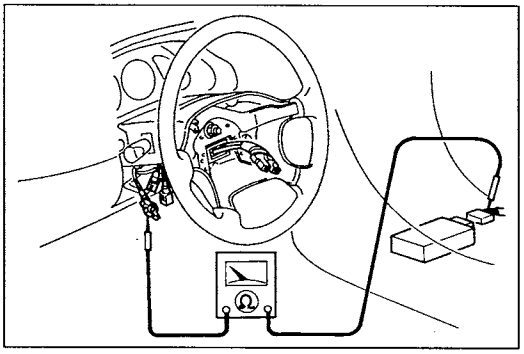
Pin	Action
OK	Go to Step 2
Broken	Replace combination switch (Refer to page T–14)

Step 2
1. Connect the leads of the **SST** to terminals B and C of the driver-side air bag module connector.
2. Set the resistance of the **SST** to 2 ohms.
3. Connect the clock spring connector.
4. Connect the negative battery cable.
5. Turn the ignition switch to ON and check the diagnostic trouble code.

Diagnostic trouble code	Action
6	Go to Step 3
Other	Replace driver-side air bag module (Refer to page T–74)







Step 3
1. Turn the ignition switch to LOCK.
2. Disconnect the negative battery cable and wait for more than one minute to allow the backup power supply to deplete its stored power.
3. Disconnect the clock spring connector.
4. Verify that the clock spring connector.

Pin	Action
OK	Go to Step 4
Broken	Repair wiring harness (Clock spring — SAS unit)

Step 4
1. Connect the leads of the **SST** to terminals B and C of the clock spring connector.
2. Set the resistance of the **SST** to 2 ohms.
3. Connect the negative battery cable.
4. Turn the ignition switch to ON and check the diagnostic trouble code.

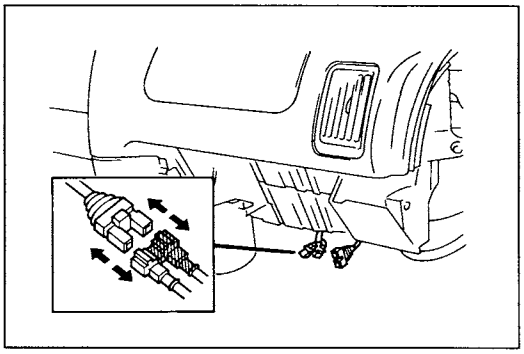
Diagnostic trouble code	Action
6	Go to Step 5
Other	Replace combination switch (Refer to page T–14)

Step 5
1. Turn the ignition switch to LOCK.
2. Disconnect the negative battery cable and wait for more than one minute to allow the backup power supply to deplete its stored power.
3. Remove the center lower panel. (Refer to section S.)
4. Disconnect the SAS unit connector.
5. Check the wiring harness between the terminals of the SAS unit connector and the clock spring connector for the following.
   - Ground short circuit
   - Line short circuit
   - Open circuit
6. If the wiring harness is normal, replace the SAS unit. (Refer to page T–76.)
7. If the wiring harness is faulty, repair it. (Clock spring — SAS unit)

Flowchart No.4	Symptom	Diagnostic trouble code 7

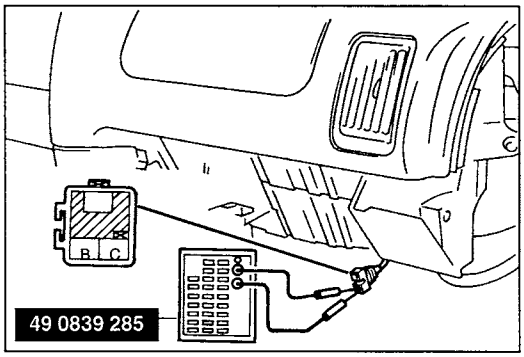
Possible cause
- Damaged passenger-side air bag module
- Damaged SAS unit
- Open or short circuit in wiring harness
- Poor connection of connector

Warning
- **Handling the air bag module and SAS unit improperly can accidently deploy the air bag, which may seriously injure you. Read SERVICE WARNINGS, page T–66, before handling the air bag module and SAS unit.**



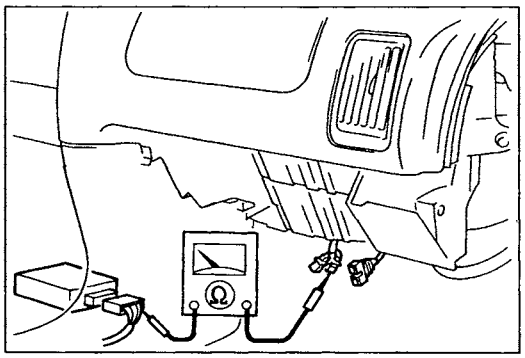
Step 1
1. Carry out the "Before Servicing" procedure under GENERAL PROCEDURES, page T–67.
2. Verify that the passenger-side air bag module connector pin is not broken.

Pin	Action
OK	Go to Step 2
Broken	Repair wiring harness (Passenger-side air bag module — SAS unit)



Step 2
1. Connect the leads of the **SST** to terminals B and C of the passenger-side air bag module connector.
2. Set the resistance of the **SST** to 2 ohms.
3. Connect the clock spring connector.
4. Connect the negative battery cable.
5. Turn the ignition switch to ON and check the diagnostic trouble code.

Diagnostic trouble code	Action
7	Go to Step 3
Other	Replace passenger-side air bag module (Refer to page T–75)



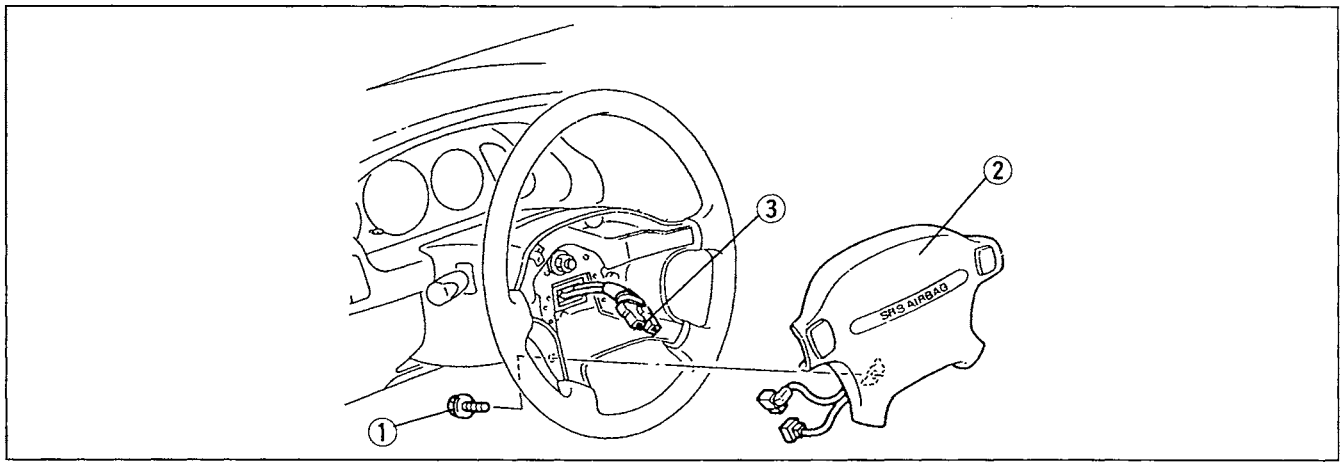
Step 3
1. Turn the ignition switch to LOCK.
2. Disconnect the negative battery cable and wait for more than one minute to allow the backup power supply to deplete its stored power.
3. Remove the column cover. (Refer to section S.)
4. Disconnect the clock spring connector.
5. Remove the center lower panel. (Refer to section S.)
6. Disconnect the SAS unit connector.
7. Check the wiring harness between the terminals of the SAS unit connector and the passenger-side air bag connector for the following.
   - Ground short circuit
   - Line short circuit
   - Open circuit
8. If the wiring harness is normal, replace the SAS unit. (Refer to page T–76.)
9. If the wiring harness is faulty, repair it. (Passenger-side air bag module — SAS unit)

DRIVER-SIDE AIR BAG MODULE
Removal / Installation

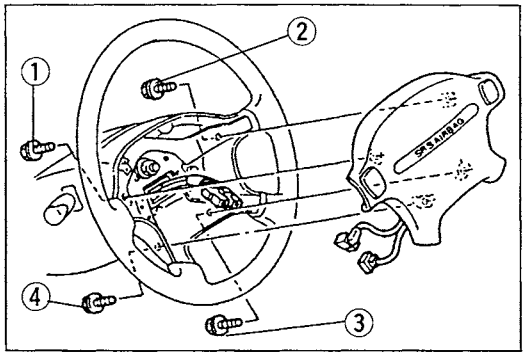
Warning
- **Handling the air bag module improperly can accidently deploy the air bag, which may seriously injure you. Read SERVICE WARNINGS, page T–66, before handling the air bag module.**

Warning
- **Installing the driver-side air bag module when a service code 6 is not indicated can accidently deploy the air bag, which can cause serious injury. Carry out the proper troubleshooting procedures and verify that service code 6 is indicated before installing the driver-side air bag module.**

1. Carry out the "Before Servicing" procedure under GENERAL PROCEDURES, page T–67.
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.
4. Follow the troubleshooting flowchart (page T–68) to verify that the air bag system is operating normally.



1. Bolt
   Installation note ..... page T–75
2. Driver-side air bag module
3. Connector



Installation note
Bolt
Tighten the bolts in the order shown in the figure.

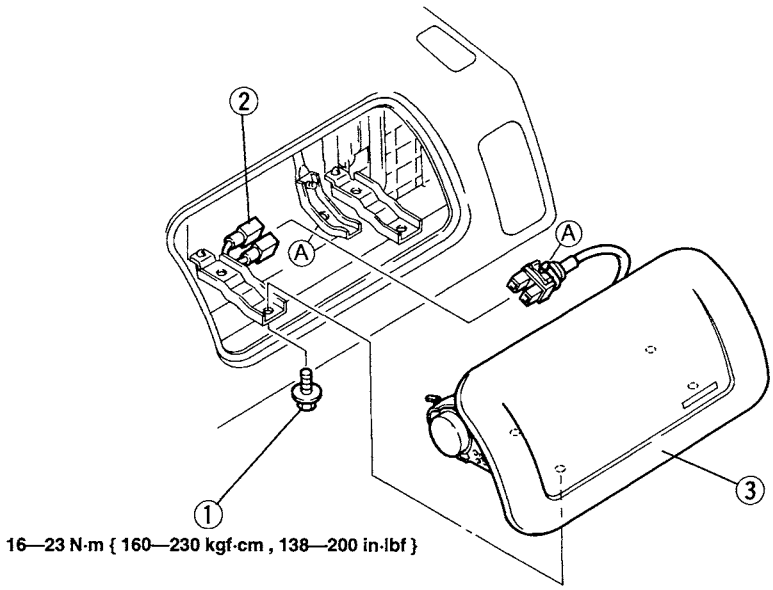
Tightening torque:
7.9—11.7 N·m { 80—120 kgf·cm , 70—104 in·lbf }

PASSENGER-SIDE AIR BAG MODULE
Removal / Installation

Warning
- **Handling the air bag module improperly can accidently deploy the air bag, which may seriously injure you. Read SERVICE WARNINGS, page T–66, before handling the air bag module.**

Warning
- **Installing the passenger-side air bag module when a service code 7 is not indicated can accidently deploy the air bag, which can cause serious injury. Carry out the proper troubleshooting procedures and verify that service code 7 is indicated before installing the passenger-side air bag module.**

1. Carry out the "Before Servicing" procedure under GENERAL PROCEDURES, page T–67.
2. Remove the glove compartment and undercover.
   (Refer to section S.)
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.
5. Follow the troubleshooting flowchart (page T–68) to verify that the air bag system is operating normally.

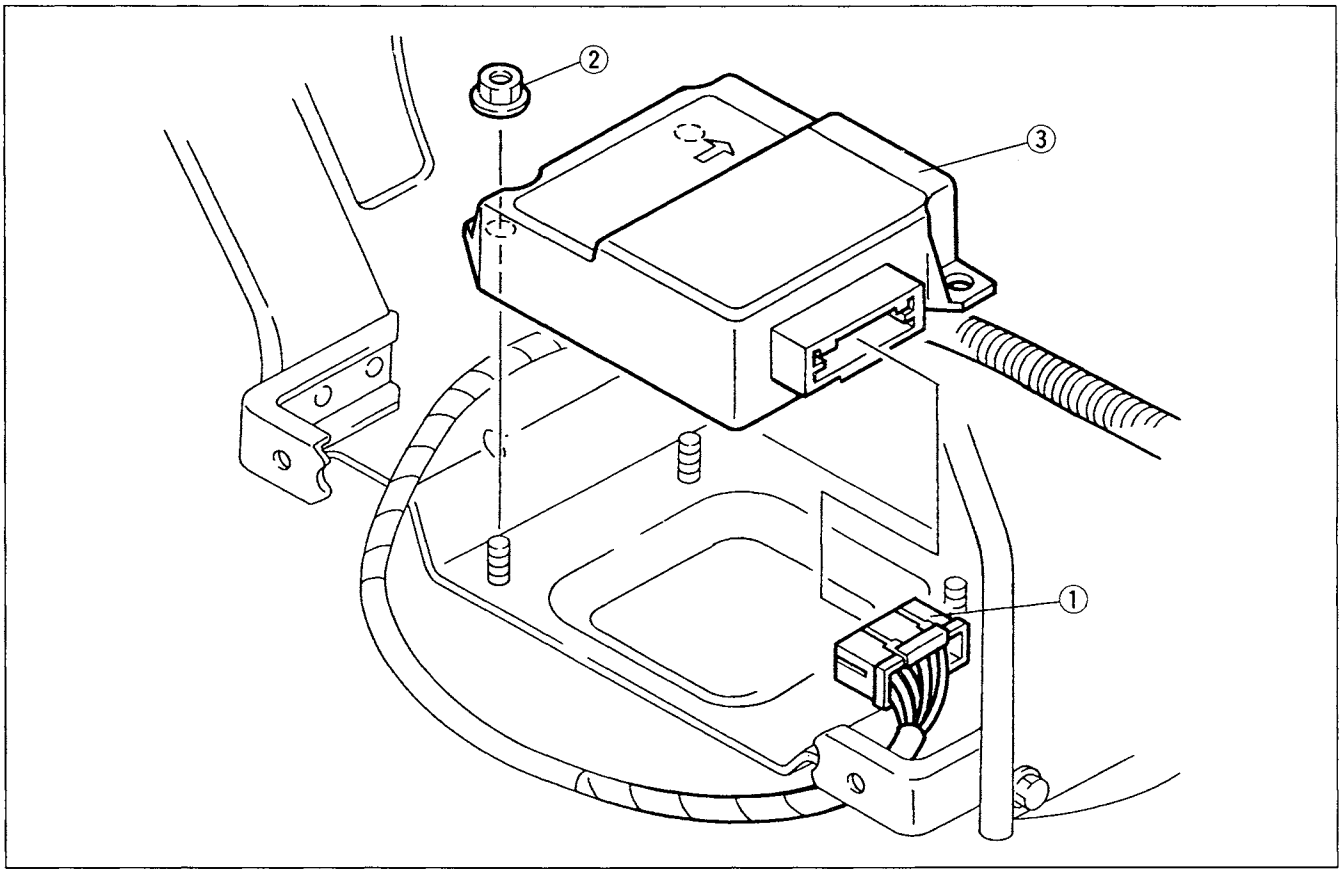


1. Bolt
2. Connectors
3. Passenger-side air bag module

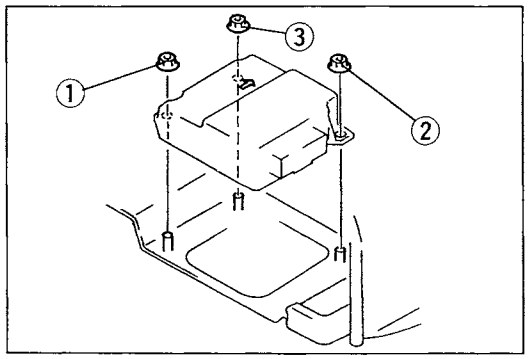
SAS UNIT
Removal / Installation

Warning
- **Handling the SAS unit improperly can accidently deploy the air bags, which may seriously injure you. Read SERVICE WARNINGS, page T–66, before handling the SAS unit.**

1. Carry out the "Before Servicing" procedure under GENERAL PROCEDURES, page T–67.
2. Remove the center lower panel.
   (Refer to section S.)
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.
5. Follow the troubleshooting flowchart (page T–68) to verify that the air bag system is operating normally.
6. Perform the Deployment Authorization Procedures when installing a new SAS unit.
   (Refer to page T–77.)



1. Connector
2. Nut
   Installation note ..... below
3. SAS unit



Installation note
Bolt
Tighten the bolts in the order shown in the figure.

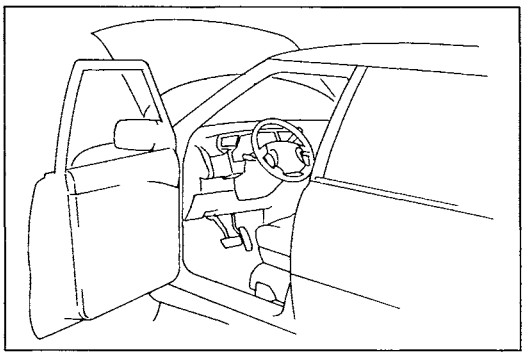
Tightening torque:
7.9—11.7 N·m { 80—120 kgf·cm , 70—104 in·lbf }

Deployment Authorization Procedures

1. Install a new SAS unit then verify that the air bag system warning light flashes approximately 6 seconds after the ignition switch is turned to ON.
2. If a service code is indicated, perform the appropriate troubleshooting.
3. Turn the ignition switch to LOCK then back to ON while the air bag system warning light is flashing continuously if the procedures have been performed correctly, the air bag system warning light illuminates the goes out afted approximately 6 seconds.

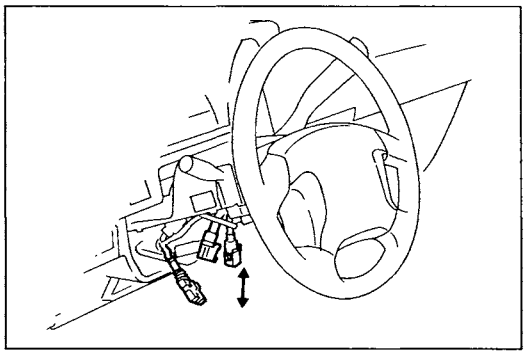
AIR BAG MODULE DISPOSAL PROCEDURE

Before scrapping a vehicle with an undeployed air bag module, deploy the air bag. Never dispose of a live air bag module. If the **SST** is not available, consult the nearest Mazda representative for assistance.



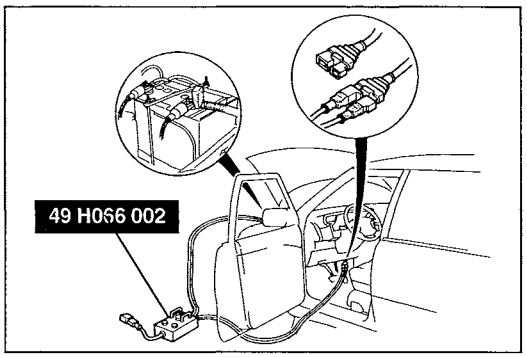
Air Bag Deployment

1. Move the vehicle to an open space, away from strong winds, and open all of the vehicle's doors.
2. Disconnect the negative battery cable and wait for more than one minute to allow the backup power supply to deplete its stored power.
3. Follow the appropriate procedure for the driver-side or passenger-side air bag module.

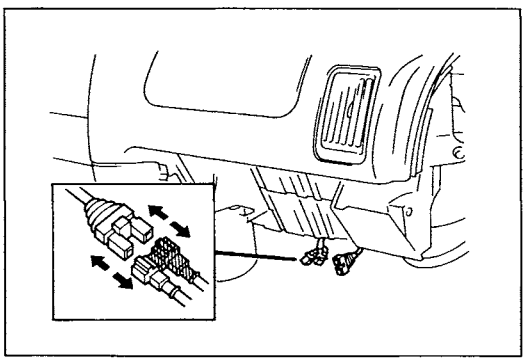


Driver-side air bag

(1) Make sure the air bag module is firmly mounted to the steering wheel.
(2) Remove the column cover.
(Refer to section S.)
(3) Disconnect the orange and blue clock spring connectors.

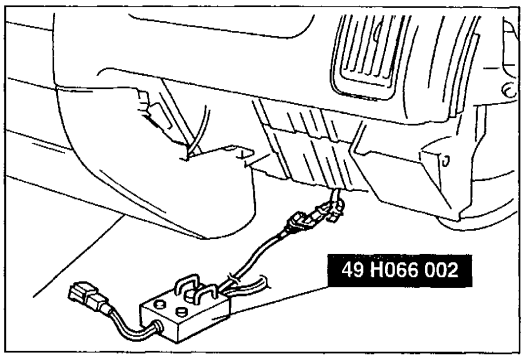


(4) Inspect the **SST**.
(Refer to page T–79.)
(5) Connect the **SST** to the clock spring connector as shown in the figure.

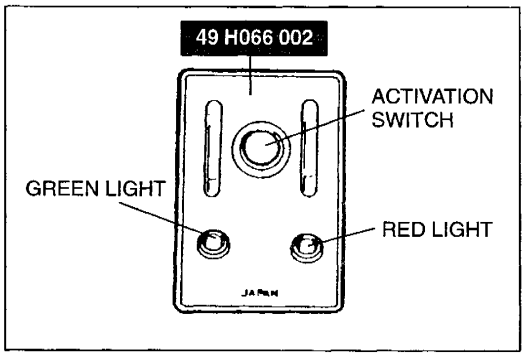


Passenger-side air bag

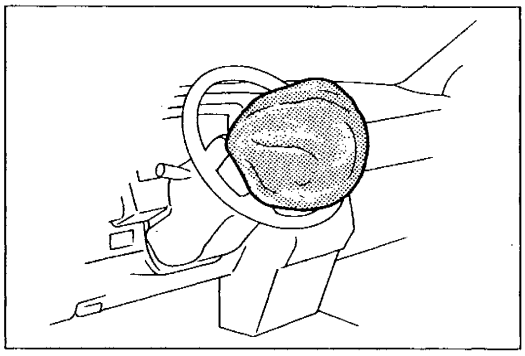
(1) Make sure the air bag module is firmly mounted to the dashboard.
(2) Remove the glove compartment cover.
(Refer to section S.)
(3) Disconnect the orange and blue passenger-side air bag module connector.



(4) Inspect the **SST**.
(Refer to page T–79.)
(5) Connect the **SST** to the passenger-side air bag module connector as shown in the figure.



4. Connect the red clip of the **SST** to the positive battery terminal and the black clip to the negative terminal.
5. Verify that the red light on the **SST** is illuminated.
6. Make sure all persons are standing at least **6 m { 20 ft }** from the vehicle.
7. Press the activation switch on the **SST** to deploy the air bag.

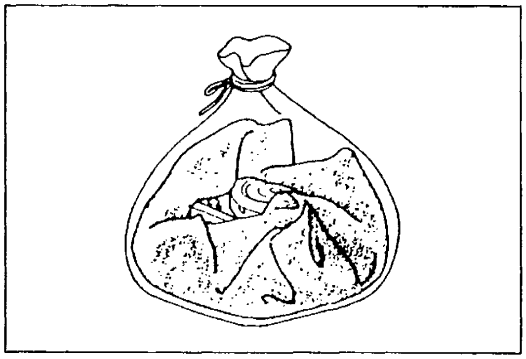


Air Bag Disposal

Warning
- **The air bag is very hot immediately after it deploys. You can be burned. Do not touch the air bag module for at least 15 minutes after deployment.**

Warning
- **Pouring water on a deployed air bag is dangerous. The water will mix the residual gases to form a gas that can make breathing difficult if inhaled. Do not pour water on the deployed air bag module.**

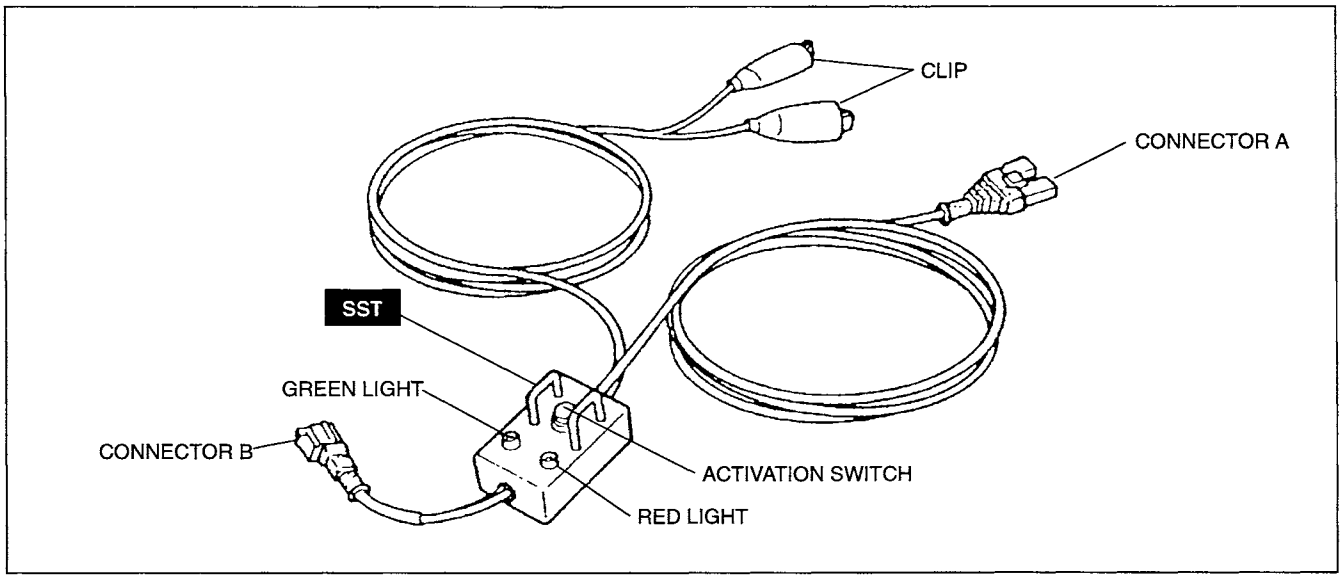
Warning
- **A deployed air bag module may contain deposits of sodium hydroxide, a caustic by-product of the gas-generated combustion. If this substance gets in your eyes or on your hands, it can cause irritation and itching. When handling a deployed air bag module, wear gloves and safety glasses.**

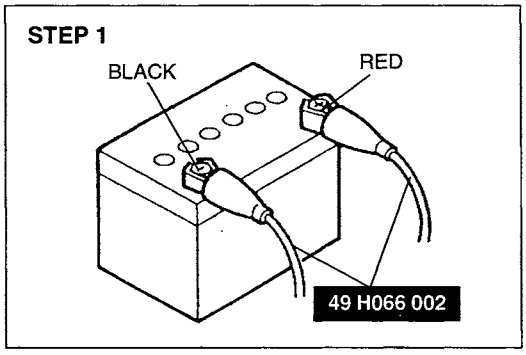


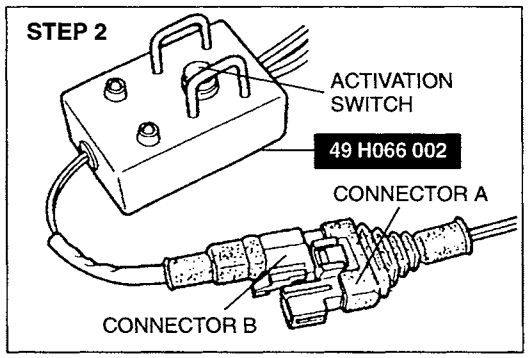
1. Put on gloves and safety glasses.
2. Place the deployed air bag module in a plastic bag, seal it, and then dispose of it.
3. Wash your hands after removing your gloves.

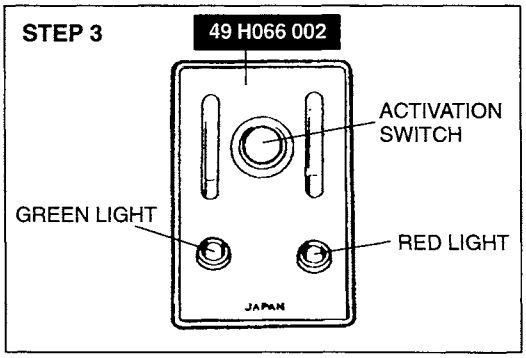
INSPECTION OF SST (DEPLOYMENT TOOL)

- Use the **SST** to deploy a live air bag module before disposing of it.
- Before connecting the **SST** to the clock spring connector or air bag module connector, inspect the operation of the **SST**.









Inspection Procedure

1. Follow the steps below to inspect the operation of the **SST**.

Step	Inspection procedure	Light condition	
		Green	Red
1	Connect red clip to positive battery terminal and black clip to negative battery terminal.	ON	OFF
2	Connect connectors A and B of **SST**.	OFF	ON
3	Press activation switch.	ON	OFF

2. If not as specified, do not use the **SST** because it may cause the air bag to unexpectedly deploy upon connection to the harnesses.

Before beginning any service procedure, refer to section T of this manual for air bag system service warnings.

HEATER AND AIR CONDITIONER SYSTEMS

R-134a SYSTEM INTRODUCTION

OUTLINE

- R-12 and other fluorocarbons now used in air conditioners can destroy the ozone layer in the stratosphere. The result is an increase in hazardous ultraviolet rays which over time can adversely affect both human health and the biosphere.
- Because of this concern, Mazda has chosen to use Refrigerant-134a (R-134a), a hydrofluorocarbon-based refrigerant that does not deplete the ozone layer, in this vehicle.
- R-12 and R-134a are not interchangeable; system parts and system service tools also differ. The table below compares the two systems.

Refrigerant system

Part	R-12 system	R-134a system	Remarks
Refrigerant	Chlorofluorocarbon–12 (CFC-12) [CCl_2F_2]	Hydrofluorocarbon-134a (HFC-134a) [CH_2FCF_3]	If the refrigerants are mixed or one refrigerant is used in a system that requires the other, the compressor oil will separate from the refrigerant and not circulate within the system. This can damage the A/C compressor. In addition, mixing R-134a with R-12 or using R-134a instead of R-12 in an R-12 system can lower the durability of the NBR O-ring and dissolve the fluorine rubber O-rings. If the fluorine rubber O-rings are dissolved, refrigerant may leak.
Compressor oil	Mineral oil	Polyalkylene glycol oil (PAG oil) [ND-OIL8]	If the oils are mixed or one oil is used in a system that requires the other, the compressor oil will separate from the refrigerant and not circulate within the system. This can damage the A/C compressor. Mixing PAG oil with mineral oil or using PAG oil instead of mineral oil in an R-12 system can lower the durability of the NBR and fluorine rubber O-rings.
O-ring	Nitrile butadiene rubber (NBR) Fluorine rubber	Rubber in behalf of R-134a (RBR)	If an NBR O-ring is used in an R-134a system, the PAG oil and R-134a will lower the durability of the O-ring. If a fluorine rubber O-ring is used in an R-134a system, the R-134a will dissolve the O-ring and cause the refrigerant to leak.
Joint nuts	Inch threads	Metric threads	Thread standards for joint nuts connecting pipes and hoses have been changed to avoid connecting R-12 system parts with R-134a system parts.
Charging valve	Screw-on type HI: 3/8-24 UNF LO: 7/16-20 UNF	Quick-connect type HI: 16 mm { 0.6 in } dia. LO: 13 mm { 0.5 in } dia.	The shape of the charging valve differs for each system to avoid confusion. The quick connect charging valve prevents refrigerant from leaking when the charging hose is connected to the valve.

Service tools

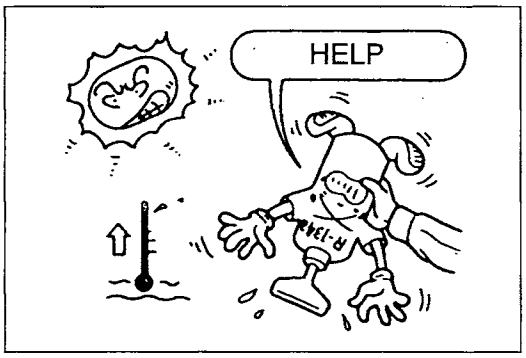
Part	R-12 system	R-134a system	Remarks
Tool joints	Inch threads	Metric threads	Thread standards for tool joints have been changed to avoid connecting R-12 system tools with R-134a system tools.
Charging valve joints	Screw-on type HI: 3/8-24 UNF LO: 7/16-20 UNF	Quick-connect type HI: 16 mm { 0.6 in } dia. LO: 13 mm { 0.5 in } dia.	The shape of the charging valve joints differ for each system to avoid confusion. The quick-connect charging valve joint prevents refrigerant from leaking when the charging hose is connected to the valve.
Manifold gauge	High-pressure-side maximum reading: 2.9 MPa { 30 kgf/cm^2 , 430 psi }	High-pressure-side maximum reading: 3.5 MPa { 35 kgf/cm^2 , 500 psi }	R-134a requires a higher pressure to condense than R-12.
Leak tester	Gas type Electric type	Electric type	A gas leak tester reacts with chlorine in R-12 to indicate the location of a leak. This kind of tester does not work with an R-134a system, however, because R-134a has no chlorine. Two kinds of electric testers are available; those that work exclusively with one system or the other, and those that work with both.

SERVICE WARNINGS

Using/Handling Unapproved Refrigerant

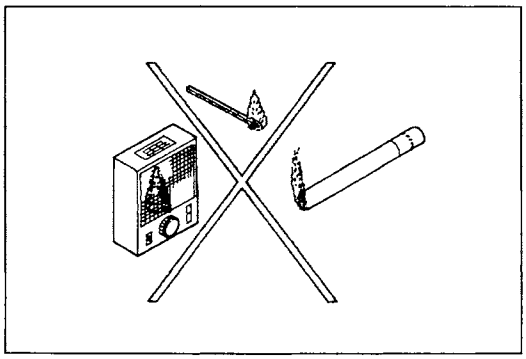
- **Using a flammable refrigerant, such as OZ-12, in this vehicle is dangerous. In an accident, the refrigerant may catch fire, resulting in serious injury or death.**
  When servicing this vehicle, use only R-134a.

- **Checking for system leaks on a vehicle that has been serviced with flammable refrigerant, such as OZ-12, is dangerous. Conventional leak detectors use an electronically generated arc which can ignite the refrigerant, causing serious injury or death. If a flammable refrigerant has been used to service the system, or if you suspect a flammable refrigerant may have been used, contact the local fire marshall or EPA office for information on handling the refrigerant.**



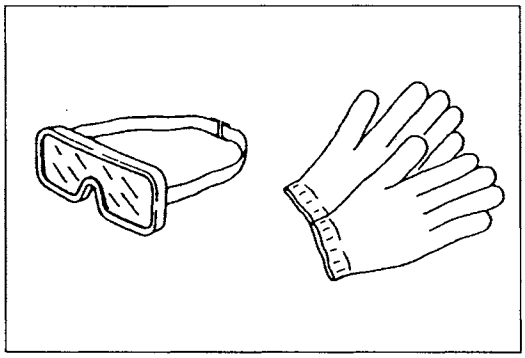
Storing Refrigerant

- **The refrigerant container is highly pressurized. If it is subjected to high heat, it could explode, scattering metal fragments and liquid refrigerant that can seriously injure you. Store the refrigerant at temperatures below 40 °C { 104 °F }.**



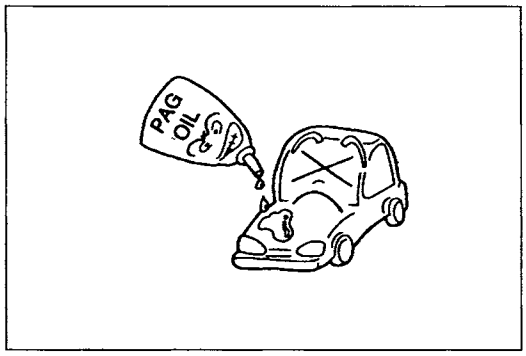
Servicing Refrigerant System

- **Do not allow the refrigerant to leak near fire or any kind of heat. A poisonous gas may be generated if the refrigerant gas contacts fire or heat such as from cigarettes and heaters.**
  When carrying out any operation that can cause refrigerant leakage, extinguish or remove the above-mentioned heat sources and maintain adquate ventilation.



Handling Refrigerant

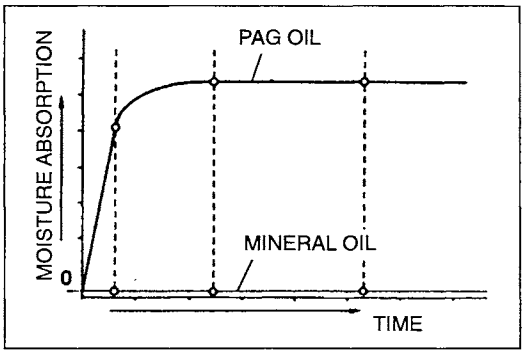
- Handling liquid refrigerant is dangerous. A drop of it on the skin can result in localized frostbite. When handling the refrigerant, wear gloves and safety goggles. If refrigerant splashes into the eyes, immediately wash them with clean water and consult a doctor.



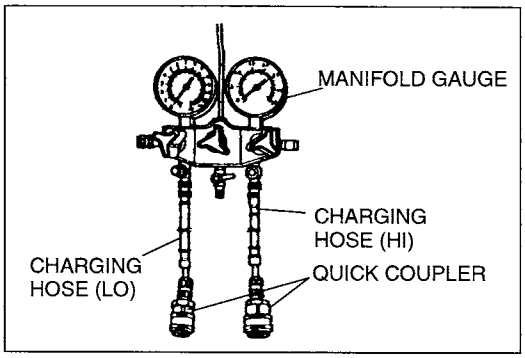
SERVICE CAUTIONS

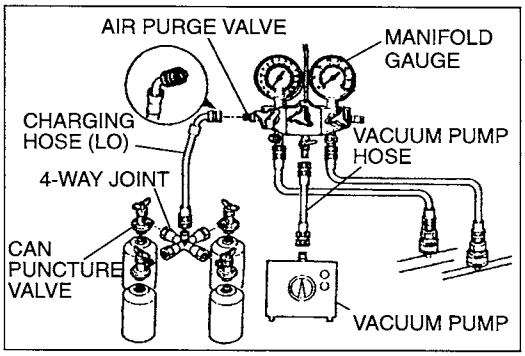
Compressor Oil (ND-OIL8)

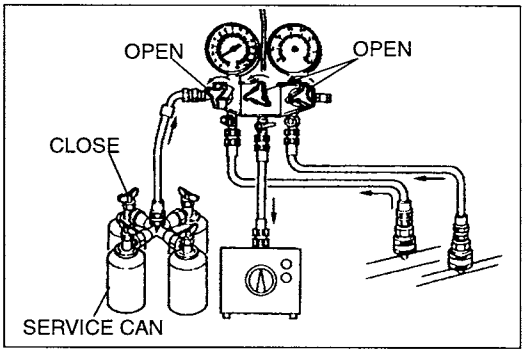
- Do not spill compressor oil on the vehicle. A drop of compressor oil on the vehicle surface can eat away at the paint. If oil gets on the vehicle, wipe it off immedeately.

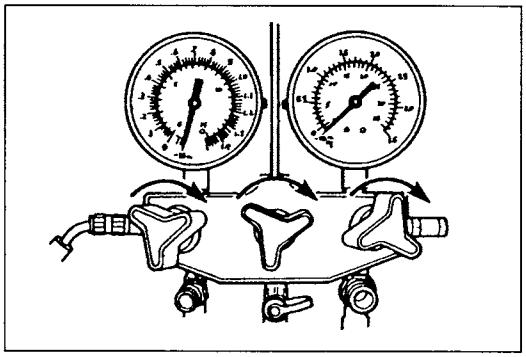


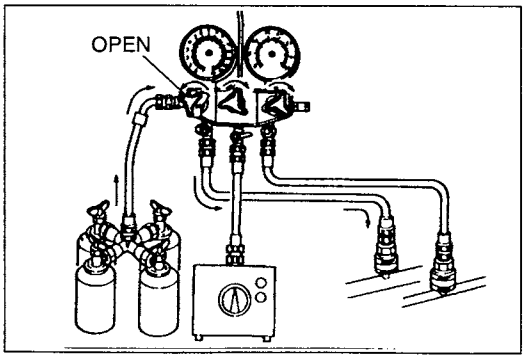
- PAG compressor oil has a higher moisture absorption effeciency than the previously used mineral oil. If moisture mixes with the compressor oil, the refrigerant system could be damaged. Therefore, install caps immediately after using the compressor oil or removing refrigerant system parts to prevent moisture absorption.











REFRIGERANT SYSTEM SERVICE PROCEDURES

MANIFOLD GAUGE SET INSTALLATION

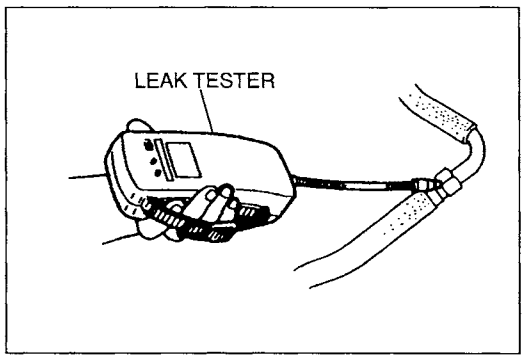
1. Fully close the valves of the manifold gauge.
2. Connect charging hoses to the high- and low-pressure side joints of the manifold gauge set.
3. Connect quick couplers to the ends of the charging hoses.
4. Remove the caps from the charging valves of the high- and low-pressure side cooler pipes.
5. Connect the quick couplers to the charging valves of the cooler pipes.

CHARGING

1. Install the manifold gauge set.
2. Connect the tap pin side of the charging hose to the air purge valve of the manifold gauge.
3. Connect the vacuum pump hose to the center joint of the manifold gauge.
4. Connect the vacuum pump hose to the vacuum pump.
5. Connect can puncture valves to a 4-way joint.
6. Fully open the can puncture valves and connect the service cans to the valves.

Regular amount of refrigerant
Single A/C : 900 g { 31.8 oz , 1.98 lb }
Twin A/C : 1000 g { 35.30 oz , 2.20 lb }

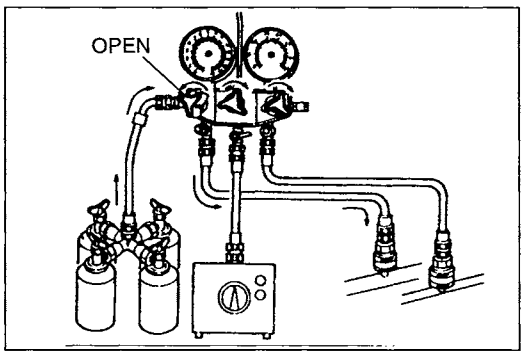
7. Fully close any can puncture valve that is not connected to a service can.
8. Connect the 4-way joint to the charging hose that is connected to the gauge set air purge valve.
9. Open all the valves of the manufold gauge.
10. Start the vacuum pump and let it operate for 15 minutes.
11. After 15 minutes, verify that the high- and low-pressure-side readings of the manifold gauge set are at **–101 kPa { –760 mmHg , –29.9 inHg }**. Close each valve of the manifold gauge.
12. Stop the vacuum pump and wait for about 5 minutes.
13. After 5 minutes, check the low-pressure-side reading of the manifold gauge. If the reading has changed, check for leaks and then repeat from step 9. If the reading has not changed, go to step 14.
14. Open the service cans by using the can puncture valves.
15. Open the low-pressure side valve of the manifold gauge set and charge with refrigerant until the low-pressure-side reading is at **100 kPa { 1 kgf/cm^2 , 10 psi }**.
16. Close the low-pressure side valve of the manifold gauge.



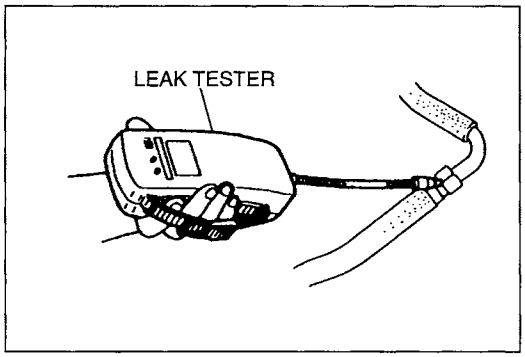
17. Check for leaks by using a leak tester. If there are no leaks, go to step 18. If a leak is found at a loose joint, tighten the joint and check for leaks again. If there is still a leak at the same joint, discharge the refrigerant and then repair the joint. Repeat the charging procedure from step 9. If there are no leaks after tightening the joint, go to step 18.

Warning

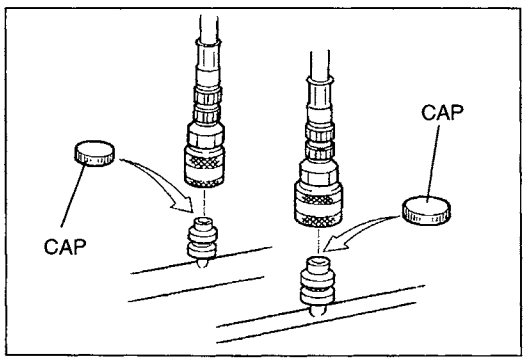
- **Running the engine with the high-pressure side valve open is dangerous. Pressure within the service cans will increase and the cans could explode, scattering metal fragments and liquid refrigerant that can seriously injure you. Therefore, do not open the high-pressure side valve while the engine is running.**



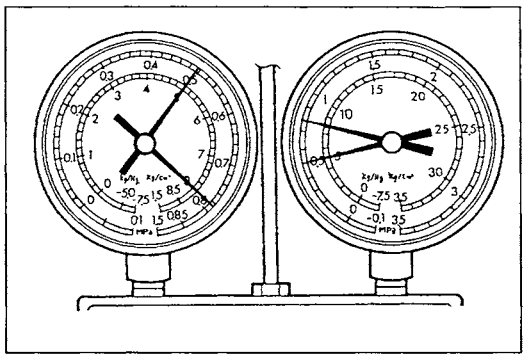
18. Open the low-pressure side valve of the manifold gauge and charge with the remaining refrigerant.



19. Close the low-pressure side valve of the manifold gauge.
20. Check for leaks by using a leak tester. If there are no leaks, go to step 21. If a leak is found at a loose joint, tighten the joint and check for leaks again. If there is still a leak at the same joint, discharge the refrigerant and then repair the joint. Repeat the charging procedure from step 9. If there are no leaks after tightening the joint, go to step 21.

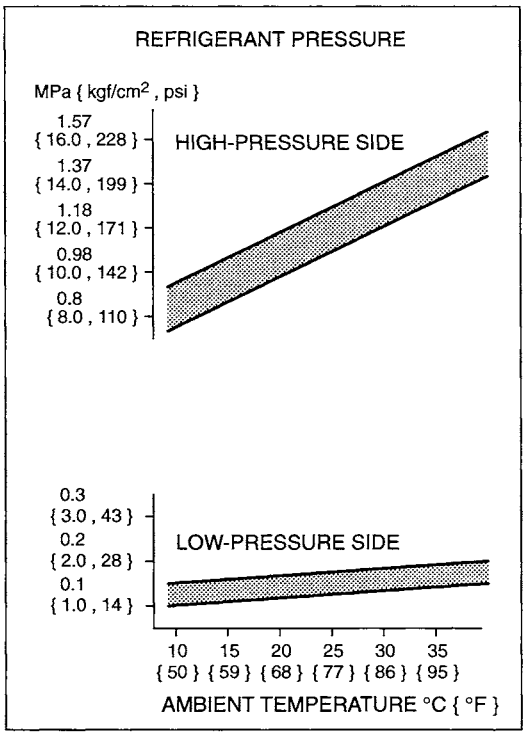


21. Disconnect the high- and low-pressure side quick couplers from the charging valves that are connected to the high and low-pressure side cooler pipes of the refrigerant system.
22. Install the caps to the charging valves of the cooler pipes.



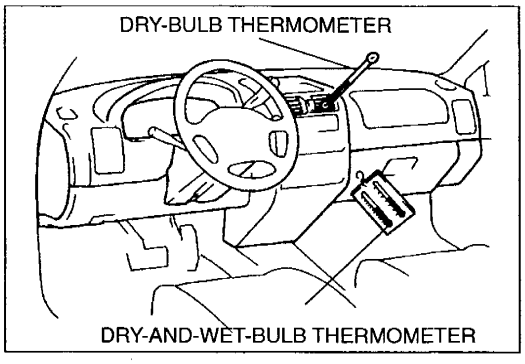
CHECKING REFRIGERANT AMOUNT

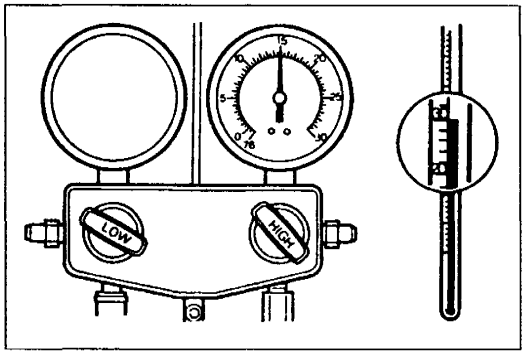
1. Install the manifold gauge set. (Refer to page U–5.)
2. Check the refrigerant pressure reading with the engine stopped.
3. Verify that the high- and low-pressure-side readings of the manifold gauge are at **493—788 kPa { 5.02—8.04 kgf/cm^2 , 71—114 psi }**. If the pressure readings are lower than specified, recharge the refrigerant. (Refer to page U–5.)
   If the pressure readings are within the specification but there is insufficient cooling, go to the next step. If the pressure readings are within the specification and there are no leaks, the refrigerant amount is OK.
4. Start the engine and run it at a constant **2,000 rpm**.
5. Turn the A/C switch on, set the front fan switch at the fourth position, and set the intake mode at recrculate.
6. If the A/C compressor is short-cycling, note the low-pressure-side reading at which the magnetic clutch kicks out.
7. If the pressure is **170 kPa { 1.7 kgf/cm^2 , 24 psi }** or lower, evacuate and recharge the refrigerant system with the proper amount of refrigerant. (Refer to page U–5.) If the pressure is **210 kPa { 2.1 kgf/cm^2 , 30 psi }** or higher, inspect the thermoswitch. (Refer to page U–36.)



CHECKING REFRIGERANT PRESSURE

1. Close the doors and windows and open the hood.
2. Install the manifold gauge set. (Refer to page U–5.)
3. Start the engine and run it at **1,500 rpm**.
4. Turn the A/C switch on and set the front fan switch to the fourth position.
5. Set the REC/FRESH lever to RECIRCULATE.
6. Set the MODE lever to VENT.
7. Set the TEMP lever to MAX COLD.
8. Verify that the pressure readings of the manifold gauge are in the shaded zones.
9. If the pressures are not as specified, inspect and repair the refrigerant system.
10. If the pressures are abnormal, refer to flowchart No.14 and troubleshoot the system.





PERFORMANCE TEST

After finishing repairs, conduct a performance test of the air conditioning system as follows.

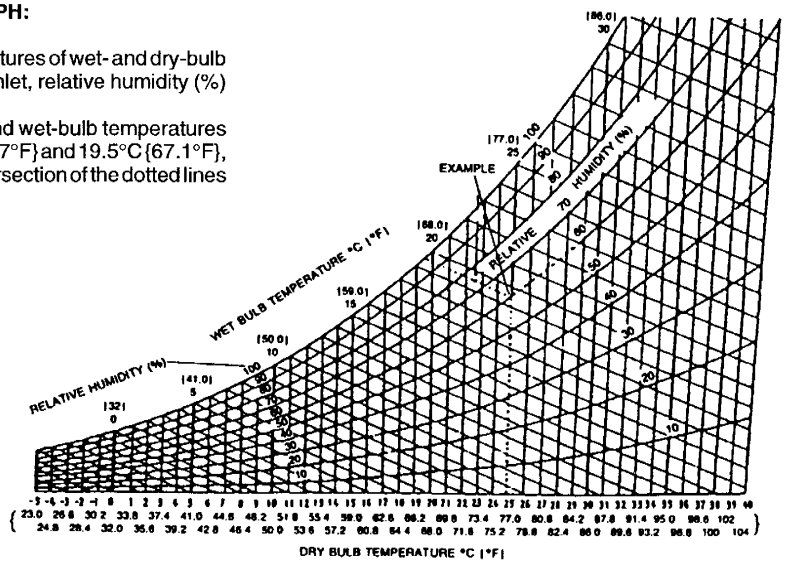
1. Install the manifold gauge set. (Refer to page U–5.)
2. Start the engine and keep the engine speed at **1,500 rpm**.
3. Operate the air conditioner at maximum cooling.
4. Close all windows and doors.
5. Place a dry-bulb thermometer in the center ventilator outlet.
6. Place a dry-and-wet thermometer close to the blower inlet.
7. Wait until the air conditioner outlet temperature stabilizes. If the high-pressure side becomes too high, pour cool water on the condenser. If it is too low, cover the front of the condenser.

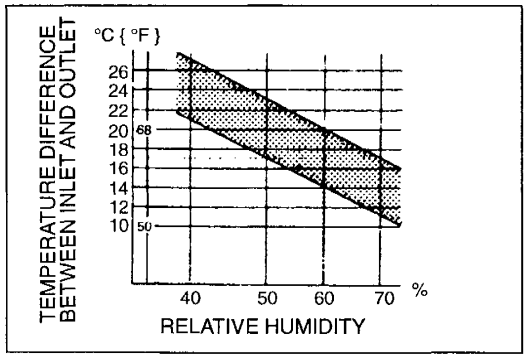
   Stabilized condition
   Blower inlet temperature: 30—35 °C { 86—95 °F }
   High pressure: 1.38—1.56 MPa
   { 14.0—16.0 kgf/cm^2 , 200—227 psi }

8. After the air conditioner stabilizes, read the dry-and-wet thermometer at the air inlet.
9. Calculate the relative humidity from the below chart by comparing the wet-bulb and dry-bulb readings.

HOW TO READ THE GRAPH:

After measuring the temperatures of wet- and dry-bulb thermometer at the blower inlet, relative humidity (%) can be obtained.
Example; Supposing dry- and wet-bulb temperatures at the blower inlet are 25°C {77°F} and 19.5°C {67.1°F}, respectively, the point of intersection of the dotted lines in the graph is 60%.





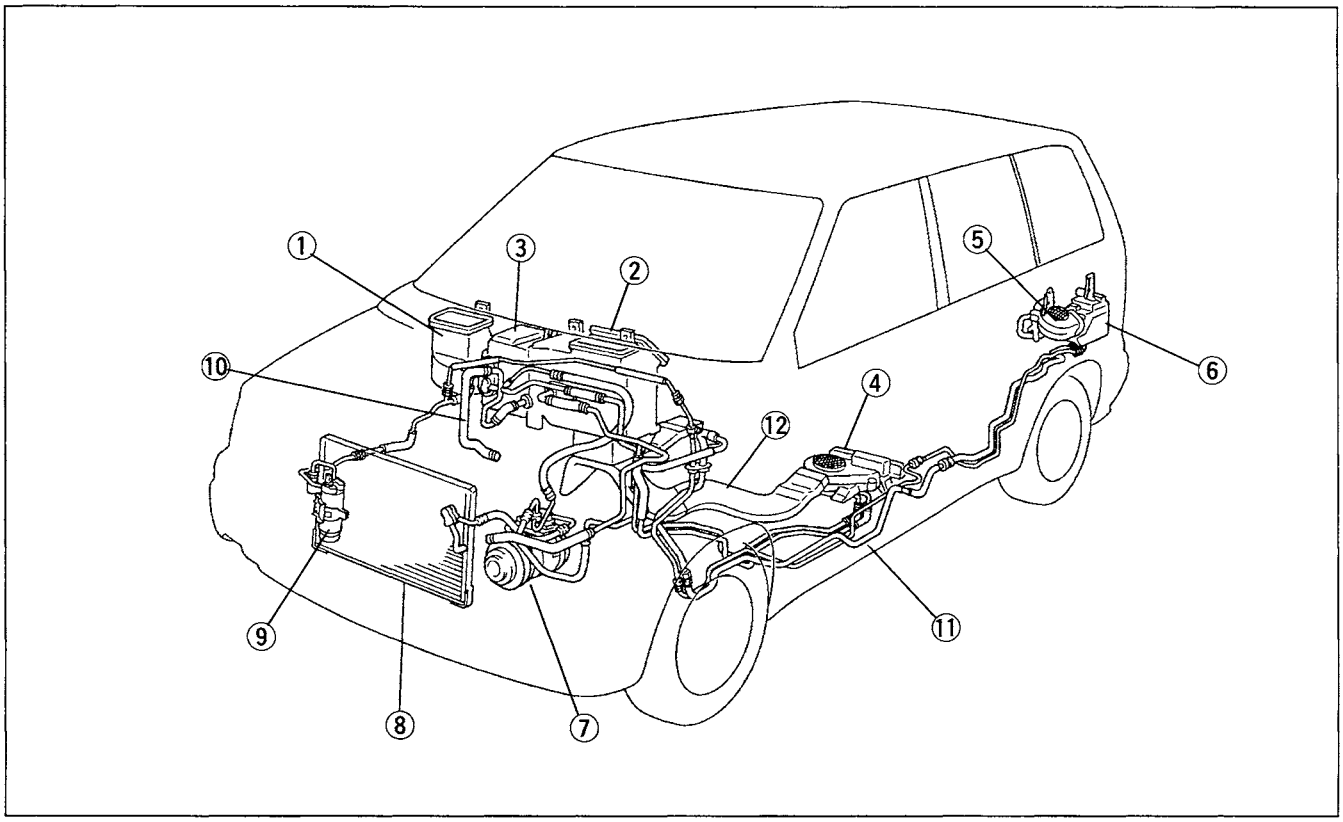
10. Read the dry-bulb thermometer at the air outlet, and calculate the difference between the inlet dry-bulb and outlet dry-bulb temperature.
11. Verify that the intersection of the relative humidity and temperature difference is in the shaded zone.

BASIC SYSTEM

PREPARATION
SST

0000–41–0812–13 Seal sleeve protector		For protection damage of shaft seal

STRUCTURAL VIEW

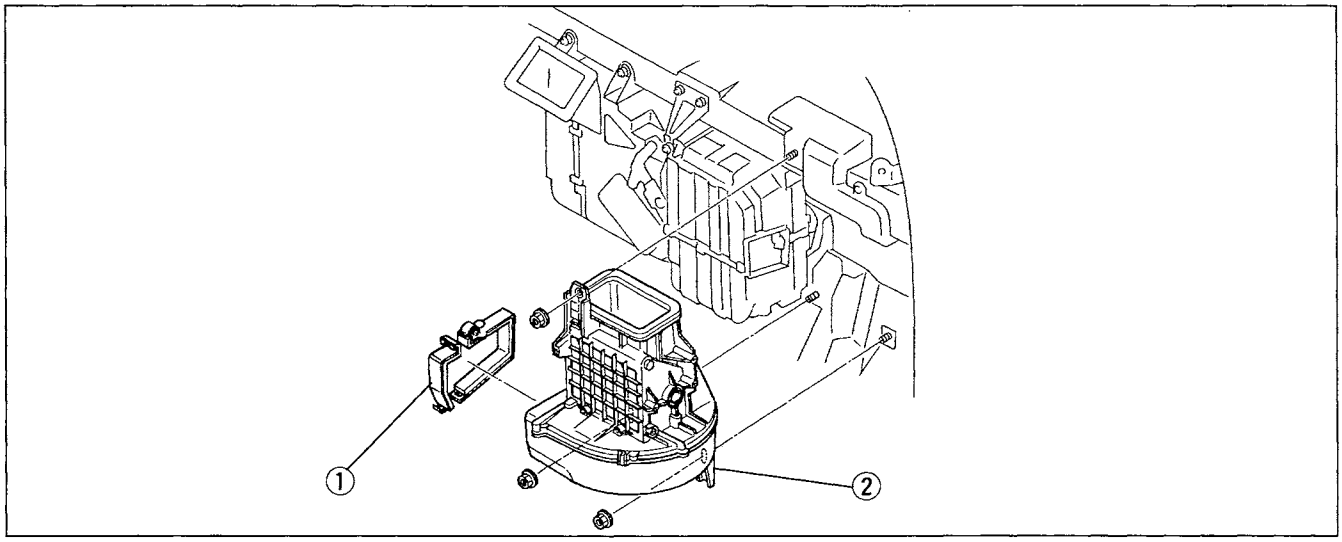


1. Blower unit
   - Removal / Installation ..... page U–10
   - Disassembly / Assembly ..... page U–10
2. Heater unit
   - Removal / Installation ..... page U–11
   - Disassembly / Assembly ..... page U–12
   - Inspection ..... page U–12
3. Cooling unit
   - Removal / Installation ..... page U–13
   - Disassembly / Assembly ..... page U–14
   - Inspection ..... page U–14
4. Rear heater unit
   - Removal / Installation ..... page U–15
   - Disassembly / Assembly ..... page U–16
   - Inspection ..... page U–16
5. Rear blower unit
   - Removal / Installation ..... page U–17
   - Disassembly / Assembly ..... page U–17
6. Rear cooling unit
   - Removal / Installation ..... page U–18
   - Disassembly / Assembly ..... page U–19
   - Inspection ..... page U–19
7. A/C compressor
   - Removal / Installation ..... page U–20
   - Disassembly ..... page U–20
   - Assembly ..... page U–22
8. Condenser
   - Removal / Installation ..... page U–25
   - Inspection ..... page U–26
9. Receiver/drier
   - Removal / Installation ..... page U–26
10. Heater hoses and pipes
    - Removal / Installation ..... page U–27
11. Refrigerant lines
    - Removal / Installation ..... page U–28
12. Rear heat duct
    - Removal / Installation ..... page U–29

BLOWER UNIT

Removal / Installation

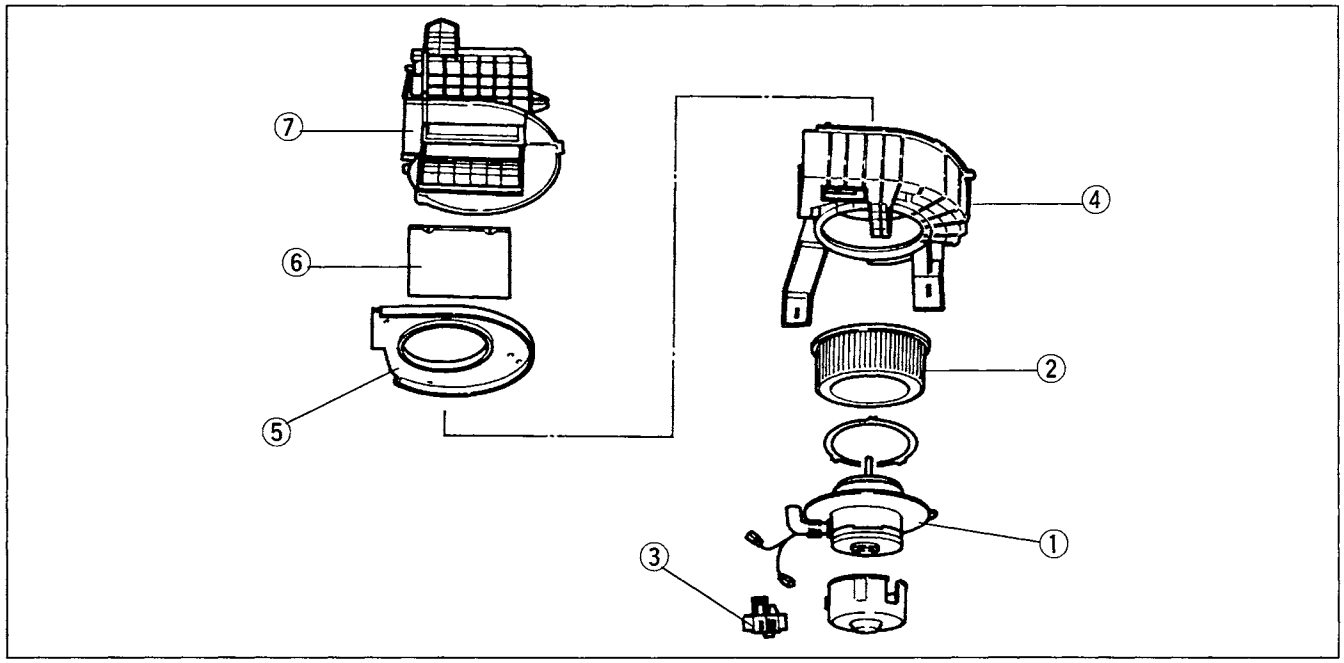
1. Remove the glove compartment cover. (Refer to section S.)
2. Disconnect the blower unit connectors.
3. Disconnect the air intake wire.
4. Remove the cooling unit bracket, keyless unit and door lock timer unit bracket.
5. Remove in the order shown in the figure.
6. Install in the reverse order of removal.



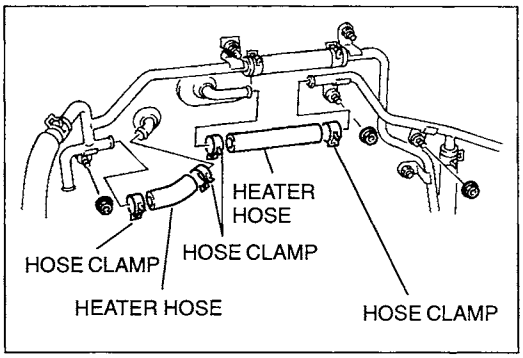
1. Seal plate
2. Blower unit
   Disassembly / Assembly ..... below

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.

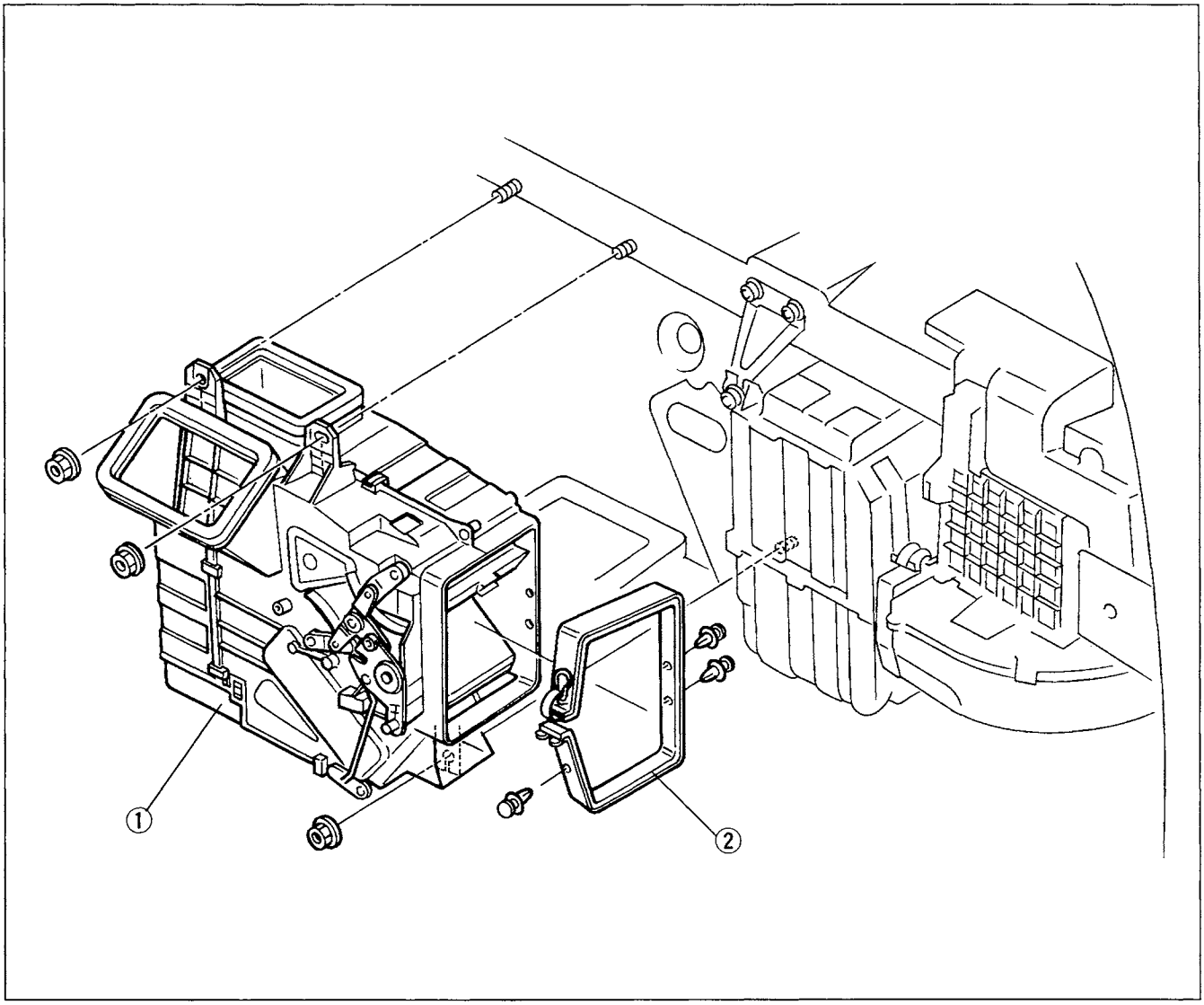


1. Front blower motor
2. Blower fan
3. Resistor
4. Case (bottom)
5. Air guider
6. Air intake door
7. Case (top)



HEATER UNIT
Removal / Installation
1. Drain the engine coolant. (Refer to section E.)
2. Remove the nuts.
3. Remove the hose clamps and heater hoses.
4. Remove the dashboard. (Refer to section S.)

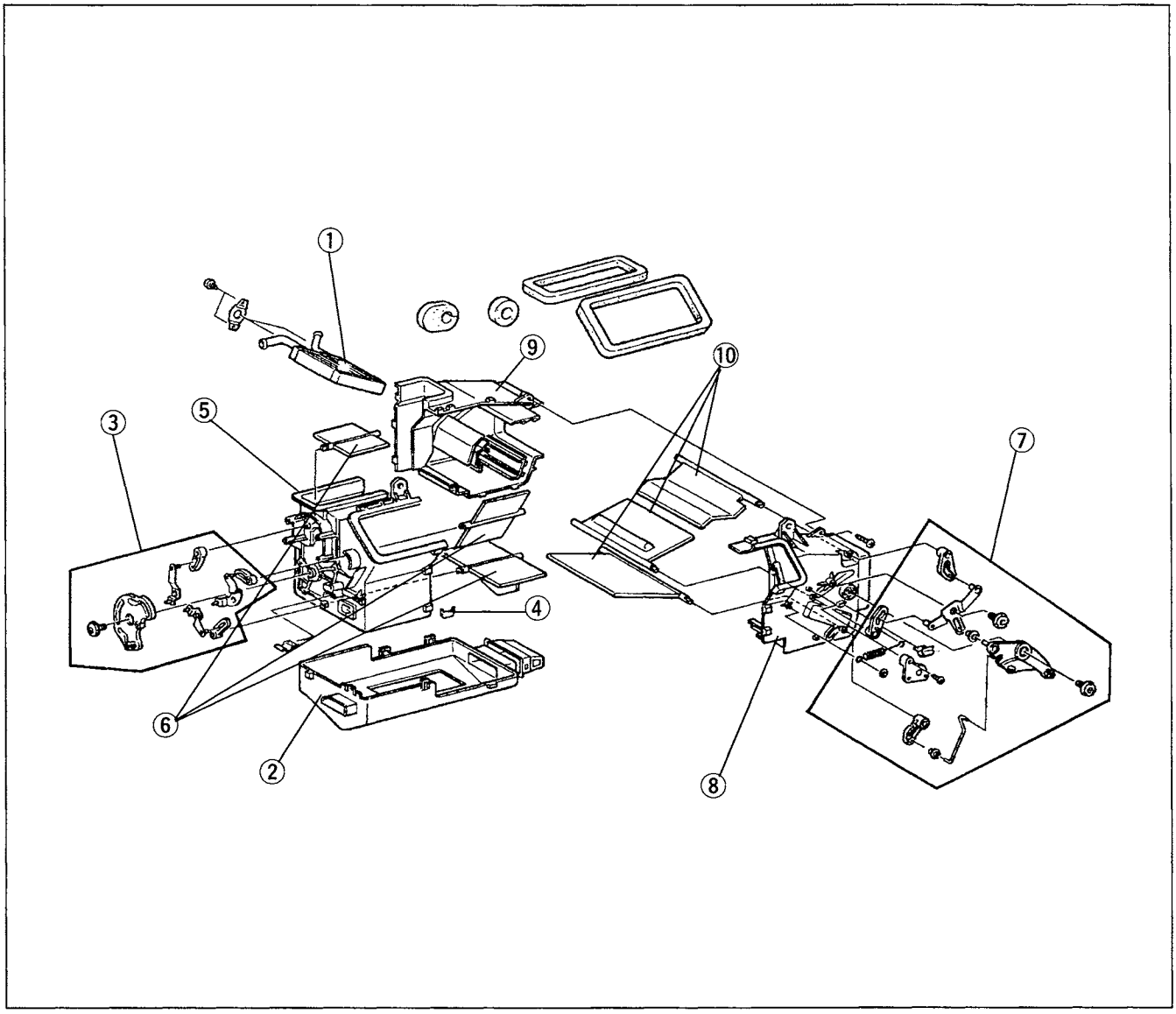
5. Remove in the order shown in the figure.
6. Install in the reverse order of removal.



1. Heater unit
   Disassembly / Assembly ..... page U–12
   Inspection ..... page U–12
2. Seal plate

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



1. Heater core
   Inspection ..... below
2. Duct
3. Airflow mode link set
4. Crip
5. Heater case (1)
6. Airflow mode door
7. Air mix link set
8. Heater case (2)
9. Heater case (3)
10. Air mix door

Inspection

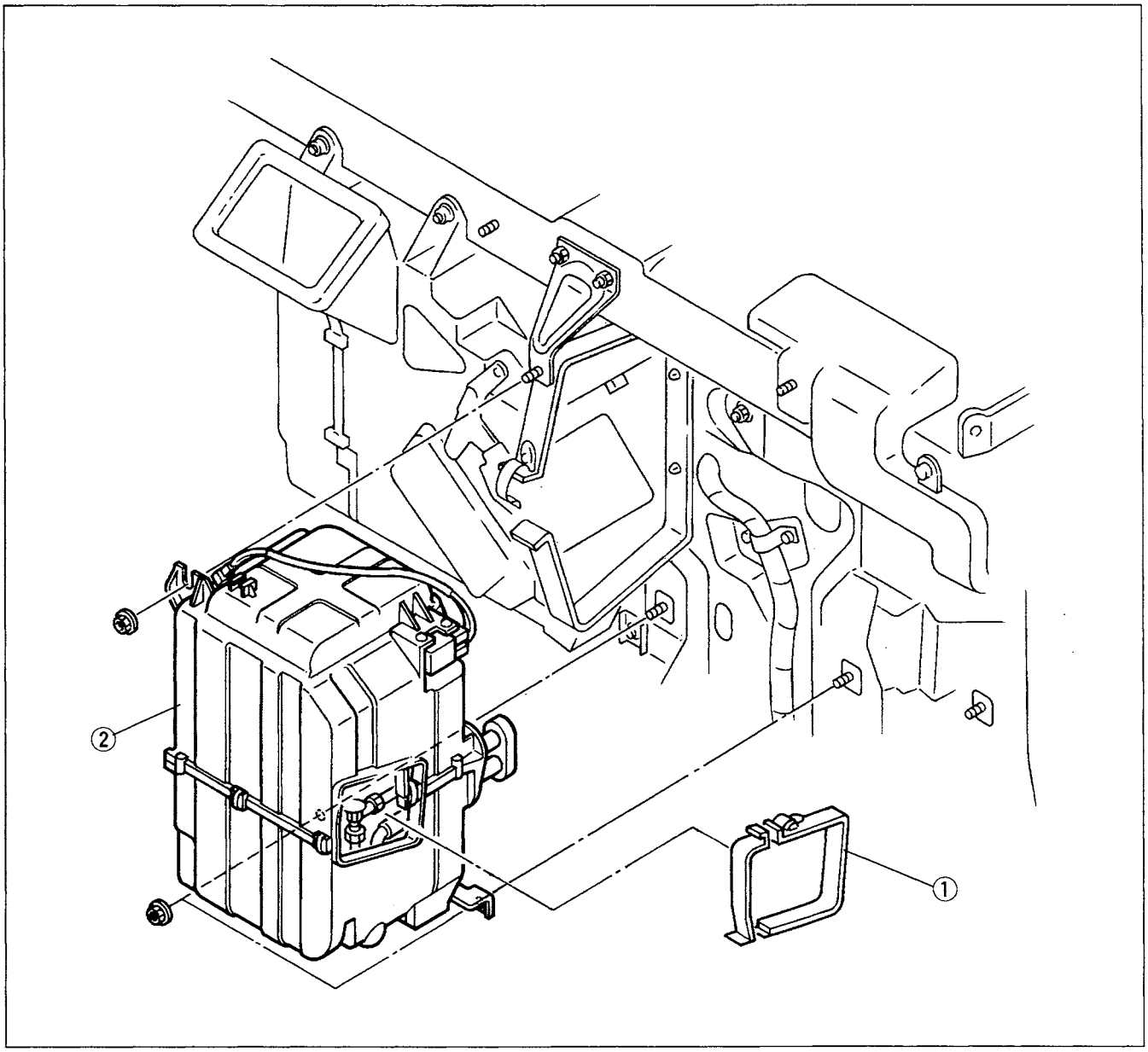
Heater core

1. Remove the heater core from the heater unit.
2. Check for cracks, damage, and coolant leakage. Repair or replace the heater core if necessary.
3. Check for bent fins. If they are bent, use a flat-head screwdriver to straighten them.
4. Check for fittings for cracks or damage. Replace the heater core if necessary.

COOLING UNIT

Removal / Installation

1. Discharge the refrigerant from the system.
2. Disconnect the thermoswitch connector.
3. Disconnect front cooler pipe No.1 and front cooler hose (LO) from the cooling unit. (Refer to page U–29.)
4. Remove in the order shown in the figure.
5. Install in the reverse order of removal, referring to **Installation note**.
6. Test its performance after charging the system. (Refer to page U–5, 8.)



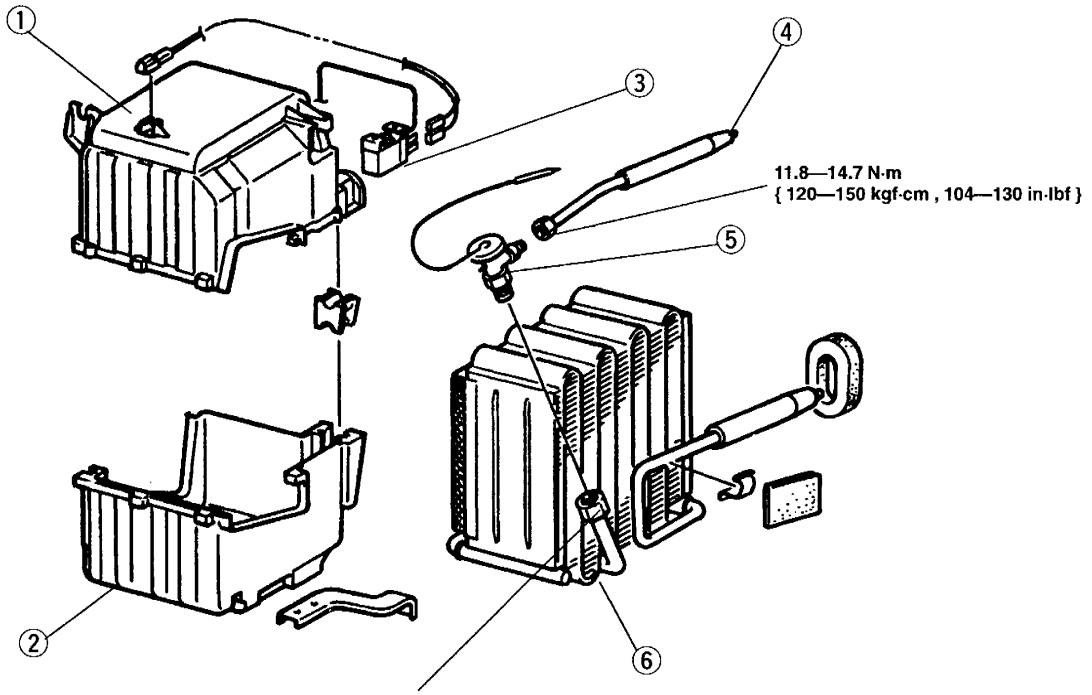
1. Seal plate
2. Cooling unit
   - Installation note ..... below
   - Disassembly / Assembly ..... page U–14
   - Inspection ..... page U–14

Installation note

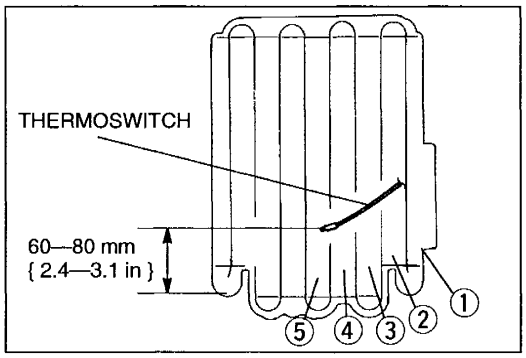
When installing a new cooling unit (evaporator), add **40 ml { 40 cc , 1.4 fl oz }** of compressor oil through the high-pressure side of the A/C compressor.

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly, referring to **Disassembly note**.



1. Case (top)
2. Case (bottom)
3. Thermoswitch
   Assembly note ..... below
4. Inlet pipe
5. Expansion valve
   Assembly note ..... below
6. Evaporator
   Inspection ..... below



Assembly note

Expansion valve

Apply clean compressor oil to the O-rings before connecting the fittings; do not apply compressor oil to the fitting nuts.

Thermoswitch

Assemble the sensor part of the thermoswitch as shown in the figure.

Inspection

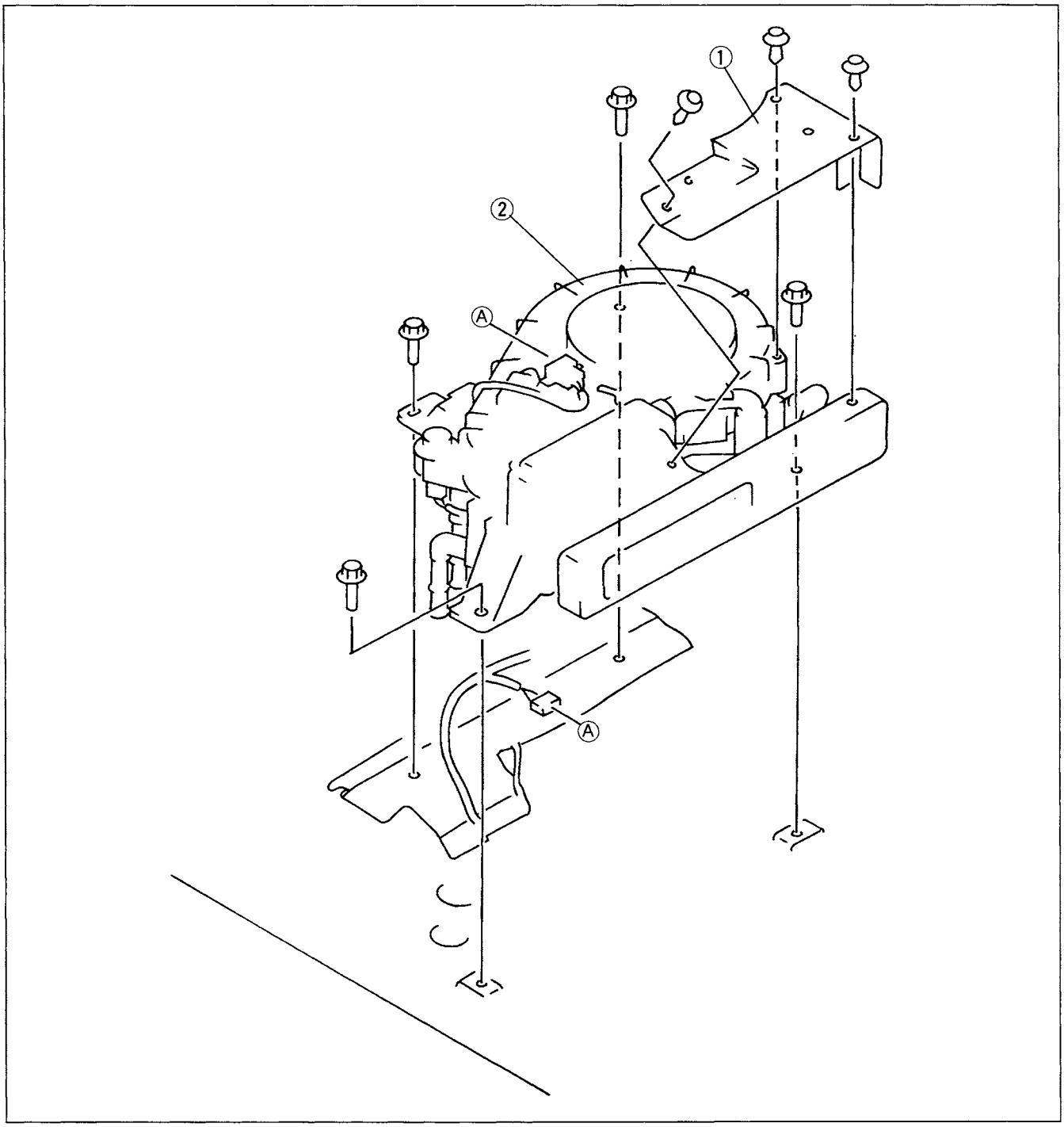
Evaporator

1. Check the evaporator fins for blockage. If the fins are clogged, clean them with compressed air. Do not use water.
2. Check the fittings for cracks and damage. Replace the evaporator if necessary.

REAR HEATER UNIT

Removal / Installation

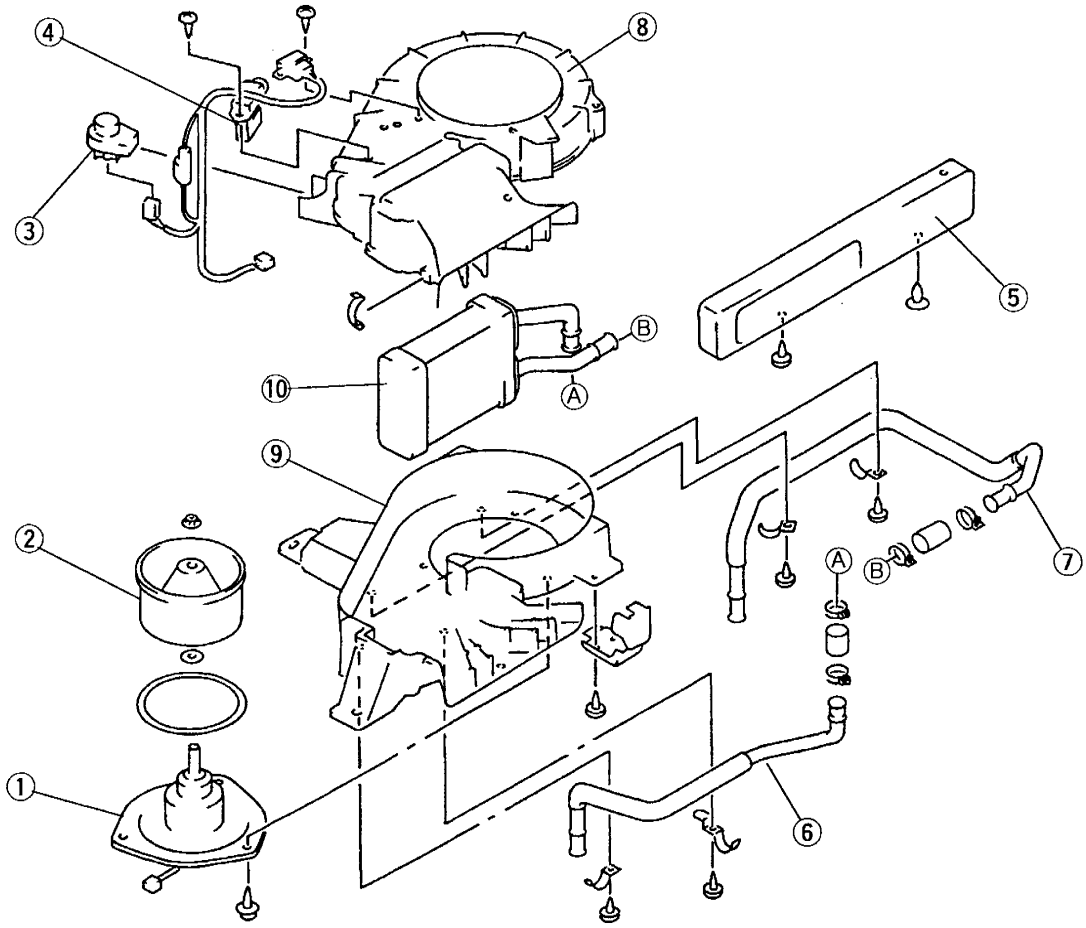
1. Drain the engine coolant. (Refer to section E.)
2. Remove the hose clamps and disconnect the rear heater hoses from the rear heater unit.
3. Remove the driver's seat. (Refer to section S.)
4. Disconnect the rear heater unit connector.
5. Remove in the order shown in the figure.
6. Install in the reverse order of removal.



1. Cover
2. Rear heater unit
   Disassembly / Assembly ..... page U–16
   Inspection ..... page U–16

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



1. Rear heater blower motor
2. Blower fan
3. Blower relay
4. Rear heater resistor
5. Panel
6. Rear heater pipe
7. Rear heater pipe
8. Rear heater case (top)
9. Rear heater case (bottom)
10. Heater core
    Inspection ..... below

Inspection

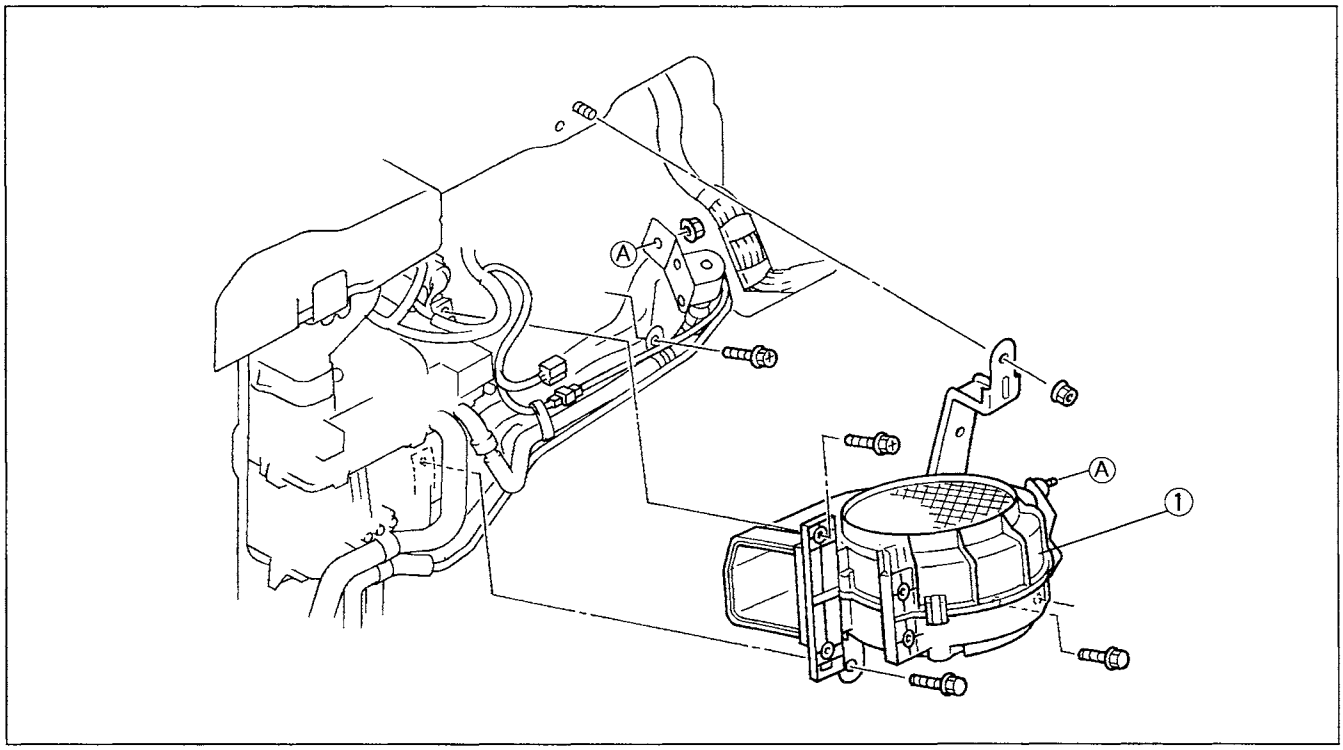
Heater core

1. Disassemble the rear heater unit.
2. Check for cracks, damage, and coolant leakage. Repair or replace the heater core if necessary.
3. Check for bent fins. If they are bent, use a flat-head screwdriver to straighten them.
4. Check for fittings for cracks or damage. Replace the heater core if necessary.

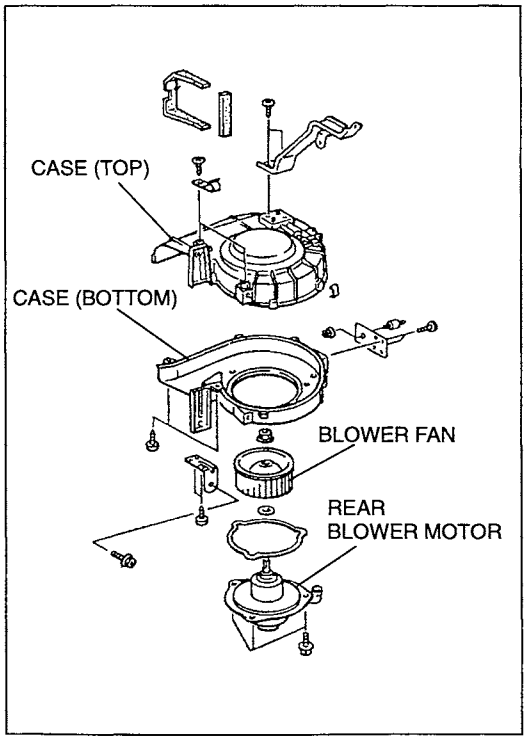
REAR BLOWER UNIT

Removal / Installation

1. Remove the left rear side trim. (Refer to section S.)
2. Remove the magnetic solenoid valve relay and rear blower relay bracket.
3. Disconnect the rear blower unit connector.
4. Remove as shown in the figure.
5. Install in the reverse order of removal.



1. Rear blower unit
   Disassembly / Assembly ..... below



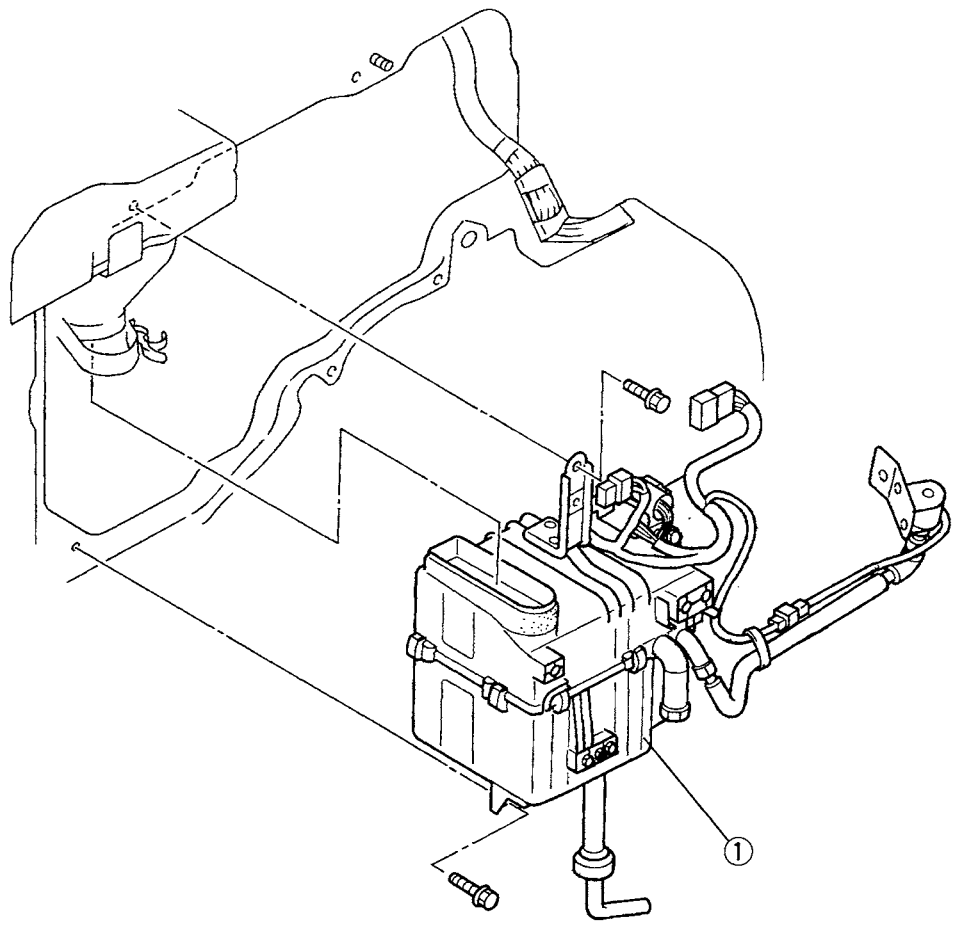
Disassembly / Assembly

1. Remove the rear blower motor.
2. Remove the blower fan.
3. Remove the case (top).
4. Remove the case (bottom).
5. Assemble in the reverse order of disassembly.

REAR COOLING UNIT

Removal / Installation

1. Discharge the refrigerant from the system.
2. Remove the rear blower unit. (Refer to page U–17.)
3. Disconnect the rear cooling unit connector.
4. Disconnect rear cooler pipes No.8 and No.9 from the rear cooling unit. (Refer to page U–29.)
5. Remove as shown in the figure.
6. Install in the reverse order of removal, referring to **Installation note**.
7. Test its performance after charging the system. (Refer to page U–5, 8.)



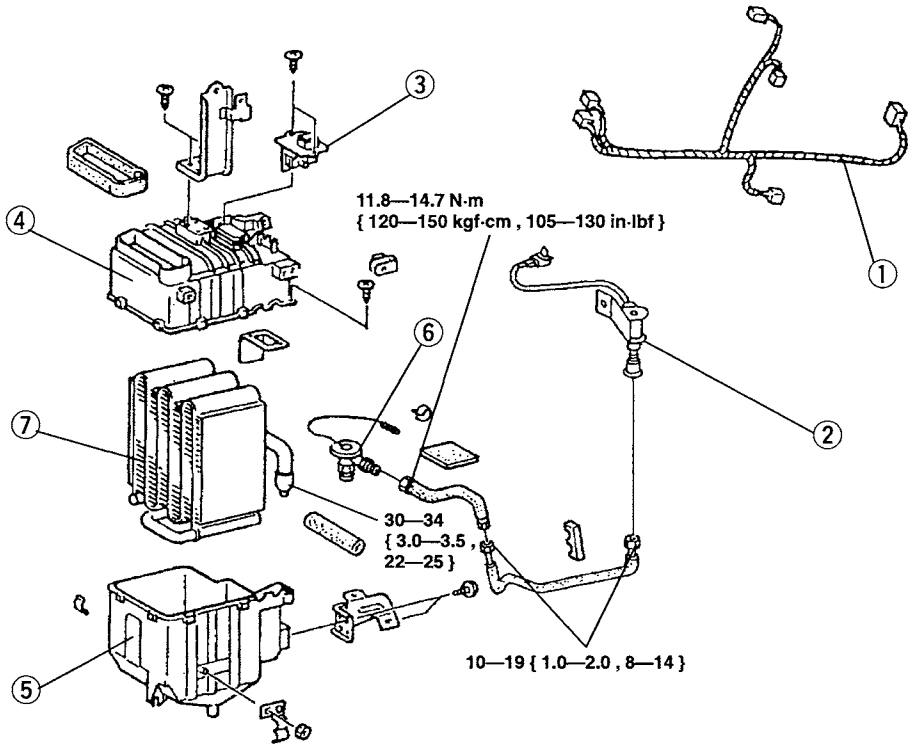
1. Rear cooling unit
   - Installation note ..... below
   - Disassembly / Assembly ..... page U–19
   - Inspection ..... page U–19

Installation note

When installing a new rear cooling unit (evaporator), add **40 ml { 40 cc , 1.4 fl oz }** of compressor oil through the high-pressure side of the A/C compressor.

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



1. Rear cooler harness
2. Magnetic solenoid valve
3. Rear resistor
4. Rear cooler unit case (top)
5. Rear cooler unit case (bottom)
6. Expansion valve
   Assembly note ..... below
7. Evaporator
   Inspection ..... below

Assembly note

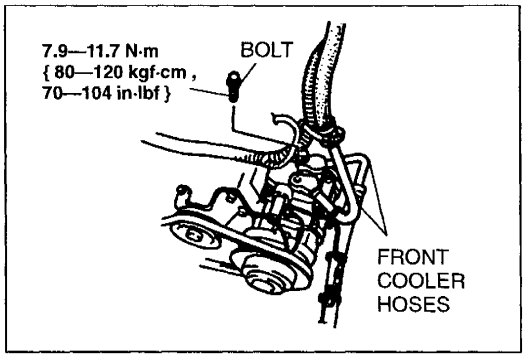
Expansion valve

Apply clean compressor oil to the O-rings before connecting the fittings. Do not apply compressor oil to the fitting nuts.

Inspection

Evaporator

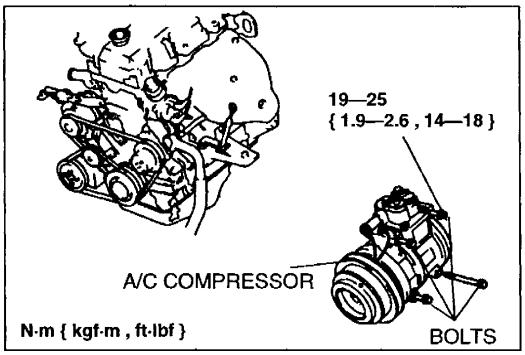
1. Check the evaporator fins for blockage. If the fins are clogged, clean them with compressed air. Do not use water.
2. Check the fittings for cracks and damage. Replace the evaporator if necessary.



A/C COMPRESSOR

Removal / Installation

1. Discharge the refrigerant from the system.
2. Remove the fresh-air duct. (Refer to section F.)
3. Loosen the A/C drive belt. (Refer to section B.)
4. Disconnect the front cooler hoses from the A/C compressor.

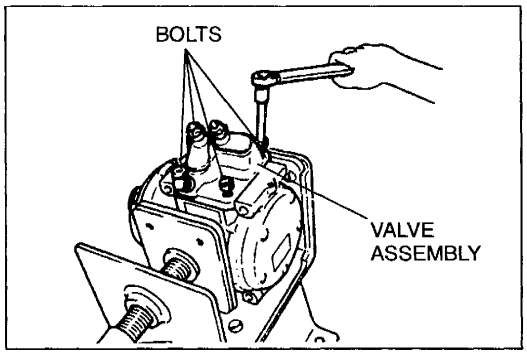


5. Remove the mounting bolts and the A/C compressor.
6. Install in the reverse order of removal. When replacing the A/C compressor with a new one, remove the following amount of compressor oil from the new A/C compressor.

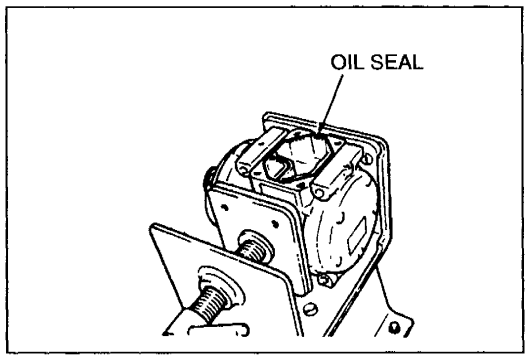
Compressor oil to be removed
= 200—215 ml { 200—215 cc , 6.76—7.26 fl oz } – (oil from old A/C compressor + 10—15 ml { 10—15 cc , 0.4—0.5 fl oz }

Disassembly

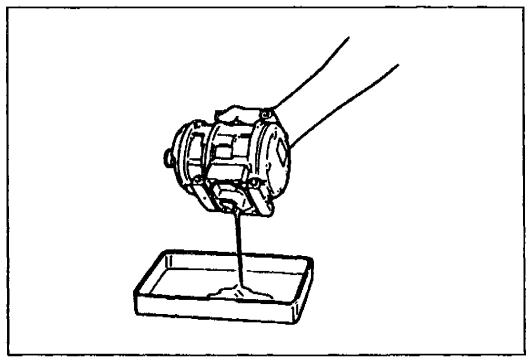
1. Disassemble the magnetic clutch. (Refer to page U–32.)
2. Remove the bolts and the valve assembly.

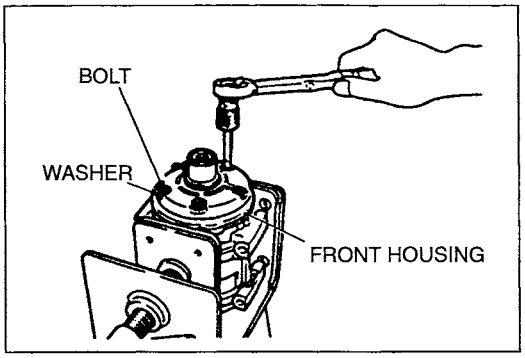


3. Remove the oil seal.

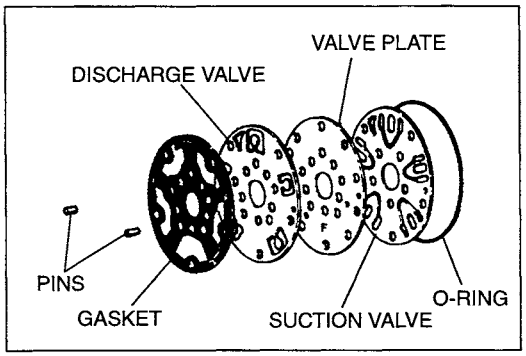


4. Drain the compressor oil.

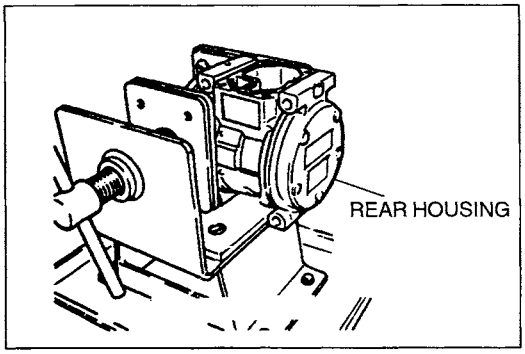




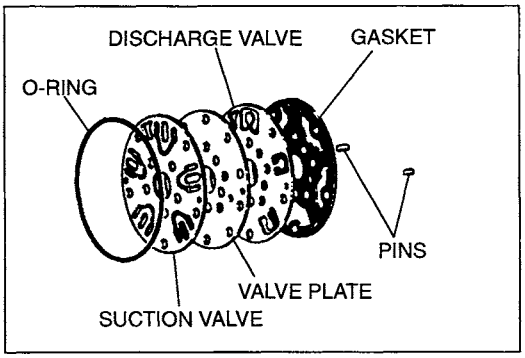
5. Remove the bolts and the front housing.



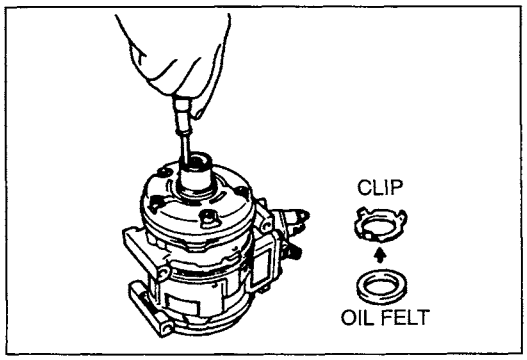
6. Remove the valves in the following order.
   1) Pins
   2) Gasket
   3) Discharge valve
   4) Valve plate
   5) Suction valve
   6) O-ring



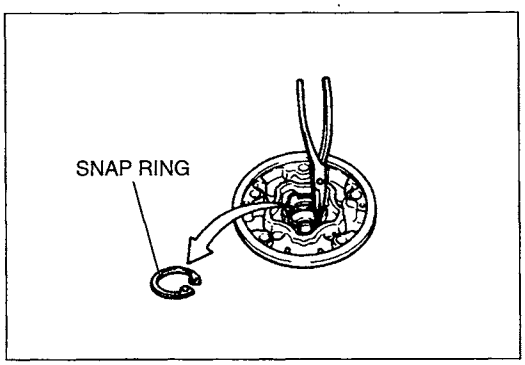
7. Remove the rear housing.



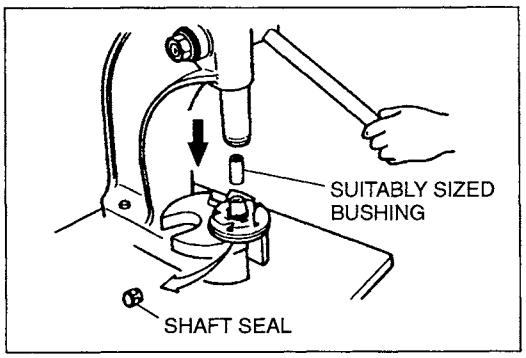
8. Remove the valves in the following order.
   1) Pins
   2) Gasket
   3) Discharge valve
   4) Valve plate
   5) Suction valve
   6) O-ring



9. Remove the clip and the oil felt.



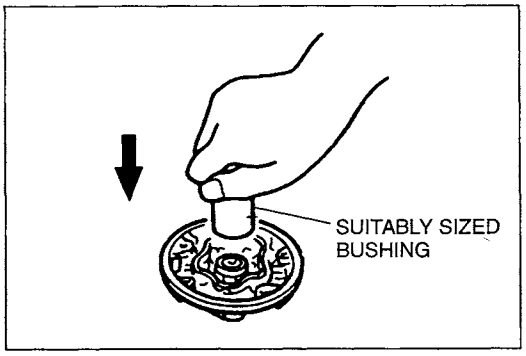
10. Remove the snap ring by using snap ring pliers.

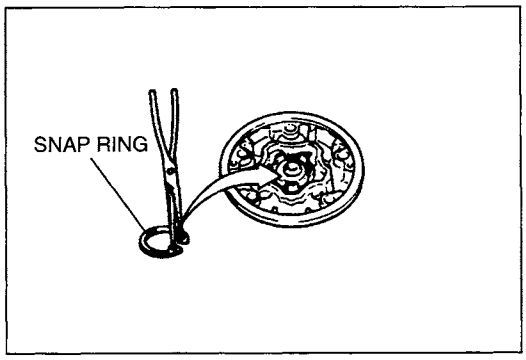


11. Remove the shaft seal by using a suitably sized bushing.

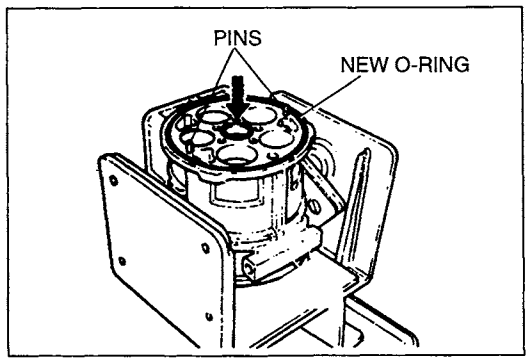
Assembly

1. Install the shaft seal by using a suitably sized bushing.

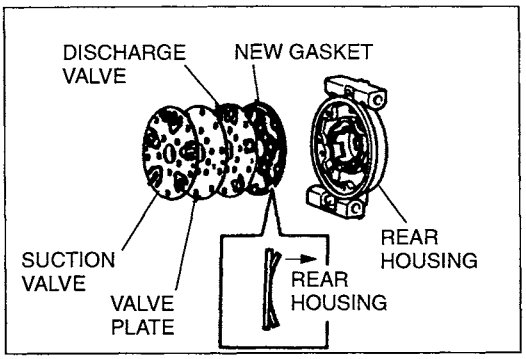




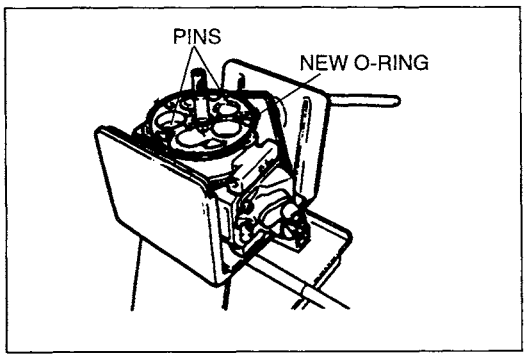
2. Install the snap ring.



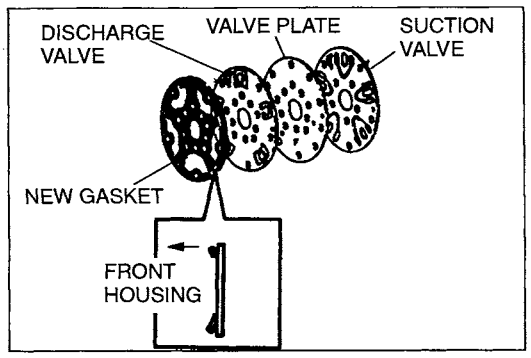
3. Install the valves in the following order.
   1) Pins
   2) New O-ring



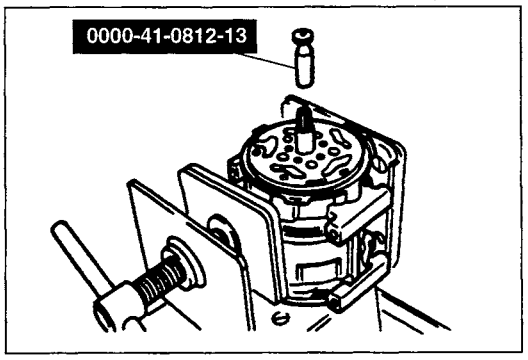
1) Suction valve
2) Valve plate
3) Discharge valve
4) New gasket
5) Rear housing



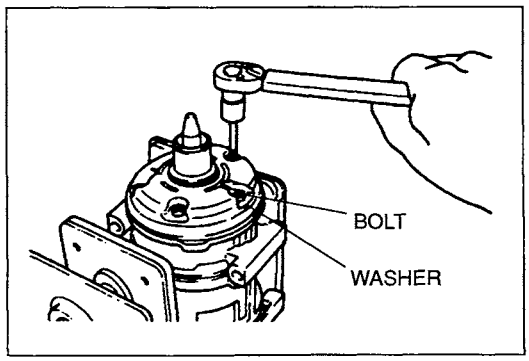
4. Install the valves in the following order.
   1) Pins
   2) New O-ring



1) Suction valve
2) Valve plate
3) Discharge valve
4) New gasket

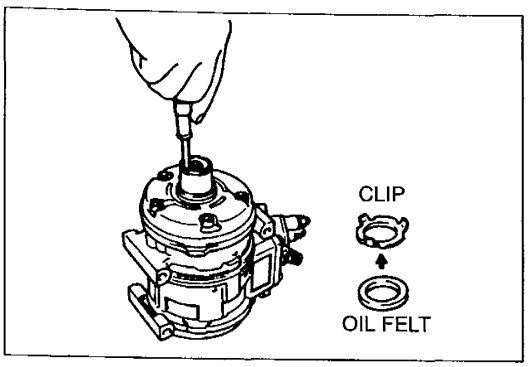


5. Set the **SST** onto the shaft to prevent damaging the shaft seal.

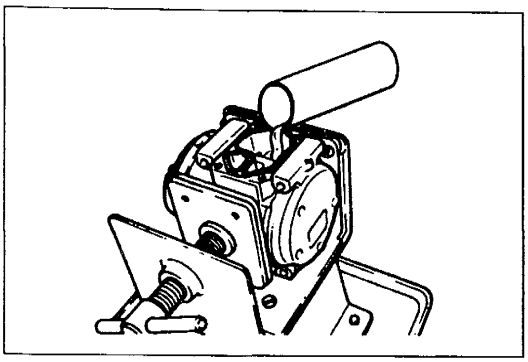


6. Install the front housing.

   Tighten torque:
   25—26 N·m { 2.5—2.7 kgf·m , 18—19 ft·lbf }

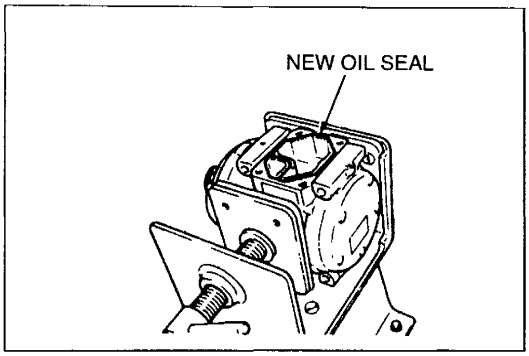


7. Install the oil felt and the clip.

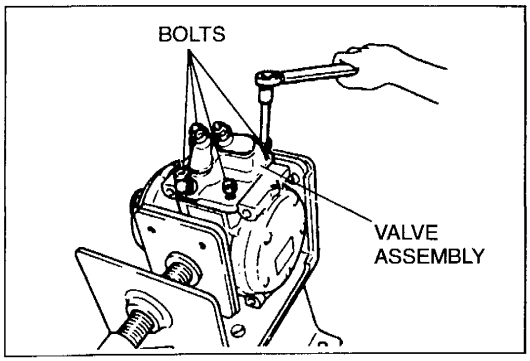


8. Pour compressor oil into the A/C compressor.

Compressor oil (specified amount):
200—215 ml { 200—215 cc , 6.76—7.26 fl oz }



9. Install a new oil seal.

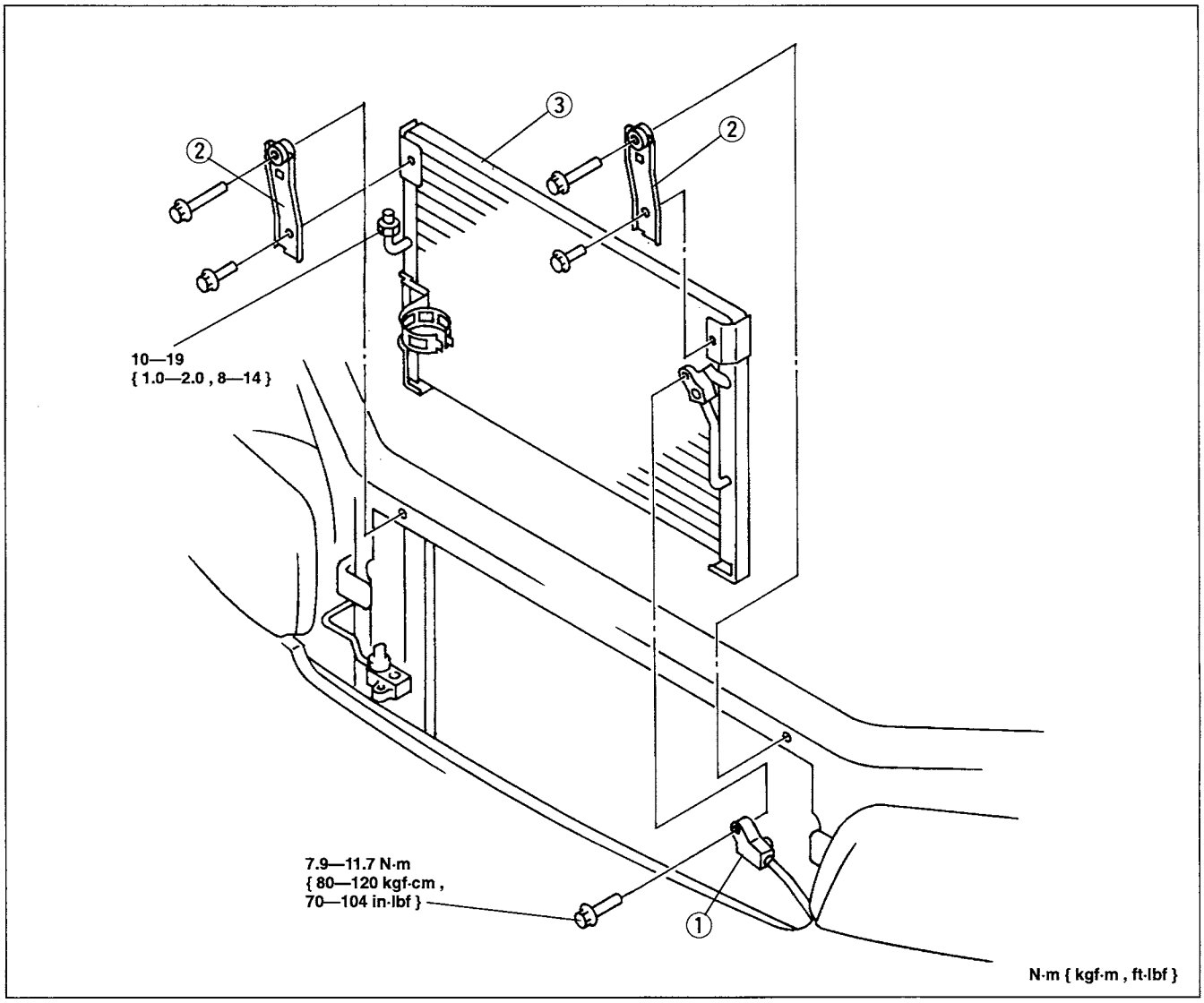


10. Install the valve assembly.
11. Assemble the magnetic clutch. (Refer to page U–32.)

CONDENSER

Removal / Installation

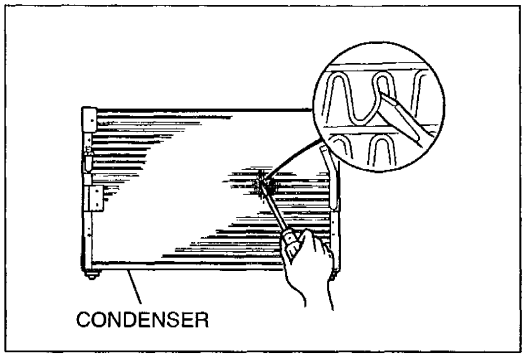
1. Discharge the refrigerant from the system.
2. Remove the receiver/drier. (Refer to page U–26.)
3. Remove the condenser fan. (Refer to page U–31.)
4. Remove the center stay.
5. Remove the hood lock assembly. (Refer to section S.)
6. Remove in the order shown in the figure.
7. Install in the reverse order of removal, referring to **Installation note**.
8. Test its performance after charging the system. (Refer to page U–5, 8.)



1. Front cooler hose (HI)
   Installation note ..... page U–29
2. Condenser bracket
3. Condenser
   Installation note ..... below
   Inspection ..... page U–26

Installation note

When installing a new condenser, add **40 ml { 40 cc , 1.4 fl oz }** of compressor oil through the high-pressure side of the A/C compressor.



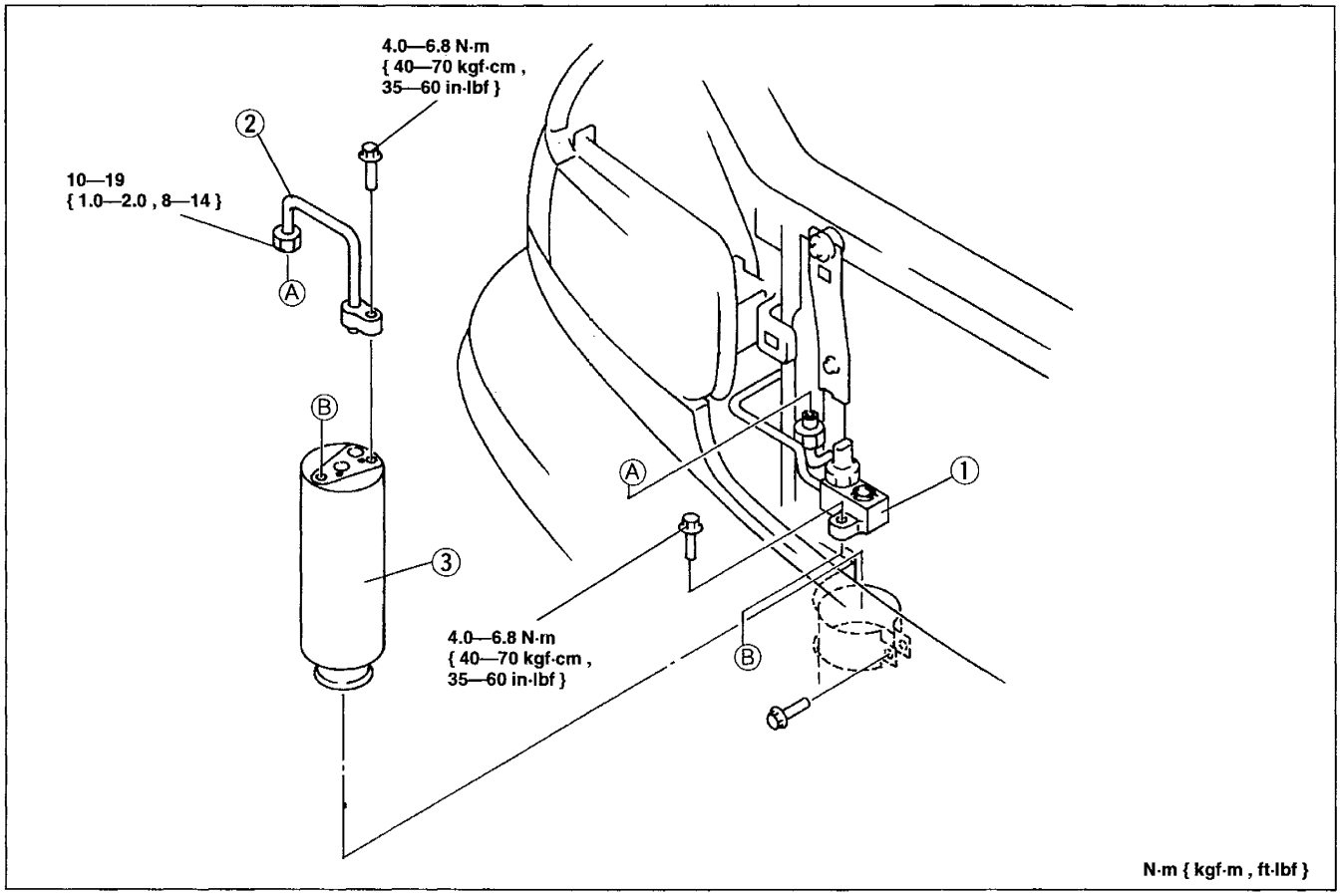
Inspection

1. Check for cracks, damage, and oil leakage. Repair or replace the condenser if necessary.
2. Check for bent fins. If they are bent, use a flathead screwdriver to straighten them.

RECEIVER/DRIER

Removal / Installation

1. Discharge the refrigerant from the system.
2. Remove the radiator grille. (Refer to section S.)
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal, referring to **Installation note**.
5. Charge the system and test its performance. (Refer to page U–5, 8.)



1. Front cooler pipe No.2
   Installation note ..... page U–29
2. Front cooler pipe No.3
   Installation note ..... page U–29
3. Receiver/drier
   Installation note ..... below

Installation note

When installing a new receiver/driver, add **10 ml { 10 cc , 0.3 fl oz }** of compressor oil through the high-pressure side of the A/C compressor.

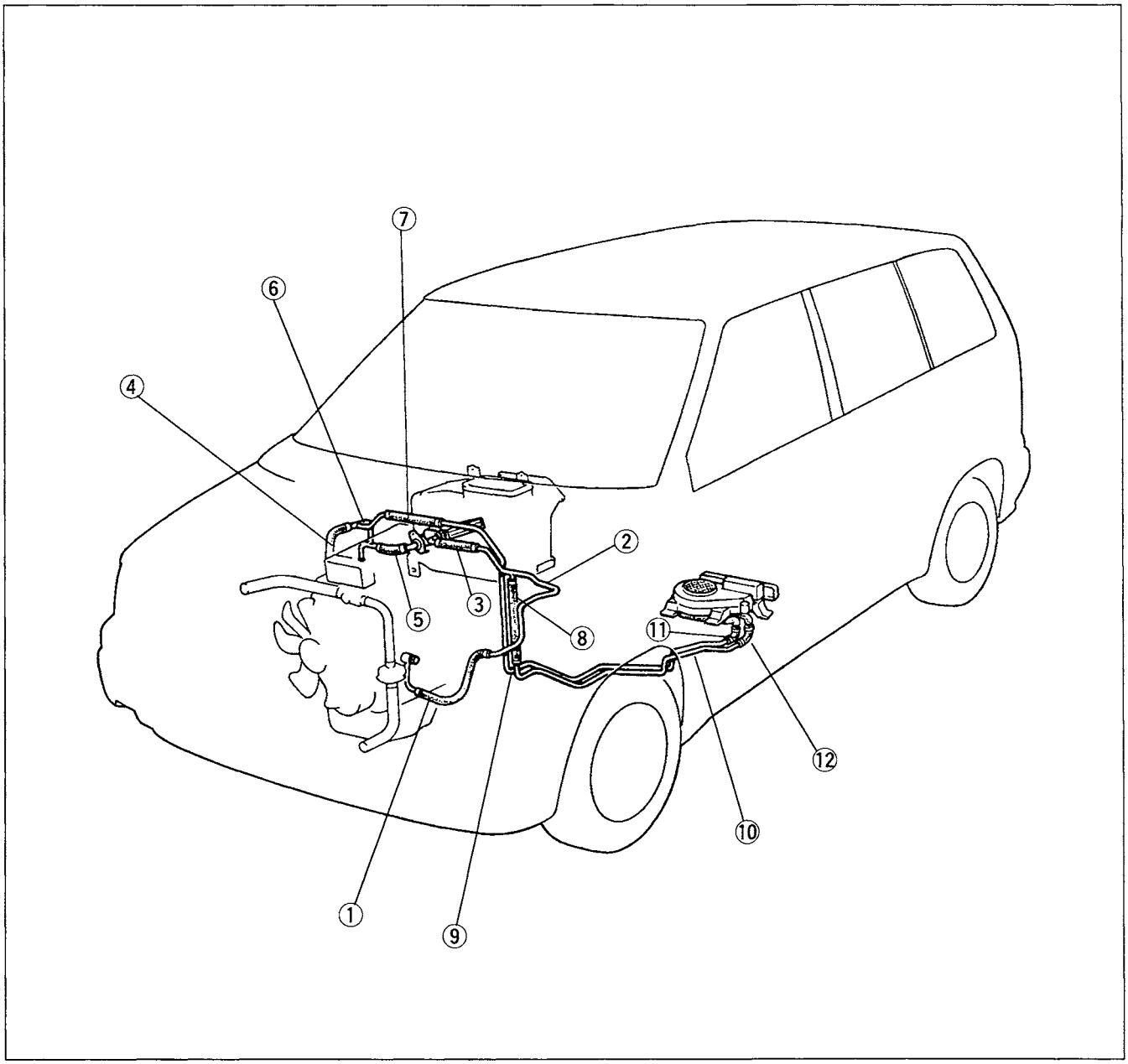
HEATER HOSES AND PIPES

Removal / Installation

1. Drain the engine coolant. (Refer to section E.)
2. Remove the following parts, depending on the pipe and hose to be removed.

Removal heater pipe and hose	Removal parts	Section
Rear heater pipe No.1 Rear heater pipe No.2	Undercover	E

3. Remove the heater hose or heater pipe as shown in the figure.
4. Install in the reverse order of removal.



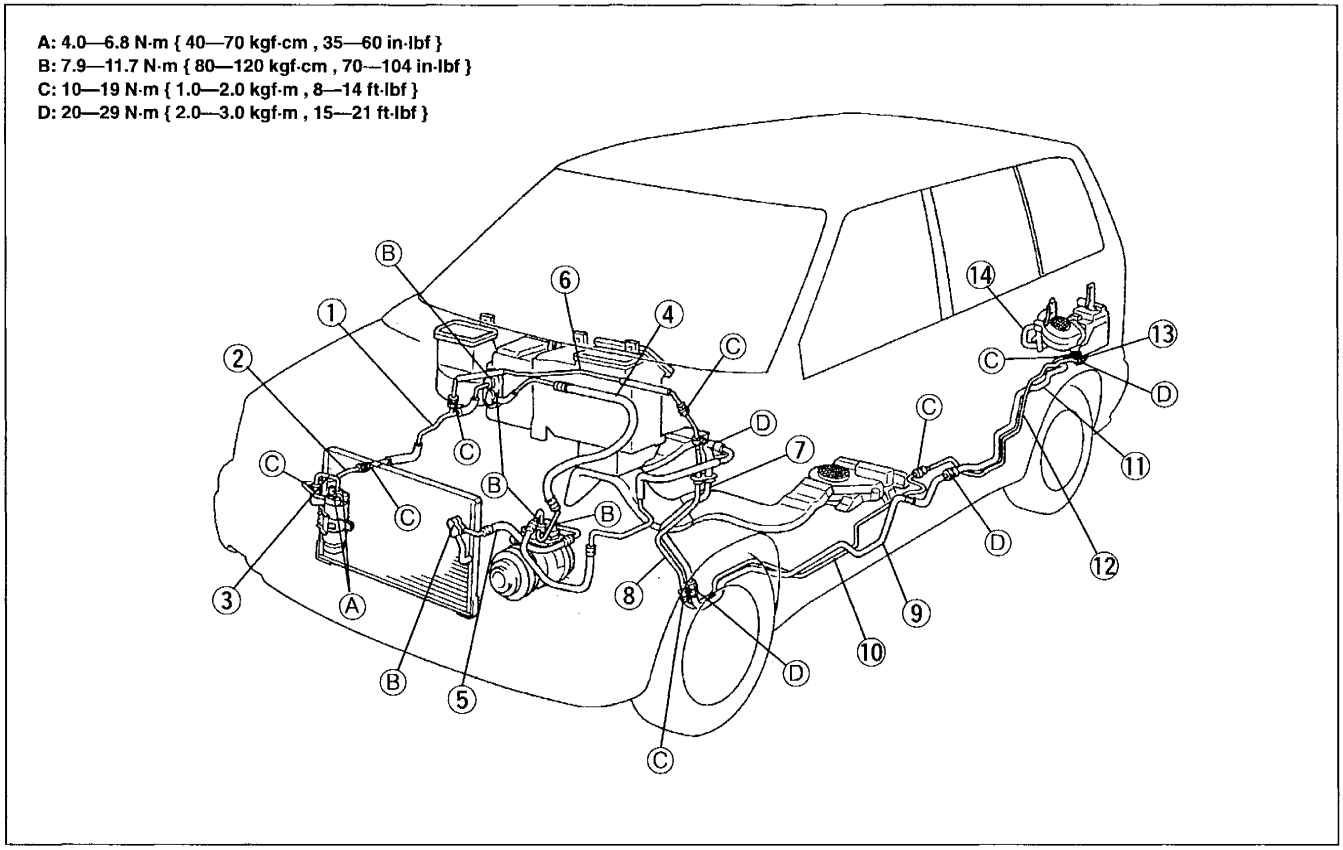
1. Front heater hose No.1
2. Front heater pipe No.1
3. Front heater hose No.2
4. Front heater hose No.3
5. Front heater hose No.4
6. Front heater pipe No.2
7. Rear heater hose No.1
8. Rear heater hose No.2
9. Rear heater pipe No.1
10. Rear heater pipe No.2
11. Rear heater hose No.3
12. Rear heater hose No.4

REFRIGERANT LINES
Removal / Installation

1. Discharge the refrigerant from the system.
2. Remove the following parts, depending on the pipe and hose to be removed.

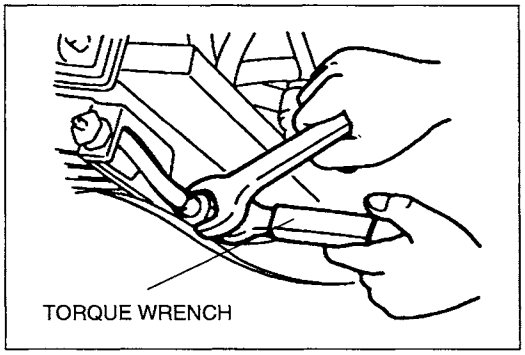
Removal cooler pipe and hose	Removal parts	Section
Front cooler pipe No.2 Front cooler pipe No.3 Front cooler hose (HI)	Radiator grille	S
Front cooler hose (LO)	Air cleaner	F
Rear cooler pipe No.6 Rear cooler pipe No.7	Rear bumper seal Seal plate	—

3. Remove the cooler pipe or cooler hose as shown in the figure. Do not allow compressor oil to spill. Immediately plug all open fittings to keep moisture out of the system.
4. Install in the reverse order of removal, referring to **Installation note**.
5. Charge the system and test its performance. (Refer to page U–5, 8.)



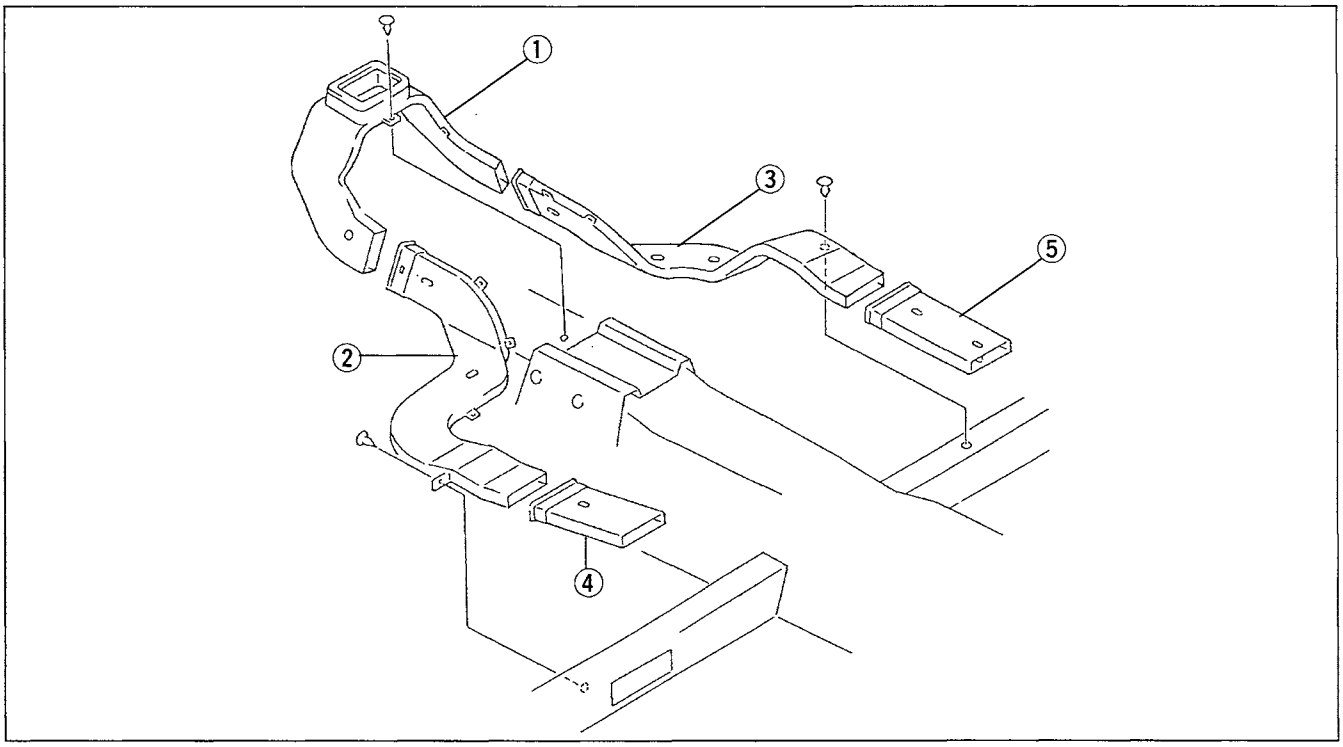
1. Front cooler pipe No.1
   Installation note ..... page U–29
2. Front cooler pipe No.2
   Installation note ..... page U–29
3. Front cooler pipe No.3
   Installation note ..... page U–29
4. Front cooler hose (LO)
   Installation note ..... page U–29
5. Front cooler hose (Hi)
   Installation note ..... page U–29
6. Rear cooler pipe No.1
   Installation note ..... page U–29
7. Rear cooler pipe No.2
   Installation note ..... page U–29
8. Rear cooler pipe No.3
   Installation note ..... page U–29
9. Rear cooler pipe No.4
   Installation note ..... page U–29
10. Rear cooler pipe No.5
    Installation note ..... page U–29
11. Rear cooler pipe No.6
    Installation note ..... page U–29
12. Rear cooler pipe No.7
    Installation note ..... page U–29
13. Rear cooler pipe No.8
    Installation note ..... page U–29
14. Rear cooler pipe No.9
    Installation note ..... page U–29

Installation note
Cooler pipe, Cooler hose
1. Replace the O-rings at the pipe and/or hose joints when installing pipes.
2. Apply compressor oil to the O-rings and connect the joints.
3. When installing a new cooler pipe or cooler hose, add **10 ml { 10 cc , 0.3 fl oz }** of compressor oil through the high-pressure side of the A/C compressor.



4. Tighten the joints in the following order.
   1) Verify that the O-rings are installed.
   2) Tighten the nut or bolt of the joint by hand.
   3) Fix the bracket and clip installed on the hose or pipe to the vehicle.
   4) Tighten the joint to the specified torque. If it is a nut joint, tighten in the procedure shown in the figure.

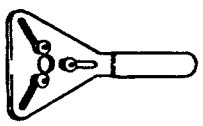
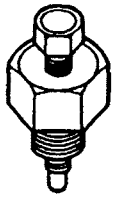
REAR HEAT DUCT
Removal / Installation
1. Remove the heater unit. (Refer to page U–11.)
2. Remove the under seat tray.
3. Turn over the floor covering. (Refer to section S.)
4. Remove the rear heat duct as shown in the figure.
5. Install in the reverse order of removal.



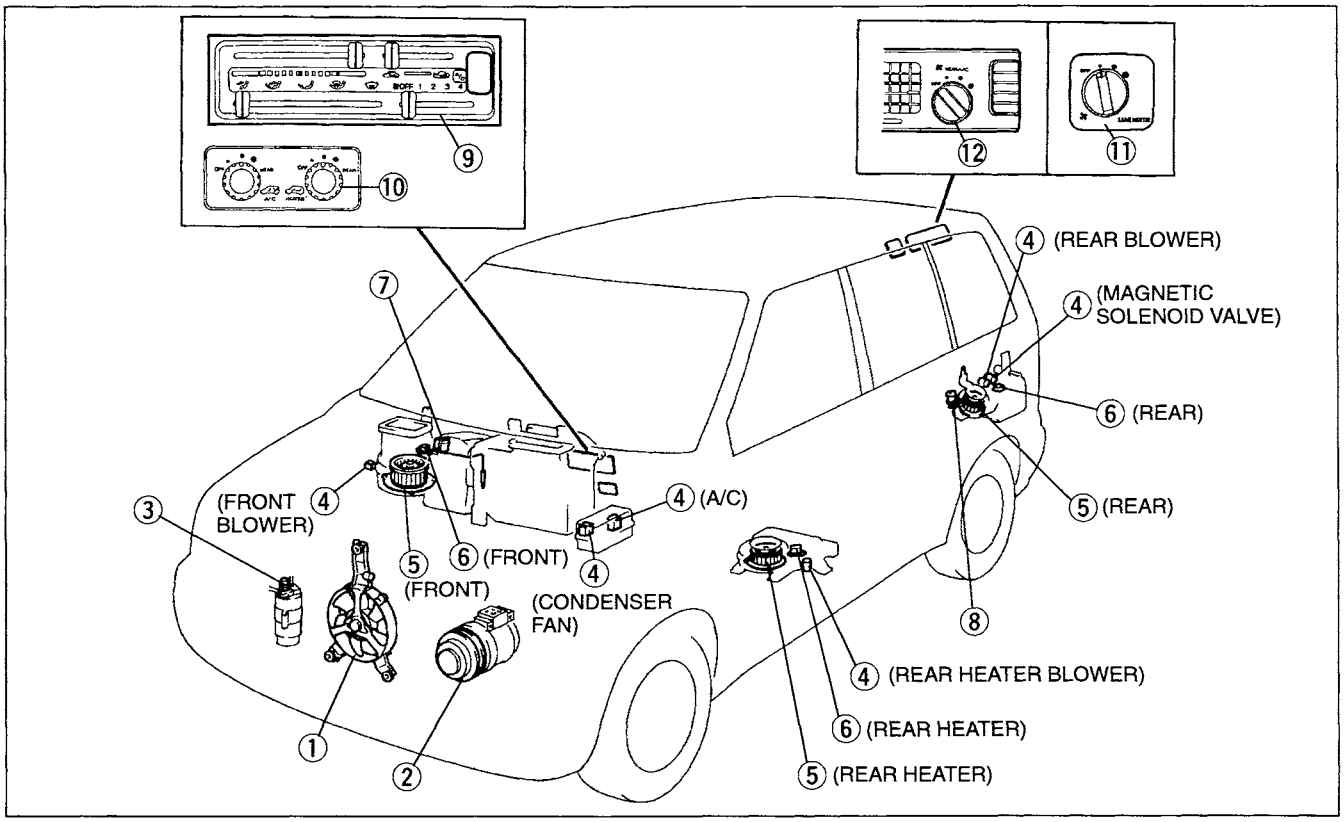
1. Rear heat duct No.1
2. Rear heat duct No.2
3. Rear heat duct No.3
4. Rear heat duct No.4
5. Rear heat duct No.5

CONTROL SYSTEM

PREPARATION
SST

0000-41-0812-05 Clutch holder 	For removal and installation of magnetic clutch	4992-02-020 Pressure plate remover 	For removal of pressure plate

STRUCTURAL VIEW

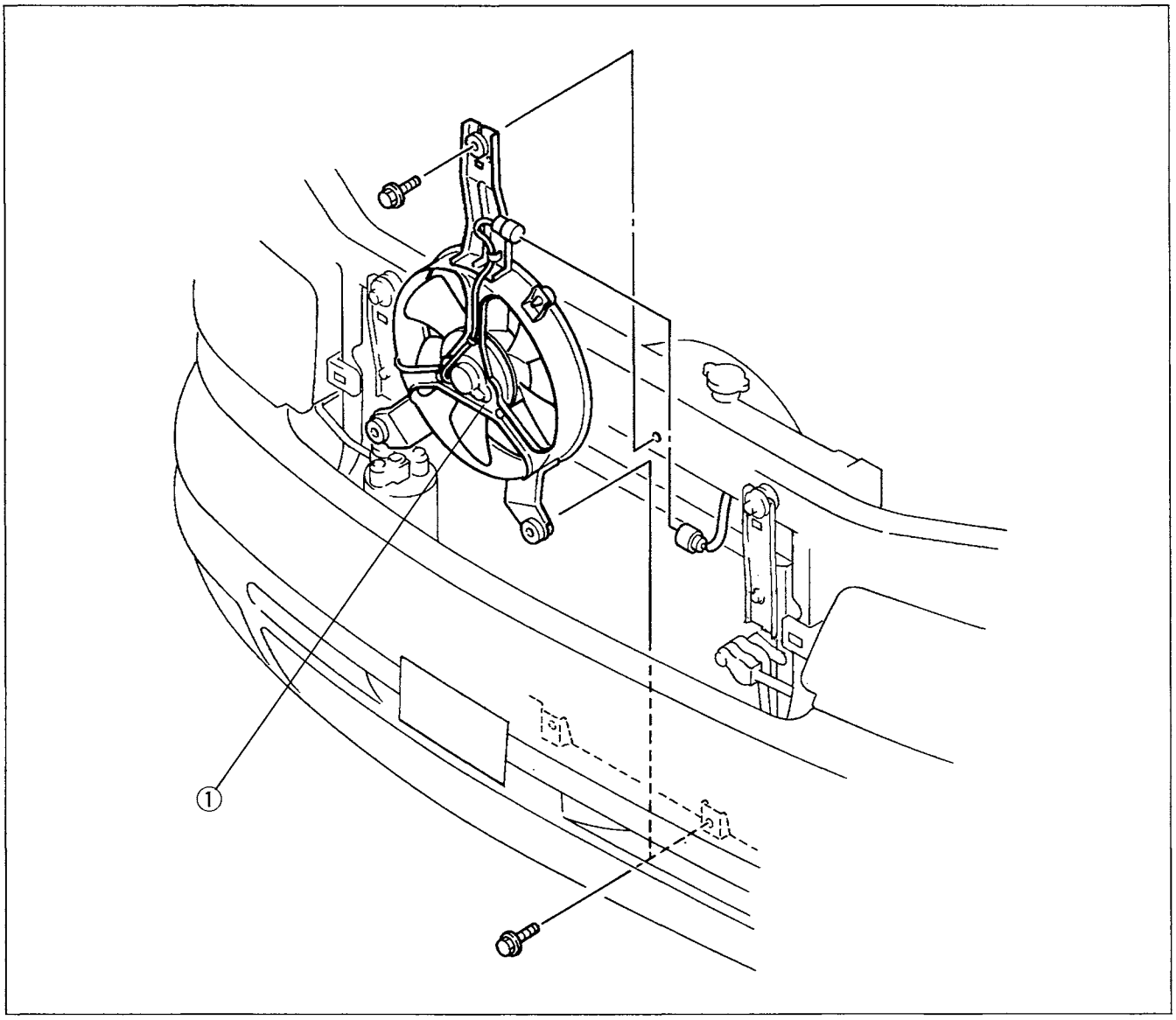


1. Condenser fan
   - Removal / Installation ..... page U–31
   - On-vehicle inspection ..... page U–31
2. Magnetic clutch
   - Disassembly / Assembly ..... page U–32
   - Inspection ..... page U–33
3. Refrigerant pressure switch
   - Inspection ..... page U–34
4. Relay
   - Inspection ..... page U–34
5. Blower motor
   - Removal / Installation ..... page U–34
   - Inspection ..... page U–34
6. Resistor
   - Removal / Installation ..... page U–35
   - Inspection ..... page U–35
7. Thermoswitch
   - Inspection ..... page U–36
8. Magnetic solenoid valve
   - On-vehicle inspection ..... page U–36
9. Heater control unit
   - Removal / Installation ..... page U–37
   - Wire adjustment ..... page U–37
   - Disassembly / Assembly ..... page U–38
   - Inspection ..... page U–39
10. Rear main switch
    - Removal / Installation ..... page U–39
    - Disassembly / Assembly ..... page U–40
    - Inspection ..... page U–40
11. Rear heater fan switch
    - Removal / Installation ..... page U–41
    - Inspection ..... page U–41
12. Rear cooler fan switch
    - Removal / Installation ..... page U–42
    - Inspection ..... page U–42

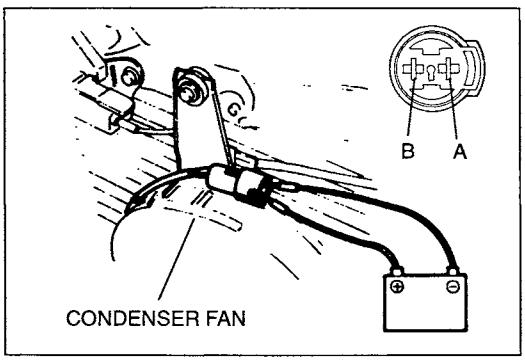
CONDENSER FAN

Removal / Installation

1. Remove the radiator grille. (Refer to section S.)
2. Disconnect the condenser fan connector.
3. Remove as shown in the figure.
4. Install in the reverse order of removal.

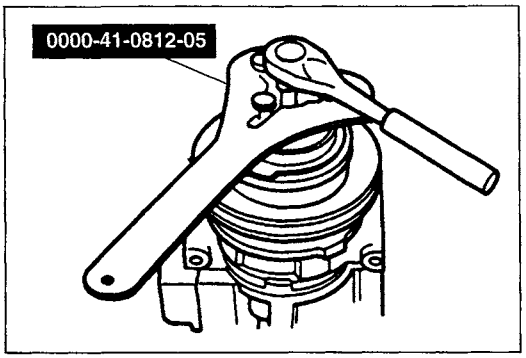


1. Condenser fan
   On-vehicle inspection ..... below

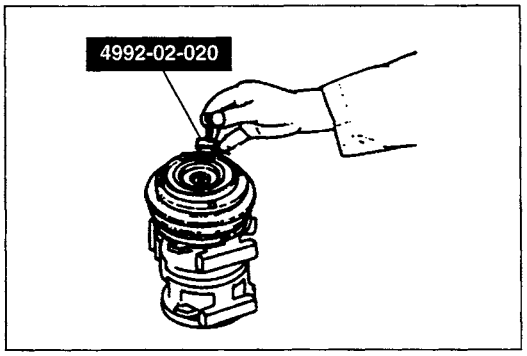


On-vehicle Inspection

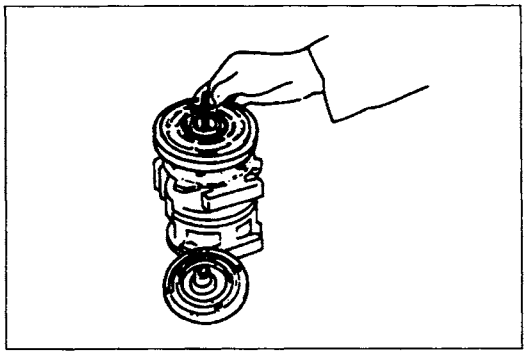
1. Disconnect the condenser fan connector.
2. Connect battery positive voltage to terminal A and ground to terminal B of the condenser fan and verify its operation.
3. If the condenser fan does not operate, replace the condenser fan.



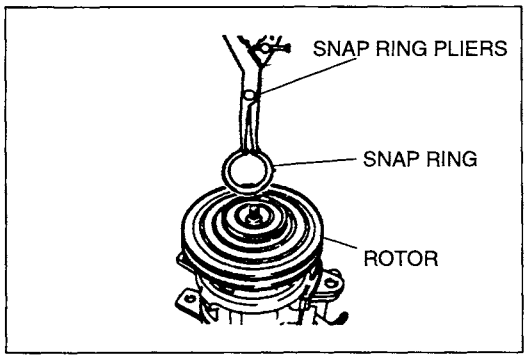
MAGNETIC CLUTCH
Disassembly / Assembly
1. Remove the A/C compressor. (Refer to page U–20.)
2. Remove the shaft bolt by using the **SST**.



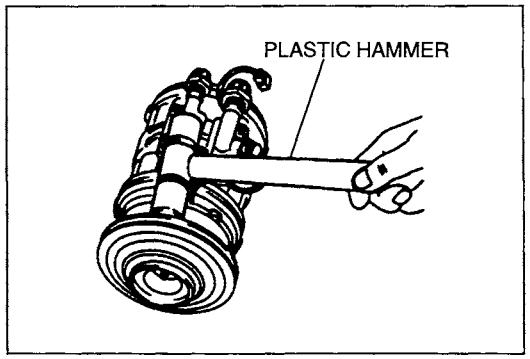
3. Remove the pressure plate by using the **SST**.



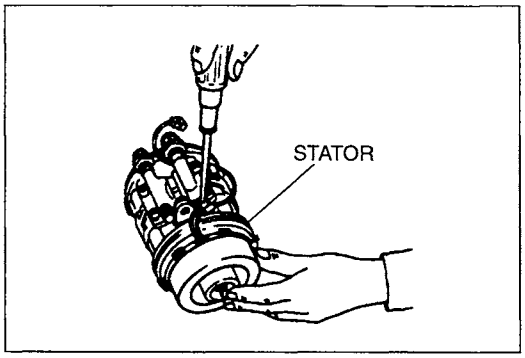
4. Remove the shims.



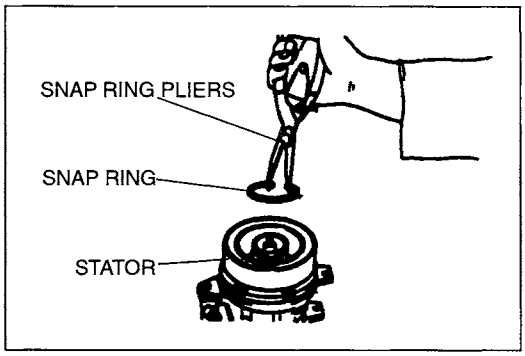
5. Remove the snap ring.



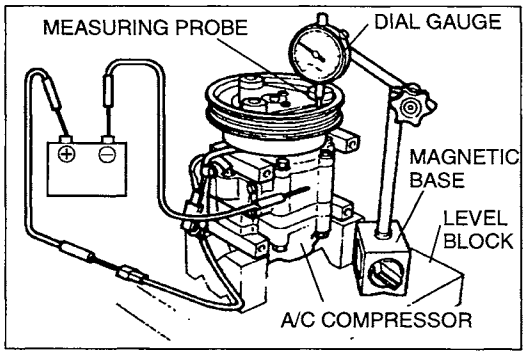
6. Remove the rotor by tapping it with a plastic hammer.



7. Disconnect the stator lead wires from the A/C compressor housing.



8. Remove the snap ring and the stator.
9. Assemble in the reverse order of disassembly.



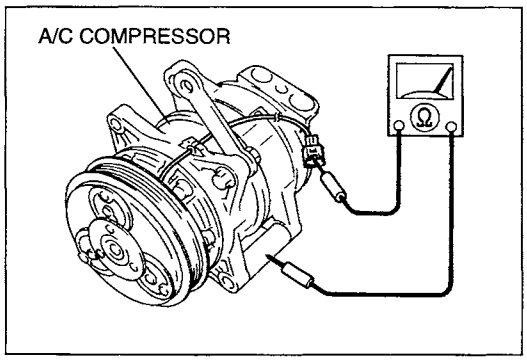
Inspection
Pressure plate

1. Measure the clearance between the pressure plate and the rotor pulley.
   1) Set the A/C compressor on a level block.
   2) Fix a dial gauge on a magnetic base and set the measuring probe on the pressure plate surface.
   3) Alternately apply and remove battery positive voltage as shown in the figure. The clearance is the difference in the dial gauge readings.
   4) Compare the measured clearance with the specified clearance below.

   Clearance: 0.4—0.6 mm { 0.016—0.023 in }

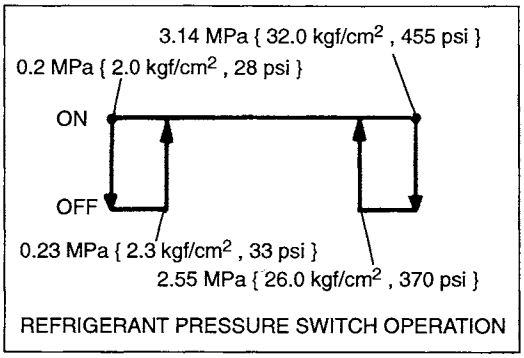
2. If not as specified, install shims to adjust the clearance.

Part No.	Thickness
KA10 61L21	0.10 mm { 0.004 in }
KA10 61L22	0.30 mm { 0.012 in }
KA10 61L23	0.50 mm { 0.020 in }



Stator

1. Set the ohmmeter to the $\times 1{,}000\ \Omega$ range.
2. Verify that there is continuity between the stator connector and the A/C compressor body.
3. If there is no continuity, replace the stator.

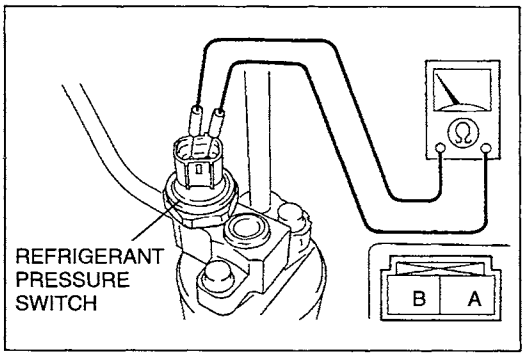


REFRIGERANT PRESSURE SWITCH OPERATION

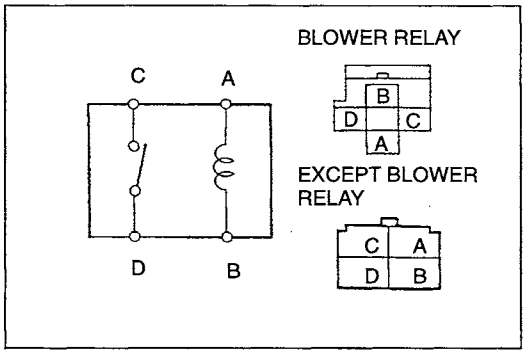
REFRIGERANT PRESSURE SWITCH

Inspection

1. Install the manifold gauge set. (Refer to page U–5.)
2. Make sure the high-pressure side is in the ON range as shown in the figure.



3. Disconnect the refrigerant pressure switch connector.
4. Verify that there is continuity between terminals A and B of the refrigerant pressure switch.
5. If there is no continuity, replace the front cooler pipe No.2



RELAY

Inspection

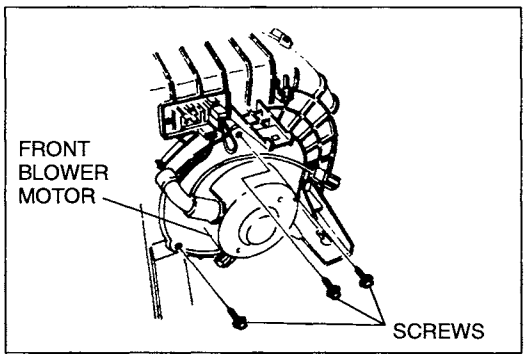
A/C relay, condenser fan relay, front blower relay, rear heater blower relay, rear blower relay, magnetic solenoid valve relay

1. Remove the relay.
2. Check for continuity between the relay terminals by using an ohmmeter.

○—○: Continuity B+: Battery positive voltage

Step \ Terminals	A	B	C	D
1	○	○		
2	B+	GND	○	○

3. If not as specified, replace the relay.

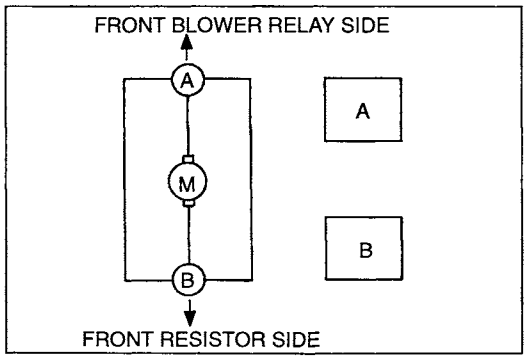


BLOWER MOTOR

Removal / Installation

Front blower motor

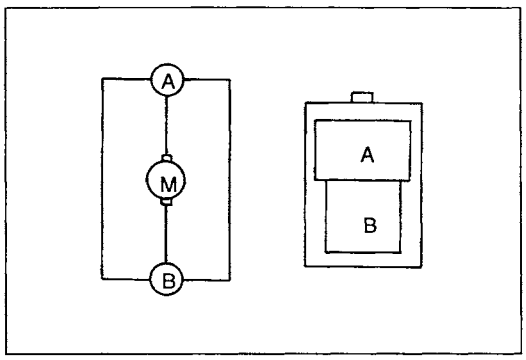
1. Remove the glove compartment cover. (Refer to section S.)
2. Disconnect the front blower motor connector.
3. Remove the screws and the front blower motor.
4. Install in the reverse order of removal.



Inspection

Front blower motor

1. Remove the glove compartment cover. (Refer to section S.)
2. Disconnect the blower motor connector.
3. Connect battery positive voltage to terminal A and ground to terminal B.
4. If the motor does not operate, replace the front blower motor. (Refer to page U–10.)

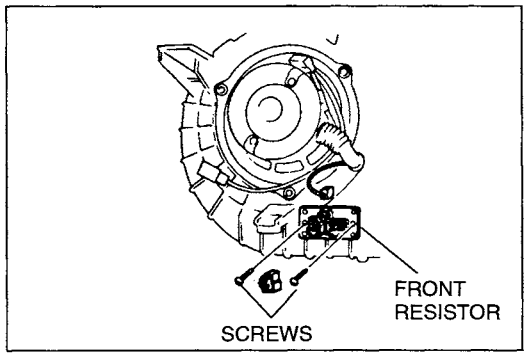


Rear heater blower motor

1. Remove the rear heater unit. (Refer to page U–15.)
2. Disconnect the rear heater blower motor connector.
3. Connect battery positive voltage to terminal A and ground to terminal B.
4. If the motor does not operate, replace the rear heater blower motor. (Refer to page U–16.)

Rear blower motor

1. Remove the left rear side trim. (Refer to section S.)
2. Disconnect the rear blower motor connector.
3. Connect battery positive voltage to terminal A and ground to terminal B.
4. If the motor does not operate, replace the rear blower motor. (Refer to page U–17.)

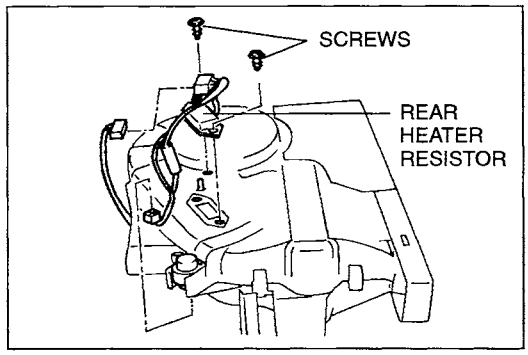


RESISTOR

Removal / Installation

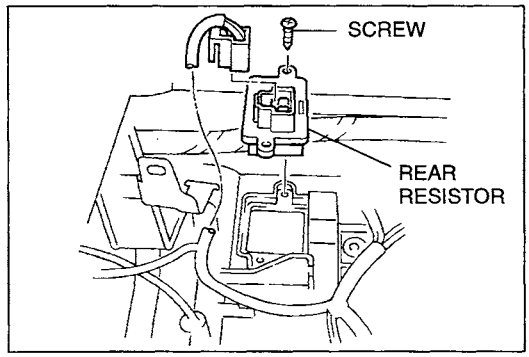
Front resistor

1. Remove the glove compartment cover. (Refer to section S.)
2. Disconnect the front resistor connector.
3. Remove the screws and the front resistor.
4. Install in the reverse order of removal.



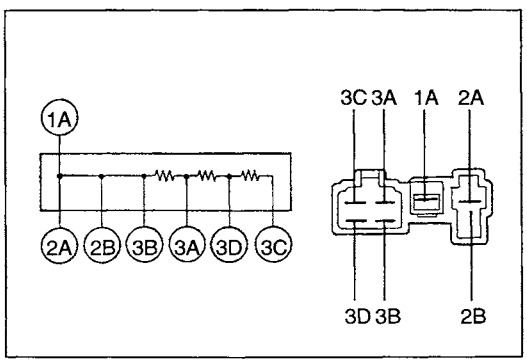
Rear heater resistor

1. Remove the driver's seat. (Refer to section S.)
2. Disconnect the rear heater unit connector and rear heater blower relay connector.
3. Remove the screws and the rear heater resistor.
4. Install in the reverse order of removal.



Rear resistor

1. Remove the left rear side trim. (Refer to section S.)
2. Disconnect the rear resistor connector.
3. Remove the screws and the rear resistor.
4. Install in the reverse order of removal.



Inspection

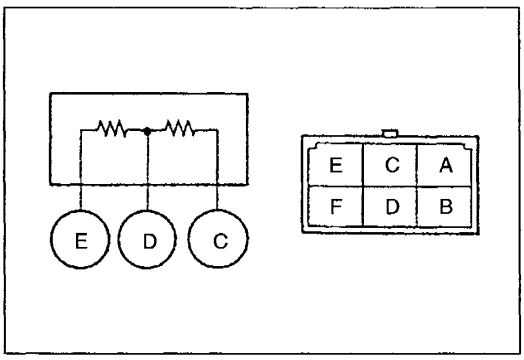
Front resistor

1. Disconnect the front resistor connector.
2. Verify that the continuity and resistance between terminals of the front resistor as shown below.

○—○: Continuity ○-∿∿-○: Resistance

1A	2A	2B	3B	3A	3D	3C
○	○	○	○	∿∿	○	∿∿ ○
			0.42 Ω		0.69 Ω	1.37 Ω

3. If not as specified, replace the front resistor.

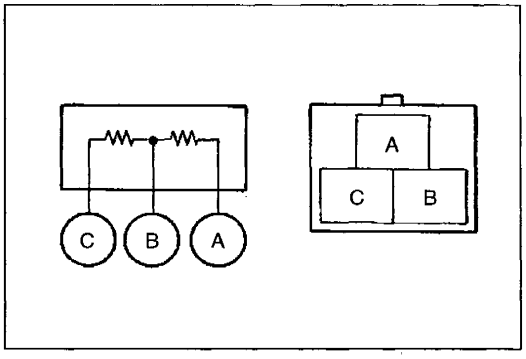


Rear heater resistor

1. Disconnect the rear heater unit connector.
2. Verify that the resistance between terminals of the rear heater resistor as shown below.

Terminal	Resistance (Ω)
C—D	1.7
D—E	4.3

3. If not as specified, replace the rear heater resistor.

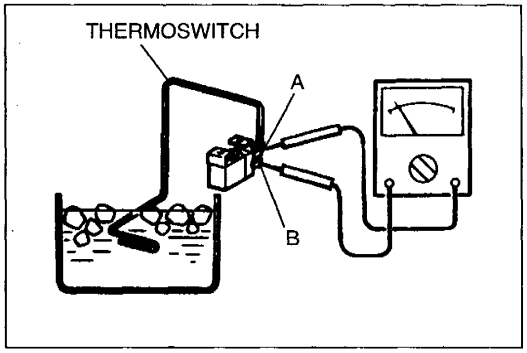


Rear resistor

1. Remove the left rear side trim. (Refer to section S.)
2. Disconnect the rear resistor connector.
3. Verify that the resistance between terminals of the rear resistor as shown below.

Terminal	Resistance (Ω)
A—B	1.4
B—C	3.7

4. If not as specified, replace the rear resistor.



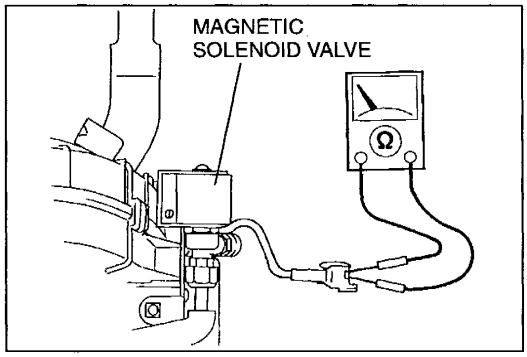
THERMOSWITCH

Inspection

1. Remove the thermoswitch from the cooling unit. (Refer to page U–14.)
2. Immerse the sensor part of the thermoswitch in a container of ice water.
3. Check for continuity between terminals A and B of the thermoswitch.

Temperature	Continuity
Above 5 °C { 41 °F }	Yes
Below 0 °C { 32 °F }	No

4. If not as specified, replace the thermoswitch. (Refer to page U–14.)



MAGNETIC SOLENOID VALVE

On-vehicle Inspection

1. Disconnect the magnetic solenoid valve connector.
2. Measure the resistance of the magnetic solenoid valve.

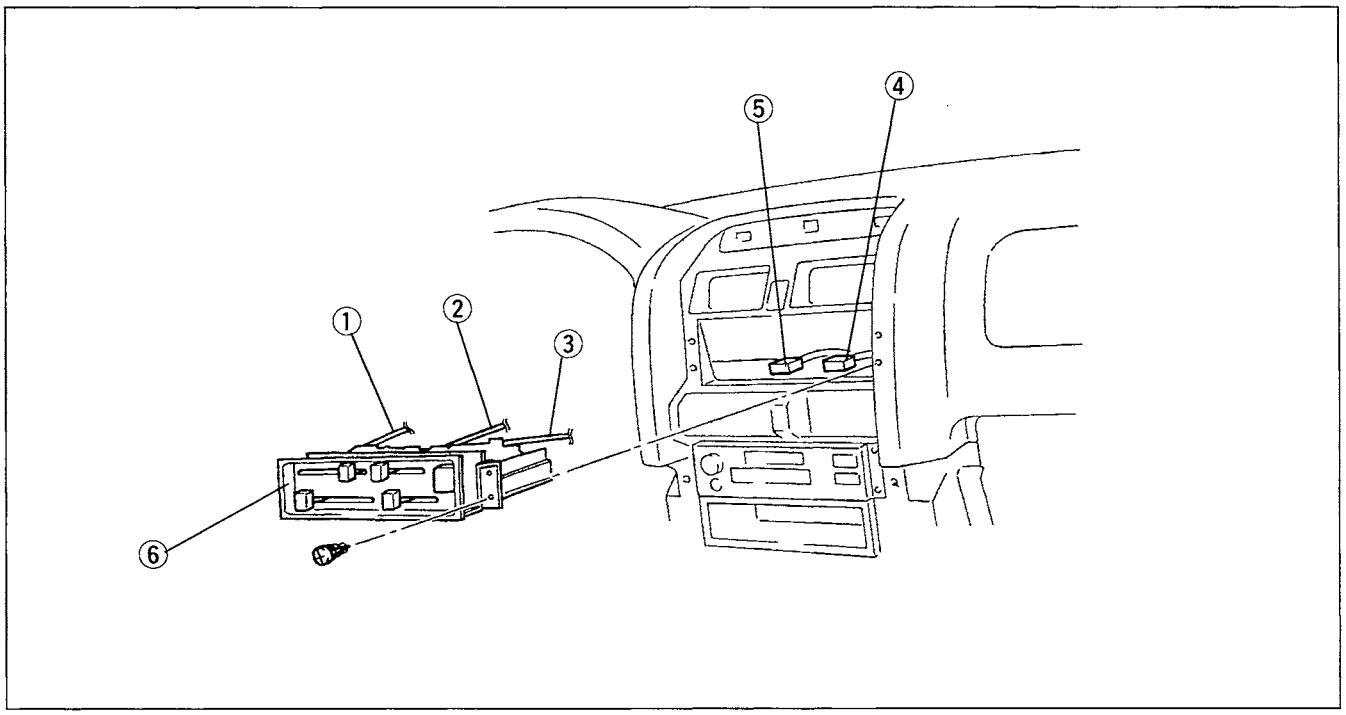
   Resistance: Approx. 20 Ω

3. If not as specified, replace the magnetic solenoid valve. (Refer to page U–19.)

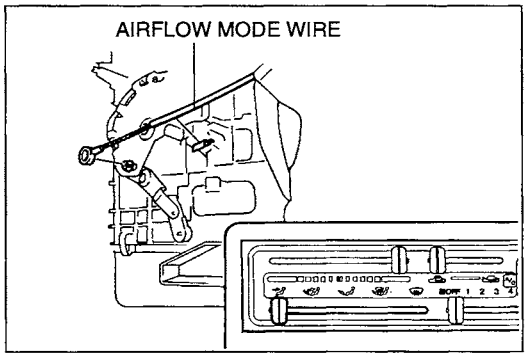
HEATER CONTROL UNIT

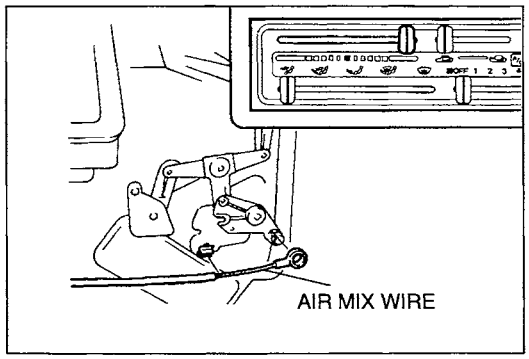
Removal / Installation

1. Remove the center upper panel. (Refer to section S.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



1. Airflow mode wire
   Wire adjustment ..... below
2. Air mix wire
   Wire adjustment ..... below
3. Air intake wire
   Wire adjustment ..... page U–38
4. A/C switch connector
5. Fan switch connector
6. Heater control unit
   Disassembly / Assembly ..... page U–38
   Inspection ..... page U–39





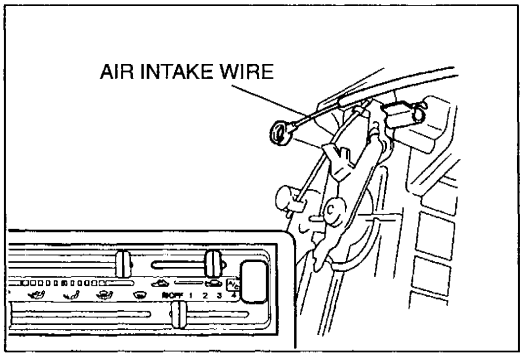
Wire Adjustment

Airflow mode wire

1. Set the MODE lever to VENT.
2. Connect and clamp the wire with the shutter lever on the heater unit at its closest point.
3. Move the MODE lever to make sure the wire is securely attached and that it moves fully from DEF to VENT.

Air mix wire

1. Set the temperature control lever to MAX–HOT.
2. Connect and clamp the wire with the shutter lever on the heater unit at its closest points.
3. Move the temperature control lever to make sure the wire is securely attached and that it moves fully from MAX–COLD to MAX–HOT.

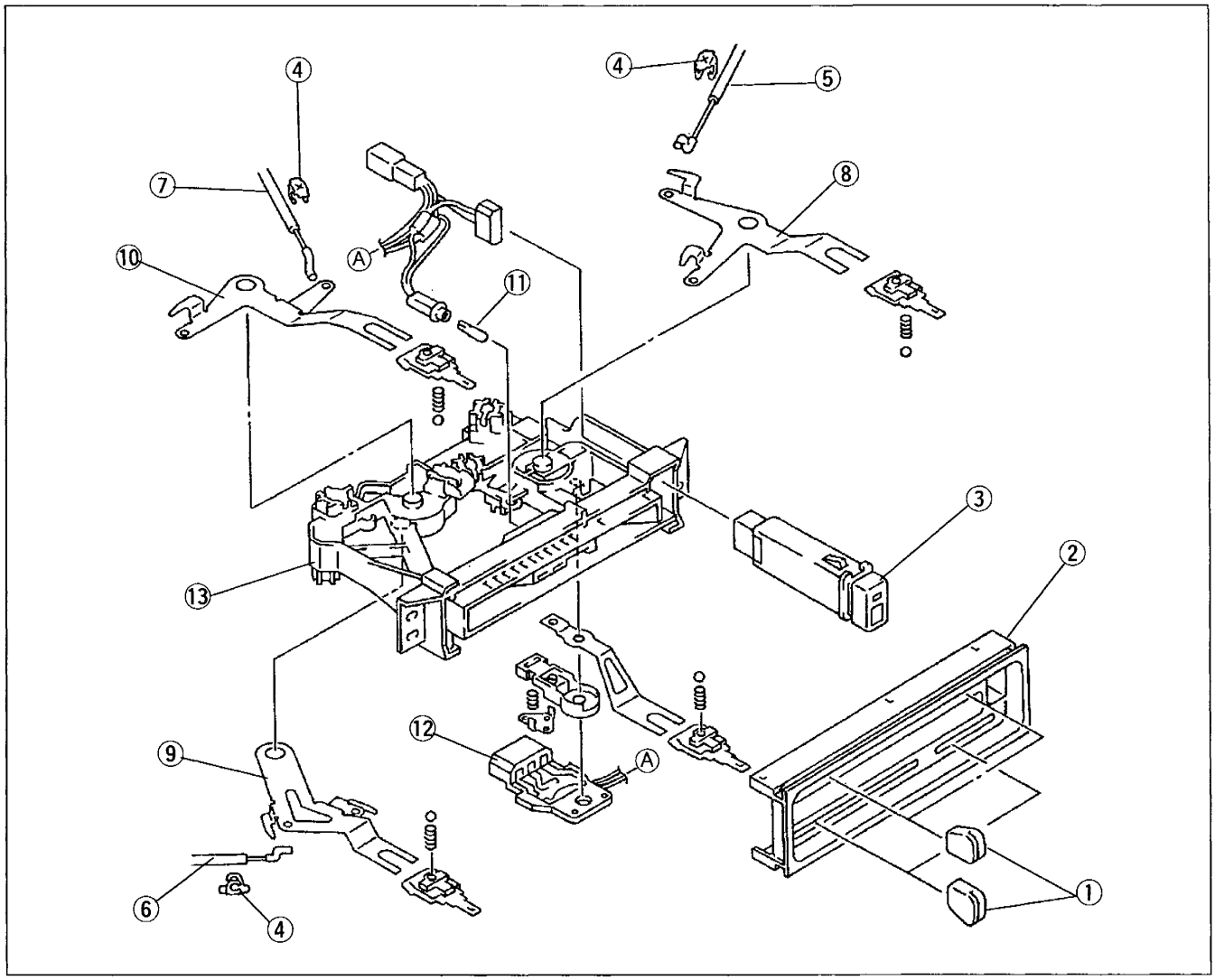


Air intake wire

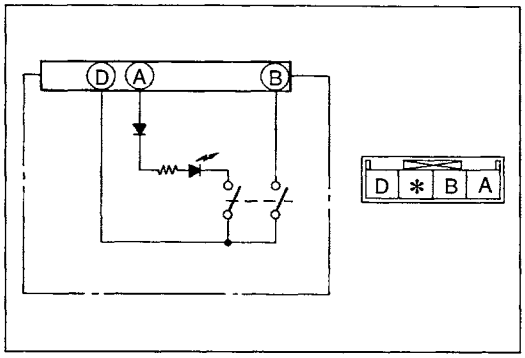
1. Set the REC/FRESH lever to FRESH.
2. Connect and clamp the wire with the shutter lever on the blower unit at its closest point.
3. Move the REC/FRESH lever to make sure the wire is securely attached and that it moves fully from REC to FRESH.

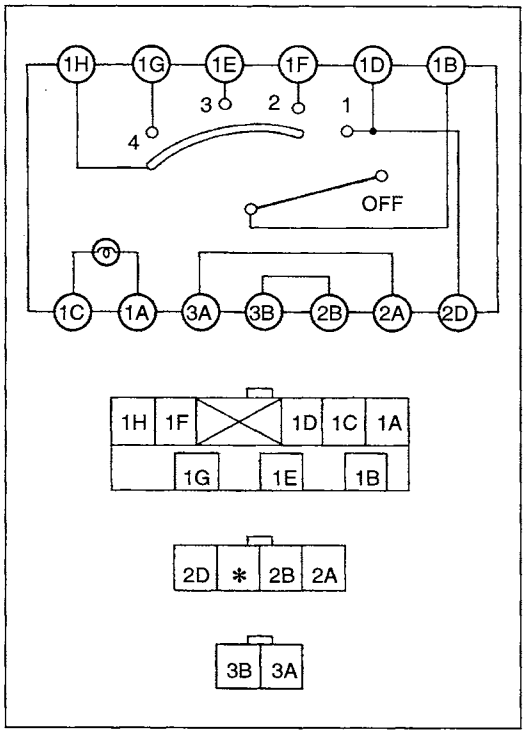
Disassembly / Assembly

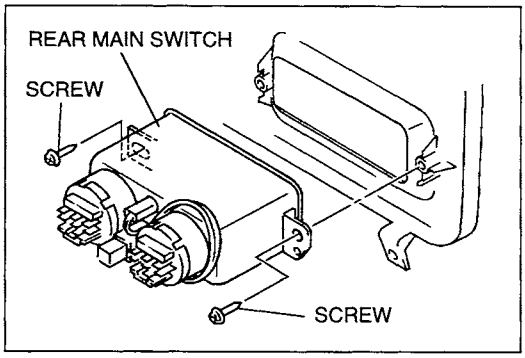
1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



1. Knob
2. Panel
3. A/C switch
   Inspection ..... page U–39
4. Clip
5. Air intake wire
6. Airflow mode wire
7. Air mix wire
8. REC/FRESH lever
9. MODE lever
10. Temperature control lever
11. Bulb
12. Front fan switch
    Inspection ..... page U–39
13. Body







Inspection
A/C switch

1. Remove the A/C switch. (Refer to page U–38.)
2. Check for continuity between the terminals of the A/C switch.

○—○: Continuity

Switch position \ Terminal	B	D
OFF		
ON	○	○

3. Connect battery positive voltage to terminal A and ground to terminal D.
4. Turn the A/C switch on and check that indicator light illuminates.
5. If not as specified, replace the A/C switch. (Refer to page U–38.)

Front fan switch

1. Remove the heater control unit. (Refer to pge U–37.)
2. Check for continuity between the terminals of the front fan switch.

○—◎—○ : Bulb ○—○: Continuity

Switch position \ Terminal	1A	1C	1B	1H	1D	1F	1E	1G	2D	2A	3A	2B	3B
OFF	○	◎	○		○				○	○	○	○	○
1	○	◎	○		○				○	○	○	○	○
2	○	◎	○	○		○				○	○	○	○
3	○	◎	○	○			○			○	○	○	○
4	○	◎	○	○				○		○	○	○	○

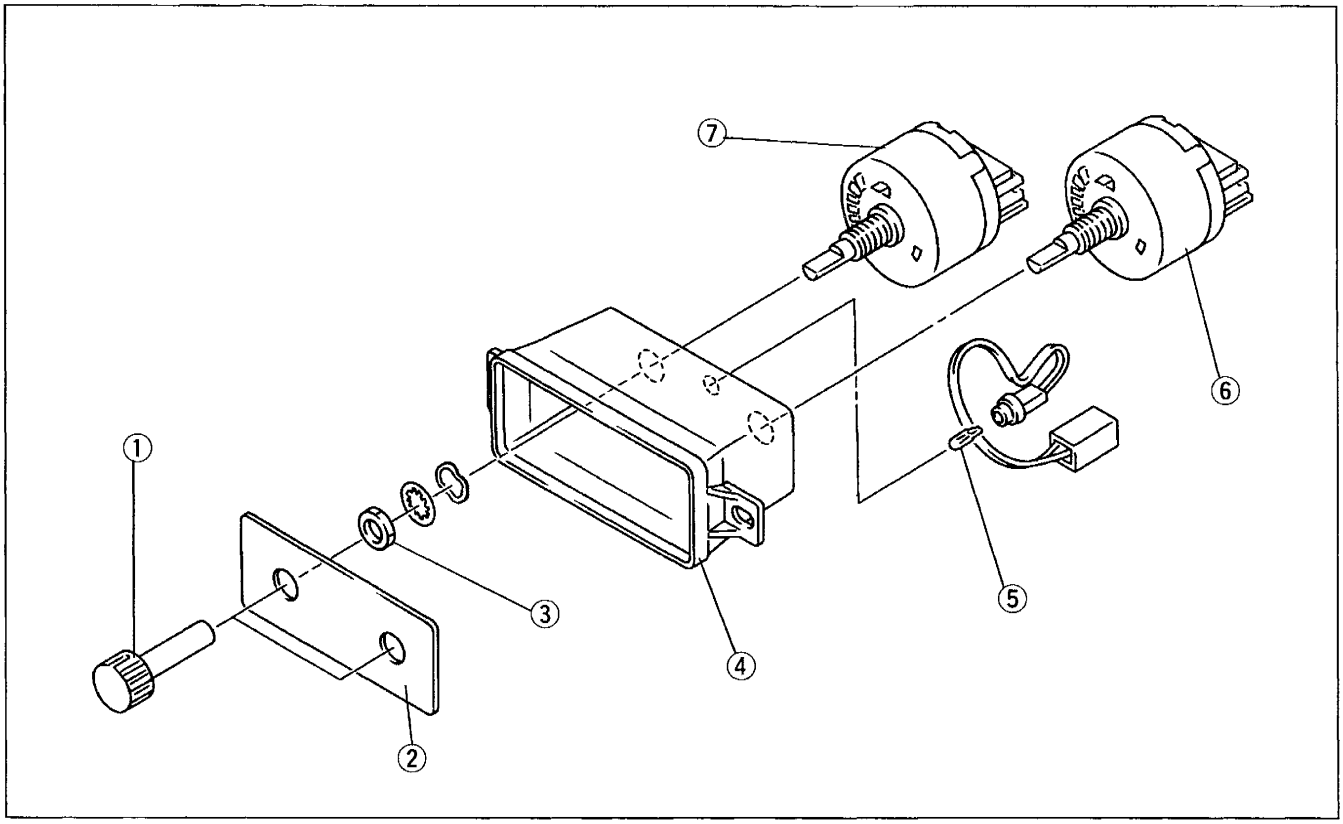
3. If not as specified, replace the front fan switch. (Refer to page U–38.)

REAR MAIN SWITCH
Removal / Installation

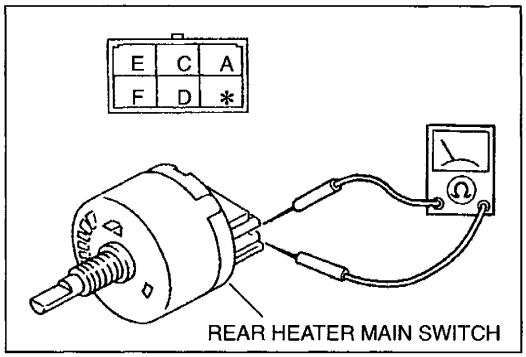
1. Remove the center upper panel. (Refer to section S.)
2. Remove the screws and the rear main switch.
3. Install in the reverse order of removal.

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



1. Knob
2. Panel
3. Nut
4. Case
5. Bulb
6. Rear heater main switch
   Inspection ..... below
7. Rear cooler main switch
   Inspection ..... page U–41



Inspection

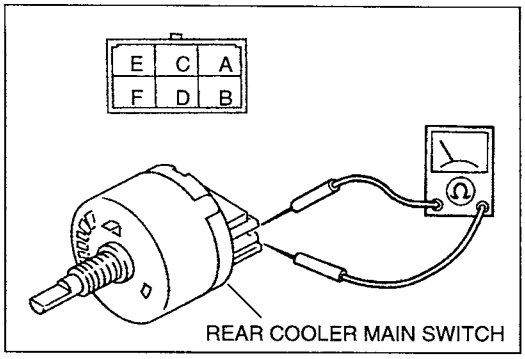
Rear heater main switch

1. Remove the center upper panel. (Refer to section S.)
2. Check for continuity between the terminals of the rear heater main switch.

O—O: Continuity

Switch position \ Terminal	A	C	E	F	D
OFF					
REAR SW	O	O			
1	O		O		
2	O			O	
3	O				O

3. If not as specified, replace the rear heater main switch.



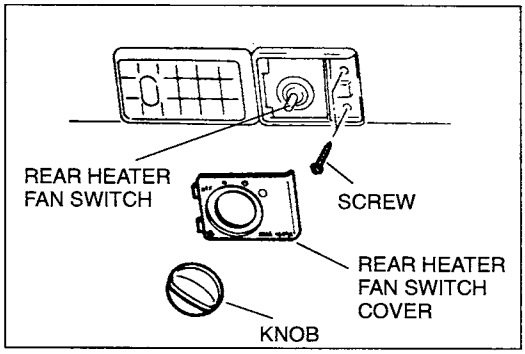
Rear cooler main switch

1. Check for continuity between the terminals of the rear cooler main switch

○—○: Continuity

Switch position \ Terminal	A	B	C	E	F	D
OFF						
REAR SW	○	○	○			
1	○	○		○		
2	○	○			○	
3	○	○				○

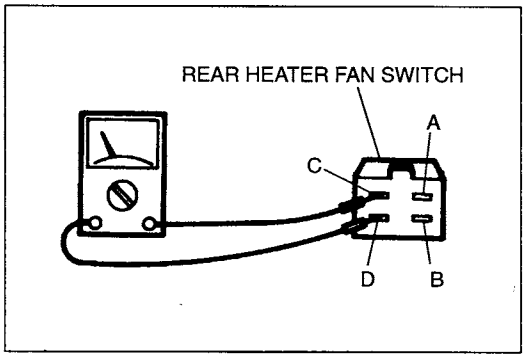
2. If not as specified, replace the rear cooler main switch. (Refer to page U–40.)



REAR HEATER FAN SWITCH

Removal / Installation

1. Remove the rear heater fan switch knob and cover.
2. Remove the screws and the rear heater fan switch.
3. Install in the reverse order of removal.



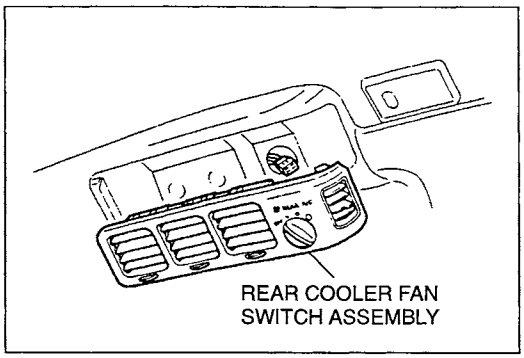
Inspection

1. Remove the rear heater fan switch.
2. Check for continuity between the terminals of the rear heater fan switch.

○—○: Continuity

Switch position \ Terminal	A	B	C	D
OFF				
1			○	○
2	○			○
3		○		○

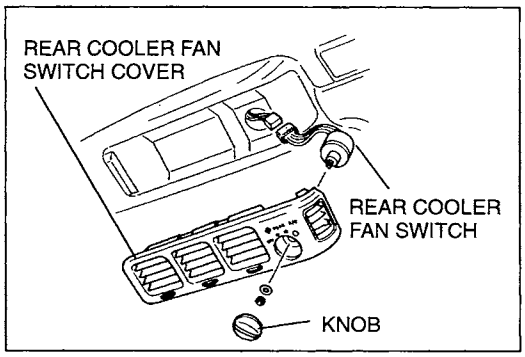
3. If not as specified, replace the rear heater fan switch.



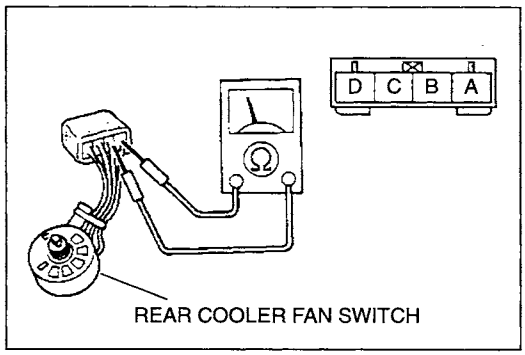
REAR COOLER FAN SWITCH

Removal / Installation

1. Pull out the rear cooler fan switch assembly.
2. Disconnect the rear cooler fan switch connector.



3. Remove the rear cooler fan switch as shown in the figure.
4. Install in the reverse order of removal.



Inspection

1. Remove the rear cooler fan switch.
2. Check for continuity between the terminals of the rear cooler fan switch.

O—O: Continuity

Switch position \ Terminal	A	B	C	D
OFF				
1			O—O	
2	O—O			
3		O—O		

3. If not as specified, replace the rear cooler fan switch.

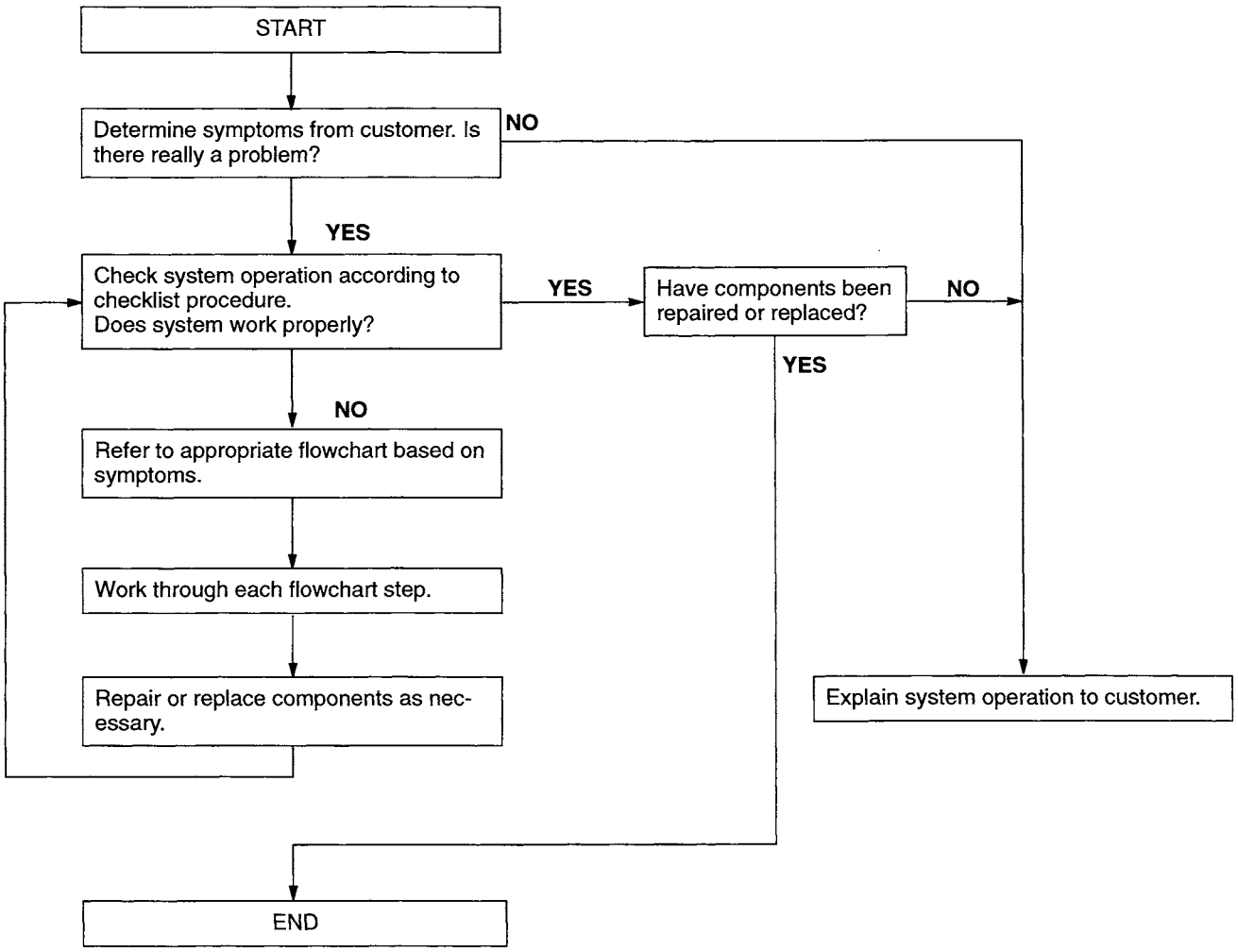
TROUBLESHOOTING

TROUBLESHOOTING NOTES

- Precise understanding of customer complaints is the key to diagnosing problems.
- Diagnosis of air conditioning system problems can be difficult because of the surrounding temperatures. Therefore, checking the system operation is important. Further checking the system operation in a logical order is necessary for the accurate understanding of problems.

USING THIS SECTION

When troubleshooting, follow the procedure shown below.



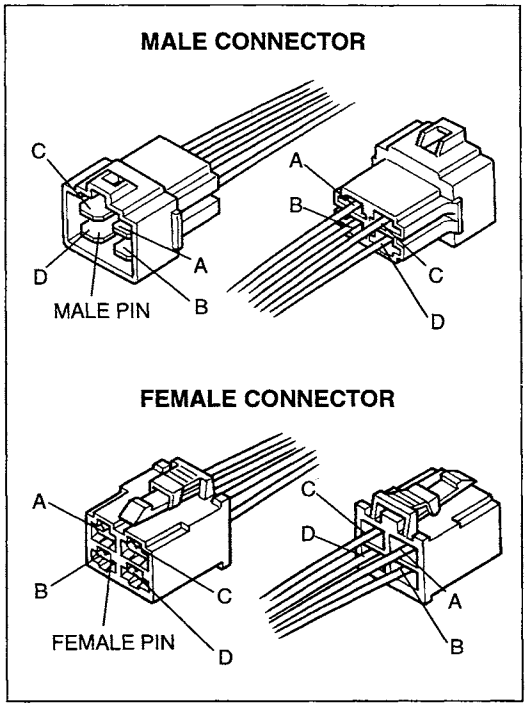
- Note the following points when using the flowcharts.

Flowchart No.	A/C signal system inspection	Symptom·····Magnetic clutch, condenser fan, and A/C compressor idle-up do not operate
5		Related parts···A/C amplifier, refrigerant pressure switch, heater control unit, PCM, wiring harness

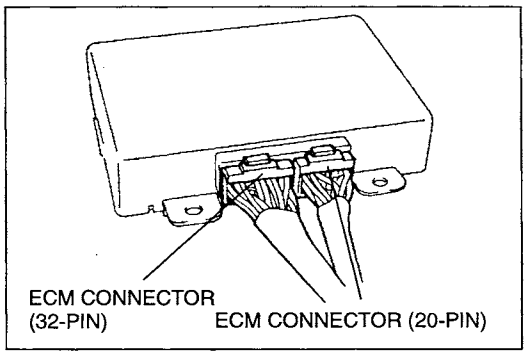
B+:Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
3	1)Connect jumper wire between terminal B or C of A/C amplifier connector (female) and ground. 2)Verify that temperature around evaporator temperature sensor is 3.5°C (38.3°F) or more. 3)Start engine. 4)Do magnetic clutch and condenser fan operate?	Jumper wire between terminal B and ground	YES	Disconnect jumper wire from terminal B and connect to terminal C.
			NO	Repair wiring harness [Refrigerant pressure switch−A/C amplifier:A−8]
		Jumper wire between terminal C and ground	YES	Remove jumper wire and go to Step 4
			NO	Check A/C amplifier (Refer to page U−36)
4	Measure voltage at terminal of heater control unit connector (female:16-pin).	2D	B+	Go to Step 5
			Other	Repair wiring harness [A/C amplifier−heater control unit:C−2D]
5	1)Turn the ignition switch to OFF. 2)Disconnect midway connector (X−26). 3)Is there continuity between terminals of heater control unit connector (female:16-pin) and midway connector (female)?	2E−A	YES	Replace heater control unit (Refer to page U−34)
			NO	Repair wiring harness [Heater control unit−midway connector:2E−A]

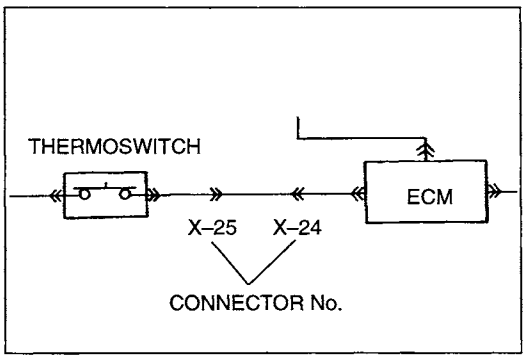
1. Follow the Steps in order when troubleshooting the system.
2. Before inspection, turn all switches to OFF. When moving from step to step, keep the switches, connectors, and jumper wire in their former position unless otherwise instructed.
   Before connecting or disconnecting a jumper wire, turn the ignition switch to OFF to prevent burning the electrical parts. After the jumper wire is connected or disconnected, the ignition switch can be turned to ON again.
3. When checking for continuity of the wiring harness, the terminal names are shown under "Terminal" and their corresponding connector names are shown under "Inspection procedure." When repairing the wiring harness, the terminal names and the corresponding part names to which they are connected are shown under "Action."



4. Inspect connectors from either the male or female side stated after the connector name.



5. When more than one connector is attached to the same part, the pin number enclosed in ( ) after the connector name distinguishes the connectors.
   The wiring diagram connector number shown before the alphabet letter distinguishes the terminals.



6. When more than one harness connects 2 different parts, the wiring diagram connector number enclosed in ( ) after the connector name distinguishes the connectors.

TROUBLESHOOTING

Checklists

Determine the symptoms of the problem based on the customer's complaints. Refer to the fuse checklist and match the symptoms obtained from the customer with those listed in the table. Check the appropriate fuse. If the fuse is OK, operate the system. Determine the general area of the problem; for example, airflow, or temperature.

Look at the main checklist and locate the general problem area (first column). Follow each step of the instructions for the specific system (second column). If the system does not operate properly (third column), determine the symptoms and corresponding flowchart number (fourth and fifth columns). Refer to the appropriate flowchart and troubleshoot the system.

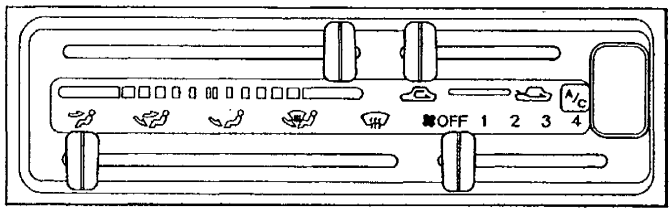
Fuse checklist

Symptom	Related fuse
Entire control system does not operate	AIR CON 15 A
Front blower motor does not operate	HEATER 40 A
Magnetic clutch and condenser fan do not operate	AIR COND2 15 A
Condenser fan does not operate	ADD FAN 20 A
Rear heater blower motor and rear cooler blower motor do not operate	R. A/C 20 A

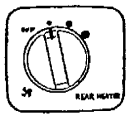
Main checklist

Start and warm up the engine so that the engine coolant temperature reaches **40—100 °C { 104—212 °F }**. Keep the engine running while doing the procedures.

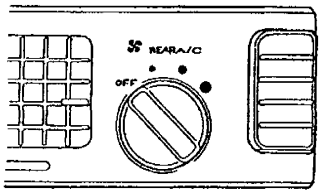
HEATER CONTROL UNIT



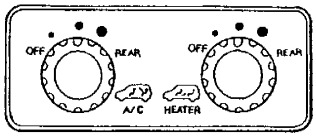
REAR HEATER FAN SWITCH



REAR COOLER FAN SWITCH



REAR MAIN SWITCH



General problem area	Procedure	Proper operation	Symptom	Flowchart No. (Reference)
Entire control system	Operate A/C switch, front fan switch, rear main switch, rear cooler fan switch and rear heater fan switch.	Following control system parts operate when switches are operated: • Magnetic clutch • Condenser fan • Front blower motor • Rear heater blower motor • Rear blower motor	Control system does not operate	1 (page U–49)
			Rear cooling unit and rear heater unit do not operate	2 (page U–49)
Air outlet volume system	(Front) Set front fan switch in order at 1st, 2nd, 3rd, and 4th.	Front blower motor operates corresponding to front fan switch operation	Front blower motor does not operate	4 (page U–49)
			Front blower motor does not operate properly with front fan switch position	5 (page U–50)
	(Rear heater) Set rear heater fan switch in order at 1st, 2nd, and 3rd.	Rear heater blower motor operates corresponding to rear heater fan switch operation	Rear heater blower motor does not operate	6 (page U–50)
			Rear heater blower motor does not operate properly with rear heater fan switch position	7 (page U–51)
	Set rear heater main switch in order at REAR CTRL, 1st, 2nd, and 3rd.		Rear heater blower motor does not operate properly with rear heater main switch position	8 (page U–52)
	(Rear cooler) Set rear cooler fan switch in order at 1st, 2nd, and 3rd.	Rear blower motor operates corresponding to rear cooler fan switch operation	Rear blower motor does not operate	9 (page U–52)
			Rear blower motor does not operate properly with rear cooler fan switch position	10 (page U–53)
	Set rear cooler main switch in order at REAR CTRL, 1st, 2nd, and 3rd.		Rear blower motor does not operate properly with rear cooler main switch position	11 (page U–53)
Air intake mode system	1. Set front fan switch at 4th. 2. Set REC/FRESH lever in order at each air intake mode.	Air intake wire (air intake mode) operates (changes) corresponding to REC/FRESH lever operation	Air intake mode does not change	Wire adjustment (page U–38)
Airflow mode system	1. Set front fan switch at 4th. 2. Set MODE lever in order at each airflow mode.	Airflow mode wire (Airflow mode) operates (changes) corresponding to MODE lever operation	Airflow mode does not change	Wire adjustment (page U–37)
Electrical load idle-up system	Set front fan switch in order at 1st, 2nd, 3rd, and 4th. (Electrical load should be blower motor only.)	Electrical load idle-up operates with front fan switch at 2nd, 3rd, and 4th	Electrical load idle-up does not operate with front fan switch at 2nd, 3rd, and 4th	3 (page U–49)
Air outlet temperature system	(Front) 1. Set fan switch at 4th. 2. Change temperature control lever from MAX COLD to MAX HOT.	Air mix wire (air outlet temperature) operates (changes) corresponding to temperature control lever	Air outlet temperature does not change	Wire adjustment (page U–37)

General problem area	Procedure	Proper operation	Symptom	Flowchart No. (Reference)
Air outlet temperature system	3. Turn A/C switch on.	Magnetic clutch, condenser fan, and A/C compressor idle-up operate	Magnetic clutch, condenser fan, and A/C compressor idle-up do not operate	12 (page U–54)
			A/C compressor idle-up operates, but magnetic clutch and condenser fan do not operate	13 (page U–55)
			Only magnetic clutch does not operation	14 (page U–55)
			Only condenser fan does not operation	15 (page U–56)
	(Rear cooler) 1. Turn A/C siwtch on. 2. Set front fan switch at 1st. 3. Set rear cooler main switch at 3rd.	Check air outlet temperature is cold	Cool air does not discharge or air cooling ability is low	16 (page U–57)

Flowcharts

Flowchart No.	A/C main power source system inspection	Symptom ..... Control system does not operate
1		Related parts .... Wiring harness

Remedy

Repair the wiring harness [Front fan switch—Ground: B—GND]

Flowchart No.	Rear cooling unit and rear heater unit power source system inspection	Symptom ..... Rear cooling unit and rear heater unit do not operate
2		Related parts .... Wiring harness

Remedy

Repair the wiring harness (Fuse—Rear cooling unit: R.A/C 20 A—G)
Repair the wiring harness (Fuse—Rear heater unit: R.A/C 20 A—A)

Flowchart No.	Electrical load idle-up system inspection	Symptom ..... Electrical load idle-up does not operate with front fan switch at 2nd, 3rd, and 4th
3		Related parts .... Front fan switch, CPU, ECM, Wiring harness

Check the following parts. Repair or replace any abnormal parts.
1. Wiring harness [Front fan switch—CPU: H—B]
2. Wiring harness [CPU—ECM: F—1P]
3. Front fan switch (Refer to page U–39.)
4. Terminals B and F of CPU (Refer to section T.)
5. Terminal P of ECM (Refer to section F.)

Flowchart No.	Front blower motor system inspection	Symptom ..... Front blower motor does not operate
4		Related parts .... Front resistor, Front blower motor, Front blower relay, Front fan switch, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Turn ignition switch to ON 2) Measure voltage at terminals of connector	A	B+	Measure voltage at terminal C
			Other	Repair wiring harness (Fuse—Front blower relay: AIR CON 15 A—A)
		C	B+	Repair wiring harness (Front blower relay—GND)
			Other	Measure voltage at terminal D
		D	B+	Measure voltage at terminal E
			Other	Repair wiring harness (Fuse—Front blower relay: HEATER 40 A—D)
		E	B+	Go to Step 2
			Other	Replace front blower relay
2	Measure voltage at terminal of front blower motor	A	B+	Go to Step 3
			Other	Repair wiring harness (Front blower relay—Front blower motor)
3	1) Turn front fan switch off 2) Measure voltage at terminal of front resistor connector	A (1-pin connector)	B+	Go to Step 5
			Other	Go to Step 4
4	1) Disconnect front blower motor connector 2) Check for continuity between terminal of front blower motor connector and front resistor connector	A—A (1-pin connector)	Yes	Check front blower motor
			No	Repair wiring harness (Front blower motor—Front resistor)

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
5	Measure voltage at terminal of front fan switch	B	B+	Repair wiring harness (Front fan switch—GND)
			Other	Check front resistor and front fan switch

Flowchart No.	Front blower motor system inspection	Symptom ..... Front blower motor does not operate properly with front fan switch position
5		Related parts .... Front resistor, Front fan switch, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Turn ignition switch to ON 2) Turn front fan switch off 3) Measure voltage at terminals of front resistor connector	B	B+	Measure voltage at terminal A
			Other	Check front resistor
		A	B+	Measure voltage at terminal D
			Other	Check front resistor
		D	B+	Measure voltage at terminal C
			Other	Check front resistor
		C	B+	Go to Step 2
			Other	Check front resistor
2	Measure voltage at terminals of front fan switch connector	D	B+	Measure voltage at terminal F
			Other	Repair wiring harness (Front resistor—Front fan switch)
		F	B+	Measure voltage at terminal E
			Other	Repair wiring harness (Front resistor—Front fan switch)
		E	B+	Measure voltage at terminal G
			Other	Repair wiring harness (Front resistor—Front fan switch)
		G	B+	Check front fan switch
			Other	Check wiring harness (Front resistor—Front fan switch)

Flowchart No.	Rear heater blower motor system inspection	Symptom ..... Rear heater blower motor does not operate
6		Related parts .... Rear heater 10 A fuse, Rear heater blower relay, Rear heater blower motor, Rear heater fan switch, Rear heater main switch, Wiring harness

Step	Inspection procedure	Terminal	Result	Action
1	Check rear heater 10 A fuse in rear heater unit	—	OK	Go to Step 2
			Burnt	Check for a short circuit in the wiring harness before replacing the rear heater 10 A fuse
2	1) Disconnect rear heater main switch connector 2) Check for continuity between terminal of rear heater main switch connector and ground	A—GND	Yes	Go to Step 3
			No	Repair wiring harness (Rear heater main switch—GND)

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
3	1) Turn ignition switch to ON 2) Measure voltage at terminal of rear heater unit connector	C	B+	Measure voltage at terminal D
			Other	Go to Step 4
		D	B+	Measure voltage at terminal E
			Other	Check rear heater resistor
		E	B+	Check rear heater fan switch and rear heater main switch
			Other	Check rear heater resistor
4	Measure voltage at terminals of rear heater blower relay connector	A	B+	Measure voltage at terminal
			Other	Repair wiring harness (Fuse—Rear heater blower relay: AIR CON 15 A—A)
		B	B+	Repair wiring harness (Rear heater blower relay—GND)
			Other	Measure voltage at terminal
		C	B+	Measure voltage at terminal
			Other	Repair wiring harness (Fuse—Rear heater blower relay: R.A/C 20 A—C)
		D	B+	Go to Step 5
			Other	Replace rear heater blower relay
5	Measure voltage at terminals of rear heater blower motor	A	B+	Repair wiring harness (Rear heater blower motor—Rear heater resistor)
			Other	Measure voltage at terminal
		B	B+	Check blower motor
			Other	Repair wiring harness (Blower relay—Blower motor)

Flowchart No.	Rear heater blower motor system inspection	Symptom ..... Rear heater blower motor does not operate properly with rear heater fan switch position
7		Related parts .... Rear heater fan switch, Rear heater main switch, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Turn ignition switch to ON 2) Turn rear heater main switch off 3) Set rear heater fan switch at 3rd 4) Measure voltage at terminals of rear heater fan switch connector	C	B+	Measure voltage at terminal A
			Other	Repair wiring harness (Rear heater unit—Rear heater fan switch)
		A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (Rear heater unit—Rear heater fan switch)
		B	B+	Measure voltage at terminal D
			Other	Repair wiring harness (Rear heater unit—Rear heater fan switch)
		D	B+	Go to Step 2
			Other	Check rear heater fan switch
2	Measure voltage at terminal of rear heater main switch connector	D	B+	Check rear heater fan switch and rear heater main switch
			Other	Repair wiring harness (Rear heater fan switch—Rear heater main switch)

Flowchart No.	Rear heater blower motor system inspection	Symptom ..... Rear heater blower motor does not operate properly with rear heater main switch position
8		Related parts .... Rear heater main switch, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Turn ignition switch to ON 2) Turn rear heater main switch off 3) Measure voltage at terminals of rear heater main switch connector	C	B+	Measure voltage at terminal E
			Other	Repair wiring harness (Rear heater unit—Rear heater main switch)
		E	B+	Measure voltage at terminal F
			Other	Repair wiring harness (Rear heater unit—Rear heater main switch)
		F	B+	Check rear heater main switch
			Other	Repair wiring harness (Rear heater unit—Rear heater main switch)

Flowchart No.	Rear blower motor system inspection	Symptom ..... Rear blower motor does not operate
9		Related parts .... Rear resistor, Rear blower motor, Rear blower relay, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Disconnect rear cooler main switch connector 2) Check for continuity between terminal of rear cooler main switch connector and ground	A—GND	Continuity	Go to Step 2
			No continuity	Repair wiring harness (Rear cooler main switch—GND)
2	1) Turn ignition switch to ON 2) Measure voltage at terminal of rear resistor connector	A	B+	Check rear resistor
			Other	Go to Step 3
3	Measure voltage at terminals of rear blower relay connector	A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (Fuse—Rear blower relay: AIR CON 15 A—A)
		B	B+	Repair wiring harness (Rear blower relay—GND)
			Other	Measure voltage at terminal C
		C	B+	Measure voltage at terminal D
			Other	Repair wiring harness (Fuse—Rear blower relay: R.A/C 20 A—C)
		D	B+	Go to Step 4
			Other	Check rear blower relay
4	Measure voltage at terminals of rear blower motor connector	B	B+	Repair wiring harness (Rear blower motor—Rear blower relay)
			Other	Measure voltage at terminal A
		A	B+	Check rear blower motor
			Other	Repair wiring harness (Rear blower relay—Rear blower motor)

Flowchart No.	Rear blower motor system inspection	Symptom ..... Rear blower motor does not operate properly with rear cooler fan switch position
10		Related parts .... Rear cooler fan switch, Rear cooler main switch, Rear cooling unit, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Turn ignition switch to ON 2) Turn rear cooler main switch off 3) Set rear cooler fan switch at 3rd 4) Measure voltage at terminals of rear cooler fan switch connector	C	B+	Measure voltage at terminal A
			Other	Repair wiring harness (Rear resistor—Rear cooler fan switch)
		A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (Rear resistor—Rear cooler fan switch)
		B	B+	Measure voltage at terminal D
			Other	Repair wiring harness (Rear resistor—Rear cooler fan switch)
		D	B+	Go to Step 2
			Other	Check rear cooler fan switch
2	Measure voltage at terminal of rear cooler main switch connector	D	B+	Check rear cooler fan switch and rear cooler main switch
			Other	Go to Step 3
3	Measure voltage at terminal of rear cooling unit connector (8-pin)	D	B+	Repair wiring harness (Rear cooling unit—Rear cooler main switch)
			Other	Go to Step 4
4	Measure voltage at terminal of rear cooling unit connector (4-pin)	D	B+	Repair wiring harness (Rear cooling unit [8-pin, terminal D]—Rear cooling unit [4-pin, terminal D])
			Other	Repair wiring harness (Rear cooler fan switch—Rear cooling unit)

Flowchart No.	Rear blower motor system inspection	Symptom ..... Rear blower motor does not operate properly with rear cooler main switch position
11		Related parts .... Rear cooler main switch, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Turn ignition switch to ON 2) Turn rear cooler main switch off 3) Measure voltage at terminals of rear cooler main switch connector	C	B+	Measure voltage at terminal E
			Other	Repair wiring harness (Rear resistor—Rear cooler main switch)
		E	B+	Measure voltage at terminal F
			Other	Repair wiring harness (Rear resistor—Rear cooler main switch)
		F	B+	Check rear cooler main switch
			Other	Repair wiring harness (Rear resistor—Rear cooler main switch)

Flowchart No.	A/C signal system inspection	Symptom ..... Magnetic clutch, condenser fan, and A/C compressor idle-up do not operate
12		Related parts .... A/C relay, ECM, Thermoswitch, A/C switch, Front fan switch, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Turn ignition switch to ON 2) Measure voltage at terminals of A/C relay connector	C	B+	Measure voltage at terminal C
			Other	Repair wiring harness (Fuse—A/C relay: AIR COND2 15 A—C)
		D	B+	Repair wiring harness (A/C relay—Refrigerant pressure switch)
			Other	Measure voltage at terminal A
		A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (Fuse—A/C relay: AIR CON 15 A—A)
		B	B+	Go to Step 2
			Other	Check A/C relay
2	1) Turn ignition switch to ON 2) Disconnect ECM connector (22-pin) 3) Connect jumper wire between terminal 1G of ECM connector and ground 4) Start engine 5) Do magnetic clutch, condenser fan, and A/C compressor operate?	—	Yes	Reconnect ECM connector (22-pin), remove jumper wire, and go to Step 3
			No	Check wiring harness (A/C relay—ECM) Check ECM (Refer to section F)
3	1) Turn ignition switch to ON 2) Turn front fan switch off 3) Check evaporator temperature at above 5 °C { 41 °F } 4) Measure voltage at terminals of thermoswitch connector	A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (ECM—Thermoswitch)
		B	B+	Go to Step 4
			Other	Check thermoswitch
4	1) Turn A/C switch on 2) Measure voltage at terminals of A/C switch connector	B	B+	Measure voltage at terminal A
			Other	Repair wiring harness (Thermoswitch—A/C switch)
		A	B+	Measure voltage at terminal D
			Other	Repair wiring harness (Fuse—A/C switch: AIR CON 15 A—A)
		D	B+	Go to Step 5
			Other	Check A/C switch
5	1) Set front fan switch at 1st 2) Measure voltage at terminal of front fan switch connector	B	B+	Repair wiring harness (Front fan switch—GND)
			Other	Go to Step 6
6	1) Disconnect front fan switch connector 2) Disconnect A/C switch connector 3) Check for continuity between terminal of A/C switch connector and front fan switch connector	D—D	Yes	Check front fan switch
			No	Repair wiring harness (A/C switch—Front fan switch)

Flowchart No.	A/C power source system inspection	Symptom ..... A/C compressor idle-up operates, but magnetic clutch and condenser fan do not operate
13		Related parts .... A/C relay, Refrigerant pressure switch, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Turn ignition switch to ON 2) Measure voltage at terminals of A/C relay connector	C	B+	Measure voltage at terminal D
			Other	Repair wiring harness (Fuse—A/C relay: AIR COND2 15 A—C)
		D	B+	Go to Step 2
			Other	Check A/C relay
2	Measure voltage at terminals of refrigerant pressure switch connector	B	B+	Measure voltage at terminal A
			Other	Repair wiring harness (A/C relay—Refrigerant pressure switch)
		A	B+	Repair wiring harness (Pressure switch—Magnetic clutch, Refrigerant pressure switch—Condenser fan relay)
			Other	Check refrigerant pressure switch

Flowchart No.	A/C power source system inspection	Symptom ..... Only magnetic clutch does not operate
14		Related parts .... Magnetic clutch, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Run engine at idle 2) Turn A/C switch and fan switch on 3) Measure voltage at terminal of magnetic clutch connector	GND	B+	Repair the ground connection
			Other	Measure voltage at terminal A
		A	B+	Check magnetic clutch
			Other	Repair wiring harness (Refrigerant pressure switch—Magnetic clutch)

Flowchart No.	A/C power source system inspection	Symptom ..... Only condenser fan does not operate
15		Related parts .... Condenser fan relay, Condenser fan, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Run engine at idle 2) Turn A/C switch and front fan switch on 3) Measure voltage at terminals of condenser fan relay connector	A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (Refrigerant pressure switch—Condenser fan relay)
		B	B+	Repair wiring harness (Condenser fan relay—GND)
			Other	Measure voltage at terminal C
		C	B+	Measure voltage at terminal D
			Other	Repair wiring harness (Fuse—Condenser fan relay: ADD FAN 20 A—C)
		D	B+	Go to Step 2
			Other	Check condenser fan relay
2	Measure voltage at terminals of condenser fan connector	A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (Condenser fan relay—Condenser fan)
		B	B+	Repair wiring harness (Condenser fan—GND)
			Other	Replace condenser fan

Flowchart No.	Rear cooling unit system inspection	Symptom ..... Cool air does not discharge or air cooling ability is low
16		Related parts .... Magnetic solenoid valve, Magnetic solenoid valve relay, Rear cooler main switch, Diode, Rear resistor, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Run engine at idle 2) Turn A/C switch and fan switch on 3) Verify rear cooler main switch off 4) Measure voltage at terminal of magnetic solenoid valve relay connector	A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (A/C relay—Magnetic solenoid valve)
		B	B+	Go to Step 2
			Other	Check magnetic solenoid valve
2	Measure voltage at terminal of magnetic solenoid valve relay connector	A	B+	Measure voltage at terminal C
			Other	Repair wiring harness (Fuse—Magnetic solenoid valve relay: AIR CON 15 A—A)
		C	B+	Set rear cooler main switch to 1st and measure voltage at terminal D
			Other	Repair wiring harness (Magnetic solenoid valve—Magnetic solenoid valve relay)
		D	B+	Repair wiring harness (Magnetic solenoid valve relay—GND)
			Other	Measure voltage at terminal B
		B	B+	Go to Step 3
			Other	Check magnetic solenoid valve relay
3	Measure voltage at terminal of rear cooler main switch connector	C	B+	Check rear cooler main switch
			Other	Go to Step 4
4	Measure voltage at terminal of diode connector	A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (Magnetic solenoid valve relay—Diode)
		B	B+	Repair wiring harness (Diode—Rear cooler main switch)
			Other	Go to Step 5
5	1) Remove diode 2) Connect ⊕ lead to terminal B and ⊖ lead of circuit tester to terminal A of diode connector 3) Check for continuity between terminals of diode connector	A—B	Yes	Go to Step 6
			No	Replace rear cooler harness
6	Measure voltage at terminal of rear resistor connector	C	B+	Repair wiring harness (Diode—Rear resistor)
			Other	Check rear resistor