1993 Mazda RX-7 Workshop Manual

FOREWORD

This workshop manual is intended for use by service technicians of Authorized Mazda Dealers to help them service Mazda vehicles. It can also be useful to owners and operators of Mazda vehicles in diagnosing some problems and performing limited repair and maintenance on Mazda vehicles.

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.

Mazda Motor Corporation
HIROSHIMA, JAPAN

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

CONTENTS

*** Refer to the 1993 RX-7 Body Electrical Troubleshooting manual (form No. 1312-10-91L) for servicing of the body electrical components.**

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(9999-95-018B-93)

VEHICLE IDENTIFICATION NUMBERS (VIN)

JM1FD 331*PO 200001 ~
JM1FD 332*PO 200001 ~

GENERAL INFORMATION

07UGIX-001

IMPORTANT INFORMATION

BASIC ASSUMPTIONS

This workshop manual assumes that you have certain special tools that are necessary for the safe and efficient performance of service operations on Mazda vehicles and that you know how to use them properly. It also assumes that you are familiar with automobile systems and basic service and repair procedures. You should not attempt to use this manual unless these assumptions are correct and you understand the consequences described below.

SAFETY RISK

This manual contains certain notes, warnings, and other precautionary information that you should carefully read and follow to reduce the risk of personal injury to yourself or others and the risk of improper service that may damage the vehicle of render it unsafe. If there is no such information in regard to any specific service method, this does not mean there is no possibility that personal safety or vehicle safety will be jeopardized by the use of incorrect methods or tools.

POSSIBLE LOSS OF 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.

WARNING ON LUBRICANTS AND GREASES

Avoid all prolonged and repeated contact with mineral oils, especially used oils. Used oils contaminated during service (e.g., engine sump oils) are more irritating and more likely to cause serious effects, including skin cancer, in the event of gross and prolonged skin contact.

Wash skin thoroughly after work involving oil.
Protective hand cleaners may be of value provided they can be removed from the skin with water. Do not use gasoline, paraffin, or other solvents to remove oil from the skin.

Lubricants and greases may be slightly irritating to the eyes.

Repeated or prolonged skin contact should be avoided by wearing protective clothing if necessary. Particular care should be taken with used oils and greases containing lead. Do not allow work clothing to be contaminated with oil. Dry clean or launder such clothing at regular intervals.

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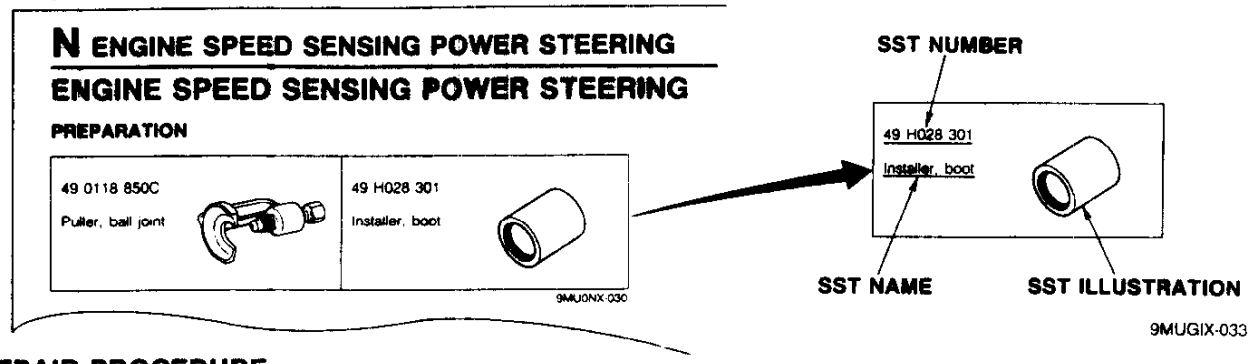
HOW TO USE THIS MANUAL

PREPARATION

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

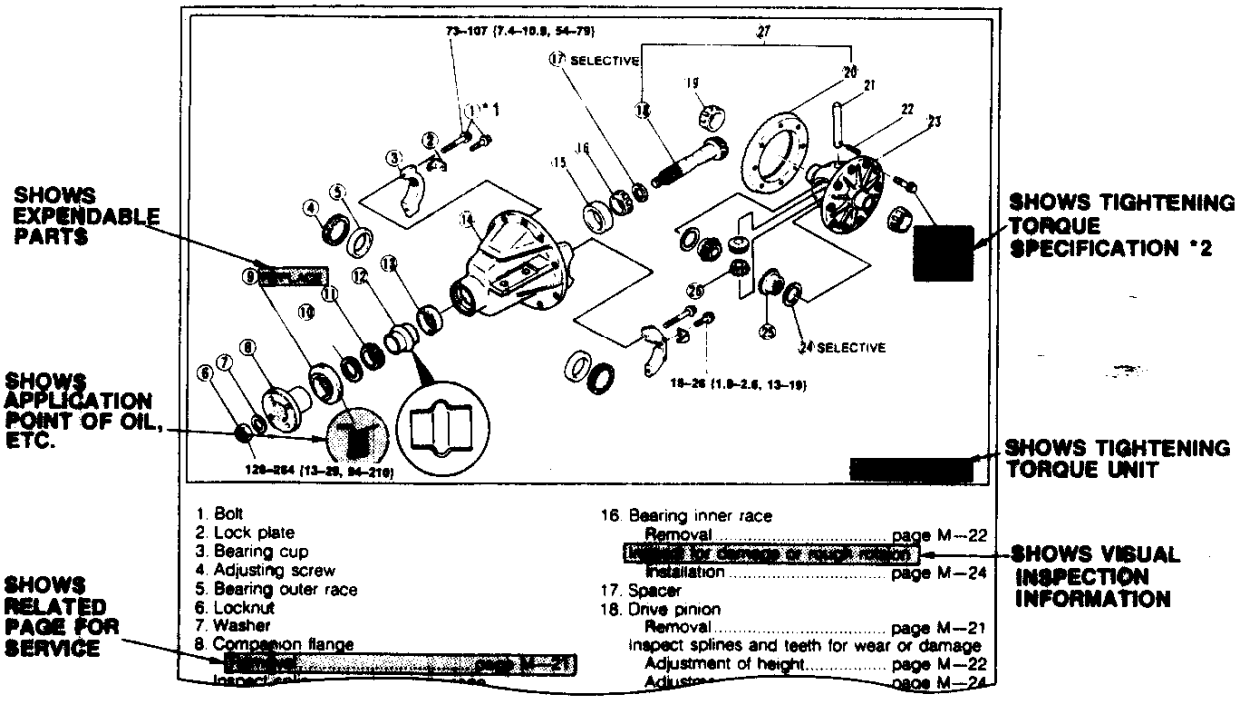
Example:



REPAIR PROCEDURE

1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual parts inspections. 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 ex.) refer to parts identification and where necessary servicing procedure.
* 2: Units are in N·m {kgf·m, ft·lbf} unless otherwise specified.

05UGIX-004

SYMBOLS

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

Symbol	Meaning	Kind
	Apply oil	New engine oil or gear oil as appropriate
	Apply brake fluid	Only brake fluid
	Apply automatic transmission fluid	Only ATF
	Apply grease	Appropriate grease
	Apply sealant	Appropriate sealant
	Apply petroleum jelly	Petroleum jelly

07UGIX-002

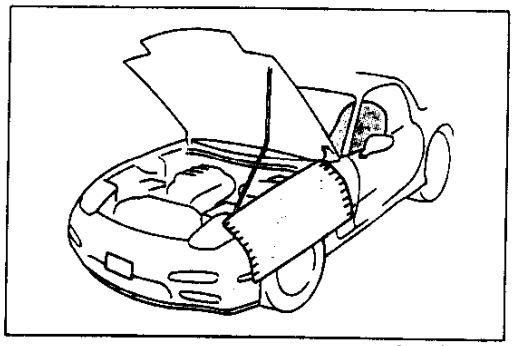
Note

- **When specific oil or grease is needed, this is shown in the illustration.**

NOTES, CAUTIONS, AND WARNINGS

As you read through the procedures, you will come across NOTES, CAUTIONS, and WARNINGS. Each one is there for a specific purpose. **NOTES** give you **added information** that will help you to complete a particular procedure. **CAUTIONS** are given to prevent you from making an error that could **damage the vehicle. WARNINGS** remind you to be especially careful in those areas where carelessness can cause **personal injury**. The following list contains some general WARNINGS you should follow when you work on a vehicle.

9MUGIX-036

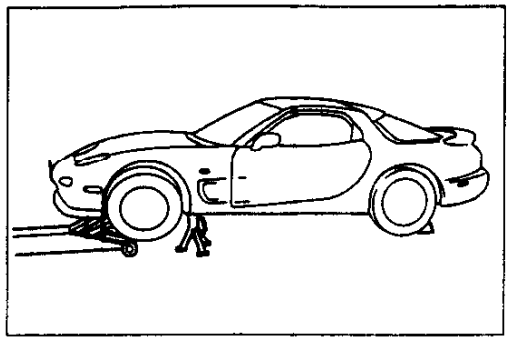


9MUGIX-037

FUNDAMENTAL PROCEDURES

PROTECTION OF THE VEHICLE

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

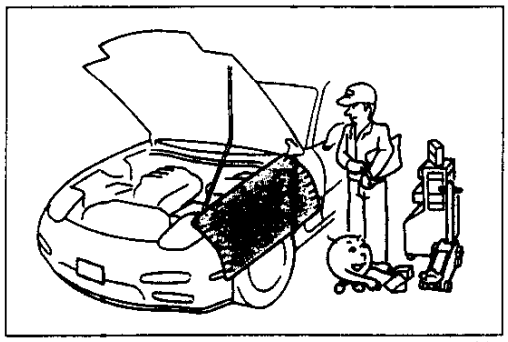


9MUGIX-003

A WORD ABOUT SAFETY

The following precautions must be followed when jacking up the vehicle.
1. Block the wheels.
2. Use only the specified jacking positions.
3. Support the vehicle with safety stands.

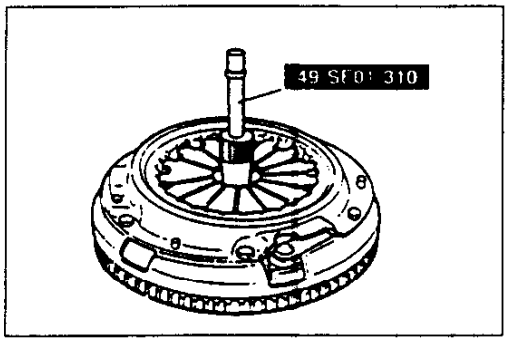
Start the engine only after making certain the engine compartment is clear of tools and people.



9MUGIX-038

PREPARATION OF TOOLS AND MEASURING EQUIPMENT

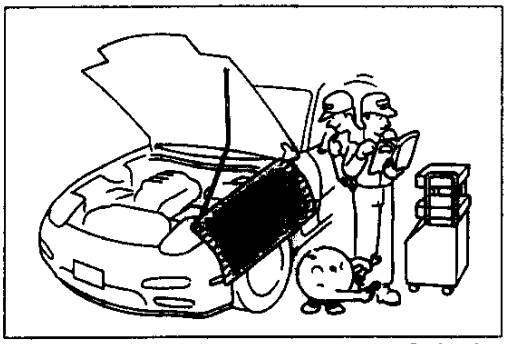
Be sure that all necessary tools and measuring equipment are available before starting any work.



9MUGIX-003

SPECIAL TOOLS

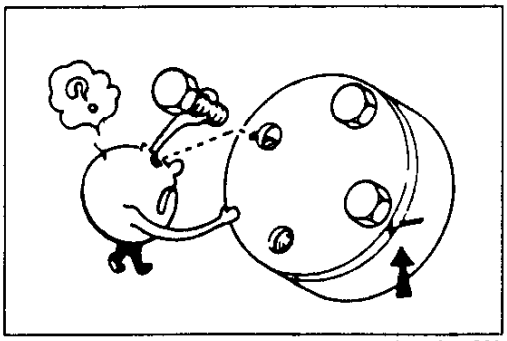
Use Special Service Tools (**SST**) when they are required.



47UGIX-006

REMOVAL OF PARTS

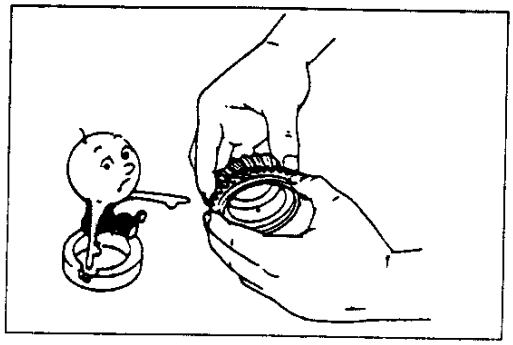
While correcting a problem, try also to determine its cause. Begin work only after first learning which parts and subassemblies must be removed and disassembled for replacement or repair.



9MUGIX-039

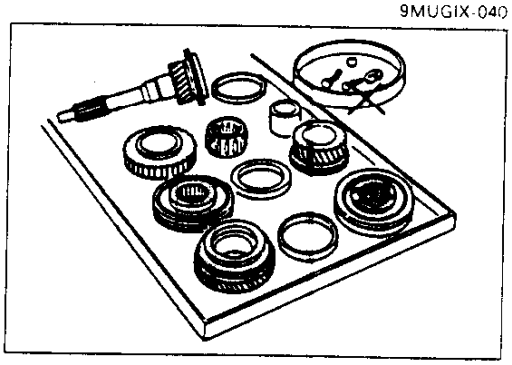
DISASSEMBLY

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.


9MUGIX-040

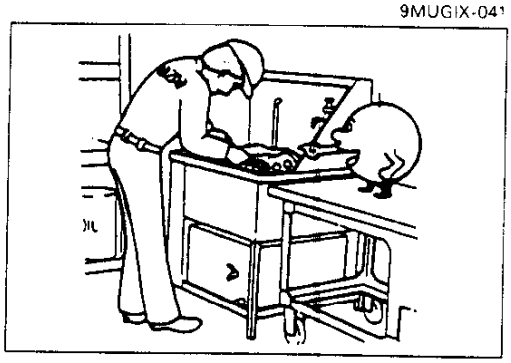
1. Inspection of parts

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


9MUGIX-041

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.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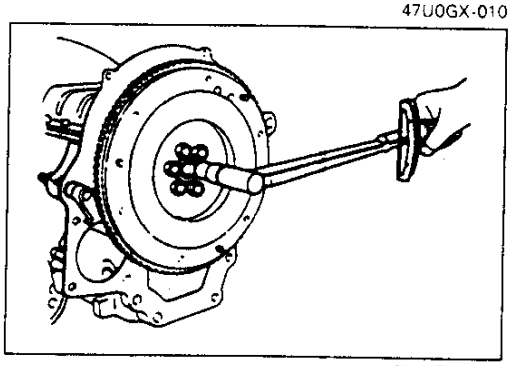
3. Cleaning parts for reuse

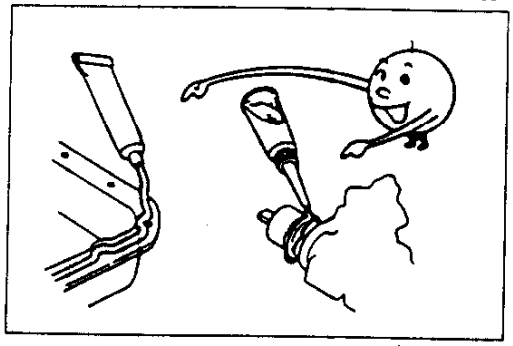
All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.


9MUGIX-004

REASSEMBLY

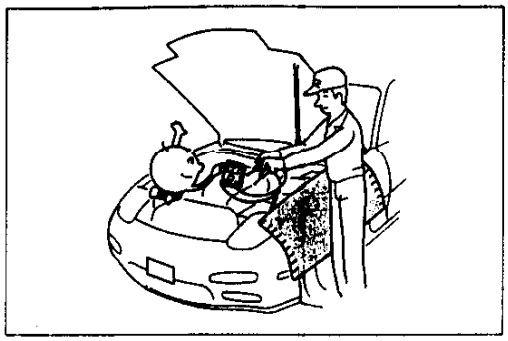
Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
Refer to STANDARD BOLT AND NUT TIGHTENING TORQUE in Section TD for tightening torques not mentioned in the main text.
If removed, these parts should be replaced with new ones:

1. Oil seals
2. Gaskets
3. O-rings
4. Lock washers
5. Cotter pins
6. Nylon nuts


9MUGIX-042

Depending on location:

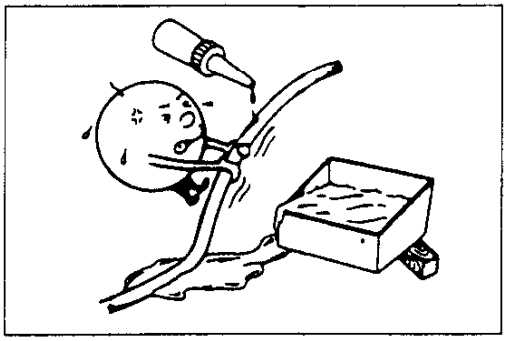
1. Sealant should be applied to gaskets.
2. Oil should be applied to the moving components of parts.
3. Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



67UGIX-002

ADJUSTMENTS

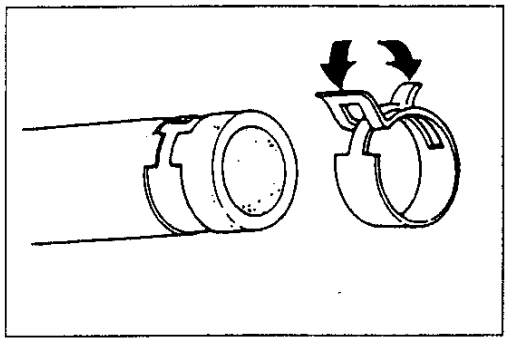
Use suitable gauges and/or testers when making adjustments.



9MUGIX-005

RUBBER PARTS AND TUBING

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



19GGIX-008

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.

CAUTIONS ON USE OF CHASSIS ROLLER

Observe the following when test-running a vehicle on a dynamometer.

- Place a cooling fan with adequate capacity in front of the vehicle.
  (A vehicle speed proportional type is desirable.)
- Connect an exhaust gas ventilation unit.
- Cool around the exhaust pipes with a cooling fan.
  Exhaust heat could cause thermal deformation in the rear bumper facia.
  Bumper surface temperature: 70°C {158°F} max.
- Allow adequate space in front and rear of the vehicle.
  Do not let heat built up around the vehicle.
- Pay attention to the water temperature gauge readings.
  Do not allow the engine to overheat.
- Avoid excessively loaded running.
  Run the vehicle at a constant speed.

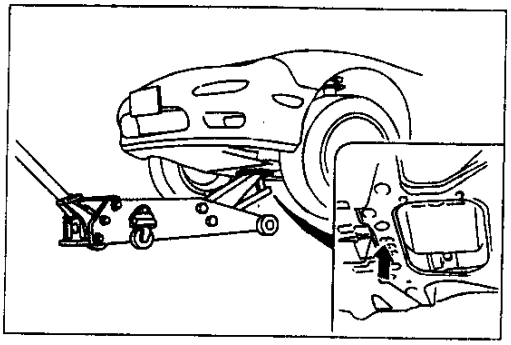
19GGIX-009

JACK AND SAFETY STAND POSITIONS

FRONT

Jack position:

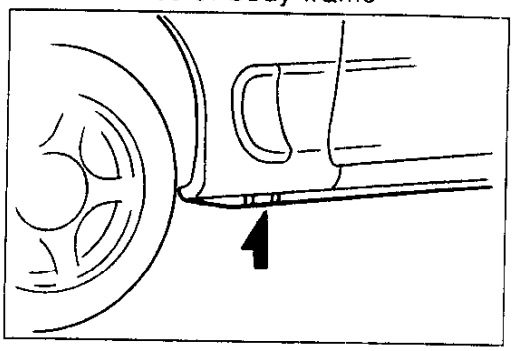
At center of crossmember



07UGIX-004

Safety stand positions:

At both sides of body frame

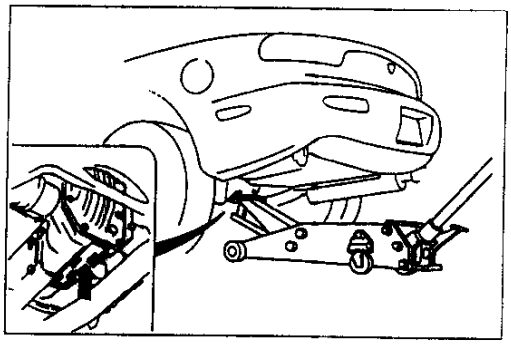


07UGIX-005

REAR

Jack position:

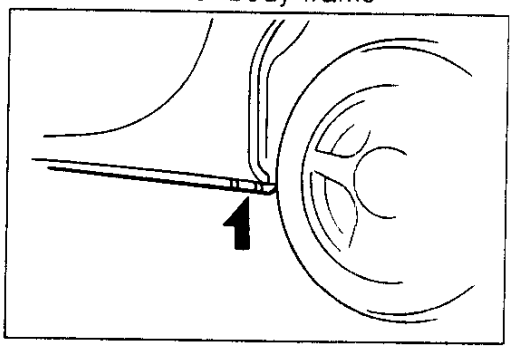
At the center of the differential



07UGIX-006

Safety stand positions:

At both sides of body frame



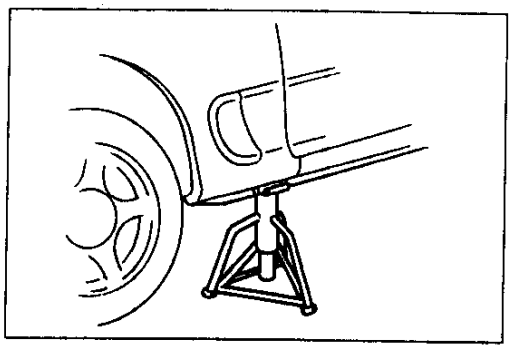
07UGIX-007

VEHICLE LIFT (2-SUPPORT TYPE) POSITIONS

FRONT END

Frame

Side sills

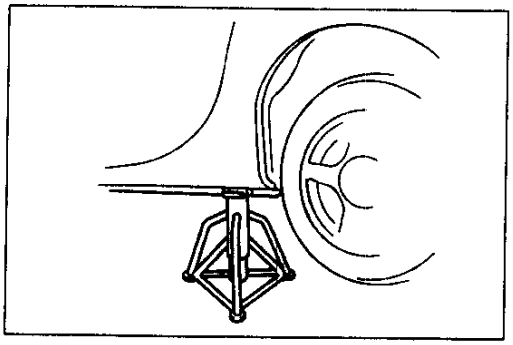


9MUGIX-010

REAR END

Frame

Side sills



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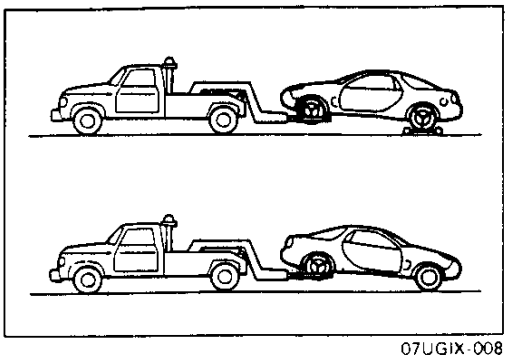


07UGIX-008

TOWING

Proper towing equipment is necessary to prevent damage to the vehicle during any towing operation.
Laws and regulations applicable to vehicles in tow must always be observed.
Release the parking brake, place the shift lever/selector lever in neutral, and set the ignition switch in the ACC position. As a rule, towed vehicles should be pulled with the driving wheels raised off the ground or on a towing dolly.

WITH MANUAL TRANSMISSION

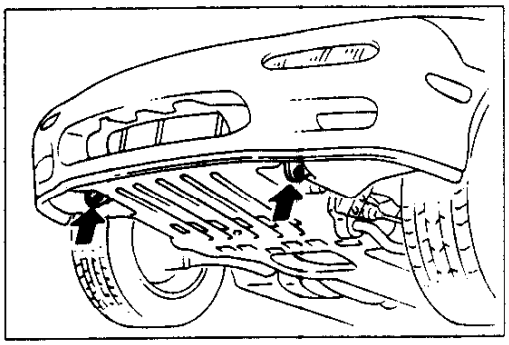
If the transmission, rear axle, and steering system are not damaged, the vehicle may be towed on all wheels if necessary. If any of these components are damaged, use a towing dolly.

WITH AUTOMATIC TRANSMISSION

If the vehicle is towed with all wheels on the ground, it may be towed only forward. In this case, do not exceed 56 km/h {35 mph} or a distance of 56 km {35 miles} or transmission damage could result.

If towing speed will exceed 56 km/h {35 mph}, or if towing distance will exceed 56 km {35 miles}, one of these methods must be used:
1. Place the rear wheels on a dolly.
2. Tow with the rear wheels off the ground.
3. Disconnect the propeller shaft.

If the transmission or rear axle is inoperative, tow the vehicle with its rear wheels off the ground or disconnect the propeller shaft.

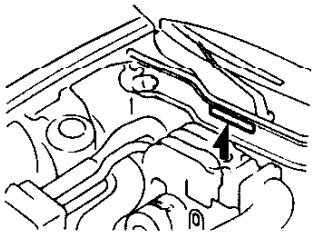


Caution

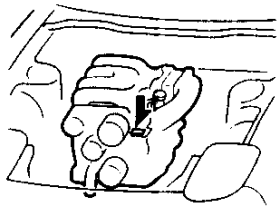
- **The following points are important when the vehicle is towed with all wheels on the ground. The transmission must be in NEUTRAL, the ignition switch in "ACC" position, and the parking brake released. Remember that the power assist for the brakes and the steering will not be available when the engine is inoperative.**
  The towing hook should be used only in an emergency situation, (e.g., to pull the vehicle out of a ditch, snow bank, or mud).
  When the towing hook is used, always pull on the cable or chain in a straight direction with respect to the hook. Do not apply side force to the hook. To prevent damage, do not take up slack in the cable or chain too quickly.

IDENTIFICATION NUMBER LOCATIONS

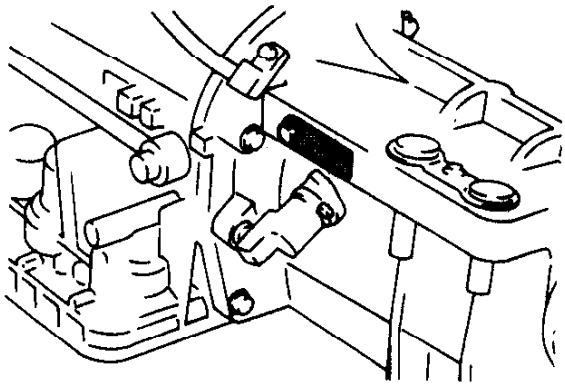
CHASSIS NUMBER



ENGINE NUMBER



AUTOMATIC TRANSMISSION MODEL AND NUMBER



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UNITS

N·m {kgf·m or kgf·cm, ft·lbf or in·lbf}	Torque
rpm	Revolution per minute
A	Ampere(s)
V	Volt(s)
Ω	Ohm(s) (resistance)
kPa {kgf/cm², psi}	Pressure (usually positive)
kPa {mmHg, inHg}	Pressure (usually negative)
W	Watt
L {US qt, Imp qt}	Volume
mm {in}	Length

16EGIX-030

ABBREVIATIONS

AAS	Auto adjusting suspension
ABDC	After bottom dead center
ABS	Anti-lock braking system
A/C	Air conditioner
ACC	Accessories
ACV	Air control valve
ASV	Air supply valve
A/T	Automatic transmission
ATDC	After top dead center
ATF	Automatic transmission fluid
AWS	Accelerated warm-up system
BAC	Bypass air control
BBDC	Before bottom dead center
BTDC	Before top dead center
EC-AT	Electronically controlled Automatic Transmission
ECPS	Electronically controlled power steering
ECU	Engine control unit
EGI	Electronic gasoline injection
E/L	Electrical load
ESA	Electronic spark advance
ESPS	Engine speed sensing power steering
EX	Exhaust
IC	Integrated circuit
IGN	Ignition
IN	Intake
INT	Intermittent
ISC	Idle speed control
LH	Left hand
LSD	Limited slip differential
M	Motor
MIL	Malfunction indicator lamp
MOP	Metering oil pump
M/T	Manual transmission
OD	Overdrive
OFF	Switch off
ON	Switch on
PBV	Proportioning bypass valve
PCV	Positive crankcase ventilation
PRC	Pressure regulator control
P/S	Power steering
P/W	Power window
RH	Right hand
SST	Special service tool
ST	Start
SW	Switch
TDC	Top dead center
VDI	Variable dynamic effect intake
VRIS	Variable resonance induction system

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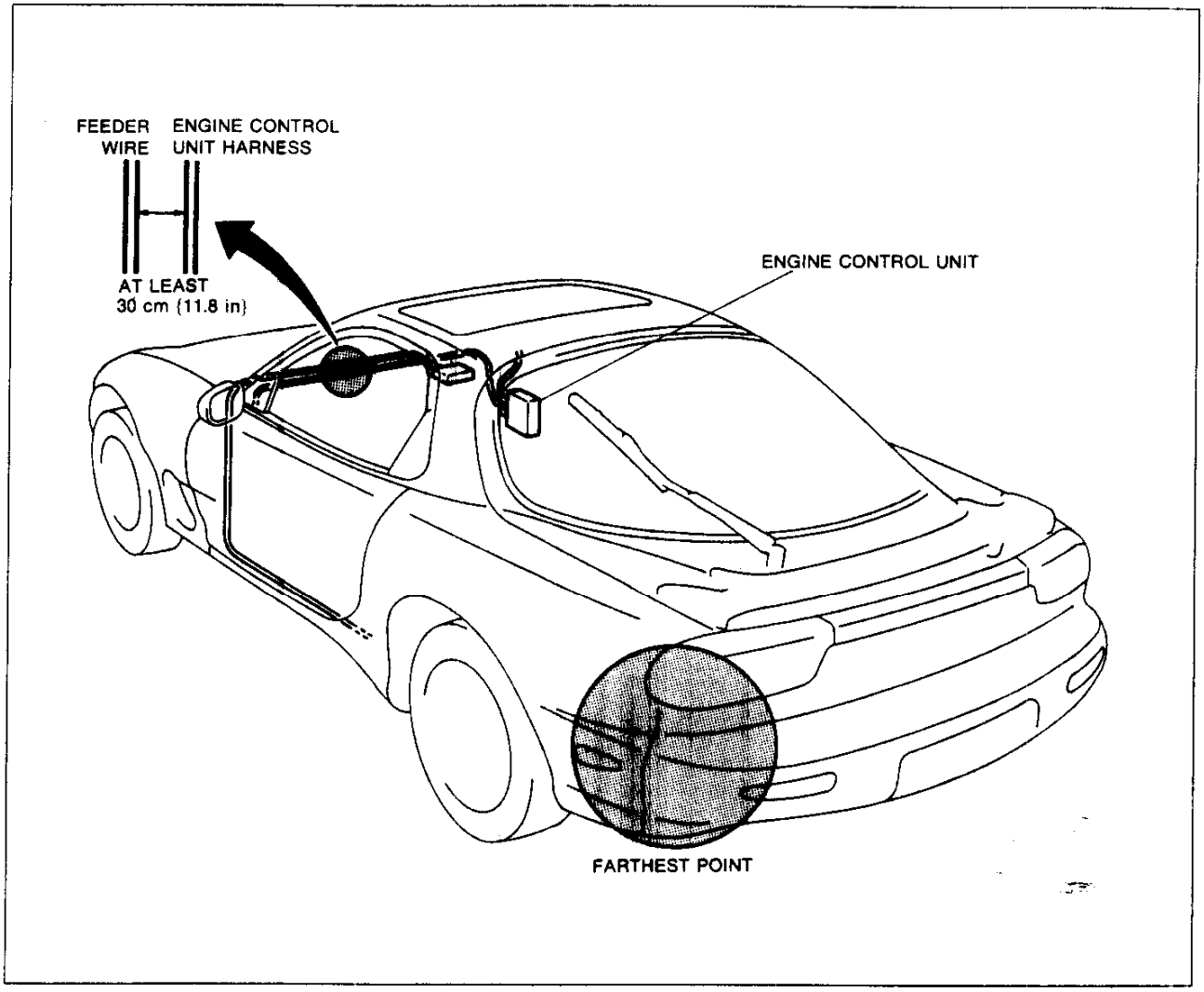
CAUTION

INSTALLATION OF MOBILE TWO-WAY RADIO SYSTEM

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

1. Install the antenna at the farthest point from control units.
2. Install the antenna feeder as far as possible from the control unit 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 mobile two-way radio system.



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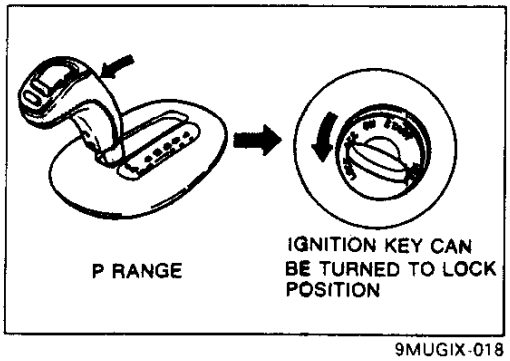
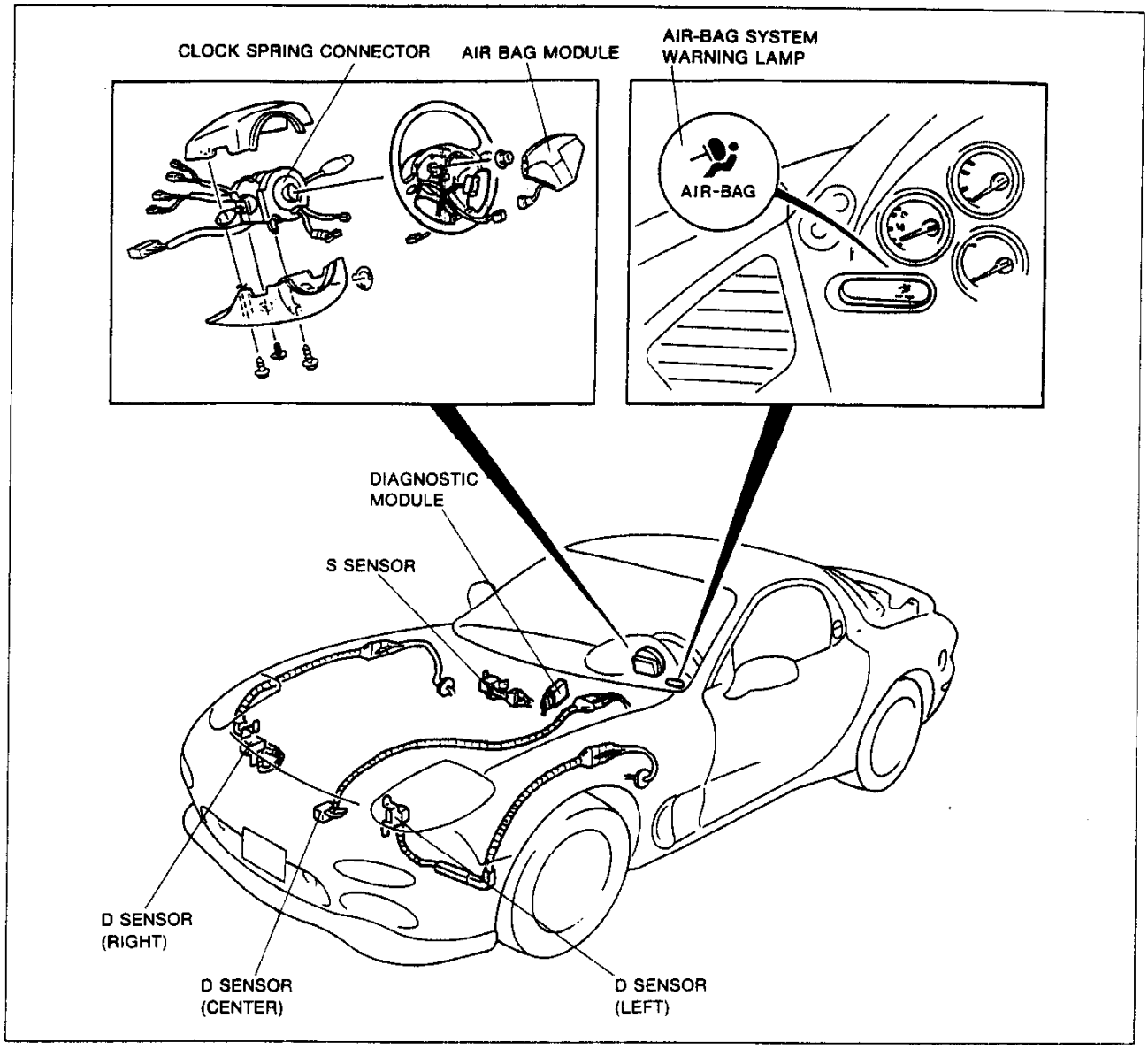


9MUGIX-018

REMOVAL OF IGNITION KEY ON AUTOMATIC TRANSMISSION MODEL

The selector lever must be in P (PARK) to turn the ignition key to the OFF position. If the switch seems to be off but the key cannot be removed, the switch may still be in the ACC position, or the selector lever may not be in P (PARK). Shift the selector lever to P (PARK), and turn the ignition key to the LOCK position. The key should now be free for removal.

SERVICE PRECAUTIONS CONCERNING AIR BAG SYSTEM



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Before Replacing any Components

Before replacing of any air bag system components, or before disconnecting any connectors of the system, first disconnect the negative battery cable. Then remove the air bag module from the vehicle even if it has not failed.

Prohibition of Component Disassembly and Wiring Harness Repair

The components of the air bag system are not intended to be disassembled for service.
If a component failure is indicated by the diagnostic module, replace the suspected component after verifying the condition of the connections and the wiring harness. **Do not disassemble any components**.
If an open circuit is found by a continuity test, replace the wiring harness. **Do not attempt to repair the wiring**.

Handling of Air Bag Module

1. Do not use an ohmmeter for inspection of the air bag module; it may cause an accidental deployment.
2. When carrying a live air bag module, make sure the trim cover is pointed away from your body to prevent injury in the event of an accidental deployment.

3. When placing a live air bag module on any surface, always face the trim cover upward. This will reduce the motion of the module if it is accidentally deployed.
4. When handling a deployed air bag module, wear gloves and safety glasses because the deployed air bag module may display deposits of sodium hydroxide, a product of the gas generant combustion.
5. An air bag module must be disposed of only by the proper procedure recommended for the specific situation. (Refer to page T–162.)

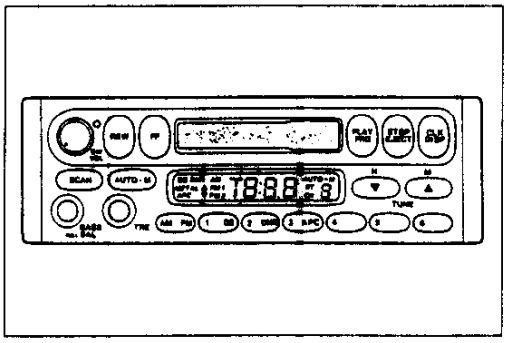
Crash Sensor Installation

1. The angle and direction of the sensors is very important for their proper operation. If a vehicle has been involved in a crash where the front sheet metal has been damaged, inspect the body structure at the sensor mounting area for deformation. If damaged, restore it to its original shape.
2. When installing a crash sensor, be sure to tighten the mounting bolts to the specified torque to ensure proper grounding, as the ground circuit is made directly through the sensor's mounting plate.

Adjustment of Clock Spring Connector

When the steering wheel is removed or the clock spring connector is replaced, the clock spring connector must be properly aligned.
Align the clock spring connector as follows:
(1) Set the front wheels straight ahead.
(2) Turn the clock spring connector clockwise until it stops. **Do not force it**.
(3) Return it 2.75 turns.
(4) Align the mark on the clock spring connector to the outer housing.
(5) Carefully install the steering wheel disturbing the clock spring connector.

07UGIX-010

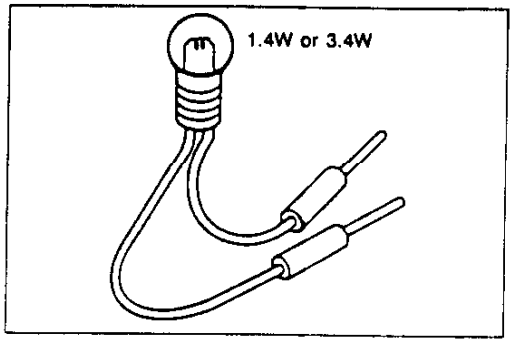


15UGIX-004

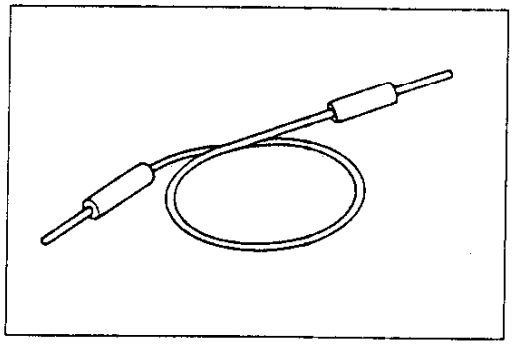
AUDIO ANTI-THEFT SYSTEM

An audio with an anti-theft function is optionally available. Before removing the negative battery terminal or disconnecting the audio power source, obtain the code number and deactivate the audio anti-theft system. (Refer to Section T.)

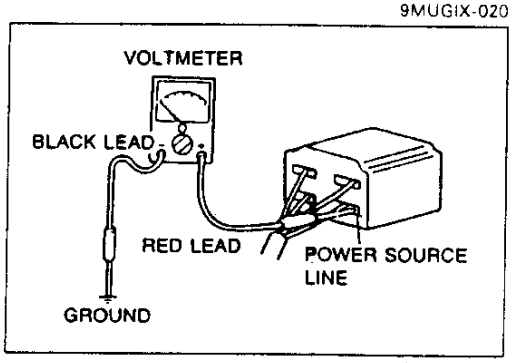
CAUTION



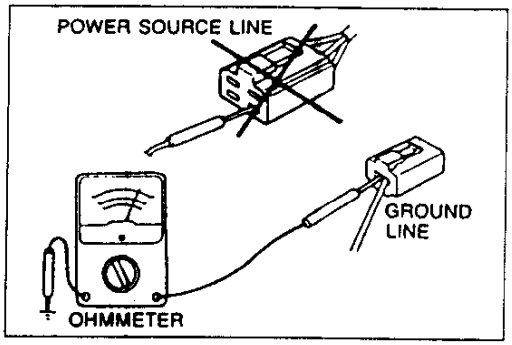
05UGIX-019



9MUGIX-020



05UGIX-020



05UGIX-022

ELECTRICAL TROUBLESHOOTING TOOLS

Test Light

The test light, as shown in the figure, uses a 12V 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

- **When checking a control unit, never use a bulb over 3.4W.**

Jumper Wire

The jumper wire is used for testing by shorting across switch terminals and ground connections.

Caution

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

Voltmeter

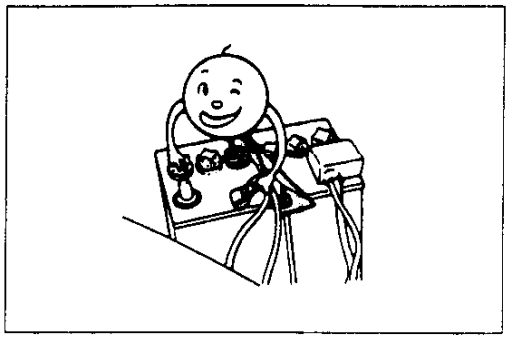
The DC voltmeter is used to measure circuit voltage. A voltmeter with a range of 15V or more is used by connecting the positive (+) probe (red lead wire) to the point where voltage is to be measured and the negative (–) probe (black lead wire) to a body ground.

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 attempt to connect the ohmmeter to any circuit to which voltage is applied; this may burn or otherwise damage the ohmmeter.**

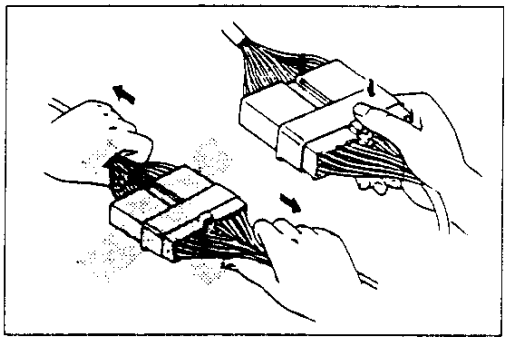


05UGIX-023

CAUTION WITH ELECTRICAL PARTS

Battery Cable

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

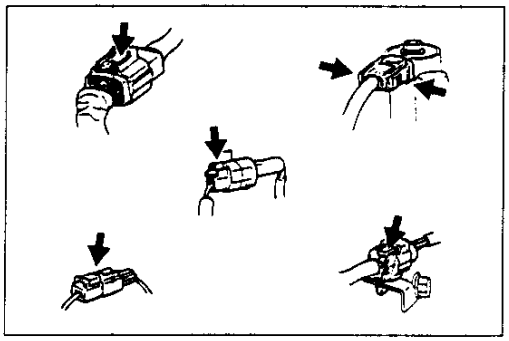


07UGIX-011

Connectors

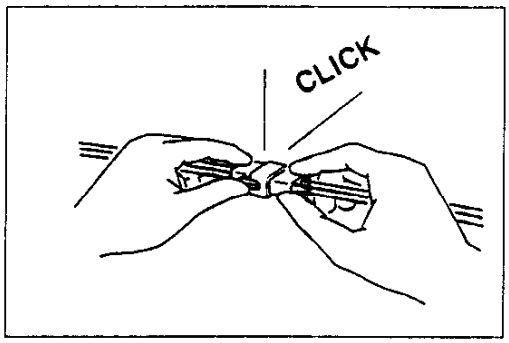
Disconnecting connectors

Never pull on wiring harness when disconnecting connectors.



05UGIX 025

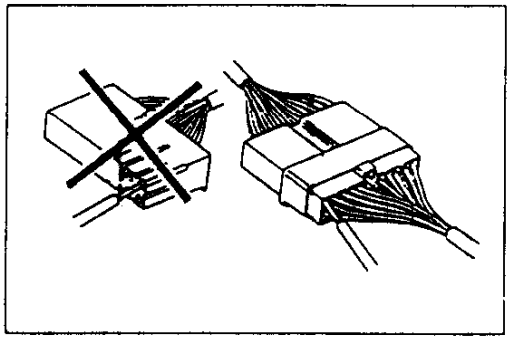
Connectors can be disconnected by pressing or pulling the lock lever as shown.



05UGIX-026

Locking connectors

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

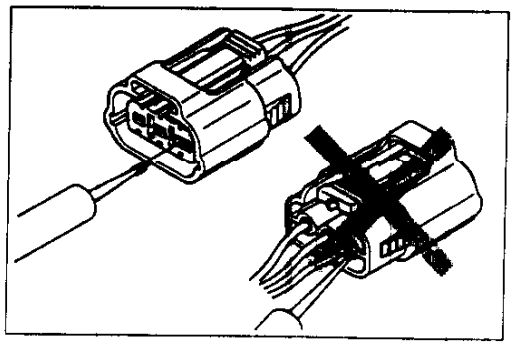


07UGIX-012

Inspection

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

CAUTION

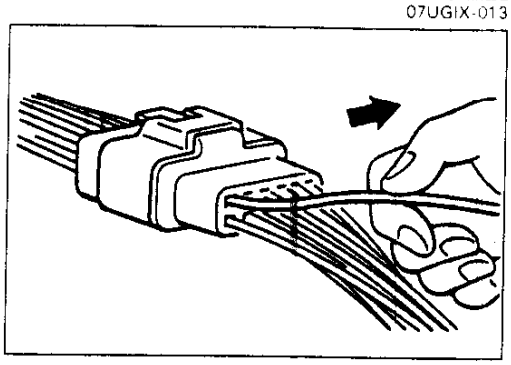


07UGIX-013

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

Caution

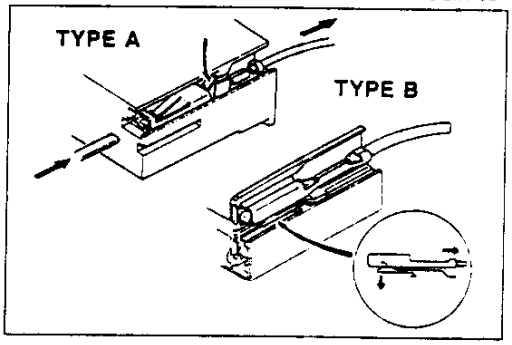
- **Use fine wire to prevent damage to the terminal. Do not damage the terminal when inserting the tester lead.**



9MUGIX-027

Terminals
Inspection

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



9MUGIX-028

Replacement of terminals

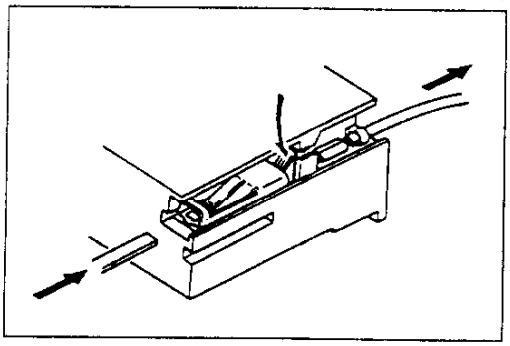
Use the appropriate tools to remove the terminal as shown. When installing the terminal, be sure to insert it until it locks securely.

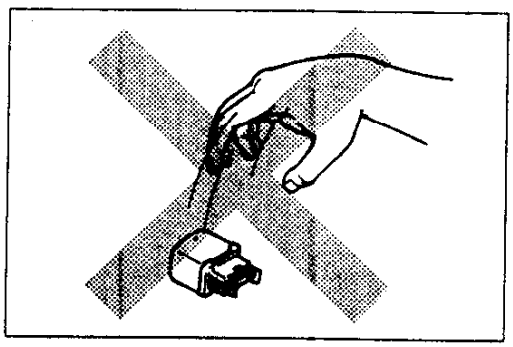
< Female >

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.

< Male >

Same as the female type.

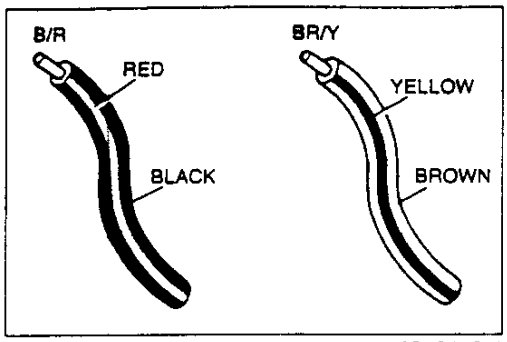




05UGIX-029

Sensors, Switches, and Relays

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

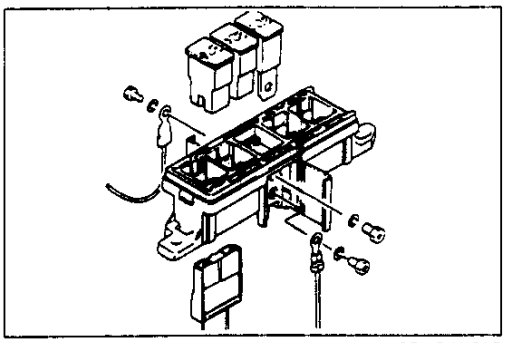


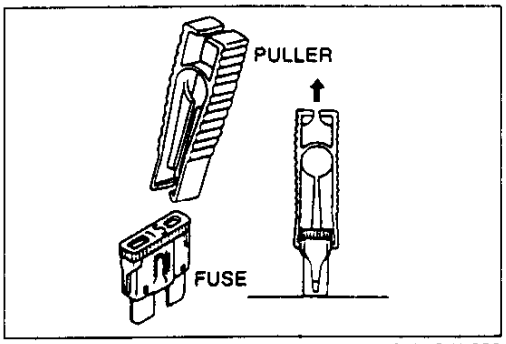
07UGIX-014

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	–	–


07UGIX-015



9MUGIX-032

Fuse
Replacement

1. When replacing a fuse, be sure to replace it with one of the specified capacity.
   If a fuse again fails after it has been replaced, the circuit probably has a short and the wiring should be checked.
2. Be sure the negative battery terminal is disconnected before replacing the main fuse (80A).
3. When replacing a pullout fuse, use the fuse puller supplied in the fuse box cover.

PRE-DELIVERY INSPECTION AND SCHEDULED MAINTENANCE SERVICES

07U0AX-007

PRE-DELIVERY INSPECTION TABLE

The following items may be done at any time prior to delivery to your customer.

EXTERIOR

INSPECT and **ADJUST**, if necessary, the following items to the specifications:
- ☐ Glass, exterior bright metal, and paint for damage
- ☐ Wheel lug nuts and locks
  89–117 N·m {9.0–12.0 kgf·m, 66–86 ft·lbf}
- ☐ All weather strips for damage and detachment
- ☐ Operation of hood release and lock
- ☐ Operation of fuel lid and rear hatch opener
- ☐ Door operation and alignment
- ☐ Headlight aim

INSTALL the following parts
- ☐ Wheel caps (if equipped)
- ☐ Outside rearview mirror (s)
- ☐ Front air deflector (if equipped)

REMOVE
- ☐ Tie-down hooks

UNDER HOOD–ENGINE OFF

INSPECT and **ADJUST**, if necessary, the following items to the specifications:
- ☐ Fuel, coolant, and hydraulic lines, fittings, connections, and components for leaks
- ☐ Engine oil level
- ☐ Power steering fluid level
- ☐ Brake and clutch master cylinder fluid levels
- ☐ Windshield washer reservoir fluid level
- ☐ Radiator coolant level and specific gravity
- ☐ Tightness of battery terminals

INTERIOR

INSTALL the following parts:
- ☐ Rubber stopper for inside rearview mirror

CHECK the operations of the following items:
- ☐ Seat controls (sliding and reclining) and headrest
- ☐ Door locks
- ☐ Seat belts and warning system
- ☐ Ignition switch and steering lock
- ☐ Air bag system using indicator light (if equipped)
- ☐ Shift-lock system and inhibitor switch (A/T only)
- ☐ Starter interlock switch (clutch pedal, M/T only)
- ☐ All lights including warning and indicator lights and retractable headlight mechanism
- ☐ IC audible warning system
- ☐ Horn, wipers, and washers (front and rear, if equipped)
- ☐ Radio and antenna (if equipped)
- ☐ Cigarette lighter and clock
- ☐ Remote control outside rearview mirror (if equipped)
- ☐ Power windows (if equipped)
- ☐ Heater, defroster, and air conditioner at all mode selections (if equipped)
- ☐ Sunroof (if equipped)
- ☐ Theft-deterrent system (if equipped)

CHECK the following items:
- ☐ Spare fuse
- ☐ Upholstery and interior finishes

CHECK and **ADJUST**, if necessary, the following items:
- ☐ Pedal height and free play of brake and clutch pedal

	Pedal height mm (in)	Pedal free play mm (in)
Clutch pedal	183–193 {7.20–7.60} (With carpet)	0.6–3.0 {0.02–0.12}
Brake pedal	184–189 {7.24–7.44} (With carpet)	3.0–8.0 {0.12–0.31}

- ☐ Parking brake
  7–10 notches / 200 N {20 kgf, 44 lbf}

UNDER HOOD–ENGINE RUNNING AT OPERATING TEMPERATURE

CHECK the following items:
- ☐ Bypass air control system
- ☐ Automatic transmission fluid level

ON HOIST

CHECK the following items:
- ☐ Manual transmission oil level
- ☐ Rear axle oil level
- ☐ Underside fuel, coolant, and hydraulic lines, fittings, connections, and components for leaks
- ☐ Tires for cuts and bruises
- ☐ Steering linkage, suspension, exhaust system, and all underside hardware for looseness or damage

ROAD TEST

CHECK the following items:
- ☐ Brake operation
- ☐ Clutch operation
- ☐ Steering control
- ☐ Operation of meters and gauges
- ☐ Squeaks, rattles, or unusual noises
- ☐ Emergency locking retractors
- ☐ Cruise control system (if equipped)

AFTER ROAD TEST

- ☐ **CHECK** for necessary owner information materials, tools, and spare tire in vehicle
- ☐ **REMOVE** identification color tape on directiona tires

Following items must be done just before the delivery to your customer.

- ☐ Load test battery and charge if necessary
- ☐ Adjust tire pressure to the specification (Refer to Section Q)
- ☐ Clean outside of vehicle
- ☐ Install fuses for accessories
- ☐ Remove seat and floor mat protective covers
- ☐ Vacuum inside of vehicle

SCHEDULED MAINTENANCE SERVICES

MAINTENANCE TABLE (USA)

Follow Schedule 1 (Normal Driving Conditions) if the vehicle is operated mainly where none of the following conditions apply.
Follow Schedule 2 (Unique Driving Conditions) if any of the conditions below apply.

- 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 and/or muddy roads.
- Extended periods of idling and/or low-speed operation.
- Driving for prolonged periods in cold temperatures and/or extremely humid climates.

Schedule 1 (Normal Driving Conditions)

Maintenance Interval / Maintenance Operation	Number Of Months Or Miles (Kilometer), Whichever Comes First								
	Months		7.5	15	22.5	30	37.5	45	52.5	60
	X 1000 Miles		7.5	15	22.5	30	37.5	45	52.5	60
	X 1000 Km		12	24	36	48	60	72	84	96
Engine										
Engine Oil	Replace every 5,000 miles (8,000 km) or 5 months									
Oil Filter	Replace every 5,000 miles (8,000 km) or 5 months									
Drive Belts						I				I
Air cleaner										
Air Cleaner Element						R				R
Ignition system										
Spark Plugs						R				R
Fuel system										
Idle Speed			I *2			I *2		I *2		I
Fuel Filter										R
Fuel Lines						I *1				I
Cooling system										
Cooling System			I			I		I		I
Engine Coolant						R				R
Chassis & body										
Brake Lines, Hoses & Connections						I				I
Disc Brakes						I				I
Steering Operations & Linkages						I				I
Front & Rear Suspension Ball Joints						I				I
Rear Suspension Uni Ball & Sliding Rubber Bushing						I				I
Manual Transmission Oil										R
Rear Axle Oil										R
Drive Shaft Dust Boots						I				I
Bolts & Nuts on Chassis & Body						T				T
Exhaust System Heat Shield						I				I
All Looks & Hinges	L		L	L	L	L	L	L	L	L
Air conditioner system (If equipped)										
Refrigerant	Inspect the refrigerant amount annually									
Compressor	Inspect the operation annually									
Electrical system										
Engine Oil Level Warning System			I			I		I		I
Engine Coolant Level Warning System						I		I		I

Chart symbols:
I: Inspect and, if necessary, correct, clean, or replace
R: Replace or change
T: Tighten
L: Lubricate

Remarks:
After 60 months or 60,000 miles (96,000 km), continue to follow the prescribed maintenance items and intervals periodically.
As for * marked items in this maintenance chart, please pay attention to the following points.

*1 This maintenance operation is recommended by Mazda. However, it is not necessary for emission warranty coverage or manufacturer recall liability.
*2 This maintenance operation is required for Canada and all states except California. However, we recommend that it also be performed on California vehicles as well.

SCHEDULED MAINTENANCE SERVICES

Schedule 2 (Unique Driving Conditions)

Maintenance Interval / Maintenance Operation	Number Of Months Or Miles (Kilometer), Whichever Comes First											
Months	5	10	15	20	25	30	35	40	45	50	55	60
X1000 **Miles**	5	10	15	20	25	30	35	40	45	50	55	60
X1000 **Km**	8	16	24	32	40	48	56	64	72	80	88	96
Engine												
Engine Oil	Replace every 3,000 miles (5,000 km) or 3 months											
Oil Filter	Replace every 3,000 miles (5,000 km) or 3 months											
Drive Belts						I						
Air cleaner												
Air Cleaner Element						R						R
Ignition system												
Spark Plugs						R						R
Cooling system												
Cooling System			I			I			I			
Engine Coolant						R						R
Fuel system												
Fuel Filter												R
Fuel Lines						I*1						I
Idle Speed			I *2			I *2			I *2			I
Chassis & body												
Brake Lines, Hoses & Connections						I						I
Brake Fluid						R						R
Disc Brakes			I			I			I			I
Steering Operations & Linkages						I						I
Front & Rear Suspension Ball Joints						I						I
Rear Suspension Uni Ball & Sliding Rubber Bushing						I						I
Manual Transmission Oil						R						R
Rear Axle Oil						R						R
Drive Shaft Dust Boots						I						I
Bolts & Nuts on Chassis & Body			T			T			T			T
Exhaust System Heat Shield						I						I
All Locks & Hinges	L	L	L	L	L	L	L	L	L	L	L	L
Air conditioner system (If equipped)												
Refrigerant	Inspect the refrigerant amount annually											
Compressor	Inspect the operation annually											
Electrical system												
Engine Oil Level Warning System			I			I			I			I
Engine Coolant Level Warning System						I						I

Chart symbols:
I: Inspect and, if necessary, correct, clean, or replace
R: Replace or change
T: Tighten
L: Lubricate

Remarks:
After 60 months or 60,000 miles (96,000 km), continue to follow the prescribed maintenance items and intervals periodically.
As for * marked items in this maintenance chart, please pay attention to the following points.
*1 This maintenance operation is recommended by Mazda. However, it is not necessary for emission warranty coverage or manufacturer recall liability.
*2 This maintenance operation is required for Canada and all states except California. However, we recommend that it also be performed on California vehicles as well.

MAINTENANCE TABLE (CANADA)

Maintenance Interval / Maintenance Operation	Number Of Months Or Miles (Kilometer), Whichever Comes First											
	Months	5	10	15	20	25	30	35	40	45	50	55	60
	X1000 **Km**	8	16	24	32	40	48	56	64	72	80	88	96
	(X1000 **Miles**)	(5)	(10)	(15)	(20)	(25)	(30)	(35)	(40)	(45)	(50)	(55)	(60)
Engine													
Engine Oil	Replace every 5,000 kilometers or every 3 months												
Oil Filter	Replace every 5,000 kilometers or every 3 months												
Tension of All Drive Belts	Inspect every 5,000 kilometers or every 3 months												
Air cleaner													
Air Cleaner Element				I			R			I			R
Ignition system													
Spark Plugs							R						R
Cooling system													
Engine Coolant Level & Strength	Inspect every 5,000 kilometers or every 3 months												
Cooling System for Leaks				I			I			I			I
Engine Coolant							R						R
Fuel system													
Idle Speed				I			I			I			I
Fuel Lines & Hoses							I *1						I
Fuel Filter							R						R
Emission Hoses & Tubes													I
Chassis & body													
Manual Transmission Oil Level				I			I			I			I
Automatic Transmission Fluid Level	Inspect every 5,000 kilometers or every 3 months												
Transmission Oil M/T & A/T							R						R
Oil Level in Final Drive Case	Inspect every 5,000 kilometers or every 3 months												
Differential Oil							R						R
Driveshaft Dust Boots							I						I
Brake Lines & Hoses							I						I
Brake & Clutch Fluid Level	Inspect every 5,000 kilometers or every 3 months												
Brake Fluid							R						R
Disc Brakes (Front & Rear)							I			I			I
Tire Inflation Pressure & Tire Wear	Inspect every 5,000 kilometers or every 3 months												
Rotate Tires	Rotate every 24,000 kilometers or every 15 months												
Power Steering Fluid Level	Inspect every 5,000 kilometers or every 3 months												
Steering Operation & Linkage (Includes Four Wheel Alignment)							I						I
Suspension Components Front & Rear							I						I
Rear Suspension Uniball & Sliding Rubber Bushing							I						I
All Chassis & Body Nuts & Bolts				T			T			T			T
Exhaust System Heat Shield							I						I
All Locks & Hinges	Lubricate every 5,000 kilometers or every 3 months												
Washer Fluid Level	Inspect every 5,000 kilometers or every 3 months												
Function of All Lights	Inspect every 5,000 kilometers or every 3 months												
Engine Oil Level Warning System				I			I			I			I
Engine Coolant Level Warning System							I						I
Air conditioner system (If equipped)													
Refrigerant	Inspect the refrigerant amount annually												
Compressor	Inspect the operation annually												

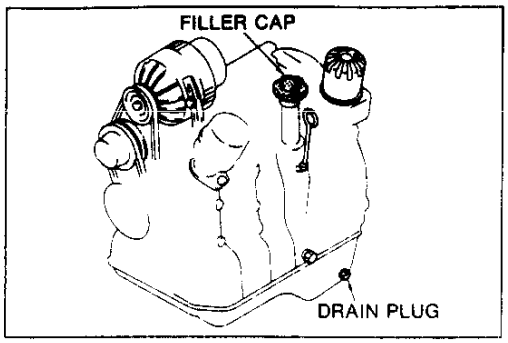
Note:

I : Inspect and if necessary, correct, clean, or replace.
(Inspect and if necessary, replace air cleaner element only)
R: Replace or change
T: Tighten
L: Lubricate

After 60 months or 96,000 km (60,000 miles), continue to follow the described maintenance items and intervals periodically.

Please pay attention to the following point.

This maintenance is recommended by Mazda; however it is not necessary for emission warranty coverage or manufacturer recall liability.



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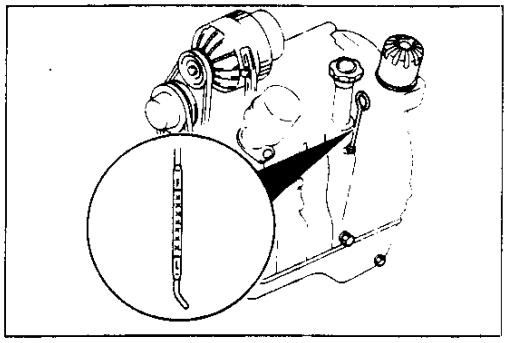

67U00X-006

REPLACEMENT OF ENGINE OIL

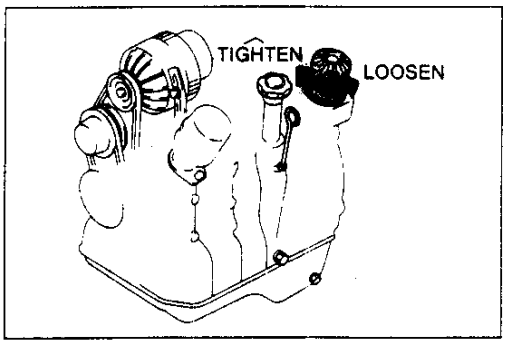
1. Warm up the engine if it is cold.
2. Remove the drain plug.
3. Remove the oil filler cap. This will allow the oil to drain more easily.
4. Fill engine oil to the "F" mark on the dipstick. Use oil with the proper SAE viscosity.

Oil capacity:
Total: 4.9 L {5.2 US qt, 4.3 Imp·qt} ..... except R1 model
5.4 L {5.7 US qt, 4.8 Imp·qt} ..... R1 model
Oil pan: 3.9 L {4.1 US qt, 3.4 Imp·qt}
Note
- **After starting the engine, recheck the oil level and also check the drain plug washer for leaks.**

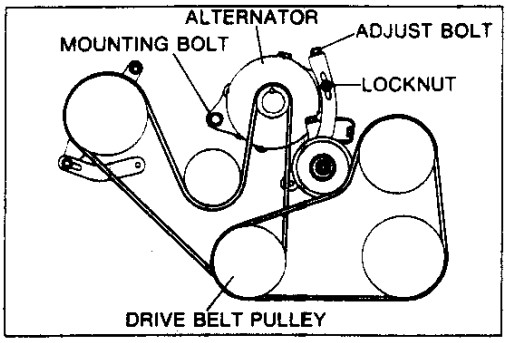
Typical specification:
API service "Fuel efficient"
SG grade (Mineral oil only)

Recommended SAE viscosity numbers

Temperature	(°C)	-30	-20	-10	0	10	20	30	40	50
	(°F)	-20	0	20	40	60	80	100	120	
Engine oil		5W-30								
						10W-30				



67U00X-007



77U15X-012

REPLACEMENT OF ENGINE OIL FILTER

To install the oil filter, apply engine oil to the oil filter gasket, and then tighten the oil filter fully by hand.

Caution
- **After installing the filter, start the engine and check that the joints are not leaking. Top up with oil if necessary.**

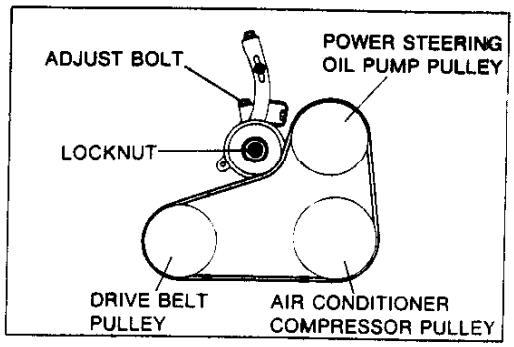
INSPECTION OF DRIVE BELTS

1. Check the belt for cracks or any other damage.
2. If necessary, adjust the drive belt tension with thumb pressure of about 98N {10 kgf, 22 lbf}.

Alternator and air pump drive belt

1. Loosen the alternator mounting bolt and locknut.
2. Move the alternator to obtain proper belt tension.
3. Tighten the bolts and recheck the tension.

Deflection	7.0–7.5 mm {0.28–0.29 in}

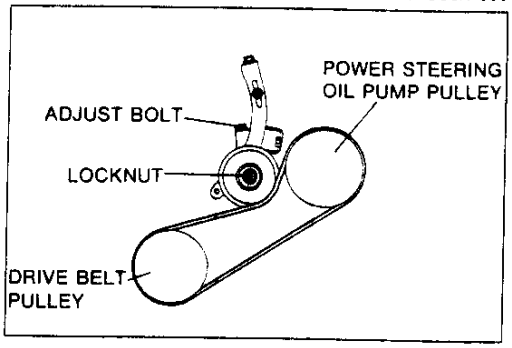


67U00X-009

Air conditioner drive belt (if equipped)

1. Loosen the lock nut on the idler pulley.
2. Turn the adjusting bolt until the correct tension is obtained.
3. Tighten the lock nut and recheck the tension.

Deflection	4.5–5.0 mm {0.18–0.20 in}

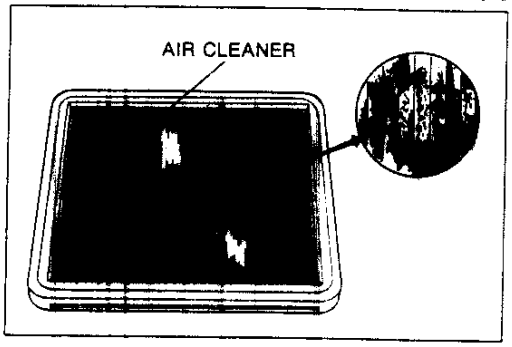


67U00X-010

Power steering oil pump drive belt

1. Loosen the lock nut on the idler pulley.
2. Turn the adjusting bolt until the correct tension s obtained.
3. Tighten the lock nut and recheck the tension.

Deflection	4.5–5.0 mm {0.18–0.20 in}



67U00X-011

REPLACEMENT OF AIR CLEANER ELEMENT

Use only a genuine Mazda air cleaner element or one of equivalent quality.

INSPECTION OF SPARK PLUGS

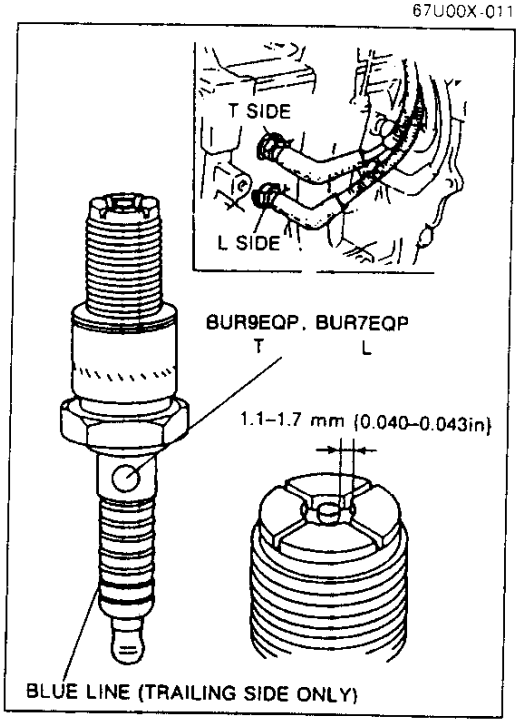
Check the following points. If a problem is found, replace the spark plug.

- Damaged insulation
- Worn electrodes
- Carbon deposits
  If cleaning is necessary, use a plug cleaner or a wire brush. Clean the upper insulator, also.
- Damaged gasket
- Burnt

Plug gap: 1.0–1.1 mm {0.040–0.043 in}

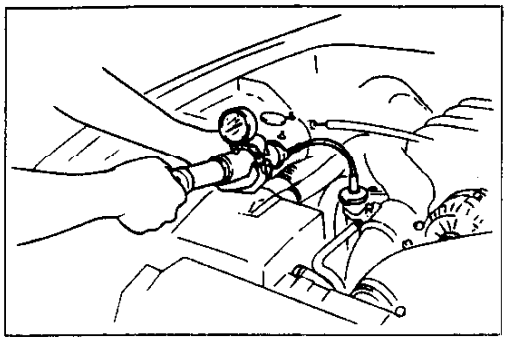
Plug position	NGK	Discrimination color
Leading side	BUR7EQP*, (BUR7EQ) (BUR6EQP) (BUR6EQ)	–
Trailing side	BUR9EQP*, (BUR9EQ) (BUR8EQP) (BUR8EQ)	Blue

* Standard plug



Caution

- **To protect the platinum electrode:**
  (1) Do not use a wire brush to clean the electrode.
  (2) Use a plug cleaner for a maximum of 20 seconds and air pressure below 589 kPa {6 kgf/cm², 85 psi}.
  (3) Do not adjust the plug gap to protect a platinum electrode.



77U00X-005

INSPECTION OF COOLING SYSTEM

1. Check the cooling system hoses (including the heater hoses) for cracks or wear.
2. Check the cooling system for leaks by applying a pressure of 103 kPa {1.05 kgf/cm^2, 14.93 psi} with a radiator cap tester.

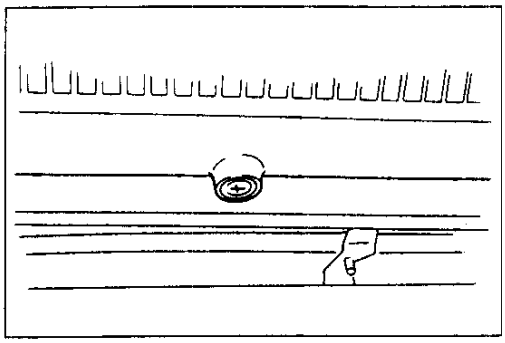
Note

- **Do not pressurize the system to more than 103 kPa {1.05 kgf/cm^2, 14.93 psi}.**

If necessary, replace the hoses.

Warning

- **Be careful to avoid injury from escaping steam or hot water when removing the radiator cap.**



67U00X-014

REPLACEMENT OF ENGINE COOLANT

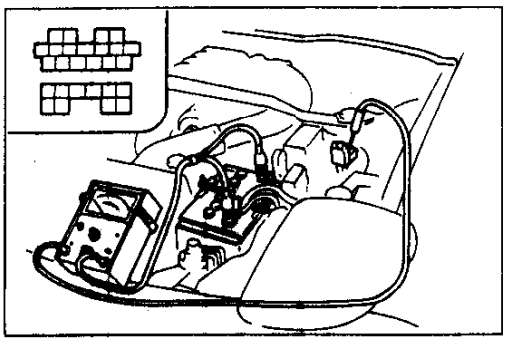
Drain the engine coolant by removing the radiator drain plug.

Warning

- **Be careful to avoid injury when checking a hot engine.**

Fill with new coolant according to the recommended mixture ratio as follows.

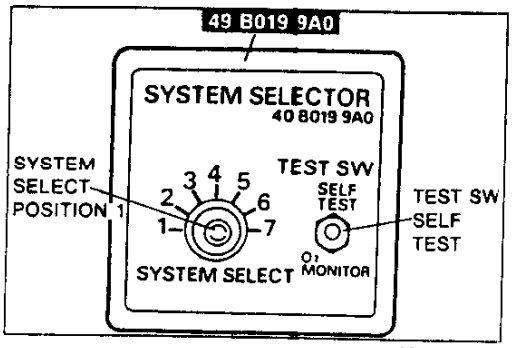
Protection	Mixture percentage (volume)	
	Anti-freeze solution	Water
Above –4°C {25°F}	20	80
Above –16°C {3°F}	35	65
Above –26°C {-15°F}	45	55
Above –40°C {-40°F}	55	45



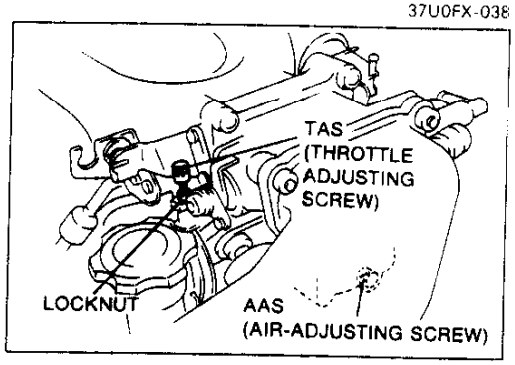
INSPECTION OF IDLE SPEED

Preparation

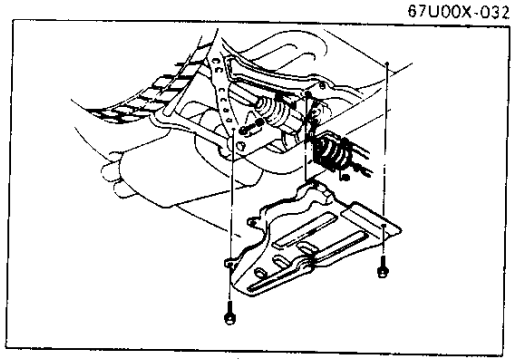
1. Warm up the engine to normal operating temperature.
2. Turn all electric loads OFF.
3. Connect the **SST** to the diagnosis connector.
4. Connect a tachometer to the diagnosis connector **IG**-terminal as shown.

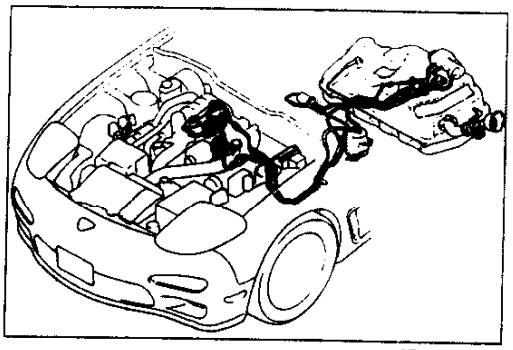


37U0FX-038

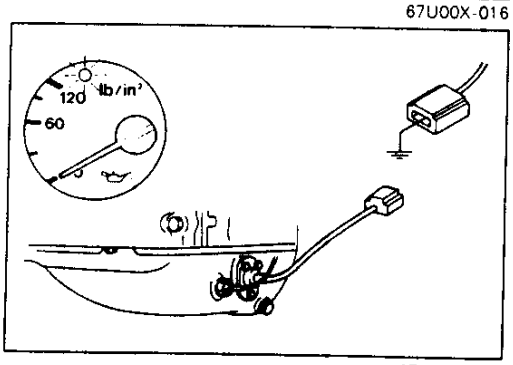


67U00X-032





67U00X-016



67U00X-017

Idle Speed

1. Perform "Preparation".
2. Verify that the idle speed is within specification.

Idle speed: 700–750 rpm

Caution
- **Check the idle speed when the electric cooling fan does not operate.**

3. If not within the specification, adjust the idle by turning the air-adjusting screw. (AAS)
4. If not within specification when air adjusting screw fully closed, loosen the locknut and turn the throttle adjusting screw to set the idle.
5. Tighten the locknut and put a paint mark on the nut and throttle body.
6. Disconnect the **SST**.

REPLACEMENT OF FUEL FILTER

Replace the fuel filter with a new one.

Note
- **Be careful of the fuel flow direction on the filter.**

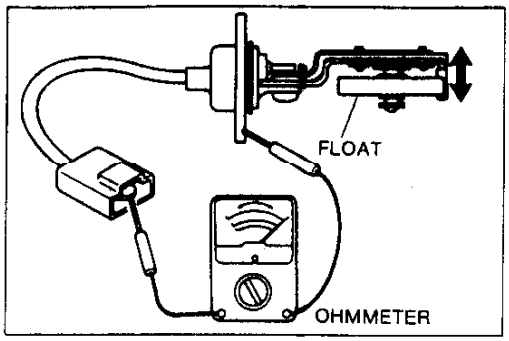
Caution
- **a) Cover the hoses with a rag since fuel will be splashed out when you disconnect the hoses.**
- **b) Keep sparks and open flames away from the fuel area.**

INSPECTION OF FUEL LINES

1. Check the fuel line fittings, connections and components for leaks.
2. There should be no wetness or stained areas that might indicate leaks.
3. Replace any defective hoses or clips.

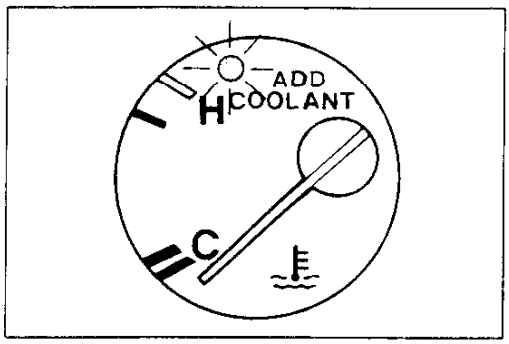
INSPECTION OF OIL LEVEL WARNING SYSTEM

1. When you turn the ignition switch ON, the oil leve warning light comes ON.
2. Start the engine and the warning light should go OFF
3. Disconnect the connector from the oil level sensor and ground the terminal at idle.
   The oil level warning light comes ON and the buzzer sounds.
4. Remove the sensor.
5. Check that the oil holes of the oil chamber are not clogged.
   If necessary, clean the oil holes with solvent.



67U00X-000

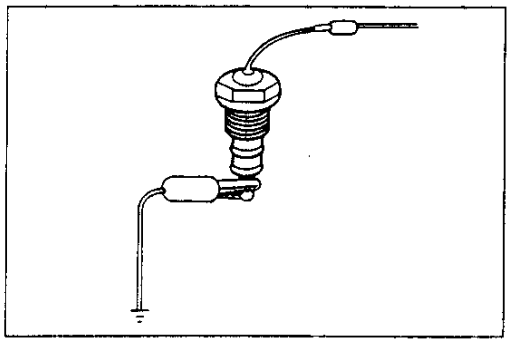
6. Connect an ohmmeter to the level sensor and check the continuity by moving the float up and down. When the float is on the upper side, the ohmmeter should not show any continuity.
   When moved to the lower side, it should show a continuity of the circuit. If this is found not to be so, replace the oil level sensor.



67U00X-018

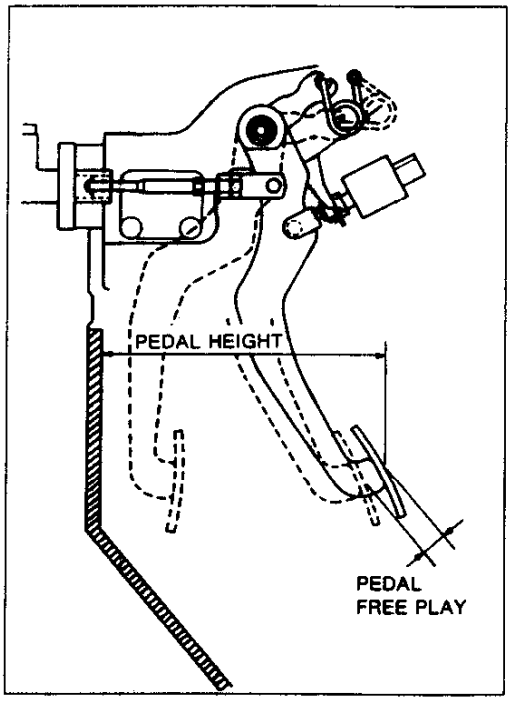
INSPECTION OF ENGINE COOLANT LEVEL WARNING SYSTEM

1. Turn the ignition switch ON. The coolant level warning light comes ON.
2. Start the engine and the warning light should go OFF.
3. Disconnect the connector from the level sensor and make sure the warning light comes ON after 9–16 seconds and the buzzer sounds at idle.



67U00X-031

4. Remove the radiator cap to relieve the pressure in the radiator.
5. Remove the sensor from the radiator and plug the hole to prevent coolant leakage.
6. Carefully check the sensor for cracks or damage.
7. Start the engine.
8. Ground the tip of the sensor.
   Check to see if the coolant level warning light goes OFF.
   If it does not, replace the sensor.



INSPECTION OF CLUTCH PEDAL

Clutch Pedal Height

Measure the distance from the upper surface of the pedal to the carpet.

Pedal height: 165.5–177.0 mm {6.516–6.968 in}
(with carpet)

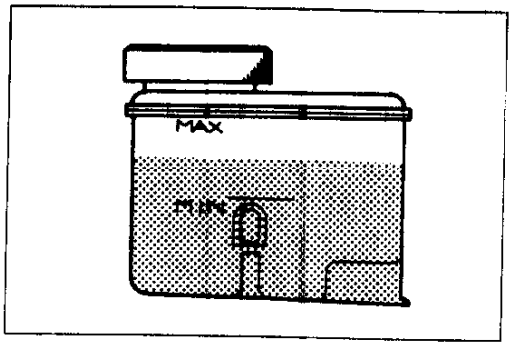
If necessary, adjust the pedal height.

Clutch Pedal Free Play

Depress the clutch pedal by hand until clutch resistance is felt.

Pedal free play: 0.6–3.2 mm {0.02–0.13 in}
Total pedal free play: 5.1–14 mm {0.20–0.55 in}

If necessary, adjust the pedal free play.



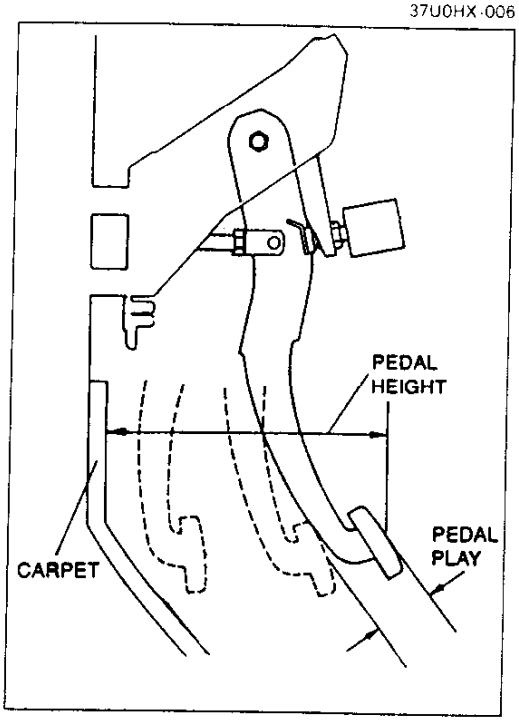
37U0HX-006

INSPECTION OF CLUTCH FLUID

Note

- **A common reservoir is used for the clutch and brake system fluids.**

1. Make sure that fluid level in the reservoir is between the MAX and MIN mark.
2. If the fluid level is extremely low, check the clutch and brake systems for leakage.



INSPECTION OF BRAKE PEDAL

Pedal Height Inspection

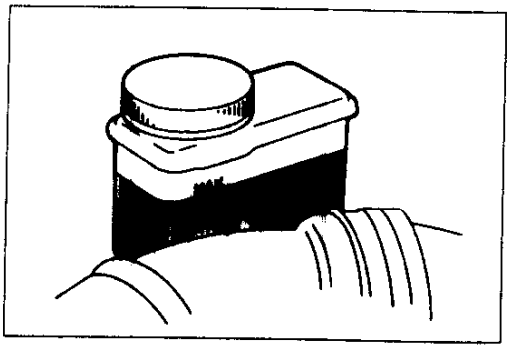
Check if the distance from the center of the upper surface of the pedal pad to the carpet is as specified.

Pedal height: 164.5–176.0 mm {6.48–6.92 in} (with carpet)

Pedal Play Inspection

1. Depress the pedal a few times to eliminate the vacuum in the system.
2. Lightly depress the pedal by hand unitil resistance is felt and check the free play.

Free play: 3–8 mm {0.12–0.31 in}

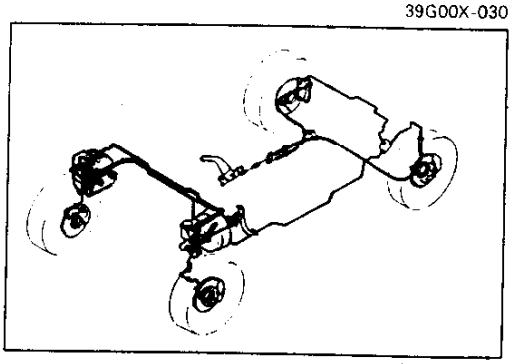


39G00X-030

INSPECTION OF BRAKE FLUID

Check that the brake fluid level is near the "MAX" level line on the see-through reservoir. If necessary, add brake fluid to bring the level to the "MAX" level line.

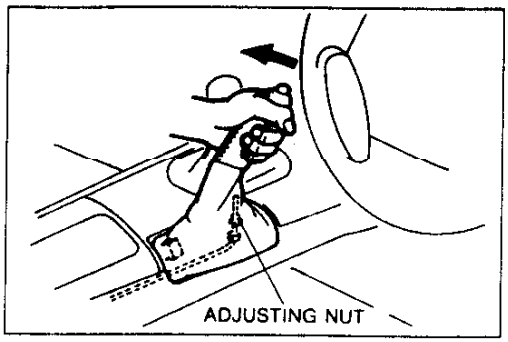
Fluid specification:
FMVSS 116 DOT-3



39G00X-028

INSPECTION OF BRAKE LINE, HOSES AND CONNECTIONS

Check the brake lines and hoses for proper attachment and connections. There should not be any leaks, cracks, chafing, abrasion, deterioration, etc. on lines and connections.

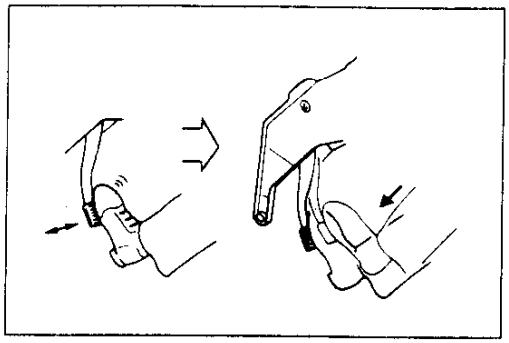


77U00X-009

INSPECTION OF PARKING BRAKE

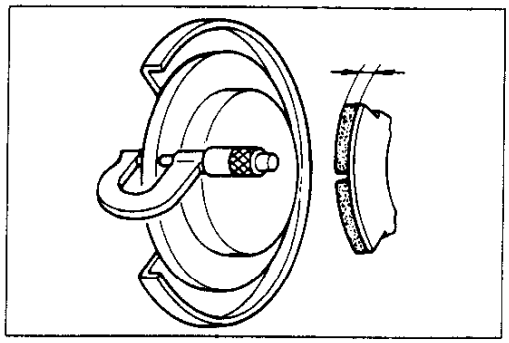
1. Pull the brake lever with 200 N {20 kgf, 44 lbf} of force and measure the lever stroke.
2. If necessary, adjust the lever stroke by turning the adjusting nut.

Lever notices: 7–10


39G00X-032

INSPECTION OF POWER BRAKE UNIT AND HOSES

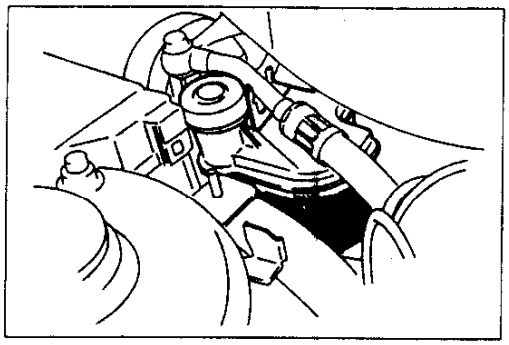
1. Check the vacuum hoses, connectors, and check the valve for cracks, chafing, deterioration, etc.
2. Check the power brake for proper operation. To check, depress the brake pedal several times to make sure the pedal play does not change. Then, while depressing the brake pedal, start the engine. At this time, the pedal should go down a little.


39G00X-033

INSPECTION OF DISC BRAKES

Check the following conditions of disc brake components.

1. Check caliper operation and inspect for leaks.
2. Check pads for wear.
3. Check condition and thickness of disc plate.


19G0AX-114

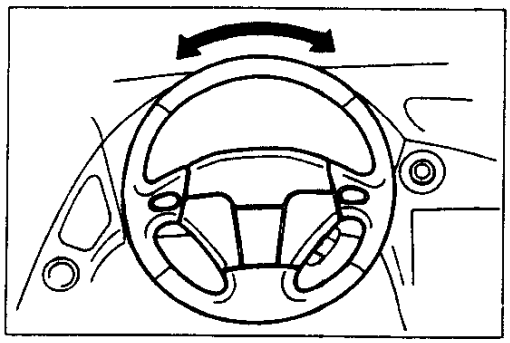
INSPECTION OF POWER STEERING FLUID LEVEL

Check the power steering fluid level. Add fluid to the specified level, if necessary.

Caution

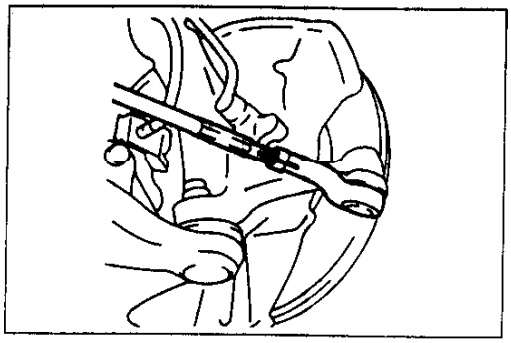
- **Use only the specified power steering fluid.**

Fluid specification: ATF Dexron®II or M-III


95A0AX-028

INSPECTION OF STEERING OPERATION AND LINKAGE

1. Check the steering wheel free play. (Refer to page N–6.)
   Free play: 0–30 mm {0–1.18 in}
2. Check the steering for proper operation and for looseness of the steering housing.
3. Check the steering gear housing for fluid leakage or seepage.
4. Check for excessive play on the tie rod ends and rack guide
5. Check for damage of the dust boots.
6. Check for looseness or grease leakage of the tie rod ends.

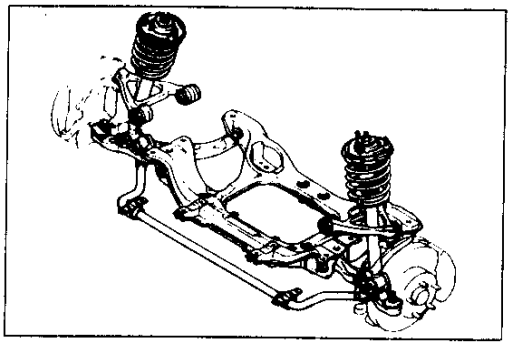


67U00X-023

INSPECTION OF STEERING LINKAGES, RACK GUIDE AND TIE ROD ENDS

Check the steering linkage for looseness and damage.
Check that there is:

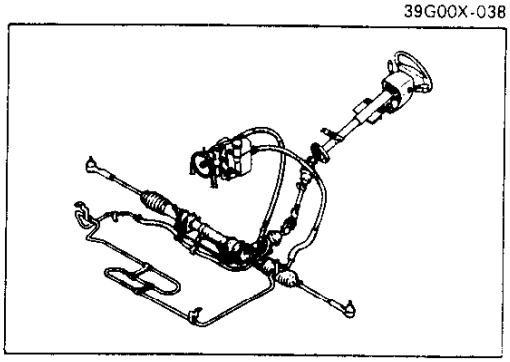
1. No excessive play on tie rod ends and rack guide.
2. No looseness or grease leakage on tie rod ends.



39G00X-038

INSPECTION OF SUSPENSION BALL JOINTS

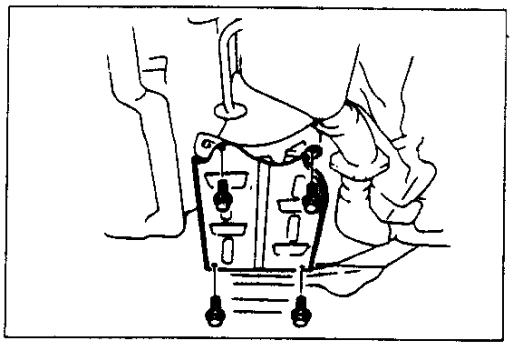
Check the ball joints for damage, looseness and grease leakage.



67U00X-024

INSPECTION OF RACK SEAL BOOTS

Check the boot for cracking or other damage.
If a problem is found, replace the boot.



37U0JX-007

INSPECTION OF MANUAL TRANSMISSION OIL

Caution

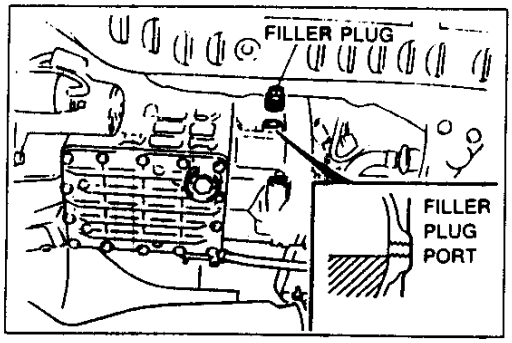
- **Park the vehicle on level ground.**

1. Remove the transmission cover.
2. Remove the filler plug.
3. Verify that the oil is up to the bottom of the check plug hole.
4. If the oil level is low, add the specified oil through the filler plug port.
5. Install a new filler plug.

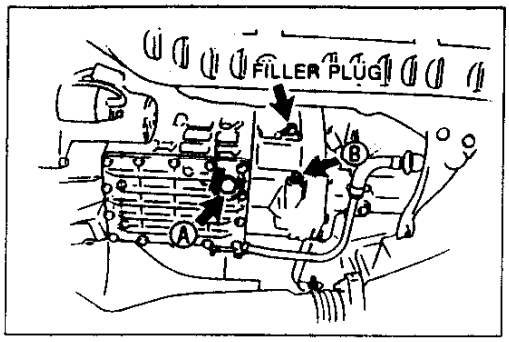
Tightening torque:
25–39 N·m {2.5–4.0 kgf·m, 19–28 ft·lbf}

6. Install the transmission cover.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}



37U0JX-008



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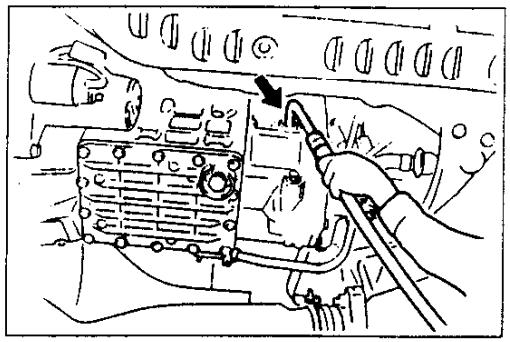
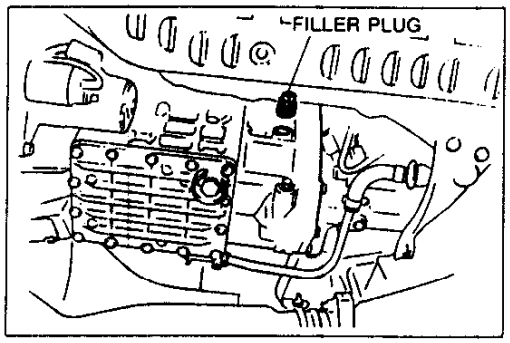
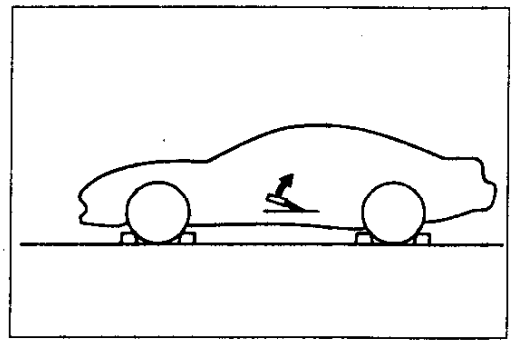
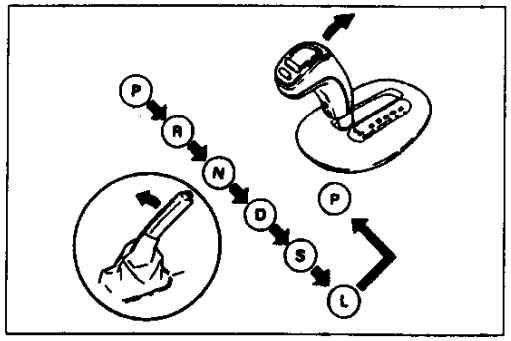

37U0JX-010



37U0JX-011


19G0KX-121



19G0KX-122

REPLACEMENT OF MANUAL TRANSMISSION OIL

1. Remove the transmission cover.
2. Remove plug A (with washer) and B, and drain the oil into a suitable container.
3. Wipe all plug clean.
4. Apply sealant to the B plug threads.
5. Install new plugs A (with new washer) and B.

Tightening torque:
A: 40–58 N·m {4.0–6.0 kgf·m, 29–43 ft·lbf}
B: 21–31 N·m {2.1–3.2 kgf·m, 16–23 ft·lbf}

6. Remove filler plug and add the specified oil through the filler plug port until the level rises to the bottom of the port.

Specified oil:
Grade: API service GL-4 or GL-5
All-season: SAE 75W-90
Above 10°C {50°F}: SAE 80W-90

Capacity: 2.5 L {2.6 US qts, 2.2 Imp qts}

7. Install a new filler plug.

Tightening torque:
25–39 N·m {2.5–4.0 kgf·m, 19–28 ft·lbf}

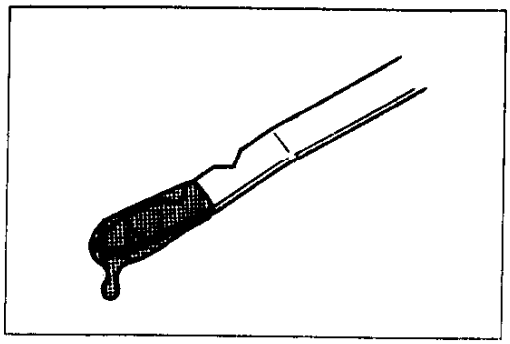
8. Install the transmission cover.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

INSPECTION OF AUTOMATIC TRANSMISSION FLUID LEVEL

Caution
- **Place the vehicle on a flat, level surface.**

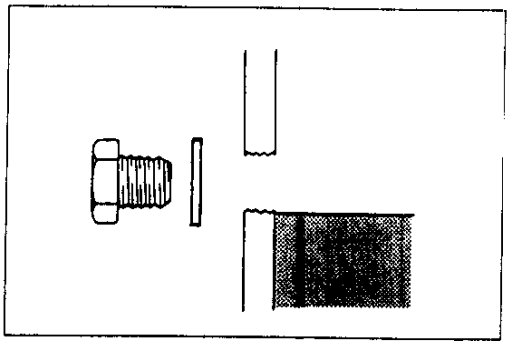
1. Apply the parking brake and securely position wheel chocks to prevent the vehicle from rolling.
2. Warm up the engine until the ATF temperature reaches **60–70°C {140–158°F}**.
3. While depressing the brake pedal, shift the selector lever to each range (P–L). Leave it a few seconds in each range.
4. Shift back to P range.



19G0KX-123

5. Ensure that the ATF level is between the notches of the ATF dipstick. Add ATF to the specified level, if necessary.

ATF Type: Dexron®II or M-III
Capacity: 8.6 L {9.1 US qt, 7.6 Imp qt}



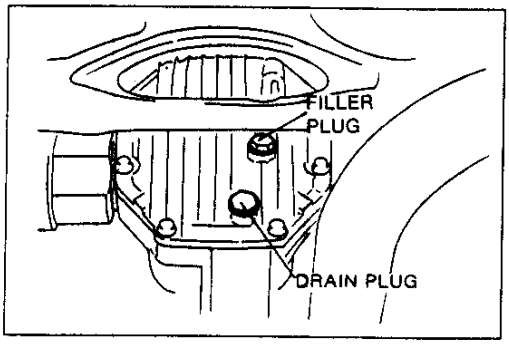
37U0MX-050

INSPECTION OF DIFFERENTIAL OIL

Caution
- **Position the vehicle level.**

1. Remove the filler plug.
2. Verify that the oil is at the bottom of the filler plug hole. If it is low, add the specified oil.
3. Install a new washer and the filler plug.

Tightening torque:
39–53 N·m {4.0–5.5 kgf·m, 29–39 ft·lbf}



37U0MX-051

REPLACEMENT OF DIFFERENTIAL OIL

1. Remove the filler and drain plugs.
2. Drain the differential oil into a suitable container.
3. Wipe the plugs clean.
4. Install a new washer and the drain plug.

Tightening torque:
39–53 N·m {4.0–5.5 kgf·m, 29–39 ft·lbf}

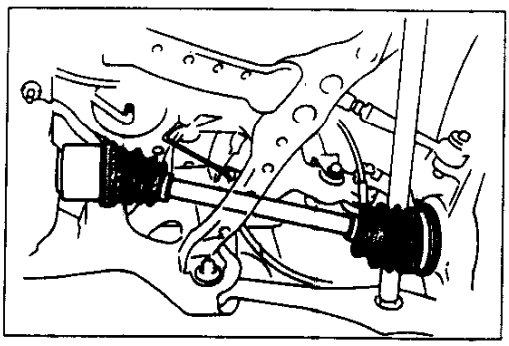
5. Add the specified oil from the filler plug hole until it reaches the bottom of the hole.

Specified oil
Type
Above –18°C {0°F}: API GL-4 or 5, SAE 90
Below –18°C {0°F}: API GL-4 or 5, SAE 80
Capacity: 1.30 L {1.38 US qt, 1.14 Imp qt}

6. Install a new washer and the filler plug.

Tightening torque:
39–53 N·m {4.0–5.5 kgf·m, 29–39 ft·lbf}

29U0MX-060

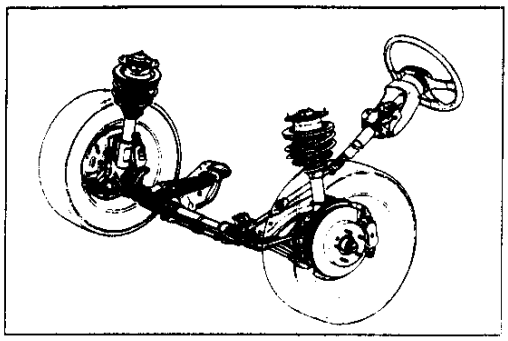


19G0AX-123

On vehicles equipped with limited-slip differential, API GL-5, SAE 90 special lubricant is required for limited-slip differentials.

INSPECTION OF DRIVE SHAFT DUST BOOTS

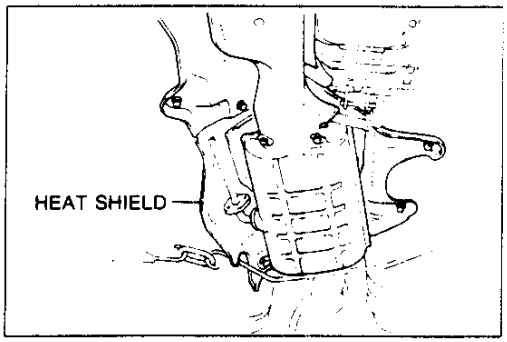
Check the dust boot on the drive shaft for cracks, damage, grease leakage, and a loose boot band.



67U00X-027

TIGHTENING BOLTS AND NUTS ON CHASSIS AND BODY

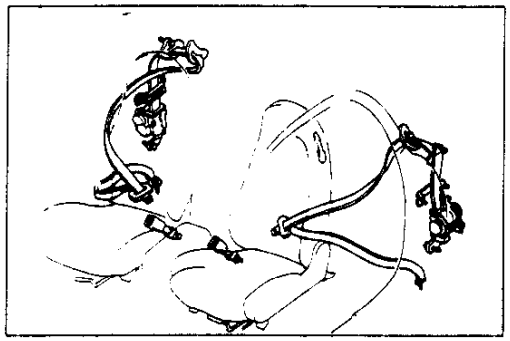
1. Tighten all seat mounting bolts.
2. Retighten all loose nuts and bolts of front and rear suspensions to the specified torque. (Refer to Section 30)



47U00X-063

INSPECTION OF EXHAUST SYSTEM HEAT SHIELDS

1. Check the clearance between insulator and body, and also between the insulator and the exhaust system.
2. Visually inspect the pipes, hangers and connections for severe corrosion, leaks or damage.



67U00X-028

INSPECTION OF SEAT BELTS, BUCKLES, RETRACTORS AND ANCHORS

1. Pull each seat belt to be sure it moves smoothly.
2. Check for scratches, tears, or wear of the webbing, and doe bent metal fittings.

Caution

- **Do not disassemble the buckle or ELR assembly.**

3. Check operation of retractors.
4. Check tightness of belt anchor bolts.

ENGINE

37U0CX-001

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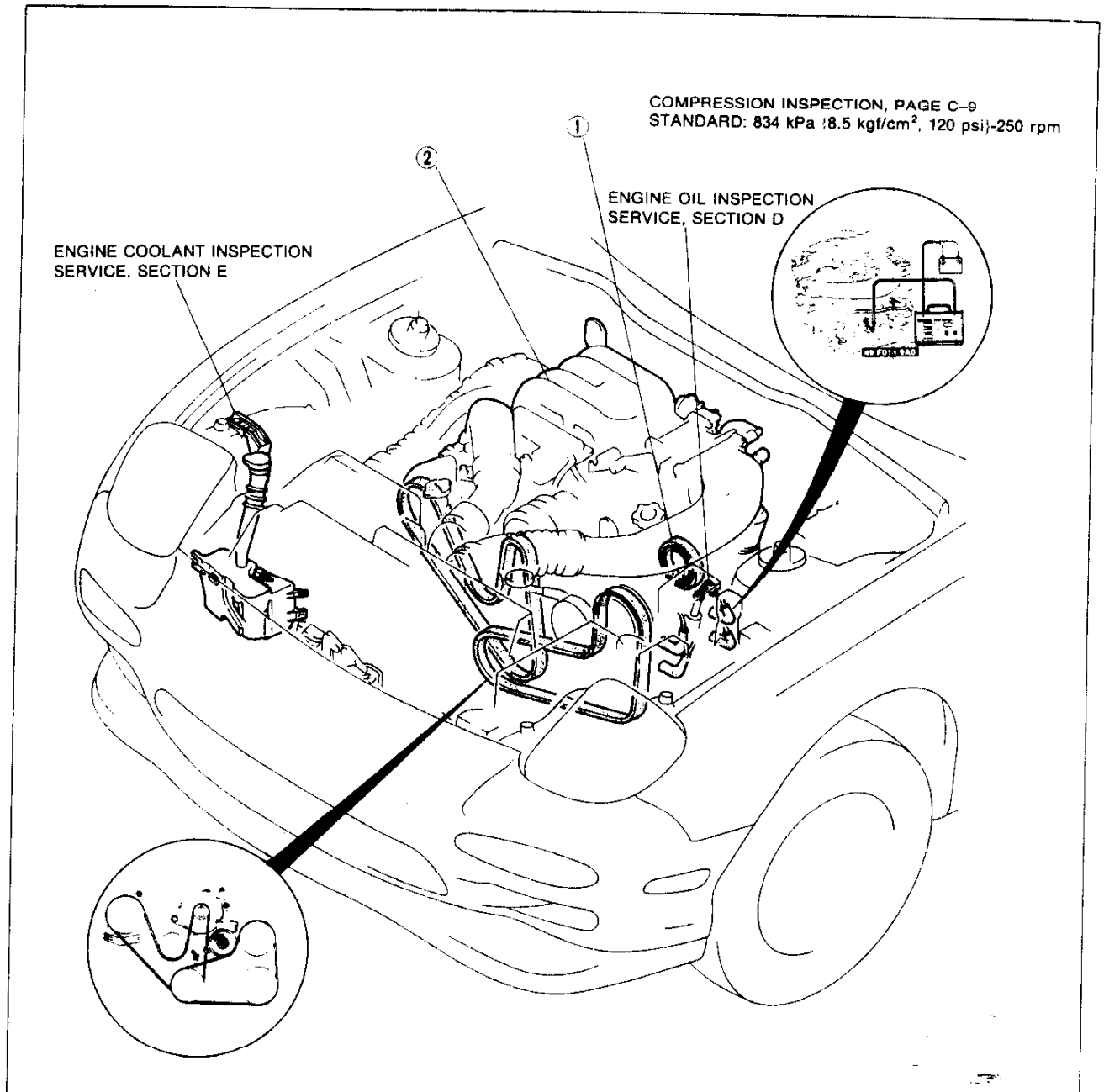


DEFLECTION mm {in}

DRIVE BELT	NEW	USED	LIMIT
ALTERNATOR	6.0–7.0 {0.24–0.27}	7.0–7.5 {0.28–0.29}	9.0 {0.35}
P/S · A/C	3.5–4.0 {0.14–0.15}	4.5–5.0 {0.18–0.19}	6.0 {0.24}

37U0CX-001

OUTLINE

SPECIFICATIONS

Item \ Engine				13B Turbo
Engine type				Rotary
Displacement			cm³ {cu in}	654 × 2 {40.0 × 2}
Number of cylinders and arrangement				2 rotors, longitudinal
Combustion chamber type				Bathtub
Compression ratio				9.0 : 1
Air induction				4-port induction
Port timing	Intake	Open	Primary	45° BTDC
			Secondary	32° BTDC
		Close	Primary	50° ABDC
			Secondary	50° ABDC
	Exhaust	Open		75° BBDC
		Close		48° ATDC
Fuel supply system				EGI
Ignition timing*			Trailing	20°ATDC (–20°BTDC)
			Leading	5°ATDC (–5°BTDC)
Idle speed*			rpm	700 – 750

* TEN terminal of diagnosis connector is grounded.

37U0CX-003

TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Difficult starting	**Insufficient compression**		
	Deformation or abnormal wear of side housing	Replace	C–51
	Deformation or abnormal wear of rotor housing	Replace	C–54
	Wear of rotor grooves	Replace	C–57, 58
	Deformation of or loose rotor seals	Replace	C–57, 58
	Worn or weak rotor seal springs	Replace	–
	Malfunction of metering oil pump		Section D
	Malfunction of electrical system		Section F
	Malfunction of electrical system		Section G
Poor idling	**Insufficient compression**		
	Deformation or abnormal wear of side housing	Replace	C–51
	Deformation or abnormal wear of rotor housing	Replace	C–54
	Wear of rotor grooves	Replace	C–57, 58
	Deformation or loose rotor seals	Replace	C–57, 58
	Worn or weak rotor seal springs	Replace	–
	Malfunction of fuel system		Section F
	Malfunction of ignition system		Section G

37U0CX-004

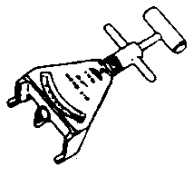
TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Insufficient power	**Insufficient compression**		
	Deformation or abnormal wear of side housing	Replace	C–51
	Deformation or abnormal wear of rotor housing	Replace	C–54
	Wear of rotor grooves	Replace	C–57, 58
	Deformation or loose rotor seals	Replace	C–57, 58
	Worn or weak rotor seal springs		
	Malfunction of fuel system		Section F
	Malfunction of ignition system		Section G
Abnormal combustion	**Malfunction in combustion chamber**		
	Carbon accumulation	Remove and clean	C–49
	Malfunction of fuel system		Section F
	Malfunction of ignition system		Section G
Excessive oil consumption	**Leakage into combustion chamber**		
	Deformation or abnormal wear of side housing	Replace	C–51
	Malfunction of rotor (blow holes)	Replace	C–54
	Scratched or burred rotor land	Replace	C–54
	Malfunction of oil seal (incorrect angle)	Replace	C–56
	Leakage into coolant passages		
	Deformed rotor housing	Replace	C–54
	Malfunction of sealing rubber	Replace	–
	Leakage to outside of engine		Section D
	Malfunction of lubrication system		Section D
Engine noise	**Rotor seal noise**		
	Malfunction of rotor seals	Replace	C–56, 57
	Malfunction of housing	Replace	C–51, 54
	Malfunction of seal spring	Replace	C–56, 57
	Malfunction of metering oil pump		Section D
	Knocking noise		
	Accumulation of carbon	Remove and clean	C–49
	Hitting noise		
	Malfunction of main bearing or rotor bearing	Replace	C–53, 56
	Excessive end play	Adjust	C–73
	Foreign matter in internal gear or stationary gear or malfunction of gear	Replace	C–53
	Other		
	Malfunction of water pump bearing		Section E
	Loose drive belt	Adjust	C–5
	Malfunction of alternator bearing		Section G
	Exhaust gas leakage		Section F
	Malfunction of fuel system		Section F

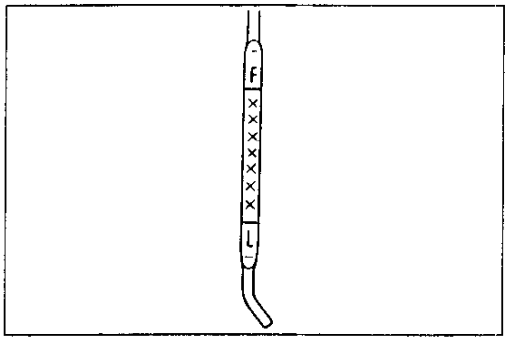
37U0CX-01 5

ENGINE TUNE-UP PROCEDURE

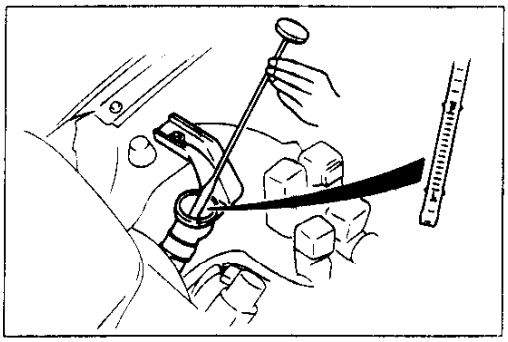
PREPARATION
SST

49 9200 020 Tension gauge, V-ribbed belt		For inspection of drive belt tension

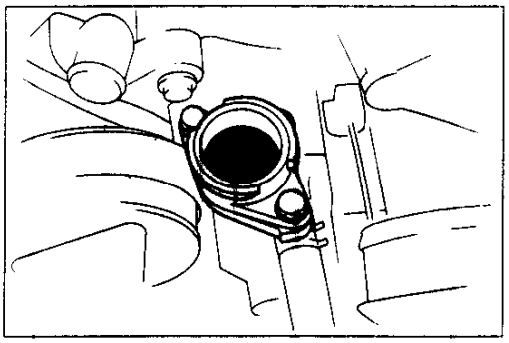
16E0B1-006



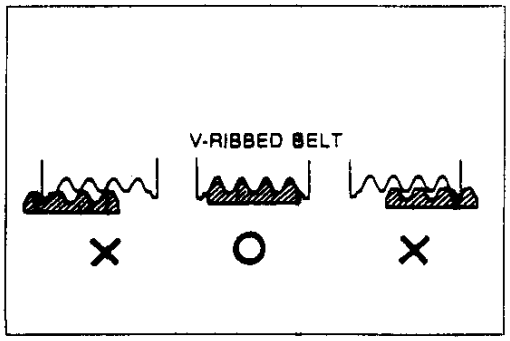
37U0CX-006



16E0B1-008



16E0B1-009



16E0B1-010

ENGINE OIL
Inspection
1. Be sure the vehicle is on level ground.
2. Warm up the engine to normal operating temperature and stop it.
3. Wait for five minutes.
4. Remove the oil level 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 1.7L {1.8 US qt, 1.5 Imp qt}.**

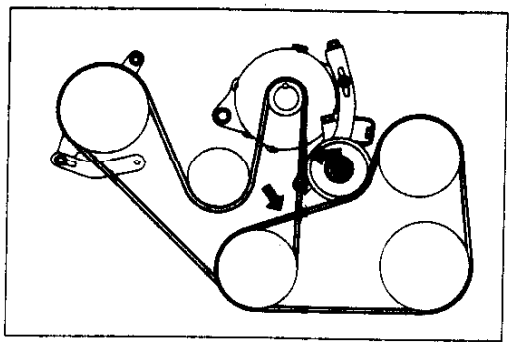
ENGINE COOLANT
Inspection
Coolant level (Engine cold)

Warning
- **Never remove the radiator cap while the engine is hot.**
- **Wrap a thick cloth around the cap when removing it.**

1. Verify that the coolant level is near the filler port neck.
2. Remove the coolant level dipstick from the coolant reservoir and verify that the coolant level is between the F and L marks. Add coolant if necessary.

Coolant quality
1. Verify that there is no buildup of rust or scale around the radiator cap and radiator filler neck.
2. Verify that the coolant is free of oil.
3. Replace the coolant if necessary.

DRIVE BELT
Inspection
1. Check the drive belts for wear, cracks, and fraying. Replace if necessary.
2. Verify that the drive belts are correctly mounted on the pulleys.


37U0CX-007

3. Check the drive belt deflection by applying moderate pressure **98 N {10 kgf, 22 lbf}** midway between the pulleys.

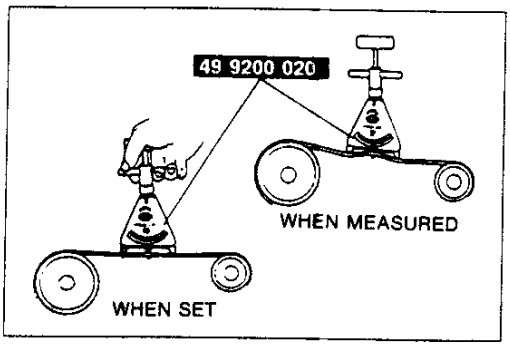
Note
- **Measure the belt deflection between the specified pulleys.**
- **A belt is considered "New" if it has been used on a running engine for less than 5 minutes. Set the deflection specified below accordingly.**
- **Check the belt deflection when the engine is cold, or at least 30 minutes after the engine has stopped.**

Deflection

mm { in }

Drive belt	New	Used	Limit
Alternator	6.0–7.0 {0.24–0.27}	7.0–7.5 {0.28–0.29}	9.0 {0.35}
P/S·A/C	3.5–4.0 {0.14–0.15}	4.5–5.0 {0.18–0.19}	6.0 {0.24}

4. If the deflection is not with in specification, adjust it.



37U0CX-008

Drive belt tension check

Note
- **Belt tension can be checked in place of belt deflection.**
- **Belt tension can be measured between any two pulleys.**

1. Using the **SST**, check the belt tension.

Tension

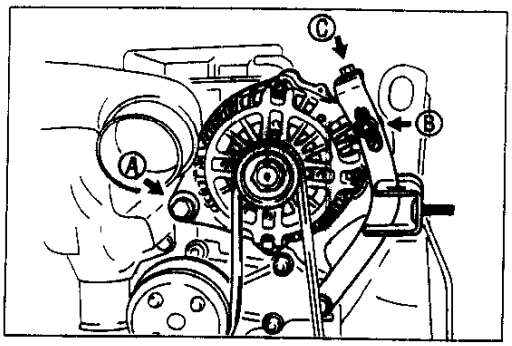
N {kgf·lbf}

Drive belt	New	Used	Limit
Alternator	690–780 {70–80, 160–170}	590–680 {60–70, 140–150}	320 {33, 73}
P/S·A/C	740–880 {75–90, 170–190}	540–630 {55–65, 130–140}	320 {33, 73}

2. If the tension is not with in specification, adjust it.

Adjustment

Caution
- **A belt is considered "New" if it has been used on a running engine for less than 5 minutes.**



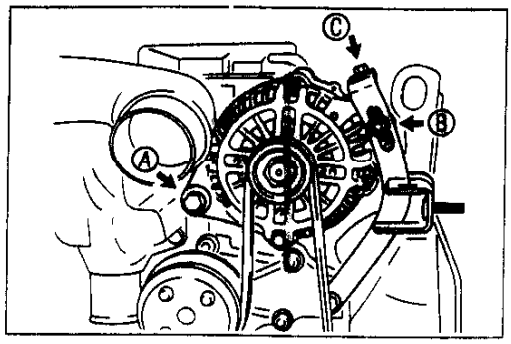
37U0CX-009

Alternator

1. Loosen bolt A and nut B.
2. Adjust the belt deflection by turning adjusting bolt C.

Deflection

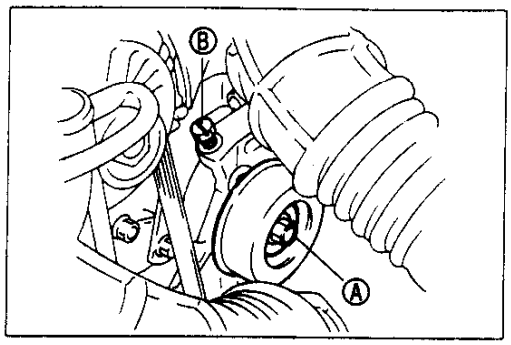
New : 6.0–7.0 mm {0.24–0.27 in}
Used : 7.0–7.5 mm {0.28–0.29 in}
Limit : 9.0 mm {0.35 in}



37U0CX-010

3. Tighten bolt A, and nut B.

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



37U0CX-011

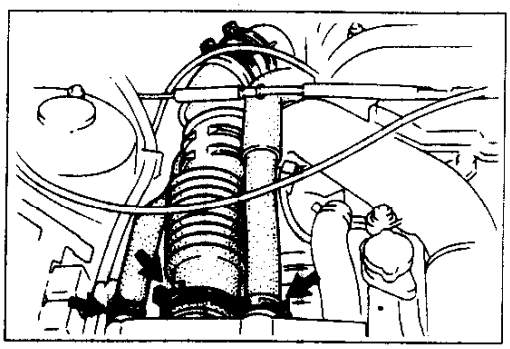
P/S, A/C

1. Loosen nut A.
2. Adjust the belt deflection by turning adjusting bolt B.

Deflection
New : 3.5–4.0 mm {0.14–0.15 in}
Used: 4.5–5.0 mm {0.18–0.19 in}
Limit: 6.0 mm {0.24 in}

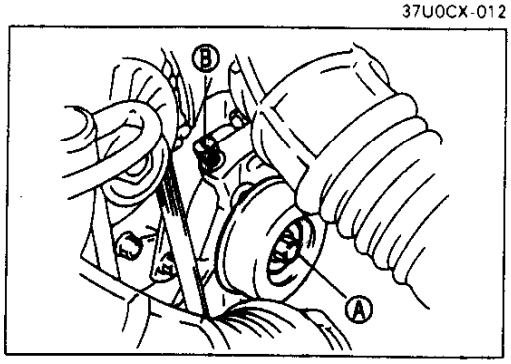
3. Tighten nut A.

Tightening torque:
37–53 N·m {3.7–5.5 kgf·m, 27–39 ft·lbf}


37U0CX-012

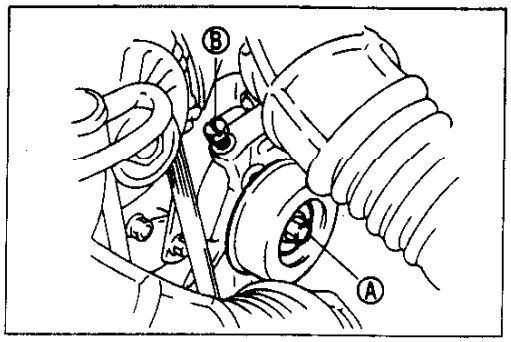
Replacement
P/S, A/C

1. Disconnect the air hoses shown in the figure.



37U0CX-013

2. Loosen idler pulley locknut A.
3. Loosen adjusting bolt B.
4. Remove the belt.



37U0CX-014

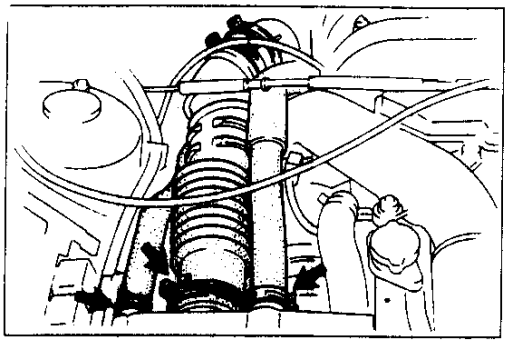
5. Install the new belt on the pulleys.
6. Adjust the belt deflection by turning adjusting bolt B.

Deflection
3.5–4.0mm {0.14–0.15 in}

7. Tighten pully locknut A.

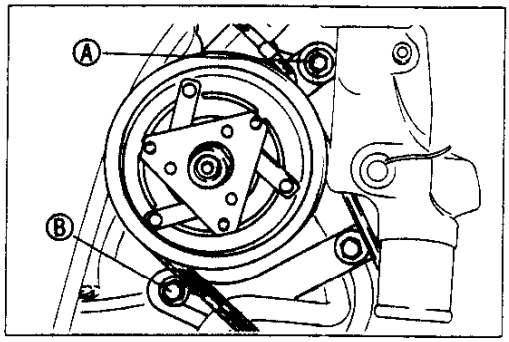
Tightening torque:
37–53 N·m {3.7–5.5 kgf·m, 27–39 ft·lbf}

8. Connect the air hoses.


37U0CX-015

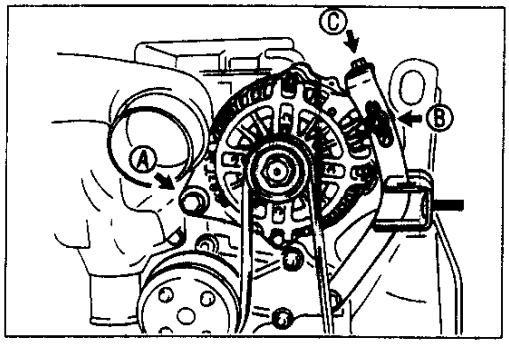
Alternator

1. Disconnect the air hoses shown in the figure.



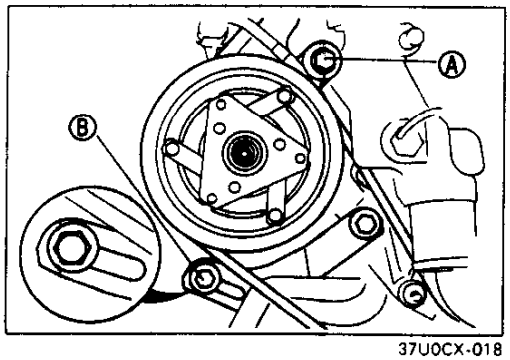
37U0CX-016

2. Loosen air pump mount bolts A and B.



37U0CX-017

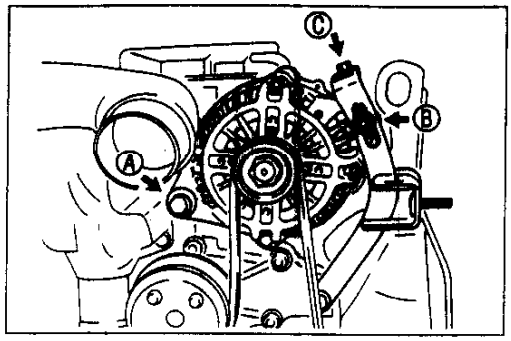
3. Loosen alternator mount bolt A and locknut B.
4. Loosen adjusting bolt C.
5. Remove the drive belt.



37U0CX-018

6. Install the new drive belt on the pulleys.
7. Install the air pump while applying the pressure the drive belt.

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



37U0CX-019

8. Adjust the belt deflection by turning adjusting bolt C.

Deflection
6.0–7.0 mm {0.24–0.27 in}

9. Tighten alternator mount bolt A and locknut B.

Tightening torque:
Bolt A 37–51 N·m {3.8–5.3 kgf·m, 28–38 ft·lbf}
Nut B 19–25 N·m {1.9–2.6 kgf·m, 14–18 ft·lbf}

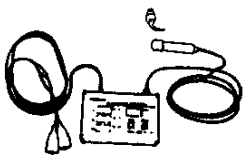
10. Connect the air hoses.

COMPRESSION

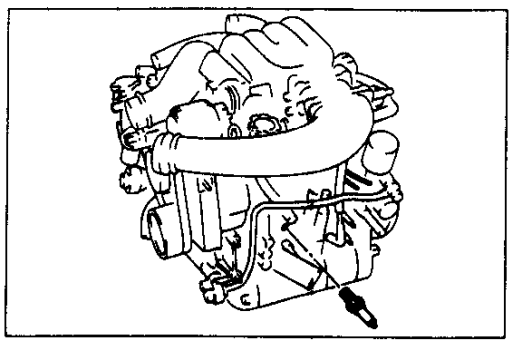
If the engine exhibits low power, poor fuel economy, or poor idle, check the following:
1. Ignition system (Refer to Section G.)
2. Compression
3. Fuel system (Refer to Section F.)

37U0CX-020

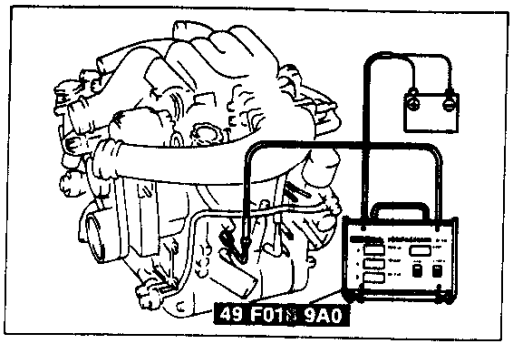
PREPARATION
SST

49 F018 9A0 Tester, compression		For Inspection of compression

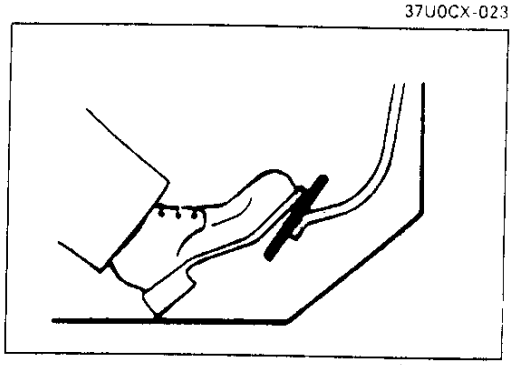
37U0CX-013


37U0CX-022

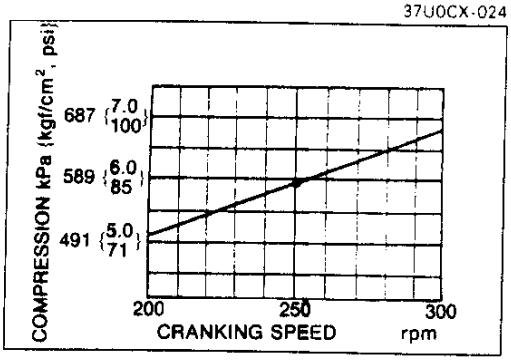
1. Check that the battery is fully charged. Recharge it if necessary.
2. Warm up the engine to the normal operating temperature, then stop it.
3. Allow about 10 minutes for the exhaust manifold to cool.
4. Remove the front and rear trailing-side spark plugs.
5. Disconnect the circuit-opening relay and the igniter connector.



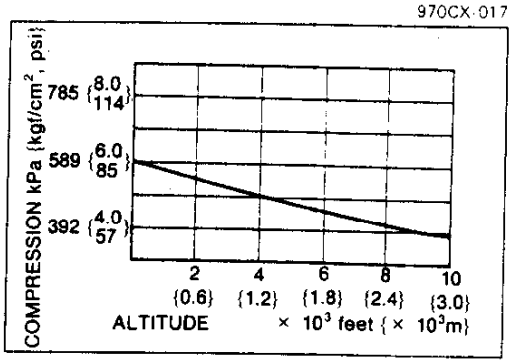
37U0CX-023



37U0CX-024



970CX-017



970CX-018

6. Connect the **SST** to the front rotor housing and the battery.
7. Fully depress the accelerator pedal and crank the engine for 5 to 10 seconds.
8. Make a note of the compression of the three combustion chambers and cranking speed.

Compression:
590 kPa {6.0 kgf/cm², 85 psi}–250 rpm
Differential limit of chambers:
150 kPa {1.5 kgf/cm², 21 psi}–250 rpm

Note
1) If pressure below 290 kPa {3.0 kgf/cm², 43 psi} exists in one or two chambers of a rotor, the tester indicates one correct measurement and two 00.0 readings.
2) If three chamber pressure are below 290 kPa {3.0 kgf/cm², 43 psi}, the tester indicates three 00.0 readings.
3) In the above cases, the cranking speed readings are all 00.0.

9. Check the rear chambers by using the same procedure.

Note
- **Compensate for the compression values if they are measured at cranking speeds different than standard or if they are measured at a high altitude.**

Cranking speed compensation

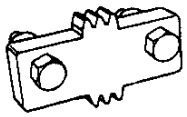
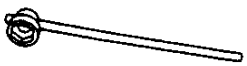
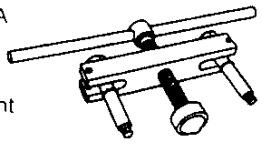
Compensate for the cranking speed.

Altitude compensation

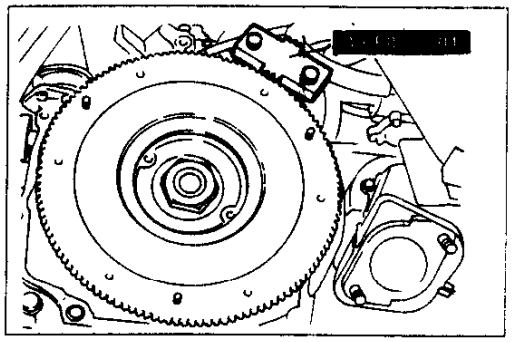
Compensate for the altitude.

ON-VEHICLE MAINTENANCE

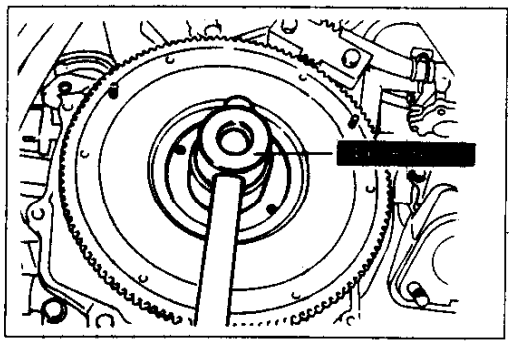
REAR OIL SEAL
PREPARATION
SST

49 F011 101 Brake, ring gear 	For prevention of eccentric shaft rotation	49 0820 035 Box wrench, flywheel 	For removal of flywheel locknut
49 1881 055A Stopper, counterweight 	For prevention of eccentric shaft rotation	49 0839 305A Puller, counterweight 	For removal of counterweight

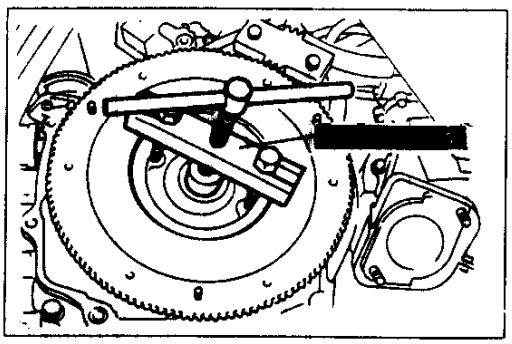
37U0CX-025



37U0CX-026



97U0CX-021



97U0CX-022

Removal Note

1. Disconnect the negative battery cable.
2. Drain the engine oil.
3. Remove the manual transmission. (Refer to Section J.) Remove the automatic transmission. (Refer to Section K.)
4. Remove the clutch cover and clutch disc. (Refer to Section H.)

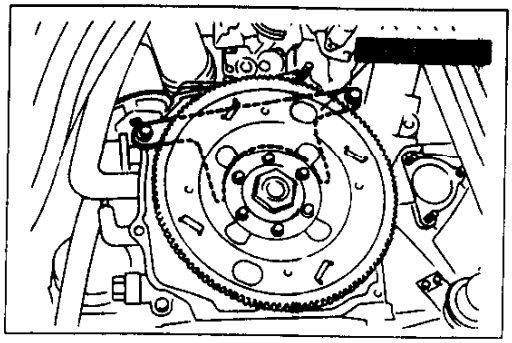
(MT)

5. Install the **SST** against the flywheel.

Caution

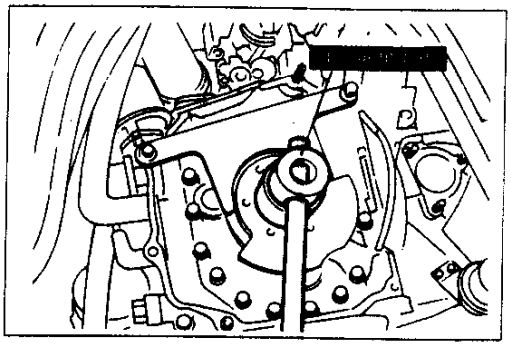
- **Place a rag between the SST and the vacuum pipes to protect the pipes.**

6. Remove the locknut by using the **SST**.
7. Remove the flywheel by using the **SST**.
8. Remove the key.



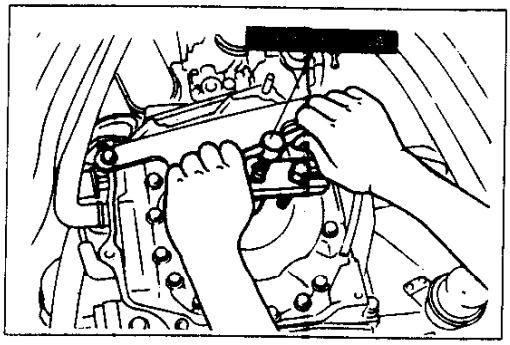
97U0CX-023

(AT)
5. Install the **SST** against the counterweight.



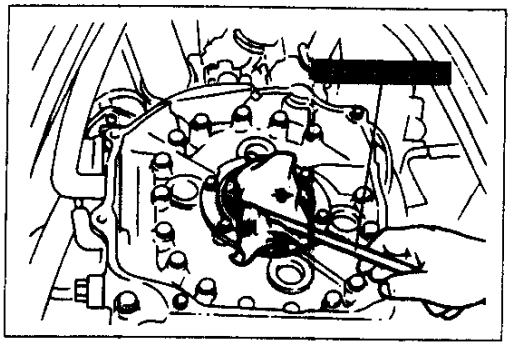
97U0CX-024

6. Remove the back plate and drive plate.
7. Remove the locknut by using the **SST**.



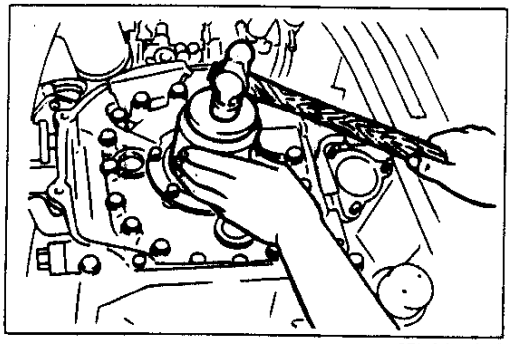
97U0CX-025

8. Remove the counterweight by using the **SST**.



17U0CX-022

(MT and AT)
9. Remove the oil seal by using the **SST**.



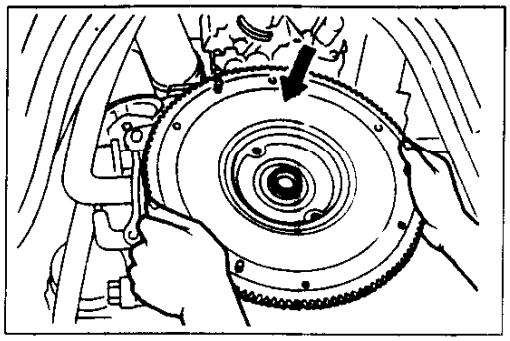
37U0CX-027

Installation Note
Rear oil seal

1. Apply engine oil to the seal lip.
2. Fit the oil seal onto the stationary gear.
3. Tap the oil seal in evenly using a suitable pipe.

Oil seal outer diameter: 95.0 mm {3.74 in}

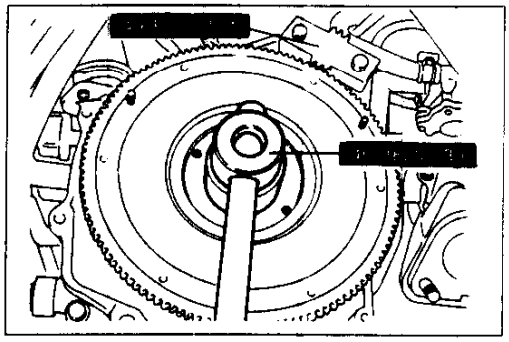
Caution
- **The oil seal must be tapped in until it is flush with the edge of the rear cover.**



97U0CX-028

Flywheel (MT)

1. Fit the key to the eccentric shaft.
2. Install the flywheel to the eccentric shaft.
3. Apply thread-locking compound to the eccentric shaft threads.
4. Apply sealant to the contact surface of the locknut.

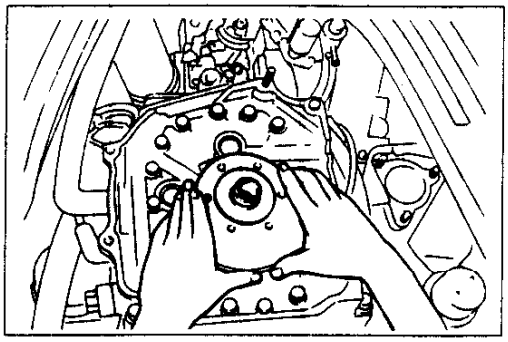


37U0CX 028

5. Install the locknut and tighten it with the **SST**.

Tightening torque:
400–490 N·m {40–50 kgf·m, 290–360 ft·lbf}

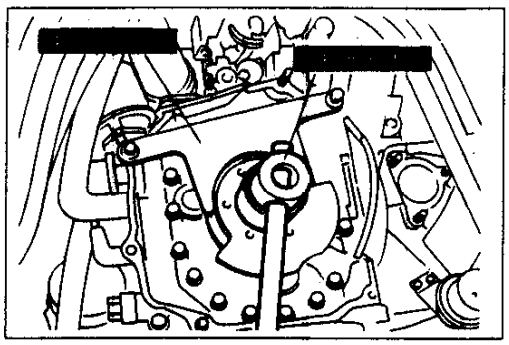
Caution
- **Place a rag between the SST and the vacuum pipes to protect pipes.**



97U0CX-030

Drive plate (AT)

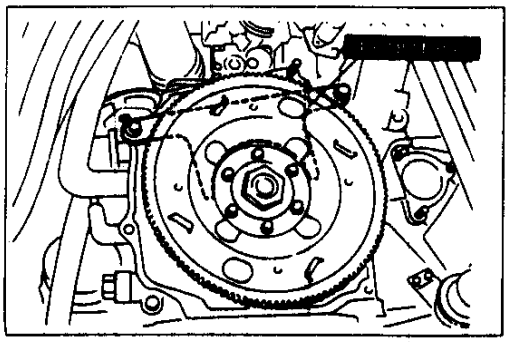
1. Fit the key to the eccentric shaft.
2. Install the counterweight to the eccentric shaft.
3. Apply thread-locking compound to the eccentric shaft threads.
4. Apply sealant to the contact surface of the locknut.



37U0CX-029

5. Install the locknut and tighten it with the **SST.**

Tightening torque:
400–490 N·m {40–50 kgf·m, 290–360 ft·lbf}



37U0CX-030

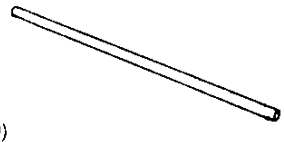
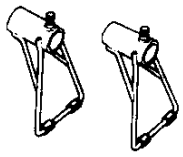
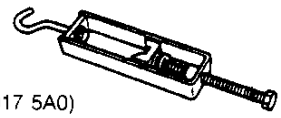
6. Install the drive plate and the back plate.
Tightening torque:
44–60 N·m {4.4–6.2 kgf·m 32–44 ft·lbf}

Steps After Installation

1. Add engine oil to the specified level.
2. Connect the negative battery cable.
3. Start the engine and do the following:
   (1) Check for leakage of engine oil.
   (2) Perform engine adjustments as necessary.
   (3) Recheck the oil level.

REMOVAL

PREPARATION
SST

49 G017 5A0 Support, engine 	For support of engine	49 G017 501 Bar (Part of 49 G017 5A0) 	For support of engine
49 G017 502 Support (Part of 49 G017 5A0) 	For support of engine	49 G017 503 Hook (Part of 49 G017 5A0) 	For support of engine
49 W023 585A Adjust wrench 	For prevention of P/S oil pump rotation		

37U0CX-031

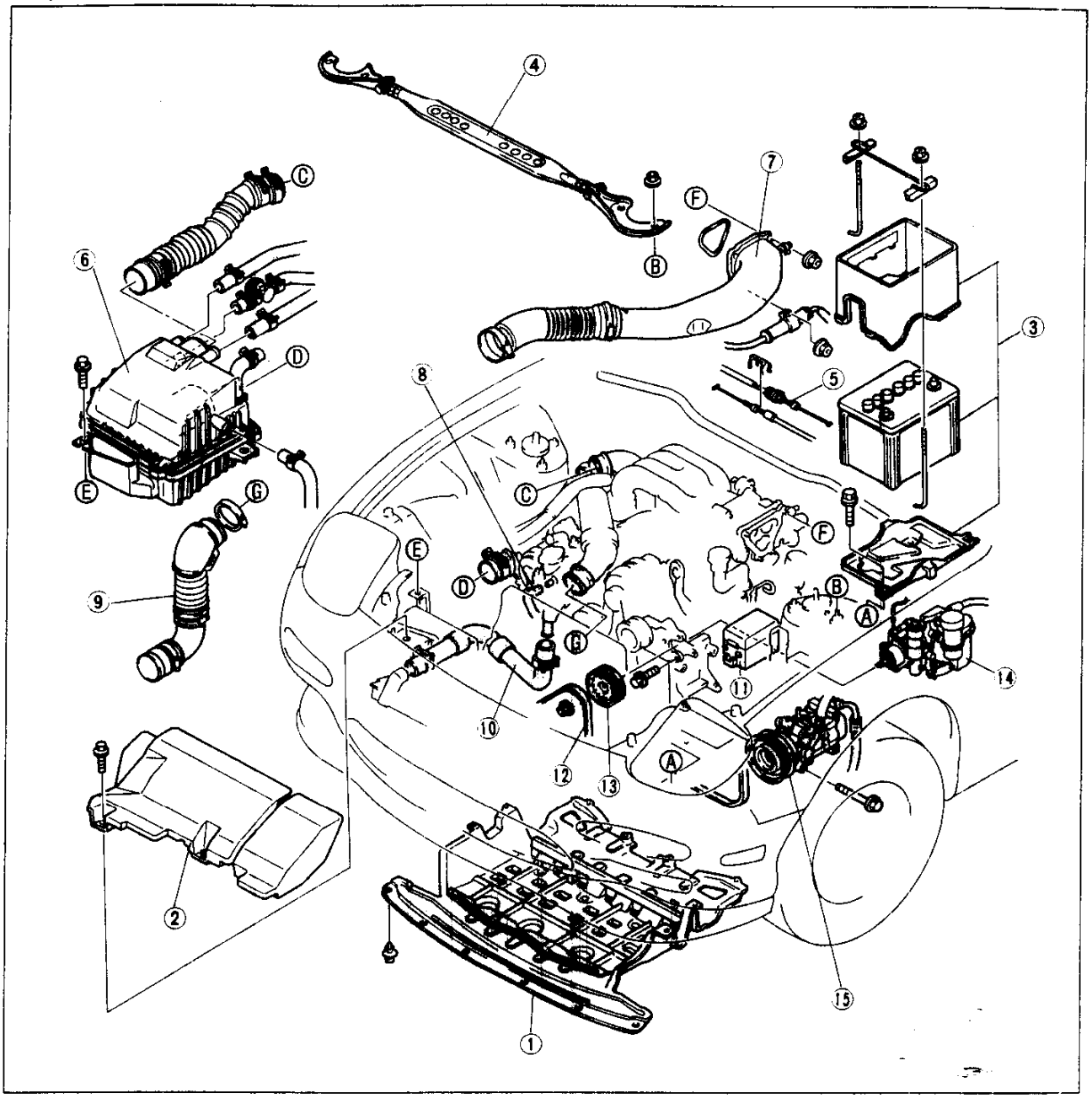
PROCEDURE

Warning
- **Release the fuel pressure. (Refer to Section F)**

1. Disconnect the negative battery cable.
2. Drain the engine coolant and engine oil.
3. Remove the undercover.
4. Remove the transmission. (Refer to Section J or K.)
5. Disconnect the engine control unit. (Refer to Section F.)
6. Remove in the order shown in the figure, referring to **Removal Note**.

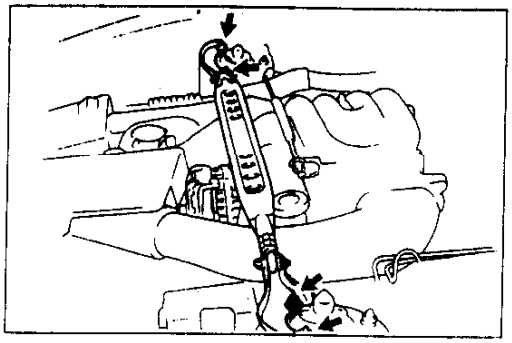
37U0CX-032

Step 1



1. Undercover
2. Fresh air duct
3. Battery and box
4. Strut bar
   Removal Note ..... page C–16
5. Accelerator cable
6. Air cleaner assembly
7. Hose
8. Water hose
9. Air hose
10. Radiator hose (upper)
11. Fuse box
    Removal Note ..... page C–16
12. Drive belt
    Removal Note ..... page C–25
13. P/S oil pump pulley
    Removal Note ..... page C–16
14. P/S oil pump
    Removal Note ..... page C–16
15. A/C compressor
    Removal Note ..... page C–16

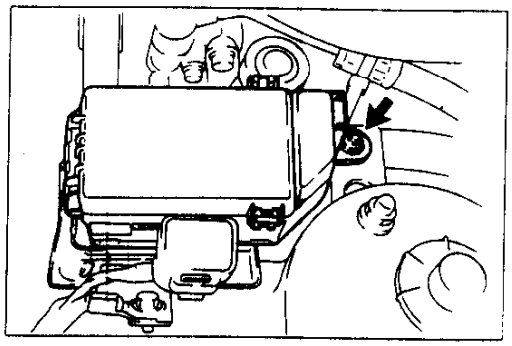
REMOVAL



37U0CX-034

Removal Note
Strut bar

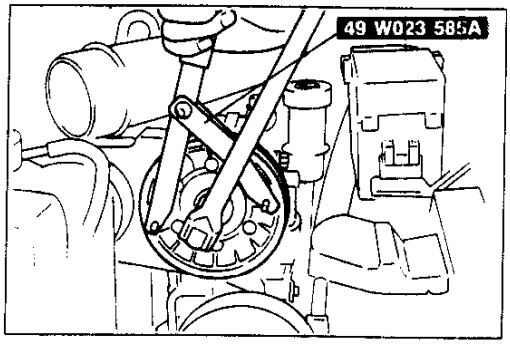
1. Remove the strut bar.
2. Temporarily tighten the locknut to the stud bolt.



37U0CX-035

Fuse box

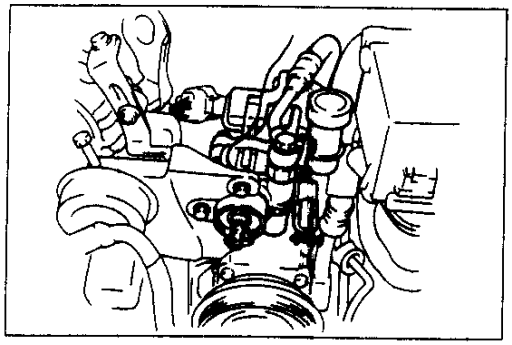
Remove the fuse box with the harness still connected.



37U0CX-036

P/S Oil pump pulley

1. Hold the P/S oil pump pulley by using the **SST**.
2. Remove the P/S oil pump pulley nut.
3. Remove the P/S oil pump pulley.

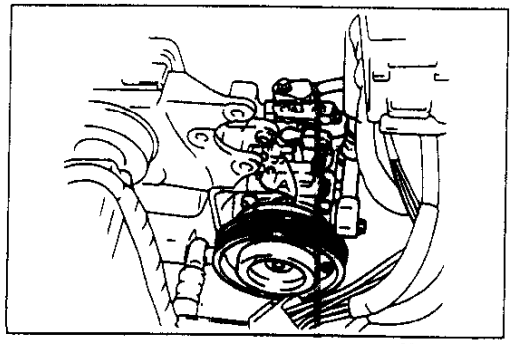


37U0CX-037

P/S oil pump

Caution
- **Do not damage the hoses.**

1. Remove the P/S oil pump with the hose still connected.
2. Position the pump away from the engine, and support it with wire.



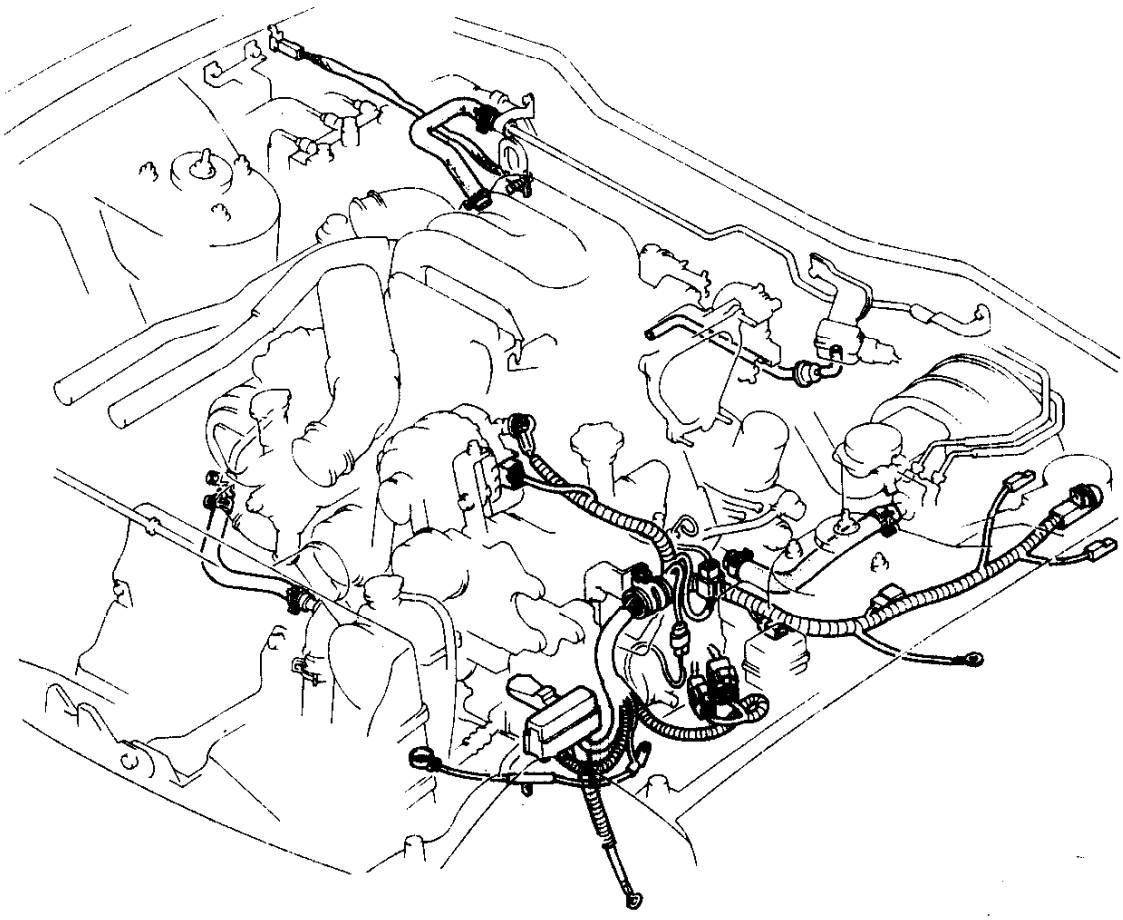
37U0CX-038

A/C Compressor

Caution
- **Do not damage the hoses.**

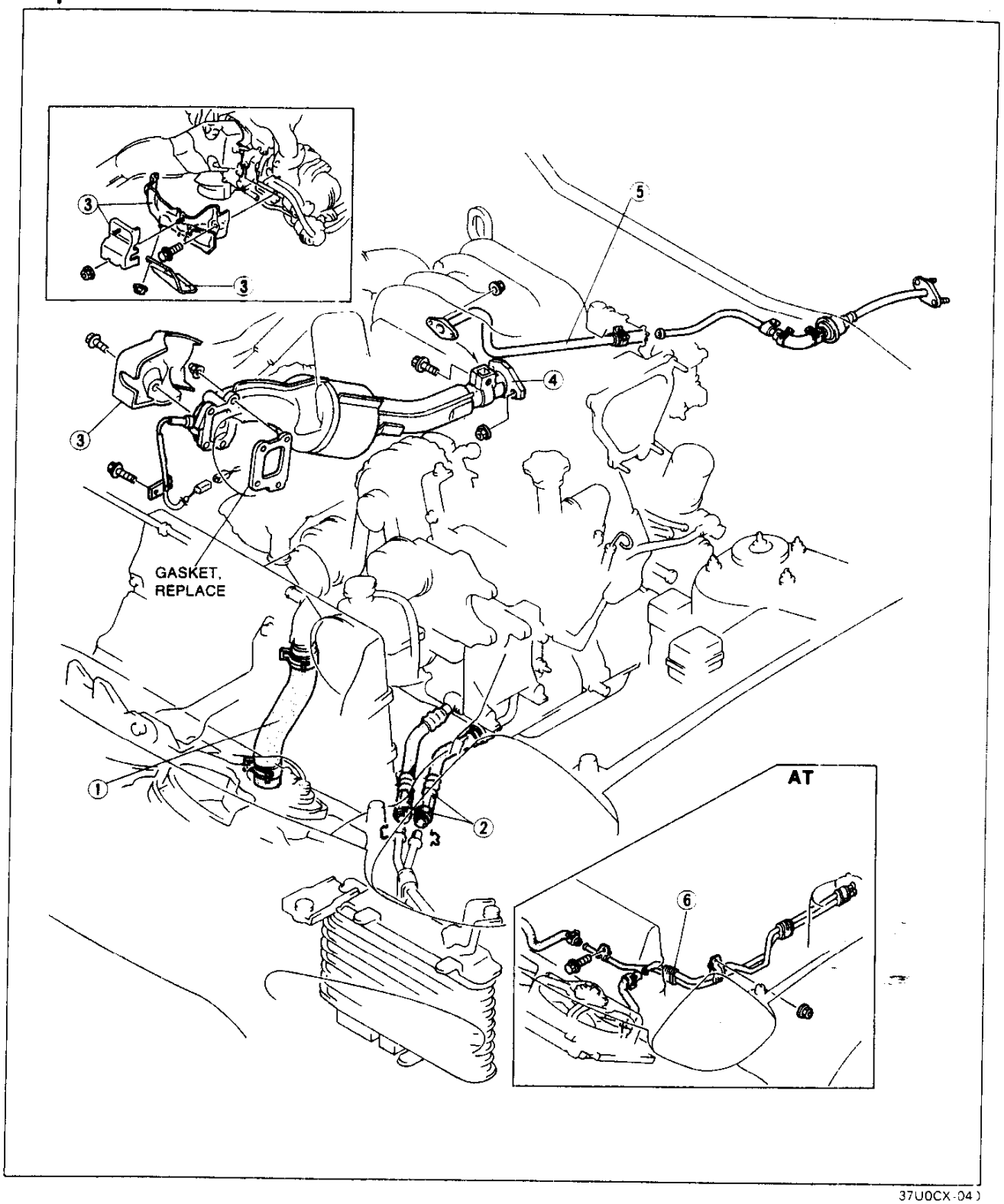
1. Remove the A/C compressor with the hoses still connected.
2. Position the compressor away from the engine, and support it with wire.

Step 2
Disconnect the harness connectors and hoses.



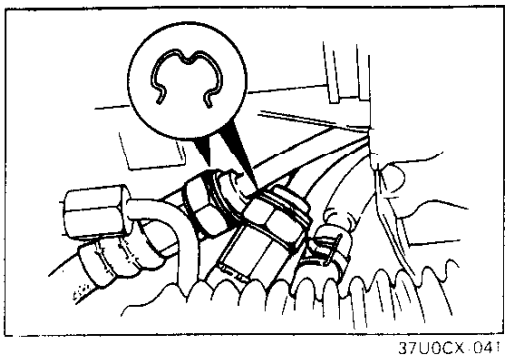
37U0CX-339

Step 3



37U0CX-04

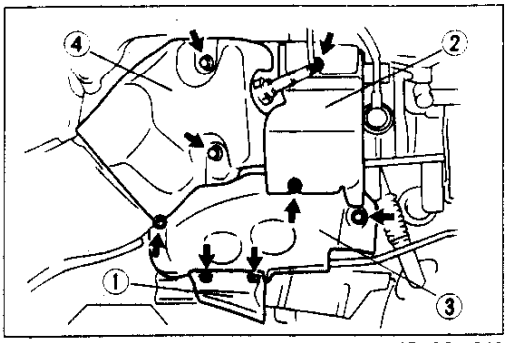
1. Radiator hose (lower)
2. Oil pipe
   Removal Note ..... page C–19
3. Insulator
   Removal Note ..... page C–19
4. Front exhaust pipe
   Removal Note ..... page C–19
5. Split air pipe
6. Oil cooler pipe (AT)
   Removal Note ..... page C–19


37U0CX-041

Removal Note
Oil pipe

Remove the clip and disconnect the oil pipe.

Caution
- **Use a drain pan to catch the oil when the oil pipe is disconnected.**

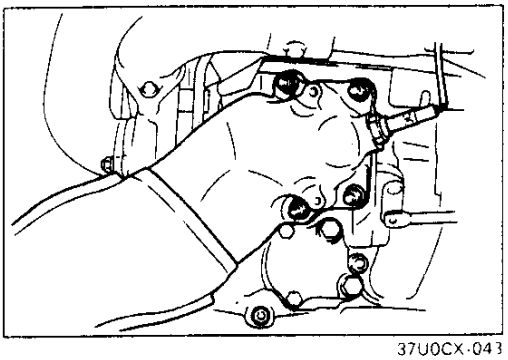


37U0CX-042

Insulator

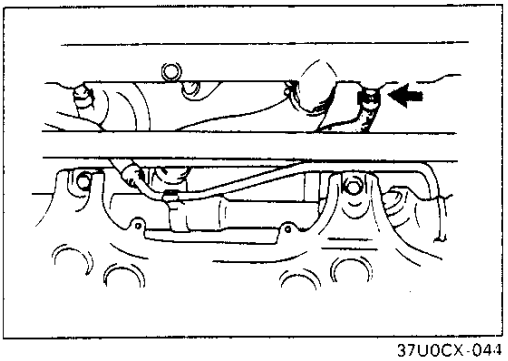
Remove the insulators in the order shown in the figure.

Caution
- **Do not allow oil on the insulators.**


37U0CX-043

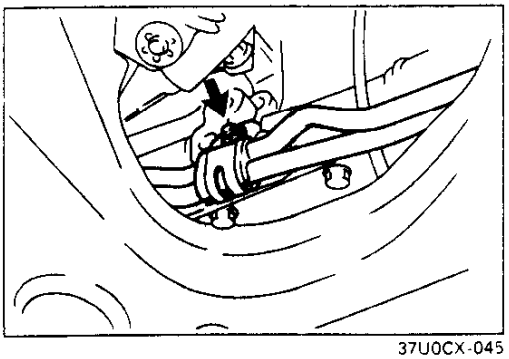
Front exhaust pipe

1. Disconnect the oxygen sensor harness.
2. Remove the front exhaust pipe.


37U0CX-044

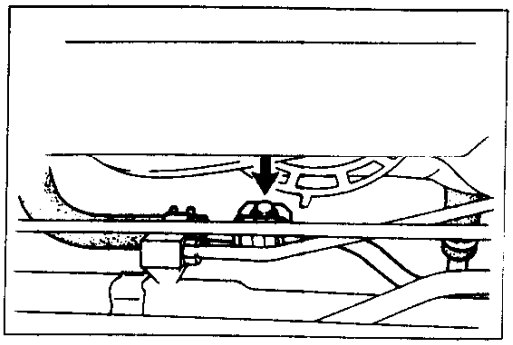
Oil cooler pipe (AT)

1. Disconnect the oil cooler pipe.


37U0CX-045

2. Remove the nut shown in the figure.

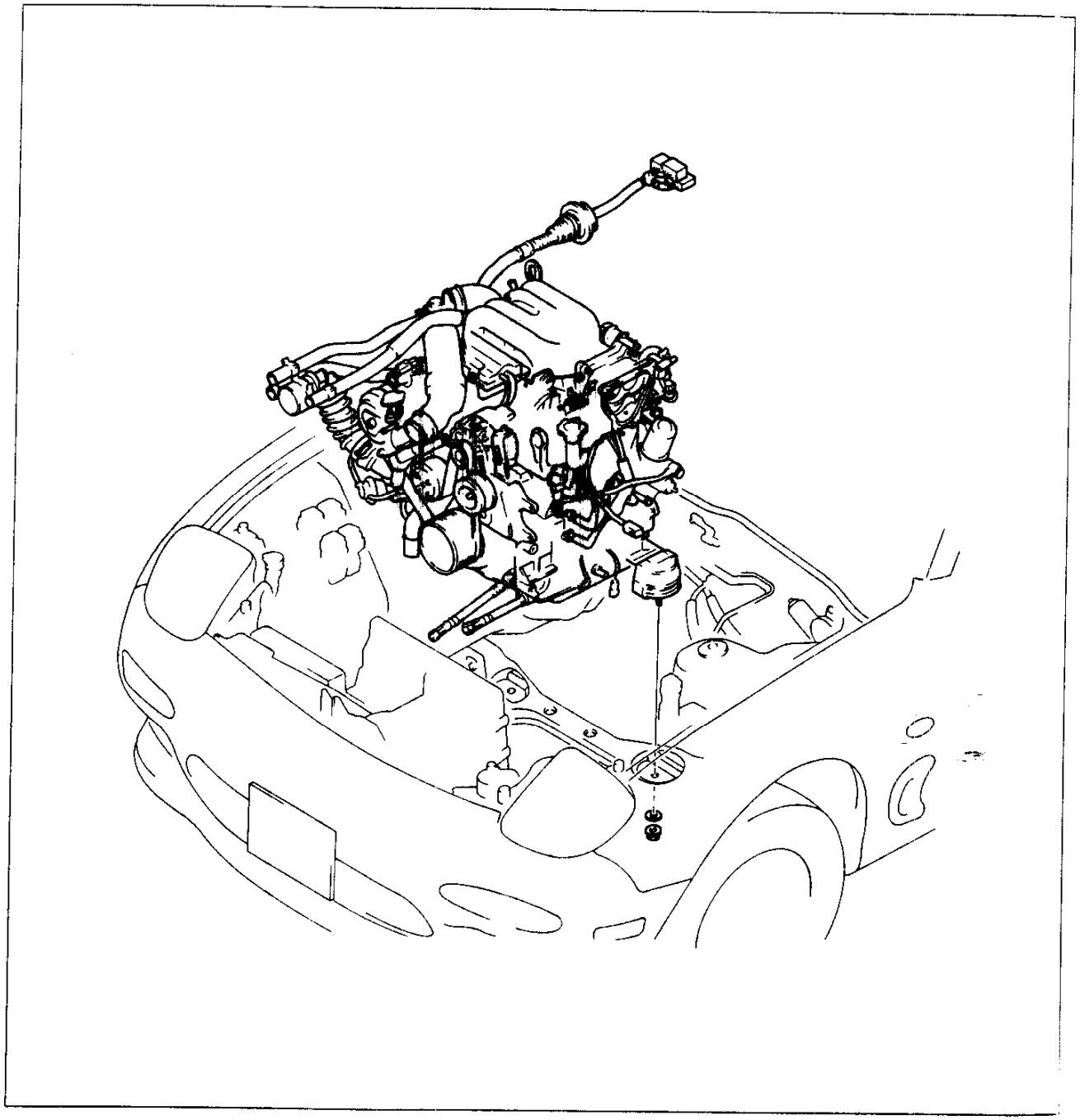
REMOVAL



37U0CX-046

3. Remove the bolt shown in the figure and disconnect the oil cooler pipe from the engine.

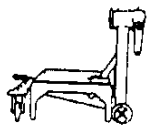
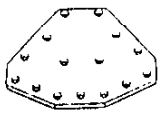
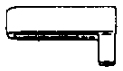
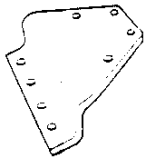
Step 4



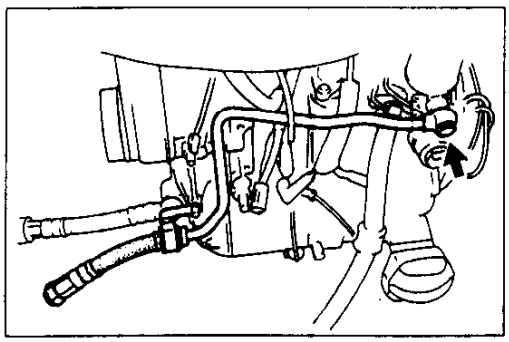
37U0CX-047

ENGINE STAND MOUNTING

PREPARATION
SST

49 O107 680A Stand, engine 	For disassembly / assembly of engine	49 L010 1A0 Hanger set, engine stand 	For disassembly / assembly of engine
49 L011 101 Plate (Part of 49 L011 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 L011 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 1114 005 Hanger, engine 	For disassembly / assembly of engine		

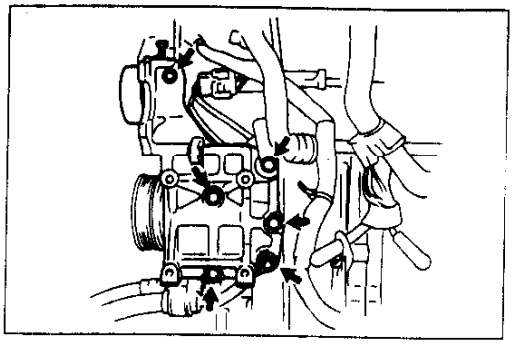
37U0CX-048



37U0CX-049

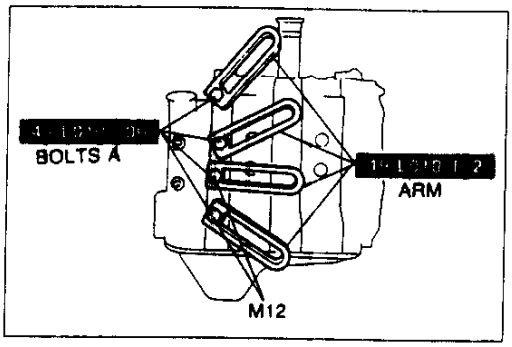
PROCEDURE
When using 49 L010 1A0

1. Remove the oil pipe.



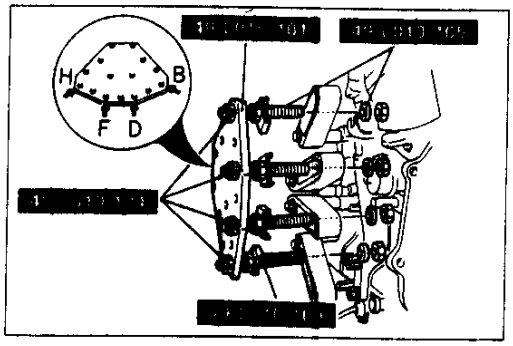
37U0CX 050

2. Remove the A/C compressor and P/S oil pump bracket.
3. Remove the stud.



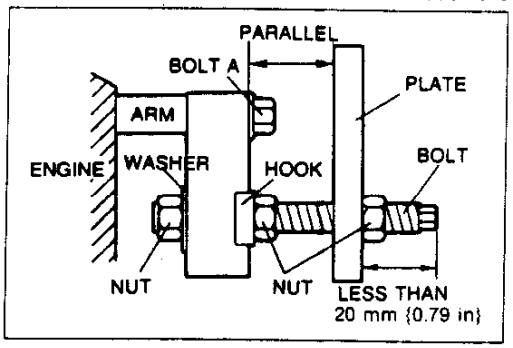
37U0CX-051

4. Install the **SST** (arms) to the block holes shown in the figure and loosely tighten bolts A.



97U0CX-045

5. Assemble the **SST** (bolts, nuts, hooks and plate).
6. Install the **SST** assembly to the respective arms while adjusting parallelism between the arms and plate by turning the bolts and nuts.

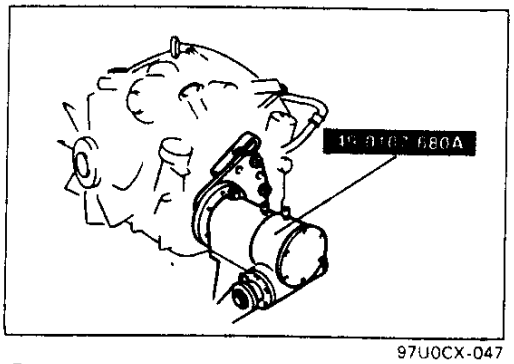


97U0CX-046

Warning

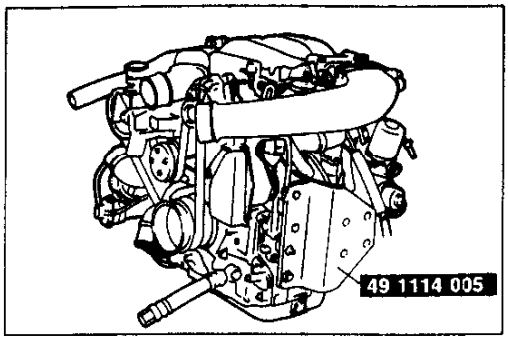
- **Use special caution while turning the engine stand handle to prevent hand injury.**

7. Tighten the bolts and nuts to affix the **SST**.



97U0CX-047

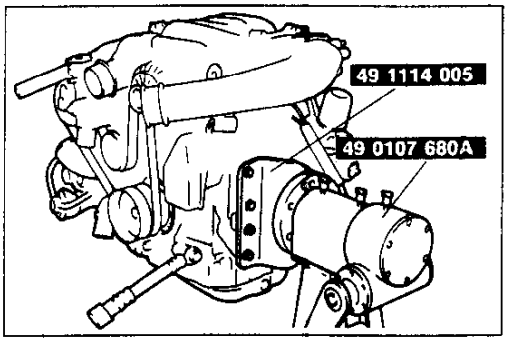
8. Install the engine on the **SST** (engine stand).



37U0CX-052

When using 49 1114 005

1. Remove the engine mounts, A/C compressor, and P/S oil pump bracket.
2. Install the **SST** as shown in the figure.

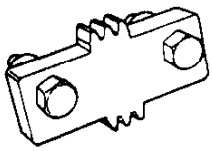
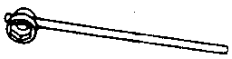
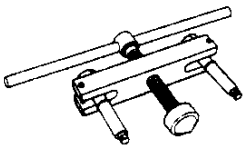
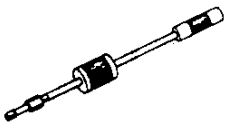
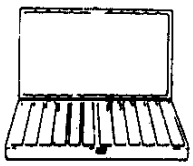
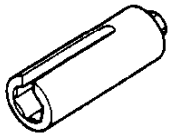


37U0CX-053

3. Mount the engine on the **SST** (engine stand).

DISASSEMBLY

PREPARATION
SST

49 F011 101 Brake, ring gear 	For prevention of engine rotation	49 1881 055A Stopper, counterweight 	For prevention of engine rotation
49 0820 035 Box wrench flywheel 	For removal/ installation of locknut	49 0839 305A Puller counterweight 	For removal of counterweight
49 0813 215A Puller, tubular dowel 	For removal of tubular dowel	49 0813 225 Remover, oil seal 	For removal of oil seal
49 0813 250 Case, seal 	For arrangement of rotor seals	49 H018 001 Wrench, knock sensor 	For removal of knock sensor

37U0CX-054

DISASSEMBLY

1. Code all identical parts (such as rotors, rotor oil seals, rotor seals, and seal springs) so that they can be reinstalled in the location from which they were removed.
2. Clean the parts with a steam cleaner; blow off any remaining water with compressed air.

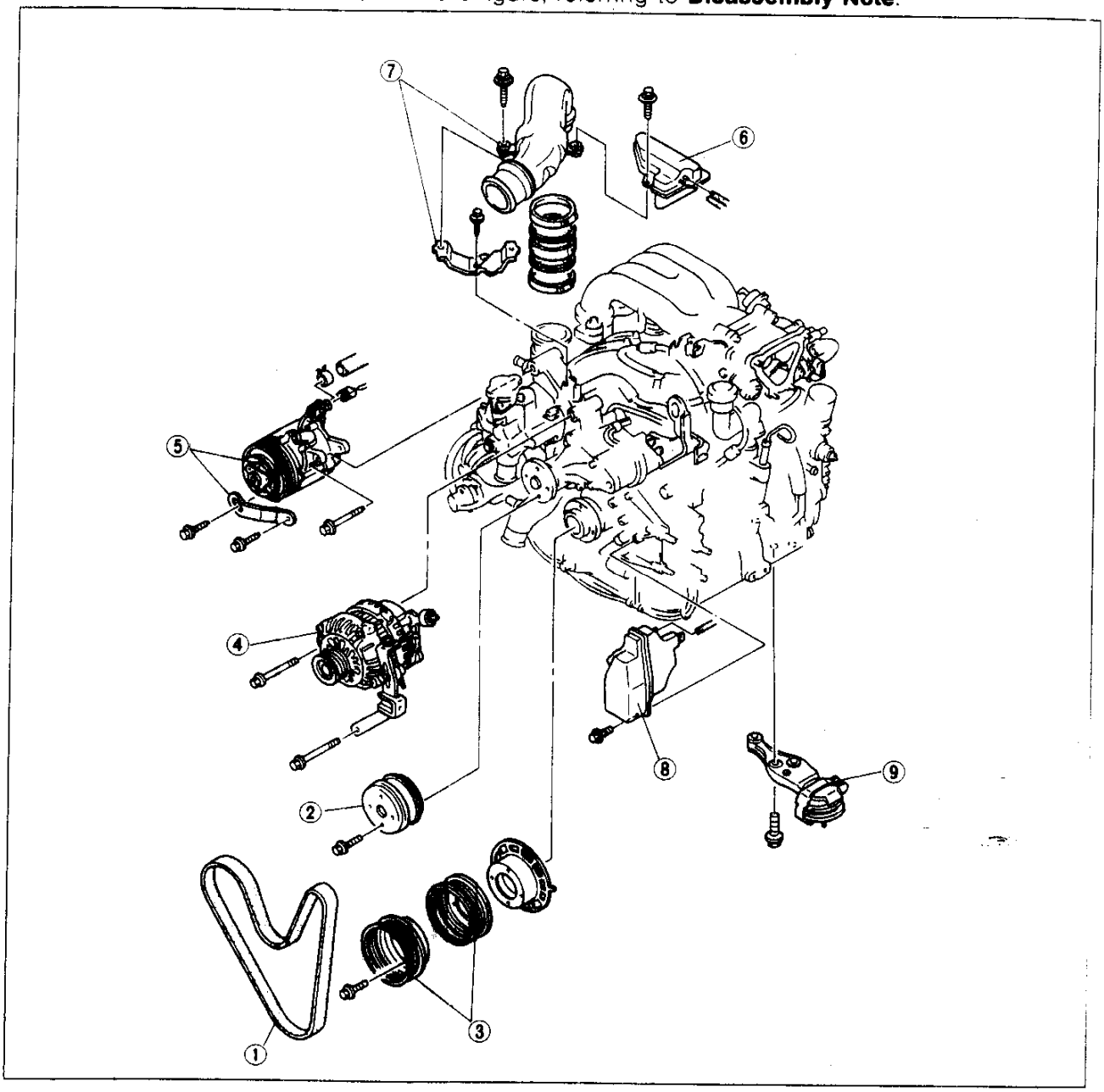
Note

- **During the disassembly of any part or system, be sure to study its order of assembly. Also, note any deformation, wear, or damage.**

AUXILIARY PARTS (I)

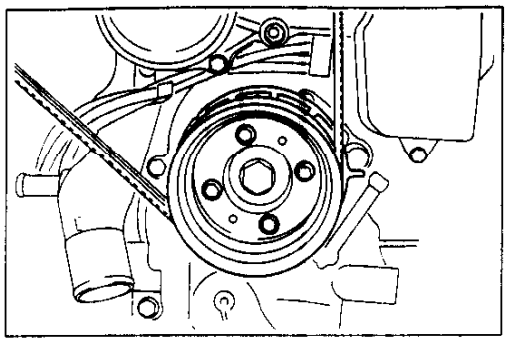
97U0CX-049

1. Drain the engine oil.
2. Disassemble in the order shown in the figure, referring to **Disassembly Note**.



37U0CX-055

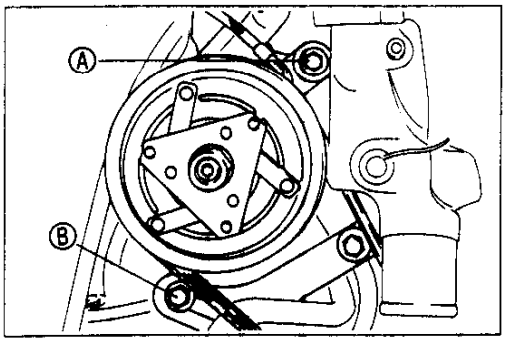
1. Drive belt
   Disassembly Note ..... page C-25
2. Water pump pulley
3. Drive belt pulley
4. Alternator and bracket
5. Air pump and bracket
6. Pressure chamber
7. Air pipe and bracket
8. Vacuum chamber
9. Engine mount (RH and LH)



37U0CX-056

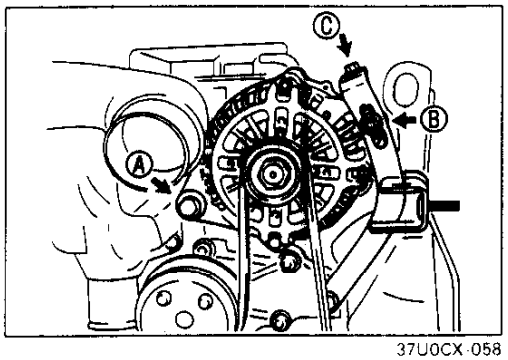
Disassembly Note
Drive belt

1. Loosen the water pump pully lock bolts and drive belt pully bolts.



37U0CX-057

2. Loosen air pump lock bolts A and B.



37U0CX-058

3. Loosen alternator lock bolt A and nut B.
4. Loosen adjusting bolt C.
5. Remove the drive belt.

TURBOCHARGER

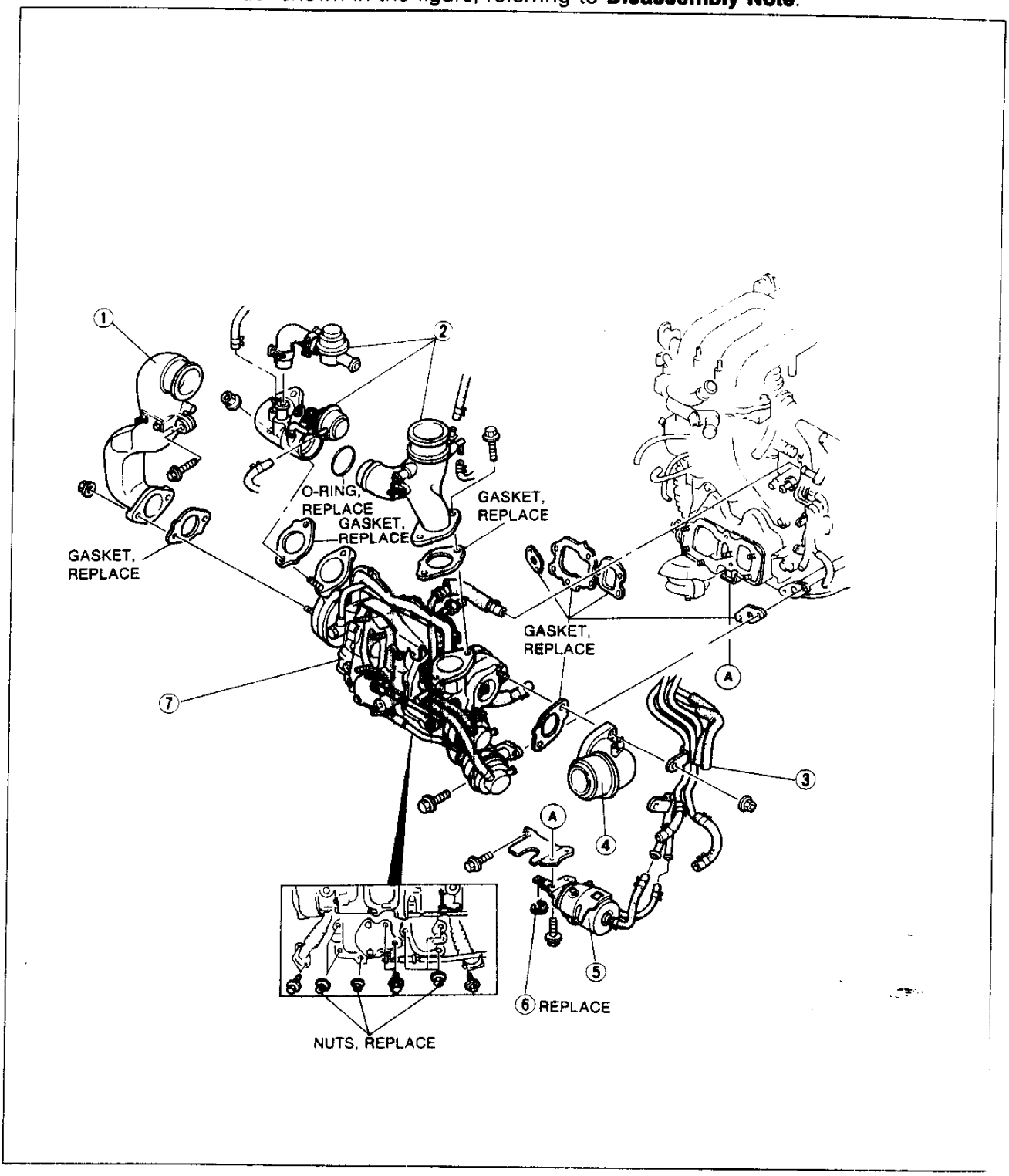
Caution

- **When removing and carrying the turbocharger, do not hold the actuator, rod or actuator hose.**
- **If studs are damaged, replace them with the specified studs and nuts. Using unspecified studs may cause gas leakage because of insufficient clamping.**
- **As the turbocharger operates at high speed and high temperature, use care to prevent deformation of the oil pipe and entry of any foreign material into the oil line.**
- **Tape the turbocharger air port and exhaust port to prevent entry of any foreign material.**
- **Do not deform the insulators, and do not allow oil on them.**

37U0CX-059

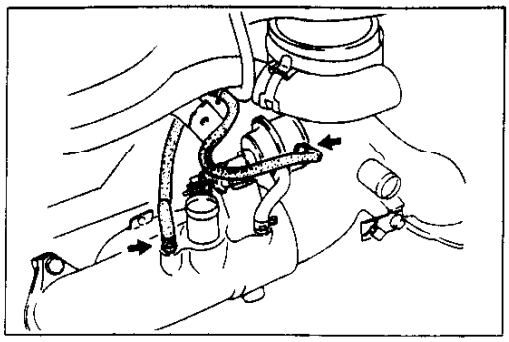
DISASSEMBLY

Disassemble in the order shown in the figure, referring to **Disassembly Note**.



37U0CX-060

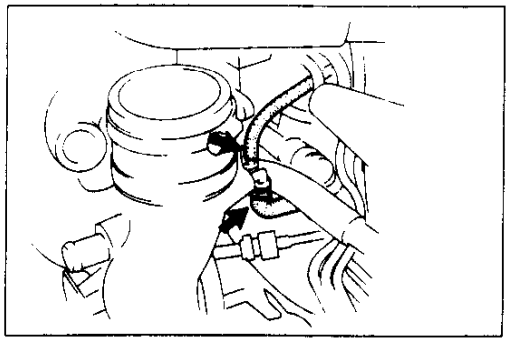
1. Air pipe
2. Air pipe and control valve
   Disassembly Note ..... page C–27
3. Vacuum pipe
   Disassembly Note ..... page C–27
4. Air intake pipe
5. Turbo control actuator
   Disassembly Note ..... page C–27
6. Clip
7. Turbocharger assembly
   Disassembly Note ..... page C–28



37U0CX 061

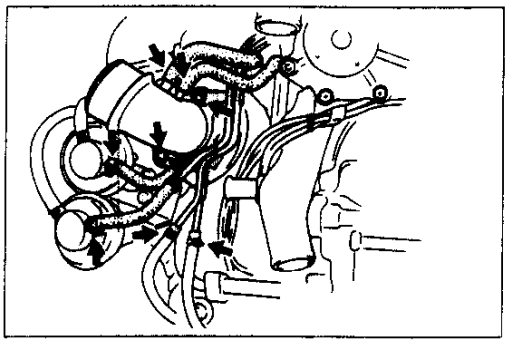
Disassembly Note
Air pipe and control valve

1. Disconnect the hoses shown in the figure.



37U0CX-062

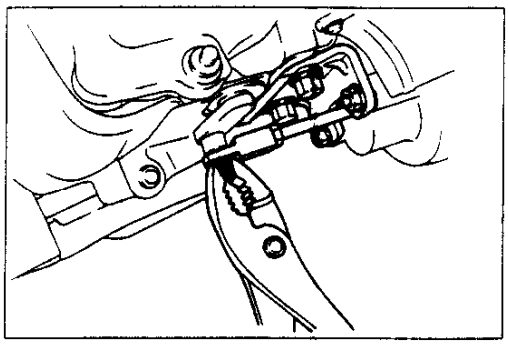
2. Disconnect the vacuum hoses shown in the figure.
3. Remove the air pipe and control valve assembly.



37U0CX-063

Vacuum pipe

1. Disconnect the vacuum hoses shown in the figure.
2. Remove the nuts shown in the figure.
3. Disconnect the vacuum pipe from the turbocharger.

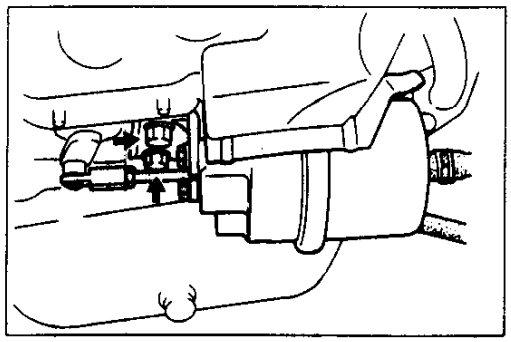


37U0CX-064

Turbo control actuator

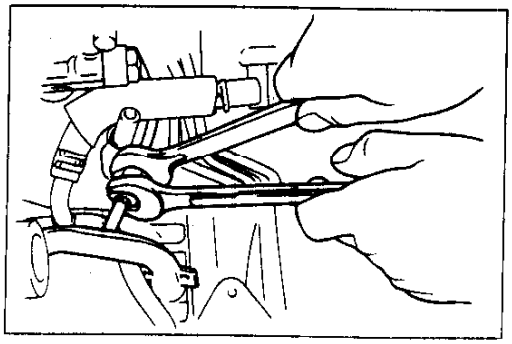
1. Remove the clip shown in the figure.

Caution
- **Do not reuse the clip.**



37U0CX-065

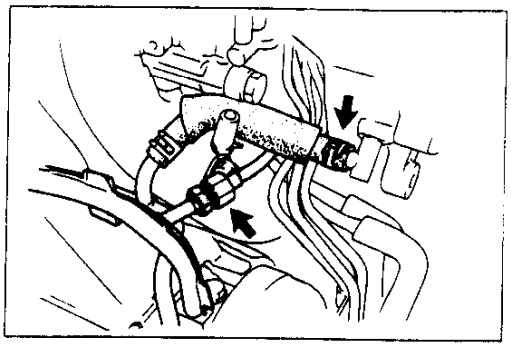
2. Remove the bolts and remove the turbo control actuator.



37U0CX-066

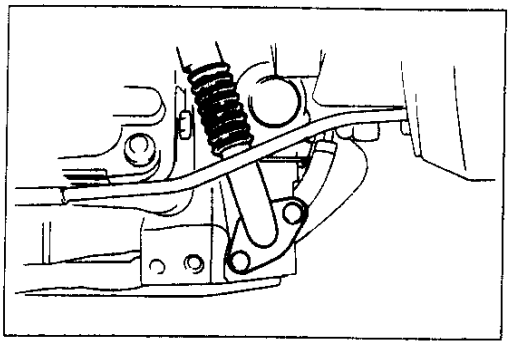
Turbocharger assembly

Caution
- **Hold the pipe by using a wrench.**



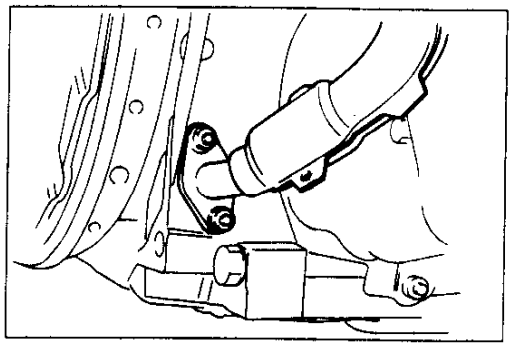
37U0CX-067

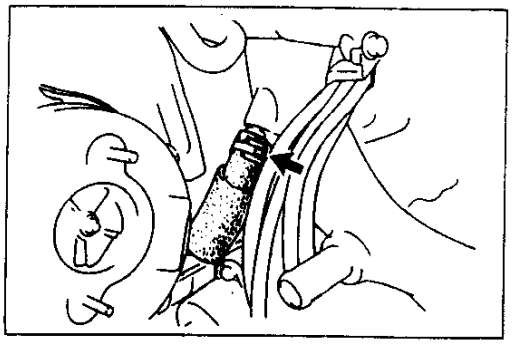
1. Disconnect the water hose and the oil inlet pipe shown in the figure.



37U0CX-068

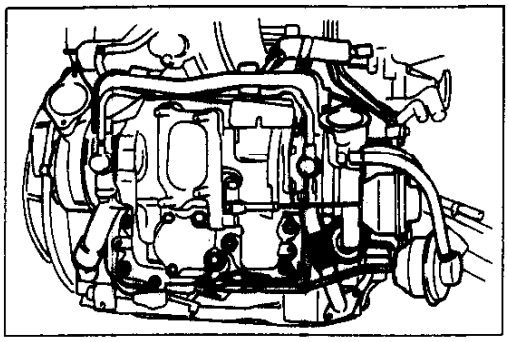
2. Disconnect the oil outlet pipes.





37U0CX-069

3. Disconnect the water hose.



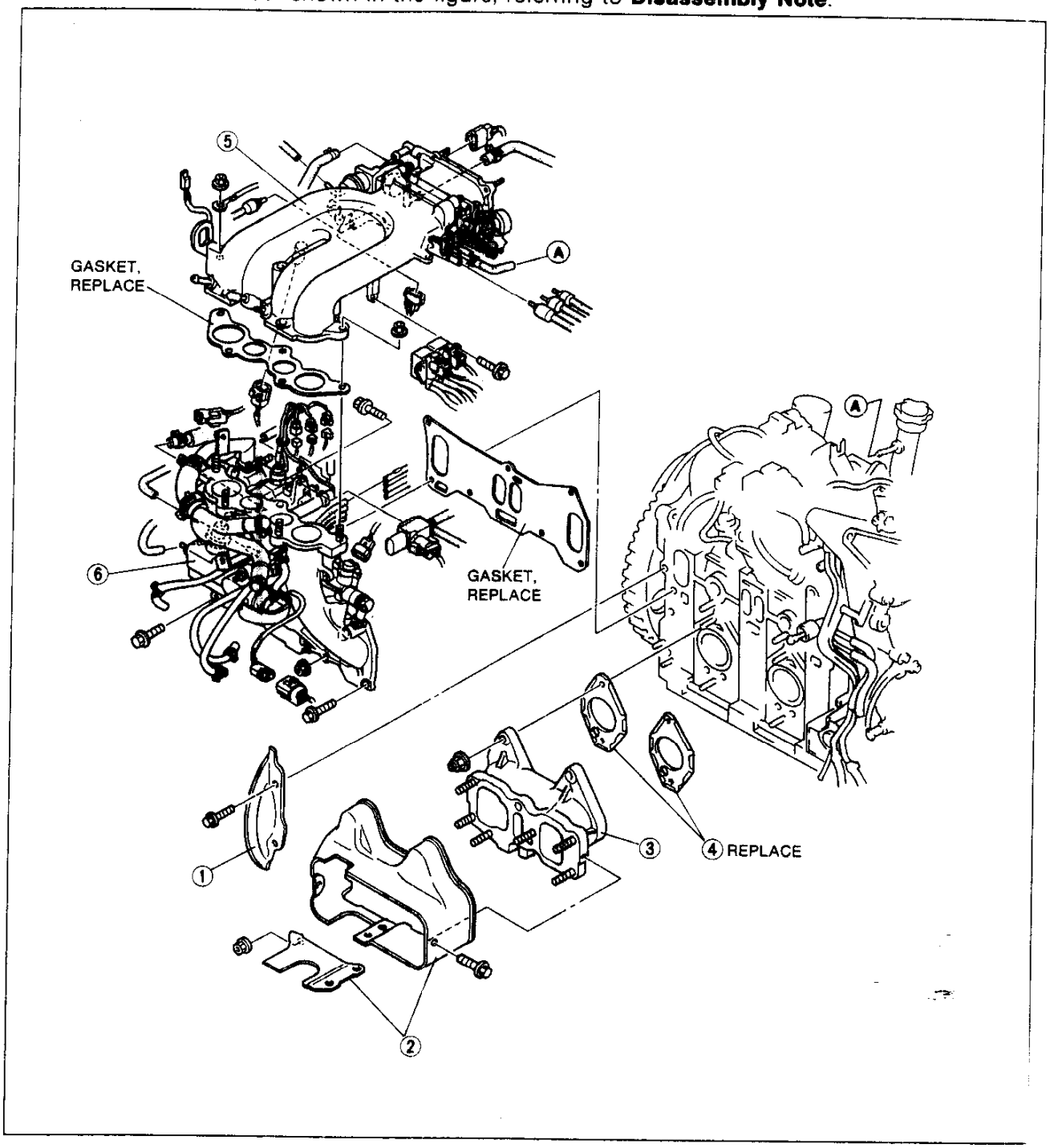
37U0CX-070

4. Remove the bolts and nuts and remove the turbocharger assembly.

Caution
- **Do not reuse the nuts.**

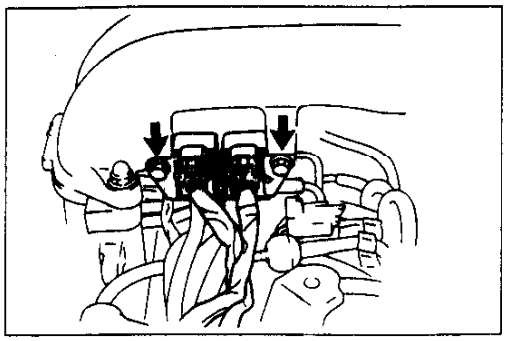
AUXILIARY PARTS (II)

Disassemble in the order shown in the figure, referring to **Disassembly Note**.



37U0CX-071

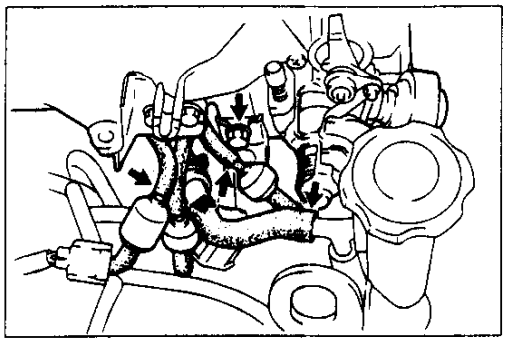
1. Oil seal plate
2. Exhaust manifold insulator
3. Exhaust manifold
4. Exhaust manifold gasket
5. Surge tank assembly
   Disassembly Note ..... page C–31
6. Intake manifold assembly
   Disassembly Note ..... page C–32



37U0CX-072

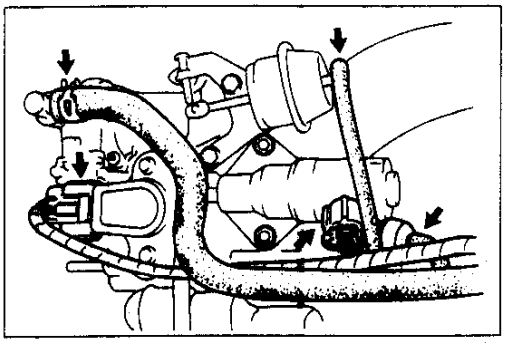
Disassembly Note
Surge tank assembly

1. Remove the bolts shown in the figure.
2. Disconnect the duty solenoid valve from the surge tank.



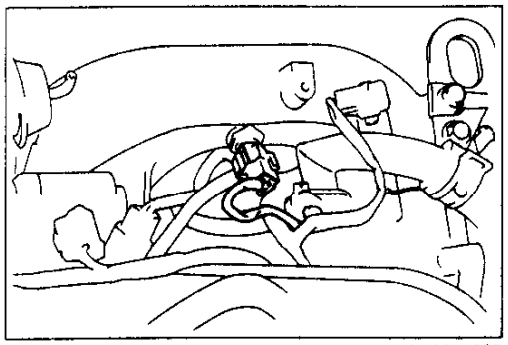
37U0CX-073

3. Disconnect the vacuum hoses and blowby hose shown in the figure.
4. Loosen the bolt shown in the figure.



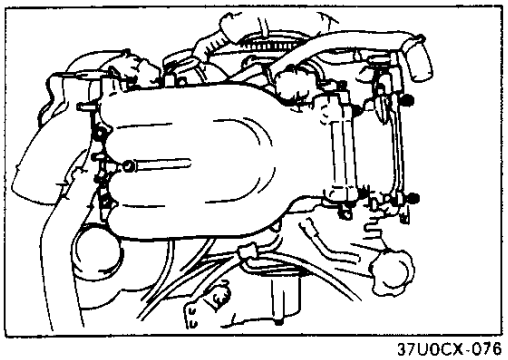
37U0CX-074

5. Disconnect the hoses and connectors shown in the figure.



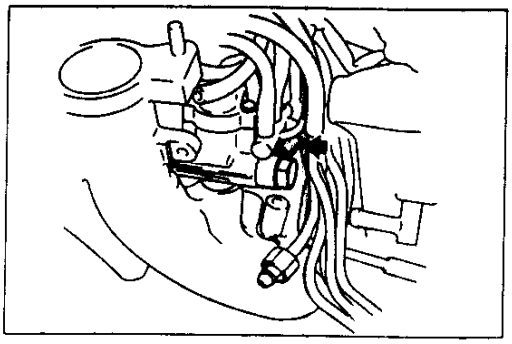
37U0CX-075

6. Disconnect the connector shown in the figure.



37U0CX-076

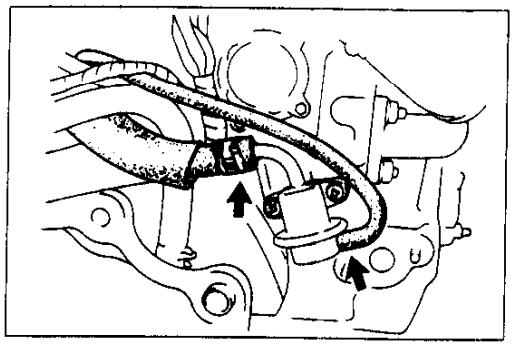
7. Remove the bolts and remove the surge tank assembly.



37U0CX-077

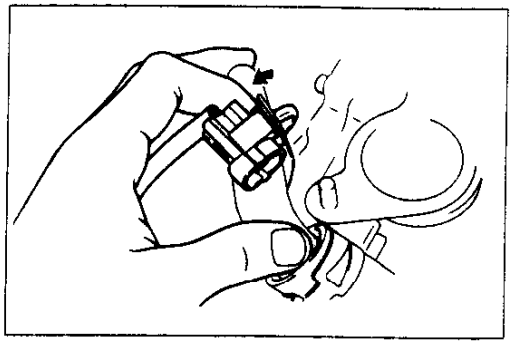
Intake manifold assembly

1. Disconnect the hose shown in the figure.



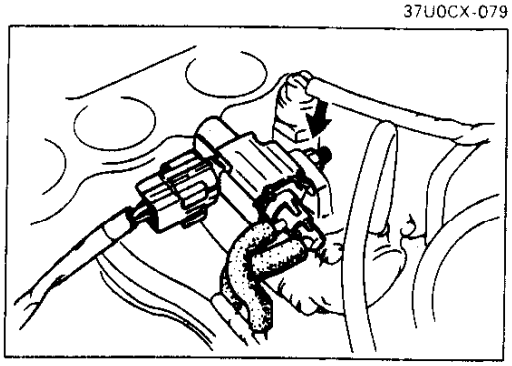
37U0CX-078

2. Disconnect the fuel hose and vacuum hose shown in the figure.



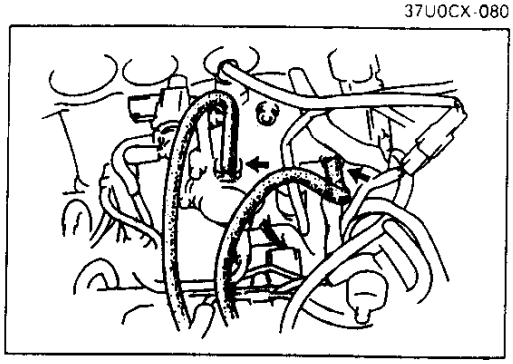
37U0CX-079

3. Remove the oxygen sensor connector.



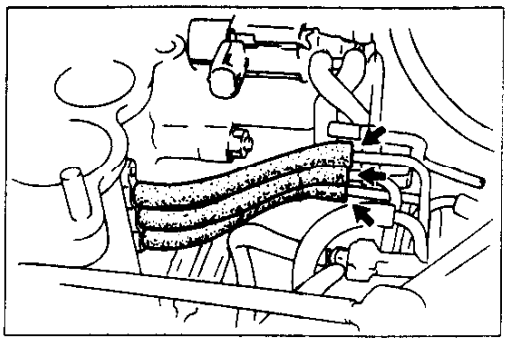
37U0CX-080

4. Remove the nut shown in the figure.
5. Remove the three-way solenoid.

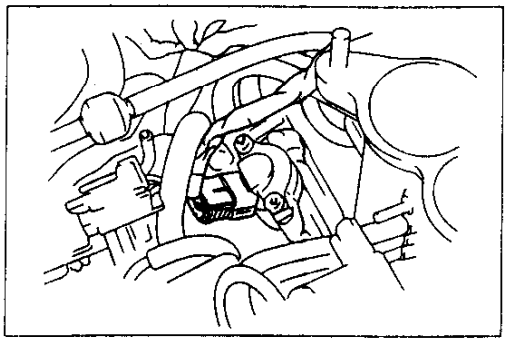


37U0CX-081

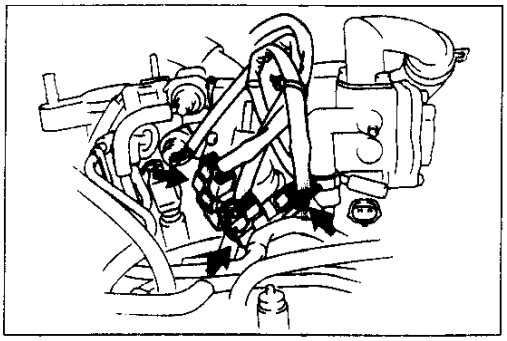
6. Disconnect the vacuum hoses shown in the figure.


37U0CX-082

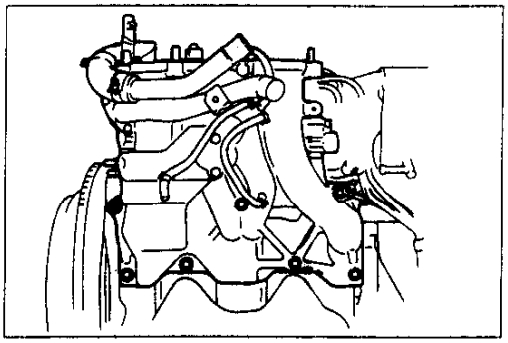
7. Disconnect the vacuum hoses shown in the figure.


37U0CX-083

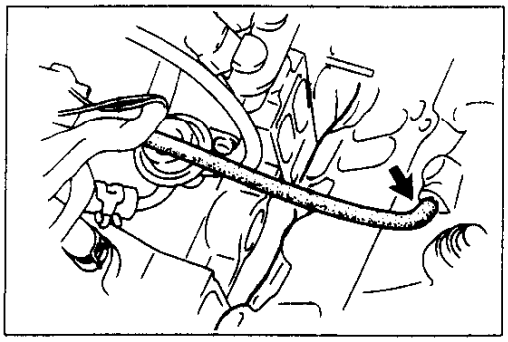
8. Disconnect the injector connectors.


37U0CX-084

9. Disconnect the connectors.


37U0CX-085

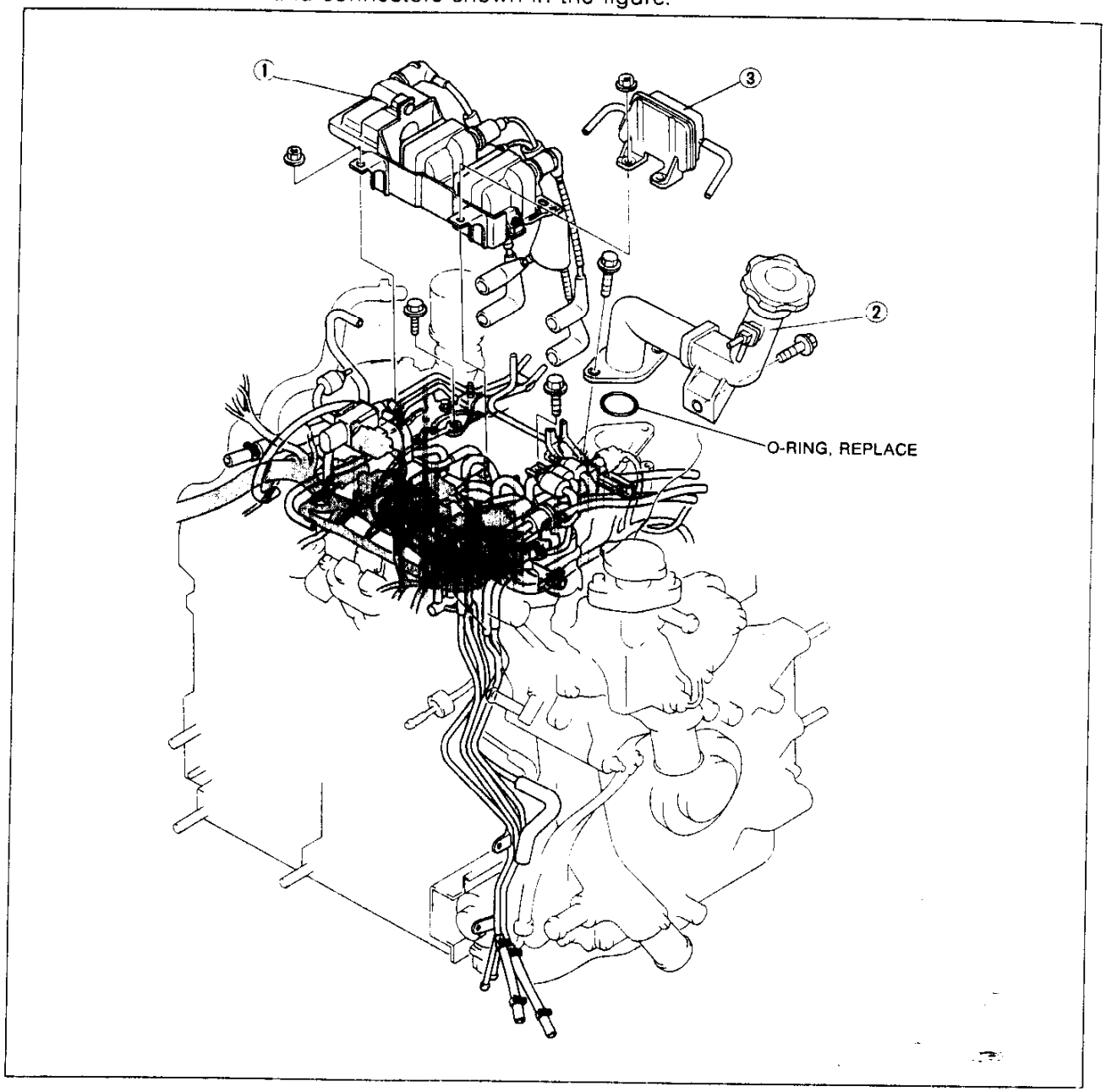
10. Remove the intake manifold assembly.


37U0CX-086

11. Disconnect the vacuum hose.

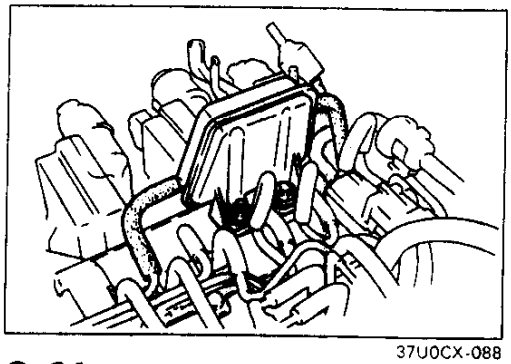
Vacuum pipe assembly

Disconnect the hoses and connectors shown in the figure.



37U0CX-08

1. Ignition coil assembly
   Disassembly Note ..... below
2. Oil filler pipe
3. Vacuum chamber



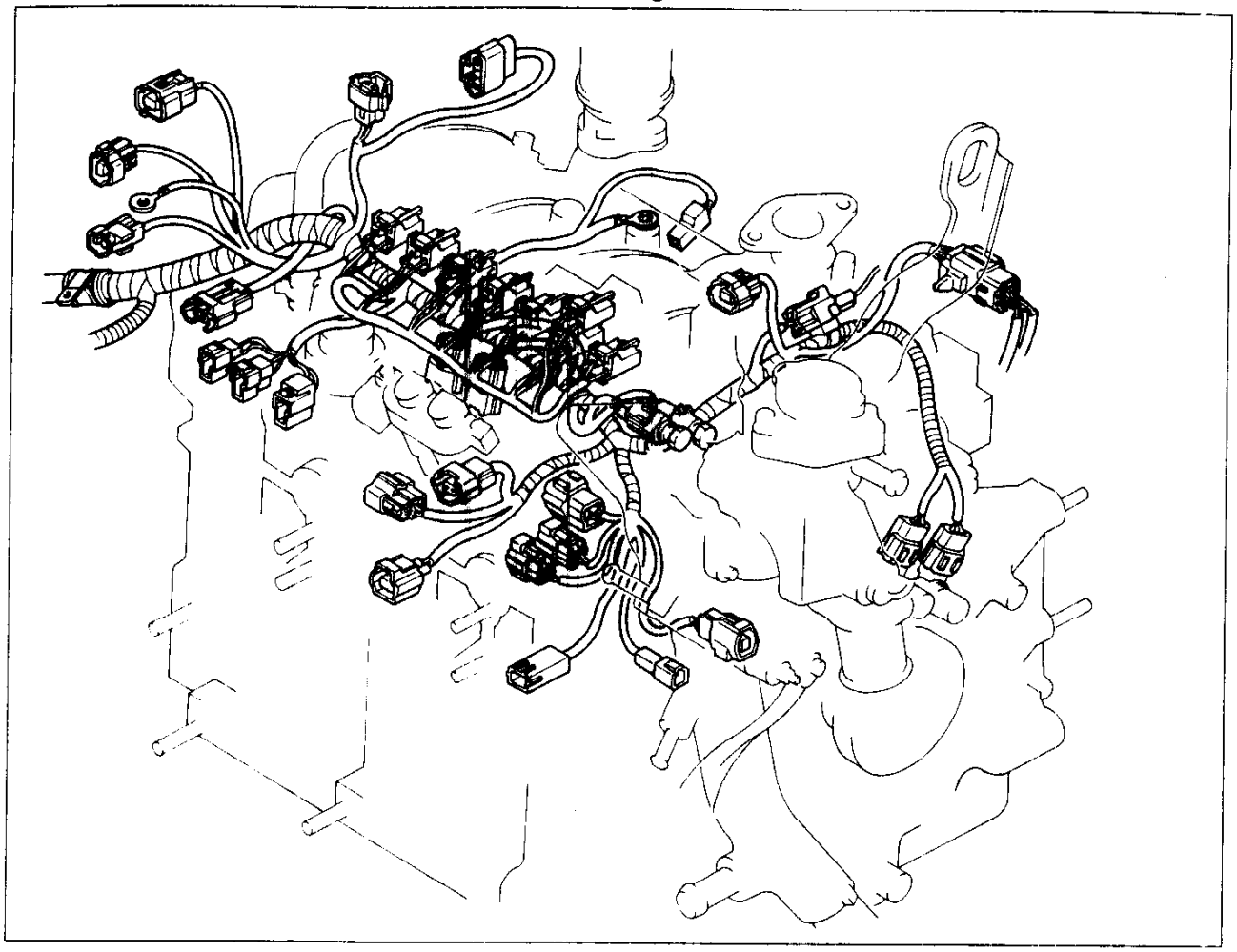
37U0CX-088

Disassembly Note
Ignition coil assembly

1. Remove the vacuum chamber.
2. Remove the ignition coil assembly.

Harness

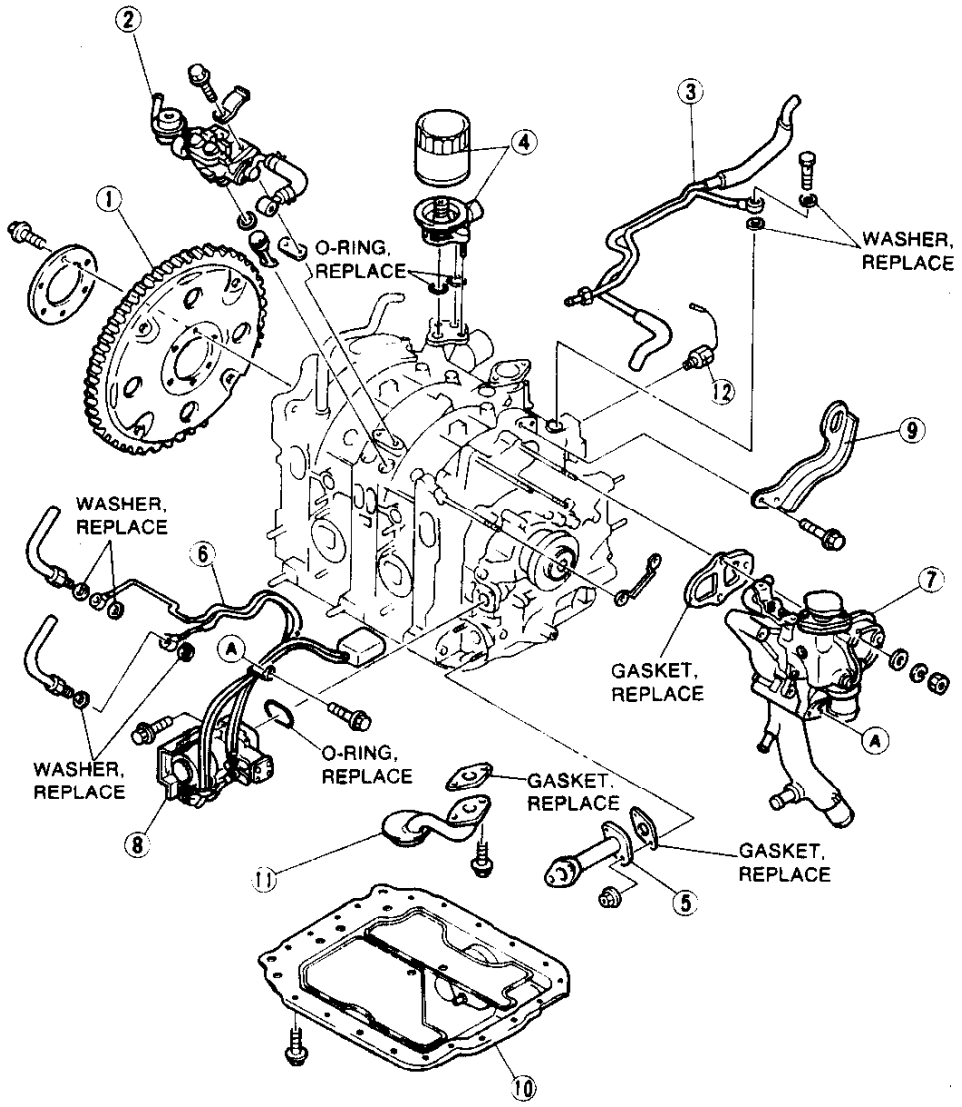
Disconnect the harness connectors shown in the figure.



37U0CX-039

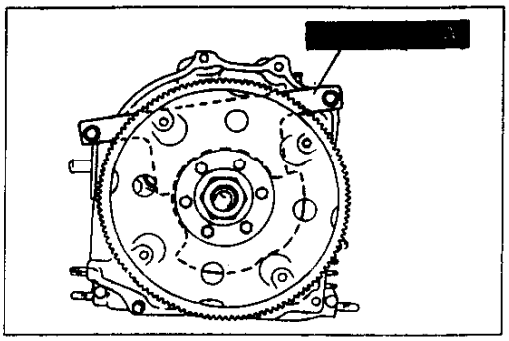
HOUSING (EXTERNAL PARTS I)

Disassemble in the order shown in the figure, referring to **Disassembly Note**.



37U0CX-09(

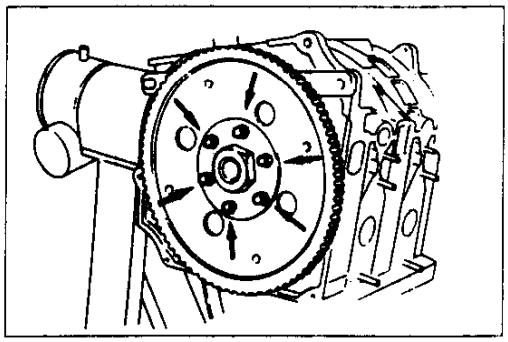
1. Drive plate (AT)
   Disassembly Note ..... page C–37
2. Fuel delivery pipe and mixing plate
   Disassembly Note ..... page C–37
   Service ..... Section F
3. Oil inlet pipe
4. Oil filter body
5. Oil pipe
6. Metering oil nozzle
   Service ..... Section D
7. Water pump body
   Disassembly Note ..... page C–37
   Service ..... Section E
8. Metering oil pump
   Service ..... Section D
9. Engine hanger
10. Oil pan
    Disassembly Note ..... page C–38
11. Oil strainer
12. Knock sensor
    Disassembly Note ..... page C–38



37U0CX-091

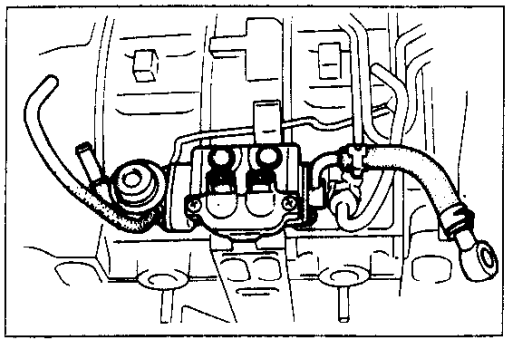
Disassembly Note
Drive plate (AT)

1. Attach the **SST** to the counterweight.



37U0CX-092

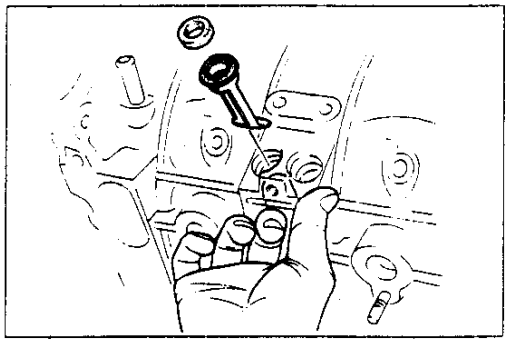
2. Remove the retainer and the drive plate.



37U0CX-093

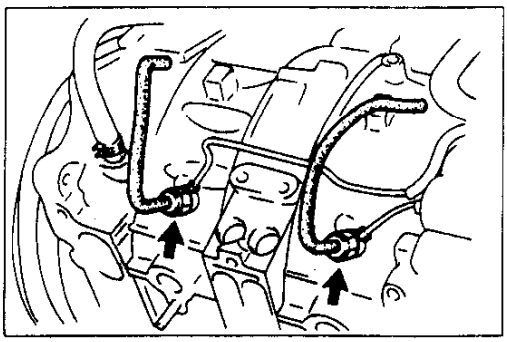
Fuel delivery pipe and mixing plate

1. Remove the fuel delivery pipe and spacer.



37U0CX-094

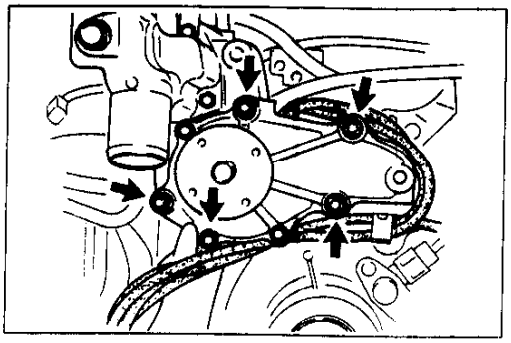
2. Reach into the intake port and push out the mixing plate by hand.



37U0CX-095

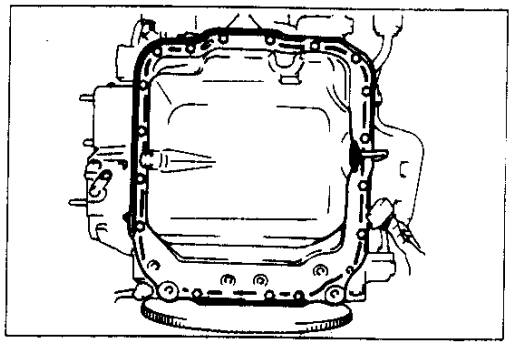
Water pump body

1. Disconnect the metering oil tubes.



37U0CX 096

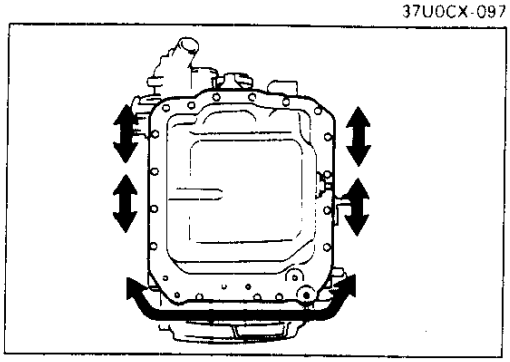
2. Remove the water pump body and spacer.



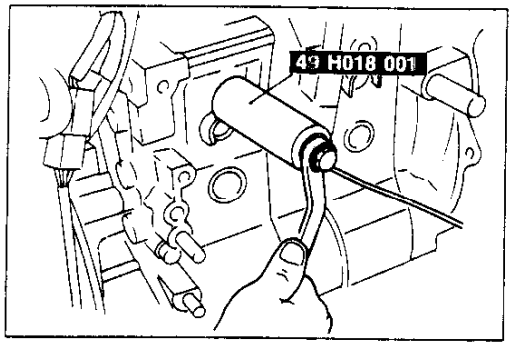
37U0CX-097

Oil pan

1. Remove the oil pan attaching bolts.



2. Remove the oil pan by inserting screwdriver or a suitable tool into only the areas shown in the figure.



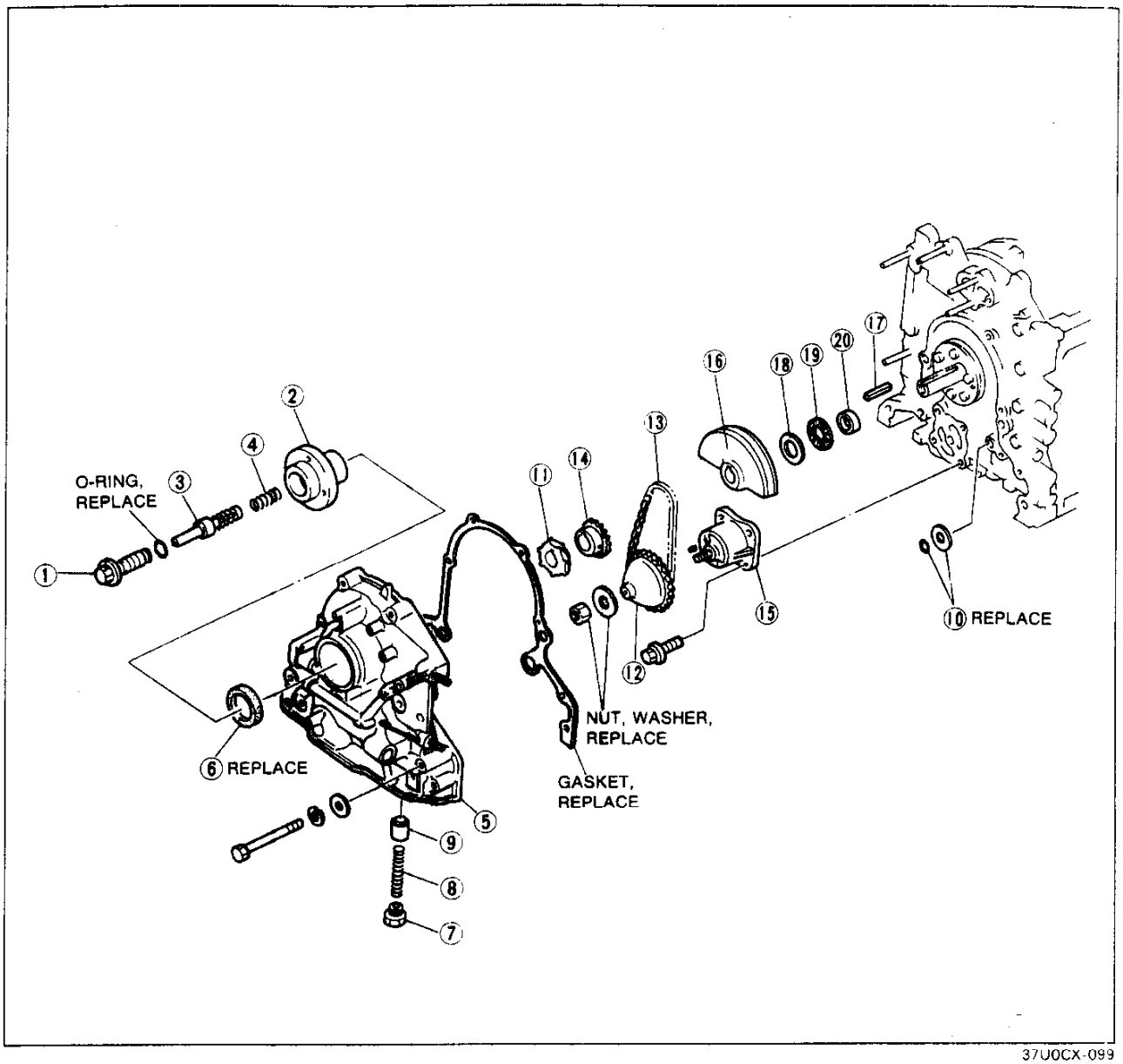
37U0CX-098

Knock sensor

Remove the knock sensor by using the **SST**.

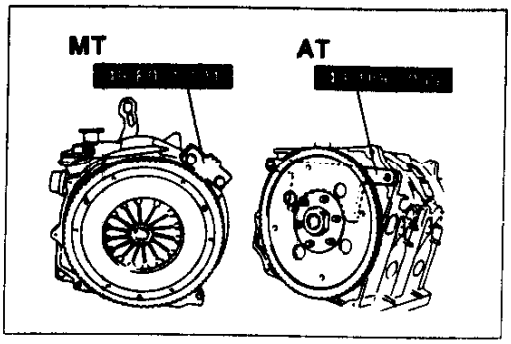
HOUSING (EXTERNAL PARTS II)

Disassemble in the order shown in the figure, referring to **Disassembly Note**.



37U0CX-099

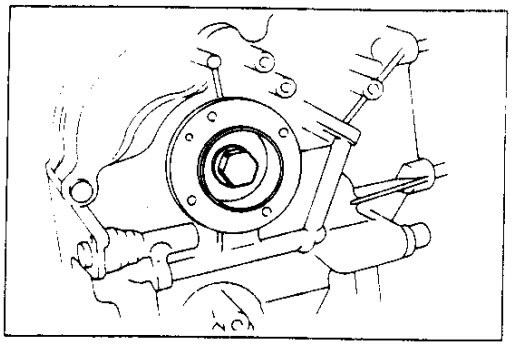
1. Eccentric shaft lock bolt
   Disassembly Note ..... page C–40
2. Pully boss
3. Eccentric shaft bypass valve
   Inspection ..... page C–59
4. Spring
5. Front cover
6. Oil seal
   Disassembly Note ..... page C–40
7. Plug
8. Control valve spring
9. Control valve
10. O-ring and backup ring
11. Drive gear
12. Oil pump sprocket wheel
    Disassembly Note ..... page C–40
13. Oil pump drive chain
    Inspection ..... page C–59
14. Oil pump drive gear
    Inspection ..... page C–59
15. Oil pump
    Service ..... Section D
16. Balance weight
17. Key
18. Thrust washer
    Inspection ..... page C–59
19. Needle bearing
    Inspection ..... page C–59
20. Spacer



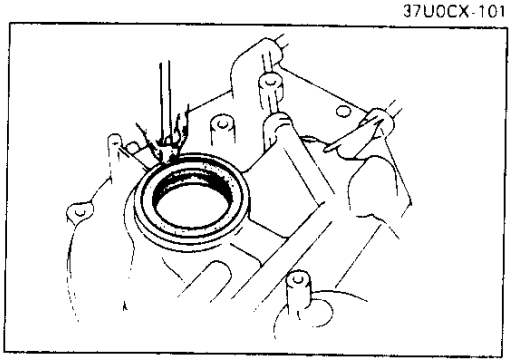
37U0CX-100

Disassembly Note
Eccentric shaft lock bolt

1. Attach the **SST** to the flywheel (MT) or counterweight (AT).

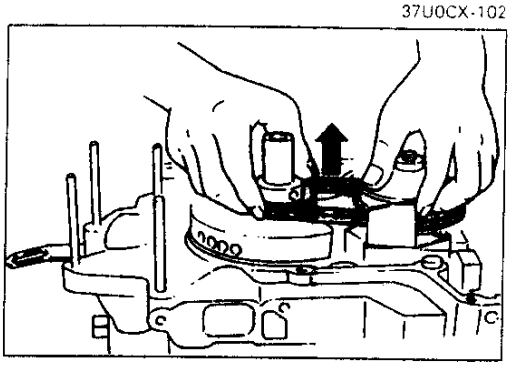

37U0CX-101

2. Remove the eccentric shaft lock bolt.


37U0CX-102

Oil seal

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

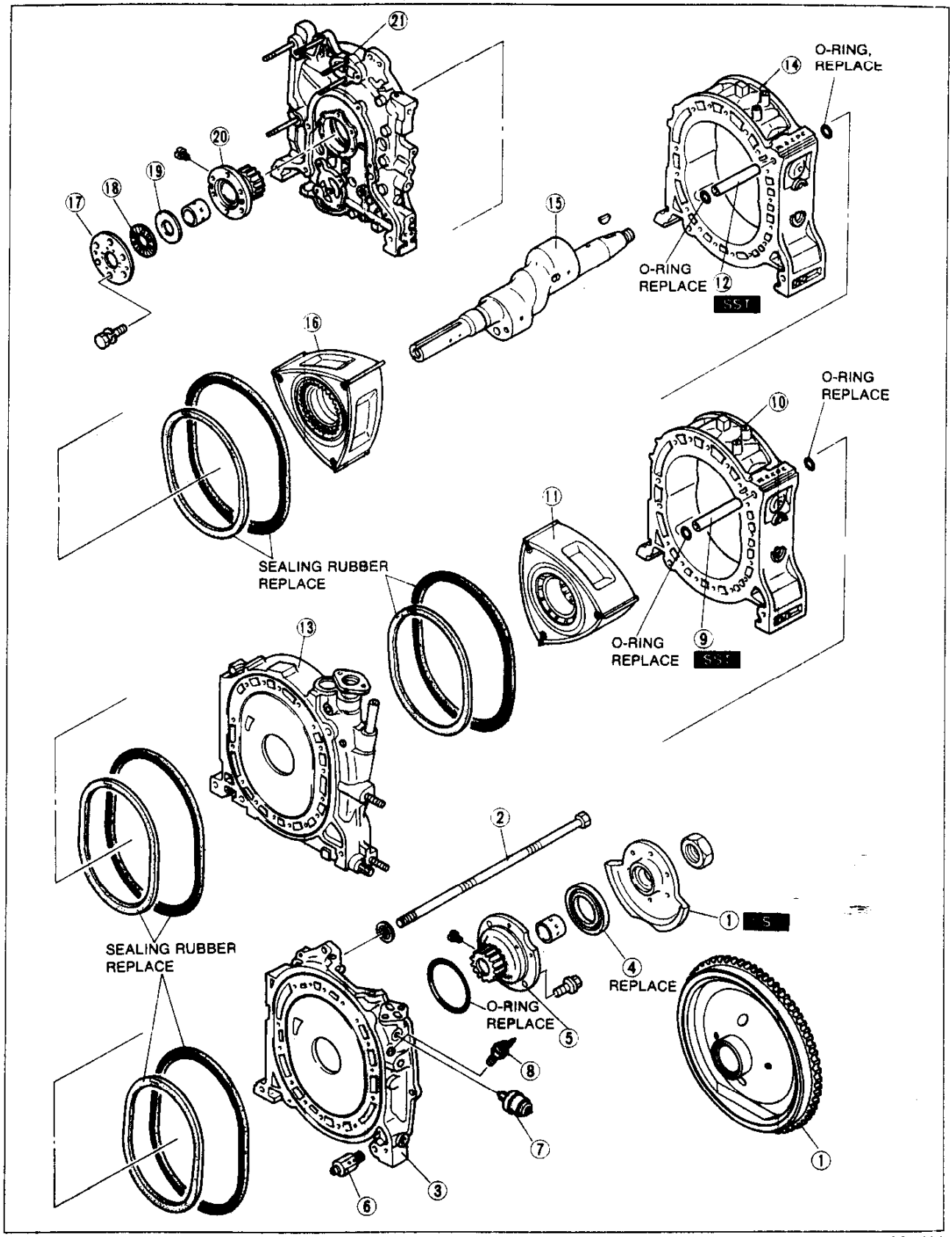

37U0CX-103

Oil pump sprocket wheel

1. Lift the lock washer tab and remove the sprocket locknut.
2. Remove the oil pump drive gear, sprocket wheel, and drive chain as an assembly.

HOUSING (INTERNAL PARTS)

Disassemble in the order shown in the figure, referring to **Disassembly Note**.



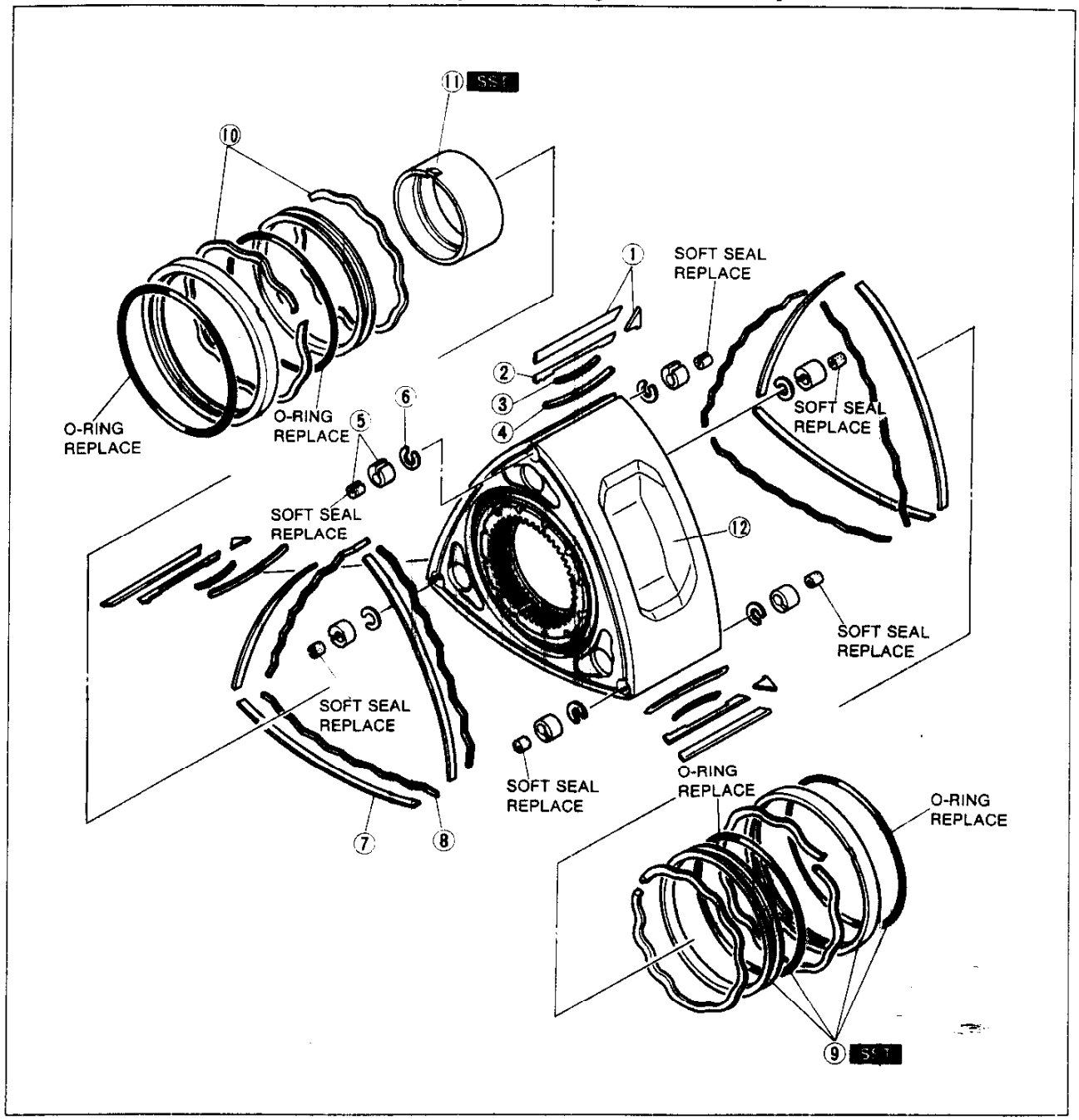
37U0CX-104

DISASSEMBLY

1. Flywheel (MT) / Counterweight (AT)
   Disassembly Note ..... page C–44
2. Tension bolts
   Disassembly Note ..... page C–45
3. Rear housing
   Disassembly Note ..... page C–45
   Inspection ..... page C–51
4. Rear oil seal
   Disassembly Note ..... page C–45
5. Rear stationary gear
   Inspection ..... page C–52
6. Oil regulator valve
   Service ..... Section D
7. Oil pressure switch
   Disassembly Note ..... page C–45
8. Heat gauge unit
9. Tubular dowel
   Disassembly Note ..... page C–46
10. Rear rotor housing
    Disassembly Note ..... page C–46
    Inspection ..... page C–54
11. Rear rotor
    Disassembly Note ..... page C–46
    Inspection ..... page C–54
12. Tubular dowel
    Disassembly Note ..... page C–47
13. Intermediate housing
    Disassembly Note ..... page C–47
    Inspection ..... page C–51
14. Front rotor housing
    Disassembly Note ..... page C–47
    Inspection ..... page C–54
15. Eccentric shaft
    Inspection ..... page C–58
16. Front rotor
    Disassembly Note ..... page C–47
    Inspection ..... page C–54
17. Plate
18. Needle bearing
    Inspection ..... page C–59
19. Thrust washer
    Inspection ..... page C–59
20. Front stationary gear
    Inspection ..... page C–52
21. Front housing
    Inspection ..... page C–51

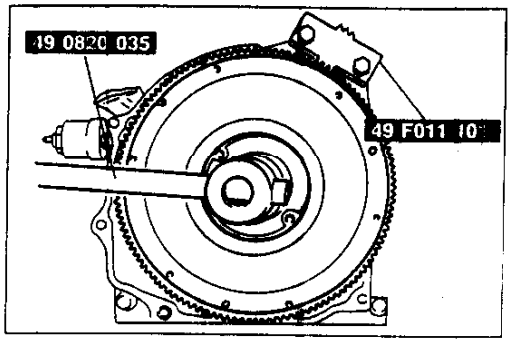
HOUSING (ROTOR)

Disassemble in the order shown in the figure, referring to **Disassembly Note**.



37U0CX-105

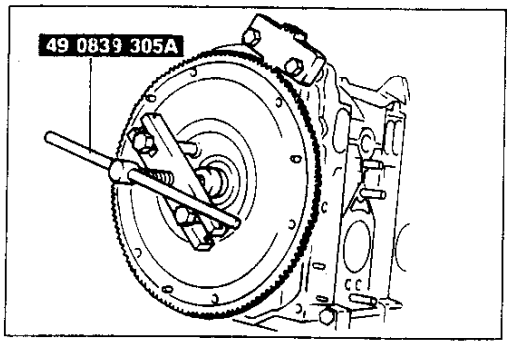
1. Apex seal and side piece
   Inspection ..... page C–57
2. Second piece
   Inspection ..... page C–57
3. Apex seal spring (short)
4. Apex seal spring (long)
5. Corner seal
   Inspection ..... page C–58
6. Corner seal spring
7. Side seal
   Inspection ..... page C–57
8. Side seal spring
9. Oil seal and O-ring
   Disassembly Note ..... page C–48
   Inspection ..... page C–56
10. Oil seal spring
11. Rotor bearing
   Inspection ..... page C–56
12. Rotor
   Inspection ..... page C–55



97U0CX-106

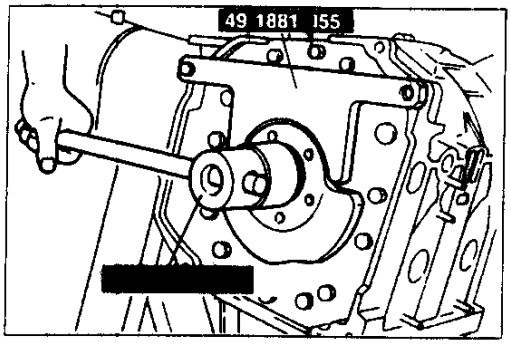
Disassembly Note
Flywheel (MT)

1. Remove the flywheel nut by using the **SST**.



37U0CX-107

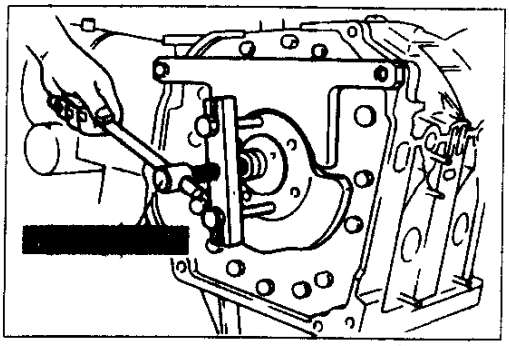
2. Remove the flywheel by using the **SST**.
3. Remove the key.
4. Remove the **SST**.



37U0CX-108

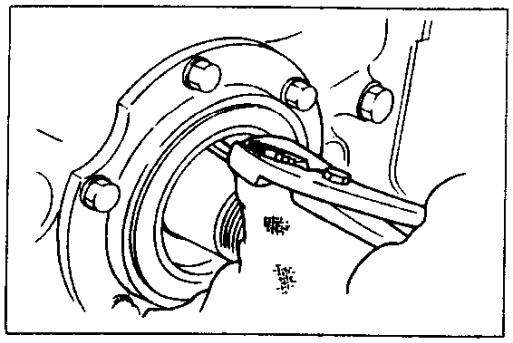
Counterweight (AT)

1. Remove the counterweight nut by using the **SST**.



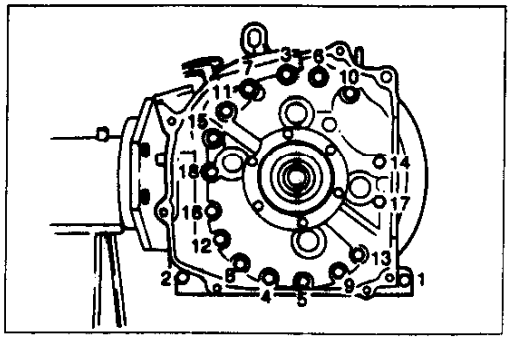
37U0CX-109

2. Remove the counterweight by using the **SST**.



37U0CX-110

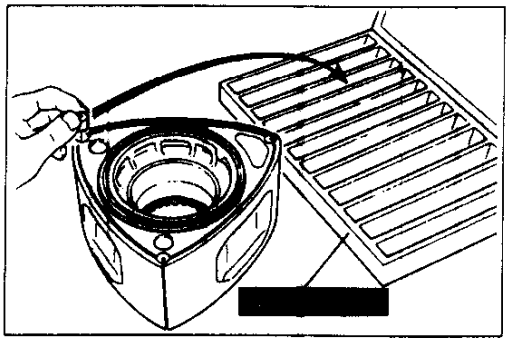
3. Remove the key by using a rag.
4. Remove the **SST**.



37U0CX-111

Tension bolts

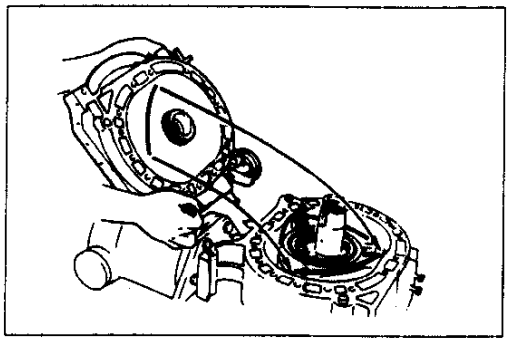
Loosen the tension bolts gradually and in the sequence shown in the figure; then remove them.



37U0CX-112

Note

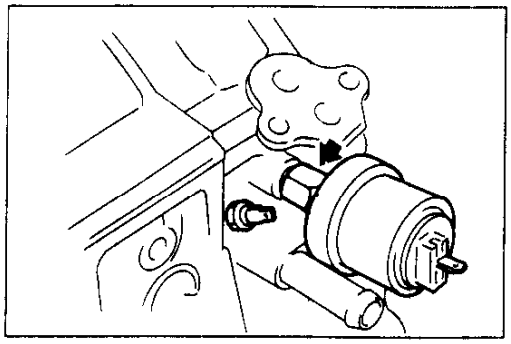
- **Rotor seals – apex seals, side seals and corner seals – are distinguishable by the numbers near each respective groove on the retor face. Place them in the SST in accordance with the numbers.**



37U0CX-113

Rear housing

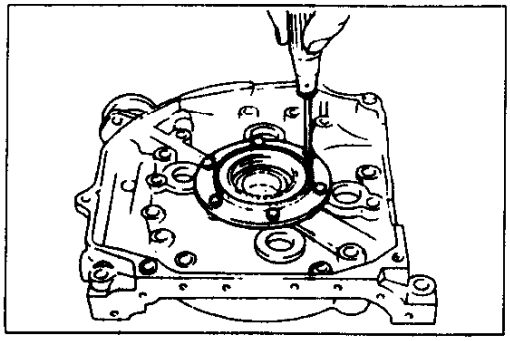
1. Remove the rear housing.
2. If the seals stick to the housing when it is removed, put them back into their original position.



37U0CX-114

Oil pressure switch

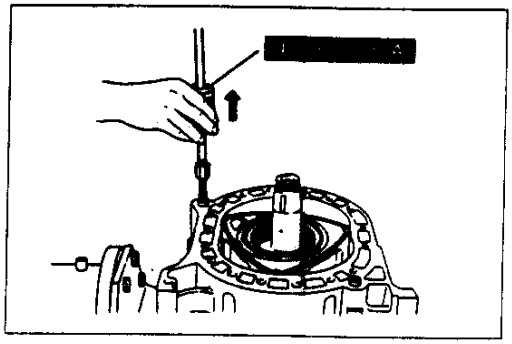
Remove the oil pressure switch by using a wrench.



37U0CX-115

Rear oil seal

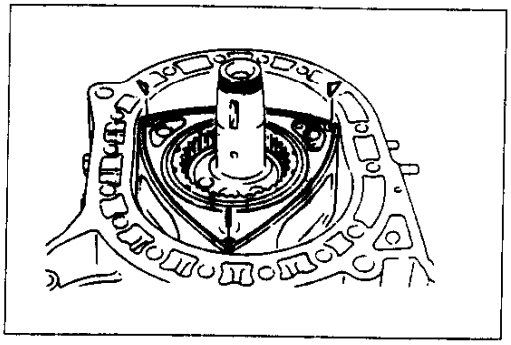
Remove the oil seal cover and the oil seal from the rear housing.



37U0CX-116

Tubular dowel

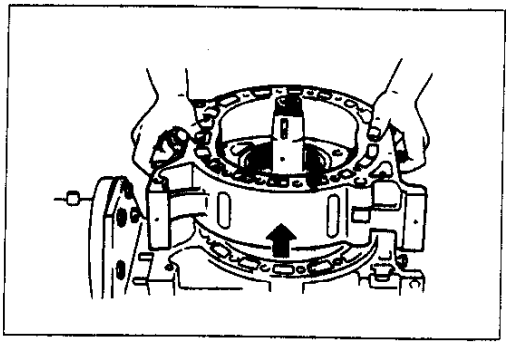
Remove the tubular dowels by using the **SST**.



37U01X-117

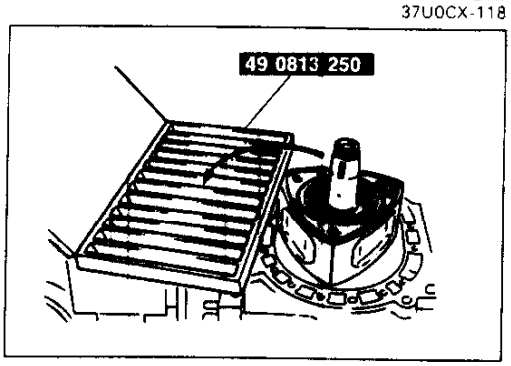
Rear rotor housing

1. Remove the side pieces and place them in the **SST**.



37U0CX-118

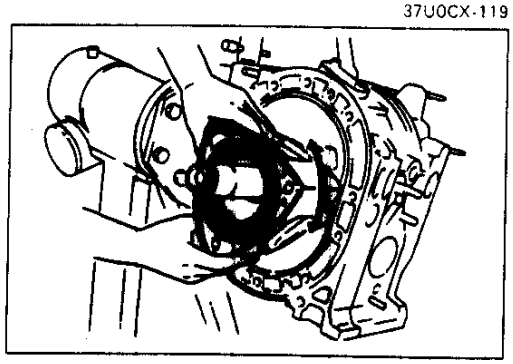
2. Remove the rotor housing. Be careful not to drop the apex seals.
3. Remove the O-ring from the upper dowel hole.



37U0CX-119

Rear rotor

1. Remove the seals and springs, and place them in position in **SST**.

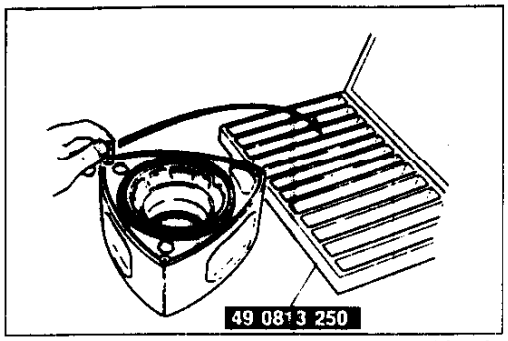


37U0CX-120

2. Remove the rotor.
   If the seals stick on the intermediate housing surface put them back into their respective position in the rotor.

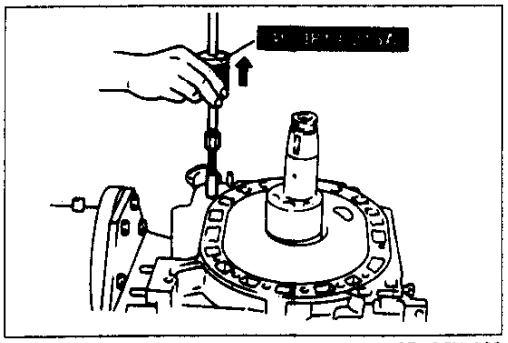
Caution

- **Do not place the rotor on a hard surface.**



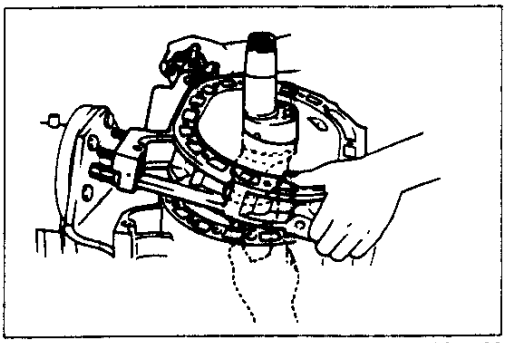
37U0CX-121

3. Remove the seals and springs, and put them in position in the **SST**.
4. Mark the rotor with an "R" for proper reassembly.


37U0CX-122

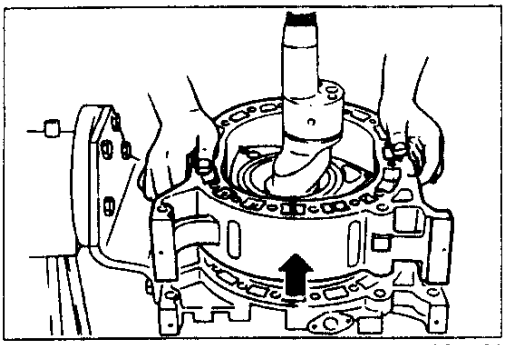
Tubular dowel

Remove the tubular dowels by using the **SST**.


37U0CX-123

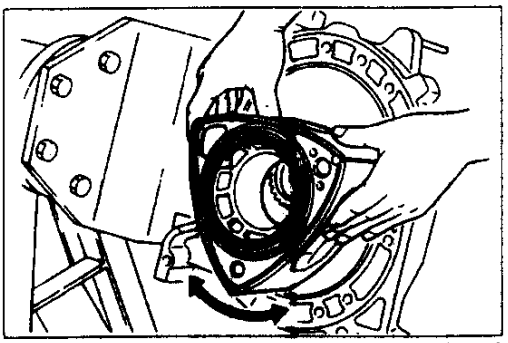
Intermediate housing

1. Turn the eccentric shaft so that the rotor journal faces in the short axial direction.
2. Remove the intermediate housing while pushing the eccentric shaft up.
3. If the seals stick to the intermediate housing surface, put them back into their respective position in the rotor.
4. Remove the sealing rubbers.


37U0CX-124

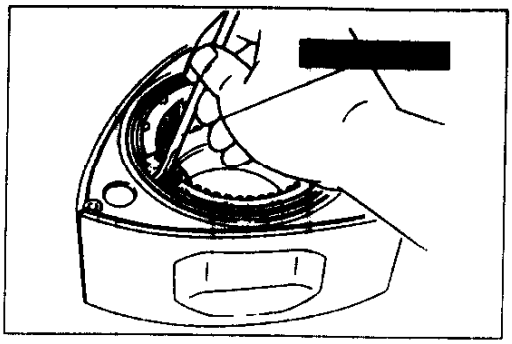
Front rotor housing

1. Remove the side pieces and place them in the **SST**.
2. Remove the rotor housing. Be careful not to drop the apex seals.
3. Remove the O-ring from the upper dowel hole.


37U0CX-125

Front rotor

Remove the front rotor in the same procedure as the removal of the rear rotor.



97U0CX-080

Rotor oil seal

1. Remove the outer oil seal from the rotor by using the **SST**.
2. Remove the inner oil seal in the same manner.
3. Remove the oil seal springs.
4. Remove the O-ring from the oil seal.

CLEANING

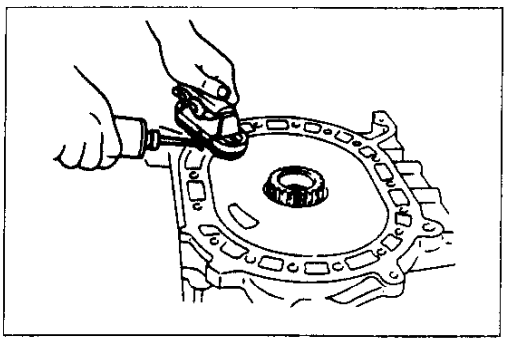
PREPARATION
SST

49 0813 225 Remover, oil seal 	For cleaning of rotor

37U0CX-126

Clean all parts, taking care to remove any gasket fragments, dirt, oil, grease, carbon, and other materials.

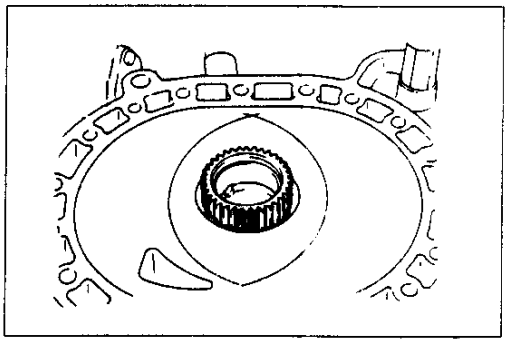
97U0CX 082



97U0CX-083

Side Housings (front, intermediate and rear housings)

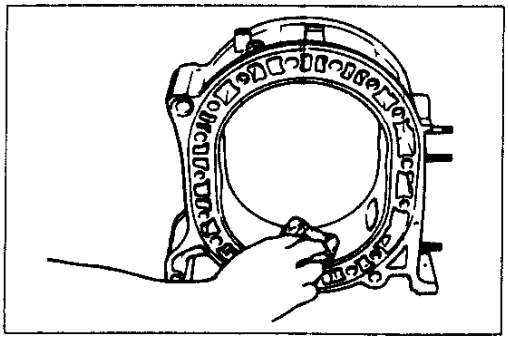
1. Remove the sealing agent from the housing surface by using a cloth or a brush soaked in solvent or thinner.



67U01X-078

2. Remove all carbon from the rotor chamber surface by using extrafine emery paper.

Caution
- **If using a carbon scraper, be careful not to damage the surface.**

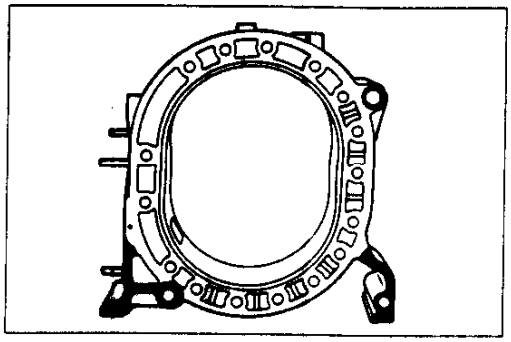


67U01X-079

Rotor Housing

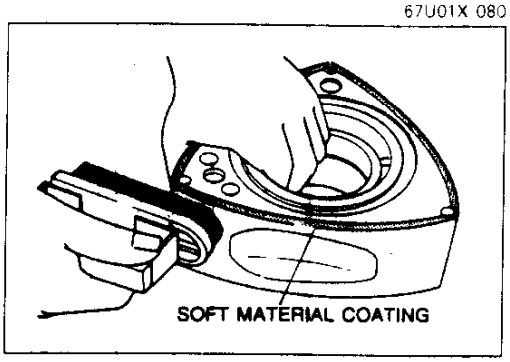
Note
- **Before cleaning, check for traces of gas or water leakage along the inner margin of the rotor housings.**

1. Remove all carbon from the inner surface of the rotor housing by wiping with a cloth soaked in solvent or thinner.



67U01X 080

2. Remove all deposits and rust from the coolant passages of the housing.
3. Remove the sealing agent from the housing by wiping with a cloth or brush soaked in solvent or thinner.



37U0CX-127

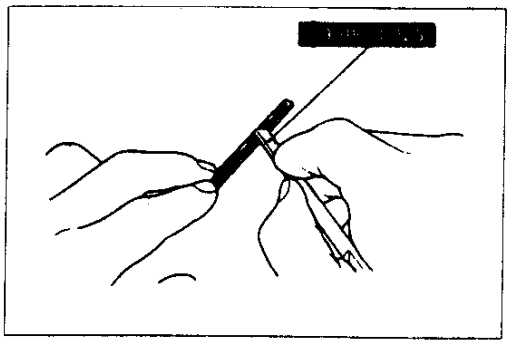
Rotor

1. Remove the carbon from the rotor by using a nonabrasive sponge and carbon cleaner.

Caution

- **Take care not to damage the soft material coating on the side surfaces.**

2. Remove the carbon from each groove.
3. Wash the rotor with a cleaning solution.



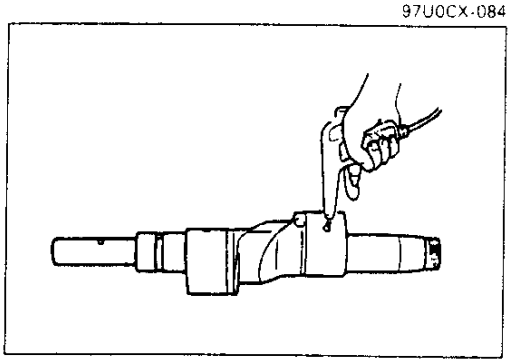
97U0CX-084

Rotor Seals (apex, side and corner seals)

1. Remove the carbon from each seal by using the **SST**.
2. Wash the seals with a cleaning solution.

Caution

- **Do not use emery paper.**



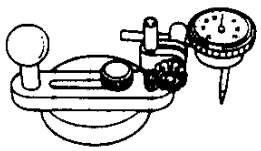
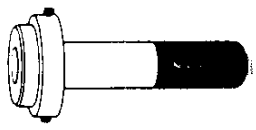
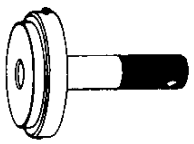
67U01X-084

Eccentric Shaft

1. Wash the eccentric shaft with a cleaning solution.
2. Blow the oil passages clean with compressed air.

INSPECTION / REPAIR

PREPARATION
SST

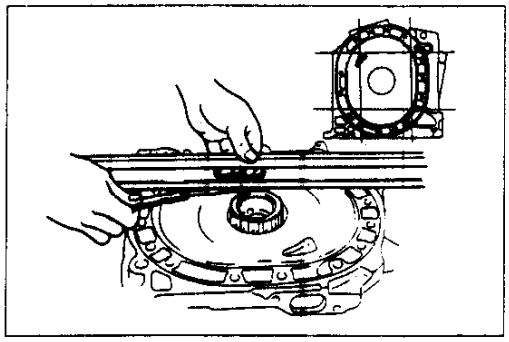
49 0727 570 Body, gauge 	For inspection of side housing	49 0813 235 Puller and installer, main bearing 	For removal / installation of main bearing
49 0839 165 Gauge, corner seal 	For inspection of corner seal	49 0813 240 Puller and installer, rotor bearing 	For removal / installation of rotor bearing

37U0CX-188

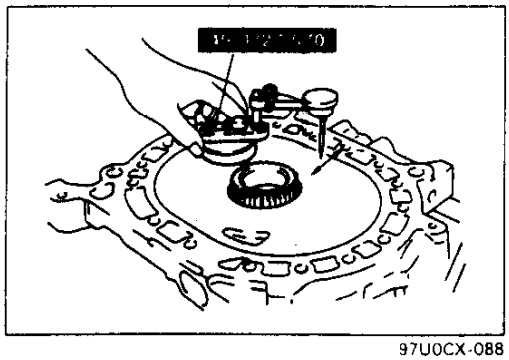
1. Clean all parts, being sure to remove any gasket fragments, dirt, oil, grease, carbon, moisture residue, and other foreign materials. (Refer to page C–50.)
2. Inspection and repairs must be performed in the order specified.

Caution
- **Do not damage the joints or friction surfaces of aluminum alloy components.**

37U0CX 189



97U0CX 087



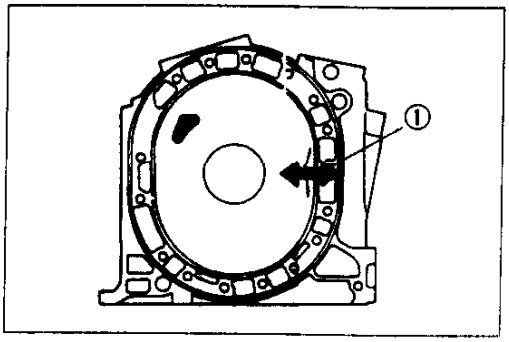
97U0CX-088

Side Housings (front, intermediate and rear housings)

1. Check the housing surface for warpage in the four directions shown in the figure. If necessary, replace the housing.

   Warpage: 0.04 mm {0.0016 in} max.

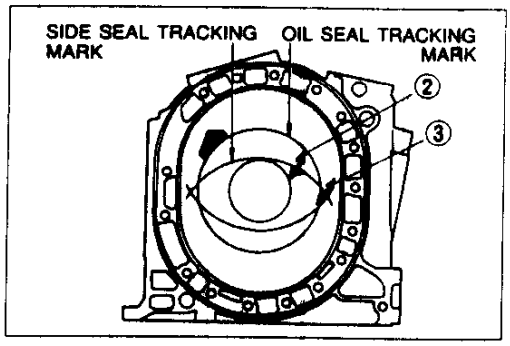
2. Check the contact surface for wear by using a dial indicator mounted on the **SST**. Slide the gauge across the area as indicated in the figure.



67U01X-087

(1) Side seal wear

Wear: 0.10 mm {0.0039 in} max.



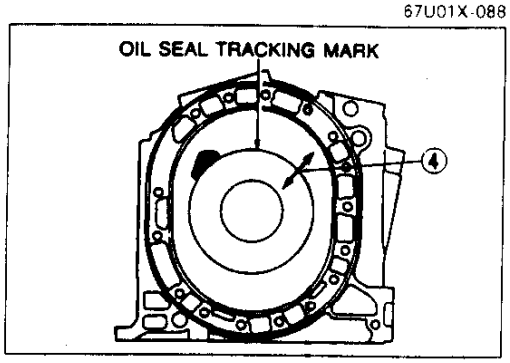
67U01X-088

(2) Side seal wear, overlapping oil seal wear

Wear: 0.01 mm {0.0004 in} max.

(3) Side seal wear, outside oil seal wear

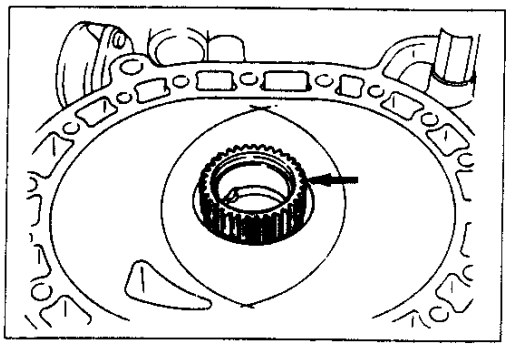
Wear: 0.10 mm {0.0039 in} max.



67U01X-089

(4) Oil seal wear

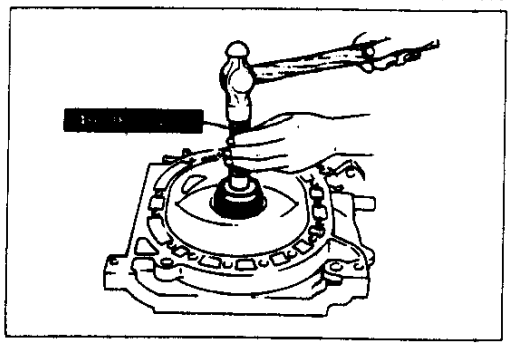
Wear: 0.02 mm {0.0008 in} max.



67U01X-090

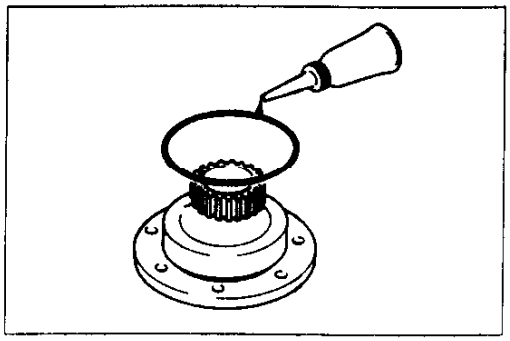
Stationary Gear

1. Check the front and rear stationary gear for cracked, scored, worn, and chipped teeth.



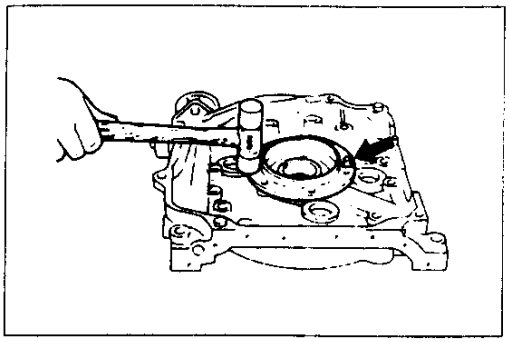
97U0CX-089

2. If necessary, replace the stationary gear.
   (1) (Front stationary gear)
   Remove the plate, needle bearing, and thrust plate.
   (Rear stationary gear)
   Remove the attaching bolts.
   (2) Remove the stationary gear by using the **SST**.



67U01X-092

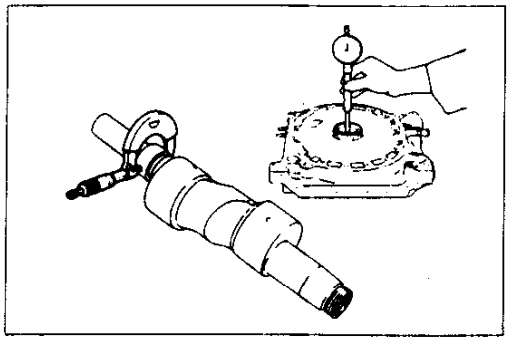
(3) (Rear stationary gear only)
Apply petroleum jelly to a new O-ring and install it on the rear stationary gear. Apply sealant to the stationary gear flange.



37U0CX-130

(4) Install the stationary gear to the housing so that the slot of the stationary gear is fit over the dowel on the housing.
(5) (Front stationary gear)
Install the thrust plate, needle bearing, and plate (Rear stationary gear)
Tighten the attaching bolts.

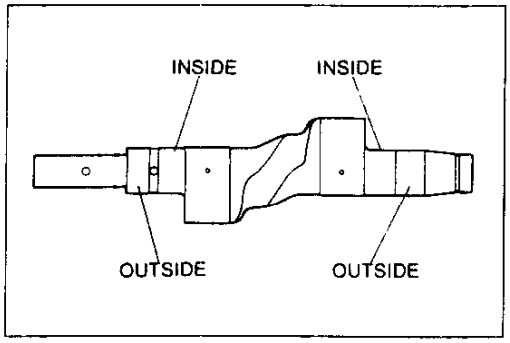
Tightening torque:
16–22 N·m {1.6–2.3 kgf·m, 12–16 ft·lbf}



37U0CX-131

Main Bearing

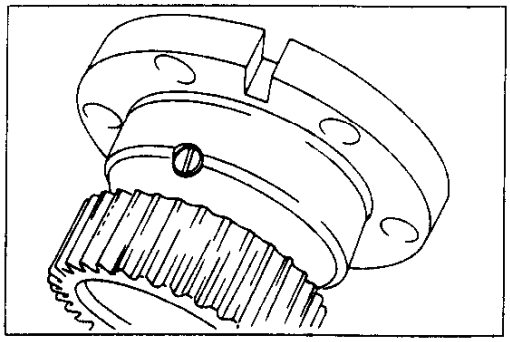
1. Check the main bearing for wear, scoring, flaking, and other damage.
2. Measure the main bearing clearance. Measure the inner diameter of the main bearing and the outer diameter of the eccentric shaft main journal.



37U0CX-132

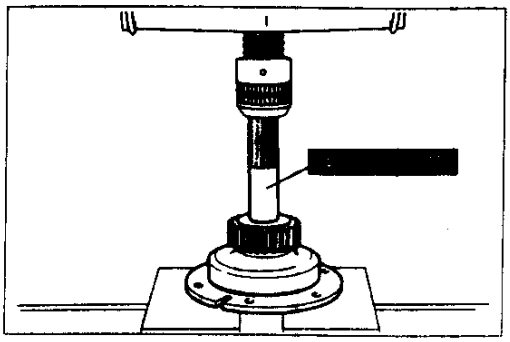
Note
- **The inside and outside specifications of the journals differ as shown.**

Standard clearance:
0.08–0.11 mm {0.0031–0.0043 in} outside
0.06–0.08 mm {0.0023–0.0031 in} inside
Clearance: 0.13 mm {0.0051 in} outside max
0.11 mm {0.0043 in} inside max



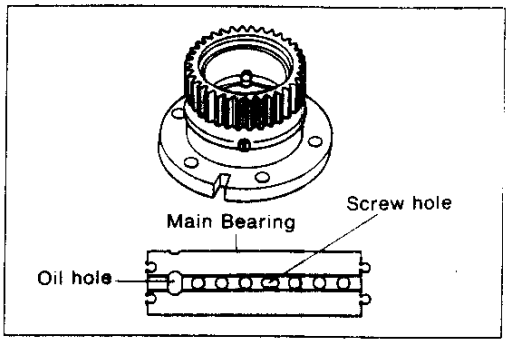
37U0CX-133

3. If necessary replace the main bearing.
   (1) Remove the stationary gear. (Refer to page C–52.)
   (2) Remove the screw.


37U0CX-134

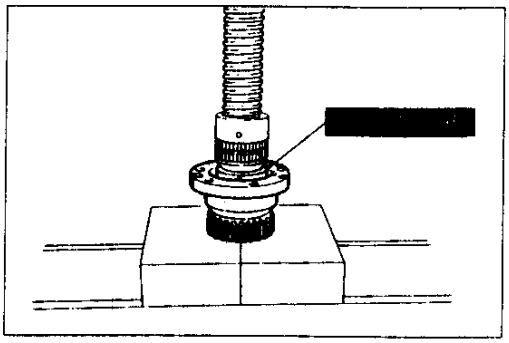
(3) Place the stationary gear on the support with the gear facing upward.
(4) Press out the main bearing by using the **SST** without the adaptor ring.

Caution
- **Do not reuse the main bearing.**

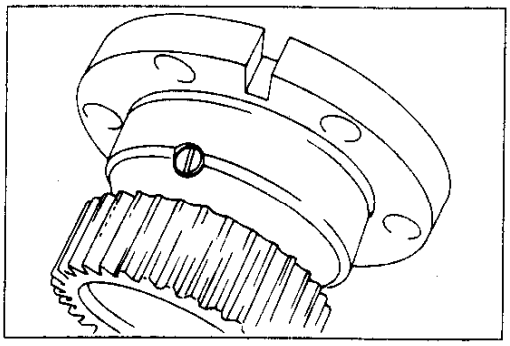


37U0CX-135

(5) Place the stationary gear on the support with the gear downward.
(6) Place the new main bearing on the stationary gear so that the small hole is in line with the screw hole of the stationary gear.

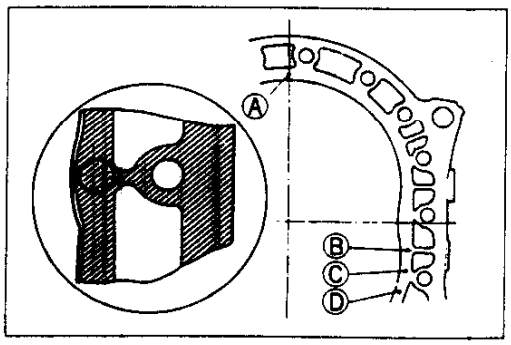

37U0CX-136

(7) Press in the main bearing by using the **SST**.


37U0CX-137

(8) Remove the thread-locking compound from the screw and screw hole threads.
(9) Apply new thread-locking compound to the screw threads and tighten the screw.

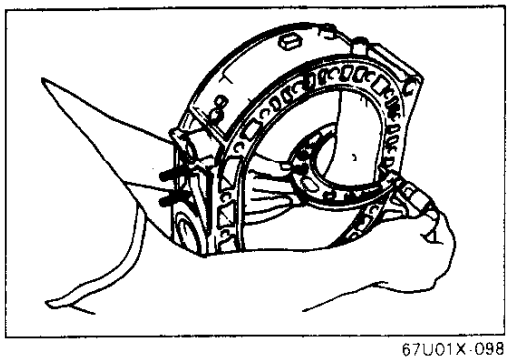
Tightening torque:
3.3–4.7 N·m {33–48 kgf·cm, 29–41 in·lbf}



67U01X-097

Rotor Housing

1. Check the chromium plated surface on the rotor housing for scoring, flaking, and other damage.
2. Check the width difference of the rotor housing.
   (1) Measure the rotor housing width at the points A, B, C, and D, as shown in the figure.

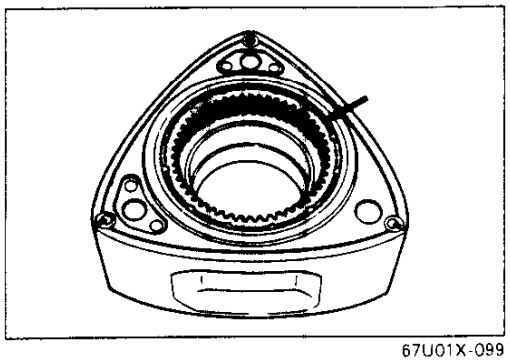


67U01X-098

(2) Calculate the difference between the value of point A and the minimum value among points B, C, and D.

Difference: 0.06 mm {0.0024 in} max.

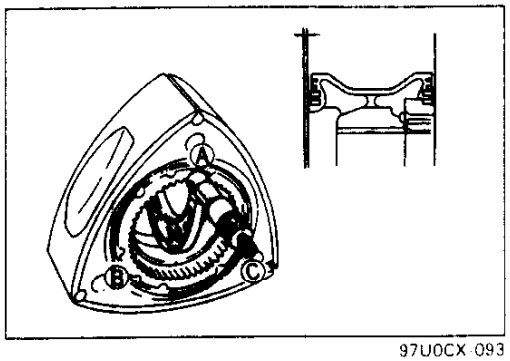
3. If the difference excedes the specification, replace the rotor housing.



67U01X-099

Rotor

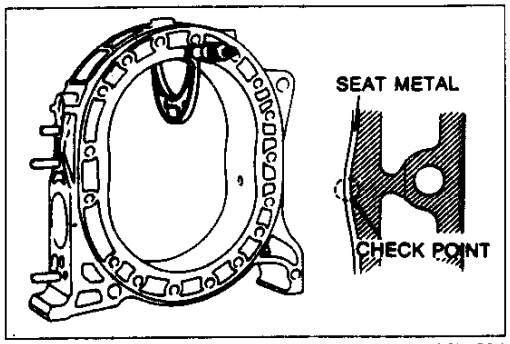
1. Carefully inspect the rotor and replace it if it is severely worn or damaged.
2. Check the internal gear for cracked, scored, worn, and chipped teeth.



97U0CX-093

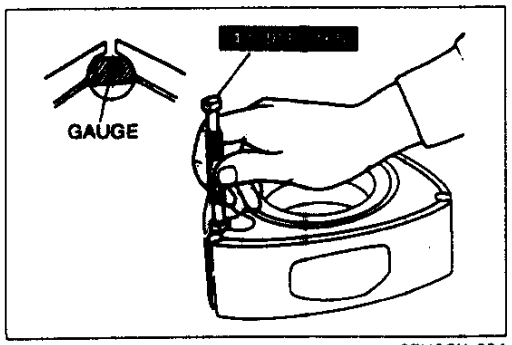
3. Check the clearance between the side housing and rotor. Measure the rotor housing width (point A above) and the maximum rotor width at the three points indicated in the figure.

Standard: 0.12–0.21 mm {0.0047–0.0083 in}
Clearance: 0.10 mm {0.0039 in} min.



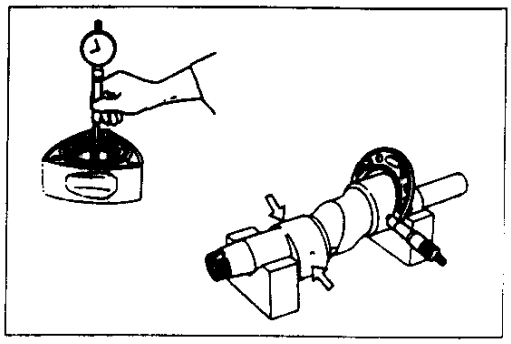
97U0CX-094

4. If the clearance is more or less than specified, replace the rotor assembly.

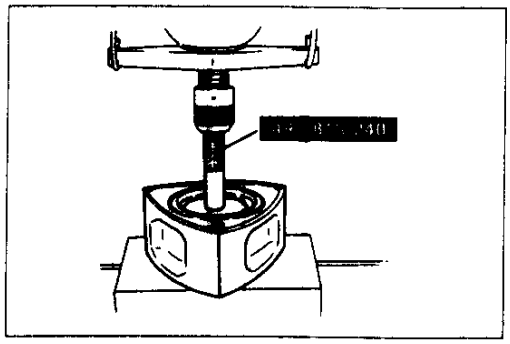


97U0CX-094

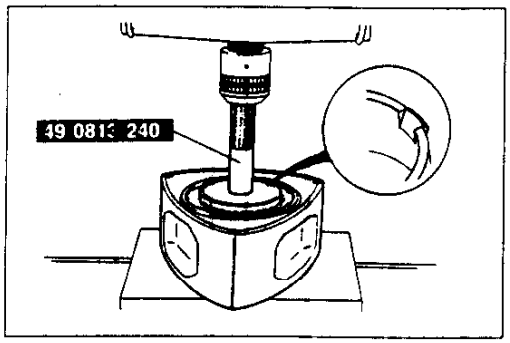
5. Check the corner seal bore for wear using the **SST**.
   (1) If neither end of the gauge goes into the bore, use the original corner seal.
   (2) If only one end of the gauge goes into the bore, replace the corner seal.
   (3) If both ends of the gauge go into the bore, replace the rotor.



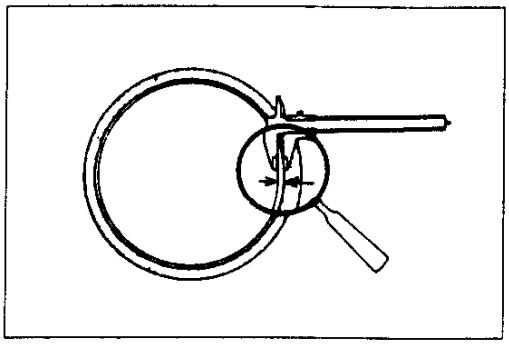
37U0CX-138



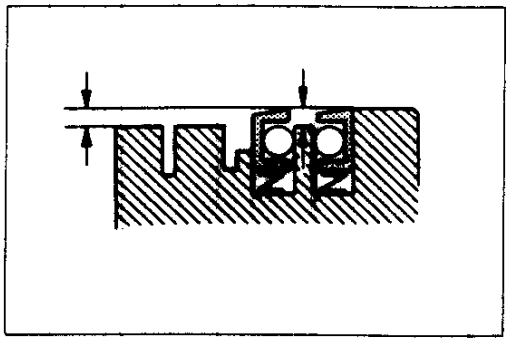
97U0CX-096



97U0CX-097



67U01X-106



67U01X-107

Rotor Bearing

1. Check the rotor bearing for wear, flaking, scoring, and other damage.
2. Check the rotor bearing clearance. Measure the inner diameter of the rotor bearing and the outer diameter of the eccentric shaft rotor journal.

Standard clearance:
0.06–0.08 mm {0.0016–0.0031 in}
Clearance: 0.11 mm {0.0043 in} max.

3. If not within specification, replace the rotor bearing.
   (1) Place the rotor on a support with the internal gear downward.
   (2) Press the bearing out of the rotor by using the **SST** without the adapter ring.
   (3) Place the rotor on the support with the internal gear facing upward.
   (4) Place the new rotor bearing on the rotor so that the bearing lug is in line with the slot of the rotor bore.
   (5) Using the **SST**, press the bearing in until it is flush with the rotor boss.

Rotor Oil Seal

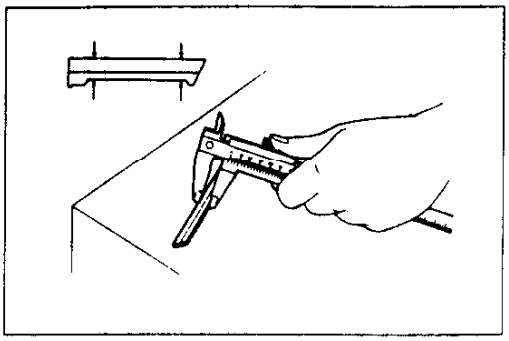
1. Inspect the oil seal for wear and damage. If necessary, replace it.
2. Check the oil seal lip width.

Lip width: 0.5 mm {0.020 in} max.

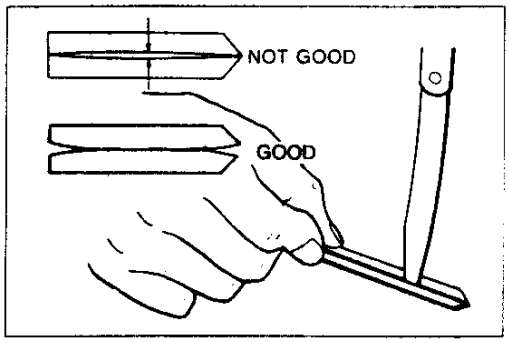
3. Install the oil seal springs and oil seals into their respective grooves.
4. Check the oil seals for free vertical movement.
5. Check the oil seal protrusion.

Protrusion: 0.5 mm {0.020 in} min.

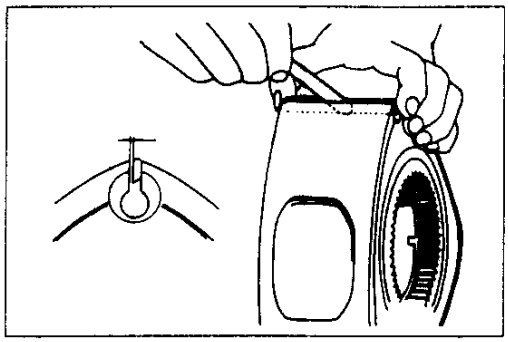
6. If necessary, replace the oil seal or the spring.



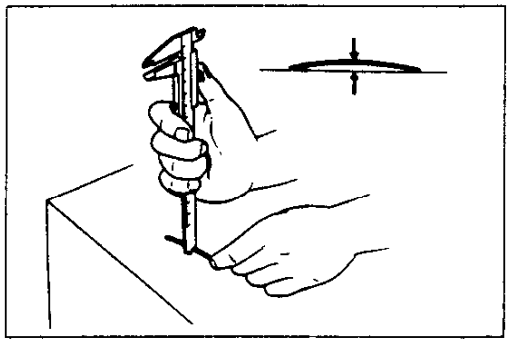
67U01X-108



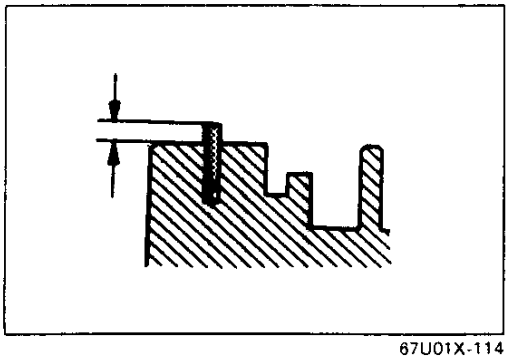
97U0CX-098



17U0CX-008



97U0CX-214



67U01X-114

Apex Seal

1. Check the apex seal for wear, cracks, and other damage. If necessary, replace it.
2. Measure the combined height of the upper and lower apex seals at two points.

Standard height: 8.0 mm {0.315 in}
Height: 6.5 mm {0.256 in} min.

Note
- **Replace the short apex seal spring if the apex seal height is below 7.5 mm {0.295 in}.**

3. Check the apex seals for warpage.
   Put two apex seals together, top-to-top, and check the warpage. Do this with all three seals.
   If warpage exists in the middle of the seals, replace the apex seals.
   If the warpage exists in the ends of the seals, the seals can be reused.

4. Check the clearance between the apex seal and the groove. Place the apex seal in its respective groove in the rotor, and measure the apex seal clearance. If necessary, replace it.

Standard clearance
0.051–0.101 mm {0.0020–0.0040 in}
Clearance: 0.15 mm {0.0059 in} max.

5. Check the apex seal spring for wear and free height. If necessary, replace it.

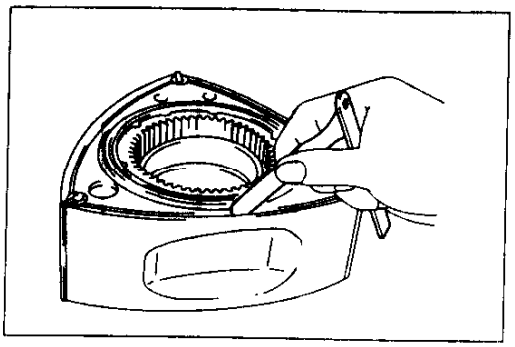
Free height
Long spring: 4.6 mm {0.181 in} min.
Short spring: 1.7 mm {0.067 in} min.

Note
- **Replace the short apex seal spring if the apex seal height is below 7.5mm {0.295 in}.**

Side Seal

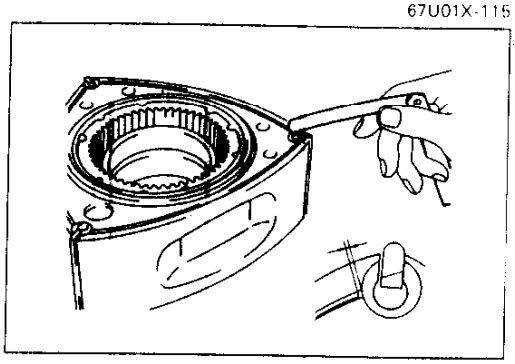
1. Inspect the side seal for wear and damage. If necessary, replace it.
2. Install the side seal spring and side seal into their respective grooves.
3. Check the side seal for free vertical movement.
4. Check the side seal protrusion.

Protrusion: 0.5 mm {0.020 in} min.


67U01X-115

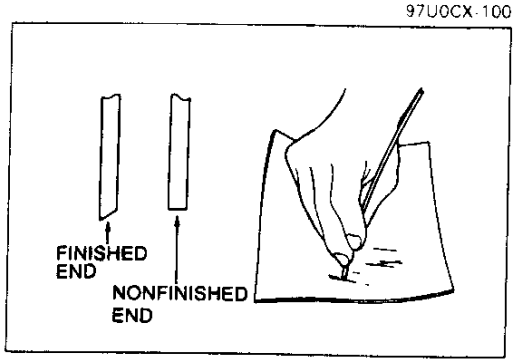
5. Check the clearance between the side seal and the groove.

Standard clearance:
0.028–0.078 mm {0.0011–0.0031 in}
Clearance: 0.10 mm {0.0039 in} max.


97U0CX-100

6. Check the clearance between the side seal and the corner seal.

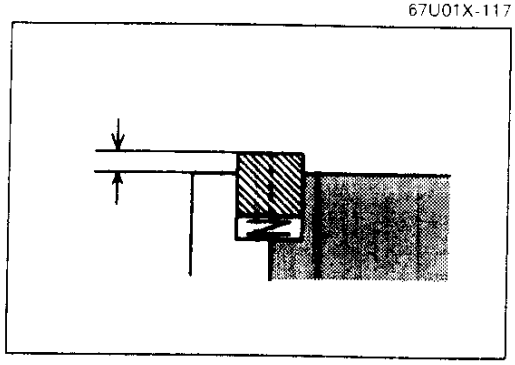
Standard clearance:
0.05–0.15 mm {0.0020–0.0059 in}
Clearance: 0.40 mm {0.016 in} max.



67U01X-117

7. If necessary, replace the side seal.
Adjust the clearance between the side seal and corner seal by carefully lapping the nonfinished end.

Adjusted clearance:
0.05–0.15 mm {0.002–0.0059 in}

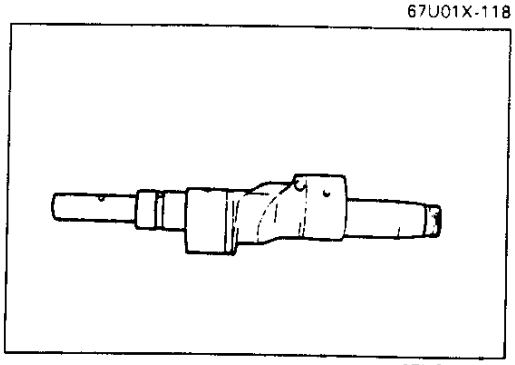

67U01X-118

Corner Seal

1. Inspect the corner seal and soft seal for wear, cracks, and other damage. If necessary, replace them.
2. Install the corner seal spring and corner seal into its respective groove.
3. Check the corner seal for free vertical movement.
4. Check the corner seal protrusion.

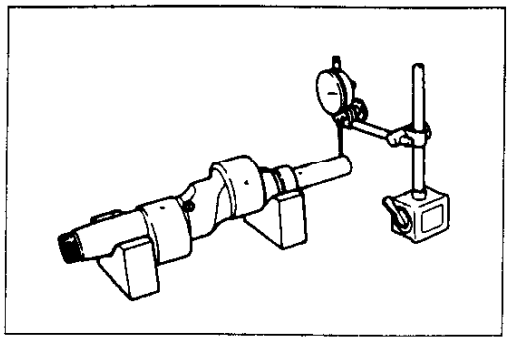
Protrusion: 0.5 mm {0.020 in} min.

5. If necessary, replace the corner seal and/or the spring.


67U01X-119

Eccentric Shaft

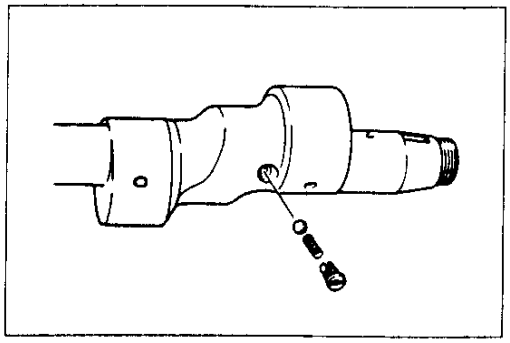
1. Check the eccentric shaft for cracks, scoring, wear, and other damage.
2. Verify that the oil passages are open.



17U0CX-016

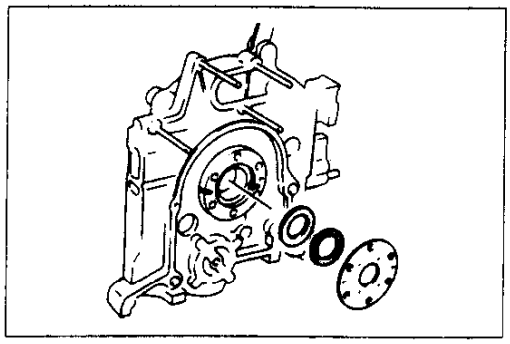
3. Check the eccentric shaft runout. Measure the run-out at the end of the shaft, and replace it if necessary.

Runout: 0.06 mm {0.0024 in} max.



97U0CX-101

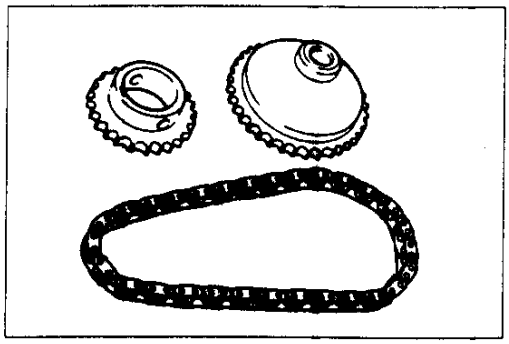
4. Check the oil jet spring for weakness, and check for sticking and damage of the steel ball.



67U01X-122

Needle Bearing and Thrust washer

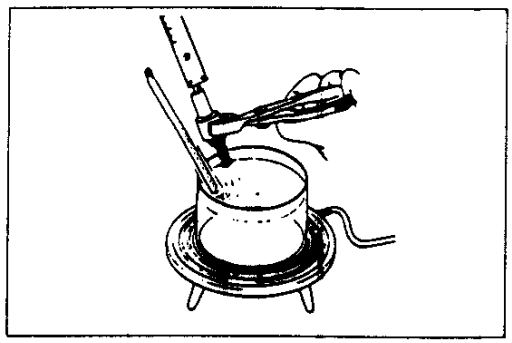
1. Check the needle bearing for wear and damage.
2. Check the bearing housing and thrust plate for wear and other damage.



67U01X-123

Oil Pump Drive Chain and Sprocket Wheel

1. Check the oil pump drive chain for broken links.
2. Check the oil pump drive sprocket and driven sprocket for cracks and worn or damaged teeth. If necessary, replace with new parts.



37U0CX-139

Eccentric Shaft Bypass Valve

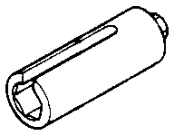
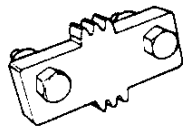
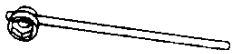
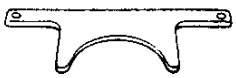
1. Place the eccentric shaft bypass valve in oil and heat up the oil gradually.
2. Check the protrusion of the valve at **60°C {140°F}**.

Protrusion: 6 mm {0.24 in} min.

3. If not as specified, replace the bypass valve.

ASSEMBLY

PREPARATION
SST

49 H018 001 Wrench, knock sensor 	For installation of knock sensor	49 F011 101 Brake, ring gear 	For prevention of engine rotation
49 0820 035 Box wrench, flywheel 	For removal / installation of locknut	49 1881 055A Stopper counter weight 	For prevention of engine rotation

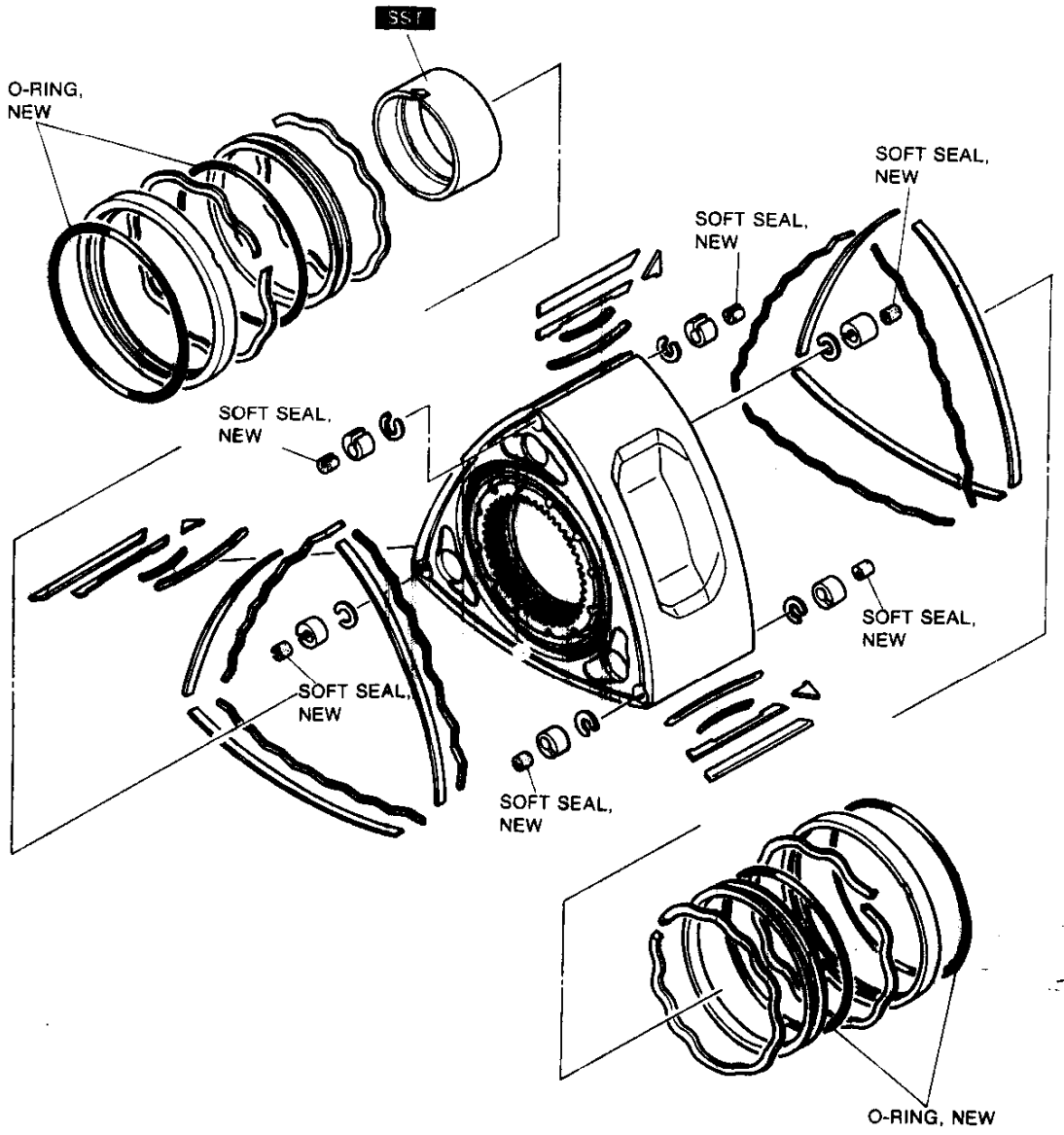
37U0CX-14(

1. Clean all parts before reinstallation.
2. Apply clean engine oil to all sliding and rotating parts.
3. Install identical parts (such as rotor seals, seal springs, rotor oil seals, and rotor) in the exact positions from which they were removed.
4. Replace plain bearings if they are peeling, burned, or otherwise damaged.
5. Tighten all bolts and nuts to the specified torques.

Caution
- **Do not reuse gaskets or oil seals.**

97U0CX-1(3

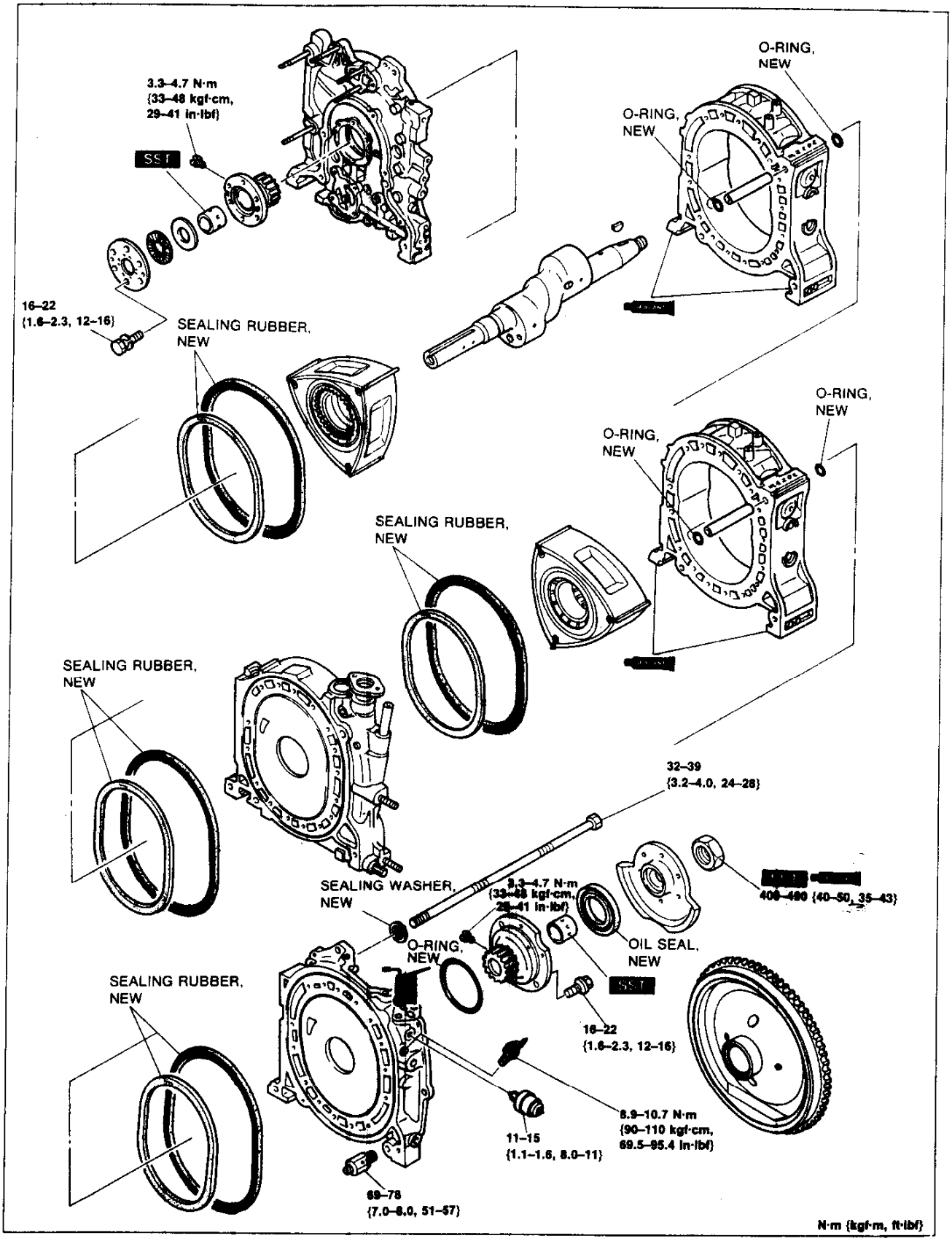
HOUSING (ROTOR)



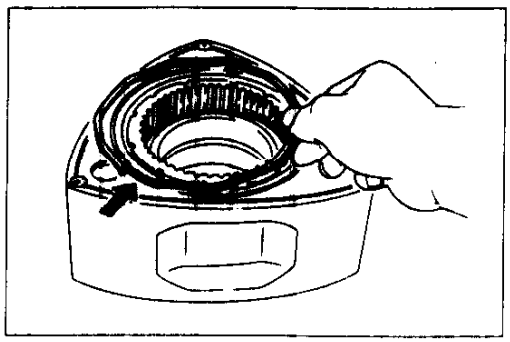
37U0CX-141

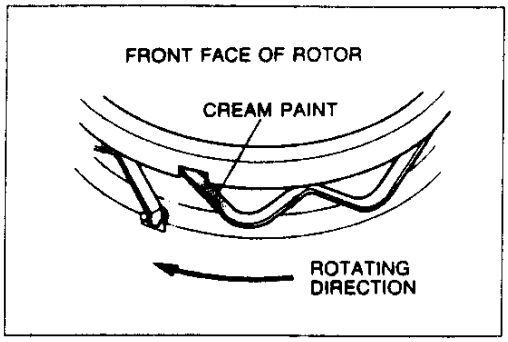
HOUSING (INTERNAL PARTS)

Torque Specifications

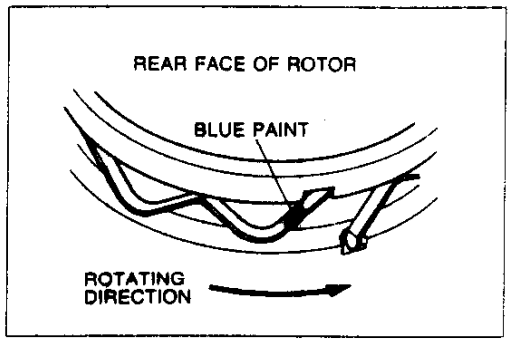


37U0CX-142

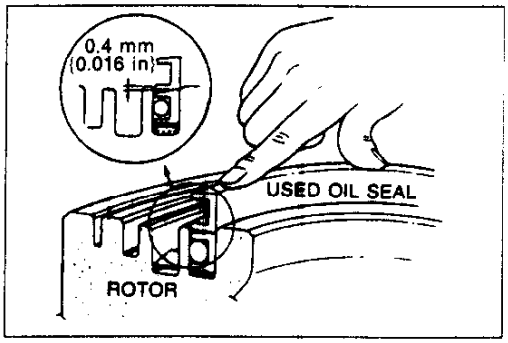

97U0CX-106



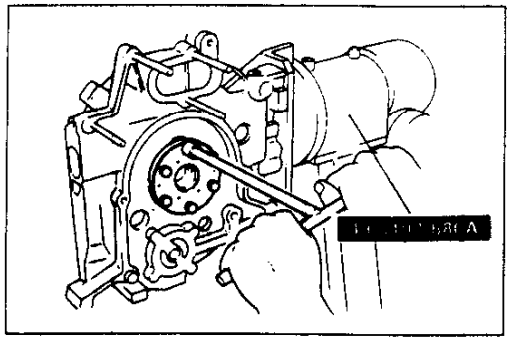
67U01X-126



97U0CX-107



37U0CX-143


37U0CX-144

Rotor Oil Seal

Note
- **When replacing the oil seal, first make sure that it moves smoothly in the groove without the O-ring in place.**
- **Be careful not to deform the lip of the oil seal.**

1. Install the oil seal springs in their respective grooves on the rotor with the round edge of the spring fitted in the stopper hole of the oil seal grooves.

Note
- **The oil seal springs are identified by a paint mark.**
  Cream ..... for front faces of front and rear rotors.
  Blue ..... for rear faces of front and rear rotors.

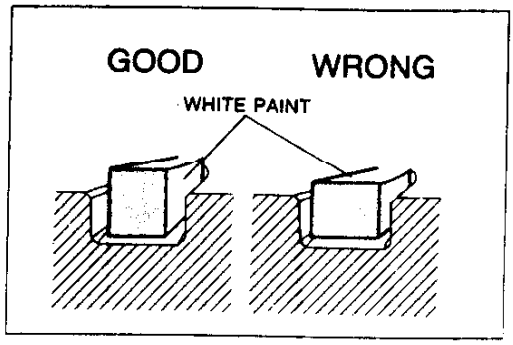
2. Apply engine oil to the new O-ring.
3. Install the O-ring in the oil seal.
4. Place the inner oil seal in the oil seal groove so that the square edge of the spring fits into the notch of the oil seal.

5. Press in the oil seal by using a used oil seal until the lip of the new oil seal is approximately **0.4 mm {0.016 in}** below the surface of the rotor.
6. Push the oil seal slowly by hand and make sure it moves freely.

Front Housing

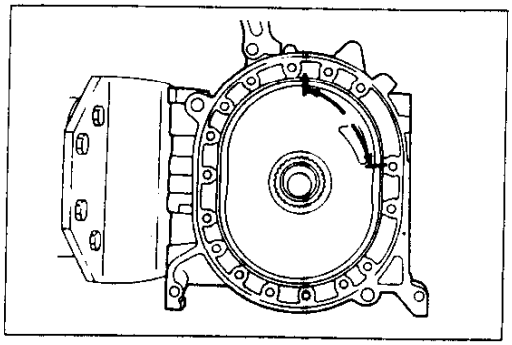
1. Mount the front housing to the **SST**.
2. Position the thrust plate with the chamfer facing toward the front housing. Install the needle bearing and plate.

Tightening torque:
16–22 N·m {1.6–2.3 kgf·m, 12–16 ft·lbf}



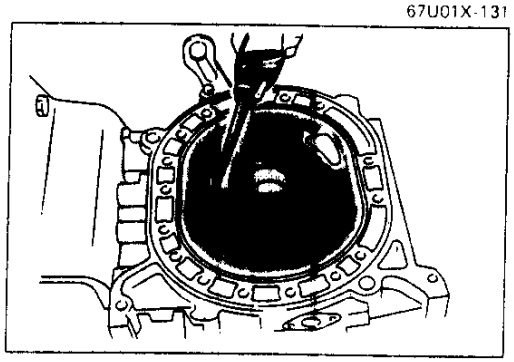
67U01X-130

3. Apply petroleum jelly to the new outer and inner sealing rubbers.
4. Install the outer sealing rubber so that the white paint faces the side wall of the groove.



67U01X-131

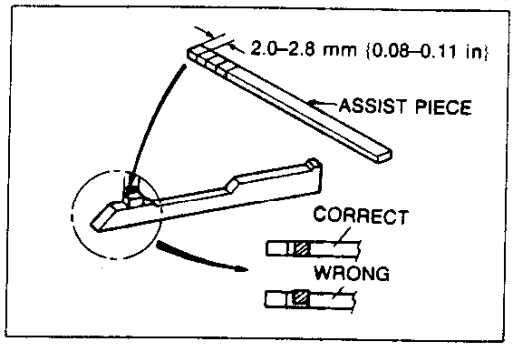
5. Install the inner sealing rubber so that the blue paint faces the outer wall of the groove and so that the seam is placed within the position as shown in the figure.
6. Check that the outer and inner sealing rubbers are not twisted.



67U01X-132

7. Apply engine oil to the contact surfaces, stationary gear, and main bearing.

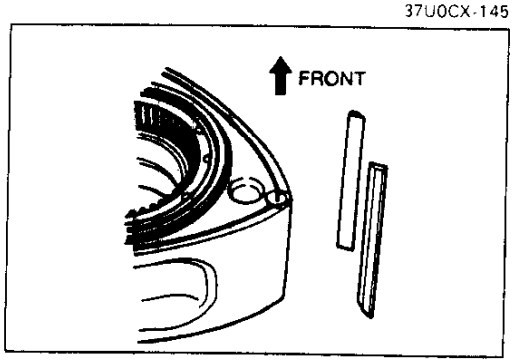
Caution
- **Do not apply engine oil to the sealing rubber.**



37U0CX-145

Rotor Seals (Front side of rotor)

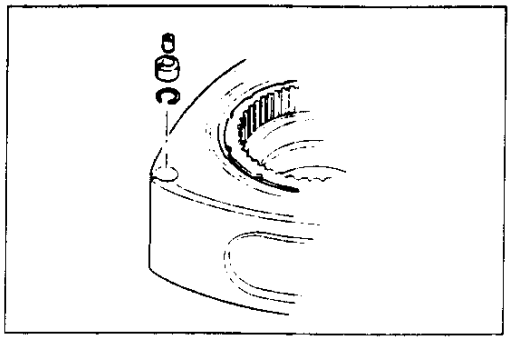
1. Place the front rotor on a clean rubber pad or cloth with the front side upward.
2. Cut the assist piece with a razor knife so that it is **2.0–2.8 mm {0.08–0.11 in}** long.
3. Peel the paper off the assist piece and stick it onto the apex seal.



97U0CX-111

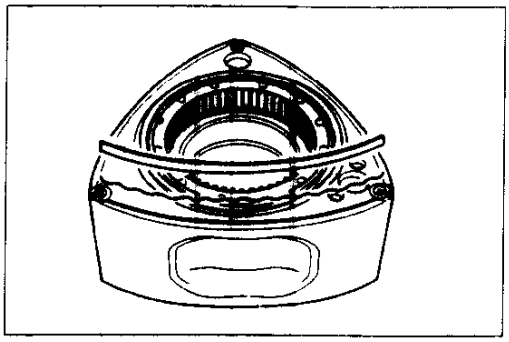
4. Install the upper and lower apex seals without the spring and side piece into their respective grooves so that the side piece mounting is at the rear side of the rotor.

Caution
- **If the apex seals are installed incorrectly, this may result in poor gas sealing.**



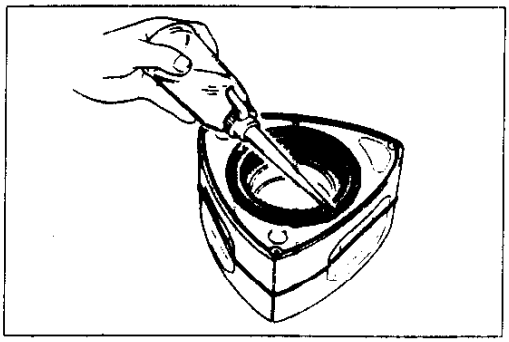
97U0CX-112

5. Install the new soft seals into the corner seals.
6. Install the corner seal springs and corner seals so that the chamfered surfaces face the bottom of the groove.



97U0CX-113

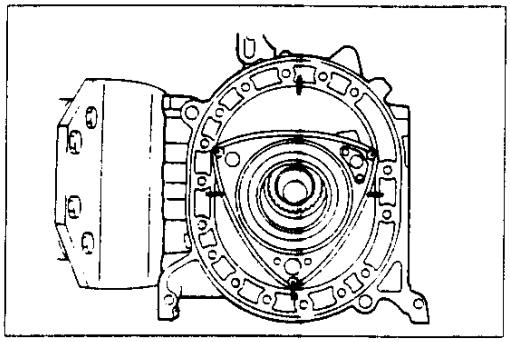
7. Install the side seal springs and side seals so that the paint mark faces the bottom of the groove.
8. Confirm smooth movement of the corner seals and side seals by lightly pressing them.
9. Apply petroleum jelly to the side seals.



67U01X-136

Front Rotor

1. Apply clean engine oil to the rotor oil seal, rotor bearing, and internal gear.

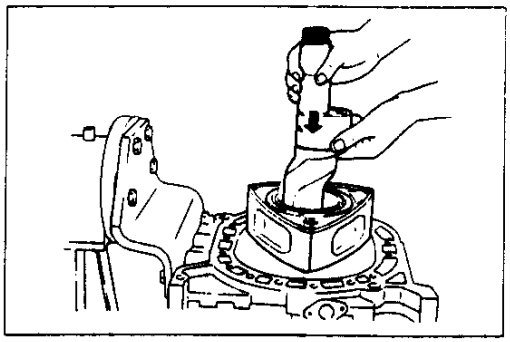


67U01X-137

2. Place the front rotor in the front housing, and mesh the internal gear and stationary gear so that one of the rotor apexes is set to one of the four positions illustrated.

Caution

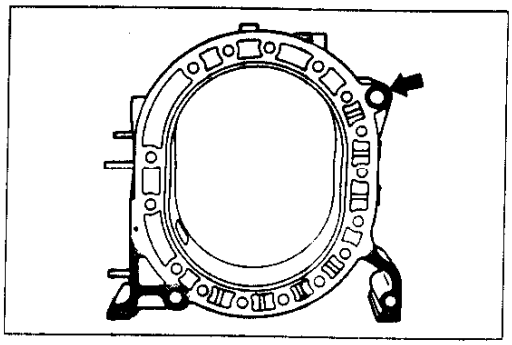
- **Do not place the rotor on the sealing rubber.**



37U0CX-146

Eccentric Shaft

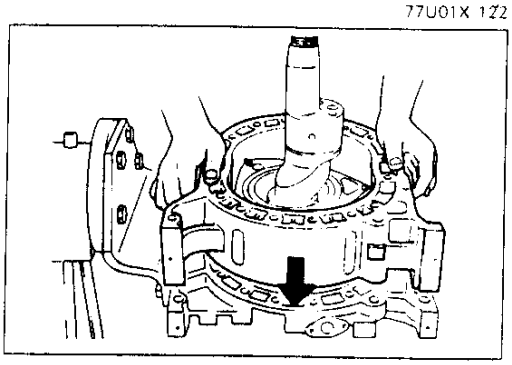
1. Apply clean engine oil to the front rotor journal and main journal.
2. Insert the eccentric shaft, being careful not to damage the rotor bearing or the main bearing.



77U01X-122

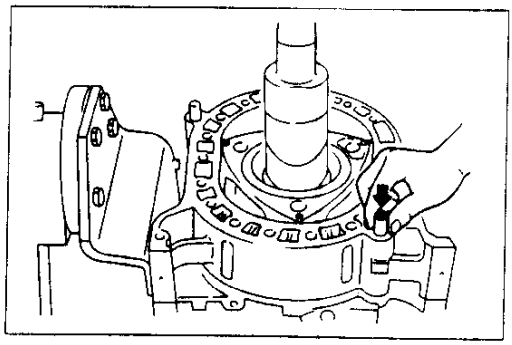
Front Rotor Housing

1. Apply petroleum jelly to the new O-ring, and install it to the rotor housing.
2. Apply sealant to the rotor housing front side, as shown by the shaded areas in the figure.



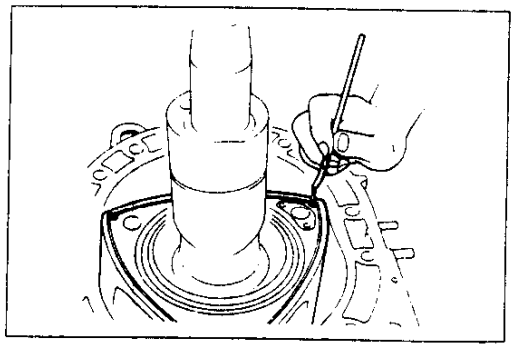
77U01X-123

3. Apply clean engine oil to the trochoid (chamber) surface of the rotor housing.
4. Install the rotor housing.



77U01X-124

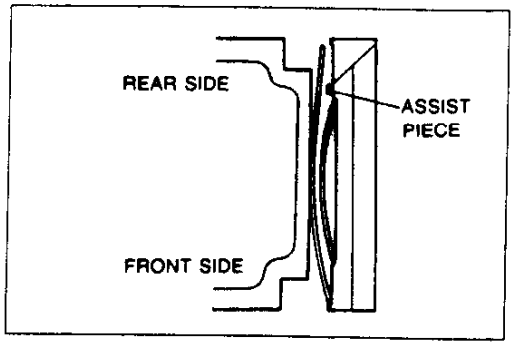
5. Apply clean engine oil to the tubular dowels and insert them through the front rotor housing holes into the housing holes.



67U01X-142

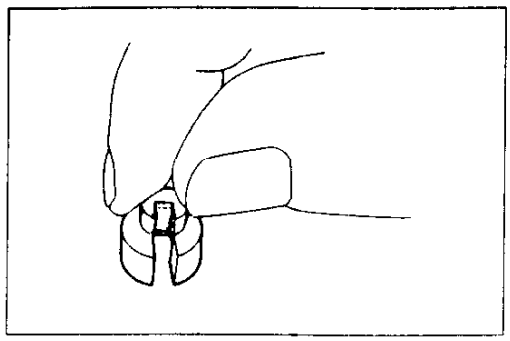
Rotor Seals (Rear side of rotor)

1. Insert the short apex seal springs.



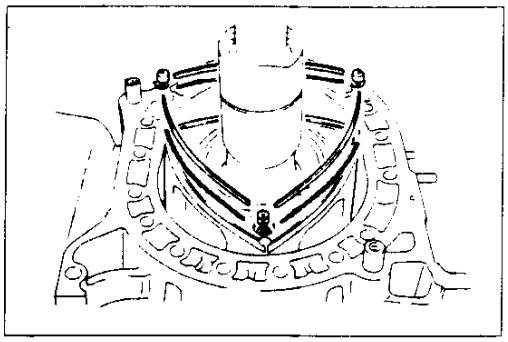
97U0CX-116

2. Insert the long apex seal springs.
3. Fit each side piece into its original position and confirm that the springs are set correctly on the side pieces.
4. Confirm smooth movement of each seal by pressing its head.



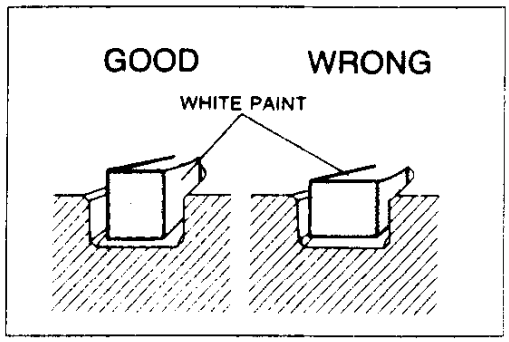
97U0CX-117

5. Install the new soft seals into the corner seals.
6. Install the corner seal springs and corner seals so that the chamfered surfaces face the bottom of the groove.



97U0CX-118

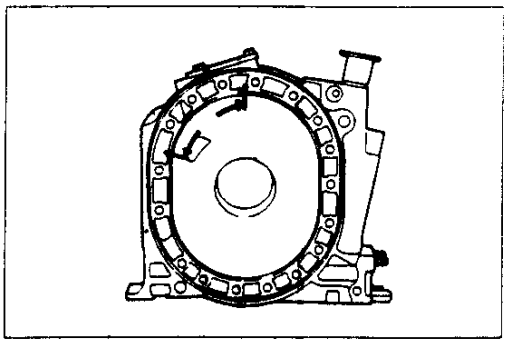
7. Install the side seal springs and side seals so that the paint mark faces the bottom of the groove.
8. Confirm smooth movement of the corner seals and side seals by lightly pressing them



67U01X-146

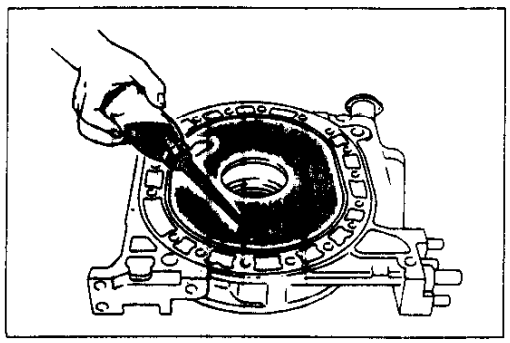
Intermediate Housing

1. Apply petroleum jelly to the new outer and inner sealing rubbers.
2. Install the outer sealing rubber to the front side so that the white paint faces the side wall of the groove.



67U01X-147

3. Install the inner sealing rubber to the front side so that the blue paint faces the outer wall of the groove and so that the seam is placed within the position shown in the figure.
4. Check that the outer and inner sealing rubbers are not twisted.

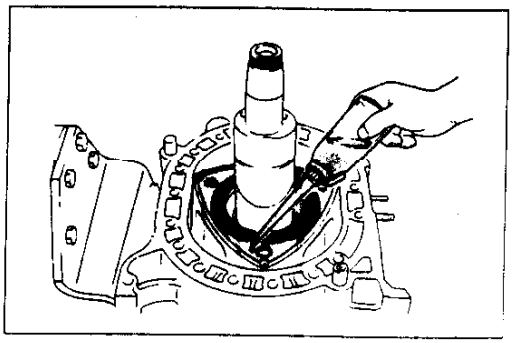


87U01X-010

5. Apply clean engine oil to the contact surfaces of the intermediate housing.

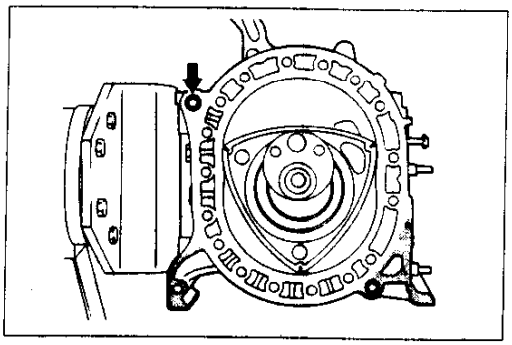
Caution

- **Do not apply engine oil to the sealing rubber.**



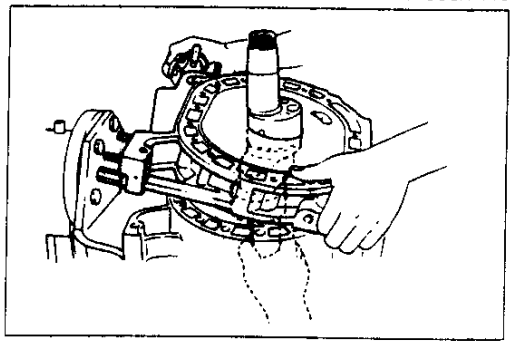
67U01X-149

6. Apply clean engine oil to the rotor oil seal on the rear side of the front rotor.



97U0CX-119

7. Apply petroleum jelly to a new O-ring, and install it on the rotor housing.
8. Apply sealant to the shaded areas as shown in the figure.

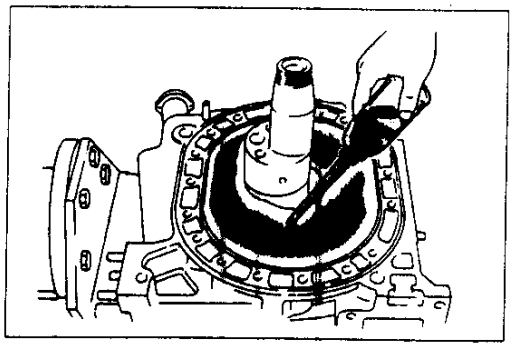


97U0CX-120

9. Turn the eccentric shaft so that the rear rotor journal faces the intake and exhaust side.
10. Lift the eccentric shaft about **25 mm {1.0 in}**, and install the intermediate housing over the eccentric shaft and onto the front rotor housing.

Note

- **Do not lift the shaft over 35 mm {1.4 in}.**

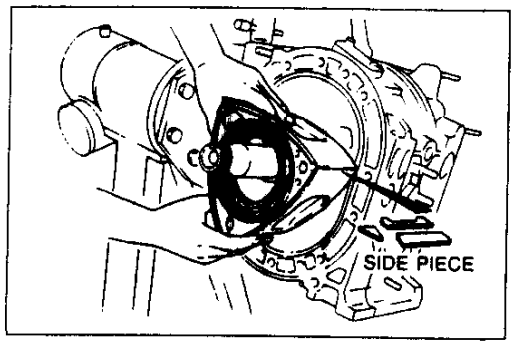


67U01X-152

11. Install the outer and inner sealing rubber to the rear side of the intermediate housing using the same method as for the front side of the intermediate housing.
12. Apply clean engine oil to the rear contact surfaces.

Caution

- **Do not apply engine oil to the sealing rubber.**



37U0CX-147

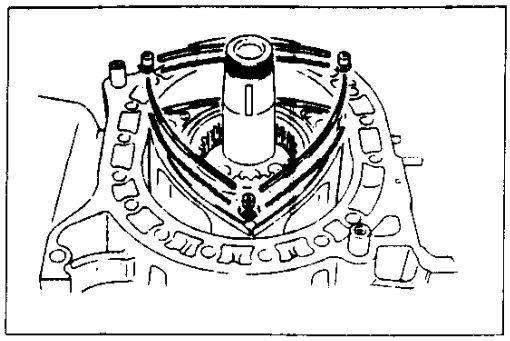
Rear Rotor, Rotor Seals, and Rear Rotor Housing

Install the rotor seals, rear rotor, and rear rotor housing by using the same procedure as for the installation of the rotor seals, front rotor, and front rotor housing.

1. Install the rotor seals and rear rotor.
(Refer to page C–64.)

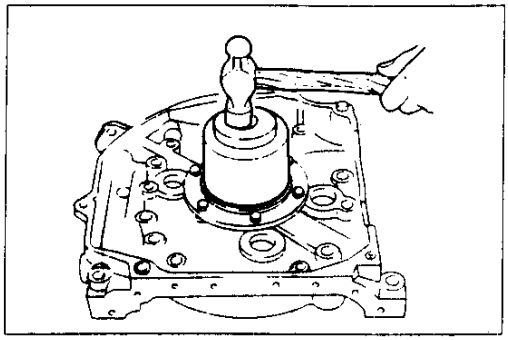
Caution

- **The side piece of the rotor seal must face the rear housing side.**



37U0CX-148

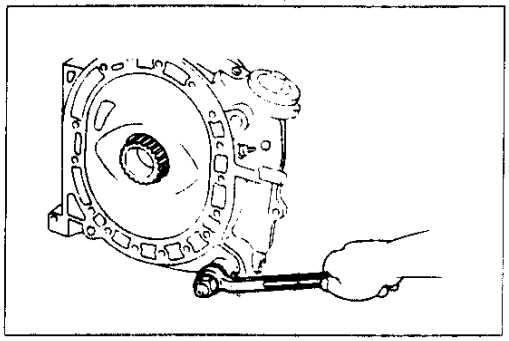
2. Install the rear rotor housing. (Refer to page C–66.)
3. Install the tubular dowels.
4. Install the rotor seals at the side of the rotor. (Refer to page C–66.)



67U01X-155

Rear Housing

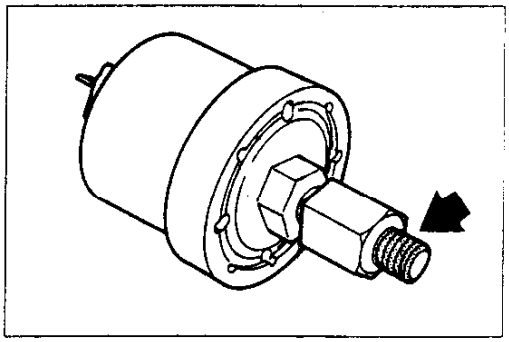
1. Apply clean engine oil to a new rear oil seal and the groove of the rear stationary gear.
2. Install the oil seal into the rear stationary gear.



37U0CX-149

3. Install the oil regulator valve.

Tightening torque:
69–78 N·m {7.0–8.0 kgf·m, 51–57 ft·lbf}

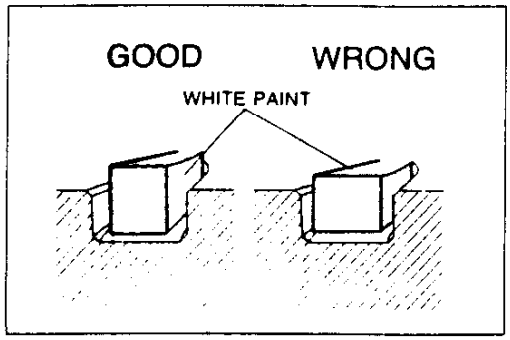


37U0CX-150

4. Apply sealant to the oil pressure switch threads and install the oil pressure switch.

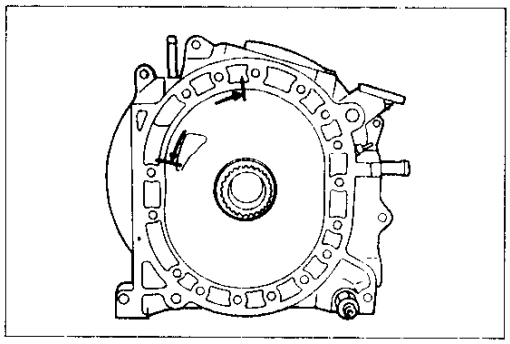
Caution
- **Do not allow sealant in the pressure switch hole.**

Tightening torque:
10.8–15.6 N·m {110–160 kgf·cm, 96–138 in·lbf}



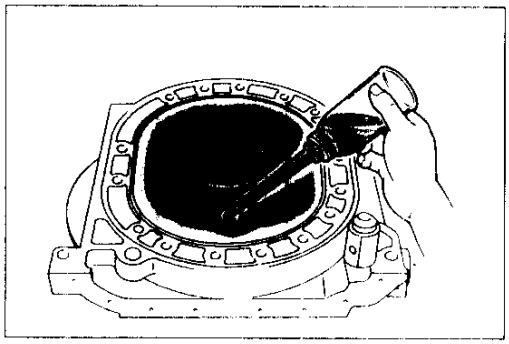
67U01X-157

5. Apply petroleum jelly to the new outer and inner sealing rubbers.
6. Install the outer sealing rubber so that the white paint faces the side wall of the groove.



67U01X 158

7. Install the inner sealing rubber so that the blue paint faces the outer wall of the groove and so that the seam is placed within position shown in the figure.
8. Verify that the outer and inner sealing rubbers are not twisted.

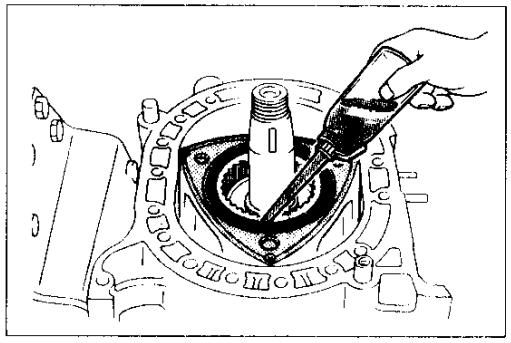


67U01X 159

9. Apply clean engine oil to the contact surfaces, stationary gear, and main bearing.

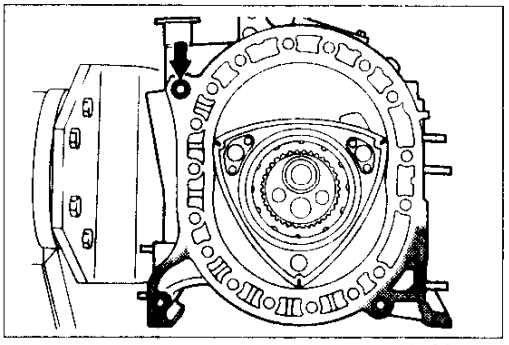
Caution

- **Do not apply engine oil to the sealing rubber.**



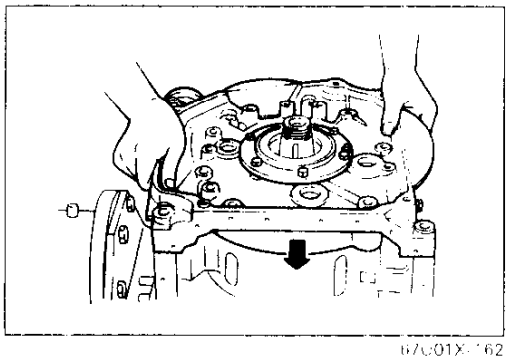
67U01X 160

10. Apply clean engine oil to the rotor oil seal of the rear side of the rotor.



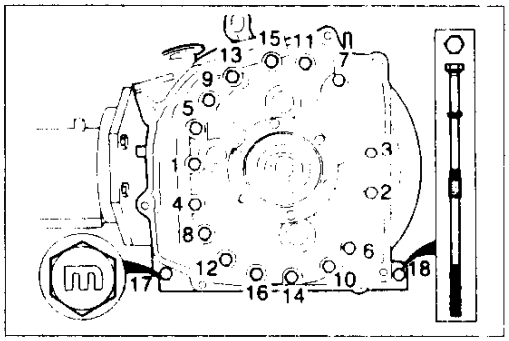
37U0CX 151

11. Apply petroleum jelly to a new O-ring and fit it into the rear rotor housing.
12. Apply sealant to the shaded areas as shown in the figure.



67C01X 162

13. Install the rear housing on the rear rotor housing.
14. Verify that the side pieces of the front and rear apex seals are not wedged between the rotor housing and side housing.



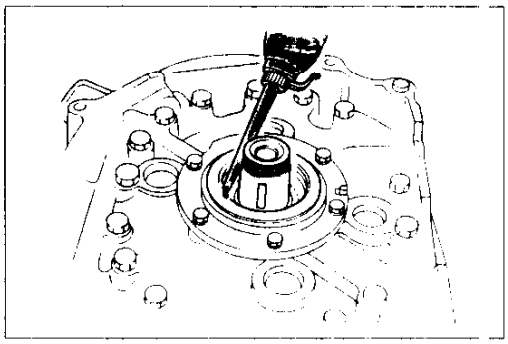
37U0CX-152

Tension Bolt

1. Apply clean engine oil to new seal washers and install them on the tension bolts.
2. Apply clean engine oil to the bolt threads.
3. Install the tension bolts and tighten them gradually in the order shown in the figure.

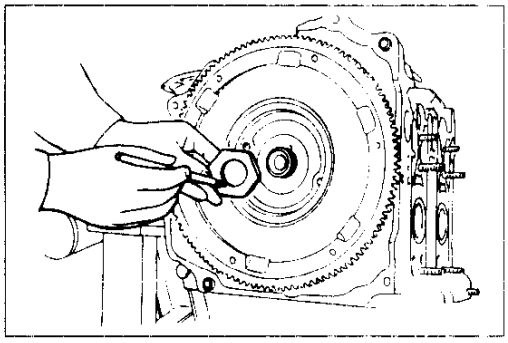
   Tightening torque:
   32–39 N·m {3.2–4.0 kgf·m, 24–28 ft·lbf}

   Note
   - **The bolt with the "m" mark is for the No. 17 position.**
   - **The bolt with the protector tube is for the No. 18 position.**
4. Turn the eccentric shaft and make sure that it rotates easily and smoothly.

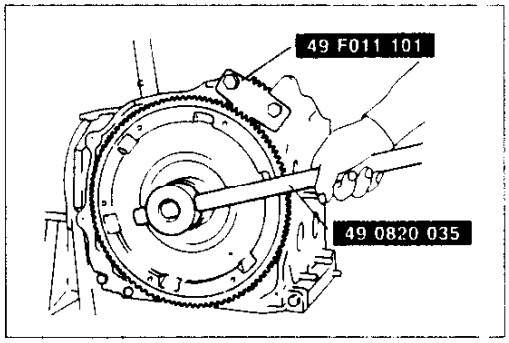

97U0CX-126

Flywheel (MT)

1. Apply clean engine oil to the oil seal in the rear housing.
2. Fit the key to the eccentric shaft.
3. Install the flywheel to the eccentric shaft.


97U0CX-127

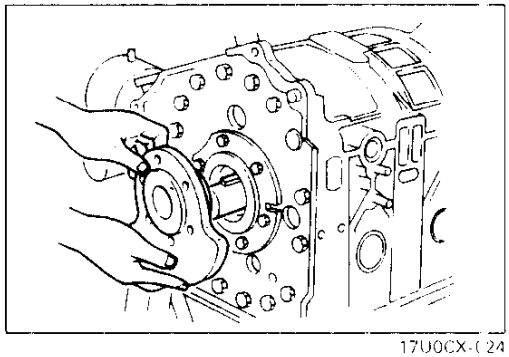
4. Apply thread-locking compound to the eccentric shaft threads.
5. Apply sealant to the contact surface of the locknut.



37U0CX-153

6. Install the locknut and tighten it by using the **SST**.

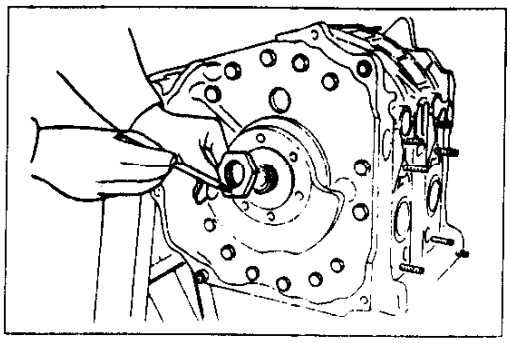
   Tightening torque:
   400–490 N·m {40–50 kgf·m, 290–360 ft·lbf}


17U0CX-024

Counterweight and Drive Plate (AT)

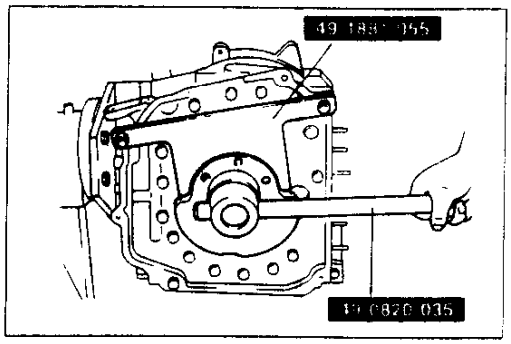
1. Apply clean engine oil to the oil seal in the rear housing.
2. Fit the key into the eccentric shaft.
3. Install the counterweight onto the eccentric shaft.

   Caution
   - **Take care not to damage the seal.**



97U0CX-130

4. Apply thread-locking compound to the eccentric shaft threads.
5. Apply sealant to the contact surface of the locknut.



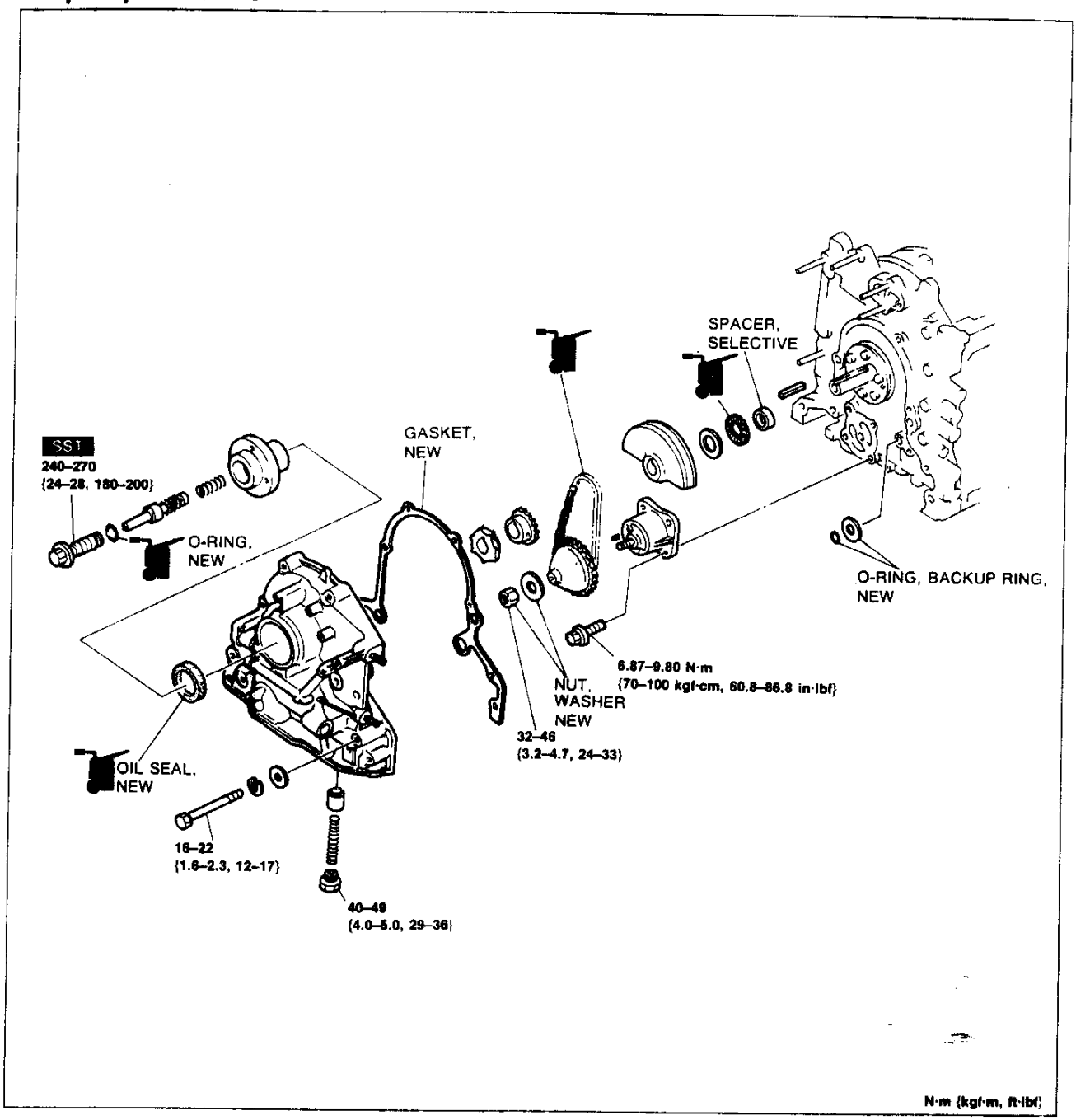
37U0CX-154

6. Install the locknut and tighten it by using the **SST**.

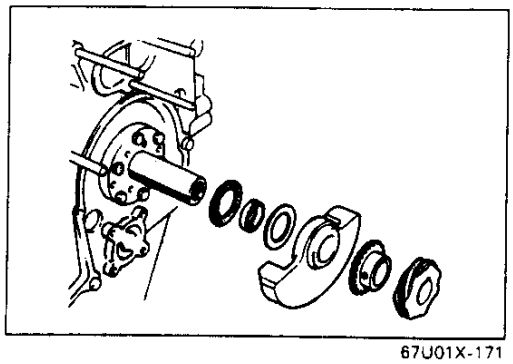
Tightening torque:
400–490 N·m {40–50 kgf·m, 290–360 ft·lbf}

HOUSING (EXTERNAL PARTS II)

Torque Specifications



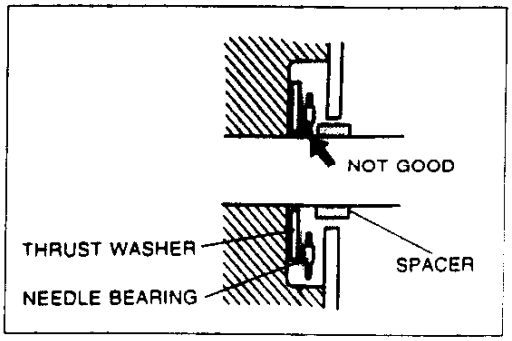
37U0CX-135



67U01X-171

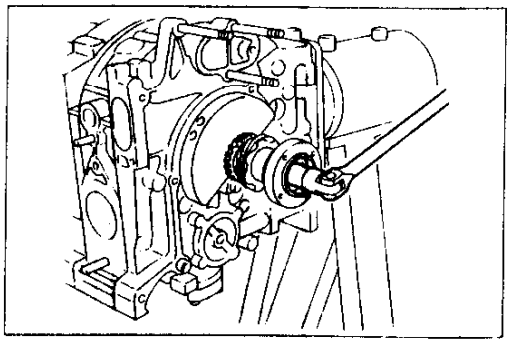
Balance Weight, Bearing, and Spacer

1. Install the following parts to the eccentric shaft:
   (1) Spacer
   (2) Thrust needle bearing
   (3) Thrust washer
   (4) Balance weight
   (5) Oil pump drive sprocket
   (6) Drive gear



97U0CX-132

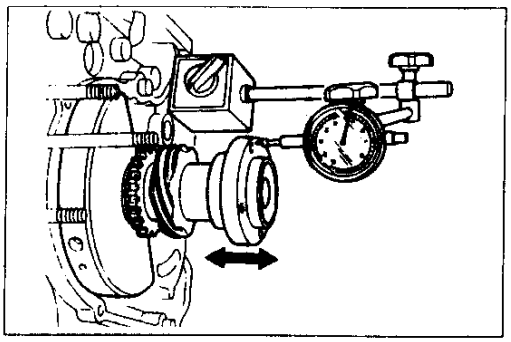
Caution
- **When installing the needle bearing, make sure it is not caught by the spacer.**



37U0CX-156

2. Install the eccentric shaft pulley boss and tighten the new pulley lock bolt.

   Tightening torque:
   108–132 N·m {11.0–13.5 kgf·m, 79.6–97.6 ft·lbf}
3. Remove the **SST**.

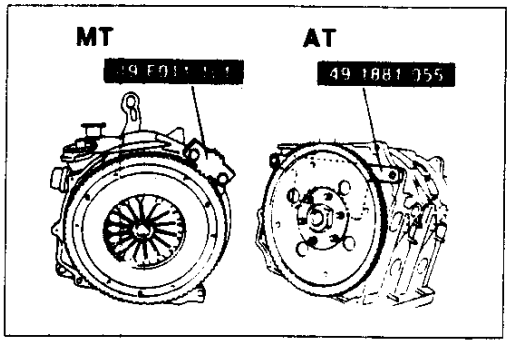


37U0CX-157

4. Measure the end play of the eccentric shaft.

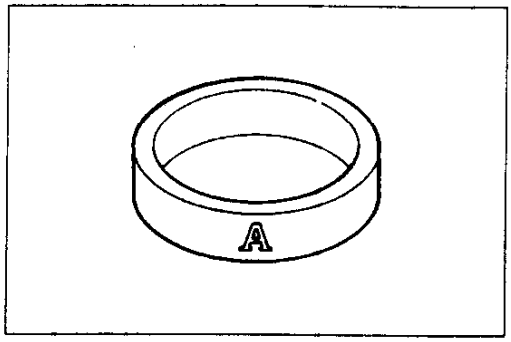
   Standard:
   0.040–0.070 mm {0.0016–0.0028 in}
   Maximum:
   0.09 mm {0.0035 in} max.

   If the end play is not within specification, continue from step 5 and replace the spacer.



37U0CX-158

5. Attach the **SST** to the flywheel (MT) or to the counterweight (AT).
6. Remove the eccentric shaft lock bolt, drive gear, and oil pump drive sprocket.

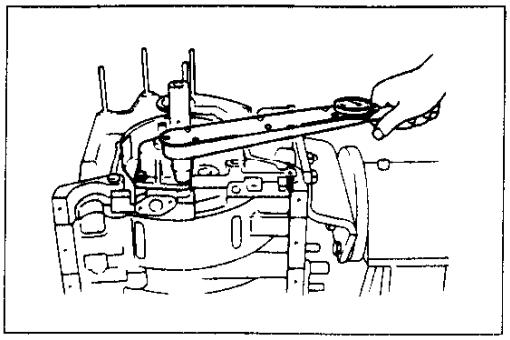


37U0CX-159

7. If the end play is less than specified, replace the spacer with a thicker one. If the end play is more than specified, install a thinner spacer.

Spacer stamp and thickness

Stamp	Thickness mm {in}	Stamp	Thickness mm {in}
A	7.975–7.995 {0.3140–0.3147}	D	8.035–8.055 {0.3164–0.3171}
B	7.995–8.015 {0.3148–0.3155}	E	8.055–8.075 {0.3172–0.3179}
C	8.015–8.035 {0.3156–0.3163}		

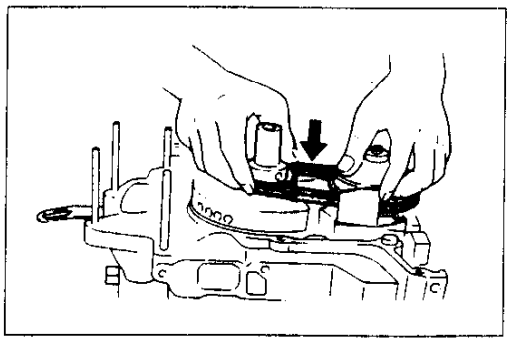


97U0CX-136

Oil pump

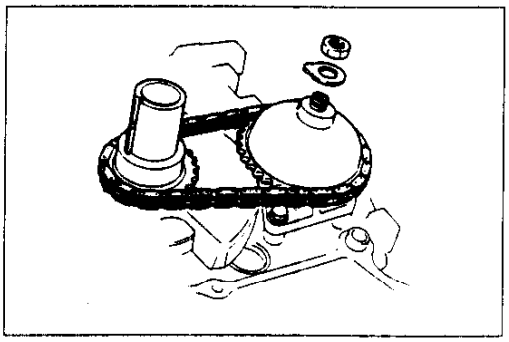
1. Apply clean engine oil to the oil pump shaft.
2. Install the oil pump to the front housing.

Tightening torque:
6.87–9.80 N·m {70–100 kgf·cm , 60.8–86.8 in·lbf}



67U01X-179

3. Install the key to the oil pump shaft.
4. Install the oil pump drive gear, driven gear, and drive chain as an assembly.

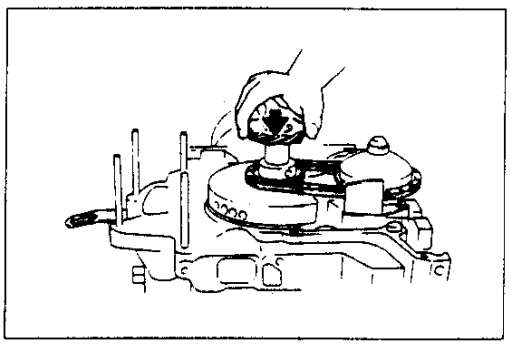


37U0CX-160

5. Install the key to the eccentric shaft.
6. Install a new washer and oil pump locknut.

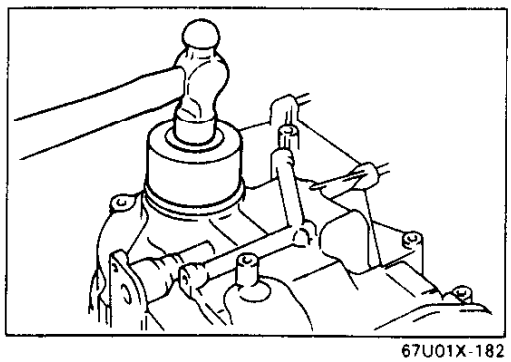
Tightening torque:
32–46 N·m {3.2–4.7 kgf·m, 24–33 ft·lbf}

7. Bend the washer to lock the nut.



37U0CX-161

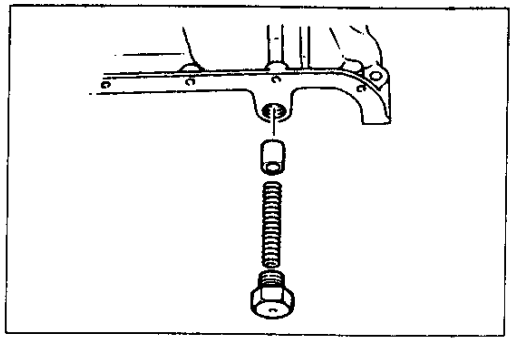
8. Install the drive gear so that the chamfered surface faces the housing.



67U01X-182

Front Cover

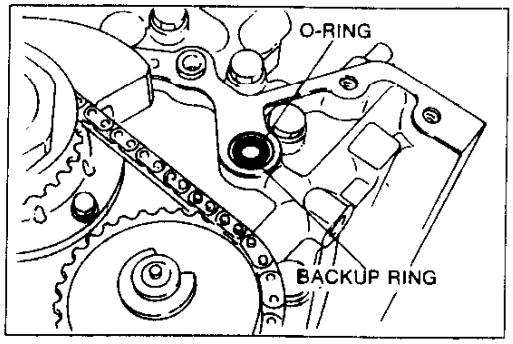
1. Apply clean engine oil to the new front oil seal and the groove of the front cover.
2. Install the oil seal in the front cover.



37U0CX-162

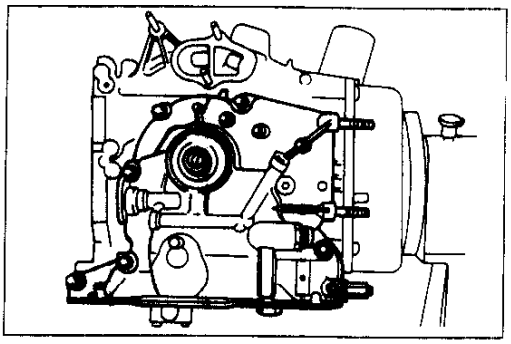
3. Install the oil pressure control valve in the front cover.

Tightening torque:
40–49 N·m {4.0–5.0 kgf·m, 29-36 ft·lbf}



37U0CX-163

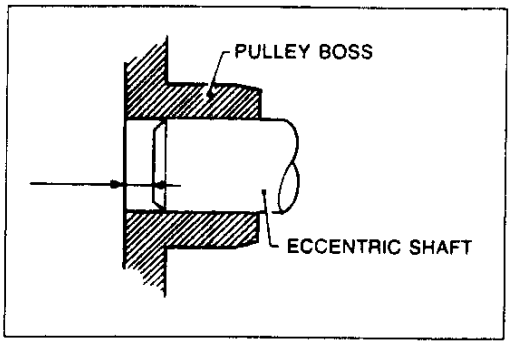
4. Apply petroleum jelly to the new O-ring and backup ring.



37U0CX-164

5. Install the front cover along with a new gasket.

Tightening torque:
16–22 N·m {1.6–2.3 kgf·m, 12–17 ft·lbf}

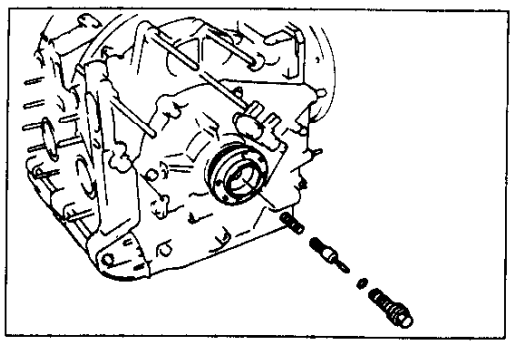


97U0CX-138

Eccentric Shaft Lock Bolt and Bypass Valve

1. Install the eccentric shaft pulley boss.
2. Temporarily install the lock bolt, and tighten it by hand.
3. Remove the lock bolt, and measure the pulley boss protrusion. If it is over the limit, the needle bearing may be caught by the spacer. Remove and reinstall the needle bearing, if necessary.

Protrusion: 2.44 mm {0.0961} max.



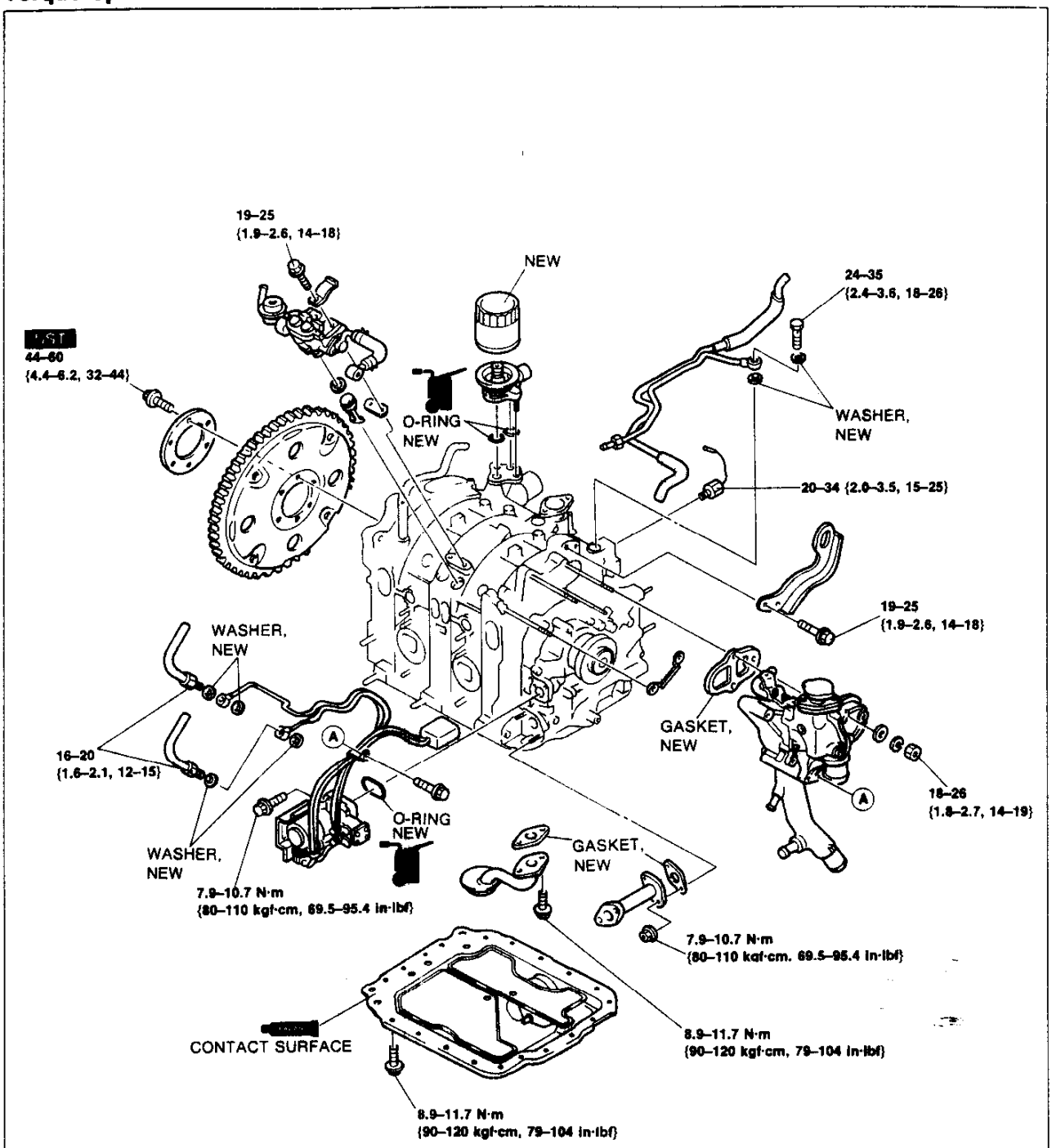
37U0CX-165

4. Install the bypass valve and spring into the eccentric shaft.
5. Apply clean engine oil to the new O-ring and install it on the lock bolt.
6. Apply sealant to the flange face of a new lock bolt.
7. Install the lock bolt.

Tightening torque:
240–270 N·m {24–28 kgf·m, 180–200 ft·lbf}

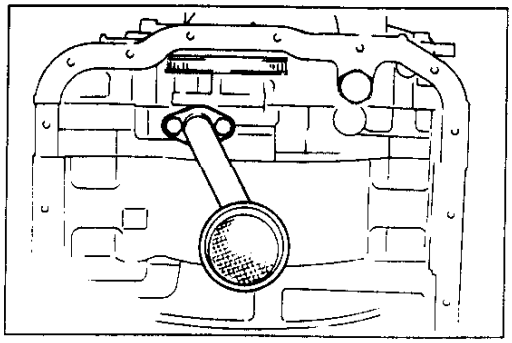
HOUSING (EXTERNAL PARTS I)

Torque Specifications



N·m {kgf·m, ft·lbf}

37U0CX-166

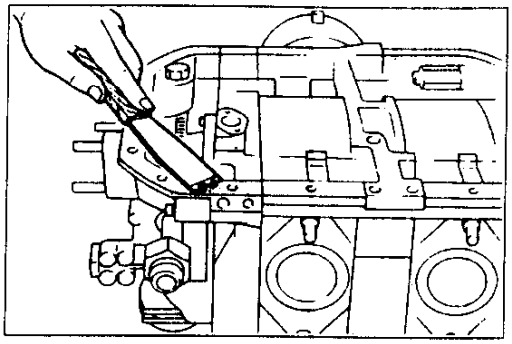


97U0CX-140

Oil Strainer

Install the oil strainer along with a new gasket.

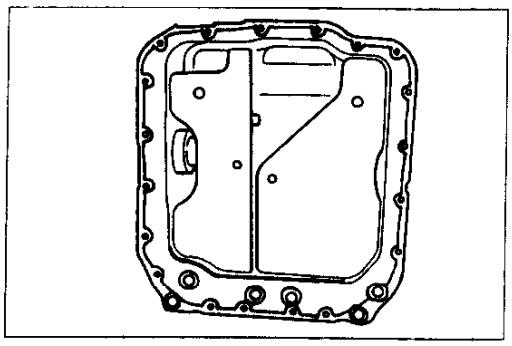
Tightening torque:
8.9–11.7 N·m {90–120 kgf·cm, 79–104 in·lbf}



97U0CX-141

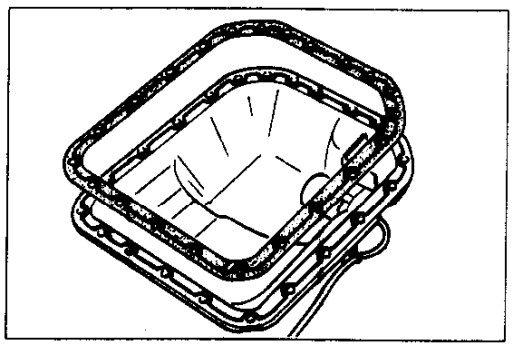
Oil Pan

1. Cut away the part of the gasket that projects from between the front cover and the housing.



17U0CX-025

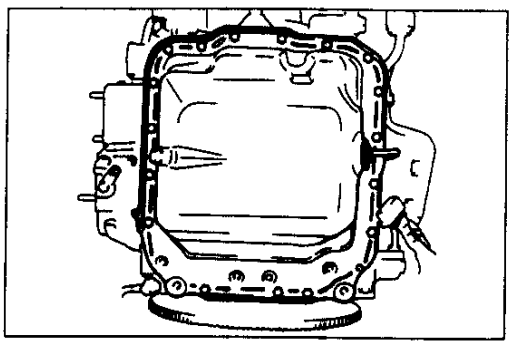
2. Clean the mating surface of the housing and oil pan with degreaser and a soft cloth.
3. **(Without gasket)**
   Apply a **4–6 mm {0.16–0.24 in}** diameter bead of sealant around the inside edge of the housing as shown in the figure. It should be continuously applied inboard of the bolt holes, and the ends should overlap.



17U0CX-018

(With gasket)
Apply a **4–6 mm {0.16–0.24 in}** diameter bead of sealant around the inside edge of the oil pan and the housing side of the new gasket. It should be continuously applied inboard of the bolt holes, and the ends should overlap.

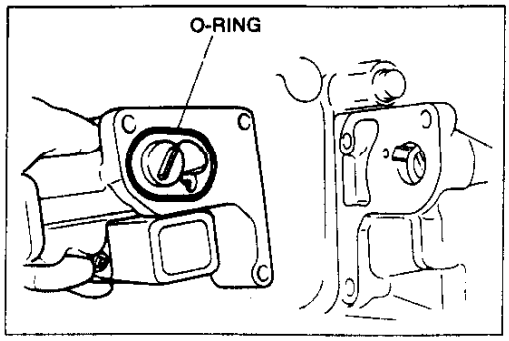
Caution
- **Install the oil pan within 5 minutes after the sealant is applied.**



37U0CX-167

4. Install the oil pan and tighten the bolts gradually and evenly.

Tightening torque:
8.9–11.7 N·m {90–120 kgf·cm, 79–104 in·lbf}

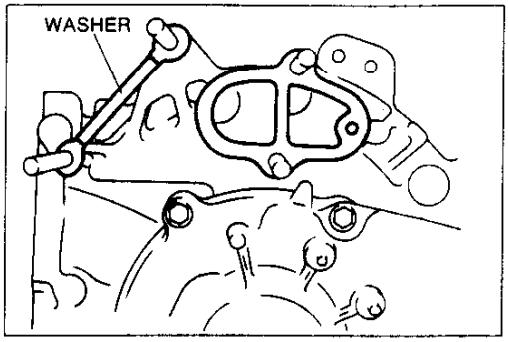


37U0CX-168

Metering oil pump

1. Apply engine oil to the new O-ring.
2. Install the metering oil pump to the front housing.

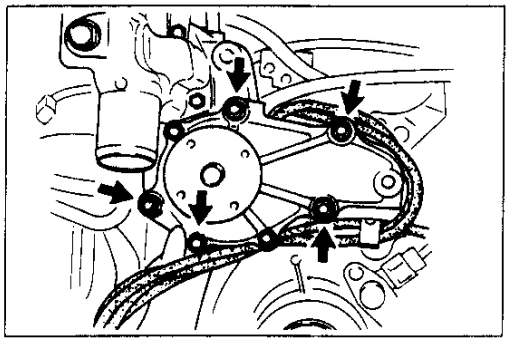
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



37U0CX-169

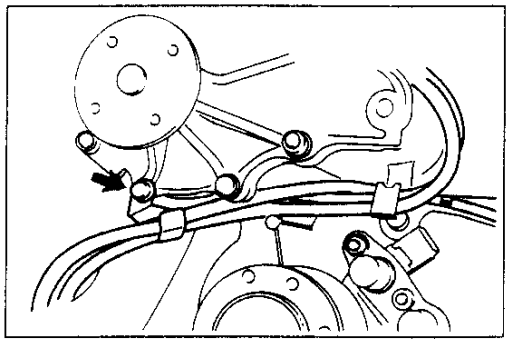
Water pump

1. Install the washer and new gasket to the front housing.


37U0CX-170

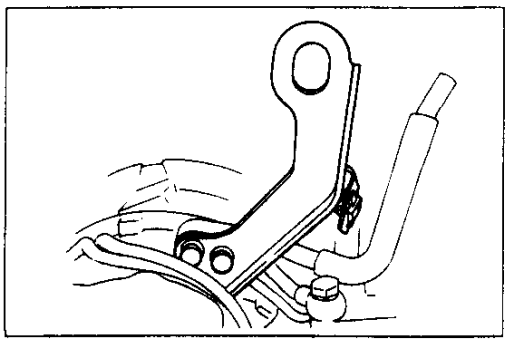
2. Install the water pump to the front housing.

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


37U0CX-171

3. Install the metering oil pump harness and the metering oil tube to the water pump housing.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

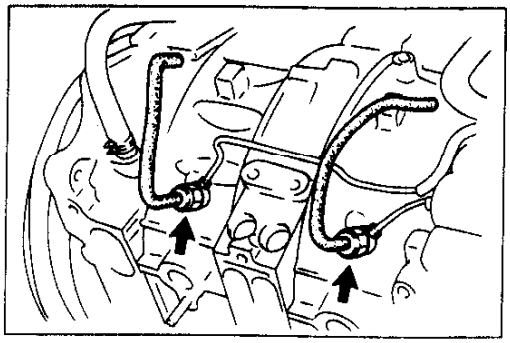

37U0CX-172

Engine hanger

1. Install the engine hanger to the front housing.

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

2. Mount the metering oil pump connector to the engine hanger.

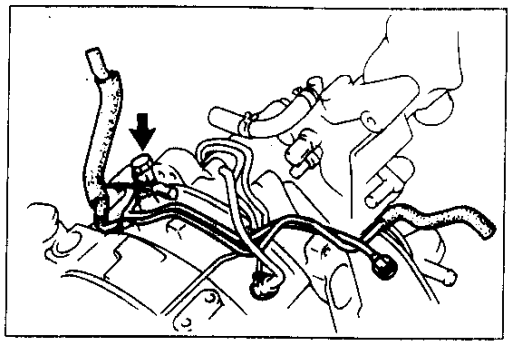

37U0CX-173

Metering oil nozzle

Install the oil nozzles and connect the metering oil tubes using new washers.

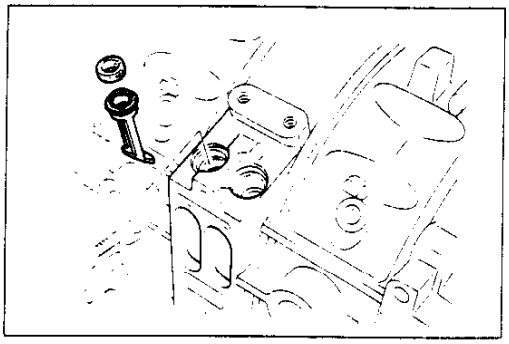
Tightening torque:
16–22 N·m {1.6–2.3 kgf·m, 12–16 ft·lbf}

Note
- **The oil tube ends are colored.**
  White : Front rotor housing
  Yellow: Rear rotor housing


37U0CX-174

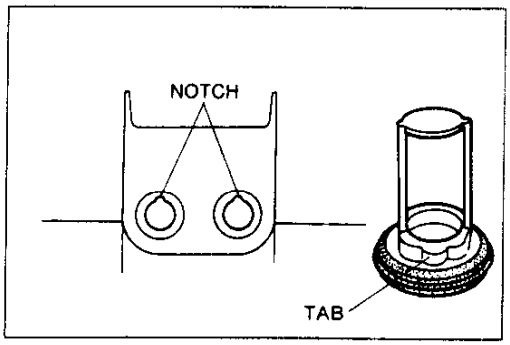
Oil inlet pipe

Install the oil inlet pipe and new washers as an assembly and loosely tighten the connecting bolt.


37U0CX-175

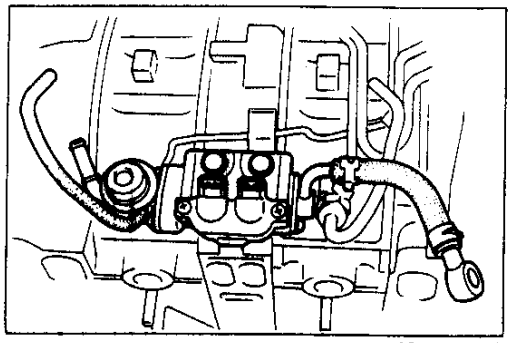
Fuel delivery pipe and mixing plate

1. Apply clean engine oil to the air bleed socket.
2. Install the air bleed socket into the engine.



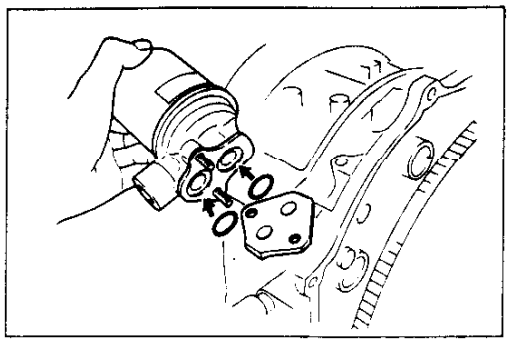
37U0CX-176

Caution
- **Install the mixing plate by aligning the mixing plate tab with the housing notch.**


37U0CX-177

3. Install the fuel delivery pipe.

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

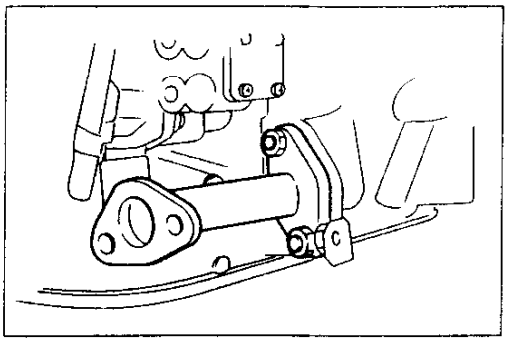


37U0CX-178

Oil filter body

Install the oil filter body along with new O-rings.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

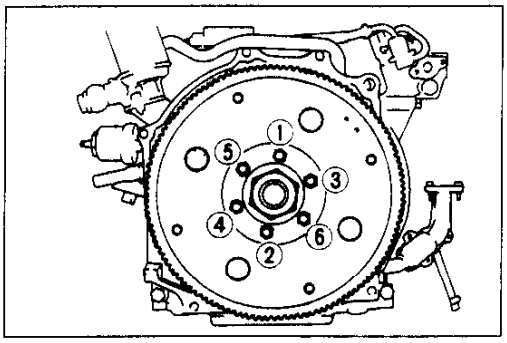


37U0CX-179

Oil pipe

Install the oil pipe along with a new gasket.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

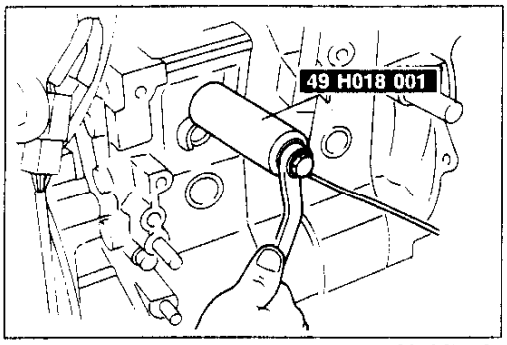


37U0CX-180

Drive plate (AT)

1. Attach the **SST** to the counterweight.
2. Install the drive plate and the back plate.
3. Tighten the bolts in two or three steps in the order shown in the figure.

Tightening torque:
44–60 N·m {4.4–6.2 kgf·m, 32–44 ft·lbf}



37U0CX-181

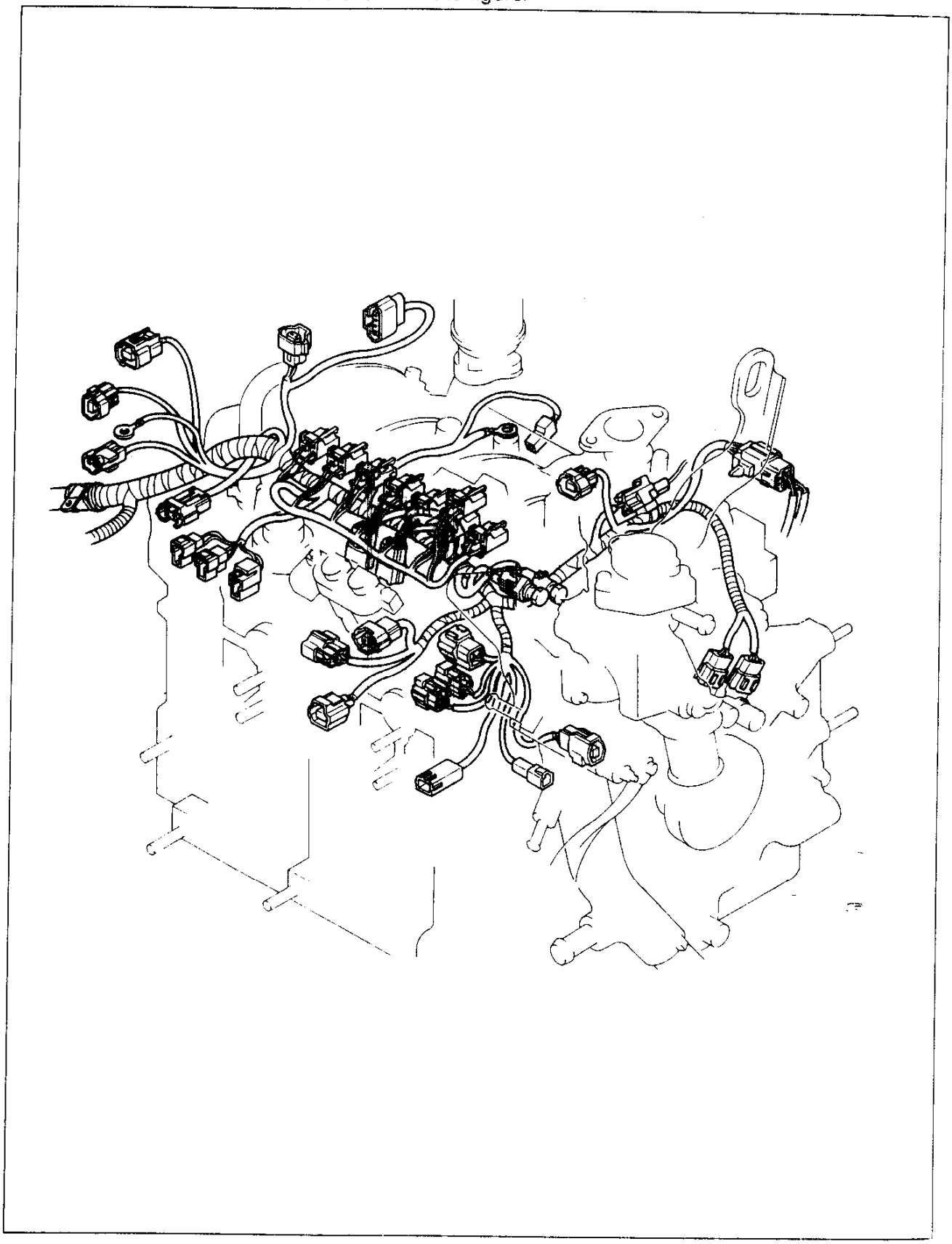
Knock sensor

Install the knock sensor and tighten it by using the **SST**.

Tightening torque:
20–34 N·m {2.0–3.5 kgf·m, 15–25 ft·lbf}

Harness

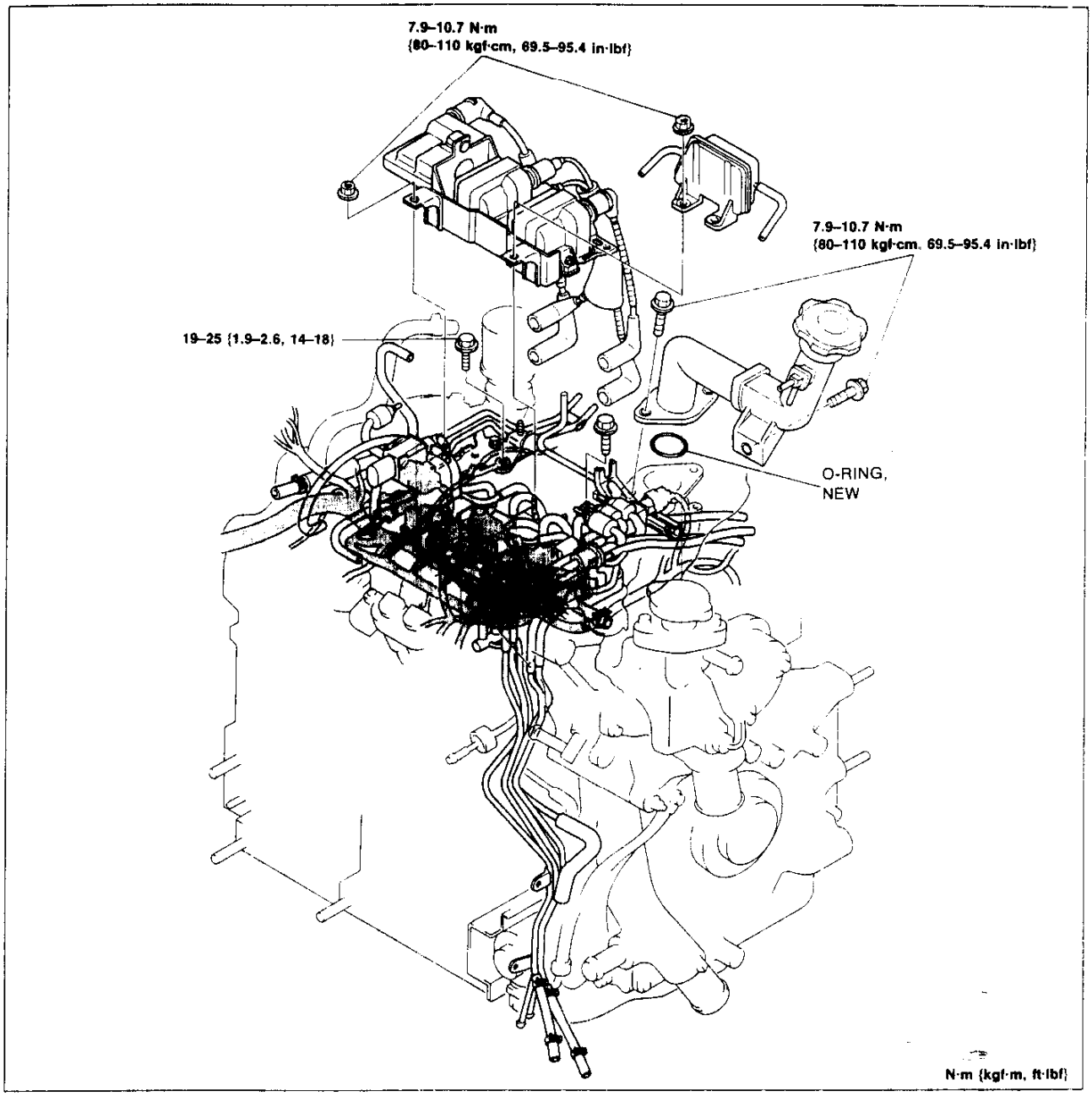
Connect the harness connectors shown in the figure.



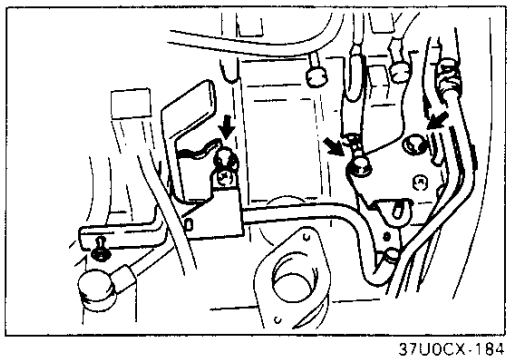
37U0CX-182

Vacuum pipe assembly

Connect the hoses and connectors shown in the figure.



37U0CX-183



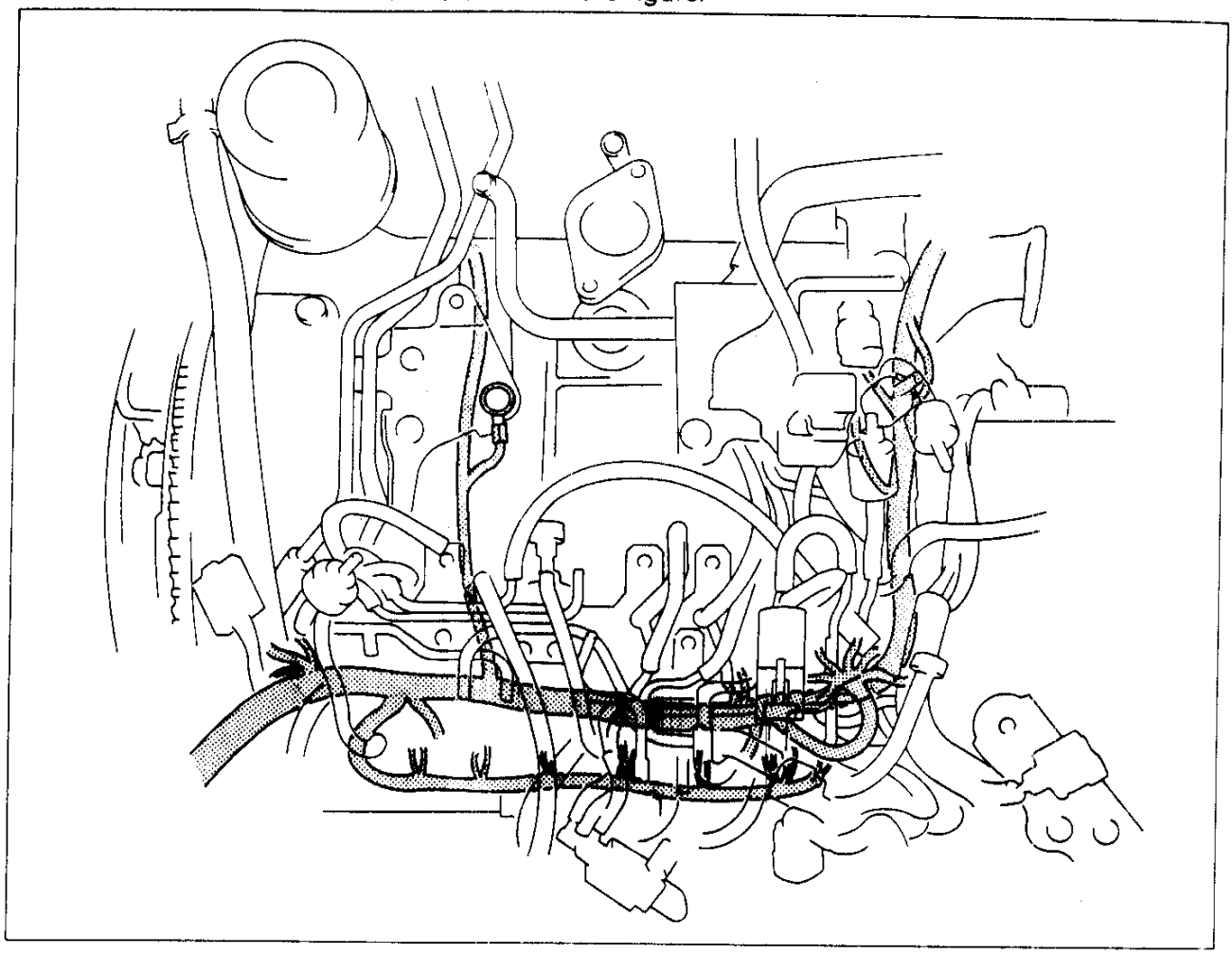
37U0CX-184

Vacuum pipe

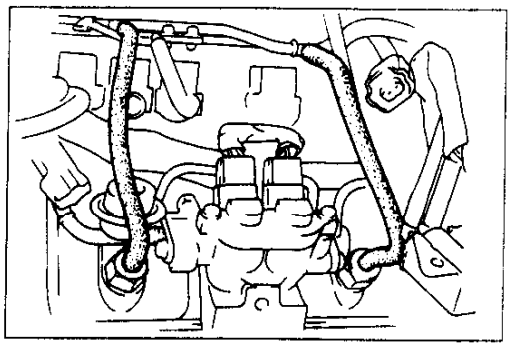
1. Install the vacuum pipe and ground harness.

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

2. Install the harness and hoses as shown in the figure.

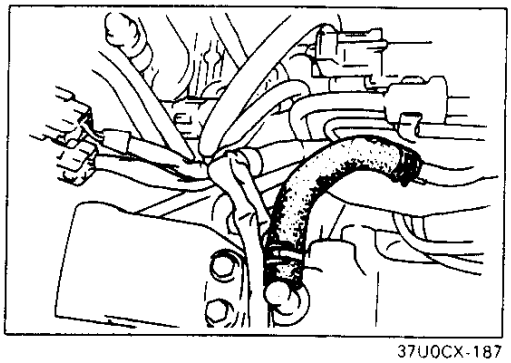


37U0CX-185



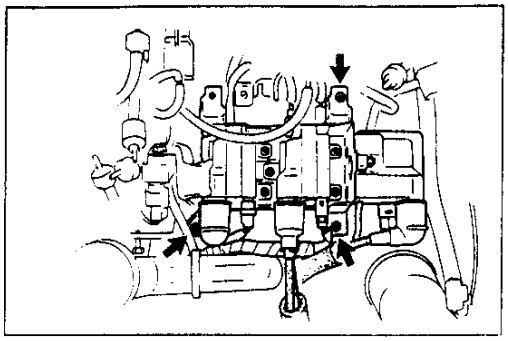
37U0CX-186

3. Connect the vacuum hoses.



37U0CX-187

4. Connect the water hose.

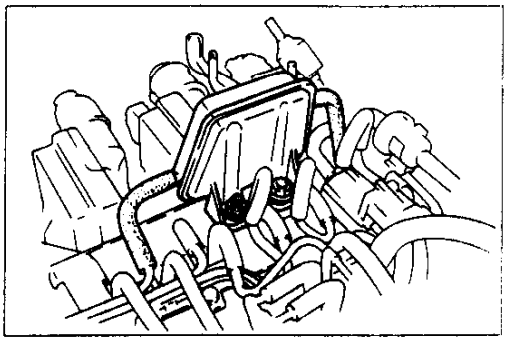


37U0CX-188

Ignition coil assembly and vacuum chamber

1. Install the ignition coil assembly

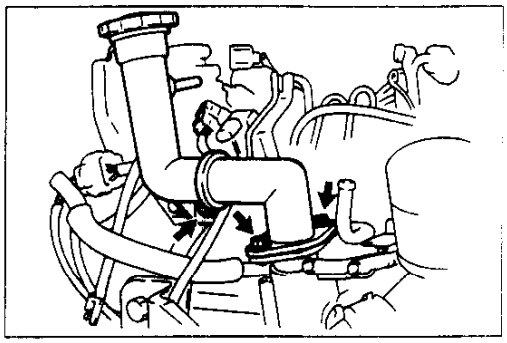
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



37U0CX-189

2. Install the vacuum chamber.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



37U0CX-190

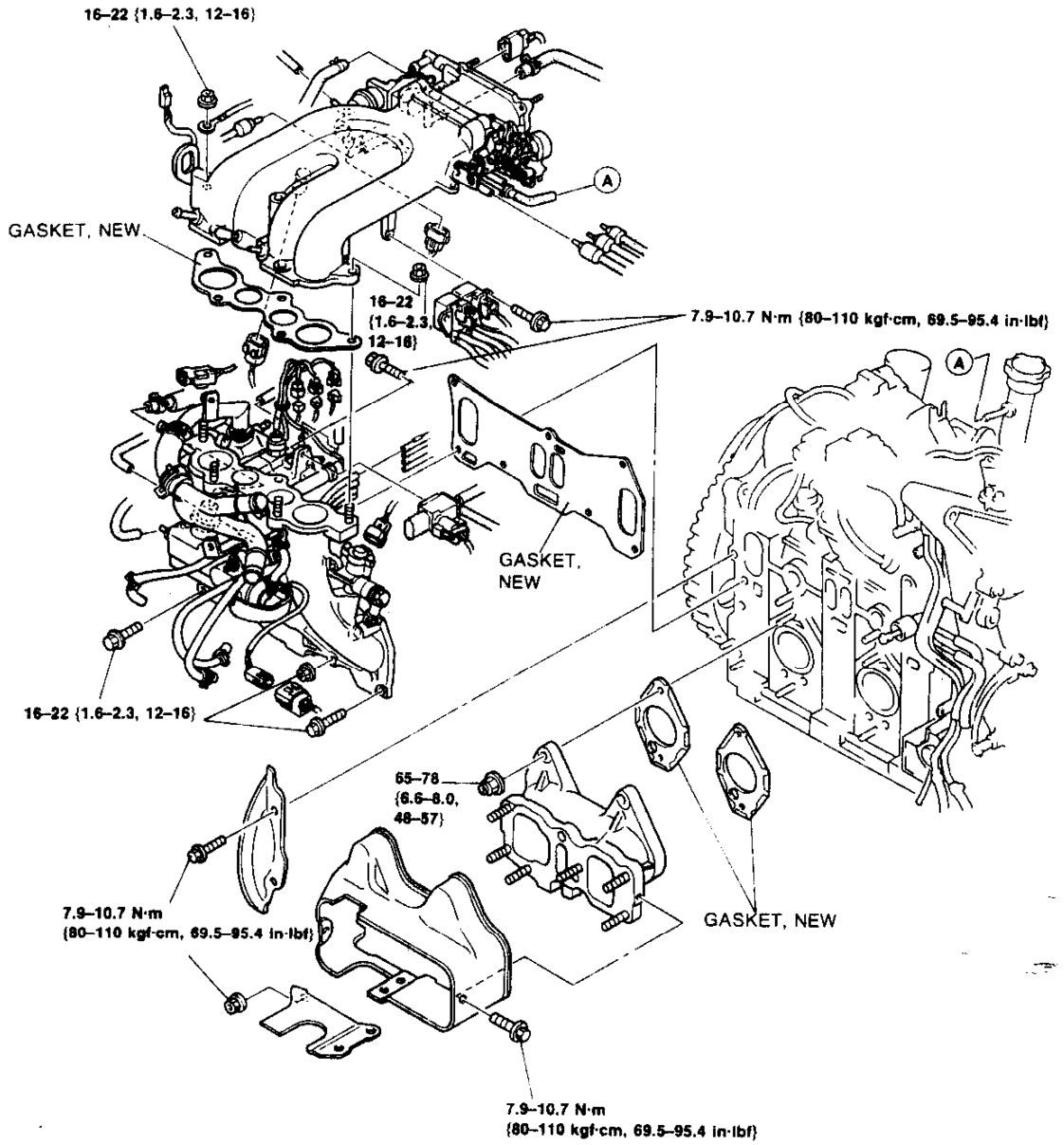
Oil filler pipe

Install the oil filler pipe along with a new O-ring.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

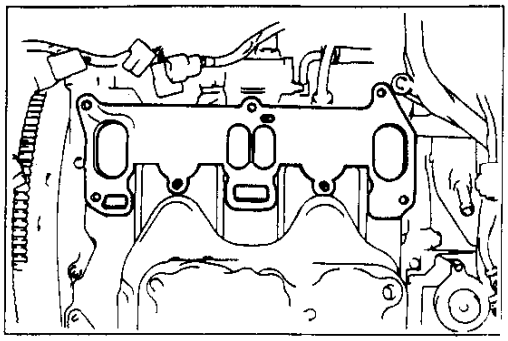
AUXILIARY PARTS (II)

Torque Specifications



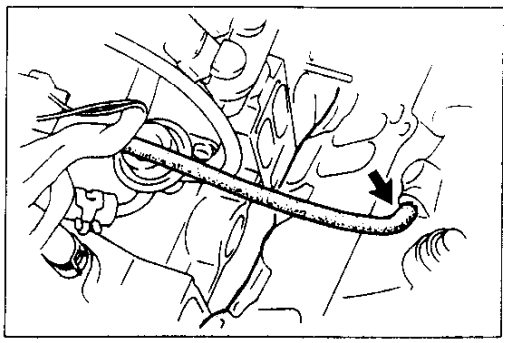
N·m {kgf·m, ft·lbf}

37U0CX-191

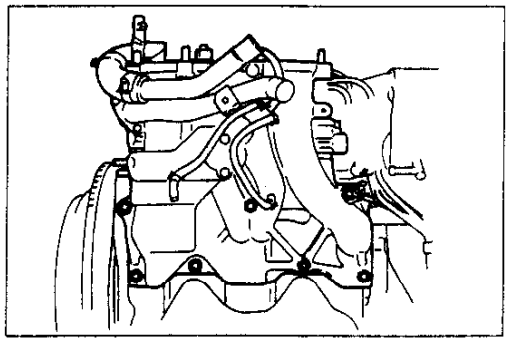

37U0CX-192

Intake manifold assembly

1. Install the new intake manifold gasket on the engine.

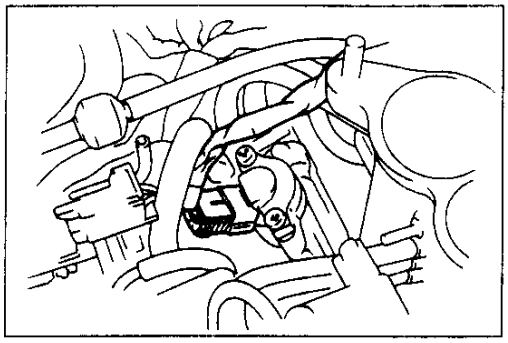

37U0CX-193

2. Connect the vacuum hose to the intake manifold.

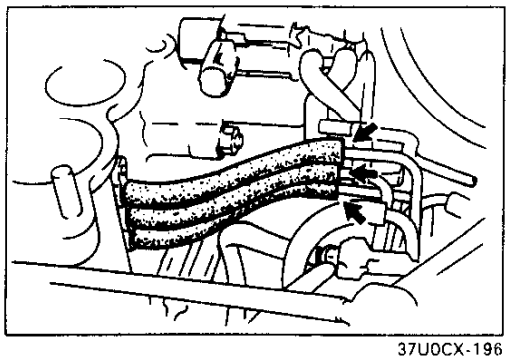

37U0CX-194

3. Install the intake manifold.

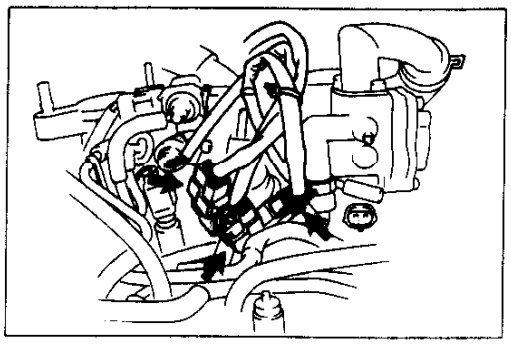
Tightening torque:
16–22 N·m {1.6–2.3 kgf·m, 12–16 ft·lbf}


37U0CX-195

4. Connect the injector connectors.

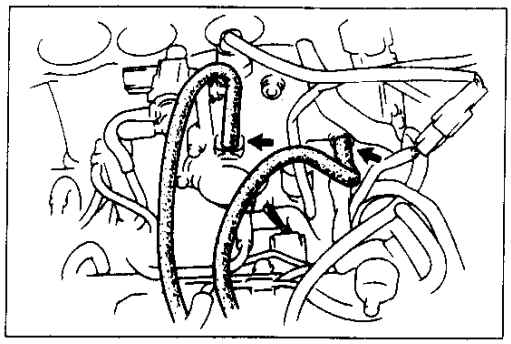

37U0CX-196

5. Connect the vacuum hoses as shown in the figure.



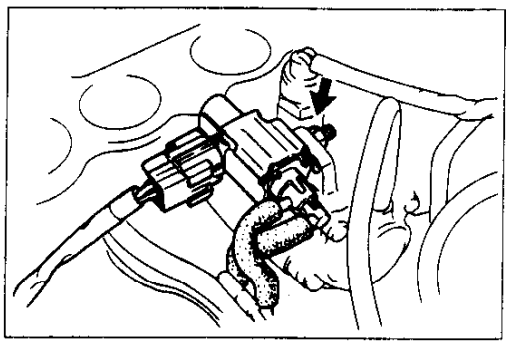
37U0CX-197

6. Connect the connectors shown in the figure.



37U0CX-198

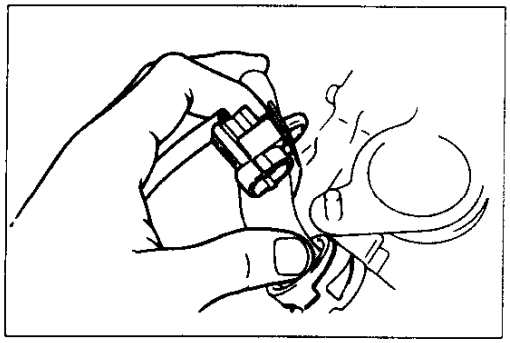
7. Connect the vacuum hoses as shown in the figure.



37U0CX-199

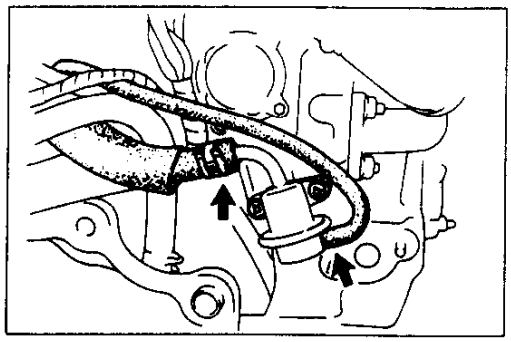
8. Install the three-way solenoid shown in the figure.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



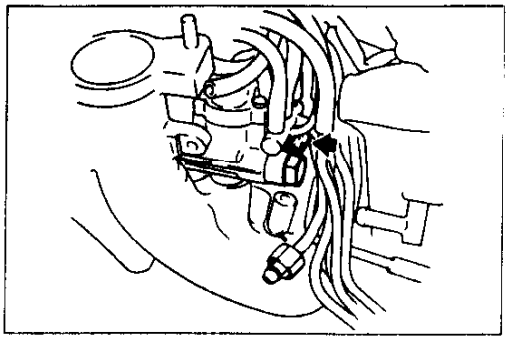
37U0CX-200

9. Mount the oxygen sensor connector.

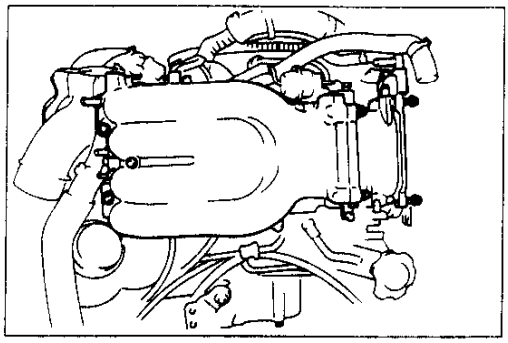


37U0CX-201

10. Connect the fuel hose and vacuum hose.


37U0CX-202

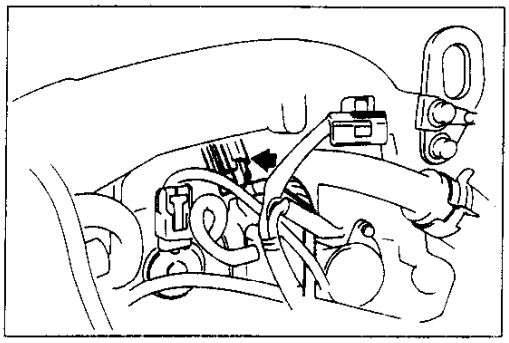
11. Connect the fuel hose shown in the figure.


37U0CX-203

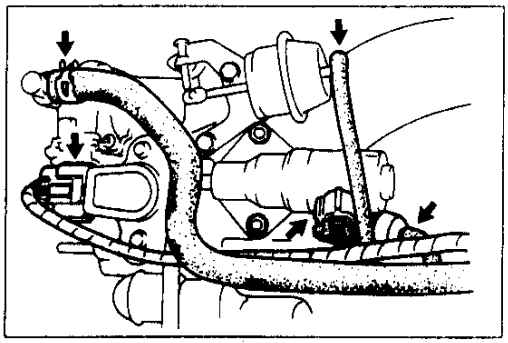
Surge tank assembly

1. Install the surge tank assembly and the ground harness.

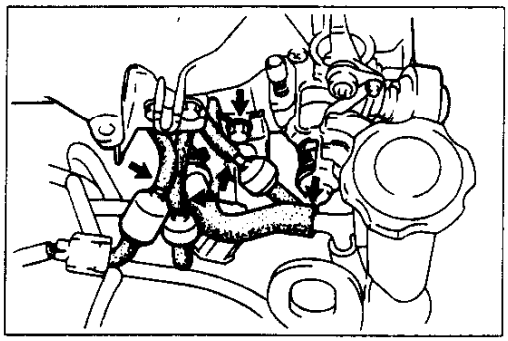
Tightening torque:
16–22 N·m {1.6–2.3 kgf·m, 12–16 ft·lbf}


37U0CX-204

2. Connect the connector shown in the figure.


37U0CX-205

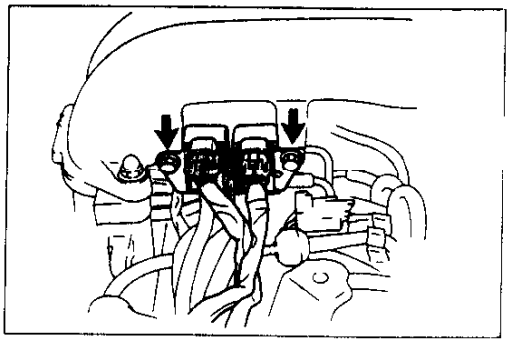
3. Connect the connector and the hoses shown in the figure.


37U0CX-206

4. Tighten the bolt.

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

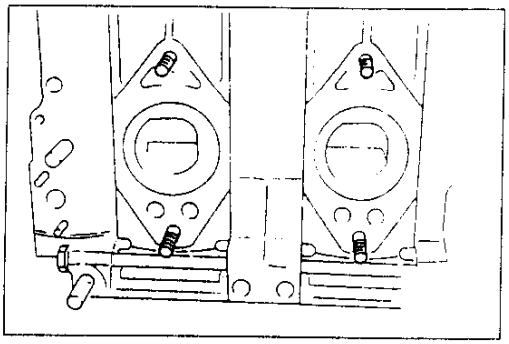
5. Connect the vacuum hoses and the blowby hose as shown in the figure.



37U0CX-207

6. Connect the duty solenoid valve as shown in the figure.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

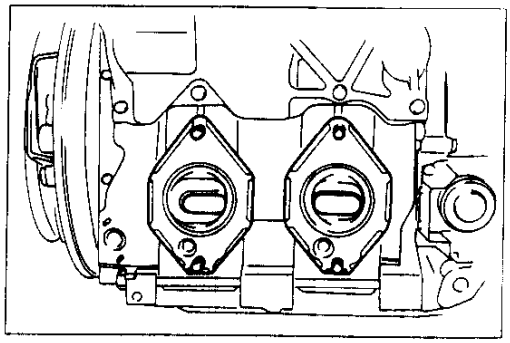


37U0CX-208

Exhaust manifold

1. Retighten the studs to the specified torque.

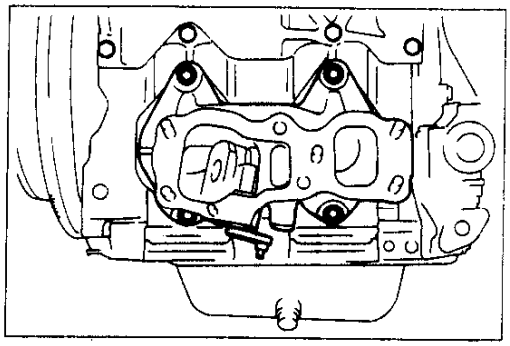
Tightening torque:
30–35 N·m {3.0–3.6 kgf·m, 22–26 ft·lbf}



37U0CX-209

2. Install the new exhaust manifold gaskets on the engine.

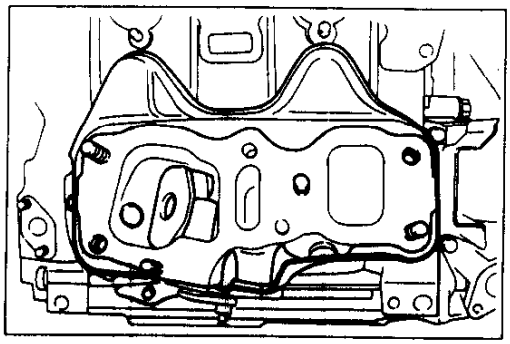
Caution
- **Install the gaskets with the crimped side facing the exhaust manifold.**



37U0CX-210

3. Install the exhaust manifold.

Tightening torque:
65–78 N·m {6.6–8.0 kgf·m, 48–57 ft·lbf}

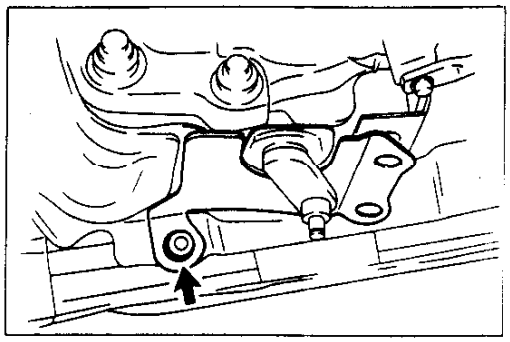


37U0CX-211

Exhaust manifold insulator

1. Install the exhaust manifold insulator.

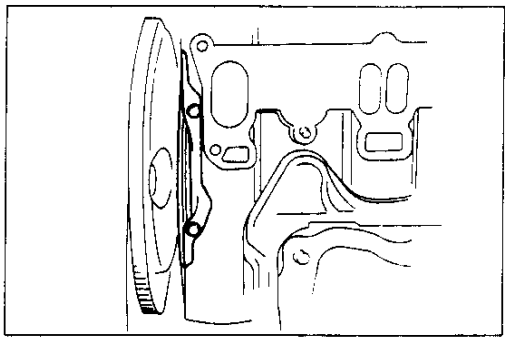
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



37U0CX-212

2. Install the exhaust manifold insulator.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



37U0CX-213

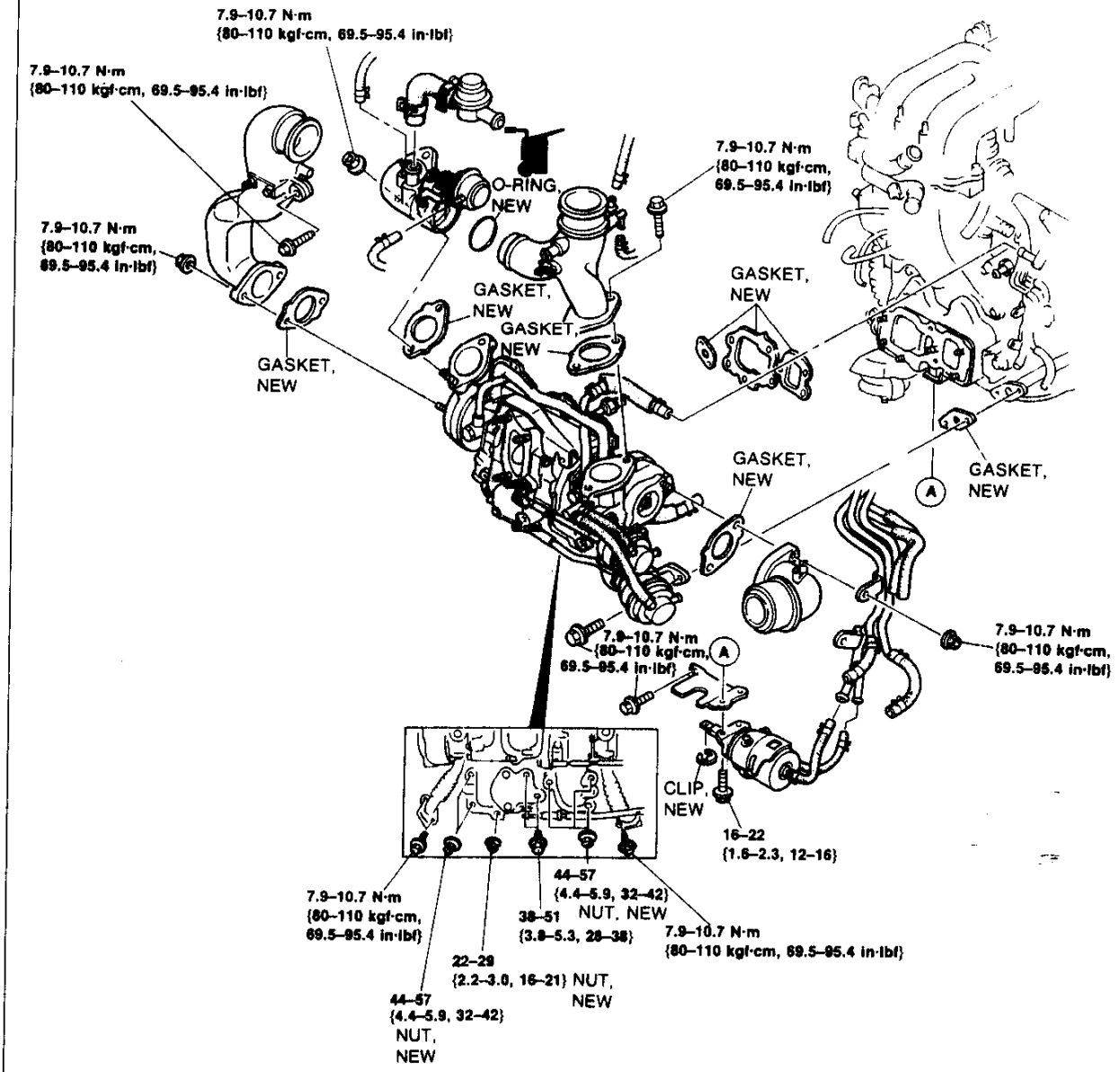
Oil seal plate

Install the oil seal plate.

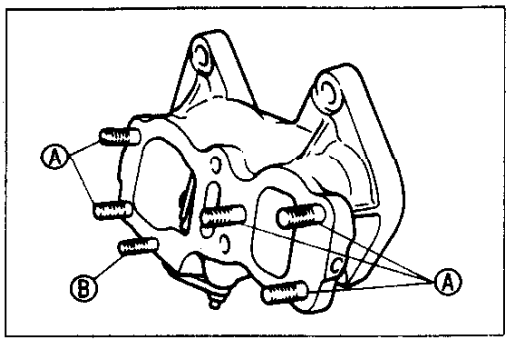
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

TURBOCHARGER

Torque specifications



37U0CX-214

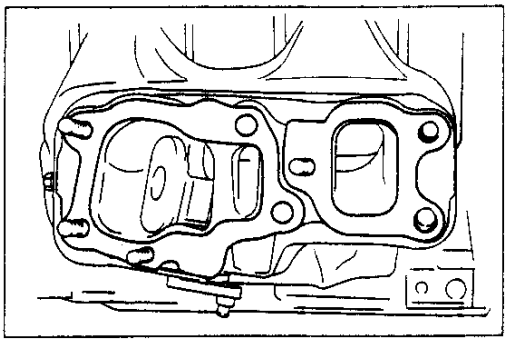


37U0CX-215

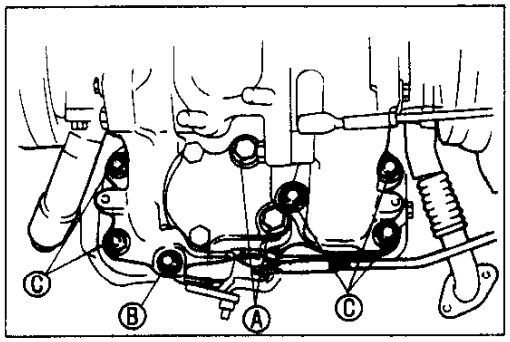
Turbocharger

1. Retighten the stud to the specified torque.

Tightening torque:
A: 16–23 N·m {1.6–2.4 kgf·m, 12–17 ft·lbf}
B: 7.9–11.7 N·m {80–120 kgf·cm, 70–104 in·lbf}


37U0CX-216

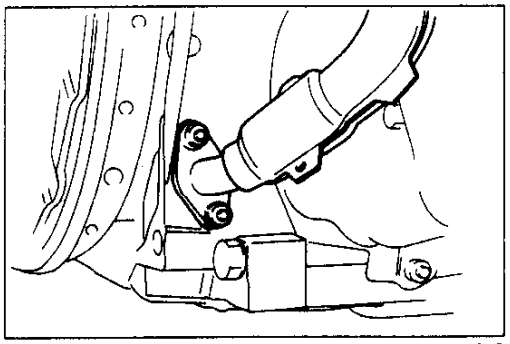
2. Install the new turbocharger gaskets.



37U0CX-217

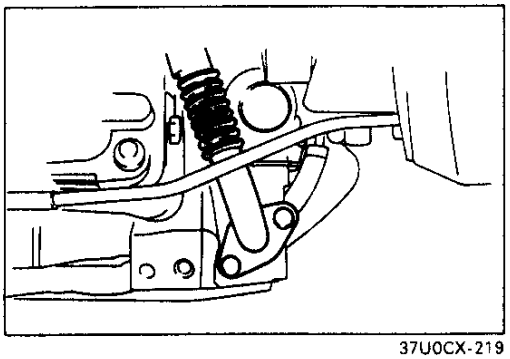
3. Install the turbocharger assembly.

Tightening torque:
A: 38–51 N·m {3.8–5.3 kgf·m, 28–38 ft·lbf}
B: 22–29 N·m {2.2–3.0 kgf·m, 16–21 ft·lbf}
C: 44–57 N·m {4.4–5.9 kgf·m, 32–42 ft·lbf}


37U0CX-218

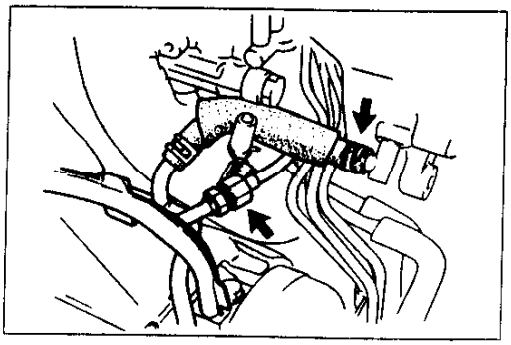
4. Connect the oil outlet pipe along with a new gasket.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}


37U0CX-219

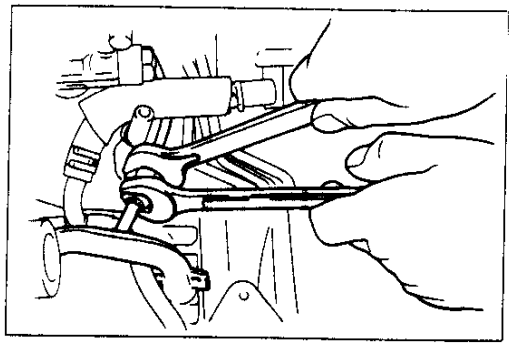
5. Connect the oil outlet pipe along with a new gasket.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}


37U0CX-220

6. Connect the oil inlet pipe and water hose.

Caution
- **Do not twist the oil inlet pipe.**


37U0CX-221

7. Tighten the oil inlet pipe connector bolt.

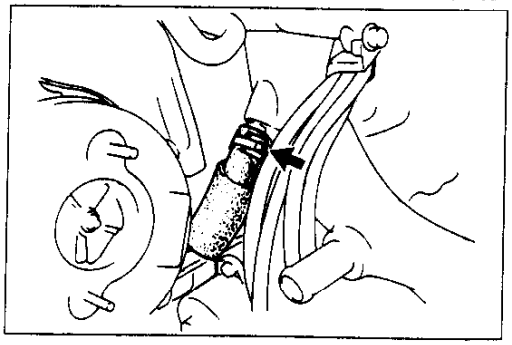
Caution
- **Use two wrenches, as shown.**

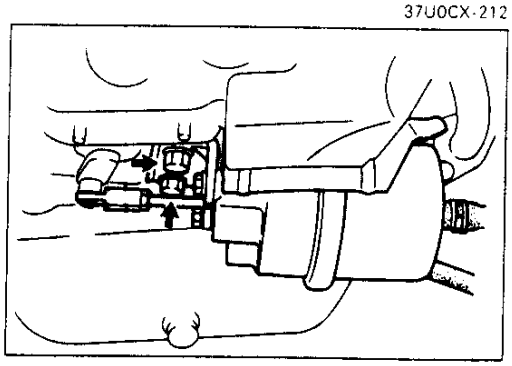
Tightening torque:
18–22 N·m {1.8–2.3 kgf·m, 14–16 ft·lbf}

8. Tighten the oil inlet pipe connecting bolt. (Refer to C–80)

Tightening torque
24–35 N·m {2.4–3.6 kgf·m, 18–26 ft·lbf}

9. Connect the water hose.

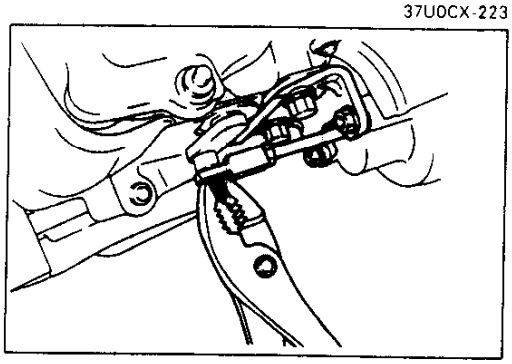

37U0CX-212


37U0CX-223

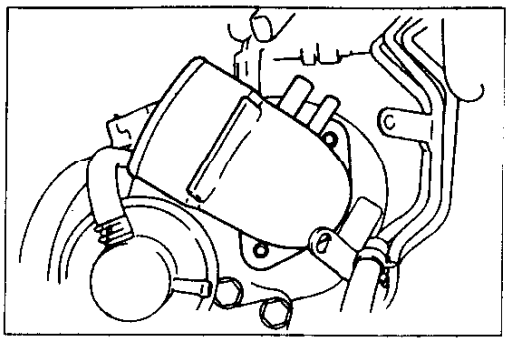
10. Install the turbo control actuator.

Tightening torque:
16–22 N·m {1.6–2.3 kgf·m, 12–16 ft·lbf}

11. Connect the air hoses.


37U0CX-224

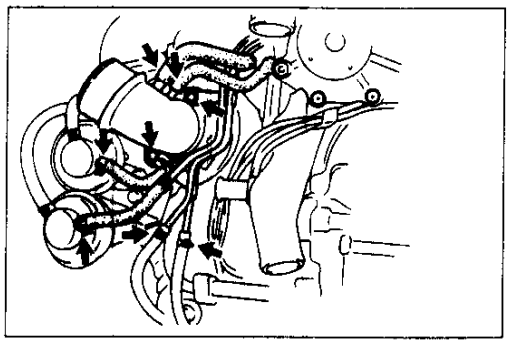
12. Install a new clip on the actuator rod.



37U0CX-225

Air intake pipe

Install the air intake pipe.



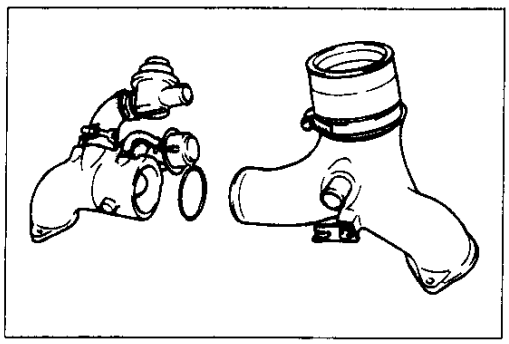
37U0CX-226

Vacuum pipe

1. Install the vacuum pipe.

   Tightening torque:
   7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

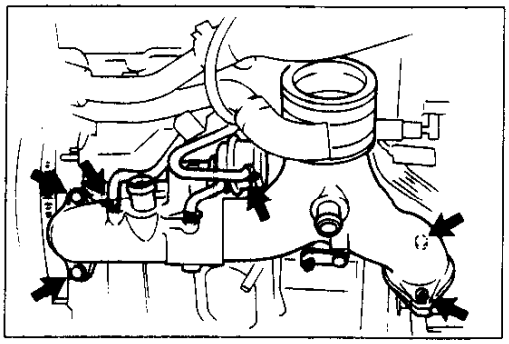
2. Connect the vacuum hoses.



37U0CX-227

Air pipe and control valve

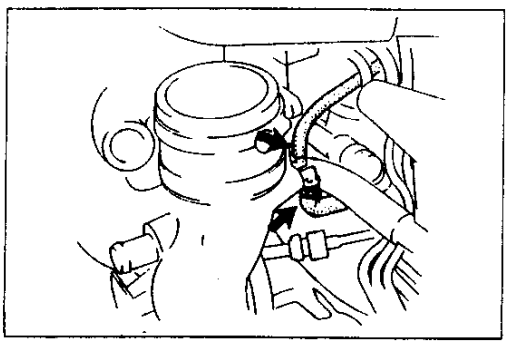
1. Apply clean engine oil to the new O-ring, and install it between the air pipe and control valve.



37U0CX-228

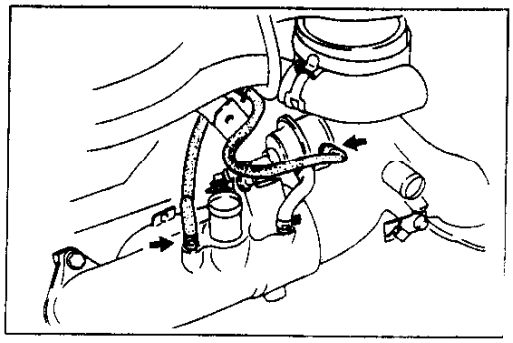
2. Install the air pipe and control valve on the turbocharger assembly along with new gaskets.

   Tightening torque:
   7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



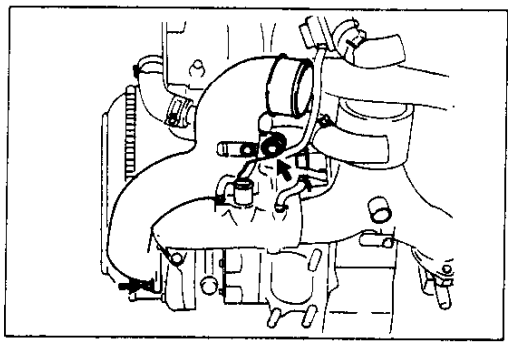
37U0CX-229

3. Connect the vacuum hoses shown in the figures.



37U0CX-230

4. Connect the hoses shown in the figure.



37U0CX-231

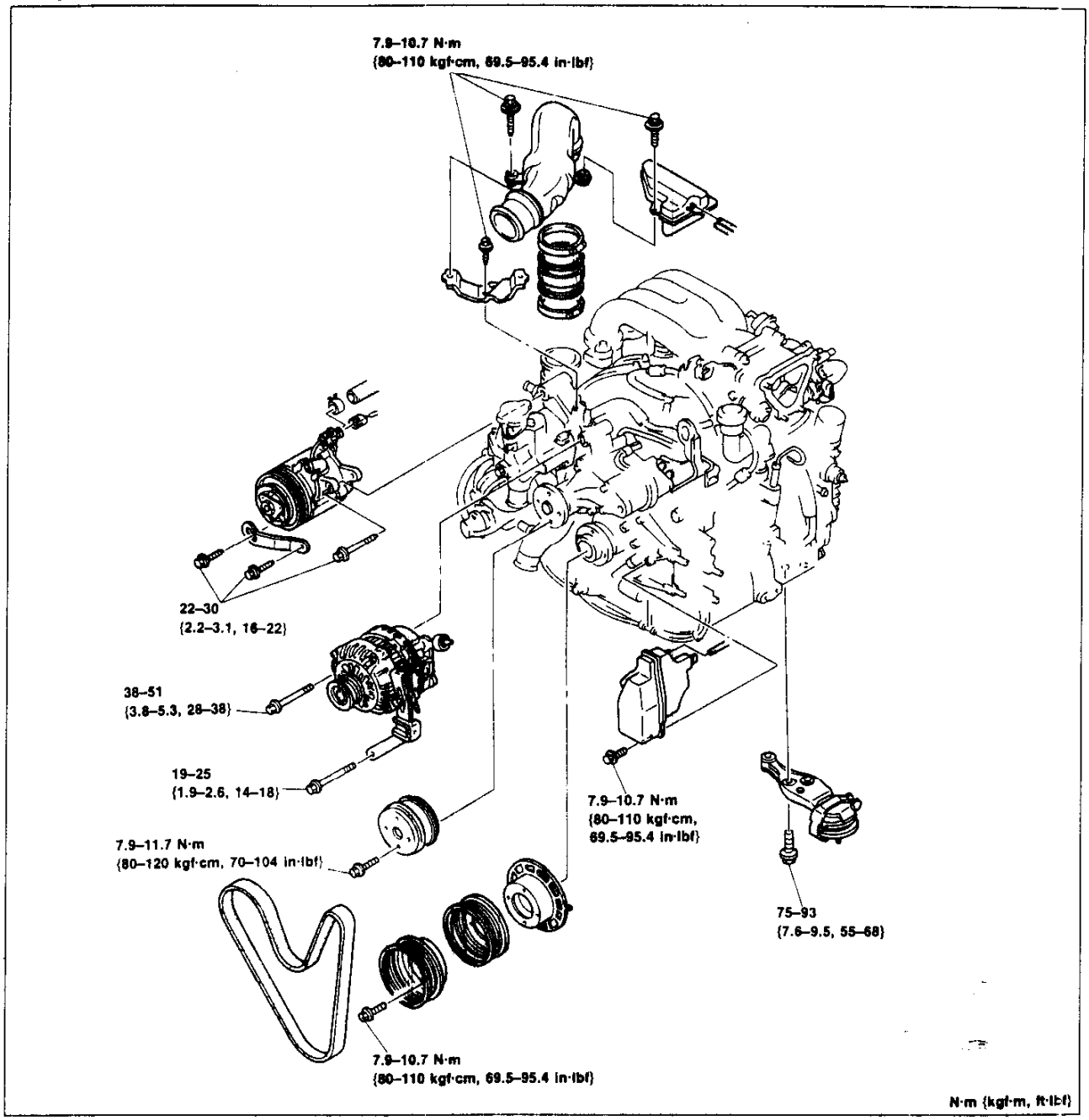
Air pipe

Install the air pipe along with a new gasket.

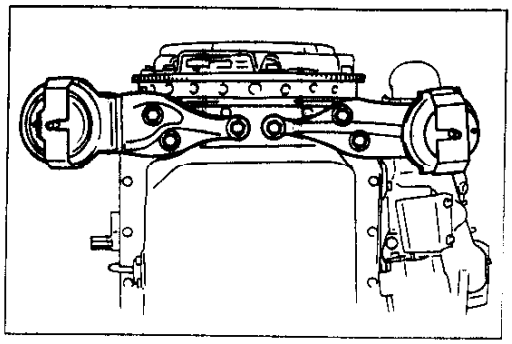
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

AUXILIARY PARTS (I)

Torque specifications



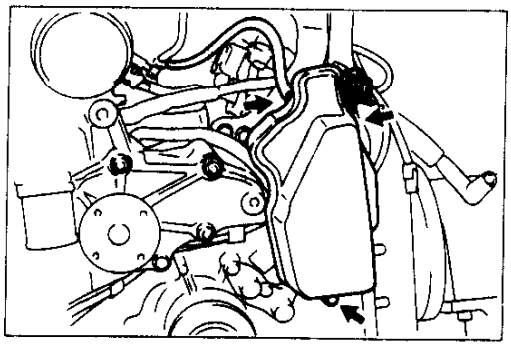
37U0CX-232


37U0CX-233

Engine mount right and left.

Install the engine mount right and left.

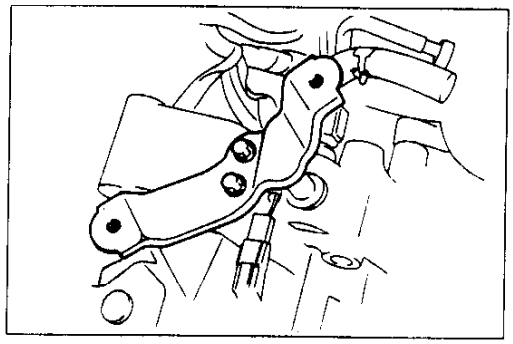
Tightening torque:
75–93 N·m {7.6–9.5 kgf·m, 55–68 ft·lbf}


37U0CX-234

Vacuum chamber

1. Connect the vacuum hose.
2. Install the vacuum chamber.

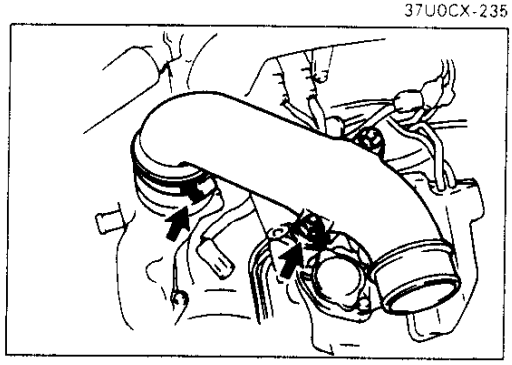
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}


37U0CX-235

Air pipe and bracket

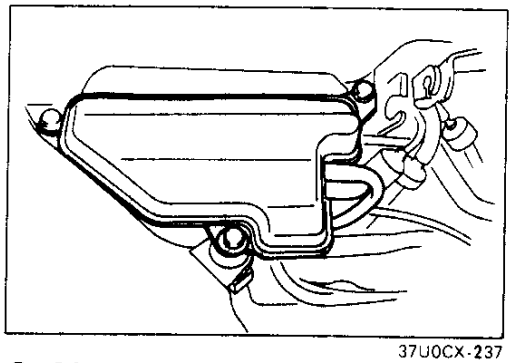
1. Install the air pipe bracket.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}


37U0CX-236

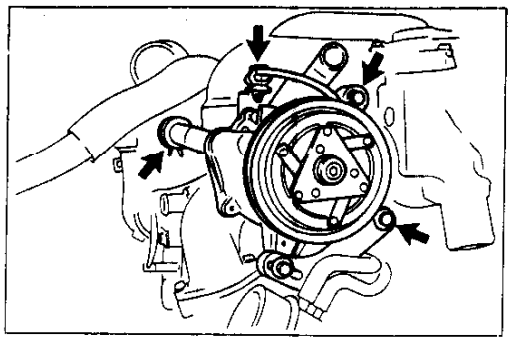
2. Install the air pipe.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}


37U0CX-237

3. Install the pressure chamber.

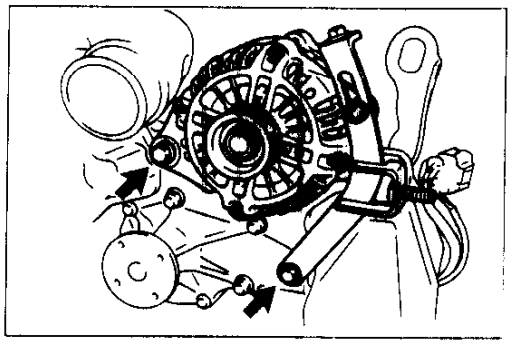
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



37U0CX-238

Air pump

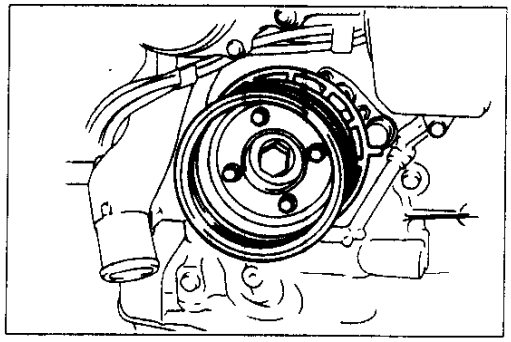
1. Install the air pump and bracket and loosely tighten the mounting bolts.
2. Connect the connector and air hose



37U0CX-239

Alternator and bracket

Install the alternator and bracket and loosely tighten the mounting bolts.

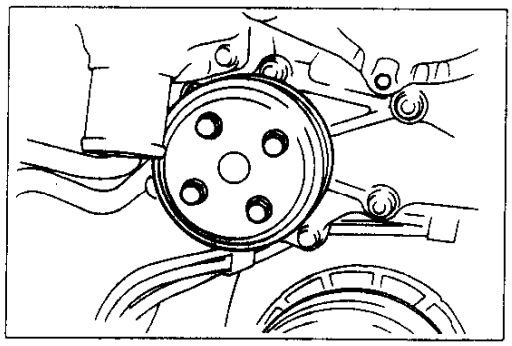


37U0CX-240

Drive belt pulley

Install the drive belt pulley as shown in the figure.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



37U0CX-241

Water pump pulley

1. Install the water pump pulley and loosely tighten the mounting bolts.
2. Install the drive belt. (Refer to page C–5.)
3. Tighten the water pump pulley bolts to specified torque.

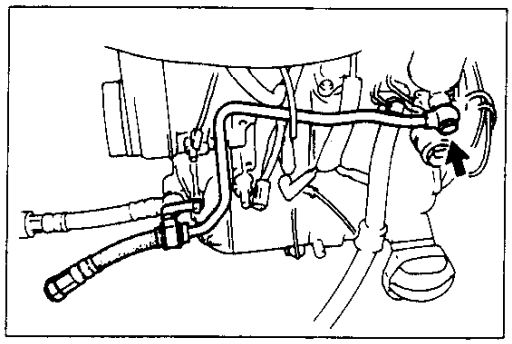
Tightening torque:
7.9–11.7 N·m {80–120 kgf·cm, 70–104 in·lbf}

ENGINE STAND DISMOUNTING

PROCEDURE

1. Remove the engine from the engine stand.
2. Remove the **SST** from the engine.

37U0CX-242



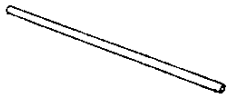
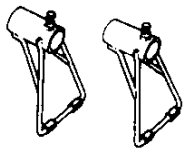
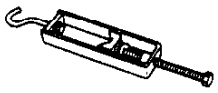
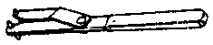
37U0CX-243

3. Install the new studs into the front housing.
4. Install new washers and the oil pipe.

Tightening torque:
54–68 N·m {5.5–7.0 kgf·m, 40–50 ft·lbf}

INSTALLATION

PREPARATION
SST

49 G017 5A0 Support, engine 	For support of engine	49 G017 501 Bar (Part of 49 G017 5A0) 	For support of engine
49 G017 502 Support (Part of 49 G017 5A0) 	For support of engine	49 G017 503 Hook (Part of 49 G017 5A0) 	For support of engine
49 W023 585A Adjust wrench 	For removal / installation of locknut		

37U0CX-244

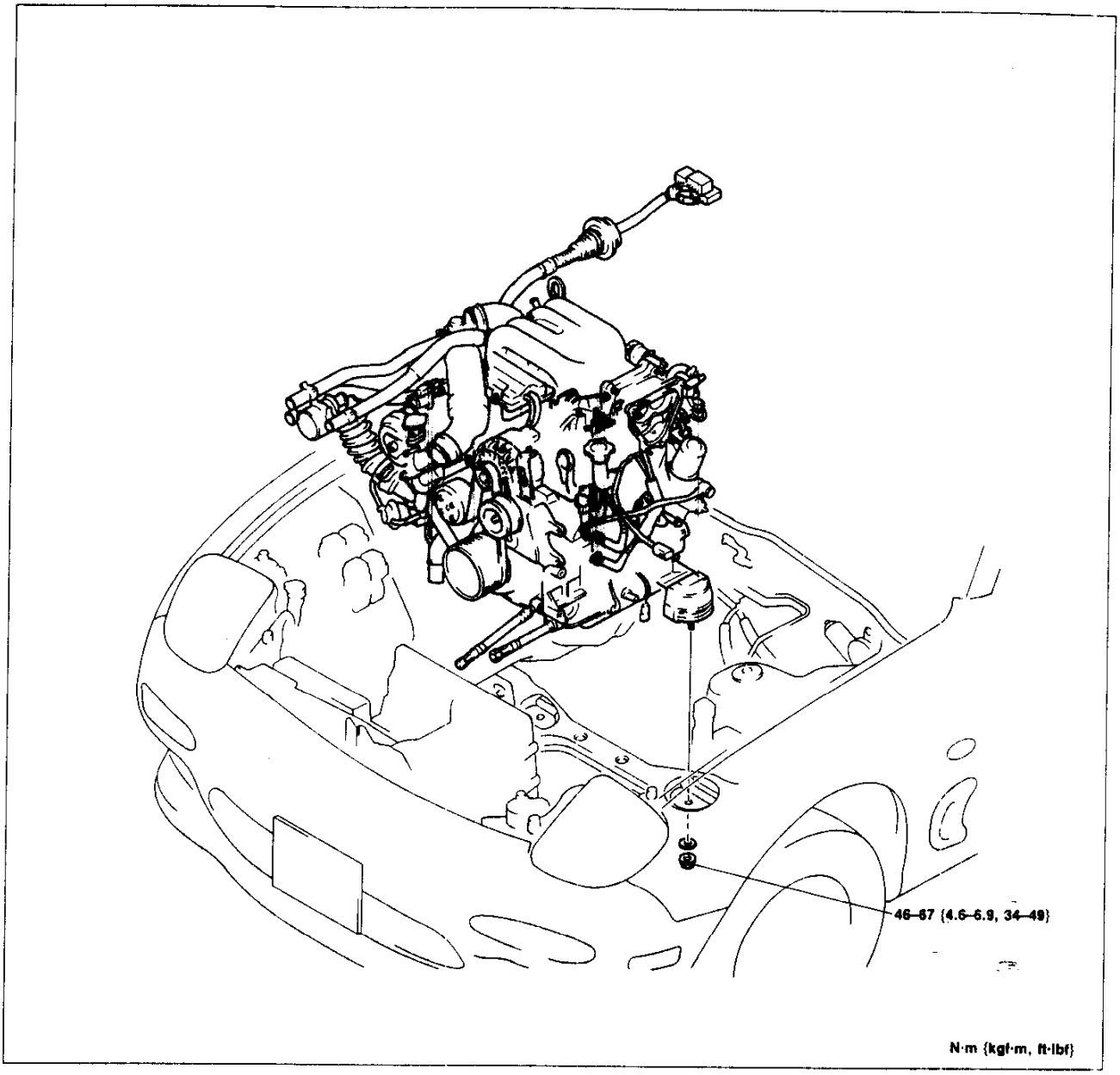
PROCEDURE

Step 1

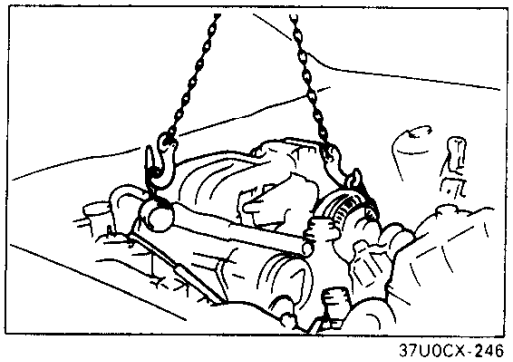
Warning

- **Be sure the vehicle is securely supported on safety stands.**

Torque specifications



37U0CX-245



37U0CX-246

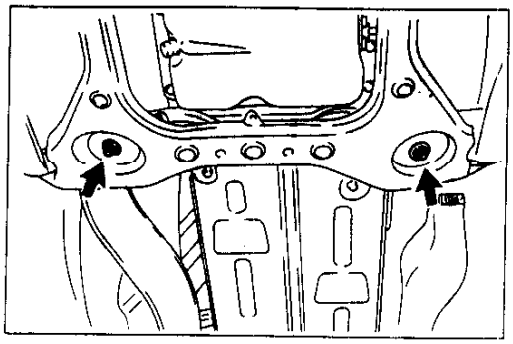
Engine

1. Suspend the engine.

Caution

- **Do not damage any components in the engine compartment.**

2. Install the engine in the engine compartment, aligning the engine mounts with the crossmember mounting holes.



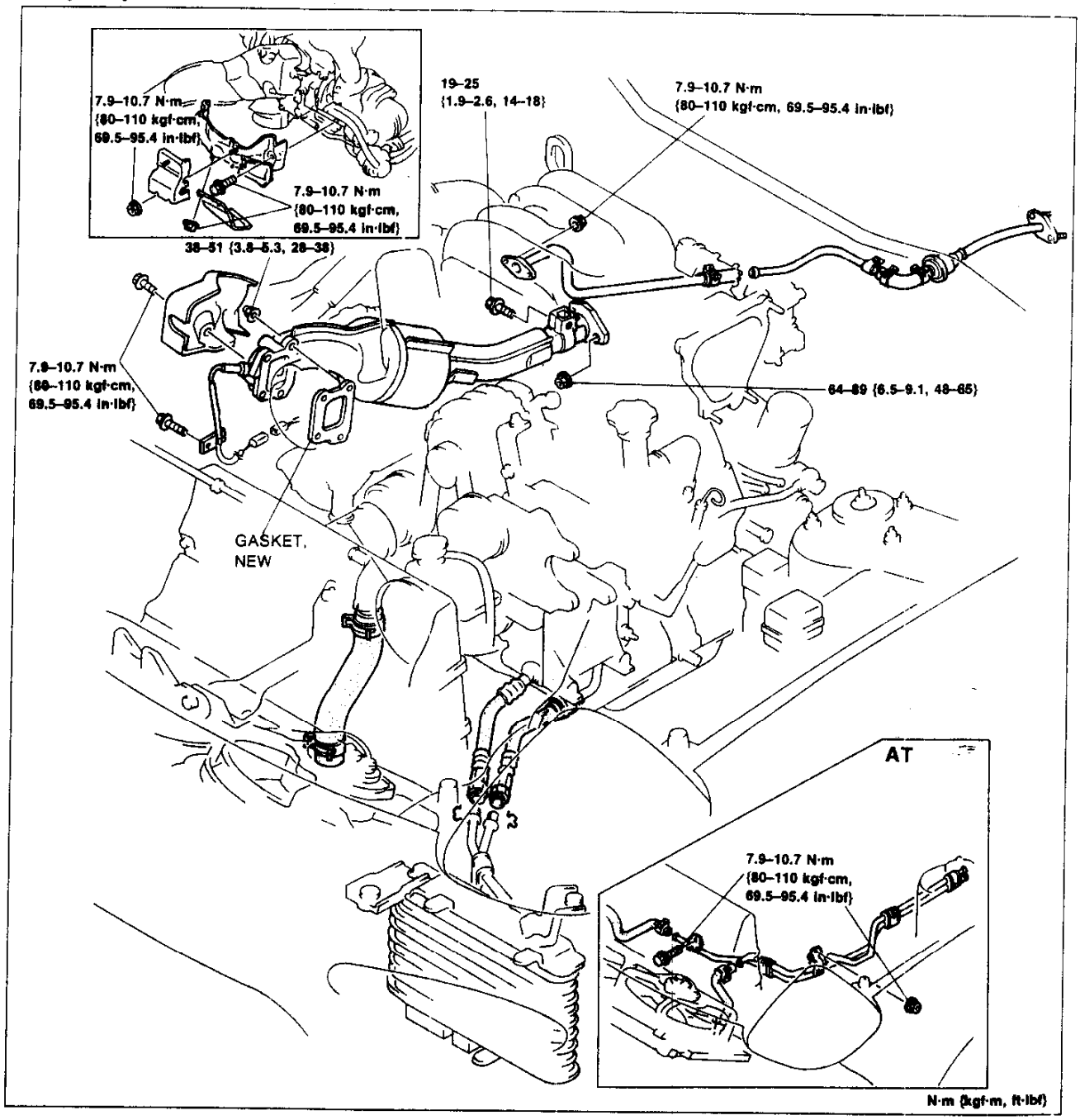
37U0CX-247

Engine mount

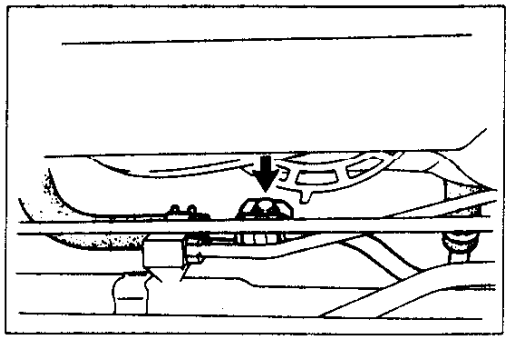
Install and tighten the engine mount nuts.

Tightening torque:
46–67 N·m {4.6–6.9 kgf·m, 34–49 ft·lbf}

Step 2
Torque specifications



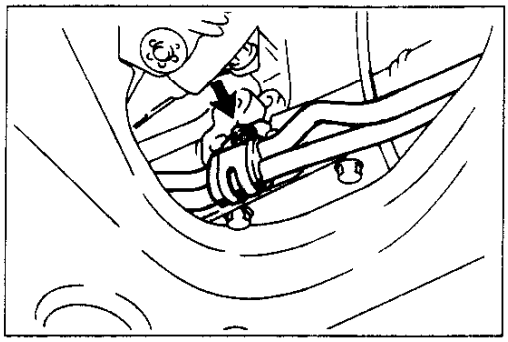
37U0CX-298


37U0CX-249

Oil Cooler Pipe (AT)

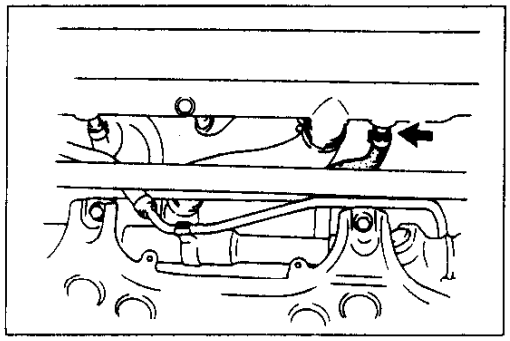
1. Install the oil cooler pipe.
2. Tighten the bolt.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

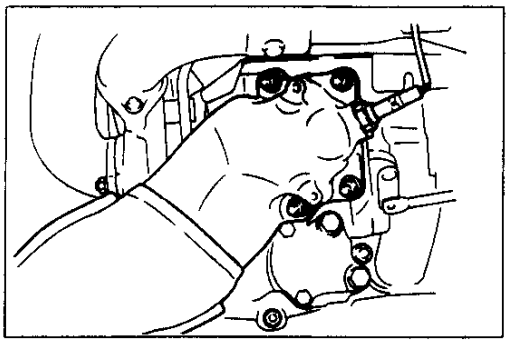

37U0CX-250

3. Tighten the nut shown in the figure.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}


37U0CX-251

4. Connect the oil cooler hose.

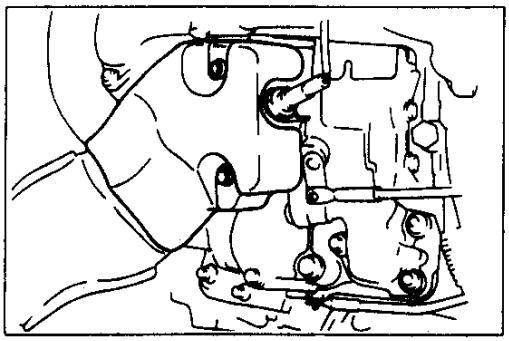

37U0CX-252

Front Exhaust Pipe

1. Connect the front exhaust pipe along with a new gasket.

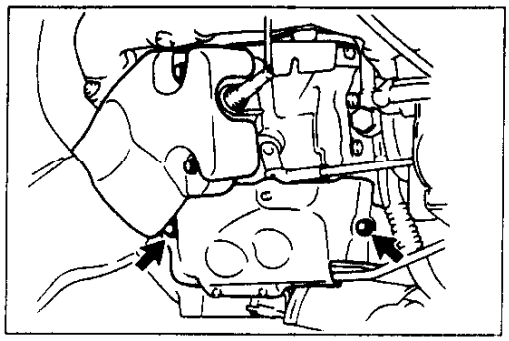
Tightening torque:
38–51 N·m {3.8–5.3 kgf·m, 28–38 ft·lbf}

2. Install the oxygen sensor harness.

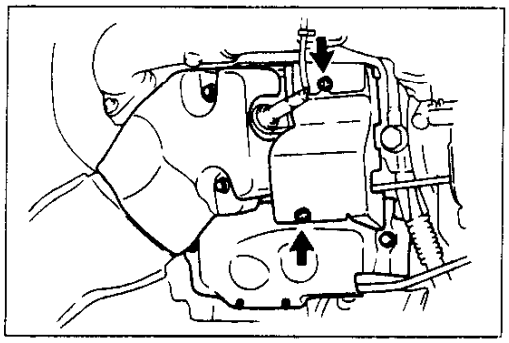

37U0CX-253

Insulator

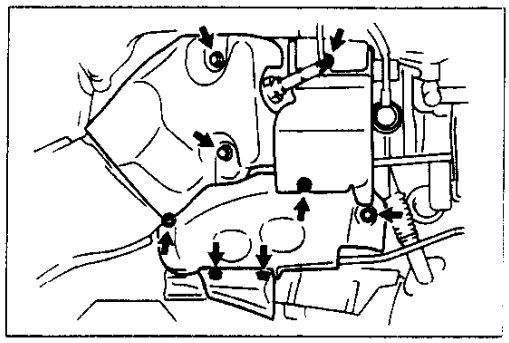
1. Install the front exhaust pipe insulator and loosely tighten the bolts.


37U0CX-254

2. Install the turbo insulator and loosely tighten the bolts.

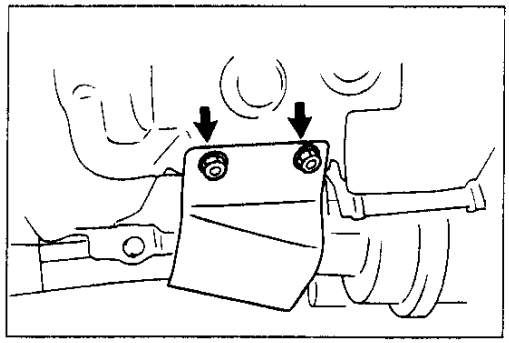

37U0CX-255

3. Install the center insulator and loosely tighten the bolts.


37U0CX-256

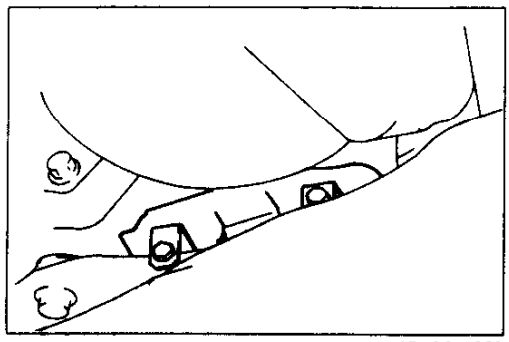
4. Tighten the insulator fasteners.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}


37U0CX-257

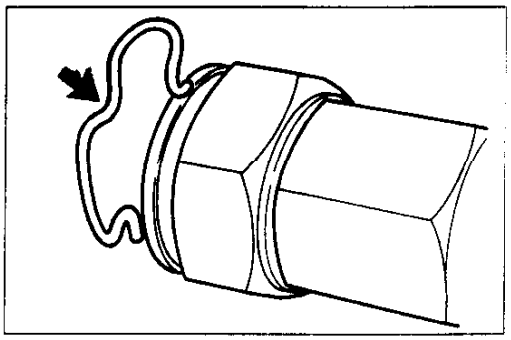
5. Install the insulator.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}


37U0CX-258

6. Install the engine mount insulator.

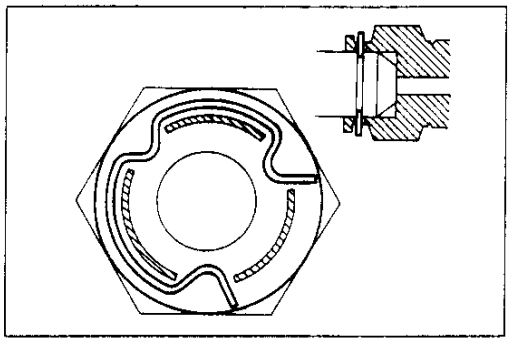
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



37U0CX-259

Oil Pipe

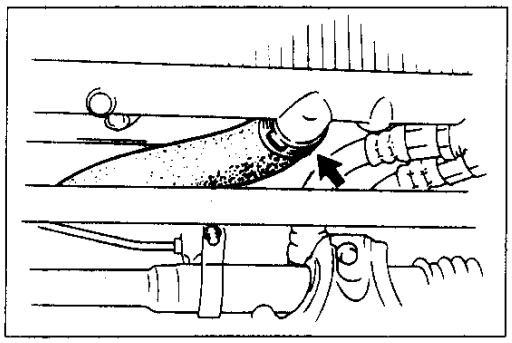
Connect the oil pipe and install the retaining clip.



37U0CX-260

Caution

- **After connecting the oil pipe, verify that it is securely locked.**



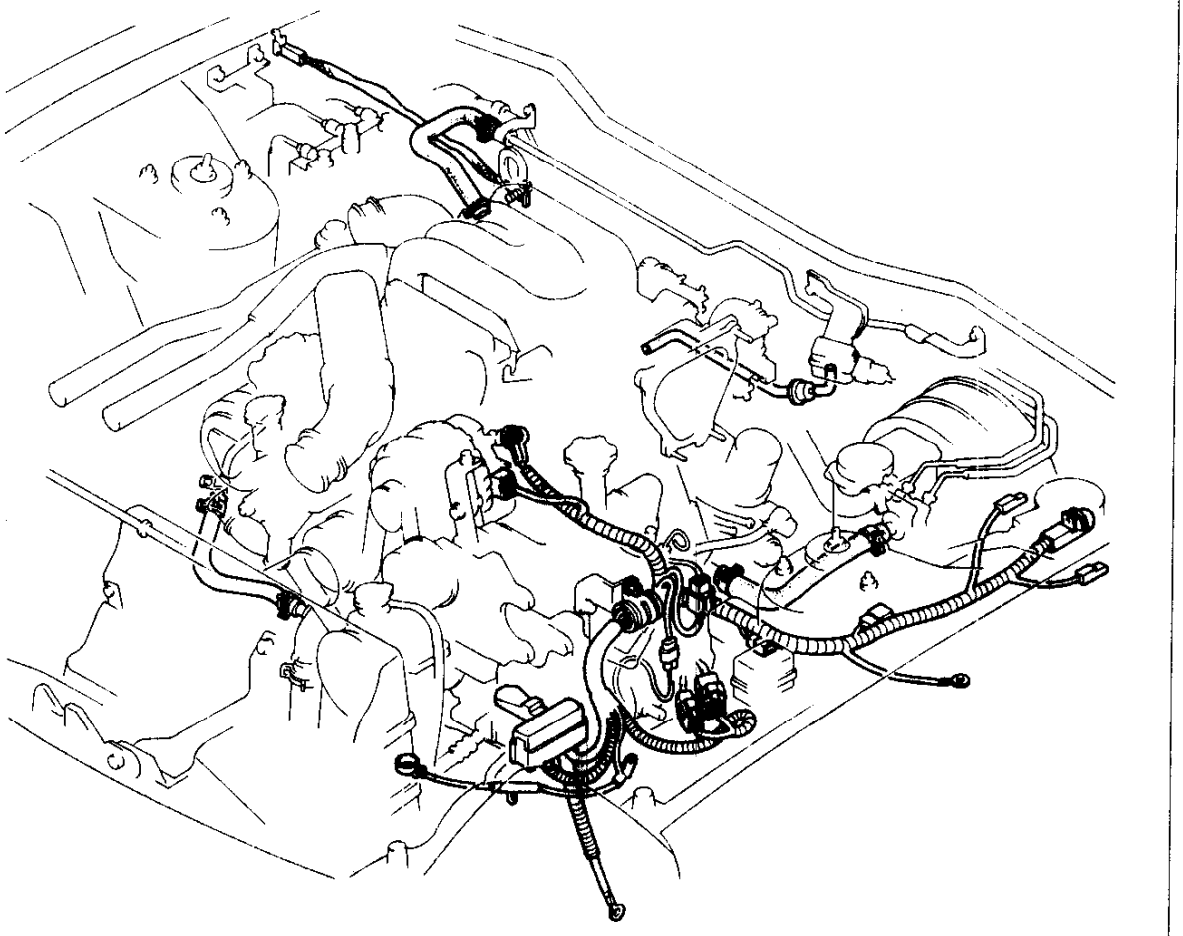
37U0CX-261

Radiator hose (lower)

Connect the lower radiator hose.

Step 3

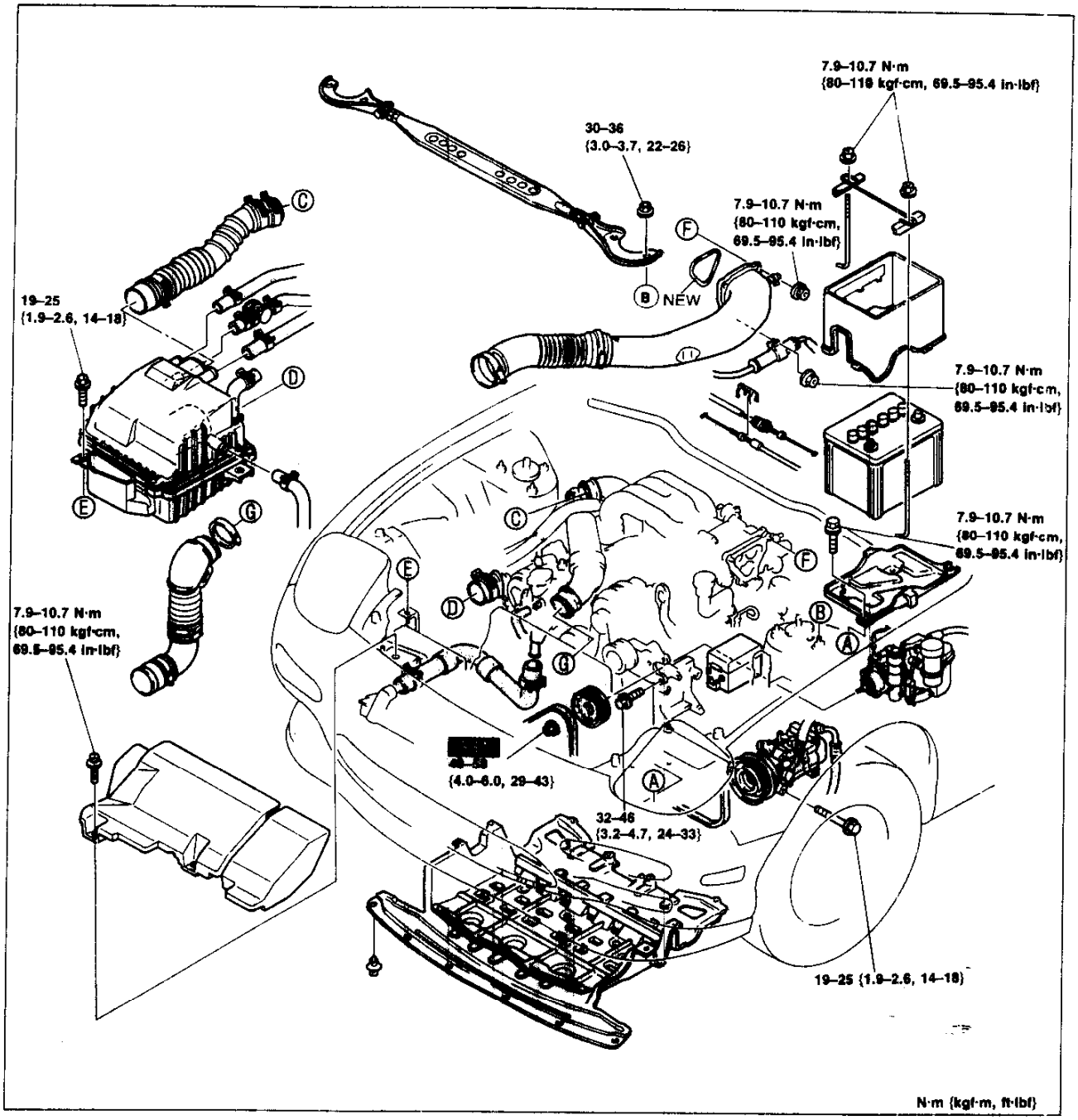
Connect the harness connectors and the hoses shown in the figure.



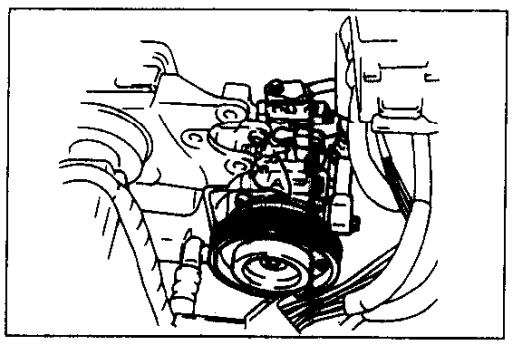
37U0CX-262

Step 4

Torque specifications



37U0CX-263

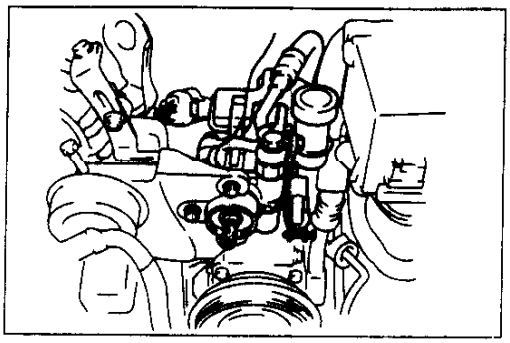


37U0CX-264

A/C compressor

Install the A/C compressor to the bracket.

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



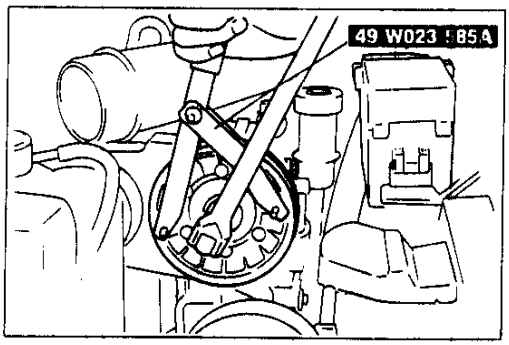
37U0CX-265

P/S oil pump

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

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

2. Connect the connector.

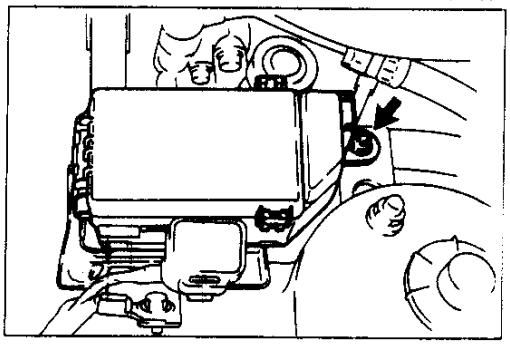


37U0CX-266

P/S oil pump pulley

1. Install the P/S oil pump pulley to the pump body and loosely tighten the nut.
2. Tighten the pulley nut while holding the pulley with the **SST**.

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

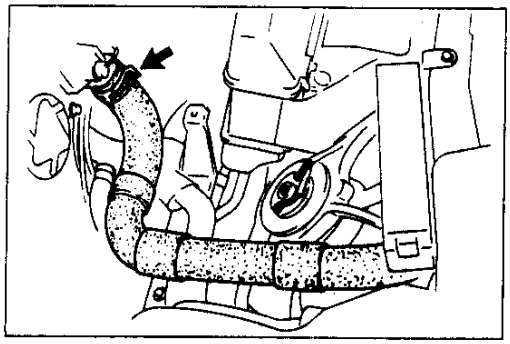


37U0CX-267

Fuse box

Install the fuse box.

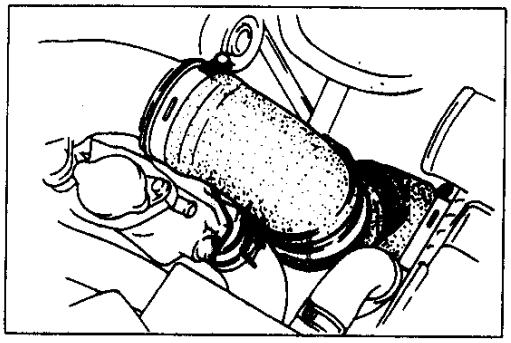
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



37U0CX-268

Radiator hose (upper)

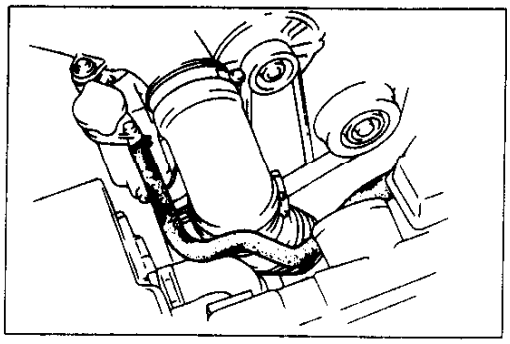
Connect the upper radiator hose.



37U0CX-269

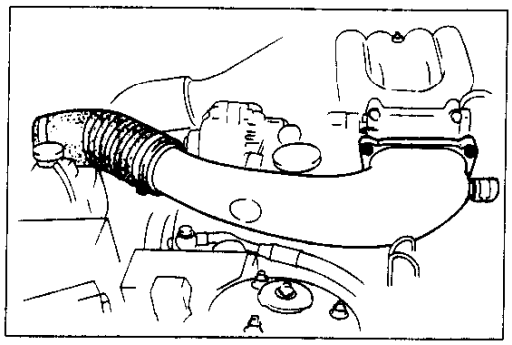
Air hose

Connect the air hose.


37U0CX-270

Water hose

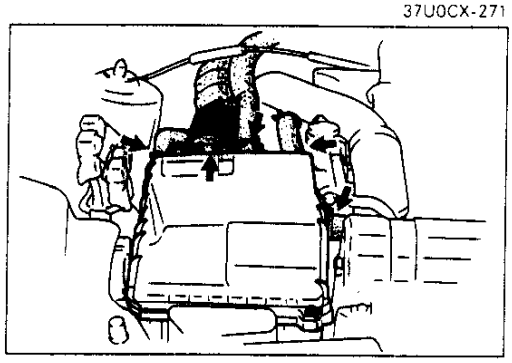
Connect the water hose.


37U0CX-271

Hose

Install the hose.

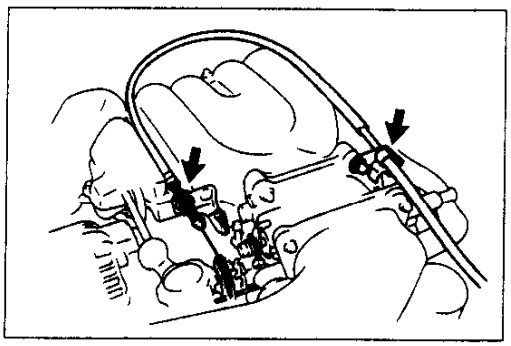
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}


37U0CX-272

Air cleaner assembly

1. Connect the air hose.
2. Install the air cleaner assembly.

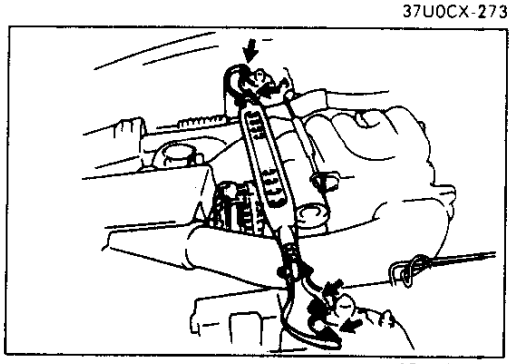
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}


37U0CX-273

Accelerator cable

1. Install the accelerator cable.
2. Adjust the cable deflection.

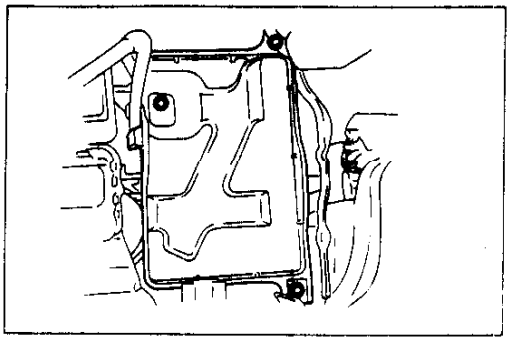
Deflection:
1–3 mm {0.04–0.12 in}


37U0CX-274

Strut bar

1. Remove the upper nuts.
2. Install the strut bar.

Tightening torque:
30–36 N·m {3.0–3.7 kgf·m, 22–26 ft·lbf}



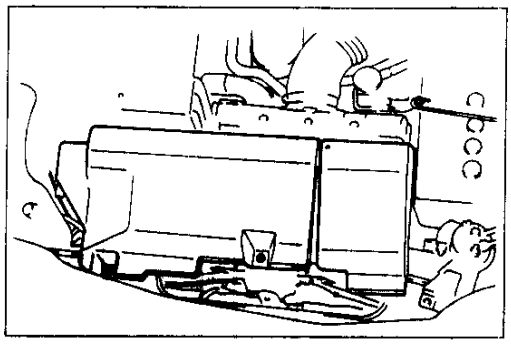
37U0CX-275

Battery and carrier

1. Install the battery carrier.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

2. Install the battery.
3. Connect the positive battery cable.



37U0CX-276

Fresh air duct

Install the fresh air duct.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}

Steps After Installation

1. Connect the engine control unit. (Refer to Section F.)
2. Fill the radiator with the specified amount and type of engine coolant. (Refer to Section E.)
3. Fill the engine with the specified amount and type of engine oil. (Refer to Section D.)
4. Connect the negative battery cable.
5. Install the hood.
6. Start the engine and check the following.
   (1) Engine oil, transmission oil, and engine coolant leakage.
   (2) Drive belt deflection. (Refer to page C–5.)
   (3) Ignition timing and idle speed. (Refer to Section F.)
   (4) Operation of emission control system.
7. Perform a road test.
8. Recheck the engine oil and coolant levels.

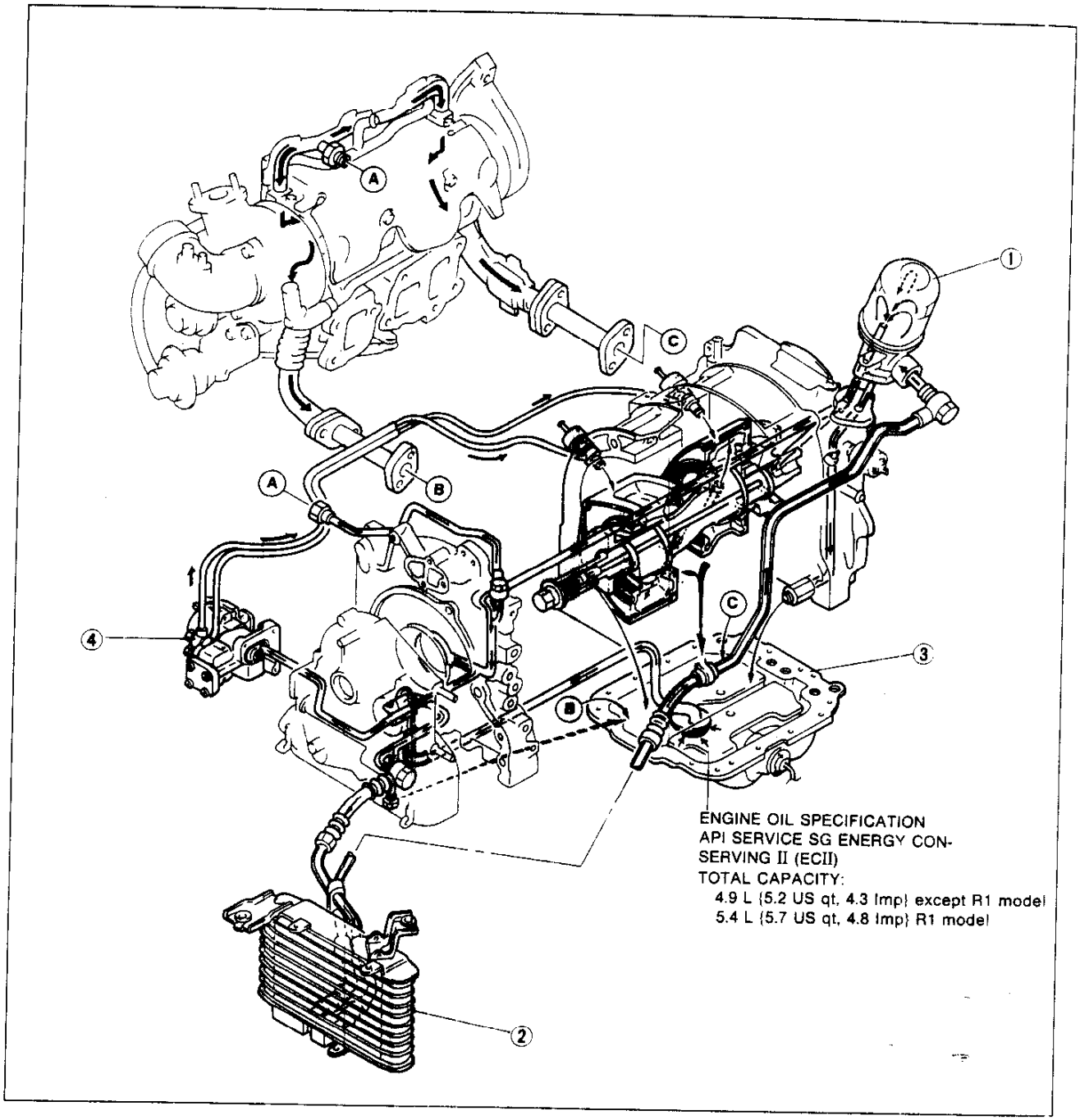
37U0CX-277

Before beginning any service procedure, refer to the 1993 RX-7 Body Electrical Troubleshooting Manual; see Section S for air bag system precautions and J1 for audio anti-theft system precautions.

LUBRICATION SYSTEM

37U0DX-001

INDEX



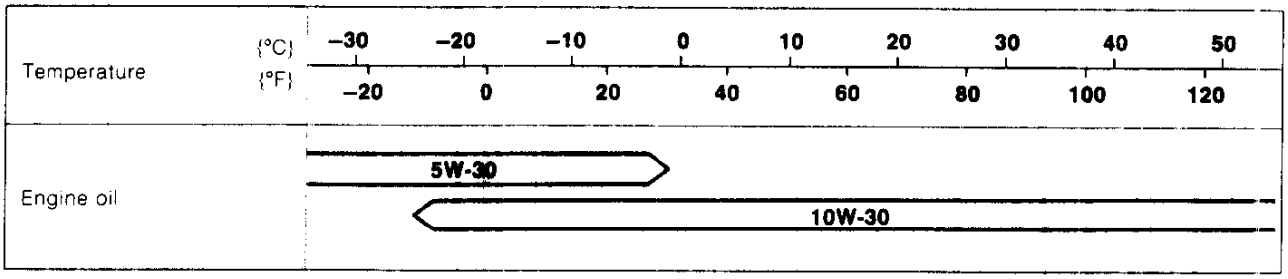
OUTLINE

SPECIFICATIONS

Item \ Engine model			13B Turbo
Lubrication system			Force-fed
Oil pump	Type		Trochoid
	Number of rotors		2
	Diameter × width of rotor mm {in}		50 × 17.5 {1.97 × 0.69}
Control valve relief pressure		kPa {kgf·cm², psi}	1080 {11.0, 156}
Oil cooler	Type		Air-cooled, with bypass valve
	Relief temperature	°C {°F}	60–65 {140–149} or below
	Relief pressure differential	kPa {kgf·cm², psi}	349 {3.56, 50} at 60°C {149°F}
Regulator valve relief pressure		kPa {kgf·cm², psi}	780 {8.0, 110}
Oil filter	Type		Full-flow, paper element
	Relief pressure differential	kPa {kgf·cm², psi}	98 {1.0, 14}
Eccentric shaft bypass valve relief temperature		°C {°F}	60 {140} or below
Oil capacity	Total (dry engine)	L {US qt, Imp qt}	4.9 {5.2, 4.3}.....except R1 model 5.4 {5.7, 4.8}.....R1 model
	Oil pan	L {US qt, Imp qt}	3.9 {4.1, 3.4}
	Oil cooler	L {US qt, Imp qt}	0.85 {0.90, 0.75}
	Oil filter L {US qt, Imp qt}	Factoryinstalled	0.19 {0.20, 0.17}
		Service part	0.17 {0.18, 0.15}
Engine oil (API service)			API Service SG Energy Conserving II (ECII)

37U0DX-003

Recommended SAE Viscosity



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

97U0DX-004

TROUBLESHOOTING GUIDE

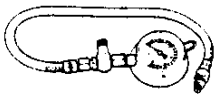
Problem	Possible Cause	Action	Page
Engine hard starting	Improper oil	Replace	D–6
	Insufficient oil	Add oil	D–6
Excessive oil consumption	Malfunction of metering oil pump mechanical component	Inspect	D–14
	Faulty oil nozzle	Inspect	D–17
	Oil leakage	Repair	–
Oil leakage	Loose drain plug or damaged washer	Tighten or replace	D–9
	Faulty seal at oil pan	Repair	D–9
	Damaged front cover	Replace	–
	Loose front cover bolt or oil pan bolt	Tighten	–
	Damaged sealing rubber, O-ring, or front cover gasket	Replace	–
	Malfunction of oil seal	Replace	–
	Loose oil filter	Tighten	D–7
	Loose or damaged oil level sensor or oil pressure gauge	Tighten or replace	–
	Damaged oil cooler or oil cooler hose	Replace	D–8
	Damaged oil tube	Replace	–
Oil pressure drop*	Oil leak	Repair	–
	Insufficient oil	Add oil	D–6
	Worn or damaged oil pump gear	Refer to Section C	–
	Clogged oil strainer	Clean	–
	Malfunction of oil pressure control valve	Replace	D–13
	Malfunction of oil pressure regulator valve	Replace	D–9
	Clogged oil filter	Replace	D–7
	Malfunction of eccentric shaft bypass valve	Refer to Section C	–
	Excessive oil clearance between eccentric shaft and main bearing	Refer to Section C	–
Oil pressure gauge does not work	Oil pressure drop	As described above	D–5
	Malfunction of oil pressure gauge unit	Refer to Section T	–
	Malfunction of electrical system	Refer to Section T	–
Oil level warning indicator illuminates when engine is running	Insufficient oil	Add oil	D–6
	Malfunction oil level sensor	Refer to Section T	–
	Malfunction of electrical system	Refer to Section T	–
Poor acceleration	Malfunction of metering oil pump electrical component	Inspect	D–14
Rough idle	Malfunction of metering oil pump electrical component	Inspect	D–14

37U0DX-005

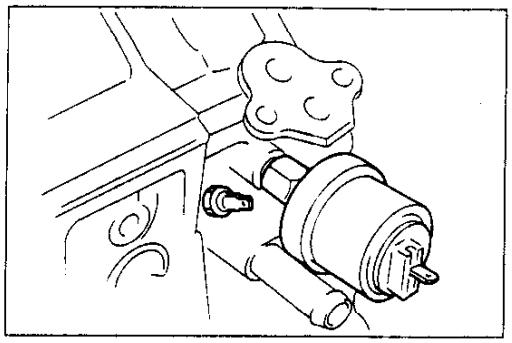
* Oil pressure becomes low when the engine is cold because the eccentric shaft bypass valve operates.

OIL PRESSURE

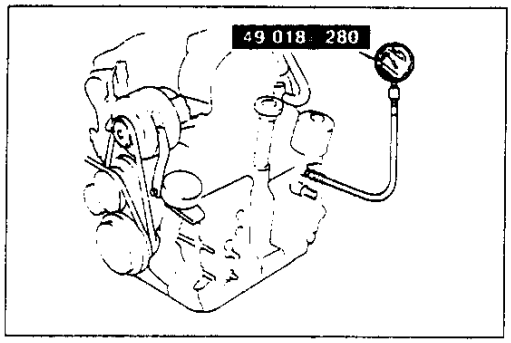
PREPARATION
SST

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

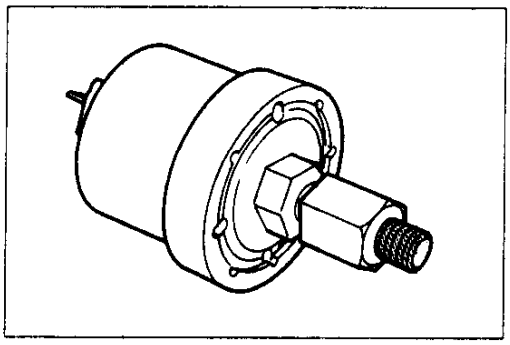
37U0DX-006



37U0DX-007



37U0DX-008



37U0DX-009

INSPECTION

1. Disconnect the connector and remove the oil pressure switch.
2. Install the **SST**.
3. Start the engine and let it warm up to operating temperature.
4. Run the engine at 3,000 rpm and note the gauge reading.

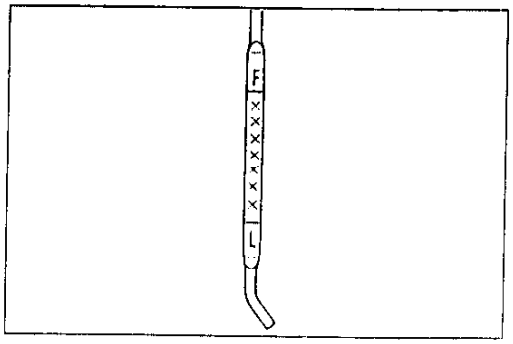
Oil pressure: 340 kPa {3.5 kgf·cm², 50 psi} min

5. If the pressure is not as specified, check for the cause and repair. (Refer to Troubleshooting Guide.)
6. Remove the **SST**.
7. Apply sealant to the threads and install the oil pressure switch.

Tightening torque:
11–15 N·m {1.1–1.6 kgf·m, 8–11 ft·lbf}

Caution
- **Do not allow sealant in the oriffice of the oil pressure switch.**

8. Connect the switch connecter.



37U0DX-010

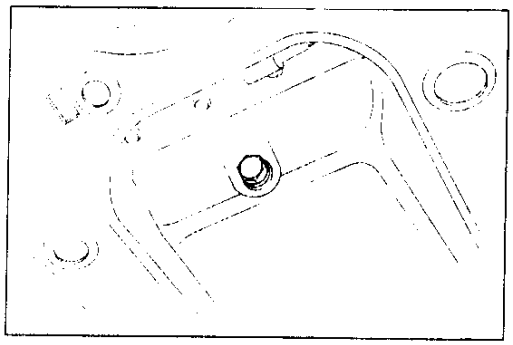
ENGINE OIL

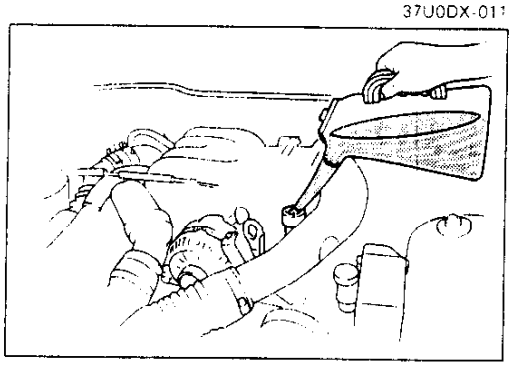
INSPECTION

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

Note

- **The distance between the L and F marks on the dipstick represents 1.7 L {1.8 US qt, 1.5 Imp qt}.**


37U0DX-011


37U0DX-012

REPLACEMENT

Warning

- **Be careful when draining; the oil is hot.**

1. Warm up the engine to the normal operating temperature and stop it.
2. Remove the oil filler cap and the oil drain plug.
3. Drain the oil into a suitable container.
4. Install a new gasket and the drain plug.

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

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

Oil capacity:

L {US qt, Imp qt}

Total (dry engine)	4.9 {5.2, 4.3}...excepta R1 model 5.4 {5.7, 4.8}...R1 model
Engine oil replacement	3.5 {3.7, 3.1}
Engine oil replacement (with oil filter)	3.7 {3.9, 3.3}

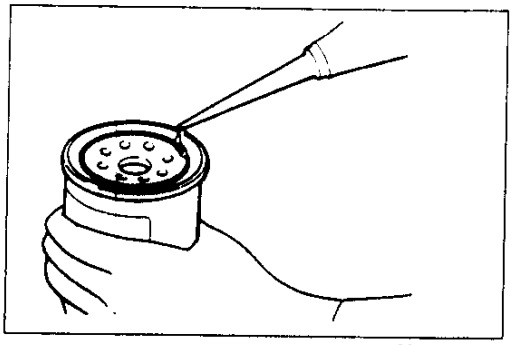
6. Refit the oil filler cap.
7. Run the engine a few minutes and stop it.
8. Recheck the oil level and add oil if necessary.

OIL FILTER

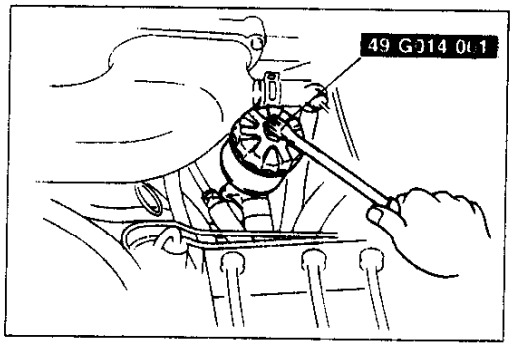
PREPARATION
SST

49 G014 001 Wrench, oil filter		For removal/ installation of oil filter

37U0DX-013



37U0DX-014



37U0DX-015

REPLACEMENT

1. Remove the oil filter by using the **SST**.
2. Using a clean rag, wipe the mounting surface on the engine.
3. Apply a small amount of 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 an additional 1–1/6 turns by using the **SST**.
5. Start the engine and inspect for leaks around the filter seal.
6. Stop the engine and check the oil level; add oil if necessary.

Note

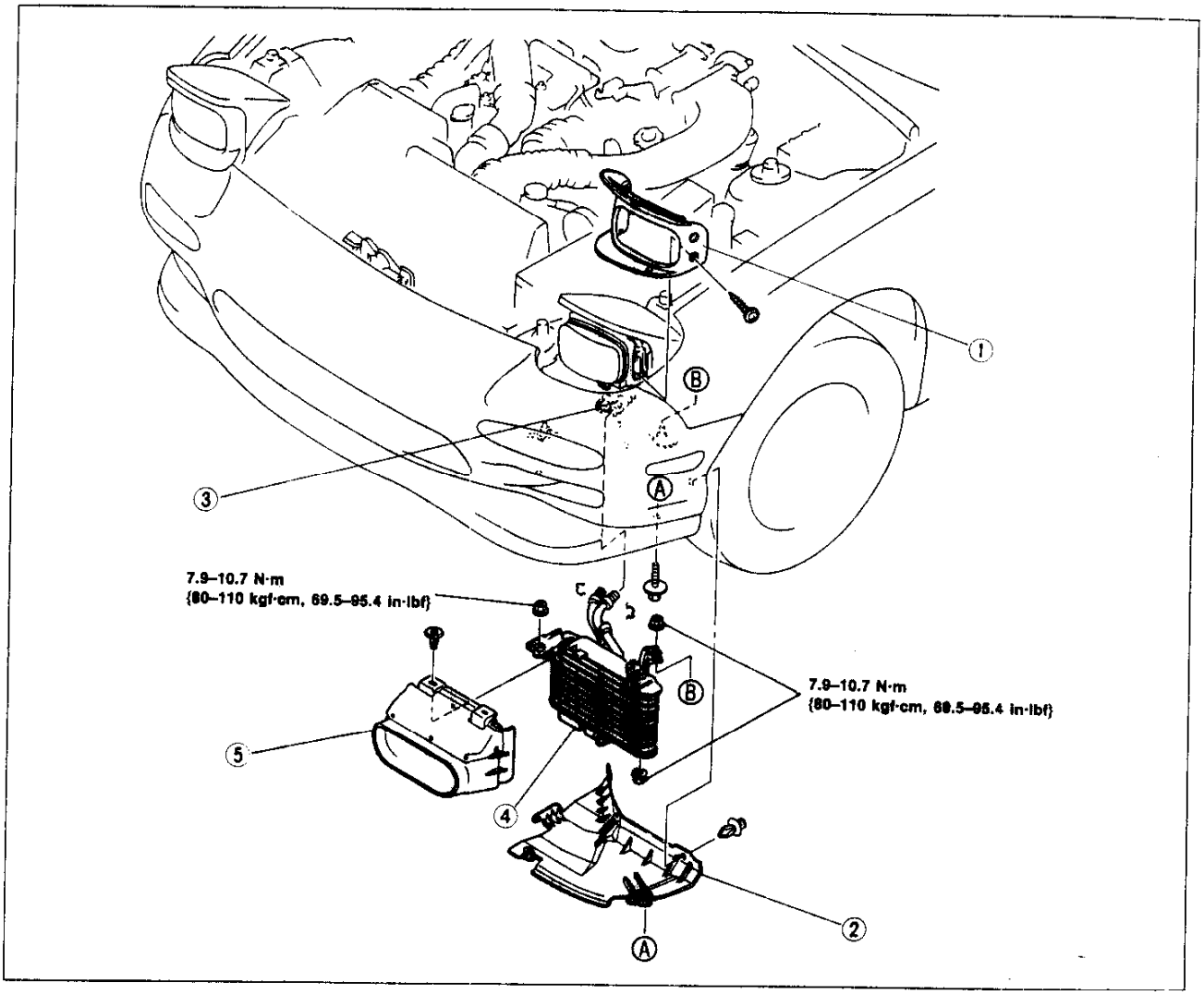
- **The factoryinstalled oil filter and the service part filter are different.**

Service oil filter capacity:
0.19 L {0.20 US qt, 0.17 Imp qt}

OIL COOLER

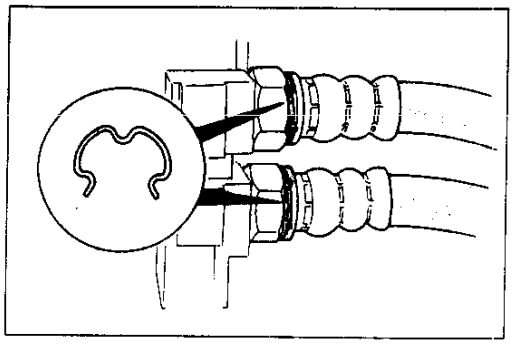
REMOVAL / INSTALLATION

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



37U0DX-016

1. Lamp bezel
2. Brake pipe air duct
3. Oil cooler hoses
   Removal Note ..... page D–9
4. Oil cooler
   Removal Note ..... page D–9
5. Air duct (oil cooler)

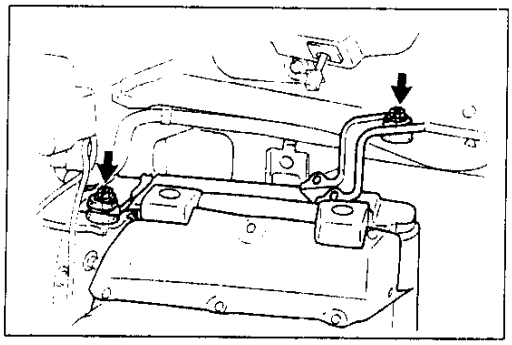


37U0DX-017

Removal Note
Oil cooler hose

1. Remove the clip shown in the figure
2. Disconnect the oil hose.

Caution
- **Use a drain pan to catch the oil when the oil hoses are disconnected.**



37U0DX-018

Oil cooler

1. Remove the lamp bezel.
2. Remove the mounting bracket nuts.
3. Remove the oil cooler.

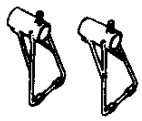
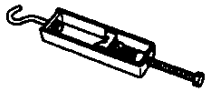
Step After Installation

37U0D 019

Fill the engine with the specified amount and type of engine oil. (Refer to Inspection, page D–6)

OIL PAN

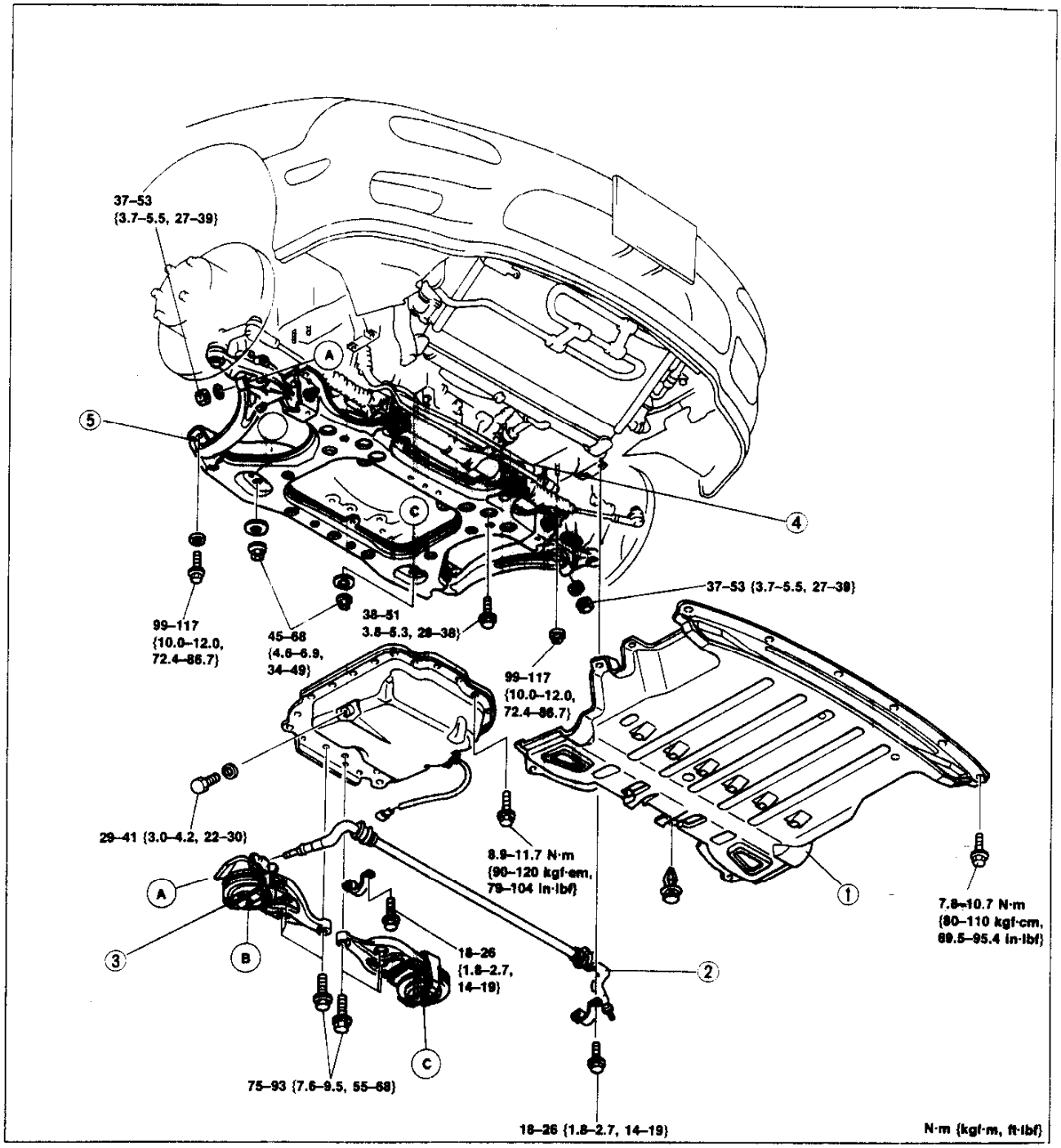
PREPARATION
SST

49 G017 5A0 Support, engine 	For support of engine	49 G017 501 Bar (Part of 49 G017 5A0) 	For support of engine
49 G017 502 Support (Part of 49 G017 5A0) 	For support of engine	49 G017 503 Hook (Part of 49 G017 5A0) 	For support of engine

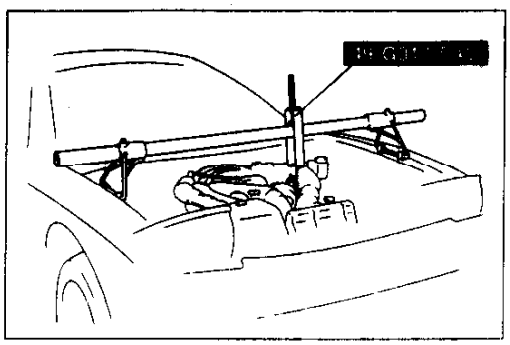
33U0EX-020

REMOVAL / INSTALLATION

1. Disconnect the negative battery cable.
2. Remove the undercover.
3. Drain the engine oil.
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**.

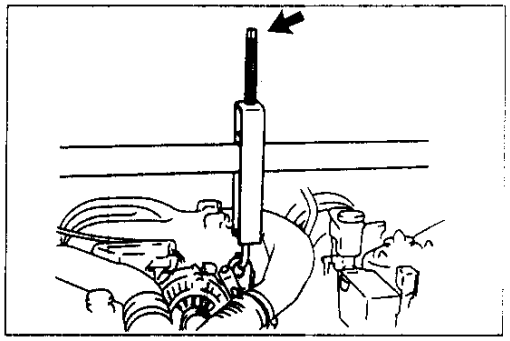


1. Undercover
2. Stabilizer
3. Engine mount bracket
   Removal Note ..... page D–11
4. Steering gear box
5. Crossmember
   Removal Note ..... page D–11
6. Oil pan
   Removal Note ..... page D–11
   Installation Note ..... page D–12

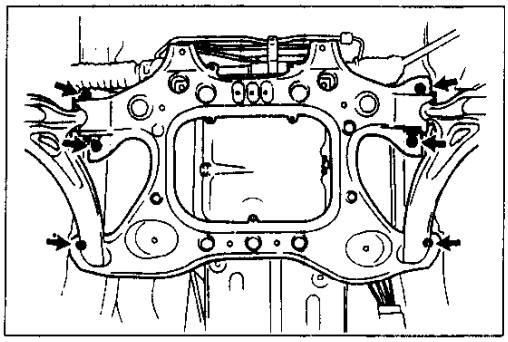

37U0DX-022

Removal Note
Engine mount bracket

1. Assemble the **SST** and connect the hook to the front engine hanger.

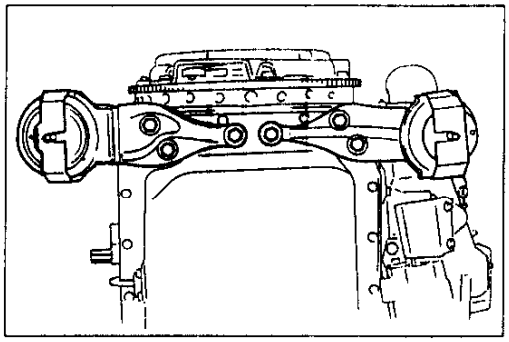

37U0DX-023

2. Remove the engine mounting nuts.
3. Turn the bolt of the **SST** clockwise to lift the engine.


37U0DX-024

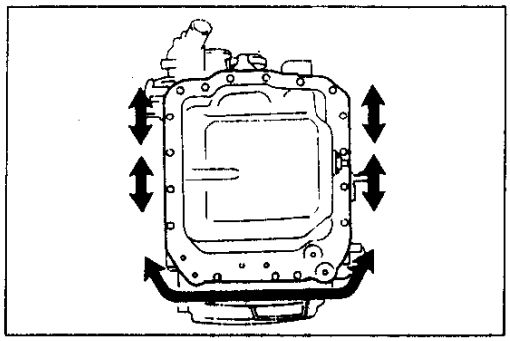
Crossmember

1. Remove the power steering oil hose bracket from the crossmember.
2. Remove the bolts and nuts (arrows) and the crossmember.

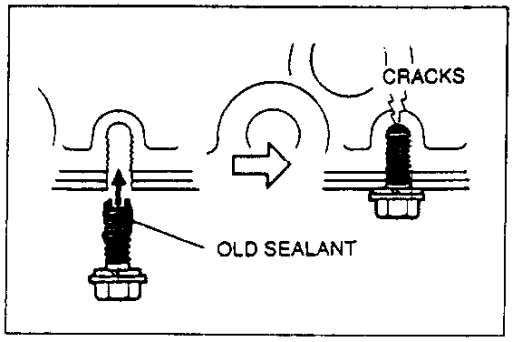

37U0DX-025

Oil pan

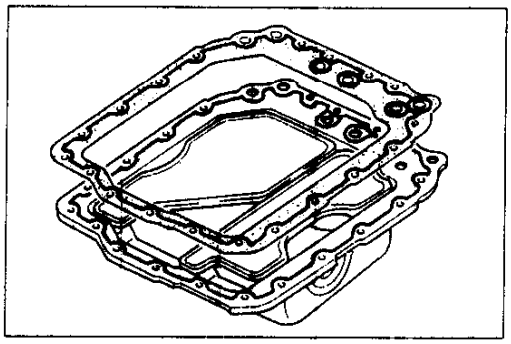
1. Remove the engine mount brackets from the engine.
2. Disconnect the oil level sensor connector and remove it from the harness bracket.
3. Remove the oil pan mounting bolts.


37U0DX-026

4. Insert a screwdriver or suitable tool only between the points shown in the figure to pry the oil pan loose.



37U0DX-027



37U0DX-028

Installation Note
Oil pan

1. Remove all foreign material from the oil pan contact surfaces.

Caution
- **If the bolts are reused, remove the old sealant from the bolt threads. Tightening bolts with old sealant on them may cause cracking inside the bolt holes.**
- **Secure the oil pan within 5 minutes after applying the sealant.**

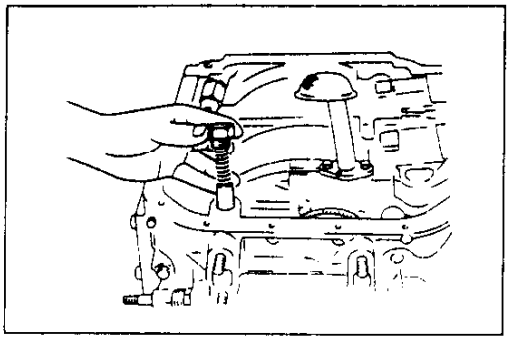
2. Apply silicone sealant to the contact surfaces of the oil pan and the engine side of the new gasket.
3. Install the oil pan.

Tightening torque:
8.9–11.7 N·m {90–120 kgf·cm, 79–104 in·lbf}

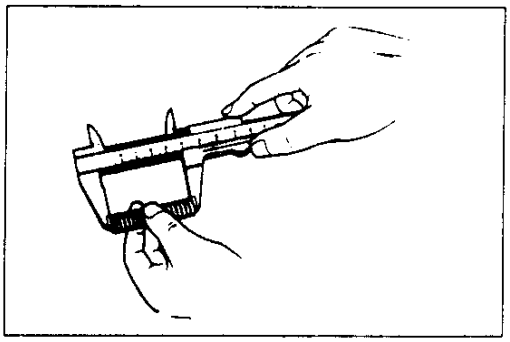
Step After Installation

Fill the engine with the specified amount and type of engine oil. (Refer to page Inspeciton, D–6.)

37U0DX-029



37U0DX-030



37U0DX-031

OIL PRESSURE CONTROL VALVE

REMOVAL / INSTALLATION

1. Remove the parts in the following order.
   (1) Oil pan (Refer to page D–9.)
   (2) Cap bolt and spring
   (3) Control plunger
2. Install in the reverse order.
3. Check the engine for oil leakage and check the oil level.

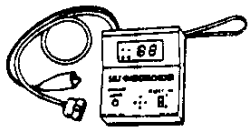
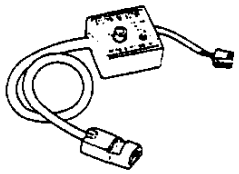
INSPECTION

1. Check each part for damage and scoring. Replace if necessary.
2. Measure the free length of the spring, and if necessary, replace it.

Free length: 73.0 mm {2.87 in}

METERING OIL PUMP

PREPARATION
SST

49 H018 9A1 Self-Diagnosis Checker 	For diagnosis of metering oil pump system	49 B019 9A0 System Selector 	For diagnosis of metering oil pump system

37U0DX-030

Malfunctions related to the metering oil pump may be described as electrical component problems and mechanical component problems.

Electrical Component Related Problem

1. Check for service codes by using the **SST** (49 H018 9A1, 49 B019 9A0). (Refer to Section F.)
2. If Service Code No. 20, 26, 27 or 37 appears, check the metering oil pump following the diagnosis chart below.

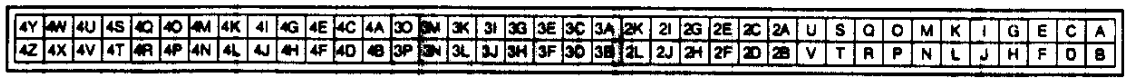
Diagnosis Chart

37U0DX-033

Service Code No.	Possible Cause	Action
20 (Metering oil pump position sensor)	• Open or short circuit in position sensor wiring • Open or short circuit in wiring between engine control unit and position sensor • Loose connection of position sensor or engine control unit	Perform Inspection 2 (page D–16)
26 (Metering oil pump control system)	• Open or short circuit in wiring between engine control unit and stepping motor • Loose connection of metering oil pump or engine control unit • Damaged stepping motor • Insufficient engine control unit voltage	Perform Inspection 1 (page D–15)
27 (Metering oil pump control system)	• Open or short circuit in wiring between engine control unit and stepping motor • Loose connection of metering oil pump or engine control unit • Damaged stepping motor • Position sensor inaccurate • Insufficient engine control unit voltage	Perform Inspection 1 (page D–15)
37 (Battery voltage drop)	• Malfunction of charging system	Refer to Section G

37U0DX-034

Control Unit Terminal



37U0DX-035

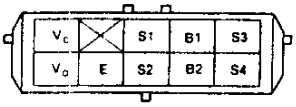
INSPECTION

1. Metering oil pump control system

Stepping motor resistance

Measure the resistance at the following terminals. Is voltage as shown? (Reading must be A or B)

Terminals \ Reading	A	B
+ B1 to S1 - S3	Open	16–31 Ω
+ B2 to S2 - S4	Open	16–31 Ω
+ B1 to S2 - S4	16–31 Ω	Open
+ B2 to S1 - S3	16–31 Ω	Open



NO → Replace metering oil pump

YES

Harness terminal voltage

Turn ignition switch ON; is battery voltage indicated at terminals + B1 and + B2 of harness with connector disconnected?

NO → Repair or replace wiring harness

YES

Harness and connector continuity

Is there continuity between stepping motor and engine control unit as shown?

Stepping motor	Control unit
S1 (B/O)	4I
S2 (B/L)	4J
S3 (B/LG)	4K
S4 (B/Y)	4L

NO → Repair or replace wiring harness

YES

Control unit terminal voltage (stepping motor)

Turn ignition switch ON; is battery voltage indicated at terminals 4I, 4J, 4K, and 4L?

Note
This test must be done with connector connected.

NO → Replace engine control unit

YES

Control unit terminal voltage (position sensor)

Turn ignition switch ON; is approx. 1–4.2V indicated at terminal 3A?

NO → Replace metering oil pump

YES

Is approx. 1.1V at idle?

NO → Replace metering oil pump

YES

Does voltage increase from approx. 1.1V then return to approx. 1.1V when accelerating and decelerating engine?

NO → Replace metering oil pump

YES

Position sensor operation

Cancel memory of malfunctions by disconnecting negative battery cable for 20 seconds; then reconnect it
Warm up engine unit coolant temperature reaches 80°C (176°F) and let it idle for 15 minutes
Do Service Codes No. 26 or 27 appear?

YES → Replace metering oil pump

NO

Metering oil pump control system OK

37U0DX-006

2. Metering oil pump position sensor

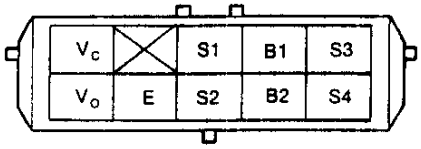
Position sensor resistance

Is resistance between terminals V_c and E as specified?

Resistance: 1–2 kΩ

Is resistance of terminal (Vo–E) and (Vo–Vc) as specified?

Resistance: 0.4–12 kΩ



NO → Replace metering oil pump

YES

Harness and connector continuity

Is there continuity between position sensor and engine control unit as shown?

Position sensor	Control unit
V_c (BR/W)	3I
V_o (G/B)	3A
E (BR/B)	4D

NO → Repair or replace wiring harness

YES

Harness short circuit

Is there short or ground between Vo and 3A of wiring harness?

YES → Replace wiring harness

NO

Control unit terminal voltage

Turn ignition switch ON; is there approx. 1–4.2V indicated at terminal 3A?

NO → Replace metering oil pump

YES

Cancel memory of malfunctions by disconnecting negative battery cable for 20 seconds; then reconnect it.
Does Service Code No. 20 appear?

YES → Replace engine control unit

NO

Position sensor operation

Cancel memory of malfunctions by disconnecting negative battery cable for 20 seconds; then reconnect it
Warm up engine until coolant temperature reaches 80°C (176°F) and let it idle 15 minutes
Does Service Code No. 20 appear?

YES → Replace metering oil pump

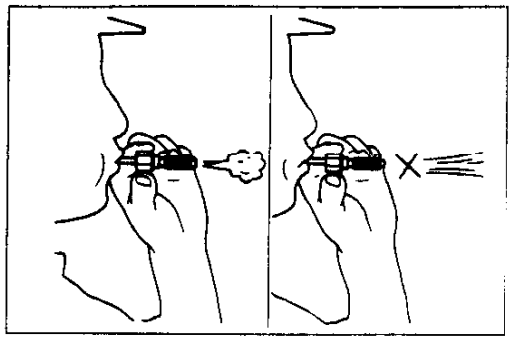
NO

Metering oil pump control system OK

Mechanical Component Related Problem

Excessive oil consumption may be caused by a metering oil pump malfunction.
Before replacing the metering oil pump, refer to "Oil leakage" in the Troubleshooting Guide (page D–4) and perform the electrical component inspection (pages D–15 and D–16).

37U0DX-017



37U0DX-038

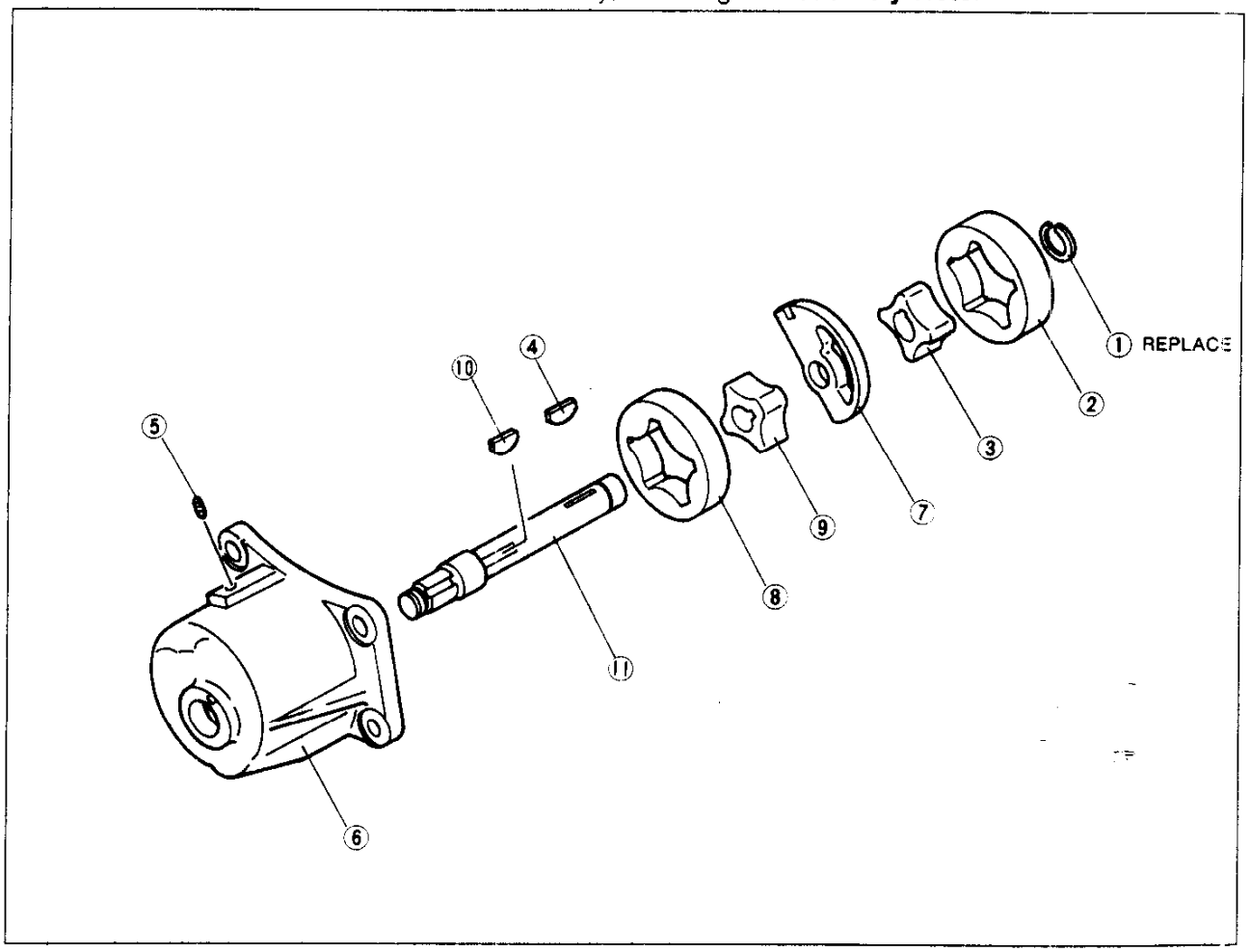
Oil nozzle

1. Remove the oil nozzles from the rotor housing and the intake manifold.
2. Verify that air passes in only one direction as shown. If not so, replace the oil nozzle.

OIL PUMP

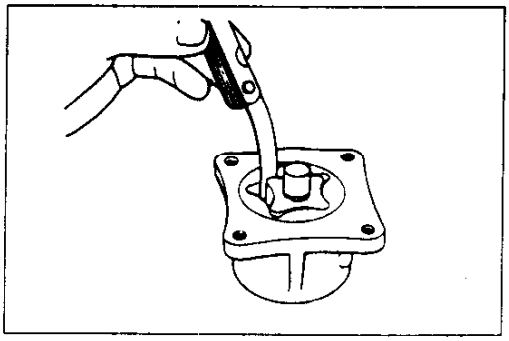
DISASSEMBLY / ASSEMBLY

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



37U0DX-039

1. Snap ring
2. Rear outer rotor
   Assembly Note
   ..... page D–18
3. Rear inner rotor
   Assembly Note
   ..... page D–18
4. Key
5. Screw
   Assembly Note
   ..... page D–19
6. Body
7. Center plate
8. Front outer rotor
   Assembly Note
   ..... page D–18
9. Front inner rotor
   Assembly Note
   ..... page D–18
10. Key
11. Shaft

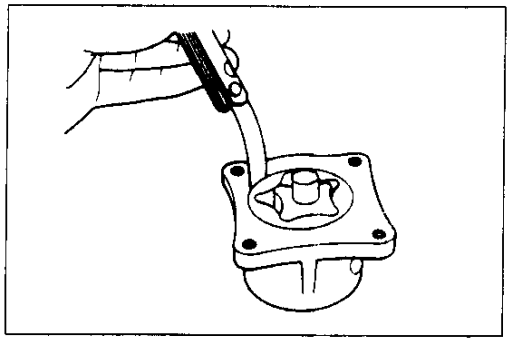


37U0DX-040

INSPECTION

1. Inspect the oil pump parts for wear and damage. Replace as necessary.
2. Measure the clearance between the lobes of rotors by using a feeler gauge.

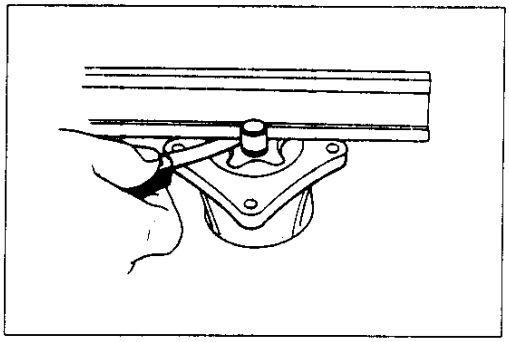
Standard clearance:
0.03–0.12 mm {0.0012–0.0047 in}
Maximum: 0.15 mm {0.0059 in}



67U0DX-041

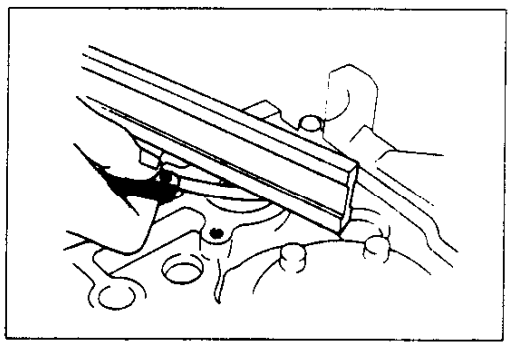
3. Measure the clearance between the outer rotor and the pump body.

Standard clearance:
0.20–0.25 mm {0.0079–0.098 in}
Maximum: 0.30 mm {0.0118 in}



37U0DX-042

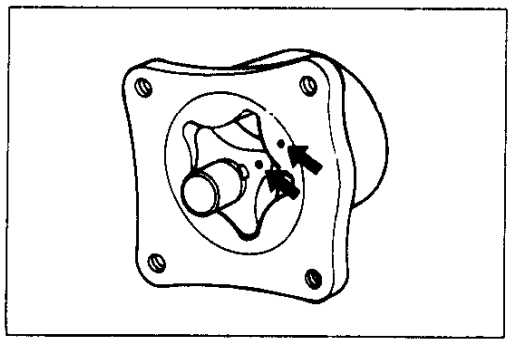
4. Inspect the side clearance of the rotors.
   (1) Using a straightedge and a feeler gauge, measure the depth of the rotor in the pump body.



37U0DX-043

   (2) Measure the depth of the rotor sliding surface from the pump mounting surface.
   (3) Add the two depth amounts to obtain the side clearance.
   (4) If not as specified, grind or replace the pump body.

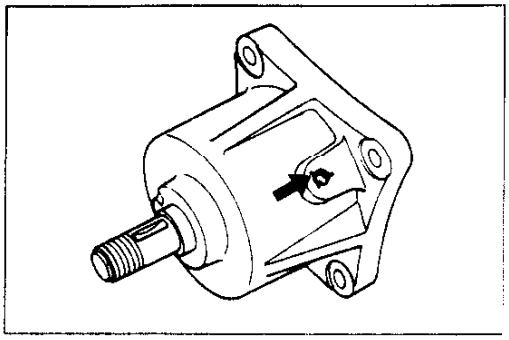
Standard end clearance:
0.03–0.125 mm {0.0012–0.0049 in}
Maximum: 0.15 mm {0.0059 in}



37U0DX-044

Assembly Note
Outer rotor and inner rotor

Install the front and rear outer and inner rotors so that the tally marks on the rotors face the front housing.



37U0DX-045

Screw

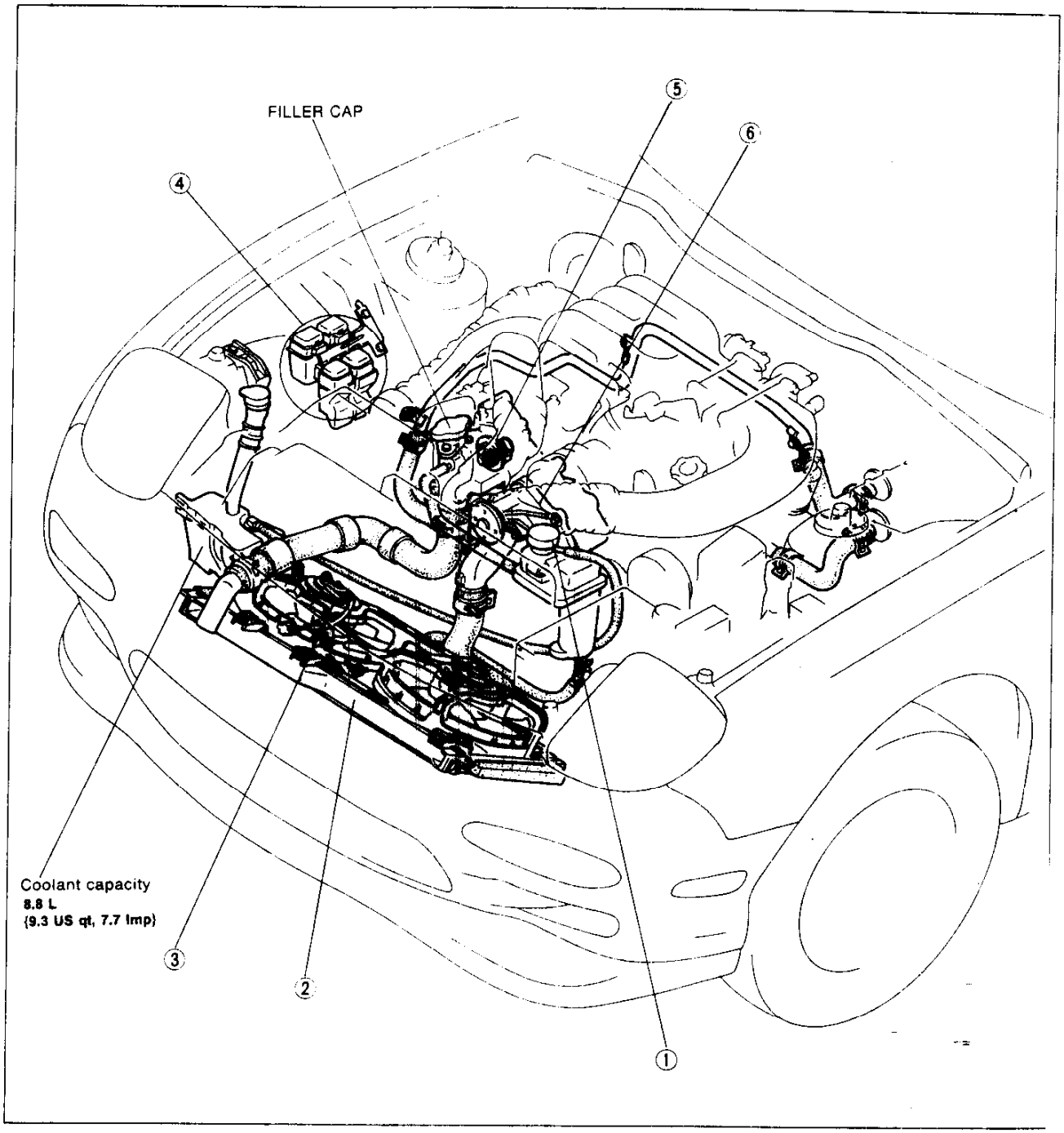
To prevent the screw from loosening, stake it after installation.

Before beginning any service procedure, refer to the 1993 RX-7 Body Electrical Troubleshooting Manual; see Section S for air bag system precautions and Section J1 for audio antitheft system precautions.

COOLING SYSTEM

37U0EX-001

INDEX



37U0EX-002

OUTLINE

SPECIFICATIONS

Item \ Engine model			13B Turbo
Cooling system			Water-cooled, forced circulation
Coolant capacity		L {US qt, Imp qt}	8.8 {9.3, 7.7}
Water pump	Type		Centrifugal
	Water seal		Unified mechanical seal
Thermostat	Type		Wax, bottom-bypass
	Opening temperature	°C {°F}	80.5–83.5 {177–182}
	Full-open temperature	°C {°F}	95 {203}
	Full-open lift	mm {in}	8–10 {0.31–0.39}
Radiator	Type		Corrugated fin
	Cap valve opening pressure	kPa {kgf/cm^2, psi}	113–142 {1.15–1.45, 16.4–20.6}
Cooling fan	Motor current	A	High: 13.6, Med: 9.5, Low: 8.8
	Number of blades		No.1: 5, No.2: 4
	Outer diameter of blades	mm {in}	No.1, No.2: 300 {11.8}

37U0EX-003

TROUBLESHOOTING GUIDE

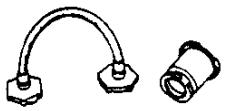
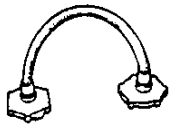
Problem	Possible cause	Action	Page
Overheating	Coolant level insufficient	Add	E–5
	Coolant leakage	Repair	–
	Radiator fins clogged	Clean	E–10
	Radiator cap malfunction	Replace	E–7
	Cooling fan malfunction	Replace	E–11
	Thermostat malfunction	Replace	E–15
	Water passage clogged	Clean	E–5
	Water pump malfunction	Replace	E–16
Corrosion	Impurities in coolant	Replace	E–5

37U0EX-004

ENGINE COOLANT

PREPARATION

SST

49 9200 145 Adapter set, radiator cap tester 	For inspection of cooling system pressure	49 9200 146 Adapter A (Part of 49 9200 145) 	For inspection of cooling system pressure

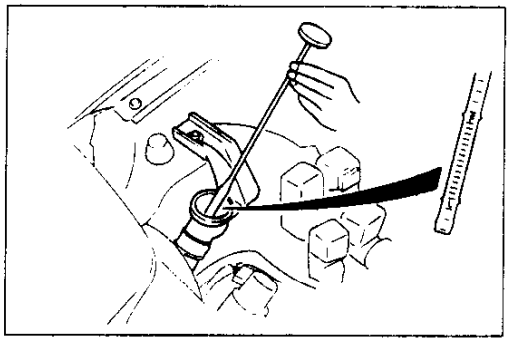
05U0EX-005

INSPECTION

Warning

- **Never remove the radiator cap while the engine is hot.**
- **Wrap a thick cloth around the cap when removing it.**
- **When removing the radiator cap, loosen it slowly to the first stop until the pressure in the radiator is released, and then remove it.**

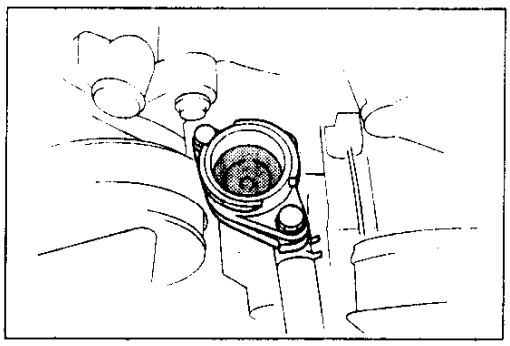
03U0EX-006



03U0EX-007

Coolant Level (Engine cold)

1. Verify that the coolant level is near the filler neck.
2. Verify that the coolant level in the coolant reservoir is between the F and L.
3. Add coolant if necessary.



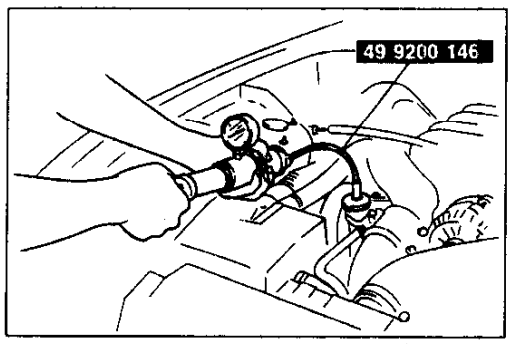
03U0EX-008

Coolant Quality

Warning

- **Never open the radiator cap while the engine is hot.**
- **Wrap a thick cloth around the cap when loosening.**
- **Use caution when draining hot coolant.**

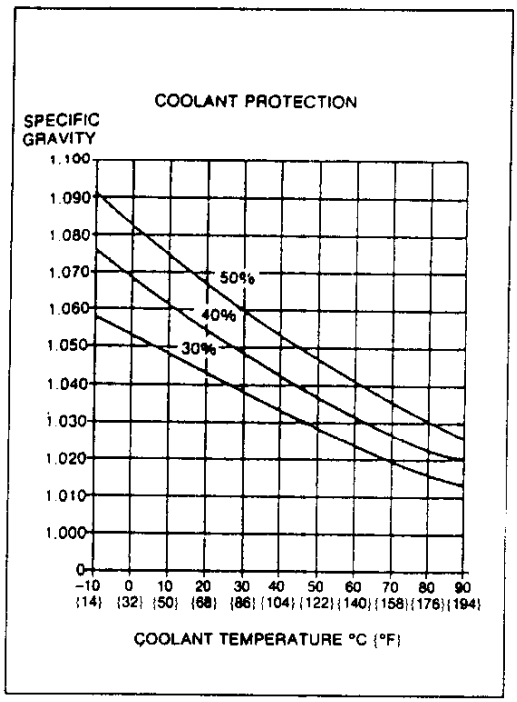
1. Verify that there is no buildup of rust or scale around the radiator cap or filler neck.
2. Verify that coolant is free of oil. Replace the coolant if necessary.



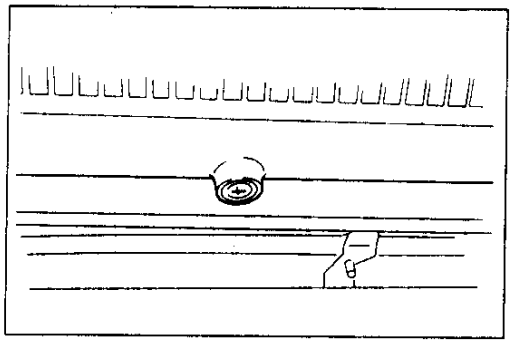
37U0EX-005

Coolant Leakage

1. Connect a radiator tester (commercially available) and the **SST** to the radiator filler neck.
2. Apply **142 kPa {1.45 kgf/cm², 20.6 psi}** of pressure to the system.
3. Verify that the pressure is held.
4. If not as specifed, check for coolant leakage.



05U0EX-009



37U0EX-005

Coolant Protection

Caution

- **Do not use alcohol- or methanol-based coolant.**
- **Use only soft (demineralized) water in the coolant mixture.**

1. Measure the coolant temperature and the 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.

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

05U0EX-010

REPLACEMENT

Warning

- **Never open the radiator cap while the engine is hot.**
- **Wrap a thick cloth around the cap when loosening.**
- **Use caution when draining hot coolant.**

Caution

- **Do not use alcohol- or methanol-based coolant.**
- **Use only soft (demineralized) water in the coolant mixture.**

1. Remove the radiator cap and loosen the drain plug.
2. Drain the coolant into a suitable container.
3. Flush the cooling system with water until all traces of color are gone; then let the system drain completely.
4. Install the drain plug.
5. Perfrom air bleeding. (Refer to page E–6.)

AIR BLEEDING

When refilling the cooling system after draining the coolant, perform the following.

1. Slowly fill the radiator with ethyleneglycol-based coolant up to the filler neck. Refer to the table on page E-5 for the proper amount.

   Filling pace:
   1.0 L {1.1 US qt, 0.9 Imp qt}/min. max

   Coolant capacity
   8.8 L {9.3 US qt, 7.7 Imp qt}

2. Fill the coolant reservoir up to the F mark.
3. Install the coolant filler cap and the radiator cap securely and start the engine.
4. Run the engine at idle until it reaches normal operating temperature.

   Caution
   - **If the temperature increases beyond normal, there is excessive air in the system.**
   - **Stop the engine and allow it to cool; then repeat Steps 1–4.**

5. Run the engine at 2,200–2,800 rpm for 5 minutes.
6. Stop the engine and allow it to cool.
7. Repeat Steps 1–6; then go to Step 8.

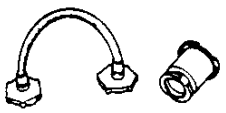
   Warning
   - **Do not remove the radiator cap until the engine is cool.**
   - **Remove the coolant filler cap and the radiator cap carefully and slowly, using a thick rag.**

8. Remove the coolant filler cap and the radiator cap, and verify that the engine coolant level is near the filler neck. If not, repeat Steps 1–8.
9. Fill the reservoir to the F mark.

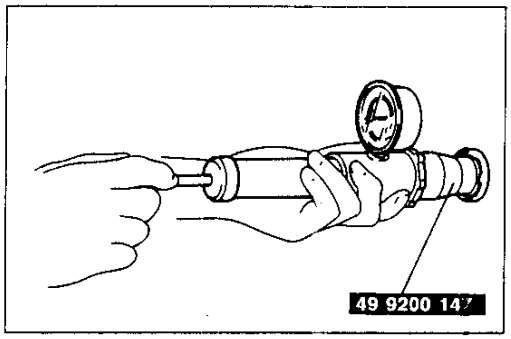
37U0EX-016

RADIATOR CAP

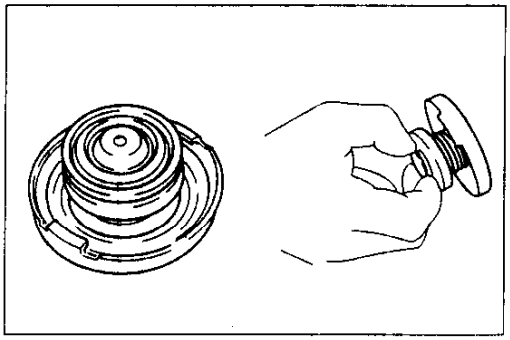
PREPARATION
SST

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

05U0EX-014



37U0EX-007



37U0EX-008

INSPECTION

Radiator Cap Valve

1. Remove foreign material (such as water residue) from between the radiator cap valve and the valve seat.
2. Attach the radiator cap to a radiator cap tester (commercially available) by using the **SST**. Apply pressure gradually to **113–142 kPa {1.15–1.45 kgf/cm^2, 16.4–20.6 psi}**.
3. Wait about **10 seconds**. Verify that the pressure has not decreased.
4. If not as specified, replace the radiator cap.

Negative Pressure Valve

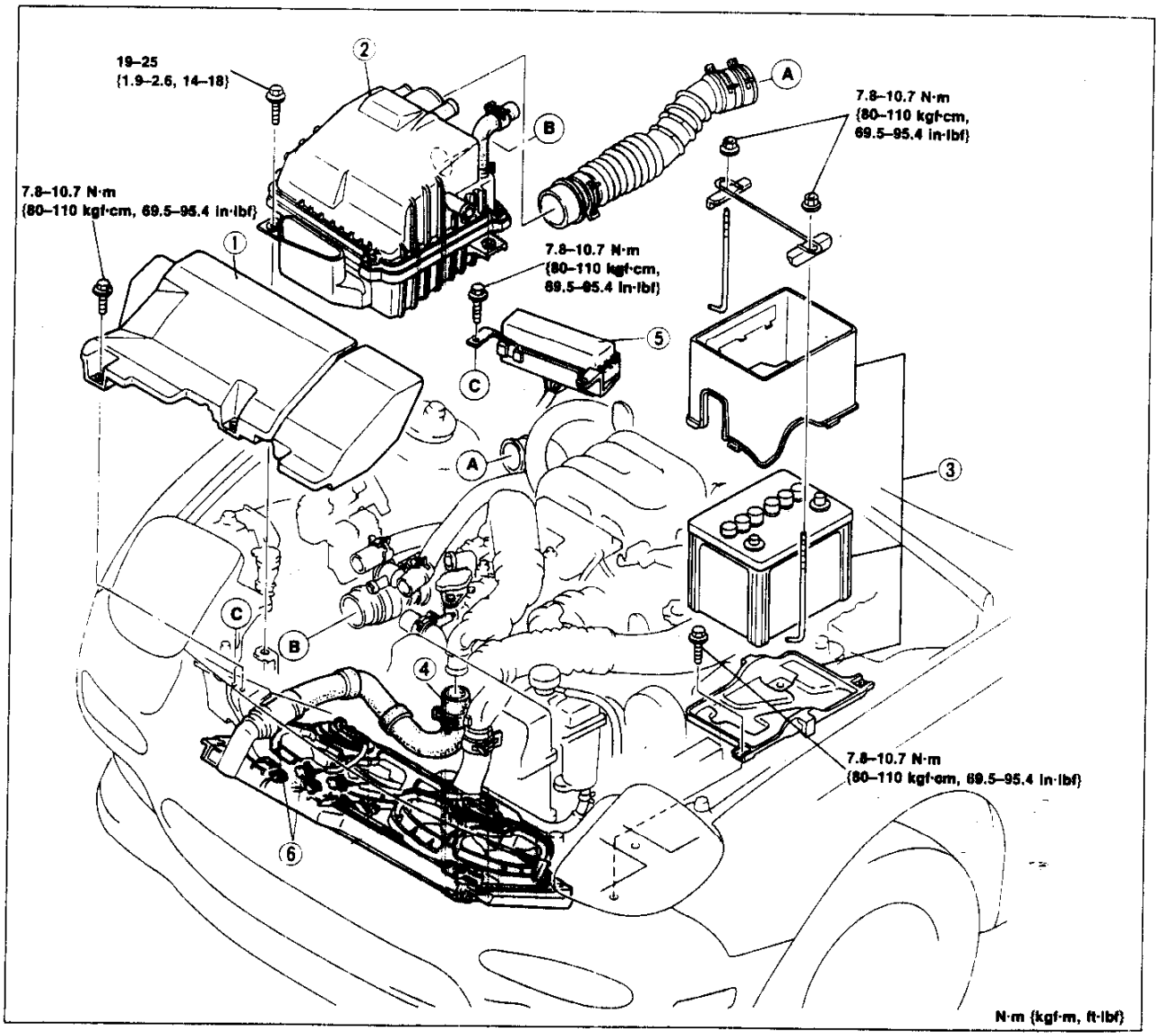
1. Pull the negative pressure valve to open it. Verify that it closes completely when released.
2. Check for damage on the contact surfaces and for cracked or deformed seal packing.
3. Replace the radiator cap if a problem is found.

RADIATOR AND ELECTRIC COOLING FAN

REMOVAL / INSTALLATION

1. Raise the vehicle and position it on safety stands.
2. Disconnect the negative battery cable.
3. Drain the engine coolant.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Install in the reverse order of removal.

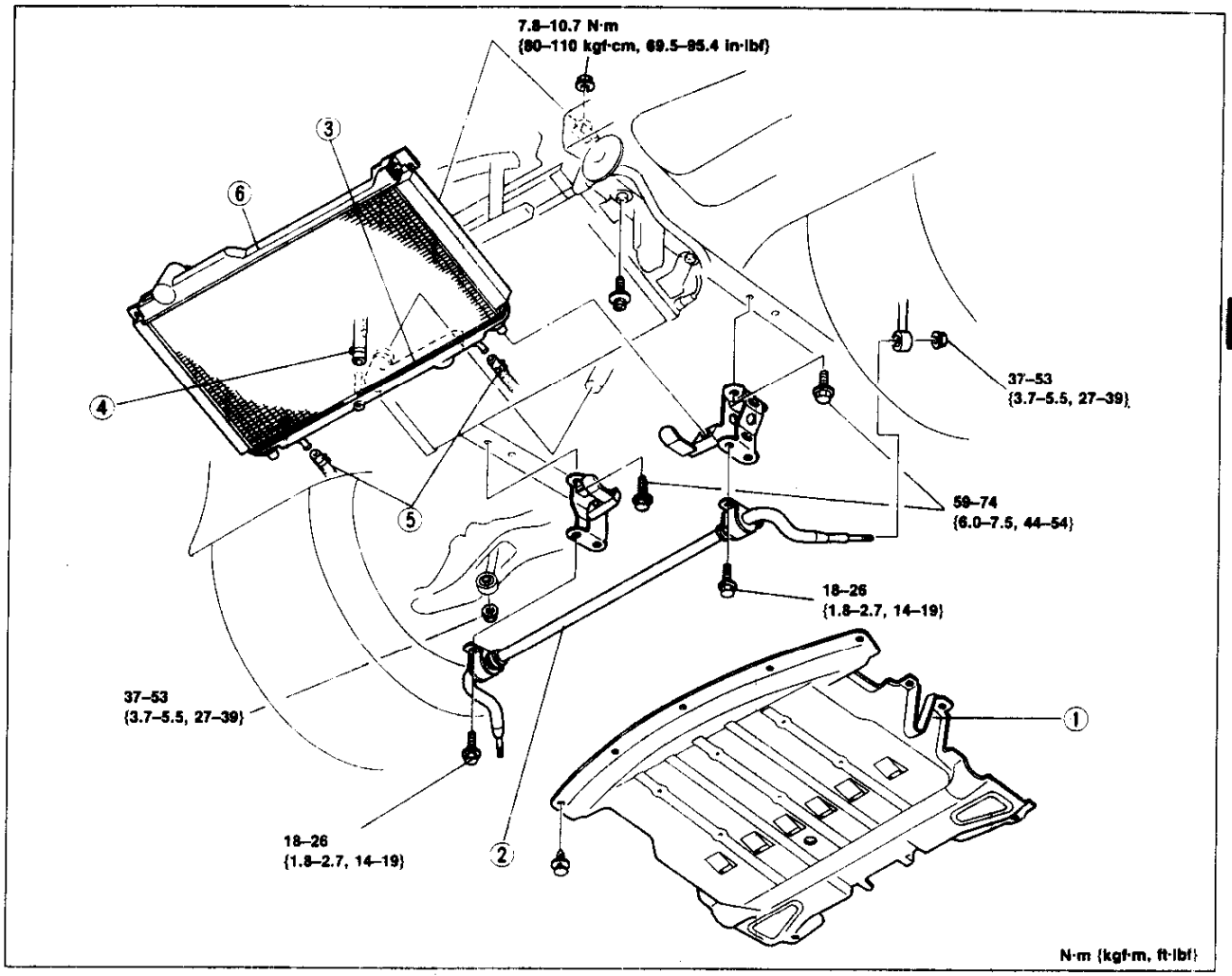
STEP 1



37U0EX-009

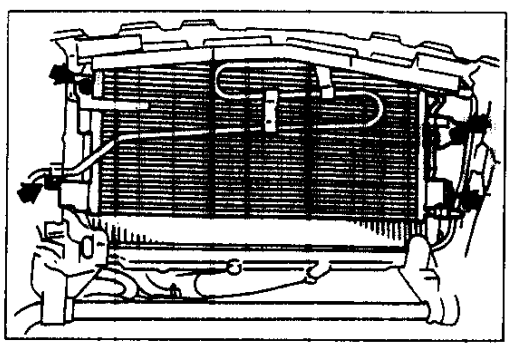
1. Fresh air duct
2. Air cleaner assembly
3. Battery and carrier
4. Radiator hose (upper)
5. Relay box
6. Cooling fan connector

STEP 2



37U0EX-010

1. Undercover
2. Stabilizer and bracket
   Service ..... Section R
3. Radiator hose (lower)
4. Air separation hose
5. Oil cooler hose (A/T)
6. Radiator and cooling fan
   Removal Note ..... below
   Inspection ..... page E–10

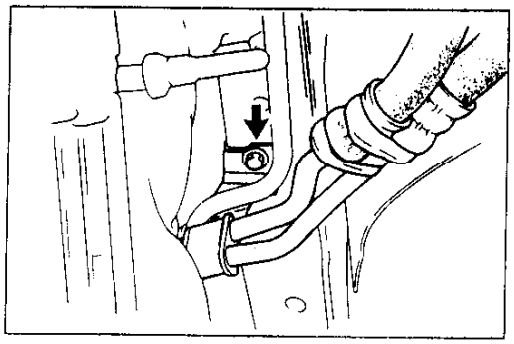


37U0EX-011

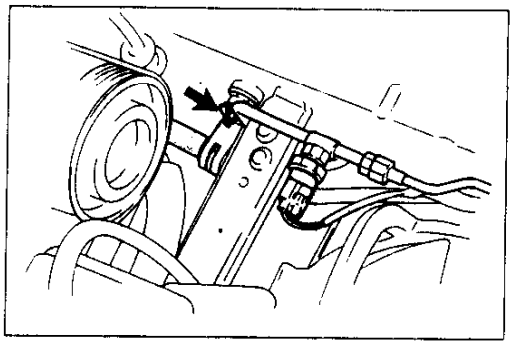
Removal Note
Radiator and cooling fan

1. Remove the bolts shown in the figure.
2. Position the A/C condenser away from the radiator and secure it with wire.

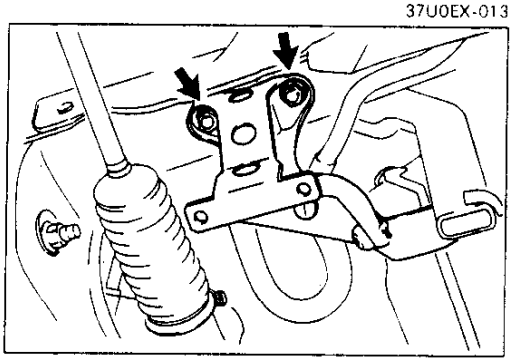
Caution
- **Do not disconnect the A/C piping.**


37U0EX-012

3. Remove the P/S oil pipe bracket shown in the figure.


37U0EX-013

4. Remove the A/C high-pressure pipe bracket as shown in the figure.

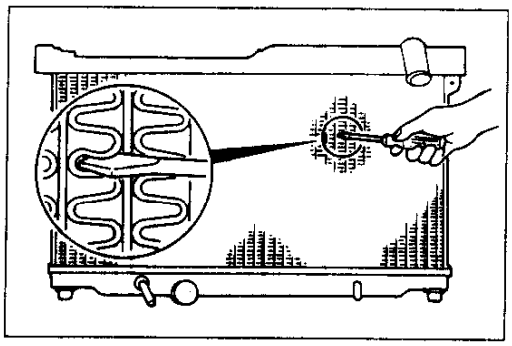

37U0EX-014

Caution
- **Do not drop the radiator and electric cooling fan.**

5. Remove the radiator bracket.

Caution
- **Do not damage the condenser.**

6. Remove the radiator and electric cooling fan.

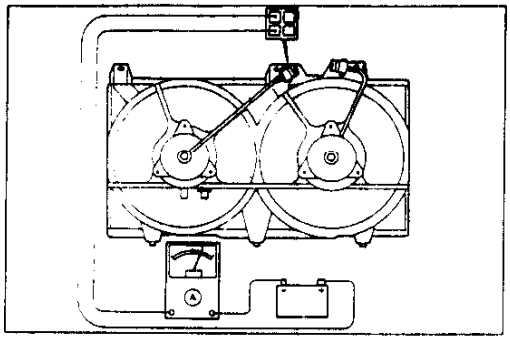

37U0EX-015

INSPECTION

Radiator

Check for the following and repair or replace the radiator as necessary.

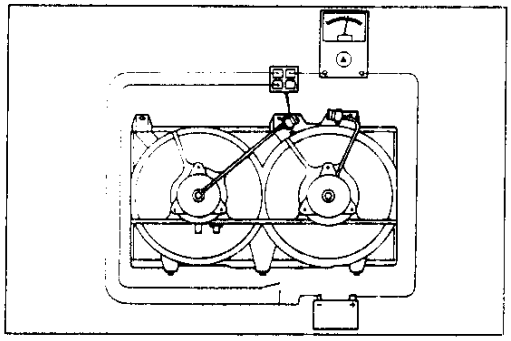
1. Cracks, damage and water leakage.
2. Bent fins (repair with a screwdriver).
3. Damaged radiator inlet, outlet, and hose connectors.


37U0EX-016

Fan Motor (Three-speed type)

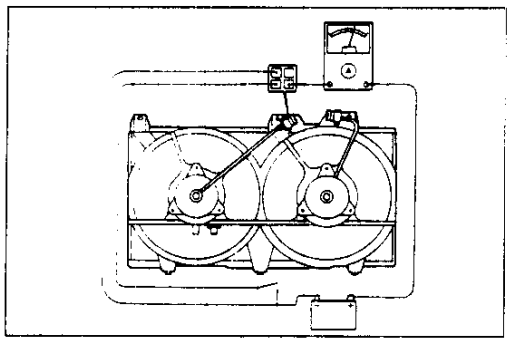
1. Verify that the battery is fully charged.
2. Disconnect the fan motor connectors.
3. Connect battery voltage and an ammeter as shown to the fan motor connector for low-speed inspection.
4. Verify that the fan motor operates smoothly at the standard current .

Current: 5.8–11.8A


37U0EX-017

5. Connect battery voltage, an ammeter, and a switch to the fan motor connector as shown for medium-speed inspection.
6. Verify that the fan motor operates smoothly at the standard current or less with the switch ON.

Current: 6.5–12.5A


37U0EX-018

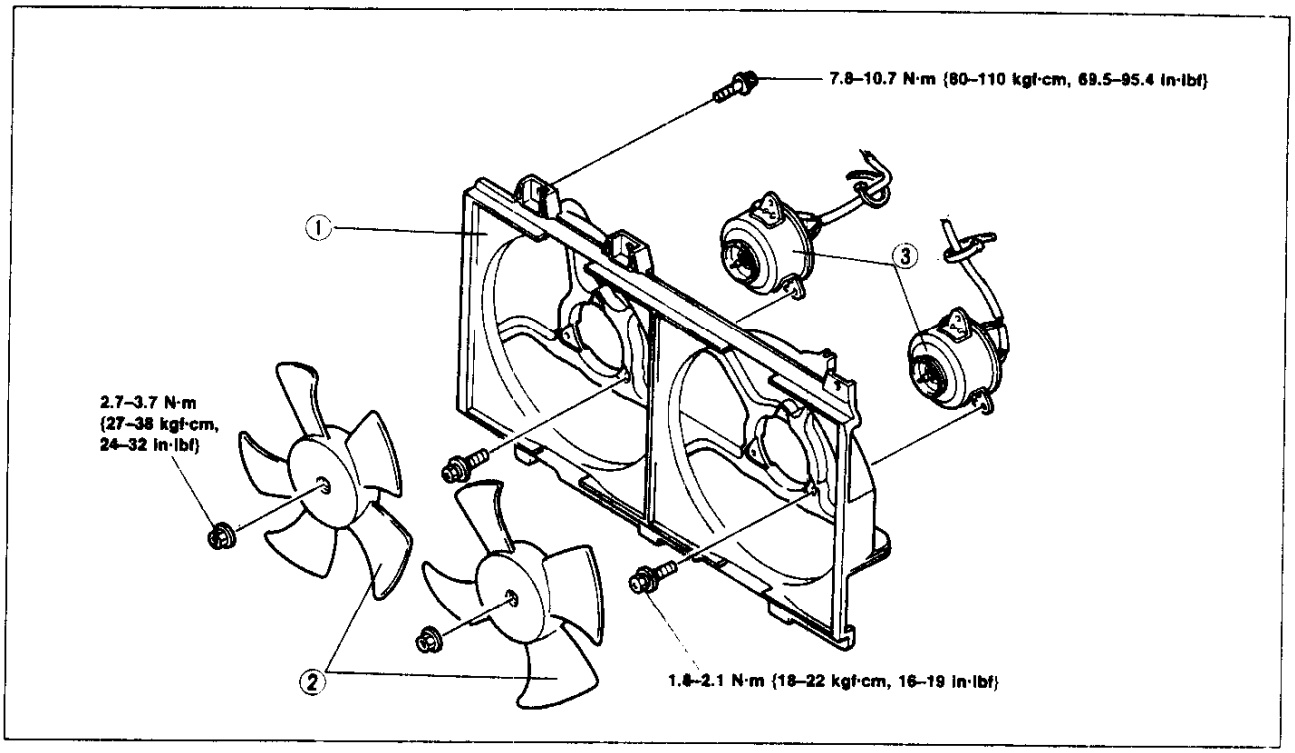
7. Connect battery voltage, an ammeter, and a switch to the fan motor connector as shown for high-speed inspection.
8. Verify that the fan motor operates smoothly at the standard current or less with the switch ON.

Current: 10.6–16.6A

9. Check the other fan motor as described above.
10. If a fan motor does not operate as specified, replace it.

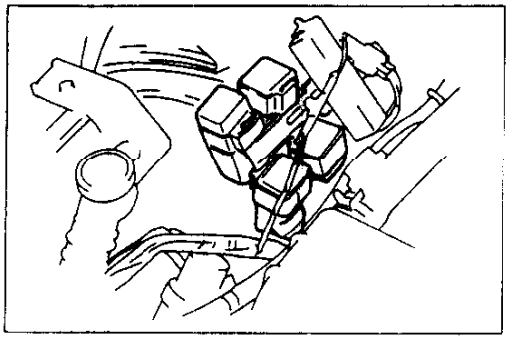
REPLACEMENT

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

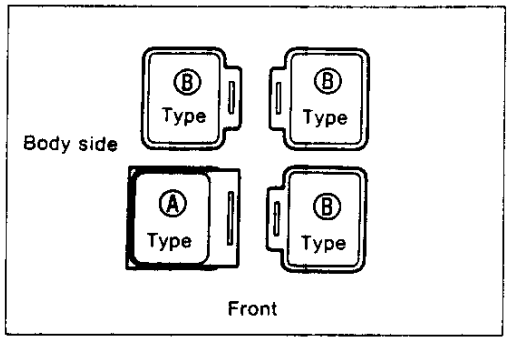


37U0EX-019

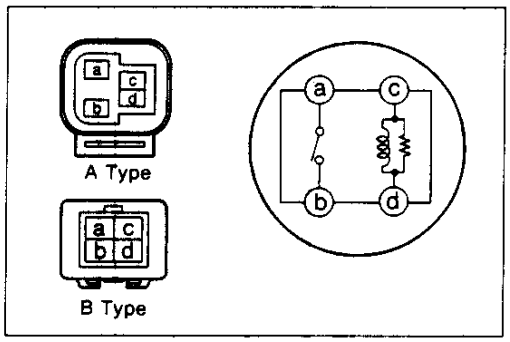
1. Radiator cowling
2. Fan
3. Fan motor



37U0EX-020



37U0EX-021



37U0EX-022

FAN RELAY

REMOVAL / INSTALLATION

Side the fan relays off the bracket.

Note

- **The relay positions are as shown in the figure.**

INSPECTION

1. Check continuity of the relaly as shown.

Terminal	Continuity
a–b	No
c–d	Yes

2. Apply 12V between terminals c and d.
   Check for continuity between terminal a and b.
3. If not as specified, replace the fan relay.

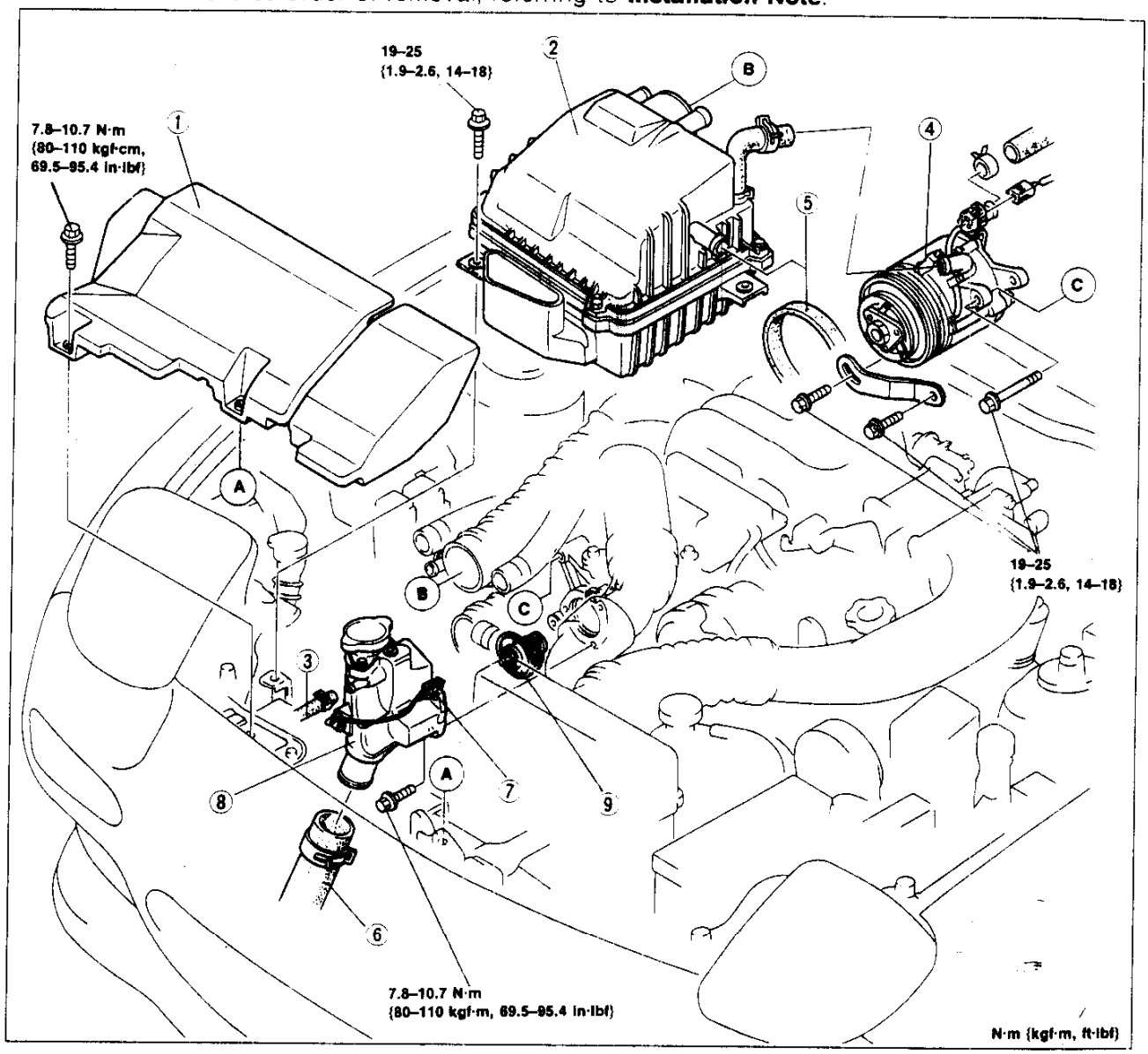
Steps After Installation

1. Fill the rediator with the specified amount and type of engine coolant. (Refer to page E–5.)
2. Connect the negative battery cable.
3. Start the engine and check for leaks.
4. Bleed the cooling system. (Refer to page E–6.)

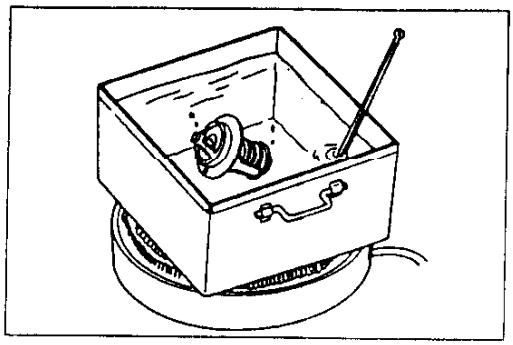
THERMOSTAT

REMOVAL / INSTALLATION

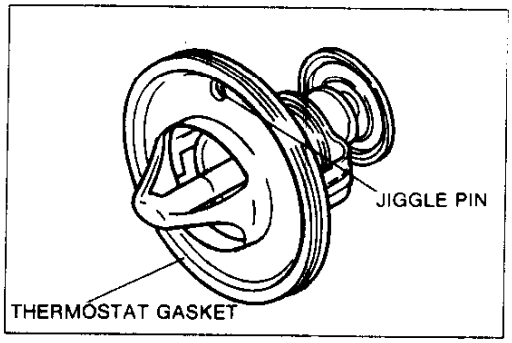
1. Disconnect the negative battery cable.
2. Drain the engine coolant.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal, referring to **Installation Note**.



1. Fresh air duct
2. Air cleaner assembly
3. Water hose
4. Air pump
5. Drive belt
   Service ..... Section C
6. Radiator hose (upper)
7. Coolant level sensor connector
8. Thermostat cover
9. Thermostat and gasket
   Inspection ..... page E–15
   Installation Note ..... page E–15



37U0EX-024



37U0EX-025

INSPECTION

1. Visually check that the thermostat valve is airtight.
2. Place the thermostat and a thermometer in water.
3. Heat the water and check the following.

Initial-opening temperature:
80.5–83.5°C {177–182°F}
Full-open temperature: 95°C {203°F}
Full-open lift: 8.0–10 mm {0.31–0.39 in} min.

4. Check the thermostat gasket; if damaged, replace the thermostat assembly.

Installation Note
Thermostat

Install the thermostat into the thermostat case with the jiggle pin at the top.

Steps After Installation

1. Fill the radiator with the specified amount and type of engine coolant. (Refer to page E–5.)
2. Connect the negative battery cable.
3. Start the engine and check for leaks.
4. Bleed the cooling system. (Refer to page E–6.)

37U0EX-026

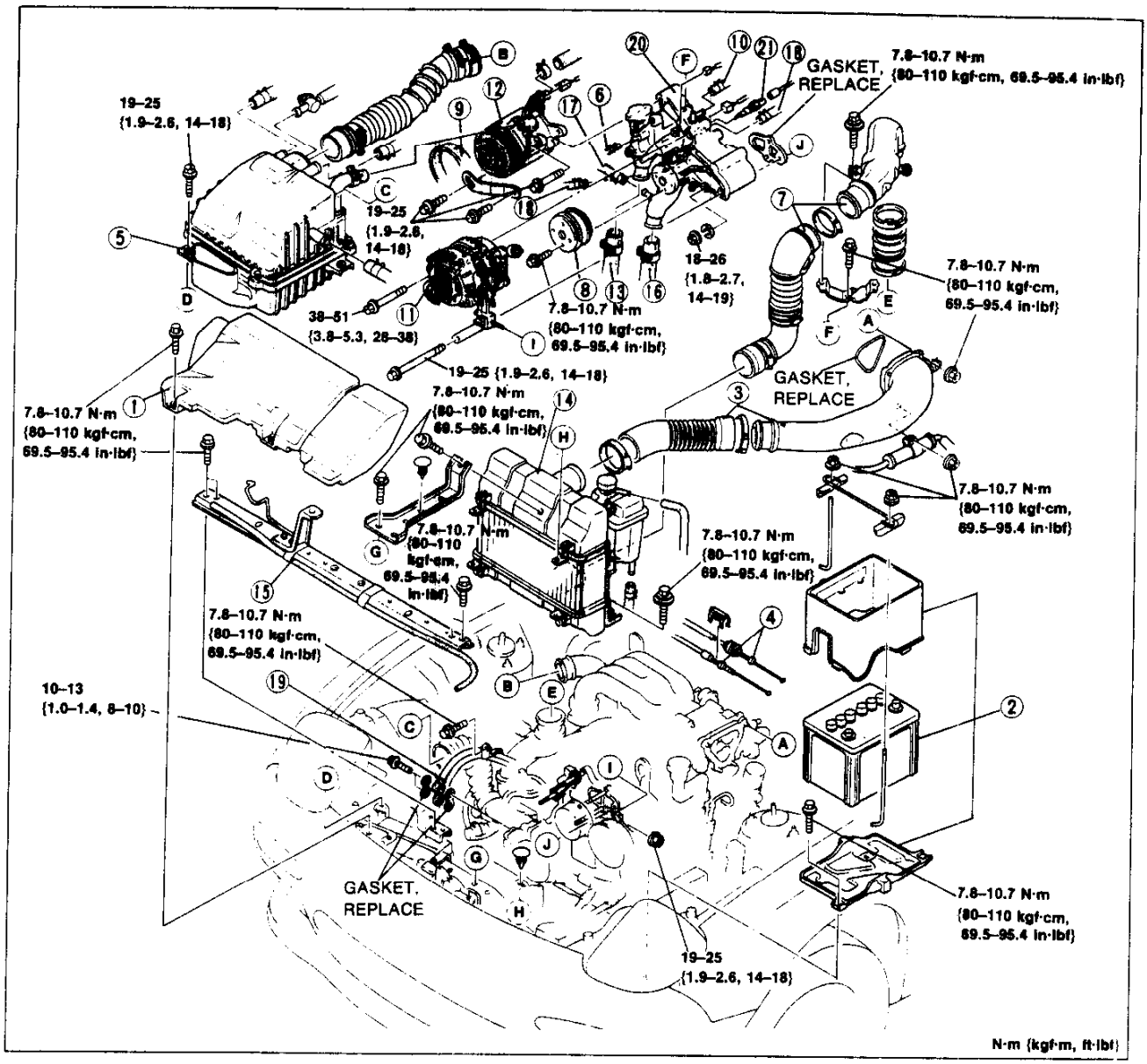
WATER PUMP AND WATER THERMOSWITCH

REMOVAL / INSTALLATION

1. Disconnect the negative battery cable.
2. Drain the engine coolant.
3. Remove in the order shown in the figure (page E–14), referring to **Removal Note**.
4. Install in the reverse order of removal.

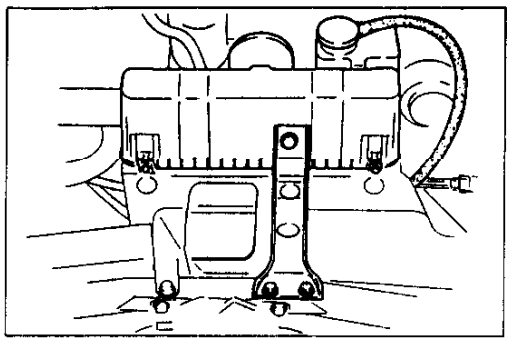
37U0EX-027

WATER PUMP AND WATER THERMOSWITCH



37U0EX-01.8

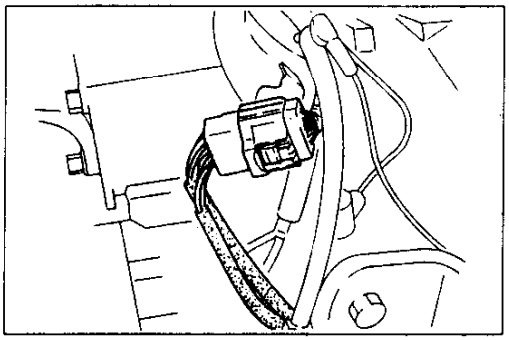
1. Fresh air duct
2. Battery and carrier
3. Air funnel and air hose
4. Accelerator cable
   Service ..... Section F
5. Air cleaner assembly
6. Water hose (filler port)
7. Air pipe and air hose
8. Water pump pulley
9. Drive belt
   Service ..... Section C
10. Water hose (water pump body)
11. Alternator and strap
12. Air pump and strap
13. Radiator hose (upper)
14. Intercooler and air separation tank
    Removal Note ..... page E–17
15. Subframe
16. Radiator hose (lower)
17. Heater hose
18. Water hose (water pump body)
19. Metering oil tube
20. Water pump and pump body
    Removal Note ..... page E–17
21. Water thermoswitch
    Inspection ..... page E–17
    Installation Note ..... page E–17



37U0EX-029

Removal Note
Intercooler and air separation tank

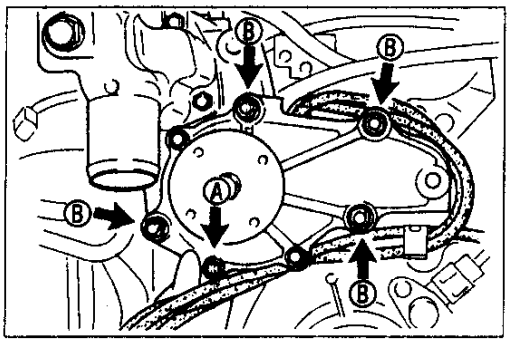
Do not remove the air duct from the body.



37U0EX-030

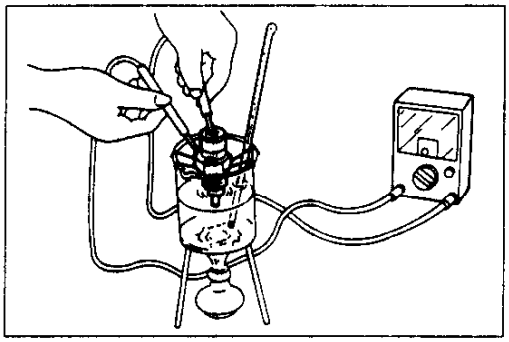
Water pump and pump body

1. Remove the metering oil pump connector from the engine hanger.



37U0EX-031

2. Remove the bolt A shown in the figure.
3. Position the metering oil tube and metering oil pump harness under the lower radiator hose.
4. Remove the nuts B shown in the figure.
5. Remove the water pump and pump body.



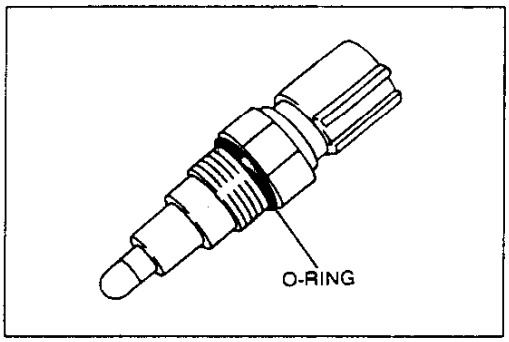
37U0EX-032

INSPECTION
Water Thermoswitch

1. Place the switch and a thermometer in water.
2. Heat the water gradually and check resistance of the switch.

Coolant	Resistance
101°C {214°F}	0.5 Ω max.
108°C {226°F}	1 MΩ min.

3. If not as specified, replace the water thermoswitch.



37U0EX-033

Installation Note
Water thermoswitch

1. Apply a small amount of engine coolant to the new O-ring.

Caution
- **Do not use an impact wrench for installation.**

2. Install the water thermoswitch.

Tightening torque:
5.9–8.8 N·m {60–90 kgf-cm, 52–78 in-lbf}

Before beginning any service procedure, refer to Section S of this manual for air bag system service precautions, and to Section T for audio anti-theft system cautions.

FUEL AND EMISSION CONTROL SYSTEMS

37U0FX-001

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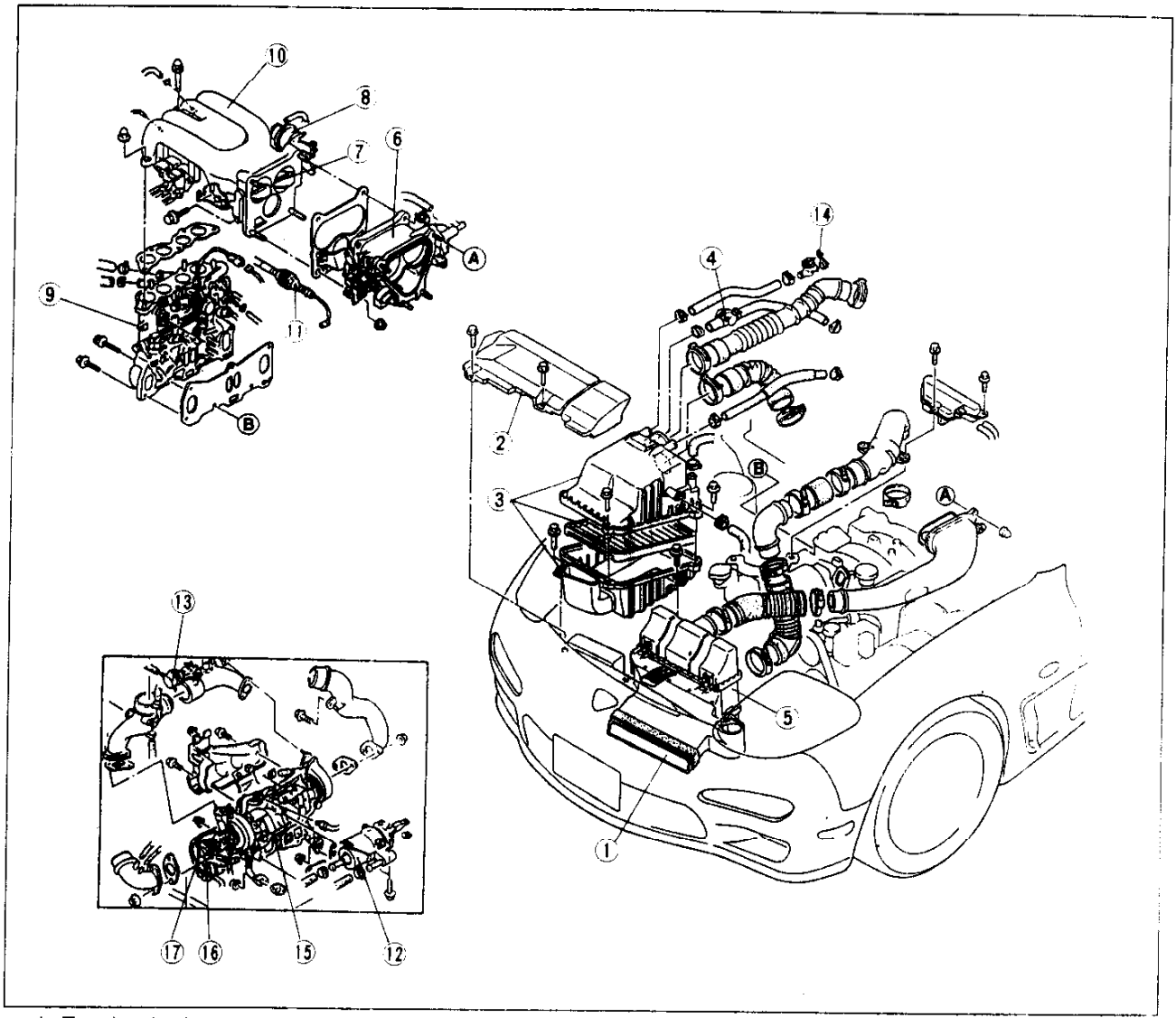
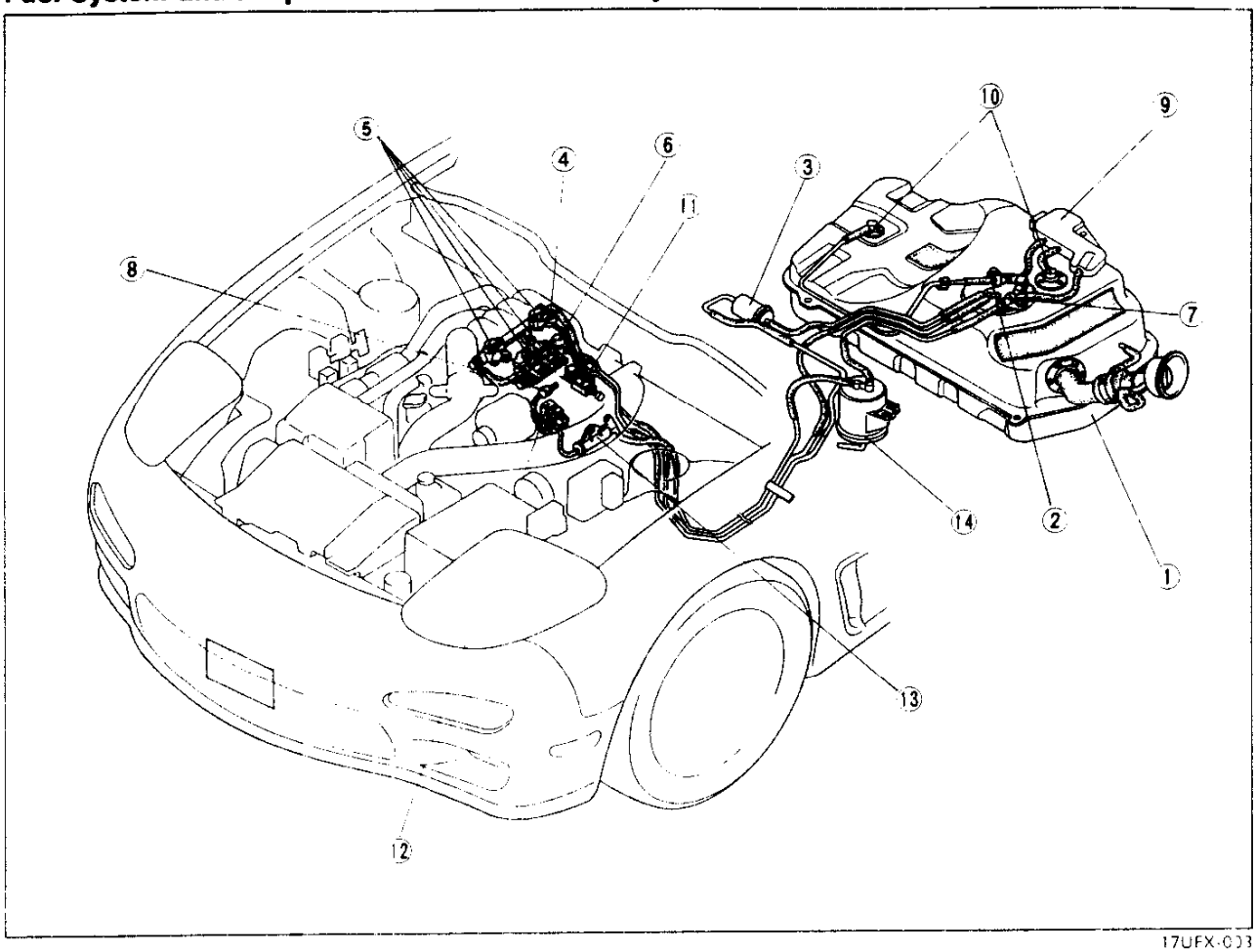
Intake Air System



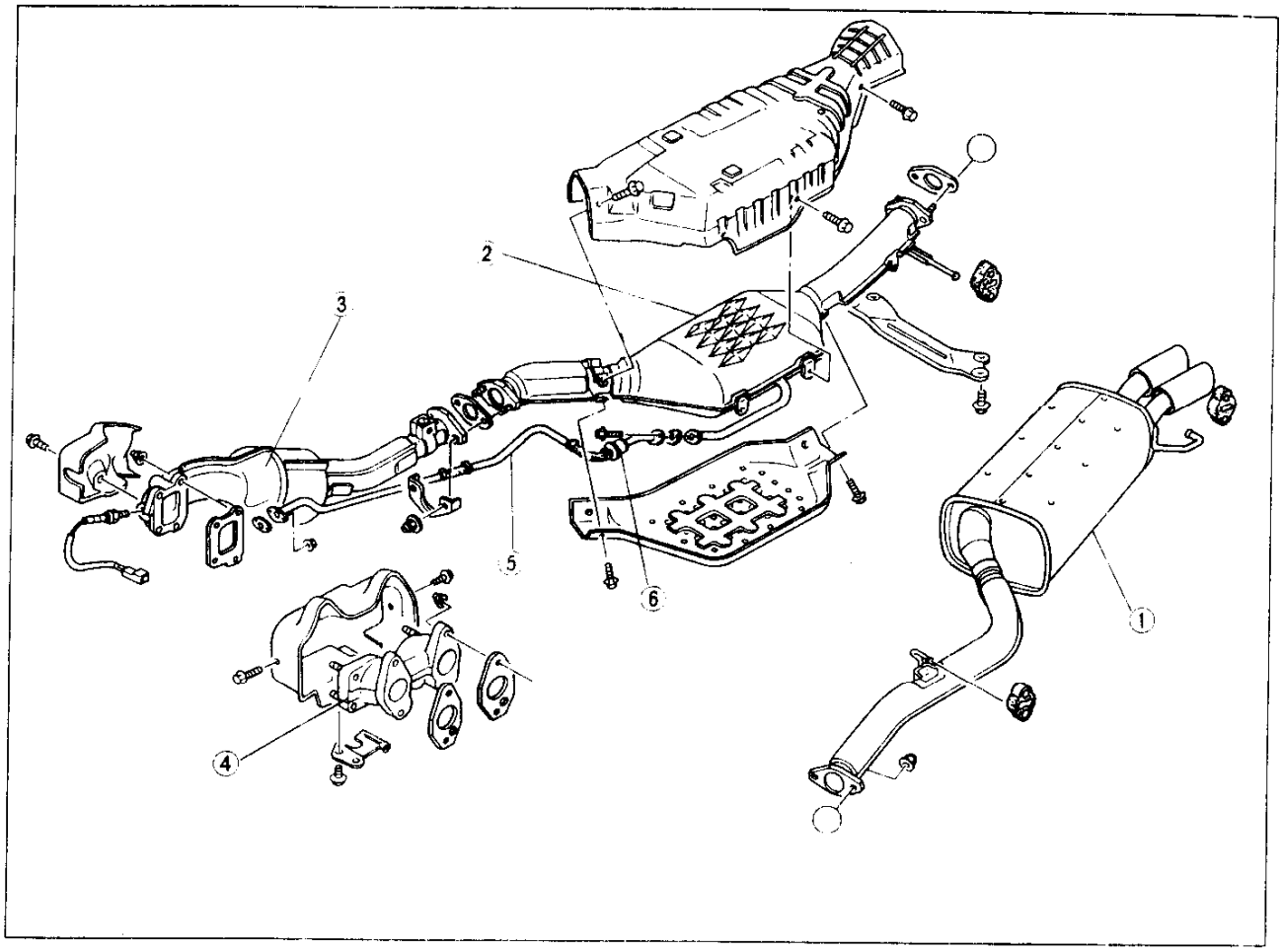
17U0FX-002

Fuel System and Evapolative Emission Control System.



17UFX-003

Exhaust System



17U0FX-E04

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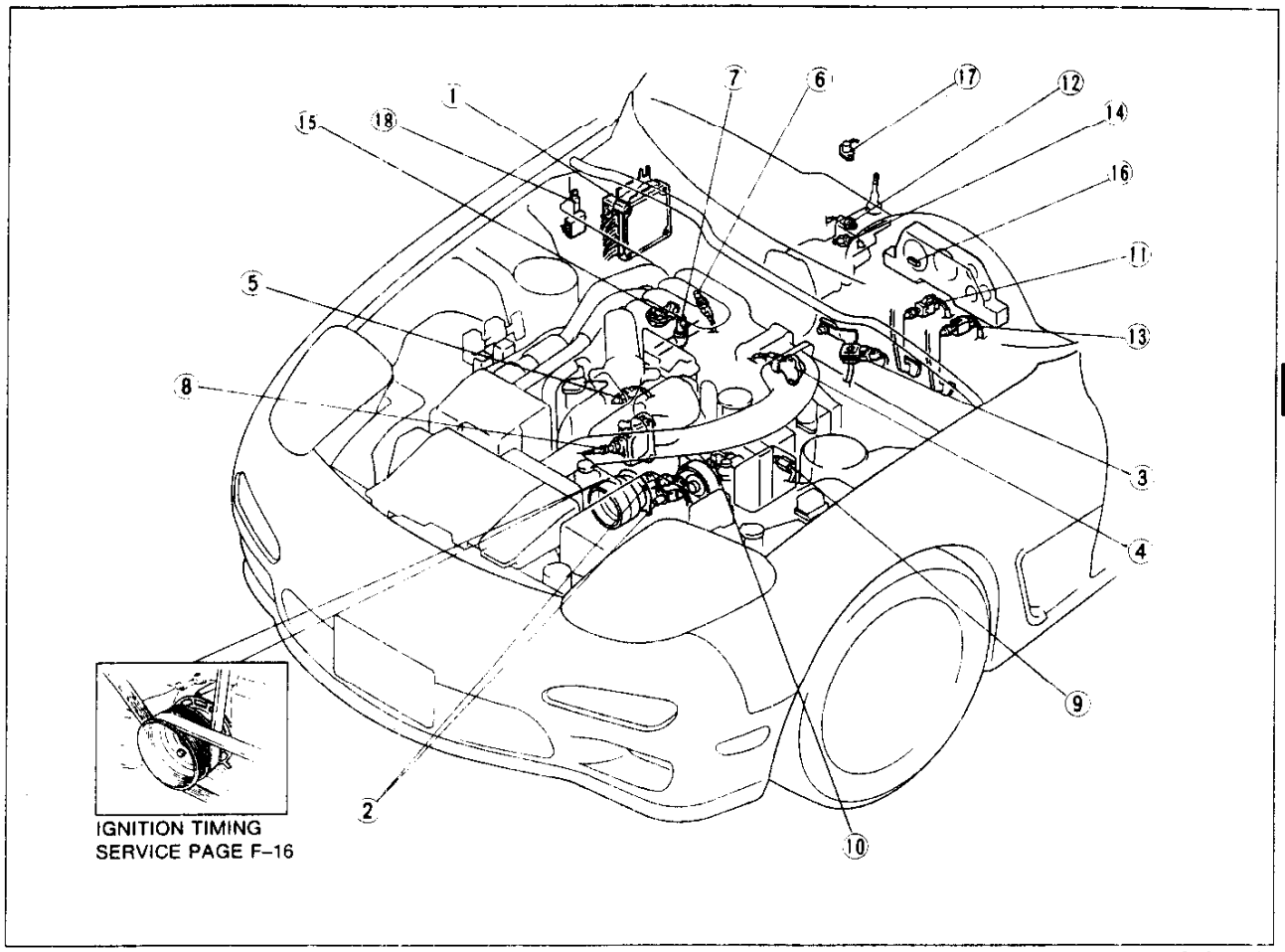
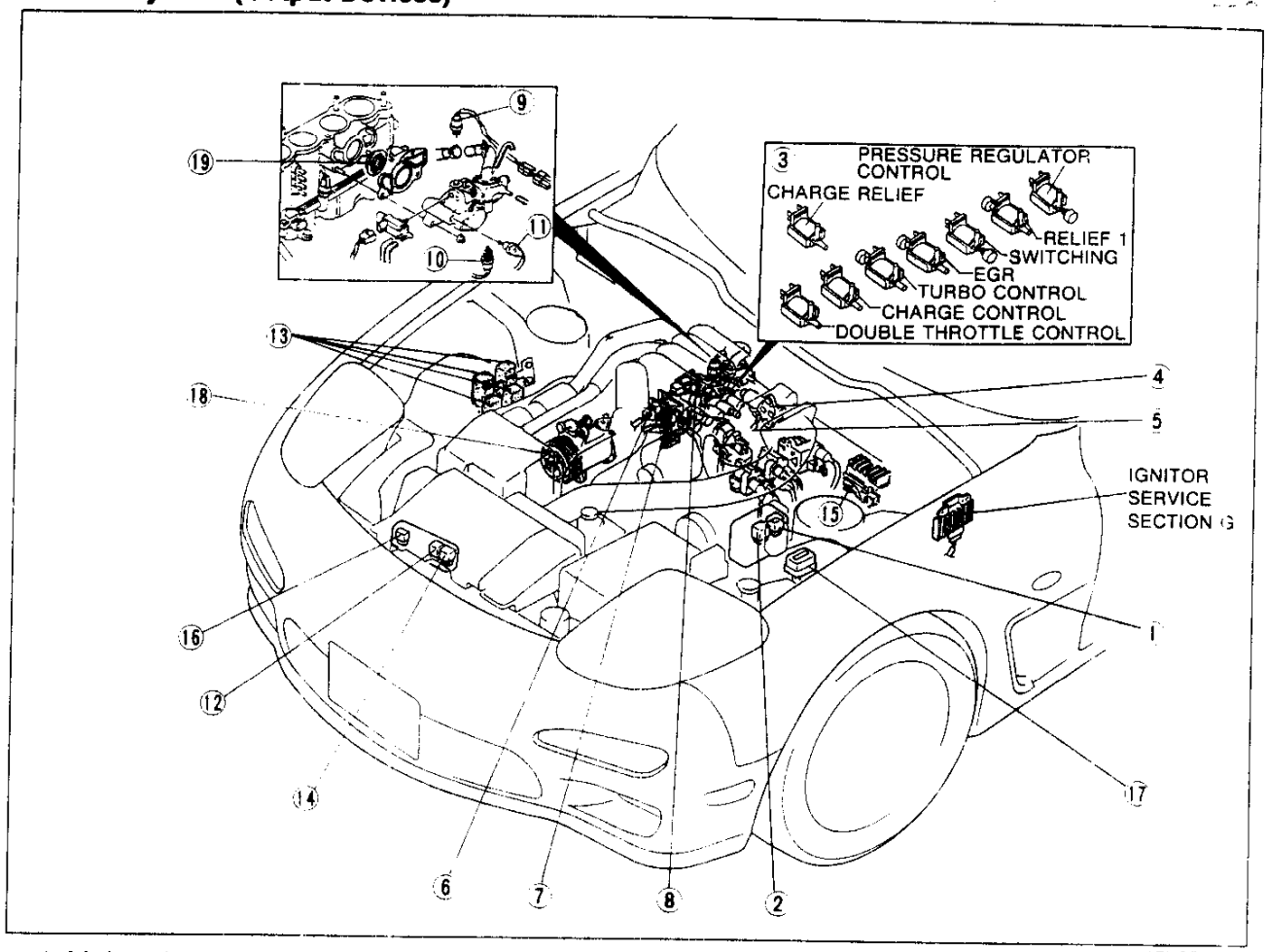
Control System (Input Devices)



Control System (Output Devices)



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2. Circuit opening relay
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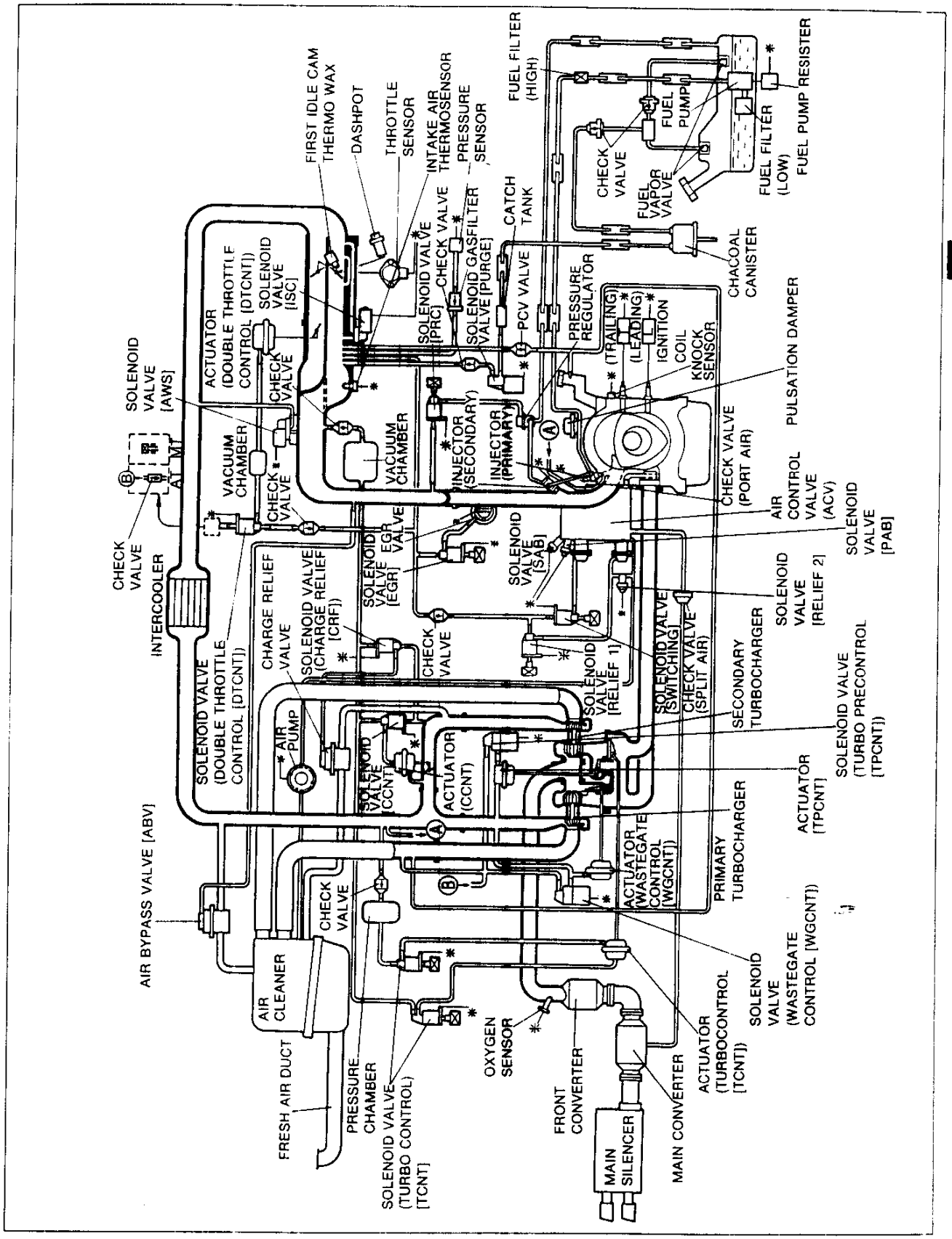
   Removal / Installation ..... page F– 93
   Inspection ..... page F– 93
9. Solenoid valve (Port air bypass)
   Removal / Installation ..... page F–119
   Inspection ..... page F–119
10. Solenoid valve (Relief 2)
    Removal / Installation ..... page F–119
    Inspection ..... page F–119
11. Solenoid valve (Split air bypass)
    Removal / Installation ..... page F–119
    Inspection ..... page F–120
12. A/C relay
    Inspection ..... page F–143
13. Cooling fan relay
    Inspection ..... page F–145
14. Fuel pump relay
    Inspection ..... page F–110
15. Fuel pump resistor
    Removal / Installation ..... page F–109
    Inspection ..... page F–109
16. Air pump relay
    Inspection ..... page F–123
17. Diagnosis connector
18. Air pump
    Inspection /
    Removal / Installation ..... page F–121
19. Check valve (Port air)
    Inspection ..... page F–120

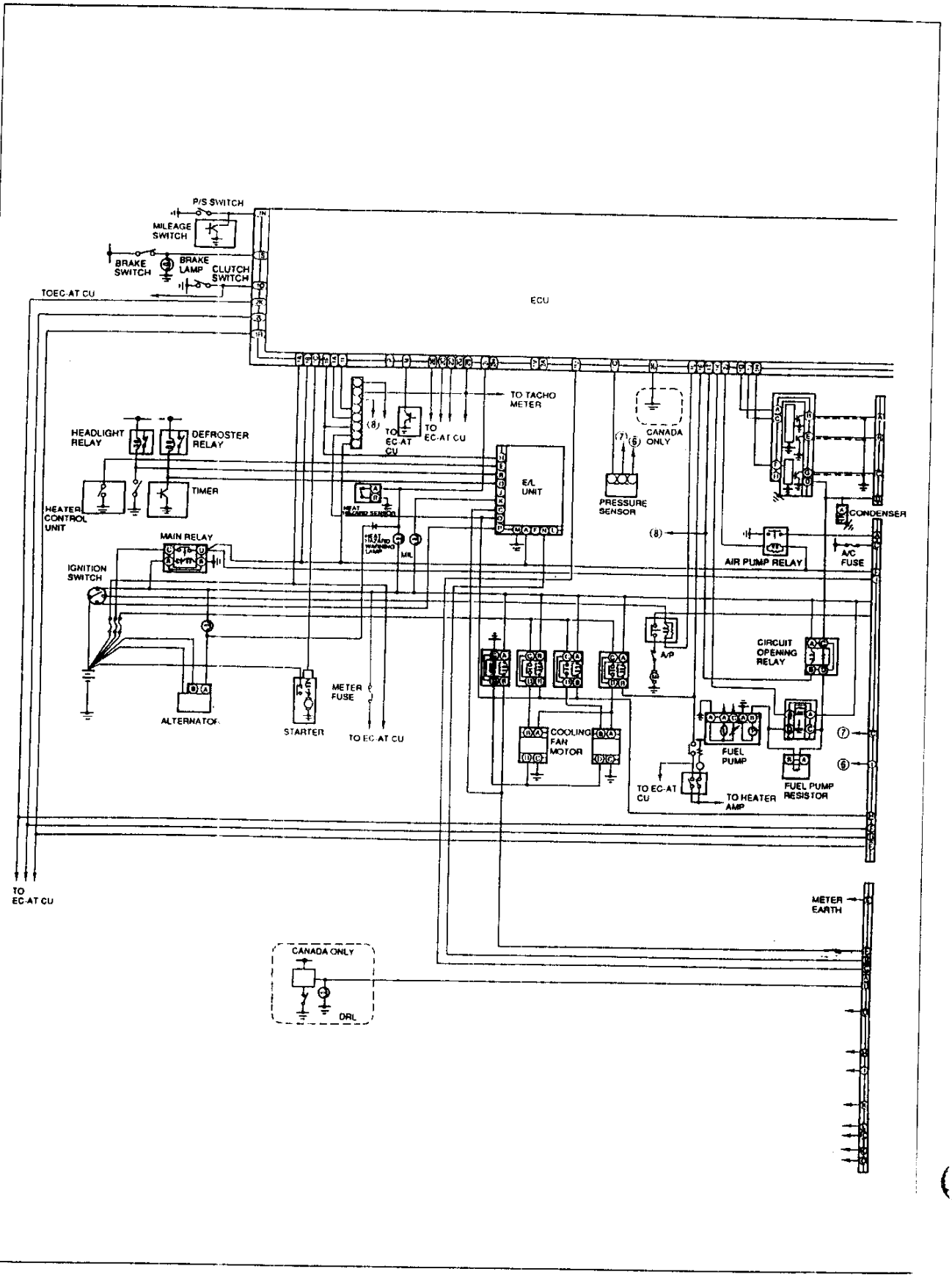
OUTLINE

SYSTEM DIAGRAM

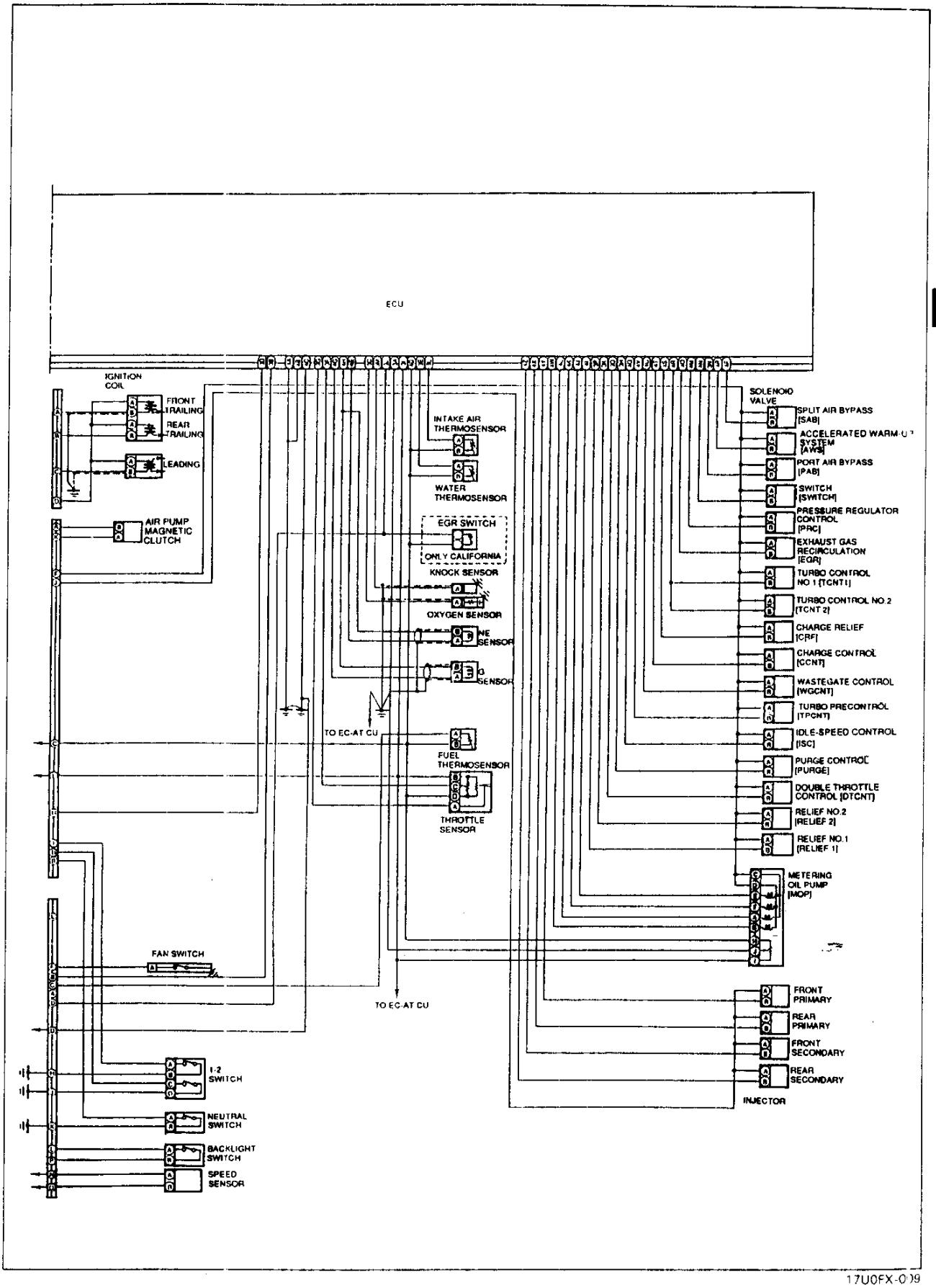


17U0FX-007

WIRING DIAGRAM

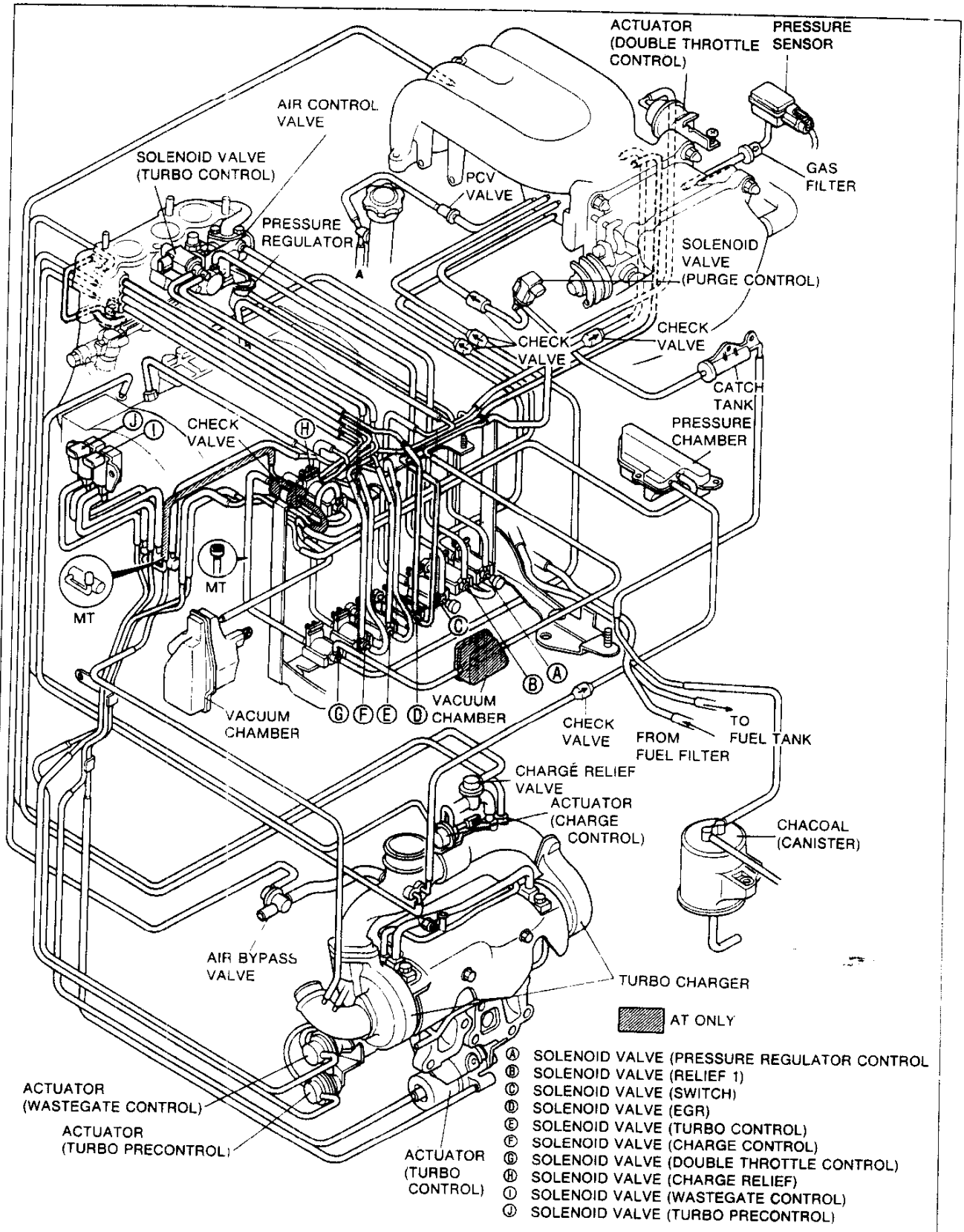


17U0FX-008


ECU
IGNITION COIL
FRONT TRAILING
REAR TRAILING
LEADING
AIR PUMP MAGNETIC CLUTCH
FAN SWITCH
1-2 SWITCH
NEUTRAL SWITCH
BACKLIGHT SWITCH
SPEED SENSOR
INTAKE AIR THERMOSENSOR
WATER THERMOSENSOR
EGR SWITCH
ONLY CALIFORNIA
KNOCK SENSOR
OXYGEN SENSOR
NE SENSOR
G SENSOR
TO EC-AT CU
FUEL THERMOSENSOR
THROTTLE SENSOR
TO EC-AT CU
SOLENOID VALVE
SPLIT AIR BYPASS [SAB]
ACCELERATED WARM-UP SYSTEM [AWS]
PORT AIR BYPASS [PAB]
SWITCH [SWITCH]
PRESSURE REGULATOR CONTROL [PRC]
EXHAUST GAS RECIRCULATION [EGR]
TURBO CONTROL NO.1 [TCNT1]
TURBO CONTROL NO.2 [TCNT2]
CHARGE RELIEF [CRF]
CHARGE CONTROL [CCNT]
WASTEGATE CONTROL [WGCNT]
TURBO PRECONTROL [TPCNT]
IDLE-SPEED CONTROL [ISC]
PURGE CONTROL [PURGE]
DOUBLE THROTTLE CONTROL [DTCNT]
RELIEF NO.2 [RELIEF 2]
RELIEF NO.1 [RELIEF 1]
METERING OIL PUMP [MOP]
FRONT PRIMARY
REAR PRIMARY
FRONT SECONDARY
REAR SECONDARY
INJECTOR

17U0FX-009

VACCUM HOSE ROUTING DIAGRAM



17U0FX-01

SPECIFICATIONS

Item			Specification
Idle speed*		rpm	700–750 (720 $^{+30}_{-20}$)
Ignition timing*	Leading	ATDC	5°
	Trailing	ATDC	20°
Air cleaner			
Element type			Oil permeated
Throttle body			
Type			Horizontal draft {2 stage–3 barrel}
Throat diameter	Primary	mm {in}	45 {1.772}
	Secondary	mm {in}	50 {1.969} × 2
Dashpot touch angle		°	8
Water thermovalve Operation (full open) temperature		°C {°F}	55–65 {131–149} or more
Intercooler			
Type			Air cooled
Core size {w × h × t}		mm {in}	294 × 114 × 65 {11.575 × 4.4882 × 2.5591}
Turbo charger			
System type			Sequential twin turbo charged
Cooling method			water + engine oil
Boost control actuator			turbo pre-control + wastegate control
Boost control method			Solenoid valve (duty-controled) × 2
Fuel tank			
Capacity		liters {US gal, Imp gal}	76 {20.1, 16.7}
Fuel filter			
Type	Low-pressure		Nylon element
	High-pressure		paper element
Pressure regulator			
Type			Diaphragm
Regulated pressure		kPa {kgf/cm^2, psi}	250–260 {2.5–2.6, 35.6–37.0}
Fuel pump			
Type			Impeller (In tank)
Output pressure		kPa {kgf/cm^2, psi}	490–740 {5.0–7.5, 71.1–106.7}
Injector			
Type			Side-feeding
Injection volume	Primary	cm^3 {cc}/min	550 {550}
	Secondary	cm^3 {cc}/min	850 {850}
Catalytic converter			
Type	Pri-converter		Metal
	Main converter		Monolithic
Air pump			
Capacity		cm^3 {cc}/rev	375 {375}
Output		L/min	MT 140–200, AT 160–200
Fuel			
Specification			Unleaded premium (RON95 or higher)

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* TEN terminal of diagnosis connector is grounded.

COMPONENT DESCRIPTIONS

Component	Function	Remark
1-2 switch	Detects gear position (1st, 2nd)	MT only
Actuator (charge control)	Controls charge control valve	–
Actuator (Double throttle control)	Controls double throttle valve	Installed on extension manifold
Actuator (Turbo control)	Controls turbo control valve	Controlled by two solenoid valves
Actuator (Turbo precontrol)	Controls turbo precontrol valve	Part of turbocharger assembly
Actuator (Wastegate control)	Controls wastegate control valve	Part of turbocharger assembly
Air Bypass Valve	Reduces sound of intake air entering air cleaner from turbocharger deceleration	
Air Cleaner	Filters air entering throttle chamber	Oil permeated type
Air Control Valve	Directs air to one of three locations: exhaust port, main converter, or relief air silencer	Consists of two valves: Relief valve Switching valve
Air pump	Supplies secondary air to air control valve	With electromagnetic clutch
Atmospheric Pressure Sensor	Detects atmospheric pressure; sends signal to control unit	Built in ECU
Catalytic Converter	Reduces HC, CO and NOx	–
Charcoal Canister	Stores fuel tank fumes when engine is stoped	Vented to atmosphere through charcoal and air filter
Circuit opening relay	Voltage for fuel pump while engine running	–
Clutch switch	Detects clutch condition (engaged / disengaged)	MT only
Crank Angle Sensor	Detects eccentric shaft angle at 30° intervals and front rotor position; sends signal to control unit	–
Dashpot	Prevents sudden throttle valve closing during deceleration	–
Diagnosis connector	**Service connector terminals:** 1. EGI self-diagnosis 2. EC-AT self-diagnosis [AT] 3. Initial set 4. Fuel pump check 5. Engine speed output 6. Switch and oxygen sensor monitor 7. Supply battery voltage 8. Ground 9. A/C self-diagnosis 10. Cruise control self-diagnosis 11. Electrical cooling fan self-diagnosis	**25-pin (located near fuse box)** 1. FEN terminal 2. TAT and FAT terminal 3. TEN terminal 4. F/P terminal 5. IG- terminal 6. MEN terminal 7. +B terminal 8. GND terminal 9. TAC and FAC terminal 10. TSC and FSC terminal 11. TFA terminal

Component	Function	Remark
Engine control unit (ECU)	**Detects the following:**	
	1. Engine speed	1. Crank angle sensor
	2. Knocking signal	2. Knock sensor
	3. Vehicle speed	3. Speedometer sensor
	4. Engine coolant temperature	4. Water thermosensor
	5. Intake air temperature	5. Intake air thermosensor
	6. Throttle valve opening angle (full range)	6. Throttle sensor (full range)
	7. Intake manifold pressure	7. Pressure sensor
	8. Atmospheric pressure	8. Atmospheric pressure sensor
	9. Oxygen concentration	9. Oxygen sensor
	10. Air/Fuel ratio	10. Oxygen sensor
	11. Throttle valve opening angle (narrow range)	11. Throttle sensor (narrow range)
	12. Metering oil pump (MOP) position signal	12. MOP position sensor
	13. Fuel temperature	13. Fuel thermosensor
	14. Gear position	14. 1-2 switch (MT)
	15. Clutch condition	15. Clutch switch (MT)
	16. In-gear condition	16. Neutral switch (MT)
	17. Power steering operation	17. P/S pressure switch
	18. Braking signal	18. Stoplight switch
	19. Starter signal	19. Ignition switch
	20. Electrical Load (E/L) condition	20. E/L unit
	21. EGR condition	21. EGR swich
	Control operation of the following	
	1. Fuel injection system	Injector
	2. Ignition control system	Igniter
	3. Idle speed control (ISC) system	Solenoid valve (Idle speed control [ISC])
	4. Pressure negulaton control system	Solenoid valve (Pressure Regulator control [PRC)
	5. Secondary air injection system	Solenoid valve (Split air bypass [SAB])
		Solenoid valve (Port air bypass [PAB])
		Solenoid valve (Swich [SWITCHING])
		Solenoid valve (Relief No.2 [RELIEF2])
		Solenoid valve (Relief No.1 [RELIEF1])
	6. Accelerated warm-up System	Solenoid valve (AWS)
	7. Sequential twin turbocharger control system	Solenoid valve (Turbo control No.1 [TCNT1)
		Solenoid valve (Turbo control No.2 [TCNT2)
		Solenoid valve (Wastegate control [WGCNT)
		Solenoid valve (Turbo precontrol [TPCNT])
		Solenoid valve (Change control [CCNT])
		Solenoid valve (Change relief [CRF])
	8. Exhaust Gas Recirculation control system	Solenoid valve (EGR)
	9. Double throttle control system	Solenoid valve (DTCNT)
	10. A/C control system	A/C relay
	11. Electric cooling fan control system	Fan relay
	12. Lock-up control system	EC-AT CU
	13. Slip control system	EC-AT CU
	14.Self-diagnosis function	Self diagnosis checker or DT-S1000
	15 Monitor function	Self diagnosis checker or DT-S1000
	16 Simulation function	DT-S1000
	17 Real-time monitor function	DT-S1000
	18 Back up function	

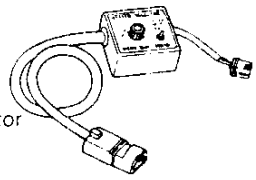
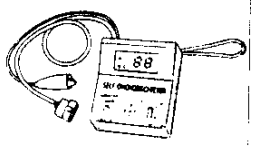
Component	Function	Remark
Fuel filter	Filters particles from fuel	
Fuel pump	Provides fuel to injectors	• Operates while engine running • In fuel tank
Igniter	Receives spark signal from ECU and generates high voltage in ignition coil	
Ignition switch (START position)	Sends engine cranking signal to ECU	–
Inhibitor switch (AT)	Detects load condition; sends signal to ECU	–
Injector	Injects fuel into intake port	• Controlled by signal from ECU (side-feed type)
Intake air thermosensor	Detects intake air temperature; sends signal to ECU	• Installed in extension manifold
Knock sensor	Detects engine knocking; sends signal to ECU	–
Main relay	Supplies current to output devices and ECU	–
Neutral/Clutch switches (MT)	Detects in-gear condition; sends signal to ECU	• Switch is ON in neutral
Oxygen sensor	Detects oxygen concentration; sends signal to ECU	• Zirconic and platinum coat
PCV valve	Controls blowby gas introduced into engine	–
Pressure regulator	Adjusts fuel pressure supply to injectors	–
Pressure sensor	Detects intake manifold pressure; sends signal to ECU	–
P/S pressure switch	Detects P/S operation	• P/S switch ON when steering wheel turned
Pulsation dumper	Absorbs fuel pulsations	–
Solenoid valve (ISC)	Supplies bypass air into intake manifold	• Controlled by duty signal from ECU
Solenoid valve (PRC)	Controls vacuum to pressure regulator	• Installed below extension manifold
Solenoid valve (SAB)	Controls split air volume	• Installed in ACV
Solenoid valve (SWITCHING)	Controls switching valve of air control valve	• Installed below extension manifold
Solenoid valve (RELIEF2)	Controls relief valve	• Installed in ACV
Solenoid valve (RELEF1)	Controls relief valve	• Installed below extension manifold
Solenoid valve (PAB)	Controls port air volume	• Installed in ACV
Solenoid valve (AWS)	Controls accelerated warm-up system	• Installed in extension manifold
Solenoid valve (TCNT1)	Controls turbo control valve	• Installed in ACV (perssure applied)
Solenoid valve (TCNT2)	Controls turbo control valve	• Installed below extension manifold (vacuum applied)
Solenoid valve (WGCNT)	Controls wastegate valve	• Controlled by duty signal from ECU
Solenoid valve (TPCNT)	Controls turbo precontrol valve	• Controlled by duty signal from ECU
Solenoid valve (CCNT)	Controls charge control valve	• Installed below extension manifold
Solenoid valve (CRF)	Controls charge relief valve	• Installed below extension manifold
Solenoid valve (EGR)	Controls EGR valve	• Installed below extension manifold
Solenoid valve (DTCNT)	Controls double throttle valve	• Installed below extension manifold
Solenoid valve (PURGE)	Controls evapolative fumes from chacoal canister to intake manifold	• Controlled by duty signal from ECU
Speedometer sensor	Detects vehicle speed; sends signal to ECU	• Installed in instrument cluster
Stoplight switch	Detects braking; sends signal to ECU	–
Throttle body	Controls intake air amount	–
Throttle sensor	Detects throttle valve opening angle	• Installed on throttle body
Water thermosensor	Detect coolant temperature; send signals to ECU	• Installed in engine

17U0FX-012

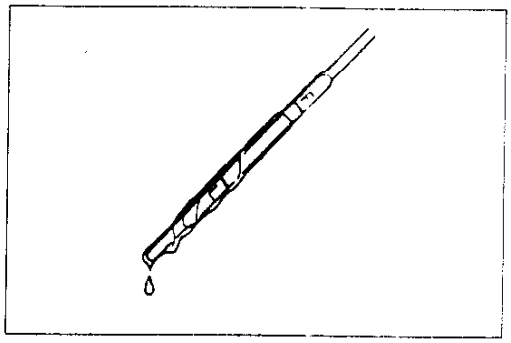
ENGINE TUNE-UP

PREPARATION

SST

49 B019 9A0 System Selector 	For inspection of ignition timing and idle speed and diagnosis	49 H018 9A1 Self Daguosis checker 	For diagnosis

17U0FX-013

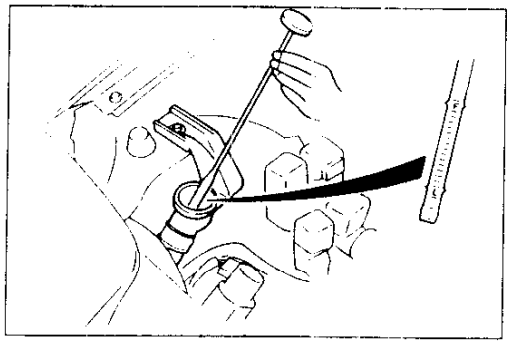


17U0FX-014

BASIC INSPECTION

Engine Oil

1. Remove the dipstick and check the engine oil level and condition.
2. Add or change oil as necessary.



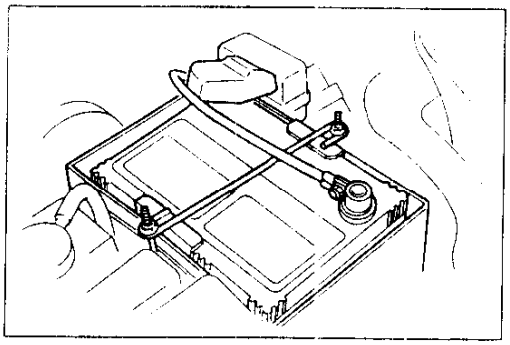
17U0FX-015

Coolant (engine cold)

Warning

- **Never remove the radiator cap while the engine is hot.**
- **Wrap a thick cloth around the cap before carefully removing it.**

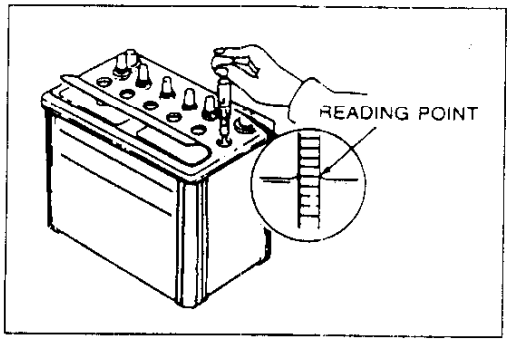
1. Remove the coolant level gauge from the coolant necervir.
2. Verify that the coolant level is between the and marks of the gauge.
3. Add coolant if necessary.



17U0FX-016

Battery

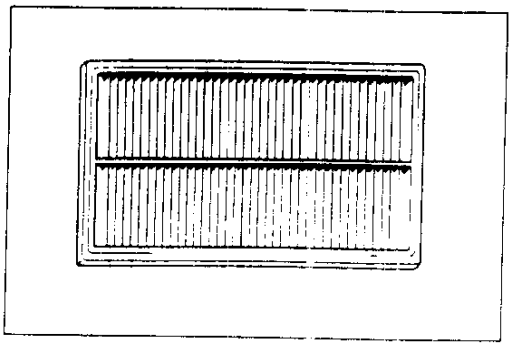
1. Check for corrosion on the terminals and for loose cable connections. If necessary, clean the clamps and tighten them firmly.
2. Make sure the electrolyte level is between the UPPER LEVEL and LOWER LEVEL marks.
3. Add distilled water if necessary.



17U0FX-017

4. Check the specific gravity with a hydrometer.

Gravity: 1.27–1.29 {at 20°C [68°F]}



17U0FX-018

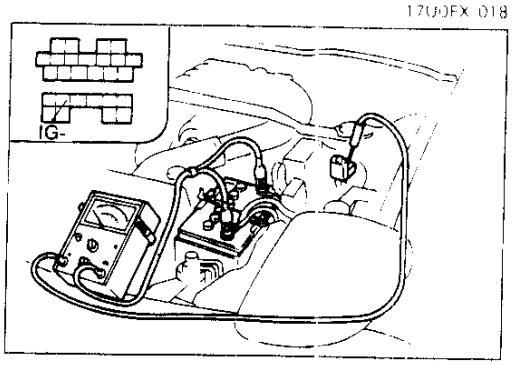
Air Cleaner Element Inspection

1. Check the air cleaner element for excessive dirt and tor oil and damage.

Caution

- **Do not blow the air cleaner element by compressed air to clean.**

2. Replace the element if necessary.

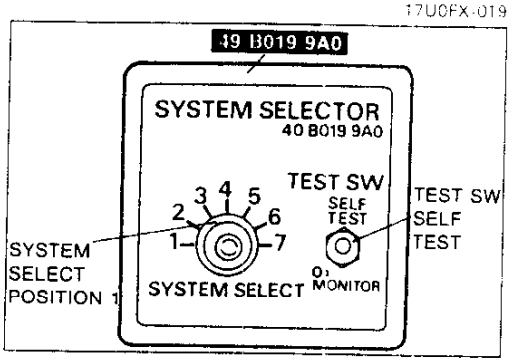


17U0FX-019

ADJUSTMENT

Preparation

1. Warm up the engine to normal operating temperature.
2. Turn all electric loads OFF.
3. Connect the **SST** to the diagnosis connector.
4. Connect a tachometer to the diagnosis connector **IG-** terminal as shown.



17U0FX-020

Ignition Timing

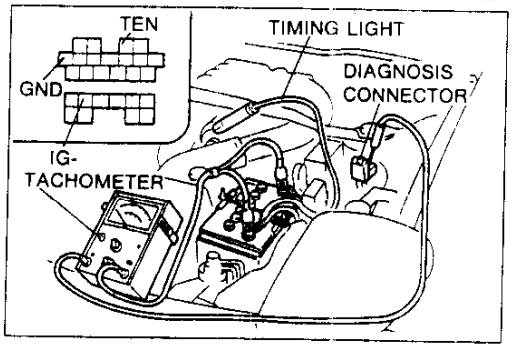
Caution

- **Do not adjust the ignition timing, it is set at the factory and must not be tempered with.**

1. Perform preparation (refer to above.)
2. Verify that the electric cooling fan does not operate.
3. Remove the fuel filler cap.
4. Set SYSTEM SELECT to position 1.
5. Set TEST SW to SELF-TEST.

Note

- **If the SST is not used, jump across the TEN terminal and the GND terminal of the diagnosis connector.**



17U0FX-021

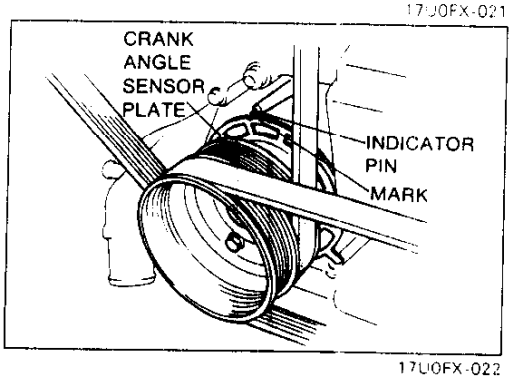
6. Make sure the idle speed is within specification; if not adjust the idle speed.
7. Connect a timing light to the high-tension lead of the front trailing-side.

Caution

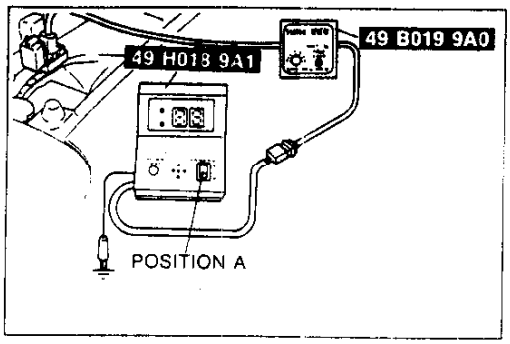
- **Some timing lights will not illuminate even of the ignition system is normal.**

8. Verify that the timing mark (white) on the crank angle sensor plate is aligned with the indicator pin.

Ignition timing: Trailing side: 20° ATDC (– 20° BTDC)
Leading side: 5° ATDC (– 5° BTDC)
Idle speed (Neutral or P range): 550–950 rpm



17U0FX-022



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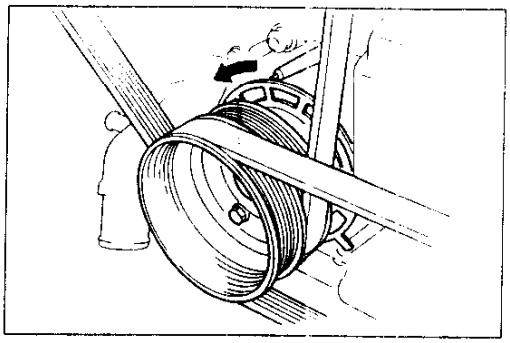
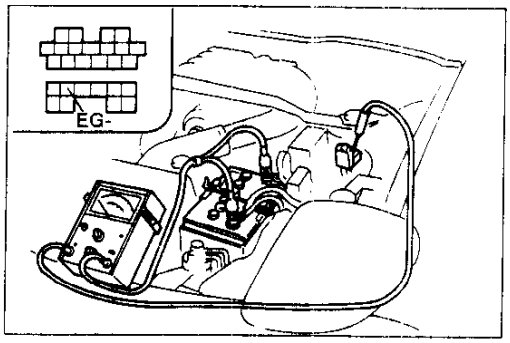
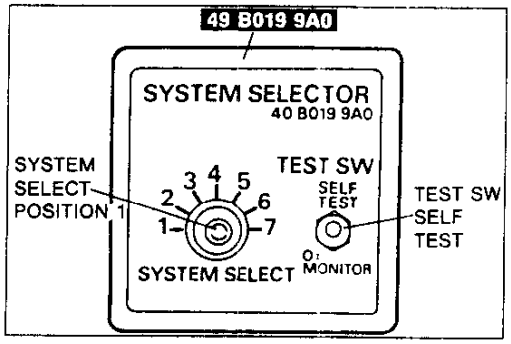

17U0FX-024



17U0FX-025



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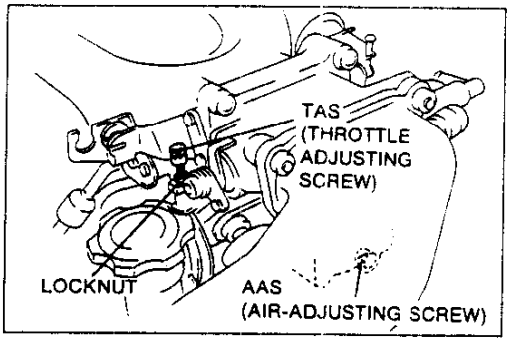


17U0FX-027

9. If the timing is incorrect, check the following procedure.
   - Verify that no service code number is present. If service code number present, check for cause referring to the specified check sequence. (Refer to page F–20)
   - 05–knock sensor
   - 13–Pressure sensor

Input devices
- E/L, P/S, A/C, Cooling fan
- Crank angle sensor (NE, signal)
- Pressure sensor
- Throttle sensor
- Neutral SW / Clutch SW (MT)
- Inhibitor signal (AT)

Others
ECU terminal 3I (Refer to page F–152)

10. Disconnect the **SST**.
11. Verify that the ignition timing advances when the engine is above 1,500 RPM.

Idle Speed

Note
- **Because the idle speed is controlled automatically by the ECU though the idle speed control (ISC) valve, usually it is not necessary to check and adjust the idle speed. However, the idle speed should adjust when rough idling occurs adjust the idle speed following procedure.**

1. Perform "Preparation". (Refer to page F–16)
2. Set SYSTEM SELECT to position 1
3. Set TEST SW to SELF TEST
4. Verify that the idle speed is within specification.

Idle speed: 700–750 (720 $^{+30}_{-20}$ rpm)

Caution
- **Check the idle speed with the electric cooling fan not operating.**

5. If not within the specification, adjust the idle by turning the air-adjusting screw (AAS).
6. If not within the specification when air adjusting screw fully closed, loosen the locknut and turn the throttle adjusting screw to set the idle.
7. Tighten the locknut and put a paint mark on the nut and throttle body.
8. Disconnect the **SST**.

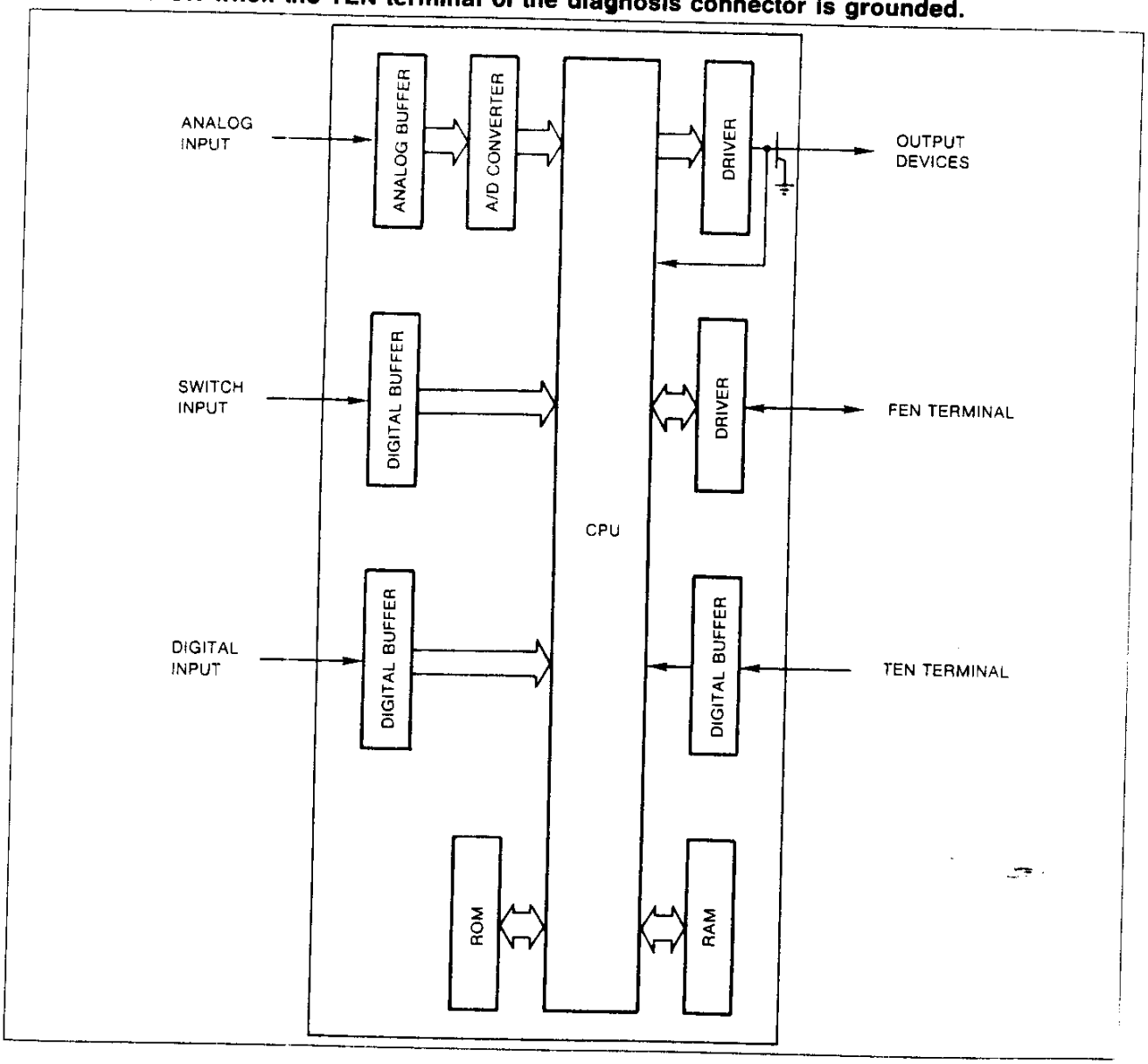
SELF-DIAGNOSIS FUNCTION

DESCRIPTION

When trouble occurs in the main input or output devices, check for the cause by using the **SST**. Failure of input and output devices is indicated and retrieved from the engine control unit (ECU) as service code numbers.

Note

- **The ECU constantly checks for malfunction of the input devices. But, it checks for malfunction of output devices only in a three-second period after the ignition switch is turned ON when the TEN terminal of the diagnosis connector is grounded.**

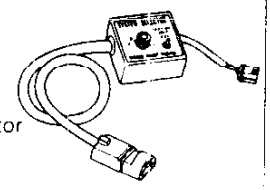
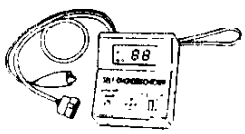
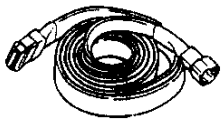
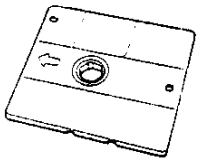


17U0FX-02E

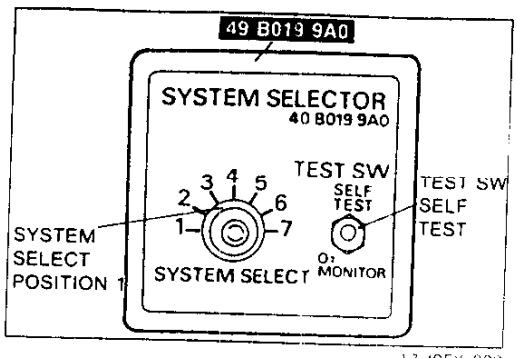
Function

	Self diagnosis checker	DT-S1000
Service Code Number Inspection	Yes	Yes
Monitor Function	Yes	Yes
Real Time Monitor Function	No	Yes
Simulation Function	No	Yes
Memory Function (DT-S1000)	No	Yes

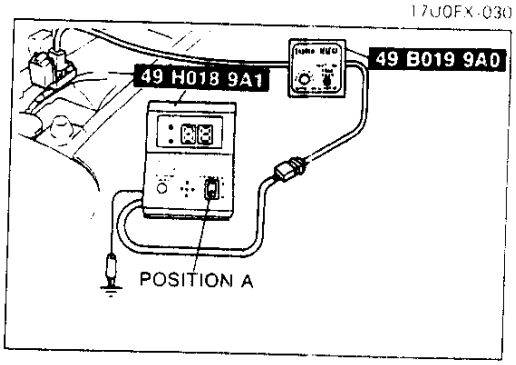
PREPARATION
SST

49 B019 9A0 System Selector 	For diagnosis	49 H018 9A1 Self-Diagnosis Checker 	For diagnosis
49 F088 001 DT-S1000 Base unit 	For diagnos s	49 F088 002 Power unit 	For diagnosis
49 F088 003 Harness power unit 	For diagnosis	49 F088 004 Interface adapter Type-1 	For diagnosis
49 F088 005 Harness Type-1 	For diagnosis	49 F088 011 System disk Type-1 (V1.00) 	For diagnosis

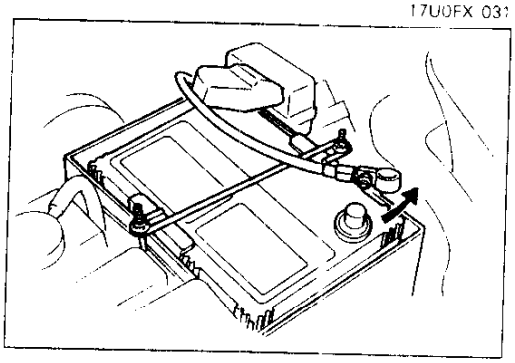
17U0FX-02



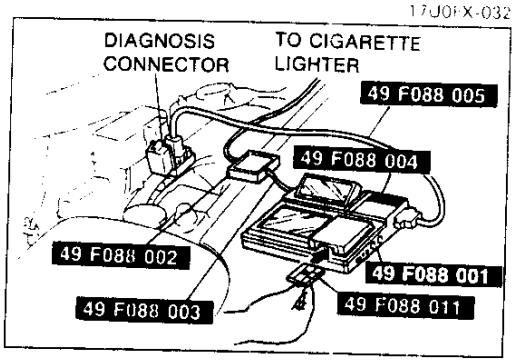
17U0FX-030



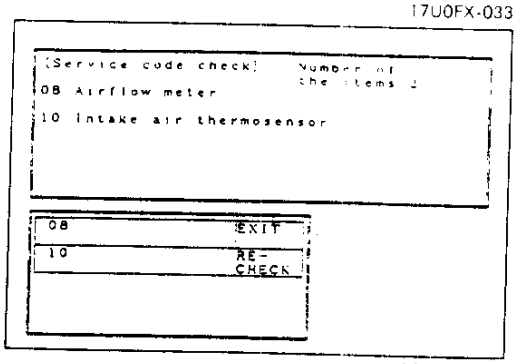
17U0FX-031



17U0FX-032



17U0FX-033



17U0FX-034

SERVICE CODE NUMBER

Inspection Procedure

1. Connect the **SST** to the Self-Diagnosis Checker to the diagnosis connector.
2. Set system select to position 1.
3. Set the test switch to SELF TEST.
4. Connect the **SST** to the System Selector and a ground.
5. Set the select switch to position A.
6. Turn the ignition switch ON.
7. Verify the "88" flashes on the digital display and the buzzer sounds for **3 sec.** after turning the ignition switch ON.
8. If "88" does not flash, check the main relay (refer to page F–188), power supply circuit, and diagnosis connector wiring.
9. If 88 flashes and the buzzer sounds continuously for more than **20 sec.**, check for a short circuit between the ECU terminal 1F and the diagnosis connector. Replace the ECU if necessary and perform Steps 3 and 7 again.
10. Note any code numbers and check for the causes by referring to the check sequences shown on pages **F–26 through F–65**. Repair as necessary.

Note

- **Cancel the code numbers by performing the after-repair procedure following repairs. (Refer to page F–66)**

DT-S1000

1. Connect the **SST** (DT-S1000) to the diagnosis connector.
2. Turn the ignition switch ON.
3. Check the service code and its cause on the **DT-S1000** display.

Note

- **If the DT-S1000 displays "No service codes", the problem will be in a system or area not covered by the self-diagnosis function.**
- **If the DT-S1000 displays "System error", verify the DT-S1000 connectiong and check for the cause(s) referring to the DT-S1000 instruction manual.**

4. Note any code number(s) and check for the cause(s). Repair as necessary.

Note

- **After repairs are made, recheck for code number(s) by performing the "After-Repair Procedure." (Refer to page F–66.)**

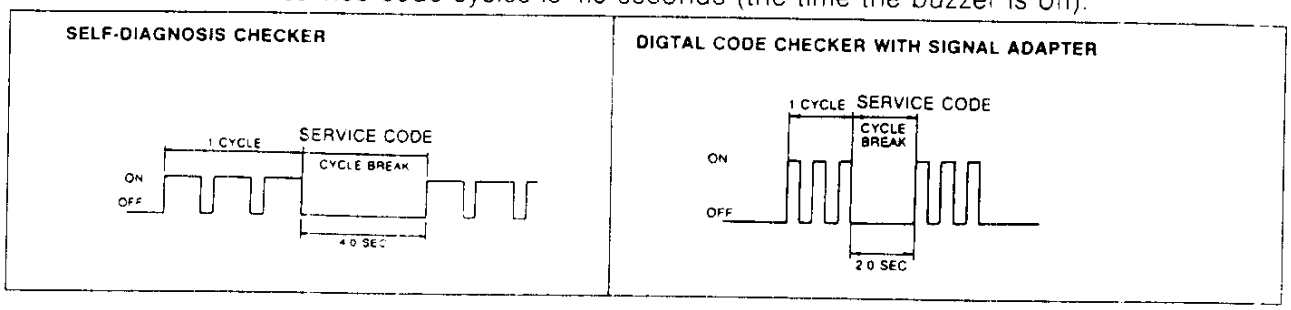
Principle of Code Cycle

Service codes are determined as shown below.

17U0FX-035

1. Code cycle break

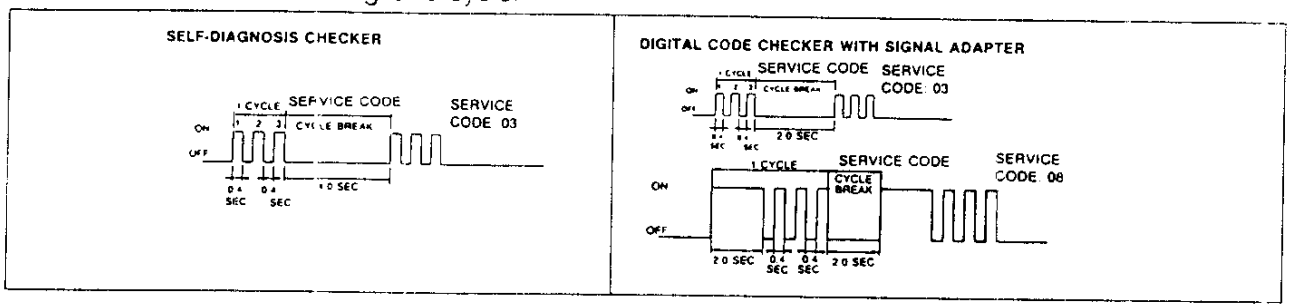
The time between service code cycles is 4.0 seconds (the time the buzzer is off).



17U0FX-036

2. Second digit of service code (ones position)

The digit in the ones position of the service code represents the number of times the buzzer sounds 0.4 second during one cycle.

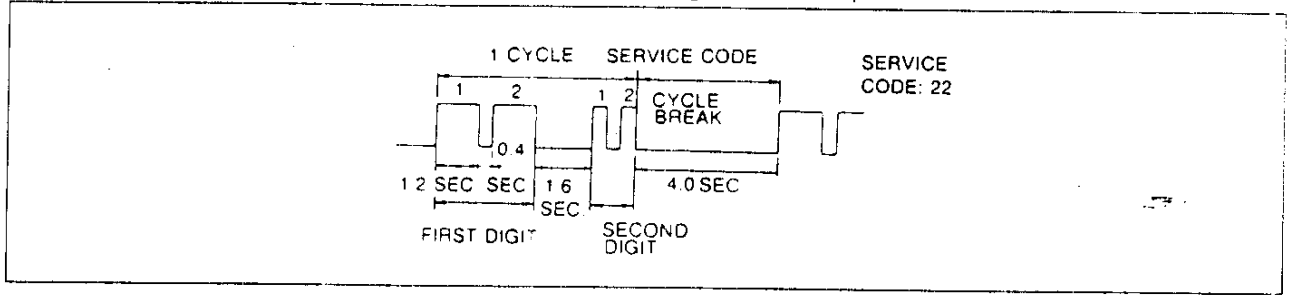


17U0FX-037

3. First digit of service code (tens position)

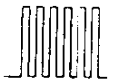
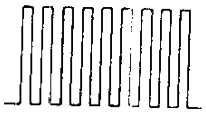
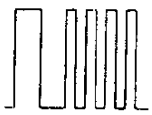
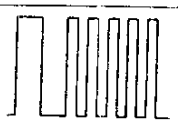
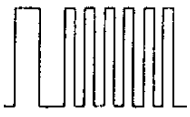
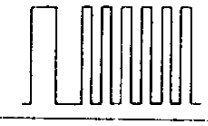
The digit in the tens position of the service code represents the number of times the buzzer is on 1.2 seconds during one cycle.

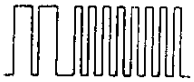
The buzzer is off for 1.6 seconds between the long and short pulses.



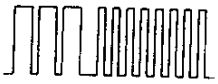
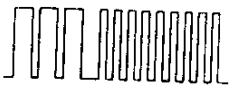
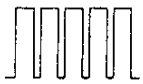
17U0FX-038

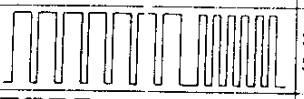
Service Code Numbers

No.	Indicator flashing pattern	Diagnosed circuit	Condition	Point	Memorized	Page
02	ON / OFF 	Crank angle sensor (NE signal)	No NE signal	• Crank angle sensor connector • Wiring from crank angle sensor to ECU • Crank angle sensor	Yes	F-26
03	ON / OFF 	Crank angle sensor (G signal)	No G signal	• Crank angle sensor connector • Wiring from crank angle sensor to ECU • Crank angle sensor	Yes	F-27
05	ON / OFF 	Knock sensor	Open or shout circuit	• Knock sensor connector • Wiring from knock sensor to ECU • Knock sensor	Yes	F-28
06	ON / OFF 	Speedometer Sensor	No speed meter sensor signal	• Speedometer sensor connector • Wiring from speedometer sensor to ECU	Yes	F-29
09	ON / OFF 	Water thermosensor	Open or short circuit	• Water thermosensor connector • Wiring from water thermosensor to ECU • Water thermosensor resistance	Yes	F-30
11	ON / OFF 	Intake air thermosensor		• Intake air thermosensor connector • Wiring from intake air thermosensor to ECU • Intake air thermosensor resistance	Yes	F-31
12	ON / OFF 	Throttle sensor (Full range)		• Throttle sensor connector • Wiring from throttle sensor to ECU	Yes	F-32
13	ON / OFF 	Pressure sensor		• Pressure sensor connector • Wiring from pressure sensor to ECU • Pressure sensor resistance	Yes	F-33
14	ON / OFF 	Atmospheric pressure sensor (in ECU)		• ECU	Yes	F-34
15	ON / OFF 	Oxygen sensor	Sensor output continues less than 0.55V 25 sec. in feedback zone	• Oxygen sensor connector • Wiring from oxygen sensor to ECU • Oxygen sensor	Yes	F-34
16	ON / OFF 	EGR switch (California only)	Open or short circuit	• EGR switch connector • Wiring from EGR switch to ECU • EGR switch	Yes	F-35
17	ON / OFF 	Feedback system	Sensor output not changed 120 sec. in feedback zone	• Fuel pressure • Injection fuel leakage • Ignition system • Air leakage • ECU	Yes	F-36
18	ON / OFF 	Throttle sensor (Narrow range)	Open or short circuit	• Throttle sensor connector • Wiring from throttle sensor to ECU	Yes	F-38

No.	Indicator flashing pattern	Diagnosed circuit	Condition	Point	Memorized	Page
20	ON / OFF 	Metering oil pump position sensor	Open or Short circuit	• MOP connector • Wiring from MOP position sensor to ECU • MOP position sensor continuity	Yes	F–39
23	ON / OFF 	Fuel thermosensor		• Fuel thermosensor connector • Wiring from Fuel thermosensor to ECU • Fuel thermosensor resistance	Yes	F–40
25	ON / OFF 	Solenoid valve (pressure regulator control)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No	F–41
26	ON / OFF 	Metering oil pump (stepping moter)		• MOP connector • Wiring from MOP to ECU • MOP continuity	No	F–42
27	ON / OFF 	Metering oil pump	Open or short circuit or Sticking of MOP sensor	• MOP connector • Wiring from MOP to ECU • Mop continuity	Yes	F–43
28	ON / OFF 	Solenoid valve (EGR)	Open or short circuit	• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No	F–44
30	ON / OFF 	Solenoid valve (Split air bypass)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No	F–45
31	ON / OFF 	Solenoid valve (Relief 1)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No	F–46
32	ON / OFF 	Solenoid valve (Switching)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No	F–47
33	ON / OFF 	Solenoid valve (Port air bypass)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No	F–48
34	ON / OFF 	Solenoid valve (Idle speed control)		• Solenoid valve connector • Wiring from solenoid valve to ECU • Solenoid valve continuity	No	F–49
37	ON / OFF 	Metering Oil Pump	Low battery voltage	• Charging system • MOP connector • Wiring from MOP to ECU	Yes	F–50

SELF-DIAGNOSIS FUNCTION

No.	Indicator flashing pattern	Diagnosed circuit	Condition	Point	Memorized	Page
38	ON / OFF 	Solenoid valve (Accelerated warm-up system)	Open or Short Circuit	• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No	F-51
39	ON / OFF 	Solenoid valve (Relief 2)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No	F-52
40	ON / OFF 	Solenoid valve (Purge control)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No	F-53
42	ON / OFF 	Solenoid valve (Turbo precontrol)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No	F-54
43	ON / OFF 	Solenoid valve (Wastegate control)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No	F-55
44	ON / OFF 	Solenoid valve (Turbo control)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No	F-56
45	ON / OFF 	Solenoid valve (Charge control)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No	F-57
46	ON / OFF 	Solenoid valve (Charge relief)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No	F-58
50	ON / OFF 	Solenoid valve (Double throttle control)		• Solenoid valve connector • Wiring from Solenoid valve to ECU • Solenoid valve continuity	No	F-59
51	ON / OFF 	Fuel pump relay		• Fuel pump relay connector • Wiring from relay to ECU • Relay continuity	No	F-60
54	ON / OFF 	Air pump relay		• Air pump relay connector • Wiring from relay to ECU • Relay continuity	No	F-61

No.	Indicator flashing pattern	Diagnosed circuit	Condition	Point	Memorized	Page
71	ON / OFF 	Injector (Front secondary)	Open circuit	• Injector connector • Wiring from Injector to ECU • Injector resistance	No	F-62
73	ON / OFF 	Injector (Rear secondary)		• Injector connector • Wiring from injector to ECU • Injector resistance	No	F-63
76	ON / OFF 	Slip Lock up off Signal (EC-AT CU)	Open or Short circuit	• EC-AT CU connector • Wiring from EC-AT CU to ECU	No	F-64
77	ON / OFF 	Torque reduced signal (EC-AT CU)		• EC-AT CU connector • Wiring from EC-AT CU to ECU	No	F-65

37U0F-039

Caution

- **If more than one failure is present, the code numbers will be indicated in numerical order, lowest number first.**
- **After repairing a failures, turn off the ignition switch and disconnect the negative battery cable for 20 seconds and depress the brake pedal to erase the service code(s) from the ECU memory.**

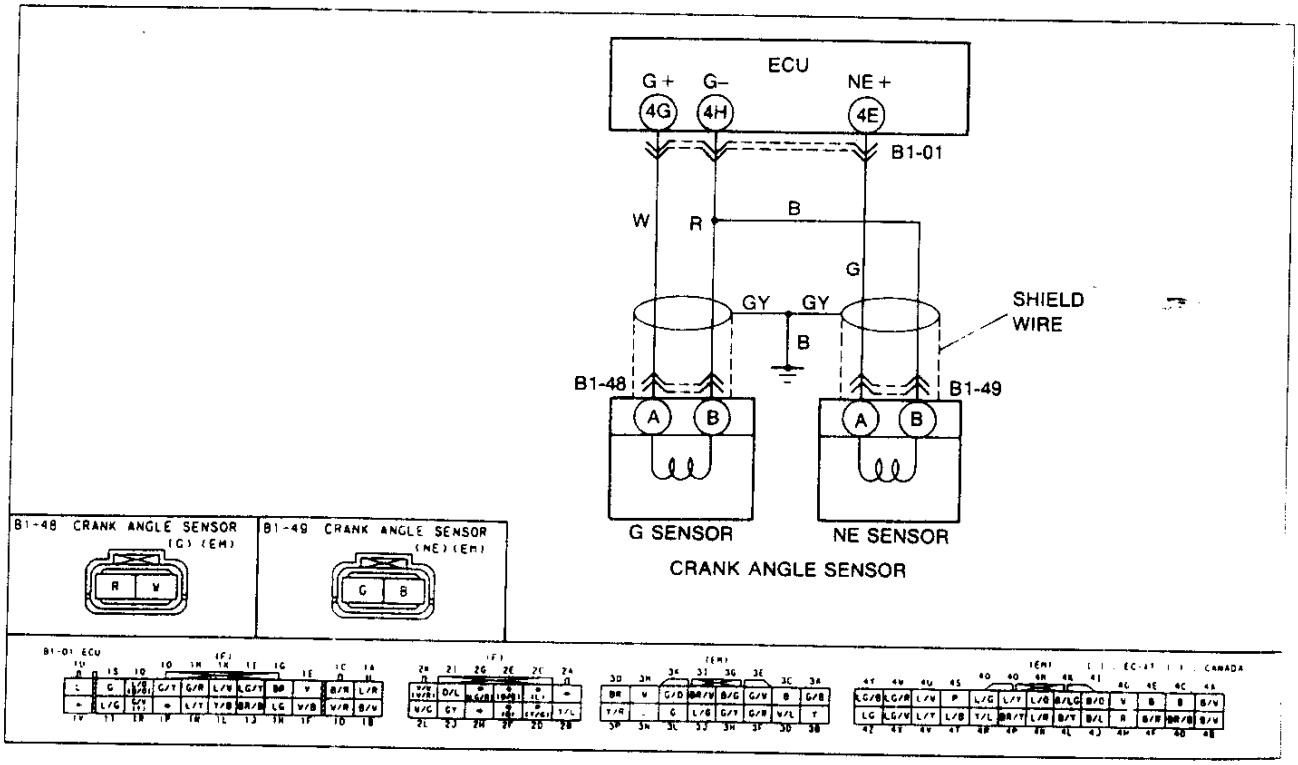
Troubleshooting

If a service code number is shown on the **SST,** check for the cause by referring to the related chart.

CODE No.	02 (CRANK ANGLE SENSOR [NE SENSOR])		
STEP	INSPECTION		ACTION
1	Is Code No.03 also present?	Yes	Go to next step
		No	Go to step 5
2	Does crank angle sensor circuit have poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
3	Is resistance of crank angle sensor [NE SENSOR] OK? **Resistance: 0.95–1.25 kΩ (20°F [68°F])**	Yes	Go to next step
		No	Replace crank angle sensor [NE SENSOR] **☞ page F–180**
4	Is clearance of crank angle sensor [NE signal] OK? **Clearance: 1.0–2.0 mm (0.039–0.078 in)**	Yes	Go to next step
		No	Adjust clearance **☞ page F–180**
5	Is there continuity between ground and 4E or ground and 4H terminal? (at harness side)	Yes	Check for short circuit in wiring (Crank angle sensor–4H or 4E terminal)
		No	Go to next step
6	Disconnect connector from ECU; is resistance between 4E (G) and 4H (R) terminals OK? **Resistance: 0.95–1.25 KΩ (20°C [68°F])**	Yes	Replace ECU **☞ page F–150**
		No	Check for open circuit in wiring (Crank angle sensor–4H or 4E terminal)

17U0FX-040

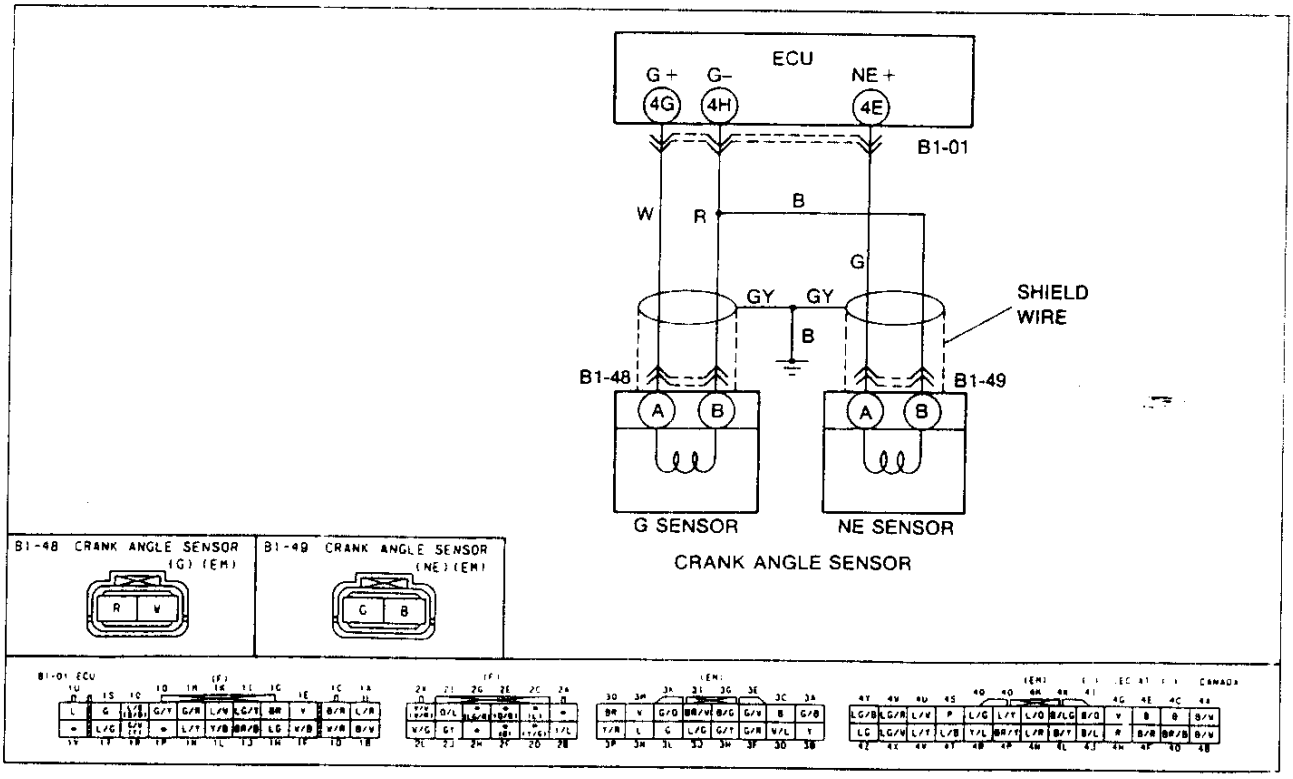
Circuit Diagram



CODE No.	03 (CRANK ANGLE SENSOR [G SENSOR])		
STEP	INSPECTION		ACTION
1	Is Code No.02 also present?	Yes	Go to next step
		No	Go to step 5
2	Does crank angle sensor circuit have poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
3	Is resistance of crank angle sensor [G SENSOR] OK? **Resistance: 0.95–1.25 KΩ (20°F [68°F])**	Yes	Go to next step
		No	Replace crank angle sensor [G SENSOR] ☞ **page F–180**
4	Is clearance of crank angle sensor [G signal] OK? **Clearance: 1.0–2.0 mm (0.039–0.0178 in)**	Yes	Go to step
		No	Adjust clearance ☞ **page F–180**
5	Is there continuity between ground and 4G or ground and 4H terminal? (at harness side)	Yes	Check for short circuit in wiring (Crank angle sensor–4H or 4G terminal)
		No	Go to next step
6	Disconnect connector from ECU; is resistance between 4G (W) and 4H (R) terminals OK? **Resistance: 0.95–1.25 KΩ (20°C [68°F])**	Yes	Replace ECU ☞ **page F–150**
		No	Check for open circuit in wiring (Crank angle sensor–4G or 4H terminal)

16E0F2-041

Circuit Diagram

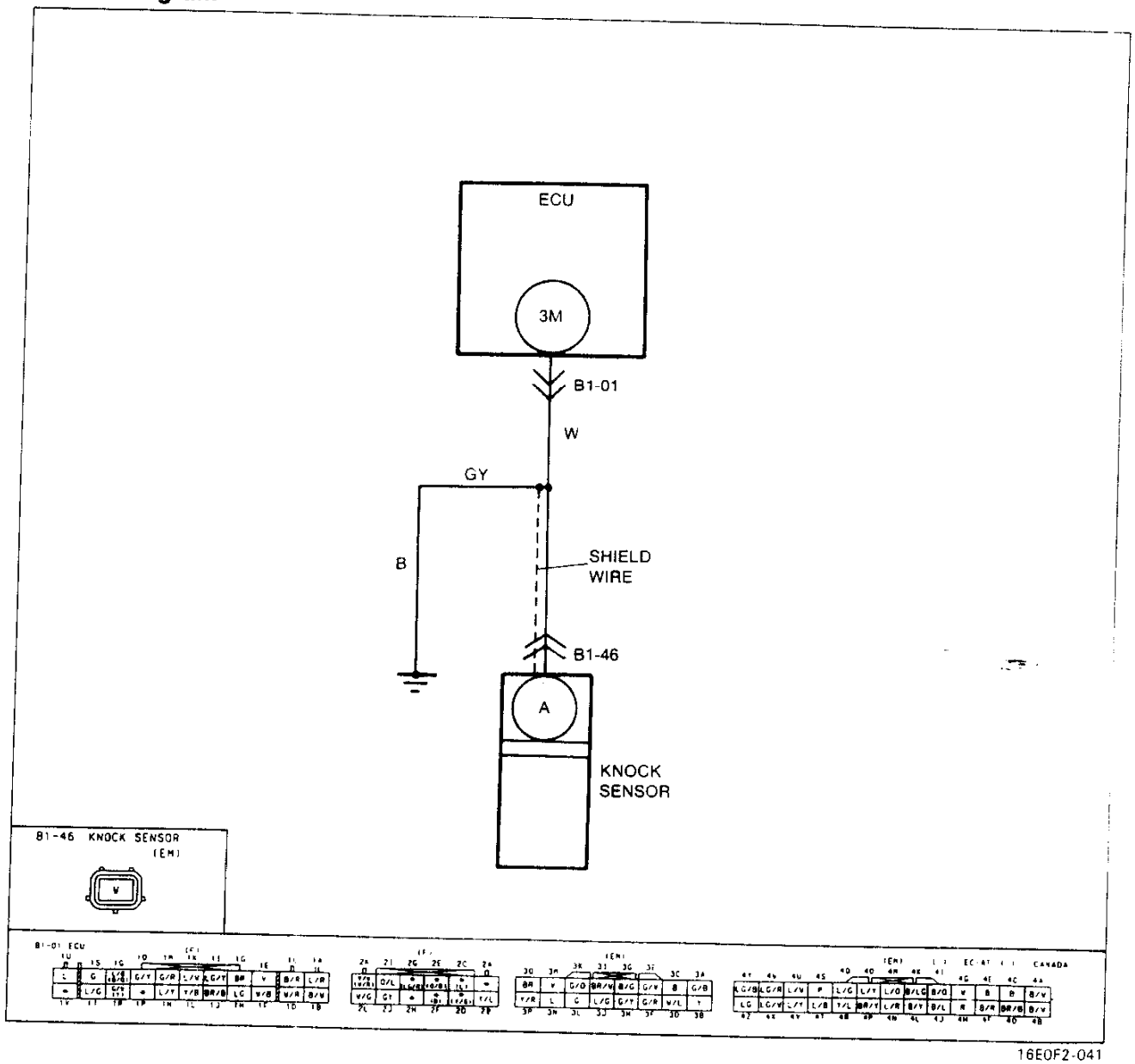


SELF-DIAGNOSIS FUNCTION

CODE No.	05 (KNOCK SENSOR)		
STEP	INSPECTION		ACTION
1	Does knock sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is there continuity between knock sensor and ECU terminal 3M (W)?	Yes	Check continuity between ECU terminal 3M (W) and ground ⇨ If continuity, repair or replace wiring ⇨ If no continuity, go to next step
		No	Repair wiring harness
3	Try known good knock sensor. Is same code No. present?	Yes	Replace ECU ☞ page F–180
		No	Replace knock sensor ☞ page F–185

Circuit Diagram

17U0FX-142

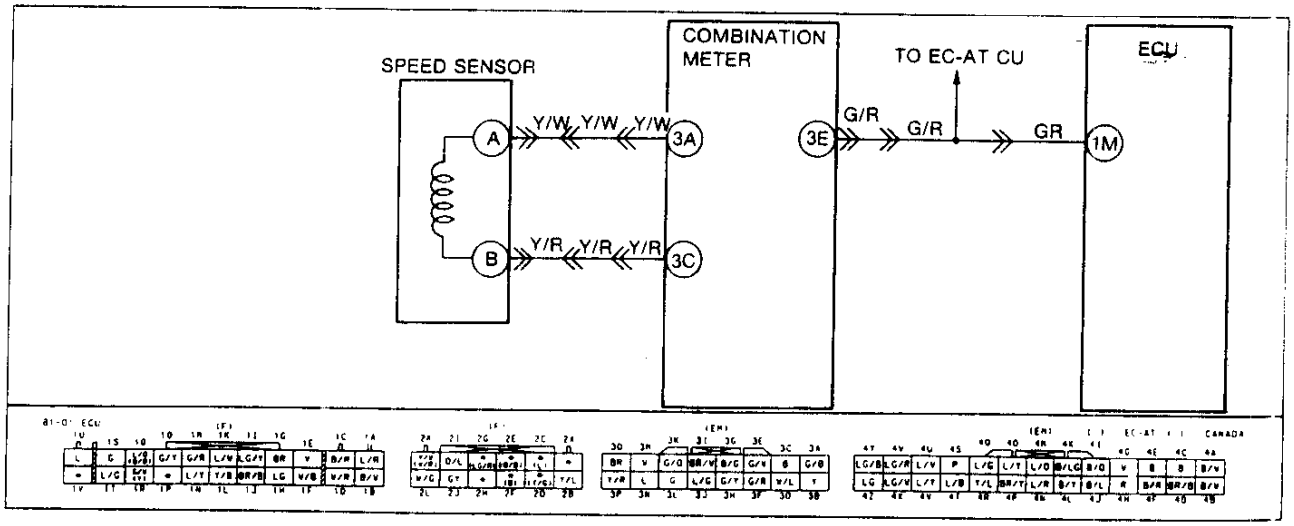


16E0F2-041

CODE No.	06 (SPEEDOMETER SENSOR)		
STEP	INSPECTION		ACTION
1	Is speedometer working correctry	Yes	Go to next step
		No	Go to step 5
2	Check for EC-AT CU service code. Is code No.07 also present?	Yes	Go to step 5
		No	Go to next step
3	Does speedometer sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
4	Is there speedometer sensor terminal 1M (G/R) voltage OK? Condition / Voltage: While driving 2–3V; Idle 4–5V	Yes	Check for open or short circuit wiring harness (Speedometer sensor terminal 3E (G/R)-ECU terminal 1M) ⇨ If OK go to step 8 ⇨ If not OK, repair wiring harness.
		No	Replace speedometer
5	Remove speed sensor Is resistance felt when turning speedometerdriven gear by hand?	Yes	Go to next step
		No	Replace speed sensor
6	Disconnect speed sensor connector and connect circuit tester Does pointer of circuit tester move slightly when driven gear is slowly turned?	Yes	Go to next step
		No	Replace speed sensor
7	Disconnect speed sensor connector Is continuity of sensor OK? **Resistance: Approx. 290 Ω (20°C [68°F]); (reference)**	Yes	Check wiring and connectors from speed sensor to speedometer ⇨ If OK, go to next step ⇨ If not OK, repair wiring and/or connector
		No	Replace speed sensor
8	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU ☞ page F–150
		No	Intermittent poor connection Check for cause

17U0FX-043

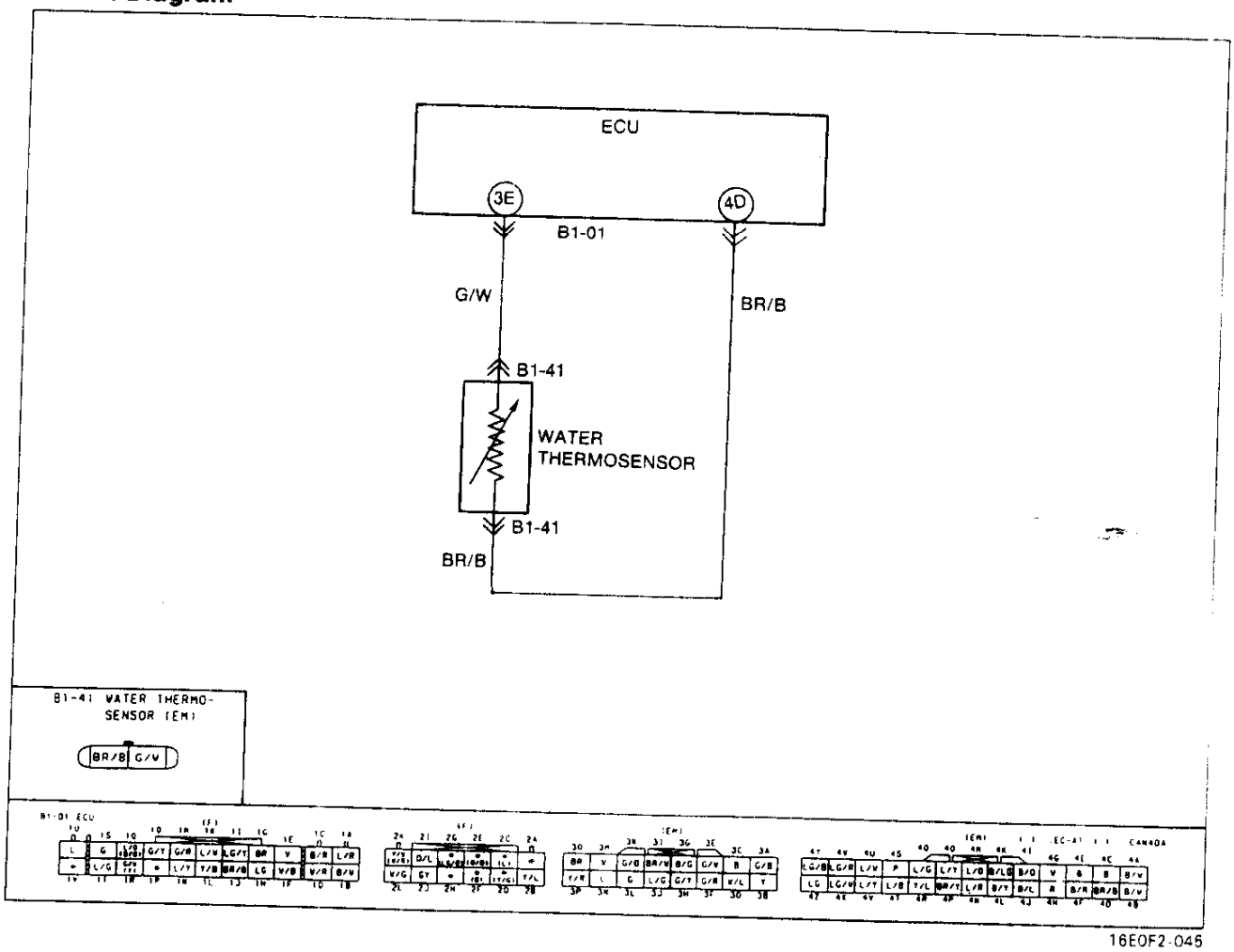
Circuit Diagram



CODE No.	09 (WATER THERMOSENSOR)		
STEP	INSPECTION		ACTION
1	Does the water thermosensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is water thermosensor terminal (G/W) Voltage OK with water thermosensor connector disconnected? Condition: Ignition switch ON — Voltage: Approx. 5.0V	Yes	Go to next step
		No	Check for short or open circuit in wiring harness (Water thermosensor terminal [G/W]–ECU terminal 3E) ⇨ If OK, replace ECU ⇨ If not OK, repair wiring harness
3	Is there continuity between water thermosensor terminal (BR/B) and a ground	Yes	Go to next step
		No	Repair wiring harness
4	Is resistance of water thermosensor OK? Coolant temp. –20°C {–4°F}: 14.6–17.8 kΩ 20°C {68°F}: 2.2–2.7 80°C {176°F}: 0.29–0.35	Yes	Replace ECU ☞ page F–150
		No	Replace water thermosensor ☞ page F–183

17U0FX-044

Circuit Diagram

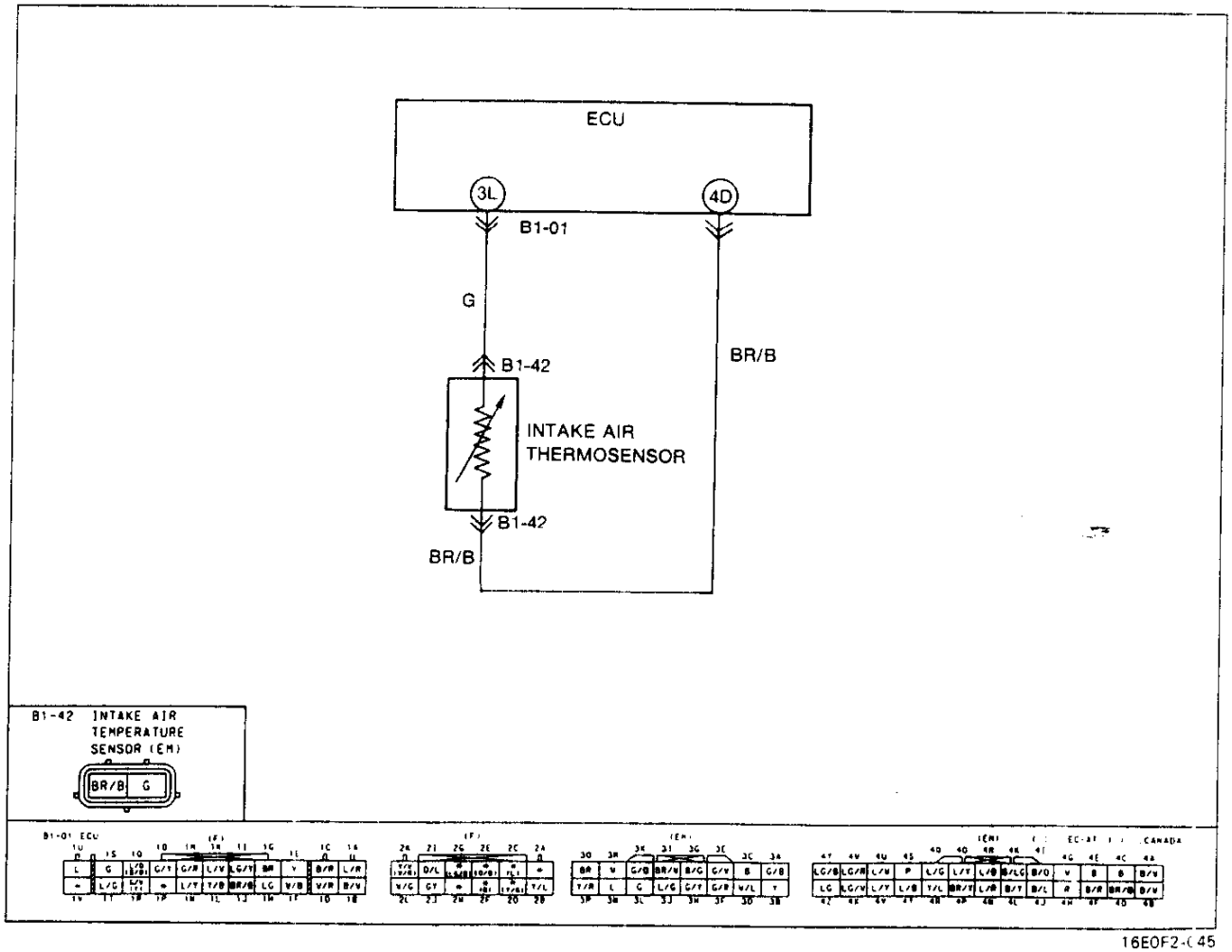


16E0F2-045

CODE No.	11(INTAKE AIR THERMOSENSOR)		
STEP	INSPECTION		ACTION
1	Does the water thermosensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is Intake air thermosensor terminal (G) voltage OK with Intake air thermosensor connector disconnected? Condition: Ignition switch ON — Voltage: Approx. 5.0V	Yes	Go to next step
		No	Check for short or open circuit in wiring harness (intake air thermosensor terminal [G]-ECU terminal 3L) ⇨ If OK, replace ECU ⇨ If not OK, repair wiring harness
3	Is there continuity between intake air thermosensor terminal (BR/B) and a ground	Yes	Go to next step
		No	Repair wiring harness
4	Is resistance of intake air thermosensor OK? Temperature: 20°C {68°F} — Resistance {kΩ}: 2.2–2.7 Temperature: 85°C {185°F} — Resistance {kΩ}: 0.29–0.35	Yes	Replace ECU ☞ page F–150
		No	Replace intake air thermosensor ☞ page F–183

17U0F-045

Circuit Diagram

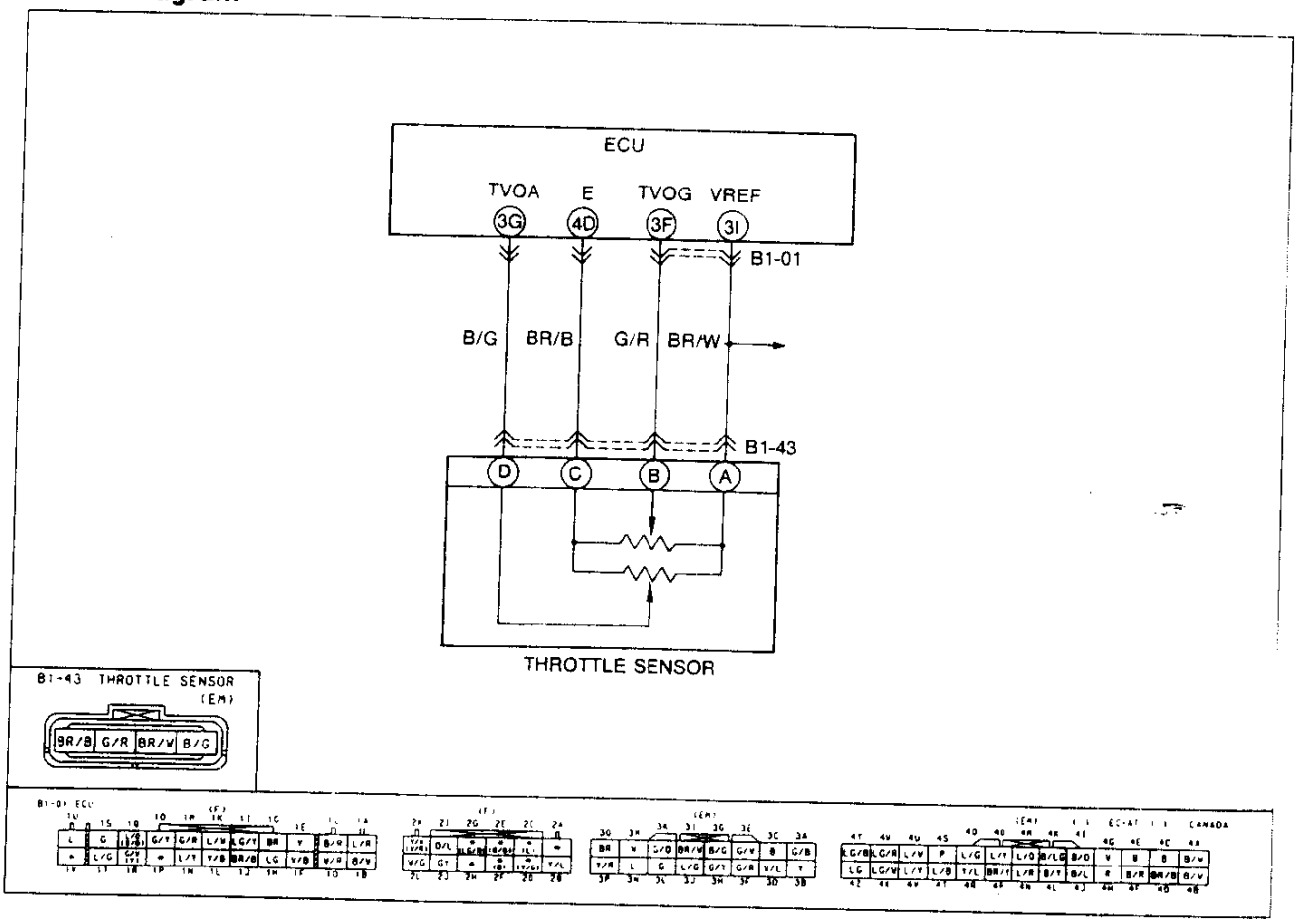


16E0F2-045

CODE No.	12 (THROTTLE SENSOR [FULL RANGE])		
STEP	INSPECTION		ACTION
1	Does throttle sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is throttle sensor terminal (BR/W) voltage OK with throttle sensor disconnected? Condition: Ignition switch ON — Voltage: Approx. 5.0V	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Throttle sensor terminal [BR/W]-ECU terminal 3I) ⇨ If OK, replace ECU ⇨ If not OK, repair wiring harness
3	Is there continuity between throttle sensor and ECU? Throttle sensor (B/G) — ECU 3G (B/G) Throttle sensor (BR/B) — ECU 4D (BR/B)	Yes	Check for short circuit in wiring harness (Throttle sensor terminal (B/G)-ECU terminal 3G) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is there continuity between terminals (BR/W) and (B/G) with throttle valve fully closed to fully opened OK?	Yes	Replace ECU ☞ page F–150
		No	Replace throttle sensor ☞ page F–182

17U0FX-046

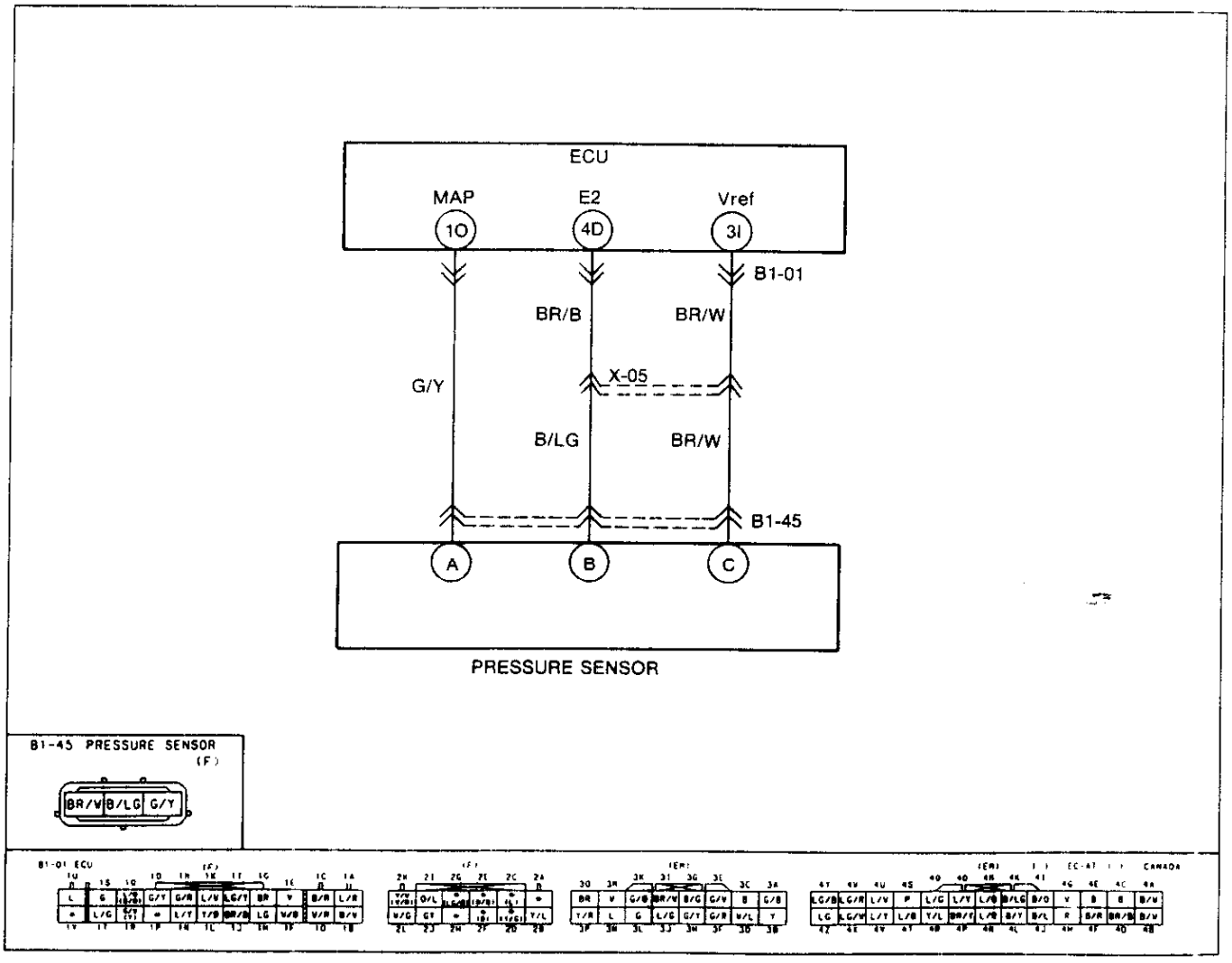
Circuit Diagram



CODE No.	13 (PRESSURE SENSOR)		
STEP	INSPECTION		ACTION
1	Does pressure sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (BR/W) voltage OK with pressure sensor connector disconnected? Condition: Ignition switch ON — Voltage: Approx. 5V	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (pressure sensor terminal [BR/W] ECU relay terminal [BR/W])
3	Is there continuity between pressure sensor terminal (BR/B) and ECU terminal 4D	Yes	Go to next step
		No	Repair wiring harness
4	Is output voltage (G/Y) of pressure sensor OK? Pressure or Vaccum — Voltage – 66 kPa {– 500 mmHg, 19.7 inHg} — 1.3–1.6V 0 kPa {0 mmHg, 0 inHg} — 2.3–2.8V 98.7 kPa {740 mmHg, 29.1 inHg} — 4.3–4.6V	Yes	Replace ECU ☞ page F–150
		No	Replace pressure sensor ☞ page F–181

17U0F1-047

Circuit Diagram



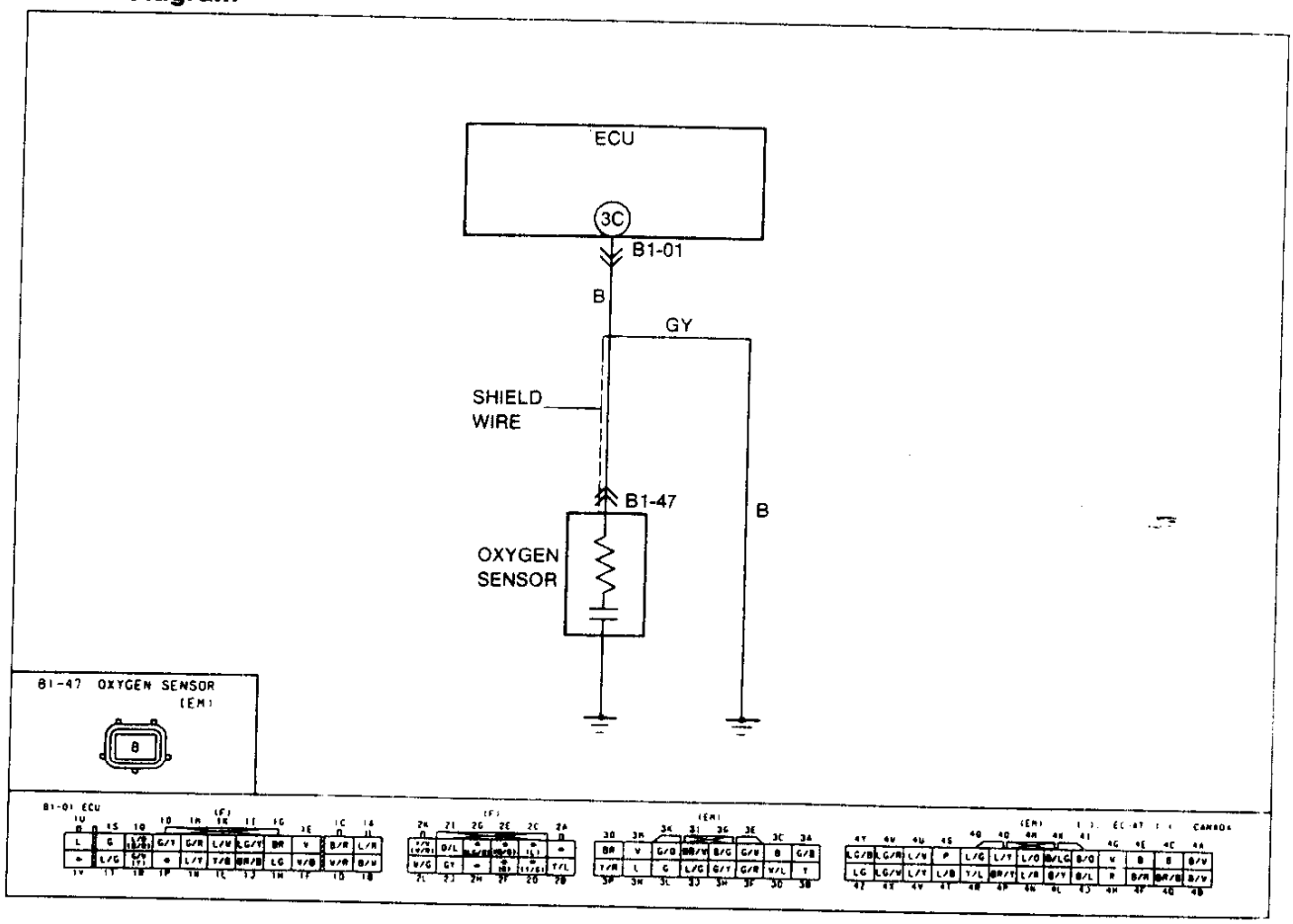
CODE No.	14 (ATMOSPHERIC PRESSURE SENSOR-IN ECU)
STEP	ACTION
1	Replace ECU ☞ page F-150

16EDI2-050

CODE No.	15 (OXYGEN SENSOR-INACTIVATION)		
Note ● If Code No.15 and 17 are both present, first perform the checking procedure for Code No.17.			
STEP	INSPECTION		ACTION
1	Does oxygen sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is oxygen sensor output voltage OK?	Yes	Go to next step
		No	Replace oxygen sensor ☞ page F-113
3	Is there continuity between oxygen sensor and ECU terminal 3C (B)?	Yes	Check for short circuit in wiring ☞ page F-150 ⇨ If OK, replace ECU ⇨ If not OK, repair wire harness
		No	Repair wiring harness

17U0FX 048

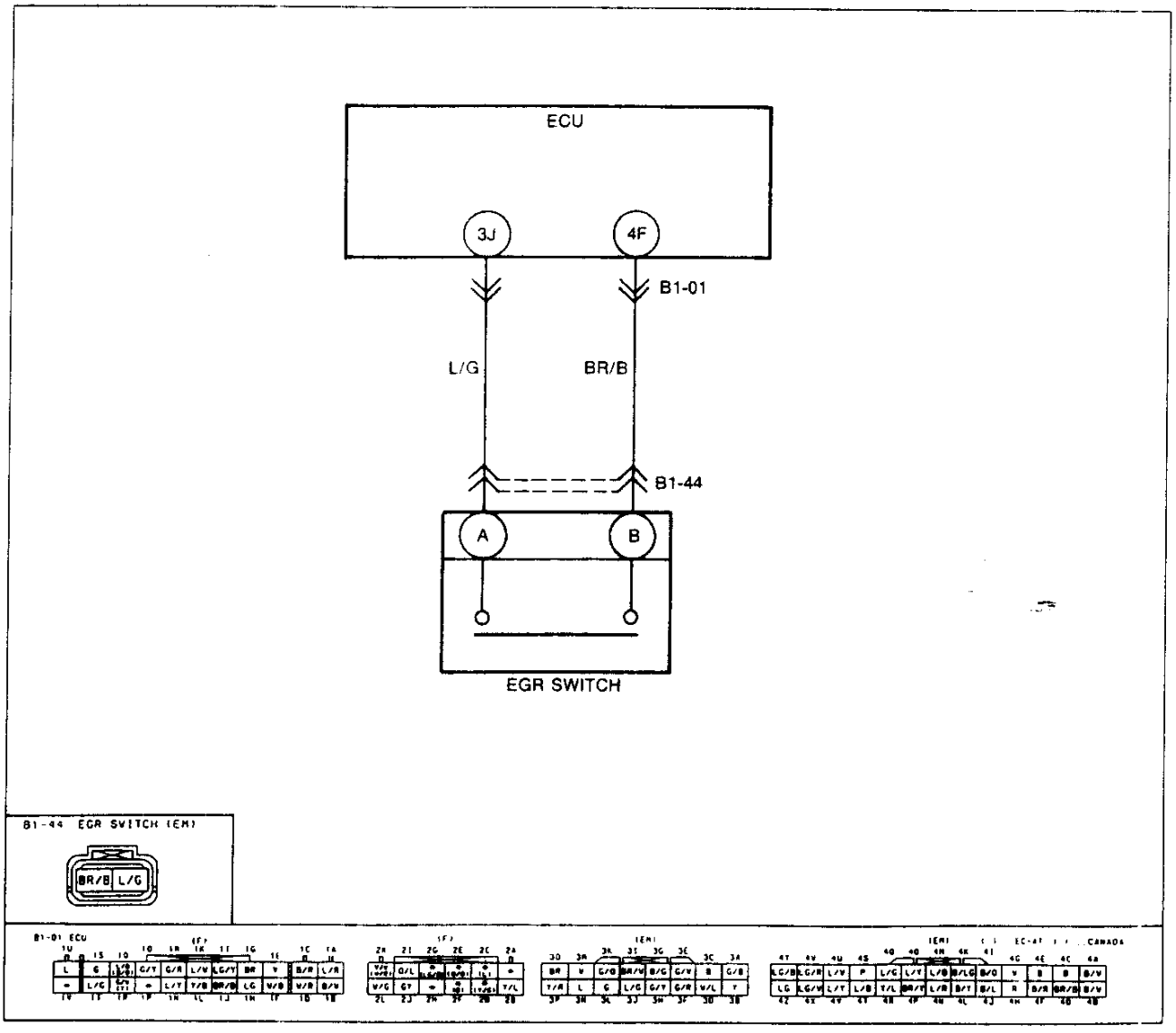
Circuit Diagram



CODE No.	16 (EGR SWITCH) — CALIFORNIA ONLY		
STEP	INSPECTION		ACTION
1	Does EGR switch circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (L/G) voltage OK with EGR switch connector disconnected.	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (EGR switch terminal [LG]-ECU terminal 3J)
3	Is there continuity between EGR switch terminal (BR/B) and ECU terminal 4F?	Yes	Go to next step
		No	Repair wiring harness
4	Is EGR switch OK? ☞ page F–127	Yes	Replace ECU ☞ page F–150
		No	Replace EGR valve

17U0F1-049

Circuit Diagram



SELF-DIAGNOSIS FUNCTION

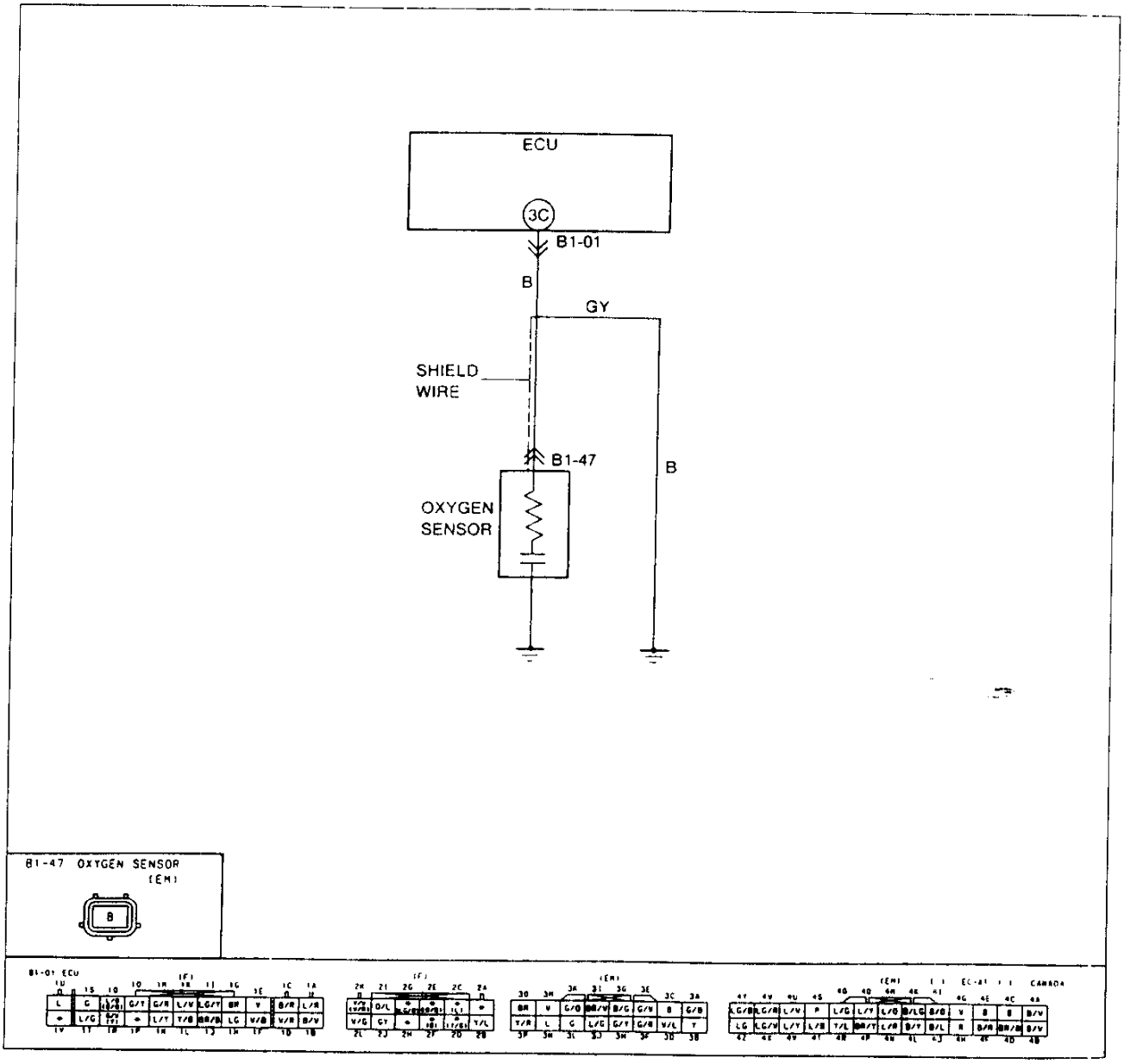
CODE No.	17 (FEEDBACK SYSTEM)		
STEP	INSPECTION		ACTION
1	Is the same Code No. present following afterrepair procedure? ☞ page F–66	Yes	Go to next step
		No	Check oxygen sensor circuit for a poor connection ⇨ If OK, perform troubleshooting Code No.15
2	Does monitor lamp of Self-Diagnosis Checker illuminate at idle after the engine has been warmed up and run at **2500–3000 rpm** for **3 min**?	Yes	Go to next step **Note** • **A/F mixture rich**
		No	Go to Step 5 **Note** • **A/F mixture is lean or misfire is occurring**
3	Is fuel line pressure correct at idle? ☞ page F–104 **Fuel line pressure:** **190–220 kPa {1.9–2.3 kgf/cm², 28–32 psi}**	Yes	Go to next step
		No	**High pressure** Check if fuel return hose is clogged or restricted ☞ page F–104 ⇨ If OK, replace pressure regulator
4	Is there fuel leakage at injector? ☞ page F–107	Yes	Replace injector ☞ page F–105
		No	Check water termosensor? ☞ page F–183 ⇨ If it is OK, replace oxygen sensor ⇨ If it is not OK, replace it
5	Disconnect each high tension lead at idle; does engine speed decrease equally at each rotor?	Yes	Go to next step
		No	Go to Step 8
6	Is fuel line pressure correct at idle? ☞ page F–97 **Fuel line pressure:** **190–220 kPa {1.9–2.3 kgf/cm², 28–32 psi}**	Yes	Go to next step
		No	**Low pressure** Check fuel line pressure while pinching fuel return hose ⇨ If it **quickly** increases, check pressure regulator ☞ page F–104 ⇨ If it **gradually** increases, check for clogging between fuel pump and pressure regulator ⇨ If hose is not clogged, check fuel pump maximum pressure ☞ page F–101
7	Is there air leakage in intake air system components?	Yes	Replace oxygen sensor
		No	Repair ☞ page F–76
8	Is there a misfire of a dead rotor from Step 5 inspection?	Yes	Repair or replace ignition system component(s)
		No	Go to next step

V_B: Battery voltage

STEP	INSPECTION		ACTION
9	Is there an injector operating sound at idle of dead rotor from Step 5 inspection?	Yes	Go to next step
		No	Check for approx. V_B at injector terminal wire ⇨ If there is, replace injector ☞ page F-105 ⇨ If there is not, check for a short or open circuit in wire harness
10	Replace injector at dead rotor from Step 5 inspection ☞ page F-105 Is the same Code No. present following afterrepair procedure?	Yes	Try known good ECU
		No	System OK

17U0F-050

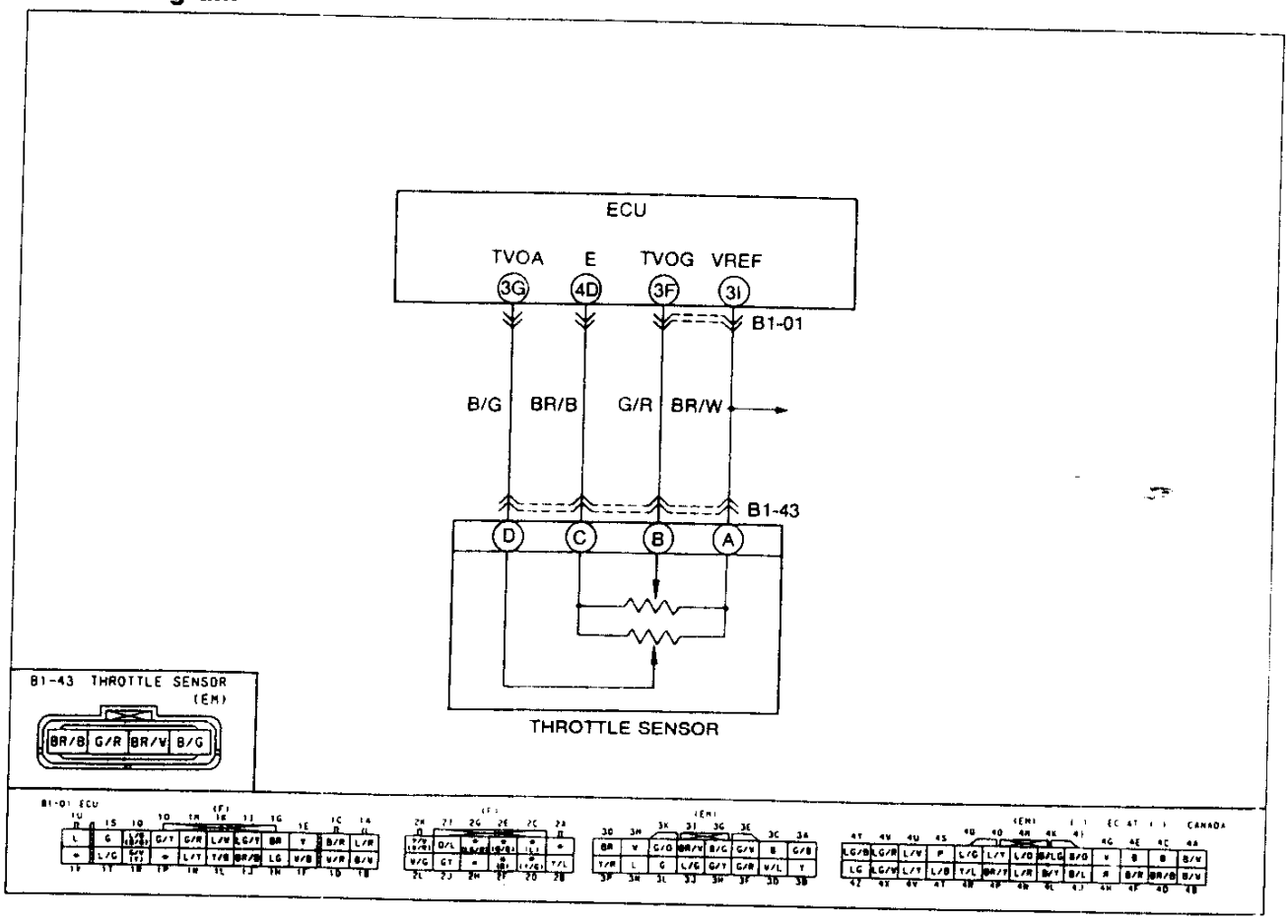
Circuit Diagram



CODE No.	18 (THROTTLE SENSOR [NARROW RANGE])		
STEP	INSPECTION		ACTION
1	Does throttle sensor circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is throttle sensor terminal (BR/W) voltage OK with throttle sensor disconnected? Condition: Ignition switch ON — Voltage: Approx. 5.0V	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Throttle sensor terminal [BR/W]-ECU terminal 3I) ⇨ If OK, replace ECU ⇨ If not OK, repair wiring harness
3	Is there continuity between throttle sensor and ECU? Throttle sensor (G/R) — ECU 3F (G/R) Throttle sensor (BR/B) — ECU 4D (BR/B)	Yes	Check for short circuit in wiring harnes (Throttle sensor terminal (G/R)-ECU terminal 3F) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is there continuity between terminals (BR/W) and (G/R) with throttle valve closed to fully opened OK?	Yes	Replace ECU ☞ page F-150
		No	Replace throttle sensor ☞ page F-182

17U0FX 051

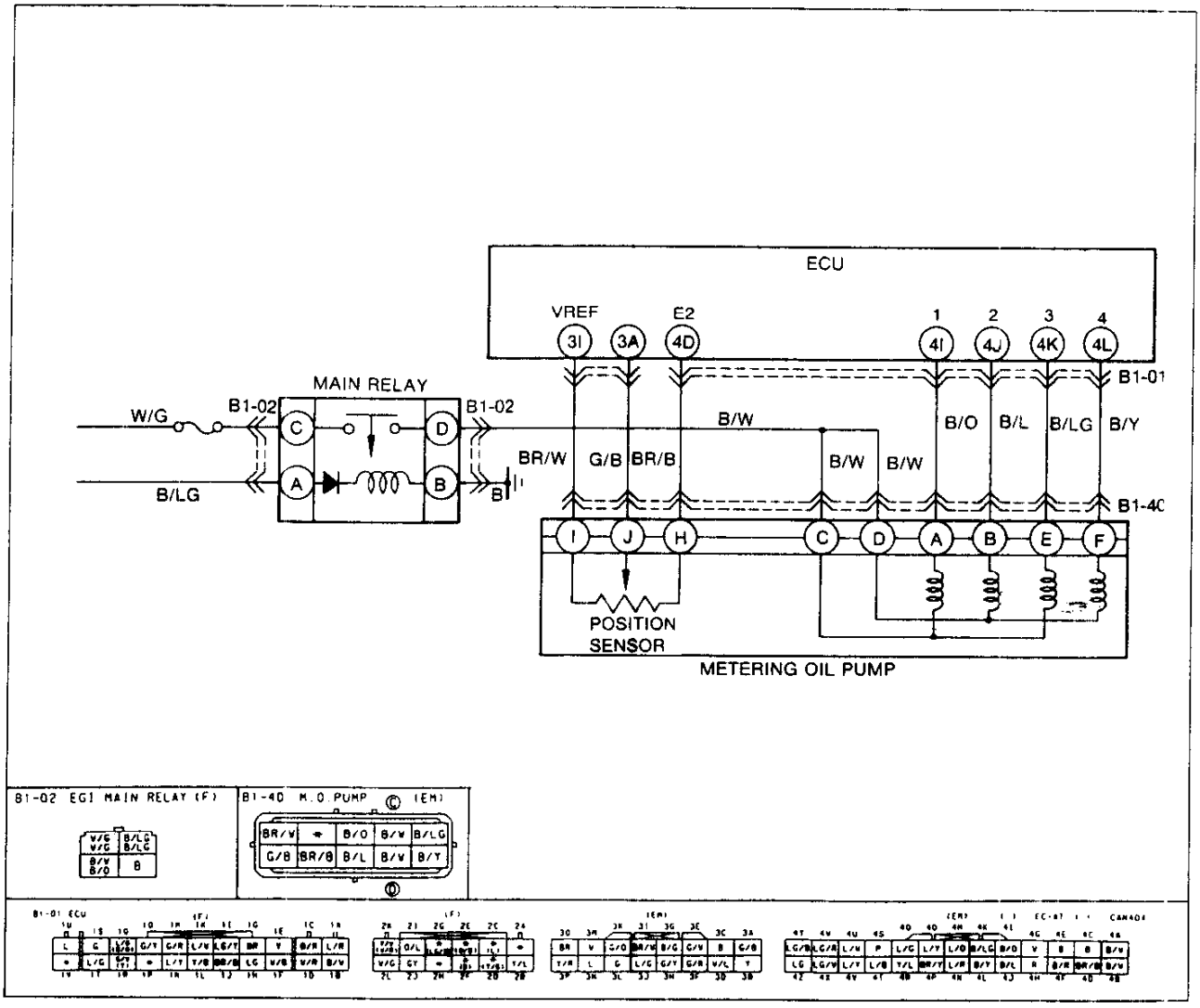
Circuit Diagram



CODE No.	20 (METERING OIL PUMP POSITION SENSOR)		
STEP	INSPECTION		ACTION
1	Are there any poor conections at metering oil pump and ECU connectors?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECU terminal 3A (G/B) voltage OK? Condition: Idle — Voltage: 1.1V Condition: Acceleration — Voltage: 1.1V–4.2V	Yes	Go to step 4
		No	Go to next step
3	Is resistance of MOP position sensor OK? Resistance: J–H 0.4–12 kΩ J–I 1.0–2 kΩ H–I 0.4–12 kΩ	Yes	Repair wiring harness (Mop position sensor-ECU terminal 3A)
		No	Replace MOP
4	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for sarvice code Is service code displayed?	Yes	Replace ECU
		No	Intermittent poor connection check for cause.

Circuit Diagram

17U0F)-052

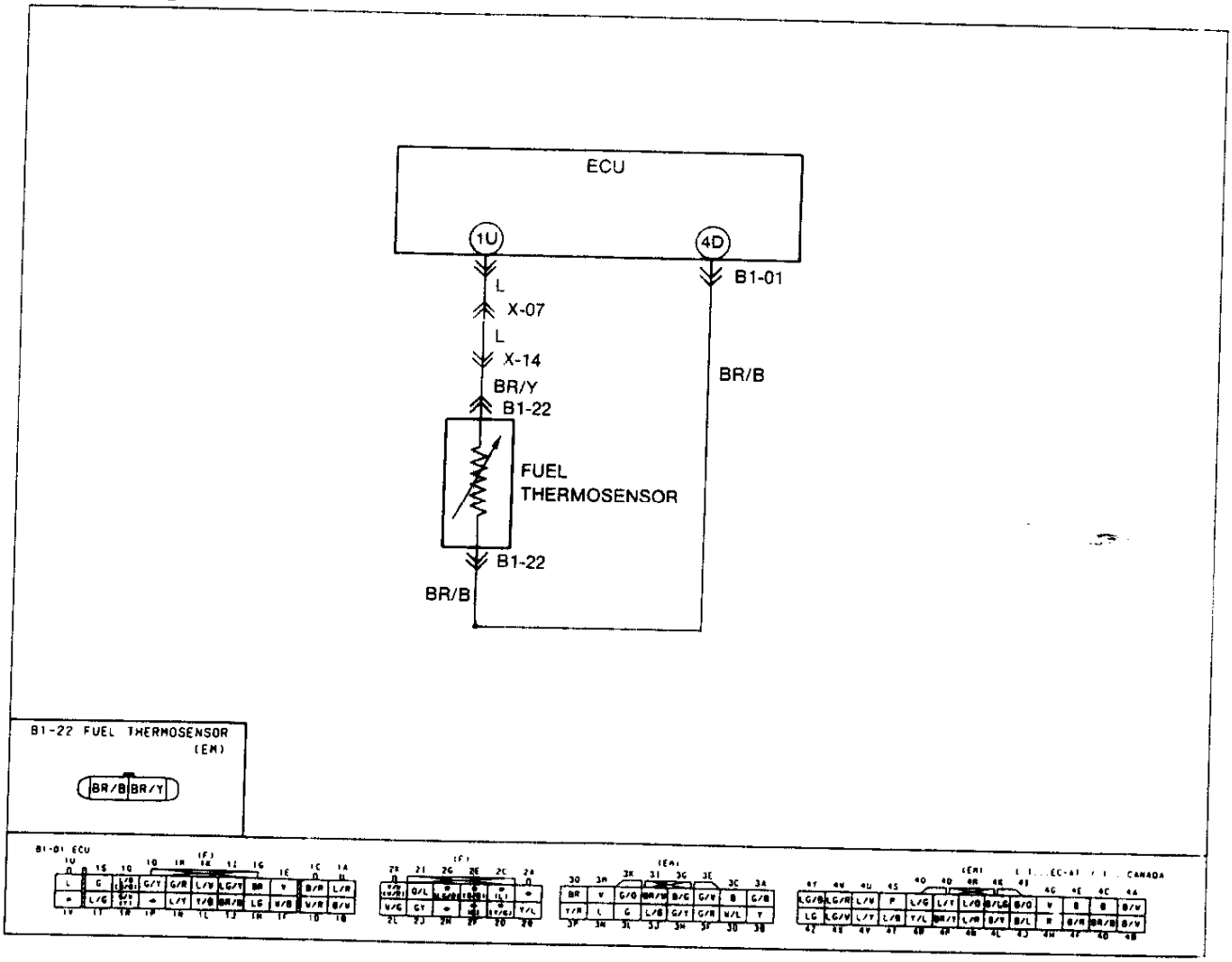


SELF-DIAGNOSIS FUNCTION

CODE No.	23 (FUEL THERMOSENSOR)		
STEP	INSPECTION		ACTION
1	Does the fuel thermosensor circuit have a poor connection?	Yes	Repair connector and/or harness
		No	Go to next step
2	Is fuel thermosensor terminal (BR/B) voltage OK with fuel thermosensor connector disconnected? Condition: Ignition switch ON — Voltage: Approx. 5.0 V	Yes	Go to next step
		No	Check for short or open circuit in wiring harness (fuel thermosensor terminal [BR/B]-ECU terminal 1U) ⇨ If OK, replace ECU ⇨ If not OK, repair wiring harness
3	Is there continuity between fuel thermosensor terminal (BR/Y) and a ground?	Yes	Go to next step
		No	Repair wiring harness
4	Is resistance of fuel thermosensor OK? Fuel temp: −20°C {−4°F} — Resistance {kΩ}: 14.6–17.8 20°C {68°F}: 2.2–2.7 80°C {176°F}: 0.29–0.35	Yes	Replace ECU ☞ page F–151
		No	Replace fuel thermosensor ☞ page F–184

17U0FX 053

Circuit Diagram

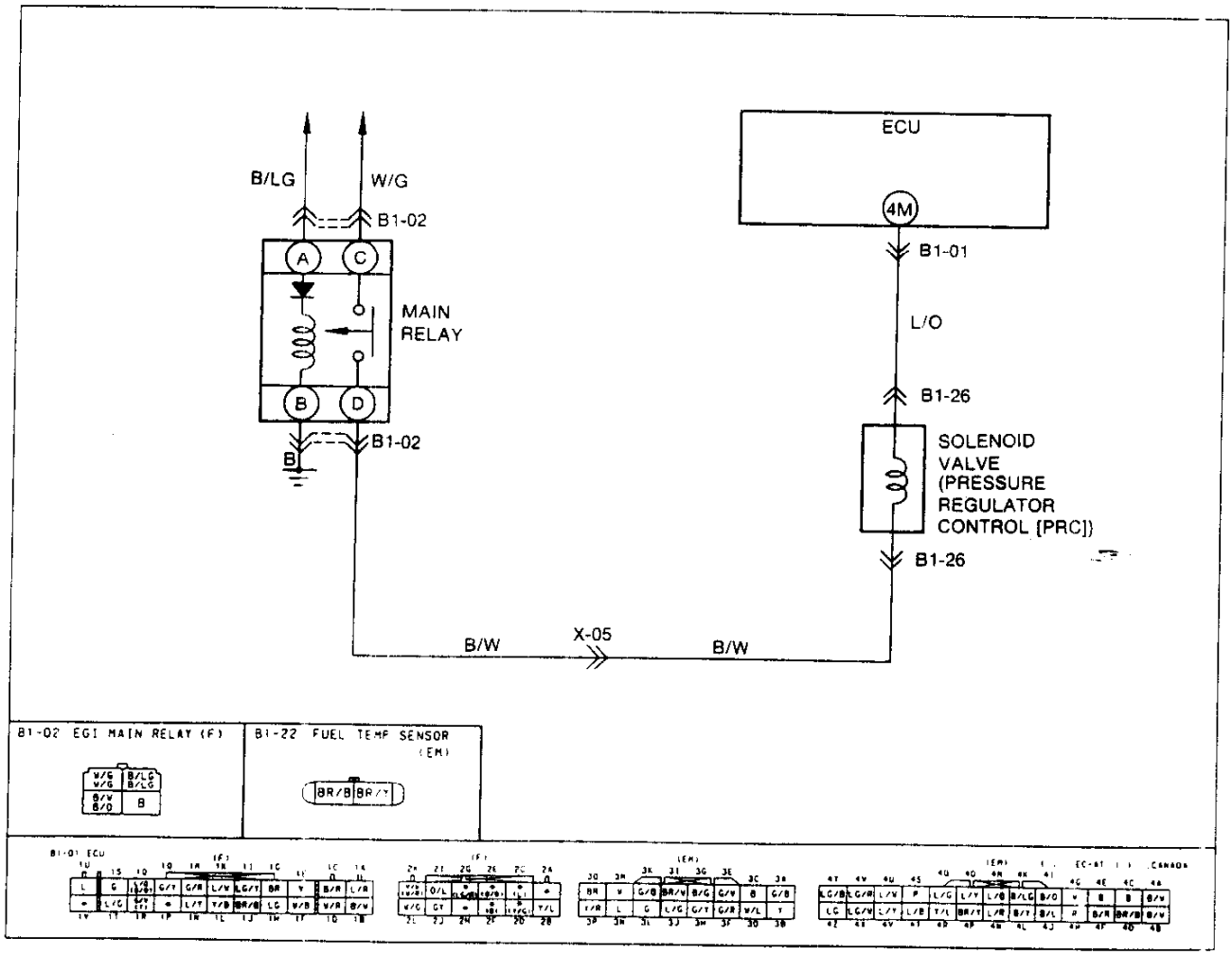


16E0F2-075

CODE No.	25 (SOLENOID VALVE–PRESSURE REGULATOR CONTROL [PRC])		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/O) and ECU terminal 4M?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/O]-ECU terminal 4M) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F-190	Yes	Replace ECU ☞ page F-150
		No	Replace solenoid valve

17U0FX 054

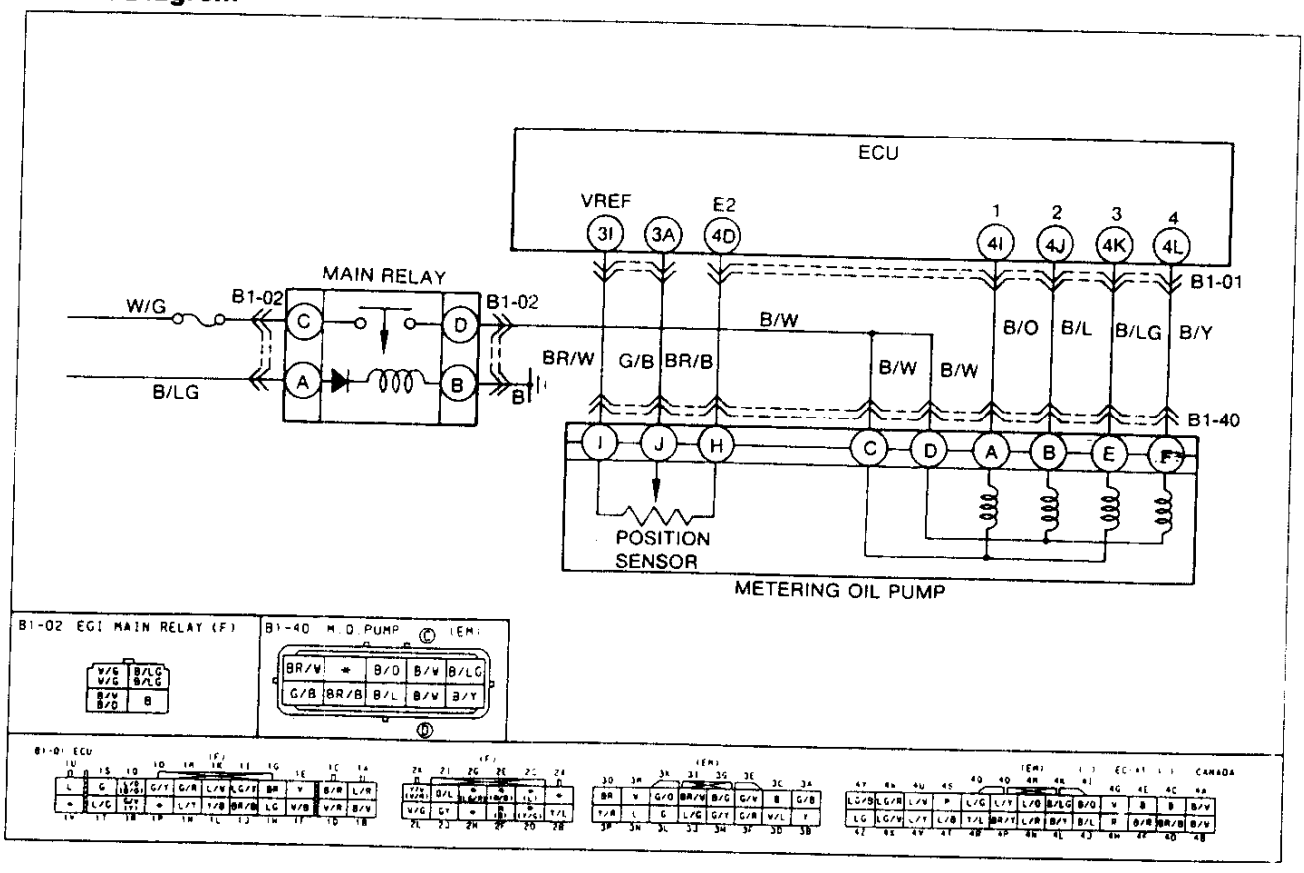
Circuit Diagrem



CODE No.	26 (METERING OIL PUMP STEPPING MOTOR)		
STEP	INSPECTION		ACTION
1	Are there any poor conections at metering oil pump and ECU connector?	Yes	Repair or replace connector
		No	Go to next step
2	Is resistance of MOP stepping motor OK? Resistance: terminal — kΩ C – SM1 A C – SM3 E D – SM2 B D – SM4 F 16–31	Yes	Go to next step
		No	Replace MOP
3	Is continuity between MOP stepping motor and ECU terminals OK? MOP terminal — ECU termina SM1 A — 4I (B/O) SM2 B — 4J (B/L) SM3 E — 4K (B/LG) SM4 F — 4L (B/Y)	Yes	Repair wiring harness (MOP-Main relay)
		No	Repair wiring harness (MOP-ECU terminals)
4	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU
		No	Intermittent poor connection check for cause

17U0FX 055

Circuit Diagrem



CODE No. 27 (METERING OIL PUMP)

STEP	INSPECTION		ACTION
1	Are there any poor conections at metering oil pump and ECU connector?	Yes	Repair or replace connector
		No	Go to next step
2	Is ECU terminal 3A voltage OK? Condition: Idle — Voltage: 1.1V Condition: Acceleration — Voltage: 1.0V–4.2V	Yes	Go to step 4
		No	Go to next step
3	Is resistance of MOP position sensor OK? Resistance: J–H 0.4–12 kΩ J–I 10–2 kΩ H–I 0.4–12 kΩ	Yes	Go to next step
		No	Replace MOP
4	Is ECU terminals voltage OK? Specification: (Idle) SM1 A — 4I (B/O) — One terminal: V_B SM2 B — 4J (B/L) — V_B SM3 E — 4K (B/LG) — Three terminals: 5–9 V SM4 F — 4L (B/Y) — 5–9 V	Yes	Go to step 7
		No	Go to next step
5	Is resistance of MOP stepping motor OK? Resistance: C – SM1 A: 16–31 kΩ C – SM3 E: 16–31 kΩ D – SM2 B: 16–31 kΩ D – SM4 F: 16–31 kΩ	Yes	Go to next step
		No	Replace MOP
6	Is continuity between MOP stepping motor and ECU terminals OK? SM1 A — 4I (B/O) SM2 B — 4J (B/L) SM3 E — 4K (B/LG) SM4 F — 4L (B/Y)	Yes	Repair wiring harness (MOP-Main relay)
		No	Repair wiring harness (MOP-ECU terminals)
7	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU
		No	Intermittent poor connection check for cause

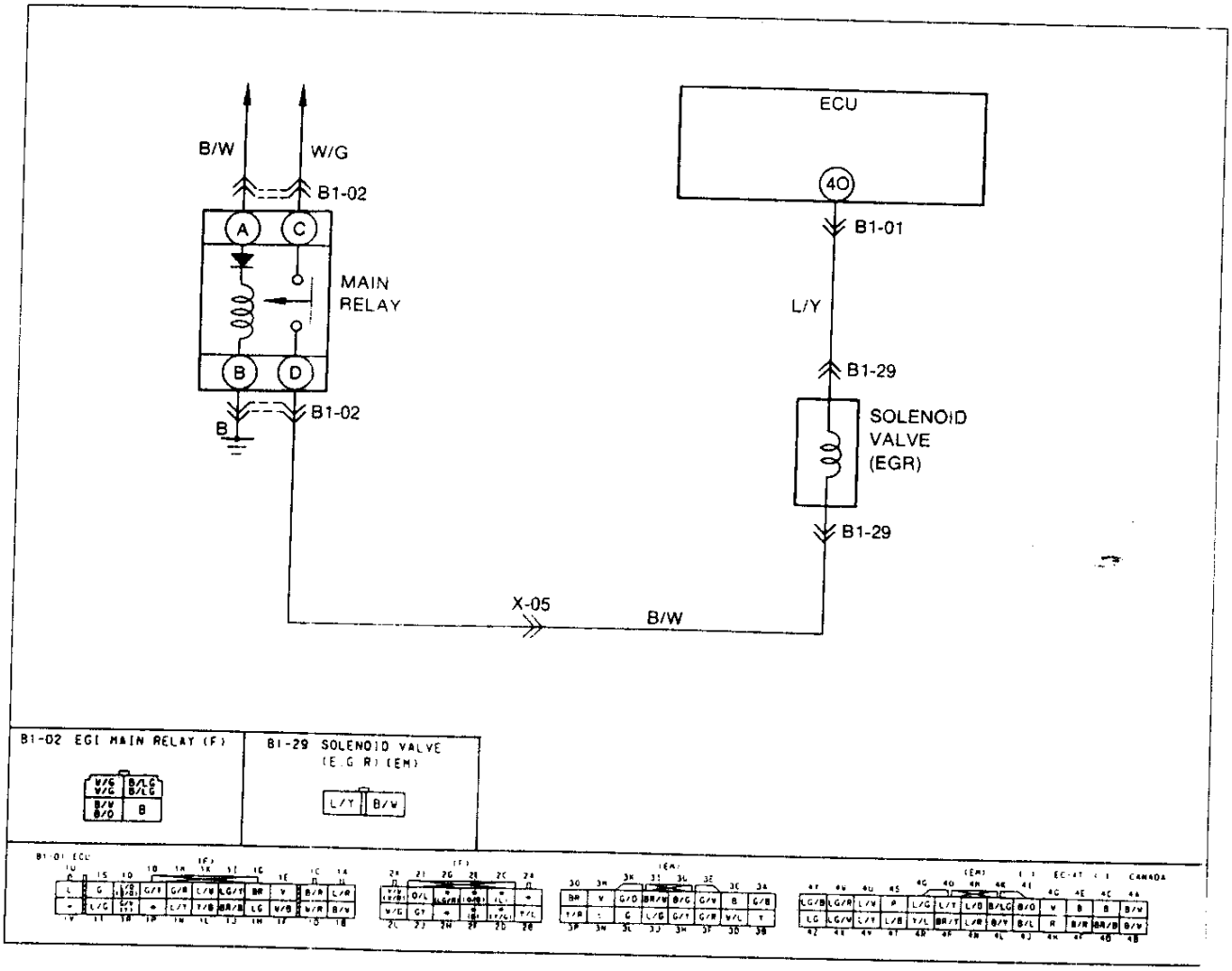
17U0FX-156

Circuit Diagrem
(Refer to page F–42)

CODE No.	28 (SOLENOID VALVE–EGR)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/Y) and ECU terminal 4O?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/Y]–ECU terminal 4O) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–190	Yes	Replace ECU ☞ page F–15(
		No	Replace solenoid valve

17U0FX 057

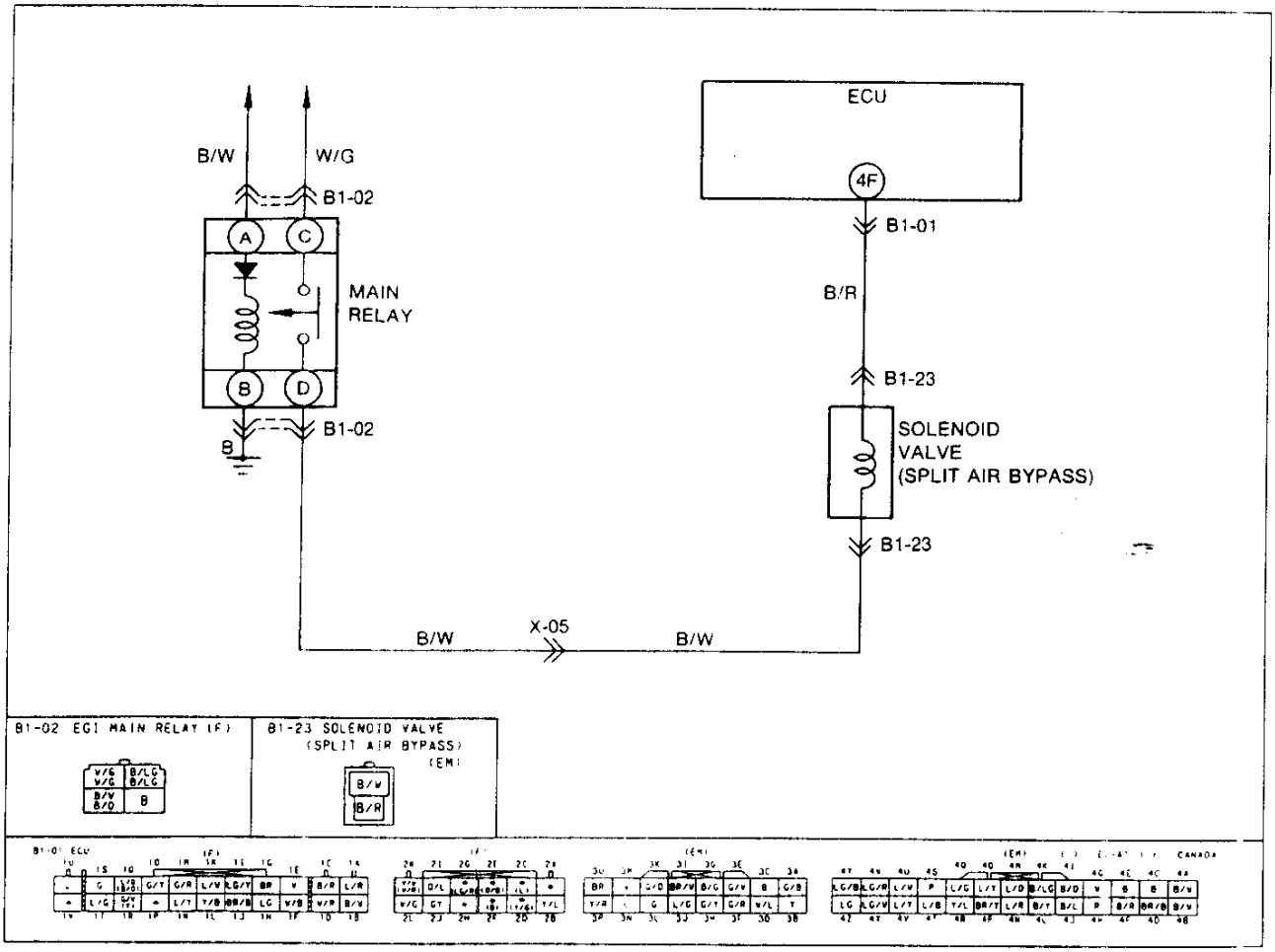
Circuit Diagrem



CODE No.	30 (SOLENOID VALVE–SPLIT AIR BYPASS)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (B/R) and ECU terminal 4F?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [B/R]–ECU terminal 4F) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–120	Yes	Replace ECU ☞ page F–15(
		No	Replace solenoid valve

17U0F)-058

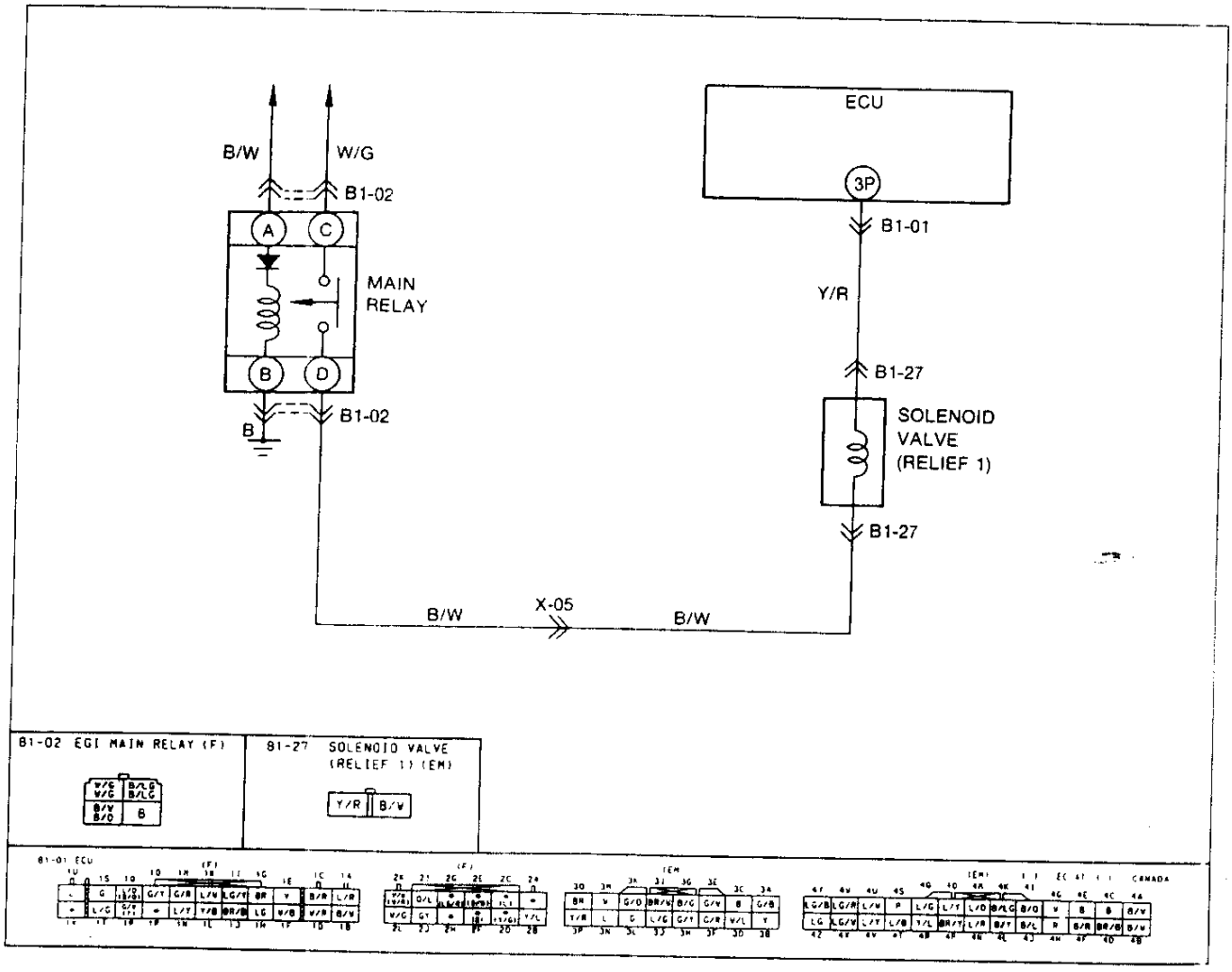
Circuit Diagrem



CODE No.	31 (SOLENOID VALVE–RELIEF 1)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (Y/R) and ECU terminal 3P?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [Y/R]–ECU terminal 3P) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F-123	Yes	Replace ECU ☞ page F-15(
		No	Replace solenoid valve

17U0FX 059

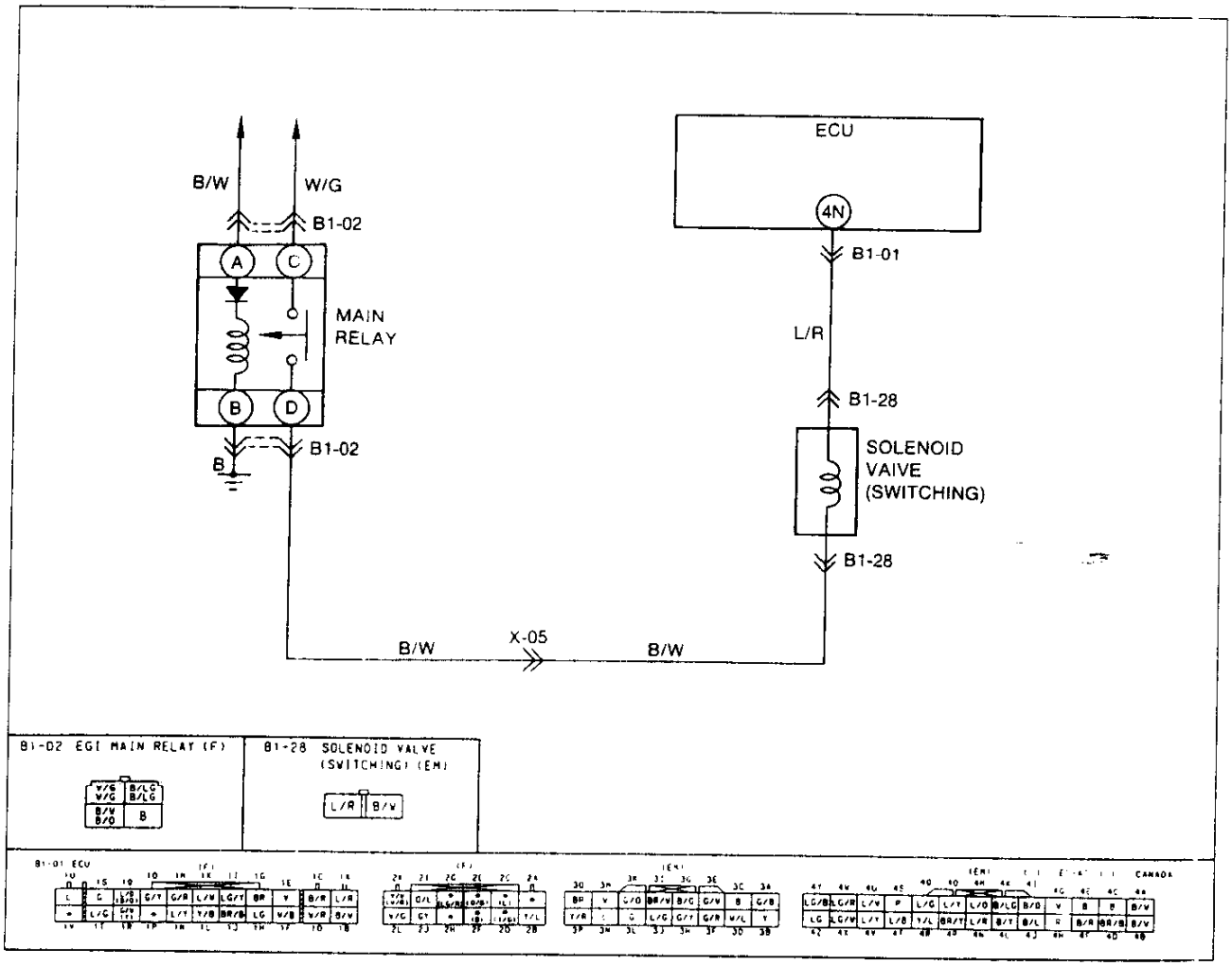
Circuit Diagrem



CODE No.	32 (SOLENOID VALVE–SWITCHING)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/R) and ECU terminal 4N?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/R]–ECU terminal 4N) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–190	Yes	Replace ECU ☞ page F–153
		No	Replace solenoid valve

17U0F0-060

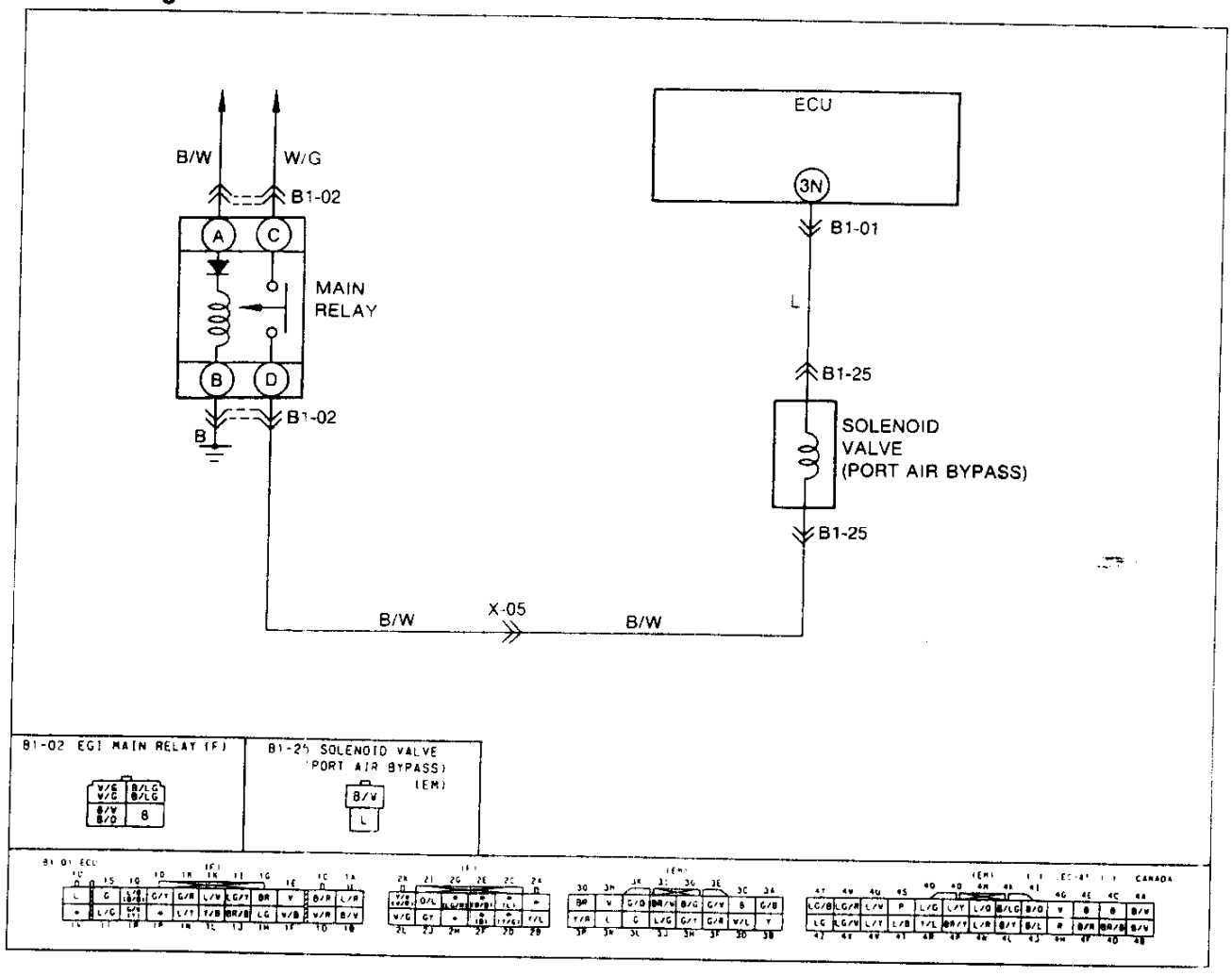
Circuit Diagrem



CODE No.	33 (SOLENOID VALVE–PORT AIR BYPASS)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L) and ECU terminal 3N?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L]–ECU terminal 3N) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–119	Yes	Replace ECU ☞ page F–150
		No	Replace solenoid valve

17U0FX 061

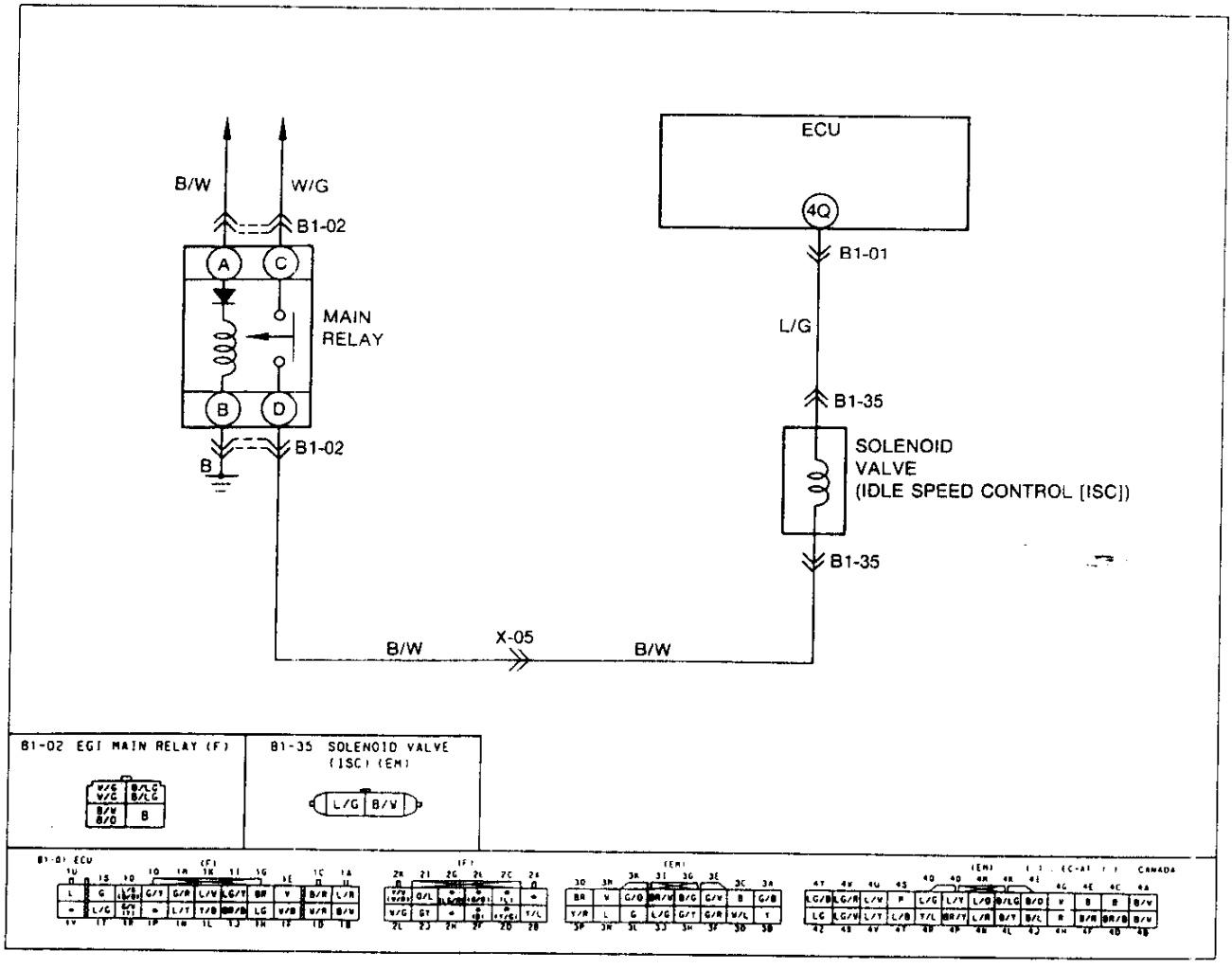
Circuit Diagrem



CODE No.	34 (SOLENOID VALVE–IDLE SPEED CONTROL)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/G) and ECU terminal 4Q?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/G]–ECU terminal 4Q) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–83	Yes	Replace ECU ☞ page F–150
		No	Replace solenoid valve

17U0F F-062

Circuit Diagrem

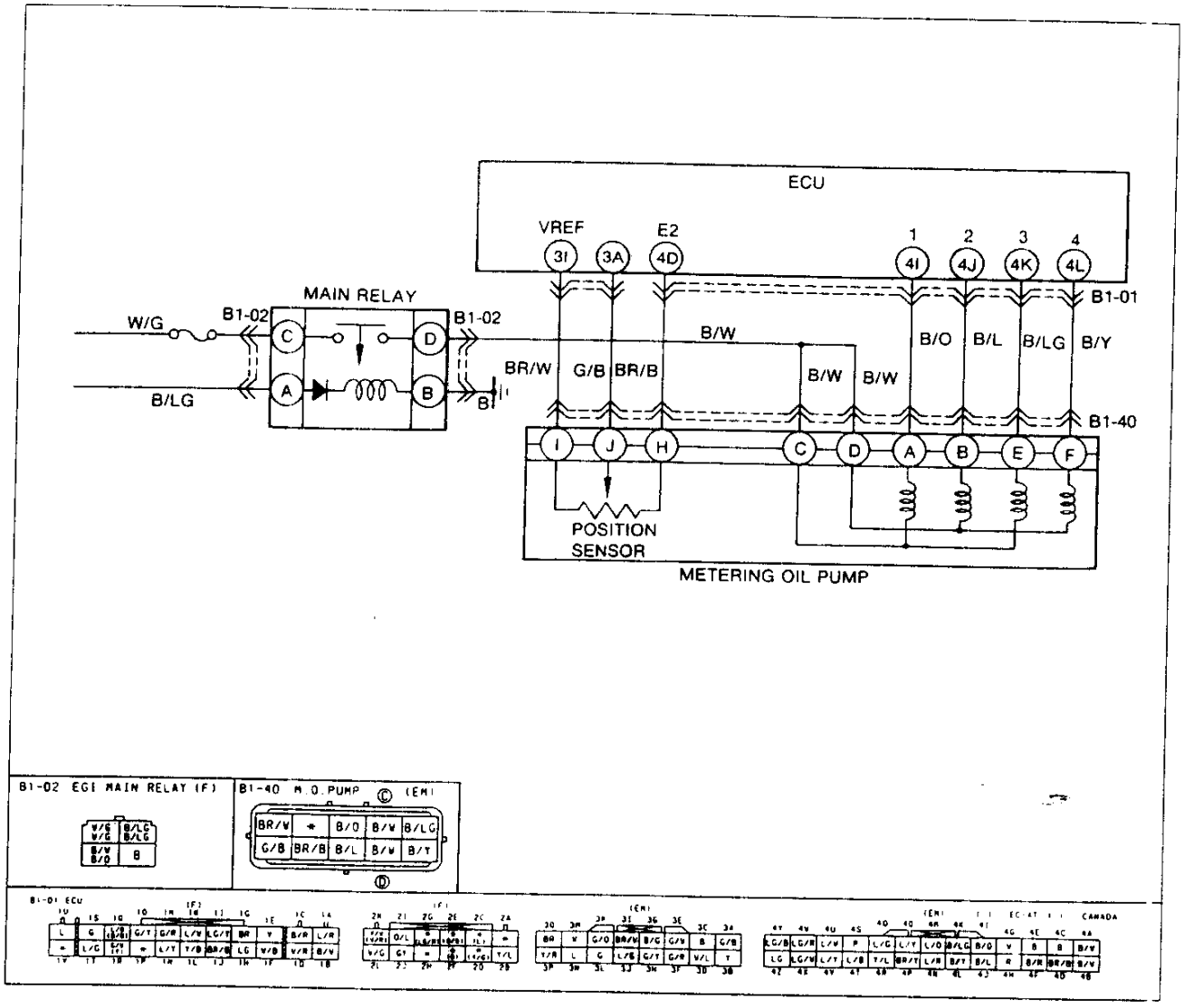


SELF-DIAGNOSIS FUNCTION

CODE No.	37 (METERING OIL PUMP)		
STEP	INSPECTION		ACTION
1	Is vattery voltage OK? **Specification: 12–14V (at Idle)**	Yes	Go to next step
		No	Repair charging system and/or Battery
2	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU ☞ page F–150
		No	Intermittent poor connection Check for cause

17U0F -063

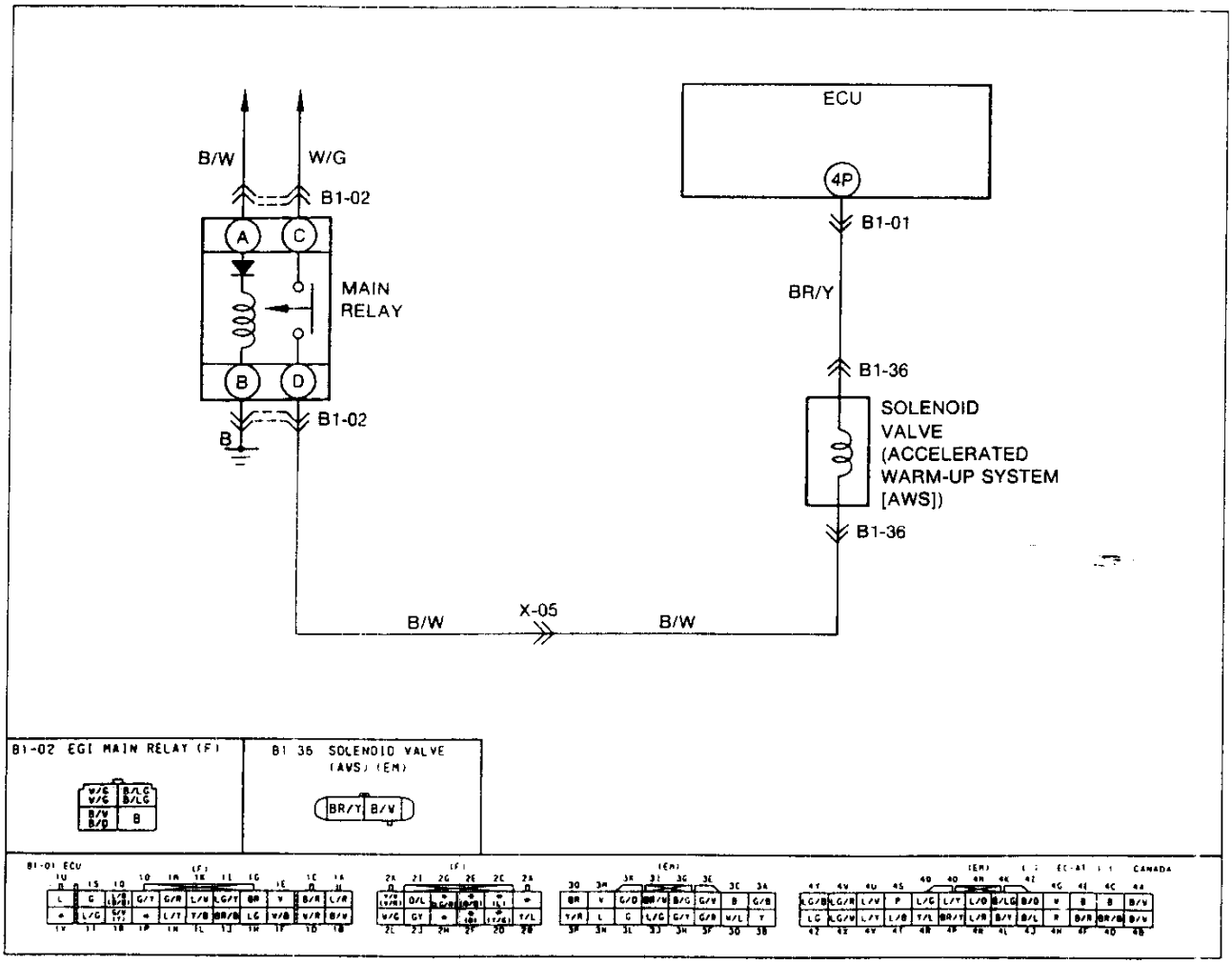
Circuit Diagram



CODE No.	38 (SOLENOID VALVE–ACCELERATED WARM-UP SYSTEM [AWS])		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (BR/Y) and ECU terminal 4P?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [BR/Y]–ECU terminal 4P) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–83	Yes	Replace ECU ☞ page F–15
		No	Replace solenoid valve

17UOF1-064

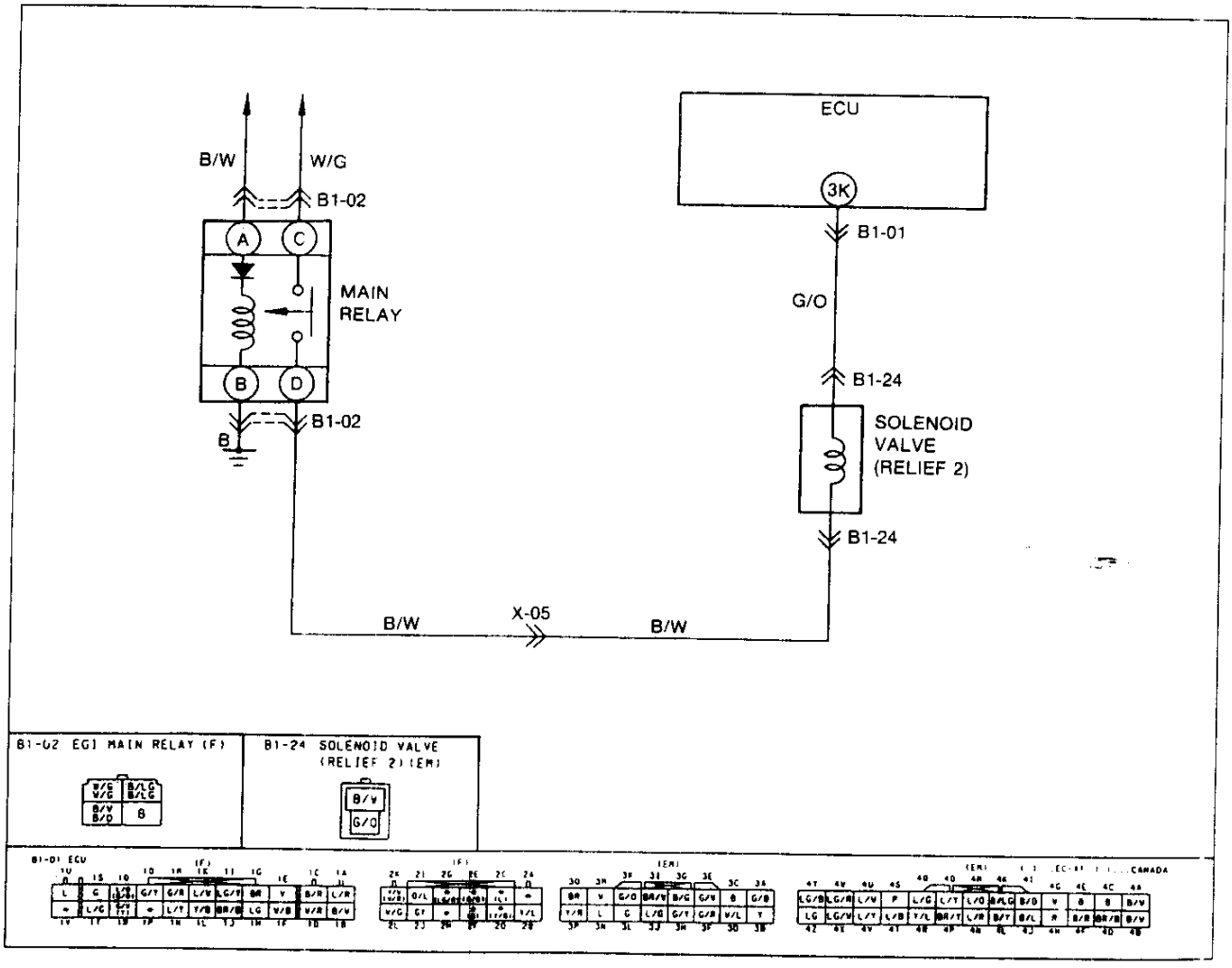
Circuit Diagram



CODE No.	39 (SOLENOID VALVE–RELIEF 2)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (G/O) and ECU terminal 3K?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [G/O]–ECU terminal 3K) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–123	Yes	Replace ECU ☞ page F–150
		No	Replace solenoid valve

17U0FX 065

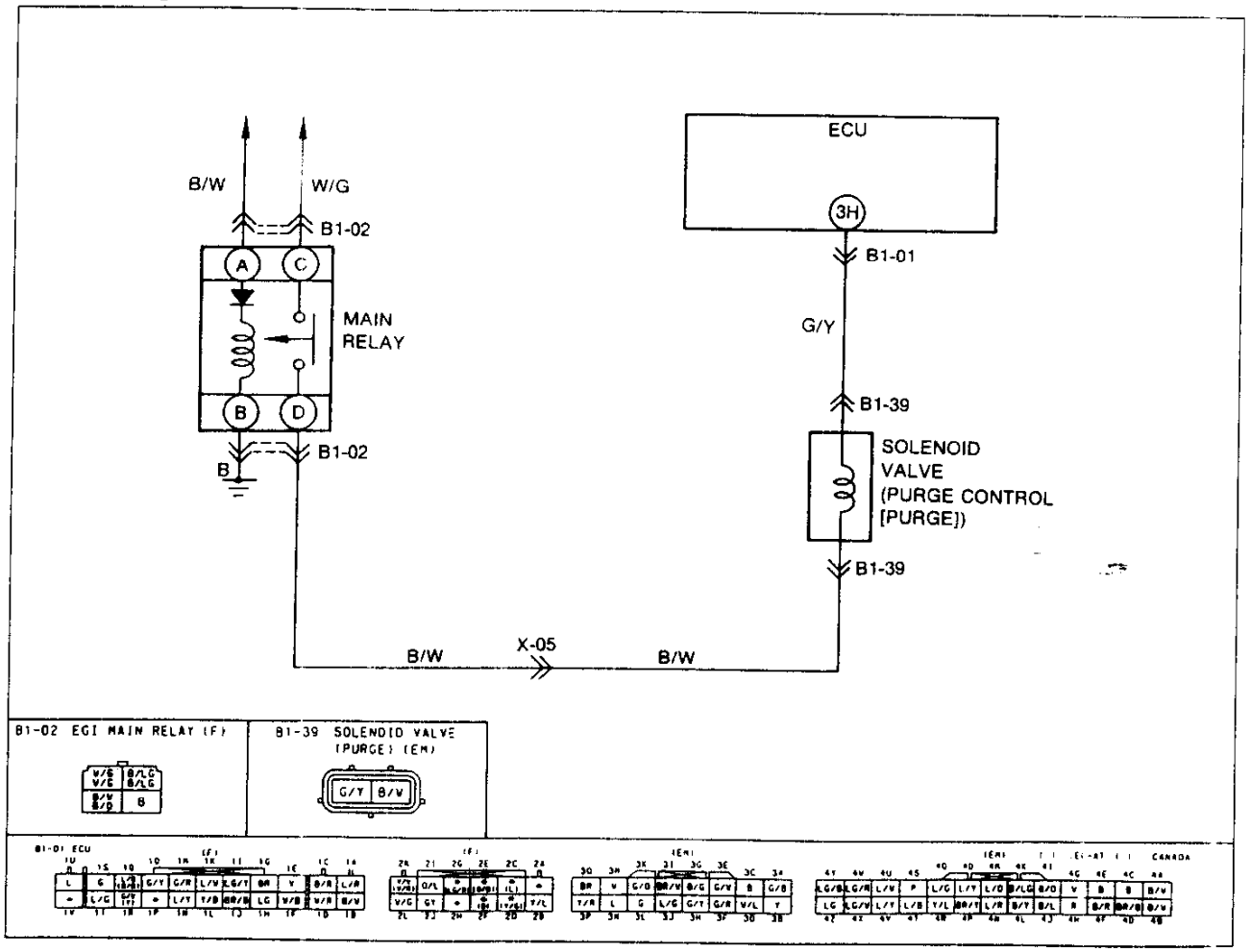
Circuit Diagram



CODE No.	40 (SOLENOID VALVE–PURGE CONTROL [PURGE])		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (G/Y) and ECU terminal 3H?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [G/Y]–ECU terminal 3H) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–131	Yes	Replace ECU ☞ page F–15
		No	Replace solenoid valve

117U0F-066

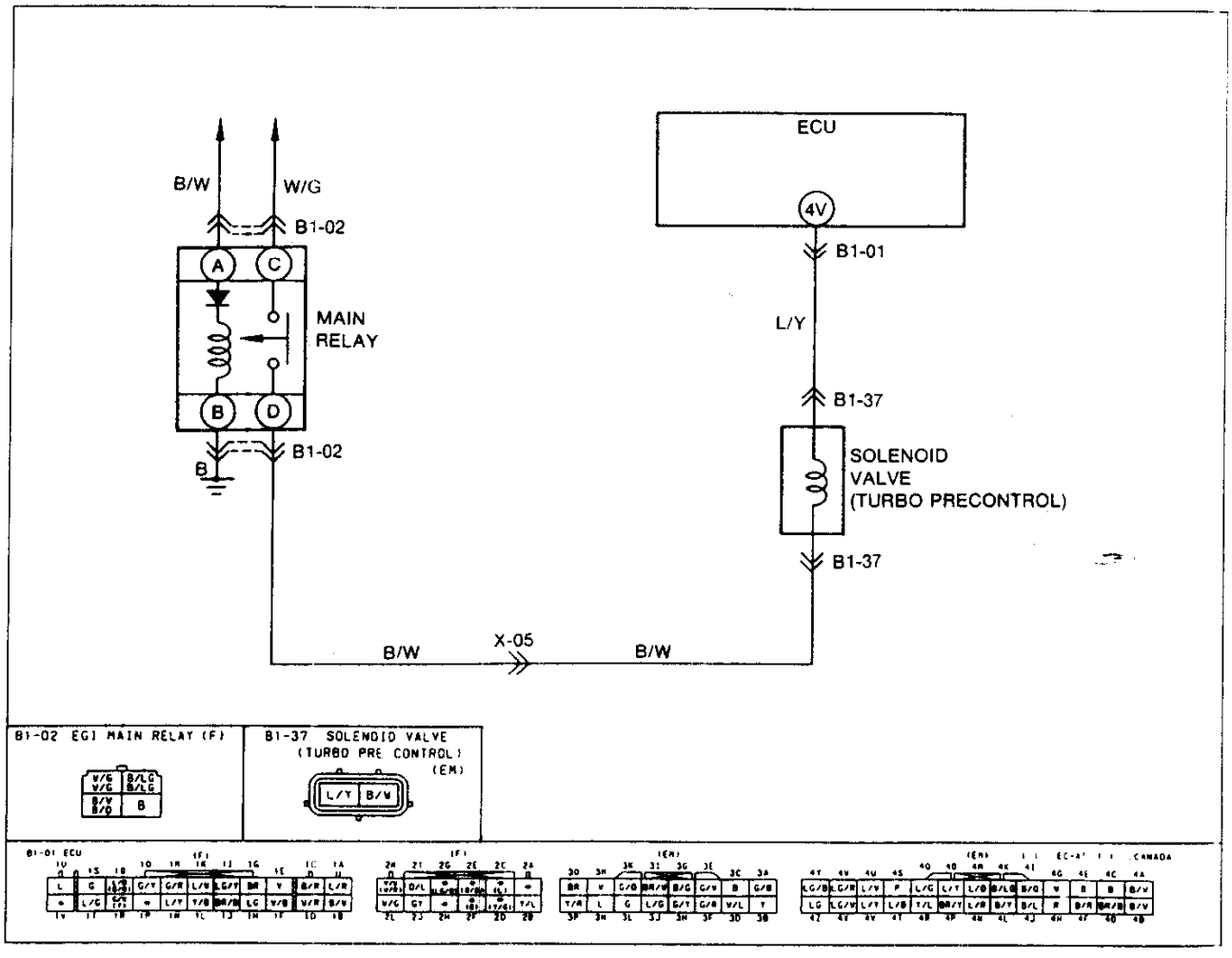
Circuit Diagram



CODE No.	42 (SOLENOID VALVE–TURBO PRECONTROL)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/Y) and ECU terminal 4V?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/Y]–ECU terminal 4V) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–93	Yes	Replace ECU ☞ page F–150
		No	Replace solenoid valve

17U0FX-07

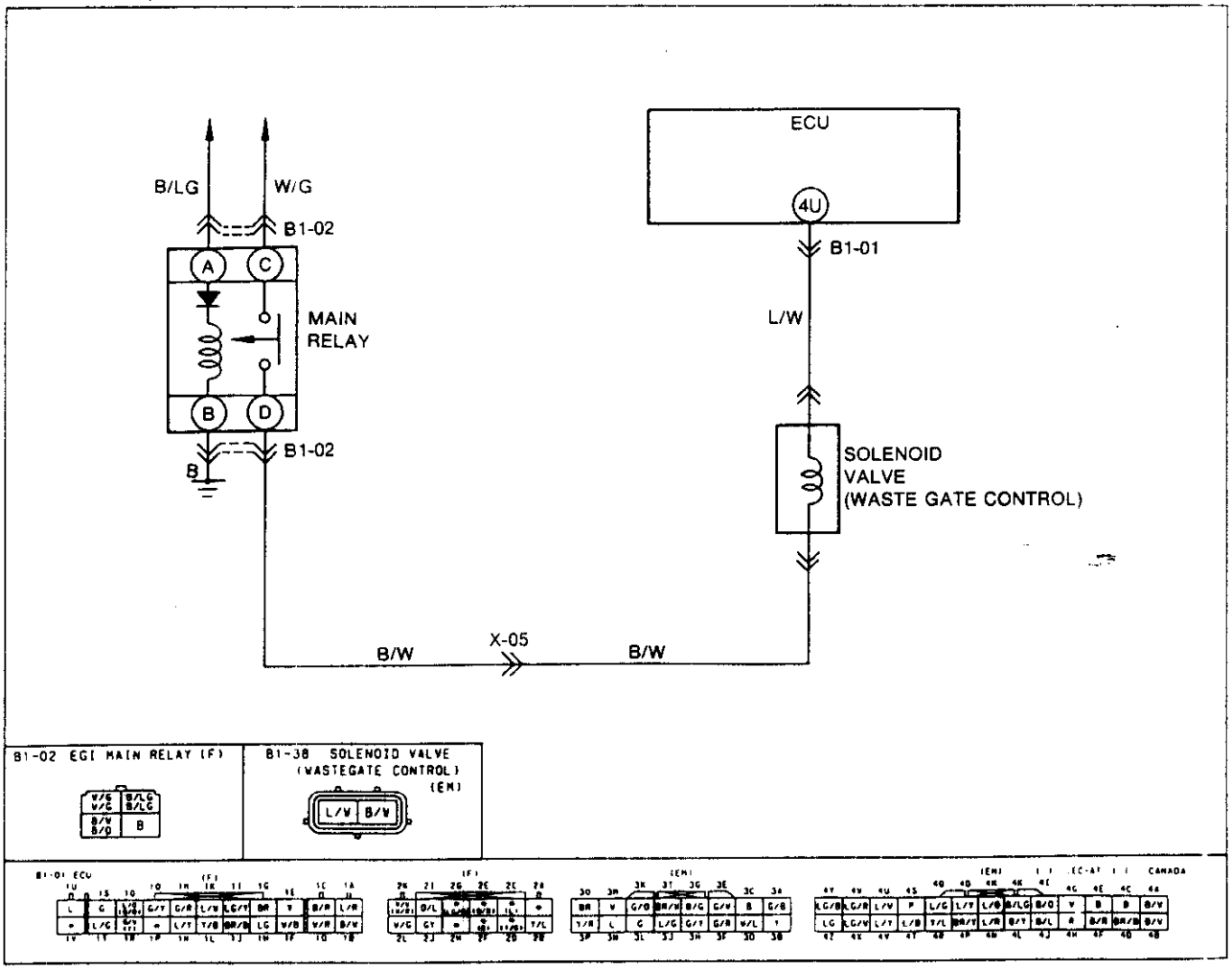
Circuit Diagram



CODE No.	43 (SOLENOID VALVE–WASTEGATE CONTROL)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/W) and ECU terminal 4U?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/W]–ECU terminal 4U) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–93	Yes	Replace ECU ☞ page F–150
		No	Replace solenoid valve

17U0FX-068

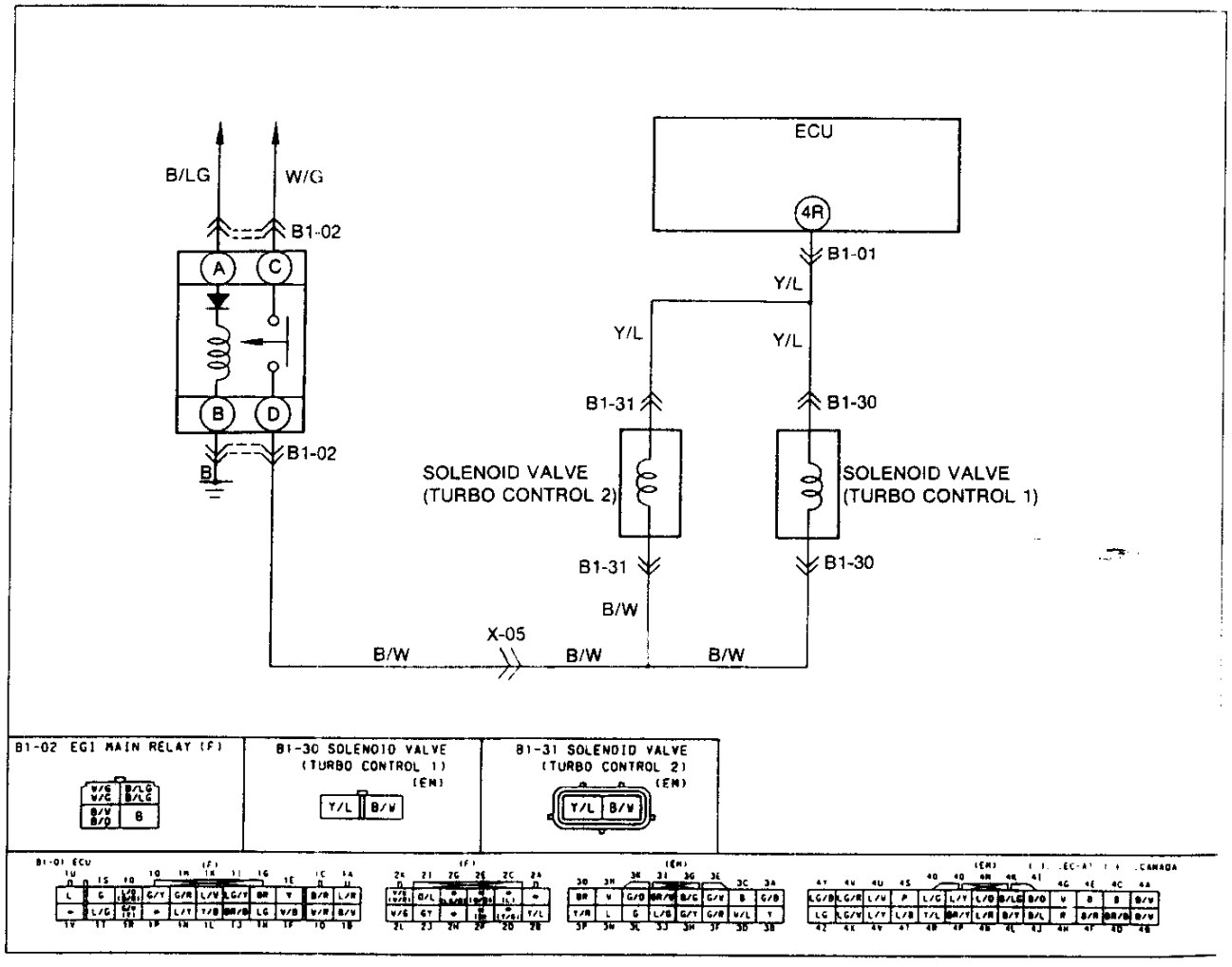
Circuit Diagram



CODE No.	44 (SOLENOID VALVE–TURBO CONTROL)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (Y/L) and ECU terminal 4R?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [Y/L]–ECU terminal 4R) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–93	Yes	Replace ECU ☞ page F–150
		No	Replace solenoid valve

17U0FX-0E 9

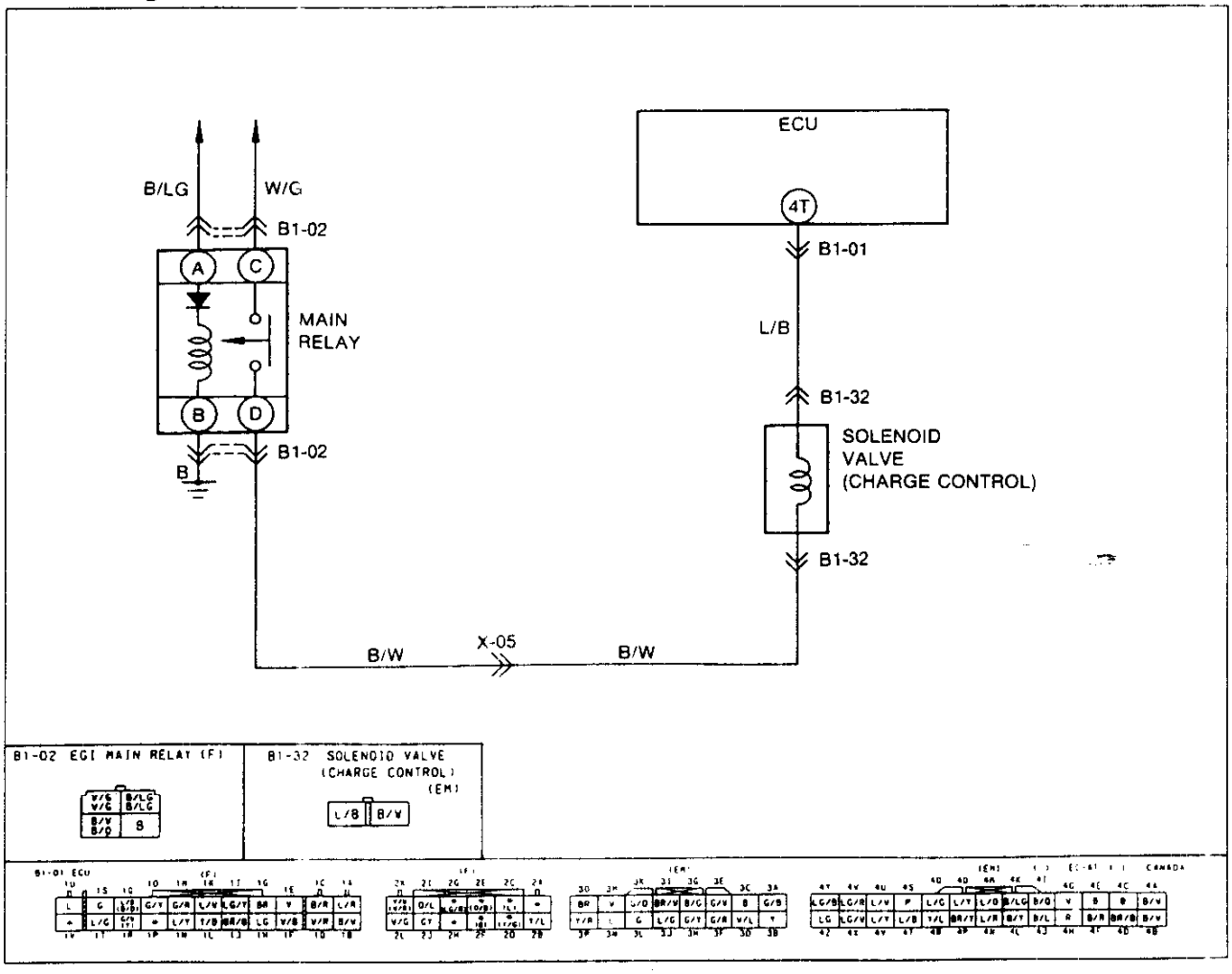
Circuit Diagram



CODE No.	45 (SOLENOID VALVE–CHARGE CONTROL)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (L/B) and ECU terminal 4T?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [L/B]–ECU terminal 4T) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–190	Yes	Replace ECU ☞ page F–150
		No	Replace solenoid valve

17U0FX-1170

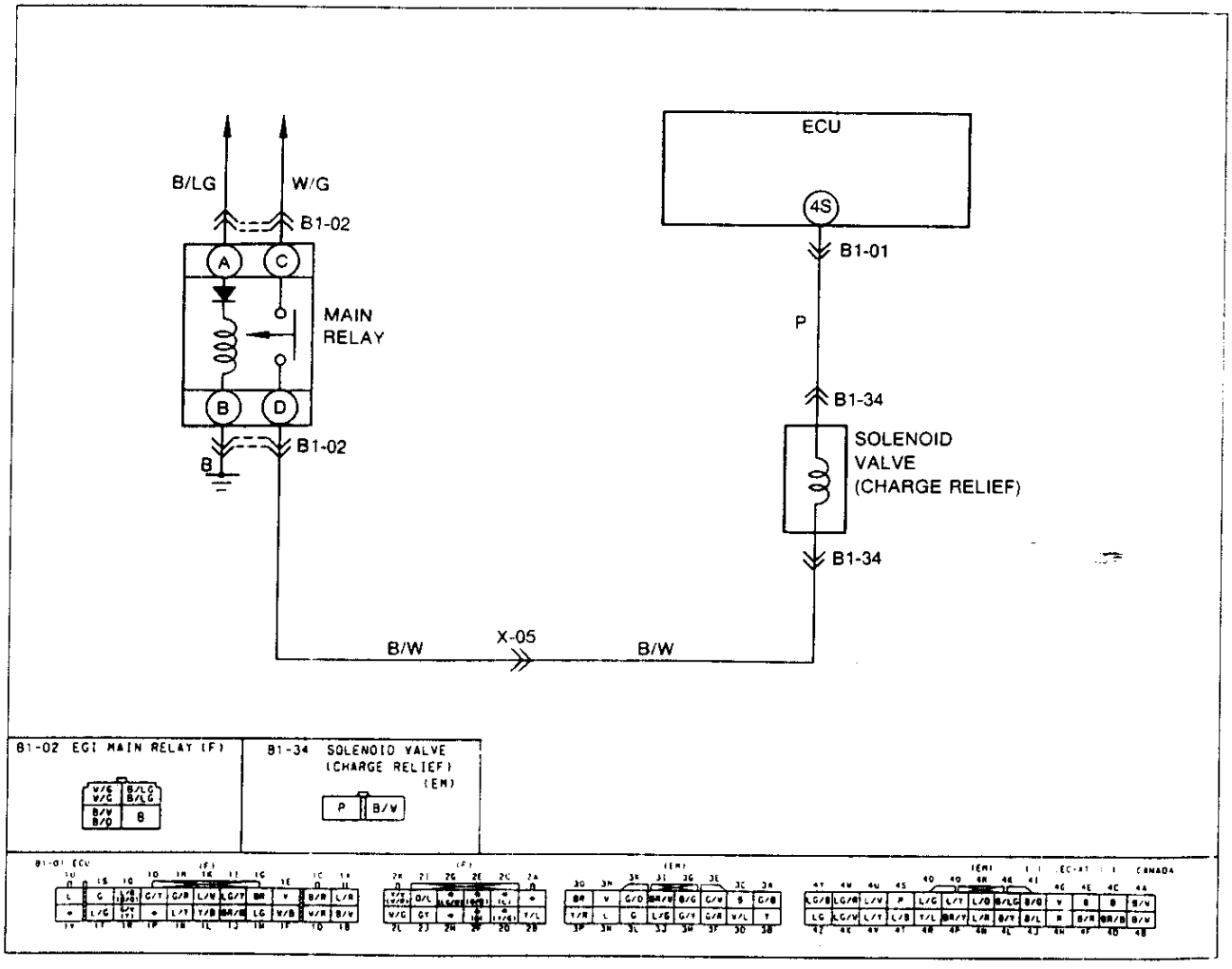
Circuit Diagram



CODE No.	46 (SOLENOID VALVE–CHARGE RELIEF CONTROL)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (B/R) and ECU terminal 4S?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [B/R]–ECU terminal 4S) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–190	Yes	Replace ECU ☞ page F–150
		No	Replace solenoid valve

17U0FX-071

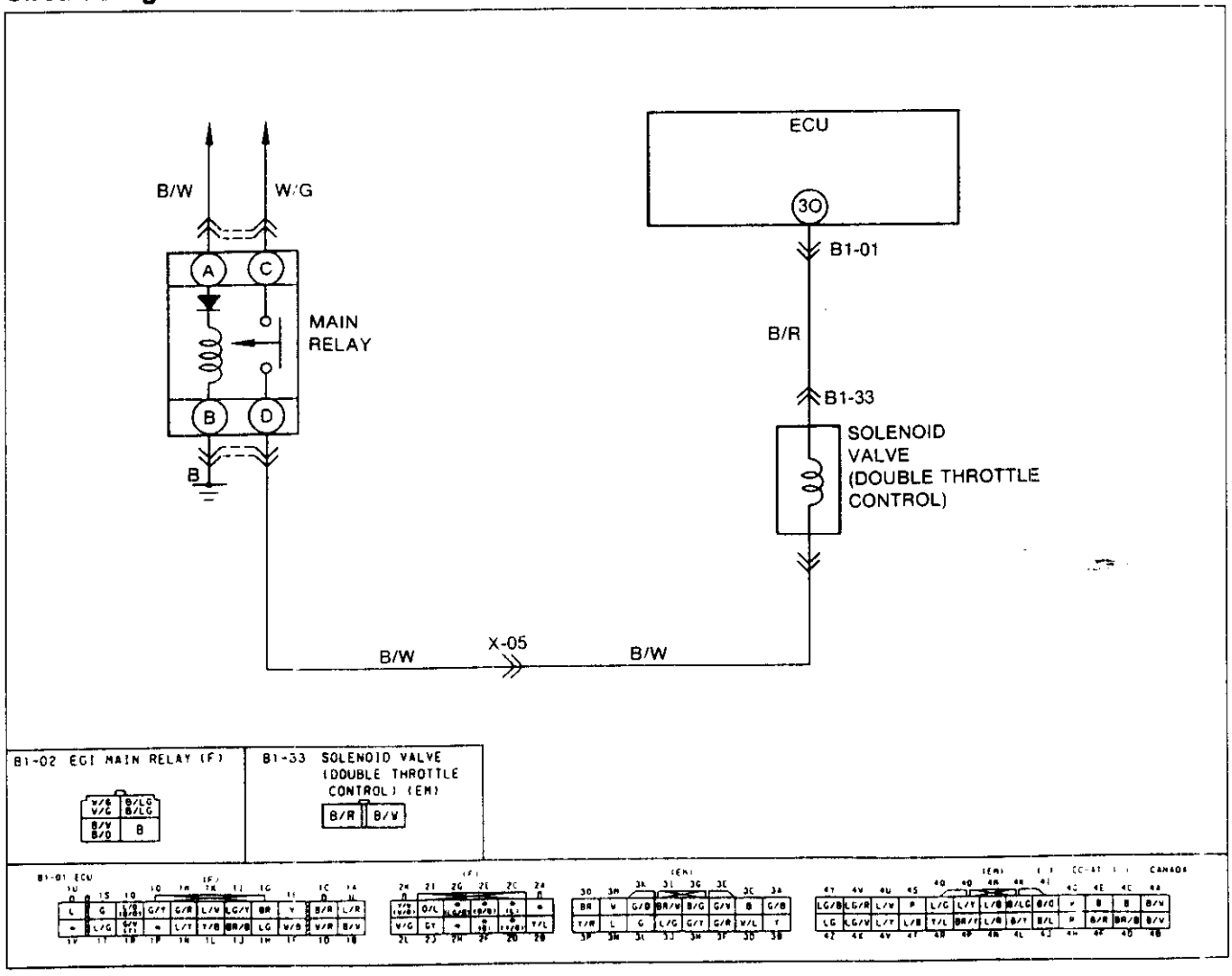
Circuit Diagram



CODE No.	50 (SOLENOID VALVE–DOUBLE THROTTLE CONTROL)		
STEP	INSPECTION		ACTION
1	Does solenoid valve circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with solenoid valve connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Solenoid valve terminal [B/W]–Main relay terminal [B/W])
3	Is there continuity between solenoid valve terminal (B/R) and ECU terminal 30?	Yes	Check for short circuit in wiring harness (Solenoid valve terminal [B/R]–ECU terminal 30) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is solenoid valve OK? ☞ page F–190	Yes	Replace ECU ☞ page F–150
		No	Replace solenoid valve

17U0FX-072

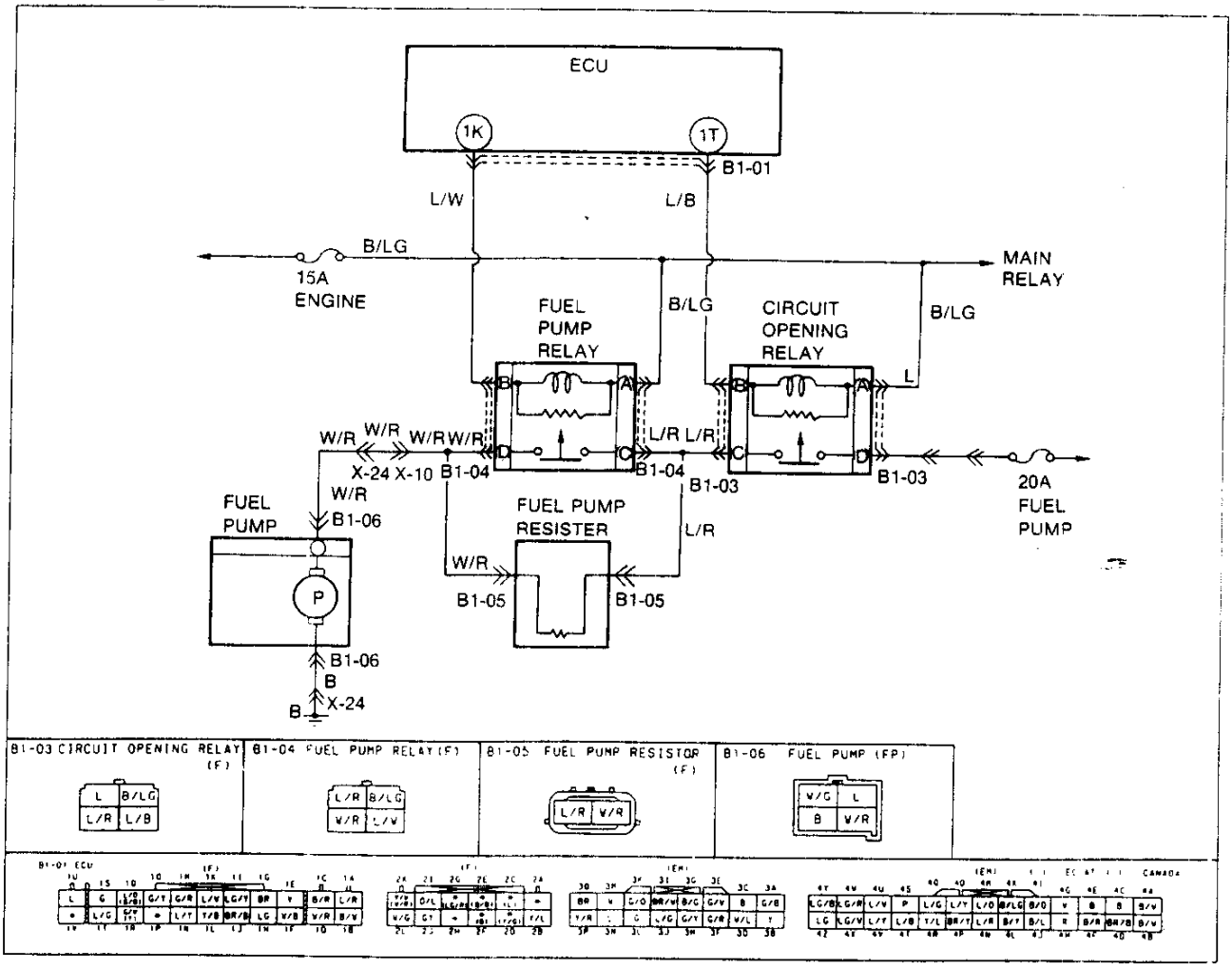
Circuit Diagram



CODE No.	51 (FUEL PUMP RELAY)		
STEP	INSPECTION		ACTION
1	Does fuel pump relay circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/LG) voltage OK with fuel pump relay connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (Fuel pump relay terminal [B/LG]–Main relay terminal [B/LG])
3	Is there continuity between fuel pump relay terminal (L/W) and ECU terminal 1K?	Yes	Check for short circuit in wiring harness (Fuel pump relay terminal [L/W]–ECU terminal 1K) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is fuel pump relay OK? ☞ page F–110	Yes	Replace ECU ☞ page F–150
		No	Replace fuel pump relay

17U0FX-073

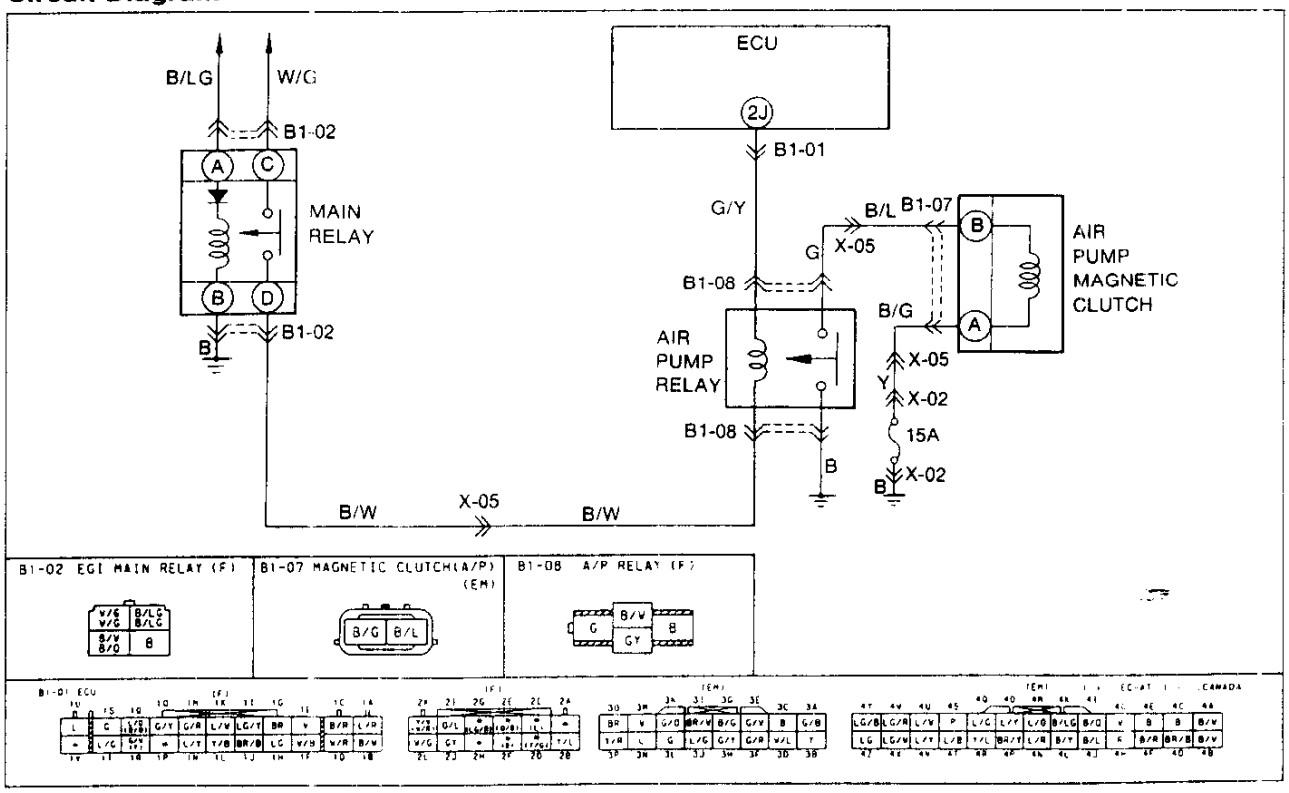
Circuit Diagram



CODE No.	54 (AIR PUMP RELAY)		
STEP	INSPECTION		ACTION
1	Does air pump relay circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/W) voltage OK with airpump relay connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (airpump relay [B/W]–Main relay terminal [B/W])
3	Is there continuity between airpump relay terminal (G/Y) and ECU terminal 2J?	Yes	Check for short circuit in wiring harness (Airpump relay [G/Y]–ECU terminal 2J) ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
4	Is air pump relay OK? ☞ page F–122	Yes	Replace ECU ☞ page F–150
		No	Replace airpump relay

17U0FX-074

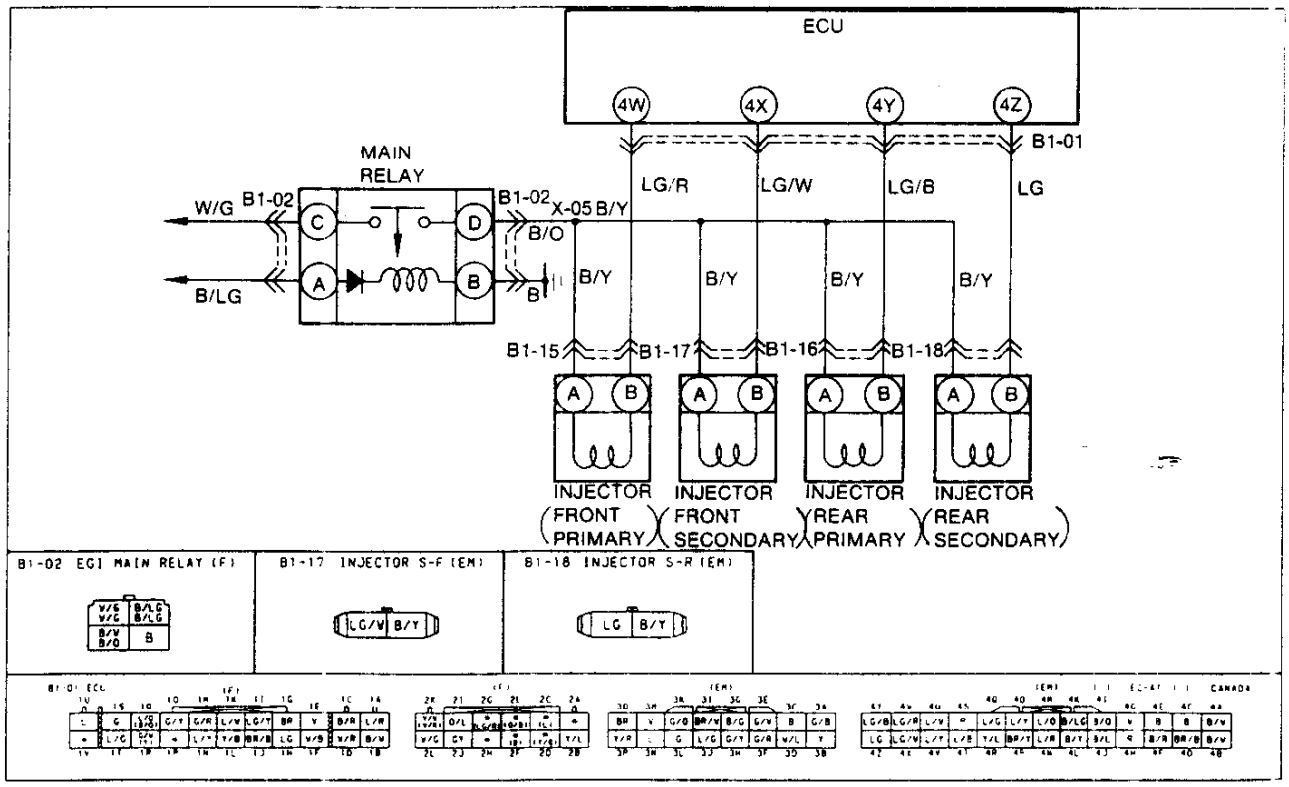
Circuit Diagram



CODE No.	71 (INJECTOR [FRONT SECONDARY])		
STEP	**INSPECTION**		**ACTION**
1	Does injector circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/Y) voltage OK with injector connector disconnected? **Condition**: Ignition switch ON; **Voltage**: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (injector terminal 4X [B/Y]–Main relay terminal [B/O])
3	Is injector resistance OK? **Resistance: 13.5 Ω (20°C [68°F])**	Yes	Go to next step
		No	Replace injector
4	Is there continuity between injector terminal and ECU terminal? INJECTOR: Front (LG/W); ECU: 4X	Yes	Check for short circuit in wiring harness Injector to ECU ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
5	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU ☞ page F–150
		No	Intermittent poor connection Check for cause

17U0FX-05

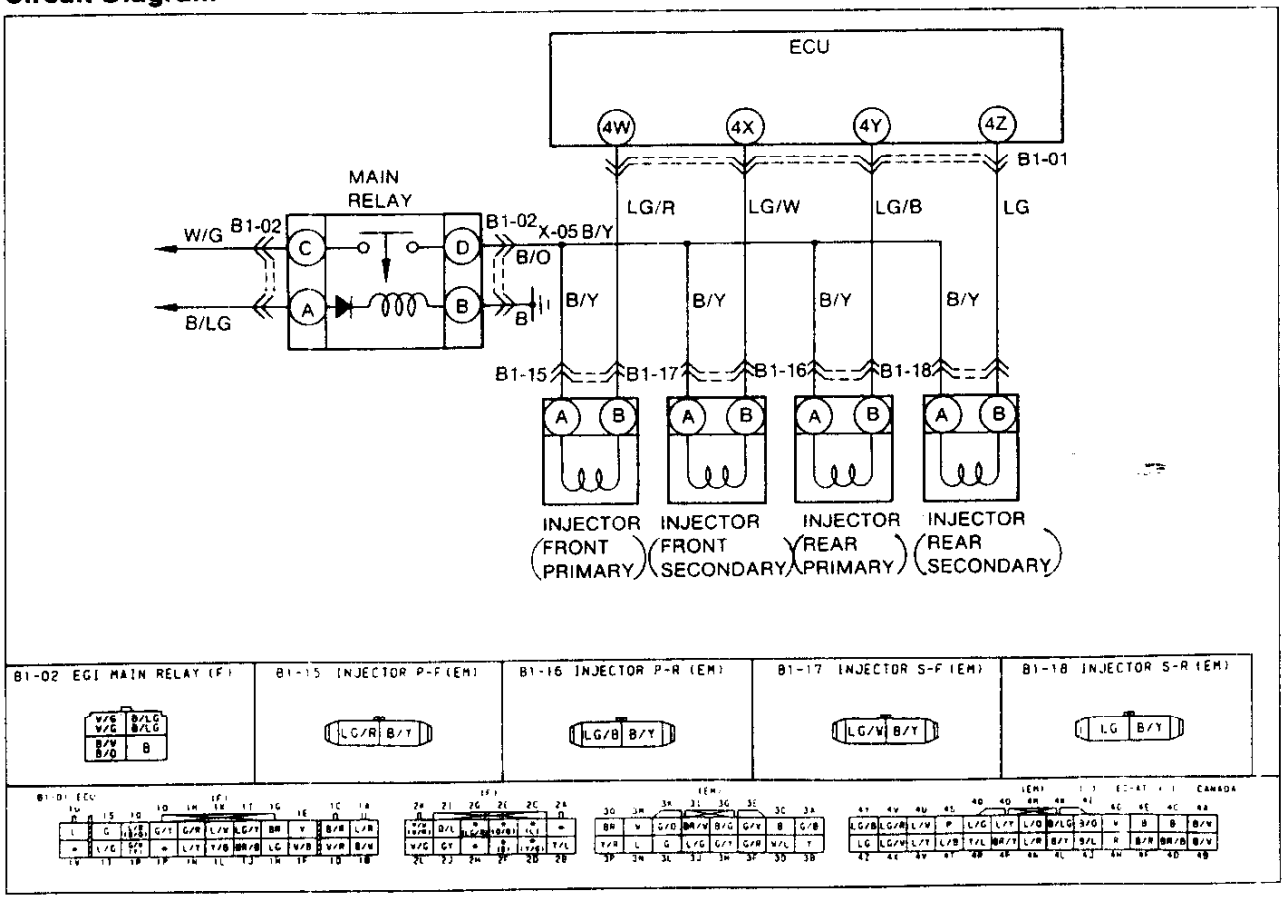
Circuit Diagram



CODE No.	73 (INJECTOR [REAR SECONDARY])		
STEP	INSPECTION		ACTION
1	Does injector circuit have a poor connection?	Yes	Repair connector and/or wiring harness
		No	Go to next step
2	Is connector terminal (B/Y) voltage OK with injector connector disconnected? Condition: Ignition switch ON — Voltage: Battery voltage	Yes	Go to next step
		No	Check for open or short circuit in wiring harness (injector terminal 4Z [B/Y] Main relay terminal [B/O])
3	Is injector resistance OK? **Resistance: 13.8 Ω (20°C [68°F])**	Yes	Go to next step
		No	Replace injector
4	Is there continuity between injector terminal and ECU terminal? INJECTOR: Rear (LG) — ECU: 4Z	Yes	Check for short circuit in wiring harness Injector to ECU ⇨ If OK, go to next step ⇨ If not OK, repair wiring harness
		No	Repair wiring harness
5	Disconnect negative battery cable for at least 20 seconds Connect battery cable and recheck for service code Is service code displayed?	Yes	Replace ECU ☞ page F-150
		No	Intermittent poor connection Check for cause

17U0FX-076

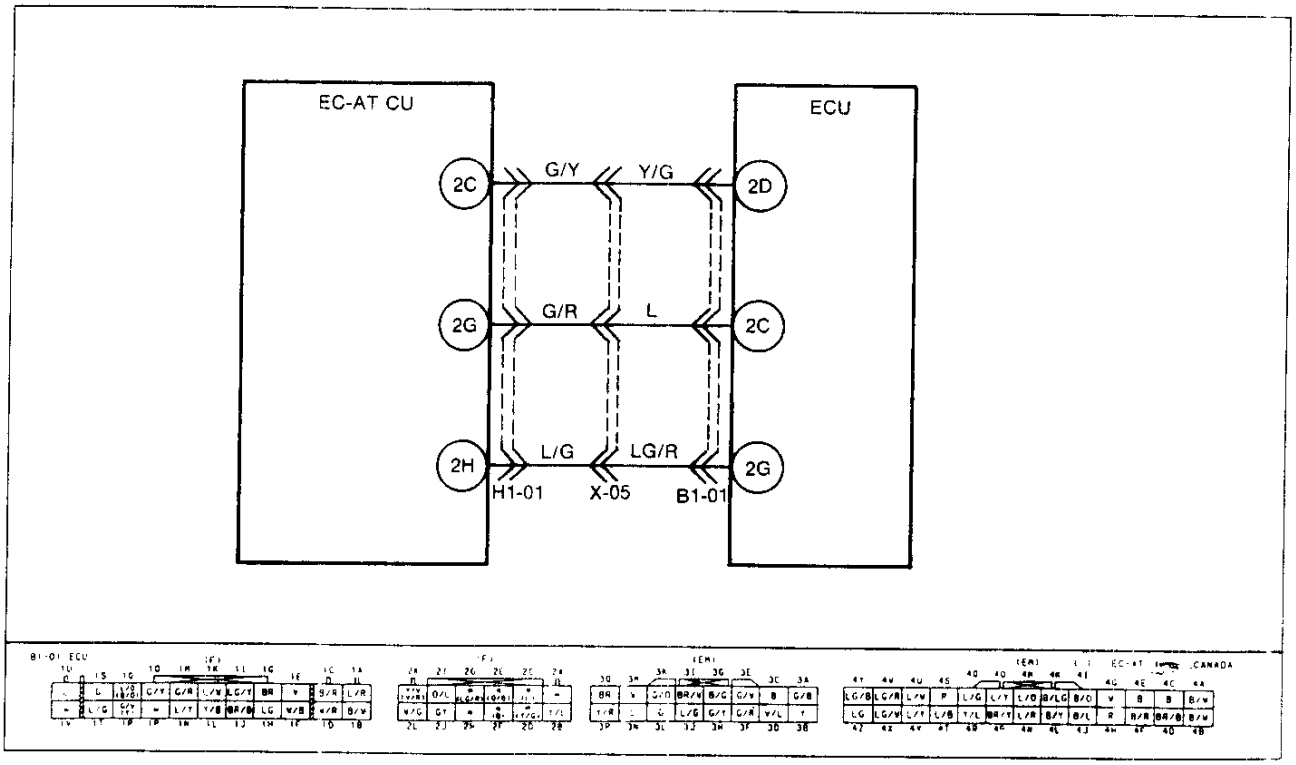
Circuit Diagram



Code No.	76 (SLIP LOCKUP OFF SIGNAL)		
STEP	INSPECTION		ACTION
1	Is there poor connection in Lockup off signal circuit between ECU and EC-AT CU?	Yes	Repair or replace connector
		No	Go to next step
2	Is there continuity between ECU terminal 2G and EC-AT CU terminal 2H	Yes	Go to next step
		No	Check for open circuit in wiring from EC-AT CU to ECU
3	Is EC-AT CU terminal 2H voltage OK?	Yes	Go to next step
		No	Check for cause ☞ page F-156
4	Is ECU terminal 2G voltage OK?	Yes	Replace ECU ☞ page F-150
		No	Check for short circuit in wiring from EC-AT CU to ECU

17U0PX-177

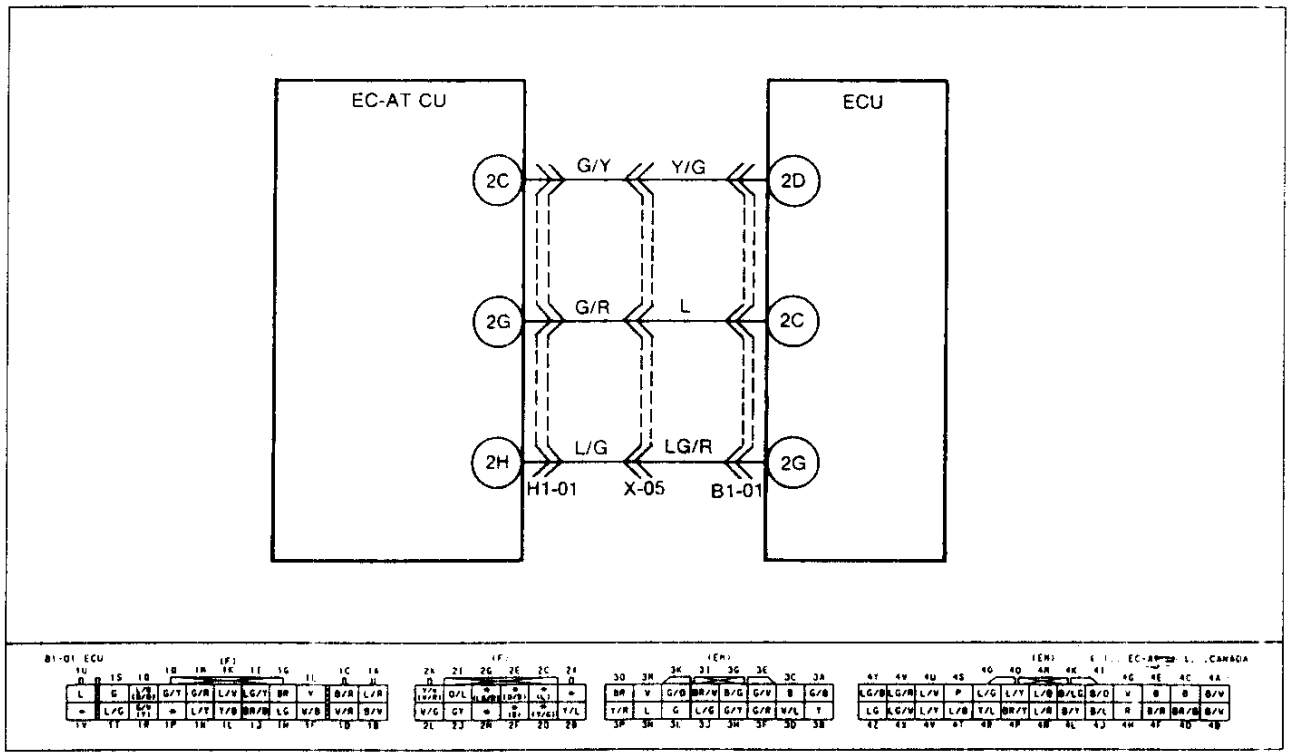
Circuit Diagram

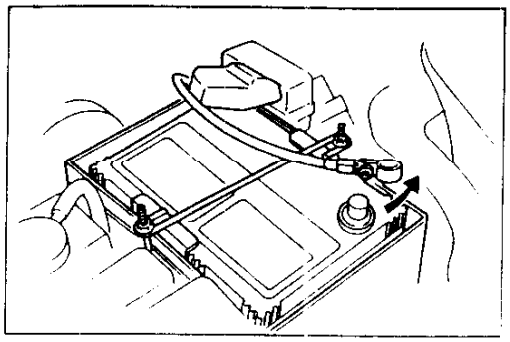


Code No.	77 (TORQUE REDUCED SIGNAL)		
STEP	INSPECTION		ACTION
1	Is there poor connection in Torque reduced signal circuit between ECU and EC-AT CU?	Yes	Repair or replace connector
		No	Go to next step
2	Is there continuity between ECU terminal 2D and EC-AT CU terminal 2C	Yes	Go to next step
		No	Check for open circuit in wiring from EC-AT CU to ECU
3	Is EC-AT CU terminal 2C voltage OK?	Yes	Go to next step
		No	Check for cause ☞ page F-156
4	Is ECU terminal 2D voltage OK?	Yes	Replace ECU ☞ page F-150
		No	Check for short circuit in wiring from EC-AT CU to ECU

17U0FX-078

Circuit Diagram

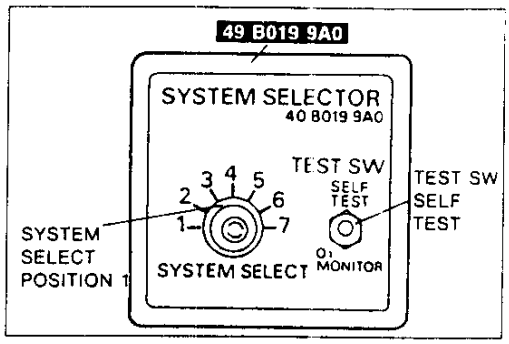




17U0FX-079

After-repair Procedure

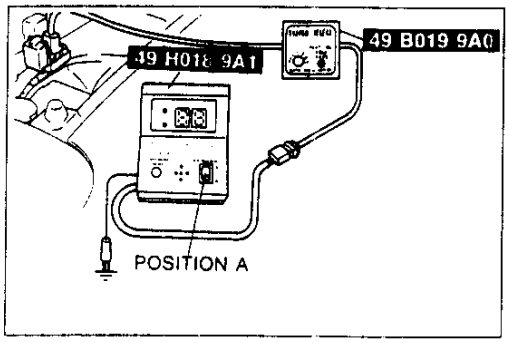
Cancel the memory of service code number by disconnecting the negative battery cable for **20 sec** and depress the brake pedal. Reconnect the negative battery cable



17U0FX 080

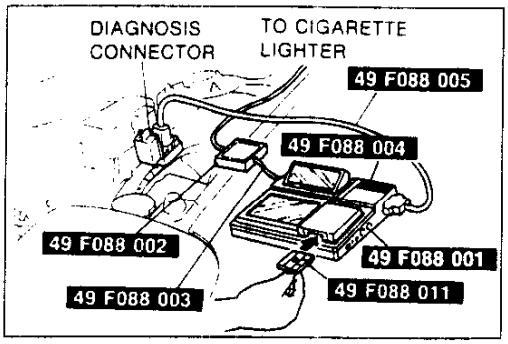
Self-diagnosis Checker

1. Connect the **SST** (System Selector) to the diagnosis connector.
2. Set system select to position 1.
3. Set the test switch to SELF TEST.



17U0FX-081

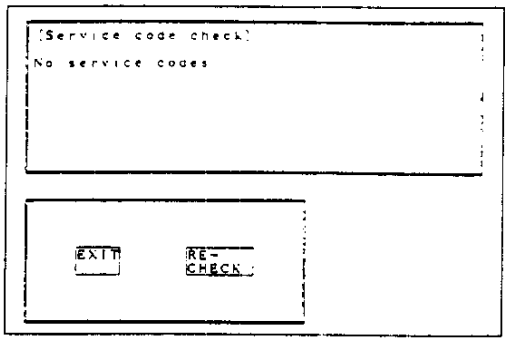
4. Connect the **SST** (Self-Diagnosis Checker) to the System Selector and a ground.
5. Set the select of the Self-Diagnosis Checker to position A.
6. Turn the ignition switch ON.
7. Verify that no service code numbers are displayed.



17U0FX-082

DT-S1000

1. Connect the **SST** (DT-S1000) to the diagnosis connector.
2. Select Service code check.
3. Turn the ignition switch ON.



17U0FX-083

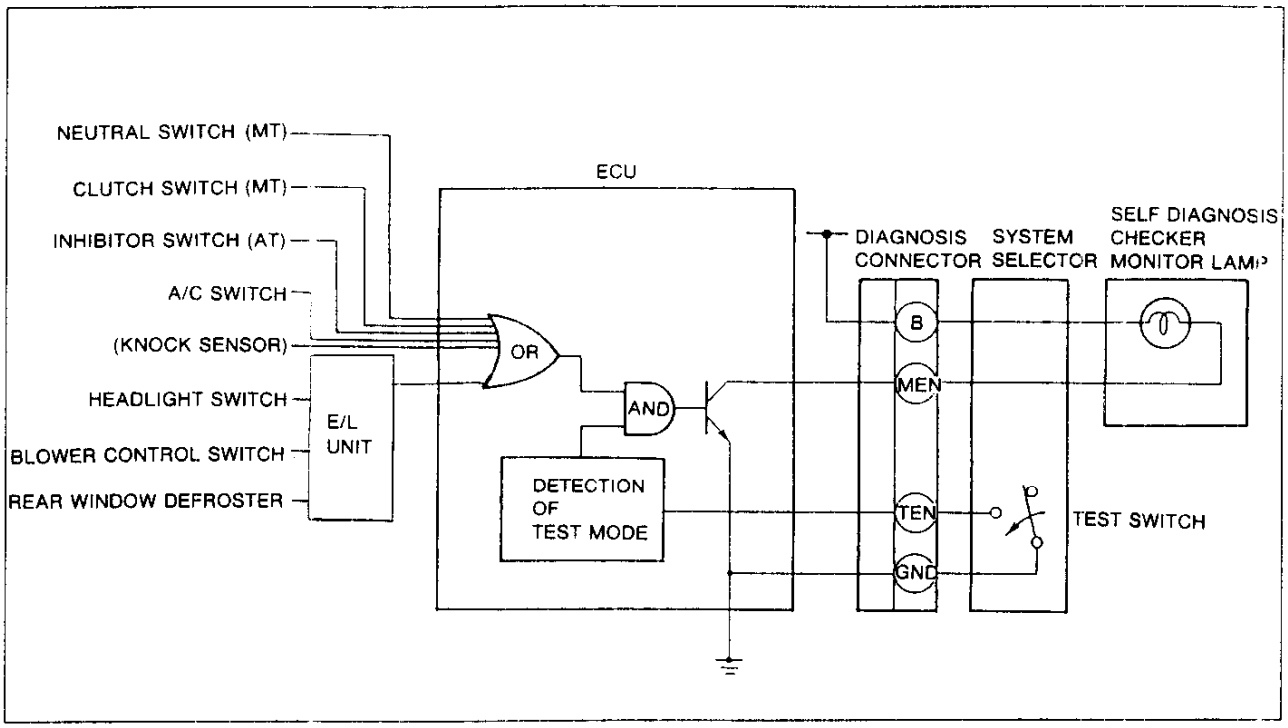
4. Verify that no service code numbers are displayed.

SWITCH MONITOR FUNCTION

Individual switches can be inspected by the **SST** (Self-Diagnosis Checker or DT-S1000)

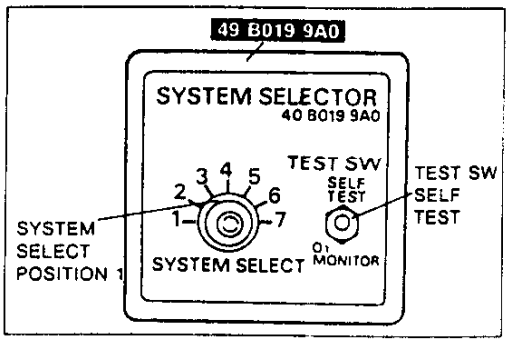
Note

- **The TEN terminal of the diagnosis connector must be grounded and the ignition switch ON (engine stopped).**
- **If either switch remains activated, the monitor lamp will be illuminated.**

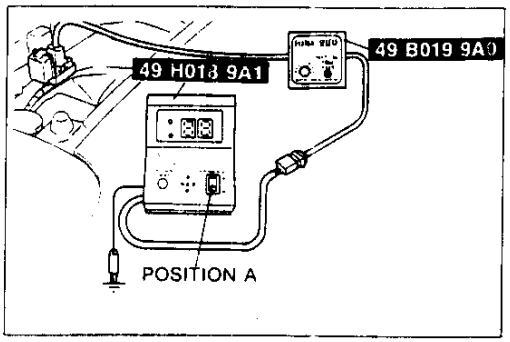


17U0FX-084

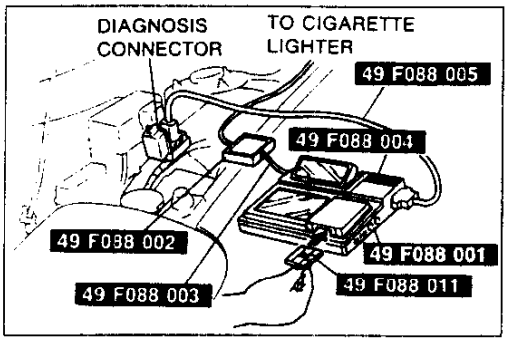
Switch	Self-Diagnosis Checker (Monitor lamp)		Remarks
	Light ON	Light OFF	
Clutch switch (MT)	Pedal released	Pedal depressed	In gear
Neutral switch (MT)	In gear	Neutral	Clutch pedal released
Inhibitor switch (AT)	L, S, D or R range	N or P range	–
Headlight switch	ON	OFF	Headlight switch I or II position
Blower switch	ON	OFF	At 3rd or 4th position
Rear window defroster switch	ON	OFF	–
A/C switch	ON	OFF	Blower switch at 1st or higher position



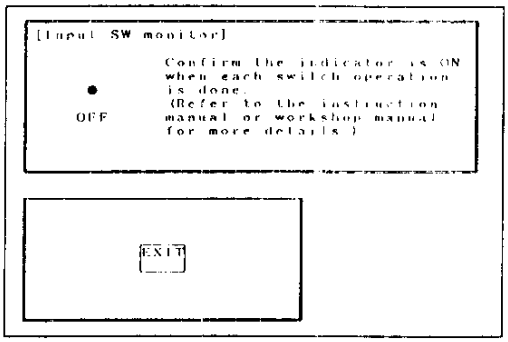
17U0FX-085



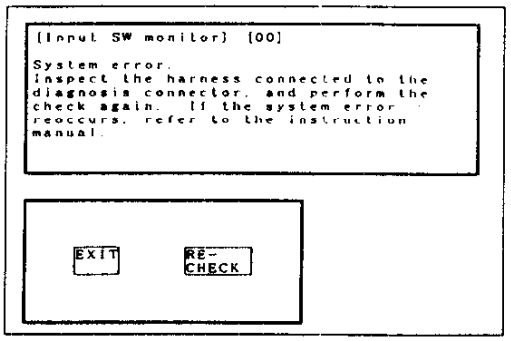
17U0FX-086



17U0FX-087



17U0FX-088



Inspection Procedure
Self-Diagnosis Checker

1. Connect the **SST** (System Selector) to the diagnosis connector.
2. Set system select to position 1.
3. Set TEST SW to SELF-TEST.

4. Connect the **SST** (Self-Diagnosis Checker) to the System Selector and a ground.
5. Set the select switch of the Self-Diagnosis Checker to position A.
6. Turn the ignition switch ON.
7. Check if the Monitor Lamp illuminates when each switch is made to function as described.

Caution
- **If either switch remains activated, the monitor lamp will be illuminated.**
- **Do not start the engine.**

DT-S1000

1. Connect the **SST** (DT-S1000) to the diagnosis connector.
2. Select switch monitor check.
3. Turn ignition switch ON.

4. Check if the Monitor indicator turn black to white when each switch is made to function as described.

Caution
- **If the DT-S1000 detects a system error as a result of diagnosis, the display on the left will appear.**
- **If this message appears refer to the instruction manual.**
- **Press EXIT to return function selection display.**

Procedure

Set conditions to deactivate each switch
- All accessories OFF
- Transmission in neutral
- All pedals released

Is monitor lamp illuminated?

YES →
Check each switch and related wire harness
- Clutch switch — ☞ page F-187
- Neutral switch — ☞ page F-186
- Headlight switch — ☞ 1993 RX-7 Body electrical troubleshooting manual
- Rear window defroster switch — ☞ 1993 RX-7 Body electrical troubleshooting manual
- Blower switch — ☞ 1993 RX-7 Body electrical troubleshooting manual
- A/C switch — ☞ 1993 RX-7 Body electrical troubleshooting manual
- Position switch — ☞ 1993 RX-7 Body electrical troubleshooting manual

NO ↓

Check each switch as described

16E0F2-083

Neutral switch (MT)

Shift transmission into in-gear (Clutch pedal released.)
Is monitor lamp illuminated?

NO →
PC
- Neutral switch malfunction — ☞ page F-186
- Open circuit in related wire harness
- ECU terminal 1R voltage incorrect — ☞ page F-150
- ECU malfunction

YES ↓

Neutral switch OK
Return transmission to neutral

Clutch switch (MT)

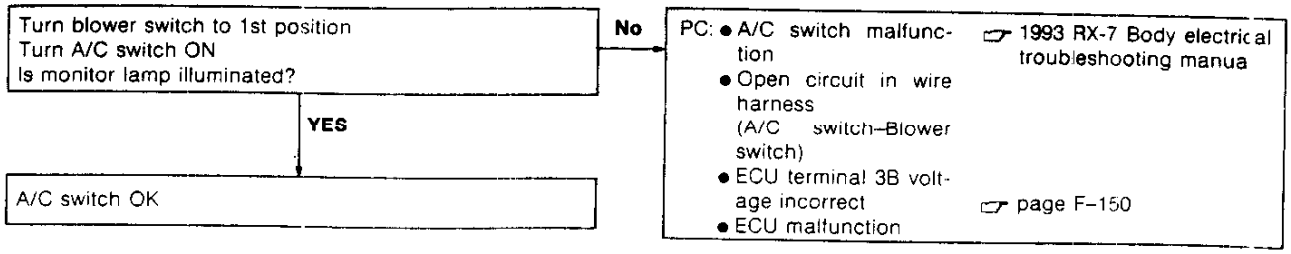
Clutch pedal released. (In gear)
Is monitor lamp illuminated?

NO →
PC
- Clutch switch malfunction — ☞ page F-187
- Open circuit in related wire harness
- ECU terminal 1Q voltage incorrect — ☞ page F1-150
- ECU malfunction

YES ↓

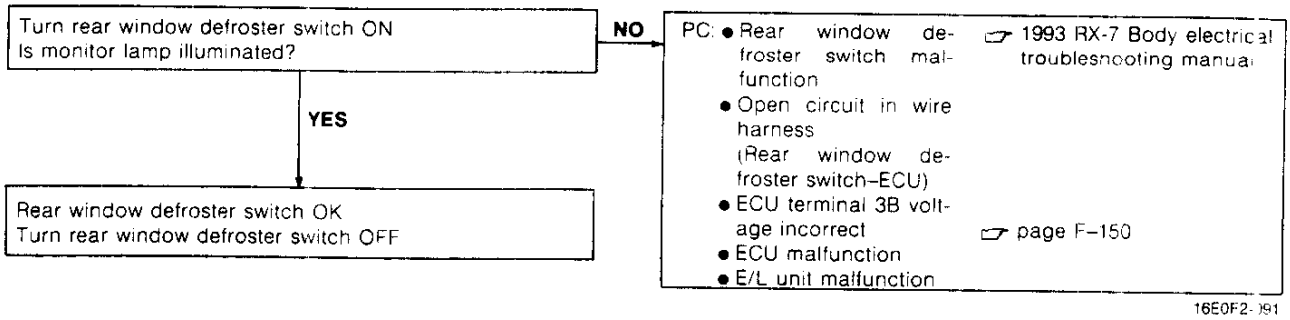
Clutch switch OK
Reture transmission to neutral

A/C switch



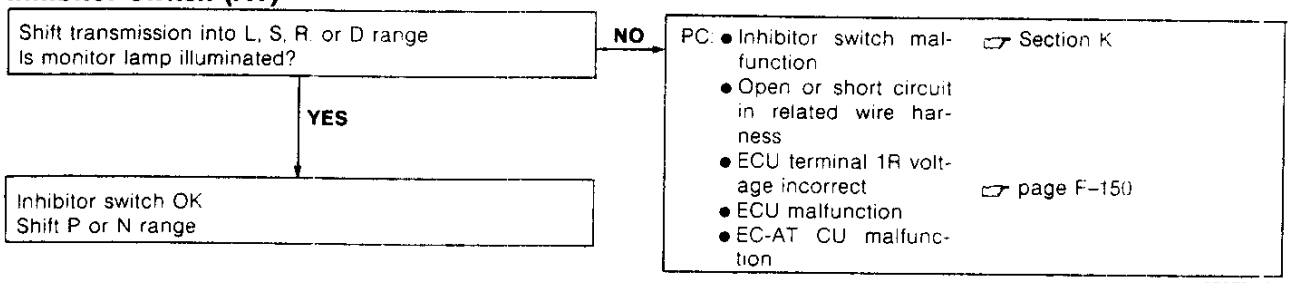
16E0F2-090

Rear window defroster switch



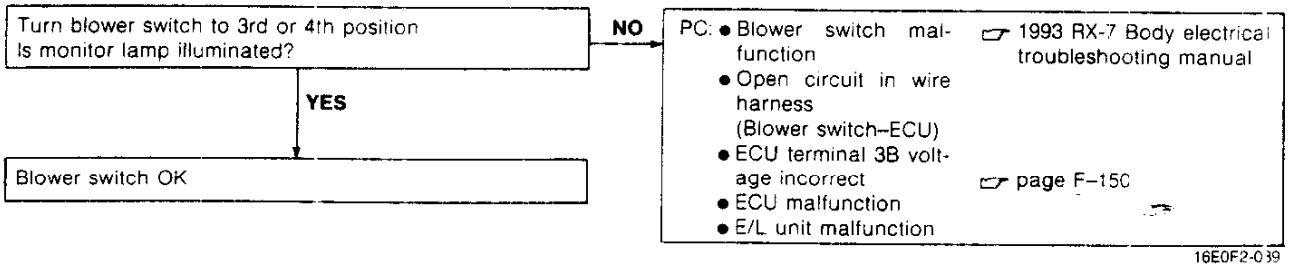
16E0F2-091

Inhibitor switch (AT)



16E0F2-092

Blower switch



16E0F2-039

OXYGEN SENSOR MONITOR FUNCTION

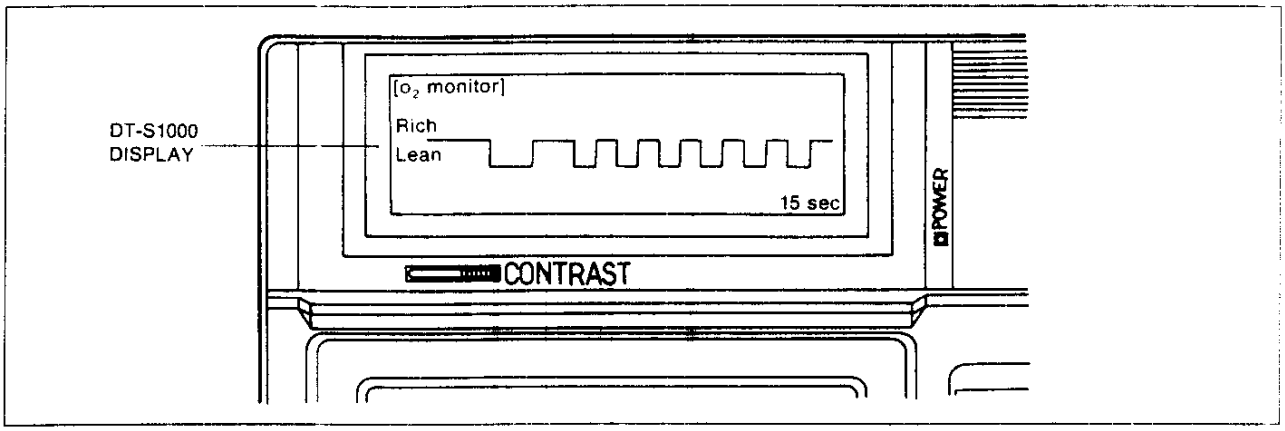
Engine Signal Monitor

With the **SST** see to O_2 Monitor, the oxygen sensor is monitored by the Self-Diagnosis checker as discribed.

Condition		Item monitored	Function
Engine	System selector switch		
Running	O_2 monitor	Oxygen sensor output signal	Oxygen sensor output more than 0.45 V Monitor lamp: Flashes

DT-S1000

With the DT-S1000 monitor check, the oxygen sensor signal is displayed as graph.



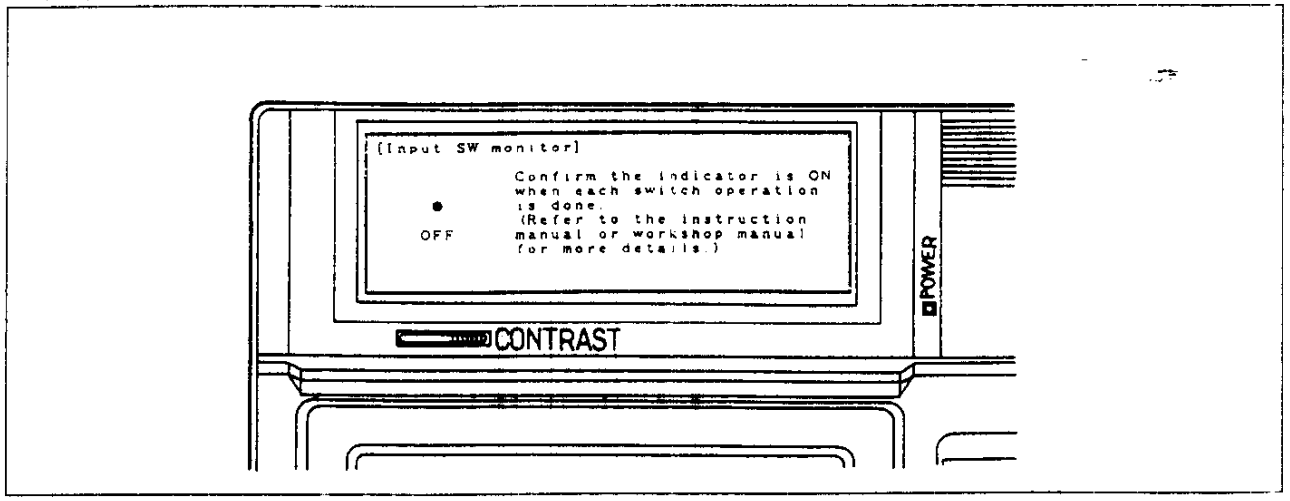
KNOCK SENSOR MONITOR FUNCTION

With the System selector set to Engine Signal Monitor. SELF-TEST the knock sensor is monitored by the Self-Diagnosis checker as described below.

Item monitored	Condition			Function
	Test	Ignition switch	System selector switch	
Knock sensor output signal	Tap the engine hanger lightly with hammer	ON	SELF-TEST	Monitor lamp: Flashes

DT-S1000

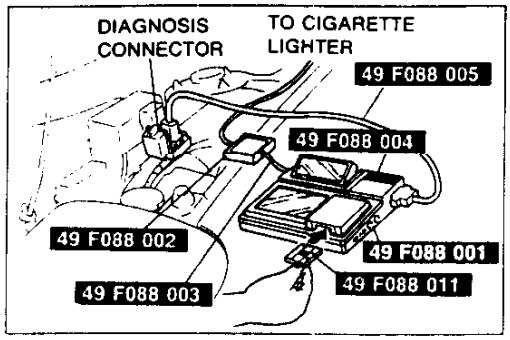
With the DT-S1000 at input Switch monitor check, operation of the knock sensor is monitored and displayed.



REAL TIME MONITOR FUNCTION (DT-S1000)

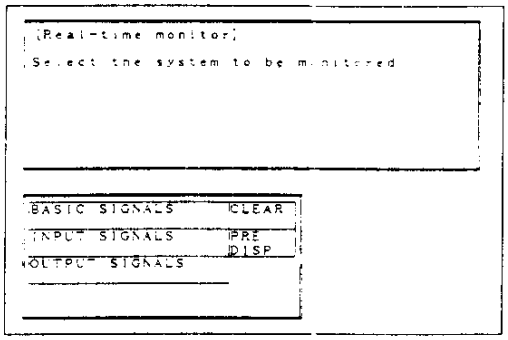
Indivisual input output signal can be inspected by the **SST** (DT-S1000).

Signal	Monitor Item		Unit	Remark
BASIC	Engine speed		[rpm]	
	Intake air pressure		[kPa]	
	Throttle opening amount (Narrow range)		[V]	
	Throttle opening amount (Full range)		[V]	
	Engine coolant temperature		[°C]	
	Solenoid valve (ISC)		[%]	Duty control
	Battery voltage		[V]	
	Ignition timing (IGT-L)		[BTDC°]	
	Ignition timing (IGT-T)		[BTDC°]	
	Injection drive signal (Primary)		[m sec]	
	Injector drive signal (Secondary)		[m sec]	
INPUT	Oxygen sensor voltage		[V]	
	Intake air temperature		[°C]	
	Fuel temperature		[°C]	
	Atmosphric pressure (in ECU)		[kPa]	in ECU
	Vehicle speed		[km/h]	
	MOP position (target figure)		[V]	
	MOP position sensor		[V]	Target figure
	Power steering pressure signal		[ON/OFF]	
	Starter signal		[ON/OFF]	
	Brake signal		[ON/OFF]	
	A/C signal		[ON/OFF]	
	E/L signal		[ON/OFF]	
	Heat hazard signal		[ON/OFF]	
	Canada switch (Canada only)		[ON/OFF]	
	DRL signal (Canada only)		[ON/OFF]	
	California switch (Carifornia only)		[ON/OFF]	
	EGR switch signal (California only)		[ON/OFF]	
	Neutral signal		[ON/OFF]	MT only
	Clutch signal		[ON/OFF]	
	1st gear signal		[ON/OFF]	
	2nd gear signal		[ON/OFF]	
	Inhibitor signal		[ON/OFF]	AT only
	Reduce torque signal		[ON/OFF]	
	Slip lock-up signal		[ON/OFF]	
	Shift solenoid A signal		[ON/OFF]	
	Shift solenoid B signal		[ON/OFF]	
OUTPUT	Solenoid valve	Solenoid valve (Turbo precontrol)	[%]	
		Solenoid valve (Wastegate control)	[%]	
		Solenoid valve (Purge control)	[%]	Duty control
		Solenoid valve (Charge relief)	[ON/OFF]	
		Solenoid valve (Charge control)	[ON/OFF]	
		Solenoid valve (Turbo control)	[ON/OFF]	
		Solenoid valve (Switching)	[ON/OFF]	Secondarg air injection system
		Solenoid valve (Relief1)	[ON/OFF]	
		Solenoid valve (Relief2)	[ON/OFF]	
		Solenoid valve (Port air bypass)	[ON/OFF]	
		Solenoid valve (Split air bypass)	[ON/OFF]	
		Solenoid valve (Pressure regulator control)	[ON/OFF]	Sequential twin turbo-charger control system
		Solenoid valve (Double throttle control)	[ON/OFF]	
		Solenoid valve (Exhaust gas recirculation)	[ON/OFF]	
		Solenoid valve (Accelerated warm-up system)	[ON/OFF]	
	Relay	Electric cooling fan relay	[ON/OFF]	
		A/C relay	[ON/OFF]	
		Air pump relay	[ON/OFF]	
		Fuel pump relay	[ON/OFF]	
	Signal	Torque reduced signal	[ON/OFF]	AT only
		Slip lock up OFF signal	[ON/OFF]	
		Idle signal	[ON/OFF]	



Inspection Procedure

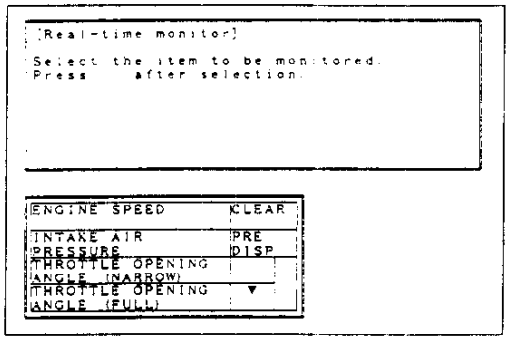
1. Connect the **DT-S1000** to the diagnosis connector as shown in figure.



2. Select the real time monitor from the **DT-S1000** display.
3. Turn ignition switch ON.

Caution

- **Do not turn the ignition switch OFF until real time monitor is completed.**

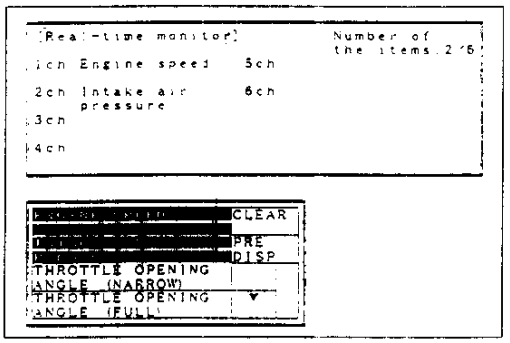


4. Select the inspection items.

Note

- **The maximum selection items are 8.**
- **Basic Input signal need two-channel, therefore if all selection items basic signal, The maximum selection item is 4.**

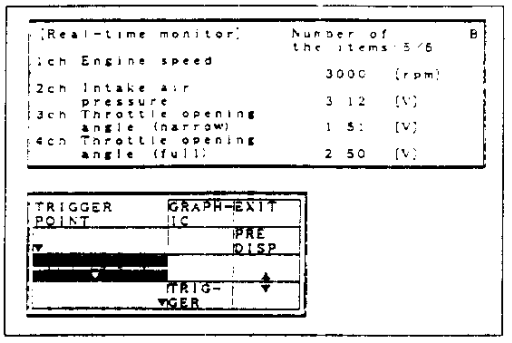
5. Verify indication of respective data item in each condition, referring to ECU terminal condition chart. (Refer to page F–166)



<Example>
When checking the of throtlle sensor operation pattern at engine speed and intake air pressure, the following steps are available.

Step 1.

Select the engine speed, intake air pressure and Throttlesensor from Basic signal.



Step 2.

Drive the vehicle and verify that the engine speed (rpm), intake air pressure (kPa), Throttlesensor output voltage (V) on the display.

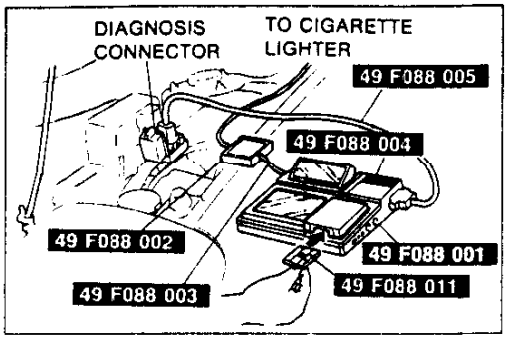
Note

- **Referring to the DT-S1000 instruction manual.**

SIMULATION FUNCTION (DT-S1000)

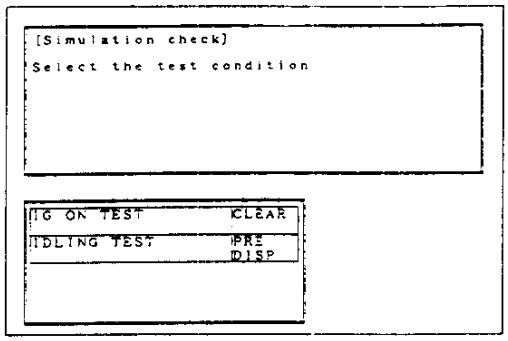
By using the simulation function, the following solenoid valves and relays can be externally driven. This function allows easy system checking.

Check condition	Simulation item	Operation
Ign ON	Solenoid valve (Turbo precontrol)	Driven with duty value of 50%
	Solenoid valve (Wastegate control)	Driven with duty value of 50%
	Solenoid valve (PURGE control)	Driven with duty valve of 50%
	Solenoid valve (Charge relief)	ON/OFF
	Solenoid valve (Charge control)	ON/OFF
	Solenoid valve (Turbo control)	ON/OFF
	Solenoid valve (Switching)	ON/OFF
	Solenoid valve (Relief1)	ON/OFF
	Solenoid valve (Relief2)	ON/OFF
	Solenoid valve (Port air bypass)	ON/OFF
	Solenoid valve (Split air bypass)	ON/OFF
	Solenoid valve (Pressure regulator control)	ON/OFF
	Solenoid valve (Double throttle control)	ON/OFF
	Solenoid valve (Exhaust gas recirculation)	ON/OFF
	Solenoid valve (Accelerated warm-up system)	ON/OFF
	Electric cooling fan relay	ON/OFF
	A/C relay	ON/OFF
	Air pump relay	ON/OFF
	F/P relay	ON/OFF
Idling	Injector (Front Primary)	Stopped
	Injector (Rear Primary)	Stopped
	Injector (Front primary)	Driven with 1 to 30% inclease or decrease injection time
	Injector (Rear primary)	
	Solenoid valve (Idle speed control [ISC])	Driven with any duty value
	Solenoid valve (Purge Control)	Driven with any duty valve
	Solenoid valve (Charge control)	ON/OFF
	Solenoid valve (Turbo control)	ON/OFF
	Solenoid valve (Switching)	ON/OFF
	Solenoid valve (Relief1)	ON/OFF
	Solenoid valve (Pressure regulation control)	ON/OFF
	Solenoid valve (Duoble throttle control)	ON/OFF
	Solenoid valve (Exhaust gas recirculation [EGR])	ON/OFF
	Solenoid valve (Accelerated warm-up system [AWS])	ON/OFF
	A/C relay	ON/OFF
	Air Pump relay	ON/OFF



Inspection Procedure

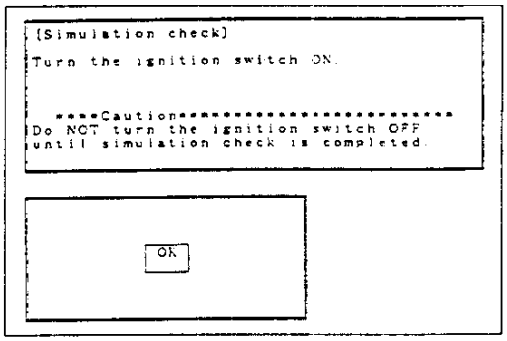
1. Connect the **DT-S1000** to the diagnosis connector as shown in figure.



2. Select the simulation function from the **DT-S1000** display.
3. Turn ignition switch ON.

Caution

- **Do not turn the ignition switch OFF until simulation check is completed.**



4. Select the check condition and simulation item.

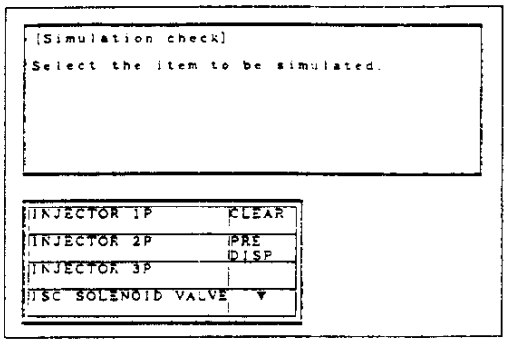
Note

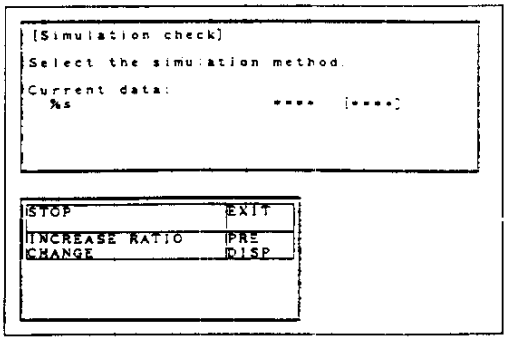
- **Selection item is 1.**

5. Start the engine, if necessary.
6. Verify operation (sound, engine condition, etc.) when solenoid valve or relay is ON.

Note

- **If the DT-S1000 displays "Communication error". Inspect the harness connected to the diagnosis connector, and perform the check again.**
- **Referring to the DT-S1000 instruction manual.**



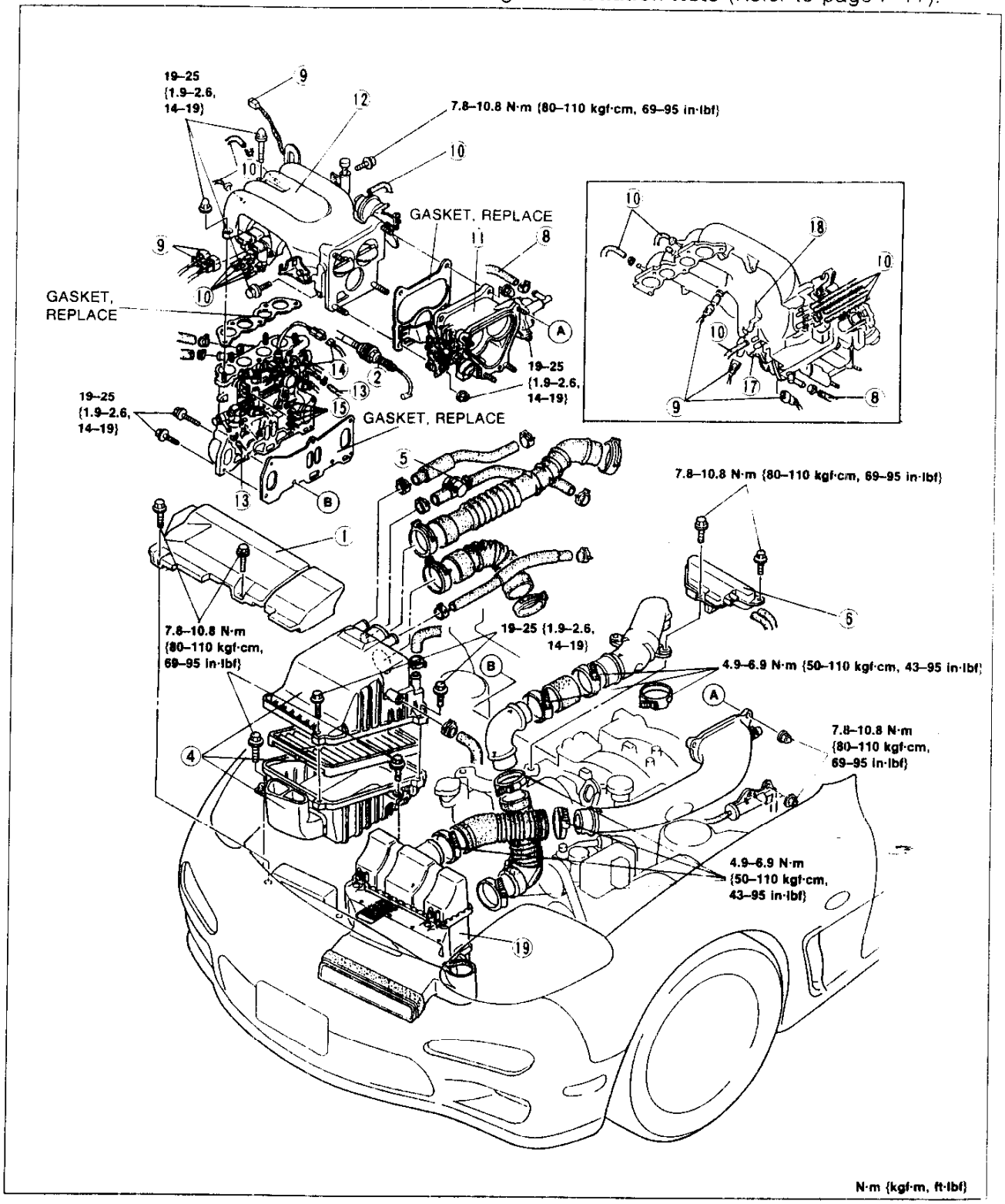


INTAKE AIR SYSTEM

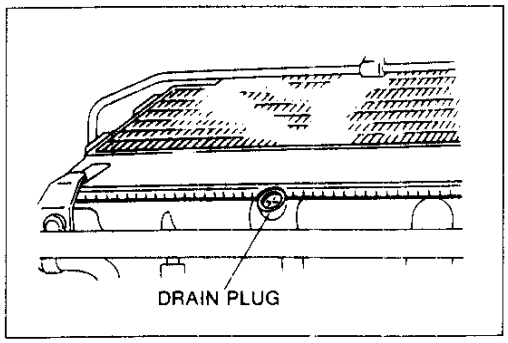
COMPONENT PARTS

Removal / Inspection / Installation

1. Remove in the order shown in the figure, reffering **Removal Note** (Refer to page F–77).
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal, reffering to **Installation Note** (Refer to page F–77).

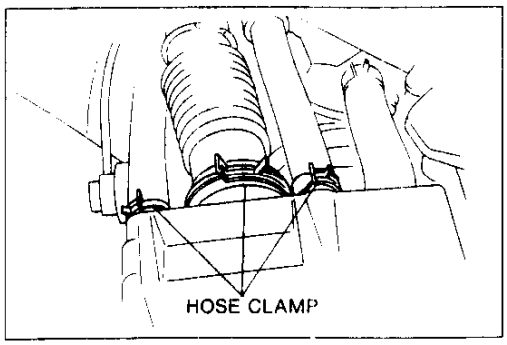


1. Fresh air duct
   Inspect for damage and cracks
2. Accelerator cable
3. Air intake hose
   Inspect for damage
4. Air cleaner
   Inspection ..... page F–16
5. Air bypass valve
   Inspection ..... page F–77
6. Pressure chamber
7. Air intake pipe
   Inspect for damage and cracks
8. Water hose
9. Connector
10. Vacuum hose
11. Throttle body
    Inspection ..... page F–79
12. Extension manifold
    Inspection ..... page F–79
13. Fuel hose
14. Connector
15. Vacuum hose
16. Intake manifold
    Inspection ..... page F–79
17. Solenoid valve (ISC)
    Inspection ..... page F–83
18. Solenoid valve (AWS)
    Inspection ..... page F–83
19. Intercooler
    Removal / Inspection / Installation ..... page F–78



Removal Note

1. Loosen the drain plug and radiator cap and drain the coolant from radiator.
2. Remove the water hose from the throttle body.
3. After installation of the throttle body, refill the radiator. (Refer to Section E)

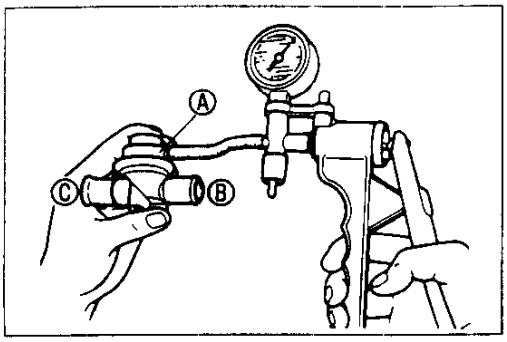


Installation Note

1. Install the air intake hoseclamp and hose same place as shown in figure.

Caution

- **Position the hose clamp in the original location on the hose, and squeeze it lightly with large pliers to ensure a good fit.**



AIR BYPASS VALVE

Inspection

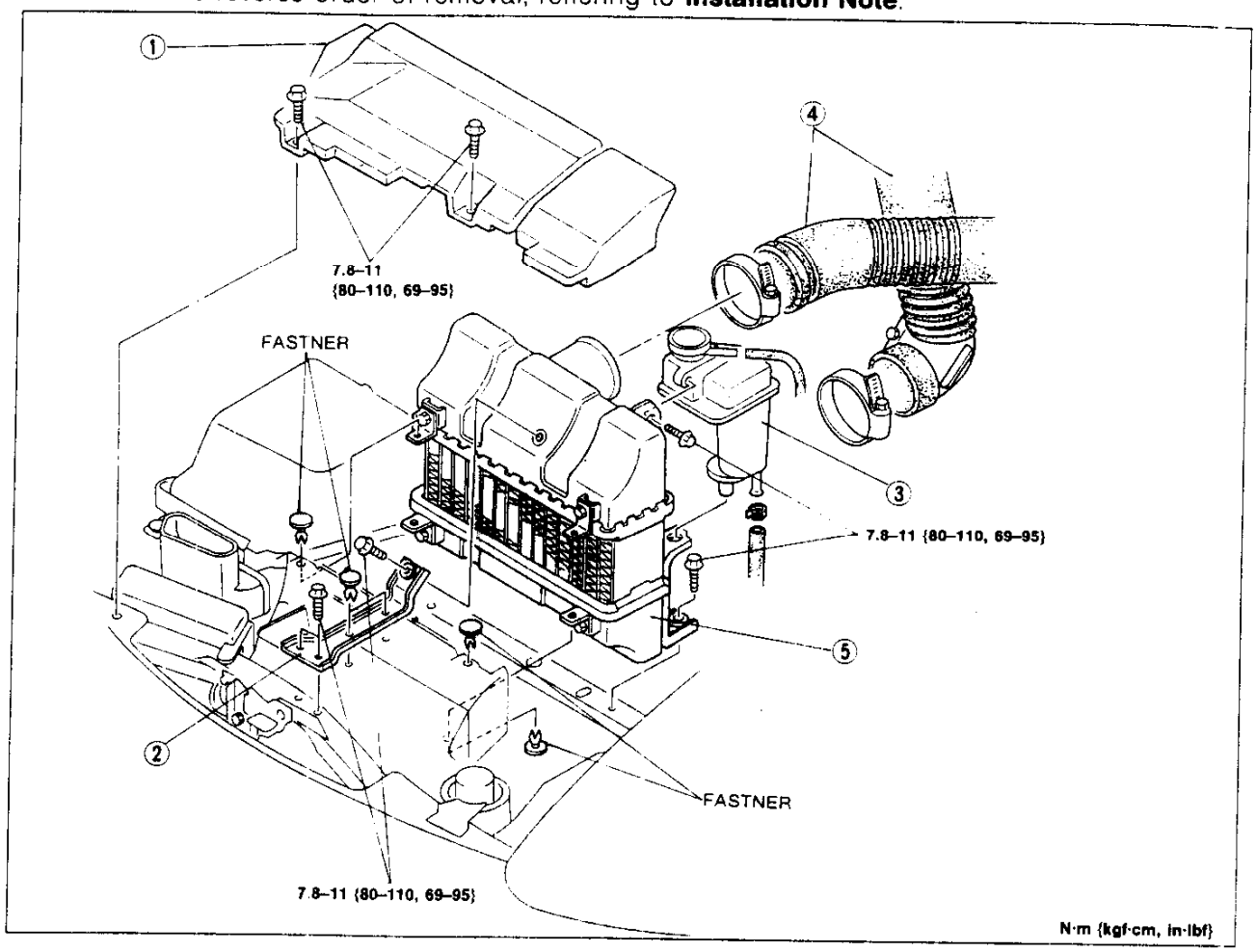
1. Remove the air bypass valve.
2. Connect a vaccum pump to the air bypass valve port A.
3. Check the operation of the air bypass valve.

Apply approx 14–22 kPa {100–170 mmHg, 3.9–6.7 inHg}	Air flow
Apply approx 31.3 kPa {235 mmHg, 9.2 inHg}	Fully open

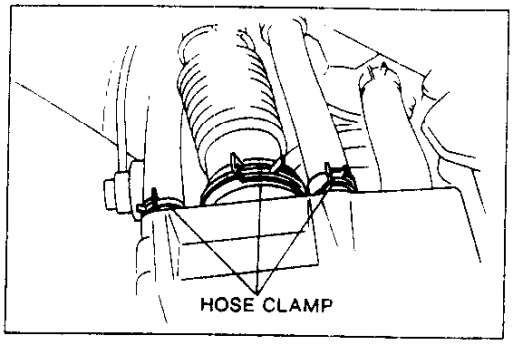
INTERCOOLER

Removal / Inspection / Installation

1. Remove in the order shown in figure.
2. Inspect the intercooler visually and repair or replace if necessary.
3. Install in the reverse order of removal, reffering to **Installation Note**.



1. Fresh air duct
2. Intercooler braket
3. Air separation tank
4. Air hose
5. Intercooler

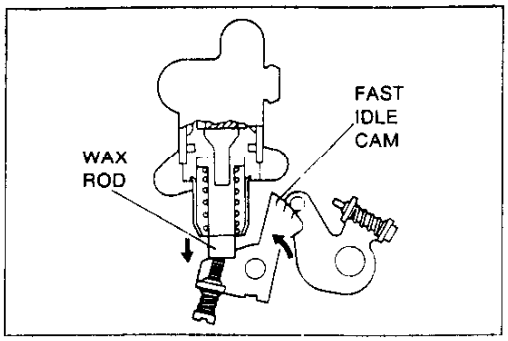


Installation Note

Install the air intake hose and hose clamp same place as show in figure.

Caution

- **Position the hose clamp in the original location on the hose, and squeeze it lightly with large pliers to ensure a good fit.**

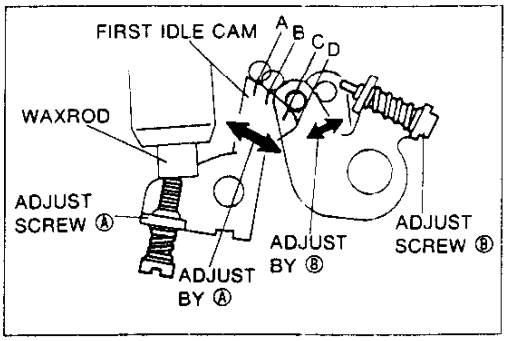


THROTTLE BODY

Inspection

Fast idle cam

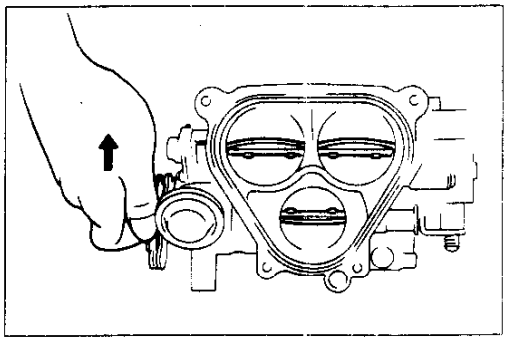
1. Verify that the indicated mark on the fast idle cam is aligned with the center of the cam.
2. Warm up the engine to operating temperature and verify that the waxrod extends outward fully and the idle cam separates from the roller at 55–65°C {131–149°F}.
3. Adjust the adjust screws if necessary.



Adjustment

1. To adjust the first idle cam separates point D turn adjust screw B.
2. To adjust the first idle cam opening temperature turn adjust screw A.

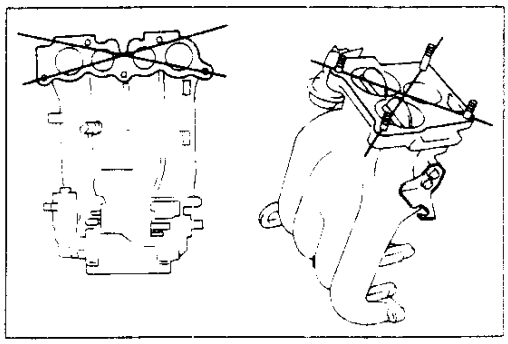
Temperature	Position
– 20°C {– 5°F}	A
0°C {0°F}	B
25°C {77°F}	C
60°C {140°F}	D



Double throttle valve

Inspection

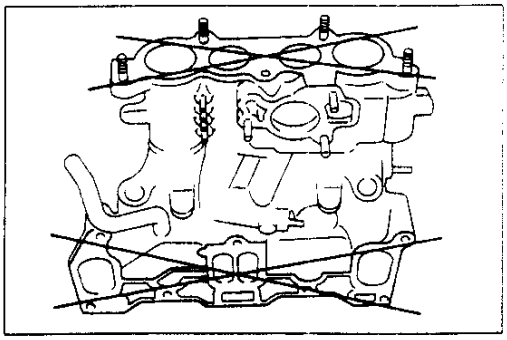
1. Verify that the No.2 secondary throttle valve and linkage move smoothly when primary throttle valve is fully opened.
2. Replace throttle body if necessary.



EXTENSION MANIFOLD

Inspection

1. Visually check for cracks or damage and replace it if necessary.
2. Check for distortion of extension manifold and replace if necessary.



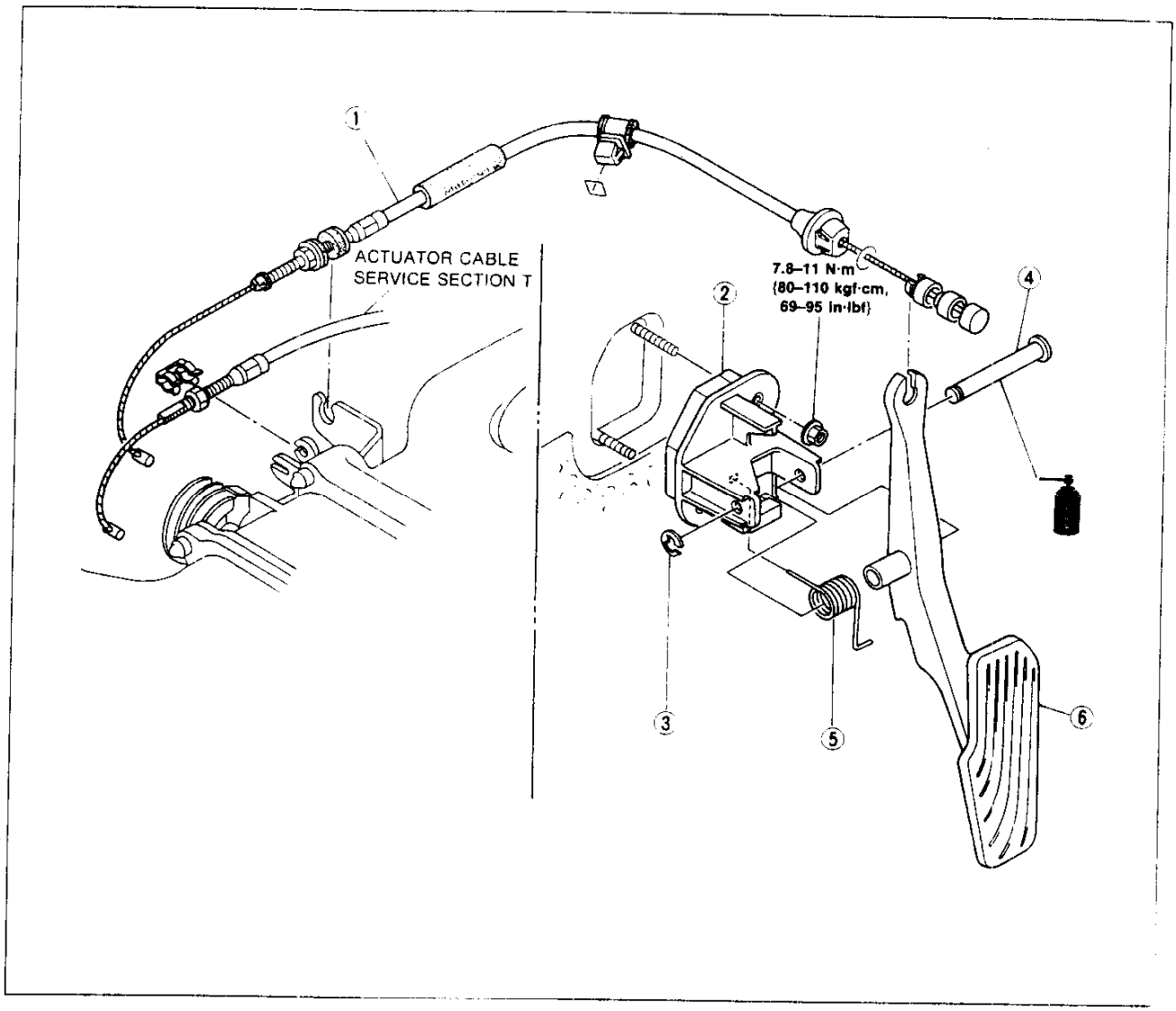
INTAKE MANIFOLD

1. Visually check for cracks or damage and replace if necessary.
2. Check for distortion of the intake manifold and replace it if necessary.

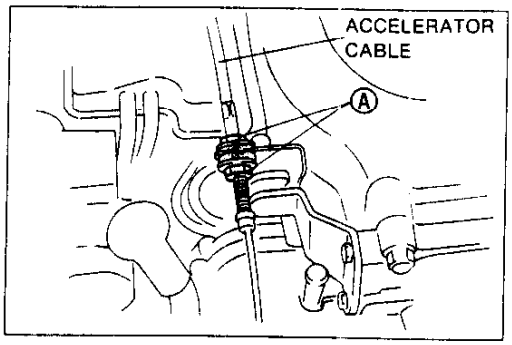
ACCELERATOR PEDAL

Removal / Inspection / Installation

1. Remove in the order as shown in the figure.
2. Visually check the accelerator pedal and retainer for cracks or damage.
3. Install in the reverse order of removal.



1. Accelerator cable
   Inspection / Adjustment ..... below
2. Retainer
3. Clip
4. Shaft
5. Return spring
6. Accelerator pedal



ACCELERATOR CABLE

Inspection / Adjustment

1. Warm up the engine at normal operating temperature.
2. Depress the accelerator pedal to the floor and check that the throttle valve is fully opened.
3. Inspect the play of the accelerator cable.

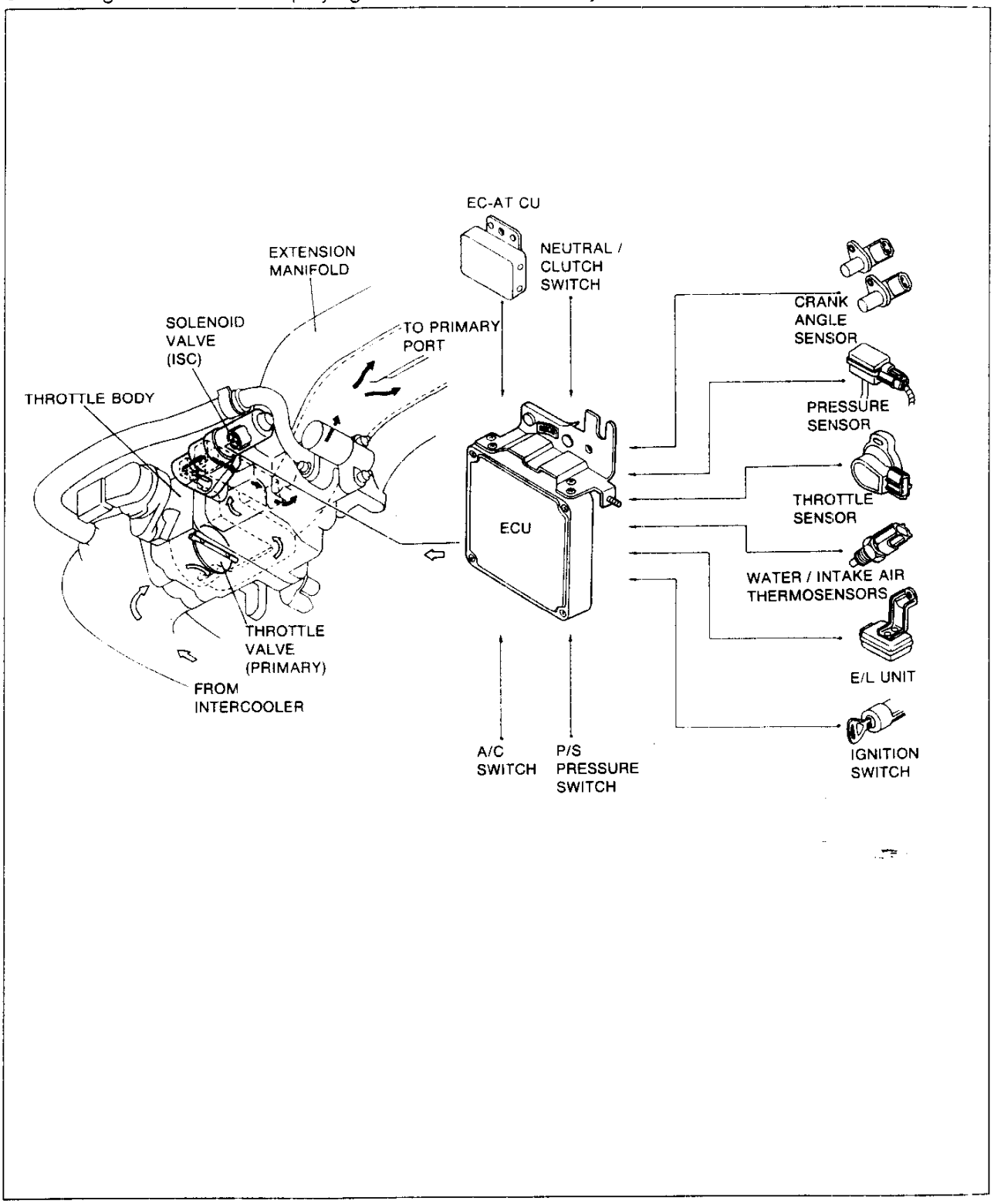
Play: 1–3 mm {0.04–0.12 in}

4. Loosen nuts A to adjust the play if necessary.

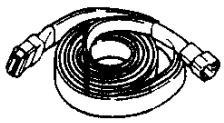
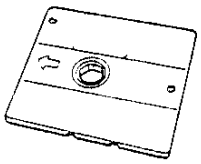
IDLE-SPEED CONTROL (ISC) SYSTEM

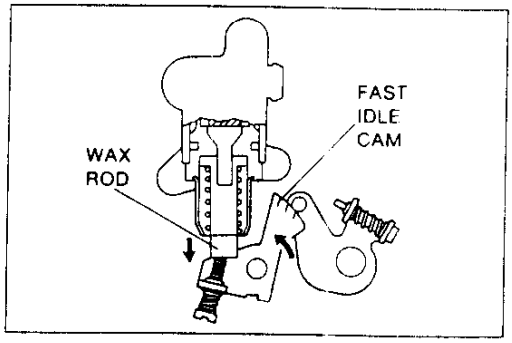
DESCRIPTION

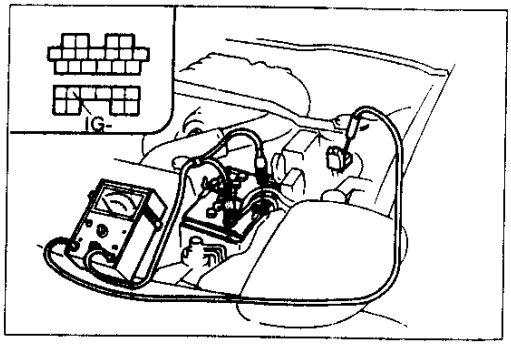
Idle speed control (ISC) system controls the bypass air amount that passes through the throttle valve, the idle-speed control system performs feedback control so that engine idle smoothly and at the target speed. The system also performs the function of the AAV (anti-afterburns valve), thereby eliminating the AAV and simplifying deceleration control system.

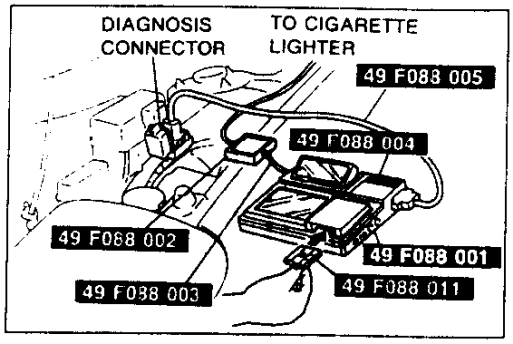


PREPARATION
SST

49 F088 001 DT-S1000 Base unit 	For inspection of solenoid valve and relay	49 F088 002 Power unit (DC12V) 	For inspection of solenoid valve
49 F088 003 Harness Power unit 	For inspection of solenoid valve	49 F088 004 Interface adapter Type-1 	For inspection of solenoid valve
49 F088 005 Harness Type-1 	For inspection of solenoid valve	49 F088 011 System disk Type-1 (Ver 1.00) 	For inspection of solenoid valve







SYSTEM OPERATION

1. Warm up the engine and run it idle.
2. Verify that the fast idle cam separates.
3. Turn all electrical loads OFF.

Note
- **Check the idle speed with the electric cooling fan not operating.**

4. Connect a tachometer to the diagnosis connector terminal IG-
5. Verify that the idle speed is within specification.

Idle speed (Neutral or P range): 700–750 (720 $^{+30}_{-20}$) rpm

6. Verify that the idle speed is within specification under the condition below.

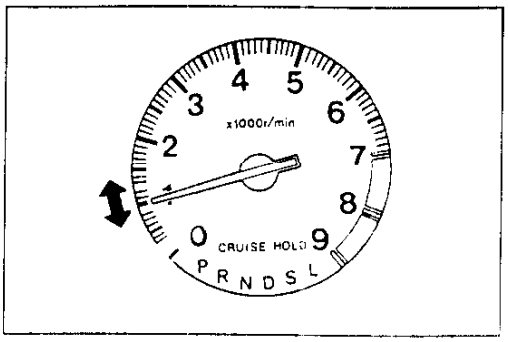
Condition	Idle speed (rpm)	
	M/T	A/T
No load	700–750 (720 $^{+30}_{-20}$)	
Electrical load ON	775–825	
Air conditioner ON	875–925	775–825

DT-S1000

1. Warm up the engine and run it idle.
2. Verify that the fast idle cam separates.
3. Connect the **SST** to the diagnosis connector.

Note
- **Check the idle speed with the electric cooling fan not operating.**

4. Connect a tachometer to the diagnosis connector terminal IG-

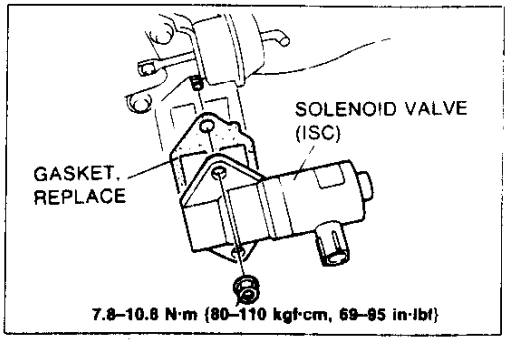


5. Verify that the idle speed is within specification.

Idle speed (Neutral or P range): 700–750 (720 ±30) rpm

6. Select simulation function and verify that the idle speed decrease and increase as the duty cycle changed.

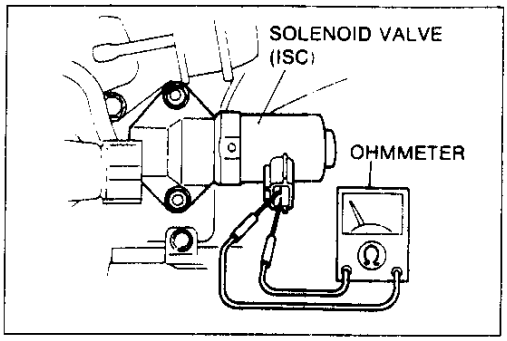
Standard Idle duty: 32–65 %



SOLENOID VALVE (IDLE SPEED CONTROL [ISC])

Removal / Installation

1. Disconnect Negative battery cable.
2. Remove the extension manifold. (Refer to Page F–76)
3. Disconnect the solenoid valve connector.
4. Remove the solenoid valve (ISC) as shown in figure.
5. Install in the reverse order of removal.

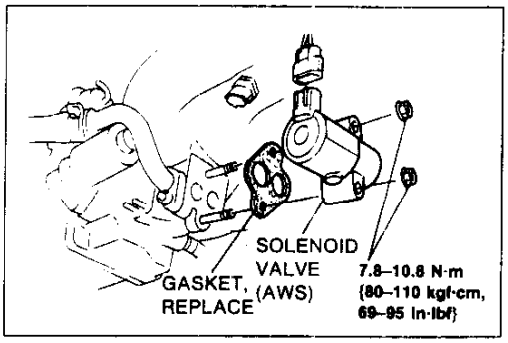


Inspection

1. Remove the solenoid valve. (Refer to above)
2. Measure the solenoid valve resistance with an ohmmeter.

Resistance: 10.7–12.3 Ω (20°C {68°F})

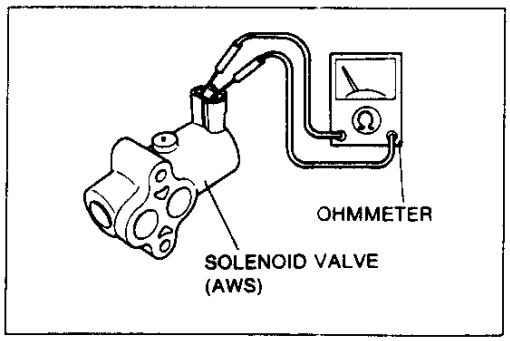
3. If not as specified, replace solenoid valve.



SOLENOID VALVE (ACCELERATED WARM-UP SYSTEM [AWS])

Removal / Installation

1. Disconnect Negative battery cable.
2. Remove the extension manifold. (Refer to Page F–76
3. Disconnect the solenoid valve connector.
4. Remove the solenoid valve (AWS) as shown in figure
5. Install in the reverse order of removal.



Inspection

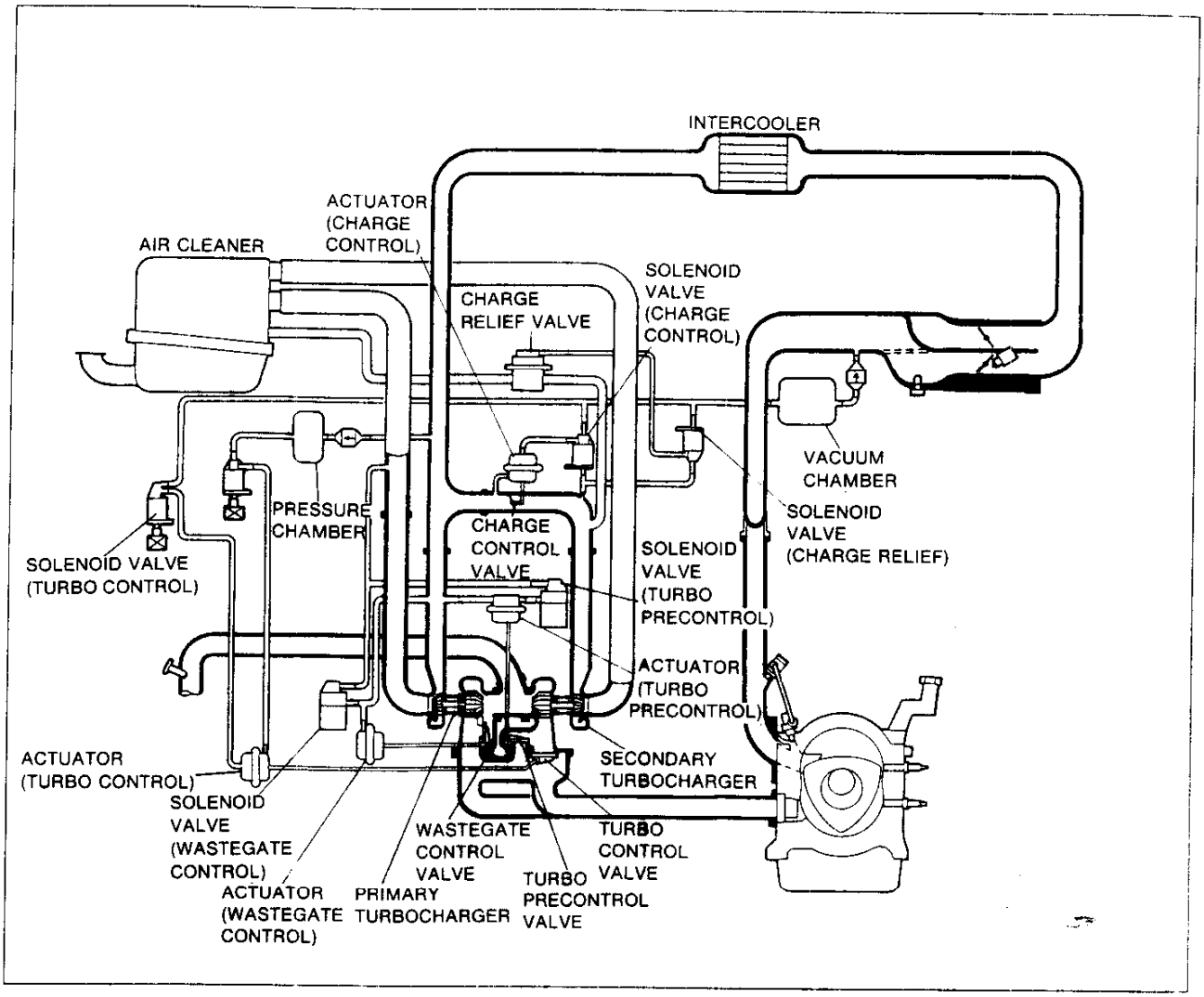
1. Remove the solenoid valve (Refer to above F–76)
2. Measure the solenoid valve resistance with an ohmmeter

Resistance: 9.3–11.3 Ω (20°C {68°F})

3. If not as specified, replace solenoid valve.

SEQUENTIAL TWIN TURBOCHARGER SYSTEM

- The sequential twin turbocharger system consists of two turbochargers (primary and secondary) fitted in line with each other. In the low-speed, light-load range, turbocharging is done only by the primary turbocharger; in the high-speed, heavy-load range, turbocharging is done by the primary and secondary turbochargers in union.
- To prevent a drop of boost pressure when the secondary turbocharger begins to operate, the secondary turbocharger is made to spin prior to its operation.
- The sequential twin turbocharger system consists of the primary and secondary turbochargers and the actuators and solenoid valves (turbo precontrol, turbo control, wastegate control, charge control, charge relief).

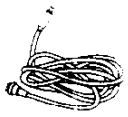
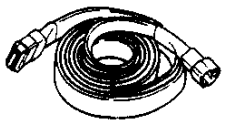
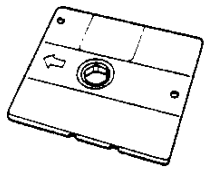
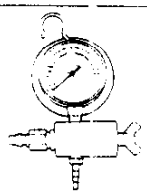
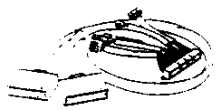


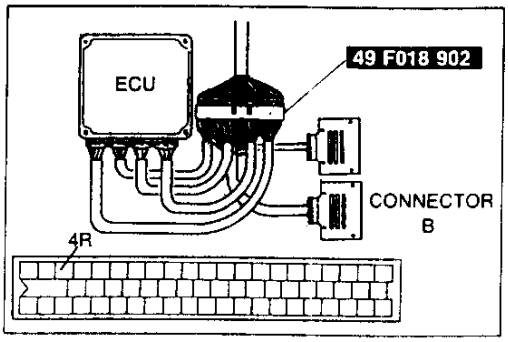
37U0FX-519

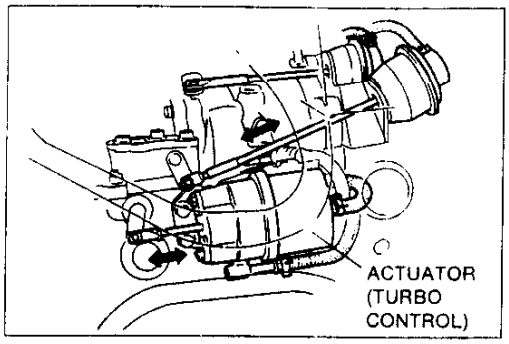
Operation

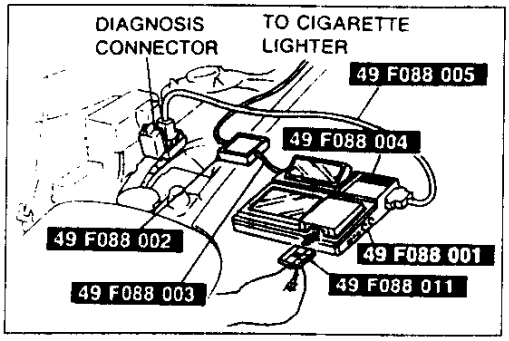
Devices \ Engine speed		Low-speed → High-speed Light-load → Heavy-load		
Turbocharger	Primary	Boost pressure		
	Secondary	Stop	Preliminary rotation	Boost
Solenoid valve	Turbo precontrol	Duty control		Duty 5% (Fully open)
	Wastegate control	Duty 95% (Fully closed)		Duty control
	Charge relief	OFF		ON
	Charge control	ON		OFF
	Turbo control	OFF		ON

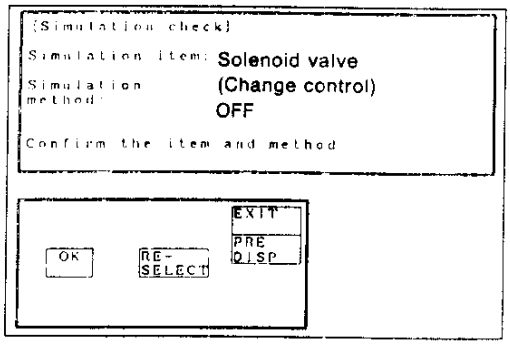
PREPARATION
SST

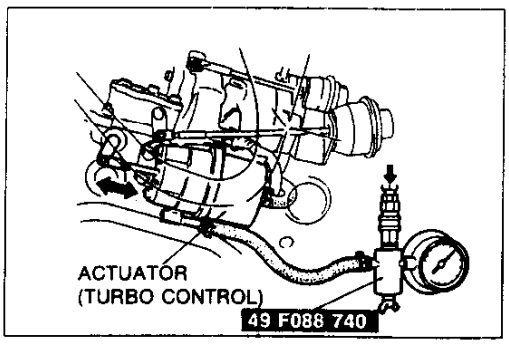
49 F088 001 DT-S1000 Base unit 	For inspection of solenoid valve	49 F088 002 Power unit 	For inspection of solenoid valve
49 F088 003 Harness power unit 	For inspection of solenoid valve	49 F088 004 Interface adapter type-1 	For inspection of solenoid valve
49 F088 005 harness type-1 	For inspection of solenoid valve	49 F088 011 System disk type-1 (V1.00) 	For inspection of solenoid valve
49 F088 740 Pressure tester 	For inspection of turbocharger	49 F018 902 Adapter harness 	For inspection of solenoid valve











ACTUATOR (TURBO CONTROL [TCNT])

System Operation

Engine signal monitor

1. Connect the **SST** (Engine signal Monitor Adaptor Harness) to the ECU as shown.
2. Start the engine and verify that the actuator rod is moved once.
3. Run it idle.
4. Short the ECU terminal 4R and verify that the actuator rod is pulled into the actuator.
5. If the actuator rod is not moved, check the following condition below.

- Vaccum tube
  Inspect vaccum line fitting, connections and components for leaks. (Refer to page F–10)
- Vaccum and pressure chamber
  Visually check for clogging damage or crack.
- Solenoid valve (Turbo control)
  Inspection (Refer to page F–190)
- Actuator (Turbo control)
  Inspection (Refer to below)

DT-S1000

1. Connect the **SSTs** (DT-S1000 and Harness) to the Diagnosis connector as shown.
2. Start the engine and run it idle.
3. Select the simulation check and verify that the actuator rod is moved when solenoid valve ON and OFF.
4. If the actuator rod is not moved, check the condition above.

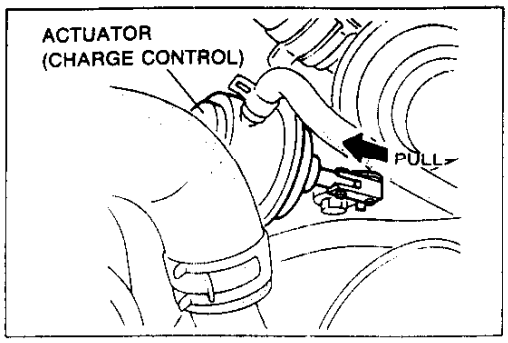
Inspection

1. Disconnect the air hose and attached it to the **SST** as shown.
2. Adjust the compressioned air pressure to 49 kPa. {0.5 kg·f/cm^2, 7.1 psi}
3. Verify that the actuator rod is move when appying and releasing air pressure.

Caution

- **Do not apply compressed air higher than 79.4 kPa {0.81 kg·f/cm^2, 11.5 psi}.**

4. If not as specified replace the actuator. (Refer to page F–91)

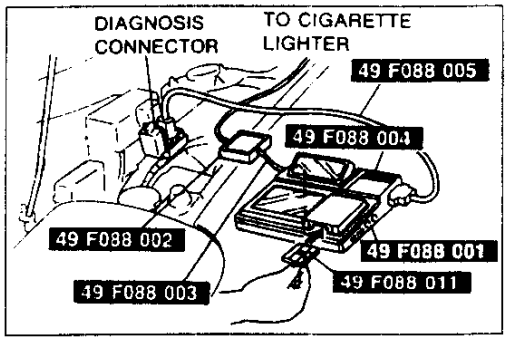


ACTUATOR (CHARGE CONTROL)

System Operation

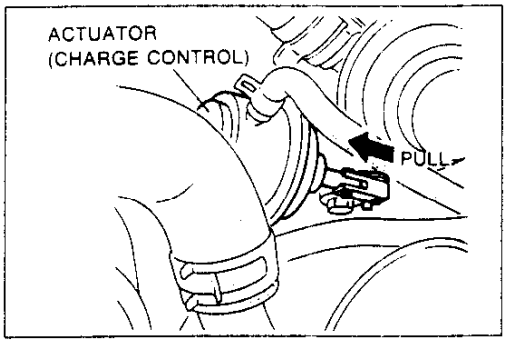
1. Start the engine and verify that the actuator rod is pulled into the actuator.
2. If the actuator rod is not pulled, check the following condition below.

- Vacuum tube
  Inspect vaccum line fitting, connections and components for leak. (Refer to page F–10)
- Vacuum chamber
  Inspect the damage or crack.
- Solenoid valve (Charge control)
  Inspection (Refer to page F–190)
- Actuator (Charge control)
  Inspection (Refer to below)
- Shutter valve
  Inspection (Refer to below)

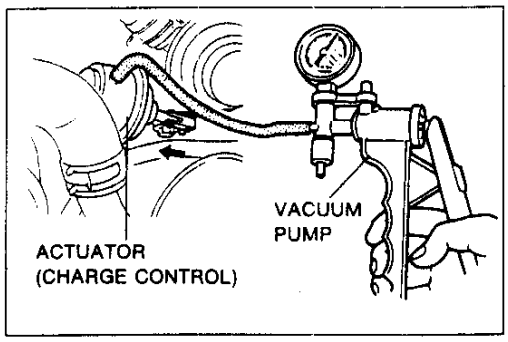


DT-S1000

1. Connect the **SSTs** (DT-S1000 and Harness) to the diagnosis connector as shown.

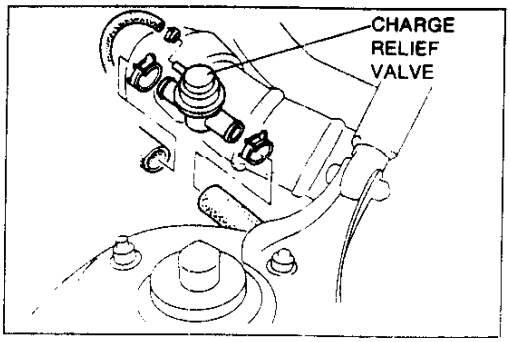


2. Select the simulation function and verify that the actuator rod is pulled when solenoid valve OFF.
3. If the actuator rod is not pulled, check the condition above.



Inspection

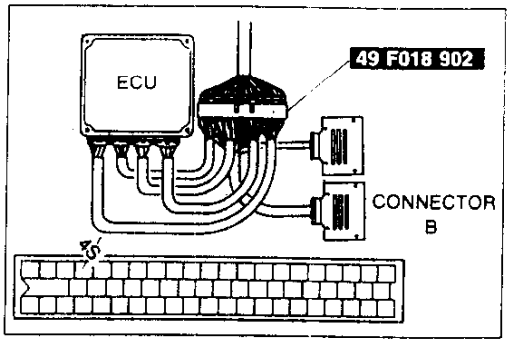
1. Disconnect the vacuum hose from the actuator.
2. Connect a vacuum pump.
3. Verify that the actuator rod is pulled when applying vacuum more than 6.7 kPa {50 mmHg, 1.9 inHg}
4. If not as specified, replace the actuator. (Refer to page F–91)



CHARGE RELIEF VALVE

Removal / Installation

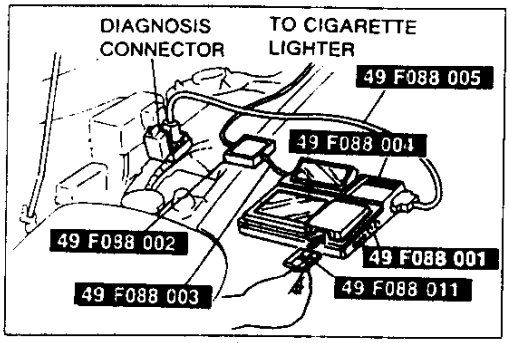
1. Remove in the order shown in figure.
2. Install in the reverse order of removal.



Engine Signal Monitor

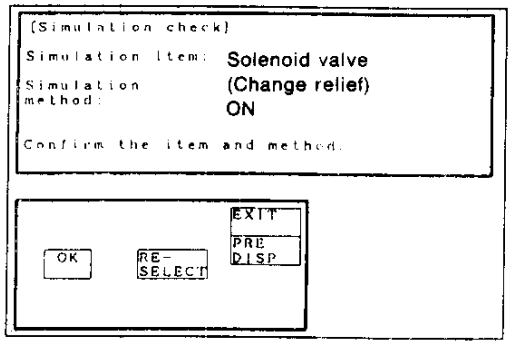
System operation

1. Connect the **SST** (Engine Signal Monitor Adaptor Harness) to the ECU as shown.
2. Turn ignition switch to ON.
3. Short the ECU terminal 4S and verify that the operating sound is heard when the solenoid valve ON.
4. If no sound is heard, check the solenoid valve. (Refer to page F–190)

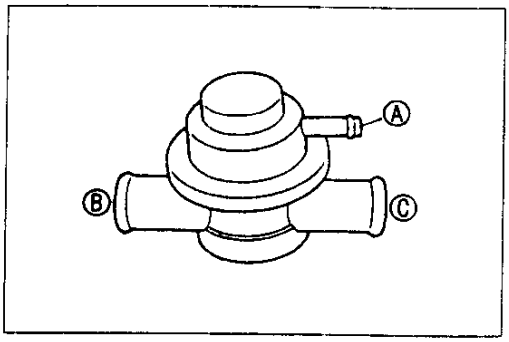


DT-S1000

1. Connect the **SSTs** (DT-S1000 and Harness) to the diagnosis connector.
2. Turn ignition switch to ON.

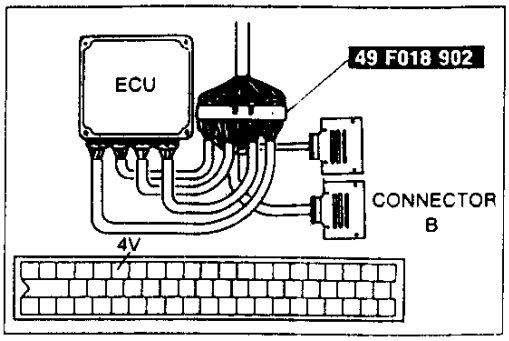


3. Select the simulation function and verify that the operating sound is heard when the solenoid valve ON and OFF.
4. If no sound is heard, check the solenoid valve. (Refer to page F–190)



Inspection

1. Remove the charge relief valve.
2. Connect a vacuum pump to port A.
3. Apply approx 26.7 kPa {200 mmHg, 7.87 inHg} to port A and verify that air flows between B and C.
4. Replace if necessary.



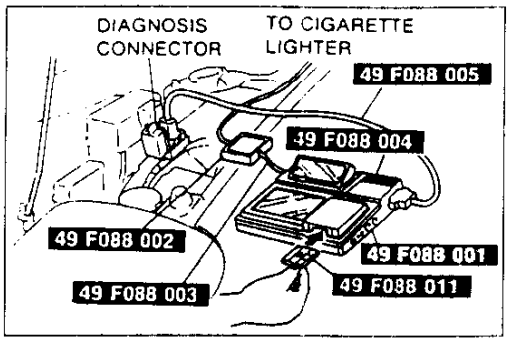
TURBOCHARGER

Actuator (Turbo precontrol)

Engine Signal Monitor

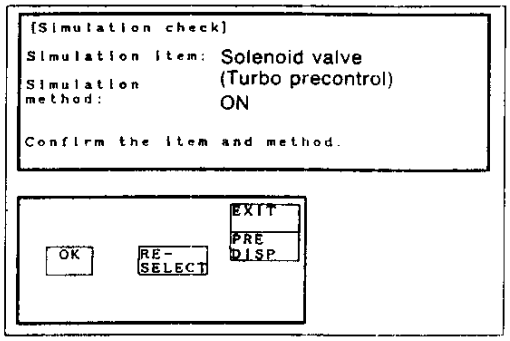
System operation

1. Connect the **SST** (Engine Signal Monitor Adaptor Harness) to the ECU.
2. Turn ignition switch to ON.
3. Short the ECU terminal 4V and verify that the operating sound is heard.
4. If no sound is heard, check the solenoid valve. (Refer to page F–93)

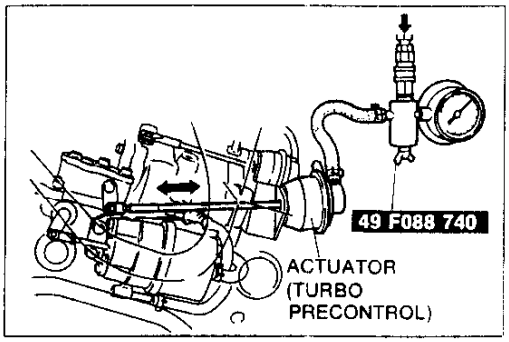


DT-S1000

1. Connect the **SSTs** (DT-S1000 and Harness) to the Diagnosis connector as shown.
2. Turn ignition switch to ON.



3. Select the simulation function and verify that the operating sound is heard when solenoid valve ON and OFF.



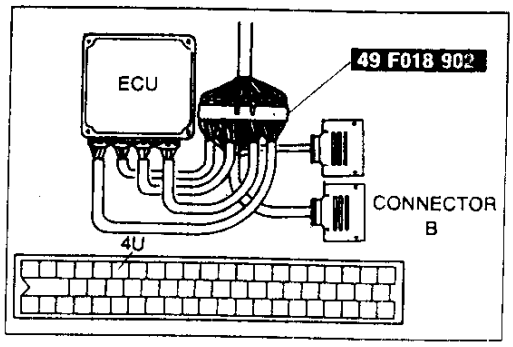
Inspection

1. Disconnect the air hoses and attached one to the **SST** and plug the other pipe as shown.
2. Verify that the actuator rod is moved when applying compressed air pressure to 69–98 kPa {0.7–1.0 kgf/cm^2, 10–14 psi}

Caution

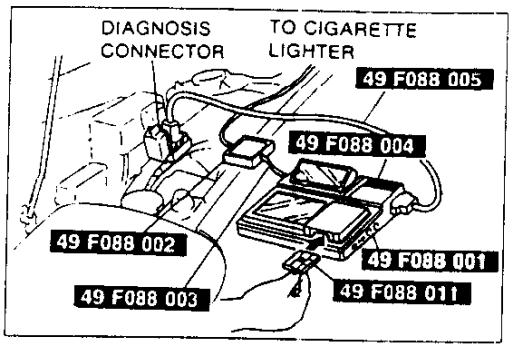
- **Do not apply compressed air higher than 98 kPa {1.0 kgf/cm^2, 14 psi}**

3. Replace turbocharger, if necessary. (Refer to page F–91)



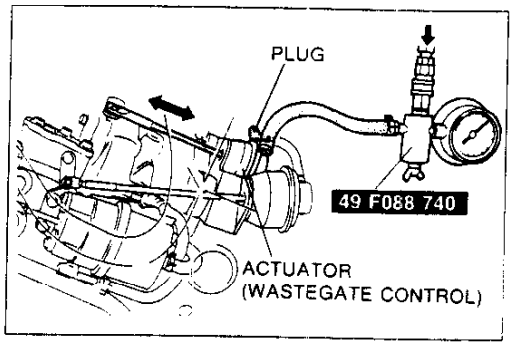
Actuator (wastegate control)
Engine Signal Monitor
System Operation

1. Connect the **SSTs** (Engine Signal Monitor and Adaptor Harness) to the ECU.
2. Turn ignition switch to ON.
3. Short the ECU terminal 4U and verify that the operating sound is heard.
4. If no sound is heard check the solenoid valve (Refer to page F–93)



DT-S1000

1. Connect the **SSTs** (DT-S1000 and Harness) to the Diagnosis connector as shown.
2. Turn ignition switch to ON.
3. Select the simulation function and verify that the operating sound is heard when solenoid valve ON and OFF.



Inspection

1. Disconnect the air hoses and attached one to the **SST** and plug the other pipe as shown.
2. Verify that the actuator rod is moved when applying pressed air pressure to 69–98 kPa {0.7–1.0 kgf/cm^2 10–14 psi}

Caution
- **Do not apply compressed air higher than 98 kPa {1.0 kgf/cm^2 14 psi}**

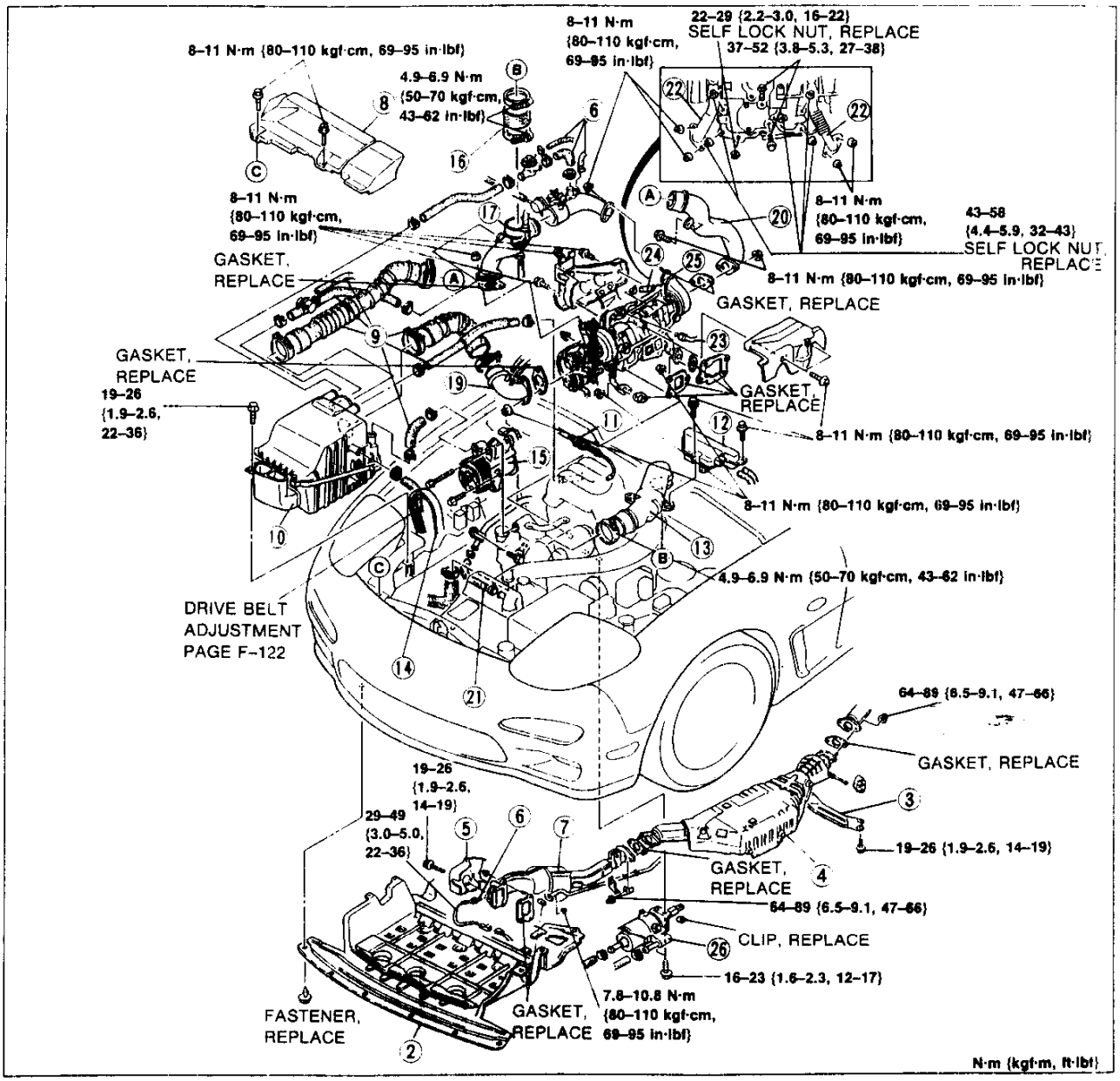
3. Replace turbocharger, if necessary. (Refer to page F–91)

Removal / Installation

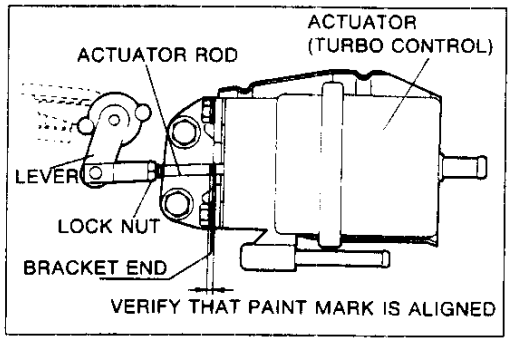
Caution

- **Be careful of following points after turbocharger removal.**
- **Do not hold the actuator rod or hose when carring the turbocharger.**
- **Do not damage the actuator and actuator rod.**
- **Cover the turbocharger compressor air inlet / outlet, turbine exhaust inlet / outlet and oil passage to prevent dirt or other material from entering**
- **Set the turbocharger down with turbine shaft horizontal.**
- **Use the specified new studs when installing the turbocharger.**

1. Disconnect the negative battery cable.
2. Lift up the vehicle.
3. Drain the engine coolant.
4. Remove in the order shown in the figure.
5. Install in the reverse order of removal, reffering to **Installation Note**.

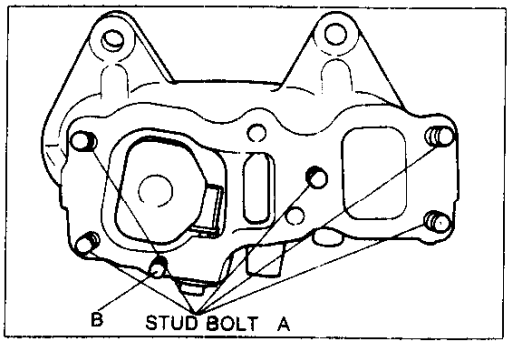


1. Negative battery cable
2. Under cover
3. Braket
4. Main converter assembly
5. Insulator
6. Oxygen sensor
7. Front converter
8. Fresh air duct
9. Air hoses
10. Air cleaner
11. Accelerater cable
    Removal / Installation ..... page F–80
    Inspection / Adjustment ..... page F–80
12. Pressure chamber
13. Air pipe
14. Drive belt
15. Air pump
16. Air hose
17. Air pipe
18. Charge control valve assembly
    Inspection ..... page F–87
19. Air intake pipe (Secondary)
20. Air intake pipe (Primary)
21. Water hose
22. Oil return pipes
23. Oil pipe
24. Water hose
25. Turbocharger
    Inspection ..... below
26. Actuator (Turbo control)
    Inspection ..... page F–86



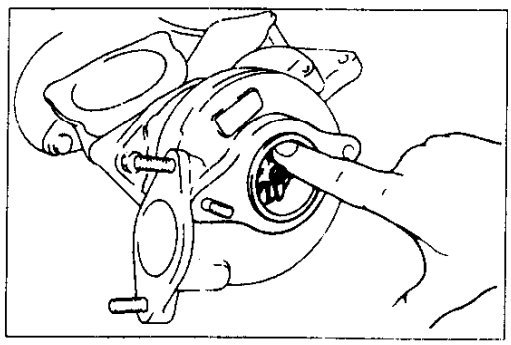
Installation Note

1. Verify that the paint mark on the actuator rod is aligned with actuator braket end.
2. If the mark is not aligned, adjust the actuator rod length



3. Check the stud bolt tighting torque before installing turbocharger.

Tighting torque
A: 16–24 N·m {1.6–2.4 kgf·m, 12–17 ft·lbf}
B: 8–12 N·m {0.8–1.2 kgf·m, 5.8–8.7 ft·lbf}



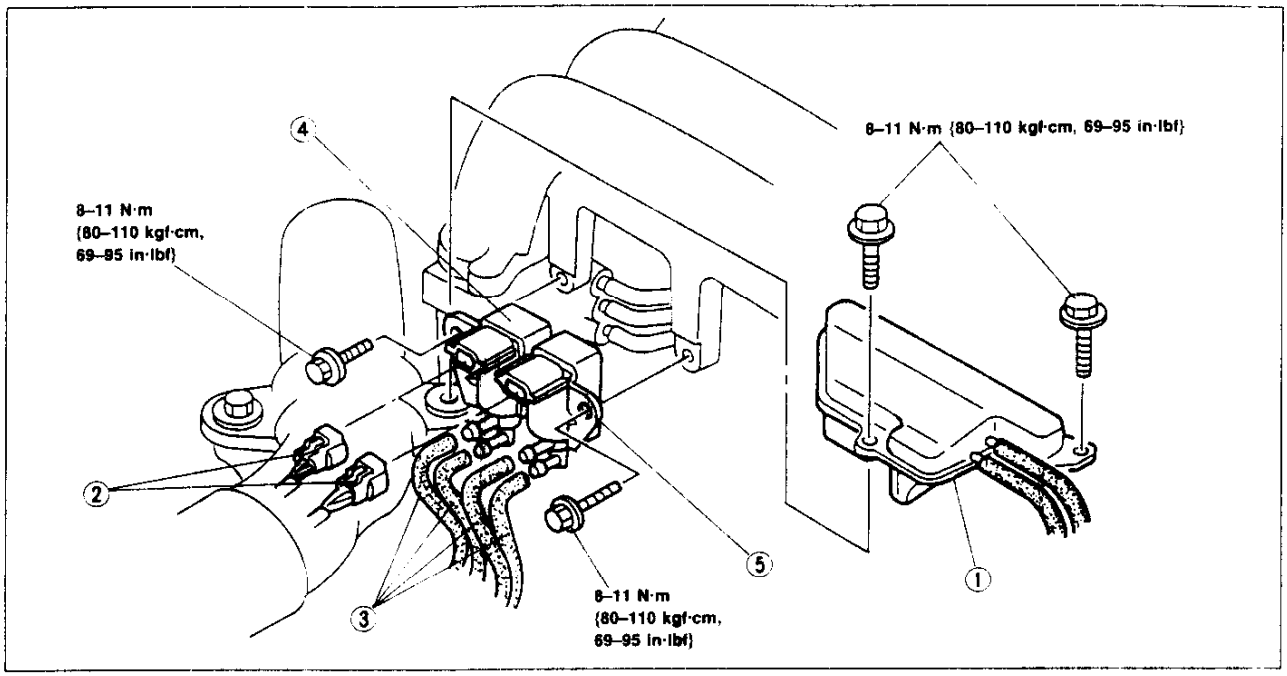
Inspection

1. Be sure the engine is cool
2. Remove the turbocharger.
3. Check that the compressor wheel assembly turns smoothly.
4. If there is excessive drag or noise, replace the turbocharger.

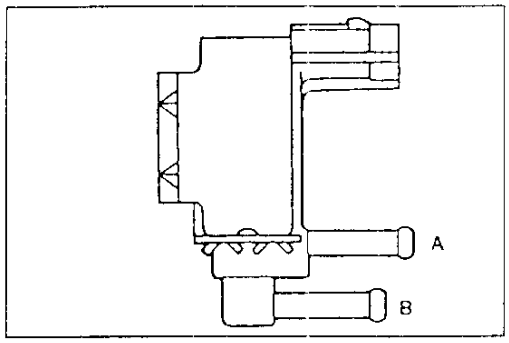
SOLENOID VALVE (TURBO PRECONTROL, WASTEGASTE CONTROL)

Removal / Installation

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

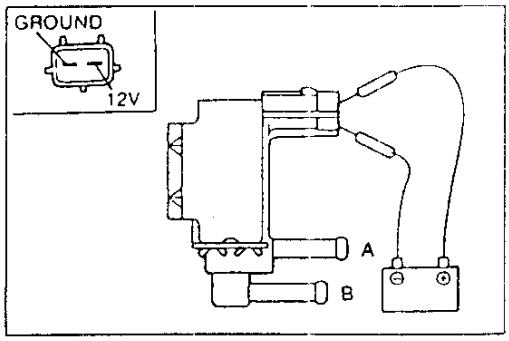


1. Pressure chamber
2. Connectors
3. Vaccum hoses
4. Solenoid valve. (Turbo precontrol)
   Inspection ..... below
5. Solenoid valve. (Wastegate control)
   Inspection ..... below



Inspection

1. Remove the solenoid valve.
2. Blow through the solenoid valve from hose A and check that air does not flows from B to A.



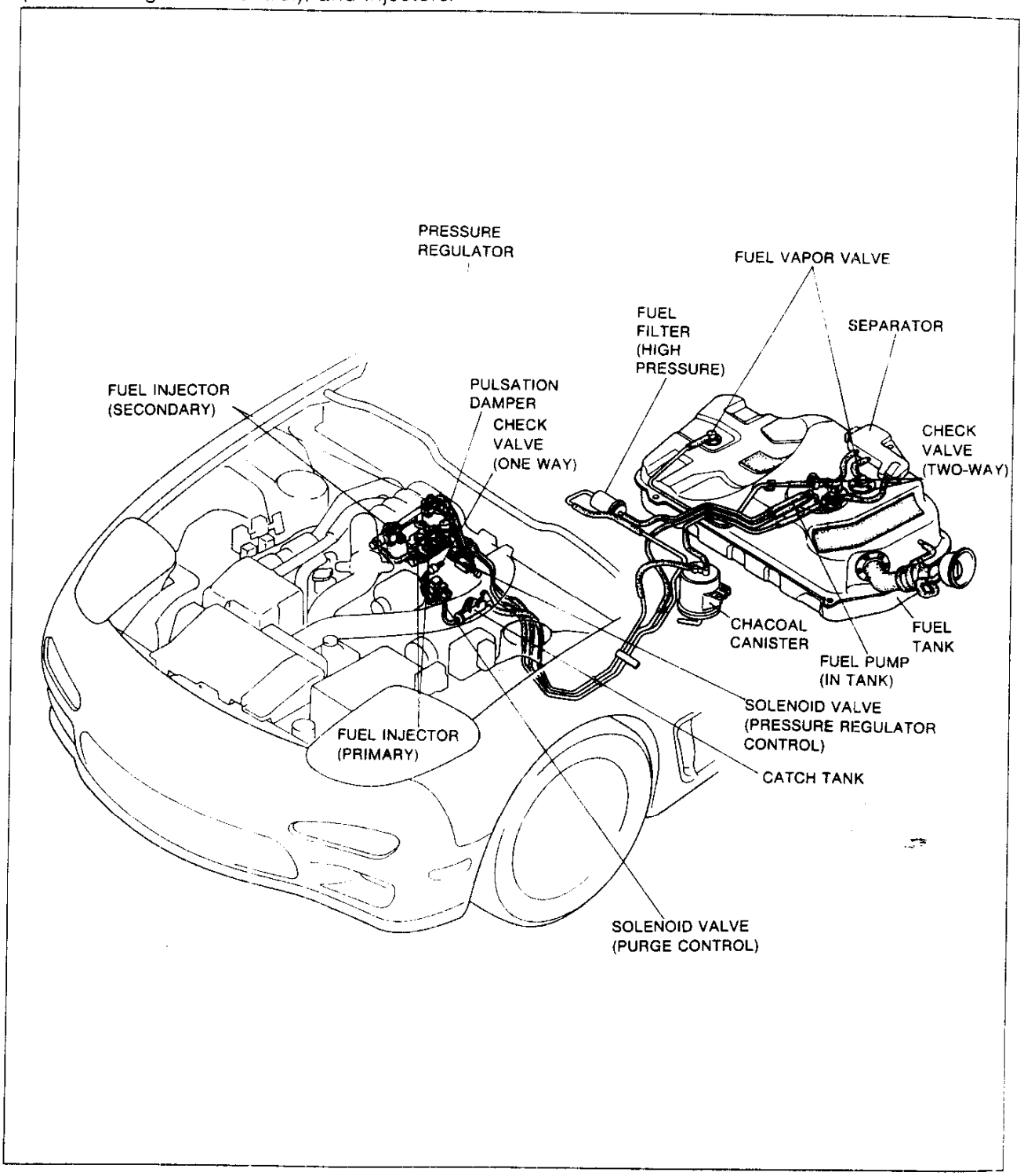
3. Apply battery voltage to solenoid valve and check that air does flow the solenoid valve from A to B.
4. If not as specified measure the resistance.

Resistance: 29–33 Ω {20°C [68°F]}

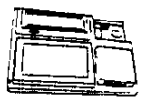
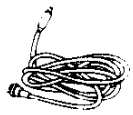
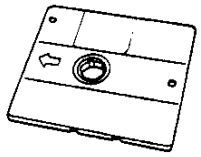
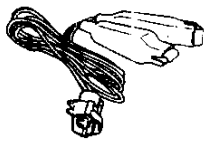
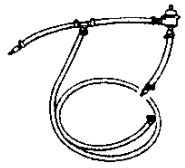
FUEL SYSTEM

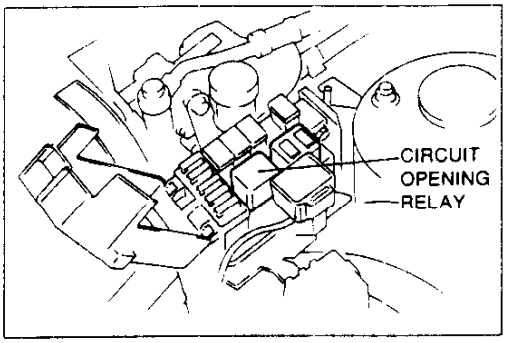
DESCRIPTION

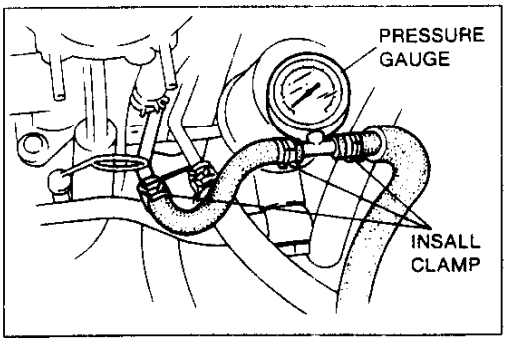
This system supplies the necessary fuel at constant pressure to the injectors.
Fuel is metered and injected into intake manifold and intake port according to the injection control signals from the ECU. (Engine Control Unit)
This system consists of fuel pump, fuel filters, pressure regulator, pulsation dumper, solenoid valve (Pressure regulator control), and injectors.



PREPARATION
SST

49 F088 001 DT-S1000 Base unit 	For inspection of relay	49 F088 002 Power unit DC-12V 	For inspection of relay
49 F088 003 Power unit Harness 	For inspection of relay	49 F088 004 Interface Adaptor Type-1 	For inspection of relay
49 F088 005 Harness Type-1 	For inspection of relay	49 F088 011 System disk Type-1 (Ver 1.00) 	For inspection of relay
49 L018 901 Injector checker 	For inspection of injector	49 F013 102 Injector checker Hose 	For inspection of injector





PRECAUTION

Fuel Pressure Release and Servicing Fuel system

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

Before disconnecting any fuel line, release the fuel pressure from the fuel system as described to reduce the posibility of injury or fire.

1. Start the engine.
2. Remove the circuit opening relay.
3. After the engine stalls, turn OFF the ignition switch.
4. Install the circuit opening relay.

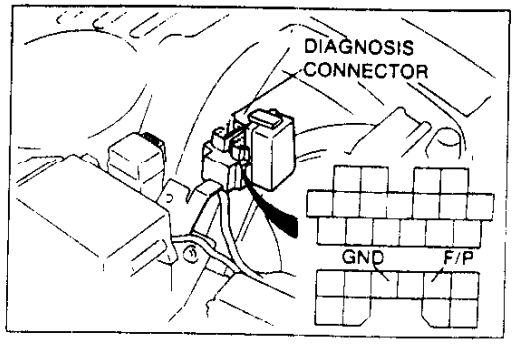
Use a rag as protection from fuel spray when disconnecting the hoses.

Plug the hoses after removal.

When inspecting the fuel system, use a fuel pressure gauge.

Caution

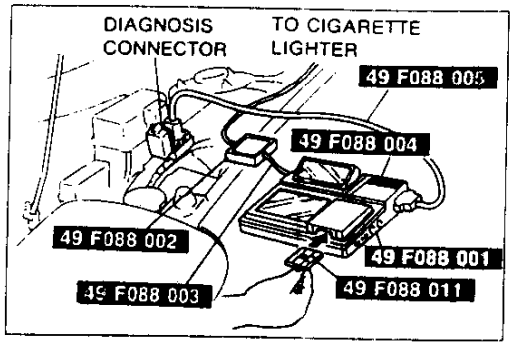
- **Install hose clamps to secure the fuel pressure gauge to the fuel pipe and the fuel main hose to prevent fuel leakage.**



Priming Fuel System

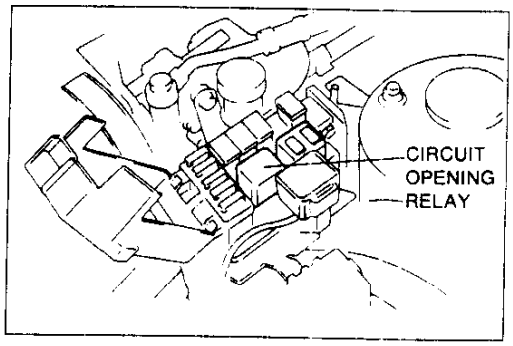
After releasing the fuel pressure for repairs or inspection, the system must be primed to avoid excessive cranking when first starting the engine. Follow the steps below.

1. Connect the diagnosis connector terminals **F/P** and **GND** with a jumper wire.
2. Turn the ignition switch ON for Approximately 10 (ten) seconds and check for fuel leaks.
3. Turn the ignition switch OFF and remove the jumper wire.



SYSTEM OPERATION

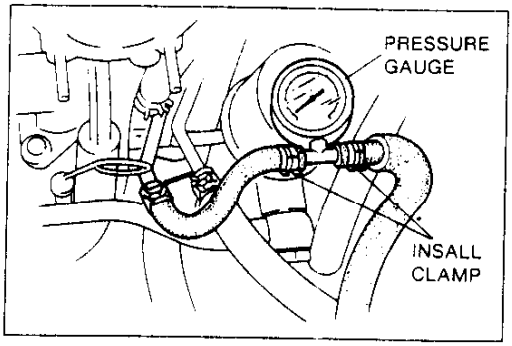
1. Connect the **SSTs** (DT-S1000 and Harness) to the diagnosis connector.
2. Start the engine and run it idle.
3. Select the simulation check and verify that the engine speed is dropped when injector stopped.



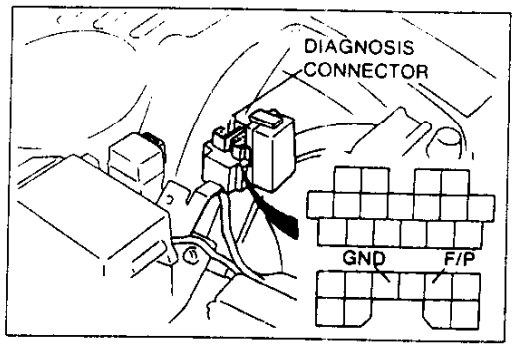
Fuel Pressure Hold Inspection

Warning

- **Before performing the following operation, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F–96)**



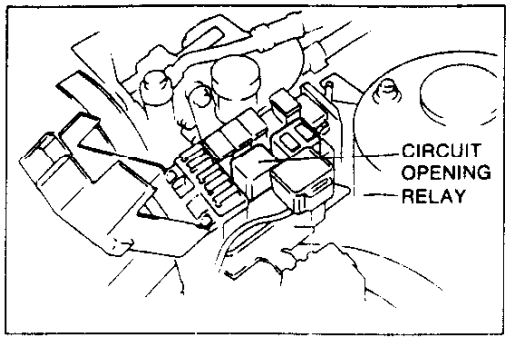
1. Disconnect the negative battery terminal.
2. Install a fuel pressure gauge as shown.
3. Connect the negative battery terminal.



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

   Fuel pressure:
   More than 150 kPa {1.5 kgf/cm², 21 psi}

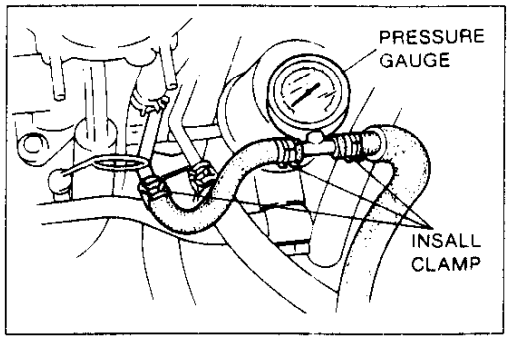
8. If not as specified, perform the following inspections.
   - Fuel pump hold pressure. (Refer to page F–100)
   - Pressure regulator fuel line pressure. (Refer to page F–104)
   - Injector fuel leakage. (Refer to page F–107)



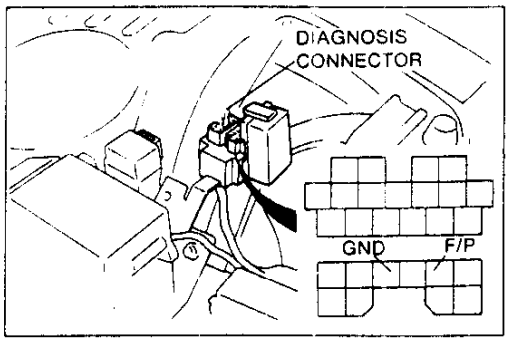
Fuel Line Pressure Inspection

Warning

- **Before performing the following operation, release the fuel pressure from the fuel system to reduce the possibility of injury fire. (Refer to page F–95)**



1. Disconnect the negative battery cable.
2. Install a fuel pressure gauge as shown in the figure.
3. Connect the negative battery cable.



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

Fuel line pressure:
250–260 kPa {2.5–2.7 kg/cm^2, 36–38 psi}

Pressure low – Measure fuel pump maximum pressure. (Refer to page F–101) If as specified, the fuel line or fuel filter might be clogged or restricted.

Pressure high – Replace the pressure regulator. (Refer to page F–105)

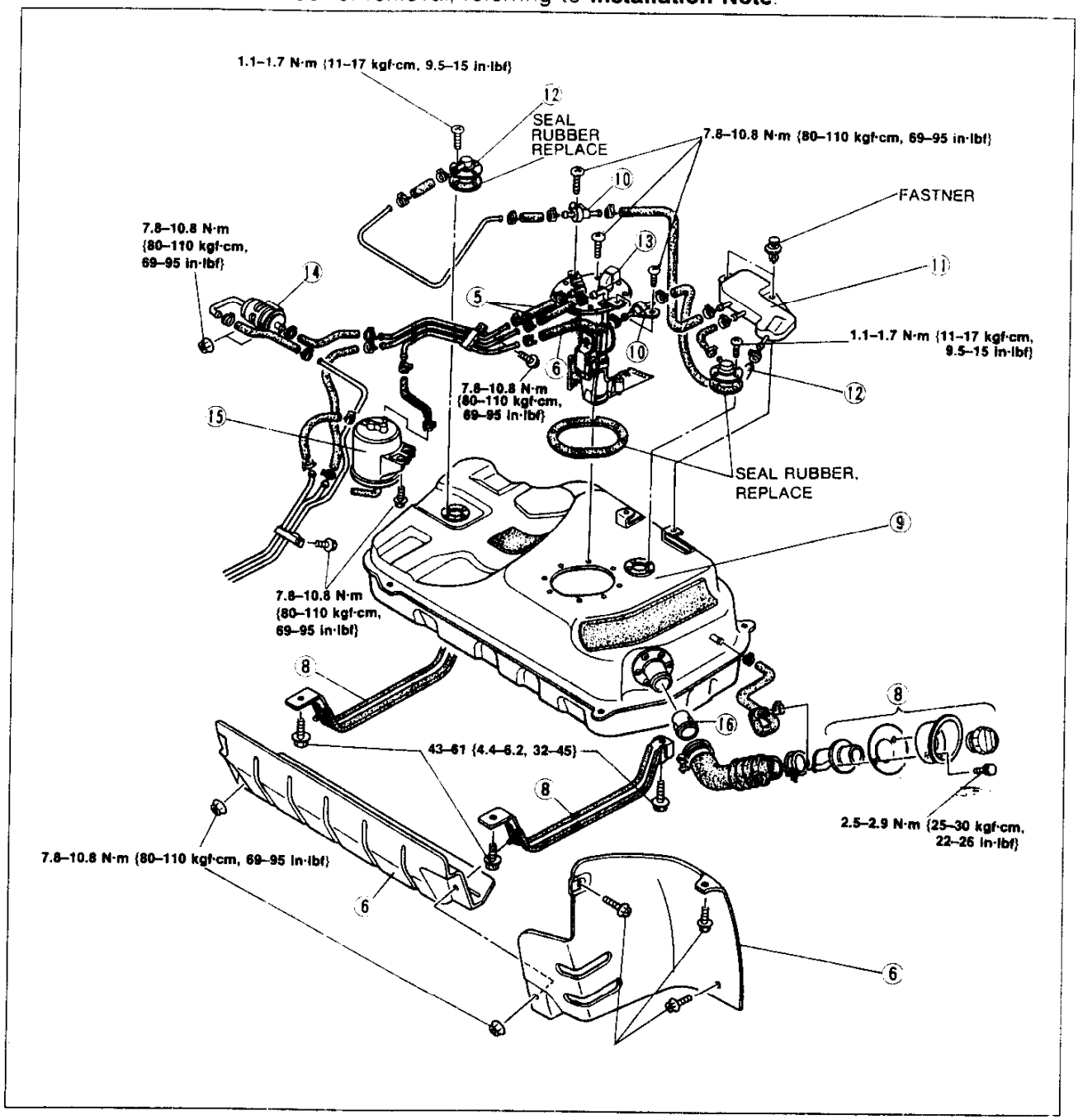
FUEL TANK

Removal / Inspection / Installation

Warning

- **Before performing the following operation, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F–95.)**
- **When removing the fuel tank, keep sparks, cigarettes, and open flames away from it.**
- **Before repairing the fuel tank, clean it thoroughly with steam to remove all explosive gas.**

1. Remove in the order shown in the figure.
2. Inspect the fuel tank components visually and repair or replace if necessary.
3. Install in the reverse order of removal, referring to **Installation Note**.



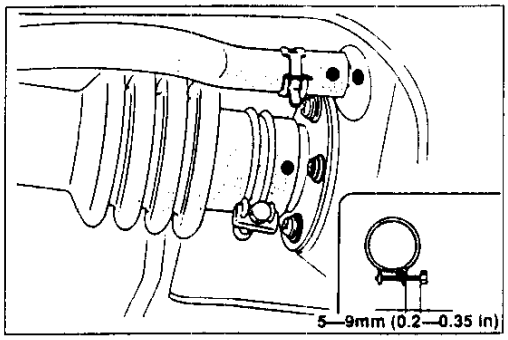
Note

- **Drain the fuel from the fuel tank before removing the fuel tank.**

1. Battery cable
2. Fuel hoses
   Installation Note ..... page F–99
3. Evapolative hoses
   Installation Note ..... page F–99
4. Under cover
5. Fuel filler pipe
6. Fuel tank strap
7. Fuel tank
   Inspect for cracks and corrosion
8. Check valve
   Inspection ..... page F–132
9. Separator
   Inspect for cracks and corrosion
10. Fuel vapor valve
    Inspection ..... page F–132
11. Fuel pump
    Inspection
    Removal / Installation
    Assembly / Disassembly ..... page F–102
12. Nonreturn valve

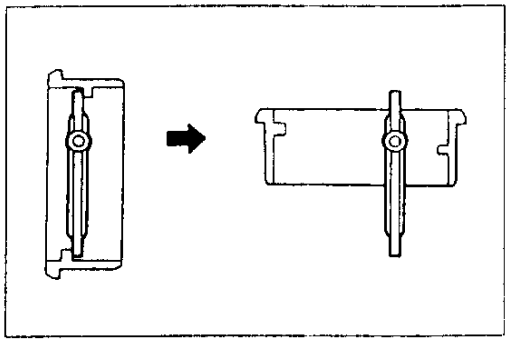
Installation Note

1. Push the ends of the main fuel hose, fuel return hose, and evaporative hoses onto the fuel tank fittings **at least 25 mm {1.0 in}**.
2. Push the fuel filter hose onto the fuel tank pipe and filter pipe **at least 35 mm {1.4 in}**.
3. Push the evaporative hoses onto the fuel vapor valve **at least 20 mm {0.8 in}**.
4. Push the evaporative hoses onto the check valve **at least 17 mm {0.7 in}**.



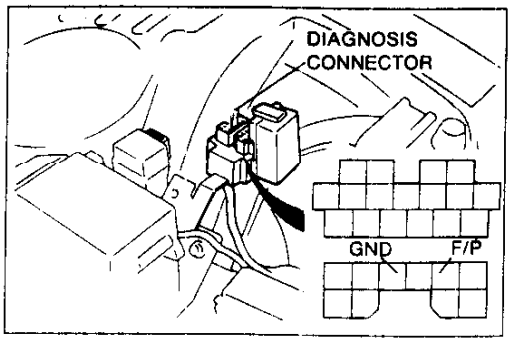
19U0FX-145

5. Connect the fuel filler hose and breather hose onto the fuel tank as shown in the figure.



Nonreturn Valve

Verify that the nonreturn valve operates under its own weight as shown in the figure.

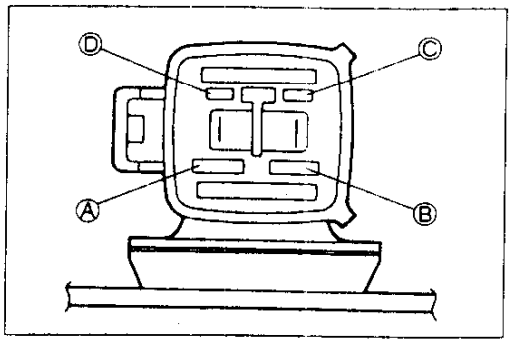


FUEL PUMP

Inspection

Fuel pump operation

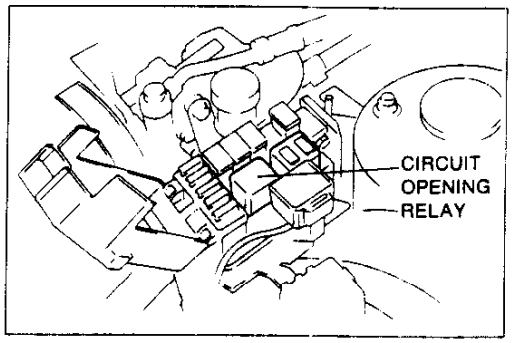
1. Connect the diagnosis connector terminals **F/P** and **GND** with a jumper wire.
2. Remove the fuel filler cap.
3. Turn the ignition switch ON.
4. Listen for operational sound of the fuel pump at the filler inlet.
5. Install the fuel filler cap.



6. If no sound was heard, measure the voltage between the fuel pump connector wire W/R to ground.

   Voltage: Battery voltage

7. If not correct, check the circuit opening relay and its circuits. (Refer to page F–110.)
8. If the voltage is normal, check for continuity between fuel pump connector A and B.
9. If there is continuity, replace the fuel pump.
10. If there is no continuity, repair the ground circuit.

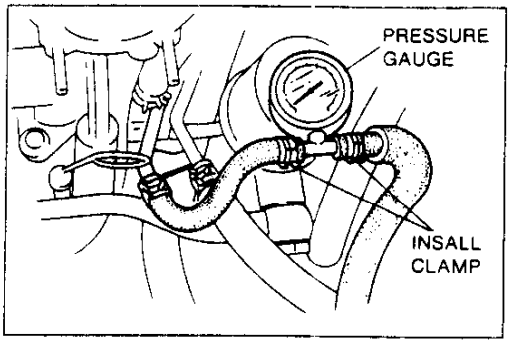


Hold pressure

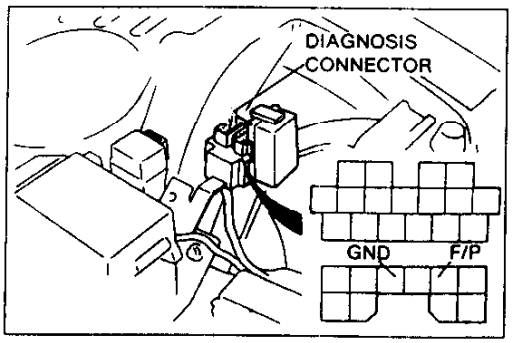
Perform the inspection if the fuel pressure hold inspection is not as specified.

Warning

- **Before performing the following operation, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F–96.)**



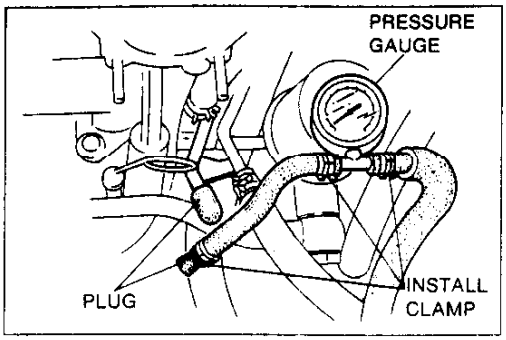
1. Disconnect the negative battery terminal.
2. Connect a fuel pressure gauge to the fuel main pipe and plug the outlet of the fuel pressure gauge as shown. (Install clamps as shown.)
3. Connect the negative battery terminal.



4. Connect diagnosis connector terminals **F/P** and **GND** with a jumper wire.
5. Turn the ignition switch ON and measure the fuel pressure.

   Fuel pressure:
   490–740 kPa {5.0–7.5 kgf/cm², 71–106 psi}

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

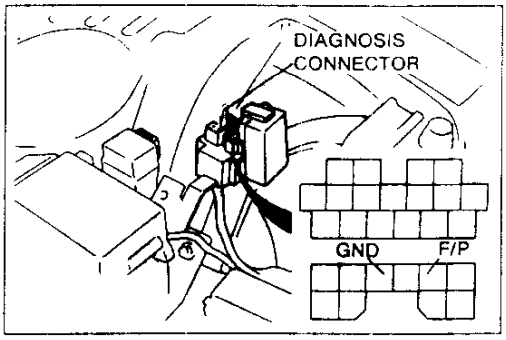


Fuel pump maximum pressure

Warning

- **Before performing the following operation, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F–96.)**

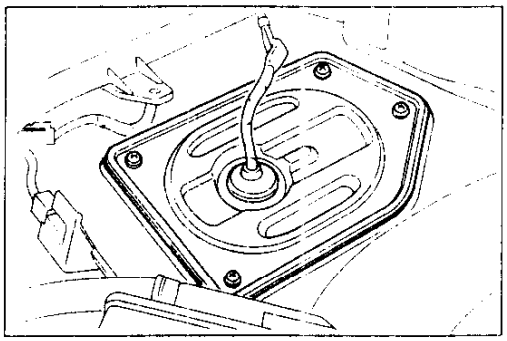
1. Disconnect the negative battery terminal.
2. Connect a fuel pressure gauge to the fuel main pipe and plug the outlet of the gauge as shown. (Install clamps as shown.)



3. Connect the negative battery terminal.
4. Connect diagnosis connector terminals **F/P** and **GND** with a jumper wire.
5. Turn the ignition switch ON to operate the fuel pump.
6. Measure the pump maximum pressure.

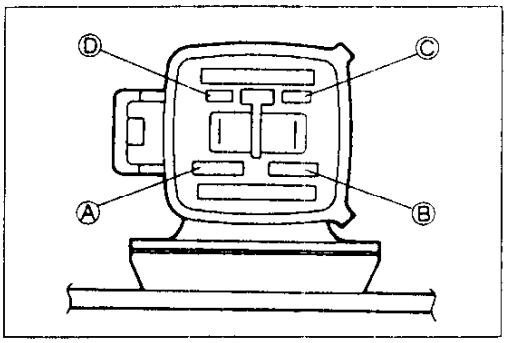
Fuel pump maximum pressure:
490–740 kPa {5.0–7.5 kgf/cm^2, 71–107 psi}

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



Continuity Inspection

1. Remove the luggage room carpet.
2. Remove the acoustic wave guide assembly. (if eqeipped)
3. Disconnect the fuel pump connector.



4. Check for continuity between the fuel pump connector A and B.
5. If there is none, replace the fuel pump.

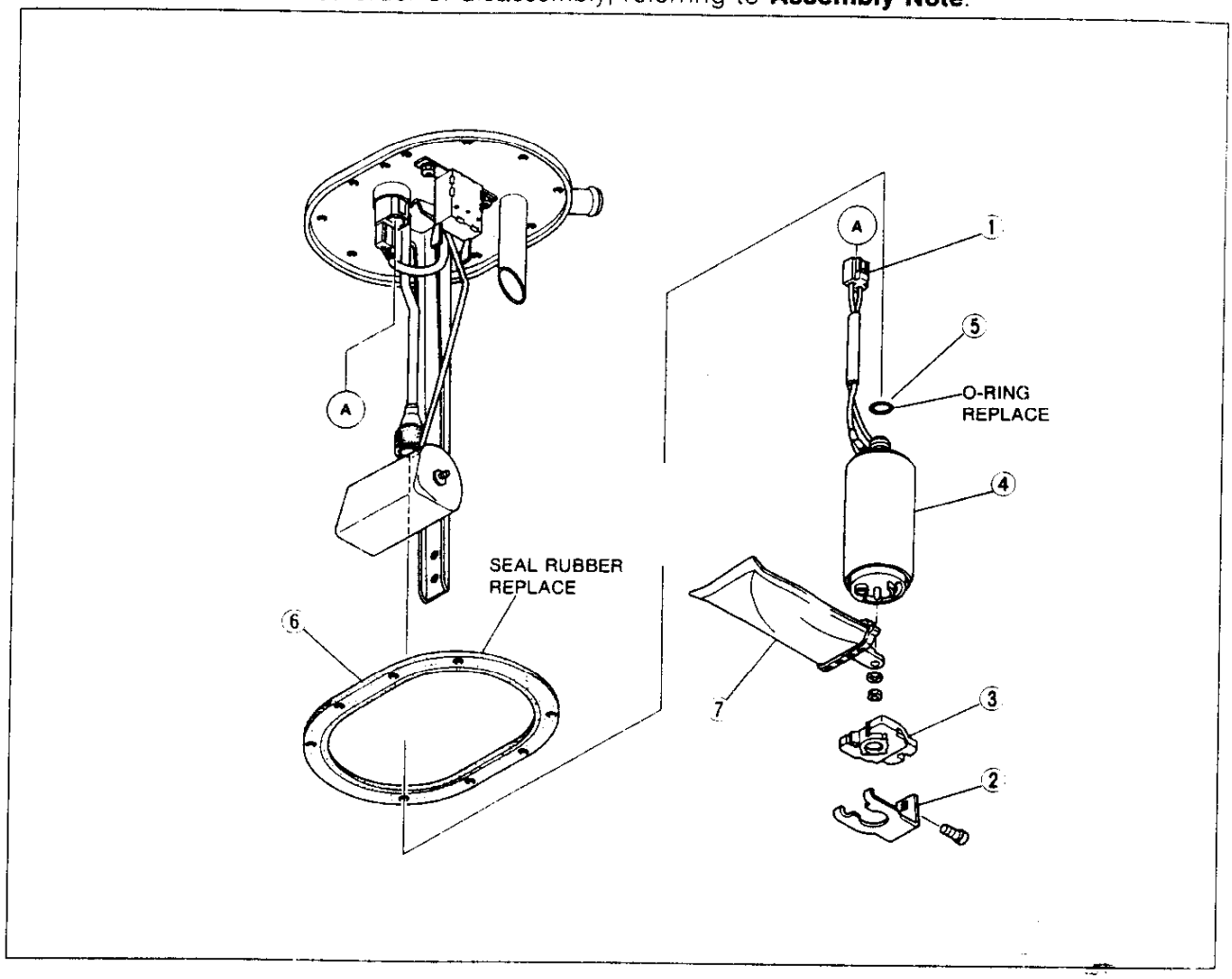
Remove / Installation
(Refer to page F–98)

Disassembly / Assembly

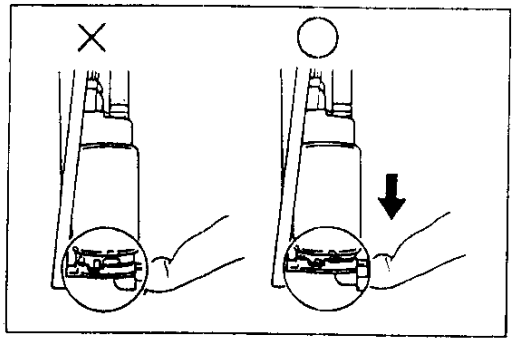
Warning

- **When replacing the fuel system parts, keep sparks, cigarettes, and open flames away from the fuel.**
- **Before performing the following operation, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F–96).**

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



1. Fuel pump connector
2. Bracket
3. Mounting rubber
4. Fuel pump
5. O-ring
6. Seal rubber
7. Fuel filter (Low pressure side)



Assembly Note

After installing the fuel pump to the braket, pull the pump down so that it is tight against the braket.

FUEL FILTER

Replacement

Warning

- **Always work away from sparks and open flames.**

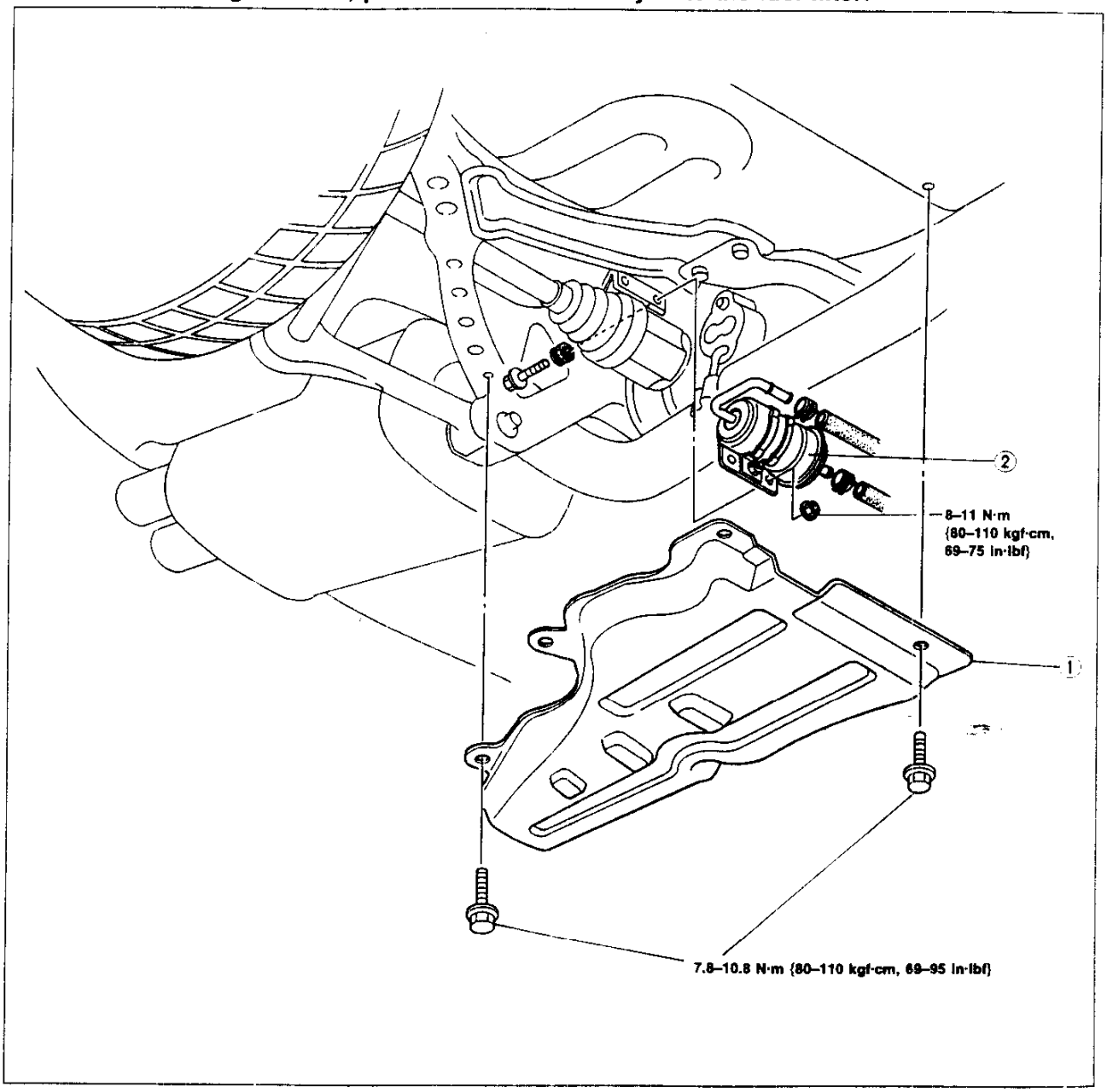
High-pressure side

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

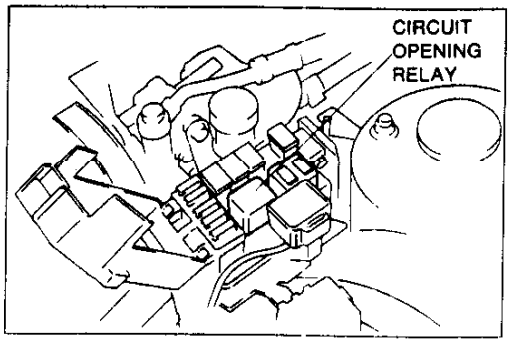
1. Before removing the fuel filter, release the fuel pressure from the fuel system.
2. Remove in the order shown in figure.
3. Install in the reverse order of removal.

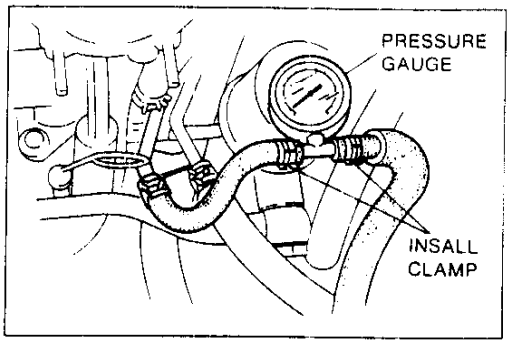
Note

- **When installing the filter, push the fuel hoses fully onto the fuel filter.**



1. Under cover
2. Fuel filter (High-pressure side)





PRESSURE REGULATOR

Inspection

Fuel line pressure

Warning

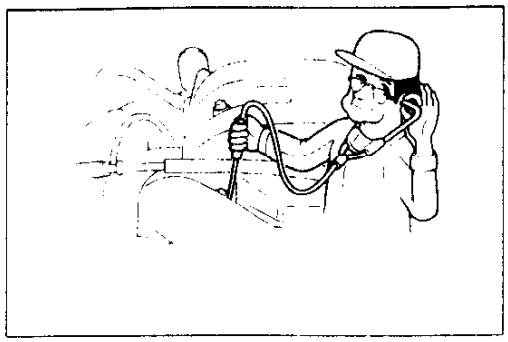
- **Before performing the following operation, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F-96.)**

1. Disconnect the negative battery terminal.
2. Connect a fuel pressure gauge between the fuel filter and the fuel main hose. (Install clamps as shown.)
3. Connect the negative battery terminal.
4. Start the engine and run at idle.
5. Measure the fuel line pressure.

Fuel line pressure:
190–220 kPa {1.9–2.3 kgf/cm^2, 28–32 psi}

Removal / Installation

(Refer to page F–105)



INJECTOR

Inspection (On-vehicle)

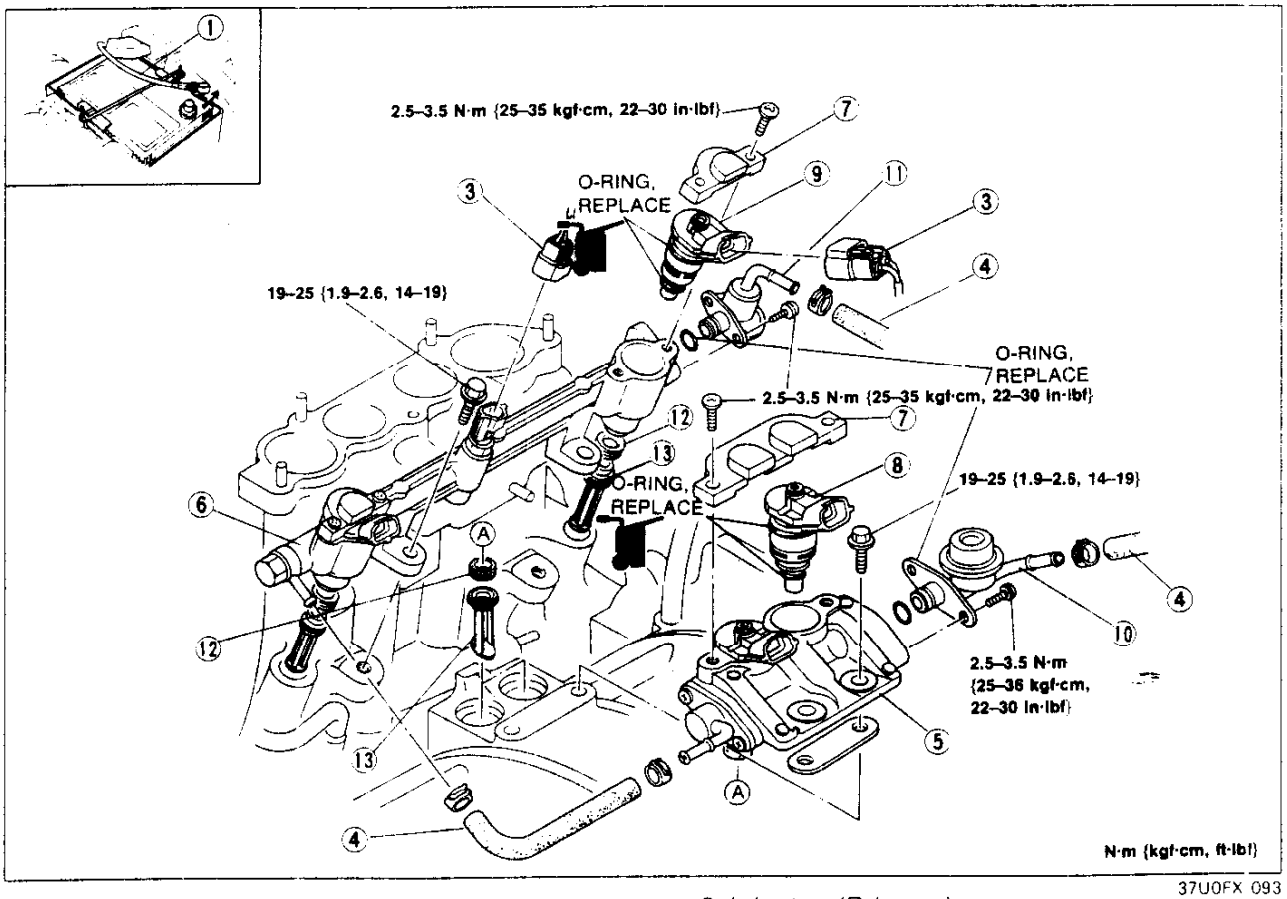
1. Warm up the engine and run it idle.
2. Listen for the operational sound of primary injector with a screwdriver or a sound scope.

Removal / Installation

Warning

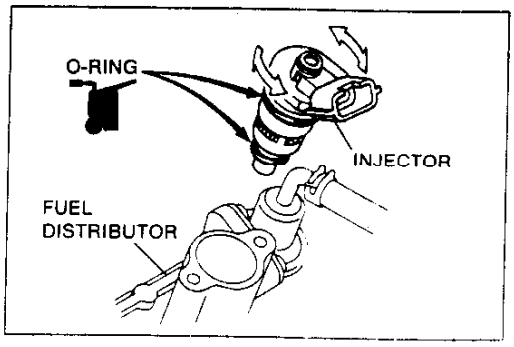
- **Before performing the following operation, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F–96.)**
- **When removing the fuel system components, keep sparks, cigarettes, and open flames away from the fuel.**

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal, referring to Installation Note.



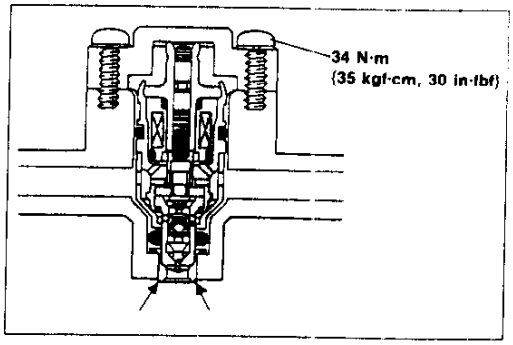
37U0FX 093

1. Negative battery cable
2. Extension manifold (Refer to page F–76)
3. Connector
4. Fuel hoses
5. Fuel distributor assembly (Primary)
6. Fuel distributor assembly (Secondary)
7. Cover
8. Injector (Primary)
   Inspection ..... page F–107
9. Injector (Secondary)
   Inspection ..... page F–107
10. Pulsation damper
11. Pressure regulator
    Inspection ..... page F–104
12. Insulator
13. Air bleed socket



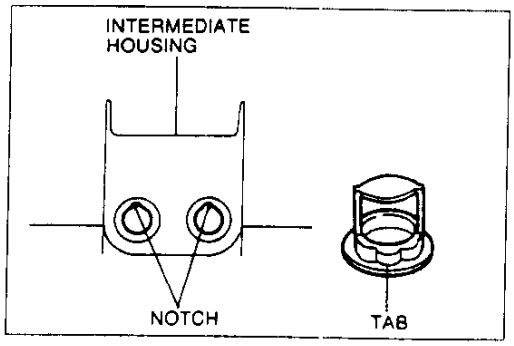
Installation Note
Injector installation

1. Use new O-rings.
2. Apply a small amount of clean engine oil to the O-rings before installing them.
3. Install the injector squarely into fuel distributor and gradually twist it.
4. Verify that the deposit is not to the holder inside of fuel distributor.
5. If there is, clean the holder inside by used to gasoline.



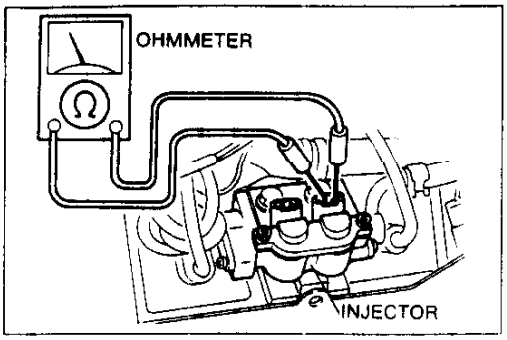
Fuel leakage test

1. Install the fuel hose.
2. Connect the diagnosis connector terminals F/P and GND with a jumper wire.
3. Turn the ignition switch ON and check for fuel leaks from the fuel distributor.
4. If fuel leaks check the injector O-ring and fuel distributor.



Air bleed socket installation

Align the tab of the air bleed socket with the notches in the intermediate housing.



Inspection

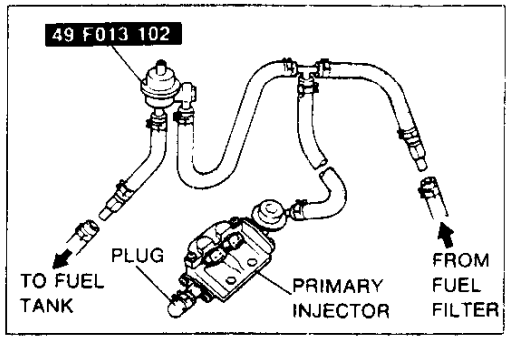
Caution

- **Do not remove the injector from the fuel distributor if it is not necessary.**

Injector resistance

1. Disconnect injector connector as shown in figure.
2. Measure the resistance of the injection with an ohmmeter.

   Resistance: Approx. 13.8 Ω {20°C [68°F]}

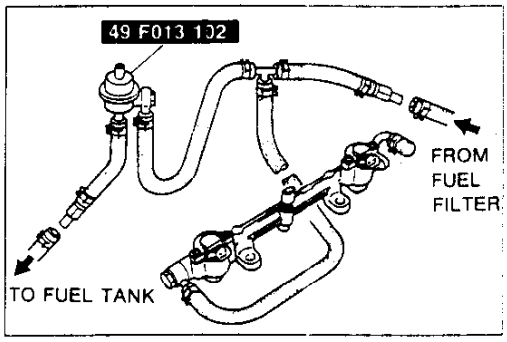


3. If not as specified, replace the injector.

Fuel leakage test

1. Remove the injector together with fuel distributor.
2. Connect the **SST** as shown in figure.
3. Connect the diagnosis connector terminals F/P and GND with a jumper wire.
4. Turn the ignition switch ON and check for fuel leaks from the injector.

   Fuel leakage: Less than 1 drop / 5 min.

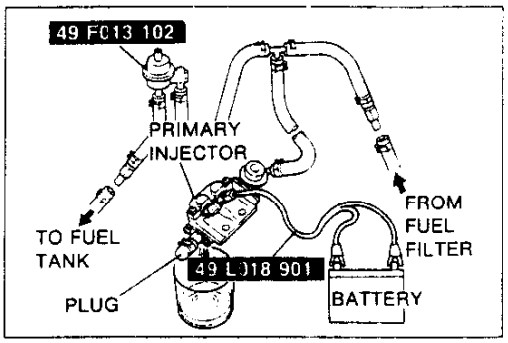


5. If not as specified, check the injector O-ring and fuel distributor contact face.

Note

- **Perform the following installation carefully to prevent fuel leakage from O-ring.**

6. Install the injector.
7. Turn the ignition switch ON and check for fuel leaks from injector.
8. If not as specified replace the injector.



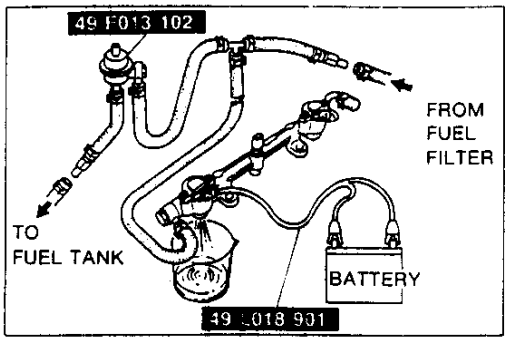
Volume Test

1. Remove the injectors together with the fuel distributor.
2. Connect the **SST** as shown in figure.

Warning

- **Be extremely careful when working with fuel. Always work away from sparks and open flames.**

3. Check the injection volume with a graduated container.



Injection volume

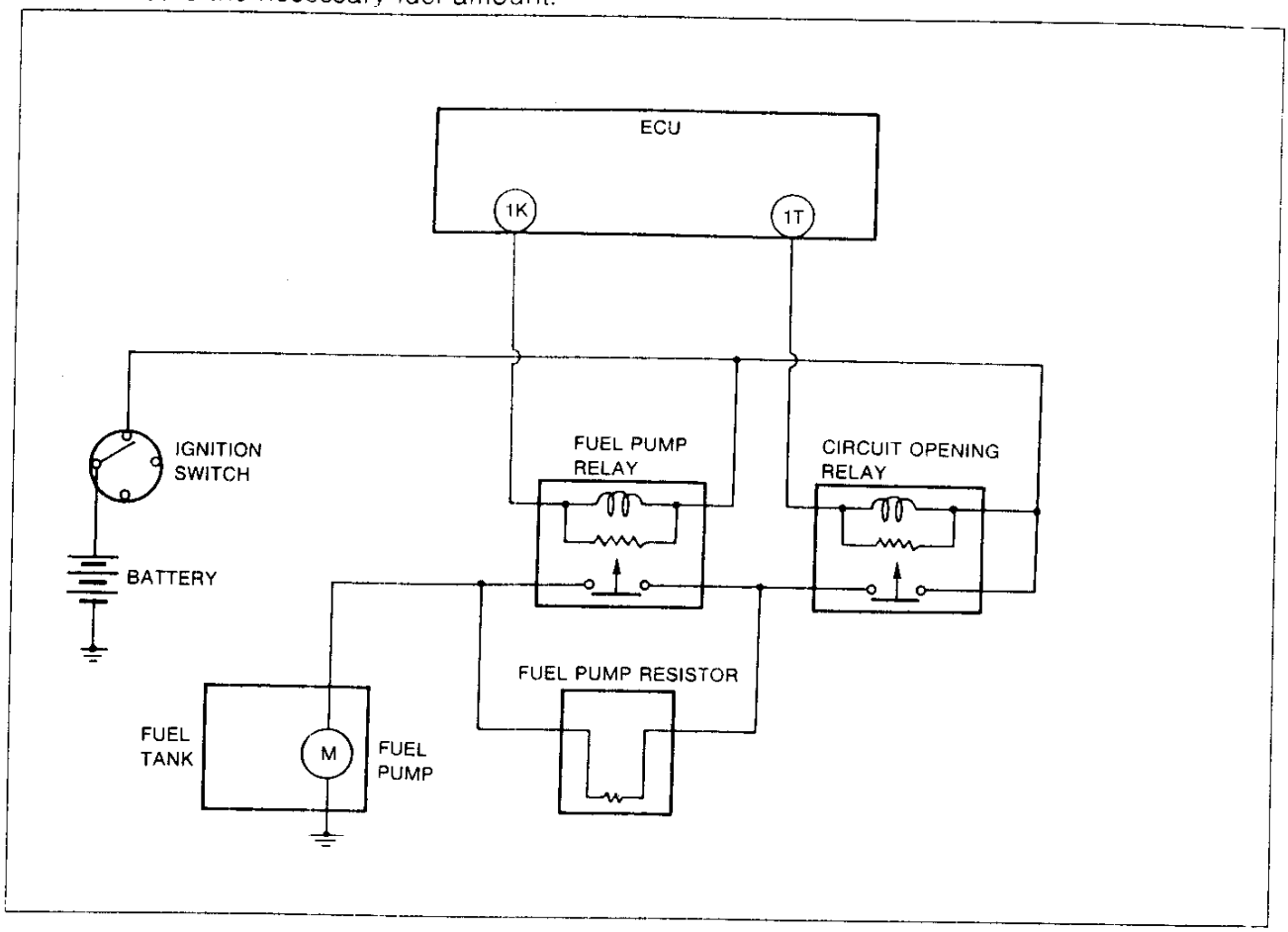
Primary injector:
128–147 cc {7.8–8.9 cuin} / 15 sec.
Secondary injector:
198–227 cc {12.0–13.8 cuin} / 15 sec.

4. If not as specified, replace the injector.

FUEL PUMP CONTROL SYSTEM

Description

- The ECU turns the fuel pump ON/OFF via the circuit opening relay. By controlling the fuel pump relay, the ECU also controls fuel pump operation in two phases to improve fuel pump reliability and ensure the necessary fuel amount.



Circuit opening relay

- The circuit opening relay is controlled by the ECU and turns the fuel pump ON/OFF.

Fuel pump relay

- The fuel pump relay is controlled by the ECU and controls fuel pump operation voltage via the fuel pump relay.

Fuel pump resister

- The fuel pump resister controls fuel pump operation voltage. During low-speed engine operation, fuel pump voltage is supplied via the fuel pump resistor.

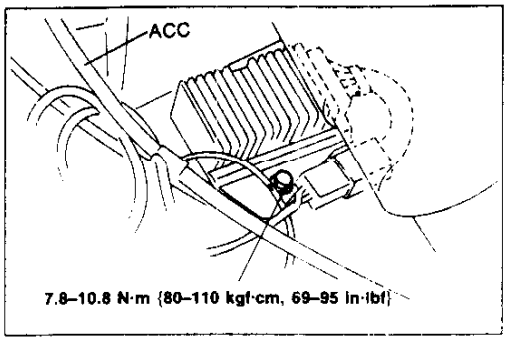
Operation

(1) In low-speed range (1K terminal of ECU is battery voltage)
- The fuel pump is driven by voltage from the fuel pump resister.

(2) In high-speed range (1K terminal of is 0V)
- The fuel pump is driven by battery voltage.

Operating conditions

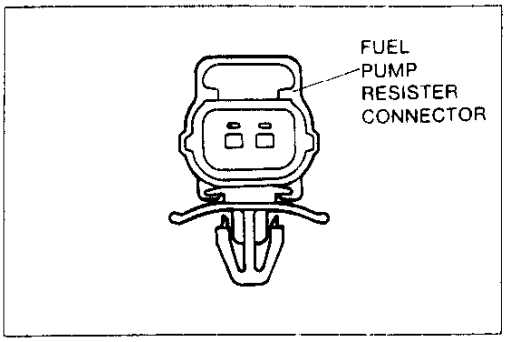
The system operates when either of the following conditions is met.
- During engine start-up
- Solenoid valve (pressure regulator control) operating
- High speed and heavy load



FUEL PUMP RESISTOR

Removal / Installation

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

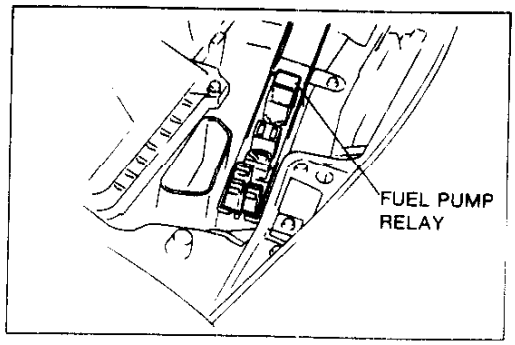


Inspection

1. Disconnect fuel pump resistor connector.
2. Measure resistance of the fuel pump resistor with an ohmmeter.

   Resistance 0.57–0.70 Ω {at 20°C [68°F]}

3. Replace the fuel pump resistor if necessary.

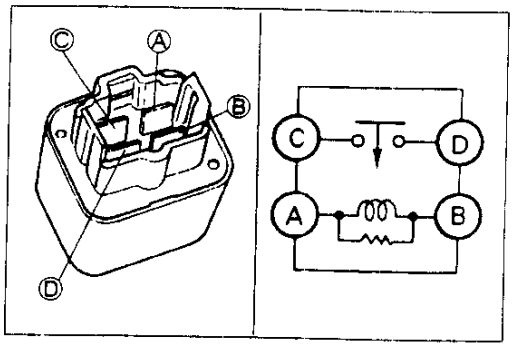


FUEL PUMP RELAY

Inspection

Operation check

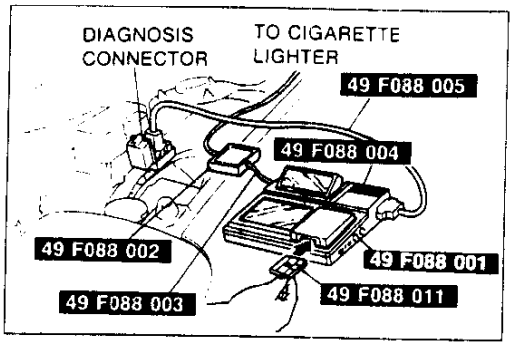
Listen for operational sound of the fuel pump relay when ignition switch ON.



Continuity inspection

Check continuity between the terminals with ohmmeter.

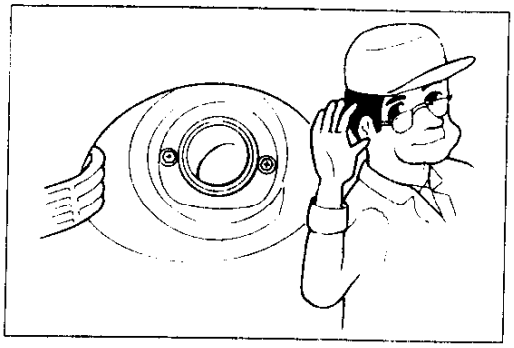
Terminal A–B	Terminal C–D
Apply V_B	Yes
Not apply V_B	No



DT-S1000

Operation check

1. Connect the **SSTs** (DT-S1000 and Harness) to the diagnosis connector as shown.
2. Turn ignition switch ON.

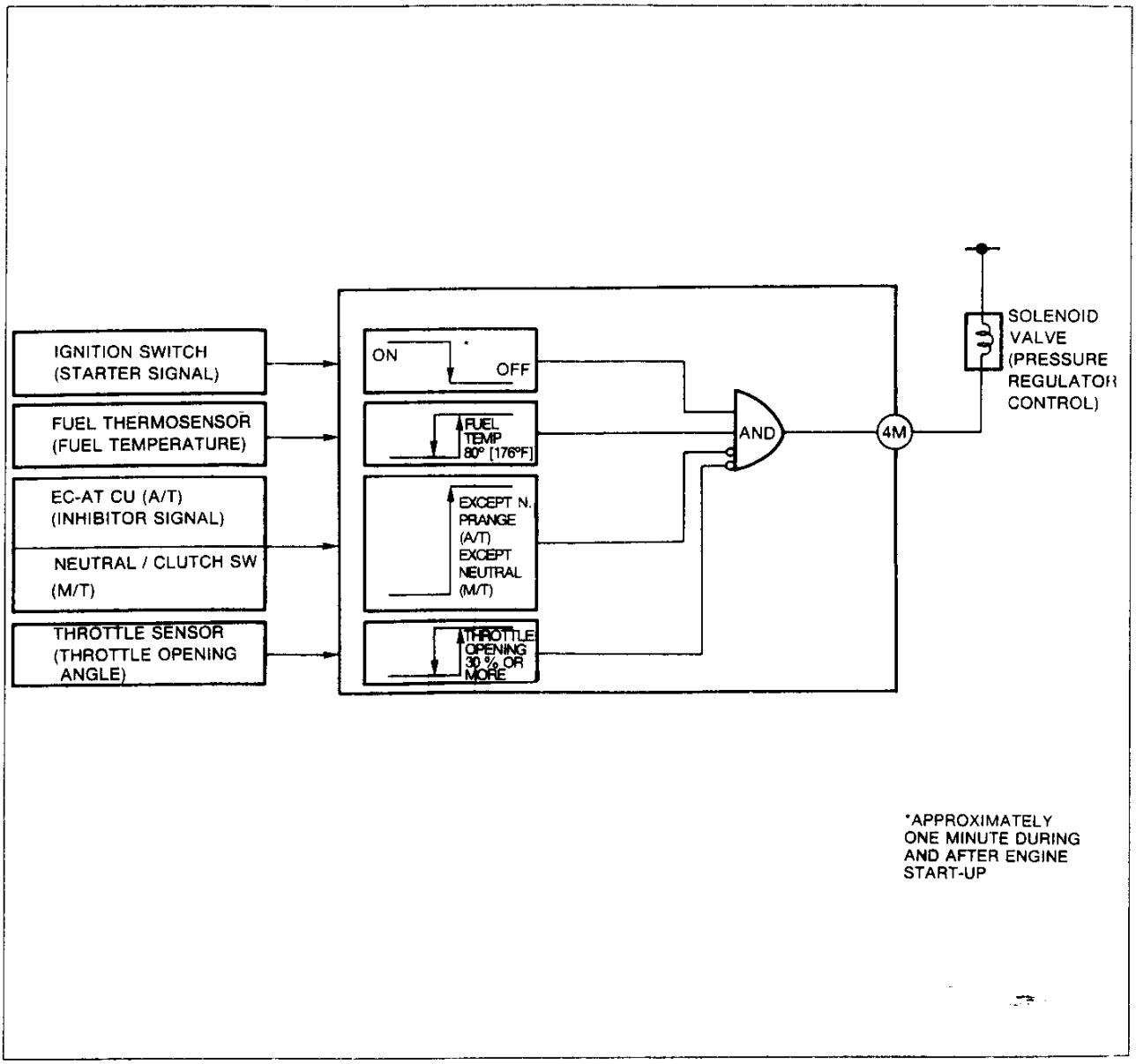


3. Select the simulation check and verify that the fuel pump relay operation sound is heard.
4. If no sound is heard check continuity of fuel pump relay.

PRESSURE REGULATOR CONTROL (PRC) SYSTEM

DESCRIPTION

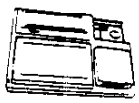
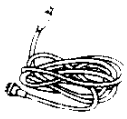
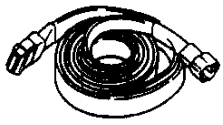
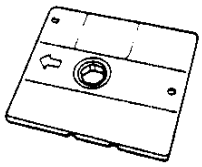
- This system cancels the vacuum applied to the pressure regulator and increases the fuel pressure during hot engine start-up and for a period immediately following engine start-up. This improves hot starting as well as providing smooth idle.

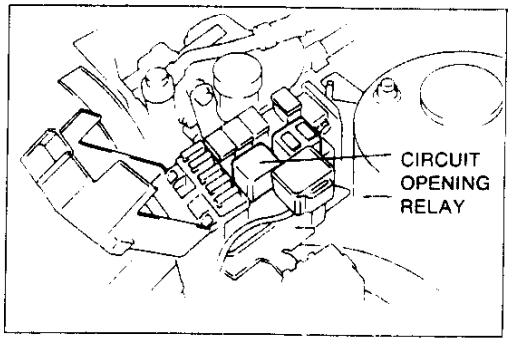


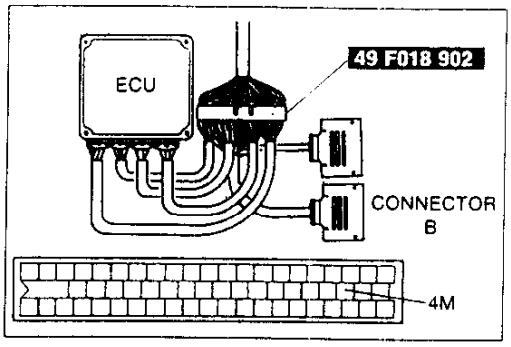
Operation

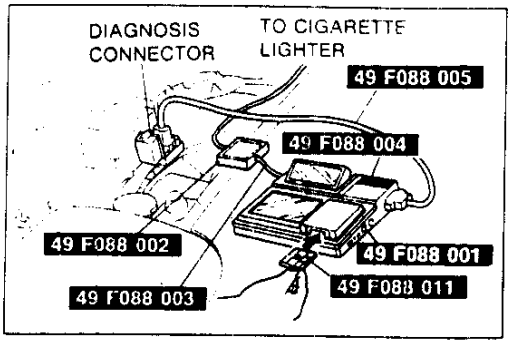
To prevent vapor-lock during hot restart idle, vacuum to the pressure regulator is momentarily cut, and fuel injection pressure is increased.

PREPARATION
SST

49 F088 001 DT-S1000 Base unit 	For inspection of solenoid valve and relay	49 F088 002 Power unit (DC12V) 	For inspection of solenoid valve
49 F088 003 Harness Power unit 	For inspection of solenoid valve	49 F088 004 Interface adapter Type-1 	For inspection of solenoid valve
49 F088 005 Harness Type-1 	For inspection of solenoid valve	49 F088 011 System disk Type-1 (Ver 1.00) 	For inspection of solenoid valve







SYSTEM OPERATION

Warning

- **Before performing the following operation, release the fuel pressure from the fuel system to reduce the possibility of injury or fire. (Refer to page F-96.)**

1. Remove the circuit opening relay.
2. Connect a fuel pressure gauge to the main hose.
3. Connect the circuit opening relay.
4. Start the engine and run it idle.
5. Verify the fuel pressure.

Fuel line pressure
190–220 kPa {1.9–2.3 kgf/cm², 28–32 psi}

6. Short the ECU Terminal 4M and verify that fuel pressure.

Fuel line pressure
250–260 kPa {2.5–2.7 kgf/cm², 36–38 psi}

7. If not as specified, check the pressure regulator and solenoid valve.

DT-S1000

1. Remove the circuit opening relay.
2. Connect a fuel pressure gauge to the main hose.
3. Connect the circuit opening relay.
4. Connect the DT-S1000 to the diagnosis connector.
5. Start the engine and run it idle.
6. Select the simulation check and verify that the fuel line pressure increase when solenoid valve ON.
7. If fuel line pressure does not increase, check the operation sound of solenoid valve.

EXHAUST SYSTEM

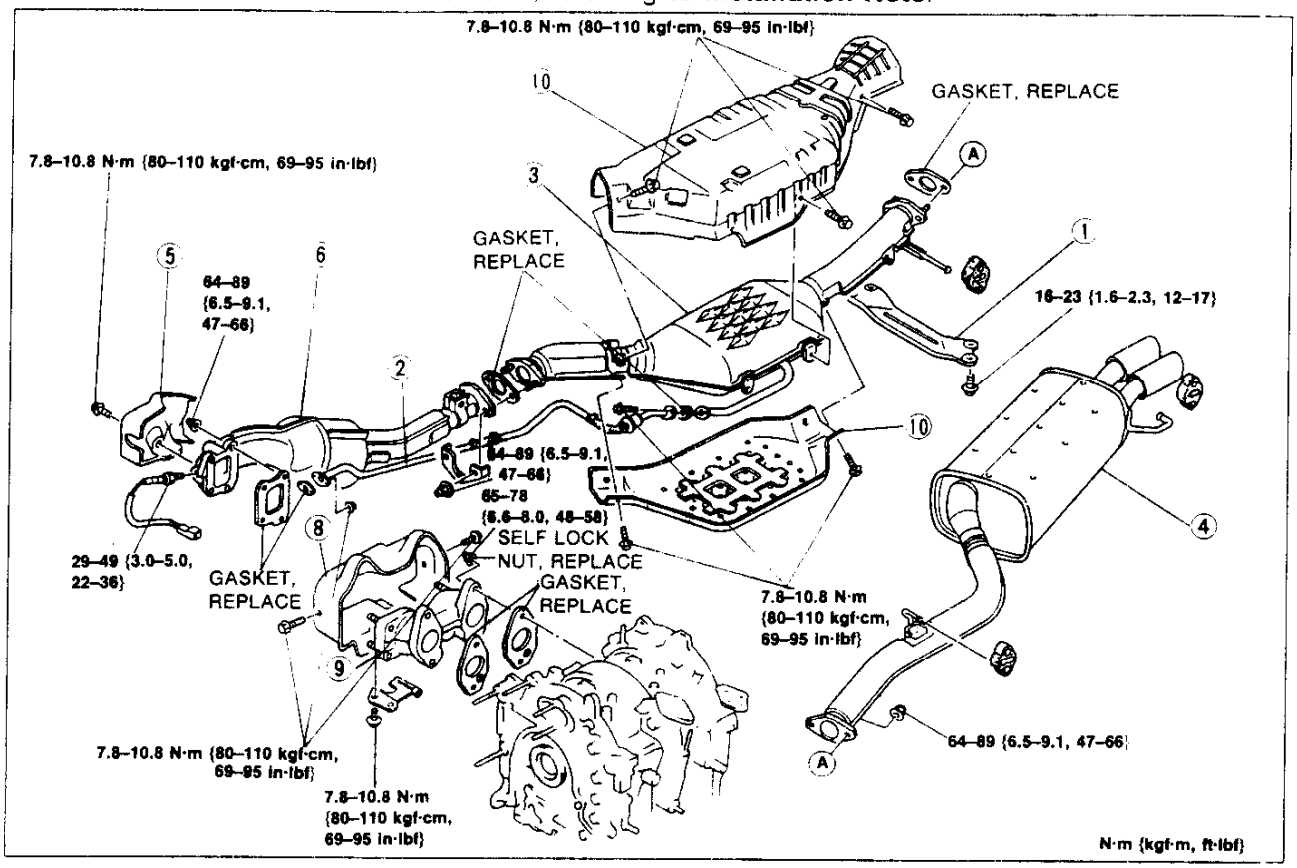
COMPONENT PARTS

Inspection (On-vehicle)

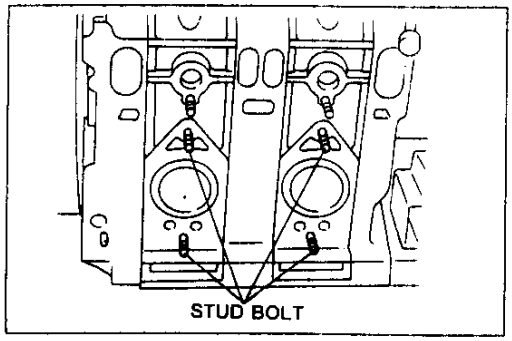
Start the engine and verify that there is no exhaust gas leakage from the exhaust system components.

Removal / Inspection / Installation

1. Remove in the order shown in the figure.
2. Check all parts and repair or replace if necessary.
3. Install in the reverse order of removal, referring to **Installation Note**.



1. Braket
2. Secondary air pipe.
   Inspect for deterioration and restriction.
3. Main converter
   Inspect for deterioration and restriction.
4. Main silencer
   Inspect for deterioration and restriction.
5. Insulator
6. Front converter
   Inspect for deterioration and restriction
7. Turbocharger
   Removal ..... Refer to page F–89
8. Insulator
9. Exhaust manifold
   Inspect for deterioration and restriction
10. Insulatior



Installation Note

1. Check the stud bolt tighteing torque before installing exhaust manifold.

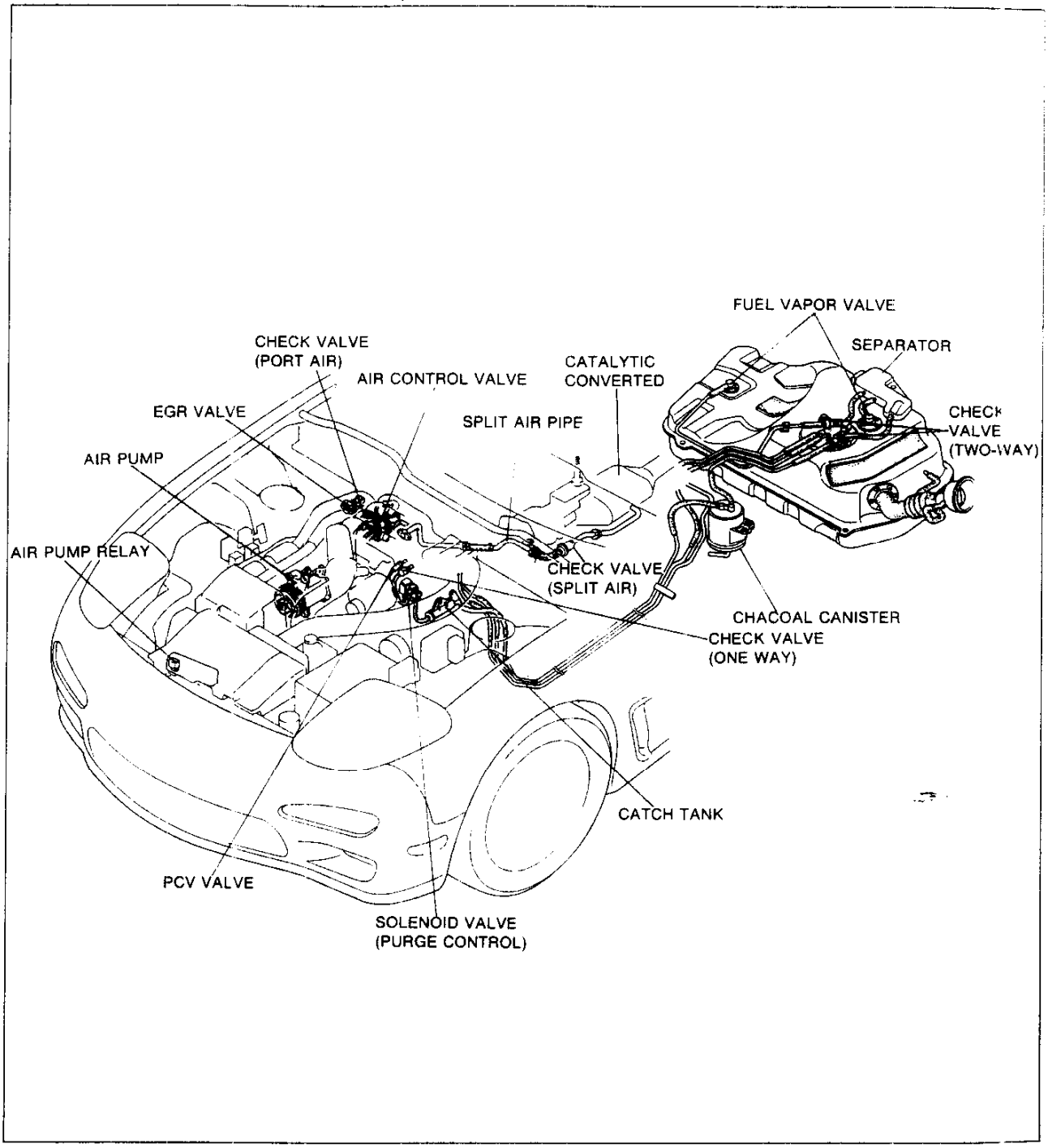
Tighting torque: 30–35 N·m {3.0–3.6 kgf·m, 22–26 ft·lbf}

OUTLINE OF EMISSION SYSTEM

STRUCTURAL VIEW

The following systems are employed to reduce CO, HC, and NOx emissions.

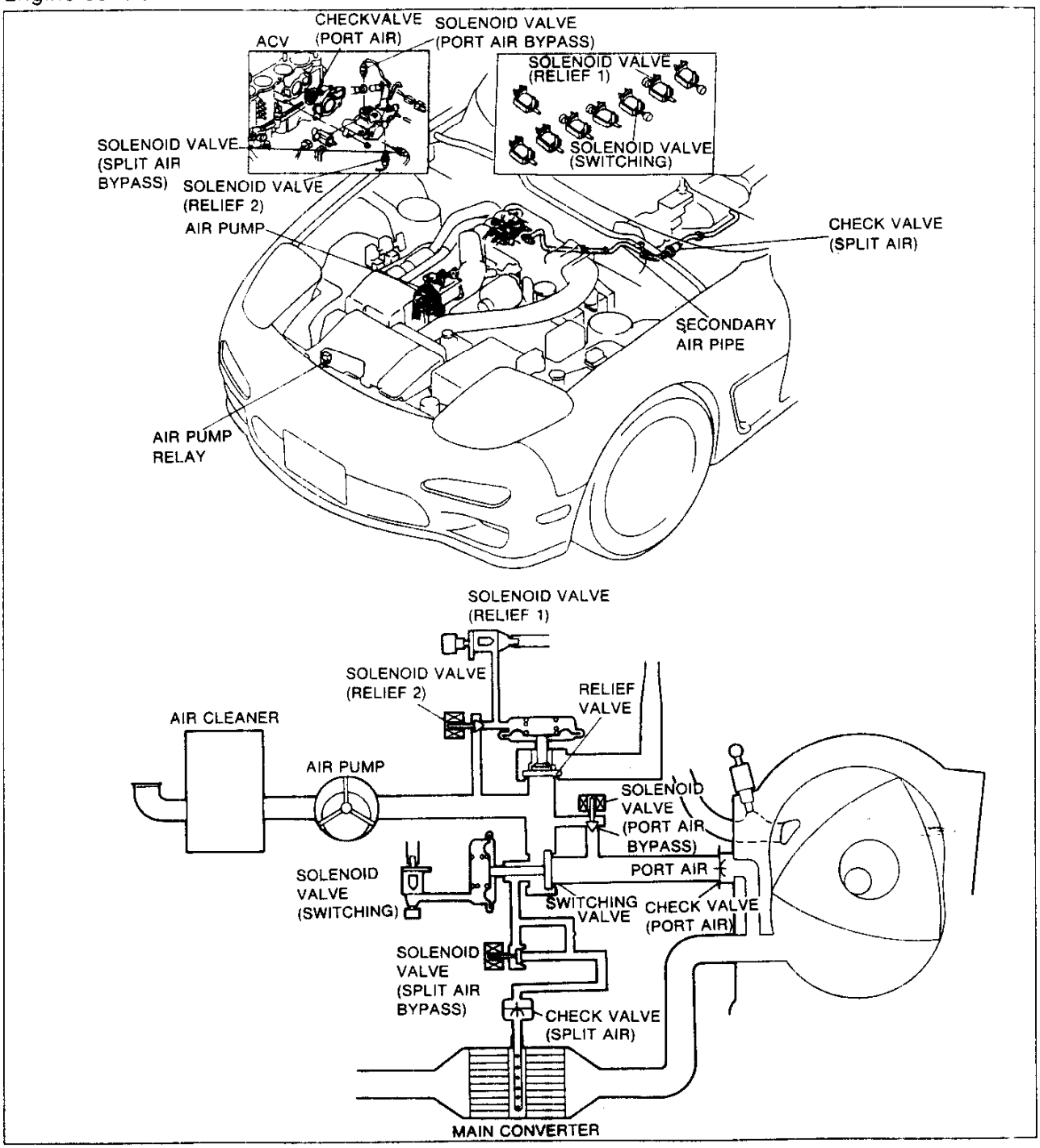
1. Secondary air injection system
2. Positive crankcase ventilation system
3. Evaporative emission control system
4. Catalytic converter
5. Deceleration control system
6. Exhaust gas recirculation control system



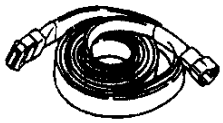
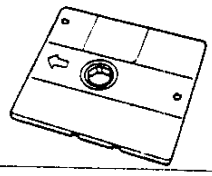
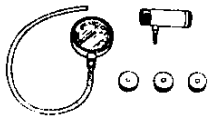
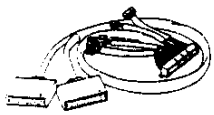
SECONDARY AIR INJECTION SYSTEM

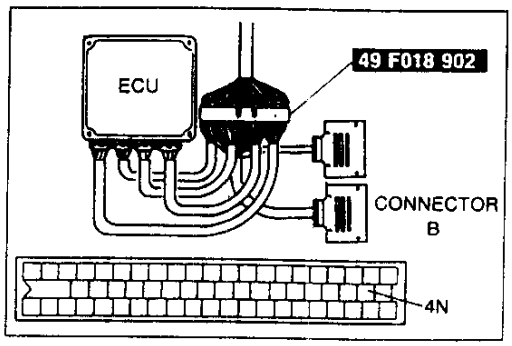
DESCRIPTION

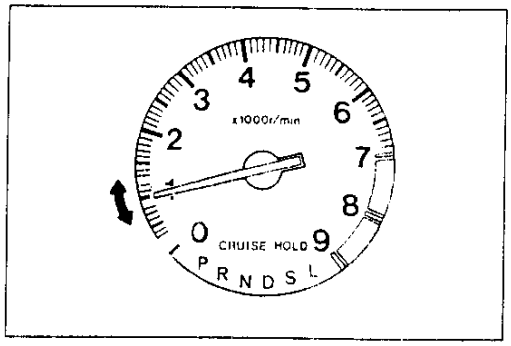
The secondary air injection system helps to clean the exhaust gas by introducing fresh air into the exhaust port or catalytic converter in relation to the during condition.
The ECU controls secondary air by actuating the solenoid valves (switching, relief 1, 2, port air bypass, split air bypass) and the air pump relay.
This system consist of an air control valve (ACV), three way solenoid valves, air pump relay and Engine control unit.

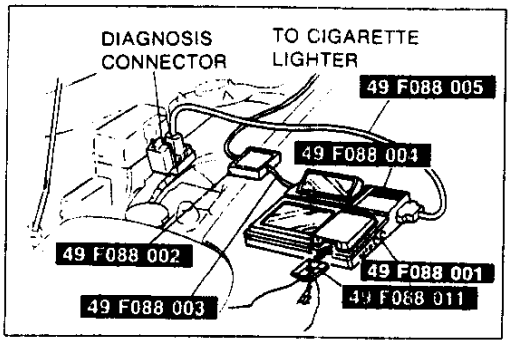


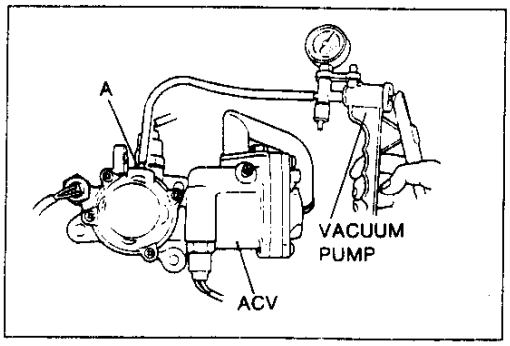
PREPARATION
SST

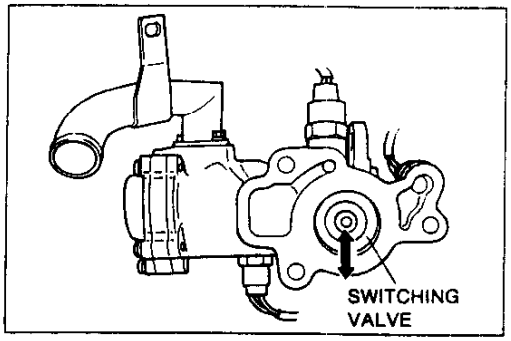
49 F088 001 DT-S1000 Base unit 	For inspection of solenoid valve and relay	49 F088 002 Power unit (DC12V) 	For inspection of solenoid valve
49 F088 003 Harness Power unit 	For inspection of solenoid valve	49 F088 004 Interface adapter Type–1 	For inspection of solenoid valve
49 F088 005 Harness Type–1 	For inspection of solenoid valve	49 F088 011 System disk Type–1 (Ver 1.00) 	For inspection of solenoid valve
49 2113 011B Air pump gauge set 	For inspection of air pump	49 F018 902 Adapter harness 	For inspection of solenoid valve











AIR CONTROL VALVE (ACV) SWITCHING VALVE

System operation

Engine Signal Monitor

1. Connect the **SSTs** (Engine Signal Monitor and Adapter Harness) to the ECU as shown.
2. Start the engine and run it idle.
3. Short the ECU terminal 4N and verify that the engine condition change (idle roughing)
4. If the engine condition does not change, check the following below.
   - Vacuum tube
     Inspect the vacuum line fitting, connections and components for leaks. (Refer to page F–10)
   - Solenoid valve (Switching)
     Inspection (Refer to page F–19)
   - Air relief valve
     Inspection (Refer to page F–117)
   - Air pump
     Inspection (Refer to page F–121)
   - Air pump relay
     Inspection (Refer to page F–123)

DT-S1000

1. Connect the **SSTs** (DT-S1000 and Harness) to the diagnosis connector as shown.
2. Start the engine and run it idle.
3. Select the simulation check and verify that the engine condition change at idle (idle roughing) when solenoid valve (Switching) to ON.
4. If the engine condition does not change, stop the engine and turn ignition switch ON.
5. Select the simulation check and verify that the solenoid valve (Switching) operation sound is heard.
6. If the solenoid valve operation sound is not heard check the condition above.

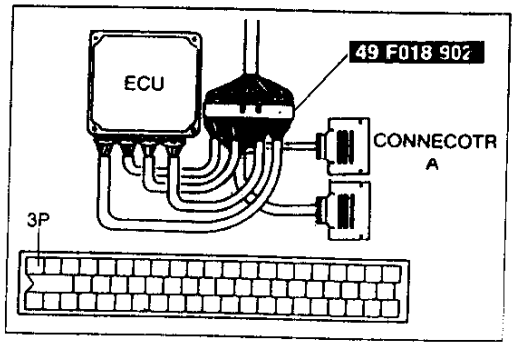
Inspection

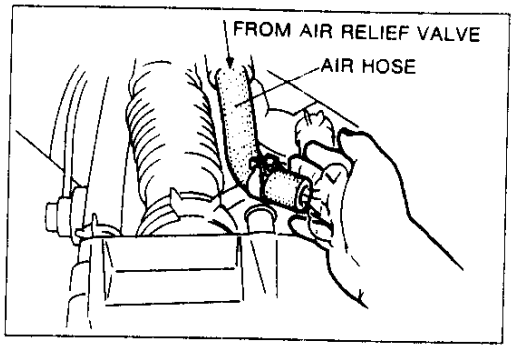
1. Remove the air control valve. (Refer to page F–119)
2. Connect a vacuum pump to port A.
3. Verify that the switching valve opens at a vacuum 14.7 kPa {110 mmHg, 4.3 inHg}

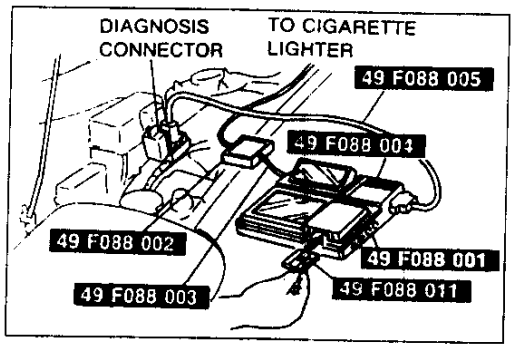
Caution

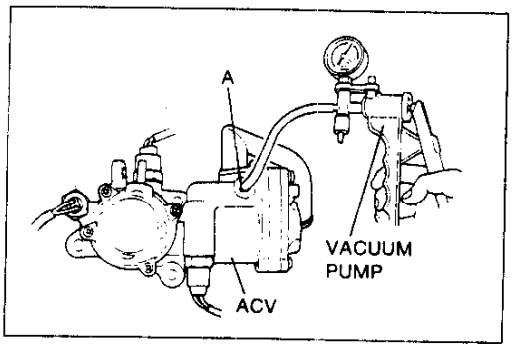
- **Do not apply vacuum more than 66.7 kPa {500 mmHg, 19.7 inHg}**

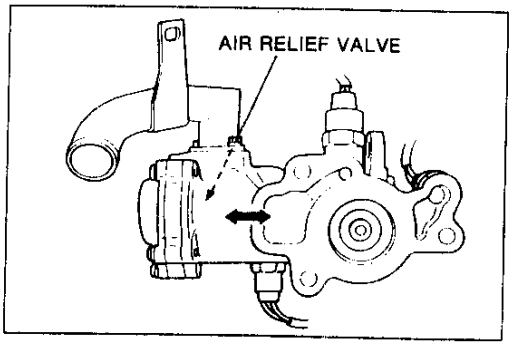
4. If not as specified, replace air control valve.
   (Refer to page F–119)











Air Relief Valve
System operation
Engine Signal Monitor

1. Connect the **SSTs** (Engine Signal Monitor and Adaptor Harness) to the ECU as shown.
2. Start the engine and run it idle.
3. Verify that air does not flows from air relief valve.
4. Short the ECU terminal 3P and verify that the air flows from air relief valve.
5. If the air does not flow, check the following condition below.
   - Vacuum tube
     Inspect the vacuum line fitting, connections and components for leaks. (Refer to page F–10)
   - Solenoid valve (Relief 1)
     Inspection (Refer to page F–190)
   - Air pump
     Inspection (Refer to page F–121)
   - Air pump relay.
     Inspection (Refer to page F–123)

DT-S1000

1. Connect the **SSTs** (DT-S1000 and Harness) to the diagnosis connector as shown.
2. Start the engine and run it idle.
3. Verify that air does not flows from air relief valve.
4. Select simulation check and verify that the air flows from air relief valve when solenoid valve (air relief) to ON.
5. If the air does not flows from air relief valve, stop the engine and turn ignition switch ON.
6. Select simulation check and verify that the solenoid valve (air relief) operational sound is heard.
7. If the solenoid valve operational sound is not heard check the condition above.

Inspection

1. Remove the air control valve (Refer to page F–119)
2. Connect a vacuum pump to port A
3. Verify that the air relief valve opens at a vacuum 19.3 kPa {145 mmHg, 5.7 inHg}

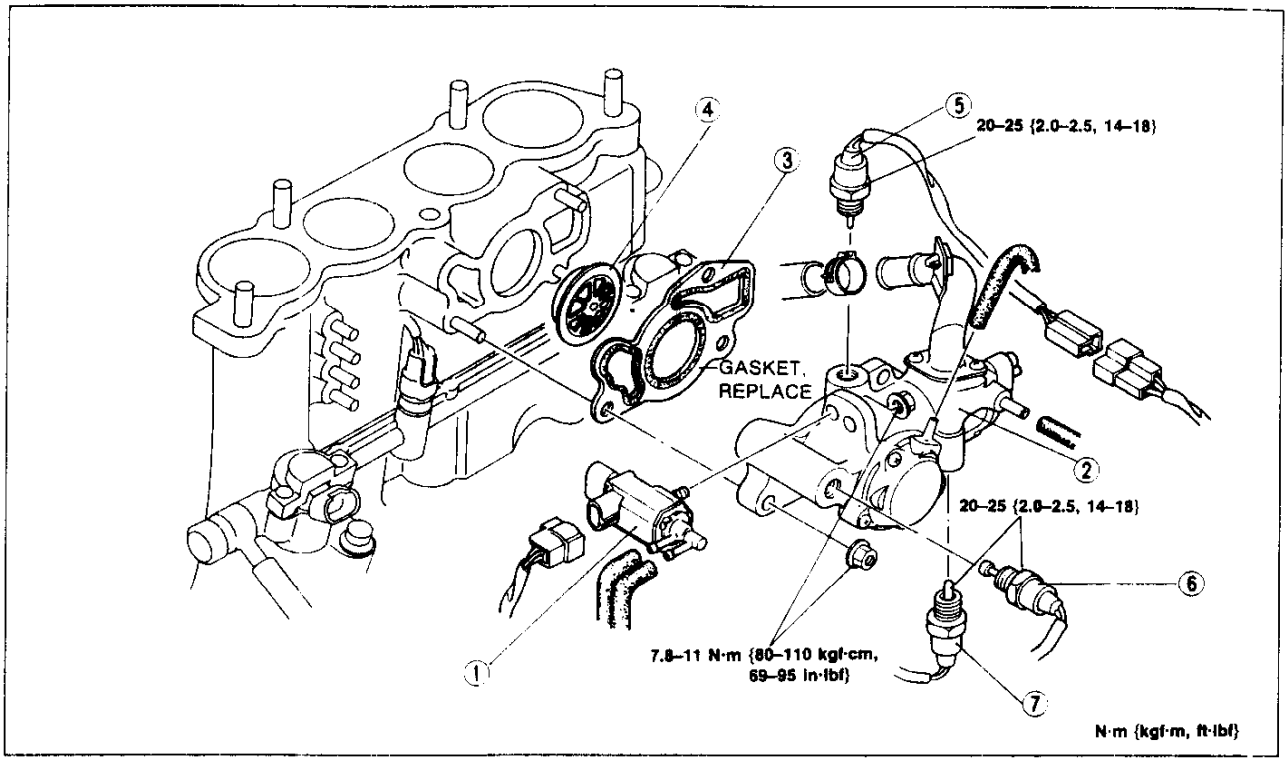
Caution

- **Do not apply vacuum More than 66.7 kPa {500 mmHg, 19.7 inHg}**

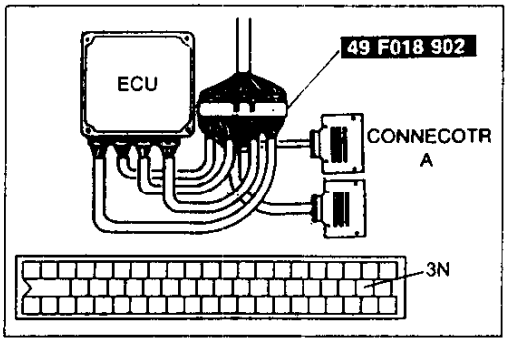
4. If not as specified, replace air control valve.

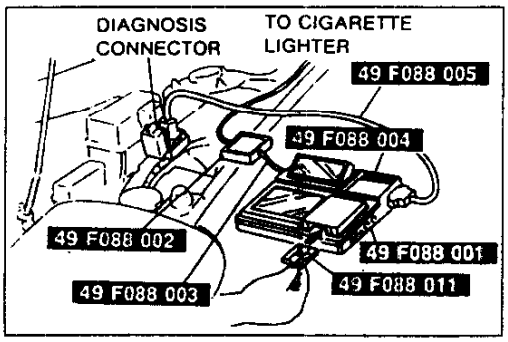
Removal / Installation

1. Remove the extension manifold. (Refer to page F–76)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



1. Solenoid valve (Turbo control)
   Inspection ..... page F–190
2. Air control valve
3. Gasket
4. Check valve (Port air)
   Inspection ..... page F–120
5. Solenoid valve (Port air bypass)
   Inspection ..... below
6. Solenoid valve (Split air bypass)
   Inspection ..... page F–120
7. Solenoid valve (Relief2)
   Inspection ..... page F–123





SOLENOID VALVE (PORT AIR BYPASS)

System Operation

Engine Signal Monitor

1. Connect the **SSTs** (Engine Signal Monitor Adaptor Harness) to the ECU.
2. Turn ignition switch ON.
3. Short the ECU terminal 3N and verify that the operational sound is heard.

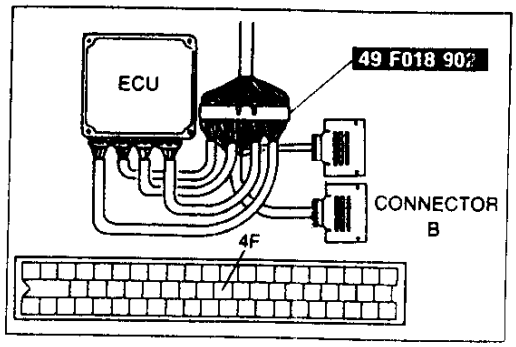
DT-S1000

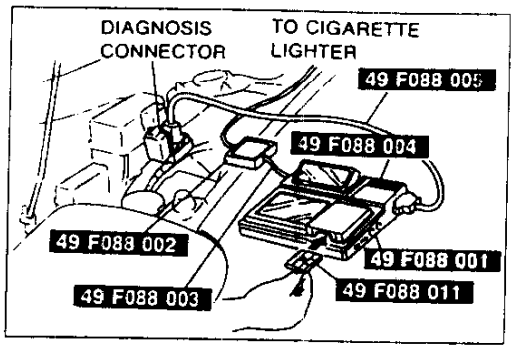
1. Connect the **SSTs** (DT-S1000 and Harness) to the diagnosis connector.
2. Turn ignition switch ON.
3. Select simulation check (port air bypass) and verify that the operational sound is heard.

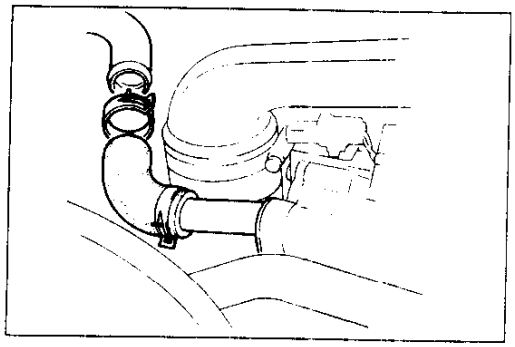
Inspection

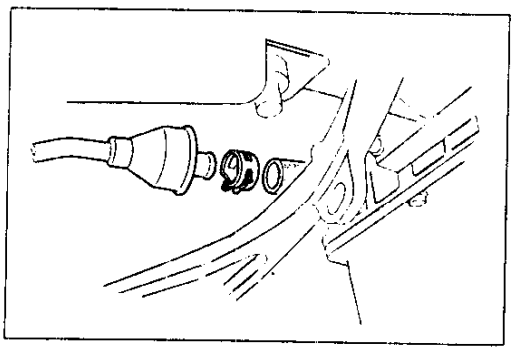
1. Disconnect the solenoid valve (Port air bypass) connector.
2. Measure the solenoid valve resistance with an ohmmeter.

   Resistance: 26.6–32.6 Ω (20°C [68°F])
3. If not as specified replace solenoid valve. (Refer to page F–190)









SOLENOID VALVE (SPLIT AIR BYPASS)

System Operation

1. Connect the **SSTs** (Engine Signal Monitor Adaptor Harness) to the ECU.
2. Turn ignition switch ON.
3. Short the ECU terminal 4F and verify that the operational sound is heard.

DT-S1000

1. Connect the **SSTs** (DT-S1000 and Harness) to the diagnosis connector.
2. Turn ignition switch ON.
3. Select simulation check and verify that the operational sound is heard.

Inspection

1. Disconnect the solenoid valve.
2. Measure the solenoid valve resistance with an ohmmeter.

Resistance: 27–32 Ω {20°C [68°F]}

3. If not as specified, replace solenoid valve.

CHECK VALVE (PORT AIR)

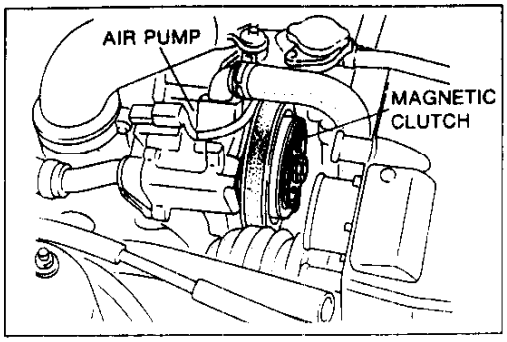
Inspection

1. Disconnect the air hose (From air pump to air control valve) at the air control valve.
2. Start the engine and run it idle.
3. Verify that the exhaust gas does not flow from air control valve.
4. If the exhaust gas flows from air control valve replace the check valve (port air)
   (Refer to page F–119)

CHECK VALVE (SPLIT AIR)

Inspection

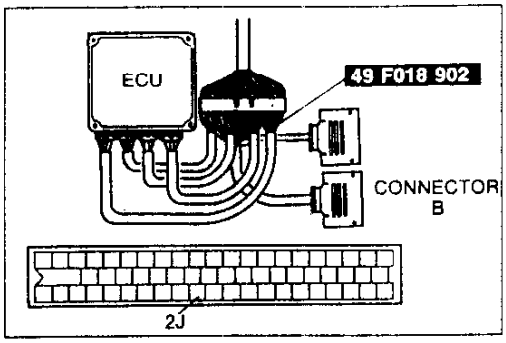
1. Disconnect the air hose (From air control valve to air pipe) at the air pipe.
2. Connect a tachometer to the engine.
3. Start the engine.
4. Increase the engine speed to 2,000 rpm and verify that the exhaust gas does not flow from split air pipe.
5. If not as specified, replace the check valve (Spilit air)



AIR PUMP

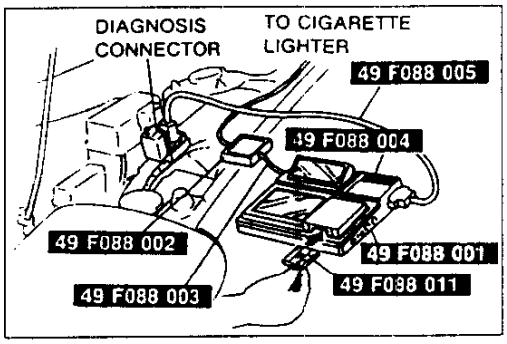
System Operation

1. Start the engine.
2. Increase the engine speed to above 3250 rpm and verify that the air pump magnetic clutch OFF.



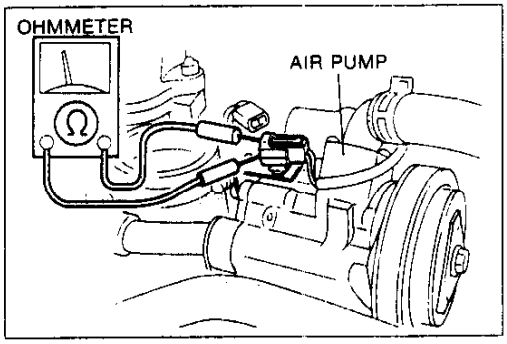
Inspection
Magnetic clutch
Engine signal monitor

1. Connect the **SST** (Engine Signal Monitor Adaptor Harness) to the ECU.
2. Turn ignition switch ON.
3. Short the ECU terminal 2J and verify that the magnetic clutch OFF.
4. If the magnetic clutch does not OFF check the Air pump relay. (Refer to page F–123)
5. If the relay is OK, disconnect the air pump connector and check the continuity.
6. If not as specified, replace the air pump.



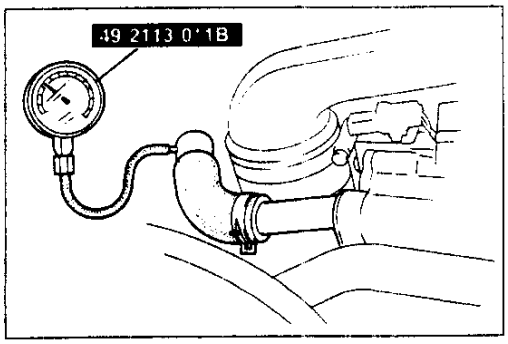
DT-S1000

1. Connect the **SST** (DT-S1000 and Harness) to the diagnosis connector.
2. Turn ignition switch ON.
3. Select a simulation check (air pump relay) and verify that the magnetic clutch ON and OFF.
4. If the magnetic clutch does not ON OFF check the air pump relay. (Refer to page F–123)
5. If the relay is OK, disconnect the air pump connector and check the continuity.
6. If not as specified, replace the air pump.



Continuity

1. Disconnect the air pump connector.
2. Check for continuity between terminals.
3. If no continuity, replace the air pump.



Pressure

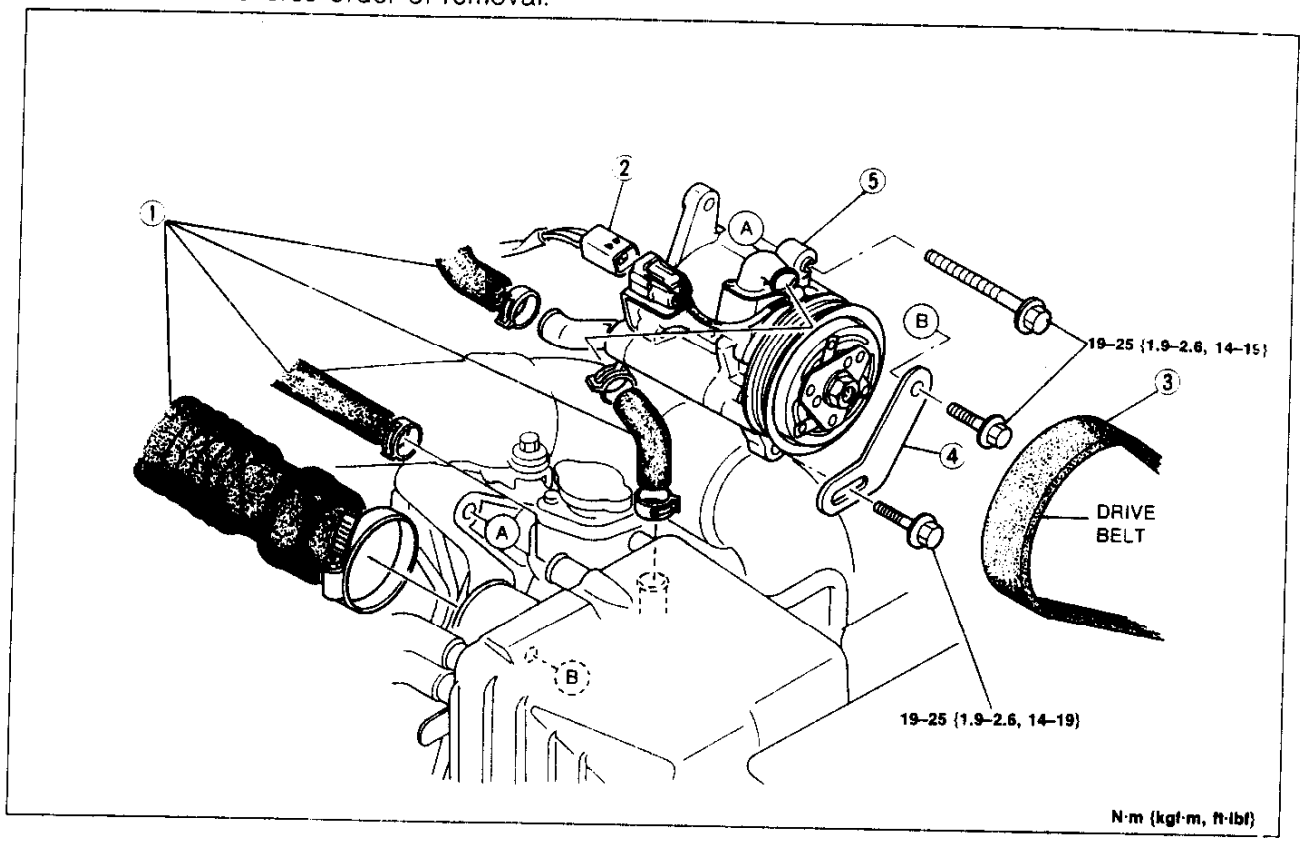
1. Disconnect air hose (from air control valve to air pump) at the air control valve.
2. Connect the **SST** to the air hose.
3. Start the engine and run it idle.
4. Measure the pressure.

Pressure
More than 4.9 kPa {0.05 kgf/cm², 0.7 psi}

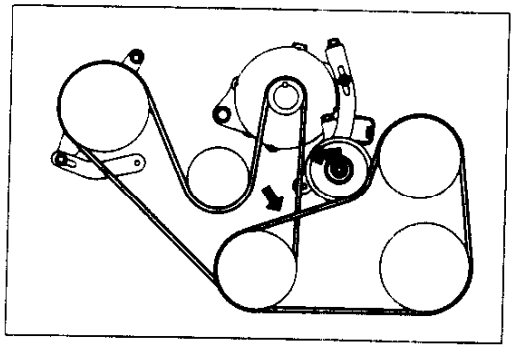
5. If not as specified, replace the air pump.

Removal / Installation

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



1. Air hoses
2. Connector
3. Drive belt
   Inspection ..... below
4. Braket
5. Air pump
   Inspection ..... page F–121



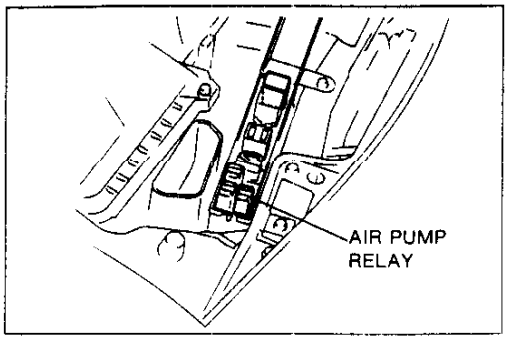
AIR PUMP DRIVE BELT

Inspection

1. Check the drive belt for cracks deterioration or oil contamination.
2. Replace if necessary.
3. If the belt is noisy, check for loose or misaligned pulleys.

Adjustment

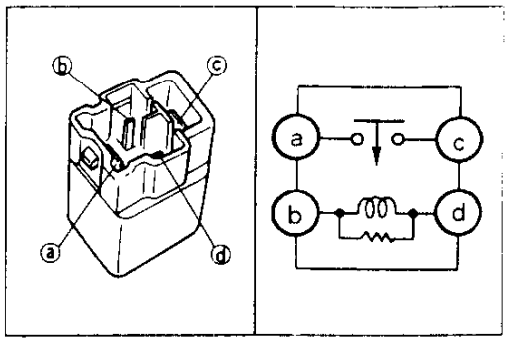
Refer to section C



AIR PUMP RELAY

Inspection (On-vehicle)

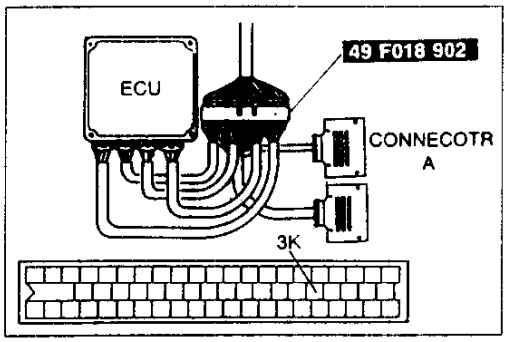
Check that a "clicking" sound is heard at the Air pump relay when turning the ignition switch ON and OFF.



Inspection

1. Disconnect the air pump relay.
2. Apply Battery voltage and ground to terminals B and D of the relay.
3. Check continuity of the relay.

Operation	A–C terminals
V_B Applied	Continuity
V_B Not applied	No continuity

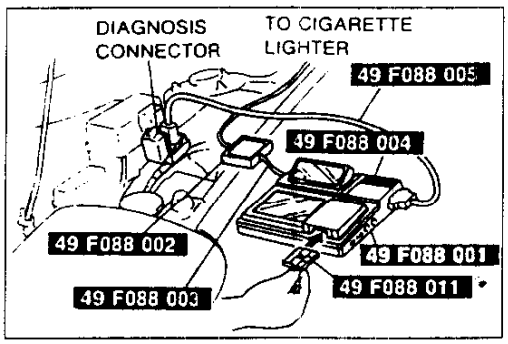


SOLENOID VALVE (RELIEF2)

System Operation

Engine Signal Monitor

1. Connect the **SST** (Engine Signal Monitor Adaptor Harness) to the ECU.
2. Turn ignition switch ON.
3. Short the ECU terminal 3K and verify that the operation sound is heard.



DT-S1000

1. Connect the **SST** (DT-S1000 and Harness) to the diagnosis connector.
2. Turn ignition switch ON.
3. Select simulation check (RELIEF 2) and verify that the operation sound is heard.

Inspection

1. Disconnect the solenoid valve. (Refer to page F–119)
2. Measure the solenoid valve resistance with an ohmmeter.

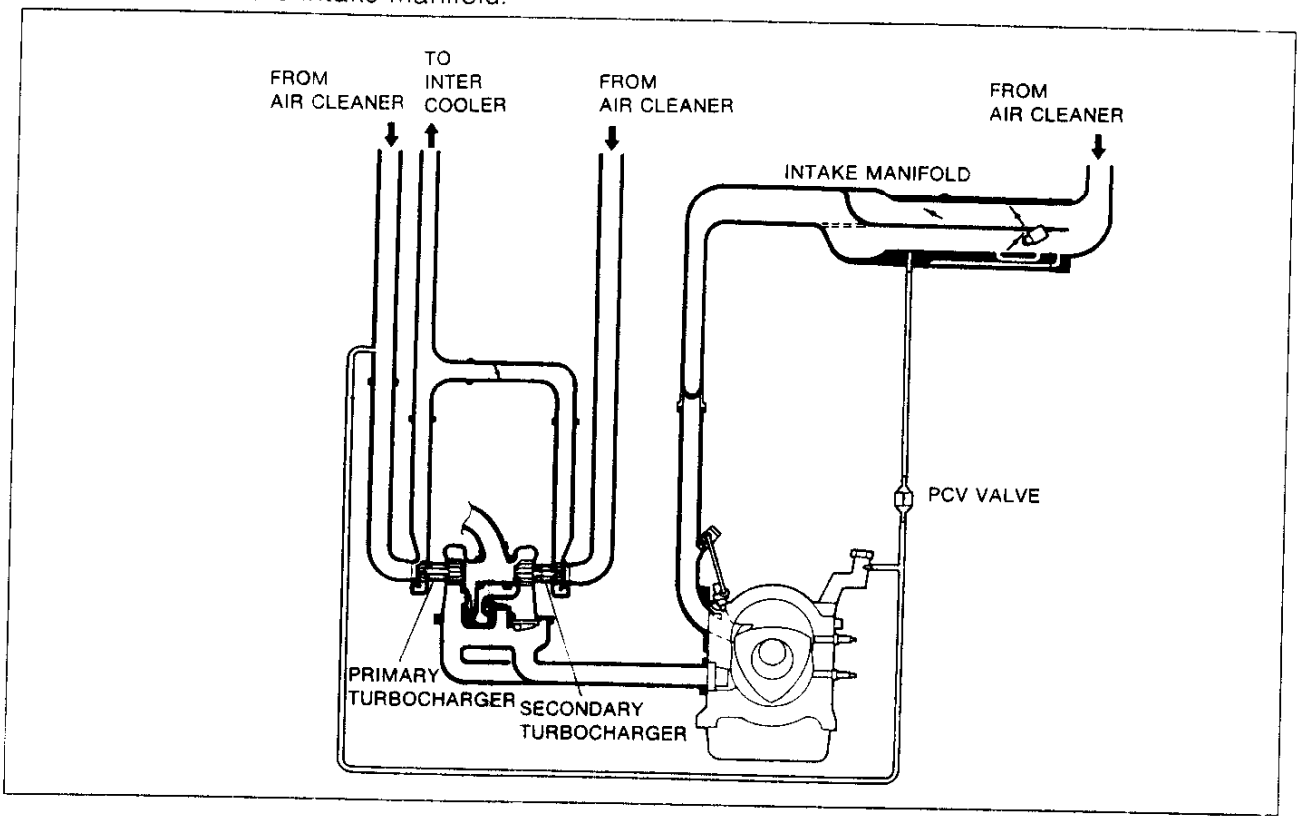
Resistance 27–32 Ω {20°C [68°F]}

3. If not as specified, replace solenoid valve. (Refer to page F–119)

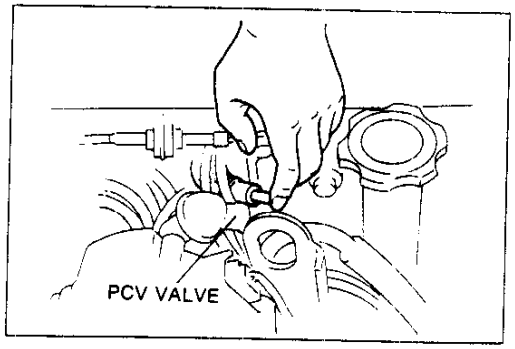
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

DESCRIPTION

The PCV valve is operated by the intake manifold vacuum.
When the engine is running at idle, the PCV valve is opened slightly and a small amount of blow by gas is drawn into the dynamic chamber to be burned.
As the engine speed rises the PCV valve is opened further, allowing a larger amount of blow by gas to be drawn into the intake manifold.



29U0FX-231



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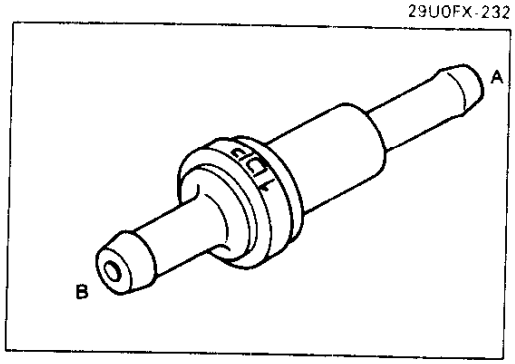


29U0FX-233

PCV VALVE

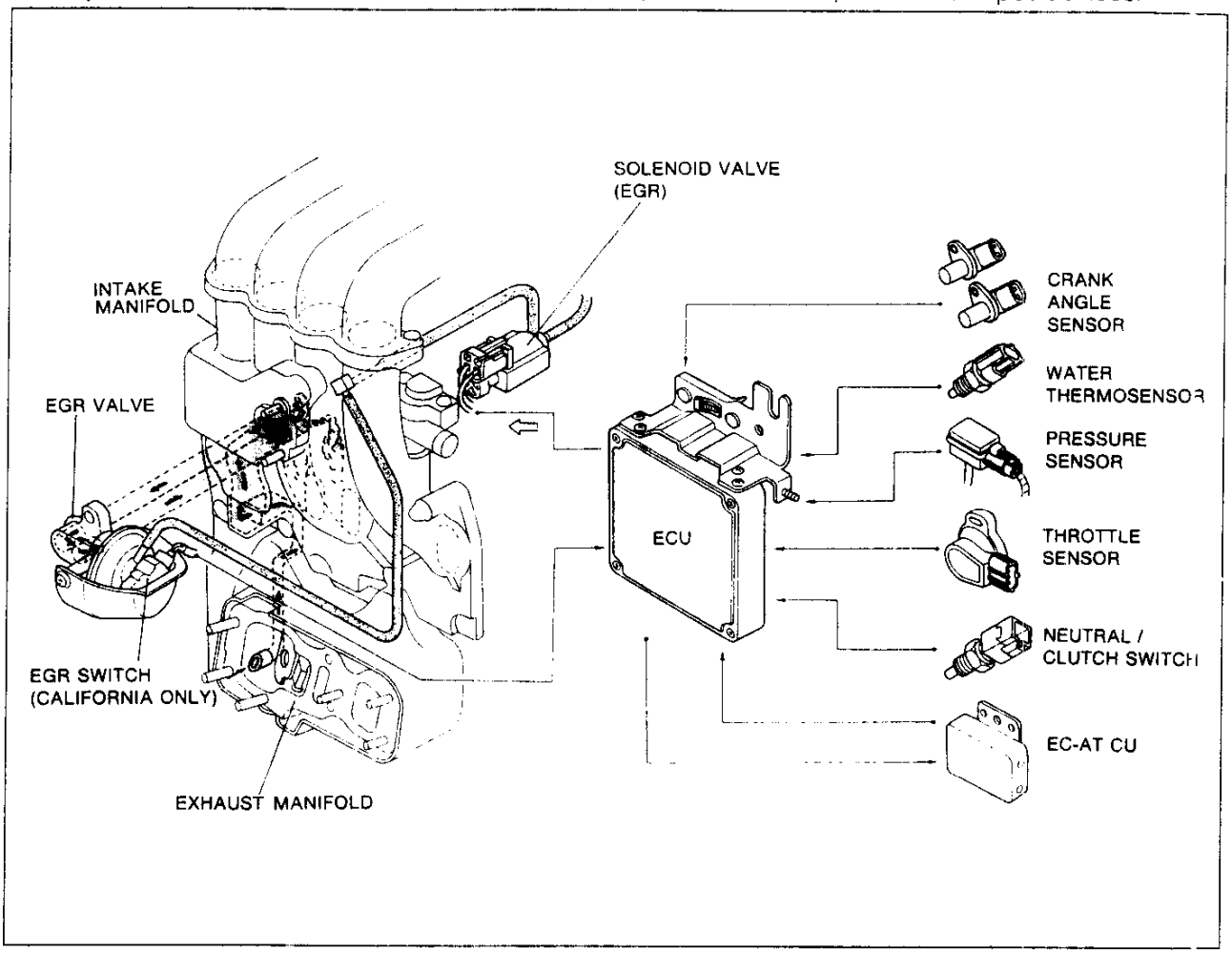
Inspection

1. Warm up the engine to the normal operating temperature and run it at idle.
2. Disconnect the PCV valve with the ventilation hose.
3. Block the PCV valve opening.
4. Verify that vacuum is felt.
5. Remove the PCV valve.
6. Blow through the valve from port A and verify that air comes out of port B.
7. Blow through the valve from port B and verify that no air comes out of port A.
8. Replace the PCV valve if necessary.

EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM

DESCRIPTION

This system recirculates a small amount of exhaust gas into the intake manifold to reduce the combustion temperature, and reduce NOx emissions.
This system consists of the EGR valve, EGR switch, solenoid valve, ECU and input devices.



Operation

Cold engine (Engine coolant temperature: below 70°C [158°F])

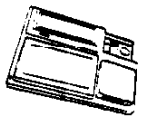
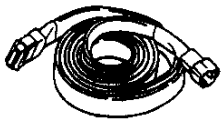
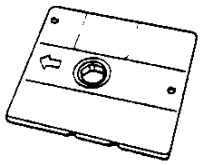
EGR operation is stopped to improve drivabilty when the engine is cold.

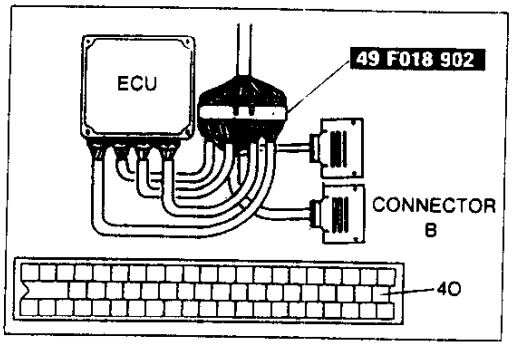
Warm engine

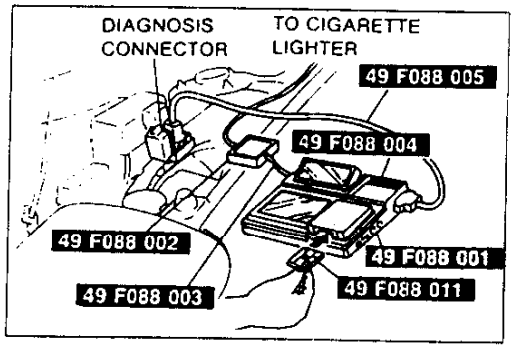
The ECU controls the solenoid valve to supply EGR gases as described below.

Operating condition	EGR operation	Remark
Idle	Stopped	–
Deceleration		
High engine speed		Above 3850 rpm
Heavy load		–
Others (Engine speed above 1050 rpm)	Supplied EGR gas	MT 5th gear, AT OD position Above 1700 rpm

PREPARATION
SST

49 F088 001 DT-S1000 Base unit 	For inspection of solenoid valve	49 F088 002 Power unit (DC12V) 	For inspection of solenoid valve
49 F088 003 Harness Power unit 	For inspection of solenoid valve	49 F088 004 Interface adaptor Type–1 	For inspection of solenoid valve
49 F088 005 Harness Type–1 	For inspection of solenoid valve	49 F088 011 System disk Type–1 (Ver 1.00) 	For inspection of solenoid valve





SYSTEM OPERATION
Engine Signal Monitor

1. Connect the **SST** (Engine Signal Monitor Adaptor Harness) to the ECU as shown.
2. Start the engine.
3. Accelerates the engine and verify that ECU terminal 4O, voltage V_B while the engine is still cold.
4. Warm up the engine to normal operating temperature and run it at idle.
5. Short the ECU terminal 4O and verify that the engine runs roughly or stalls at idle.

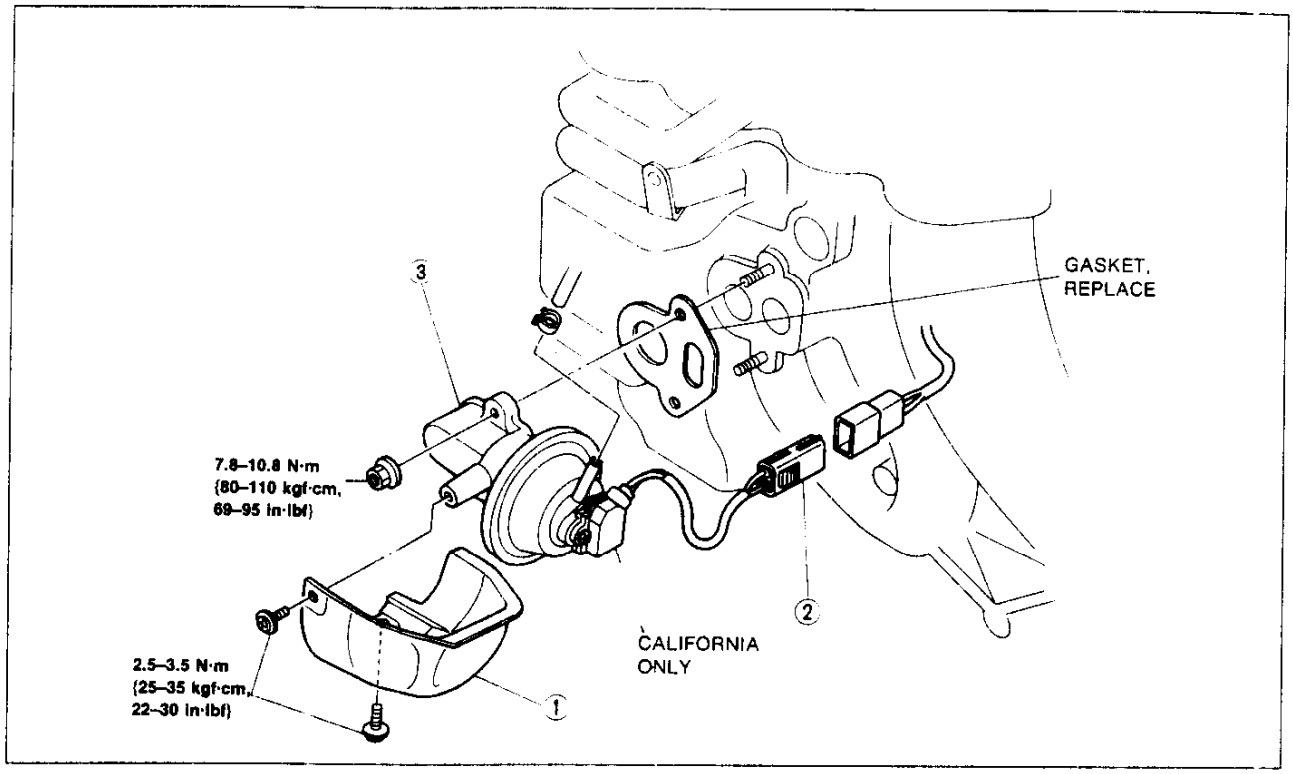
DT-S1000

1. Connect the **SSTs** (DT-S1000 and Harness) to the diagnosis connector as shown.
2. Start the engine.
3. Accelerate the engine and verify that the EGR solenoid valve OFF while engine is still cold.
4. Warm up the engine to normal operating temperature and run it at idle.
5. Select simulation check and verify that the engine runs roughly or stalls at idle when solenoid valve ON.

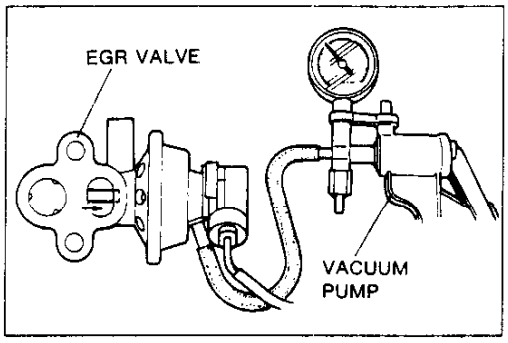
EGR VALVE

Removal / Installation

1. Remove the intake air system component parts. (Refer to page F–76)
2. Remove in the order shown in figure.
3. Install in the reverse order of removal.



1. Insulator
2. Connector
3. EGR valve
   Inspection ..... below

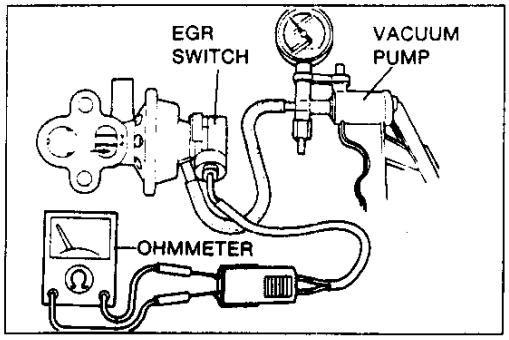


Inspection

1. Connect a vacuum pump as shown and apply vacuum.
2. Verify that the EGR valve moves at more than the specified vacuum.

Specification: 11–15.3 kPa {85–115 mmHg, 3.3–4.5 inHg}

3. If not as specified, replace EGR valve.



EGR SWITCH (CALIFORNIA ONLY)

Inspection

1. Remove the EGR valve (Refer to above)
2. Connect a vacuum pump as show and apply vacuum.
3. Verify that the EGR switch ON at more than the specified vacuum.

Specification: 11–15.3 kPa {85–115 mmHg, 3.3–4.5 inHg}

4. If not as specified, replace EGR valve.

SOLENOID VALVE (EGR)

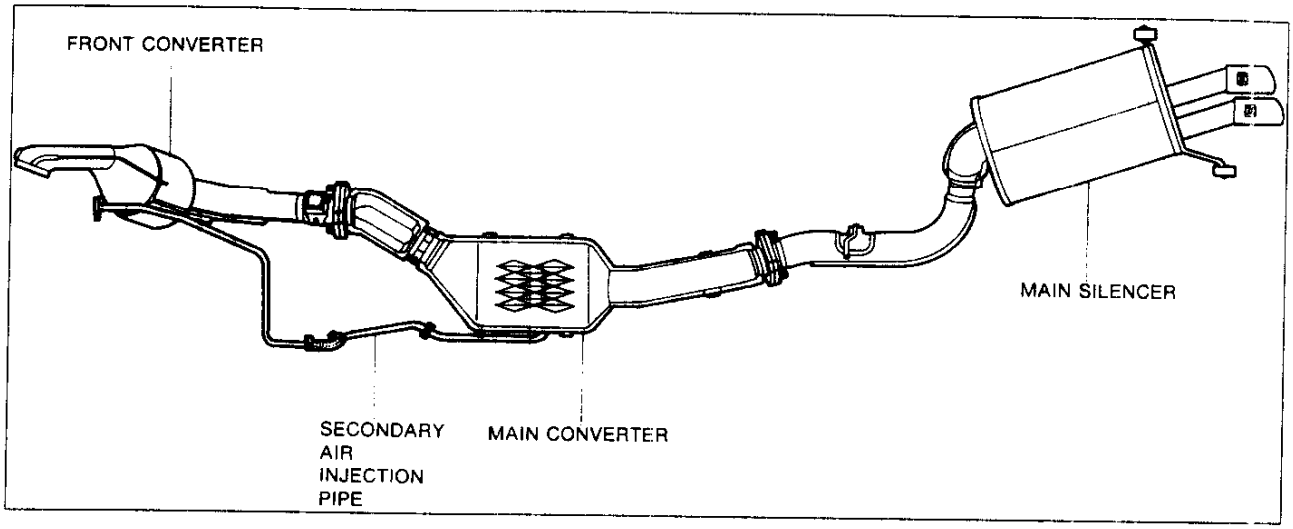
Inspection

(Refer to page F–190)

CATALYTIC CONVERTER SYSTEM

DESCRIPTION

Two bets three-way catalytic converters are used to reduce CO, HC, and NOx emissions.
For efficient operation. the front converter is placed close to the exhaust manifold so that it will heat up quickly and purify exhaust gas efficiently when engine runs at idle.
The front converter also protects the main converter from damaged by acting as a phosphorus and lead filter.



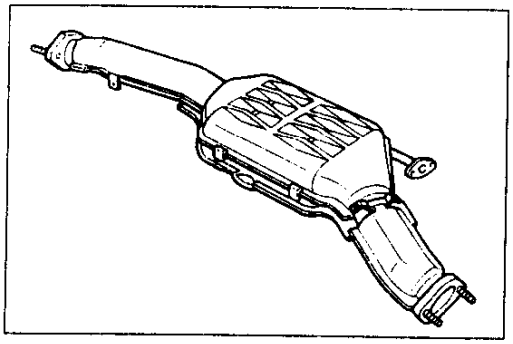
The catalytic converters reduce CO and HC, emissions through oxidization and NOx emissions by chemical reaction.

Catalytic converter	Type
Front converter	Metal
Main converter	Monotythic

Operation

(1) Before the engine is warmed up, when large amounts of CO and HC are ceated, the converter is supplied port air and uses both the first and second stages as the oxidization catalyst.
(2) In the normal driving range, the converter is supplied split air and uses the first stage as the ternary catalyst and second stage as the oxidization catalyst.
(3) During high-speed driving, an additional air to the converter is cut off, and the first and second stages are used the ternary catalyst.

	First stage	Second stage	Remark
Port air	Oxidation	Oxidation	Low-speed range, Deceleration range
Split air	Ternary	Oxidation	Cruising range
Air cut	Ternary	Ternary	High-speed range



CATALYTIC CONVERTER (FRONT CONVERTER AND MAIN CONVERTER)

Inspection

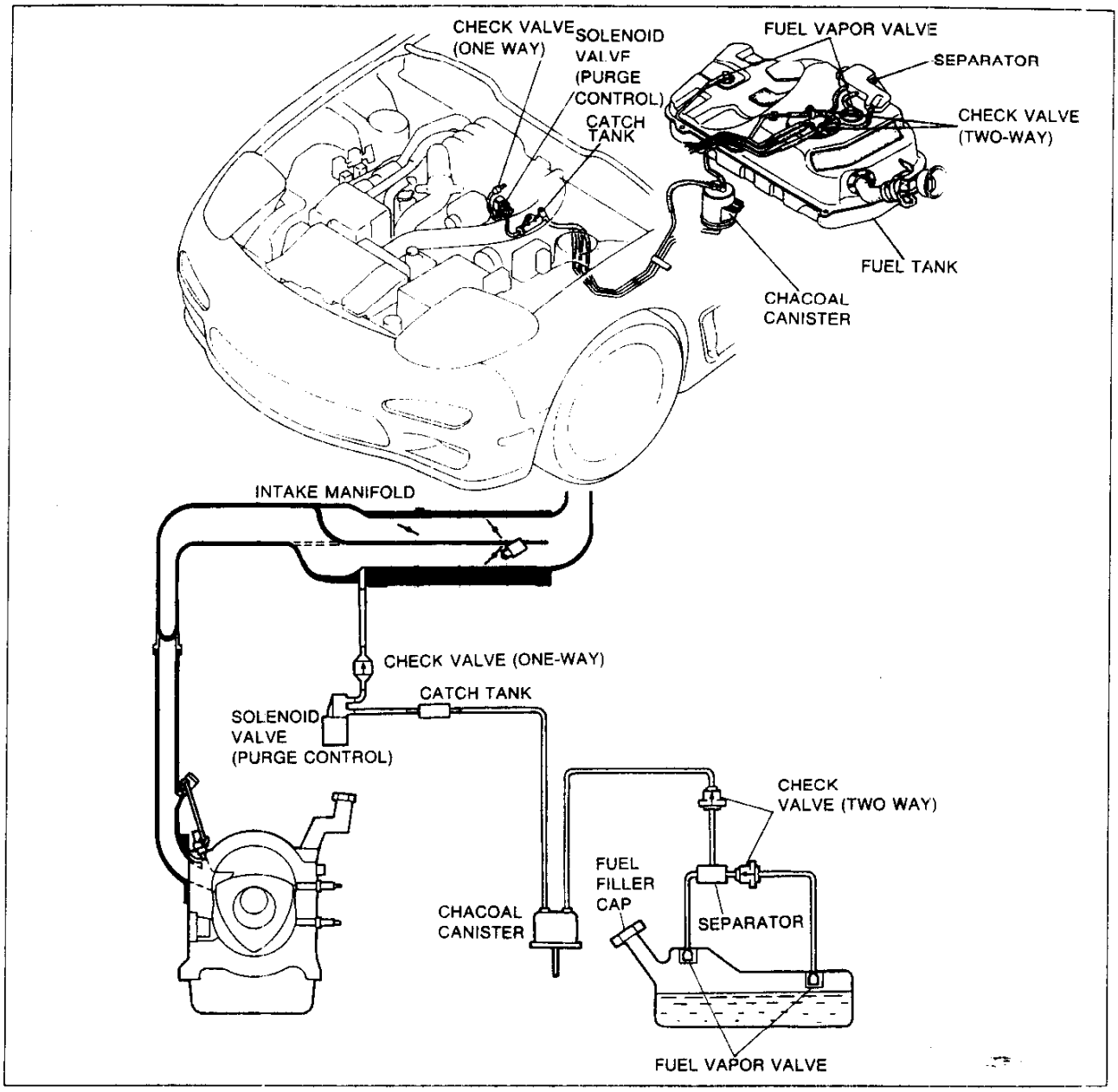
1. Check the catalytic converter for deterioration or clogging.
2. Check the insulation covers welded onto the catalytic converter for damage.

Note

- **If the insulation cover is touching the catalytic converter housing, excessive heat at the floor will occur.**

EVAPORATIVE EMISSION CONTROL SYSTEM

DESCRIPTION



The evaporative emission control system temporarily stores in the canister the evaporative fumes generated in the fuel tank. The stored gas is then passed into the air intake system for combustion when the engine is running. This operation prevents evaporative fumes from flowing out to the atmosphere.

Sending a large volume of evaporative fumes at one time into the air intake system deteriorates the airfuel ratio; thus, the ECU uses the solenoid valve (purge control) to regulate this volume.

Operation

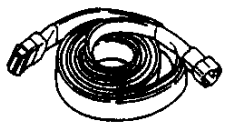
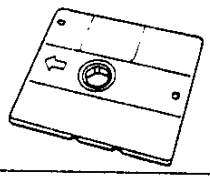
With engine stopped and no load applied

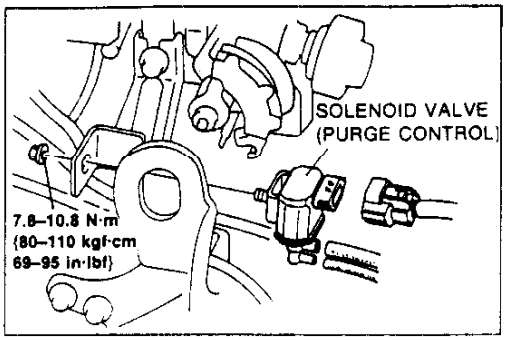
The evaporative fumes from the fuel tank are absorbed by the charcoal canister.

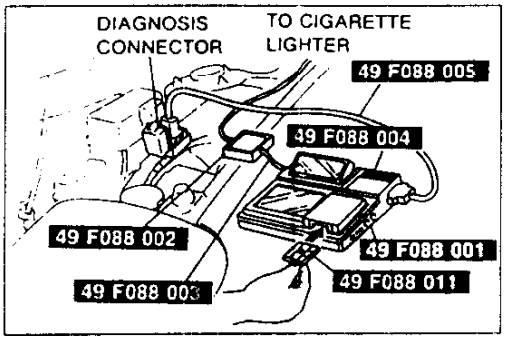
With engine running and load applied

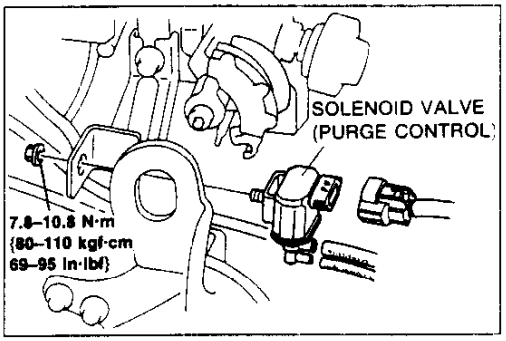
The evaporative fumes absorbed by the charcoal canister are drawn into the engine via the solenoid valve (purge control). The volume of fumes drawn depends on engine conditions.

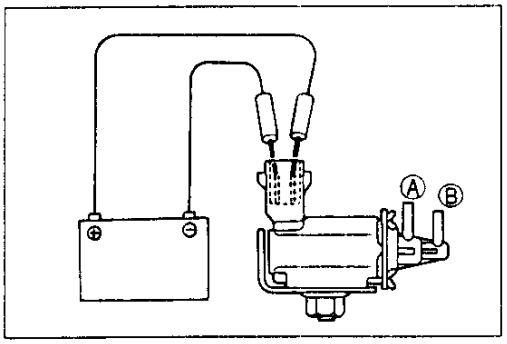
PREPARATION
SST

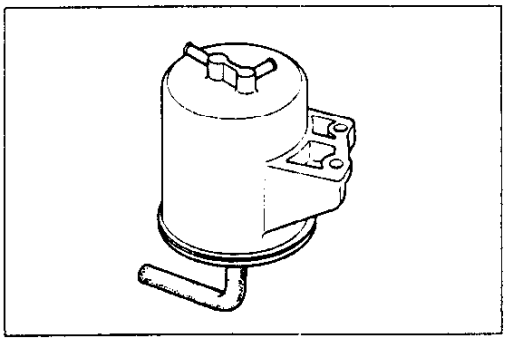
49 F088 001 DT-S1000 Base unit 	For inspection of solenoid valve and relay	49 F088 002 Power unit (DC12V) 	For inspection of solenoid valve
49 F088 003 Harness Power unit 	For inspection of solenoid valve	49 F088 004 Interface adaptor Type–1 	For inspection of solenoid valve
49 F088 005 Harness Type–1 	For inspection of solenoid valve	49 F088 011 System disk Type–1 (Ver 1.00) 	For inspection of solenoid valve











SYSTEM OPERATION

1. Warm up the engine to normal operating temperature and run it at idle.
2. Disconnect the vacuum hose from the solenoid valve (purge control) as shown in the figure, and verify that no vacuum is felt at the solenoid valve.
3. If not as specified, check the solenoid valve.

DT-S1000

1. Connect the **SST**s (DT-S1000 and Harness) to the diagnosis connector.
2. Warm up the engine to normal operating temperature and run it idle.
3. Select simulation check and verify that the solenoid valve operation sound is heard when solenoid valve ON.
4. If operation sound is not heard, check the following condition below.
   - Vacuum tube
     Inspect vacuum line fitting, connections and components for leaks. (Refer to page F–10)
   - Evaporative hose
     Inspect evaporative line fitting, connection and components for leaks.

SOLENOID VALVE (PURGE CONTROL)

Removal / Installation

1. Disconnect the vacuum hoses and connector from solenoid valve.
2. Remove the mounting nuts and solenoid valve.
3. Install in the reverse order of removal.

Inspection

1. Disconnect the vacuum hoses from the solenoid valve.
2. Blow into the valve and verify that no air flows through it.
3. Disconnect the solenoid valve connector and apply battery voltage as shown in the figure.
4. Blow into the valve and verify that air flows through it.
5. If not as specified, measure the solenoid valve resistance with an ohmmeter.

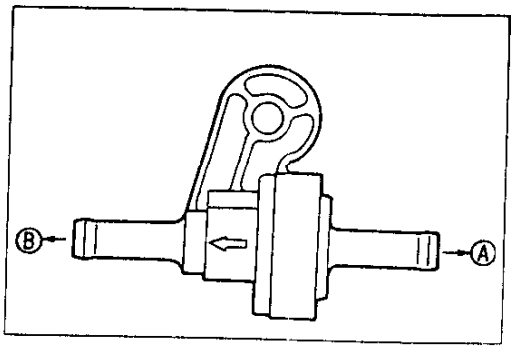
   Resistance: 30–34 Ω (20°C [68°F])

6. If not as specified, replace the solenoid valve.

CHARCOAL CANISTER

Inspection

Visually check for damage and replace the charcoal canister if necessary.

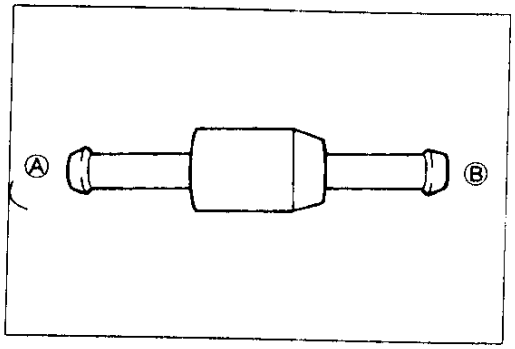


CHECK VALVE (TWO-WAY)

Inspection

1. Remove the check valve.
2. Check the operation of the check valve by using a vacuum pump.

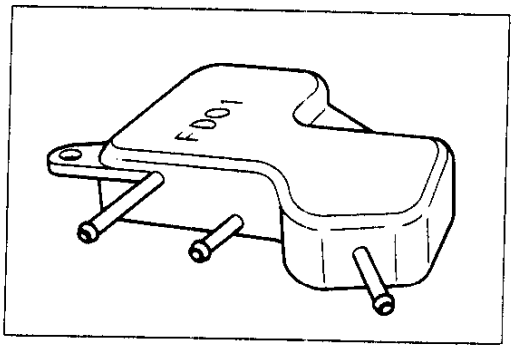
Apply approx. 5 kPa {37 mmHg, 1.46 inHg} vacuum at port A	Air flow
Apply approx. 6 kPa {44 mmHg, 1.73 inHg} vacuum at port B	Air flow



CHECK VALVE (ONE-WAY)

Inspection

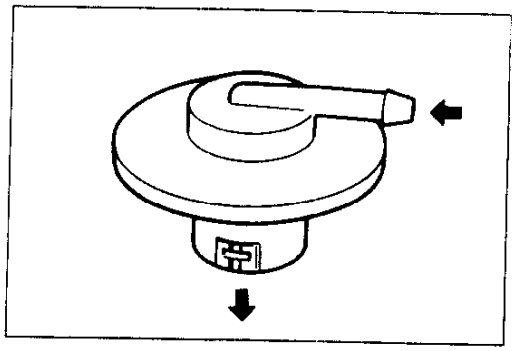
1. Remove the check valve.
2. Blow through the check valve from port A, and check that the air flows from port B
3. Blow through the check valve from port B, and check there is no flow.



SEPARATOR

Inspection

Visually check for damage and replace the separator if necessary.

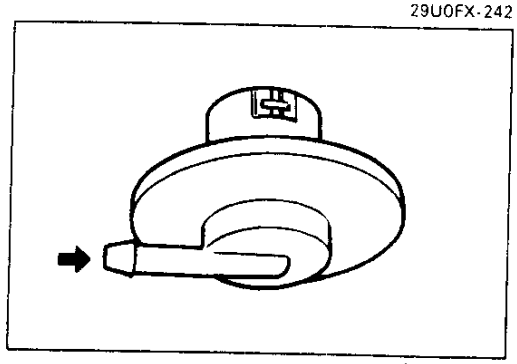


29U0FX-242

FUEL VAPOR VALVE

Inspection

1. Remove the valve.
2. Blow through the valve and verify that air flows in the direction shown.



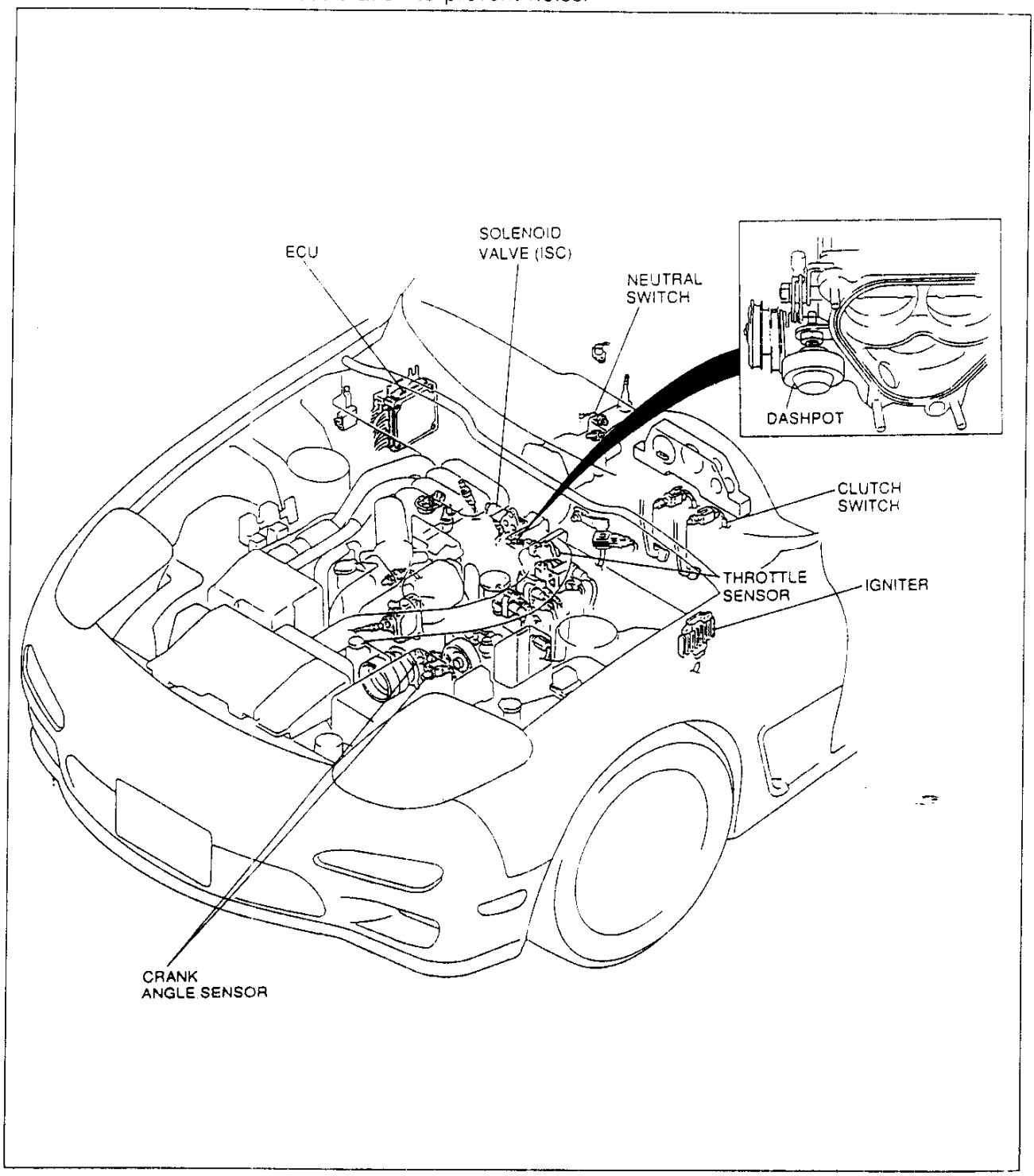
29U0FX-243

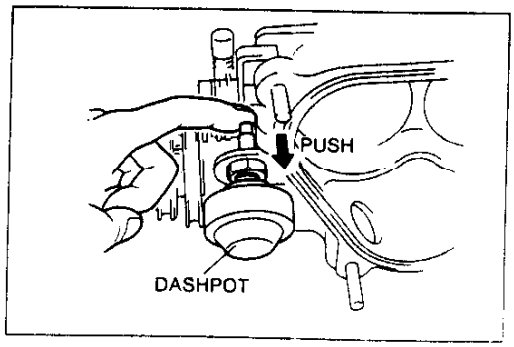
3. Turn the valve over and blow through the valve. Verify that no air flows.
4. Replace the valve if necessary.

DECELERATION CONTROL SYSTEM

DESCRIPTION

- Dash pot : To prevent the throttle valves from closing suddenly.
- Solenoid valve (ISC) : To prevent afterburn, air is supplied to intake manifold during deceleration.
- Fuel cut control : To improve the fuel economy and to prevent engine bucking during deceleration.
- Air bypass valve : Bypasses compressed air from after the turbocharger to air cleaner during deceleration to prevent noise.

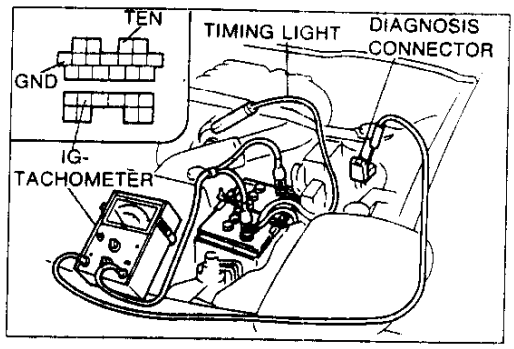




DASHPOT

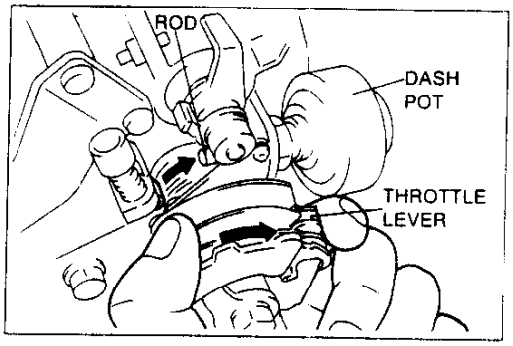
Inspection

1. Open the throttle valve fully, then push the dash pot rod with a finger and verify that the rod goes in slowly.
2. Release the rod and verify that it comes out quickly.
3. Replace it, if necessary.



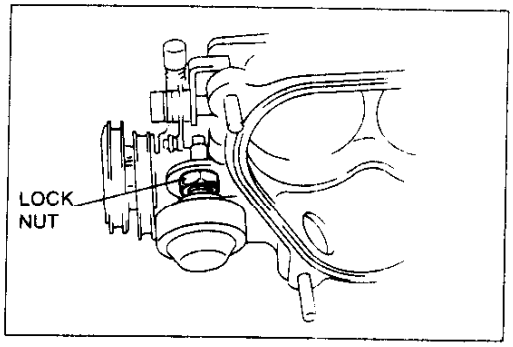
Adjustment

1. Warm up the engine to the normal operating temperature and run it idle.
2. Verify that the fast idle cam separates.
3. Turn all electrical loads OFF.
4. Connect a tachometer to the diagnosis connector terminal **IG-**.

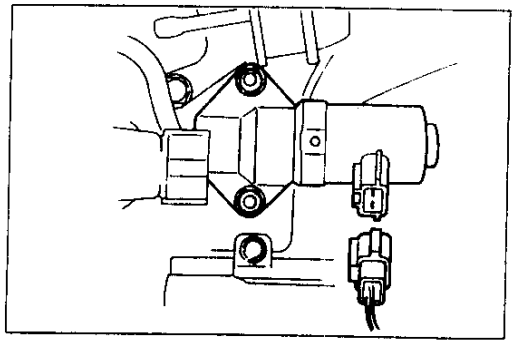


5. Open the throttle valve until the dash pot rod separates from the lever.
6. Check the engine speed when the dash pot rod touches to the lever.

Engine speed: 2600–3000 {2800 ±200} rpm



7. Loosen the lock nut and adjust by turning the dash pot, if necessary.



ANTI AFTERBURN CONTROL

System operation

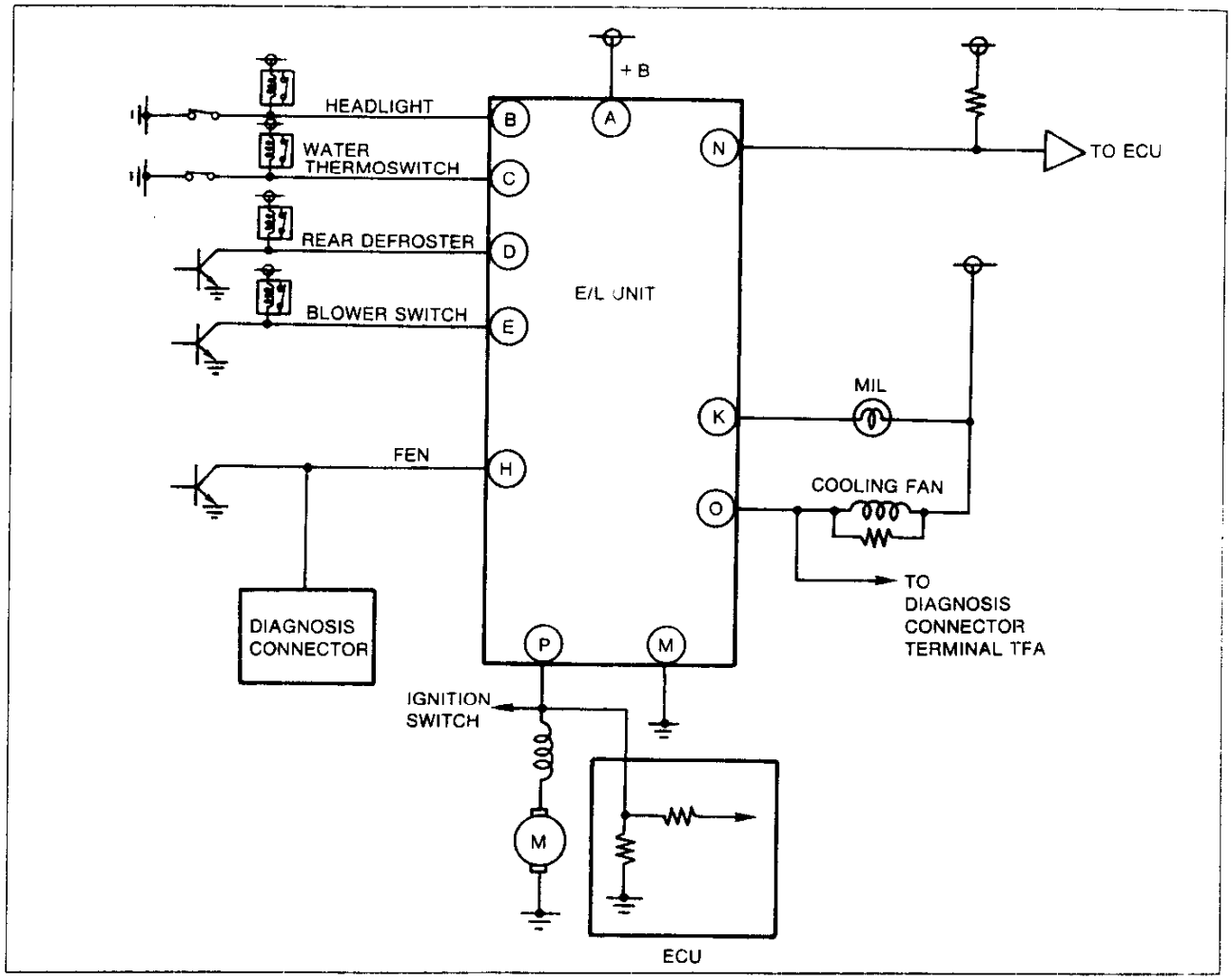
1. Start the engine and run it at idle.
2. Disconnect solenoid valve (ISC) connector.
3. Increase the engine speed to over 4,000 rpm then decrease the engine speed rapidly.
4. Verify that the engine speed decrease roughly at 1500–1000 rpm.

ELECTRICAL LOAD (E/L) CONTROL SYSTEM

DESCRIPTION

The engine speed increases when any of the following switches are ON.

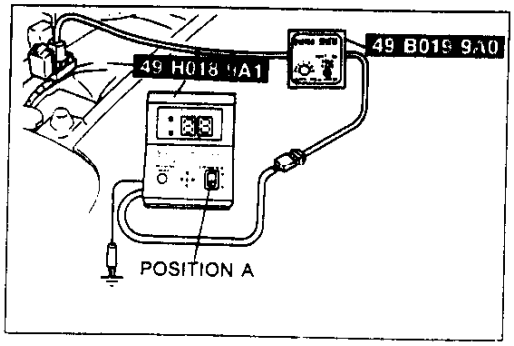
- Rear defroster switch
- Headlight switch
- Blower motor switch 3rd or 4th position.
- Water thermo switch for fan motor.



PREPARATION

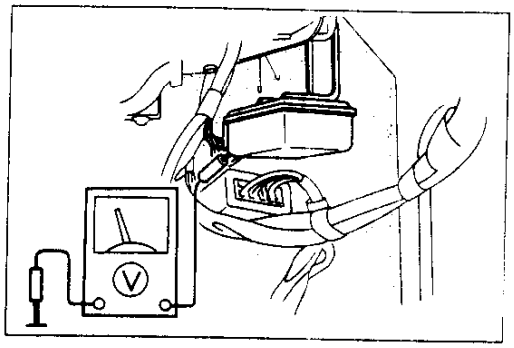
SST

49 B019 9A0 System Selector	For diagnosis	49 H018 9A1 Self-Diagnosis Checker	For diagnosis



SYSTEM OPERATION

1. Connect the **SST** (System selector) to the diagnosis connector.
2. Set switch A to position 1 and TEST SW to SELF-TEST.
3. Connect the **SST** (Self-Diagnosis Checker) to the System Selector and a ground.
4. Set the select switch to position A.
5. Turn ignition switch ON.
6. Check if the monitor lamp illuminates when each switch is made to function. (Refer to page F-67)



Inspection

1. Remove the E/L unit. (Refer to page F-150)
2. Connect the E/L unit connector.
3. Measure the voltage at each terminal by using a voltmeter.
4. If any E/L unit terminal voltage is incorrect, check the input or output device and related wiring harness. If they are normal, replace the E/L unit.

Terminal voltage

V_B: Battery voltage

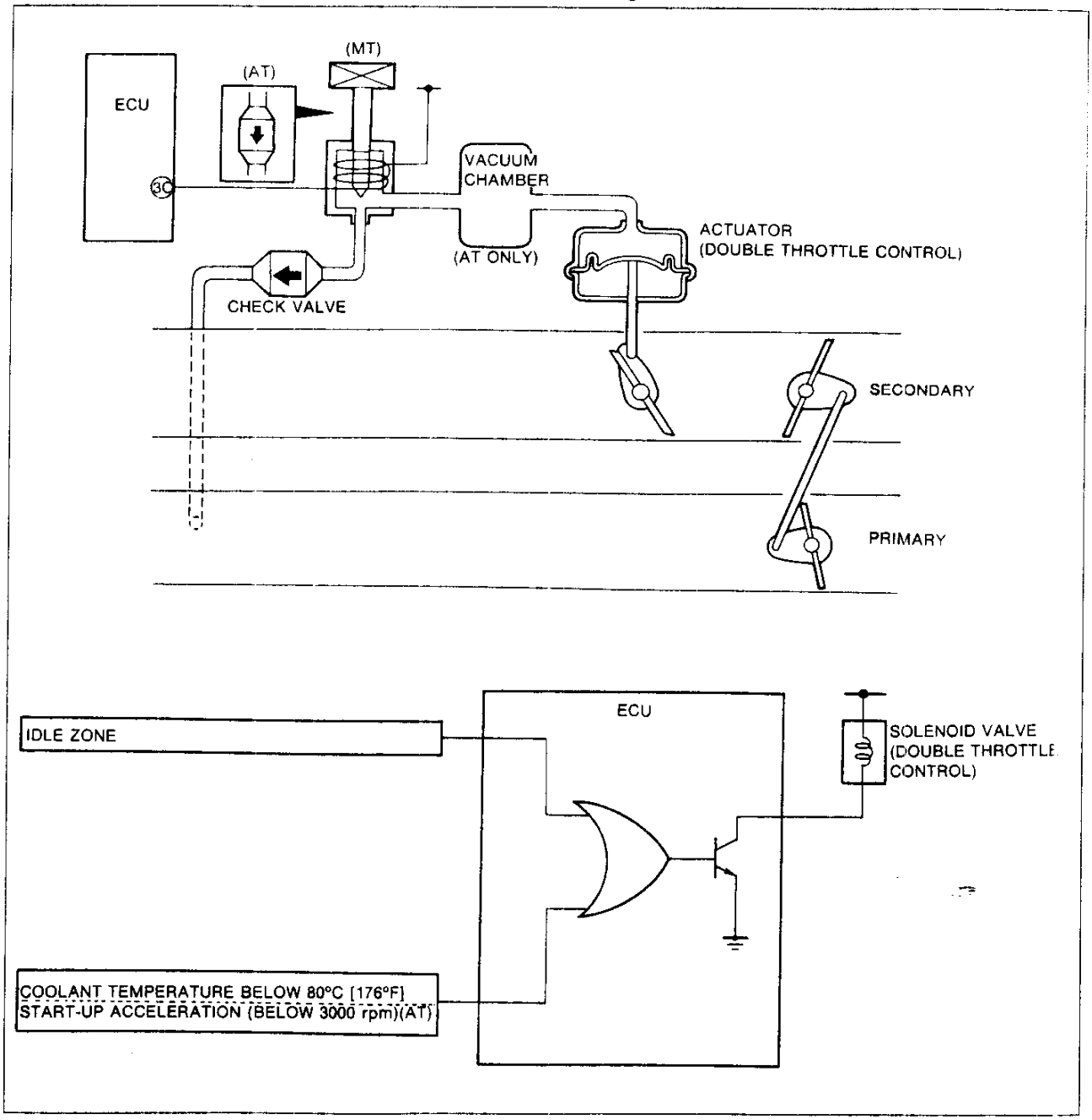
Terminal	Input	Output	Connected to	Test condition	Correct voltage	Remark
A	–	–	Main relay	Ignition switch ON	V_B	–
B	○		TNS relay	Position light ON	V_B	–
				Position light OFF	0V	
C	○		Water thermoswitch	Engine coolant temperature below 108°C	V_B	Ignition switch ON
				Engine coolant temperature above 108°C {221°F}	0V	
D	○		Rear window defroster ready	Rear window defroster OFF	V_B	Ignition switch ON
				Rear window defroster ON	Below 1.0V	
E	○		Blower moter relay	Blower switch 3rd or 4th position	Below 1.0V	Ignition switch ON
				Blower switch 1st or 2nd position	V_B	
F	–	–	–	–	–	–
G	–	–	–	–	–	–
H		○	Self-Diagnosis checker Diagnosis connector (FEN)	Buzzer sounded for 3 sec. after ignition switch OFF → ON	Below 2.5V	• With Self-Diagnosis checker and system Selector • With System Selector test switch at SELF TEST
				Buzzer not sounded for after 3 sec.	V_B	
				Buzzer sounded	Below 2.5V	
				Buzzer not sounded	V_B	
I	–	–	–	–	–	–
J	–	–	–	–	–	–
K		○	Malfunction indicator lamp (MIL)	Lamp illuminated for 3 sec. after ignition switch ON	Below 2.5V	With system selector test switch at SELF TEST
				Lamp not illuminated after 3 sec.	V_B	
				Lamp illuminated	Below 2.5V	
				Lamp not illuminated	V_B	
L	–	–	–	–	–	–
M	–	–	Ground	Constant	0V	–
N		○	ECU	Electrical load ON	Below 2.5V	Ignition switch ON
				Electrical load OFF	V_B	
O		○	Cooling fan relay	Engine coolant temperature below 108°C	Below 2.5V	Ignition switch ON
				Engine coolant temperature above 108°C	V_B	
P	○		Ignition switch	While cranking	–	–
				Ignition switch ON	Below 1.0V	

DOUBLE THROTTLE CONTROL SYSTEM

DESCRIPTION

The response delay of the pressure sensor followed mounted by rapid acceleration temporarily causes a lean fuel mixture. The double throttle control system prevents hesitation caused by this lean fuel mixture by slightly delaying the opening of the double throttle valve after the secondary throttle valve.

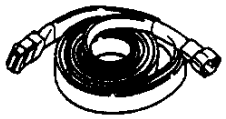
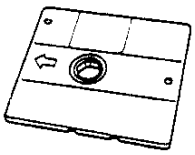
The double throttle valve is controlled by the ECU through the solenoid valve.

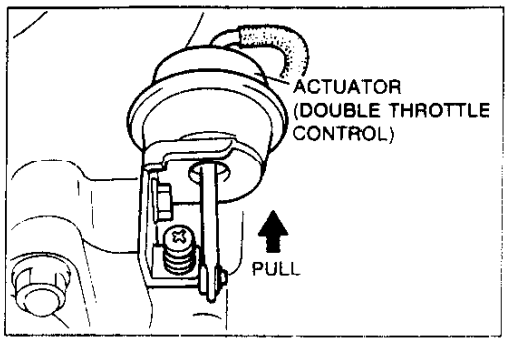


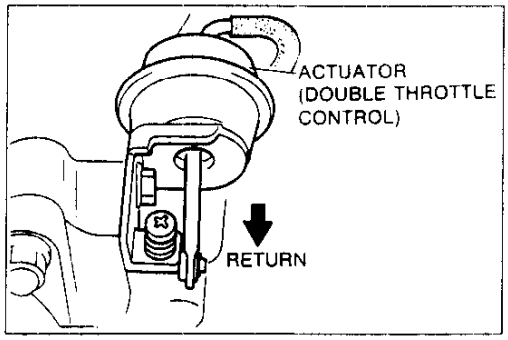
OPERATION

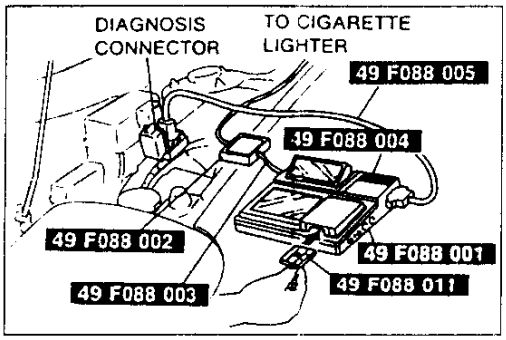
When one or more of the above conditions are met, the ECU turns the solenoid valve ON, applies vacuum to the actuator (double throttle control), and closes the double throttle valve.

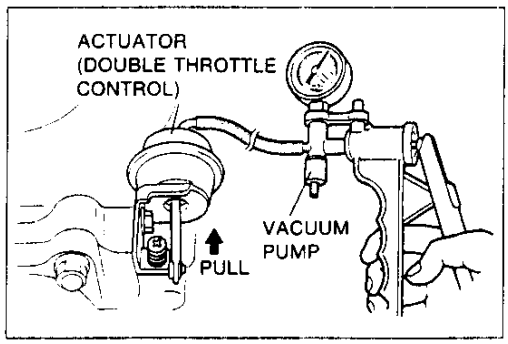
PREPARATION
SST

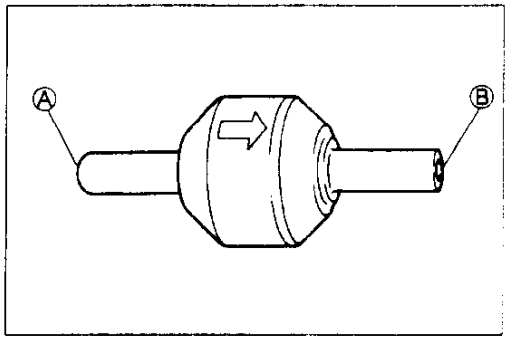
49 F088 001 DT-S1000 Base unit 	For inspection of solenoid valve and relay	49 F088 002 Power unit (DC 12V) 	For inspection of solenoid valve
49 F088 003 Harness Power unit 	For inspection of solenoid valve	49 F088 004 Interface adapter Type–1 	For inspection of solenoid valve
49 F088 005 Harness Type–1 	For inspection of solenoic valve	49 F088 011 System disk Type–1 (Ver.1.00) 	For inspection of solenoid valve











SYSTEM OPERATION

1. Start the engine and verify that the actuator (Double throttle control) rod is pulled into actuator while engine is cold.
2. If the actuator rod is not pulled, check the following condition below.
   - Vacuum tube
     Inspect vacuum line fitting, connections and components for leaks. (Refer to page F–10.)
   - Vacuum chamber
     Visually check for dogging damage or crack.
   - Actuator
     Inspection. (Refer to below.)
   - Solenoid valve (Double throttle control)
     Inspection. (Refer to page F–190.)
   - Water thermosensor
     Inspection. (Refer to page F–183.)
3. Verify that the actuator rod is returned, when warm up the engine to normal operating temperature.
4. If the actuator rod is not return, check the folbing condition below.
   - Solenoid valve (Double throttle control)
     Inspection. (Refer to page F–190.)
   - Water thermosensor
     Inspection (Refer to page F–183.)

DT-S1000

1. Connect the **SST**s (DT-S1000 and Harness)
2. Start the engine and run it idle.
3. Select the simulation check (Double throttle control) and verify that the actuator rod is moved when solenoid valve on and OFF
4. If actuator rod is not moved check the condition above.

ACTUATOR (DOUBLE THROTTLE CONTROL)

Inspection

1. Disconnect vacuum hose
2. Connect a vacuum pump and verify that actuator rod is pulled into actuator when apply the vacuum more than 22.0–28.7 kPa {165–215 mmHg, 6.5–8.5 inHg}
3. If not as specified, replace the actuator

Removal / Installation

(Refer to page F–78)

CHECK VALVE

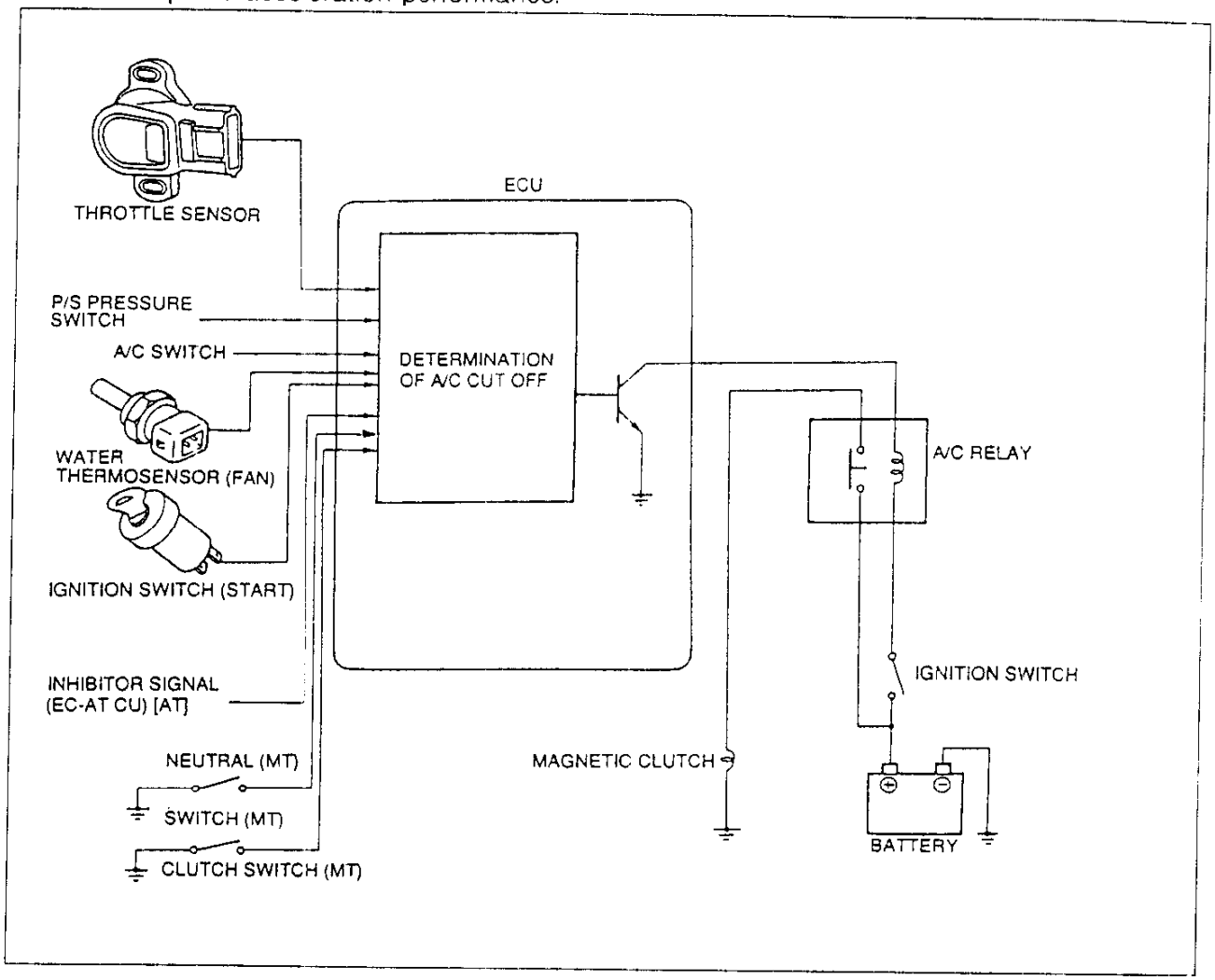
Inspection

1. Remove the check valve.
2. Blow through A and check that air flows from B.
3. Blow through B and check that air does not flow from A.

A/C CUT-OFF SYSTEM

DESCRIPTION

An A/C cut off system in used to improve idle smoothness immediately after starting the engine and to improve acceleration performance.

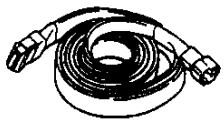
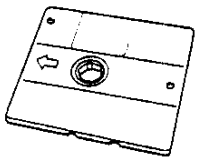


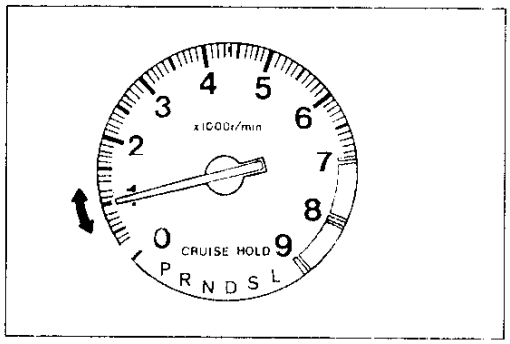
16EOF2-19

Operation

Engine condition	Purpose	Cut off period
After engine started	Improved idle	Approx. 8 sec.
Throttle valve fully open	Improved drivability	Approx. 7 sec.
Water temperature over 117°C {243°F}	Prevent engine from over heating	Water temperature under 115°C {239°F}

PREPARATION
SST

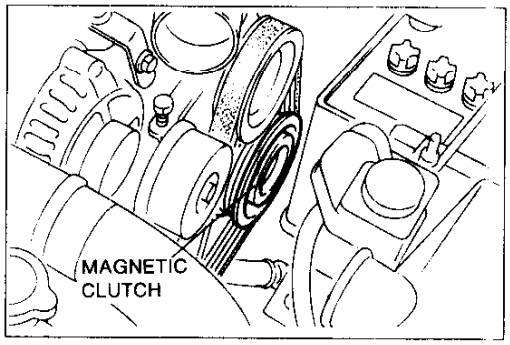
49 F088 001 DT-S1000 Base unit 	For inspection of solenoid valve and relay	49 F088 002 Power unit (DC 12V) 	For inspection of solenoid valve
49 F088 003 Harness Power unit 	For inspection of solenoid valve	49 F088 004 Interface adapter Type–1 	For inspection of solenoid valve
49 F088 005 Harness Type–1 	For inspection of solenoid valve	49 F088 011 System disk Type–1 (Ver.1 00) 	For inspection of solenoid valve



SYSTEM OPERATION

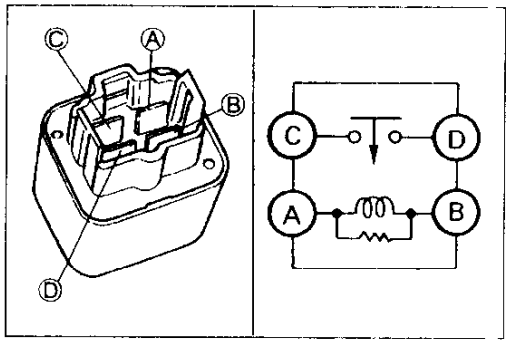
1. Start the engine and it idle.
2. Turn the A/C and blower switches ON, and verify that no engine speed decrease.
3. Turn the blowen switch OFF and verity that no engine speed increase.
4. If not as specified, check for cause.

- Solenoid valve (ISC)
  Inspection (Refer to page F–82)
- A/C signal (ECU terminal 1E)
  Inspection (Refer to page F–152)



Inspection
Acceleration cut-off

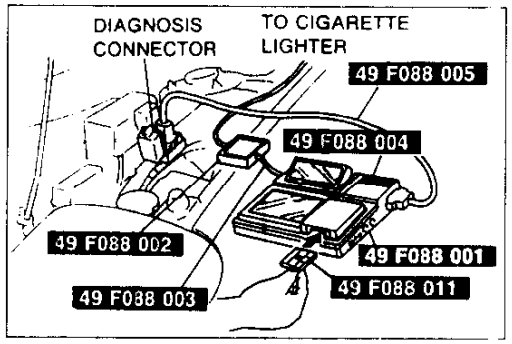
1. Turn ignition switch ON.
2. Shift transmission into gear (MT) on shift into D range (AT)
3. Turn the A/C and blower switches ON
4. Open the throttle valve fully and verify that the magnetic clutch disengage (click is heard) then renganges after **approx 5 seconds.**



A/C relay
Continuity inspection

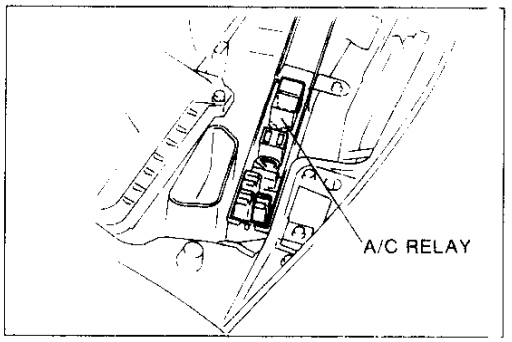
Check continuity between the terminals with ohmmeter

Terminal A–B	Terminal C–D
Apply V_B	Yes
Not Apply V_B	No



DT-S1000

1. Connect the DT-S1000 to the diagnosis connector.
2. Select simulation check.
3. Turn ignition switch ON.

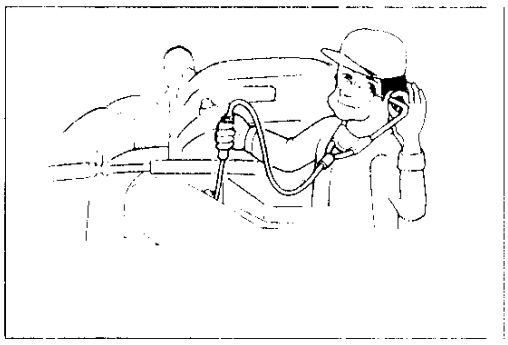


4. Verify that the A/C relay operation sound is heard.
5. If no sound is heard check the continuity of A/C Relay.

DECHOKE CONTROL SYSTEM

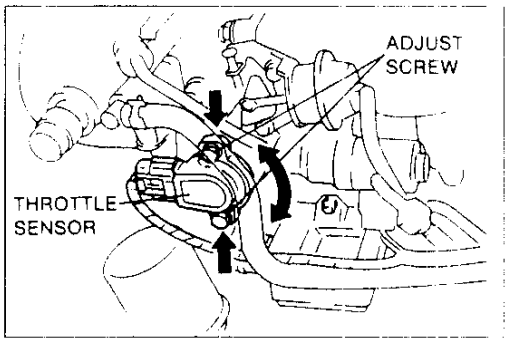
DESCRIPTION

To facilitate starting the engine if the spark plugs become fouled, such as when the engine is flooded, fuel injection is cut if the throttle valve is held wide open while cranking the engine. This allows the spark plugs to dry and purges excess fuel from the cylinders.



SYSTEM OPERATION

1. Verify that the engine will not start and no operational sound of primary injector with a serewdriver or a soundscope when cranked at normal speed with the throttle fully open.

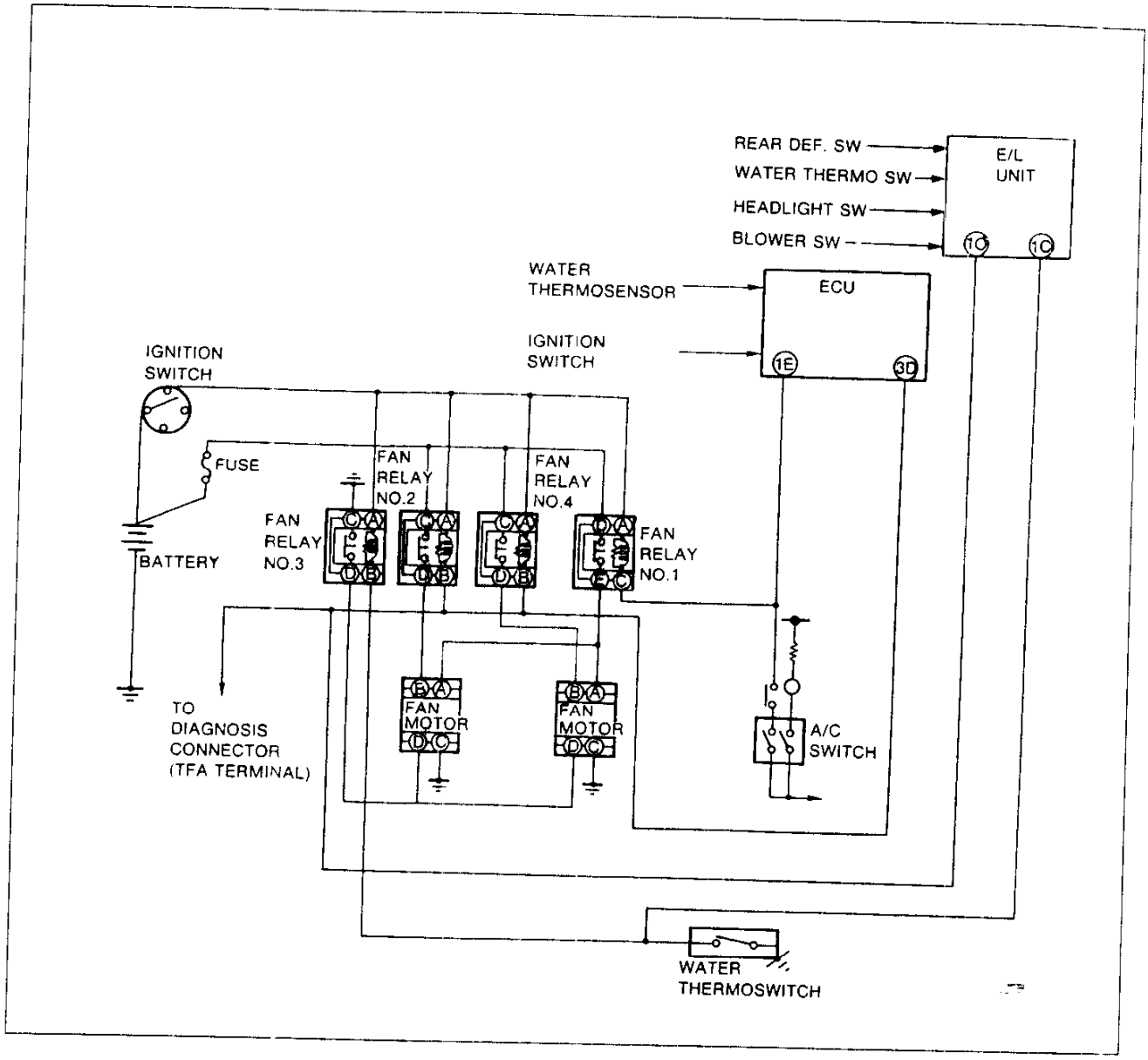


2. If the engine starts, and operational sound of primary injector is heard, inspect the throttle sensor. (Refer to page F–182) and the ECU terminal 1C voltage. (Refer to page F–152.)

ELECTRICAL COOLING FAN CONTROL SYSTEM

DESCRIPTION

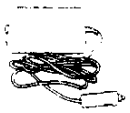
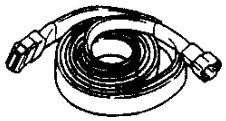
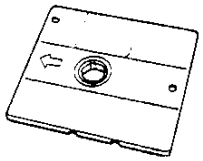
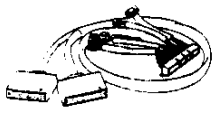
To improve idle smoothness and engine reliability, the Electrical cooling fan control system controls the electrical fan speed by ECU. This system consist of the cooling fan, fan relays, ECU, and input devices.



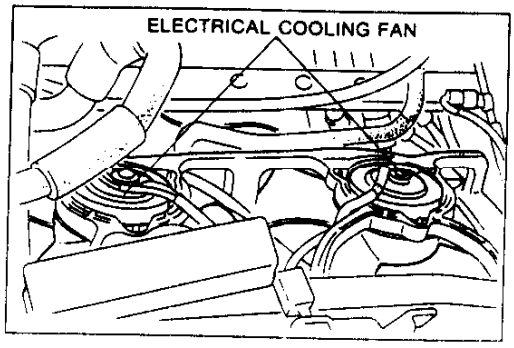
Operation

Engine condition (No electrical load)	A/C operation	Fan relay No.1	Fan relay No.2	Fan relay No.3	Fan relay No.4	Cooling fan operation
Coolant temperature below 105°C {221°F}	OFF	OFF	OFF	OFF	OFF	OFF
	ON	ON	ON	OFF	ON	LOW
Coolant temperature {221–226°F} 105–108°C	OFF	OFF	ON	OFF	ON	LOW
	ON	ON	ON	OFF	ON	MIDDLE
Coolant temperature above 108°C {226°F} (Water thermo switch ON)	OFF	OFF	ON	ON	ON	MIDDLE
	ON	ON	ON	ON	ON	HIGH
Water thermosensor malfunction	–	OFF	ON	OFF	ON	LOW
TFA terminal ground	–	OFF	ON	OFF	ON	LOW

PREPARATION
SST

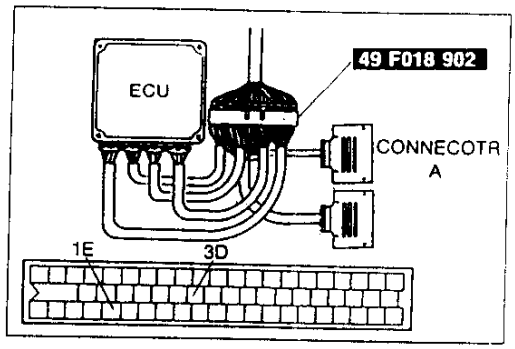
49 F088 001 DT-S1000 Base unit 	For inspection of solenoid valve and relay	49 F088 002 Power unit (DC 12V) 	For inspection of solenoid valve
49 F088 003 Harness Power unit 	For inspection of solenoid valve	49 F088 004 Interface adapter Type-1 	For inspection of solenoid valve
49 F088 005 Harness Type-1 	For inspection of solenoid valve	49 F088 011 System disk Type-1 (Ver. 1.00) 	For inspection of solenoid valve
49 F018 902 Adaptor harness 	For inspection of solenoid valve		

ELECTRICAL COOLING FAN CONTROL SYSTEM



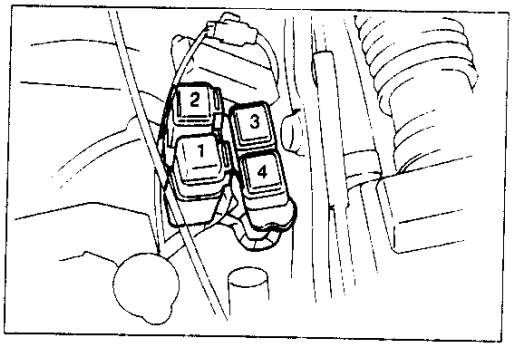
SYSTEM OPERATION

1. Connect the diagnosis connector terminals TFA and GND with a jumper wire.
2. Turn ignition switch ON.
3. Verify that electrical cooling fans operate.



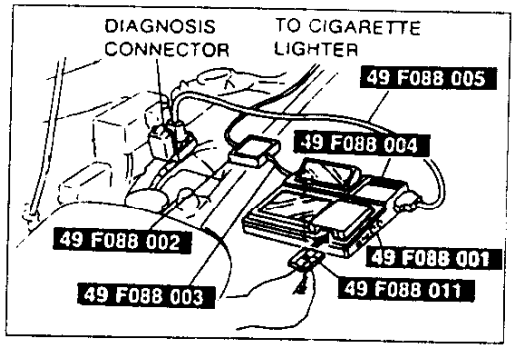
Inspection

1. Connect the **SST** (Engine Signal Monitor Adaptor Harness) to the ECU
2. Turn ignition switch ON.
3. Short the ECU terminals and verify that the cooling fan operate as following condition below.



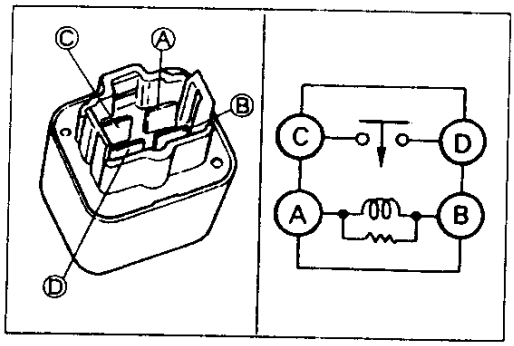
Terminal	Fan relay
3D	2.4
1E	1

4. If not as specified, check the harness and relays.



DT-S1000

1. Connect the **SST**s (DT-S1000 and Harness) to the diagnosis connector.
2. Turn ignition switch ON.
3. Select the simulation check (fan relay) and verify that the cooling fan operate.



FAN RELAY

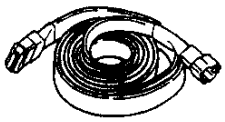
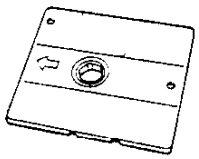
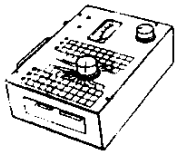
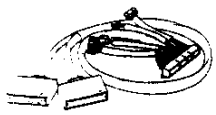
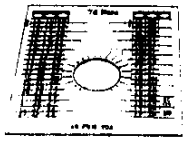
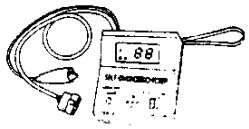
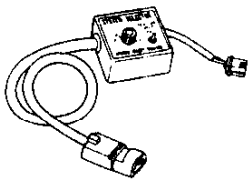
Inspection

1. Disconnect cooling fan relay
2. Apply battery voltage and ground to terminal A and B of cooling fan relay.
3. Check continuity of the relay

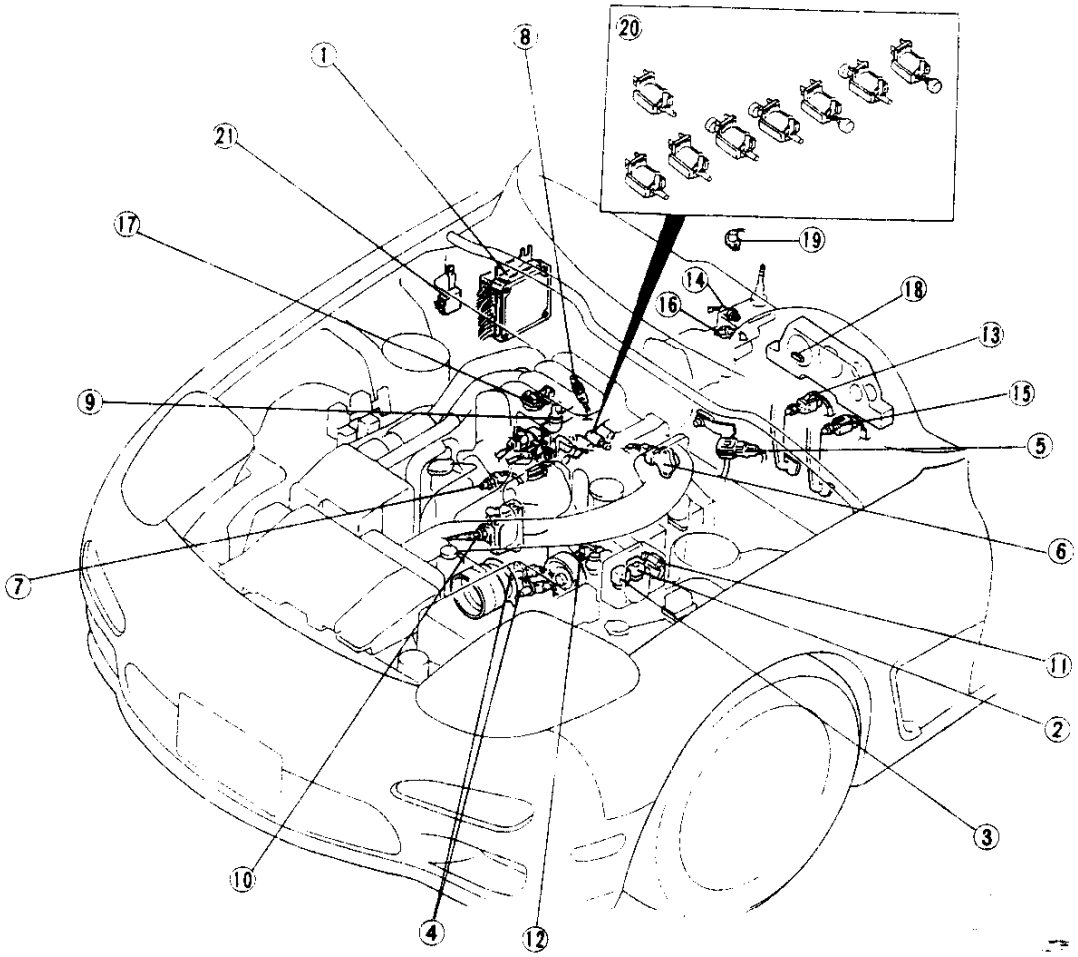
Operation	C–D terminal
V_B applied	Continuity
V_B Not applied	No continuity

CONTROL SYSTEM

PREPARATION
SST

49 F088 001 DT-S1000 Base unit 	For inspection of ECU terminal voltage and input / output devices	49 F088 002 Power unit (DC 12V) 	For inspection of ECU terminal voltage and input / output devices
49 F088 003 Harness Power unit 	For inspection of ECU terminal voltage and input / output devices	49 F088 004 Interface adaptor Type–1 	For inspection of ECU terminal voltage and input / output devices
49 F088 005 Harness Type–1 	For inspection of ECU terminal voltage and input / output devices	49 F088 011 System disk Type–1 (Ver. 1.00) 	For inspection of ECU terminal voltage and input / output devices
49 9200 162 Engine Signal monitor 	For inspection of ECU terminal voltage.	49 F018 902 Adaptor harness 	For inspection of ECU terminal voltage.
49 F018 903 Sheet 	For inspection of ECU terminal voltage	49 H018 9A1 Self-Diagnosis Checker 	For inspection of oxygen sensor and knock sensor
49 B019 9A0 System Selector 	For inspection of oxygen sensor and knock sensor		

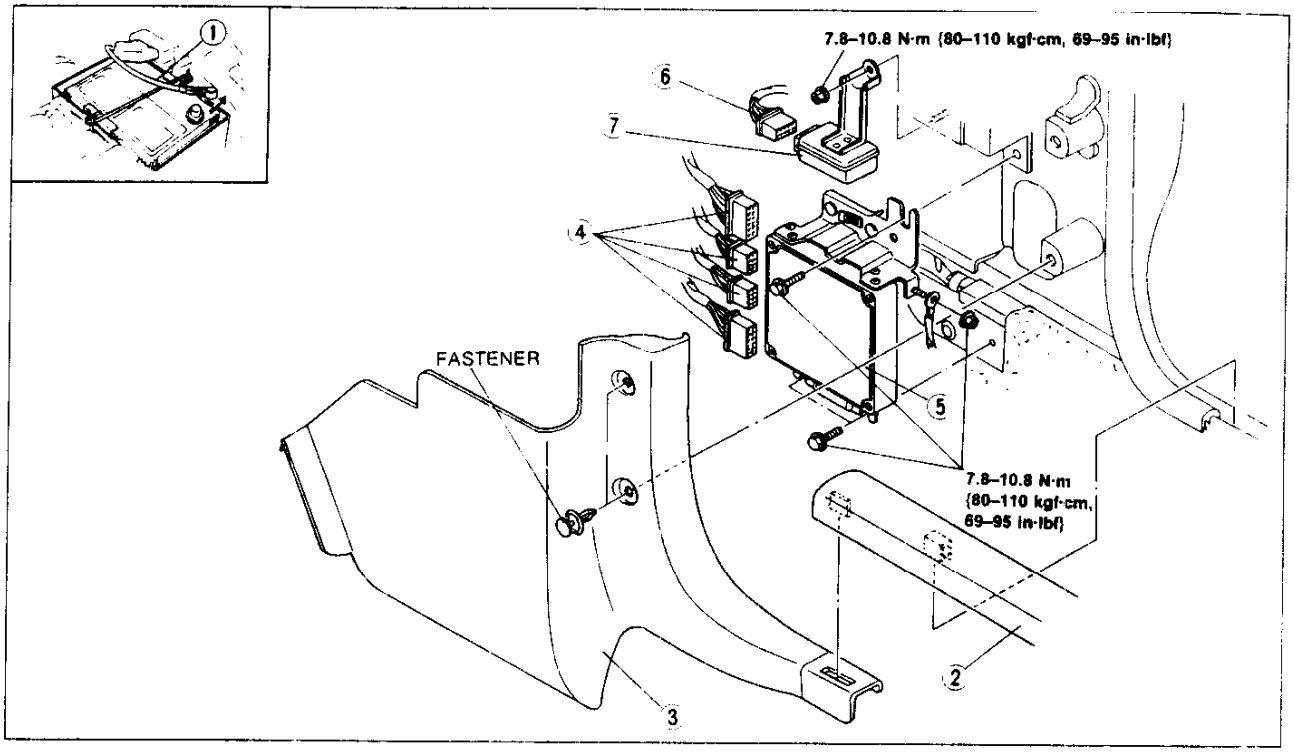
STRUCTUAL VIEW



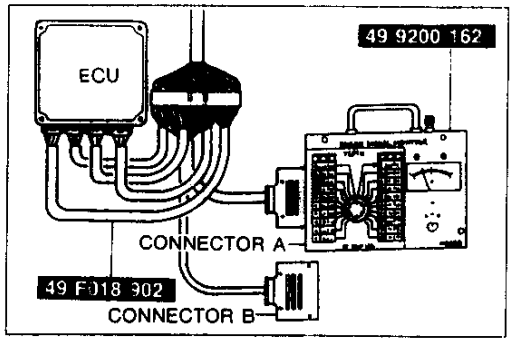
ENGINE CONTROL UNIT (ECU)

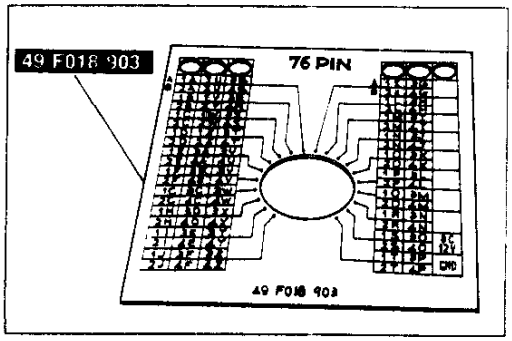
Removal / Installation

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



1. Battery cable
2. Scuff plate
3. Front side trim
4. Connectors
5. ECU
   Inspection (Engine Signal Monitor) ... below
   Inspection (DT-S1000) ..... page F–151
6. Connector
7. E/L unit
   Inspection ..... page F–136





Inspection

Engine signal Monitor

1. Connect the **SST** (Engine Signal Monitor) between the ECU and the wiring harness by using the **SST**. (Adaptor)

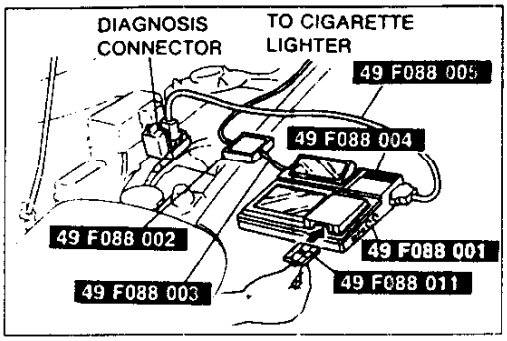
Note

- **Use connector A of the adaptor to measure voltage at terminals 1A through 1V and 3A though 3P, and use connector B to measure voltage at terminals 2A through 2L, and 4A through 4Z.**

2. Place the **SST** (Sheet: 76-pin type) on the **SST** (Engine Signal Monitor).
3. Measure the voltage at each terminal.
4. If any ECU terminal voltage is incorrect, check the input or output device and related wiring. If they are normal, replace the ECU.

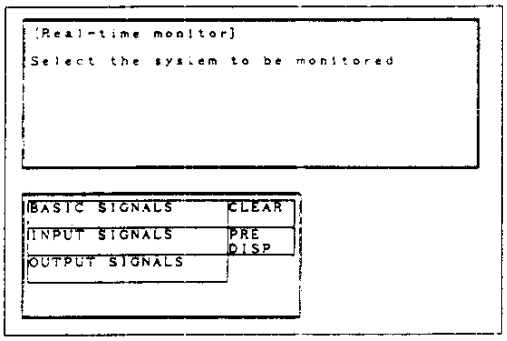
Caution

- **Never apply voltage to SST terminals A and B.**



DT-S1000

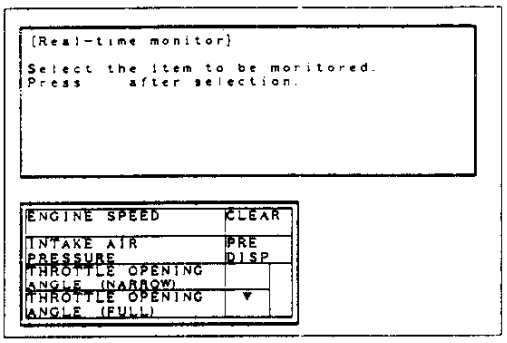
1. Connect the **DT-S1000** to the diagnosis connector as shown in figure.



2. Select the real time monitor from the **DT-S1000** display.
3. Turn ignition switch ON.

Caution

- **Do not turn the ignition switch OFF until real time monitor is completed.**

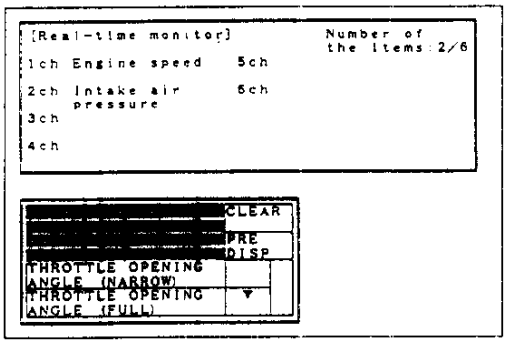


4. Select the inspection items.

Note

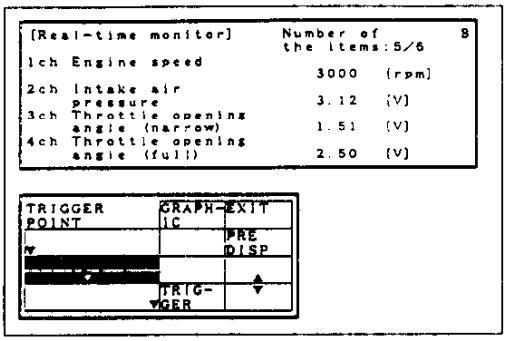
- **The maximum selection items are 8.**
- **Basic input signal need two-channel, therefore if all selection items basic input signal. The maximum selection item is 4.**

5. Verify indication of respective data item in each condition, referring to ECU terminal condition chart. (Refer to page F–166)



<Example>
When checking the throttle sensor operation pattern at engine speed and intake air pressure, the following steps are available.
Step 1.

Select the engine speed and intake air pressure from Basic signal then select the solenoid valves.



Step 2.

Drive the vehicle and verify that the engine speed (rpm), intake air pressure (kPa), solenoid valves ON/OFF and duty signal (%) valve on the display.

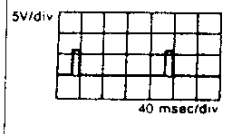
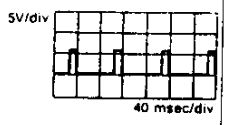
Note

- **Referring to the DT-S1000 instruction manual.**

Terminal voltage

1. Using the engine signal monitor

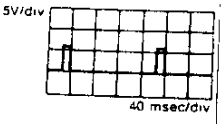
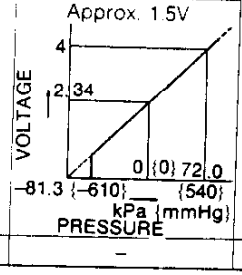
V_B: Battery vo tage

Terminal	Input	Output	Connected to	Test condition		Correct voltage	Remark
1A	–	–	Battery	Constant		V_B	For backup
1B	○		Main relay (FUEL INJ relay)	Ignition switch	OFF	0V	–
					ON	V_B	
1C	○		Ignition switch (START)	While cranking		V_B	–
				Ignition switch ON		Below 1.0V	
1D		○	Self-Diagnosis checker (monitor lamp)	Test switch at SELF TEST Lamp illuminated for 3 sec. after ignition switch OFF → ON		4.5–5.5V	With Self-Diagnosis checker and System Selector
				Lamp not illuminated after 3 sec.		V_B	
				Test switch at O_2 MONITOR Lamp illuminated		4.5–5.5V	
				Test switch at O_2 MONITOR Lamp not illuminated		V_B	
1E	○		A/C switch	A/C switch ON		Below 3.0V	• With Blower SW ON • Ignition switch ON
				A/C switch OFF		V_B	
1F		○	Self-Diagnosis checker (code number)	Buzzer sounded for 3 sec. after ignition switch OFF → ON		Below 2.5V	• With Self-Diagnosis checker and System Selecto • With System Selector test switch at SELF TEST
				Buzzer not sounded for after 3 sec.		V_B	
				Buzzer sounded		Below 2.5V	
				Buzzer not sounded		V_B	
1G		○	Igniter (Trailing) Front rotor	Ignition switch ON		0V	–
				Idle		0.2–0.5V (Reference)	
				Oscilloscope			
				Engine speed: above 2,500 rpm		0.5–0.8V (Reference)	Initial acceleration
1H		○	Igniter (Leading)	Ignition switch ON		0V	–
				Idle		0.2–0.5V (Reference)	
				Oscilloscope			
				Engine speed: above 2,500 rpm		0.8–1.2V (Reference)	Initial acceleration

V_B: Battery voltage

Incorrect voltage		Possible cause
Always 0V		• ROOM 10A fuse burnt • Open circuit in wiring from ROOM 10A fuse to ECU terminal 1A
Always 0V		• Main relay malfunction (Refer to page F–188) • Open or short circuit in wiring from main relay to ECU terminal 1B
Always 0V (starter turns)		• Open or short circuit in wiring from ignition switch to ECU terminal 1C • Ignition switch malfunction (Refer to Section T)
Always 0V		• Main relay (FUEL INJ relay) malfunction (Refer to page F–188) • Open circuit in wiring from ignition switch to diagnosis connector terminal +B • Open or short circuit in wiring from diagnosis connector terminal MEN to ECU terminal 1D
Always V_B		• Poor connection at ECU connector • ECU malfunction
Always approx. 5V		ECU malfunction
Always below 1.0V		• Short circuit in wiring from A/C switch to ECU terminal 1E • A/C switch malfunction (Refer to Section T)
Always V_B		• Open circuit in wiring from A/C switch to ECU terminal 1E • A/C switch malfunction (Refer to Section T)
Always below 2.5V	No display on Self-Diagnosis Checker	• Main relay (FUEL INJ relay) malfunction (Refer to page F–188) • Open circuit in wiring from ignition switch to diagnosis connector terminal +B
	"88" displayed and buzzer sounds continuously	Open or short circuit in wiring from diagnosis connector terminal FEN to ECU terminal 1F
Always V_B		• Poor connection at ECU connector • ECU malfunction
Always 0V		Refer to page F–16 (Ignition timing adjustment)
Always 0V		Refer to page F–16 (Ignition timing adjustment)

V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition		Correct condition	Remark
1I	○		Diagnosis connector (TEN terminal)	System Selector test switch at O_2 MONITOR		V_B	• With System Selector • Ignition switch ON
				System Selector test switch at SELF TEST		0V	
1J		○	Igniter (Trailing) Rear rotor	Ignition switch ON		0V	
				Idle		0.2–0.5V (Reference)	
					Oscilloscope		–
				Engine speed: above 2500 rpm		0.5–0.8V (Reference)	Initial acceleration
1K		○	Fuel pump relay	Ignition switch ON		Below 1.0V	
				While cranking		Below 1.0V	
				Idle	Solenoid valve (PRC) does not operate	V_B	
					Solenoid valve (PRC) operates	Below 1.0V	
1L		○	A/C relay	While cranking		V_B	A/C switch, Blower switch ON
				Idle		Below 1.0V	
				During acceleration (Running)		V_B	
1M	○		Speecometer sensor	Ignition switch ON		4.0–5.0V	
				Driving		2.0–2.5V	–
1N	○		P/S pressure switch	P/S OFF at idle		V_B	
				P/S ON at idle		Below 1.0V	–
			Mileage switch	Under 20,000 miles {34,000 km}		Below 1.5V	Ignition switch ON after 2 seconds
				Over 20,000 miles {34,000 km}		V_B	
1O	○		Pressure sensor	Ignition switch ON		Approx. 2.6V	
				Idle		Approx. 1.5V	–
							
1P	–	–	–	–		–	–

V_B: Battery voltage

Incorrect condition	Possible cause
Always below 1.0V	Short circuit in wiring from diagnosis connector terminal TEN to ECU terminal 1I
Always V_B	• Open circuit in wiring from diagnosis connector terminal TEN to ECU terminal 1I • Open circuit in wiring from diagnosis connector terminal GND to ground
Always 0V	Refer to page F-16 (Ignition timing adjustment)
Always below 1.0V	Refer to code No.51 Troubleshooting (Refer to page F-60)
Always V_B	• Poor connection at ECU connector • Fuel pump relay malfunction (Refer to page F-110) • ECU malfunction
Always V_B	• A/C relay malfunction (Refer to page F-143) • Open circuit in wiring from ignition switch to A/C relay • Open circuit in wiring from A/C relay to ECU terminal 1L
Always below 1.0V	• Short circuit in wiring from A/C relay to ECU terminal 1L • A/C relay malfunction (Refer to page F-143)
Always 0V	• Open or short circuit in wiring from speedometer sensor to ECU terminal 1M • Speedometer sensor malfunction (Refer to Section T)
Always below 1.0V	• P/S pressure switch malfunction (Refer to page F-186) • Short circuit in wiring from P/S pressure switch to ECU terminal 1N • ECU malfunction
Always V_B	• P/S pressure switch malfunction (Refer to page F-186) • Open circuit in wiring from P/S pressure switch to ECU terminal 1N • Open circuit in wiring from P/S pressure switch to ground
Always V_B under 20,000 miles	• Mileage switch malfunction (Refer to page F-189) • ECU malfunction
Always below 1.5V over 20,000 miles	• Mileage switch malfunction (Refer to page F-189) • ECU malfunction
Always 0V or 5V	Refer to Code No.13 Trouble shooting (Refer to page F-33)
–	–

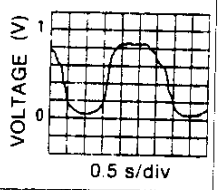
V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition	Correct voltage	Remark
1Q	○		Clutch switch (MT)	Clutch pedal: released	V_B	Ignition switch ON
				Clutch pedal: depressed	Below 1.0V	
			EC-AT control unit (AT)	Idle	V_B	Reduce torque signal
				When shifting from 1st to 2nd or from 2nd to 3rd with the throttle opening above 1.5/8	Below 1.0V	
				Idle	V_B	Slip lock up signal
				When slip lockup with the throttle opening below 0.5/8	Below 1.0V	
1R	○		Neutral switch (MT)	Neutral	Below 1.0V	Ignition switch ON
				In gear	V_B	
			EC-AT control unit (AT)	Por N range	Below 1.0V	• Inhibitor signal • Ignition switch ON
				Other	V_B	
1S	○		Stoplight switch	Brake pedal released	Below 1.0V	Ignition switch ON
				Brake pedal depressed	V_B	
1T		○	Circuit opening relay	Ignition switch ON	V_B	–
				Idle	Below 1.0V	
1U	○		Fuel thermosensor	Idle (after warm up)	1.5–3.0V	
1V	–	–	–	–	–	–
2A	–	–	–	–	–	–
2B		○	Diagnosis connector (IG-terminal)	Ignition switch ON	0V	–
				Idle	0.3–0.8 (Reference)	
				Engine speed: 3,000 rpm	1.8–2.2V (Reference)	Initial acceleration
2C		○	EC-AT (AT) control unit	Idle	V_B	Slip lock up OFF signal
				Engine speed: hold 3,000 rpm (after 5 seconds)	Below 1.0V	Initial acceleration
2D		○	EC-AT control unit (AT)	Ignition switch ON	2–4.5V	Atmospheric pressure signal
2E		○	EC-AT control unit (AT)	Idle	Below 1.0V	Idle signal
				Other	Approx 5V	
2F		○	Open (ex. Canada)	Constant	1–2.5V	–
			Ground (Canada)	Constant	0V	
2G		○	EC-AT control unit (AT)	Idle	V_B	Torque reduced signal
				Throttle opening above 1/8 (Engine coolant temp. below 40°C (104°F))	Below 1.0V	
2H	–	–	–	–	–	–
2I	○		Heat Hazard Sensor	Ignition switch ON	Below 2.0V	
				Idle (Temp.: Below 100°C (212°F))	V_B	
				Idle (Temp: Above 100°C (212°F))	Below 1.0V	
2J		○	A/P relay	Engine speed Idle–Below 3,250 rpm	Below 1.0V	
				Engine speed above 3,250 rpm	V_B	

V_B: Battery voltage

Incorrect voltage	Possible cause
Always V_B	• Clutch switch malfunction (Refer to page F–187) • Open circuit in wiring from clutch switch to ECU terminal 1Q
Always below 1.0V	• Clutch switch malfunction (Refer to page F–187) • Short circuit in wiring from clutch switch to ECU terminal 1Q
Always V_B	• Open circuit in wiring from ECU terminal 1Q to EC-AT C.U terminal 2P
Always below 1.0V	• Short circuit in wiring from ECU terminal 1Q to EC-AT C.U terminal 2P
Always below 1.0V	• Neutral switch malfunction (Refer to page F–186) • Short circuit in wiring from neutral switch to ECU termina 1R
Always V_B	• Neutral switch malfunction (Refer to page F–186) • Open circuit in wiring from neutral switch to ECU termina 1R
Always below 1.0V	• Inhibitor switch malfunction (Refer to Section K) • Short circuit in wiring from EC-AT control unit terminal 1C to ECU terminal R
Always V_B	• Inhibitor switch malfunction (Refer to Section K) • Open circuit in wiring from EC-AT control unit terminal 1C to ECU terminal R
Always below 1.0V (Stoplight OK)	Open circuit in wiring from stoplight switch to ECU terminal 1S
Always below 1.0V or V_B	• Open or short circuit in wiring from circuit opening relay to ECU terminal 1T • Circuit opening relay malfunction (Refer to page F–188)
Always Approx. 0V or approx 5V	Refer to Code No.23 Troubleshooting (Refer to page F–40)
–	–
–	–
Always 0V	• Open circuit in wiring from diagnosis connector IG-terminal to ECU terminal 2B • Crank angle sensor malfunction (Refer to page F–180) • ECU malfunction
Always V_B	Open circuit in wiring from EC-AT C.U terminal 2G to ECU terminal 2C
Always below 1.0V	Short circuit in wiring from EC-AT C.U terminal 2G to ECU terminal 2C
Always 0V or 4V	• Refer to code No 14 Troubleshooting (Refer to page F–34) • Open or short circuit in wiring from EC-AT C.U terminal 2C to ECU terminal 2D
Always below 1.0V	Short circuit in wiring from EC-AT C.U terminal 2M to ECU terminal 2E
Always V_B	Open circuit in wiring from EC-AT C.U terminal 2M to ECU terminal 2E
Always 0V	Short circuit in wiring ECU terminal 2F to ground.
Always approx. 5V	Open circuit in wiring ECU terminal 2F to ground.
Always below 1.0V	Short circuit in wiring from EC-AT C.U terminal 2P to ECU terminal 2G
Always V_B	Open circuit in wiring from EC-AT C.U terminal 2P to ECU terminal 2G
–	–
Always below 1.0V	• Short circuit in wiring from heat hazard sensor to ECU terminal 2I • Heat hazard sensor malfunction (Refer to page F–189)
Always V_B	• Open circuit in wiring from heat hazard sensor to ECU terminal 2I • Heat hazard sensor malfunction (Refer to page F–189)
Always below 1.0V or V_B	Refer to Code No 54 Troubleshooting (Refer to page F–61)

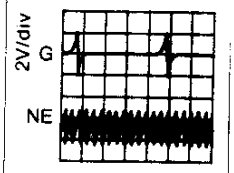
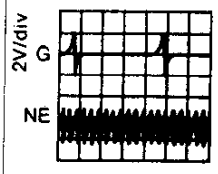
V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition		Correct voltage	Remark
2K	○		1–2 switch (MT)	1st position		V_B	Ignition switch ON
				Other		Below 1.0V	
			EC–AT CU (AT)	2nd or 3rd position		Below 1.0V	While running
				Other		V_B	
2L	○		1–2 switch (MT)	2nd position		Below 1.0V	Ignition switch ON
				Other		V_B	
			EC–AT CU (AT)	3rd or O/D position		Below 1.0V	While running
				Other		V_B	
3A	○		Metering oil pump position sensor	Ignition switch ON		1.0–4.2V	Voltage increase when accelerating
				Idle		Approx. 1.1V	
				Accelerator pedal depressed		1.1–4.2V	
3B	○		E/L unit	Headlight switch position I, II, Blower motor position III, IV, Rear defroster switch ON		Below 4.0V	
				Headlight switch, Blower motor, rear defroster switch are OFF		5V	
3C	○		Oxygen sensor	Idle	Cold engine	Approx 0V	
					After warm up	0.0–1.0V	
					Oscilloscope		
				Acceleration (after warm up)		0.5–1.0V	
				Deceleration (after warm up)		0.0–0.4V	
3D		○	Cooling fan relay	Idle	During electrical cooling fan operating	V_B	
					Electrical cooling fan does not oprate	Below 1.0V	
				TFA terminal of diagnosis connector is grounded		Below 1.0V	Ignition switch ON
3E	○		Water thermosensor	Engine coolant temperature 20°C (68°F)		Approx. 2.5V	Ignition switch ON
				After warm up		Below 0.5V	
3F	○		Throttle sensor (Narrow range)	Accelerator pedal released		0.75–1.25	• Ignition switch ON • After warm-up
				Accelerator pedal fully depressed		4.8–5.0	
3G	○		Throttle sensor (Full range)	Accelerator pedal released		0.1–0.7	• Ignition switch ON • After warm-up
				Accelerator pedal fully depressed		4.2–4.6	
3H		○	Solenoid valve (purge control)	Ignition switch ON		V_B	
				Idle			
				Engine speed: 1,500–3,300 rpm		4–10V	While running

V_B: Battery voltage

Incorrect voltage	Possible cause
Always below 1.0V	• Short circuit in wiring from 1–2 switch to ECU terminal 2K • 1–2 switch malfunction (Refer to page F–187)
Always V_B	• Open circuit in wiring from 1–2 switch to ECU terminal 2K • 1–2 switch malfunction (Refer to page F–187)
Always below 1.0V	Short circuit in wiring from EC-AT CU terminal 1D to ECU terminal 2K
Always V_B	Open circuit in wiring from EC-AT CU terminal 1D to ECU terminal 2K
Always below 1.0V	• Short circuit in wiring from 1–2 switch to ECU terminal 2L • 1–2 switch malfunction (Refer to page F–187)
Allways V_B	• Open circuit in wiring from 1–2 switch to ECU terminal 2L • 1–2 switch malfunction (Refer to page F–187)
Always below 1.0V	• Short circuit in wiring from EC-AT CU terminal 1B to ECU terminal 2L
Always V_B	• Open circuit in wiring from EC-AT CU tarminal 1B to ECU terminal 2L
Always approx 0V or approx 5V	Refer to Code No.27 Troubleshooting (Refer to page F–43)
Always below 1.0V	• Short circuit in wiring from switches ~ E/L unit ~ ECU terminal 3B • Switches malfunction (Refer to Section T)
Always V_B	• Open circuit in wiring from switches ~ E/L unit ~ ECU terminal 3B • Switches malfunction (Refer to Section T)
0V after warm-up	Refer to Code No.15 Troubleshooting (Refer to page F–34)
Always approx. 1V after warm-up	Refer to Code No.17 Troubleshooting (Refer to page F–36)
Always below 1.0V or Always V_B	• Open or short circuit in wiring from cooling fan relay to ECU terminals 3D • Fan relay malfunction (Refer to page F–147) • ECU malfunction
Always approx. 0V or approx. 5V	Refer to Code No.09 Troubleshooting (Refer to page F–30)
Always approx. 0V	Refer to Code No.12 Troubleshooting (Refer to page F–32)
Always approx. 5V	
Always approx. 0V	Refer to Code No.18 Troubleshooting (Refer to page F–38)
Always approx. 5V	
Always 0V or V_B	Refer to Code No.40 Troubleshooting (Refer to page F–53)

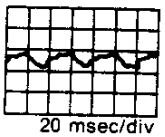
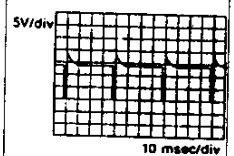
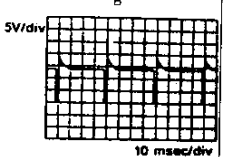
V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition		Correct voltage	Remark
3I	○		Throttle sensor	Constant		Approx. 5.0V	Ignition switch ON
3J	○		EGR switch	EGR valve operates		V_B	Califolnia only
				EGR valve does not operate		Below 1.0V	
	○		DRL relay	Idle	Pull the parking brake (Turnlight OFF)	0V	Canada only
					Release the parking brake (Turnlight ON)	V_B	
3K		○	Solenoid valve (Relief2)	Ignition switch ON		V_B	
				Idle	Before warm up approx. 40°C (104°F)	Below 1.0V	
					After warm up	V_B	
3L	○		Intake air thermosensor	Ambient air temperature 20°C (68°F)		Approx. 2.5V	Ignition switch ON
				After warm up		Approx. 0.6V	
3M	○		Knock sensor	Ignition switch ON		Approx. 2.5V	
				Knocking occur (Tap the engine hanger with hanmer)		2.6–2.8V (Reference)	Ignition switch ON
3N		○	Solenoid valve (Port air by-pass)	Ignition switch ON		V_B	
				After warm up Engine speed: 1,500–3,000 rpm		Below 1.0V	While running
3O		○	Solenoid valve (Double throttle control)	Engine coolant temperature below 80°C (176°F)		Below 1.0V	Ignition switch ON
				After warm up		V_B	
3P		○	Solenoid valve (Relief1)	Idle		V_B	• After warm up
				Engine speed: 2,700–3,200 rpm		Below 1.0V	• While running
4A	–	–	Ground (Output)	Constant		0V	–
4B	–	–	Ground (Output)	Constant		0V	–
4C	–	–	Ground (CPU)	Constant		0V	–
4D	–	–	Ground (Input)	Constant		0V	–
4E	○		Crank angle sensor [NE – signal]	Ignition switch ON		Below 1.0V	Engine signal monitor: Red lamp flash
				Idle	Oscilloscope		
					Voltmeter	0.1–0.4V (Reference)	
4F		○	Solenoid valve (Split air by-pass)	Idle		V_B	
				5th position (MT) / OD (AT)		Below 1.0V	• After warm up • While running
4G	○		Crank angle sensor [G signal]	Ignition switch ON		Below 1.0V	
				Idle	Oscilloscope		
					Voltmeter	0.1–0.4V (Reference)	

V_B: Battery voltage

Incorrect voltage	Possible cause
Always 0V	• Short circuit in wiring from main relay to ECU terminal 3I • Main relay malfunction (Refer to page F–188)
Always 0V or V_B	• EGR switch malfunction (Refer to page F–127) • Open or short circuit in wiring from EGR switch to ECU terminal 3J
	• DRL relay malfunction (Refer to section T) • Open or short circuit in wiring from DRL relay to ECU terminal 3J
Always below 1.0V or V_B	Refer to Code No.39 Troubleshooting (Refer to page F–52)
Always 0V or approx. 5V	Refer to Code No.11 Troubleshooting (Refer to page F–31)
Always 0V	Refer to Code No.05 Troubleshooting (Refer to page F–28)
Always below 1.0V or V_B	Refer to Code No.33 Troubleshooting (Refer to page F–48)
Always below 1.0V or V_B	Refer to Code No.50 Troubleshooting (Refer to page F–59)
Always below 1.0V or V_B	Refer to Code No.31 Troubleshooting (Refer to page F–46)
Above 0V	• Poor connection at ground terminal • Open circuit in wiring from ECU
Always approx. 0V or approx. 5V	Refer to Code No.03 Troubleshooting (Refer to page F–27)
Always below 1.0V or V_B	Refer to Code No.30 Troubleshooting (Refer to page F–45)
Always approx. 0V or approx. 5V	Refer to Code No.02 Troubleshooting (Refer to page F–26)

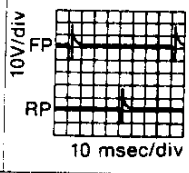
V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition	Correct voltage	Remark
4H	○		Crank angle sensor	Constant	Below 1.0V	–
4I		○	Stepping motor (Metering oil pump)	Ignition switch ON	V_B	
4J				Idle	3 terminals / 4 terminals V_B Other terminal 5–9V	
4K						
4L						
4M		○	Solenoid valve (Pressure regulator control)	Idle	V_B	
				Idle after hot start	Below 1.0V	approx. 1 minute
4N		○	Solenoid valve (Switching)	Ignition switch ON/Idle	V_B	
				Engine speed: above 3,200 rpm (After warm up)	Below 1.0V	Initial acceleration
4O		○	Solenoid valve (EGR)	Idle	V_B	
				5th position (MT)/OD (AT)	Below 1.0V	While running
4P		○	Solenoid valve (AWS)	Before warm up approx. 40°C (104°F)	Below 1.0V	Idle
				After warm up	V_B	
4Q		○	Solenoid valve (ISC)	Ignition switch ON	8.0–11.0V	Reference valve ● Cranking 99 % ● Idle 32–65 % ● Initial set 38 %
				Idle Oscilloscope	5.0–11.0 (Reference) 5V/div  20 msec/div	
4R		○	Solenoid valve (Turbo control)	Idle	V_B	
				Engine speed: above 5,500 rpm (MT) Engine speed: above 5,250 rpm (AT)	Below 1.0V	Initial acceleration
4S		○	Solenoid valve (Charge relief)	Idle	V_B	
				Engine speed: 4,000–5,500 rpm (MT) for 8 sec. 3,500–5,000 (AT) for 4 sec.	Below 1.0V	Initial acceleration
				Engine speed: above 5,500 rpm (MT) above 5,250 rpm (AT)		
4T		○	Solenoid valve (Charge control)	Idle	Below 1.0V	
				Engine speed: above 5,500 rpm (MT) Engine speed: above 5,250 rpm (AT)	V_B	Initial acceleration
4U		○	Solenoid valve (Wastegate control)	Ignition switch ON	V_B	Reference valve ● Idle 5% ● Solenoid valve (Turbo control) before operates 95%
				Idle Oscilloscope	V_B 5V/div  10 msec/div	
				Initial acceleration	5.0–11.0 V	
4V		○	Solenoid valve (Turbo precontrol)	Ignition switch ON	V_B	Reference valve ● Idle 5% ● Solenoid valve (Turbo control) after operates 5%
				Idle Oscilloscope	V_B 5V/div  10 msec/div	
				Engine speed: above 3,000 rpm	4.0–10.0V (Reference)	Initial acceleration

V_B: Battery voltage

Incorrect voltage	Possible cause
Always above 1.0V	Refer to Code No.02 Troubleshooting (Refer to page F–26)
Always 0v or V_B	Refer to Code No.26 Troubleshooting (Refer to page F–42)
Always below 1.0V or V_B	Refer to Code No.25 Troubleshooting (Refer to page F–41)
Always below 1.0V or V_B	Refer to Code No.32 Troubleshooting (Refer to page F–47)
Always below 1.0V or V_B	Refer to Code No.28 Troubleshooting (Refer to page F–44)
Always below 1.0V or V_B	Refer to Code No.38 Troubleshooting (Refer to page F–51)
Always below 1.0V or V_B	Refer to Code No.34 Troubleshooting (Refer to page F–49)
Always below 1.0V or V_B	Refer to Code No.44 Troubleshooting (Refer to page F–56)
Always below 1.0V or V_B	Refer to Code No.46 Troubleshooting (Refer to page F–58)
Always below 1.0V or V_B	Refer to Code No.45 Troubleshooting (Refer to page F–57)
Always below 1.0V or V_B	Refer to Code No.43 Troubleshooting (Refer to page F–55)
Always below 1.0V or V_B	Refer to Code No.42 Troubleshooting (Refer to page F–54)

V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition	Correct voltage	Remark
4W		○	Injector (Front primary)	Ignition switch ON	V_B	• Secondary injector not working at no load condition * Engine Signal Monitor: Green lamp flash
4X		○	Injector (Front secondary)	idle*	12–14V	
4Y		○	Injector (Rear primary)	Oscilloscope		
4Z		○	Injector (Rear secondary)			

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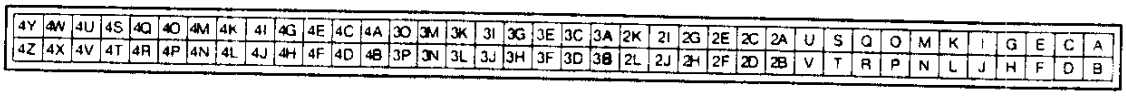
Control Unit Connector (Control Unit Side)



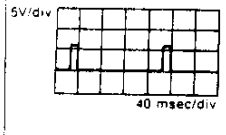
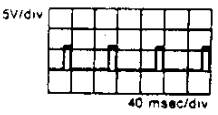
V_B: Battery voltage

Incorrect voltage	Possible cause
Always 0V	• Open or short circuit in wiring from injector to ECU terminal 4W, 4X, 4Y, or 4Z • Main relay malfunction (Refer to page F–188) • Refer to troubleshooting

Using the DT-S1000

DT mark terminal can use the DT-S1000, if no mark use the circuit tester or oscilloscope.

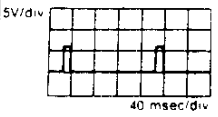
V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition	Correct condition	Remark
1A	–	–	Battery	Constant	V_B	For backup
1B DT S 1.0B	○		Main relay (FUEL INJ relay)	Ignition switch OFF	11–13V	–
				Ignition switch ON	12–14V	
1C DT S 1.0C	○		Ignition switch (START)	While cranking	OFF	–
				Ignition switch ON	ON	
1D		○	Self-Diagnosis Checker (monitor lamp)	Test switch at SELF TEST Lamp illuminated for 3 sec. after ignition switch OFF → ON	4.5–5.5V	With Self-Diagnosis Checker and System Selector
				Lamp not illuminated after 3 sec.	V_B	
				Test switch at O_2 MONITOR Lamp illuminated	4.5–5.5V	
				Test switch at O_2 MONITOR Lamp not illuminated	V_B	
1E DT S 1.0D	○		A/C switch	A/C switch ON	ON	• With Blower SW ON • Ignition switch ON
				A/C switch OFF	OFF	
1F		○	Self-Diagnosis Checker (code number)	Buzzer sounded for 3 sec. after ignition switch OFF → ON	Below 2.5V	• With Self-Diagnosis Checker and System Selector • With System Selector test switch at SELF TEST
				Buzzer not sounded after 3 sec	V_B	
				Buzzer sounded	Below 2.5V	
				Buzzer not sounded	V_B	
1G DT S 1.0G		○	Igniter (Trailing) Front rotor	Idle	BTDC –20°CA	
				Oscilloscope		
				Engine speed: 2,500 rpm	BTDC 15–35°CA	Initial acceleration
1H DT S 1.0H		○	Igniter (Leading)	Idle	BTDC –5°CA	
				Oscilloscope		
				Engine speed: above 2,500 rpm	BTDC 15–35°CA	Initial acceleration

V_B: Battery voltage

Incorrect condition		Possible cause
Always 0V		• ROOM 10A fuse burnt • Open circuit in wiring from ROOM 10A fuse to ECU terminal 1A
Always 0V		• Main relay malfunction (Refer to page F-188) • Open or short circuit in wiring from main relay to ECU terminal 1B
Always OFF (starter turns)		• Open or short circuit in wiring from ignition switch to ECU terminal 1C • Ignition switch malfunction (Refer to Section T)
Always 0V		• Main relay (FUEL INJ relay) malfunction (Refer to page F-188) • Open circuit in wiring from ignition switch to diagnosis connector terminal +B • Open or short circuit in wiring from diagnosis connector terminal MEN to ECU terminal 1D
Always V_B		• Poor connection at ECU connector • ECU malfunction
Always approx. 5V		ECU malfunction
Always ON		• Short circuit in wiring from A/C switch to ECU terminal 1E • A/C switch malfunction (Refer to Section T)
Always OFF		• Open circuit in wiring from A/C switch to ECU terminal 1E • A/C switch malfunction (Refer to Section T)
Always below 2.5V	No display on Self-Diagnosis Checker	• Main relay (FUEL INJ relay) malfunction (Refer to page F-188) • Open circuit in wiring from ignition switch to diagnosis connector terminal +B
	"88" displayed and buzzer sounds continuously	Open or short circuit in wiring from diagnosis connector terminal FEN to ECU terminal 1F
Always V_B		• Poor connection at ECU connector • ECU malfunction
Different ignition timing		Refer to page F-16 (Ignition timing adjustment)
Different ignition timing		Refer to page F-16 (Ignition timing adjustment)

V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition	Correct condition	Remark
1I	○		Diagnosis connector (TEN terminal)	System Selector test switch at O_2 MONITOR	V_B	● With System Selector ● Ignition switch ON
				System Selector test switch at SELF TEST	0V	
1J		○	Igniter (Trailing) Rear rotor	Ignition switch ON	0V	
				Idle	0.2–0.5V (Reference)	
				Oscilloscope		
				Engine speed: above 2,500 rpm	0.5–0.8V (Reference)	Initial acceleration
1K DTS		○	Fuel pump relay	Ignition switch ON	ON	
				While cranking	ON	
				Idle — Solenoid valve (PRC) does not operate	OFF	
				Idle — Solenoid valve (PRC) operates	ON	
1L DTS		○	A/C relay	While cranking	OFF	
				Idle	ON	A/C switch, Blower switch ON
				During acceleration (Running)	OFF	
1M DTS	○		Speedometer sensor	Ignition switch ON	0 km/h	–
				Driving (20km/h)	18–22 km/h	
1N DTS	○		P/S pressure switch	P/S OFF at idle	OFF	–
				P/S ON at idle	ON	
			Mileage switch	Under 20,000 miles {34,000 km}	Below 1.5V	Ignition switch ON after 2 seconds
				Over 20,000 miles {34,000 km}	V_B	
1O DTS	○		Pressure sensor	Idle	−64–−66.7 kPa	● After warm-up ● Initial acceleration
				Engine speed: 1,000 rpm	−46.7–−60 kPa	
				Engine speed: 2,000 rpm	−26.7–−46.7 kPa	
1P	–	–	–	–	–	–

V_B: Battery voltage

Incorrect condition	Possible cause
Always below 1.0V	Short circuit in wiring from diagnosis connector terminal TEN to ECU terminal 1I
Always V_B	• Open circuit in wiring from diagnosis connector terminal TEN to ECU terminal 1I • Open circuit in wiring from diagnosis connector terminal GND to ground
Always 0V	Refer to page F-16 (Ignition timing adjustment)
Always OFF	Refer to code No.51 Troubleshooting (Refer to page F-60)
Always OFF	• A/C relay malfunction (Refer to page F-143) • Open circuit in wiring from ignition switch to A/C relay • Open circuit in wiring from A/C relay to ECU terminal 1L
Always ON	• Short circuit in wiring from A/C relay to ECU terminal 1L • A/C nelay malfunction (Refer to page F-143)
Always 0 km/h	• Open or short circuit in wiring from speedometer sensor to ECU terminal 1M • Speedometer sensor malfunction (Refer to Section T)
Always ON	• P/S pressure switch malfunction (Refer to page F-186) • Short circuit in wiring from P/S pressure switch to ECU terminal 1N • ECU malfunction
Always OFF	• P/S pressure switch malfunction (Refer to page F-186) • Open circuit in wiring from P/S pressure switch to ECU terminal 1N • Open circuit in wiring from P/S pressure switch to ground
Always V_B under 20,000 miles	• Mileage switch malfunction (Refer to page F-189) • ECU malfunction
Always below 1.5V over 20,000 miles	• Mileage switch malfunction (Refer to page F-189) • ECU malfunction
Different pressure	Refer to Code No.13 Troubleshooting (Refer to page F-33)
–	–

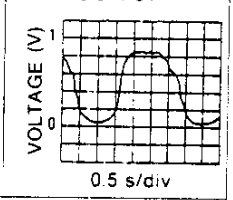
V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition	Correct condition	Remark
1Q DT-S 1000	○		Clutch switch (MT)	Clutch pedal: released	OFF	Ignition switch ON
				Clutch pedal: depressed	ON	
			EC-AT control unit (AT)	Idle	OFF	Reduce torque signal
				When shifting from 1st to 2nd or from 2nd to 3rd with the throttle opening above 1 5/8	ON	
				Idle	OFF	Slip lock up signal
				When slip lockup with the throttle opening below 0.5/8	ON	
1R DT-S 1000	○		Neutral switch (MT)	Neutral	ON	Ignition switch ON
				In gear	OFF	
			EC-AT control unit (AT	P or N range	ON	• Inhibitor signa • Ignition switch ON
				Other	OFF	
1S DT-S 1000	○		Stoplight switch	Brake pedal released	OFF	Ignition switch ON
				Brake pedal depressed	ON	
1T DT-S 1000		○	Circuit opening relay	Ignition switch ON	OFF	–
				Idle	ON	
1U DT-S 1000	○		Fuel thermosensor	Fuel temperature 20°C	20°C	
				Fuel temperature 40°C	40°C	
				Fuel temperature 60°C	60°C	
1V	–	–	–	–	–	–
2A	–	–	–	–	–	–
2B		○	Diagnosis Connector (IG-terminal)	Idle	700–750 rpm	• After warm-up • No electrical load
2C		○	EC-AT (AT) control unit	Idle	OFF	Slip lock up OFF signal
				Engine speed: hold 3,000 rpm (after 5 seconds)	ON	Initial acceleration
2D		○	EC-AT control unit (AT)	Ignition switch ON	2–4.5V	Atmospheric pressure signal
2E		○	EC-AT control unit (AT)	Idle	ON	Idle signal
				Other	OFF	
2F		○	Open (ex. Canada)	Constant	OFF	
			Ground (Canada)	Constant	ON	
2G		○	EC-AT control unit (AT)	Idle	OFF	Torque reduced signal
				Throttle opening above 1/8 (Engine coolant temp. below 40°C (104°F))	ON	
2H	–	–	–	–	–	–
2I	○		Heat Hazard Sensor	Ignition switch ON	ON	
				Idle (Temp. Below 100°C (212°F))	OFF	
				Idle (Temp. Above 100°C (212°F))	ON	
2J DT-S 1000		○	A/P relay	Engine speed Idle-below 3,750 rpm	ON	
				Engine speed above 3,750 rpm	OFF	

V_B: Battery voltage

Incorrect condition	Possible cause
Always OFF	• Clutch switch malfunction (Refer to page F–187) • Open circuit in wiring from clutch switch to ECU terminal 1Q
Always ON	• Clutch switch malfunction (Refer to page F–187) • Short circuit in wiring from clutch switch to ECU terminal 1Q
Always OFF	Open circuit in wiring from ECU terminal 1Q to EC-AT C.U terminal 2P
Always ON	Short circuit in wiring from ECU terminal 1Q to EC-AT C.U terminal 2P
Always ON	• Neutral switch malfunction (Refer to page F–186) • Short circuit in wiring from neutral switch to ECU terminal 1R
Always OFF	• Neutral switch malfunction (Refer to page F–186) • Open circuit in wiring from neutral switch to ECU terminal 1R
Always ON	• Inhibitor switch malfunction (Refer to section K) • Short circuit in wiring from EC-AT C.U terminal 1C ECU terminal 1R
Always OFF	• Inhibitor switch malfunction (Refer to section K) • Open circuit in wiring from EC-AT C.U terminal 1C ECU terminal 1R
Always OFF (Stoplight OK)	Open circuit in wiring from stoplight switch to ECU terminal 1S
Always ON or OFF	• Open or short circuit in wiring from circuit opening relay to ECU terminal 1T • Circuit opening relay malfunction (Refer to page F–188)
Different temperature	Refer to Code No.23 Troubleshooting (Refer to page F–40)
–	–
–	–
Always 229 rpm	• Open circuit in wiring from diagnosis connoctor IG-terminal to ECU terminal 2B • Crank argle sensor malfunction (Refer to page F–180) • ECU malfunction
Always OFF	Open circuit in wiring from EC-AT C.U terminal 2G to ECU terminal 2C
Always ON	Short circuit in wiring from EC-AT C.U terminal 2G to ECU terminal 2C
Always 0V or 4V	• Refer to code No.14 Troubleshooting (Refer to page F–34) • Open or short circuit in wiring from EC-AT C.U terminal 2C to ECU termianl 2D
Always ON	Short circuit in wiring from EC-AT C.U terminal 2M to ECU terminal 2E
Always OFF	Open circuit in wiring from EC-AT C.U terminal 2M to ECU terminal 2E
Always ON	Short circuit in wiring ECU terminal 2F to ground.
Always OFF	Open circuit in wiring ECU terminal 2F to ground.
Always ON	Short circuit in wiring from EC-AT C.U terminal 2P to ECU terminal 2G
Always OFF	Open circuit in wiring from EC-AT C.U terminal 2P to ECU terminal 2G
–	–
Always ON	• Short circuit in wiring from heat hazard sensor to ECU terminal 2I • Heat hazard sensor malfunction (Refer to page F–189)
Always OFF	• Open circuit in wiring from heat hazard sensor to ECU terminal 2I • Heat hazard sensor malfunction (Refer to page F–189)
Always ON or OFF	Refer to Code No.54 Troubleshooting (Refer to page F–61)

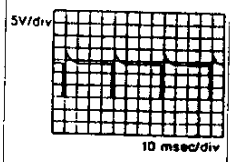
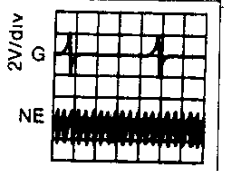
V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition		Correct condition	Remark
2K	○		1-2 switch (MT)	1st position		ON	Ignition switch ON
				Other		OFF	
			EC-AT CU (AT)	2nd or 3rd position		OFF	While running
				Other		ON	
2L	○		1-2 switch (MT)	2nd position		ON	Ignition switch ON
				Other		OFF	
			EC-AT CU (AT)	3rd or O/D position		OFF	While running
				Other		ON	
3A	○		Metering Oil pump position sensor	Ignition switch ON		1.0–4.2V	Voltage increase while accelerating
				Idle		Approx. 1.1V	
				Accelerator pedal depressed		1.1–4.2V	
3B	○		E/L unit	Headlight switch position I, II,		ON	
				Blower motor position III, IV,		ON	
				Rear defrostor switch ON		ON	
				Headlight switch, Blower motor, rear defroster switch are OFF		OFF	
3C	○		Oxygen sensor	Idle	Cold engine	Approx. 0V	
					After warm up	0.0–1.0V	
					Oscilloscope		
				Acceleration (After warm up)		0.5–1.0V	
				Deceleration (After warm up)		0.0–0.4V	
3D		○	Cooling fan relay	Idle	During electrical cooling fan operating	OFF	–
					Electrical cooling fan does not operate	ON	
3E	○		Water thermosensor	Engine coolant temperature 20°C		20°C	Ignition switch ON
				Engine coolant temperqture 60°C		60°C	
3F	○		Throttle sensor (Narrow range)	Accelerator pedal released		0.75–1.25V	• Ignition switch ON • After warm-up
				Accelerator pedal fully depressed		4.8–5.0V	
3G	○		Throttle sensor (full range)	Accelerator pedal released		0.1–0.7V	• Ignition switch ON • After warm-up
				Accelerator pedal fully depressed		4.2–4.6V	
3H		○	Solenoid valve (purge control)	Idle		0 %	
				Engine speed 1,500–3,300 rpm		5–70 % (Reference)	While running

V_B: Battery voltage

Incorrect condition	Possible cause
Always OFF	• Open circuit in wiring from 1–2 switch to ECU terminal 2K • 1–2 switch malfunction (Refer to page F–187)
Always ON	• Short circuit in wiring from 1–2 switch to ECU terminal 2K • 1–2 switch malfunction (Refer to page F–187)
Always ON	Short circuit in wiring from EC-AT CU terminal 1D to ECU terminal 2K
Always OFF	Open circuit in wiring from EC-AT CU terminal 1D to ECU terminal 2K
Always ON	• Short circuit in wiring from 1–2 switch to ECU terminal 2L • 1–2 switch malfunction (Refer to page F–187)
Allways OFF	• Open circuit in airing from 1–2 switch to ECU terminal 2L • 1–2 switch malfunction (Refer to page F–187)
Always ON	Short circuit in wiring from EC-AT CU terminal 1B to ECU terminal 2L
Always OFF	Open circuit in wiring from EC-AT CU tarminal 1B to ECU terminal 2L
Always approx. 0V or approx 5V	Refer to Code No.27 Troubleshooting (Refer to page F–43)
Always ON	• Short circuit in wiring from switches ~ E/L unit ECU terminal 3B • Switch malfunction (Refer to Section T)
Always OFF	• Open circuit in wiring from switches ~ E/L unit ~ ECU terminal 3B • Switch malfunction (Refer to Section T)
0V after warm up	Refer to Code No.15 Troubleshooting (Refer to page F–34)
Always approx. 1V after warm up	Refer to Code No.17 Troubleshooting (Refer to page F–36)
Always ON or OFF	• Oper or short circuit in wiring from cooling fan relay to ECU terminals 3D • Fan relay malfunction (Refer to page F–147) • ECU malfunction
Different temperature	Refer to Code No.09 Troubleshooting (Refer to page F–30)
Always approx. 0V	Refer to Code No.12 Troubleshooting (Refer to page F–32)
Always approx. 5V	
Always approx. 0V	Refer to Code No.18 Troubleshooting (Refer to page F–38)
Always approx. 5V	
Always duty valve not change	Refer to Code No.40 Troubleshooting (Refer to page F–53)

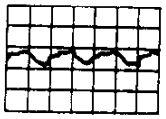
V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition		Correct condition	Remark
3I	○		Throttle sensor	Constant		Approx. 5.0V	Ignition switch ON
3J DT S 10-1	○		EGR switch	EGR valve operates		ON	California only
				EGR valve does not operate		OFF	
	○		DRL relay	Idle	Pull the parking brake (Turnlight OFF)	OFF	Canada only
					Release the parking brake (Turnlight ON)	ON	
3K DT S 10-3		○	Solenoid valve (Relief2)	Ignition switch ON		OFF	
				Idle	Befor warm up approx. 40°C {104°F}	ON	
					After warm up	OFF	
3L DT S 10-3	○		Intake air thermosensor	Ambient air temperature 20°C {68°F}		20°C	Ignition switch ON
3M	○		Knock sensor	Ignition switch ON		Approx. 2.5V	Ignition switch ON
				Knocking occur (Tap the engine hunger with hammer)		2.6–2.8V (Reference)	
3N DT S 6-3		○	Solenoid valve (Port air by-pass)	Ignition switch ON		OFF	
				After warm up Engine speed: 1,500–3,000 rpm		ON	While running
3O DT S 2-3		○	Solenoid valve (Doulbe throttle control)	Engine coolant temperature below 80°C {176°F}		ON	Ignition switch ON
				After warm up		OFF	
3P DT S 5-3		○	Solenoid valve (Relief1)	Idle		OFF	
				Engine speed: 2,700–3,200 rpm		ON	• After warm-up • While running
4A	–	–	Ground (Output)	Constant		0V	–
4B	–	–	Ground (Output)	Constant		0V	–
4C	–	–	Ground (CPU)	Constant		0V	–
4D	–	–	Ground (Input)	Constant		0V	–
4E DT S 10-3	○		Crank angle sensor [NE + signal]	Idle		700–750 rpm	
				Oscilloscope			–
4F DT S 10-3		○	Solenoid valve (Split air by-pass)	Idle		OFF	
				5th position (MT), OD (AT)		ON	• After warm up • While running
4G	○		Crank angle sensor [G signal]	Ignition switch ON		Below 1.0V	
				Idle	Oscilloscope		
					Voltmeter	0.1–0.4V (Reference)	

V_B: Battery voltage

Incorrect condition	Possible cause
Always 0V	• Short circuit in wiring from main relay to ECU terminal 3I • Main relay malfunction (Refer to page F–188)
Always ON or OFF	• EGR switch malfunction (Refer to page F–127) • Open or short circuit in wiring from EGR switch to ECU terminal 3J
	• DRL relay malfunction (Refer to section T) • Open or short circuit in wiring from DRL relay to ECU terminal 3J
Always ON or OFF	Refer to Code No.39 Troubleshooting (Refer to page F–52)
Different temperature	Refer to Code No.11 Troubleshooting (Refer to page F–31)
Always 0V	Refer to Code No.05 Troubleshooting (Refer to page F–28)
Always ON or OFF	Refer to Code No.33 Troubleshooting (Refer to page F–48)
Always ON or OFF	Refer to Code No.50 Troubleshooting (Refer to page F–59)
Always ON or OFF	Refer to Code No.31 Troubleshooting (Refer to page F–46)
Above 0V	• Poor connection at ground terminal • Open circuit in wiring from ECU
Always 229 rpm	Refer to Code No.03 Troubleshooting (Refer to page F–27)
Always ON or OFF	Refer to Code No.30 Troubleshooting (Refer to page F–45)
Always approx. 0V or approx. 5V	Refer to Code No.02 Troubleshooting (Refer to page F–26)

V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition	Correct condition	Remark
4H	○		Crank angle sensor	Constant	below 1.0V	
4I 4J 4K 4L		○	Stepping motor (Metering oil pump)	Ignition switch ON	V_B	
				Idle	3 terminals / 4 terminals V_B Other terminal 5–9V	
4M DT S 1900		○	Solenoid valve (Pressure regulator control)	Idle	OFF	
				Idle after hot start	ON	approx. 1 minute
4N DT S 1900		○	Solenoid valve (Switching)	Ignition switch ON/Idle	OFF	
				Engine speed: above 3,200 rpm (After warm up)	ON	Initial acceleration
4O DT S 1900		○	Solenoid valve (EGR)	Idle	OFF	
				5th position (MT)/OD (AT)	ON	While running
4P DT S 1900		○	Solenoid valve (AWS)	Before warm up approx. 40°C (104°F)	ON	Idle
				After warm up	OFF	
4Q DT S 1900		○	Solenoid valve (ISC)	While cranking	99 %	
				Idle after warm up	32–65 %	No electrical load
				Oscilloscope	5V/div  20 msec/div	Reference valve ● Initial set 38 %
4R DT S 1900		○	Solenoid valve (Turbo control)	Idle	OFF	
				Engine speed: above 5,500 rpm (MT)	ON	Initial acceleration
				Engine speed: above 5,250 rpm (AT)		
4S DT S 1900		○	Solenoid valve (charge relief)	Idle	OFF	
				Engine speed: 4,000–5,500 rpm (MT) for 8 sec. 3,500–5,000 (AT) for 4 sec.	ON	Initial acceleration
				Engine speed: above 5,500 rpm (MT) above 5,250 rpm (AT)		
4T DT S 1900		○	Solenoid valve (Charge control)	Idle	ON	
				Engine speed: above 5,500 rpm (MT)	OFF	Initial acceleration
				Engine speed: above 5,250 rpm (AT)		
4U DT S 1900		○	Solenoid valve (Wastegate control)	Idle	5 %	Reference valve ● Solenoid valve (Turbo control) before operates 95 %
				Initial acceleration	40–95 %	
				Oscilloscope		
4V DT S 1900		○	Solenoid valve (turbo pre-control)	Idle	5 %	Reference valve ● Solenoid valve (Turbo control) after operates 5 %
				Engine speed: above 3,000 rpm (Initial acceleration)	20–60 %	
				Oscilloscope		

V_B: Battery voltage

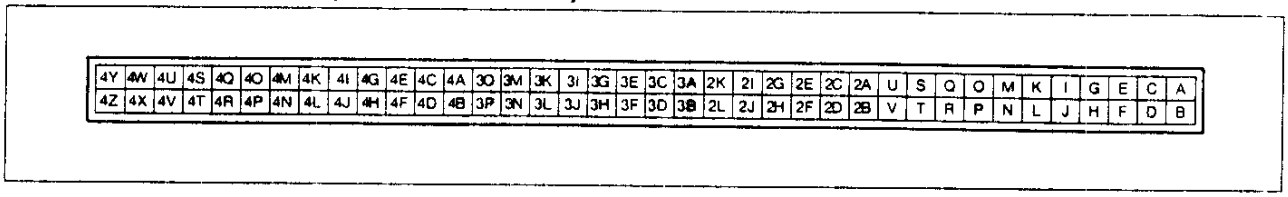
Incorrect condition	Possible cause
Always above 1.0V	Refer to Code No.02 Troubleshooting (Refer to page F–26)
Always 0V or V_B	Refer to Code No.26 Troubleshooting (Refer to page F–42)
Always ON or OFF	Refer to Code No.25 Troubleshooting (Refer to page F–41)
Always ON or OFF	Refer to Code No.32 Troubleshooting (Refer to page F–47)
Always ON or OFF	Refer to Code No.28 Troubleshooting (Refer to page F–44)
Always ON or OFF	Refer to Code No.38 Troubleshooting (Refer to page F–51)
Always duty value not change	Refer to Code No.34 Troubleshooting (Refer to page F–49)
Always ON or OFF	Refer to Code No.44 Troubleshooting (Refer to page F–56)
Always ON or OFF	Refer to Code No.46 Troubleshooting (Refer to page F–58)
Always ON or OFF	Refer to Code No.45 Troubleshooting (Refer to page F–57)
Always duty value not change	Refer to Code No.43 Troubleshooting (Refer to page F–55)
Always duty value not change	Refer to Code No.42 Troubleshooting (Refer to page F–54)

V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition	Correct condition	Remark
4W		○	Injector (Front primary)	Idle*	2.0–3.0 msec	• Secondary injection not working at no load condition * Engine Signal Monitor: Green lamp flash
4X		○	Injector (Front secondary)	Oscilloscope	10V/div FP RP 10 msec/div	
4Y		○	Injector (Rear primary)			
4Z		○	Injector (Rear secondary)			

16E0F2-19

Control Unit Connector (Control Unit Side)



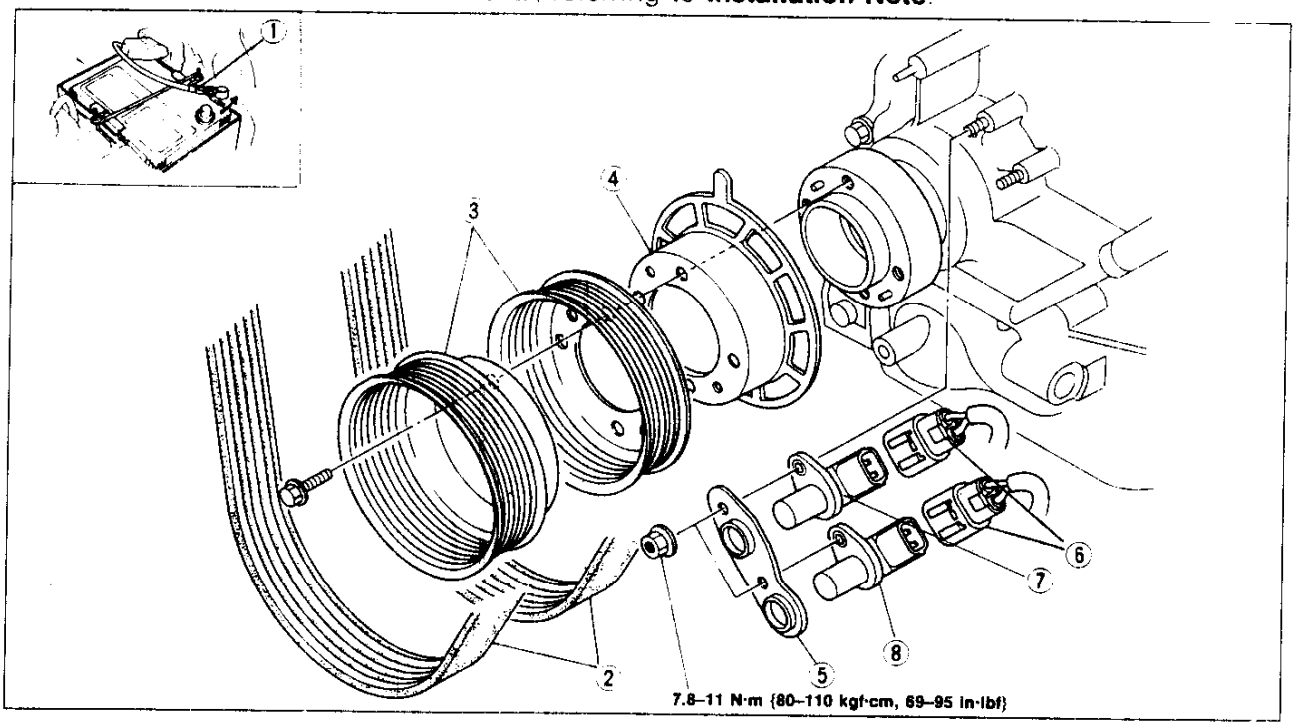
V_B: Battery voltage

Incorrect condition	Possible cause
Different fuel injection amount	• Open or short circuit in wiring from injector to ECU terminal 4W, 4X, 4Y, or 4Z • Main relay malfunction (Refer to page F–188) • Refer to troubleshooting

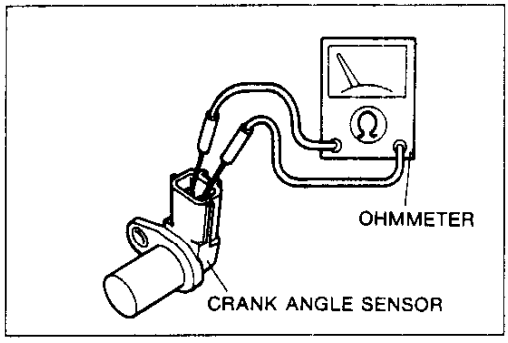
CRANK ANGLE SENSOR

Removal / Installation

1. Remove in the order shown in figure.
2. Install in the reverse order of removal, referring to **Installation Note**.



1. Battery cable
2. Drive belt
3. Eccentric shaft pulley
4. Crank angle sensor plate
5. Bracket
6. Connectors
7. Crank angle sensor (NE-signal)
   Inspection ..... below
8. Crank angle sensor (G-signal)
   Inspection ..... below

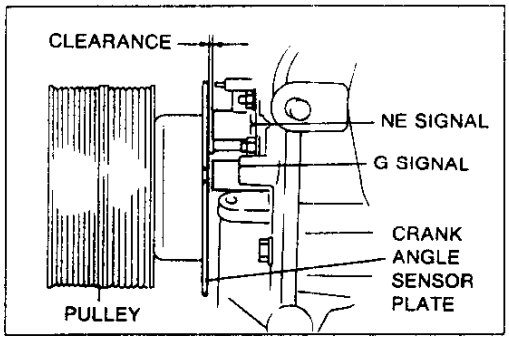


Inspection

1. Remove the crank angle sensor
2. Measure the resistance of the sensor

Resistance: 0.95–1.25 kΩ (20°C [68°F])

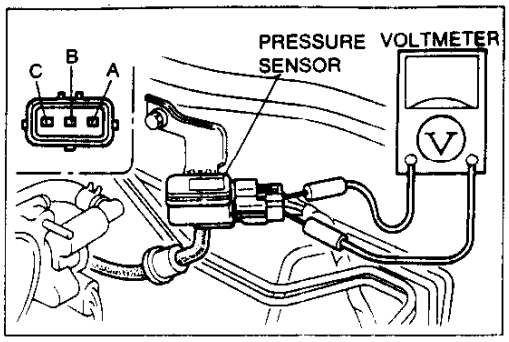
3. If not as specified, replace the crank angle sensor.

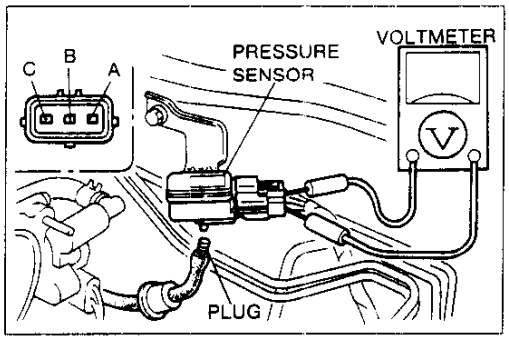


Installation Note

Measure the crank angle sensor to crank angle sensor plate clearance by using feeler gauge.

Clearance: 1.0–2.0 mm {0.039–0.078 in}





PRESSURE SENSOR

Inspection

1. Warm up the engine to normal operating temperature and run it at idle.
2. Turn all electrical load off.
3. Connect a voltmeter between the pressure sensor terminal A and B and verify the voltage is within specification.

Voltage: 1.3–1.6V

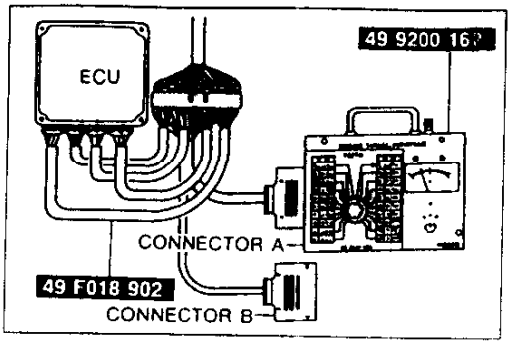
4. Disconnect vacuum tube and plug the vacuum tube and verify the voltage is within specification.

Voltage: 2.38–2.78V

5. Connect a vacuum pump to the pressure sensor.
6. Apply vacuum and measure the voltage of the pressure sensor

Vacuum	Voltage
– 66 kPa {– 500 mmHg, –19.7 inHg}	1.25–1.55V
0 kPa {0 mmHg, 0 inHg}	2.38–2.78V
98.7 kPa {740 mmHg, 29.1 inHg}	4.35–4.65V

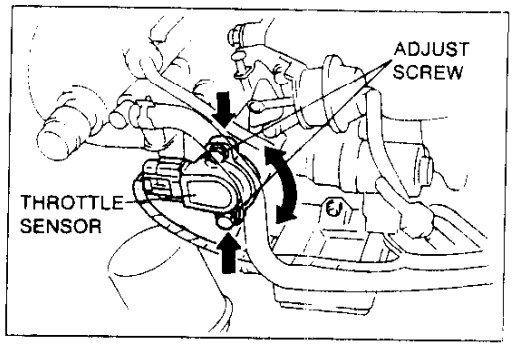
7. If not as specified, replace the pressure sensor.
8. Cancel the memory of malfunctions by disconnecting the negative battery cable for at least 20 seconds and depress brake pedal.
9. Reconnect the negative battery cable.



THROTTLE SENSOR

Inspection

1. Warm up the engine to normal operating temperature and run it at idle.
2. Verify the first idle cam separates.
3. Stop the engine.
4. Connect the **SST**s (Engine Signal Monitor and Adaptor Harness) to ECU or connect the **SST**s (DT-S1000 and Harness) to diagnosis connector as shown.
5. Turn the ignition switch to ON.

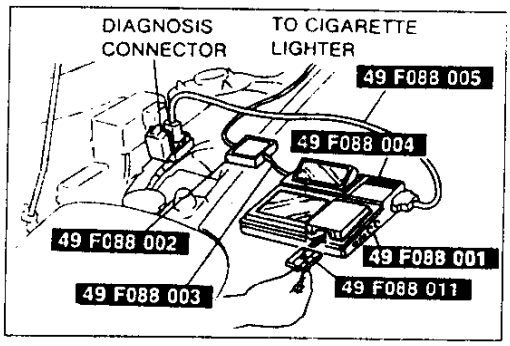


6. Rotate the throttle link by hand verify that the voltage is within specification.

Specification

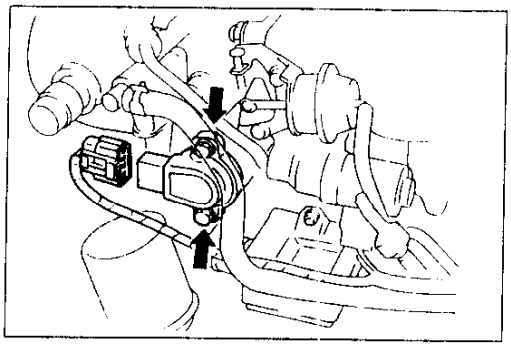
ECU Terminal	Throttle valve condition		
	Fully closed	closed to open	Fully open
3F (Narrow range)	0.75–1.25V	1.0–5.0V	4.8–5.0V
3G (Full range)	0.1–0.7V	0.4–4.3V	4.2–4.6V

7. If not as specified, adjust or replace the throttle sensor.



Adjustment

1. Warm up the engine to normal operating temperature and run it idle.
2. Verify that the first idle cam separates.
3. Stop the engine.
4. Connect the **SST**s (Engine Signal Monitor and Adaptor Harness) to ECU or connect the **SST**s (DT-S1000 and Harness) to diagnosis connector as shown.
5. Turn the ignition switch to ON.



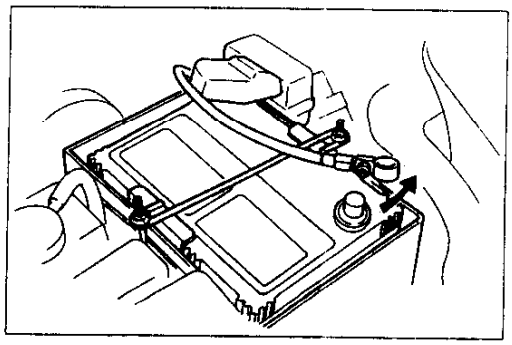
6. Loosen the screws and rotate the throttle sensor to set the correct closed position voltage.
   (Refer to "Specification" above)
7. Check the correct open position voltage and close to open voltage.
   (Refer to "Specification" above)
9. Tighten the screws.

Note

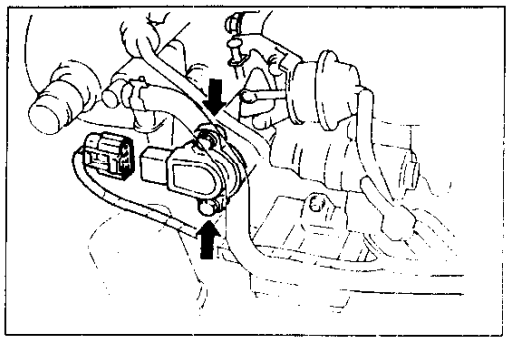
- **When installing the sensor, Tighten to the specified torque.**

Tightening Torque

1.6–2.4 N·m {16–24 kgf·cm, 140–210 in·lbf}



10. Cancel the memory of malfunctions by disconnecting the negative battery cable for at least 20 seconds and depress the brake pedal.
11. Reconnect the negative battery cable.



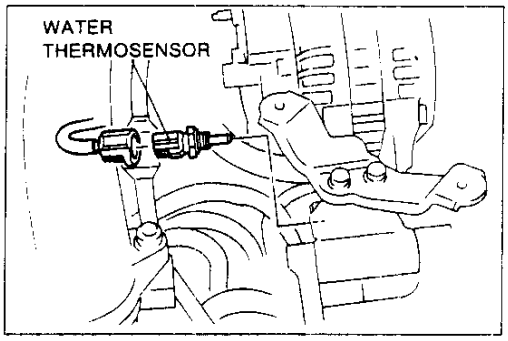
Removal / Installation

1. Turn ignition switch to OFF.
2. Disconnect the throttle sensor connector.
3. Remove the throttle sensor.

Caution

- **Do not drop the throttle sensor.**

4. Adjust the throttle sensor (Refer to page F–182)



WATER THERMOSENSOR

Removal / Installation

Warning

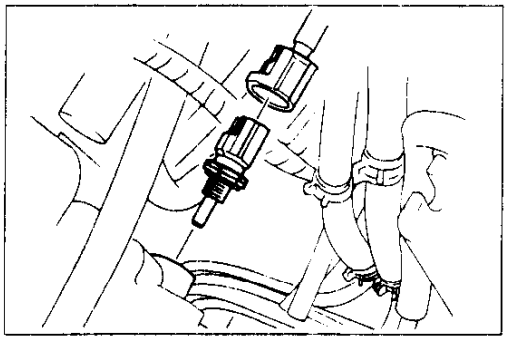
- **Never remove water thermosensor while the engine is hot.**

1. Remove the extension manifold. (Refer to page F–76)
2. Disconnect water thermosensor connector.
3. Remove the water thermosensor.
4. Install a new gasket and Install in the reverse order of removal.

Note

- **When istalling the sensor, tighten to the specified torque.**

Tightening torque:
19.6–24.5 N·m {200–250 kgf·cm, 174–217 in·lbf}

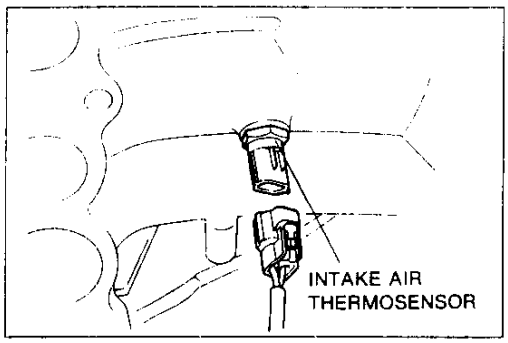


Inspection

1. Place the water thermosensor in water with a thermometer and heat the water gradually.
2. Measure the resistance of the sensor with an ohmmeter.

Water temperature	Resistance
20°C {68°F}	2.2–2.7 kΩ
80°C {176°F}	0.29–0.35 kΩ

3. Replace the sensor, if necessary.



INTAKE AIR THERMOSENSOR

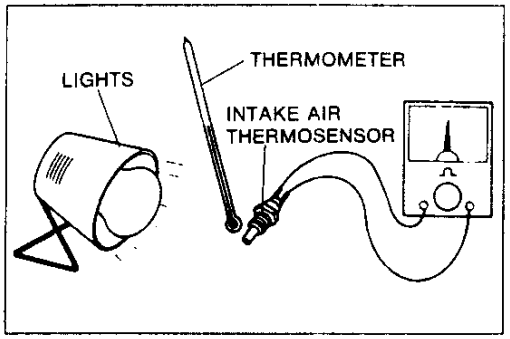
Removal / Installation

1. Remove the extension manifold (Refer to page F–76)
2. Remove the intake air thermosensor from extension manifold.

Note

- **When installing the sensor, tighten to the specified torque.**

Tightening torque:
7.8–12 N·m {0.8–1.2 kgf·m, 5.8–8.7 ft·lbf}

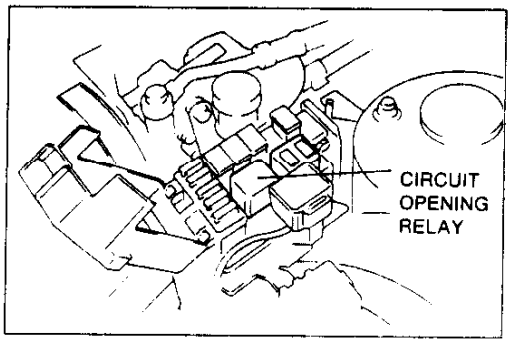


Inspection

1. Remove the intake air thermosensor and heat the sensor as shown in figure.
2. Measure the resistance of the sensor with an ohmmeter.

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

3. Replace the sensor, if necessary.



FUEL THERMOSENSOR

Removal / Installation

Warning

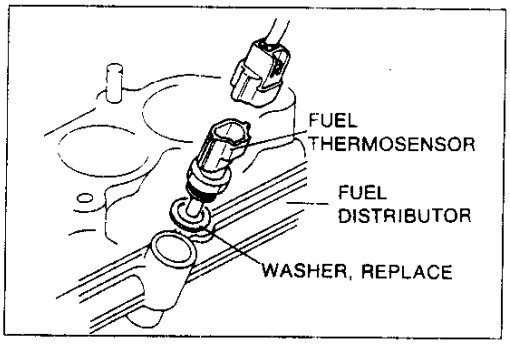
- **Before performing the following operation, release the fuel pressure from the fuel system to reduce the possibility injury or fire (Refer to page F–95).**

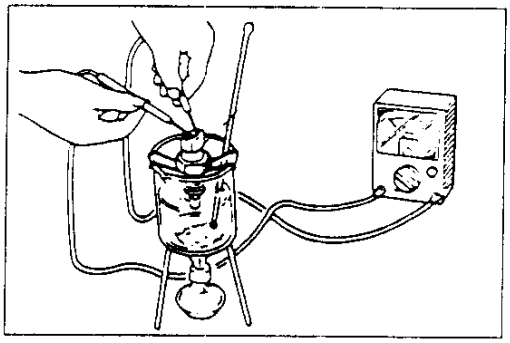
1. Remove the intake air system component parts. (Refer to page F–76)
2. Disconnect the fuel thermosensor connector.
3. Remove the fuel thermosensor.
4. Install in the reverse order of removal.

Note

- **When installing the sensor, tighten to the specified torque.**

Tightening torque:
19.6–24.5 N·m {200–250 kgf·cm, 174–217 in·lbf}



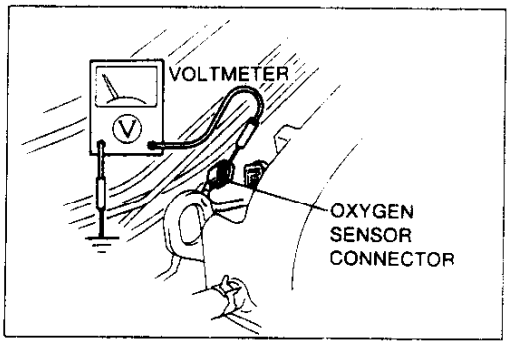


Inspection

1. Place the fuel thermosensor in water with a thermometer and heat the water gradually.
2. Measure the resistance of the sensor with an ohm meter.

Water temperature	Resistance
20°C {68°F}	2.2–2.7 kΩ
80°C {176°F}	0.29–0.35 kΩ

3. Replace the sensor, if necessary.



OXYGEN SENSOR

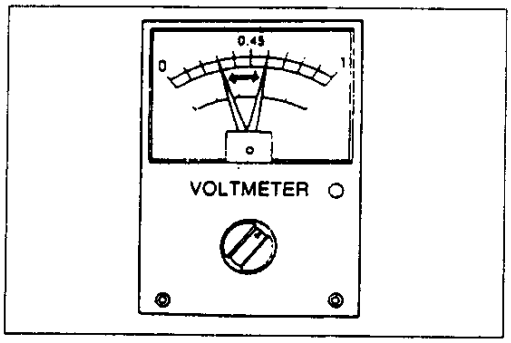
Inspection of Terminal Voltage.

1. Warm up the engine to normal operating temperature and run it at idle.
2. Disconnect the oxygen sensor connector.
3. Connect a voltmeter between the oxygen sensor terminal.

Caution

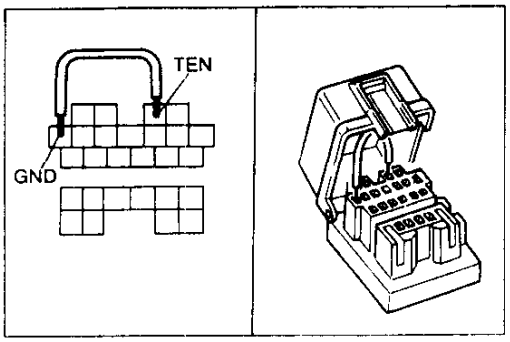
- **When measuring the terminal voltage of oxygen sensor, use a high internal resistance type (More than 40 kΩ) voltmeter.**

4. Measure the voltage while increasing and decreasing the engine speed suddenly several times.



Specification

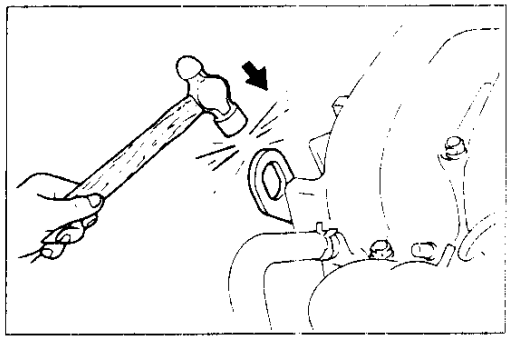
Engine condition	Voltage
While decelerating	0.0–0.4V
While accelerating	0.5–1.0V



KNOCK SENSOR

Inspection (On vehicle)

1. Turn the ignition switch to ON.
2. Connect a voltmeter to the MEN terminal of the diagnosis connector
3. Connect the diagnosis connector terminals TEN and GND by using a jumper wire.
4. Turn ignition switch ON

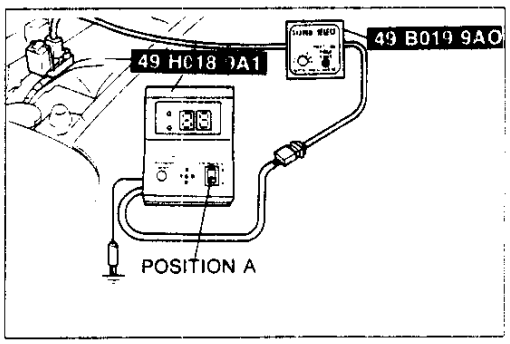


5. Lightly tap the engine hanger with a hammer.
6. Verify that the voltmeter indicator move.

Note

- **When inspect again, turn ignition switch OFF.**

Self Diagnosis Checker

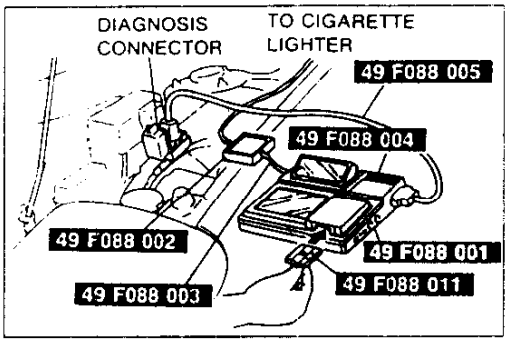


1. Connect the **SST**s (System selector and Self-Diagnosis Checker) to diagnosis connector.
2. Set switch A to position of Self-Diagnosis Checker
3. Set SYSTEM SELECT position 1 and TEST SW to SELF-TEST of System selector.
4. Turn ignition switch ON
5. Lightly tap the engine hanger with a hammer.
6. Verify that the monitor lamp illuminates for approx. 0.5 seconds.

Note

- **When inspect again, turn ignition switch OFF.**

DT-S1000

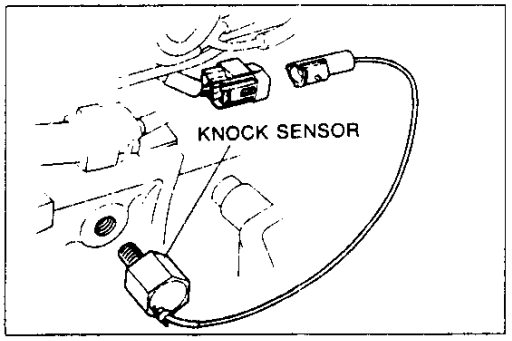


1. Connect the **SST**s (DT-S1000 and Harness) to diagnosis connector.
2. Select Switch Monitor function.
3. Turn ignition switch ON.
4. Lightly tap the engine hanger with a hammer.
5. Verify that the indicator, turn white to black for approx 0.5 seconds.

Note

- **When ispect again, turn ignition switch OFF.**

Removal / Installation

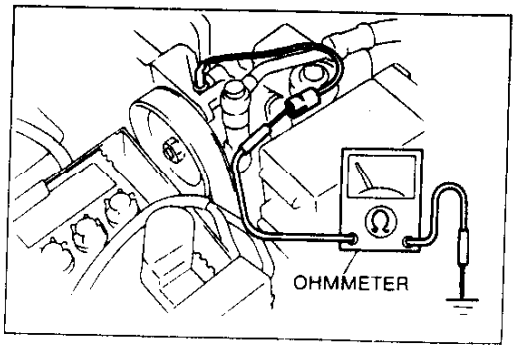


1. Disconnect knock sensor connector.
2. Remove the knock sensor.
3. Install in the reverse order of removal.

Tightning Torque:
20–34 N·m {2.0–3.5 kgf·m, 14–25 ft·lbf}

Caution

- **Do not use a impact wrench.**
- **Do not drop the knock sensor.**

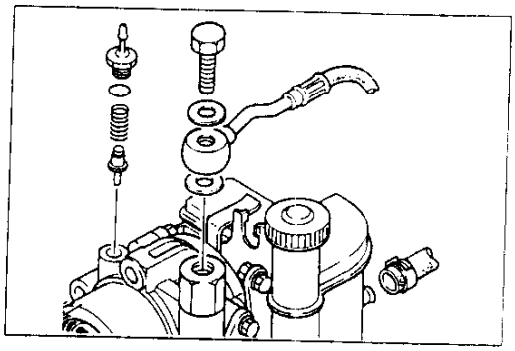


POWER STEERING PRESSURE SWITCH

Inspection (On the vehicle)

1. Disconnect the P/S pressure switch connector.
2. Start the engine, and check continuity of the switch.

Steering wheel	Continuity
Turned	Yes
Straight ahead	No

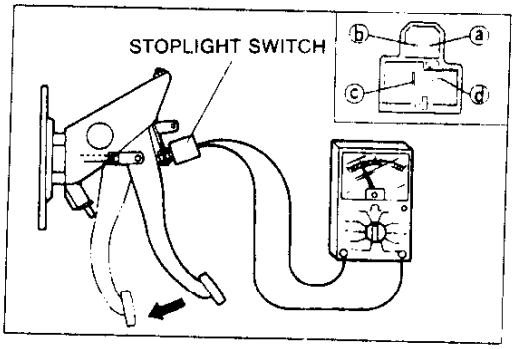


3. Replace the P/S pressure switch if not as specified

Note

- **When installing the switch, tighten to the specified torque.**

Tightning torque:
29–39 N·m {3.0–4.0 kgf·m, 22–29 ft·lbf}

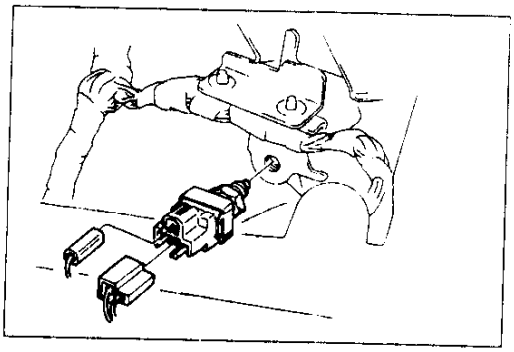


STOPLIGHT SWITCH

Inspection

1. Disconnect the stop light switch connector.
2. Connect a circuit tester between the stop light switch terminal C and D.
3. Check the continuity of the switch.

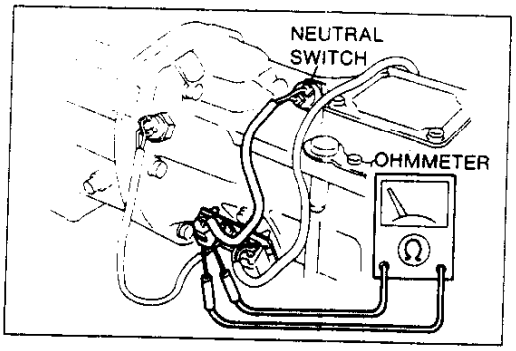
Pedal	Continuity
Depressed	Yes
Released	No



Removal / Installation

1. Disconnect the stoplight switch connector.
2. Remove the stoplight switch.
3. Install the stoplight switch.
4. Connect a circuit tester between the stoplight switch terminal C and D, and verify that the continuity when the brake pedal depressed and no continuity when the brake pedal released.
5. Tighten the adjust nut.

Tightening Torque:
14–18 N·m {1.4–1.8 kgf·m, 10–13 ft·lbf}

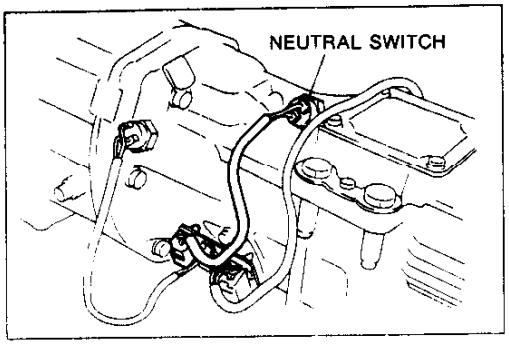


NEUTRAL SWITCH (MT)

Inspection

1. Disconnect the neutral switch connector.
2. Connect a circuit tester to the switch.
3. Check the continuity.

Transmission	Continuity
In neutral	Yes
In other ranges	No



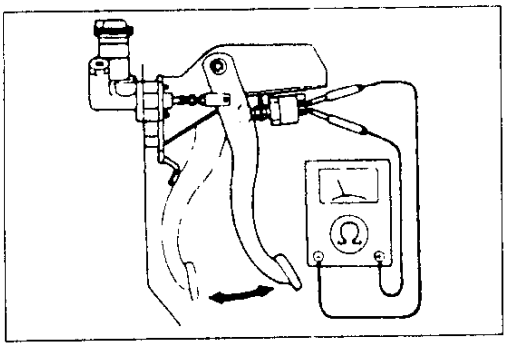
Removal / Installation

1. Remove the extension housing (Refer to Section J).
2. Disconnect the neutral switch connector.
3. Remove the neutral switch.
4. Install in the reverse order of removal.

Note

- **When installing the switch tighten to the specified torque.**

Tightening Torque:
25–34 N·m {2.5–3.5 kgf·m, 18–25 ft·lbf}

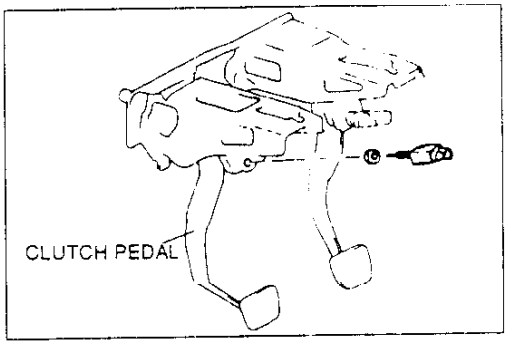


CLUTCH SWITCH (MT)

Inspection

1. Disconnect the clutch switch connector.
2. Connect a circuit tester to the switch.
3. Check the continuity.

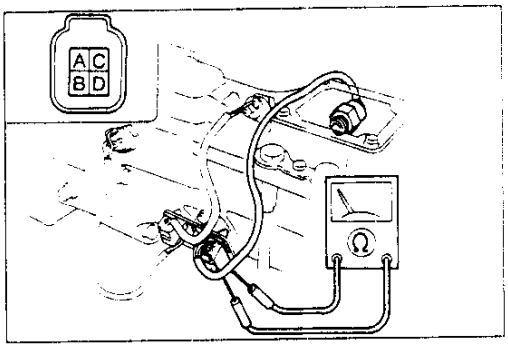
Pedal	Continuity
Depressed	Yes
Released	No



Removal / Installation

1. Remove the extension housing (Refer to Section J).
2. Remove the clutch switch.
3. Install the clutch switch.
4. Connect a circuit tester to the switch and verify that there is continuity when the clutch pedal depressed and no continuity when the clutch pedal released.
5. Tighten the adjust nut.

Tightening torque:
14–18 N·m {1.4–1.8 kgf·m 10–13 ft·lbf}

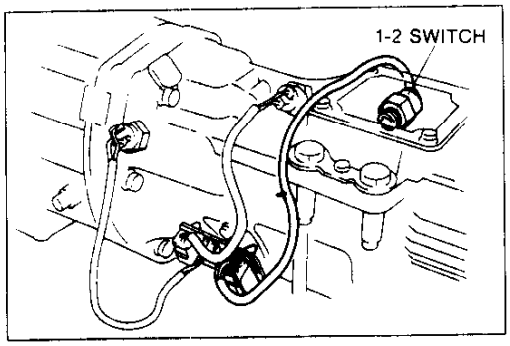


1-2 SWITCH (MT)

Inspection

1. Disconnect 1-2 switch.
2. Connect a circuit tester to the switch.
3. Check the continuity.

Terminal	Transmission	Continuity
A–B	In 1st range	No
	In other range	Yes
C–D	In 2nd	Yes
	In other range	No



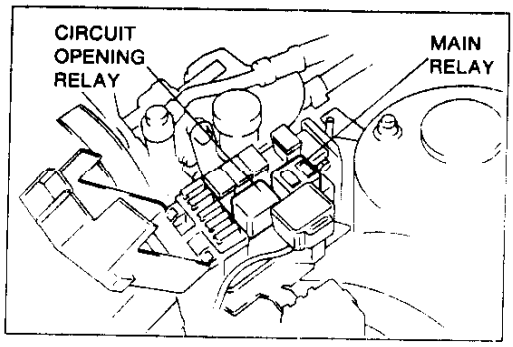
Removal / Installation

1. Remove the extension housing (Refer to Section J).
2. Remove the 1-2 switch.
3. Install in the reverse order of removal.

Note

- **When installing the switch tighten to the specified torque.**

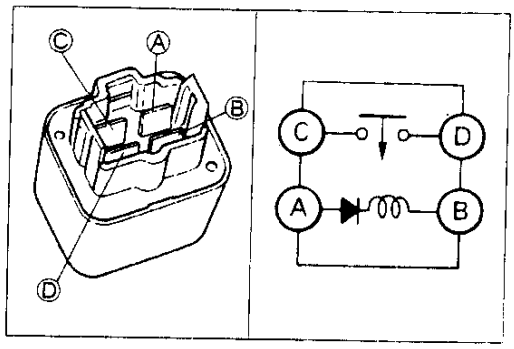
Tightening torque:
25–34 N·m {2.5–3.5 kgf·m, 18–25 ft·lbf}



MAIN RELAY (EGI RELAY)

Inspection (On vehicle)

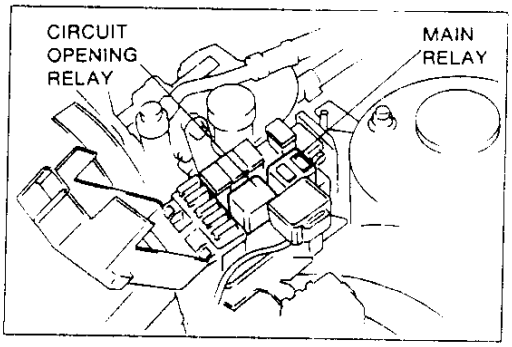
Check that a "clicking" sound is heard at the EGI main relay when turning the ignition switch OFF and ON



Inspection

1. Disconnect the main relay
2. Apply Battery voltage and ground to terminals A anc B of the EGI main relay.
3. Check continuity of the relay.

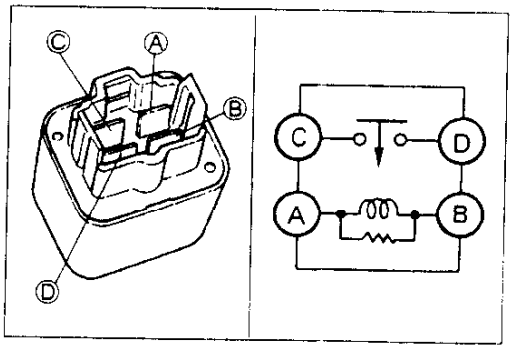
Operation	C-D terminals
V_B Applied	Continuity
V_B Not applied	No continuity



CIRCUIT OPENING RELAY

Inspection (On vehicle)

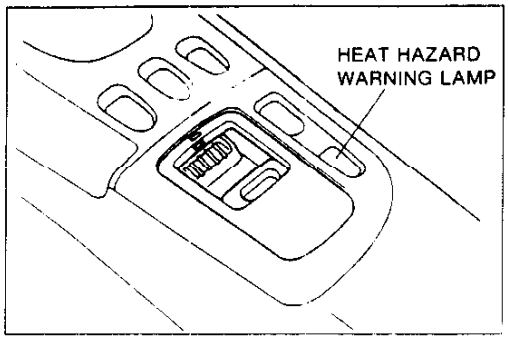
Check that a "clicking" sound is heard at the circuit opening relay, when turning the ignition switch OFF and ON.



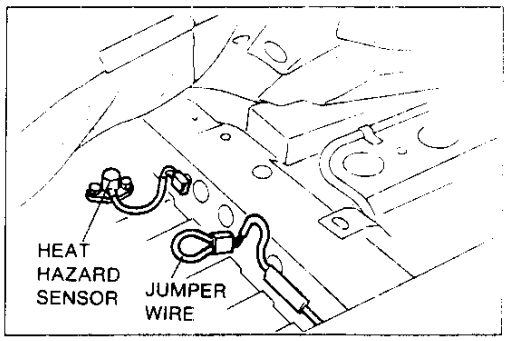
Inspection

1. Disconnect the circuit opening relay.
2. Apply battery voltage and ground to terminal A and B of the circuit opening relay.
3. Check continuity of the relay.

Operation	C-D terminals
V_B applied	Continuity
V_B Not applied	No continuity



97U0F2-203



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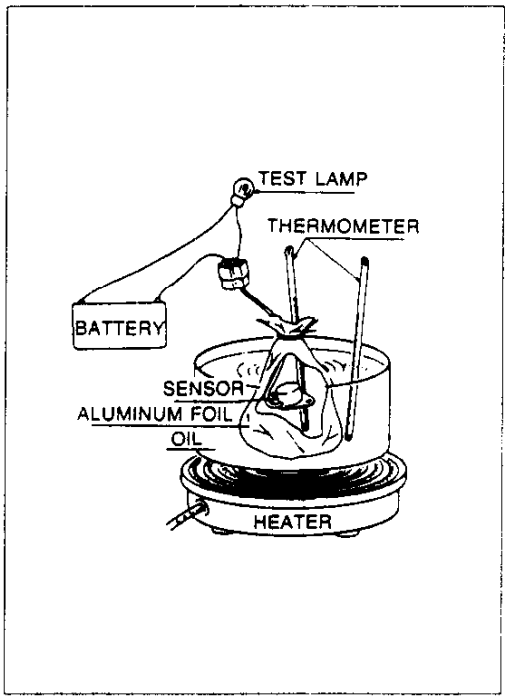
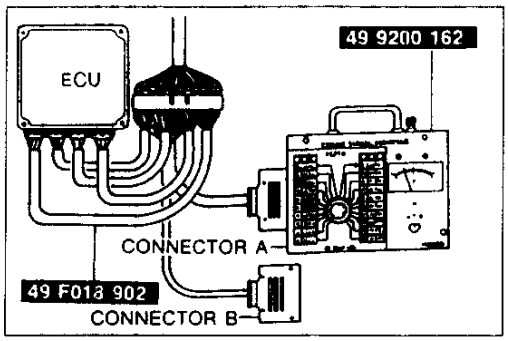




HEAT HAZARD SENSOR

Inspection (Warning system)

1. Turn the ignition switch ON Verify that the heat hazard warning lamp illuminates.
2. Start the engine and verify that the warning lamp goes out.
3. Disconnect the heat hazard sensor connector.
4. Check that the heat hazard warning lamp illuminates on when a jumper wire is connected to the terminals of the sensor connector (harness side).

Removal

1. Remove right front seat.
2. Lift up the floor mat.
3. Disconnect the heat hazard sensor connector and remove the sensor.

Installation

Install in the reverse order of removal.

Inspection

1. Wrap the sensor and a thermometer in aluminum foil and place them in a container of oil.
2. Connect a test lamp and 12V to the terminals of the sensor connector.
3. Gradually heat the oil.
   Verify that the test lamp comes on when the temperature in the aluminum foil reaches 105–115°C {221–239°F}.

Caution

- **Do not heat the oil to more than 150°C {302°F}.**

4. Replace the sensor, if necessary.

MILEAGE SWITCH

Inspection

1. Connect the **SST** (Engine Signal Monitor) to the ECU.
2. Turn ignition switch ON.
3. Check the ECU terminal 1N as show.

Under 20,000 miles	Below 1.5V
Over 20,000 miles	V_B

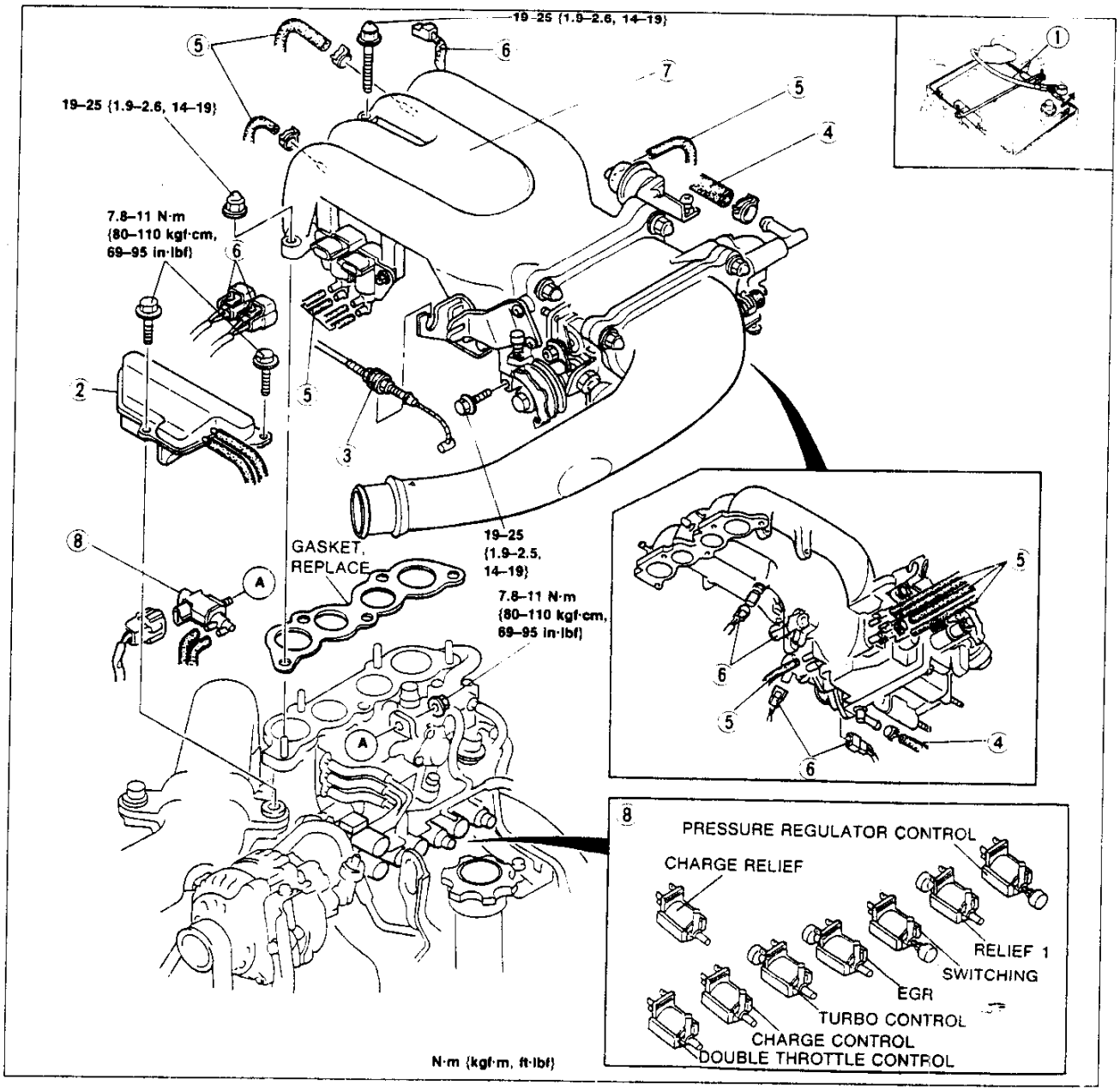
Note

- **When checking the terminal voltage, mesure the during two second after ignition switch ON.**

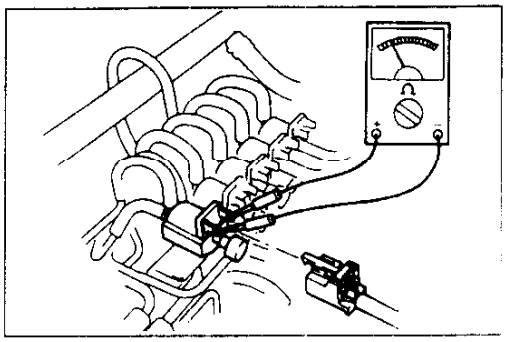
SOLENOID VALVES

Removal / Installation

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

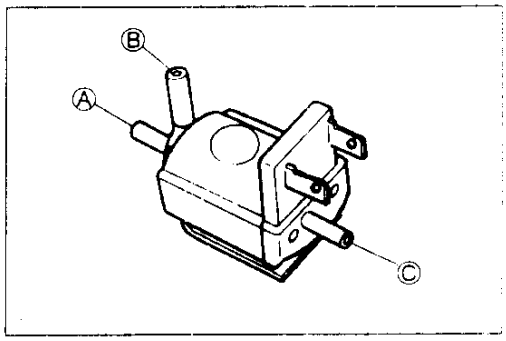


1. Battery cable
2. Pressure chamber
3. Accelerator cable
   removal / installation ..... page F–80
   Inspection / adjustment ..... page F–80
4. Water hose
5. Vacuum hoses
6. Connector
7. Extension manifold
8. Solenoid valves
   Inspection ..... page F–12



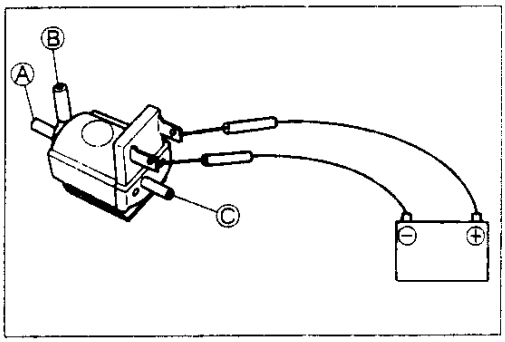
Inspection

1. Disconnect the connector.
2. Connect a circuit tester to the solenoid valve.
3. Check the continuity at the terminals.



4. Verify that air flows between each ports as below.

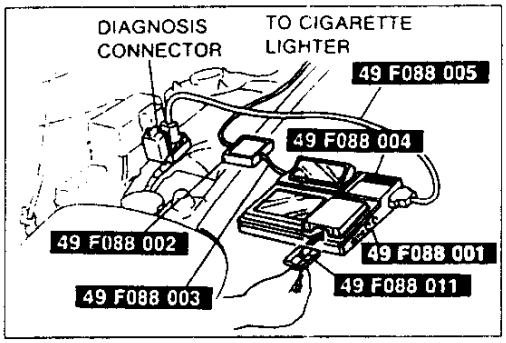
Port	Air flow
A–B	No
A–C	No
B–C	Yes



5. Connect V_B and a ground to the terminals of the solenoid valve.
6. Verify that air flows between each ports as below.

Port	Air flow
A–B	Yes
A–C	No
B–C	No

7. Replace the solenoid valve, if necessary.



DT-S1000

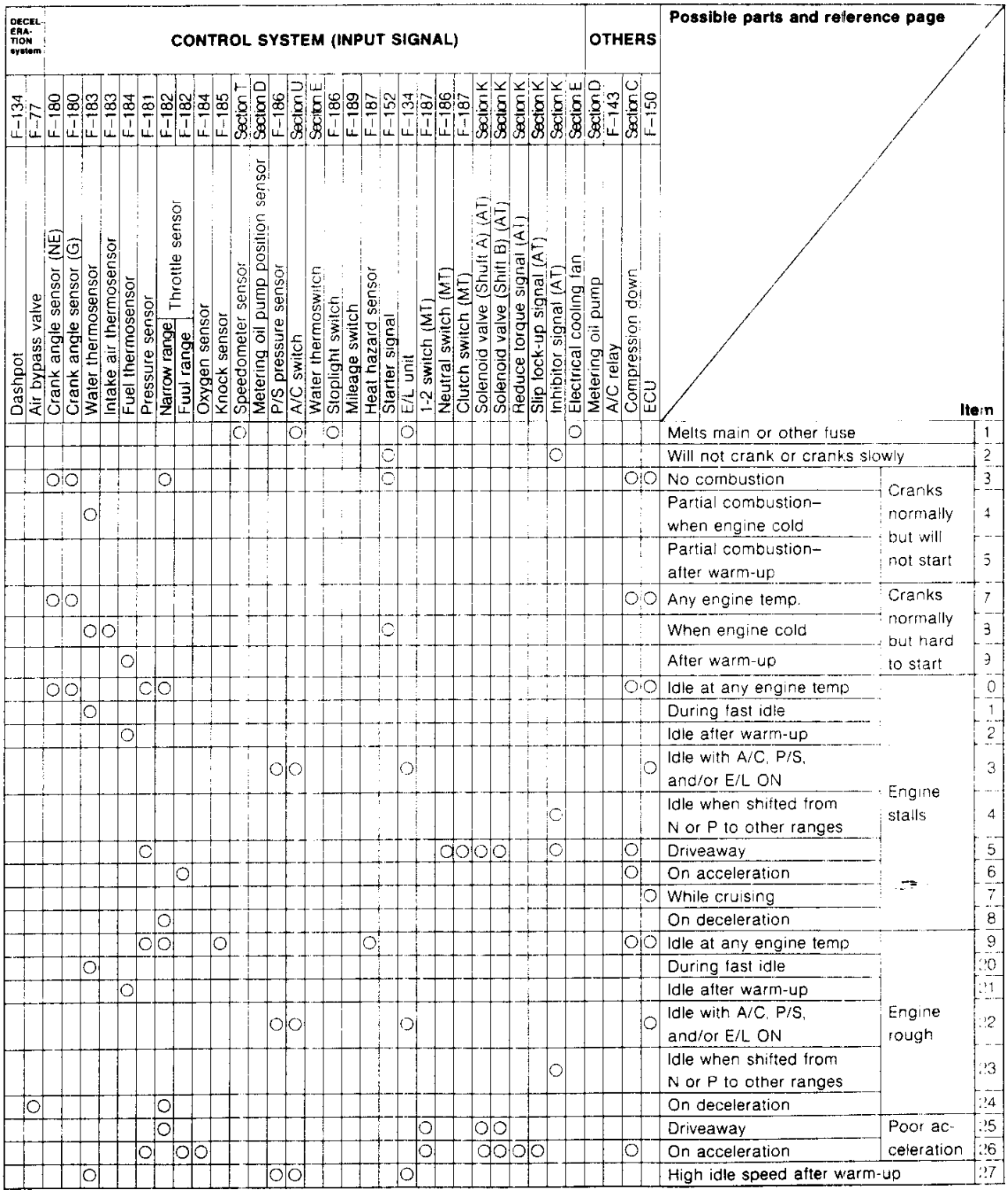
1. Connect the **SST** (DT-1000) between the diagnosis connector and the wiring harness by using the **SST** (Harness).
2. Turn the ignition switch to ON.
3. Select the simulation function.
4. Listen for operational sounds of each solenoid valve.
5. If no sound is heard, check the wiring to the solenoid valves and measure the voltage of the ECU terminals. (Refer to page F–152).

TROUBLESHOOTING GUIDE

QUICK DIAGNOSIS CHART

This Quick Diagnosis Chart shows the relationship between troubleshooting items and inspection points.

Item		Possible parts and reference page	Intake air system					Fuel system								Ignition system			Turbo charger system				Secondary air injection system						Emission system			
			F-16	F-83	F-83	F-137	F-79	F-76	F-105	F-105	F-103	F-100	F-110	F-109	F-110	F-104	F-112	Section G	Section G	Section G	F-16	F-93	F-93	F-93	F-93	F-123	F-119	F-119	F-123	F-121	F-123	F-128	F-131	F-131	F-127
			Air cleaner element	Solenoid valve (ISC)	Solenoid valve (AWS)	Solenoid valve (Double throttle)	Fast idle cam	Intake air leakage	Injector (Primary)	Injector (Secondary)	Fuel filter	Fuel pump	Fuel pump relay	Fuel pump resistor	Circuit opening relay	Pressure regulator	Solenoid valve (PRC)	Igniter	Ignition coil	Spark plug	Ignition timing	Turbo precontrol	Wastegate control	Turbo control	Charge control	Charge relief	Relief 1	Switching	Split air bypass	Port air bypass	Relief 2	Air pump	Air pump relay	Catalytic converter	Charcoal canister	Solenoid valve (Purge control)	Solenoid valve (EGR)
																						Solenoid valve					Solenoid valve								
1	Melts main or other fuse			○		○			○	○		○			○		○																		
2	Will not crank or cranks slowly																																		
3	Cranks normally but will not start	No combustion										○			○		○	○	○	○																
4		Partial combustion– when engine cold						○	○			○								○																
5		Partial combustion– after warm-up														○																		○	○		
7	Cranks normally but hard to start	Any engine temp.	○	○				○	○		○	○			○		○			○																
8		When engine cold					○												○																	
9		After warm-up														○																		○	○		
10	Engine stalls	Idle at any engine temp		○				○		○	○				○		○	○	○	○														○	○		
11		During fast idle		○		○																														
12		Idle after warm-up														○																		○	○		
13		Idle with A/C, P/S, and/or E/L ON		○																																
14		Idle when shifted from N or P to other ranges		○																																
15		Driveaway						○																												
16		On acceleration													○																					
17		While cruising						○			○			○			○	○																		
18		On deceleration																																		
19	Engine rough	Idle at any engine temp	○	○				○		○	○				○		○	○	○	○					○	○				○	○					
20		During fast idle		○		○																														
21		Idle after warm-up														○																		○	○		
22		Idle with A/C, P/S, and/or E/L ON		○																																
23		Idle when shifted from N or P to other ranges		○																																
24		On deceleration																																		
25	Poor acceleration	Driveaway			○					○										○	○						○									
26		On acceleration	○		○				○	○		○				○	○			○	○	○	○	○						○						
27	High idle speed after warm-up			○	○		○	○	○						○	○																			



DECELERATION system	CONTROL SYSTEM (INPUT SIGNAL)																												OTHERS			Possible parts and reference page		Item
	Dashpot	Air bypass valve	Crank angle sensor (NE)	Crank angle sensor (G)	Water thermosensor	Intake air thermosensor	Fuel thermosensor	Pressure sensor	Narrow range / Throttle sensor / Fuul range	Oxygen sensor	Knock sensor	Speedometer sensor	Metering oil pump position sensor	P/S pressure sensor	A/C switch	Water thermoswitch	Stoplight switch	Mileage switch	Heat hazard sensor	Starter signal	E/L unit	1-2 switch (MT)	Neutral switch (MT)	Clutch switch (MT)	Solenoid valve (Shuft A) (AT)	Solenoid valve (Shift B) (AT)	Reduce torque signal (AT)	Slip lock-up signal (AT)	Inhibitor signal (AT)	Electrical cooling fan	Metering oil pump	A/C relay	Compression down	ECU			
	F–134	F–77	F–180	F–180	F–183	F–183	F–184	F–181	F–182	F–182	F–184	F–185	Section T	Section D	F–186	Section U	Section E	F–186	F–189	F–187	F–152	F–134	F–187	F–186	F–187	Section K	Section K	Section K	Section K	Section K	Section E	Section D	F–143	Section C	F–150			
												○			○		○													○					Melts main or other fuse		1
																				○								○					Will not crank or cranks slowly		2
			○	○					○											○											○	○	No combustion	Cranks normally but will not start	3
					○																													Partial combustion–when engine cold		4
																																		Partial combustion–after warm-up		5
			○	○																												○	○	Any engine temp.	Cranks normally but hard to start	7
					○	○														○														When engine cold		8
							○																											After warm-up		9
			○	○					○																							○	○	Idle at any engine temp	Engine stalls	0
					○																													During fast idle		1
							○																											Idle after warm-up		2
														○	○						○												○	Idle with A/C, P/S, and/or E/L ON		3
																													○					Idle when shifted from N or P to other ranges		4
								○															○	○	○	○						○		Driveaway		5
									○																							○		On acceleration		6
																																	○	While cruising		7
																																		On deceleration		8
								○	○			○							○													○	○	Idle at any engine temp	Engine rough	9
					○																													During fast idle		20
							○																											Idle after warm-up		21
														○	○						○												○	Idle with A/C, P/S, and/or E/L ON		22
																													○					Idle when shifted from N or P to other ranges		23
	○								○																									On deceleration		24
									○													○			○	○								Driveaway	Poor acceleration	25
							○			○												○			○	○	○	○					○	On acceleration		26
					○									○	○						○													High idle speed after warm-up		27

TROUBLESHOOTING GUIDE

Item	Possible parts and reference page	Intake air system					Fuel system									Ignition system			Turbo charger system				Secondary air injection system						Emission system			
		Air cleaner element F-16	Solenoid valve (ISC) F-83	Solenoid valve (AWS) F-83	Solenoid valve (Double throttle) F-137	Fast idle cam F-79	Intake air leakage F-76	Injector (Primary) F-105	Injector (Secondary) F-105	Fuel filter F-103	Fuel pump F-100	Fuel pump relay F-110	Fuel pump resistor F-109	Circuit opening relay F-110	Pressure regulator F-104	Solenoid valve (PRC) F-112	Igniter Section G	Ignition coil Section G	Spark plug Section G	Ignition timing F-16	Turbo precontrol F-93	Wastegate control F-93	Turbo control F-93	Charge control F-93	Charge relief F-93	Relief 1 F-123	Switching F-119	Split air bypass F-119	Port air bypass F-119	Relief 2 F-123	Air pump F-21	Air pump relay F-123	Catalytic converter F-128	Charcoal canister F-131	Solenoid valve (Purge control) F-131	Solenoid valve (EGR) F-127
																				Solenoid valve					Solenoid valve									
28	Idle fluctuates / idle hunts		○				○											○	○	○															
29	Hesitates / Stumbles on acceleration	○			○			○	○		○							○	○		○			○	○										
30	Surges while cruising						○	○	○		○				○			○	○		○			○	○										
31	Lack of power	○							○	○		○			○	○		○	○		○	○	○	○	○										
32	Poor fuel economy	○					○					○			○	○		○	○		○	○	○	○	○							○			
33	A/C does not work																															○			
34	Knocking / Pinging						○	○	○						○	○			○																
35	Fuel odor																																○		
36	Exhaust sulfur smell									○																						○	○		
37	High oil consumption																														○				
38	Self-Diagnosis Checker flashes 88																																		
39	Self-Diagnosis Checker will not work																																		

DECELERATION system		CONTROL SYSTEM (INPUT SIGNAL)																													OTHERS				Possible parts and reference page	
Dashpot	Air bypass valve	Crank angle sensor (NE)	Crank angle sensor (G)	Water thermosensor	Intake air thermosensor	Fuel thermosensor	Pressure sensor	Throttle sensor: Narrow range	Throttle sensor: Fuul range	Oxygen sensor	Knock sensor	Speedometer sensor	Metering oil pump position sensor	P/S pressure sensor	A/C switch	Water thermoswitch	Stoplight switch	Mileage switch	Heat hazard sensor	Starter signal	E/L unit	1-2 switch (MT)	Neutral switch (MT)	Clutch switch (MT)	Solenoid valve (Shuft A) (AT)	Solenoid valve (Shift B) (AT)	Reduce torque signal (AT)	Slip lock-up signal (AT)	Inhibitor signal (AT)	Electrical cooling fan	Metering oil pump	A/C relay	Compression down	ECU		Item
F-134	F-77	F-180	F-180	F-183	F-183	F-184	F-181	F-182	F-182	F-184	F-185	Section T	Section D	F-186	Section U	Section E	F-186	F-189	F-187	F-152	F-134	F-187	F-186	F-187	Section K	Section K	Section K	Section K	Section K	Section E	Section D	F-143	Section C	F-150		
								○																											Idle fluctuates / idle hunts	28
							○		○	○																	○								Hesitates / Stumbles on acceleration	29
										○	○																								Surges while cruising	30
							○		○																○	○	○	○					○	○	Lack of power	31
				○			○																		○	○		○					○	○	Poor fuel economy	32
															○																	○			A/C does not work	33
				○																														○	Knocking / Pinging	34
																																		○	Fuel odor	35
																																			Exhaust sulfur smell	36
				○			○						○																		○			○	High oil consumption	37
																																		○	Self-Diagnosis Checker flashes 88	38
																																		○	Self-Diagnosis Checker will not work	39

RELATIONSHIP CHART

INPUT DEVICE \ OUTPUT DEVICE		INJECTOR					SOLENOID VALVE																				
		FUEL INJECTION AMOUNT	FUEL INJECTION TIMING	CIRCUIT OPENING RELAY	FUEL PUMP RELAY	IGNITER	IDLE SPEED CONTROL SYSTEM	ACCELEATED WARM-UP SYSTEM	DUBLE THROTTLE CONTROL SYSTEM	PRESSURE REGULATOR CONTROL	TURBO PRECONTROL	WASTEGATE CONTROL	TURBO CONTROL	CHARGE CONTROL	CHARGE RELIEF	RELIEF 1	SWITCHING	SPLIT AIR BYPASS	PORT AIR BYPASS	RELIEF 2	PURGE CONTROL	EGR	EC-AT CONTROL UNIT	METERING OIL PUMP	A/C RELAY	AIR PUMP RELAY	SERVICE CODE	MONITOR LAMP
CRANK ANGLE SENSOR	NE SIGNAL	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	G SIGNAL		○			○																					○	
THROTTLE SENSOR	NARROW RANGE	○				○	○		○	○						○	○	○	○	○	○	○	○	○		○	○	
	FULL RANGE	○	○			○	○				○	○	○	○	○							○			○	○	○	○
WATER THERMOSENSOR		○				○	○	○	○		○	○				○	○	○	○	○	○	○			○	○	○	
INTAKE AIR THERMOSENSOR		○				○	○																			○	
FUEL THERMOSENSOR		○			○	○	○			○											○					○	
PRESSURE SENSOR		○			○	○	○				○	○	○	○	○	○	○	○	○	○	○	○		○		○	○	
OXYGEN SENSOR		○														○		○	○		○							
KNOCK SENSOR						○																				○	○
SPEEDOMETER SENSOR							○																	○		○	
MOP POSITION SENSOR																							○			○	
E/L UNIT						○	○																				
A/C SWITCH		○				○	○																				
P/S PRESSURE SWITCH		○				○	○																				
IGNITION SWITCH (ST SIGNAL)		○			○	○	○	○		○			○			○								○	○		
STOPLIGHT SWITCH							○																				
NEUTRAL SWITCH (MT)		○				○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○			○	○		
CLUTCH SWITCH (MT)		○				○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○			○	○		
1-2 SWITCH (MT)											○	○	○	○	○												
EGR SWITCH (Calif)																						○				○	
MILEAGE SWITCH																○		○	○	○							
HEAT HAZARD SENSOR																									○		
SOLENOID VALVE SIGNAL (AT)	SHIFT A					○			○		○	○	○	○	○		○	○				○				○	
	SHIFT B					○			○		○	○	○	○	○		○	○				○				○	
REDUCE TORQUE SIGNAL (AT)					○																	○					
SLIP LOCK-UP SIGNAL (AT)					○																	○					
INHIBITOR SIGNAL (AT)		○			○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	
DIAGNOSIS CONNECTOR (TEN-TERMINAL)		○				○																				○	○
ATMOSPHERIC PRESSURE SENSOR (IN ECU)		○			○	○			○		○	○	○	○	○		○			○		○				○	

Output devices and Engine condition

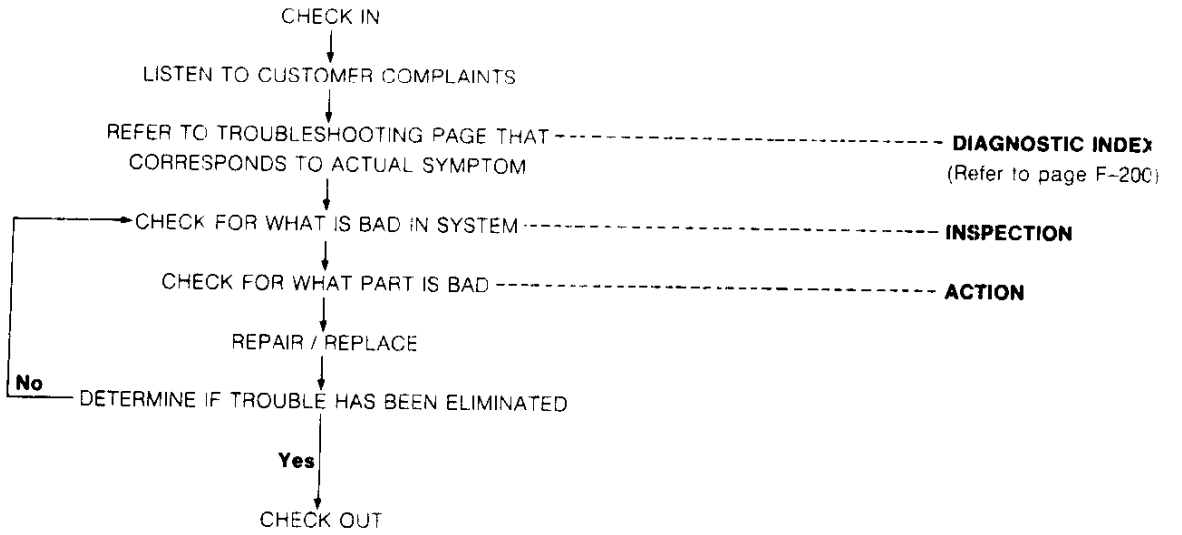
ENGINE CONDITION / OUTPUT DEVICE		CRANKING (COLD ENGINE)	WARMING UP (DURING IDLE)	MEDIUM LOAD		ACCELERATION	HEAVY LOAD	DECELERATION	IDLE	IG: ON (ENGINE NOT RUNNING)	REMARK
				COLD	WARM						
INJECTOR	FUEL INJECTION AMOUNT	Rich			Normal	Rich		FUEL CUT*	Rich	No injection	
	Primary	Operate						Not operate	Operate		
	Secondary	Not operate				Operate		Not operate			
CIRCUIT OPENING RELAY		ON								OFF	
FUEL PUMP RELAY		OFF (Low speed)				ON (High speed)		OFF (Low speed)			
IGNITER		Fixed at BTDC 5°	Advanced: depends on engine condition						Fixed at ATDC 5° (L) ATDC 20° (T)	-	
	ACCELERATED WARM-UP (AWS)	ON	OFF								
	IDLE SPEED CONTROL (ISC)	ON (Feedback duty)	ON (Fixed duty)						ON (Feedback duty)		
	DOUBLE THROTTLE CONTROL	ON (Closed)		OFF (Open)		ON (AT only)	OFF (Open)				
	TURBO PRE-CONTROL	OFF (Closed)	Depends on engine condition					OFF (Closed)			
	WASTEGATE CONTROL	OFF (Closed)				Depends on engine condition		OFF (Closed)			
	TURBO CONTROL	OFF (Closed)				ON (Open)		OFF (Closed)			
	CHARGE CONTROL	ON (Closed)				OFF (Open)		ON (Closed)			
	CHARGE RELIEF CONTROL	OFF (Open)				ON (closed)		OFF (Closed)			
	RELIEF 1	OFF (Closed)		ON (Open)		OFF (Closed)					
	SWITCHING	OFF (Port)		ON (Split)				OFF (Port)			
	SPLIT AIR BYPASS	OFF (Closed)		ON (Open)				OFF (Closed)			
	PORT AIR BYPASS	OFF (Closed)	ON (Open)			OFF (Closed)					
	RELIEF 2	ON (Open)	OFF (Closed)								
	PRESSURE REGULATOR CONTROL (PRC)	OFF (Vacuum to pressure regulator)							ON*	OFF	* During hot start only
	PURGE CONTROL (PURGE)	OFF		ON (Purge)		OFF					
	EXHAUST GAS RECIRULATION (EGR)	OFF (EGR Cut)		ON* (EGR)		OFF (EGR Cut)					Engine speed: 1,700–3,850 rpm
A/C RELAY		OFF (A/C cut)	ON			OFF (A/C cut)	ON				
COOLING FAN RELAY		OFF		Depends on engine coolant temperature							
METERING OIL PUMP (MOP)		OFF	ON							OFF	

USING THIS SECTION

Introduction

Most of the fuel and emission control systems are electronically controlled, often making it difficult to diagnose problems, especially intermittent problems. Before undertaking actual checks, take 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 the intermittent ones. Through a talk with the customer, you will usually find out what the symptoms are and under what conditions they occur.

Work flow



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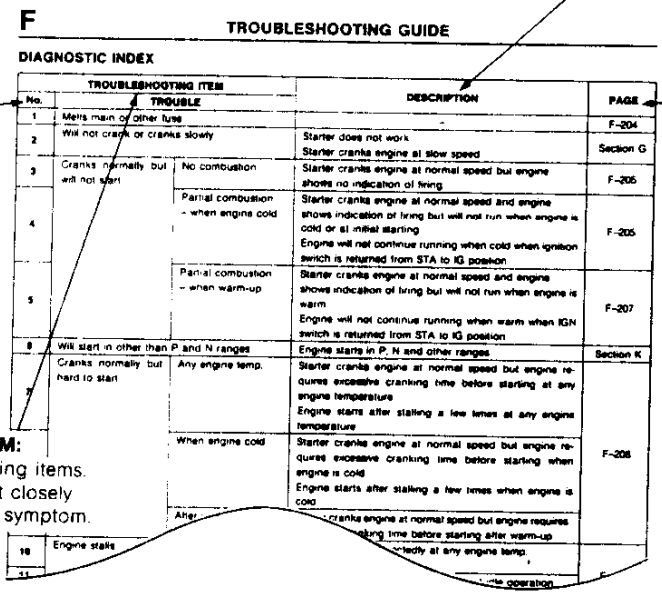
Diagnostic index

DESCRIPTION:
Describes each troubleshooting item



F TROUBLESHOOTING GUIDE

DIAGNOSTIC INDEX

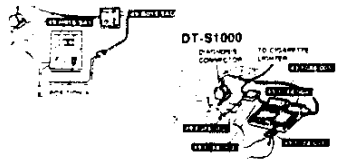
No.	TROUBLESHOOTING ITEM TROUBLE		DESCRIPTION	PAGE
1	Melts main or other fuse			F-204
2	Will not crank or cranks slowly		Starter does not work Starter cranks engine at slow speed	Section G
3	Cranks normally but will not start	No combustion	Starter cranks engine at normal speed but engine shows no indication of firing	F-205
4		Partial combustion – when engine cold	Starter cranks engine at normal speed and engine shows indication of firing but will not run when engine is cold or at initial starting Engine will not continue running when cold when ignition switch is returned from STA to IG position	F-205
5		Partial combustion – when warm-up	Starter cranks engine at normal speed and engine shows indication of firing but will not run when engine is warm Engine will not continue running when warm when IGN switch is returned from STA to IG position	F-207
6	Will start in other than P and N ranges		Engine starts in P, N and other ranges	Section K
7	Cranks normally but hard to start	Any engine temp.	Starter cranks engine at normal speed but engine requires excessive cranking time before starting at any engine temperature Engine starts after stalling a few times at any engine temperature	F-208
		When engine cold	Starter cranks engine at normal speed but engine requires excessive cranking time before starting when engine is cold Engine starts after stalling a few times when engine is cold	
		After	cranks engine at normal speed but engine requires king time before starting after warm-up	
10	Engine stalls		ediately at any engine temp.	
11			ile operation	

No.:
Each troubleshooting item is assigned a number.

TROUBLESHOOTING ITEM:
There are 58 troubleshooting items. Choose the item that most closely corresponds to the actual symptom.

PAGE:
Shows the reference page or section.

Troubleshooting chart

7, 8, 9	CRANKS NORMALLY BUT HARD TO START	• ANY ENGINE TEMPERATURE • WHEN ENGINE COLD • AFTER WARM-UP
DESCRIPTION	• Starter cranks engine at normal speed but engine requires excessive cranking time before starting • Engine starts after stalling a few times • Battery in normal condition • Engine runs normally at idle (If idle condition not OK, refer to "Engine rough" [Nos. 19, 20, 21, 22, or 23])	
[TROUBLESHOOTING HINTS] ① Injector • Fuel leakage from injector(s) ② Fuel pump • Poor connection of pump connector • Poor connection of circuit opening relay connector ③ Pressure regulator • Malfunction of pressure regulator ④ Fast idle cam • Malfunction of fast idle cam (when engine cold) ⑤ Spark plug • Dirty or worn spark plug(s)		⑥ Intake air system • Air leakage ⑦ Water thermosensor • Poor connection of water thrmosensor • Malfunction of water thermosensor ⑧ Solenoid valve (Purge control) • Air leakage ⑨ Metering oil pump • Malfunction of pump ⑩ Crank angle sensor • Ground circuit open
STEP	INSPECTION	ACTION
1	Is "00" or "No service codes" displayed on SST with ignition switch ON? SELF-DIAGNOSIS CHECKER ☞ page F-20 	Yes: "00" or "No service codes" displayed Go to next step No: Service Code No. displayed Check for cause (Refer to specified check sequence)
2	Is air leakage felt or heard at intake air system components at idle?	Yes: Repair or replace
3		

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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 to quickly determine the malfunction of parts. If a detailed procedure is necessary to perform the INSPECTION, refer to the page specified by the "☞" mark.

ACTION:

This recommends the appropriate action to take as a result (Yes/No) of the INSPECTION. How to perform the actions is described on the reference page specified by the "☞" mark.

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DIAGNOSTIC INDEX

TROUBLESHOOTING ITEM			DESCRIPTION	PAGE
No.	TROUBLE			
1	Melts main or other fuse		–	F-204
2	Will not crank or cranks slowly		Starter does not work Starter cranks engine at slow speed	Section G
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6	Will start in other than P and N ranges		Engine starts in P, N and other ranges	Section K
7	Cranks normally but hard to start	Any engine temperature	Starter cranks engine at normal speed but engine requires excessive cranking time before starting at any engine temperature Engine starts after stalling a few times at any engine temperature	F-208
8		When engine cold	Starter cranks engine at normal speed but engine requires excessive cranking time before starting when engine is cold Engine starts after stalling a few times when engine is cold	
9		After warm-up	Starter cranks engine at normal speed but engine requires excessive cranking time before starting after warm-up	
10	Engine stalls	Idle at any engine temperature	Engine stops unexpectedly at any engine temperature	F-210
11		During fast idle	Engine stops unexpectedly during fast-idle operation	
12		Idle after warm-up	Engine stops unexpectedly at idle after warm-up	
13		Idle with A/C, P/S, and/or E/L ON	Engine stops unexpectedly when A/C, P/S, and/or E/L is turned ON at idle	F-212 Section K
*14		Idle when shifted from N or P to other ranges	Engine stops unexpectedly when shifted from N or P to other ranges at idle	
15		Driveaway	Engine stops unexpectedly upon driveaway	F-213
16		On acceleration	Engine stops unexpectedly at beginning of acceleration or during acceleration	F-215
17		While cruising	Engine stops unexpectedly while cruising	
*18		On deceleration	Engine stops unexpectedly at beginning of deceleration or recovery from deceleration Exhaust afterburn	F-216 Section K
19	Engine rough	Idle at any engine temperature	Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at any engine temperature Idle speed too slow and excessive engine shake at any engine temperature	F-217
20		During fast idle	Fast idle speed too slow and excessive engine shake during fast idle, but returns to normal after warm-up	
21		Idle after warm-up	Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at idle after warm-up	

* Refer to Section F2 before referring to Section K.

TROUBLESHOOTING ITEM			DESCRIPTION	PAGE
No.	TROUBLE			
22	Engine rough	Idle with A/C, P/S, and/or E/L ON	Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at idle when A/C, P/S, and/or E/L ON	F-210
23		Idle when shifted from N or P to other range	Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at idle when shifted from P or N to other range	
24*		On deceleration	Engine shakes at beginning of deceleration, during deceleration, or recovery from deceleration Exhaust afterburn	F-220 Section K
25*	Poor acceleration	Driveaway	Engine speed increases normally but vehicle speed slowly, increases during driveaway	F-22 Section K
26*		On acceleration	Engine speed increases normally but vehicle speed slowly increases during acceleration	
27	High idle speed after warm-up		Idle speed continues at fast idle after warm-up Engine returns slowly to idle after accelerator is released	F-223
28	Idle fluctuates / Idle hunts		Engine speed hunts between specified idle speed and higher speed	F-225
29	Hesitates / Stumbles on acceleration		Momentary pause at beginning of acceleration or during acceleration	F-226
30*	Surges while cruising		Momentary minor irregularity in engine power at steady vehicle speed	F-228 Section K
31*	Lack of power		Performance poor under load (i.e., power down when climbing hills)	F-229 Section K
32*	Poor fuel economy		Fuel economy unsatisfactory	F-229 Section K
33	A/C does not work		A/C compressor magnetic clutch does not engage when A/C switch ON	F-229
34	Knocking / Pinging		Sound produced as air/fuel mixture is ignited by something other than spark plug (i.e., hot spot in combustion chamber)	F-230
35	Fuel odor		Gasoline fuel smell or visible leaks	F-230
36	Exhaust sulfur smell		Rotten egg (sulfur) smell from exhaust	F-230
37	High oil consumption		Oil consumption excessive	F-230
38	Self-Diagnosis Checker flashes 88 / DT-S1000 indicates "SYSTEM ERROR"		Checker flashes 88 with test connector grounded or DT-S1000 indicates "System error"	F-231
39	MIL never ON		Self-Diagnosis Checker or DT-S1000 indicates Service Code No. of input device but MIL never ON	F-231
40	Vehicle does not move in D, S, L and/or R ranges		No creep at all Vehicle does not move when accelerator pedal is depressed after shifted to D, S, L and/or R ranges	Section K
41	Vehicle moves in N range		Vehicle creeps in N ranges Vehicle moves with accelerator pedal not depressed	Section K
42	Vehicle moves in P range		Vehicle rolls in P range	Section K
43	Excessive creep		Vehicle moves quickly in D, S, L and R range (with accelerator pedal not depressed) **Note** **• Excessive N to R range and N to D range shift shock felt**	Section K

* Refer to Section F before referring to K Sections

TROUBLESHOOTING GUIDE

TROUBLESHOOTING ITEM			DESCRIPTION	PAGE
No.	TROUBLE			
44	No shift		Single range shift (1st → 2nd, 2nd → 3rd or 3rd → O/D) only Sometimes shifts correctly **Note** **• Gear position held in hold mode.**	Section K
45	Abnormal shift		Shifts incorrectly (incorrect shift pattern) (ex) Vehicle shifts 1st → O/D directly when accelerating with accelerator pedal depressed slightly	Section K
46	Frequent shifting		Downshift occurs when accelerated slightly in D, S and L ranges (except hold mode)	Section K
47	Shift point high or low		Shift points do not match shift diagram Shift delayed when accelerating Shift occur too fast when accelerating and engine speed does not increase	Section K
48	No lockup		No lockup when vehicle speed reaches lockup range	Section K
49	No kickdown		Does not downshift when accelerator pedal depressed more than 7/8 within kickdown range	Section K
50	Engine speed flares up	When accelerating	Engine speed flares up on acceleration	Section K
51		When upshifting and/or downshifting	Engine flares up when accelerator pedal depressed before upshifting Engine flares up suddenly when accelerator pedal depressed before downshifting	Section K
52	Excessive shift shock	P, N to R and/or N to D	Strong shift shock felt at idle when shifting from N to D or R range	Section K
53		When upshifting and/or downshifting	Excessive shift shock felt when accelerating at upshifting Excessive shift shock felt when accelerator pedal depressed at downshifting during cruising	Section K
54	No engine braking		Engine speed drops to idle but vehicle does not slow when accelerator pedal released during cruising at medium to high speed Engine speed drops to idle but vehicle does not slow when accelerator pedal released when in L range at low vehicle speed	Section K
55	No mode change		Mode does not change to/from normal mode in D range Hold mode not engaged or not cancelled	Section K
56	Transmission noise	All ranges	Transmission noisy in all ranges when vehicle is idling	Section K
57		D, S, L, R ranges	Abnormal noise from transmission in D, S, L, R	Section K
58	Transmission overheats		ATF smells burnt and/or is discolored	Section K

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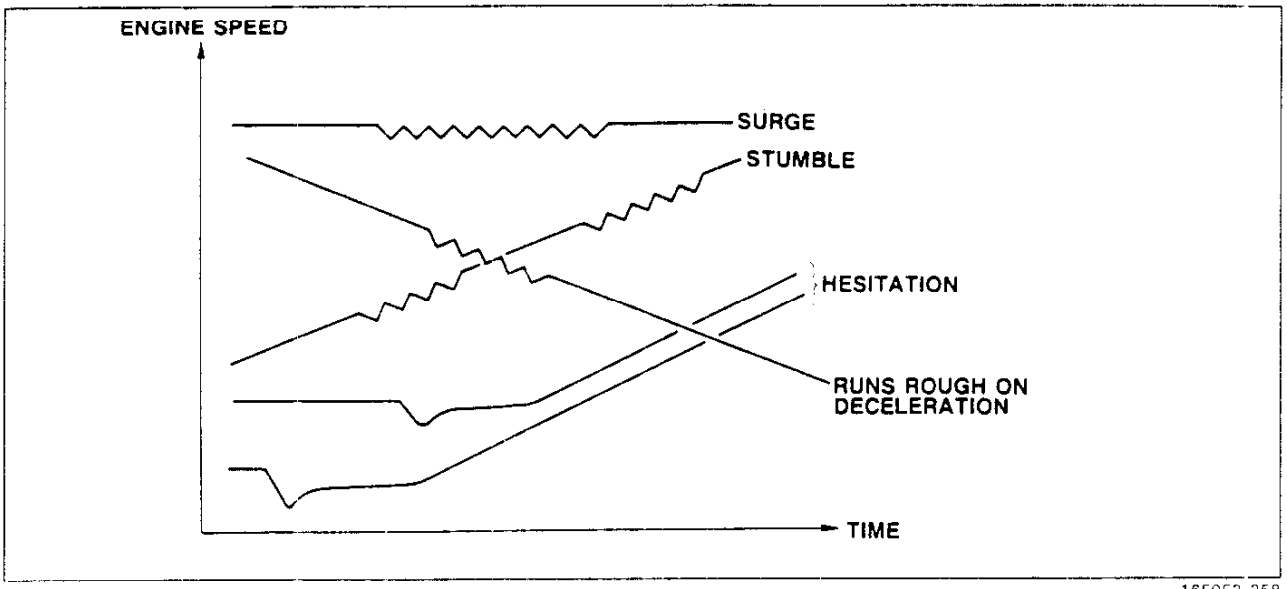
Description of Drivability Problems

STUMBLE : Mild jerking during acceleration.
HESITATION : Flat spot occurring just after the accelerator pedal is depressed.
SURGE : Continuous soft jerking while cruising.



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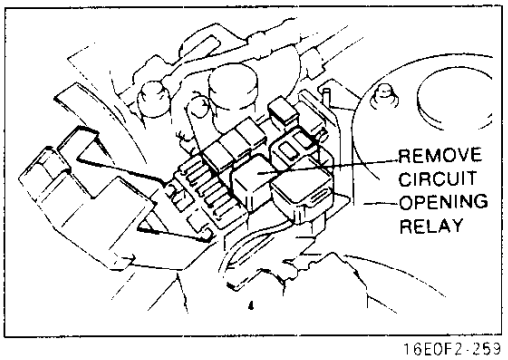

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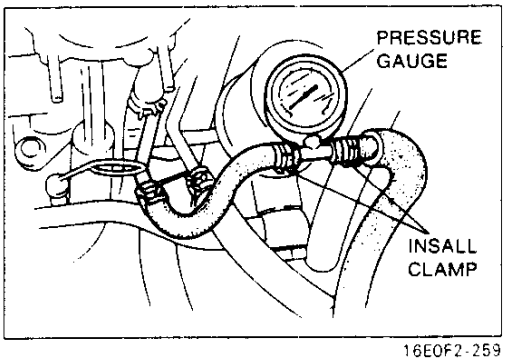

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PRECAUTION

Fuel Pressure Release and Servicing Fuel System

a) Fuel in the fuel system remains under high pressure when the engine is not running.
Before disconnecting any fuel line, release the fuel pressure from the fuel system as described to reduce the possibility of injury or fire.
1. Start the engine.
2. Remove the circuit opening relay.
3. After the engine stalls, turn OFF the ignition switch.
4. Install the circuit opening relay.

b) Use a rag as protection from fuel spray when disconnecting the hoses.
Plug the hoses after removal.

c) When inspecting the fuel system, use a suitable fuel pressure gauge.

Caution

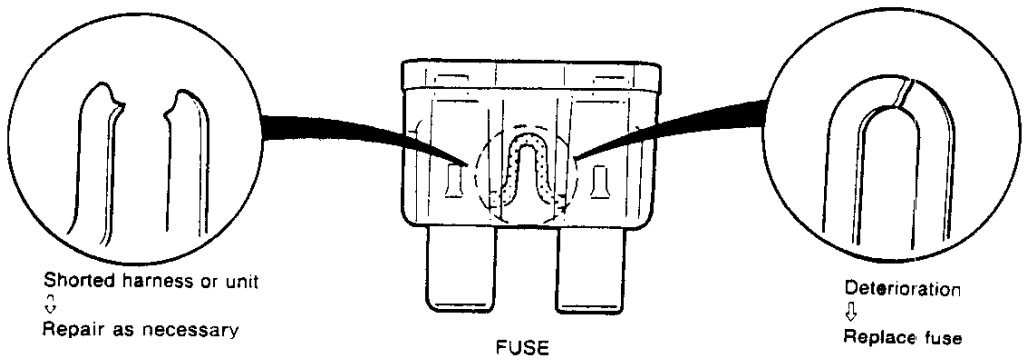
- **Install hose clamps to secure the fuel pressure gauge to prevent fuel leakage.**

SYMPTOM TROUBLESHOOTING

1	MELTS MAIN OR OTHER FUSE

[TROUBLESHOOTING HINTS]

Check the condition of the fuse



Damaged Fuse	Related Wiring Harness	
MAIN (120A)	Main fuse	Alternator (B)
BTN (60A)	BTN fuse	ROOM fuse (W/R)
ROOM (10A)	ROOM fuse	ECU terminal 1A (L/R)
EGI INJ (30A)	Main relay	Injectors (B/Y) ECU terminal 1B (B/W) Oxygen sensor (B/W) Solenoid valves (B/W) E/L unit (B/W) Air pump relay (B/W)
ENGINE (15A)	ENGINE fuse	Main relay (B/W)
METER (15A)	METER fuse	Diagnosis connector terminal + B (B/Y)
FUEL PUMP (20A)	FUEL PUMP fuse Circuit opening relay	Circuit opining relay (L) Fuel pump (W/R)

3	CRANK NORMALLY BUT WILL NOT START	• NO COMBUSTION
DESCRIPTION	• Starter cranks engine at normal speed but engine shows no indication of firing	

[TROUBLESHOOTING HINTS]

① Crank angle sensor
- Poor connection of connector

② Main relay
- Poor connection of connector
- Malfunction of relay

③ Fuel pump
- No fuel in tank
- Poor connection of fuel pump connector

④ ECU
- Poor connection of connector (Especially 1H, 1O, 1T, 3I, 4D, 4E, 4G, 4H)

⑤ Igniter
- Poor connection of connector

⑥ Injector
- Poor connection of connector

4	CRANKS NORMALLY BUT WILL NOT START	• PARTIAL COMBUSTION – WHEN ENGINE COLD
DESCRIPTION	• Starter cranks engine at normal speed and engine shows indication of firing but will not run when engine is cold at initial starting • Engine will not continue running when cold when ignition switch is returned from STA to IG position • Refer to "ENGINE STALLS" if this symptom initially appears after engine stalls • Fuel in tank • Battery in normal condition	

[TROUBLESHOOTING HINTS]

① Igniter
- Poor connection of connector

② Ignition coil
- Poor connection of connector

③ Spark plug
- Dirty or worn spark plug(s)

④ Injector (primary)
- Poor connection of connector
- Fuel leakage from injector(s)

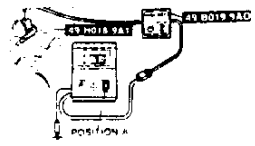
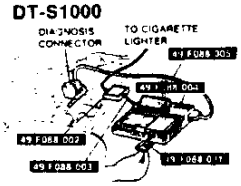
⑤ Intake air system
- Air leakage

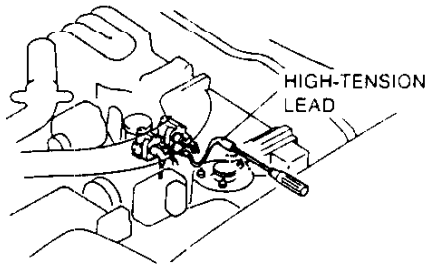
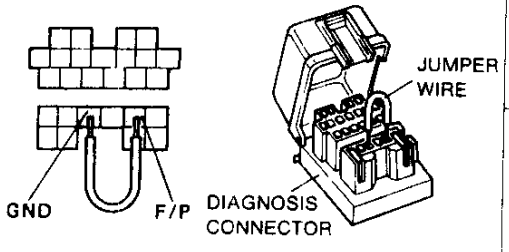
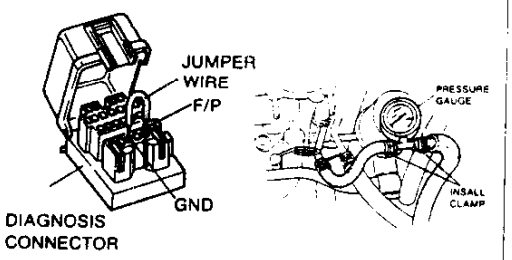
⑥ Water thermosensor
- Poor connection of connector

⑦ Engine compression

⑧ ECU
- Poor connection of connector
(Especially 1B, 1G, 1H, 1J, 1N, 1O, 1T, 3E, 4E, 4G, 4H)

⑨ Solenoid valve (Purge control)
- Short circuit (Solenoid valve fully opened)

STEP	INSPECTION		ACTION
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? ☞ **page F–20** **SELF-DIAGNOSIS CHECKER**  **DT-S1000** 	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence)

STEP	INSPECTION		ACTION
2	Is strong blue spark visible at each disconnected high-tension lead while cranking engine? 	Yes	Go to next step
		No	Check ignition system ☞ **Section G**
3	Are spark plugs OK? ☞ **Section G**	Yes	Go to next step
		No	Clean or replace
4	Connect jumper wire between F/P and GND terminals of diagnosis connector; will engine start? 	Yes	Check as follows: • 1T terminal voltage at ECU ☞ **page F–156** • Continuity between 1T terminal and circuit opening relay connector terminal • Condition of ECU and circuit opening relay connector female terminals
		No	Check if fuel pump operating sound is heard • If yes, go to next step • If no, check fuel pump and wiring harness ☞ **page F–100**
5	Are ECU terminal voltages OK? ☞ **page F–152**	Yes	Go to next step
		No	Check for cause ☞ **page F–153**
6	Connect diagnosis connector terminals F/P and GND with a jumper wire; is fuel line pressure correct with ignition switch ON? ☞ **page F–98** **Fuel line pressure:** **250-260 kPa {2.5-2.7 kgf/cm², 36-38 psi}** 	Yes	Go to next step
		No	**Low pressure** Check fuel line pressure while pinching fuel return hose • If pressure **quickly** increases, check pressure regulator ☞ **page F–104** • If pressure **gradually** increases, check for clogging between fuel pump and pressure regulator If hose not clogged, check fuel pump maximum pressure ☞ **page F–101**

STEP	INSPECTION		ACTION
7	Are injectors OK? ☞ **page F-107** • Fuel leakage • Primary injector(s) clogged	Yes	Go to next step
		No	Replace injector(s) ☞ **page F-105**
8	Is engine compression OK? ☞ **Section C** **Compression** **690 kPa {7.0 kgf/cm², 100 psi} – 250 rpm** **Differential limit of chambers** **150 kPa {1.5 kgf/cm², 21psi} – 250 rpm**	Yes	Go to next step
		No	Check for cause ☞ **Section C**
9	Try known good ECU; does condition improve? ☞ **page F-150**		

5	CRANKS NORMALLY BUT WILL NOT START	• PARTIAL COMBUSTION – AFTER WARM UP
DESCRIPTION	• Starter cranks engine at normal speed and engine shows indication of firing but will not run when engine is warm • Engine will not continue running when ignition switch is returned from STA to IG position	

[TROUBLESHOOTING HINTS]

① Solenoid valve (PRC)
- Poor connection of solenoid valve connector or ECU 4M terminal

② Fuel
- High RVP (winter) fuel used in warm weather

③ Water thermosensor
- Malfunction of water thermosensor

④ Evaporative emission control
- Malfunction of check valve (two-way)

⑤ Fuel pump
- Malfunction of circuit opening relay

7, 8, 9	CRANKS NORMALLY BUT HARD TO START	• ANY ENGINE TEMPERATURE • WHEN ENGINE COLD • AFTER WARM-UP
DESCRIPTION	• Starter cranks engine at normal speed but engine requires excessive cranking time before starting • Engine starts after stalling a few times • Battery in normal condition • Engine runs normally at idle (if idle condition not OK, refer to "Engine rough" [Nos. 19, 20, 21, 22, or 23])	

[TROUBLESHOOTING HINTS]

① Injector
- Fuel leakage from injector(s)

② Fuel pump
- Poor connection of pump connector
- Poor connection of circuit opening relay connector

③ Pressure regulator
- Malfunction of pressure regulator

④ Fast idle cam
- Malfunction of fast idle cam (when engine cold)

⑤ Spark plug
- Dirty or worn spark plug(s)

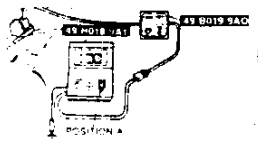
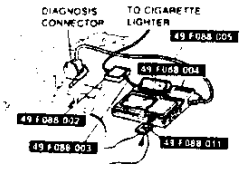
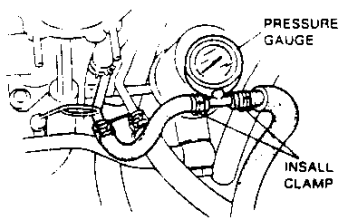
⑥ Intake air system
- Air leakage

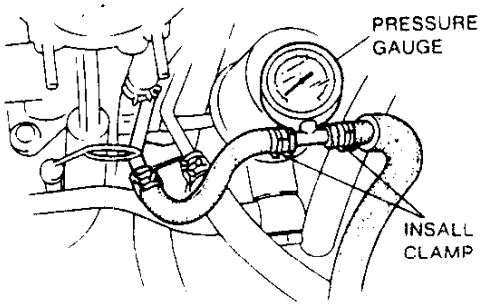
⑦ Water thermosensor
- Poor connection of water thrmosensor
- Malfunction of water thermosensor

⑧ Solenoid valve (Purge control)
- Air leakage

⑨ Metering oil pump
- Malfunction of pump

⑩ Crank angle sensor
- Ground circuit open

STEP	INSPECTION		ACTION
1.	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? **SELF-DIAGNOSIS CHECKER** ☞ page F–20  	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence)
2	Is air leakage felt or heard at intake air system components at idle?	Yes	Repair or replace
		No	Go to next step
3	Is fast idle cam OK? ☞ page F–79	Yes	Go to next step
		No	Adjust ☞ page F–79
4	Connect diagnosis connector terminals F/P and GND with a jumper wire; is fuel line pressure correct with ignition switch ON? ☞ page F–98 **Fuel line pressure:** **250–260 kPa {2.5–2.7 kgf/cm², 36–38 psi}** 	Yes	Go to next step
		No	**Low pressure** Check fuel line pressure while pinching fuel return hose • If pressure **quickly** increases, check pressure regulator ☞ page F–104 • If pressure **gradually** increases, check for clogging between fuel pump and pressure regulator If hose not clogged, check fuel pump maximum pressure ☞ page F–101

STEP	INSPECTION		ACTION
5	Is fuel line pressure held after ignition switch is turned OFF? ☞ page F-97 **Fuel pressure:** **More than 150 kPa {1.5 kgf/cm², 21 psi}**  	Yes	Go to next step
		No	Plug outlet of pressure regulator, Is fuel line pressure held after ignition switch is turned OFF? ☞ page F-100 • If yes, replace pressure regulator ☞ page F-104 • If no, check fuel pump hold pressure ☞ page F-101 If fuel pump OK, check injectors for fuel leakage ☞ page F-106
6	Are spark plugs OK? ☞ Section G	Yes	Go to next step
		No	Repair or replace
7	Is EGR control system OK? ☞ page F-126	Yes	Go to next step
		No	Check as follows: • Solenoid valve (EGR) for sticking • Condition of solenoid valve connector female terminal(s)
8	Try known good ECU; does condition improve? ☞ page F-150		

16E0F2-266

10, 11, 12	ENGINE STALLS	• IDLE AT ANY ENGINE TEMP • DURING FAST IDLE • IDLE AFTER WARM-UP
DESCRIPTION	• Engine stops unexpectedly at idle and/or during fast idle operation	

[TROUBLESHOOTING HINTS]

① Injector
- Fuel leakage from injector(s)
- Injector(s) clogged

② Fuel pump
- Poor connection of connector

③ Circuit opening relay
- Poor connection of connector

④ Spark plug
- Dirty or worn spark plug(s)

⑤ Pressure sensor
- Poor connection of pressure sensor connector

⑥ EGR control valve
- EGR control valve stuck

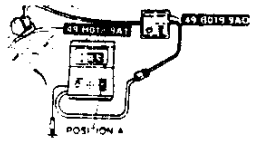
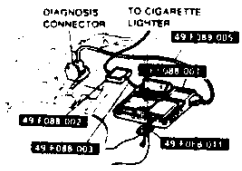
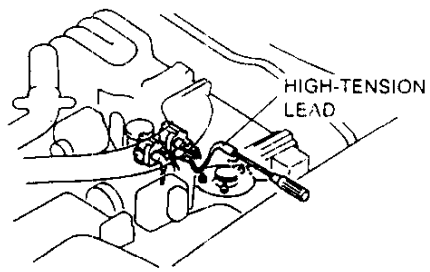
⑦ Solenoid valve (ISC)
- Poor connection of connector

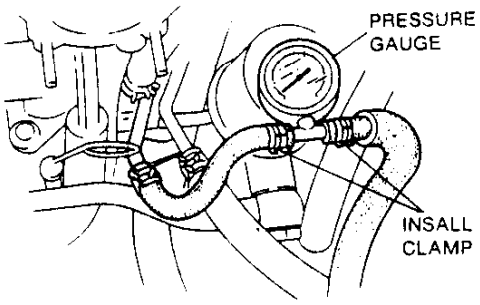
⑧ Crank angle sensor
- Poor connection of connector

⑨ ECU
- Poor connection of connector

⑩ Igniter
- Poor connection of connector

⑪ Metering oil pump
- Malfunction of oil pump

STEP	INSPECTION		ACTION
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? ☞ **page F-20** **SELF-DIAGNOSIS CHECKER**  **DT-S1000** 	Yes	**"00" or "No service codes" displayed** • If symptom occurs at idle at any engine temp., go to next step • If symptom occurs during fast idle operation, go to next step • If symptom occurs at idle after warmup, go to Step 6
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence)
2	Is fast idle cam OK ? ☞ **page F-79**	Yes	Go to next step
		No	Adjust ☞ **page F-79**
3	Is strong blue spark visible at each disconnected high-tension lead while cranking engine? 	Yes	Go to next step
		No	Check ignition system ☞ **Section G**

STEP	INSPECTION		ACTION
4	Are following ECU terminal voltages OK? ☞ **page F-152** • 1B (ECU power) • 1G, 1H, 1J (Igniter) • 1O (Pressure sensor) • 1T (Circuit opening relay) • 3E (Water thermosensor) • 3F (Throttle sensor narrow range) • 4E, 4G, 4H (Crank angle sensor) • 4O (Solenoid valve (EGR)) • 4P (Solenoid valve (AWS)) • 4Q (Solenoid valve (ISC)) • 4W, 4Y (Primary fuel injector)	Yes	Go to next step
		No	Check for cause ☞ **page F-153**
5	Connect diagnosis connector terminals F/P and GND with a jumper wire; is fuel line pressure correct with ignition switch ON? ☞ **page F-98** **Fuel line pressure:** **250–260 kPa {2.5–2.7 kgf/cm², 36–38 psi}**  	Yes	Go to next step
		No	**Low pressure** Check fuel line pressure while pinching fuel return hose • If pressure **quickly** increases, check pressure regulator ☞ **page F-104** • If pressure **gradually** increases, check for clogging between fuel pump and pressure regulator If hose not clogged, check fuel pump maximum pressure ☞ **page F-101**
6	Is engine compression correct? ☞ **Section C** **Compression** **690 kPa {7.0 kgf/cm², 100 psi} – 250 rpm** **Differential limit of chambers** **150 kPa {1.5 kgf/cm², 21 psi} – 250 rpm**	Yes	Go to next step
		No	Check for cause
7	Are spark plugs OK? ☞ **Section G**	Yes	Go to next step
		No	Clean or replace
8	Try Known good ECU, does condition improves? ☞ **page F-150**		

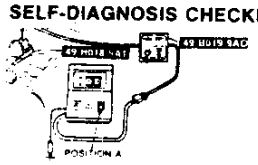
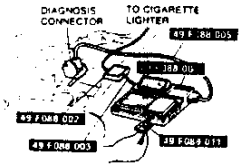
13, 14	ENGINE STALLS	• IDLE WITH A/C, P/S, and/or E/L ON • IDLE WHEN SHIFTED FROM N OR P TO OTHER RANGES
DESCRIPTION	• Engine stops unexpectedly when A/C, P/S, and/or E/L turned ON at idle • Engine stops unexpectedly when shifted from N or P to other ranges at idle • Idle condition is normal when A/C, P/S, and E/L are OFF and in N and P	

[TROUBLESHOOTING HINTS]

① Monitor switch functions (SST)
- A/C switch
- Headlight switch
- Rear window defroster
- Blower switch

② Solenoid valve (ISC)
- Solenoid valve stuck

③ Air control valve
- Malfunction of air control valve

STEP	INSPECTION		ACTION
1	Are switches correct when checked by using **SST** monitor switch function while ignition switch ON? ☞ **page F–44** • Blower switch • Headlight switch • Rear window defroster switch • Electric cooling fan • Electrical load unit • A/C switch	Yes	Go to next step
		No	Lamp not ON/OFF with specified switch Check for cause (Refer to specified check sequence) ☞ **page F–45**
2	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? ☞ **page F–20** **SELF-DIAGNOSIS CHECKER**  **DT-S1000** 	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence) ☞ **page F–22**
3	Is terminal voltage at ECU correct at idle? ☞ **page F–150** **4Q terminal: Approx. 5-11V (at Idle)**	Yes	Check solenoid valve (ISC) and replace it if necessary ☞ **page F–83** If OK, go to "ENGINE STALLS–IDLE WHEN SHIFTED FROM N or P TO OTHER RANGES" in Section K of this manual
		No	Try known good ECU and check if condition improves ☞ **page F–150**

15	ENGINE STALLS	• DRIVEAWAY
DESCRIPTION	• Engine stops unexpectedly upon driveaway • Idle condition normal	

[TROUBLESHOOTING HINTS]

① Injector
- Fuel leakage from injector(s)
- Injector(s) clogged

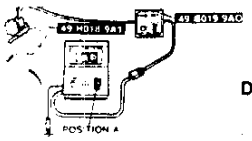
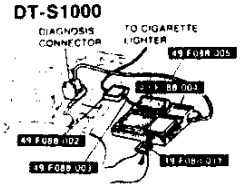
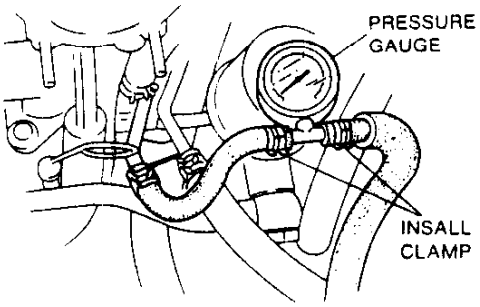
② Pressure regulator
- diaphragm damaged

③ Fuel filter
- Fuel filter clogged

④ Metering oil pump
- Poor connection of connector

⑤ Water thermosensor
- Poor connection of connector

⑥ Crank angle sensor
- Malfunction of sensor

STEP	INSPECTION		ACTION
1	Is "00 " or "No service codes" displayed on **SST** with ignition switch ON? ☞ **page F–20** **SELF-DIAGNOSIS CHECKER**  	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence) ☞ **page F–22**
2	Using Engine Signal Monitor, do voltage reading and lamp operation change as follows upon driveaway? Terminal: 1O — Condition: Voltage gradually increase Terminal: 4D, 4E — Condition: Voltage not suddenly change Terminal: 4W, 4Y — Condition: Flashing of green and red lamps becomes quicker	Yes	Go to next step
		No	Check as follows: • Condition of female terminals in related connector • Continuity between injector connector and ECU 4W or 4Y terminal
3	Connect diagnosis connector terminals F/P and GND with a jumper wire; is fuel line pressure correct with ignition switch ON? ☞ **page F–98** **Fuel line pressure:** **250–260 kPa {2.5–2.7 kgf/cm², 36–38 psi}** 	Yes	Go to next step
		No	**Low pressure** Check fuel line pressure while pinching fuel return hose • If pressure **quickly** increases, check pressure regulator ☞ **page F–104** • If pressure **gradually** increases, check for clogging between fuel pump and pressure regulator If hose not clogged, check fuel pump maximum pressure ☞ **page F–101**
4	Are injectors OK? • No fuel leakage ☞ **page F–106** • Injectors not clogged (Perform volume test) ☞ **page F–67**	Yes	Go to next step
		No	Replace injector ☞ **page F–105**

STEP	INSPECTION		ACTION
5	Is engine compression OK? ☞ **Section G** **Compression** **690 kPa {7.0 kgf/cm², 100 psi} – 250 rpm** **Differential limit of chambers** **150 kPa {1.5 kgf/cm², 21 psi} – 250 rpm**	Yes	Go to next step
		No	Check for cause
6	Are spark plugs OK? ☞ **Section G**	Yes	Go to next step
		No	Clean or replace
7	Try known good ECU: does condition improve? ☞ **page F–150**		

16, 17	ENGINE STALLS	• ON ACCELERATION / WHILE CRUISING
DESCRIPTION	• Engine stops unexpectedly at beginning of acceleration or during acceleration • Engine stops unexpectedly while cruising	

[TROUBLESHOOTING HINTS]

① Fuel pump
- Poor connection

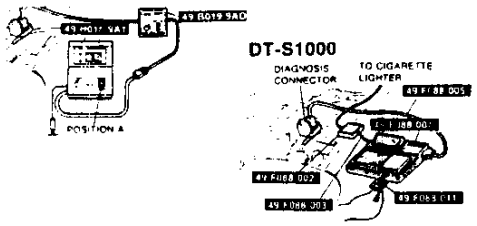
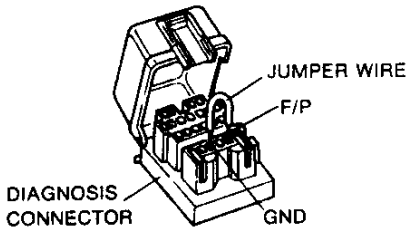
② Pressure regulator
- Diaphragm damaged

③ Crank angle sensor
- Poor connection of connector

④ Pressure sensor
- Poor connection of connector

⑤ Spark plug
- Misfire

⑥ Main relay
- Poor connection of connector

STEP	INSPECTION		ACTION
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? ☞ **page F-20** **SELF-DIAGNOSIS CHECKER**  	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence)
2	Ground terminal F/P of diagnosis connector within ignition switch ON; does condition improve?  	Yes	Check as follows; • Poor connection of circuit opening relay • Poor connection of ECU 1T terminal
		No	Go to next step
3	Is pressure regulator OK? ☞ **page F-104**	Yes	Go to next step
		No	Replace
4	Try known good ECU; does condition improved? ☞ **page F-150**		

18	ENGINE STALLS	• ON DECELERATION
DESCRIPTION	• Engine stops unexpectedly at beginning of deceleration or recovery from deceleration • Exhaust afterburn	

[TROUBLESHOOTING HINTS]

① Fuel pump
- Poor connection of connector

② Idle speed
- Idle speed too low

③ Crank angle sensor
- Poor connection of connector

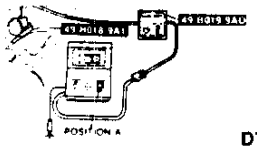
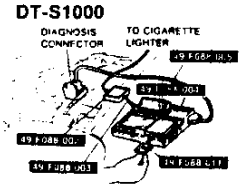
④ Pressure sensor
- Malfunction of pressure sensor

⑤ Solenoid valve (ISC)
- Solenoid valve stuck

⑥ EGR control valve
- Solenoid valve stuck open

⑦ ECU
- Poor connection of connector

⑧ Fuel cut control

STEP	INSPECTION		ACTION
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON ☞ **page F-20** **SELF-DIAGNOSIS CHECKER**  **DT-S1000** 	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence)
2	Are following ECU terminal voltage correct? **Note** **When checking voltages, tap, move, and wiggle harness and connector** • 1B (Main relay) • 1G, 1H, 1J (Igniter) • 1T (Circuit opening relay) • 4D (Ground) • 4W, 4Y (Primary injector)	Yes	**MT** Check neutral switch and clutch switch ☞ **page F-186** **AT** Go to "ENGINE STALLS ON DECELERATION" in Section K of this manual
		No	Check for cause

19, 20, 21	ENGINE ROUGH	• IDLE AT ANY ENGINE TEMP / DURING FAST IDLE / IDLE AFTER WARM-UP
DESCRIPTION	• Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at any engine temperature • Idle speed too low and excessive engine shake at any engine temperature • Fast idle speed too low and excessive engine shake during fast idle, but returns to normal after warm-up • Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at idle after warm-up	

[TROUBLESHOOTING HINTS]

① Injector
- Fuel leakage from injector(s)
- Injector(s) clogged

② Air pump
- Malfunction of air pump

③ Circuit opening relay
- Poor connection of connector

④ Spark plug
- Misfire

⑤ Engine
- Compression low

⑥ Fast idle cam
- Malfunction of fast idle cam

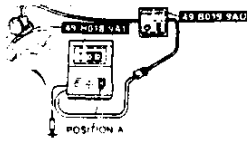
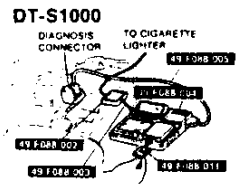
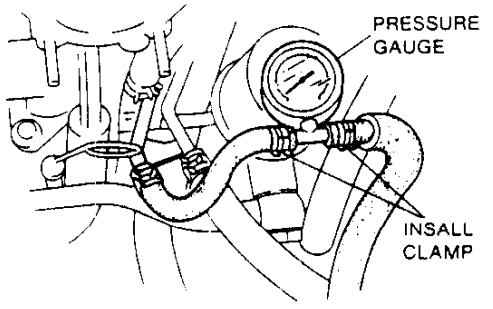
⑦ Pressure sensor
- Malfunction of pressure sensor

⑧ Water thermosensor
- Poor connection of connector

⑨ EGR control valve
- EGR control valve stuck

⑩ Solenoid valve (ISC)
- Poor connection of connector

⑪ Fuel thermosensor

STEP	INSPECTION		ACTION
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON ? ☞ **page F–20** **SELF-DIAGNOSIS CHECKER**  **DT-S1000** 	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence) ☞ **page F–22**
2	Are spark plugs OK?	Yes	Go to next step
		No	Clean or replace
3	Is strong blue spark visible at each disconnected high-tension lead at idle?	Yes	Go to next step
		No	Check ignition system ☞ **Section G**
4	Connect diagnosis connector terminals F/P and GND with a jumper wire; is fuel line pressure correct with ignition switch ON? ☞ **page F–98** 	Yes	• If symptom occurs at idle at any engine temperature, go to next step • If symptom occurs during fast idle operation, go to Step 6 • If symptom occurs at idle after warm-up, go to Step 10
		No	**Low pressure** Check fuel line pressure while pinching fuel return hose • If pressure **quickly** increases, check pressure regulator ☞ **page F–104** • If pressure **gradually** increases, check for clogging between fuel pump and pressure regulator If hose not clogged, check fuel pump maximum pressure ☞ **page F–10**
5	Is air pump OK? ☞ **page F-121**	Yes	Go to next step
		No	Repair or replace

STEP	INSPECTION		ACTION
6	Is solenoid valve (ISC) OK? ☞ **page F–83**	Yes	Go to next step
		No	Repair or replace
7	Is fast idle cam OK? ☞ **page F–79**	Yes	Go to next step
		No	Adjust
8	Is accelerated warm-up system OK? ☞ **page F–83**	Yes	Go to next step
		No	Repair or replace
9	Is engine compression correct? ☞ **Section C** **Compression** **690 kPa {7.0 kgf/cm², 100 psi} – 250 rpm** **Differential limit of chambers** **150 kPa {1.5 kgf/cm², 21 psi} – 250 rpm**	Yes	Go to next step
		No	Check for cause ☞ **Section G**
10	Are following ECU terminal voltages correct? ☞ **page F–152** ● 1O (Pressure sensor) ● 3E (Water thermosensor) ● 3L (Intake air thermosensor) ● 4I, 4J, 4K, 4L (Metering oil pump) ● 4Y (Rear primary injector) ● 4W (Front primary injector)	Yes	Go to next step
		No	Check for cause
11	Is EGR control system OK? ☞ **page F–126**	Yes	Try known good ECU; does condition improve? ☞ **page F–150**
		No	Repair or replace

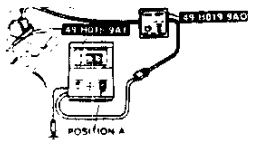
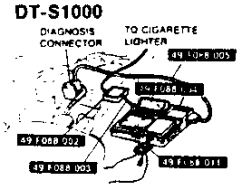
22, 23	ENGINE ROUGH	• IDLE WITH A/C, P/S AND/OR E/L ON • IDLE WHEN SHIFTED FROM N OR P TO OTHER RANGES
DESCRIPTION	• Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at idle when A/C, P/S and/or E/L ON • Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at idle when shifted from P or N to other range	

[TROUBLESHOOTING HINTS]

① Idle speed
- Idle speed too low

② Monitor switch function (SST)
- A/C switch
- Headlight switch
- Rear window defroster switch
- Blower switch

③ Solenoid valve (ISC)
- Solenoid valve stuck

STEP	INSPECTION		ACTION
1	Is idle speed correct? ☞ page F-16	Yes	Go to next step
		No	Adjust ☞ page F-16
2	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? ☞ page F-20 **SELF-DIAGNOSIS CHECKER**  **DT-S1000** 	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence) ☞ page F-22
3	Are following terminal voltage at ECU correct? ☞ page F-1 • 1E (A/C switch) • 1N (P/S pressure switch) • 1R (EC-AT control unit) [AT] • 3B (Electrical load unit) • 3D(Electrical cooling fan)	Yes	Go to next step
		No	Check for cause
5	Warm-up engine Does idle speed decrease when solenoid valve (ISC) connector disconnected?	Yes	• If symptom occurs at idle with A/C ON, check A/C system in Seciton U of this manual • If symptom occurs at idle with E/L ON, check E/L unit ☞ page F-13 • If symptom occurs at idle with P/S ON, check P/S pump in Section N of this manual • If symptom occurs at idle when shifted from N or P to other range, go to "ENGINE ROUGH-IDLE WHEN SHIFTED FROM N OR P TO OTHER RANGE" in Section K of this manual (AT)
		No	Check fast idle cam ☞ page F-79

24	ENGINE ROUGH	• ON DECELERATION
DESCRIPTION	• Engine shakes at beginning of deceleration, or recovery from deceleration • Exhaust afterburn.	

[TROUBLESHOOTING HINTS]

① Fuel pump
- Poor connection of connector

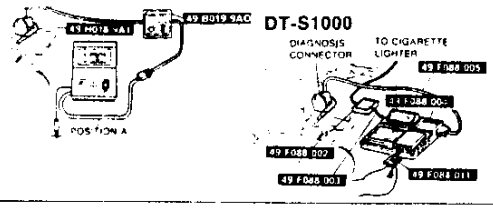
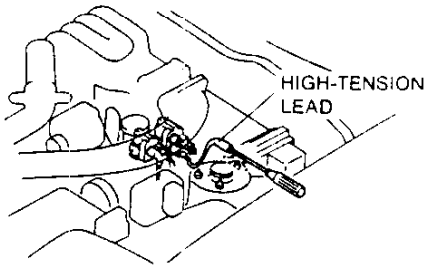
② Injector
- Fuel leakage from injector(s)

③ Dashpot
- Dashpot misadjusted

④ Throttle sensor
- Poor connection of connector

⑤ Secondary air injection system

⑥ Solenoid valve (ISC)
- Solenoid valve stuck

STEP	INSPECTION		ACTION
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? **SELF-DIAGNOSIS CHECKER** ☞ page F-20  	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence) ☞ page F-22
2	Is strong blue spark visible at each disconnected high-tension lead?  	Yes	Check spark plugs If OK, go to next step If not OK, clean or replace spark plug
		No	Check ignition system ☞ Section G
3	Is dashpot OK? ☞ page F-134	Yes	Go to next step
		No	Adjust
4	Is intake manifold vacuum correct at idle? **Vacuum:** **More then 60.0 kPa {450 mmHg, 17.7 inHg}**	Yes	Go to next step
		No	Check as follows: • Intake air system components for proper installation • Vacuum hoses for disconnection and damage • Engine compression ☞ Section C
5	Are injectors OK? ☞ page F-106	Yes	Go to next step
		No	Replace
6	Is engine compression OK? ☞ Section C **Compression** **690 kPa {7.0 kgf/cm², 100 psi} – 250 rpm** **Differential limit of chambers** **150 kPa {1.5 kgf/cm², 21 psi} – 250 rpm**	Yes	Go to next step
		No	Check for cause ☞ Section C
7	Try known good ECU; does condition improve? ☞ page F-150		

25, 26	POOR ACCELERATION	• DRIVEAWAY • ON ACCELERATION
DESCRIPTION	• Engine speed increases normally but vehicle speed slowly increases during driveaway or acceleration	

[TROUBLESHOOTING HINTS]

① Injector
- Fuel leakage from injector(s)
- Injector nozzle clogged

② Pressure regulator
- Pressure regulator malfunction

③ Fuel filter
- Filter clogged

④ Spark plug
- Misfire

⑤ Igniter
- Poor connection of connector

⑥ Air leakage in intake air system

⑦ Pressure sensor
- Pressure sensor filter or hose clogged
- Poor connection of connector

⑧ Crank angle sensor
- Poor connection of connector

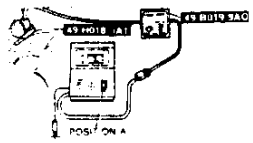
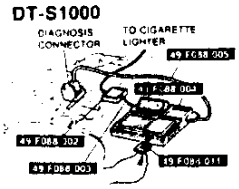
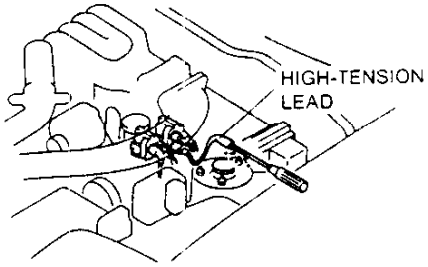
⑨ Metering oil pump
- Malfunction of oil pump
  (Fuel injection amount and ignition timing fixed)

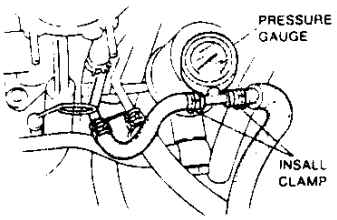
⑩ Solenoid valve (Turbo control, Charge control)
- Malfunction of solenoid valve
  (Fuel injection amount and ignition timing fixed)

⑪ EGR control system
- EGR control valve stuck (open)

⑫ Water thermosensor
- Malfunction of thermosensor

⑬ Double throttle control system

STEP	INSPECTION		ACTION
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? ☞ **page F–20** **SELF-DIAGNOSIS CHECKER**  **DT-S1000** 	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence) ☞ **page F–22**
2	Is a strong blue spark visible at each disconnected high-tension lead while cranking engine? 	Yes	Check spark plugs If OK, go to next step If not OK, clean or replace spark plug
		No	Check ignition system ☞ **Section G**
3	Is intake manifold vacuum correct at idle? **Vacuum:** **More than 60.0 kPa {450 mmHg, 17.7 inHg}**	Yes	Go to next step
		No	Check as follows: • Intake air system components and installation • Vacuum hoses for disconnection and damage • Engine compression ☞ **Section C**
4	Is air leakage felt or heard at intake air system components?	Yes	Repair or replace
		No	Go to next step

STEP	INSPECTION		ACTION
5	Is fuel line pressure correct at idle? ☞ **page F-98** **Fuel line pressure:** **190–220 kPa {1.9–2.3 kgf/cm², 28–32 psi}**  	Yes	Go to next step
		No	**Low pressure** Check as follows: • Fuel filter for clogging • Operation of pressure regulator
6	Are injectors OK? ☞ **page F-106**	Yes	**MT** Go to next step **AT** Go to "POOR ACCELERATION – DRIVEAWAY / ON ACCELERATION" in Section K of this manual
		No	Replace
7	Try known good ECU; does condition improve? ☞ **page F-150**		

27	HIGH IDLE SPEED AFTER WARM-UP
DESCRIPTION	• Idle sped continues at fast idle after warm-up • Engine returns slowly to idle after accelerator is released

[TROUBLESHOOTING HINTS]

① Fast idle cam
- Malfunction of fast idle cam

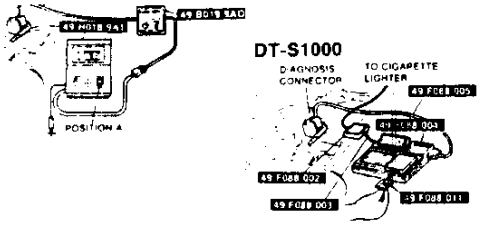
② Accelerated warm-up system
- Solenoid valve (AWS) open

③ Water thermosensor
- Malfunction of water thermosensor

④ Solenoid valve (ISC)
- Solenoid valve (ISC) stuck (open)
- A/C, P/S, or E/L signal always ON

⑤ Throttle valve
- Valve not fully closed

⑥ Dashpot

STEP	INSPECTION	ACTION	
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? ☞ **page F–20** **SELF-DIAGNOSIS CHECKER**  	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence) ☞ **page F–22**
2	Connect diagnosis connector terminals TEN and GND with a jumper wire; does idle speed decrease?	Yes	Check following terminal voltage at ECU ☞ **page F–152** • 1E (A/C switch) • 1N (P/S pressure switch) • 3B (Electrical load unit)
		No	Go to next step
3	Are following terminal voltage at ECU correct? ☞ **page F–152** • 1E (A/C switch) • 1O (Pressure sensor) • 3B (Electric load unit) • 3E (Water thermosensor) • 3F (Throttle sensor-Narrow range) • 3L (Intake air thermosensor) • 4P (Solenoid valve (AWS)) • 4Q (Solenoid valve (ISC))	Yes	Go to next step
		No	Check for cause ☞ **page F–153**
4	Is throttle valve fully closed?	Yes	Go to next step
		No	Check following devices • Accelerator cable linkage • Throttle lever • Accelerator pedal • Fast idle cam

STEP	INSPECTION		ACTION
5	Is solenoid valve (AWS) OK? ☞ page F–83	Yes	Go to next step
		No	Repair
6	Is water thermosensor OK? ☞ page F–183	Yes	Go to next step
		No	Replace
7	Try known good ECU: does condition improved? ☞ page F–150		

28	• IDLE FLUCTUATES • IDLE HUNTS
DESCRIPTION	• Engine speed changes back and forth between specified idle speed and higher speed

[TROUBLESHOOTING HINTS]

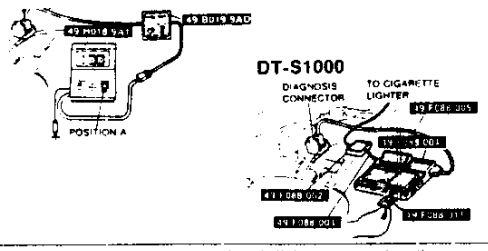
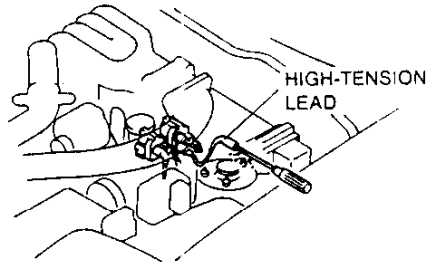
① PCV valve
- PCV valve stuck

② Spark plug
- Dirty or worn spark plug(s)

③ Throttle sensor
- Incorrect adjustment

④ Solenoid valve (ISC)
- Solenoid valve stuck

⑤ Intake air system
- Air leakage

STEP	INSPECTION	ACTION	
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? ☞ **page F–20** **SELF-DIAGNOSIS CHECKER** 	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence) ☞ **page F–22**
2	Is a strong blue spark visible at each disconnected high-tension lead while cranking engine? 	Yes	Check spark plug(s) If OK, go to next step If not OK clean or, replace spark plug(s)
		No	Check as follows: • Ignition coils • Igniter • High tension leads • ECU 1G, 1H, 1J terminal voltage ☞ **Section G**
3	Is air leakage felt or heard at intake air system components?	Yes	Repair or replace
		No	Go to next step
4	Is PCV valve stuck? ☞ **page F–124**	Yes	Replace PCV valve
		No	Go to next step
5	Is solenoid valve (ISC) OK? ☞ **page F–83**	Yes	Go to next step
		No	Replace
6	Is fuel line pressure correct at idle? ☞ **page F–98** **Fuel line pressure:** **190–220 kPa {1.9–2.3 kgf/cm², 28–32 psi}**	Yes	Go to next step
		No	**Low pressure** Check as follows: • Fuel filter for clogging • Operation of pressure regulator
7	Try known good ECU; does condition improved? ☞ **page F–150**		

29	• **HESITATES** • **STUMBLES ON ACCELERATION**
DESCRIP-TION	• Momentary pause at beginning of acceleration or during acceleration

[TROUBLESHOOTING HINTS]

① Injector
- Fuel leakage from injector(s)

② Pressure regulator
- Pressure regulator stuck

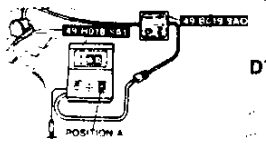
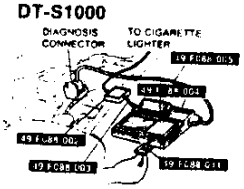
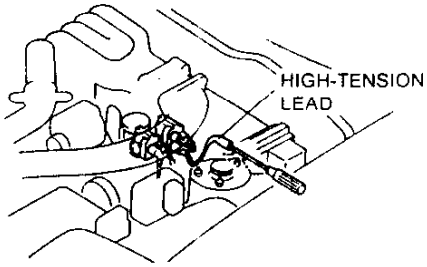
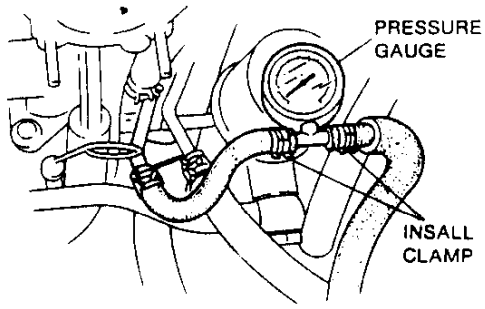
③ High-tension lead
- Lead damaged

④ Spark plug
- Dirty or worn spark plug(s)

⑤ Pressure sensor
- Malfunction of pressure sensor

⑥ EGR control valve
- EGR control valve stuck

⑦ Double throttle control
- Double throttle valve stuck

STEP	INSPECTION		ACTION
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? ☞ **page F–20** **SELF-DIAGNOSIS CHECKER**  **DT-S1000** 	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence) ☞ **page F–22**
2	Is strong blue spark visible at each disconnected high-tension lead at idle? 	Yes	Check spark plug(s) If OK, go to next step If not OK, clean or replace spark plug(s)
		No	Check ignition system ☞ **Section G**
3	Is fuel line pressure correct at idle? ☞ **page F–104** **Fuel line pressure** **190–220 kPa {1.9–2.3 kgf/cm², 28–32 psi}** 	Yes	Go to next step
		No	**Low pressure** Check fuel line pressure while pinching fuel return hose • If pressure **quickly** increases, check pressure regulator ☞ **page F–104** • If pressure **gradually** increases, check for clogging between fuel pump and pressure regulator If hose not clogged, check fuel pump maximum pressure ☞ **page F–101**

STEP	INSPECTION		ACTION
4	Does fuel pressure increase when throttle valve opened? (engine running)	Yes	Go to next step
		No	Check pressure regulator ☞ page F-104
5	Are following termina. voltage at ECU correct? ☞ page F-154 1O (Pressure sensor) 3F (Throttle sensor–Full range) 3G (Throttle sensor–Narrow range) 3K (Solenoid valve (Relief 2)) 30 (Solenoid valve (Double throttle)) 3P (Solenoid valve (Relief 1)) 4E (Crank angle sensor (NE)) 4I, 4J, 4K, 4L (Metering oil pump) 4O (Solenoid valve (EGR)) 4R (Solenoid valve (Turbo control)) 4S (Solenoid valve (Charge relief)) 4T (Solenoid valve (Charge control)) 4V (Solenoid valve (Turbo precontrol)) 4W, 4X, 4Y, 4Z (Fuel injector)	Yes	Go to next step
		No	Check for cause ☞ page F-155
6	Are injectors OK? ☞ page F-106	Yes	Go to next step
		No	Repair or replace
7	Is EGR control system OK? ☞ page F-126		
8	Try known good ECU. does condition improve? ☞ page F-150		

30	SURGES WHILE CRUISING
DESCRIPTION	• Momentary minor irregularity in engine power at steady vehicle speed.

[TROUBLESHOOTING HINTS]

① Injector
- Poor connection of connector

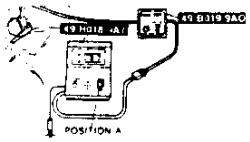
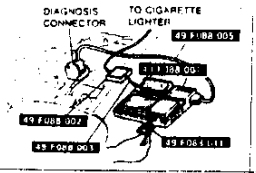
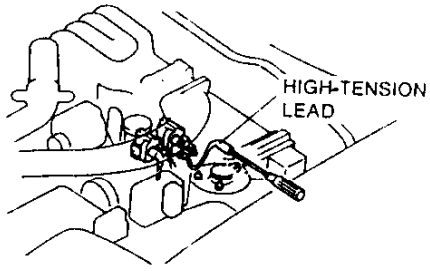
② Spark plug
- Dirty or worn spark plug(s)

③ Pressure sensor
- Poor connection of connector

④ Igniter
- Poor connection of connector

⑤ Ignition coil
- Malfunction of ignition coil

⑥ Throttle sensor

STEP	INSPECTION		ACTION
1	Is "00" or "No service codes" displayed on **SST** with ignition switch ON? ☞ **page F–20** **SELF-DIAGNOSIS CHECKER**  **DT-S1000** 	Yes	**"00" or "No service codes" displayed** Go to next step
		No	**Service Code No. displayed** Check for cause (Refer to specified check sequence) ☞ **page F–22**
2	Is strong blue spark visible at each disconnected high-tension lead while cranking engine? 	Yes	Check spark plug(s) for damage If OK, go to next step If not OK, replace spark plug(s)
		No	Check ignition system ☞ **Section G**
3	Does idle become rough when shaking connector of following devices? • Injector • Igniter • Ignition coil • Crank angle sensor	Yes	Check condition of connector
		No	Go to next step
4	Are following terminal voltage at ECU correct? ☞ **page F–158** • 1G, 1H, 1J (Igniter) • 3G (Throttle sensor–Full range) • 4O (Solenoid valve (EGR)) • 4R (Solenoid valve (Turbo control)) • 4S (Solenoid valve (Charge relief)) • 4V (Solenoid valve (Turbo precontrol)) • 4W, 4X, 4Y, 4Z (Injector)	Yes	Go to next step
		No	Check for cause ☞ **page F–159**
5	Try known good ECU; does condition improve? ☞ **page F–150**		

31	LACK OF POWER
DESCRIPTION	• Performance poor under load (i.e., power down when climbing hills)

[TROUBLESHOOTING HINTS]

① Pressure sensor
- Malfunction of pressure sensor

② Secondary injector
- Poor connection of connector
- Nozzle clogged

③ Air leakage
- Turbo boost leakage

④ Spark plug
- Dirty or worn spark plug(s)

⑤ Throttle sensor (Full range)
- Malfunction of throttle sensor

⑥ Fuel filter
- Filter clogged

⑦ Pressure regulator
- Malfunction of pressure regulator

⑧ Double throttle control system
- Double throttle valve not open

⑨ Sequential twin turbo control system
- Secondary port not open

⑩ EGR control system
- EGR control valve stuck (open)

⑪ Air cleaner
- Clogged element

⑫ Catalytic converter
- Clogged catalytic converter

⑬ Fuel
- Low octane fuel used

⑭ Metering oil pump
- Poor connection of connector

32	POOR FUEL ECONOMY
DESCRIPTION	• Fuel economy unsatisfactory

[TROUBLESHOOTING HINTS]

① Engine compression
- Compression low

② Spark plug(s)
- Dirty or worn spark plug(s)

③ Ignition coil
- Malfunction of ignition coil

④ Pressure regulator
- Malfunction of pressure regulator

⑤ Intake air leakage
- Air hose damaged or disconnected

33	A/C DOES NOT WORK
DESCRIPTION	• A/C compressor magnetic clutch does not engage when A/C switch ON

[TROUBLESHOOTING HINTS]

① A/C relay
- Poor connection of connector
- Relay malfunction

☞ Section U

② A/C switch
- Does not send signal to ECU terminal 1E

☞ page F-152

③ ECU
- ECU 1L terminal circuit open

☞ page F-154

16E0F2-232

34	• KNOCKING • PINGING
DESCRIPTION	• Sound produced when air/fuel mixture is ignited by something other than spark plug (i.e., hot spot in combustion chamber)
[TROUBLESHOOTING HINTS] Knock sensor • Open or short in harness (Code No.05 output)	☞ page F-185

16E0F2-283

35	FUEL ODOR
DESCRIPTION	• Gasoline smell or visible leaks
[TROUBLESHOOTING HINTS] ① Solenoid valve (purge control) • Open harness (Code No.26 output) ② Charcoal canister • Canister full of fuel and leaking	☞ page F-131

16E0F2-284

36	EXHAUST SULFUR SMELL
DESCRIPTION	• Rotten egg smell (sulfur) from exhaust
[TROUBLESHOOTING HINTS] High sulfer content fuel used	

16E0F2-285

37	HIGH OIL CONSUMPTION
DESCRIPTION	• Oil consumption excessive
[TROUBLESHOOTING HINTS] ① Metering oil pump • Malfunction of metering oil pump • Open or short in wiring harness ② PCV valve • PCV valve stuck open	☞ Section D ☞ page F-124

38	SELF-DIAGNOSIS CHECKER FLASHES 88 / DT-S1000 INDICATES "SYSTEM ERROR"
DESCRIP-TION	• Checker flashes 88 with test connector (TEN) grounded • DT-S1000 indicates "System error"
[TROUBLESHOOTING HINTS] ① Short circuit in wiring between diagnosis connector terminal FEN and ECU terminal 1F ② ECU malfunction	

16E0F2-287

39	MIL NEVER ON
DESCRIP-TION	• Self-Diagnosis Checker or DT-S1000 indicates Service Code No. of input device but MIL never ON
[TROUBLESHOOTING HINTS] ① Bulb burnt ② Electrical load unit 1K terminal circuit open ☞ page F-135	

16E0F2-288

SERVICE POINTS

OUTLINE

[Power and Ground]

ECU ground (Injector)

- An open circuit will not produce any symptom.
- If the ECU ground (Output devices) circuit also has an open, the engine will not start.

ECU ground (Output devices)

- An open circuit will not produce any symptom.
- If ECU ground (Injector) circuit also has an open, the engine will not start.

ECU ground (System)

- An open circuit will not produce any symptom.

ECU ground (Analogue)

- If the circuit has an open, engine hard starting and rough idle will be caused and Service Code Nos. 09, 11, 12, 13, 20 and 23 will be output.

Main relay (Battery power)

- If the circuit is shorted, the EGI INJ fuse (30A) will burn out.

Room fuse (ECU memory power)

- If the circuit is open, the ECU memory function will not operate, and service codes for intermittent malfunctions will not be indicated. Also, the learning control will be canceled, but will not produce any particular symptom.
- If the circuit is shorted, the ROOM fuse (15A) will burn out.

[Input Device]

A/C switch

- The switch monitor function can confirm the presence of an open or short circuit.
- If the circuit is open, the air conditioner (the magnetic clutch) will not operate.
- If the circuit is shorted, the air conditioner will constantly operate when the blower is ON.

Atmospheric pressure sensor

- The sensor is contained in the ECU.
- If the sensor has an open or short circuit, Service Code No. 14 is output, and the ECU will use a preprogrammed pressure of sea level.
- A malfunction in the sensor causes engine roughness at high elevation.

Clutch switch (MT)

☞ Refer to "Neutral / clutch switches"on page F–187.

Crank angle sensor (NE, G signal)

- If the NE signal circuit has an open or short, Service Code No. 02 is output.
- If the G signal circuit has an open or short, Service Code No. 03 is output.
- If the NE or G signal circuit has an open or short, the engine will not start (No fuel injection and no ignition).

Daytime running light unit (Canada)

- If the circuit has an open, the idle speed will be slightly slow.
- If the circuit is shorted, idle speed will be slightly fast.

E/L unit

- If the circuit has an open, the switch monitor function can confirm that the blower fan, headlight, rear window defroster, and electric cooling fan operating signals are not input to the ECU.
- If the circuit is short, the Idle speed will be increased slightly.

EGR Switch (Calif.)
- If the EGR switch or circuit has an open or short, Service Code No. 16 is output.
- In the above conditions, the EGR control valve will be fully closed.

Fuel thermosensor
- If the thermosensor circuit has an open or short, Service Code No. 23 is output.
- In the above conditions, the ECU will use a preprogrammed temperature value of 50°C {122°F} and no symptom will be noticed.

Heat hazard switch
- If the circuit has open, no sympotm will be noticed.
- If the switch or circuit has a short, the heat hazard warning light will illuminate and the air pump will not operate, causing rough idle.

Inhibitor signal (AT ; Refer to Section K)
- If the circuit is open or shorted, the idle speed will be slightly low in R, D, S, and L ranges.

Intake air thermosensor
- If the thermosensor or circuit has an open or short, Service code No. 11 is output.
- In the above conditions, no symptom will be noticed.

Knock sensor
- If the knock sensor or circuit has an open or short, Service Code No. 05 is output.
- In the above conditions, ignition timing is retarded.

Metering oil pump position sensor
- If the sensor or circuit has an open or short, Service Code 20 is output.
- In the above conditions, the fuel injection amount is fixed, causing poor acceleration and hesitation.

Mileage switch / Power steering pressure switch
- If the switch circuit has an open circuit, no particular symptom will be noticed.
- If the switch circuit has a short circuit, idle speed will be increased.

Neutral switches (MT)
- The switch monitor function of the Self-Diagnosis Checker can confirm the presence of an open or short circuit.
- If the circuit is open, the idle speed drops when the A/C, P/S, or electrical load is ON.

1–2 switch (MT)
- If the circuit has an open or short, no symptom will be noticed.

Oxygen sensor
- If the sensor output voltage continues below 0.55V for 100 sec. after the engine exceeds 1,500 rpm because of an open or short circuit, Service Code No. 15 is output.
- If the sensor output voltage continues unchanged 50 sec, after the engine exceeds 1,500 rpm, Service Code No. 17 is output.
- In the above conditions, no fuel injection feedback control will be present and no symptom will be noticed.

Pressure sensor
- If the sensor or circuit has an open or short, Service code No. 13 is output.
- In the above condition, the ECU uses a preprogrammed fuel injection amount, causing rough idle and poor acceleration with afterburn.

P/S pressure switch
- Refer to "Mileage switch"

Reduce torque signal (AT ; Refer to Section K)
- If a malfunction occurs in the reduce torque signal, the torque reduction control system is inhibited and line pressure will be high at shifting. Shift shock may be slightly increased.

Slip lock-up signal (AT ; Refer to Section K)
- If a malfunction occurs in the slip lock-up signal, line pressure will be high at shifting and shift shock may be slightly increased.

Solenoid valve (Shift A) (AT)
- Refer to Section K

Solenoid valve (Shift B) (AT)
- Refer to Section K

Speedometer sensor
- If the vehicle speed signal circuit has an open or short, Service Code No. 06 is output.
- If the circuit has open or short, hold mode will not operate.

Start signal
- A lack of engine cranking signal will cause hard starting when engine is cold.

Stoplight switch
- The switch monitor function can confirm the presence of an open or short circuit.
- An open or short circuit will produce no symptom.
- A short circuit will cause the STOP fuse (20A) burn out.

Throttle sensor (Narrow range)
- If the sensor or circuit has an open or short, Service Code No. 18 is output.
- In the above condition, rough idle, and engine stall on deceleration will be caused.

Throttle sensor (Full range)
- If the sensor or circuit has an open or short, Service Code No. 12 is output.
- In the above condition, poor acceleration will be caused.

TEN terminal (Diagnosis connector)
- If the circuit is open, the Self-Diagnosis Checker or DT-S1000 can not perform service code checks, switch monitoring checks, real time monitor check and simulation check.
- If the circuit is shorted, the opening amount of the solenoid valve (ISC) will not change, causing hard starting and rough idle. The Self-Diagnosis Checker or DT-S1000 cannot perform sensor monitoring chekcs.

Water thermosensor
- If the thermosensor or circuit has an open or short, Service Code No. 09 is output, and ECU uses a preprogrammed temperature value of 82°C {180°F}.
- A malfunction in the water thermosensor or its circuit will cause hard starting or engine stall when engine is cold.
- In the above condition, the electric cooling fan will constantly operate when the ignition switch is ON.

[Output Device]

A/C relay

- If the circuit is open, the air conditioner (Magnetic clutch) will not operate.
- If the circuit is shorted, the air conditioner will constantly operate when blower is ON, causing rough idle.

Air pump relay

- If the relay or circuit has an open or short, Service Code No. 54 is output.
- If the circuit is short, air pump will always operate, causing catalytic converter melted.
- If the circuit is open, the air pump will never operate, causing rough idle.

Circuit opening relay

- If the circuit is open, the engine will not start.
- If the circuit is shorted, the fuel pump will operate whenever the ignition switch is ON.

EC-AT control unit (AT)

- Refer to Section K

Electric cooling fan relay

- If the circuit is shorted, the cooling fan will always operate while the ignition switch ON.
- If the circuit is open, the cooling fan will not operate until the engine temperature exceeds 108°C {226°F}.

Fuel injector

- If a secondary injector or circuit has an open or short, Service Code No. 71 (Front) or 73 (Rear) is output, causing poor acceleration and lack of engine power.
- If a primary injector or circuit has an open, engine will stall and will not start.

Fuel pump relay

- If the relay or circuit has an open or short, Service Code No. 51 is output.
- If the circuit is open, engine will hesitate or engine power will lack.

FEN terminal (Diagnosis connector)

- If the circuit between the diagnosis connector and E/L unit is open, the Self-Diagnosis Checker buzzer will not sound during the service code check or the DT-S 1000 will indicate " System error" on the display.
- If the circuit between ECU 1F terminal and E/L unit is open, the Self-Diagnosis Checker buzzer will constantly sound during the service code check or the DT-S1000 will indicate "System error" on the display.
- If the circuit is shorted, code "88"will keep flashing and the buzzer will continue sounding (Self-Diagnosis Checker), or "service error" is indicated on DT-S1000 display, preventing a service code check.

Igniter

- If a trailing igniter or circuit has an open or short, idle speed will be slightly decreased and poor acceleration will be cased.
- If the leading igniter or circuit has an open or short, hard starting and rough idle will be caused.

Metering oil pump

- If the pump or circuit has an open or short, Service Code No. 26 and 27 are output.
- In the above conditions, ECU fixes ignition timing and fuel injection amount, causing engine poor acceleration.

MEN Terminal (Diagnosis Connector)
- If the circuit is open, the monitor lamp will not illuminate.
- If the circuit is shorted, the monitor lamp will stay on.

Solenoid valve (Accelerated warm-up system)
- If the solenoid valve or circuit has an open or short, Service Code No. 38 is output.
- If the circuit is open, the fast idle speed just after engine starting will not exceed 2,000 rpm.
- If the circuit is shorted, the idle speed will be increased and then hunted at the specified speed (approx. 1500 rpm after warm-up).

Solenoid valve (Charge control)
- If the solenoid valve or circuit has an open or short, Service Code No. 45 is output.
- In the above conditions, the ECU fixes the ignition timing and fuel injection amount, causing poor acceleration and lack of power.

Solenoid valve (Charge relief)
- If the solenoid valve or circuit has an open or short, Service Code No. 46 is output.
- If the circuit is open, the charge relief valve will always open, causing poor acceleration.
- If the circuit is shorted, the charge relief valve will always closed, causing momentarily intake air noise on acceleration.

Solenoid valve (Double throttle control)
- If the solenoid valve or circuit has an open or short, Service Code No. 50 is output.
- If the circuit is open, the double throttle valve will always closed, causing poor acceleration and lack of power.
- If the circuit is shorted, the double throttle valve will always open, causing hesitation when the engine is cold.

Solenoid valve (EGR)
- If the solenoid valve or circuit has an open or short, Service Code No. 28 is output.
- If the circuit is open, no symptom will be noticed.
- If the circuit is shorted, the EGR valve will always open, causing engine stalling and hard starting.

Solenoid valve (ISC)
- If the solenoid valve or circuit has an open or short, Service Code No. 34 is output.
- If the circuit is open, the valve will always fully closed, causing rough idle and hard starting.
- If the circuit is shorted, the valve will always fully open, causing high idle speed. (After warm-up, engine hunts at approx. 1500 rpm.)

Solenoid valve (Port air bypass)
- If the solenoid valve or circuit has an open or short, Service Code No. 33 is output.
- In the above conditions, no symptom will be noticed.

Solenoid valve (Pressure regulator control)
- If the solenoid valve or circuit has an open or short, Service Code No. 25 is output.
- If the circuit is open, hard starting may result when the engine is hot.
- If the circuit is shorted, fuel pressure will always be approx. 280 kPa {2.9 kgf/cm^2, 41 psi} and no symptom will be noticed.

Solenoid valve (Purge control)
- If the solenoid valve or circuit has an open or short, Service Code No. 40 is output.
- If the circuit is open, no symptom will be noticed.
- If the circuit is shorted, the engine stalls at low speed.

Solenoid valve (Relief 1)
- If the solenoid valve or circuit has an open or short, Service Code No. 31 is output.
- If the circuit is open, no symptom will be noticed.
- If the circuit is shorted, solenoid / valve will be always open and CO and HC will be increased.

Solenoid valve (Relief 2)
- If the solenoid valve or circuit has an open or short, Service Code No. 39 is output.
- If the circuit is open, no symptom will be noticed.
- If the circuit is shorted, secondary air noise will be heard while the air pump operates.

Solenoid valve (Split air bypass)
- If the solenoid valve or circuit has an open or short, Service Code No. 30 is output
- In the above conditions, no symptom will be produced.

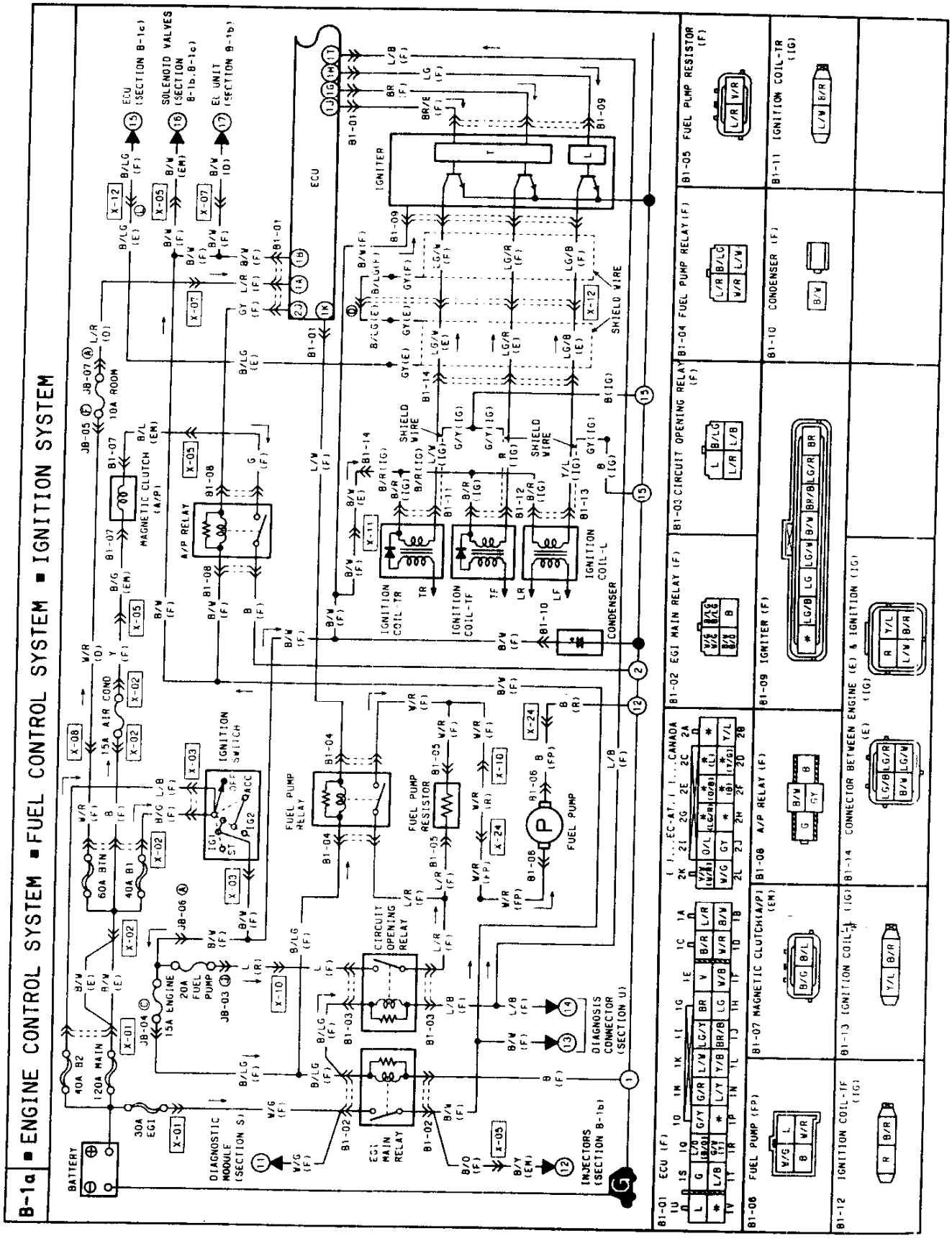
Solenoid valve (switching)
- If the solenoid valve or circuit has an open or short, Service Code No. 32 is output.
- If the circuit is open, no symptom will be noticed.
- If the circuit is shorted, rough idle will result.

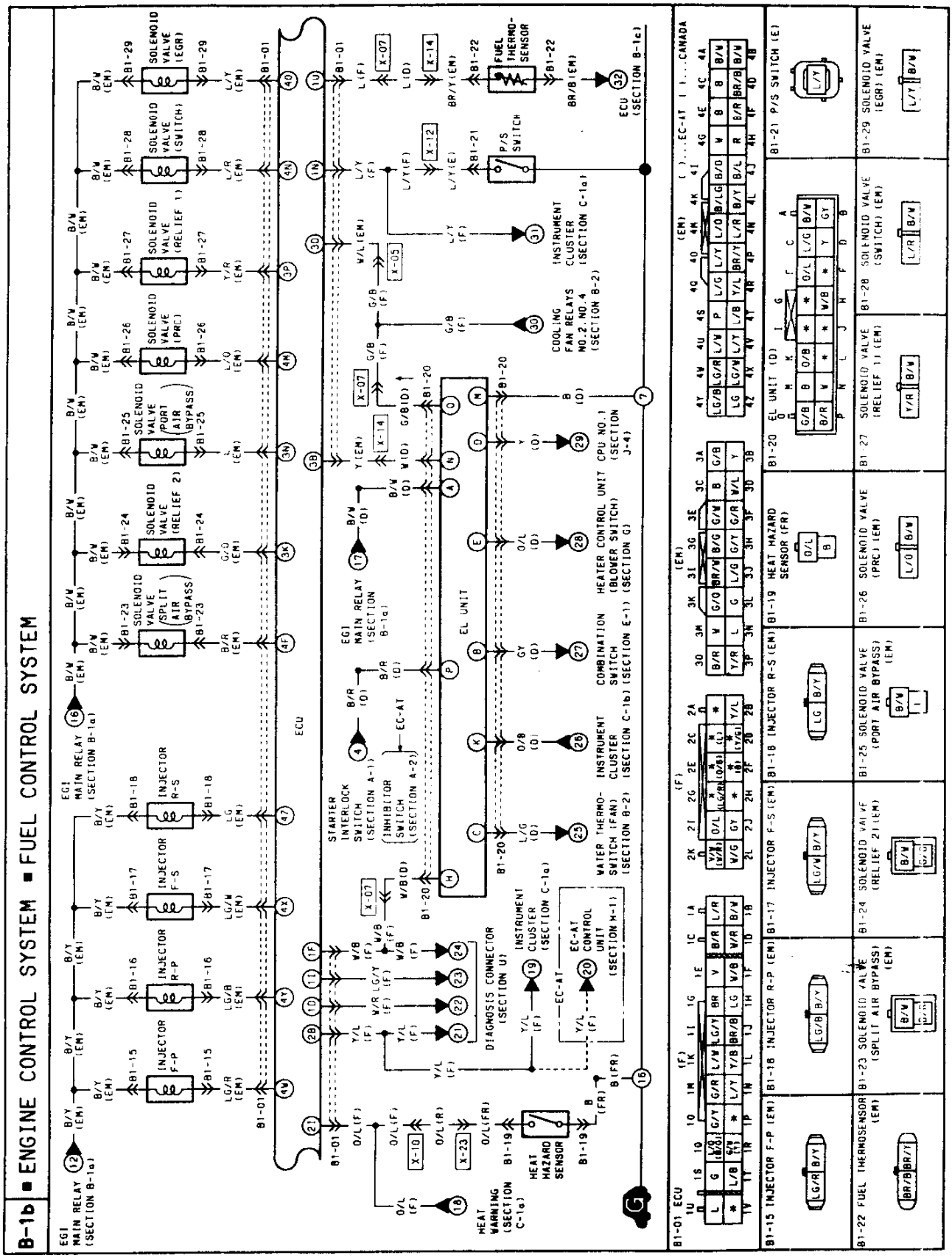
Solenoid valve (Turbo control 1, Turbo control 2)
- If the solenoid valve or circuit has an open or short, Service Code No. 44 is output.
- If the circuit is open, the turbo control valve will not open, causing poor acceleration and lack of power.
- If the circuit is shorted, turbo control valve will open earlier on acceleration, causing poor acceleration.

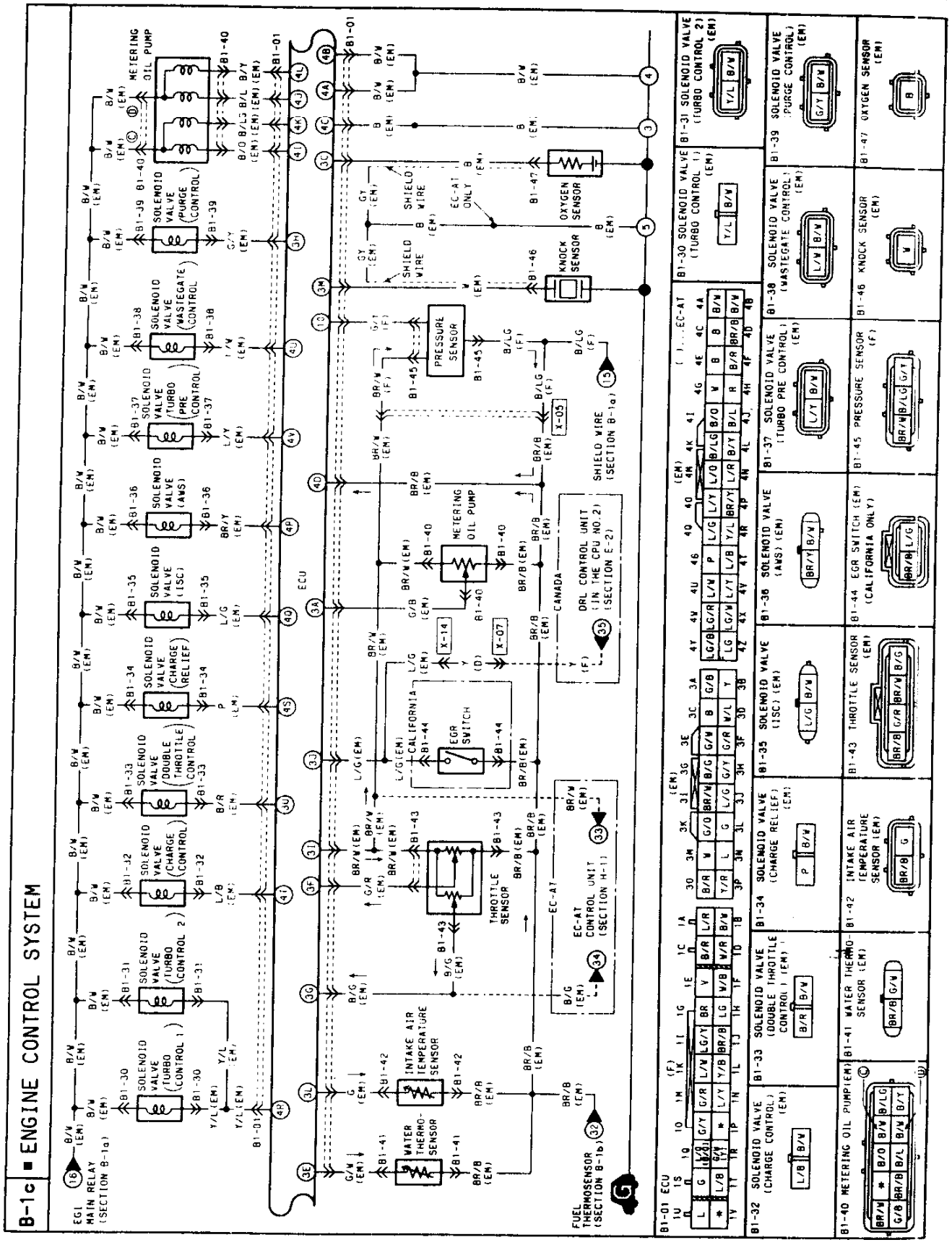
Solenoid valve (Turbo precontrol)
- If the solenoid valve or circuit has an open or short, Service Code No. 42 is output.
- If the circuit is open, the precontrol valve will open earlier, causing slightly hesitation and poor acceleration.
- If the circuit is short, precontrol valve will never open, causing hesitation and poor acceleration.

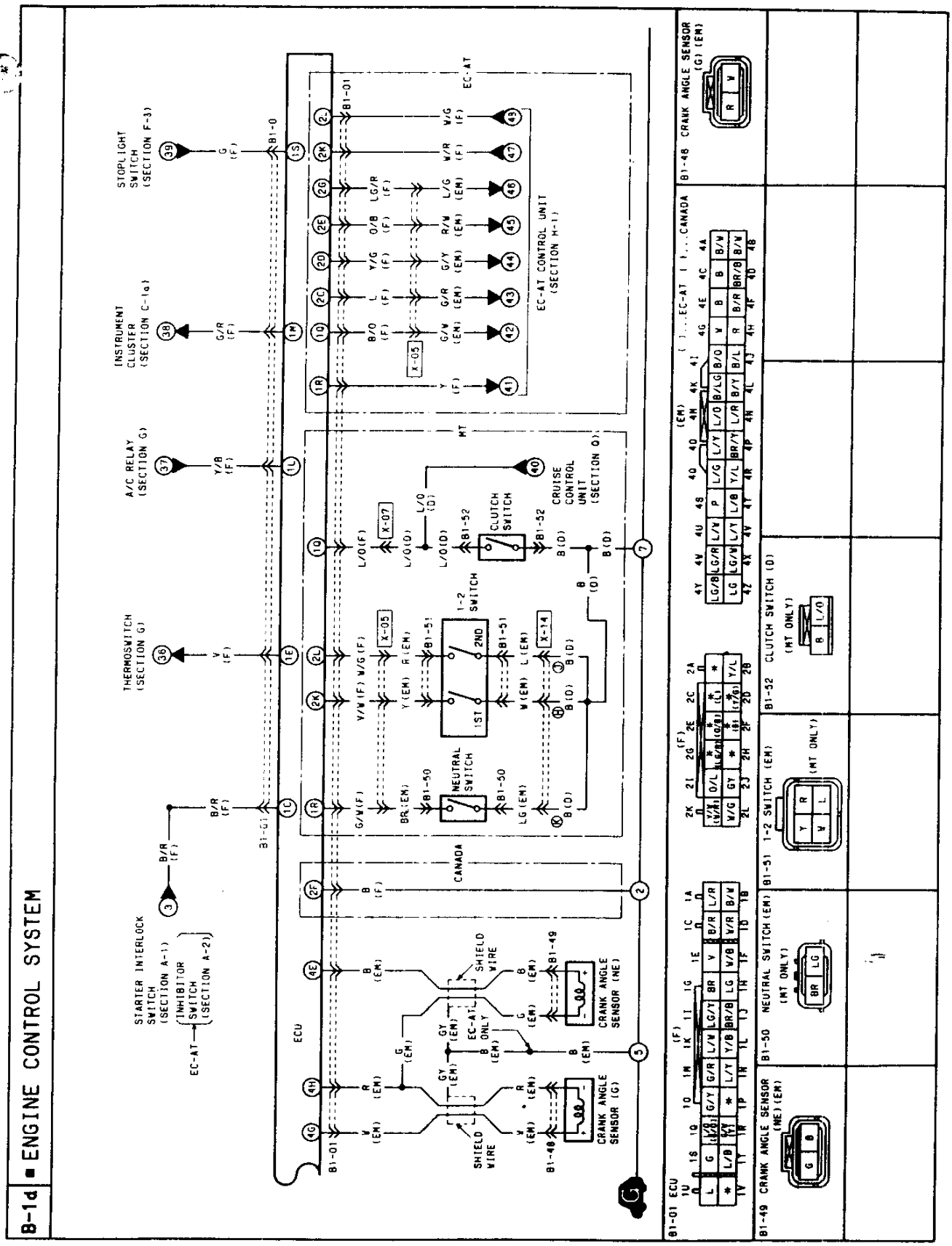
Solenoid valve (Wastegate control)
- If the solenoid valve or circuit has an open or short, Service Code No. 43 is output.
- If the circuit is open, wastegate valve will open earlier, causing poor acceleration and lack of power.
- If the circuit is shorted, wastegate valve will not open easily and no symptom will be noticed. (To prevent engine damage, the overboost fuel cut will be operated)

WIRING DIAGRAM




B-1b ■ ENGINE CONTROL SYSTEM ■ FUEL CONTROL SYSTEM
EGI MAIN RELAY (SECTION B-1a)
ECU
INJECTOR F-P
INJECTOR R-P
INJECTOR F-S
INJECTOR R-S
SOLENOID VALVE (SPLIT AIR BYPASS)
SOLENOID VALVE (PORT AIR BYPASS)
SOLENOID VALVE (RELIEF 2)
SOLENOID VALVE (RELIEF 1)
SOLENOID VALVE (PRC)
SOLENOID VALVE (SWITCH)
SOLENOID VALVE (EGR)
STARTER INTERLOCK SWITCH (SECTION A-1)
(INHIBITOR SWITCH (SECTION A-2))
EGI MAIN RELAY (SECTION B-1a)
EL UNIT
DIAGNOSIS CONNECTOR (SECTION U)
INSTRUMENT CLUSTER (SECTION C-1a)
EC-AT CONTROL UNIT (SECTION H-1)
WATER THERMO-SWITCH (FAN) (SECTION B-2)
INSTRUMENT CLUSTER (SECTION C-1b) (SECTION E-1) (SECTION G)
COMBINATION SWITCH (SECTION E-1)
HEATER CONTROL UNIT (BLOWER SWITCH) (SECTION G)
CPU NO.1 (SECTION J-4)
COOLING FAN RELAYS NO.2 NO.4 (SECTION B-2)
INSTRUMENT CLUSTER (SECTION C-1a)
P/S SWITCH
FUEL THERMO-SENSOR
ECU (SECTION B-1c)
HEAT WARNING (SECTION C-1a)
HEAT HAZARD SENSOR
B1-01 ECU
B1-15 INJECTOR F-P (EM)
B1-16 INJECTOR R-P (EM)
B1-17 INJECTOR F-S (EM)
B1-18 INJECTOR R-S (EM)
B1-19 HEAT HAZARD SENSOR (FR)
B1-20 EL UNIT (D)
B1-21 P/S SWITCH (E)
B1-22 FUEL THERMOSENSOR (EM)
B1-23 SOLENOID VALVE (SPLIT AIR BYPASS) (EM)
B1-24 SOLENOID VALVE (RELIEF 2) (EM)
B1-25 SOLENOID VALVE (PORT AIR BYPASS) (EM)
B1-26 SOLENOID VALVE (PRC) (EM)
B1-27 SOLENOID VALVE (RELIEF 1) (EM)
B1-28 SOLENOID VALVE (SWITCH) (EM)
B1-29 SOLENOID VALVE (EGR) (EM)


B-1c ■ ENGINE CONTROL SYSTEM
EGI MAIN RELAY (SECTION B-1a)
SOLENOID VALVE (TURBO CONTROL 1)
SOLENOID VALVE (TURBO CONTROL 2)
SOLENOID VALVE (CHARGE CONTROL)
SOLENOID VALVE (DOUBLE THROTTLE CONTROL)
SOLENOID VALVE (CHARGE (RELIEF))
SOLENOID VALVE (ISC)
SOLENOID VALVE (AWS)
SOLENOID VALVE (TURBO PRE CONTROL)
SOLENOID VALVE (WASTEGATE CONTROL)
SOLENOID VALVE (PURGE CONTROL)
METERING OIL PUMP
ECU
WATER THERMO-SENSOR
INTAKE AIR TEMPERATURE SENSOR
THROTTLE SENSOR
EGR SWITCH
CALIFORNIA
CANADA
EC-AT CONTROL UNIT (SECTION H-1)
ORL CONTROL UNIT (IN THE CPU NO.2) (SECTION E-2)
PRESSURE SENSOR
KNOCK SENSOR
OXYGEN SENSOR
SHIELD WIRE
EC-AT ONLY
FUEL THERMOSENSOR (SECTION B-1b)
SHIELD WIRE (SECTION B-1a)
B1-01 ECU
B1-30 SOLENOID VALVE (TURBO CONTROL 1) (EM)
B1-31 SOLENOID VALVE (TURBO CONTROL 2) (EM)
B1-32 SOLENOID VALVE (CHARGE CONTROL) (EM)
B1-33 SOLENOID VALVE (DOUBLE THROTTLE CONTROL) (EM)
B1-34 SOLENOID VALVE (CHARGE RELIEF) (EM)
B1-35 SOLENOID VALVE (ISC) (EM)
B1-36 SOLENOID VALVE (AWS) (EM)
B1-37 SOLENOID VALVE (TURBO PRE CONTROL) (EM)
B1-38 SOLENOID VALVE (WASTEGATE CONTROL) (EM)
B1-39 SOLENOID VALVE (PURGE CONTROL) (EM)
B1-40 METERING OIL PUMP (EM)
B1-41 WATER THERMO-SENSOR (EM)
B1-42 INTAKE AIR TEMPERATURE SENSOR (EM)
B1-43 THROTTLE SENSOR (EM)
B1-44 EGR SWITCH (EM) (CALIFORNIA ONLY)
B1-45 PRESSURE SENSOR (F)
B1-46 KNOCK SENSOR (EM)
B1-47 OXYGEN SENSOR (EM)


B-1d ■ ENGINE CONTROL SYSTEM
STARTER INTERLOCK SWITCH (SECTION A-1)
INHIBITOR SWITCH (SECTION A-2)
EC-AT
B/R (F)
THERMOSWITCH (SECTION G)
A/C RELAY (SECTION G)
INSTRUMENT CLUSTER (SECTION C-1a)
STOPLIGHT SWITCH (SECTION F-3)
EC-AT CONTROL UNIT (SECTION H-1)
ECU
NEUTRAL SWITCH
1-2 SWITCH
CLUTCH SWITCH
CRUISE CONTROL UNIT (SECTION G)
CANADA
MT
CRANK ANGLE SENSOR (NE)
CRANK ANGLE SENSOR (G)
SHIELD WIRE
EC-AT ONLY
B1-01 ECU
B1-48 CRANK ANGLE SENSOR (G) (EM)
B1-49 CRANK ANGLE SENSOR (NE) (EM)
B1-50 NEUTRAL SWITCH (EM)
B1-51 1-2 SWITCH (EM)
B1-52 CLUTCH SWITCH (D)
(MT ONLY)

ELECTRICAL DIAGNOSIS SUPPORT

[Power and Ground]

Main relay (Battery power)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1B)—Main relay	Engine hard starting	EGI INJ fuse (30A) burns out when ignition switch ON	NA

16E0F1-291

Room fuse (Memory power)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1A)—Room fuse	No symptom	ROOM fuse (15A) burns out	NA

16E0F1-292

ECU ground (Output device, Injector, System, Analogue)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4A)—Ground (Output device)	(One side open circuit) No symptom (Both sides open circuit) Engine will not start	NA	(One side poor ground) No symptom (Both sides poor ground) Engine will not start
ECU (4B)—Ground (Injector)			
ECU (4C)—Ground (System)	No symptom		No symptom
ECU (4D)—Ground (Analogue)	Code Nos. 09, 11, 12, 13, 20, and 23 Engine hard starting Rough idle		Code Nos. 09, 11, 12, 13, 20, and 23 Engine hard starting Rough idle

16E0F2 293

[Input Device]

A/C switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1E)—A/C amplifier	Air conditioner (magnetic clutch) will not operate	Air conditioner will constantly operate with blower ON	NA

Clutch switch (MT)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1Q)—Clutch switch	No symptom	No symptom	NA

Crank angle sensor (NE, G signal)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4E)—Crank angle sensor (NE)	Code No. 02 output Engine will not start	Code No. 02 output Engine will not start	NA
ECU (4G)—Crank angle sensor (G)	Code No. 03 output Engine will not start	Code No. 03 output Engine will not start	
ECU (4H)—Crank angle sensor (Ground)	Code Nos. 02 and 03 output Engine will not start	NA	Engine will not start Engine suddenly stalls

Daytime running light unit (Canada)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3J)—Daytime running light unit	Idle speed may be slightly low	Idle speed may be slightly high	NA

NA: Not applicable

E/L unit

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1F)—E/L unit (H)	MIL will never ON	MIL will always ON Self-Diagnosis Checker buzzer sounds constantly	NA
ECU (3B)—E/L unit (N)	Idle speed will be low when E/L ON*1	Idle speed will be high	
Main relay—E/L unit (A)	Idle speed will be low when E/L ON*1	EGI INJ fuse (30A) burns out when ignition switch ON	
Headlight switch—E/L unit (B)	Idle speed may be low when headlight switch ON	Parking lights will always ON	
Electric cooling fan relay—E/L unit (C)	Idle speed may be low when cooling fan operates	Cooling fan always operates when ignition switch ON	
Rear defroster switch—E/L unit (D)	Idle speed may be low when defroster switch ON	Rear window defroster always ON when ignition switch ON	
Heater control unit—E/L unit (E)	Idle speed may be low when blower fan operate high speed	High idle speed when blower fan not operate	
MIL—E/L unit (K)	MIL will never ON	MIL will always ON	
Ground—E/L unit (M)	Idle speed drops when E/L ON*1 MIL will never ON	NA	Idle speed hunts or drops when E/L ON*1 MIL will never ON
Electric cooling fan relay—E/L unit (O)	Idle speed may be low when cooling fan operates	Cooling fan always operates when ignition switch ON	NA
Inhibitor switch—E/L unit (P)	No symptom	No symptom	

*1 E/L ON: Headlight switch ON, electric cooling fan operating, rear window defroster switch ON, or blower fan control switch at 3rd or 4th position.

EGR switch (Calif.)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3J)—EGR switch	Code No. 16 output No symptom	Code No. 16 output No symptom	NA
ECU (4D)—EGR switch		No symptom	

Fuel thermosensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1U)—Fuel thermosensor	Code No. 23 output No symptom	Code No. 23 output No symptom	NA
ECU (4D)—Fuel thermosensor		No symptom	

Heat hazard switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (2I)—Heat hazard switch	No symptom	Heat hazard warning light illuminates Rough idle	NA
Ground—Heat hazard switch		No symptom	No symptom

NA: Not applicable

Inhibitor signal (AT)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1R)—EC-AT control unit (1C)	Idle speed drops when shifted to L, S, D or R range		NA

Intake air thermosensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3L)—Thermosensor	Code No. 11 output No symptom	Code No. 11 output No symptom	NA
ECU (4D)—Thermosensor		No symptom	

Knock sensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3M)—Knock sensor	Code No. 05 output Lack of power Knocking	Code No. 05 output Lack of power Knocking	NA

Metering oil pump position sensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3A)—Metering oil pump (J)	Code No. 20 output Poor acceleration Hesitation	Code No. 20 output Poor acceleration Hesitation	NA
ECU (4D)—Metering oil pump (H)		No symptom	
ECU (3I)—Metering oil pump (I)		Code No. 20 output Poor acceleration Hesitation	

Mileage switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1N)—Mileage switch	No symptom	Idle speed slightly high	NA

Neutral switch (MT)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1R)—Neutral switch	Idle speed slightly high	Idle speed drops when A/C, P/S, or E/L ON	NA

1-2 switch (MT)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (2K)—1-2 switch	No symptom	No symptom	NA
ECU (2L)—1-2 switch			
Ground—1-2 switch			No symptom

NA: Not applicable

Oxygen sensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3C)—Oxygen sensor	Code No. 15 output No symptom	Code No. 15 output No symptom	NA

Pressure sensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1O)—Pressure sensor	Code No. 13 output Poor acceleration Rough idle	Code No. 13 output Poor acceleration Rough idle	NA
ECU (3I)—Pressure sensor			
ECU (4D)—Pressure sensor		No symptom	

P/S Pressure sensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1N)—P/S Pressure switch	No symptom	Idle speed slightly high	NA

Reduced torque signal, slip lock-up signal (AT)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1Q)—EC-AT control unit (2P)	Shift shock slightly increased		NA

Solenoid valve (Shift A) (AT)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (2K)—EC-AT CU (1D)	Shift shock slightly increased		NA

Solenoid valve (Shift B) (AT)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (2L)—EC-AT CU (1B)	Shift shock slightly increased		NA

Speedometer sensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1M)—Speedometer sensor	Code No. 06 output Hold mode will not operate (AT)		NA

Stoplight signal (Stoplight switch)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1S)—Stoplight switch	No symptom	STOP fuse (20A) burns out	NA

NA: Not applicable

Throttle sensor (Narrow range, Full range)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3F)—Throttle sensor (Narrow range)	Code No.18 output Rough idle Strong shift shock (AT)	Code No.18 output Rough idle Strong shift shock (AT)	NA
ECU (3G)—Throttle sensor (Full range)	Code No.12 output Poor acceleration Strong shift shock (AT)	Code No.12 output Poor acceleration Strong shift shock (AT)	
ECU (3I)—Throttle sensor	Code Nos.12, 18 output Rough idle	Code Nos.12 and 18 output Rough idle	
ECU (4D)—Throttle sensor	Code No.12 output Rough idle	No sympton	

TEN terminal (Diagnosis connector)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1I)—Diagnosis connector	Cannot perform service code checks and switch monitor checks	Hard starting Rough idle	NA

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Water thermosensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3E)—Water thermosensor	Code No.09 output Rough idle and hard starting when engine cold	Code No.09 output Rough idle and hard starting when engine cold	NA
ECU (4D)—Water thermosensor		No symptom	

[Output Device]
A/C relay

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1L)—A/C relay	A/C will not operate	A/C constantly operate when blower ON Rough idle	NA

Air pump relay

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (2J)—Air pump relay	Code No.54 output Rough idle	Code No.54 output Catalytic converter melted	NA

Fuel injector

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4X, 4Z)—Secondary injector	Code No.71 or 73 output Lack of power	Code No.71 or 73 output Engine will not start	NA
ECU (4W, 4X)—Primary injector	Engine stall Engine will not start	Engine stalls Engine will not start	

Electric cooling fan relay

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3D)—fan relay	Cooling fan will not operate until coolant temperature exceeds 108°C {226°F}	Cooling fan always operate when ignition switch ON	NA

NA : Not applicable

Fuel pump relay

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1K)—Fuel pump relay	Code No.51 output Hesitation Lack of power	Code No.51 output No symptom	NA

FEN terminal (Diagnosis connector)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1F)—Diagnosis connector	Self-Diagnosis Checker buzzer will not sound during service code check or "system error" indicated on DT-S1000 display	Code "88" will keep flashing and buzzer will continue sounding during service code check or "system error" indicated on DT-S1000 display	NA

Igniter

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1G)—Igniter (Trailing Front) ECU (1J) —Igniter (Trailing Rear)	Poor acceleration Hard starting when engine cold		NA
ECU (1H)—Igniter (Leading)	Rough idle Poor acceleration Hard starting when engine cold		

Metering oil pump

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4I, 4J, 4K, 4L)—Metering oil pump	Code No.26 and 27 output Poor acceleration		NA

NA: Not applicable

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MEN terminal (Diagnosis connector)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (1D)—MEN terminal	Monitor lamp will not illuminate	Monitor lamp stays on	NA

Solenoid valve (Accelerated warm-up system)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4P)—Solenoid valve	Code No.38 output Fast idle speed just after engine starting will not exceed 2,000 rpm	Code No.38 output Idle speed stays stays or fluctuates at approx. 1,500 rpm after warm-up	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

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Solenoid valve (Charge control)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4T)—Solenoid valve	Code No.45 output Lack of power Poor acceleration	Code No.45 output Lack of power Poor acceleration	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

NA: Not applicable

Solenoid valve (Charge relief)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4S)—Solenoid valve	Code No.46 output Poor acceleration	Code No.46 output Momentarily Intake air noise on acceleration	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

Solenoid valve (Double throttle control)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3O)—Solenoid valve	Code No.50 output Poor acceleration Lack of power	Code No.50 output Hesitation when engine cold	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

Solenoid valve (EGR) [Calif.]

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4O)—Solenoid valve	Code No.28 output No symptom	Code No.28 output Engine stall Hard starting	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

Solenoid valve (ISC)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4Q)—Solenoid valve	Code No.34 output Rough idle Hard start	Code No.34 output Idle speed stays or fluctuates at approx. 1,500 rpm after warm-up	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

Solenoid valve (Port air bypass)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3N)—Solenoid valve	Code No.33 output No symptom	Code No.33 output No symptom	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

NA: Not applicable

Solenoid valve (Pressure regulator control)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4M)—Solenoid valve	Code No.25 output Hard starting when engine warm-up	Code No.25 output No symptom EGI INJ fuse (30A) burns out when ignition switch ON	NA
Solenoid valve—Main relay			

Solenoid valve (Purge control)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3H)—Solenoid valve	Code No.40 output No symptom	Code No.40 output Hard starting Engine stalls at low speed	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

Solenoid valve (Relief 1)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3P)—Solenoid valve	Code No.31 output No symptom	Code No.31 output CO and HC increased	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

Solenoid valve (Relief 2)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (3K)—Solenoid valve	Code No.39 output No symptom	Code No.39 output Secondary air noise heard while air pump operates	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

Solenoid valve (Split air bypass)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4F)—Solenoid valve	Code No.30 output No symptom	Code No.30 output No symptom	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

Solenoid valve (Switching)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4N)—Solenoid valve	Code No.32 output No symptom	Code No.32 output Rough idle	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

NA: Not applicable

Solenoid valve (Turbo control 1, Turbo control 2)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4R)—Solenoid valve (s)	Code No.44 output Poor acceleration	Code No.44 output Poor acceleration	NA
Solenoid valve (s)—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

Solenoid valve (Turbo precontrol)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4V)—Solenoid valve	Code No.42 output Hesitation Poor acceleration	Code No.42 output Hesitation Poor acceleration	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

Solenoid valve (Wastegate control)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ECU (4U)—Solenoid valve	Code No.43 output Lack of power Poor acceleration	Code No.43 output No symptom	NA
Solenoid valve—Main relay		EGI INJ fuse (30A) burns out when ignition switch ON	

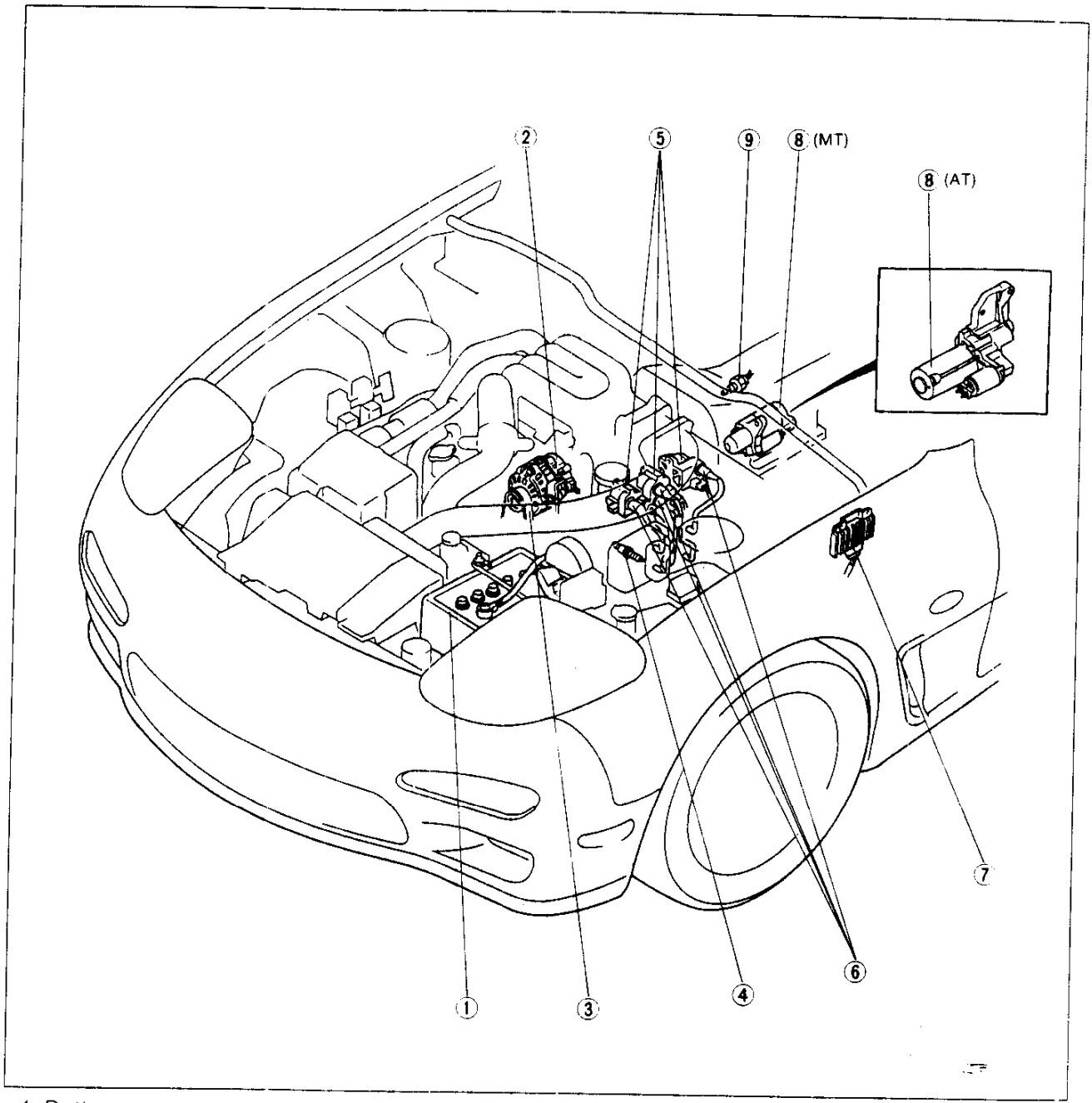
NA: Not applicable

Before beginning any service procedure, refer to the 1993 RX-7 Body Electrical Troubleshooting Manual; see section S for air bag system precautions and J1 for audio anti-theft system precautions.

ENGINE ELECTRICAL SYSTEM

37U0GX-001

INDEX



37U0GX-0(2

OUTLINE

SPECIFICATIONS

Item \ Transmission					MT	AT
voltage				V	12, negative ground	
Battery	Type and capacity (20-hour rate)				55D23L (60Ah) 65D23L (55Ah)*1	55D23L (60Ah) 75D26L (65Ah)*1
Ignition system	Spark timing (test connector grounded)				Leading : ATDC 5° (BTDC – 5°) Trailing : ATDC 20° (BTDC – 20°) at idle (AT: P range)	
	Spark advance				Electronic spark advance (ESA)	
	Spark plug	Type		Leading	NGK : BUR7EQP*2, BUR6EQP, BUR7EQ, BUR6EQ	
				Trailing	NGK : BUR9EQP*2, BUR8EQP, BUR9EQ, BUR8EQ	
		Plug gap		mm {in}	1.1–1.7 {0.044–0.066}	
Alternator	Output			V-A	12–100	
	Regulated voltage			V	14.1–14.7 (with temperature gradient characteristics)	
	Brush length	Standard		mm {in}	21.5 {0.846}	
		Minimum		mm {in}	8.0 {0.315}	
Stater	Type				Direct	Reduction
	Output			V-kW	12–1.2	12–2.0
	Output (no load)	Voltage		V	11	
		Current		A	Max 90	
		Speed		rpm	Min 3000	Min 2200
	Brush length	Standard		mm {in}	17.5 {0.689}	18 {0.71}
		Minimum		mm {in}	12 {0.47}	11 {0.43}

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*1 Cold area
*2 Standard plug

TROUBLESHOOTING GUIDE

DIAGNOSTIC INDEX

No.	Troubleshooting items	Page
1	Will not crank–starter motor does not operate	Below
2	Will not crank–starter motor spins	Below
3	Cranks slowly	G–5
4	Alternator warning lamp illuminates while engine running	G–5
5	Discharged battery	G–5
6	Misfire	G–6

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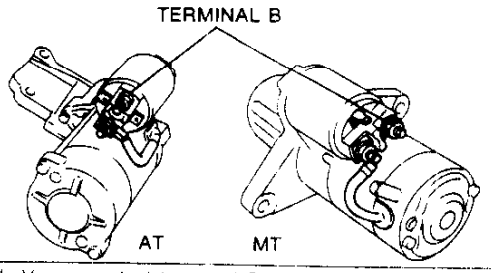
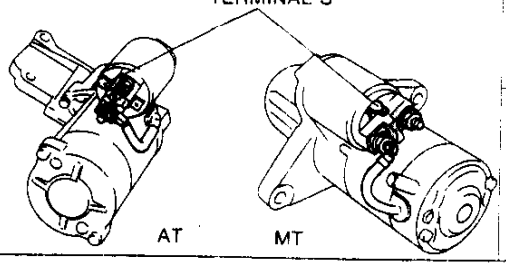
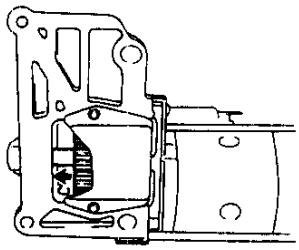
SYMPTOM TROUBLESHOOTING

Vʙ: Battery voltage

1	Will not crank–starter motor does not operate			
STEP	INSPECTION		ACTION	
1	Does engine crank with fully charged battery?	Yes	Check charging system	☞ page G–8
		No	Go to next step	
2	Is V_B present at terminal B? 	Yes	Go to next step	
		No	Check wiring harness	
3	Is V_B present at terminal S with ignition switch in START position? 	Yes	• Check magnetic switch • Check armature	☞ page G–30 ☞ page G–30
			• Check inhibitor switch • Check ignition switch • Check wiring harness	☞ Section K ☞ Section T

16E0GX-006

2	Will not crank–starter motor spins			
STEP	INSPECTION		ACTION	
1	Is drive pinion pushed out when energized? (Is click heard?) 	Yes	Remove starter and check ring gear teeth and starter drive pinion teeth	
		No	Check magnetic switch	☞ page G–30

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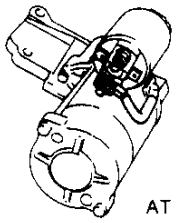
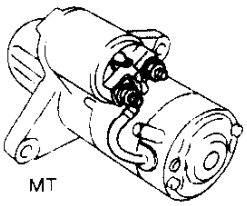
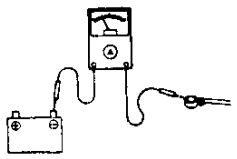
3	Cranks slowly		
STEP	INSPECTION		ACTION
1	Does engine crank normally with fully charged battery?	Yes	Check charging system ☞ page G–8
		No	Go to next step
2	Are starter cable connections loose or corroded?  AT  MT	Yes	Repair connection
		No	Check starter for binding (brush, armature, etc.) ☞ page G–30

16E0G>-008

V_B: Battery Voltage

4	Alternator warning lamp illuminates while engine running		
STEP	INSPECTION		ACTION
1	Is V_B correct at idle? **Specification: 14.1–14.7V**	Yes	Check wiring harness (Alternator terminal L–Alternator warning lamp)
		No	Check charging system ☞ page G–8

16E0G>-009

5	Discharged battery		
STEP	INSPECTION		ACTION
1	Is charging system OK? ☞ page G–8	Yes	Turn ignition switch ON and measure dark current as shown  Dark current: 20 mA max
		No	Repair or replace parts as necessary

16E0G>-010

TROUBLESHOOTING

VB: Battery voltage

6	Misfire		
STEP	INSPECTION		ACTION
1	Are "02" or "03" displayed on **SST** while ignition switch ON?	Yes	Check for cause ☞ **page F–20**
		No	Go to next step
2	Are connector and wiring harness connections OK? (High-tension leads, igniter, ignition coils, ECU)	Yes	Go to next step
		No	Repair connection
3	Remove each high-tension lead; is there strong blue spark while engine is cranking?	Yes	Go to next step
		No	Replace
4	• Are high-tension leads OK? • Is resistance of high-tension leads OK? **Specification: 16 kΩ per 1 m {3.28 ft} (at 20°C [68°F])**	Yes	Go to next step
		No	Replace high-tension leads
5	Is there V_B at ignition coils terminal A and igniter terminal D with ignition switch in ON position?* (Disconnect each connection)	Yes	Go to next step
		No	Check wiring harness (Ignition coils terminal A and igniter terminal D-Ignition switch)*
6	Are ignition coils OK? ☞ **page G–21**	Yes	Go to next step
		No	Replace ignition coil ☞ **page G–20**
7	Is wiring harness from ignition coils to igniter OK?*	Yes	Go to next step
		No	Repair or replace
8	Is ignitor OK? ☞ **page G–23**	Yes	Go to next step
		No	Replace igniter ☞ **page G–22**
9	Is wiring harness from ignitor to ECU terminals OK?*	Yes	Go to next step
		No	Repair or replace
0	Is input sensor OK? • Crank angle sensor ☞ **page F–180**	Yes	Replace ECU ☞ **page F–150**
		No	Check input sensor

* Refer to circuit diagram

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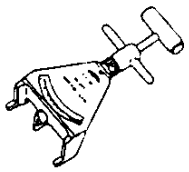
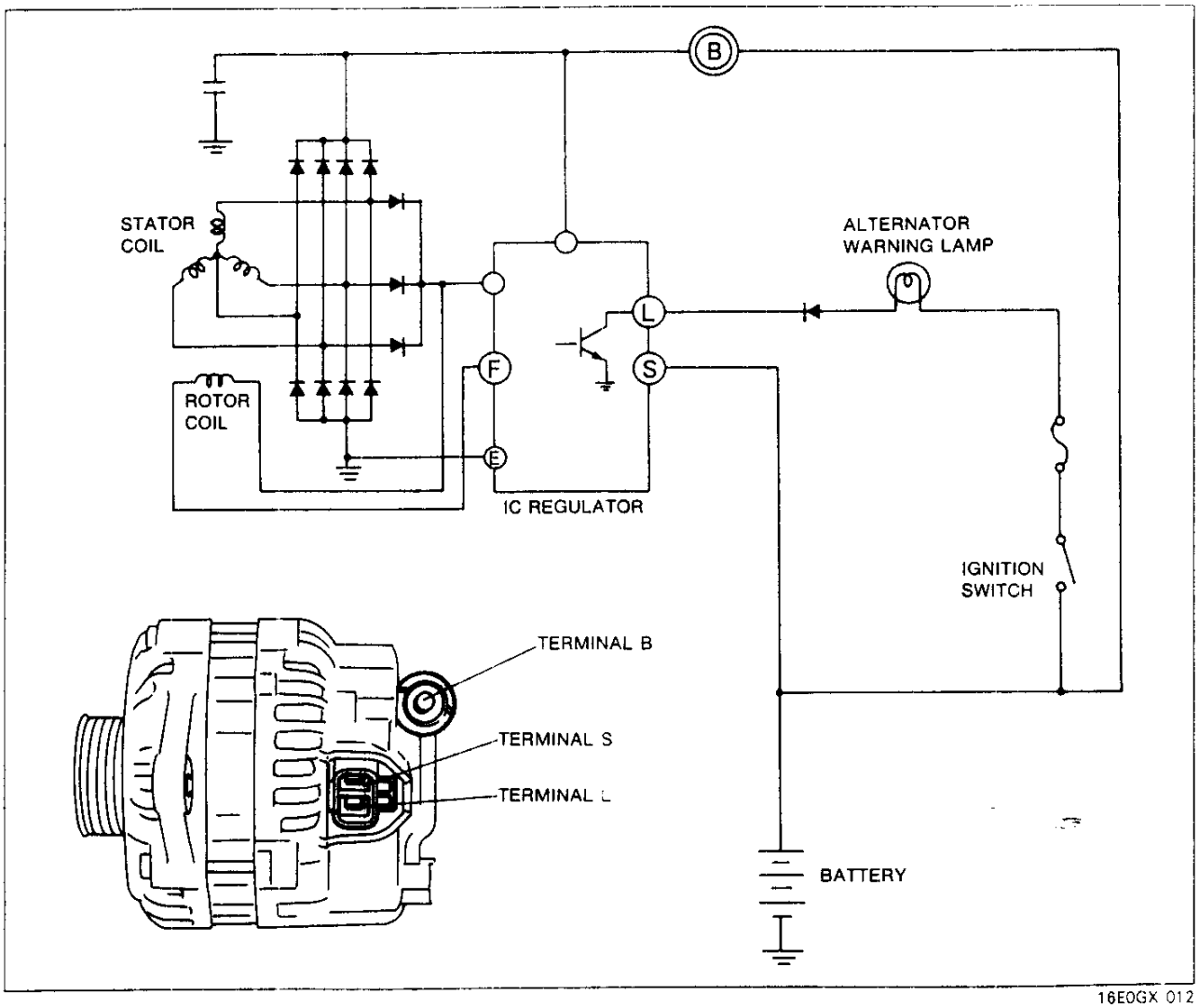
CHARGING SYSTEM

PREPARATION
SST

49 9200 020 Tension gauge V-ribbed belt		For inspection of drive belt tension

16E0GX-011

CIRCUIT DIAGRAM



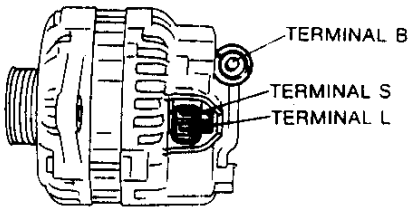
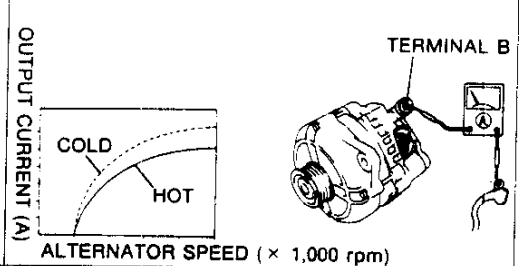
16E0GX 012

The alternator has a self-diagnosis function to warn of the following problems in the charging system. If a problem arises, the alternator warning lamp illuminates.

1. Terminal S circuit open
2. No voltage output
3. Field coil circuit open
4. Terminal B circuit open
5. Voltage output too high (above 16.2V)

TROUBLESHOOTING

Vʙ: Battery voltage

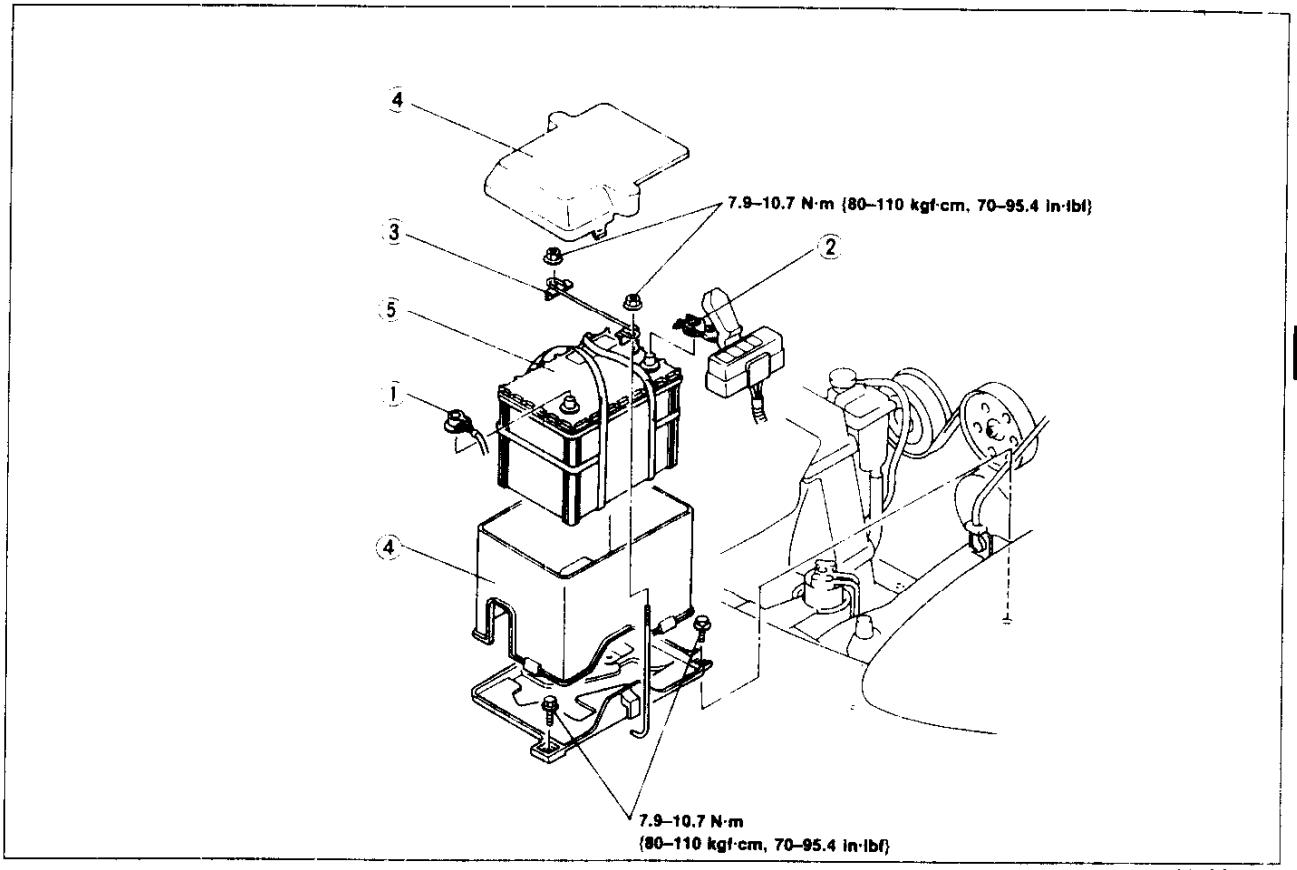
STEP	INSPECTION		ACTION
1	Check battery voltage; is it correct? **Specification: Above 12.4V**	Yes	Go to next step
		No	Check battery ☞ page G–9
2	Does alternator warning lamp illuminate with ignition switch ON?	Yes	Go to Step 3
		No	Check warning lamp bulb and wiring harness (Alternator warning lamp–Terminal L)
3	Does alternator warning lamp go out after engine started?	Yes	Go to Step 5
		No	Go to next step
4	Is voltage at alternator terminals correct? **Specification:** Terminal / Ign: ON (V) / Idle (V) B / V_B / 14.1–14.7 L / Approx. 1 / 12.9–13.5 S / V_B / 14.1–14.7  	Yes	Check wiring harness (Battery–Terminal B)
		No	• Check and repair wiring harness as necessary ☞ page G–12 • Replace or repair alternator
5	1. Connect ammeter (100A min.) between terminal B and harness 2. Start engine 3. Turn all electrical loads ON and depress brake pedal 4. Is output current 100A or more at 2,500–3,000 rpm? **Caution** **• Do not ground terminal B**  	Yes	Charging system normal
		No	Go to next step
6	Is drive belt tension OK? ☞ page G–15	Yes	Replace or repair alternator ☞ page G–12
		No	• Adjust drive belt tension • Replace drive belt

16E0GX-01

BATTERY

Removal / Installation

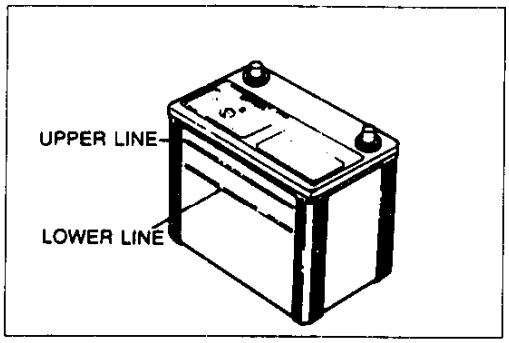
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



37U0GX-005

1. Battery negative cable
2. Battery positive cable
3. Battery clamp
4. Battery box
5. Battery

Inspection ..... page G– 9
Recharging ..... page G–10

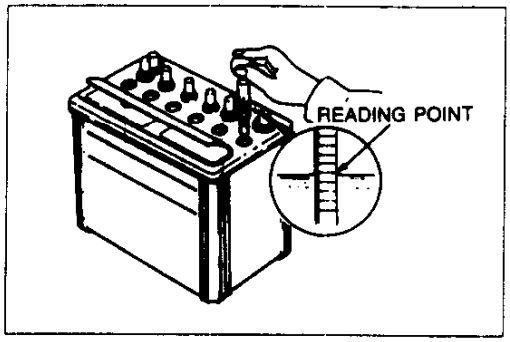


16E0GX-014

Inspection

Electrolyte level

1. Check if the electrolyte level is between the upper and lower line.
2. If low, add distilled water, being careful not to overfill



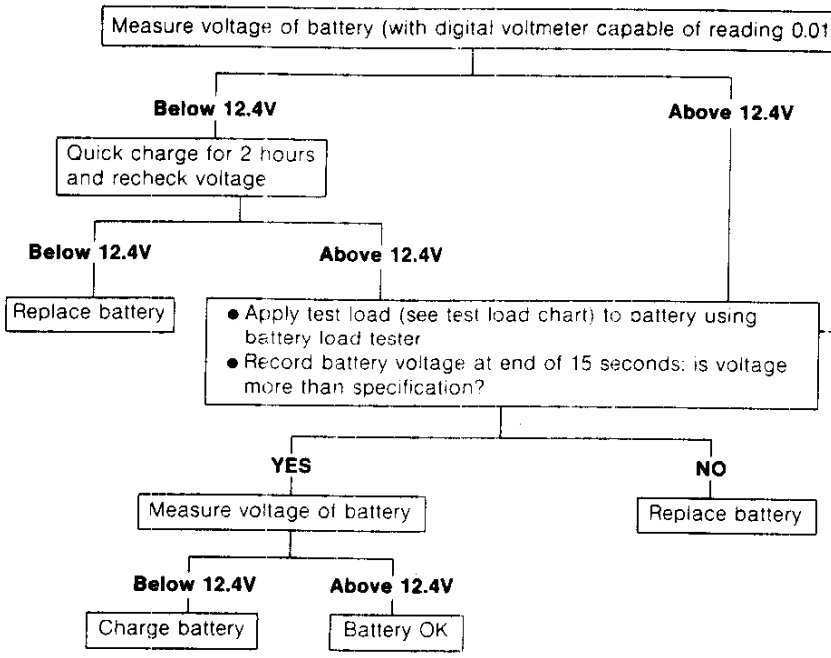
16E0GX-015

Specific gravity of electrolyte

Measure the specific gravity by using a hydrometer.

Specification: 1.27–1.29 (at 20°C {68°F})

Battery Discharge Test



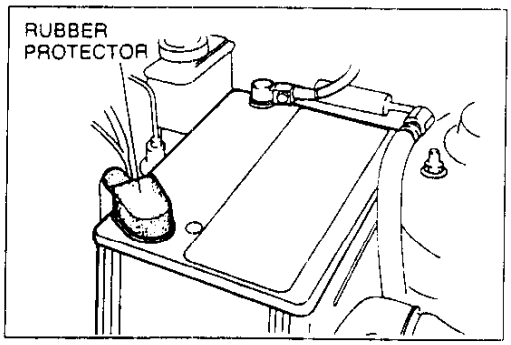
Test load

Battery	Load (A)
55D23L	180
65D23L	165
75D26L	195

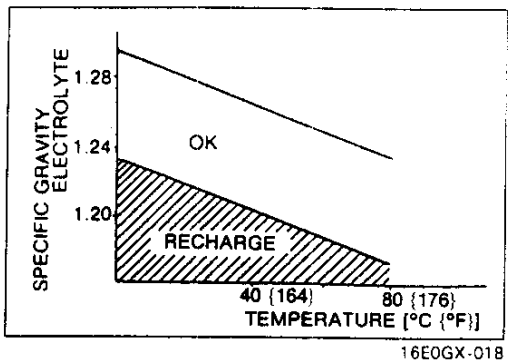
Battery voltage with load

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

16E0GX-016



16E0GX-017



16E0GX-018

Terminal and cable

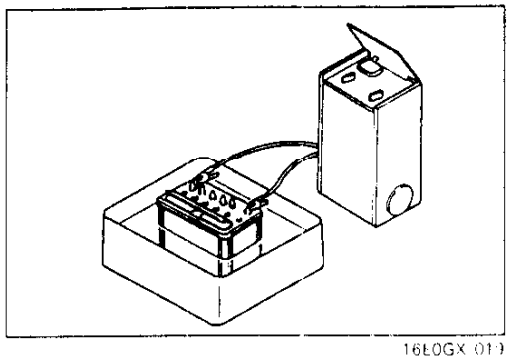
1. Check the tightness of the terminals to ensure good electrical connections.
2. Check for corroded and frayed battery cables. Replace if necessary.
3. Check the rubber protector on the positive terminal for proper coverage.
4. Clean the terminals if necessary, and coat them with grease.

Recharging

Battery	Slow charge (A)	Quick charge (A)
55D23L	Under 6	Max. 30
65D23L	Under 5	Max. 25
75D26L	Under 8	Max. 30

Slow charging

If is not necessary to remove the vent caps to perform a slow charge.



Quick charging

Remove the battery from the vehicle and remove the vent caps to perform a quick charge.

Caution

- **Obtain the code number and deactivate the audio anti-theft system before disconnecting the battery. (Refer to T section)**

Warning

- **Before performing maintenance or recharging the battery, turn OFF all accessories and stop the engine.**
- **The negative cable must be removed first and installed last.**
- **Set the battery in water when quick charging to prevent overheating the battery.**

ALTERNATOR

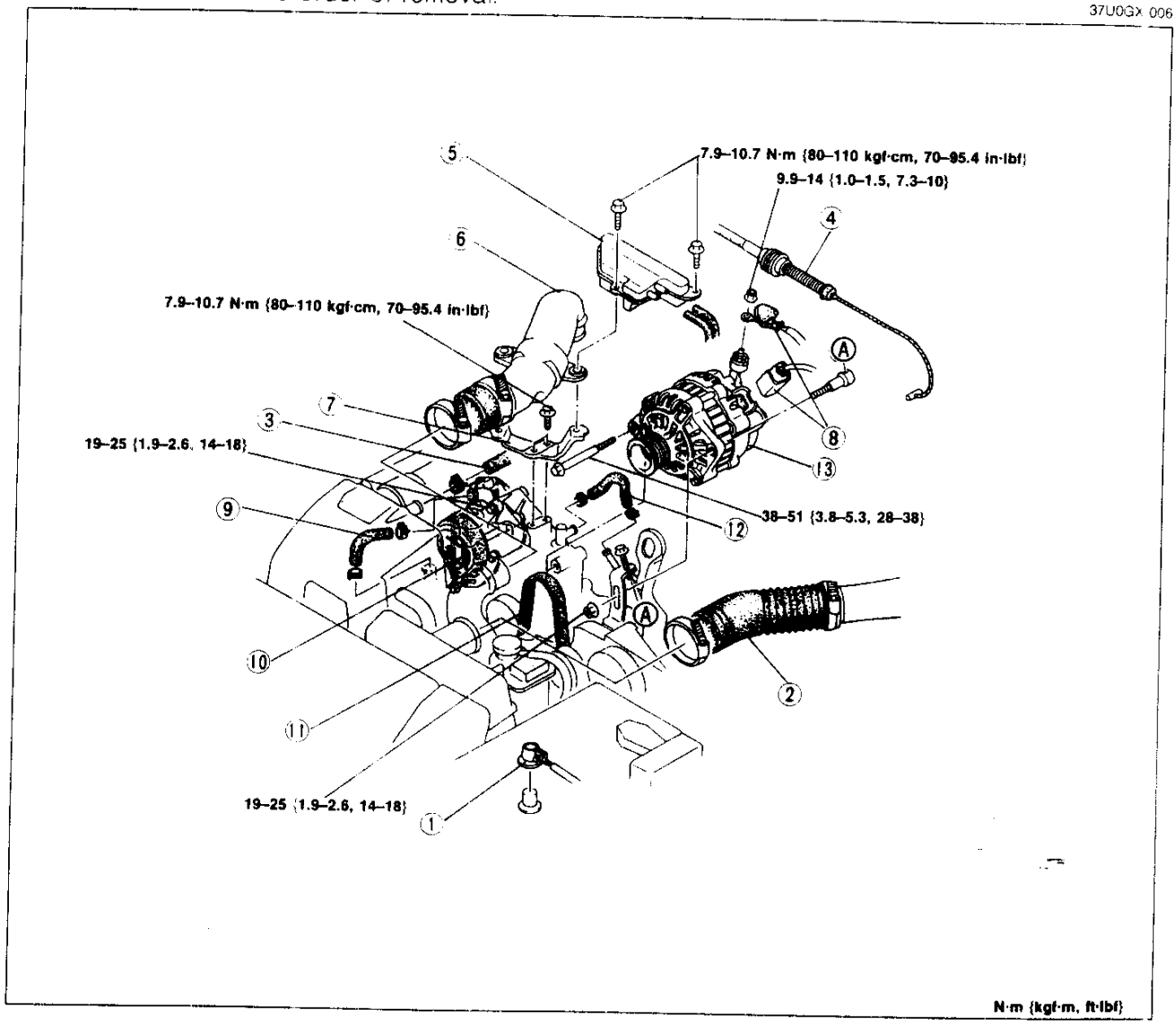
Caution

- **Be sure the battery connections are not reversed as this will damage the rectifier.**
- **Do not use high-voltage testers such as a megger as they will damage the rectifier.**
- **Remember that battery voltage is always present at alternator terminal B.**
- **Do not ground terminal L while the engine is running.**
- **Do not start the engine while the connector is disconnected from terminals L and S.**

Removal / Installation

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

37U0GX-006

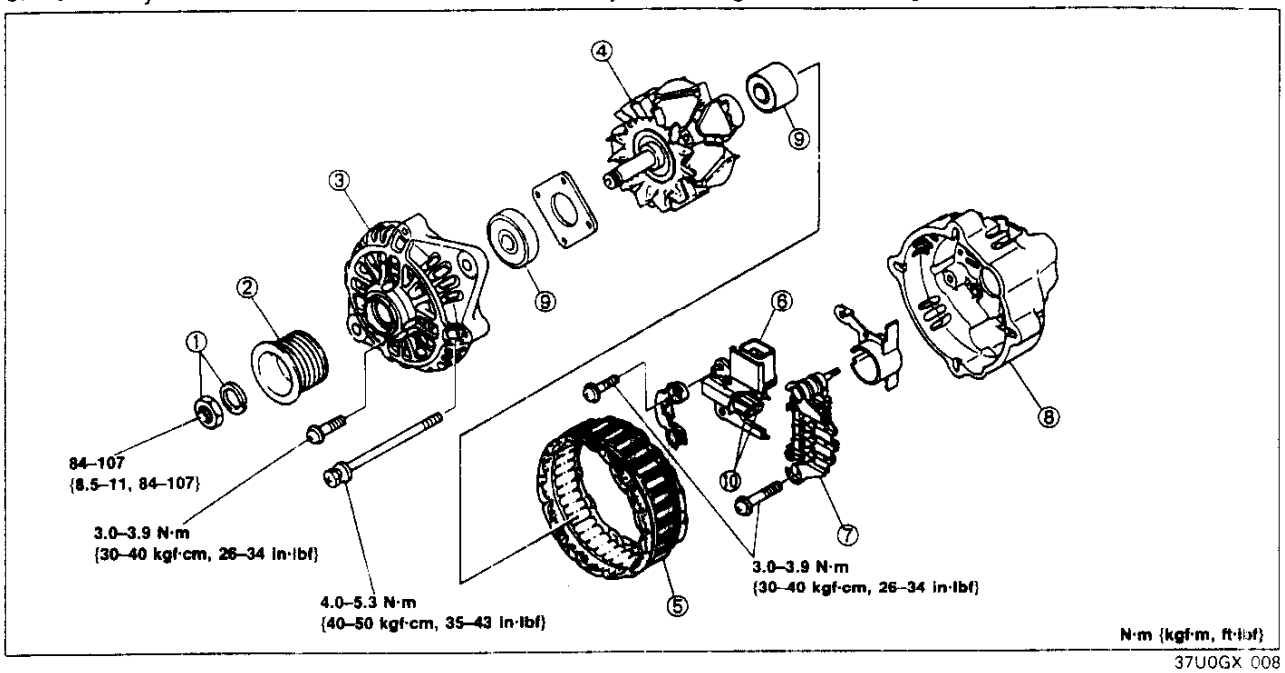


37U0GX-007

1. Battery (negative cable) Removal / Installation ..... page G– 9
2. Air-intake hose
3. Air-relief hose
4. Accele cable
5. Pressure chamber
6. Air pipe
7. Bracket
8. Terminal B and connector
9. Air pump hose
10. Air pump
11. Drive belt Inspection ..... page G–15 Adjustment ... page G–15
12. Water hose
13. Alternator Disassembly / Assembly ..... page G–13 Inspection ..... page G–14

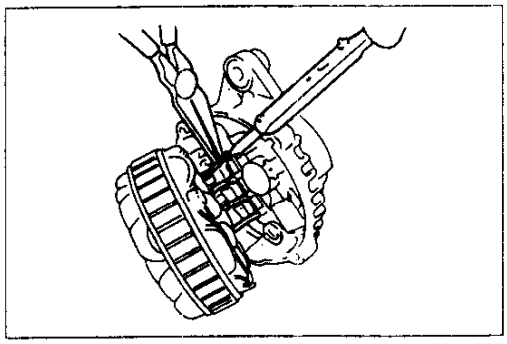
Disassembly / Assembly

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



37U0GX-008

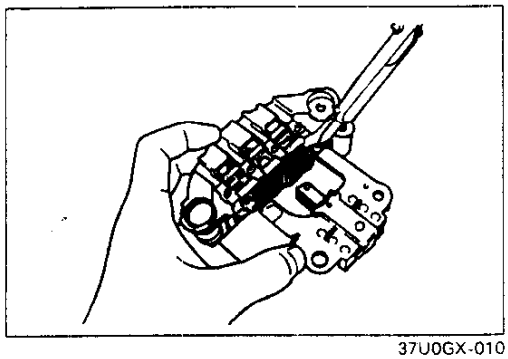
1. Nut, washer
2. Pulley
3. Front bracket
4. Rotor
   Inspection ..... page G–14
5. Stator
   Disassembly / Assembly
   Note ..... page G–13
   Inspection ..... page G–14
6. Regulator
   Disassembly / Assembly
   Note ..... page G–13
7. Rectifier
   Disassembly / Assembly
   Note ..... page G–13
   Inspection ..... page G–14
8. Rear bracket
   Disassembly / Assembly
   Note ..... page G–13
9. Bearing
   Inspection ..... page G–14
10. Brush
    Inspection ..... page G–14



37U0GX-009

Disassembly / Assembly Note
Rear bracket, stator wire

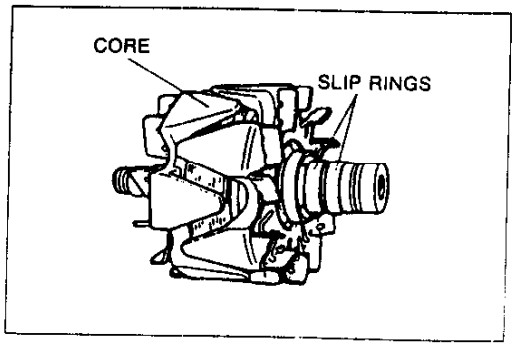
Melt the solder quickly, the diodes (rectifier) and regulator will be damaged by excessive heat.



37U0GX-010

Brush holder, regulator assembly and rectifier

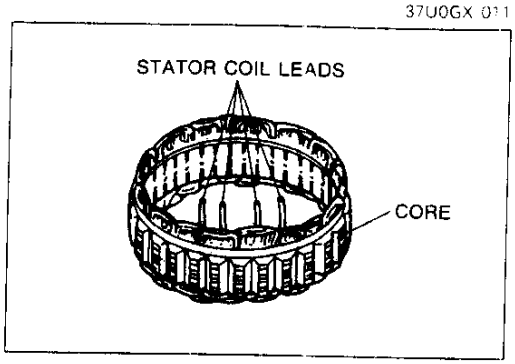
Melt the solder quickly, the diodes (rectifier) and regulator will be damaged by excessive heat.



37U0GX-011

Inspection
Rotor
- Check the continuity as shown.

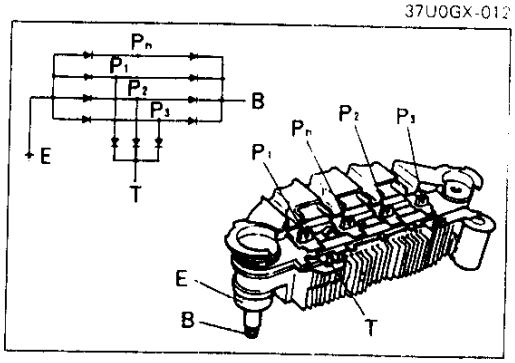
Inspection point	Continuity
Core – Slip ring	No
Slip ring – Slip ring	Yes



37U0GX-012

Stator
- Check the continuity as shown.

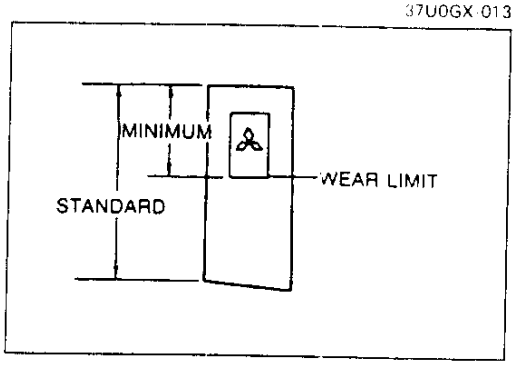
Inspection point	Continuity
Core – Stator coil leads	No
Between leads	Yes



37U0GX-013

Rectifier
- Check the continuity as shown.

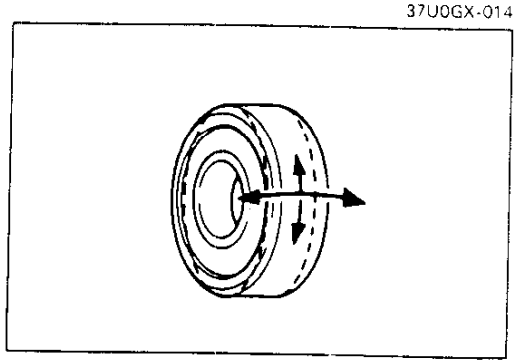
Negative	Positive	Continuity
E	P_n, P_1, P_2, P_3	Yes
B		No
T		No
P_n, P_1, P_2, P_3	E	No
	B	Yes
P_1, P_2, P_3	T	Yes
P_n		No



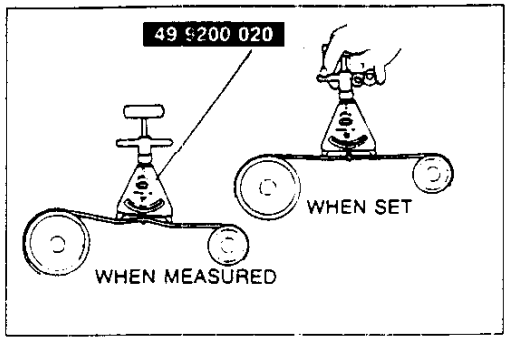
37U0GX-014

Brush
If a brush is worn almost to or beyond the limit, replace the brushes.

Standard: 21.5 mm {0.847 in}
Minimum: 8 mm {0.31 in}


37U0GX-015

Bearing
1. Check for abnormal noise, looseness, and sticking.
2. Replace the bearing(s) as necessary.

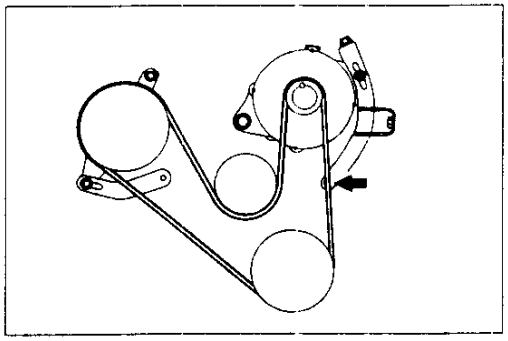


93E0GX-031

DRIVE BELT

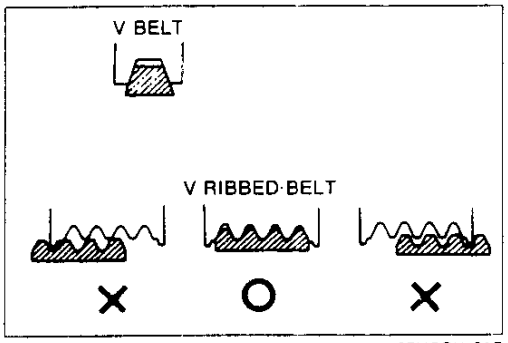
Inspection

1. Check the drive belts and pulleys for wear, cracks and fraying. Replace as necessary.
2. Measure the drive belt tension by using a tension gauge, and measure the deflection by applying moderate pressure midway between the pulleys. Adjust the belt if necessary.


37U0GX-016

Tension

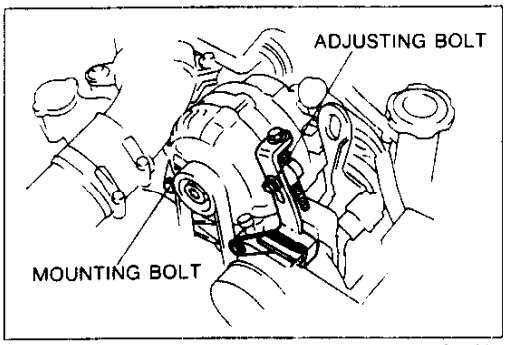
Tension: N {kgf, lbf}
New : 687–784 {70–80, 154–176}
Used: 589–686 {60–70, 132–154}



37U0GX-017

Deflection

Deflection: mm {in} / 98 N {10 kgf, 22 lbf}
New : 6–8 {0.24–0.31}
Used: 7–9 {0.28–0.35}



93E0GX-034

Adjustment

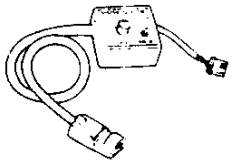
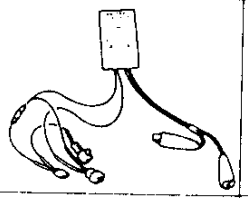
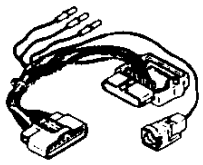
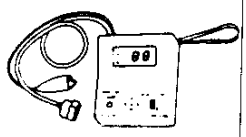
1. Loosen the alternator mounting bolts and turn the adjusting bolt.
2. Move the alternator to set the specified deflection.
3. Tighten all bolts and recheck the tension

Tightening torque:
Mounting bolt:
38–51 N·m {3.8–5.3 kgf·m, 28–38 ft·lbf}
Adjusting bolt:
19–25 N·m {1.9–2.6 kgf·m, 14–18 ft·lbf}

IGNITION SYSTEM

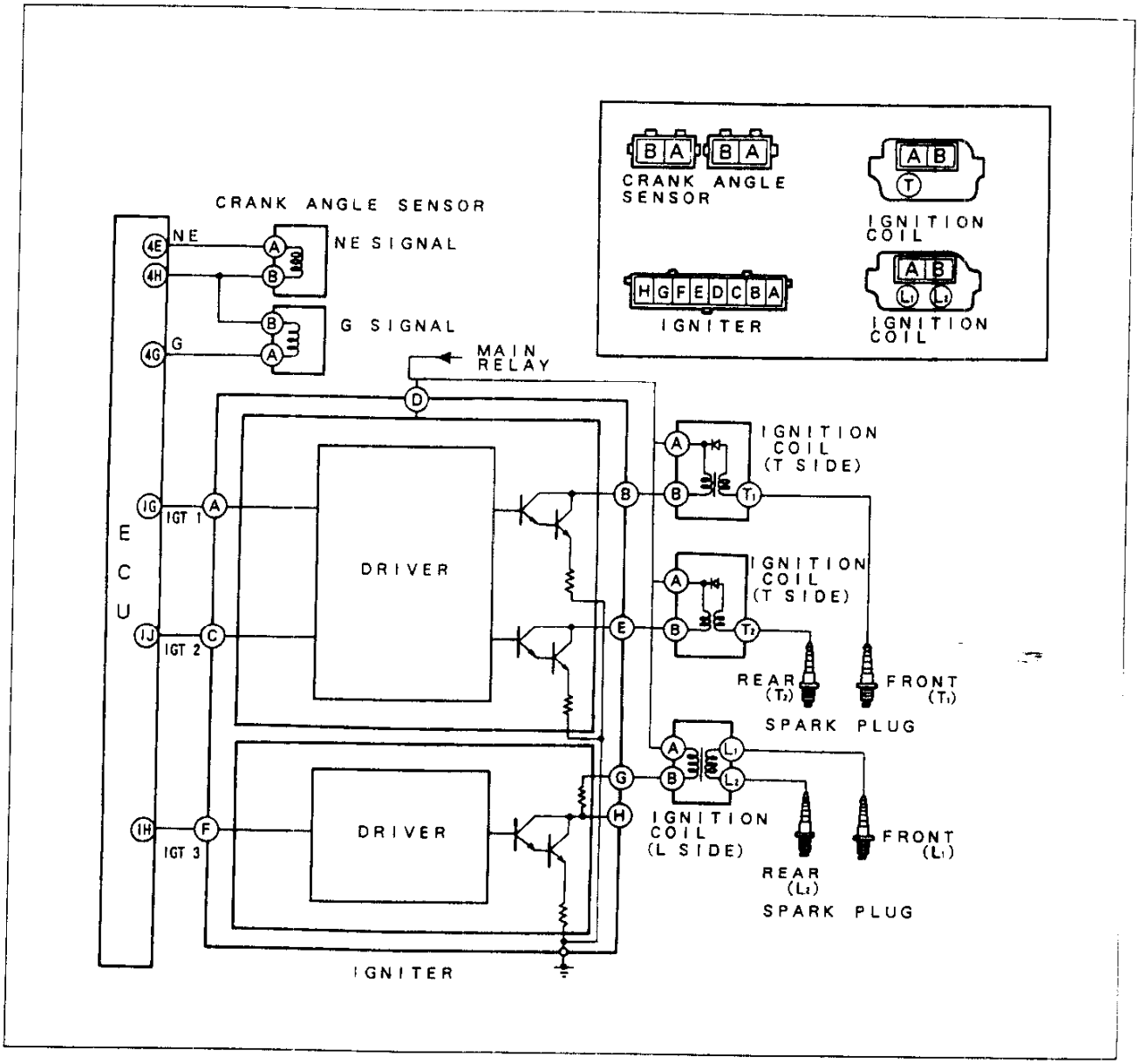
PREPARATION

SST

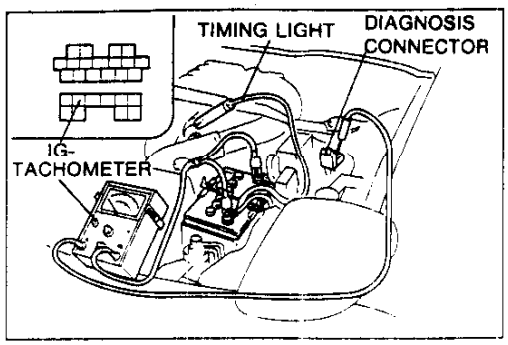
49 B019 9A0 System selector		For self-diagnosis and inspection of ignition timing	49 F018 002 Igniter Checker		For inspection of igniter
49 F018 003 Adapter Harness		For inspection of igniter	49 H018 9A1 Self-Diagnosis Checker		For self-diagnosis inspection

37U0GX-018

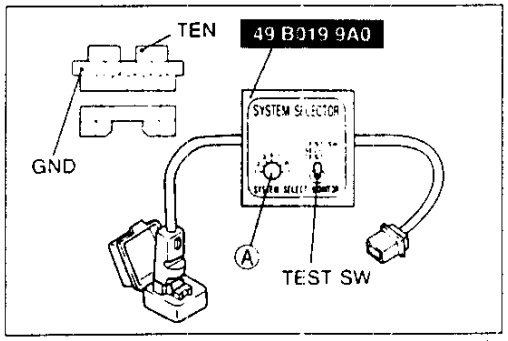
CIRCUIT DIAGRAM



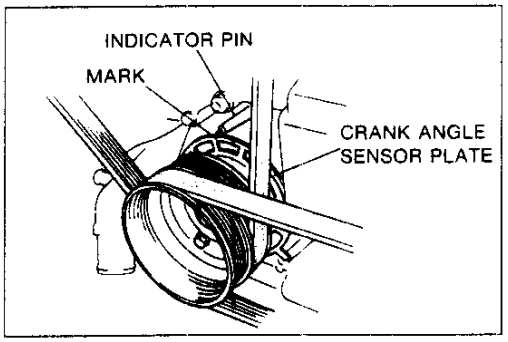
37U0GX-019



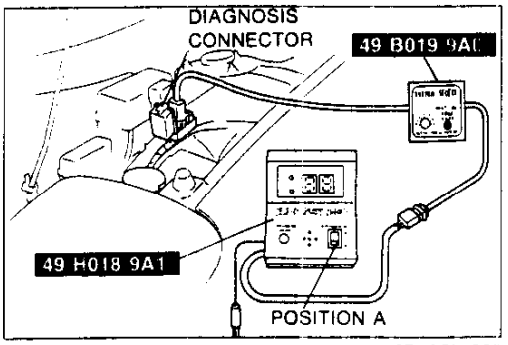
37U0GX-020



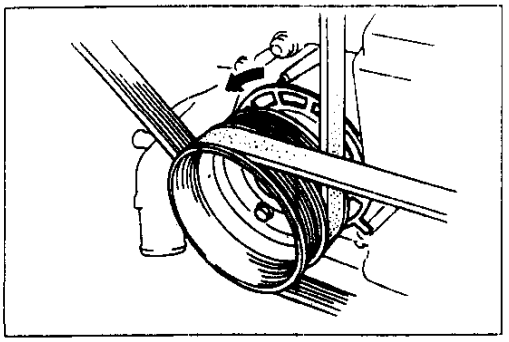
37U0GX-02



37U0GX-022



37U0GX-023


37U0GX-024

IGNITION TIMING

Caution

- **Do not adjust the ignition timing, it is set at the factory and must not be tempered with.**

Preperation

1. Warm up the engine to normal operating temperature.
2. Run the engine at idle and verify the following.
   - Sift selector lever to Prange (AT) / Neutral (MT).
   - Set steering wheel straight ahead.
   - Turn all electrical loads OFF.
   - Wait for electic cooling fan to stop.

Inspection

1. Connect a timing light and a tachometer.

Caution

- **Connect the timing light to the high-tension lead of the front trailing side.**
- **Some timing lights will not illuminate even if the ignition system is normal.**

2. Connect the **SST** to the diagnosis connector.
3. Set switch A to position 1.
4. Set TEST SW to SELF-TEST.
5. Verify that the idle speed is within specification.

Idle speed: 550–950 rpm

6. Verify that the timing mark (white) on the crank angle sensor plate is aligned with the indicator pin.

Ignition timing: Trailing side: 20°ATDC (– 20°BTDC)
Leading side: 5°ATDC (– 5°BTDC)

7. If the timing is incorrect, check the following.
   - Verify that no service code number is present. If present, check for the cause referring to the specified check sequence. (Refer to page F–20)
   - 05 Knock sensor
   - 13 Pressure sensor

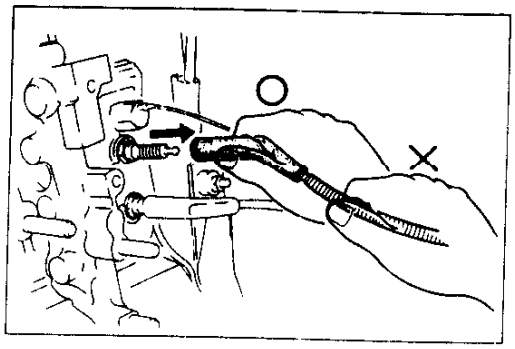
Input devices

- E/L, P/S, A/C, electric cooling fan
- Crank angle sensor (NE,G-Signal)
- Pressure sensor
- Throttle sensor
- Neutral SW / Clutch SW (MT)
- Inhibitor signal (AT)

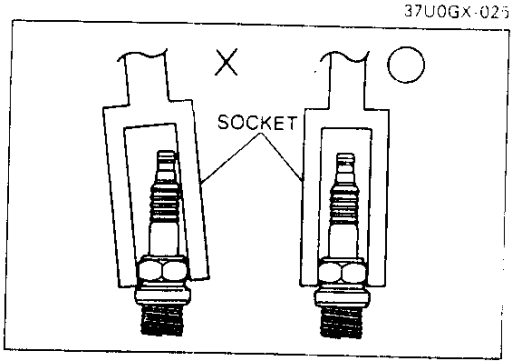
Others

- ECU terminal 3l voltage

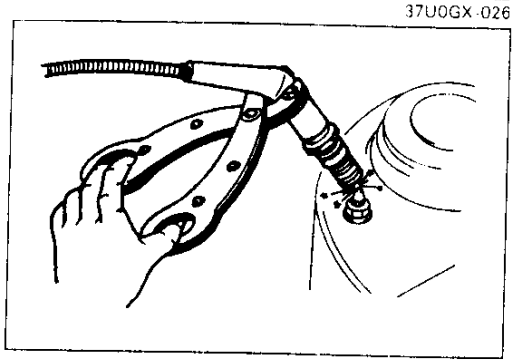
8. Disconnect the **SST**.
9. Verify that the ignition timing advances when the engine is above 1,500 rpm.



37U0GX-025



37U0GX-026


37U0GX-027

SPARK PLUGS

Removal / Installation

1. Remove and install the high-tension leads carefully

Caution

- **When the spark plug lead is to be pulled off, be sure to pull on the boot itself, not the wire.**

2. Remove and install the spark plugs by using a plug socket.

Caution

- **Be sure the socket is fit squarely over the spark plug.**

3. Apply anti-seize compound or molybdenum-based lubricant to the spark plug threads before installing.
4. Tighten the spark plugs to the specified torque.

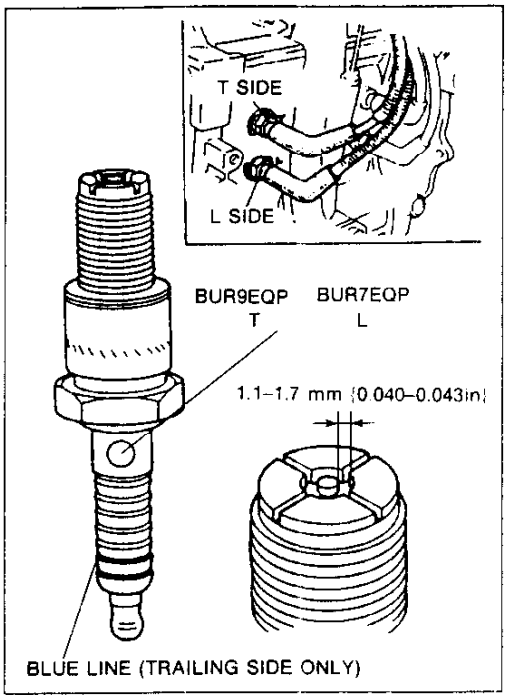
Tightening torque:
13–17 N·m {1.3–1.8 kgf·m, 9.5–13 ft·lbf}

Spark test

1. Remove the spark plug.
2. Connect the spark plug to a high-tension lead.
3. Hold the high-tension lead and spark plug with insulated pliers 5–10 mm {0.20–0.39 in} from a ground.
4. Check the engine and verify that there is a strong blue spark.

Note

- **If not as specified, replace the spark plug or high-tension lead as necessary.**



37U0GX-028

Inspection

Check the following points. If a problem is found, replace the spark plug.

- Damaged insulation
- Worn electrodes
- Carbon deposits
  If cleaning is necessary, use a plug cleaner or a wire brush. Clean the upper insulator, also.
- Damaged gasket
- Burnt

Plug gap: 1.1–1.7 mm {0.044–0.066 in}

Plug position	NGK	Color
Leading side	BUR7EQP*, (BUR7EQ) (BUR6EQP) (BUR6EQ)	–
Trailing side	BUR9EQP*, (BUR9EQ) (BUR8EQP) (BUR8EQ)	Blue

* Standard plug

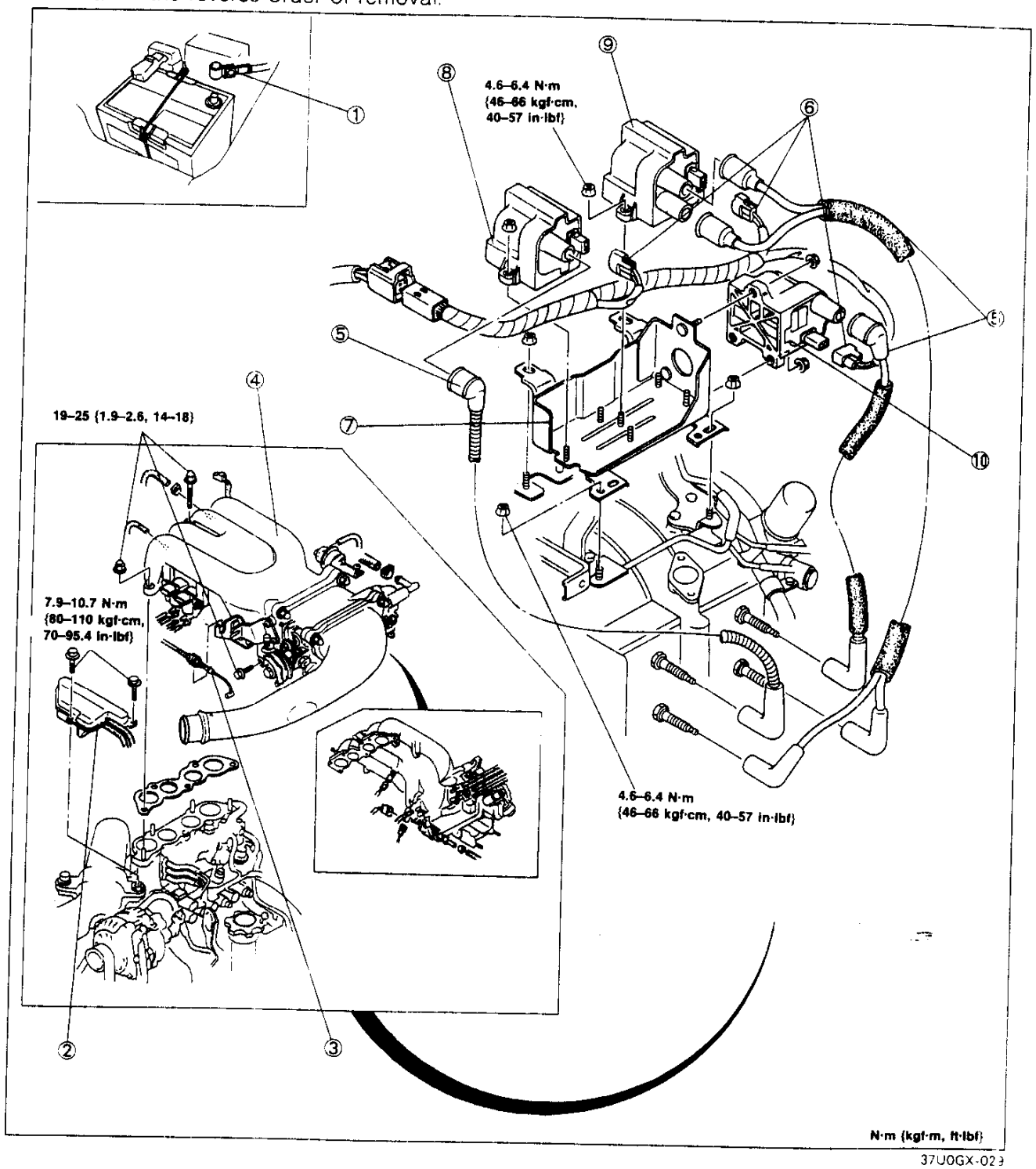
Caution

- **To protect the platinum electrode:**
  (1) Do not use a wire brush to clean the electrode.
  (2) Use a plug cleaner for a maximum of 20 seconds and air pressure below 589 kPa {6 kgf/cm^2, 85 psi}.
  (3) Do not adjust the plug gap to protect a platinum electrode.

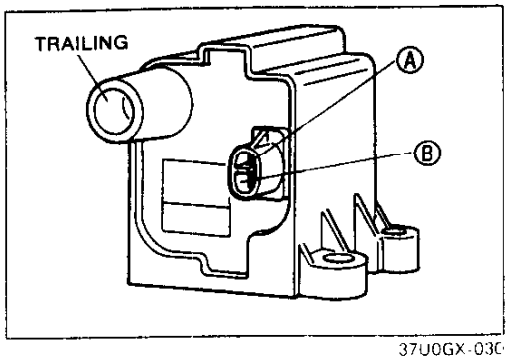
IGNITION COIL

Removal / Installation

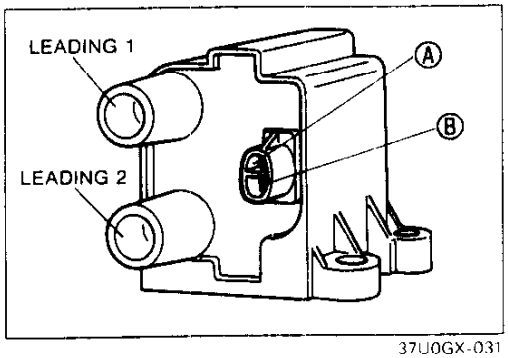
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



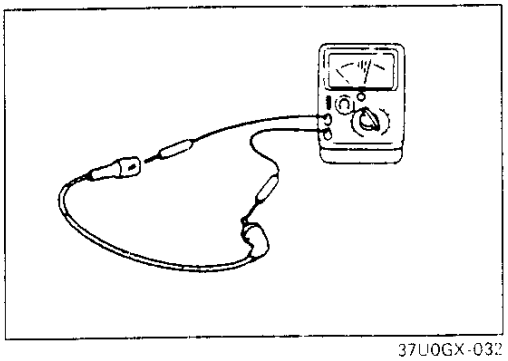
1. Battery negative cable
2. Pressure chamber
3. Accelerator cable
4. Extension manihold
5. High-tension lead
   Inspection ..... page G–21
6. Connector
7. Ignition coil bracket
8. Ignition coil (Trailing No.1)
   Inspection ..... page G–21
9. Ignition coil (Leading)
   Inspection ..... page G–21
10. Ignition coil (Trailing No.2)
    Inspection ..... page G–21



37U0GX-030



37U0GX-031



37U0GX-032

Inspection
T (Trailing) side

1. Measure resistance of the coil.

Inspection point	Resistance
A–B (primory coil winding)	below 1.0 Ω
A–T (secondary coil winding)	∞ (infinity)

2. If not within specification, replace the ignitioncoil.

L (Leading) side

1. Measure resistance of the coil.

Inspection point	Resistance
A–B (primary coil winding)	below 1.0 Ω
L_1–L_2 (secondary coil winding)	9.6–16.0 kΩ

2. If not within specification, replace the ignition coil.

HIGH-TENSION LEAD
Inspection

1. Measure resistance of the high-tension leads.

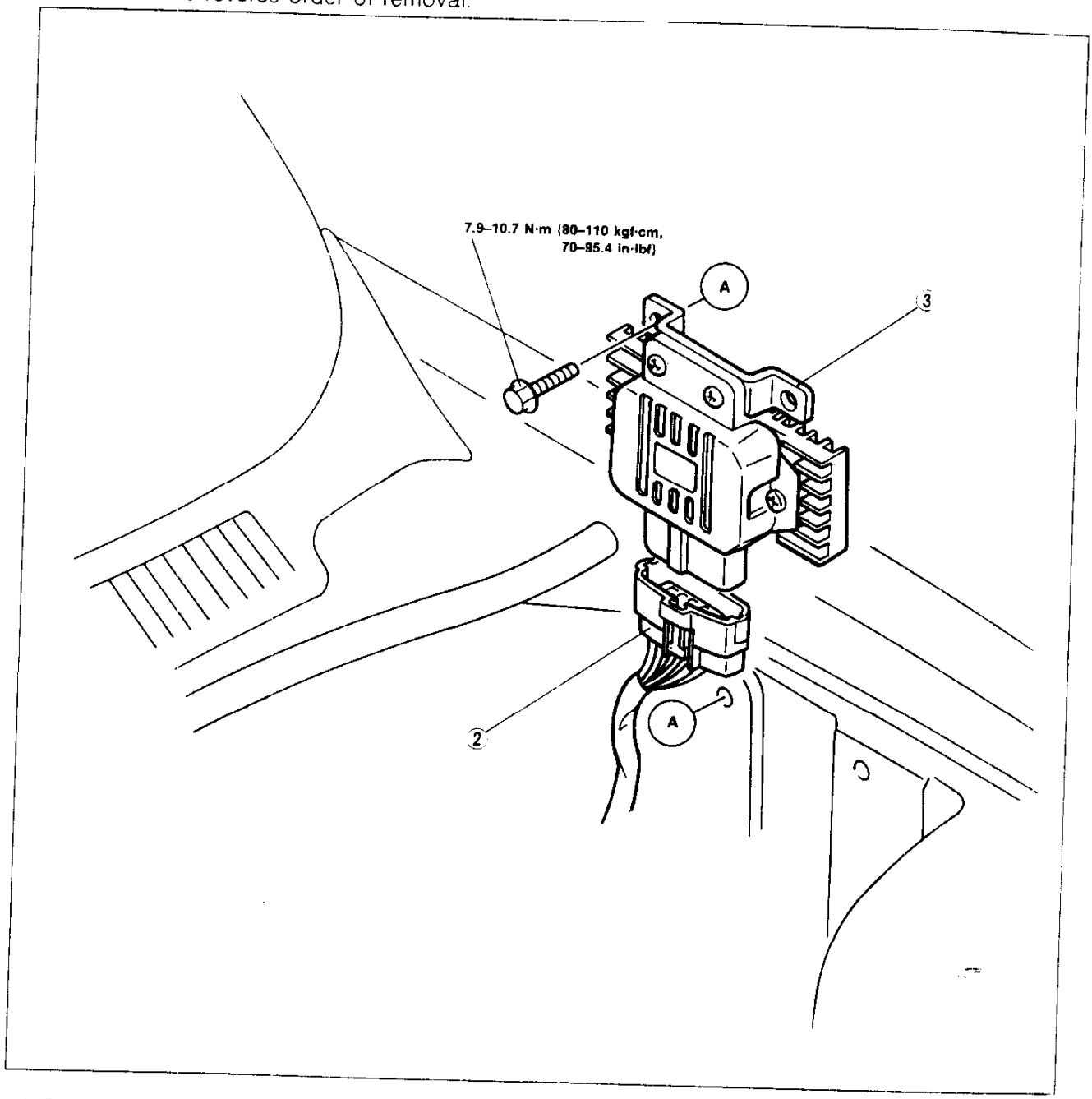
Specification: 16 kΩ per 1 m {3.28 ft}

2. If not as specified, replace the high-tension leads.

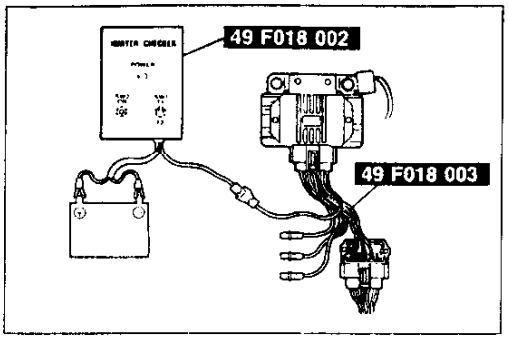
IGNITER

Removal / Installation

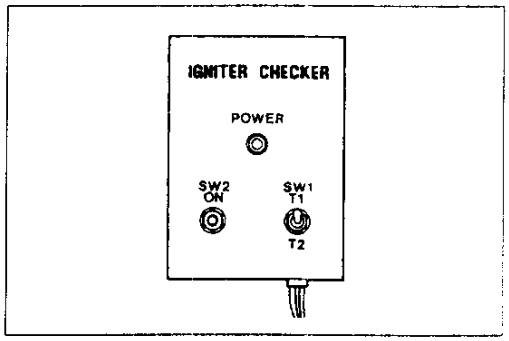
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



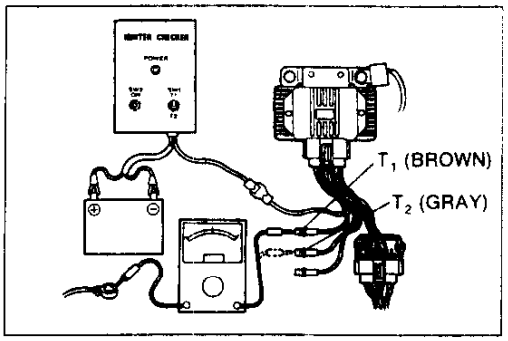
1. Battery negative cable
2. Connector
3. Igniter
   Inspection ..... page G–23



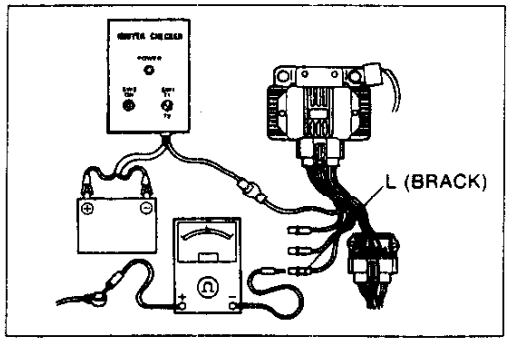
37U0GX-034



37U0GX-035



37U0GX-036



37U0GX-037

Inspection

Before this inspection, check the specific gravity of the battery, and that it is at or near full charge.

Note
- **SST (Adapter harness, Igniter checker) are used for inspection of the igniter.**

1. Disconnect the negative battery cable.
2. Disconnect the igniter connector.
3. Connect the **SST**.
4. Reconnect the negative battery cable.
5. Turn the ON ignition switch.

Note
- **Switch 1 may be in any position.**

Trailing side

1. Insert the voltmeter probe into the brown (Front rotor trailing) or gray (Rear rotor trailing) lead of the **SST** (adapter harness) and verify that the voltage is as specified.

Voltage: Battery voltage

2. Press switch 2 to ON when certify to shake a hand of voltmeter.
3. Replace the igniter, if necessary.

Leading side

1. Insert the voltmeter probe into the black lead of the **SST** (adapter harness) and verify that the voltage is as specified.

Voltage: Battery voltage

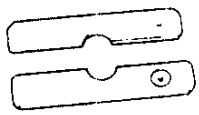
2. Press switch 2 to ON when certify to shake a hand of voltmeter.
3. Replace the igniter, if necessary.

37U0GX-038

STARTING SYSTEM

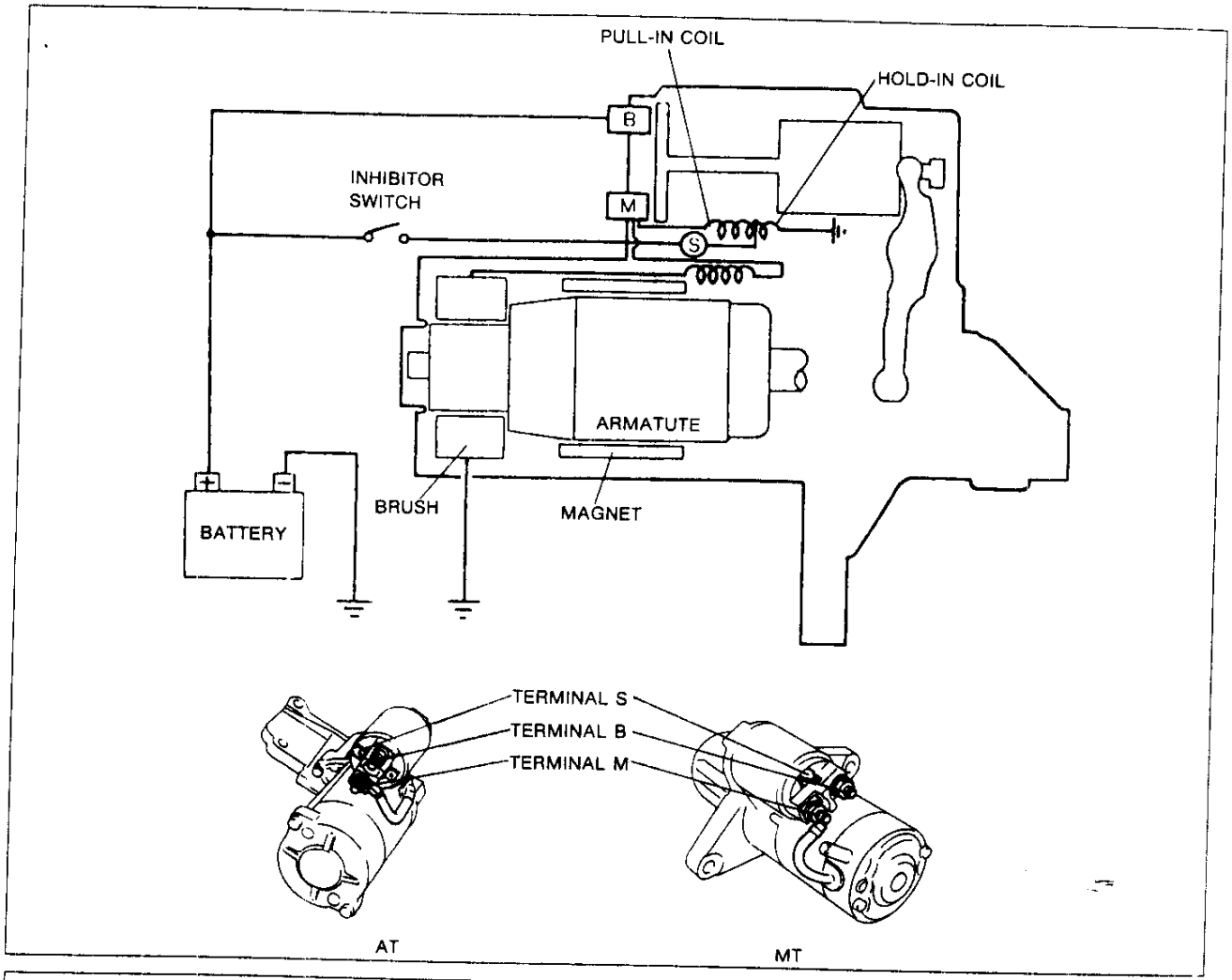
PREPARATION

SST

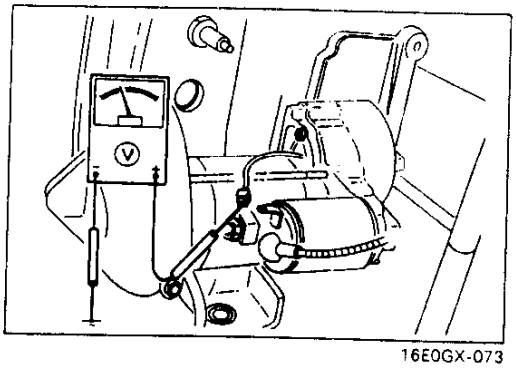
49 E301 144 Plate, removing		For installation of overrunning clutch

16E0GX-071

CIRCUIT DIAGRAM



37U0GX-039



16E0GX-073

STARTER

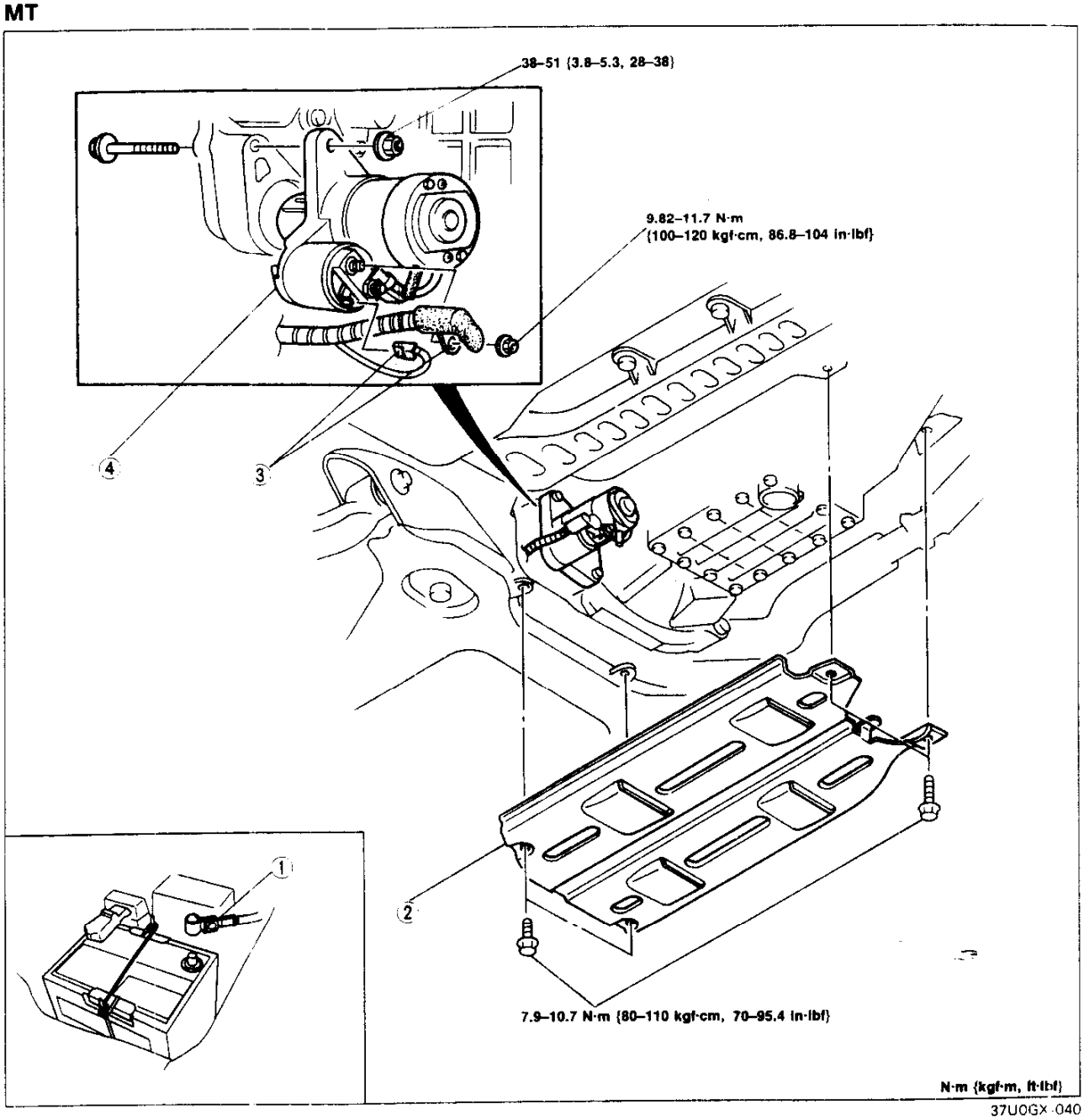
Inspection (on-vehicle)

1. Measure the battery voltage.
   Specification: Above 12.4V
2. Crank the engine, and verify that the starter turns smoothly.
3. If the starter does not turn, measure the voltage at terminal S.
4. If the voltage is **more than 8V,** remove and inspect the starter. If the voltage is **less than 8V,** check the wiring harness, ignition switch, and inhibitor switch (AT).

Removal / 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.

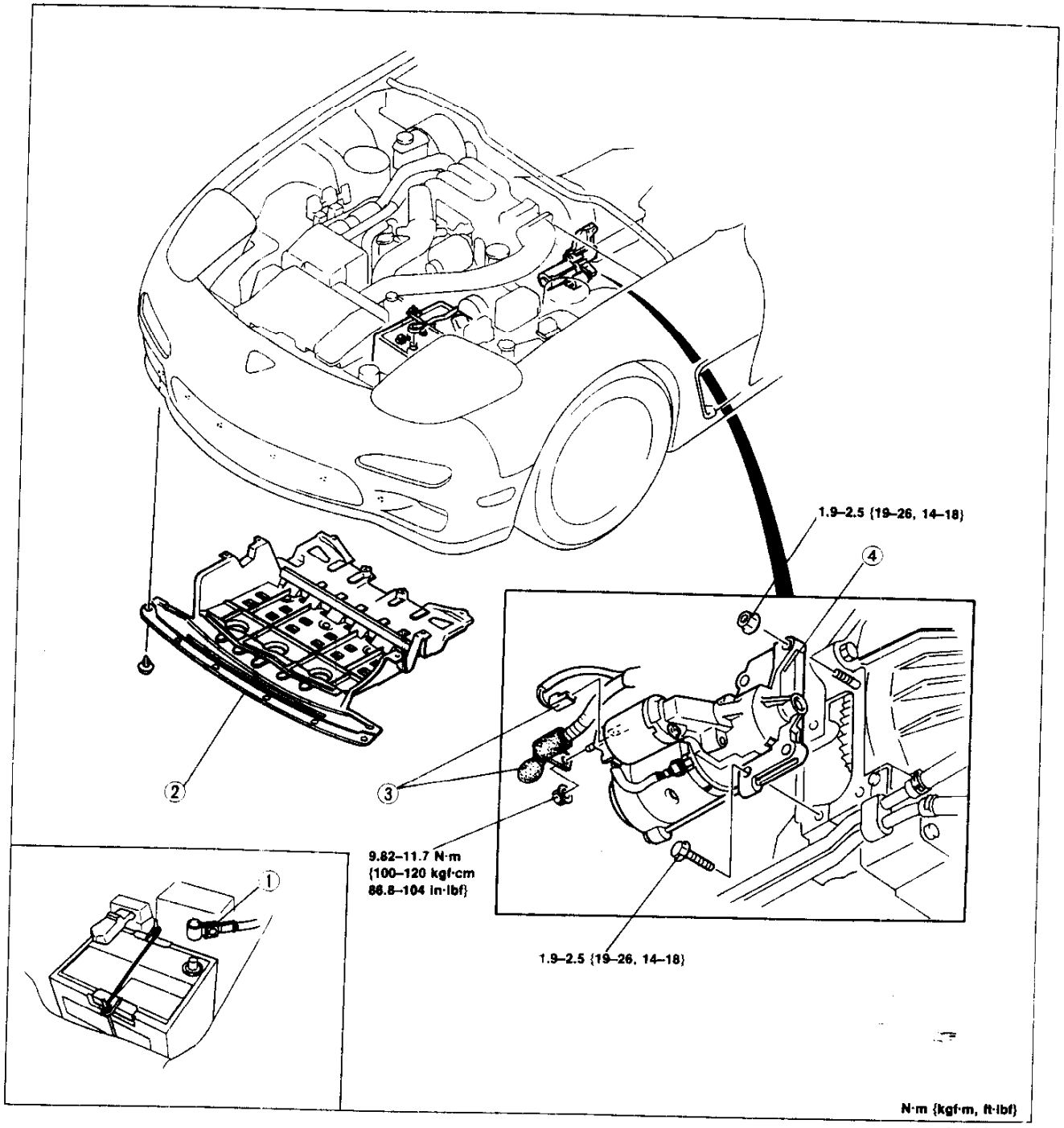
MT



37U0GX-040

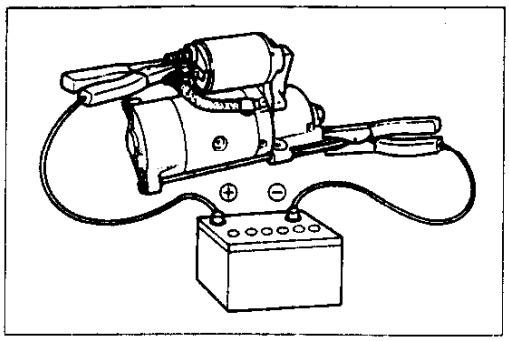
1. Battery negative cable
2. Under cover
3. Terminal S and B wire
4. Stater
   - Performance inspection ..... page G-27
   - Disassembly / Assembly ..... page G-28
   - Inspection ..... page G-30

AT

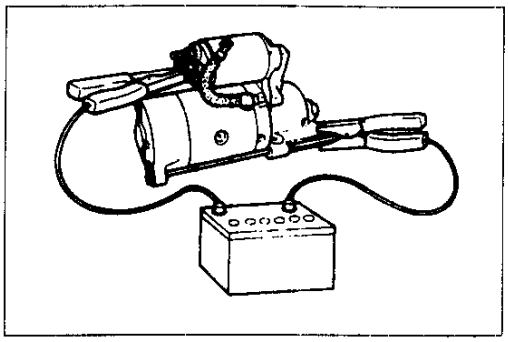


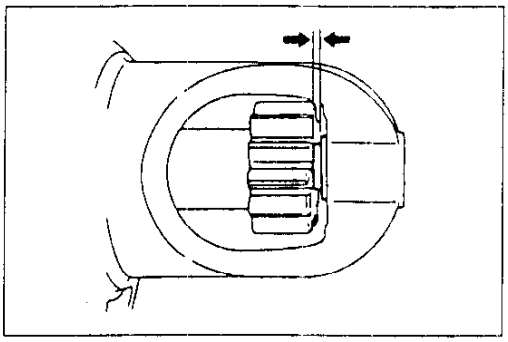
37U0GX-041

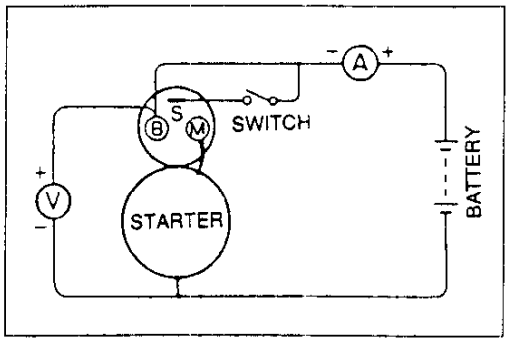
1. Battery negative cable
2. Under cover
3. Terminal S and B wire
4. Stater
   - Performance inspection ..... page G–27
   - Disassembly / Assembly ..... page G–29
   - Inspection ..... page G–30



37U0GX-042


16E0GX 078


16E0GX-079



16E0GX-080

Performance Inspection
Magnetic switch

Disconnect terminal M wire, and perform the following tests. Replace the magnetic switch if necessary.

Pull-in test

Connect battery voltage as shown and verify that the pinion is ejected.

Caution
- **Do not apply power for more than 10 seconds.**

Hold-in test

After completing the pull-in test, disconnect the wire from terminal M (with pinion ejected) and verify that the pinion does not return.

Adjustment of pinion gap

1. Disconnect the wire from terminal M.
2. Apply battery voltage between terminal S and the starter body.
3. Measure the clearance (pinion gap) between the pinion and the stopper.

Note
- **Do not apply power for more than 10 seconds.**

Pinion gap: 0.5–2.0 mm {0.020–0.078 in}

4. If the pinion gap is not within specification, increase or decrease the number of washers between the magnetic switch and the drive housing.

Note
- **The gap becomes smaller as the number of washers is increased.**

No load test

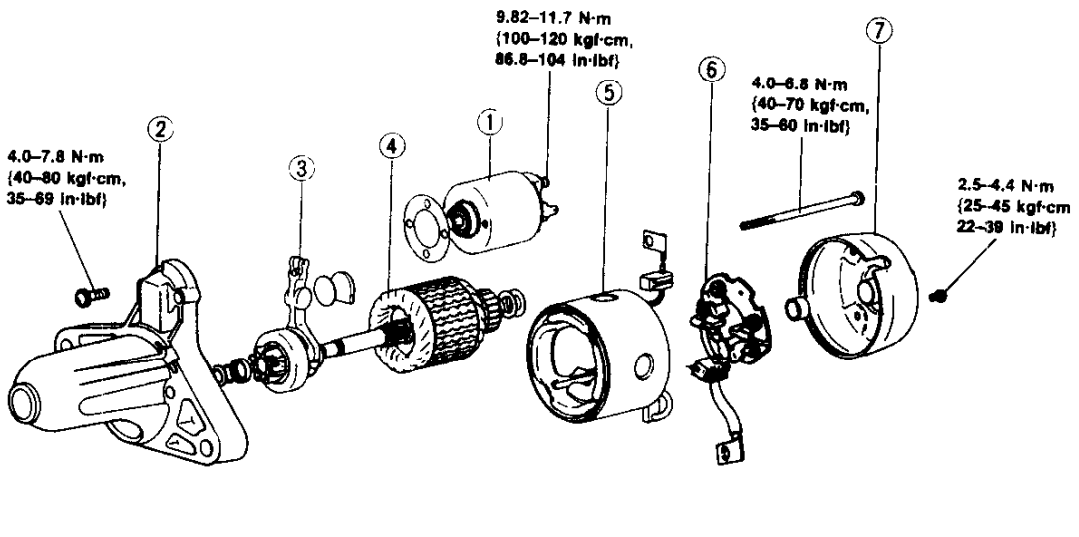
1. Connect a circuit as shown.
2. Measure voltage, current, and speed as shown below.

Voltage	**(V)**	11.0
Current	**(A)**	Max 90
Speed	**(rpm)**	Min 2,200 (AT), Min 3,000 (MT)

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.

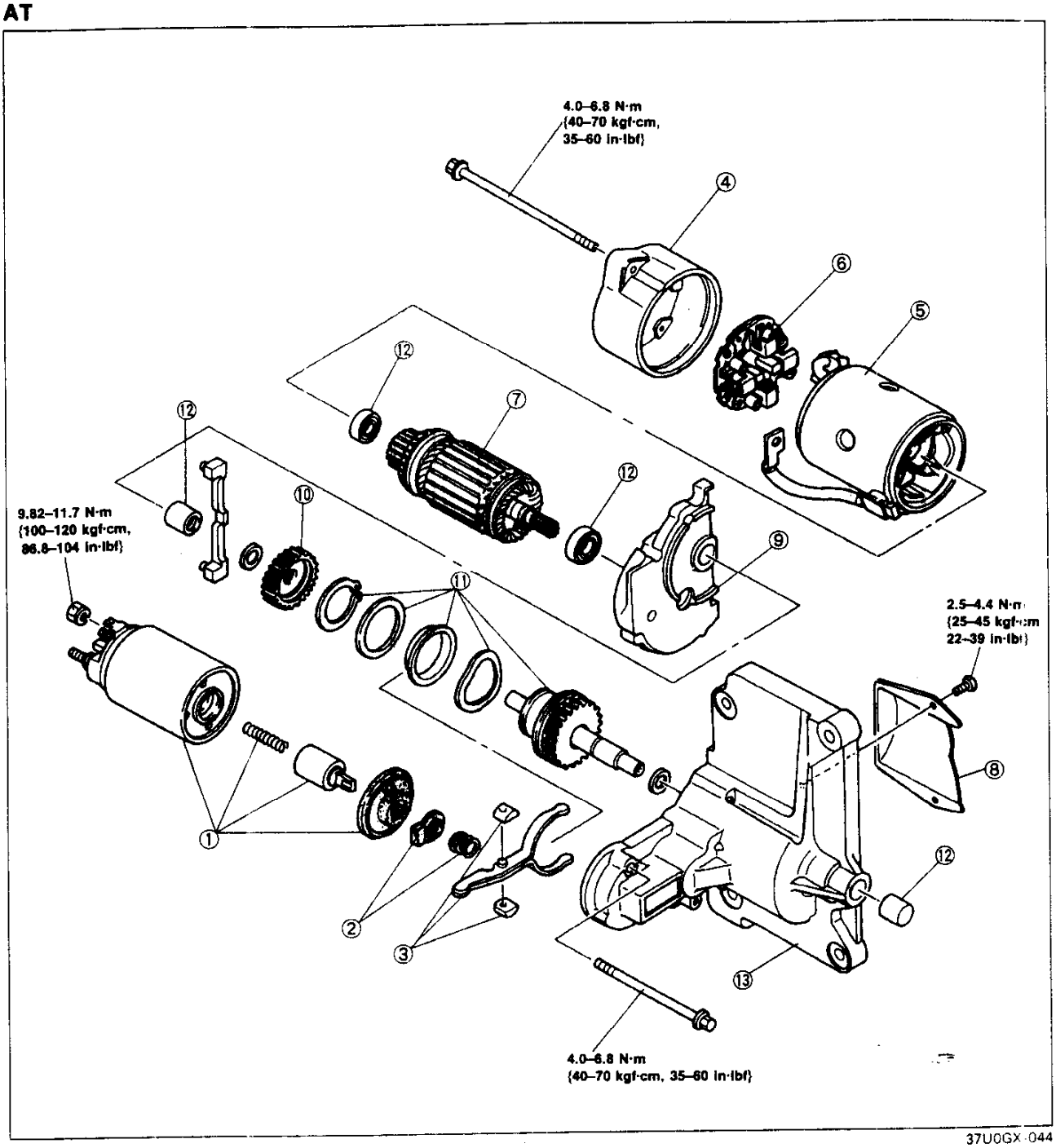
MT



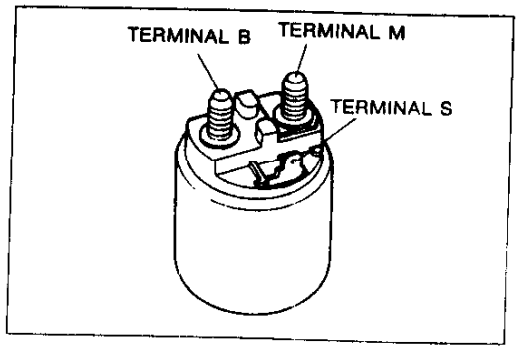
37U0GX-013

1. Magnetic switch
   Performance inspection ..... page G–27
   Inspection ..... page G–30
2. Front bracket
3. Drive pinion
   Inspection ..... page G–31
4. Lever
5. Armature
   Inspection ..... page G–30
6. Field coil
   Inspection ..... page G–30
7. Brush and Brush holder
   Inspection ..... page G–3·
8. Rear bracket
9. Bearing

AT



1. Magnetic switch
   Performance
   Inspection ... page G–27
   Inspection ..... page G–30
2. Spring set
3. Lever set
4. Rear bracket
5. Field coil
   Inspection ..... page G–30
6. Brush and Brush holder
   Inspection ..... page G–31
7. Armature
   Inspection ..... page G–30
8. Cover
9. Center bracket
10. Reduction gear
11. Pinion shaft assembly
    (Overrunning clutch)
    Inspection ..... page G–31
12. Bearing
13. Front bracket



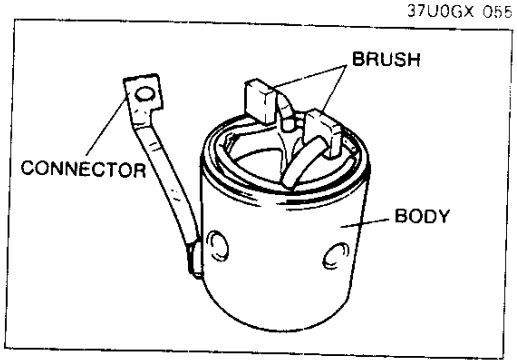
37U0GX-055

Inspection

Magnetic switch

- Check the continuity as shown.

Inspection point	Continuity
Terminal S–M	Yes
Terminal M–B	No
Terminal S–Body	Yes

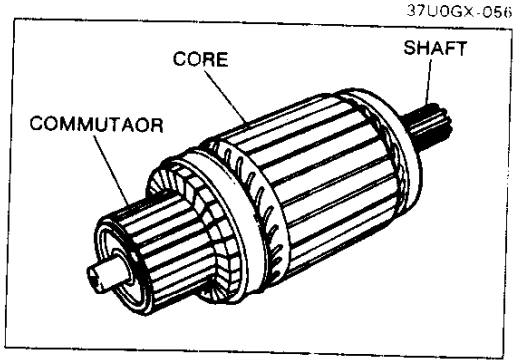


37U0GX-056

Field coil

- Check the continuity as shown.

Inspection point	Continuity
Brush – Connector	Yes
Body – Connector	No

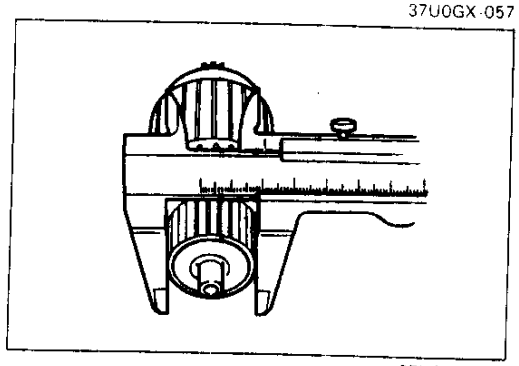


37U0GX-057

Armature

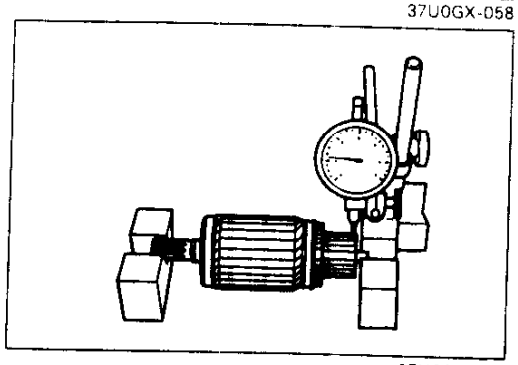
1. Check the continuity as shown.

Inspection point	Continuity
Commutator – Core	Yes
Commutator – Shaft	No
Core – Shaft	No


37U0GX-058

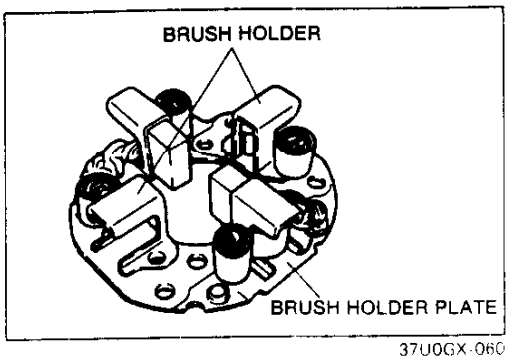
2. Replace the armature if the outer diameter of the commutator is almost at or less than the minimum.
3. If the commutator surface is dirty, wipe it with a cloth; if it is rough, repair it with a lathe or fine sandpaper.

Minimum diameter
32.0 mm {1.26 in}


37U0GX-059

4. Place the armature on V-blocks, and measure the runout by using a dial indicator.
5. If the runout is not within specification, repair the armature by using a lathe or replace it.

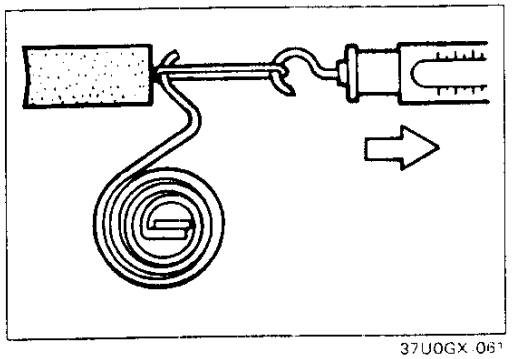
Runout: 0.05 mm {0.002 in}



37U0GX-060

Brush and Brush holder

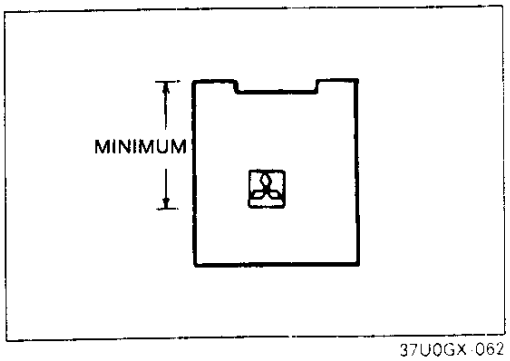
1. Check for continuity between the insulated brush and the plate. Repair or replace if there is continuity. Also check that the brush slides smoothly inside the brush holder.


37U0GX-061

2. Measure the force of the brush spring by using a spring balance.

   Standard: 18.6–22.6 N {1.89–2.31 kgf, 4.16–5.09 lbf}
   Maximum: 6.9 N {0.7 kgf, 1.5 lbf}

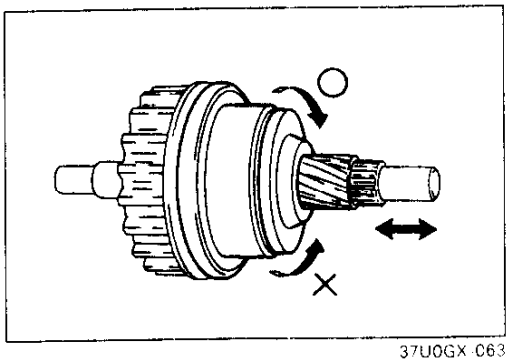
3. Replace the spring if not as specified.



37U0GX-062

4. If a brush is worn almost to or beyond the wear limit, replace all of the brushes.

Specification	MT	AT
Standard mm {in}	17 {0.67}	18 {0.71}
Minimum mm {in}	11 {0.43}	11 {0.43}


37U0GX-063

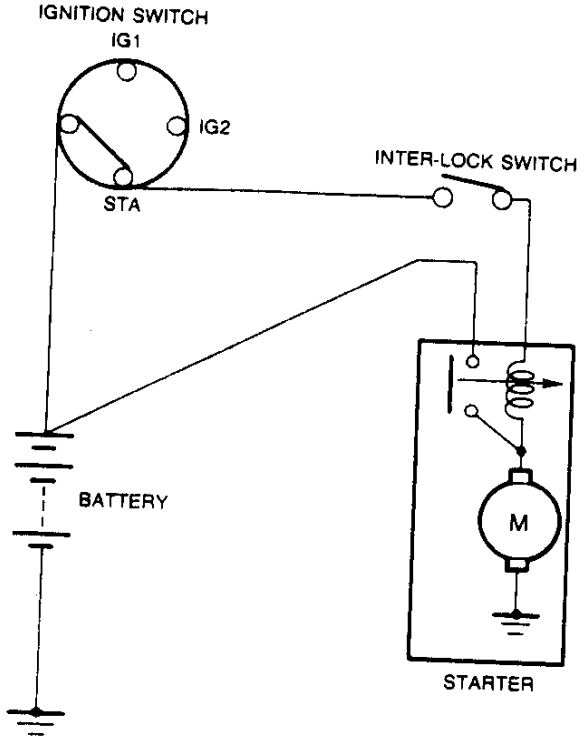
Overrunning Clutch

1. Turn the pinion shaft by hand while holding the overrunning clutch.
2. Replace the overrunning clutch if the pinion turns in both or in neither direction.

Note

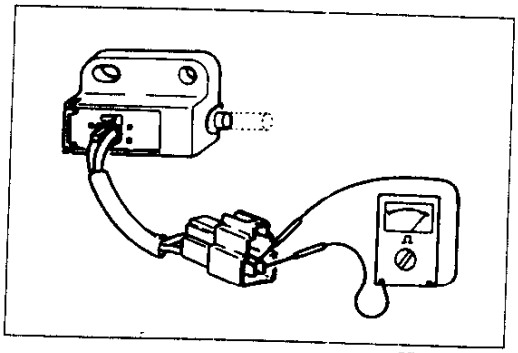
- **Do not wash the overrunning clutch with solvent, as it is packed with grease.**

INTERLOCK SWITCH



77U0GX-015

This system is similar to that of the inhibitor switch on at AT vehicle.
If the clutch pedal is not depressed during starting, battery power will not be supplied to the starter and the starter will not operate.



77U0GX-016

Inspection

1. Disconnect the interlock switch connector.
2. Connect a circuit tester to the switch.
3. Check the continuity.

Pedal	Continuity
Depressed	Yes
Released	No

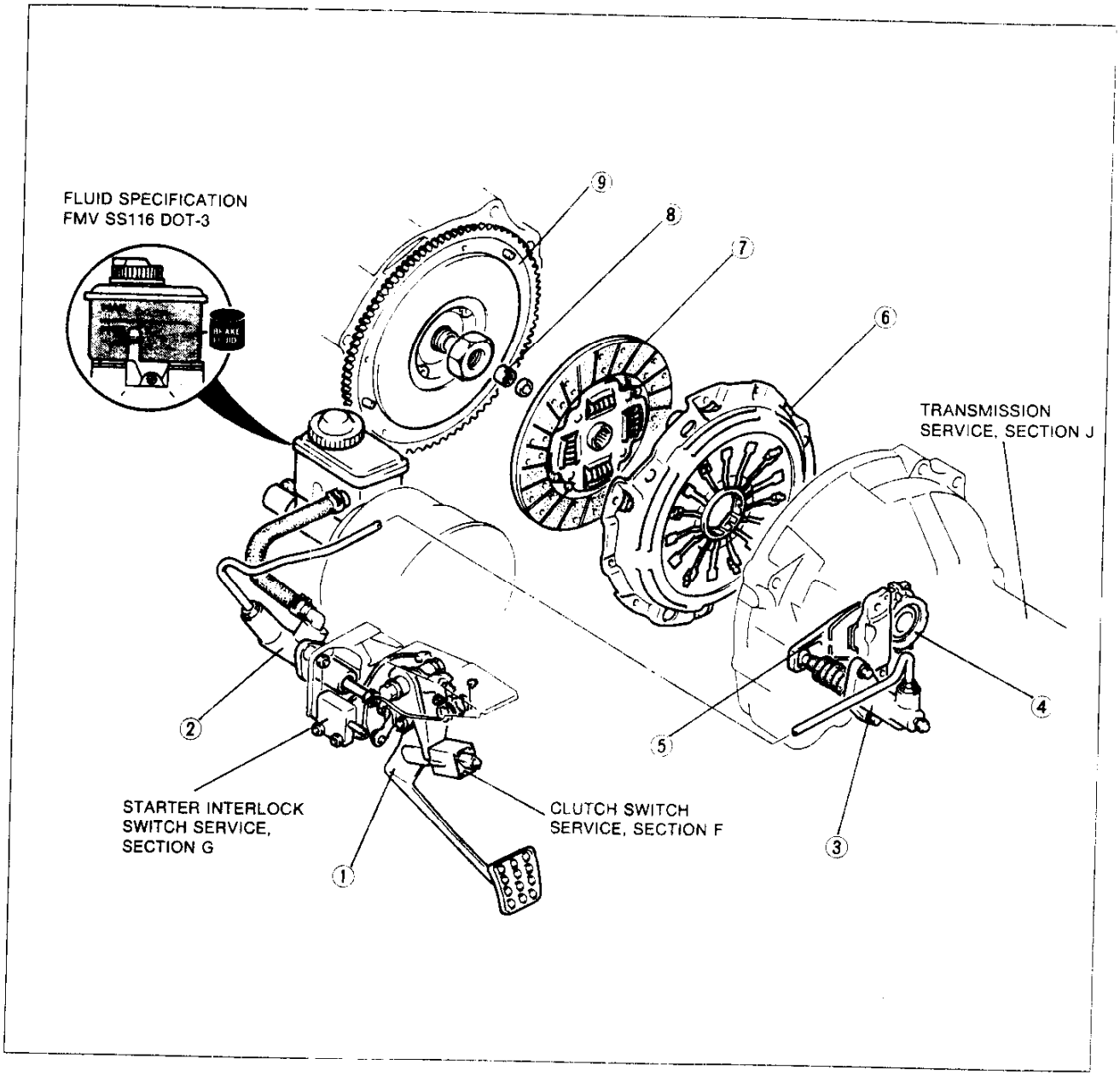
4. If not as specified, replace the switch.

Before beginning any service procedure, refer to the 1993 RX-7 Body Electrical Troubleshooting Manual; see section S for air bag system precautions and J1 for audio anti-theft system precautions.

CLUTCH

37U0HX-001

INDEX



OUTLINE

SPECIFICATIONS

Item \ Transmission model			R15M-D (R5M-D)
Clutch control			Hydraulic
Clutch pedal	Type		Suspended
	Pedal ratio		6.35
	Full stroke	mm {in}	135 {5.32}
	Height (with carpet)	mm {in}	165.5–177.0 {6.516–6.968}
Clutch disc	Outer diameter	mm {in}	236 {9.29}
	Inner diameter	mm {in}	160 {6.30}
	Facing thickness	Flywheel side mm {in}	3.5 {0.14}
		Pressure plate side mm {in}	3.5 {0.14}
Clutch cover	Type		Diaphragm spring
	Set load	N {kgf, lbf}	7,220 {736,1619}
Clutch master cylinder	Inner diameter	mm {in}	15.87 {0.625}
Clutch release cylinder	Inner diameter	mm {in}	19.05 {0.750}
Clutch fluid			FMVSS116 DOT-3

37U0HX-003

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Slipping	Clutch disc facing worn excessively	Replace	**H-17**
	Clutch disc facing surface hardened or oil soaked	Repair or replace	**H-17**
	Pressure plate damaged	Replace	**H-17**
	Flywheel damaged	Replace	**H-17**
	Diaphragm spring damaged or weak	Replace	**H-17**
	Insufficient clutch pedal play	Adjust	**H-6**
	Clutch pedal sticking	Repair or replace	**H-7, 8**
Faulty disengagement	Clutch disc damaged or excessive runout	Replace	**H-17**
	Clutch disc splines rusted or worn	Repair or replace	**H-17**
	Oil on clutch disc facing	Repair or replace	**H-17**
	Diaphragm spring damaged or weak	Replace	**H-17**
	Excessive clutch pedal play	Adjust	**H-6**
	Leakage of clutch fluid	Locate and repair or replace	–
Clutch vibrates when accelerating	Oil on clutch disc facing	Repair or replace	**H-17**
	Clutch disc facing hardened or damaged	Repair or replace	**H-17**
	Diaphragm spring weak	Replace	**H-17**
	Clutch disc facing rivets loose	Replace	**H-17**
	Pressure plate damaged or excessive runout	Replace	**H-17**
	Flywheel surface hardened or damaged	Repair or replace	**H-17**
	Loose or worn engine mount	Tighten or replace	–
Clutch pedal sticks	Pedal shaft not properly lubricated	Lubricate or replace	**H-8**
Abnormal noise	Clutch release collar damaged	Replace	**H-17**
	Release collar not properly lubricated	Lubricate or replace	**H-17**
	Torsion spring weak	Replace	**H-17**
	Pilot bearing worn or damaged	Replace	**H-17**
	Worn pivot points of release fork	Repair or replace	**H-17**
	Release fork contact points not properly lubricated	Lubricate or replace	**H-17**
Clutch pedal vibrates when engine running	Improper installation of or damage to wedge collar and wire ring assembly	Replace	**H-17**

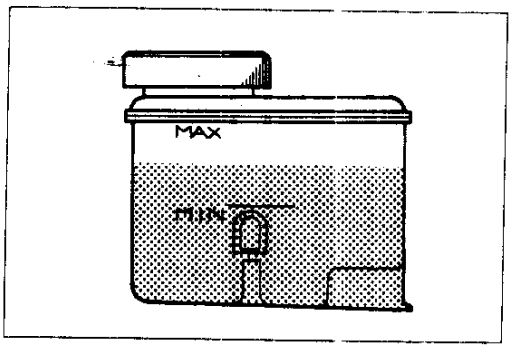
37U0HX-004

CLUTCH FLUID

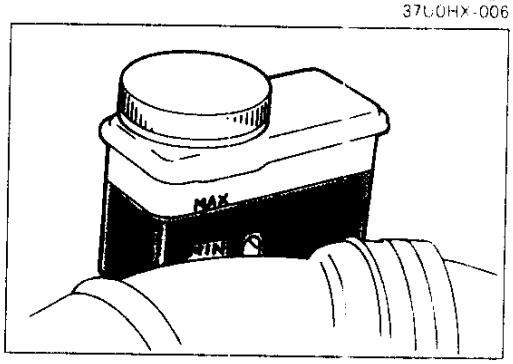
PREPARATION
SST

49 0259 770B Wrench flare nut		For air bleeding

37U0HX-005



37U0HX-006



37U0HX-007

INSPECTION

Note

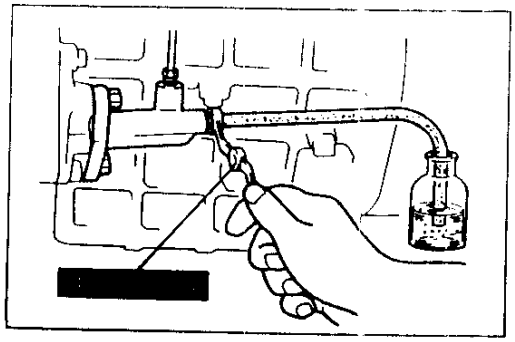
- **A common reservoir is used for the clutch and brake system fluids.**

1. Make sure that the fluid level in the reservoir is between the MAX and MIN mark.
2. If the fluid level is extremely low, check the clutch and brake systems for leakage.

REPLACEMENT

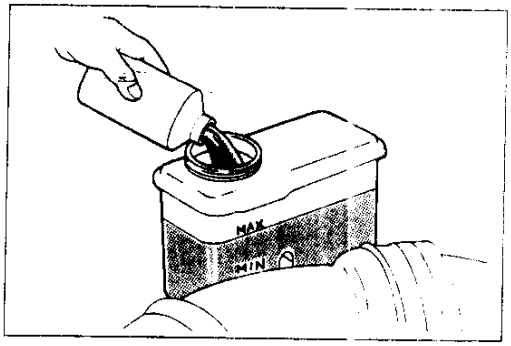
Caution

- **Be careful not to spill fluid on a painted surface. If this should happen, wash the surface off immediately.**
- **Use only the specified fluid. Avoid mixing different brands of fluid.**
- **Do not reuse old clutch fluid.**
- **The clutch and brakes draw fluid from the same reservoir; therefore draining the clutch fluid also drains the brake fluid from the reservoir.**



37U0HX-009

1. Drain the brake fluid from the reservoir by using a suction pump. (Refer to section P.)
2. Remove the bleeder cap from the clutch release cylinder and attach a vinyl hose to the bleeder plug.
3. Insert the other end of the vinyl hose into a clear container.
4. Loosen the bleeder screw by using the **SST**.
5. With another person slowly pumping the clutch pedal, drain the clutch fluid.
6. Repeat step 5 until all the fluid is drained.



37J0HX-010

7. Tighten the bleeder screw by using the **SST**.

Caution

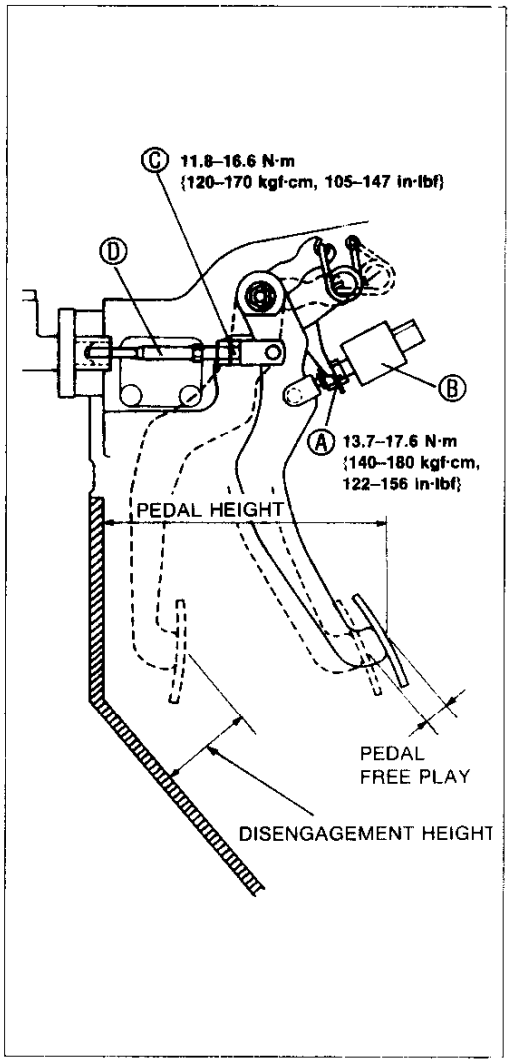
- **When tightening the bleeder screw with the SST, adjust the below-written tightening torque by using the following formulas. Choose the formula that applies to you.**

(L = torque wrench length)

N·m	N·m × L m ÷ (L m + 0.05)
kgf·cm	kgf·cm × L cm ÷ (L cm + 5.0)
in·lbf	in·lbf × L in ÷ (L in + 2.0)

Tightening torque:
5.9–8.8 N·m {60–90 kgf·cm, 53–78 in·lbf}

8. Add fluid to the MAX mark.
9. Bleed the air from the clutch. (Refer to page H–11.)
10. Bleed the air from the brakes. (Refer to section P.)
11. Check for correct clutch operation.
12. Verify that there is no fluid leakage.



37GH1X-01

CLUTCH PEDAL

ADJUSTMENT

Clutch Pedal Height
Inspection

Measure the distance from the upper surface of the pedal to the carpet.

Pedal height: 165.5–177.0 mm {6.516–6.968 in} (with carpet)

If necessary, adjust the pedal height.

Adjustment

1. Disconnect the clutch switch connector.
2. Loosen locknut A and turn clutch switch B until the pedal height is correct.
3. Tighten locknut A.

Tightening torque:
13.8–17.6 N·m {140–180 kgf·cm 122–156 in·lbf}

4. After adjustment, inspect the pedal free play.

Clutch Pedal Free Play
Inspection

Depress the clutch pedal by hand until clutch resistance is felt.

Pedal free play: 0.6–3.2 mm {0.02–0.13 in}
Total pedal free play: 5.1–14 mm {0.20–0.55 in}

If necessary, adjust the pedal free play.

Adjustment

1. Loosen locknut C and turn push rod D until pedal free play is correct.
2. Verify that the disengagement height from the upper surface of the pedal height to the carpet is correct when the pedal is fully depressed.

Minimum disengagement height: 48 mm {1.9 in} (with carpet)

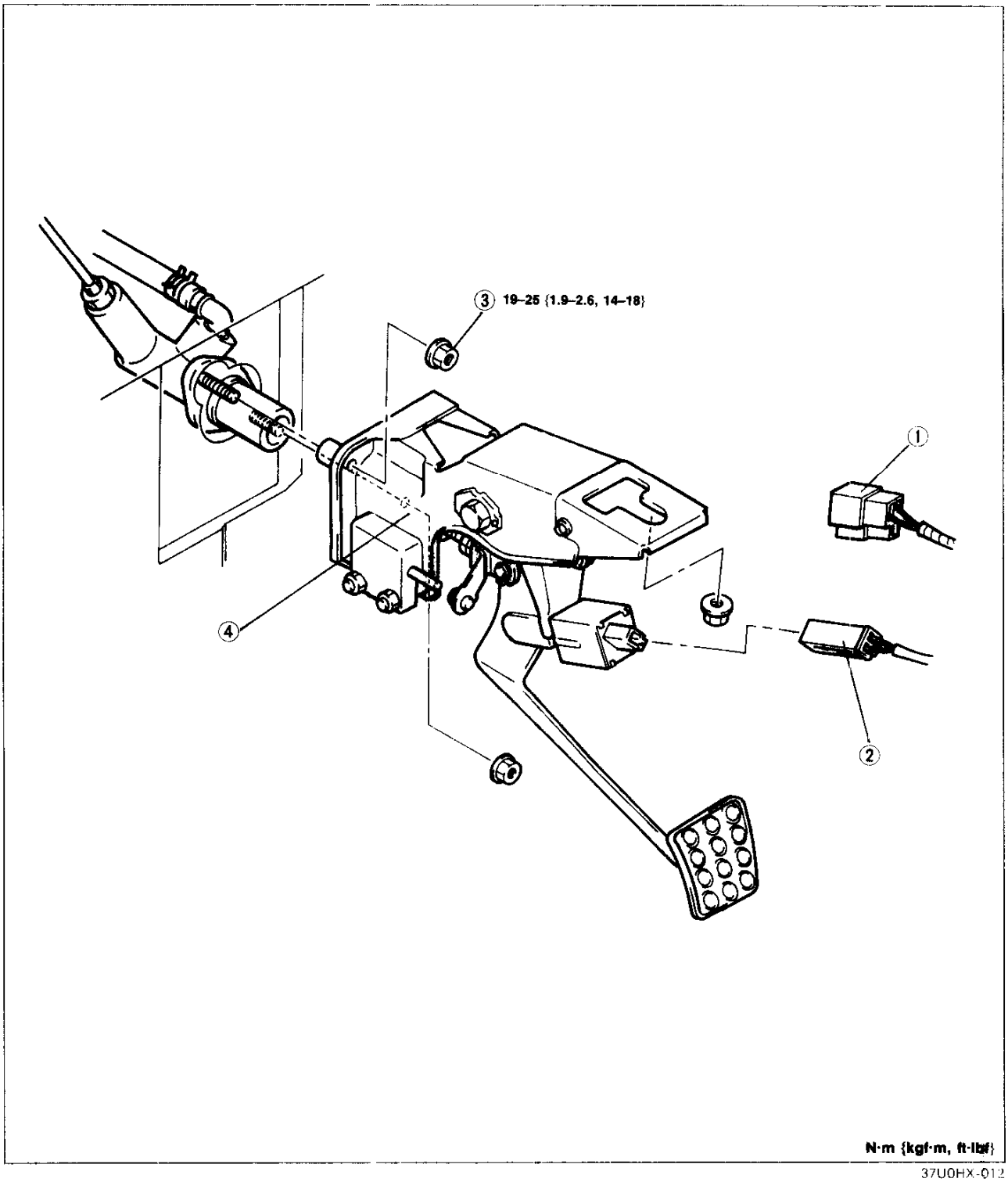
3. Tighten locknut C.

Tightening torque:
11.8–16.6 N·m {120–170 kgf·cm, 105–147 in·lbf}

4. After adjustment, inspect the pedal height.

REMOVAL / INSTALLATION

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



37U0HX-012

1. Starter interlock switch connector
2. Clutch switch connector
3. Nut
4. Clutch pedal assembly
   Adjustment ..... page H-6
   Overhaul ..... page H-8

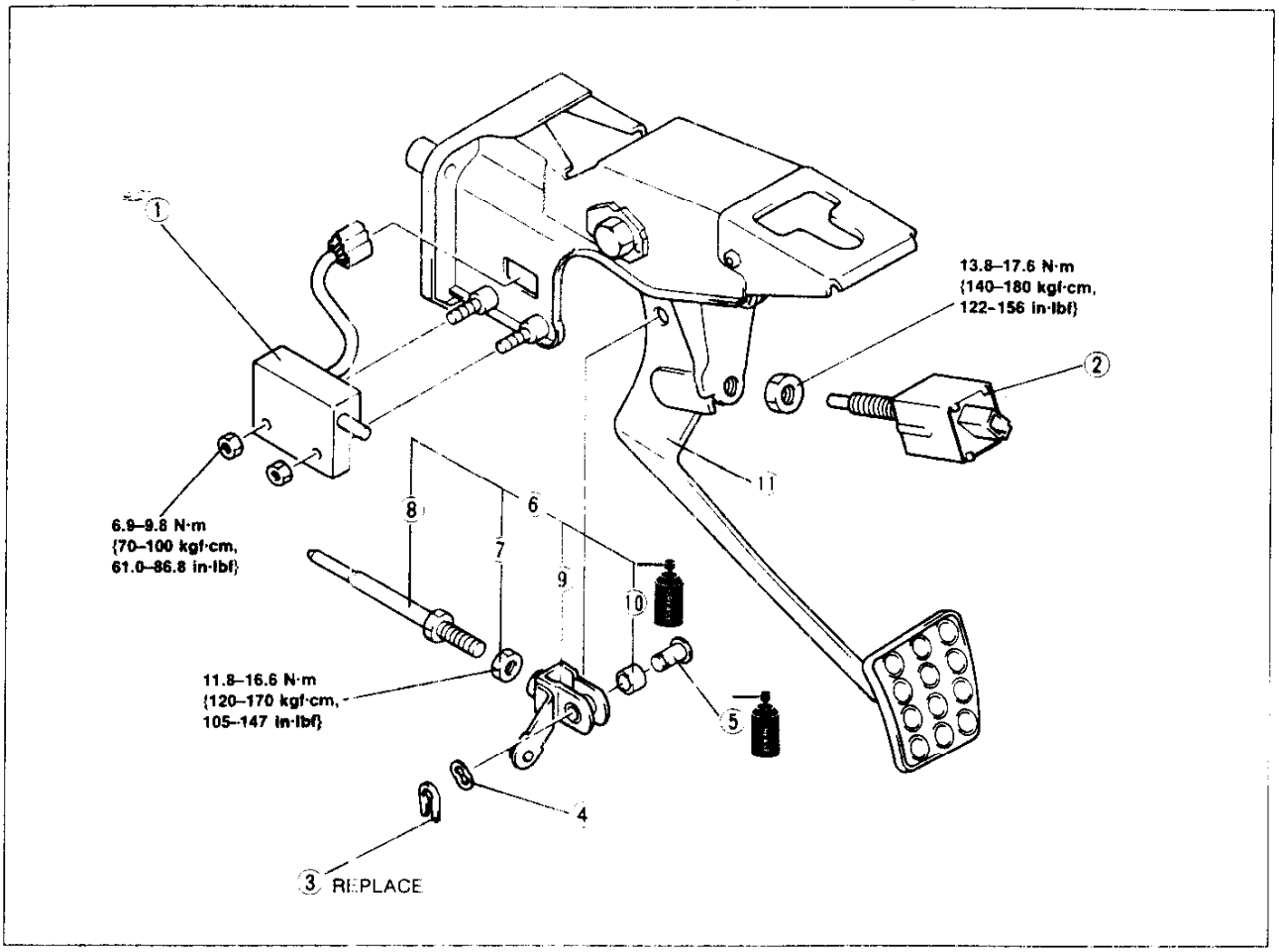
OVERHAUL

1. Disassemble in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.

Note

- **Apply lithium-based grease to the spring, bushings, and pins when assembling.**

3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



37U0HX013

1. Starter interlock switch
2. Clutch switch
3. Retaining ring
4. Wave washer
5. Pin
6. Push rod assembly
   Inspect for damage and bending.
7. Nut
8. Push rod
9. Fork
10. Spacer
11. Clutch pedal assembly

CLUTCH MASTER CYLINDER

PREPARATION

SST

49 0259 770B Wrench, flare nut		For disconnecting and connecting clutch pipe

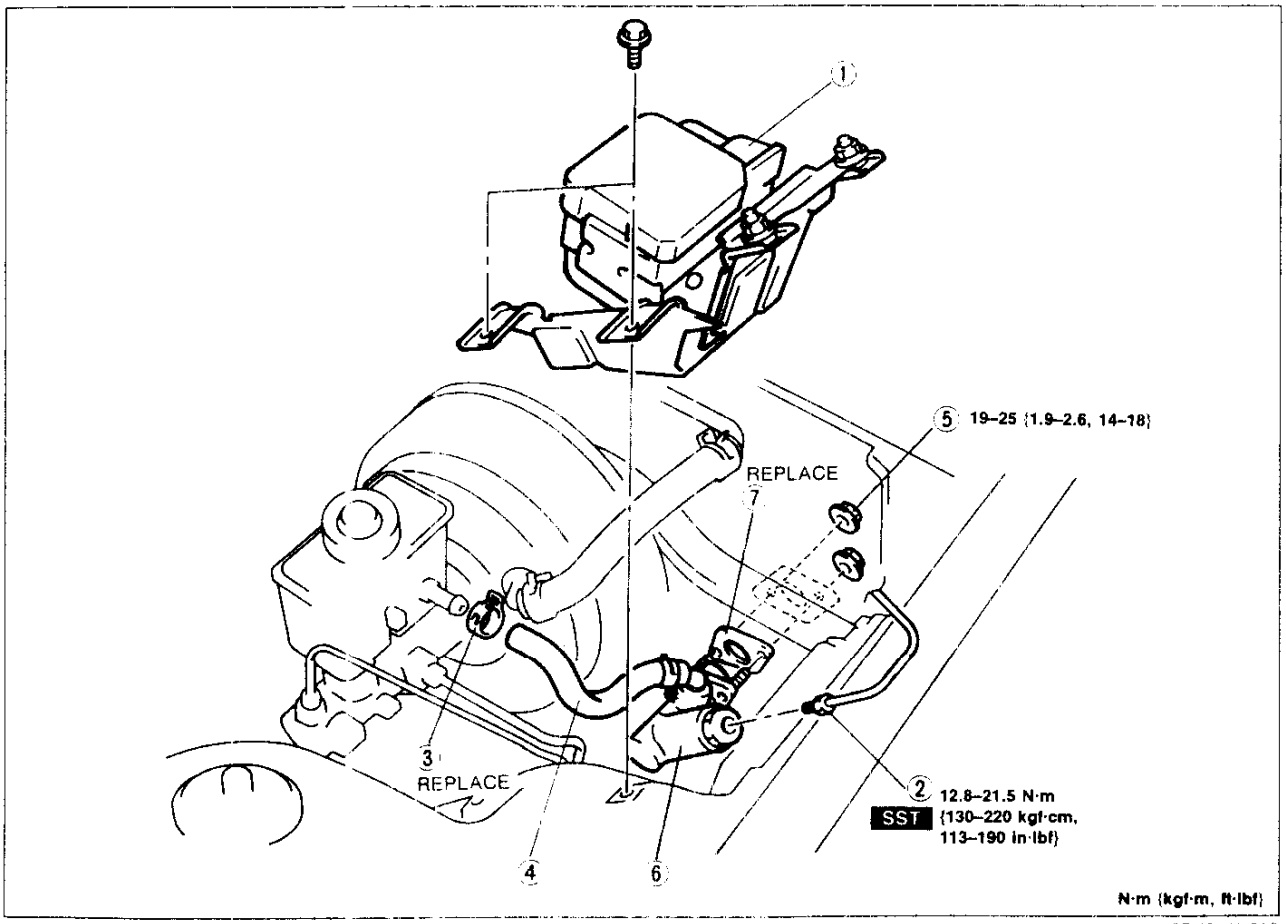
37U0HX-014

REMOVAL / INSPECTION / INSTALLATION

Caution

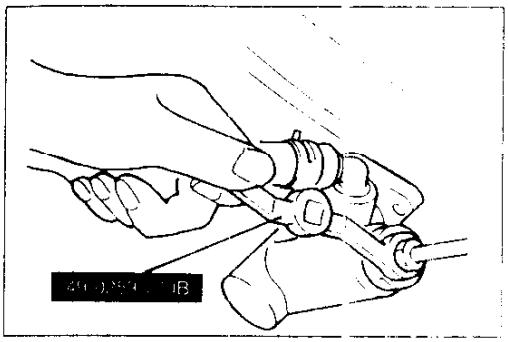
- **Clutch fluid will damage painted surfaces. Be sure to use a container or rags to collect it. If fluid gets on a painted surface, wipe it off immediately with a rag.**

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**.

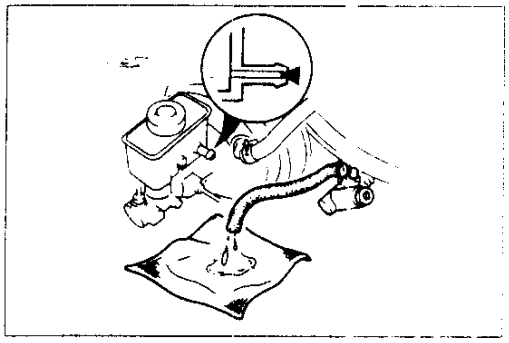


37U0HX-015

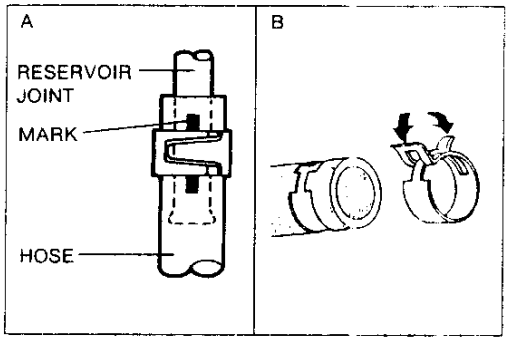
1. Cruise control actuator assembly
2. Clutch pipe
   Removal Note ..... page H–10
   Installation Note ..... page H–10
3. Hose clamp
4. Clutch hose
   Installation Note ..... page H–10
5. Nut
6. Clutch master cylinder
   Overhaul ..... page H–12
   Inspect for fluid leakage from the cylinder bore
   Air bleeding .... page H–11
7. Gasket



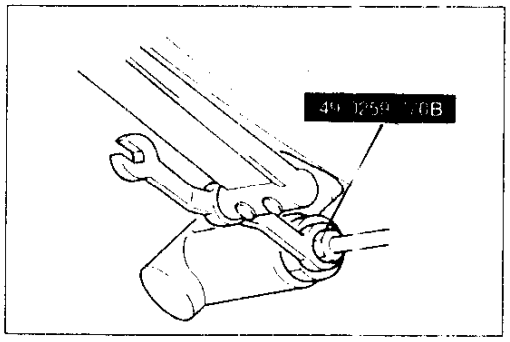
37U-HX-016



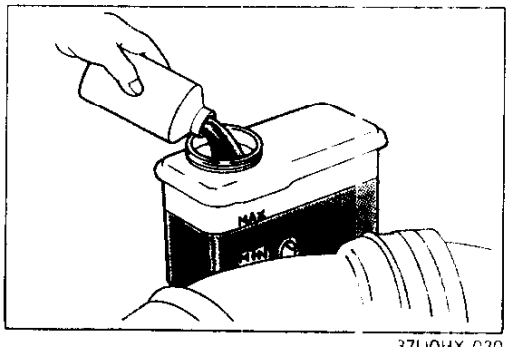
37J0HX-017



37U0HX-018



37U0HX-019



37U0HX-020

Removal Note
Clutch pipe

Caution
- **Clutch fluid will damage painted surfaces. If fluid does get on a painted surface, wipe it off immediately with a rag.**

1. Disconnect the clutch pipe by using the **SST**
2. Disconnect the clutch hose from the reservoir.
3. Plug the outlet of the reservoir.

Installation Note
Clutch hose

Caution
- **Install the clutch hose with the mark facing upward, as shown in figure A.**
- **If reusing the clutch hose, install the new hose clamp exactly into the mark left by the previous hose clamp, as shown in figure B.**
- **Squeeze the clamp lightly with large pliers to ensure a good fit.**

Clutch pipe

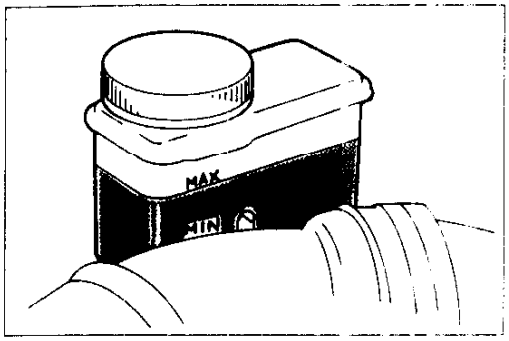
Tighten the clutch pipe by using the **SST**.

Caution
- **Before tightening the clutch pipe with the SST, refer to the formulas on page H–5 to calculate the required torque.**

Tightening torque:
12.8–21.5 N·m {130–220 kgf·cm, 113–190 in·lbf}

After-installation Procedure

1. Bleed the clutch system. (Refer to page H–11.)
2. Add fluid to the reservoir MAX mark.
3. Inspect and adjust the clutch pedal height and free play. (Refer to page H–6.)



AIR BLEEDING

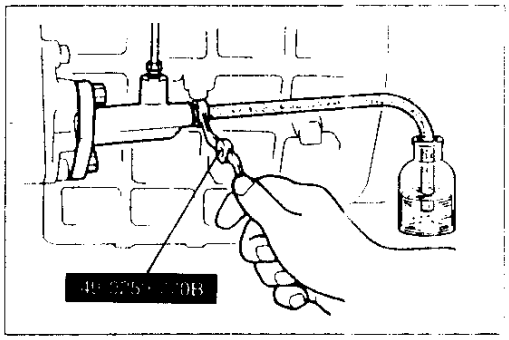
The clutch hydraulic system must be bled to remove air introduced whenever a hydraulic line is disconnected.

Note

- **The fluid in the reservoir must be maintained at the 3/4 level or higher during air bleeding.**

Caution

- **Be careful not to spill fluid on a painted surface. If this should happen, wash the surface off immediately.**
- **Use only the specified fluid. Avoid mixing different brands of fluid.**
- **Do not reuse clutch fluid.**



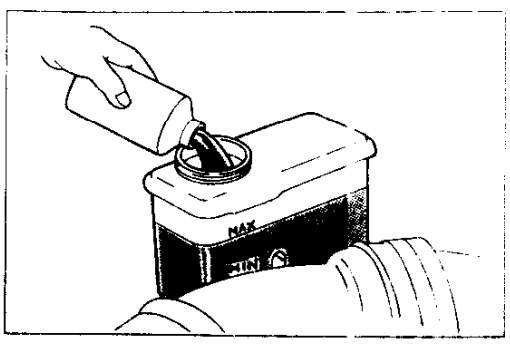
1 Remove the bleeder cap from the clutch release cylinder and attach a vinyl hose to the bleeder plug.
2 Insert the other end of the vinyl hose in a fluid-filled clear container.
3 With another person slowly pumping the clutch pedal, use the **SST** to loosen the bleeder screw to let fluid and air escape. Close the bleeder screw.
4 Repeat step 3 until no air bubbles are seen in the fluid.

Caution

- **Before tightening the bleeder screw with the SST, refer to the formulas on page H–5 to calculate the required torque.**

5 Tighten the bleeder screw by using the **SST**.

Tightening torque:
5.9–8.8 N·m {60–90 kgf·cm, 53–78 in·lbf}



37U0HX-023

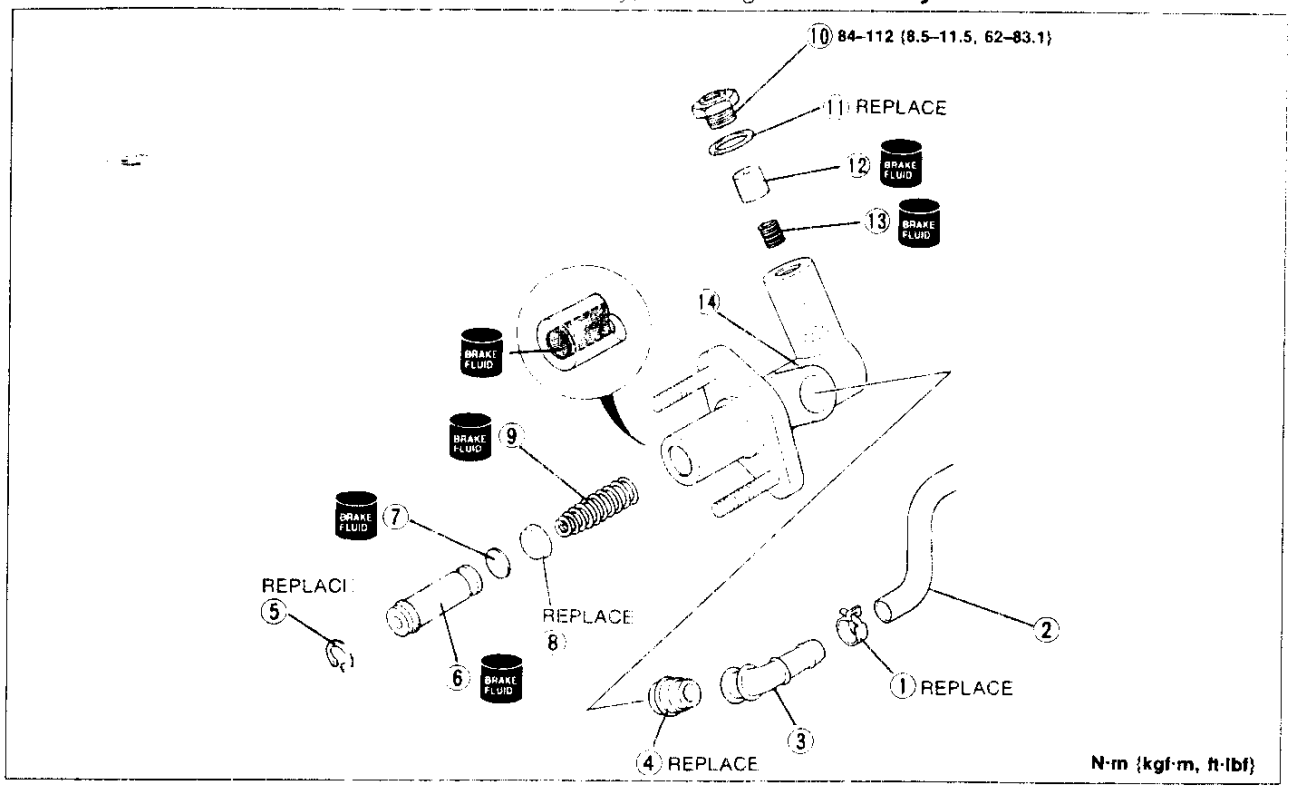
6 Add fluid to the MAX mark.
7 Check for correct clutch operation.
8 Verify that there is no fluid leakage.
9 Verify that the brakes function properly. (Refer to section P.)

OVERHAUL

Caution

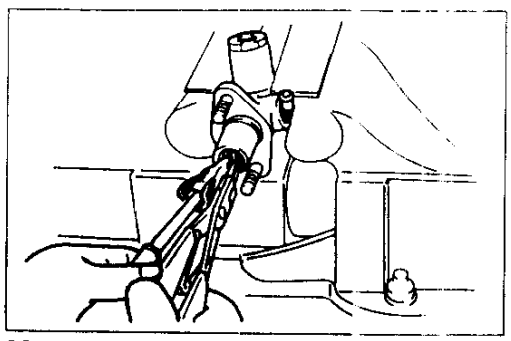
- **Clean the disassembled parts in solvent and blow through all ports and passages with compressed air. Before assembling, coat the piston secondary cup and the cylinder bore with clean fluid, and make sure there are no dust or particles in or on any of the parts.**

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**.



37U0HX-024

1. Hose clamp
2. Clutch hose
3. Joint
4. Bushing
5. Snap ring
   Disassembly Note ..... below
   Assembly Note ..... page H-13
6. Piston and secondary cup assembly
   Disassembly Note ..... page H-13
   Inspect for wear, scoring, and cracks
   Assembly Note ..... page H-13
7. Spacer
8. Primary cup
   Inspect for wear and cracks
9. Return spring
10. Joint bolt
11. Packing
12. One-way valve piston
    Disassembly Note ..... page H-13
13. Return spring
14. Master cylinder body
    Inspect for scoring and corrosion.
    Replace master cylinder assembly if any scoring or corrosion is found.



37U0HX-025

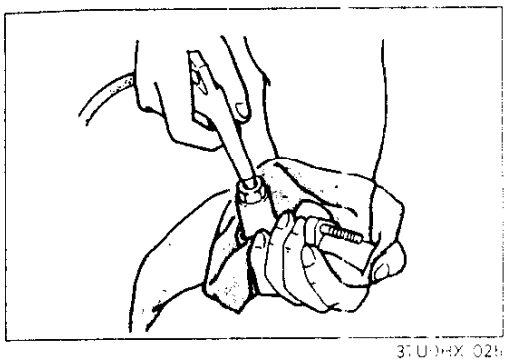
Disassembly Note

Snap ring

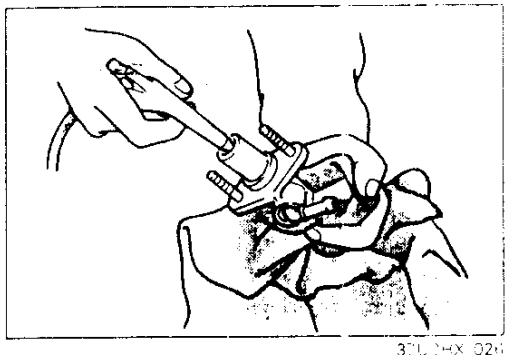
Caution

- **Do not damage the push rod contact surface of the piston.**

Press down on the piston by using a cloth-wrapped Phillips screwdriver, and remove the snap ring.



37U0HX-024



37U0HX-025

Piston and secondary cup assembly

Caution

- **Hold a rag over the master cylinder to prevent the piston and secondary cup assembly from jumping out.**

Remove the piston and secondary cup assembly, spacer, primary cup, and the return spring by applying compressed air through the clutch pipe installation hole.

One-way valve piston

Caution

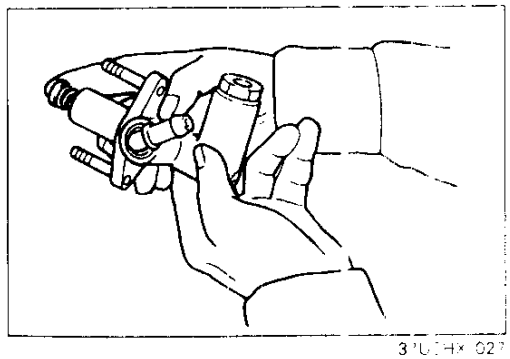
- **Hold a rag over the master cylinder to prevent the piston and spring from jumping out.**

Remove the piston by applying compressed air through the cylinder bore.

Assembly Note

Caution

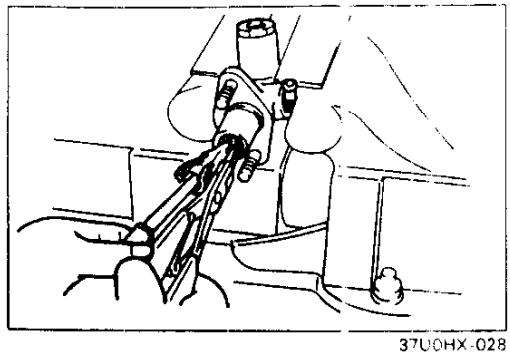
- **Before assembly, make sure all parts are completely clean.**
- **Use only the specified clutch fluid. Avoid mixing different brands of clutch fluid.**
- **Do not reuse clutch fluid.**
- **Apply the specified clutch fluid to the piston and secondary cup assembly, spacer, primary cup, and cylinder bore before assembly.**
- **Replace parts with new ones whenever specified.**



37U0HX-027

Piston and secondary cup assembly

Install the spring, primary cup, spacer, and piston and secondary cup assembly, noting the proper direction of the parts.



37U0HX-028

Snap ring

Caution

- **Do not damage the pushrod contact surface of the piston.**

Press down on the piston with a cloth-wrapped Phillips screwdriver, and install the snap ring.

CLUTCH RELEASE CYLINDER

PREPARATION
SST

49 0259 770B Wrench, flare nut		For disconnecting and connecting clutch pipe

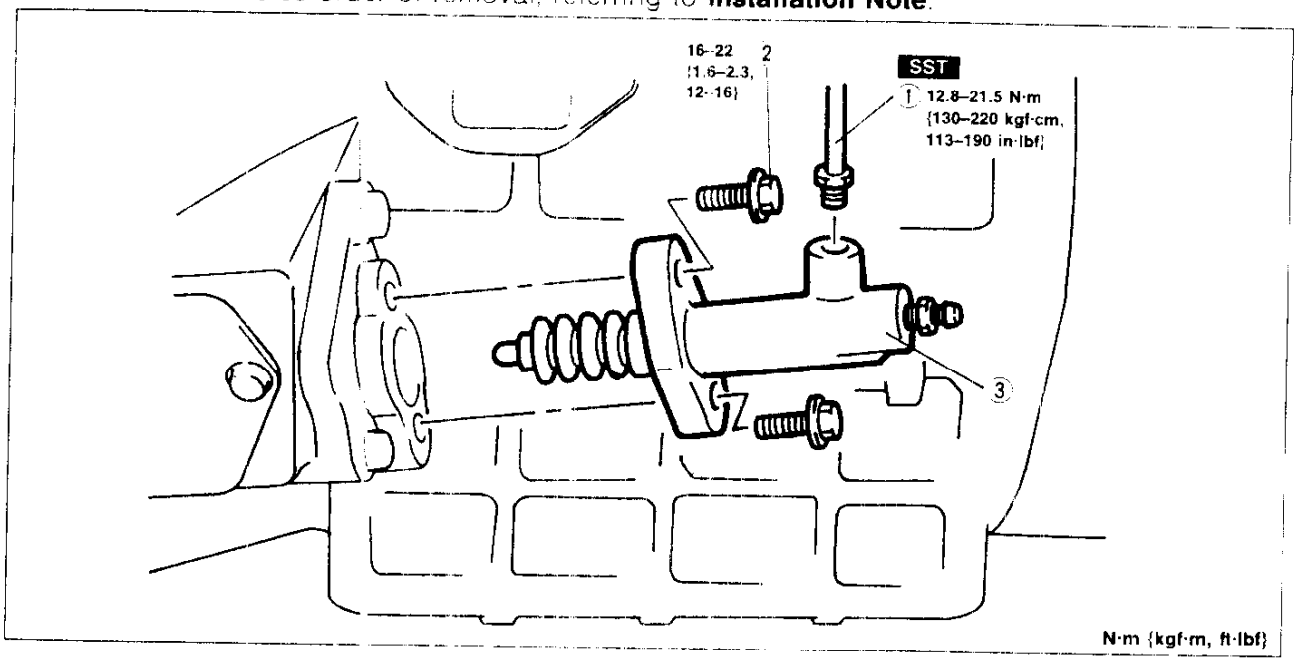
37U0HX-029

REMOVAL / INSPECTION / INSTALLATION

Caution

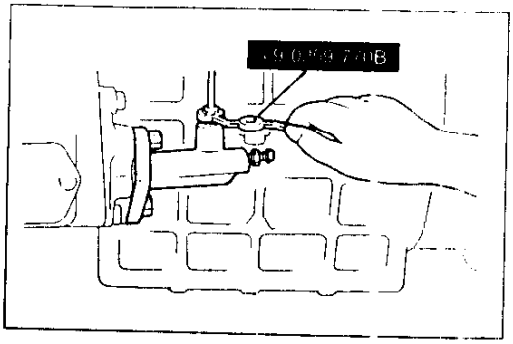
- **Clutch fluid will damage painted surfaces. If fluid does get on a painted surface, wipe it off immediately with a rag.**

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**.



37U0HX-030

1. Clutch pipe
   Removal Note ..... below
   Installation Note ..... page H–15
2. Bolt
3. Clutch release cylinder
   Remove boot and check for fluid leakage
   Overhaul ..... page H–15



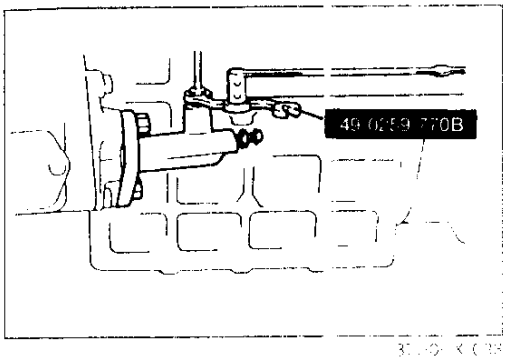
37U0HX-031

Removal Note
Clutch pipe

Caution

- **Plug the clutch pipe after removing, to avoid fluid leakage.**

Disconnect the clutch pipe from the clutch release cylinder by using the **SST**.



Installation Note
Clutch pipe

Caution
- **Before tightening the clutch pipe with the SST, refer to the formulas on page H–5 to calculate the required torque.**

Tighten the clutch pipe onto the clutch release cylinder.

Tightening torque:
12.8–21.5 N·m {130–220 kgf·cm, 113–190 in·lbf}

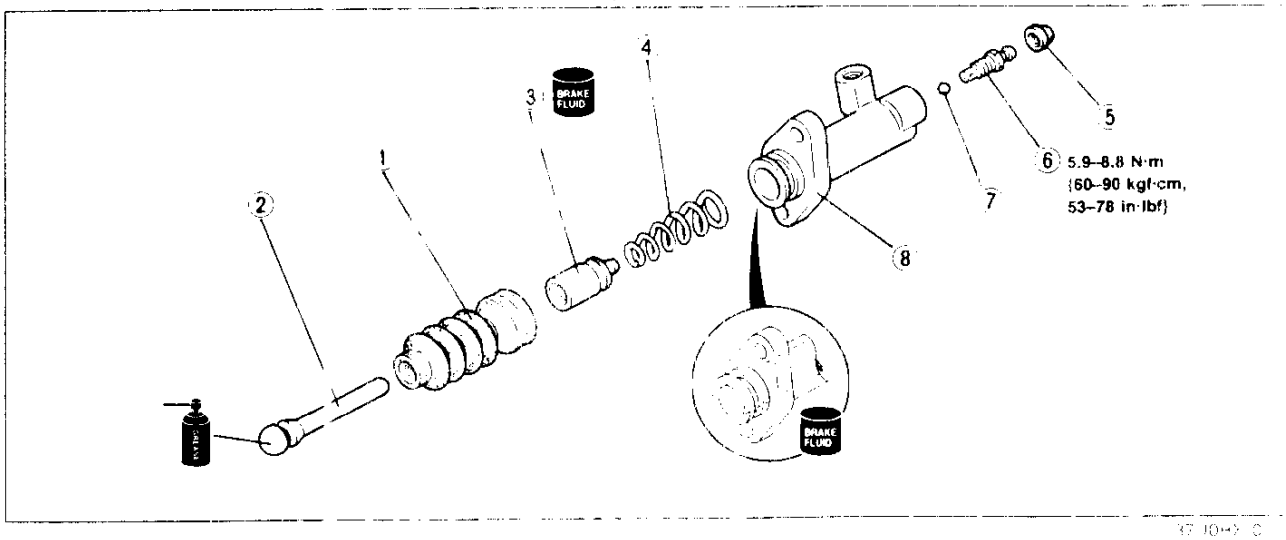
Air Bleeding

After installation, bleed the clutch system.
(Refer to page H–11)

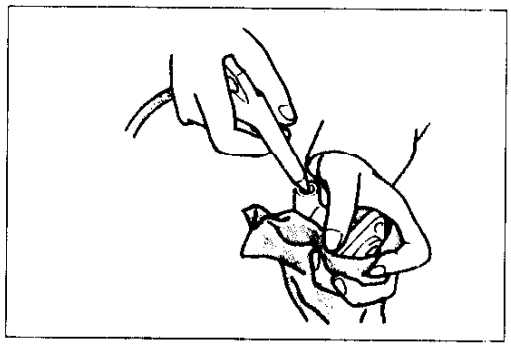
OVERHAUL

Caution
- **Clean the disassembled parts in solvent and blow through all ports and passages with compressed air.**
- **Before assembly, make sure all parts are completely clean.**
- **Apply the specified clutch fluid to the piston and cup assembly and cylinder bore before 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.



1. Boot
2. Push rod
3. Piston and cup assembly
   Disassembly Note ..... page H–16
   Inspect for wear, scoring and cracks
4. Return spring
5. Bleeder cap
6. Bleeder screw
7. Steel ball
8. Release cylinder body
   Inspect cylinder bore for scoring and corrosion
   Replace cylinder assembly if any is found



37U0HX-035

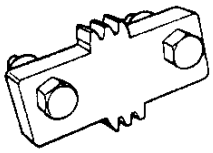
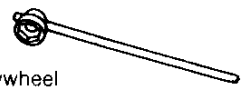
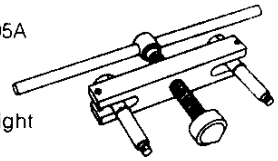
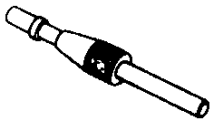
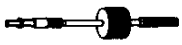
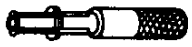
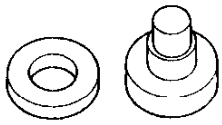
Disassembly Note
Piston and cup assembly

Caution
- **Hold a rag over the release cylinder to prevent the piston and cup assembly from jumping out.**

Remove the piston and cup assembly by applying compressed air through the clutch pipe installation hole.

CLUTCH UNIT

PREPARATION
SST

49 F011 101 Brake, ring gear 	For prevention of engine rotation	49 0820 035 Box wrench, flywheel 	For removal and installation of flywheel
49 0839 305A Puller, counterweight 	For removal of flywheel	49 SE01 310A Clutch disc centering tool 	For support of clutch disc
49 1285 071 Puller, bearing 	For removal of pilot bearing and oil seal	49 1285 073 Chuck (Part of 49 1285 071) 	For removal of pilot bearing and oil seal
49 F011 1A1 Installer set, bearing 	For installation of pilot bearing and oil seal	49 G030 795 Installer, oil seal 	For installation of pilot bearing and oil seal
49 G030 797 Handle (Part of 49 G030 795) 	For installation of pilot bearing and oil seal		

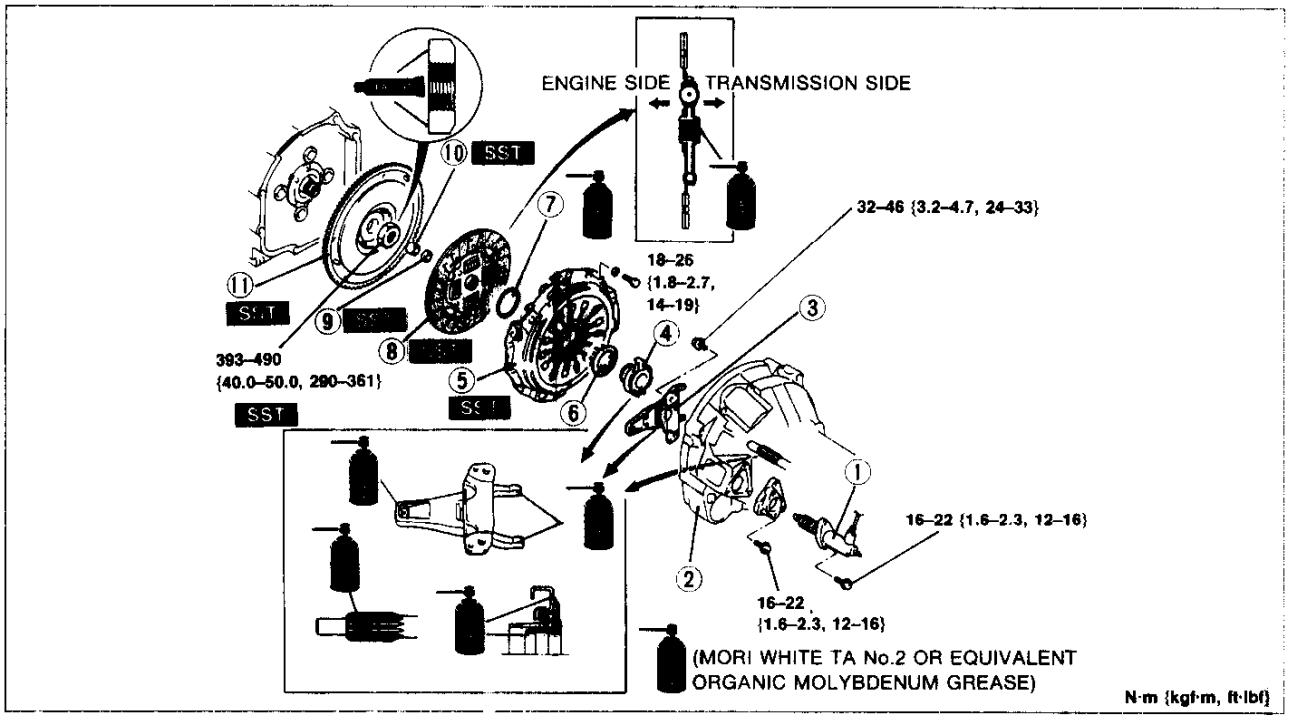
37U0HX-036

REMOVAL / INSTALLATION

Note

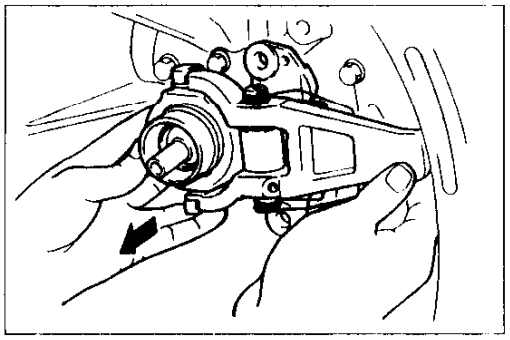
- **Remove the clutch release cylinder with the clutch pipe connected.**
- **Do not remove the pilot bearing unless necessary.**

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**.



37U0HX-03

1. Clutch release cylinder
2. Transmission
   Service ..... section J
3. Clutch release fork assembly
   Removal Note ..... below
   Inspection ..... page H–21
   Overhaul ..... page H–22
4. Clutch release collar
   Removal Note ..... below
   Inspection ..... page H–23
5. Clutch cover
   Removal Note
   ..... page H–18
   Inspection ..... page H–20
   Installation Note
   ..... page H–20
6. Wedge collar
   Removal Note
   ..... page H–18
   Installation Note
   ..... page H–19
7. Wire ring
8. Clutch disc
   Removal Note
   ..... page H–18
   Inspection ..... page H–21
   Installation Note
   ..... page H–20
9. Oil seal
   Removal Note
   ..... page H–18
   Installation Note
   ..... page H–19
10. Pilot bearing
    Removal Note
    ..... page H–18
    Inspection ..... page H–23
    Installation Note
    ..... page H–19
11. Flywheel
    Removal Note
    ..... page H–18
    Inspection ..... page H–23
    Installation Note
    ..... page H–19

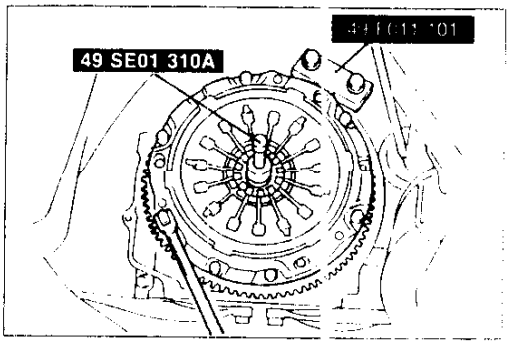


37U0HX-04

Removal Note

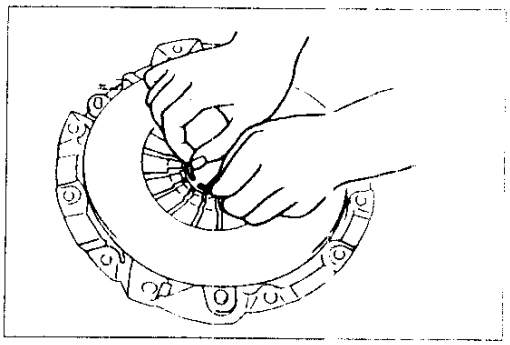
Clutch release fork assembly and clutch release collar

1. Remove the release fork assembly bolts.
2. Remove the release fork assembly and release collar together as shown in the figure.



Clutch cover and disc

1. Install the **SST**.
2. Loosen each bolt one turn each in a crisscross pattern until spring tension is released.
3. Remove the clutch cover and disc.

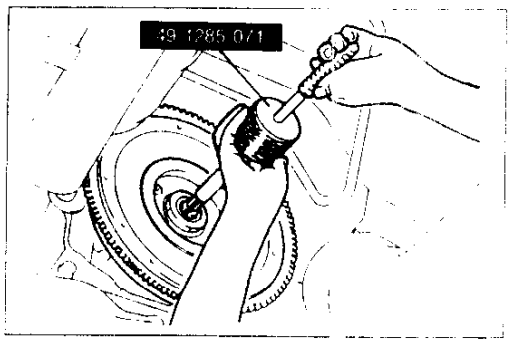


Wedge collar

Caution

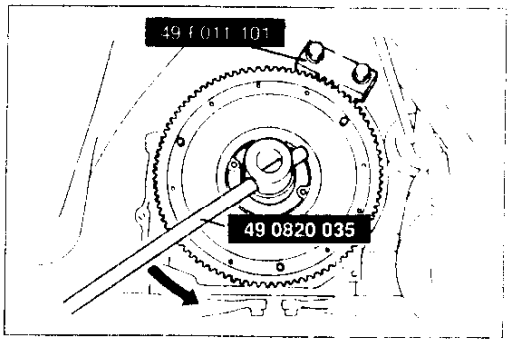
- **Do not reuse the wire ring or the wedge collar.**

1. Remove the wire ring from the wedge collar.
2. Remove the wedge collar from the clutch cover.



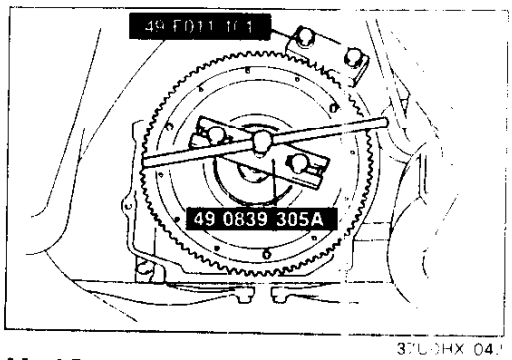
Oil seal and pilot bearing

Remove the pilot bearing together with the oil seal by using the **SST**.



Flywheel

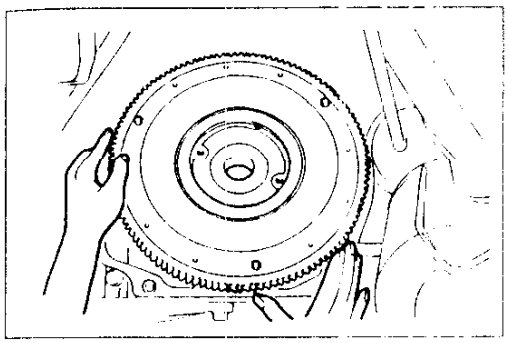
1. Hold the flywheel by using the **SST**.
2. Remove the locknut by using the **SST**.



Note

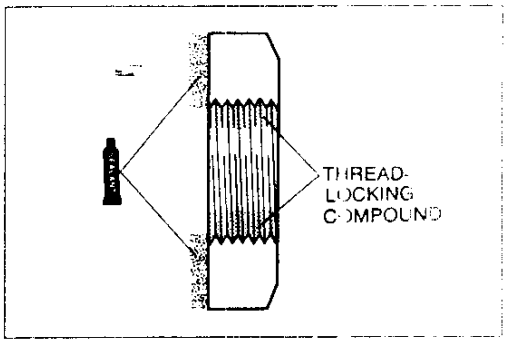
- **After removing the flywheel, inspect for oil leakage past the crankshaft rear oil seal.**
- **If necessary, replace the oil seal. (Refer to section C.)**

3. Remove the flywheel by using the **SST**.
4. Remove the key from the eccentric shaft.

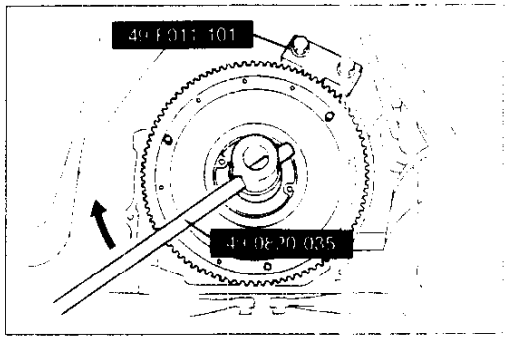


Installation Note
Flywheel

1. Set the key in the eccentric shaft.
2. Align the groove with the eccentric shaft key and slide the flywheel into place.

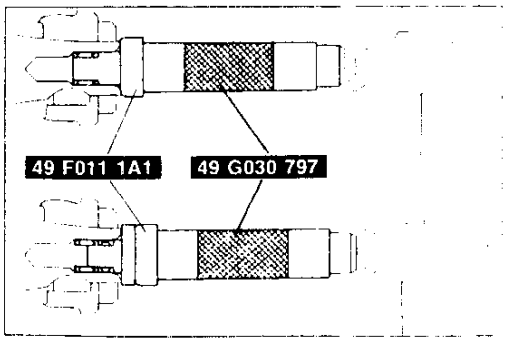


3. Apply a small amount of sealant and thread-locking compound to the flywheel locknut as shown.



4. Install the **SST** to the flywheel.
5. Tighten the locknut by using the **SST**.

Tightening torque:
393–490 N·m {40.0–50.0 kgf·m, 290–361 ft·lbf}

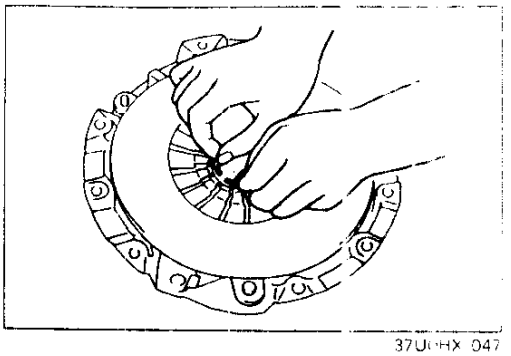


Pilot bearing and oil seal

1. Install the new bearing by using the **SST.**

Bearing outer diameter: 20 mm {0.79 in}
Insertion depth: 11.5–12.3 mm {0.453–0.482 in}

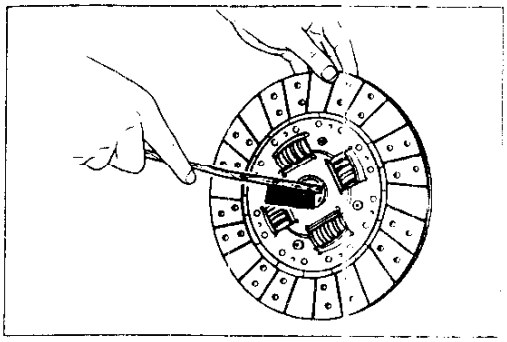
2. Install the new oil seal by using the **SST**.



Wedge collar

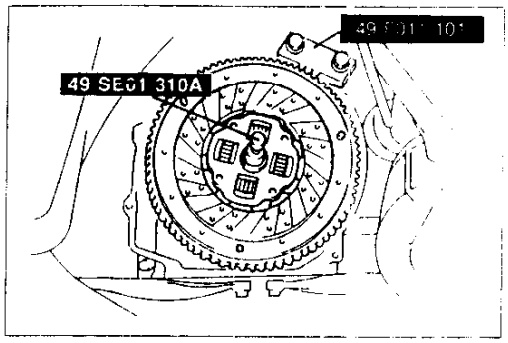
Caution
- **Do not deform the wedge collar or wire ring when installing.**

1. Install a new wedge collar to the clutch cover.
2. Apply a small amount of grease to a new wire ring and install into exact position.

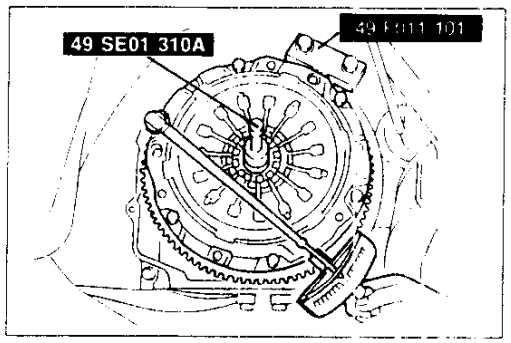


Clutch disc

1. Clean the clutch disc splines and main drive gear splines. Apply molybdenum sulfide grease to the splines.



2. Hold the flywheel by using the **SST**.
3. Hold the clutch disc in position by using the **SST**.



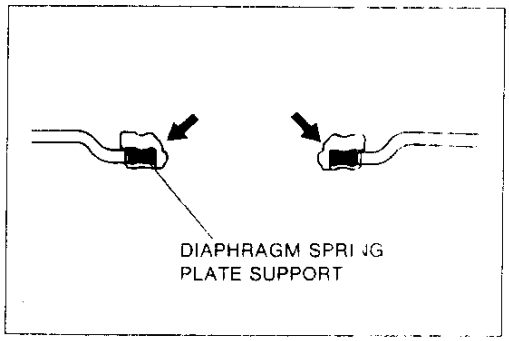
Clutch cover

Caution

- **Do not damage the wedge collar when installing the clutch cover.**

1. Align the dowel holes with the flywheel dowels and set the clutch cover in place.
2. Tighten the bolts evenly and gradually in a crisscross pattern, while securing the flywheel by using the **SST**.

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



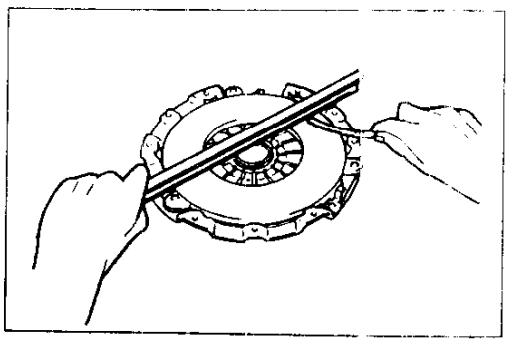
CLUTCH COVER

INSPECTION

Caution

- **Inspect for wear and damage, and replace if necessary.**

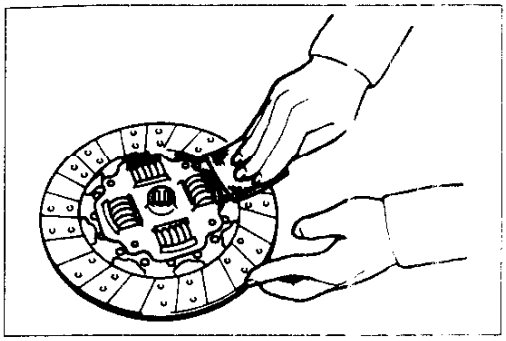
1. Inspect for wear or damage to the wire ring contact surface of the diaphragm spring plate.
2. Inspect for loosening of the diaphragm spring plate support.



3. Measure the flatness of the pressure plate/clutch disc contact surface in a crisscross pattern with a straightedge and a feeler gauge.

Maximum: 0.20 mm {0.008 in}

4. Check for discoloration of the pressure plate/clutch disc contact surface.



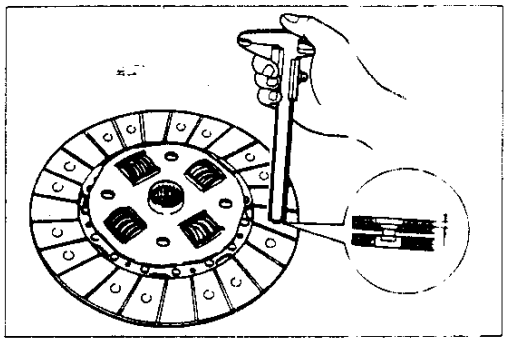
CLUTCH DISC

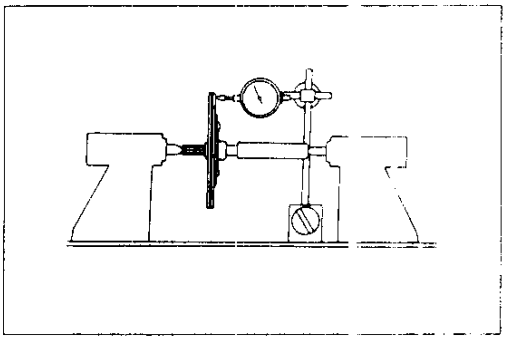
INSPECTION

Caution
- **Inspect for wear and damage, and replace if necessary.**

1. Inspect the lining surface for burning or oil contamination. Remove minor scratches or discoloration with sandpaper.
2. Inspect for loose facing rivets and torsion springs. Replace the clutch disc if any are loose.
3. Measure the thickness of the lining at a rivet head on both sides with vernier calipers.

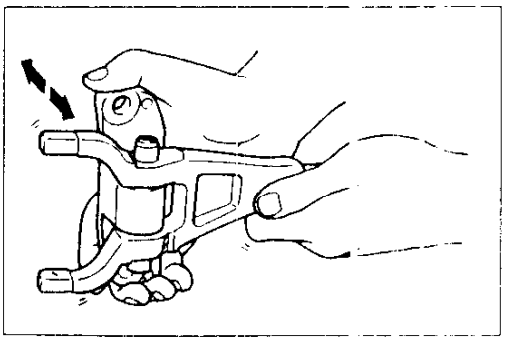
Thickness: 0.3 mm {0.012 in} min.





4. Measure the clutch disc runout with a dial indicator. Replace the clutch disc if runout is excessive.

Runout: 0.6 mm {0.024 in} max.

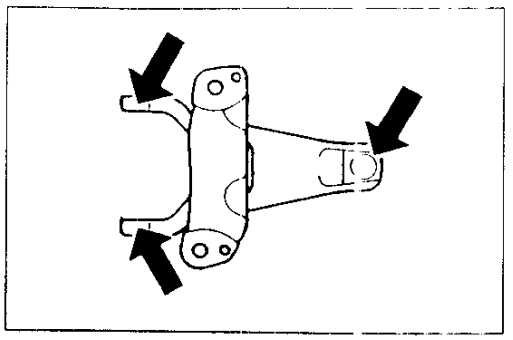


CLUTCH RELEASE FORK ASSEMBLY

Caution
- **Remove the return spring before inspection.**

INSPECTION

1. Swing the release fork back and forth, and make sure it moves smoothly.

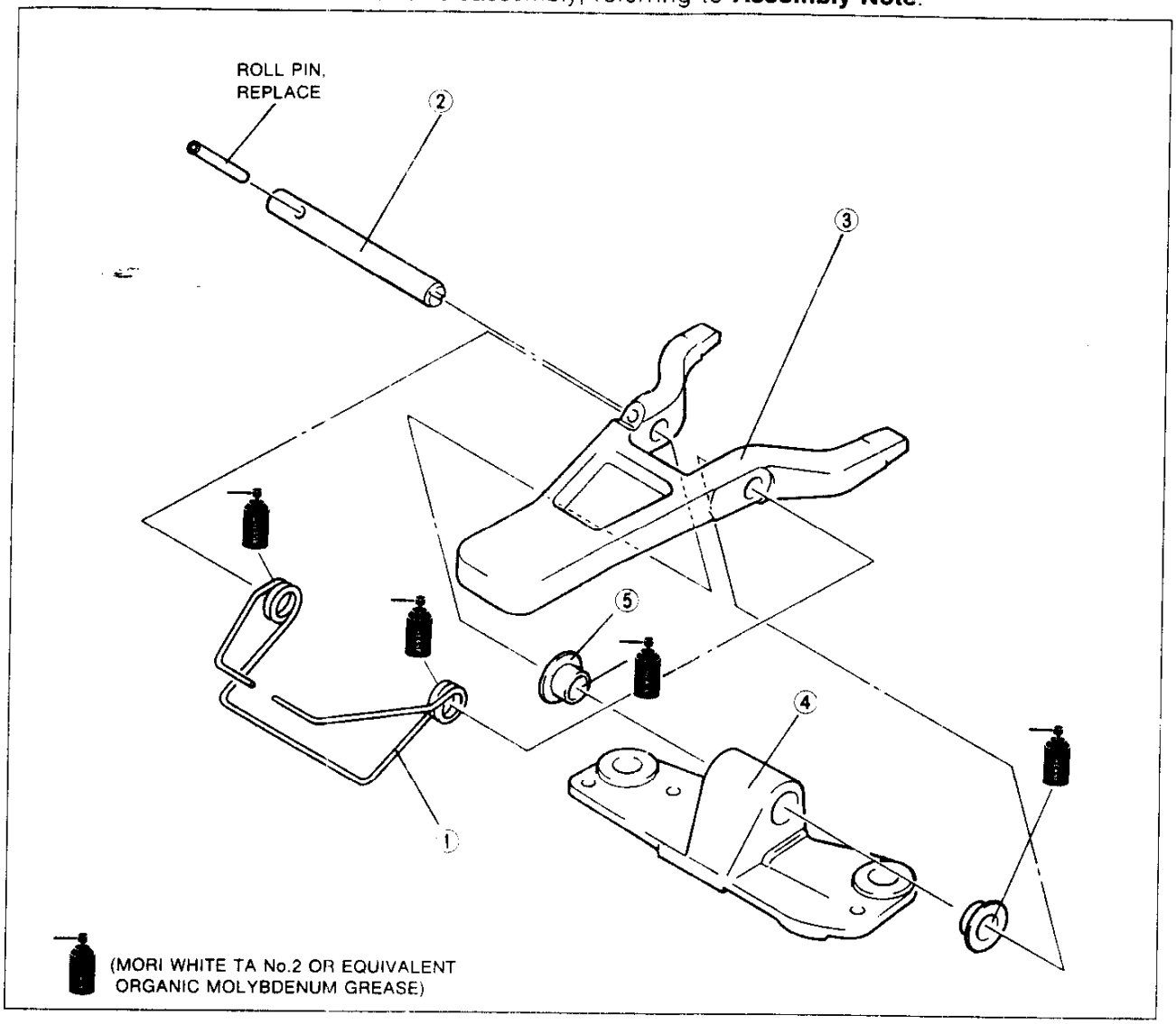


2. Inspect for wear and damage to the push rod contact surface.
3. Inspect for wear and damage to the release collar contact surfaces.
4. Replace parts as necessary.

CLUTCH RELEASE FORK ASSEMBLY

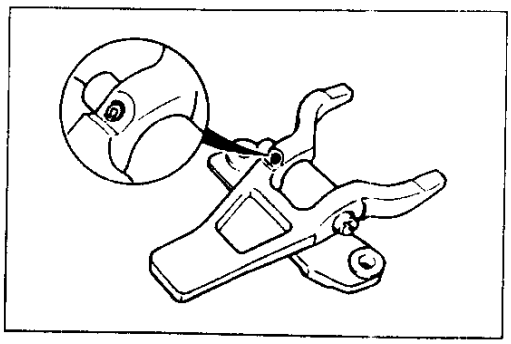
OVERHAUL

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



37U0HX-058

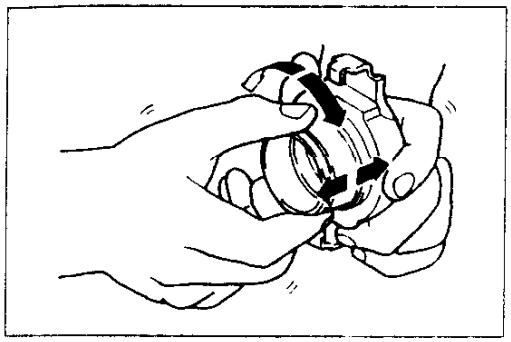
1. Return spring
   Inspect for damage and bending
2. Fork shaft
   Assembly Note ..... below
3. Clutch release fork
   Inspect for wear and damage
4. Release fork support
5. Bushing
   Inspect bushing bore for wear and damage



37U0HX-059

Assembly Note
Fork shaft

1. Install the roll pin with the split facing as shown.
2. Make sure the roll pin is installed flush with the release fork surface.



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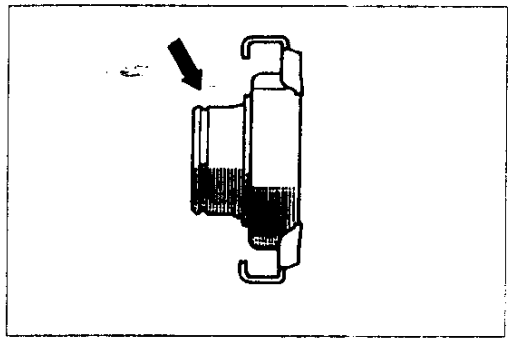

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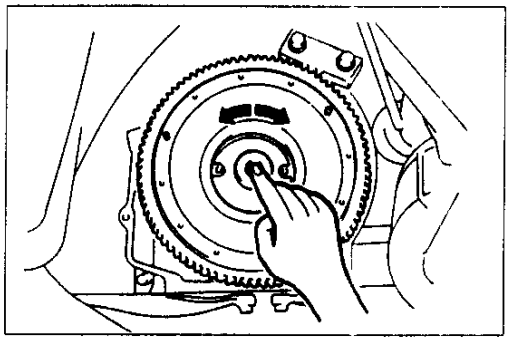

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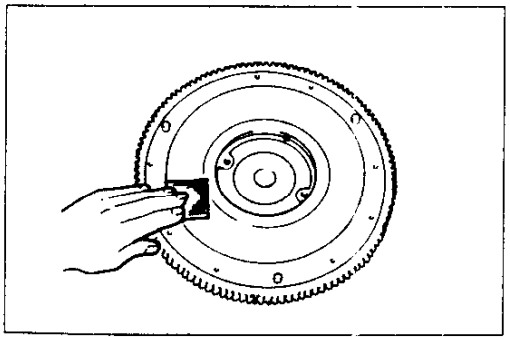

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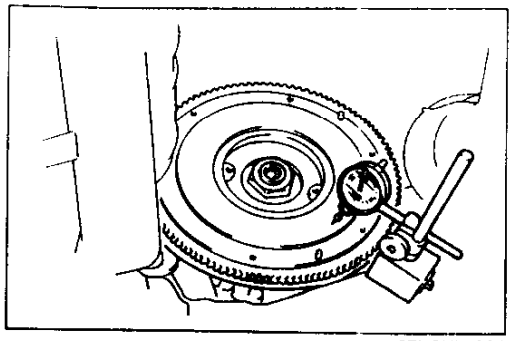


37U0HX-064

CLUTCH RELEASE COLLAR

INSPECTION

Caution

- **Inspect for wear and damage, and replace if necessary.**
- **The clutch release collar is a sealed bearing and must not be washed in solvent or by steam cleaning.**

1. Turn the collar while applying force in the axial direction. If the collar sticks or has excessive resistance, replace it.
2. Inspect for wear and damage to the release collar groove.

PILOT BEARING

INSPECTION

Caution

- **Inspect for wear and damage, and replace if necessary.**

Note

- **Inspect the pilot bearing while it is installed in the flywheel.**

Inspect the pilot bearing for wear or damage and check rotating condition.

FLYWHEEL

INSPECTION

Caution

- **Inspect for wear and damage, and replace if necessary.**

Note

- **Remove minor scoring or burning with emery paper.**

1. Inspect for scoring, cracks, and burning of the flywheel/clutch disc contact surface.
2. Inspect the ring gear teeth for wear and damage.
3. Measure the flywheel runout with a dial indicator. Replace the flywheel if runout is excessive.

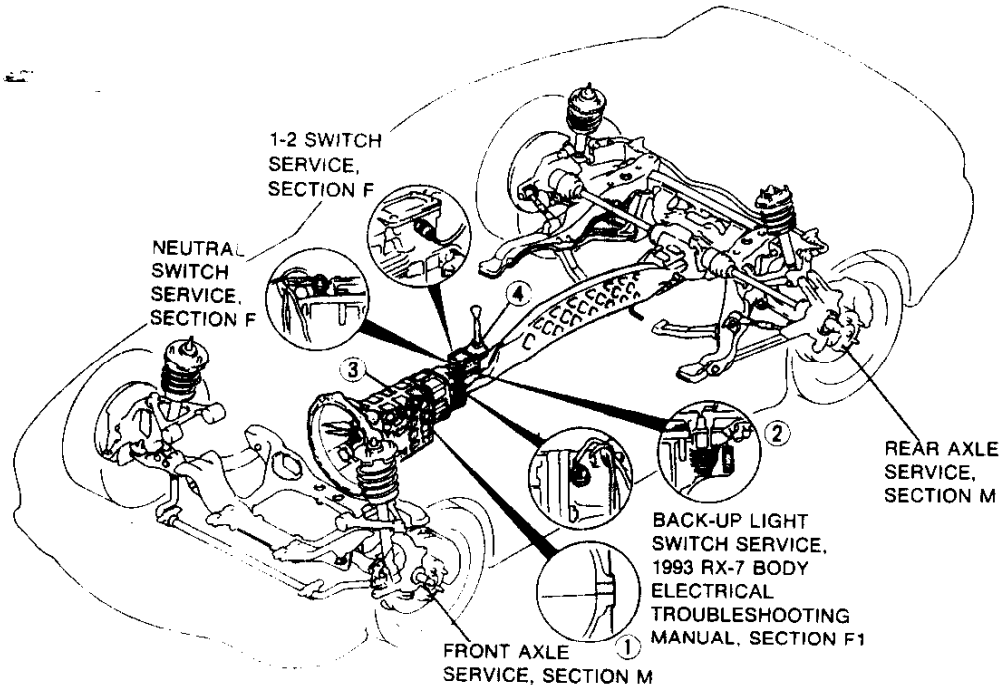
Runout: 0.2 mm {0.008 in} max.

Before beginning any service procedure, refer to the 1993 RX-7 Body Electrical Troubleshooting Manual; see section S for air bag system precautions and J1 for audio anti-theft system precautions.

MANUAL TRANSMISSION (R15M-D)

37U0JX-001

INDEX



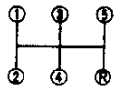
OIL SPECIFICATION

GRADE	: API SERVICE GL-4 OR GL-5
ALL SEASON	: SAE 75W-90
ABOVE 10°C (50°F)	: SAE 80W-90
CAPACITY	: 2.5 L (2.6 US qts, 2.2 Imp qts)

37U0JX-002

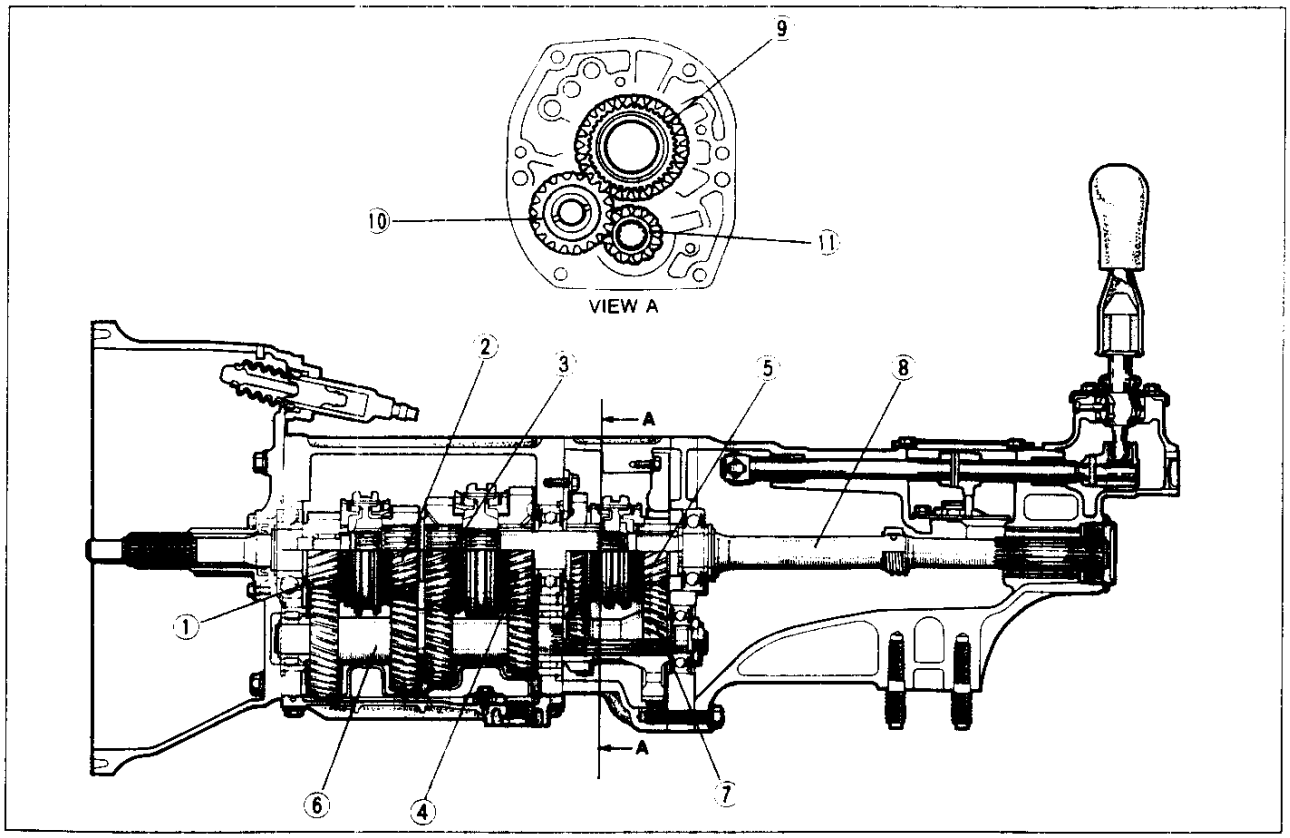
OUTLINE

SPECIFICATIONS

Item			Model: R15M-D (R5M-D)
Synchronization mechanism			Forward: Synchromesh Reverse: Synchromesh
Shift type			5-speed, floor shift
Shift pattern			
Gear ratio	1st		3.483
	2nd		2.015
	3rd		1.391
	4th		1.000
	5th		0.719
	Reverse		3.288
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 qts, Imp qts)	2.5 (2.6, 2.2)

37U0JX-003

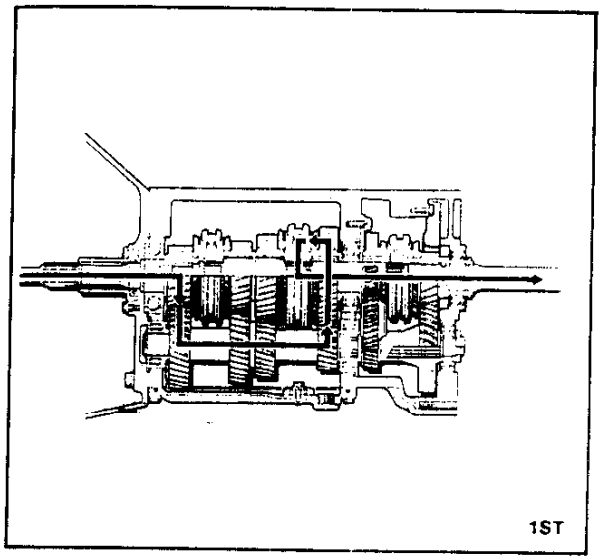
STRUCTURAL VIEW

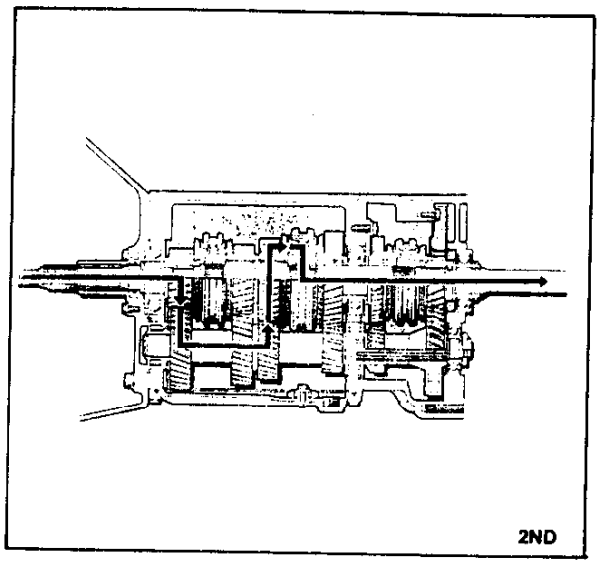


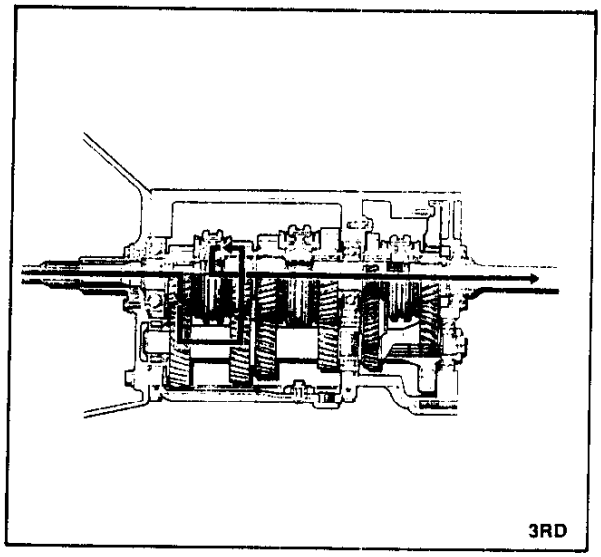
37U0JX-004

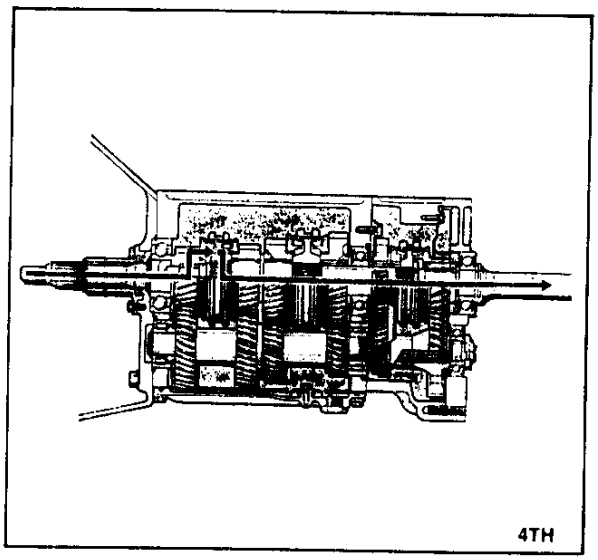
1. Main drive gear (4th gear)
2. 3rd gear
3. 2nd gear
4. 1st gear
5. 5th gear
6. Countershaft
7. Counter 5th gear
8. Mainshaft
9. Reverse gear
10. Reverse idler gear
11. Counter reverse gear

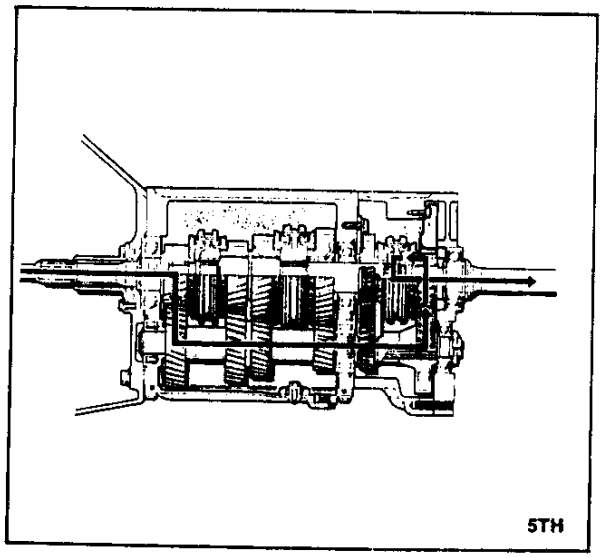
POWERFLOW

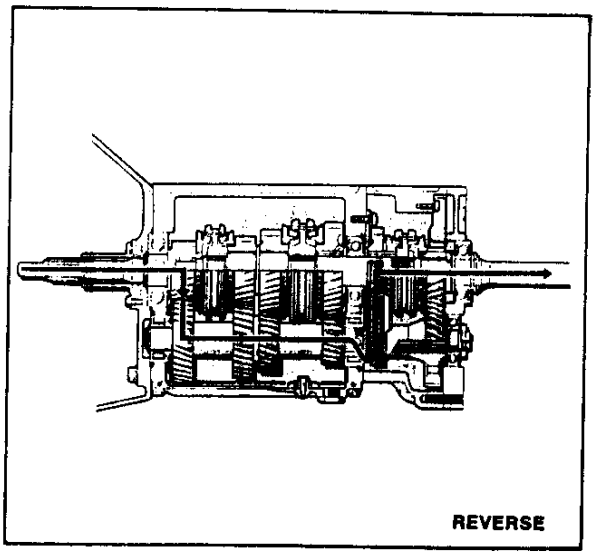










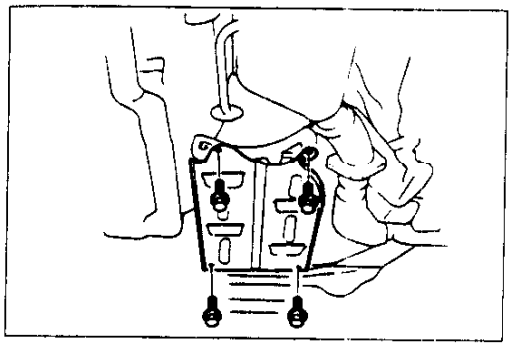


37U0JX-005

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Abnormal noise	Insufficient oil	Add oil	J–6
	Deter oration of oil quality	Replace with specified oil	J–6
	Worn bearing	Replace	–
	Worn contact surface of countershaft gear	Replace	J–26
	Worn contact surface of gears	Replace	J–18, 22, 26
	Excessive gear backlash	Replace	J–18, 22, 26
	Damaged gear teeth	Replace	J–18, 22, 26
	Object caught in gears	Repair or replace	J–18, 22, 26
Difficult to shift	Bent shift rod	Replace	J–18
	Insufficient oil	Add oil	J–6
	Deter oration of oil quality	Replace with specified oil	J–6
	Wear or play of shift fork or shift rod	Replace	J–18, 22
	Worn or damaged synchronizer ring (1st, 4th, 5th, Reverse)	Replace	J–18, 26
	Worn or damaged synchronizer assembly (2nd and 3rd)	Replace	J–26
	Worn synchronizer gear cone	Replace	J–18, 22, 26
	Poor contact of synchronizer ring and gear cone	Replace	J–18, 22, 26
	Excessive longitudinal play of gears	Replace	J–18, 22, 26
	Worn bearing	Replace	–
	Improper disengagement of clutch	Refer to section H	–
	Weak synchronizer key spring	Replace	J–18, 26
Jumps out of gear	Weak detent ball spring	Replace	J–18
	Worn shift fork	Replace	J–18, 22
	Worn clutch hub	Replace	J–18, 26
	Worn clutch hub sleeve	Replace	J–18, 26
	Worn gears	Replace	J–18, 22, 26
	Excessive gear backlash	Replace	J–18, 22, 26
	Worn bearing	Replace	–
	Loose engine mounts or transmission mounts	Tighten	–

37U0JX-006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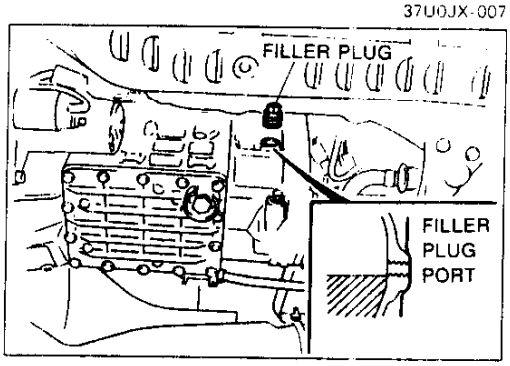

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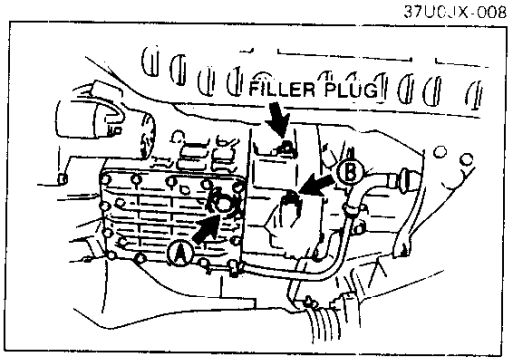

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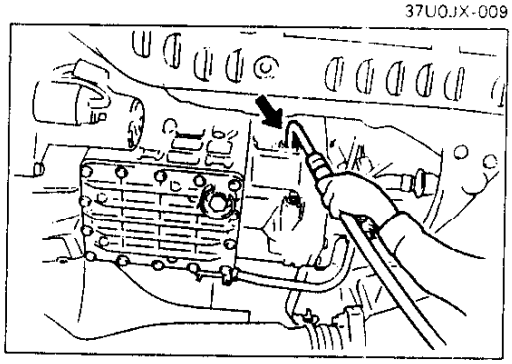
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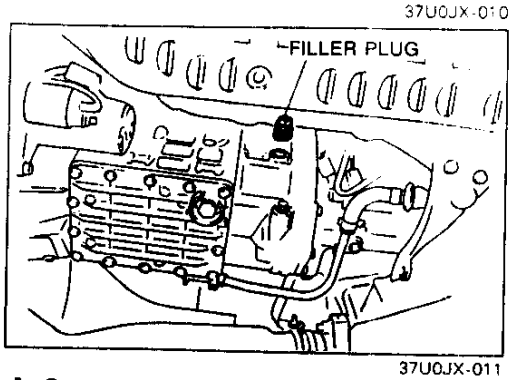


37U0JX-011

TRANSMISSION OIL

INSPECTION

Caution
- **Park the vehicle on level ground.**

1. Remove the transmission cover.
2. Remove the filler plug.
3. Verify that the oil is up to the bottom of the filler plug hole.
4. If the oil level is low, add the specified oil through the filler plug port.
5. Install a new filler plug.

Tightening torque:
25–39 N·m {2.5–4.0 kgf·m, 19–28 ft·lbf}

6. Install the transmission cover.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

REPLACEMENT

1. Remove the transmission cover.
2. Remove plug A (with washer) and B, and drain the oil into a suitable container.
3. Wipe both plugs clean.
4. Apply sealant to the B plug threads.
5. Install plug A (with new washer) and B.

Tightening torque:
A: 40–58 N·m {4.0–6.0 kgf·m, 29–43 ft·lbf}
B: 21–31 N·m {2.1–3.2 kgf·m, 16–23 ft·lbf}

6. Remove the filler plug and add the specified oil through the filler plug port until the level rises to the bottom of the port.

Specified oil:
Grade: API service GL-4 or GL-5
All-season: SAE 75W-90
Above 10°C {50°F}: SAE 80W-90

Capacity: 2.5 L {2.6 US qts, 2.2 Imp qts}

7. Install a new filler plug.

Tightening torque:
25–39 N·m {2.5–4.0 kgf·m, 19–28 ft·lbf}

8. Install the transmission cover.

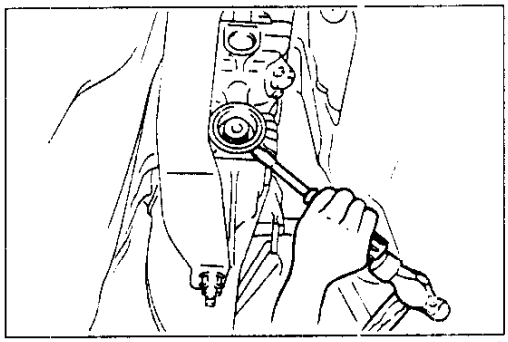
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

OIL SEAL (EXTENSION HOUSING)

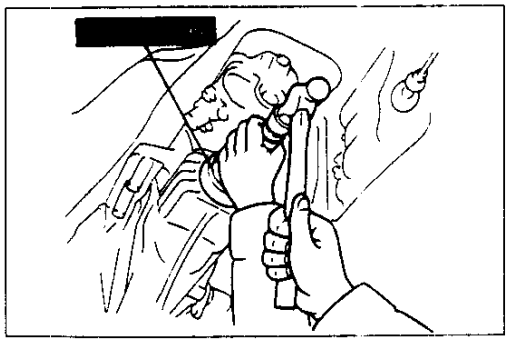
PREPARATION
SST

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 G030 797 Handle (Part of 49 G030 795) 	For installation of oil seal		

37U0JX-012



37U0JX-013



37U0JX-014

ON-VEHICLE REPLACEMENT

Caution
- **Do not damage the extension housing or mainshaft splines.**

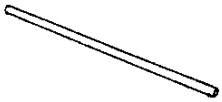
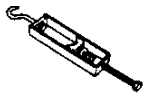
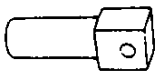
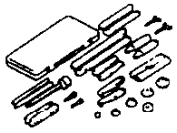
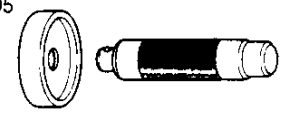
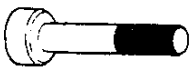
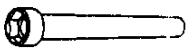
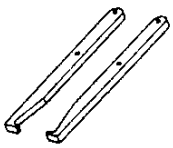
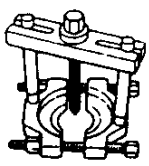
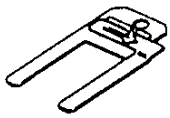
1. Remove the transmission cover.
2. Remove the propeller shaft. (Refer to section L.)
3. Remove the oil seal with a screwdriver.

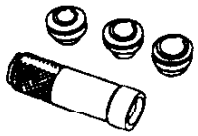
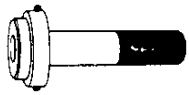
4. Apply the specified oil to the new oil seal.
5. Install the oil seal by using the **SST**.
6. Install the propeller shaft. (Refer to section L.)
7. Inspect the oil level. (Refer to page J–6)
8. Install the transmission cover.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

TRANSMISSION

PREPARATION
SST

49 G017 5A0 Support, engine 	For support of engine	49 G017 501 Bar (Part of 49 G017 5A0) 	For support of engine
49 G017 502 Support (Part of 49 G017 5A0) 	For support of engine	49 G017 503 Hook (Part of 49 G017 5A0) 	For support of engine
49 S120 440 Holder, mainshaft 	For holding mainshaft	49 0839 425C Puller set, bearing 	For removal of bearing
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 G030 797 Handle (Part of 49 G030 795) 	For installation of oil seal	49 0500 330 Installer, transmission bearing 	For installation of bearing
49 0636 145 Puller, fan pulley boss 	For removal of clutch hub assembly	49 0862 350 Guide, shift fork	For installation of interlock pin
49 1243 465A Wrench, mainshaft locknut 	For removal of locknut	49 H017 101 Hook 	For removal of bearing
49 0710 520 Puller, bearing 	For removal of bearing	49 F017 101 Holder, synchronizer ring 	For installation of bearing

49 F401 330B Installer set, bearing 	For installation of bearing	49 F401 331 Body (Part of 49 F401 330B) 	For installation of clutch hub assembly
49 F401 335A Attachment A (Part of 49 F401 330B) 	For installation of bearing race	49 0813 235 Replacer, main bearing 	For installation of main bearing

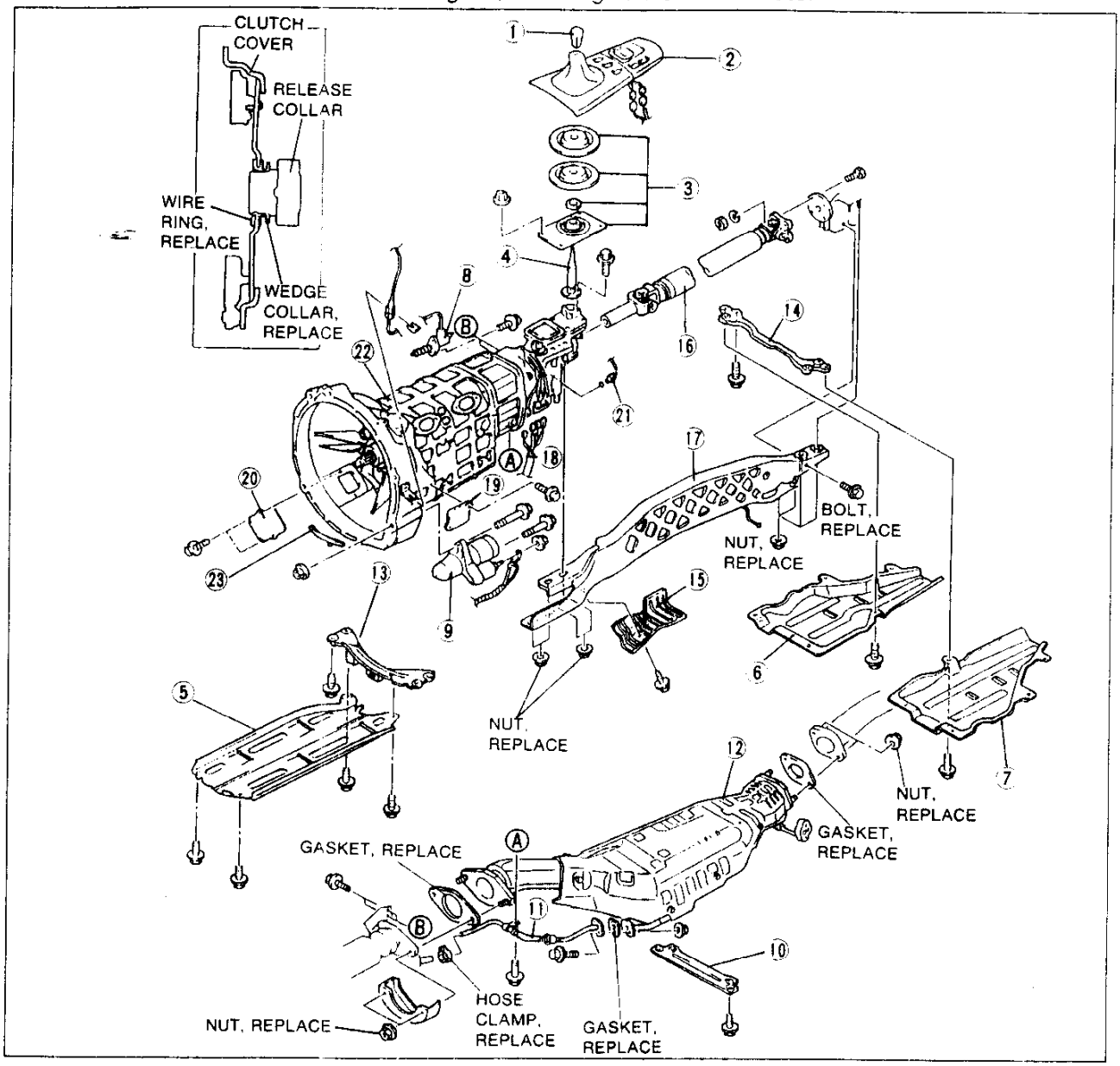
37U0JX-015

REMOVAL

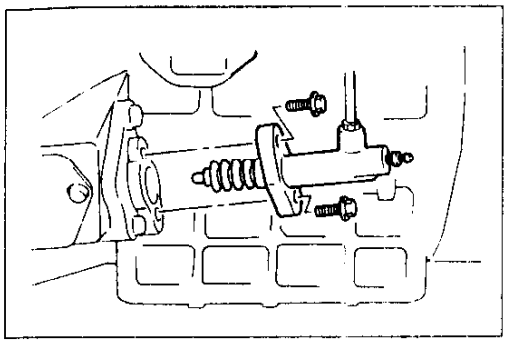
Caution

- **Remove the clutch release collar from the clutch cover before removing transmission.**

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**.



1. Shift lever knob
2. Console panel assembly
3. Insulator assembly
4. Shift lever assembly
5. Transmission cover
6. Right undercover
7. Left undercover
8. Clutch release cylinder Removal Note ..... page J-11
9. Starter
10. Tunnel reinforcement (center)
11. Secondary air injection pipe
12. Catalytic converter assembly
13. Tunnel reinforcement (front)
14. Tunnel reinforcement (rear)
15. Cover
16. Propeller shaft Removal Note ..... page J-11
17. Power Plant Frame (PPF) Removal Note ..... page J-11
18. Connectors
19. Service hole A cover
20. Service hole B cover
21. Back-up light switch
22. Transmission Removal Note ..... page J-12
23. Dust cover

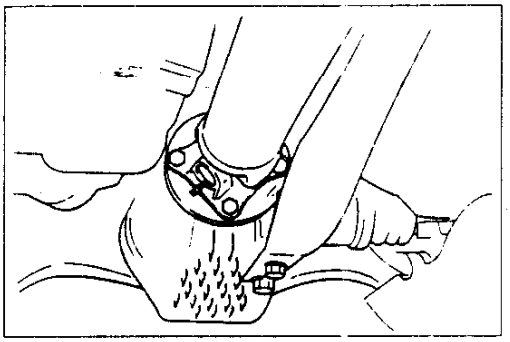


37U0JX-017

Removal Note
Clutch release cylinder

Caution
- **Do not damage the clutch pipe.**

1. Loosen the clutch release cylinder installation bolts.
2. Loosen the clutch pipe bracket bolt.
3. Secure the clutch release cylinder/clutch pipe assembly in a place where it will not interfere with transmission removal.



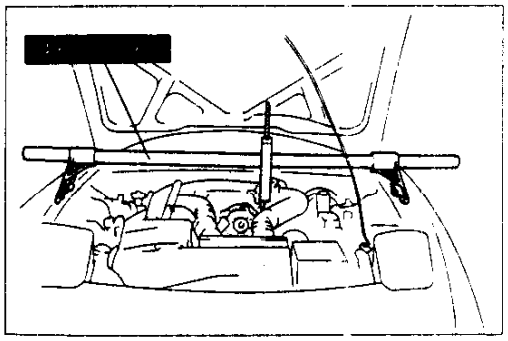
37U0JX-016

Propeller shaft

1. Mark the flanges for correct reinstallation.
2. Remove the propeller shaft.

37U0JX-019

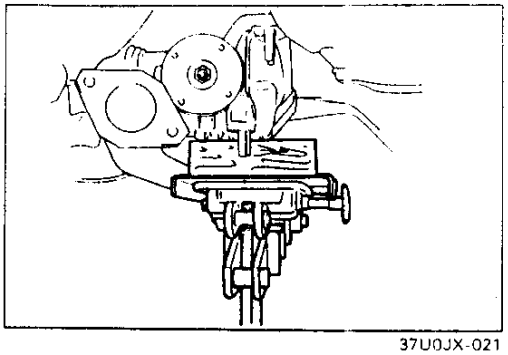
3. Install the **SST** to the extension housing.



37U0JX-020

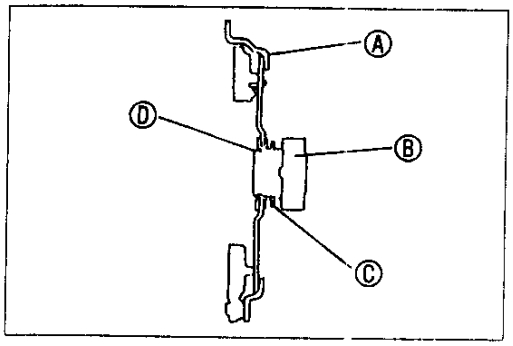
Power plant frame (PPF)

1. Hold the engine by using the **SST** (engine supports).



37U0JX-021

2. Hold the differential with a transmission jack.
3. Remove the PPF.
4. Remove the back-up light switch from the transmission.

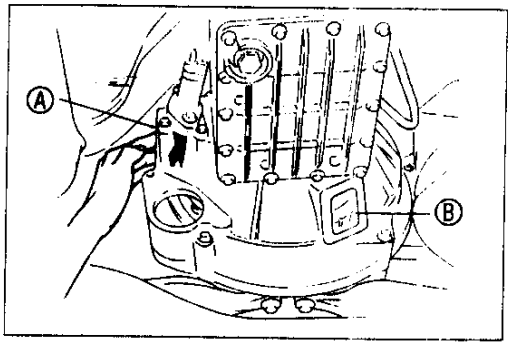


37U0JX-022

Transmission

1. The clutch cover and clutch release collar are joined as shown in the figure.

   A: Clutch cover
   B: Clutch release collar
   C: Wedge collar
   D: Wire ring

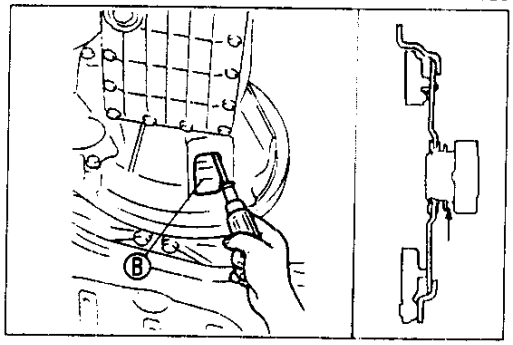


37U0JX-023

Caution

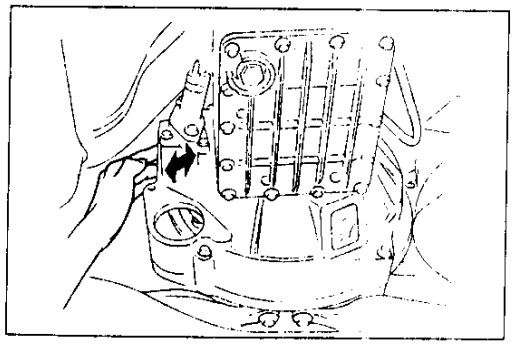
- **Separation of the clutch cover and release collar must be done with the release collar pushed into the clutch cover, away from the transmission.**
- **Do not reuse wedge collar or wire ring. (Refer to section H.)**

2. Remove the covers from service holes A and B.
3. Through service hole A, swing the release fork so that the release collar is pushed and held toward the clutch cover (engine side).

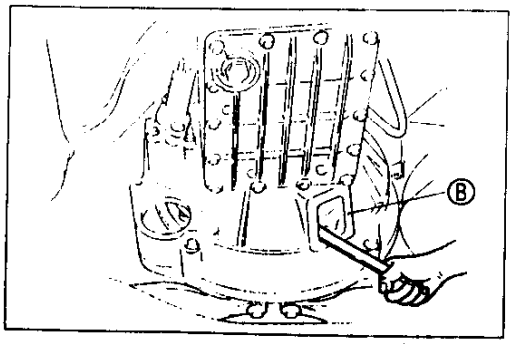


37U0JX-024

4. Insert a screwdriver through service hole B, into the space between the wedge collar and the release collar. Pry and separate the release collar from the clutch cover.

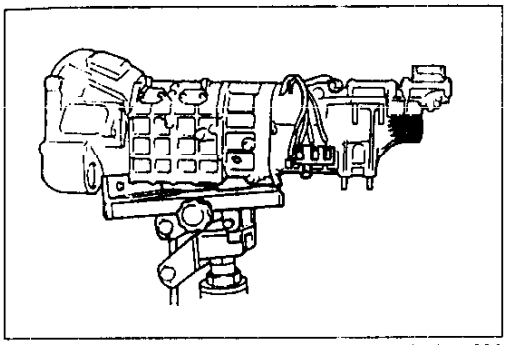

37U0JX-025

5. Swing the release fork back and forth to make sure that the release collar and clutch cover are separated.



37U0JX-026

6. If the above procedure does not work, then separate the clutch cover from the flywheel, following the procedure below.
   (1) Through service hole B, gradually loosen the 6 clutch cover installation bolts in a crisscross pattern.
   (2) Remove the clutch cover installation bolts, and separate the clutch cover from the flywheel.



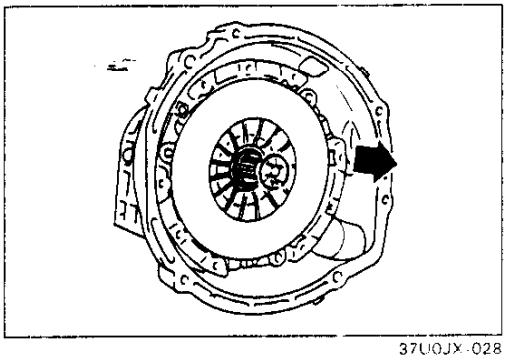
37U0JX-027

7. Support the transmission with a transmission jack.

Warning

- **Do not allow the transmission to fall from the jack.**

8. Loosen the transmission installation bolts.
9. Remove the transmission.



37U0JX-028

10. Remove the clutch cover.
    (1) Remove the clutch cover from the flywheel. (Refer to section H.)
    (2) If the transmission was removed by following step 6, remove the wire ring from the release collar and separate the release collar from the clutch cover.

DISASSEMBLY

Precaution

1. Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvents before disassembly.
2. Clean the removed parts (except sealed bearings) with cleaning solvent, and dry with compressed air. Clean out all holes and passages with compressed air, and check that there are no obstructions.
3. Wear eye protection when using compressed air.
4. Use a plastic hammer when disassembling the transmission case and other light alloy metal parts.
5. Keep all disassembled parts in a clean area.
6. When using a vise, insert protective plates to prevent damage to the part.
7. Note the assembly position of each part as it is disassembled.
8. Inspect each part for damage while disassembling.

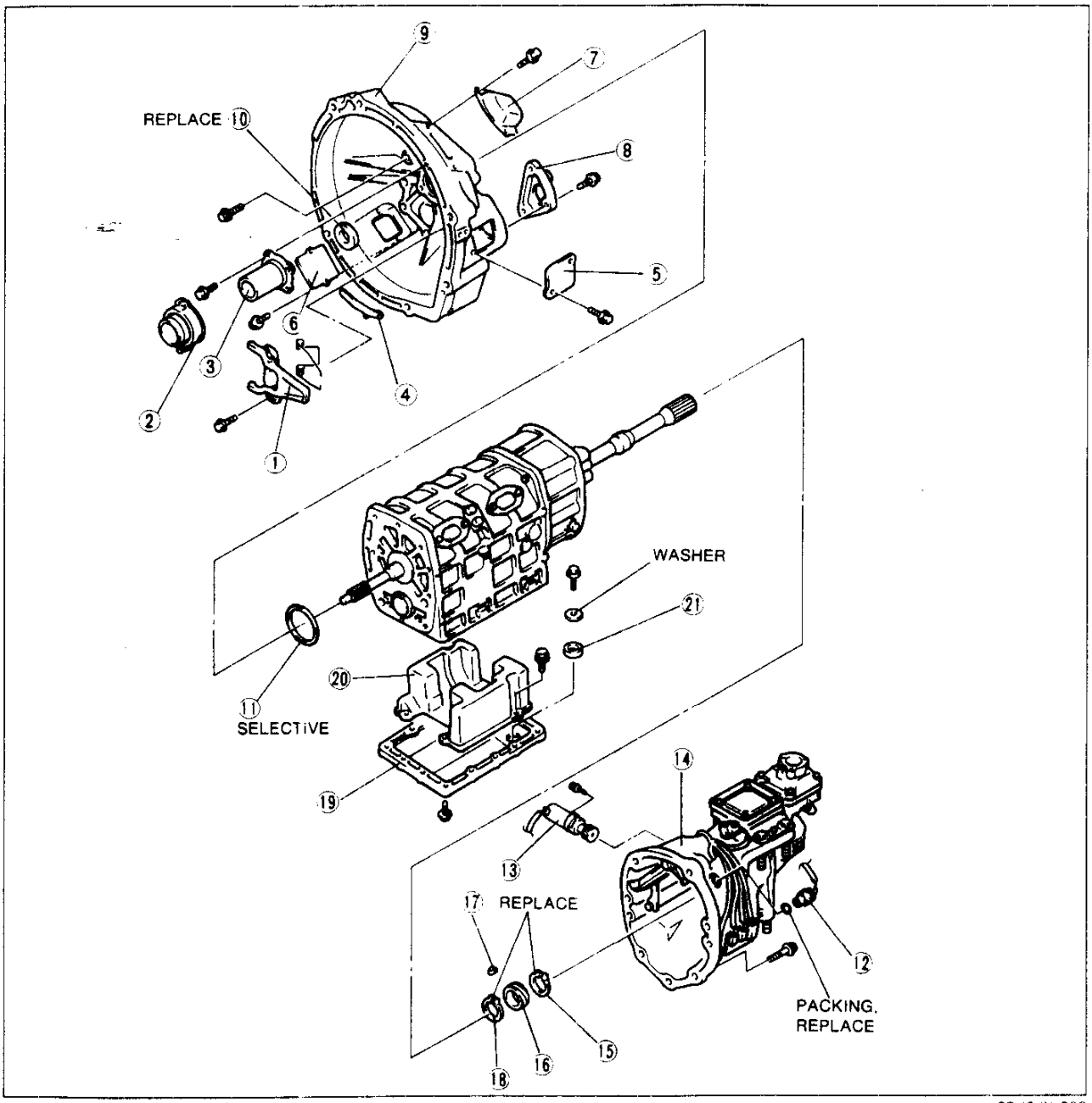
37U0JX-029

Clutch Housing and Extension Housing Components

Note

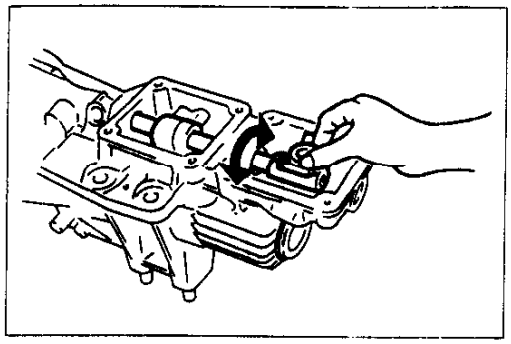
- **Do not remove the front and rear oil seals unless necessary.**

Disassemble in the order shown in the figure, referring to **Disassembly Note**.



37U0JX-030

1. Release fork assembly
2. Release collar
3. Front cover
4. Dust cover
5. Service hole A cover
6. Service hole B cover
7. Vent cover
8. Release cylinder support
9. Clutch housing
10. Oil seal (clutch housing)
11. Adjustment shim
12. Back-up light switch
13. Speedometer sensor (Speedometer driven gear)
14. Extension housing Disassembly note ..... page J–16
15. Snap ring
16. Speedometer drive gear
17. Key
18. Snap ring
19. Undercover
20. Oil baffle
21. Magnet



37J0JX-031

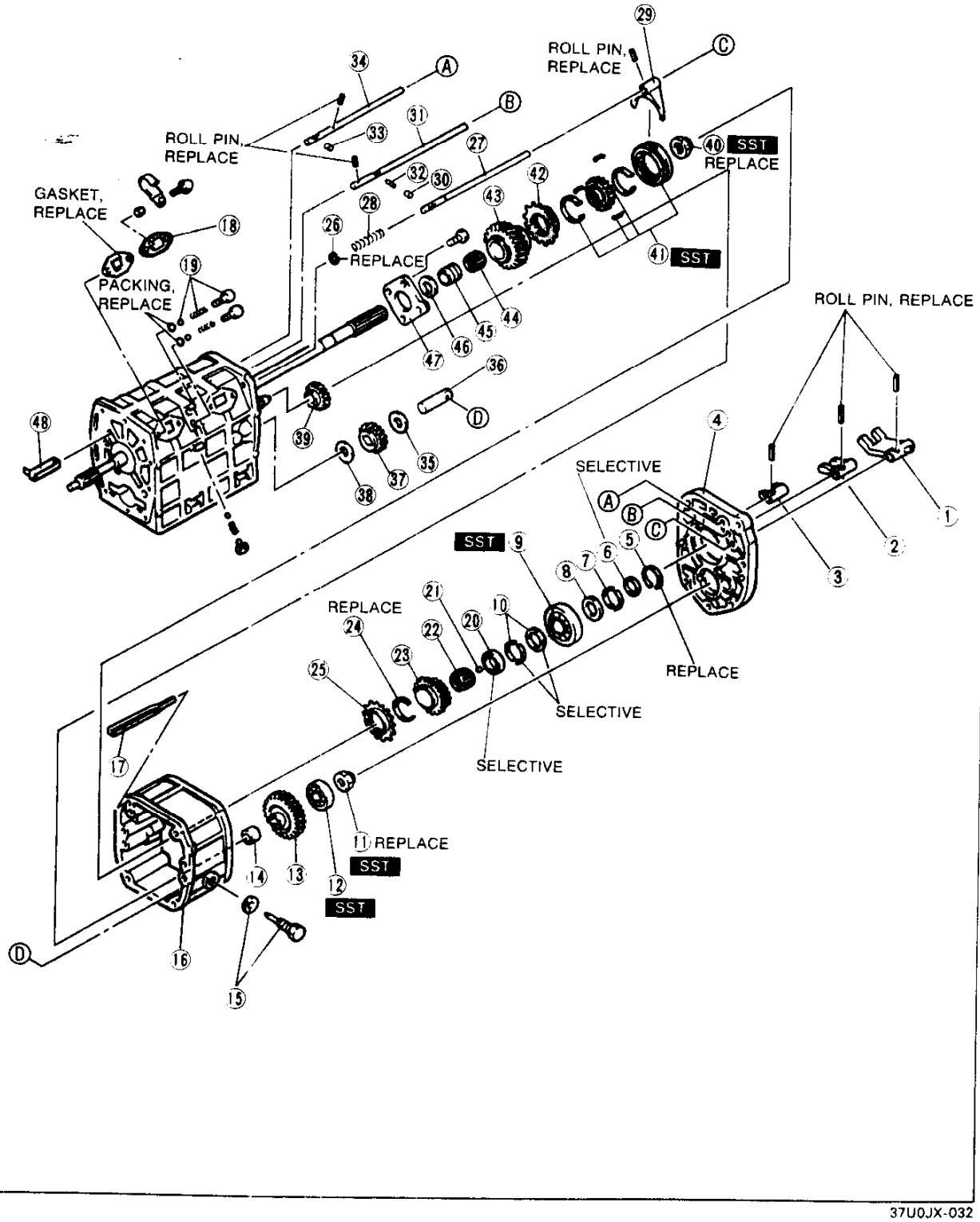
Disassembly note
Extension housing

1. Move the control rod end to the neutral position.
2. Remove the extension housing installation bolts.
3. Lift up on and remove the extension housing from the center housing.

MEMO

5th/Reverse Gear and Housing Components

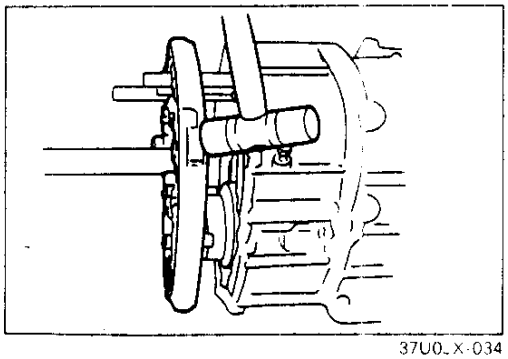
Disassemble in the order shown in the figure, referring to **Disassembly Note**.



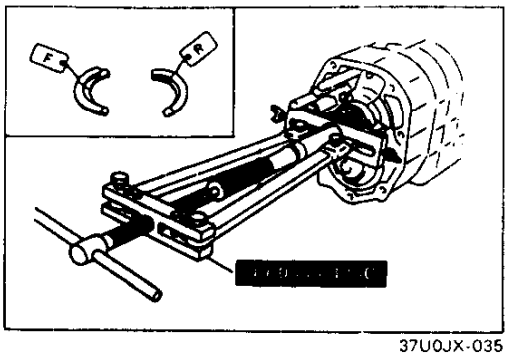
37U0JX-032

1. 5th/Reverse shift rod end
   Inspection ..... page J–32
2. 3rd/4th shift rod end
   Inspection ..... page J–32
3. 1st/2nd shift rod end
   Inspection ..... page J–32
4. Bearing housing
   Disassembly Note
   ..... below
5. Snap ring
6. Thrust washer
7. C-washers
8. Retaining ring
9. Mainshaft rear bearing
   Disassembly Note
   ..... below
   Inspect for damage
10. C-washers and
    retaining ring
11. Locknut
    Disassembly Note
    ..... page J–20
12. Countershaft rear bearing
    Disassembly Note
    ..... page J–20
    Inspect for damage
13. Counter 5th gear
    Inspection ..... page J–31
14. Spacer
15. Set bolt and washer
16. Center housing
    Disassembly Note
    ..... page J–20
17. Oil guide
18. Blind cover
19. Cap plug, spring, and
    detent ball
20. Thrust lock washer
21. Steel ball
22. Bearing
    Inspect for damage
23. 5th gear
    Inspection ..... page J–31
24. Retaining ring
25. Synchronizer ring (5th)
    Inspection ..... page J–32
26. Retaining ring
27. 5th/Reverse shift rod
    Disassembly Note
    ..... page J–20
28. Spring
    Inspection ..... page J–33
29. 5th/Reverse shift fork
30. Interlock pin (large)
31. 3rd/4th shift rod
    Disassembly Note
    ..... page J–21
32. Interlock pin (small)
33. Interlock pin (large)
34. 1st/2nd shift rod
    Disassembly Note
    ..... page J–21
35. Thrust washer
36. Reverse idler gear shaft
    Inspection ..... page J–33
37. Reverse idler gear
    Inspection ..... page J–33
38. Thrust washer
39. Counter reverse gear
    Inspection ..... page J–31
40. Locknut
    Disassembly Note
    ..... page J–21
41. 5th/Reverse clutch hub
    assembly
    Disassembly Note
    ..... page J–21
    Inspection ..... page J–32
42. Synchronizer ring
    (Reverse)
    Inspection ..... page J–32
43. Reverse gear
    Inspection ..... page J–31
44. Bearing
    Inspect for damage
45. Bearing race
46. Thrust washer
47. Bearing cover
48. Oil guide

37U0JX-033



37U0JX-034



37U0JX-035

Disassembly note
Bearing housing

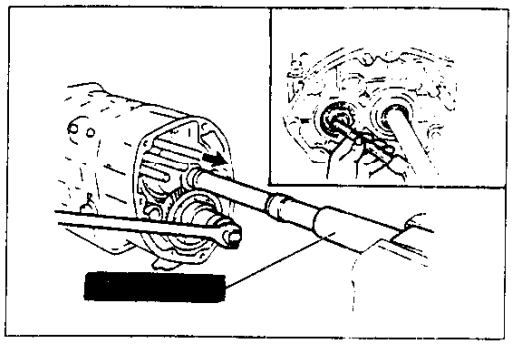
Caution
- **Using metal tools to remove the bearing housing could cause severe damage to its machined surfaces.**

Hit down and outward on the bearing housing with a plastic hammer to remove.

Mainshaft rear bearing

Caution
- **The front and rear C-washers may have different thicknesses.**

1. Remove the snap ring, washer, retaining ring, and rear C-washers.
2. Remove the mainshaft rear bearing by using the **SST**.
3. Remove the retaining ring and the front C-washers.



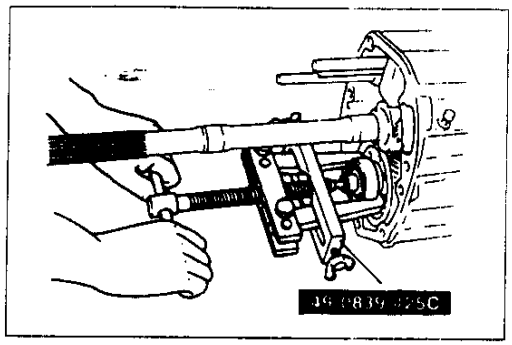
37U0JX-036

Locknut and countershaft rear bearing

1. Shift the 1st/2nd shift rod to 1st gear.

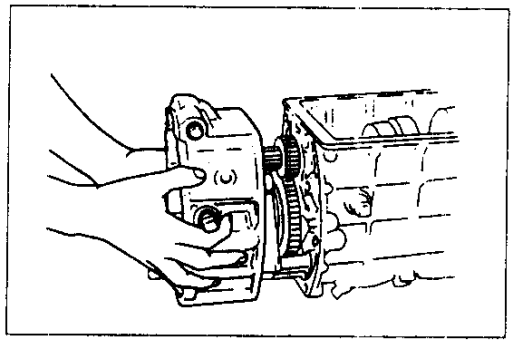
Caution
- **Do not reuse the locknut.**
- **Do not scratch or damage the countershaft.**

2. Uncrimp the tab of the locknut.
3. Hold the mainshaft by using the **SST** and a vise.
4. Remove the locknut.



37U0JX-037

5. Remove the countershaft rear bearing by using the **SST**.



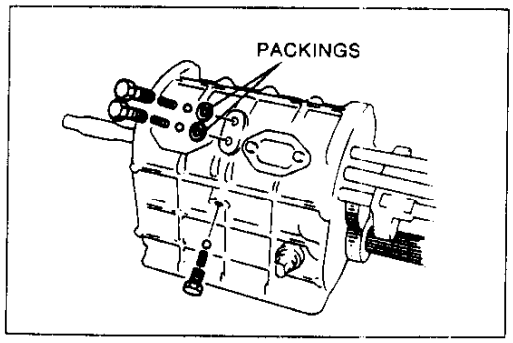
37U0JX-038

Center housing

1. Remove the set bolt and washer from the center housing.

Note
- **If the center housing is difficult to remove, tap around the edge of the center housing with a plastic hammer.**

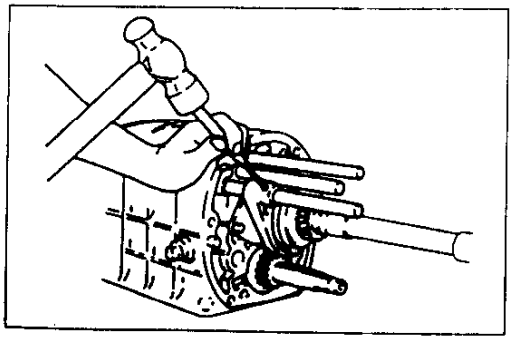
2. Remove the center housing.



37U0JX-039

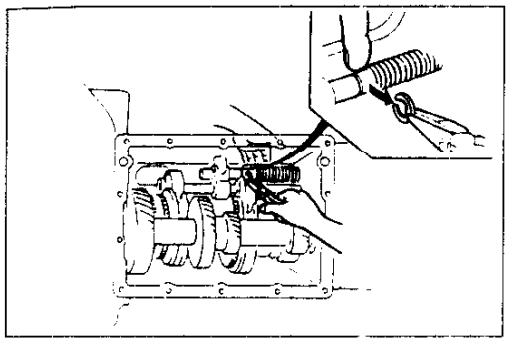
5th/Reverse shift rod

1. Remove the three cap plugs, packings, detent balls, and springs.

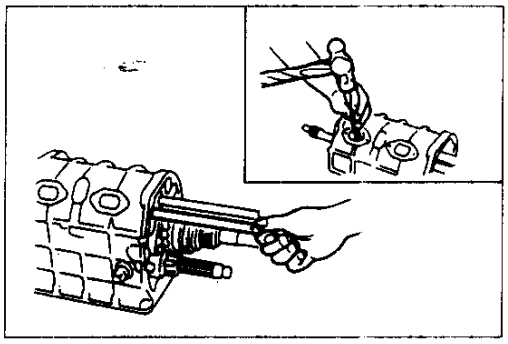


37U0JX-040

2. Drive the roll pin from the 5th/Reverse shift fork.

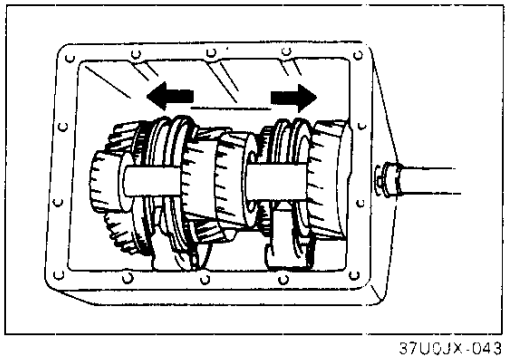

37U0JX-041

3. Pull the retaining ring from the 5th/Reverse shift rod.
4. Slide the 5th/Reverse shift rod out of the transmission case, and remove the spring.


37U0JX-042

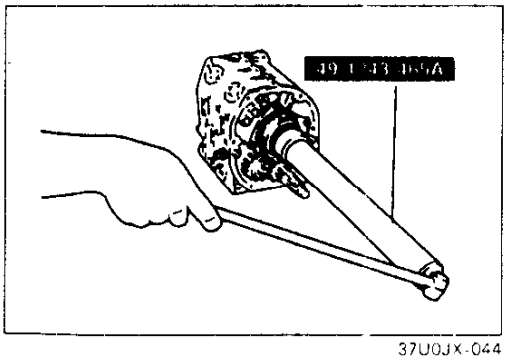
1st/2nd and 3rd/4th shift rods

1. Shift the transmission into 4th gear to gain access to the roll pin. Drive the roll pin from the 3rd/4th shift fork.
2. Slide the 3rd/4th shift rod and interlock pin (small) out from the rear of the transmission case.
3. Drive the roll pin from the 1st/2nd shift fork. Slide the 1st/2nd shift rod out from the rear of the transmission case, and remove the interlock pin (large).


37U0JX-043

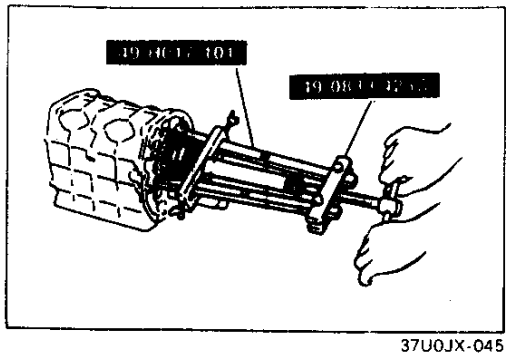
Locknut

1. Uncrimp the tab of the locknut.
2. Shift into 1st and 4th gears to lock the rotation of the mainshaft.


37U0JX-044

Caution
- **Do not reuse the locknut.**

3. Remove the locknut by using the **SST**.

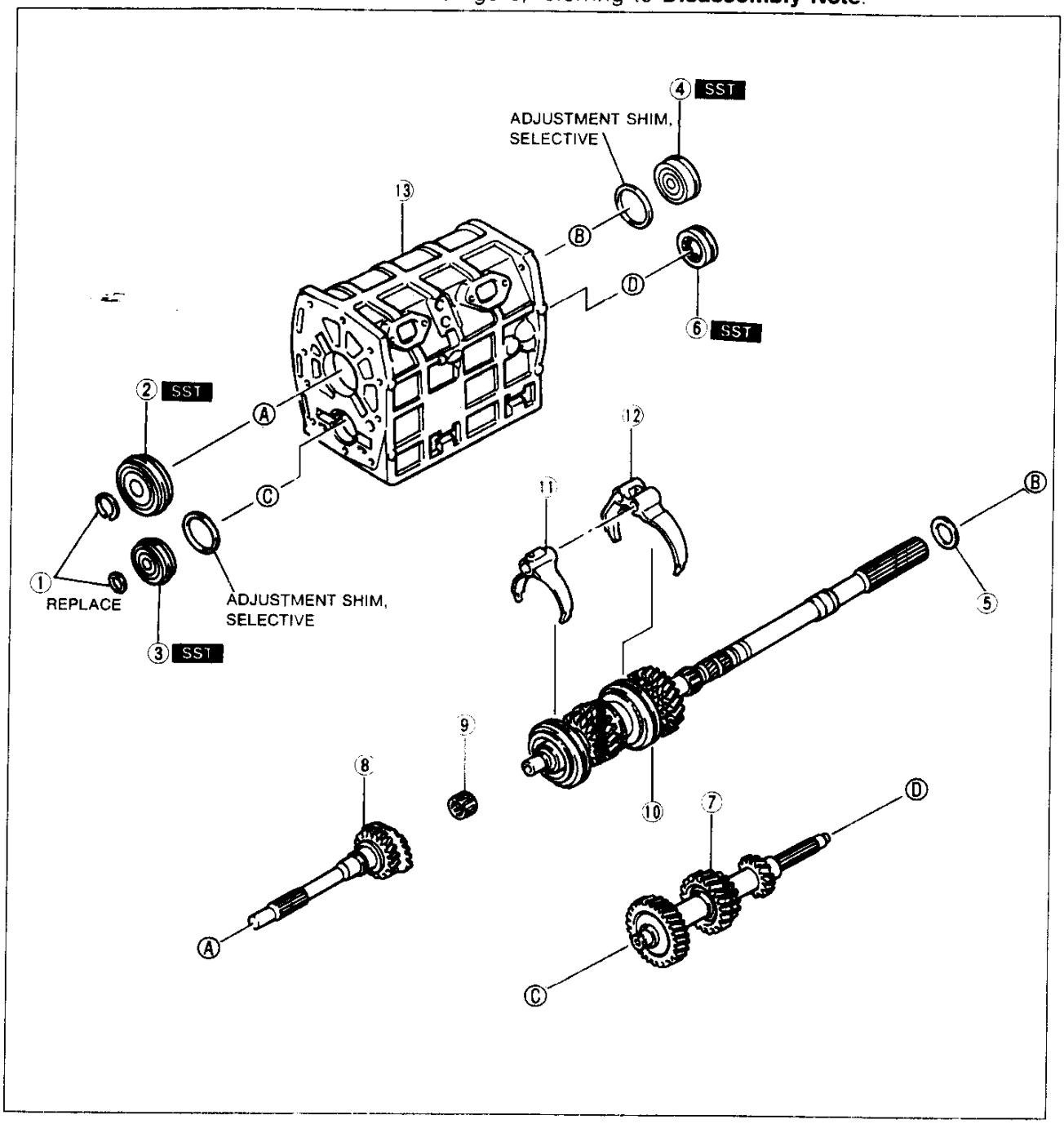

37U0JX-045

5th/Reverse clutch hub assembly

1. Remove the bearing cover installation bolts.
2. Attach the **SST** to the bearing cover and remove the assembly, which consists of the following parts:
   - 5th/Reverse clutch hub assembly
   - Synchronizer ring
   - Needle bearing
   - Bearing race
   - Reverse gear
   - Thrust washer

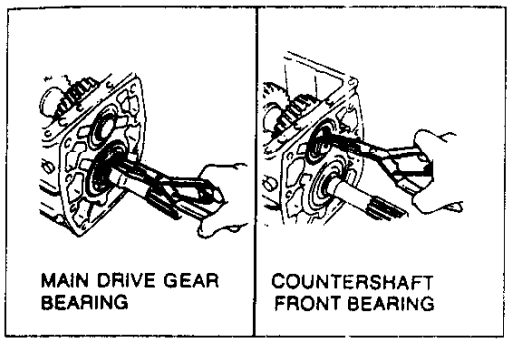
Transmission Case Components

Disassemble in the order shown in the figure, referring to **Disassembly Note**.



37U0JX-046

1. Snap rings
   Disassembly Note ..... page J–23
2. Main drive gear bearing
   Disassembly Note ..... page J–23
   Inspect for damage
3. Countershaft front bearing
   Disassembly Note ..... page J–23
   Inspect for damage
4. Mainshaft front bearing
   Disassembly Note ..... page J–24
   Inspect for damage
5. Thrust washer
6. Countershaft center bearing
   Disassembly Note ..... page J–24
   Inspect for damage
7. Countershaft assembly
8. Main drive gear
   Inspection ..... page J–31
9. Bearing
10. Mainshaft gear assembly
    Disassembly Note ..... page J–24
11. 3rd/4th shift fork
12. 1st/2nd shift fork
13. Transmission case

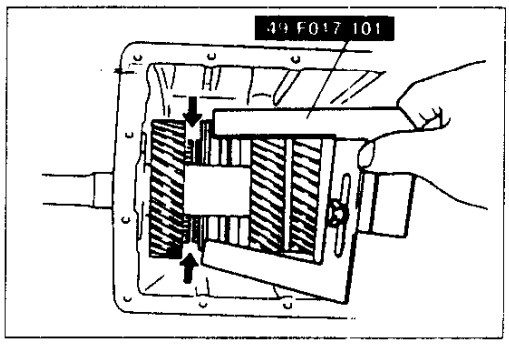


37U0JX-047

Disassembly note
Snap rings

Caution
- **Do not reuse the snap rings.**

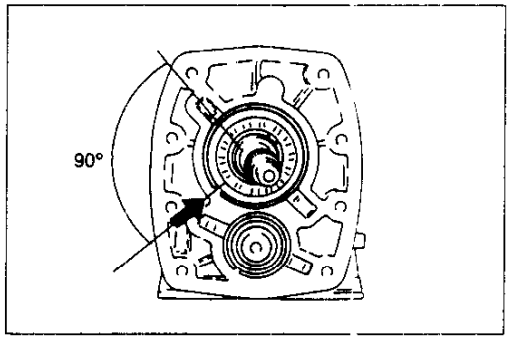
Remove the snap rings from the mainshaft and the countershaft by using snap ring pliers.



37U0JX-048

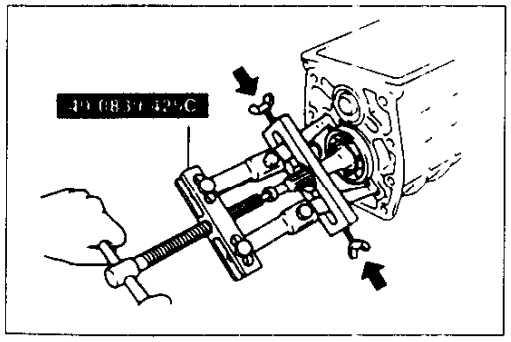
Main drive gear bearing

1. Install the **SST** between the 4th gear synchronizer ring and main drive synchromesh gear.



37U0JX-049

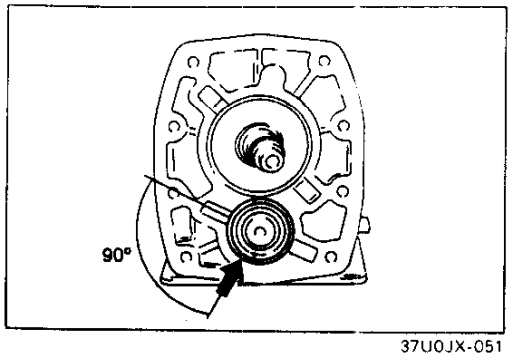
2 Turn the bearing snap rings so that the ends are 90° to the transmission case grooves.



37U0JX-050

Caution
- **Be extremely careful not to damage the bearing snap ring while using the SST (bearing puller).**
- **Tighten the SST side screws shown in the figure.**

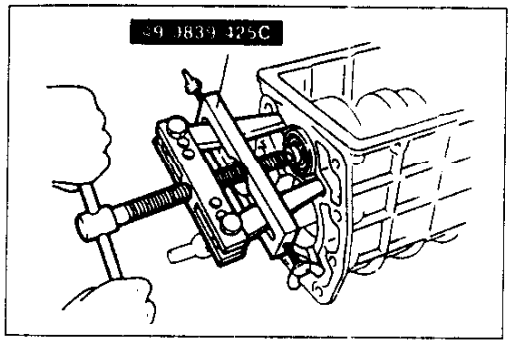
3. Remove the main drive gear bearing by using the **SST**.



37U0JX-051

Countershaft front bearing

1. Turn the bearing snap rings so that the ends are 90° to the transmission case grooves.

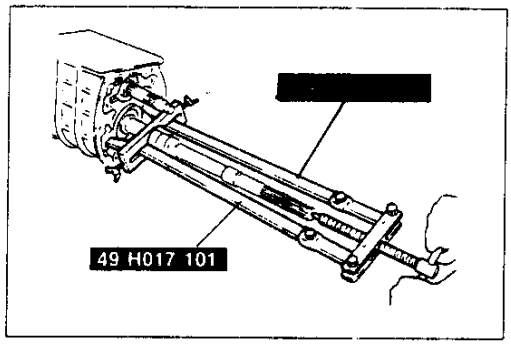


37U0JX-052

Note

- **Replace the countershaft front bearing and countershaft front spacer as one assembly.**

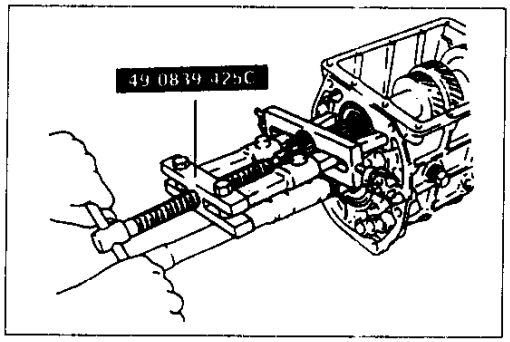
2. Remove the countershaft front bearing by using the **SST**.



37U0JX-053

Mainshaft front bearing

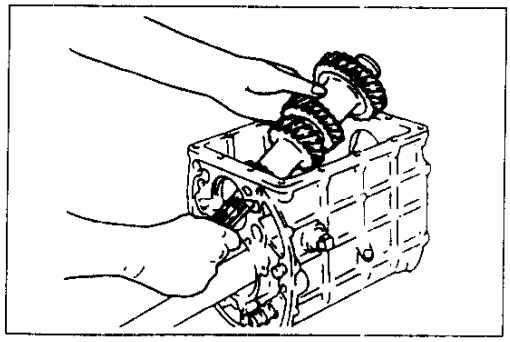
Remove the mainshaft front bearing by using the **SST**.



37U0JX-054

Countershaft center bearing

1. Remove the countershaft center bearing by using the **SST**.

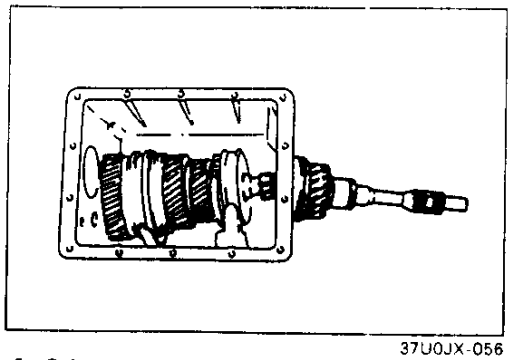


37U0JX-055

Caution

- **Do not damage the transmission case or countershaft.**

2. Remove the countershaft.



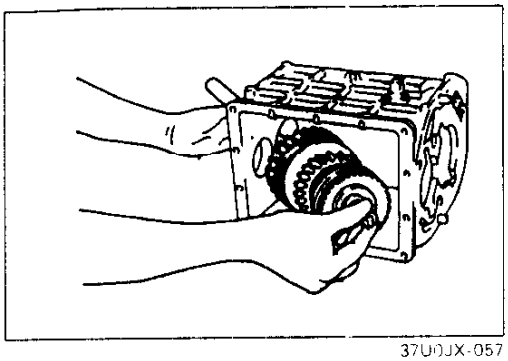
37U0JX-056

Mainshaft gear assembly

Caution

- **Do not damage the main drive gear bearing bore.**

1. Remove the main drive gear from the transmission case.
2. Remove the needle bearing from the mainshaft joint of the main drive gear.



37U0JX-057

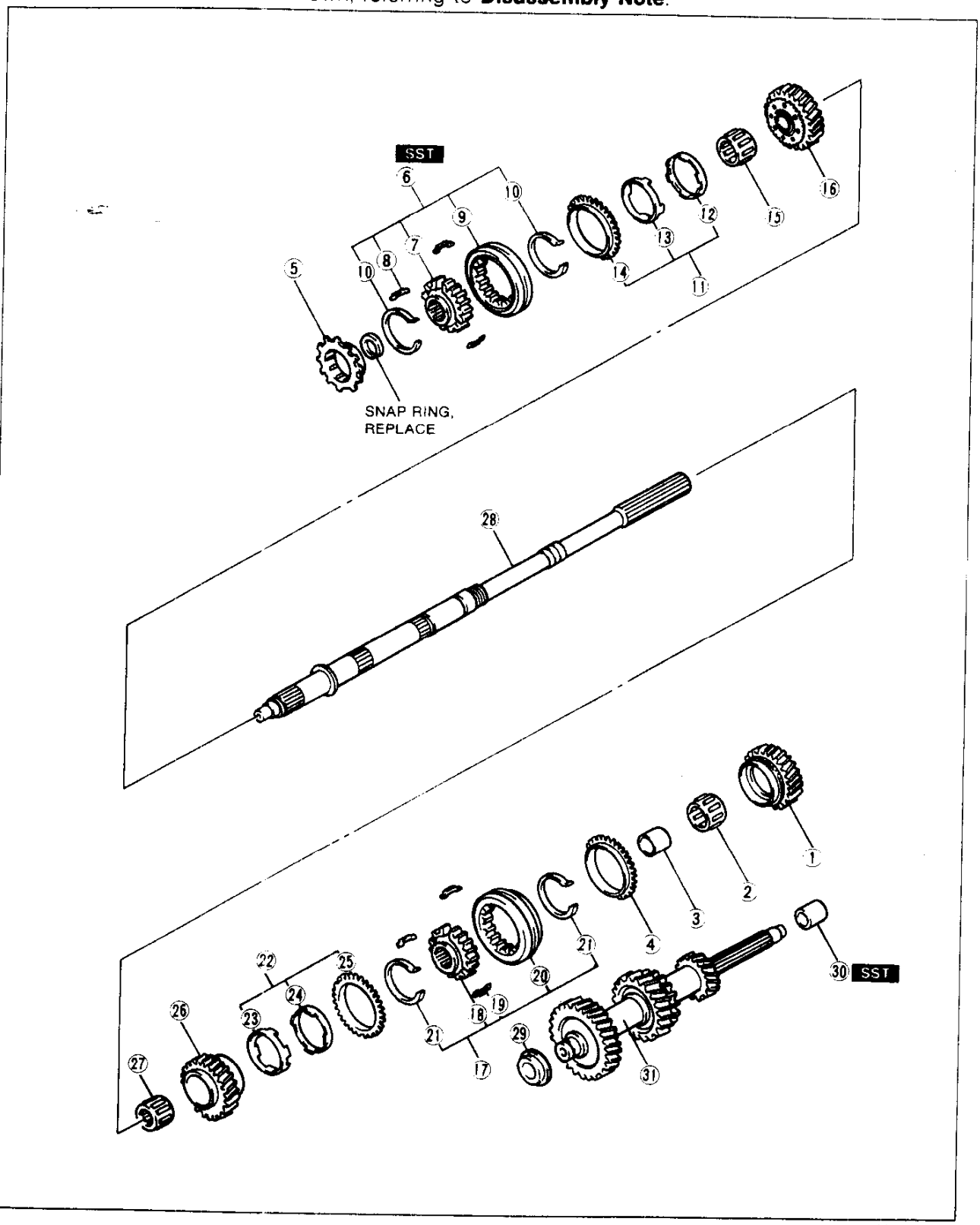
3. Remove the mainshaft gear assembly from the transmission case.

Mainshaft and Countershaft Components

Caution

- **Do not remove the countershaft center bearing race unless necessary.**

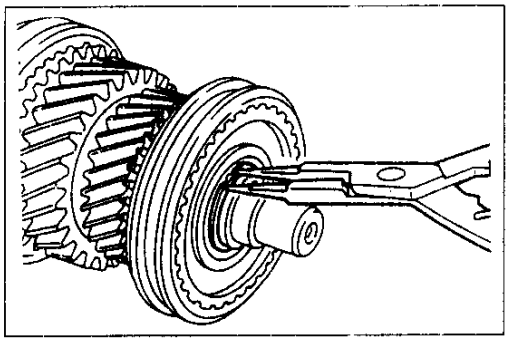
Disassemble in the order shown, referring to **Disassembly Note**.



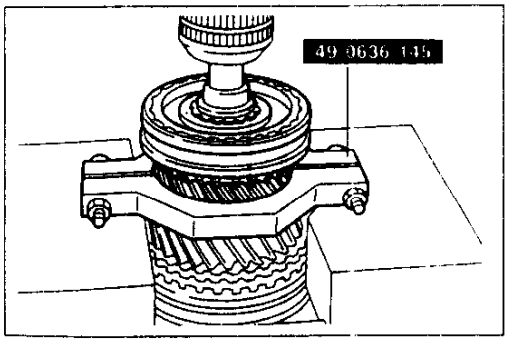
37U0JX-058

1. 1st gear
   Inspection ..... page J–31
2. Bearing
   Inspect for damage
3. Bearing race
4. Synchronizer ring (1st)
   Inspection ..... page J–32
5. Synchronizer ring (4th)
   Inspection ..... page J–32
6. 3rd/4th clutch hub assembly
   Disassembly Note
   ..... below
   Inspection ..... page J–32
7. 3rd/4th clutch hub
8. Synchronizer key
9. Clutch hub sleeve
10. Synchronizer key spring (3rd/4th)
11. Synchronizer assembly (3rd)
    Inspection ..... page J–33
12. Inner cone
13. Double cone
14. Synchronizer ring
15. Bearing
    Inspect for damage
16. 3rd gear
    Inspection ..... page J–31
17. 1st/2nd clutch hub assembly
    Disassembly Note
    ..... below
    Inspection ..... page J–32
18. 1st/2nd clutch hub
19. Synchronizer key
20. Clutch hub sleeve
21. Synchronizer key spring
22. Synchronizer assembly (2nd)
    Inspection ..... page J–33
23. Inner cone
24. Double cone
25. Synchronizer ring
26. 2nd gear
    Inspection ..... page J–31
27. Bearing
    Inspect for damage
28. Mainshaft
    Inspection ..... page J–31
29. Countershaft front bearing spacer
30. Countershaft center bearing race
    Disassembly Note
    ..... page J–28
31. Countershaft
    Inspection ..... page J–31

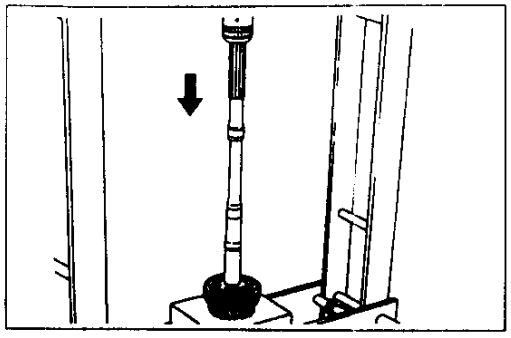
37U0JX-059



37U0JX-060



37U0JX-061



37U0JX-062

Disassembly note
3rd/4th clutch hub assembly

Caution
- **Do not reuse the snap ring.**

1. Remove the snap ring from the front of the mainshaft.

2. Position the **SST** between 2nd and 3rd gears.

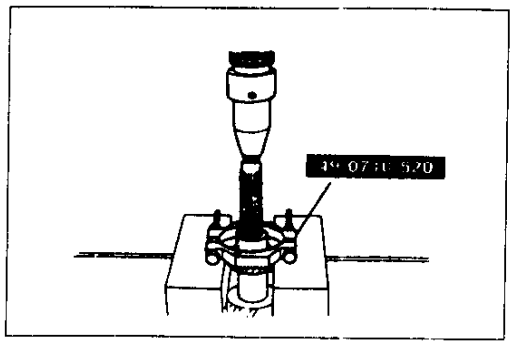
Caution
- **Hold the mainshaft with one hand so that it does not fall.**

3. Press the mainshaft out from the 3rd gear, synchronizer ring assembly (3rd), and the 3rd/4th clutch hub assembly.

1st/2nd clutch hub assembly

Caution
- **Hold the mainshaft with one hand so that it does not fall.**

Press the 1st/2nd clutch hub assembly, synchronizer ring assembly (2nd), and 2nd gear from the mainshaft.



37U0JX-063

Countershaft center bearing race

Caution

- **Hold the countershaft with one hand so that it does not fall.**

Note

- **Replace the countershaft center bearing and bearing race as one assembly.**

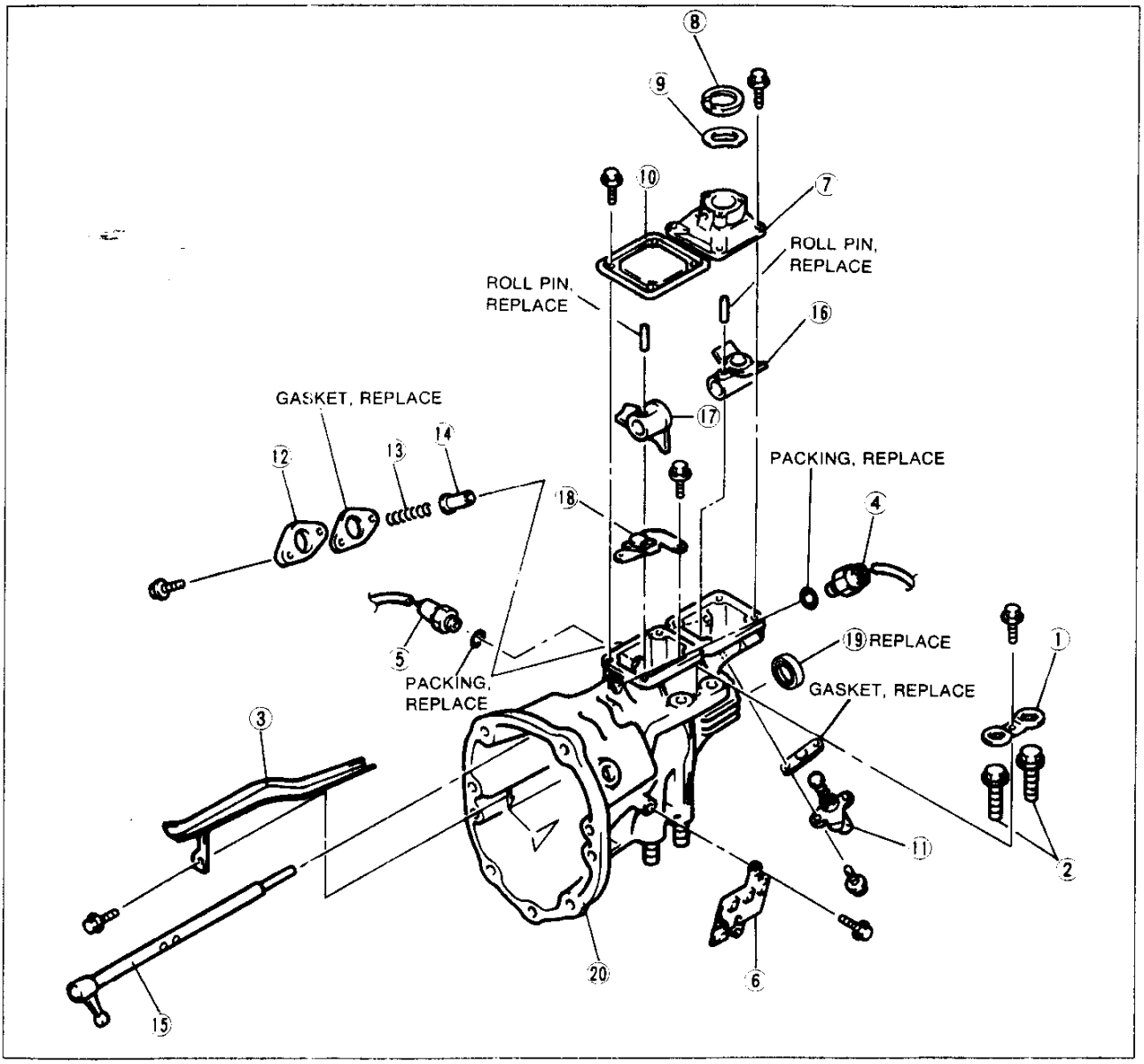
Remove the countershaft bearing race from the mainshaft by using the **SST**.

Extension Housing Components

Caution

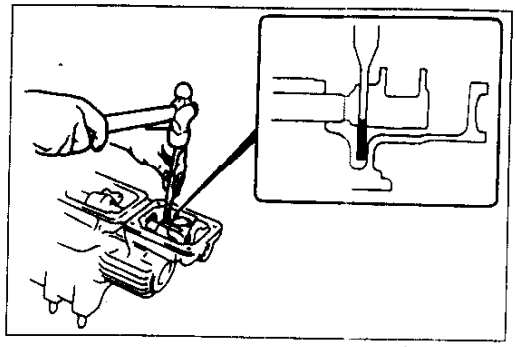
- **Do not remove the extension housing oil seal unless necessary.**

Disassemble in the order shown, referring to **Disassembly Note**.



57U0JX-064

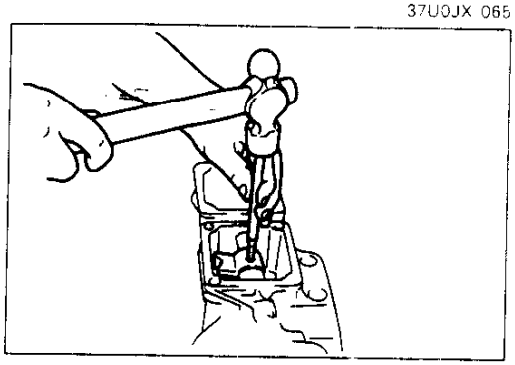
1. Stopper
2. Power plant frame installation bolts
3. Oil guide
4. Neutral switch
5. 1-2 switch
6. Bracket
7. Control case
8. Bushing
   Inspect for wear and damage
9. Wave washer
   Inspect for wear and damage
10. Blind cover
11. Select spindle assembly
12. Spring cap
13. Select lock spindle spring
    Inspection ..... page J–33
14. Select lock spindle
15. Control rod
    Disassembly Note ..... page J–30
    Inspection ..... page J–32
16. Control rod end
17. Selector
18. Shift guide assembly
19. Oil seal
    Disassembly Note ..... page J–30
20. Extension housing
    Inspection ..... page J–34



37U0JX-065

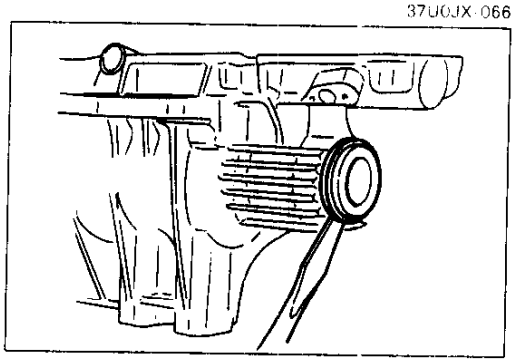
Disassembly note
Control rod

1. Slide the control rod end to the point where the roll pin is directly above the recess in the extension housing.
2. Remove the roll pin from the control rod end by using a pin punch and hammer.



37U0JX-066

3. Remove the roll pin from the selector by using a pin punch and hammer.
4. Slide the control rod from the extension housing, and remove the control rod end and selector.



37U0JX-067

Oil seal (extension housing)

Caution

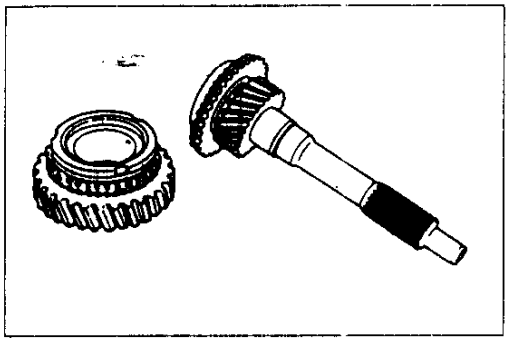
- **Do not scratch or damage the extension housing.**

Remove the oil seal from the extension housing by using a screwdriver.

INSPECTION

Inspect all parts, and repair or replace as necessary.

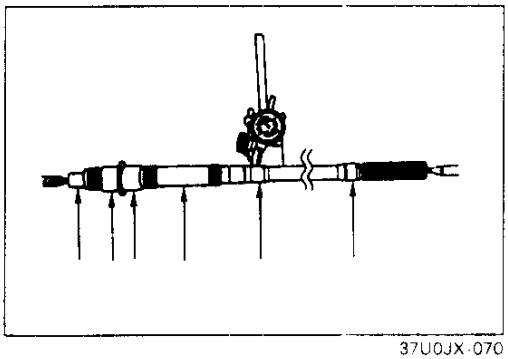
37U0JX-068



37U0JX-069

Each Gear and Main Drive Gear

1. Inspect synchronizer cones for wear.
2. Inspect individual gear teeth for damage, wear, and cracks.
3. Inspect synchronizer ring matching teeth for damage and wear.
4. Inspect main drive gear splines for damage and wear.



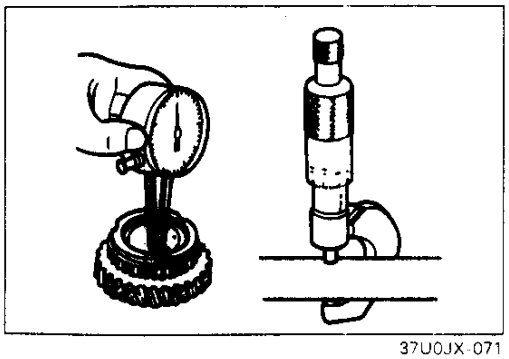
37U0JX-070

Mainshaft

1. Measure the mainshaft runout.

   Runout: 0.03 mm {0.0012 in} max.

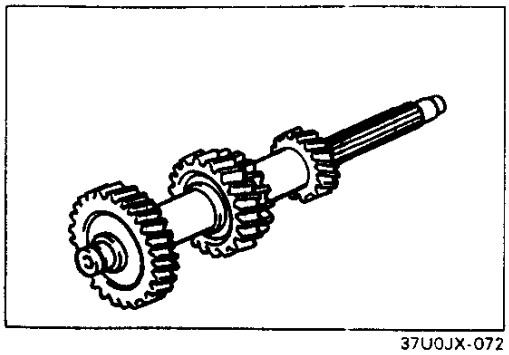
2. Inspect splines for damage and wear.



37U0JX-071

3. Measure the clearance between mainshaft and gear (or bushing).

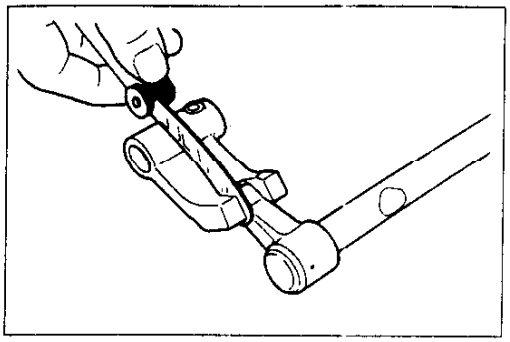
   Clearance: 0.15 mm {0.006 in} max.



37U0JX-072

Countershaft

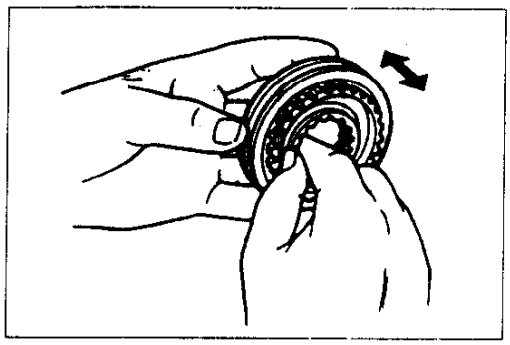
1. Inspect gear teeth for damage, wear, and cracks.
2. Inspect splines for damage and wear.


37U0JX-073

Control Rod Lever and Shift Rod

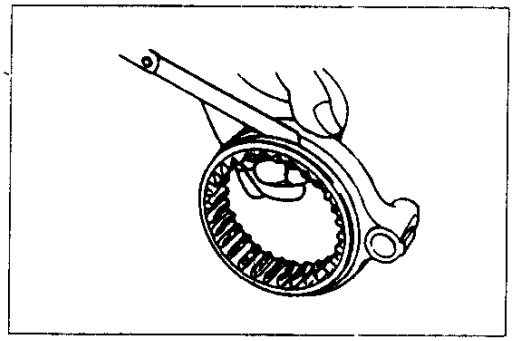
Measure the clearance between the control rod lever and the shift rod gate.

Clearance: 0.8 mm {0.031 in} max.


37U0JX-074

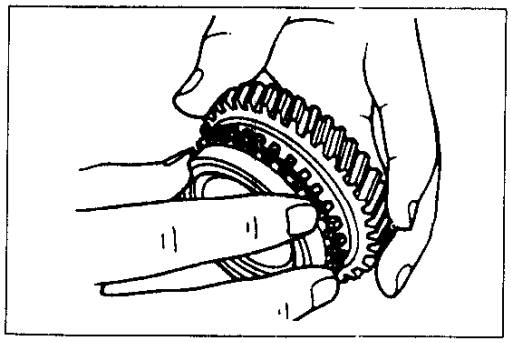
Each Clutch Hub Assembly

1. Inspect clutch hub sleeve and hub operation.
2. Inspect individual gear teeth for damage, wear, and cracks.
3. Inspect synchronizer keys for damage, wear, and cracks.


37U0JX-075

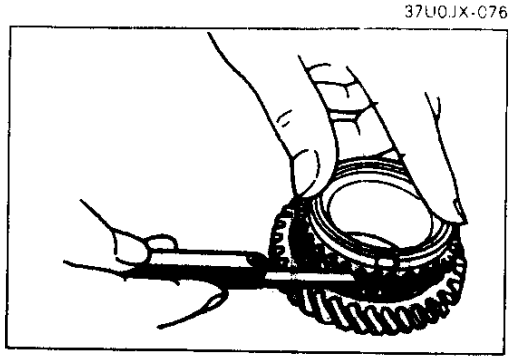
4. Measure the clearance between the hub sleeve groove and shift fork.

Clearance:
0.2–0.3 mm {0.008–0.012 in}
Maximum: 0.5 mm {0.020 in}


37U0JX-076

Synchronizer Ring (1st, 4th, 5th, Reverse)

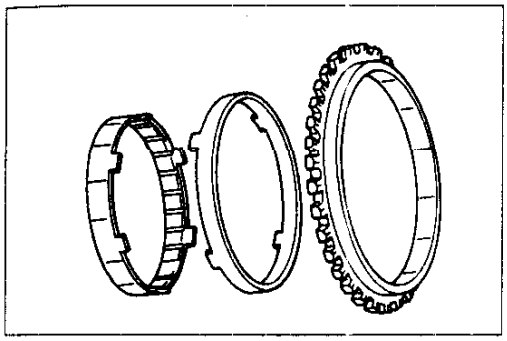
1. Inspect individual synchronizer ring teeth for damage, wear, and cracks.
2. Inspect taper surface for wear and cracks.


37U0JX-077

Note
- **Set the synchronizer ring squarely in the gear.**

3. Measure the clearance between the synchronizer ring and flank surface of gear.

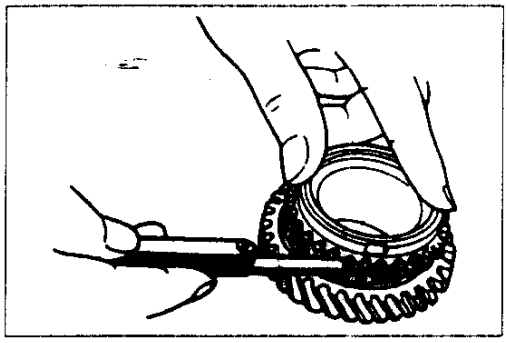
Clearance: 1.5 mm {0.059 in}
Minimum: 0.8 mm {0.031 in}


37U0JX-078

Synchronizer Assembly (2nd/3rd)

Caution
- **If any part of the synchronizer assembly is damaged, replace the assembly as a whole.**

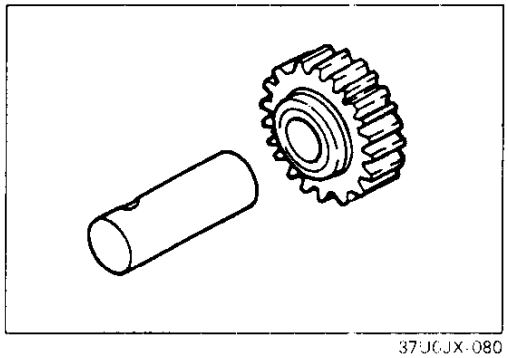
1. Inspect individual synchronizer ring gear teeth for damage, wear, and cracks.
2. Inspect for wear and damage to the tapered surfaces of the inner cone, double cone, and synchronizer ring.


37U0JX-079

Note
- **Set the synchronizer assembly squarely in the gear.**

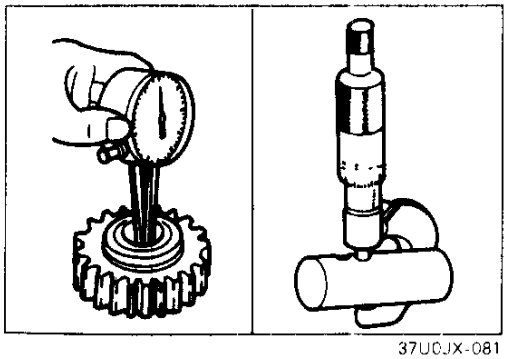
3. Measure the clearance between the synchronizer ring and flank surface of gear.

Clearance: 1.5 mm {0.059 in}
Minimum: 0.8 mm {0.031 in}


37U0JX-080

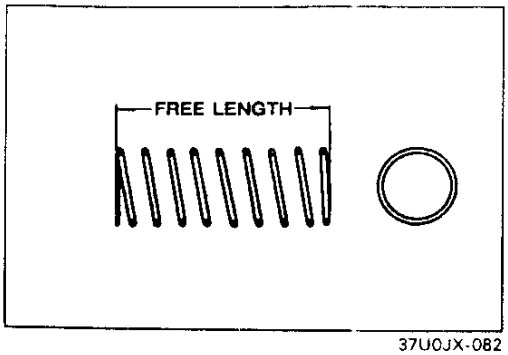
Reverse Idler Gear and Shaft

1. Inspect gear teeth for damage, wear, and cracks.


37U0JX-081

2. Measure the clearance between the reverse idler gear bushing and shaft.

Clearance:
0.02–0.05 mm {0.0008–0.0020 in}
Maximum: 0.15 mm {0.006 in}

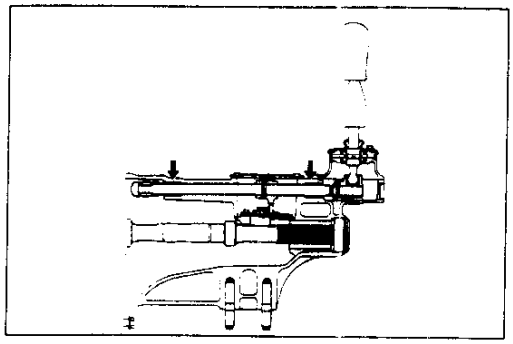


37U0JX-082

Spring

Measure the free length of the spring.

Standard free length: mm {in}
Detent ball spring: 22.5 {0.886}
5th/Reverse retaining spring: 73.00 {2.874}
Select lock spindle spring: 43.25 {1.703}


37U0JX-083

Extension Housing

1. Inspect the indicated bearings for damage.
2. Replace the extension housing if necessary.

ASSEMBLY

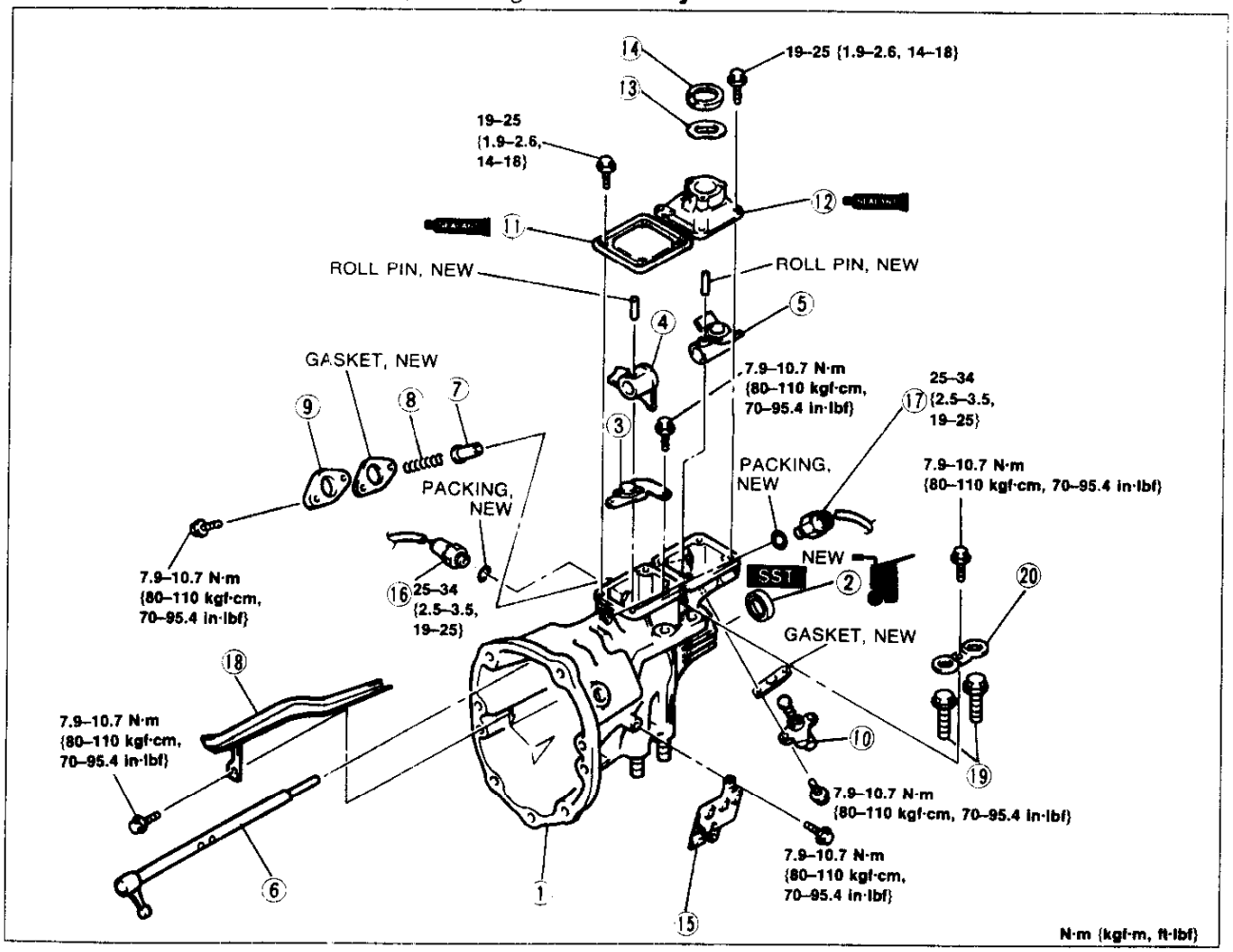
Precaution

1. Make sure each part is cleaned before assembling.
2. Coat all movable parts with the specified oil.
3. Replace parts wherever required.
4. Remove old sealant from contact surfaces before applying new sealant.
5. Assemble the parts within 10 minutes after applying sealant. Allow all sealant to cure at least 30 minutes after assembly before filling the transmission with transmission oil.
6. When using a vise, insert protective plates to prevent damage to the part.

37U0JX-084

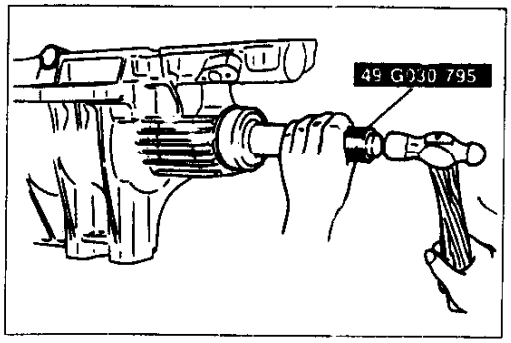
Extension Housing Components

Assemble in the order shown, referring to **Assembly Note**.



37U0JX-085

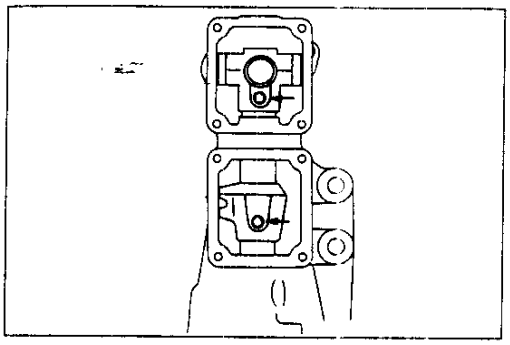
1. Extension housing
2. Oil seal (extension housing) Assembly Note ..... page J–36
3. Shift guide assembly
4. Selector
5. Control rod end
6. Control rod Assembly Note ..... page J–36
7. Select lock spindle
8. Select lock spindle spring
9. Spring cap
10. Select spindle assembly
11. Blind cover Assembly Note ..... page J–36
12. Control case Assembly Note ..... page J–36
13. Wave washer
14. Bushing
15. Bracket
16. 1-2 switch
17. Neutral switch
18. Oil guide
19. Power plant frame installation bolts
20. Stopper



37U0JX-086

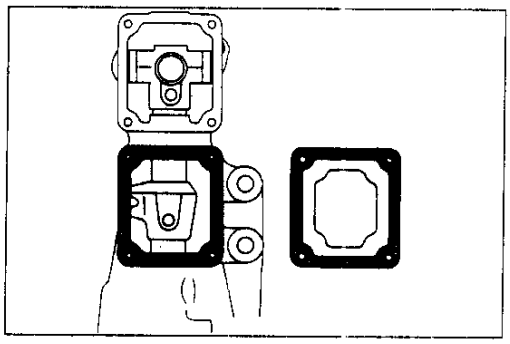
Assembly note
Oil seal (extension housing)

1. Apply clean oil to the lip and outer edge of a new oil seal.
2. Install the oil seal evenly and gradually by using the **SST**.


37U0JX-087

Control rod

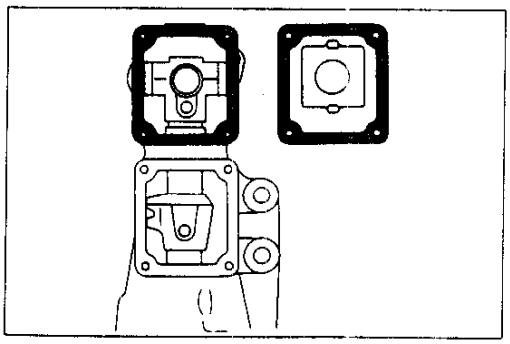
1. Install the control rod through the selector and control rod end, into the extension housing.
2. Install new roll pins into the selector and control rod ends as shown in the figure.


37U0JX-088

Blind cover

1. Apply sealant to the contact surfaces of the blind cover and extension housing.
2. Install the blind cover.

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


37U0JX-089

Control case

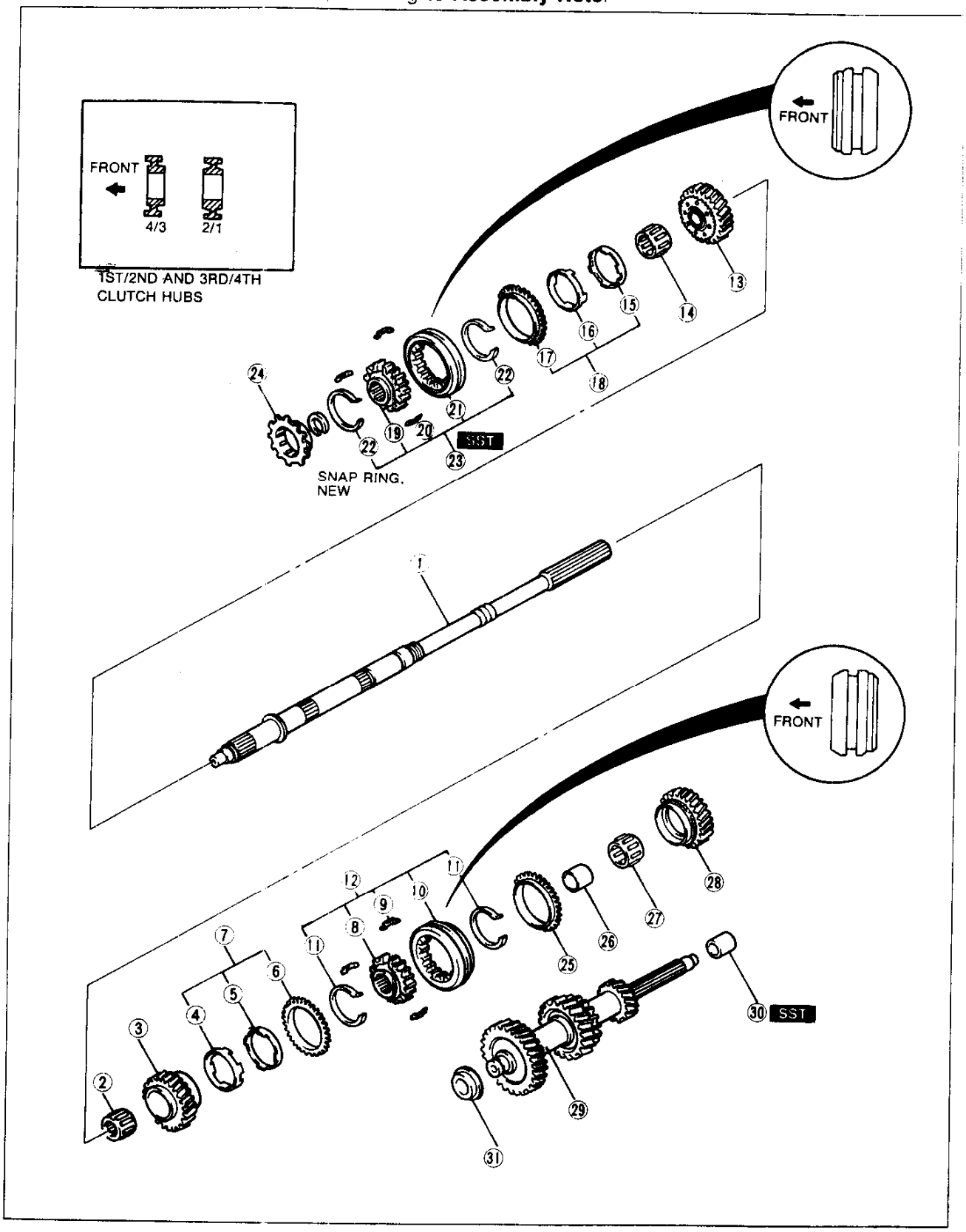
1. Apply sealant to the contact surfaces of the extension housing and control case.
2. Install the control case to the extension housing.

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

MEMO

Mainshaft and Countershaft Components

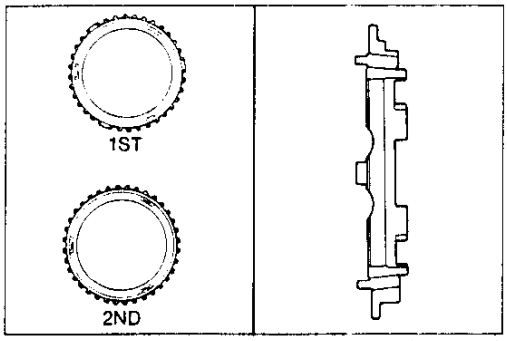
Assemble in the order shown, referring to **Assembly Note**.



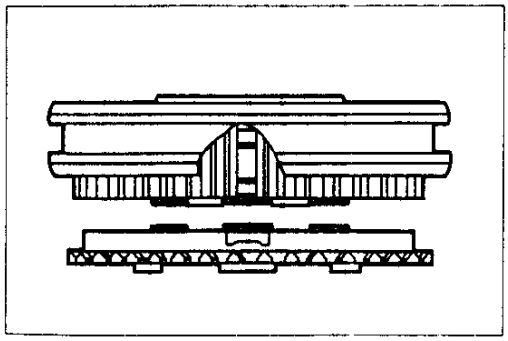
37U0JX-090

1. Mainshaft
2. Bearing
3. 2nd gear
4. Inner cone
5. Double cone
6. Synchronizer ring
7. Synchronizer assembly (2nd)
   Assembly Note ..... below
8. 1st/2nd clutch hub
9. Synchronizer key
10. Clutch hub sleeve
11. Synchronizer key spring
12. 1st/2nd clutch hub assembly
    Assembly Note ..... below
13. 3rd gear
14. Bearing
15. Inner cone
16. Double cone
17. Synchronizer ring
18. Synchronizer assembly (3rd)
    Assembly Note ..... below
19. 3rd/4th clutch hub
20. Synchronizer key
21. Clutch hub sleeve
22. Synchronizer key spring
23. 3rd/4th clutch hub assembly
    Assembly Note ..... below
24. Synchronizer ring (4th)
25. Synchronizer ring (1st)
26. Bearing race
27. Bearing
28. 1st gear
29. Countershaft
30. Countershaft center bearing race
    Assembly Note
    ..... page J–41
31. Countershaft front bearing spacer
    Assembly Note
    ..... page J–41

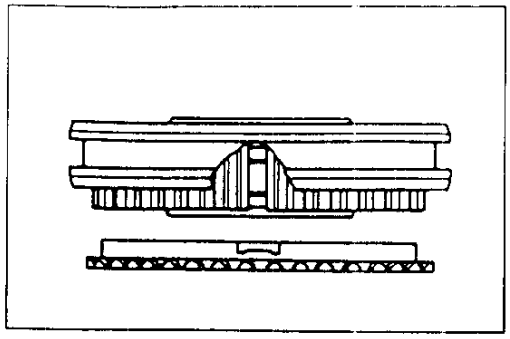
37U0JX-091



37J0JX-092



37J0JX-093



37U0JX-094

Assembly note
Synchronizer assembly (2nd, 3rd)

Note

- **The 1st and 2nd synchronizer rings can be easily distinguished by noting that the 1st synchronizer ring has two teeth fused together at three equally spaced places around its outer edge. The 2nd synchronizer ring has no distinguishing marks.**

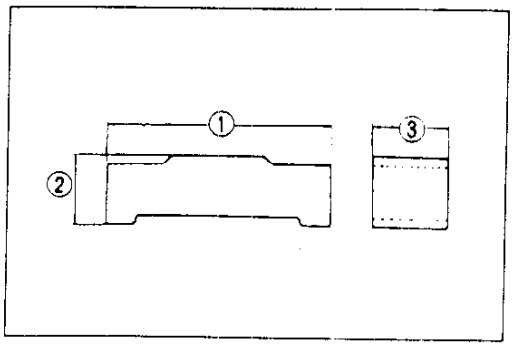
Install the inner cone, double cone, and synchronizer ring as shown in the figure.

Clutch hub assembly (1st/2nd, 3rd/4th)

Caution

- **Align the synchronizer ring grooves (2nd, 3rd) with the synchronizer keys during installation.**
- **Align the slots in the clutch hub with the tabs on the inner cone.**

- **Align the synchronizer ring grooves (1st, 4th) with the synchronizer keys.**



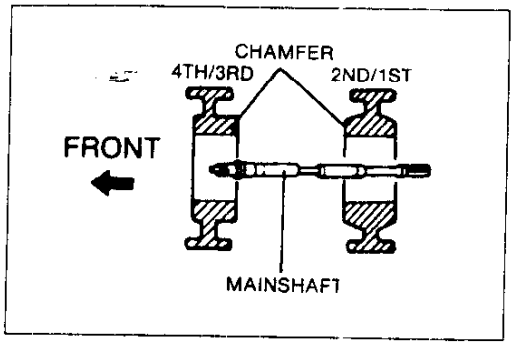
37U0JX-095

Note

- **Standard key dimensions are as follows:**

mm {in}

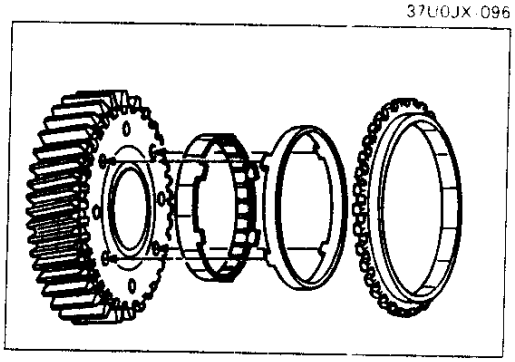
	1	2	3
1st and 2nd	18.00 {0.709}	5.45 {0.215}	6.00 {0.236}
3rd and 4th	17.00 {0.669}	4.25 {0.167}	5.00 {0.197}



37U0JX-096

Caution

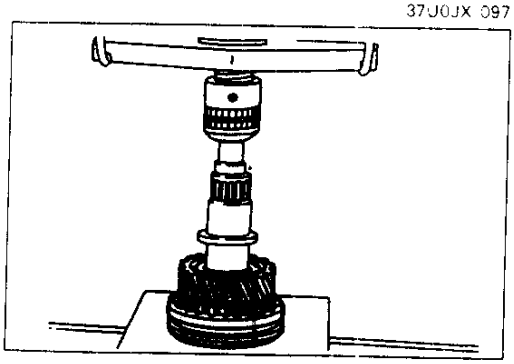
- **Press each clutch hub assembly onto the mainshaft in the proper direction as shown.**



37U0JX-097

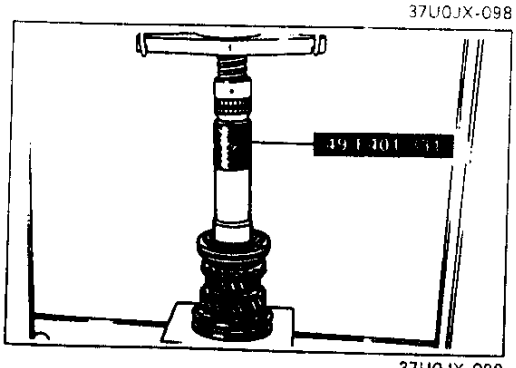
Caution

- **Do not damage parts while using the press.**
- **Install the double cone pegs into the holes in the flank side of the gear as shown in the figure.**



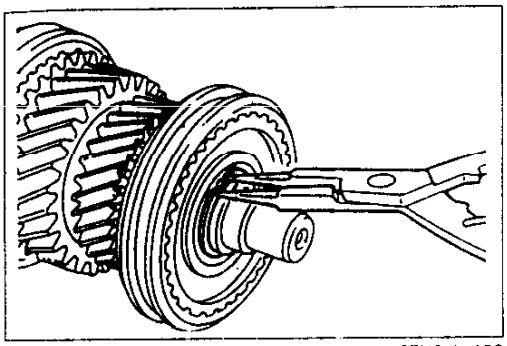
37U0JX-098

1 Set the needle bearing, 2nd gear, synchronizer assembly (2nd), and the 1st/2nd clutch hub assembly on the mainshaft, then press in the mainshaft.



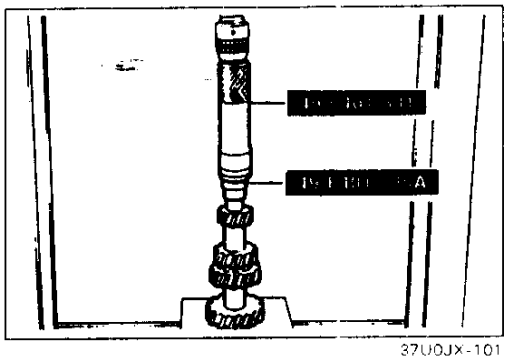
37U0JX-099

2. Set the needle bearing, 3rd gear, synchronizer assembly (3rd), and 3rd/4th clutch hub assembly on the mainshaft, then press them onto the mainshaft by using the **SST**.



37U0JX-100

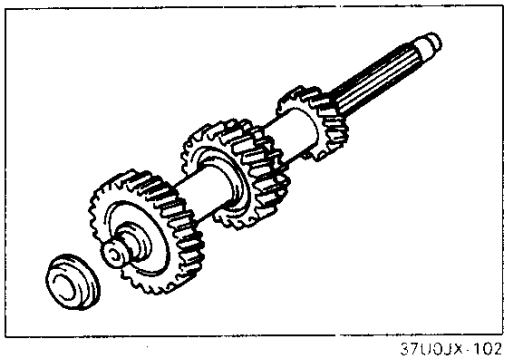
3. Install a new snap ring on the front of the mainshaft.



37U0JX-101

Countershaft center bearing race

Press the countershaft center bearing race onto the countershaft by using the **SST**.



37U0JX-102

Countershaft front bearing spacer

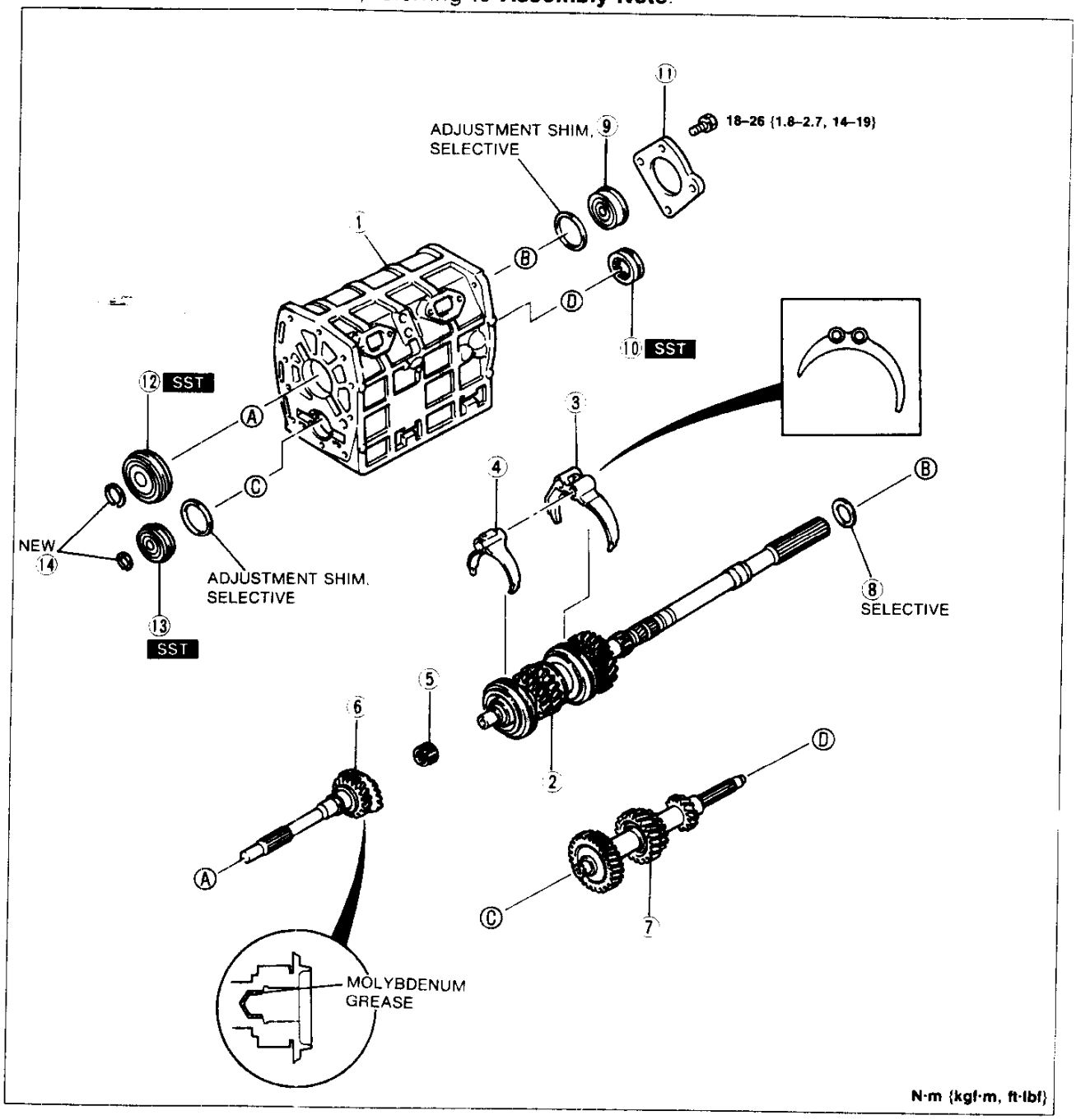
Note

- **Replace the countershaft front bearing and countershaft front bearing spacer as one assembly.**

Install the countershaft front bearing spacer.

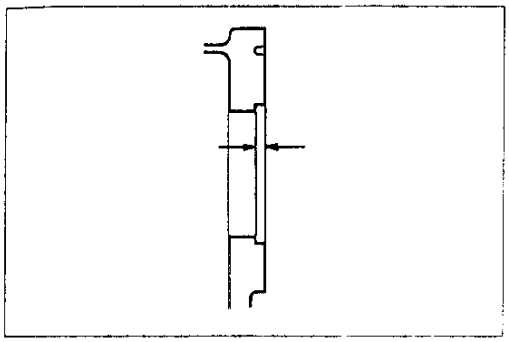
Transmission Case Components

Assemble in the order shown, referring to **Assembly Note**.



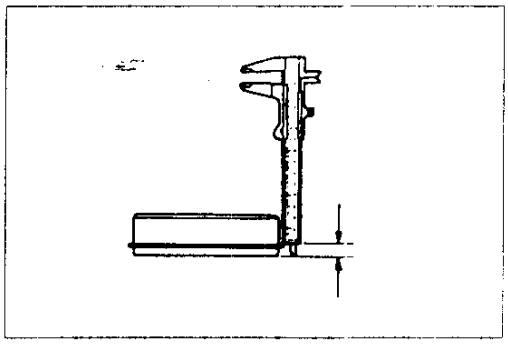
37U0JX-103

1. Transmission case
   Assembly Note
   ..... page J–43
2. Mainshaft gear assembly
3. 1st/2nd shift fork
4. 3rd/4th shift fork
5. Bearing
6. Main drive gear
7. Countershaft assembly
8. Thrust washer
9. Mainshaft front bearing
   Assembly Note
   ..... page J–44
10. Countershaft center bearing
    Assembly Note
    ..... page J–44
11. Bearing cover
12. Main drive gear bearing
    Assembly Note
    ..... page J–44
13. Countershaft front bearing
    Assembly Note
    ..... page J–45
14. Snap rings


37U0JX-104

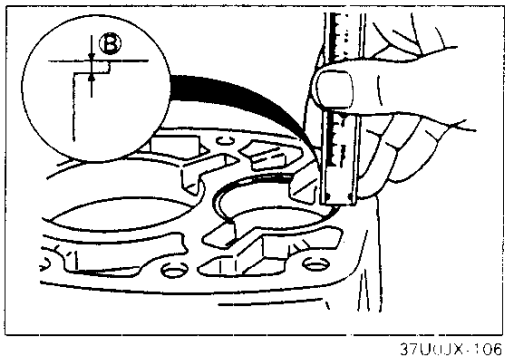
Assembly note
Transmission case

1. Measure the mainshaft front bearing thrust play as follows.
   (1) Measure the depth of the mainshaft front bearing bore in the rear of the transmission case.


37U0JX-105

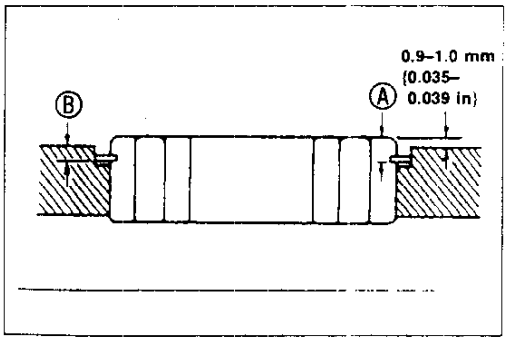
(2) Measure the mainshaft front bearing height.
The difference between the two measurements indicates the required thickness of the adjustment shim.

Standard thrust play:
0–0.05 mm {0–0.002 in}
Adjustment shim thicknesses:
0.1 mm {0.004 in}, 0.3 mm {0.012 in}



37U0JX-106

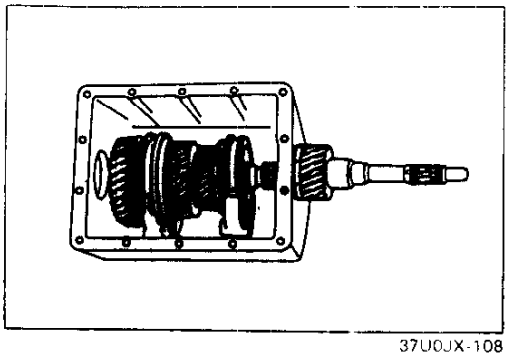
2. Measure the countershaft front bearing thrust play as follows.
   (1) Measure depth B of the countershaft front bearing bore in the transmission case.



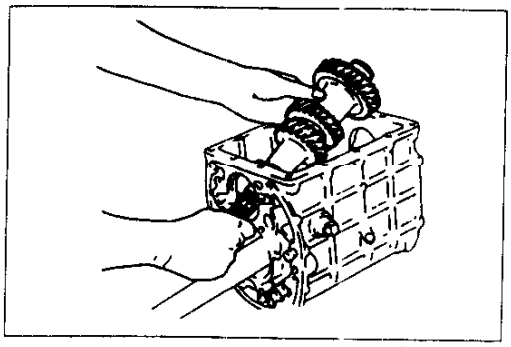
37U0JX-107

(2) Measure the countershaft front bearing snap ring height A.
(3) Choose an adjustment shim that will allow the difference between the two measurements to be equal to the standard bearing height.

A-B + Adjustment shim(s) = 0.9–1.0 mm
{0.035–0.039 in}
Standard bearing height on installing:
0.9–1.0 mm {0.035–0.039 in}
Adjustment shim thicknesses:
0.1 mm {0.004 in}, 0.3 mm {0.012 in}

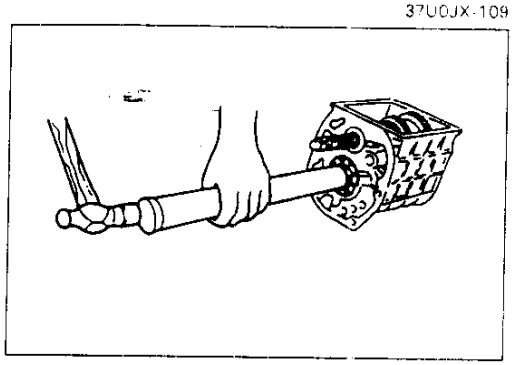

37U0JX-108

3. Position the 1st/2nd and 3rd/4th shift forks into the grooves of the clutch hub and sleeve assemblies.
4. Apply molybdenum grease to the needle bearing and install it in the main drive gear.
5. Install the main drive gear onto the front of the mainshaft.



37U0JX-109

6. Set the countershaft assembly into the case, making sure the countershaft gears engage each gear of the mainshaft assembly.

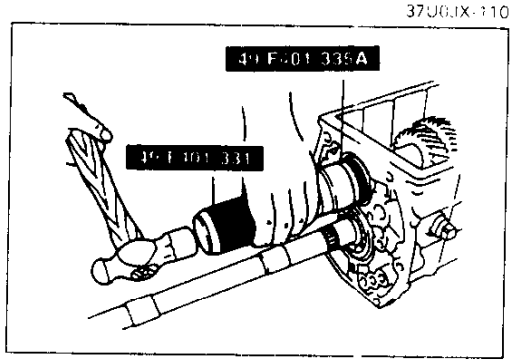


37U0JX-110

Mainshaft front bearing

1. Install the correct shim onto the rear of the mainshaft as determined in the transmission case assembly note (page J–43.)
2. Install the mainshaft front bearing with a suitable pipe.

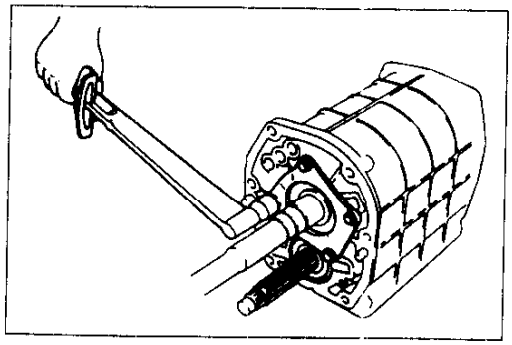
Bearing inner diameter: 32 mm {1.3 in}
Bearing outer diameter: 75 mm {3.0 in}



37U0JX-111

Countershaft center bearing

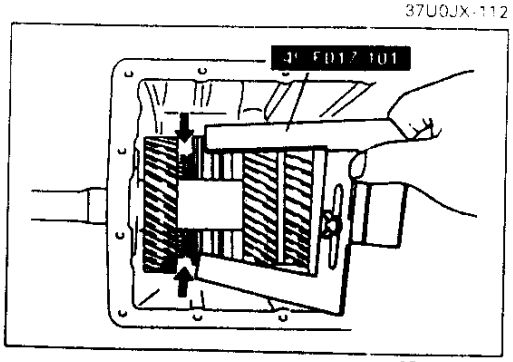
1. Install the countershaft center bearing onto the rear of the countershaft by using the **SST**.



37U0JX-112

2. Install the bearing cover.

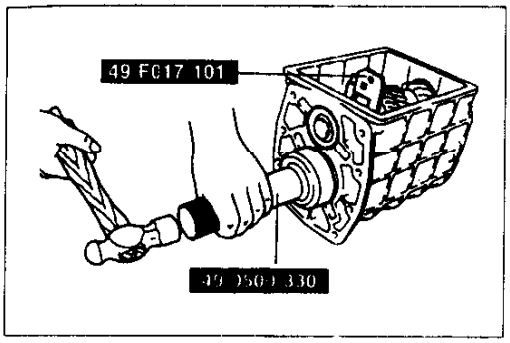
Tightening torque:
18–26 N·m {1.8–2.7 kgf·m, 14–19 ft·lbf}



37U0JX-113

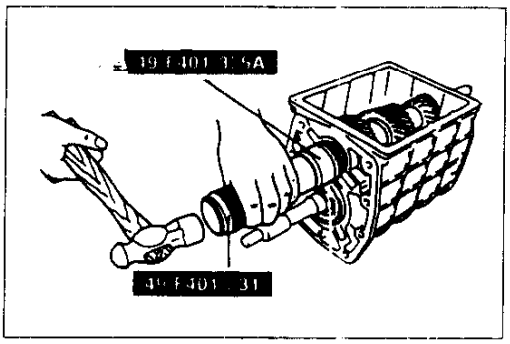
Main drive gear bearing

1. Install the **SST** between the 4th synchronizer ring and the main drive synchromesh gear.



37U0JX-114

2. Install the main drive gear bearing by using the **SST**.



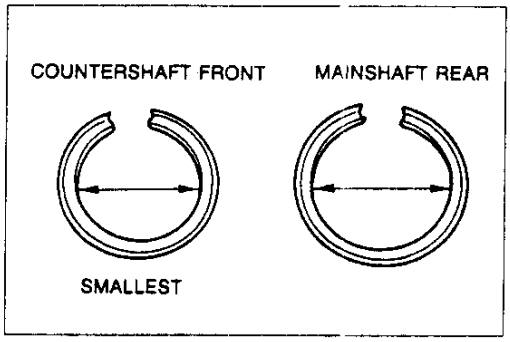
37U0JX-115

Countershaft front bearing

Note

- **Replace the countershaft front bearing and countershaft front bearing spacer as an assembly.**

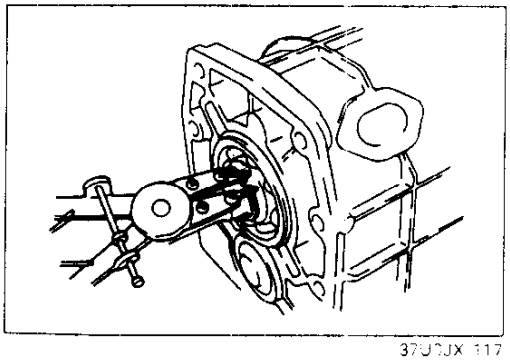
1. Install the correct shim onto the countershaft front bearing as determined in the transmission case assembly note (page J–43.)
2. Install the countershaft front bearing by using the **SST**.



37U0JX-116

Note

- **Do not confuse the front and rear bearing snap rings. The countershaft front snap ring is the smallest.**

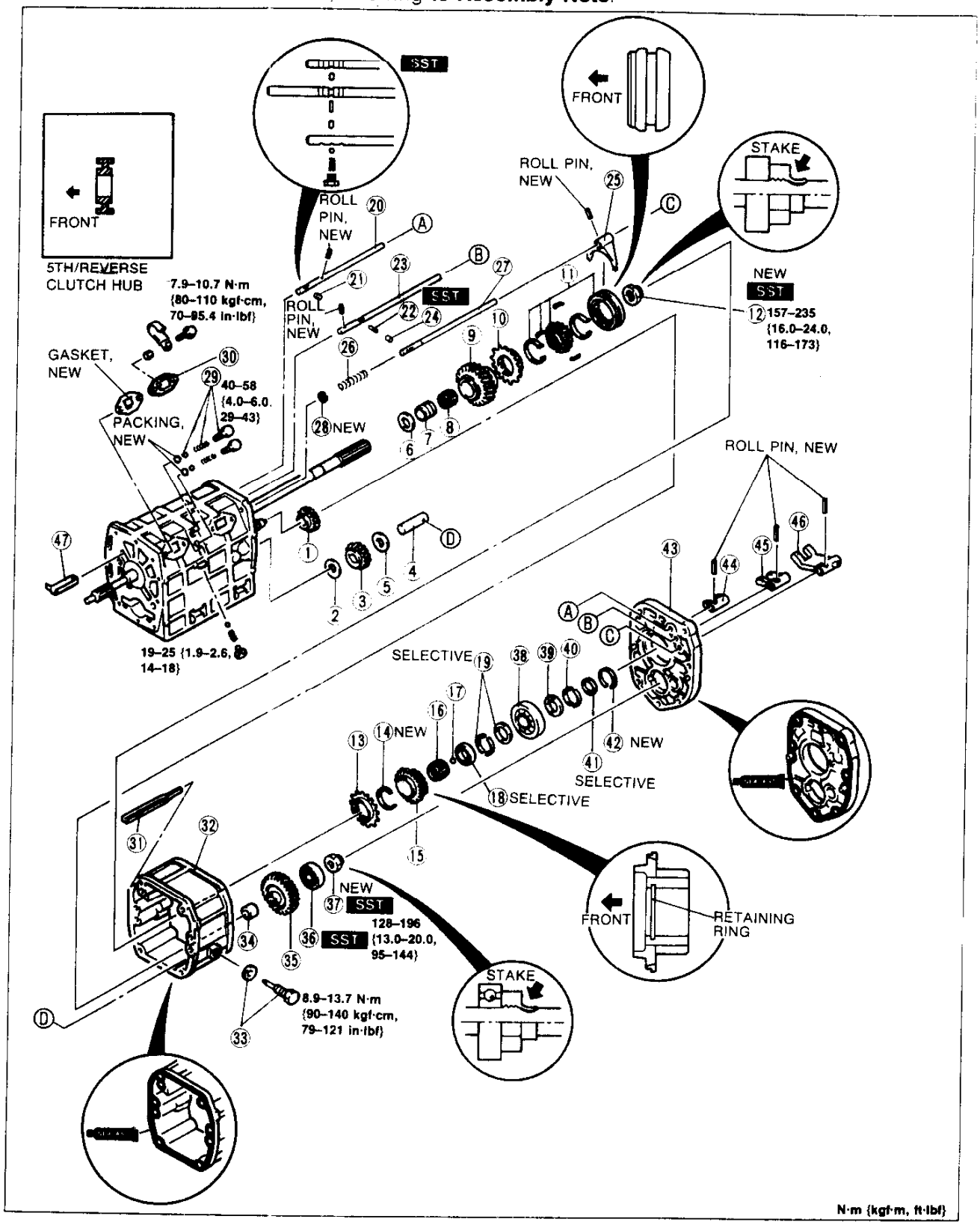


37U0JX-117

3. Install new snap rings to the main drive gear and countershaft gear.

5th/Reverse Gear and Housing Components

Assemble in the order shown, referring to **Assembly Note**.



37U0JX-118

1. Counter reverse gear
2. Thrust washer
3. Reverse idler gear
4. Reverse idler gear shaft
5. Thrust washer
6. Thrust washer
7. Bearing race
8. Bearing
9. Reverse gear
10. Synchronizer ring (Reverse)
    Assembly Note ..... below
11. 5th/Reverse clutch hub assembly
    Assembly Note ..... below
12. Locknut
    Assembly Note ..... below
13. Synchronizer ring (5th)
    Assembly Note ..... below
14. Retaining ring
15. 5th gear
    Assembly Note ..... page J-48
16. Bearing
17. Steel ball
18. Thrust lock washer
19. C-washers and retaining ring
20. 1st/2nd shift rod
    Assembly Note ..... page J-49
21. Interlock pin (large)
22. Interlock pin (small)
23. 3rd/4th shift rod
    Assembly Note ..... page J-49
24. Interlock pin (large)
25. 5th/Reverse shift fork
    Assembly Note ..... page J-49
26. Spring
27. 5th/Reverse shift rod
    Assembly Note ..... page J-49
28. Retaining ring
29. Cap plug, spring, and detent ball
30. Blind cover
31. Oil guide
32. Center housing
    Assembly Note ..... page J-50
33. Set bolt and washer
34. Spacer
35. Counter 5th gear
36. Countershaft rear bearing
    Assembly Note ..... page J-51
37. Locknut
38. Mainshaft rear bearing
    Assembly Note ..... page J-51
39. Retaining ring
40. C-washers
41. Thrust washer
42. Snap ring
43. Bearing housing
    Assembly Note ..... page J-52
44. 1st/2nd shift rod end
    Assembly Note ..... page J-52
45. 3rd/4th shift rod end
    Assembly Note ..... page J-52
46. 5th/Reverse shift rod end
    Assembly Note ..... page J-52
47. Oil guide

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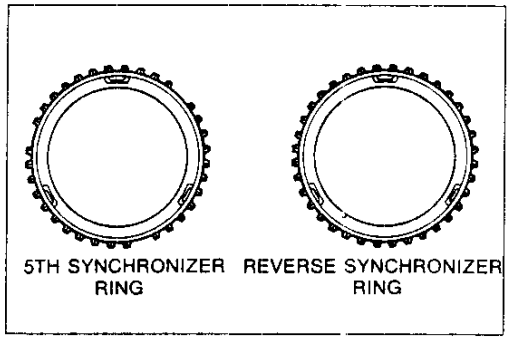
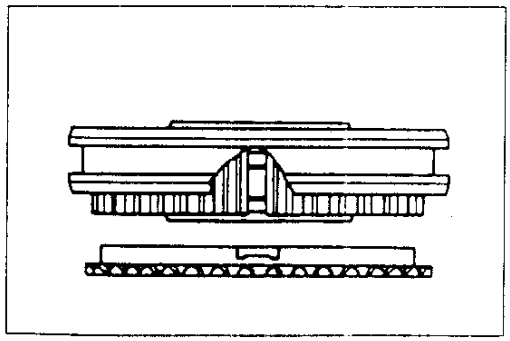
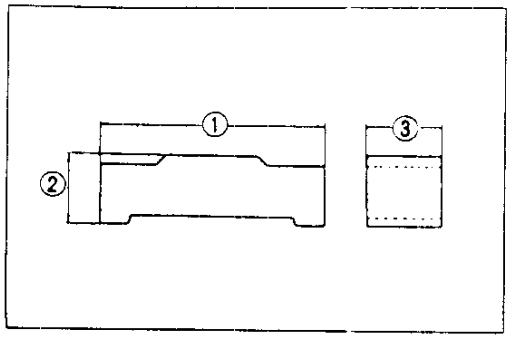


37U0JX-120



37U0JX-121



37U0JX-122

Assembly note
Synchronizer ring (5th/Reverse)

The 5th and Reverse synchronizer rings are differentiated as follows.

(1) The 5th synchronizer ring has 3 places on its circumference with one tooth missing in each place.
(2) The Reverse synchronizer ring has no distinguishing marks.

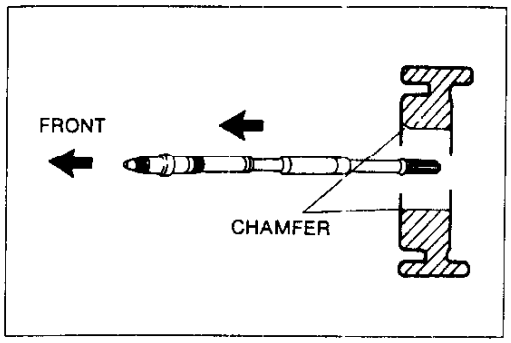
5th/Reverse clutch hub assembly and locknut

Caution
- **Align the 5th/Reverse synchronizer grooves with the synchronizer keys.**

Note
- **Standard key dimensions are as follows.**

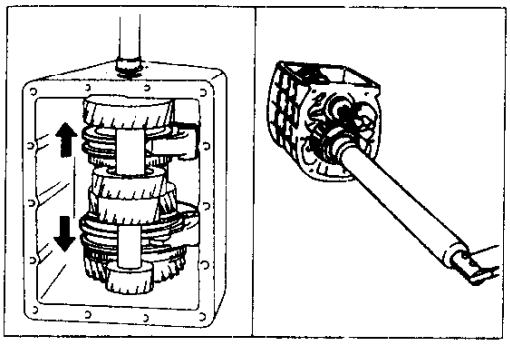
mm {in}

	1	2	3
5th/Reverse	17.00 {0.669}	4.250 {0.167}	5.00 {0.197}



37U0JX-123

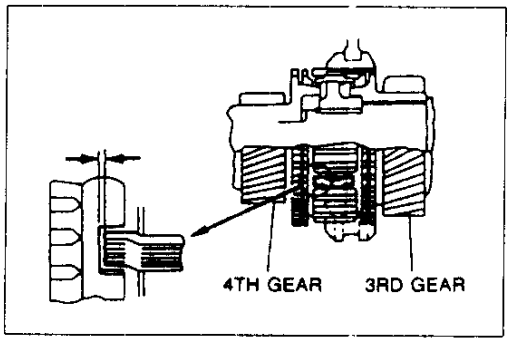
Caution
- **Install the 5th/Reverse clutch hub assembly in the proper direction as shown.**



37U0JX-124

1. Shift the clutch hubs into 1st and 4th gears to lock the rotation of the mainshaft.
2. Install a new locknut and tighten it with the **SST**.

Tightening torque:
157–235 N·m {16.0–24.0 kgf·m, 116–173 ft·lbf}



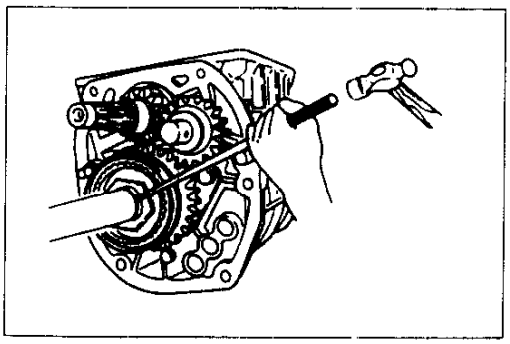
37U0JX-125

Caution
- **The total combined thickness of the front and rear thrust washers must equal 6.0 mm {0.236 in}.**

3. Check the clearance between the synchronizer key and the exposed edge of the synchronizer ring.
If it is not as specified, adjust by changing the thrust washers on the front and rear of the mainshaft front bearing.

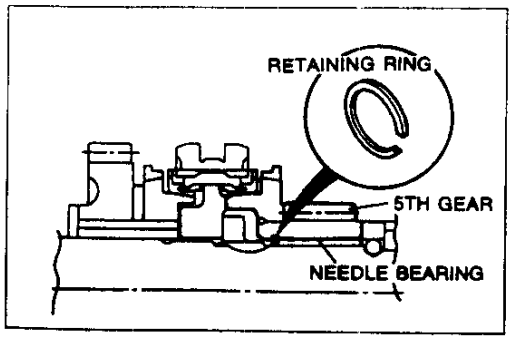
Clearance: 0.66–2.0 mm {0.026–0.079 in}

Available thrust washer thicknesses:
2.5 mm {0.098 in}, 3.0 mm {0.118 in}
3.5 mm {0.138 in}



37U0JX-126

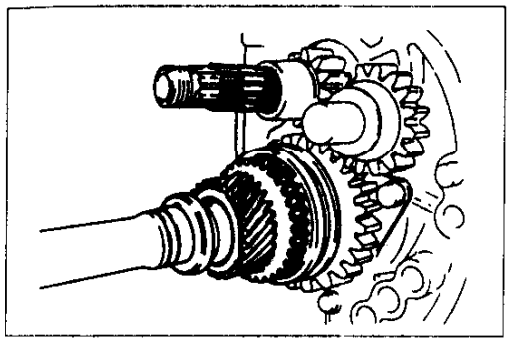
4. Stake the locknut into the mainshaft groove.



37U0JX-127

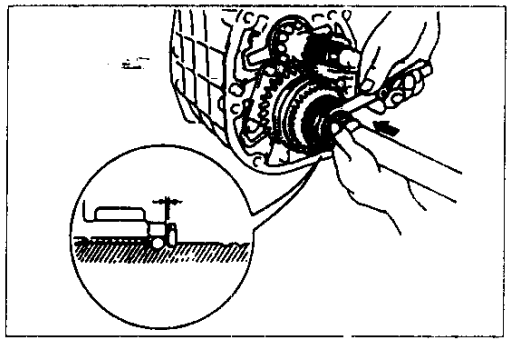
5th gear

1. Install a new retaining ring to the 5th gear.



37U0JX-128

2. Install the synchronizer ring, 5th gear, and needle bearing.
3. Install the steel ball and thrust lock washer.
4. Install the 3.0 mm {0.118 in} C-washers and hold them with a retaining ring.



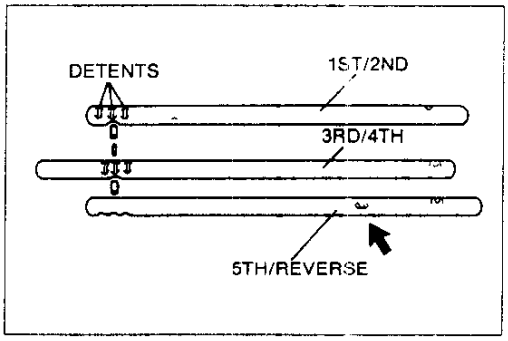
37U0JX-129

5. Push the C-washers toward 5th gear and measure the clearance between the C-washers and thrust lock washer. If the clearance is not as specified, select the proper thrust lock washer.

Standard: 0.1–0.2 mm {0.004–0.008 in}

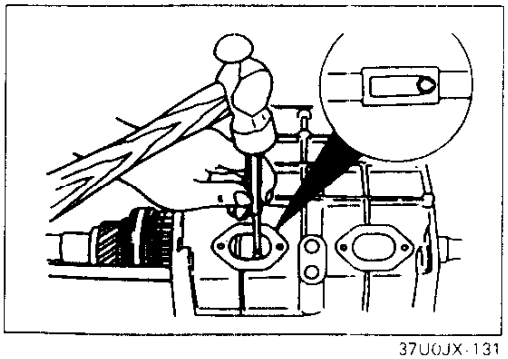
Available thrust lock washer thicknesses:
6.2 mm {0.244 in}, 6.3 mm {0.248 in}
6.4 mm {0.252 in}, 6.5 mm {0.256 in}
6.6 mm {0.260 in}, 6.7 mm {0.264 in}

Shift forks and rods



37U0JX-130

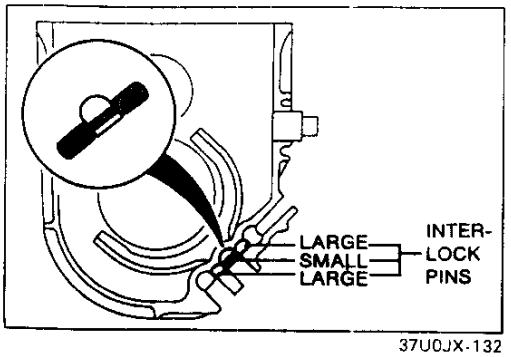
Note
- **A simple way to identify the shift rods is as follows:**
- **The 3rd/4th shift rod is the longest.**
- **The 5th/Reverse shift rod has an extra hole for the shift fork roll pin at the rear of the rod.**
- **When installing the shift rods, set the detents toward the ball side.**



37U0JX-131

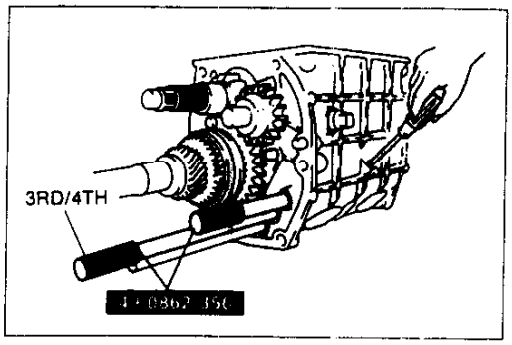
Caution
- **The roll pin must be installed with the split as shown.**

1. Slide the 1st/2nd shift rod into the case.
2. Secure the 1st/2nd shift fork to the rod with a new roll pin.



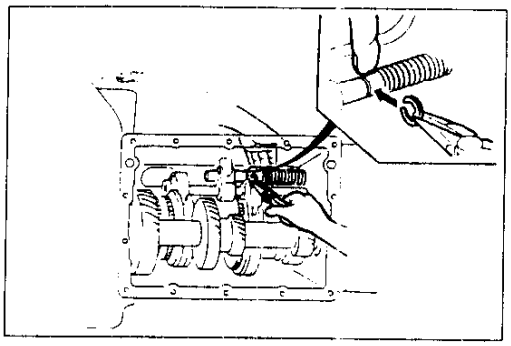
37U0JX-132

Note
- **The interlock pins must be installed as shown.**

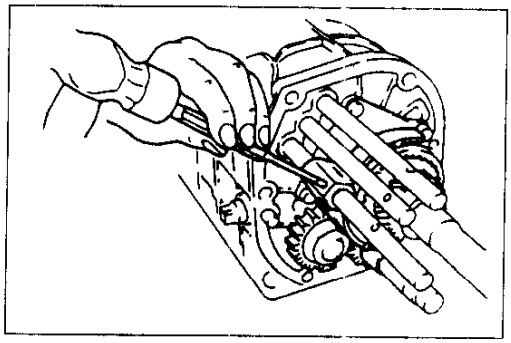


37U0JX-133

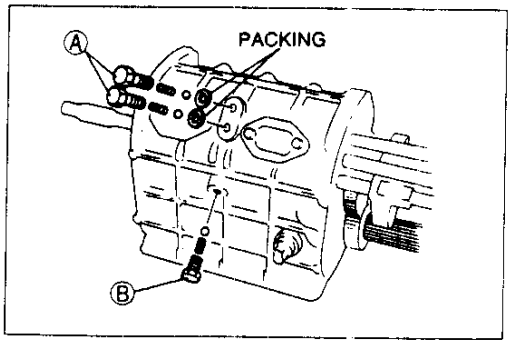
3. Slide the two **SST** into the transmission case to guide the interlock pins, and insert the first pin.
4. Remove the 3rd/4th shift fork guide from the case.
5. Slide the 3rd/4th shift rod containing the interlock pin (small) into the case.
6. Secure the 3rd/4th shift rod onto the fork with the new roll pin.
7. Insert the remaining interlock pin and remove the **SST**


37U0JX-134

8. Install the 5th/Reverse shift fork onto the clutch hub.
9. Install the 5th/Reverse shift rod in the transmission case through the spring.
10. Push back the spring, and install a new clip to the 5th/Reverse shift rod.


37U0JX-135

11. Install a new roll pin into the 5th/Reverse shift fork.



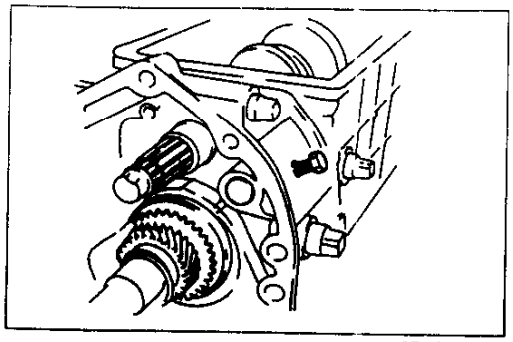
37U0JX-136

12. Install the two blind covers and two new gaskets.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

13. Install the packings, detent balls, springs, and cap bolts.

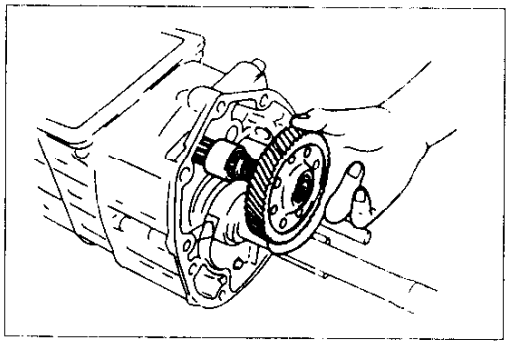
Tightening torque:
A: 40–58 N·m {4.0–6.0 kgf·m, 29–43 ft·lbf}
B: 19–25 N·m {1.9–2.6 kgf·m, 14–18 ft·lbf}


37U0JX-137

Center housing

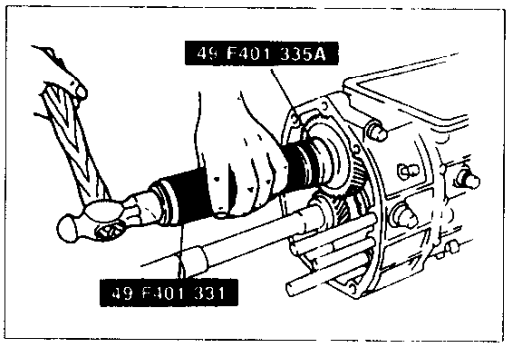
1. Apply sealant to the contact surfaces of the transmission case and center housing.
2. Install the oil guide.
3. Install the center housing.
4. Align the reverse idler gear shaft with the set bolt hole, and install the set bolt and washer.

Tightening torque:
8.9–13.7 N·m {90–140 kgf·cm, 79–121 in·lbf}



37U00JX 138

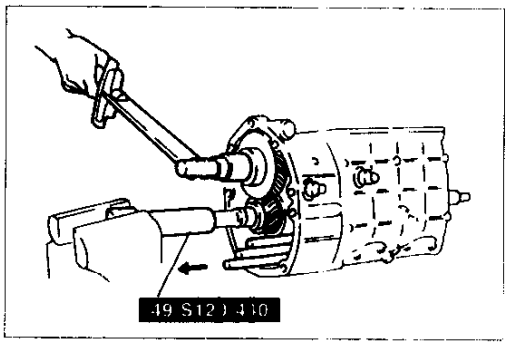
5. Install the spacer and counter 5th gear.



37U00JX 139

Countershaft rear bearing

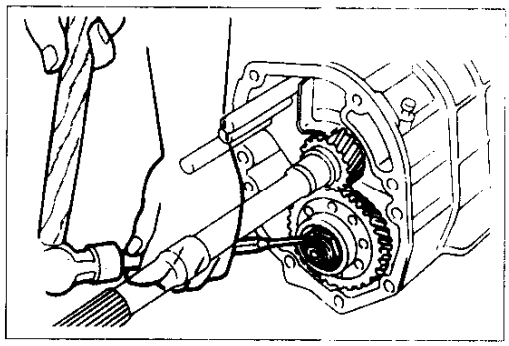
1. Install the countershaft rear bearing by using the **SST**



37J00JX 140

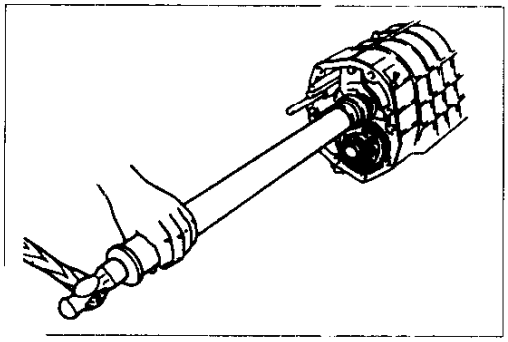
2. Connect the **SST** to the mainshaft and mount it securely in a vise.
3. Shift into 1st gear to lock the countershaft.
4. Install the new countershaft locknut.

Tightening torque:
128–196 N·m {13.0–20.0 kgf·m, 95–144 ft·lbf}



37J00JX 141

5. Stake the locknut into the countershaft groove.

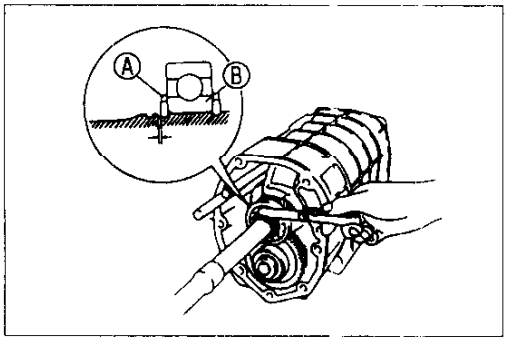


37J00JX 142

Mainshaft rear bearing

1. Drive on the mainshaft rear bearing with a suitable pipe

Bearing diameter (inner): 22 mm {0.87 in}
Bearing diameter (outer): 56 mm {2.2 in}



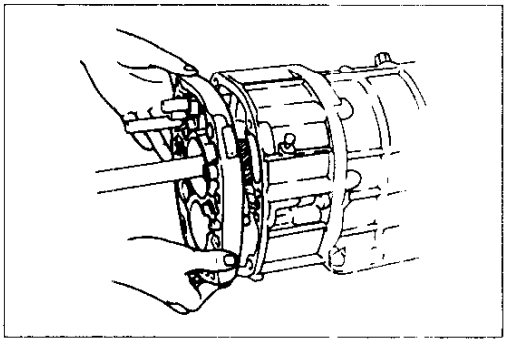
37J0JX-143

2. Install the C-washers and hold them in place with a new retaining ring.
3. With points A and B pressed tightly together, measure the clearance between the C-washers and the groove. If the clearance is not as specified, select the proper C-washers.

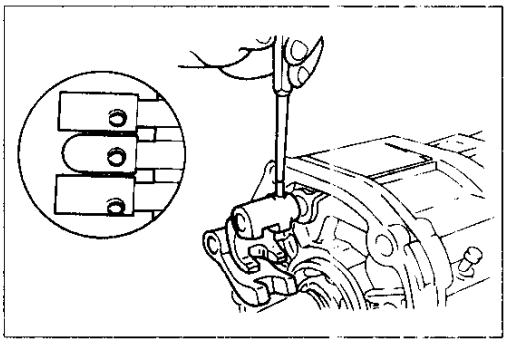
Standard: 0–0.1 mm {0–0.004 in}

Available C-washer thicknesses:
2.9 mm {0.114 in}, 3.0 mm {0.118 in}
3.1 mm {0.122 in}, 3.2 mm {0.126 in}

Bearing housing


37J0JX-144

1. Apply sealant to the contact surfaces of the center housing and bearing housing.
2. Install the bearing housing onto the center housing.

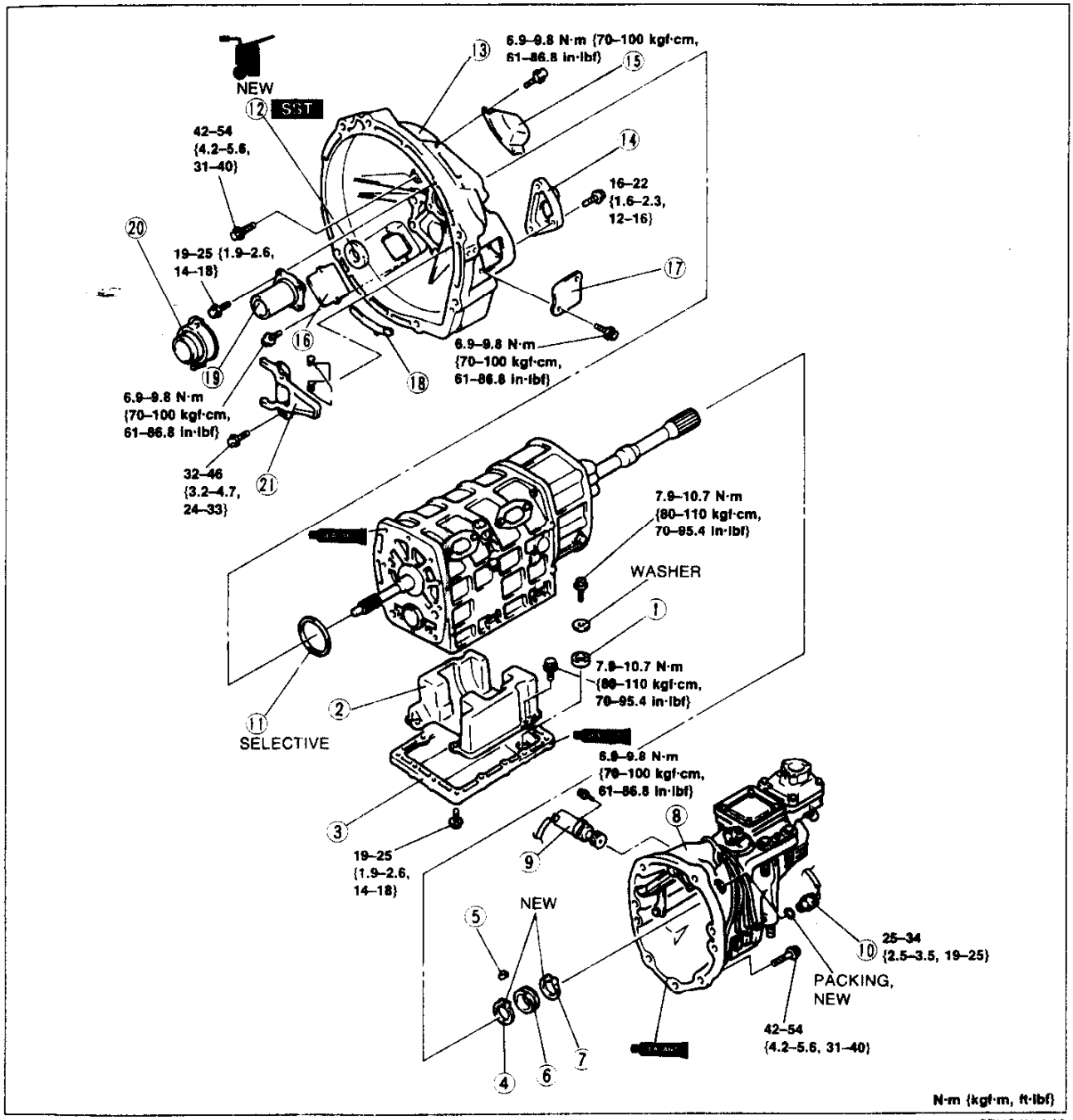

37J0JX-145

Shift rod ends

Install the shift rod ends onto the proper shift rods, and secure them with new roll pins facing as shown in the figure.

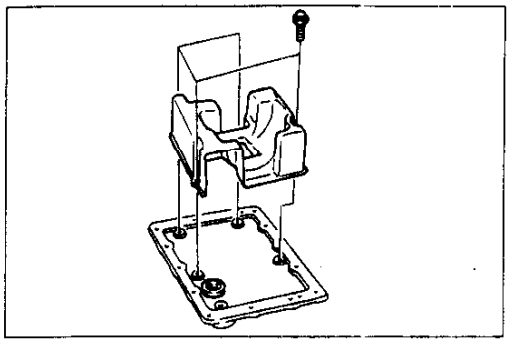
Clutch Housing and Extension Housing Components

Assemble in the order shown, referring to **Assembly Note**.



37U0JX-146

1. Magnet
2. Oil baffle
3. Undercover
   Assembly Note
   ..... page J–54
4. Snap ring
5. Key
6. Speedometer drive gear
7. Snap ring
8. Extension housing
   Assembly Note
   ..... page J–54
9. Speedometer sensor
   (Speedometer driven gear)
10. Back-up light switch
11. Assist shim
12. Oil seal (clutch housing)
    Assembly Note
    ..... page J–54
13. Clutch housing
    Assembly Note
    ..... page J–54
14. Release cylinder support
15. Vent cover
16. Service hole B cover
17. Service hole A cover
18. Dust cover
19. Front cover
20. Release collar
    Assembly Note
    ..... page J–55
21. Release fork assembly
    Assembly Note
    ..... page J–55



37U0JX-147

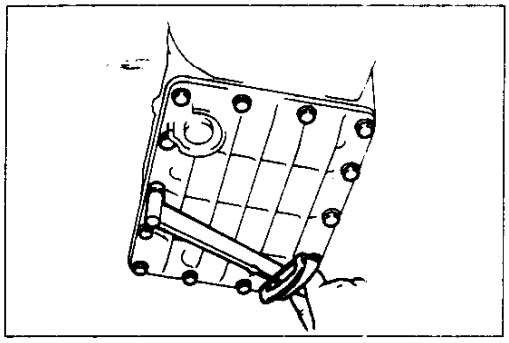
Assembly note
Undercover

1. Install the magnet to the undercover.

Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

2. Install the oil baffle to the undercover.

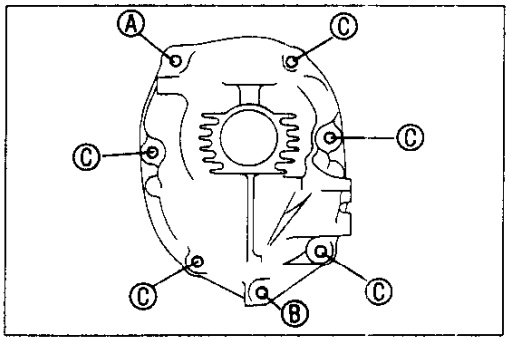
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}



37U0JX-148

3. Apply sealant to the contact surfaces of the undercover and the transmission case.
4. Install the undercover.

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



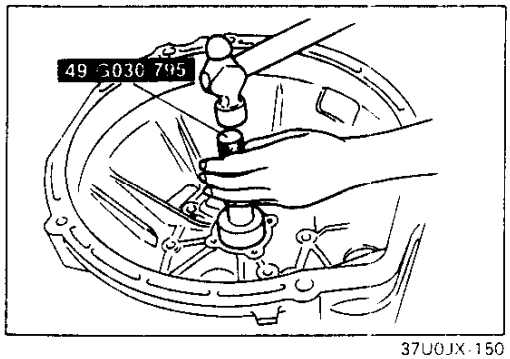
37U0JX-149

Extension housing

1. Apply sealant to the contact surfaces of the extension housing and bearing housing.
2. Install the extension housing.

Bolt length (measured from below the head):
A: 135 mm {5.31 in}
B: 48 mm {1.89 in}
C: 165 mm {6.50 in}

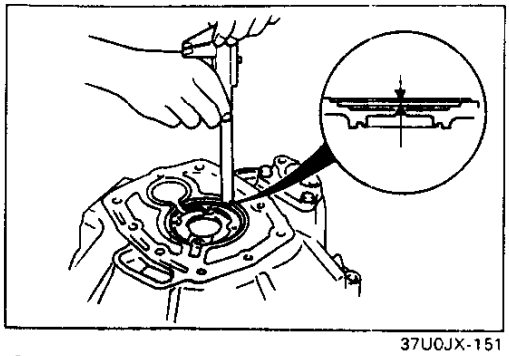
Tightening torque:
42–54 N·m {4.2–5.6 kgf·m, 31–40 ft·lbf}



37U0JX-150

Oil seal (clutch housing)

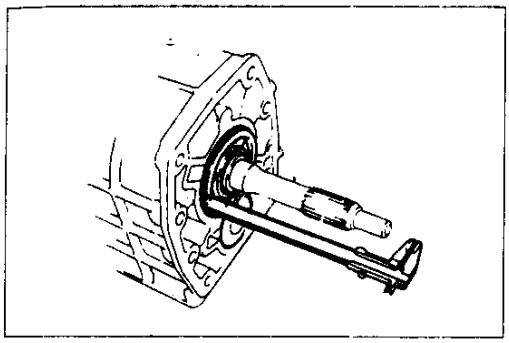
1. Apply the specified oil to the lip of a new oil seal.
2. Install the oil seal evenly by using the **SST**.

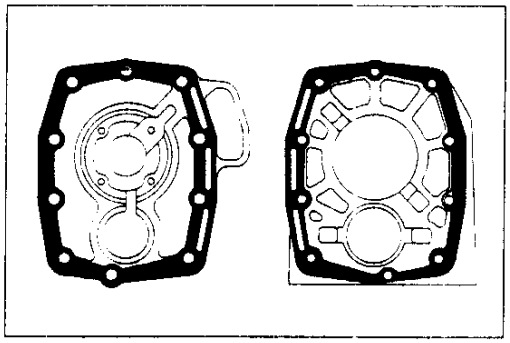


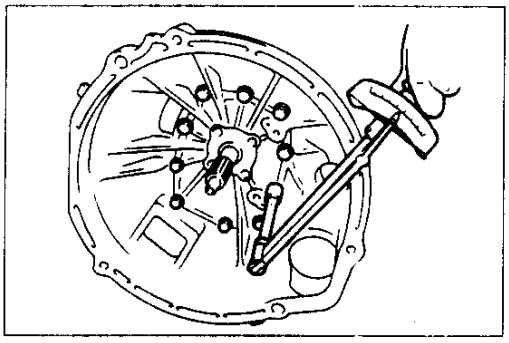
37U0JX-151

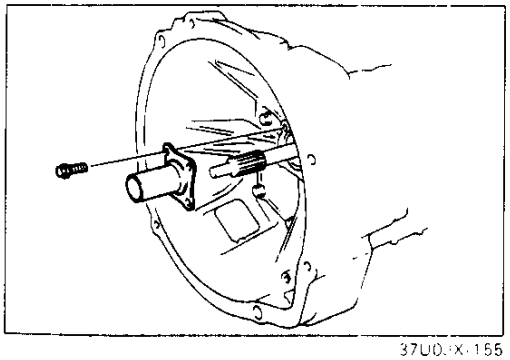
Clutch housing

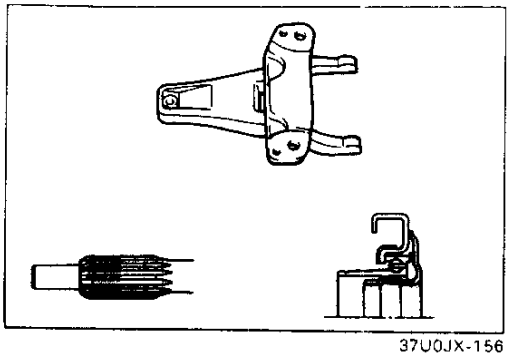
1. Measure the depth of the main drive gear bearing bore in the clutch housing by using vernier calipers.


37UCJX-152


37U0JX-153


37U0JX-154


37U0JX-155


37U0JX-156

Caution

- **Make the following measurement after assembling the transmission case.**

2. Measure the main drive gear bearing height.
3. The difference between the measurements in steps 1 and 2 indicates the required thickness of the adjustment shim.

Standard thrust play: 0–0.1 mm {0–0.004 in}
Adjustment shim thicknesses:
0.3 mm {0.012 in}, 0.4 mm {0.016 in}
0.5 mm {0.020 in}, 0.6 mm {0.024 in}
0.7 mm {0.028 in}

4. Apply sealant to the contact surfaces of the clutch housing and transmission case.
5. Install the correct adjustment shim on the main drive gear bearing as determined in steps 1 and 2.

6. Install the clutch housing.

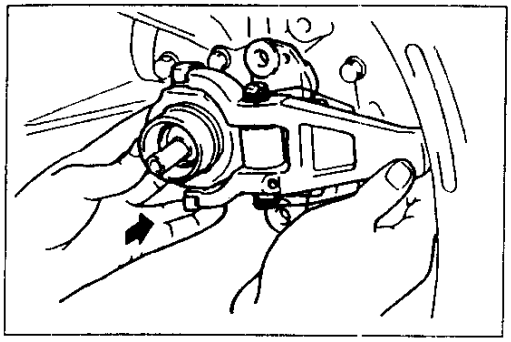
Tightening torque:
42–54 N·m {4.2–5.6 kgf·m, 31–40 ft·lbf}

7. Install the front cover to the clutch housing.

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

Release collar and release fork assembly

1. Apply molybdenum grease to the shaded areas of the release bearing and release fork.



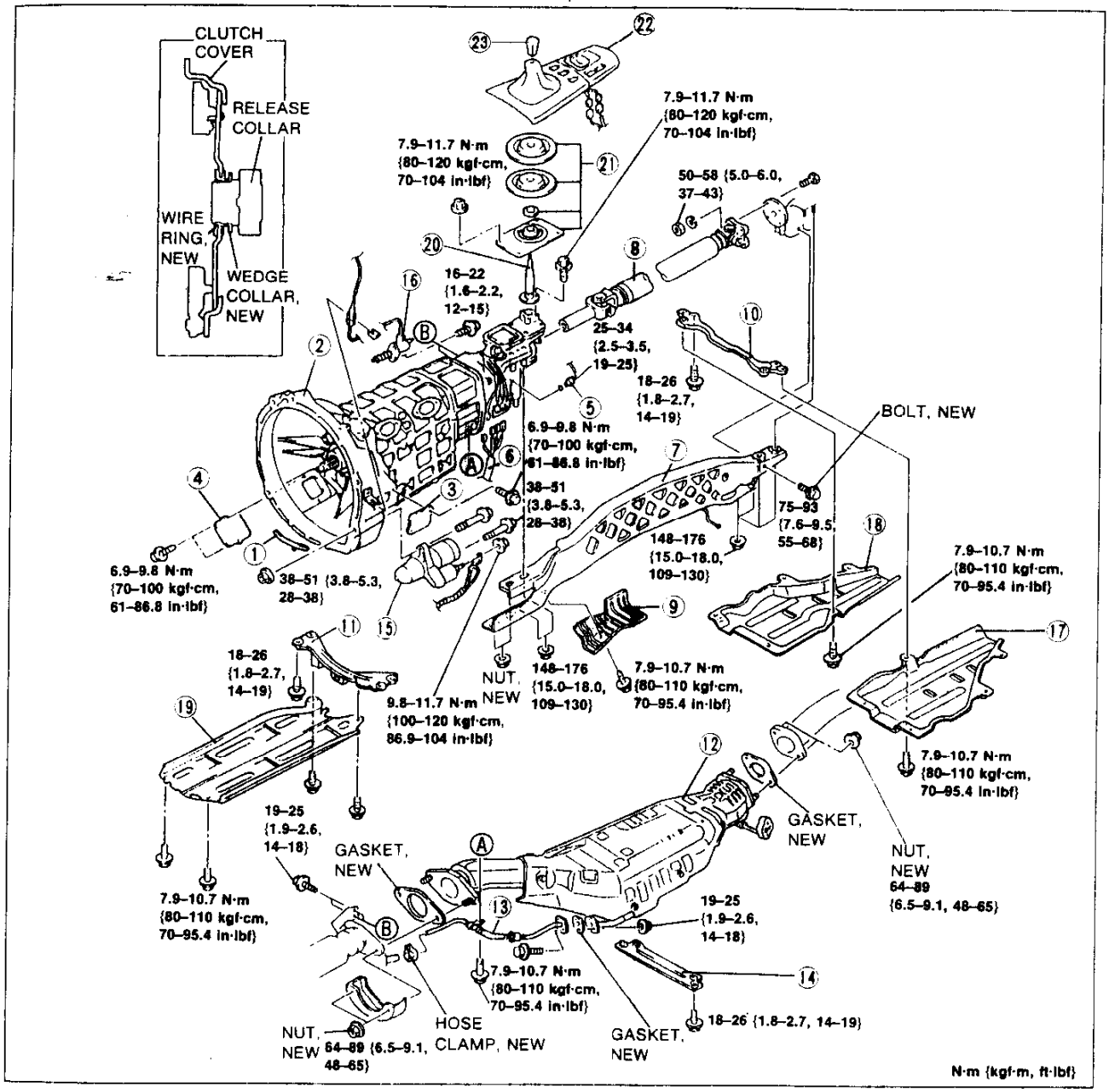
37U0JX-157

2. Install the release bearing and release fork assembly.

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

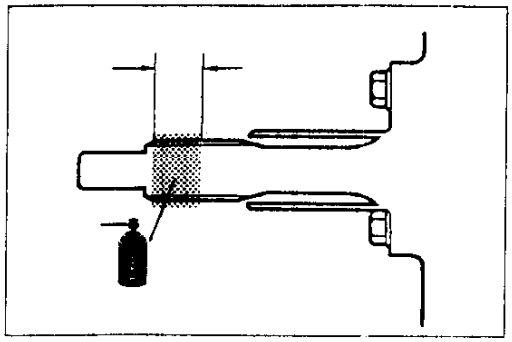
INSTALLATION

1. Install in the order shown, referring to **Installation Note**.
2. After installation, fill the transmission with the specified oil and do a road test.



37UOJX-158

1. Dust cover
2. Transmission
   Installation Note
   ..... page J–58
3. Service hole A cover
4. Service hole B cover
5. Back-up light switch
6. Connectors
7. Power Plant Frame (PPF)
   Installation Note
   ..... page J–59
8. Propeller shaft
   Installation Note
   ..... page J–60
9. Cover
10. Tunnel reinforcement (rear)
11. Tunnel reinforcement (front)
12. Catalytic converter assembly
13. Secondary air injection pipe
14. Tunnel reinforcement (center)
15. Starter
16. Clutch release cylinder
17. Left undercover
18. Right undercover
19. Transmission cover
20. Shift lever assembly
21. Insulator assembly
22. Console panel assembly
23. Shift lever knob

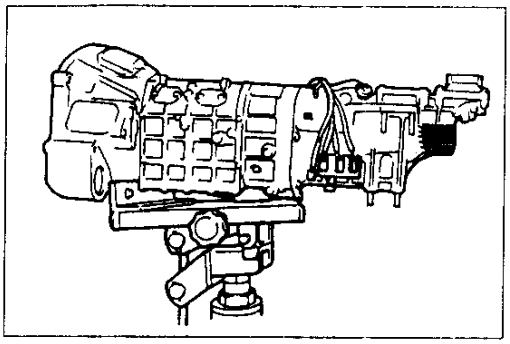


37U0JX-159

Installation Note
Transmission

Caution
- **Do not install the back-up light switch until after the transmission is installed.**

1. Coat the main drive gear splines with grease as shown in the figure.

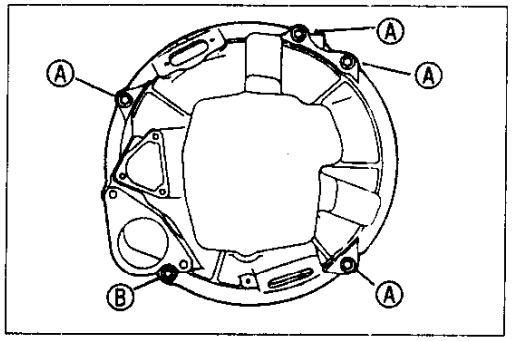


37U0JX-160

Warning
- **Do not allow the transmission to fall from the jack.**

2. Set the transmission on a transmission jack.

Caution
- **Do not damage the wedge collar when installing the transmission to the engine.**
- **Do not damage the harnesses, clutch pipe, or clutch release cylinder.**

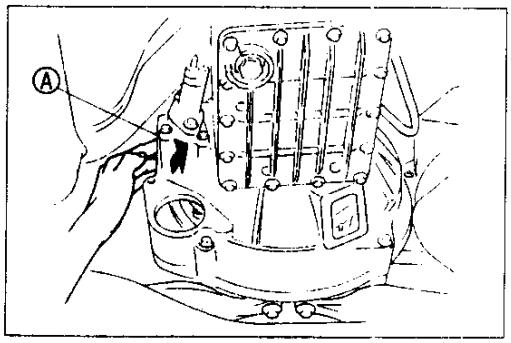


37U0JX-161

3. Raise the transmission into place and install it to the engine.
4. Tighten the installation bolts.

Bolt length:
A: 55 mm {2.2 in}
B: 90 mm {3.5 in}

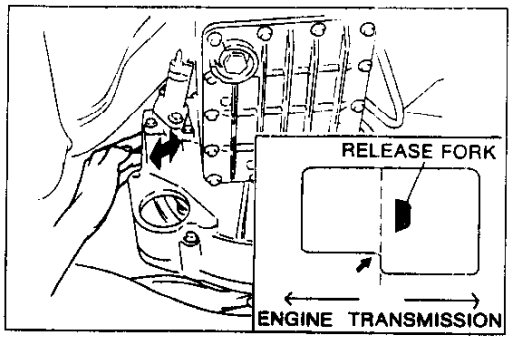
Tightening torque:
38–51 N·m {3.8–5.3 kgf·m, 28–38 ft·lbf}



37U0JX-162

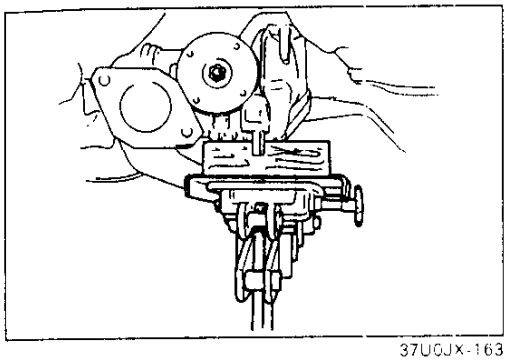
Caution
- **Make sure that the clutch release collar snaps properly into the clutch cover.**

5. Through service hole A, push the release-cylinder end of the clutch release fork toward the transmission, and connect the clutch release collar to the clutch cover.



37U0JX-174

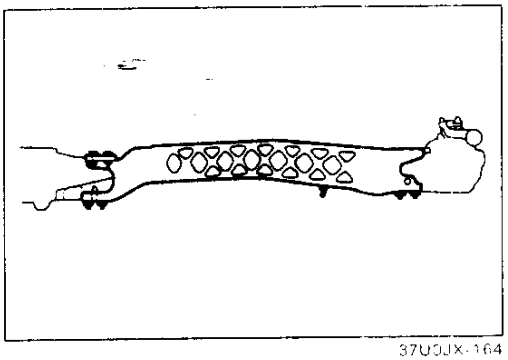
6. Swing the clutch release fork back and forth to verify that the clutch release collar is connected to the clutch cover.
7. Push the release-cylinder end of the clutch release fork toward the engine, and verify that it does not move past the dotted line.


37U0JX-163

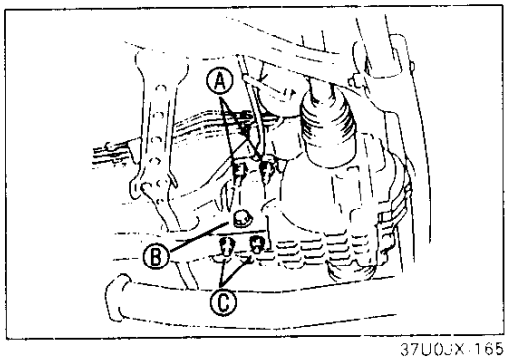
Power plant frame (PPF)

Caution
- **Do not reuse PPF installation nuts.**

1. Hold the differential at a 0° angle by using the transmission jack.


37U0JX-164

2. Hold the PPF in place with a new bolt and 8 new nuts.

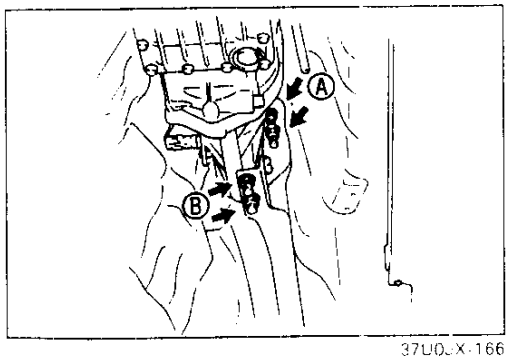


37U0JX-165

Caution
- **Tighten the differential-side PPF installation bolt/nuts first.**

3. Tighten the differential-side PPF installation bolt and nuts in the order shown.

Tightening torque:
A, C: 148–176 N·m {15.0–18.0 kgf·m, 109–130 ft·lbf}
B: 75–93 N·m {7.6–9.5 kgf·m, 55–68 ft·lbf}

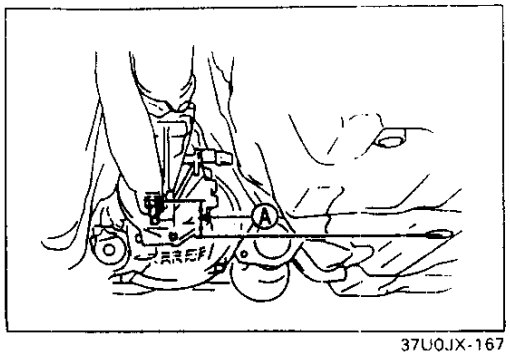


37U0JX-166

4. Tighten the transmission-side PPF installation nuts in the order shown.

Tightening torque:
148–176 N·m {15.0–18.0 kgf·m, 109–130 ft·lbf}

5. Remove the transmission jack.
6. Lower the vehicle to the ground, and remove the **SST** (engine supports).



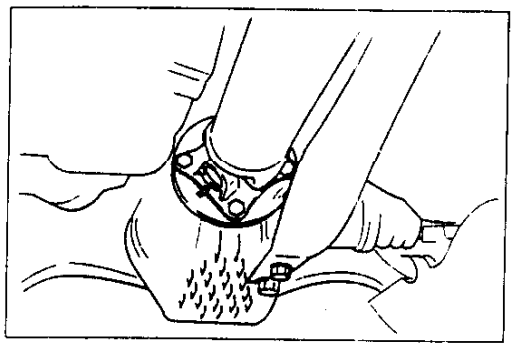
37U0JX-167

7. Measure A as shown in the figure.

Standard:
Right: 73 mm {2.9 in} min.
Left : 75 mm {3.0 in} min.

Note
- **When measuring by using a straight edge placed on both the right and left sides, the clearance should be 74.0 mm {2.91 in} minimum.**

8. If outside the standard, readjust the PPF.


37U0JX-168

Propeller shaft

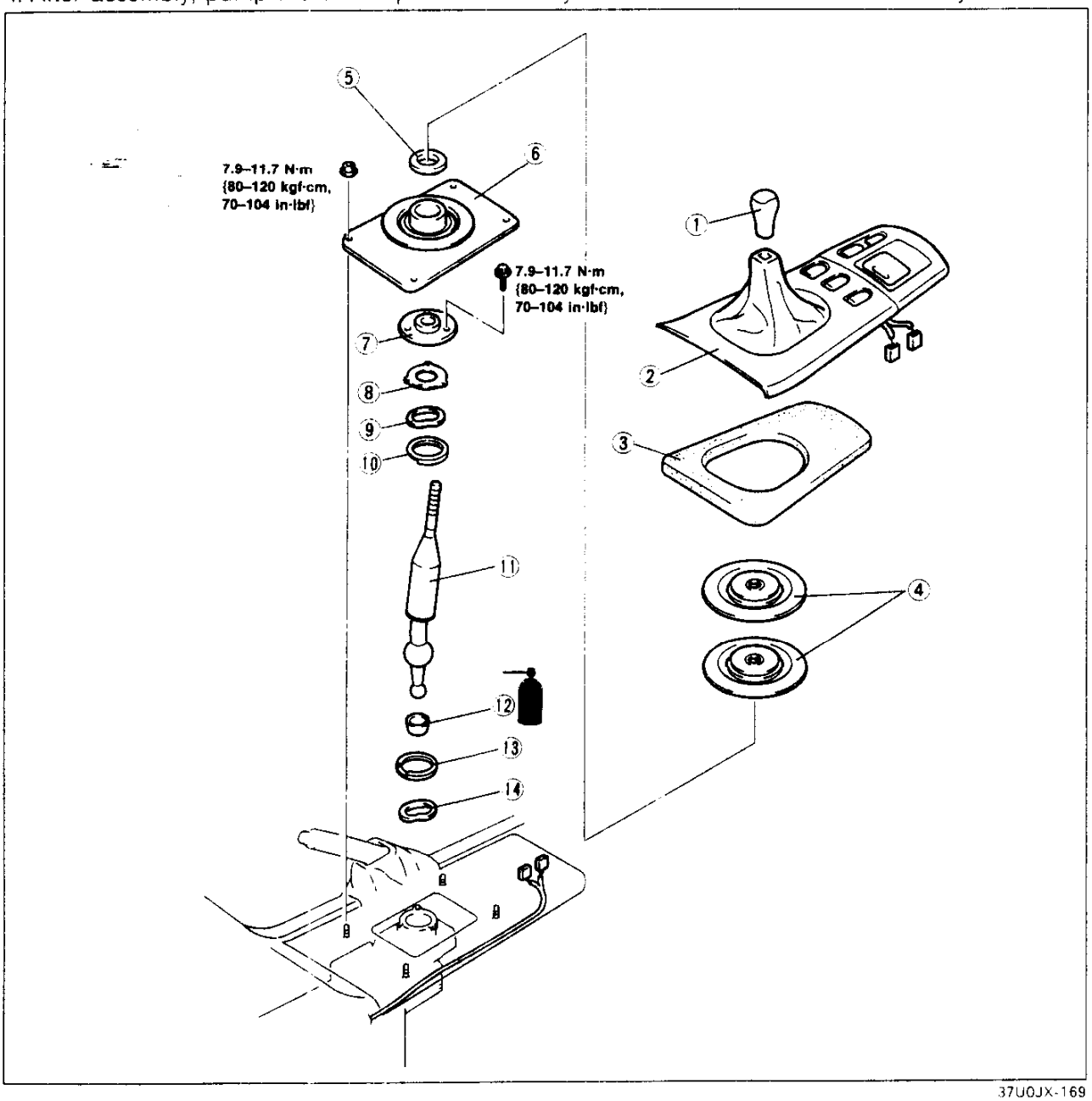
1. Align the marks on the flanges (made during removal).
2. Install the propeller shaft.

Tightening torque:
50–58 N·m {5.0–6.0 kgf·m, 37–43 ft·lbf}

SHIFT MECHANISM

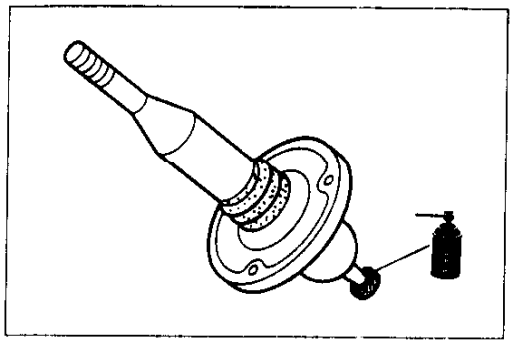
OVERHAUL

1. Disassemble as shown in the figure.
2. Inspect each part, and replace if necessary.
3. Assemble in the reverse order of disassembly.
4. After assembly, pump the clutch pedal and verify that the shift lever moves smoothly.



37U0JX-169

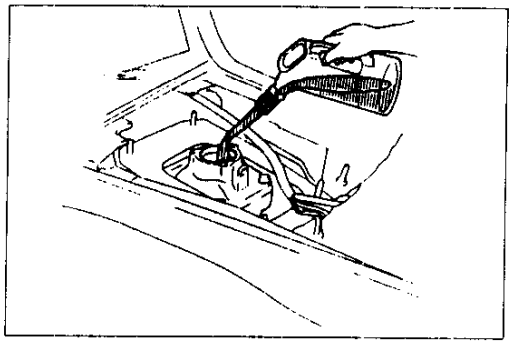
1. Shift lever knob
2. Console panel assembly
3. Bushing pad
4. Insulator boot pads
5. Insulator boot ring
6. Insulator boot
7. Dust boot
8. Gasket
9. Wave washer
10. Bushing
11. Shift lever
    Assembly Note
    ..... page J–62
12. Shift seat
    Assembly Note
    ..... page J–62
13. Bushing
14. Wave washer



37U0JX-170

Assembly Note
Shift seat

Apply grease to both the inside and outside of the shift seat.



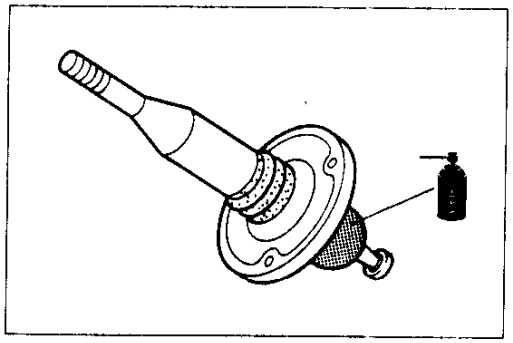
37U0JX-171

Shift lever

Note
- **Fill the change control case with oil after removing the clutch housing or disassembling the transmission.**

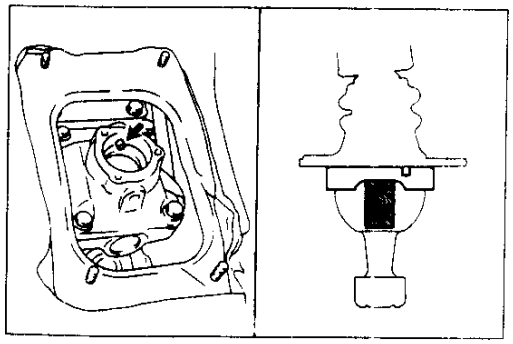
1. Fill the change control case with the specified oil.

Capacity: 80–95 cc {4.9–5.8 cu in}



37U0JX-172

2. Apply grease to the shift lever ball joint.



37U0JX-173

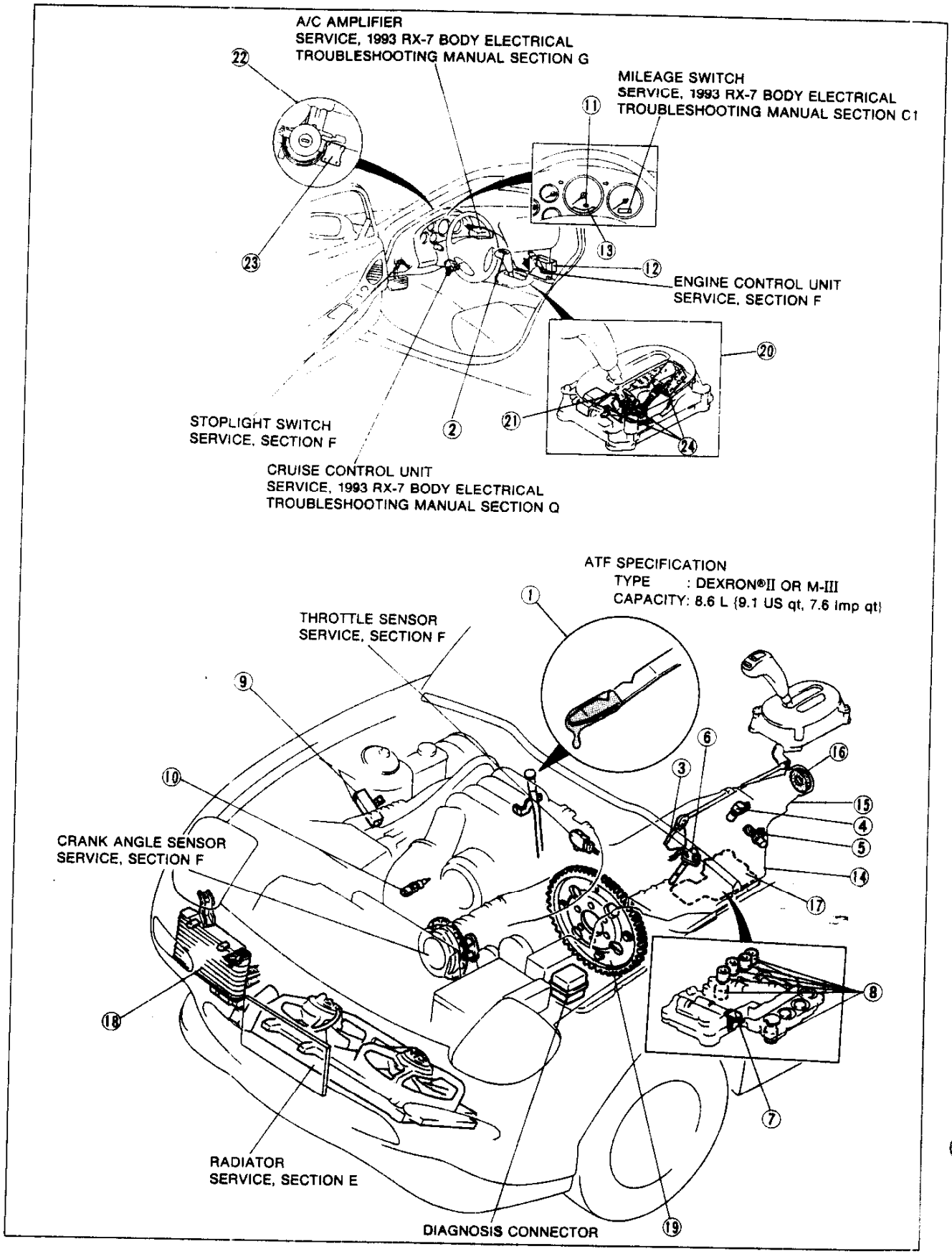
3. Align the control case pin with the slots in the change bushings and the shift lever, and install.

Before beginning any service procedure, refer to the 1993 RX-7 Body Electrical Troubleshooting Manual; see section S for air bag system precautions and J1 for audio anti-theft system precautions.

AUTOMATIC TRANSMISSION (Electronically Controlled)

37U0KX-001

INDEX



29U0KX-002

37U0KX 002

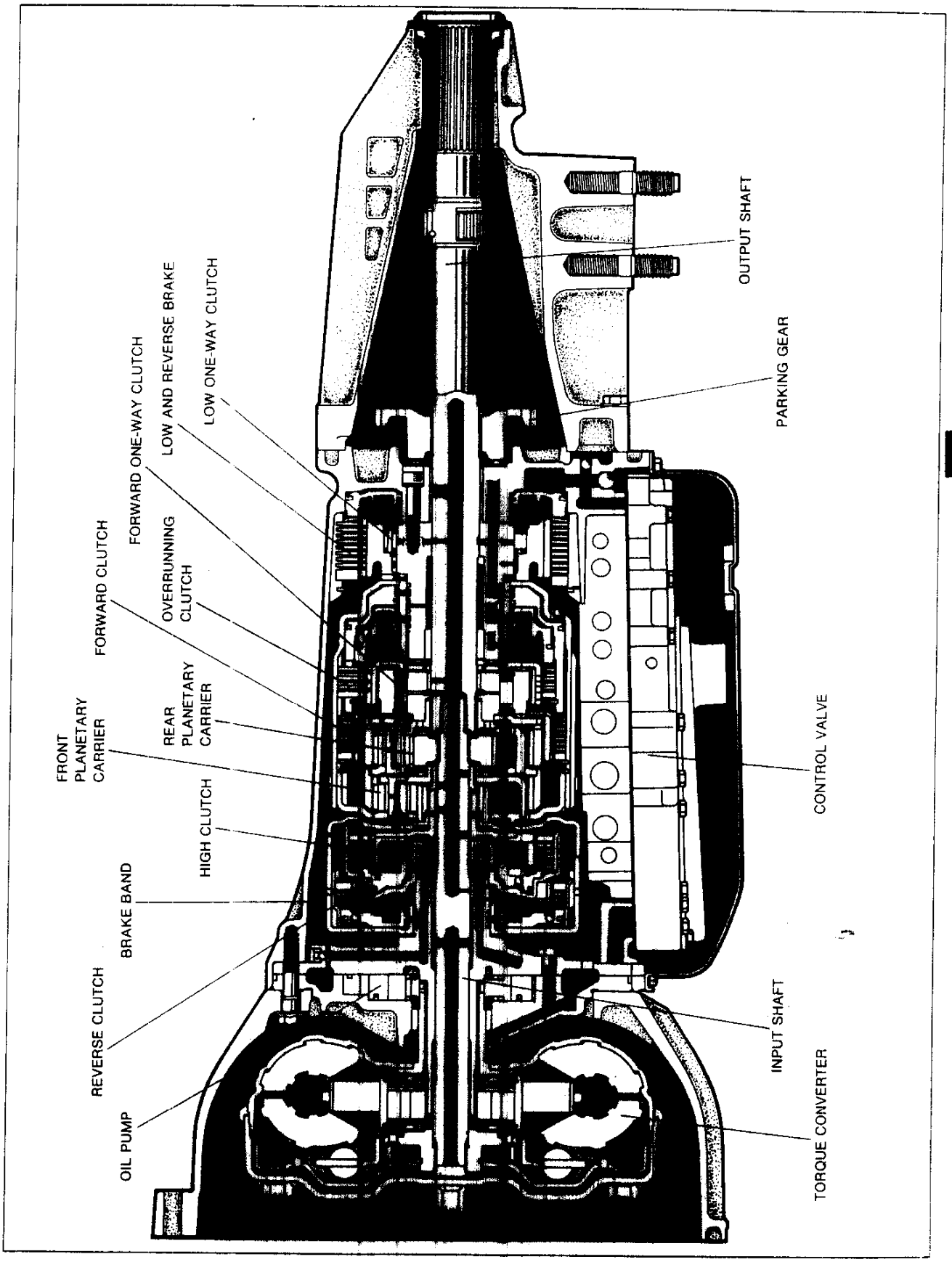
OUTLINE

SPECIFICATIONS

Item \ Model			RB4A-EL
Gear ratio	1st		3.027
	2nd		1.619
	3rd		1.000
	O/D		0.694
	Reverse		2.272
Final gear ratio			3.909
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}
Torque converter stall torque ratio			2.200
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		7/7
Band servo mm {in}	Servo piston outer / inner diameter		80.0/50.0 {3.15/1.97}
	O/D servo piston outer diameter		72.0 {2.83}
Front planetary gear unit number of teeth	Sun gear		33
	Pinion gear		21
	Internal gear		75
Rear planetary gear unit number of teeth	Sun gear		37
	Pinion gear		19
	Internal gear		75

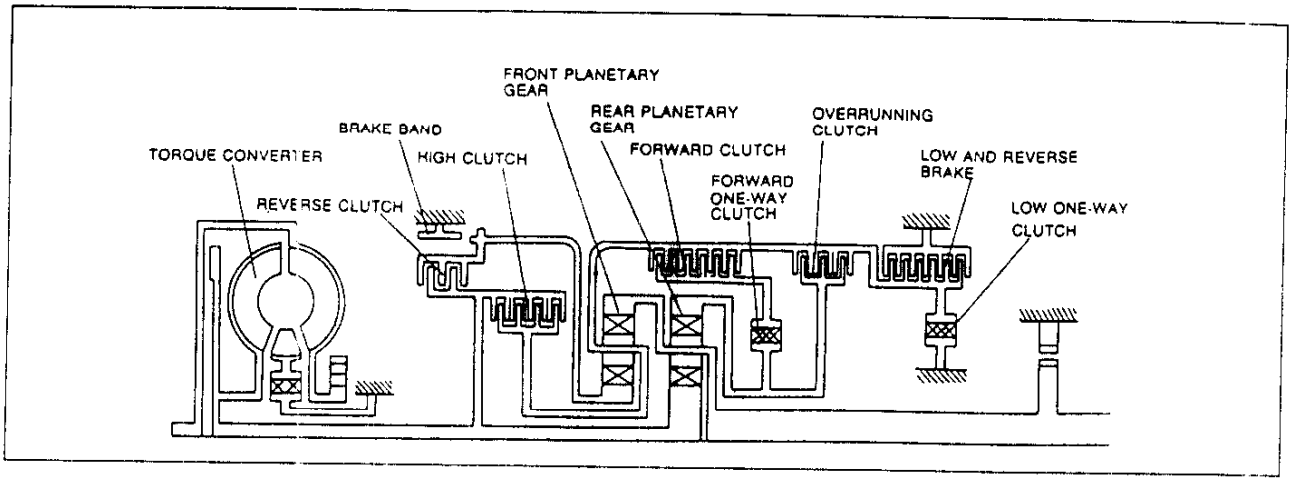
37U0KX 003

CROSS-SECTIONAL VIEW



29U0KX-005

POWERFLOW DIAGRAM



29U0KX-006

OPERATION OF COMPONENTS

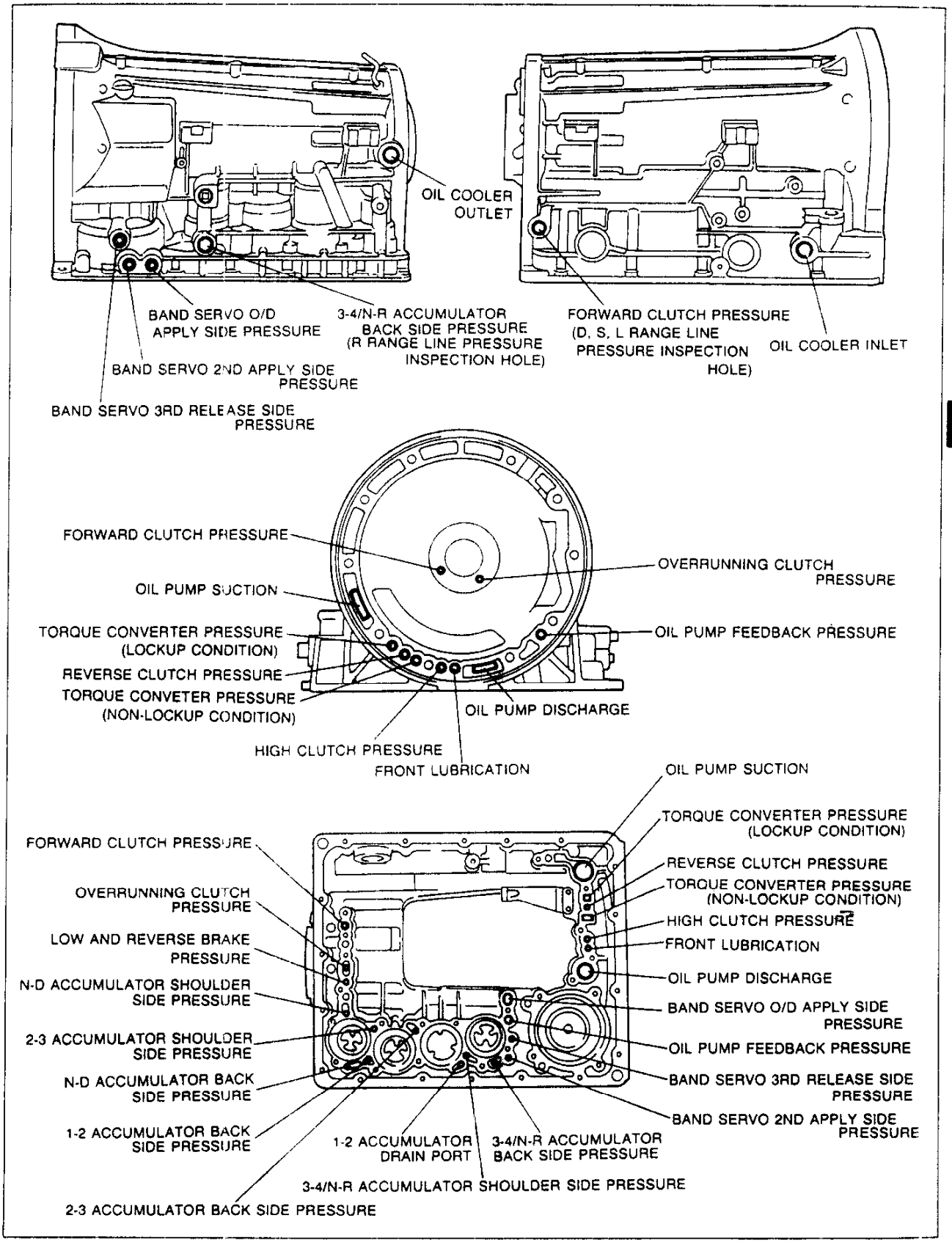
Range	Mode	Gear	Shift	Reverse clutch	High clutch	Forward clutch	Overrunning clutch	Band servo piston			Forward OWC	Low OWC	Low and reverse brake
								2nd applied	3rd released	O/D applied			
P	–	–	–										
R	–	Reverse	–	○									○
N	–	–	–										
D	Except hold	1st	↕			○	■				●	●	
		2nd	↕			○	*3 ■	○			●		
		3rd	↕		○	○	*3 ■	*1 ⊗	⊗		●		
		O/D	↕		○	⊗		*2 ⊗	⊗	○			
	hold	2nd	↑			○	*3 ◎	○			●		
		3rd	↑		○	○	*3 ◎	*1 ⊗	⊗		●		
		*4 O/D	↑		○	⊗		*2 ⊗	⊗	○			
S	Except hold	1st	↕			○	△				●	●	
		2nd	↕			○	*3 △	○			●		
		3rd	↕		○	○	*3 △	*1 ⊗	⊗		●		
	hold	2nd	↑			○	*3 △	○			●		
		*4 3rd	↑		○	○	*3 △	*1 ⊗	⊗		●		
L	Except hold	1st	↕			○	*3 ○				●	●	○
		2nd	↕			○	*3 ○	○			●		
	hold	1st	↑			○	*3 ○				●	●	○
		*4 2nd	↑			○	*3 ○	○			●		

37U0KX-004

OWC: one-way clutch
*1: Hydraulic pressure is applied to both 2nd applied side and 3rd released side of band servo piston. However, because area of 3rd released side is larger than 2nd applied side, the brake band does not engage
*2: Hydraulic pressure is applied to O/D applied side in the above conditions (*1) and brake band engages.
*3: Indicates that engine braking is available as a result of operation of overrunning clutch.
*4: Prevents engine overspeed.
○: Constantly engaged.
●: Operates when accelerated
△: Engaged when throttle opening is below approximately 1.3/8.
◎: Engaged when vehicle speed is above approximately 10 km/h {6.2 MPH} and throttle opening is below approximately 1.3/8.
■: Engaged when vehicle speed is above approximately 10 km/h {6.2 MPH} and throttle opening is below approximately 1.3/8 (NORMAL A/C OFF mode)
⊗: Engaged, however does not transmit power

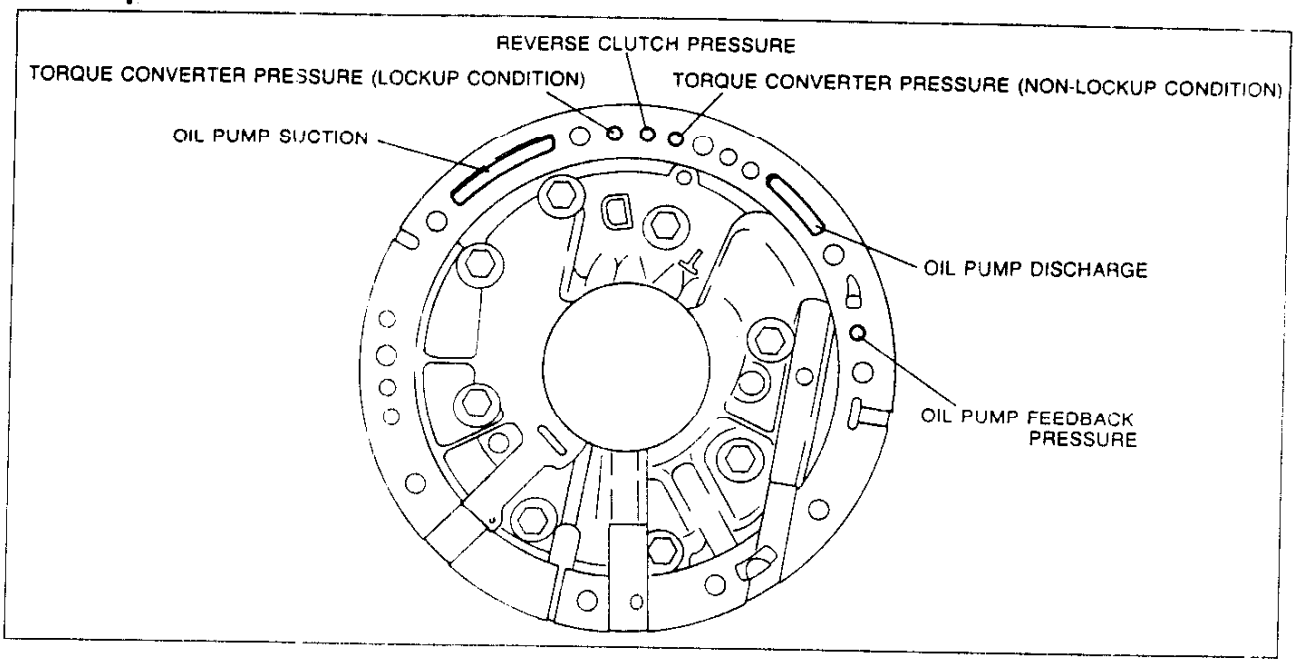
FLUID PASSAGE LOCATION

Transmission Case



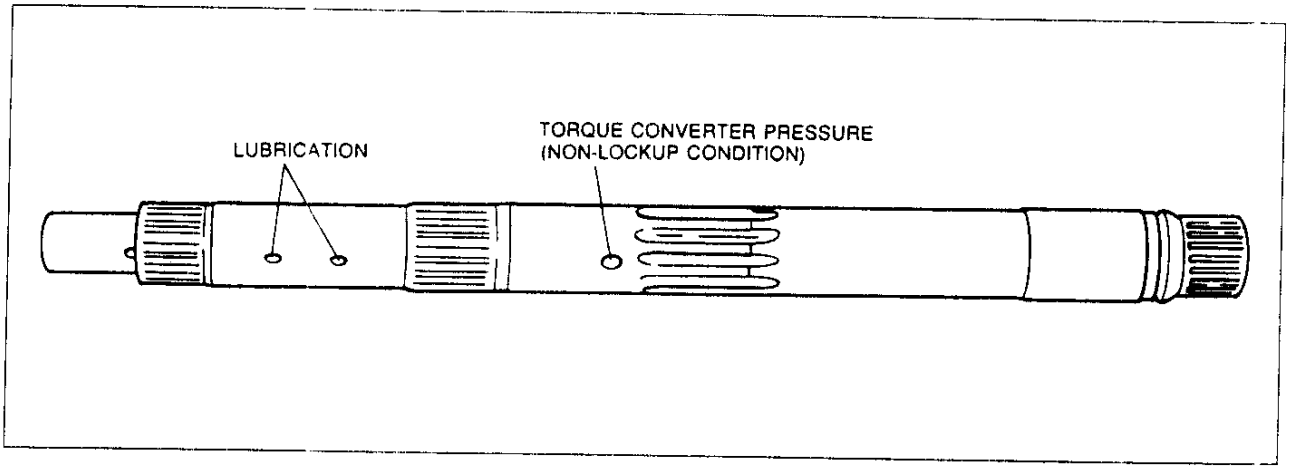
29U0KX-008

Oil Pump



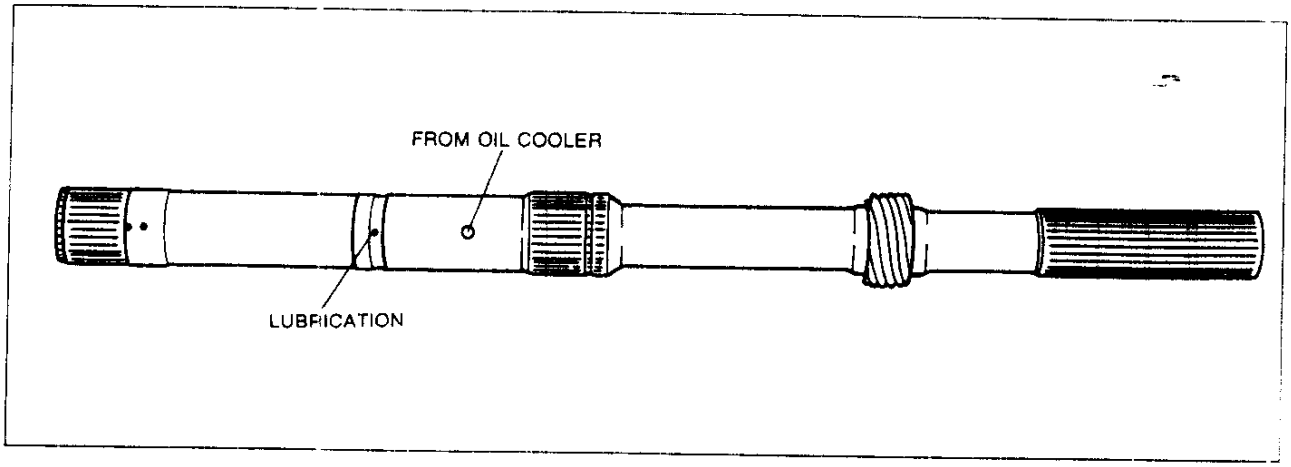
29U0KX-009

Input Shaft



29U0KX-010

Output Shaft

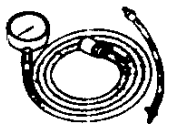
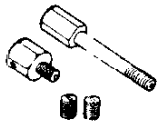
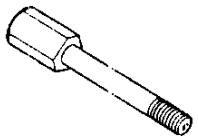


29U0KX-011

MECHANICAL SYSTEM TEST

PREPARATION

SST

49 0378 400A Gauge set, oil pressure		For oil pressure test	49 B019 901 Gauge, oil pressure		For oil pressure test
49 F019 0A0 Adapter set		For oil pressure test	49 F019 002 Adapter A (Part of 49 F019 0A0)		For oil pressure test
49 F019 003 Adapter B (Part of 49 F019 0A0)		For oil pressure test	49 F019 004 Screw (Part of 49 F019 0A0)		For oil pressure test

37U0KX-005

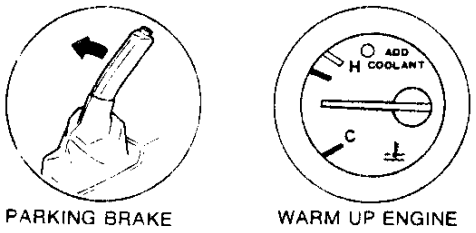
K

STALL TEST

This test is performed to determine if there is slippage of the friction elements or malfunction of the hydraulic components.

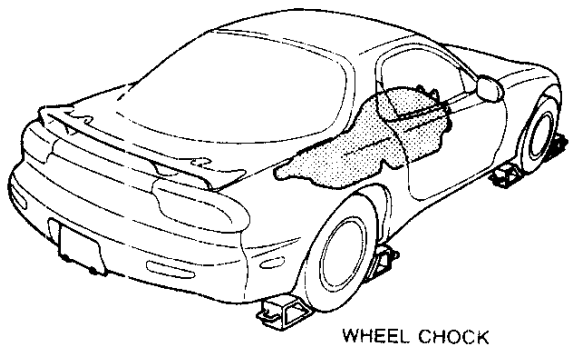
Preparation

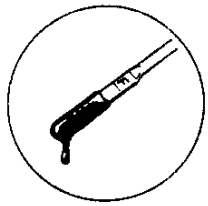
1. Engage the parking brake and use wheel chocks at the front and rear of the wheels.
2. Warm the engine thoroughly to raise the ATF temperature to operating level **60–70°C {140–158°F}**
3. Check, and correct as necessary, the engine coolant, engine oil, and ATF levels before testing.

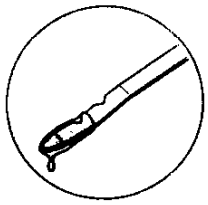

PARKING BRAKE

WARM UP ENGINE


COOLANT LEVEL

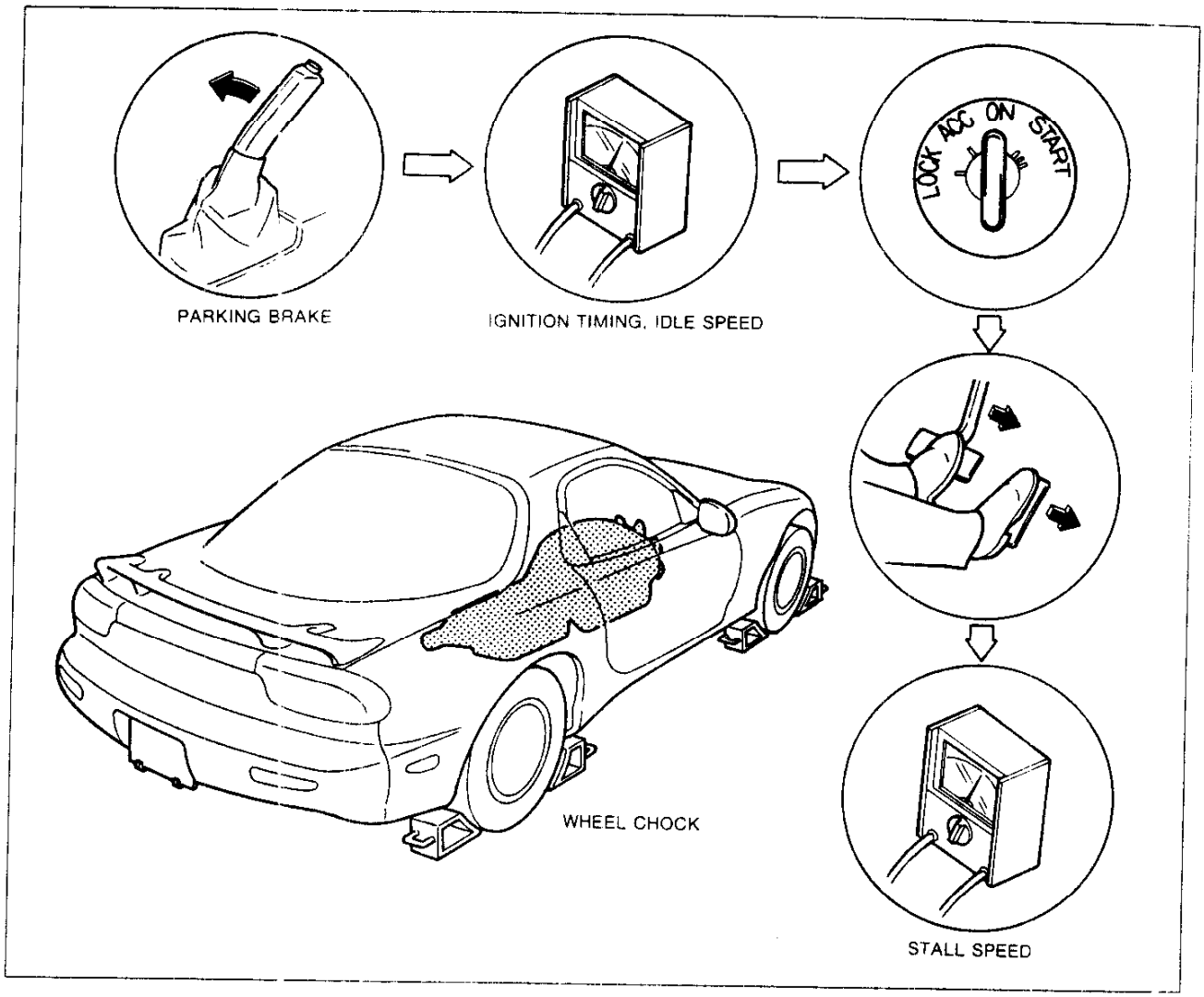

WHEEL CHOCK


ENGINE OIL LEVEL


ATF LEVEL

37U0KX-006

Procedure



37U0KX-007

1. Check the idle speed and ignition timing in P range. (Refer to Section F.)

Idle speed: 700–750 rpm
Ignition timing: Leading 5° ATDC
Trailing 20° ATDC
(TEN terminal of diagnosis connector grounded)

Caution
- **Steps 2 and 3 must be performed within five (5) seconds.**
- **After measuring the engine stall speed, idle for at least one (1) minute in N range to cool the ATF and to prevent its deterioration.**

2. Firmly depress the brake pedal with the left foot, shift the selector lever to D range (except hold mode) and gradually depress the accelerator pedal with the right until the throttle valve is fully opened.
3. When the engine speed no longer increases, quickly read the speed and release the accelerator.

Caution
- **Be sure to allow sufficient cooling time between each stall test.**

4. Perform a stall test for the following ranges in the same manner.
   (1) D range (hold mode)
   (2) S range (except hold mode)
   (3) S range (hold mode)
   (4) L range (except hold mode)
   (5) L range (hold mode)
   (6) R range

Engine stall speed: 3,000–3,300 rpm

37U0K[illegible]008

Caution
- **Check the following even if the engine speed is within specification.**
  High clutch slipping
  Brake band slipping

Evaluation of Stall Test

Condition		Possible Cause	
Above specification	In all ranges	Insufficient line pressure	Worn oil pump
			Oil leakage from oil pump, control valve and/or transmission case
			Stuck pressure regulator valve
	In D and S ranges (except hold mode)	Forward clutch slipping Forward one-way clutch slipping Low one-way clutch slipping	
	In R range	Low and reverse brake slipping Reverse clutch slipping Perform road test to determine whether problem is low and reverse brake or reverse clutch a) Engine braking applied in L range 1st ...Reverse clutch slipping b) Engine braking not applied in L range 1st ...Low and reverse brake slipping	
Below specification		Engine out of tune	
		One-way clutch slipping within torque converter	

37U0KX 009

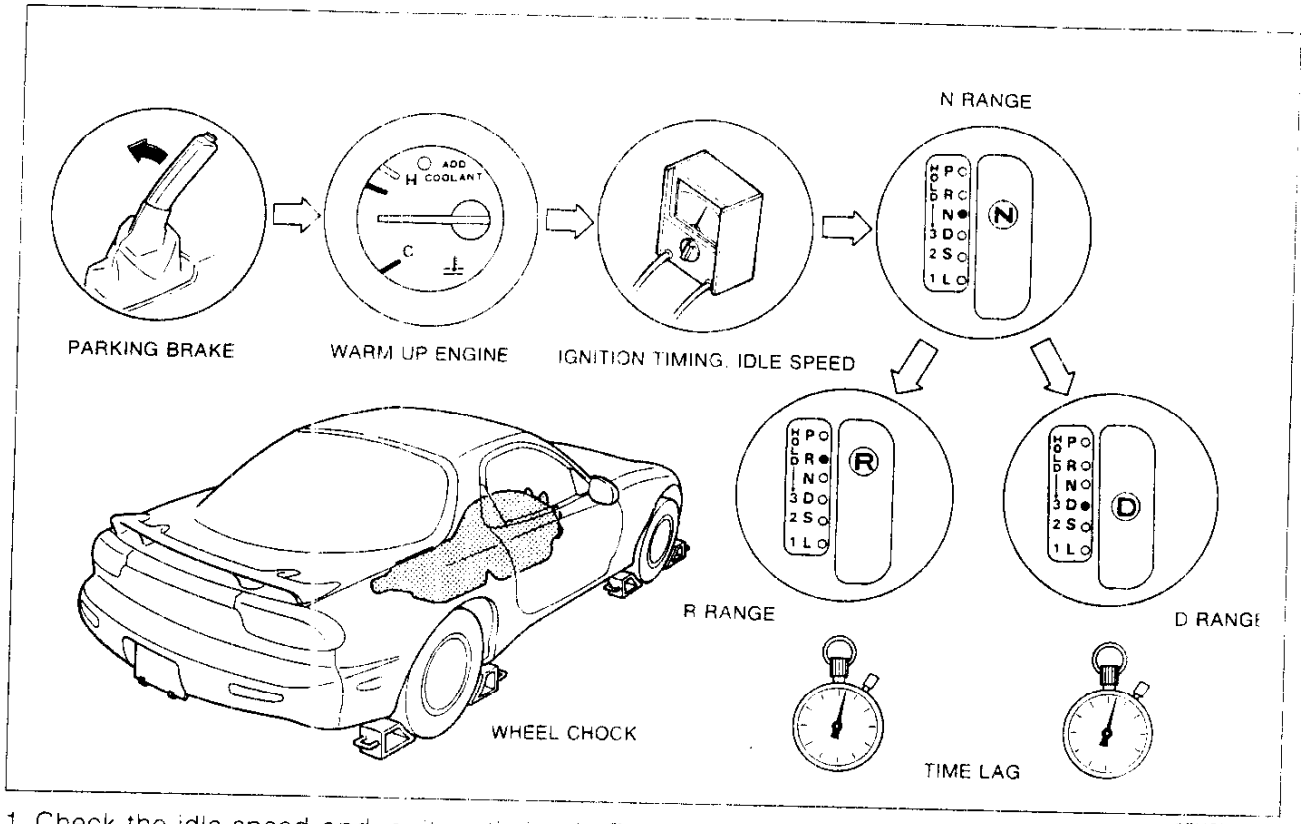
TIME LAG TEST

If the selector lever is shifted while the engine is idling, there will be a certain time lapse, or time lag, before shock is felt. This step measures this time lag in order to check conditions of the N-D, 1-2, and 3-4/N-R accumulators; forward, reverse, and one-way clutches; brake band; and low and reverse brake.

Preparation

Perform the preparation procedure outlined in STALL TEST. (Refer to page K–9.)

Procedure



1. Check the idle speed and ignition timing in P range. (Refer to Section F.)

   Idle speed: 700–750 rpm
   Ignition timing: Leading 5° ATDC
   Trailing 20° ATDC
   (TEN terminal of diagnosis connector grounded)

2. Shift from N range to D range (except hold mode).
3. Use a stopwatch to measure the time taken from shifting until shock is felt.

Note

- **Make three measurements for each test and average the results.**

4. Perform the test for the following shifts in the same manner.
   (1) N → D range (hold mode)
   (2) N → R range

Time lag: N → D range ..... Below 1.0 sec.
N → R range ..... Below 1.2 sec.

If the result of time lag test is above specification, check for the following possible causes.

Evaluation of Time Lag Test

Condition		Possible Cause
Above specification	N → D shift (except hold mode)	Insufficient line pressure
		Forward clutch slipping
		Low one-way clutch slipping
		N-D accumulator not operating properly
	N → D shift (hold mode)	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

37U0K-11

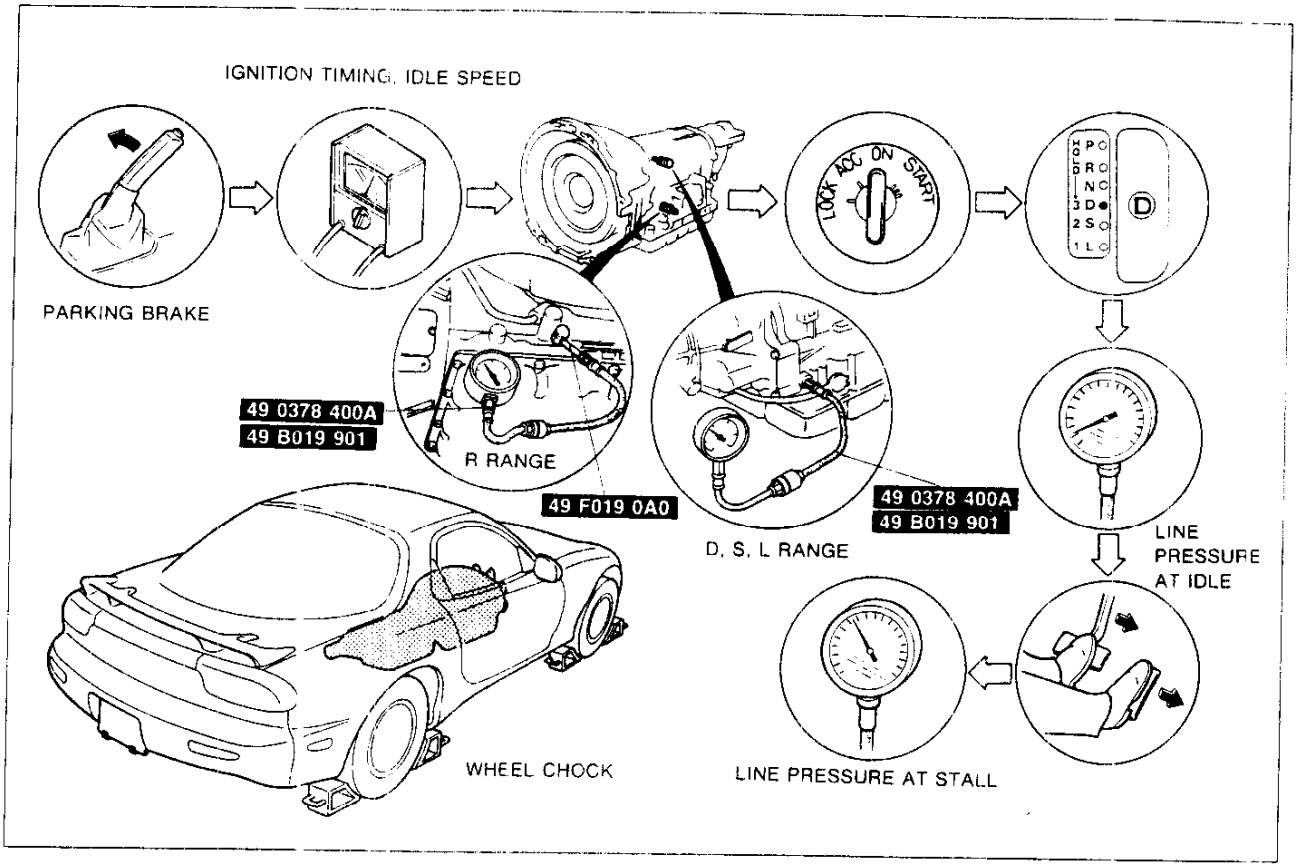
LINE PRESSURE TEST

This test measures line pressures as a means of checking the hydraulic components and inspecting for oil leakage.

Preparation

Perform the preparation procedure outlined in STALL TEST. (Refer to page K–9.)

Procedure



1. Check the idle speed and ignition timing in P range. (Refer to Section F.)

   Idle speed: 700–750 rpm
   Ignition timing: Leading 5° ATDC
   Trailing 20° ATDC
   (TEN terminal of diagnosis connector grounded)
2. Remove the tunnel member (front) and the exhaust pipe bracket.
3. Remove the line pressure inspection bolt and connect the **SST** (49 F019 0A0).
4. Replace the gauge of **SST** (49 0378 400A) with **SST's** (49 B019 901).

   Caution
   - **After performing step 5, remove the SST (49 B019 901) and replace the gauge of it with the SST (49 0378 400A).**
5. Shift the selector lever to D range and read the line pressure at idle.
6. Connect the **SST** (49 0378 400A) to the line pressure inspection port.

   Caution
   - **After reading the line pressure at stall, idle for at least one (1) minute in N range.**
   - **Steps 7 and 8 must be performed within five (5) seconds to prevent possible transmission damage.**
7. Depress the brake pedal firmly with the left foot and gradually depress the accelerator pedal with the right foot until the throttle valve is fully opened.
8. Read the line pressure as soon as the engine speed becomes constant, then release the accelerator pedal.

9. Read the line pressure at idle and at the engine stall speed for each range in the same manner.

Specified line pressure:

Range	Line pressure kPa {kgf/cm², psi}	
	Idle	Stall
D, S, L	500–520 {5.0–5.4, 72–76}	1,200–1,270 {12.2–13.0, 174–184}
R	620–650 {6.3–6.7, 90–95}	1,510–1,570 {15.3–16.1, 218–228}

37U0K-[illegible]

Caution

- **Do not reuse the bolt because it is coated.**

10. Remove the **SST** and install a new square head plug in the inspection port.

Tightening torque: 5.0–9.8 N·m {50–100 kgf·cm, 44–86 in·lbf}

11. Install the exhaust pipe bracket.

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

12. Install the tunnel member (front).

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

If the result of line pressure test is out of the specification, check for the following possible causes.

Evaluation of Line Pressure Test

Condition		Possible Cause
At idle	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, oil pump, and pressure regulator valve
	Low pressure in forward ranges	Fluid leaking from hydraulic circuit of forward clutch
	Low pressure in D and S ranges (hold mode)	Fluid leaking from hydraulic circuit of band servo 2nd apply side
	Low pressure in R range	Fluid leaking from hydraulic circuit of reverse clutch
	Low pressure in R and L ranges	Fluid leaking from hydraulic circuit of low and reverse brake
	Higher than specification	Throttle sensor out of adjustment Damaged ATF thermosensor Solenoid valve (line pressure) sticking Short circuit of solenoid valve (line pressure) circuit Pressure modifier valve sticking Pressure regulator valve or plug sticking
At stall speed	Low pressure	Throttle sensor out of adjustment Solenoid valve (line pressure) sticking Short circuit of solenoid valve (line pressure) circuit Pressure regulator valve or plug sticking Pressure modifier valve sticking Pilot valve sticking Damaged control piston (in oil pump)

37U0K2-[illegible]14

ROAD TEST

Caution

- **Perform the test at normal ATF operating temperature 60–70°C {140–158°F}.**

Note

- **The vehicle's indicated speed as shown by its speedometer may not be accurate when the vehicle is on a chassis roller. Therefore, verify the shift points by using only the vehicle speed as shown by the DT-S1000.**
- **The throttle sensor voltage of the DT-S1000 represents the throttle valve opening.**

This step is performed to inspect for problems in the various gear ranges. If these tests show any problems, refer to the electronic system component or mechanical section of this manual to adjust or replace as necessary.

D RANGE TEST

Shift Point, Shift Pattern, and Shift Shock

Note

- **The power mode and the normal mode are automatically selected by the EC-AT control unit.**
- **Once the power mode is selected, the EC-AT control unit does not switch to normal mode until the ignition switch is turned OFF.**
- **When the ATF temperature is less than 40°C {104°F} in the period shortly after the engine is started, the EC-AT control unit selects the low ATF temperature mode.**
- **The shift points during the low ATF temperature mode are higher than in the power mode and lockup is inhibited.**

1. Shift the selector lever to D range.

Note

- **There is no O/D when the ATF temperature is below 10°C {50°F}.**
- **There is no O/D when the ATF temperature is below 38°C {100°F} and vehicle speed is less than 63 Km/h {39 MPH}.**
- **There is no O/D when the cruise control is operating and there is an 8 km/h {5 MPH} difference between the preset cruise speed and the vehicle speed, or the RESUME/ACCEL switch is ON.**

2. Accelerate the vehicle with half- and full-throttle opening.
3. Verify that 1-2, 2-3, and 3-O/D upshifts are obtained. The shift points must be as shown in the D range shift diagram.
4. Drive the vehicle in O/D, 3rd and 2nd gears and verify that kickdown occurs for O/D → 3, O/D → 2, O/D → 1, 3 → 2, 3 → 1, 2 → 1, and that the shift points are as shown in the D range shift diagram.
5. Decelerate the vehicle and verify that engine braking effect is felt in 3rd and 2nd gears when normal A/C OFF mode is selected, vehicle speed is more than 10 km/h {6.2 MPH}, and the throttle opening is less than 1/8.

Note

- **When the engine coolant temperature is above 115°C {239°F}, the lockup points are lowered.**
- **There is no lockup when the transmission is in O/D gear position and the ATF temperature is below 20°C {68°F}.**
- **There is no lockup when the transmission is in 3rd gear position and ATF temperature is below 38°C {100°F}.**
- **There is no slip lockup when the ATF temperature is below 50°C {122°F}.**
- **There is no slip lockup when the ATF temperature is above 100°C {212°F}.**
- **There is no slip lockup when the slip lockup OFF signal is ON.**
- **There is no slip lockup when the transmission is in O/D gear position and the idle signal is ON.**
- **There is no slip lockup when the transmission is in 3rd gear position, the idle signal is ON, and vehicle speed is less than 140 km/h {87 MPH}.**
- **There is no slip lockup when the accelerator pedal is depressed rapidly.**

6. Drive the vehicle and verify that lockup is obtained.
7. Select hold mode.
8. Accelerate the vehicle with half- and full-throttle opening, and verify that 3rd gear is held after 2-3 upshift is obtained. The shift points must be as shown in the D range (hold mode) shift diagram.
9. Drive the vehicle in 3rd and 2nd gears and verify that kickdown does not occur.
10. Decelerate the vehicle and verify that engine braking effect is felt in 3rd and 2nd gears when vehicle speed is more than 10 km/h {6.2 MPH} and the throttle opening less than 1.3/8.

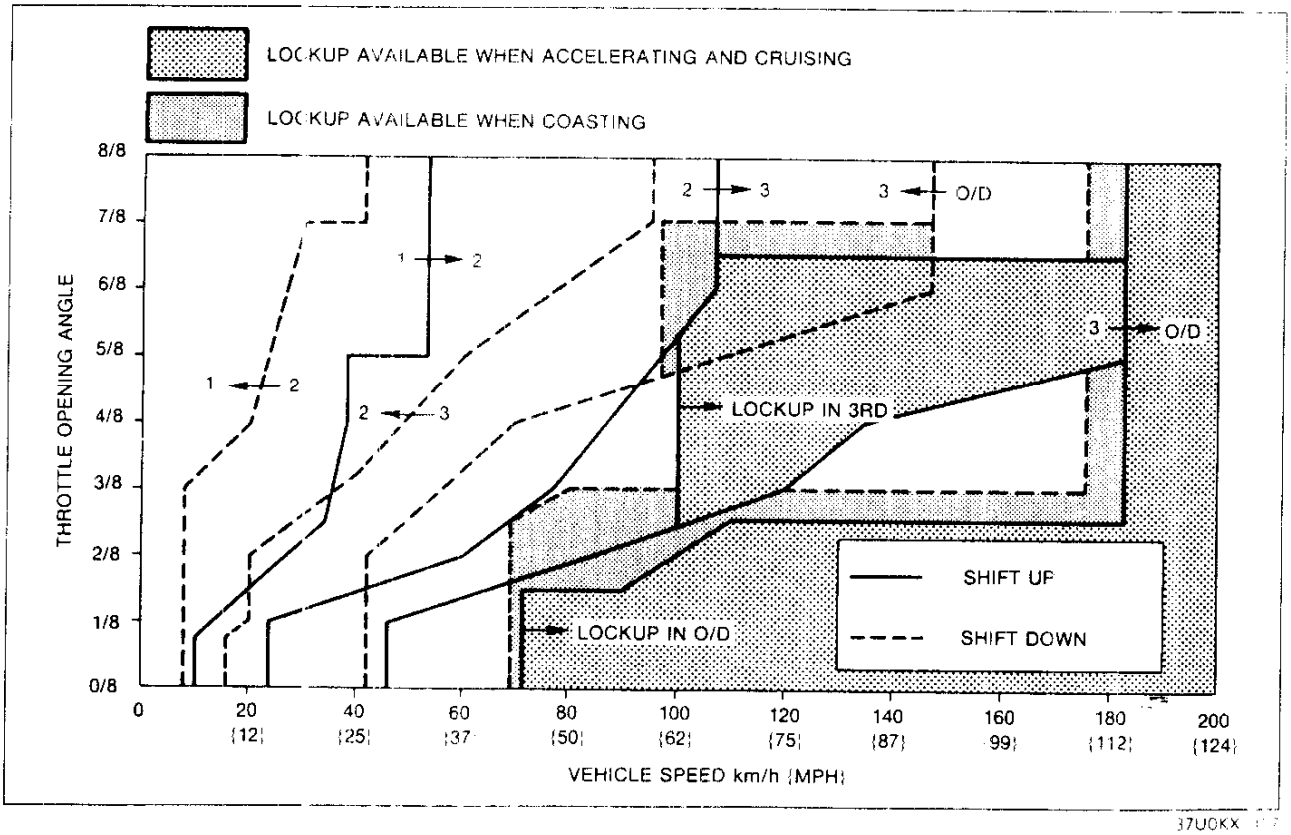
Note

- **When the engine coolant temperature is above 115°C {239°F}, the lockup points are lowered.**
- **There is no lockup when the transmission is in 3rd gear position and the ATF temperature is below 38°C {100°F}.**

11. Drive the vehicle and verify that lockup is obtained.

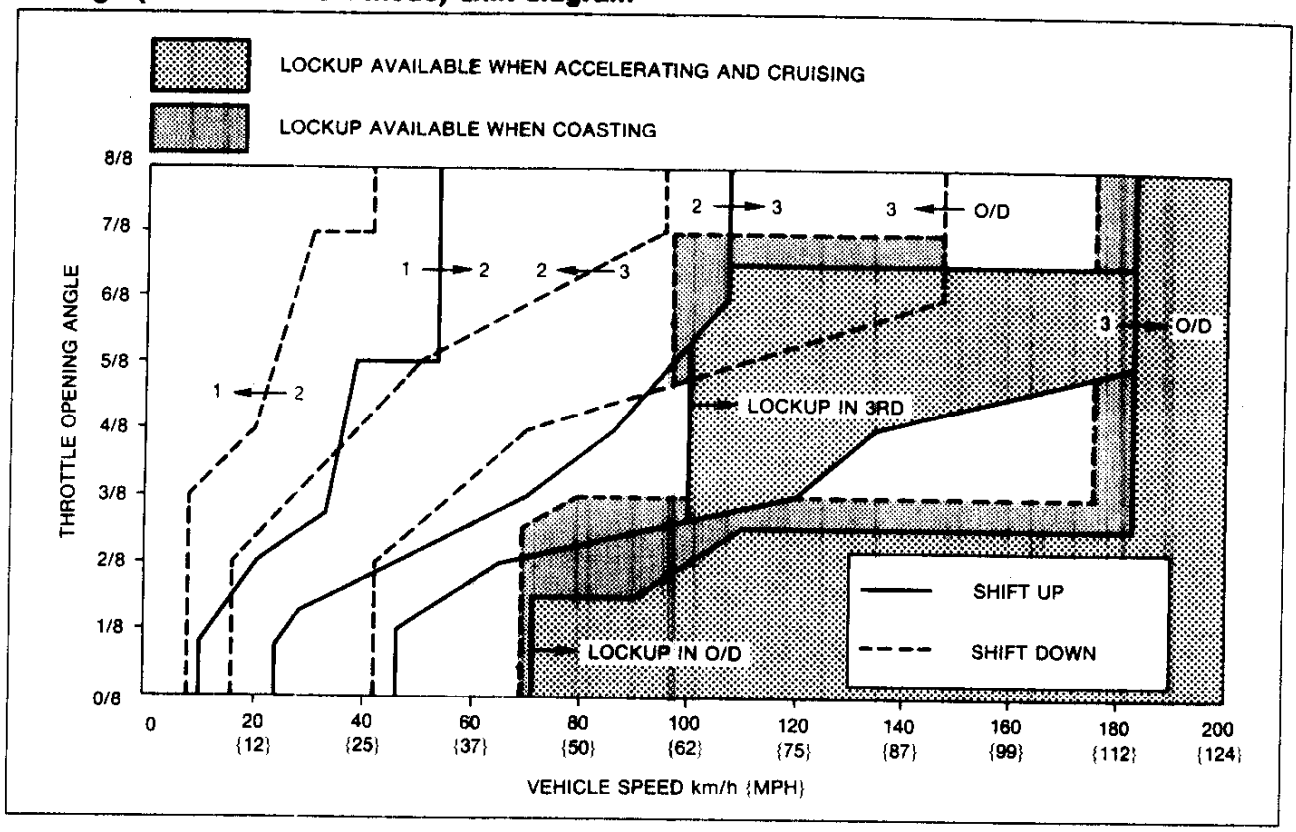
37U0K

D range (power mode) shift diagram



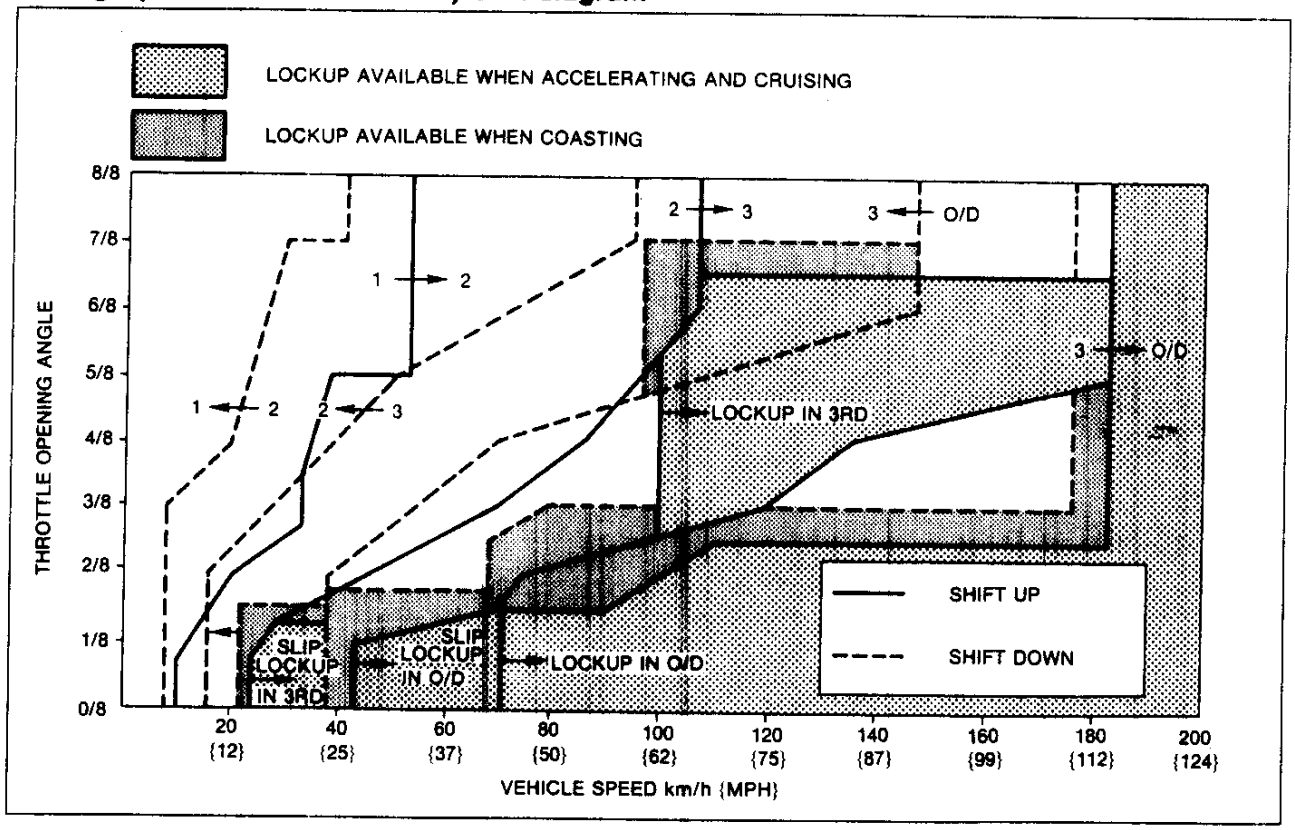
37U0KX

D range (normal A/C ON mode) shift diagram



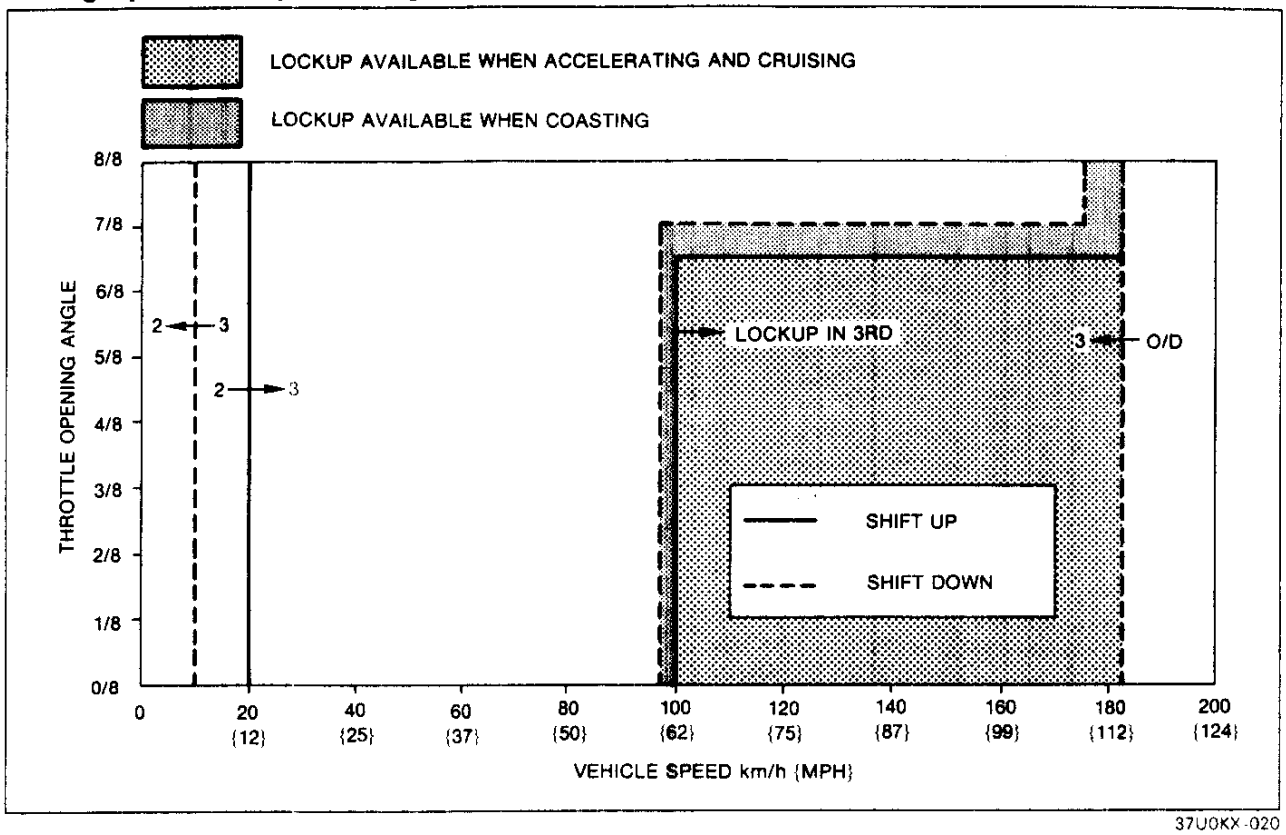
37U0KX-018

D range (normal A/C OFF mode) shift diagram



37U0KX-019

D range (hold mode) shift diagram



37U0KX-020

Noise and Vibration

Note

- **Abnormal noise and vibration can also be caused by the torque converter, propeller shaft, or differential. Therefore, check with extreme care.**

Drive the vehicle in O/D (lockup), O/D (no lockup), and 3rd (hold) and check for abnormal noise and vibration.

29U0KX-121

S RANGE TEST

Shift Point, Shift Pattern, and Shift Shock

1. Shift the selector lever to S range.
2. Accelerate the vehicle with half- and full-throttle opening.
3. Verify that 1-2 and 2-3 upshifts are obtained. The shift points must be as shown in the S range shift diagram.
4. Drive the vehicle in 3rd and 2rd gears and verify that kickdown occurs for 3 → 2, 3 → 1, 2 → 1, and that the shift points are as shown in the S range shift diagram.
5. Decelerate the vehicle and verify that engine braking effect is felt in 3rd and 2nd gears when the throttle opening is less than 1.3/8.

Note

- **When the engine coolant temperature is above 115°C {239°F}, the lockup points are lowered.**
- **There is no lockup when the transmission is in 3rd gear position and the ATF temperature is below 38°C {100°F}.**

6. Drive the vehicle and verify that lockup is obtained.
7. Select hold mode.
8. Accelerate the vehicle with half- and full-throttle opening, and verify that 2nd gear is held.
9. Decelerate the vehicle and verify that engine braking effect is felt when the throttle opening is less than 1.3/8.

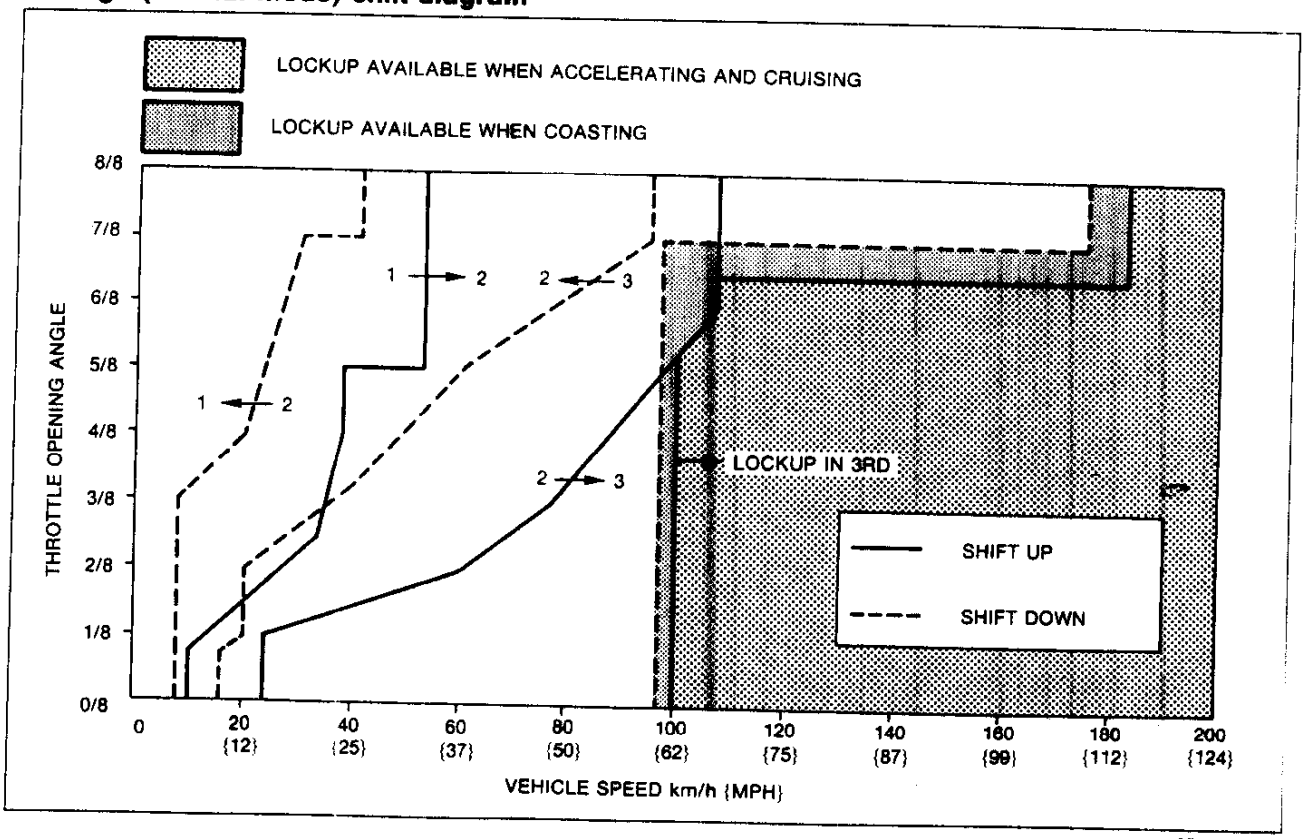
Note

- **When the engine coolant temperature is above 115°C {239°F}, the lockup points are lowered.**

10. Drive the vehicle and verify that lockup is obtained.

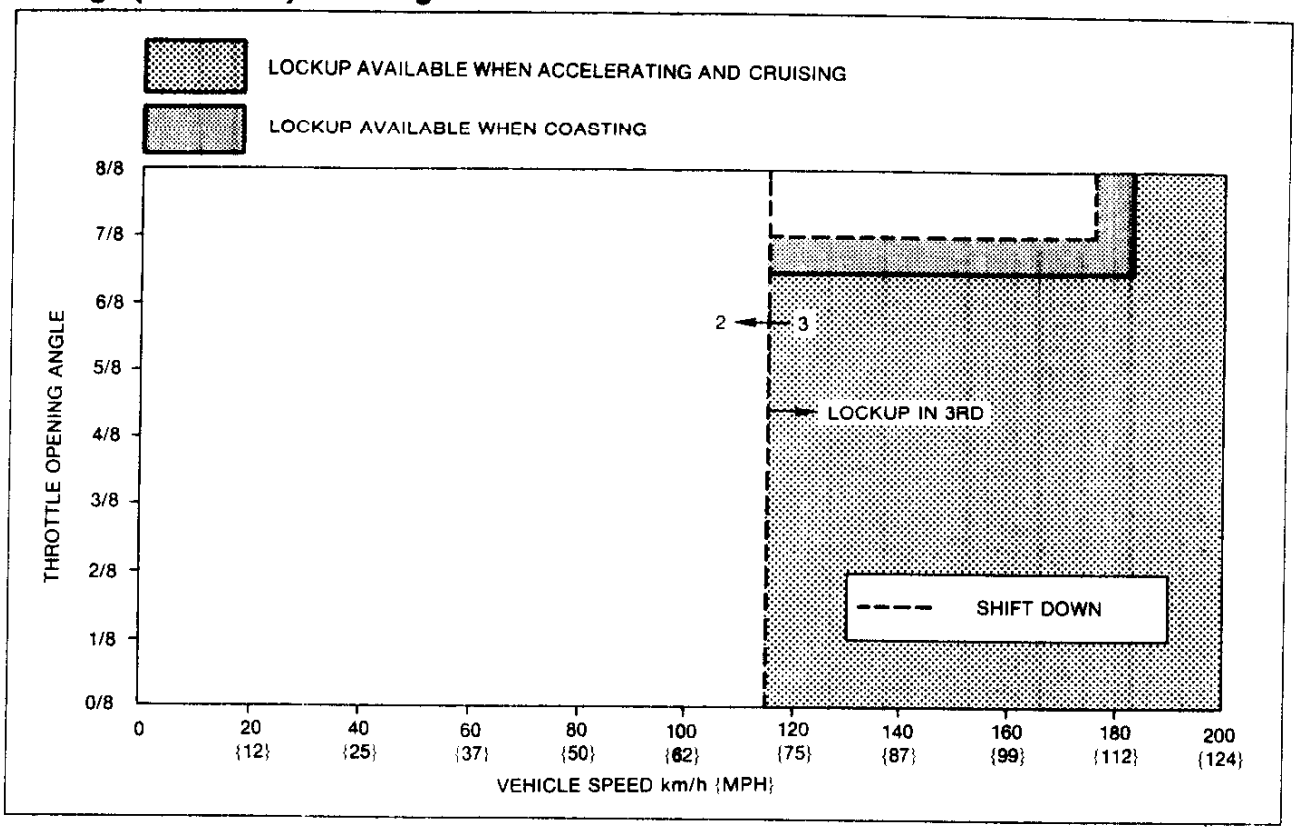
37U0KX-021

S range (normal mode) shift diagram



37U0KX-022

S range (hold mode) shift diagram



37U0KX-023

Noise and Vibration

Note

- **Abnormal noise and vibration can also be caused by torque converter, propeller shaft, or differential. Therefore, check with extreme care.**

Drive the vehicle in 2nd (hold) and check for abnormal noise and vibration.

29U9KX-125

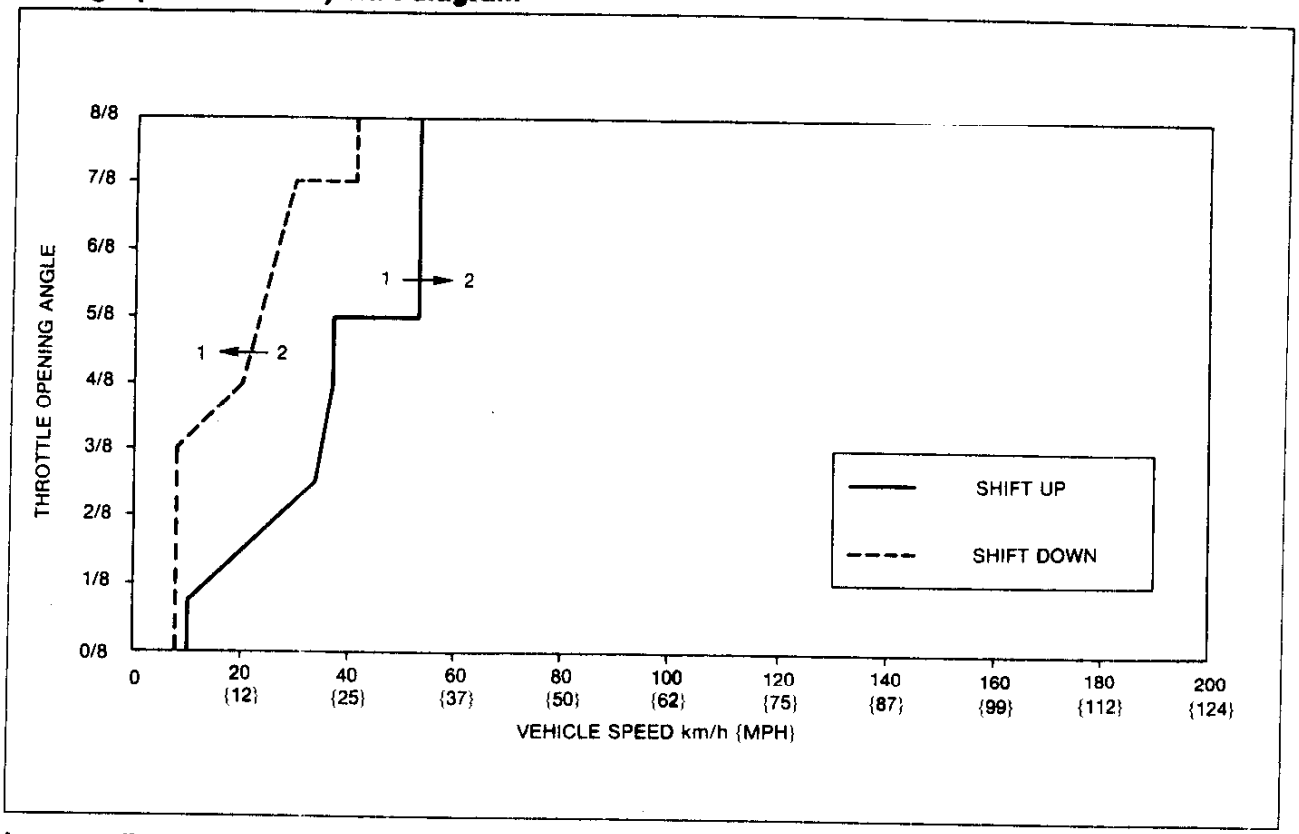
L RANGE TEST

Shift Point, Shift Pattern, and Shift Shock

1. Shift the selector lever to L range.
2. Accelerate the vehicle with half- and full-throttle opening.
3. Verify that 1-2 upshift is obtained. The shift points must be as shown in the L range shift diagram.
4. Drive the vehicle in 2nd gear and verify that kickdown occurs for 2 → 1, and that the shift point is as shown in the L range shift diagram.
5. Decelerate the vehicle and verify that engine braking effect is felt in 2nd and 1st gears.
6. Select hold mode.
7. Accelerate the vehicle with half- and full-throttle opening, and verify that 1st gear is held.
8. Decelerate the vehicle and verify that engine braking effect is felt.

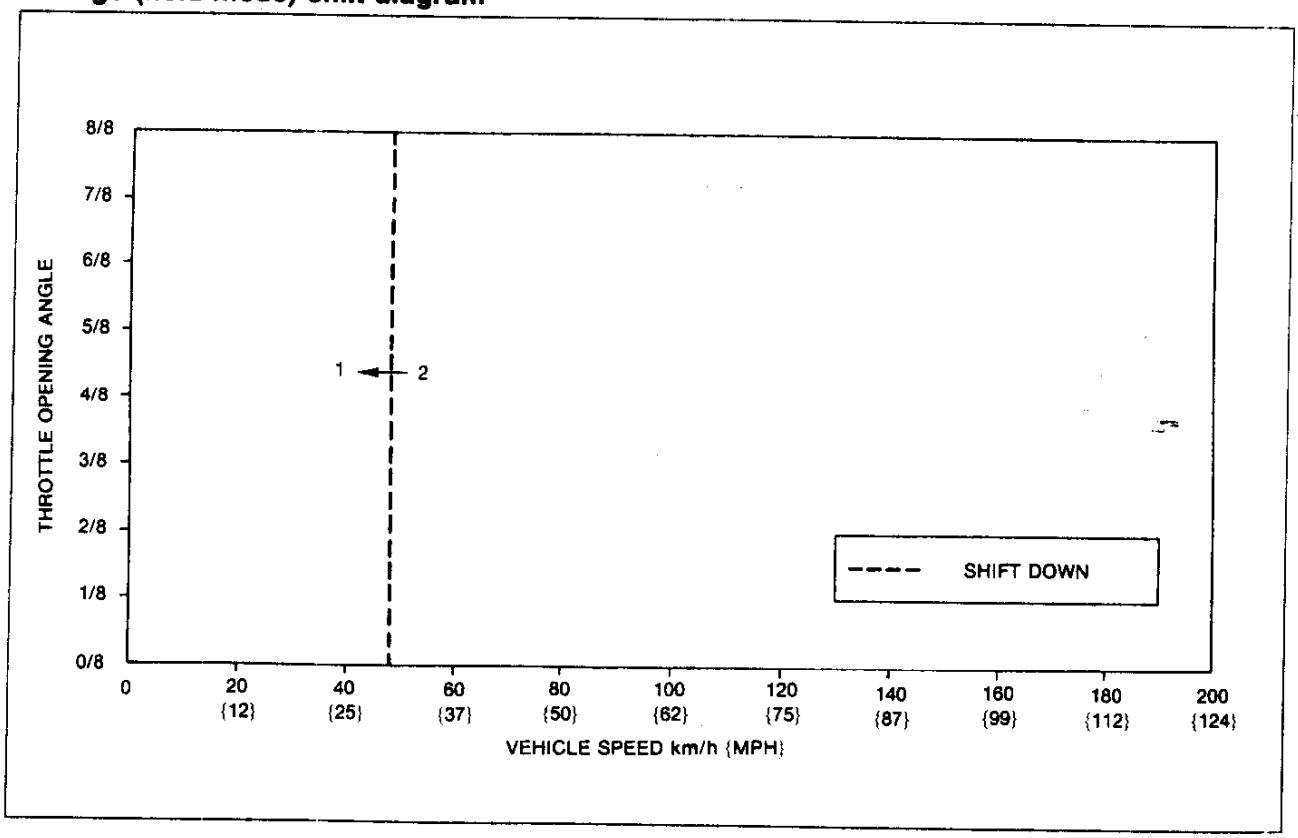
37U0KX-9024

L range (normal mode) shift diagram



37U0KX 025

L range (hold mode) shift diagram



37U0KX-026

Noise and Vibration

Note

- **Abnormal noise and vibration can also be caused by the torque converter, propeller shaft, or differential. Therefore, check with extreme care.**

Drive the vehicle in 1st (hold) and check for abnormal noise and vibration.

29U0K0-129

P RANGE TEST

Shift into P range on a gentle slope. Release the brake and verify that the vehicle does not roll.

29U0K0-130

Vehicle Speed at Shift Point Table

Range	Mode	Throttle condition (throttle sensor voltage)	Shift	Vehicle speed km/h {MPH}
D	POWER	Fully open (4.0–4.5V)	$D_1 \rightarrow D_2$	50–56 {31–35}
			$D_2 \rightarrow D_3$	103–111 {64–69}
			$D_3 \rightarrow$ O/D	178–188 {111–117}
		Half throttle	$D_1 \rightarrow D_2$	35–41 {22–25}
			$D_2 \rightarrow D_3$	81–93 {50–58}
			$D_3 \rightarrow$ O/D	126–144 {78–89}
			Lockup ON (D_3)	94–106 {58–66} (81–93 {50–58})
			Lockup ON (O/D)	174–192 {108–119} (126–144 {78–89})
		Fully closed (0.1–1.1V)	O/D $\rightarrow D_3$	39–45 {24–28}
			$D_3 \rightarrow D_2$	13–19 {8–12}
			$D_2 \rightarrow D_1$	5–11 {3–7}
		Kickdown	O/D $\rightarrow D_3$	142–152 {88–94}
			$D_3 \rightarrow D_2$	91–99 {57–62}
			$D_2 \rightarrow D_1$	38–44 {24–27}
	NORMAL A/C ON	Fully open (4.0–4.5V)	$D_1 \rightarrow D_2$	50–56 {31–35}
			$D_2 \rightarrow D_3$	103–111 {64–69}
			$D_3 \rightarrow$ O/D	178–188 {111–117}
		Half throttle	$D_1 \rightarrow D_2$	32–38 {20–24}
			$D_2 \rightarrow D_3$	80–92 {50–57}
			$D_3 \rightarrow$ O/D	126–144 {78–89}
			Lockup ON (D_3)	94–106 {58–66} (80–92 {50–57})
			Lockup ON (O/D)	174–192 {108–119} (126–144 {78–89})
		Fully closed (0.1–1.1V)	O/D $\rightarrow D_3$	39–45 {24–28}
			$D_3 \rightarrow D_2$	13–19 {8–12}
			$D_2 \rightarrow D_1$	5–11 {3–7}
		Kickdown	O/D $\rightarrow D_3$	142–152 {88–94}
			$D_3 \rightarrow D_2$	91–99 {57–62}
			$D_2 \rightarrow D_1$	38–44 {24–27}
	NORMAL A/C OFF	Fully open (4.0–4.5V)	$D_1 \rightarrow D_2$	50–56 {31–35}
			$D_2 \rightarrow D_3$	103–111 {64–69}
			$D_3 \rightarrow$ O/D	178–188 {111–117}
		Half throttle	$D_1 \rightarrow D_2$	32–38 {20–24}
			$D_2 \rightarrow D_3$	80–92 {50–57}
			$D_3 \rightarrow$ O/D	126–144 {78–89}
			Lockup ON (D_3)	94–106 {58–66} (80–92 {50–57})
			Lockup ON (O/D)	174–192 {108–119} (126–144 {78–89})
		Fully closed (0.1–1.1V)	O/D $\rightarrow D_3$	32–38 {20–24}
			$D_3 \rightarrow D_2$	13–19 {8–12}
			$D_2 \rightarrow D_1$	5–11 {3–7}
		Kickdown	O/D $\rightarrow D_3$	142–152 {88–94}
			$D_3 \rightarrow D_2$	91–99 {57–62}
			$D_2 \rightarrow D_1$	38–44 {24–27}

Note

- **Lockup indicates complete lockup.**
- **( ) indicates lockup points when the engine coolant temperature is above 115°C {239°F}.**

Range	Mode	Throttle condition (throttle sensor voltage)	Shift	Vehicle speed km/h {MPH}
D	HOLD	–	O/D → D_3	180–186 {112–116}
			D_3 → D_2	7–13 {4–8}
			D_2 → D_1	15–25 {9–16}
			Lockup ON (D_3)	94–106 {58–66} {39–51 {24–32}}
S	EXCEPT HOLD	Fully open (4.0–4.5V)	S_1 → S_2	50–56 {31–35}
			S_2 → S_3	103–111 {64–69}
		Half throttle	S_1 → S_2	35–41 {22–25}
			S_2 → S_3	81–93 {50–58}
			Lockup ON (S_3)	94–106 {58–66} {81–93 {50–58}}
		Fully closed (0.1–1.1V)	S_3 → S_2	13–19 {8–12}
			S_2 → S_1	5–11 {3–7}
		Kickdown	S_3 → S_2	91–99 {57–62}
			S_2 → S_1	38–44 {24–27}
	HOLD	–	S_3 → S_2	112–118 {70–73}
L	EXCEPT HOLD	Fully open (4.0–4.5V)	L_1 → L_2	50–56 {31–35}
		Half throttle	L_1 → L_2	35–41 {22–25}
		Fully closed (0.1–1.1V)	L_2 → L_1	5–11 {3–7}
		Kickdown	L_2 → L_1	38–44 {24–27}
	HOLD	–	L_2 → L_1	45–51 {28–32}

37U0KX-027

Note

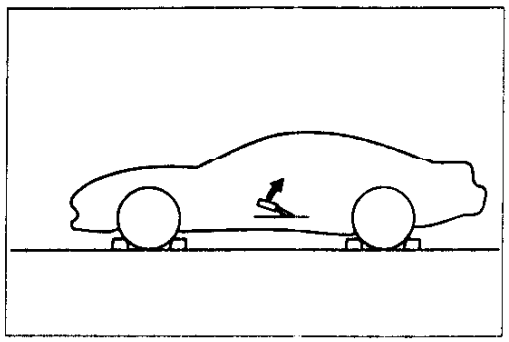
- **Lockup indicates complete lockup.**
- **( ) indicates lockup points when the engine coolant temperature is above 115° {239°F}.**
- **Throttle sensor voltage as a throttle condition should be calculated as shown:**

Throttle condition	Calculation	Example
Fully closed voltage	DT-S1000 indicated voltage at fully closed	0.3V
Fully open voltage	DT-S1000 indicated voltage at fully open	3.5V
Half throttle voltage	DT-S1000 indicated voltage difference between fully open and fully closed, divided by 2	(3.5V – 0.3V) ÷ 2 = 1.6V

37U0KX-028

Condition		Possible Cause
Shifting	Starts in 2nd or shifts directly from 1st to O/D	Stuck solenoid valve (shift A) Stuck shift valve A
	Starts in O/D	Stuck solenoid valve (shift B) Stuck shift valve B
	No shift	Stuck solenoid valve (shift A and B) Stuck shift valve A and/or B
	Incorrect shift points	Throttle sensor out of adjustment Speed sensor 1 (revolution sensor) not operating properly
Shift shock felt or slipping		Stuck solenoid valve (line pressure) Accumulators not operating properly Throttle sensor out of adjustment Speed sensor 1 (revolution sensor) not operating properly ATF thermosensor not operating properly Worn clutches, one-way clutches, and/or brakes
No engine braking		Stuck solenoid valve (overrunning clutch) Worn clutches and/or brakes
No lockup shift		Stuck solenoid valve (lockup) Stuck lockup control valve

29U0KX-103



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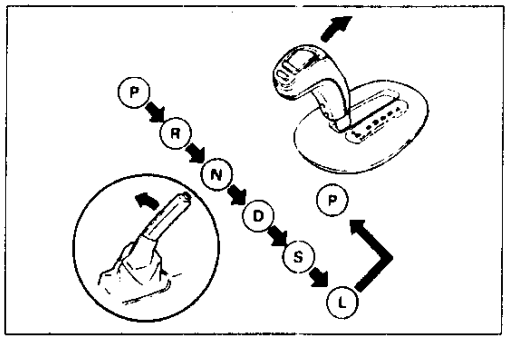
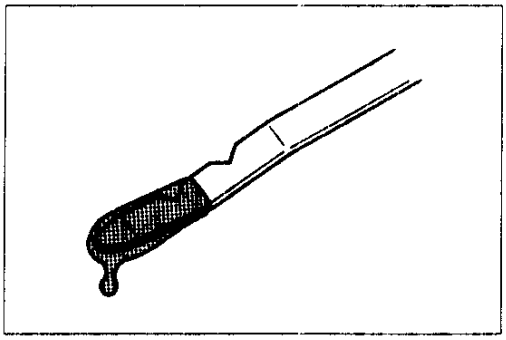


29U0KX-135



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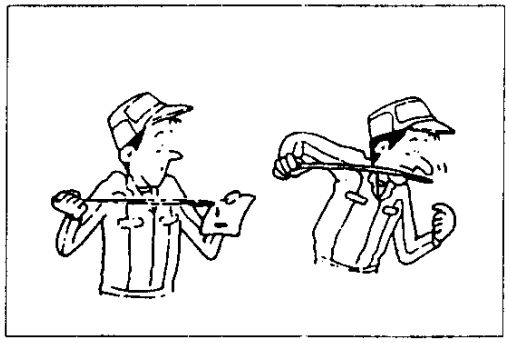


29U0KX-137

AUTOMATIC TRANSMISSION FLUID (ATF)

ATF

Inspection

Level

Caution

- **Place the vehicle on a flat, level surface.**

1. Apply the parking brake and securely position wheel chocks to prevent the vehicle from rolling.
2. Warm up the engine until the ATF temperature reaches **60–70°C {140–158°F}**.
3. While depressing the brake pedal, shift the selector lever to each range (P-L). Leave it a few seconds in each range.
4. Shift back to P range.
5. Ensure that the ATF level is between the notches of the ATF dipstick. Add ATF to specification, if necessary.

ATF Type: Dexron®II or M-III
Capacity: 8.6 L {9.1 US qt, 7.6 Imp qt}

Condition

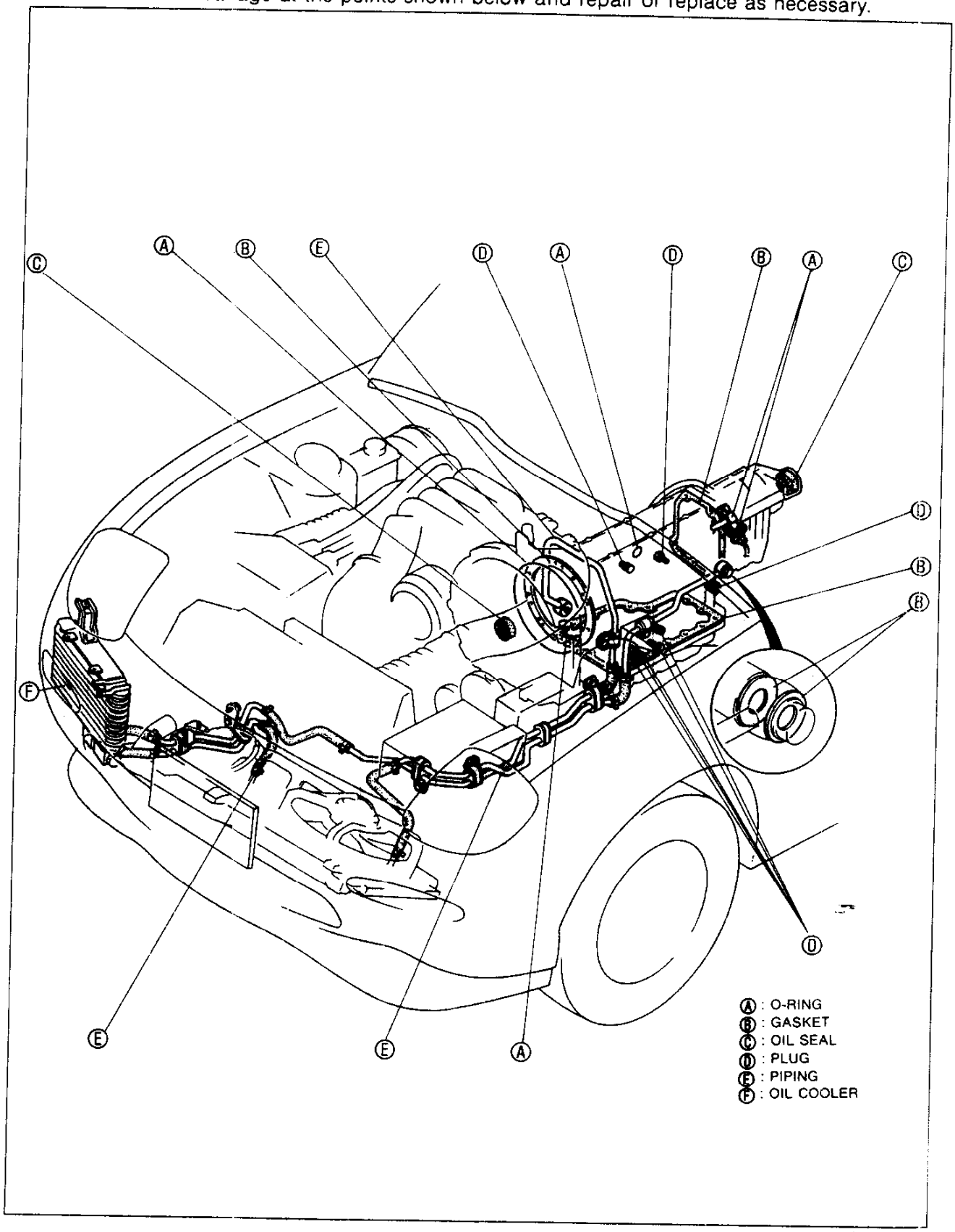
Note

- **Observe the condition of the ATF carefully, and determine whether or not the automatic transmission should be disassembled.**
- **If the ATF is muddy and varnished, it indicates burned drive plates and/or brake band.**

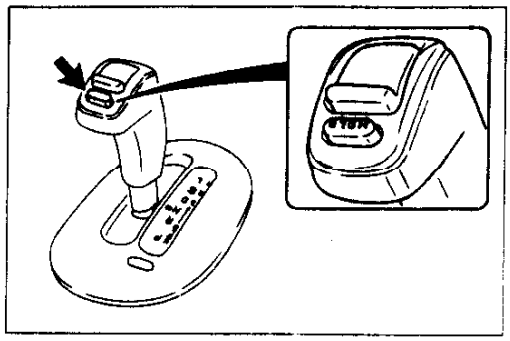
1. Check the ATF for discoloration.
2. Check the ATF for any unusual smell.

Fluid leakage

Check for ATF leakage at the points shown below and repair or replace as necessary.



29U0KX-138-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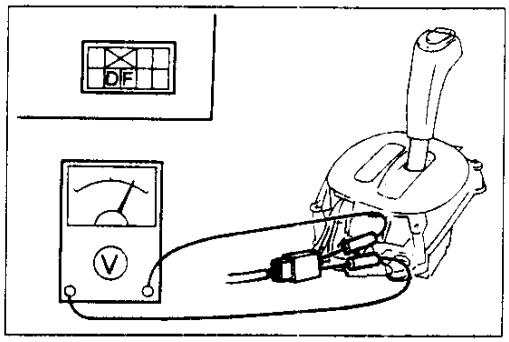
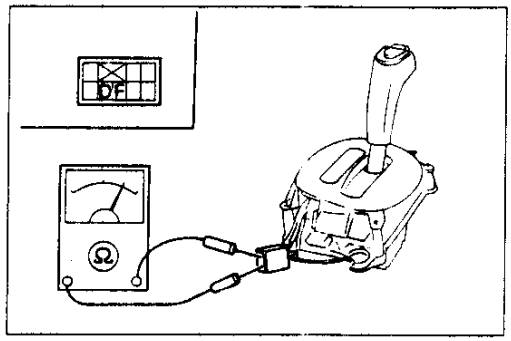
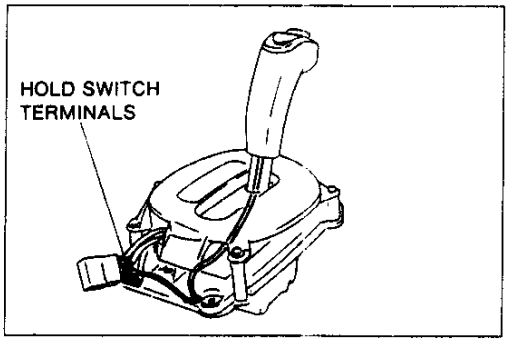


37U0KX-031



37U0KX-032



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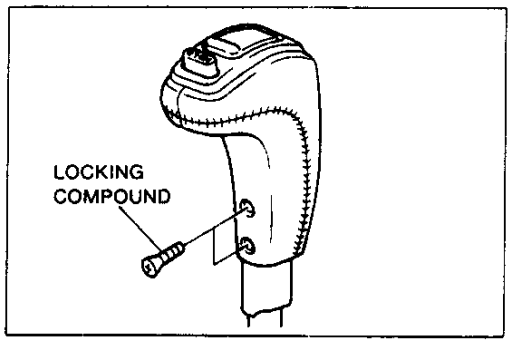


37U0KX-034

ELECTRONIC SYSTEM COMPONENTS

HOLD SWITCH

Inspection

Operation

1. Turn the ignition switch ON.
2. Press the hold switch ON/OFF and verify that the hold indicator illuminates when the hold mode is selected.
3. If not as specified, measure the hold switch terminal voltage.

Terminal voltage

1. Remove the console panel.
2. Turn the ignition switch ON.
3. Press the hold switch ON/OFF, and measure the voltage between terminals D and F.

V_B: Battery voltage

Terminal / Switch condition	Terminal voltage (V)	
	D	F
Released	0	0
Depressed	V_B	0

4. If not correct, check the hold switch continuity.

Continuity

1. Disconnect the negative battery cable and the shift-lock control unit connector.
2. Press the hold switch ON/OFF, and check continuity between terminals D and F.

Switch condition	Continuity
Released	Yes
Depressed	No

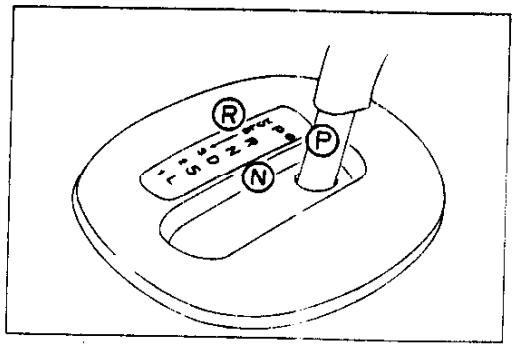
3. If not correct, replace the selector lever knob.
4. Connect the shift-lock control unit connector.
5. Install the console panel.
6. Connect the negative battery cable.

Replacement

1. Remove the console panel.
2. Remove the indicator panel screws.
3. Disconnect the shift-lock control unit connector and pull the hold switch terminals out of the connector.
4. Remove the selector lever knob.
5. Install the new selector lever knob.
6. Insert the hold switch terminals into the connector and connect the shift-lock control unit connector.
7. Apply a small amount of locking compound to the screws, and tighten.

Tightening torque:
1.5–2.9 N·m {15–30 kgf·cm, 14–26 in·lbf}

8. Install and adjust the indicator panel. (Refer to page K–165.)
9. Install the console panel.



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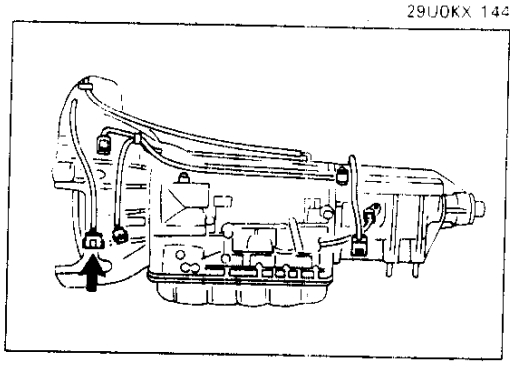
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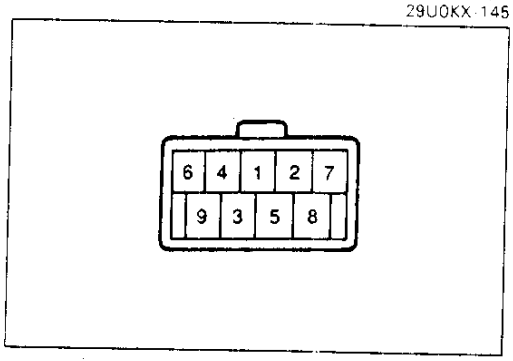

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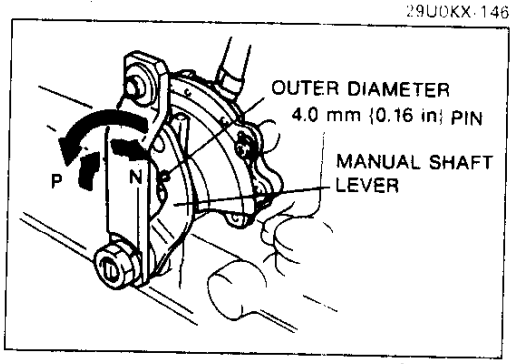

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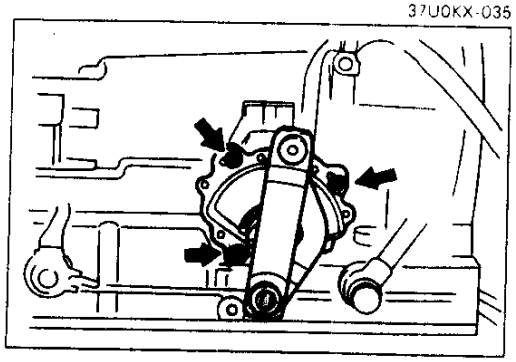

37U0KX-036

INHIBITOR SWITCH

Inspection

Operation

1. Turn the ignition switch ON.
2. Shift the selector lever and verify that the selected range and selector indicator lamp (built into combination meter) positions are aligned.
3. Apply the parking brake and securely position wheel chocks to prevent the vehicle from rolling.
4. Verify that the starter operates with the ignition switch at START position and the selector lever in P and N ranges only.
5. Verify that the back-up lights illuminate when the selector lever is shifted to R range with the ignition switch at ON position.
6. If not as specified, check the inhibitor switch continuity.

Continuity

1. Disconnect the negative battery cable and the inhibitor switch connector.
2. Remove the inhibitor switch connector from the bracket.
3. Check continuity of the inhibitor switch terminals.

Position	1	2	3	4	5	6	7	8	9
P	○						○	○	○
R		○					○		
N			○				○	○	○
D				○			○		
S					○		○		
L						○	○		

○—○ : Indicates continuity

4. If not correct, adjust or replace the inhibitor switch.
5. Install the inhibitor switch connector to the bracket.
6. Connect the inhibitor switch connector and the negative battery cable.

Adjustment

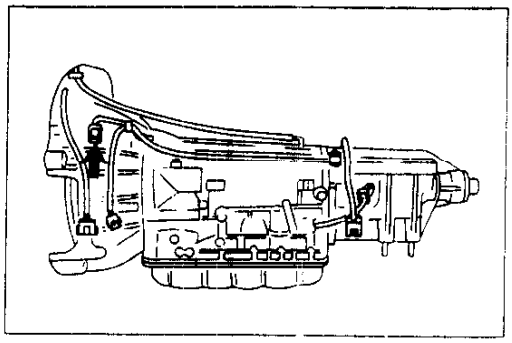
1. Remove the selector rod from the manual shaft lever.
2. Move the manual shaft to N range position.
3. Loosen the inhibitor switch mounting bolts.
4. Align the holes of the inhibitor switch and the manual shaft by inserting an **approx. 4.0 mm {0.16 in}** outer diameter pin.
5. Tighten the inhibitor switch mounting bolts and remove the pin.

Tightening torque:
2.5–3.9 N·m {25–40 kgf·cm, 22–34 in·lbf}

6. Recheck the continuity of the inhibitor switch.
7. If not correct, readjust or replace the inhibitor switch.
8. Install the selector rod to the manual shaft lever.

Replacement

Refer to "Adjustment" above for replacement of the inhibitor switch.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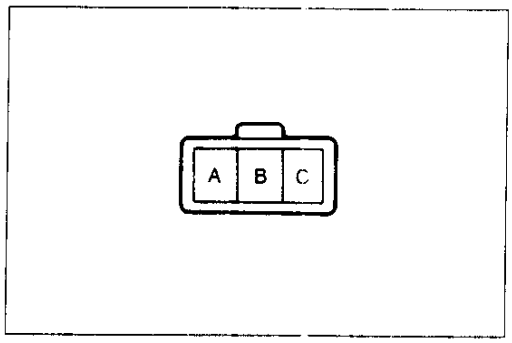

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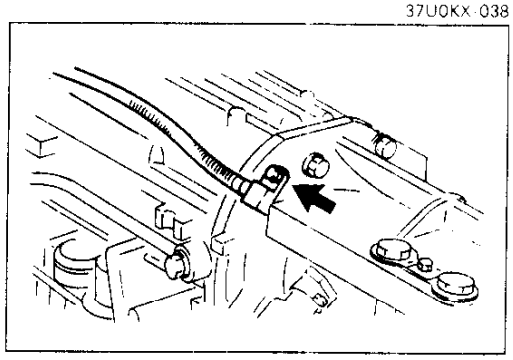
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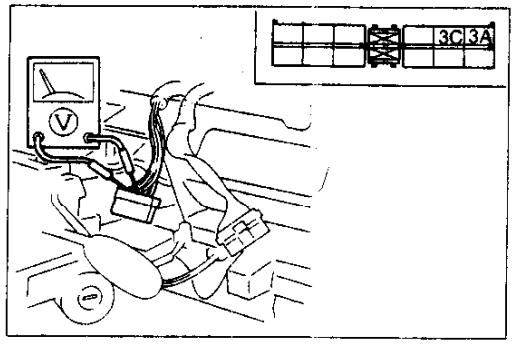


37U0KX-040

SPEED SENSOR 1 (REVOLUTION SENSOR)

Inspection

1. Disconnect the negative battery cable.
2. Disconnect speed sensor 1 connector.
3. Measure the resistance between the terminals of speed sensor 1.

ATF temperature: 20–80°C {68–176°F}

Terminal	Resistance (Ω)
A and B	500–1,000
B and C	∞
A and C	∞

4. If not correct, replace speed sensor 1.
5. Connect speed sensor 1 connector.
6. Connect the negative battery cable.

Replacement

1. Disconnect the negative battery cable.
2. Disconnect speed sensor 1 connector.
3. Remove the speed sensor 1 from the extension housing.
4. Apply ATF to a new O-ring and install it on the speed sensor 1.
5. Install new speed sensor 1.

Tightening torque:
5.0–6.8 N·m {50–70 kgf·cm, 44–60 in·lbf}

6. Connect the speed sensor 1 connector.
7. Connect the negative battery cable.

SPEED SENSOR 2 (SPEEDOMETER SENSOR)

Speedometer

Inspection

Note

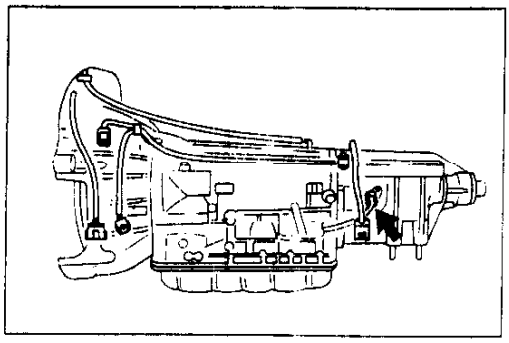
- **Speed sensor 2 is an alternating current generator which produces an alternating current to generate vehicle speed signals. Therefore, a direct current circuit tester cannot be used to measure the speed signal output because it cannot register signal charges quickly enough. (If using an alternating current circuit tester, the voltage increases as the vehicle speed increases.)**

1. Remove the combination meter. (Refer to 1993 RX-7 Body Electrical Troubleshooting Manual Section C1.)
2. Disconnect the speedometer connector.

Note

- **Set the voltmeter to the 5V range.**

3. Turn the ignition switch to LOCK position.
4. Measure the voltage between terminals 3A and 3C of the speedometer connector (harness side) with the rear wheels turning slowly.
5. When the voltmeter pointer moves slightly, replace the speedometer. If the pointer does not move, check the speed sensor 2 and/or wiring.
6. Connect the speedometer connector.
7. Install the combination meter. (Refer to 1993 RX-7 Body Electrical Troubleshooting Manual Section C1.)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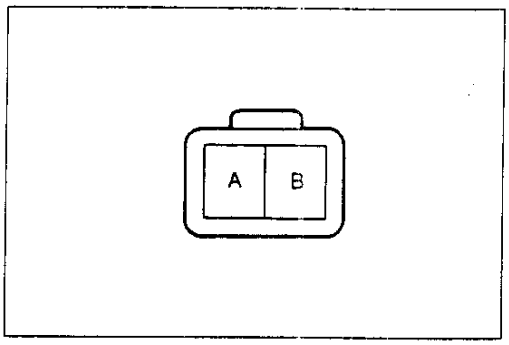

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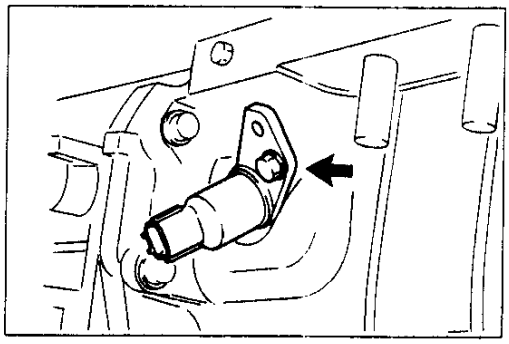

37U0KX-043

Speed Sensor 2
Inspection

1. Disconnect the negative battery cable.
2. Remove the speed sensor 2.
3. Verify that magnetic resistance is felt when turning the speed sensor 2 driven gear by hand.
4. Disconnect the speed sensor 2 connector.

Note
- **Set the voltmeter to the 5V range.**

5. Measure the voltage between terminals A and B with the rear wheels turning slowly.
6. If the pointer does not move, check the speed sensor 2 continuity.
7. Measure the resistance between terminals A and B.

Resistance:
Approx. 290 Ω (at 20–80°C {68–176°F})

8. If not correct, replace the speed sensor 2.
9. Apply ATF to a new O-ring and install it on the speed sensor 2.
10. Install the speed sensor 2.

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

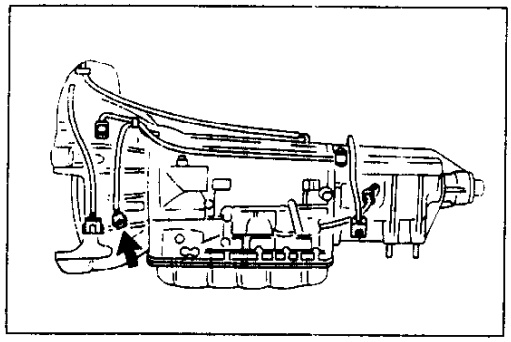
11. Connect the speed sensor 2 connector.
12. Connect the negative battery cable.

Replacement

1. Disconnect the negative battery cable.
2. Disconnect the speed sensor 2 connector.
3. Remove the speed sensor 2 from the extension housing.
4. Apply ATF to a new O-ring and install it on the speed sensor 2.
5. Install the new speed sensor 2.

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

6. Connect the speed sensor 2 connector.
7. Connect the negative battery cable.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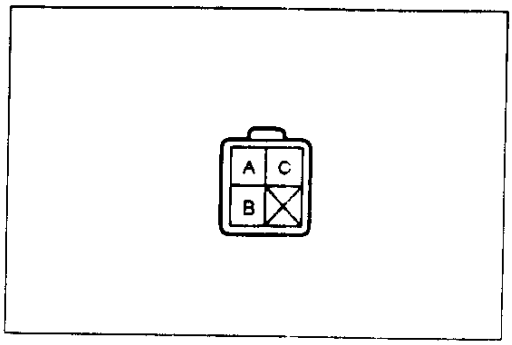
PULSE GENERATOR
Inspection

1. Disconnect the negative battery cable.
2. Disconnect the pulse generator connector.



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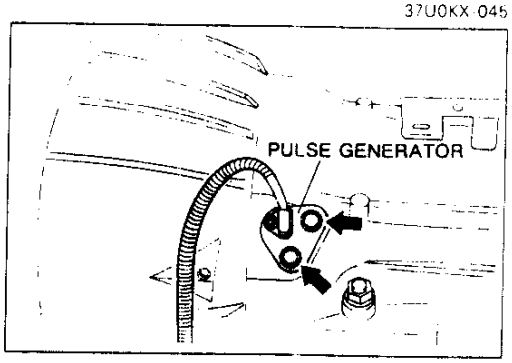

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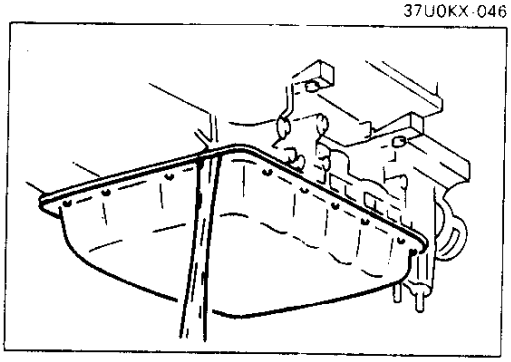
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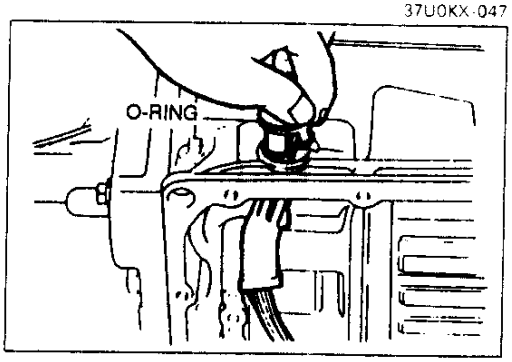

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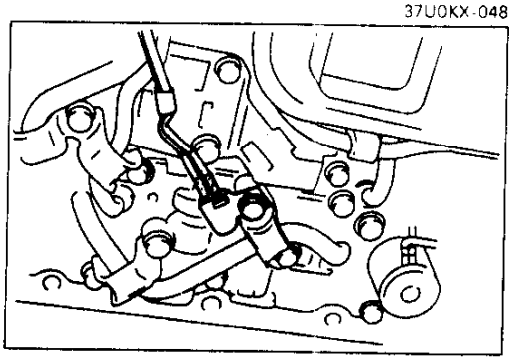

37U0KX-049

3. Measure the resistance between the terminals of the pulse generator.

ATF temperature: 20–80°C {68–176°F}

Terminal	Resistance (kΩ)
A and B	2.2–3.5
B and C	∞
A and C	∞

4. If not correct, replace the pulse generator.
5. Connect the pulse generator connector.
6. Connect the negative battery cable.

Replacement

1. Remove the transmission assembly. (Refer to page K–42.)
2. Remove the pulse generator from the transmission case.
3. Apply ATF to a new O-ring and install it on the new pulse generator.
4. Install the new gasket and new pulse generator.
5. Install new bolts and tighten.

Tightening torque:
5.0–6.8 N·m {50–70 kgf·cm, 44–60 in·lbf}

6. Install the transmission assembly. (Refer to page K–149.)

ATF THERMOSENSOR

Replacement

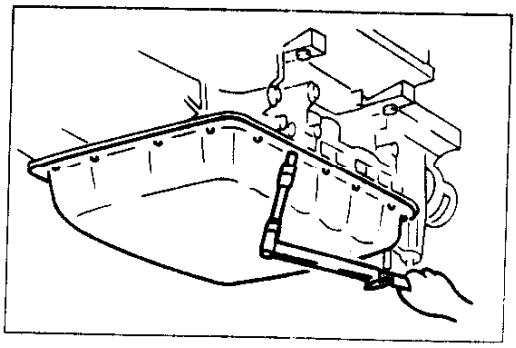
Warning
- **Be careful when draining; the ATF is hot.**

1. Disconnect the negative battery cable.
2. Disconnect the solenoid valve connector.
3. Loosen the oil pan mounting bolts and drain the ATF into a suitable container.
4. Remove the oil pan.
5. Remove the ATF thermosensor from the control valve body.
6. Remove the control valve body. (Refer to page K–128.)

Note
- **The ATF thermosensor is part of the solenoid valve harness.**

7. Remove the solenoid valve harness from the transmission case.
8. Apply ATF to a new O-ring and install it on the solenoid valve harness.
9. Install the new solenoid valve harness into the transmission case.
10. Install the control valve body. (Refer to page K–130.)
11. Install the ATF thermosensor onto the control valve body.

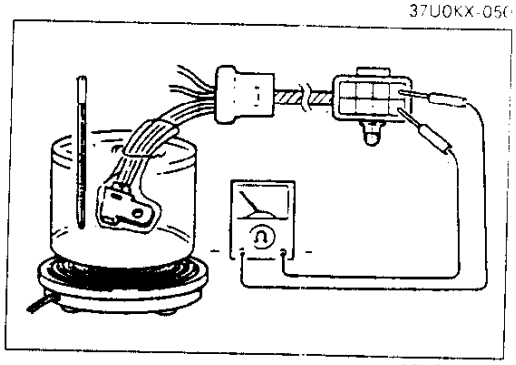
Tightening torque:
6.9–8.8 N·m {70–90 kgf·cm, 61–78 in·lbf}


37U0KX-050

12. Clean the oil pan and the magnet, and set the magnet into the oil pan.
13. Install a new gasket and the oil pan.

Tightening torque:
5.0–7.8 N·m {50–80 kgf·cm, 44–69 in·lbf}

14. Connect the solenoid valve connector.
15. Fill the transmission with the specified amount and type of ATF. (Refer to page K–25.)
16. Connect the negative battery cable.

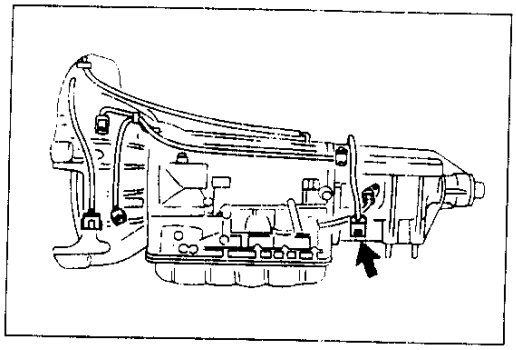

37U0KX 051

Inspection

1. Refer to "Replacement" on the previous page for removal of the ATF thermosensor.
2. Wrap the ATF thermosensor and place it in water with a thermometer as shown and heat the water gradually.
3. Measure the resistance between the terminals of the thermosensor.

Water temperature	Resistance (kΩ)
10°C {50°F}	2.5
40°C {104°F}	0.6
80°C {176°F}	0.3

4. If not correct, replace the ATF thermosensor.
5. Refer to "Replacement" for installation of the ATF thermosensor.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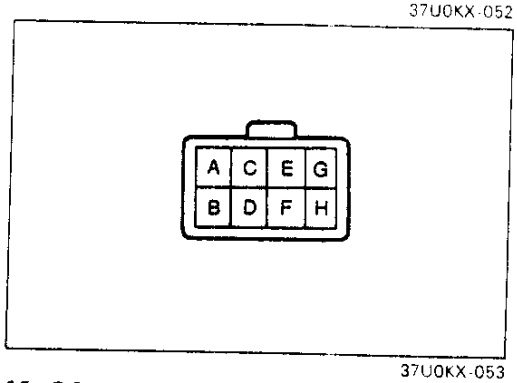


37U0KX-053

SOLENOID VALVES

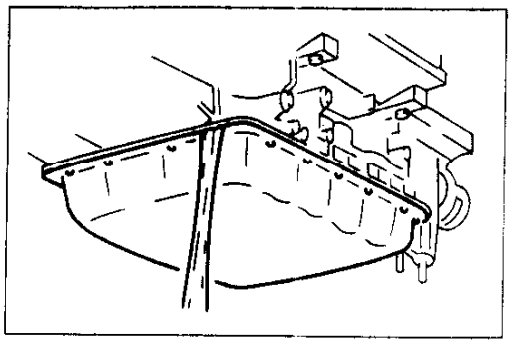
Inspection

1. Disconnect the negative battery cable.
2. Disconnect the solenoid valve connector.
3. Measure the resistance between terminals A through F and a ground.

ATF temperature: 20–80°C {68–176°F}

Terminal	Solenoid valve	Resistance (Ω)
A	Lockup control	20–40
B	Shift A	20–40
C	Shift B	20–40
D	Overrunning clutch	20–40
E	Line pressure	2.5–5.0
F	Lockup	10–20

4. If not correct, replace the solenoid valves.
5. Connect the solenoid valve connector.
6. Connect the negative battery cable.



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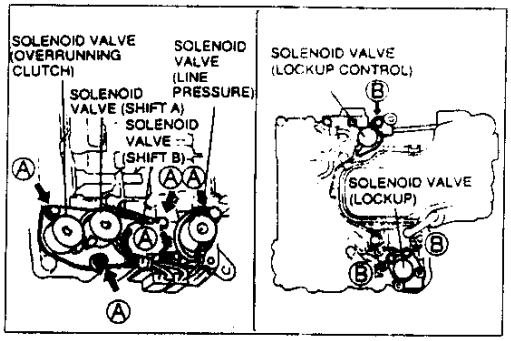

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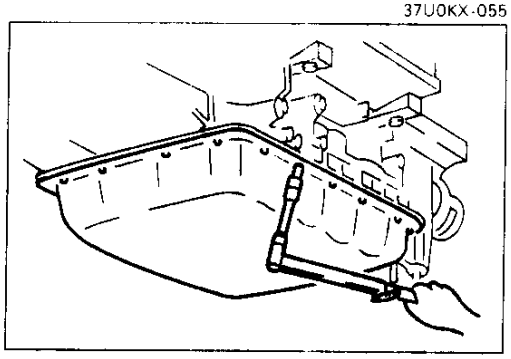

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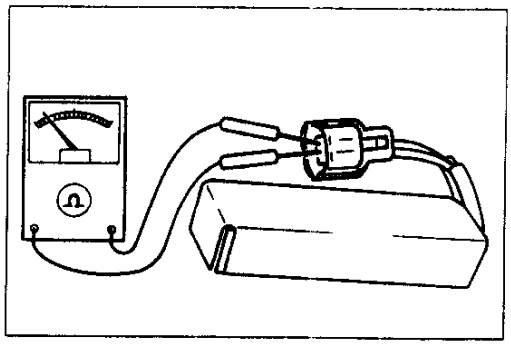

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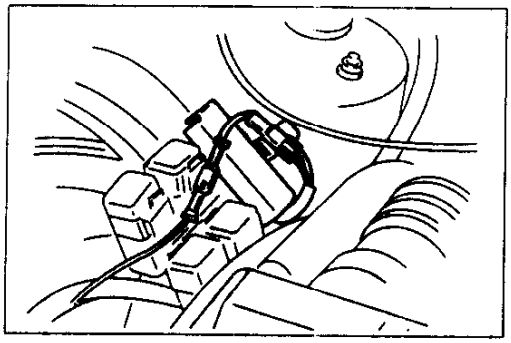


37U0KX-057

Replacement

Warning

- **Be careful when draining; the ATF is hot.**

Note

- **If the solenoid valves (shift A, shift B, overrunning clutch, and line pressure) are not correct, replace the solenoids as an assembly.**

1. Disconnect the negative battery cable.
2. Loosen the oil pan mounting bolts and drain the ATF into a suitable container.
3. Remove the oil pan.
4. Remove the control valve body. (Refer to page K–128.)
5. Remove the solenoid valve(s).
6. Apply ATF to a new O-ring(s) and install it on the new solenoid valve(s).
7. Install the new solenoid valve(s) to the control valve body.

Tightening torque

A: 6.9–9.8 N·m {70–100 kgf·cm, 61–86 in·lbf}
B: 9.9–12.7 N·m {100–130 kgf·cm, 86.9–112 in·lbf}

8. Install the control valve body. (Refer to page K–130.)
9. Clean the oil pan and the magnet, and set the magnet into the oil pan.
10. Install a new gasket and the oil pan.

Tightening torque:

5.0–7.8 N·m {50–80 kgf·cm, 44–69 in·lbf}

11. Fill the transmission with the specified amount and type of the ATF. (Refer to page K–25.)
12. Connect the negative battery cable.

DROPPING RESISTOR

Inspection

1. Disconnect the negative battery cable.
2. Disconnect the dropping resistor connector.
3. Measure the resistance between the terminals of the resistor.

Resistance: 10–14 Ω

4. If not correct, replace the dropping resistor.
5. Connect the dropping resistor connector.
6. Connect the negative battery cable.

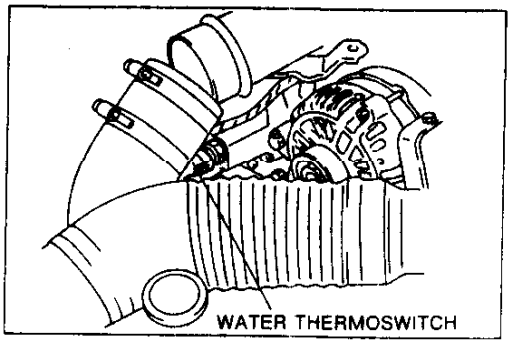
Replacement

1. Disconnect the negative battery cable.
2. Disconnect the dropping resistor connector.
3. Remove the dropping resistor.
4. Install the new dropping resistor.

Tightening torque:

7.9–11.7 N·m {80–120 kgf·cm, 70–104 in·lbf}

5. Connect the dropping resistor connector.
6. Connect the negative battery cable.



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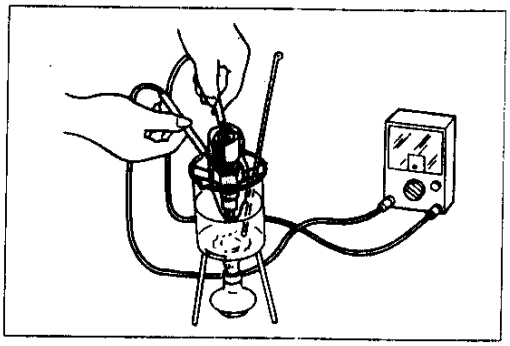

37U0KX-059

WATER THERMOSWITCH

Replacement

1. Disconnect the negative battery cable.
2. Disconnect the water thermoswitch connector.
3. Drain the engine coolant.
4. Remove the water thermoswitch.
5. Install the new water thermoswitch.

Tightening torque:
5.9–8.8 N·m {60–90 kgf·cm, 53–78 in·lbf}

6. Connect the water thermoswitch connector.
7. Fill the engine with the specified amount and type of engine coolant.
8. Connect the negative battery cable.

Inspection

1. Refer to "Replacement" above for removal of water thermoswitch.
2. Wrap the water thermoswitch in wrapping vinyl, place it in the ATF with a thermometer as shown, and heat the ATF gradually.
3. Measure the resistance between the terminals of the water thermoswitch.

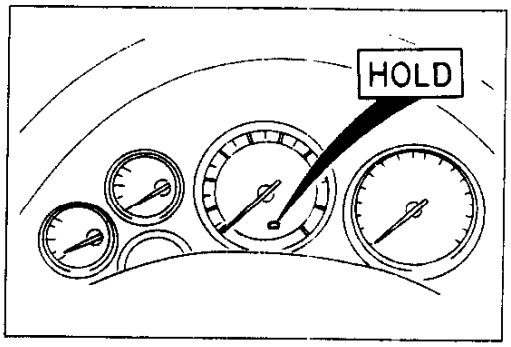
ATF temperature	Continuity
Above 115°C {239°F}	Yes
Below 110°C {230°F}	No

4. If not correct, replace the water thermoswitch.
5. Refer to "Replacement" above for installation of the water thermoswitch.

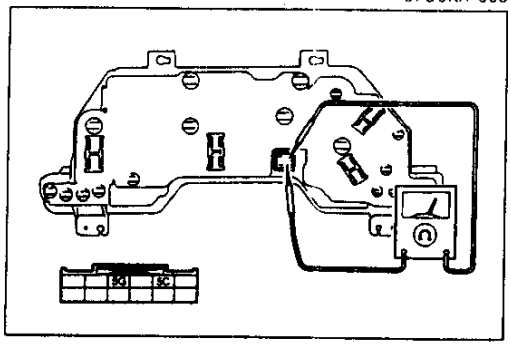
HOLD INDICATOR

Inspection

Operation



37U0KX-060


37U0KX-061

1. Turn the ignition switch ON.

Note

- **If a malfunction occurs in the EC-AT system, the hold indicator flashes.**

2. Press the hold switch ON/OFF and verify that the hold indicator illuminates when the hold mode is selected.
3. If not as specified, inspect the combination meter and/or hold switch.

Continuity

1. Disconnect the negative battery cable.
2. Remove the combination meter. (Refer to 1993 RX-7 Body Electrical Troubleshooting Manual Section C1.)
3. Check for continuity between terminals 5C and 5G of the combination meter.

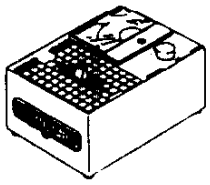
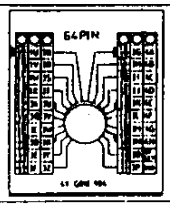
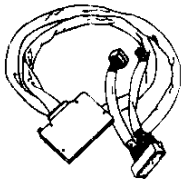
Terminal	5C	5G
Continuity	○	○

○ ○: Indicates continuity

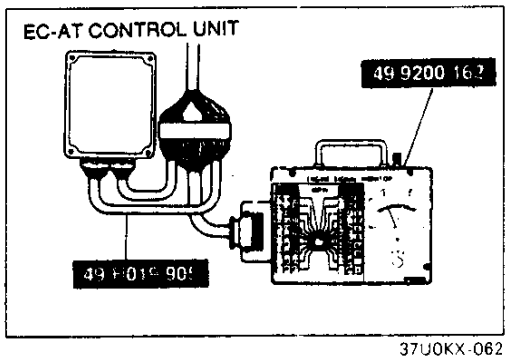
4. If not correct, replace the bulb or the combination meter.
5. Install the combination meter. (Refer to 1993 RX-7 Body Electrical Troubleshooting Manual Section C1.)
6. Connect the negative battery cable.

EC-AT CONTROL UNIT

Preparation
SST

49 9200 162 Monitor, Engine Signal		For inspection of EC-AT control unit terminal voltage	49 G018 904 Sheet		For inspection of EC-AT control unit terminal voltage
49 H019 905 Adapter Harness		For inspection of EC-AT control unit terminal voltage			

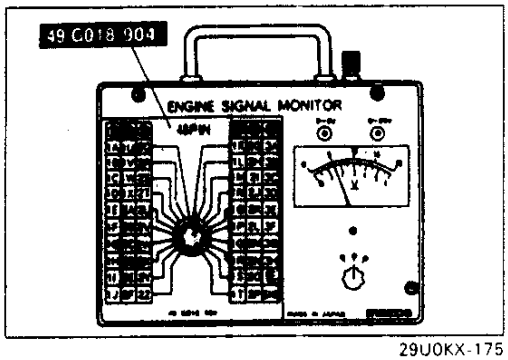
29U0KX-173



37U0KX-062

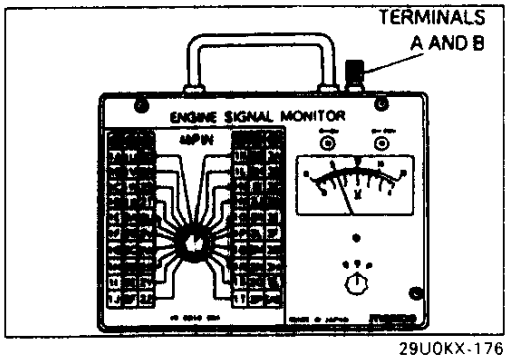
Inspection

1. Lift out the EC-AT control unit by referring to the EC-AT control unit replacement procedure.
   (Refer to page K–41.)
2. Disconnect the EC-AT control unit connectors.
3. Connect the **SSTs (Engine Signal Monitor** and **Adapter Harness)** to the EC-AT control unit as shown.



29U0KX-175

4. Place the **SST (Sheet)** on the **Engine Signal Monitor**.
5. Turn the ignition switch ON.
6. Measure the terminal voltage at each terminal.
7. If any EC-AT control unit terminal voltage is incorrect, check the related input or output devices and wiring. If no problem is found, replace the EC-AT control unit.

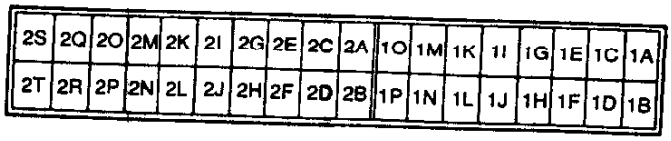


29U0KX-176

Caution

- **Never apply voltage to SST terminals A and B.**

Terminal Voltage Chart (Reference Data)

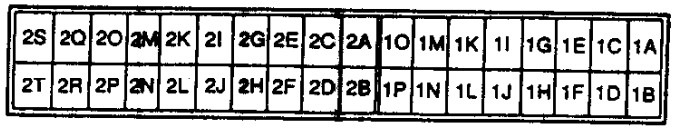


V_B: Battery voltage

Terminal	Color	Component	Connected to	Voltmeter (+) terminal	Voltmeter (−) terminal	Correct voltage	Condition	Check area
1A	L/R	Battery (backup)	Battery	1A	Ground	V_B	Constant	• Wiring and/or connector from 1A terminal to battery
1B (Output)	W/G	Solenoid valve (shift B)	Solenoid valve	1B		V_B	P, R, and N ranges or 1st and 2nd gear positions	• Solenoid valve (shift B) • Wiring and/or connector from 1B terminal to solenoic valve (shift B)
						Below 1.0V	3rd and O/D gear positions	
1C (Output)	Y	Inhibitor signal	Engine control unit	1C		Below 1.0V	P and N ranges	• Inhibitor switch, pulse generator, and/or engine control unit • Wiring and/or connector from 1C terminal to engine control unit 1R terminal
						V_B	Except P and N ranges	
1D (Output)	W/R	Solenoid valve (shift A)	Solenoid valve	1D		V_B	P, R, and N ranges or 1 st and O/D gear positions	• Solenoid valve (shift A) • Wiring and/or connector from 1D terminal to solenoid valve (shift A)
						Below 1.0V	2nd and 3rd gear positions	
1E (Input)	R	Inhibitor switch (R range)	Inhibitor switch	1E		V_B	R range	• Inhibitor switch • Wiring and/or connector from 1E terminal to inhibitor switch
						0V	Excect R range	
1F (Output)	W/L	Solenoid valve (line pressure)	Solenoid valve	1F		Above 1.5V	Throttle valve fully closed	• Solenoid valve (line pressure) • Wiring and/or connector from 1F terminal to solenoid valve (line pressure)
						Below 1.0V	Throttle valve fully opened	
1G (Input)	Y/L	Engine rpm signal	Engine control unit	1G		0.3–0.8V	Engine running at idle	• Wiring and/or connector from 1G terminal to engine control unit 2B terminal • Engine control unit
						0V	Engine stopped	
						1.8–2.2V	Engine running at 3,000 rpm (no load)	
1H (Output)	B/LG	Dropping resistor	Dropping resistor	1H		V_B	Throttle valve fully closed	• Dropping resistor and/or solenoid valve (line pressure) • Wiring and/or connector between 1H terminal, dropping resistor, and solenoid valve.
						Below 1.0V	Throttle valve fully opened	

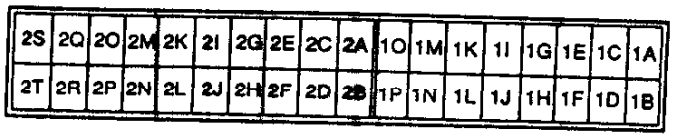
Caution

- **The 1D terminal voltage [solenoid valve (shift A)] is below 1.0V when in HOLD mode in P, R, and N ranges.**



V_B: Battery voltage

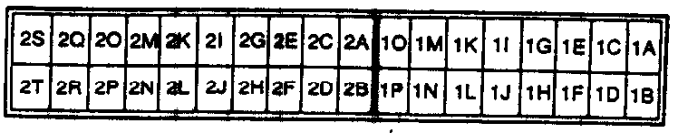
Terminal	Color	Component	Connected to	Voltmeter (+) terminal	Voltmeter (–) terminal	Correct voltage	Condition	Check area
1I (Input)	G/R	Speed sensor 2 (speedometer sensor)	Speedometer	1I	Ground	2–3V	Vehicle moving	● Speed sensor 2 and/or speedometer ● Wiring and/or connector between 1I terminal, speedometer, and speed sensor 2.
						0V or 4.5–5.5V	Vehicle stopped	
1J (Ground)	B/L	Ground (EC-AT control unit)	–	1J		0V	Constant	● Wiring condition.
1K (Output)	O/L	Hold indicator / FAT terminal (diagnosis connector)	Combination meter (hold indicator lamp) and FAT terminal (diagnosis connector)	1K		Below 1.0V	Hold mode	● Wiring and/or connector from 1K terminal to hold indicator lamp (combination meter) ● Hold indicator lamp
						V_B	Except hold mode	
1L (Input)	V/P	A/C signal	A/C relay	1L		Below 3.0V	A/C ON	● Engine control unit and/or A/C switch ● Wiring and/or connector from 1L terminal to A/C switch
						V_B	A/C OFF	
1M (Output)	W	Solenoid valve (lockup)	Solenoid valve	1M		V_B	Lockup	● Solenoid valve (lockup) ● Wiring and/or connector from 1M terminal to solenoid valve (lockup)
						Below 1.0V	No lockup	
1N	B/Y	Battery (main)	Ignition switch	1N		V_B	Ignition switch ON	● Meter fuse and/or ignition switch ● Wiring and/or connector from 1N terminal to ignition switch (IG1)
						0V	Ignition switch OFF	
1O (Output)	W/Y	Solenoid valve (overrunning clutch)	Solenoid valve	1O		Below 1.0V	Throttle valve fully opened (D range)	● Solenoid valve (overrunning clutch) ● Wiring and/or connector from 1O terminal to solenoid valve (overrunning clutch)
						V_B	Throttle valve closed (D range)	
1P	B/Y	Battery (main)	Ignition switch	1P		V_B	Ignition switch ON	● Meter fuse and/or ignition switch ● Wiring and/or connector from 1P terminal to ignition switch (IG1)
						0V	Ignition switch OFF	
2A (Input)	BR/W	Throttle sensor (V_{REF})	Throttle sensor	2A		4.5–5.5V	Ignition switch ON	● Wiring and/or connector from 2A terminal to engine control unit 3I terminal ● Throttle sensor
						0V	Ignition switch OFF	



V_B: Battery voltage

Terminal	Color	Component	Connected to	Voltmeter (+) terminal	Voltmeter (−) terminal	Correct voltage	Condition	Check area
2B (Input)	Y/G	Inhibitor switch (D range)	Inhibitor switch	2B	Ground	V_B	D range	• Inhibitor switch • Wiring and/or connector from 2B terminal to inhibitor switch
						0V	Except D range	
2C (Input)	G/Y	Atmospheric pressure sensor	Engine control unit	2C		2.0–4.5V	Ignition switch ON	• Wiring and/or connector from 2C terminal to engine control unit 2D terminal
						0V	Ignition switch OFF	
2D (Input)	L/Y	Inhibitor switch (P and N ranges)	Inhibitor switch	2D	Ground	0V	P and N ranges	• Inhibitor switch and/or ignition switch • Wiring and/or connector between 2D terminal, inhibitor switch, and ignition switch (STA)
						V_B	Except P and N ranges	
2E (Input)	O	Pulse generator	Pulse generator	2E*	2L	Approx. above 0.5V (AC)	Vehicle speed above 25 km/h {16 MPH}	• Pulse generator • Wiring and/or connector from 2E terminal to pulse generator
						Approx. 0V (AC)	Vehicle stopped (Ignition switch ON)	
2F (Output)	G/W	Solenoid valve (lockup control)	Solenoid valve	2F	Ground	V_B	lockup	• Solenoid valve (lockup control) • Wiring and/or connector from 2F terminal to solenoid valve (lockup control)
						Below 1.0V	No lockup	
2G (Input)	G/R	Slip lockup OFF signal	Engine control unit	2G		Below 1.0V	Engine running at 3,000 rpm	• Wiring and/or connector from 2G terminal to engine control unit 2C terminal • Engine control unit
						V_B	Engine running at idle	
2H (Input)	L/G	Torque reduced signal	Engine control unit	2H		V_B	Engine running at idle	• Wiring and/or connector from 2H terminal to engine control unit 2G terminal • Throttle sensor, speed sensor 1 pulse generator, and/or engine control unit
						Below 1.0V	Throttle opening above 1/8 (Engine coolant temp. below 40°C {104°F})	
2I (Input)	W/Y	Hold switch	Hold switch	2I		V_B	Switch depressed	• Hold switch • Wiring and/or connector from 2I terminal to hold switch
						0V	Switch released	

* Check the 2E (pulse generator) terminal voltage by using the AC range.

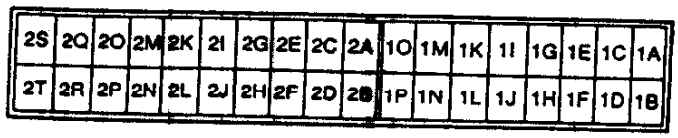


V_B: Battery voltage

Terminal	Color	Component	Connected to	Voltmeter (+) terminal	Voltmeter (–) terminal	Correct voltage	Condition	Check area
2J (Input)	Y/G	Speed sensor 1 (revolution sensor)	Speed sensor 1 (revolution sensor)	2J*	2L	Approx. above 1.0V (AC)	Vehicle speed above 25 km/h {16 MPH}	● Speed sensor 1 (revolution sensor) ● Wiring and/or connector from 2J terminal to speed sensor 1
						Approx. 0V (AC)	Vehicle stopped	
2K	L/W	TAT terminal (diagnosis connector) / O/D inhibit signal (auto speed control signal)	TAT terminal (diagnosis connector) and cruise control unit	2K	Ground	4.5–5.5	Ignition switch ON	● 1N and 1P terminal voltage ● Wiring and/or connector from 2K terminal to diagnosis connector TAT terminal ● Wiring and/or connector from 2K terminal to cruise control unit G terminal
						0V	TAT terminal grounded	
2L (Ground)	W	Ground (input signals)	–	2L		0V	Constant	● Wiring condition
2M (Input)	R/W	Idle signal	Engine control unit	2M	Ground	4.5–5.5V	Throttle valve opened	● Throttle sensor and/or engine control unit ● Wiring and/or connector from 2M terminal to engine control unit 2E terminal
						Below 1.0V	Throttle valve fully closed	
2N (Input)	B	Water thermoswitch / mileage switch	Water thermoswitch and mileage switch	2N		0V	Engine coolant temp. above 115°C {239°F} or vehicle total mileage above 625 km {388 miles} and vehicle stopped	● Water thermoswitch and/or mileage switch ● Wiring and/or connector from 2N terminal to water thermoswitch
						V_B	Engine coolant temp. below 110°C {230°F} or vehicle total mileage below 625 km {388 miles} and vehicle stopped	
2O (Input)	LG/R	Stoplight switch	Stoplight switch	2O		V_B	Brake pedal depressed	● Stoplight switch ● Wiring and/or connector from 2O terminal to stoplight switch
						0V	Brake pedal released	

* Check the 2J (speed sensor 1) terminal voltage by using the AC range.

ELECTRONIC SYSTEM COMPONENTS



V_B: Battery voltage

Terminal	Color	Component	Connected to	Voltmeter (+) terminal	Voltmeter (−) terminal	Correct voltage	Condition	Check area
2P (Output)	G/W	Reduce torque signal / slip lockup signal	Engine control unit	2P	Ground	Below 1.0V	When shifting from 1st to 2nd or from 2nd to 3rd with the throttle opening above 1.5/8 When slip lockup with the throttle opening below 0.5/8.	● Wiring and/or connector from 2P terminal to engine control unit 1Q terminal ● Throttle sensor, speed sensor 1, pulse generator, solenoid valve (lockup, lockup control), and/or engine control unit
						V_B	Engine running at idle	
2Q (Input)	BR/W	Inhibitor switch (L range)	Inhibitor switch	2Q		V_B	L range	● Inhibitor switch ● Wiring and/or connector from 2Q terminal to inhibitor switch
						0V	Except L range	
2R (Input)	R	ATF thermosensor	ATF thermo-sensor	2R	2L	Approx. 2.4–0.4V	While warming up ATF Note ● Approx. 1.8V: ATF temperature 10°C {50°F} ● Approx. 1.1V: ATF temperature 40°C {104°F}	● ATF thermosensor ● Wiring and/or connector from 2R terminal to ATF thermosensor
2S (Input)	L/R	Inhibitor switch (S range)	Inhibitor switch	2S	Ground	V_B	S range	● Inhibitor switch ● Wiring and/or connector from 2S terminal to inhibitor switch
						0V	Except S range	
2T (Input)	B/G	Throttle sensor (TVO)	Throttle sensor	2T		0.1–1.1V	Throttle valve fully closed	● Throttle sensor ● Wiring and/or connector from 2T terminal to throttle sensor
						4.0–4.5V	Throttle valve fully opened	

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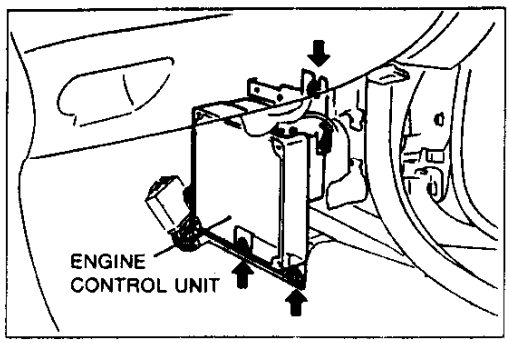

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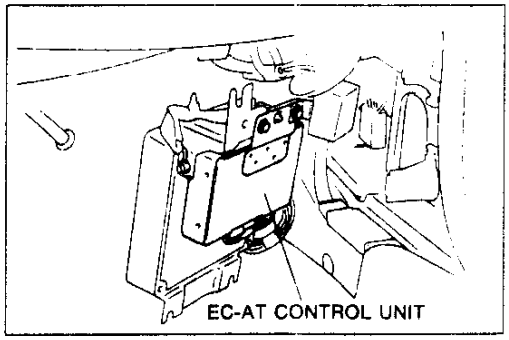


Replacement

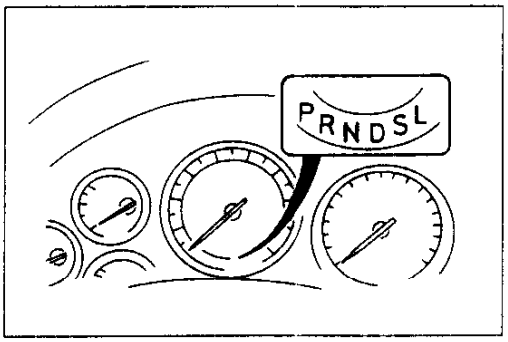
1. Disconnect the negative battery cable.
2. Remove the front side trim (passenger side).
3. Remove the engine control unit. (Refer to Section F.)
4. Remove the nuts shown in the figure and disconnect the EC-AT control unit connectors.
5. Install the new EC-AT control unit.

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

6. Connect the EC-AT control unit connectors.
7. Install the engine control unit. (Refer to Section F.)

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

8. Install the front side trim (passenger side).
9. Connect the negative battery cable.

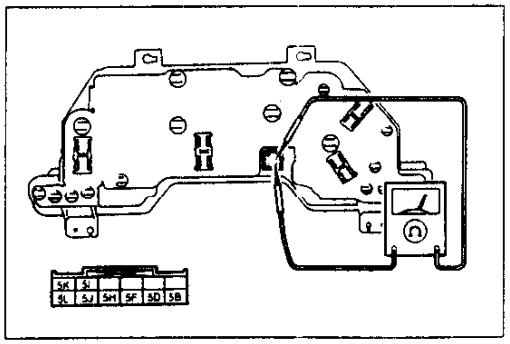


SELECTOR INDICATOR LAMP

Inspection

Operation

1. Verify that the selected range and selector indicator lamp (built into combination meter) positions are aligned.
2. If not as specified, check the inhibitor switch and/or selector indicator lamp.



Continuity

1. Disconnect the negative battery cable.
2. Remove the combination meter. (Refer to 1993 RX-7 Body Electrical Troubleshooting Manual Section C1.)
3. Check for continuity between the terminals.

Terminal / Position	5K	5I	5L	5J	5H	5F	5D	5B
P	○		○					
R	○			○				
N		○			○			
D		○				○		
S		○					○	
L		○						○

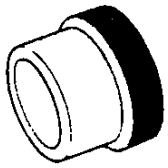
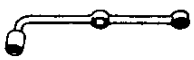
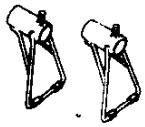
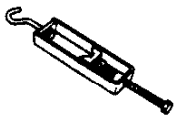
○—○ : Indicates continuity

4. If not correct, replace the bulb or combination meter.
5. Install the combination meter. (Refer to 1993 RX-7 Body Electrical Troubleshooting Manual Section C1.)
6. Connect the negative battery cable.

TRANSMISSION

TRANSMISSION UNIT (REMOVAL)

Preparation
SST

49 J019 002 Cap 	For prevention of ATF leakage	49 0877 435 Special wrench 	For loosening of torque converter installation bolts
49 G017 5A0 Support, engine 	For support of engine	49 G017 501 Bar (Part of 49 G017 5A0) 	For support of engine
49 G017 502 Support (Part of 49 G017 5A0) 	For support of engine	49 G017 503 Hook (Part of 49 G017 5A0) 	For support of engine

37U0KX-065

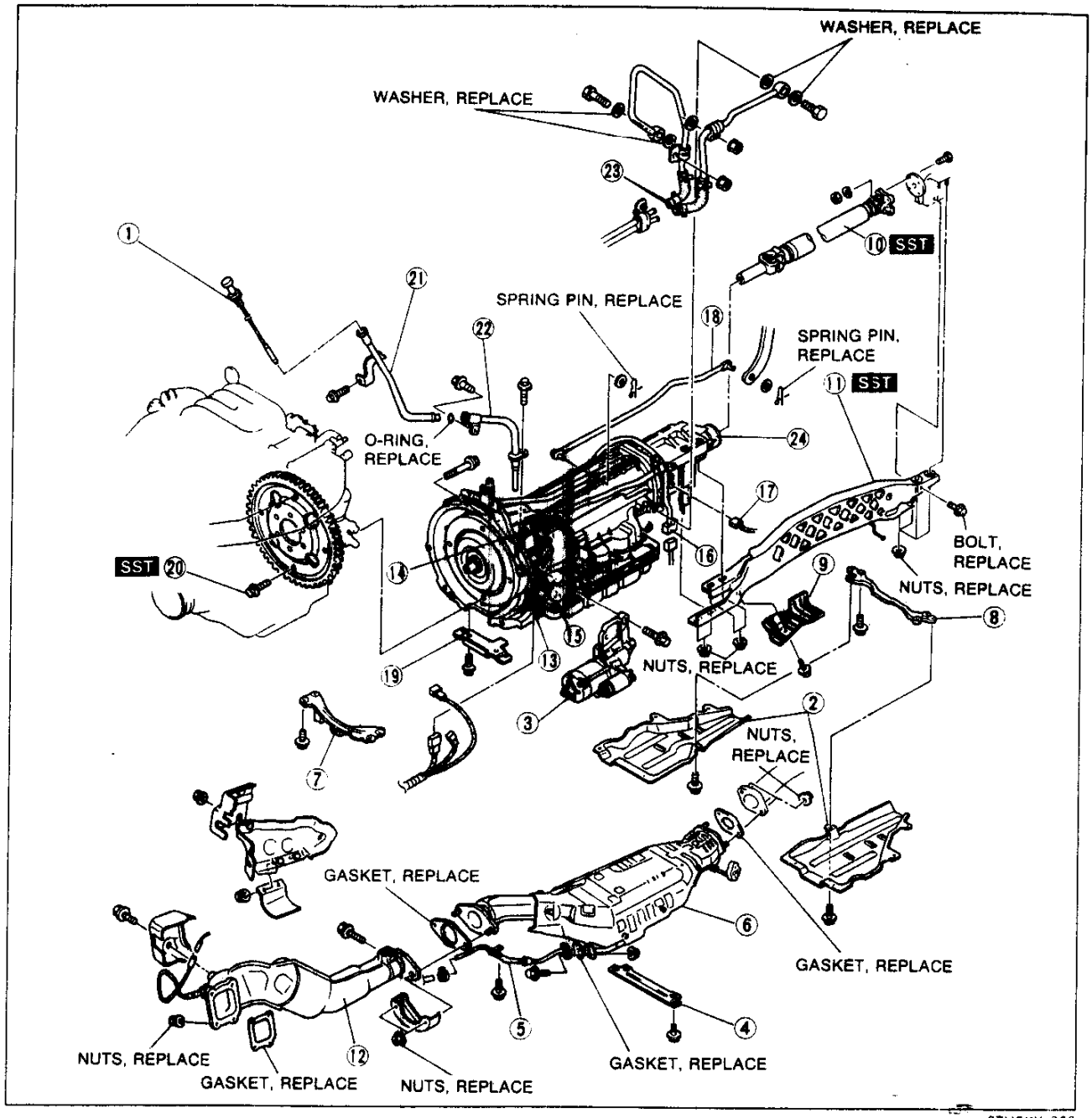
Removal

1. Disconnect the negative battery cable.
2. Jack up the vehicle and support it with safety stands.
3. Remove in the order shown in the figure, referring to **Removal Note**.

Caution

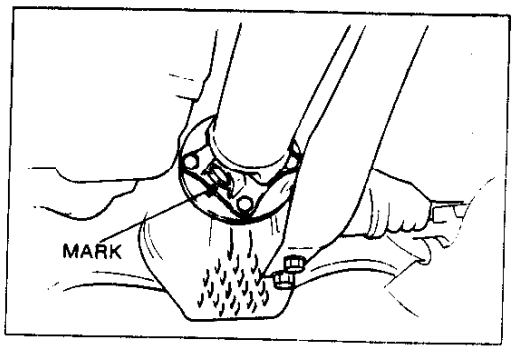
- **Keep the transmission upright so that any foreign material will remain in the oil pan.**

29U0KX-180



37U0KX-066

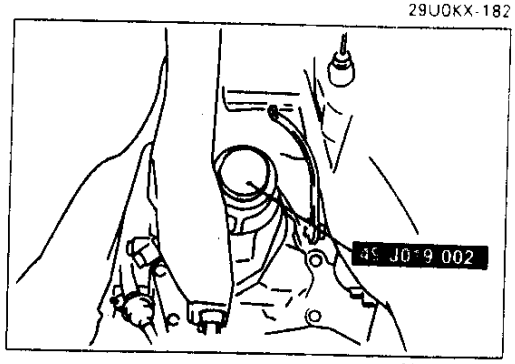
1. ATF dipstick
2. Undercover (right and left)
3. Starter
4. Tunnel member (center)
5. Secondary air injection pipe
6. Catalytic converter assembly
7. Tunnel member (front)
8. Tunnel member (rear)
9. Cover
10. Propeller shaft
    Removal Note ..... page K–44
11. Power plant frame (PPF)
    Removal Note ..... page K–44
12. Front exhaust pipe
13. Inhibitor switch connector
14. Speed sensor 1 connector
15. Pulse generator connector
16. Solenoid valve connector
17. Speed sensor 2 connector
18. Selector rod (selector lever side)
19. Service hole cover
20. Torque converter bolts
    Removal Note ..... page K–44
21. Oil filler tube (upper)
22. Oil filler tube (lower)
23. Oil cooler hose
24. Transmission
    Removal Note ..... page K–45



29U0KX-182

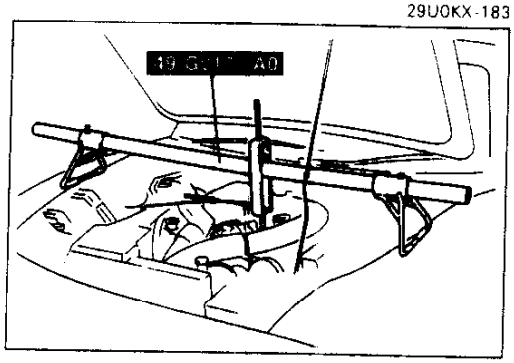
Removal note
Propeller shaft

1. Mark the flange for proper reassembly.
2. Remove the propeller shaft.



29U0KX-183

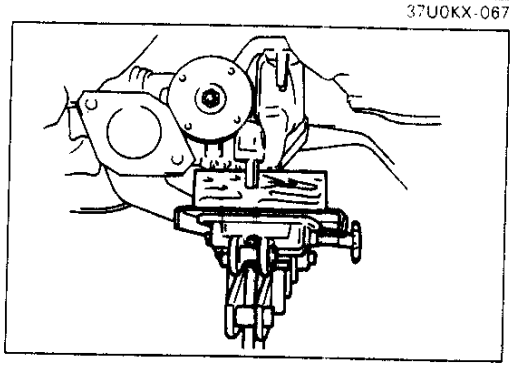
3. Install the **SST** into the extension housing.



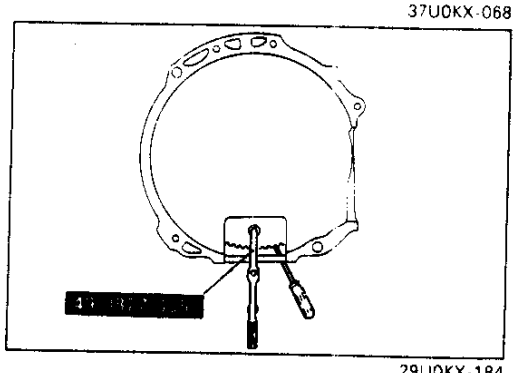
37U0KX-067

Power plant frame (PPF)

1. Hold the engine with the **SST**.

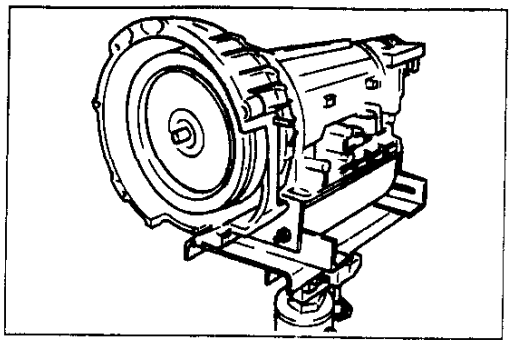

37U0KX-068

2. Hold the differential with a transmission jack.
3. Remove the PPF.


29U0KX-184

Torque converter bolts

1. Lock the drive plate by using a screwdriver.
2. Remove the torque converter bolts by using the **SST**.



37U0KX-069

Transmission

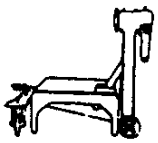
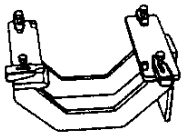
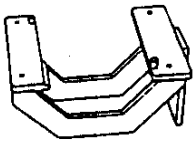
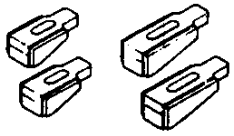
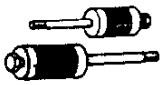
1. Support the transmission with a transmission jack.

Caution
- **Do not drop the torque converter.**
- **Do not allow the transmission to lean toward the torque converter side.**
- **Do not damage the oil pipes.**

2. Carefully lower and remove the transmission.

TRANSMISSION UNIT (DISASSEMBLY)

Preparation
SST

49 0107 680A Engine stand 	For disassembly of transmission	49 U019 0A0A Hanger set, transmission 	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		

29U0KX-188

Precaution
General Notes:

1. Disassemble the transmission in a clean area (clean work space) to prevent contaminants from entering 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; organize 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 out or when the ATF has degenerated.

Cleaning Notes:

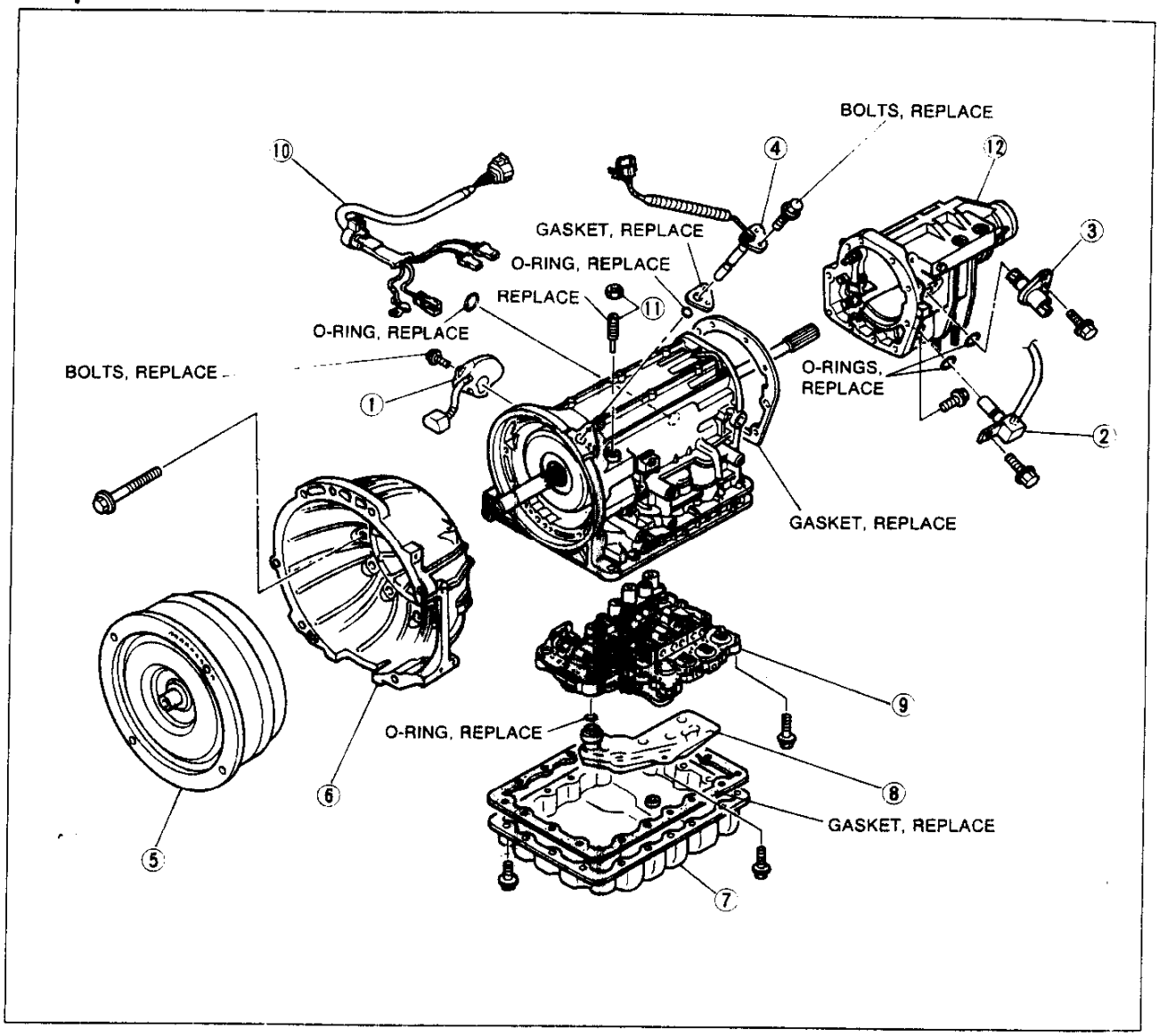
1. Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvents, or both, before disassembly.
2. Clean the removed parts with cleaning solvent, and dry with compressed air. Clean out all holes and passages with compressed air, and check that there are no obstructions.
3. Wear eye protection when using compressed air to clean components.

29U0KX-139

Disassembly

Disassemble in the order shown in the figure, referring to **Disassembly Procedure**.

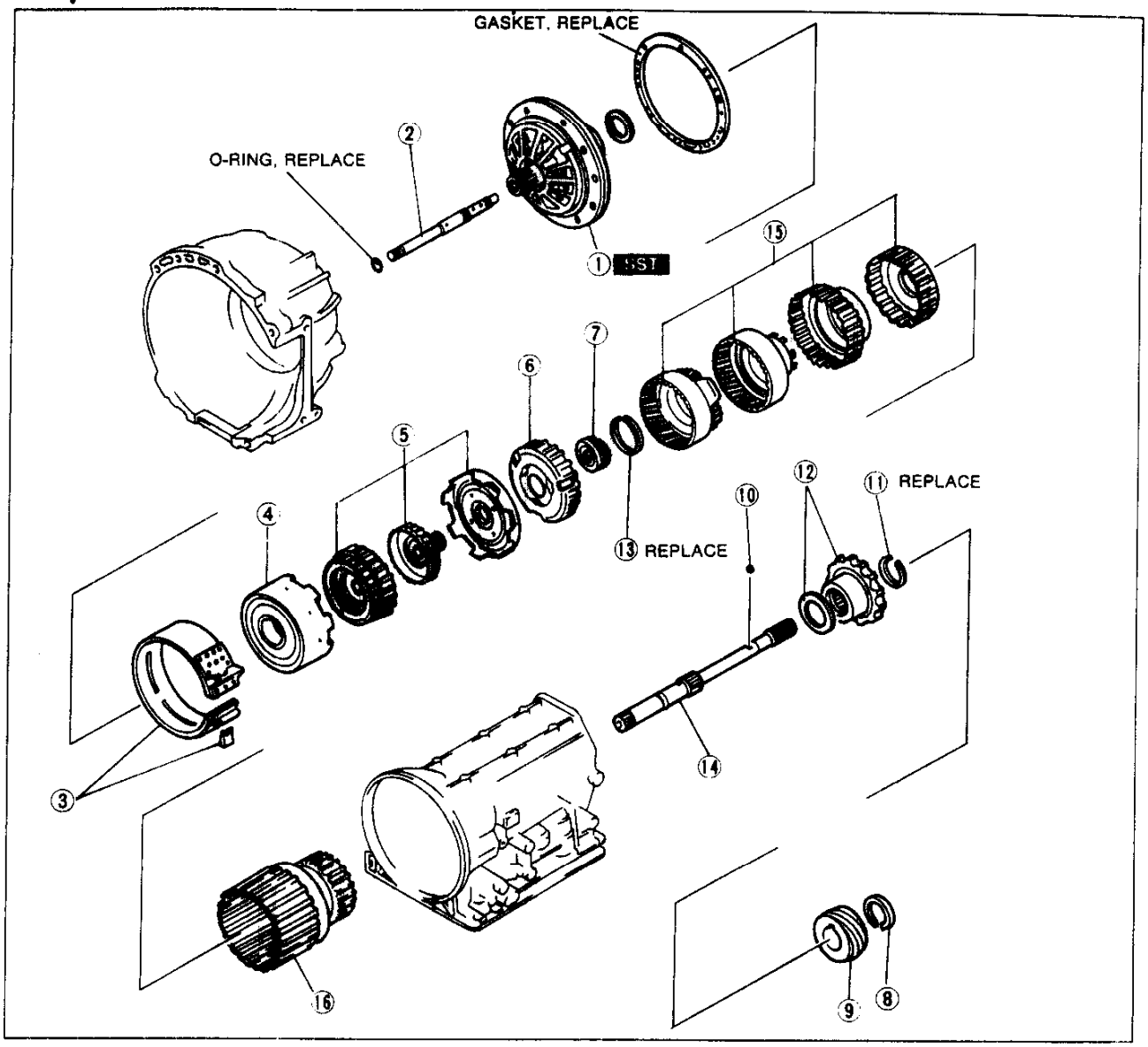
Components 1



3700KX 070

1. Inhibitor switch
   - Inspection ..... page K–28
   - Adjustment ..... page K–28
   - Replacement ..... page K–28
2. Speed sensor 1
   - Inspection ..... page K–29
   - Replacement ..... page K–29
3. Speed sensor 2
   - Inspection ..... page K–30
   - Replacement ..... page K–30
4. Pulse generator
   - Inspection ..... page K–30
   - Replacement ..... page K–31
5. Torque converter
   - Inspection ..... page K–57
6. Converter housing
7. Oil pan
8. Oil strainer
9. Control valve body
   - Disassembly / Inspection ..... page K–108
   - Assembly ..... page K–125
   - On-Vehicle Removal ..... page K–128
   - On-Vehicle Installation ..... page K–130
10. Solenoid valve harness
11. Anchor end bolt and nut
12. Extension housing / Parking mechanism
    - Disassembly / Inspection / Assembly ..... page K– 97
    - On-Vehicle Removal / Installation ..... page K–101

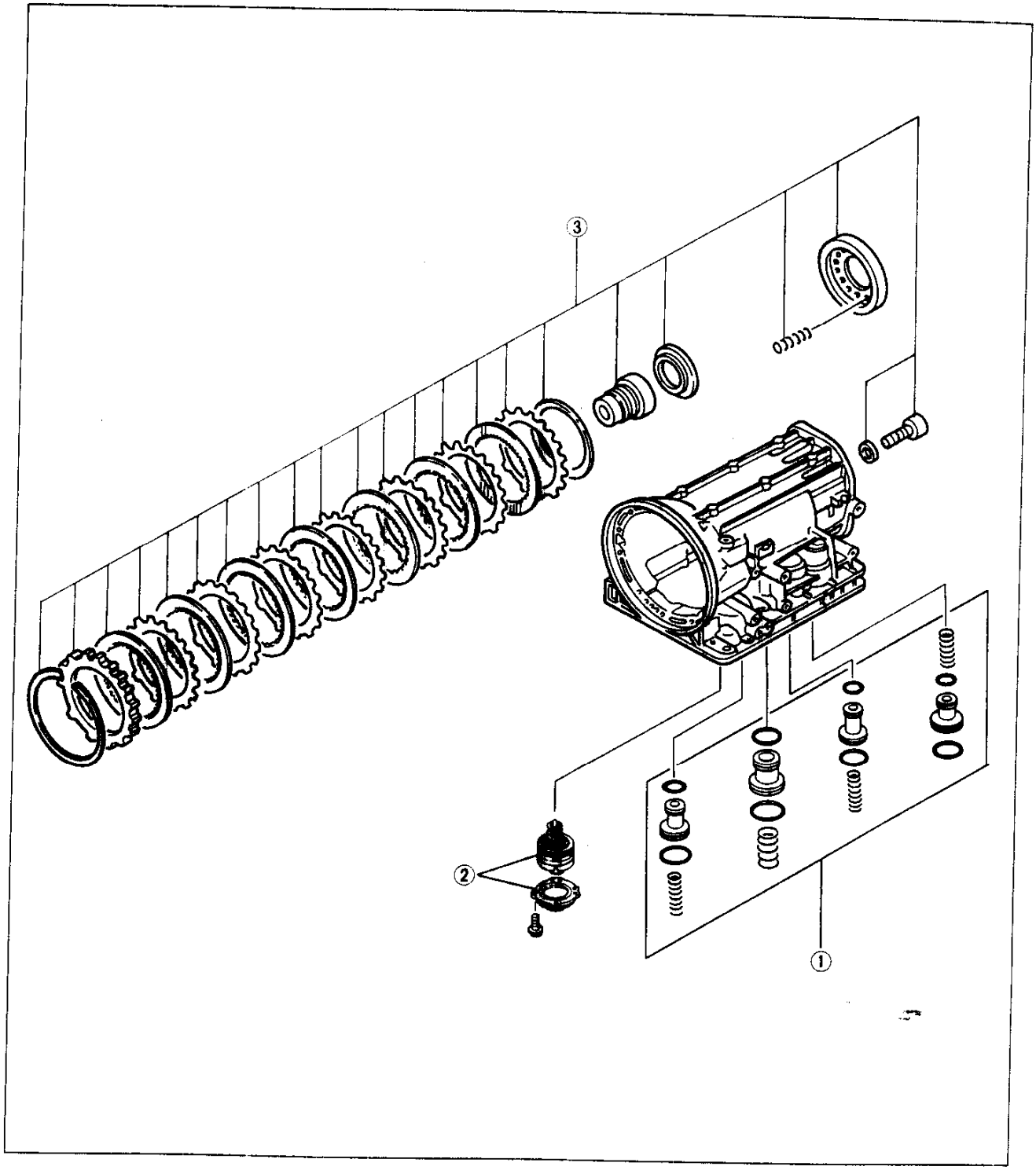
Components 2



37U0KX-071

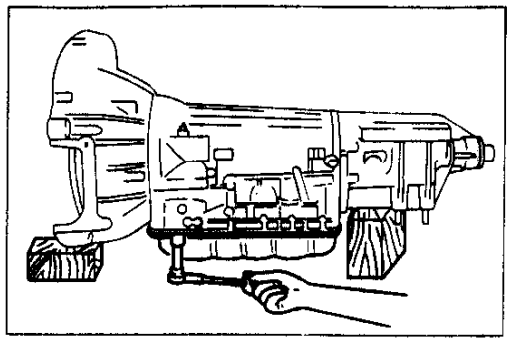
1. Oil pump
   Disassembly / Inspection / Assembly ..... page K–60
2. Input shaft
3. Brake band and strut
4. Reverse clutch
   Preinspection ..... page K–64
   Disassembly / Inspection / Assembly ..... page K–65
5. High clutch and front sun gear
   Preinspection ..... page K–70
   Disassembly / Inspection / Assembly ..... page K–71
6. Front planetary carrier
7. Rear sun gear
8. Snap ring
9. Speedometer drive gear
10. Steel ball
11. Snap ring
12. Parking gear and bearing
13. Snap ring
14. Output shaft
15. Front internal gear, rear internal gear, forward clutch hub, overrunning clutch hub
    Preinspection ..... page K–80
    Disassembly / Inspection / Assembly ..... page K–80
16. Forward clutch drum (forward clutch, overrunning clutch, low one-way clutch)
    Preinspection ..... page K–83
    Disassembly / Inspection / Assembly ..... page K–84

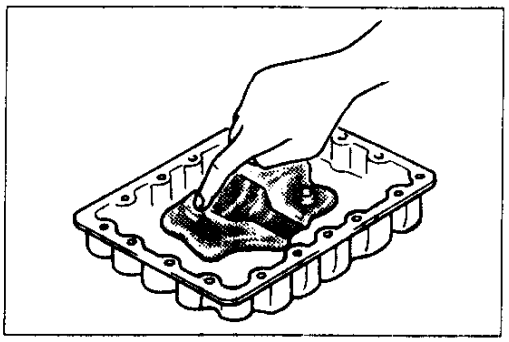
Components 3

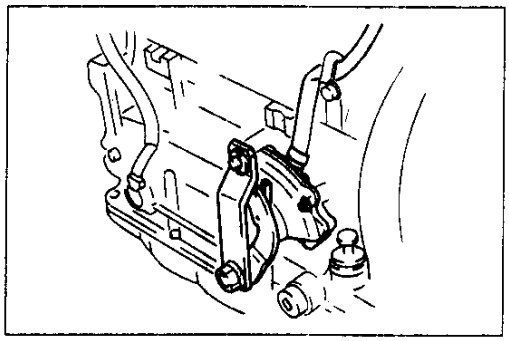


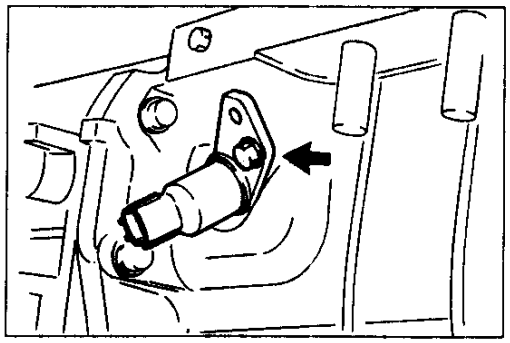
37U0KX-072

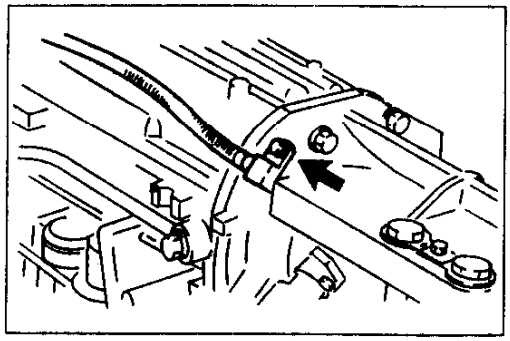
1. Accumulators
   Disassembly / Inspection / Assembly ..... page K–58
2. Band servo
   Preinspection ..... page K–76
   Disassembly / Inspection / Assembly ..... page K–76
3. Low and reverse brake
   Preinspection ..... page K–91
   Disassembly / Inspection / Assembly ..... page K–92


29U0KX-193


29U0KX-194


37U0KX-073


37U0KX-074


29U0KX-197

Disassembly procedure

Caution
- **Keep the transmission upright so that any foreign material will remain in the oil pan.**

1. Place the transmission on wooden blocks under the converter housing and the extension housing.

Caution
- **If large amounts of material are found, replace the torque converter and carefully check the transmission for the cause.**

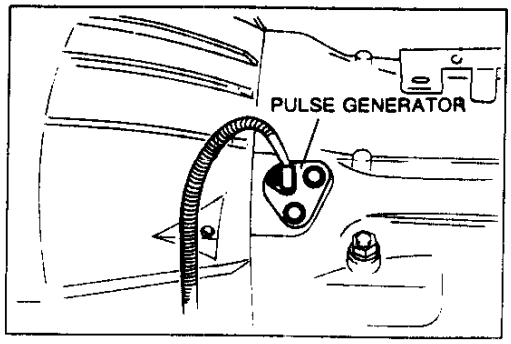
2. Remove the oil pan and gasket.
3. Examine any material found in the pan or on the magnet to determine the condition of the transmission.
   Clutch facing material ..... Drive plate and brake band wear
   Steel (magnetic) ..... Bearing gear, and driven plate wear
   Aluminum (nonmagnetic) ..... Bushings or cast aluminum parts wear
4. Install the oil pan with a few bolts to protect the control valve body.
5. Remove the harness from the connector bracket.
6. Remove the inhibitor switch.
7. Remove the harness from the connector bracket.
8. Remove the connector bracket from the converter housing.

Caution
- **Do not damage the speed sensor 2.**

9. Remove speed sensor 2.
10. Remove the O-ring from speed sensor 2.

Caution
- **Do not damage the speed sensor 1.**

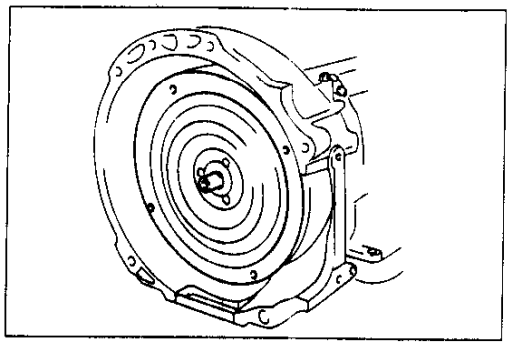
11. Remove speed sensor 1.
12. Remove the O-ring from speed sensor 1.



29U0KX-198

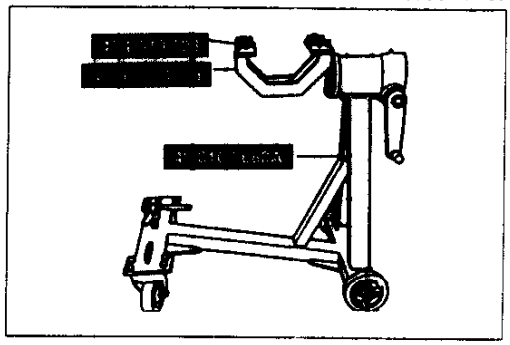
Caution
- **Do not damage the pulse generator.**

13. Remove the pulse generator and gasket from the transmission case.
14. Remove the O-ring from the pulse generator.

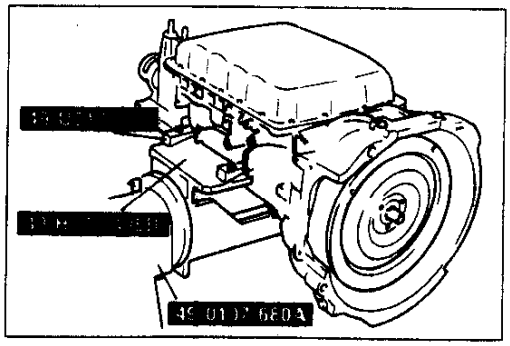

29U0KX-199

Note
- **Be careful not to spill the ATF when removing the torque converter.**

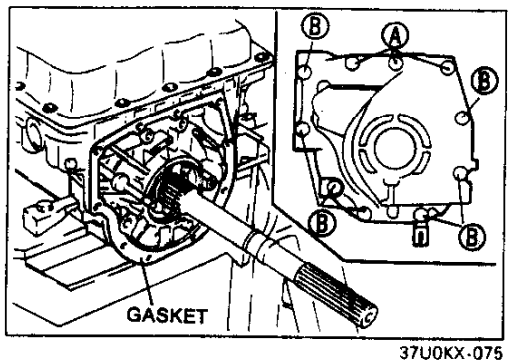
15. Remove the torque converter.


29U0KX-200

16. Assemble the **SST** as shown.


29U0KX-201

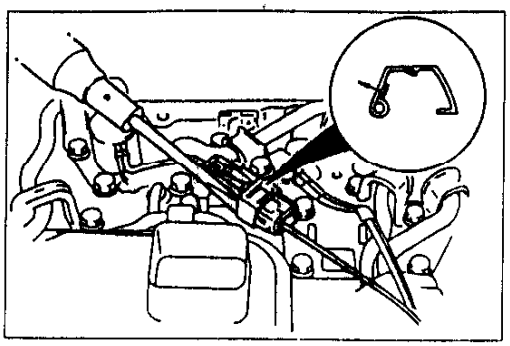
17. Mount the transmission to the **SST**.
18. Remove the oil pan, gasket, and magnet.



37U0KX-075

19. Remove the extension housing and gasket.

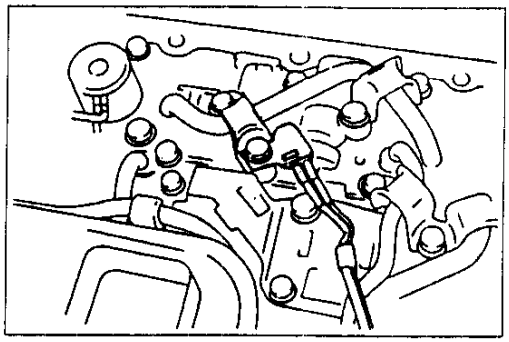
Bolt length (measured from below bolt head)
A: 30 mm {1.181 in}
B: 45 mm {1.772 in}



29U0KX-203

Caution
- **Do not damage the harness or connector.**

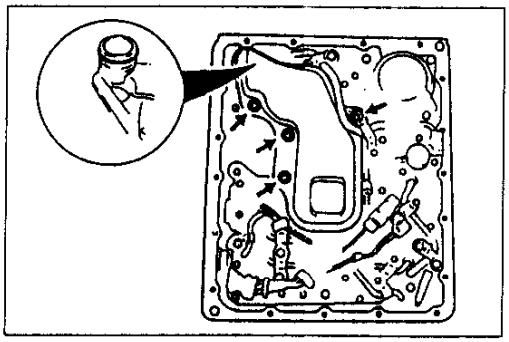
20. Remove the clip.
21. Remove the solenoid valve (lockup) connector.



37U0KX-076

22. Remove the ATF thermosensor.

Bolt length (measured from below bolt head):
45 mm {1.772 in}

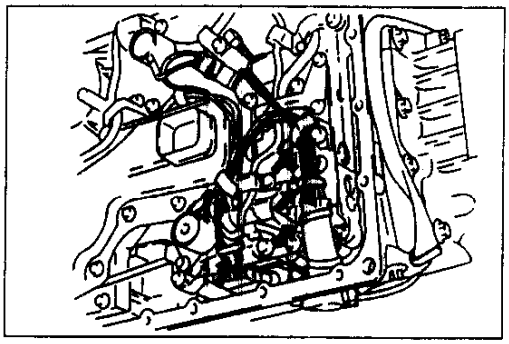


37U0KX-077

23. Remove the oil strainer.

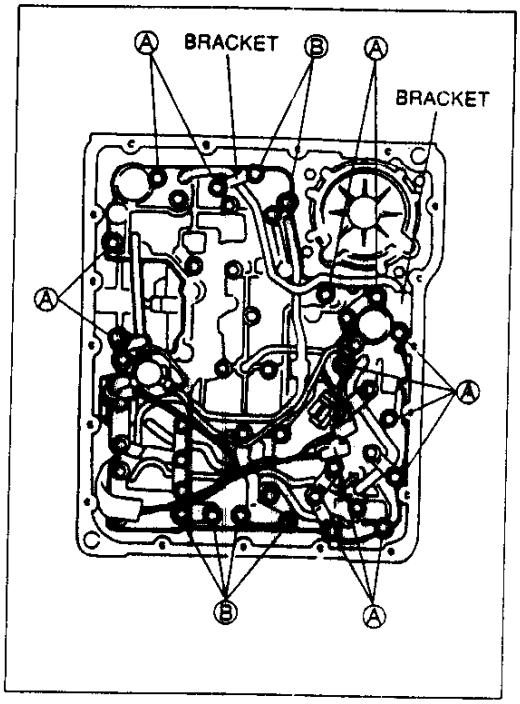
Bolt length (measured from below bolt head):
50 mm {1.969 in}

24. Remove the O-ring from the oil strainer.



29U0KX-206

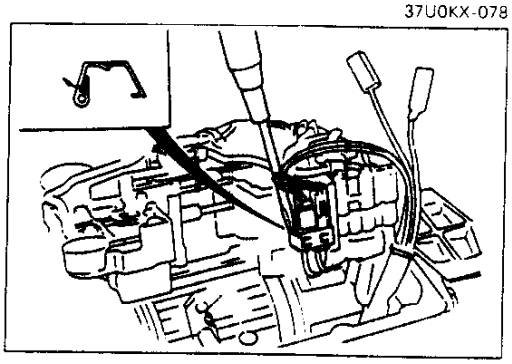
25. Separate the solenoid valve harness from the harness clip.



37U0KX-078

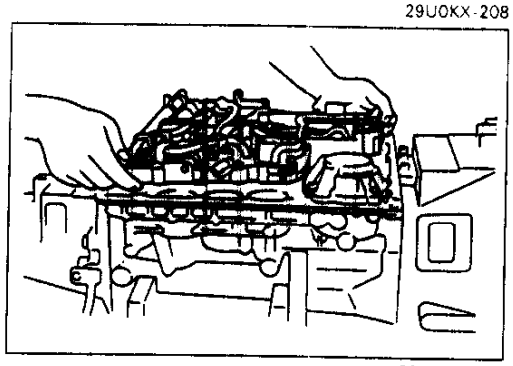
26. Remove bolts A, B, and the brackets shown in the figure.

Bolt length (measured from below bolt head)
A: 33 mm {1.299 in}
B: 45 mm {1.772 in}

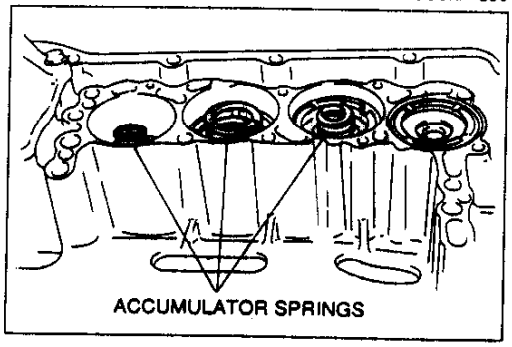

29U0KX-208

Caution
- **Do not damage the harness or connector.**

27. Remove the clip.
28. Disconnect the solenoid valve connectors.

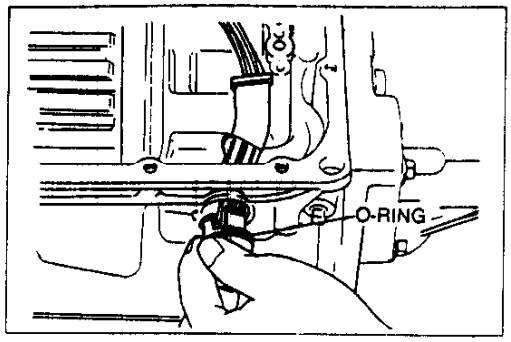

29U0KX-209

29. Remove the control valve body.



29U0KX-210

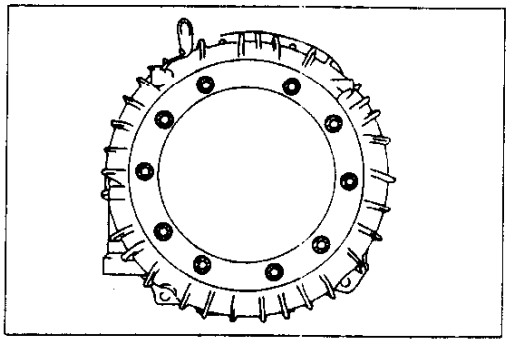
30. Remove the accumulator springs.



29U0KX-211

Caution
- **Do not damage the solenoid connector.**

31. Remove the solenoid connector from the transmission case.
32. Remove the O-ring from the solenoid valve harness.

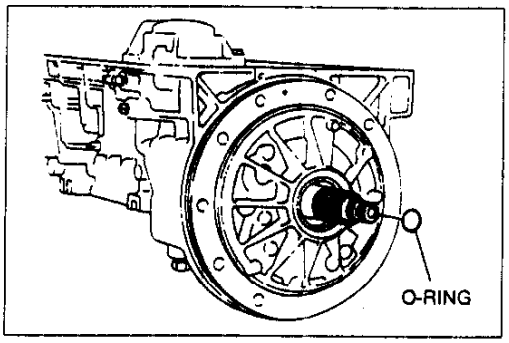


29U0KX-212

33. Remove the converter housing from the transmission case.

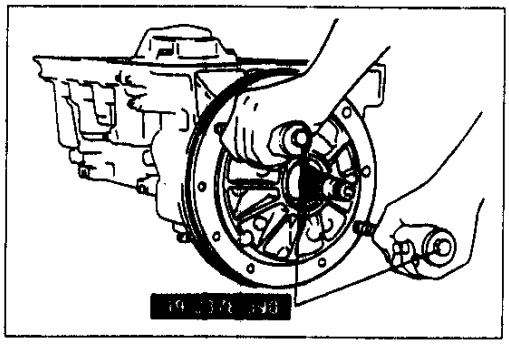
Caution
- **Do not damage the sealing surface.**

34. Clean the sealant from the converter housing.



29U0KX-213

35. Remove the O-ring from the input shaft.

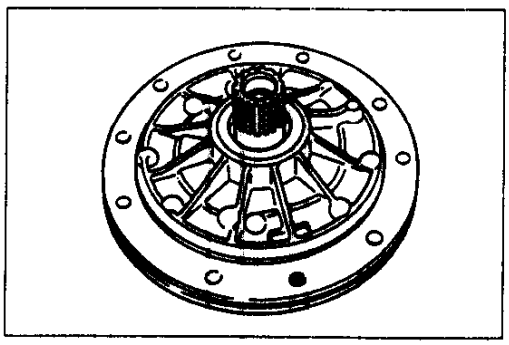


29U0KX-214

36. Install the **SST** to the oil pump.

Caution
- **Do not damage the sealing surface; remove slowly.**

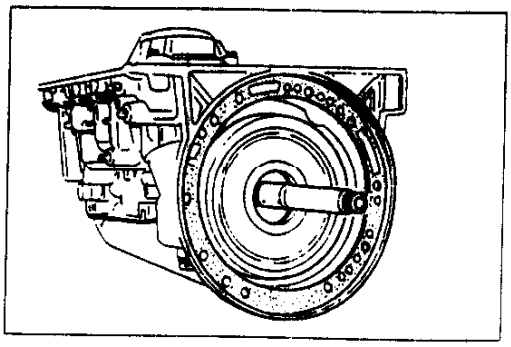
37. Remove the oil pump from the transmission case by evenly sliding the weights of the **SST**. Remove the **SST** from the oil pump.



29U0KX-215

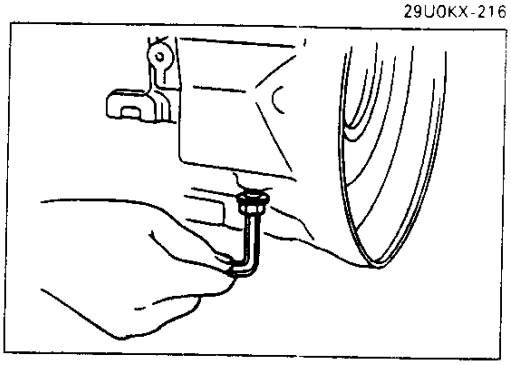
Caution
- **Do not scratch the oil pump housing.**

38. Clean the sealant from the oil pump housing.



29U0KX-216

39. Remove the oil pump gasket.
40. Pull out the input shaft while holding the reverse clutch drum.

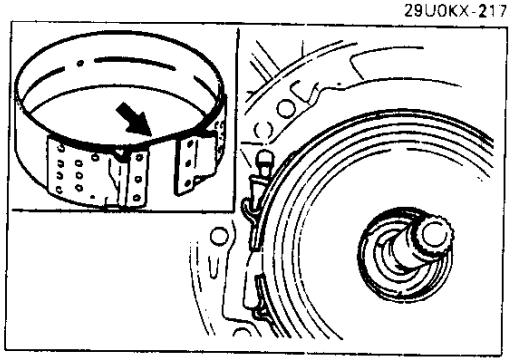


29U0KX-217

41. While holding the anchor end bolt, loosen the locknut.

Caution
- **Do not reuse the anchor end bolt.**

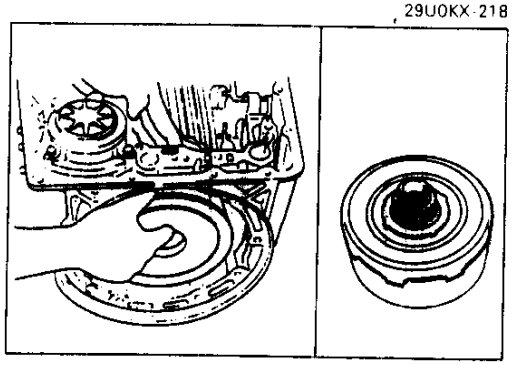
42. Remove the anchor end bolt.
43. Clean the sealant from the case threads.



29U0KX-218

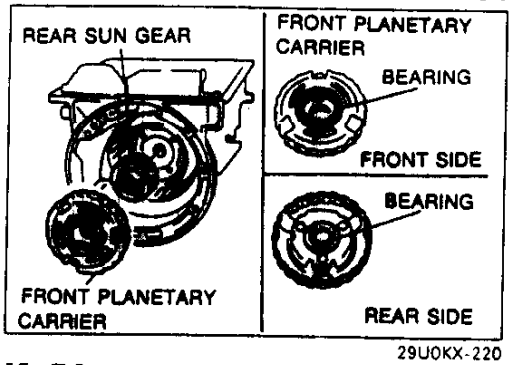
Caution
- **To prevent the brake facing from cracking or peeling, do not stretch the brake band. Secure it with a wire clip.**

44. Remove the brake band and the band strut.



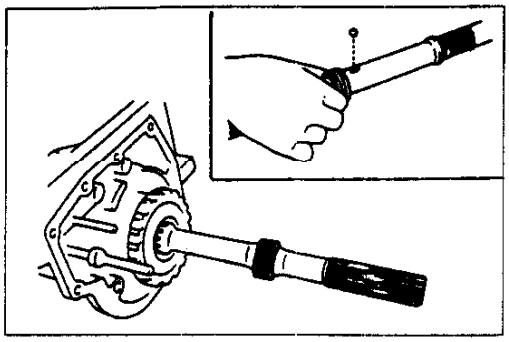
29U0KX-219

45. Remove the reverse clutch, high clutch, and front sun gear assembly from the transmission case.



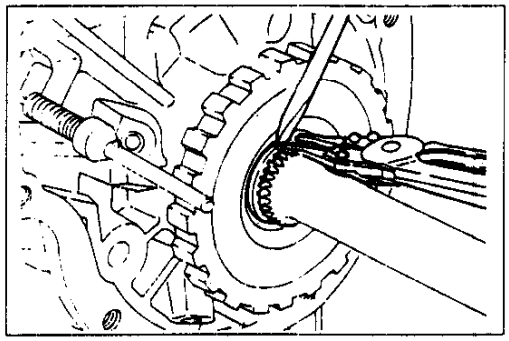
29U0KX-220

46. Remove the front planetary carrier, bearings, and rear sun gear.
    Inspect the following and replace as necessary.
    1) Front planetary carrier
       Inspect gear teeth for damage, wear, and cracks.
       Check for rough rotation of pinion gears.
    2) Rear sun gear
       Inspect gear teeth for damage, wear, and cracks.
    3) Bearing
       Inspect for damage and rough rotation.



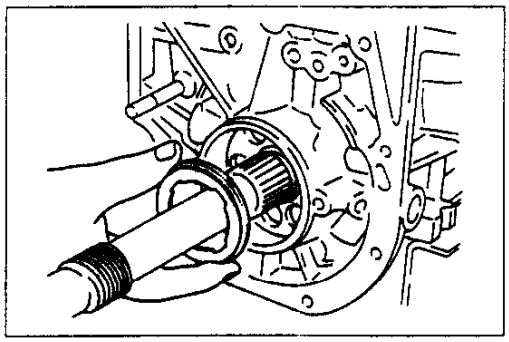
37U0KX-079

47. Remove the snap ring and the speedometer drivegear.
48. Remove the steel ball.



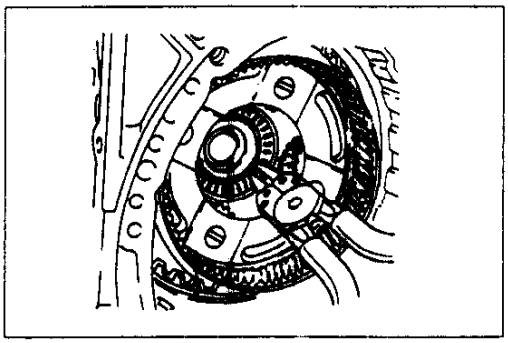
29U0KX-222

49. Remove the snap ring from the output shaft.
50. Remove the parking gear.



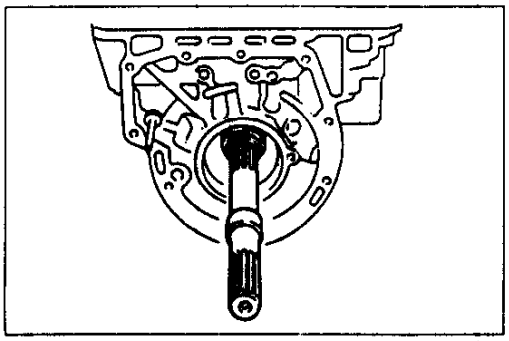
29U0KX-223

51. Remove the bearing from the rear of the transmission case.
    Inspect for damage and rough rotation.
    Replace as necessary.



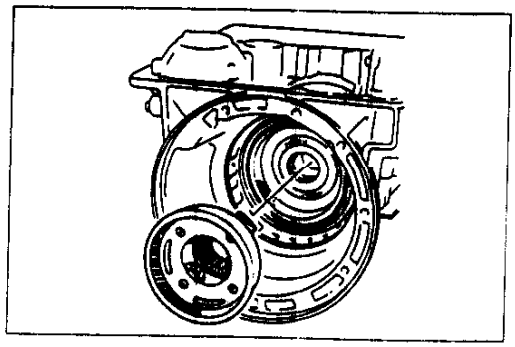
29U0KX-224

52. Push the output shaft slightly forward and remove the snap ring from the output shaft.



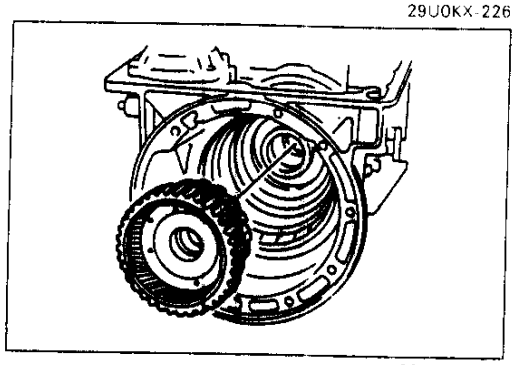
29U0KX-225

53. Slide the output shaft from the rear of the transmission case.



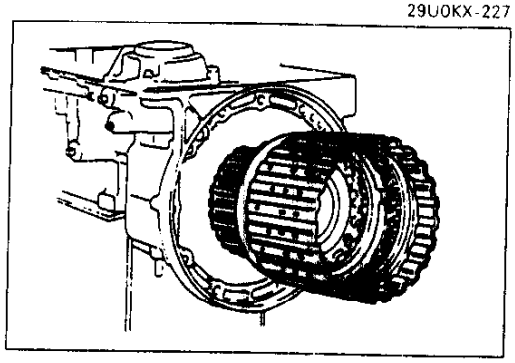
29U0KX-226

54. Remove the front internal gear (integrated with rear planetary carrier).



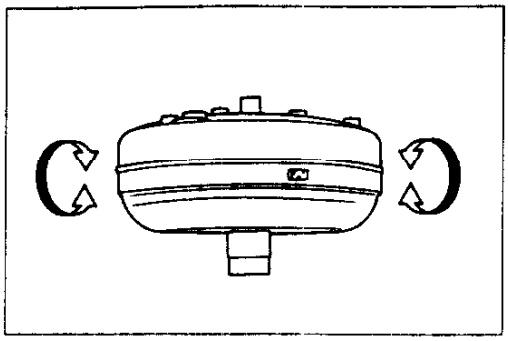
29U0KX-227

55. Remove the rear internal gear, forward clutch hub, and overrunning clutch hub assembly.

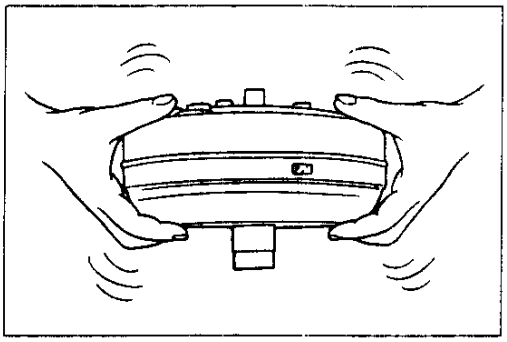


29U0KX-228

56. Remove the forward clutch drum (forward clutch, overrunning clutch, and low one-way clutch) assembly.



29U0KX-229



37U0KX-080

TORQUE CONVERTER

Note
- **The torque converter is welded together and cannot be disassembled.**

Inspection

1. Check the outside of the converter for damage and cracks. Replace the torque converter if there are any problems.
2. Check for rust on the pilot hub or the boss. Remove any rust completely.

Cleaning the inside of the converter

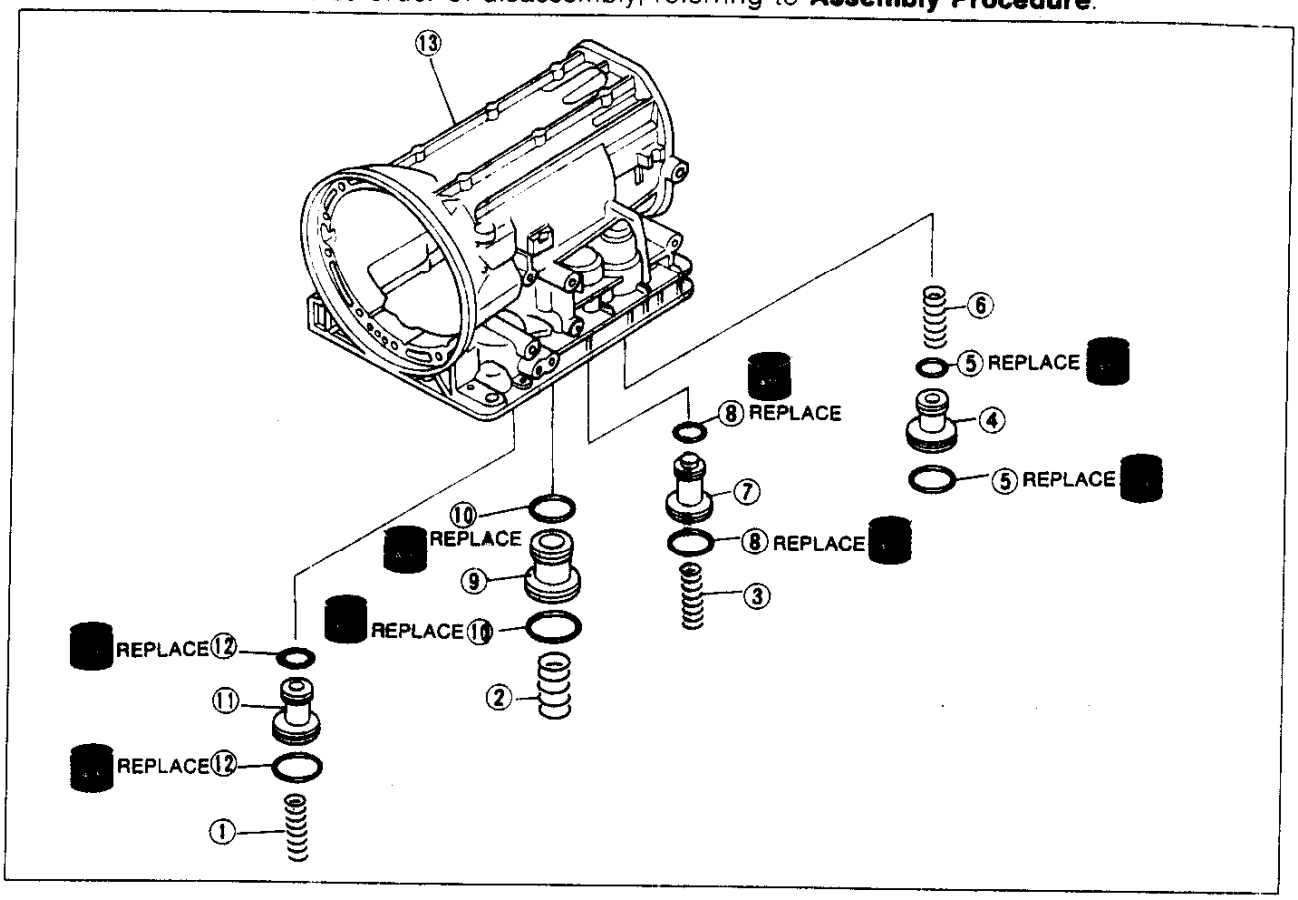
Caution
- **Do not reuse the ATF.**

1. Drain all ATF remaining in the converter.
2. Pour in new ATF **(2.0 L {2.1 US qt, 1.8 Imp qt})**.
3. Shake the converter to clean the inside. Drain the ATF.
4. Pour in new ATF again.

ACCUMULATORS

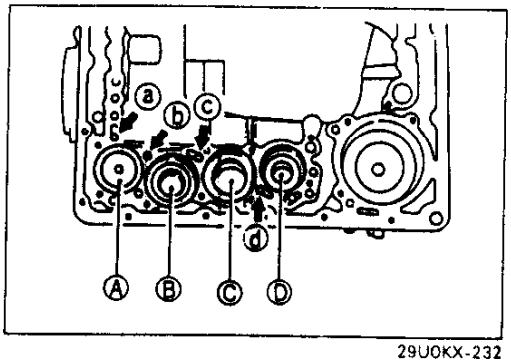
Disassembly / Inspection / Assembly

1. Disassemble in the order in the figure, referring to **Disassembly Note**.
2. Inspect all parts and replace if necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



37U0KX-031

1. 3-4/N-R accumulator spring
   Inspection ..... page K–59
2. 1-2 accumulator spring
   Inspection ..... page K–59
3. 2-3 accumulator spring
   Inspection ..... page K–59
4. N-D accumulator piston
   Disassembly Note ..... below
5. O-rings
6. N-D accumulator spring
   Inspection ..... page K–59
7. 2-3 accumulator piston
   Disassembly Note ..... below
8. O-rings
9. 1-2 accumulator piston
   Disassembly Note ..... below
10. O-rings
11. 3-4/N-R accumulator piston
    Disassembly Note ..... below
12. O-rings
13. Transmission case

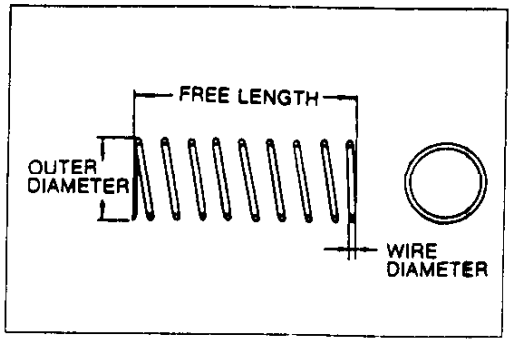


29U0KX-232

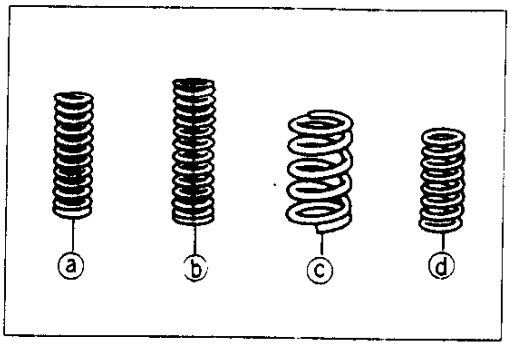
Disassembly note
Accumulator piston

Remove the accumulator pistons from transmission case by applying compressed air through the oil passage as shown in the figure.

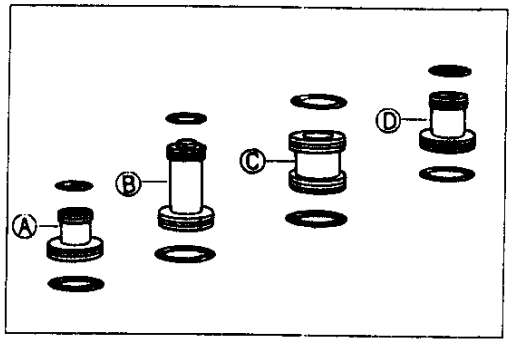
Item / Accumulator	Location	Oil passage
N-D accumulator	A	a
2-3 accumulator	B	b
1-2 accumulator	C	c
3-4/N-R accumulator	D	d

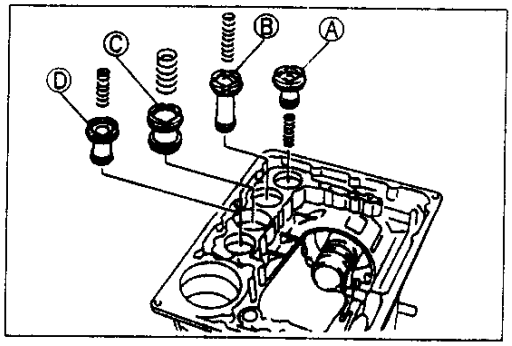


37U0KX-082

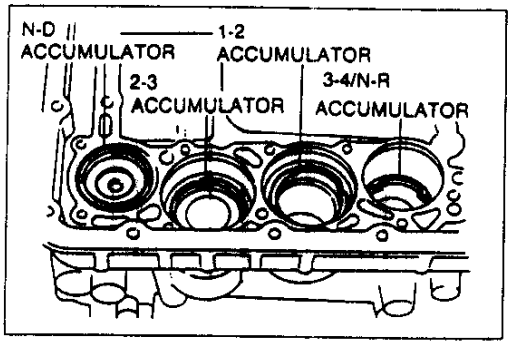


37U0KX-083





37U0KX-084



29U0KX-236

Inspection

Accumulator spring

1. Measure the spring free length

Item / Spring	Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
N-D accumulator spring	18.0 {0.71}	43.0 {1.69}	7.9	2.3 {0.091}
1-2 accumulator spring	29.3 {1.15}	45.0 {1.77}	3.8	3.7 {0.15}
2-3 accumulator spring	19.5 {0.77}	66.0 {2.60}	8.6	3.0 {0.12}
3-4/N-R accumulator spring	18.0 {0.71}	43.0 {1.69}	7.9	2.3 {0.091}

2. If not within specification, replace the spring.

Assembly procedure

Note

- **Installation order**
  N-D accumulator: Spring – Piston
  2-3 accumulator: Piston – Spring
  1-2 accumulator: Piston – Spring
  3-4/N-R accumulator: Piston – Spring
- **Outer diameter of spring**

	Spring	Outer dia. mm {in}
a	N-D accumulator	18.0 {0.71}
b	2-3 accumulator	19.5 {0.77}
c	1-2 accumulator	29.3 {1.15}
d	3-4/N-R accumulator	18.0 {0.71}

1. Apply ATF to the new O-rings and install them onto the accumulator pistons.

Piston / O-ring		Large mm {in}	Small mm {in}
A	N-D accumulator	45.0 {1.77}	29.0 {1.14}
B	2-3 accumulator	50.0 {1.97}	32.0 {1.26}
C	1-2 accumulator	50.0 {1.97}	45.0 {1.77}
D	3-4/N-R accumulator	45.0 {1.77}	29.0 {1.14}

Note

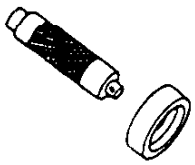
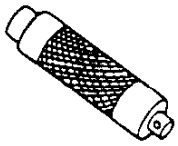
- **Apply even pressure to the perimeter of the accumulator pistons during installation to avoid damaging the O-rings.**

2. Install the accumulator pistons and springs.

OIL PUMP

Preparation

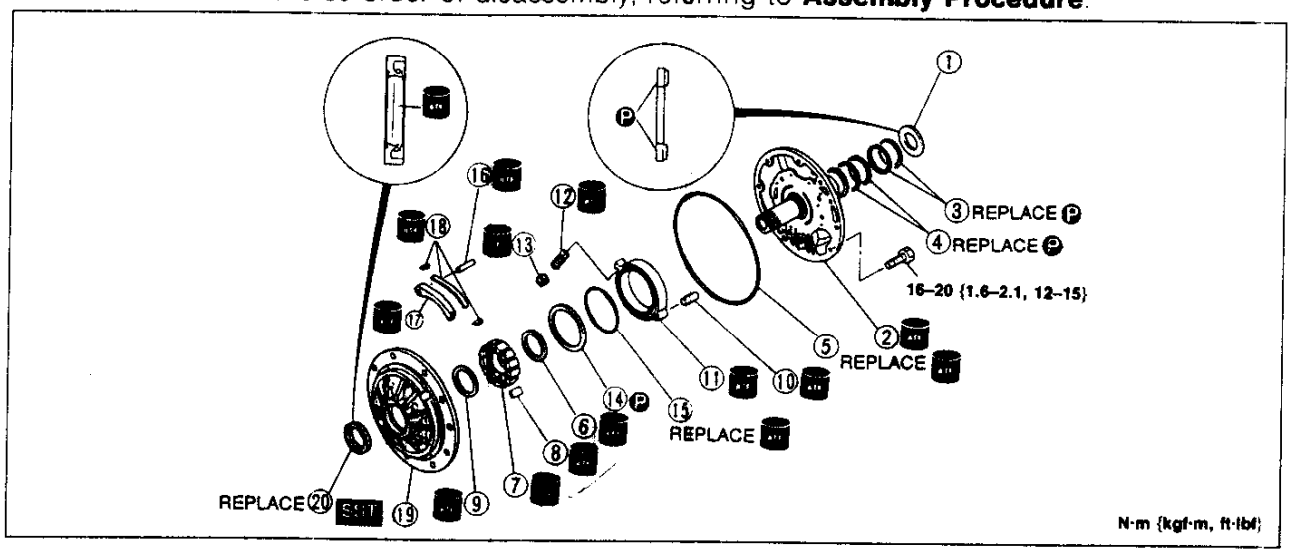
SST

49 G030 795 Installer, oil seal 	For installation of oil seal	49 G030 796 Body (Part of 49 G030 795) 	For installation of oil seal
49 G030 797 Handle (Part of 49 G030 795) 	For installation of oil seal		

27U0KX-237

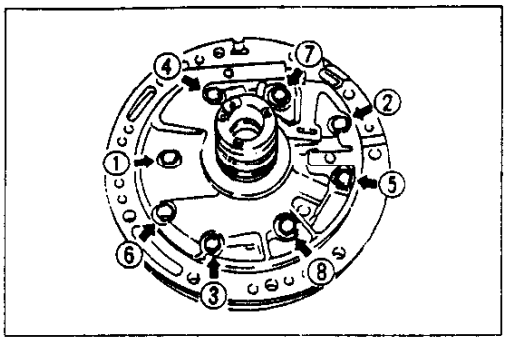
Disassembly / Inspection / Assembly

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



37U0KX-035

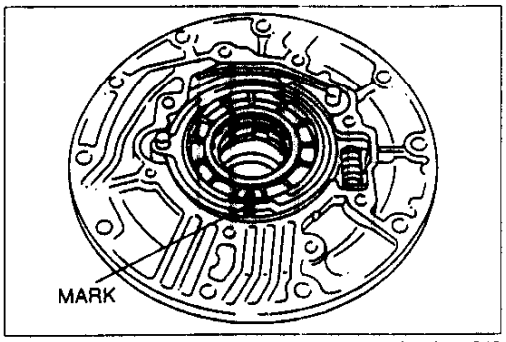
1. Bearing
   Inspect for damage and rough rotation
2. Oil pump cover
   Disassembly Note ..... page K–61
   Inspection ..... page K–61
3. Seal ring (small diameter)
4. Seal ring (large diameter)
5. O-ring
6. Vane ring
7. Rotor
   Disassembly Note ..... page K–61
   Inspection ..... page K–62
8. Vane
   Inspection ..... page K–62
9. Vane ring
10. Pivot pin
    Disassembly Note ..... page K–61
11. Cam ring
    Disassembly Note ..... page K–61
    Inspection ..... page K–62
12. Cam ring spring
    Inspection ..... page K–62
13. Spring seat
14. Friction ring
15. O-ring
16. Pivot pin
17. Control piston
    Inspection ..... page K–62
18. Side seal
19. Oil pump housing
    Inspection ..... page K–62
20. Oil seal



29U0KX-239

Disassembly note
Oil pump cover

1. Gradually loosen the mounting bolts in the order shown.
2. Remove the oil pump cover from the oil pump housing.

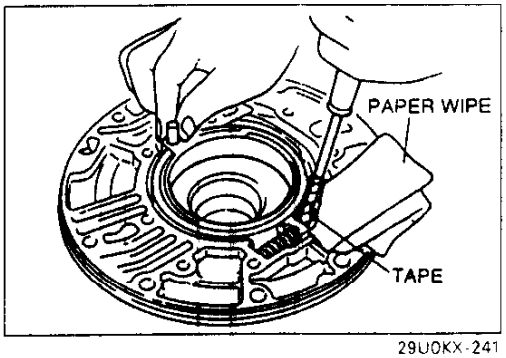


29U0KX-240

Rotor

Caution
- **Do not use a punch to mark the rotor and cam ring.**

1. Mark the rotor and cam ring.
2. Remove the rotor and vanes from the cam ring.

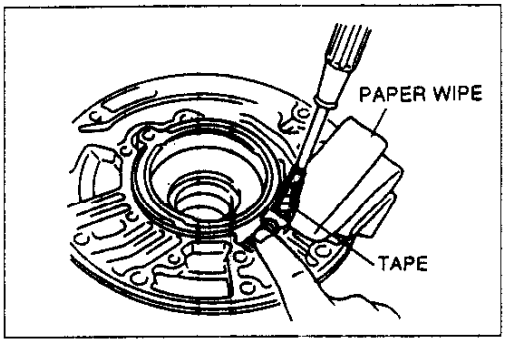


29U0KX-241

Pivot pin

Caution
- **Do not scratch the oil pump housing.**

1. Wrap a screwdriver with tape.
2. Hold the cam ring and remove the pivot pin.

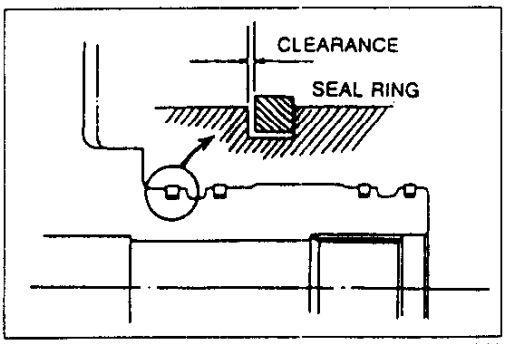


29U0KX-242

Cam ring

Caution
- **Do not scratch the oil pump housing.**
- **Hold the cam ring spring to prevent it from popping out.**

Remove the cam ring and spring.



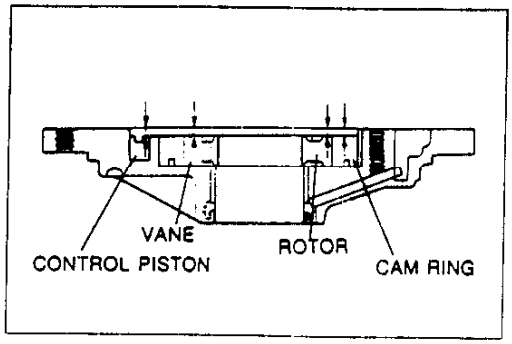
37U0KX-086

Inspection
Oil pump cover

1. Fit new seal rings into the oil pump cover.
2. Measure the clearance between the seal ring and the ring groove.

Standard clearance:
0.10–0.25 mm {0.004–0.010 in}
Maximum clearance: 0.25 mm {0.010 in}

3. If not within specification, replace the oil pump assembly.



37U0KX-087

Oil pump housing, cam ring, rotor, vane, and control piston

Note
- **Do not install the friction ring, O-ring, control piston, side seals, and cam ring spring.**

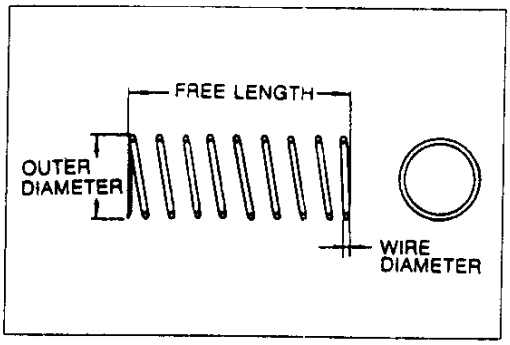
1. Install the cam ring, vanes, rotor, and control piston.
2. Measure the distance from the edge of the oil pump housing to the cam ring, rotor, vanes, and control piston at least four points along their circumferences.

Clearance

mm {in}

Part \ Distance	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 specification, replace the oil pump assembly.



37U0KX-088

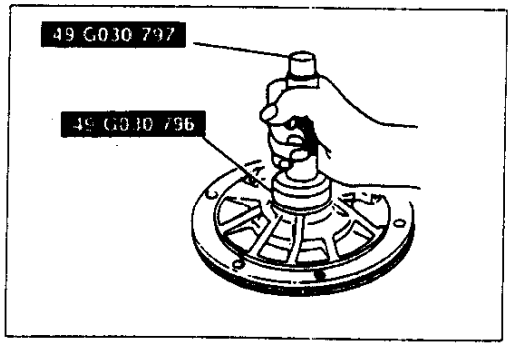
Cam ring spring

1. Measure the spring free length.

Specification

Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
13.7 {0.539}	39.8 {1.567}	7.8	2.3 {0.091}

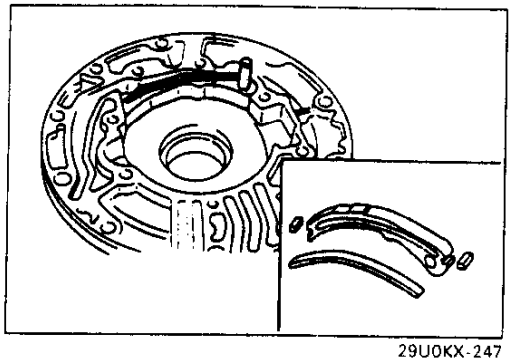
2. If not correct, replace the cam ring spring.



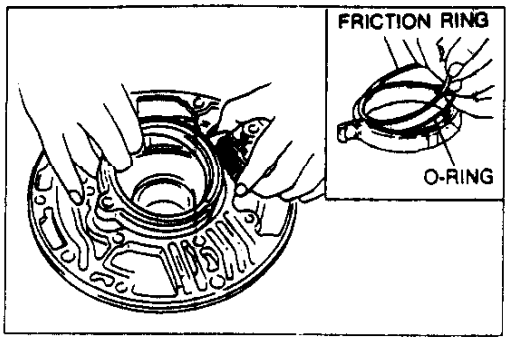
29U0KX-246

Assembly procedure

1. Apply ATF to the lip of a new oil seal, and install it by using the **SST**.

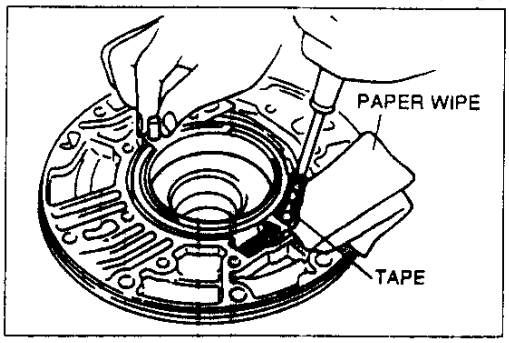

29U0KX-247

2. Apply ATF to side seals, and install them on the control piston with the black surface facing the control piston.
3. Install the control piston and pivot pin.



29U0KX-248

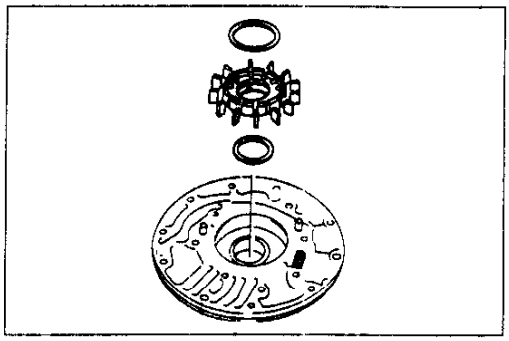
4. Apply petroleum jelly to the cam ring groove and install a new O-ring and friction ring into the cam ring.
5. Install the cam ring and spring while compressing the spring against the oil pump housing.



29U0KX-249

Caution
- **Do not scratch the oil pump housing.**

6. Wrap a screwdriver with tape.
7. Hold the cam ring and install the pivot pin.



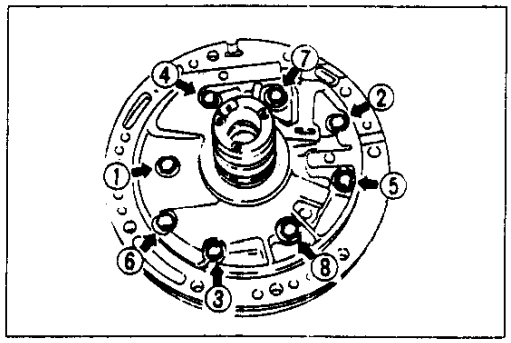
29U0KX-250

8. Confirm that the mark on the rotor is facing upward, and install the rotor, vanes, and vane rings.

Caution
- **Do not damage the oil seal by the splines of the oil pump cover.**

9. Install the oil pump cover onto the oil pump housing.
10. Tighten the bolts evenly and gradually in the order shown.

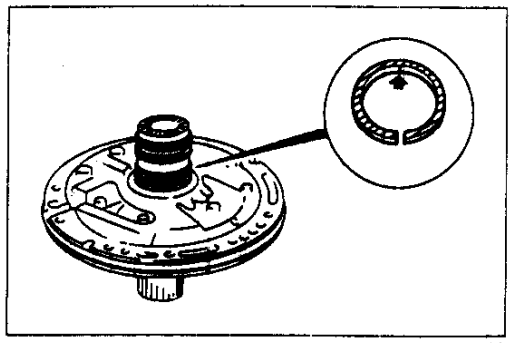
Tightening torque:
16–20 N·m {1.6–2.1 kgf·m, 12–15 ft·lbf}



37U0KX-089

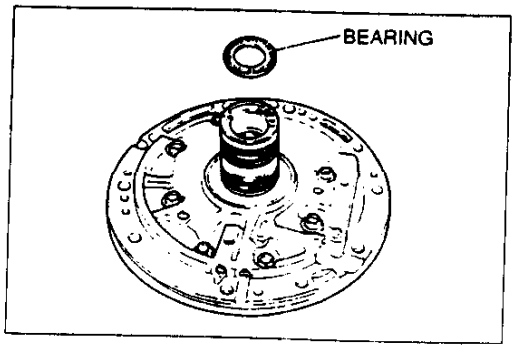
Caution
- **Do not overexpand the seal rings when installing them.**

Note
- **Press the seal rings down into the petroleum jelly to hold them.**
- **Seal rings come in two different diameters.**
  Small dia.: No mark
  Large dia.: Yellow mark in area shown by arrow



29U0KX-252

11. Apply petroleum jelly into the ring grooves, and install new seal rings.
12. Apply ATF to a new O-ring and install it onto the oil pump.



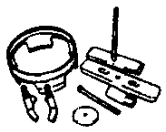
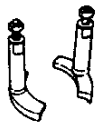
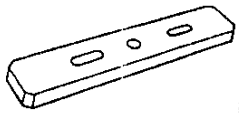
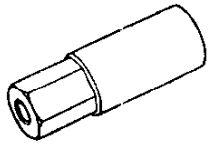
37U0KX-090

13. Apply petroleum jelly to the bearing and set it on the oil pump.

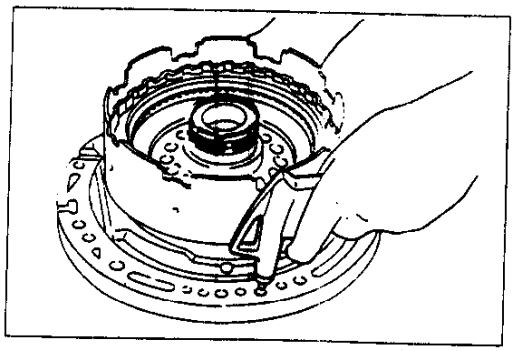
Bearing outer diameter: 47.0 mm {1.85 in}

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		

29U0KX-254

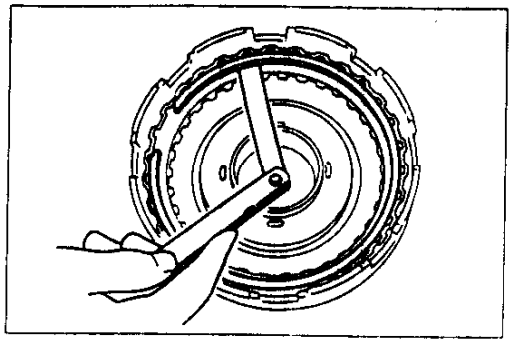

37U0KX-091

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.
2. Verify that the retaining plate moves toward the snap ring.

Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.

3. If not, the D-ring or the seal ring may be damaged or fluid may be leaking at the piston check ball. Inspect and replace as necessary when assembling



37U0KX-092

Clearance between retaining plate and snap ring

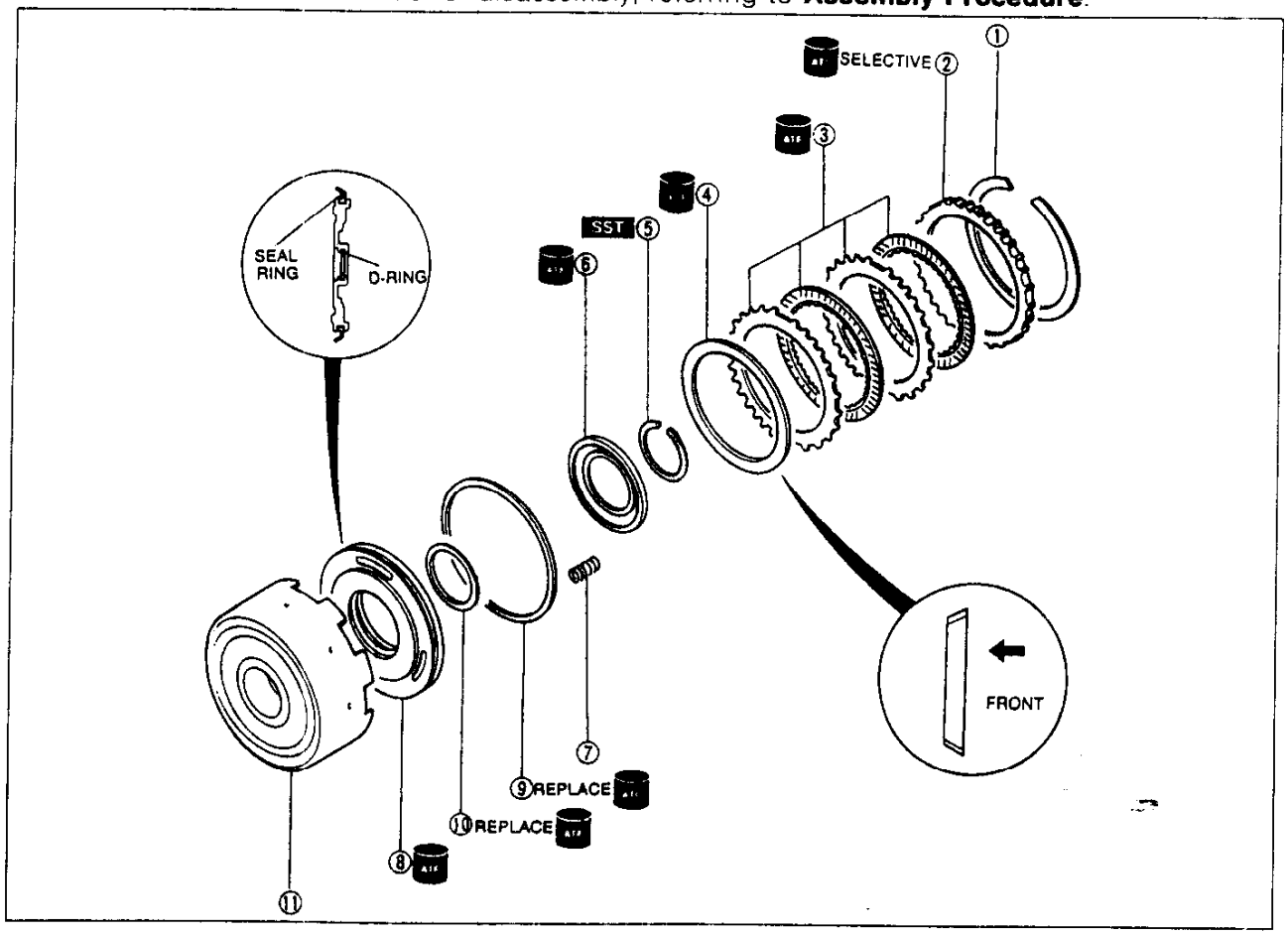
1. Measure the clearance between the retaining plate and the snap ring.

   Clearance: 0.50–1.20 mm {0.020–0.047 in}

2. Select the correct retaining plate when assembling. (Refer to page K–68)

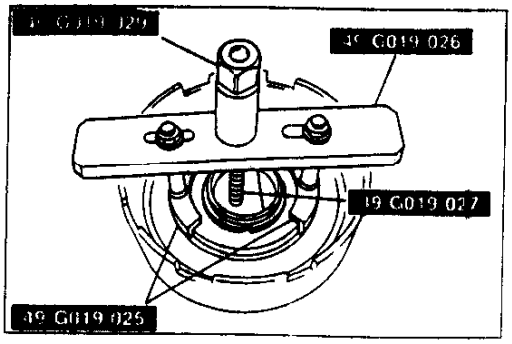
Disassembly / Inspection / Assembly

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

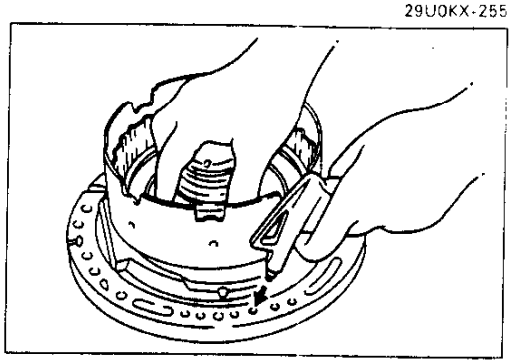


37U0KX-093

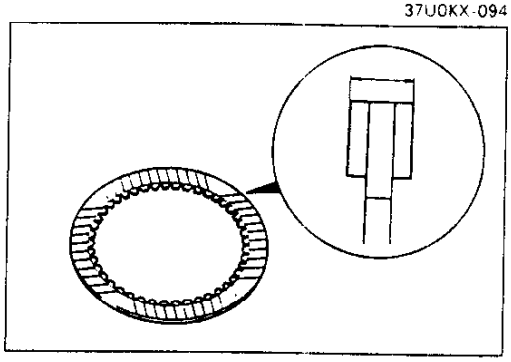
1. Snap ring
2. Retaining plate
3. Drive plates and driven plates
   Inspect for wear and burning
   Inspection ..... page K–66
4. Dished plate
5. Snap ring
   Disassembly Note ..... page K–66
6. Spring retainer
7. Return springs
   Inspection ..... page K–66
8. Clutch piston
   Inspect balls for sticking by shaking the piston
   Disassembly Note ..... page K–66
   Inspection ..... page K–66
9. Seal ring
10. D-ring
11. Reverse clutch drum



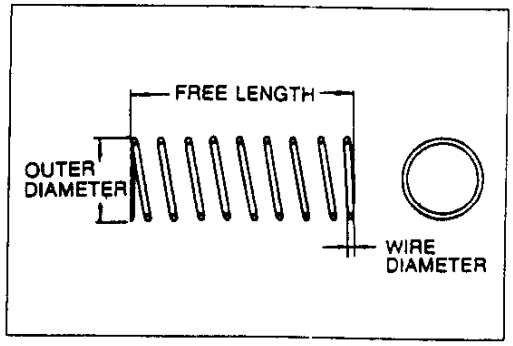
29U0KX-255



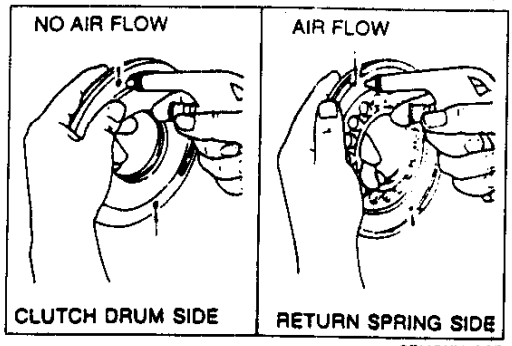
37U0KX-094



37U0KX-095



37U0KX-096



37U0KX-097

Disassembly Note
Snap ring

Caution
- **Depress the spring retainer only enough to remove the snap ring.**
- **Do not damage the snap ring.**

1. Compress the springs by using the **SST**, and remove the snap ring with snap ring pliers.
2. Remove the spring retainer and return springs.

Clutch piston

1. Install the reverse clutch with seal rings onto the oil pump.
2. Remove the piston by applying compressed air through the oil passage.

Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.

Inspection
Drive plates

1. Measure the facing thickness in three places, and calculate the average.

Thickness
Standard: 2.0 mm {0.079 in}
Minimum: 1.8 mm {0.071 in}

2. If not within specification, replace the drive plate.

Return springs

1. Measure the spring free length.

Specification

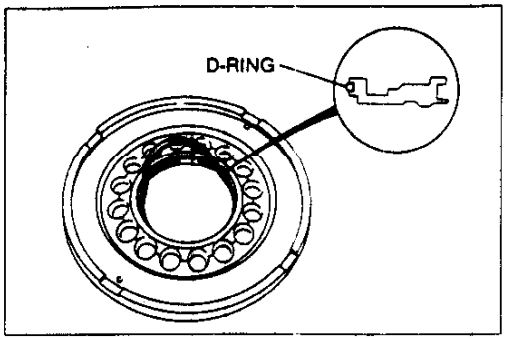
Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
11.6 {0.457}	19.69 {0.775}	4.0	1.3 {0.051}

2. If not within specification, replace the return spring.

Clutch piston

1. Shake the clutch piston and verify that the check ball is free.
2. Verify that there is no air flow when applying compressed air through the oil hole on the clutch drum side.
3. Verify that there is air flow when applying compressed air through the oil hole on the return spring side.

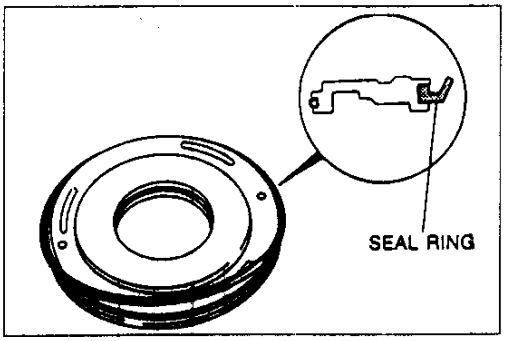
Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.



29U0KX-263

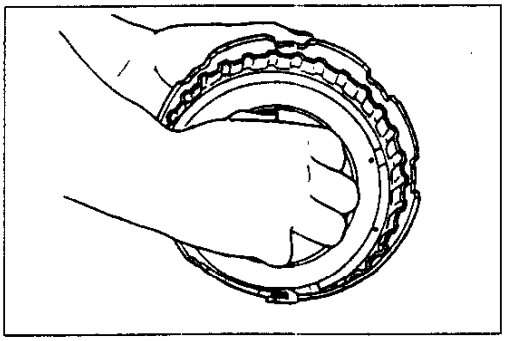
Assembly procedure

1. Apply ATF to a new D-ring and install it into the clutch piston.



29U0KX-264

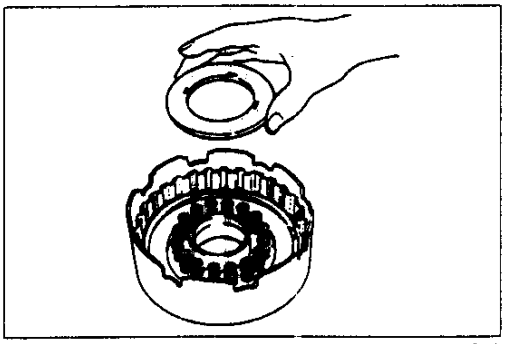
2. Apply ATF to a new seal ring and install it into the clutch piston.


29U0KX-265

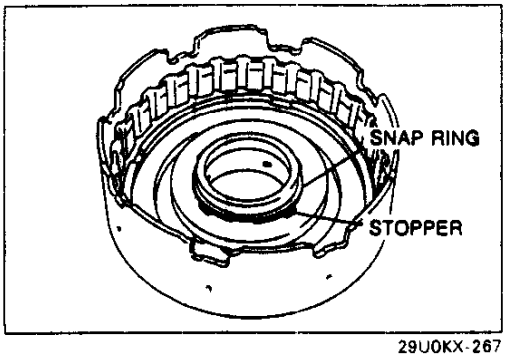
3. Apply ATF to the inner face of the reverse clutch drum.

Caution
- **Apply even pressure to the perimeter of the clutch piston when installing it to avoid damaging the seal ring and D-ring.**
- **If the piston cannot be turned by hand, remove it and check for damage to the seal ring.**

4. Install the clutch piston into the reverse clutch drum by turning it evenly and gradually.

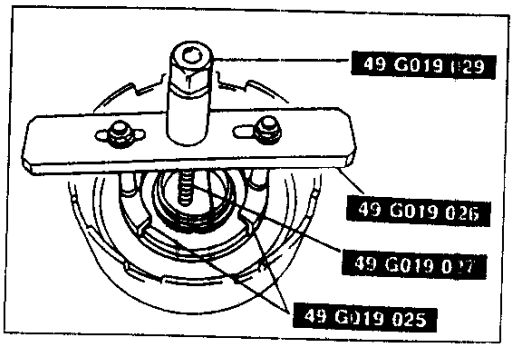

29U0KX-266

5. Install the return springs and spring retainer.



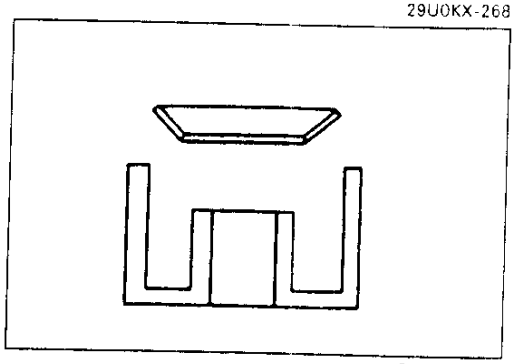
29U0KX-267

Caution
- **Depress the spring retainer only enough to install the snap ring.**
- **Do not overexpand the snap ring when installing it.**
- **Install the snap ring inside the stopper of the spring retainer.**
- **Do not align the ring endgap with the spring retainer stopper.**

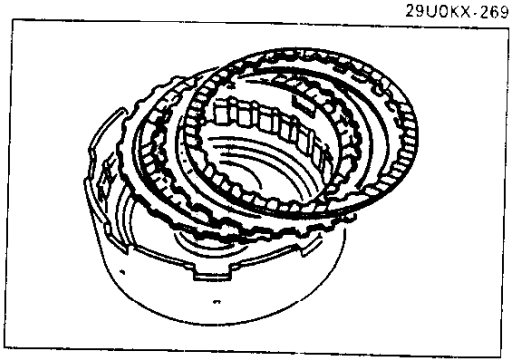


29U0KX-268

6. Install the snap ring while compressing the springs by using the **SST**.

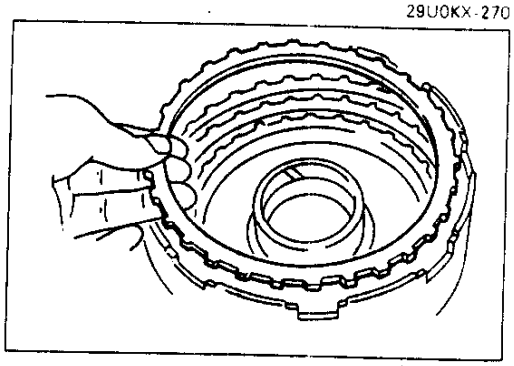

29U0KX-269

7. Install the dished plate as shown in the figure.


29U0KX-270

Note
- **Installation order: Driven-Drive-Driven-Drive**
- **Soak new drive plates in ATF for at least two hours before installation.**

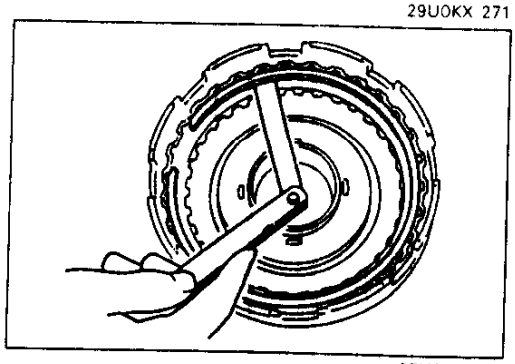
8. Apply ATF to the drive plates and driven plates, and install them into the reverse clutch drum.


29U0KX 271

9. Install the retaining plate.

Caution
- **Do not deform the snap ring.**

10. Install the snap ring.


37U0KX-098

11. Measure the clearance between the retaining plate and the snap ring by using a feeler gauge.

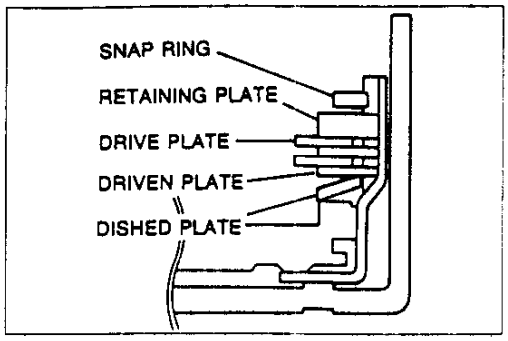
Clearance: 0.50–1.20 mm {0.020–0.047 in}

12. If not within specification, adjust the clearance by selecting the correct retaining plate.

Retaining plate size

mm {in}

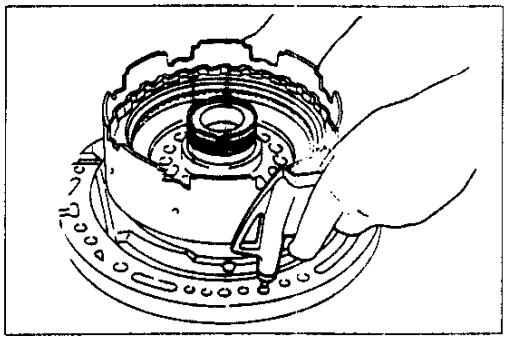
4.6 {0.181}	4.8 {0.189}	5.0 {0.197}	5.2 {0.205}
5.4 {0.213}	5.6 {0.220}	5.8 {0.228}	—



37U0KX-099

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 selecting the correct retaining plate.

Clearance: 0.50–0.80 mm {0.020–0.031 in}



37U0KX-100

Caution

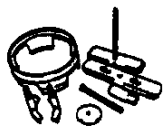
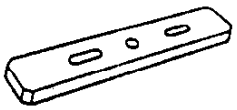
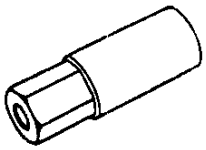
- **Apply air for no more than 3 seconds.**

14. Install the reverse clutch with seal rings onto the oil pump. Apply compressed air through the oil passage and verify clutch operation.

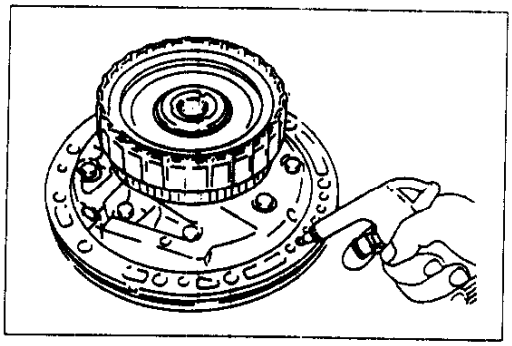
Air pressure: 390 kPa {4.0 kgf/cm^2, 57 psi} max.

HIGH CLUTCH AND FRONT SUN GEAR

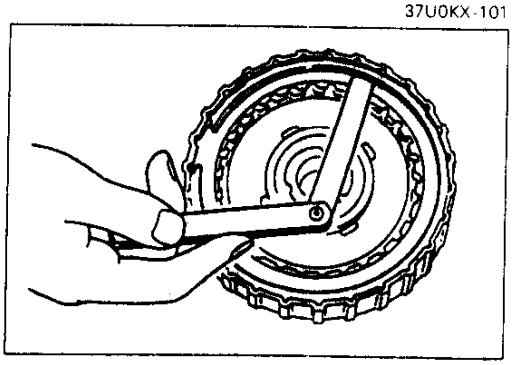
Preparation
SST

49 G019 0A7A Compressor set, return spring 	For removal / installation of snap ring	49 G019 025 Body B (Part of 49 G019 0A7A) 	For removal / installation of snap ring
49 G019 026 Plate (Part of 49 G019 0A7A) 	For removal / installation of snap ring	49 G019 027 Attachment A (Part of 49 G019 0A7A) 	For removal / installation of snap ring
49 G019 029 Nut (Part of 49 G019 0A7A) 	For removal / installation of snap ring		

29U0KX-27



37U0KX-101



37U0KX-102

Preinspection
High clutch operation

1. Install the high clutch with seal rings onto the oil pump. Apply compressed air through the oil passage as shown.
2. Verify that the retaining plate moves toward the snap ring.

Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.

3. If not, the D-rings may be damaged or fluid may be leaking at the piston check ball. Inspect and replace as necessary when assembly.

Clearance between retaining plate and snap ring

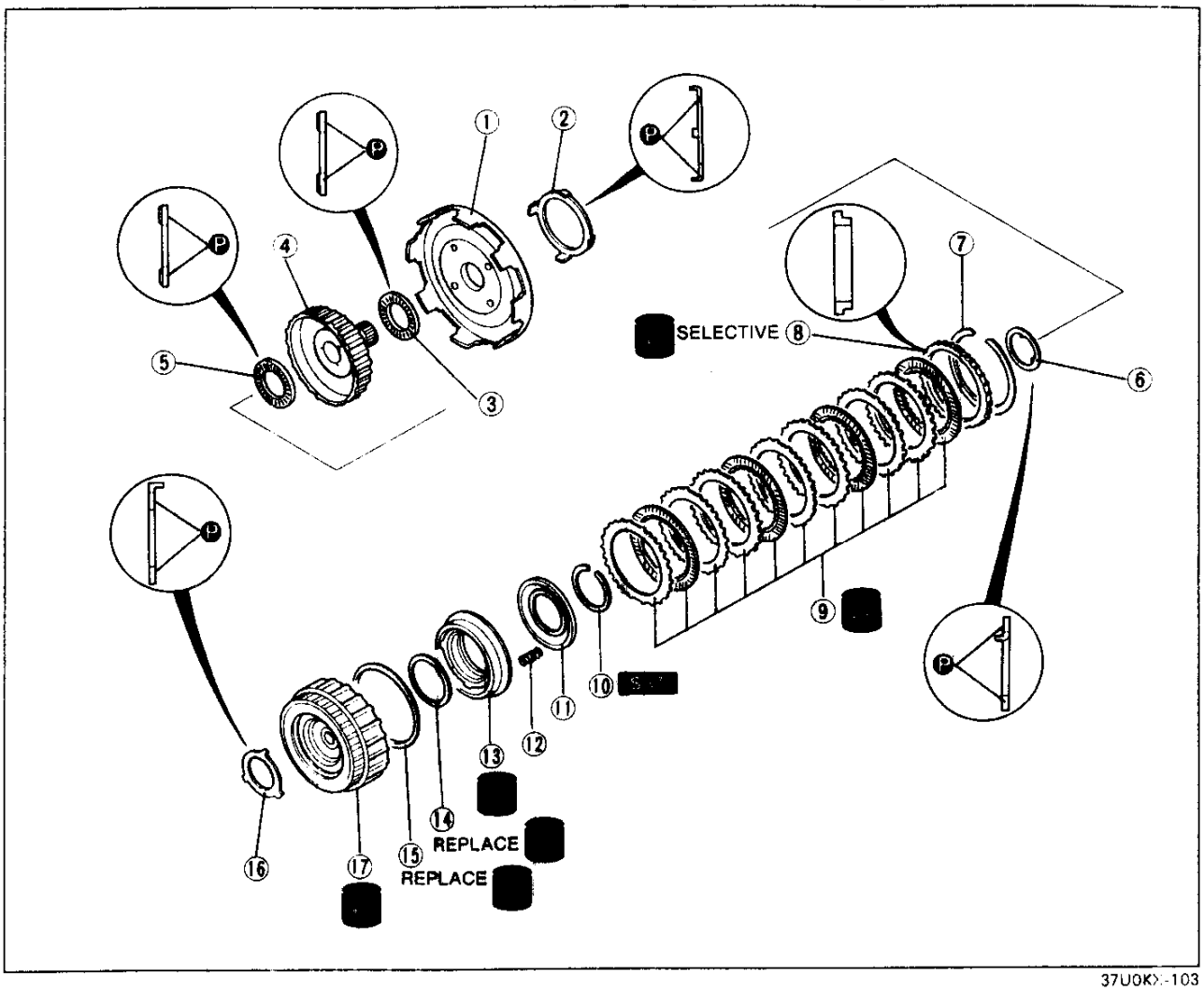
1. Measure the clearance between the retaining plate and the snap ring.

Clearance: 1.8–3.0 mm {0.071–0.118 in}

2. Select the correct retaining plate when assembling. (Refer to page K–74.)

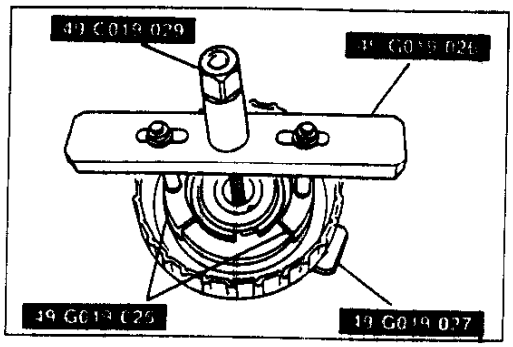
Disassembly / Inspection / Assembly

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

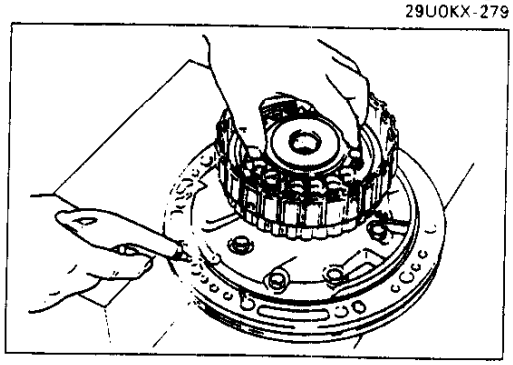


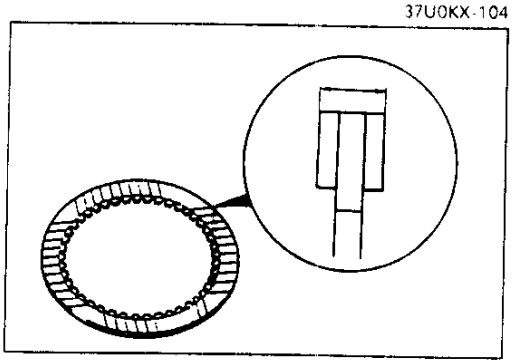
37U0K)-103

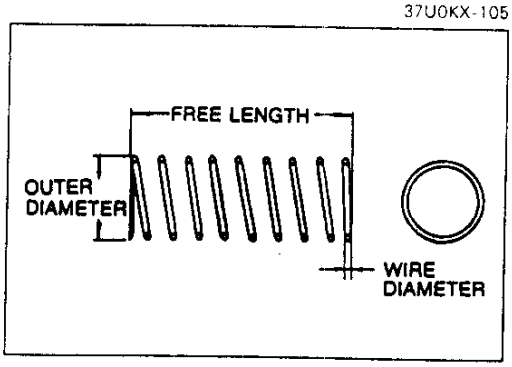
1. Front sun gear
   Inspect gear teeth for damage, wear, and cracks
2. Bearing race
   Inspect bearing surface for scoring and scratches
3. Bearing
   Inspect for damage and rough rotation
4. High clutch hub
5. Bearing
   Inspect for damage and rough rotation
6. Bearing race
   Inspect bearing surface and scoring or scratches
7. Snap ring
8. Retaining plate
9. Drive plates and driven plates
   Inspect for wear and burning
   Inspection ..... page K–72
10. Snap ring
    Disassembly Note ..... page K–72
11. Spring retainer
12. Return springs
    Inspection ..... page K–72
13. Clutch piston
    Inspect balls for sticking by shaking the piston
    Disassembly Note ..... page K–72
    Inspection ..... page K–72
14. D-ring
15. D-ring
16. Bearing race
    Inspect bearing surface for scoring and scratches
17. High clutch drum



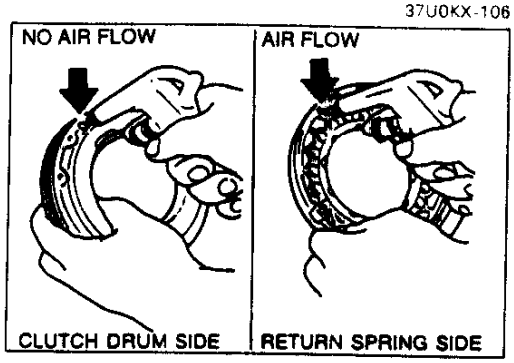
29U0KX-279


37U0KX-104


37U0KX-105



37U0KX-106



37U0KX-107

Disassembly note
Snap ring

Caution
- **Depress the spring retainer only enough to remove the snap ring.**
- **Do not damage the snap ring.**

1. Compress the springs by using the **SST**, and remove the snap ring with snap ring pliers.
2. Remove the piston retainer and return springs.

Clutch piston

1. Install the high clutch with seal rings onto the oil pump.
2. Remove the piston by applying compressed air through the oil passage.

Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.

Inspection
Drive plates

1. Measure the facing thickness in three places, and calculate the average.

Thickness
Standard: 1.6 mm {0.063 in}
Minimum: 1.4 mm {0.055 in}

2. If not within specification, replace the drive plate.

Return springs

1. Measure the spring free length.

Specification

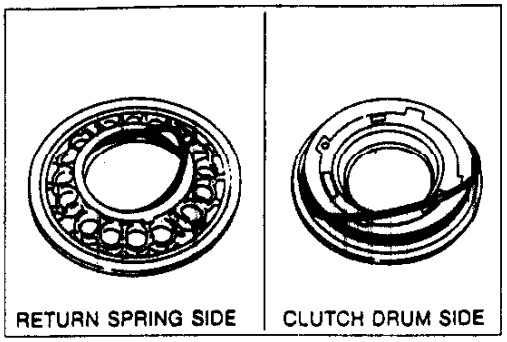
Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
11.6 {0.457}	22.3 {0.878}	5.2	1.2 {0.047}

2. If not within specification, replace the return spring.

Clutch piston

1. Shake the clutch piston and verify that the check ball is free.
2. Verify that there is no air flow when applying compressed air through the oil hole on the clutch drum side
3. Verify that there is air flow when applying compressed air through the oil hold on the return spring side.

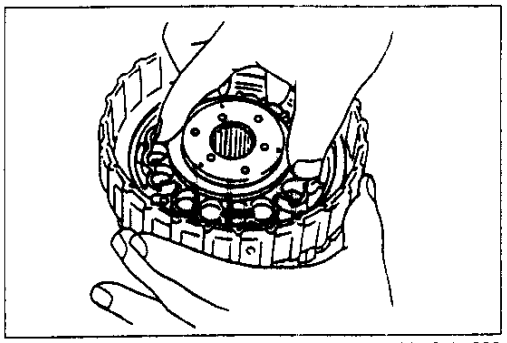
Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.



29U0KX-284

Assembly procedure

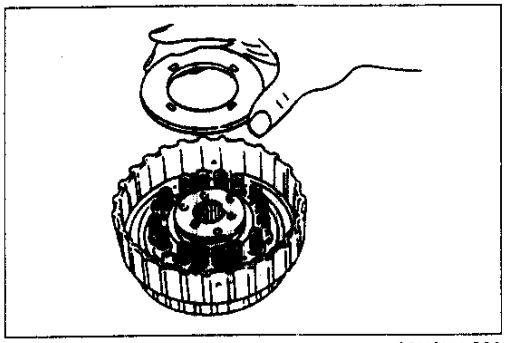
1. Apply ATF to new D-rings and install them into the clutch piston.


29U0KX-285

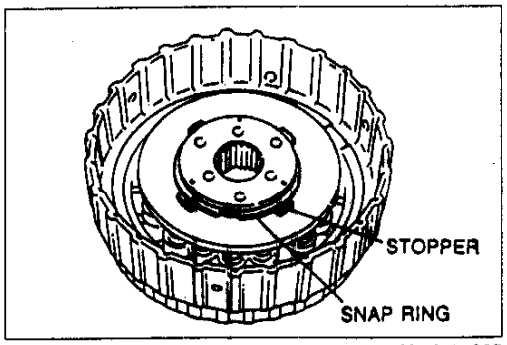
2. Apply ATF to the inner face of the high clutch drum.

Caution
- **Apply even pressure to the perimeter of the clutch piston when installing it to avoid damaging the D-rings.**

3. Install the clutch piston into the high clutch drum by turning it evenly and gradually.

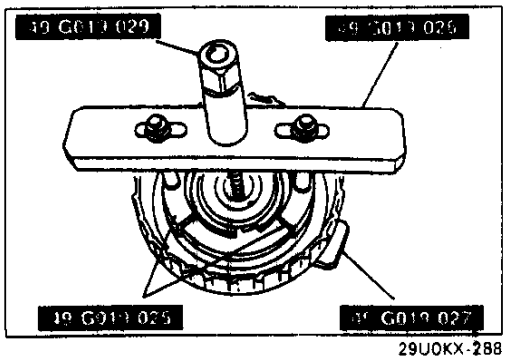

29U0KX-286

4. Install the return springs and spring retainer.

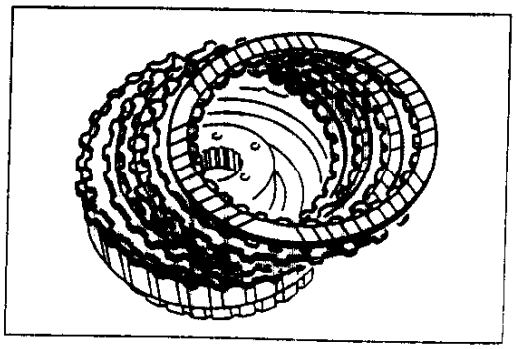


29U0KX-287

Caution
- **Depress the spring retainer only enough to install the snap ring.**
- **Do not overexpand the snap ring when installing.**
- **Install the snap ring inside the stopper of the spring retainer.**
- **Do not align the snap ring endgap with the spring retainer stopper.**

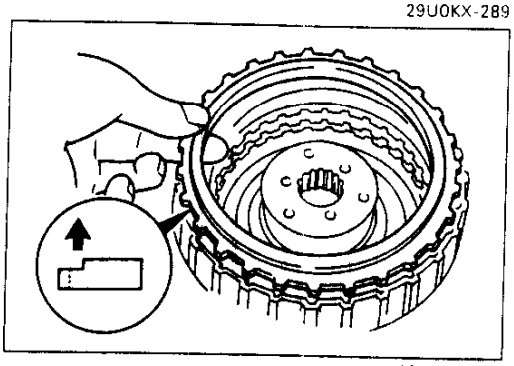

29U0KX-288

5. Install the snap ring while compressing the springs by using the **SST**.


29U0KX-289

Note
- **Installation order:**
  Driven-Drive-Driven-Driven-Drive-Driven-Driven-Drive-Driven-Driven-Drive
- **Soak new drive plates in ATF for at least two hours before installation.**

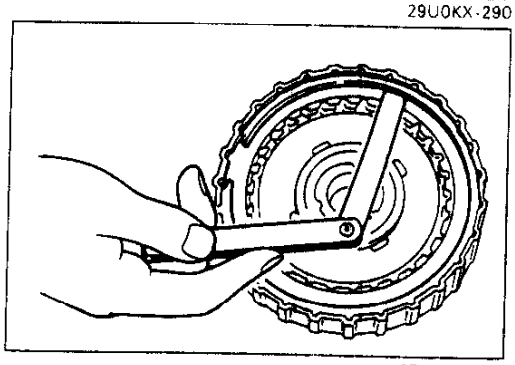
6. Apply ATF to the drive plates and driven plates, and install them into the high clutch drum.


29U0KX-290

7. Install the retaining plate.

Caution
- **Do not deform the snap ring.**

8. Install the snap ring.


37U0KX-108

9. Measure the clearance between the retaining plate and the snap ring by using a feeler gauge.

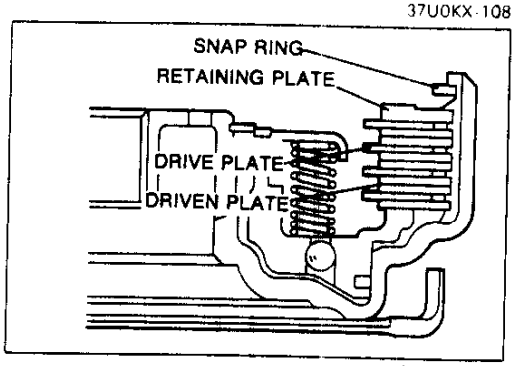
Clearance: 1.8–3.0 mm {0.071–0.118 in}

10. If not within specification, adjust the clearance by selecting the correct retaining plate.

Retaining plate size

mm {in}

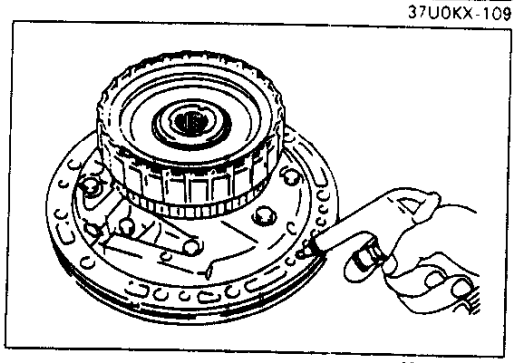
3.4 {0.134}	3.6 {0.142}	3.8 {0.150}
4.0 {0.157}	4.2 {0.165}	-



37U0KX-109

11. If the clearance cannot be brought to within specification after installation of the thickest retaining plate, replace the driven plates and drive plates. Adjust the clearance by selecting the correct retaining plate.

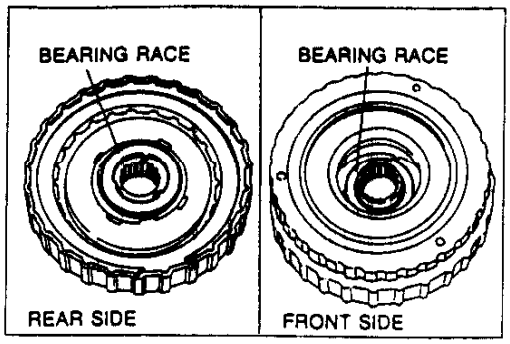
Clearance: 1.8–2.2 mm {0.071–0.087 in}


37U0KX-110

Caution
- **Apply air for no more than 3 seconds.**

12. Install the high clutch with the seal rings onto the oil pump. Apply compressed air through the oil passage and verify clutch operation.

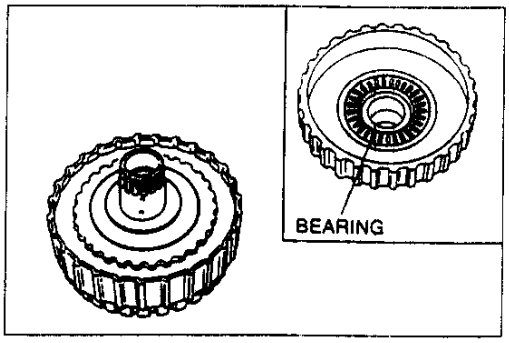
Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.



37U0KX-111

13. Apply petroleum jelly to the bearing races and install them in the high clutch drum as shown.

Bearing race outer diameter
Front: 43.5 mm {1.71 in}
Rear: 51.5 mm {2.03 in}

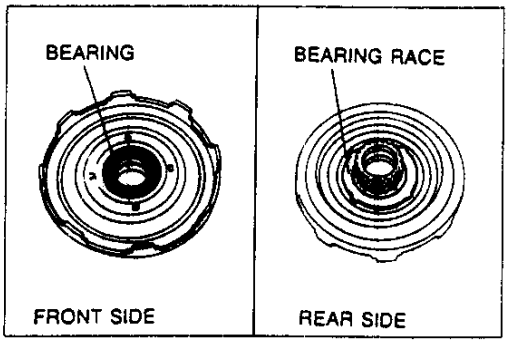


37U0KX-112

14. Apply petroleum jelly to the bearing and install it in the high clutch hub as shown.

Bearing outer diameter: 53.0 mm {2.09 in}

15. Apply ATF to the high clutch hub, and install it in the high clutch drum by turning it evenly and gradually.

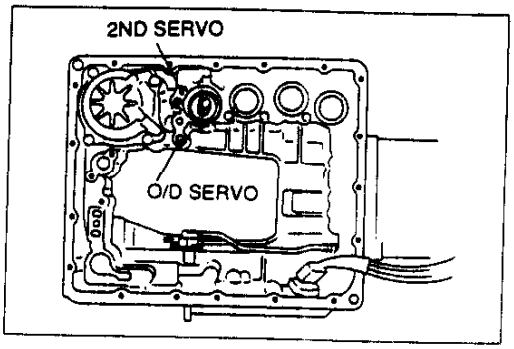


37U0KX-113

16. Apply petroleum jelly to the bearing and bearing race, and install them to the front sun gear.

Bearing outer diameter: 53.0 mm {2.09 in}
Bearing race outer diameter: 75.0 mm {2.95 in}

17. Assemble the front sun gear, reverse clutch, high clutch, and high clutch hub.



37U0KX-114

BAND SERVO

Preinspection

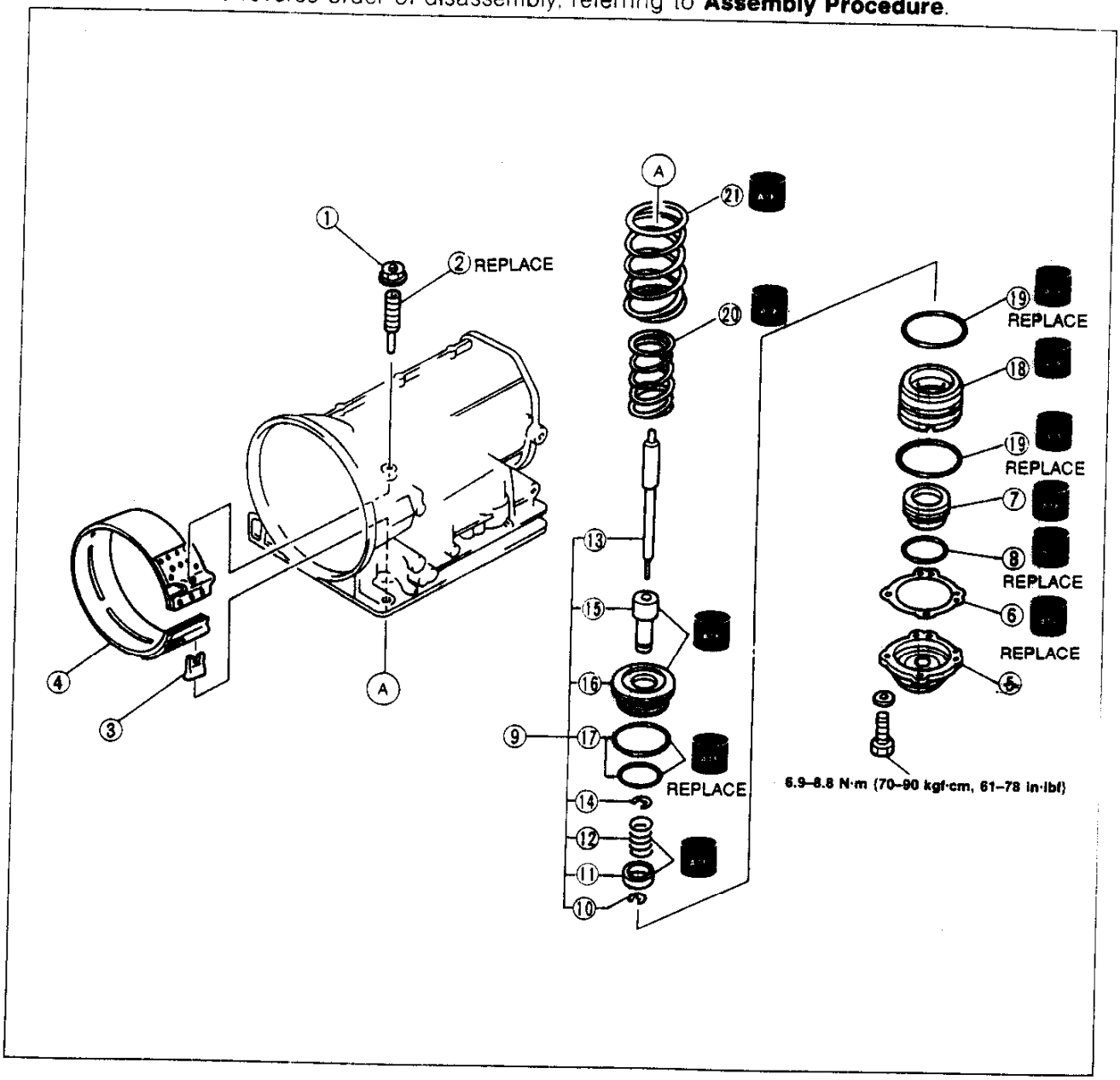
Band servo operation

1. Apply compressed air through the oil passage as shown.
2. Verify that the piston stem moves toward the brake band.

   Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.
3. If not, the D-rings or the O-rings may be damaged or the piston assembly may be sticking. Inspect and replace as necessary when assembling.

Disassembly / Inspection / Assembly

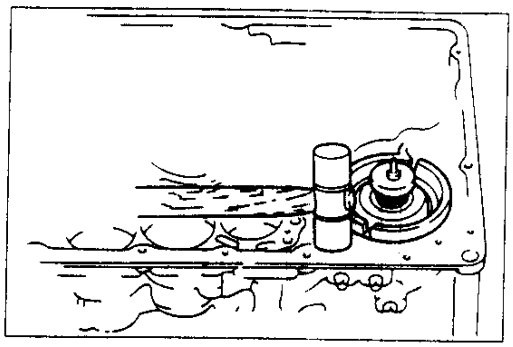
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



29U0KX-298

1. Locknut
2. Anchor end bolt
3. Band strut
4. Brake band
5. Band servo retainer
6. Gasket
7. O/D band servo piston
   Disassembly Note ..... below
8. D-ring
9. Piston and servo piston retainer
   Disassembly Note ..... below
10. Retaining ring (small)
11. Spring retainer
12. Return spring C
    Inspection ..... below
13. Piston stem
14. Retaining ring (large)
15. Servo spring retainer
16. Band servo piston
17. D-rings
18. Servo piston retainer
19. O-rings
20. Return spring B
    Inspection ..... below
21. Return spring A
    Inspection ..... below

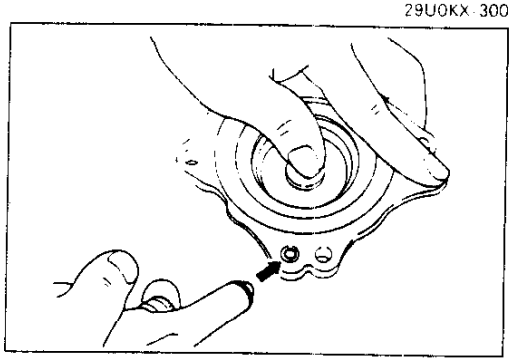
29U0KX-299



29U0KX-300

Disassembly note
Piston and servo piston retainer

Remove the piston and servo piston retainer from the transmission case by using a plastic hammer.



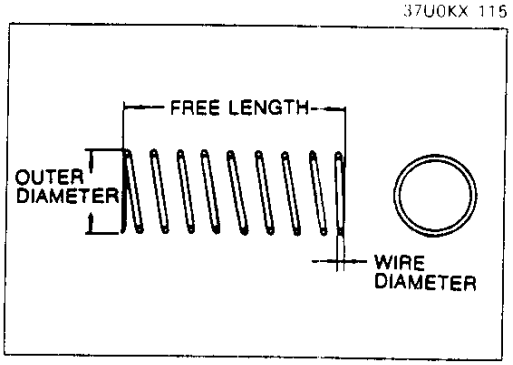
37U0KX-115

O/D band servo piston

1. Block one oil hole of the O/D servo piston retainer and the center hole in the O/D band servo piston.
2. Apply compressed air through the other oil hole in the O/D servo piston retainer to remove O/D band servo piston.

Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.

3. Remove the D-ring from the O/D band servo piston.



37U0KX-116

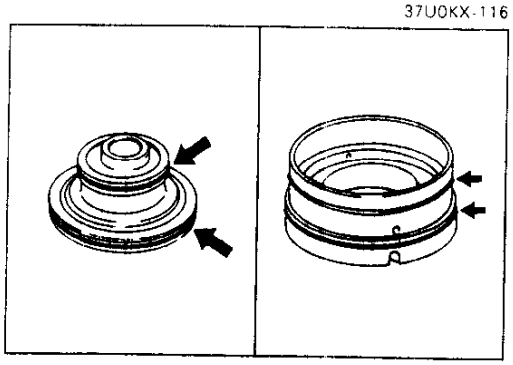
Inspection
Return spring

1. Measure the spring free length.

Specification

Item / Spring	Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
Spring A	40.3 {1.59}	53.8 {2.12}	3.0	2.3 {0.091}
Spring B	34.3 {1.35}	45.6 {1.80}	3.0	2.3 {0.091}
Spring C	27.6 {1.09}	29.7 {1.17}	3.2	2.6 {0.102}

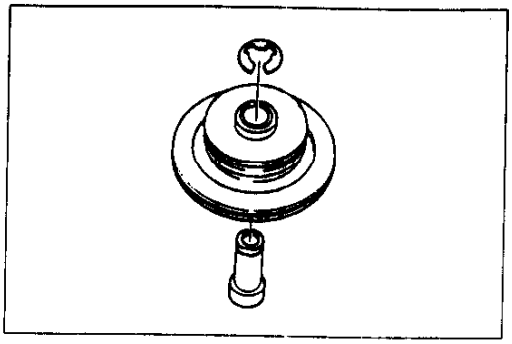
2. If not within specification, replace the return spring.



29U0KX-303

Assembly procedure

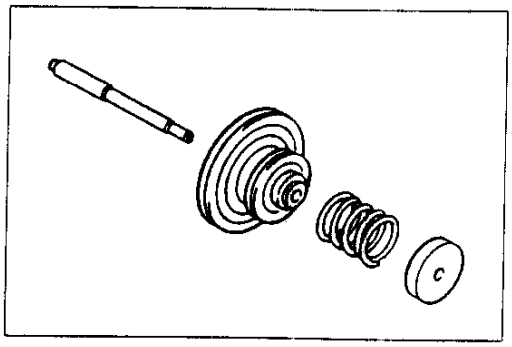
1. Apply ATF to new O-rings and install them onto the servo piston retainer.
2. Apply ATF to new D-rings and install them onto the band servo piston.



29U0KX-304

Caution
- **Do not deform the retaining ring.**

3. Apply ATF to the servo spring retainer and retaining ring (large). Assemble them in the band servo piston.

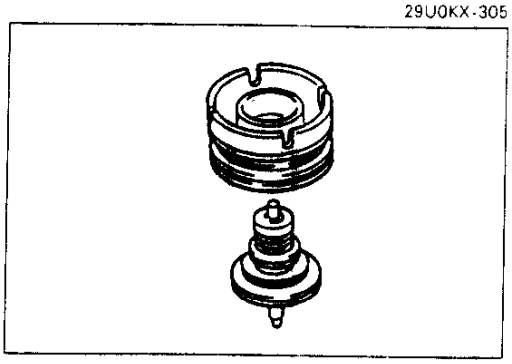


29U0KX-305

4. Assemble the band servo piston, piston stem, return spring, and spring retainer.

Caution
- **Do not deform the retaining ring.**

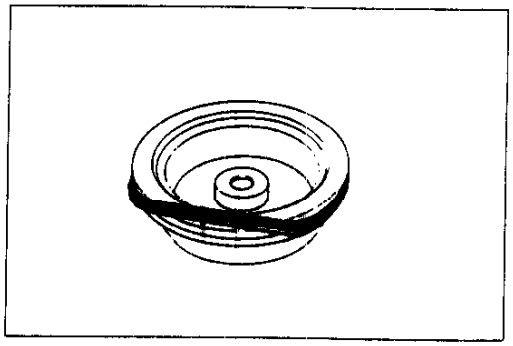
5. Install the retaining ring (small).



29U0KX-306

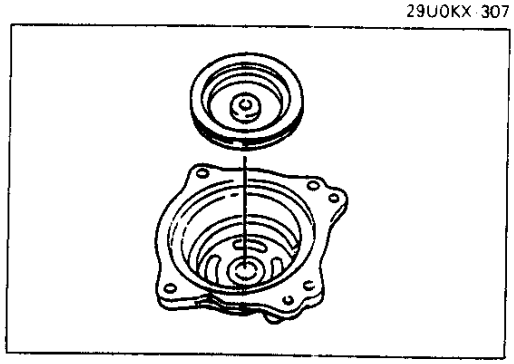
Caution
- **Apply even pressure to the perimeter of the piston when installing it to avoid damaging the O-rings and D-rings.**

6. Apply ATF to the band servo piston assembly and install it onto the servo piston retainer.



29U0KX-307

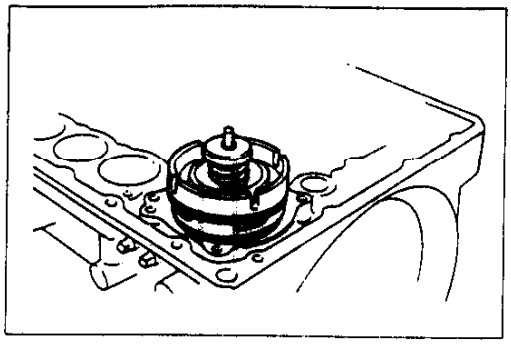
7. Apply ATF to a new D-ring and install it onto the O/D band servo piston.



29U0KX-308

Caution
- **Apply even pressure to the perimeter of the piston when installing it to avoid damaging the D-ring.**

8. Apply ATF to the O/D band servo piston, and install it into the band servo retainer.

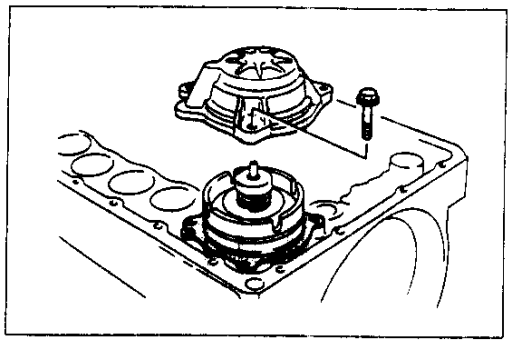


29U0KX-309

9. Install return springs A and B.

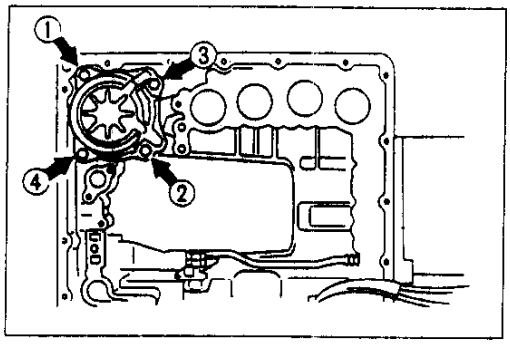
Caution
- **Apply even pressure to the perimeter of the body when installing it to avoid damaging the O-rings and D-rings.**

10. Apply ATF to the piston assembly and install it into the transmission case.



29U0KX-310

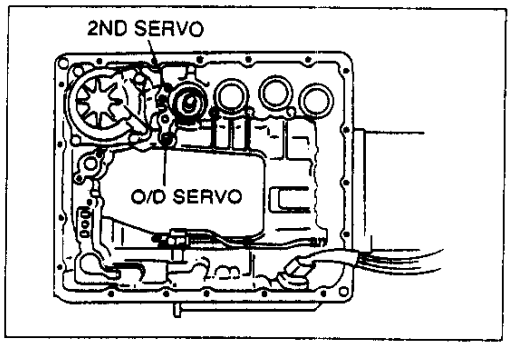
11. Apply ATF to the band servo retainer and a new gasket, and install them on the transmission case.



37U0KX-117

12. Tighten the bolts evenly and gradually in the order shown.

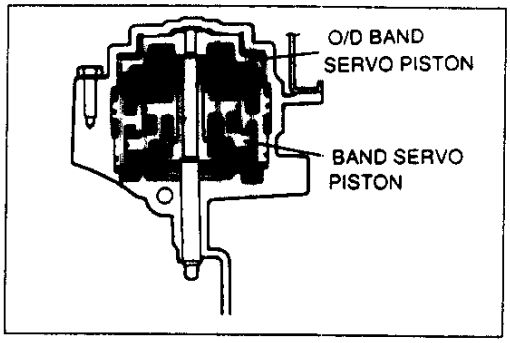
Tightening torque:
6.9–8.8 N·m {70–90 kgf·cm, 61–78 in·lbf}

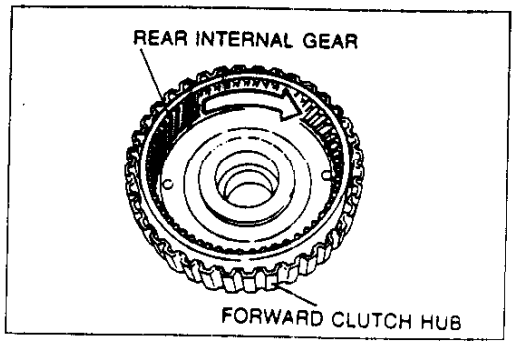


37U0KX-118

13. Verify servo piston operation by applying compressed air through the oil holes as shown.

Air pressure: 390 kPa {4.0 kgf/cm^2, 57 psi} max.





29U0KX-313

FRONT INTERNAL GEAR, REAR INTERNAL GEAR, FORWARD CLUTCH HUB, OVERRUNNING CLUTCH HUB

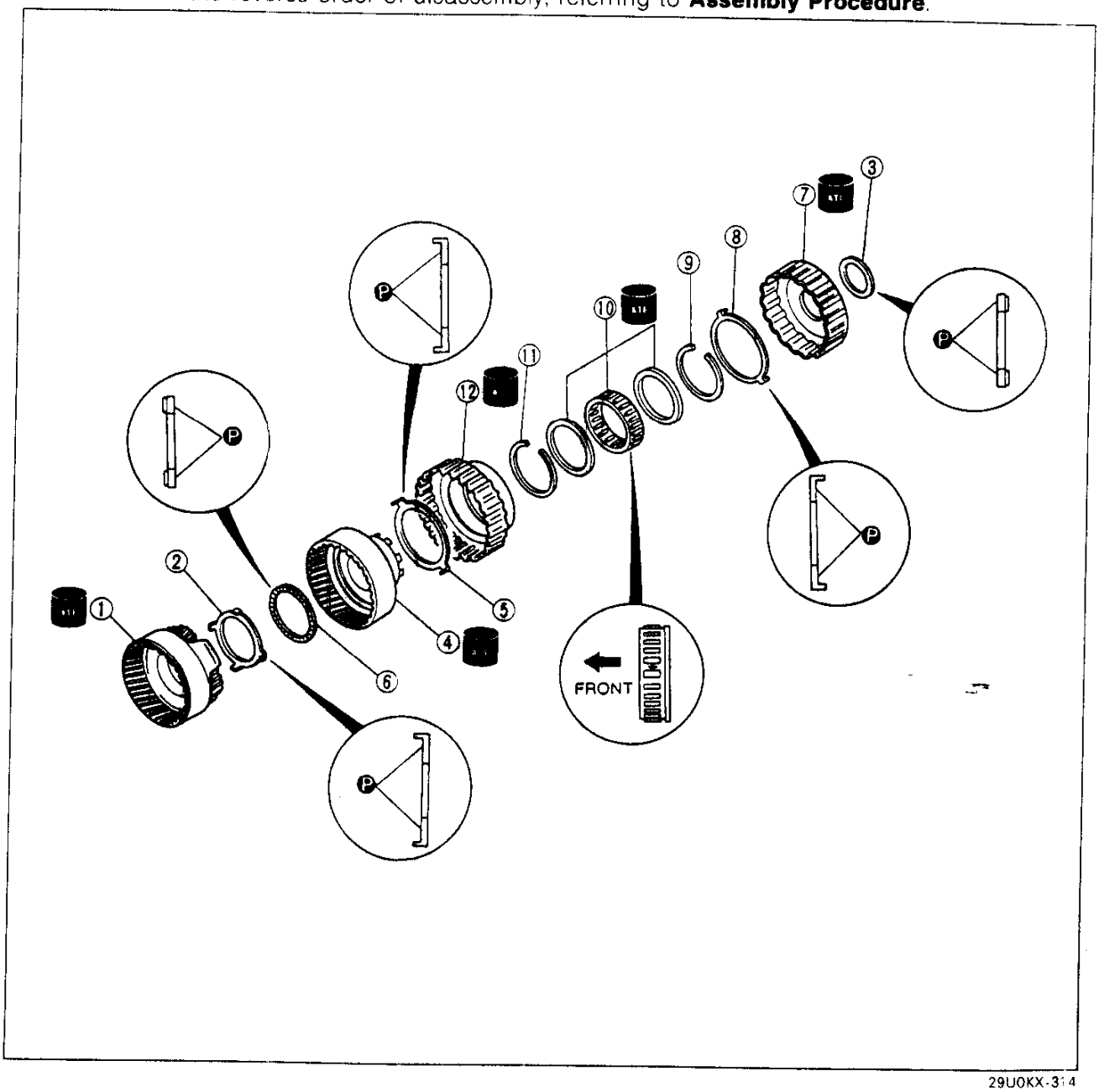
Preinspection

Forward one-way clutch operation

1. While holding the forward clutch hub, verify that the rear internal gear rotates smoothly when turned clockwise and locks when turned counterclockwise.
2. If not as specified, replace the one-way clutch.

Disassembly / Inspection / Assembly

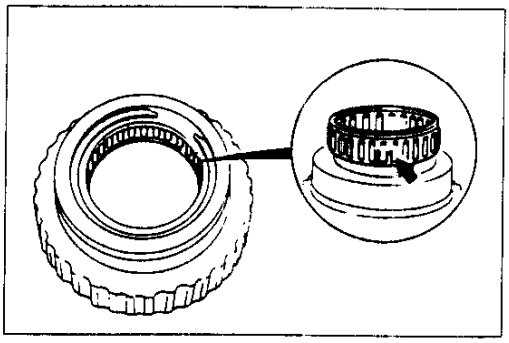
1. Disassemble in the order shown in the figure.
2. Inspect all parts and replace if necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



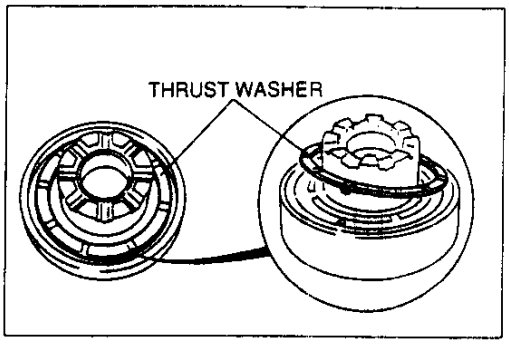
29U0KX-314

1. Front internal gear (with rear planetary carrier)
   Inspect gear teeth for damage, wear, and cracks
   Check rotation of pinion gears
2. Bearing race
   Inspect bearing surface for scoring and scratches
3. Bearing
   Inspect for damage and rough rotation
4. Rear internal gear
   Inspect gear teeth for damage, wear, and cracks
5. Thrust washer
6. Bearing
   Inspect for damage and rough rotation
7. Overrunning clutch hub
8. Thrust washer
9. Snap ring
10. Forward one-way clutch
    Inspection ..... page K–80
11. Snap ring
12. Forward clutch hub

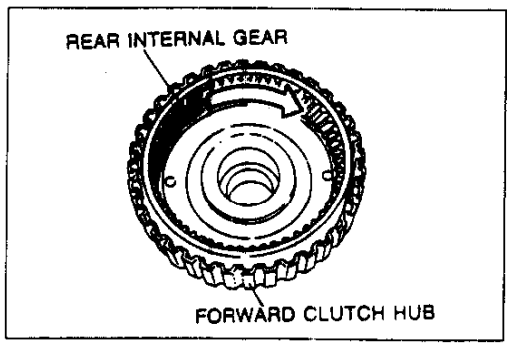
37U0KX-119



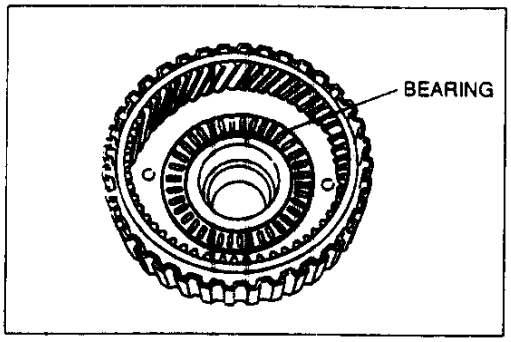
29U0KX-316



29U0KX-317



29U0KX-318



37U0KX-120

Assembly procedure

Caution
- **Do not deform the snap ring.**
- **Install the side indicated by the arrow in the figure toward the front when inserting the one-way clutch into the forward clutch hub.**

1. Install the snap ring into the forward clutch hub.
2. Apply ATF to the forward one-way clutch. Install it in the forward clutch hub and install the snap ring.

Note
- **Be sure the locating tabs of the thrust washer are set into the holes in the rear internal gear.**

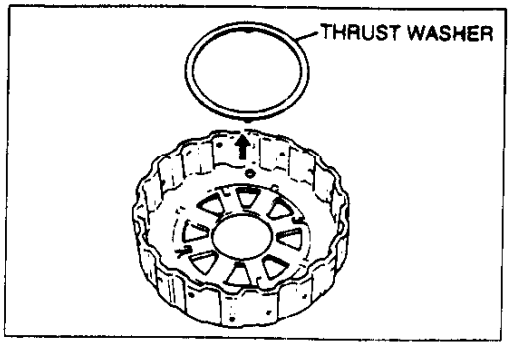
3. Apply petroleum jelly to the thrust washer and set it on the rear internal gear.

Note
- **If the rear internal gear turns counterclockwise, the one-way clutch is installed upside down.**

4. Apply ATF to the rear internal gear, and install it in the forward clutch hub by turning it evenly and gradually.
5. While holding the forward clutch hub, verify that the rear internal gear turns clockwise only.

6. Apply petroleum jelly to the bearing, and install it on the rear internal gear.

Bearing outer diameter: 78.0 mm {3.07 in}

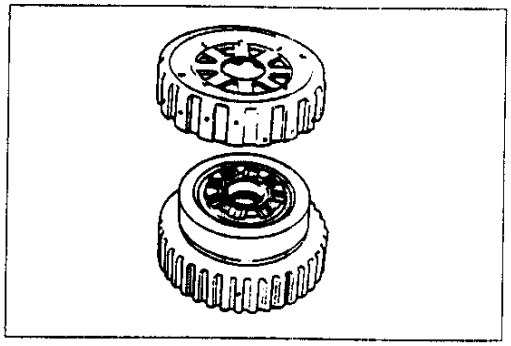


29U0KX-320

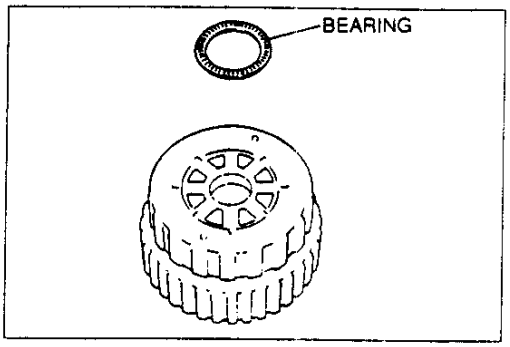
Note

- **Be sure the locating tabs of the thrust washer are set into the holes in the overrunning clutch hub.**

7. Apply petroleum jelly to the thrust washer, and set it in the overrunning clutch hub.


29U0KX-321

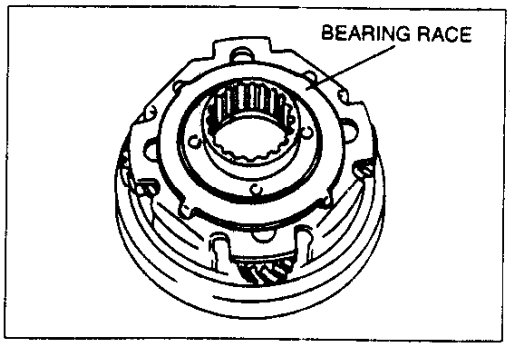
8. Set the overrunning clutch hub on the rear internal gear.



37U0KX-121

9. Apply petroleum jelly to the bearing, and set it on the overrunning clutch hub.

Bearing outer diameter: 59.0 mm {2.32 in}



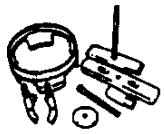
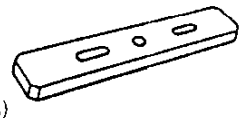
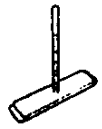
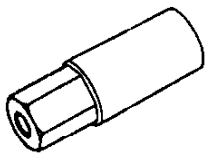
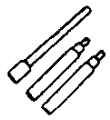
37U0KX-122

10. Apply petroleum jelly to the bearing race, and set it on the front internal gear.

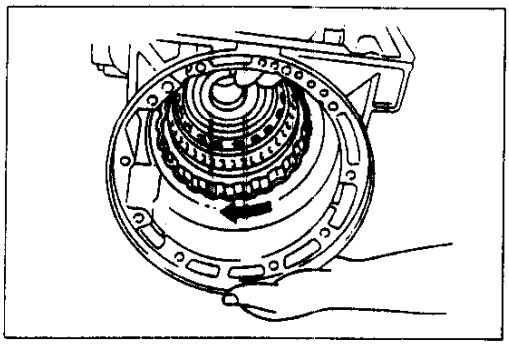
Bearing race outer diameter: 75.0 mm {2.95 in}

FORWARD CLUTCH DRUM (FORWARD CLUTCH, OVERRUNNING CLUTCH, LOW ONE-WAY CLUTCH)

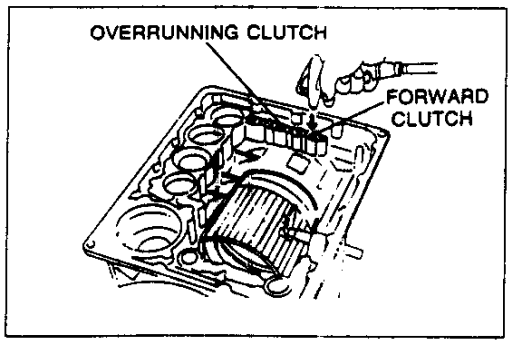
Preparation
SST

49 G019 0A7A Compressor set, return spring 	For removal / installation of snap ring	49 G019 025 Body B (Part of 49 G019 0A7A) 	For removal / installation of snap ring
49 G019 026 Plate (Part of 49 G019 0A7A) 	For removal / installation of snap ring	49 G019 027 Attachment A (Part of 49 G019 0A7A) 	For removal / installation of snap ring
49 G019 029 Nut (Part of 49 G019 0A7A) 	For removal / installation of snap ring	49 L019 001 Bolt 	For removal / installation of snap ring

29U0KX-324



29U0KX-325



37U0KX-123

Preinspection
Low one-way clutch operation

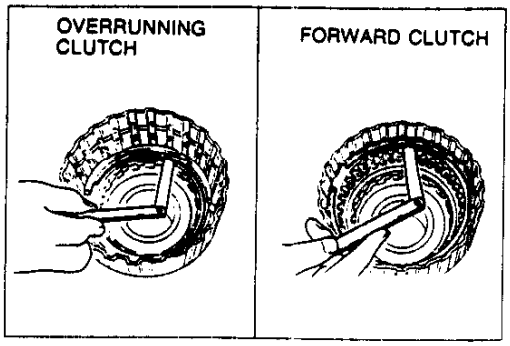
1. Install the forward clutch drum into the transmission case.
2. Verify that the forward clutch drum rotates smoothly when turned clockwise, and locks when turned counterclockwise.
3. If not, replace the one-way clutch.

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.
2. Verify that the retaining plates move toward the snap rings.

Air pressure: 390 kPa {4.0 kgf/cm^2, 57 psi} max.

3. If not, the D-rings or the seal ring may be damaged or fluid may be leaking at the piston check ball. Inspect and replace as necessary when assembling.



37U0KX-124

Clearance between retaining plate and snap ring

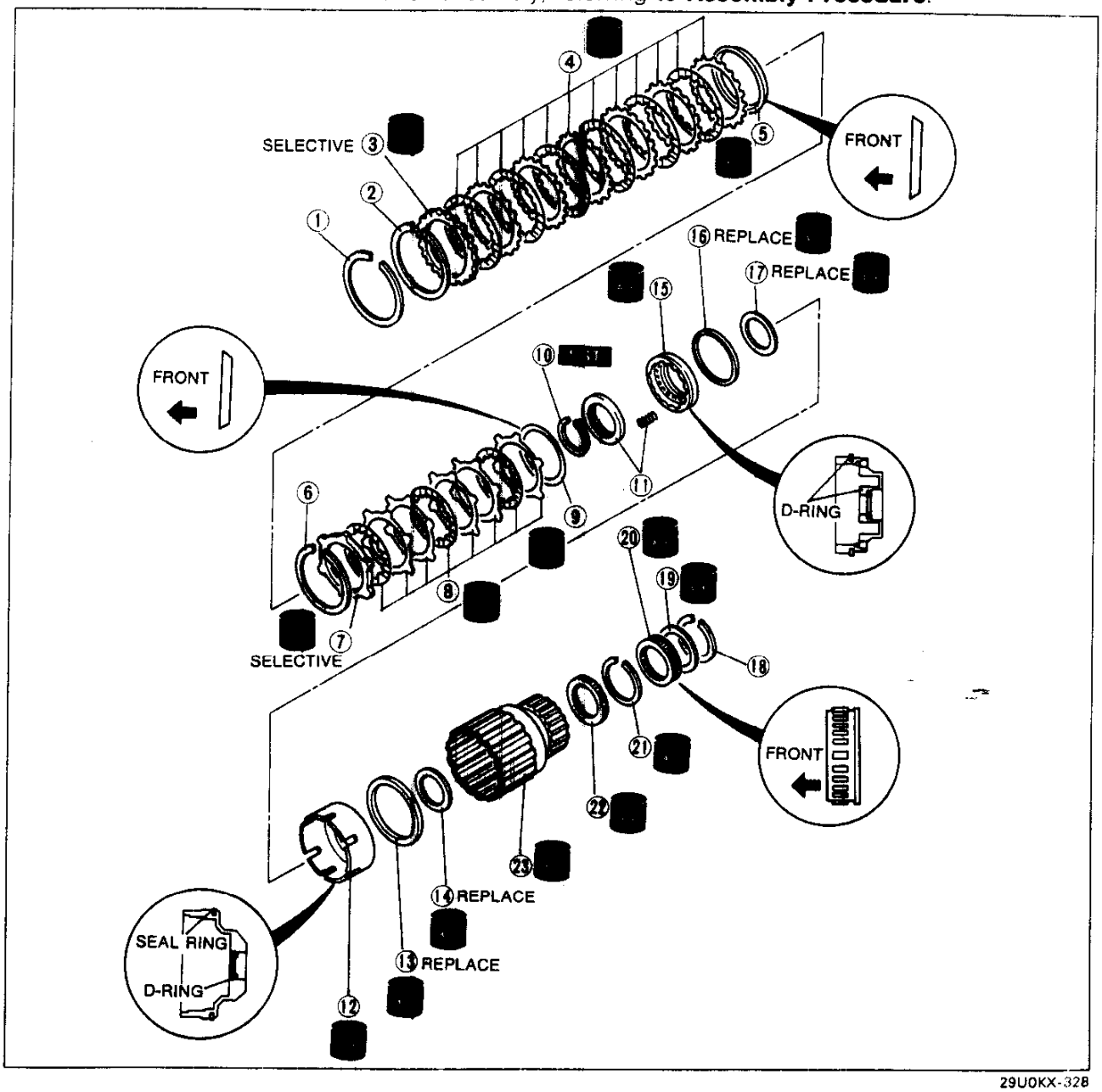
1. Measure the clearance between the retaining plate and the snap ring of the forward clutch and the overrunning clutch.

Clearance
Forward clutch: 0.45–1.85 mm {0.018–0.073 in}
Overrunning clutch: 1.0–2.0 mm {0.039–0.079 in}

2. Select the correct retaining plate when assembling. (Refer to pages K–89, 90.)

Disassembly / Inspection / Assembly

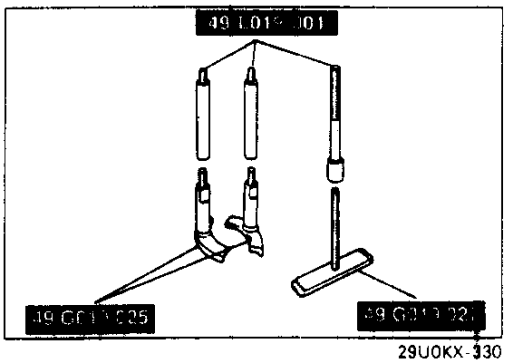
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



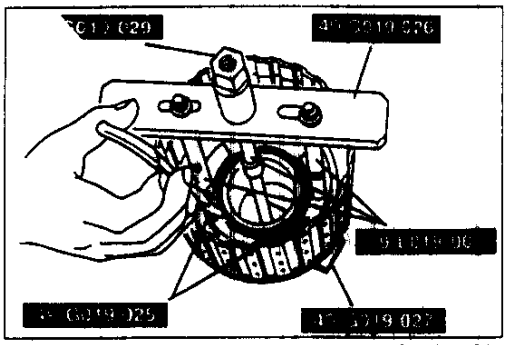
29U0KX-328

1. Snap ring
2. Snap ring
3. Retaining plate
4. Drive plates and driven plates
   Inspect for wear and burning
   Inspection ..... page K–86
5. Dished plate
6. Snap ring
7. Retaining plate
8. Drive plates and driven plates
   Inspect for wear and burning
   Inspection ..... page K–86
9. Dished plate
10. Snap ring
    Disassembly Note ..... below
11. Spring retainer and return springs
    Inspection ..... page K–86
12. Forward clutch piston
    Disassembly Note ..... below
13. Seal ring
14. D-ring
15. Overrunning clutch piston
    Inspect balls for sticking by shaking piston
    Disassembly Note ..... below
    Inspection ..... page K–86
16. D-ring
17. D-ring
18. Snap ring
19. Side plate
20. Low one-way clutch
    Inspection ..... page K–83
21. Snap ring
22. Bearing (radial bearing)
    Inspect for damage and rough rotation
23. Forward clutch drum
    Inspection ..... page K–86

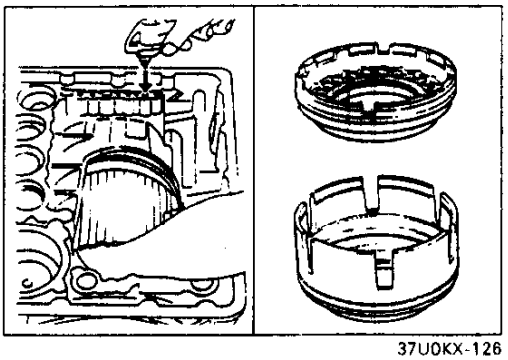
37U0KX-125



29U0KX-330



29U0KX-331



37U0KX-126

Disassembly note
Snap ring

1. Assemble the **SST**.

Caution
- **Depress the spring retainer only enough to remove the snap ring.**
- **Do not damage the snap ring.**

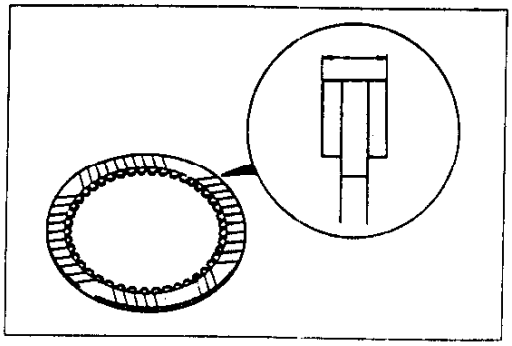
2. Compress the springs by using the **SST**, and remove the snap ring with snap ring pliers.
3. Remove the spring retainer and return springs.

Forward clutch piston, Overrunning clutch piston

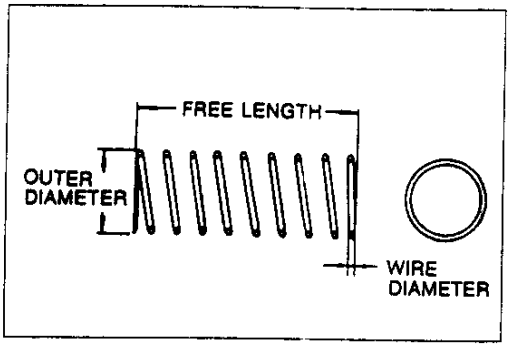
1. Set the forward clutch drum in the transmission case.
2. Remove the piston by applying compressed air through the oil passage.

Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.

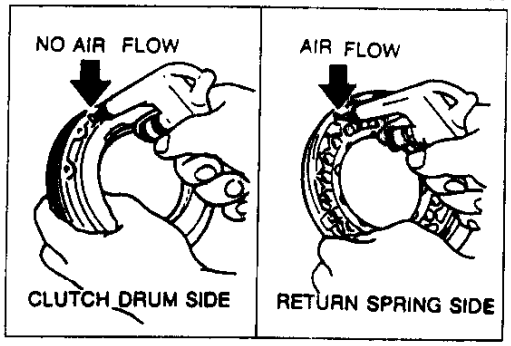
3. Remove the overrunning clutch piston from the forward clutch piston.



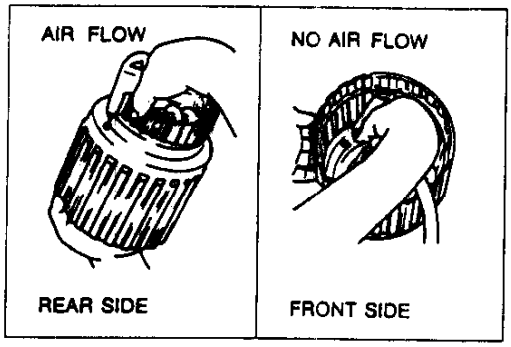
37U0KX-127



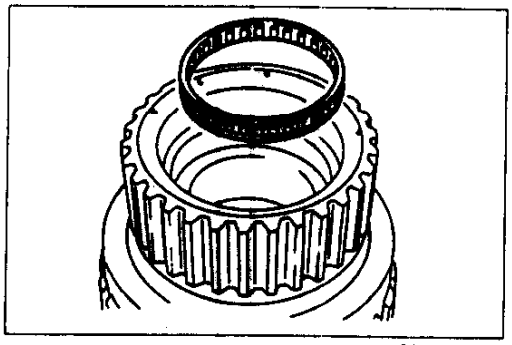
37U0KX-128



37U0KX-128



37U0KX-130



29U0KX-337

Inspection
Drive plates

1. Measure the facing thickness in three places, and calculate the average.

Forward clutch
Standard: 2.0 mm {0.079 in}
Minimum: 1.8 mm {0.071 in}

Overrunning clutch
Standard: 2.0 mm {0.079 in}
Minimum: 1.8 mm {0.071 in}

2. If not within specification, replace the drive plate.

Return springs

1. Measure the spring free length.

Specification

Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
9.7 {0.38}	35.8 {1.41}	10.3	1.3 {0.051}

2. If not within specification, replace the return spring.

Overrunning clutch piston

1. Shake the clutch piston and verify that the check ball is free.
2. Verify that there is no air flow when applying compressed air through the oil hole on the clutch drum side.
3. Verify that there is air flow when applying compressed air through the oil hole on return spring side.

Air pressure: 390 kPa {4.0 kgf/cm^2, 57 psi} max.

Forward clutch drum

1. Verify that there is no air flow when applying compressed air through the oil hole on the front side.
2. Verify that there is air flow when applying compressed air through the oil hole on the rear side.

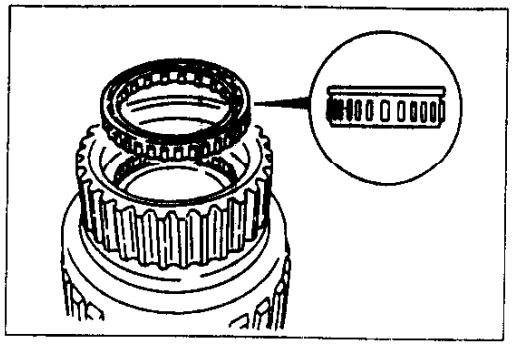
Air pressure: 390 kPa {4.0 kgf/cm^2, 57 psi} max.

Assembly procedure

1. Apply ATF to the bearing and install it into the forward clutch drum.

Caution
- **Do not deform the snap ring.**

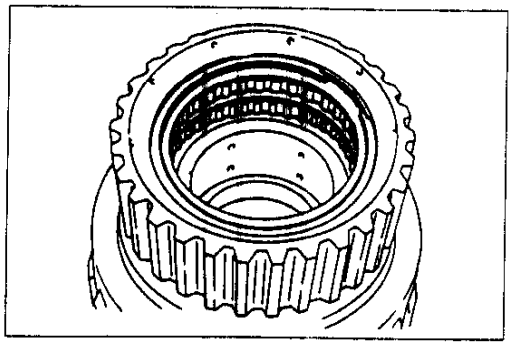
2. Install the snap ring.



29U0KX 338

Caution
- **Install the low one-way clutch with the flange facing upward.**
- **Do not damage the forward clutch drum inner face when installing the low one-way clutch.**

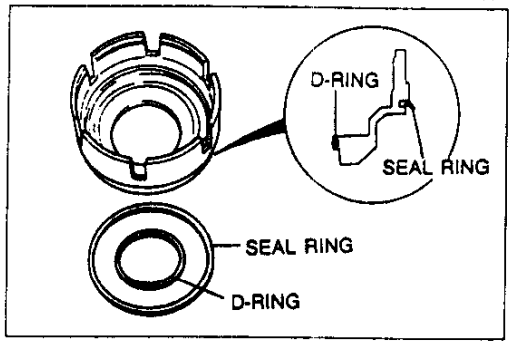
3. Apply ATF to the low one-way clutch, and install it into the forward clutch drum.



29U0KX-339

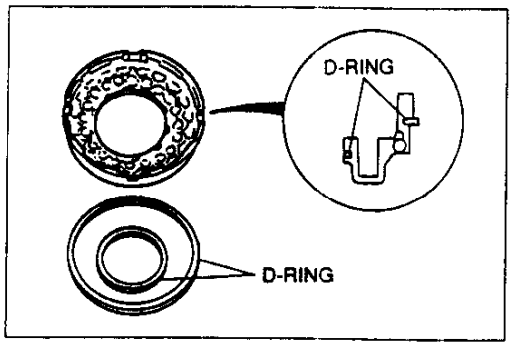
Caution
- **Do not deform the snap ring.**

4. Apply ATF to the side plate and snap ring, and install them into the forward clutch drum.



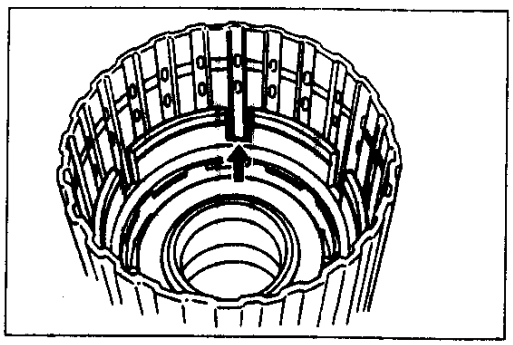
29U0KX-340

5. Apply ATF to a new D-ring and seal ring, and install them into the forward clutch piston as shown.



29U0KX-341

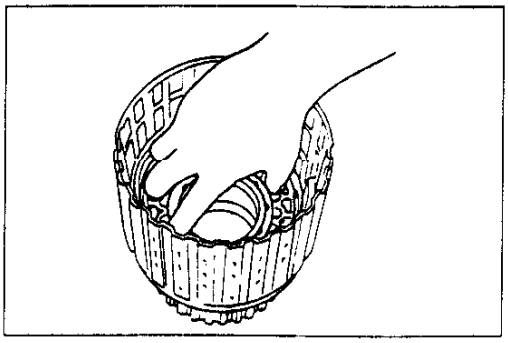
6. Apply ATF to the new D-rings, and install them to the overrunning clutch piston as shown.



29U0KX-342

Caution
- **Apply even pressure to the perimeter of the piston when installing it to avoid damaging the seal ring and D-ring.**
- **If the piston cannot be turned by hand, remove the piston and check for damage to the seal ring.**

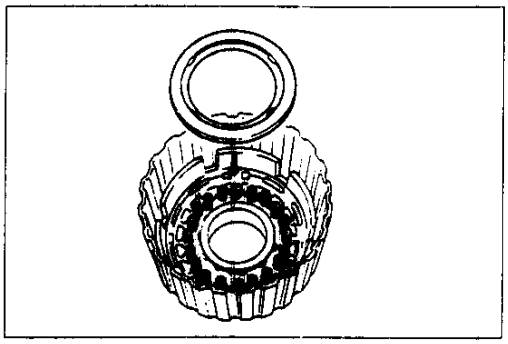
7. Apply ATF to the inner face of the forward clutch drum and to the forward clutch piston.
8. Install the forward clutch piston in the forward clutch drum by turning it evenly and gradually. Align the notches in the forward clutch piston with the grooves in forward clutch drum.



29U0KX-343

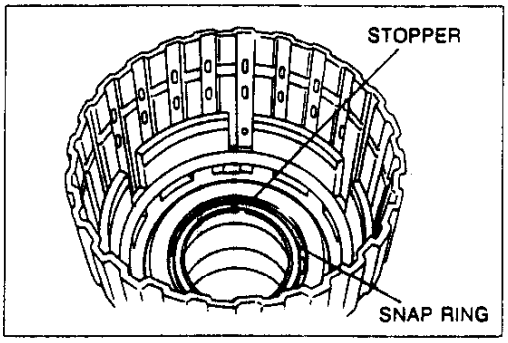
Caution
- **Apply even pressure to the perimeter of the piston when installing it to avoid damaging the D-rings.**

9. Apply ATF to the inner face of the forward clutch piston and to the overrunning clutch piston.
10. Install the overrunning clutch piston in the forward clutch piston by turning it evenly and gradually.



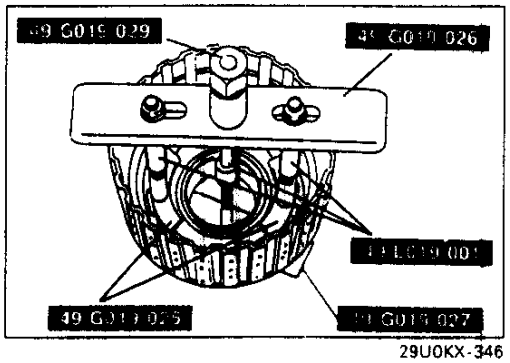
29U0KX-344

11. Install the return springs and spring retainer.



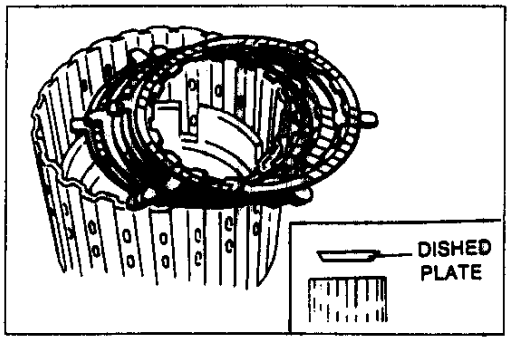
29U0KX-345

Caution
- **Depress the spring retainer only enough to install the snap ring.**
- **Do not overexpand the snap ring.**
- **Install the snap ring inside the stopper of the spring retainer.**
- **Do not align the snap ring endgap with the spring retainer stopper.**



29U0KX-346

12. Install the snap ring while compressing the springs by using the **SST**.

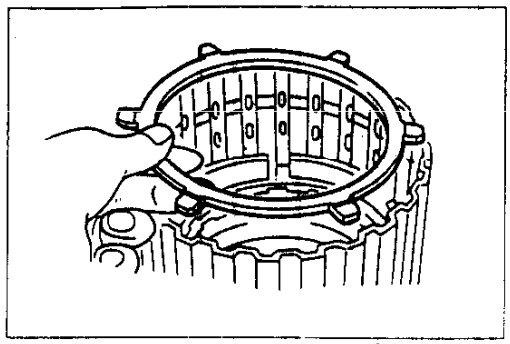


29U0KX-347

13. Install the dished plate as shown.

Note
- **Installation order: Driven-Drive-Driven-Driven-Drive-Driven-Driven-Drive**
- **Soak new drive plates in ATF for at least two hours before installation.**

14. Apply ATF to the drive plates and driven plates, and install them into the forward clutch piston.

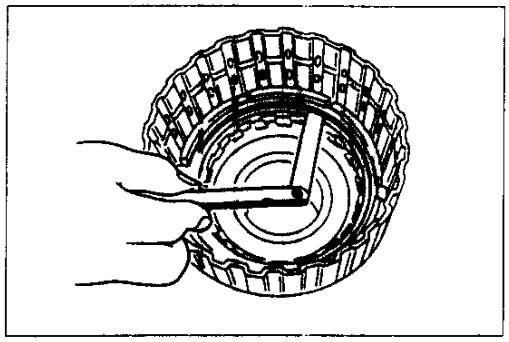


29U0KX-348

15. Install the retaining plate.

Caution
- **Do not deform the snap ring.**

16. Install the snap ring.



37U0KX-131

17. Measure the clearance between the retaining plate and the snap ring by using a feeler gauge

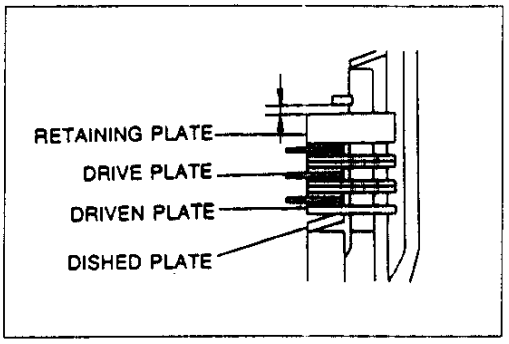
Clearance: 1.0–2.0 mm {0.039–0.079 in}

18. If not within specification, adjust the clearance by selecting the correct retaining plate.

Retaining plate size

mm {in}

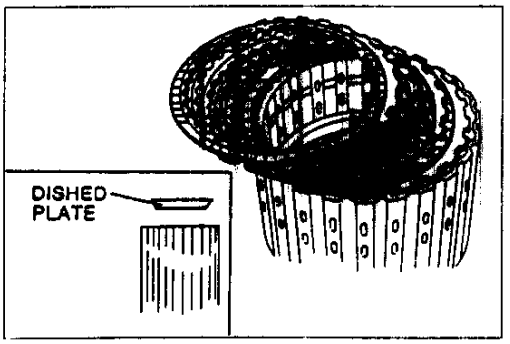
4.0 {0.157}	4.2 {0.165}	4.4 {0.173}	4.6 {0.181}
4.8 {0.189}	5.0 {0.197}	5.2 {0.205}	–



37U0KX-132

19. 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 selecting the correct retaining plate.

Clearance: 1.0–1.4 mm {0.039–0.055 in}

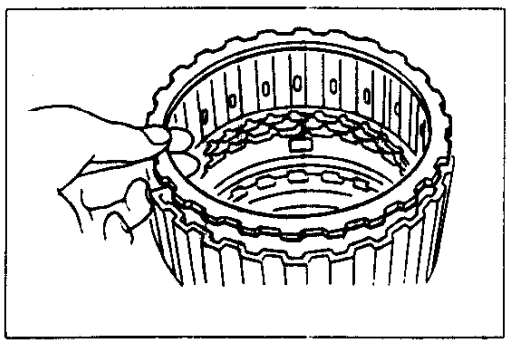


37U0KX-133

20. Install the dished plate as shown.

Note
- **Installation order:**
  Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive
- **Soak new drive plates in ATF for at least two hours before installation.**

21. Apply ATF to the drive plates and driven plates, and install them into the forward clutch drum.

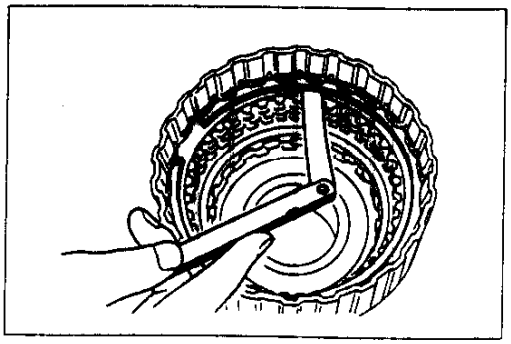


29U0KX-352

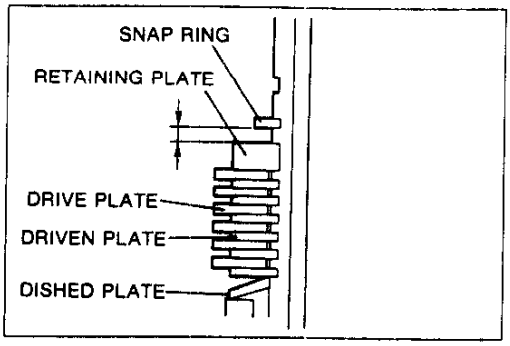
22. Install the retaining plate.

Caution
- **Do not deform the snap ring.**

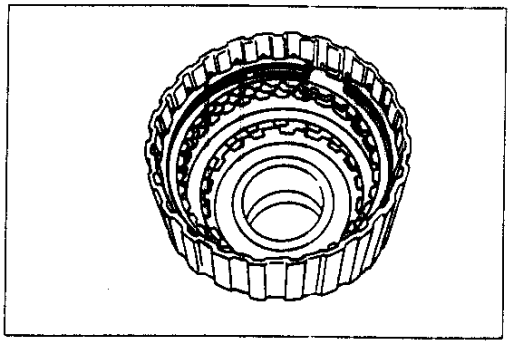
23. Install the snap ring.



37U0KX-134



37U0KX-135



29U0KX-355

24. Measure the clearance between the retaining plate and the snap ring by using a feeler gauge. If not within specification, adjust the clearance by selecting the correct retaining plate.

Clearance: 0.45–1.85 mm {0.018–0.073 in}

Retaining plate size

mm {in}

8.0 {0.315}	8.2 {0.323}	8.4 {0.331}	8.6 {0.339}
8.8 {0.346}	9.0 {0.354}	9.2 {0.362}	–

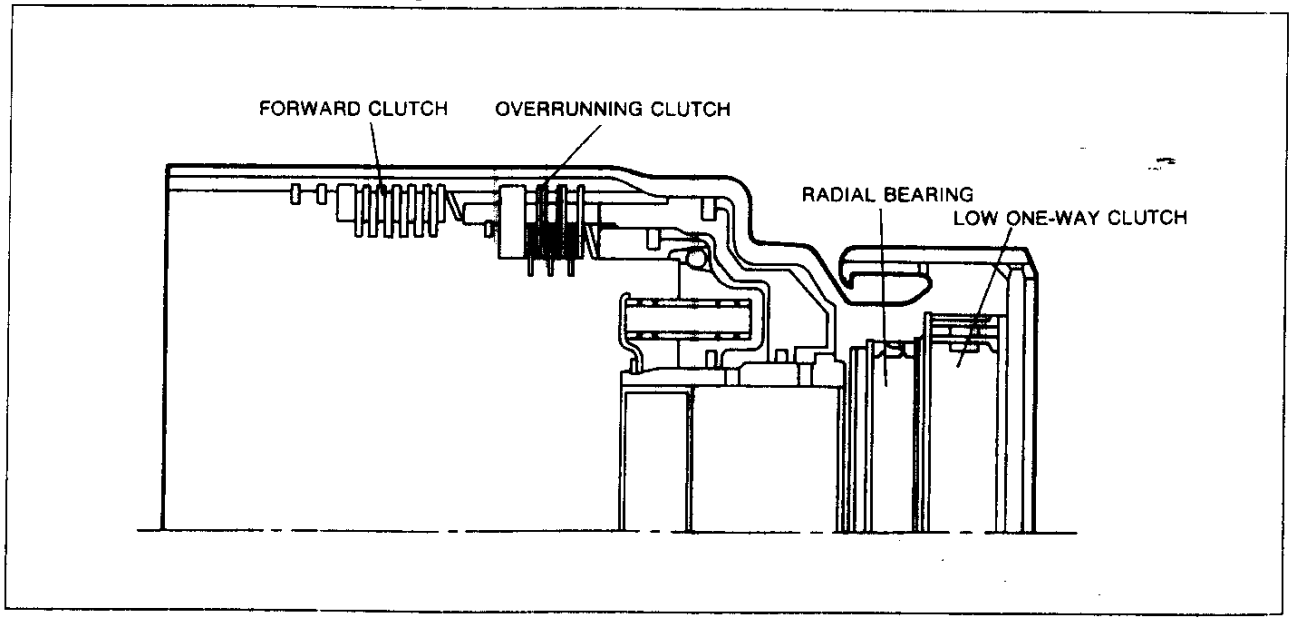
25. If the clearance cannot be brought to within specification after installation of the thickest retaining plate, replace the dished plate, driven plates, and drive plates.
Adjust the clearance by selecting the correct retaining plate.

Clearance: 0.45–0.85 mm {0.018–0.033 in}

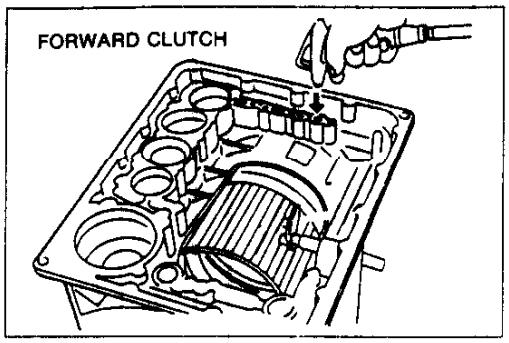
Caution
- **Do not deform the snap ring.**

26. Install the snap ring.

Illustration of proper assembly



29U0KX-356

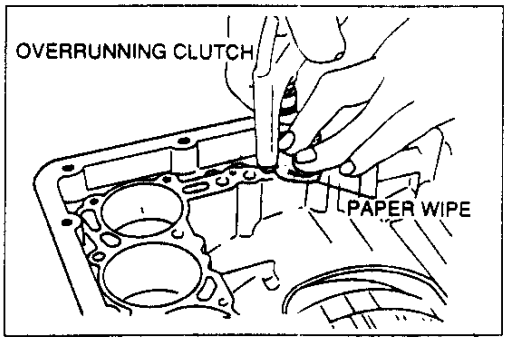


37U0KX-136

Caution
- **Apply air for no more than 3 seconds.**

27. Set the forward clutch drum in the transmission.
28. Apply compressed air through the oil passage as shown, and verify the forward clutch operation.

Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.

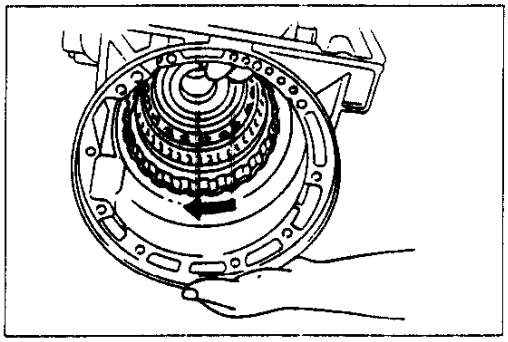


37U0KX-137

Note
- **Use a paper wipe to block the oil passage.**

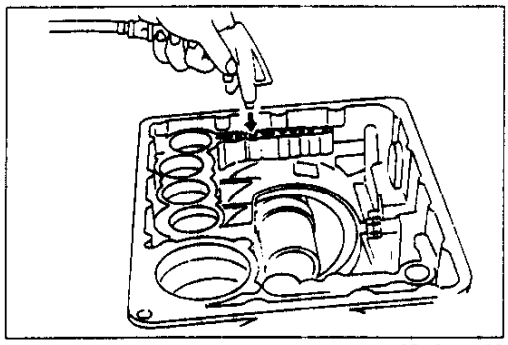
29. Apply compressed air through the oil passage as shown, and check the overrunning clutch operation.

Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.


29U0KX-359

30. Verify that the forward clutch drum turns clockwise only.

Note
- **If it turns counterclockwise, the one-way clutch has been installed upside down.**


37U0KX-138

LOW AND REVERSE BRAKE

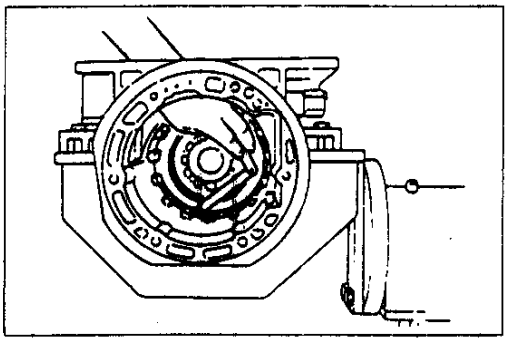
Preinspection

Low and reverse brake operation

1. Apply compressed air through the oil passage as shown.
2. Verify that the retaining plate moves toward the snap ring.

Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.

3. If not, the D-ring or the seal ring may be damaged or fluid may be leaking at the piston check ball. Inspect and replace as necessary when assembling.


37U0KX-139

Clearance between retaining plate and snap ring

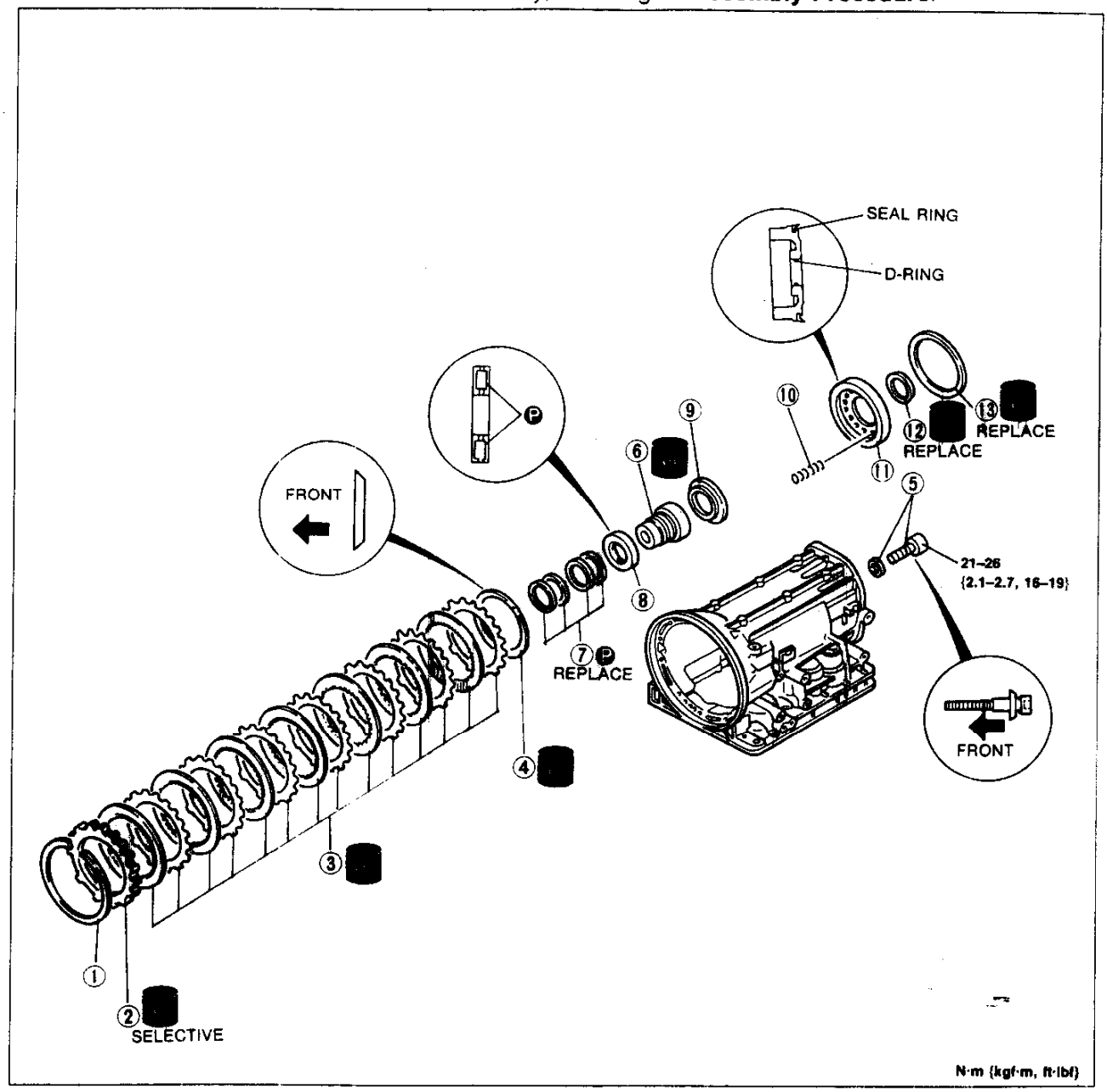
1. Measure the clearance between the retaining plate and the snap ring.

Clearance: 0.8–2.6 mm {0.031–0.102 in}

2. Select the correct retaining plate when assembling. (Refer to page K–95.)

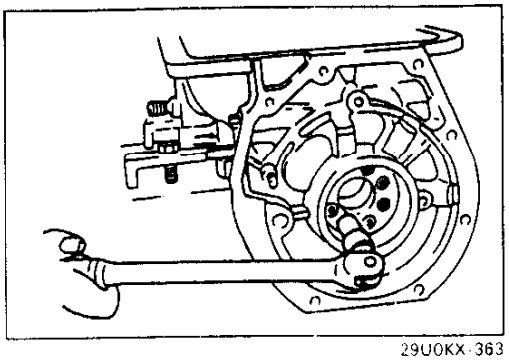
Disassembly / Inspection / Assembly

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



37U0KX-140

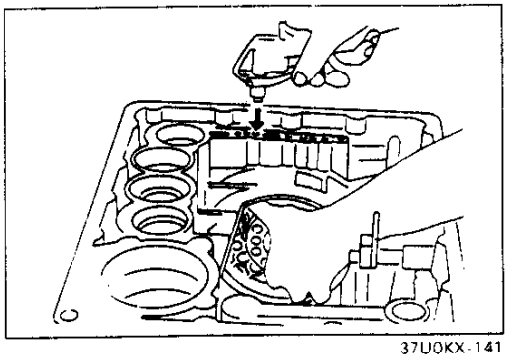
1. Snap ring
2. Retaining plate
3. Drive plates and driven plates
   Inspect for damage and burning
   Inspection ..... page K–93
4. Dished plate
5. Allen-head bolts and washers
6. Low one-way clutch inner race
   Disassembly Note ..... page K–93
   Inspection ..... page K–93
7. Seal rings
8. Bearing
   Inspect for damage and rough rotation
9. Spring retainer
10. Return springs
    Inspection ..... page K–93
11. Low and reverse brake piston
    Inspect balls for sticking by shaking piston
    Disassembly Note ..... page K–93
12. D-ring
13. Seal ring


29U0KX-363

Disassembly note
Low one-way clutch inner race

Caution
- **Do not allow the spring retainer to jump out when removing the low one-way clutch inner race.**

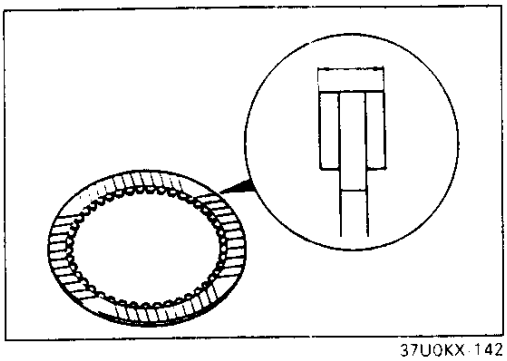
Remove the Allen-head bolts, washers, and low one-way clutch inner race.


37U0KX-141

Low and reverse brake piston

Remove the low and reverse brake piston by applying compressed air through the oil passage as shown.

Air pressure: 390 kPa {4.0 kgf/cm^2, 57 psi} max.

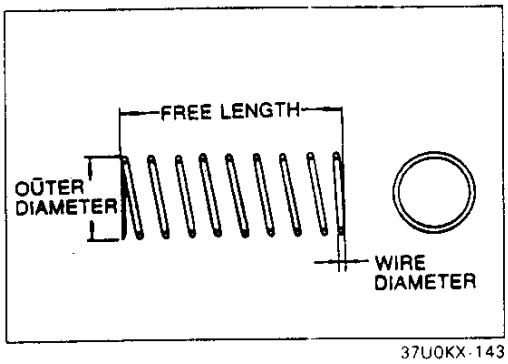

37U0KX-142

Inspection
Drive plates

1. Measure the facing thickness in three places, and calculate the average.

Thickness
Standard: 2.0 mm {0.079 in}
Minimum: 1.8 mm {0.071 in}

2. If not within specification, replace the drive plate.



37U0KX-143

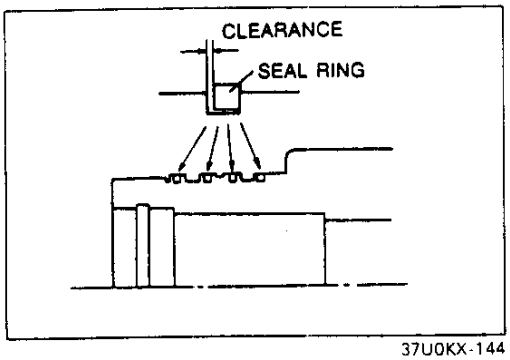
Return springs

1. Measure the spring free length.

Specification

Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
11.6 {0.457}	22.3 {0.878}	5.2	1.2 {0.047}

2. If not within specification, replace the return spring.



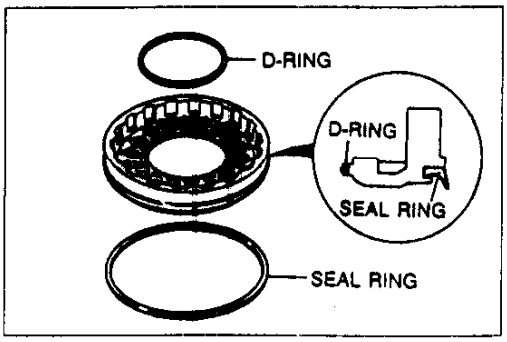
37U0KX-144

Low one-way clutch inner race

1. Apply petroleum jelly to new seal rings and install them to the one-way clutch inner race.
2. Measure the clearance between each seal ring and ring groove.

Standard clearance:
0.10–0.25 mm {0.004–0.010 in}
Maximum clearance: 0.25 mm {0.010 in}

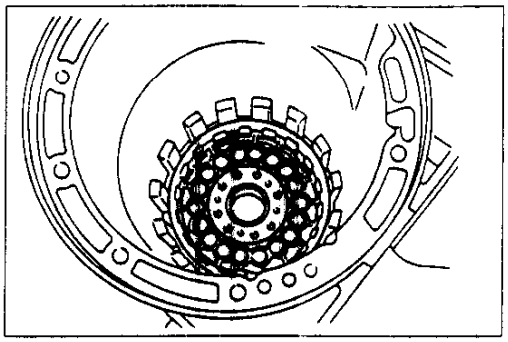
3. If not within specification, replace the low one-way clutch inner race.



29U0KX-368

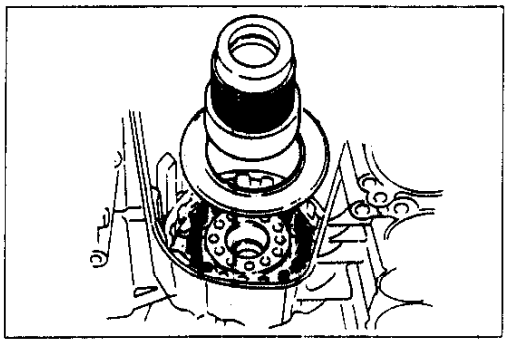
Assembly procedure

1. Apply ATF to a new D-ring and seal ring and install them to the low and reverse brake piston.

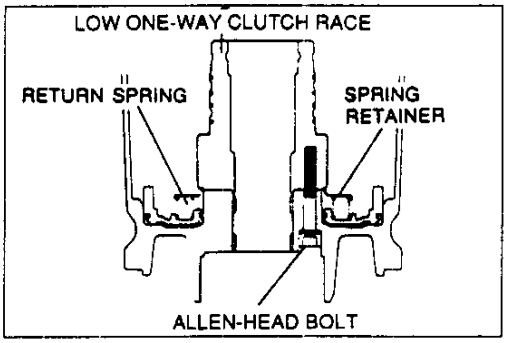

29U0KX-369

Caution
- **Apply even pressure to the perimeter of the brake piston when installing it to avoid damaging the D-ring and seal ring.**
- **If the piston cannot be turned by hand, remove it and check for damage to the seal ring.**

2. Apply ATF to the inner face of the transmission case.
3. Install the low and reverse brake piston in the transmission case by turning it evenly and gradually.

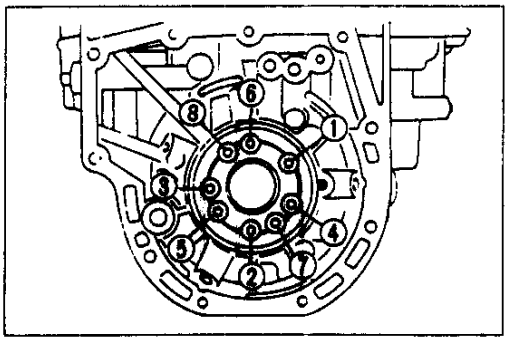

29U0KX-370

4. Set the return springs, spring retainer, and low one-way clutch inner race into the transmission case.



29U0KX-371

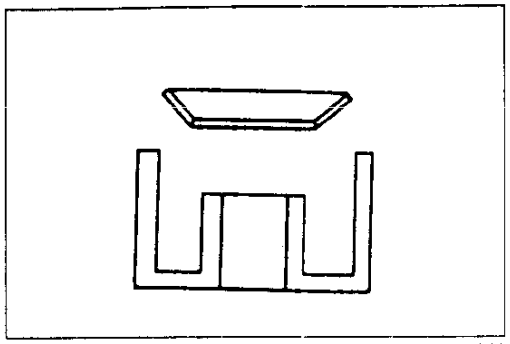
5. Verify that the return springs, spring retainer, and low one-way clutch inner race are properly positioned.



29U0KX-145

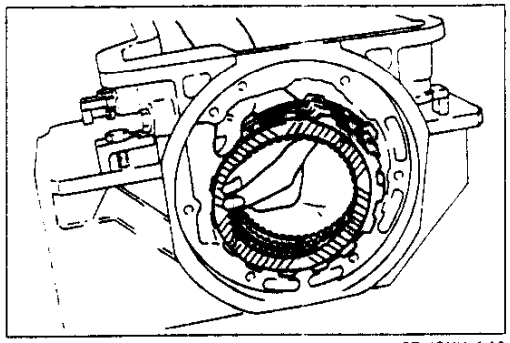
6. Tighten the Allen-head bolts evenly and gradually in the order shown.

Tightening torque:
21–26 N·m {2.1–2.7 kgf·m, 16–19 ft·lbf}



29U0KX-373

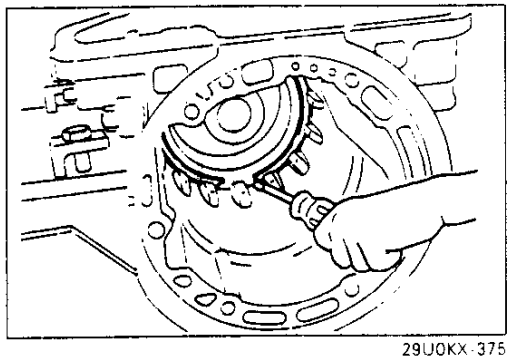
7. Install the dished plate as shown.



37U0KX-146

Note
- **Installation order:**
  Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive
- **Soak new drive plates in ATF for at least two hours before installation.**

8. Apply ATF to the drive plates and driven plates, and install them into the transmission case.

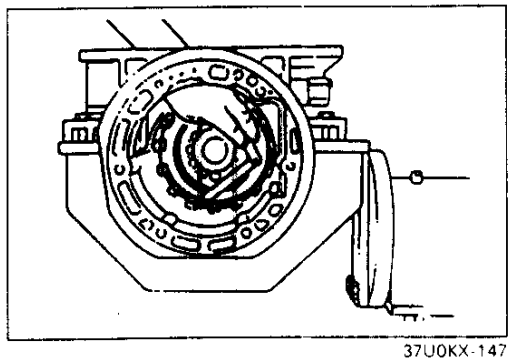


29U0KX-375

9. Install the retaining plate.

Caution
- **Do not deform the snap ring.**

10. Install the snap ring.



37U0KX-147

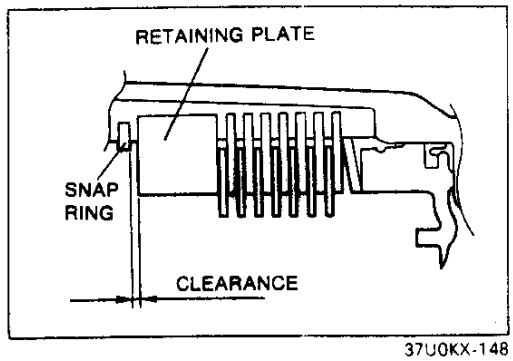
11. Measure the clearance between the retaining plate and the snap ring by using a feeler gauge. If not within specification, adjust the clearance by selecting the correct retaining plate.

Clearance: 0.8–2.6 mm {0.031–0.102 in}

Retaining plate size

mm {in}

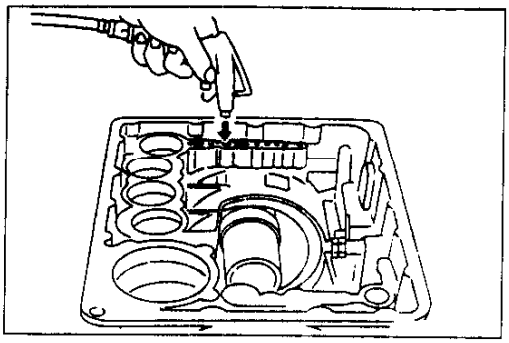
6.2 {0.244}	6.4 {0.252}	6.6 {0.260}	6.8 {0.268}
7.0 {0.276}	7.2 {0.283}	7.4 {0.291}	7.6 {0.299}
7.8 {0.307}	8.0 {0.315}	–	–



37U0KX-148

12. 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 selecting the correct retaining plate.

Clearance: 0.8–1.2 mm {0.031–0.047 in}

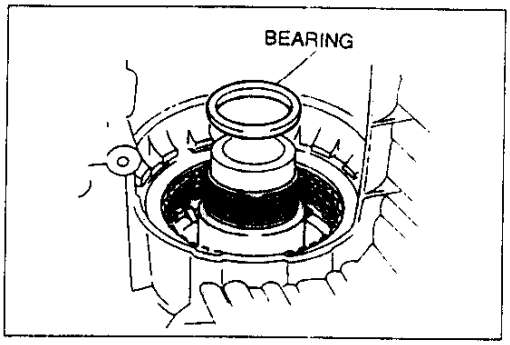


37U0KX-149

Caution
- **Apply air for no more than 3 seconds.**

13. Verify operation of the piston by applying compressed air through the oil passage of the low and reverse brake as shown.

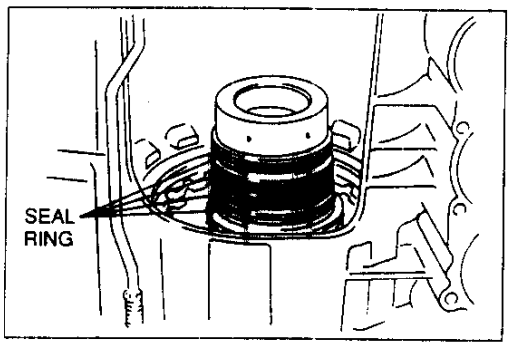
Air pressure: 390 kPa {4.0 kgf/cm², 57 psi} max.



37U0KX-150

14. Apply petroleum jelly to the bearing, and install it on the low one-way clutch inner race with the black surface facing downward.

Bearing outer diameter: 78.1 mm {3.07 in}



29U0KX-380

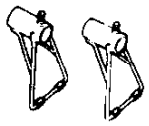
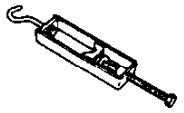
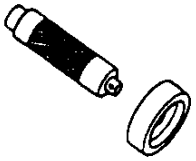
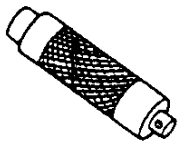
Caution
- **Do not overexpand the seal rings when installing them.**

Note
- **Press the seal rings down into the petroleum jelly to hold them.**

15. Apply petroleum jelly to the seal rings and install them onto the low one-way clutch inner race.

EXTENSION HOUSING / PARKING MECHANISM

Preparation
SST

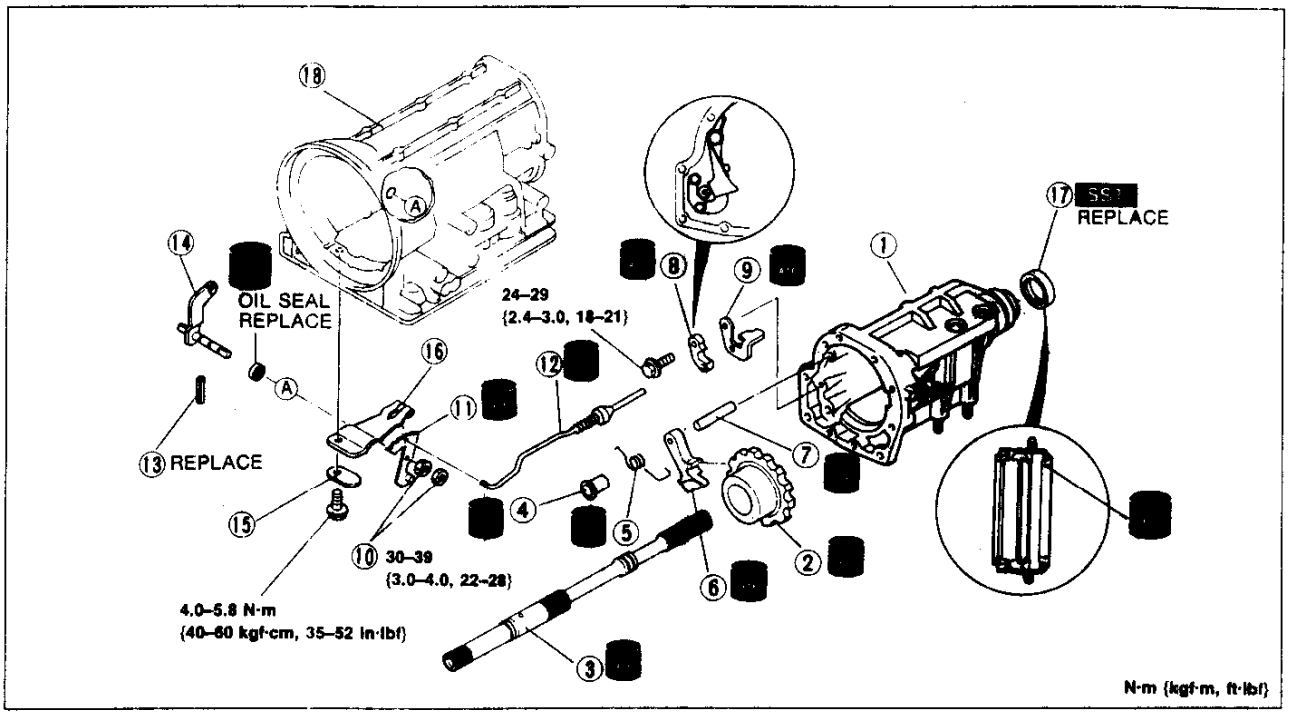
49 G017 5A0 Support, engine 	For support of engine	49 G017 501 Bar (Part of 49 G017 5A0) 	For support of engine
49 G017 502 Support (Part of 49 G017 5A0) 	For support of engine	49 G017 503 Hook (Part of 49 G017 5A0) 	For support of engine
49 G030 795 Installer, oil seal 	For installation of oil seal	49 G030 797 Handle (Part of 49 G030 795) 	For installation of oil seal
49 F019 001 Installer, oil seal 	For installation of oil seal		

37U0KX-151

Disassembly / Inspection / Assembly

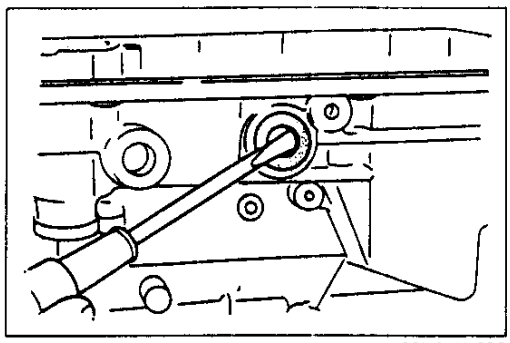
Caution
- **Do not remove the oil seals unless necessary to do so for repairs.**

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



29U0KX-382

1. Extension housing
2. Parking gear
   Inspect gear teeth for damage and wear
   Inspect bearing for rough rotation
3. Output shaft
   Inspect splines for damage and wear
4. Parking pawl spacer
5. Return spring
6. Parking pawl
7. Parking pawl shaft
8. Parking actuator
9. Parking rod guide
10. Locknuts
11. Manual plate
12. Parking rod
13. Roll pin
14. Manual shaft
15. Spacer
16. Detent spring
    Inspect for fracture and wear
17. Oil seal (extension housing)
18. Transmission case
    Inspection
    a) Damage and wear of oil seal
       Disassembly Note ..... below
    b) Damage and rough rotation of inner bearing

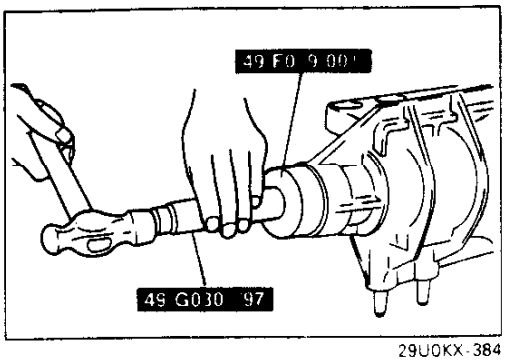


29U0KX-383

Disassembly note
Oil seal (transmission side)

Caution
- **Do not remove the oil seal unless necessary.**
- **Do not scratch the inside of the transmission case.**

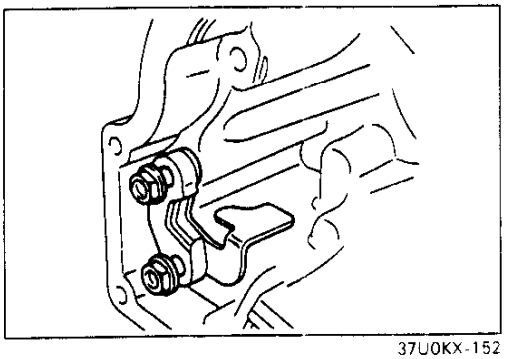
Remove the oil seal by using a screwdriver.



29U0KX-384

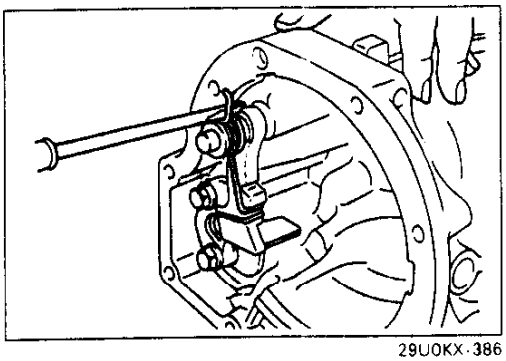
Assembly procedure

1. Apply ATF to the lip of the new oil seal.
2. Install the oil seal by using the **SST**.

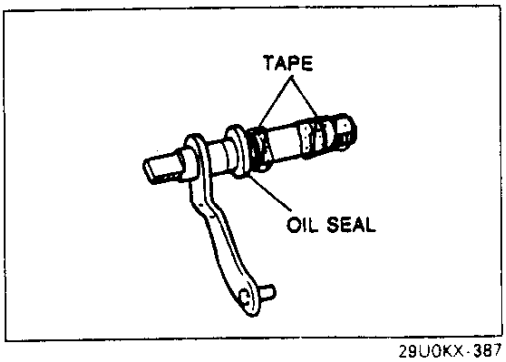

37U0KX-152

3. Apply ATF to the parking rod guide and parking actuator and install them in the extension housing.

Tightening torque:
24–29 N·m {2.4–3.0 kgf·m, 18–21 ft·lbf}

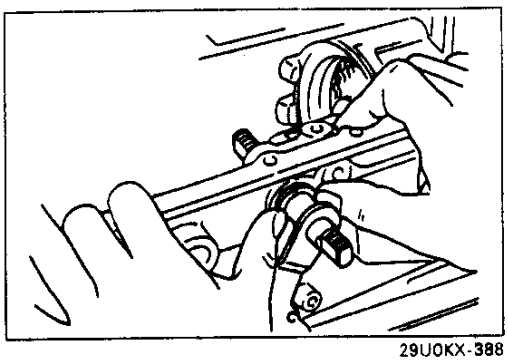

29U0KX-386

4. Apply ATF to the parking pawl shaft and install it in the extension housing.
5. Apply ATF to the parking pawl, return spring, and spacer. Install them in the extension housing.

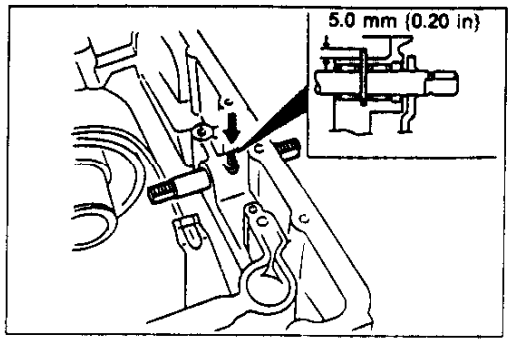


29U0KX-387

6. Wrap the threads of the manual shaft with tape.
7. Apply ATF to the lip of a new oil seal and install it onto the manual shaft.

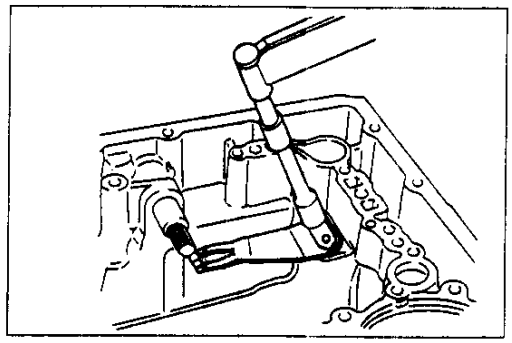

29U0KX-388

8. Apply ATF to the bearing in the transmission case.
9. Install the manual shaft into the transmission case.
10. Push the oil seal squarely into the transmission case.
11. Remove the tape.



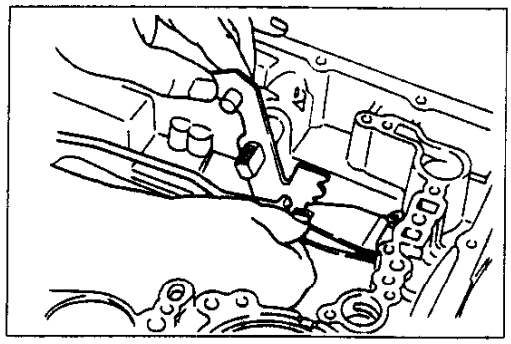
29U0KX-389

12. Align the groove in manual shaft with the roll pin hole. Tap the roll pin into the case as shown in the figure.

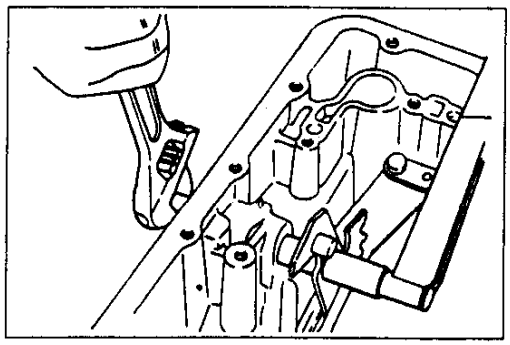

37U0KX-153

13. Install the detent spring and spacer.

Tightening torque:
4.0–5.8 N·m {40–60 kgf·cm, 35–52 in·lbf}


29U0KX-391

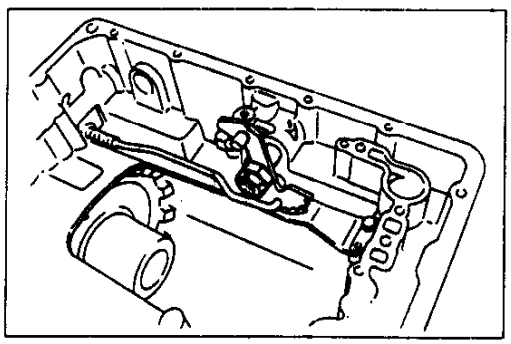
14. Install the manual plate and parking rod.


37U0KX-154

Caution
- **When tightening the locknuts, hold the manual shaft as shown.**

15. Tighten the locknuts.

Tightening torque:
30–39 N·m {3.0–4.0 kgf·m, 22–28 ft·lbf}


29U0KX-393

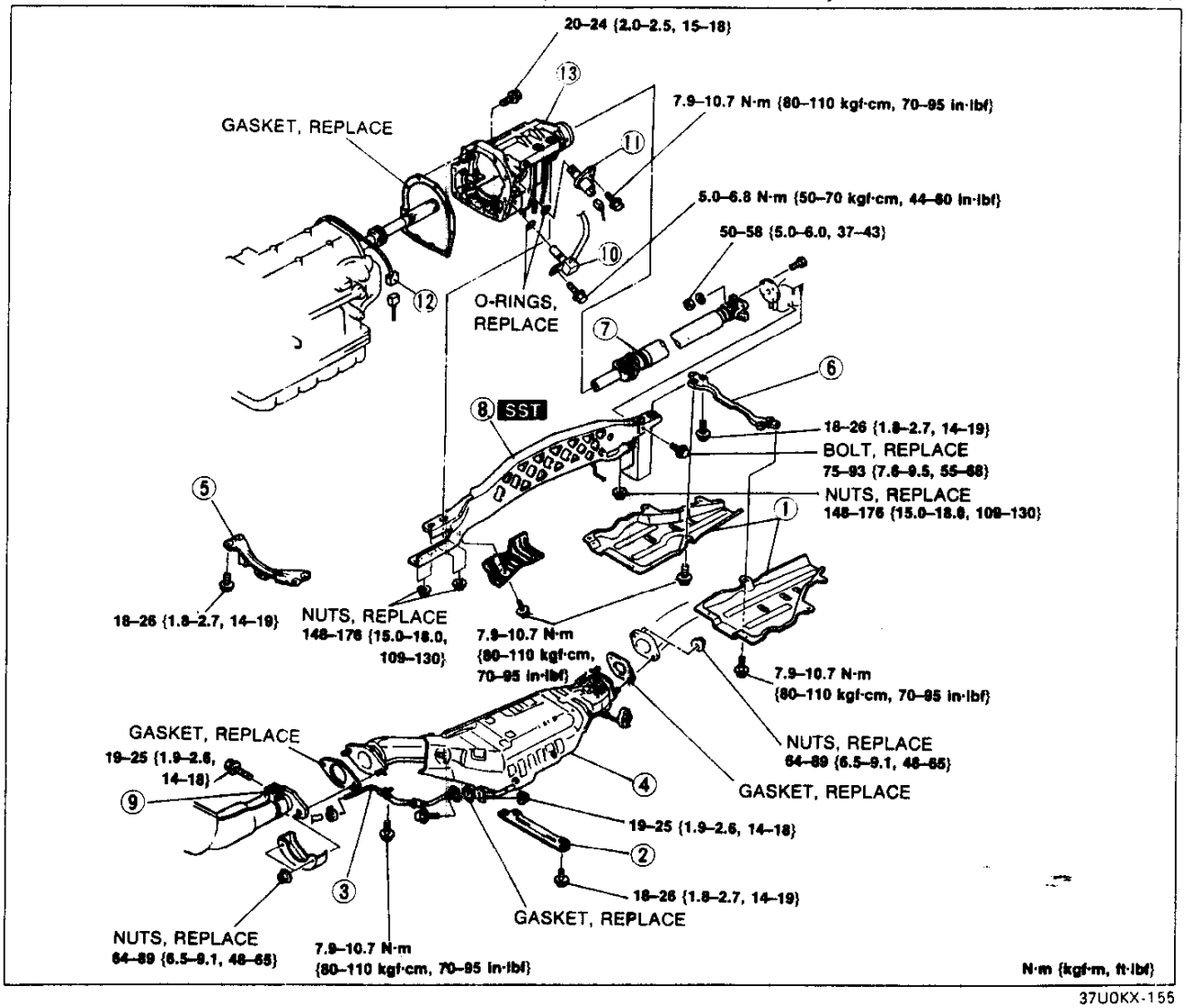
16. Verify operation of the parking mechanism.

On-Vehicle Removal / Installation

Caution

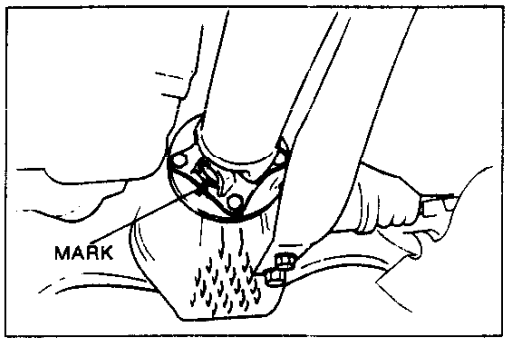
- **Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvent before removal.**

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install the reverse order of removal, referring to **Installation Note**.
4. Perform the following after installation of the extension housing.
   (1) Connect the negative battery cable.
   (2) Check the ATF level and add ATF to specification, if necessary.



37U0KX-155

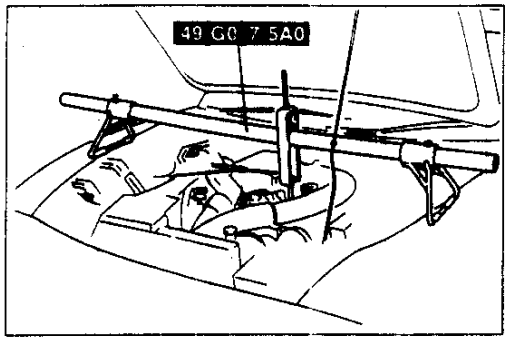
1. Undercover (right and left)
2. Tunnel member (center)
3. Secondary air injection pipe
4. Catalytic converter assembly
5. Tunnel member (front)
6. Tunnel member (rear)
7. Propeller shaft
   Removal Note ..... page K–102
   Installation Note ..... page K–103
8. Power plant frame (PPF)
   Removal Note ..... page K–102
   Installation Note ..... page K–102
9. Front exhaust pipe bracket
10. Speed sensor 1
11. Speed sensor 2
12. Solenoid valve connector
13. Extension housing
    Installation Note ..... page K–102



37U0KX-156

Removal note
Propeller shaft

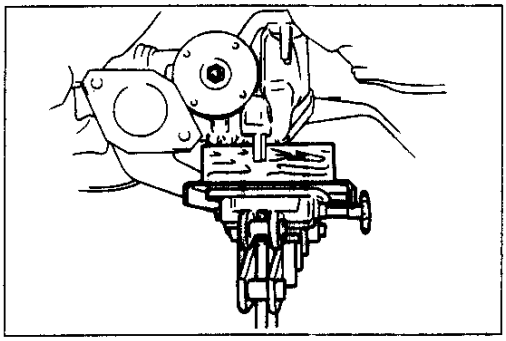
1. Mark the flange for proper reassembly.
2. Remove the propeller shaft.



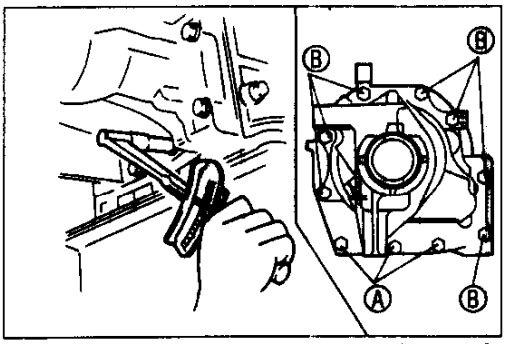
37U0KX-157

Power plant frame (PPF)

1. Hold the engine with the **SST**.


37U0KX-158

2. Hold the differential with the transmission jack.
3. Remove the PPF.



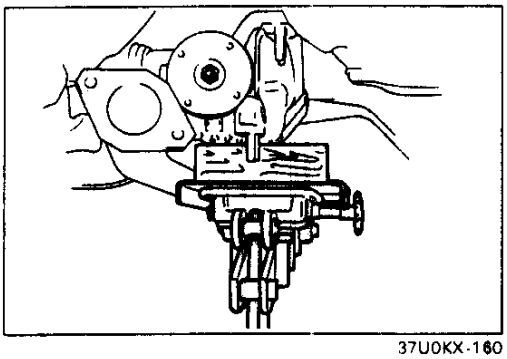
37U0KX-159

Installation note
Extension housing

1. Install a new gasket on the transmission case.
2. Install the extension housing.

Bolt length (measured from below the head):
A: 30 mm {1.18 in}
B: 45 mm {1.77 in}

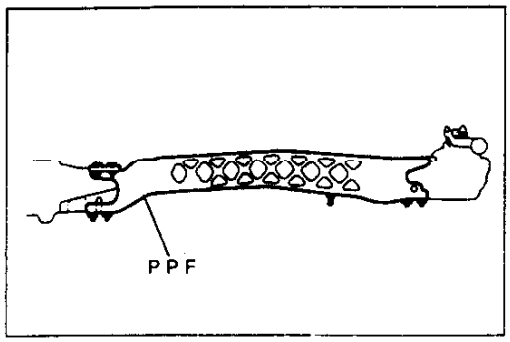
Tightening torque:
20–24 N·m {2.0–2.5 kgf·m, 15–18 ft·lbf}


37U0KX-160

Power plant frame (PPF)

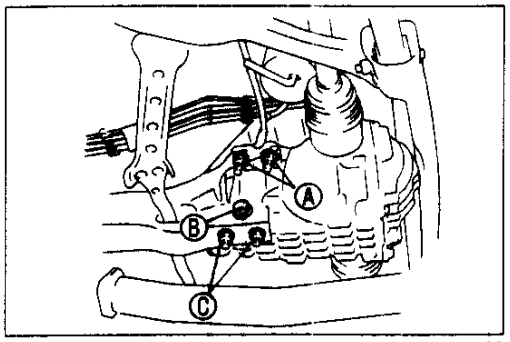
Caution
- **Do not reuse PPF installation bolt and nuts.**

1. Hold the differential at a 0° angle by using the transmission jack.



37U0KX-161

2. Hold the PPF in place with a new bolt and nuts.

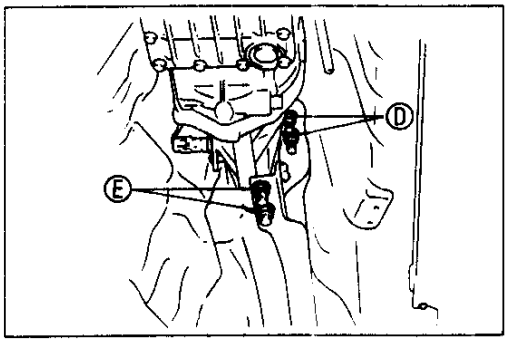


37U0KX-162

Caution
- **Tighten the differential-side PPF installation bolt and nuts first.**

3. Tighten the differential-side PPF installation bolt and nuts in the order A, B, C.

Tightening torque:
A, C: 148–176 N·m {15.0–18.0 kgf·m, 109–130 ft·lbf}
B: 75–93 N·m {7.6–9.5 kgf·m, 55–68 ft·lbf}

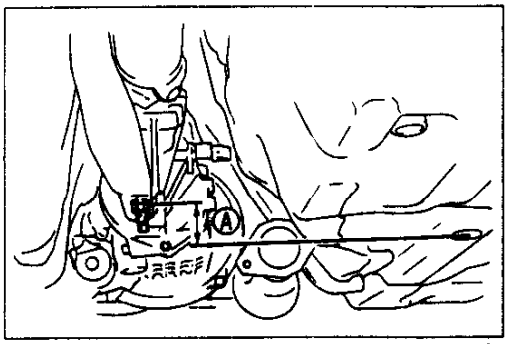


37U0KX-163

4. Tighten the transmission-side PPF installation nuts in the order D, E.

Tightening torque:
148–176 N·m {15.0–18.0 kgf·m, 109–130 ft·lbf}

5. Remove the transmission jack.



37U0KX-164

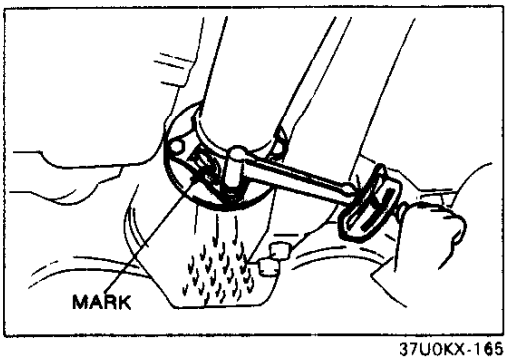
6. Measure A as shown in the figure.

Specification
Right side: 73.0 mm {2.87 in} min.
Left side : 75.0 mm {2.95 in} min.

Note
- **When measuring with a straight edge placed on both the right and left sides, the clearance should be 74.0 mm {2.91 in} minimum.**

7. If not within specification, readjust the PPF.

Propeller shaft



37U0KX-165

Caution
- **Align the mark.**

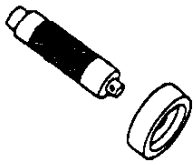
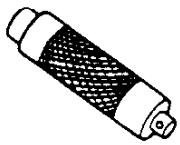
Install the propeller shaft.

Tightening torque:
50–58 N·m {5.0–6.0 kgf·m, 37–43 ft·lbf}

OIL SEAL (EXTENSION HOUSING)

Preparation

SST

40 G030 795 Installer, oil seal 	For installation of oil seal	40 G030 797 Handle (Part of 49 G030 795) 	For installation of oil seal
40 F019 001 Installer, oil seal 	For installation of oil seal		

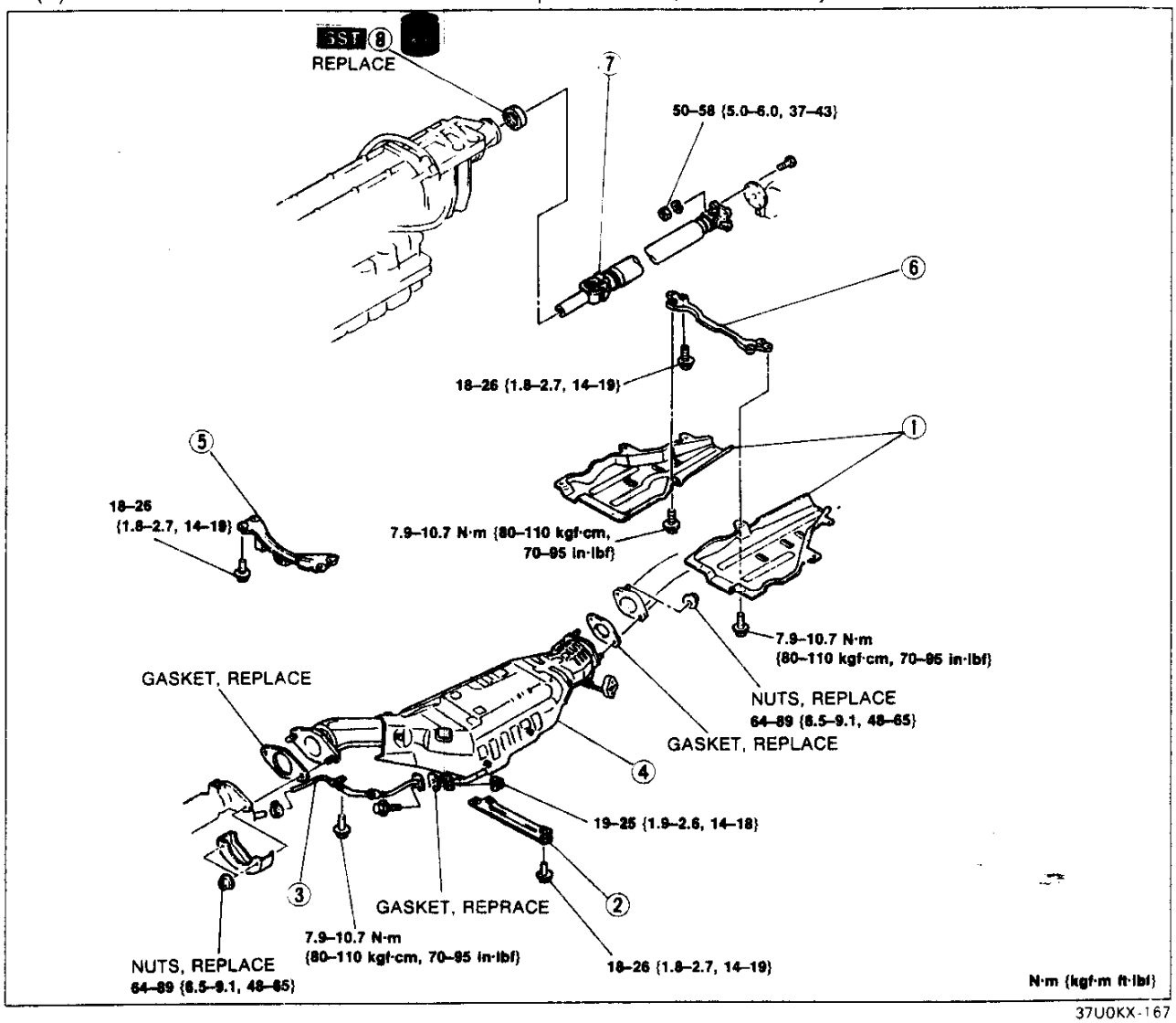
370U0KX-166

On-Vehicle Removal / Installation

Caution

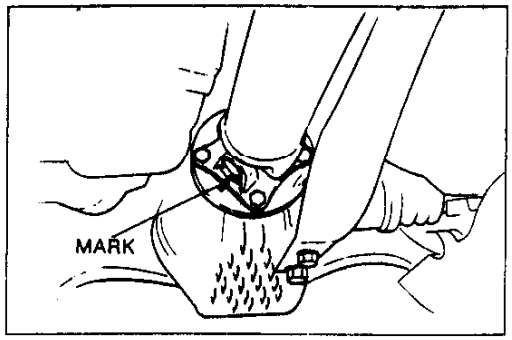
- **Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvent before removal.**

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, referring to **Installation Note**.
4. Perform the following after installation of the oil seal.
   (1) Connect the negative battery cable.
   (2) Check the ATF level and add ATF to specification, if necessary.



37U0KX-167

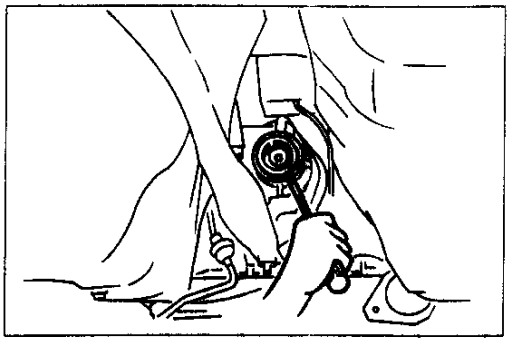
1. Undercover (right and left)
2. Tunnel member (center)
3. Secondary air injection pipe
4. Catalytic converter assembly
5. Tunnel member (front)
6. Tunnel member (rear)
7. Propeller shaft
   Removal Note ..... page K–106
   Installation Note ..... page K–106
8. Oil seal
   Removal Note ..... page K–106
   Installation Note ..... page K–106



29U0KX-404

Removal Note
Propeller shaft

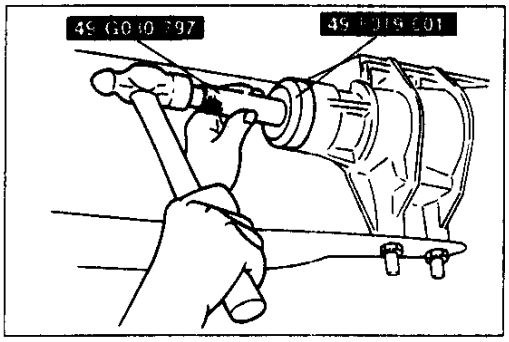
1. Mark the flange for proper reassembly.
2. Remove the propeller shaft


29U0KX-405

Oil seal

Caution
- **Do not damage the extension housing or output shaft.**

Remove the oil seal by using a screwdriver.

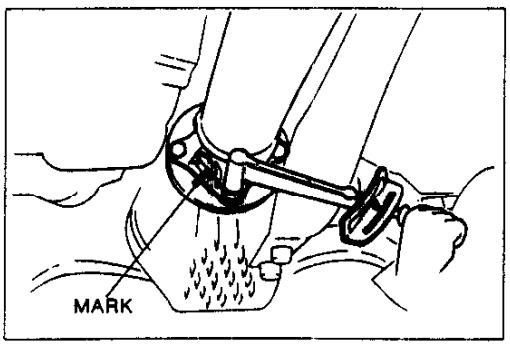

29U0KX-406

Installation note
Oil seal

1. Apply ATF to the lip of the new oil seal.

Caution
- **Install the oil seal until the stopper contacts the extension housing.**

2. Install the new oil seal by using the **SST**.



37U0KX-168

Propeller shaft

Caution
- **Align the mark.**

Install the propeller shaft.

Tightening torque:
50–58 N·m {5.0–6.0 kgf·m, 37–43 ft·lbf}

MEMO

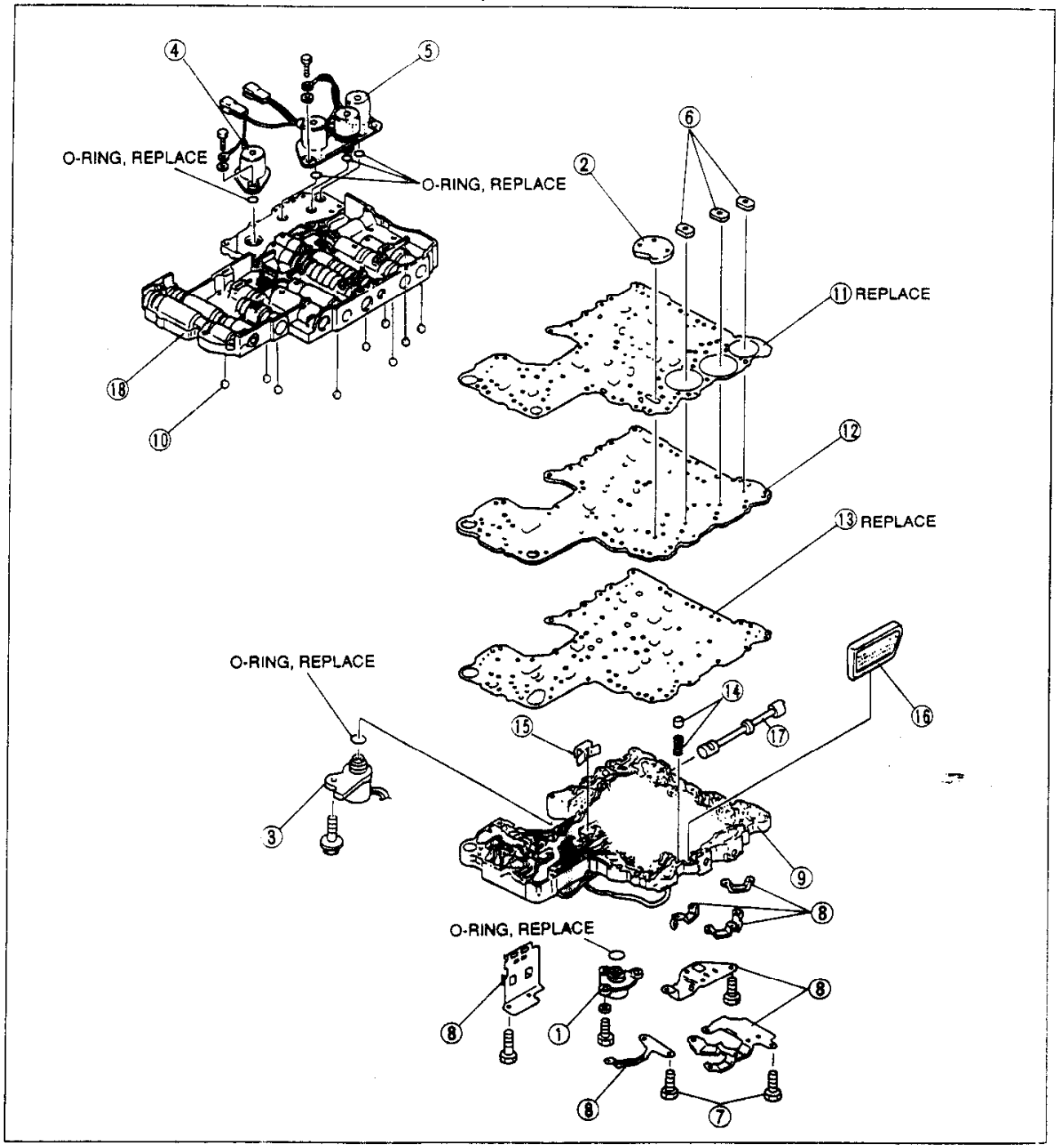
CONTROL VALVE BODY (DISASSEMBLY / INSPECTION)

Disassembly / Inspection

Caution

- **Be especially careful when handling the control valve; it consists of the most precise and delicate parts of the transmission.**
- **Neatly arrange the removed parts to avoid confusing them with similar parts.**
- **Clean the removed parts with cleaning solvent, and dry them with compressed air. Clean out all holes and passages with compressed air.**

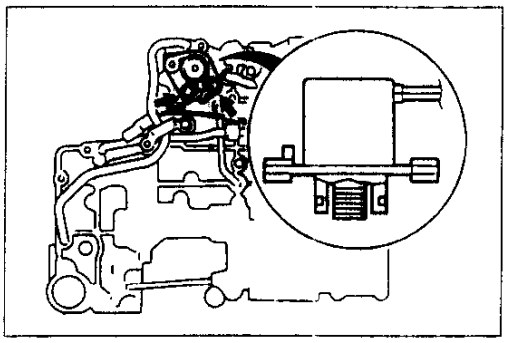
1. Disassemble in the order shown in the figure, referring to **Disassembly Procedure**.
2. Inspect all parts and replace as necessary.



29U0KX-4C9

1. Solenoid valve (lockup)
   Inspect filter for clogging and damage
   Inspection ..... page K– 32
2. Side plate
3. Solenoid valve (lockup control)
   Inspect filter for clogging and damage
   Inspection ..... page K– 32
4. Solenoid valve (line pressure)
   Inspect filter for clogging and damage
   Inspection ..... page K– 32
5. Solenoid valves (overrunning clutch, shift A, and shift B)
   Inspect filter for clogging and damage
   Inspection ..... page K– 32
6. Support plate
7. Retaining bolts and nuts
   Installation position ..... page K–124
8. Brackets
   Installation position ..... page K–123
9. Lower control valve body
   Disassembly / Inspection / Assembly ..... page K–120
10. Steel balls
    Installation position ..... page K–123
11. Upper gasket
12. Separator plate
    Inspect fluid passages for clogging and damage
13. Lower gasket
14. Orifice check valve and spring
15. Pilot filter
    Inspect for clogging and damage
16. Accumulator filter
    Inspect for clogging and damage
17. Manual valve
    Inspect for sticking, scoring, and scratches
18. Upper control valve body
    Disassembly / Inspection / Assembly ..... page K–112

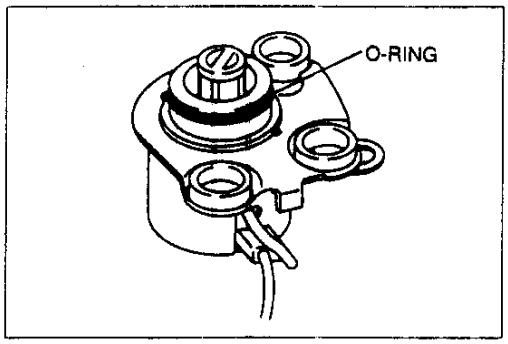
370U0KX-69



29U0KX-411

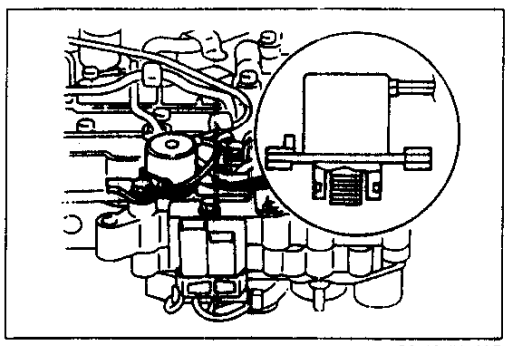
Disassembly procedure

1. Remove the solenoid valve (lockup) and side plate from the lower control valve body.



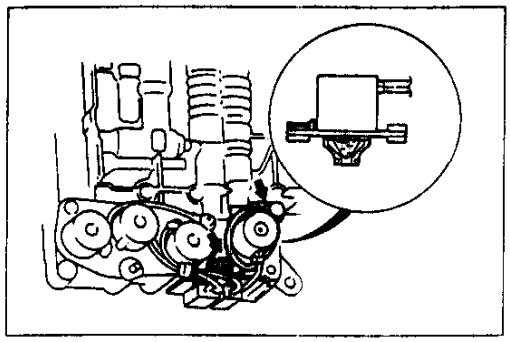
29U0KX-412

2. Remove the O-ring from the solenoid valve (lockup).



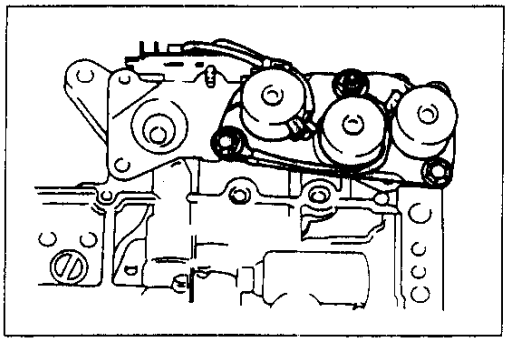
29U0KX-413

3. Remove the solenoid valve (lockup control) from the lower control valve body.
4. Remove the O-ring from the solenoid valve (lockup control).



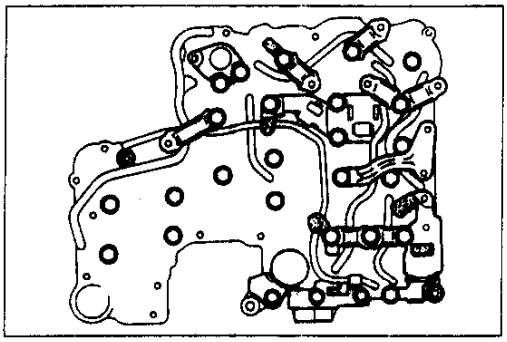
29U0KX-414

5. Remove the solenoid valve (line pressure) from the upper control valve body.
6. Remove the O-ring from the solenoid valve (line pressure).



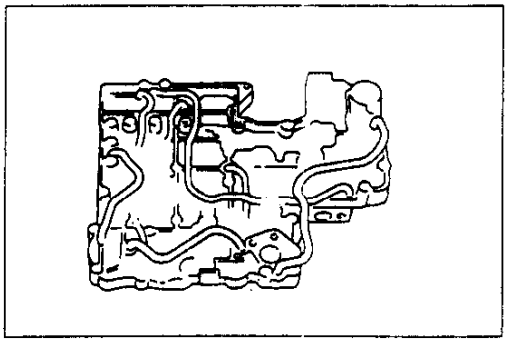
29U0KX-415

7. Remove the solenoids from the upper control valve body.
8. Remove the O-rings from the solenoids.



29U0KX-416

9. Remove the support plates.
10. Remove the bolts, nuts, and brackets.

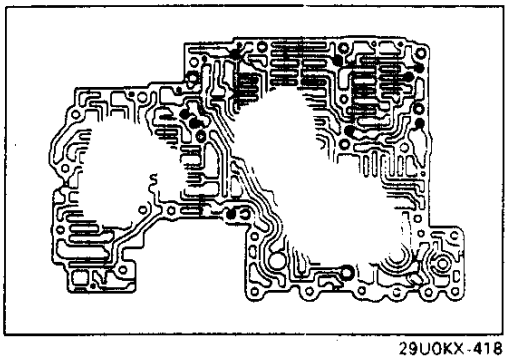


29U0KX-417

Caution

- **Do not scratch the valve body.**
- **Be careful not to drop the pilot filter, orifice check valve, spring, or accumulator filter.**

11. Separate the lower control valve body, lower and upper gaskets, and separator plate assembly from the upper control valve body.

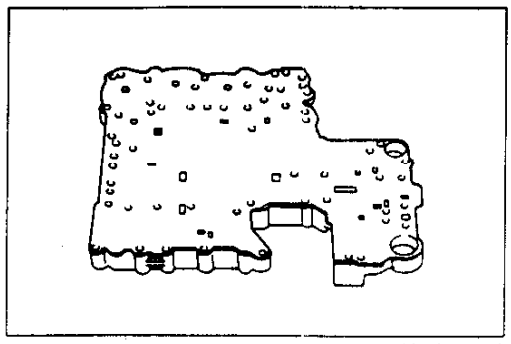


29U0KX-418

Caution

- **Do not drop or lose the steel balls.**

12. Remove the steel balls from the upper control valve body.

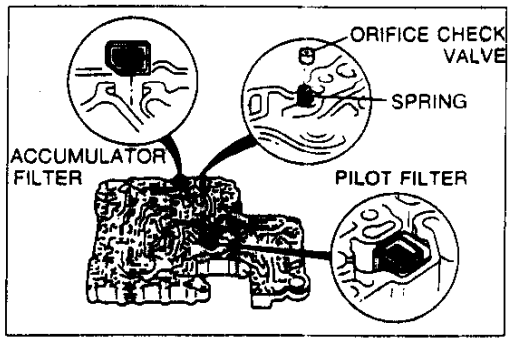


29U0KX-419

13. Face the lower control valve body downward.

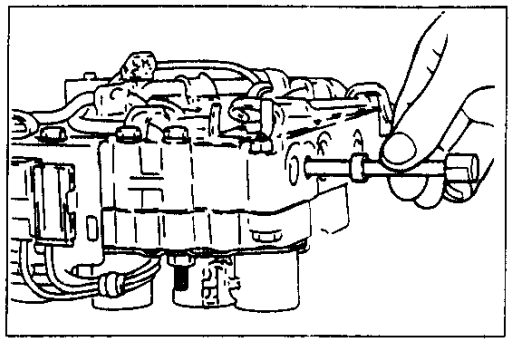
Caution
- **Do not lose the pilot filter, orifice check valve, spring, or accumulator filter.**

14. Remove the separator plate and gaskets.



29U0KX-420

15. Remove the orifice check valve, spring, pilot filter, and accumulator filter.



29U0KX-421

16. Remove the manual valve from the lower control valve body.

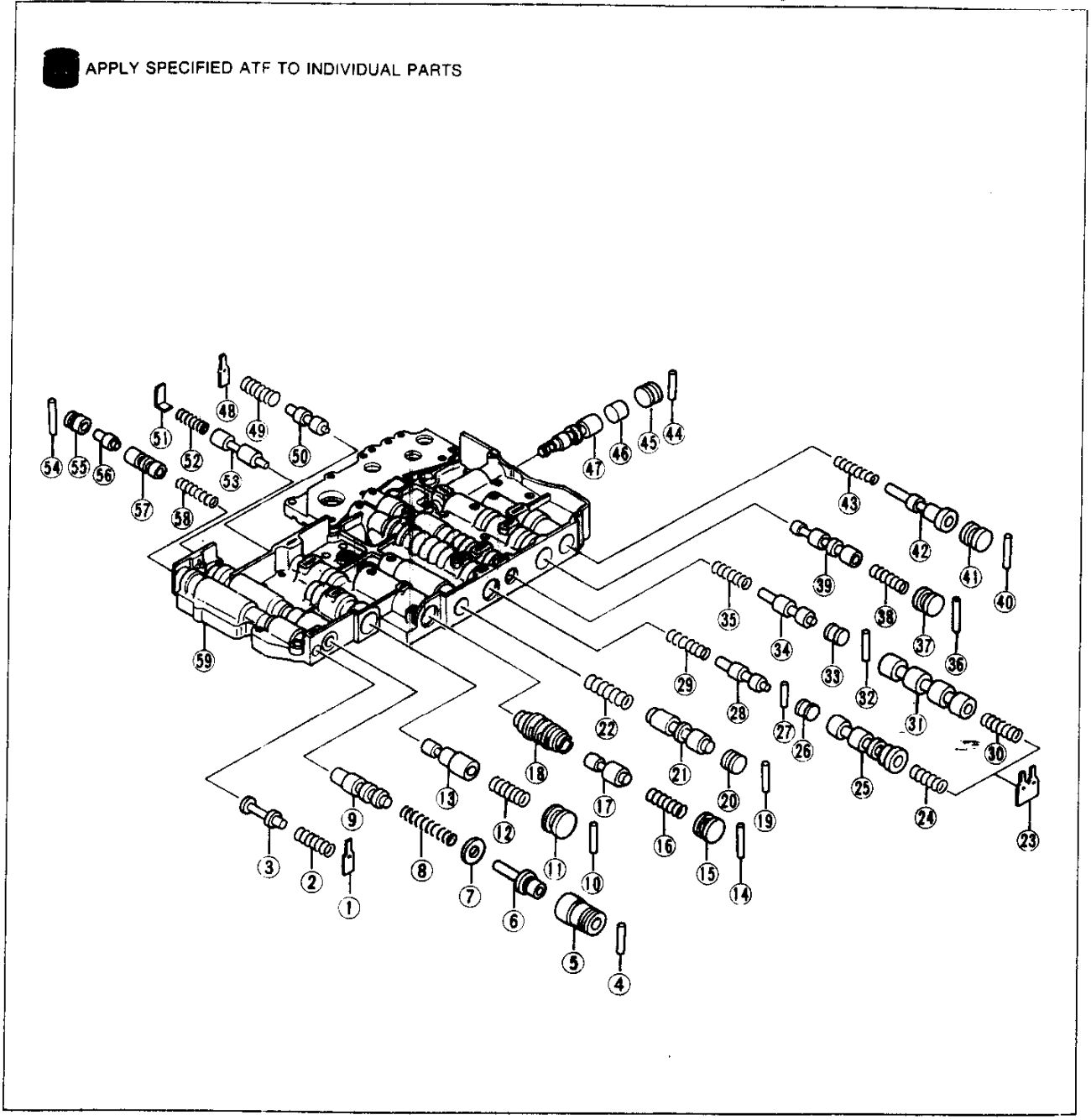
UPPER CONTROL VALVE BODY

Disassembly / Inspection / Assembly

Caution

- **Each valve should slide out by its own weight.**
- **When a valve will not slide out by its own weight, depending on the valve, push it out with a wire or place the valve body open-side down and lightly tap it with a plastic hammer. Never scratch or otherwise damage the valve surface or bore.**
- **Do not use a magnet to remove or install parts.**
- **Do not drop or lose the valves or internal parts.**

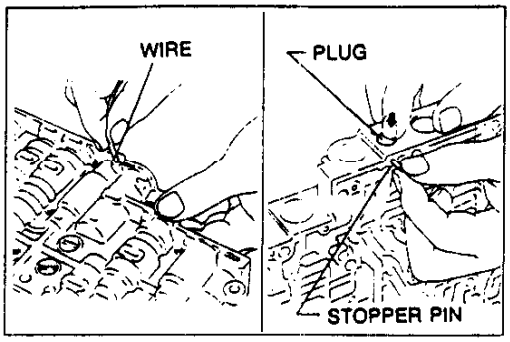
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



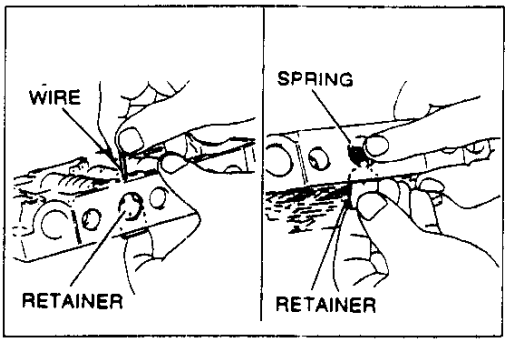
37U0KX-170

1. Retainer
   Disassembly Note ..... page K–114
2. Torque converter relief spring
   Inspection ..... page K–115
3. Torque converter relief valve
   Inspect for sticking, scoring, and scratches
4. Stopper pin
   Disassembly Note ..... page K–114
5. Pressure regulator sleeve
6. Pressure regulator plug
   Inspect for sticking, scoring, and scratches
7. Spring seat
8. Pressure regulator spring
   Inspection ..... page K–115
9. Pressure regulator valve
   Inspect for sticking, scoring, and scratches
10. Stopper pin
    Disassembly Note ..... page K–114
11. Pressure modifier plug
12. Pressure modifier spring
    Inspection ..... page K–115
13. Pressure modifier valve
    Inspect for sticking, scoring, and scratches
14. Stopper pin
    Disassembly Note ..... page K–114
15. Accumulator control plug
16. Accumulator control valve spring
    Inspection ..... page K–115
17. Accumulator control valve
    Inspect for sticking, scoring, and scratches
18. Accumulator control sleeve
    Inspect for sticking, scoring, and scratches
19. Stopper pin
    Disassembly Note ..... page K–114
20. Shuttle shift valve D plug
21. Shuttle shift valve D
    Inspect for sticking, scoring, and scratches
22. Shuttle shift valve D spring
    Inspection ..... page K–115
23. Retainer
    Disassembly Note ..... page K–114
24. Shift valve B spring
    Inspection ..... page K–115
25. Shift valve B
    Inspect for sticking, scoring, and scratches
26. Stopper pin
    Disassembly Note ..... page K–114
27. 4-2 sequence plug
28. 4-2 sequence valve
    Inspect for sticking, scoring, and scratches
29. 4-2 sequence spring
    Inspection ..... page K–115
30. Shift valve A spring
    Inspection ..... page K–115
31. Shift valve A
    Inspect for sticking, scoring, and scratches
32. Stopper pin
    Disassembly Note ..... page K–114
33. 4-2 relay plug
34. 4-2 relay valve
    Inspect for sticking, scoring and scratches
35. 4-2 relay spring
    Inspection ..... page K–115
36. Stopper pin
    Disassembly Note ..... page K–114
37. Overrunning clutch control plug
38. Overrunning clutch control spring
    Inspection ..... page K–115
39. Overrunning clutch control valve
    Inspect for sticking, scoring and scratches
40. Stopper pin
    Disassembly Note ..... page K–114
41. Overrunning clutch reducing plug
42. Overrunning clutch reducing valve
    Inspect for sticking, scoring and scratches
43. Overrunning clutch reducing spring
    Inspection ..... page K–115
44. Stopper pin
    Disassembly Note ..... page K–114
45. Shuttle shift valve S plug 1
46. Shuttle shift valve S plug 2
47. Shuttle shift valve S
    Inspect for sticking, scoring and scratches
48. Retainer
    Disassembly Note ..... page K–114
49. Pilot spring
    Inspection ..... page K–115
50. Pilot valve
    Inspect for sticking, scoring and scratches
51. Retainer
    Disassembly Note ..... page K–114
52. Lockup modifier spring
    Inspection ..... page K–115
53. Lockup modifier valve
    Inspect for sticking, scoring and scratches
54. Stopper pin
    Disassembly Note ..... page K–114
55. Lockup control sleeve
56. Lockup control plug
    Inspect for sticking, scoring and scratches
57. Lockup control valve
    Inspect for sticking, scoring and scratches
58. Lockup control spring
    Inspection ..... page K–115
59. Upper control valve body
    Inspect for damage and scoring

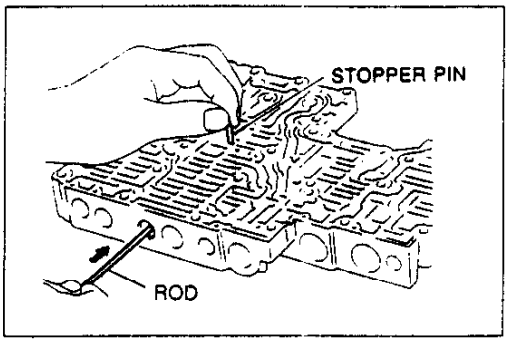
370U0KX-171



29U0KX-424



29U0KX-425



37U0KX-172

Disassembly note
Stopper pin

Caution
- **Do not use a magnet to hold the stopper pin.**

1. Push the stopper pin out with a wire.
2. Depress and hold the plug or sleeve with a finger to prevent the valve from popping out.
3. Remove the stopper pin, and remove the valve and internal parts.

Retainer

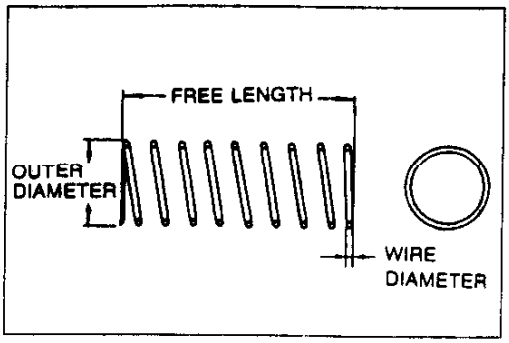
Caution
- **Do not use a magnet to hold the retainer.**

1. Push the retainer 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.

Stopper pin
(4-2 sequence valve and 4-2 relay valve)

Caution
- **Removal may be difficult.**
- **Do not use a magnet to hold the stopper pin.**

1. Push the stopper pin out with a wire.
2. Depress the plug with a vinyl-tape-wrapped **1.5 mm {0.059 in}** diameter rod.
3. Remove the stopper pin, the valve, and the internal parts.



29U0KX-427

Inspection
Springs

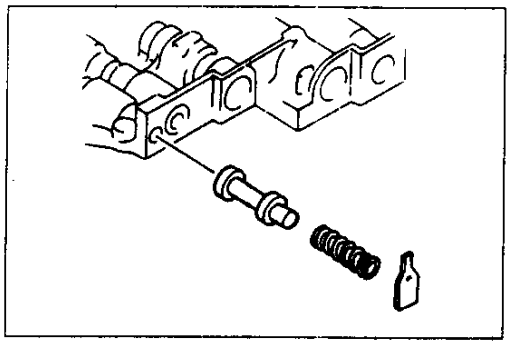
1. Measure the spring free length.
2. If not within specification, replace the spring.

Specification

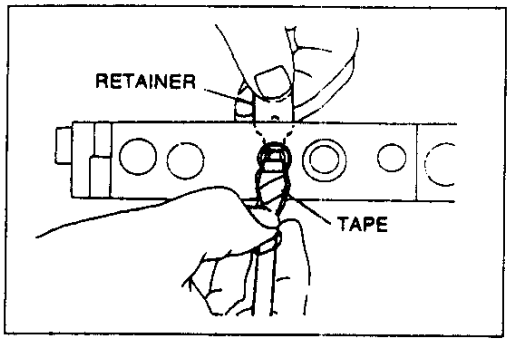
Spring / Item		Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
Torque converter relief valve		9.2 {0.362}	38.3 {1.508}	14.2	1.5 {0.059}
Pressure regulator valve		14.0 {0.551}	29.0 {1.142}	5.6	1.6 {0.063}
Pressure modifier valve*	A	6.8 {0.268}	31.95 {1.258}	15.5	0.8 {0.031}
	B	6.9 {0.272}	32.6 {1.283}	22.2	0.9 {0.035}
	C	6.9 {0.272}	32.8 {1.291}	15.6	0.9 {0.035}
Accumulator control valve spring		10.5 {0.413}	17.0 {0.669}	4.3	0.5 {0.012}
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		7.0 {0.276}	32.5 {1.280}	12.6	0.85 {0.033}
Pilot valve		9.1 {0.358}	25.7 {1.012}	8.3	1.1 {0.043}
Lockup modifier valve		4.2 {0.165}	21.5 {0.846}	13.6	0.4 {0.016}
Lockup control valve		4.7 {0.185}	23.4 {0.921}	15.6	0.45 {0.018}

* Either A, B, or C type spring is installed at shipment. Only A type spring is available for replacement.

37U0KX-173



29U0KX-429



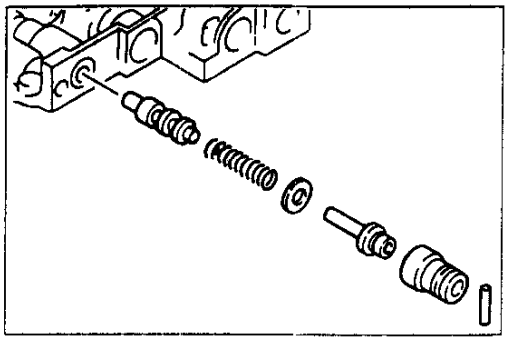
29U0KX-430

Assemble procedure

Caution

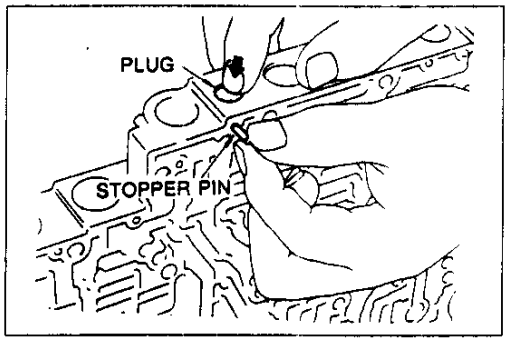
- **Before assembly, make sure all parts are thoroughly cleaned.**
- **Apply ATF to all parts and bores.**
- **Note the proper direction of the valve and internal parts.**
- **Do not reuse any parts that have been dropped.**
- **Do not scratch the valve or valve body.**
- **Wrap a screwdriver or rod with tape before using to insert a valve.**

1. Insert the torque converter relief valve and spring.
2. Install the retainer while compressing the spring.



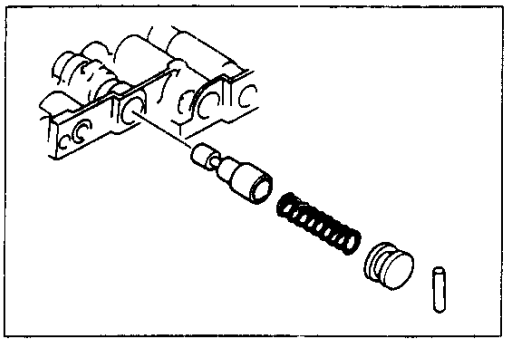
29U0KX-431

3. Insert the pressure regulator valve, spring, spring seat, plug, and sleeve.



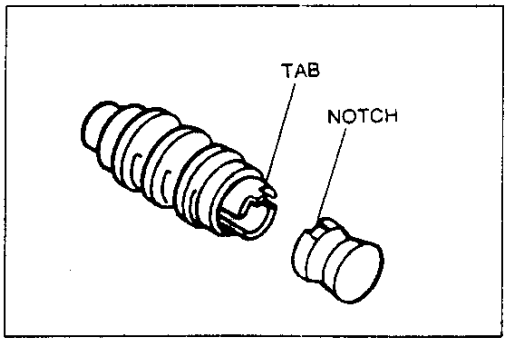
29U0KX-432

4. Insert the stopper pin while pushing the sleeve.



29U0KX-433

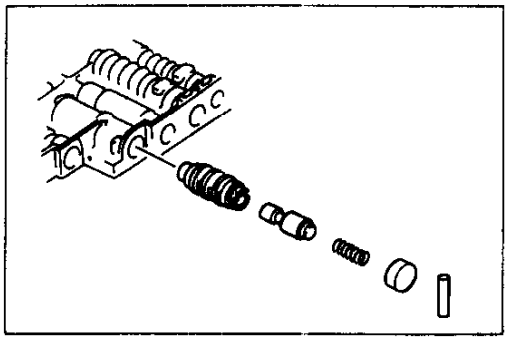
5. Insert the pressure modifier valve, spring, and plug.
6. Insert the stopper pin while pushing the plug.



29U0KX-434

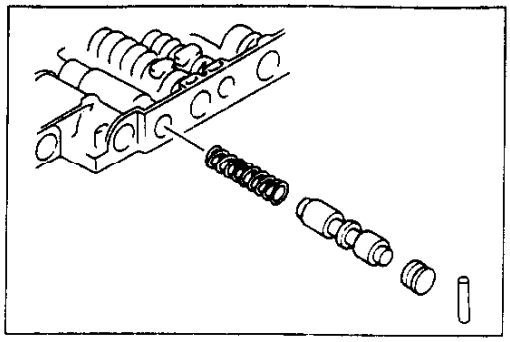
Note

- **Align the tab of the sleeve with the plug notch.**



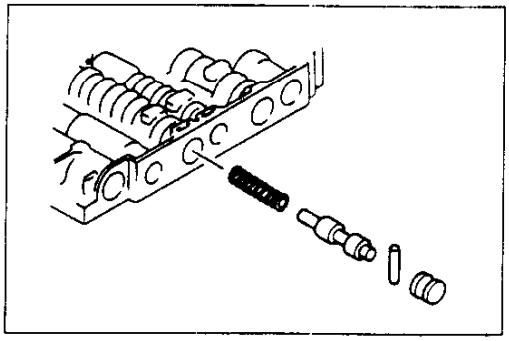
37U0KX-174

7. Insert the accumulator control sleeve, valve, and spring.
8. Insert the plug.
9. Insert the stopper pin.



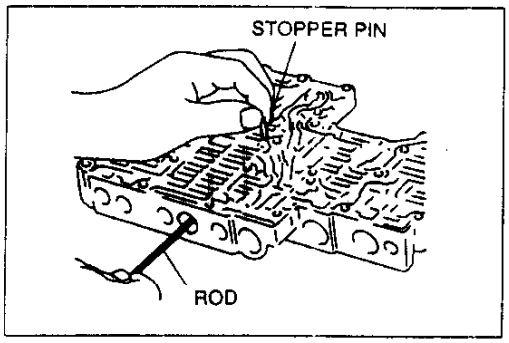
29U0KX-436

10. Insert the shuttle shift valve D spring, valve, and plug.
11. Insert the stopper pin while pushing the plug.



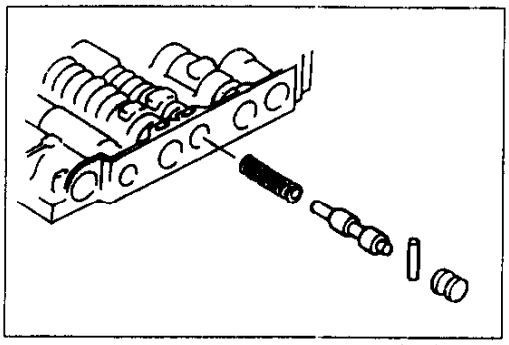
29U0KX-437

12. Insert the 4-2 sequence spring, valve, and plug.



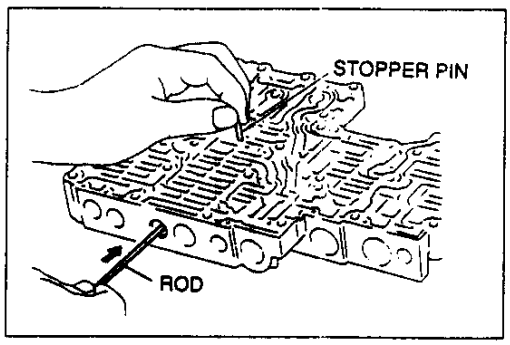
37U0KX-175

13. Push in the plug with a vinyl-tape-wrapped **1.5 mm {0.059 in}** diameter rod.
14. Insert the stopper pin.



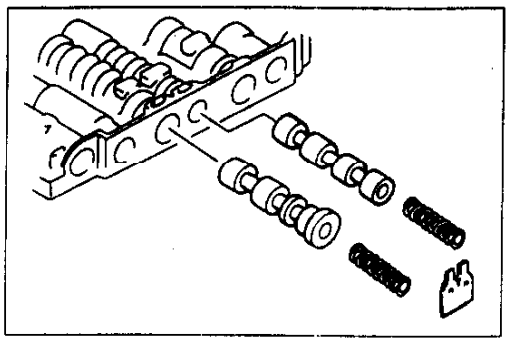
29U0KX-439

15. Insert the 4-2 relay spring, valve, and plug.



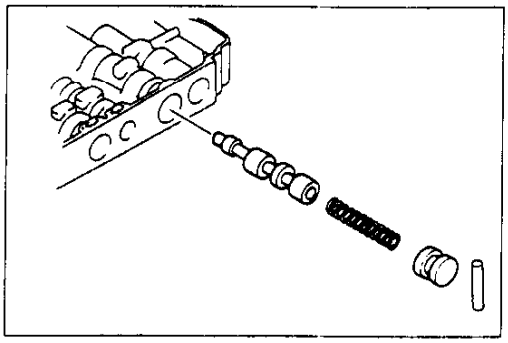
37U0KX-176

16. Push in the plug with a vinyl-tape-wrapped **1.5 mm {0.059 in}** diameter rod and insert the stopper pin.



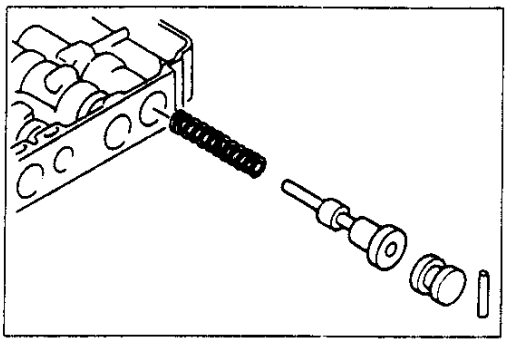
29U0KX-441

17. Insert shift valve A and spring.
18. Insert shift valve B and spring.
19. Install the retainer while compressing the springs.



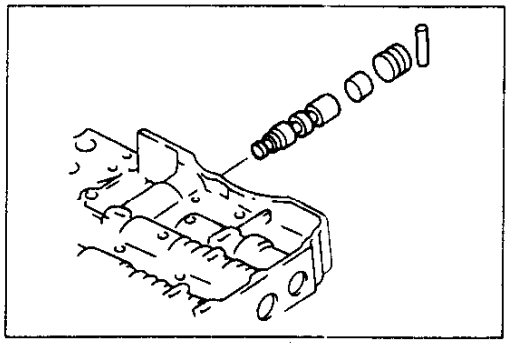
29U0KX-442

20. Insert the overrunning clutch control valve, spring, and plug.
21. Insert the stopper pin while pushing the plug.



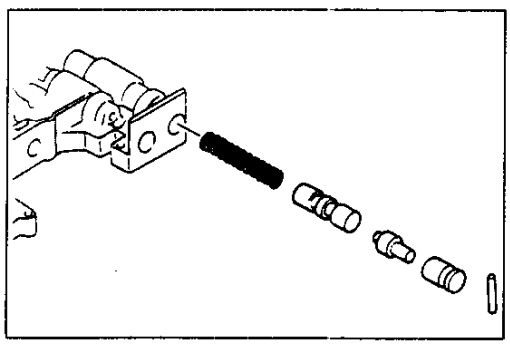
29U0KX-443

22. Insert the overrunning clutch reducing spring, valve, and plug.
23. Insert the stopper pin while pushing the plug.



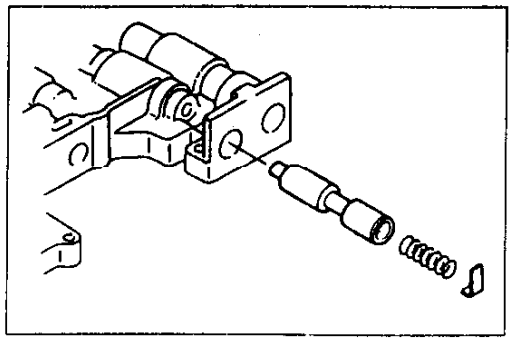
29U0KX-444

24. Insert the shuttle shift valve S, plug 2, and plug 1.
25. Insert the stopper pin.



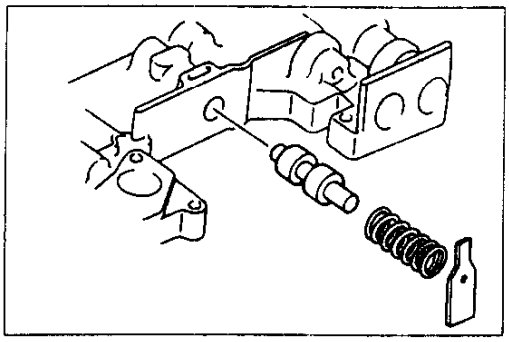
29U0KX-445

26. Insert the lockup control spring, valve, plug, and sleeve.
27. Insert the stopper pin while pushing the sleeve.



29U0KX-446

28. Insert the lockup modifier valve and spring.
29. Insert the retainer while pushing the spring.



29U0KX-447

30. Insert the pilot valve and spring.
31. Insert the retainer while pushing the spring.

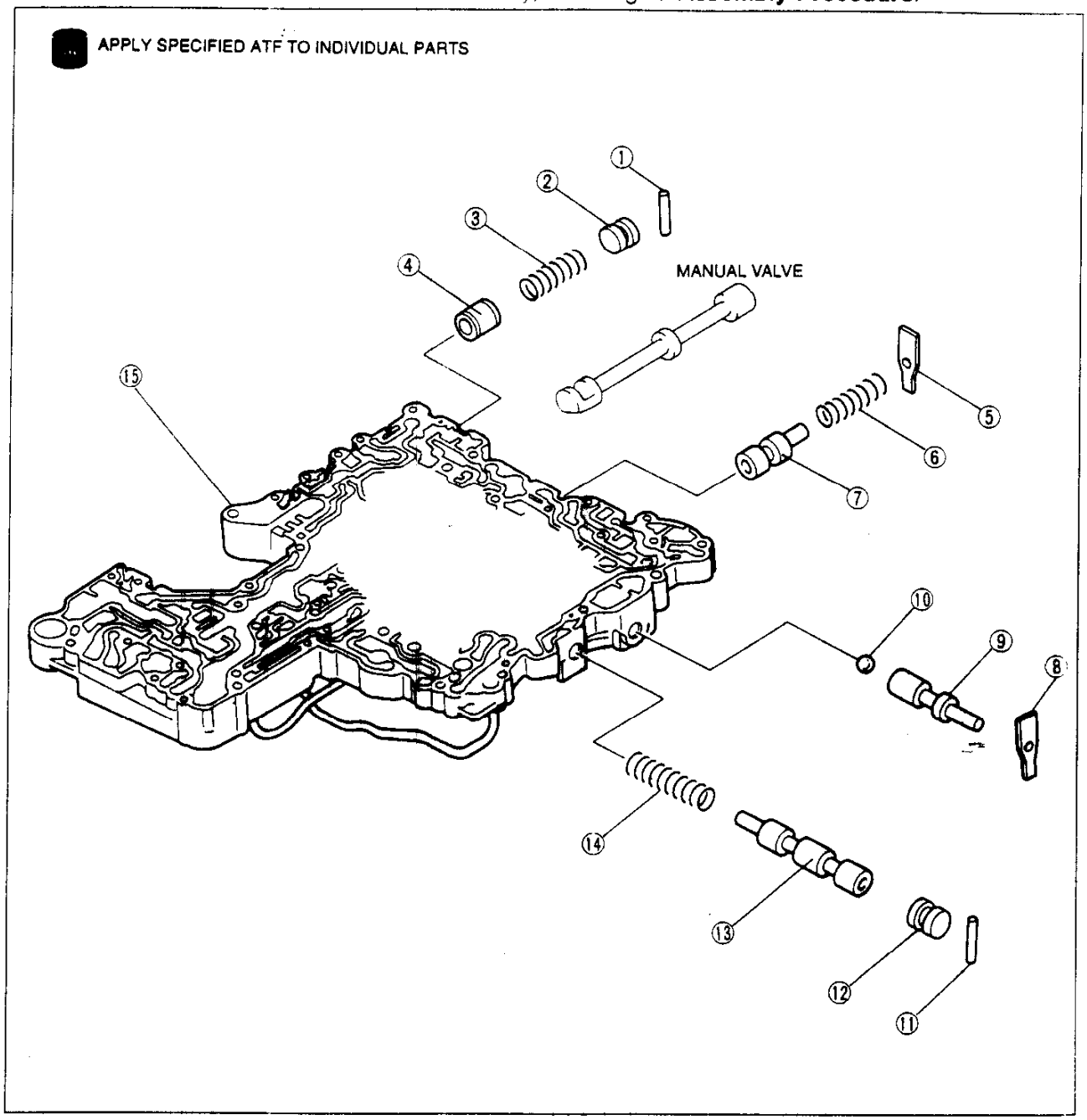
LOWER CONTROL VALVE BODY

Disassembly / Inspection / Assembly

Caution

- **Each valve should slide out by its own weight.**
- **When a valve will not slide out by its own weight, depending on the valve, push it out with a wire or place the valve body open-side down and lightly tap it with a plastic hammer. Never scratch or otherwise damage the valve surface or bore.**
- **Do not drop or lose the valves or internal parts.**
- **Do not use a magnet to remove or install parts.**

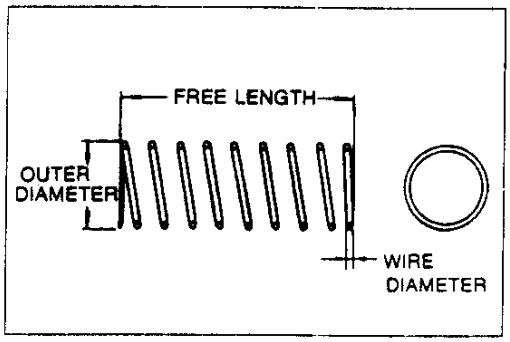
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Procedure**.



37U0KX-177

1. Stopper pin
   Disassembly Note ..... page K–114
2. Modifier accumulator plug
3. Modifier accumulator spring
   Inspection ..... below
4. Modifier accumulator valve
   Inspect for sticking, scoring and scratches
5. Retainer
   Disassembly Note ..... page K–114
6. 1st reducing spring
   Inspection ..... below
7. 1st reducing valve
   Inspect for sticking, scoring and scratches
8. Retainer
   Disassembly Note ..... page K–114
9. 3-2 timing valve
   Inspect for sticking, scoring and scratches
10. Steel ball
11. Stopper pin
    Disassembly Note ..... page K–114
12. Servo charger plug
13. Servo charger valve
    Inspect for sticking, scoring and scratches
14. Servo charger spring
    Inspection ..... below
15. Lower control valve body
    Inspect for damage and scoring

370U0KX-78



29U0KX-450

Inspection
Springs

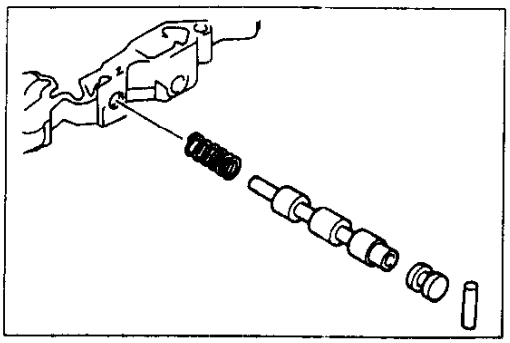
1. Measure the spring free length.
2. If not within specification, replace the spring.

Specification

Item / Spring	Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
Modifier accumulator valve	9.8 {0.39}	30.5 {1.20}	8.75	1.3 {0.05}
1st reducing valve	6.8 {0.27}	25.4 {1.00}	12.5	0.8 {0.03}
Servo charger valve	6.5 {0.26}	33.2 {1.31}	12.0	0.5 {0.02}

37U0KX-179

Assembly procedure

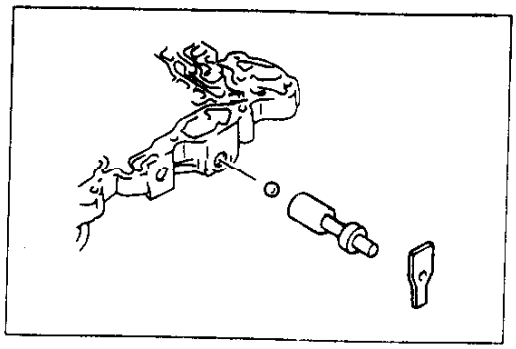


29U0KX-452

Caution

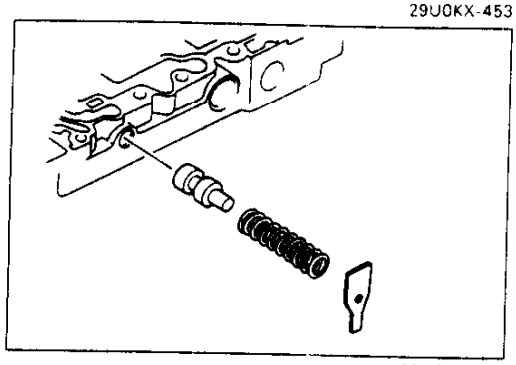
- **Before assembly, make sure all parts are thoroughly cleaned.**
- **Apply ATF to all parts and bores.**
- **Note the proper direction of the valve and internal parts.**
- **Do not reuse any parts that have been dropped.**
- **Do not scratch the valve or valve body.**
- **Wrap a screwdriver or rod with tape before using it to insert a valve.**

1. Insert the servo charger spring, valve, and plug.
2. Insert the stopper pin while pushing the plug.



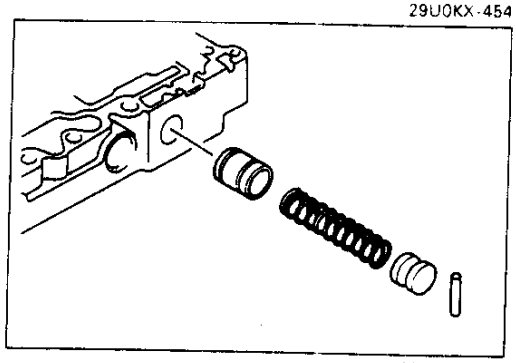
29U0KX-453

3. Insert the steel ball and 3-2 timing valve.
4. Insert the retainer.



29U0KX-454

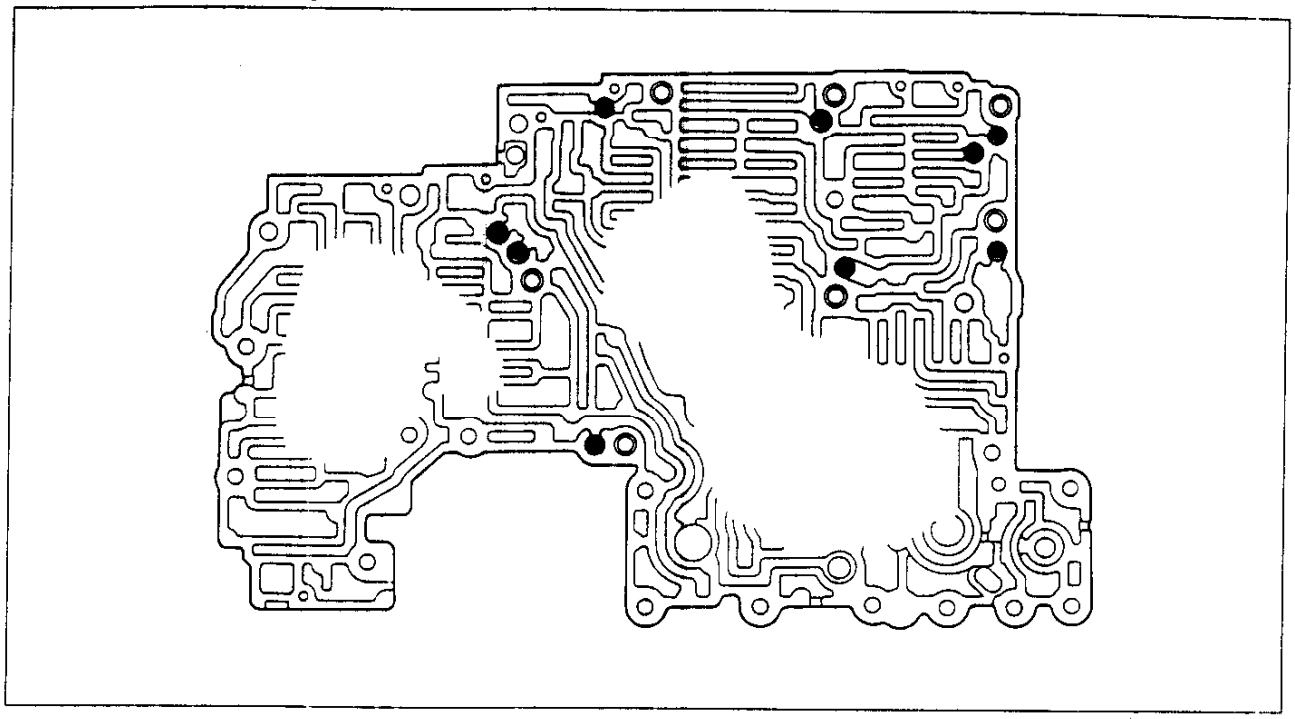
5. Insert the 1st reducing valve and spring.
6. Insert the retainer while compressing the spring.



29U0KX-455

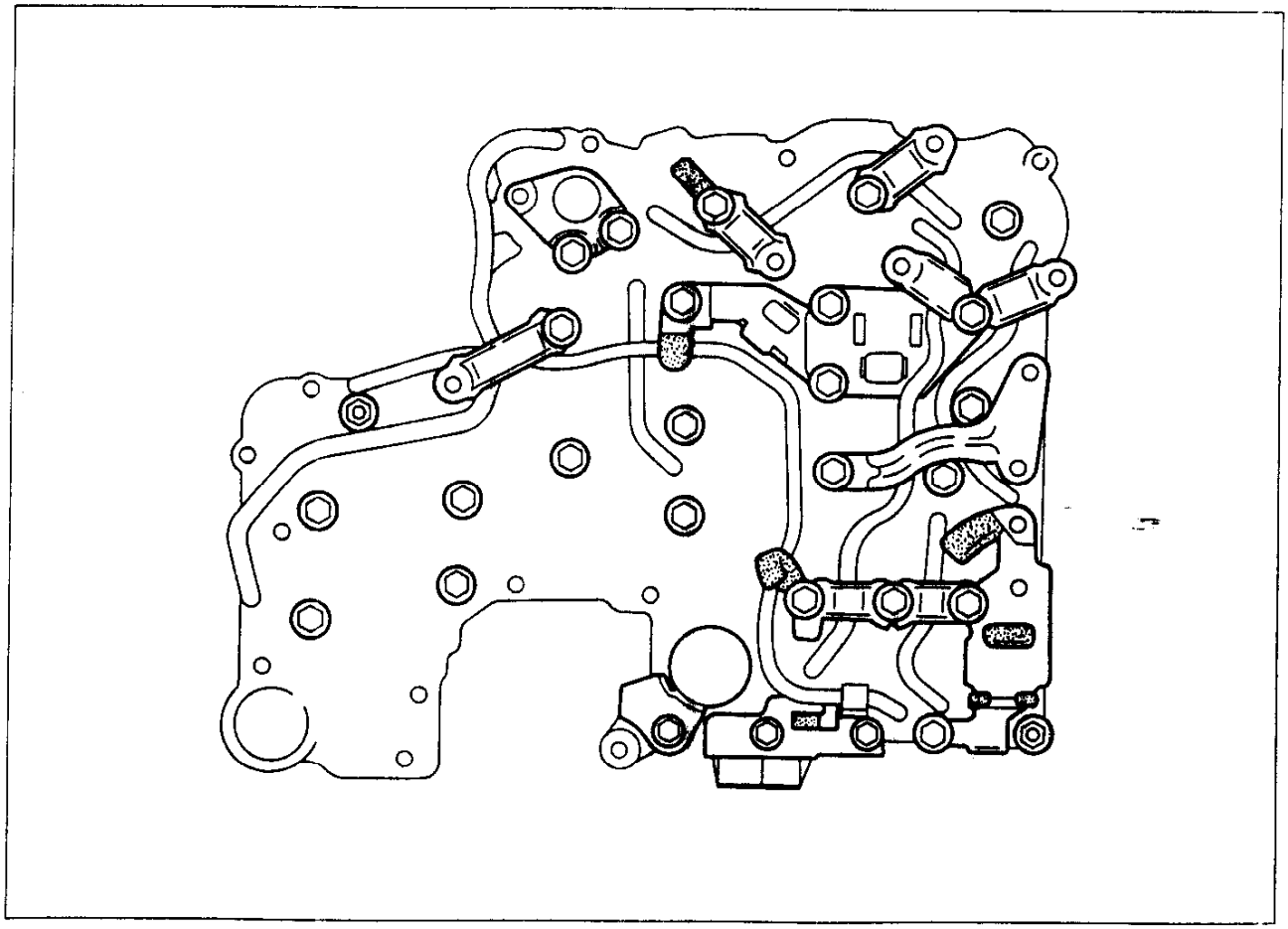
7. Insert the modifier accumulator valve, spring, and plug.
8. Insert the stopper pin while pushing the plug.

Steel ball installation positions



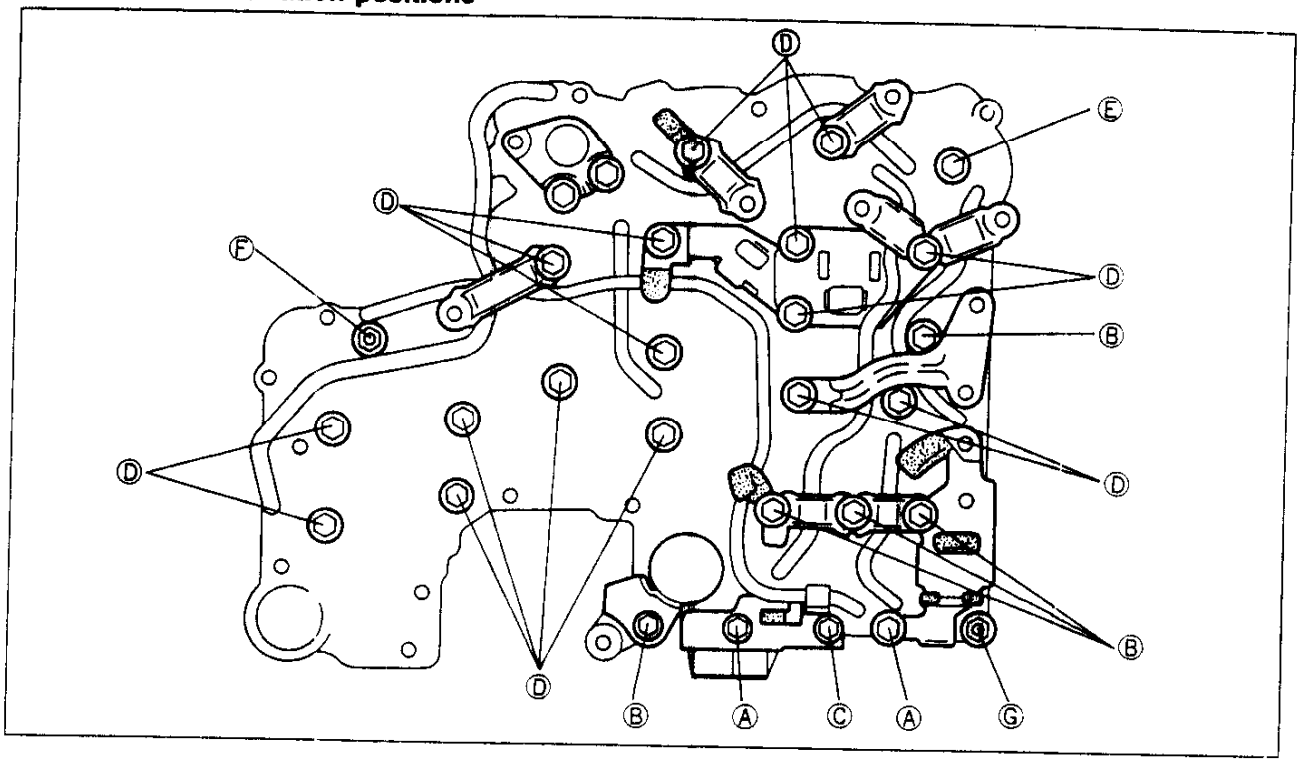
29U0KX-456

Bracket installation positions

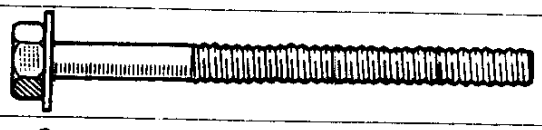
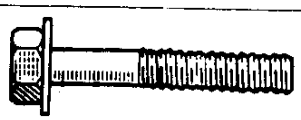
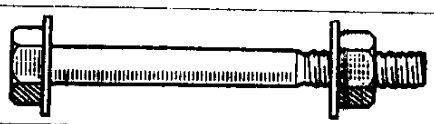
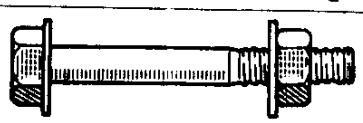


29U0KX-457

Bolt and nut installation positions



29U0KX-458

Identification letter	Bolt and nut	Length mm {in}	Torque specification N·m {kgf·cm, in·lbf}
A		65 {2.6}	6.9–8.8 {70–90, 61–78}
B		50 {2.0}	
C		40 {1.6}	
D		33 {1.3}	
E		27 {1.1}	
F		55 {2.2}	
G		45 {1.8}	

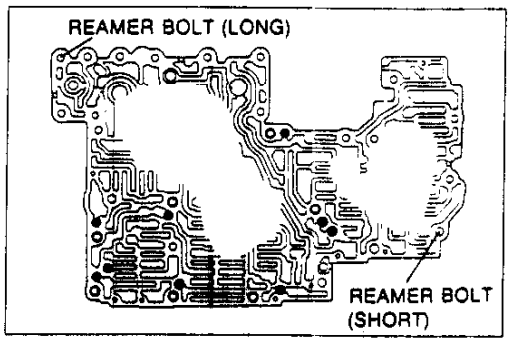
37U0KX-180

CONTROL VALVE BODY (ASSEMBLY)

Assembly

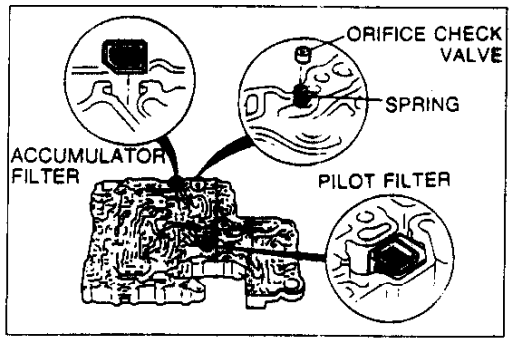
Caution
- **Before assembly, make sure all parts are thoroughly cleaned.**
- **Apply ATF to all parts.**
- **Do not reuse the gasket or O-ring.**

29U0KX-160



29U0KX 461

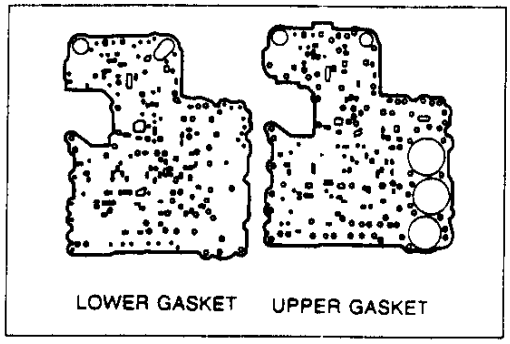
1. Install the steel balls and reamer bolts into their proper positions in the upper control valve body. (Refer to page K–123 for installation positions.)



29U0KX-462

Caution
- **Note the proper direction of the accumulator filter.**

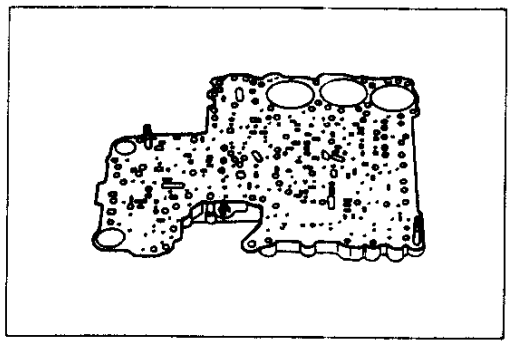
2. Install the pilot filter, accumulator filter, orifice check valve, and spring into their proper positions in the lower control valve body.

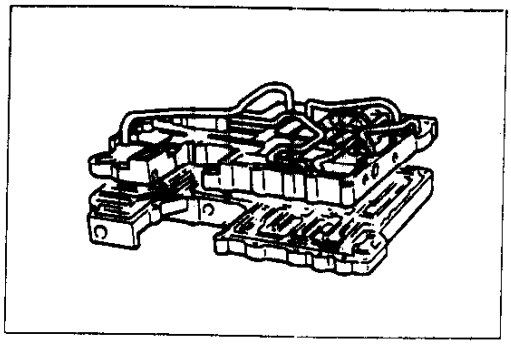


29U0KX-463

Caution
- **Do not mixup the upper and lower gaskets.**
- **Do not scratch the lower control valve body.**

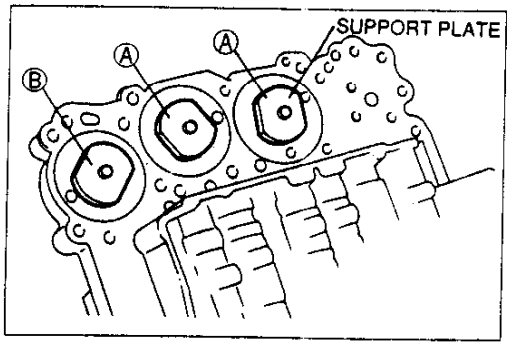
3. Install new gaskets and the separator plate onto the lower control valve body.





29U0KX-464

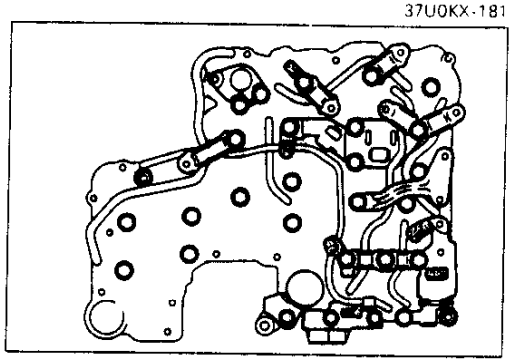
4. Set the lower control valve body onto the upper control valve body.



37U0KX-181

5. Install the support plates as shown.

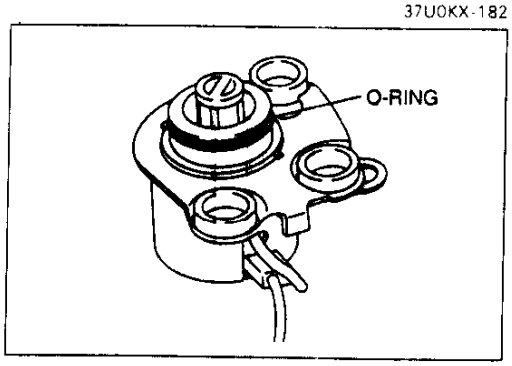
Bolt length (measured from below bolt head):
A: 33 mm {1.3 in}
B: 27 mm {1.1 in}



37U0KX-182

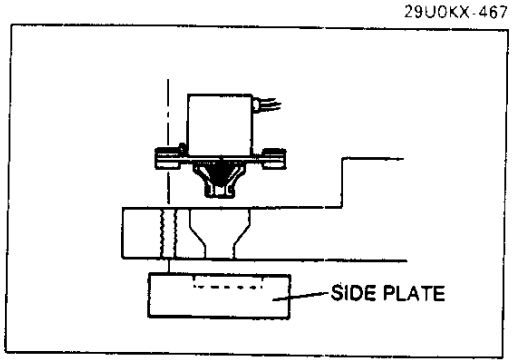
6. Install the brackets in their proper positions. (Refer to page K–123 for installation positions.)
7. Install the bolts and nuts in their proper positions, and tighten the fasteners evenly and gradually. (Refer to page K–124 for installation positions.)

Tightening torque:
6.9–8.8 N·m {70–90 kgf·cm, 61–78 in·lbf}



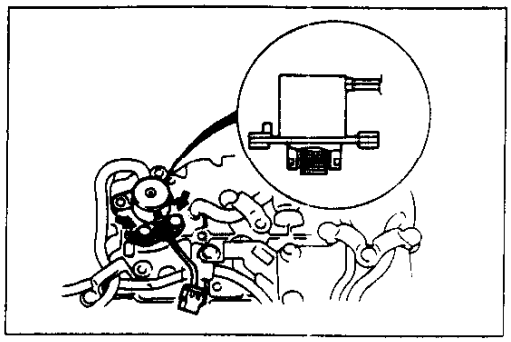
29U0KX-467

8. Install a new O-ring onto the solenoid valve (lockup).



29U0KX-468

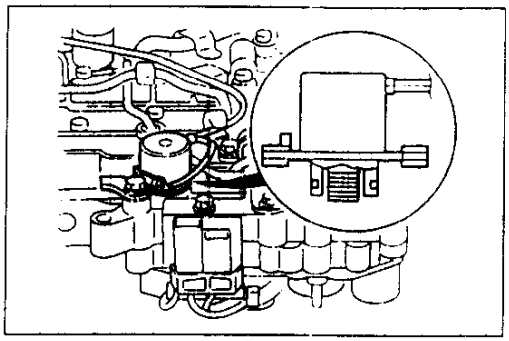
Note
- **Install the side plate as shown.**



37U0KX-183

9. Install the solenoid valve (lockup) and side plate to the lower control valve body.

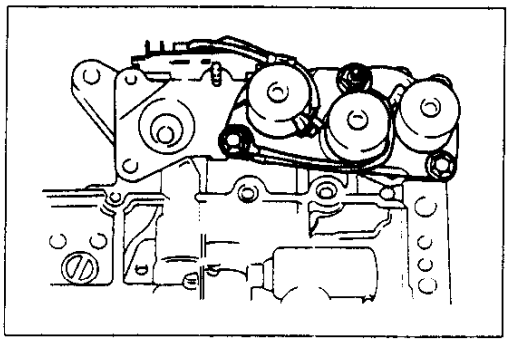
Tightening torque:
9.9–12.7 N·m {100–130 kgf·cm, 87–112 in·lbf}



37U0KX-184

10. Install a new O-ring onto the solenoid valve (lockup control).
11. Install the solenoid valve (lockup control) into the lower control valve body.

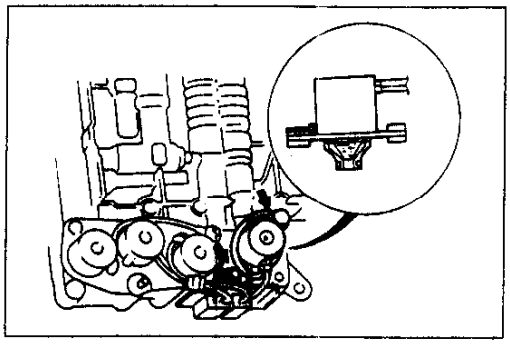
Tightening torque:
9.9–12.7 N·m {100–130 kgf·cm, 87–112 in·lbf}



37U0KX-185

12. Install the new O-rings onto the solenoids.
13. Install the solenoids into the upper control valve body.

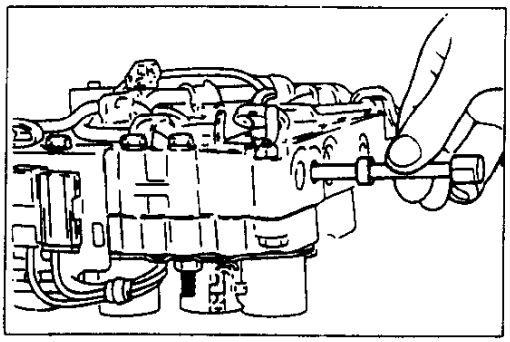
Tightening torque:
6.9–9.8 N·m {70–100 kgf·cm, 61–86 in·lbf}



37U0KX-186

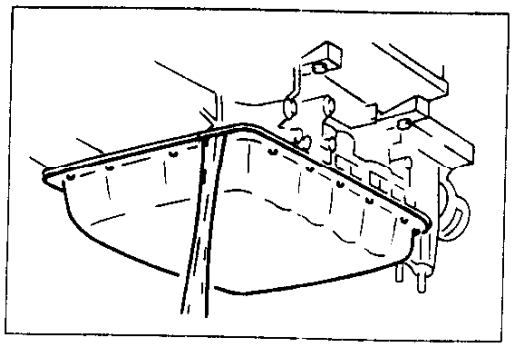
14. Install a new O-ring onto the solenoid valve (line pressure).
15. Install the solenoid valve (line pressure) into the upper control valve body.

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



29U0KX-473

16. Insert the manual valve.


37U0KX-187

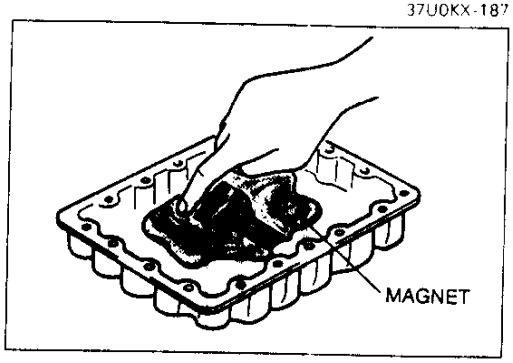
CONTROL VALVE BODY (ON-VEHICLE REMOVAL / INSTALLATION)

On-vehicle Removal

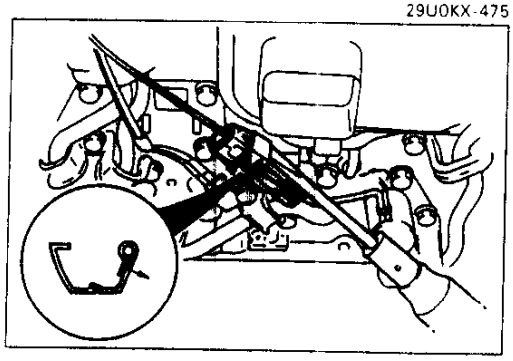
Warning
- **Be careful when draining; the ATF is hot.**

Caution
- **Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvent before removal.**

1. Disconnect the negative battery cable.
2. Jack up the vehicle and support it with safety stands.
3. Loosen the oil pan bolts and drain the ATF into a suitable container.
4. Remove the oil pan and gasket.
5. Remove the magnet from the oil pan and examine any material found in the pan or on the magnet to determine the condition of the transmission.

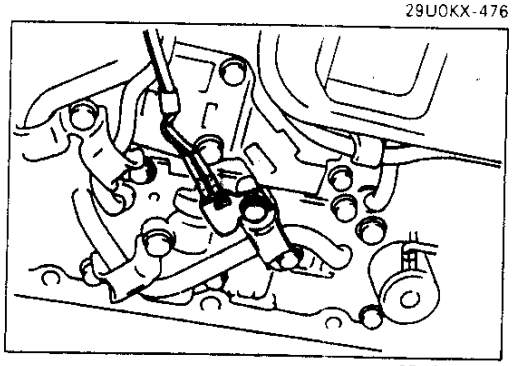


29U0KX-475


29U0KX-476

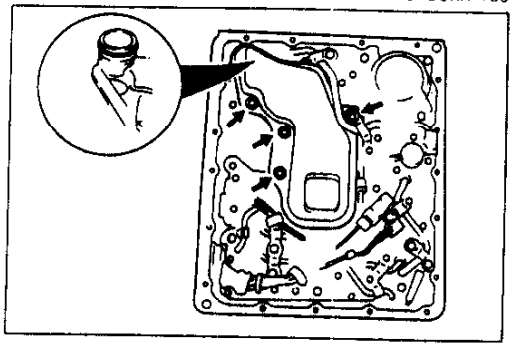
Caution
- **Do not damage the harness or connector.**

6. Remove the clip.
7. Disconnect the solenoid valve (lockup) connector.


37U0KX-188

8. Remove the ATF thermosensor.

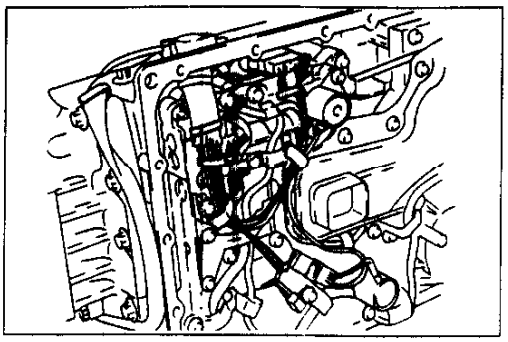
Bolt length (measured from below bolt head):
45 mm {1.8 in}


37U0KX-189

9. Remove the oil strainer.

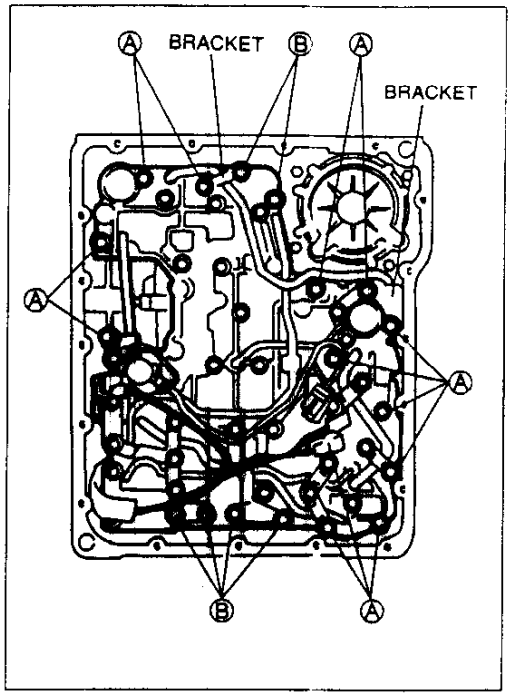
Bolt length (measured from below bolt head):
50 mm {2.0 in}

10. Remove the O-ring from the oil strainer.



29U0KX-479

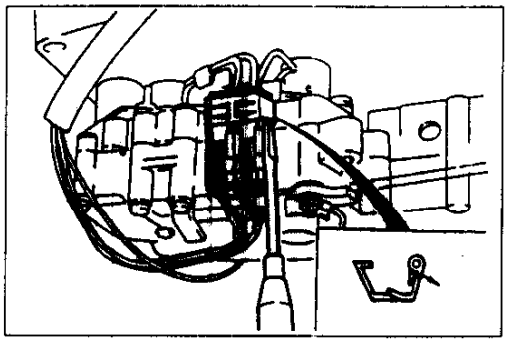
11. Separate the solenoid valve harness from the harness clip.



37U0KX-190

12. Remove bolts A and B and the brackets shown in the figure.

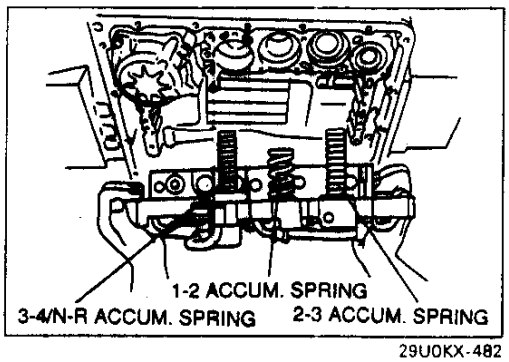
Bolt length (measured from below bolt head):
A: 33 mm {1.3 in}
B: 45 mm {1.8 in}



29U0KX-481

Caution
- **Do not damage the harness or connector.**

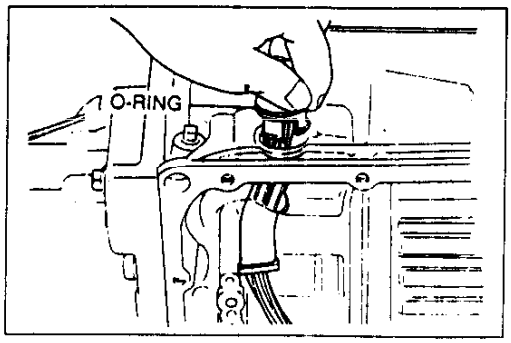
13. Remove the clip.
14. Disconnect the solenoid valve connectors.



29U0KX-482

Caution
- **Do not drop the accumulator springs.**

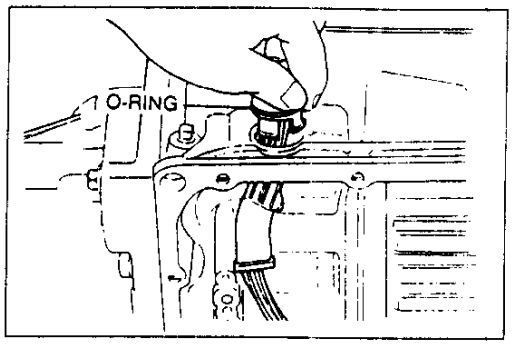
15. Remove the control valve body and accumulator springs.



29U0KX-483

Caution
- **Do not damage the harness.**

16. If necessary, remove the solenoid valve harness from the transmission case.
17. Remove the O-ring from the solenoid valve harness.



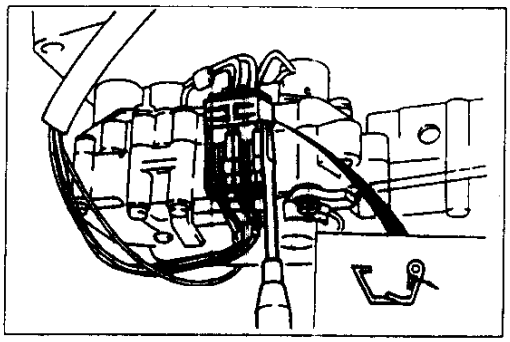
29U0KX-484

On-Vehicle Installation

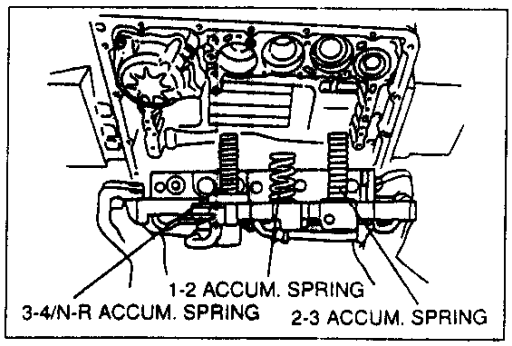
1. Apply ATF to the new O-ring and install it onto the solenoid valve harness.

Caution
- **Do not damage the harness.**

2. Install the solenoid valve harness into the transmission case.


29U0KX-485

3. Connect the solenoid valve connectors.
4. Install the clip.



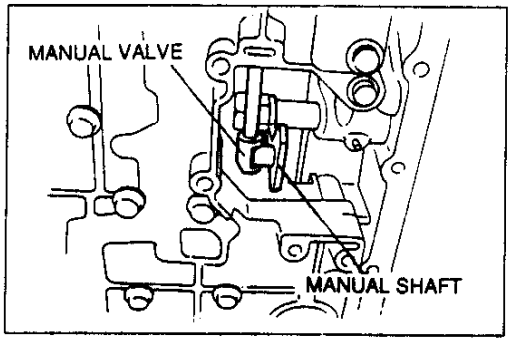
37U0KX-191

5. Set the accumulator springs into the control valve body as shown.

Spring specifications

mm {in}

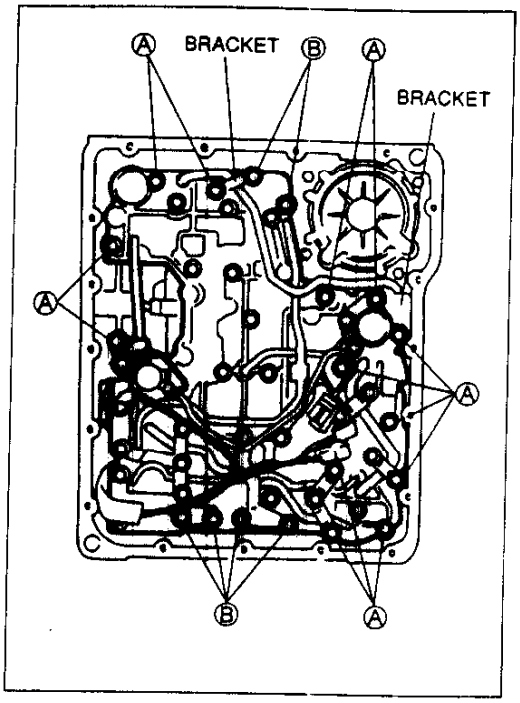
Item / Spring	Outer dia.	Free length	No. of coils	Wire dia.
3-4 / N-R accumulator piston	18.0 {0.71}	43.0 {1.69}	7.9	2.3 {0.091}
1-2 accumulator piston	29.3 {1.15}	45.0 {1.77}	3.8	3.7 {0.15}
2-3 accumulator piston	19.5 {0.77}	66.0 {2.60}	8.6	3.0 {0.12}



29U0KX-487

Note
- **Verify that the manual valve and manual shaft are assembled correctly.**
- **Verify that the accumulator springs are installed correctly.**

6. Set the control valve into the transmission case and secure it.

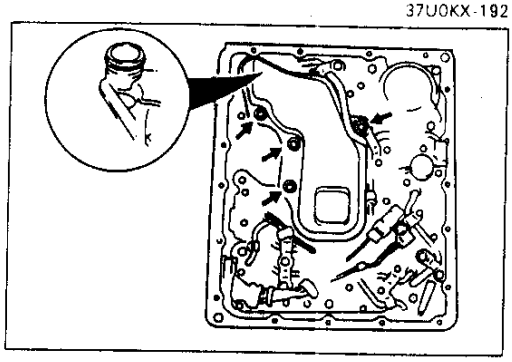


37U0KX-192

7. Install the A and B bolts and bracket shown in the figure.

Bolt length (measured from below bolt head):
A: 33 mm {1.3 in}
B: 45 mm {1.8 in}

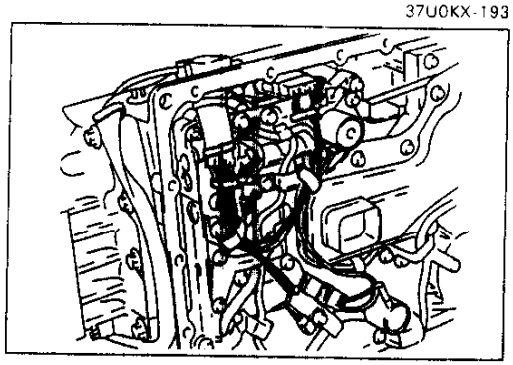
Tightening torque:
6.9–8.8 N·m {70–90 kgf·cm, 61–78 in·lbf}


37U0KX-193

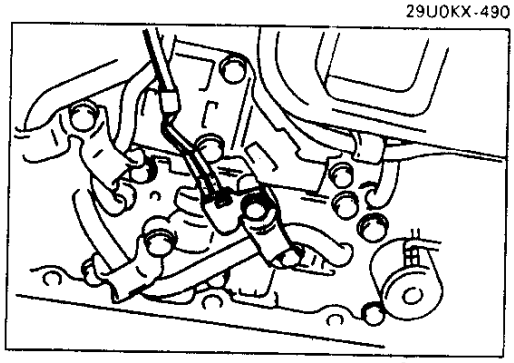
8. Apply ATF to a new O-ring and install it onto the oil strainer.
9. Install the oil strainer.

Bolt length (measured from below bolt head):
50 mm {2.0 in}

Tightening torque:
6.9–8.8 N·m {70–90 kgf·cm, 61–78 in·lbf}


29U0KX-490

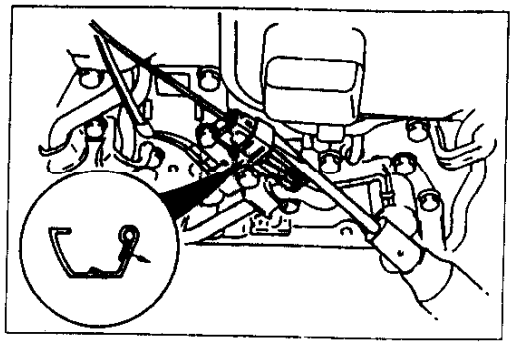
10. Secure the solenoid valve harness with the harness clip.


37U0KX-194

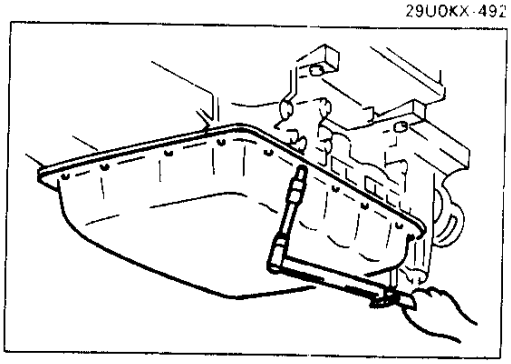
11. Install the ATF thermosensor.

Bolt length (measured from below bolt head):
45 mm {1.8 in}

Tightening torque:
6.9–8.8 N·m {70–90 kgf·cm, 61–78 in·lbf}

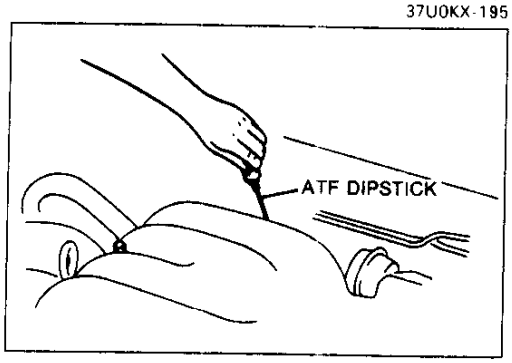

29U0KX-492

12. Connect the solenoid valve (lockup) connector.
13. Install the clip.


37U0KX-195

14. Clean the oil pan and the magnet, and set the magnet into the oil pan.
15. Install a new gasket and the oil pan.

Tightening torque:
5.0–7.8 N·m {50–80 kgf·cm, 44–69 in·lbf}



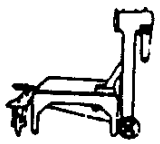
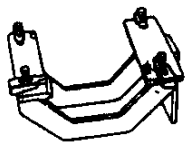
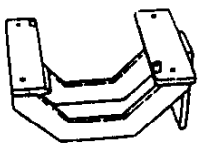
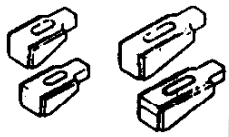
37U0KX-196

16. Connect the negative battery cable.
17. Pour in ATF and check the ATF level as specified. (Refer to page K–25.)

TRANSMISSION UNIT (ASSEMBLY)

Preparation

SST

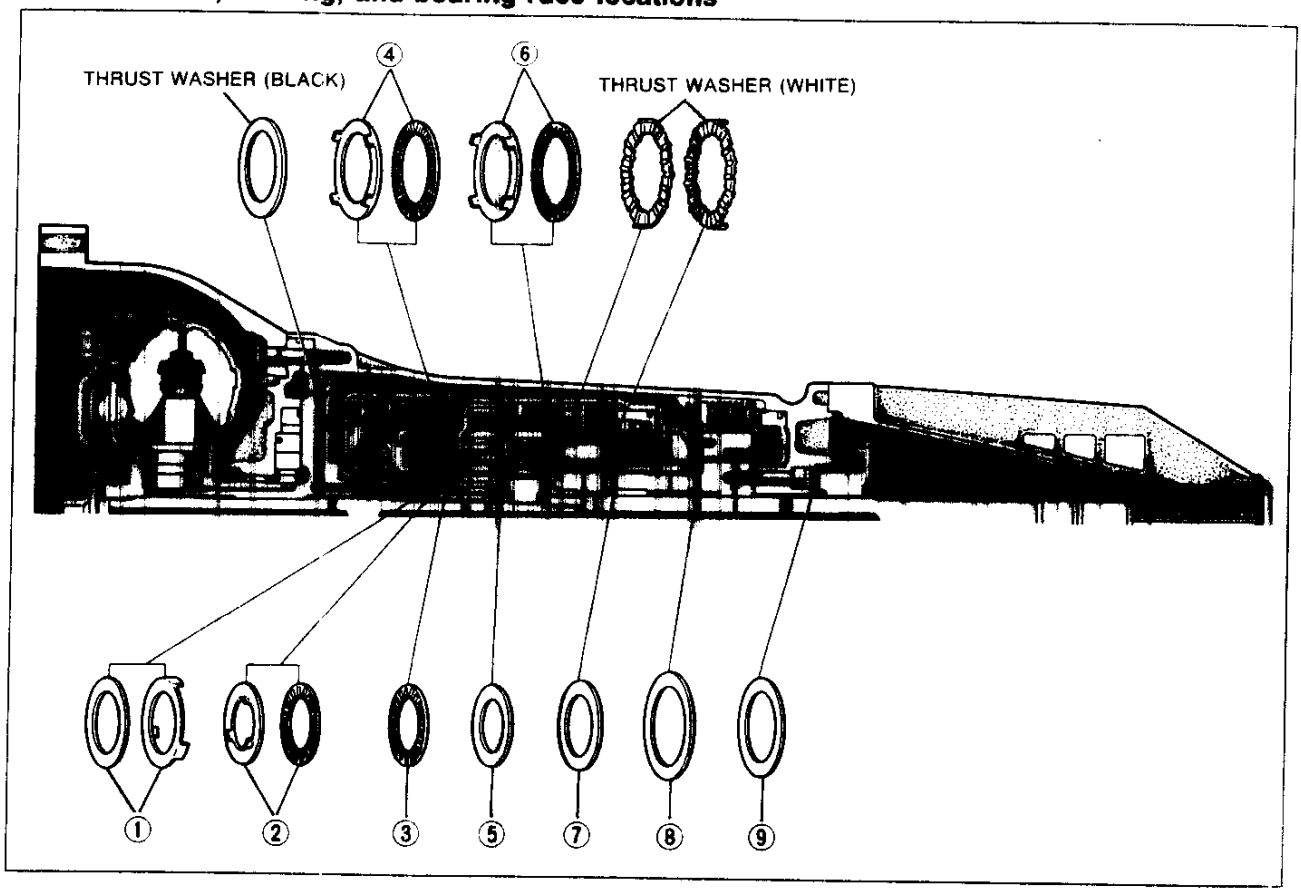
49 0107 680A Engine stand 	For assembly of transmission	49 U019 0A0A Hanger set, transmission 	For assembly of transmission
49 H075 495B Body (Part of 49 U019 0A0A) 	For assembly of transmission	49 U019 003 Holder (Part of 49 U019 0A0A) 	For assembly of transmission

29U0KX-495

Precaution

1. If the drive plates or brake band is replaced with new one(s), 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 bearing race locations



29U0KX-496

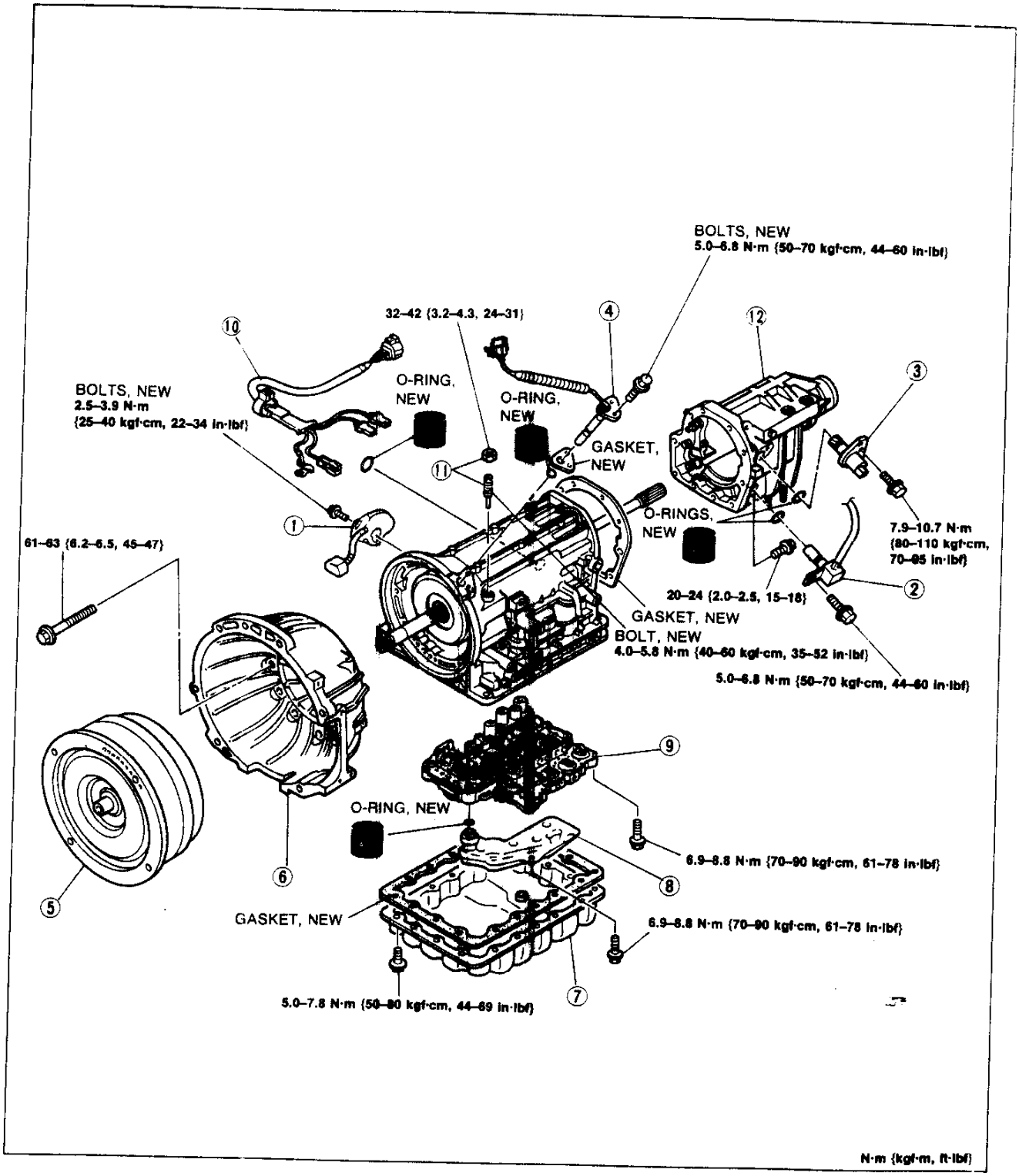
Outer diameter of bearing and race

		1	2	3	4	5	6
Bearing	mm {in}	47.0 {1.85}	53.0 {2.09}	53.0 {2.09}	78.0 {3.07}	53.0 {2.09}	78.0 {3.07}
Race	mm {in}	43.5 {1.71}	51.5 {2.03}	–	75.0 {2.95}	–	75.0 {2.95}

		7	8	9
Bearing	mm {in}	59.0 {2.32}	78.1 {3.08}	64.0 {2.52}
Race	mm {in}	–	–	–

37U0KX-197

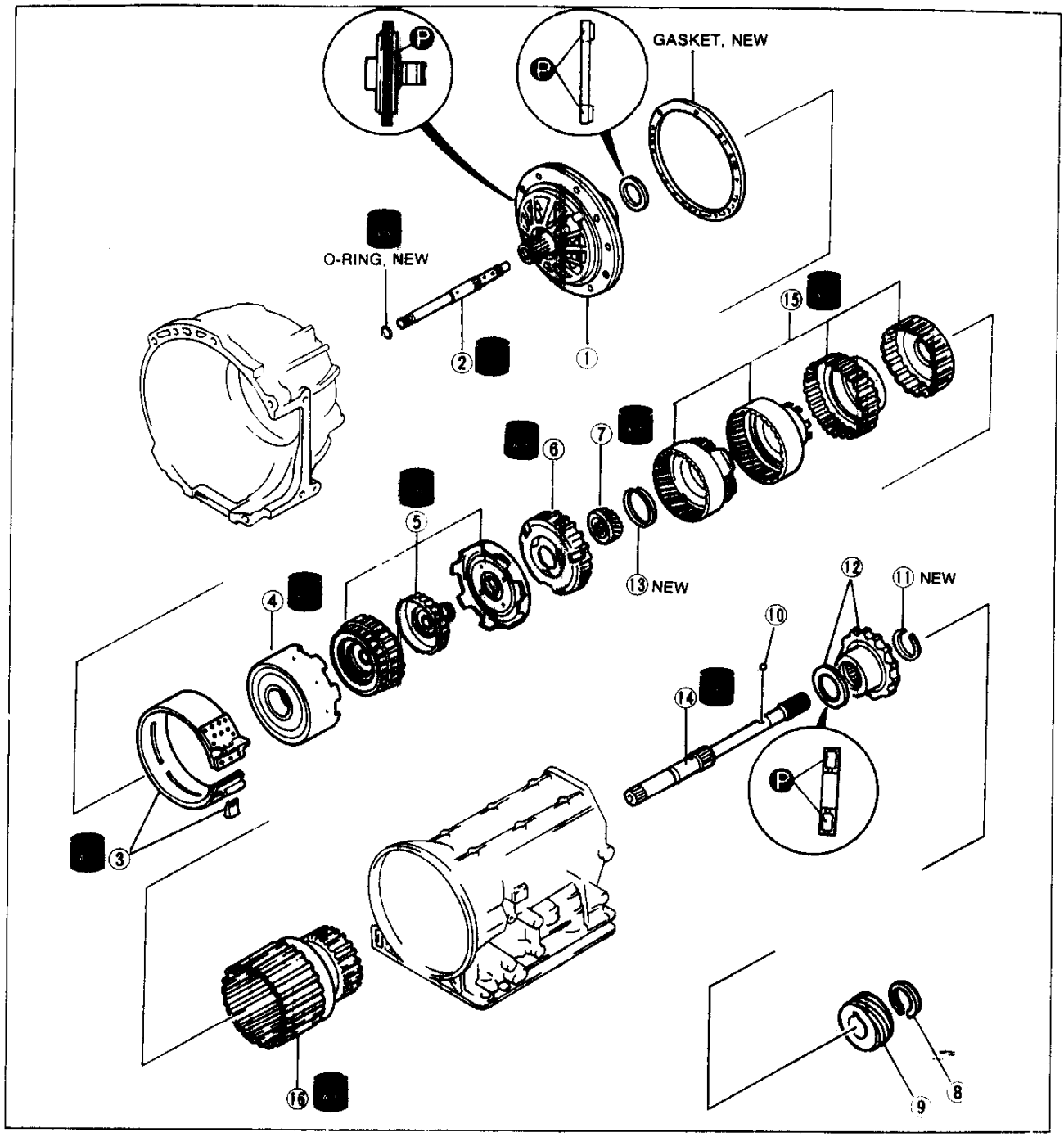
Components 1



29U0KX-438

1. Inhibitor switch
2. Speed sensor 1
3. Speed sensor 2
4. Pulse generator
5. Torque converter
6. Converter housing
7. Oil pan
8. Oil strainer
9. Control valve body
10. Solenoid valve harness
11. Anchor end bolt and nut
12. Extension housing / Parking mechanism

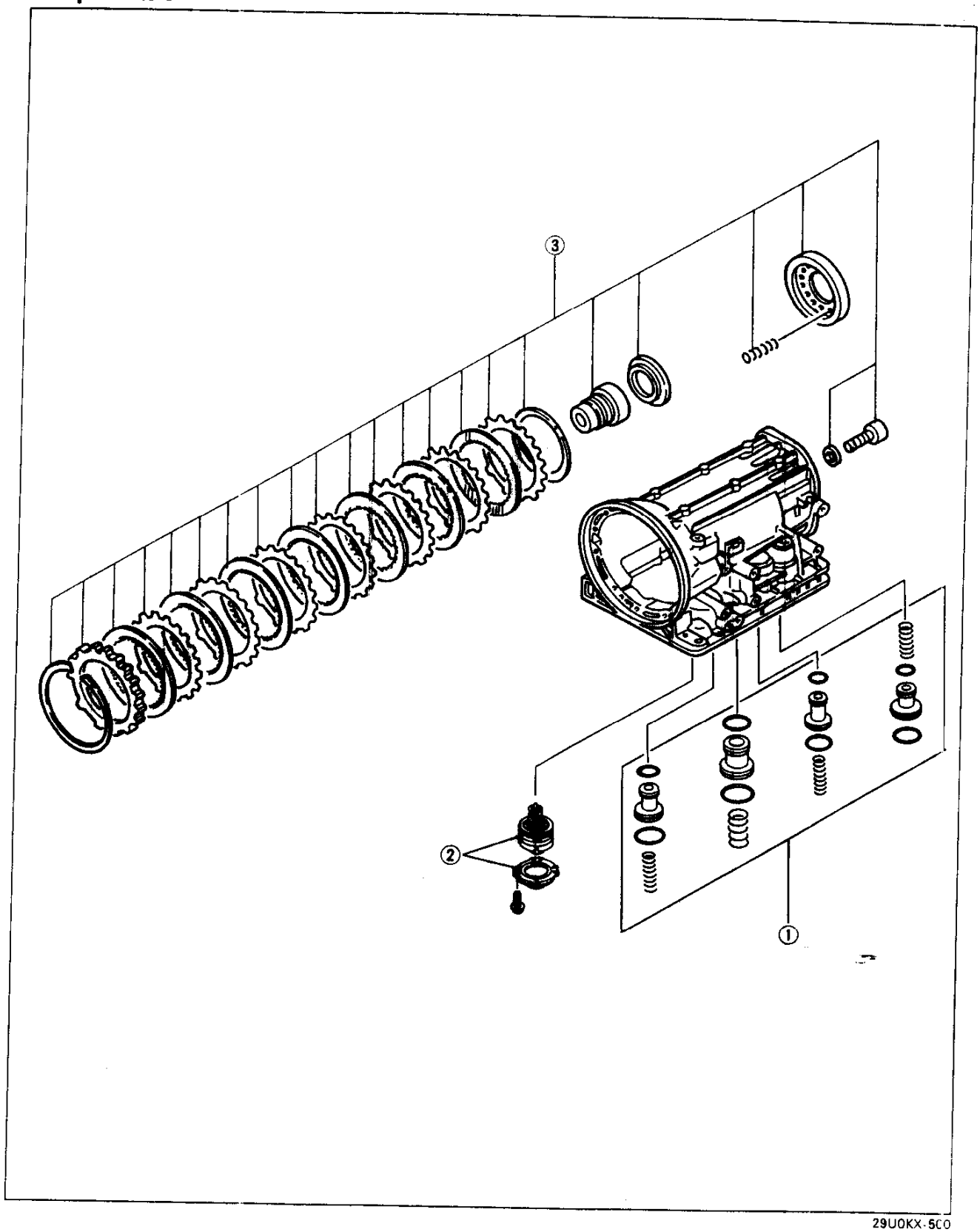
Components 2



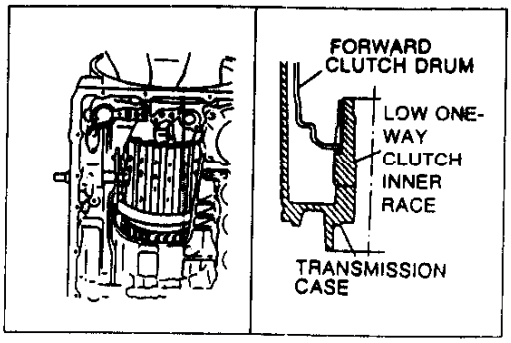
37U0KX-198

1. Oil pump
2. Input shaft
3. Brake band and strut
4. Reverse clutch
5. High clutch and front sun gear
6. Front planetary carrier
7. Rear sun gear
8. Snap ring
9. Speedometer drive gear
10. Steel ball
11. Snap ring
12. Parking gear and bearing
13. Snap ring
14. Output shaft
15. Front internal gear, rear internal gear, forward clutch hub, overrunning clutch hub
16. Forward clutch drum (forward clutch, overrunning clutch, low one-way clutch)

Components 3



1. Accumulator
2. Band servo
3. Low and reverse brake

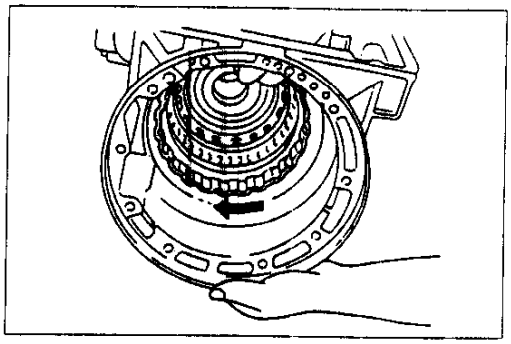


29U0KX-501

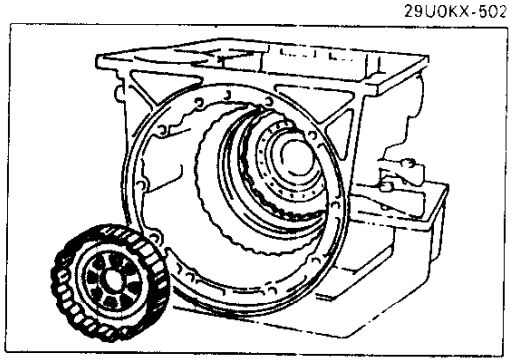
Assembly procedure

Caution
- **Do not damage the seal rings on the low one-way clutch inner race.**

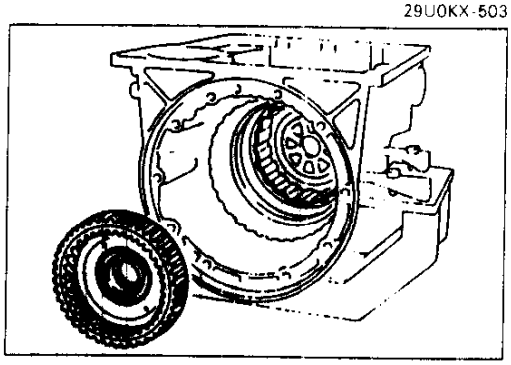
1. Install the forward clutch drum while slowly turning it clockwise until its hub passes fully over the low one-way clutch inner race.


29U0KX-502

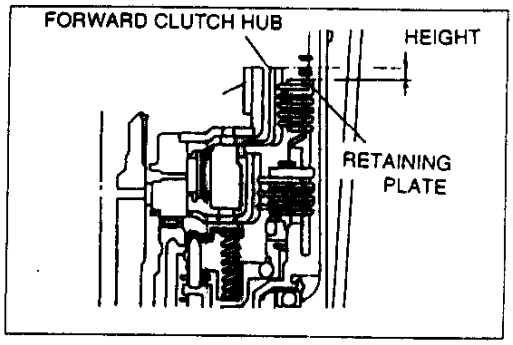
2. Verify that the forward clutch drum will turn only clockwise.


29U0KX-503

3. Verify that the bearing is installed on the rear of the overrunning clutch hub.
4. Install the overrunning clutch hub into the forward clutch drum.
5. Verify that the thrust washer is installed on the front of the overrunning clutch hub.


29U0KX-504

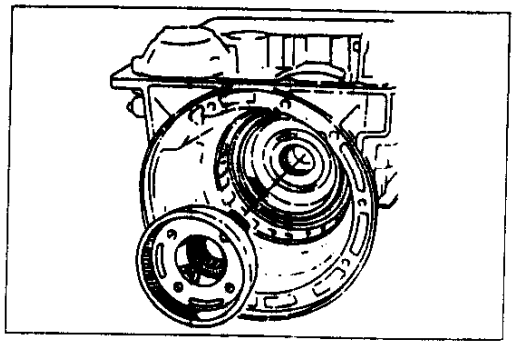
6. Install the rear internal gear and forward clutch hub assembly into the forward clutch drum.
7. Verify that the bearing is installed on the rear internal gear.



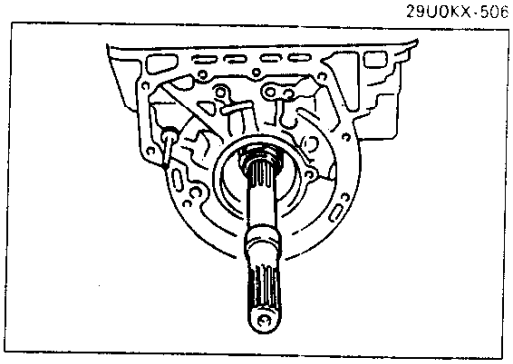
37U0KX-199

8. Measure the height difference between the forward clutch retaining plate and the top of the forward clutch hub.

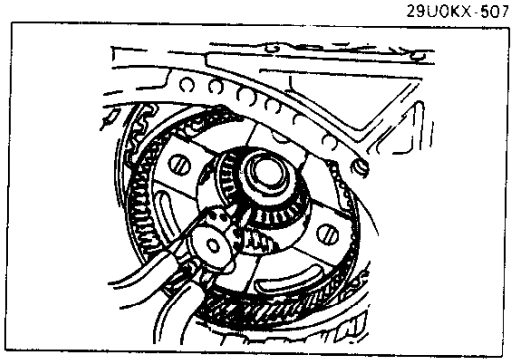
Height: 2.0–3.0 mm {0.079–0.118 in} approx.


29U0KX-506

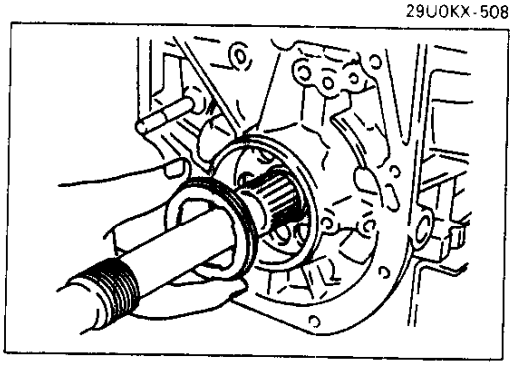
9. Verify that the bearing race is installed on the front internal gear (rear planetary carrier).
10. Install the front internal gear (rear planetary carrier) into the forward clutch assembly.


29U0KX-507

11. Insert the output shaft from the rear of the transmission case.

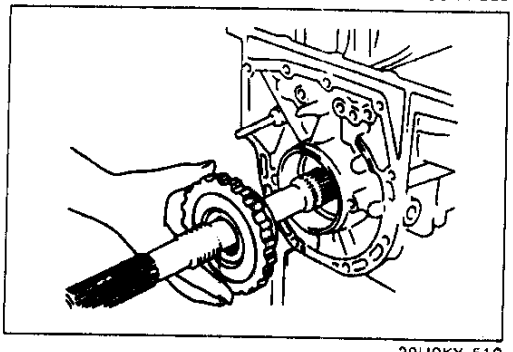

29U0KX-508

12. Push the output shaft slightly forward, and install a new snap ring on the shaft. Verify that the output shaft cannot be pulled from the rear of the transmission case.

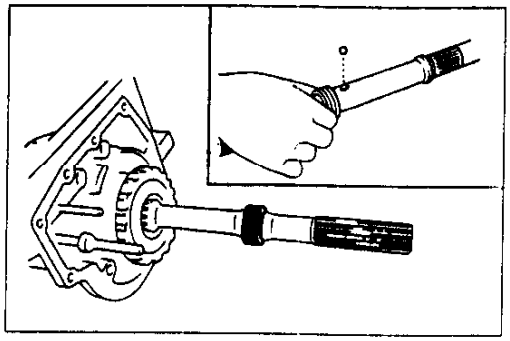

37U0KX-200

13. Apply petroleum jelly to the bearing and install it to the transmission case with the black surface facing outward.

Bearing outer diameter: 64.0 mm {2.52 in}

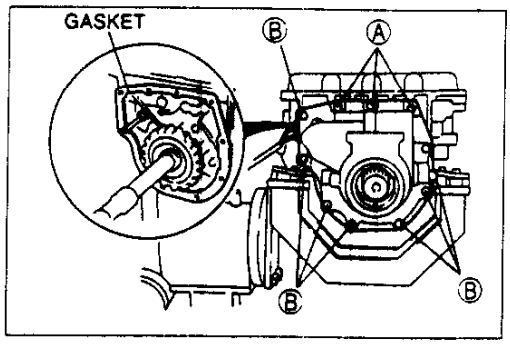

29U0KX-510

14. Install the parking gear.
15. Pull the output shaft slightly back, and install a new snap ring on the shaft. Verify that the output shaft cannot be pulled from the front of the transmission case.



37U0KX-201

16. Install the steel ball and speedometer drive gear onto the output shaft.
17. Secure the speedometer drive gear with the snap ring.

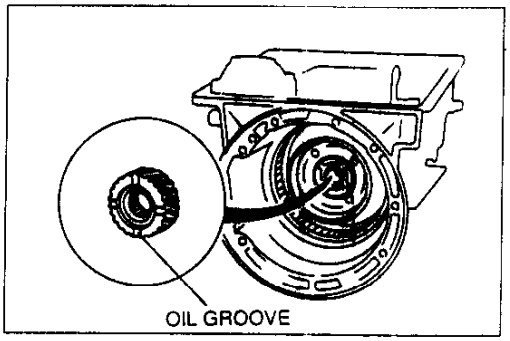


37U0KX-202

18. Install a new gasket and the extension housing.

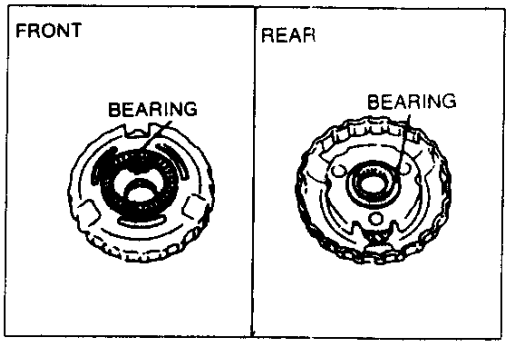
Bolt length (measured from below bolt head):
A: 30 mm {1.2 in}
B: 45 mm {1.8 in}

Tightening torque:
20–24 N·m {2.0–2.5 kgf·m, 15–18 ft·lbf}



29U0KX-513

19. Install the rear sun gear into the rear planetary carrier with the oil grooves of the gear facing outward.

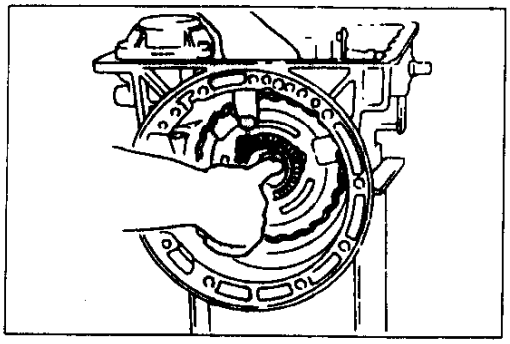


37U0KX-203

Caution
- **Install the rear bearing with the black surface facing outward.**

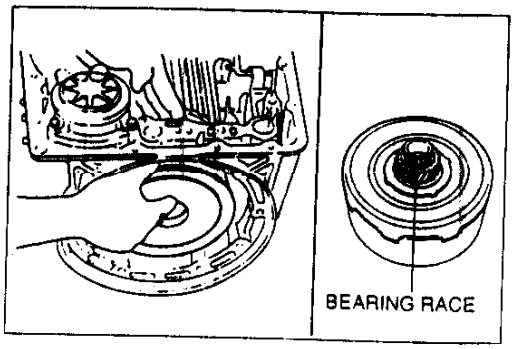
20. Apply petroleum jelly to the bearings and install them to the front planetary carrier.

Bearing outer diameter
Front: 78.0 mm {3.07 in}
Rear: 53.0 mm {2.09 in}



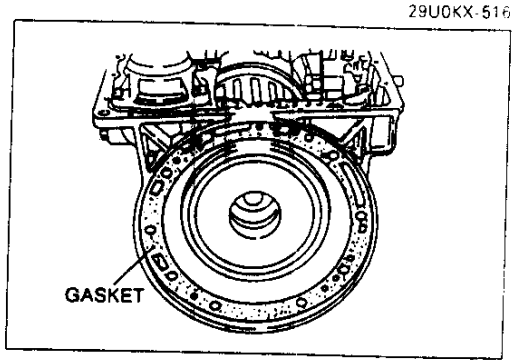
29U0KX-515

21. While rotating the forward clutch drum clockwise, install the front planetary carrier into the forward clutch drum.



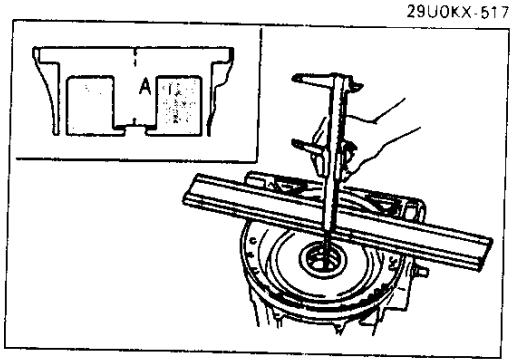
29U0KX-516

22. Verify that the bearing race is installed on the front sun gear.
23. Install the reverse clutch, high clutch, and front sun gear assembly into the transmission case.
24. Verify that the bearing race is installed on the high clutch drum.



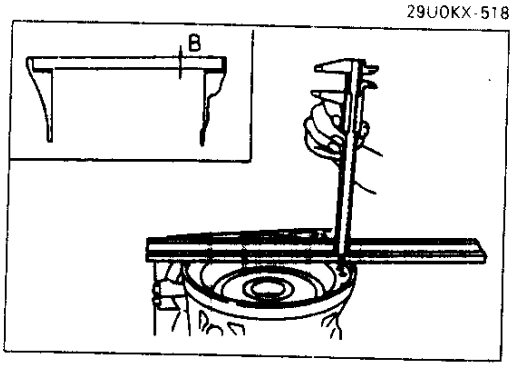
29U0KX-517

25. Adjust the total end play.
(1) Install a new oil pump gasket.



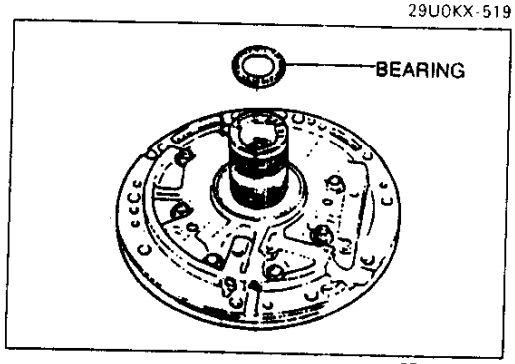
29U0KX-518

(2) Measure height A by using vernier calipers and a straightedge.



29U0KX-519

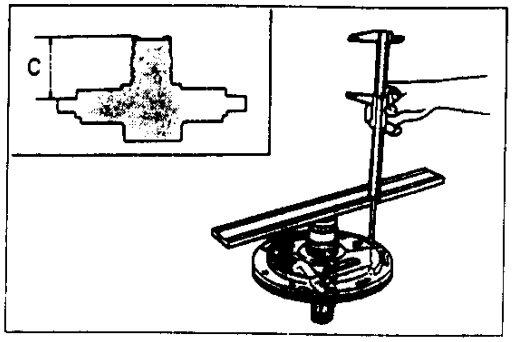
(3) Measure height B.



37U0KX-204

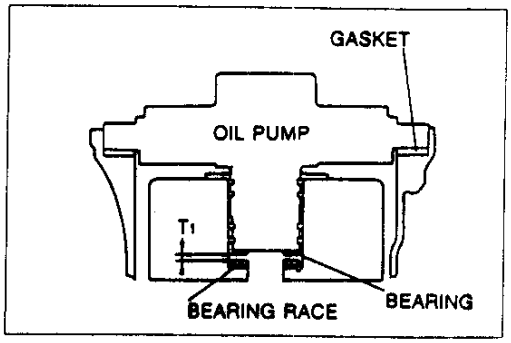
(4) Apply petroleum jelly to the bearing and install it on the oil pump.

Bearing outer diameter: 47.0 mm {1.85 in}



29U0KX-521

(5) Measure height C.



37U0KX-205

(6) Calculate the total end play by using the formula below.

Formula: T1 = A – B – C – 0.1 mm {0.004 in}

T1: Total end play
A: Distance between front of transmission case and bearing race on the high clutch drum
B: Distance between front of transmission case and oil pump gasket
C: Distance between upper surface of oil pump bearing and oil pump gasket contact surface.
0.1 mm {0.0039 in}: Amount of compression of new oil pump gasket

Total end play:
0.25–0.55 mm {0.010–0.022 in}

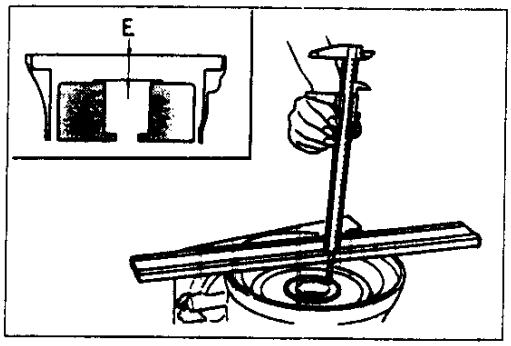
(7) If the total end play is not within specification, adjust it by selecting and installing the proper bearing race.

Bearing race size

mm {in}

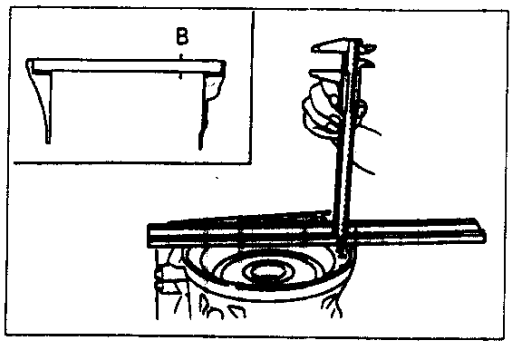
0.8 {0.031}	1.0 {0.039}	1.2 {0.047}	1.4 {0.055}
1.6 {0.063}	1.8 {0.071}	2.0 {0.079}	–

37U0KX-206



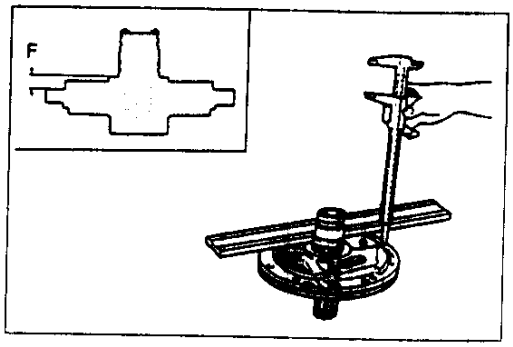
29U0KX-524

26. Adjust the reverse clutch end play.
(1) Install the thrust washer on the reverse clutch.
(2) Measure height E by using vernier calipers and a straightedge.



29U0KX-525

(3) Measure height B.



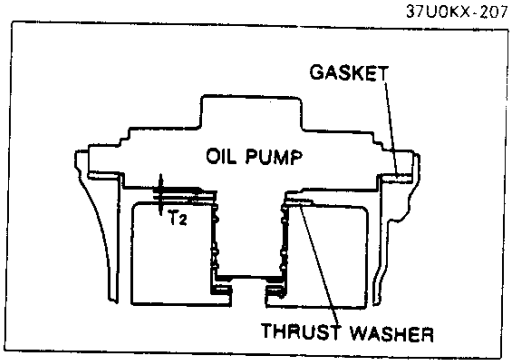
37U0KX-207

(4) Measure height F.

(5) Calculate the reverse clutch end play by using the formula below.

Formula: T2 = E – B – F – 0.1 mm {0.004 in}

T2: Reverse clutch end play
B: Distance between front of transmission case and oil pump gasket.
E: Distance between front of transmission case and thrust washer on the reverse clutch drum
F: Distance between reverse clutch thrust washer contact surface of oil pump and oil pump gasket contact surface
0.1 mm {0.0039 in}: Amount of compression of new oil pump gasket



37U0KX-208

Reverse clutch end play:
0.55–0.90 mm {0.022–0.035 in}

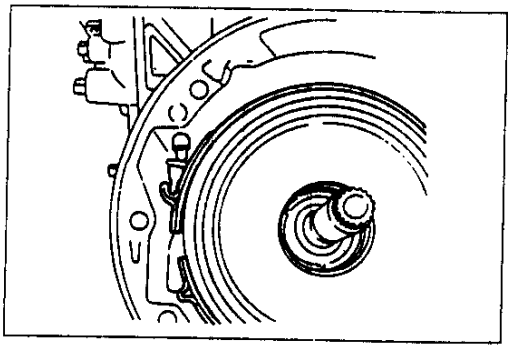
(6) If the reverse clutch end play is not within specification, adjust it by selecting and installing the proper thrust washer.

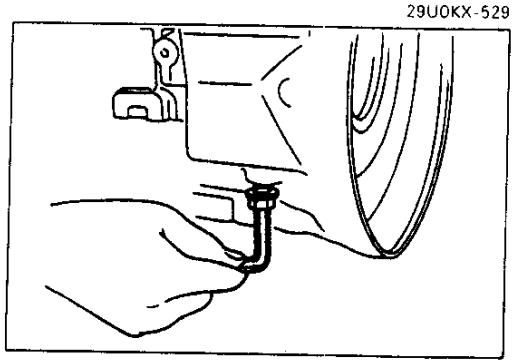
Thrust washer size

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}	–

37U0KX-209

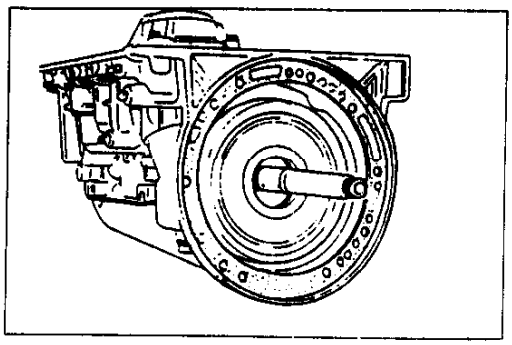

29U0KX-529


29U0KX-530

Caution
- **Adjust the brake band after installation of the converter housing.**

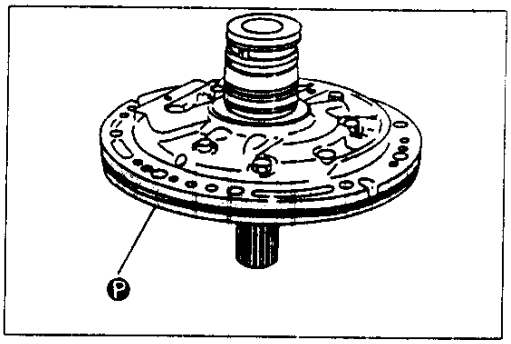
27. Apply ATF to the brake band and band strut, and install them into the transmission.

28. Temporarily install a new anchor end bolt.



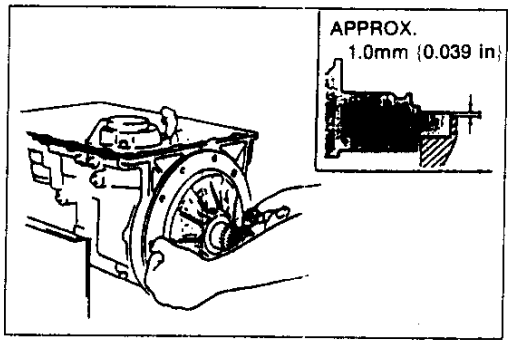
29U0KX-531

29. Apply ATF to the input shaft and install it into the transmission case.



29U0KX-532

30. Apply petroleum jelly to the oil pump assembly as shown.



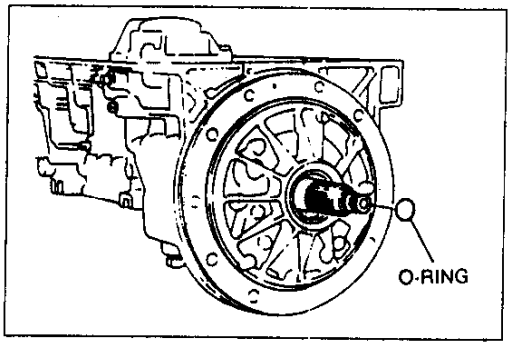
37U0KX-210

Caution

- **Do not damage the seal rings or O-ring.**
- **Do not use a hammer, plastic or any other kind, to install the oil pump.**

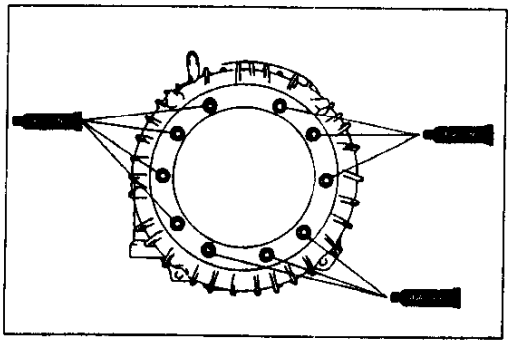
31. Install the oil pump assembly into the transmission case by using two converter housing bolts as guides. Measure the height difference between the edge of the transmission case and the oil pump as shown.

Height: 1.0 mm {0.039 in} approx.



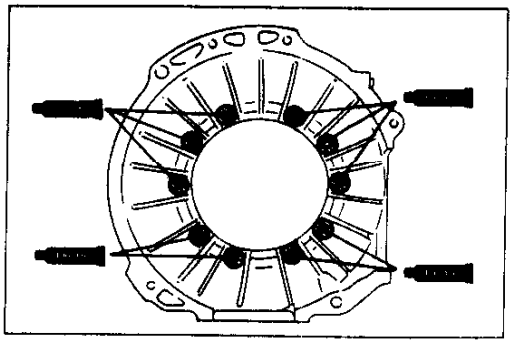
29U0KX-534

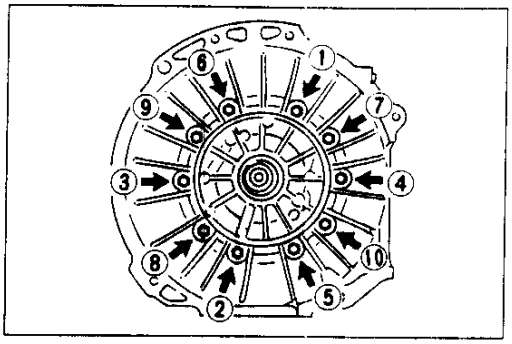
32. Apply ATF to a new O-ring, and install it onto the input shaft.



29U0KX-535

33. Apply sealant lightly around the bolt holes as shown.

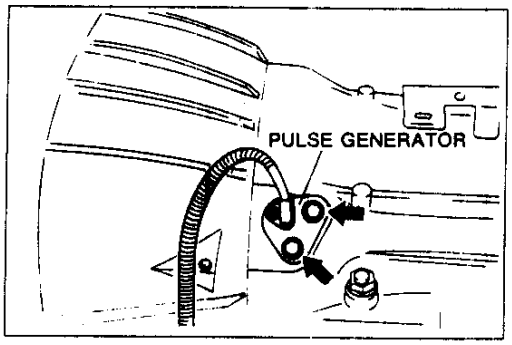




37U0KX-211

34. Remove the conventer housing guide bolts.
35. Install the converter housing onto the transmission case, and tighten the bolts evenly in the order shown.

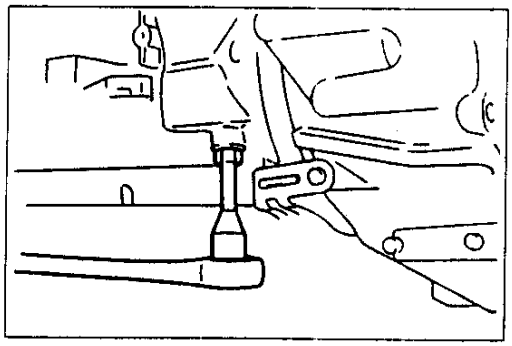
Tightening torque:
61–63 N·m {6.2–6.5 kgf·m, 45–47 ft·lbf}



37U0KX-212

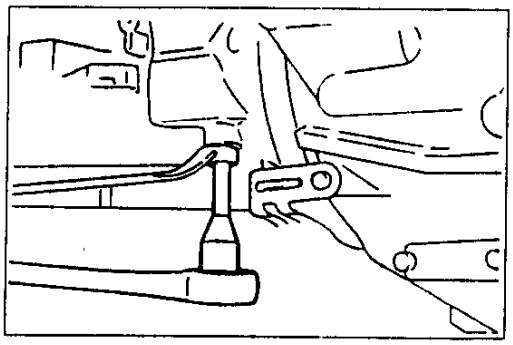
36. Apply ATF to a new O-ring and install it onto the pulse generator.
37. Install a new gasket and the pulse generator.
38. Install new bolts and tighten them.

Tightening torque:
5.0–6.8 N·m {50–70 kgf·cm, 44–60 in·lbf}


37U0KX-213

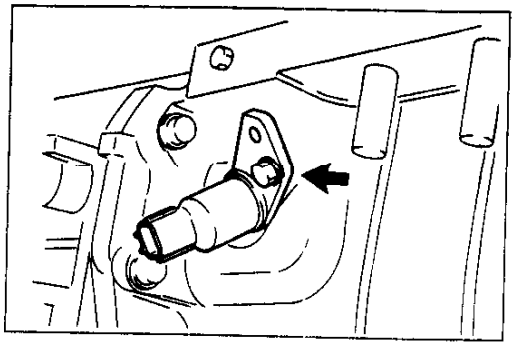
39. Adjust the brake band.
(1) Tighten the anchor end bolt.

Tightening torque:
4.0–5.8 N·m {40–60 kgf·cm, 35–52 in·lbf}


37U0KX-214

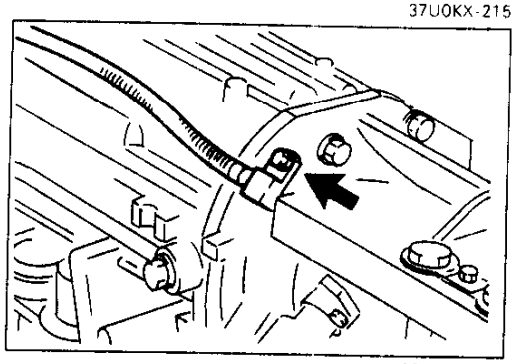
(2) Loosen the anchor end bolt 2.5 turns.
(3) Install the locknut.
(4) Hold the anchor end bolt and tighten the locknut

Tightening torque:
32–42 N·m {3.2–4.3 kgf·m, 24–31 ft·lbf}


37U0KX-215

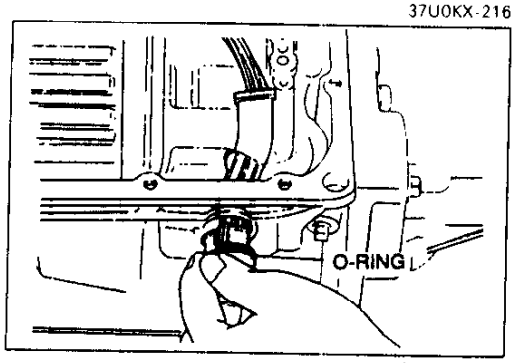
40. Apply ATF to a new O-ring and install it onto speed sensor 2.
41. Install speed sensor 2 into the extension housing.

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


37U0KX-216

42. Apply ATF to a new O-ring and install it onto speed sensor 1.
43. Install speed sensor 1 into the extension housing.

Tightening torque:
5.0–6.8 N·m {50–70 kgf·cm, 44–60 in·lbf}

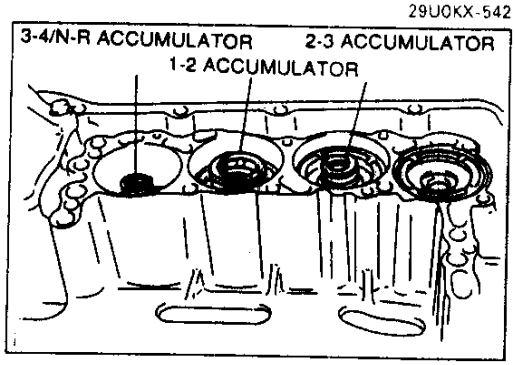


29U0KX-542

44. Apply ATF to a new O-ring and install it onto the solenoid valve harness.

Caution
- **Do not damage the solenoid valve harness.**

45. Install the solenoid valve harness into the transmission case.



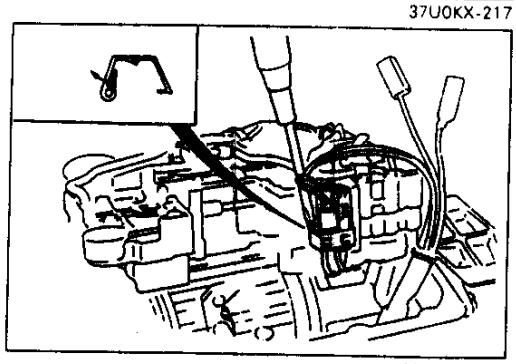
37U0KX-217

46. Install the accumulator spring into the accumulator piston.

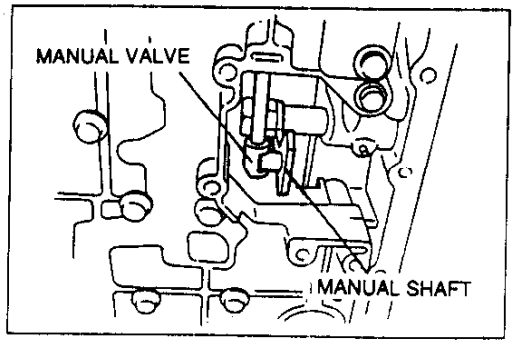
Spring specifications

mm {in}

Item / Spring	Outer dia.	Free length	No. of coils	Wire dia.
3-4/N-R accumulator piston	18.0 {0.71}	43.0 {1.69}	7.9	2.3 {0.091}
1-2 accumulator piston	29.3 {1.15}	45.0 {1.77}	3.8	3.7 {0.15}
2-3 accumulator piston	19.5 {0.77}	66.0 {2.60}	8.6	3.0 {0.12}


29U0KX-544

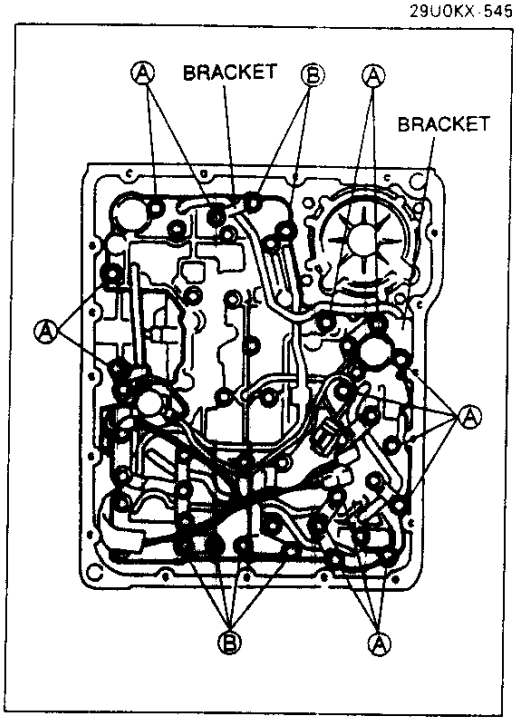
47. Connect the solenoid valve connectors.
48. Install the clip.



29U0KX-545

Caution
- **Do not damage the harness.**

49. Verify that the manual valve and manual shaft are assembled correctly.

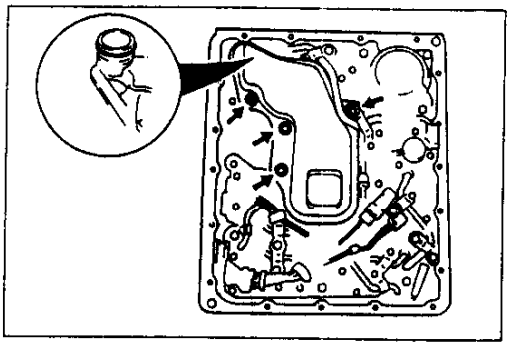


37U0KX-218

50. Install the valve body assembly, and tighten the bolts evenly.

Bolt length (measured from below bolt head):
A: 33 mm {1.3 in}
B: 45 mm {1.8 in}

Tightening torque:
6.9–8.8 N·m {70–90 kgf·cm, 61–78 in·lbf}

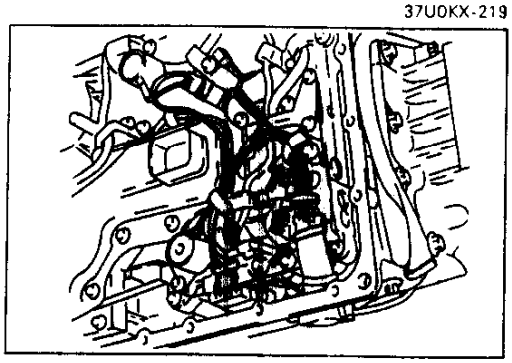


37U0KX-219

51. Apply ATF to a new O-ring and install it onto the oil strainer.
52. Install the oil strainer into the control valve body.

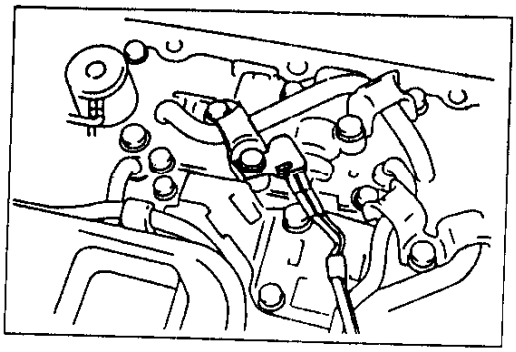
Bolt length (measured from below bolt head):
50 mm {2.0 in}

Tightening torque:
6.9–8.8 N·m {70–90 kgf·cm, 61–78 in·lbf}



29U0KX-548

53. Secure the solenoid valve harness with the clips.

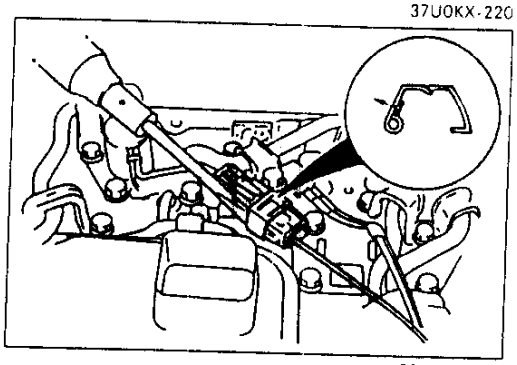


37U0KX-220

54. Install the ATF thermosensor as shown in the figure.

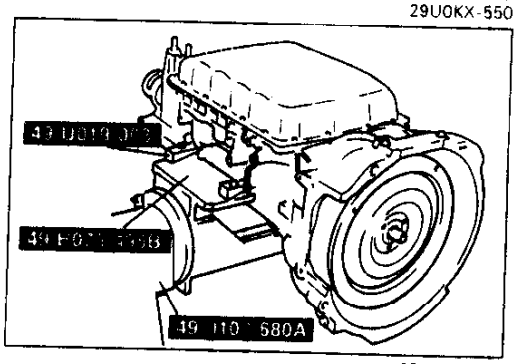
Bolt length (measured from below bolt head):
45 mm {1.8 in}

Tightening torque:
6.9–8.8 N·m {70–90 kgf·cm, 61–78 in·lbf}



29U0KX-550

55. Connect the solenoid valve (lockup) connector.
56. Install the clip.



37U0KX-221

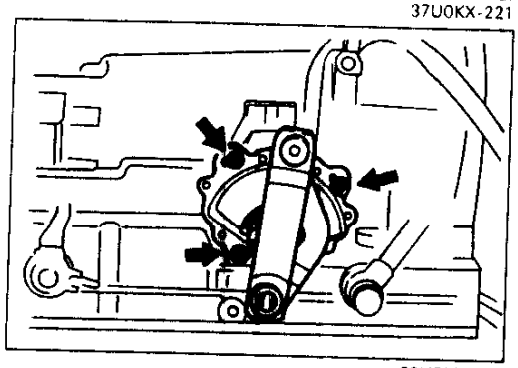
57. Set the magnet into the oil pan.
58. Install a new gasket and the oil pan.

Tightening torque:
5.0–7.8 N·m {50–80 kgf·cm, 44–69 in·lbf}

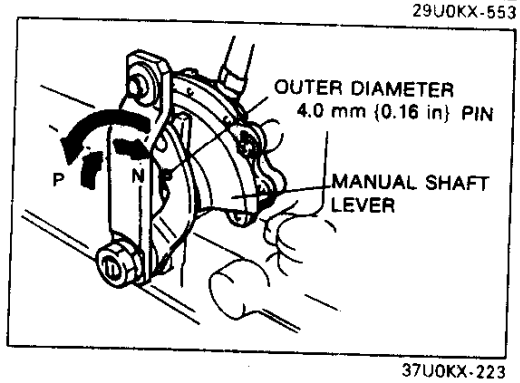
59. Remove the transmission from the **$ST (transmission hanger)**.
60. Install the connector brackets onto the extension housing.

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

61. Install the harness onto the connector bracket.
62. Install and adjust the inhibitor switch.
    (1) Verify that the manual shaft is positioned at the L position (fully forward).
    (2) Install the inhibitor switch over the manual shaft and install new bolts.



29U0KX-553

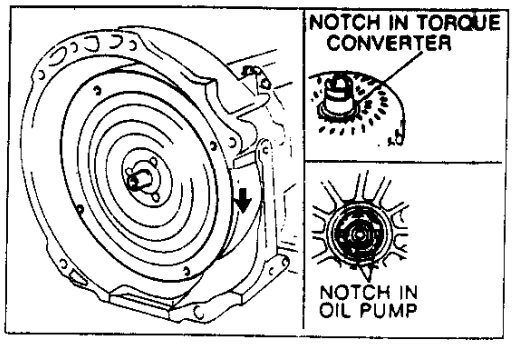


37U0KX-223

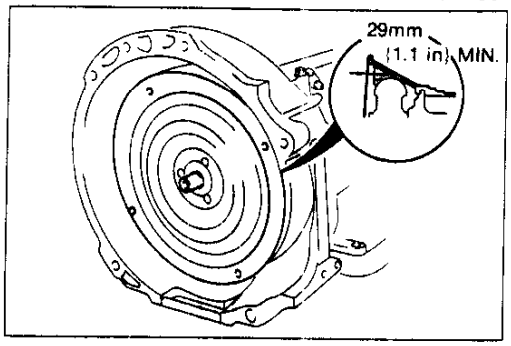
(3) Turn the manual shaft fully rearward, then return it **2 notches** (N range position).
(4) Insert **a 4.0 mm {0.16 in}** outer diameter pin through the holes of the inhibitor switch and the manual shaft lever.
(5) Tighten the inhibitor switch retaining bolts.

Tightening torque:
2.5–3.9 N·m {25–40 kgf·cm, 22–34 in·lbf}

(6) Remove the pin.



37U0KX-224



37U0KX-225

63. Remove the transmission from the **SST**. Stand the torque converter upright, and fill with ATF.

Note

- **Approximately 2.0 L {2.1 US qt, 1.8 Imp qt} of ATF are required for a new torque converter.**

64. Install the torque converter in the transmission while rotating it to align the splines.

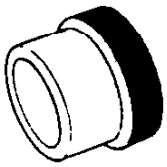
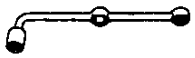
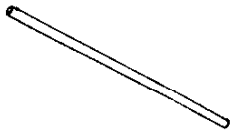
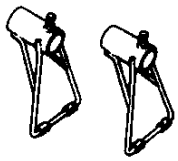
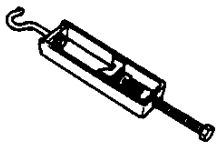
65. Measure the installation depth of the torque converter by using vernier calipers and a straightedge.

Specification: 29 mm {1.1 in} min.

TRANSMISSION UNIT (INSTALLATION)

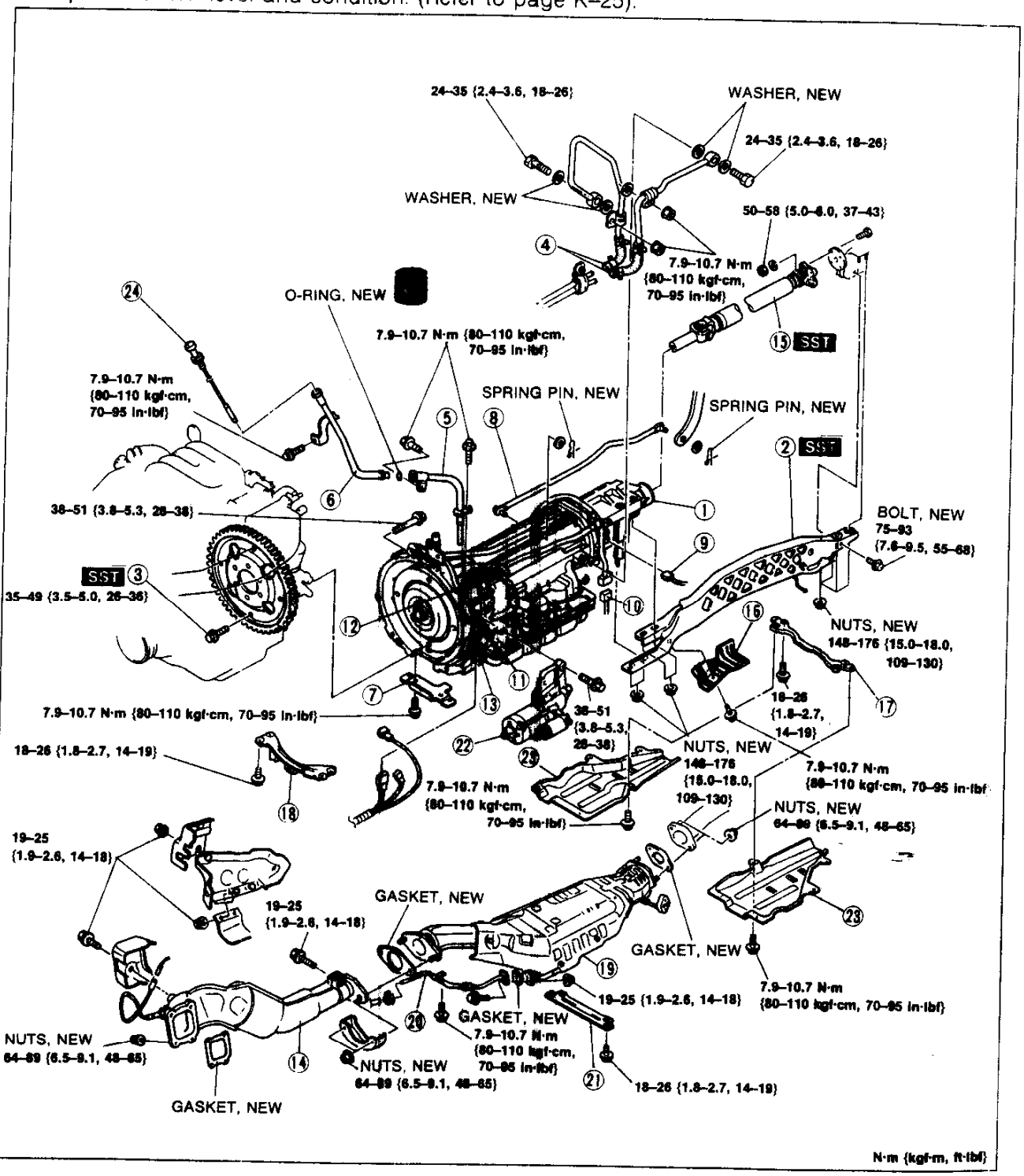
Preparation

SST

49 J019 002 Cap 	For prevention of ATF leakage	49 0877 435 Special wrench 	For loosening of torque converter installation bolts
49 G017 5A0 Support, engine 	For support of engine	49 G017 501 Bar (Part of 49 G017 5A0) 	For support of engine
49 G017 502 Support (Part of 49 G017 5A0) 	For support of engine	49 G017 503 Hook (Part of 49 G017 5A0) 	For support of engine

37U0KX-216

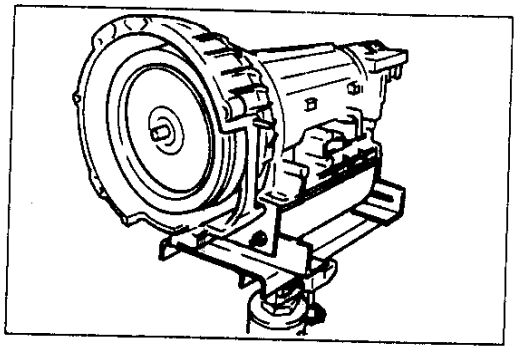
1. Install in the order shown in the figure, referring to **Installation Note**.
2. Fill the transmission with the specified ATF after installation.
3. Connect the negative battery cable.
4. Inspect the inhibitor switch operation. (Refer to page K–28).
5. Inspect the selector lever operation. (Refer to page K–164).
6. Inspect for oil leakage from the transmission.
7. Perform a road test. (Refer to page K–16).
8. Inspect the ATF level and condition. (Refer to page K–25).



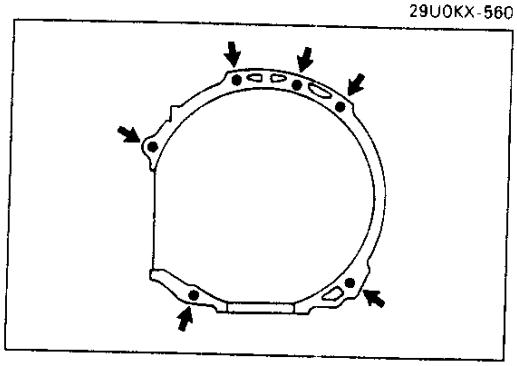
37U0KX-227

1. Transmission
   Installation Note ..... below
2. Power plant frame (PPF)
   Installation Note ..... below
3. Torque converter bolts
   Installation Note ..... page K–153
4. Oil cooler hose
5. Oil filler tube (lower)
6. Oil filler tube (upper)
7. Service hole cover
8. Selector rod (selector lever side)
   Installation Note ..... page K–153
9. Speed sensor 2 connector
10. Solenoid valve connector
11. Pulse generator connector
12. Speed sensor 1 connector
13. Inhibitor switch connector
14. Front exhaust pipe
15. Propeller shaft
    Installation Note ..... page K–153
16. Cover
17. Tunnel member (rear)
18. Tunnel member (front)
19. Catalytic converter assembly
20. Secondary air injection pipe
21. Tunnel member (center)
22. Starter
23. Under cover (right and left)
24. ATF dipstick

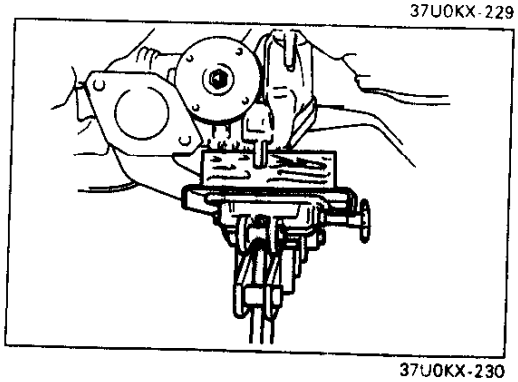
37U0• X-228



29U0KX-560



37U0KX-229



37U0KX-230

Installation note
Transmission

Caution
- **Do not allow the transmission to lean toward the torque converter side.**

1. Set the transmission on a transmission jack.
2. Mount the transmission to the engine.

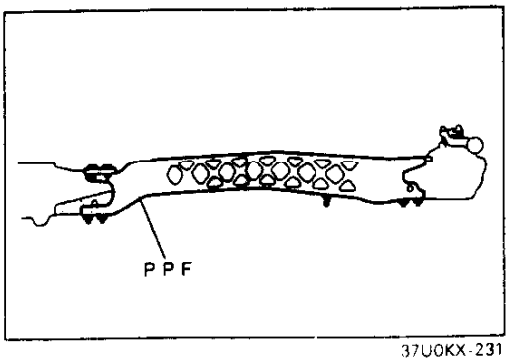
3. Gradually tighten the mounting bolts.

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

Power plant frame (PPF)

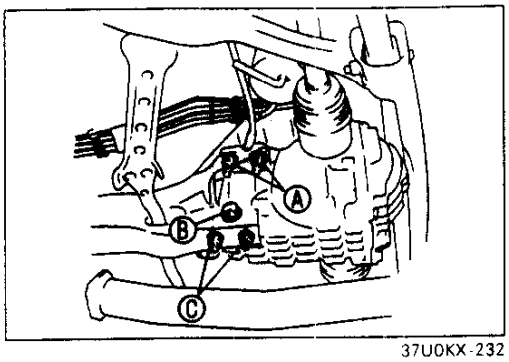
Caution
- **Do not rense PPF installation bolt and nuts.**

1. Hold the differential at a 0° angle by using the transmission jack.



37U0KX-231

2. Hold the PPF in place with a new bolt and nuts.

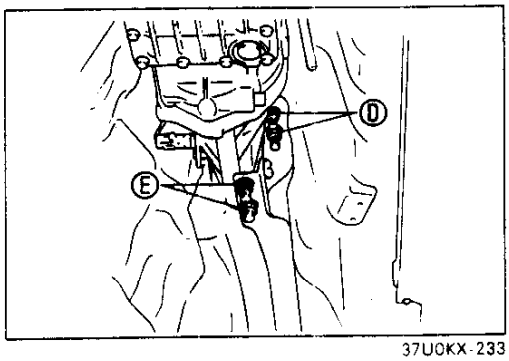


37U0KX-232

Caution
- **Tighten the differential-side PPF installation bolt and nuts first.**

3. Tighten the differential-side PPF installation bolt and nuts in the order A, B, C.

Tightening torque:
A, C: 148–176 N·m {15.0–18.0 kgf·m, 109–130 ft·lbf}
B: 75–93 N·m {7.6–9.5 kgf·m, 55–68 ft·lbf}

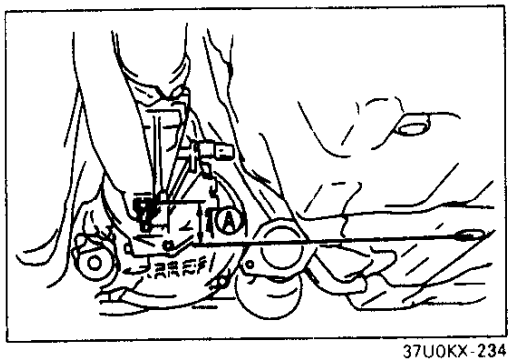


37U0KX-233

4. Tighten the transmission-side PPF installation nuts n the order D, E.

Tightening torque:
148–176 N·m {15.0–18.0 kgf·m, 109–130 ft·lbf}

5. Remove the transmission jack.



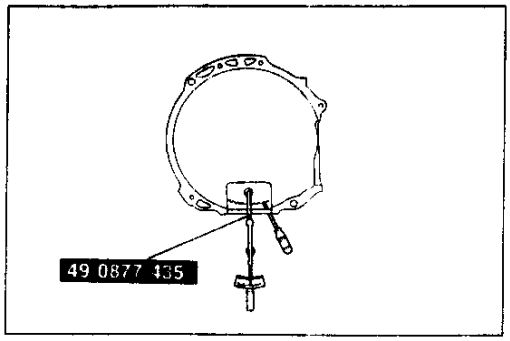
37U0KX-234

6. Measure A as shown in the figure.

Specification
Right side: Below 73.0 mm {2.87 in}
Left side : Below 75.0 mm {2.95 in}

Note
- **When measuring with a straight edge placed on both the right and left sides, the clearance should be 74.0 mm {2.91 in} minimum.**

7. If not within specification, readjust the PPF.



37U0KX-235

Torque converter bolts

1. Align the holes by turning torque converter.
2. Lock the drive plate by using a screwdriver.

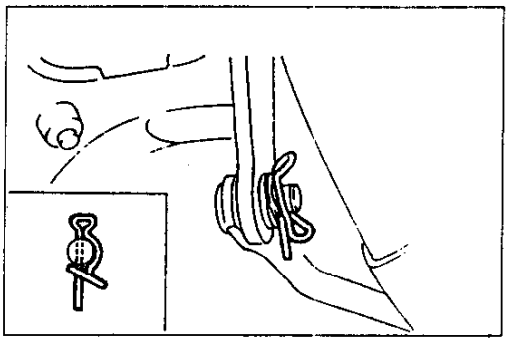
Caution
- **Loosely and equally tighten the torque converter bolts, then further tighten them to the specified tightening torque.**

3. Tighten the torque converter mounting bolts by using **SST** .

Caution
- **When tightening the bolts with the SST, adjust the below-written tightening torque by using the following formulas.**
  Choose the formula that applies to you.

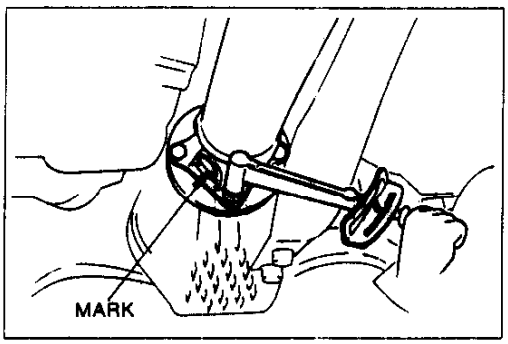
N·m	N·m × L (m) ÷ (L (m) + 0.1)
kgf·m	kgf·m × L (m) ÷ (L (m) + 0.1)
ft·lbf	ft·lbf × L (ft) ÷ (L (ft) + 0.3)

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


37U0KX-236

Selector rod

1. Install the selector rod.
2. Install the washer and a new spring pin as shown.



37U0KX-237

Propeller shaft

1. Remove the **SST (cap)** from the extension housing.

Caution
- **Align the mark.**

2. Install the propeller shaft.

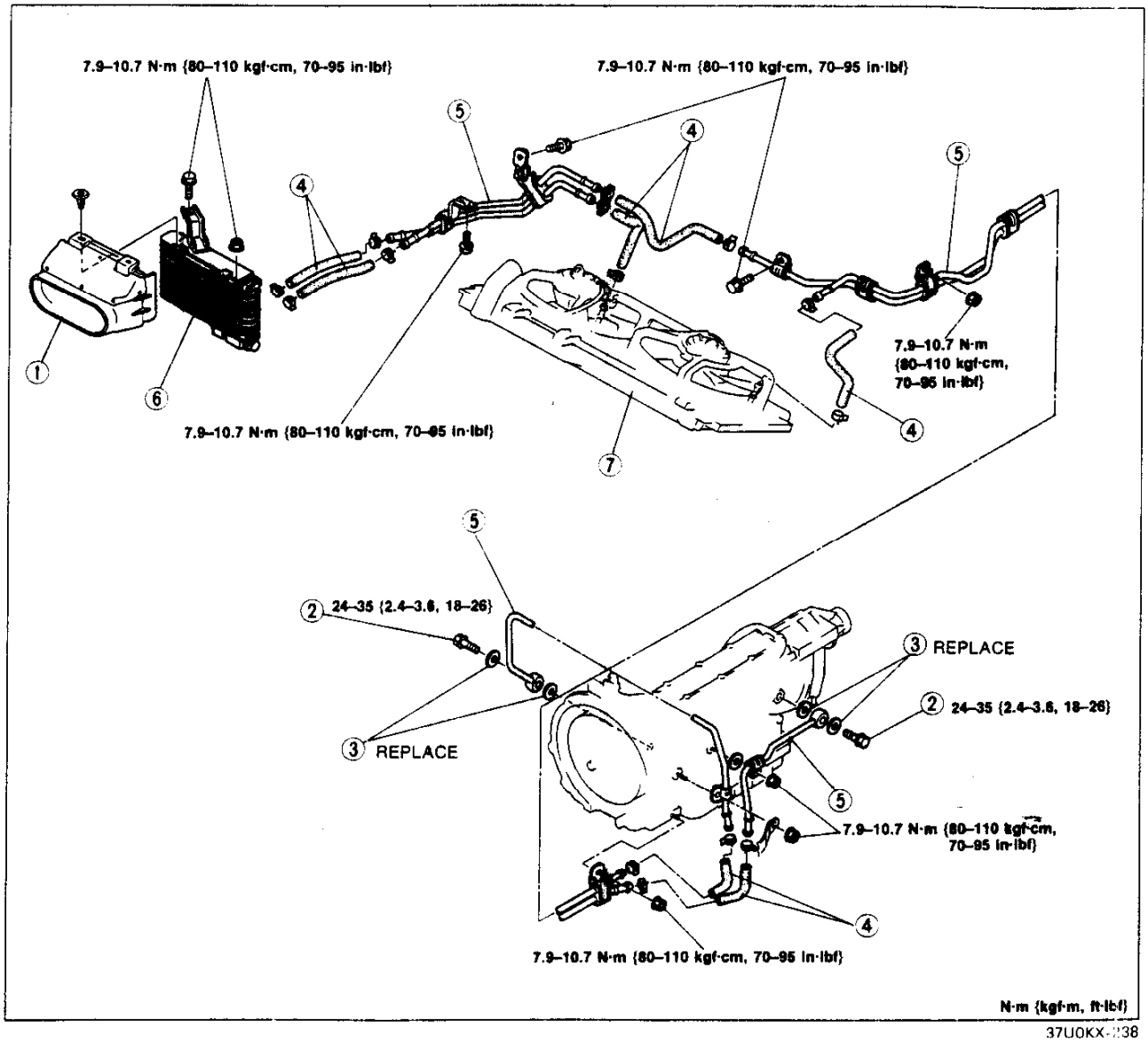
Tightening torque:
50–58 N·m {5.0–6.0 kgf·m, 37–43 ft·lbf}

OIL COOLER

OIL COOLER

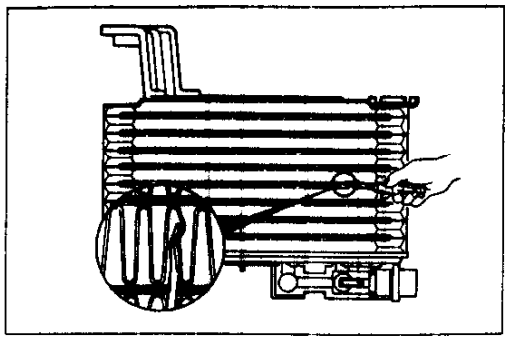
Removal / Inspection / Installation

1. Disconnect the negative battery cable.
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. Add ATF to the specified level.
6. Connect the negative battery cable.
7. Inspect the oil leakage from the oil pipes and oil hoses.
8. Inspect the ATF level and condition. (Refer to page K–25.)



37U0KX-238

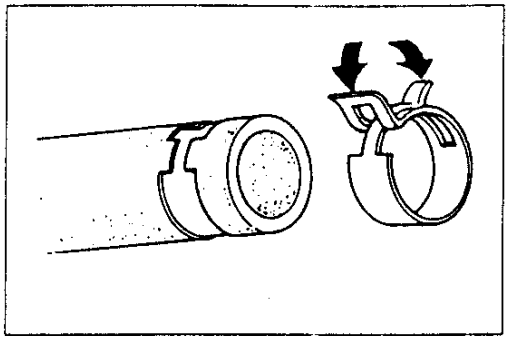
1. Air duct
2. Connector bolts
   Inspect for or clogging
3. Washers
4. Oil hoses
   Inspect for damage and cracks
   Installation Note ..... page K–155
5. Oil pipes
   Inspect for damage and cracks
6. Oil cooler
   Inspection ..... page K–155
7. Radiator
   Service ..... Section E



37U0JX-239

Inspection
Oil cooler

1. Inspect for cracks, damage, and water leakage, and replace as necessary.
2. Inspect for bent fins and repair with a screwdriver as necessary.

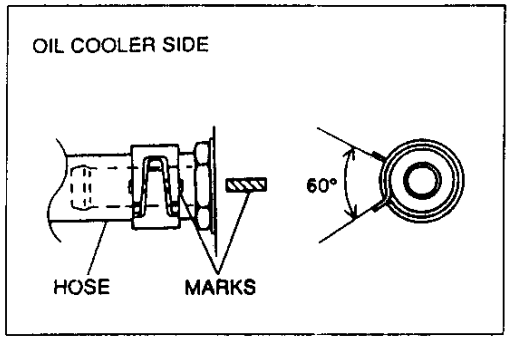


29U0KX-568

Installation note
Oil hoses

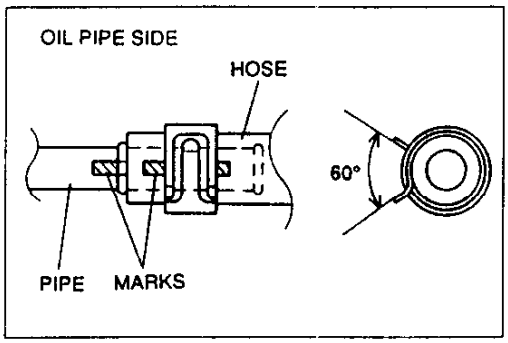
Caution

- **If reusing the hose clamp and/or oil hose, position the hose clamp in the original location on the hose.**
- **Squeeze the clamp lightly with large pilers to ensure a good tie.**



29U0KX-569

1. Align the marks, and slide the oil cooler hose onto the oil cooler pipe until it is fully seated as shown.
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 parts.



DRIVE PLATE

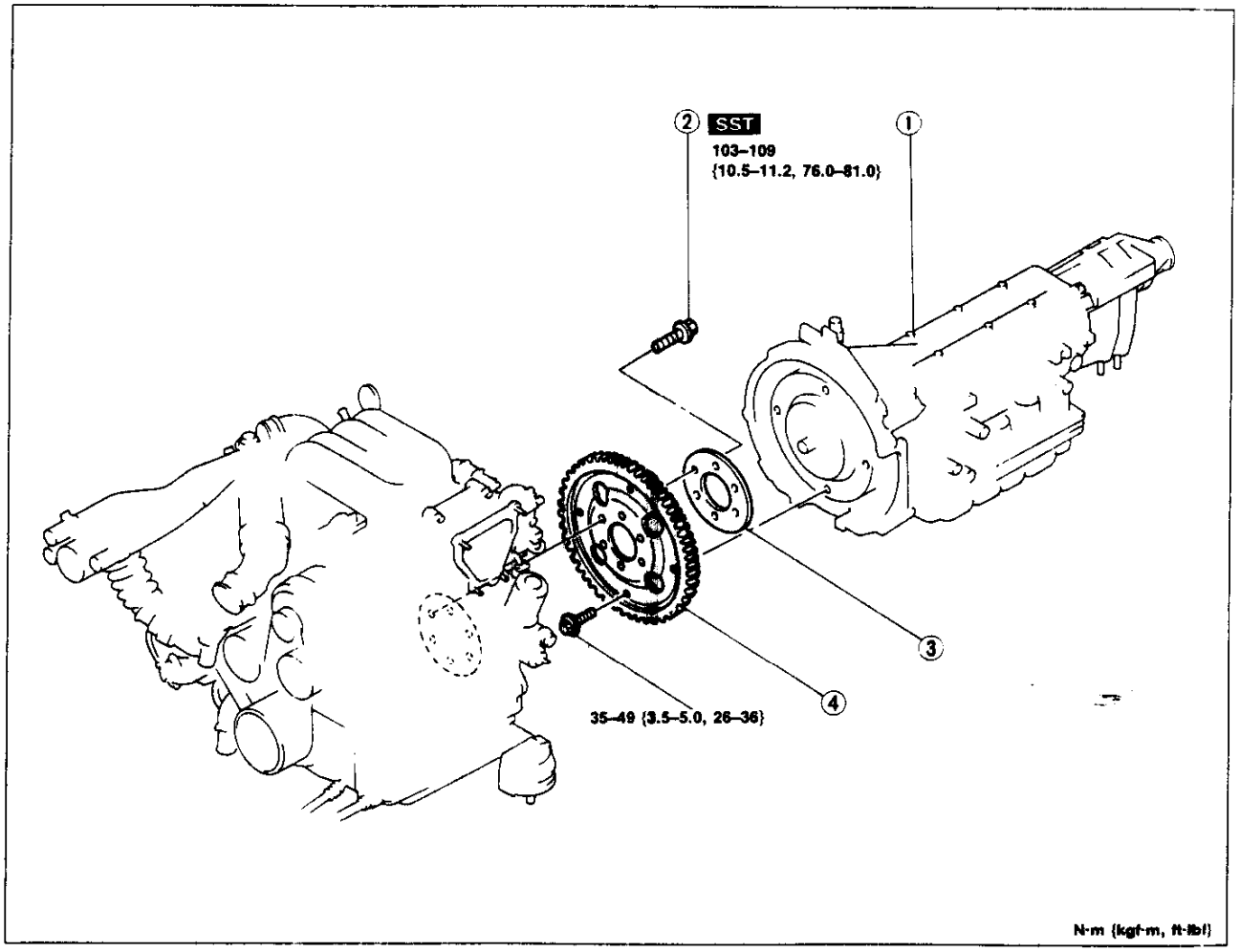
PREPARATION
SST

49 1881 055A Stopper, counter weight		For prevention of engine rotation

37U0KX-240

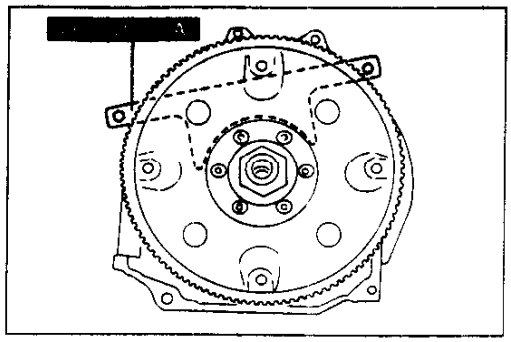
DRIVE PLATE
Removal / Inspection / Installation

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Inspect all parts and replace as necessary.
3. Install in the reverse order of removal, referring to **Installation Note**.



37U0KX-241

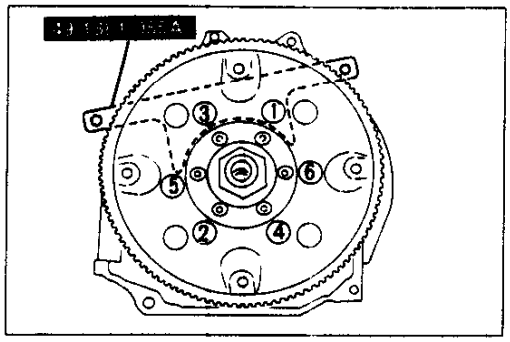
1. Transmission
   - Removal ..... page K– 42
   - Installation ..... page K–149
2. Drive plate mounting bolts
   - Removal Note ..... page K–157
   - Installation Note ..... page K–157
3. Adapter
4. Drive plate
   - Inspect for cracks and for ring gear wear and damage



29U0KX-572

Removal note
Drive plate mounting bolts

1. Set the **SST** or equivalent against the drive plate.
2. Remove the drive plate.



37U0KX-242

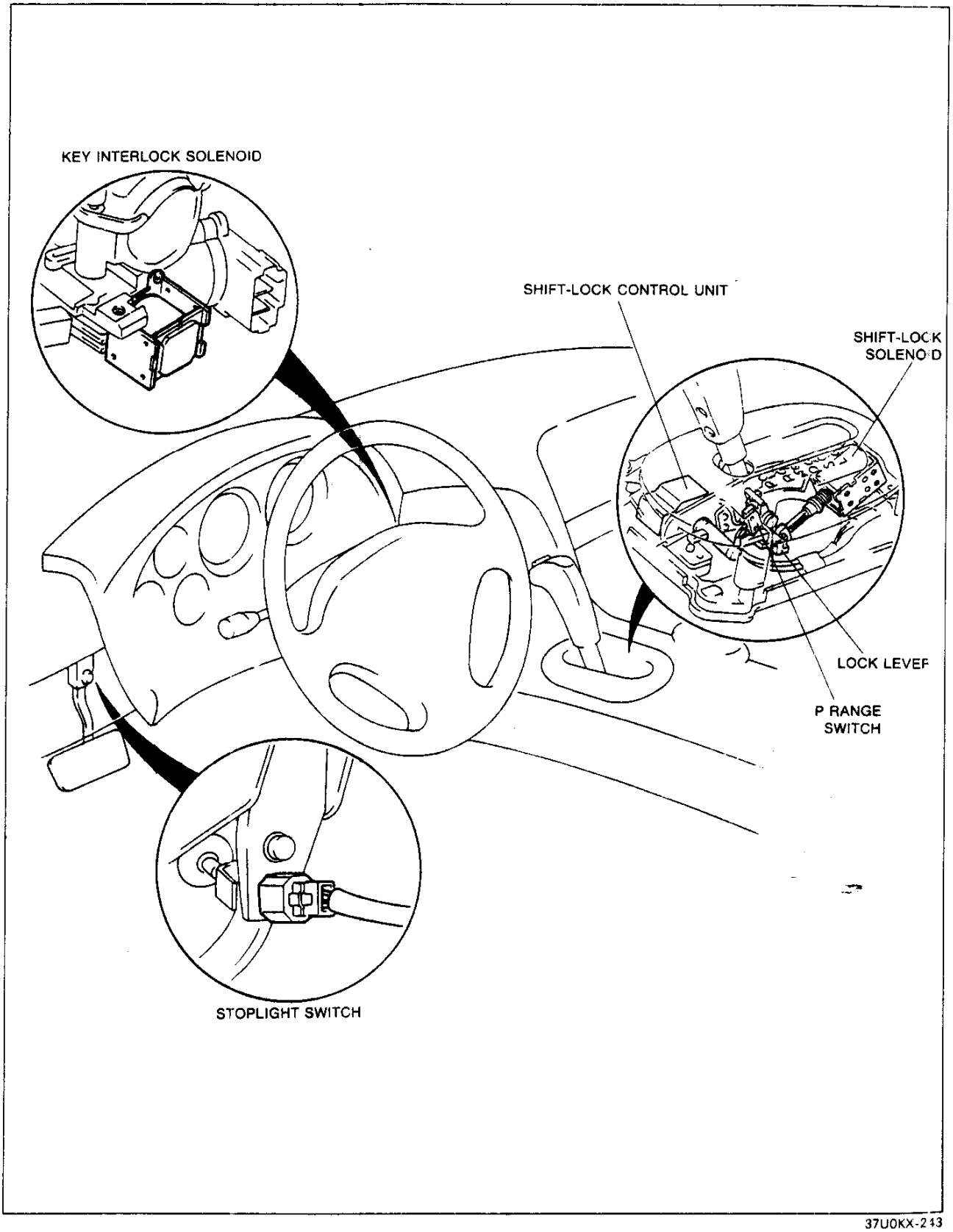
Installation note
Drive plate mounting bolts

1. Set the **SST** or equivalent against the drive plate.
2. Tighten the drive plate installation bolts in two or three steps as shown.

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

SHIFT MECHANISM

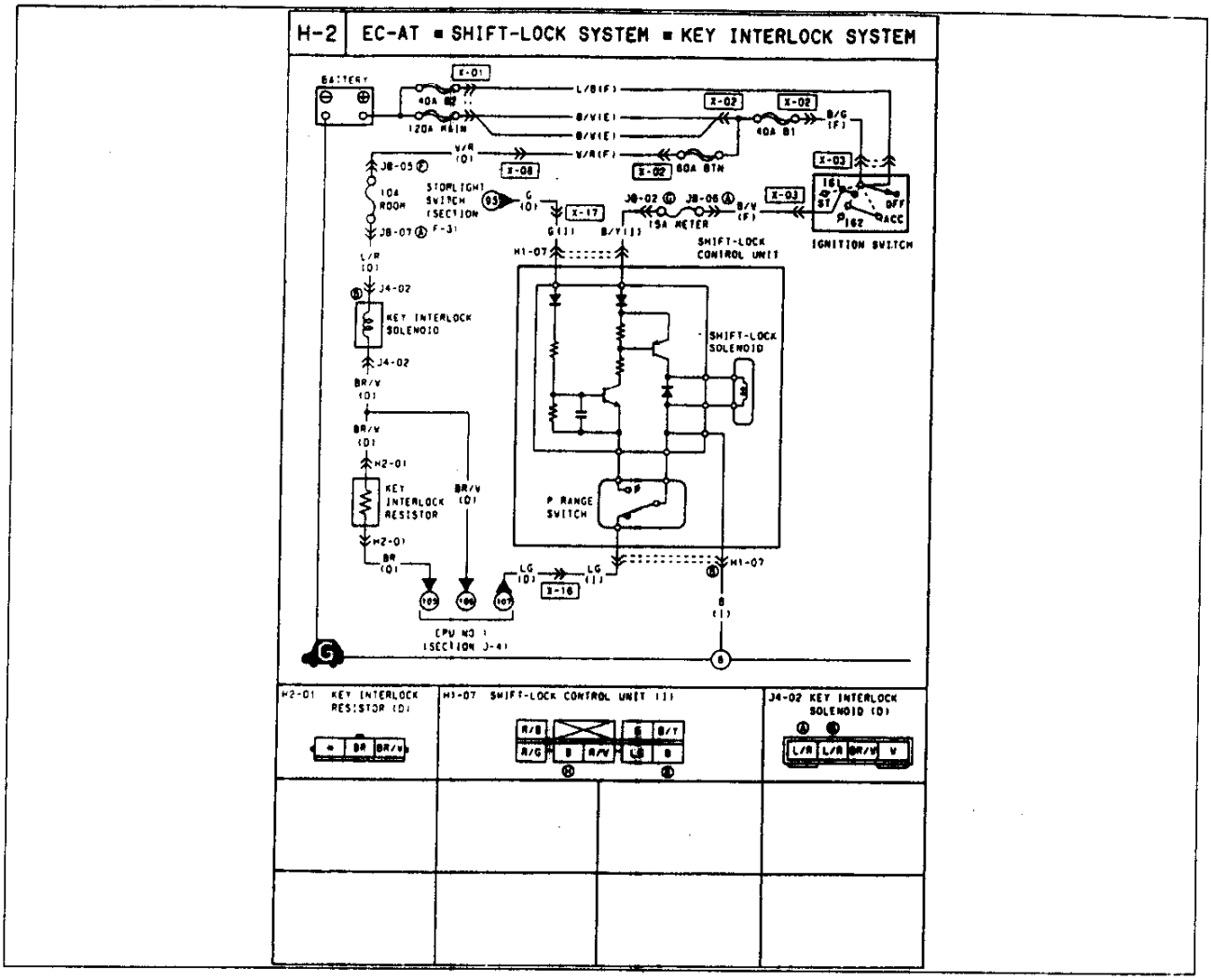
SHIFT-LOCK SYSTEM COMPONENTS



37U0KX-243

TROUBLESHOOTING

Circuit Diagram



37U0KX-244

Diagnosis chart

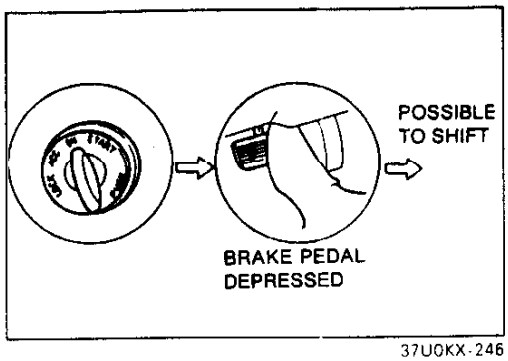
Problem	Possible cause	Action	Page
Selector lever cannot be moved from P range with brake pedal depressed and ignition switch ON	MAIN 120A fuse burned	Replace	K-159
	BTN 60A fuse burned	Replace	K-159
	STOP 20A fuse burned	Replace	K-159
	METER 15A fuse burned	Replace	K-159
	Ignition switch system malfunction ● Wire harness broken ● Poor connection	Repair or replace Connect firmly	K-159 K-159
	Ignition switch malfunction	Inspect and replace	Section T*
	Stoplight switch system malfunction ● Wire harness broken ● Poor connection	Repair or replace Connect firmly	K-159 K-159
	Stoplight switch remains OFF	Adjust or replace	Section T*
	Shift-lock control system malfunction ● Wire harness broken ● Poor connection ● P range switch remains OFF ● Shift-lock control unit malfunction ● Shift-lock solenoid malfunction	Repair or replace Connect firmly Inspect and replace Inspect and replace Inspect and replace	K-159 K-159 K-162 K-162 K-162
	Misadjustment of selector lever or improper assembly of shift-look solenoid	Adjust or repair	K-164

* Refer to 1993 RX-7 Body Electrical Troubleshooting Manual.

Problem	Possible cause	Action	Page
Selector lever can be moved from P range with ignition switch ON, but without brake pedal depressed	Stoplight switch remains ON	Adjust or replace	Section T*
	Shift-lock control system malfunction • Shift-lock control unit malfunction	Inspect and replace	K-162
	Misadjustment of selector lever or improper assembly of shift-lock solenoid	Adjust or repair	K-164
Selector lever can be moved from P range with ignition switch OFF and brake pedal depressed	Ignition switch malfunction	Inspect and replace	Section T*
	Shift-lock control system malfunction • Shift-lock control unit malfunction	Inspect and replace	K-162
	Misadjustment of selector lever or improper assembly of shift-lock solenoid	Adjust or repair	K-164
Shift-lock solenoid operation heard when brake pedal depressed with ignition switch ON in other than P range	P range switch remains ON	Inspect and replace	K-162
	Misadjustment of selector lever or improper assembly of shift-lock solenoid	Adjust or repair	K-164
Selector lever remains locked when emergency override button operated	Emergency override button not pushed fully down	Push down fully and hold emergency override button, move selector lever	–
	Broken emergency override button	Replace	K-168
	Misadjustment of indicator panel	Adjust	K-165
Ignition key can be turned to lock position with selector lever in other than P range	MAIN 120A fuse burned	Replace	K-159
	BTN 60A fuse burned	Replace	K-159
	ROOM 10A fuse burned or not installed	Replace or install	K-159
	P range switch system malfunction • Wire harness broken • Poor connection	 Repair or replace Connect firmly	 K-159 K-159
	P range switch remains ON	Inspect and replace	K-162
	Key interlock solenoid malfunction • Wire harness broken • Poor connection • Key interlock solenoid malfunction	 Repair or replace Connect firmly Inspect and replace	 K-159 K-159 K-162
	Key interlock resistor malfunction • Wire harness broken • Poor connection	 Repair or replace Connect firmly	 – –
	Key cylinder (push switch) malfunction • Wire harness broken • Poor connection	Inspect and replace Repair or replace Connect firmly	Section T* K-159 K-159
	Central processing unit (CPU) malfunction	Inspect and replace	Section T*
Ignition key cannot be turned to lock position with selector lever in P range	P range switch remains OFF	Inspect and replace	K-162
	Key interlock solenoid malfunction	Inspect and replace	K-162
	Key cylinder (push switch) malfunction	Inspect and replace	Section T*
	Misadjustment of selector lever	Adjust	K-164

* Refer to 1993 RX-7 Body Electrical Troubleshooting Manual.

37U0KX-245



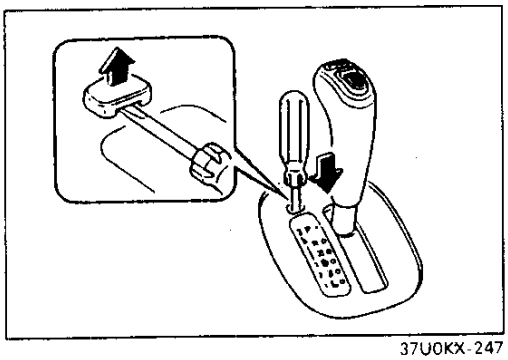
37U0KX-246

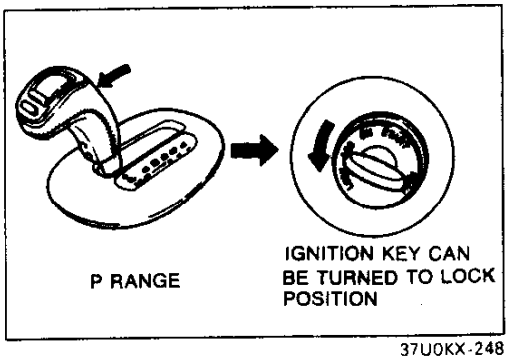
SHIFT-LOCK

Inspection

Caution
- **Service with the engine OFF.**

1. Turn the ignition switch to ON.
2. Verify that the selector lever is in P range.
3. Without the brake pedal depressed, verify that the selector lever cannot be shifted from P range.
4. Depress the brake pedal and verify that the selector lever can be shifted from P range.
5. If not as specified, check the shift-lock control system connector terminal voltage and continuity. (Refer to page K–162)


37U0KX-247



37U0KX-248

EMERGENCY OVERRIDE BUTTON

Inspection

Caution
- **Service with the ignition switch OFF.**

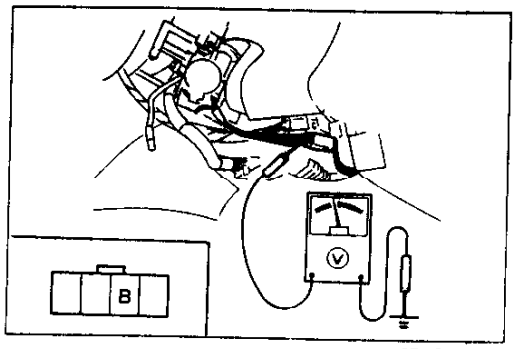
1. Verify that the selector lever is in P range.
2. Without the brake pedal depressed, verify that the selector lever cannot be shifted from P range.
3. Insert the screwdriver provided in the tool kit into the emergency override hole and push down. Verify that the selector lever can be shifted from P range.
4. If not as specified, inspect and repair as necessary, referring to Troubleshooting. (Refer to page K–159.)

KEY INTERLOCK

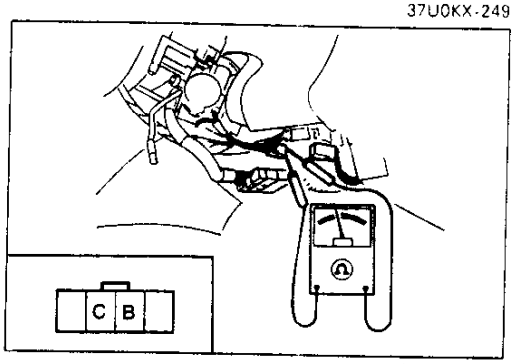
Inspection

Caution
- **Service with the engine OFF.**

1. Turn the ignition switch ON.
2. Shift the selector lever to R range.
3. Verify that the ignition key cannot be turned to LOCK position.
4. Shift the selector lever to P range.
5. Verify that the ignition key can be turned to LOCK position.
6. If not as specified, inspect and repair as necessary, referring to Troubleshooting. (Refer to page K–159.)



37U0KX-249



37U0KX-250

KEY INTERLOCK SOLENOID

Inspection

Terminal voltage

1. Remove the column cover.
2. Turn the ignition switch ON.
3. Measure the voltage between terminals B and a ground.

V_B: Battery voltage

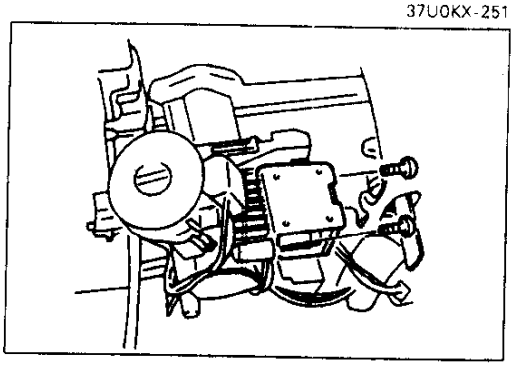
Selector lever position	Voltage
P range	V_B
Except P range	0V

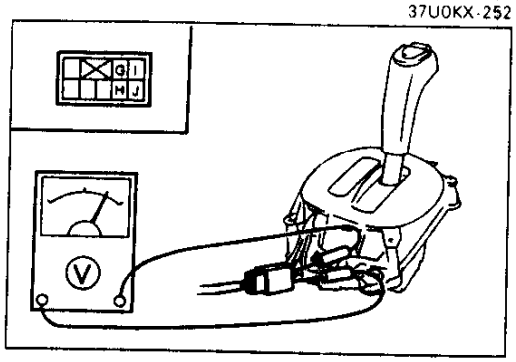
4. If not correct, check the key interlock solenoid continuity.

Continuity

1. Disconnect the negative battery cable and the key interlock solenoid connector.
2. Check continuity between terminals B and C.
3. If not correct, replace the key interlock solenoid.
4. Connect the key interlock solenoid connector.
5. Connect the negative battery cable.

37U0KX-251


37U0KX-252


37U0KX-253

Replacement

1. Disconnect the negative battery cable.
2. Remove the column cover.
3. Disconnect the key interlock solenoid connector.
4. Remove the screws and the key interlock solenoid.
5. Install the new key interlock solenoid and tighten the screws.

Tightening torque:
6.9–12.7 N·m {70–130 kgf·cm, 61–112 in·lbf}

6. Connect the key interlock solenoid connector.
7. Install the column cover.
8. Connect the negative battery cable.

SHIFT-LOCK CONTROL SYSTEM

Inspection

1. Remove the console panel.
2. Shift the selector lever to P range.
3. Turn the ignition switch ON, and check terminal voltages and continuity, referring to the chart on next page.

Caution

- **Disconnect the connector when checking continuity between terminal J (harness side) and a ground.**

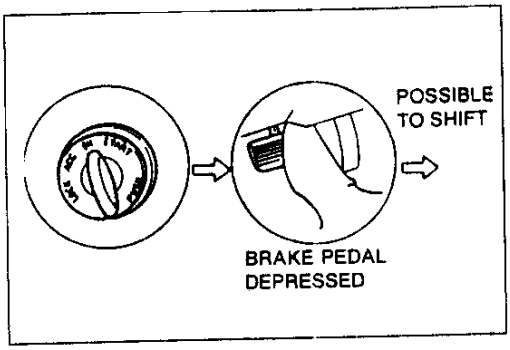
4. Turn the ignition switch OFF, and check continuity between terminal J and a ground, referring to the chart below.
5. If not as specified, repair the wire harness and/or replace the P range switch, shift-lock solenoid, and shift-lock control unit as an assembly.

37U0KX-254

V_B: Battery voltage

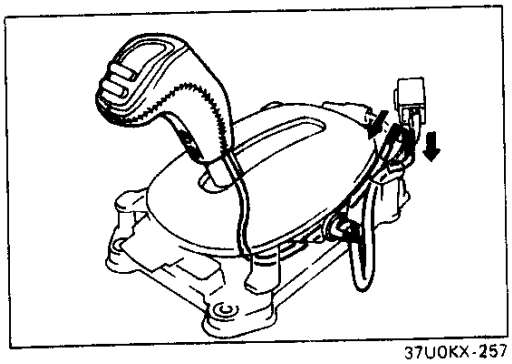
Terminal	(-) terminal connected to	Measured value	Condition		Specification
G	Ground	Voltage	Brake pedal released → depressed		0V → V_B
H	J	Continuity	P range	Selector lever push button released	No
				Selector lever push button depressed	Yes
			Except P range		Yes
I	Ground	Voltage	Ignition switch OFF → ON		0V → V_B
J	Ground	Continuity	Constant		Yes

37U0KX-255

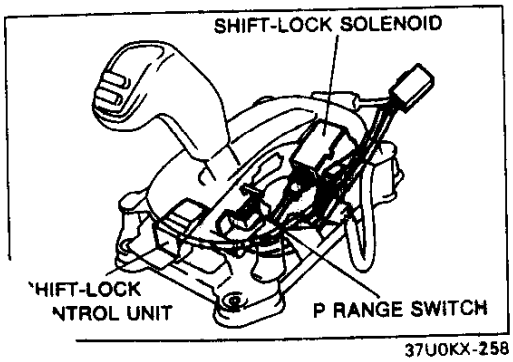


370U0KX-256

5. Install the console panel.
6. Verify correct operation of the shift-lock system. (Refer to page K–161.)



37U0KX-257



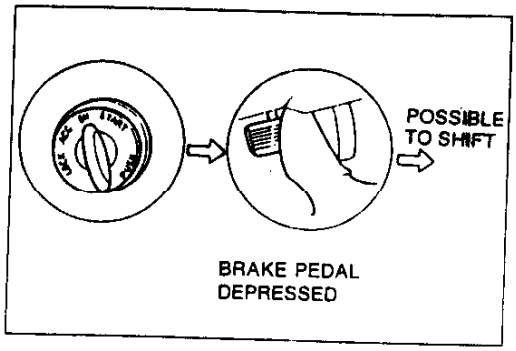
37U0KX-258

Replacement

Note

- **Replace the P range switch, shift-lock solenoid, and shift-lock control unit as an assembly if one of them is not correct.**

1. Disconnect the negative battery cable.
2. Remove the console panel and rear console.
3. Remove the indicator screws and lift up the indicator panel.
4. Disconnect the shift-lock control unit connector.
5. Pull the hold switch terminals and the position indicator lamp terminals out of the connector.
6. Remove the P range switch, shift-lock solenoid, and shift-lock control unit as an assembly.
7. Install the new P range switch, shift-lock solenoid, and shift-lock control unit as an assembly.
8. Insert the hold switch terminals and the position indicator lamp terminals into the connector.
9. Connect the shift-lock control unit connector.
10. Install and adjust the indicator panel. (Refer to page K–165.)
11. Install the console panel and rear console.
12. Connect the negative battery cable.
13. Verify correct operation of the shift-lock system. (Refer to page K–161.)



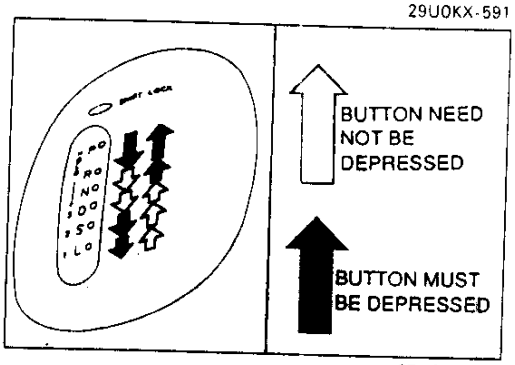
29U0KX-591

SELECTOR LEVER

Inspection

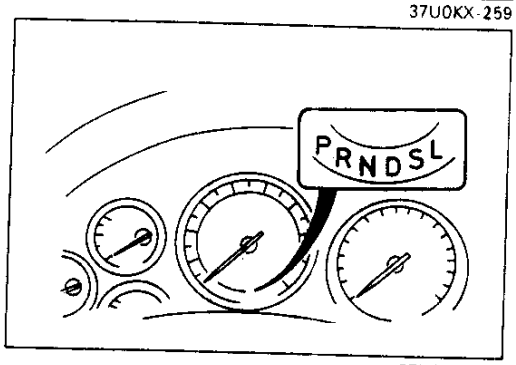
Caution

- **Shift the selector lever from P range to other ranges with the ignition switch ON and the brake pedal depressed.**



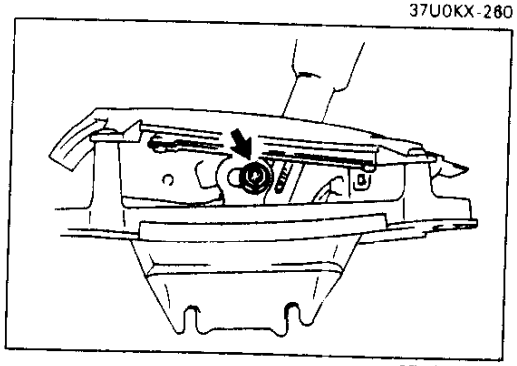
37U0KX-259

1. Verify that the selector lever can only be shifted as shown.
2. Verify that there is a "click" at each range when shifted from P → L range.
3. Verify that the positions of the selector lever and the indicator are aligned.
4. If not as specified, adjust the indicator panel. (Refer to page K–165.)



37U0KX-260

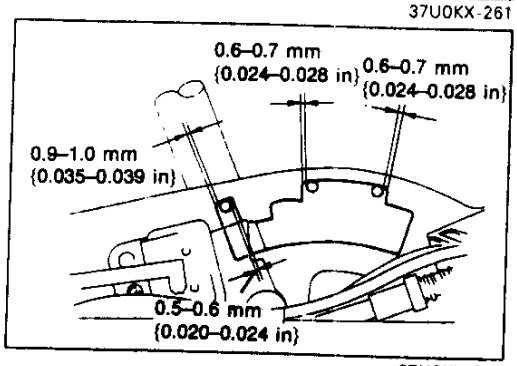
5. Verify that the positions of the selector lever and the selector indicator lamp in the instrument cluster are aligned.
6. If not as specified, adjust the inhibitor switch. (Refer to page K–28.)
7. Verify that the vehicle operates in selected range.


37U0KX-261

Adjustment

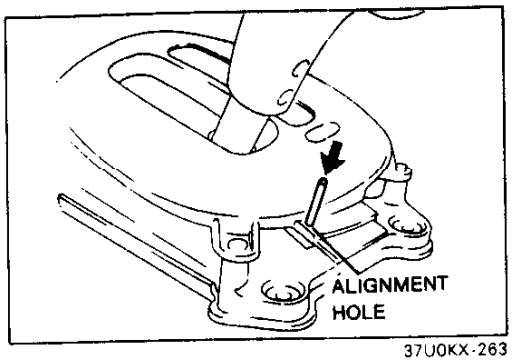
1. Remove the console panel.
2. Remove the indicator screws and lift up the indicator panel.
3. Shift the selector lever to P range.
4. Loosen the locknut as shown.
5. Adjust the lever so that the clearance between the guide plate and the guide pin in P range is as shown.
6. Tighten the locknut.

Tightening torque:
20–28 N·m {2.0–2.9 kgf·m, 15–20 ft·lbf}



37U0KX-262

7. Move the selector lever to N and D ranges and verify that the clearance between the guide plate and the guide pin is the same at both positions.
8. If not as specified, readjust the lever.
9. Install and adjust the indicator panel. (Refer to page K–165.)
10. Install the console panel.
11. Connect the negative battery cable.



37U0KX-263

Indicator panel adjustment

1. Shift the selector lever to P range.
2. Align the alignment holes in the slider with the holes in the indicator panel.
3. Install a suitable heavy-gauge wire to hold the slider.
4. Tighten the indicator screws.

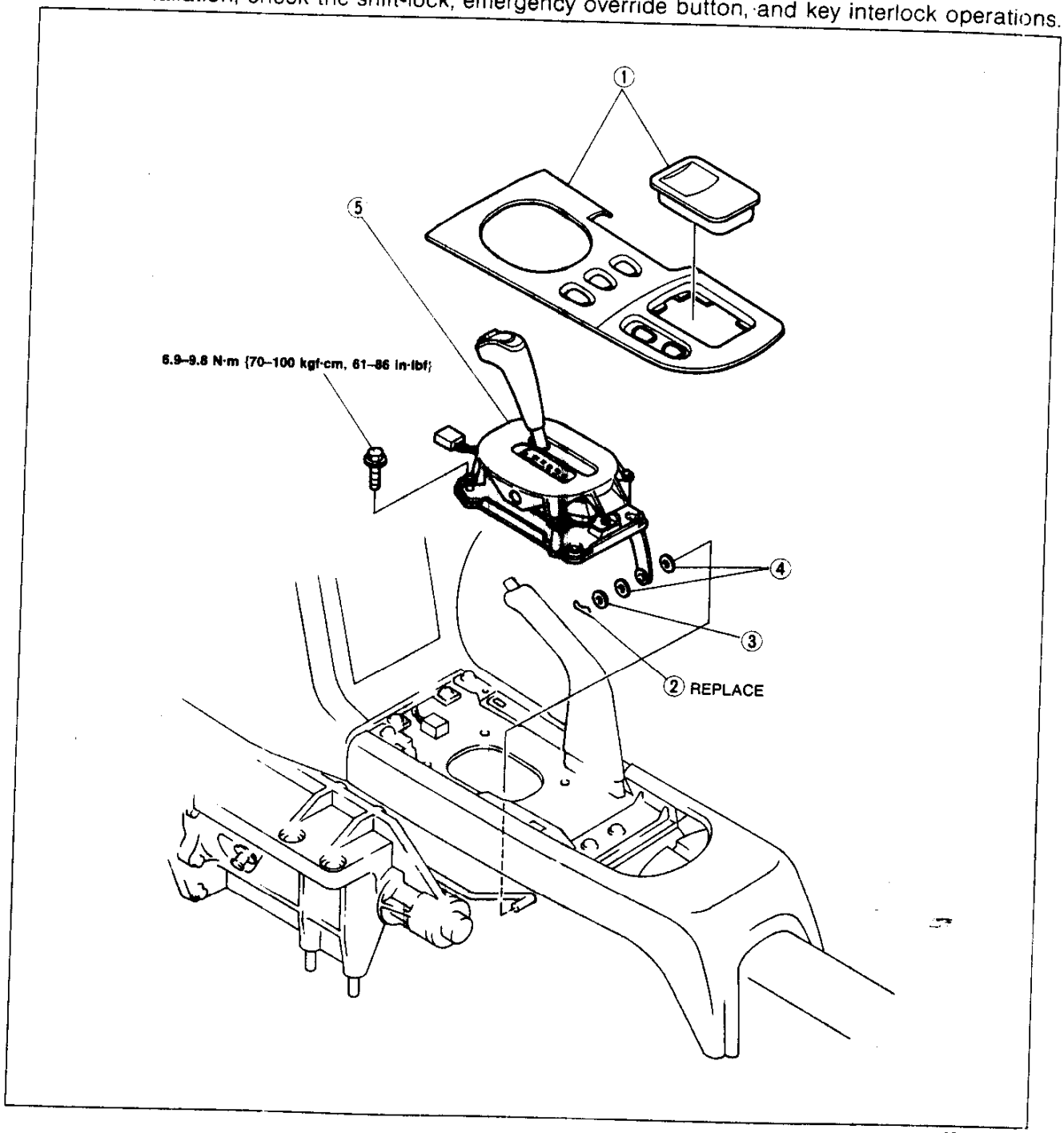
Tightening torque:
2.0–2.9 N·m {20–30 kgf·cm, 18–26 in·lbf}

5. Remove the wire.
6. Verify that the selector lever properly aligns with the indicator in each range.

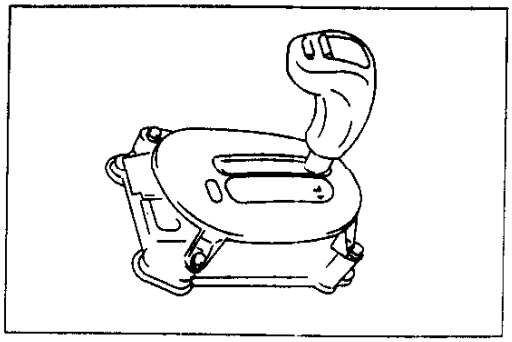
37U0KX-264

Removal / Installation

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, referring to **Installation Note**.
4. Connect the negative battery cable.
5. After installation, check the shift-lock, emergency override button, and key interlock operations.



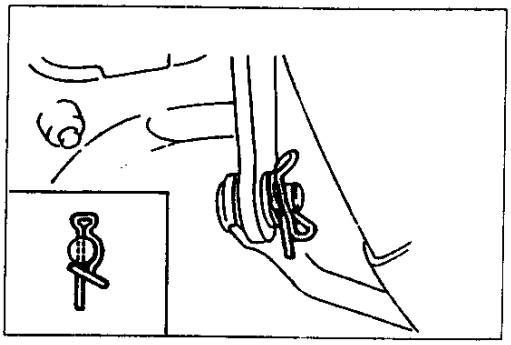
1. Console panel
2. Spring pin
   - Removal Note ..... page K–167
   - Installation Note ..... page K–167
3. Wave washer
4. Washer
5. Selector lever
   - Inspection ..... page K–164
   - Adjustment ..... page K–164
   - Disassembly / Inspection / Assembly ..... page K–168



37U0KX-266

Removal Note
Spring pin

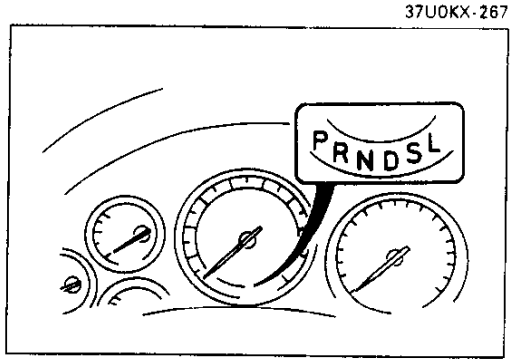
1. Shift the selector lever to L range.
2. Remove the spring pin and washer.
3. Remove the selector rod from the adjustment lever.



37U0KX-267

Installation Note
Spring pin

1. Shift the selector lever to L range.
2. Install the selector rod to adjustment lever.
3. Install the washer and new spring pin as shown.



37U0KX-268

4. Tighten the selector lever bolt.

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

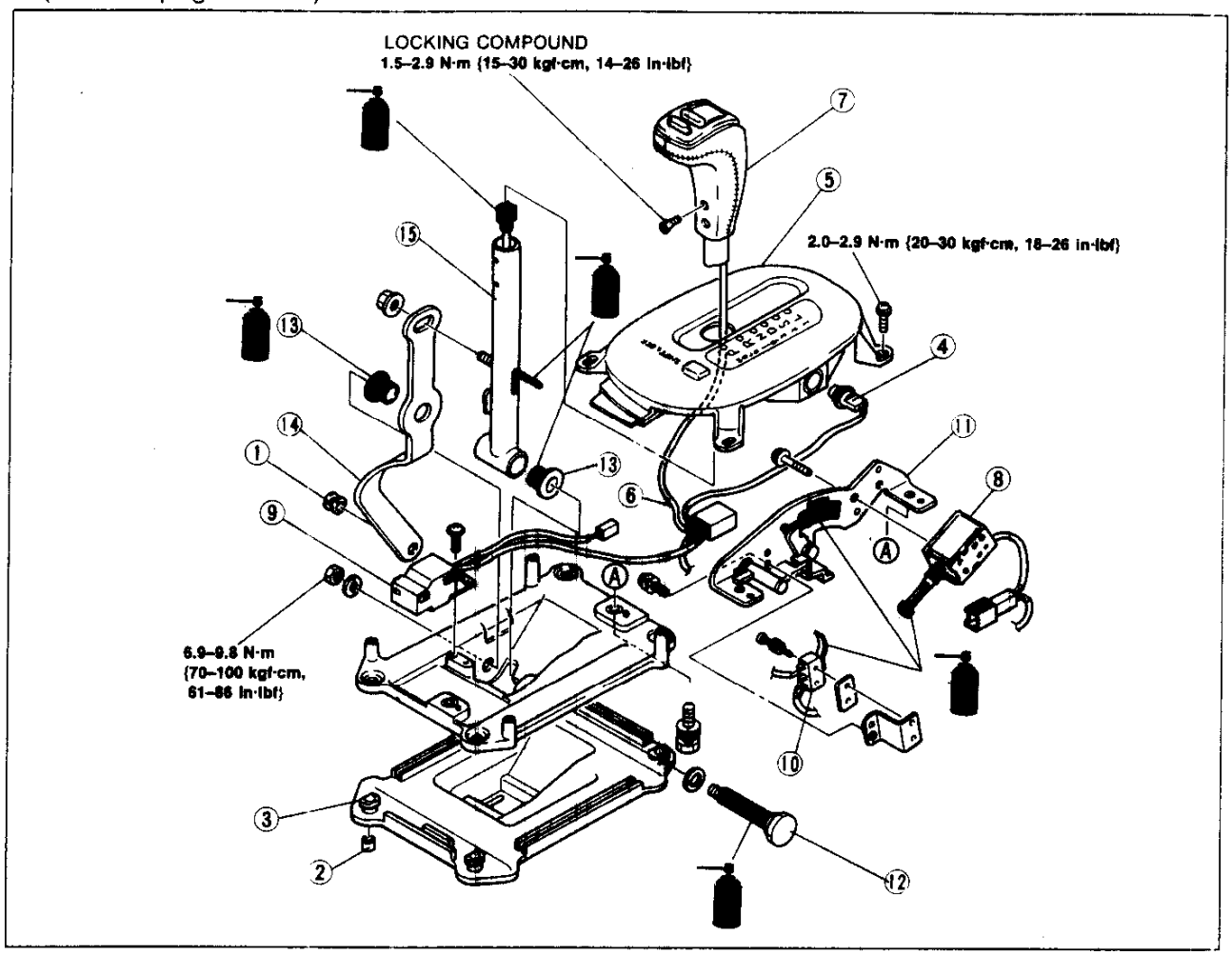
5. Verify that the positions of the selector lever and the selector indicator lamp are aligned.

Disassembly / Inspection / Assembly

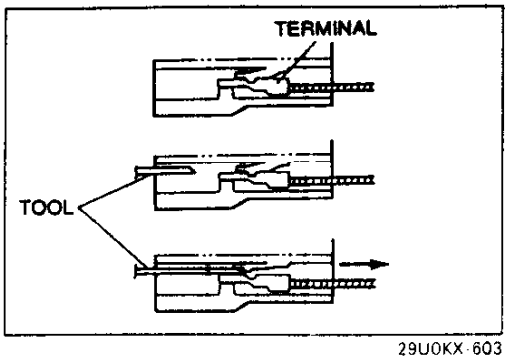
Note

- **Do not remove the P range switch or adjustment lever unless necessary.**

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**.
4. If the adjustment lever locknut is loosened, adjust the selector lever after installation. (Refer to page K–164.)



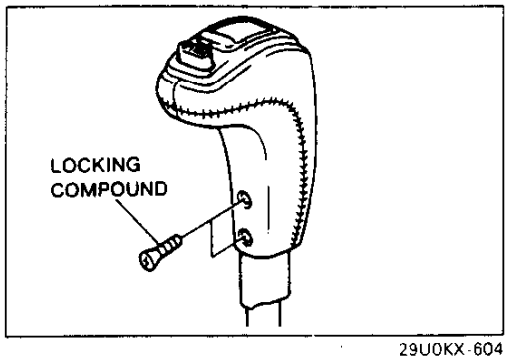
1. Bushing
2. Spacer
3. Boot
4. Position indicator lamp
5. Indicator panel
   Assembly Note ..... page K–170
6. Connector pin
   Disassembly Note ..... page K–169
7. Selector lever knob
   Disassembly Note ..... page K–169
   Assembly Note ..... page K–170
8. Shift-lock solenoid
   Inspection ..... page K–162
9. Shift-lock control unit
   Inspection ..... page K–162
10. P range switch
    Inspection ..... page K–162
11. Guide plate
12. Spindle
    Disassembly Note ..... page K–169
    Assembly Note ..... page K–169
13. Bushing
14. Adjustment lever
15. Selector lever
    Inspection for smooth operation
    Inspection guide pin for damage and wear
16. Selector lever bracket.



29U0KX-603

Disassembly Note
Connector pin

1. Insert a thin piece of metal from the terminal side of the connector, and press down the terminal locking top.
2. Pull the terminal out of the connector.

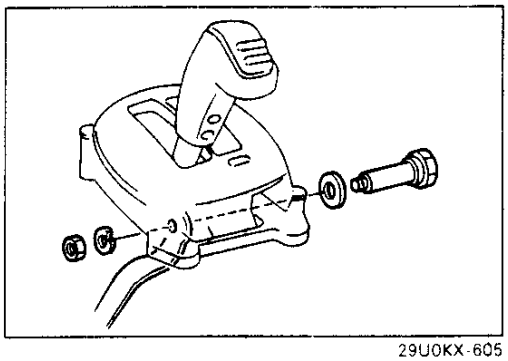


29U0KX-604

Selector lever knob

Caution
- **Do not damage the hold switch harness.**

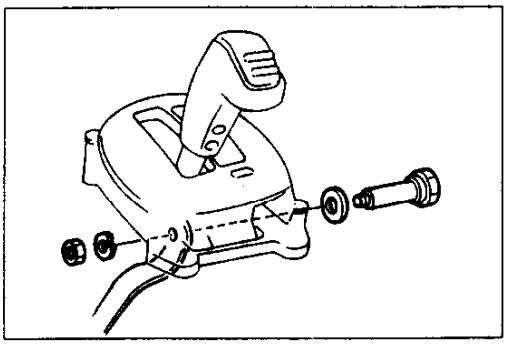
1. Remove the screws from selector lever knob.
2. Remove the selector lever knob and sleeve.


29U0KX-605

Spindle

Caution
- **Use pads in the vise to prevent damaging the part.**

1. Shift the selector lever to P range.
2. Secure the adjustment lever in a vise.
3. Remove the spindle nut.

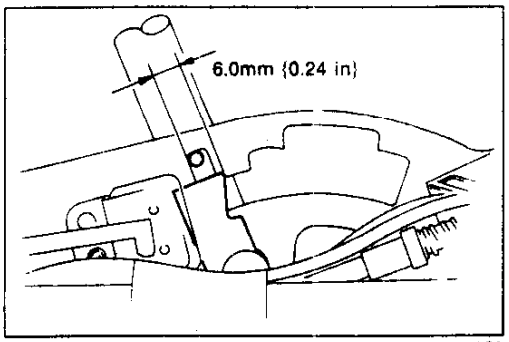

29U0KX-606

Assembly Note
Spindle

Caution
- **Use pads in the vise to prevent damaging the part.**

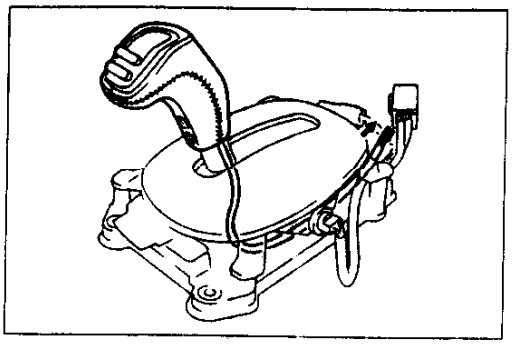
1. Install the selector lever and spindle to the selector lever bracket.
2. Shift the selector lever to P range.
3. Place the adjustment lever in a vise and tighten the spindle nut.

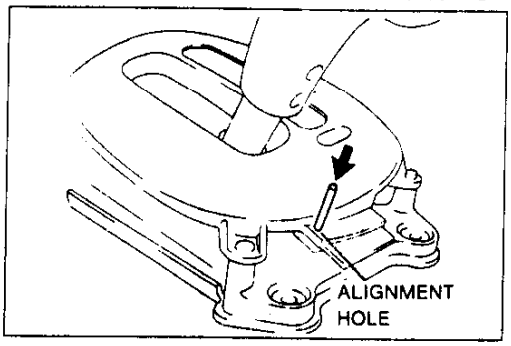
Tightening torque:
6.9–9.8 N·m {70–100 kgf·cm, 61–86 in·lbf}



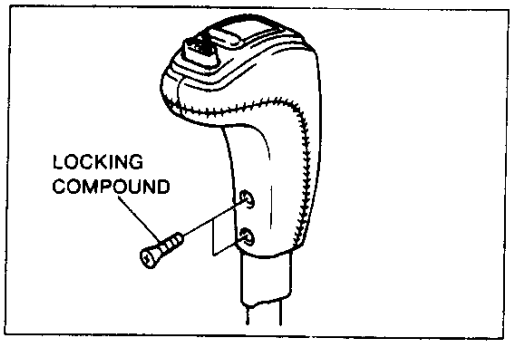
37U0KX-270

4. Verify that the overlap of the guide pin and the lock lever is within specification with the selector lever pushed forward.


37U0KX-271



37U0KX-272



37U0KX-273

Indicator panel

1. Install the selector sleeve and the selector lever knob to the selector lever.

Caution
- **Do not damage the hold switch harness.**

2. Position the hold switch harness as shown.
3. Insert the connect pin to the connector.
4. Shift the selector lever to P range.
5. Align the alignment holes in the slider with the holes in the indicator panel.
6. Install a suitable heavy-gauge wire to hold the slider.
7. Tighten the indicator screws.

Tightening torque:
2.0–2.9 N·m {20–30 kgf·cm, 18–26 in·lbf}

8. Remove the wire.
9. Verify that the selector lever properly aligns with the indicator in each range.

Selector lever knob

1. Apply locking compound to the screws.
2. Tighten the screws.

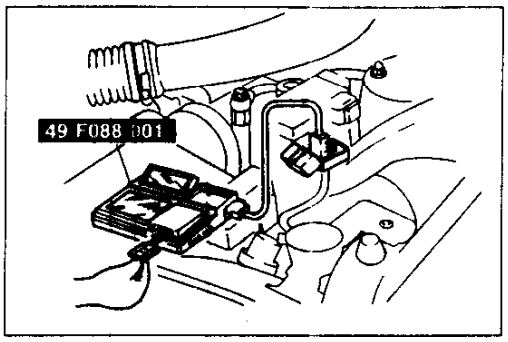
Tightening torque:
1.5–2.9 N·m {15–30 kgf·cm, 14–26 in·lbf}

TROUBLESHOOTING GUIDE

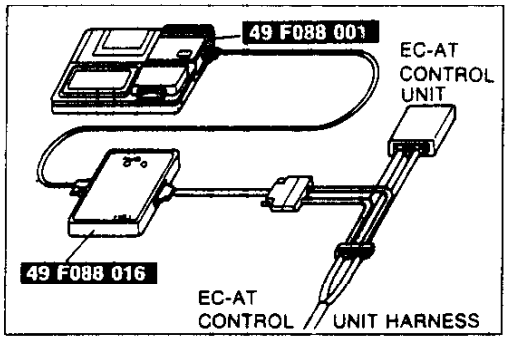
GENERAL NOTES

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; therefore, when troubleshooting begin with those points which can be inspected quickly and easily. The recommended troubleshooting sequence is described below.

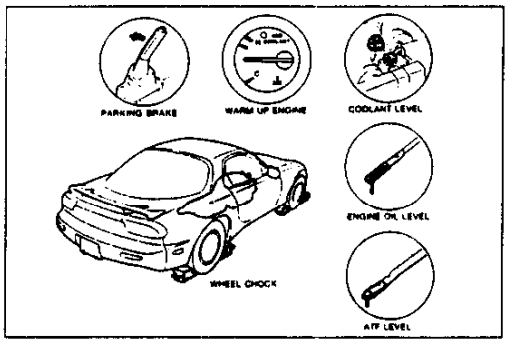
29U0KX-012



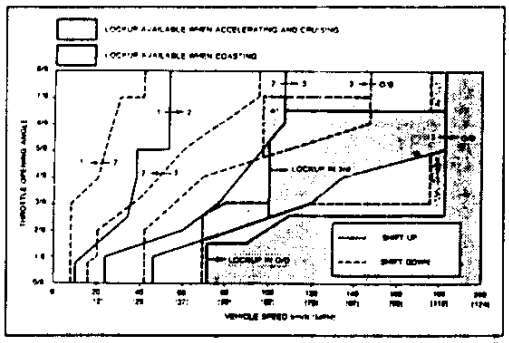
37U0KX-274



37U0KX-275



37U0KX-276



37U0KX-277

Step 1: Self-diagnostic System Inspection

Check for service code(s) memorized in the EC-AT control unit by using the **DT-S1000** or **Self-Diagnosis Checker**. (Refer to page K–214.)

Note

- **Service code(s) can also be checked by observing the flashing sequence of the hold indicator lamp. (Refer to page K–214.)**

Step 2: Electric Signal Inspection

Check the signals to/from the EC-AT control unit with the **DT-S1000**. (Refer to page K–248.)

Note

- **Signals can also be checked by checking the EC-AT control unit terminal voltages with the Engine Signal Monitor or a voltmeter. (Refer to page K–35.)**

Step 3: Mechanical System Test

Check the engine stall speed, time lag, and line pressure. (Refer to page K–9.)

Step 4: Road Test

Note

- **For correct testing, the vehicle speed, engine speed, throttle opening (throttle sensor voltage), and gear position should be checked with the DT-S1000.**

Check the shift point, shift schedule, and shift shock. (Refer to page K–16.)

QUICK DIAGNOSIS CHART

OUTLINE

The Quick Diagnosis Chart shows various problems and the various components that might be the cause of the problem.

1. Components indicated in the "Self-diagnosis" line of the QUICK DIAGNOSIS CHART (I) are diagnosed by the EC-AT control unit self-diagnosis function. **DT-S1000** or **Self-Diagnosis Checker** can be used for easy retrieval of the service code numbers.
2. Components indicated in the "Adjustment" line of the QUICK DIAGNOSIS CHART (I) indicate that there is a possibility that the problem may be the result of an incorrect adjustment. Check the adjustment of each component, and readjust if necessary.
3. Input and output signals of the EC-AT control unit for the components indicated in the **DT-S1000** line of the QUICK DIAGNOSIS CHART (I) can be easily checked by using the **DT-S1000**.
4. Components indicated in the "Stall Test" line of the QUICK DIAGNOSIS CHART (I) can be checked for malfunction by observing the results of the stall test.
5. Components indicated in the "Time Lag Test" line of the QUICK DIAGNOSIS CHART (I) can be checked for malfunction by observing the results of the time lag test.
6. Components indicated in the "Line Pressure Test" line of the QUICK DIAGNOSIS CHART (I) can be checked for malfunction by observing the results of the line pressure test.
7. Components indicated in the "Road Test" line of the QUICK DIAGNOSIS CHART (I) can be checked for malfunction by observing the results of the road test.
8. QUICK DIAGNOSIS CHART (II) shows the relationship between the troubleshooting item and inspection point.

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QUICK DIAGNOSIS CHART (I)

Item \ Possible parts and reference page			Preliminary								Electronic system																			
			K-25	K-164	Section F	Section G	K-9	K-12	K-14	K-16	K-28	Section F	K-29	K-29	Section G	K-31	K-32	K-32	K-32	K-33	K-32	K-32	K-32	K-30	K-35	Section F	K-35	K-27	K-35
			ATF level and condition	Selector lever	Idle speed and ignition timing	Ignition system and starter	Stall test	Time lag test	Line pressure test	Road test	Inhibitor switch	Throttle sensor	Speed sensor 1 (revolution sensor)	Speed sensor 2 (speedometer sensor)	Engine rpm signal	ATF thermosensor	Solenoid valve (shift A)	Solenoid valve (shift B)	Solenoid valve (line pressure)	Dropping resistor	Solenoid valve (lockup)	Solenoid valve (lockup control)	Solenoid valve (overrunning clutch)	Pulse generator	Inhibitor signal	Idle signal	O/D inhibit signal (ASC signal)	Hold switch	A/C signal
Self-diagnosis												○	○	○	○	○	○	○	○		○	○	○	○						
Adjustment			○	○	○						○	○																		
Testers	Self-Diagnosis Checker											○	○	○	○	○	○	○	○		○	○	○	○						
	DT-S1000	Service code check										○	○	○	○	○	○	○	○		○	○	○	○						
		Input / output signal monitor									○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		Shifting check monitor										○	○				○	○	○		○									
	Engine Signal Monitor										○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Stall test																														
Time lag test																														
Line pressure test																														
Road test																														

QUICK DIAGNOSIS CHART (I)

Electronic system								Hydraulic control system								Powertrain										Possible parts and reference page / Item	
Slip lockup signal	Torque reduced signal	Reduce torque signal	Stoplight switch	Slip lockup OFF signal	Water thermoswitch	Atmospheric pressure sensor	Mileage switch	Control valve body	N-D accumulator	1-2 accumulator	2-3 accumulator	3-4/N-R accumulator	Band servo	Oil pump	Hydraulic circuit	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 servo)	Parking mechanism		
K-35	K-35	K-35	K-35	K-35	K-34	K-35	K-35	K-108	K-58	K-58	K-58	K-58	K-76	K-60	K-253	K-57	K-64	K-70	K-83	K-80	K-83	K-83	K-91	K-76	K-97		
																										Self-diagnosis	
			○																							Adjustment	
	○	○				○																				Self-Diagnosis Checker	Testers
	○	○				○																				Service code check	
○	○	○	○	○	○	○	○																			Input / output signal monitor (DT-S1000)	
																										Shifting check monitor	
○	○	○	○	○	○	○	○																			Engine Signal Monitor	
								○						○		○	○	○	○	○		○	○	○		Stall test	
									○	○		○					○		○			○	○	○		Time lag test	
								○						○	○		○		○				○			Line pressure test	
								○	○	○	○	○							○	○	○	○	○	○	○	Road test	

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QUICK DIAGNOSIS CHART (II–1)

Troubleshooting item \ Possible parts and reference page			Preliminary								Electronic system																		
			K–25	K–164	Section F	Section G	K–9	K–12	K–14	K–16	K–28	Section F	K–29	K–29	Section G	K–31	K–32	K–32	K–32	K–33	K–32	K–32	K–32	K–30	K–35	Section F	K–35	K–27	K–35
			ATF level and condition	Selector lever	Idle speed and ignition timing	Ignition system and starter	Stall test	Time lag test	Line pressure test	Road test	Inhibitor switch	Throttle sensor	Speed sensor 1 (revolution sensor)	Speed sensor 2 (speedometer sensor)	Engine rpm signal	ATF thermosensor	Solenoid valve (shift A)	Solenoid valve (shift B)	Solenoid valve (line pressure)	Dropping resistor	Solenoid valve (lockup)	Solenoid valve (lockup control)	Solenoid valve (overrunning clutch)	Pulse generator	Inhibitor signal	Idle signal	O/D inhibit signal (ASC signal)	Hold switch	A/C signal
6	Engine starts in other than P and N ranges			3		2					1																		
14	Engine stalls	Idle when shifted from N or P to other ranges			1						3		5											4	2				
18		On deceleration	1		2						4		6											5	3				
24	Engine rough	On deceleration	1	3					2			6							4	5									
25	Poor acceleration	Drive away	1				3		2	7	10	6	12				8	9	4	5							11		
26		On acceleration																											
30	Surges while cruising											1	3								4					2			
31	Lack of power		1				3		2	7	10	6	12				8	9	4	5							11		
32	Poor fuel economy										10	7	11		9	6	3	4			1	2	5			8	13	14	
40	Vehicle does not move in D, S, L, and/or R ranges		1	4					2	3		7							5	6									
	①	Vehicle does not move in D, S, and/or L ranges		1.																									
	②	Vehicle does not move in D, and/or S ranges		1					2										3	4									
	③	Vehicle does not move in R range	1						2										3	4									
41	Vehicle moves in N range		1	3					2			6							4	5									
42	Vehicle moves in P range			1						2																			
43	Excessive creep				1		3		2		9	6							4	5				8	7				
44	No shift									1			5				2	3										4	
	①	Does not shift 1st to 2nd											4				2	3										1	
	②	Does not shift 2nd to 3rd											2					1											
	③	Does not shift to O/D															1												
	④	Does not shift O/D to 3rd									5		6			1	2	3					4				7	8	
	⑤	Does not shift O/D to 2nd, or 3rd to 2nd	1						6			2					3	4							1			5	
	⑥	Does not shift 3rd to 1st, or 2nd to 1st	1						6			2					3	4										5	
45	Abnormal shift		1									2	3																
	①	Shifts directly from 1st to 3rd	1																										
	②	Does not kickdown when accelerator is depressed in O/D with in kickdown range										1	2				3	4											
	③	Excessive engine speed when accelerated in O/D due to delayed kickdown										2	1				3	4											
46	Frequent shifting											1																	
47	Shift point high or low											1	3		2														4
48	No lockup										7	4	8		6	3					1	2				5			
49	No kickdown											1	5				2	3										4	

* The numbers indicate the inspection sequence.

QUICK DIAGNOSIS CHART (II-1)

Electronic system									Hydraulic control system								Powertrain										Possible parts and reference page / Troubleshooting item		
Slip lockup signal	Torque reduced signal	Reduce torque signal	Stoplight switch	Slip lockup OFF signal	Water thermoswitch	Atmospheric pressure sensor	Mileage switch	Control valve body	N-D accumulator	1-2 accumulator	2-3 accumulator	3-4/N-R accumulator	Band servo	Oil pump	Hydraulic circuit	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 servo)	Parking mechanism			
K-35	K-35	K-35	K-35	K-35	K-34	K-35	K-35	K-108	K-58	K-58	K-58	K-58	K-76	K-60	K-253	K-57	K-64	K-70	K-83	K-80	K-83	K-83	K-91	K-76	K-97			
																										Engine starts in other than P and N ranges		5
									6						8	7										Idle when shifted from N or P to other ranges	Engine stalls	14
									7						9	8										On deceleration		18
								7										10	9		8		12	11		On deceleration	Engine rough	24
								13					14	19	21	20	15	16					18	17		Drive away	Poor accelera-tion	25
																										On deceleration		26
5								6							7	8										Surges while cruising		30
								13					14	19	21	20	15	16					18	17		Lack of power		31
					12			15					18		17	16								19		Poor fuel economy		32
								8					9	10	18	14	17	11	16				13	12	15	Vehicle does not move in D, S, L, and/or R ranges		
															3							2				Vehicle does not move in D, S, and/or L ranges	①	40
								5							11		6	7	8		9		10			Vehicle does not move in D, and/or S ranges	②	
								5	6						12		7	8	9	10		11				Vehicle does not move in R range	③	
								7							11		10		8		9					Vehicle move in N range		41
																									3	Vehicle move in P range		42
								10																		Excessive creep		43
								6					7		10			9						8		No shift		
								5					6		9			8						7		Does not shift 1st to 2nd	①	
								3					4		7			6						5		Does not shift 2nd to 3rd	②	
								2					3		7						5		6	4		Does not shift to O/D	③	44
								9					10		12									11		Does not shift O/D to 3rd	④	
								7					9		11			8						10		Does not shift O/D to 2nd, or 3rd to 2nd	⑤	
								7					10		12			8				9		11		Does not shift 3rd to 1st, or 2nd to 1st	⑥	
								4					5		7									6		Abnormal shift		
										2			3		5									4		Shifts directly from 1st to 3rd	①	
																										Does not kickdown when accelerator is depressed in O/D with in kickdown range	②	45
																										Excessive engine speed when accelerated in O/D due to delayed kickdown	③	
								2							3											Frequent shifting		46
								5																		Shift point high or low		47
								9							11	10										No lockup		48
								6																		No kickdown		49

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QUICK DIAGNOSIS CHART (II-2)

Troubleshooting item			Possible parts and reference page	Preliminary								Electronic system																		
				K-25	K-164	Section F	Section G	K-9	K-12	K-14	K-16	K-28	Section F	K-29	K-29	Section G	K-31	K-32	K-32	K-32	K-33	K-32	K-32	K-32	K-30	K-35	Section F	K-35	K-27	K-35
				ATF level and condition	Selector lever	Idle speed and ignition timing	Ignition system and starter	Stall test	Time lag test	Line pressure test	Road test	Inhibitor switch	Throttle sensor	Speed sensor 1 (revolution sensor)	Speed sensor 2 (speedometer sensor)	Engine rpm signal	ATF thermosensor	Solenoid valve (shift A)	Solenoid valve (shift B)	Solenoid valve (line pressure)	Dropping resistor	Solenoid valve (lockup)	Solenoid valve (lockup control)	Solenoid valve (overrunning clutch)	Pulse generator	Inhibitor signal	Idle signal	O/D inhibit signal (ASC signal)	Hold switch	A/C signal
50			When accelerating	1	3					2			6							4	5									
51		Engine speed flares up	When upshifting and/or downshifting	1	3			9		2			6	8						4	5				7					
	①		When 1st to 2nd shifting	1	2			9		3			6	8						4	5					7				
	②		When 2nd to 3rd shifting	1	2			9		3			6	8						4	5					7				
	③		When 3rd to O/D shifting	1	2			9		3			6	8						4	5				7					
	④		When O/D, or 3rd to 2nd shifting	1	2			8		3			6							4	5				7					
	⑤		When 3rd, or 2nd to 1st shifting	1	2			9		3			6					8		4	5				7					
52			P, N to R and/or N to D	1		2		4		3		10	7							5	6				9	8				
53		Excessive shift shock	When upshifting and/or downshifting	1				3		2			6	10			8			4	5				9		7			
	①		When 1st to 2nd shifting					12		1			4	7			5			2	3				6					
	②		When 2nd to 3rd shifting					12		1			4	7			5			2	3				6					
	③		When 3rd to O/D shifting					8		1			4	7			5			2	3				6					
	④		When 2nd to 1st shifting in L range					10		1			4	7			5			2	3				6					
	⑤		When coasting							2			5	8			6			3	4			1	7		9			
	⑥		When lockup	1									3	7		6						2			5		4			
54	No engine braking			1								5	3										2				4		
55	No mode changes																											1	
56	Transmission noise		N and/or P ranges	1									4	5		6				2	3								
57			All ranges	1																									
58	Transmission overheat			1				3		2			6							4	5	7	8						
				2		1				4			7	10		9				5	6	3					8			
					3		2				1																			
											3															2	1			

* The numbers indicate the inspection sequence.

QUICK DIAGNOSIS CHART (II-2)

Electronic system									Hydraulic control system								Powertrain										Possible parts and reference page / Troubleshooting item		
K-35	K-35	K-35	K-35	K-35	K-34	K-35	K-35	K-108	K-58	K-58	K-58	K-58	K-76	K-60	K-253	K-57	K-64	K-70	K-83	K-80	K-83	K-83	K-91	K-76	K-97			
Slip lockup signal	Torque reduced signal	Reduce torque signal	Stoplight switch	Slip lockup OFF signal	Water thermoswitch	Atmospheric pressure sensor	Mileage switch	Control valve body	N-D accumulator	1-2 accumulator	2-3 accumulator	3-4/N-R accumulator	Band servo	Oil pump	Hydraulic circuit	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 servo)	Parking mechanism			
								7						13	15	14	11		8	9		10	12			When accelerating		50
						10		11		12	13	14			20			16	17	18		19		15		When upshifting and/or downshifting		
							10	11		12					14									13		When 1st to 2nd shifting	①	
							10	11			12				15			14						13		When 2nd to 3rd shifting	②	
								10				11			14			13						12		When 3rd to O/D shifting	③	51
								9							12			11						10		When O/D, or 3rd to 2nd shifting		
								10							12									11		When 3rd, or 2nd to 1st shifting	④	
								11	12			13			17		15		14				16			P, N to R and/or N to D		52
	11	12				13		14		15	16	17			21			20			19			18		When upshifting and/or downshifting		
	8	9				11	10	12		13					15									14		When 1st to 2nd shifting	①	
	8	9				11	10	12			13				16			15						14		When 2nd to 3rd shifting	②	
						9		10				11			14						13			12		When 3rd to O/D shifting	③	53
	8	9				11		12							14								13			When 2nd to 1st shifting in L range	④	
								10																		When coasting	⑤	
								8							10	9										When lockup	⑥	
								6							9						7		8			No engine braking		54
																										No mode changes		55
													7		8											N and/or P ranges		56
															2											All ranges		57
							9						10	18	17	11	12	14		15		16	13			Transmission overheat		58
							11							13	12													

Engine speed flares up

Excessive shift shock

Transmission noise

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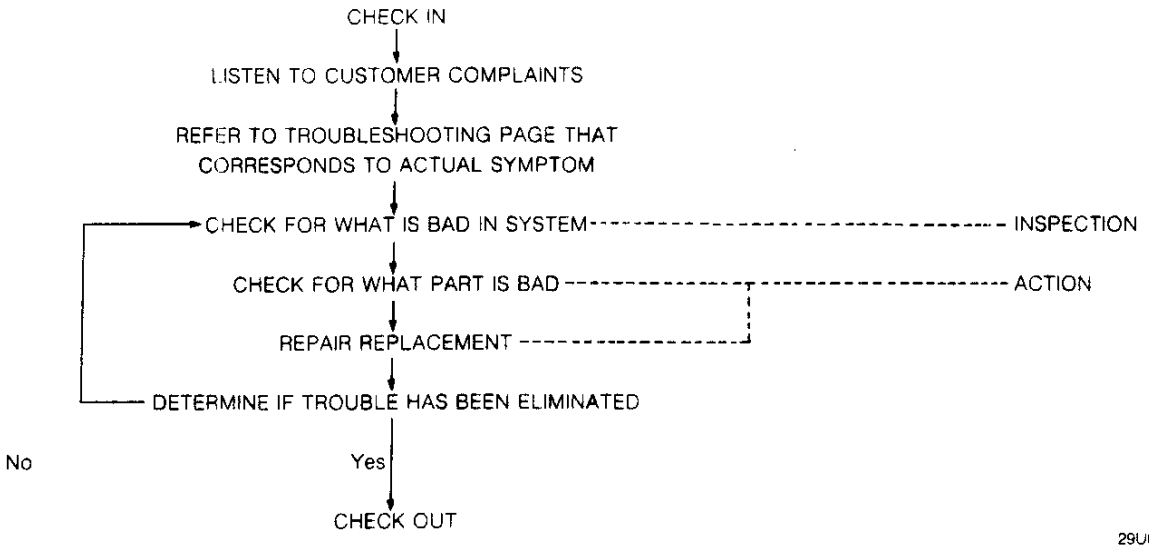
SYMPTOM TROUBLESHOOTING

USING THIS SECTION

Introduction

Most of the automatic transmission control system is electronically controlled, often making it difficult to diagnose problems in the system, especially intermittent problems. Before undertaking actual checks, take 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 talks with the customer, one can find out what the symptoms are and under what conditions they occur.

Work Flow



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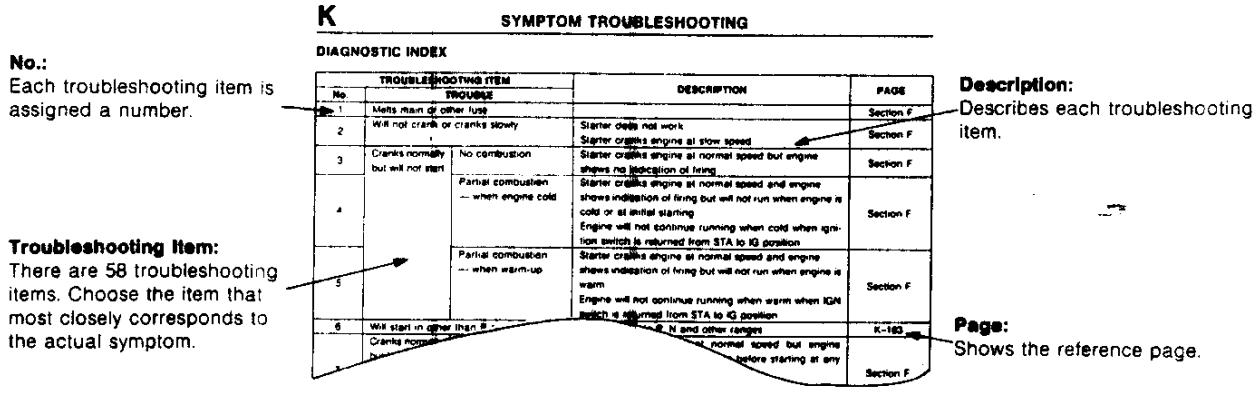
Diagnostic Index

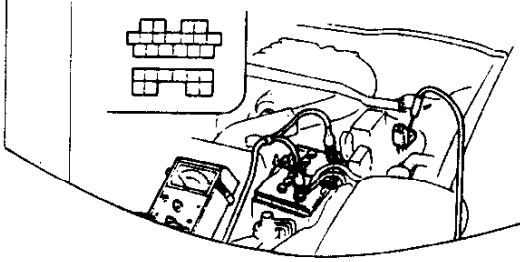


29U0K x-022

Troubleshooting Chart

K

SYMPTOM TROUBLESHOOTING

14	ENGINE STALLS IDLE WHEN SHIFTED FROM N OR P TO OTHER RANGES		
DESCRIPTION	• Engine stops unexpectedly when shifted from N or P to other ranges at idle		
[TROUBLESHOOTING HINTS] ① Engine idle speed low ② Control valve stuck (lockup control valve, shuttle shift valve D, lockup modifier valve, or pilot valve) ③ Inhibitor signal malfunction ④ Inhibitor switch worn or misadjusted ⑤ Pulse generator malfunction ⑥ Speed sensor 1 (revolution sensor) malfunction			
STEP	INSPECTION		ACTION
1	Are ignition timing and idle speed OK? ☞ Section F **Ignition timing: Leading 5° ATDC, Trailing 20° ATDC** **Idle speed: 700–750 rpm (P range)** 	Yes	Go to next step
		No	Adjust ignition timing and/or idle speed ☞ Section F

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DESCRIPTION:

Further describes the symptom. Confirm that the chart addresses the actual symptom before beginning troubleshooting.

TROUBLESHOOTING HINTS:

Describes the possible point of malfunction.

STEP:

Shows the order of troubleshooting. Proceed with troubleshooting as indicated.

INSPECTION:

Describes an inspection method to quickly determine the malfunction of parts. If a detailed procedure is necessary to perform the INSPECTION, refer to the page shown by the "☞" mark.

ACTION:

Recommends the appropriate action to take as a result (Yes/No) of the INSPECTION. How to perform the action is described on the reference page shown by the "☞" mark.

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DIAGNOSTIC INDEX

TROUBLESHOOTING ITEM			DESCRIPTION	PAGE
No.	TROUBLE			
1	Melts main or other fuse			Section F
2	Will not crank or cranks slowly		Starter does not work Starter cranks engine at slow speed	Section F
3	Cranks normally but will not start	No combustion	Starter cranks engine at normal speed but engine shows no indication of firing	Section F
4		Partial combustion — when engine cold	Starter cranks engine at normal speed and engine shows indication of firing but will not run when engine is cold or at initial starting Engine will not continue running when cold when ignition switch is returned from STA to IG position	Section F
5		Partial combustion — when warm-up	Starter cranks engine at normal speed and engine shows indication of firing but will not run when engine is warm. Engine will not continue running when warm when IGN switch is returned from STA to IG position	Section F
6	Will start in other than P and N ranges		Engine starts in P, N and other ranges	K–183
7	Cranks normally but hard to start	Any engine temp.	Starter cranks engine at normal speed but engine requires excessive cranking time before starting at any engine temperature Engine starts after stalling a few times at any engine temperature	Section F
8		When engine cold	Starter cranks engine at normal speed but engine requires excessive cranking time before starting when engine is cold Engine starts after stalling a few times when engine is cold	Section F
9		After warm-up	Starter cranks engine at normal speed but engine requires excessive cranking time before starting after warm-up	Section F
10	Engine stalls	Idle at any engine temp.	Engine stops unexpectedly at any engine temp.	Section F
11		During fast idle	Engine stops unexpectedly during fast-idle operation	Section F
12		Idle after warm-up	Engine stops unexpectedly at idle after warm-up	Section F
13		Idle with A/C, P/S, and/or E/L ON	Engine stops unexpectedly when A/C, P/S, and/or E/L turned ON at idle	Section F
* 14		Idle when shifted from N or P to other ranges	Engine stops unexpectedly when shifted from N or P to other ranges at idle	Section F K–184
15		Driveway	Engine stops unexpectedly upon driveaway	Section F
16		On acceleration	Engine stops unexpectedly at beginning of acceleration or during acceleration	Section F
17		While cruising	Engine stops unexpectedly while cruising	Section F
* 18		On deceleration	Engine stops unexpectedly at beginning of deceleration or recovery from deceleration exhaust afterburn	Section F K–186
19	Engine rough	Idle at any engine temp.	Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at any engine temp. Idle speed too slow and excessive engine shake at any engine temp.	Section F
20		During fast idle	Fast idle speed too slow and excessive engine shake during fast idle, but returns to normal after warm-up	Section F
21		Idle after warm-up	Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at idle after warm-up	Section F

* Refer to Section F before referring to K sections.

TROUBLESHOOTING ITEM No.	TROUBLE		DESCRIPTION	PAGE
22	Engine rough	Idle with A/C, P/S, and/or E/L ON	Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at idle when A/C, P/S, and/or E/L ON	Section F
23		Idle when shifted from N or P to other range	Engine speed fluctuates between specified idle speed and lower speed and excessive engine shake at idle when shifted from P or N to other range	Section F
* 24		On deceleration	Engine shakes at beginning of deceleration, during deceleration, or recovery from deceleration Exhaust afterburn	Section F K–187
* 25	Poor acceleration	Driveaway	Engine speed increases normally but vehicle speed slowly increases during driveaway	Section F K–189
* 26		On acceleration	Engine speed increases normally but vehicle speed slowly increases during acceleration	
27	High idle speed after warm-up		Idle speed continues at fast idle after warm-up Engine returns slowly to idle after acceleration is released	Section F
28	Idle fluctuates / Idle hants		Engine speed changes back and forth between specified idle speed and higher speed	Section F
29	Hesitates / Stumbles on acceleration		Momentary pause at beginning of acceleration or during acceleration	Section F
* 30	Surges while cruising		Momentary minor irregularity in engine output at steady vehicle speed	Section F K–192
* 31	Lack of power		Performance poor under load (i.e., power down when climbing hills)	Section F K–194
* 32	Poor fuel economy		Fuel economy unsatisfactory	Section F K–194
33	A/C does not work		A/C compressor magnetic clutch does not engage when A/C switch ON	Section F
34	Knocking / Pinging		Sound produced when air/fuel mixture is ignited by something other than spark plug (i.e., hot spot in combustion chamber)	Section F
35	Fuel odor		Gasoline fuel smell or visible leaks	Section F
36	Exhaust sulfur smell		Rotten egg smell from exhaust	Section F
37	High oil consumption		Oil consumption excessive	Section F
38	Self-Diagnosis Checker flashes 88 / DT-S1000 indicates "SYSTEM ERROR"		MIL always ON/Self-Diagnosis Checker flashes 88 with test connector ground / DT-S1000 indicates "SYSTEM ERROR"	Section F
39	MIL never ON		Self-Diagnosis Checker or DT-S1000 indicates service code No. of input device but MIL never ON	Section F
40	Vehicle does not move in D, S, L and/or R ranges		No creep at all Vehicle does not move when accelerator pedal depressed after shifted to D, S, L and/or R range	K–194
41	Vehicle moves in N range		Vehicle creeps in N range Vehicle moves when accelerator pedal not depressed	K–195
42	Vehicle moves in P range		Vehicle rolls in P range, and drivetrain not lockup	K–195
43	Excessive creep		Vehicle moves quickly in D, S, L and R ranges (accelerator pedal not depressed) **Note** **• Excessive N to R range and N to D range shift shock felt**	K–195

* Refer to section F before referring to K section.

TROUBLESHOOTING ITEM			DESCRIPTION	PAGE
No.	TROUBLE			
44	No shift		Single range shift (1st → 2nd, 2nd → 3rd, or 3rd → O/D) only Sometimes shifts correctly **Note** **• Gear position is held in hold mode**	K–196
45	Abnormal shift		Shifts incorrectly (incorrect shift pattern) (ex) Vehicle shifts 1st → O/D directly when accelerating with accelerator pedal depressed slightly	K–198
46	Frequent shifting		Downshift occurs when accelerator depressed slightly in D, S and L ranges (except hold mode)	K–200
47	Shift point high or low		Shift points do not match shift diagram Shift delayed when accelerating Shifts occur too fast when accelerating and engine speed does not increase	K–201
48	No lockup		No lockup when vehicle speed reaches lockup range	K–202
49	No kickdown		Does not downshift when accelerator pedal depressed more than 7/8 within kickdown range	K–202
50	Engine speed flares up	When accelerating	Engine speed flares up on acceleration	K–202
51		When upshifting and/or downshifting	Engine flares up when accelerator pedal depressed for upshifting Engine flares up suddenly when accelerator pedal depressed for downshifting	K–203
52	Excessive shift shock	P, N to R and/or N to D	Strong shift shock felt at idle when shifting from N to D or R range	K–205
53		When upshifting and/or downshifting	Excessive shift shock felt when accelerating at upshifting During cruising, excessive shift shock felt when accelerator pedal depressed at downshifting	K–208
54	No engine braking		Engine speed drops to idle but vehicle does not slow when accelerator pedal released during cruising at medium to high speed Engine speed drops to idle but vehicle does not slow when accelerator pedal released when in L range at low vehicle speed	K–211
55	No mode change		Mode does not change to/from normal mode in D range Hole mode not selected or not cancelled	K–213
56	Transmission noise	All ranges	Transmission noisy in all ranges when vehicle is idling	K–213
57		D, S, L, R ranges	Abnormal noise from transmission in D, S, L, R	K–213
58	Transmission overheats		ATF smells burnt and/or is discolored	K–213

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SYMPTOM TROUBLESHOOTING CHART

6	WILL START IN OTHER THAN P AND N RANGES
DESCRIPTION	• Engine starts in P, N and other ranges

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

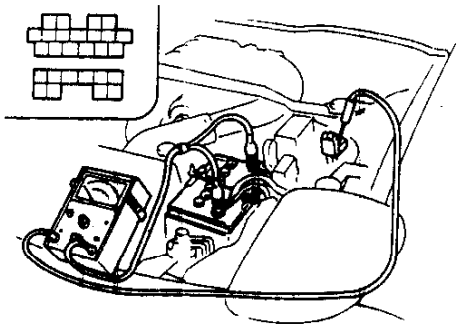
① Inhibitor switch worn or misadjusted ☞ page K-28
② Ignition system malfunction ☞ Section G
③ Selector lever installation or adjustment incorrect ☞ page K-164

37U0KX-:83

14	ENGINE STALLS IDLE WHEN SHIFTED FROM N OR P TO OTHER RANGES
DESCRIPTION	• Engine stops unexpectedly when shifted from N or P to other ranges at idle

[TROUBLESHOOTING HINTS]

① Engine idle speed low
② Control valve stuck (lockup control valve, shuttle shift valve D, lockup modifier valve, or pilot valve)
③ Inhibitor signal malfunction
④ Inhibitor switch worn or misadjusted
⑤ Pulse generator malfunction
⑥ Speed sensor 1 (revolution sensor) malfunction

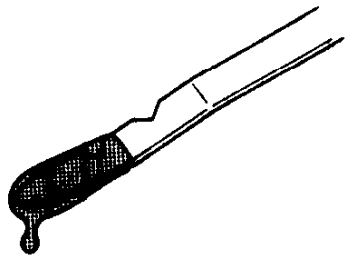
STEP	INSPECTION		ACTION
1	Are ignition timing and idle speed OK? ☞ **Section F** **Ignition timing: Leading 5° ATDC, Trailing 20° ATDC** **Idle speed: 700–750 rpm (P range)** 	Yes	Go to next step
		No	Adjust ignition timing and/or idle speed ☞ **Section F**
2	Is problem correctec when 20-pin and 16-pin connectors of EC-AT control unit are disconnected?	Yes	Go to next step
		No	Overhaul control valve body and repair or replace parts as necessary If large amounts of material are found, overhaul transmission and repair or replace parts as necessary
3	Is output voltage of inhibitor signal at EC-AT control unit terminal OK? V_B: Battery voltage	Yes	Check wiring and connector from 1C terminal of EC-AT control unit to 1R terminal of engine control unit
		No	Go to next step

Term.	Unit	Spec.	Condition	Page
1C	V	V_B	D range	K–35
		Below 1.0	P and N ranges	

Unit: V → Voltage

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>4</td><td>Are measurements at EC-AT control unit terminals OK?
V_B: Battery voltage
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="2">2D</td><td rowspan="2">V</td><td>0</td><td>P and N ranges</td><td rowspan="12">K–35</td></tr>
<tr><td>V_B</td><td>Except P and N ranges</td></tr>
<tr><td rowspan="2">1E</td><td rowspan="2">V</td><td>V_B</td><td>R range</td></tr>
<tr><td>0</td><td>Except R range</td></tr>
<tr><td rowspan="2">2B</td><td rowspan="2">V</td><td>V_B</td><td>D range</td></tr>
<tr><td>0</td><td>Except D range</td></tr>
<tr><td rowspan="2">2S</td><td rowspan="2">V</td><td>V_B</td><td>S range</td></tr>
<tr><td>0</td><td>Except S range</td></tr>
<tr><td rowspan="2">2Q</td><td rowspan="2">V</td><td>V_B</td><td>L range</td></tr>
<tr><td>0</td><td>Except L range</td></tr>
<tr><td>2E↔2L</td><td>kΩ</td><td>2.2–3.5</td><td>Constant (Ign: OFF)</td></tr>
<tr><td>2J↔2L</td><td>Ω</td><td>500–1,000</td><td>Constant (Ign: OFF)</td></tr>
</table>
Unit: V → Voltage
Ω → Resistance
Note
• 2D, 1E, 2B, 2S, 2Q terminals: Inhibitor switch
• 2E terminal: Pulse generator
• 2J terminal: Speed sensor 1 (revolution sensor)
• 2L terminal: Ground (input)</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K–41</td></tr>
<tr><td></td><td></td><td>No</td><td>Check for malfunctioning parts and wiring
• Inhibitor switch ☞ page K–28
• Pulse generator ☞ page K–30
• Speed sensor 1 (revolution sensor) ☞ page K–29</td></tr>
</table>

37U0KX-784

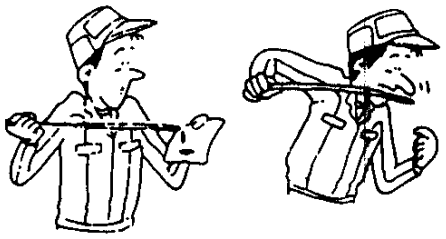
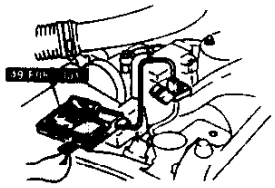
18	ENGINE STALLS ON DECELERATION		
DESCRIPTION	• Engine stops unexpectedly at beginning of deceleration or recovery from deceleration exhaust afterburn		
[TROUBLESHOOTING HINTS] ① ATF level low			
STEP	INSPECTION		ACTION
1	Is ATF level OK? ☞ page K-25 **Level: Between notches on dipstick** 	Yes	Go to No.14 "ENGINE STALLS WHEN SHIFTED FROM N TO D AND/OR FROM N TO R RANGE" in section K of this manual ☞ page K-184
		No	Adjust ATF level ☞ page K-25

37U0KX-?85

24	ENGINE ROUGH ON DECELERATION
DESCRIPTION	• Engine shakes at beginning of deceleration, during deceleration, or recovery from deceleration • Exhaust afterburn

[TROUBLESHOOTING HINTS]

① ATF level low
② Selector lever installation or adjustment incorrect
③ Throttle sensor malfunction or misadjusted
④ Line pressure low
⑤ Powertrain slippage (forward clutch, forward one-way clutch, low one-way clutch, reverse clutch, or low and reverse brake)
⑥ Control valve stuck (pressure regulator valve, pressure modifier valve, or pilot valve)
⑦ Solenoid valve (line pressure) worn
⑧ Dropping resistor malfunction

STEP	INSPECTION		ACTION
1	Are ATF level and condition OK? ☞ page K-25 	Yes	Go to next step
		No	**Note** • **After pinpointing problem, overhaul transmission and repair or replace parts as necessary** Problem within transmission Go to next step, and check for cause
2	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ page K-214 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ page K-214 If problem remains, overhaul transmission and repair or replace parts as necessary
		No	Go to next step
3	Is line pressure OK? ☞ page K-14 **Specified line pressure** **kPa (kgf/cm², psi)** Engine / Range / Idle / Stall 13B / D, S, L / 500–520 {5.0–5.4, 72–76} / 1,200–1,270 {12.2–13.0, 174–184} 13B / R / 620–650 {6.3–6.7, 90–95} / 1,510–1,570 {15.3–16.1, 218–228}	Yes	Overhaul transmission and repair or replace parts as necessary
		No	Check selector lever operation ☞ page K-164 If OK, go to next step If not OK, adjust, repair or replace selector lever ☞ page K-164, 166

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>4</td><td>Are measurements at EC-AT control unit terminals OK?
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="3">1F</td><td>Ω</td><td>2.5–5.0</td><td>Constant (Ign: OFF)</td><td>K–35</td></tr>
<tr><td rowspan="2">%</td><td>Approx. 100</td><td>Throttle valve fully closed (Ign: ON)</td><td rowspan="2">K–246</td></tr>
<tr><td>Approx. 5</td><td>Throttle valve fully opened (Ign: ON)</td></tr>
<tr><td rowspan="3">1H</td><td>Ω</td><td>12.5–19.0</td><td>Constant (Ign: OFF)</td><td>K–35</td></tr>
<tr><td rowspan="2">%</td><td>Approx. 100</td><td>Throttle valve fully closed (Ign: ON)</td><td rowspan="2">K–246</td></tr>
<tr><td>Approx. 5</td><td>Throttle valve fully opened (Ign: ON)</td></tr>
</table>
Unit: Ω → Resistance
% → ON duty
Note
•1F terminal: Solenoid valve (line pressure)
• 1H terminal: Dropping resistor</td><td>Yes</td><td>Replace control valve body assembly
☞ page K–128
If problem remains, overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td></td><td></td><td>No</td><td>If resistance not OK, check for malfunctioning parts and wiring
• Solenoid valve (line pressure) ☞ page K–32
• Dropping resistor ☞ page K–33

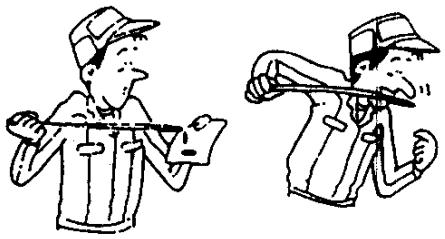
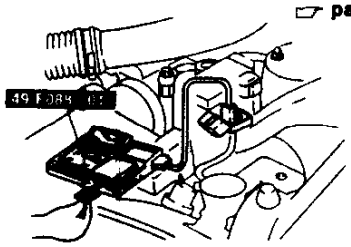
If resistance OK but duty not, go to next step</td></tr>
<tr><td>5</td><td>Is input voltage of throttle sensor at EC-AT control unit OK?
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="2">2T</td><td rowspan="2">V</td><td>0.1–1.1</td><td>Throttle valve fully closed</td><td rowspan="2">K–35</td></tr>
<tr><td>4.0–4.5</td><td>Throttle valve fully opened</td></tr>
</table>
Unit: V → Voltage</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K–41</td></tr>
<tr><td></td><td></td><td>No</td><td>Check throttle sensor and wiring
☞ Section F</td></tr>
</table>

37U0KX-283

25, 26	POOR ACCELERATION WHEN DRIVE AWAY OR ON ACCELERATION
DESCRIPTION	• Engine speed increases normally but vehicle speed slowly increases during driveaway. • Engine speed increases normally but vehicle speed slowly increases during acceleration.

[TROUBLESHOOTING HINTS]

① ATF level low
② Selector lever installation or adjustment incorrect
③ Throttle sensor malfunction or misadjusted
④ Line pressure low
⑤ Powertrain slippage
⑥ Control valve stuck (pressure regulator valve, pressure modifier valve, pilot valve, shift valve A, or shift valve B)
⑦ Solenoid valve (line pressure) worn
⑧ Dropping resistor malfunction
⑨ Solenoid valve (shift A, B) worn
⑩ Inhibitor switch worn
⑪ Hold switch worn
⑫ Speed sensor 1 (revolution sensor) malfunction
⑬ Torque converter worn
⑭ Engine power low

STEP	INSPECTION		ACTION
1	Are ATF level and condition OK? ☞ page K-25 	Yes	Go to next step
		No	**Note** • **After pin pointing problem, overhaul transmission and repair or replace parts as necessary** Problem within transmission Go to next step, and check for cause
2	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ page K-214 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ page K-214
		No	Go to next step
3	Is line pressure OK? ☞ page K-14 **Specified line pressure** **kPa {kgf/cm², psi}**	Yes	Go to next step
		No	Check selector lever operation ☞ page K-164 If OK, go to next step If not OK, adjust, repair or replace selector lever. ☞ page K-164, 166

Engine	Range	Idle	Stall
13B	D, S, L	500–520 {5.0–5.4, 72–76}	1,200–1,270 {12.2–13.0, 174–184}
	R	620–650 {6.3–6.7, 90–95}	1,510–1,570 {15.3–16.1, 218–228}

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>4</td><td>Is engine stall speed OK?
☞ page K-9
rpm
<table><tr><th>Engine</th><th>Engine stall speed</th></tr><tr><td>13B</td><td>3,000–3,300</td></tr></table></td><td>Yes</td><td>Go to Step 7</td></tr>
<tr><td></td><td></td><td>No</td><td>Overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td>5</td><td>Are measurements at EC-AT control unit terminals OK?
<table><tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr><tr><td rowspan="2">1F</td><td>Ω</td><td>2.5–5.0</td><td>Constant (Ign: OFF)</td><td>K-35</td></tr><tr><td rowspan="2">%</td><td>Approx. 100</td><td>Throttle valve fully closed (Ign: ON)</td><td rowspan="2">K-246</td></tr><tr><td>Approx. 5</td><td>Throttle valve fully opened (Ign: ON)</td></tr><tr><td rowspan="2">1H</td><td>Ω</td><td>12.5–19.0</td><td>Constant (Ign: OFF)</td><td>K-35</td></tr><tr><td rowspan="2">%</td><td>Approx. 100</td><td>Throttle valve fully closed (Ign: ON)</td><td rowspan="2">K-246</td></tr><tr><td>Approx. 5</td><td>Throttle valve fully opened (Ign: ON)</td></tr></table>Unit: Ω → Resistance
% → ON duty

Note
• 1F terminal: Solenoid valve (line pressure)
• 1H terminal: Dropping resistor</td><td>Yes</td><td>Overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td></td><td></td><td>No</td><td>If resistance not OK, check for malfunctioning parts and wiring
• Solenoid valve (line pressure) ☞ page K-32
• Dropping resistor ☞ page K-33

If resistance OK but duty not, go to next step</td></tr>
<tr><td>6</td><td>Is input voltage of throttle sensor at EC-AT control unit OK?
<table><tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr><tr><td rowspan="2">2T</td><td rowspan="2">V</td><td>0.1–1.1</td><td>Throttle valve fully closed</td><td rowspan="2">K-35</td></tr><tr><td>4.0–4.5</td><td>Throttle valve fully opened</td></tr></table>Unit: V → Voltage</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K-41
If problem remains, overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td></td><td></td><td>No</td><td>Check throttle sensor and wiring
☞ Section F
If problem remains, overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td>7</td><td>Disconnect solenoid 8-pin connector; is vehicle driven as follows?
☞ page K-247
<table><tr><th>Range</th><th>Gear position</th></tr><tr><td>D range</td><td>3rd (fixed)</td></tr><tr><td>S range</td><td>3rd (fixed)</td></tr><tr><td>L range</td><td>2nd (fixed)</td></tr><tr><td>R range</td><td>Reverse (fixed)</td></tr></table></td><td>Yes</td><td>Go to next step</td></tr>
<tr><td></td><td></td><td>No</td><td>Replace control valve body assembly
☞ page K-128
If problem remains, overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td>8</td><td>Drive vehicle in D, S, and L ranges (except hold mode); does vehicle start from stop in 1st gear?

Are engine rpm at 20 km/h (12 mph) and throttle opening OK?
RPM: Approx. 2,100
Throttle opening: 4/8</td><td>Yes</td><td>Overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td></td><td></td><td>No</td><td>Go to next step</td></tr>
</table>

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>9</td><td>Are measurements at EC-AT control unit terminals OK?
V_B: Battery voltage
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="3">1D</td><td>Ω</td><td>20–40</td><td>Constant (Ign: OFF)</td><td rowspan="6">K-35</td></tr>
<tr><td rowspan="2">V</td><td>Below 1.0</td><td>2nd and 3rd gear</td></tr>
<tr><td>V_B</td><td>1st and O/D gear</td></tr>
<tr><td rowspan="3">1B</td><td>Ω</td><td>20–40</td><td>Constant (Ign: OFF)</td></tr>
<tr><td rowspan="2">V</td><td>Below 1.0</td><td>3rd and O/D gear</td></tr>
<tr><td>V_B</td><td>1st and 2nd gear</td></tr>
</table>
Unit: Ω → Resistance
V → Voltage
Note
• 1D terminal: Solenoid valve (shift A)
• 1B terminal: Solenoid valve (shift B)</td><td>Yes</td><td>Replace control valve body assembly
☞ page K-128
If problem remains, overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td></td><td></td><td>No</td><td>If resistance not OK, check for malfunctioning parts and wiring
• Solenoid valve (shift A) ☞ page K-32
• Solenoid valve (shift B) ☞ page K-32

If resistance OK but voltage not, go to next step</td></tr>
<tr><td>10</td><td>Are measurements at EC-AT control unit terminals OK?
V_B: Battery voltage
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="2">2D</td><td rowspan="2">V</td><td>0</td><td>P and N ranges</td><td rowspan="10">K-35</td></tr>
<tr><td>V_B</td><td>Except P and N ranges</td></tr>
<tr><td rowspan="2">1E</td><td rowspan="2">V</td><td>V_B</td><td>R range</td></tr>
<tr><td>0</td><td>Except R range</td></tr>
<tr><td rowspan="2">2B</td><td rowspan="2">V</td><td>V_B</td><td>D range</td></tr>
<tr><td>0</td><td>Except D range</td></tr>
<tr><td rowspan="2">2S</td><td rowspan="2">V</td><td>V_B</td><td>S range</td></tr>
<tr><td>0</td><td>Except S range</td></tr>
<tr><td rowspan="2">2Q</td><td rowspan="2">V</td><td>V_B</td><td>L range</td></tr>
<tr><td>0</td><td>Except L range</td></tr>
<tr><td rowspan="2">2I</td><td rowspan="2">V</td><td>V_B</td><td>Switch depressed</td></tr>
<tr><td>0</td><td>Switch released</td></tr>
<tr><td>2J ↔ 2L</td><td>Ω</td><td>500–1,000</td><td>Constant (Ign: OFF)</td></tr>
</table>
Unit: V → Voltage
Ω → Resistance
Note
• 2D, 1E, 2B, 2S, 2Q terminals: Inhibitor switch
• 2I terminal: Hold switch
• 2J terminal: Speed sensor 1 (revolution sensor)
• 2L terminal: Ground (Input)</td><td>Yes</td><td>Go to next step</td></tr>
<tr><td></td><td></td><td>No</td><td>Check for malfunctioning parts and wiring
• Inhibitor switch ☞ page K-28
• Hold switch ☞ page K-27
• Speed sensor 1 (revolution sensor) ☞ page K-29

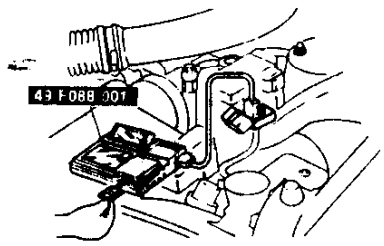
If problem remains, return to Step 7</td></tr>
<tr><td>11</td><td>Replace with known good EC-AT control unit; is problem corrected?
☞ page K-41</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K-41</td></tr>
<tr><td></td><td></td><td>No</td><td>Replace torque converter</td></tr>
</table>

37U0KX-287

30	SURGES WHILE CRUISING
DESCRIPTION	• Momentary minor irregularity in engine output at steady vehicle speed

[TROBLESHOOTING HINTS]

① ATF level low
② Throttle sensor malfunction or misadjusted
③ Solenoid valve (lockup) worn
④ Idle signal malfunction
⑤ Slip lockup OFF signal malfunction

STEP	INSPECTION		ACTION
1	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ page K-214 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ page K-214
		No	Go to next step
2	Is input voltage of throttle sensor at EC-AT control unit OK?	Yes	Go to next step
		No	Check throttle sensor and wiring ☞ Section F
3	Are resistance and output duty of solenoid valve (lockup) at EC-AT control unit terminal OK?	Yes	Replace control valve body assembly ☞ page K-128 If problem remains, overhaul transmission and repair or replace parts as necessary
		No	If resistance not OK, check for solenoid valve (lockup) and wiring ☞ page K-32 If resistance OK but duty not, go to next step

Term.	Unit	Spec.	Condition	Page
2T	V	0.1–1.1	Throttle valve fully closed	K-35
		4.0–4.5	Throttle valve fully opened	

Unit: V → Voltage

Term.	Unit	Spec.	Condition	Page
1M	Ω	10–20	Constant (Ign: OFF)	K-35
	%	Approx. 5	No lockup (Ign: ON)	K-247
		Approx. 95	Lockup (Ign: ON)	

Unit: Ω → Resistance
% → ON duty

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>4</td><td>Are measurements at EC-AT control unit terminals OK?

V_B: Battery voltage

<table>
<tr><th>Term</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="2">2M</td><td rowspan="2">V</td><td>Below 1.0</td><td>Throttle valve fully closed</td><td rowspan="4">K-35</td></tr>
<tr><td>4.5–5.5</td><td>Throttle valve opened</td></tr>
<tr><td rowspan="2">2G</td><td rowspan="2">V</td><td>Below 1.0</td><td>Engine running at 3,000 rpm</td></tr>
<tr><td>V_B</td><td>Engine running at idle</td></tr>
</table>
Unit: V → Voltage

Note
• 2M terminal: Idle signal
• 2G terminal: Slip lockup OFF signal</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K-41
If problem remains, overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td></td><td></td><td>No</td><td>Check for malfunctioning parts and wiring
• Idle signal ☞ page K-35
• Slip lockup OFF signal ☞ page K-35</td></tr>
</table>

37U0KX-288

31	LACK OF POWER
DESCRIPTION	• Performance poor under load (i.e., power down when climbing hills)

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① ATF level low ☞ page K-25
② Selector lever installation or adjustment incorrect ☞ page K-164
③ Throttle sensor malfunction or misadjusted ☞ Section F
④ Line pressure low ☞ page K-14
⑤ Powertrain slippage
⑥ Control valve stuck (pressure regulator valve, pressure modifier valve, shift valve A or shift valve B)
⑦ Solenoid valve (line pressure) worn ☞ page K-32
⑧ Dropping resistor malfunction ☞ page K-33
⑨ Solenoid valve (shift A and/or B) worn ☞ page K-32
⑩ Inhibitor switch worn or misadjusted ☞ page K-28
⑪ Hold switch circuit malfunction ☞ page K-27
⑫ Speed sensor 1 (revolution sensor) malfunction ☞ page K-29
⑬ Torque converter worn ☞ page K-57
⑭ Engine power low

37U0KX-289

32	POOR FUEL ECONOMY
DESCRIPTION	• Fuel economy unsatisfactory

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① Solenoid valve (lockup) worn ☞ page K-32
② Solenoid valve (lockup control) worn ☞ page K-32
③ Control valve stuck (lockup control valve, lockup modifier valve, pilot valve, or shuttle shift valve D)
④ ATF thermosensor malfunction ☞ page K-31
⑤ Throttle sensor malfunction or misadjusted ☞ Section F
⑥ Engine rpm signal malfunction ☞ page K-35
⑦ Speed sensor 1 (revolution sensor) malfunction ☞ page K-29
⑧ Inhibitor switch worn or misadjusted ☞ page K-28

37U0KX-290

40	VEHICLE DOES NOT MOVE IN D, S, L AND/OR R RANGES
DESCRIPTION	• No creep at all • Vehicle does not move when accelerator pedal depressed after shifted to D, S, L and/or R range

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① ATF level low ☞ page K-25
② Selector lever installation or adjustment incorrect ☞ page K-164
③ Throttle sensor malfunction or misadjusted ☞ Section F
④ Line pressure low ☞ page K-14
⑤ Powertrain slippage (high clutch, brake band, forward clutch, or reverse clutch)
⑥ Control valve stuck (manual valve pressure regulator valve, pressure modifier valve or pilot valve)
⑦ Solenoid valve (line pressure) worn ☞ page K-32
⑧ Dropping resistor malfunction ☞ page K-33
⑨ Parking mechanism worn ☞ page K-97

37U0KX-291

41	VEHICLE MOVES IN N RANGE
DESCRIPTION	• Vehicle creeps in N range • Vehicle moves when accelerator pedal not depressed

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① Selector lever installation or adjustment incorrect ☞ **page K-164**
② Powertrain burned (forward clutch, or overrunning clutch)
③ Throttle sensor malfunction or misadjusted ☞ **Section F**
④ Control valve stuck (manual valve)
⑤ Solenoid valve (line pressure) worn ☞ **page K-32**
⑥ Dropping resistor malfunction ☞ **page K-33**

37U0KX-292

42	VEHICLE MOVES IN P RANGE
DESCRIPTION	• Vehicle rolls in P range, and drivetrain not lookup

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① Selector lever installation or adjustment incorrect ☞ **page K-164**
② Parking mechanism worn ☞ **page K-97**

37U0KX-293

43	EXCESSIVE CREEP
DESCRIPTION	• Vehicle moves quickly in D, S, L, and R ranges (accelerator pedal not depressed) **Note** **• Excessive N to R range and N to D range shift shock felt**

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

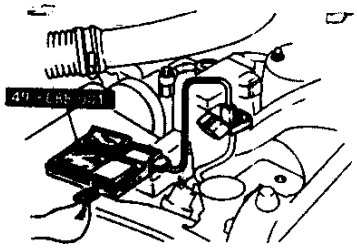
① Engine idle speed misadjusted ☞ **Section F**
② Line pressure at idle high ☞ **page K-14**

37U0KX-294

44	NO SHIFT
DESCRIPTION	• Single range shift (1st → 2nd, 2nd → 3rd, or 3rd → O/D) only • Sometimes shifts correctly **Note** **• Gear position is held in hold mode**

[TROUBLESHOOTING HINTS]

① Solenoid valve (shift A and B) worn
② Control valve stuck
③ Hold switch malfunction
④ Speed sensor 1 (revolution sensor) malfunction
⑤ Poor ground
⑥ EC-AT control unit malfunction

STEP	INSPECTION		ACTION
1	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ **page K–214** 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ **page K–214**
		No	Go to next step
2	Disconnect solenoid 8-pin connector; is vehicle driven as follows? ☞ **page K–247** **Range** / **Gear position**: D range – 3rd (fixed); S range – 3rd (fixed); L range – 2nd (fixed); R range – Reverse (fixed)	Yes	Go to next step
		No	Replace control valve body assembly ☞ **page K–128** If problem remains, overhaul transmission and repair or replace parts as necessary
3	Drive vehicle in D, S, and L ranges (except hold mode); does vehicle start from stop in 1st gear? Are engine rpm at 20 km/h (12 mph) and throttle opening OK? **RPM: Approx. 2,100** **Throttle opening: 4/8**	Yes	Go to Step 5
		No	Go to next Step

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>4</td><td>Are measurements at EC-AT control unit terminals OK?
V_B: Battery voltage
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="4">1D
1B</td><td>Ω</td><td>20–40</td><td>Constant (Ign: OFF)</td><td rowspan="8">K–35</td></tr>
<tr><td rowspan="3">V</td><td>Below 1.0</td><td>2nd and 3rd gear</td></tr>
<tr><td>V_B</td><td>1st and O/D gear</td></tr>
<tr><td>Ω</td><td>20–40</td><td>Constant (Ign: OFF)</td></tr>
<tr><td rowspan="2">V</td><td>Below 1.0</td><td>3rd and O/D gear</td></tr>
<tr><td>V_B</td><td>1st and 2nd gear</td></tr>
</table>
Unit: Ω → Resistance
V → Voltage
Note
• 1D terminal: Solenoid valve (shift A)
• 1B terminal: Solenoid valve (shift B)</td><td>Yes</td><td>Replace control valve body assembly
☞ page K–128
If problem remains, overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td></td><td></td><td>No</td><td>If resistance not OK, check for malfunctioning parts and wiring
• Solenoid valve (shift A) ☞ page K–32
• Solenoid valve (shift B) ☞ page K–32

If resistance OK, but voltage not, go to next step</td></tr>
<tr><td>5</td><td>Are measurements at EC-AT control unit terminals OK?
V_B: Battery voltage
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="2">2I</td><td rowspan="2">V</td><td>V_B</td><td>Switch depressed</td><td rowspan="3">K–35</td></tr>
<tr><td>0</td><td>Switch released</td></tr>
<tr><td>2J ↔ 2L</td><td>Ω</td><td>500–1,000</td><td>Constant (Ign: OFF)</td></tr>
</table>
Unit: V → Voltage
Ω → Resistance

Note
• 2I terminal: Hold switch
• 2J terminal: Speed sensor 1 (revolution sensor)
• 2L terminal: Ground (input)</td><td>Yes</td><td>Go to next step</td></tr>
<tr><td></td><td></td><td>No</td><td>Check for malfunctioning parts and wiring
• Hold switch ☞ page K–27
• Speed sensor 1 (revolution sensor) ☞ page K–29

If problem remains, return to Step 3</td></tr>
<tr><td>6</td><td>Is voltage between 1L terminal of EC-AT control unit and transmission case OK?

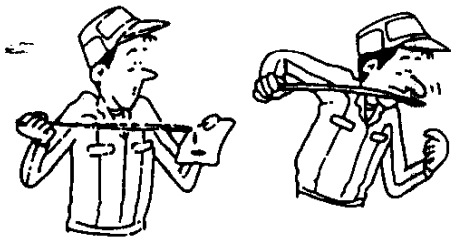
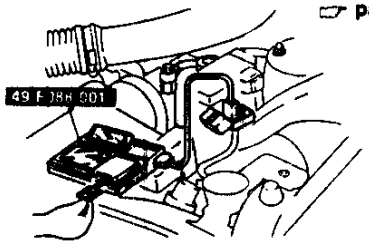
Specified voltage: 0V (Normal condition)</td><td>Yes</td><td>Go to next step</td></tr>
<tr><td></td><td></td><td>No</td><td>Problem in ground circuit
Repair wiring or replace connector</td></tr>
<tr><td>7</td><td>Replace with known good EC-AT control unit; is problem corrected?
☞ page K–41</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K–41</td></tr>
<tr><td></td><td></td><td>No</td><td>Overhaul transmission and repair or replace parts as necessary</td></tr>
</table>

37U0KX-295

45	ABNORMAL SHIFT
DESCRIPTION	• Shifts incorrectly (incorrect shift pattern) Ex) Vehicle shifts 1st → O/D directly when accelerating with accelerator pedal depressed slightly

[TROUBLESHOOTING HINTS]

① ATF level low
② Poor ground
③ Throttle sensor malfunction or misadjusted
④ Speed sensor 1 (revolution sensor) malfunction
⑤ EC-AT control unit malfunction
⑥ Stuck control valve (shift valve A, shift valve B, or pilot valve)

STEP	INSPECTION		ACTION
1	Are ATF level and condition OK? ☞ page K-25 	Yes	Go to next step
		No	**Note** **• After pinpointing problem, overhaul transmission and repair or replace parts as necessary** Problem within transmission Go to next step and check for cause
2	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ page K-214 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ page K-214
		No	Go to next step
3	Is voltage between 1L terminal of EC-AT control unit and transmission case OK? **Specified voltage: 0V (Normal condition)**	Yes	Go to next step
		No	Problem in ground circuit Repair wiring or replace connector

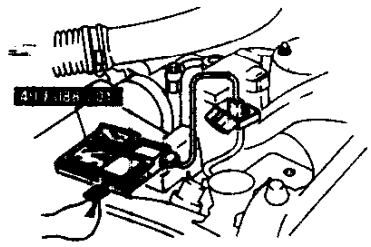
<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>4</td><td>Are measurements at EC-AT control unit terminals OK?
<table><tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr><tr><td rowspan="2">2T</td><td rowspan="2">V</td><td>0.1–1.1</td><td>Throttle valve fully closed</td><td rowspan="3">K–35</td></tr><tr><td>4.0–4.5</td><td>Throttle valve fully opened</td></tr><tr><td>2J ↔ 2L</td><td>Ω</td><td>500–1,000</td><td>Constant</td></tr></table>Unit: V → Voltage
Ω → Resistance

Note
• 2T terminal: Throttle sensor
• 2J terminal: Speed sensor 1 (revolution sensor)
• 2L terminal: Ground (input)</td><td>Yes</td><td>Go to next step</td></tr>
<tr><td></td><td></td><td>No</td><td>Check for malfunctioning parts and wiring
• Throttle sensor ☞ Section F
• Speed sensor 1 (revolution sensor) ☞ page K–29</td></tr>
<tr><td>5</td><td>Replace with known good EC-AT control unit; is problem corrected?
☞ page K–41</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K–41</td></tr>
<tr><td></td><td></td><td>No</td><td>Replace control valve body assembly
☞ page K–128
If problem remains, overhaul transmission and repair or replace parts as necessary</td></tr>
</table>

37U0KX-296

46	FREQUENT SHIFTING
DESCRIPTION	• Downshift occurs when accelerator depressed slightly in D, S, and L ranges (except hold mode)

[TROUBLESHOOTING HINTS]
① Poor ground
② Throttle sensor malfunction or misadjusted
③ EC-AT control unit misadjusted

STEP	INSPECTION		ACTION
1	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ page K-214 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ page K-214 If problem remains, overhaul transmission and repair or replace parts as necessary
		No	Go to next step
2	Is voltage between 1L terminal of EC-AT control unit and transmission case OK? **Specified voltage: 0V (Normal condition)**	Yes	Go to next step
		No	Problem in ground circuit Repair wiring or replace connector
3	Is input voltage of throttle sensor at EC-AT control unit OK?	Yes	Go to next step
		No	Check for throttle sensor and wiring ☞ Section F
4	Replace with known good EC-AT control unit; is problem corrected? ☞ page K-41	Yes	Replace EC-AT control unit ☞ page K-41
		No	Replace control valve body assembly ☞ page K-128 If problem remains, overhaul transmission and repair or replace parts as necessary

Term.	Unit	Spec.	Condition	Page
2T	V	0.1–1.1	Throttle valve fully closed	K-35
		4.0–4.5	Throttle valve fully opened	

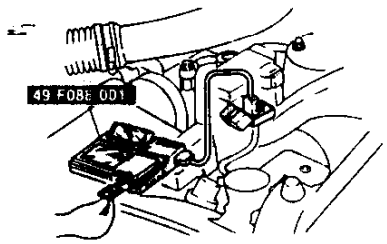
Unit: V → Voltage

37U0KX-297

47	SHIFT POINT HIGH OR LOW
DESCRIPTION	• Shift points do not match shift diagram • Shifts delayed when accelerating • Shifts occur too fast when accelerating and engine speed does not increase

[TROUBLESHOOTING HINTS]

① Throttle sensor malfunction or misadjusted
② Engine rpm signal malfunction
③ Speed sensor 1 (revolution sensor) malfunction
④ A/C signal malfunction

STEP	INSPECTION		ACTION
1	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ page K-214 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ page K-214
		No	Go to next step
2	Is input voltage of throttle sensor at EC-AT control unit OK?	Yes	Go to next step
		No	Check throttle sensor and wiring ☞ Section F

Term.	Unit	Spec.	Condition	Page
2T	V	0.1–1.1	Throttle valve fully closed	K-35
		4.0–4.5	Throttle valve fully opened	

Unit: V → Voltage

3	Are measurements at EC-AT control unit terminals OK? V_B: Battery voltage	Yes	Replace EC-AT control unit ☞ page K-41 If problem remains, overhaul transmission and repair or replace parts as necessary
		No	Check for malfunctioning parts and wiring • Engine rpm signal ☞ Section G • Speed sensor 1 (revolution sensor) ☞ page K-29 • A/C signal ☞ Section F

Term.	Unit	Spec.	Condition	Page
1G	V	0.3–0.8	Engine running at idle	K-35
		0	Engine stopped	
		1.8–2.2	Engine running at 3,000 rpm (no load)	
2J ↔ 2L	Ω	500–1,000	Constant (Ign: OFF)	
1L	V	Below 3.0	A/C ON	
		V_B	A/C OFF	

Unit: V → Voltage
Ω → Resistance

Note
- **1G terminal: Engine rpm signal**
- **2J terminal: Speed sensor 1 (revolution sensor)**
- **1L terminal: A/C signal**
- **2L terminal: Ground (Input)**

37U0KX-298

48	NO LOCKUP
DESCRIPTION	• No lockup when vehicle speed reaches lockup range

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① Solenoid valve (lockup) worn ☞ **page K–32**
② Solenoid valve (lockup control) worn ☞ **page K–32**
③ Control valve stuck (lockup control valve, lockup modifier valve, pilot valve, or shuttle shift valve D)
④ ATF thermosensor malfunction ☞ **page K–31**
⑤ Throttle sensor malfunction or misadjusted ☞ **Section F**
⑥ Idle signal malfunction ☞ **page K–35**
⑦ Engine rpm signal malfunction ☞ **page K–35**
⑧ Speed sensor 1 (revolution sensor) ☞ **page K–29**
⑨ Inhibitor switch worn or misadjusted ☞ **page K–28**

37U0KX-299

49	NO KICKDOWN
DESCRIPTION	• Does not downshift when accelerator pedal depressed more than 7/8 within kickdown range

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① Throttle sensor malfunction or misadjusted ☞ **Section F**
② Solenoid valve (shift A and/or B) worn ☞ **page K–32**
③ Control valve stuck (shift valve A, shift valve B, or pilot valve)
④ Hold switch malfunction ☞ **page K–27**
⑤ Speed sensor 1 (revolution sensor) malfunction ☞ **page K–29**

37U0KX-300

50	ENGINE SPEED FLARES UP WHEN ACCELERATING
DESCRIPTION	• Engine speed flares up on acceleration

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

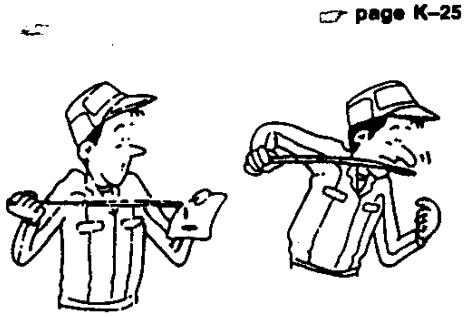
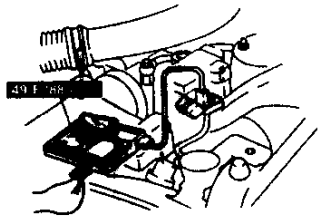
① ATF level low ☞ **page K–25**
② Selector lever installation or adjustment incorrect ☞ **page K–164**
③ Throttle sensor malfunction or misadjusted ☞ **Section F**
④ Line pressure low ☞ **page K–14**
⑤ Powertrain slippage (forward clutch, forward one-way clutch, low one-way clutch, reverse clutch, or low and reverse brake)
⑥ Control valve stuck (pressure regulator valve, pressure modifier valve or pilot valve)
⑦ Solenoid valve (line pressure) worn ☞ **page K–32**
⑧ Dropping resister malfunction ☞ **page K–33**

37U0KX-301

51	ENGINE SPEED FLARES UP WHEN UPSHIFTING AND/OR DOWNSHIFTING
DESCRIPTION	• Engine flares up when accelerator pedal depressed for upshifting • Engine flares up suddenly when accelerator pedal depressed for downshifting

[TROUBLESHOOTING HINTS]

① ATF level low
② Selector lever installation or adjustment incorrect
③ Throttle sensor malfunction or misadjusted
④ Line pressure low
⑤ Powertrain slippage (brake band, high clutch, forward clutch, forward one-way clutch, or low one-way clutch)
⑥ Control valve stuck (pressure regulator valve, pressure modifier valve, pilot valve, shift valve A, or shift valve B)
⑦ Solenoid valve (line pressure) worn
⑧ Dropping resistor malfunction
⑨ Pulse generator malfunction
⑩ Speed sensor 1 (revolution sensor) malfunction
⑪ Atmospheric pressure sensor malfunction

STEP	INSPECTION		ACTION
1	Are ATF level and condition OK? ☞ **page K-25** 	Yes	Go to next step
		No	**Note** • **After pinpointing problem, overhaul transmission and repair or replace parts as necessary** Problem within transmission Go to next step, and check for cause
2	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ **page K-214** 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ **page K-214**
		No	Go to next step
3	Is line pressure OK? ☞ **page K-14** **Specified line pressure kPa (kgf/cm², psi)** Engine 13B: Range D, S, L: Idle 500–520 {5.0–5.4, 72–76}; Stall 1,200–1,270 {12.2–13.0, 174–184} Engine 13B: Range R: Idle 620–650 {6.3–6.7, 90–95}; Stall 1,510–1,570 {15.3–16.1, 218–228}	Yes	Overhaul transmission and repair or replace parts as necessary
		No	Check selector lever operation ☞ **page K-164** If OK, go to next step If not OK, adjust, repair, or replace selector lever ☞ **page K-164, 166**

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>4</td><td>Are measurements at EC-AT control unit terminals OK?
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="3">1F</td><td>Ω</td><td>2.5–5.0</td><td>Constant (Ign: OFF)</td><td>K-35</td></tr>
<tr><td rowspan="2">%</td><td>Approx. 100</td><td>Throttle valve fully closed (Ign: ON)</td><td rowspan="2">K-246</td></tr>
<tr><td>Approx. 5</td><td>Throttle valve fully opened (Ign: ON)</td></tr>
<tr><td rowspan="3">1H</td><td>Ω</td><td>12.5–19.0</td><td>Constant (Ign: OFF)</td><td>K-35</td></tr>
<tr><td rowspan="2">%</td><td>Approx. 100</td><td>Throttle valve fully closed (Ign: ON)</td><td rowspan="2">K-246</td></tr>
<tr><td>Approx. 5</td><td>Throttle valve fully opened (Ign: ON)</td></tr>
</table>
Unit: Ω → Resistance
% → ON duty
Note
• 1F terminal: Solenoid valve (line pressure)
• 1H terminal: Dropping resistor</td><td>Yes</td><td>Replace control valve body assembly
☞ page K-128
If problem remains, overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td></td><td></td><td>No</td><td>If resistance not OK, check for malfunctioning parts and wiring
• Solenoid valve (line pressure) ☞ page K-32
• Dropping resistor ☞ page K-33

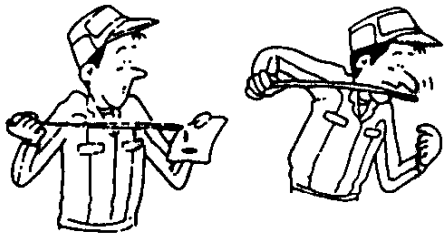
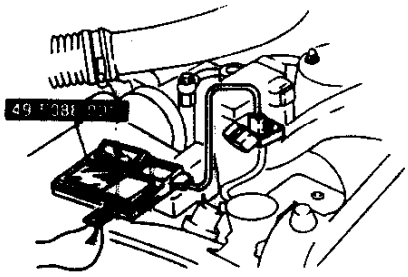
If resistance OK but duty not, go to next step</td></tr>
<tr><td>5</td><td>Is input voltage of throttle sensor at EC-AT control unit OK?
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="2">2T</td><td rowspan="2">V</td><td>0.1–1.1</td><td>Throttle valve fully closed</td><td rowspan="2">K-35</td></tr>
<tr><td>4.0–4.5</td><td>Throttle valve fully opened</td></tr>
</table>
Unit: V → Voltage</td><td>Yes</td><td>Go to next step</td></tr>
<tr><td></td><td></td><td>No</td><td>Check throttle sensor and wiring
☞ Section F</td></tr>
<tr><td>6</td><td>Are measurements at EC-AT control unit terminals OK?
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td>2E ↔ 2L</td><td>kΩ</td><td>2.2–3.5</td><td>Constant (Ign: OFF)</td><td rowspan="4">K-35</td></tr>
<tr><td>2J ↔ 2L</td><td>Ω</td><td>500–1,000</td><td>Constant (Ign: OFF)</td></tr>
<tr><td rowspan="2">2C</td><td rowspan="2">V</td><td>2.0–4.5V</td><td>Ignition switch ON</td></tr>
<tr><td>0V</td><td>Ignition switch OFF</td></tr>
</table>
Unit: Ω → Resistance
V → Voltage
Note
• 2E terminal: Pulse generator
• 2J terminal: Speed sensor 1 (revolution sensor)
• 2C terminal: Atmospheric pressure sensor
• 2L terminal: Ground (Input)</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K-41</td></tr>
<tr><td></td><td></td><td>No</td><td>Check for malfunctioning parts and wiring
• Pulse generator ☞ page K-30
• Speed sensor 1 (revolution sensor) ☞ page K-29
• Atmospheric pressure sensor ☞ page K-35</td></tr>
</table>

37U0KX-302

52	EXCESSIVE SHIFT SHOCK P, N TO R AND/OR N TO D
DESCRIPTION	• Strong shift shock felt at idle when shifting from N to D or R range

[TROUBLESHOOTING HINTS]

① ATF level low
② Idle speed high
③ Throttle sensor malfunction or misadjusted
④ Line pressure high
⑤ Control valve stuck (pressure regulator valve, pressure modifier valve, or pilot valve)
⑥ Powertrain slippage
⑦ Solenoid valve (line pressure) worn
⑧ Dropping resistor malfunction
⑨ N–D, or 3–4/N–R accumulator worn
⑩ Inhibitor signal malfunction
⑪ Pulse generator malfunction
⑫ Inhibitor switch worn or misadjusted

STEP	INSPECTION		ACTION
1	Are ATF level and condition OK? ☞ page K–25 	Yes	Go to next step
		No	**Note** **• After pinpointing problem, overhaul transmission and repair or replace parts as necessary** Problem within transmission Go to next step, and check for cause
2	Are ignition timing and idle speed OK? ☞ Section F **Ignition timing: Leading 5° ATDC, Trailing 20° ATDC** **Idle speed: 700–750 rpm (P range)**	Yes	Go to next step
		No	Adjust ignition timing and/or idle speed ☞ Section F
3	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ page K–214 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ page K–214
		No	Go to next step
4	Is line pressure OK? ☞ page K–14 **Specified line pressure kPa (kgf/cm², psi)** Engine / Range / Idle / Stall 13B / D, S, L / 500–520 {5.0–5.4, 72–76} / 1,200–1,270 {12.2–13.0, 174–184} 13B / R / 620–650 {6.3–6.7, 90–95} / 1,510–1,570 {15.3–16.1, 218–228}	Yes	Go to next step
		No	Go to Step 6

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>5</td><td>Is engine stall speed OK?
☞ page K-8
rpm
<table><tr><th>Engine</th><th>Engine stall speed</th></tr><tr><td>13B</td><td>3,000–3,300</td></tr></table></td><td>Yes</td><td>Go to Step 8</td></tr>
<tr><td></td><td></td><td>No</td><td>Overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td>6</td><td>Are measurements at EC-AT control unit terminals OK?
<table><tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr><tr><td rowspan="3">1F</td><td>Ω</td><td>2.5–5.0</td><td>Constant (Ign: OFF)</td><td>K-35</td></tr><tr><td rowspan="2">%</td><td>Approx. 100</td><td>Throttle valve fully closed (Ign: ON)</td><td rowspan="2">K-246</td></tr><tr><td>Approx. 5</td><td>Throttle valve fully opened (Ign: ON)</td></tr><tr><td rowspan="3">1H</td><td>Ω</td><td>12.5–19.0</td><td>Constant (Ign: OFF)</td><td>K-35</td></tr><tr><td rowspan="2">%</td><td>Approx. 100</td><td>Throttle valve fully closed (Ign: ON)</td><td rowspan="2">K-246</td></tr><tr><td>Approx. 5</td><td>Throttle valve fully opened (Ign: ON)</td></tr></table>Unit: Ω → Resistance
% → ON duty

Note
• 1F terminal: Solenoid valve (line pressure)
• 1H terminal: Dropping resistor</td><td>Yes</td><td>Overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td></td><td></td><td>No</td><td>If resistance not OK, check for malfunctioning parts and wiring
• Solenoid valve (line pressure) ☞ page K-32
• Dropping resistor ☞ page K-33

If resistance OK but duty not, go to next step</td></tr>
<tr><td>7</td><td>Is input voltage of throttle sensor at EC-AT control unit OK?
<table><tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr><tr><td rowspan="2">2T</td><td rowspan="2">V</td><td>0.1–1.1</td><td>Throttle valve fully closed</td><td rowspan="2">K-35</td></tr><tr><td>4.0–4.5</td><td>Throttle valve fully opened</td></tr></table>Unit: V → Voltage</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K-41</td></tr>
<tr><td></td><td></td><td>No</td><td>Check throttle sensor and wiring
☞ Section F</td></tr>
</table>

STEP	INSPECTION		ACTION
8	Are measurements at EC-AT control unit terminals OK? V_B: Battery voltage	Yes	Overhaul transmission and repair or replace parts as necessary
		No	Check for malfunctioning parts and wiring • Inhibitor signal ☞ **page K–35** • Pulse generator ☞ **page K–30** • Inhibitor switch ☞ **page K–28**

Term.	Unit	Spec.	Condition	Page
1C	V	V_B	D range	K–35
		Below 1.0	P and N ranges	
2E↔2L	kΩ	2.2–3.5	Constant (Ign: OFF)	
2D	V	0	P and N ranges	
		V_B	Except P and N ranges	
1E	V	V_B	R range	
		0	Except R range	
2B	V	V_B	D range	
		0	Except D range	
2S	V	V_B	S range	
		0	Except S range	
2Q	V	V_B	L range	
		0	Except L range	

Unit: V → Voltage
Ω → Resistance

Note
- **1C terminal: Inhibitor signal**
- **2E terminal: Pulse generator**
- **2D, 1E, 2B, 2S, 2Q terminals: Inhibitor switch**
- **2L terminal: Ground (input)**

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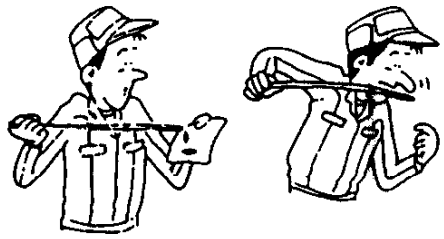
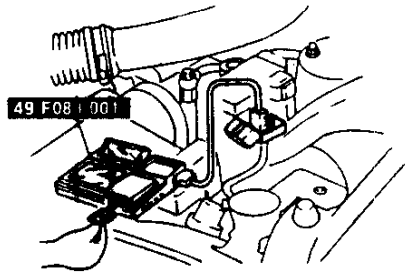
53	EXCESSIVE SHIFT SHOCK WHEN UPSHIFTING AND/OR DOWNSHIFTING
DESCRIPTION	• Excessive shift shock felt when accelerating at upshifting • During cruising, excessive shift shock felt when accelerator pedal depressed at downshifting

[TROUBLESHOOTING HINTS]

① ATF level low
② Throttle sensor malfunction or misadjusted
③ Line pressure high
④ Powertrain slippage
⑤ Control valve stuck (pressure regulator valve, pressure modifier valve, pilot valve, servo charger valve, or accumulator control valve)
⑥ Solenoid valve (line pressure) worn
⑦ Dropping resistor malfunction
⑧ Idle signal malfunction
⑨ ATF thermosensor malfunction
⑩ Pulse generator malfunction
⑪ Speed sensor 1 (revolution sensor) malfunction
⑫ Atmospheric pressure sensor malfunction
⑬ Torque reduced signal and/or reduce torque signal malfunction?

STEP	INSPECTION		ACTION
1	Are ATF level and condition OK? ☞ **page K–25** 	Yes	Go to next step
		No	**Note** • **After pinpointing problem, overhaul transmission and repair or replace parts as necessary** Problem within transmission Go to next step, and check for cause
2	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ **page K–214** 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ **page K–214**
		No	Go to next step
3	Is line pressure OK? ☞ **page K–14** **Specified line pressure kPa (kgf/cm², psi)**	Yes	Go to next step
		No	Go to Step 5

Engine	Range	Idle	Stall
13B	D, S, L	500–520 {5.0–5.4, 72–76}	1,200–1,270 {12.2–13.0, 174–184}
	R	620–650 {6.3–6.7, 90–95}	1,510–1,570 {15.3–16.1, 218–228}

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>4</td><td>Is engine stall speed OK?
☞ page K-9
rpm
<table><tr><th>Engine</th><th>Engine stall speed</th></tr><tr><td>13B</td><td>3,000–3,300</td></tr></table></td><td>Yes</td><td>Go to Step 8</td></tr>
<tr><td></td><td></td><td>No</td><td>Overhaul transmission and repair or replace part as necessary</td></tr>
<tr><td>5</td><td>Are measurements at EC-AT control unit terminal OK?
<table><tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr><tr><td rowspan="3">1F</td><td>Ω</td><td>2.5–5.0</td><td>Constant (Ign: OFF)</td><td>K-35</td></tr><tr><td rowspan="2">%</td><td>Approx. 100</td><td>Throttle valve fully closed (Ign: ON)</td><td rowspan="2">K-246</td></tr><tr><td>Approx. 5</td><td>Throttle valve fully opened (Ign: ON)</td></tr><tr><td rowspan="3">1H</td><td>Ω</td><td>12.5–19.0</td><td>Constant (Ign: OFF)</td><td>K-35</td></tr><tr><td rowspan="2">%</td><td>Approx. 100</td><td>Throttle valve fully closed (Ign: ON)</td><td rowspan="2">K-246</td></tr><tr><td>Approx. 5</td><td>Throttle valve fully opened (Ign: ON)</td></tr></table>Unit: Ω → Resistance
% → ON duty

Note
• 1F terminal: Solenoid valve (line pressure)
• 1H terminal: Dropping resistor</td><td>Yes</td><td>Overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td></td><td></td><td>No</td><td>If resistance not OK, check for malfunctioning parts and wiring
• Solenoid valve (line pressure) ☞ page K-32
• Dropping resistor ☞ page K-33

If resistance OK and duty not, go to next step</td></tr>
<tr><td>6</td><td>Is input voltage of throttle sensor at EC-AT control unit OK?
<table><tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr><tr><td rowspan="2">2T</td><td rowspan="2">V</td><td>0.1–1.1</td><td>Throttle valve fully closed</td><td rowspan="2">K-35</td></tr><tr><td>4.0–4.5</td><td>Throttle valve fully opened</td></tr></table>Unit: V → Voltage</td><td>Yes</td><td>Go to next step</td></tr>
<tr><td></td><td></td><td>No</td><td>Check throttle sensor and wiring
☞ Section F</td></tr>
<tr><td>7</td><td>Is input voltage of idle signal at EC-AT control unit OK?
<table><tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr><tr><td rowspan="2">2M</td><td rowspan="2">V</td><td>Below 1.0</td><td>Throttle valve fully closed</td><td rowspan="2">K-35</td></tr><tr><td>4.5–5.5</td><td>Throttle valve opened</td></tr></table>Unit: V → Voltage</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K-41</td></tr>
<tr><td></td><td></td><td>No</td><td>Check idle signal and wiring
☞ Section F

→</td></tr>
</table>

STEP	INSPECTION		ACTION
8	Are measurement at EC-AT control unit terminals OK? V_B: Battery voltage	Yes	Overhaul transmission and repair or replace parts as necessary
		No	Check for malfunctioning parts and wiring • ATF thermosensor ☞ page K-31 • Pulse generator ☞ page K-30 • Speed sensor 1 (revolution sensor) ☞ page K-29 • Atmospheric pressure sensor ☞ page K-35 • Reduce torque signal ☞ page K-35 • Torque reduced signal ☞ page K-35

Term.	Unit	Spec.	Condition	Page
2R↔2L	V	Approx. 1.8	ATF temp. 10°C {50°F}	K-35
		Approx. 1.1	ATF temp. 40°C {104°F}	
		Approx. 0.4	ATF temp. 80°C {176°F}	
2E↔2L	kΩ	2.2–3.5	Constant (Ign: OFF)	
2J↔2L	Ω	500–1,000	Constant (Ign: OFF)	
2C	V	2.0–4.5V	Ignition switch ON	
		0V	Ignition switch OFF	
2H	V	V_B	Engine running at idle	
		Below 1.0	Throttle opening above 1/8 (Engine coolant temp. below 40°C {104°F})	
2P	V	Below 1.0	Shifting	
		V_B	Engine running at idle	

Unit: V → Voltage
Ω → Resistance

Note

- **2R terminal: ATF thermosensor**
- **2E terminal: Pulse generator**
- **2J terminal: Speed sensor 1 (revolution sensor)**
- **2C terminal: Atmospheric pressure sensor**
- **2H terminal: Reduce torque signal**
- **2P terminal: Torque reduced signal**
- **2L terminal: Ground (input)**

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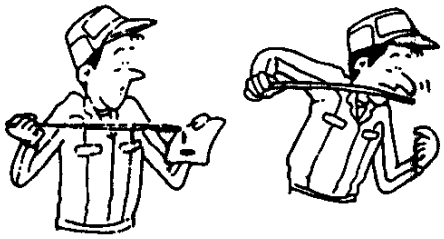
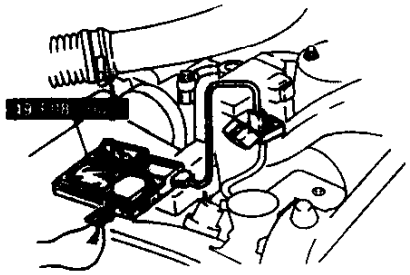
54	NO ENGINE BRAKING
DESCRIPTION	• Engine speed drops to idle but vehicle does not slow when accelerator pedal released during cruising at medium to high speed • Engine speed drops to idle but vehicle does not slow when accelerator pedal released when in L range at low vehicle speed

[TROUBLESHOOTING HINTS]

① ATF level low
② Powertrain slippage
③ Control valve stuck (overrunning clutch control valve, overrunning clutch reducing valve, 1st reducing valve, or pilot valve)
④ Solenoid valve (overrunning clutch) worn
⑤ Throttle sensor malfunction or misadjusted
⑥ O/D inhibit signal (ASC signal) malfunction
⑦ Inhibitor switch worn or misadjusted

STEP	INSPECTION		ACTION
1	Are ATF level and condition OK? ☞ page K-25 	Yes	Go to next step
		No	**Note** **• After pinpointing problem, overhaul transmission and repair or replace parts as necessary** Problem within transmission Go to next step, and check for cause
2	Are there any service code(s) displayed on the DT-S1000 or Self-Diagnosis Checker when the ignition switch is ON? ☞ page K-214 	Yes	Service code(s) displayed • Check for cause of code(s) ☞ page K-214
		No	Go to next step
3	Is there slippage when accelerating or shifting, or flare up when shifting?	Yes	Powertrain slipped Go to No.50 "ENGINE SPEED FLARES UP WHEN ACCELERATING" or No.51 "ENGINE SPEED FLARES UP WHEN UPSHIFTING AND/OR DOWNSHIFTING" in section K of this manual ☞ page K-202, 203
		No	Go to next step

<table>
<tr><th>STEP</th><th>INSPECTION</th><th></th><th>ACTION</th></tr>
<tr><td>4</td><td>Is engine braking felt in L range?
☞ page K-21</td><td>Yes</td><td>Go to next step</td></tr>
<tr><td></td><td></td><td>No</td><td>Replace control valve body assembly
☞ page K-128
If problem remains, overhaul transmission and repair or replace parts as necessary</td></tr>
<tr><td>5</td><td>Are resistance and output voltage of solenoid valve (overrunning clutch) at EC-AT control unit terminal OK?
V_B: Battery voltage
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="3">1O</td><td>Ω</td><td>20–40</td><td>Constant (Ign: OFF)</td><td rowspan="3">K-35</td></tr>
<tr><td rowspan="2">V</td><td>Below 1.0</td><td>2nd gear and throttle opening less than 1.3/8 in S range hold mode</td></tr>
<tr><td>V_B</td><td>O/D</td></tr>
</table>
Unit: Ω → Resistance
V → Voltage</td><td>Yes</td><td>Go to next or replace step</td></tr>
<tr><td></td><td></td><td>No</td><td>If resistance not OK, check for solenoid valve (overrunning clutch) and wiring
☞ page K-32
If resistance OK and voltage not, go to next step</td></tr>
<tr><td>6</td><td>Are measurements at EC-AT control unit terminals OK?
V_B: Battery voltage
<table>
<tr><th>Term.</th><th>Unit</th><th>Spec.</th><th>Condition</th><th>Page</th></tr>
<tr><td rowspan="2">2T</td><td rowspan="2">V</td><td>0.1–1.1</td><td>Throttle valve fully closed</td><td rowspan="14">K-35</td></tr>
<tr><td>4.0–4.5</td><td>Throttle valve fully opened</td></tr>
<tr><td rowspan="2">2K</td><td rowspan="2">V</td><td>4.5–5.5</td><td>Ignition switch ON</td></tr>
<tr><td>0</td><td>TAT terminal grounded</td></tr>
<tr><td rowspan="2">2D</td><td rowspan="2">V</td><td>0</td><td>P and N ranges</td></tr>
<tr><td>V_B</td><td>Except P and N ranges</td></tr>
<tr><td rowspan="2">1E</td><td rowspan="2">V</td><td>V_B</td><td>R range</td></tr>
<tr><td>0</td><td>Except R range</td></tr>
<tr><td rowspan="2">2B</td><td rowspan="2">V</td><td>V_B</td><td>D range</td></tr>
<tr><td>0</td><td>Except D range</td></tr>
<tr><td rowspan="2">2S</td><td rowspan="2">V</td><td>V_B</td><td>S range</td></tr>
<tr><td>0</td><td>Except S range</td></tr>
<tr><td rowspan="2">2Q</td><td rowspan="2">V</td><td>V_B</td><td>L range</td></tr>
<tr><td>0</td><td>Except L range</td></tr>
</table>
Unit: V → Voltage
Note
• 2T terminal: Throttle sensor
• 2K terminal: O/D inhibit signal (ASC signal), TAT terminal
• 2D, 1E, 2B, 2S, 2Q terminals: Inhibitor switch</td><td>Yes</td><td>Replace EC-AT control unit
☞ page K-41</td></tr>
<tr><td></td><td></td><td>No</td><td>Check for malfunctioning parts and wiring
• Throttle sensor ☞ Section F
• O/D inhibit signal (ASC signal), TAT terminal ☞ page K-35
• Inhibitor switch ☞ page K-28</td></tr>
</table>

37U0KX-305

55	NO MODE CHANGE
DESCRIPTION	• Mode does not change to/from normal mode in D range • Hold mode not selected or not cancelled

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① Hold switch malfunction — ☞ page K-27
② Throttle sensor malfunction or misadjusted — ☞ Section F
③ EC-AT control unit malfunction — ☞ page K-35

37U0KX-306

56	TRANSMISSION NOISE ALL RANGES
DESCRIPTION	• Transmission noisy in all ranges when vehicle is idling

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① ATF level low — ☞ page K-25
② Throttle sensor malfunction or misadjusted — ☞ Section F
③ Speed sensor 1 (revolution sensor) malfunction — ☞ page K-29
④ Engine rpm signal malfunction — ☞ page K-35

37U0KX-307

57	TRANSMISSION NOISE D, S, L, R RANGES
DESCRIPTION	• Abnormal noise from transmission in D, S, L, R

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① ATF level low — ☞ page K-25
② Torque converter malfunction — ☞ page K-57

37U0KX-308

58	TRANSMISSION OVERHEATS
DESCRIPTION	• ATF smells burnt and/or is discolored

[TROUBLESHOOTING HINTS]

Inspect parts and wiring; repair, adjust, or replace malfunctioning parts as necessary

① ATF level low — ☞ page K-25
② Line pressure low — ☞ page K-14
③ Powertrain burned
④ Solenoid valve (line pressure) stuck — ☞ page K-246
⑤ Dropping resistor malfunction — ☞ page K-33
⑥ Throttle sensor malfunction or misadjusted — ☞ Section F
⑦ Solenoid valve (lockup) worn — ☞ page K-32
⑧ Solenoid valve (lockup control) worn — ☞ page K-32
⑨ Oil cooler circuit malfunction — ☞ page K-154

37U0KX-309

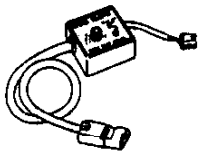
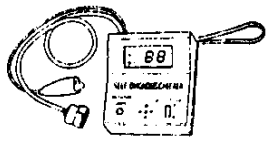
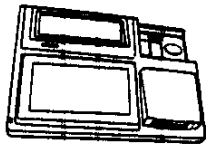
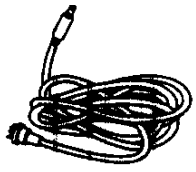
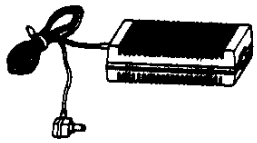
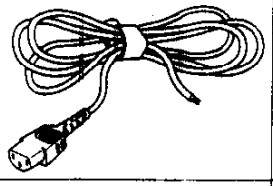
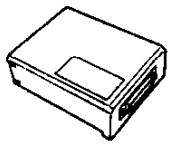
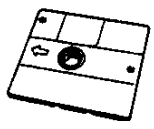
SELF-DIAGNOSIS FUNCTION

DESCRIPTION

The self-diagnosis system integrated in the EC-AT control unit diagnoses malfunction of the main sensors (input) and solenoid valves (output) and the EC-AT control unit itself.
Malfunctions or intermittent malfunctions are memorized in the EC-AT control unit to later be output as service codes.
The **Self-Diagnosis Checker** or **DT-S1000** can be used to retrieve these service codes. The **Self-Diagnosis Checker** indicates a malfunction by display a code number and sounding a buzzer. The **DT-S1000** displays a code number and shows the cause of malfunction.
When the TAT and GND terminals of the diagnosis connector are jumped with the ignition switch ON, the EC-AT control unit outputs any memorized service codes by flashing the hold indicator.

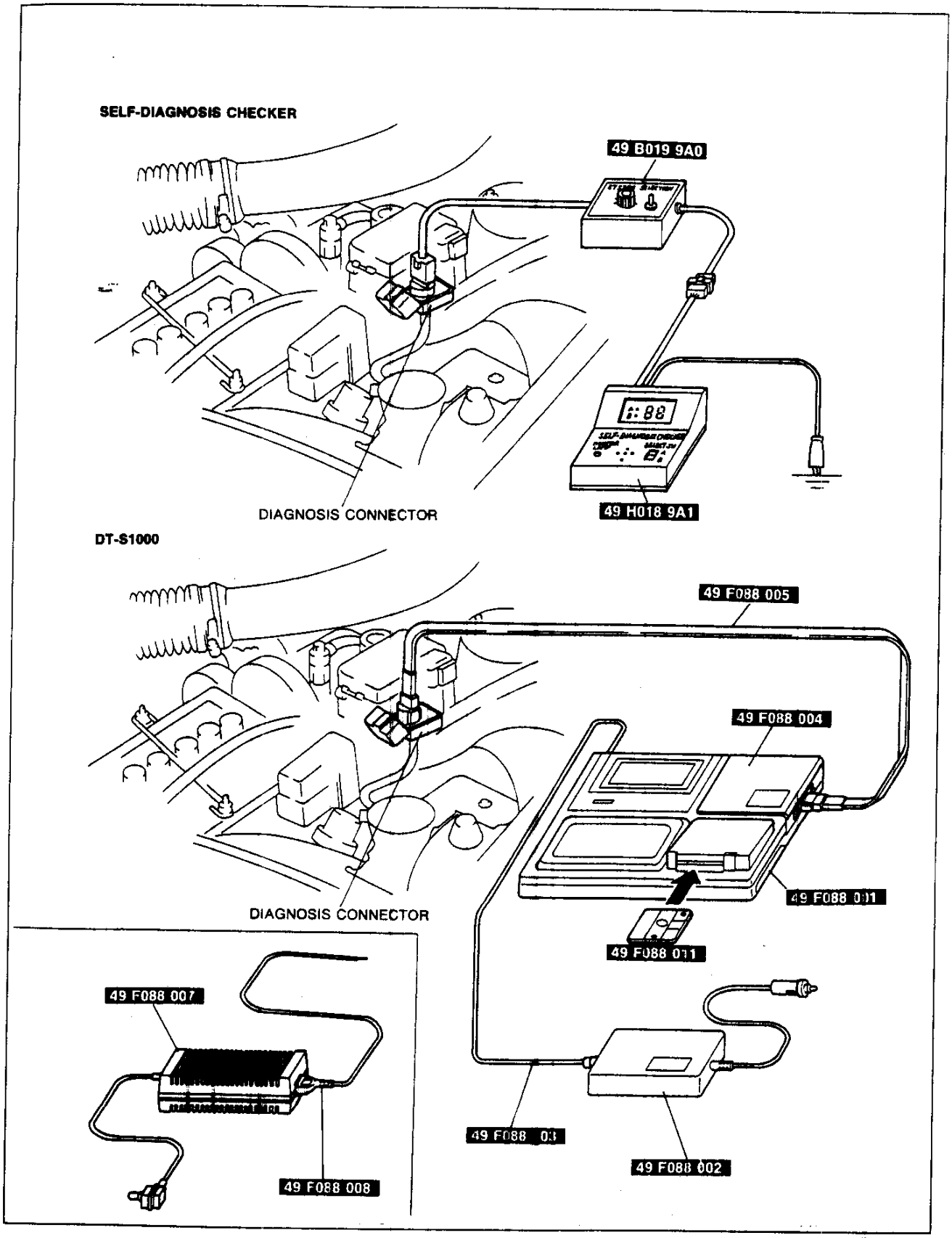
37U0KX-310

PREPARATION
SST

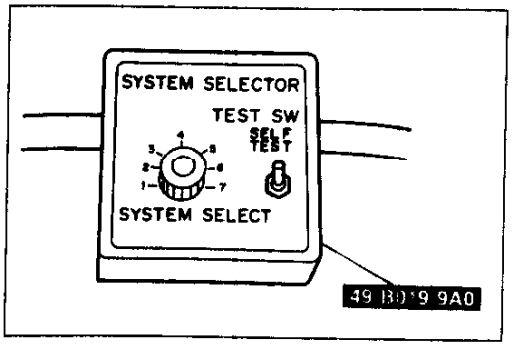
49 B019 9A0 System Selector 	For diagnosis of EC-AT	49 H018 9A1 Self-Diagnosis Checker 	For diagnosis of EC-AT
49 F088 001 DT-S1000 Base Unit 	For diagnosis of EC-AT	49 F088 002 Power Unit DC-12V 	For diagnosis of EC-AT
49 F088 003 Harness Power Unit DC 	For diagnosis of EC-AT	49 F088 007 Power Unit AC 	For diagnosis of EC-AT
49 F088 008 Harness Power Unit AC 	For diagnosis of EC-AT	49 F088 004 IF-Adapter Type-I 	For diagnosis of EC-AT
49 F088 005 Harness Type-I 	For diagnosis of EC-AT	49 F088 011 System Disk Type-I (V 1.00) 	For diagnosis of EC-AT

37U0KX-311

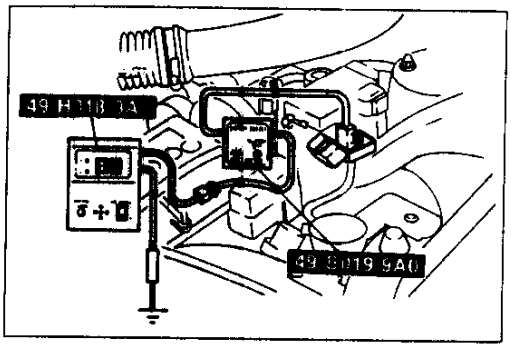
Assembly of SST

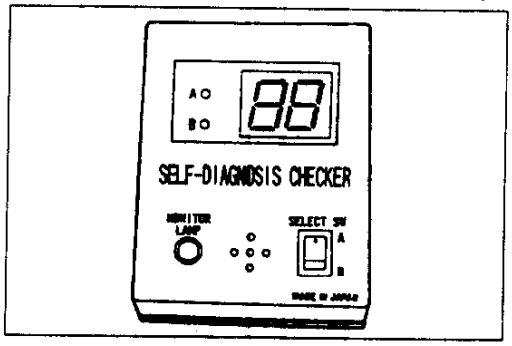


37U0KX-312

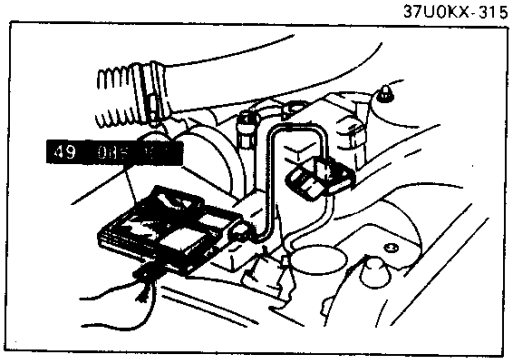


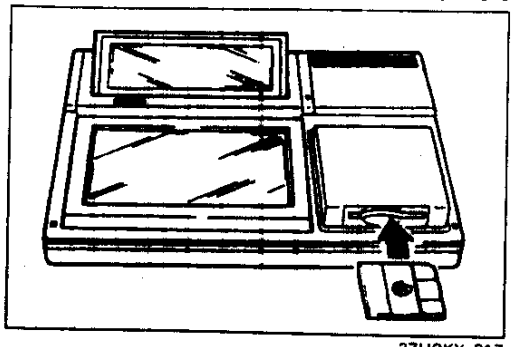
37U0KX-313


37U0KX-314



37U0KX-315


37U0KX-316


37U0KX-317

SERVICE CODE NUMBER

Inspection Procedure

Self-Diagnosis Checker

1. Connect the **SST (System Selector)** to the diagnosis connector.
2. Set the SYSTEM SELECT switch A to position 2.
3. Set the TEST SW to SELF TEST position.
4. Connect the **SST (Self-Diagnosis Checker)** to the **SST (System Selector)** and a ground.
5. Set the SELECT SW to position A.
6. Turn the ignition switch ON.
7. Verify that **"88"** flashes on the digital display and that the buzzer sounds for 3 seconds.
8. If **"88"** does not flash, check the main relay and 1N and/or 1P terminals of the EC-AT control unit for an open or short circuit.
9. If **"88"** flashes and the buzzer sounds continuously for more than 20 seconds, check the wiring to terminal 2N of the EC-AT control unit for an open or short circuit. If necessary, replace the EC-AT control unit and repeat from step 2.
10. Note any code number(s) and check for the cause(s). Repair as necessary.

Note

- **After repairs are made, recheck for code number(s) by performing the "After-Repair Procedure". (Refer to page K–234.)**

DT-S1000

1. Connect the **SST (DT-S1000)** to the diagnosis connector. (Refer to page K–215.)
2. Turn the ignition switch ON.
3. Check the service code and its cause on the DT-S1000 display.

Note

- **If the DT-S1000 displays "No service codes", the problem will be in a system or area not covered by the self-diagnosis function.**
- **If the DT-S1000 displays "System error", verify the DT-S1000 connecting and check for the cause(s) referring to the DT-S1000 instruction manual.**

4. Note any code number(s) and check for the cause(s). Repair as necessary.

Note

- **After repairs are made, recheck for code number(s) by performing the "After-Repair Procedure". (Refer to page K–234.)**

Service code number

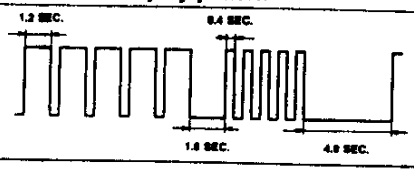
Code No.	Indicator flashing pattern	Diagnosed circuit	Condition	Point	Memorized	Page
01		Engine rpm signal	No input signal from ECU	• Wiring from engine control unit to EC-AT control unit • Engine control unit	Yes	K-219
06		Speed sensor 1 (Revolution sensor)	No input signal from speed sensor 1 (Revolution sensor)	• Speed sensor 1 connector • Wiring from speed sensor 1 to EC-AT control unit • Speed sensor 2 resistance	Yes	K-220
07		Speed sensor 2 (Speedometer sensor)	No input signal from speed sensor 2 (Speedometer sensor)	• Speed sensor 2 connector • Wiring from speed sensor 2 to combination meter • Wiring from combination meter to EC-AT control unit • Speedometer resistance	Yes	K-221
12		Throttle sensor	Open or short circuit of throttle sensor or wiring	• Throttle sensor connector • Wiring from throttle sensor to EC-AT control unit • Throttle sensor resistance	Yes	K-222
55		Pulse generator	No input signal from pulse generator	• Pulse generator connector • Wiring from pulse generator to EC-AT control unit • Pulse generator resistance	Yes	K-223
56		ATF thermosensor	Open or short circuit of ATF thermosensor or wiring	• ATF thermosensor connector • Wiring from ATF thermosensor to EC-AT control unit • ATF thermosensor resistance	Yes	K-224
57		Reduce torque signal/Slip lockup signal, torque reduced signal	Open or short circuit of reduce torque signal/slip lockup signal wiring, and/or torque reduced signal wiring	• Wiring from engine control unit to EC-AT control unit • EC-AT control unit • Engine control unit	Yes	K-225
58		Atmospheric pressure sensor	Open or short circuit of atmospheric pressure sensor wiring	• Wiring from engine control unit to EC-AT control unit • Engine control unit	Yes	K-226
60		Solenoid valve (shift A)	Open or short circuit of solenoid valve wiring	• Solenoid valve connector • Wiring from solenoid valve to EC-AT control unit • Solenoid valve resistance • Wiring from dropping resistor to EC-AT control unit (Only No.64) • Dropping resistor resistance (Only No.64)	Yes	K-227
61		Solenoid valve (shift B)			Yes	K-228
62		Solenoid valve (overrunning clutch)			Yes	K-229
63		Solenoid valve (loukup)			Yes	K-230
64		Solenoid valve (line pressure)			Yes	K-231
65		Solenoid valve (lockup control)			Yes	K-233

37U0KX-318

Caution

- **If there is more than one malfunction, the code number will be indicated in memorical order, lowereat number.**

Service code number display pattern example

Service code number	Display pattern
55	

37U0KX-319

SERVICE CODE NO.01 ENGINE RPM SIGNAL

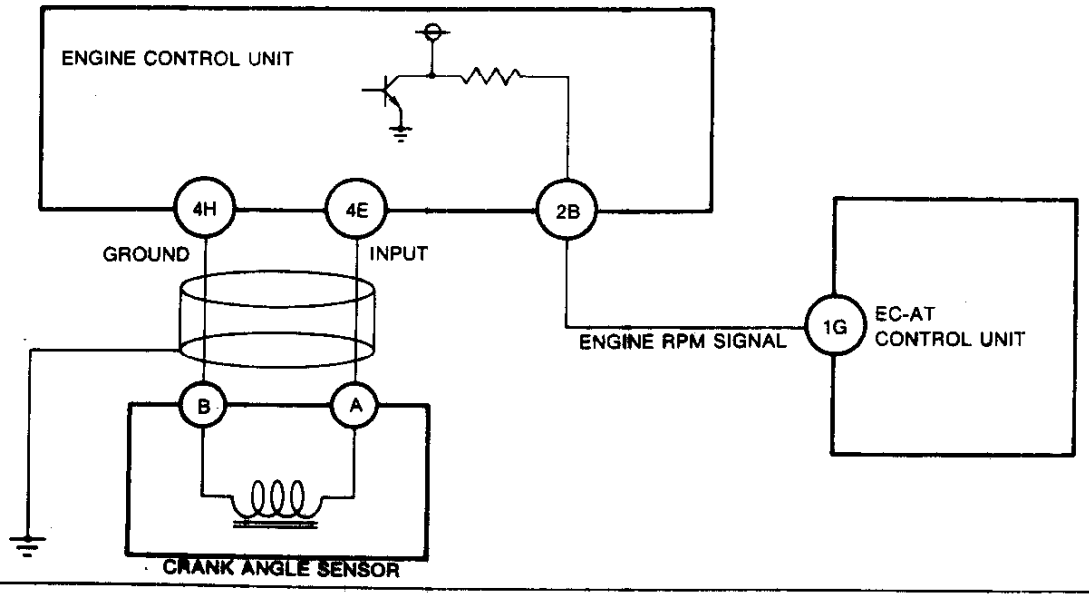
STEP	INSPECTION		ACTION
1	Are there any poor connections at distributor, engine control unit and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is input voltage of engine rpm signal at EC-AT control unit OK? ☞ page K-35	Yes	Go to Step 5
		No	Go to next step
3	Disconnect 16-pin EC-AT control unit connector Is there continuity between 1G terminal of EC-AT control unit and 2B terminal of engine control unit	Yes	Go to next step
		No	Repair wiring
4	Connect a circuit tester to terminals as shown Is input voltage of engine rpm signal at engine control unit OK? ☞ Section F	Yes	Go to next step
		No	Check crank angle sensor and/or wiring ☞ Section F If OK, replace engine control unit If not OK, repair or replace malfunction parts and/or wiring
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed. Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

(+) term.	(–) term.	Voltage (V)	Condition
1G	Ground	0	Engine stopped
		0.3–0.8	Engine idling
		1.8–2.2	Engine running at 3,000 rpm (no load)

(+) term.	(–) term.	Voltage (V)	Condition
2B	Ground	0	Engine stopped
		0.3–0.8	Engine idling
		1.8–2.2	Engine running at 3,000 rpm (no load)

37U0KX-320

CIRCUIT DIAGRAM



SERVICE CODE NO.06 SPEED SENSOR 1 (REVOLUTION SENSOR)

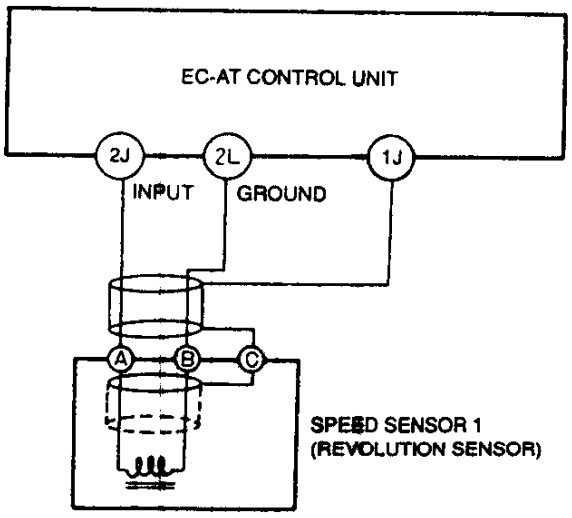
STEP	INSPECTION		ACTION
1	Are there any poor connections at speed sensor 1 and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is input voltage of speed sensor 1 at EC-AT control unit OK? ☞ page K-35	Yes	Go to Step 5
		No	Go to next step
3	Disconnect 20-pin EC-AT control unit connector Is resistance between 2J terminal and 2L terminal OK? **Resistance: 500–1,000 Ω**	Yes	Go to Step 5
		No	Go to next step
4	Disconnect speed sensor 1 connector Is resistance of sensor OK? ☞ page K-29	Yes	Check wiring and connectors from EC-AT control unit to speed sensor 1 If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace speed sensor 1 ☞ page K-29
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

(+) term.	(–) term.	Voltage (V)	Condition
2J	2L	Approx. above 1.0 (AC range)	While driving (above 25km/h {16MPH})
		Approx. 0 (AC range)	Vehicle stopped

Terminal	Resistance (Ω)
A ↔ B	500–1,000
B ↔ C	∞
A ↔ C	∞

37U0KX-321

CIRCUIT DIAGRAM



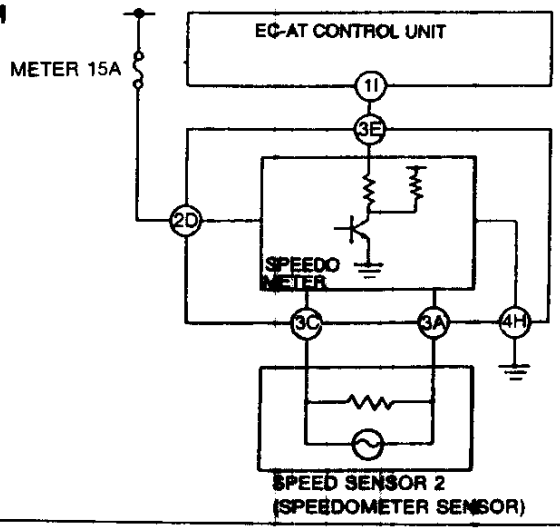
SERVICE CODE NO.07 SPEED SENSOR 2 (SPEEDOMETER SENSOR)

STEP	INSPECTION		ACTION
1	Are there any poor connections at speed sensor 2 and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is input voltage of speed sensor 2 at EC-AT control unit OK? ☞ page K-35	Yes	Go to Step 8
		No	Go to next step
3	Remove combination meter Is there continuity between 3E terminal of meter connector and 1I terminal of EC-AT control unit?	Yes	Go to next step
		No	Repair or replace wiring and/or connector
4	Connect circuit tester to 3C and 3A terminals of meter connector Does pointer of circuit tester move slightly when rear wheels are slowly turned? ☞ page K-29	Yes	Replace speedometer
		No	Go to next step
5	Remove speed sensor 2 Is resistance felt when turning speedometerdriven gear by hand? ☞ page K-30	Yes	Go to next step
		No	Replace speed sensor 2 ☞ page K-30
6	Disconnect speed sensor 2 connector and connect circuit tester Does pointer of circuit tester move slightly when driven gear is slowly turned? ☞ page K-30	Yes	Go to next step
		No	Replace speed sensor 2 ☞ page K-30
7	Disconnect speed sensor 2 connector Is continuity of sensor OK? ☞ page K-30 **Resistance: Approx. 290 Ω (20°C [68°F]); reference**	Yes	Check wiring and connectors from speed sensor 2 to speedometor If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace speed sensor 2 ☞ page K-30
8	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

(+) term.	(–) term.	Voltage (V)	Condition
1I	Ground	2–3	Vehicle moving
		0 or 4.5–5.5	Vehicle stopped

37U0KX-322

CIRCUIT DIAGRAM

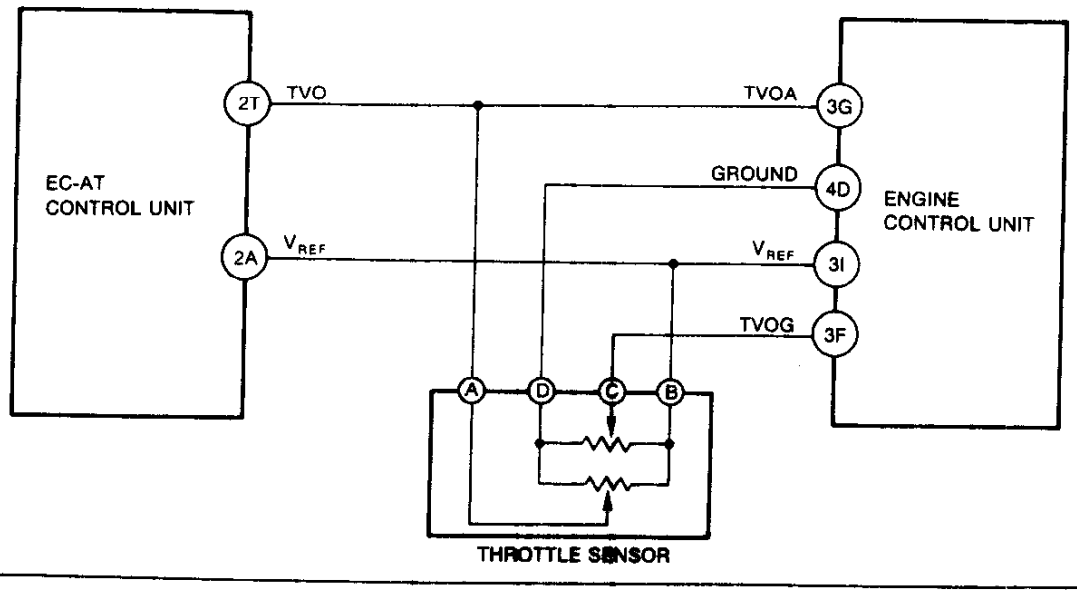


SERVICE CODE NO.12 THROTTLE SENSOR

STEP	INSPECTION		ACTION
1	Are there any poor connections at throttle sensor and EC-AT control unit connector or terminal?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is input voltage of throttle sensor (TVO) at EC-AT control unit OK? ☞ page K-35 (+) term. 2T; (–) term. Ground; Voltage (V): 0.1–1.1, Condition: Throttle valve fully closed; Voltage (V): 4.0–4.5, Condition: Throttle valve fully opened	Yes	Go to step 5
		No	Go to next step
3	Connect a circuit tester to terminals as shown Is input voltage of throttle sensor (VREF) at EC-AT control unit OK? ☞ page K-35 (+) term. 2A; (–) term. Ground; Voltage (V): 4.5–5.5, Condition: Ignition switch ON; Voltage (V): 0, Condition: Ignition switch OFF	Yes	Go to next step
		No	Check voltage at 3I terminal of engine control unit **Voltage: 4.5–5.5V (ignition switch ON)** If OK, go to next step If not OK, repair wiring and/or connector, or replace engine control unit
4	Is throttle sensor OK? ☞ Section F	Yes	Check wiring and connectors from EC-AT control unit to throttle sensor If OK, go to next step If not OK, repair wiring and/or connector
		No	Adjust or replace throttle sensor ☞ Section F
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

37U0KX-323

CIRCUIT DIAGRAM



SERVICE CODE NO.55 PULSE GENERATOR

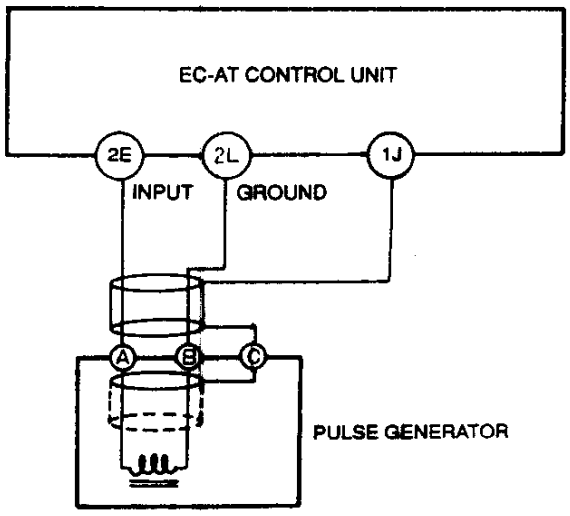
STEP	INSPECTION		ACTION
1	Are there any poor connections at pulse generator and EC-AT control unit connector or terminal?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is input voltage of pulse generator at EC-AT control unit OK? ☞ page K-35	Yes	Go to Step 5
		No	Go to next step
3	Disconnect 20-pin EC-AT control unit connector Is resistance between 2E terminal and 2L terminal OK? **Resistance: 2.2–3.5 kΩ**	Yes	Go to next step
		No	Go to next step
4	Disconnect pulse generator connector Is resistance of pulse generator OK? ☞ page K-30	Yes	Check wiring and connectors from EC-AT control unit to pulse generator If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace pulse generator ☞ page K-31
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

(+) term.	(–) term.	Voltage (V)	Condition
2E	2L	Approx. 0 above 0.5 (AC range)	While driving (above 25km/h {16mph})
		Approx. 0 (AC range)	Vehicle stopped

Terminal	Resistance (KΩ)
A ↔ B	2.2–3.5
B ↔ C	∞
A ↔ C	∞

37U0KX-324

CIRCUIT DIAGRAM



SERVICE CODE NO.56 ATF THERMOSENSOR

STEP	INSPECTION		ACTION
1	Are there any poor connections at ATF thermosensor and EC-AT control unit connector or terminal?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is input voltage of ATF thermosensor at EC-AT control unit OK? ☞ page K-35	Yes	Go to Step 5
		No	Go to next step
3	Disconnect 20-pin EC-AT control unit connector Is resistance between 2R terminal and 2L terminal OK?	Yes	Go to Step 5
		No	Go to next step
4	Disconnect solenoid connector Is resistance between G terminal and H terminal of ATF thermosensor OK? ☞ page K-32	Yes	Check wiring and connectors from EC-AT control unit to ATF thermosensor If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace ATF thermosensor ☞ page K-31
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

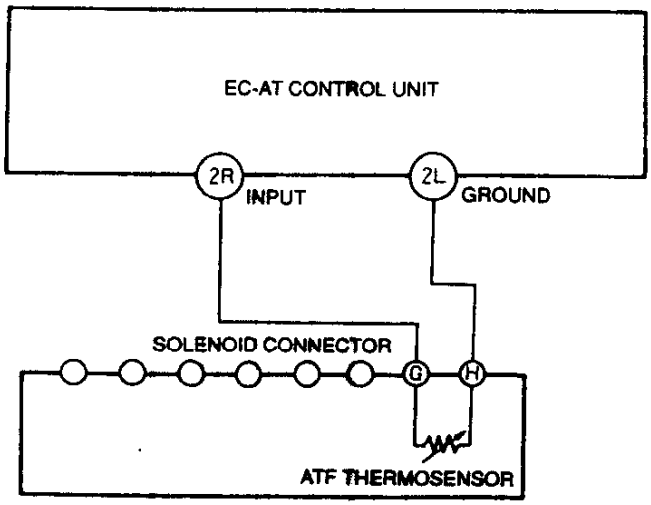
(+) term.	(–) term.	Voltage (V)	Condition
2R	2L	Approx. 1.8	ATF temp. 10°C {50°F}
		Approx. 1.1	ATF temp. 40°C {104°F}
		Approx. 0.4	ATF temp. 80°C {176°F}

Terminal	Resistance (kΩ)
2R ↔ 2L	Approx. 3.8 ATF temp. 10°C {50°F}
	Approx. 1.2 ATF temp. 40°C {104°F}
	Approx. 0.3 ATF temp. 80°C {176°F}

Terminal	Resistance (kΩ)
G ↔ H	Approx. 3.8 ATF temp. 10°C {50°F}
	Approx. 1.2 ATF temp. 40°C {104°F}
	Approx. 0.3 ATF temp. 80°C {176°F}

37U0KX-325

CIRCUIT DIAGRAM



SERVICE CODE NO.57 REDUCE TORQUE SIGNAL / SLIP LOCKUP SIGNAL, TORQUE REDUCED SIGNAL

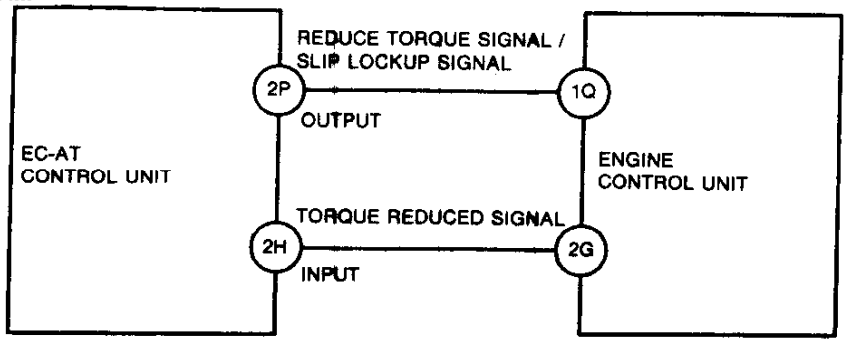
STEP	INSPECTION		ACTION
1	Are there any poor connections at engine control unit and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is input voltage of torque reduced signal at EC-AT control unit OK? ☞ page K-35 V_B: Battery voltage	Yes	Go to Step 4
		No	Go to next step
3	Disconnect 20-pin EC-AT control unit connector Is there continuity between 2H terminal of EC-AT control unit and 2G terminal of engine control unit?	Yes	Go to next step
		No	Repair wiring
4	Connect a circuit tester to terminals as shown Is output voltage of reduce torque signal at EC-AT control unit OK? ☞ page K-35 V_B: Battery voltage	Yes	Go to Step 6
		No	Go to next step
5	Disconnect 20-pin EC-AT control unit connector Is there continuity between 2P terminal of EC-AT control unit and 1Q terminal of engine control unit?	Yes	Go to next step
		No	Repair wiring
6	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit or engine control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

(+) term.	(-) term.	Voltage (V)	Condition
2H	Ground	V_B	Engine idling
		Below 1.0	Throttle opening above 1/8 (Engine coolant temp. below 40°C (104°F))

(+) term.	(-) term.	Voltage (V)	Condition
2P	Ground	Below 1.0	When shifting from 1st to 2nd or from 2nd to 3rd with the throttle opening above 1.5/8 When slip lockup with the throttle opening below 0.5/8
		V_B	Engine idling

37U0KX-326

CIRCUIT DIAGRAM



SERVICE CODE NO.58 ATMOSPHERIC PRESSURE SENSOR

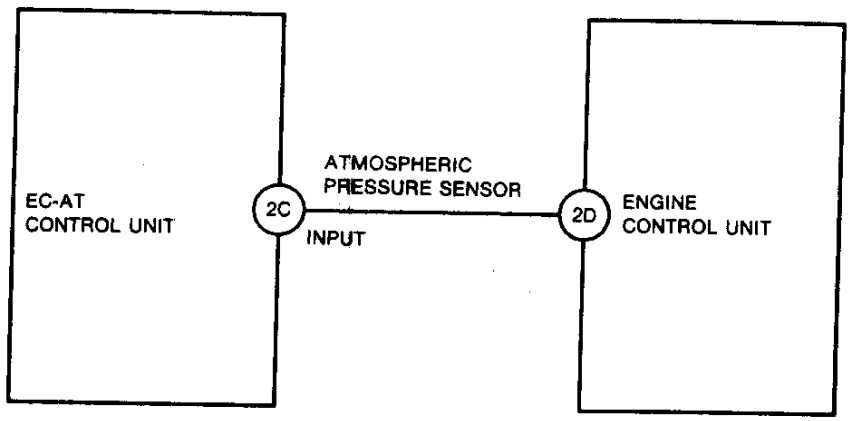
STEP	INSPECTION		ACTION
1	Are there any poor connections at engine control unit and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is input voltage of atmospheric pressure sensor at EC-AT control unit OK? ☞ page K-35	Yes	Go to Step 5
		No	Go to next step
3	Disconnect 20-pin EC-AT control unit connector Is there continuity between 2C terminal of EC-AT control unit and 2D terminal of engine control unit?	Yes	Go to next step
		No	Repair wiring
4	Connect a circuit tester to terminals as shown Is output voltage of atmospheric pressure sensor at engine control unit OK? ☞ Section F	Yes	Go to next step
		No	Replace engine control unit ☞ Section F
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

(+) term.	(–) term.	Voltage (V)	Condition
2C	Ground	2.0–4.5V	Ignition switch ON
		0V	Ignition switch OFF

(+) term.	(–) term.	Voltage (V)	Condition
2D	Ground	2.0–4.5V	Ignition switch ON
		0V	Ignition switch OFF

37U0KX-327

CIRCUIT DIAGRAM

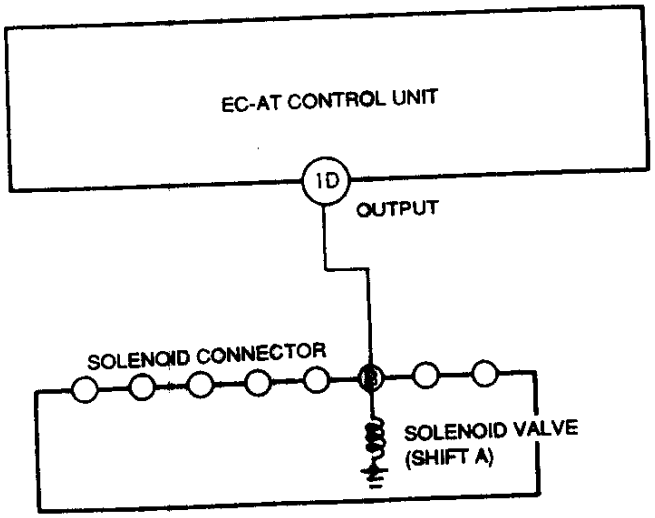


SERVICE CODE NO.60 SOLENOID VALVE (SHIFT A)

STEP	INSPECTION		ACTION
1	Are there any poor connections at solenoid valve and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is output voltage of solenoid valve (shift A) at EC-AT control unit OK? ☞ page K-35 V_B: Battery voltage (+) term. 1D; (–) term. Ground; Voltage (V): V_B / Below 1.0; Condition: 1st, O/D gear / 2nd, 3rd gear	Yes	Check wiring and go to Step 5
		No	Go to next step
3	Disconnect 16-pin EC-AT control unit connector Is resistance between 1D terminal and a ground **Resistance: 20–40 Ω**	Yes	Go to Step 5
		No	Go to next step
4	Disconnect solenoid connector Is resistance between ground and terminal B of solenoid valve (shift A) OK? ☞ page K-32 **Resistance: 20–40 Ω**	Yes	Check wiring and connectors from EC-AT control unit to solenoid valve (shift A) If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace solenoid valve (shift A) ☞ page K-33
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

37U0KX-328

CIRCUIT DIAGRAM

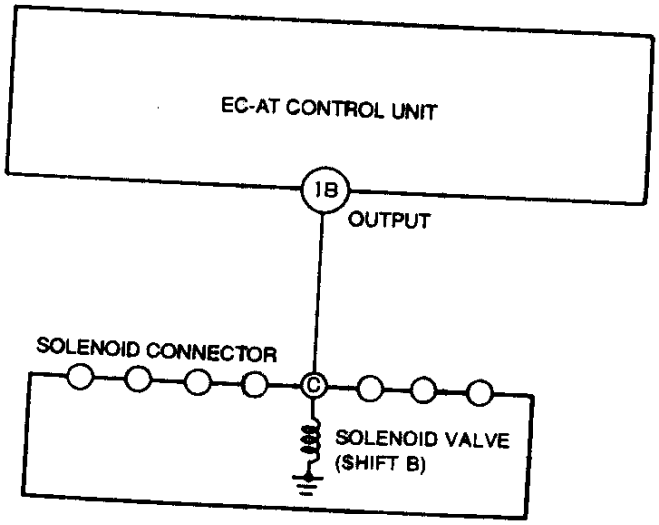


SERVICE CODE NO.61 SOLENOID VALVE (SHIFT B)

STEP	INSPECTION		ACTION
1	Are there any poor connections at solenoid valve and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is output voltage of solenoid valve (shift B) at EC-AT control unit OK? ☞ page K-35 V_B: Battery voltage (+) term. 1B; (–) term. Ground; Voltage (V): V_B; Condition: 1st, 2nd gear Voltage (V): Below 1.0; Condition: 3rd, O/D gear	Yes	Check wiring and go to Step 5
		No	Go to next step
3	Disconnect 16-pin EC-AT control unit connector Is resistance between 1B terminal and a ground OK? **Resistance: 20–40 Ω**	Yes	Go to Step 5
		No	Go to next step
4	Disconnect solenoid connector Is resistance between ground and terminal C of solenoid valve (shift B) OK? **Resistance: 20–40 Ω** ☞ page K-32	Yes	Check wiring and connectors from EC-AT control unit to solenoid valve (shift B) If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace solenoid valve (shift B) ☞ page K-33
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

CIRCUIT DIAGRAM

37U0KX-329

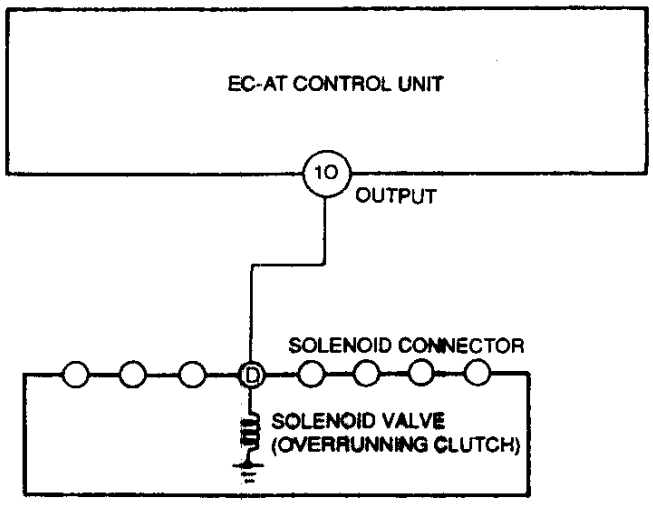


SERVICE CODE NO.62 SOLENOID VALVE (OVERRUNNING CLUTCH)

STEP	INSPECTION		ACTION
1	Are there any poor connections at solenoid valve and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is output voltage of solenoid valve (overrunning clutch) at EC-AT control unit OK? ☞ page K-35 V_B: Battery voltage (+) term. 10 / (–) term. Ground Voltage (V): V_B — Condition: D range (throttle valve closed) Voltage (V): Below 1.0 — Condition: D range (throttle valve fully opened)	Yes	Check wiring and go to Step 5
		No	Go to next step
3	Disconnect 16-pin EC-AT control unit connector Is resistance between 10 terminal and a ground OK? **Resistance: 20–40 Ω**	Yes	Go to Step 5
		No	Go to next step
4	Disconnect solenoid connector Is resistance between ground and terminal D of solenoid valve (overrunning clutch) OK? ☞ page K-32 **Resistance: 20–40 Ω**	Yes	Check wiring and connectors from EC-AT control unit to solenoid valve (overrunning clutch) If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace solenoid valve (overrunning clutch) ☞ page K-33
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

37U0KX-330

CIRCUIT DIAGRAM



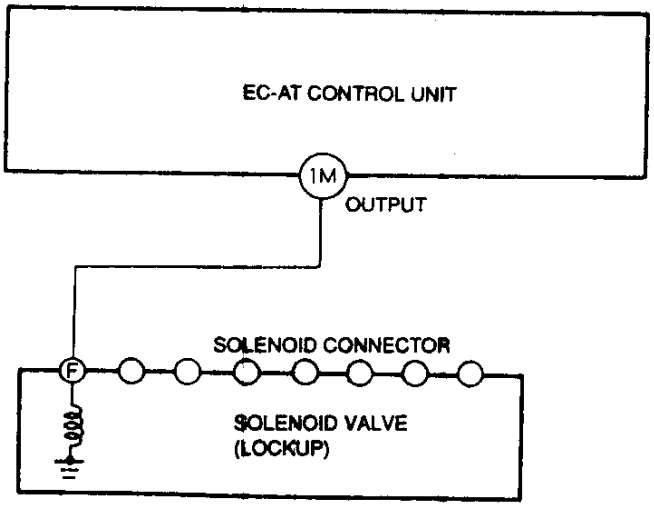
SERVICE CODE NO.63 SOLENOID VALVE (LOCKUP)

STEP	INSPECTION		ACTION
1	Are there any poor connections at solenoid valve and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Disconnect 16-pin EC-AT control unit connector Is resistance between 1M terminal and a ground OK? **Resistance: 10–20 Ω**	Yes	Go to Step 4
		No	Go to next step
3	Disconnect solenoid connector Is resistance between ground and terminal F of solenoid valve (lockup) OK? ☞ **page K–32** **Resistance: 10–20 Ω**	Yes	Check wiring and connectors from EC-AT control unit to solenoid valve (lockup) If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace solenoid valve (lockup) ☞ **page K–33**
4	Connect a dwell meter to terminals as shown Is output duty of solenoid valve (lockup) at EC-AT control unit OK? ☞ **page K–247**	Yes	Go to next step
		No	Replace EC-AT control unit ☞ **page K–41**
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ **page K–234**	Yes	Replace EC-AT control unit ☞ **page K–41**
		No	Intermittent poor connection Check for cause

(+) term.	(–) term.	Duty (ON %)	Condition
1M	Ground	Approx. 5	No lockup
		Approx. 100	Lockup

37U0KX-331

CIRCUIT DIAGRAM



SERVICE CODE NO.64 SOLENOID VALVE (LINE PRESSURE)

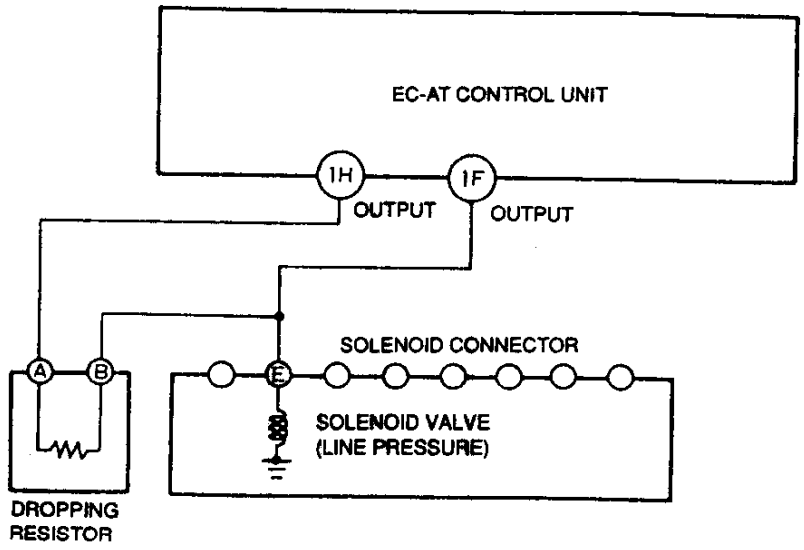
STEP	INSPECTION		ACTION
1	Are there any poor connections at solenoid valve and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Disconnect 16-pin EC-AT control unit connector Is resistance between 1F terminal (solenoid valve (line pressure)) and a ground OK? **Resistance: 2.5–5.0 Ω**	Yes	Go to next step
		No	Go to Step 4
3	Disconnect 16-pin EC-AT control unit connector Is resistance between 1H terminal (dropping resitor) and a ground OK? **Resistance: 12.5–19.0 Ω**	Yes	Go to Step 5
		No	Go to Step 7
4	Disconnect solenoid connector Is resistance between ground and terminal E of solenoid valve (line pressure) OK? ☞ **page K–32** **Resistance: 2.5–5.0 Ω**	Yes	Check wiring and connectors from EC-AT control unit to solenoid valve (line pressure) If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace solenoid valve (line pressure) ☞ **page K–33**
5	Connect a dwell meter to terminals as shown Is output duty of dropping resistor at EC-AT control unit OK? ☞ **page K–246**	Yes	Go to next step
		No	Replace EC-AT control unit, perform road test, and go to Step 8 ☞ **page K–41, 16**
6	Connect a dwell meter to terminals as shown Is output duty of solenoid valve (line pressure) at EC-AT control unit OK? ☞ **page K–246**	Yes	Go to next step
		No	Replace EC-AT control unit, perform road test, and go to Step 8 ☞ **page K–41, 16**
7	Disconnect dropping resistor connector Is resistance of resistor OK? ☞ **page K–33** **Resistance: 10–14 Ω**	Yes	Check wiring and connectors from EC-AT control unit to dropping resistor If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace dropping resistor ☞ **page K–33**
8	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ **page K–234**	Yes	Replace EC-AT control unit ☞ **page K–41**
		No	Intermittent poor connection Check for cause

(+) term.	(–) term.	Duty (ON %)	Condition
1H	Ground	Approx. 100	Throttle valve fully closed
		Approx. 5	Throttle valve fully opened

(+) term.	(–) term.	Duty (ON %)	Condition
1F	Ground	Approx. 100	Throttle valve fully closed
		Approx. 5	Throttle valve fully opened

37U0KX-332

CIRCUIT DIAGRAM

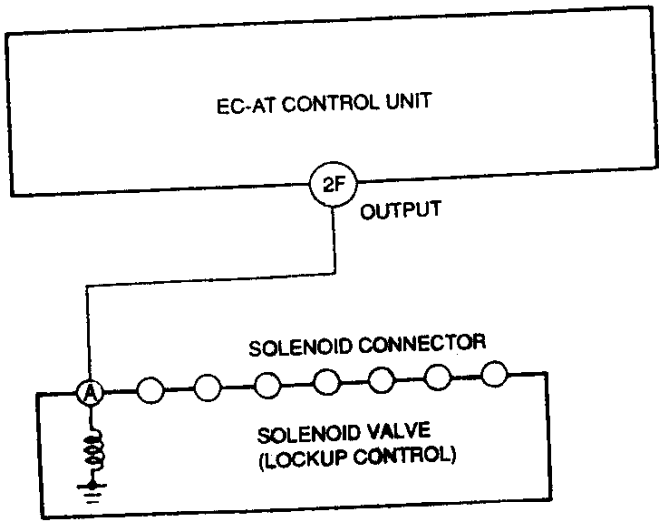


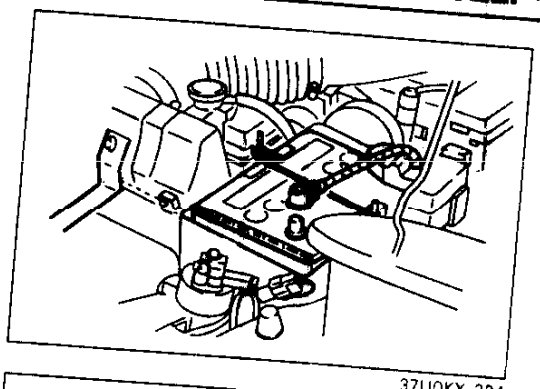
SERVICE CODE NO.65 SOLENOID VALVE (LOCKUP CONTROL)

STEP	INSPECTION		ACTION
1	Are there any poor connections at solenoid valve and EC-AT control unit connectors?	Yes	Go to next step
		No	Repair or replace connector
2	Connect a circuit tester to terminals as shown Is output voltage of solenoid valve (lockup control) at EC-AT control unit OK? ☞ page K-35 V_B: Battery voltage (+) term. 2F; (–) term. Ground; Voltage (V): V_B / Below 1.0; Condition: Lockup / No lockup	Yes	Check wiring and go to Step 5
		No	Go to next step
3	Disconnect 20-pin EC-AT control unit connector Is resistance between 2F terminal and a ground OK? **Resistance: 20–40 Ω**	Yes	Go to Step 5
		No	Go to next step
4	Disconnect solenoid connector Is resistance between ground and terminal A of solenoid valve (lockup control) OK? ☞ page K-32 **Resistance: 20–40 Ω**	Yes	Check wiring and connectors from EC-AT control unit to lockup control solenoid If OK, go to next step If not OK, repair wiring and/or connector
		No	Replace solenoid valve (lockup control) ☞ page K-33
5	Disconnect negative battery cable for at least 20 seconds and the brake pedal is depressed Connect battery cable and recheck for service code Is service code displayed? ☞ page K-234	Yes	Replace EC-AT control unit ☞ page K-41
		No	Intermittent poor connection Check for cause

37U0KX-333

CIRCUIT DIAGRAM

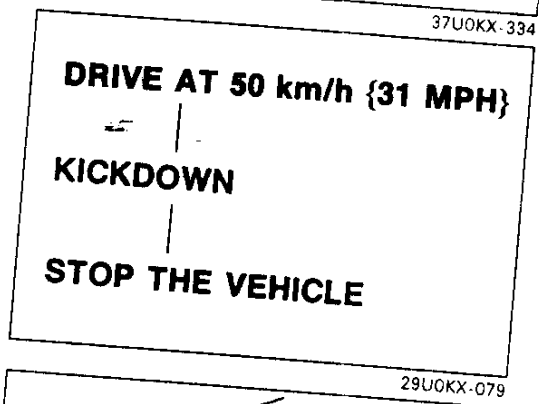




37U0KX-334

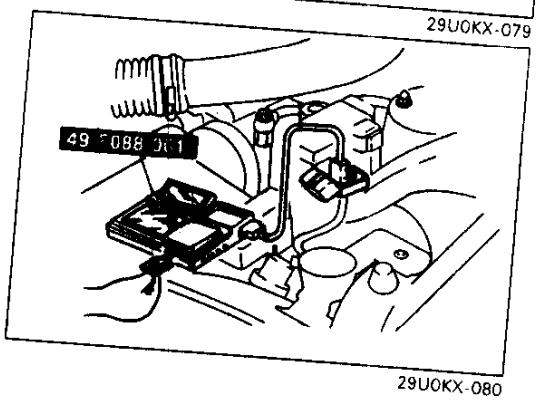
After-Repair Procedure

1. Cancel the memory of service codes by disconnecting the negative battery cable for at least **20 seconds** and the brake pedal is depressed.
   Reconnect the battery cable.
2. Remove the **SST (Self-Diagnosis Checker** or **DT-S1000)** if connected.



29U0KX-079

3. Drive the vehicle at 50 km/h {31 MPH}, and depress the accelerator pedal fully to activate kickdown. Stop the vehicle gradually.



29U0KX-080

4. Connect the **SST (Self-Diagnosis Checker** or **DT-S1000)** to the diagnosis connector.
5. Turn the ignition switch ON.
6. Verify that no code numbers are displayed.

SERVICE POINTS

OUTLINE

Hold Switch

- If the wiring of the hold switch is open or shorted, selection to/from hold mode is not possible.

Inhibitor Switch

- If a malfunction occurs in the wiring of the inhibitor switch, the EC-AT control unit cannot determine the range position and shifting may be abnormal in D, S, and L ranges. There may not be a shift to O/D.

Throttle Sensor

- If the wiring of the throttle sensor is open or shorted, service code No.12 is displayed by the self-diagnosis function, and hold mode is canceled.
- If a malfunction occurs in the throttle sensor, the EC-AT control unit judges the throttle opening signals from the idle signal, and sets the line pressure as follows:

Idle signal	Throttle opening angle	Line pressure
OFF (throttle valve opened)	4/8 stroke	Maximum
ON (throttle valve fully closed)	0/8 stroke	Minimum

Idle Signal

- If the wiring is open, the EC-AT control unit does not correct the throttle characteristics. In this case, lockup is not canceled when cruising (throttle fully closed) and vehicle jolts when accelerator pedal is depressed or released.
- If the wiring is shorted, the line pressure will be low (does not match throttle characteristics) and the transmission may slip when shifting.

Speed Sensor 1 (Revolution Sensor)

- If there is no input signal from speed sensor 1, service code No.06 is displayed by the self-diagnosis function and hold mode is canceled.
- Shifting is made based on signals from speed sensor 2 (speedometer sensor).
- If a malfunction occurs in speed sensor 1 and speed sensor 2 at the same time, solenoid valve (shift A and B) go OFF and D and S ranges become in 3rd gear position, L range becomes in 2nd gear position, andlockup is inhibited.

Speed Sensor 2 (Speedometer Sensor)

- If there is no input signal from speed sensor 2, service code No.07 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in speed sensor 2, shifting is made normal based on signals from speed sensor 1 (revolution sensor).
- If a malfunction occurs in speed sensor 1 and speed sensor 2 at the same time, solenoid valve (shift A and B) go OFF and D and S ranges become in 3rd gear position, L range becomes in 2nd gear position, and lockup is inhibited.

Pulse Generator

- If no input signal from the pulse generator, service code No.55 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in the pulse generator, the torque reduction control function is inhibited The gear position at shifting cannot be determined and timing control at shifting is made based on signals from speed sensor 1 (revolution sensor). Shift shock may be slightly strong.

Stoplight Switch

- If the wiring of the stoplight switch is open or shorted, EC-AT control is made normal.
- If the wiring is shorted to the battery power, there may be a shift from O/D to 3rd when the throttle valve is fully closed.

Torque Reduced Signal
- If the wiring is open or shorted, service code No.57 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in the torque reduced signal, the torque reduction control function is inhibited and the line pressure characteristics will be high when shifting. Shift shock may be slightly strong.
- If a malfunction occurs in the reduce torque signal or slip lockup signal, service code No.57 is displayed by the self-diagnosis function.

Mileage Switch
- If the wiring is open, the line pressure characteristics will be slightly high. Shift shock may be slightly strong when shifting from 1st to 2nd or from 2nd to 3rd.
- If the wiring is shorted, the transmission may slip when shifting from 1st to 2nd or from 2nd to 3rd until the total mileage of the vehicle exceeds approximately 600 km {372 miles}.

Water-Thermoswitch
- If the wiring of the water thermoswitch is open or shorted, EC-AT control is made normal.
- If the wiring is shorted, the engine coolant temperature may increase.

A/C Signal
- If the wiring is open, normal mode, A/C ON is selected bacause an ON A/C signal is judged.
- If the wiring is shorted, normal mode, A/C OFF is selected bacause an OFF A/C signal is judged.

Slip Lockup OFF Signal
- If the wiring of the slip lockup OFF signal is open or shorted, EC-AT control is made normal.

Engine RPM Signal
- If there is no input signal from the engine rpm signal, service code No.01 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in the engine rpm signal, lockup shock may be slightly strong.

ATF Thermosensor
- If the wiring is open, service code No.56 is memorized by the self-diagnosis function. Line pressure is set at maximum and O/D and lockup are inhibited.
- If the wiring is shorted, service code No.56 is memorized by the self-diagnosis function. Shift shock at low ATF temperature may be strong.

Atmospheric Pressure Sensor
- If the wiring is open or shorted, service code No.58 is displayed by the self-diagnosis function. Line pressure is not controlled correctly at high altitude and shift shock will be strong.

O/D Inhibit Signal (ASC Signal)
- If the wiring is open, there is no input signal from the cruise control unit and acceleration feeling (driving performance) will be deteriorated when the vehicle speed drops 8km/h (5mph) below the set speed or RESUME/ACCEL switch is operated during cruise control operation.
- If the wiring is shorted, there is no shift to O/D.

TAT Terminal (Diagnosis Connector)
- If the wiring is open, service code(s) are not displayed by the self-diagnosis function.
- If the wiring is shorted, service code(s) memorized in the EC-AT control unit are displayed by hold indicator.

Solenoid Valve (Shift A and B)
- If the wiring is open or shorted, service code No.60 for solenoid valve (shift A) or service code No.61 for solenoid valve (shift B) is displayed and hold mode is canceled.
- If either solenoid valve malfunctions, both solenoid valves go OFFand D and S ranges become in 3rd gear position, L range becomes in 2nd gear position, and lockup is inhibited.

Solenoid Valve (Line Pressure)
- If the wiring is open or shorted, service code No.64 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in the solenoid valve (line pressure), line pressure is set at maximum to make driving possible.
- If a malfunction occurs in the dropping resistor, service code No.64 is displayed by the self-diagnosis function.

Solenoid Valve (Lockup)
- If the wiring is open or shorted, service code No.63 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in the solenoid valve (lockup), the solenoid valve goes OFF and lockup is canceled.

Solenoid Valve (Lockup Control)
- If the wiring is open or shorted, service code No.65 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in the solenoid valve (lockup control), the solenoid valve goes OFF and lockup is canceled.

Solenoid Valve (Overrunning Clutch)
- If the wiring is open or shorted, service code No.62 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in the solenoid valve (overrunning clutch), the solenoid valve goes OFF and the overrunning clutch engages. Engine braking is available when coasting. There is no shift to O/D.

Dropping Resistor
- If the wiring is open or shorted, service code No.64 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in the dropping resistor, the line pressure is set at maximum to make driving possible.
- If a malfunction occurs in the solenoid valve (line pressure), service code No.64 is displayed by the self-diagnosis function.

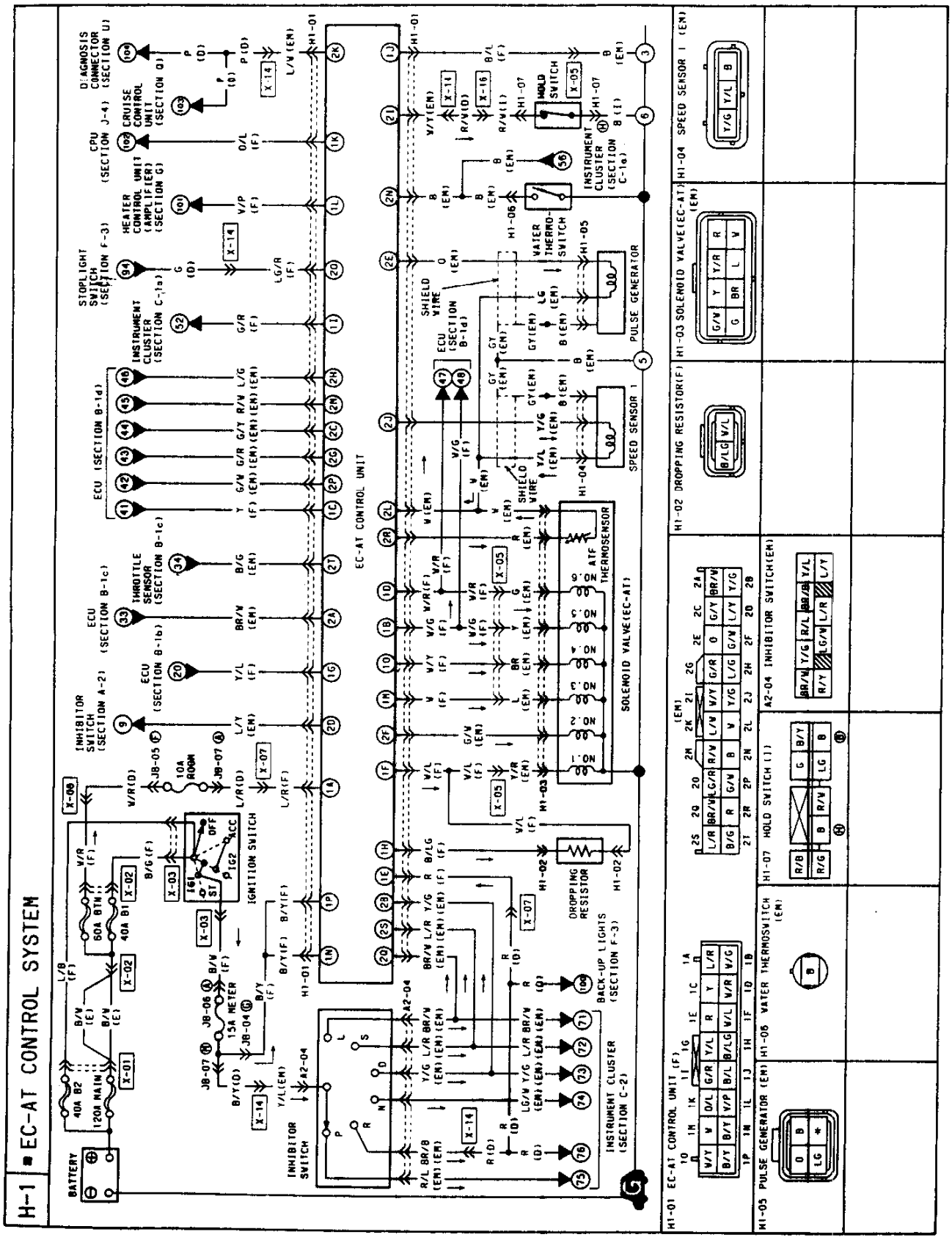
Reduce Torque Signal
- If the wiring is open or shorted, service code No.57 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in the reduce torque signal, the torque reduction control function is inhibited and line pressure will be high at shifting. Shift shock may be slightly strong.
- If a malfunction occurs in the torque reduced signal or slip lockup signal, service code No.57 is displayed by the self-diagnosis function.

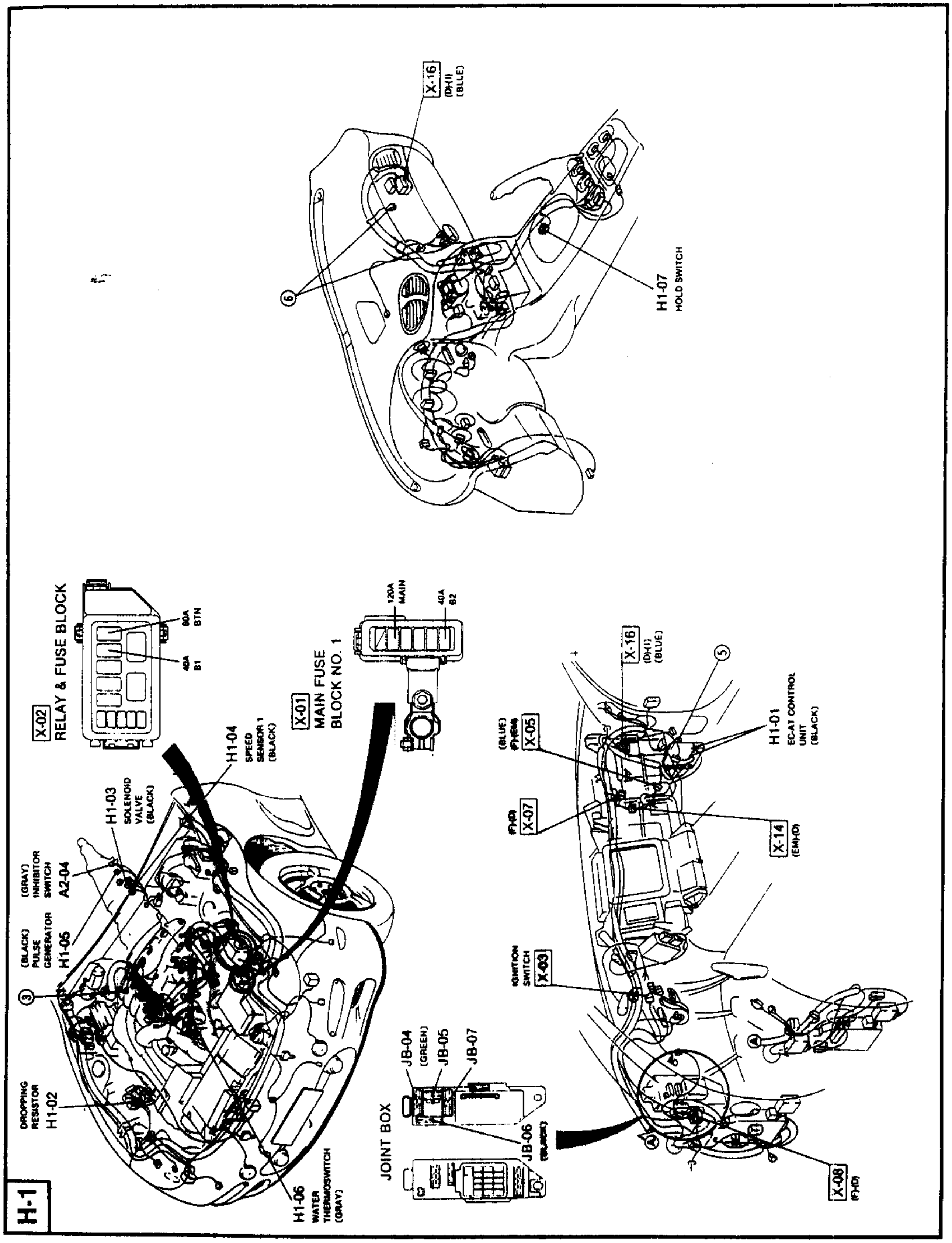
Slip Lockup Signal
- If the wiring is open or shorted, service code No.57 is displayed by the self-diagnosis function and hold mode is canceled.
- If a malfunction occurs in the slip lockup signal, the torque reduction control function is inhibited and line pressure will be high at shifting. Shift shock may be slightly strong.
- If a malfunction occurs in the torque reduced signal or reduce torque signal, service code No.57 is displayed by the self-diagnosis function.

Inhibitor Signal
- If the wiring is open, the engine speed will be slightly low in P and N ranges.
- If the wiring is shorted, the engine speed will be slightly high in R, D, S, and L ranges.

Hold Indicator Lamp
- If the wiring is open, the hold indicator lamp will not illuminate.
- If the wiring is shorted, the hold indicator lamp will remain illuminated.
- If the wiring between the FAT terminal and 2N terminal is open or shorted, service code(s) will not be displayed by the self-diagnosis function.

WIRING DIAGRAM




H-1
X-02
RELAY & FUSE BLOCK
40A
B1
80A
BTN
X-01
MAIN FUSE
BLOCK NO. 1
120A
MAIN
40A
B2
H1-04
SPEED
SENSOR 1
(BLACK)
H1-03
SOLENOID
VALVE
(BLACK)
(GRAY)
INHIBITOR
SWITCH
A2-04
(BLACK)
PULSE
GENERATOR
H1-05
3
DROPPING
RESISTOR
H1-02
H1-06
WATER
THERMOSWITCH
(GRAY)
JOINT BOX
JB-04
(GREEN)
JB-05
JB-07
JB-06
(BLACK)
X-16
(BLUE)
6
H1-07
HOLD SWITCH
X-16
(BLUE)
5
H1-01
EC-AT CONTROL
UNIT
(BLACK)
(BLUE)
X-05
X-07
X-14
IGNITION
SWITCH
X-03
X-08

MEMO

ELECTRICAL DIAGNOSIS SUPPORT

Hold Switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2I terminal — hold switch	Mode does not change when hold switch is not operated	Mode does not change when hold switch is operated	Shifting may be abnormal Mode may change when hold switch not operated
Hold switch-ground		No symptom	

Inhibitor Switch

Note

- **If fuse burns out while driving, EC-AT control unit judges current range.**
- **When ignition switch is turned from OFF to ON after fuse burns out, EC-AT control unit judges N range. EC-AT control unit inhibits lockup at this time.**

R Range Switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1E terminal — R range switch	No symptom	METER 15A fuse burns out when R range is selected	May not shift to O/D in D range S, L range shift pattern may be same as D range
R range switch — battery		Fuse burns out	
R range switch — range indicator lamp	Range indicator lamp does not illuminate	METER 15A fuse burns out when R range is selected	

L Range Switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2Q terminal — L range switch	L range shift pattern may be same as D or S range	METER 15A fuse burns out when L range is selected	May not shift to O/D in D range S, L range shift pattern may be same as D range
L range switch — battery		Fuse burns out	
L range switch — range indicator lamp	Range indicator lamp does not illuminate	METER 15A fuse burns out when L range is selected	

S Range Switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2S terminal — S range switch	S range shift pattern may be same as D or L range	METER 15A fuse burns out when S range is selected	May not shift to O/D in D range S, R range shift pattern may be same as D range
S range switch — battery		Fuse burns out	
S range switch — range indicator lamp	Range indicator lamp does not illuminate	METER 15A fuse burns out when S range is selected	

D Range Switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2B terminal — D range switch	D range shift pattern may be same as S or L range	METER 15A fuse burns out when D range is selected	May not shift to O/D in D range S, R range shift pattern may be same as D range
D range switch — battery		Fuse burns out	
D range switch — range indicator lamp	Range indicator lamp does not illuminate	METER 15A fuse burns out when D range is selected	

P, N Range Switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2D terminal — P, N range switch	No symptom	IG KEY 40A fuse burns out when ignition switch turned START	May not shift to O/D in D range S, L range shift pattern may be same as D range
P, N range switch — starter cuicuit	Starter does not operate		

Throttle Sensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2A terminal — throttle sensor	Code No.12 output Shift point incorrect and shift shock strong	Code No.12 output Shift point incorrect and shift shock strong	Line pressure will be abnormal and clutch may slip if EC-AT control unit does not judge malfunction Vehicle may jolt
EC-AT control unit 2T terminal — throttle sensor			

NA: Not applicable

Idle Signal

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2M terminal – engine control unit 2E terminal	Vehicle jolts when accelator pedal depressed or released	Clutches may slip when shifting	Line pressure will be abnormal and clutches may slip if EC-AT control unit does not judge malfunction Vehicle may jolt

Speed Sensor 1 (Revolution Sensor)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2J terminal – speed sensor 1	Code No.06 output	Code No.06 output	NA
Speed sensor 1 – ground (EC-AT control unit 2L terminal)		NA	

Speed Sensor 2 (Speedometer Sensor)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1I terminal – speed sensor 2	Code No.07 output	Code No.07 output	NA

Pulse Generator

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2E terminal – pulse generator	Code No.55 output Shift shock may be slightly strong	Code No.55 output Shift shock may be slightly strong	NA
Pulse generator – ground (EC-AT control unit 2L terminal)		NA	

Stoplight Switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2Q terminal – stoplight switch	No symptom	Stop 15A fuse burns out when brake pedal is depressed	NA
Stoplight switch – battery		NA	

Torque Reduced Signal

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2H terminal – engine control unit 2G terminal	Code No.57 output Shift shock may be slightly strong	Code No.57 output Shift shock may be slightly strong	NA

Mileage Switch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2N terminal – speedometer	Shift shock may be strong when shifting from 1st to 2nd or from 2nd to 3rd	Transmission may slip when shifting from 1st to 2nd or from 2nd to 3rd until the total mileage of the vehicle exceeds approximately 600 km {372 mile}	NA

NA: Not applicable

Water Thermoswitch

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2N terminal – water thermoswitch	Acceleration feeling (driving performance) will be deteriorated	Engine coolant temperature may increase	Acceleration feeling (driving performance) will be deteriorated

A/C Signal

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1L terminal – engine control unit 1K terminal	Will always be normal, A/C ON mode	Will always be normal, A/C OFF mode	NA

Slip Lockup OFF Signal

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2G terminal – engine control unit 2C terminal	No symptom	No symptom	NA

Engine RPM Signal

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1G terminal – engine control unit 2B terminal	Code No. 01 output Lockup shock will be strong	Code No.01 output Lockup shock will be strong	NA

ATF Thermosensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2R terminal – ATF thermosensor	Code No.56 output O/D and lockup will be inhibited	No code No.56 output Shift shock will be strong at low ATF temperature	NA
ATF thermosensor – ground (EC-AT control unit 2L terminal)		NA	

Atmospheric Pressure Sensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2C terminal – engine control unit 2D terminal	Code No.58 output Shift shock will be strong at high altitude	Code No.58 output Shift shock will be strong at high altitude	NA

O/D Inhibit Signal (ASC Signal)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2K terminal – cruise control unit 1G terminal	O/D not inhibited when O/D inhibit signal ON	Does not shift to O/D Always diagnose EC-AT system	NA

TAT Terminal (Diagnosis Connector)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2K terminal – TAT terminal	Does not diagnose EC-AT system	Always diagnose EC-AT system Does not shift to O/D	NA

NA: Not applicable

Solenoid Valve (Shift A)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1D terminal – solenoid valve (shift A)	Code No. 60 output D, S range: 3rd gear fixed L range: 2nd gear fixed	Code No. 60 output D, S range: 3rd gear fixed L range: 2nd gear fixed	Shifting may be abnormal if EC-AT control unit does not judge malfunction
Solenoid valve (shift A) – ground		No symptom	

Solenoid Valve (Shift B)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1B terminal – solenoid valve (shift B)	Code No.61 output D, S range: 3rd gear fixed L range: 2nd gear fixed	Code No.61 output D, S range: 3rd gear fixed L range: 2nd gear fixed	Shifting may be abnormal if EC-AT control unit does not judge malfunction
Solenoid valve (shift B) – ground		No symptom	

Solenoid Valve (Line Pressure)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1F terminal – solenoid valve (line pressure)	Code No.64 output Shift shock and select shock will be strong	Code No.64 output Shift shock and select shock will be strong	Shifting may be abnormal if EC-AT control unit does not judge malfunction
Solenoid valve (line pressure) – ground		No symptom	

Solenoid Valve (Lockup)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1M terminal – solenoid valve (lockup)	Code No.63 output Lockup will not operate	Code No.63 output Lockup will not operate	Lockup may not be operated in lockup zone
Solenoid valve (lockup) – ground		No symptom	

Solenoid Valve (Lockup Control)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2F terminal – solenoid valve (lockup control)	Code No.65 output Lockup will not operate	Code No.65 output Lockup will not operate	Lockup may not be operated in lockup zone
Solenoid valve (lockup control) – ground		No symptom	

Solenid Valve (Overrunning Clutch)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1O terminal – solenoid valve (overrunning clutch)	Code No.62 output Engine breaking always operated during coasting Does not shift to O/D	Code No.62 output Engine breaking always operated during coasting Does not shift to O/D	May not shift to O/D
Solenoid valve (overrunning clutch) – ground		No symptom	

Dropping Resister

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1H terminal – dropping resister	Code No.64 output Shift shock and select shock will be strong	Code No.64 output Shift shock and select shock will be strong	NA
Dropping resister – solenoid valve (line pressure)			

NA: Not applicable

Reduce Torque Signal

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2P terminal – engine control unit 1Q terminal	Code No.57 output Shift shock may be slightly strong	Code No.57 output Shift shock may be slightly strong	NA

Slip Lockup Signal

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 2P terminal – engine control unit 1Q terminal	Code No.57 output Shift shock may be slightly strong	Code No.57 output Shift shock may be slightly strong	NA

Inhibitor Signal

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1C terminal – engine control unit 1R terminal	Engine speed will be slightly low in P and N ranges	Engine speed will be slightly high in R, D, S, and L ranges	NA

Hold Indicator Lamp

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1K terminal – Hold indicator lamp	Hold indicator lamp not illuminated	Hold indicator lamp always illuminated	NA

FAT Terminal (Diagnosis Connector)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1K terminal – FAT terminal (diagnosis connector)	Service code(s) not displayed by self-diagnosis function When using Self-Diagnosis Checker, "88" flashes after 20 seconds or DT-S1000 displays "System error"	Service code(s) not displayed by self-diagnosis function When using Self-Diagnosis Checker, "88" flashes after 20 seconds or DT-S1000 displays "System error"	NA

Battery Power (Backup)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1A terminal – battery	Memory functions that rely on Self-Diagnosis, such as service code memory, do not operate	ROOM 10A fuse burns out	NA

Battery Power

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1N terminal – battery	No symptom	METER 15A fuse burns out when ignition switch is ON	NA
EC-AT control unit 1P terminal – battery	No symptom	METER 15A fuse burns out when ignition switch is ON	NA
EC-AT control unit 1N and 1P terminals – battery	EC-AT control unit does not function D, S range: 3rd gear fixed L range: 2nd gear fixed	METER 15A fuse burns out when ignition switch is ON	NA

NA: Not applicable

Ground

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
EC-AT control unit 1J terminal – ground	EC-AT control unit does not function D, S range: 3rd gear fixed L range: 2nd gear fixed	No symptom	Shifting may be abnormal

37U0KX-336

Note

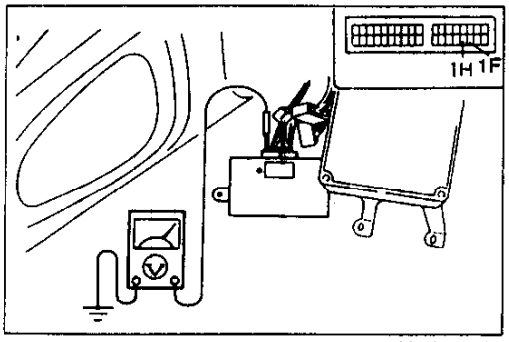
- **If a solenoid circuit or sensor circuit has poor grounding, the following malfunctions may exist:**
  1. **Abnormal shifting**
     - **Shift points abnormal**
     - **Transmission hunts (repeated upshifting/downshifting)**
     - **Drives away except in 1st gear**
     - **Does not shift to O/D**
     - **Fail-safe function may be operated by self-diagnosis system according to extent of malfunction**
  2. **Deterioration of shift feeling**
     - **Oil pressure high and shift shock strong**
     - **Shift timing incorrect and engine flares up**
     - **Shift timing incorrect and vehicle brakes on shifting**
     - **Fail-safe function may be operated by self-diagnosis system according to extent of malfunction**

SYSTEM INSPECTION

SOLENOID VALVE (LINE PRESSURE) OUTPUT DUTY Inspection

Note

- **When checking the duty ratio, check at terminal 1F (solenoid valve(line pressure)) and terminal 1H (dropping resistor) of EC-AT control unit.**
- **Output duty ratio can be checked by using the DT-S1600.**



29U0KX-085

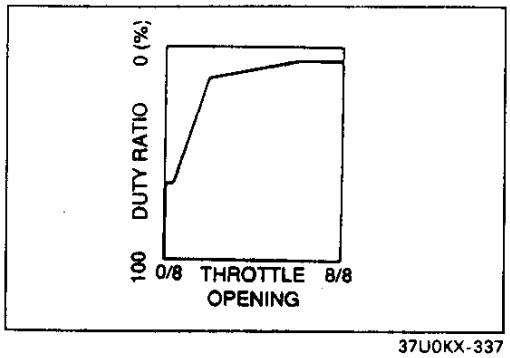
1. Connect the (+) terminal of a dwell meter to terminal 1F and/or terminal 1H at the EC-AT control unit and the (–) terminal to a ground. Set the dwell meter selector to the 4 cylinder position.
2. Turn the ignition switch to ON.

Note 29U0KX-084

- **The dwell meter indicates the OFF duty ratio.**

3. Verify the duty ratio by depressing and releasing the accelerator pedal.

Throttle opening	Duty ratio (ON %)
Fully closed (0/8)	Approx. 100
Fully open (8/8)	Approx. 5



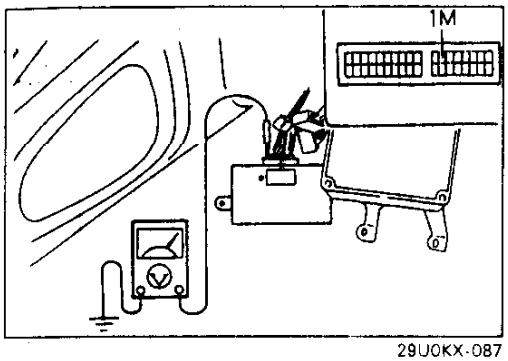
37U0KX-337

Note

- **The relationship between the dwell angle (°) and duty ratio (%) is as follows:**

Dwell angle (°)	0	18	36	54	72	90
Duty ratio (%)	0	20	40	60	80	100

4. Depress the accelerator pedal slowly and verify the duty ratio charges as shown in the graph.
5. If not as specified, check the EC-AT control unit (refer to page K–35), dropping resistor (refer to page K–33), and line pressure solenoid (refer to page K–32).



29U0KX-087

SOLENOID VALVE (LOCKUP) OUTPUT DUTY

Inspection

Note

- **Output duty ratio can be checked by using the DT-S1000.**

1. Connect the (+) terminal of a dwell meter to terminal 1M of the EC-AT control unit and the (–) terminal to a ground.
2. Drive the vehicle.

Note

- **The dwell meter indicates the OFF duty ratio.**

3. Verify the duty ratio in the lockup condition.

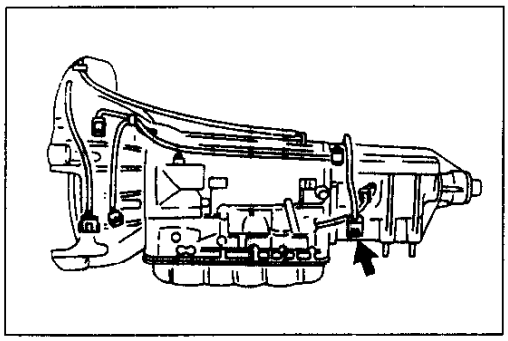
Condition	Duty ratio (ON %)
No lockup	Approx. 5
Lockup	Approx. 95

Note

- **See above note for dwell and duty relationship.**

4. If not as specified, check the EC-AT control unit (refer to page K–35), and solenoid valve (lockup) (refer to page K–32).

37U0KX-338



29U0KX-089

MANUAL OPERATION TEST

Inspection

1. Disconnect solenoid connector.

Note

- **Determine the gear position by noting the conditions upon accelerating from a stop and the engine speed while cruising.**
- **Engine rpm at 40 km/h (25 mph):**
  2nd gear: Approx. 2,300 rpm
  3rd gear: Approx. 1,500 rpm

2. Verify the gear position of each range.

Range	Gear Position
D range	3rd, fixed
S range	3rd, fixed
L range	2nd, fixed
R range	Reverse

3. If not within specification, check the oil pressure or transmission.

29U0KX-090

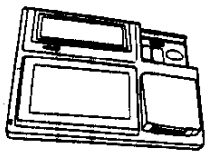
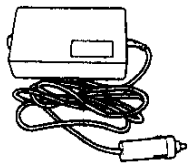
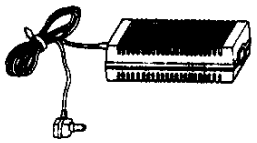
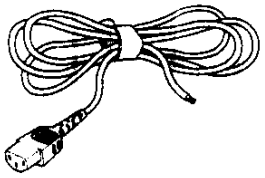
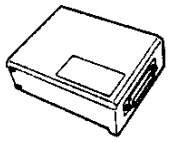
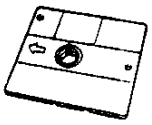
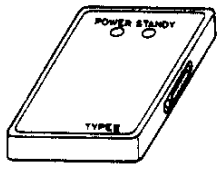
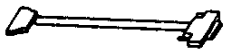
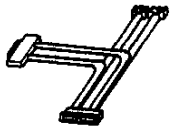
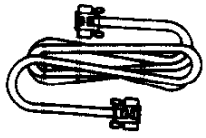
ELECTRICAL SIGNAL INSPECTION

DESCRIPTION

In this step, the input and output signals are checked by using the **DT-S1000**.
The **DT-S1000** checks for proper operation of various switches and sensors in the EC-AT system. It also checks the EC-AT control unit for output the various control signals.

37U0KX-339

PREPARATION
SST

49 F088 001 DT-S1000 Base Unit 	For inspection of electrical signal	49 F088 002 Power Unit DC-12V 	For inspection of electrical signal
49 F088 003 Harness Power Unit DC 	For inspection of electrical signal	49 F088 007 Power Unit AC 	For inspection of electrical signal
49 F088 008 Harness Power Unit AC 	For inspection of electrical signal	49 F088 004 IF-Adapter Type-I 	For inspection of electrical signal
49 F088 019 System Disk Type-III (V1.00) 	For inspection of electrical signal	49 F088 016 System Unit Type-III 	For inspection of electrical signal
49 F019 907 Adapter Harness 	For inspection of electrical signal	49 F019 906 Adapter Harness 36P 	For inspection of electrical signal
49 F088 017 Harness Type-III 	For inspection of electrical signal		

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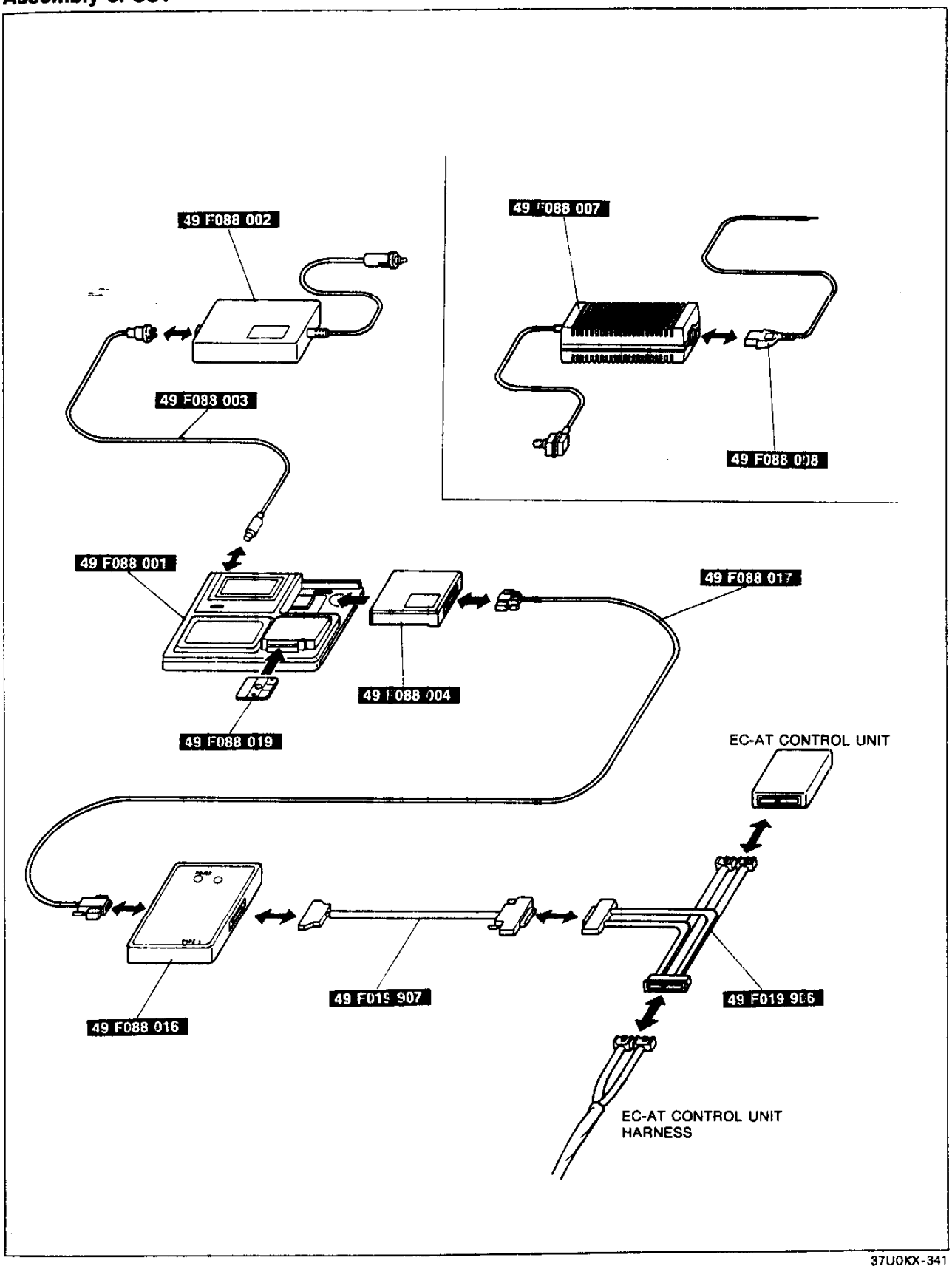
Assembly of SST



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DT-S1000 MONITOR ITEM CHART

By using the DT-S1000, following input/output signals to/from the EC-AT control unit signal can be checked.

Terminal	Input or output	Component	DT-S1000 function		
			Input/output signal monitor	Shifting check monitor	Remark
1A	–	Battery power (backup)	○ (Voltage)		
1B	Output	Solenoid valve (shift B)	○ (Voltage)	○ (Gear position)	Solenoid valve pattern can be checked DT-S1000 displayed gear position is calculated by signals received from solenoid valves (shift A, shift B)
1C	Output	Inhibitor signal	○ (Voltage)		
1D	Output	Solenoid valve (shift A)	○ (Voltage)	○ (Gear position)	Solenoid valve pattern can be checked DT-S1000 displayed gear position is calculated by signals received from solenoid valves (shift A, shift B)
1E	Input	Inhibitor switch (R range)	○ (Voltage)		
1F	Output	Solenoid valve (line pressure)	○ (Duty; %)	○ (Duty; %)	Output duty ratio can be checked
1G	Input	Engine rpm signal	○ (rpm)		Engine rpm signal can be checked
1H	Output	Dropping resistor	○ (Duty; %)		Output duty ratio can be checked
1I	Input	Speed sensor 2 (Speedometer sensor)	○ (km/h)		Vehicle speed signal (backup signal) can be checked
1J	–	Ground (EC-AT control unit)	○ (Voltage)		
1K	Output	Hold indicator	○ (Voltage)		
1L	Input	A/C signal	○ (Voltage)		
1M	Output	Solenoid valve (lockup)	○ (Duty; %)	○ (Duty; %)	Output duty ratio can be checked
1N	–	Battery power (main)	○ (Voltage)		
1O	Output	Solenoid valve (overrunnig clutch)	○ (Voltage)		Solenoid valve pattern can be checked
1P	–	Battery power (main)	○ (Voltage)		
2A	Input	Throttle sensor (V_{REF})	○ (Voltage)		
2B	Input	Inhibitor switch (D range)	○ (Voltage)		
2C	Input	Atmospheric pressure sensor	○ (Voltage)		
2D	Input	Inhibitor switch (P, N range)	○ (Voltage)		
2E	Input	Pulse generator	○ (rpm)		Input shaft rpm signal can be checked
2F	Output	Solenoid valve (lockup control)	○ (Voltage)		Solenoid valve pattern can be checked
2G	Input	Slip lockup OFF signal	○ (Voltage)		
2H	Input	Torque reduced signal	○ (Voltage)		
2I	Input	Hold switch	○ (Voltage)		
2J	Input	Speed sensor 1 (revolution sensor)	○ (Vehicle speed; km/h)	○ (Vehicle speed; km/h)	Vehicle speed signal (main signal) can be checked
2K	Input	TAT terminal/O/D inhibit signal (ASC signal)	○ (Voltage)		
2L	–	Ground (input signal)	○ (Voltage)		
2M	Input	Idle signal	○ (Voltage)		

( ) indicates DT-S1000 display unit

Terminal	Input or output	Component	DT-S1000 function		
			Input/output signal monitor	Shifting check monitor	Remark
2N	Input	Water thermoswitch/Mileage switch	○ (Voltage)		
2O	Input	Stoplight switch	○ (Voltage)		
2P	Output	Reduce torque signal/slip lockup signal	○ (Voltage)		
2Q	Input	Inhibitor switch (L range)	○ (Voltage)		
2R	Input	ATF thermosensor	○ (Voltage)		
2S	Input	Inhibitor switch (S range)	○ (Voltage)		
2T	Input	Throttle sensor (TVO)	○ (Voltage)	○ (Voltage)	Throttle opening angle can be checked

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( ) indicates DT-S1000 display unit

Solenoid valve operation table

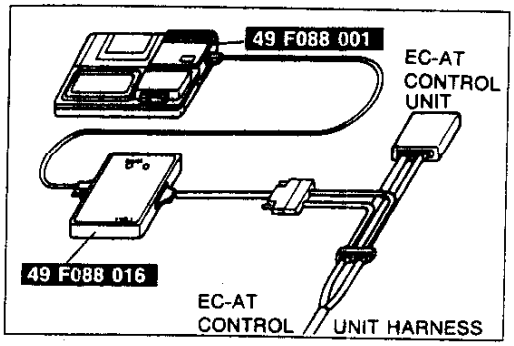
Range	Mode	Gear	Shift A	Shift B
P	–	–	ON	ON
R	–	Reverse	ON	ON
N	–	–	ON	ON
D	Except HOLD	1st	ON	ON
		2nd	OFF	ON
		3rd	OFF	OFF
		O/D	ON	OFF
	HOLD	2nd	OFF	ON
		3rd	OFF	OFF
		* O/D	ON	OFF
S	Except HOLD	1st	ON	ON
		2nd	OFF	ON
		3rd	OFF	OFF
	HOLD	2nd	OFF	ON
		3rd	OFF	OFF
L	Except HOLD	1st	ON	ON
		2nd	OFF	ON
	HOLD	1st	ON	ON
		2nd	OFF	ON

37U0KX-343

* Marked gears prevent engine overspeed.

Note

- **Solenoid valve (shift A) is OFF when P, R, or N range in HOLD mode.**



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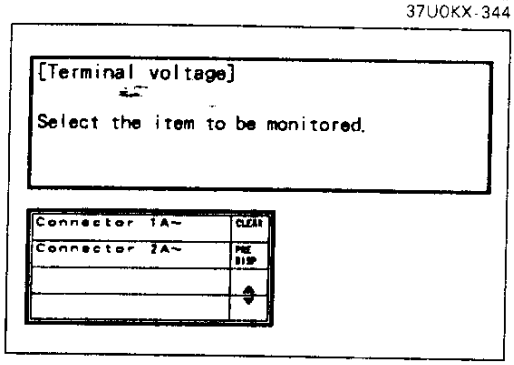

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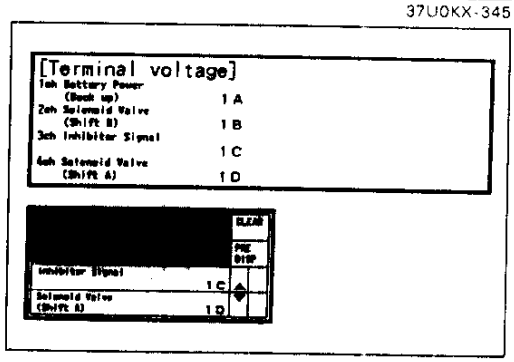

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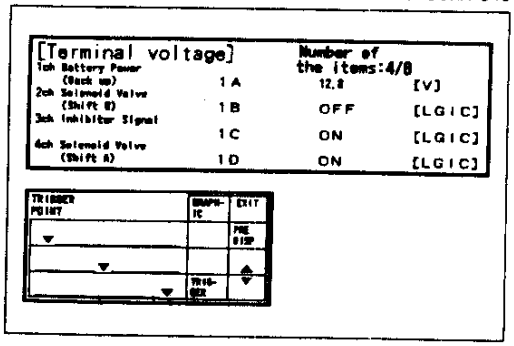
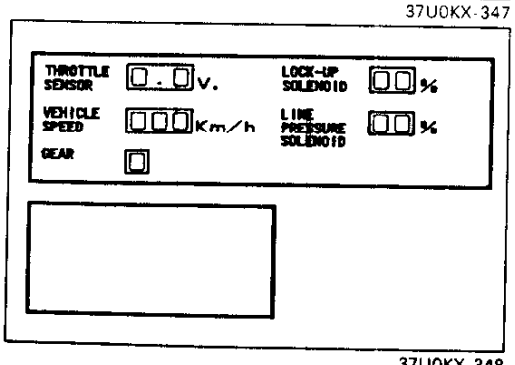


37U0KX-347



37U0KX-348

ELECTRICAL SIGNAL INSPECTION

Inspection Procedure

Input/Output signal monitor function

1. Assemble the **DT-S1000** . (Refer to page K–249.)
2. Disconnect the negative battery cable and connect the **DT-S1000** to the EC-AT control unit.
3. Reconnect the negative battery cable.
4. Select the input/output signal monitor function from the **DT-S1000** display.

Note

- **The maximum selection item is 8.**

5. Select the inspection item (terminal No.).
6. Verify indication of the respective data item in each condition, referring to the EC-AT control unit terminal voltage chart. (Refer to page K–36.)

< Example >

When checking the solenoid valve pattern at each gear position, and the overrunning clutch (engine braking) control, the following steps are available.

Step 1

Select the solenoid valve (shift A), solenoid valve (shift B), and solenoid valve (overrunning clutch).

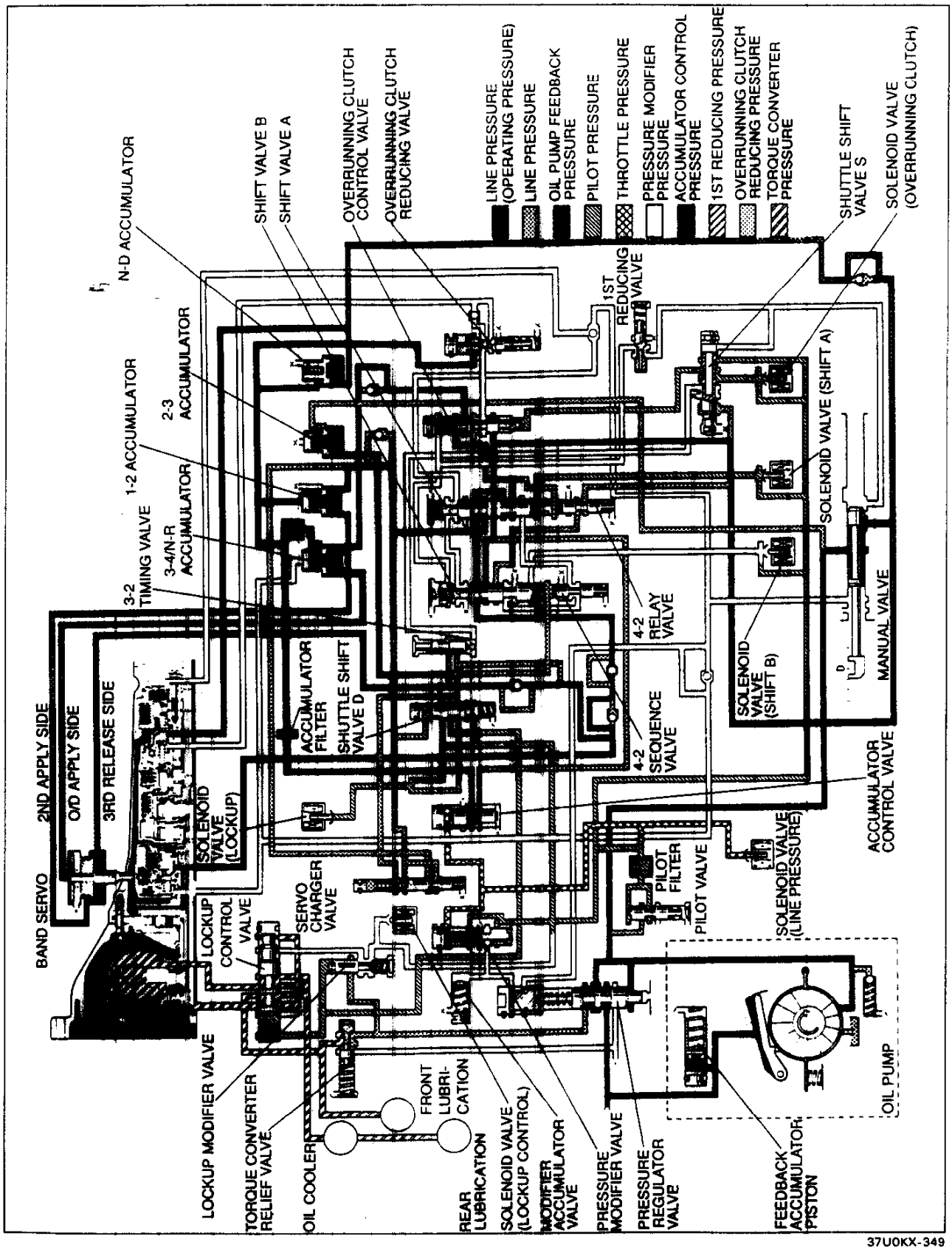
Step 2

Drive the vehicle and verify that the ON/OFF (battery voltage/0V) pattern of the solenoid valve (shift A, and B) are same as the solenoid valve operation table (refer to page K–251), and engine braking is operated when solenoid valve (overrunning clutch) is ON (battery voltage).

Shifting check monitor function

1. Assemble the DT-S1000. (Refer to page K-249.)
2. Disconnect the negative battery cable and connect the **DT-S1000** to the EC-AT control unit.
3. Reconnect the negative battery cable.
4. Select the shifting check monitor function from the **DT-S1000** display.
5. Drive the vehicle and verify the shift point, lockup point, and shift schedule.

HYDRAURIC CIRCUIT



37U0KX-349

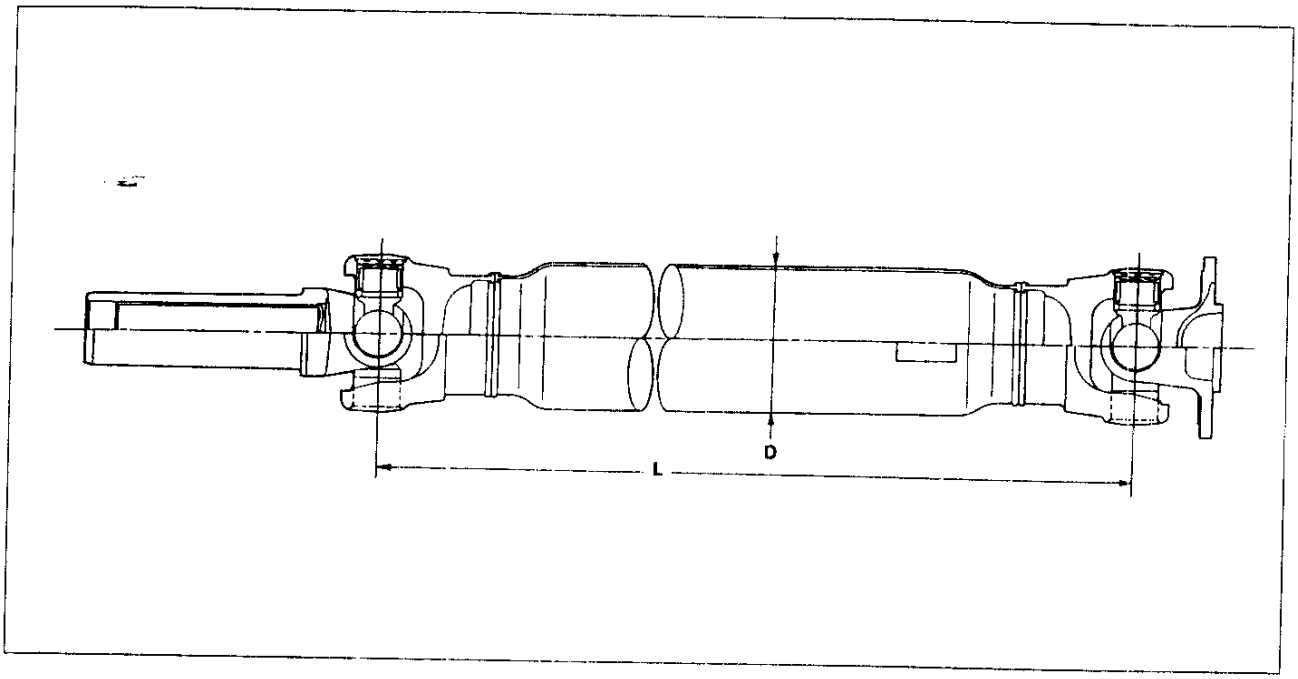
PROPELLER SHAFT

37U0LX-001

OUTLINE

SPECIFICATIONS

Item \ Engine / Transmission			RE 13B (TURBO)	
			R15M-D (MT)	RB4A-EL (AT)
Length	mm {in}	L	863 {33.98}	875 {34.45}
Outer diameter	mm {in}	D	75 {3.0}	



37U0LX-002

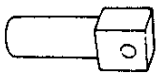
TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Vibration	Bent propeller shaft	Replace	L-3
	Worn or damaged universal joint	Replace	L-3
	Worn slip yoke or splines	Replace	L-3
	Damaged slip yoke	Replace	L-3
	Damaged universal joint yoke	Replace	L-3
Abnormal noise	Worn or damaged universal joint	Replace	L-3
	Damaged slip yoke	Replace	L-3
	Damaged universal joint yoke	Replace	L-3
	Worn slip yoke or splines	Replace	L-3

37U0LX-003

PROPELLER SHAFT

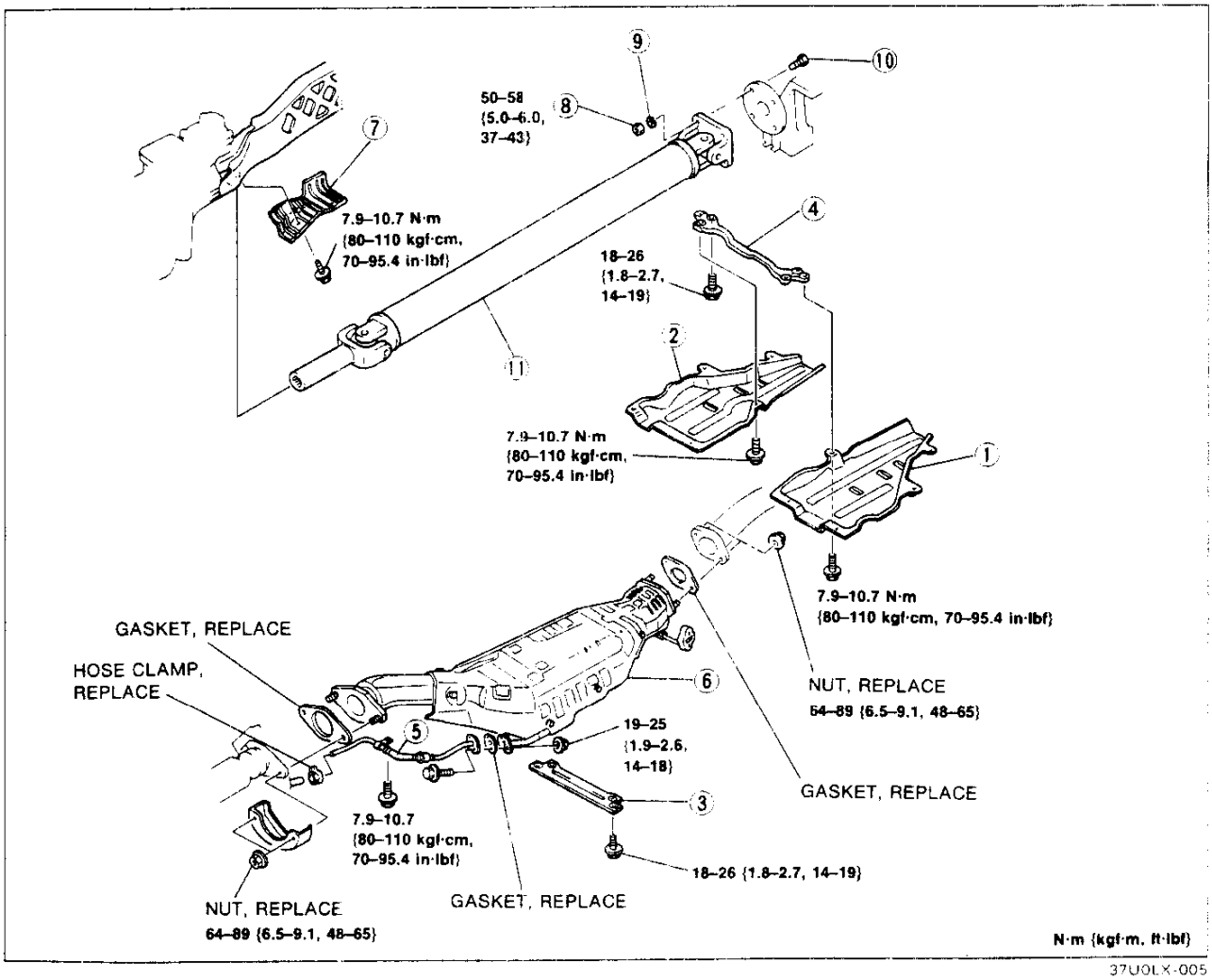
PREPARATION
SST

49 S120 440 Holder, mainshaft		For prevention of oil leakage

37U0LX-004

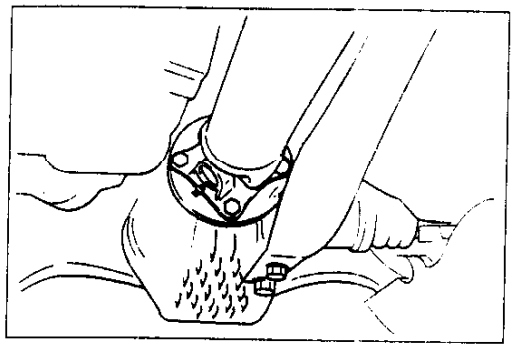
REMOVAL / INSPECTION / INSTALLATION

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**.



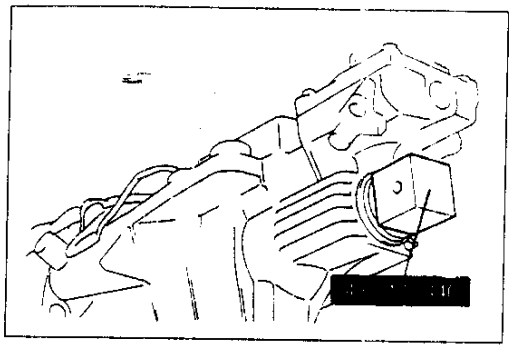
37U0LX-005

1. Left undercover
2. Right undercover
3. Tunnel reinforcement (center)
4. Tunnel reinforcement (rear)
5. Secondary air injection pipe
6. Catalytic converter assembly
7. Cover
8. Nut
9. Lock washer
10. Bolt
11. Propeller shaft
    Removal Note ..... page L–4
    Inspection ..... page L–4
    Installation Note ..... page L–4

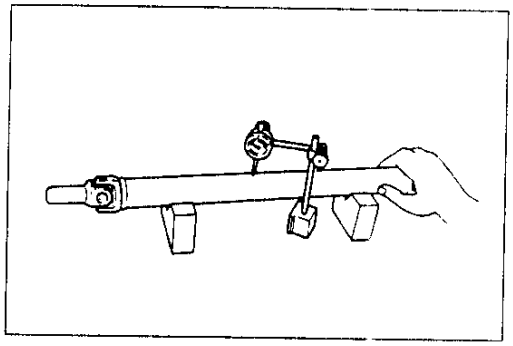

37U0LX-006

Removal Note
Propeller shaft

1. Before removing the propeller shaft, mark the companion flange and yoke for correct reassembly.


37U0LX 007

2. Remove the propeller shaft from the extension housing, and immediately install the **SST** to prevent oil leakage.

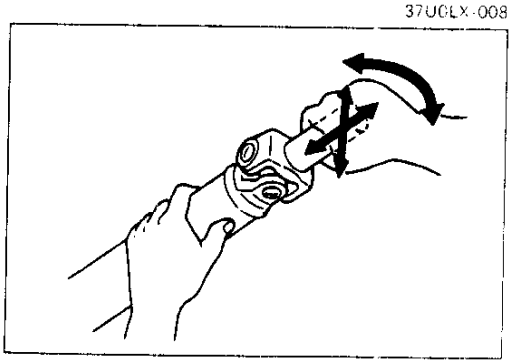

37U0LX-008

Inspection
Propeller shaft

Note
- **Before inspecting, clean the propeller shaft (except for the universal joint) with a steam cleaner or solvent.**

1. Measure the propeller shaft runout with a dial indicator.
2. If the runout is excessive, replace the propeller shaft assembly.

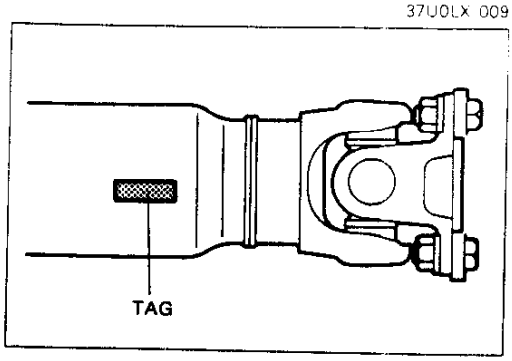
Runout: 0.4mm {0.02in} max.


37U0LX 009

3. Move the universal joint in the direction shown, and inspect joint play.

Note
- **Starting torque**
  Front yoke:
  30–98 N·m {3.0–10 kgf·m, 22–72 ft·lbf}
  Rear yoke:
  30–98 N·m {3.0–10 kgf·m, 22–72 ft·lbf}

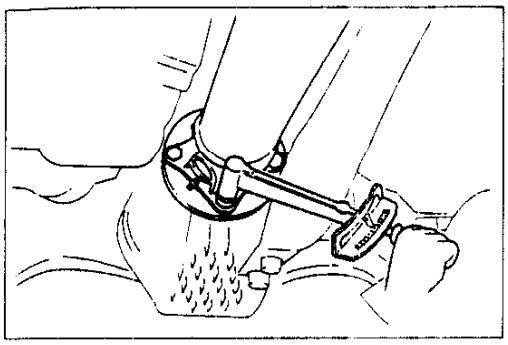
4. If there is excessive play or the starting torque is not within specification, replace the propeller shaft.



37U0LX-010

Installation Note
Propeller shaft

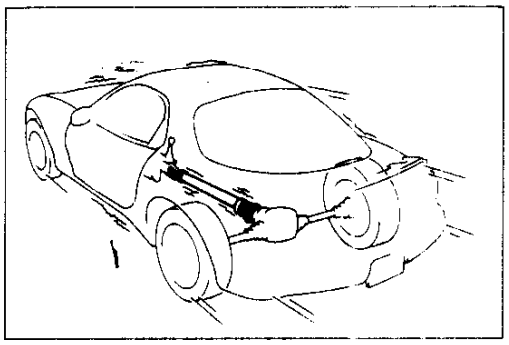
Caution
- **If installing a new propeller shaft, align the differential companion flange precast marking with the tag on the propeller shaft.**



37UCLX-011

1. Align the marks made during removal, and install the propeller shaft.

Tightening torque:
50–58 N·m {5.0–6.0 kgf·m, 37–43 ft·lbf}



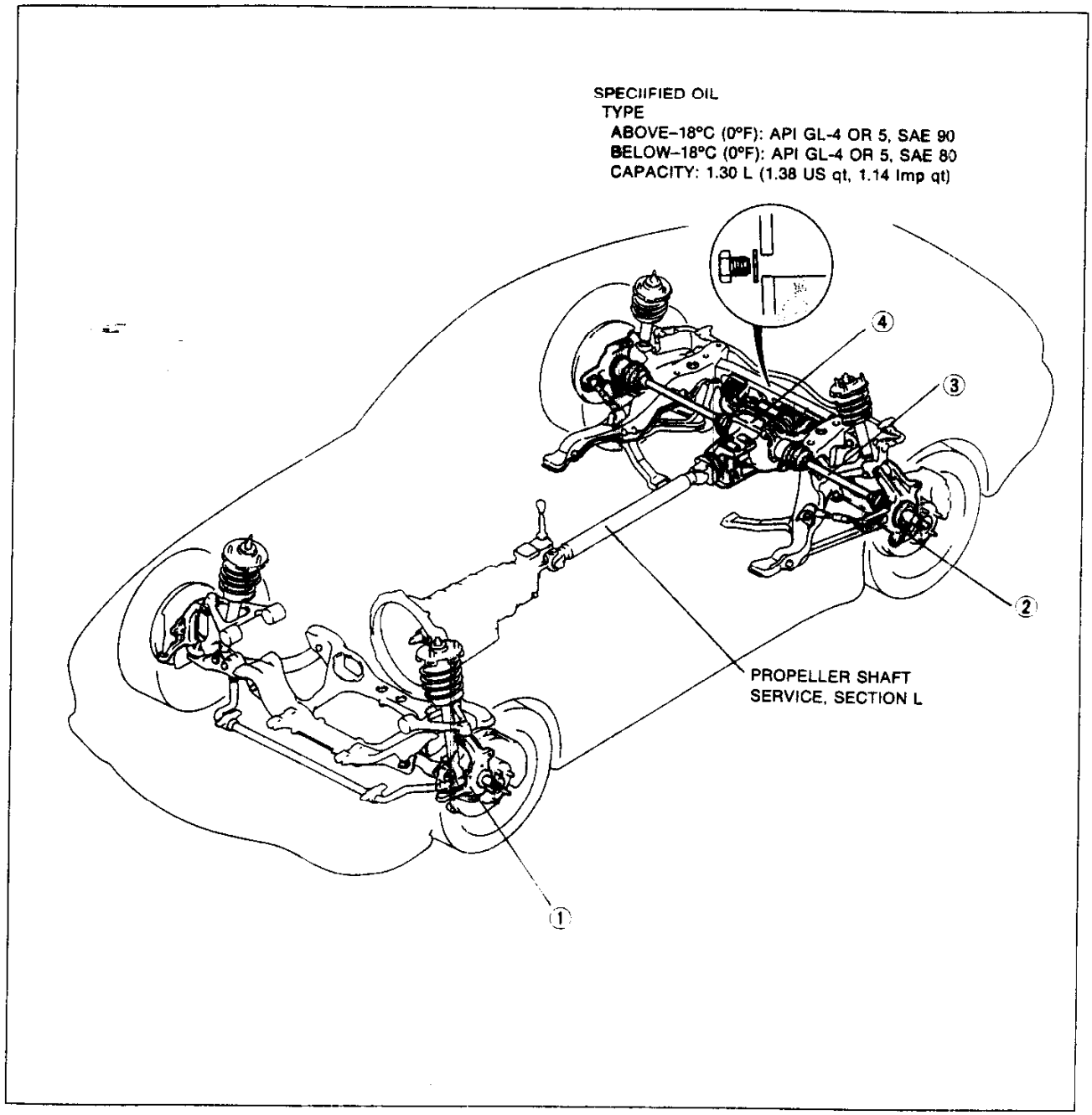
37UCLX-012

2. Perform a road test and verify that there is no noise or vibration when driving the vehicle.
3. If noise or vibration comes from the propeller shaft assembly, replace it.

FRONT AND REAR AXLES

37U0MX-001

INDEX



37U0MX-002

OUTLINE

SPECIFICATION

Item \ Engine / Transmission			13B	
			MT	AT
Front axle				
Bearing type			Unitized angular ball bearing	
Rear axle				
Bearing type			Unitized angular ball bearing	
Drive shaft				
Type			Constant velocity joint	
Length (between centers of joints)		mm {in}	484.2 {19.06}	
Diameter		mm {in}	29.0 {1.14}	
Differential				
Type			Torque sensing LSD	
Reduction gear			Hypoid gear	
Differential gear			Worm gear	
Reduction ratio			4.100	3.909
Number of teeth	Ring gear		41	43
	Drive pinion gear		10	11
Ring gear size		mm {in}	204.2 {8.038}	
Oil	Grade	mm {in}	API service GL-4 or 5	
	Viscosity		Above– 18°C (0°F): SAE 90 Below– 18°C (0°F): SAE 80	
	Capacity	L {US qt, Imp qt}	1.30 {1.38, 1.14}	

37U0MX-003

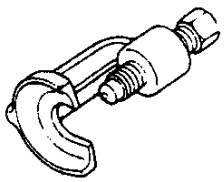
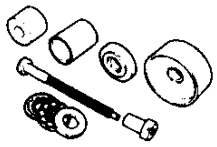
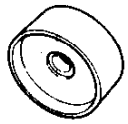
TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Front axle			
Steering wheel vibration	Worn or damaged wheel bearing	Replace	M– 5
Pulls or one-sided braking	Worn or damaged wheel bearing	Replace	M– 5
Rear axle			
Abnormal noise	Worn or damaged wheel bearing	Replace	M–12
	Bent drive shaft	Replace	M–15
	Worn drive shaft spline	Replace	M–15
Differential			
Abnormal noise	Insufficient differential oil	Add oil	M–23
	Incorrect differential oil	Replace	M–23
	Worn or damaged side bearing	Replace	M–30
	Worn or damaged ring gear	Replace	M–30
	Worn or damaged drive pinion bearing	Replace	M–30
	Worn or damaged gear in LSD assembly	Replace gear case	M–30
	Worn side gear spline	Replace	M–30
	Improperly adjusted drive pinion gear preload	Adjust	M–38
	Improperly adjusted ring gear backlash	Adjust	M–39
	Poor contact of ring gear teeth	Adjust	M–41
Heat buildup	Insufficient differential oil	Add oil	M–23
	Insufficient drive pinion gear backlash	Adjust	M–39
	Excessive bearing preload	Adjust	M–38
Oil leakage	Excessive differential oil	Remove oil	M–23
	Worn or damaged oil seal	Replace	M–24
	Loose differential carrier	Tighten or repair	M–30
No differential operation	Misassembled or damaged	Repair or replace	M–30

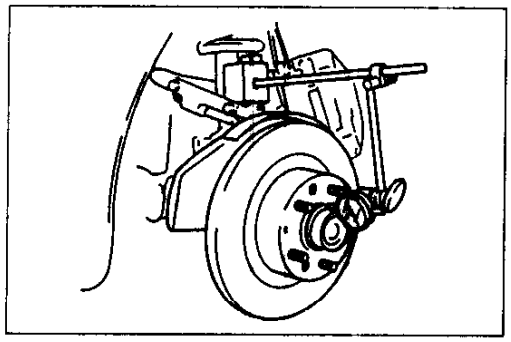
37U0MX-004

FRONT AXLE

PREPARATION
SST

49 0118 850C Puller, ball joint 	For removal of ball joint	49 H028 2A0 Replacer set, rubber bushing 	For installation of ABS sensor rotor
49 H028 204 Attachment (Part of 49 H028 2A0) 	For installation of ABS sensor rotor		

37U0MX-005



37U0MX-006

WHEEL HUB / STEERING KNUCKLE

Preinspection

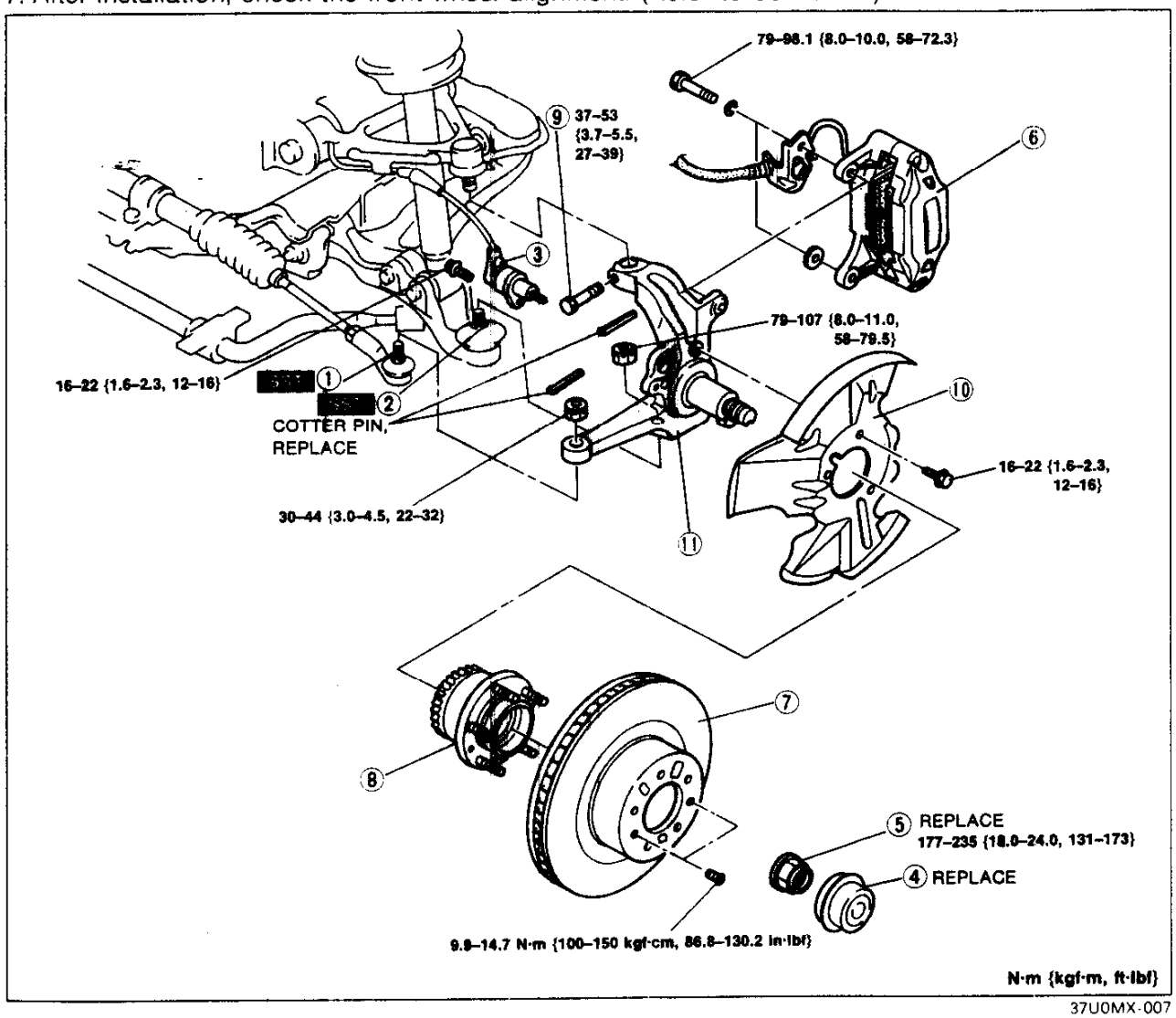
Wheel bearing play

1. Position a dial indicator against the wheel hub.
2. Push and pull the wheel hub by hand in the axial direction and measure the wheel bearing play.
3. If the bearing play exceeds specification, check and adjust the wheel hub nut torque or replace the wheel hub assembly, if necessary.

Wheel bearing play: 0.05 mm {0.002 in} max.

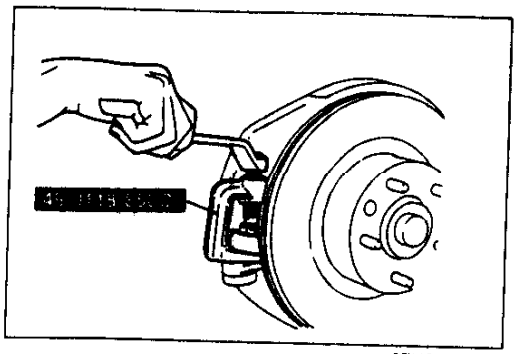
Removal / Inspection / Installation

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheel.
3. Remove in the order shown in the figure, referring to **Removal Note**.
4. Inspect all parts and repair or replace as necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Install the wheel. (Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–86 in·lbf})
7. After installation, check the front wheel alignment. (Refer to Section R.)



37U0MX-007

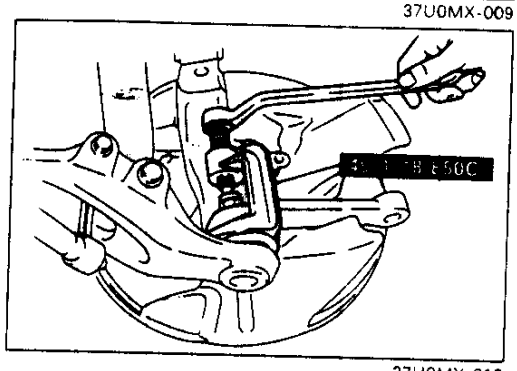
1. Tie rod end ball joint
   - Removal Note ..... page M–6
   - Service ..... Section N
2. Lower arm ball joint
   - Removal Note ..... page M–6
   - Service ..... Section R
3. ABS wheel-speed sensor
   - Service ..... Section P
4. Hub cap
5. Wheel hub nut
   - Installation Note ..... page M–6
6. Brake caliper assembly
   - Removal Note ..... page M–6
   - Service ..... Section P
7. Disc plate
   - Service ..... Section P
8. Wheel hub assembly
   - Inspect for cracks and damage
   - Inspect bearing for rough rotation
   - Disassembly / Inspection / Installation ..... page M–7
9. Bolt (upper arm)
10. Dust cover
    - Inspect for cracks and damage
11. Steering knuckle
    - Inspect for cracks and damage



37U0MX-009

Removal note
Tie rod end ball joint

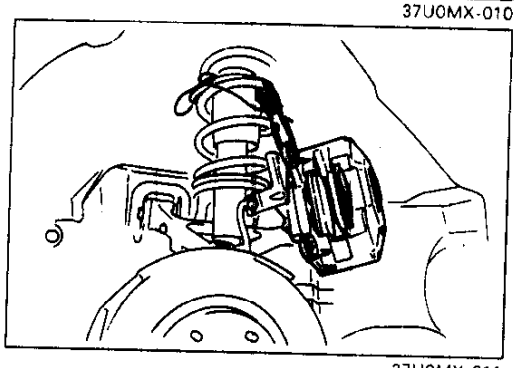
1. Loosen the tie rod end nut until it is flush with the end of the stud.
2. With the nut protecting the tie rod end stud, separate the tie rod end from the steering knuckle by using the **SST**.



37U0MX-010

Lower arm ball joint

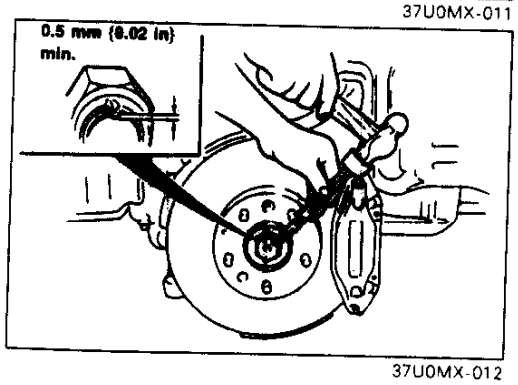
1. Loosen the nut until it is flush with the end of the stud.
2. With the nut protecting the ball joint stud, separate the ball joint from the knuckle by using the **SST**.



37U0MX-011

Brake caliper assembly

Hang the brake caliper assembly out of the way as shown in the figure.



37U0MX-012

Installation note
Wheel hub nut

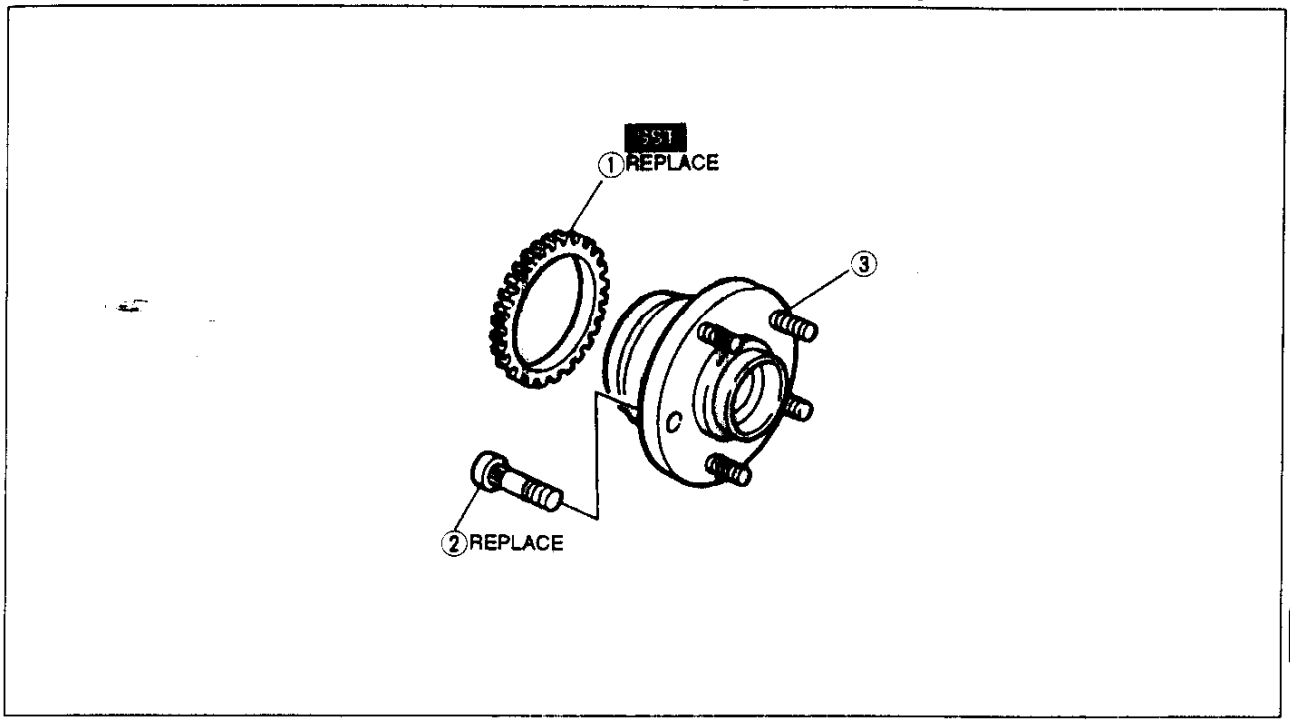
1. Install a new hub nut and stake it as shown.

Tightening torque:
177–235 N·m {18.0–24.0 kgf·m, 131–173 ft·lbf}

2. Measure the wheel bearing play. (Refer to page M–4.)

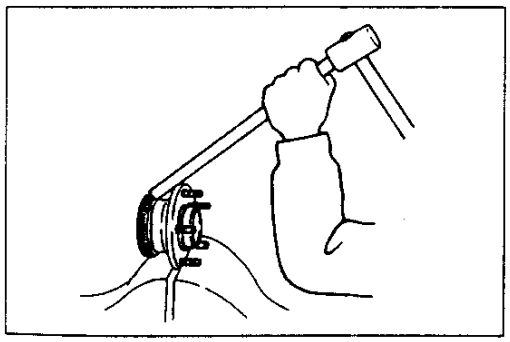
Disassembly / Inspection / Assembly

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**.



37U0MX-013

1. ABS sensor rotor
   Disassembly Note ..... below
   Assembly Note ..... page M–8
2. Hub bolt
   Disassembly Note ..... below
   Assembly Note ..... page M–8
3. Wheel hub
   Inspect bearing for rough rotation
   (Not repairable, replace hub assembly)

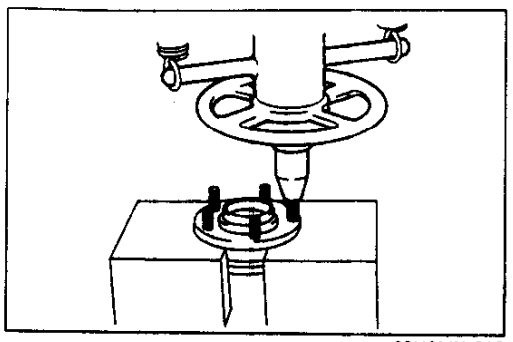


37U0MX-014

Disassembly note
ABS sensor rotor

Caution
- **Do not remove the sensor rotor if not necessary.**
- **Do not reuse the sensor rotor if removed.**

Remove the sensor rotor by using a brass bar and a hammer.

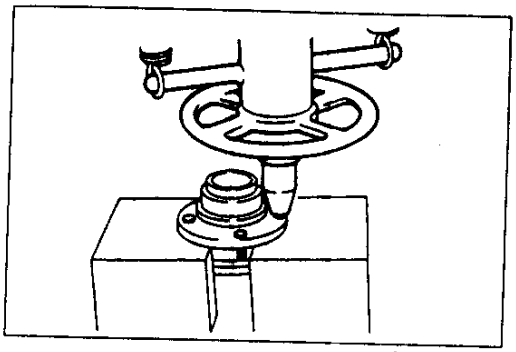


29U0MX-012

Hub bolt

Caution
- **Do not remove the hub bolts if not necessary.**
- **Do not reuse the hub bolts if removed.**

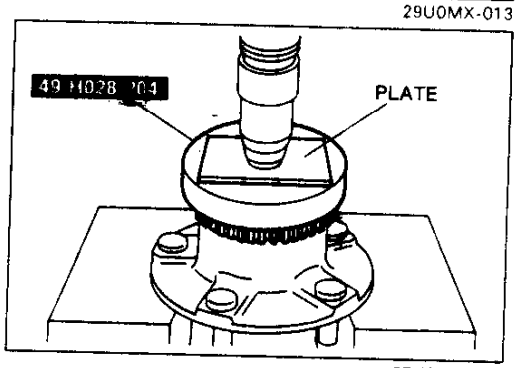
Remove the hub bolts by using a press.



29U0MX-013

Assembly note
Hub bolt

Press in new hub bolts.



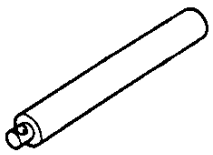
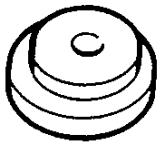
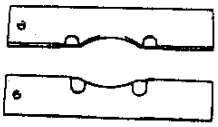
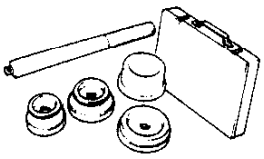
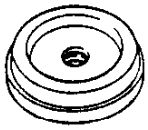
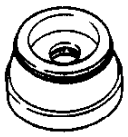
37U0MX-015

ABS sensor rotor

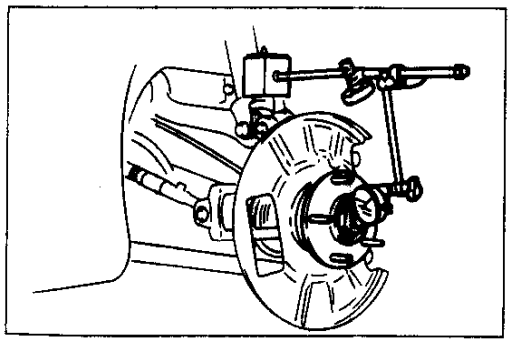
Press on the new sensor rotor by using the **SST**.

REAR AXLE

PREPARATION
SST

49 G033 102 Handle 	For removal of axle flange	49 G033 105 Attachment 	For removal of axle flange
49 F026 103 Plate, removing 	For removal of axle flange	49 F027 0A1 Installer set, bearing 	For removal of wheel bearing and installation of axle flange
49 F027 004 Attachment (Part of 49 F027 0A1) 	For installation of wheel bearing	49 F027 005 Attachment (part of 49 F027 0A1) 	For removal of wheel bearing and installation of axle flange
49 H034 201 Block, support 	For installation of wheel bearing		

37U0MX-016



37U0MX-017

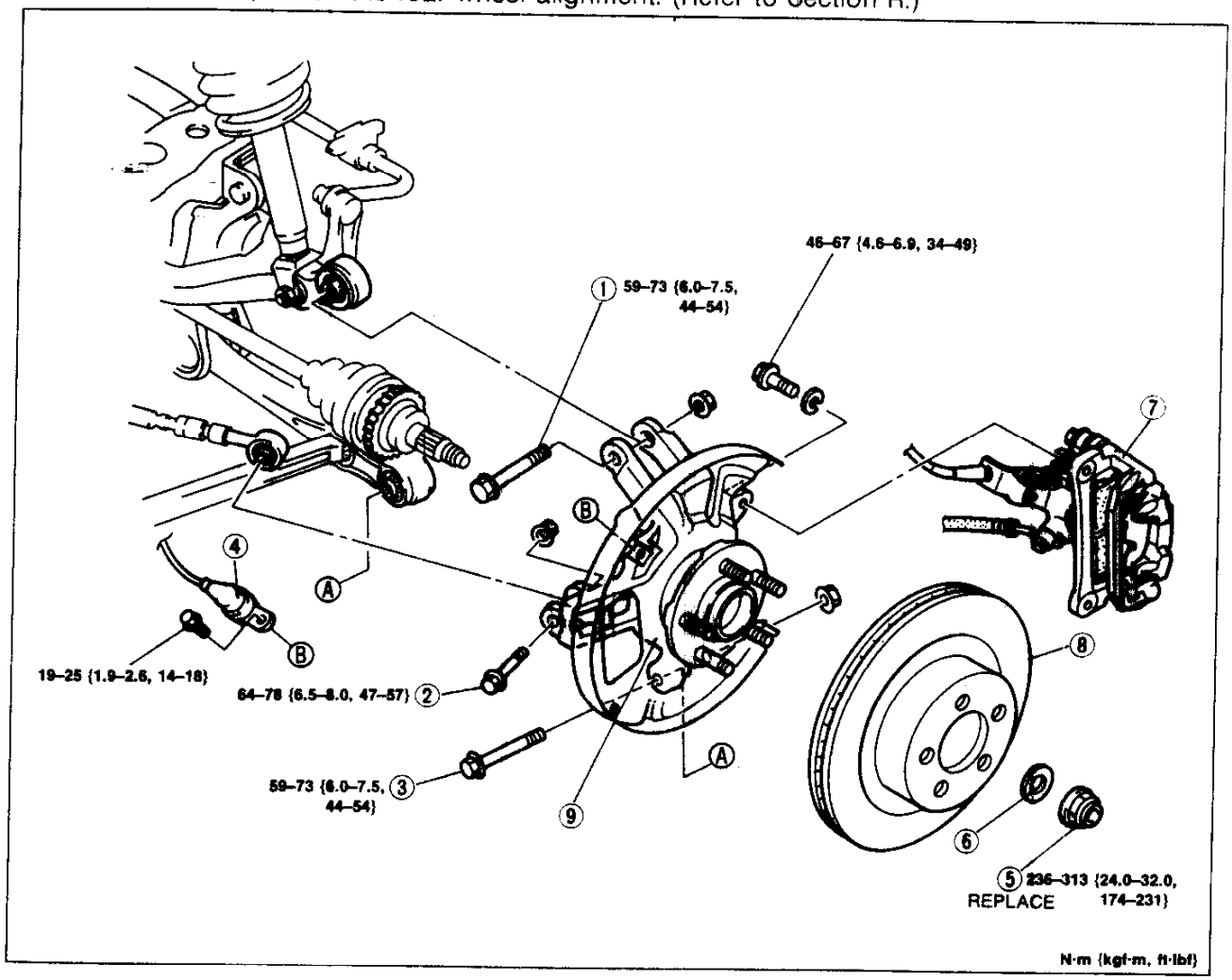
WHEEL HUB
Preinspection
Wheel bearing play

1. Position a dial indicator against the wheel hub.
2. Push and pull the wheel hub by hand in the axial direction and measure the wheel bearing play.
3. If the bearing play exceeds specification, check and adjust the wheel hub nut torque or replace the wheel bearing, if necessary.

Wheel bearing play: 0.05 mm {0.002 in} max.

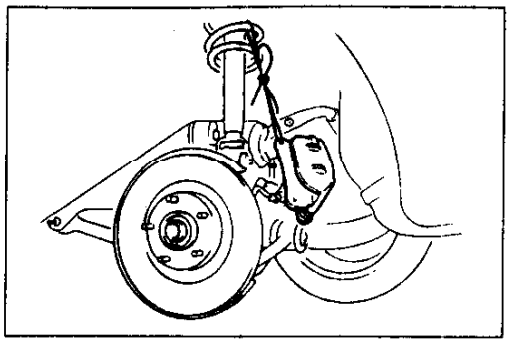
Removal / Inspection / Installation

1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove the wheel.
3. Remove in the order shown in the figure, referring to **Removal Note**.
4. Inspect all parts and repair or replace as necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Install the wheel. (Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–86 ft·lbf})
7. After installation, check the rear wheel alignment. (Refer to Section R.)



37U0MX-018

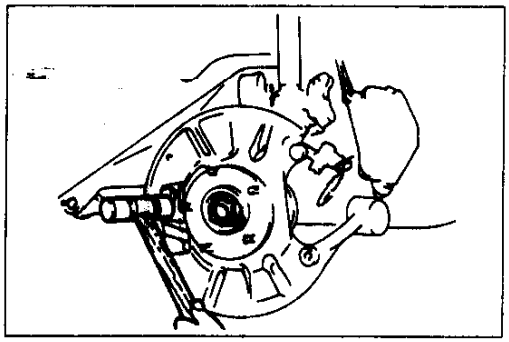
1. Bolt (upper arm)
2. Bolt (toe control link)
3. Bolt (I-arm)
4. ABS wheel-speed sensor
   Service ..... Section P
5. Wheel hub nut
   Installation Note ..... page M–11
6. Washer
7. Brake caliper assembly
   Removal Note ..... page M–11
   Service ..... Section P
8. Disc plate
   Service ..... Section P
9. Rear hub support assembly
   Removal Note ..... page M–11
   Disassembly / Inspection / Assembly ..... page M–12



37U0MX-020

Removal note
Brake caliper assembly

Hang the brake caliper assembly as shown in the figure.

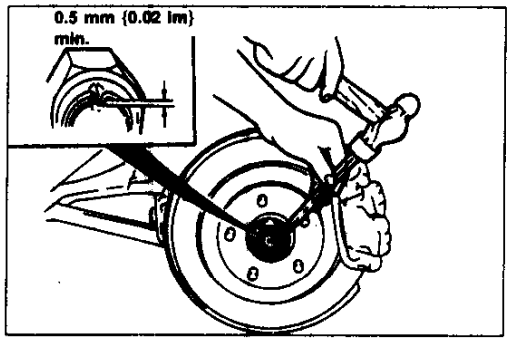


37U0MX-021

Rear hub support assembly

Note

- **If the drive shaft is stuck to the wheel hub, install a used nut until it is flush with the end of the shaft. Tap the nut with a brass hammer to drive out the drive shaft.**



37U0MX-022

Installation note
Wheel hub nut

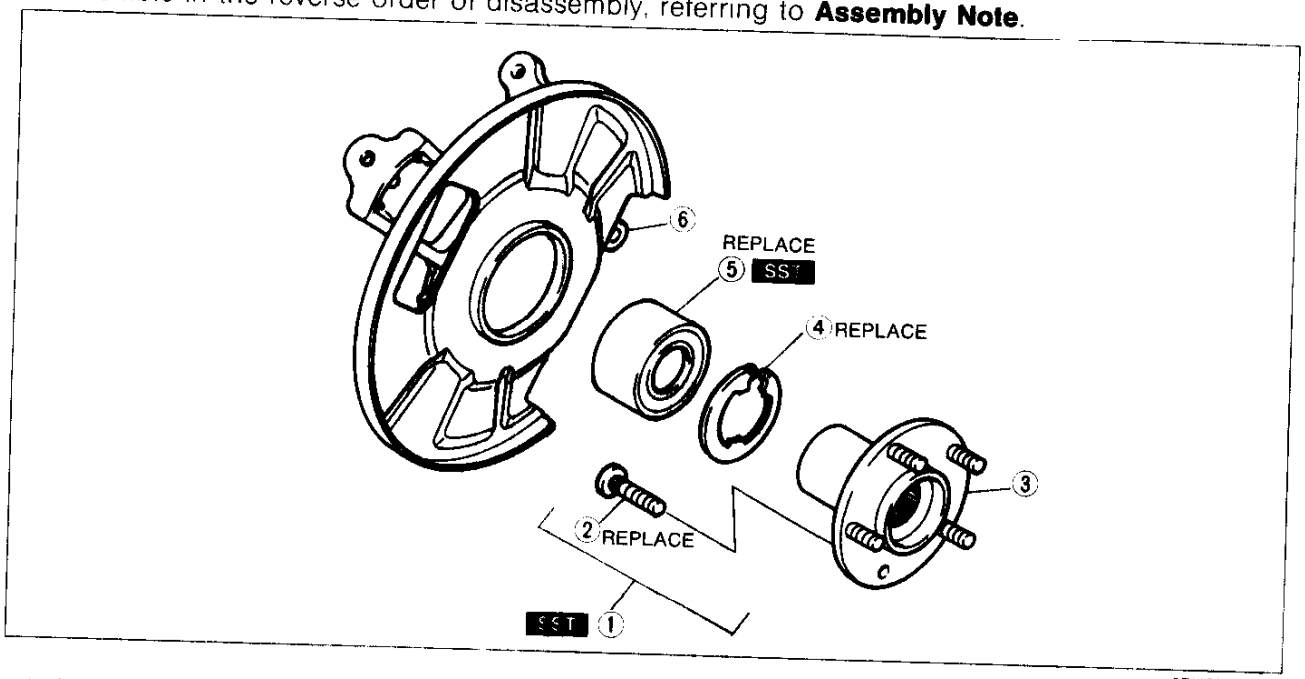
1. Install a new hub nut and stake it as shown.

Tightening torque:
236–313 N·m {24.0–32.0 kgf·m, 174–231 ft·lbf}

2. Check the wheel bearing play. (Refer to page M-9.)

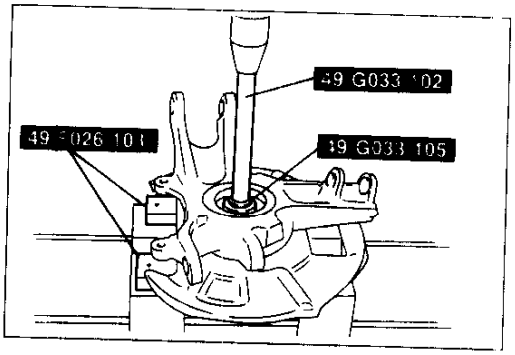
Disassembly / Inspection / Assembly

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**.

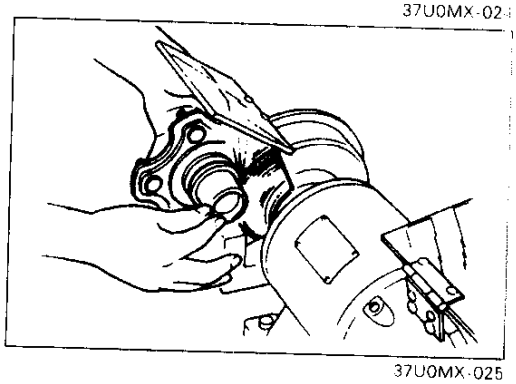


37U0MX-023

1. Axle flange assembly
   Disassembly Note ..... below
   Assembly Note ..... page M–13
2. Hub bolt
   Disassembly Note ..... page M–13
   Assembly Note ..... page M–13
3. Axle flange
   Inspect for cracks and damage
4. Retaining ring
5. Wheel bearing
   Disassembly Note ..... page M–13
   Assembly Note ..... page M–13
6. Rear hub support assembly
   Inspect for cracks and damage



37U0MX-024



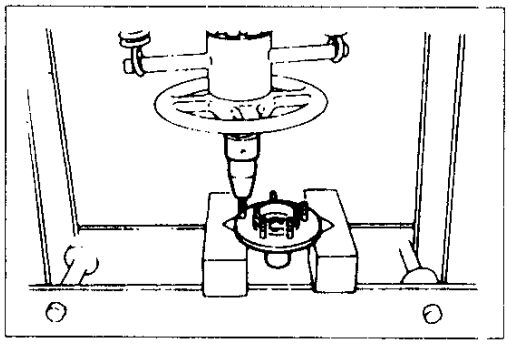
37U0MX-025

Disassembly note
Axle flange assembly

1. Remove the axle flange assembly by using the **SST**.

Caution
- **Do not damage the axle flange.**

2. Grind a section of the bearing race until **approx. 0.5 mm {0.02 in}** thickness remains.
3. Cut the race by using a chisel and remove it.

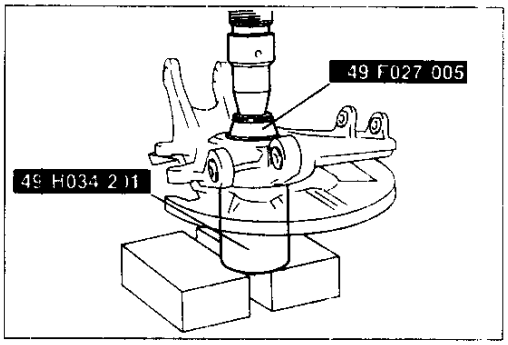


29U0MX-026

Hub bolt

Caution
- **Do not remove the hub bolts if not necessary.**
- **Do not reuse the hub bolts if removed.**

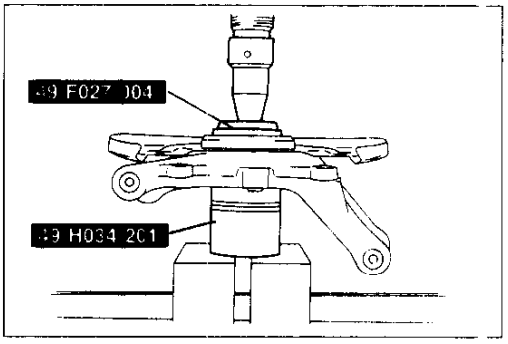
Remove the hub bolts by using a press.



29U0MX-027

Wheel bearing

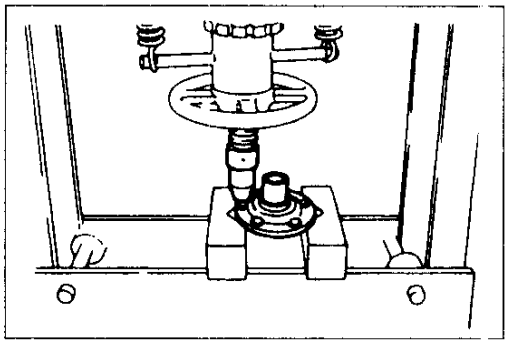
Remove the wheel bearing by using the **SST**.



29U0MX-028

Assembly note
Wheel bearing

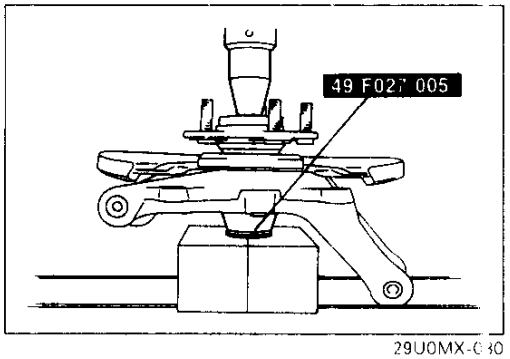
Install the new wheel bearing by using the **SST**.



29U0MX-029

Hub bolt

Press in new hub bolts.



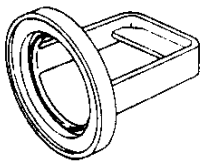
29U0MX-030

Axle flange assembly

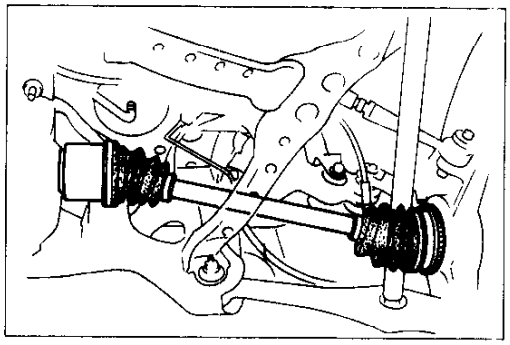
Install the axle flange assembly by using the **SST**.

DRIVE SHAFT

PREPARATION

49 F026 104 Installer, sensor rotor		For installation of ABS sensor rotor

37U0MX-026



37U0MX-027

DRIVE SHAFT (TRIPOD JOINT)

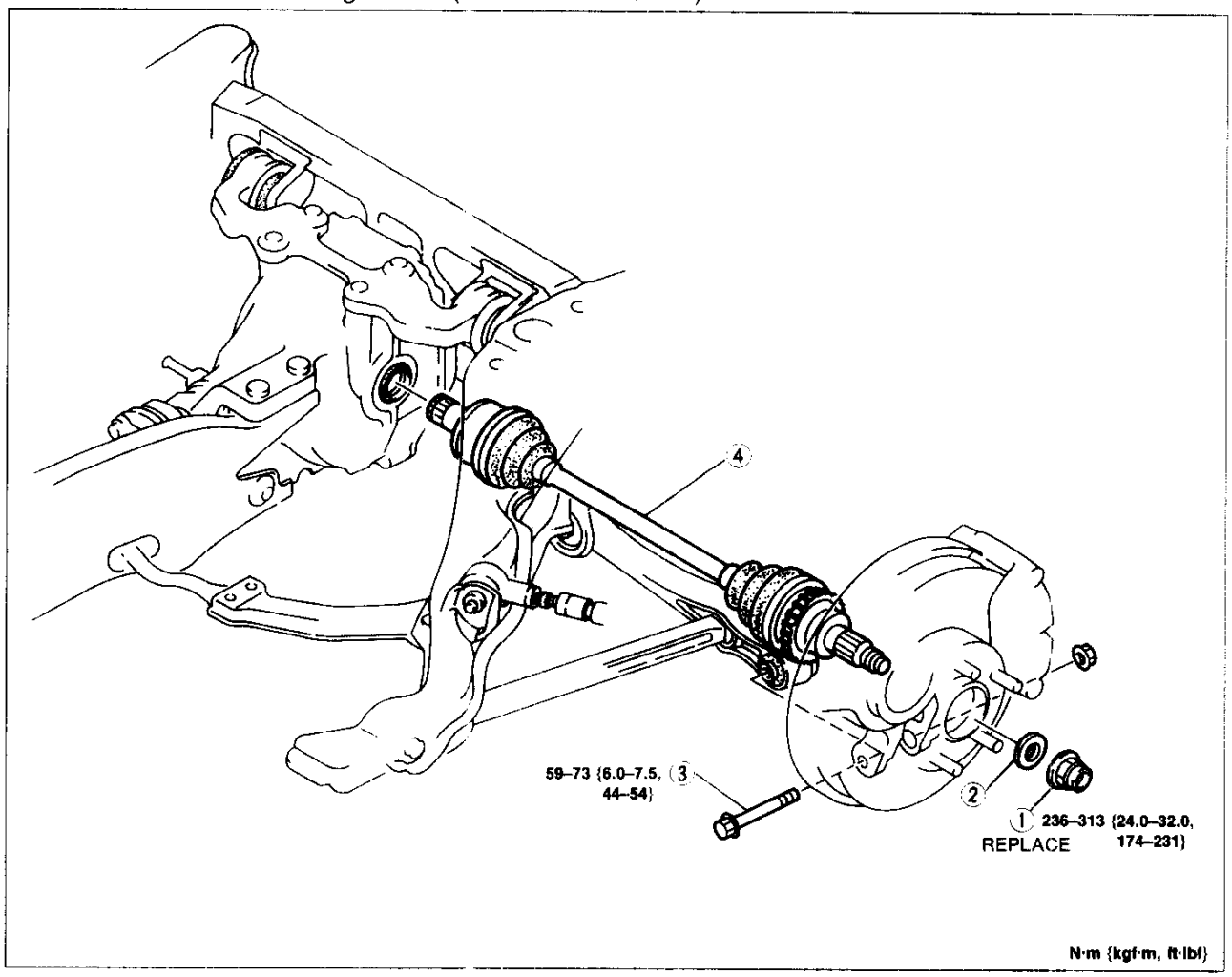
Preinspection

Drive shaft

1. Check the dust boot on the drive shaft for cracks, damage, grease leakage, and a loose boot band.
2. Check the drive shaft for bending, cracks, and wear of the joints and splines.
3. Repair or replace the drive shaft as necessary.

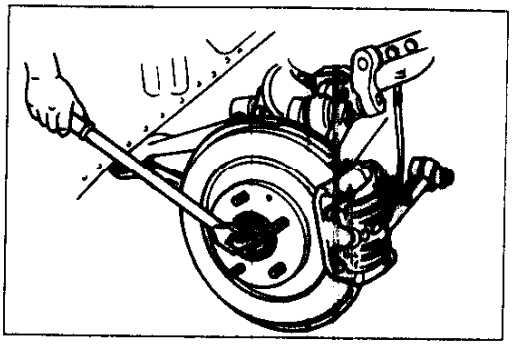
Removal / Installation

1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove the wheel.
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. Install the wheel. (Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–86 ft·lbf})
6. Check the rear wheel alignment. (Refer to Section R.)



37U0MX-028

1. Wheel hub nut
   - Removal Note ..... page M–16
   - Installation Note ..... page M–17
2. Washer
3. Bolt (I-arm)
4. Drive shaft
   - Removal Note ..... page M–16
   - Installation Note ..... page M–16
   - Overhaul ..... page M–18

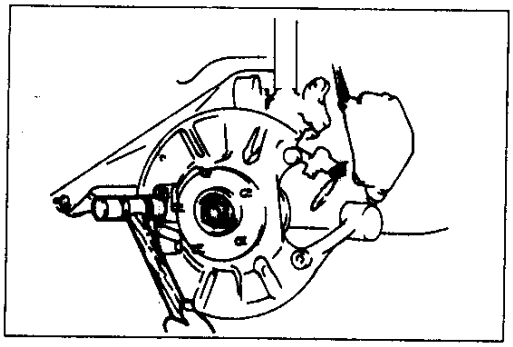


370MX-029

Removal note
Wheel hub nut

Caution
- **Do not damage the drive shaft.**

1. Raise the staked portion of the hub nut by usin chisel.
2. Lock the hub by applying the parking brakes.
3. Remove the hub nut.

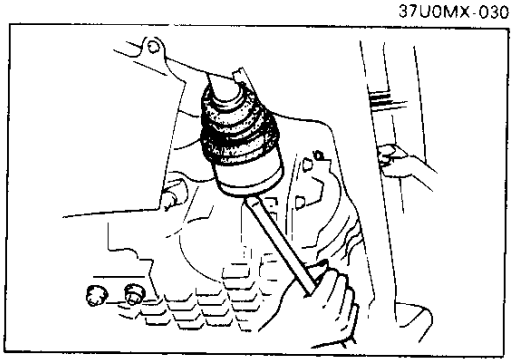


37U0MX-030

Drive shaft

Note
- **If the drive shaft is stuck in the rear hub supp install a used nut until it is flush with the end of shaft. Tap the nut with a brass hammer to drive the drive shaft.**

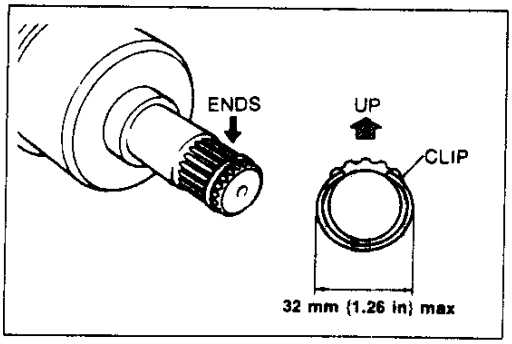
1. Pull the rear hub support from the drive shaft.



37U0MX-031

Caution
- **Do not damage the oil seal.**

2. Remove the drive shaft from the differential by usin pry bar.

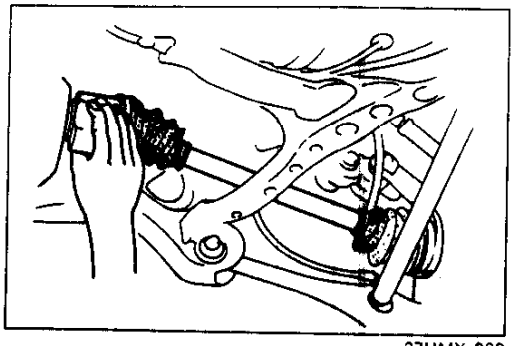


37U0MX-032

Installation note
Drive shaft

Caution
- **Do not excessively spread the clip when installi it.**
- **Measure the outside diameter of the clip af installing it on the shaft. Replace the clip if exceeds the specification.**

1. Install a new clip on the drive shaft.

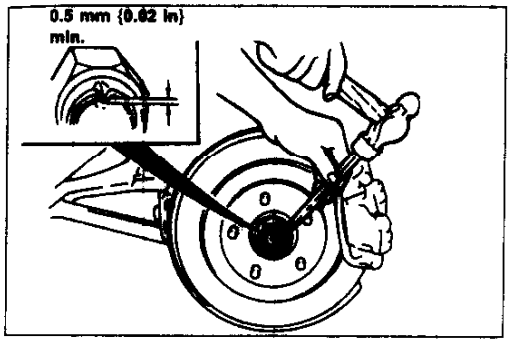


37UMX-033

Caution
- **Do not damage the oil seal.**

2. With the ends of the clip facing upward, push the dri shaft into the differential.

Note
- **After installation, pull outward on the tripod joi outer ring and verify that the drive shaft is held i the clip.**



37U0MX-034

Wheel hub nut

1. Install a new hub nut and stake it as shown.

Tightening torque:
236–313 N·m {24.0–32.0 kgf·m, 174–231 ft·lbf}

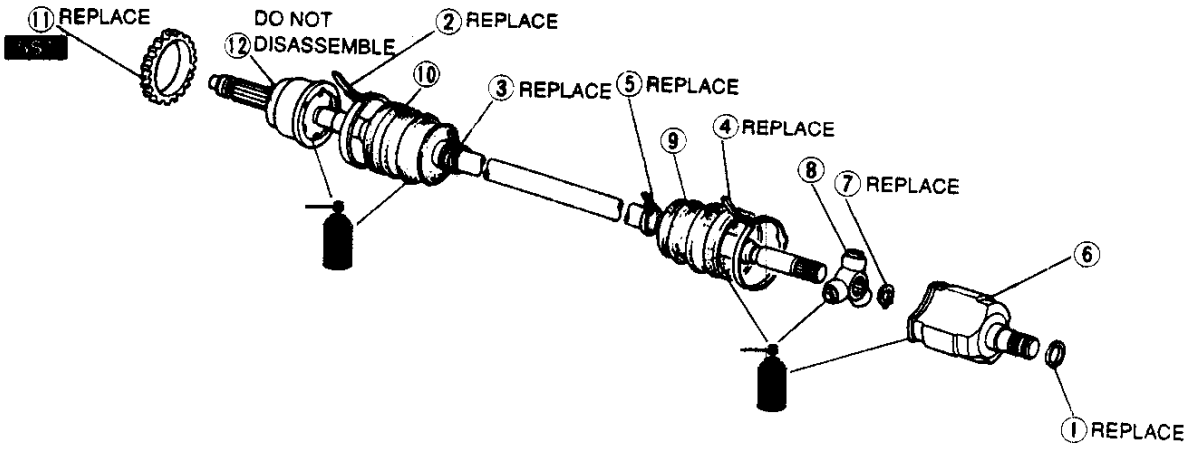
2. Check the wheel bearing play. (Refer to page M–9.)

Overhaul

Caution

- **Secure the joint in a vise with protective material (such as aluminum 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.**

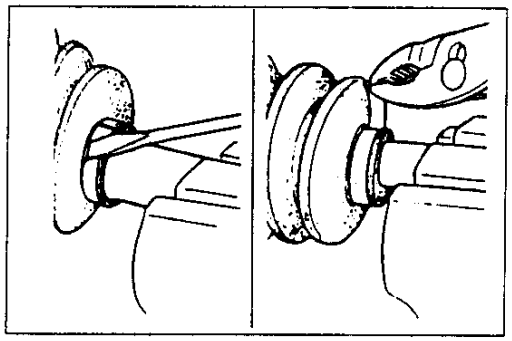
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



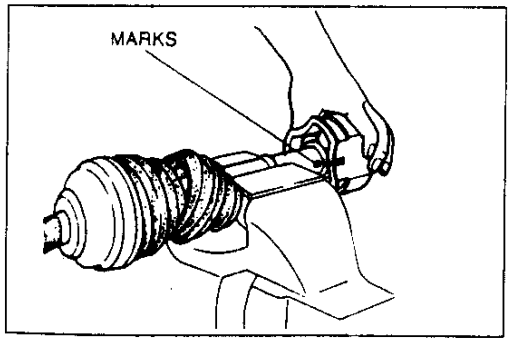
37U0MX-035

1. Clip
2. Boot band
   Disassembly Note ..... below
   Assembly Note ..... page M–21
3. Boot band
   Disassembly Note ..... below
   Assembly Note ..... page M–21
4. Boot band
   Disassembly Note ..... below
   Assembly Note ..... page M–21
5. Boot band
   Disassembly Note ..... below
   Assembly Note ..... page M–21
6. Outer ring
   Disassembly Note ..... below
   Inspect inside bore for wear, corrosion, and scoring
   Assembly Note ..... page M–21
7. Snap ring
   Disassembly Note ..... below
   Assembly Note ..... page M–21
8. Tripod joint
   Disassembly Note ..... below
   Inspect for wear and damage
   Assembly Note ..... page M–21
9. Boot
   Disassembly Note ..... page M–20
   Inspect for damage
   Assembly Note ..... page M–20
10. Boot
    Disassembly Note ..... page M–20
    Inspect for damage
    Assembly Note ..... page M–20
11. ABS sensor rotor
    Disassembly Note ..... page M–20
    Assembly Note ..... page M–20
12. Shaft and ball joint assembly
    Inspect splines for damage and wear
    Inspect wheel-side joint for excessive play and rough rotation.

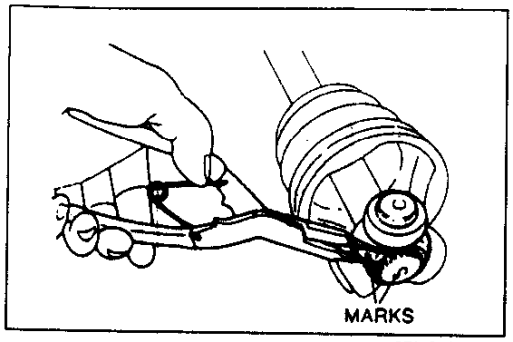
37U0MX-036



37U0MX-037



1PE0MX-073



37U0MX-038

Disassembly note
Boot band

Caution
- **Do not remove the wheel side boot band if not necessary.**

1. Pry up the locking tabs of the boot band by using a screwdriver.
2. Remove the band by using pliers.

Outer ring

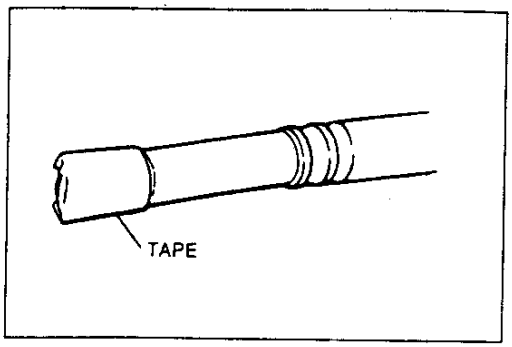
Mark the outer ring and the shaft for proper reassembly.

Snap ring / Tripod joint

1. Mark the shaft and tripod joint for proper reassembly.
2. Remove the snap ring by using snap-ring pliers.

Caution
- **Do not damage the bearings.**

3. Drive the tripod joint from the shaft by using a bar and a hammer.



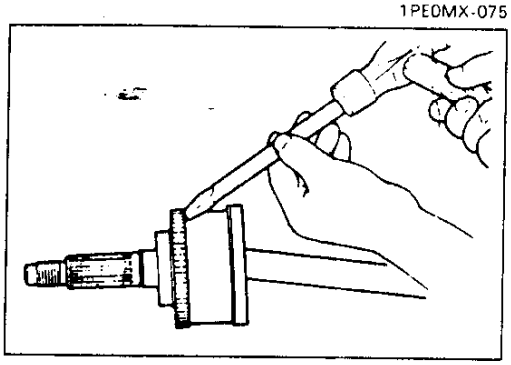
1PE0MX-075

Boot

Caution

- **Do not remove the wheel side boot if not necessary.**

Wrap the splines of the shaft with tape to prevent damaging the boot.



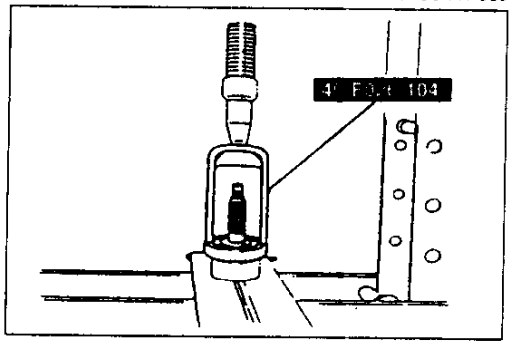
37U0MX-039

ABS sensor rotor

Caution

- **Do not remove the sensor rotor if not necessary.**
- **Do not reuse the sensor rotor if removed.**

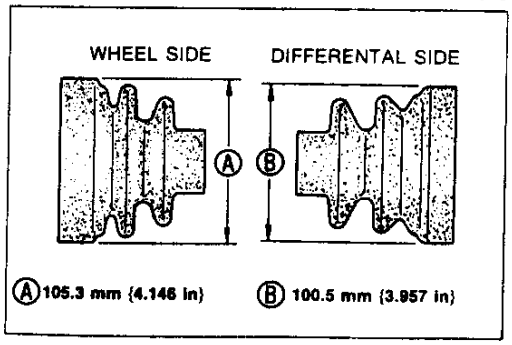
Tap the sensor rotor off the drive shaft by using a chisel and a hammer.



37U0MX-040

Assembly note
ABS sensor rotor

Set a new sensor rotor on the drive shaft and press it on by using the **SST**.

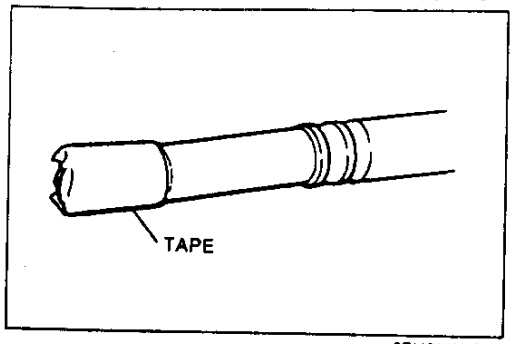


37U0MX-041

Boot

Caution

- **The wheel-side and differential side boots are different. Do not misassemble them.**



37U0MX-042

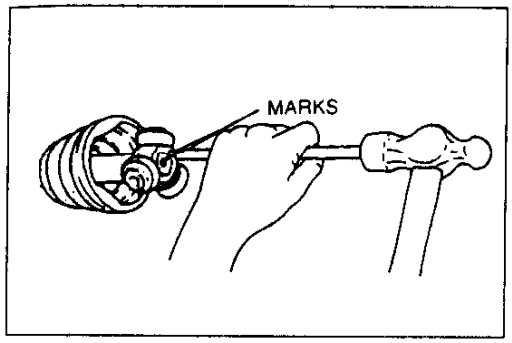
1. Wrap the splines of the differential side shaft, and install the boot.

Caution

- **Use the specified grease that it is supplied in the boot and joint kits.**

2. Fill the wheel side boot with the specified grease.

Grease amount: 100–120g (3.53–4.23 oz)

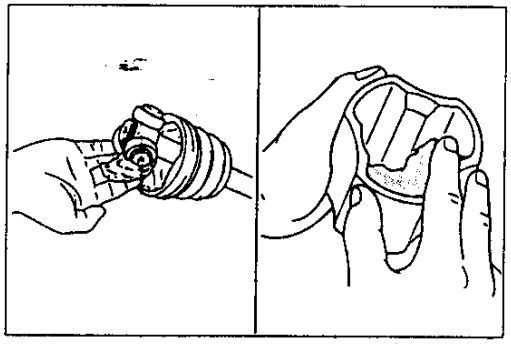


37U0MX-043

Tripod joint / Snap ring

Caution
- **Do not damage the bearing.**

1. Align the marks and install the tripod joint by using a bar and a hammer.
2. Install a new snap ring by using snap-ring pliers.

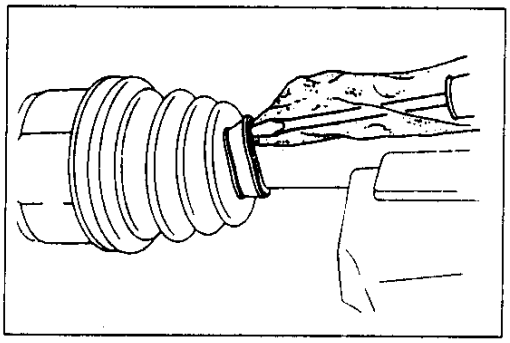

37U0MX-045

Outer ring

Caution
- **Use the specified grease that it is supplied in the boot and joint kits.**

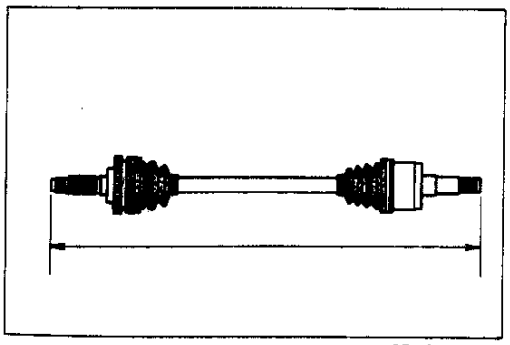
Fill the outer ring and boot (differential side) with the specified grease.

Grease amount: 170–190g (6.01–6.70 oz)


37U0MX-046

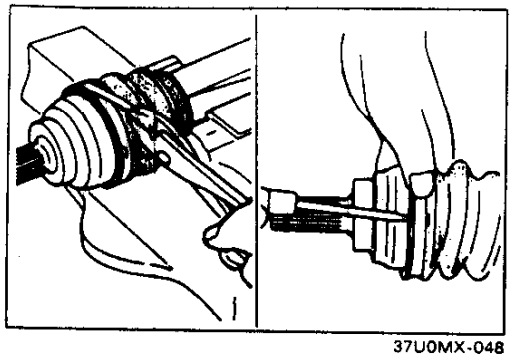
Boot band

Caution
- **Be sure the boot is not dented or twisted.**
- **Carefully lift up the small end of the boot to release any trapped air.**


37U0MX-047

1. Measure the length of drive shaft.

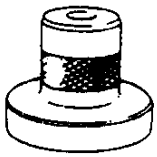
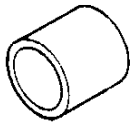
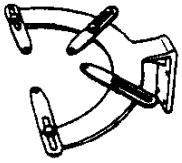
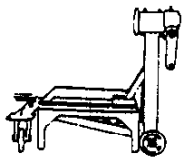
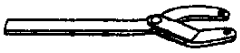
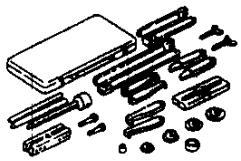
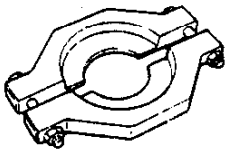
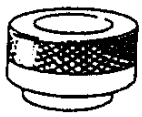
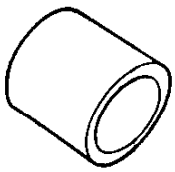
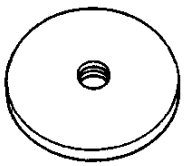
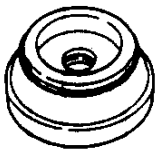
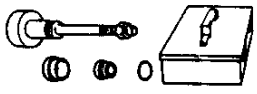
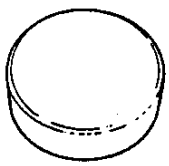
Drive shaft length: 791.2–801.2 mm {31.15–31.54 in}

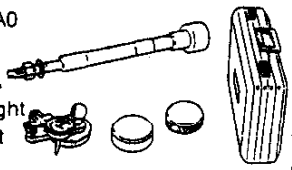
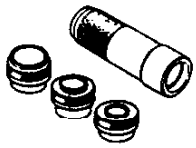
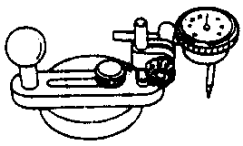
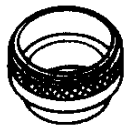
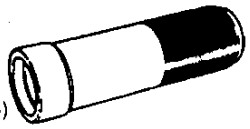

37U0MX-048

2. Fold the new boot band back by pulling on the end with pliers.
3. Lock the end of the boot band by bending the locking tabs.

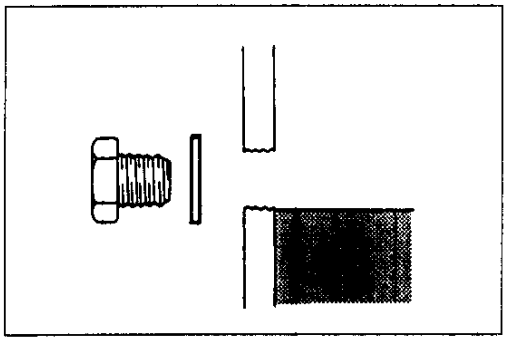
DIFFERENTIAL

PREPARATION
SST

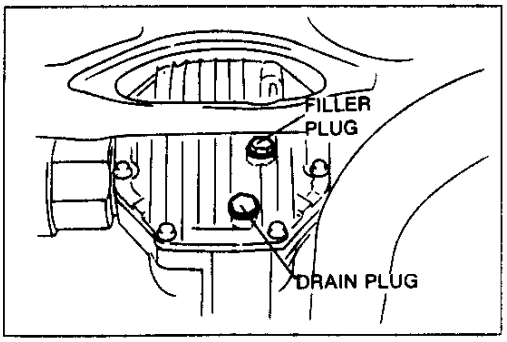
49 V001 795 Installer, oil seal 	For installation of oil seal (companion flange)	49 B001 795 Installer, oil seal 	For installation of oil seal (side bearing)
49 U027 003 Installer, oil seal 	For installation of oil seal (side bearing)	49 B001 797 Handle (Part of 49 B001 795) 	For installation of oil seal (side bearing)
49 M005 561 Hanger, differential carrier 	For disassembly / assembly of differential	49 0107 680A Stand, engine 	For disassembly / assembly of differential
49 S120 710 Holder, coupling flange 	For removal / installation of companion flange nut	49 0839 425C Puller set, bearing 	For Removal of companion flange and side bearing
49 H027 002 Remover, bearing 	For removal of rear bearing	49 UB71 525 Installer, bearing 	For installation of side bearing
49 J027 002 Collar 	For adjustment of pinion height	49 J027 001 Installer, bearing 	For installation of rear bearing race
49 F027 007 Attachment ϕ 72 	For installation of front bearing race	49 8531 567 Collar A (Part of 49 8531 565) 	For adjustment of pinion height
49 8531 565 Pinion model 	For adjustment of pinion height	49 0660 555 Gauge block (Part of 49 F027 0A0) 	For adjustment of pinion height

49 F027 0A0 Gauge set, pinion height adjustment 	For adjustment of pinion height	49 F401 330B Installer set, bearing 	For installation of rear bearing
49 0727 570 Gauge body, pinion height (Part of 49 F027 0A0) 	For adjustment of pinion height	49 G030 338 Attachment E 	For installation of rear bearing
49 F401 331 Body (Part of 49 F401 330B) 	For installation of rear bearing		

37U0MX-049



37U0MX-050



37U0MX-051

DIFFERENTIAL OIL

Inspection

Caution
- **Position the vehicle level.**

1. Remove the filler plug.
2. Verify that the oil is at the bottom of the filler plug hole. If it is low, add the specified oil.
3. Install a new washer and the filler plug.

Tightening torque:
39–53 N·m {4.0–5.5 kgf·m, 29–39 ft·lbf}

Replacement

1. Remove the filler and drain plugs.
2. Drain the differential oil into a suitable container.
3. Wipe the plugs clean.
4. Install a new washer and the drain plug.

Tightening torque:
39–53 N·m {4.0–5.5 kgf·m, 29–39 ft·lbf}

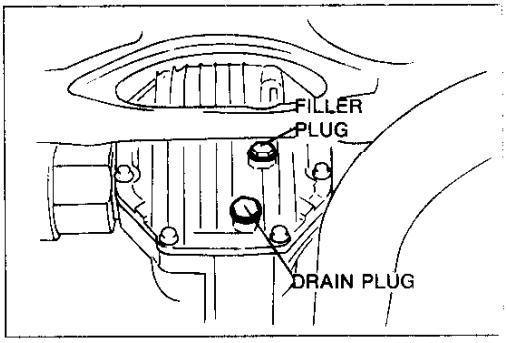
5. Add the specified oil from the filler plug hole unit it reaches the bottom of the hole.

Specified oil
Type
Above – 18°C {0°F}: API GL-4 or 5, SAE 90
Below – 18°C {0°F}: API GL-4 or 5, SAE 80
Capacity: 1.30 L {1.38 US qt, 1.14 Imp qt}

6. Install a new washer and the filler plug.

Tightening torque:
39–53 N·m {4.0–5.5 kgf·m, 29–39 ft·lbf}

29U0MX-060



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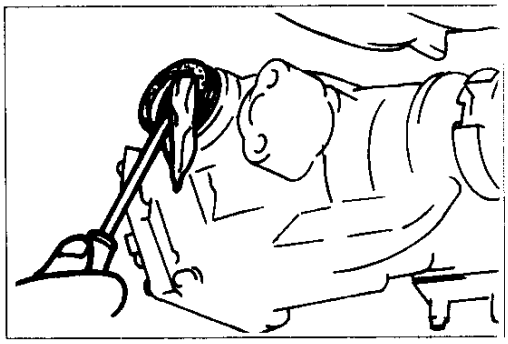
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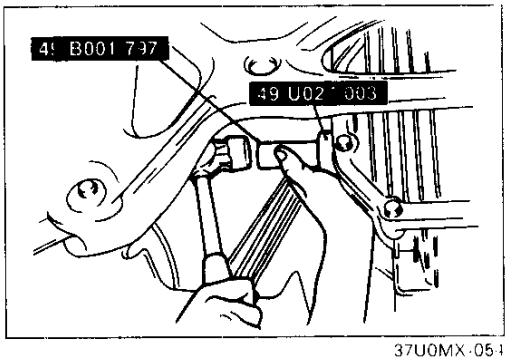

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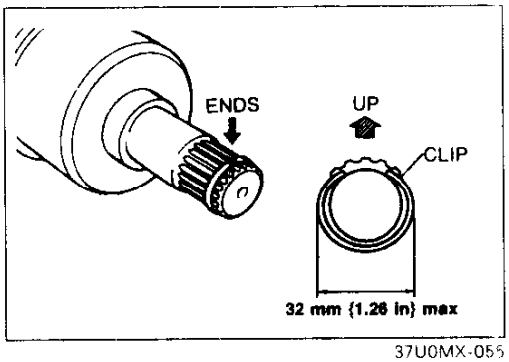

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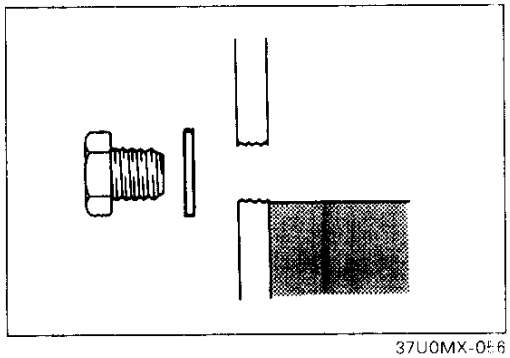

37U0MX-05

OIL SEAL

Replacement

Oil seal (side bearing)

1. Remove the filler and drain plugs.
2. Drain the differential oil into a suitable container.
3. Wipe the plugs clean.
4. Install a new washer and the drain plug.

Tightening torque:
39–53 N·m {4.0–5.5 kgf·m, 29–39 ft·lbf}

5. Remove the drive shaft. (Refer to page M–15.)
6. Remove the clip from the drive shaft.

Caution
- **Use a screwdriver covered with a rag to prevent damaging the differential carrier.**

7. Pry out the oil seal.

8. Apply clean differential oil to the lip of a new oil seal.
9. Install the oil seal by using the **SST**.

Caution
- **Measure the outside diameter of the clip after installing it on the shaft. Replace the clip if it exceeds the specification.**

10. Install a new clip onto the drive shaft.

Caution
- **Do not damage the oil seal.**

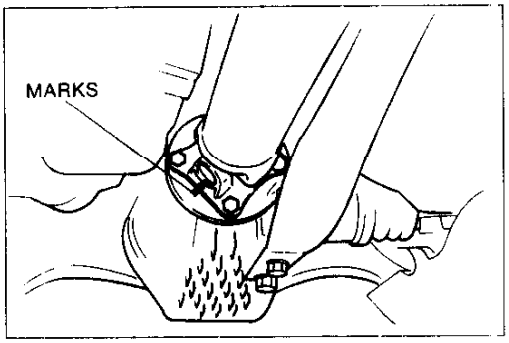
11. Install the drive shaft with the ends of the clip facing upward.
12. Verify that the drive shaft is seated into the side gear by pulling it outward by hand. It should not come out.
13. Add the specified oil through the filler plug hole until it reaches the bottom of the hole.

Specified oil
Type
Above – 18°C {0°F}: API GL-4 or 5, SAE 90
Below – 18°C {0°F}: API GL-4 or 5, SAE 80
Capacity: 1.30 L {1.38 US qt, 1.14 Imp qt}

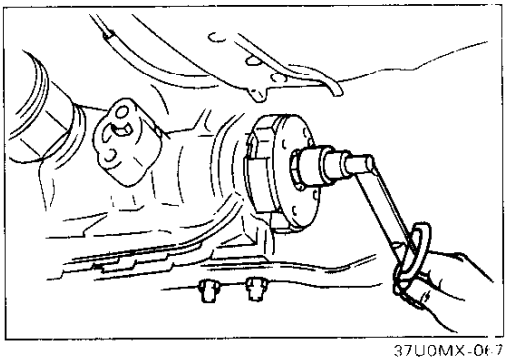
14. Install a new washer and the filler plug.

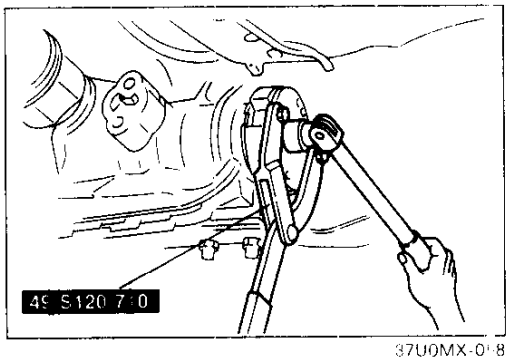
Tightening torque:
39–54 N·m {4.0–5.5 kgf·m, 29–40 ft·lbf}

15. Check for oil leakage.

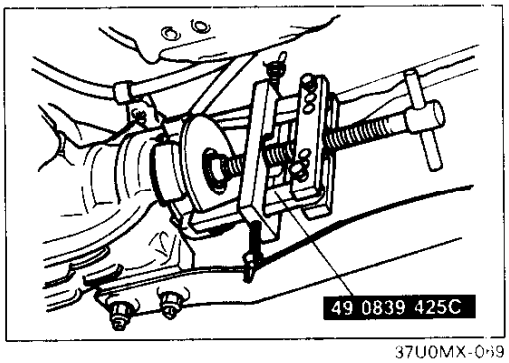


37U0MX-057

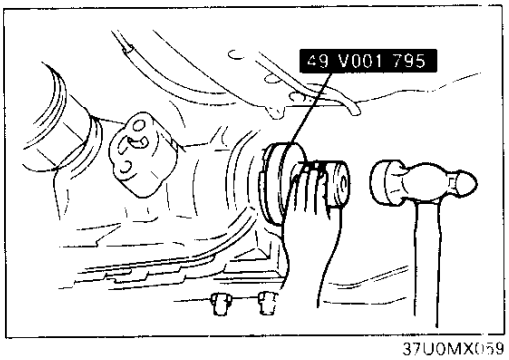

37U0MX-067



37U0MX-068



37U0MX-069



37U0MX059

Oil seal (companion flange)

1. Remove the filler and drain plugs.
2. Drain the differential oil into a suitable container.
3. Wipe the plugs clean.
4. Install a new washer and the drain plug.

Tightening torque:
40–53 N·m {4.0–5.5 kgf·m, 29–39 ft·lbf}

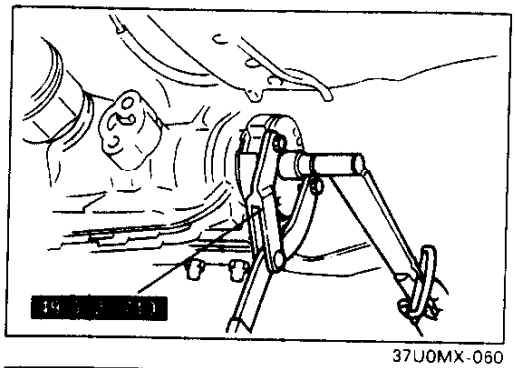
5. Mark the propeller shaft and differential companion flange for proper reinstallation.
6. Remove the nuts and bolts and remove the propeller shaft.
7. Measure and record the rotation staring torque of the drive pinion.

Note
- **Measure the torque within the range of the drive pinion backlash.**

8. Using the **SST** to hold the companion flange, remove the nut.

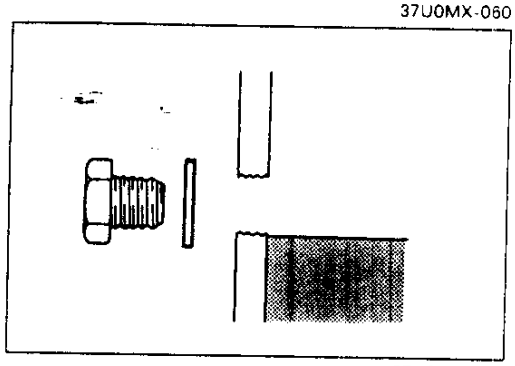
9. Use the **SST** to remove the companion flange.
10. Remove the oil seal by using a screwdriver.

11. Apply clean differential oil to the lip of the new oil seal.
12. Install the oil seal by using the **SST**.


37U0MX-060

13. Using the **SST**, hold the companion flange and tighten the new companion flange nut to the specified torque.

Tightening torque:
128–284 N·m {13.0–29.0 kgf·m, 94.1–209 ft·lbf}


37U0MX-061

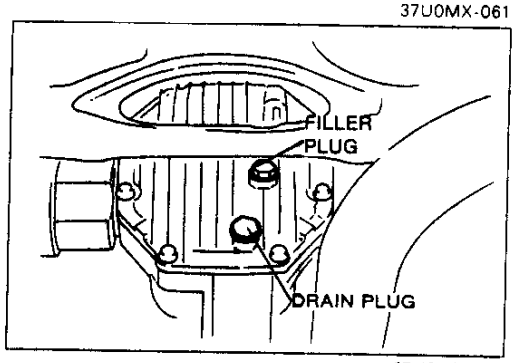
14. Loosen the nut. Retighten it to get the starting torque recorded in Step 7.
15. Add the specified oil through the filler plug hole until it reaches the bottom of the hole.

Specified oil
Type
Above – 18°C {0°F}: API GL-4 or 5, SAE 90
Below – 18°C {0°F}: API GL-4 or 5, SAE 80
Capacity: 1.30 L {1.38 US qt, 1.14 Imp qt}

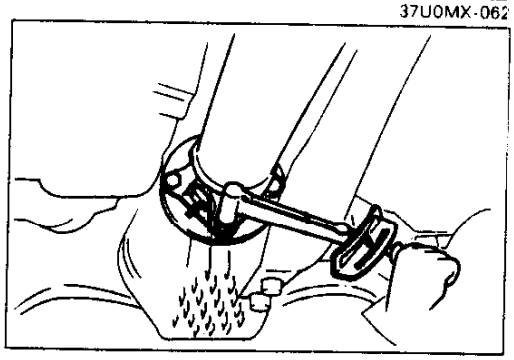
16. Install a new washer and the filler plug.

Tightening torque:
40–58 N·m {4.0–5.5 kgf·m, 29–39 ft·lbf}

17. Check for oil leakage.



37U0MX-062


37U0MX-063

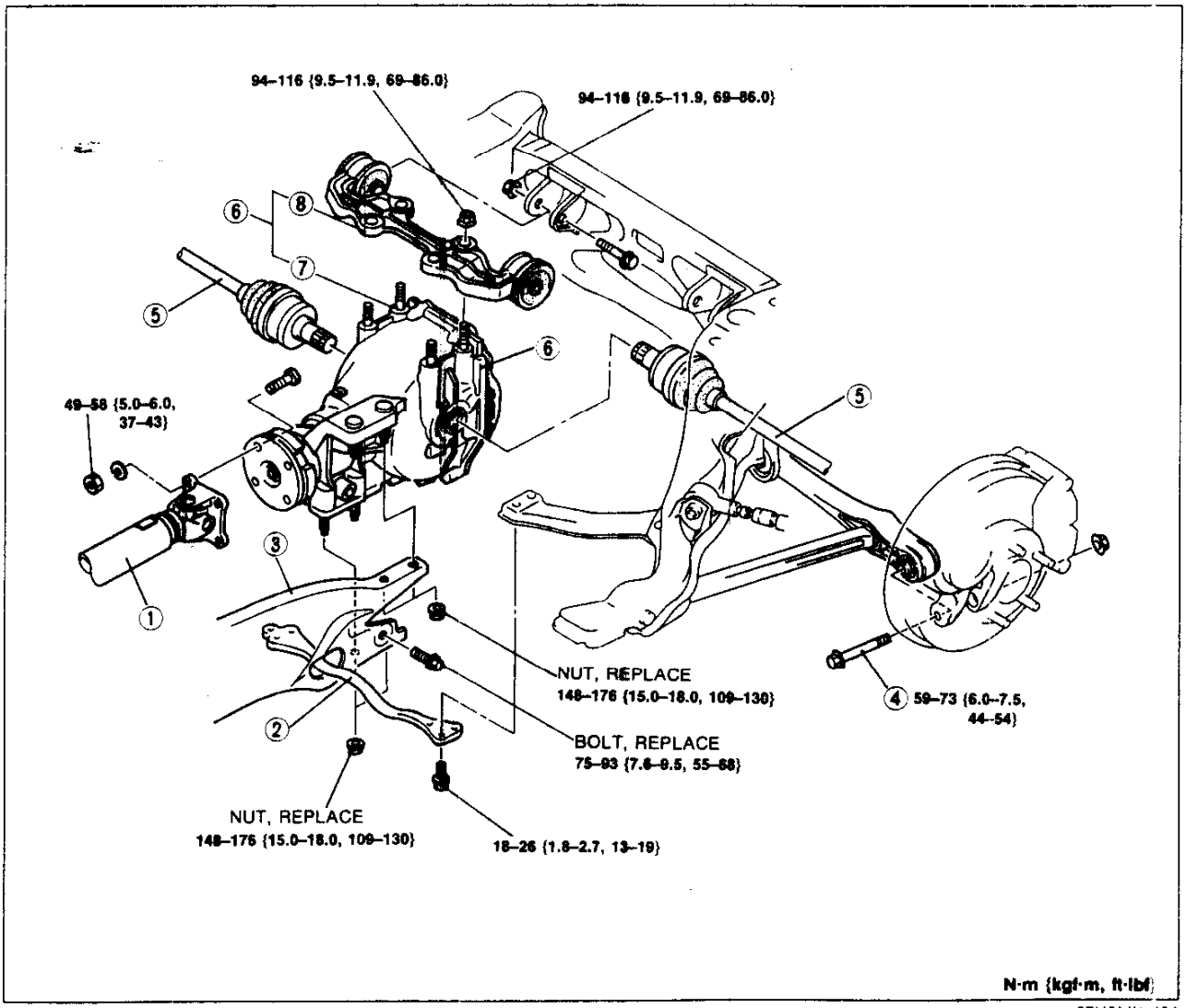
18. Align the marks and install the propeller shaft.

Tightening torque:
49–58 N·m {5.0–6.0 kgf·m, 37–43 ft·lbf}

DIFFERENTIAL (TORQUE SENSING LSD)

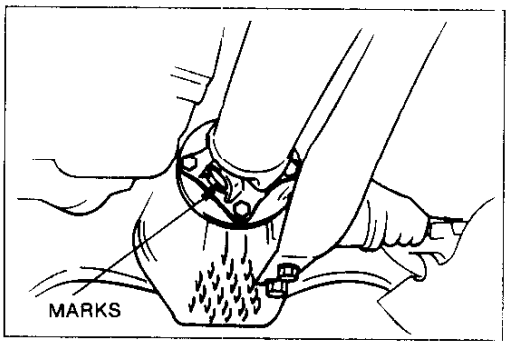
Removal / Installation

1 Remove the exhaust pipe. (Refer to Seciton F.)
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 rear wheel alignment. (Refer to Section R.)
5. Refill the differential with the specified type and amount of oil. (Refer to page M–23.)
6. Install the exhaust pipe. (Refer to Seciton F.)



37U0MX-0064

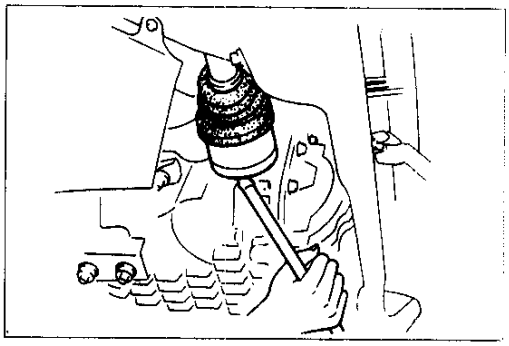
1. Propeller shaft
   - Removal Note ..... page M–28
   - Service ..... Section L
   - Installation Note ..... page M–29
2. Tunnel reinforcement bracket
3. Power plant flame
   - Service ..... Section J
4. Bolt (I-arm)
5. Drive shaft
   - Removal Note ..... page M–28
   - Installation Note ..... page M–28
6. Differential assembly
   - Removal Note ..... page M–28
7. Differential
   - Disassembly / Inspection / Assembly ..... page M–30
8. Differential mount
   - Inspect bushing for wear and damage



37U0MX-065

Removal note
Propeller shaft

1. Mark the propeller shaft and differential companion flange for proper reassembly.
2. Remove the nuts and bolts and remove the propeller shaft.

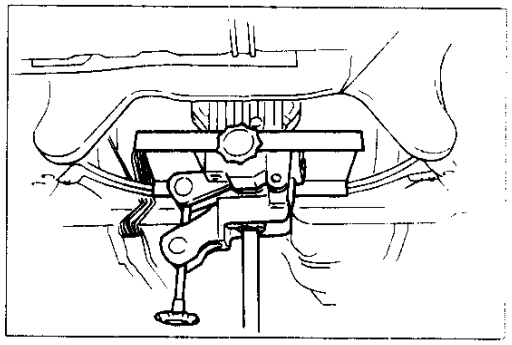


37U0MX-066

Drive shaft

Caution
- **Do not damage the oil seal.**

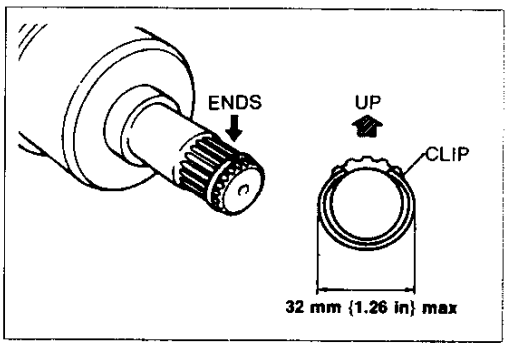
1. Remove the drive shaft from the differential by using a pry bar.
2. Pull outward on the rear hub support and disc plate to disconnect the drive shaft from the differential.



37U0MX-067

Differential assembly

1. Support the differential on a jack.
2. Remove the differential.

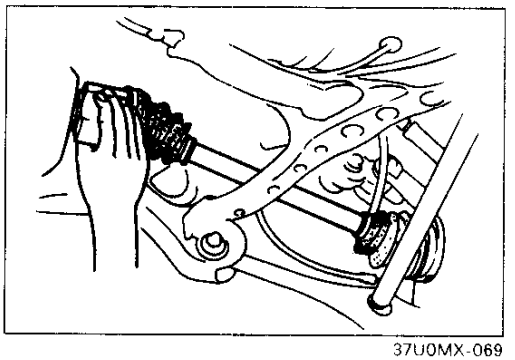


37U0MX-068

Installation note
Drive shaft

Caution
- **Do not excessively spread the clip when installing it.**
- **Measure the outside diameter of the clip after installing it on the shaft. Replace the clip if it exceeds the specification.**

1. Install a new clip on the drive shaft.

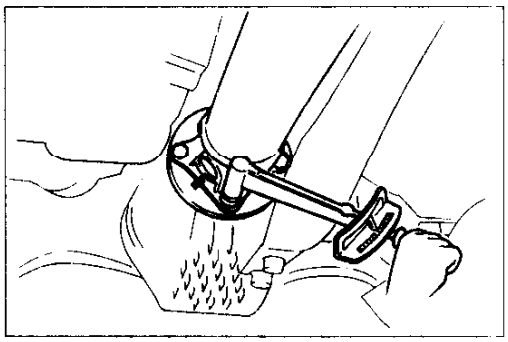


37U0MX-069

Caution
- **Do not damage the oil seal.**

2. With the ends of the clip facing upward, push the drive shaft into the differential.

Note
- **After installation, pull outward on the tripod joint outer ring and verify that the drive shaft is held by the clip.**



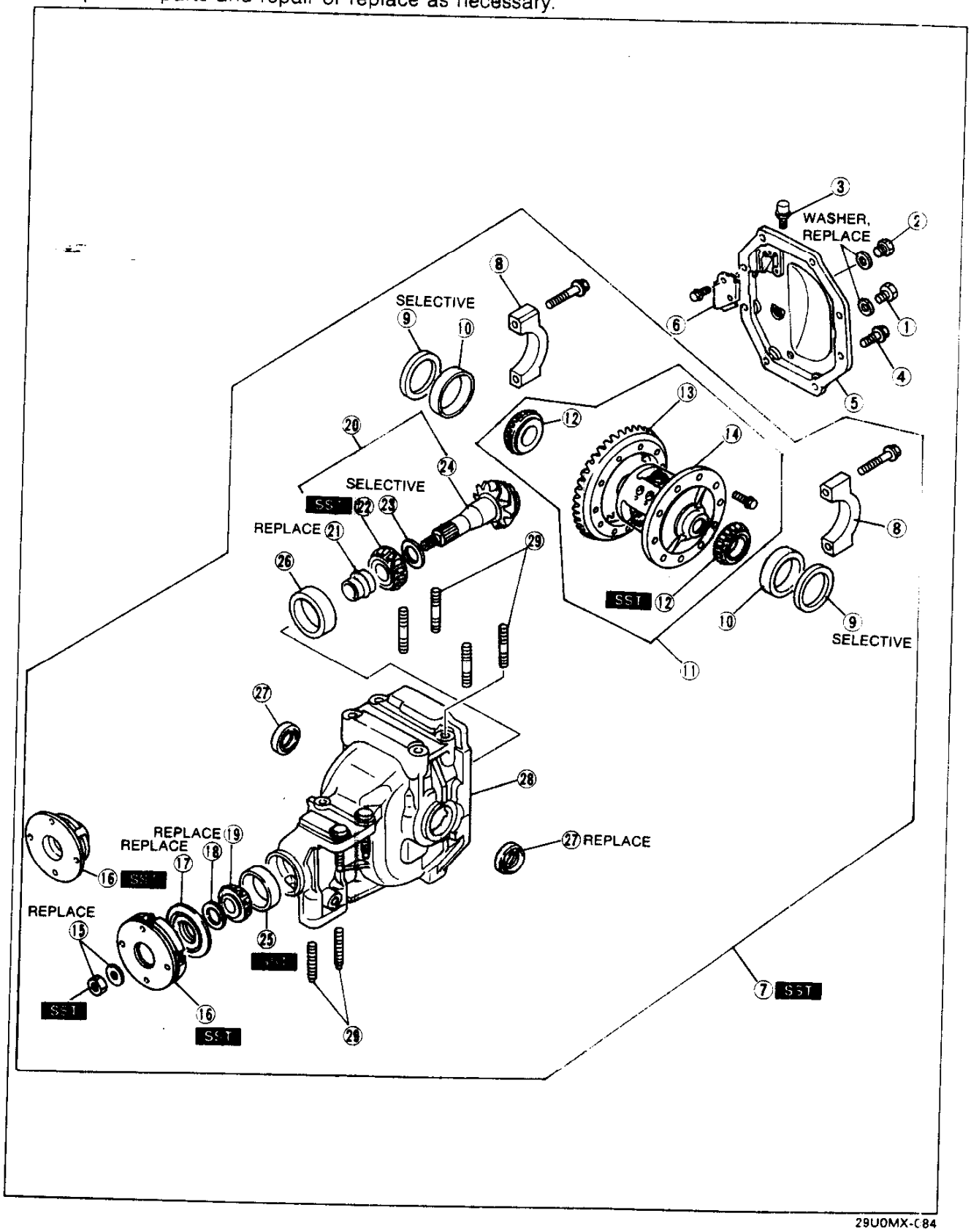
Propeller shaft

Align the marks and install the propeller shaft.

Tightening torque:
49–59 N·m {5.0–6.0 kgf·m, 37–43 ft·lbf}

Disassembly / Inspection

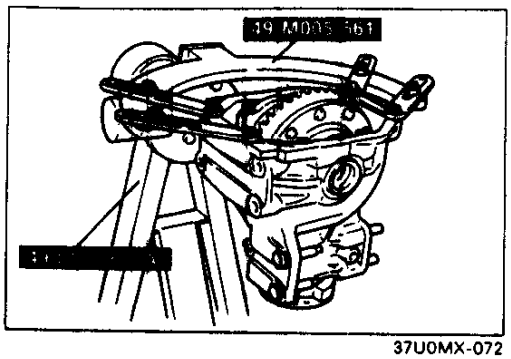
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.



29U0MX-084

1. Drain plug
2. Filler plug
3. Breather
   Inspect for clogging
4. Carrier bolt
5. Rear cover
6. Baffle
7. Differential gear assembly
   Disassembly Note ..... below
8. Bearing cap
   Disassembly Note ..... page M–32
9. Adjustment shim
   Disassembly Note ..... page M–32
10. Side bearing race
    Disassembly Note ..... page M–32
    Inspect for cracks and damage
11. Gear case assembly
12. Side bearing
    Disassembly Note ..... page M–32
    Inspect for damage and rough rotation
13. Ring gear
    Inspect gear teeth for wear and cracks
14. Gear case (Torsen LSD assembly)
    Inspect gear teeth for wear and cracks
    Inspect housing for cracks and damage
15. Companion flange nut and washer
    Disassembly Note ..... page M–32
16. Companion flange
    Disassembly Note ..... page M–33
17. Oil seal (companion flange)
18. Spacer
19. Front bearing
    Inspect for damage and rough rotation
20. Drive pinion assembly
    Disassembly Note ..... page M–33
21. Collapsible spacer
22. Rear bearing
    Disassembly Note ..... page M–33
    Inspect for damage and rough rotation
23. Spacer
24. Drive pinion
    Inspect splines for wear and damage
    Inspect gear teeth for wear and cracks
25. Front bearing race
    Disassembly Note ..... page M–33
    Inspect for cracks and damage
26. Rear bearing race
    Disassembly Note ..... page M–33
    Inspect for cracks and damage
27. Oil seal (side bearing)
28. Differential carrier
    Inspect for cracks and damage
29. Stud

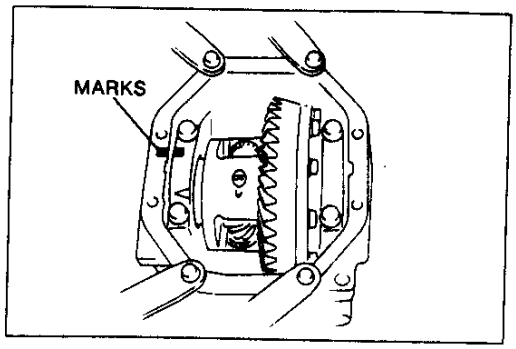
37U0MX-071



37U0MX-072

Disassembly note
Differential gear assembly

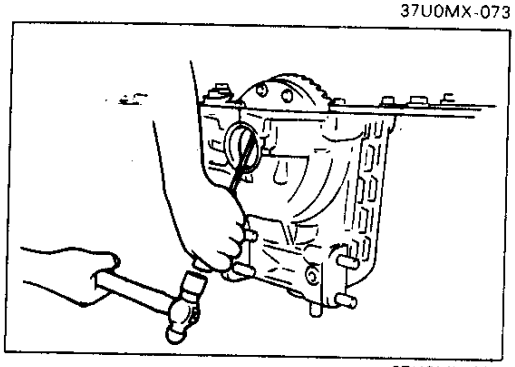
Mount the differential gear assembly on the **SST**s.



37U0MX-073

Bearing cap

1. Mark the bearing caps and differential carrier for proper reassembly.
2. Remove the bearing caps.



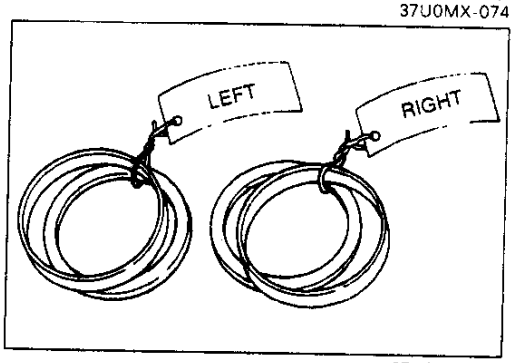
37U0MX-074

Adjustment shim and side bearing race

Caution

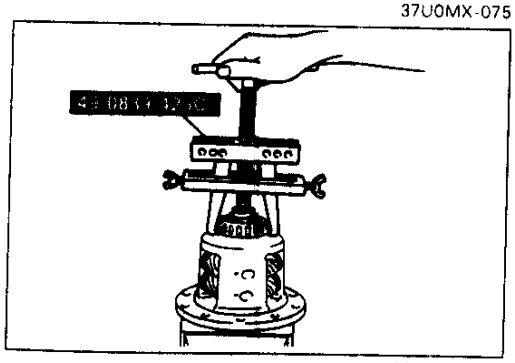
- **Do not damage the oil seal, bearing race, or differential carrier.**
- **Do not push against the bearing races.**

1. Drive out the an adjustment shim. Remove the gear case assembly, the side bearing races, and the other adjustment shim.



37U0MX-075

2. Tag the right and left adjustment shims and side bearing races for proper reassembly.



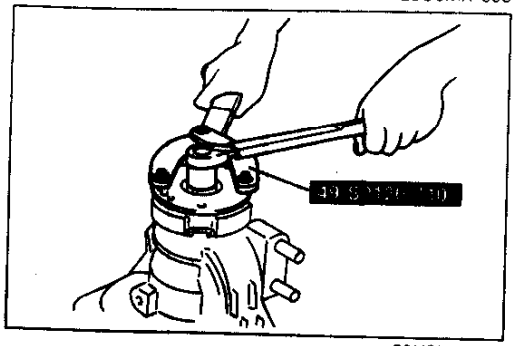
29U0MX-090

Side bearing

Caution

- **Mark the side bearings for right and left side.**
- **Use protective plates in a vise.**

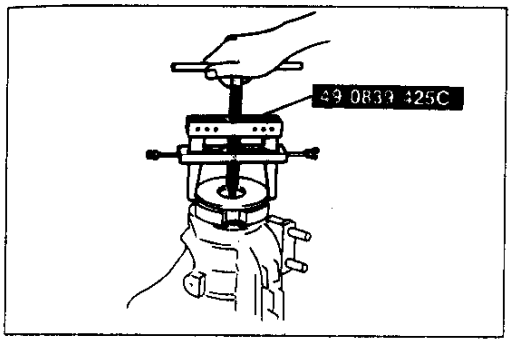
Remove the side bearings from the gear case by using the **SST**.



29U0MX-091

Companion flange nut

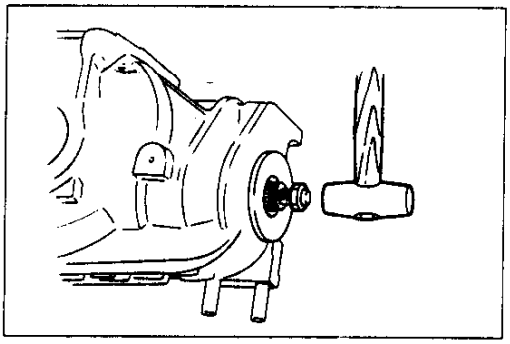
Hold the companion flange by using the **SST** and remove the nut.



37U0MX-076

Companion flange

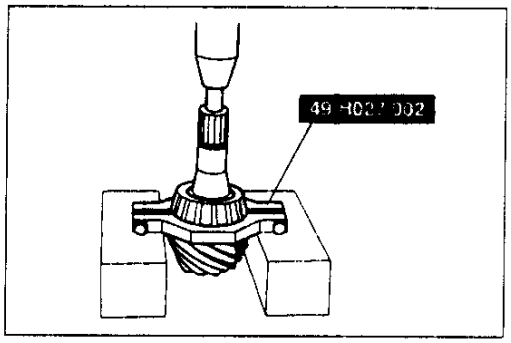
Remove the companion flange by using the **SST**.



29U0MX-093

Drive pinion assembly

1. Turn a used nut onto the drive pinion until it is about flush with the end of the shaft.
2. Tap the nut by using a brass hammer to drive the pinion assembly out of the differential carrier.



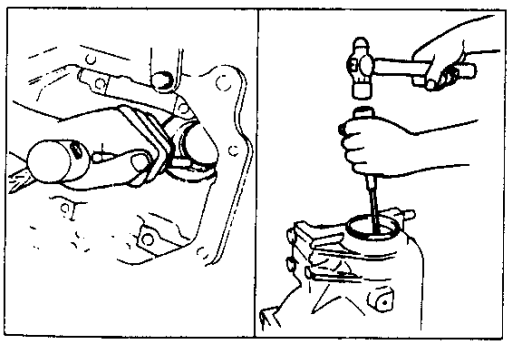
29U0MX-094

Rear bearing

Caution

- **Support the drive pinion by hand so that it will not fall.**

Remove the rear bearing by using the **SST**.



29U0MX-095

Front bearing race and rear bearing race

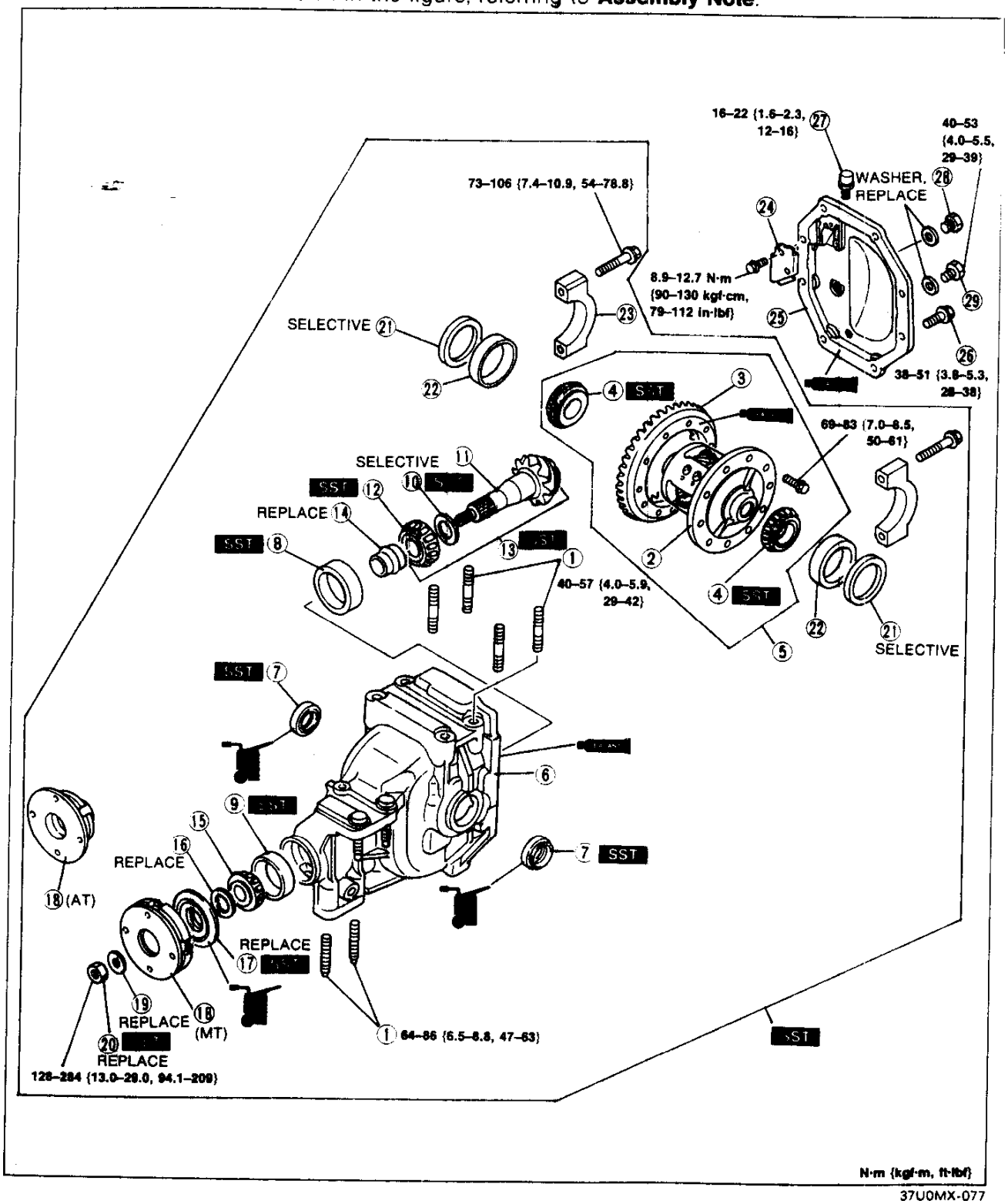
Remove the bearing races by alternately tapping the sides of the races at the grooves in the differential carrier.

Assembly

Caution

- **Install the rear cover 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.**

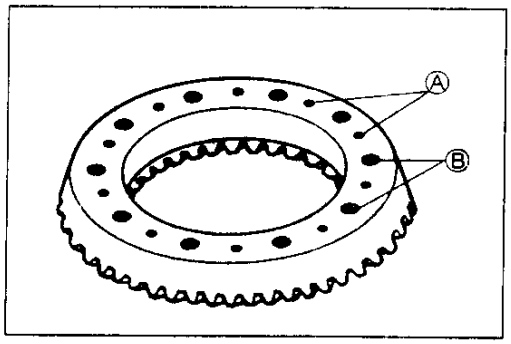
Assemble in the other shown in the figure, referring to **Assembly Note**.



37U0MX-077

1. Stud
2. Gear case (Torsen LSD assembly)
3. Ring gear
   Assembly Note ..... page M–35
4. Side bearing
   Assembly Note ..... page M–35
5. Gear case assembly
6. Differential carrier
7. Oil seal (side gear)
   Assembly Note ..... page M–35
8. Rear bearing race
   Assembly Note ..... page M–36
9. Front bearing race
   Assembly Note ..... page M–36
10. Spacer
    Assembly Note ..... page M–36
11. Drive pinion
12. Rear bearing
    Assembly Note ..... page M–37
13. Drive pinion assembly
    Assembly Note ..... page M–38
14. Collapsible spacer
15. Front bearing
16. Spacer
17. Oil seal (companion flange)
    Assembly Note ..... page M–38
18. Companion flange
    Assemble Note ..... page M–38
19. Washer
20. Companion flange nut
    Assembly Note ..... page M–39
21. Adjustment shim
    Assembly Note ..... page M–39
22. Side bearing race
23. Bearing cap
    Assemble Note ..... page M–40
24. Baffle
25. Rear cover
26. Carrier bolt
27. Breather
28. Filler plug
29. Drain plug

37U0MX-078



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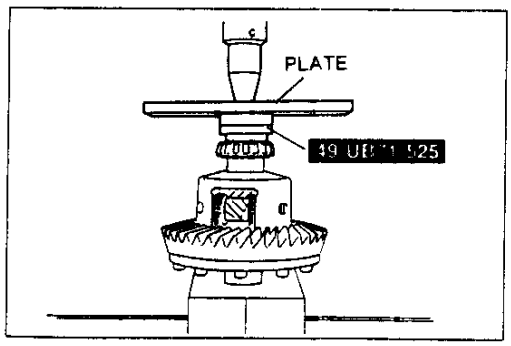

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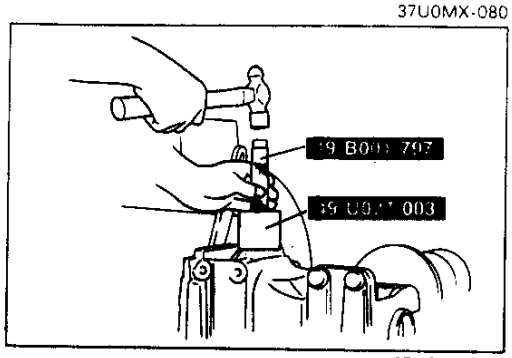

37U0MX-081

Assembly note
Ring gear

Note
- **Apply approx. 0.04 cc {0.0024 cu in} of thread-locking compound at each point.**

1. Apply thread-locking compound to bolt threads A and points B of the gear back face.
2. Install the ring gear onto the gear case.

Tightening torque:
69–83 N·m {7.0–8.5 kgf·m, 50–61 ft·lbf}

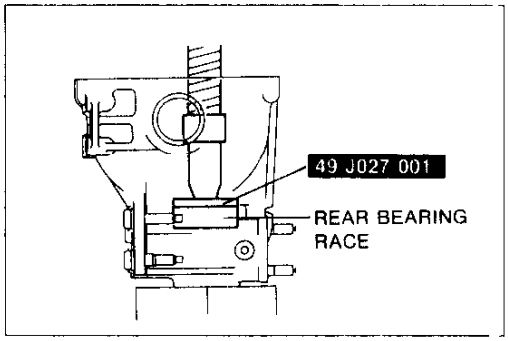
Side bearing

Caution
- **Do not mistake the right and left bearings**

Press the side bearings on by using the **SST**.

Oil seal

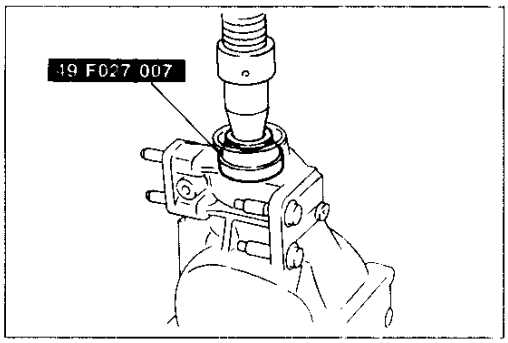
1. Apply differential oil to the lips of the new seals.
2. Install the seals by using the **SST**.



29U0MX-101

Rear bearing race

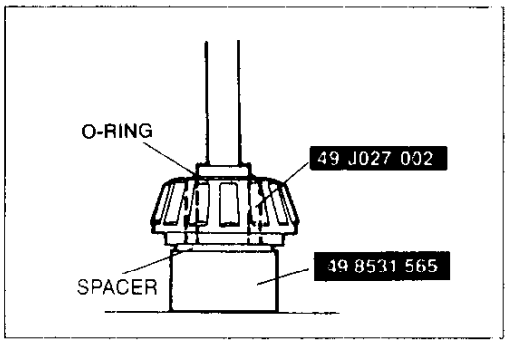
Install the rear bearing race by using the **SST**.



29U0MX-102

Front bearing race

Install the front bearing race by using **SST**.

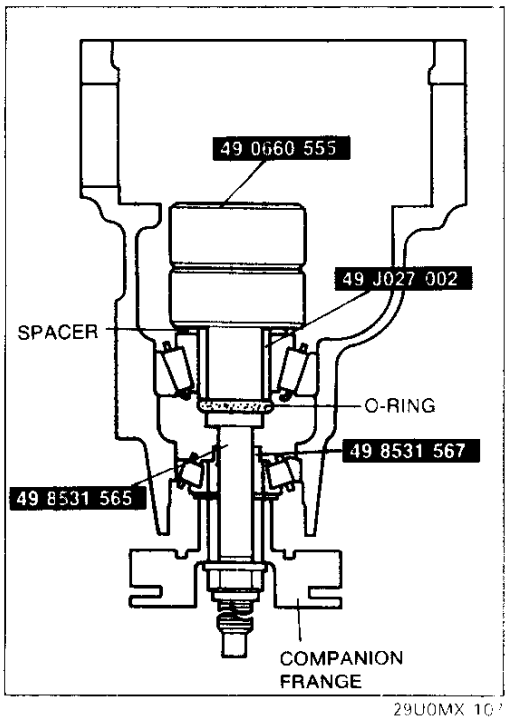


29U0MX-103

Spacer (adjustment of pinion height)

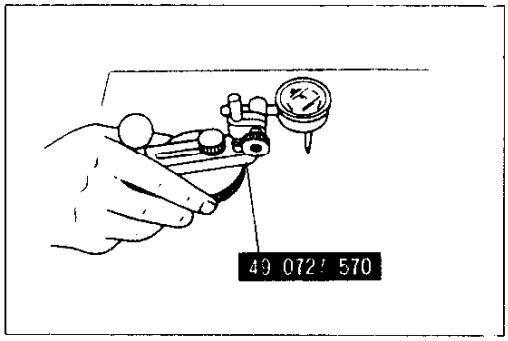
Note
- **Use the spacer that was removed.**
- **Install the spacer with the beveled side facing the drive pinion.**

1. Install the spacer, rear bearing and O-ring onto the **SST** as shown in the figure.
2. Install this assembly into the differential carrier.



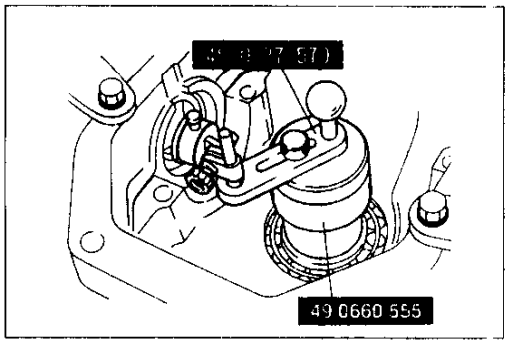
29U0MX-104

3. Install the **SST** (collar), front bearing, companion flange, washer and nut.
4. Tighten the nut just enough so that the companion flange can still be turned by hand.
5. Place the **SST** (gauge block) atop the **SST** (pinion model).



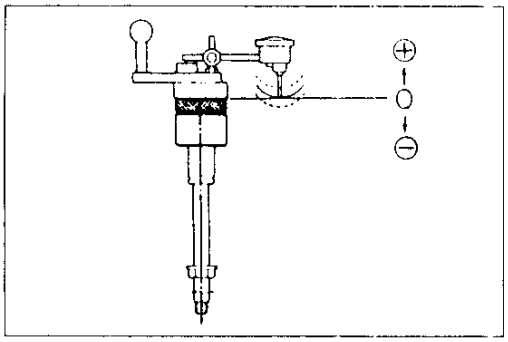
37U0MX-0? 2

6. Place the **SST** on a surface plate and set the dial indicator to Zero.



37U0MX-0? 3

7. Set the **SST** (gauge body) atop the **SST** (gauge block).
8. Place the feeler of the dial indicator so that it contacts the side bearing saddle in the carrier. Measure the lowest position on the left and right sides of the carrier.



29U0MX-1?0

9. Add the two (left and right) values obtained in Step 8 and divide the total by 2.

Specification : 0 mm {0 in}

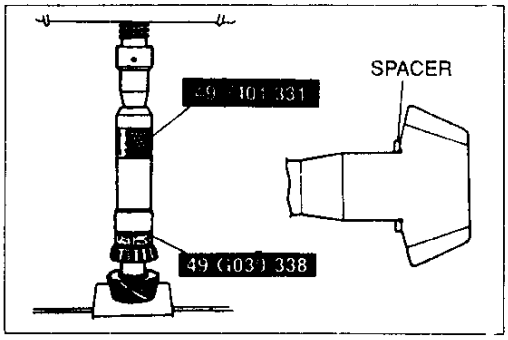
Mark	Thickness	Mark	Thickness
08	3.08 mm {0.1213 in}	29	3.29 mm {0.1295 in}
11	3.11 mm {0.1224 in}	32	3.32 mm {0.1307 in}
14	3.14 mm {0.1236 in}	35	3.35 mm {0.1319 in}
17	3.17 mm {0.1248 in}	38	3.38 mm {0.1331 in}
20	3.20 mm {0.1260 in}	41	3.41 mm {0.1343 in}
23	3.23 mm {0.1271 in}	44	3.44 mm {0.1354 in}
26	3.26 mm {0.1283 in}	47	3.47 mm {0.1366 in}

37U0MX-0?4

Note

- **Spacers are available in increments of 0.03 mm {0.002 in}. Select the spacer thickness that is closest to that necessary.**

10. If not within specification, adjust the pinion height by installing the proper spacer.



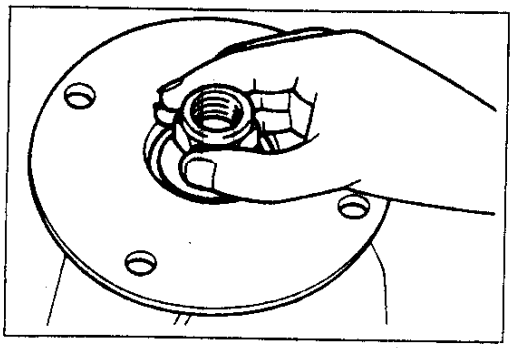
37U0MX-0?5

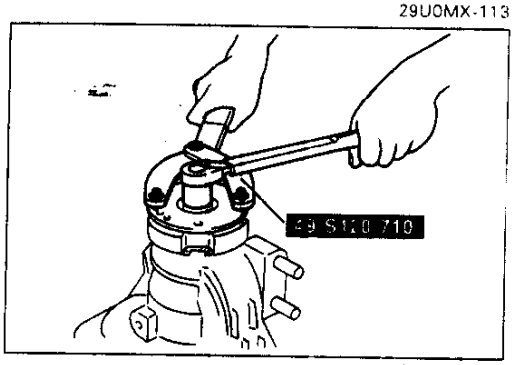
Rear bearing

Note

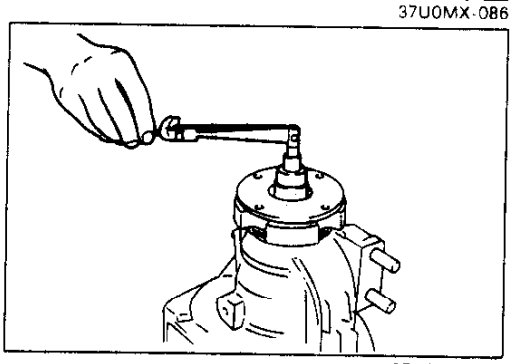
- **Install the spacer selected by the adjustment of pinion height.**
- **Install the spacer with the beveled side facing the drive pinion.**
- **Press on until the force required suddenly increases.**

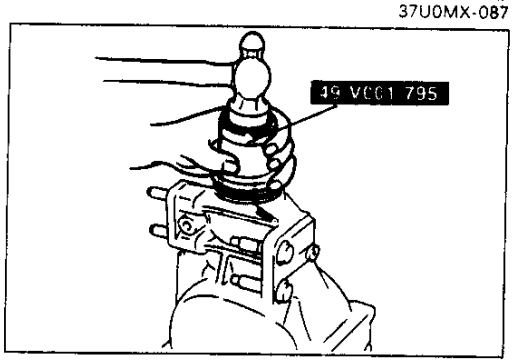
Press on the spacer and rear bearing by using the **SST**.


29U0MX-113

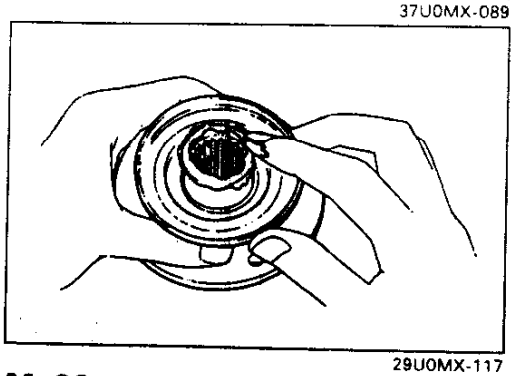


37U0MX-086


37U0MX-087



37U0MX-089


29U0MX-117

Drive pinion assembly (adjustment of drive pinion preload)

Note
- **Perform the following procedure without the companion flange oil seal installed.**

1. Apply a light coat of grease to the end face of the companion flange.
2. Install the drive pinion assembly in the differential carrier.
3. Install a new collapsible spacer, front bearing, new front spacer, companion flange, and new washer.
4. Temporarily tighten the new companion flange nut.
5. Hold the companion flange by using the **SST** and tighten the nut.

Tightening torque: 128 N·m {13 kgf·m, 94.1 ft·lbf}

6. Turn the companion flange several turns by hand to seat the bearings.
7. Measure the drive pinion preload.

Note
- **Record the tightening torque for proper reinstallation of the companion flange.**

8. Adjust the preload by tightening the nut and record the tightening torque.

Drive pinion preload:
1.3–1.8 N·m {13–18 kgf·cm, 12–15 in·lbf}
Tightening torque:
128–284 N·m {13.0–29.0 kgf·m, 94.1–209 ft·lbf}

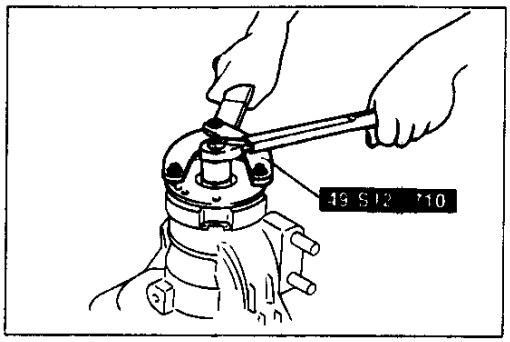
9. If the specified preload is not obtained after tightening the nut to the maximum torque, replace the collapsible spacer with a new one.
10. Remove the nut, washer, and companion flange.

Oil seal (companion flange)

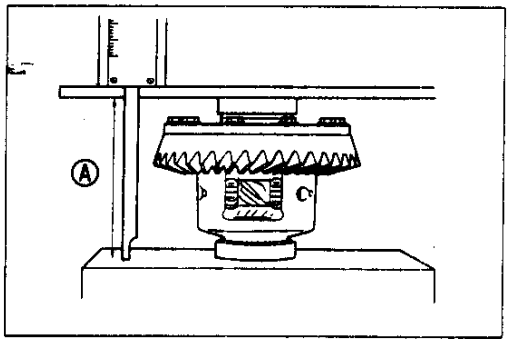
1. Apply clean differential oil to the lip of the new oil sea .
2. Install the oil seal by using the **SST**.

Companion flange

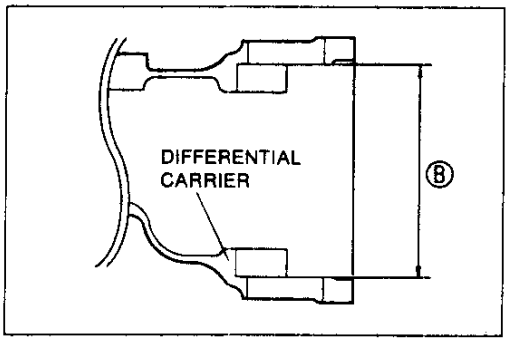
Apply a light coat of grease to the end face of the companion flange.



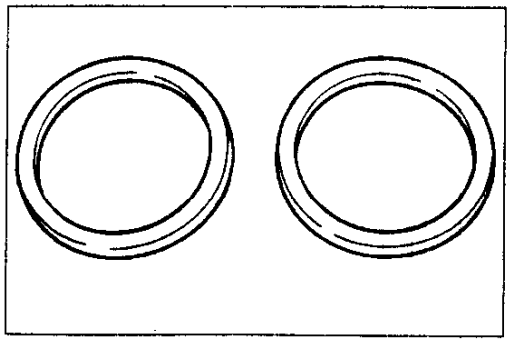
37U0MX-090



37U0MX-091



29U0MX-120



Companion flange nut

1. Using the **SST**, hold the companion flange and tighten the nut to the tightening torque recorded in "adjustment of drive pinion preload."
2. Verify that the drive pinion preload is within specification.

Drive pinion preload:
1.3–1.8 N·m {13–18 kgf·cm, 12–15 in·lbf}

Adjustment shims (adjustment of ring gear backlash)

1. Install the bearing races and measure the side bearing and gear case assembly height **A** as shown.

Standard height:
158.4–159.6 mm {6.24–6.28 in}

2. Measure the width **B** of the inside of the diffential carrier as shown.

Standard width:
170.9–171.1 mm {6.729–6.736 in}

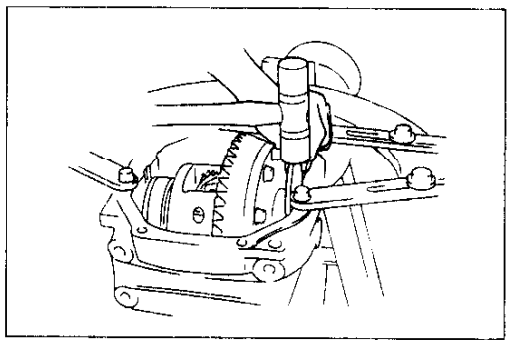
3. The right and left total adjustment shims thickness **C** is determined by the following.

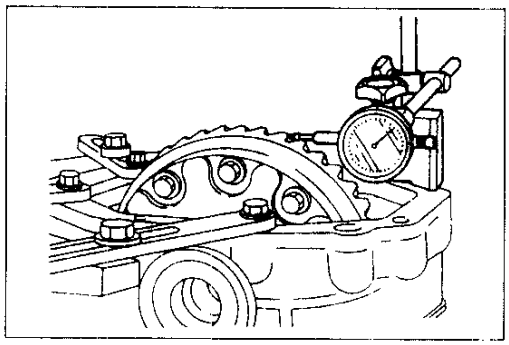
C mm = B–A mm + (0.01–0.03 mm)
C in = B–A in + (0.0004–0.0012 in)

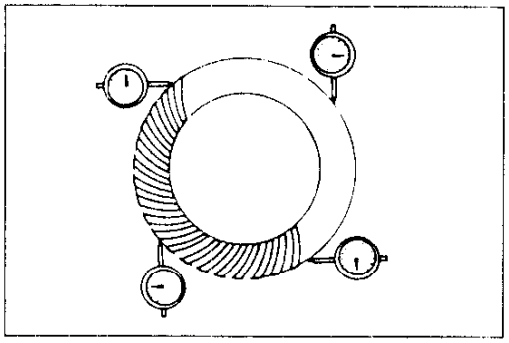
4. If **C** is equal to the total thickness of the removed right and left adjustment shims, reuse them.
5. If **C** is not equal to the removed shims, or when the shims are to be replaced, select and use the shims from the following table.

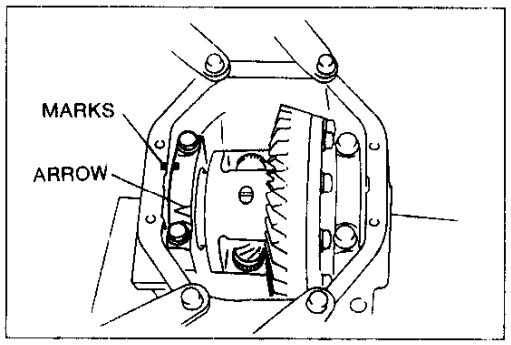
Note
- **Install the same thickness adjustment shim on both sides.**

Identification mark	Thickness	Identification mark	Thickness
550	5.50 mm {0.2165 in}	605	6.05 mm {0.2382 in}
560	5.60 mm {0.2205 in}	610	6.10 mm {0.2402 in}
565	5.65 mm {0.2224 in}	615	6.15 mm {0.2421 in}
570	5.70 mm {0.2244 in}	620	6.20 mm {0.2441 in}
575	5.75 mm {0.2264 in}	625	5.25 mm {0.2461 in}
580	5.80 mm {0.2283 in}	630	6.30 mm {0.2480 in}
585	5.85 mm {0.2303 in}	635	6.35 mm {0.2500 in}
590	5.90 mm {0.2323 in}	640	6.40 mm {0.2520 in}
595	5.95 mm {0.2343 in}	650	6.50 mm {0.2559 in}
600	6.00 mm {0.2362 in}	–	–


37U0MX-092


29U0MX-122


29U0MX-123



37U0MX-093

Caution
- **Do not interchange the right and left side bearing races.**
- **When reusing the adjustment shims, do not interchange the right and left shims.**

6. Install the side bearing races, gear case assembly and one side adjustment shim(s) into the differential carrier.
7. Tap the other side adjustment shim(s) in by using a plastic hammer.
8. Install the bearing caps and loosely tighten the bolts.
9. Mark the ring gear at four points at **approx. 90 degrees** 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 at a point marked.
10. Measure the ring gear backlash.

Standard backlash:
0.09–0.11 mm {0.0035–0.0043 in}

11. Measure 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}.**
12. If the backlash is not within specification, adjust it by inserting an appropriate adjustment shim at both sides of the carrier.

Note
- **When replacing the right adjustment shim with a thinner one, replace the left with an equally thicker one.**

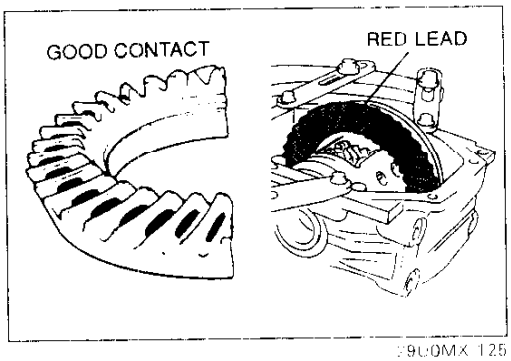
Bearing caps

Note
- **After installing the bearing caps, check the drive pinion and ring gear tooth contact. (Refer to page M–41.)**

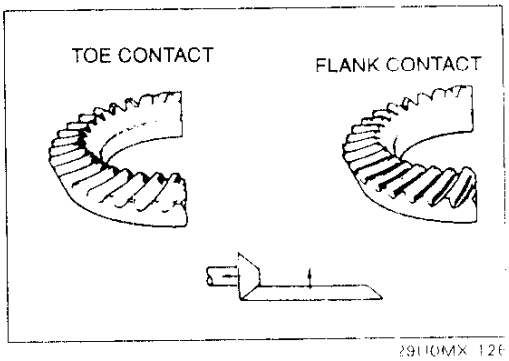
Caution
- **Do not interchange the right and left bearing caps.**

1. Match the marks and face the arrow on the caps outward.
2. Tighten the bolts to the specified torque.

Tightening torque:
73–106 N·m {7.4–10.9 kgf·cm, 54–78.8 ft·lbf}



29U0MX 125



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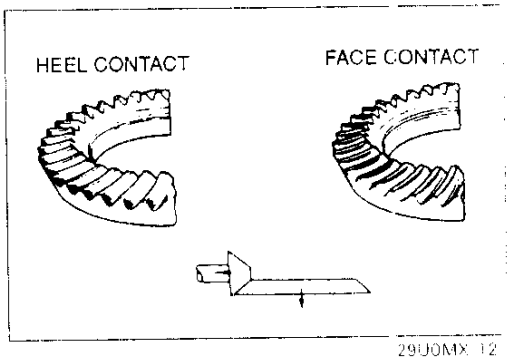

29U0MX 12

Inspection and adjustment of tooth 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, readjust 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 1993 RX-7 Body Electrical Troubleshooting Manual; see Section S for air bag system precautions and J1 for audio anti-theft system precautions.

STEERING SYSTEM

37U0NX-001

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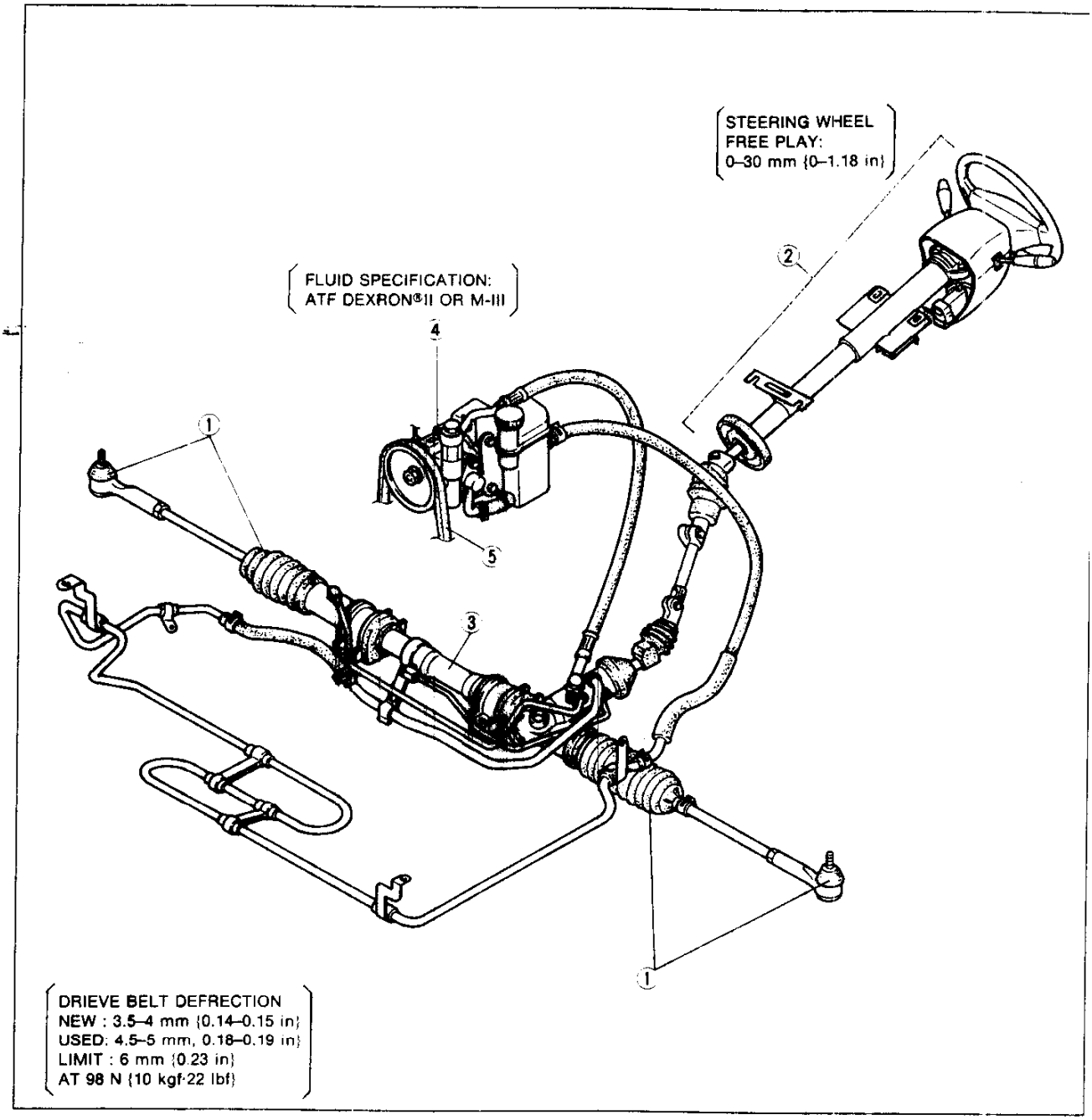


OUTLINE

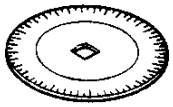
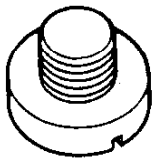
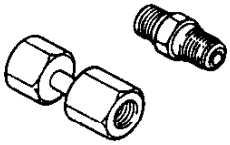
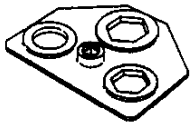
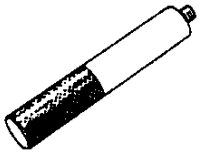
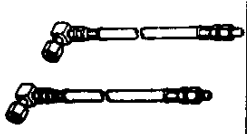
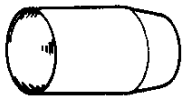
SPECIFICATIONS

Item		Specifications
Steering wheel	Outer diameter mm {in}	380 {15.0}
	Lock-to-lock turns	2.9
Steering shaft	Shaft	Collapsible
Steering gear	Power assist	Engine speed sensing
	Gear	Rack-and-pinion
	Gear ratio	∞ (infinite)
	Rack stroke mm {in}	160 {6.30}
	Power steering fluid	ATF Dexron® II or M-III
	Fluid capacity L {US qt, Imp qt}	0.96 {1.01, 0.84}

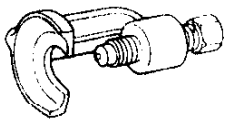
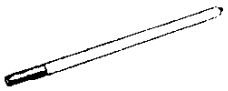
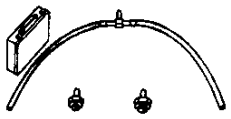
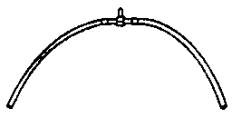
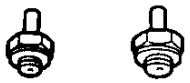
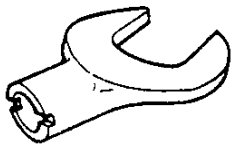
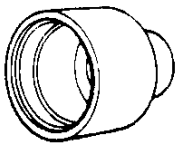
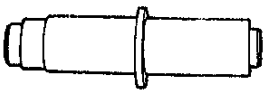
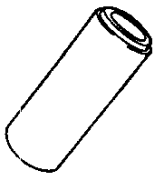
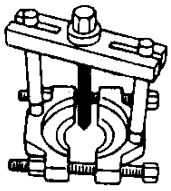
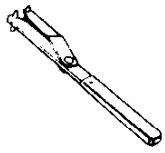
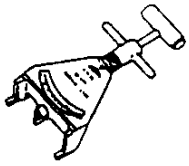
37U0NX-003

ENGINE SPEED SENSING POWER STEERING

PREPARATION
SST

49 1232 670A Gauge set, power steering 	For inspection of power steering fluid pressure	49 D032 316 Protractor 	For installation of adjusting cover
49 1232 673 Body, valve (Part of 49 1232 670A) 	For inspection of power steering fluid pressure	49 F032 317 Remover, oil seal 	For removal of oil seal and backup washer
49 H032 322 Adapter, power steering gauge 	For inspection of power steering fluid pressure	49 F032 313 Wrench 	For removal of locknut
49 1232 672 Gauge (Part of 49 1232 670A) 	For inspection of power steering fluid pressure	49 F032 305 Handle 	For removal of needle bearing
49 H002 671 Adapter, power steering gauge 	For inspection of power steering fluid pressure	49 F032 310 Protector 	For installation of oil seal

ENGINE SPEED SENSING POWER STEERING

49 0118 850C Puller, ball joint 	For removal of tie rod end ball joint	49 F032 303 Handle 	For installation of oil seal and backup washer
49 G032 3AI Set, joint hose 	For hermetic inspection of cylinder	49 G032 317 Hose (Part of 49 G032 3AI) 	For hermetic inspection of cylinder
49 G032 319 Adapter (Part of 49 G032 3AI) 	For hermetic inspection of cylinder	49 H032 301 Wrench 	For removal of tie rod
49 1243 785 Installer, boot 	For installation of outer ball joint	49 H032 328 Former, seal ring 	For formation of seal ring
49 F032 318 Installer, oil seal and bearing 	For installation of oil seal and bearing	49 F032 304 Body 	For installation of oil seal
49 F032 319 Installer 	For installation of oil seal	49 0180 510B Attachment, preload 	For measurement of pinion preload
49 0710 520 Puller, bearing 	For removal of bearing	49 F032 306A Body 	For removal of needle bearing
49 F032 301 Hanger, power steering pump 	For disassembly / assembly of power steering oil pump	49 W023 585A Adjust Wrench 	For removal / installation of oil pump pulley
49 9200 020 V-ribbed belt tension gauge 	For measurement of drive belt tension		

TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page/section
Steering feels heavy	Poor lubrication, foreign material, or abnormal wear of steering ball joint	lubricate or replace	N- 9
	Stuck or damaged lower arm ball joints	Replace	Section R
	Improper steering pinion preload	Repair of replace	N-26
	Damaged steering gear	Repair of replace	N-16, 18
	Damaged steering shaft joint	Replace	N-12
	Improperly adjusted wheel alignment	Adjust	Section R
	Incorrect tire pressure	Adjust	Section Q
	Loose or damaged oil pump drive belt	Adjust or replace	N-31
	Low fluid level or air in fluid	Add fluid or bleed air	N- 6
	Leakage of fluid	Repair or replace	–
	Insufficient oil pump pressure	Replace	N-28
Steering wheel pulls to one side	Incorrect tire pressure	Adjust	Section Q
	Unevenly worn tires	Replace	Section Q
	Weak front coil spring	Replace	Section R
	Worn or damaged stabilizer and/or suspension bushing	Replace	Section R
	Dragging brake	Repair or adjust	Section P
	Loose lower arm	Tighten or replace	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 joint	Replace	N-12
	Improper steering pinion preload	Repair of replace	N-26
	Weak front coil spring	Replace	Section R
	Worn or damaged stabilizer and/or upper or lower arm bushing	Replace	Section R
	Damaged shock absorber	Replace	Section R
	Improperly adjusted wheel alignment	Adjust	Section R
Shake (steering wheel vibrates up/down)	Excessive tire and/or wheel runout	Replace	Section Q
	Loose lug nuts	Tighten	Section Q
	Unbalanced wheel	Adjust or replace	Section Q
	Cracked or worn engine mount rubber	Replace	Section B
	Cracked or worn transmission mount rubber	Replace	Section K
Shimmy (steering wheel vibrates circumferentially)	Cracked or worn steering gear mount rubber	Replace	N-18
	Loose steering gear mounting bolts	Tighten	N-16
	Stuck or damaged steering ball joint	Replace	N- 9, 18
	Excessive tire and/or wheel runout	Replace	Section Q
	Loose lug nuts	Tighten	Section Q
	Unbalanced wheel	Adjust or replace	Section Q
	Incorrect tire pressure	Adjust	Section Q
	Unevenly worn tires	Replace	Section Q
	Damaged 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	Repair or replace	N-16, 18
	Worn or damaged steering joints	Replace	N-12
	Worn or damaged lower arm bushing	Replace	Section R
	Loose steering gear mounting bolts	Tighten	N-16
	Worn linkage or tie rod ball joint	Replace	N-18
Poor steering wheel return	Incorrect tire pressure	Adjust	Section Q
	Stuck or damaged steering joints	Replace	N-12
	Improperly adjusted front wheel alignment	Adjust	Section R
	Improper steering pinion preload	Repair or replace	N-26
	Ball joint not operating smoothly	Replace	N-16, 18
	Obstruction near steering column	Repair	N-12

TROUBLESHOOTING GUIDE (Cont'd)

Problem	Possible cause	Action	Page/Section
Abnormal noise from steering system	Loose oil pump	Tighten	N-28
	Loose steering gear	Tighten	N-16
	Loose oil pump bracket	Tighten	N-28
	Loose or too tight drive belt	Adjust	N-31
	Air in system	Bleed air	N- 6
	Damaged steering gear	Repair or replace	N-16, 18
	Damaged oil pump	Repair or replace	N-28, 29
	Obstruction near steering column	Repair or replace	N-12
	Loose steering linkage	Tighten or replace	N-16
	Worn steering joints	Replace	N-12

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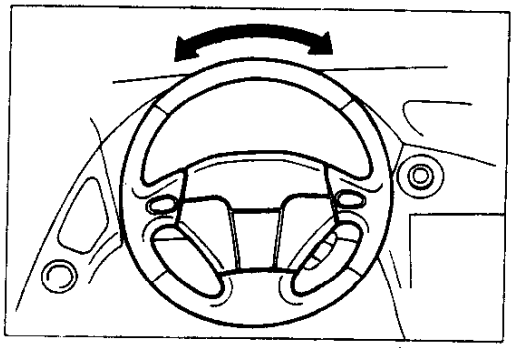

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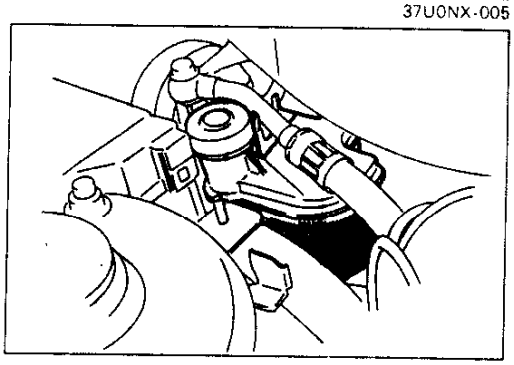

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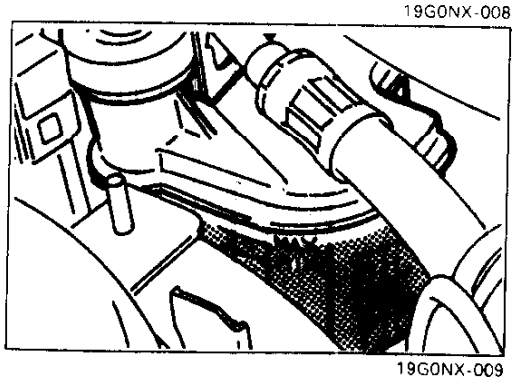


19G0NX-009

AIR BLEEDING

1. Check the fluid level. (Refer to below.)
2. Jack up the front of the vehicle and support it on safety stands.
3. Turn the steering wheel fully to the left and right several times with the engine not running.
4. Recheck the fluid level. If it has dropped, add fluid.
5. Repeat Steps 2 and 3 until the fluid level stabilizes.
6. Lower the vehicle.
7. Start the engine and let it idle.
8. Turn the steering wheel fully to the left and right several times.
9. Verify that fluid is not foamy and that the fluid level has not dropped.
10. Add fluid if necessary and repeat Steps 6 and 7.

POWER STEERING FLUID

Inspection

Fluid level

Check the power steering fluid level. Add fluid to the specified level, if necessary.

Caution

- **Use only the specified power steering fluid.**

Fluid specification: ATF Dexron® II or M-III

Fluid leakage

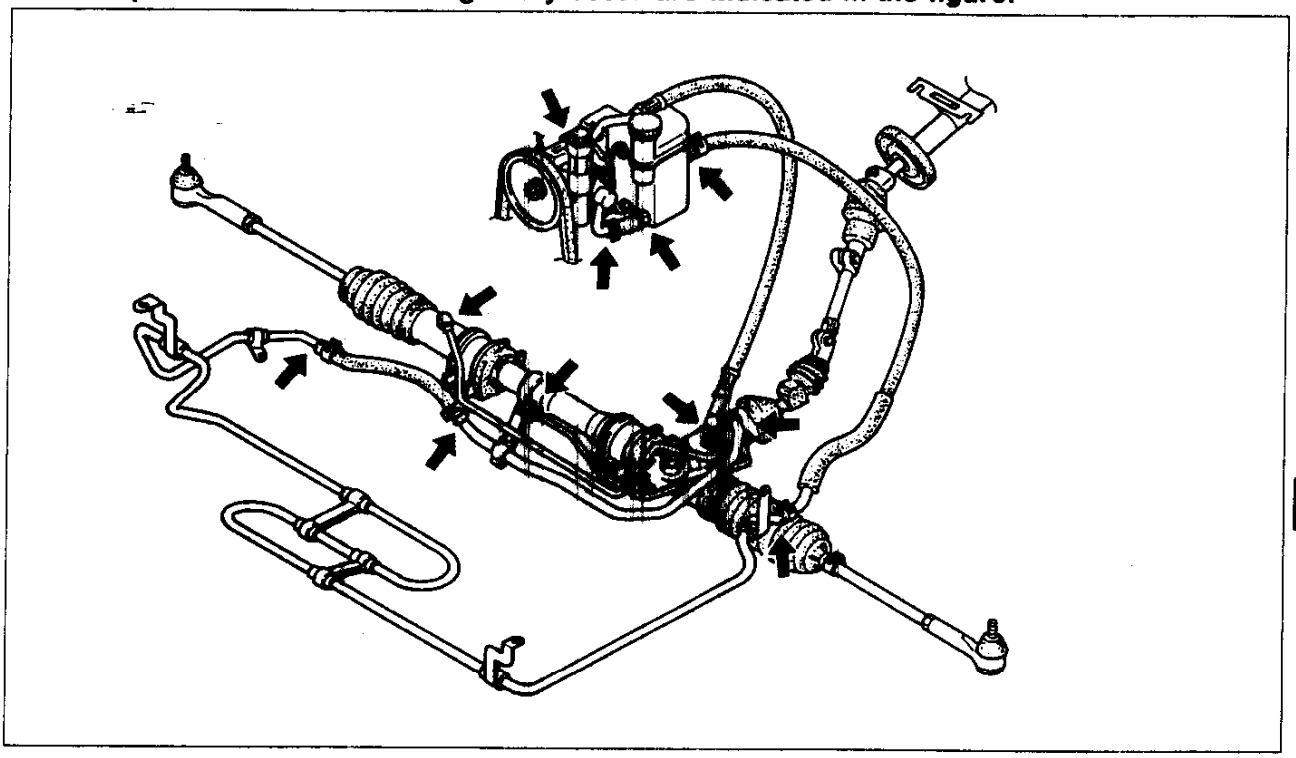
Caution

- **To prevent damage to the steering system, do not keep the steering wheel in the fully turned position for more than 15 seconds.**

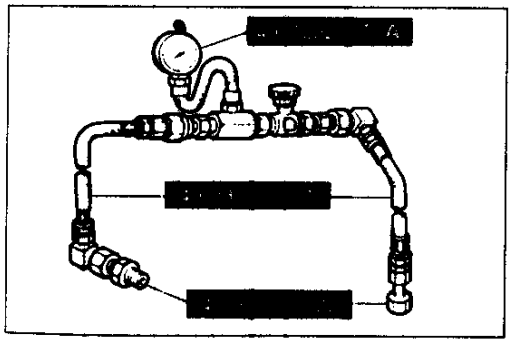
Start the engine and let it idle. Turn and briefly hold the steering wheel fully to the left and right to apply fluid pressure. Check for fluid leakage.

Note

- **The points where fluid leakage may occur are indicated in the figure.**



37U0NX-006

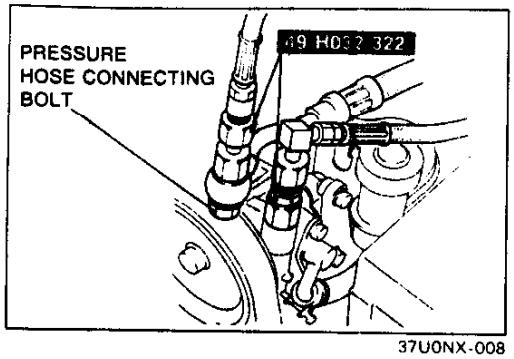


37U0NX-007

Fluid pressure

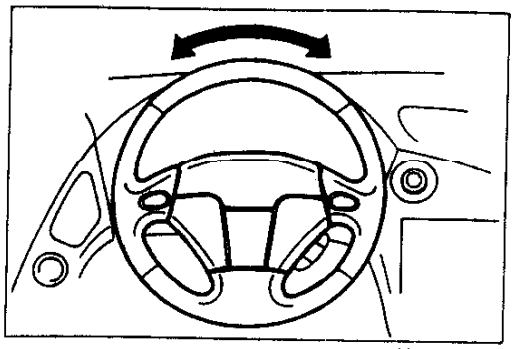
1. Assemble the **SST** as shown in the figure.

Tightening torque:
40–49 N·m {4.0–5.0 kgf·m, 29–36 ft·lbf}



37U0NX-008

2. Disconnect the pressure pipe from the oil pump, and connect the **SST**.
3. Bleed the air from the system. (Refer to page N–6.)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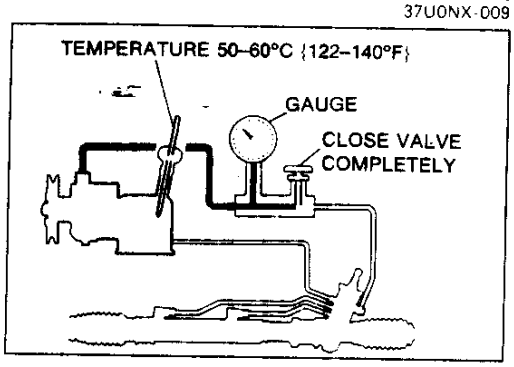

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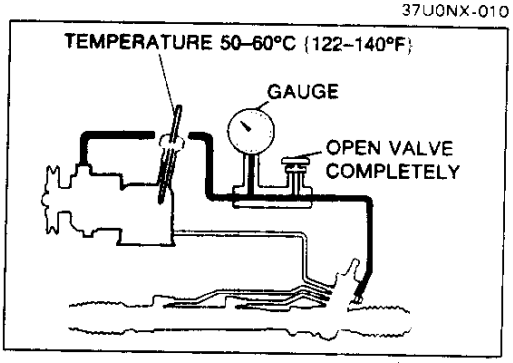

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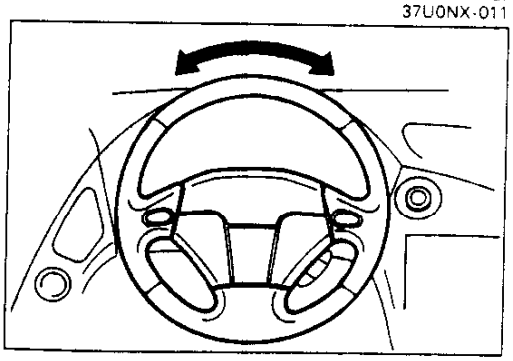

37U0NX-012

Caution
- **If the steering wheel is kept in the fully turned position for more than 15 seconds, the fluid temperature will rise excessively and adversely affect the oil pump.**

4. 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 {122–144°F}**.

Caution
- **If the valve is left closed for more than 15 seconds, the fluid temperature will increase excessively and adversely affect the oil pump.**

5. 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 not within specification, repair or replace the oil pump assembly. (Refer to page N–28.)

Oil pump fluid pressure:
7,620–8,350 kPa {77.7–85.2 kgf/cm², 1,110–1,210 psi}

6. Open the gauge valve fully and increase the engine speed to **1,000–1,500 rpm.**

Caution
- **If the steering wheel is kept in the fully turned position for more than 15 seconds, the fluid temperature will rise excessively and adversely affect the oil pump.**

7. Turn the steering wheel fully to the left and right and measure the fluid pressure generated at the gear housing. If the pressure is not within specification, repair or replace the steering gear assembly.

Gear housing fluid pressure:
7,620–8,350 kPa {77.7–85.2 kgf/cm², 1,110–1,210 psi}

8. Remove the gauge set. Install and tighten the pressure pipe to the specified torque.

Tightening torque:
24–35 N·m {2.4–3.6 kgf·m, 18–26 ft·lbf}

9. Bleed the air from the system. (Refer to page N–6.)

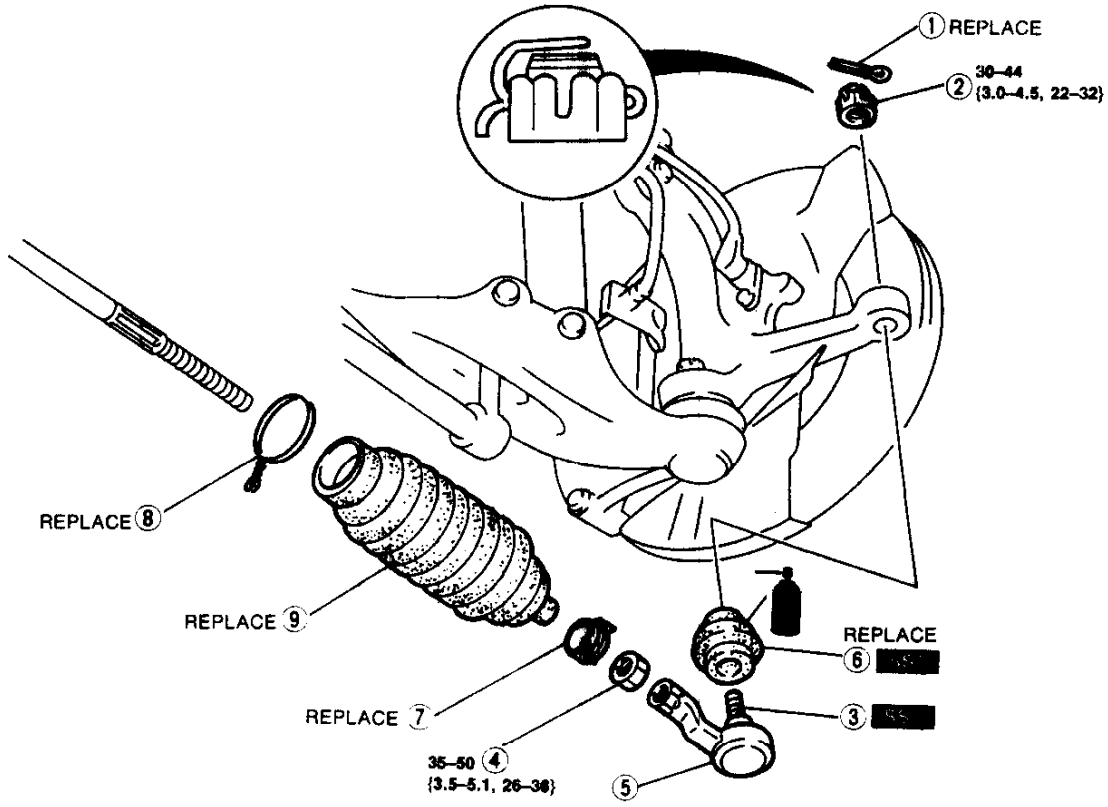
BOOT

Replacement

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheel and tire.
3. Remove in the order shown in the figure, referring to **Removal Note**.
4. Install in the reverse order of removal, referring **Installation Note**.
5. Install the wheel and tire.

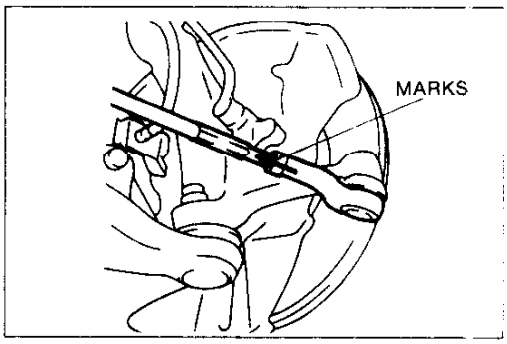
Tightening torque: 89–117 N·m {9–12 kgf·m, 66–86 ft·lbf}

6. After installation, check the steering angle and toe-in and adjust if necessary. (Refer to Section R.



37U0NX-01

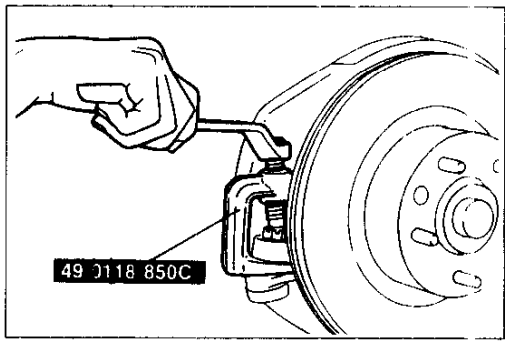
1. Cotter pin
2. Nut
3. Tie rod end ball joint
   Removal Note ..... page N–10
4. Locknut
   Removal Note ..... page N–10
5. Tie rod end
6. Tie rod end boot
   Removal Note ..... page N–10
   Installation Note ..... page N–10
7. Boot clamp
8. Boot wire
9. Steering gear boot
   Removal Note ..... page N–10
   Installation Note ..... page N–10



37U0NX 014

Removal note
Locknut

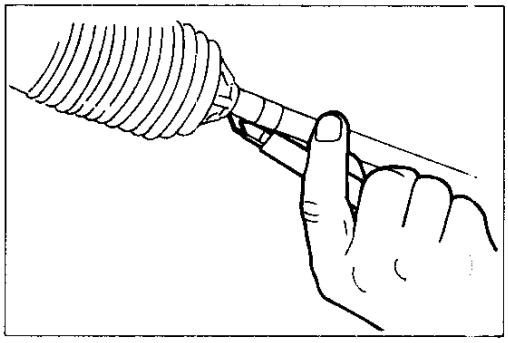
Before loosening the tie rod end locknut, make mark for reference when tightening.



37U0NX 015

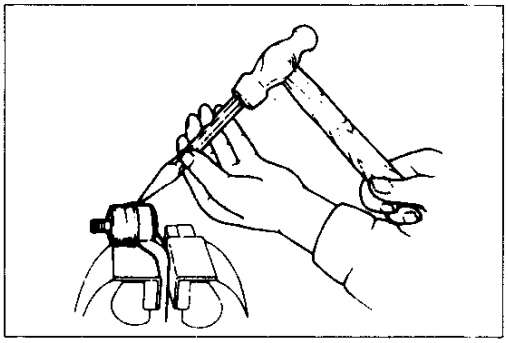
Tie rod end ball joint

1. Loosen the tie rod end ball joint nut until it is about flush with the end of the stud.
2. With the nut protecting the stud, separate the tie rod end from the steering knuckle by using the **SST**.


37U0NX 016

Steering gear boot

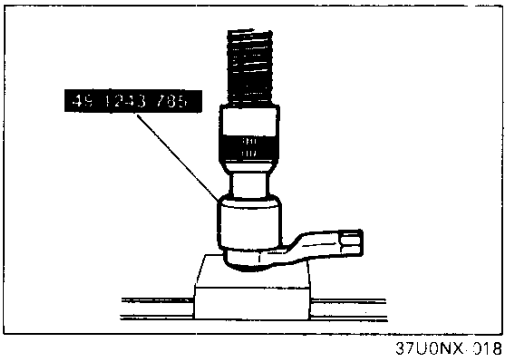
If the steering gear boot is difficult to remove, use a razor knife to cut open the small diameter end.


37U0NX 017

Tie rod end boot

Caution
- **Do not scar the part where the boot attaches to the tie rod end.**

1. Secure the tie rod end in a vise.
2. Place a chisel against the boot and hold it at an angle as shown.
3. Remove the boot by tapping it with a hammer.



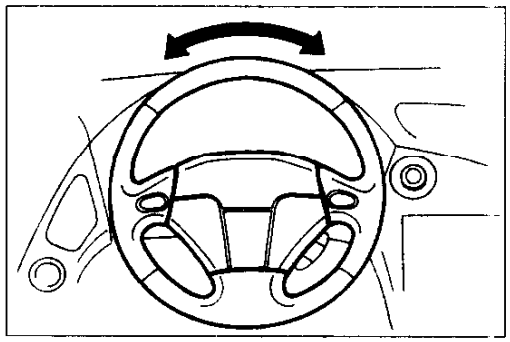
37U0NX 018

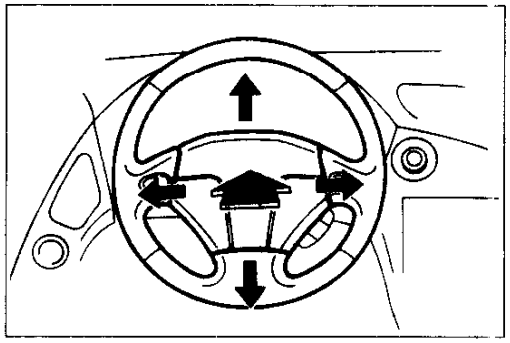
Installation note
Tie rod end boot

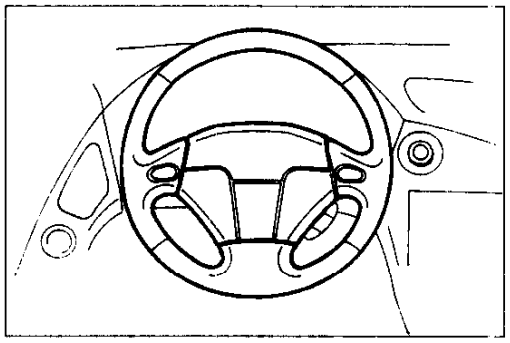
1. Wipe away the grease on the ball joint.
2. Put a small amount of grease (lithium base) into the new boot and set it onto the tie rod end.
3. Press the boot onto the tie rod end by using the **SST** and a press.
4. Wipe away any excess grease.

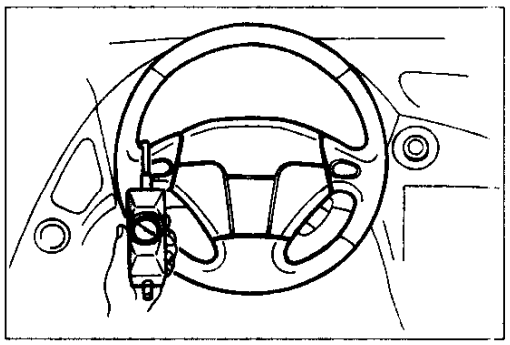
Steering gear boot

Verify that the boot is not twisted.


37U0NX-019


37U0NX-020


37U0NX-021


37U0NX-022

STEERING WHEEL AND COLUMN

On-vehicle Inspection

Steering wheel play

1. With the wheels in the straight-ahead position, gently turn the steering wheel to the left and right and verify that the play is within specification.

   Play: 0–30 mm {0–1.18 in}

2. If the play exceeds specification, check the steering joints for wear and check the steering gear for excessive backlash. Correct as necessary.

Looseness or play of steering wheel

1. Move the steering wheel in the directions of the arrows to check for column bearing wear, steering shaft joint play, steering wheel looseness, and column looseness.
2. If looseness is noted, inspect for the cause and repair as necessary.

Steering wheel effort

1. With the vehicle on a hard, level surface, put the wheels in the staight-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, attach a pull scale to the outermost point of the steering wheel spoke. Then, starting with the wheels in the straight-ahead position, measure the effort required to turn the steering wheel to the left and to the right.

   Steering wheel effort:
   30–38 N {3.0–3.9 kgf, 6.6–8.5 lbf}
   [during one turn of the steering wheel]

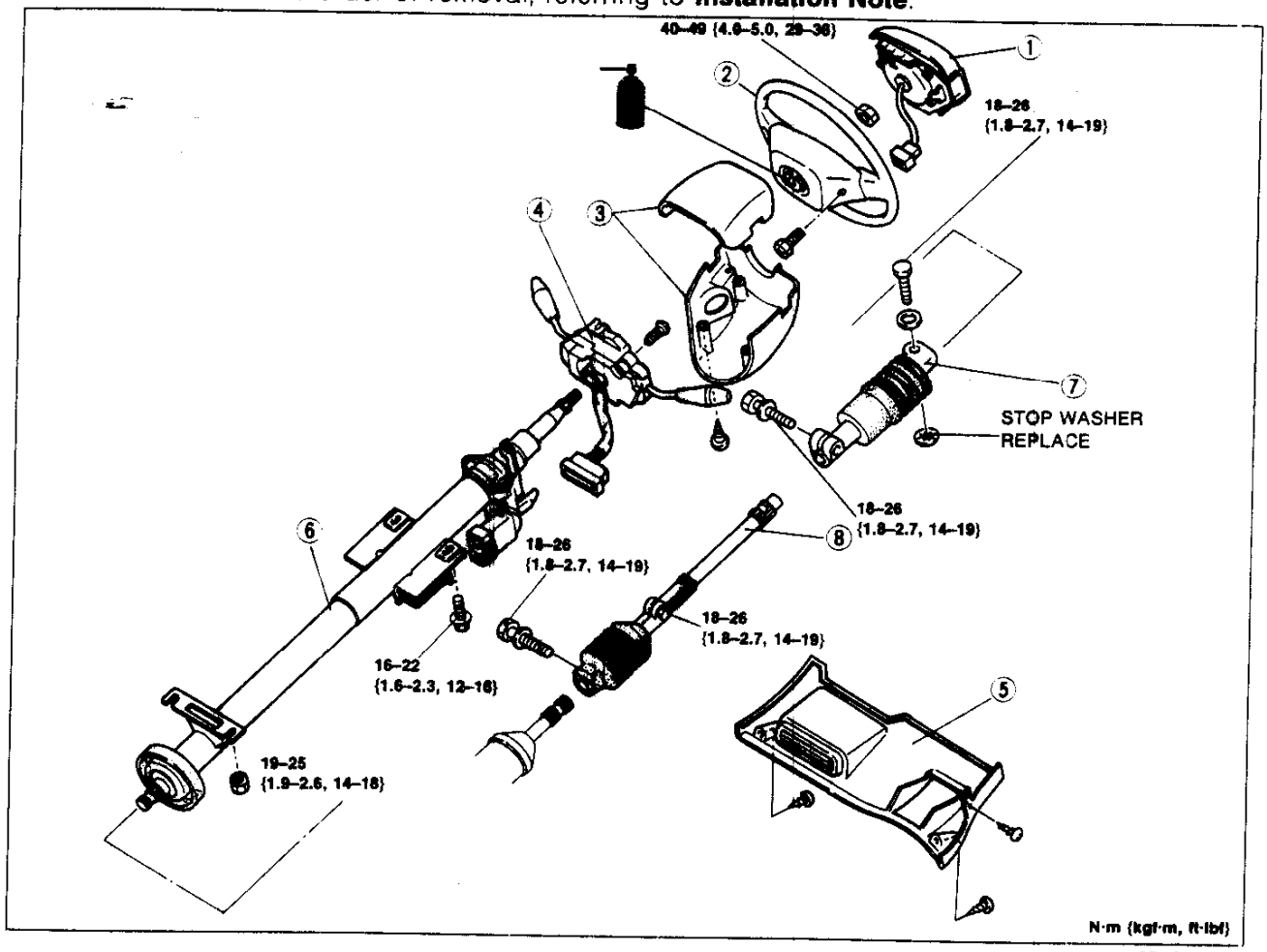
4. If not within specification, check the following: fluid level, air in system, fluid leakage in piping or connections, function of oil pump and gear box, and tire pressures.

Removal / Inspection / Installation

Caution

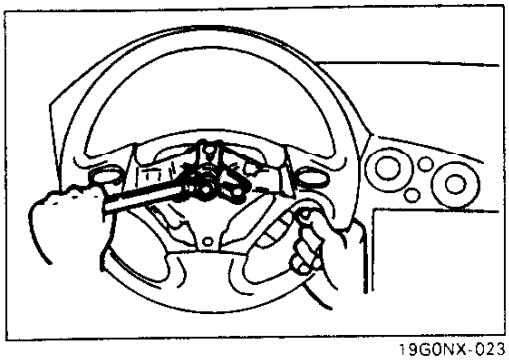
- **Refer to the 1993 RX-7 Body Electrical Troubleshooting Manual for removal and installation of the airbag module.**
- **Adjust the clockspring connector after installing the combination switch. (Refer to the 1993 RX-7 Body Electrical Troubleshooting Manual.)**

1. Disconnect the negative battery cable.
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**.



37U0NX-02

1. Air bag module
   Service ..... 1993 RX-7 Body Electrical Troubleshooting Manual
2. Steering wheel
   Removal Note ..... page N–13
   Installation Note ..... page N–13
3. Column cover
4. Combination switch
   Service ..... 1993 RX-7 Body Electrical Troubleshooting Manual
5. Lower panel
6. Steering shaft assembly
   Installation Note ..... page N–13
   Disassembly / Inspection / Assembly ..... page N–14
   Inspect dust cover for damage
7. Steering joint
   Installation Note ..... page N–13
   Inspect for damage and poor operation
   Inspect boot for cracking and tearing
8. Intermediate shaft
   Installation Note ..... page N–13
   Inspect for damage and bending
   Inspect boot for cracking and tearing

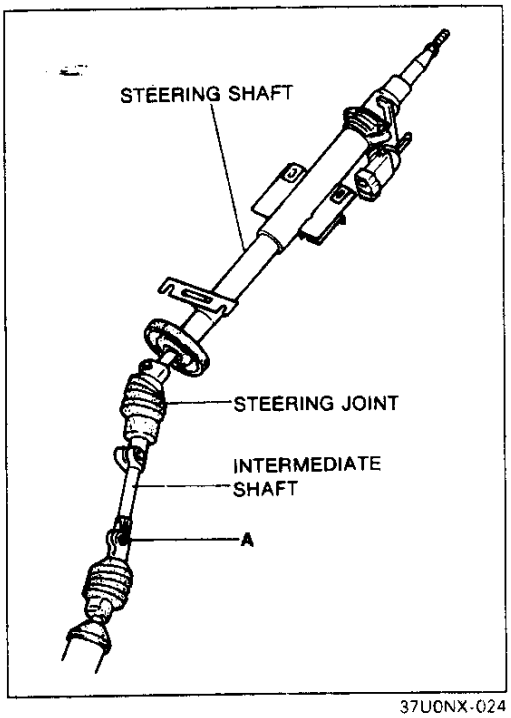


19G0NX-023

Removal note
Steering wheel

Caution
- **Do not try to remove the steering wheel by hitting the shaft with a hammer. The column will collapse.**

Remove the steering wheel by using a suitable puller.



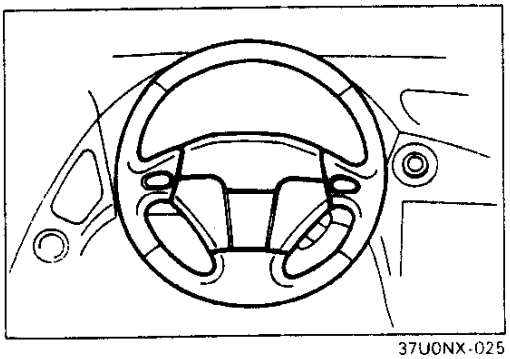
37U0NX-024

Intermediate shaft

Caution
- **Because bolt A is clamped, it can be loosened, but cannot be removed.**

Installation note
Steering shaft, steering joint, and intermediate shaft

Assemble the steering shaft, steering joint, and intermediate shaft, then tighten the bolts. Tighten bolt A last.



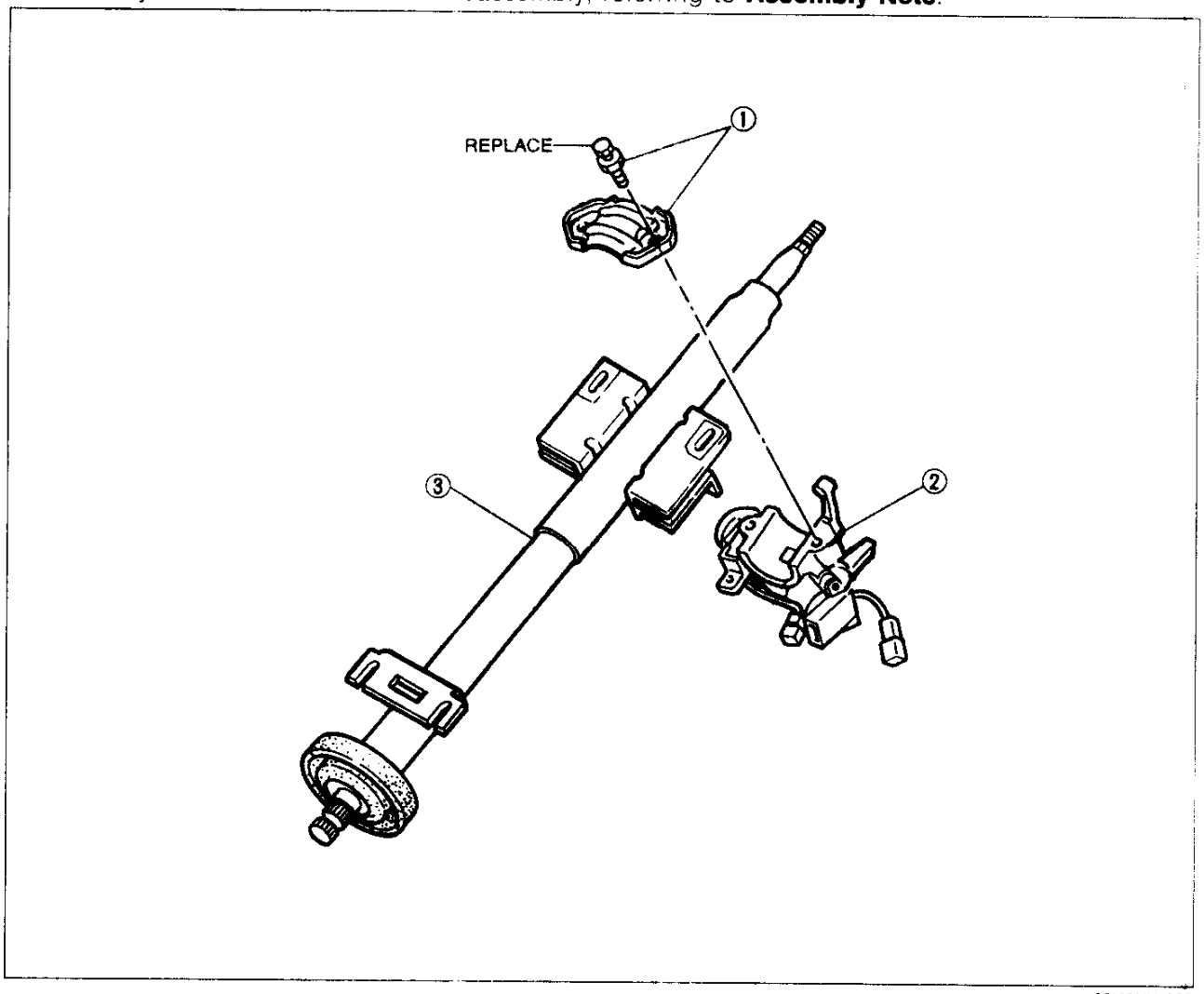
37U0NX-025

Steering wheel

Install the steering wheel with the wheels in the straight-ahead position.

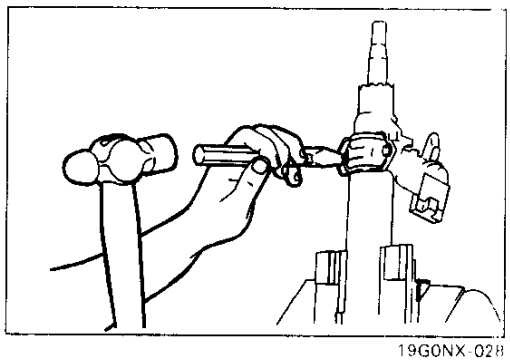
Disassembly / Inspection / Assembly

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



37U0NX-026

1. Steering lock mounting bolts and bracket
   Disassembly Note ..... below
   Assembly Note ..... page N–15
2. Steering lock assembly
   Inspection ..... page N–15
3. Steering shaft assembly
   Inspection ..... page N–15

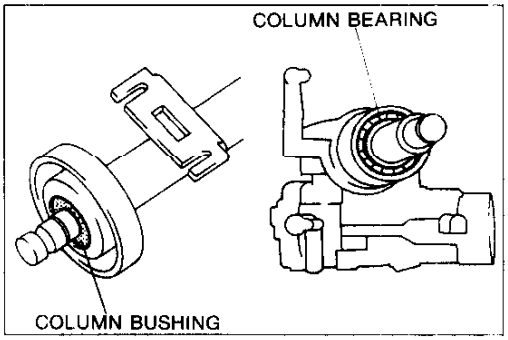


19G0NX-028

Disassembly note
Steering lock mounting bolts and bracket

Caution
- **Use protective plates in the jaws of the vise.**

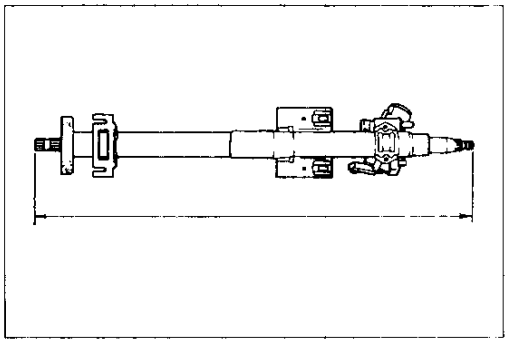
1. Secure the steering shaft in a vise.
2. Use a chisel to make a groove in the heads of the steering lock mounting bolts.
3. Remove the bolts by using a screwdriver.
4. Remove the steering lock assembly.



37U0NX-027

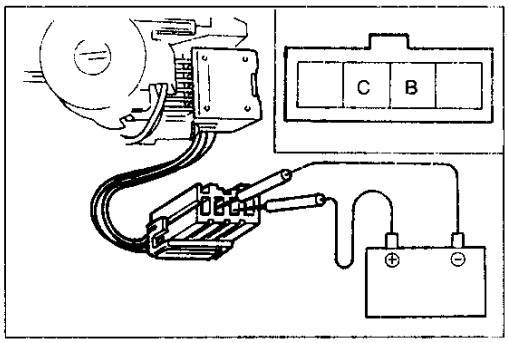
Inspection
Steering shaft assembly

Check for the following and replace the steering shaft assembly if necessary.
1. Column bearing for damage
2. Column bushing for damage


37U0NX-028

3. Steering shaft length

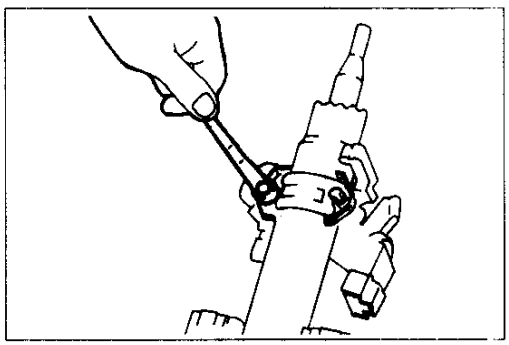
Length: 779.5–781.5 mm {30.69–30.76 in}



37U0NX-029

Steering lock assembly

1. Insert the ignition key in the key cylinder. Apply battery voltage between terminals B and C.
2. Verify that the solenoid operates.
3. If not as specified replace the key interlock solenoid. (Refer to Section K).


37U0NX-030

Assembly note
Steering lock mounting bolts and bracket

1. Install the steering lock assembly on the jacket.
2. Verify that the lock operates correctly.
3. Install new steering lock mounting bolts.
4. Tighten each bolt until its head breaks off.

STEERING GEAR AND LINKAGE

Removal / Installation

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheels and tires and the undercover.
3. Remove in the order shown in the figure, referring to **Removal Note**.

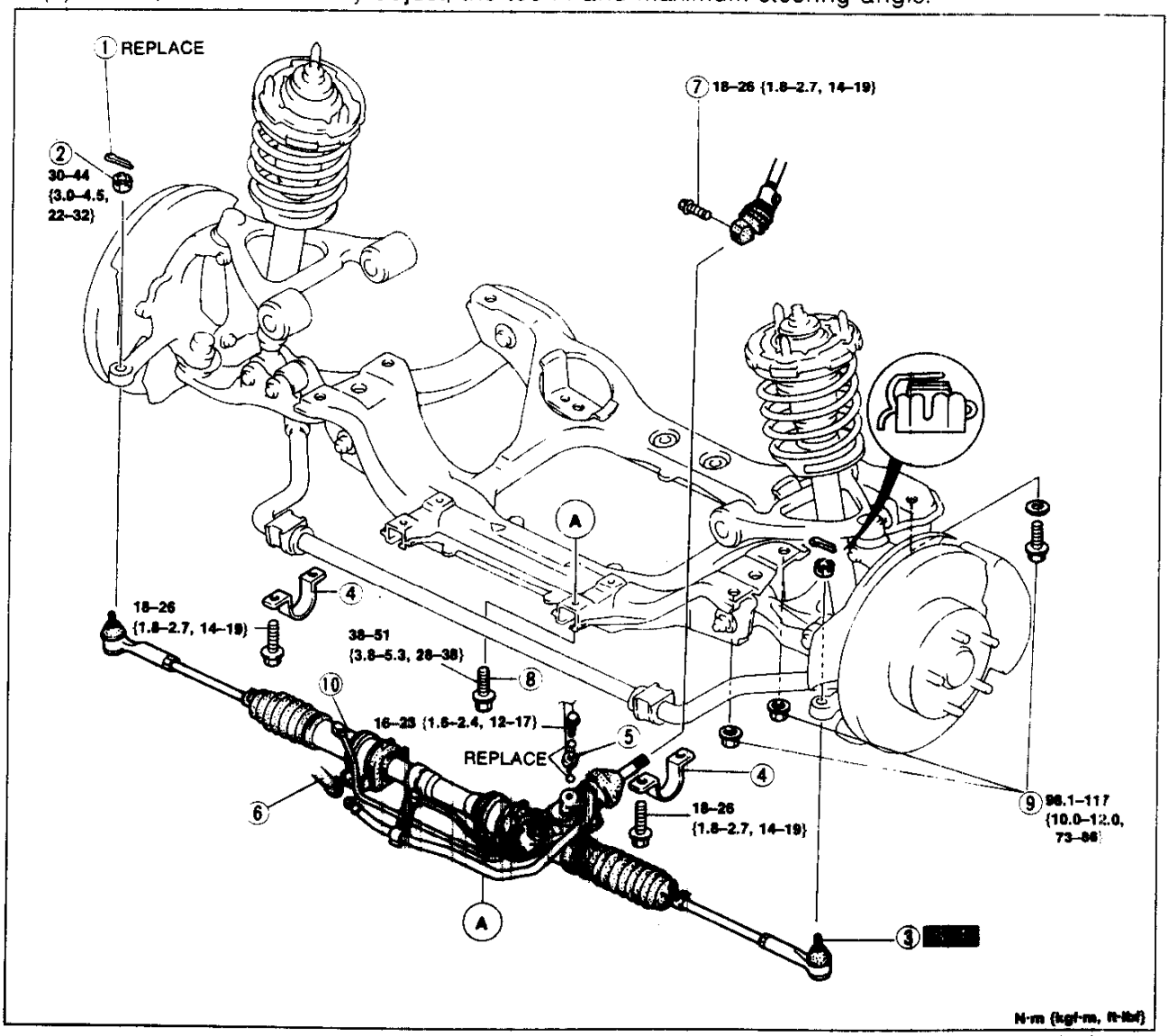
Note

- **Use a container or rags to collect the power steering fluid when disconnecting the pressure hose and return hose.**

4. Install in the reverse order of removal, referring to **Installation Note**.
5. Install the wheels and tires.

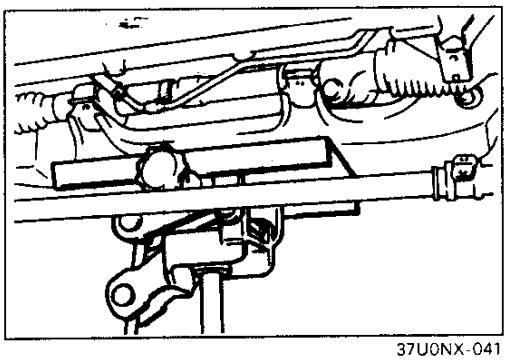
Tightening torque: 89–117 N·m {9–12 kgf·m, 66–86 ft·lbf}

6. Install the undercover.
7. After installation:
   (1) Check for fluid leakage. (Refer to page N–7.)
   (2) Bleed air from the system. (Refer to page N–6.)
   (3) Check, and if necessary adjust, the toe-in and maximum steering angle.



37U0NX-040

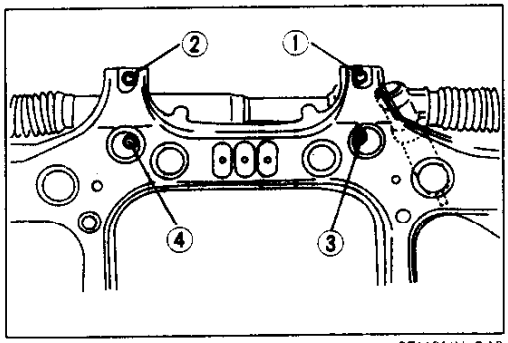
1. Cotter pin
2. Nut
3. Tie rod end ball joint
   Removal Note ..... page N–10
4. Stabilizer bracket
5. Pressure hose
   Installation Note ..... Below
6. Return hose
7. Bolt (steering joint / pinion shaft)
8. Mounting bracket bolts
   Installation Note ..... Below
9. Crossmember nuts and bolts
   Removal Note ..... Below
10. Steering gear and linkage
    Removal Note ..... Below
    Disassembly / Inspection ..... page N–18
    Assembly ..... page N–23



37U0NX-041

Removal note
Crossmember nuts and bolts, steering gear and linkage

1. Support the crossmember with a jack, and remove the crossmember nuts, and bolts.
2. Slowly lower the crossmember and remove the steering gear and linkage.

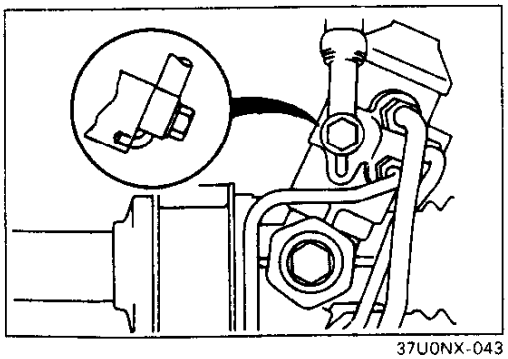


37U0NX-042

Installation note
Mounting bracket bolts

1. Loosely tigten the bolts 3 and 4.
2. Tighten all of the mounting bracket bolts to the specified torque in the order shown.

Tightening torque:
38–51 N·m {3.8–5.3 kgf·m, 27–38 ft·lbf}



37U0NX-043

Pressure hose

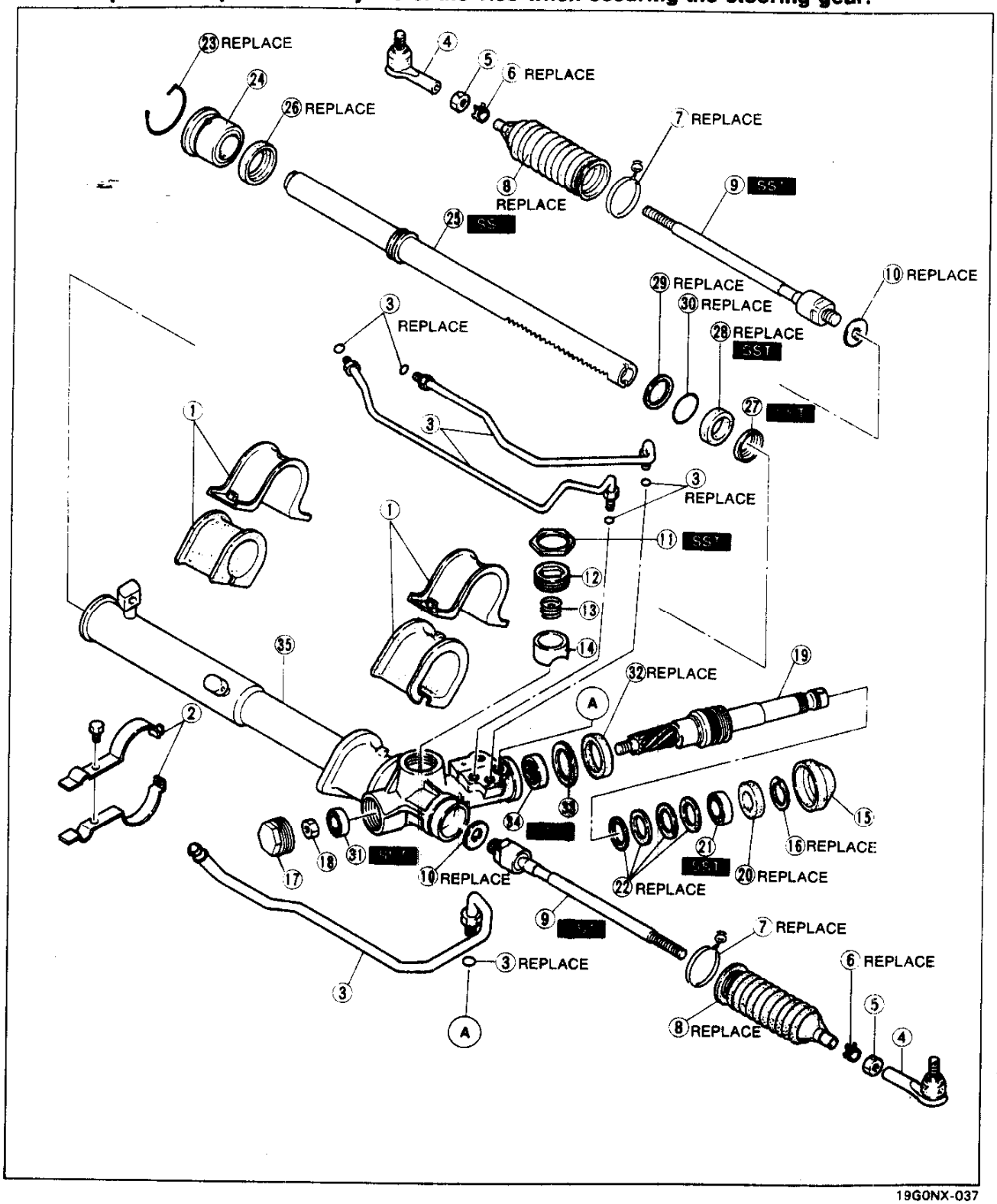
Before assembly, align the pin with the positioning hole.

Disassembly / Inspection

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.

Caution

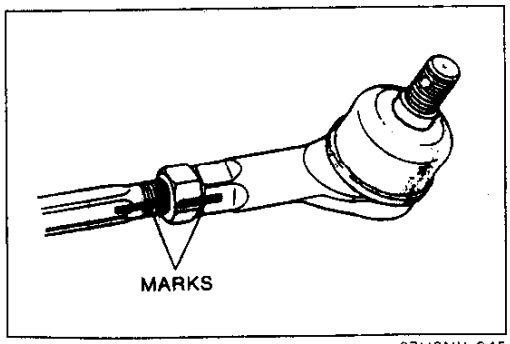
- **Use protective plates in the jaws of the vise when securing the steering gear.**



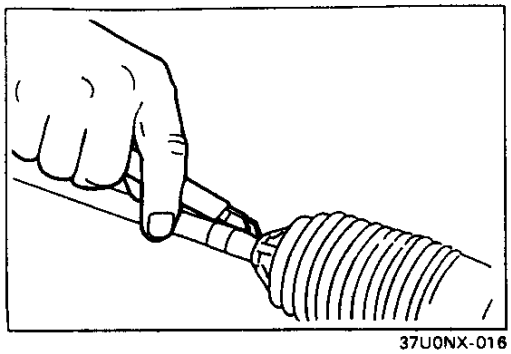
19G0NX-037

1. Mounting bracket and rubber
2. Pipe clamp
3. Oil pipe and O-ring
   Inspect for clogging and damage
4. Tie rod end
   Inspection ..... page N–22
   Disassembly Note ..... Below
5. Looknut (tie rod end)
6. Boot clamp
7. Boot wire
8. Boot
   Disassembly Note ..... Below
9. Tie rod
   Inspection ..... page N–22
   Disassembly Note ..... page N–20
10. Washer (tie rod)
11. Locknut (adjusting cover)
    Disassembly Note ..... page N–20
12. Adjusting cover
13. Yoke spring
    Inspect for damage
14. Support yoke
    Inspect for damage
15. Dust cover
16. Snap ring
17. Housing cover
18. Locknut (pinion shaft)
19. Pinion shaft assembly
    Inspect teeth for wear and damage
    Inspect valve for clogging, damage and wear
    Disassembly Note ..... page N–20
20. Oil seal
21. Upper bearing
    Inspect for wear and damage
    Disassembly Note ..... page N–20
22. Seal ring
    Disassembly Note ..... page N–20
23. Clip
    Disassembly Note ..... page N–21
24. Rack stop
    Disassembly Note ..... page N–21
25. Rack
    Disassembly Note ..... page N–21
    Inspection ..... page N–22
26. Oil seal
    Disassembly Note ..... page N–21
27. Backup washer
    Disassembly Note ..... page N–21
28. Oil seal
    Disassembly Note ..... page N–21
29. Seal ring
    Disassembly Note ..... page N–21
30. O-ring
    Disassembly Note ..... page N–21
31. Lower bearing
    Disassembly Note ..... page N–21
    Inspect for wear and damage
32. Oil seal
    Disassembly Note ..... page N–21
33. Washer
34. Needle bearing
    Disassembly Note ..... page N–22
    Inspect for wear and damage
35. Gear housing
    Inspect for damage and cracks

37U0NX-044



37U0NX-045



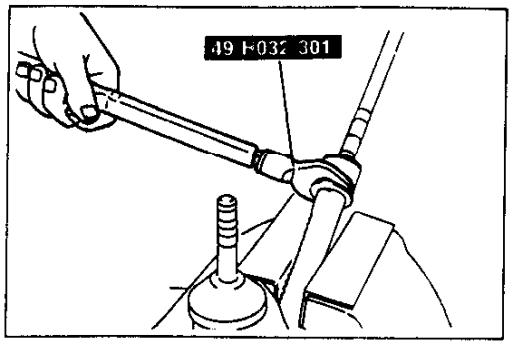
37U0NX-016

Disassembly note
Tie rod end

Before loosening, mark the tie rod end as shown for reference during installation.

Boot

If the boot is difficult to remove, use a razor knife to cut open the small diameter end.

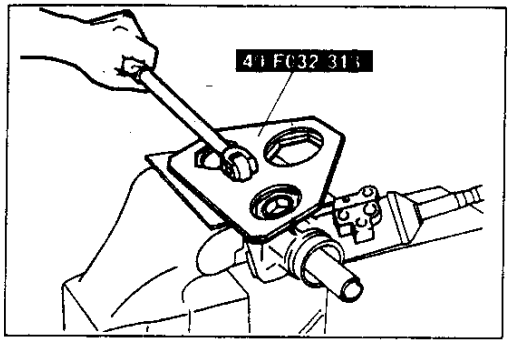


37U0NX-046

Tie rod

1. Unbend the washer
2. Remove the tie rod by using the **SST**.

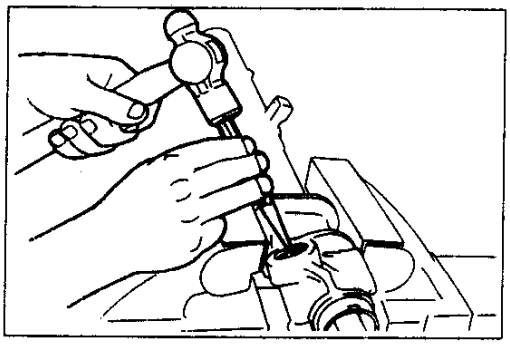
Caution
- **Use protective plates in the vise when securing the rack teeth.**



37U0NX-047

Locknut

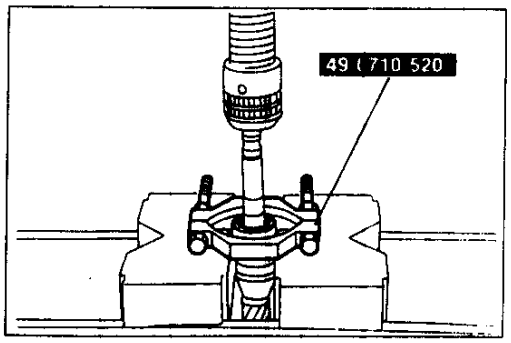
Remove the locknut by using the **SST**.


37U0NX-048

Pinion shaft assembly

Place a punch on the center of the shaft, and tap lightly with a hammer to remove it.

Caution
- **Support the pinion shaft assembly to prevent it from falling.**

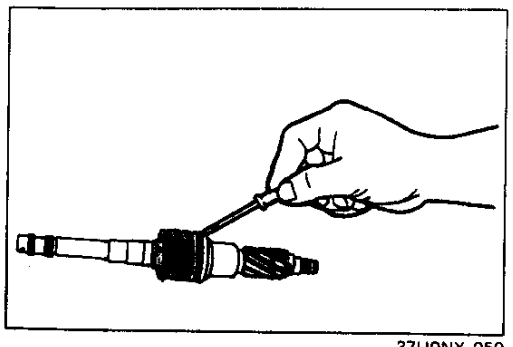


37U0NX-049

Upper bearing

Caution
- **Do not remove the upper bearing if not necessary.**

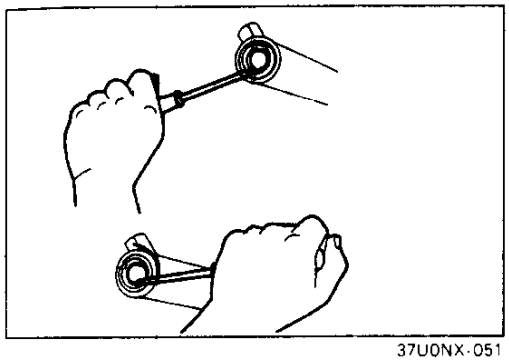
Remove the upper bearing by using the **SST**.


37U0NX-050

Seal ring

Caution
- **Do not damage the pinion shaft ring groove.**

Remove the seal ring from the pinion shaft by using a small screwdriver.

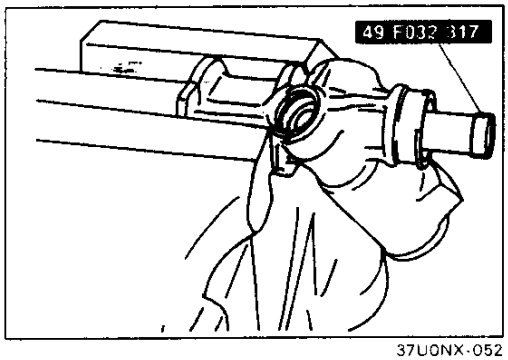


37U0NX-051

Clip and rack stop

Caution
- **Do not forcefully turn the rack stop.**

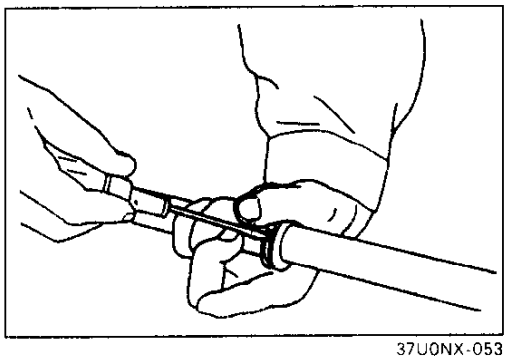
1. Turn the rack stop in the direction easiest to turn until the end of the clip pops out.
2. Turn the rack stop the opposite direction and remove the clip.
3. Remove the rack stop.



37U0NX-052

Rack, oil seal and backup washer

1. Set the **SST** into the end of the rack.
2. Pull out the rack assembly, with the oil seal and backup washer.

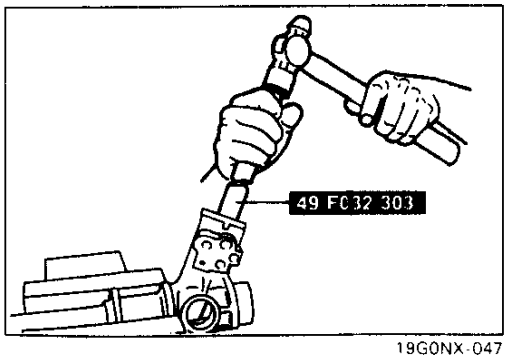


37U0NX-053

Seal ring and O-ring

Caution
- **Do not damage the piston groove.**

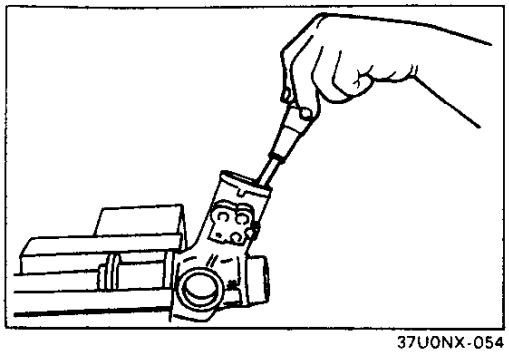
1. Remove the seal ring by using a small screwdriver.
2. Remove the O-ring.



19G0NX-047

Lower bearing

Drive the lower bearing out of the housing by using the **SST**.

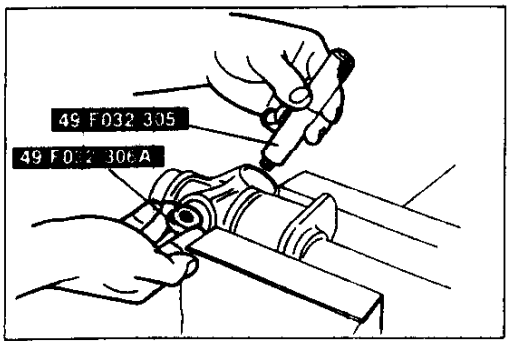


37U0NX-054

Oil seal

Caution
- **Do not damage the inside of the valve housing.**

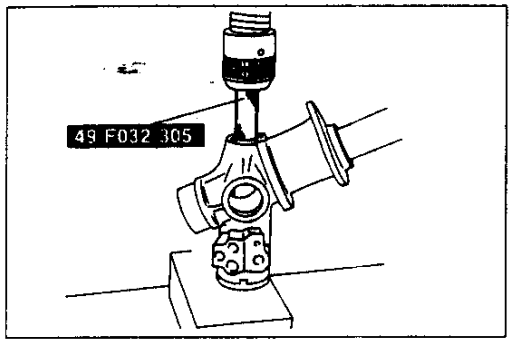
Remove the oil seal by using a screwdriver.



37U0NX-055

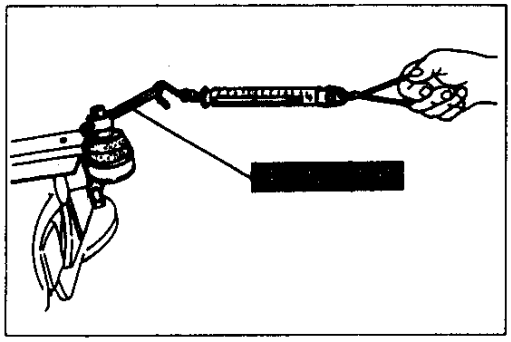
Needle bearing

1. Insert the **SST** (body) through the adjusting cover hole.
2. Set the **SST** (handle) against the **SST** of Step 1.



37U0NX-056

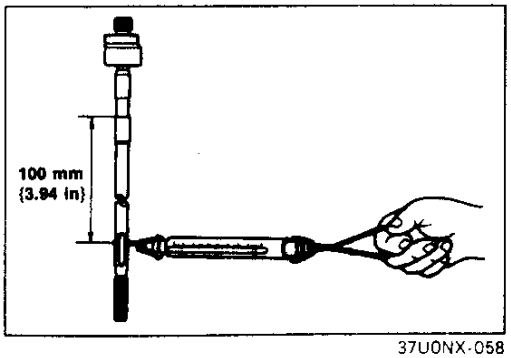
3. Press out the needle bearing by using **SST**.


37U0NX-057

Inspection
Tie rod end

1. Inspect the tie rod end for damage and the boot cracks. Replace as necessary.
2. Inspect the ball joint for looseness. Replace the tie rod end if necessary.
3. Shake and rotate the ball joint several times.
4. Measure the rotation torque of the ball joint by using the **SST** and a pull scale.

   Rotation torque: 0.3–2.9 N·m {3–30 kgf·cm, 2.6–26in·lbf}
   Pull scale reading: 3–29 N {0.3–3kgf, 0.7–6.6 lbf}
5. If not within specification, replace the tie rod end.

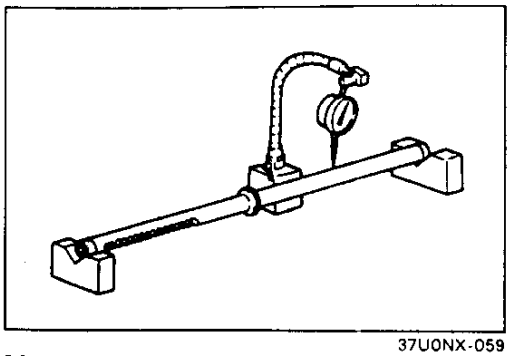


37U0NX-058

Tie rod

1. Inspect the tie rod for bending and damage. Replace it if necessary.
2. Inspect the ball joint for looseness. Replace the tie rod necessary.
3. Swing the tie rod several times.
4. Measure the swinging torque by using a pull scale.

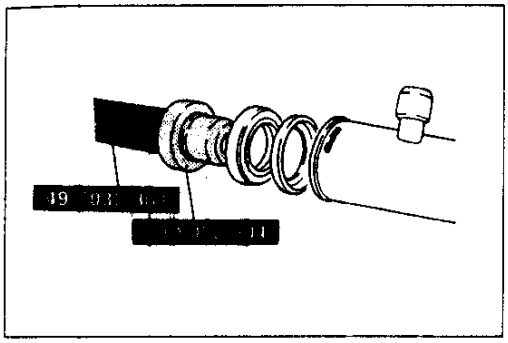
   Swinging torque: 0.1–3.4N·m {1–35 kgf·cm, 0.9–30 in·lbf}
   Pull scale reading: 0.7–21 N {0.07–2.2 kgf, 0.16–4.8 lbf}
5. If not within specification, replace the tie rod.


37U0NX-059

Rack

1. Inspect the rack for cracking, damage and tooth wear. Replace it if necessary.
2. Measure runout of the rack.

   Runout: 0.4 mm {0.016 in} max.
3. If not within specification, replace the rack.

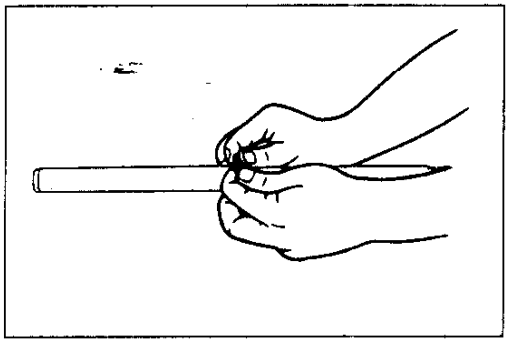


37U0NX-060

Assembly

1. Backup washer and oil seal

(1) Apply ATF to the new oil seal.
(2) Install the backup washer and oil seal by using the **SST**.
(3) After installing, shake the gear housing and verify that the backup washer does not rattle.
(4) If it rattles, remove the oil seal and backup washer and reinstall them.



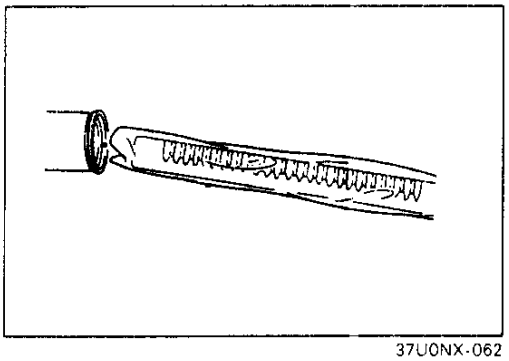
37U0NX-061

2. Rack

(1) Apply ATF to a new O-ring and seal ring.
(2) Install the O-ring then seal ring in the piston groove.

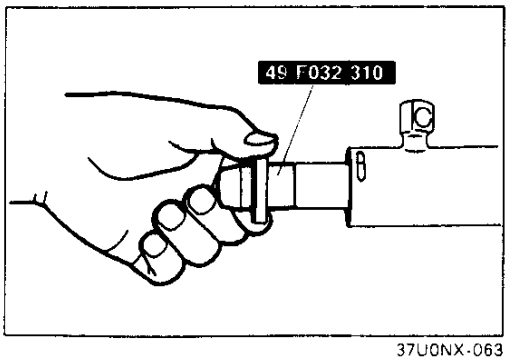
Caution

- **Do not damage the piston groove.**



37U0NX-062

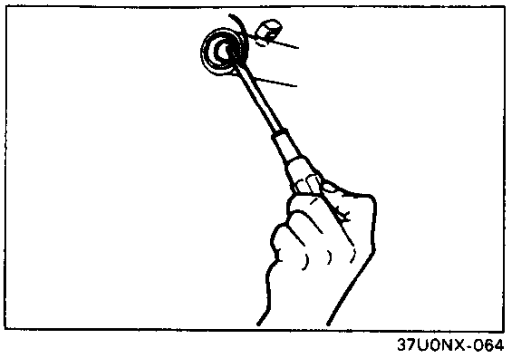
(3) Apply grease to the friction surface and teeth of the rack.
(4) Slide the vinyl sleeve supplied in the seal kit over the rack and slide the rack in from the tube side.
(5) Remove the vinyl sleeve.



37U0NX-063

3. Oil seal

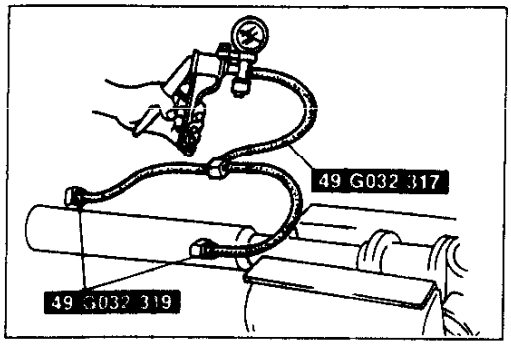
(1) Set the **SST** onto the end of the rack.
(2) Apply ATF to the new oil seal and slide it onto the and into the rack housing.



37U0NX-064

4. Rack stop and clip

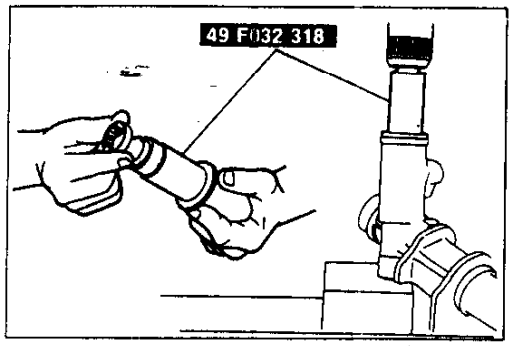
(1) Turn the rack stop into the housing until the holes of the stop and rack housing are aligned.
(2) Install the new clip.
(3) Turn the rack stop until the clip is fully installed (approx. 1.5 turns).



37U0NX-065

5. Hermetic inspection of cylinder

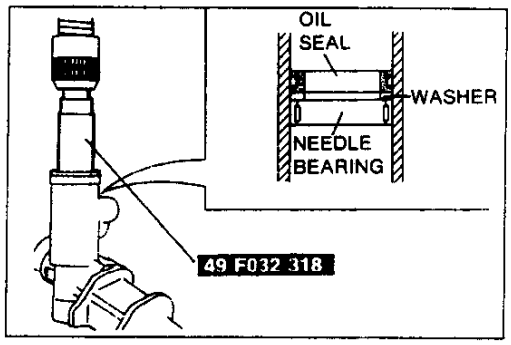
(1) Connect the **SST** (adapters) to the cylinder housing.
(2) Connect a vacuum pump to the **SST** (hose) and apply **53.3 KPa {400mmHg}** vacuum.
(3) Verify that vacuum is held for at least **30 seconds**. If not, replace the oil seals.



37U0NX-066

6. Needle bearing

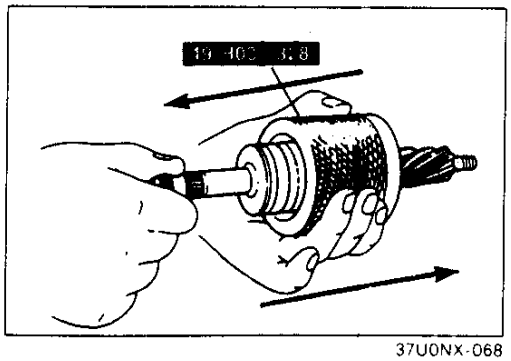
(1) Press in the needle bearing by using the **SST**.
(2) Apply grease to the needle bearing.



37U0NX-067

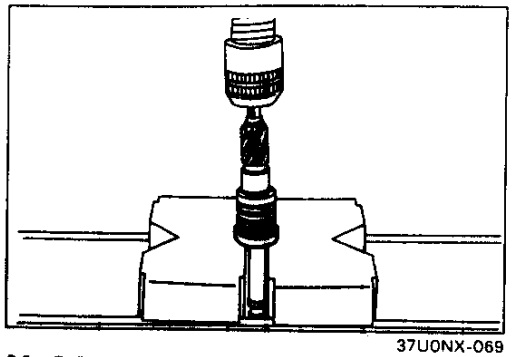
7. Washer and oil seal

(1) Install the washer
(2) Apply ATF to the new oil seal.
(3) Press in the oil seal by using the **SST**.


37U0NX-068

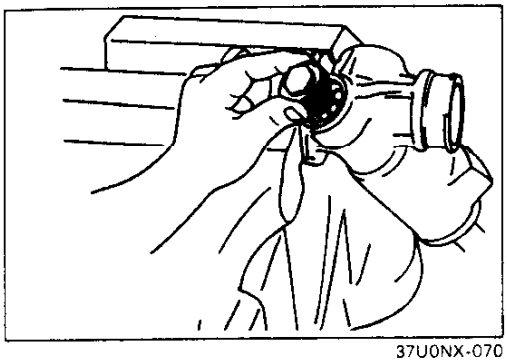
8. Seal ring

(1) Apply ATF to the new seal rings.
(2) Install the seal rings onto the pinion shaft assembly.
(3) Pass the pinion shaft assembly back and forth through the **SST** to form the seal rings.


37U0NX-069

9. Upper bearing

Press the upper bearing onto the pinion shaft assembly.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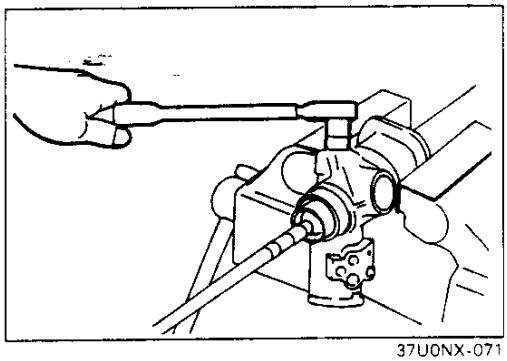
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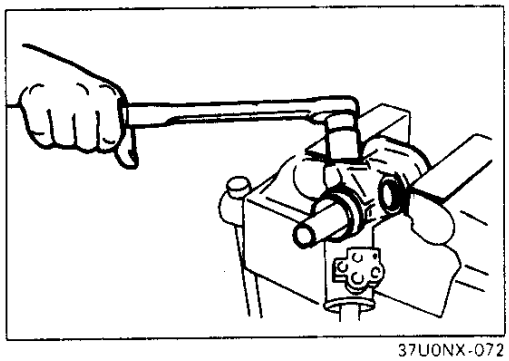
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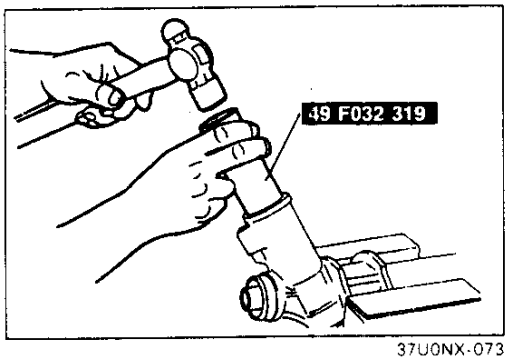

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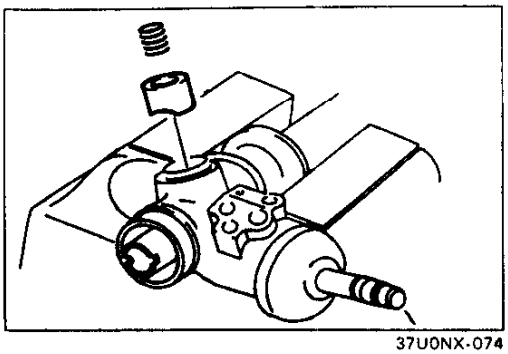

37U0NX-074

10. Pinion shaft assembly and lower bearing

(1) Apply grease to the teeth of the rack.
(2) Insert the pinion shaft assembly into the gear housing.
(3) Apply grease to the lower bearing and install t onto the pinion shaft.
(4) Seat the bearing by installing the housing cover and gradually tightening it until the tightening force suddenly increases.

(5) Remove the housing cover.

11. Locknut (pinion shaft)

(1) Temporally install the tie rod to hold the rack.
(2) Tighten the pinion shaft locknut.

Tightening torque:
20–29 N·m {2.0–3.0 kgf·m, 15–21 ft·lbf}

12. Housing cover

(1) Apply sealant to the threads of the housing cover.

Note
- **Do not use excessive sealant.**

(2) Install the housing cover.

Tightening torque:
50–69 N·m {5.0–7.0 kgf·m, 36–50 ft·lbf}

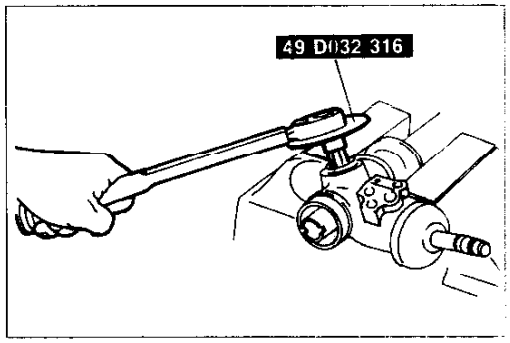
(3) Stake the housing cover at two points by using a center punch.

13. Oil seal (upper pinion shaft)

(1) Install the new oil seal by using the **SST**.
(2) Install the new snap ring.
(3) Install the dust cover.

14. Support yoke assembly

(1) Apply grease to the friction surface of the support yoke.
(2) Install the support yoke and the yoke spring.



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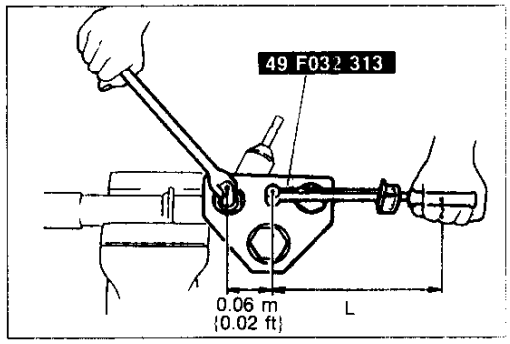


37U0NX-07

15. Adjusting cover and locknut

(1) Apply sealant to the threads of the adjusting cover.

(2) Tighten the adjusting cover to **9.81 N·m {100 kgf·cm, 86.8 in·lbf}**. To obtain good rack-and-pinion engagement, move the rack full stroke ten times, then return the adjusting cover **20–25 degrees**.

Note

- **Turning angle is determined by using the SST.**

(3) Tighten the locknut by using the **SST**.

Caution

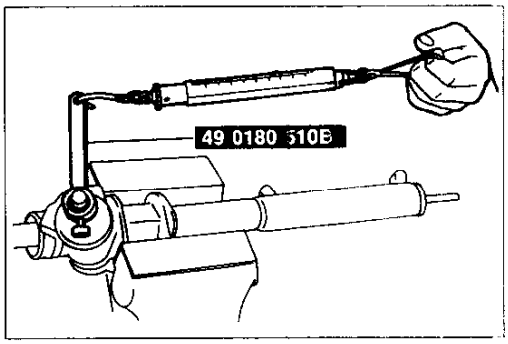
- **When tightening the looknut with the SST, adjust the below-written tightyening torque by using the following formulas. Choose the formula that applies to you.**

(L = torque wrench length)

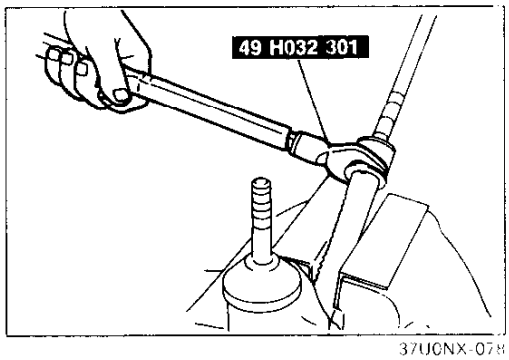
N·m	N·m × L m ÷ (L m + 0.06)
kgf·m	kgf·m × L m ÷ (L m + 0.06)
ft·lbf	ft·lbf × L ft ÷ (L ft + 0.02)

Tightening torque:
50–68 N·m {5.0–7.0 kgf·m, 37–50 ft·lbf}

- **Do not allow the adjusting cover to turn.**



37U0NX-07



37U0NX-07

16. Measurement of pinion preload

(1) Attach the **SST** and a pull scale to the pinion shaft.

(2) Measure the pinion preload. (Center of rack ±90 degrees)

Pinion preload: 1.5 N·m {15 kgf·cm, 13 in·lbf} max.
Pull scale reading: 1.5 kg {3.3 lbf} max.

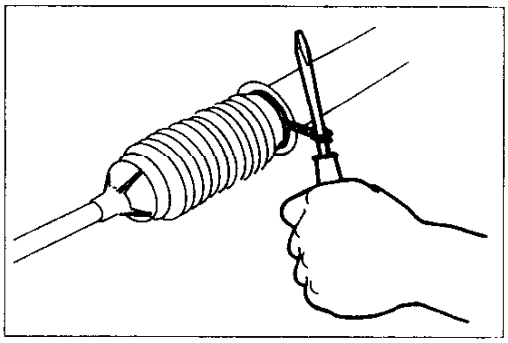
(3) If not within specification, repeat Steps 15 (2) and 15 (3).

17. Tie rod

(1) Install the tie rod by using **SST**.

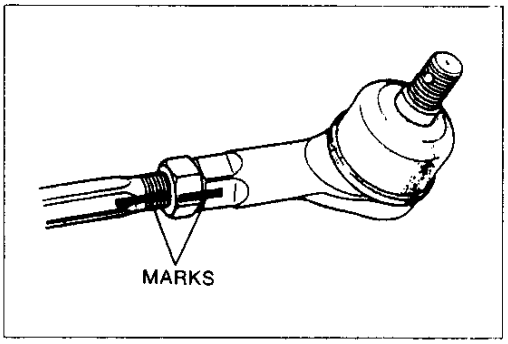
Tightening torque:
78–98 N·m {8.0–10.0 kgf·m, 58–72 ft·lbf}

(2) Bend the new washer at two places to hold the tie rod.


37U0NX 079

18. Boot

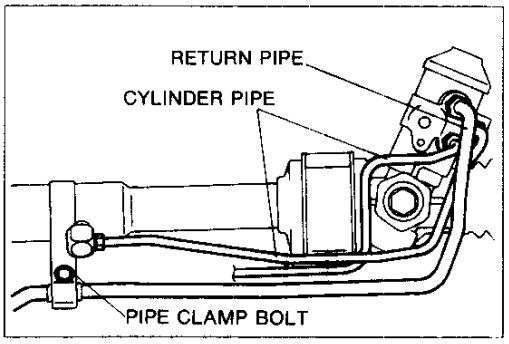
(1) Apply grease to the inner bore of the small end of the boot.
(2) Install the boot. Wrap a new boot wire around the large end of the boot two times and then twist it 4–4.5 times. Bend the twisted part toward mounting bracket.
(3) Install a new boot clamp on the small end of the boot.
(4) Slide the rack its full stroke and verify that the boot is not twisted.



37U0NX 080

19. Tie rod end

Install the tie rod end and align the reference marks.



37U0NX 08

20. Oil pipe and O-ring

(1) Install the new O-rings and the oil pipes.
(2) Install the pipe clamp.

Tightening torque
Return pipe: 24–29 N·m {2.4–3.0 kgf·m, 17–22 ft·lbf}
Cylinder pipe: 9.81–15.6 N·m {100–160 kgf·cm, 86.9–138 in·lbf}
Pipe clamp bolt: 5.0–6.8 N·m {50–70 kgf·cm, 44–60 in·lbf}

21. Mounting rubber and bracket

Install the mounting rubber and bracket

POWER STEERING OIL PUMP

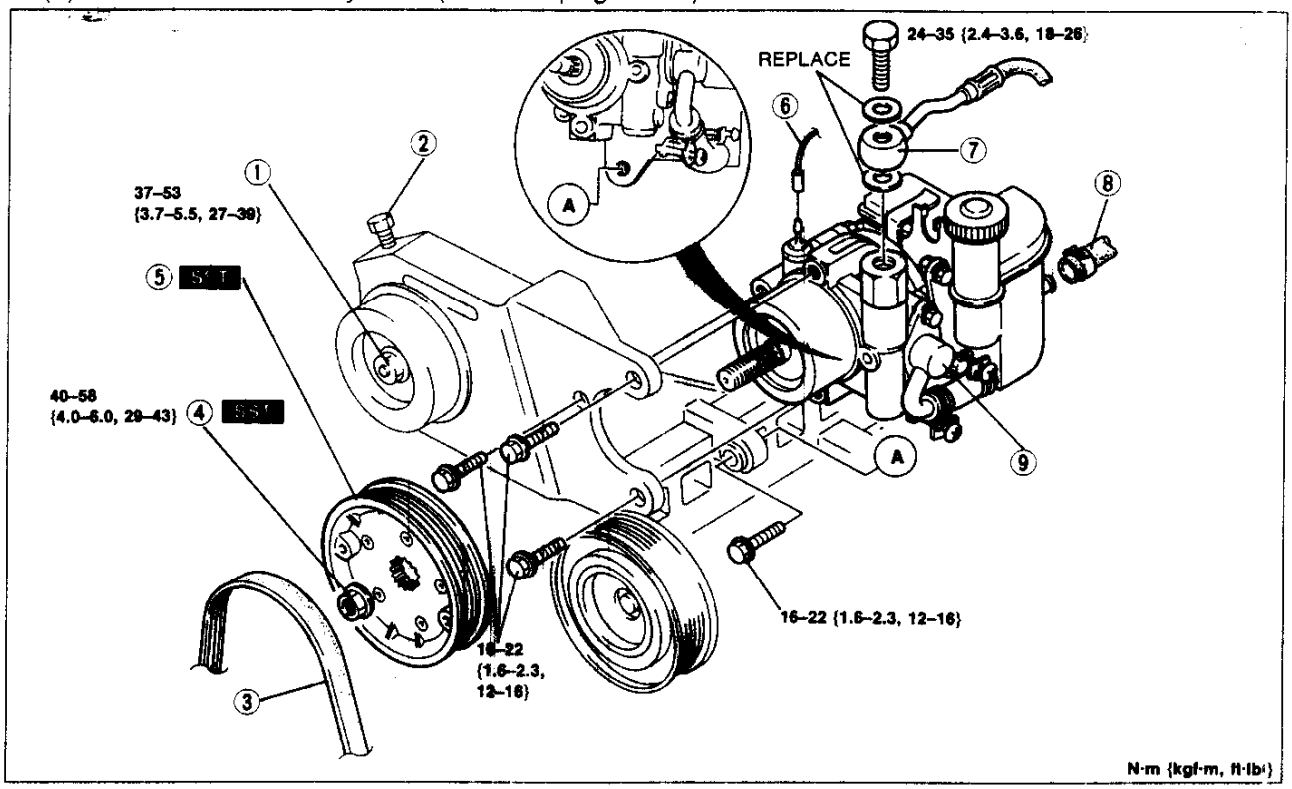
Removal / Installation

1. Remove in the order shown in the figure, referring to **Removal Note**.

Note

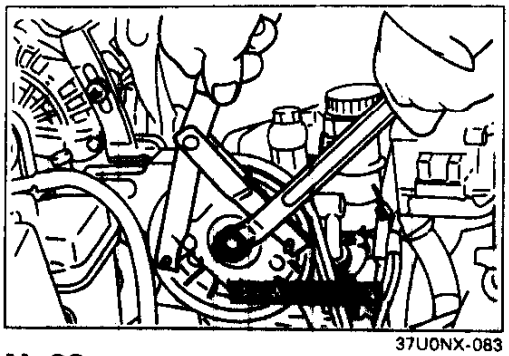
- **Use a container or rags to collect the power steering fluid when disconnecting the pressure pipe and return hose.**

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:
   (1) Adjust the belt deflection. (Refer to page N–31.)
   (2) Check connections for fluid leakage. (Refer to page N–7.)
   (3) Bleed air from the system. (Refer to page N–6.)



37U0NX-032

1. Locknut
2. Adjusting bolt
3. Drive belt
4. Nut
   Removal / Installation Note ..... below
5. Pulley
   Removal / Installation Note ..... below
6. Pressure switch connector
7. Pressure hose
8. Return hose
9. Power steering oil pump
   Disassembly / Inspection / Assembly ..... page N–29



37U0NX-083

Removal / Installation note
Nut / Pulley

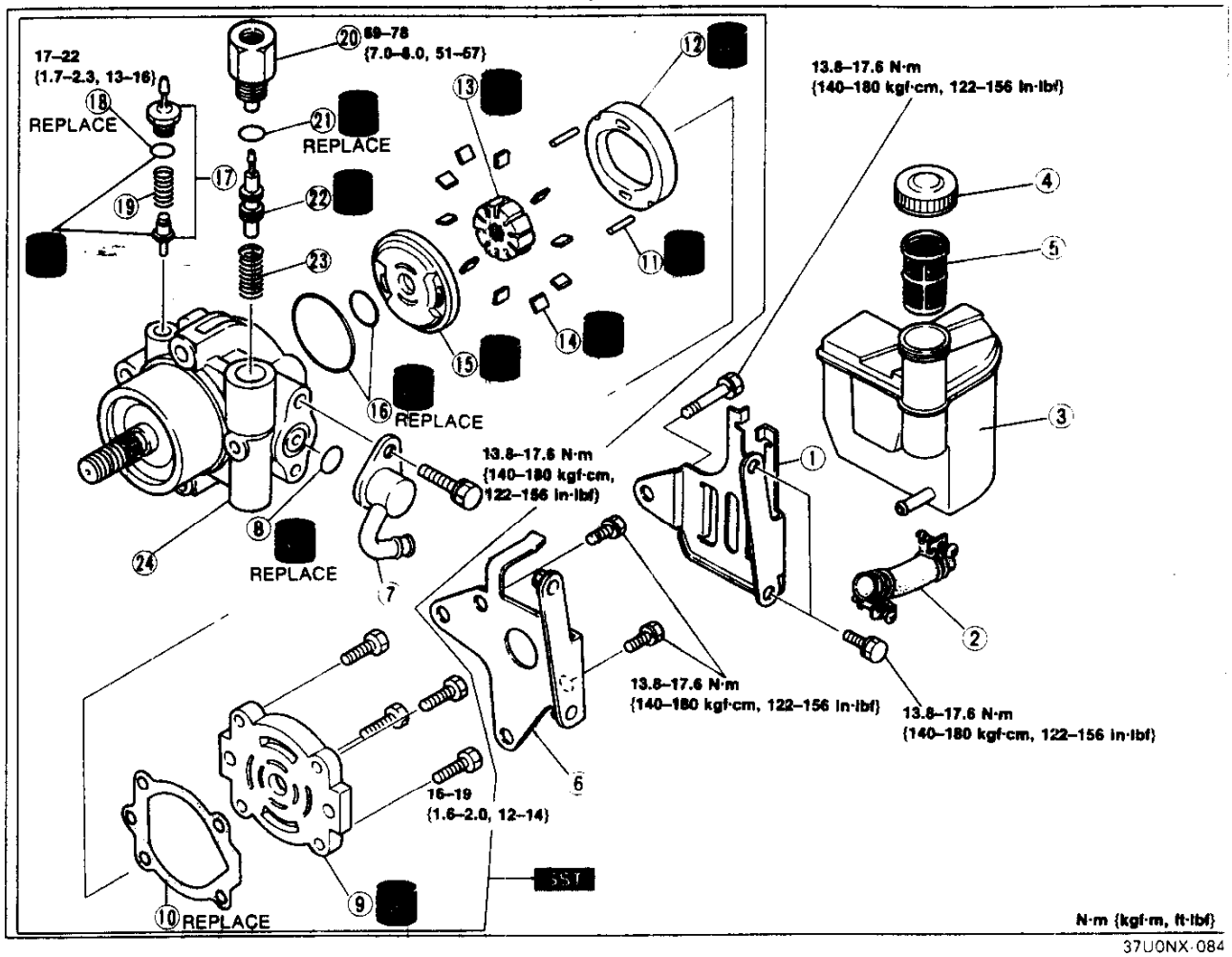
Hold the pulley by using the **SST** and loosen / tighten the nut.

Caution

- **Do not drop the pully. Replace it if it is subjected to a strong impact.**

Disassembly / Inspection / Assembly

1. The following procedure is for replacement of the O-rings only. Replace the oil pump assembly i other repairs are necessary.
2. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



37U0NX-084

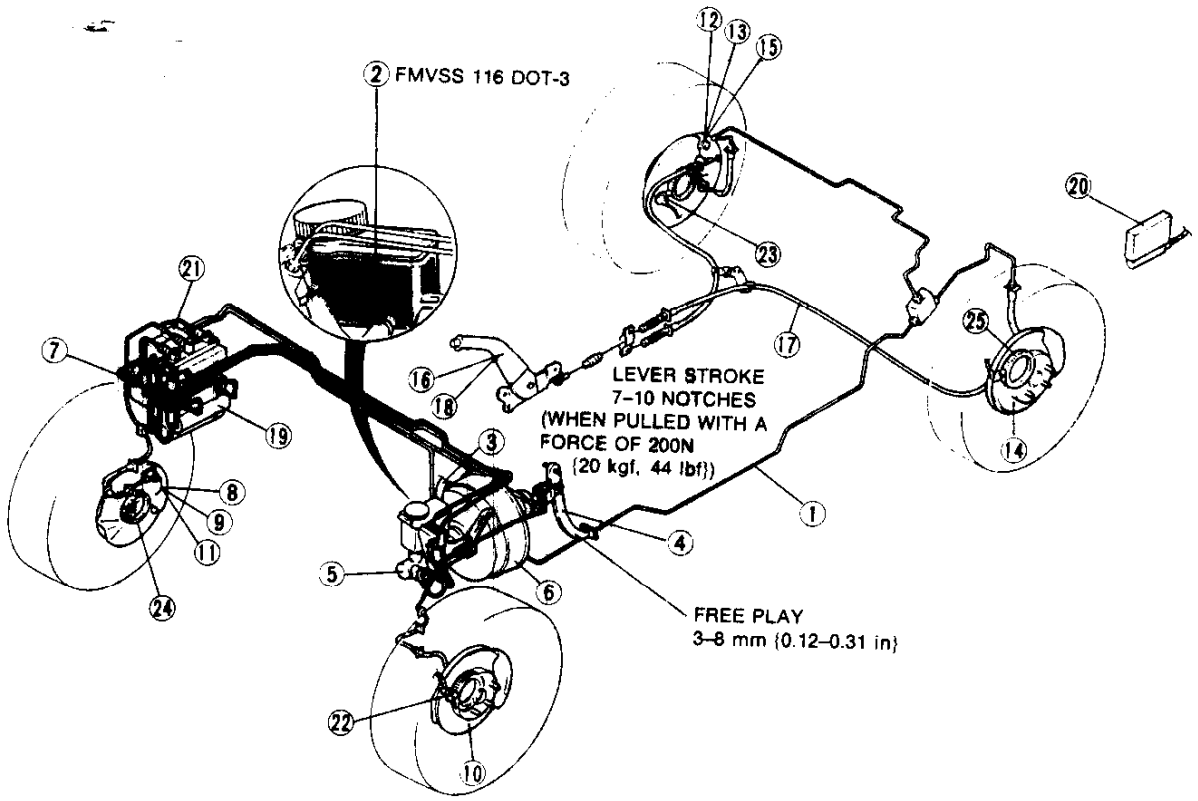
1. Bracket
2. Suction hose
   Inspect for cracks and damage
3. Reservoir
   Inspect for cracks and damage
4. Cap
5. Filter
   Inspect for clogging
6. Bracket
7. Suction pipe
8. O-ring
9. Pump body (rear)
   Assembly Note ..... page N–30
   Inspect for cracks, wear, and damage
10. Gasket
11. Pin
12. Cam ring
    Assembly Note ..... page N–30
    Inspect for wear and damage
13. Rotor
    Inspect for wear and damage
14. Blade
    Assembly Note ..... page N–30
    Inspect for wear and damage
15. Side plate
    Inspect for wear and damage
16. O-ring
17. Pressure switch assembly
18. O-ring
19. Spring
    Inspect for weakness
20. Connector
21. O-ring
22. Control valve
    Inspect for clogging, cracks, and damage
23. Spring
    Inspect for weakness
24. Pump body (front)
    Inspect for cracks, wear, and damage

Before beginning any service procedure, refer to the 1993 RX-7 Body Electrical Troubleshooting Manual; see section S for air bag system precautions and J1 for audio anti-theft system precautions.

BRAKING SYSTEM

37U0PX-001

INDEX



37U0PX-002

37U0PX-003

OUTLINE

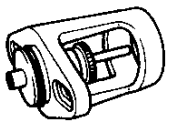
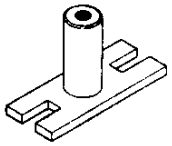
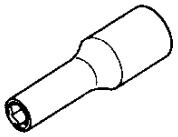
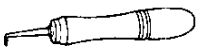
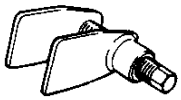
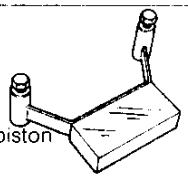
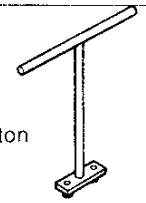
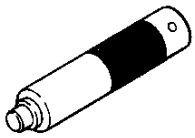
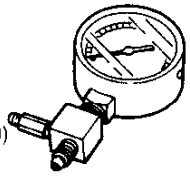
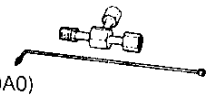
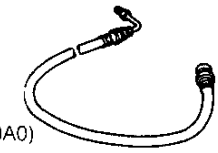
SPECIFICATIONS

Item			Specifications
Brake pedal			
Type			Suspended
Lever ratio			4.1 : 1
Maximum stroke	mm {in}		135 {5.31}
Master cylinder			
Type			Tandem (with level sensor)
			Portless, recessed type
Bore	mm {in}		23.8 {0.94}
Front brake			
Type			Disc (ventilated)
Cylinder bore	mm {in}		36.1 {1.42}
Pad dimension (area × thickness)	mm^2 × mm {in^2 × in}	Outer	4500 × 10.3 {6.97 × 0.41}
		Inner	4500 × 9.3 {6.97 × 0.37}
Disc plate dimension (outer diameter × thickness)	mm × mm {in × in}		294.0 × 22.0 {11.57 × 0.87}
Rear brake			
Type			Disc (ventilated)
Cylinder bore	mm {in}		34.9 {1.37}
Pad dimension (area × thickness)	mm^2 × mm {in^2 × in}		3210 × 8.0 {4.98 × 0.31}
Disc plate dimension (outer diameter × thickness)	mm × mm {in × in}		294.0 × 20.0 {11.57 × 0.79}
Power brake unit			
Type			Vacuum multiplier
Size	mm {in}		209.5 + 215.2 {8 + 8}
Rear wheel hydraulic control system			
Type			Proportioning bypass valve
Switching point (master cylinder pressure)	kPa {kgf/cm^2, psi}		3920 {40.0, 570}
Parking brake			
Type			Mechanical two-rear-wheel control
Operation system			Hand lever
Brake fluid			
Type			FMVSS 116 DOT-3

37U0PX-004

CONVENTIONAL BRAKE SYSTEM

PREPARATION
SST

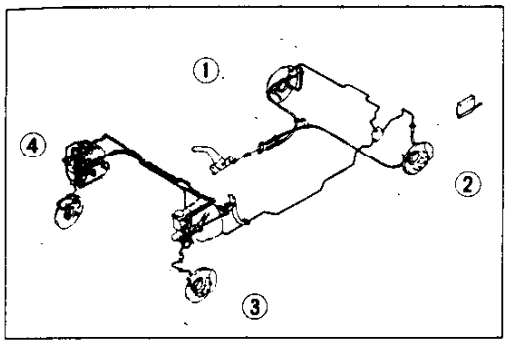
49 0259 770B Wrench, flare nut 	For removal / installation of brake pipe	49 B043 001 Gauge, adjustment 	For adjustment of push rod clearance
49 B043 003 lock tool, turning 	For adjustment of push rod clearance	49 B043 004 Wrench, socket 	For adjustment of push rod clearance
49 0208 701A Air out tool, boot 	For removal of piston seal	49 0221 600C Expantion tool, disc brake 	For installation of disc pads
49 F033 001 Stopper, disc brake piston 	For removal of disc brake piston	49 FA18 602 Wrench, disc brake piston 	For removal of disc brake piston
49 1285 071 Puller, bearing 	For removal of bearing	49 B043 002 Installer, bearing 	For installation of bearing
49 U043 0A0 Gauge set, oil pressure 	For measurement of fluid pressure	49 U043 004 Gauge, oil pressure (Part of 49 U043 0A0) 	For measurement of fluid pressure
49 U043 005 Joint (Part of 49 U043 0A0) 	For measurement of fluid pressure	49 U043 006 Hose (Part of 49 U043 0A0) 	For measurement of fluid pressure

37U0PX-005

TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Poor braking	Leakage of brake fluid	Repair	–
	Air in system	Bleed air	P–7
	Worn disc pad	Replace	P–23, 28
	Brake fluid, grease, oil, or water on disc pad	Clean or replace	P–23, 28
	Hardening of disc pad surface or poor contact	Grind or replace	P–23, 28
	Malfunction of caliper piston	Replace	P–25, 30
	Malfunction of master cylinder	Repair or replace	P–11, 15
	Malfunction of power brake unit	Replace	P–18
	Malfunction of check valve (vacuum hose)	Replace	P–8
	Damaged vacuum hose	Replace	P–8
	Deterioration of flexible hose	Replace	P–7
	Malfunction of proportioning bypass valve (PBV)	Replace	P–20
Brakes pull to one side	Worn disc pad	Replace	P–23, 28
	Brake fluid, grease, oil, or water on disc pad	Clean or replace	P–23, 28
	Hardening of disc pad surface or poor contact	Grind or replace	P–23, 28
	Abnormal wear, distortion, or runout of disc plate	Repair or replace	P–23, 29
	Malfunction of automatic adjuster	Repair or replace	P–25, 30
	Loose or damaged dust cover mounting bolt	Tighten or replace	Section M
	Malfunction of caliper piston	Replace	P–25, 30
	Worn or improperly adjusted wheel bearing preload	Adjust or replace	Section M
	Improper adjustment of wheel alignment	Adjust	Section R
	Unequal tire air pressure	Adjust	Section Q
Brakes do not release	No brake pedal play	Adjust	P–9
	Improper adjustment of push rod clearance	Adjust	P–11
	Clogged master cylinder return port	Clean	–
	Brake pad not returning properly	Repair	–
	Improper return or malfunction of caliper piston	Repair or Replace	P–25, 30
	Excessive runout of disc plate	Replace	P–23, 29
	Improper adjustment of wheel bearing preload	Adjust or replace	Section M
Pedal goes too far (excessive pedal stroke)	Air in system, insufficient brake fluid	Add fluid and bleed air	P–7, 8
	Improper adjustment of pedal play	Adjust	P–9
	Worn disc pad	Replace	P–23, 28
Abnormal noise or vibration during braking	Worn disc pad	Replace	P–23, 28
	Damaged pad	Grind or replace	P–23, 28
	Brakes do not release	Repair	–
	Foreign material or scratches on disc plate contact surface	Clean	–
	Loose caliper mounting bolt	Tighten	P–21, 27
	Damaged disc plate contact surface	Replace	P–21, 27
	Poor contact of pad	Repair or replace	P–23, 28
	Insufficient grease on sliding parts	Apply grease	–

37U0PX-006



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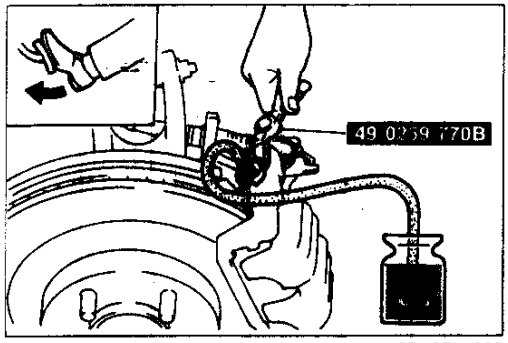

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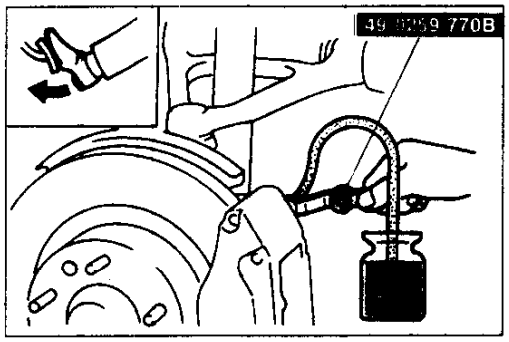

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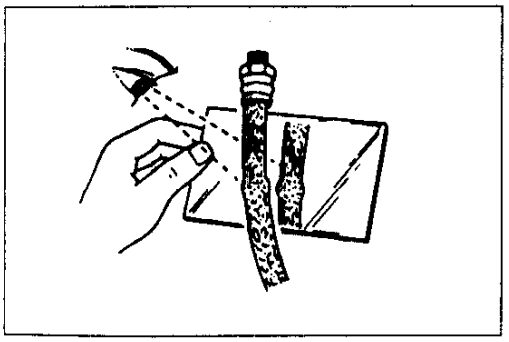
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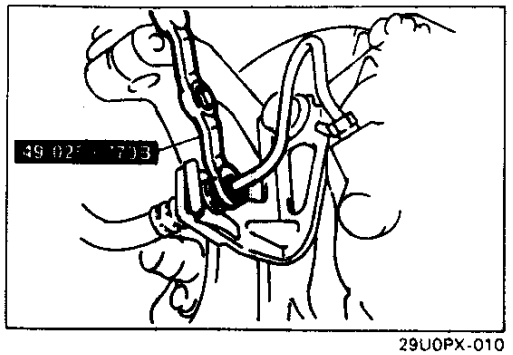


29U0PX-010

AIR BLEEDING

Caution
- **The fluid in the reservoir must be maintained of the 3/4 level or higher during air bleeding.**
- **Do not spill brake fluid onto painted surfaces. If spilled, wipe it up immediately.**

Note
- **Air bleeding must be started at the bleeder screw farthest from the master cylinder.**

1. Jack up the vehicle and support it on safety stands.
2. Remove the bleeder cap and attach a vinyl tube to the bleeder screw.
3. Place the other end of the vinyl tube in a clear container. Keep the tube immersed in brake fluid during air bleeding.
4. Have a helper depress the brake pedal several times, and then hold it in the depressed position.
5. Loosen the bleeder screw, drain out the fluid, and retighten the screw by using the **SST**.

   Tightening torque:
   5.9–8.8 N·m {60–90 kgf·cm, 53–78 in·lbf}

   Note
   - **The two persons must stay in voice contact with each other.**
   - **Be sure the pedal remains depressed until the bleeder screw is tightened.**
6. Repeat Steps 4 and 5 until no air bubbles are seen.
7. Perform the above steps for the remaining wheels.
8. Check for correct brake operation.
9. Check that there is no fluid leakage. Be sure to clean away any spilled fluid with rags.
10. After bleeding the air, add brake fluid to the MAX level in the reservoir.

BRAKE LINE

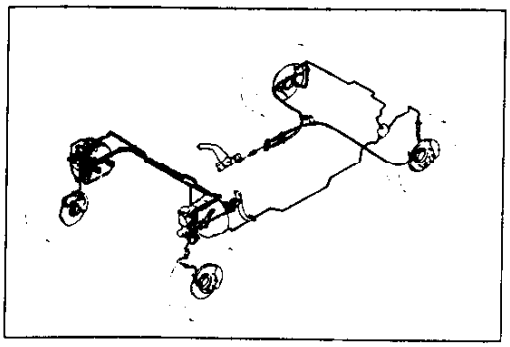
Inspection

Check for the following and repair or replace parts as necessary.

1. Cracks, damage, and corrosion of brake lines
2. Damage to brake hose threads
3. Scars, cracks, and swelling of flexible hoses
4. All lines for fluid leakage

Removal / Installation

1. When disconnecting the flexible hose and brake line, loosen the nut by using the **SST**, then remove the holding clip.
2. When connecting the flexible hose, do not overtighten or twist it.
3. Install the holding clip and tighten the brake pipe nut by using the **SST.**
4. Verify that the hose does not contact other parts when the vehicle bounces or when the steering wheel is turned all the way to the left or right.
5. Bleed the air from the brake system. (Refer to above.)



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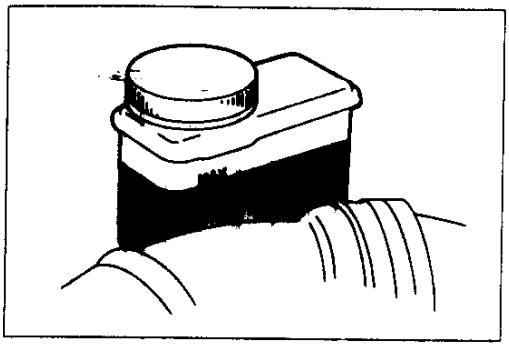

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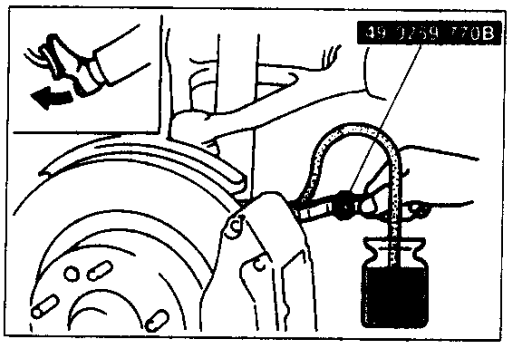

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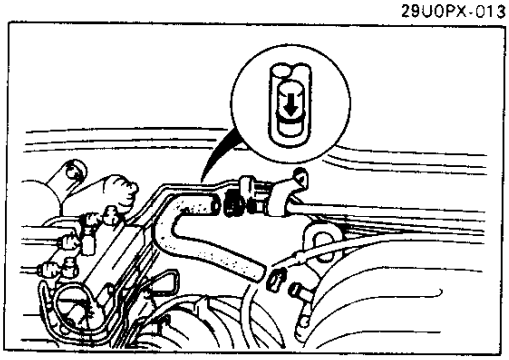

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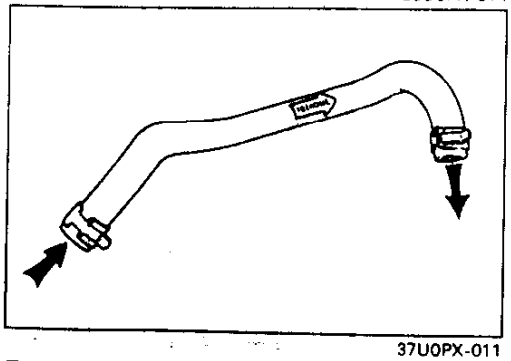


37U0PX-011

BRAKE FLUID

Inspection

1. Depress the brake pedal several times, and check the brake system for leaks.
2. Verify the fluid level in the reservoir is between the MAX and MIN lines.
3. If the fluid level is extremely low, check the brake system for leaks.

Fluid specification: FMVSS 116 DOT-3

Replacement

Caution

- **The fluid in the reservoir must be maintained at the 3/4 level or higher during air bleeding.**
- **Do not spill brake fluid onto painted surfaces. If spilled, wipe it up immediately.**

1. Remove the brake fluid from the reservoir by using a suction pump.
2. Fill the reservoir with clean brake fluid.
3. Attach a vinyl tube to the farthest bleeder screw and place the other end of the tube in a clear container.
4. Pump out the old brake fluid by loosening the bleeder screw and pumping the brake pedal until only clean fluid is expelled.
5. Perform the above for all bleeder screws.
6. Fill the reservoir to the specified level.

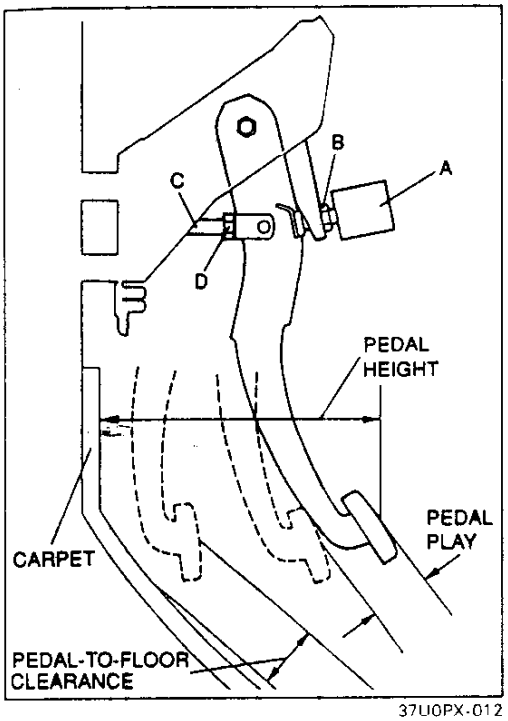
VACUUM LINE

Inspection

Note

- **The check valve is pressed into the vacuum hose.**
- **The arrow on the hose indicates the direction of hose installation (toward engine).**

1. Remove the clamps and remove the hose.
2. Apply suction and pressure to the hose from the engine side. Verify that air flows only toward the engine. If the air passes in both directions or not at all, replace the vacuum hose (together with the check valve).



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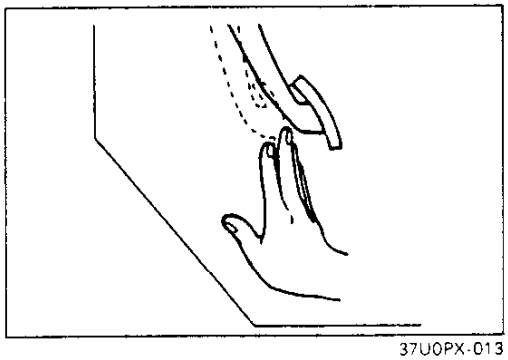
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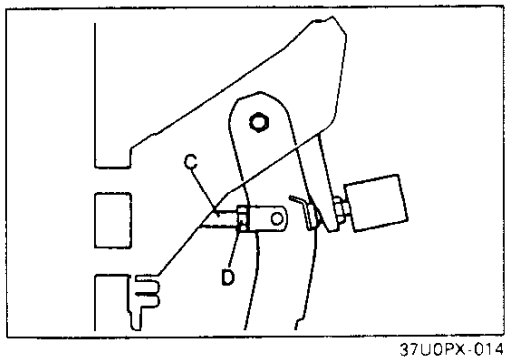

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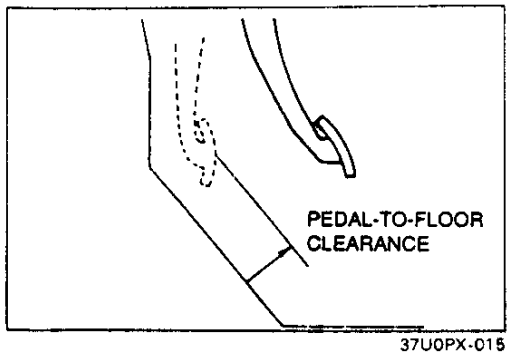


37U0PX-015

BRAKE PEDAL

Inspection (on-vehicle)

Pedal height inspection

Check if the distance from the center of the upper surface of the pedal pad to the carpet is as specified.

Pedal height: 164.5–176.0 mm {6.48–6.92 in} (with carpet)

Pedal height adjustment

1. Disconnect the stoplight switch connector.
2. Loosen locknut B and turn switch A until it does not contact the pedal arm.
3. Loosen locknut D and turn rod C to adjust the height
4. Adjust the pedal free play and tighten locknut D. (Refer to below.)
5. Turn switch A until it contacts the pedal arm; then turn an additional 1/2 turn.
6. Tighten locknut B.

   Tightening torque:
   13.8–17.6 N·m {140–180 kgf·cm, 122–156 in·lbf}
7. Connect the stoplight switch connector.

Pedal play inspection

1. Depress the pedal a few times to eliminate the vacuum in the system.
2. Lightly depress the pedal by hand until resistance is felt and check the free play.

Free play: 3–8mm {0.12–0.31 in}

Pedal play adjustment

1. Loosen locknut D and turn rod C to adjust the free play

   Free play: 3–8mm {0.12–0.31 in}
2. Tighten locknut D.

   Tightening torque:
   24–34 N·m {2.4–3.5 kgf·m, 17–25 ft·lbf}

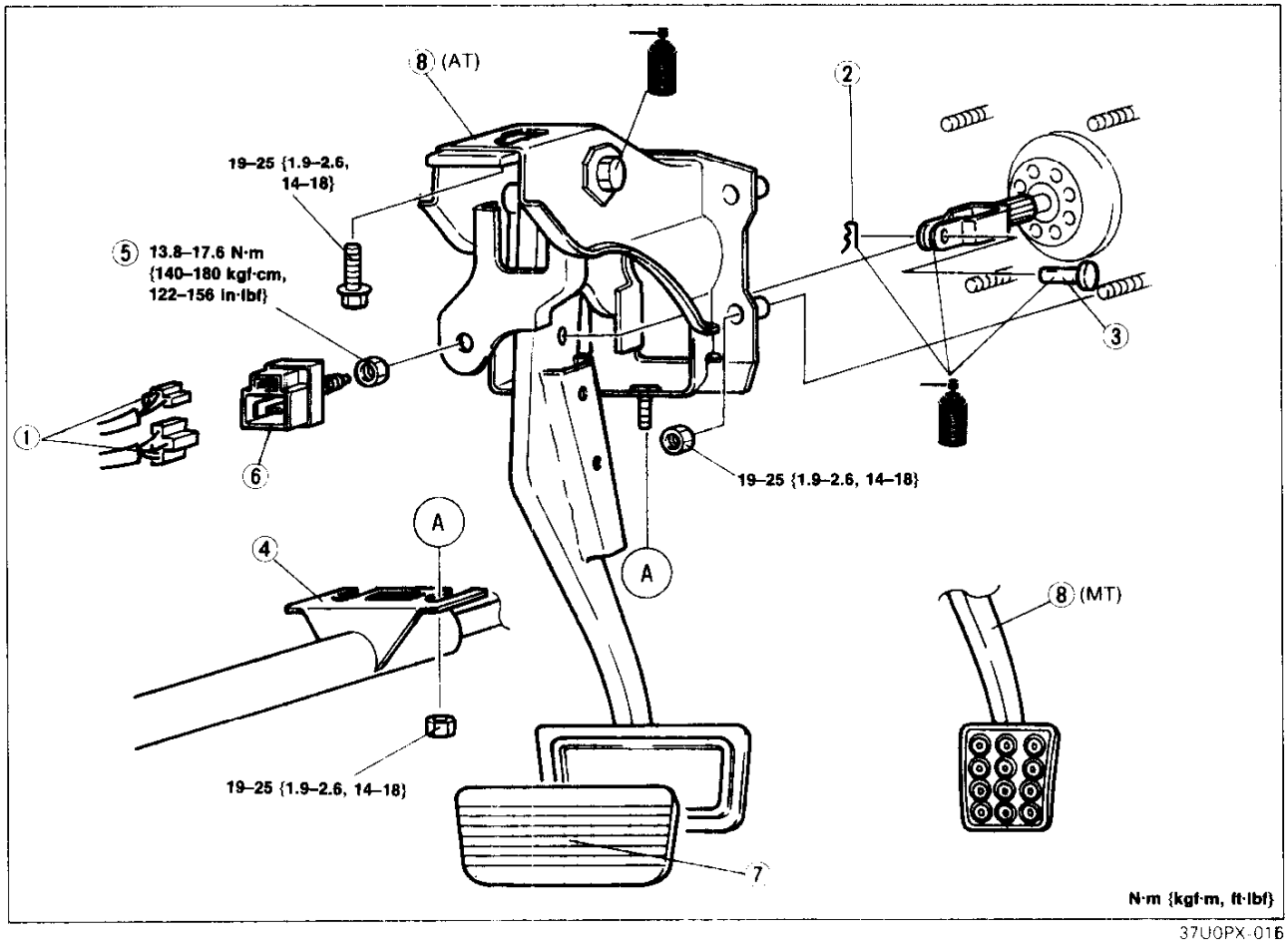
Pedal-to-floor clearance

1. Check if 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: 100 mm {3.94 in} min. (without carpet)
2. If the distance is less than specified, inspect for air in the brake system.

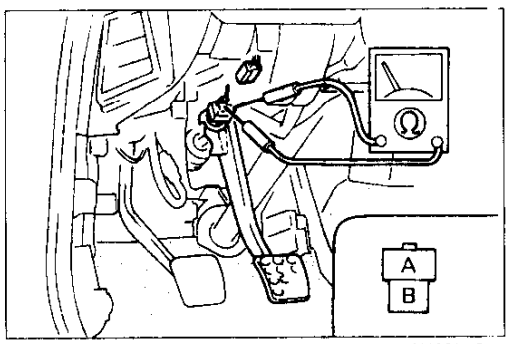
Removal / Inspection / Installation

1. Remove the side wall. (Refer to Section S.)
2. Remove the lower panel. (Refer to Section S.)
3. Remove the column cover.
4. Remove in the order shown in the figure.
5. Inspect all parts and repair or replace as necessary
6. Install in the reverse order of removal.
7. After installation, check and if necessary adjust the pedal height and free play.



37U0PX-01E

1. Stoplight switch connector
2. Spring clip
3. Clevis pin
4. Steering shaft bracket mounting nut
   Service ..... Section N
5. Nut
6. Stoplight switch
   Inspection ..... below
7. Pedal pad
   Inspect for wear and damage
8. Brake pedal
   Inspect for bending and damage



29U0PX-01I

Inspection

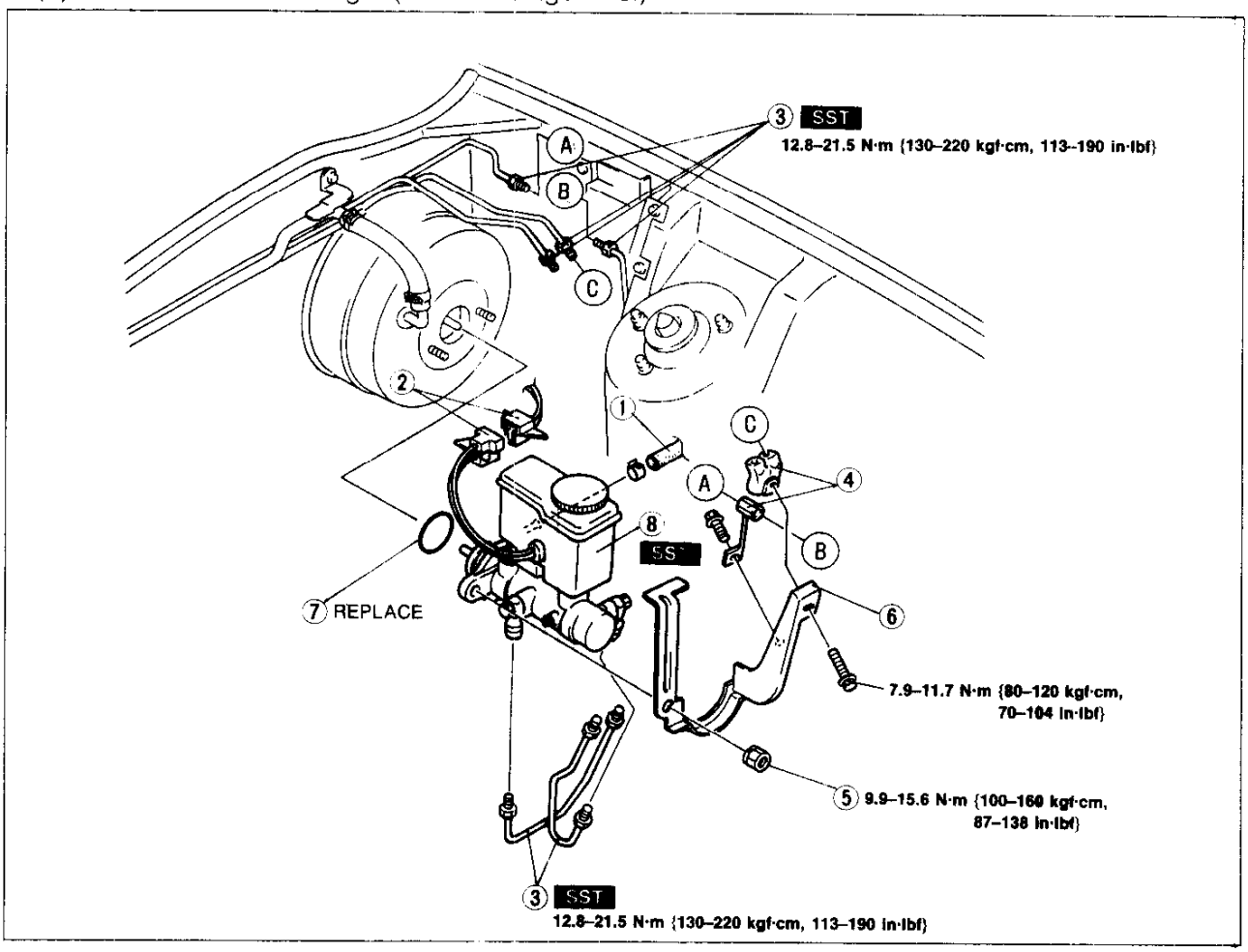
Stoplight switch

1. Disconnect the stoplight switch connector.
2. Connect an ohmmeter between terminals of the stoplight switch.
3. Confirm continuity between the terminals when the brake pedal is depressed.

MASTER CYLINDER

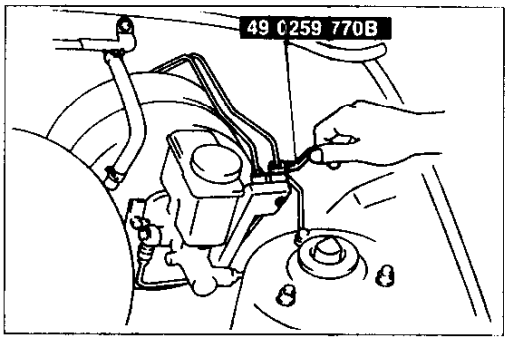
Removal / Installation

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, perform the following.
   (1) Add fluid and bleed the air. (Refer to page P–7.)
   (2) Check for fluid leakage. (Refer to page P–8.)



37U0PX-017

1. Hose (MT)
2. Brake fluid level sensor connector
3. Brake pipe
   Removal Note ..... below
   Installation Note ..... page P–14
4. Pipe joint and bracket
5. Nut
6. Bracket
7. O-ring
8. Master cylinder
   Disassembly / Inspection / Assembly ..... page P–15
   Installation Note ..... page P–12



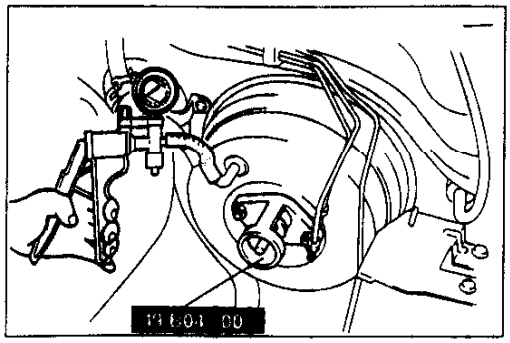
29U0PX-023

Removal note
Brake pipe

Loosen the brake pipe at the master cylinder by using the **SST**.

Caution

- **Do not allow the brake fluid to get on painted surfaces. If it does, wipe it off immediately.**



37U0PX-018

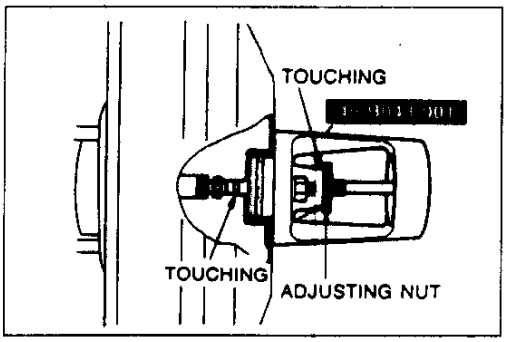
Installation note
Master cylinder
Piston to push rod clearance

1. Turn the nut of the **SST** clockwise to fully retract the gauge rod. Attach the **SST** to the power brake unit.

Caution
- **Install with the gauge rod fully retracted.**

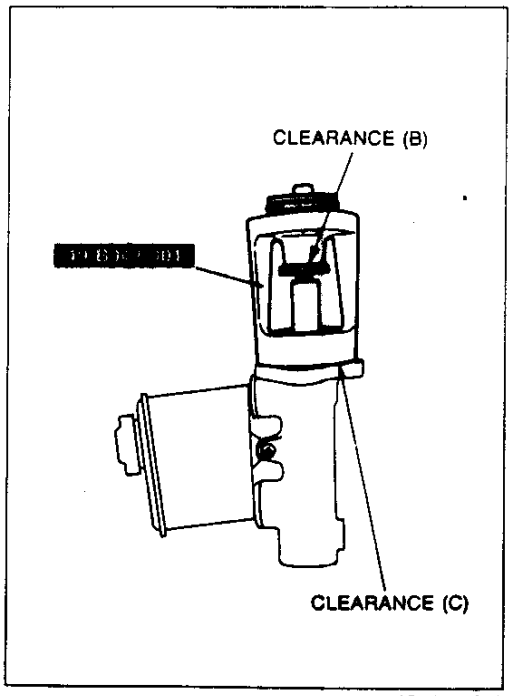
Tightening torque:
9.9–15.6 N·m {100–160 kgf·cm, 87–138 in·lbf}

2. Apply **66.7 kPa {500 mmHg, 19.7 inHg}** vacuum by using a vacuum pump.



29U0PX-025

3. Turn the adjusting nut of the **SST** counterclockwise until the gauge rod just contacts the end of the master cylinder push rod.
Push lightly on the end of the gauge rod to be sure it is seated. Verify that there is no gap between the adjusting nut and the **SST** body.



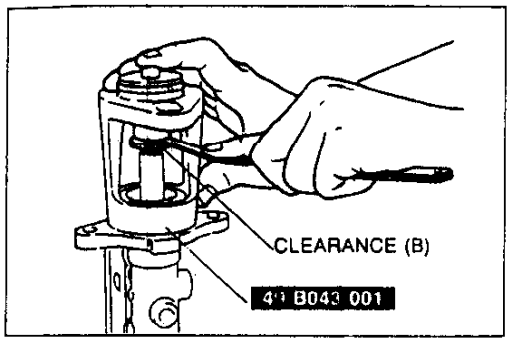
37U0PX-019

4. Remove the **SST** from the power brake unit without disturbing the adjusting nut. Set the **SST** onto the master cylinder as shown in the figure.

Caution
- **When pushing use only enough pressure to bottom the rod in the piston. If too much pressure is applied a false reading will occur.**

5. Push lightly on the end of the **SST** gauge rod to be sure it is bottomed in the master cylinder piston, and note any clearance between the **SST** body and the adjusting nut (clearance B) or between the body and the master cylinder (clearance C). Adjust the push rod as necessary as outlined in "Adjustment" on the next page.

Measurement	Push rod
Clearance at (B)	Too short
Clearance at (C)	Too long
No clearance at (B) or (C)	OK



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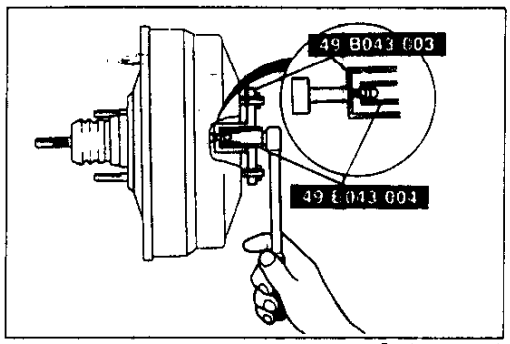
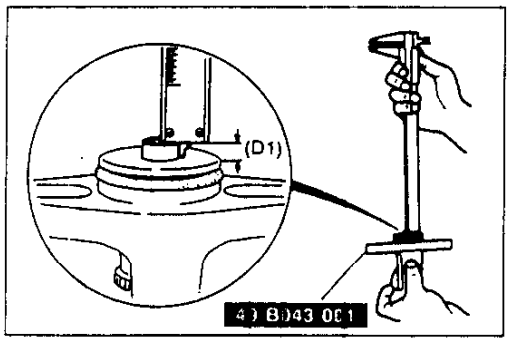
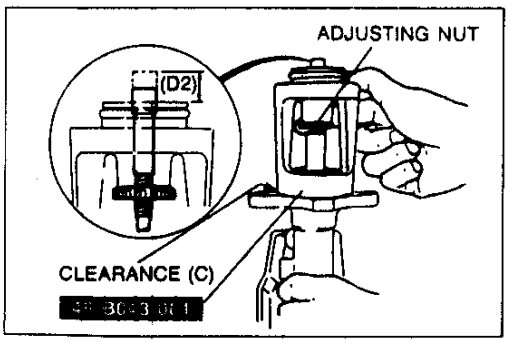


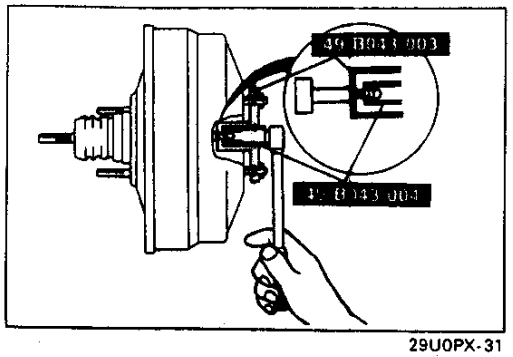
29U0PX-028



29U0PX-029



29U0PX-030



29U0PX-31

Adjustment

Note

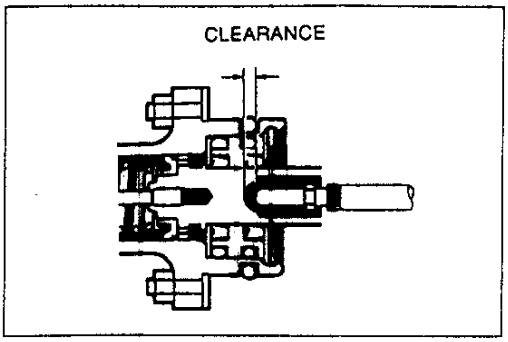
- **The threads of the push rod are specially designed so that the bolt becomes harder to turn past a certain point to prevent loosening of the bolt. Turn the bolt only within this range when adjusting.**

Clearance at B

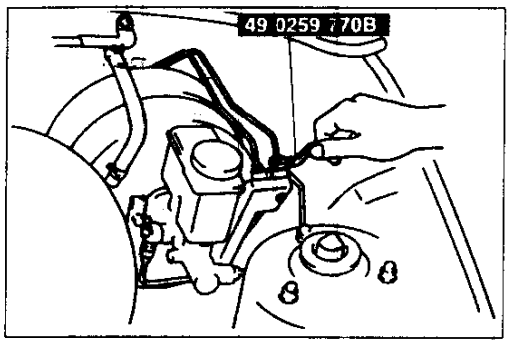
1. Push lightly on the end of the **SST** gauge rod, and measure the clearance between the adjusting nut and the **SST** body.
2. Using the **SSTs**, turn the nut to lengthen the master cylinder push rod an amount equal to the clearance measured at B.

Clearance at C

1. Measure and record height D1 of the gauge rod.
2. Turn the adjusting nut until the **SST** body sets squarely on the master cylinder. (Turn only enough for the body to touch.)
3. Measure and record height D2 of the gauge rod.
4. Subtract D1 from D2; then using the **SSTs**, turn the nut to shorten the master cylinder push rod an amount equal to the difference.



37U0PX-020



37U0PX-021

Note

- **By making the above adjustment, the clearance between the push rod and piston (after installation of the master cylinder to the power brake unit) will be as shown in the table below.**

Vacuum applied to unit	Push rod-to-piston clearance
Approx. 66.7 kPa {500 mmHg, 19.7 inHg}	0.1–0.4 mm {0.004–0.016 in}

Brake pipe

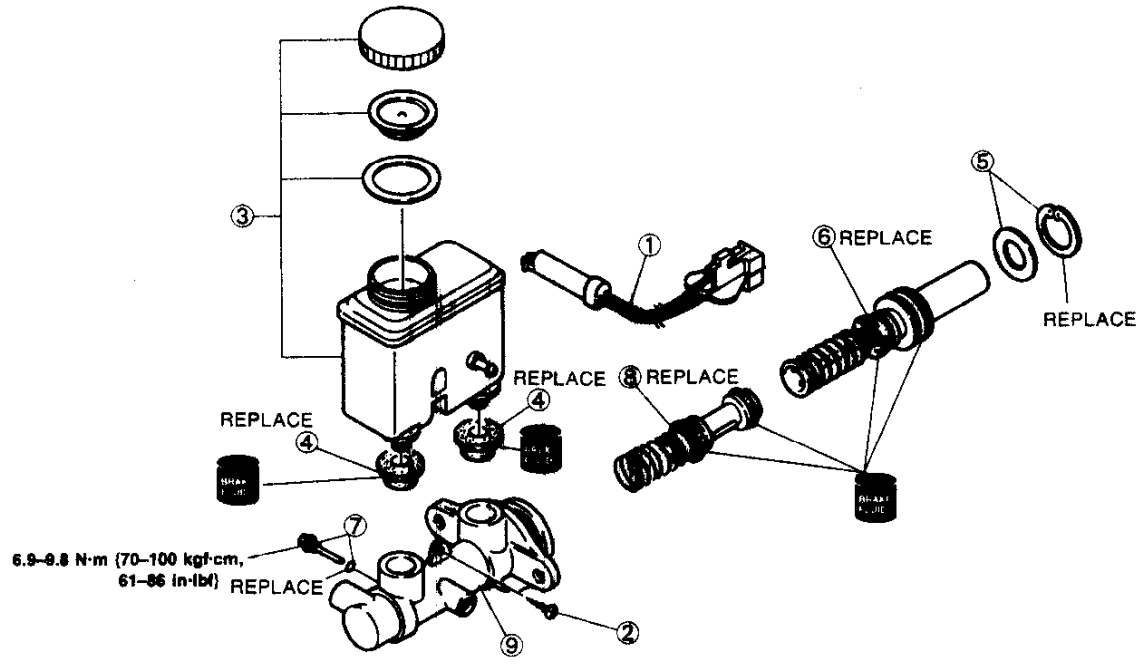
Tighten the brake pipe flare nut by using the **SST**.

Tightening torque:
12.8–21.5 N·m {130–220 kgf·cm, 113–190 in·lbf}

Disassembly / Inspection / Assembly

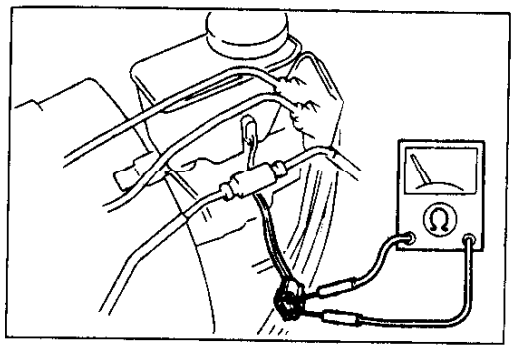
Caution
- **Secure the master cylinder flange in a vise when necessary.**
- **Replace the piston assembly, if necessary.**
- **Replace the master cylinder assembly if the master cylinder body is damaged.**

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**.



37U0PX-022

1. Brake fluid level sensor
   Inspection ..... page P–16
2. Screw
3. Reservoir assembly
   Inspect for damage and deformation
4. Bushings
5. Snap ring and spacer
6. Primary piston assembly
   Inspect for abnormal wear, rust, and damage
7. Stop pin and O-ring
   Assembly Note ..... page P–16
8. Secondary piston assembly
   Inspect for abnormal wear, rust, and damage
9. Master cylinder body
   Inspect for damage and wear
   Inspect inside of body for corrosion



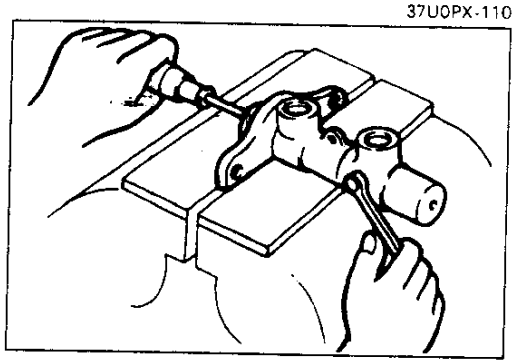
37U0PX-110

Inspection
Brake fluid level sensor

1. Disconnect the brake fluid level sensor connector.
2. Check continuity of the brake fluid level sensor.

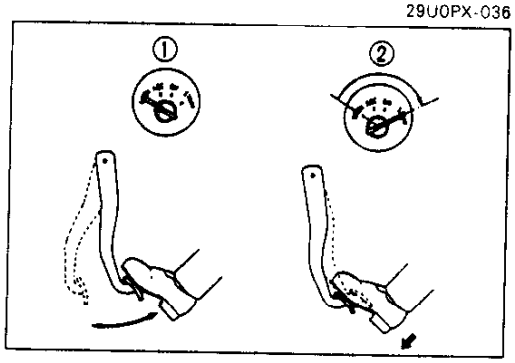
Fluid level	Continuity
Below MIN	Yes
Above MIN	No

3. If not as specified, replace the brake fluid level sensor.


29U0PX-036

Assembly note
Stop pin and O-ring

1. Install a new O-ring onto the stop pin.
2. Install the secondary piston assembly with the hole in the piston facing the stop pin.
3. Install and tighten the stop pin.
4. Push and release the piston to verify that it is held by the stop pin.

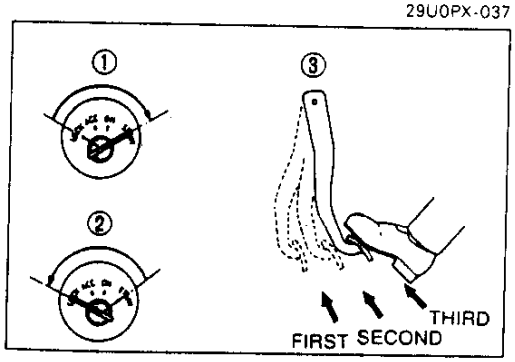


29U0PX-037

POWER BRAKE UNIT

Inspection (On-vehicle)
Power brake unit function check
(Simple method)
Step 1

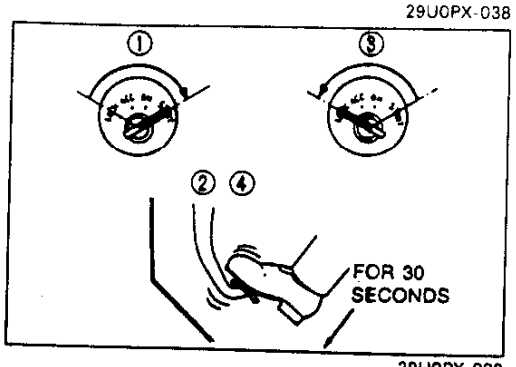
1. With the engine stopped, depress the brake pedal a few times.
2. With the pedal depressed, start the engine.
3. If immediately after the engine starts the pedal moves down slightly, the unit is operating.



29U0PX-038

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.

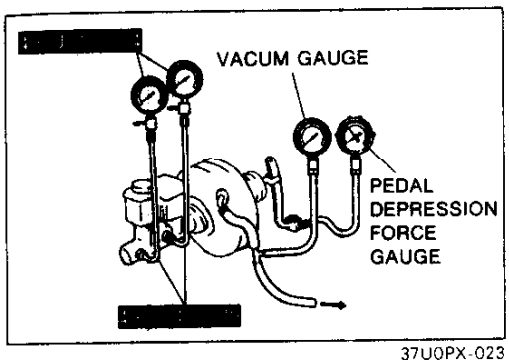


29U0PX-039

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, inspect for damage to the check valve or vacuum hose, and inspect the hose connections. Repair if necessary, and inspect once again.

If the nature of the problem is still not clear after the three steps above, follow the more detailed check described in "Method using tesers". (Refer to page P–17).

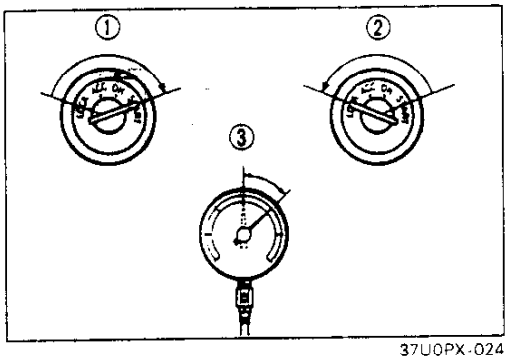


37U0PX-023

(Method using testers)

1. Connect the **SST** or equivalent, vacuum gauge, and pedal depression force gauge as shown in the figure.
2. After bleeding the air from the **SST**, conduct the test as described in the steps below.

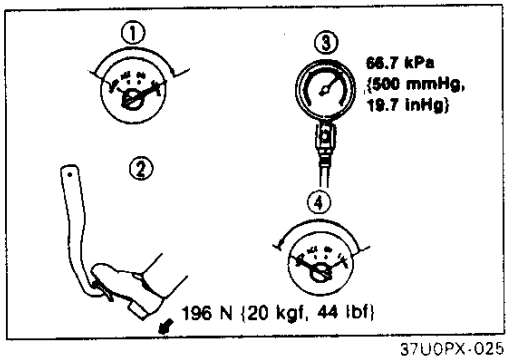
Note
- **Use commercially available vacuum gauge and pedal depression force gauge.**



37U0PX-024

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 **63.4–66.7 kPa {475–500 mmHg, 18.7–19.7 inHg}**, the unit is operating.



37U0PX-025

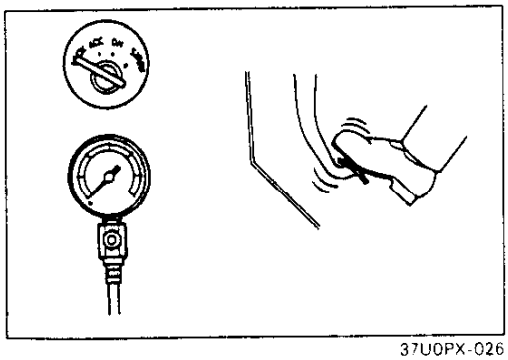
Loaded condition

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 **63.4–66.7 kPa {475–500 mmHg, 18.7–19.7 inHg}**, the unit operating.

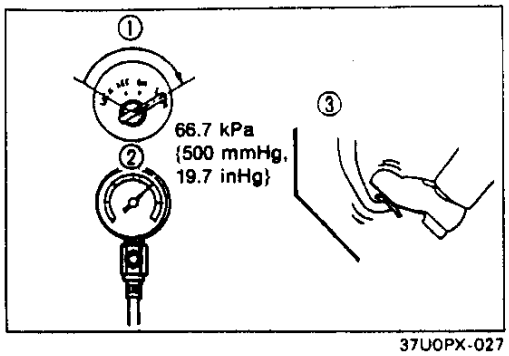
b) Checking for hydraulic pressure

1. If, with the engine stopped (vacuum **0 kPa {0 mmHg, 0 inHg}**), the fluid pressure is within specification, the unit is operating.

Pedal force	Fluid pressure kPa {kgf/cm², psi}
196 N {20 kgf, 44 lbf}	590 {6, 85} min.


37U0PX-026

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 specification, the unit is operating.

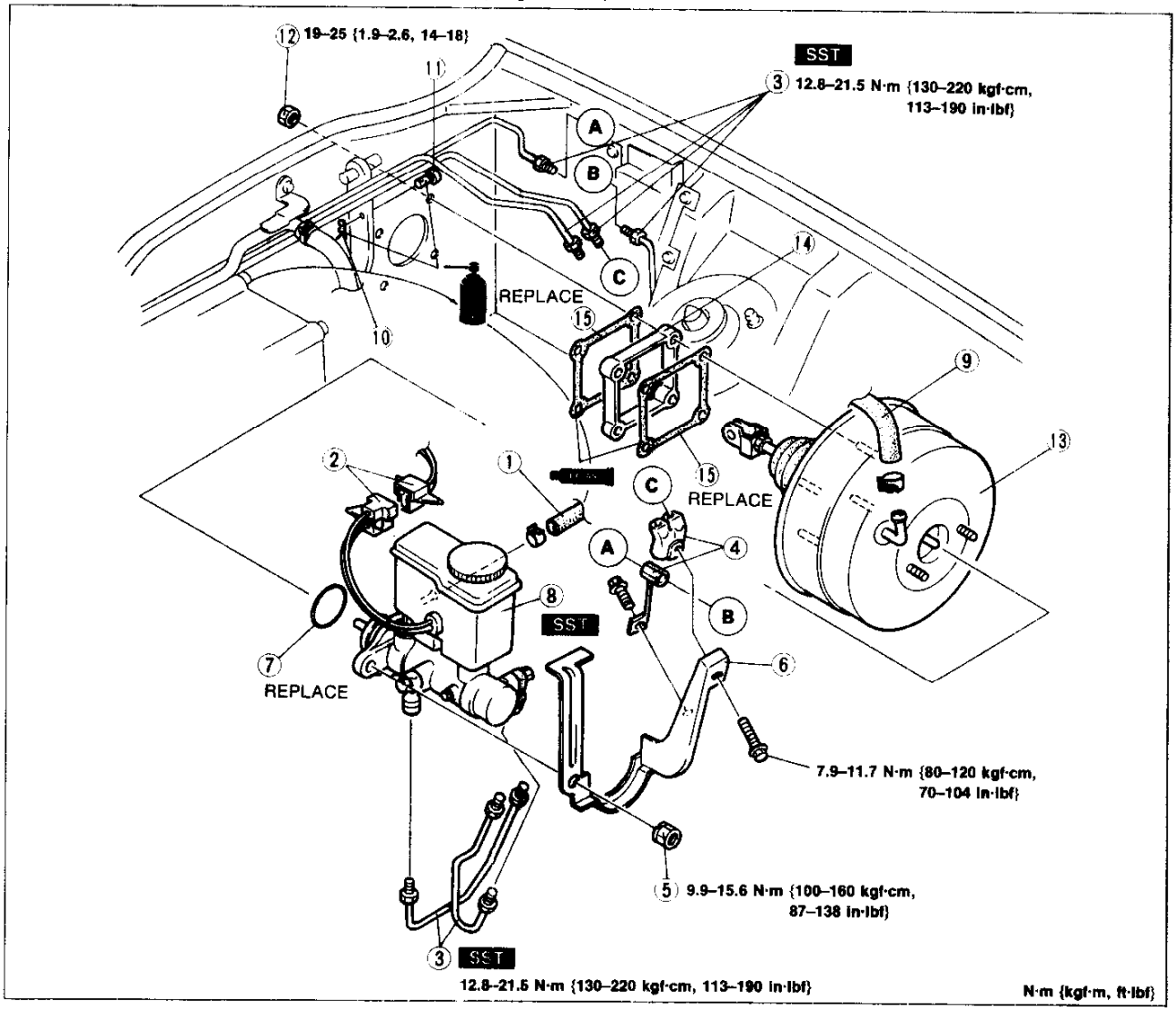


37U0PX-027

Pedal force	Fluid pressure kPa {kgf/cm², psi}
196 N {20 kgf, 44 lbf}	7750 {79, 1120} min.

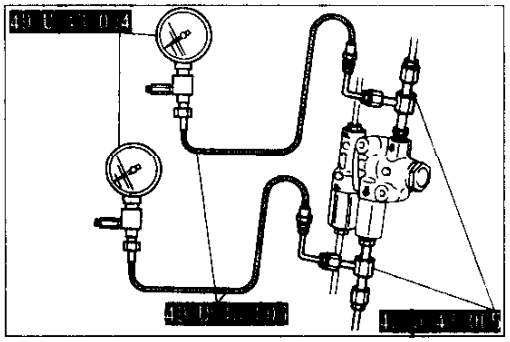
Removal / Installation

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, perform the following.
   (1) Add fluid and bleed the air. (Refer to page P–7.)
   (2) Check and adjust the brake pedal height. (Refer to page P–9.)
   (3) Check for fluid leakage. (Refer to page P–8.)

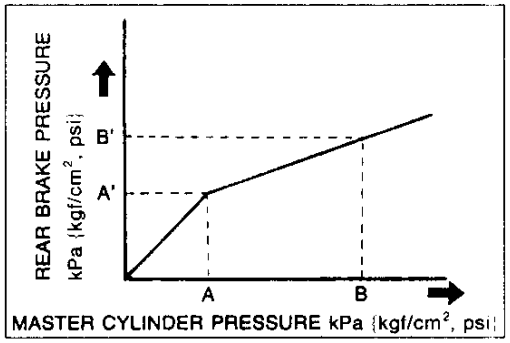


37U0PX-028

1. Hose (MT)
2. Brake fluid level sensor connector
3. Brake pipe
   Removal Note ..... page P–11
   Installation Note ..... page P–14
4. Pipe joint and bracket
5. Nut
6. Bracket
7. O-ring
8. Master cylinder
   Removal / Installation ..... page P–11
   Disassembly / Inspection / Assembly ..... page P–15
9. Vacuum hose
   Inspection ..... page P– 8
10. Spring clip
11. Clevis pin
12. Nut
13. Power brake unit
    Inspection ..... page P–16
14. Spacer
15. Gasket



37U0PX-029



37U0PX-030

PROPORTIONING BYPASS VALVE

Inspection

1. Connect the **SST** or equivalent to the inlet and outlet pipes to the rear brake system.
2. After bleeding the air from the **SST**, measure the fluid pressure from the master cylinder and to the rear brakes.

Specification:

FLUID PRESSURE KPa {kgf/cm², psi}		REAR BRAKE PRESSURE
MASTER CYLINDER PRESSURE	A = 3,920 {40,570}	A' = 3,630–4,210 {37–43, 530–610}
	B = 5,880 {60,850}	B' = 4,320–5,090 {44–52, 626–739}

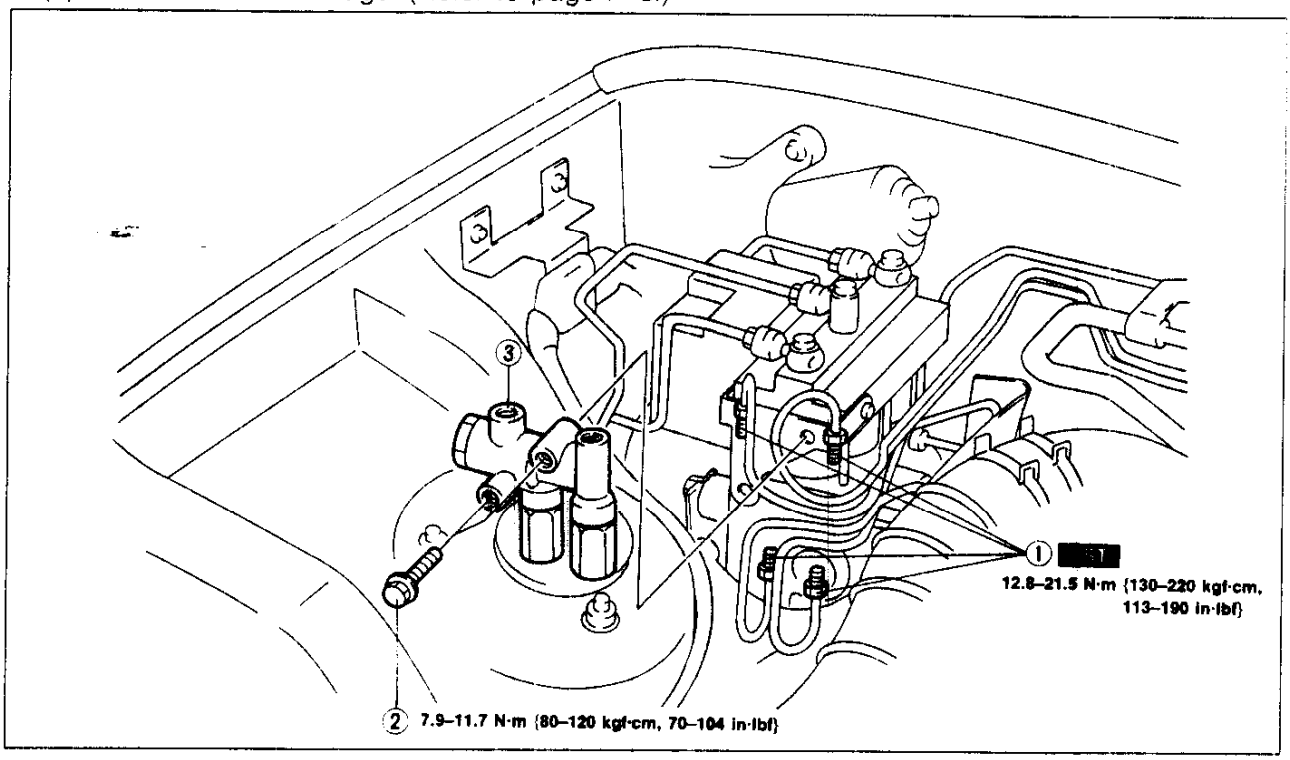
3. If not as specified, replace the proportioning bypass valve assembly.

Caution

- **After inspection:**
  Add brake fluid and bleed the air.
  (Refer to page P–7.)
- **Check the brake lines for fluid leakage.**
  (Refer to page P–8.)

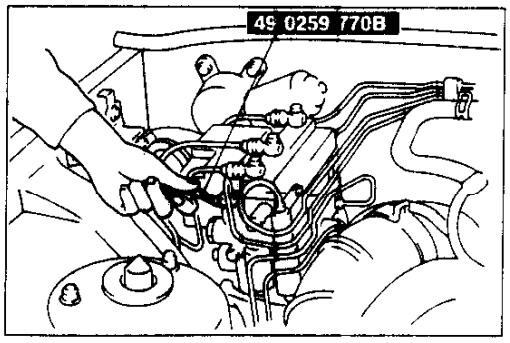
Replacement

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, perform the following.
   (1) Add fluid and bleed the air. (Refer to page P–7.)
   (2) Check for fluid leakage. (Refer to page P–8.)

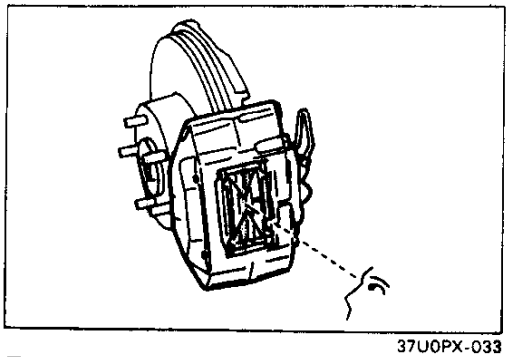


37U0PX-031

1. Brake pipe
   Removal Note ..... below
   Installation Note ..... below
2. Bolt
3. Proportioning bypass valve
   Inspection ..... page P–19



37U0PX-032



37U0PX-033

Removal / Installation note
Brake pipe

Loosen and tighten the brake pipes by using the **SST**.

Tightening torque:
12.8–21.5 N·m {130–220 kgf·cm, 113–190 in·lbf}

FRONT BRAKE (DISC)

Inspection (on-vehicle)
Disc pad

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheels.
3. Sight through the caliper inspection hole and inspect the remaining thickness of the pads.

Thickness: 1.0mm {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.

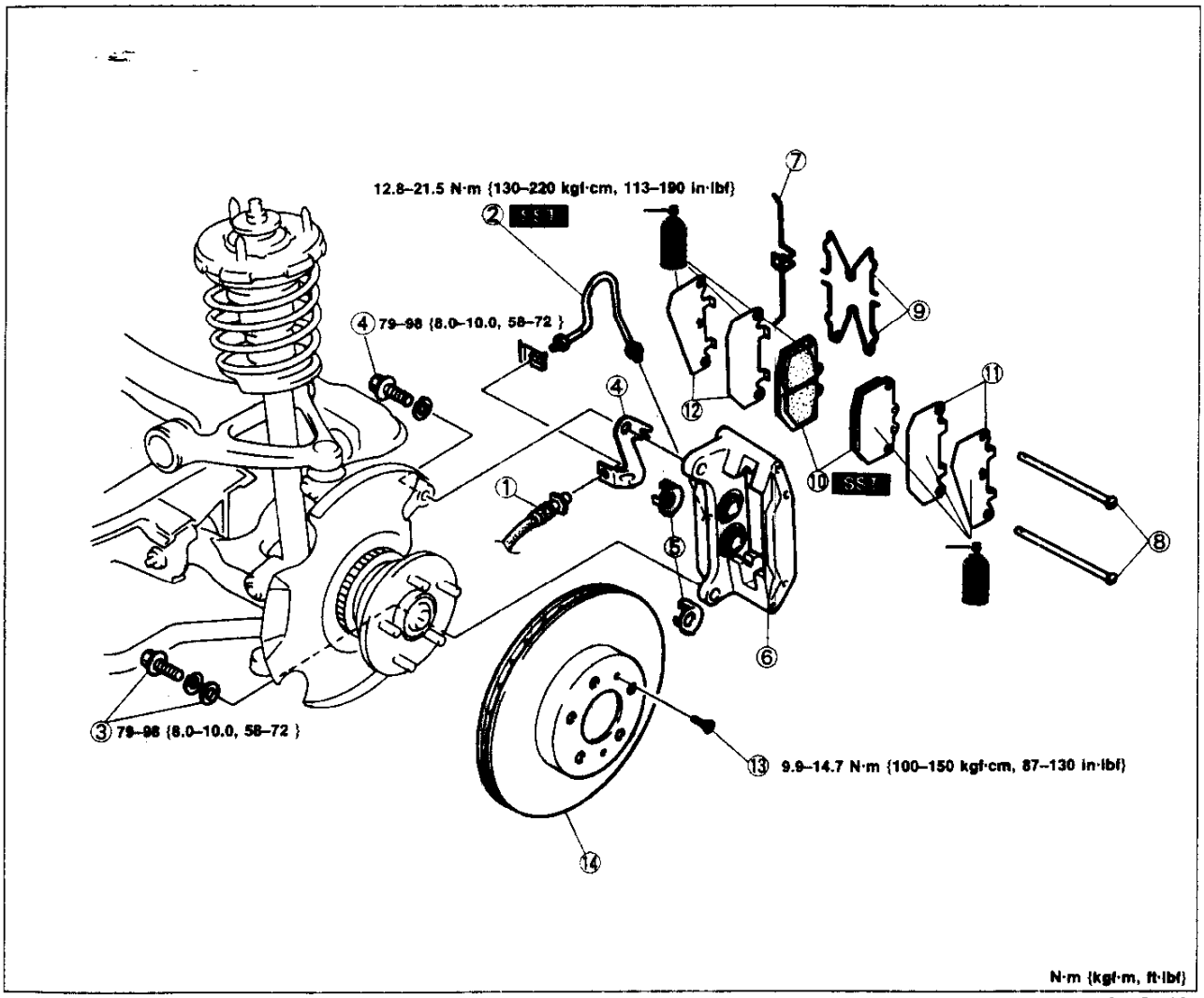
Removal / Inspection / Installation

1. Remove in the order shown in the figure, referring to **Removal Note**.

Caution

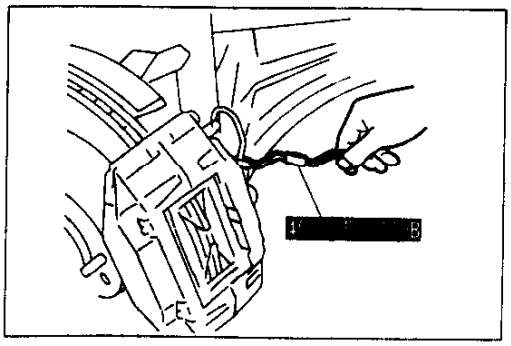
- **Do not loosen or remove the caliper bridge bolts.**

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, perform the following.
   (1) Add fluid and bleed the air. (Refer to page P–7.)
   (2) Check for fluid leakage. (Refer to page P–8.)
   (3) Depress the pedal a few times, then verify that the brakes do not drag while rotating the wheels by hand.



37U0PX-034

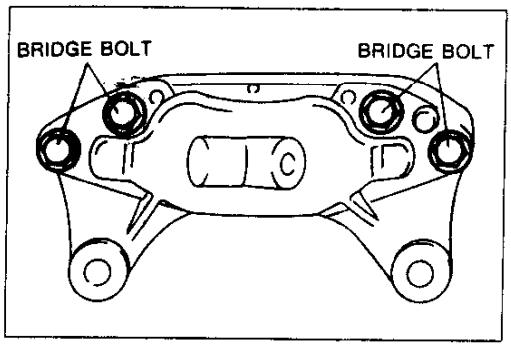
1. Brake hose
   Inspect for damage and cracks
2. Brake pipe
   Removal Note ..... page P–22
   Installation Note ..... page P–22
3. Bolt, spacer
4. Bolt, brake pipe bracket
5. Guard plate
6. Caliper
   Removal Note ..... page P–22
   Disassembly / Inspection / Assembly ..... page P–25
7. M-spring
8. Pad pin
9. M-clip
10. Disc pad
    Inspection ..... page P–20
    Installation Note ..... page P–22
11. Outer shim
    Installation Note ..... page P–22
12. Inner shim
    Installation Note ..... page P–22
13. Screw
14. Disc plate
    Inspection ..... page P–23



37U0PX-035

Removal note
Brake pipe

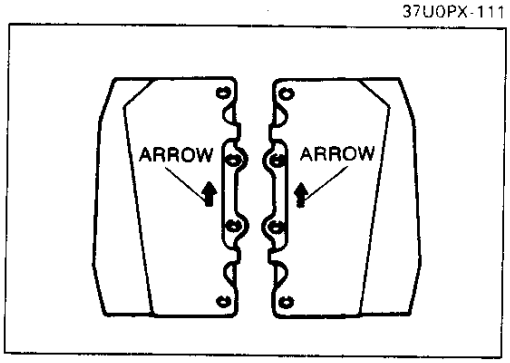
Remove the brake pipe by using the **SST**.



37U0PX-111

Caliper

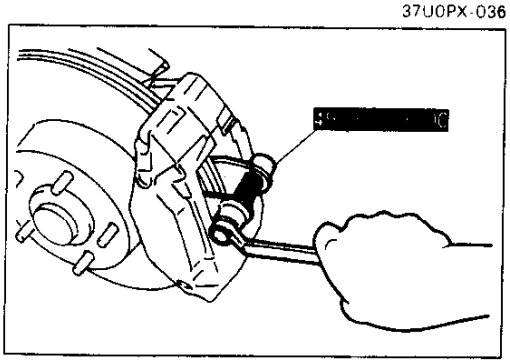
Caution
- **Do not loosen the caliper bridge bolts.**



37U0PX-036

Installation note
Outer shim, inner shim

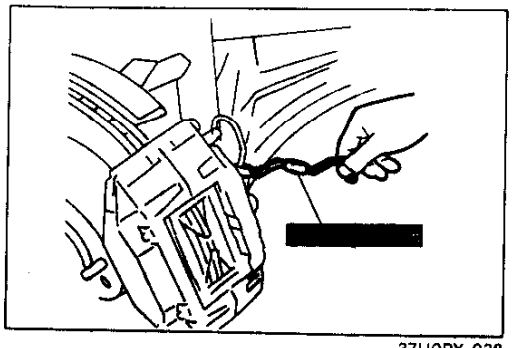
Align the arrow to the disc plate rotation and install the shims.



37U0PX-037

Disc pad

1. Clean up the piston.
2. Push the piston inward by using the **SST**.
3. Install the disc pads.



37U0PX-038

Brake pipe

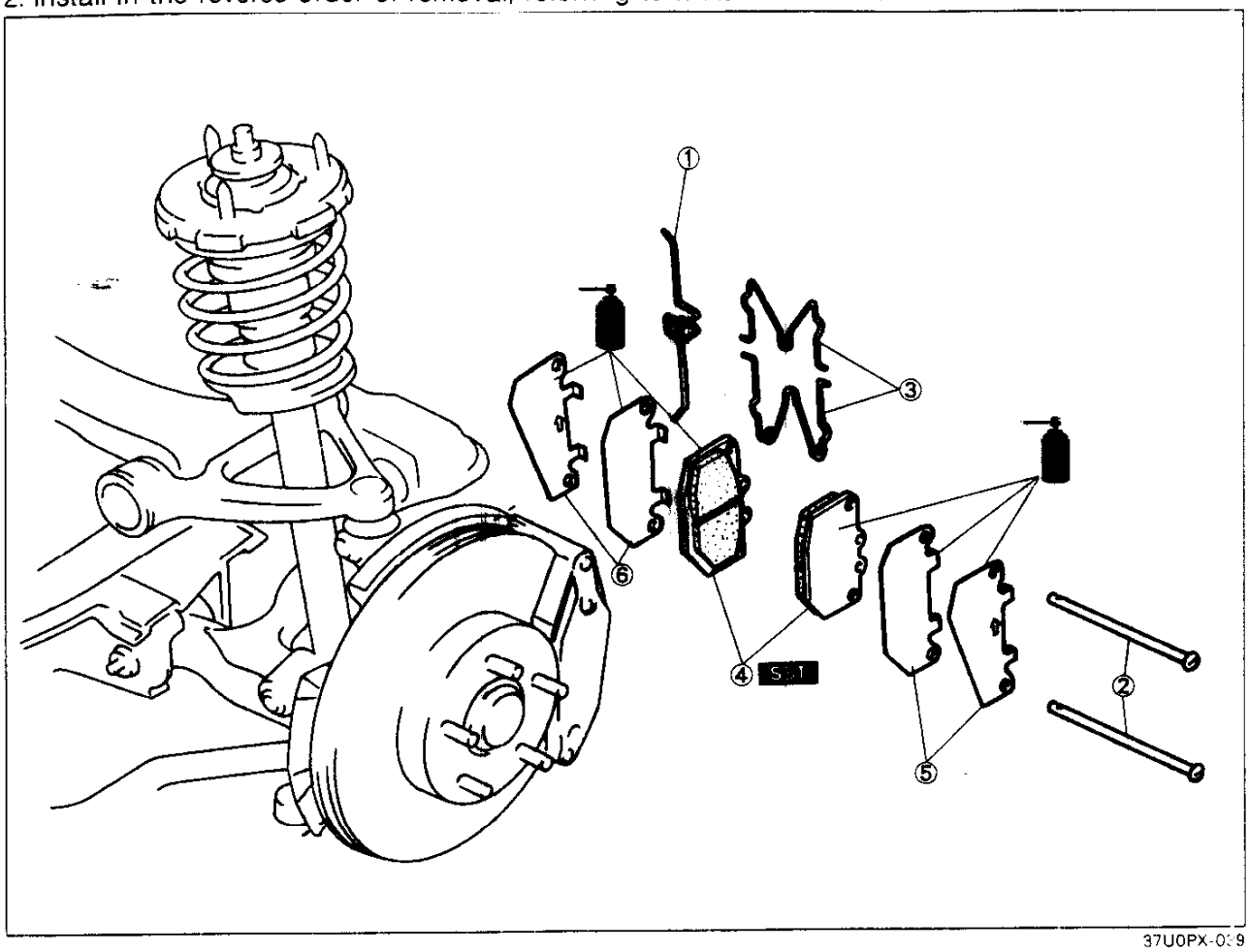
Install the brake pipe by using the **SST**.

Tightening torque:
12.8–21.5 N·m {130–220kgf·cm, 113–190in·lbf}

DISC PAD (FRONT)

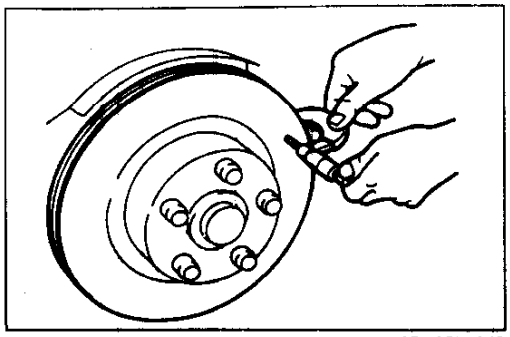
Replacement

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal, referring to **Installation Note**.



37U0PX-039

1. M-clip
2. Pad pin
3. M-spring
4. Disc pad
   Installation Note
   ..... Page P–22
5. Outer shim
   Installation Note
   ..... page P–22
6. Inner shim
   Installation Note
   ..... page P–22



37U0PX-040

DISC PLATE (FRONT)

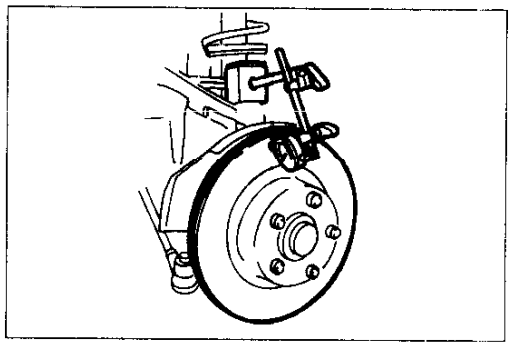
Inspection

Disc plate thickness

1. Measure the thickness of the disc plate.

   Standard: 22.0 mm {0.87 in}
   Minimum: 20.0 mm {0.79 in}

2. If the thickness is less than minimum, replace the disc plate.



37U0PX-041

Disc plate runout

Caution

- **There must be no wheel bearing looseness.**

1. Measure the runout at the outer edge of the contact surface of the disc pad.

   Runout: 0.1 mm {0.004 in} max.

2. If the runout is exceeds specification, repair or replace the disc plate.

CALIPER (FRONT)

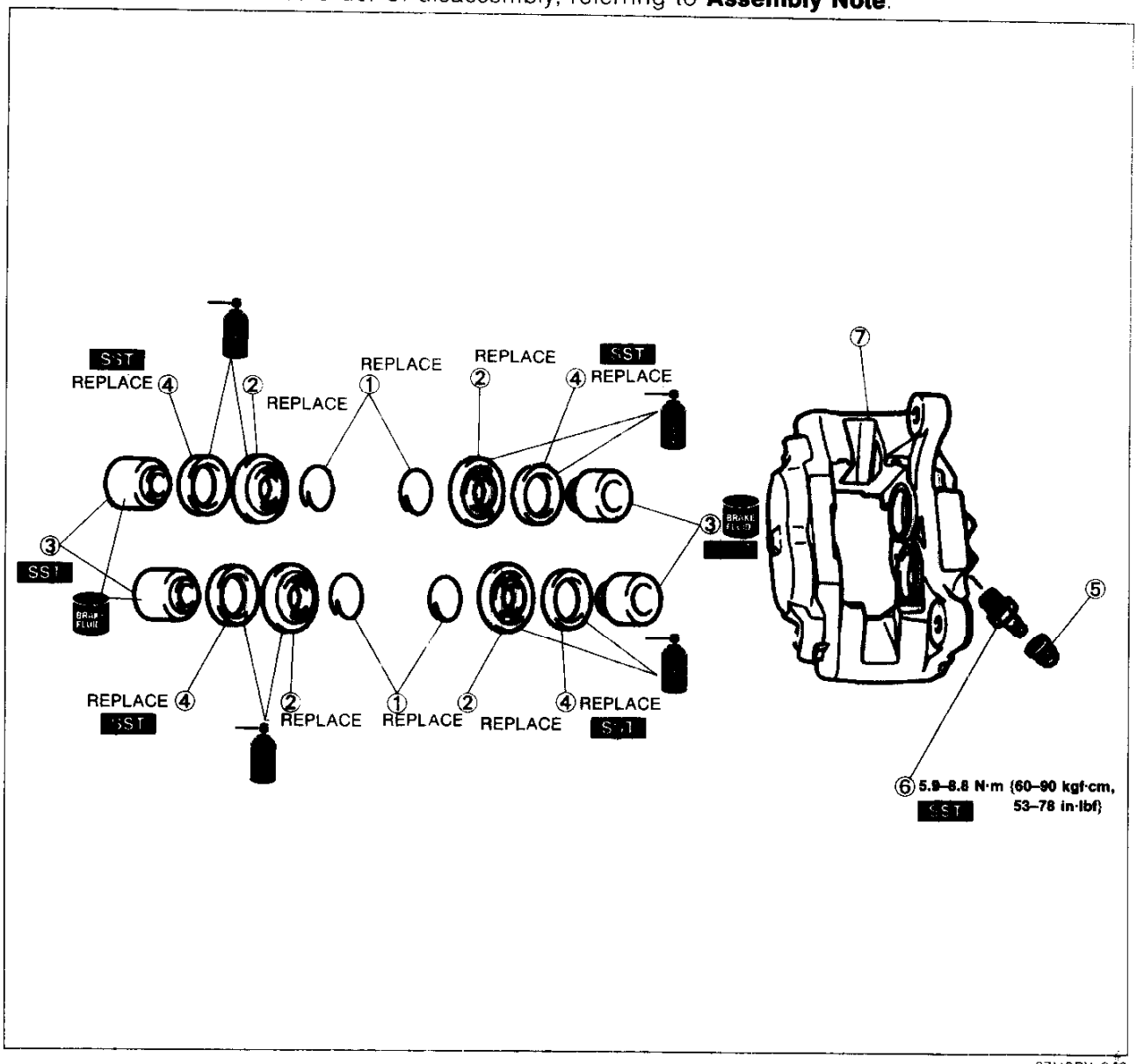
Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.

Caution

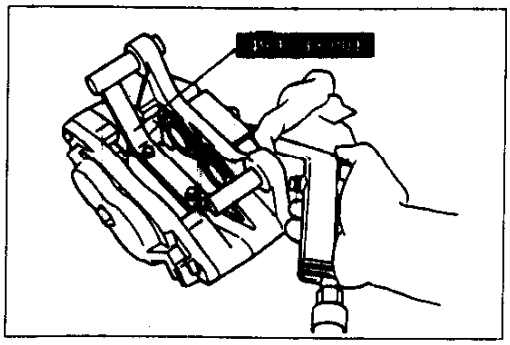
- **Do not loosen or remove the caliper bridge bolts. (Refer to page P–22.)**

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



37U0PX-042

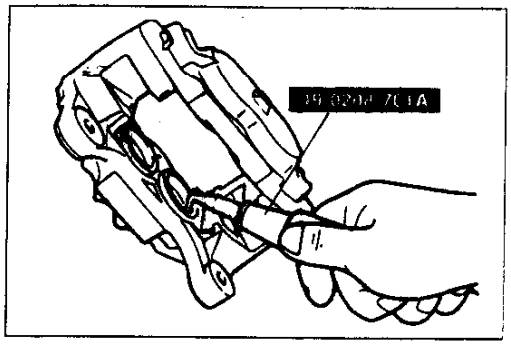
1. Piston ring
2. Dust boot
   Inspect for wear and cracks
3. Piston
   Disassembly Note ..... page P–26
   Inspect for wear and cracks
4. Piston seal
   Disassembly Note ..... page P–26
5. Bleeder cap
6. Bleeder screw
   Disassembly Note ..... page P–26
   Assembly Note ..... page P–26
7. Caliper body
   Inspect for damage and wear



37U0PX-043

Disassembly note
Piston

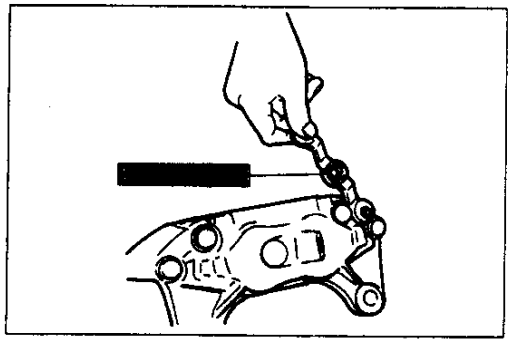
1. Place the **SST** in the caliper.
2. Blow compressed air through the pipe hole to force the pistons out of the caliper.



29U0PX-059

Piston seal

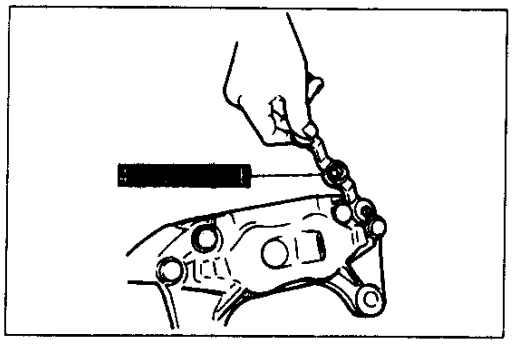
Remove the piston seal from the caliper by using the **SST**.



29U0PX-060

Bleeder screw

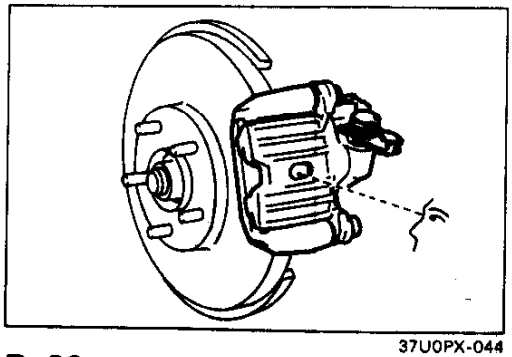
Loosen the bleeder screw by using the **SST**.



29U0PX-061

Assembly note
Bleeder screw

Tighten the bleeder screw by using the **SST**.



37U0PX-044

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. Sight 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.

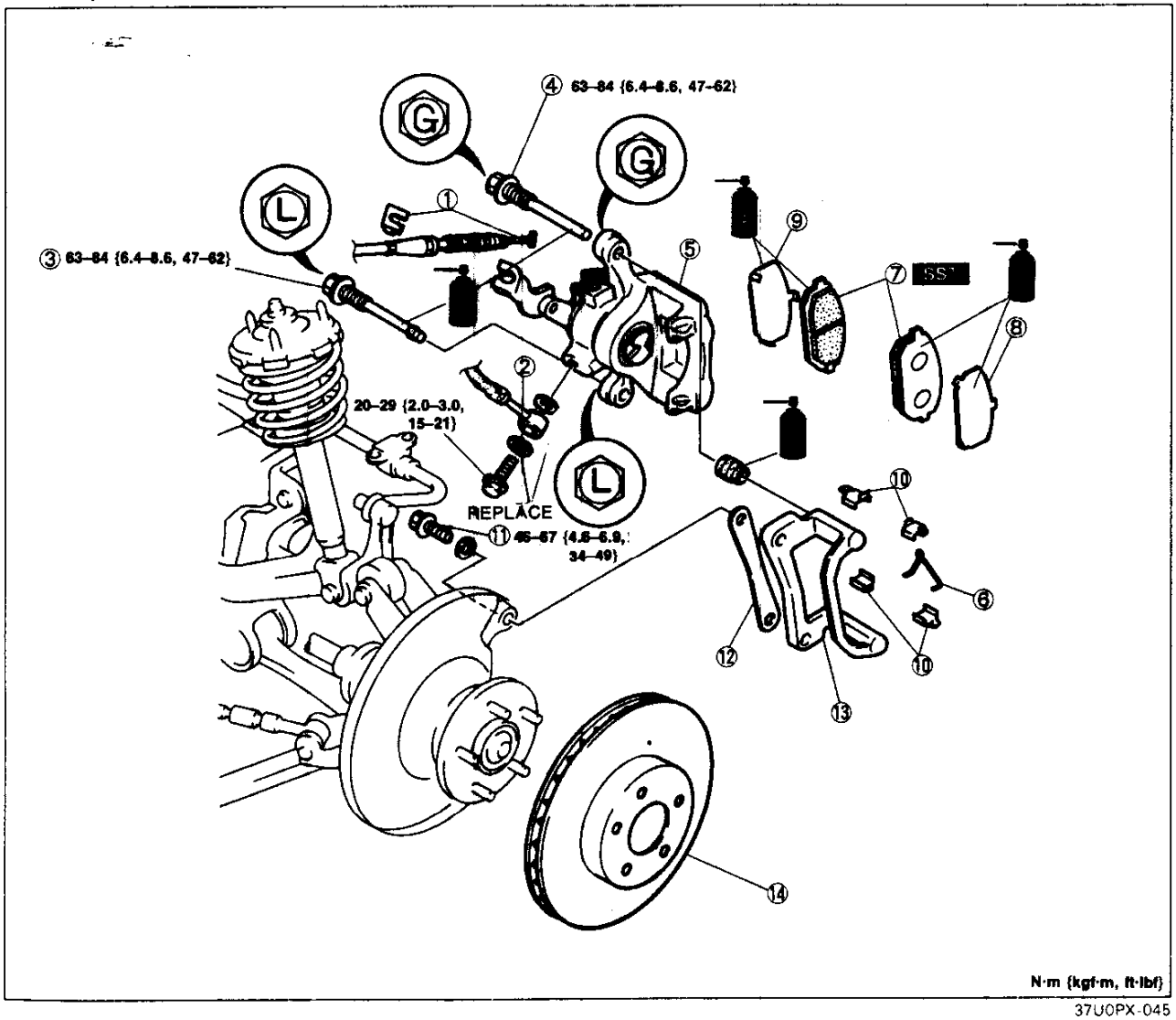
Removal / Inspection / Installation

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**.

Note

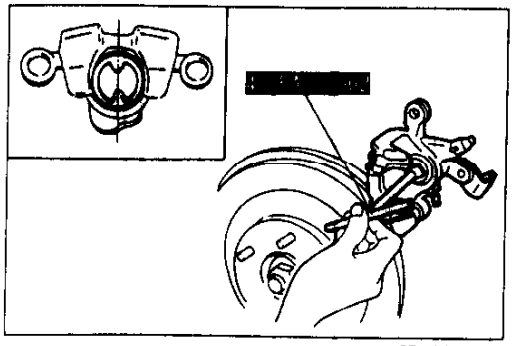
- **Match the lock pin (Ⓛ) and guide pin (Ⓖ) to the Ⓛ and Ⓖ marks of the caliper body.**

4. After installation, check the following.
   (1) Add fluid and bleed the air. (Refer to page P–7.)
   (2) Check for fluid leakage. (Refer to page P–8.)
   (3) Depress the pedal a few times, then verify that the brakes do not drag while rotating the wheels by hand.



37U0PX-045

1. Clip and rear parking cable
2. Flexible brake hose
   Inspect for damage and cracks
3. Lock pin
4. Guide pin
5. Caliper
   Disassembly / Inspection / Assembly ..... page P–30
6. V-spring
7. Disc pad
   Inspection ..... page P–26
   Installation Note ..... page P–28
8. Outer shim
9. Inner shim
10. Pad clip
11. Bolt, washer
12. Protector
13. Mounting support
14. Disc plate
    Inspection ..... page P–29



37U0PX-046

Installation note
Disc pad

1. Clean up the piston with clean brake fluid.
2. Rotate the piston clockwise by using the **SST**.

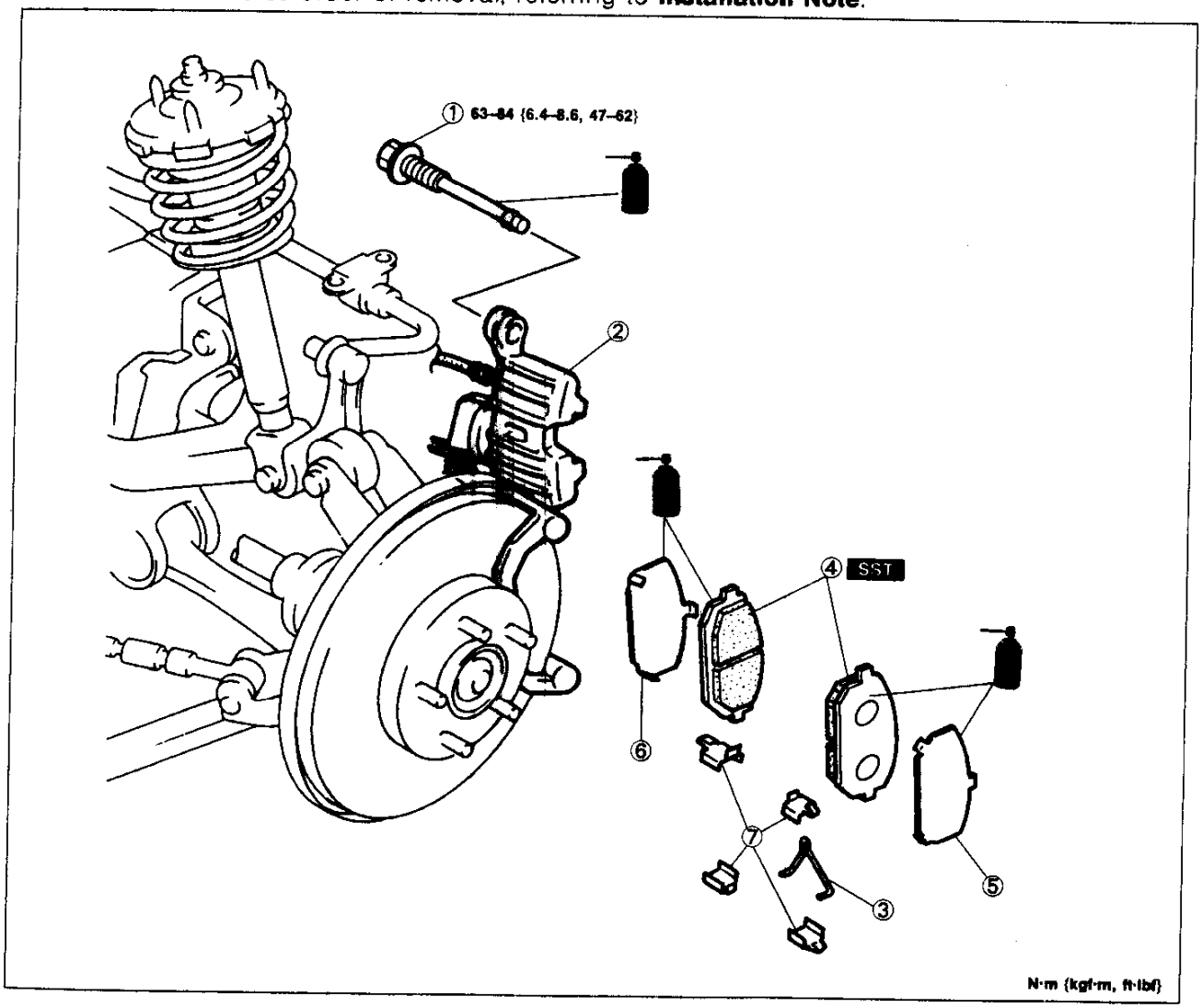
Note
- **Align the piston grooves as shown in the illustration.**

3. Install the disc pads.

DISC PAD (REAR)

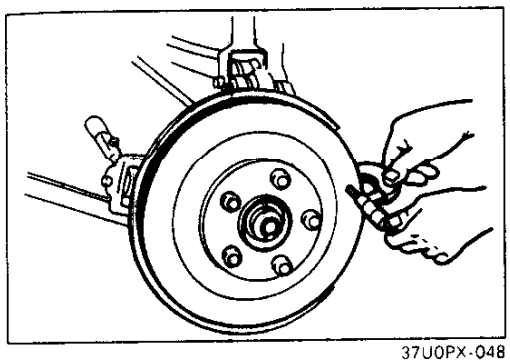
Replacement

1. Disconnect the rear parking cable from the caliper.
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal, referring to **Installation Note**.

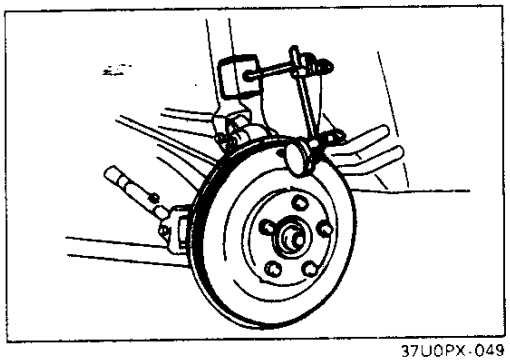


37U0PX-047

1. Lock pin
2. Caliper
3. V-spring
4. Disc pad
   Installation Note ..... above
5. Outer shim
6. Inner shim
7. Pad clip



37U0PX-048



37U0PX-049

DISC PLATE (REAR)

Inspection

Disc plate thickness

1. Measure the thickness of the disc plate.

Standard: 20.0 mm {0.79 in}
Minimum: 18.0 mm {0.71 in}

2. If the thickness is less than minimum, replace the disc plate.

Disc plate runout

Caution
- **There must be no wheel bearing looseness.**

1. Measure the runout at the outer edge of the contac surface of the disc pad.

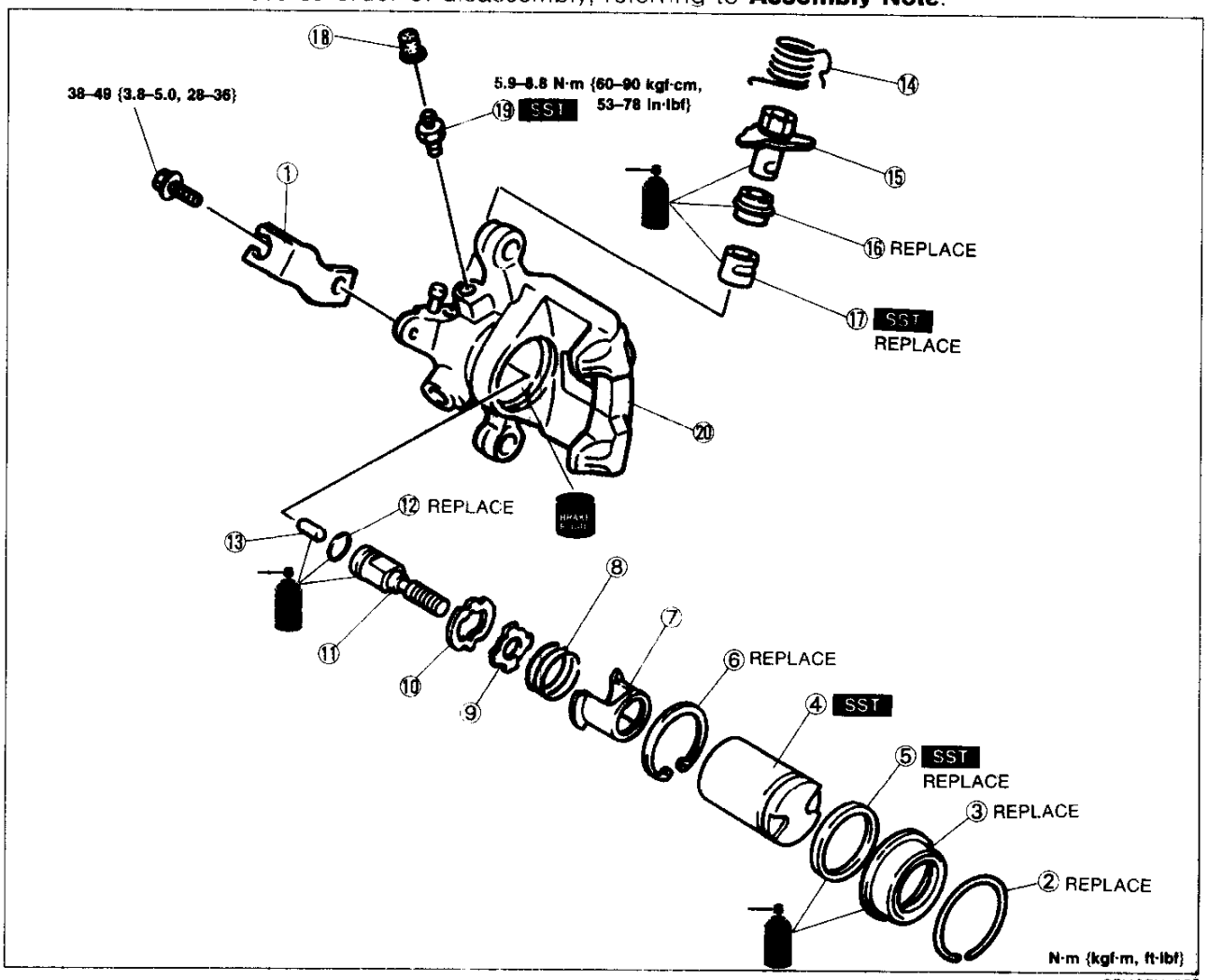
Runout: 0.1 mm {0.004 in} max.

2. If the runout exceeds specification, repair or replace the disc plate.

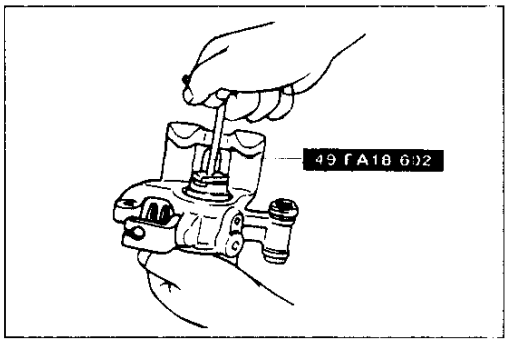
CALIPER (REAR)

Disassembly / Inspection / Assembly

1. Disassembly 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. Cable bracket
2. Retaining ring
3. Dust boot
4. Piston
   Disassembly Note
   ..... page P–31
   Inspect for wear and damage
   Assembly Note
   ..... page P–32
5. Piston seal
   Disassembly Note
   ..... page P–31
6. Snap ring
7. Case cover
8. Spring
9. Spring washer
10. Stopper
11. Adjuster spindle
    Inspect for wear and damage
12. O-ring
13. Connecting link
    Inspect for wear and damage
14. Lever spring
15. Operating lever
16. Lever boot
17. Bearing
    Disassembly Note
    ..... page P–31
    Assembly Note
    ..... page P–32
18. Bleeder cap
19. Bleeder screw
    Disassembly Note
    ..... page P–31
    Assembly Note
    ..... page P–31
20. Caliper body
    Inspect for wear and damage

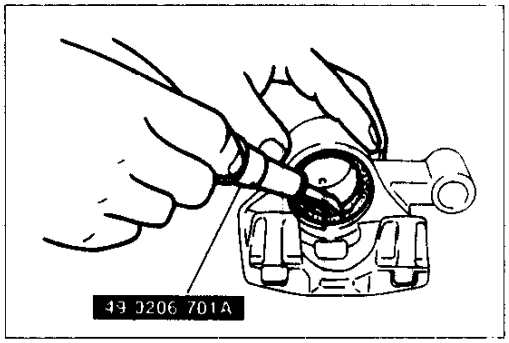


37U0PX-0

Disassembly note
Piston

Remove the piston by using the **SST**.

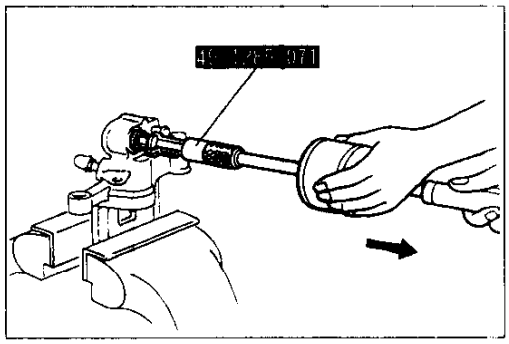
Note
- **Remove the piston by turning the SST counterclockwise.**



37U0PX-0

Piston seal

Remove the piston seal by using the **SST**.



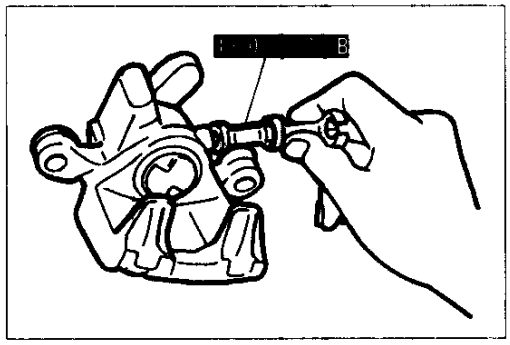
39U0PX-1

Bearing

1. Secure the caliper in a vise.

Caution
- **Insert a soft, protective material (such as copper plates) in the jaws of the vise.**

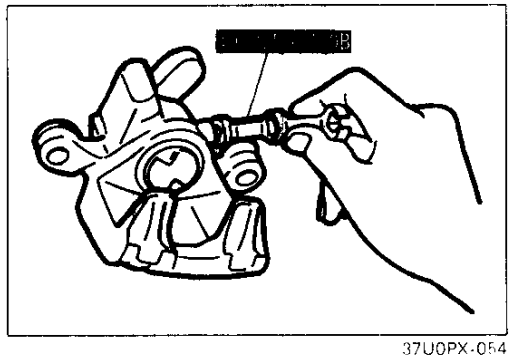
2. Remove the bearing from the caliper with the **SST**.



29U0PX-0

Bleeder screw

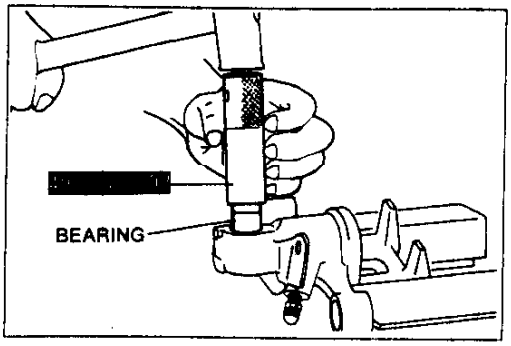
Loosen the bleeder screw by using the **SST**.



37U0PX-0

Assembly note
Bleeder screw

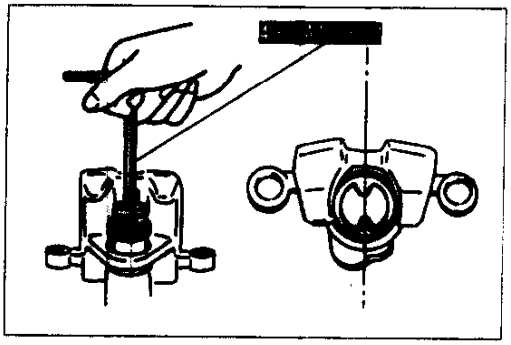
Tighten the bleeder screw by using the **SST**.



37U0PX-108

Bearing

Press the new bearing into the caliper with the **SST** until the **SST** bottoms against the caliper.


37U0PX-053

Piston

1. Clean the piston with clean brake fluid.
2. Install the new dust boot in the piston groove.
3. Turn the piston into the caliper body by rotating the **SST** clockwise.

Note

- **Turn the piston in fully, and align the piston grooves as shown in the illustration.**

4. Fit the dust boot into the caliper body.

PARKING BRAKE SYSTEM

TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Brakes do not release	Improper return of parking cable or improper adjustment	Repair or adjust	P–33
Parking brake does not hold well	Excessive parking brake lever stroke	Adjust	P–32
	Parking cable stuck or damaged	Repair or replace	P–33
	Brake fluid or oil on pads	Clean or replace	P–28
	Hardening of pad surfaces or poor contact	Grind or replace	P–28

37U0PX-055

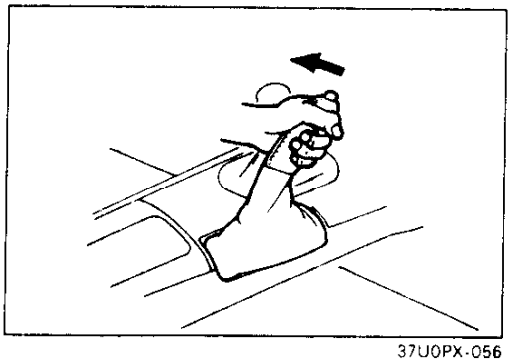
PARKING BRAKE (LEVER TYPE)

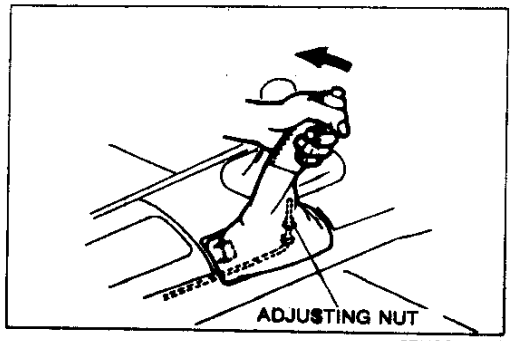
Inspection

Parking brake lever stroke

1. Depress the brake pedal several times.
2. Pull and release the parking brake lever several times.
3. Verify that the stroke is within specification when the parking brake lever is pulled with a force of **200 N {20 kgf, 44 lbf}**.

   Stroke: 7–10 notches
4. If not within specification, adjust the parking brake lever stroke. (Refer to below.)


37U0PX-056



37U0PX-057

Adjustment

Parking brake lever stroke

1. Depress the brake pedal several times.
2. Pull and release the parking brake lever several times.
3. Remove the console panel. (Refer to Section S.)
4. Adjust the parking brake lever stroke by turning the adjusting nut.

   Stroke: 7–10 notches

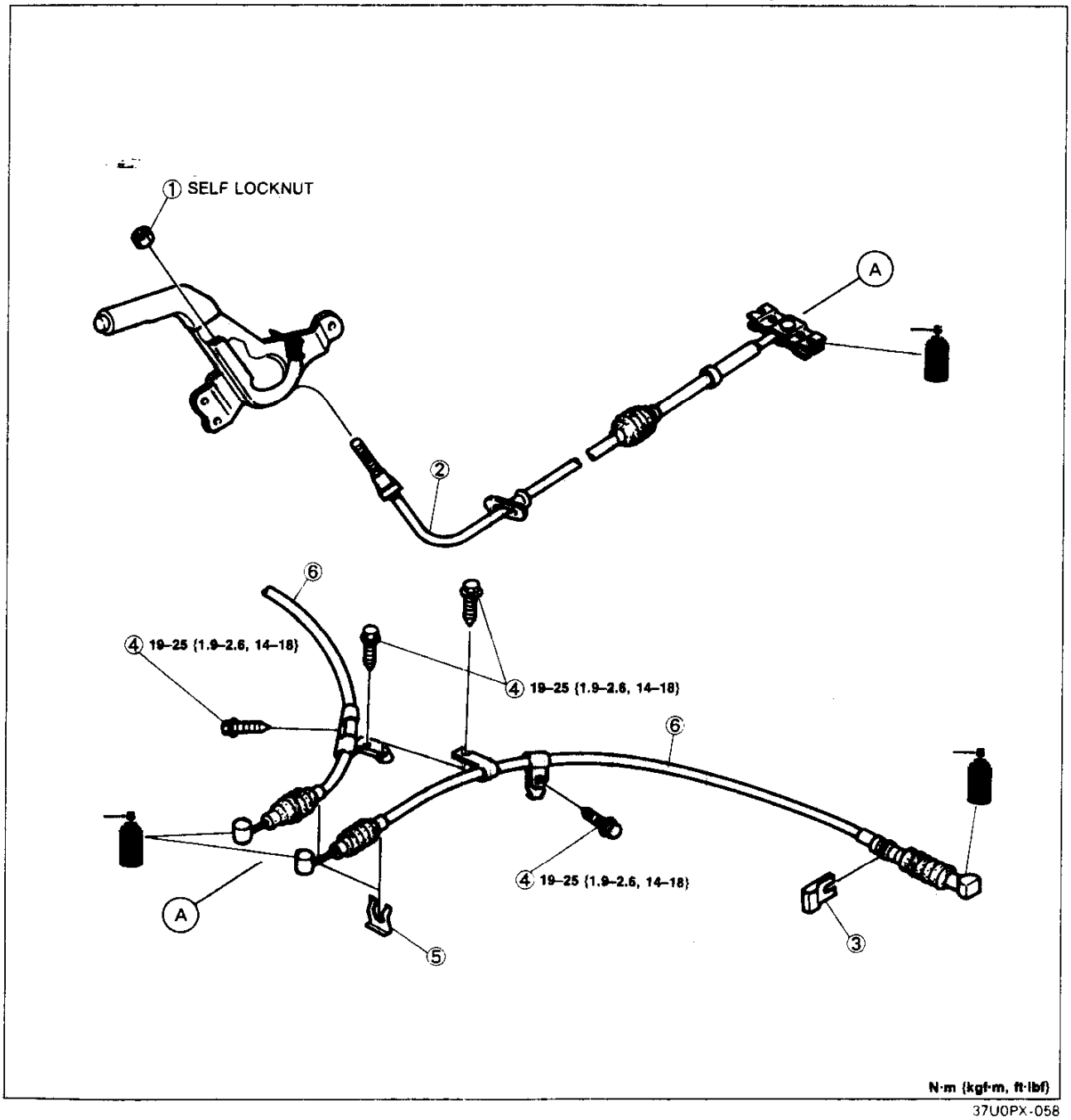
   Caution

   - **After adjustment, verify that the parking brake warning lamp illuminates when the parking brake lever is pulled one notch.**
   - **Verify that the brakes do not drag when the wheels are turned by hand.**

PARKING CABLE (LEVER TYPE)

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.
4. After installation, check the parking brake lever stroke. (Refer to page P–32.)



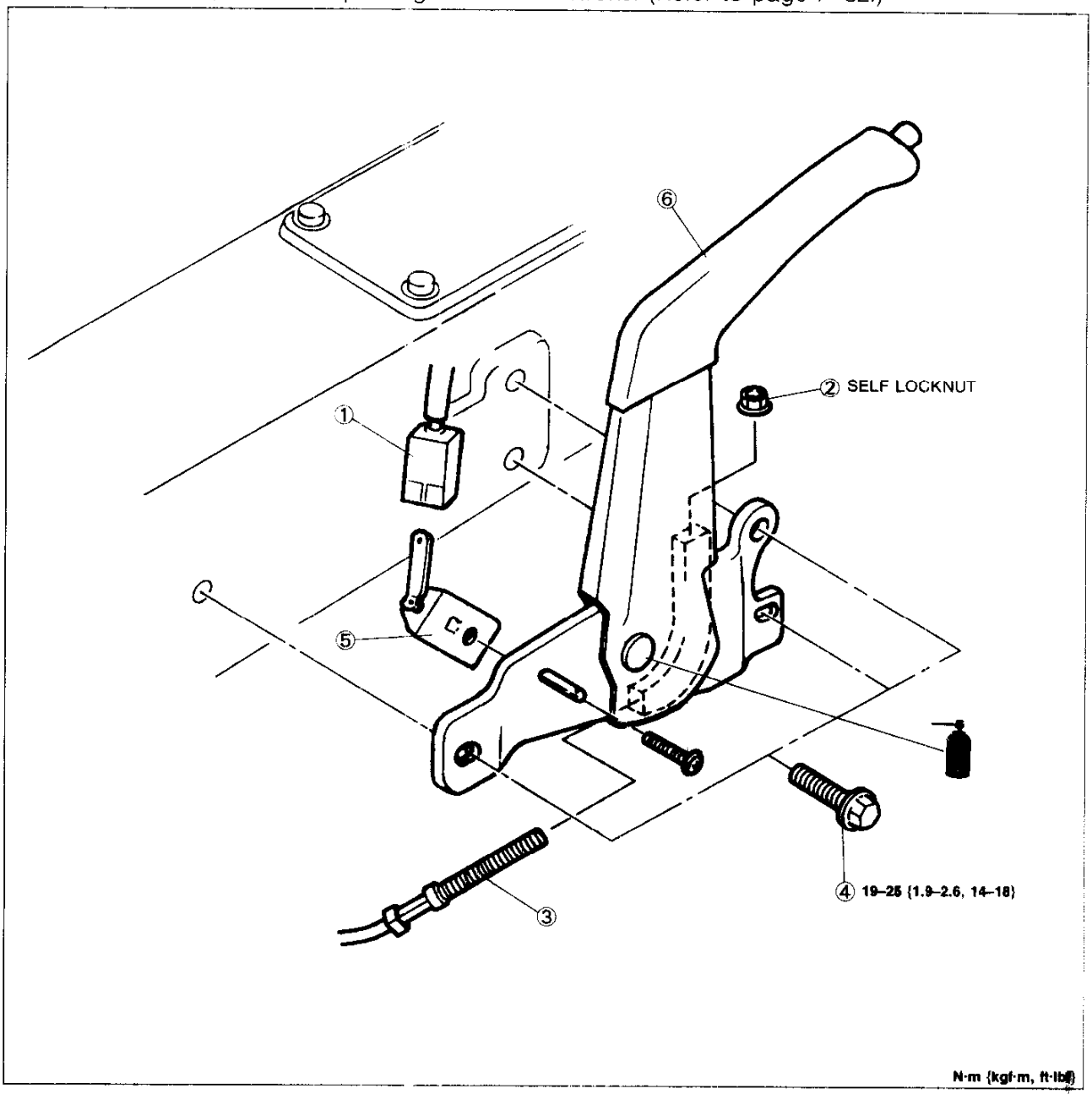
37U0PX-058

1. Adjusting nut
2. Front parking cable
   Inspect for damage and wear
3. Clip
4. Bolt
5. Clip
6. Rear parking cable
   Inspect for damage and wear

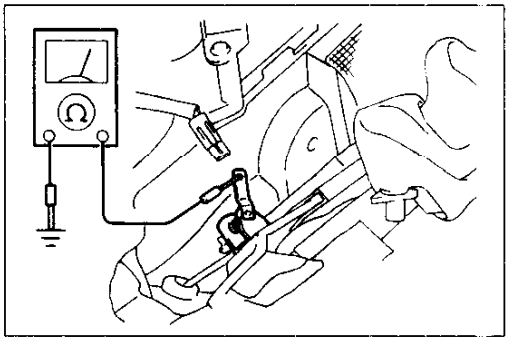
PARKING BRAKE LEVER

Removal / Inspection / Installation

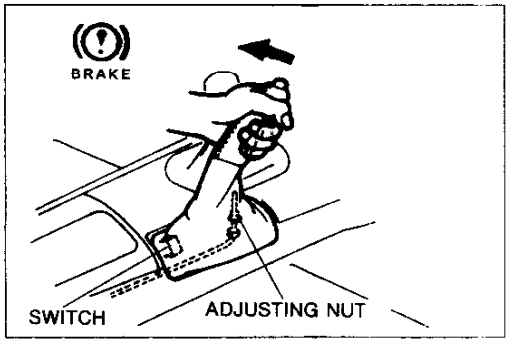
1. Remove the console panel. (Refer to Section S.)
2. Remove the rear console. (Refer to Section S.)
3. Remove in the order shown in the figure.
4. Inspect all parts and repair or replace as necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. After installation, check the parking brake lever stroke. (Refer to page P–32.)



1. Parking brake switch connector
2. Adjusting nut
3. Front parking cable
4. Bolt
5. Parking brake switch
   Inspection ..... page P–35
   Installation Note ..... page P–35
6. Parking brake lever
   Inspect for damage and bending



37U0PX-060



37U0PX-061

Inspection
Parking brake switch

1. Remove the console panel. (Refer to Section S.)
2. Disconnect the connector from the parking brake switch.
3. Pull the parking brake lever and check continuity between the terminal of the switch and a ground.

Parking brack lever	Continuity
Released	No
Pulled	Yes

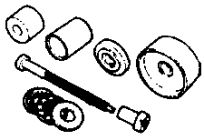
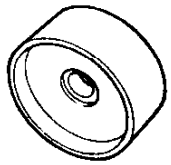
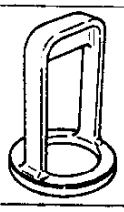
4. If not as specified, replace the parking brake switch.

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 ON, and check that the parking brake warning lamp illuminates with the lever is pulled one notch.

ANTI-LOCK BRAKE SYSTEM (ABS)

PREPARATION
SST

49 H066 003 Harness, adapter 	For connecting ABS tester	49 0259 770B Wrench, flare nut 	For removal / installation of brake pipe
49 H028 2A0 Set, rubber bushing replacer 	For installation of sensor rotor (front)	49 H028 204 Attachment (Part of 49 H028 2A0) 	For installation of sensor rotor (front)
49 F026 104 Installer, sensor rotor 	For installation of sensor rotor (rear)		

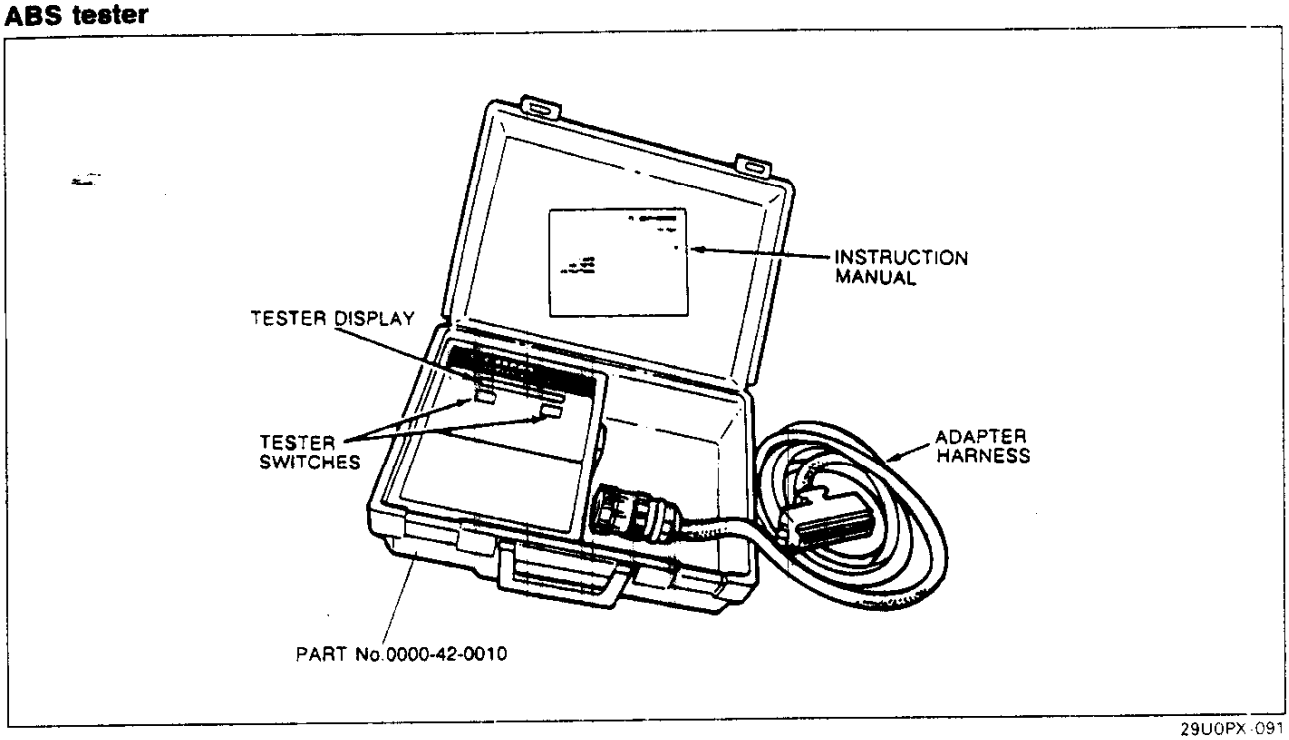
37U0PX-062

TROUBLESHOOTING GUIDE

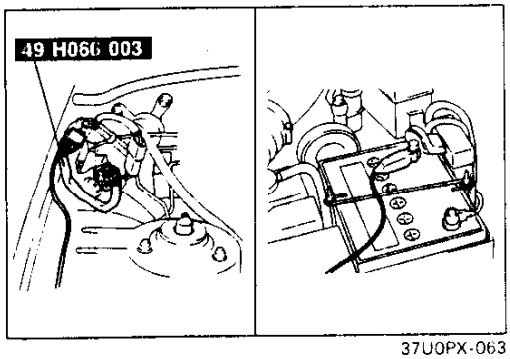
Outline

The ABS tester is used to locate the cause of a problem within the anti-lock brake system by retaining and reducing the hydraulic fluid pressure in the hydraulic unit.
Because there is no way to check the ABS control unit itself, replace the control unit assembly only after first confirming that the other electrical parts are not faulty.

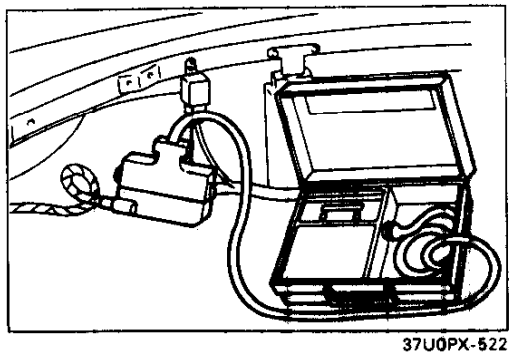
ABS tester



29U0PX-091



37U0PX-063

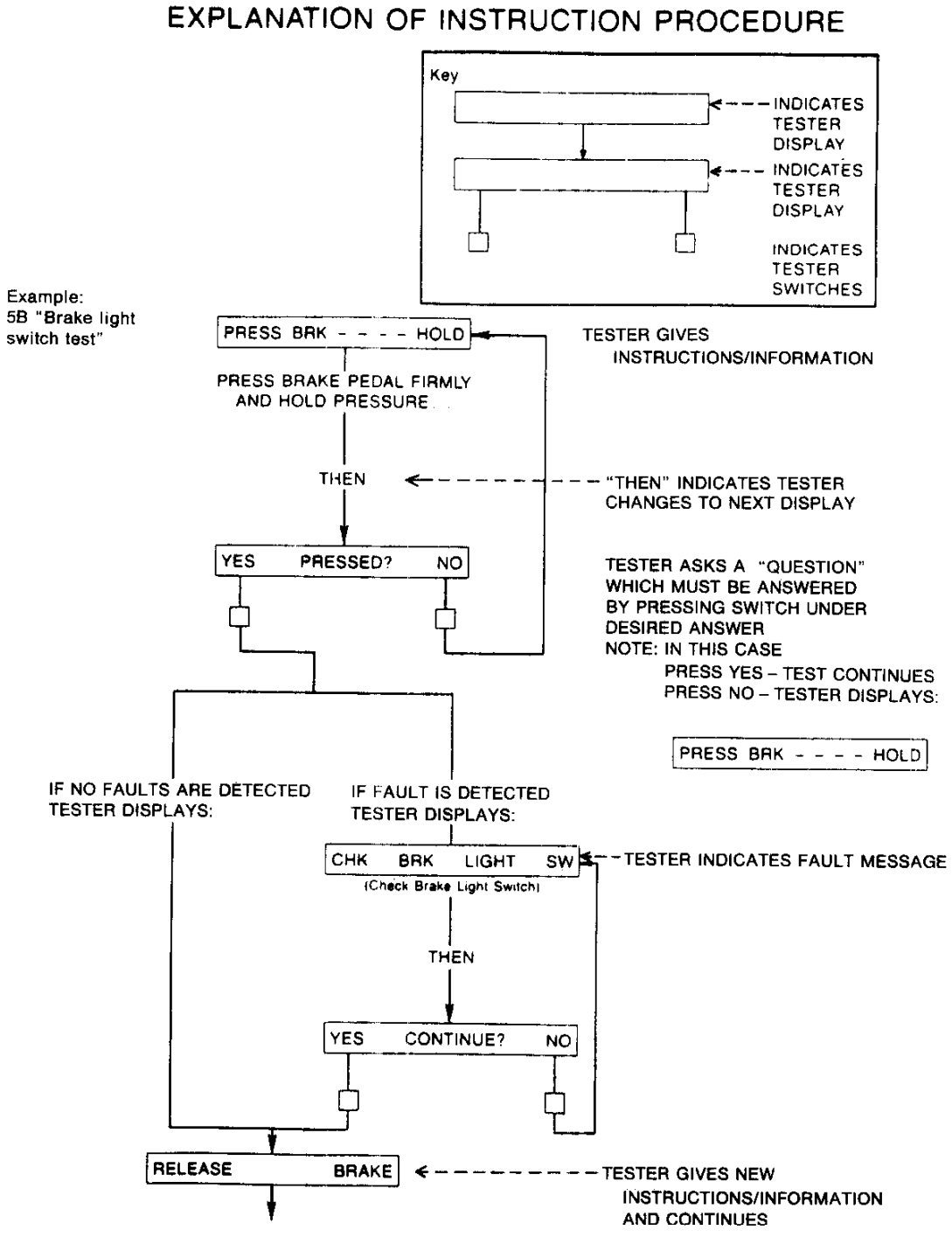


37U0PX-522

Connecting the ABS tester

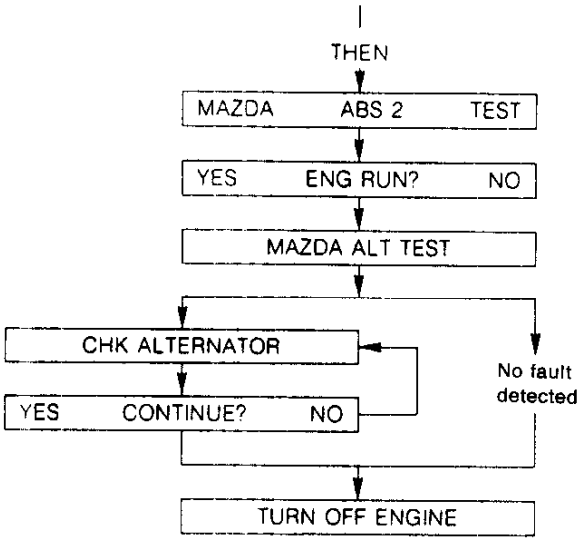
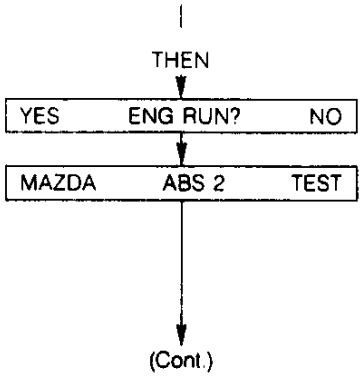
1. Turn the ignition switch OFF.
2. Connect the **SST** between the hydraulic unit wiring harness connectors and to the positive battery terminal.
3. Remove the trunk side trim.
4. Remove the ABS control unit.
5. Disconnect the control unit connector and connect the ABS tester to the control unit connector at the harness side.

Explanation of instruction procedure



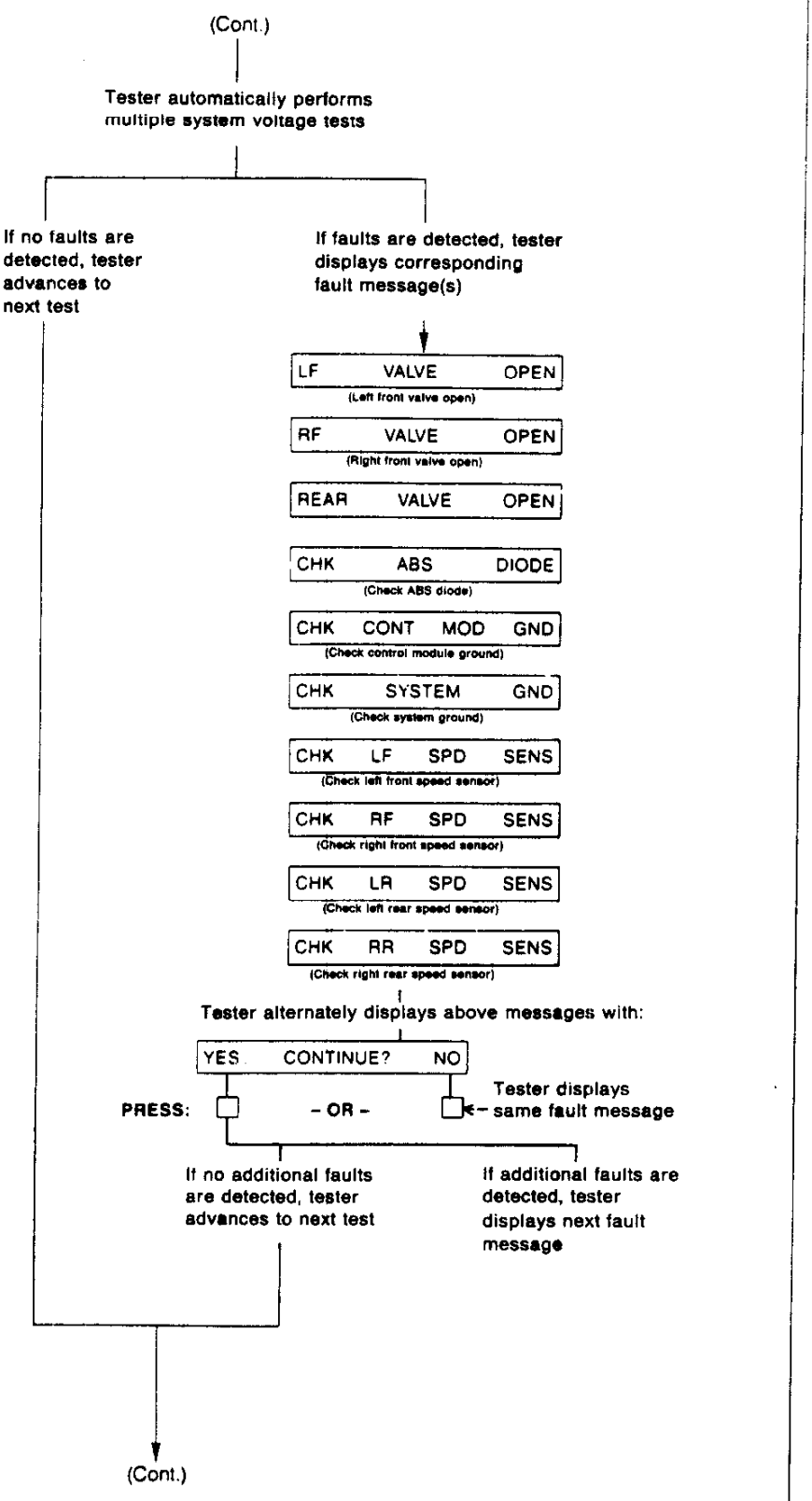
37U0PX-064

Troubleshooting procedure

ITEM	
1. CONNECTION / POWER ON	1. Locate ABS control unit 2. Disconnect control unit harness connector from control unit 3. Connect ABS tester harness to control unit harness connector. 4. Turn ignition key to ON position.
2. ALTERNATOR TEST **• Start engine**	Tester rapidly displays several messages during initial segment check. 
3. ABS SYSTEM TEST **• Turn ignition key ON (Do not run engine)**	Tester rapidly displays several messages during initial segment check. 

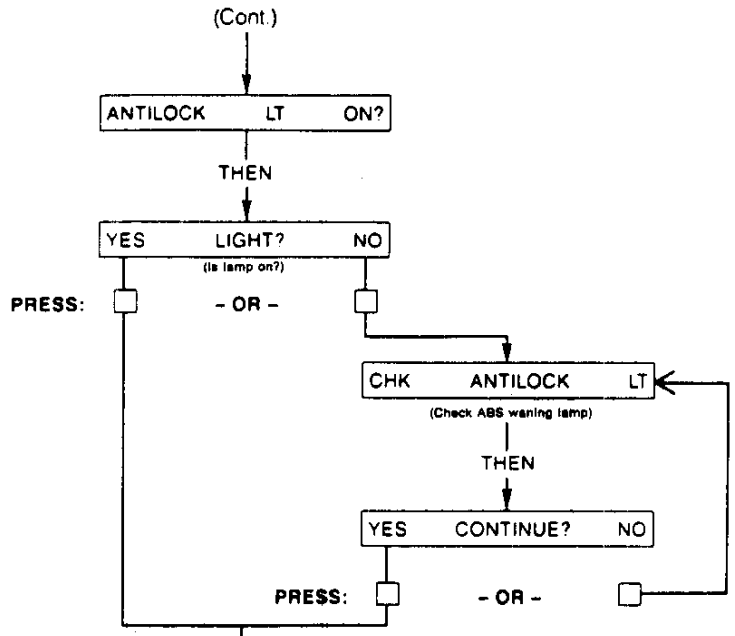
4. SYSTEM VOLTAGE CHECKS

- **If tester displays a fault message, check and repair or replace parts as necessary.**

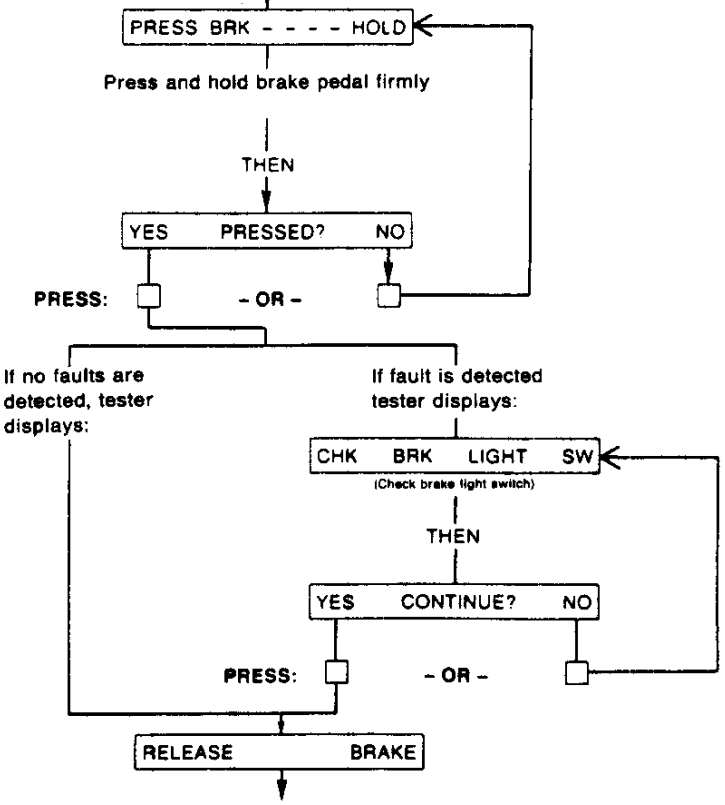


37U0P)-066

5. STATIC TESTS
5A ABS WARNING LAMP TEST

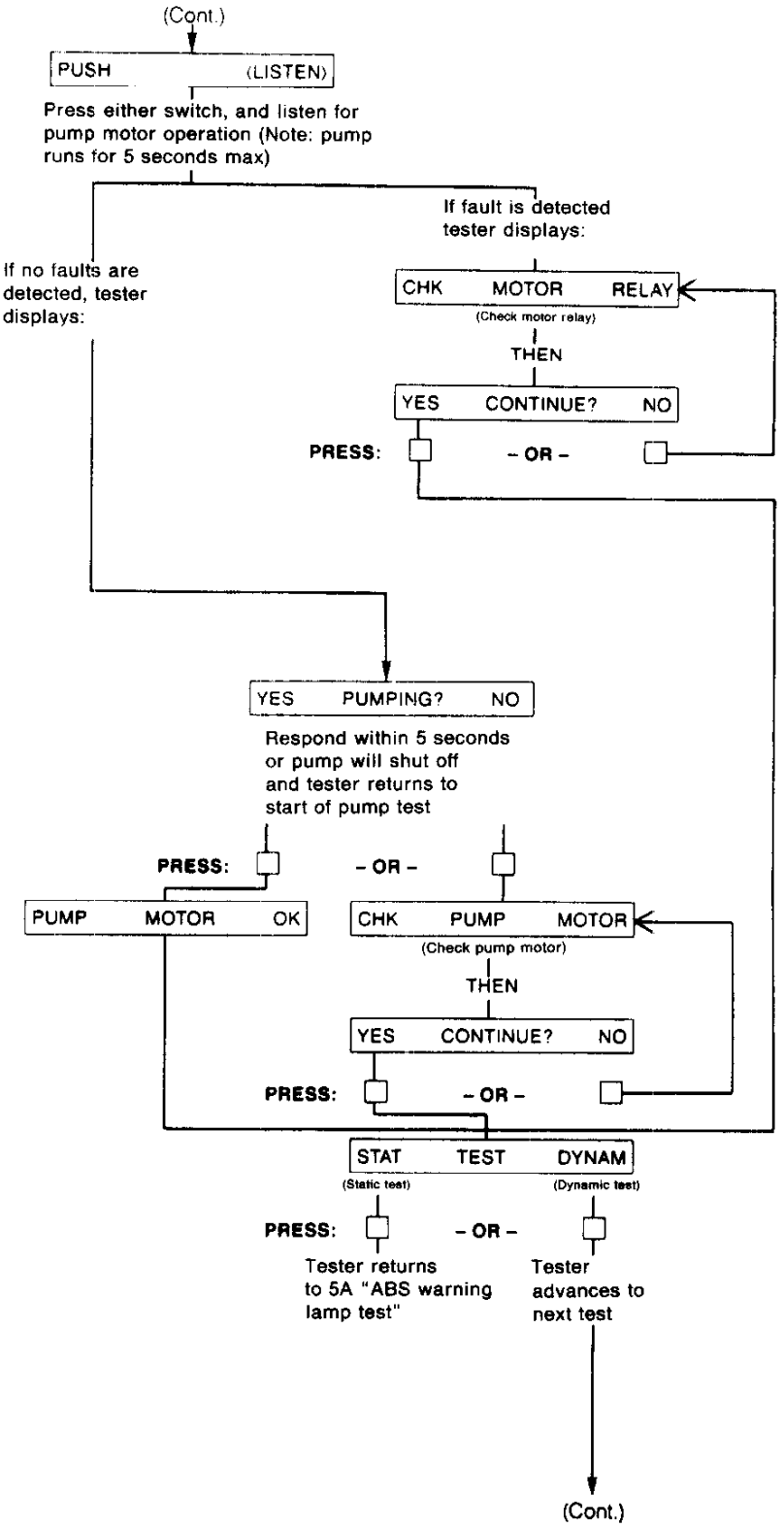


5B. BRAKE LIGHT SWITCH TEST



37U0PX-067

5C PUMP TEST



37U0PX-068

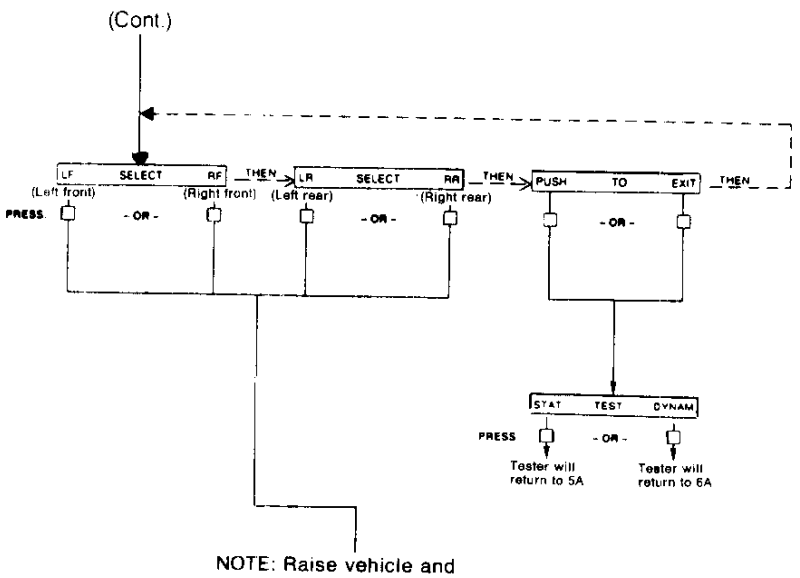
6. DYNAMIC TESTS
6A WHEEL SELECTION OR EXIT

Each messages will displayed 3-1/2 seconds
Select one wheel to begin dynamic test sequence

OR

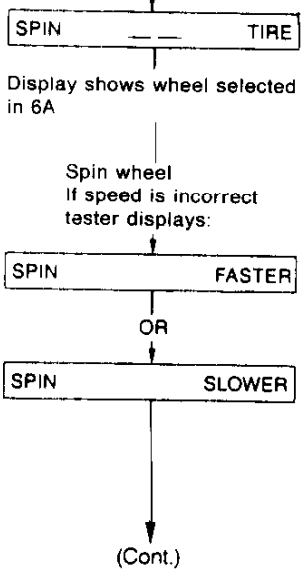
Press either switch under "PUSH TO EXIT" to return to "STAT TEST DYNAM" selection

IMPORTANT:
After completing testing of selected wheel return to 6A "WHEEL SELECTION," to select another wheel
Complete test procedures for all four wheels



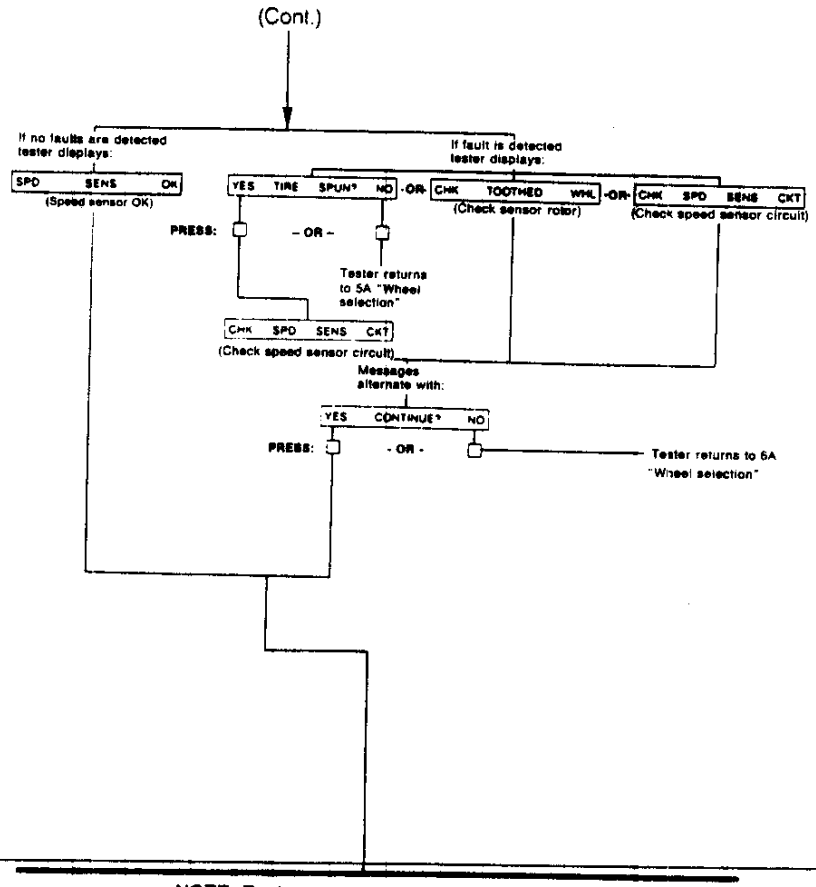
NOTE: Raise vehicle and support it on safety stands. An assistant is required to spin wheels.

6B WHEEL SENSOR TEST

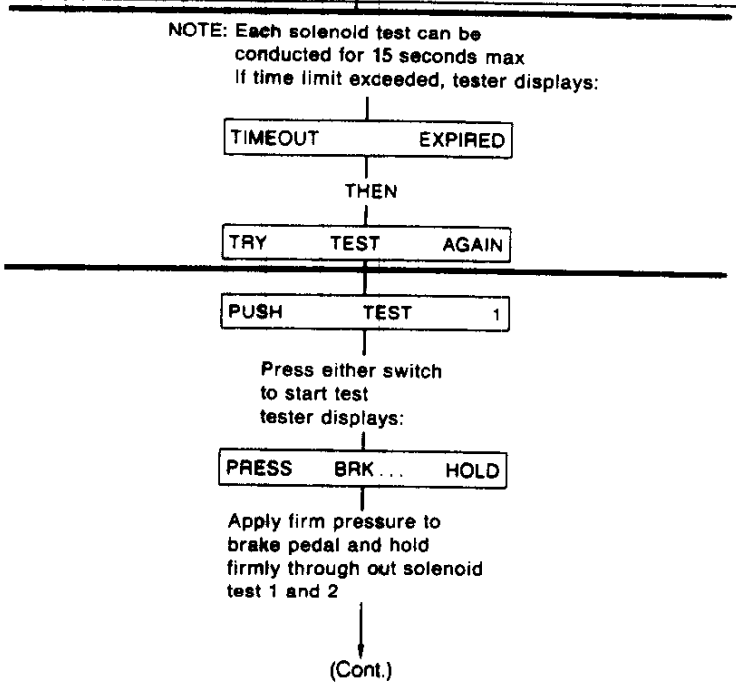


37U0PX-069

6B WHEEL SENSOR TEST

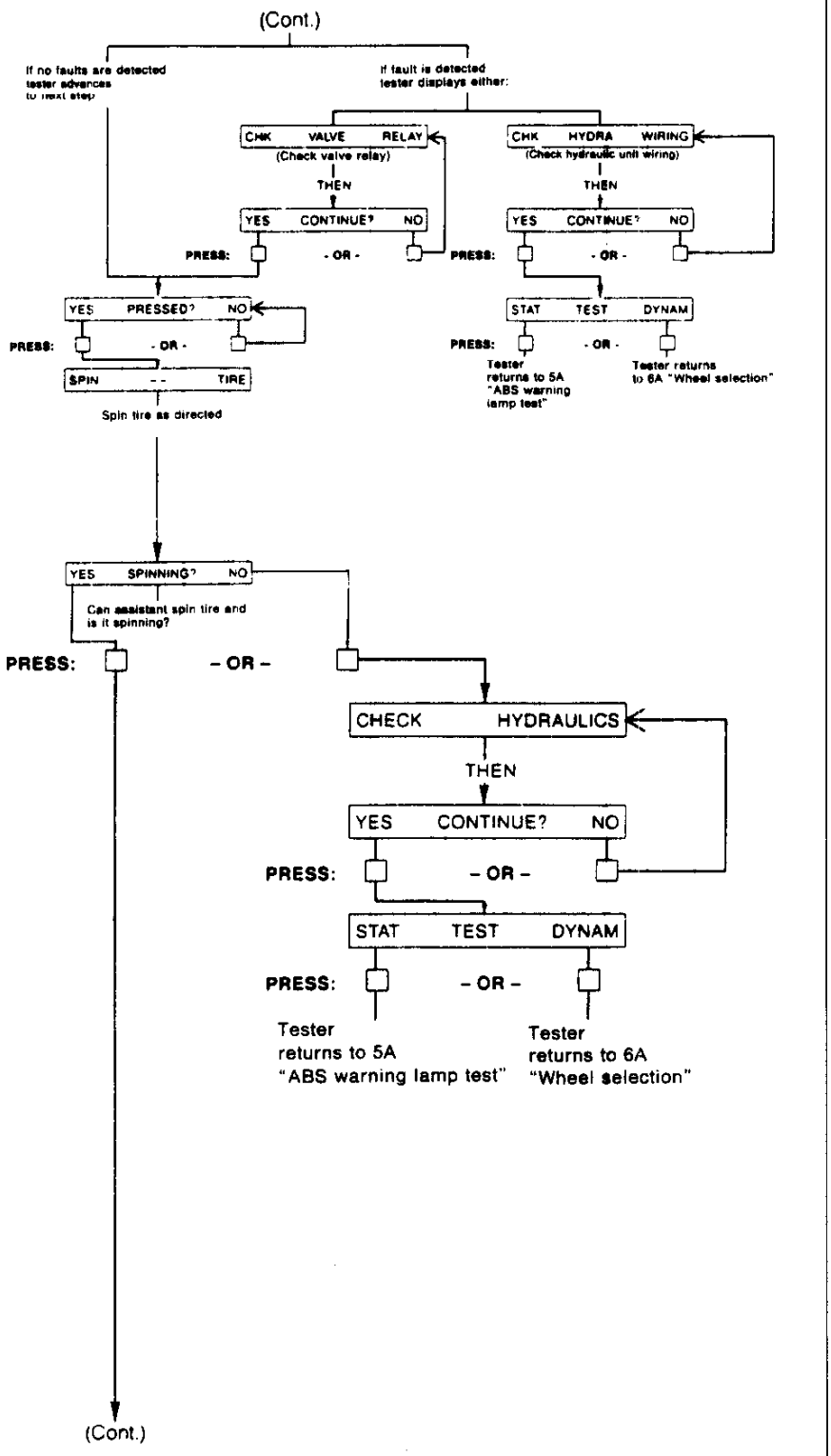


6C SOLENOID TEST



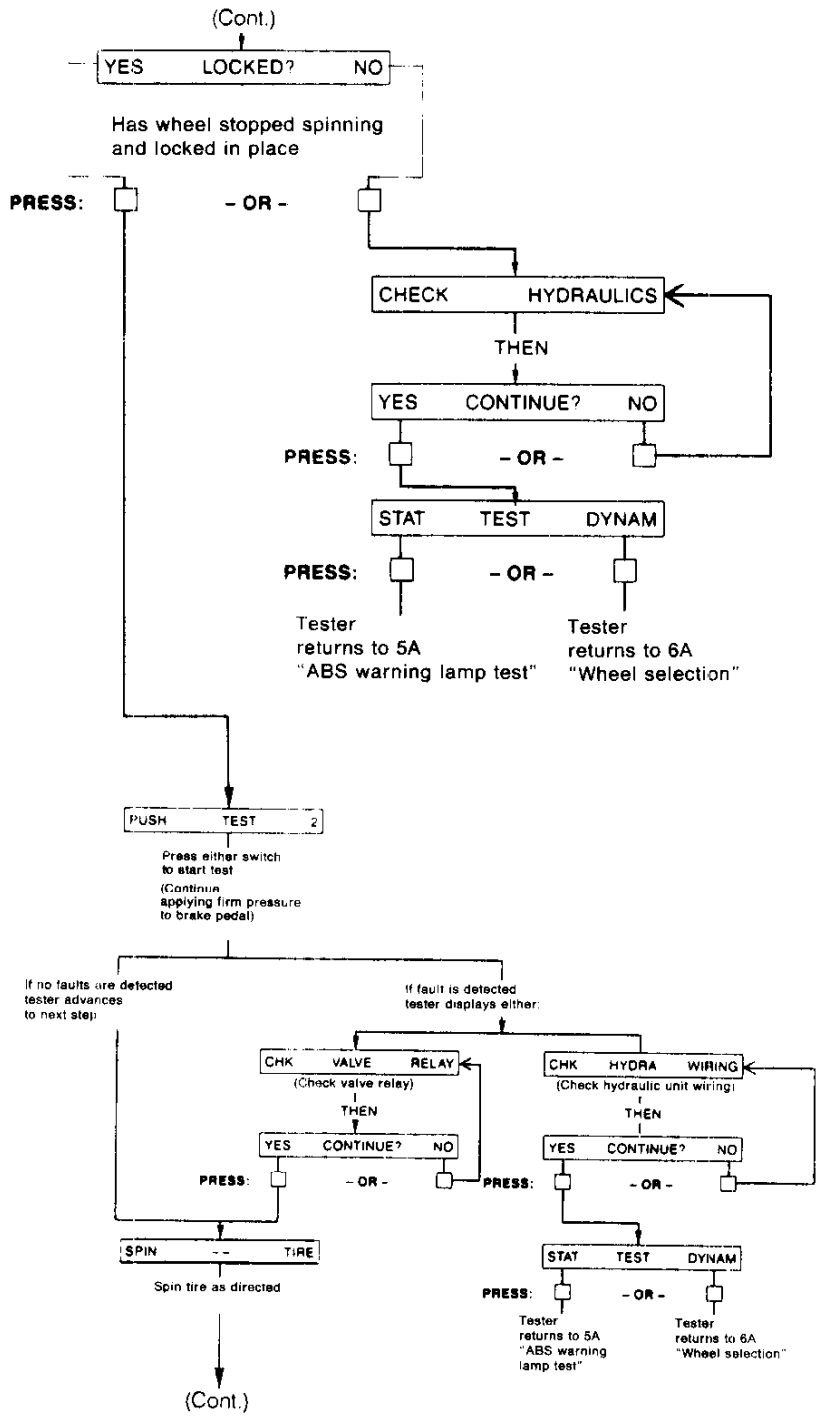
37U0PX-070

6C SOLENOID TEST



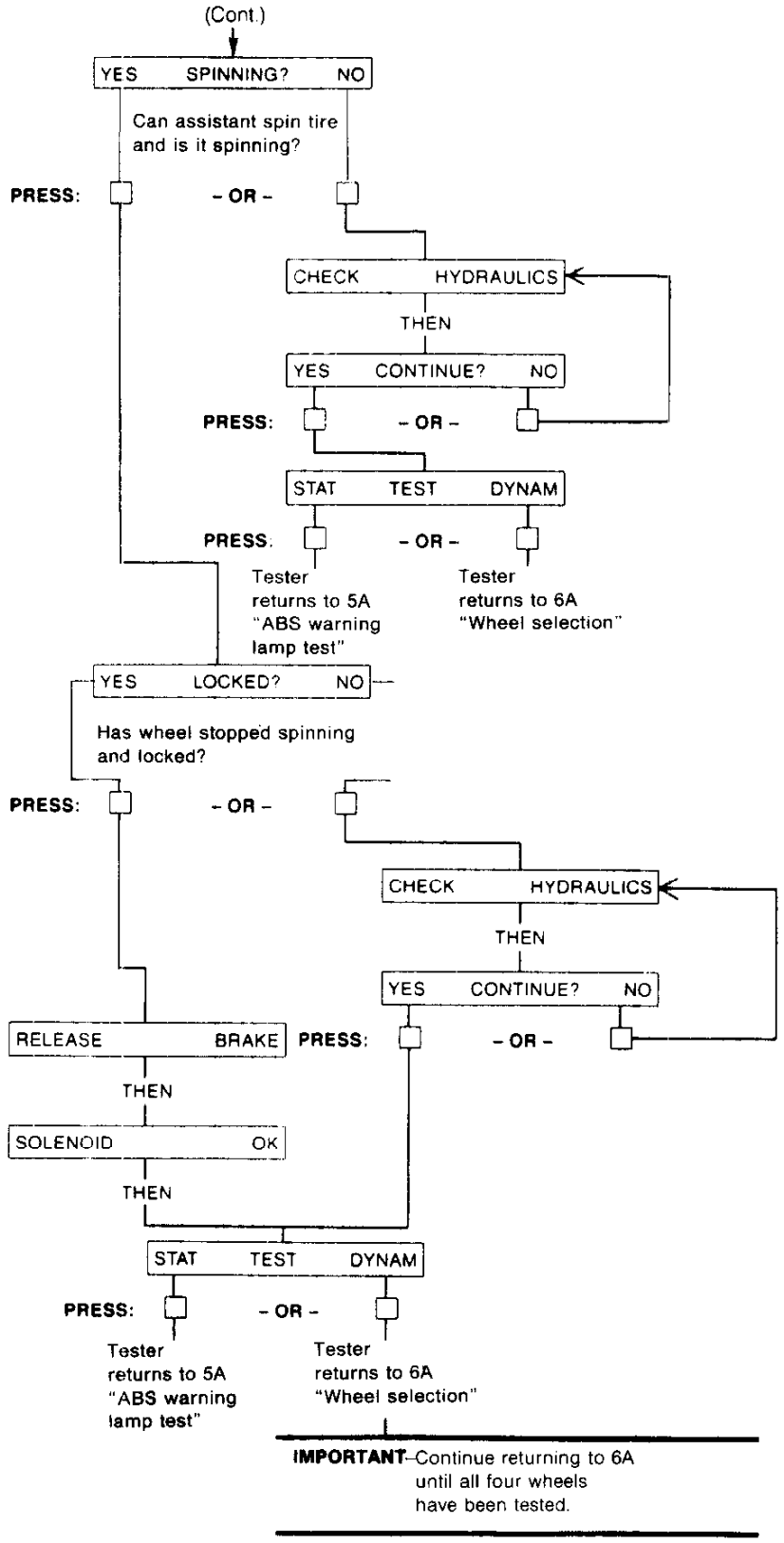
37U0PX-071

6C SOLENOID TEST

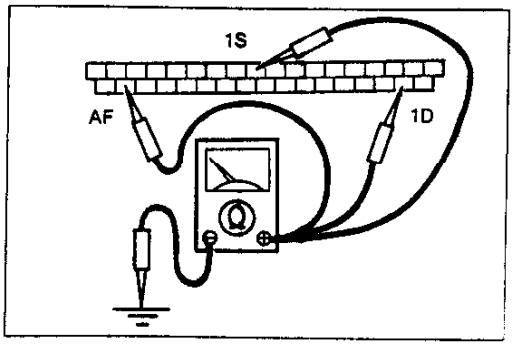


37U0PX-072

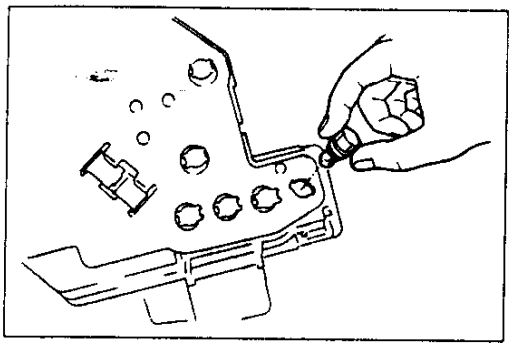
6C SOLENOID TEST

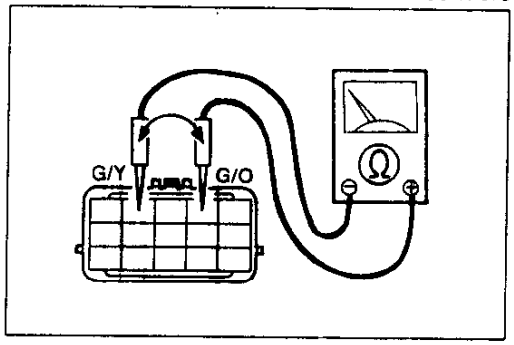


37U0PX-073



37U0PX-074


37U0PX-075



37U0PX-076

Inspection of ABS system
Check system ground

Check for an open circuit in (B) wire from terminals 1D, 1S, and AF of the ABS control unit O-01 connector and ground.

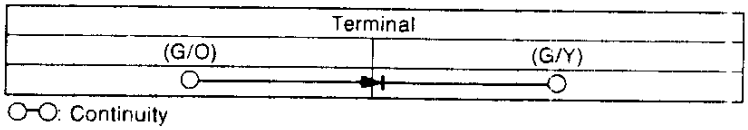
Caution
- **When checking the control unit terminal, do not use ordinary tester pins. Use only very thin pins to prevent damage to the terminals.**

Check anti-lock warning lamp

1. Remove the switch assembly. (Refer to 1993 RX-7 body electrical troubleshooting manual section Z4.)
2. Remove and check the ABS warning lamp bulb.
3. If a problem is found, replace the bulb.
4. If OK repair or replace the wiring harness. (Battery–AES control unit–ABS warning lamp)

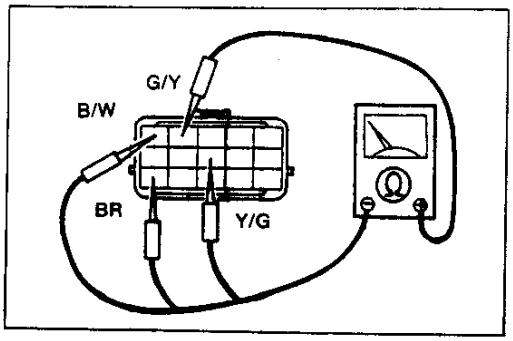
Check ABS diode

1. Check the wiring harness between the warning lamp and the control unit and hydraulic unit. Repair if necessary.
2. Disconnect the hydraulic unit O-02 connector.
3. Using an ohmmeter, check for continuity between the terminals of the connector (hydraulic unit side).



O–O: Continuity

4. If continuity is not specified, replace the hydraulic unit.



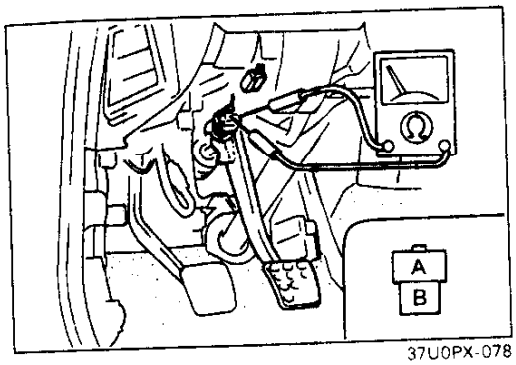
37U0PX-077

Check front and rear valves

1. Disconnect the negative battery cable.
2. Disconnect the hydraulic unit O-02 connector.
3. Check for continuity between terminals of the connector (hydraulic unit side).

Wire		Continuity
(G/Y)	(Y/G)	Yes
	(BR)	Yes
	(B/W)	Yes

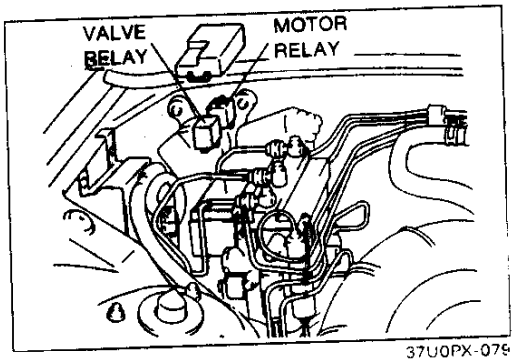
4. If not as specified, replace the hydraulic unit.



37U0PX-078

Check stoplight switch

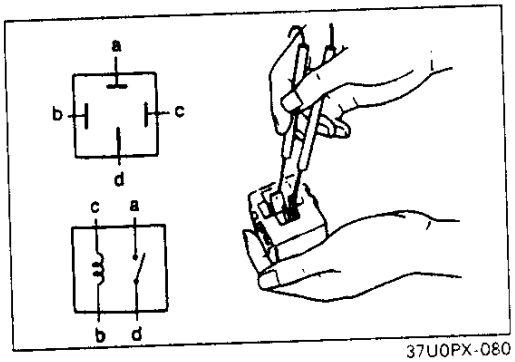
1. Disconnect the stoplight switch connector.
2. Connect an ohmmeter between terminals of the switch.
3. Verify that there is continuity between the terminals when the brake pedal is depressed.
4. If there is no continuity, replace or adjust the stoplight switch.



37U0PX-079

Check motor relay

1. Disconnect the negative battery cable.
2. Remove the motor relay.



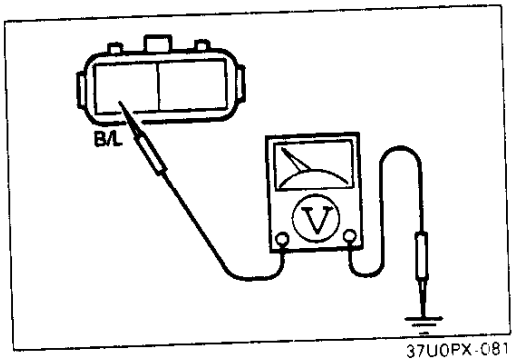
37U0PX-080

3. Using an ohmmeter, check continuity between terminals of the relay.

Connect to		a	b	c	d
12V	Ground				
–	–		○—○		
c	b	○			○

○—○: Continuity

4. If cotinuity is not as specified, replace the motor relay.



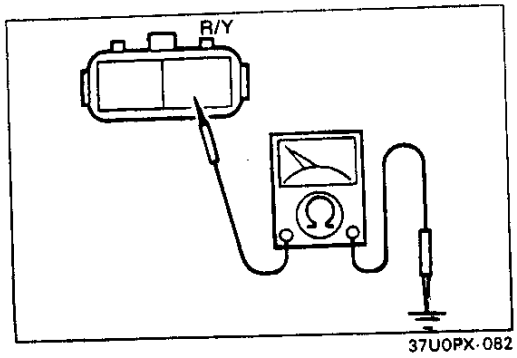
37U0PX-081

Check pump motor

1. Disconnect the hydraulic unit O-03 connector.
2. Measure the voltage between wire (B/L) and a ground.

Wire	Voltage
(B/L)	Battery voltage

3. If not as specified, check the fuse (MAIN and ABS 60A) and repair or replace the wiring harness (battery-hydraulic unit).

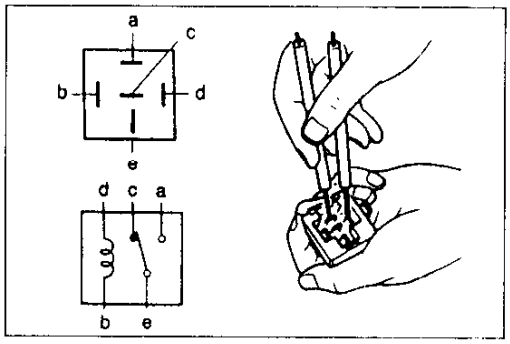


37U0PX-082

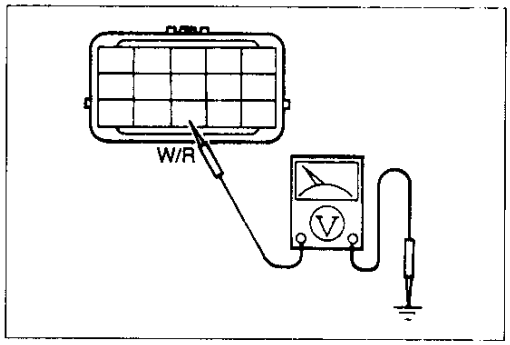
4. If as specified, check for continuity between wire (R/Y) of O-03 connector and a ground (hydraulic unit side).

Wire	Continuity
(R/Y)	Yes

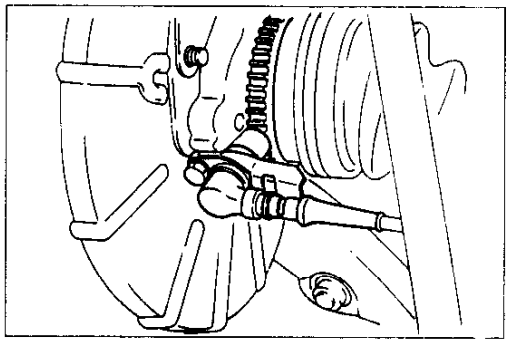
5. If there is no continuity, replace the hydraulic unit.



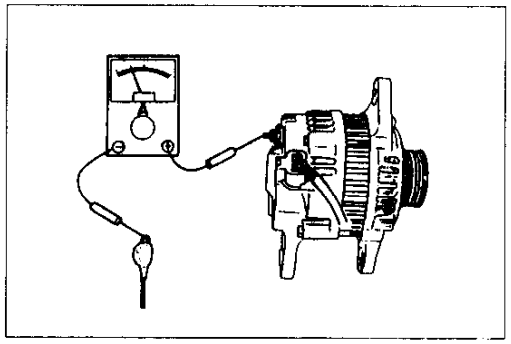
37J0PX-083



37J0PX-084



37U0PX-085



29U0PX-015

Check valve relay

1. Disconnect the negative battery cable.
2. Remove the valve relay.
3. Using an ohmmeter, check continuity between terminals of the relay.

Connect to		a	b	c	d	e
12V	Ground					
–	–			○		○
			○		○	
b	d	○				○

○-○: Continuity

4. If continuity is not as specified, replace the valve relay.
5. If as specified, connect the negative battery cable.
6. Disconnect the hydraulic unit O-02 connector.
7. Measure voltage between wire (W/R) of O-02 connector and ground.

Wire	Voltage
(W/R)	Battery voltage

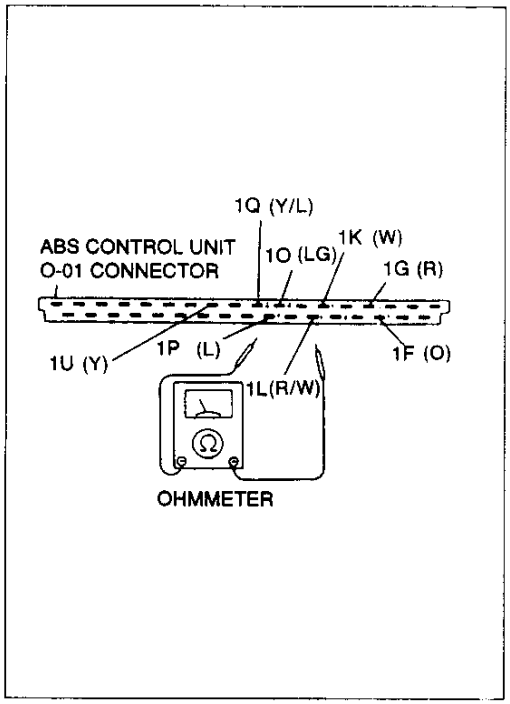
8. If not as specified, check the fuse (MAIN and ABS 15A) and repair or replace the wiring harness (battery-hydraulic unit).

Check rotor

1. Check the rotor for looseness and missing or damaged teeth.
2. Replace if necessary.

Check alternator

Refer to Section G.



37U0PX-086

Check wheel-speed sensor

1. Disconnect the O-01 connector.
2. Using an ohmmeter, check for continuity between the ABS control unit O-01 connector terminals.

Sensor \ Terminal	1K	1G	1O	1Q	1U	1F	1L	1P
Left front	O—O							
Right front					O—O			
Left rear			O—O					
Right rear							O—O	

O—O: Continuity

2. If the continuity is not as specified, repair the wiring harness (wheel-speed sensor–ABS control unit).
3. If continuity is as specified, check voltage between the following terminals while rotating the wheel one rotation per second by hand.

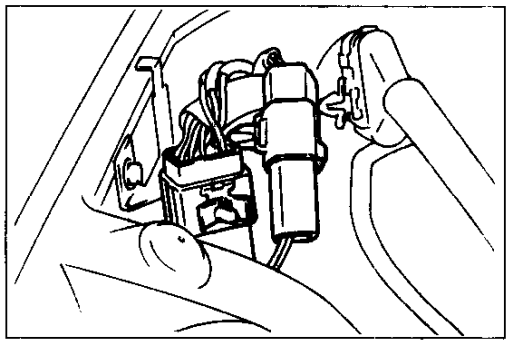
Sensor	Terminal	Voltage
Left front	1K and 1G	50–60 mV*
Right front	1U and 1F	50–60 mV*
Left rear	1O and 1Q	50–60 mV*
Right rear	1L and 1P	50–60 mV*

*Alternating current voltage

4. If voltage is not as specified, replace the wheel-speed sensor.
5. If voltage is as specified, replace the ABS control unit.

Caution

- **When checking the control unit terminals, do not use ordinary tester pins. Use only very thin pins to prevent damage to the terminals.**



37U0PX-087

Check hydraulics

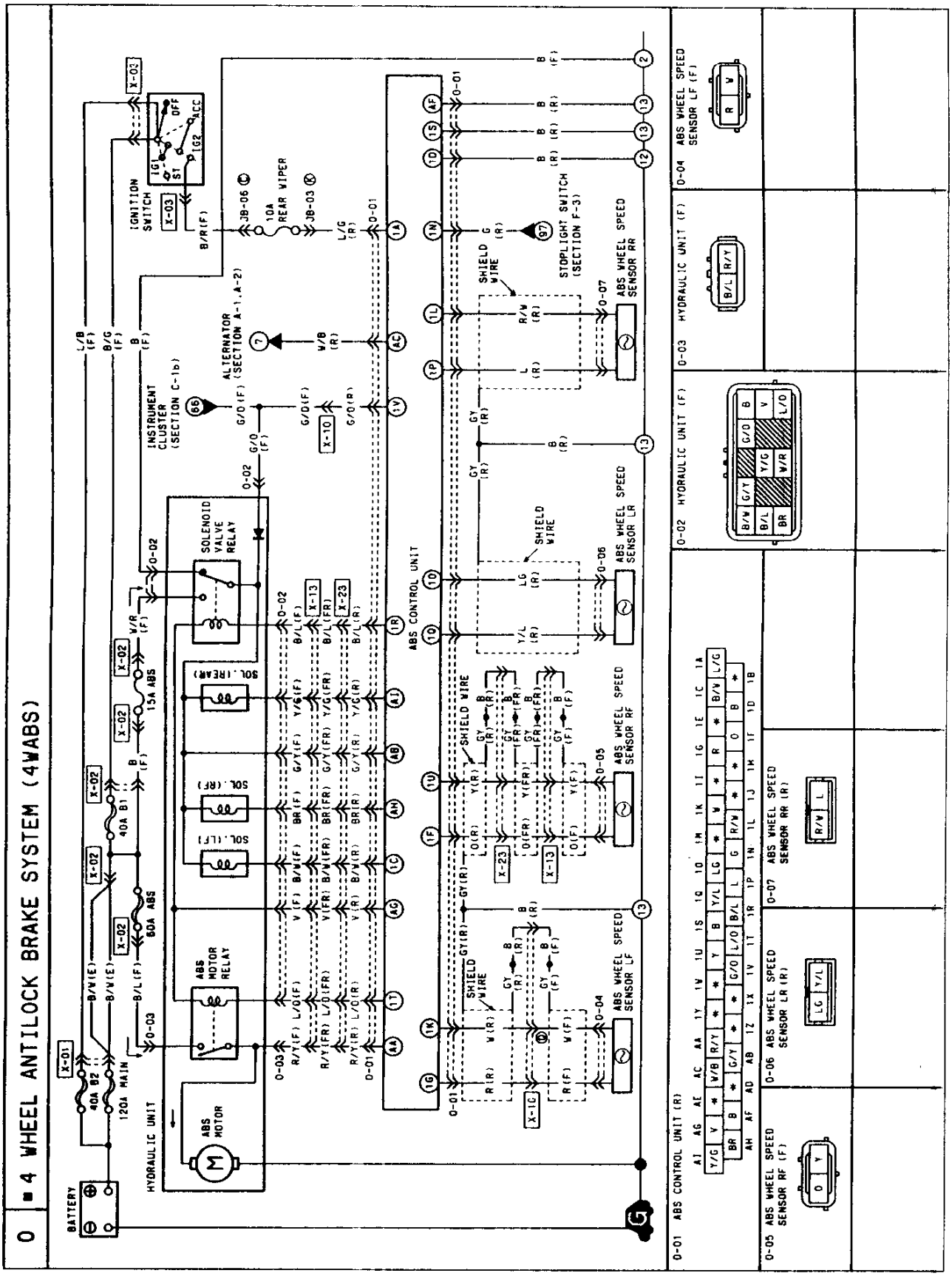
Verify that all brake fluid line connections are tight and that no fluid is leaking.

Check hydraulic unit wiring

1. Verify that the hydraulic unit connectors are properly secured.
2. Verify that the valve relay and motor relay are properly secured.

SERVICE POINTS

Circuit Diagram



29UOPX-118

Electrical diagnosis support
Hydraulic unit (HU)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
Valve relay, motor relay and solenoid valve–ABS CU	System shut down ↓ Normal braking	System shut down ↓ Normal braking	NA
HU–Fuse–Battery	System shut down ↓ Normal braking	System shut down ↓ Normal braking Fuse (ABS) burns out	NA
Motor–Ground	System shut down ↓ Normal braking	No symptom	System shut down ↓ Normal braking
O–02 connector (B) –Ground	ABS warning lamp does not illuminate when ABS CU disconnected	No symptom	ABS warning lamp does not illuminate when ABS CU disconnected
HU–ABS warning lamp	ABS warning lamp does not illuminate when ABS CU disconnected	ABS warning lamp illuminates continuously	NA

37U0PX-088

Wheel-speed sensor

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
Wheel speed sensor–ABS CU	Partial control	Partial control	NA

37U0PX-089

Partial control: If failure occurs during ABS operation, system is controlled by remaining sensors until ABS cycle is completed, then system is shut down.
NA: Not applicable

ABS control unit (ABS CU)

Circuit	Condition		
	Open circuit	Short circuit	Poor ground
ABS CU–Ignition switch–Battery	System shut down ↓ Normal braking	System shut down ↓ Normal braking Fuse (AIR CON 15A) burns out	NA
ABS CU–Stoplight switch–Battery	ABS Controllability slightly down on low coefficient road, but no other effects	ABS Controllability slightly down on low coefficient road, but no other effects Fuse (STOP 20A) burns out	NA
ABS CU–Alternator	ABS warning lamp remains illuminated after engine started ABS control normal	ABS warning lamp remains illuminated after engine started ABS control normal	NA
ABS CU–Ground	If all ground harnesses are open, system shut down	No symptom	If all ground harnesses are open, system shut down
ABS CU–ABS warning lamp	ABS warning lamp does not illuminate when ABS CU disconnected ABS warning lamp does not illuminate when ignition switch is ON and system has been shut down	ABS warning lamp illuminates continuously	NA

NA: Not applicable

37 J0PX-090

HYDRAULIC UNIT

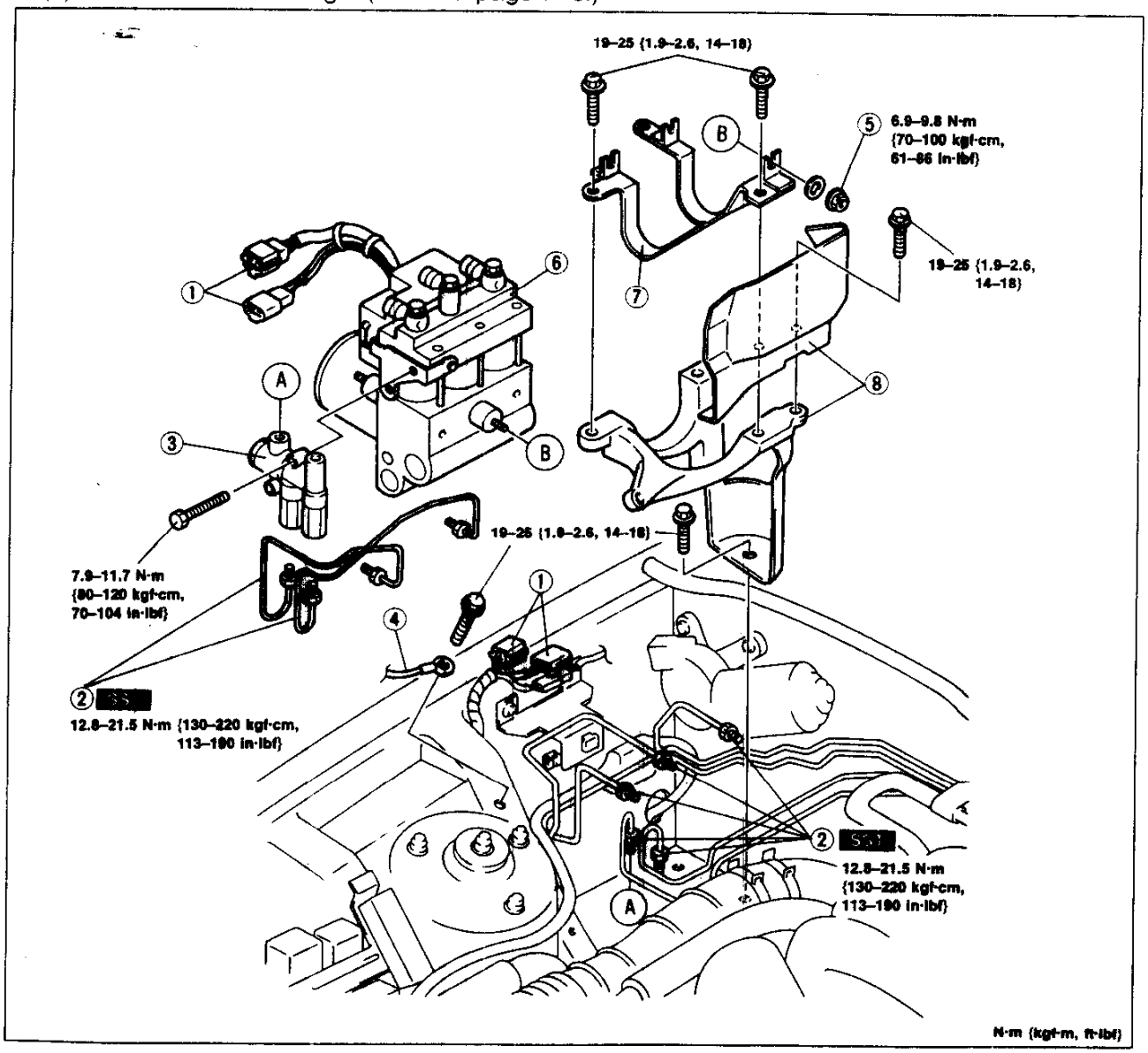
Removal / Installation

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**.

Caution

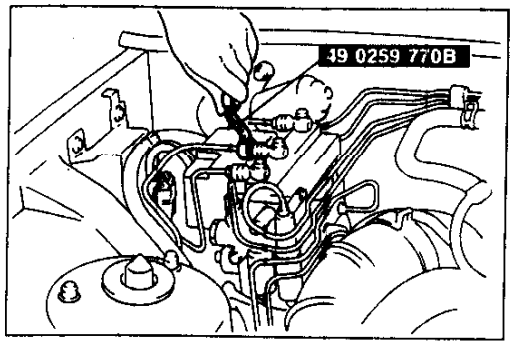
- **The only serviceable parts of the hydraulic unit are the valve relay and the motor relay, if there is a failure of any other part, replace the hydraulic unit assembly.**

3. Install in the reverse order of removal, referring to **Installation Note**.
4. After installation, perform the following.
   (1) Add fluid and bleed the air. (Refer to page P–7.)
   (2) Check for fluid leakage. (Refer to page P–8.)



37U0PX-091

1. Connector
2. Brake pipe
   Removal Note ..... page P–56
   Installation Note ..... page P–56
3. Proportioning bypass valve
4. Ground wire
5. Nut
6. Hydraulic unit
   Disassembly / Inspection / Assembly ..... page P–56
7. ABS bracket
8. Insulator and bracket



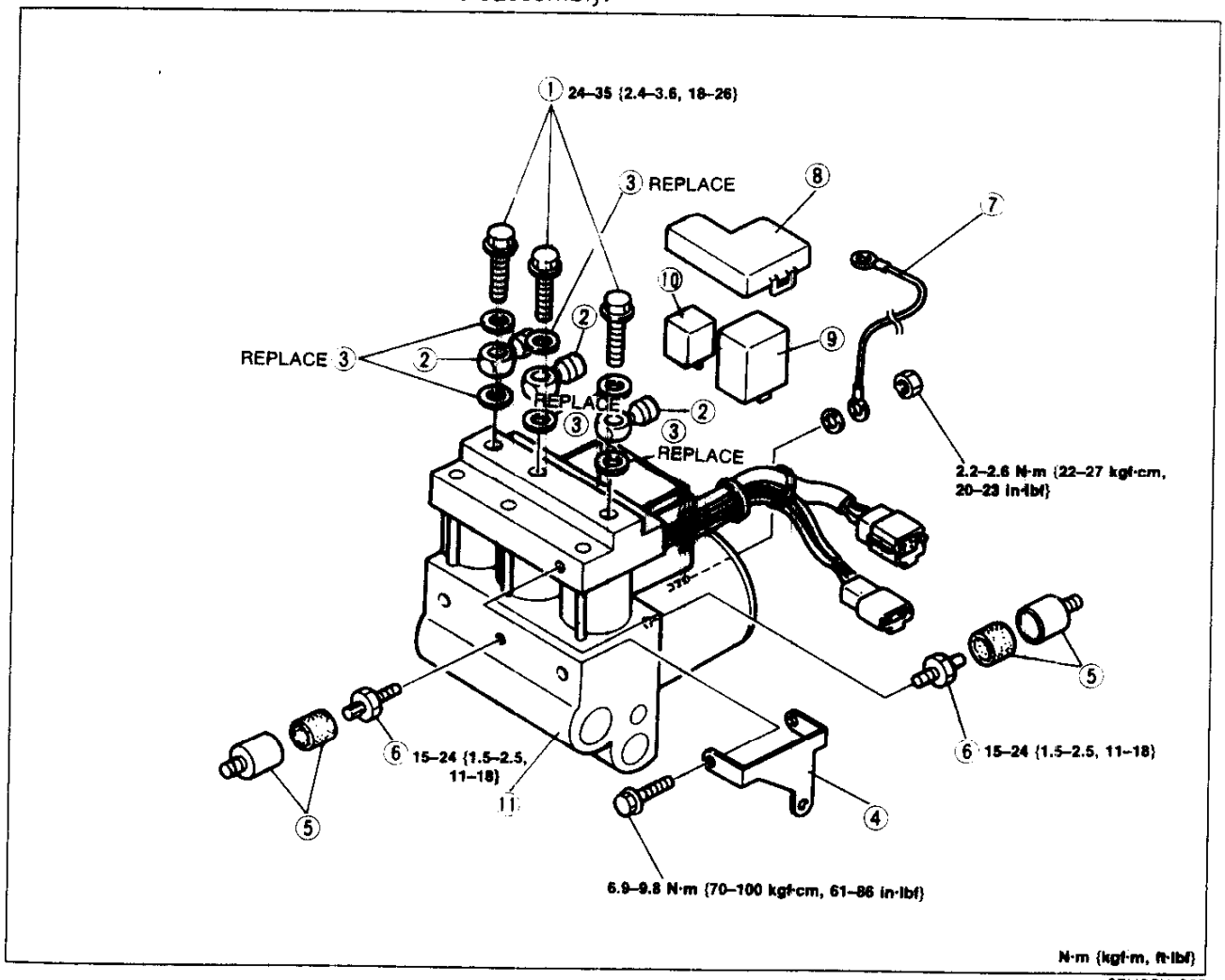
37U0PX-106

Removal / Installation note
Brake pipe

Caution
- **Be careful not to spill the brake fluid onto a painted surface. If spilled, wipe it up immediately.**

Loosen / tighten the brake pipe by using the **SST**.

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.



37U0PX-092

1. Connector bolt
2. Pipe joint
3. Gasket
4. Proportioning bypass valve holder
5. Casing and mount rubber
6. Hex stud
7. Ground wire
8. Cover
9. Motor relay
   Inspection ..... page P–62
10. Valve relay
    Inspection ..... page P–62
11. Hydraulic unit

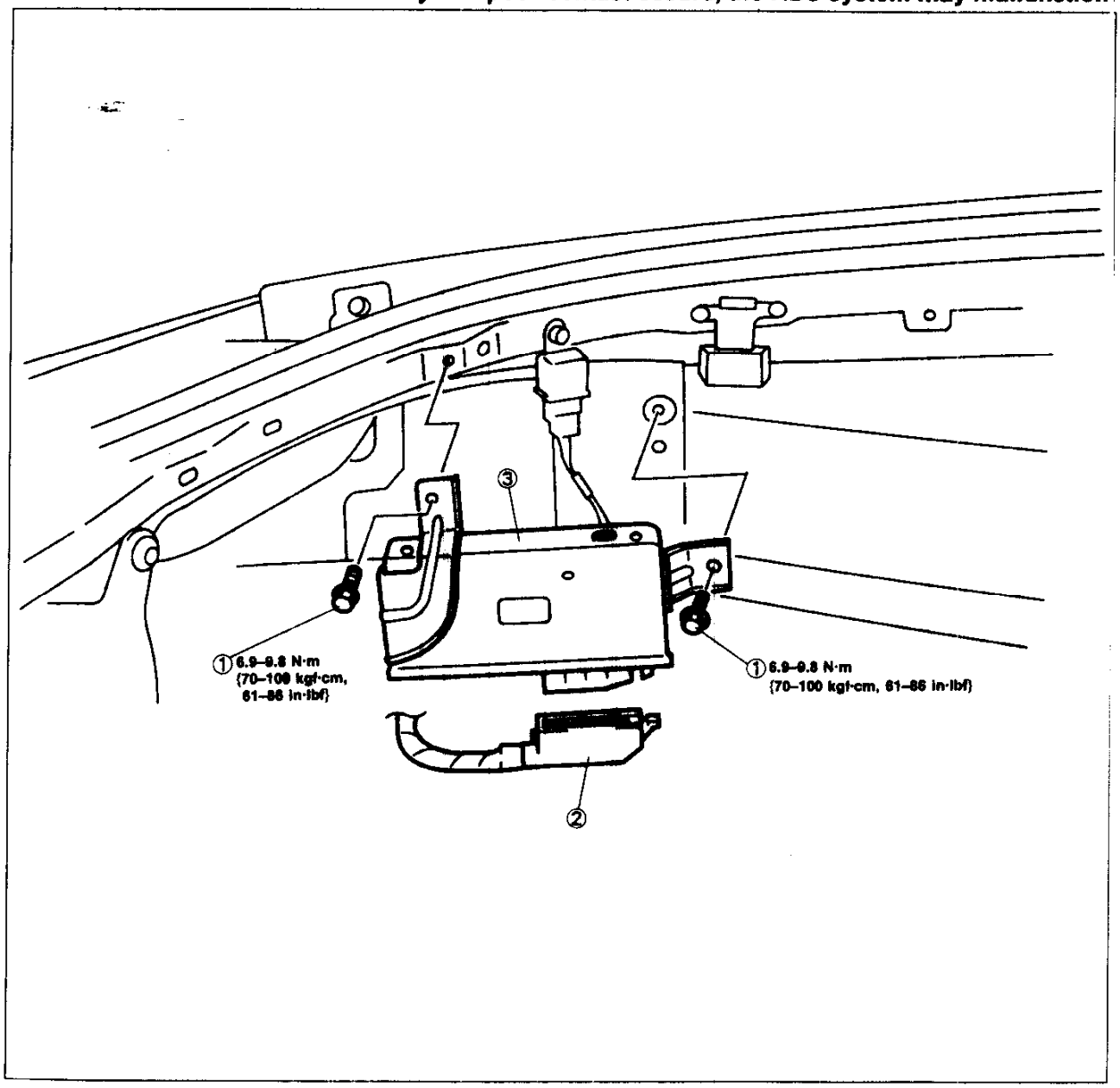
ABS CONTROL UNIT

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the luggage compartment side trim. (Refer to Section S.)
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.

Caution

- **Connect the connector securely. If a poor contact occurs, the ABS system may malfunction.**



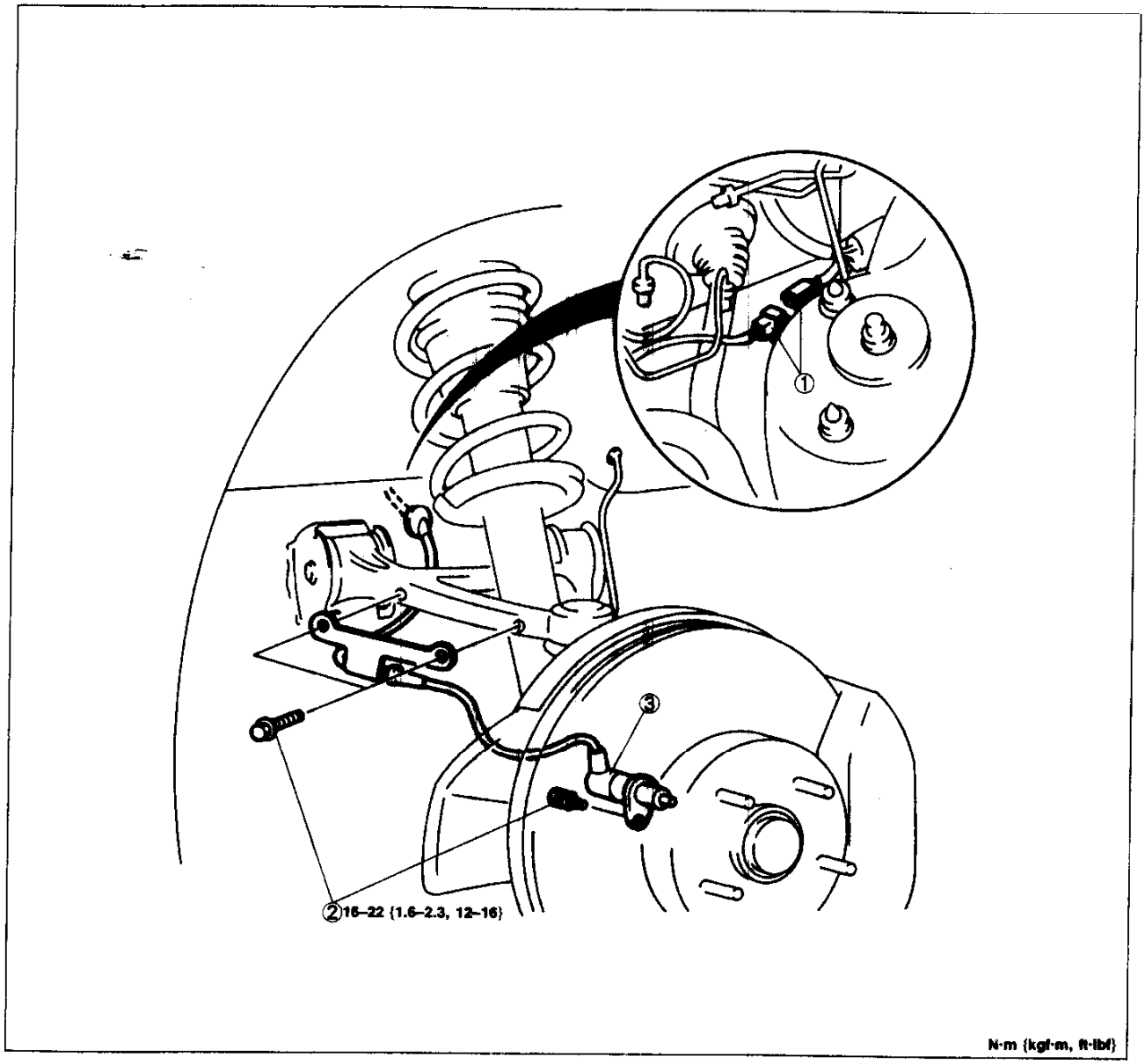
37U0PX-093

1. Bolt
2. Connector
3. ABS control unit

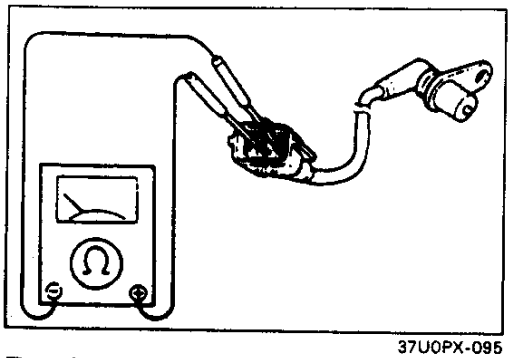
WHEEL-SPEED SENSOR (FRONT)

Removal / Installation

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



1. Connector
2. Bolt
3. Wheel-speed sensor (front)
   Inspection ..... below



Inspection

Wheel speed sensor (front)

1. Measure resistance between terminals of the wheel-speed sensor.

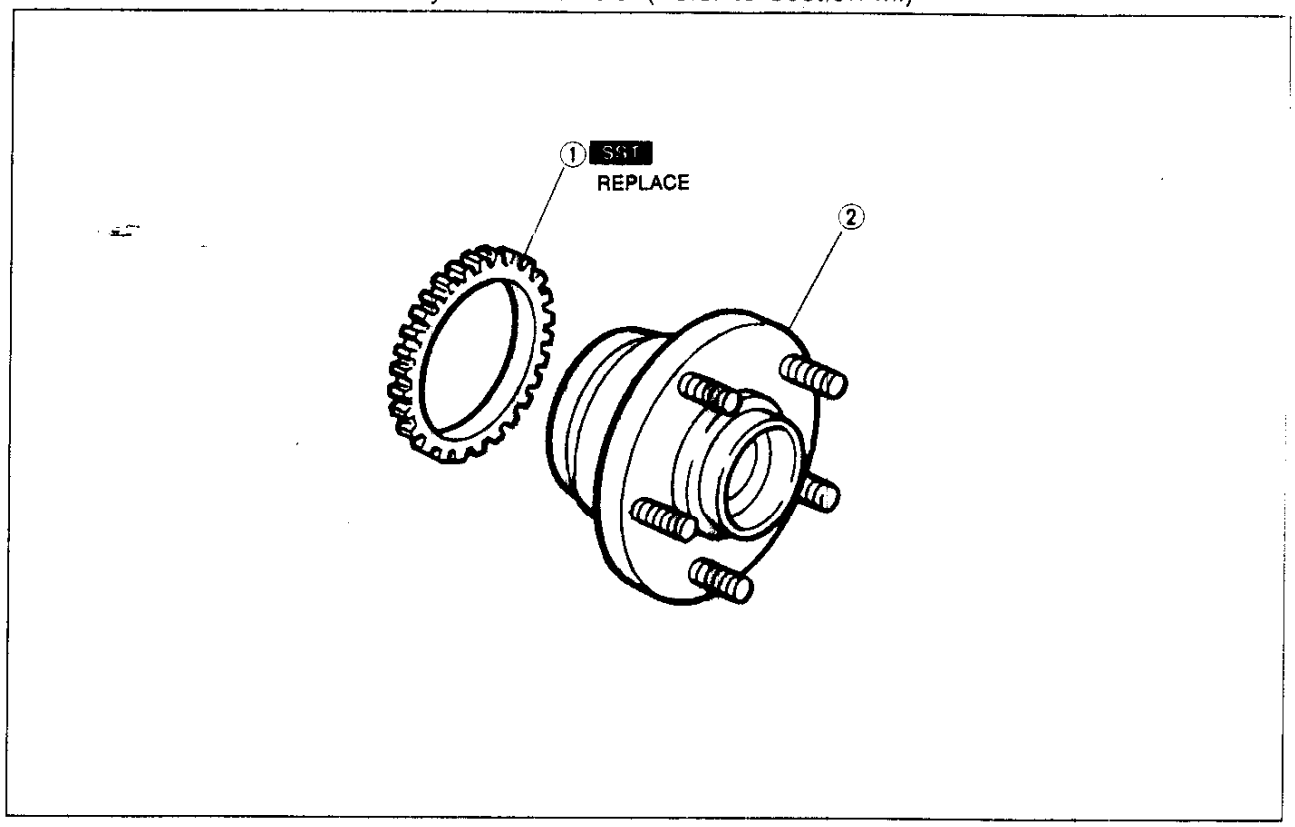
   Resistance: 0.8–1.2 kΩ

2. If resistance is not as specified, replace the wheel-speed sensor.

SENSOR ROTOR (FRONT)

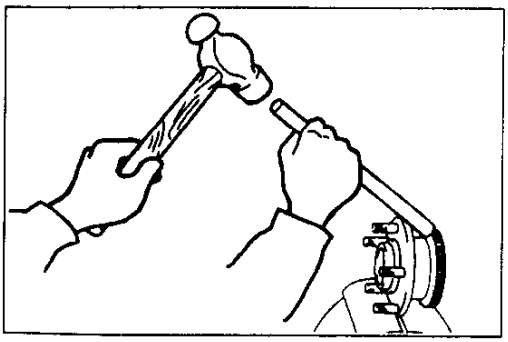
Removal / Installation

1. Remove the wheel hub assembly from the vehicle. (Refer to Section M.)
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. Install the wheel hub assembly to the vehicle. (Refer to Section M.)



37U0PX-096

1. Sensor rotor (front)
   - Removal Note ..... below
   - Installation Note ..... below
2. Front wheel hub assembly

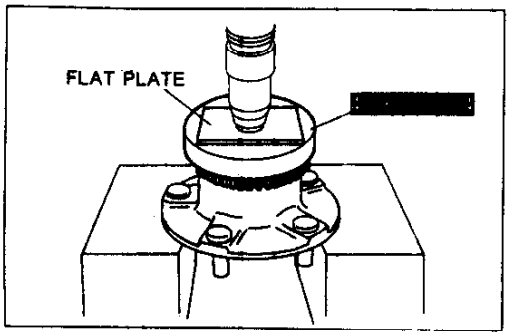


37U0PX-097

Removal note
Sensor rotor (front)

Caution
- **Do not remove the sensor rotor if not necessary.**
- **Do not reuse the sensor rotor if removed.**

Remove the sensor rotor by using a brass bar and a hammer.



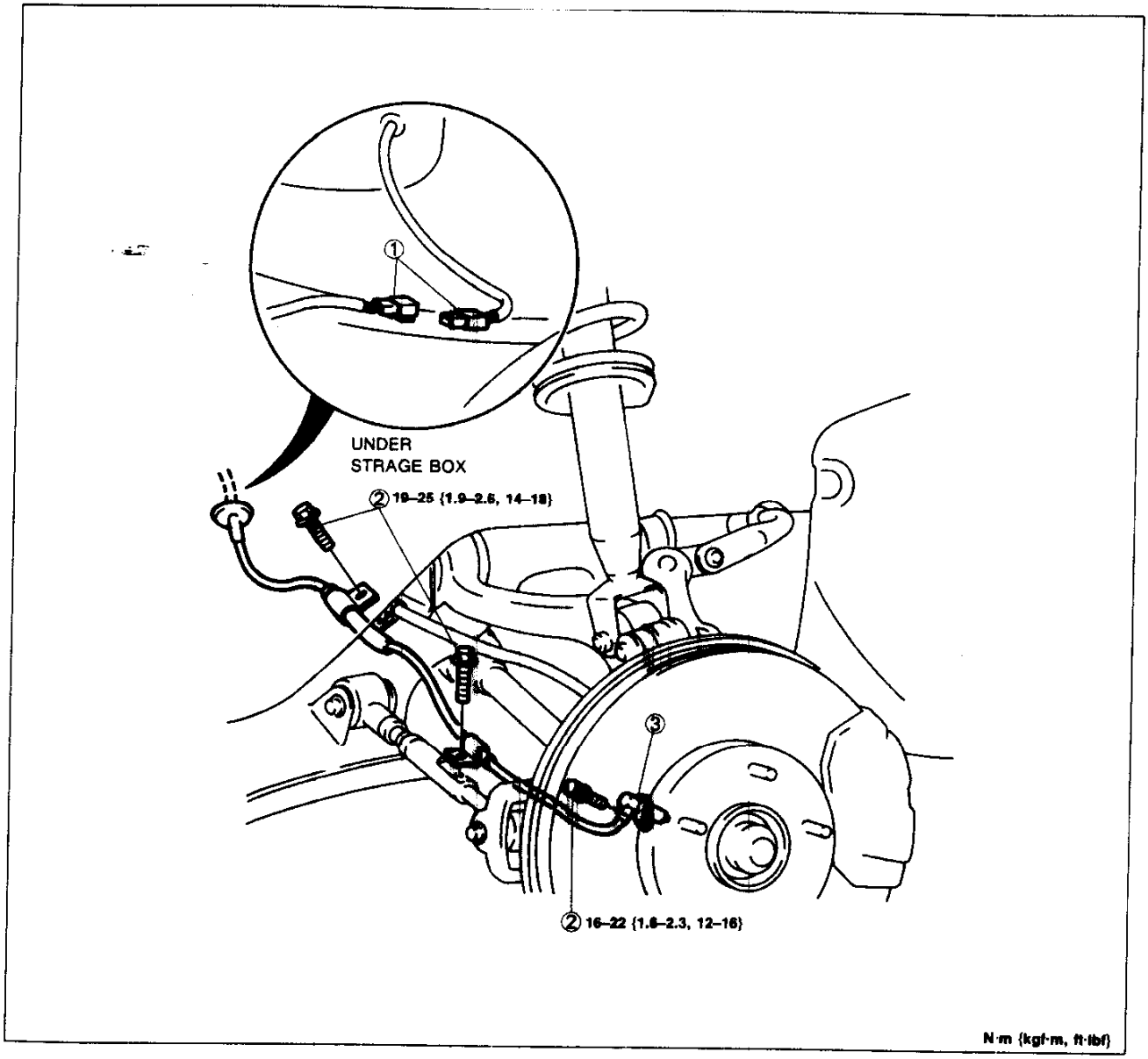
Installation note
Sensor rotor (front)

Press on the new sensor rotor by using the **SST**.

WHEEL-SPEED SENSOR (REAR)

Removal / Installation

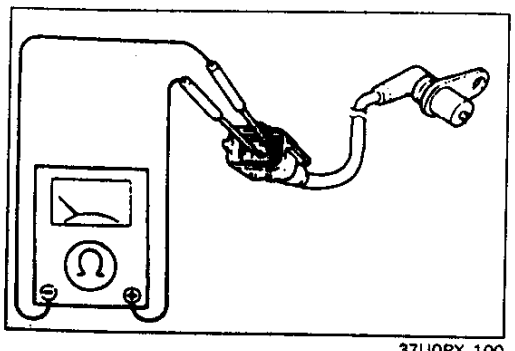
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



N·m {kgf·m, ft·lbf}

37U0PX-099

1. Connector
2. Bolt
3. Wheel-speed sensor (rear)
   Inspection ..... below



37U0PX-100

Inspection

Wheel-speed sensor (rear)

1. Measure resistance between terminals of the wheel-speed sensor.

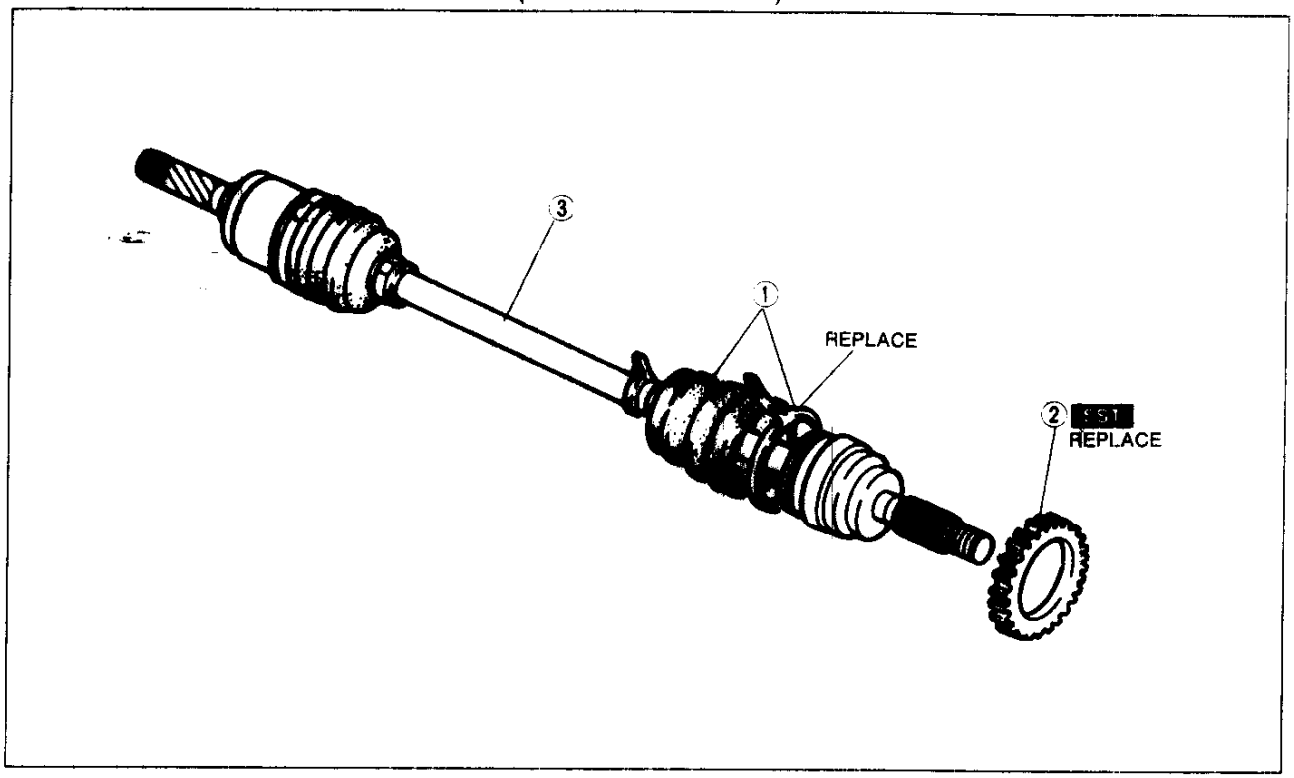
   Resistance: 0.8–1.2 kΩ

2. If resistance is not as specified, replace the wheel-speed sensor.

SENSOR ROTOR (REAR)

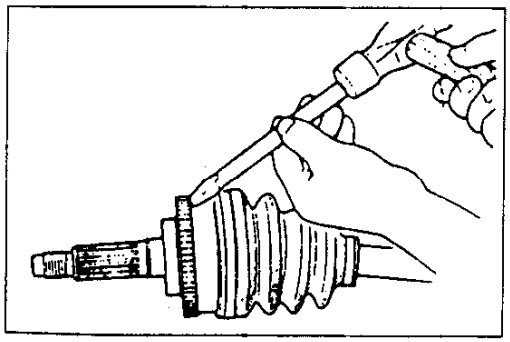
Removal / Installation

1. Remove the drive shaft from the vehicle. (Refer to Section M.)
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. Install the drive shaft to the vehicle. (Refer to Section M.)



37U0PX-101

1. Boot band and boot
2. Sensor rotor (rear)
   Removal Note ..... below
   Installation Note ..... below
3. Drive shaft

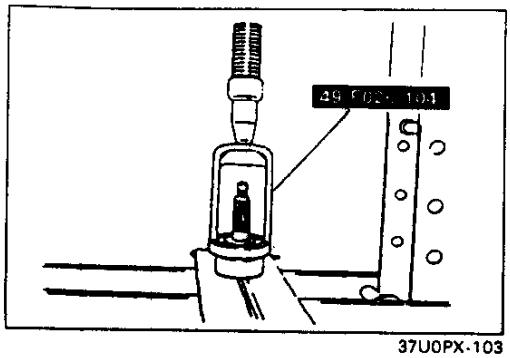


37U0PX-102

Removal note
Sensor rotor (rear)

Caution
- **Do not remove the sensor rotor if not necessary.**
- **Do not reuse the sensor rotor if removed.**

Tap the sensor rotor off the drive shaft by using a chisel and a hammer.



37U0PX-103

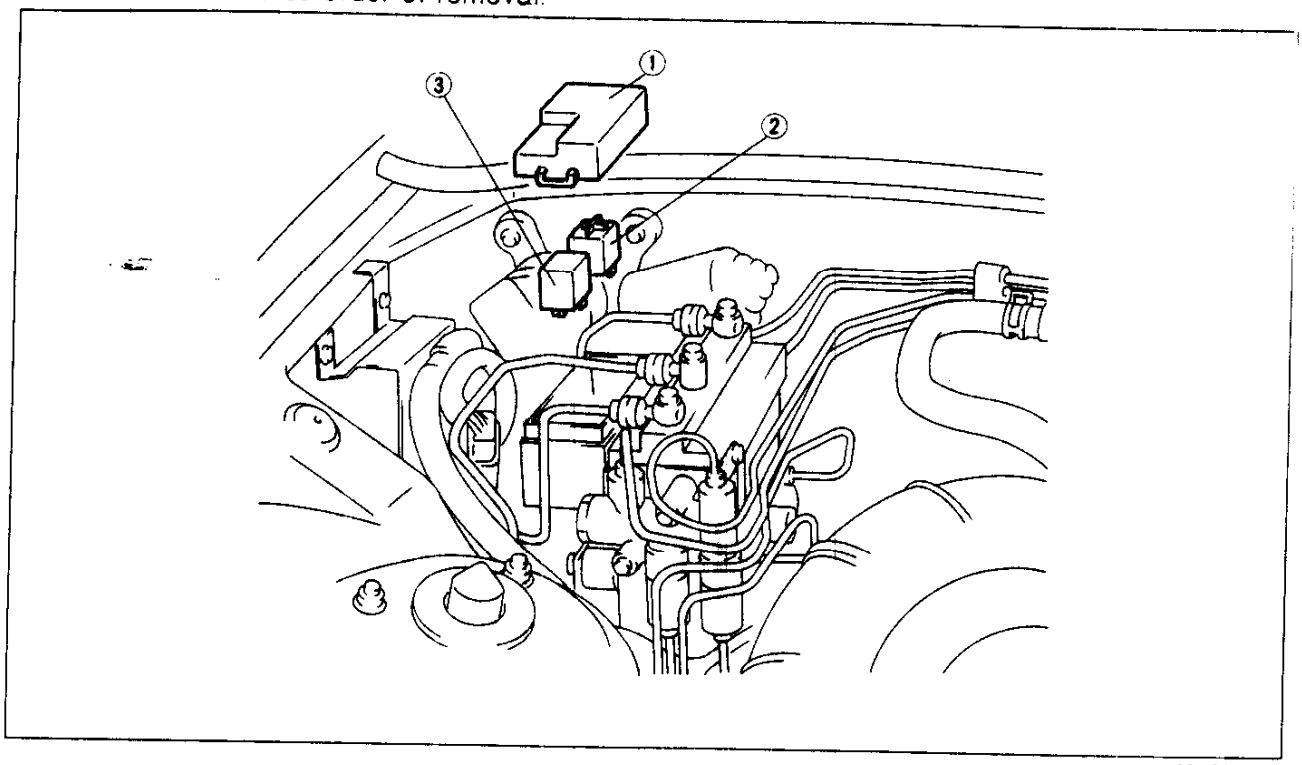
Installation note
Sensor rotor (rear)

Set a new sensor rotor on the drive shaft and press it on by using the **SST**.

RELAY

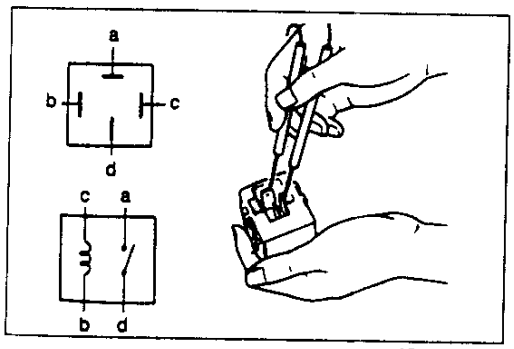
Removal / Installation

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

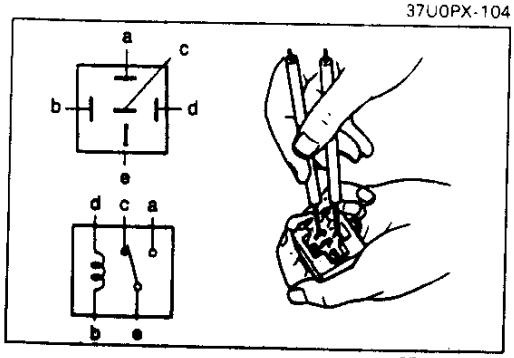


29U0PX-134

1. Cover
2. Motor relay
   Inspection ..... below
3. Valve relay
   Inspection ..... below



37U0PX-104



37U0PX-105

Inspection

Motor relay

1. Using an ohmmeter, check continuity between the relay terminals.

Connect to		a	b	c	d
12V	Ground				
–	–		○	○	
c	b	○			○

○-○: Continuity

2. If continuity is not as specified, replace the motor relay.

Valve relay

1. Using an ohmmeter, check continuity between the relay terminals.

Connect to		a	b	c	d	e
12V	Ground					
–	–			○		○
b	d	○	○		○	○

○-○: Continuity

2. If continuity is not as specified, replace the valve relay.

WHEELS AND TIRES

29U0QX-001

OUTLINE

SPECIFICATIONS

Item \ Type		Standard	Temporary spare
Wheel	Size	16 × 8JJ	16 × 4T
	Offset mm {in}	50 {1.97}	40 {1.57}
	Pitch circle diameter mm {in}	114.3 {4.50}	
	Material	Aluminum alloy	
Tire	Size	P225/50R16 91V P225/50 ZR 16	T135/70D16
	Air pressure kPa {kgf/cm², psi}	220 {2.2, 32}	415 {4.2, 60}

37U0QX-001

TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Excessive or irregular tire wear	Refer to page Q–4 for details.		
Premature tire wear	Incorrect tire pressure	Adjust	Q–3
Tire squeal	Incorrect tire pressure Tire deterioration	Adjust Replace	Q–3 –
Road noise or body vibration	Insufficient tire pressure Unbalanced wheel Deformed wheel or tire Irregular tire wear	Adjust Adjust Repair or replace Replace	Q–3 Q–5 – –
Shake (steering wheel vibrates up-/down)	Excessive tire or wheel runout Loose lug nuts Unbalanced wheel Cracked or worn engine mount rubber Cracked or worn transmission mount rubber	Replace Tighten Adjust or replace Replace Replace	– Q–4 Q–5 Section C Section J,K
Shimmy (steering wheel vibrates left/right)	Cracked or worn steering gear mount rubber Loose steering gear mounting bolts Stuck or damaged steering ball joint Excessive tire or wheel runout Loose lug nuts Unbalanced wheel Insufficient tire pressure Unevenly worn tires Malfunction of shock absorber Loose shock absorber mounting bolts Stuck 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–3 – Section R Section R Section R Section R Section M Section R
Uneven (one-sided) braking	Unequal tire pressures	Adjust	Q–3
Steering wheel doesn't return properly or pulls 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–3 – Q–3 – Q–4
General driving instability	Unequal tire pressures Damaged or unbalanced wheel Loose lug nuts	Adjust Replace or adjust Tighten	Q–3 Q–5 Q–4
Excessive steering wheel play	Loose lug nuts	Tighten	Q–4

37U0QX-002

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 salt-water or road salts) get on aluminum wheels, wash them as soon as possible to prevent damage. Use only a neutral detergent.

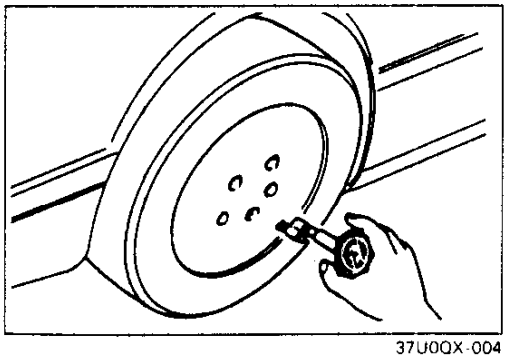
29U0QX-004

NOTES REGARDING TIRE REPLACEMENT

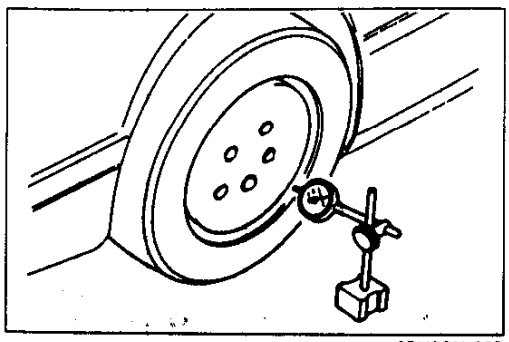
Note the following points when tires are to be removed from or mounted onto the wheels.

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 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 it to 250–300 kPa {2.5–3.0 kgf/cm^2, 36–42 psi}. Verify 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.

37U0QX-003



37U0QX-004



37U0QX-005

INSPECTION/ADJUSTMENT

Check the following and adjust or replace as necessary.

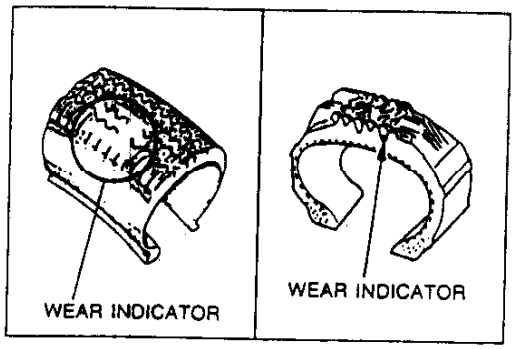
1. Air pressure.
   Check the air pressure of all tires, including the spare tire, by using an air pressure gauge.

   Air pressure
   Standard tire: 220 kPa {2.2 kgf/cm^2, 32 psi}
   Temporary spare tire: 415 kPa {4.2 kgf/cm^2, 60 psi}

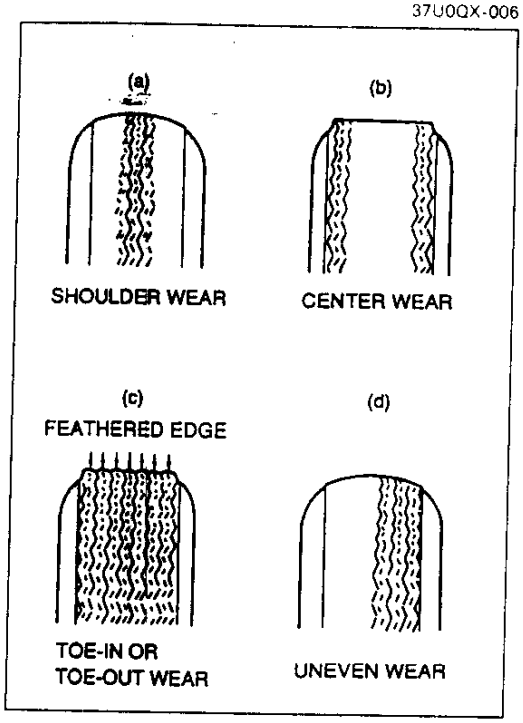
   Caution
   - **The air pressure must be measured when the tires are cold.**

2. Wheel runout.
   Set the probe of a dial indicator against the wheel, and turn the wheel one full revolution.

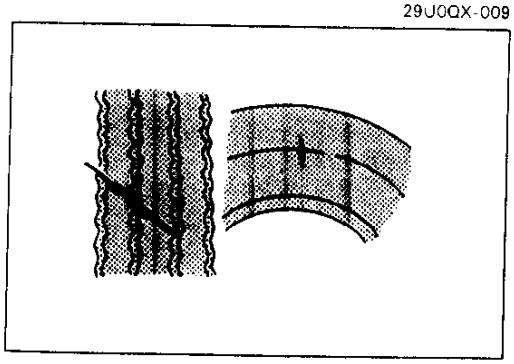
   Wheel runout
   Horizontal: 2.0 mm {0.079 in} max.
   Vertical: 1.5 mm {0.059 in} max.



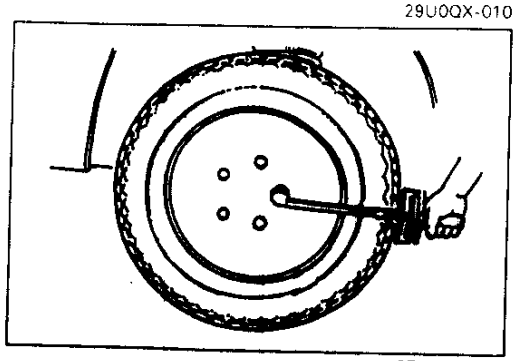
37U0QX-006



29U0QX-009



29U0QX-010



37U0QX-007

3. 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 as shown in the illustration can occur. Refer to the chart for the possible causes and actions.

	Possible cause	Action
(a)	• Underinflation (both sides worn) • Incorrect camber (one side worn) • Hard cornering • Lack of rotation	• Measure and adjust pressure • Repair or replace 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 suspension parts • Repair or replace • Balance or replace • Correct or replace • Correct or replace • Rotate tires

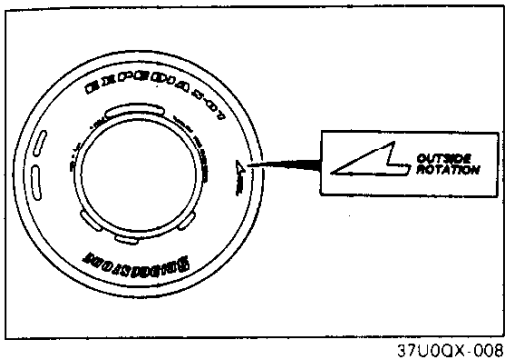
4. Cracks, damage, and foreign matter (such as metal pieces, nails, and stones) in the tire and cracks, deformation, and damage to the wheel.
5. Loose wheel lug nut (s).
6. Air leaking from valve stem.

REMOVAL/INSTALLATION

Tighten the lug nuts to the specified torque in a crisscross fashion.

Tightening torque:
89–117 N·m {9.0–12.0 kgf·m, 66–86 ft·lbf}

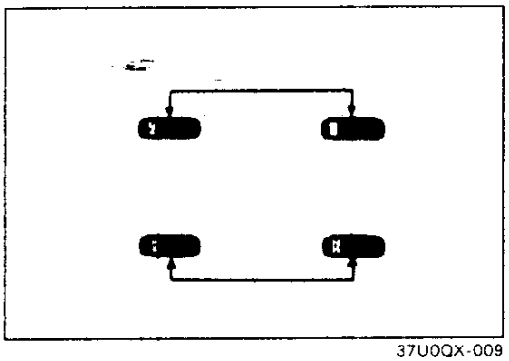
Caution
- **The wheel-to-hub contact surfaces must be clean.**
- **Never apply oil to the nuts, studs, or wheels which may cause looseness or seizure of the lug nuts.**



37U0QX-008

Caution

- **When mounting the tires, mount them so that the OUTSIDE mark faces away from the vehicle (R1).**
- **Mount the wheels on the vehicle so that the direction mark matches the tire's rotation.**



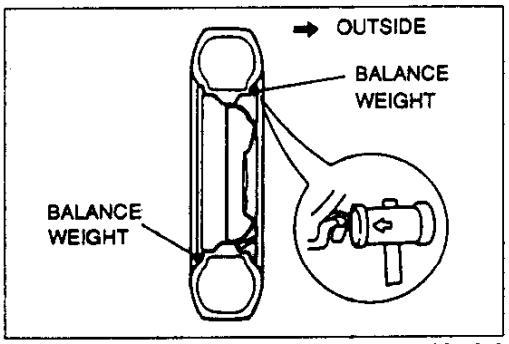
37U0QX-009

TIRE ROTATION

To prolong tire life and assure uniform tire wear, rotate the tires every 6,000 km {3,750 miles}, sooner if irregular wear develops.

Caution

- **Do not include "TEMPORARY USE ONLY" spare tire in rotation.**
- **After rotating the tires, adjust each tire to the specified air pressure. (Refer to page Q-2.)**

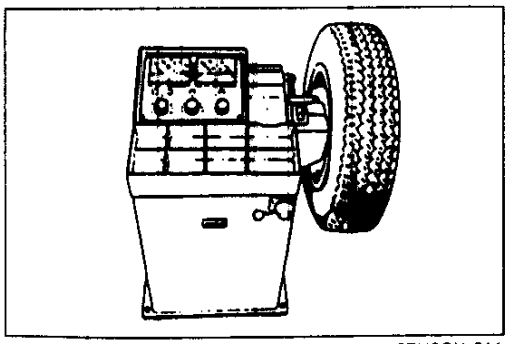


37U0QX-010

WHEEL BALANCE ADJUSTMENT

If a wheel becomes unbalanced or if a tire is replaced or repaired, the wheel must be rebalanced to within specification.

Maximum unbalance (at rim edge): 8g {0.28 oz}



37U0QX-011

Caution

- **Do not use more than two balance weights on the inner or outer side of the wheel.**
- **Individual balance weight: max 60g {2.1 oz}**
- **If the total weight exceeds 100g {3.5 oz} on one side, rebalance after repositioning the tire on the rim.**
- **Attach the balance weights tightly to the wheel.**
- **Select suitable balance weights for steel or aluminum alloy wheels.**
- **Do not use an on-car balancer for the rear wheels; it may cause transmission damage. (AT)**

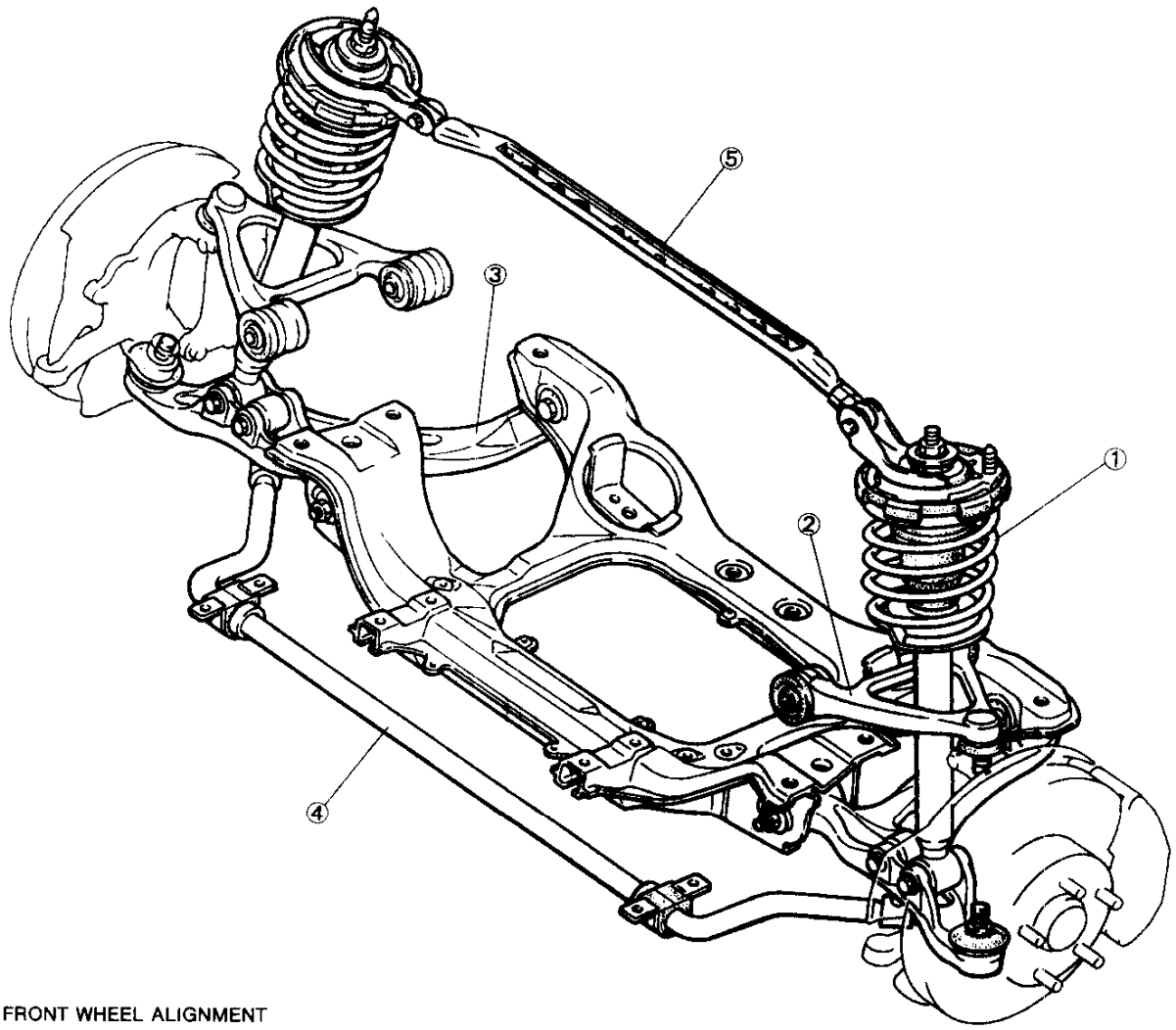
Before beginning any service procedure, refer to the 1993 RX-7 Body Electrical Troubleshooting Manual; see section S for air bag system precautions and J1 for audio anti-theft system precautions.

SUSPENSION

37U0RX-001

INDEX

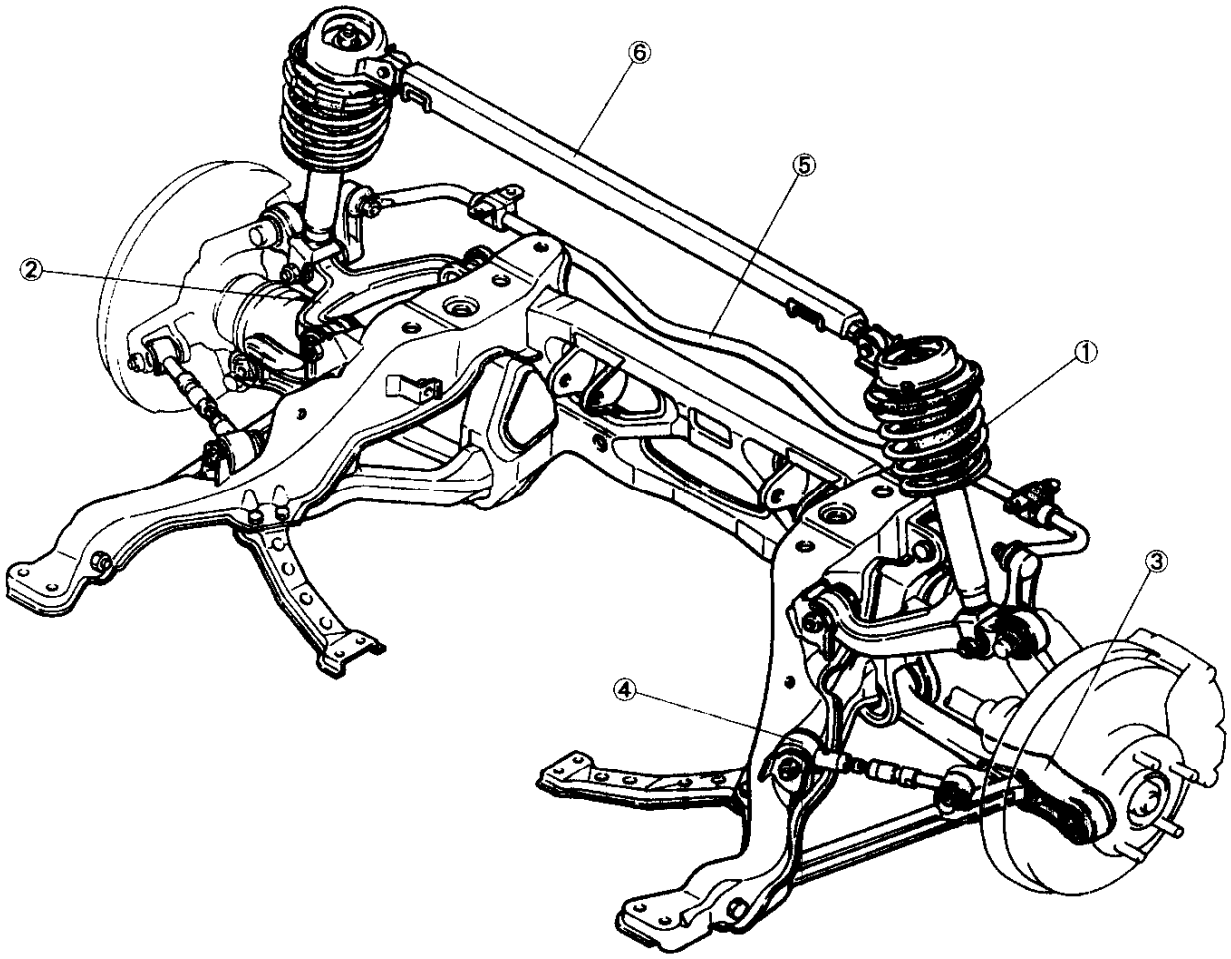
FRONT SUSPENSION



FRONT WHEEL ALIGNMENT
TOTAL TOE-IN: 1 ± 3 mm {0.04 ± 0.11 in}
TOE-IN (PER SIDE): 0°03' ± 0.8'
MAXIMUM STEERING ANGLE: 36° ± 2° (INNER)
32° ± 2° (OUTER)
CAMBER ANGLE: 0°05' ± 45'
CASTER ANGLE: 6°05' ± 1°
KINGPIN ANGLE: 13°55'

37U0RX-002

REAR SUSPENSION



REAR WHEEL ALIGNMENT
TOTAL TOE-IN: 2 ± 3 mm {0.08 ± 0.11 in}
TOE-IN (PER SIDE): 0°05' ± 08'
CAMBER ANGLE: – 1°13' ± 45'
THRUST ANGLE: 0° ± 06'

37U0RX-003

1. Rear shock absorber and spring
   Removal / Installation ..... page R–27
   Disassembly / Inspection / Assembly ... page R–29
2. Upper arm
   Removal / Inspection
   Installation .... page R–32
   Disassembly / Inspection / Assembly ..... page R–33
3. Rear lower arm
   Removal / Inspection
   Installation .... page R–36
   Disassembly / Inspection / Assembly ..... page R–37
4. Toe-control link
   Removal / Inspection
   Installation .... page R–40
5. Rear stabilizer
   Removal / Inspection / Assembly ..... page R–42
6. Rear strut bar
   Removal / Inspection / Assembly ..... page R–43

OUTLINE

SPECIFICATIONS

Item \ Grade				BASE, TOURING	R1
Front suspension					
Suspension type				Double-wishbone	
Coil spring	Identification mark color			Blue	
	Wire diameter		mm {in}	12.4 {0.49}	
	Coil center diameter		mm {in}	104.9 {4.130}	
	Free length		mm {in}	272.9 {10.74}	
	Active coil number			4.27	
Shock absorber type				Cylindrical, double-acting, low-pressure gas charged	
Stabilizer	Type			Torsion bar, hollow type	
	Diameter		mm {in}	28.6 {1.13}	
Front wheel alignment (unladen*1)	Total toe-in		mm {in}	1 ± 3 {0.04 ± 0.11}	
	Toe-in (per side)		degree	0°03' ± 08'	
	Maximum steering angle degree	Inner		36° ± 2°	
		Outer		32° ± 2°	
	Camber angle*2		degree	0°05' ± 45'	
	Caster angle*2		degree	6°05' ± 1°	
	Kingpin angle		degree	13°55'	
Rear suspension					
Suspension type				Double-wishbone	
Coil spring	Identification mark color			White	
	Wire diameter		mm {in}	12.2 {0.48}	
	Coil center diameter		mm {in}	114.7 {4.516}	
	Free length		mm {in}	299.0 {11.77}	
	Active coil number			4.21	
Shock absorber type				Cylindrical, double-acting, low-pressure gas charged	
Stabilizer	Type			Torsion bar, hollow type	
	Diameter		mm {in}	17.3 {0.68}	
Rear wheel alignment (unladen*1)	Total toe-in		mm {in}	2 ± 3 {0.08 ± 0.11}	
	Toe-in (per side)		degree	0°05' ± 08'	
	Camber angle*2		degree	−1°13' ± 45'	
	Thrust angle		degree	0° ± 06'	

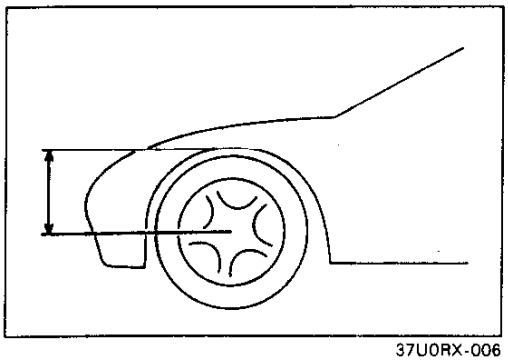
37U0RX-004

*1 Fuel tank full; radiator coolant and engine oil at specified levels; spare tire, jack, and tools in designated positions.
*2 Difference between left and right must not exceed 1°.

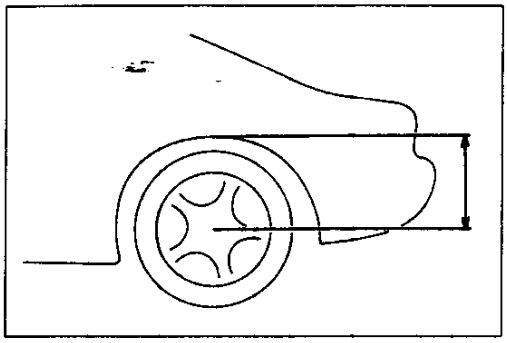
TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Body rolls	Weak stabilizer or stabilizer link	Replace	R-24, 42
	Damaged or worn stabilizer control link	Replace	R-24, 42
	Worn or deteriorated upper arm or lower arm bushings	Replace	R-17, 21, 33, 37
	Damaged shock absorber	Replace	R-12, 27
Poor riding comfort	Weak coil spring	Replace	R-13, 29
	Damaged shock absorber	Replace	R-12, 27
Body leans	Weak coil spring	Replace	R-13, 29
	Damaged or worn stabilizer control link	Replace	R-24, 42
	Worn or deteriorated upper arm or lower arm bushings	Replace	R-17, 21, 33, 37
Abnormal noise from suspension system	Poor lubrication of or worn upper arm or lower arm ball joint	Lubricate or replace	R-17, 21
	Looseness of peripheral connections	Tighten	–
	Damaged shock absorber	Replace	R-12, 27
	Damaged or worn stabilizer control link	Replace	R-24, 42
	Worn or deteriorated upper arm or lower arm bushings	Replace	R-17, 21, 33, 37
General driving instability	Weak coil spring	Replace	R-13, 29
	Damaged shock absorber	Replace	R-12, 27
	Worn or deteriorated upper arm or lower arm bushings	Replace	R-17, 21, 33, 37
	Damaged or worn stabilizer control link	Replace	R-24, 42
	Improperly adjusted wheel alignment	Adjust	R-6
	Damaged or worn upper arm or lower arm ball joint	Replace	R-17, 21
	Malfunction of steering system	–	Section N
	Damaged or unbalanced wheel	–	Section Q
Heavy steering	Poor lubrication of or worn upper arm or lower arm ball joint	Lubricate or replace	R-17, 21
	Improperly adjusted wheel alignment	Adjust	R-6
	Malfunction of steering system	–	Section N
	Damaged or unbalanced wheel	–	Section Q
Steering wheel pulls to one side	Weak coil spring	Replace	R-13, 29
	Damaged or worn stabilizer control link	Replace	R-24, 42
	Worn or deteriorated upper arm or lower arm bushings	Replace	R-17, 21, 33, 37
	Damaged or worn upper arm or lower arm	Replace	R-17, 21, 33, 37
	Improperly adjusted wheel alignment	Adjust	R-6
	Malfunction of steering system	–	Section N
	Malfunction of braking system	–	Section P
	Damaged or unbalanced wheel	–	Section Q
Shimmy occurs (steering wheel vibrates circumferential)	Damaged or worn upper arm or lower arm ball joint	Replace	R-17, 21
	Damaged shock absorber	Replace	R-12
	Loose shock absorber mounting	Tighten	R-12
	Worn or deteriorated upper arm or lower arm bushings	Replace	R-17, 21
	Damaged or worn stabilizer control link	Replace	R-24
	Improperly adjusted wheel alignment	Adjust	R-6
	Damaged or worn wheel bearing	–	Section M
	Malfunction of steering system	–	Section N
	Damaged or unbalanced wheel	–	Section Q
Steering wheel doesn't return properly	Stuck or damaged upper arm or lower arm ball joint	Replace	R-17, 21
	Improperly adjusted wheel alignment	Adjust	R-6
	Malfunction of steering system	–	Section N
	Damaged or unbalanced wheel	–	Section Q

37U0RX-005



37U0RX-006



37U0RX-007

WHEEL ALIGNMENT

PREINSPECTION

1. Check the tire inflations and set to the recommended pressure, if necessary.
2. Inspect the front wheel bearing play. Replace the bearing(s) as necessary.
3. Inspect the wheel and tire runout of all wheels.
4. Inspect the ball joints and steering linkage for excessive looseness.
5. Place the vehicle on level ground with no luggage or passenger load.
6. Rock the vehicle to settle the suspension.
7. Verify that the height difference between the left and right sides from the center of the wheel to the fender brim does not exceed specification.

   Specification: 10 mm {0.39 in}

8. Verify that the height difference between the front and rear does not exceed specifications.

   Specification: 15 mm {0.59 in}

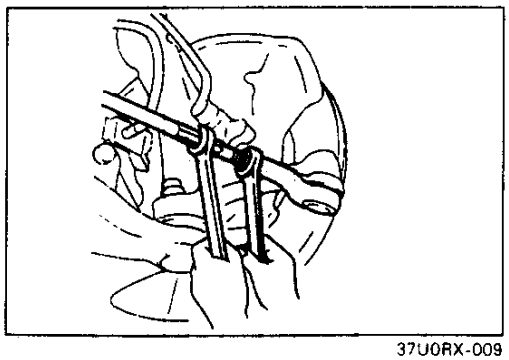
FRONT WHEEL ALIGNMENT

Specifications (Unladen*1)

Item		Specifications
Total toe-in	mm {in}	1 ± 3 {0.04 ± 0.11}
Toe-in (per side)	Degree	0°03' ± 08'
Maximum steering angle	In	36° ± 2°
	Out	32° ± 2°
Kingpin angle		13°55'
Camber angle*2	Degree	0°05' ± 45'
Caster angle*2	Degree	6°05' ± 1°

37U0RX-008

*1 Fuel tank full; radiator coolant and engine oil at specified levels; spare tire, jack, and tools in designated positions.
*2 Difference between left and right must not exceed 1°.

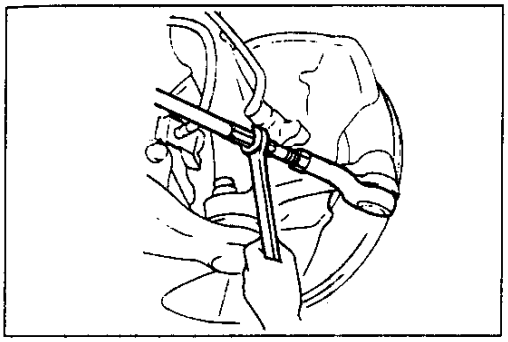


37U0RX-009

Adjustment

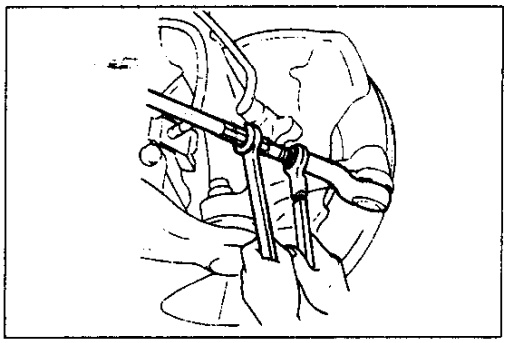
Toe-in

1. Remove the steering gear boot clamp.
2. Loosen the tie rod locknut.


37U0RX-010

3. Turn each of the tie rods the same amount.

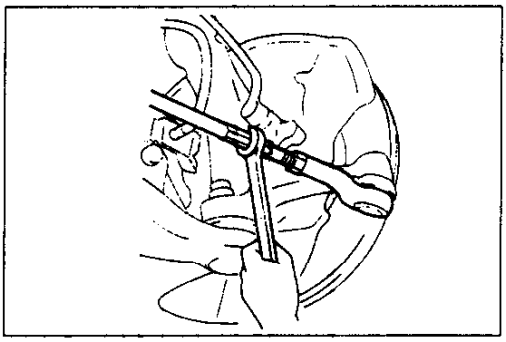
Caution
- **To increase the toe-in, turn the right tie rod toward the front of the vehicle and the left one the same amount toward the rear.**
- **One turn of the tie rod (one side) changes the toe-in about 10.6 mm {0.42 in}.**
- **Adjust the toe-in after adjusting the steering angle.**


37U0RX-011

4. Tighten the tie rod locknuts to the specified torque.

Tightening torque:
31–50 N·m {3.1–5.1 kgf·m, 23–36 ft·lbf}

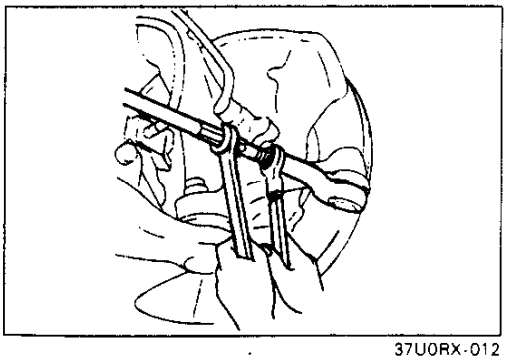
5. Verify that the boot is not twisted. Install the boot clamp.


29U0RX-010

Maximum steering angle

1. Remove the steering gear boot clamp.
2. Loosen the tie rod locknut.
3. Turn the tie rod to provide the correct maximum steering angle.

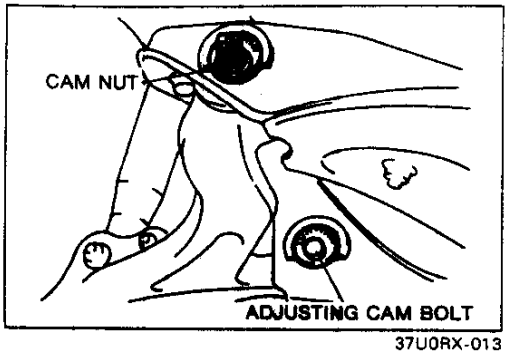
Maximum left / right difference: 3 mm {0.12 in}


37U0RX-012

4. After adjustment, tighten the locknut to the specified torque.

Tightening torque:
31–50 N·m {3.1–5.1 kgf·m, 23–36 ft·lbf}

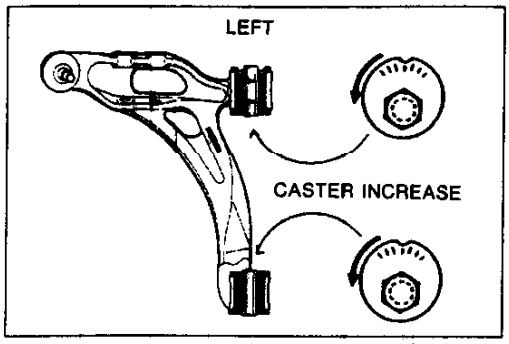
5. Adjust the toe-in. (Refer to page R–6.)
6. Verify that the boot is not twisted. Install the boot clamp.



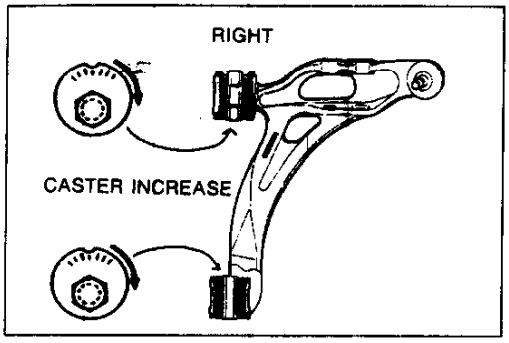
37U0RX-013

Caster

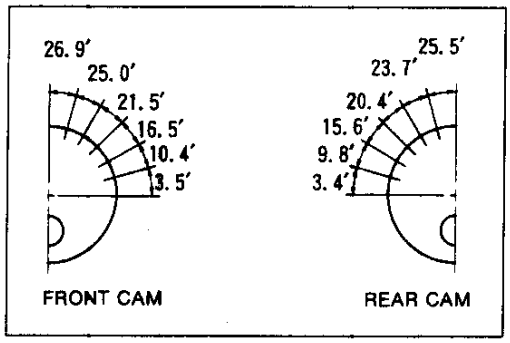
Caution
- **Adjust the caster before adjusting the camber.**



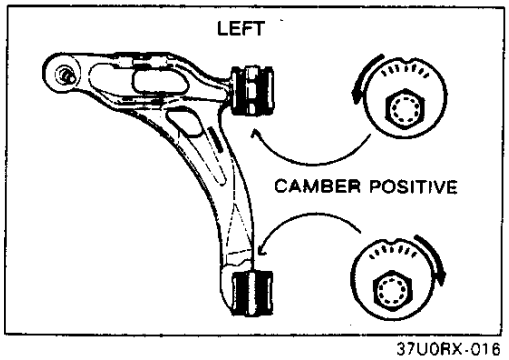
37U0RX-014



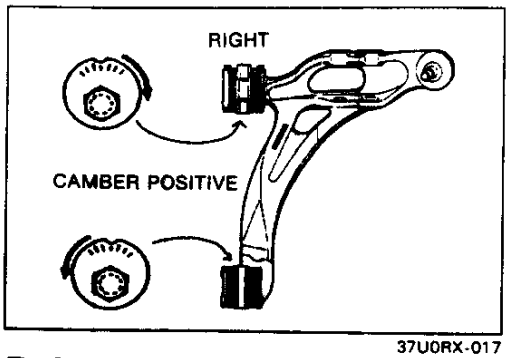
37U0RX-015



37U0RX-102



37U0RX-016



37U0RX-017

1. Loosen the front and / or rear cam nut on the front lower arm.
2. Turn the adjusting cam bolt as indicated to provide the correct caster angle.

Caster	Left wheel		Right wheel	
	Front cam	Rear cam	Front cam	Rear cam
Increase	Counter-clockwise	Counter-clockwise	Clockwise	Clockwise
Decrease	Clockwise	Clockwise	Counter-clockwise	Counter-clockwise

3. Adjust the camber and the toe-in.

Note
- **Turning the adjusting cam bolt one graduation changes the caster as shown in the illustration.**

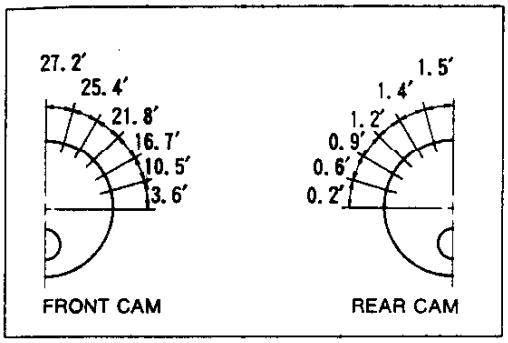
Camber

Caution
- **Adjust the camber after adjusting the caster.**

1. Loosen the front and / or rear cam nut on the front lower arm.
2. Turn the adjusting cam bolt as indicated to provide the correct camber angle.

Camber	Left wheel		Right wheel	
	Front cam	Rear cam	Front cam	Rear cam
Positive	Counter-clockwise	Clockwise	Clockwise	Counter-clockwise
Negative	Clockwise	Counter-clockwise	Counter-clockwise	Clockwise

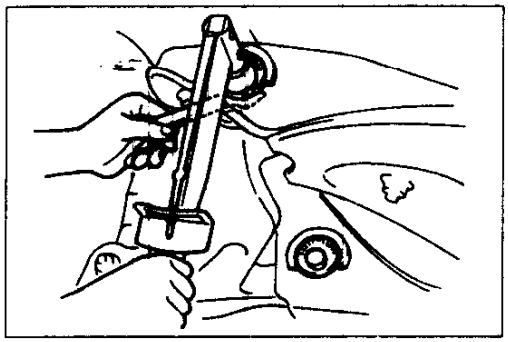
Note
- **If the cam cannot be turned enough to make the adjustment, begin again at adjustment of the caster using the other cam.**



37U0RX-103

Note

- **Turning the adjusting cam bolt one graduation changes the camber as shown in the illustration.**



37U0RX-018

3. Tighten the cam nut to the specified torque.

Tightening torque:
94–116 N·m {9.5–11.9 kgf·m, 69–86 ft·lbf}

Caution

- **Loosely tighten the rear cam nut. Then lower the vehicle and tighten it to the specified torque with the vehicle unladen.**

4. Adjust the toe-in.

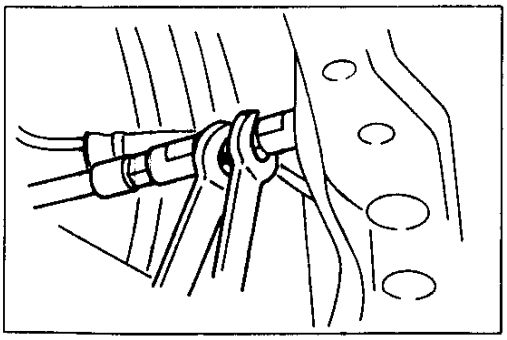
REAR WHEEL ALIGNMENT

Specifications (Unladen*1)

Item		Specifications
Total toe-in	mm {in}	2 ± 3 {0.08 ± 0.11}
Toe-in (per side)	Degree	0°05' ± 08'
Camber angle*2	Degree	−1°13' ± 45'
Thrust angle	Degree	0° ± 06'

37U0RX-019

*1 Fuel tank full; radiator coolant and engine oil at specified levels; spare tire, jack, and tools in designated positions.
*2 Difference between left and right must not exceed 1°.



37U0RX-020

Adjustment

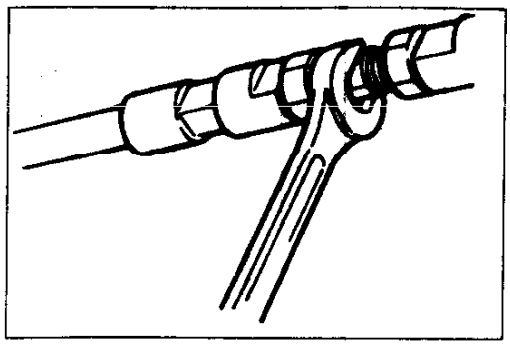
Toe-in

Note

- **The rear toe-in setting must be adjusted while maintaining a thrust angle within specified limits.**

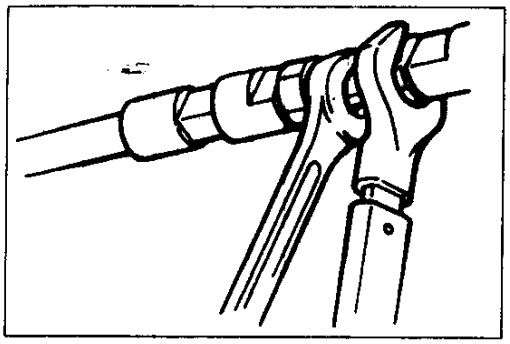
  Thrust angle: 0° ± 06'

- **If the thrust angle is not within specification, check the body dimensions.**
  Refer to 1992 RX-7 Body Shop Manual (Form No. 3256-10-92A)


37U0RX-021

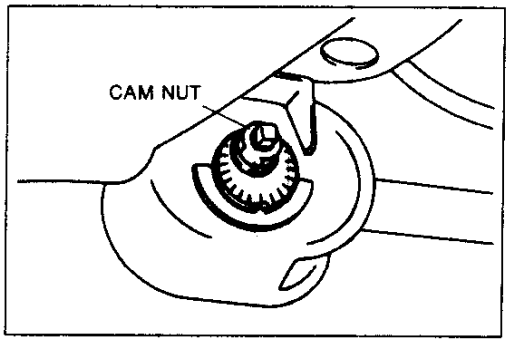
1. Loosen the left and right toe control link locknuts, and turn each of the links the same amount.

Caution
- **To increase the toe-in, turn the right link toward the front of the vehicle, and turn the left link by the same amount toward the rear.**
- **One turn of the link (one side) changes the toe-in by about 16.5 mm {0.65 in}.**


37U0RX-097

2. Tighten the toe control link locknuts to the specified torque.

Tightening torque:
55–63 N·m {5.6–6.5 kgf·m, 41–47 ft·lbf}



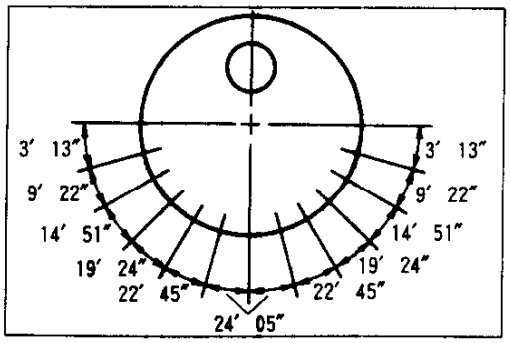
37U0RX-022

Camber

1. Loosen the cam nut on the I-arm.
2. Turn the adjusting cam bolt as indicated to provide the correct camber angle.

Camber	Left wheel	Right wheel
Positive	Clockwise	Counterclockwise
Negative	Counterclockwise	Clockwise

Note
- **Turning the adjusting cam bolt one graduation changes the camber as shown in the illustration.**



37U0RX-023

3. Tighten the cam nut to the specified torque.

Tightening torque:
94–116 N·m {9.5–11.9 kgf·m, 69–86 ft·lbf}

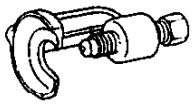
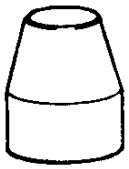
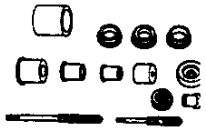
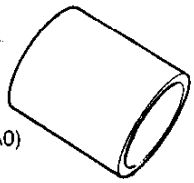
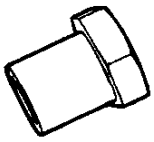
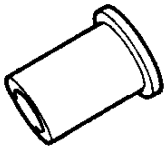
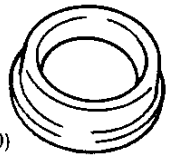
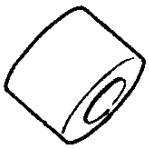
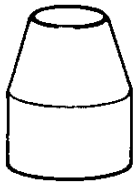
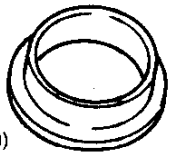
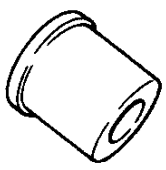
4. Adjust the toe-in.

FRONT SUSPENSION (DOUBLE WISHBONE, COIL SPRING TYPE)

PREPARATION

SST

49 0370 641 Screw, coil spring compressor	For removal / installation of coil spring	49 0223 640B Arm, coil spring compressor	For removal / installation of coil spring

49 0118 850C Puller, ball joint 	For removal of ball joint	49 0180 510B Attachment, preload measuring 	For inspection of ball joint
49 F034 211 Guide, clip 	For installation of dust boot clip	49 F034 2A0 Replacer set, rubber bushing 	For removal / installation of bushing
49 G028 203 Support (Part of 49 F034 2A0) 	For removal of bushing	49 G028 206 Shaft (Part of 49 F034 2A0) 	For removal / installation of bushing
49 G028 207 Nut (Part of 49 F034 2A0) 	For removal / installation of bushing	49 G028 208 Installer (Part of 49 F034 2A0) 	For removal of bushing
49 G034 205 Bearing (Part of 49 F034 2A0) 	For removal / installation of bushing	49 F034 204 Support (Part of 49 F034 2A0) 	For removal of bushing
49 F034 203 Support (Part of 49 F034 2A0) 	For installation of bushing	49 F034 206 Shaft (Part of 49 F034 2A0) 	For installation of bushing
49 F034 209 Installer (Part of 49 F034 2A0) 	For removal / installation of bushing	49 F034 210 Guide, clip 	For installation of dust boot clip
49 F034 205 Support (Part of 49 F034 2A0) 	For removal / installation of bushing	49 F034 208 Installer (Part of 49 F034 2A0) 	For installation of bushing

37U0RX-024

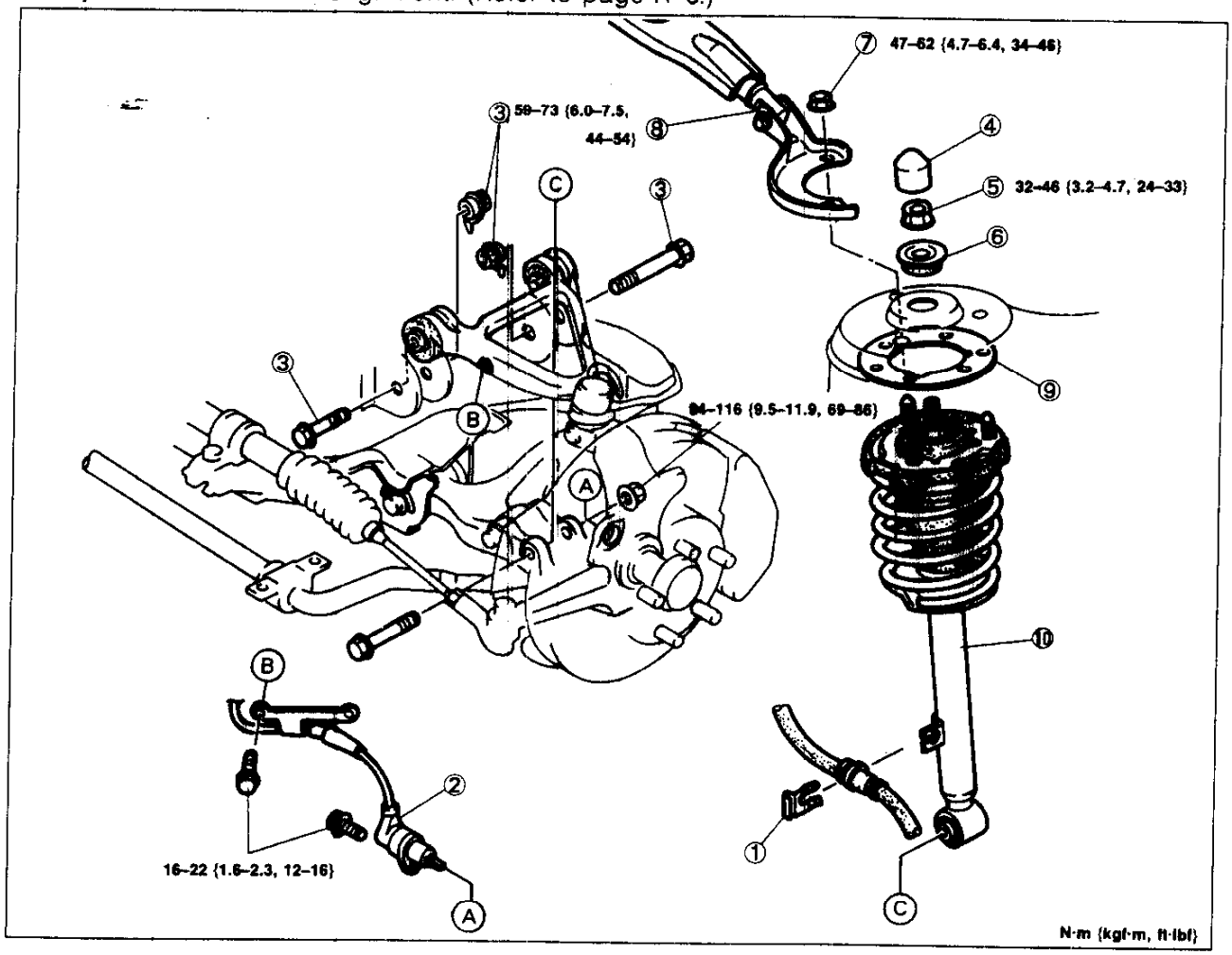
FRONT SHOCK ABSORBER AND SPRING

Removal / Installation

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheel and tire.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal, referring to **Installation Note**.
5. Install the wheel and tire.

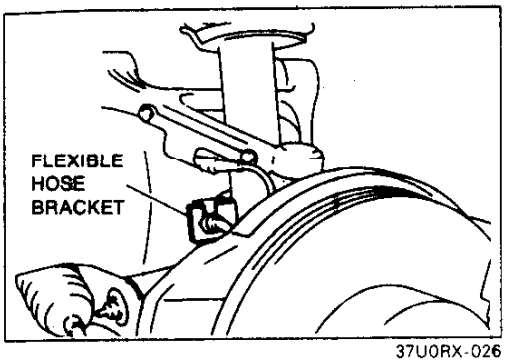
Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–87 ft·lbf}

6. Adjust the front wheel alignment. (Refer to page R–6.)



37U0RX-025

1. Clip (brake hose)
2. ABS wheel-speed sensor
3. Bolt, nut
4. Cap
5. Nut
6. Stopper rubber
7. Nut
8. Front strut bar (R1 vehicle)
   Removal / Inspection / Installation ..... page R–25
9. Insulator
10. Front shock absorber and spring
    Installation Note ..... page R–13
    Disassembly / Inspection / Assembly ..... page R–13



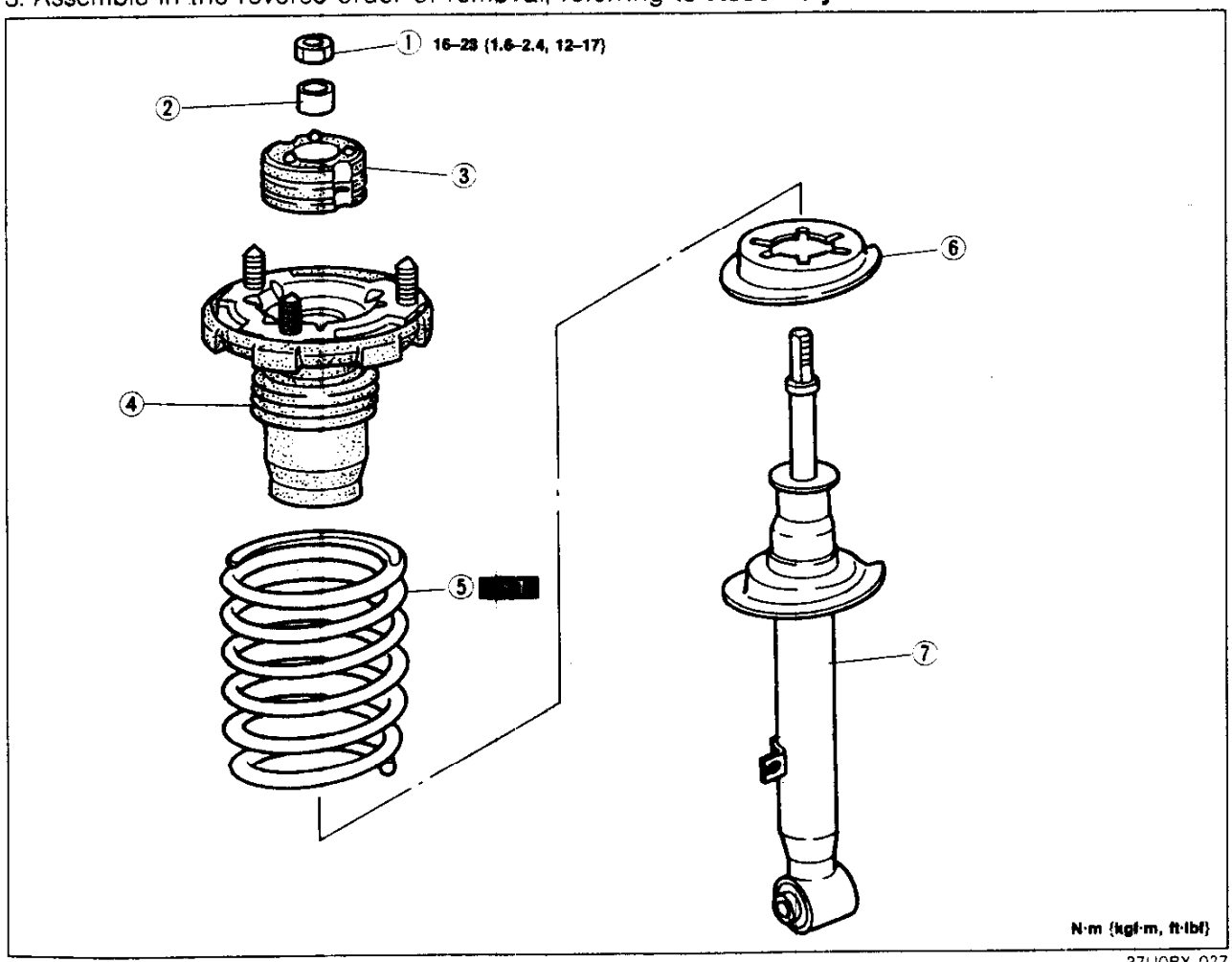
37U0RX-026

Installation note
Front shock absorber and spring

Install the shock absorber and spring so that the flexible hose bracket faces forward.

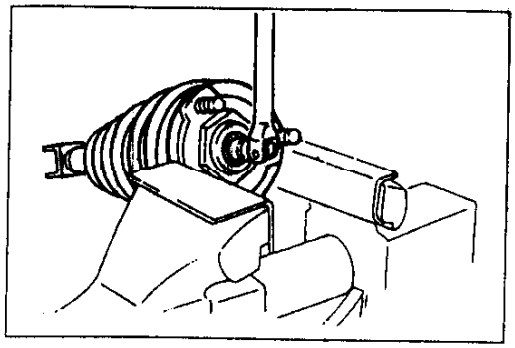
Disassembly / Inspection / Assembly

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 removal, referring to **Assembly Note**.

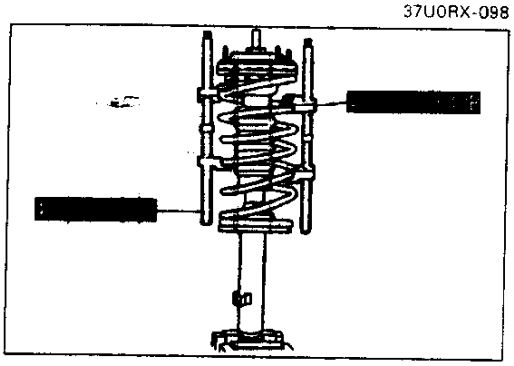


37U0RX-027

1. Nut
   Disassembly Note
   ..... page R–14
   Assembly Note
   ..... page R–15
2. Spacer
3. Mounting rubber
   Inspect for damage and deterioration
   Assembly Note
   ..... page R–15
4. Bound stopper assembly
   Inspect for damage and cracks
5. Coil spring
   Inspect for damage and weakness
   Assembly Note
   ..... page R–14
6. Lower spring seat
   Inspect for damage and cracks
7. Shock absorber
   Inspection ..... page R–14



37U0RX-098



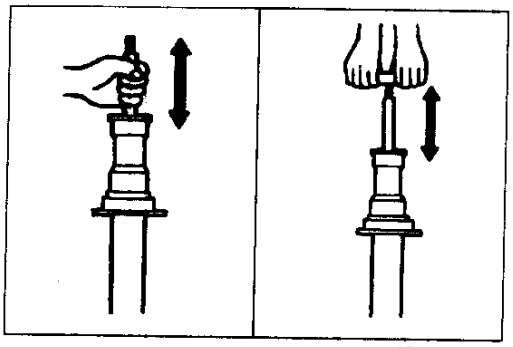
Disassembly note
Nut

Caution
- **Use protective plates in the jaws of the vise to prevent damage to the bracket.**

1. Secure the mounting rubber bracket in a vise.

Warning
- **Because the coil spring is under considerable tension, do not remove the mounting rubber nut before installation of the SST.**

2. Loosen the mounting rubber nut several turns, but do not remove it.
3. Assemble the **SST**.
4. Compress the coil spring by using the **SST** and remove the mounting nut.

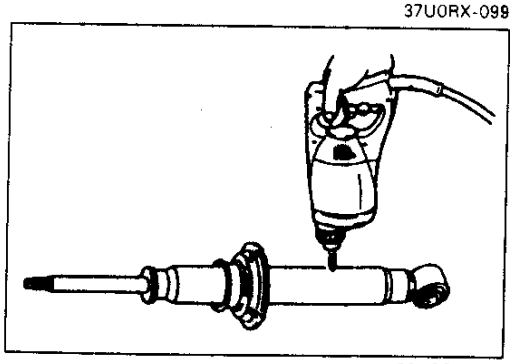


37U0RX-099

Inspection
Shock absorber

Check the following and replace the shock absorber if necessary.

1. Inspect for damage and oil leakage.
2. (1) Compress the shock absorber rod and release it.
   (2) Verify that the rod extends fully at a normal speed.
3. Compress and extend the rod at least three times. Verify that the operational force does not change and that there is no unusual noise.



29U0RX-100

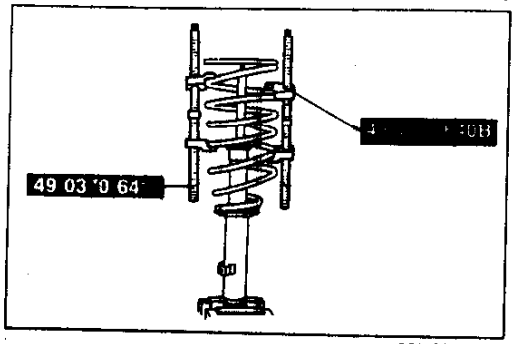
Disposal of shock absorber

Caution
- **The gas in the shock absorber is colorless, odorless, and nontoxic.**
- **Wear safety glasses because drilling chips may be blown out by the pressurized gas.**

1. Lay the shock absorber flat.
2. Drill a hole in its body.

Drill size: 2–3 mm {0.08–0.12 in}

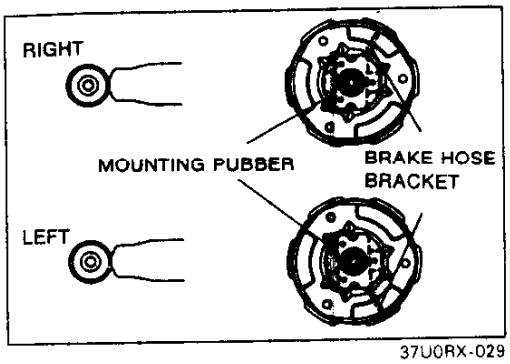
3. Allow the gas to escape from the shock absorber.
4. Discard the shock absorber.



29U0RX-028

Assembly note
Coil spring

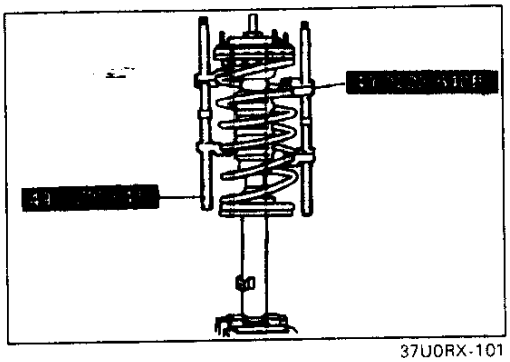
1. Compress the coil spring by using the **SST**.
2. Install the spring so that the lower coil is seated on the step of the lower seat.



37U0RX-029

Mounting rubber

Install the mounting rubber as shown.

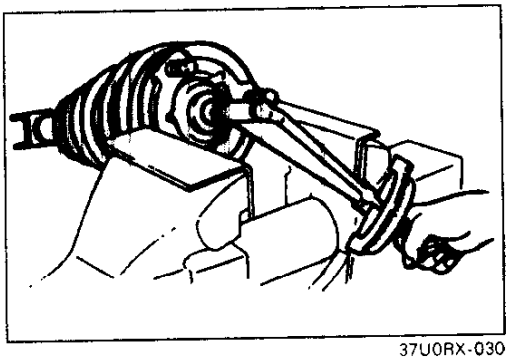

37U0RX-101

Nut

1. Tighten the mounting nut several turns.
2. Remove the **SST**.

Caution

- **Verify that the lower coil of the spring is seated on the step of the lower seat.**


37U0RX-030

3. Secure the mounting rubber bracket in a vise.
4. Tighten the nut.

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

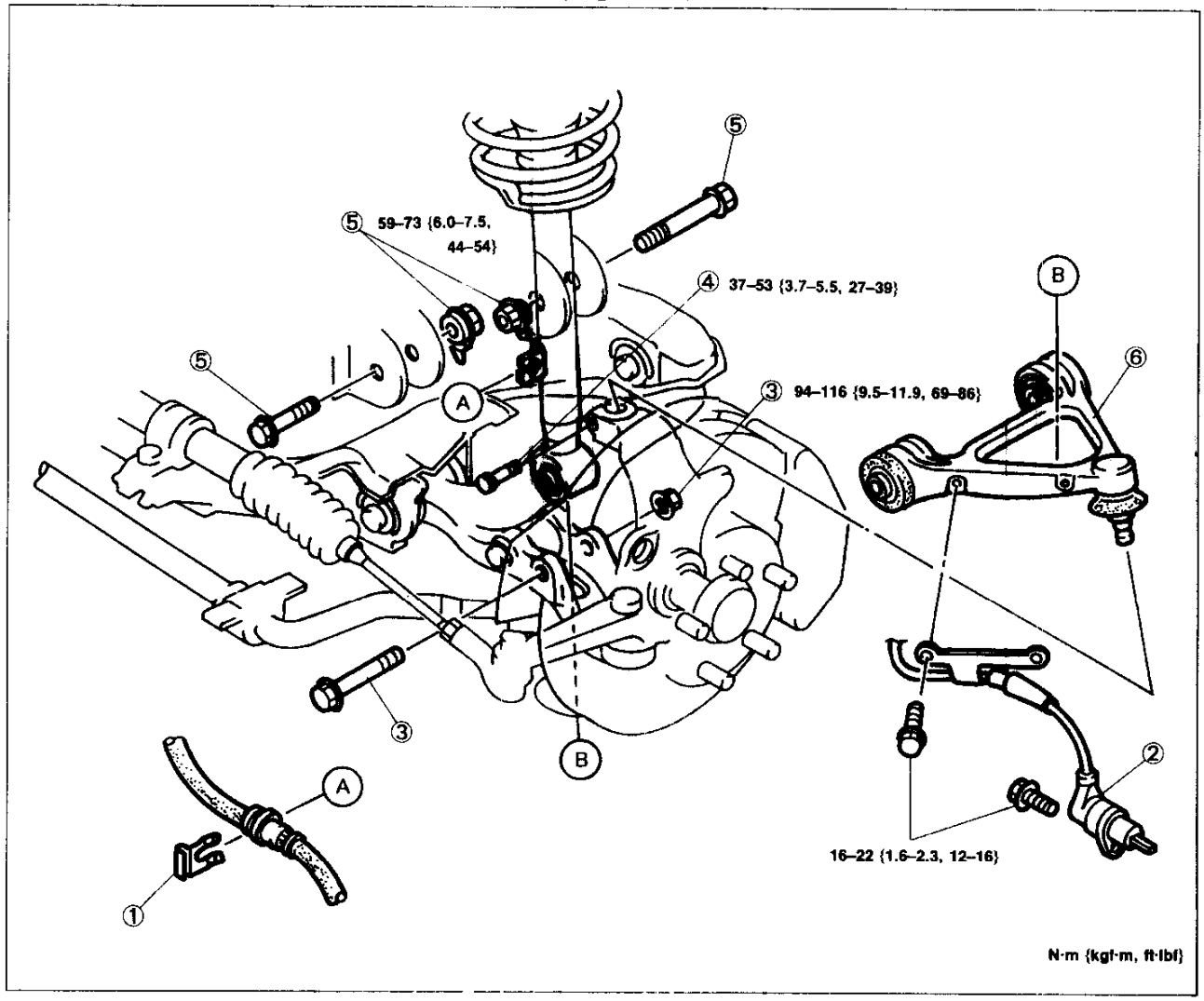
UPPER ARM

Removal / Inspection / Installation

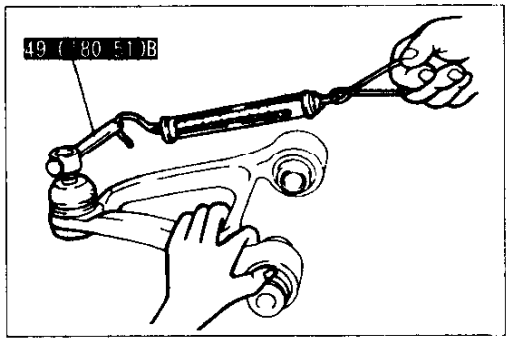
1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheel and tire.
3. Remove in the order shown in the figure.
4. Inspect all parts and repair or replace as necessary.
5. Install in the reverse order of removal.
6. Install the wheel and tire.

Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–87ft·lbf}

7. Adjust the front wheel alignment. (Refer to page R–6.)



1. Clip (brake hose)
2. ABS wheel-speed sensor
3. Bolt nut
4. Bolt
5. Bolt nut
6. Upper arm
   - Inspect for damage and cracks
   - Inspect bushing for damage and wear
   - Inspect boot for tearing and cracks
   - Inspection ..... page R–17
   - Disassembly / Inspection / Assembly ..... page R–17



37U0RX-03

Inspection
Upper arm ball joint
Ball joint rotation torque

1. Shake and rotate the ball joint stud several times.
2. Connect the **SST** to the stud and measure the starting torque and the rotation torque by using a pull scale.

Starting torque:
2.0–5.8 N·m {20–60 kgf·cm, 18–52 in·lbf}
Pull scale reading:
20–58 N {2.0–6.0 kgf, 4.4–13.2 lbf}

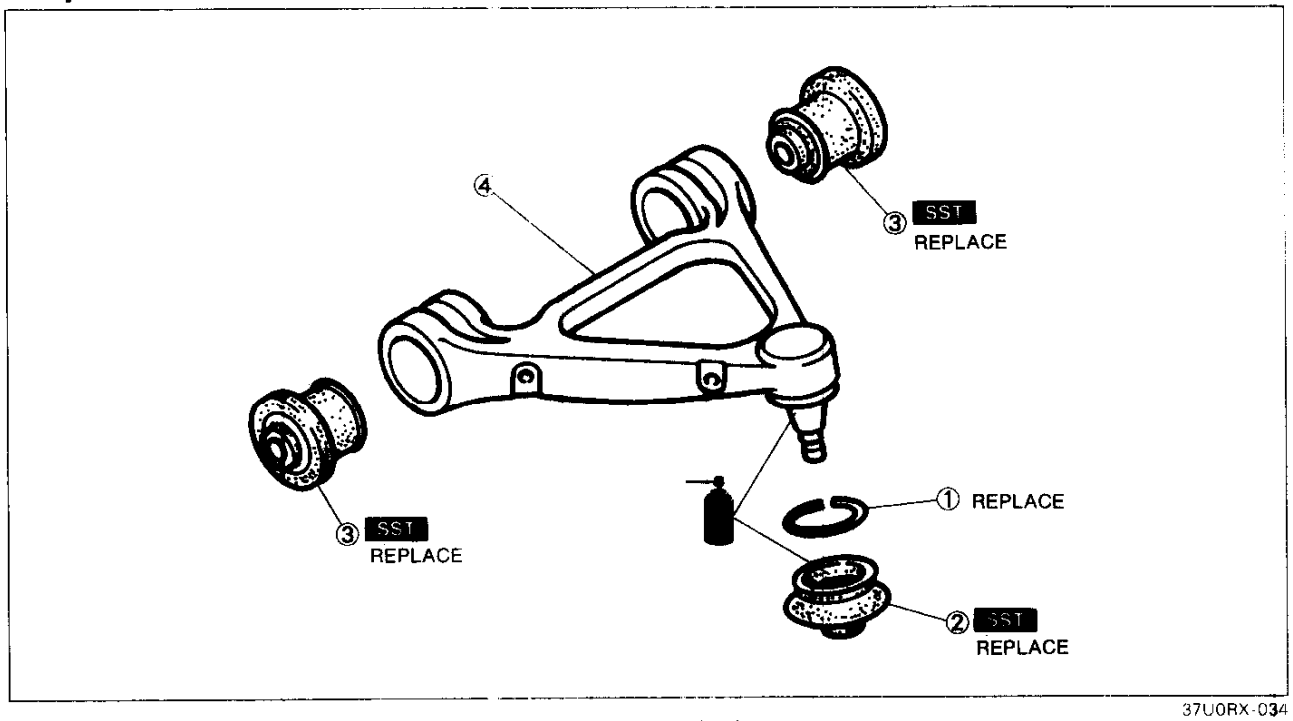
Rotation torque:
0.4–1.1 N·m {4–12 kgf·cm, 3.5–10.4 in·lbf}
Pull scale reading:
4–11 N {0.4–1.2 kgf, 0.9–2.6 lbf}

3. If not within specification, replace the upper arm.

Disassembly / Inspection / Assembly

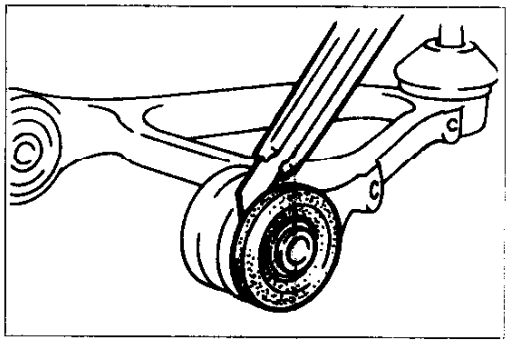
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.

Caution
- **When holding a part in a vise, use protective plates in the jaws to prevent damage to the part.**



37U0RX-034

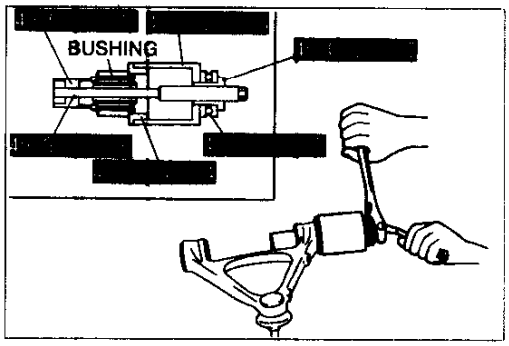
1. Clip
2. Dust boot
   Assembly Note ..... page R–18
3. Bushing
   Disassembly Note ..... page R–18
   Assembly Note ..... page R–18
4. Upper arm
   Inspect for damage and cracks



37U0RX-035

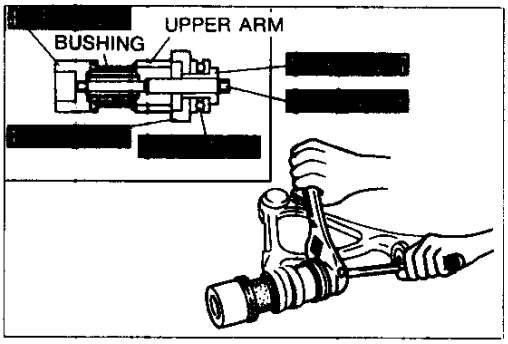
Disassembly note
Bushing

1. Cut away the projecting rubber of the bushing.



37U0RX-036

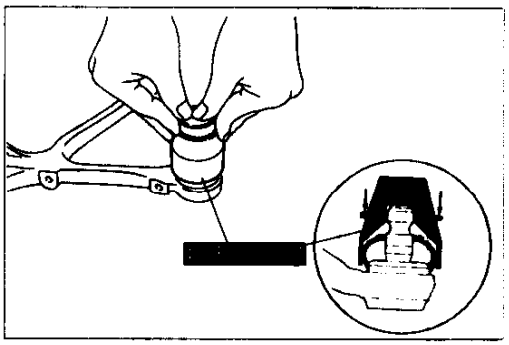
2. Remove the bushing by using the **SST**.



37U0RX-085

Assembly note
Bushing

1. Apply soapy water to the new bushing.
2. Install the bushing by using the **SST**.



37U0RX-086

Dust boot

1. Wipe the grease off the ball stud.
2. Fill the inside the new dust boot with grease.
3. Install the dust boot onto the ball joint.
4. Set the **SST** over the boot and install a new clip.
5. Wipe off the excess grease.

FRONT LOWER ARM

Removal / Inspection / Installation

1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheel and tire.
3. Remove in the order shown in the figure, referring to **Removal Note**.
4. Inspect all parts and repair or replace as necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Install the wheel and tire.

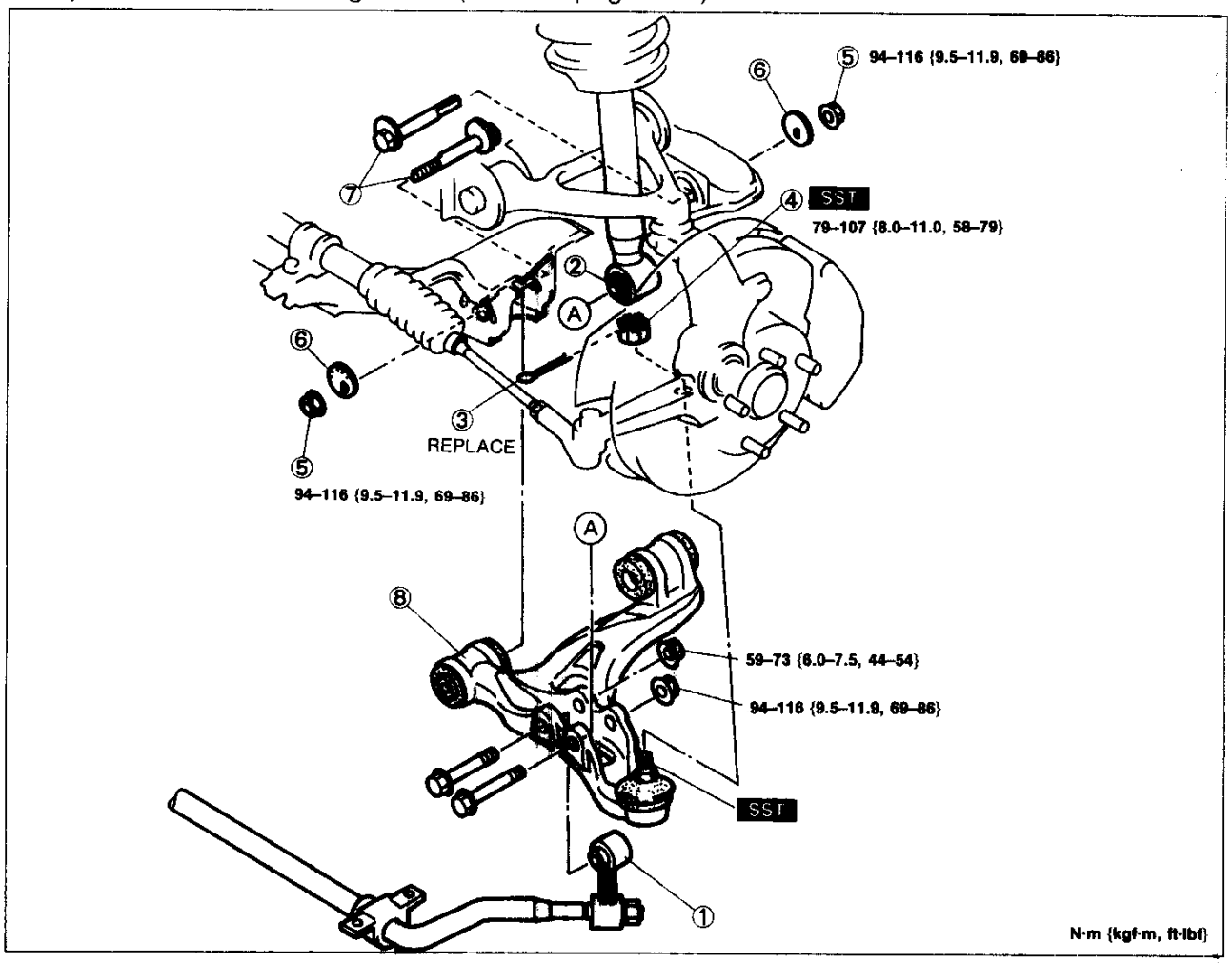
Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–87 ft·lbf}

Note

- **Loosely tighten the rear cam nut of the lower arm. Lower the vehicle and tighten the nut to the specified torque with the vehicle unladen.**

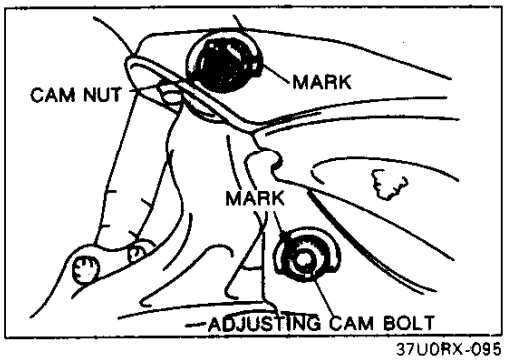
Tightening torque: 94–116 N·m {9.5–11.9 kgf·m, 69–86 ft·lbf}

7. Adjust the front wheel alignment. (Refer to page R–6.)



37U0RX-037

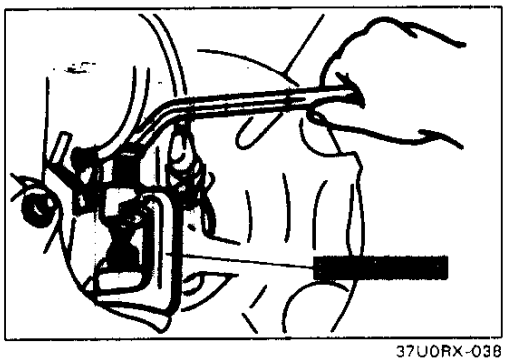
1. Front stabilizer control link
2. Shock absorber and spring
3. Cotter pin
4. Nut
5. Nut
   Removal Note ..... page R–20
   Installation Note ..... page R–20
6. Cam plate
   Removal Note ..... page R–20
   Installation Note ..... page R–20
7. Adjusting cam bolt
   Installation Note ..... page R–20
8. Front lower arm
   Removal Note ... page R–20
   Inspect for damage and cracks
   Inspect bushing for damage and wear
   Inspect boot for tearing and cracks
   Inspection ..... page R–20
   Disassembly / Inspection / Assembly ..... page R–21



37U0RX-095

Removal note
Nut and cam plate

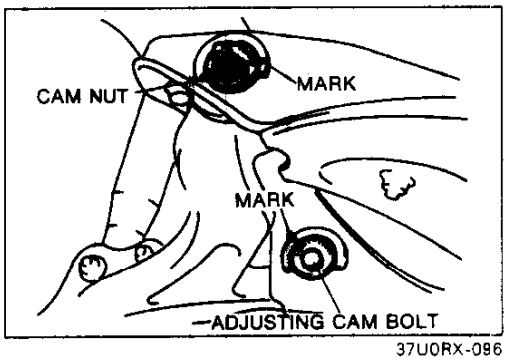
Before loosening the nut, make a mark on the cam plate and the crossmember for reference during installation.


37U0RX-038

Front lower arm

1. Loosen the nut until it is flush with the end of the stud.
2. With the nut protecting the ball joint stud, separate the ball joint from the knuckle by using the **SST**.

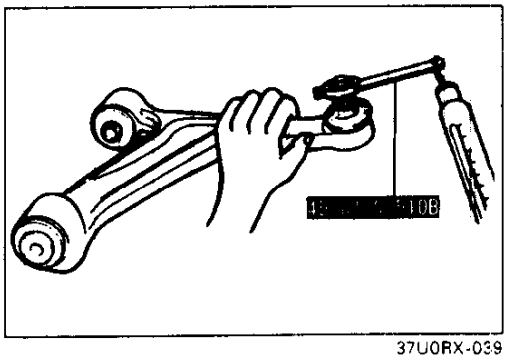
Caution
- **Do not damage the dust boot.**



37U0RX-096

Installation note
Nut, cam plate, and adjusting cam bolt

1. Install the cam plate so that the notch faces the same direction as the adjusting cam bolt.
2. Align the mark made before removing the adjusting cam bolt. Temporarily tighten the nut.


37U0RX-039

Inspection
Front lower arm ball joint
Ball joint rotation torque

1. Shake and rotate the ball joint stud at least five times.
2. Connect the **SST** to the stud and measure the starting torque and the rotation torque by using a pull scale.

Starting torque:
2.5–7.3 N·m {25–75 kgf·cm, 22–65 in·lbf}
Pull scale reading:
25–73 N {2.5–7.5 kgf, 5.5–16.5 lbf}

Rotation torque:
0.5–1.4 N·m {5–15 kgf·cm, 4.4–13.0 in·lbf}
Pull scale reading:
5–14 N {0.5–1.5 kgf, 1.1–3.3 lbf}

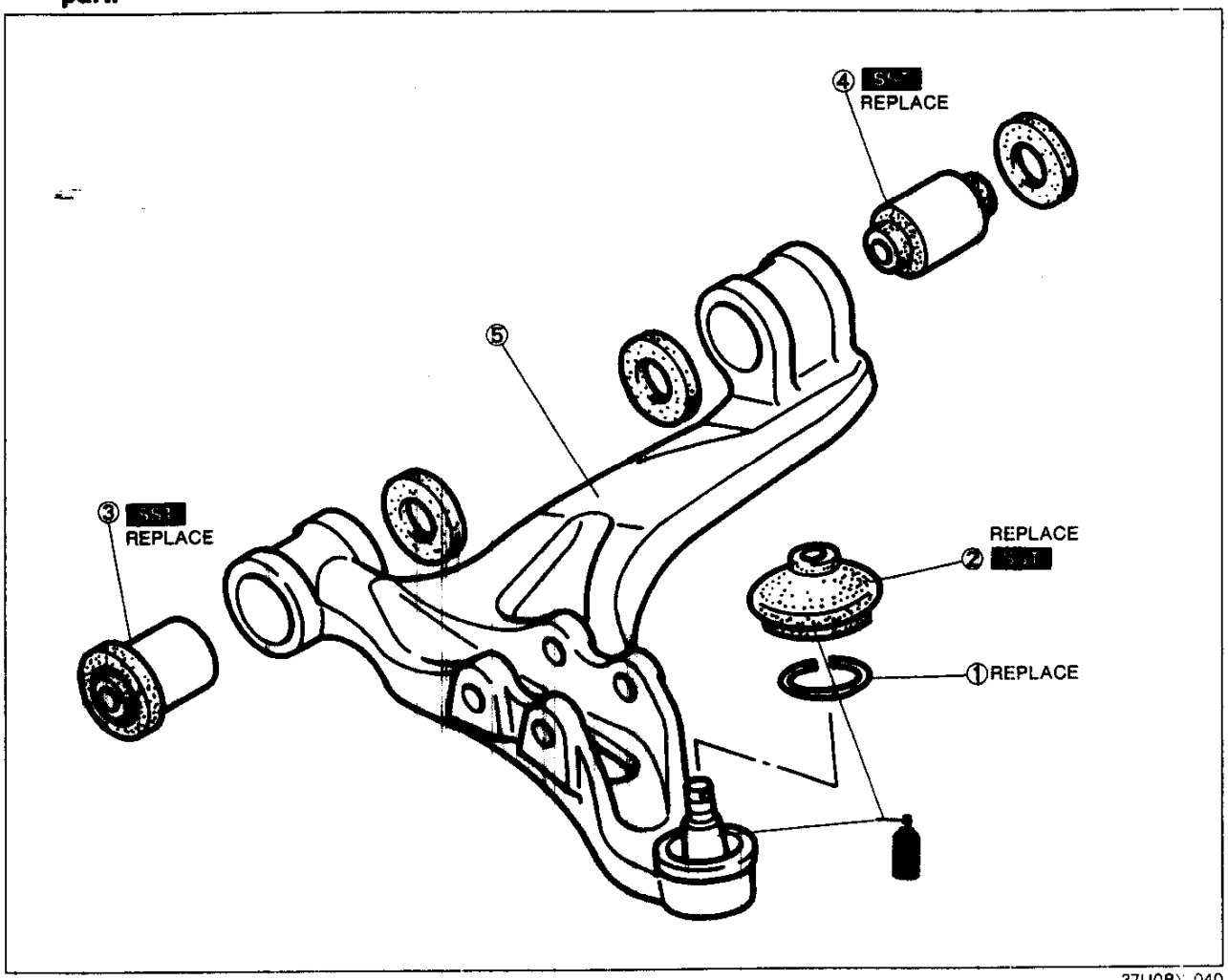
3. If not within specification, replace the front lower arm.

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**.

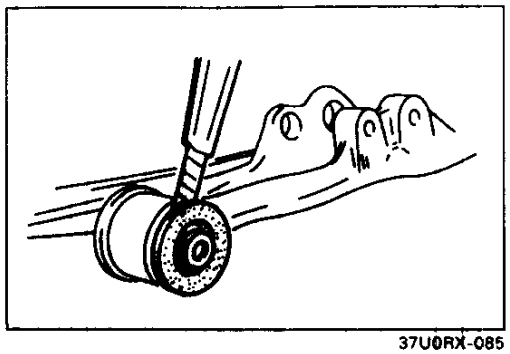
Caution

- **When holding a part in a vise, use protective plates in the jaws to prevent damage to the part.**



37U0RX-040

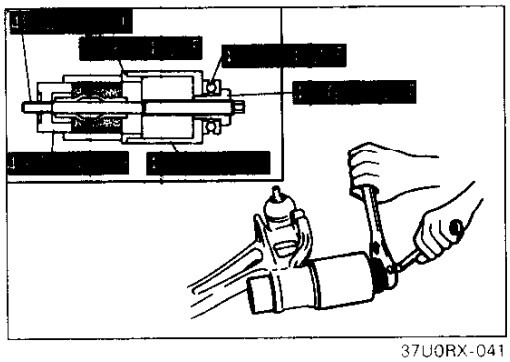
1. Clip
2. Dust boot
   Assembly Note .... page R-23
3. Bushing (front)
   Disassembly Note ..... below
   Assembly Note .... page R-22
4. Bushing (rear)
   Disassembly Note
   ..... page R-22
   Assembly Note .... page R-22
5. Front lower arm
   Inspect for damage and cracks



37U0RX-085

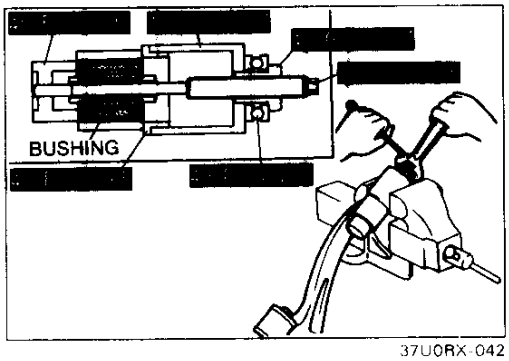
Disassembly note
Bushing (front)

1. Cut away the projecting rubber of the bushing.



37U0RX-041

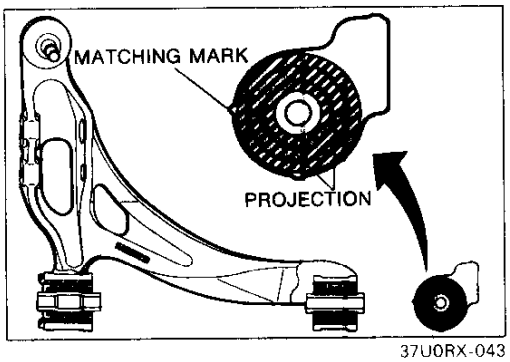
2. Remove the bushing by using the **SST**.



37U0RX-042

Bushing (rear)

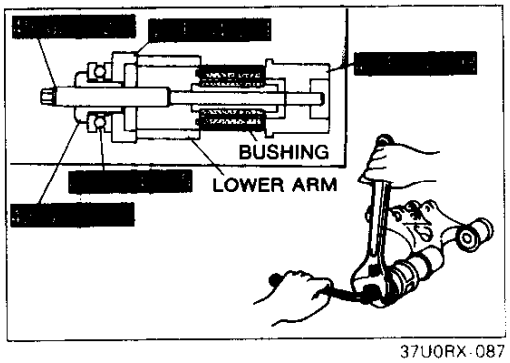
Remove the bushing by using the **SST**.



37U0RX-043

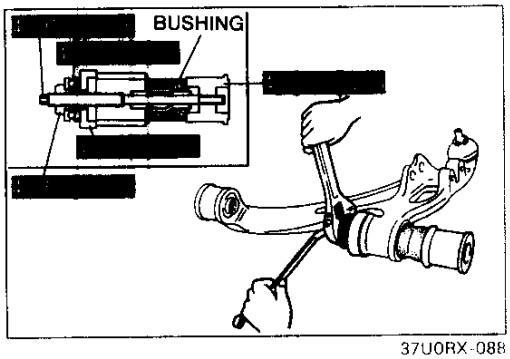
Assembly note
Bushing (rear)

1. Align the matching marks.



37U0RX-087

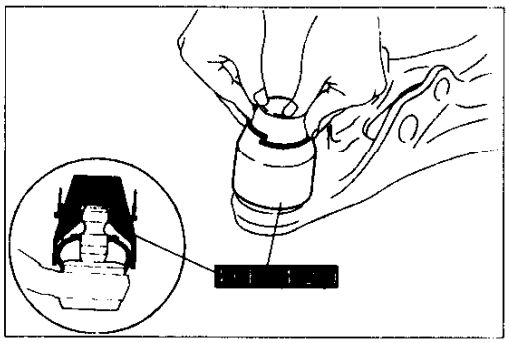
2. Apply soapy water to the new bushing.
3. Install the bushing by using the **SST**.



37U0RX-088

Bushing (front)

1. Apply soapy water to the new bushing.
2. Install the bushing by using the **SST**.



37U0RX-089

Dust boot

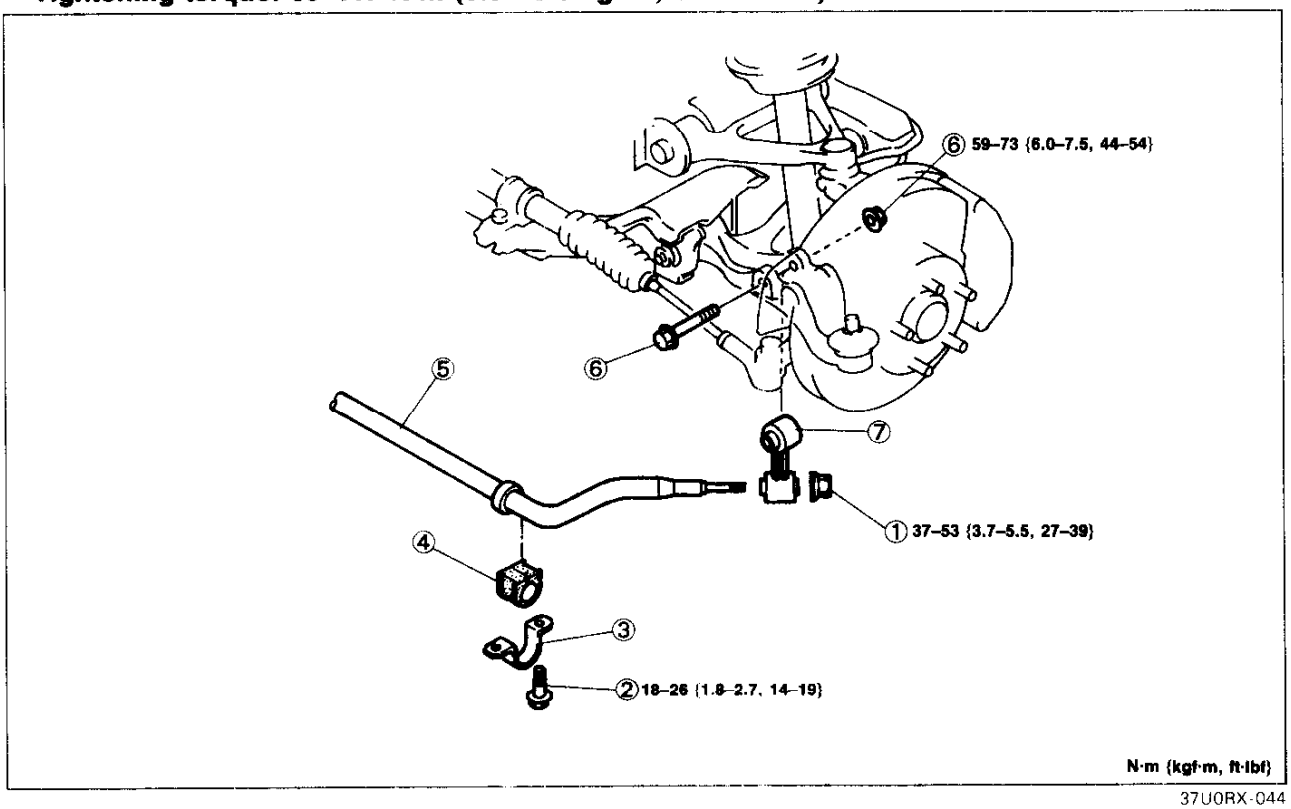
1. Wipe the grease off the ball stud.
2. Fill the inside the new dust boot with grease.
3. Install the dust boot onto the ball joint.
4. Set the **SST** over the boot and install a new clip.
5. Wipe off the excess grease.

FRONT STABILIZER

Removal / Inspection / Installation

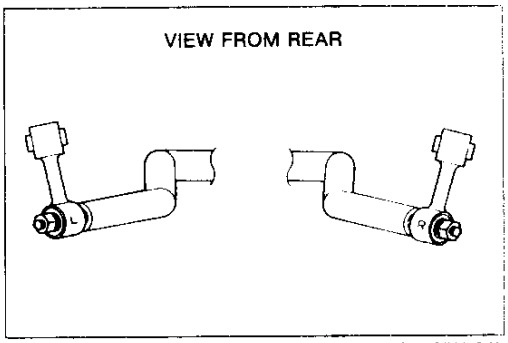
1. Jack up the front of the vehicle and support it on safety stands.
2. Remove the wheels and tires and the undercover.
3. Remove in the order shown in the figure.
4. Inspect all parts and repair or replace as necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Install the wheels and tires.

Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–87 ft·lbf}



37U0RX-044

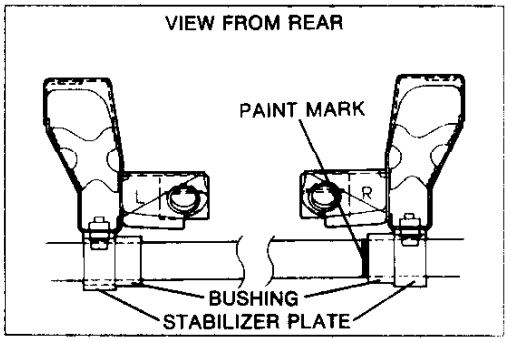
1. Nut
2. Bolt
3. Stabilizer plate
   Inspect for damage and cracks
4. Stabilizer bushing
   Inspect for wear and deterioration
5. Stabilizer bar
   Inspect for damage and bending
   Installation Note
   ..... page R–25
6. Bolt, nut
7. Stabilizer control link
   Inspect for damage and cracks
   Installation Note ..... below



37U0RX-045

Installation note
Stabilizer control link

Install the stabilizer control links with the R (right) and L (left) marks as shown.



37U0RX-04

Stabilizer bar

Install the stabilizer bar with the white paint mark at the right side.

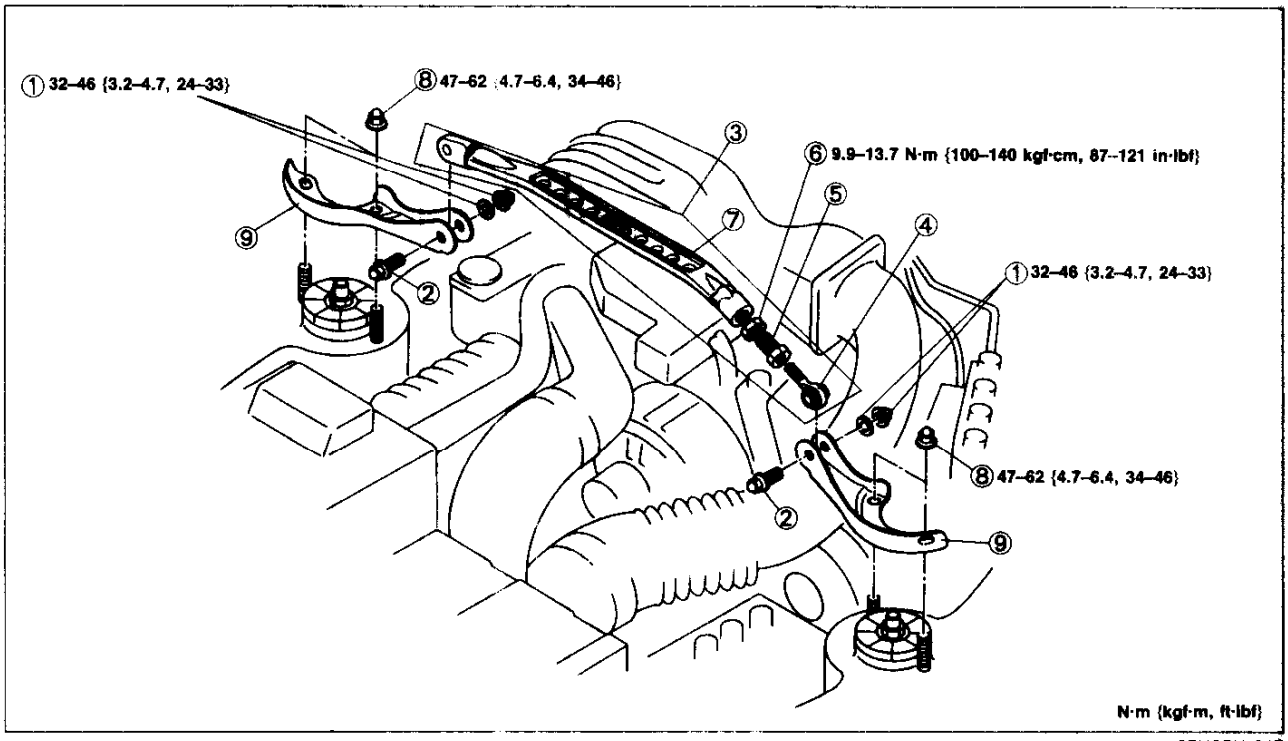
Note

- **Install the stabilizer bar as shown in the figure.**

FRONT STRUT BAR (R1 VEHICLE)

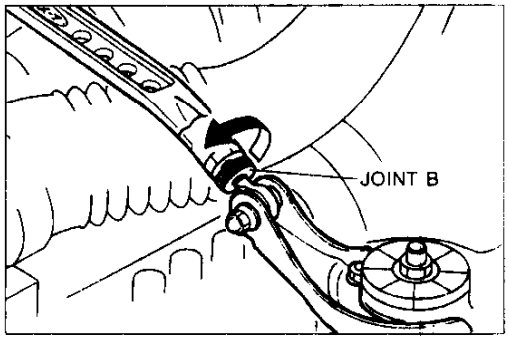
Removal / Inspection / Installation

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**.



37U0RX-047

1. Nut, washer
2. Bolt
3. Strut bar assembly
   Installation Note ..... below
4. Joint A
5. Joint B
6. Locknut
7. Front strut bar
   Inspect for damage and bending
8. Nut
9. Strut plate



37U0RX-048

Installation note
Strut bar assembly

1. Turn joint B counterclockwise to the specified torque to set the tension.

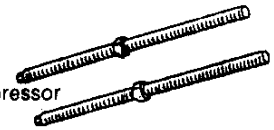
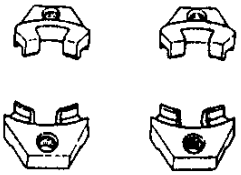
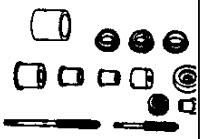
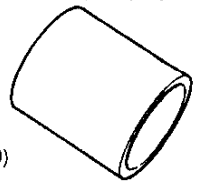
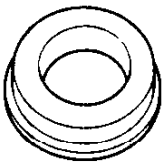
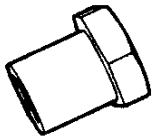
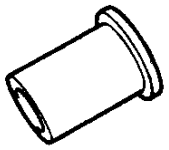
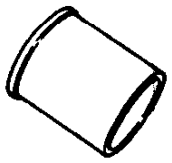
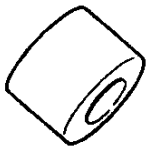
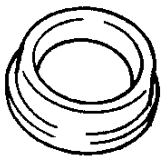
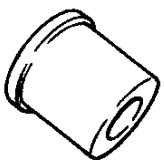
   Tightening torque:
   0.40–0.58 N·m {4–6 kgf·cm, 3.5–5.2 in·lbf}

2. Tighten the locknut to the specified torque.

   Tightening torque:
   9.9–13.7 N·m {100–140 kgf·cm, 87–121 in·lbf}

REAR SUSPENSION (DOUBLE WISHBONE, COIL SPRING TYPE)

PREPARATION
SST

49 0370 641 Screw, coil spring compressor 	For removal / installation of coil spring	49 0223 640B Arm, coil spring compressor 	For removal / installation of coil spring
49 E034 2A0 Replacer set, rubber bushing 	For removal / installation of bushing	49 G028 203 Support (Part of 49 F034 2A0) 	For removal / installation of bushing
49 G028 205 Support (Part of 49 F034 2A0) 	For removal / installation of pillow ball	49 G028 206 Shaft (Part of 49 F034 2A0) 	For removal / installation of bushing
49 G028 207 Nut (Part of 49 F034 2A0) 	For removal / installation of bushing	49 G028 208 Installer (Part of 49 F034 2A0) 	For removal / installation of pillow ball
49 G034 205 Bearing (Part of 49 F034 2A0) 	For removal / installation of bushing	49 F034 207 Installer (Part of 49 F034 2A0) 	For removal / installation of bushing
49 F034 203 Support (Part of 49 F034 2A0) 	For installation of bushing	49 F034 206 Shaft (Part of 49 F034 2A0) 	For installation of bushing
49 F034 209 Installer (Part of 49 F034 2A0) 	For installation of pillow ball	49 F034 204 Support (Part of 49 F034 2A0) 	For removal / installation of bushing
49 F034 208 Installer (Part of 49 F034 2A0) 	For removal / installation of bushing		

37U0RX-049

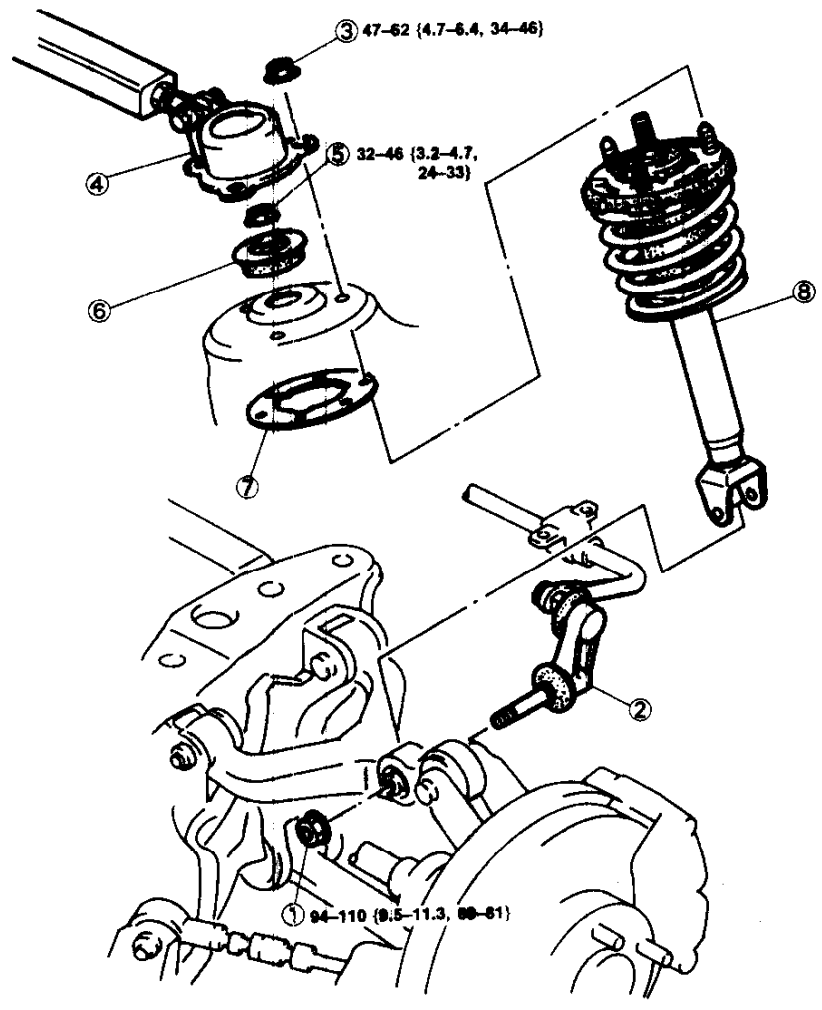
REAR SHOCK ABSORBER AND SPRING

Removal / Installation

1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove the wheel and tire.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal, referring to **Installation Note**.
5. Install the wheel and tire.

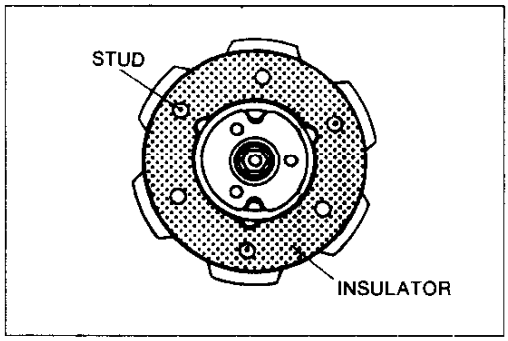
   Tightening torque: 88–117 N·m {9.0–12.0 kgf·m, 65–87 ft·lbf}

6. Check the rear wheel alignment. (Refer to page R–9.)



37U0RX-050

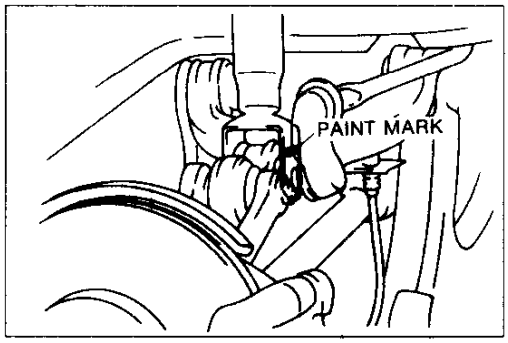
1. Nut
2. Rear stabilizer control link
3. Nut
4. Rear strut bar
   Removal / Inspection / Installation .... page R–43
5. Nut
6. Stopper rubber
7. Insulator
8. Shock absorber and spring
   Installation Note ..... page R–28
   Disassembly / Inspection / Assembly ..... page R–29



37U0RX-051

Installation note
Shock absorber and spring

1. Install the insulator so that the notches in it face the studs as shown.

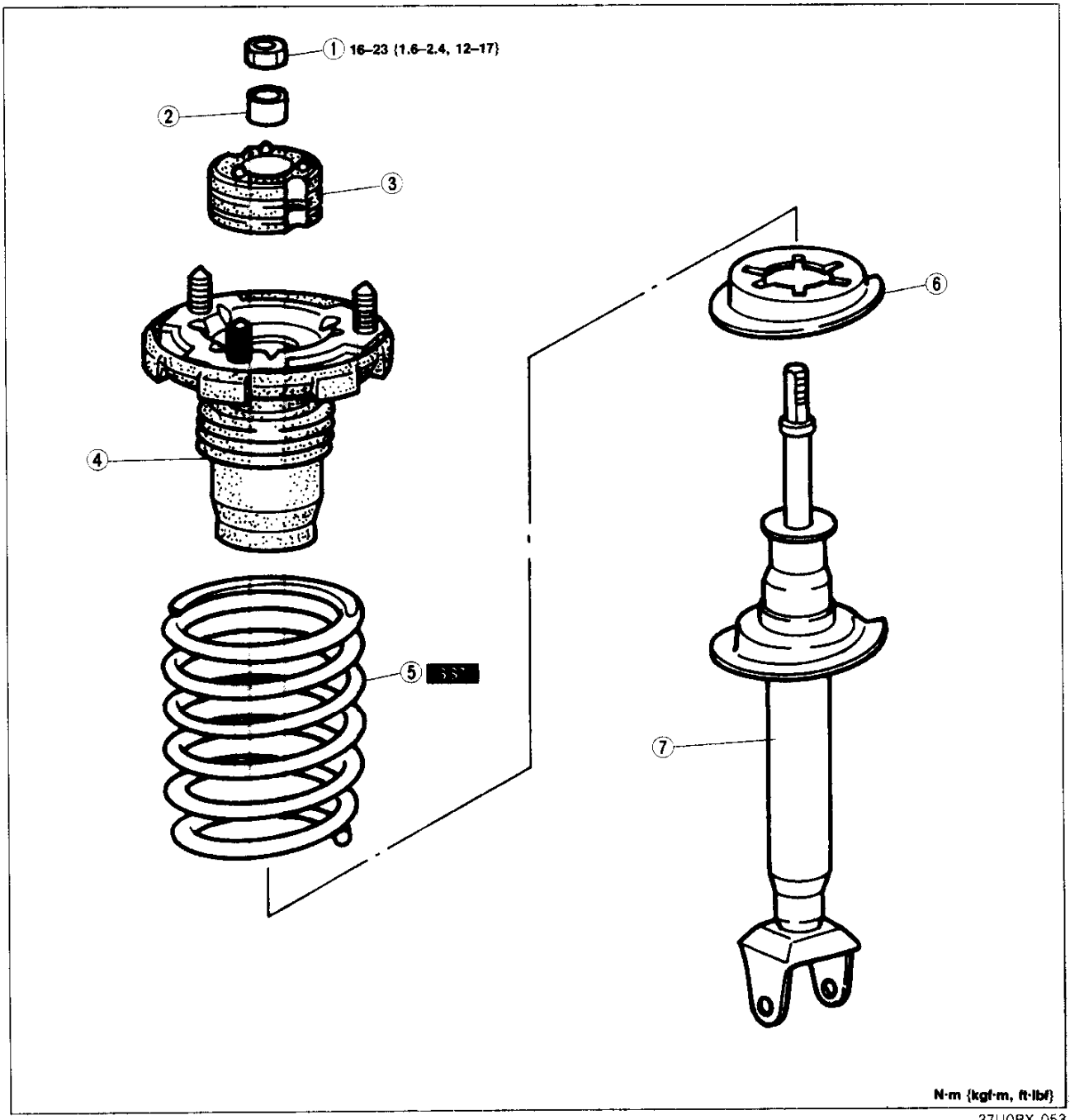


37U0RX-052

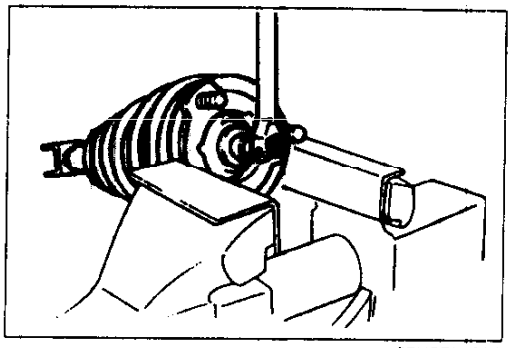
2. Install the shock absorber and spring so that the identification paint mark faces rearward.

Disassembly / Inspection / Assembly

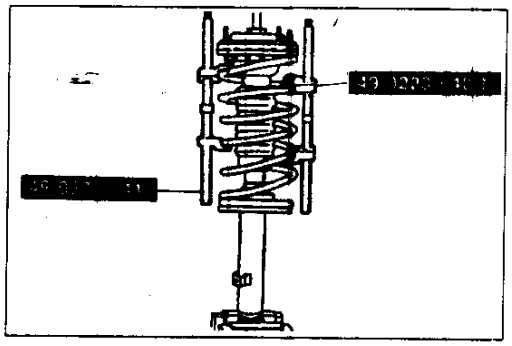
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of removal, referring to **Assembly Note**.

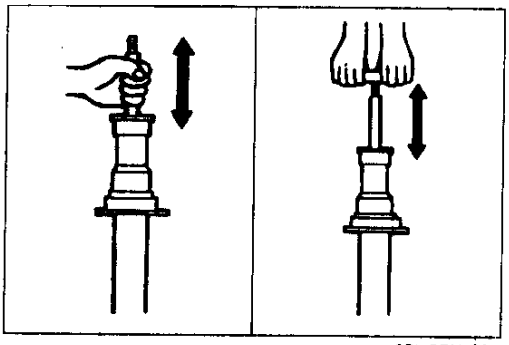


1. Nut
   Disassembly Note ..... page R–30
   Assembly Note ..... page R–31
2. Spacer
3. Mounting rubber
   Inspect for damage and deterioration
   Assembly Note ..... page R–31
4. Bound stopper assembly
   Inspect for damage and cracks
5. Coil spring
   Inspect for damage and weakness
   Assembly Note ..... page R–30
6. Lower spring seat
   Inspect for damage and cracks
7. Shock absorber
   Inspection ..... page R–30

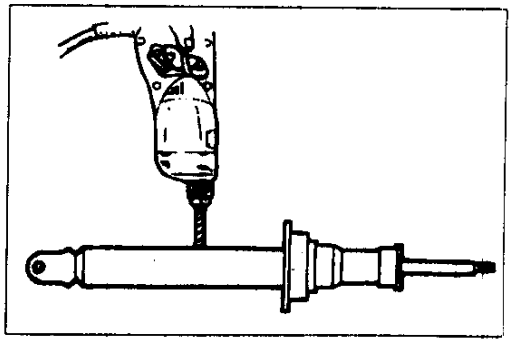


37U0RX-098

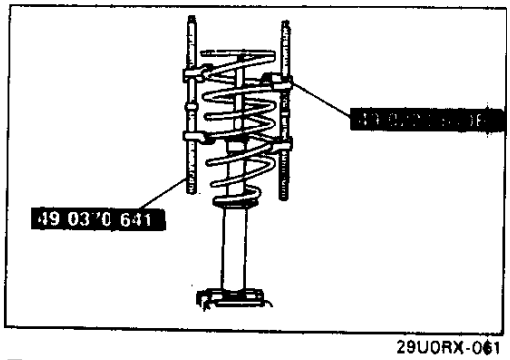




37U0RX-099



37U0RX-100



29U0RX-061

Disassembly note
Nut

Caution
- **Use protective plates in the jaws of the vise to prevent damage to the bracket.**

1. Secure the mounting rubber bracket in a vise.

Warning
- **Because the coil spring is under considerable tension, do not remove the mounting rubber nut before installation of the SST.**

2. Loosen the mounting rubber nut several turns, but do not remove it.
3. Assemble the **SST**.
4. Compress the coil spring by using the **SST** and remove the mounting nut.

Inspection
Shock absorber

Check the following and replace the shock absorber if necessary.

1. Inspect for damage and oil leakage.
2. (1) Compress the shock absorber rod and release it.
   (2) Verify that the rod extends fully at a normal speed.
3. Compress and extend the rod at least three times. Verify that the operational force does not change and that there is no unusual noise.

Disposal of shock absorber

Caution
- **The gas in the shock absorber is colorless, odorless, and nontoxic.**
- **Wear safety glasses because drilling chips may be blown out by the pressurized gas.**

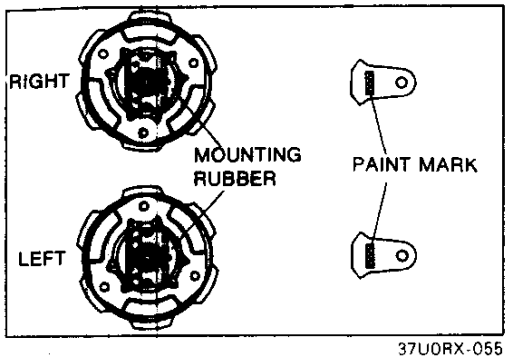
1. Lay the shock absorber flat.
2. Drill a hole in its body.

Drill size: 2–3 mm {0.08–0.12 in}

3. Allow the gas to escape.
4. Discard the shock absorber.

Assembly note
Coil spring

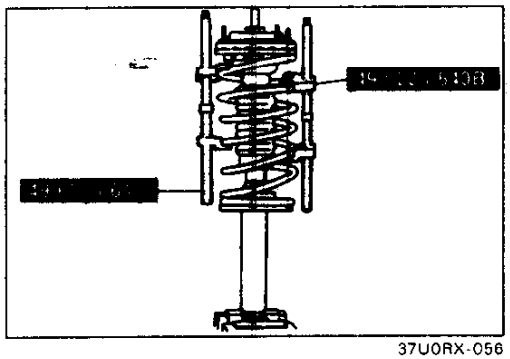
1. Compress the coil spring by using the **SST**.
2. Install the spring so that the lower coil is seated on the step of the lower seat.



37U0RX-055

Mounting rubber

Install the mounting rubber as shown.



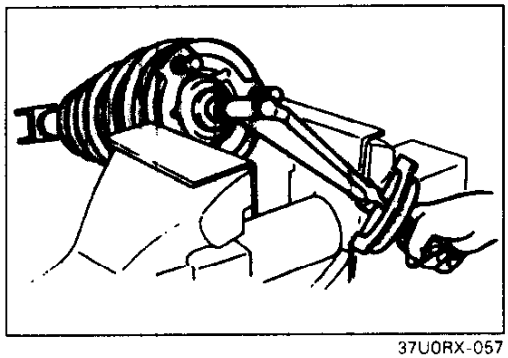
37U0RX-056

Nut

1. Tighten the mounting nut several turns.
2. Remove the **SST**.

Caution

- **Verify that the lower coil of the spring is seated on the step of the lower seat.**



37U0RX-057

3. Secure the mounting rubber bracket in a vise.
4. Tighten the nut.

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

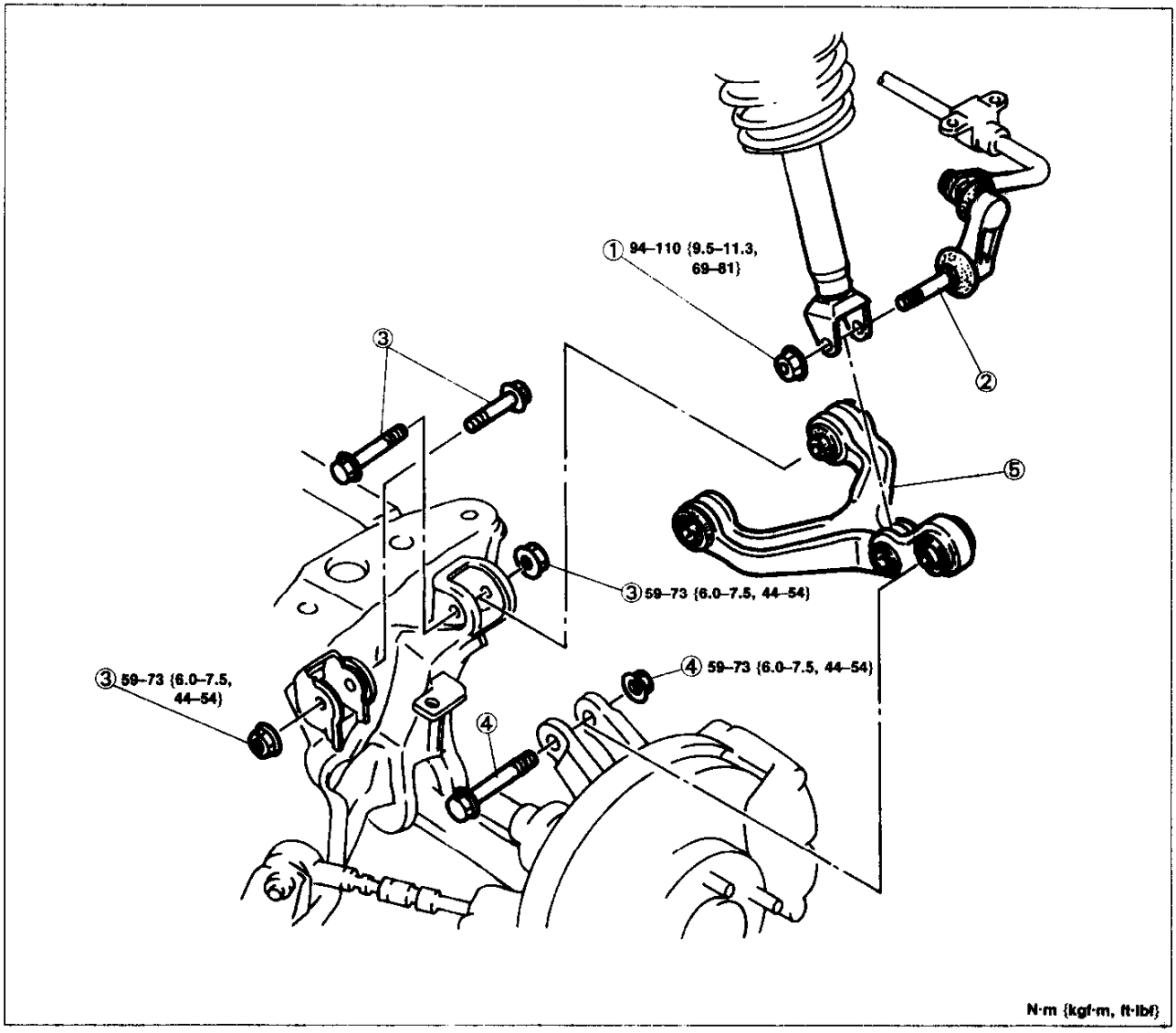
UPPER ARM

Removal / Inspection / Installation

1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove the wheel and tire.
3. Remove in the order shown in the figure.
4. Inspect all parts and repair or replace as necessary.
5. Install in the reverse order of removal.
6. Install the wheel and tire.

Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–87 ft·lbf}

7. Check the rear wheel alignment. (Refer to page R–9.)



37U0RX-058

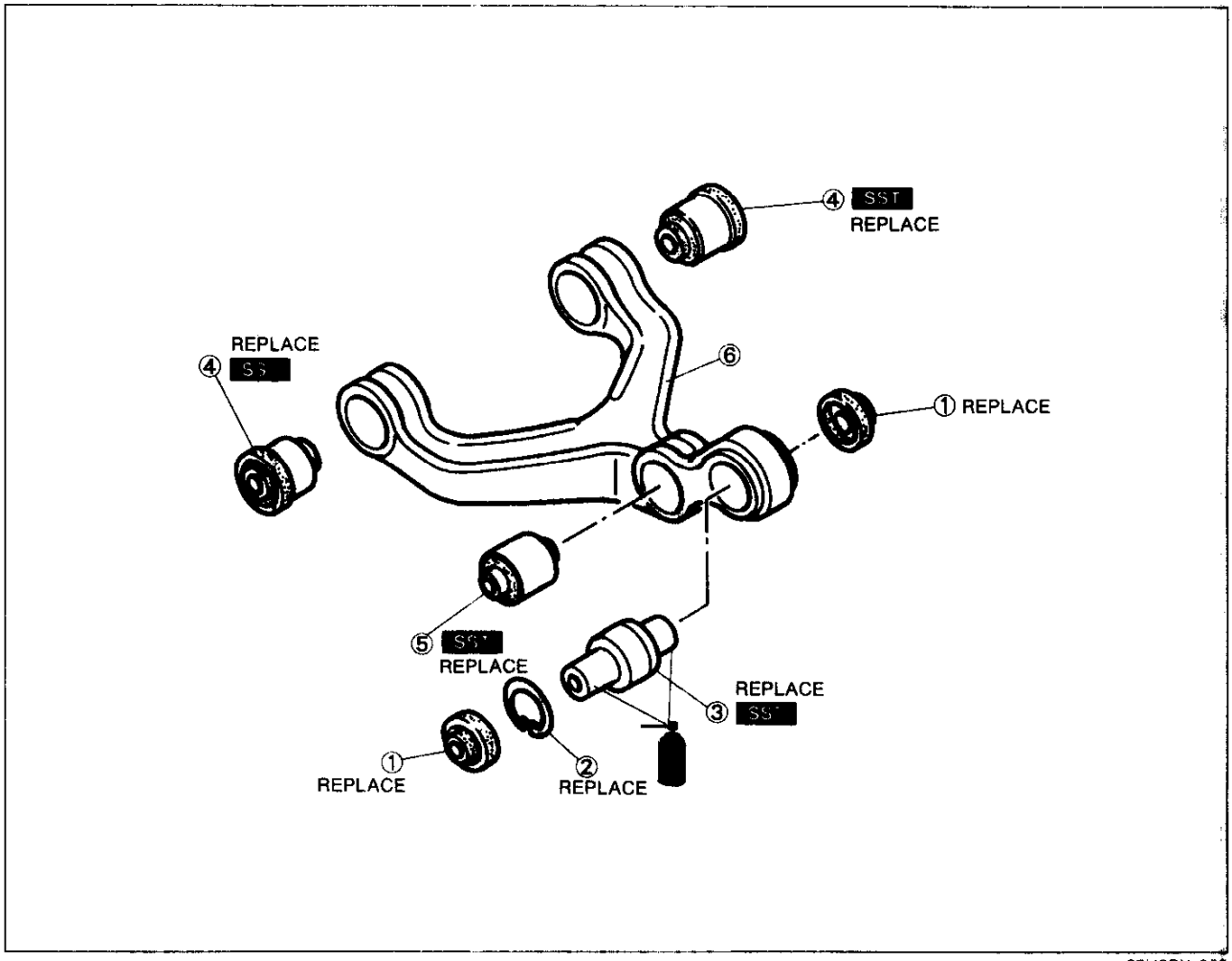
1. Nut
2. Stabilizer control link
3. Nut, bolt
4. Nut, bolt
5. Upper arm
   Inspect for damage and cracks
   Inspect bushing for wear and deterioration
   Disassembly / Inspection / Assembly ..... page R–33

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**.

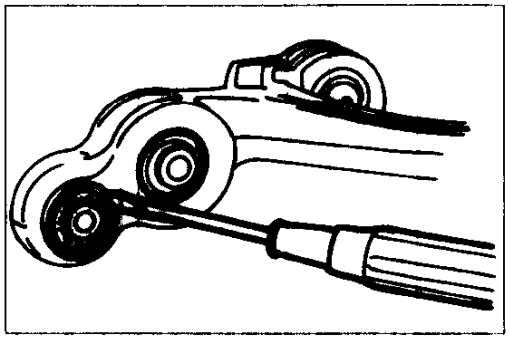
Caution

- **When holding a part in a vise, use protective plates in the jaws to prevent damage to the part.**



37U0RX-050

1. Rubber seal
2. Retaining ring
3. Pillow ball
   Disassembly Note ... below
   Assembly Note
   ..... page R–35
4. Upper arm bushing
   Disassembly Note
   ..... page R–34
   Assembly Note
   ..... page R–34
5. Damper bushing
   Disassembly Note
   ..... page R–34
   Assembly Note
   ..... page R–34
6. Upper arm
   Inspect for damage and cracks



37U0RX-060

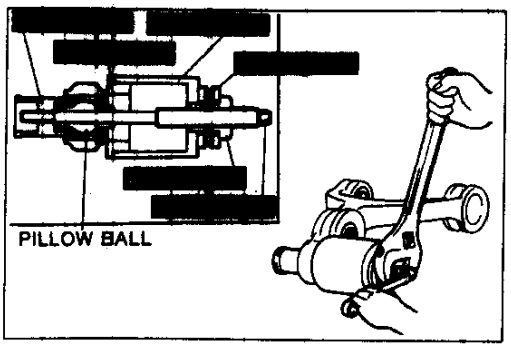
Disassembly note
Pillow ball

1. Remove the rubber seal by using a screw driver as shown.

Caution

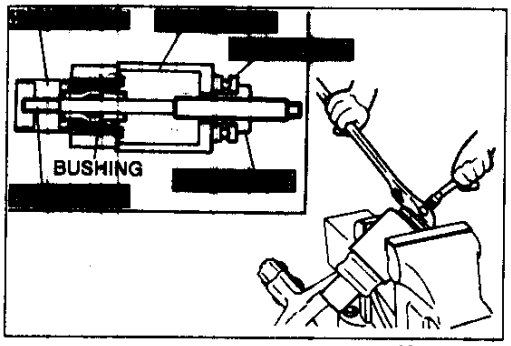
- **Do not damage the upper arm.**

2. Remove the retaining ring.



37U0RX-090

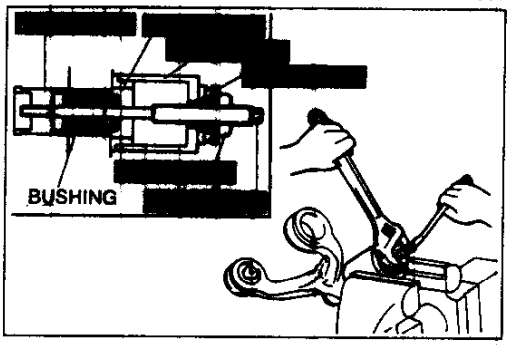
3. Remove the pillow ball by using the **SST**.



37U0RX-061

Upper arm bushing

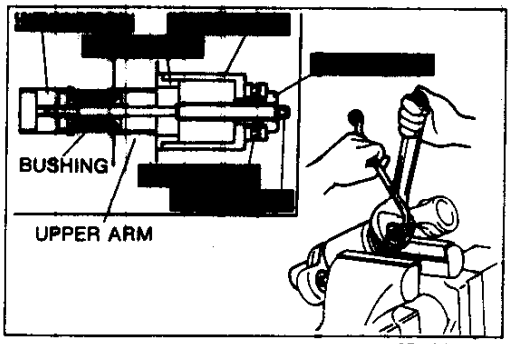
Remove the upper arm bushing by using the **SST**.



37U0RX-062

Damper bushing

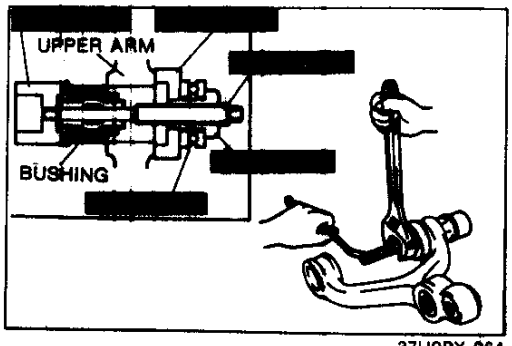
Remove the damper bushing by using the **SST**.



37U0RX-063

Assembly note
Damper bushing

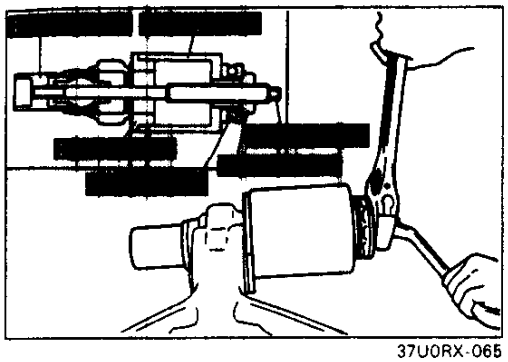
1. Apply soapy water to the new damper bushing.
2. Install the damper bushing by using the **SST**.



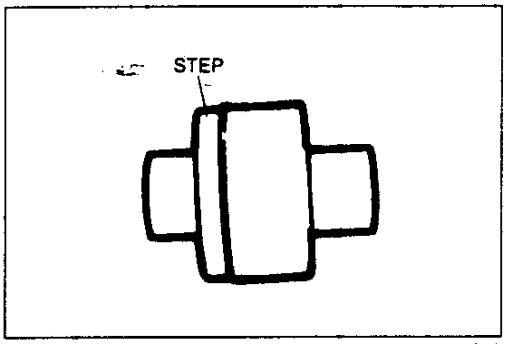
37U0RX-064

Upper arm bushing

1. Apply soapy water to the new bushing.
2. Install the upper arm bushing by using the **SST**.



37U0RX-065



37U0RX-091

Pillow ball

1. Install the new pillow ball by using the **SST**

Note

- **Install the pillow ball with the step facing into the upper arm.**

2. Install the retaining ring.
3. Fill the space between the pillow ball and rubber seal with grease.
4. Install the rubber seal.

REAR LOWER ARM

Removal / Inspection / Installation

1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove the wheel and tire.
3. Remove in the order shown in the figure, referring to **Removal Note**.
4. Inspect all parts and repair or replace as necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Install the wheel and tire.

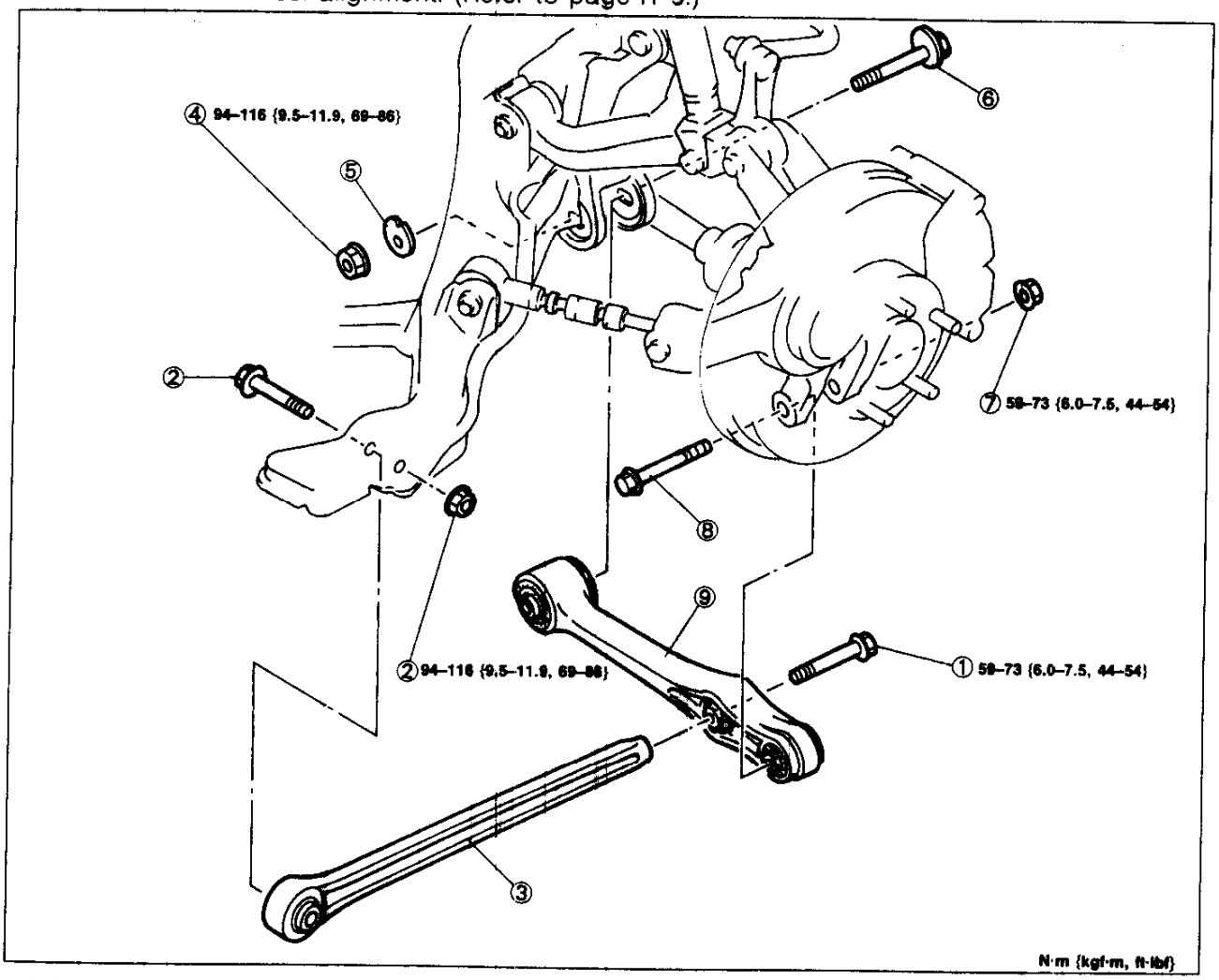
Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–87 ft·lbf}

Caution

- **Loosely tighten the front nut of the trailing link. Lower the vehicle and tighten the nut to the specified torque with the vehicle unladen.**

Tightening torque: 94–116 N·m {9.5–11.9 kgf·m, 69–86 ft·lbf}

7. Check the rear wheel alignment. (Refer to page R–9.)



37U0RX-066

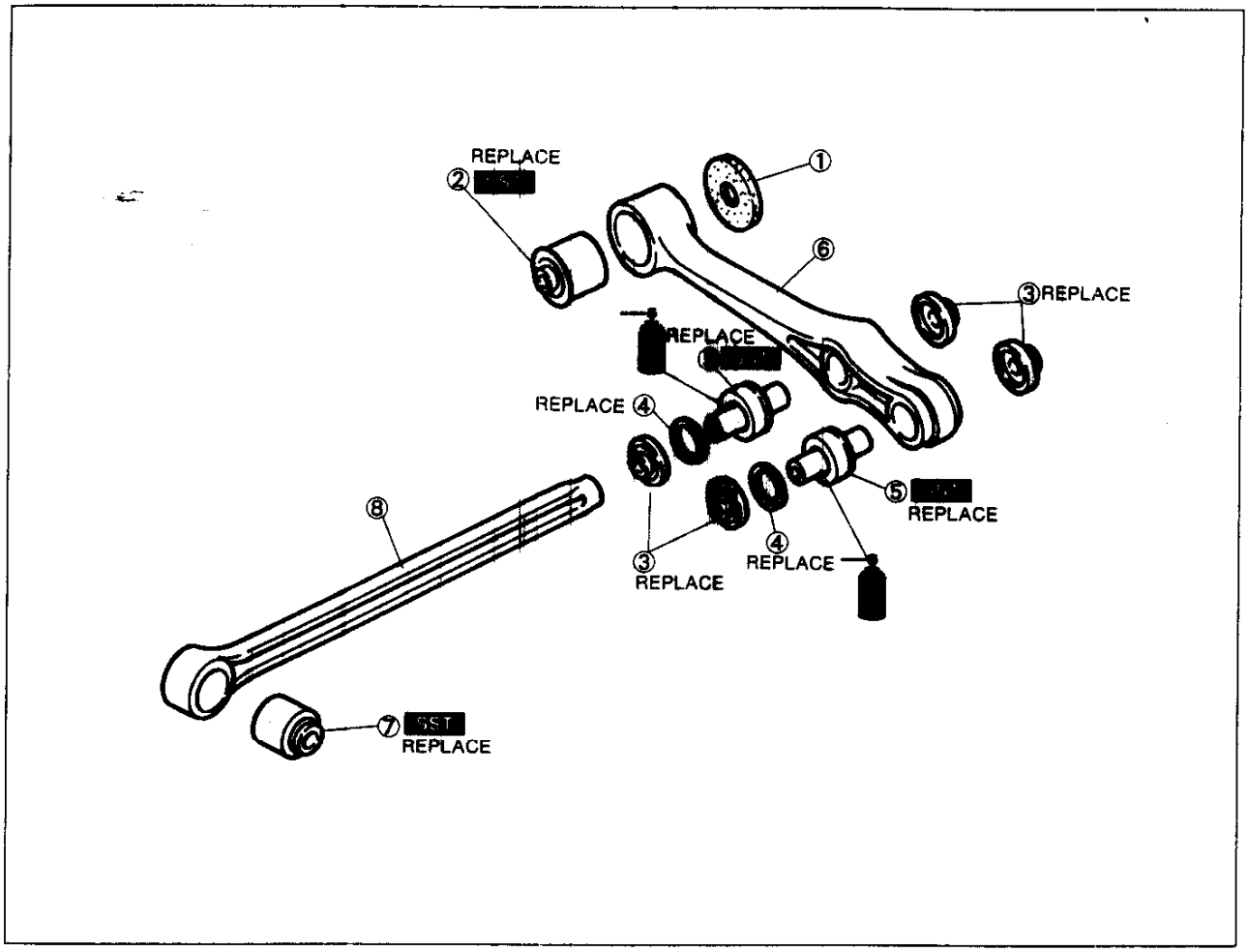
1. Bolt
2. Bolt, nut
3. Trailing link
   - Inspect for damage and cracks
   - Inspect bushing for wear and deterioration
   - Disassembly / Inspection / Assembly ..... page R–37
4. Nut
   - Removal Note ..... page R–20
   - Installation Note ... page R–20
5. Cam plate
   - Removal Note ..... page R–20
   - Installation Note ... page R–20
6. Adjusting cam bolt
   - Installation Note ... page R–20
7. Nut
8. Bolt
9. I-arm
   - Inspect for damage and cracks
   - Inspect bushing for wear and deterioration
   - Disassembly / Inspection / Assembly ..... page R–37

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**.

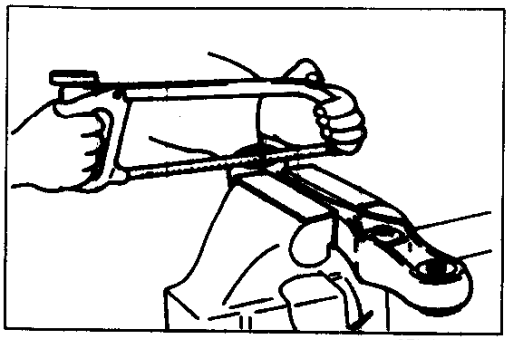
Caution

- **When holding a part in a vise, use protective plates in the jaws to prevent damage to the part.**



37U0RX-067

1. Stopper
2. Pillow ball bushing
   Disassembly Note ... below
   Assembly Note .... page R-39
3. Rubber seal
4. Retaining ring
5. Pillow ball
   Disassembly Note
   ..... page R-38
   Assembly Note .... page R-39
6. I-arm
   Inspect for damage and cracks
7. Bushing
   Disassembly Note
   ..... page R-38
   Assembly Note .... page R-38
8. Trailing link
   Inspect for damage and cracks



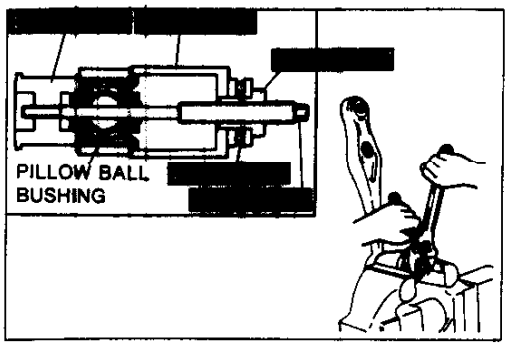
37U0RX-068

Disassembly note
Pillow ball bushing

1. Cut away the flange of the bushing.

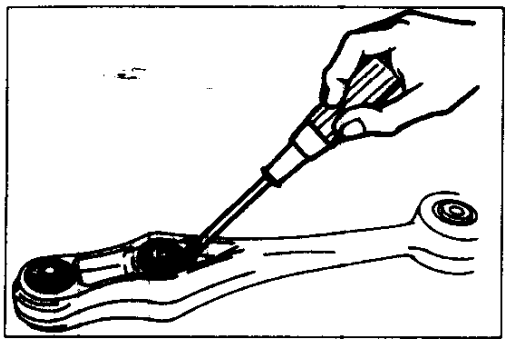
Caution

- **Do not damage the I-arm.**



37U0RX-092

2. Remove the pillow ball bushing by using the **SST**.

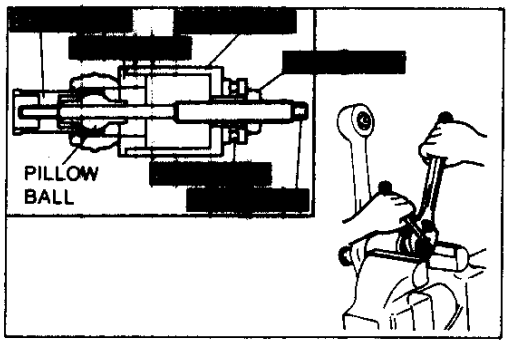

37U0RX-069

Pillow ball

1. Remove the rubber seal by using a screw driver as shown.

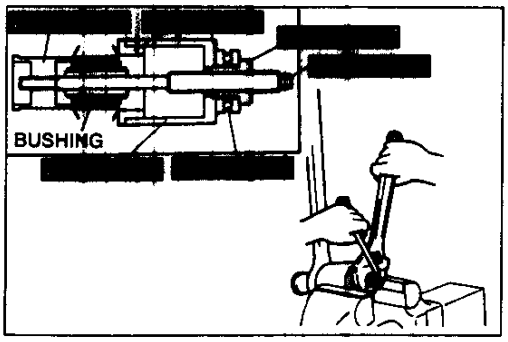
Caution
- **Do not damage the I-arm.**

2. Remove the retaining ring.



37U0RX-093

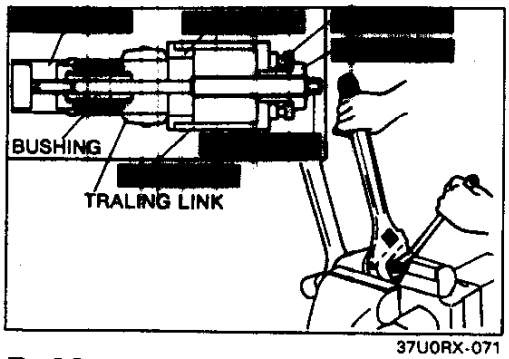
3. Remove the pillow ball by using the **SST**.



37U0RX-070

Bushing

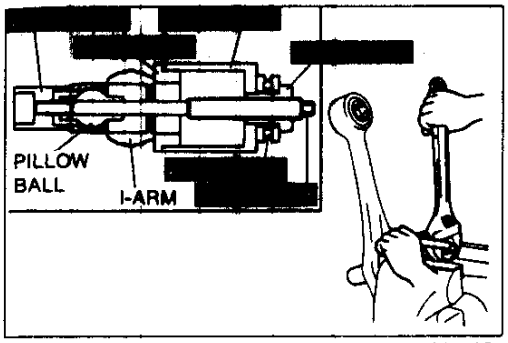
Remove the bushing by using the **SST**.



37U0RX-071

Assembly note
Bushing

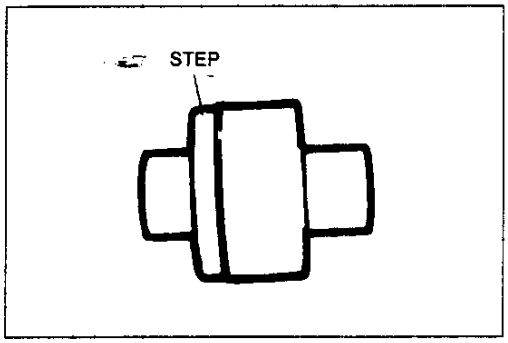
1. Apply soapy water to the new bushing.
2. Install the bushing by using the **SST**.



37U0RX-072

Pillow ball

1. Install the new pillow ball by using the **SST**.

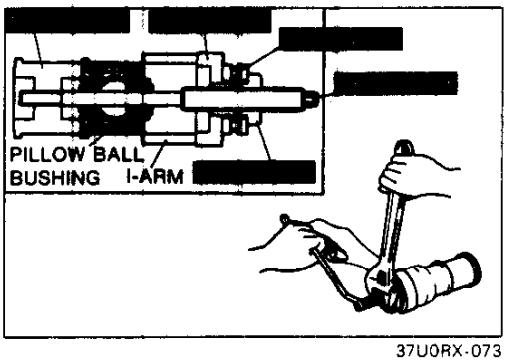


37U0RX-094

Note

- **Install the pillow ball with the step facing into the I-arm.**

2. Install the retaing ring.
3. Fill the space between the pillow ball and rubber seal with grease.
4. Install the rubber seal.



37U0RX-073

Pillow ball bushing

1. Apply soapy water to the new pillow ball bushing.
2. Install the pillow ball bushing by using the **SST**.

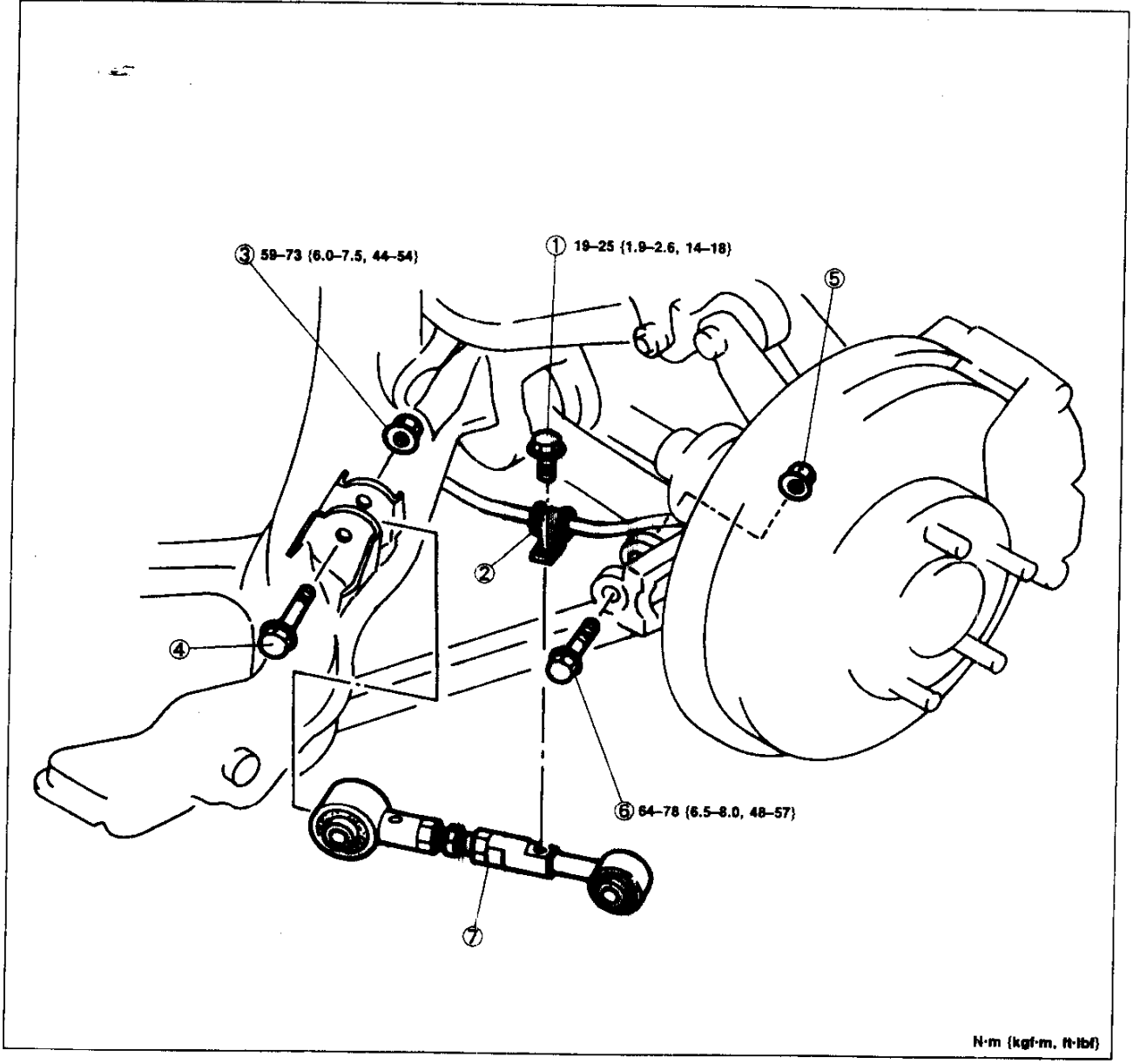
TOE-CONTROL LINK

Removal / Inspection / Installation

1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove the wheel and tire.
3. Remove in the order shown in the figure.
4. Inspect all parts and repair or replace as necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Install the wheel and tire.

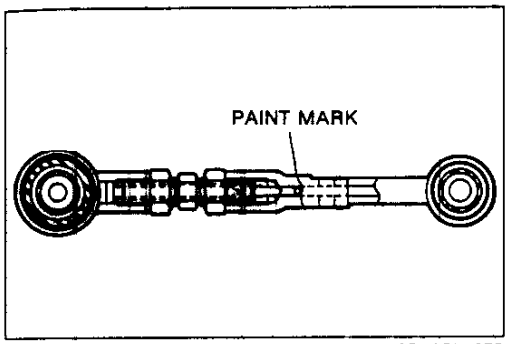
   Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–87 ft·lbf}

7. Check the rear wheel alignment. (Refer to page R–9.)



37U0RX-074

1. Bolt
2. ABS wheel-speed sensor harness
3. Nut
4. Bolt
5. Nut
6. Bolt
7. Toe-control link
   Inspect bushing for wear and deterioration
   Installation Note
   ..... page R–41



37U0RX-075

Installation note
Toe-control link

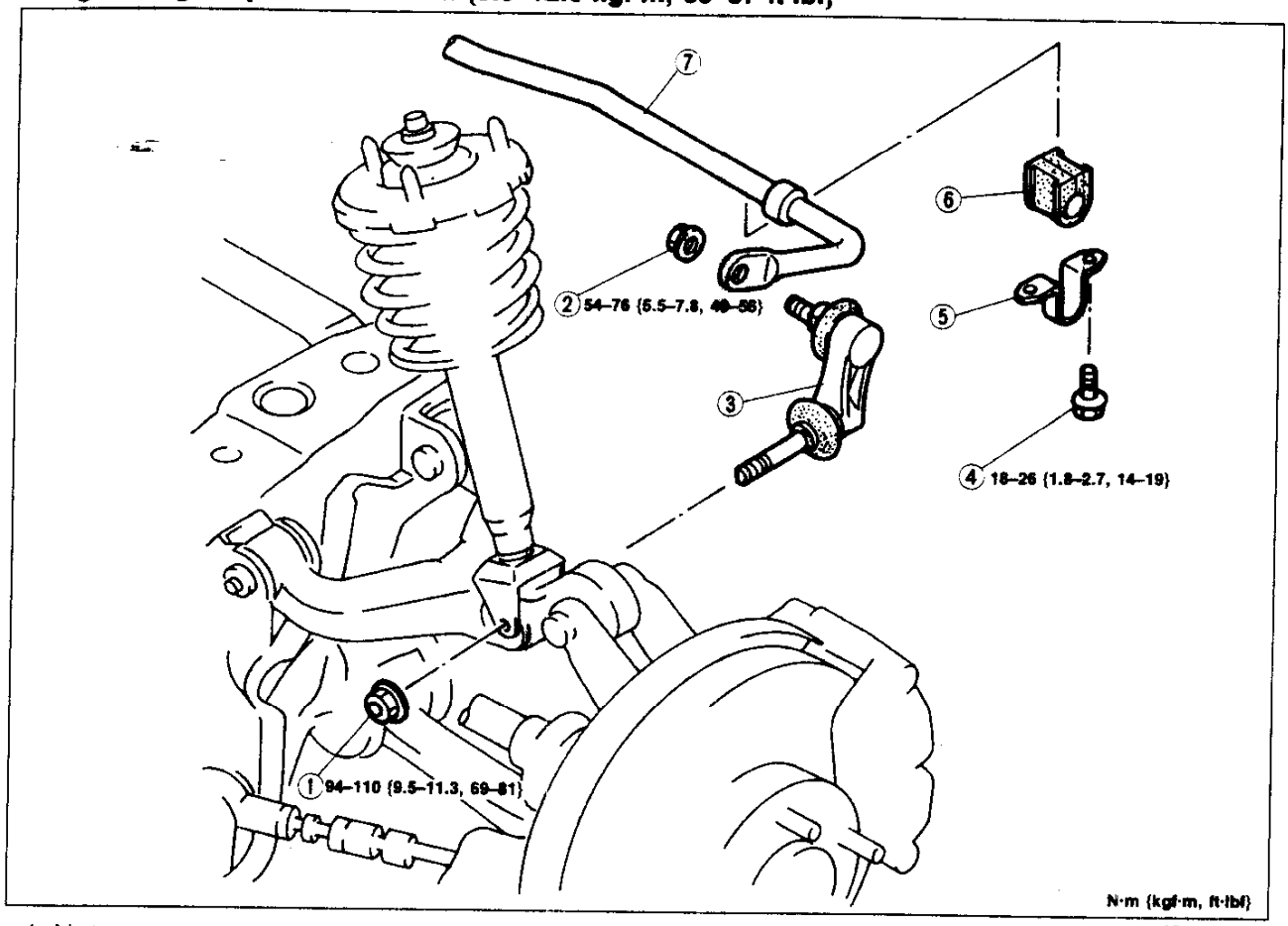
Install the toe-control link with the paint mark facing upward.

REAR STABILIZER

Removal / Inspection / Installation

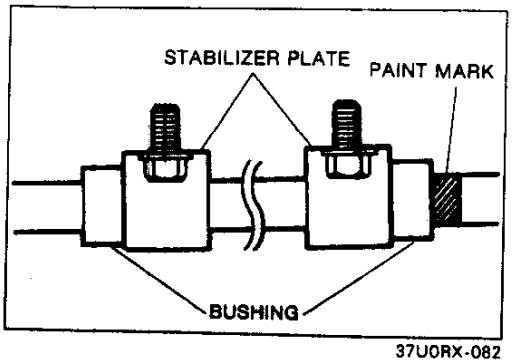
1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove the wheels and tires and the undercover.
3. Remove in the order shown in the figure.
4. Inspect all parts and repair or replace as necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Install the wheels and tires.

Tightening torque: 89–117 N·m {9.0–12.0 kgf·m, 65–87 ft·lbf}



37U0RX-081

1. Nut
2. Nut
3. Stabilizer control link
   Inspect for damage and cracks
   Installation Note
   ..... page R–43
4. Bolt
5. Stabilizer plate
   Inspect for damage and cracks
6. Stabilizer bushing
   Inspect for wear and deterioration
7. Stabilizer bar
   Inspect for damage and bending
   Installation Note
   ..... below



37U0RX-082

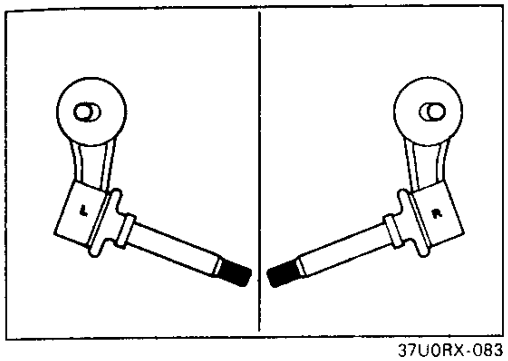
Installation note

Stabilizer bar

Install the stabilizer bar with the white paint mark at the right side.

Note

- **Install the stabilizer bar as shown in the figure.**



37U0RX-083

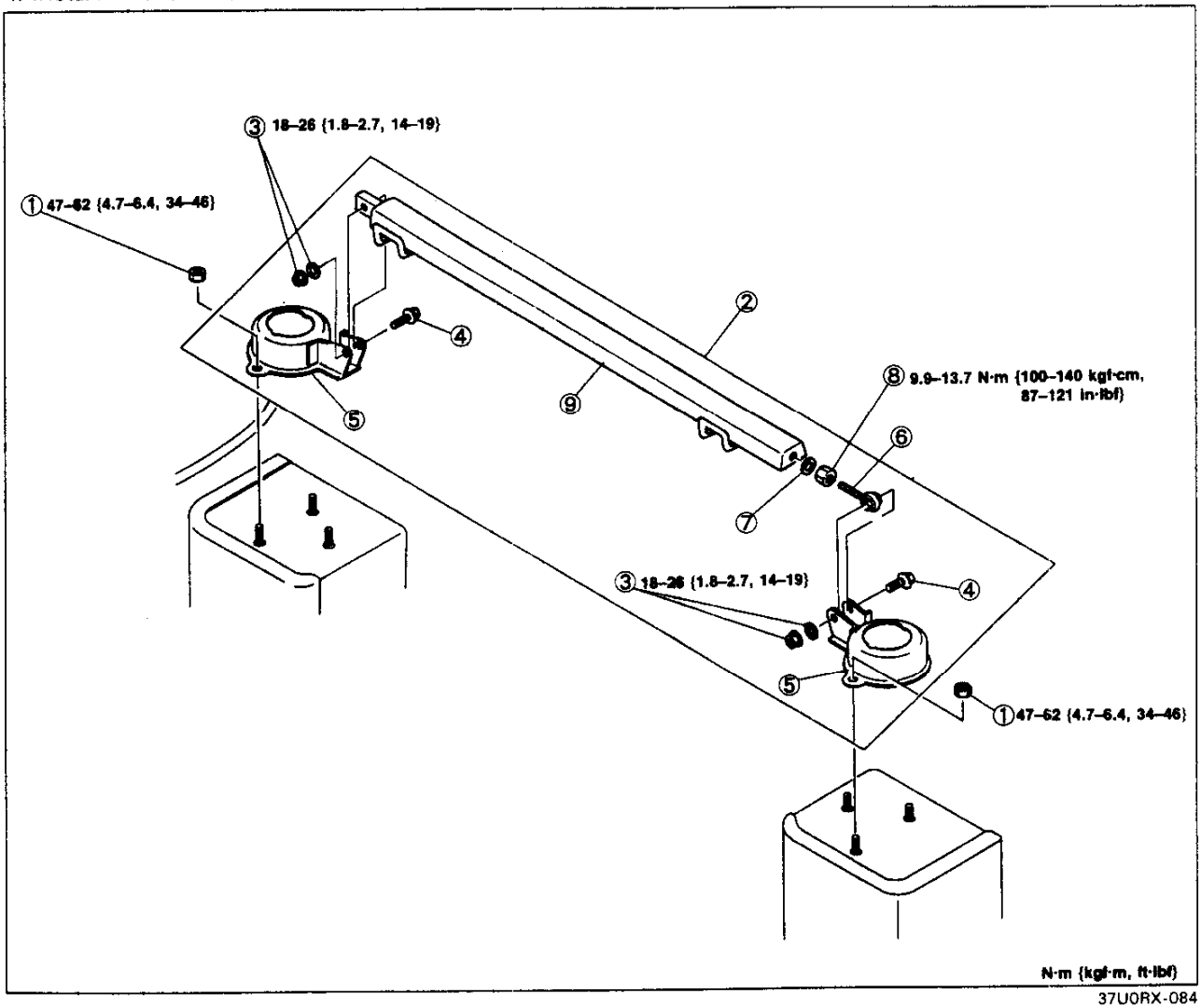
Stabilizer control link

Install the stabilizer control links with the R (right) and L (left) marks as shown.

REAR STRUT BAR

Removal / Inspection / Installation

1. Remove the suspension tower cover. (Refer to Section S.)
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.



37U0RX-084

1. Nut
2. Strut bar assembly
3. Nut, washer
4. Bolt
5. Strut plate
6. Joint A
7. Washer
8. Nut
9. Rear strut bar
   Inspect for damage and bending

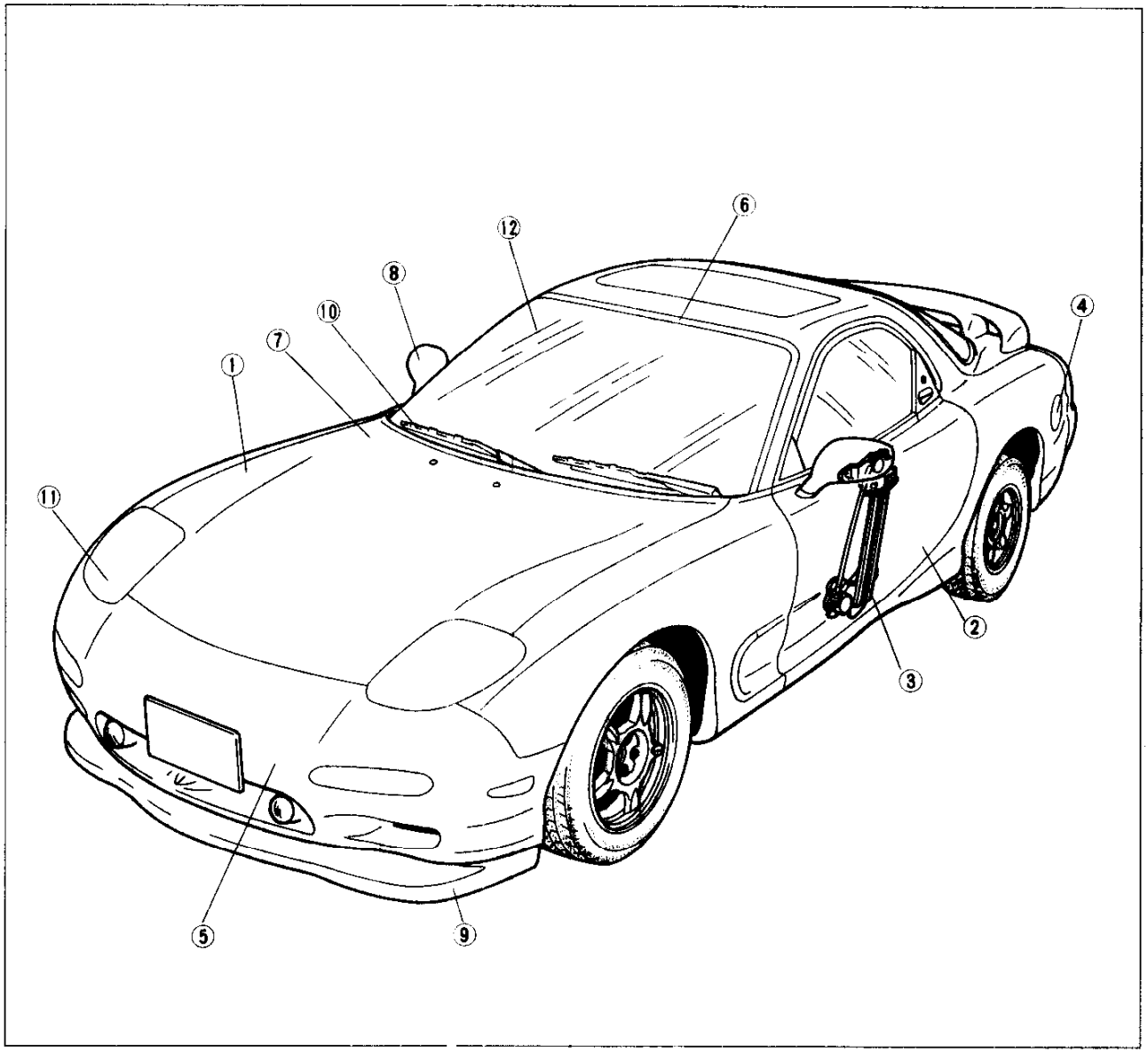
Before beginning any service procedure, refer to the 1993 RX-7 Body Electrical Troubleshooting Manual; Section S for air bag system precautions and J1 for audio anti-theft system precautions.

BODY

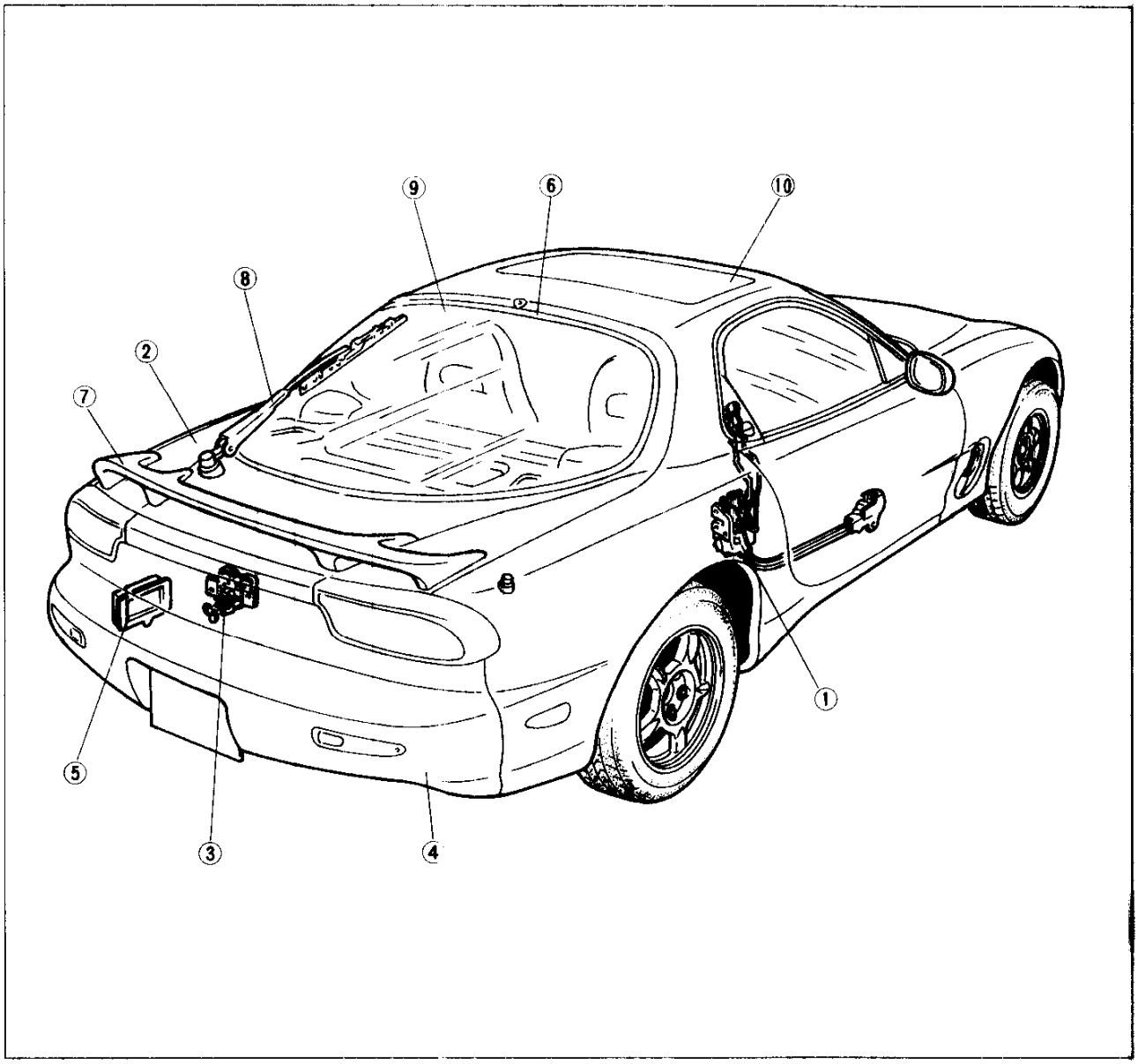
37U0SX-600

NOTE: Refer to the 1993 RX-7 Body Electrical Troubleshooting Manual (No. 1312-10-91L) for servicing of the body electrical components.

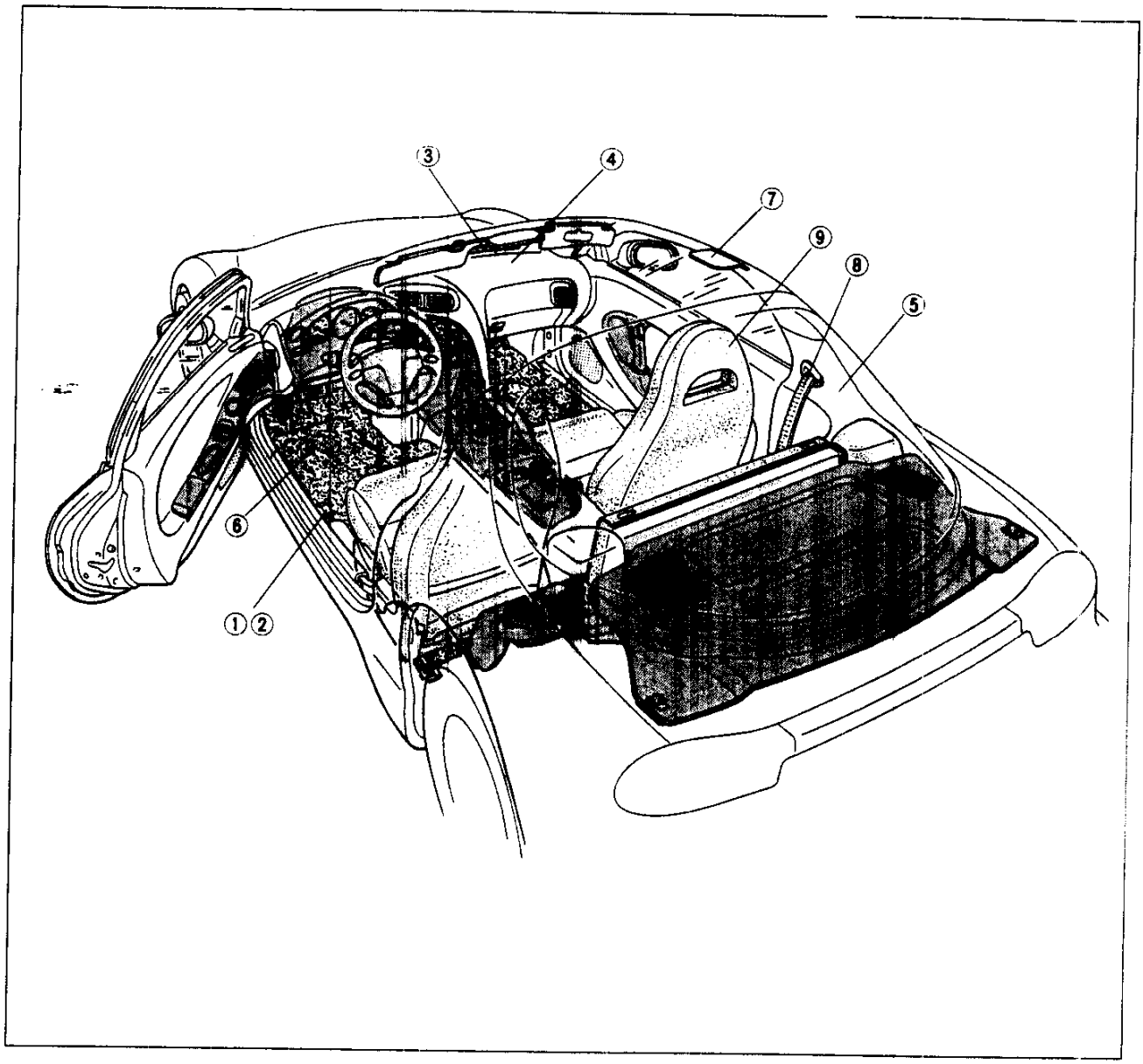
INDEX



37U0SX-689



37U0SX-601



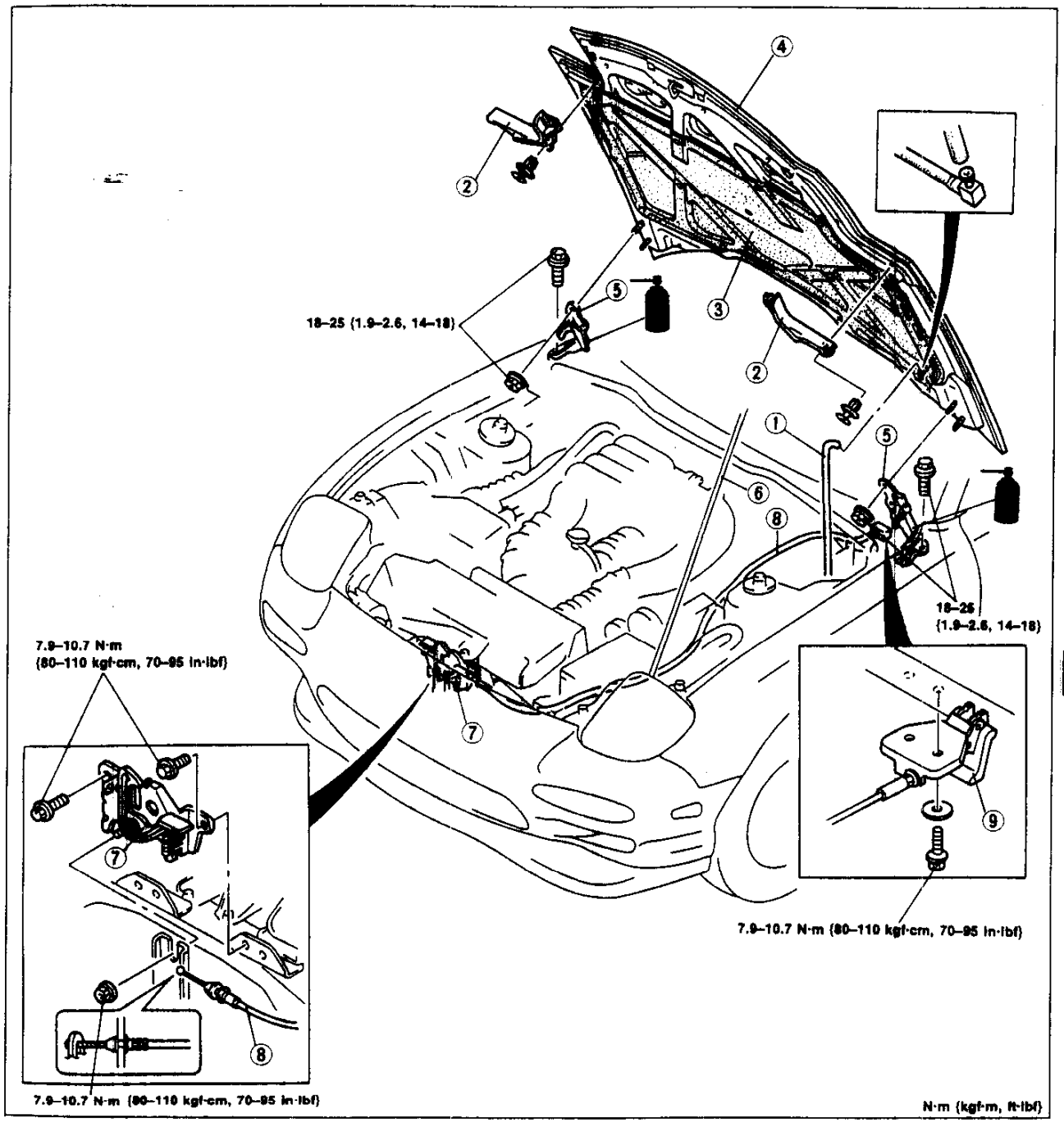
37U0SX-602

HOOD

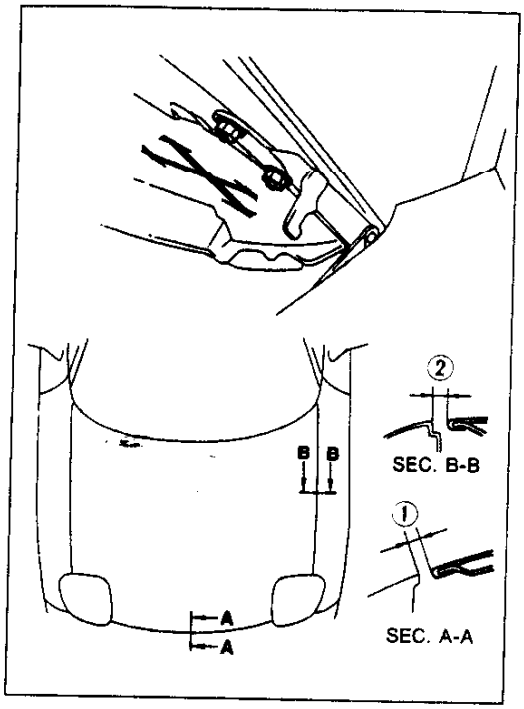
COMPONENTS

Removal / Installation

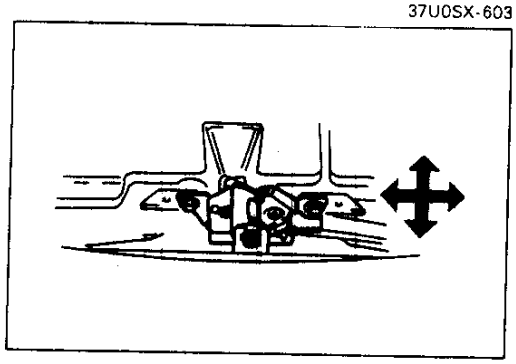
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Washer pipe
2. Protector
3. Hood insulator
4. Hood
   Adjustment ..... page S–6
5. Hinge
6. Stay
7. Lock assembly
   Adjustment ..... page S–6
8. Release cable
9. Hood release Konb



37U0SX-603



37U0SX-604

Adjustment
Hood

Adjust the hood laterally or vertically by loosening the hood-to-hinge mounting nuts and repositioning the hood.

Clearance: (1) 4.0 ± 1.0 mm {0.16 ± 0.04 in}
(2) 4.5 ± 1.0 mm {0.18 ± 0.04 in}

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

Lock assembly

1. Adjust the lock assembly after the hood has been aligned.
2. Loosen the lock mounting bolts and nut, and align the lock with the striker on the hood.

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

DOOR

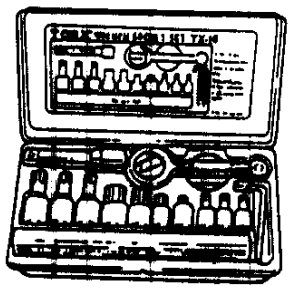
PREPARATION

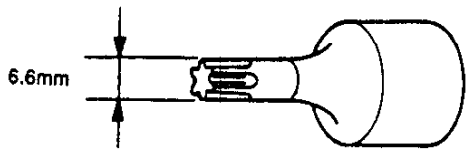
TORX tool (T40)	For installation / removal of door lock striker

1PE0SX-009

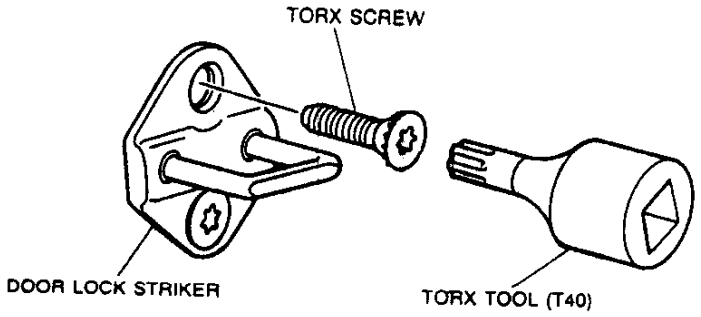
TORX TOOL (T40)

1. ILLUSTRATION





2. USAGE



1PE0SX-010

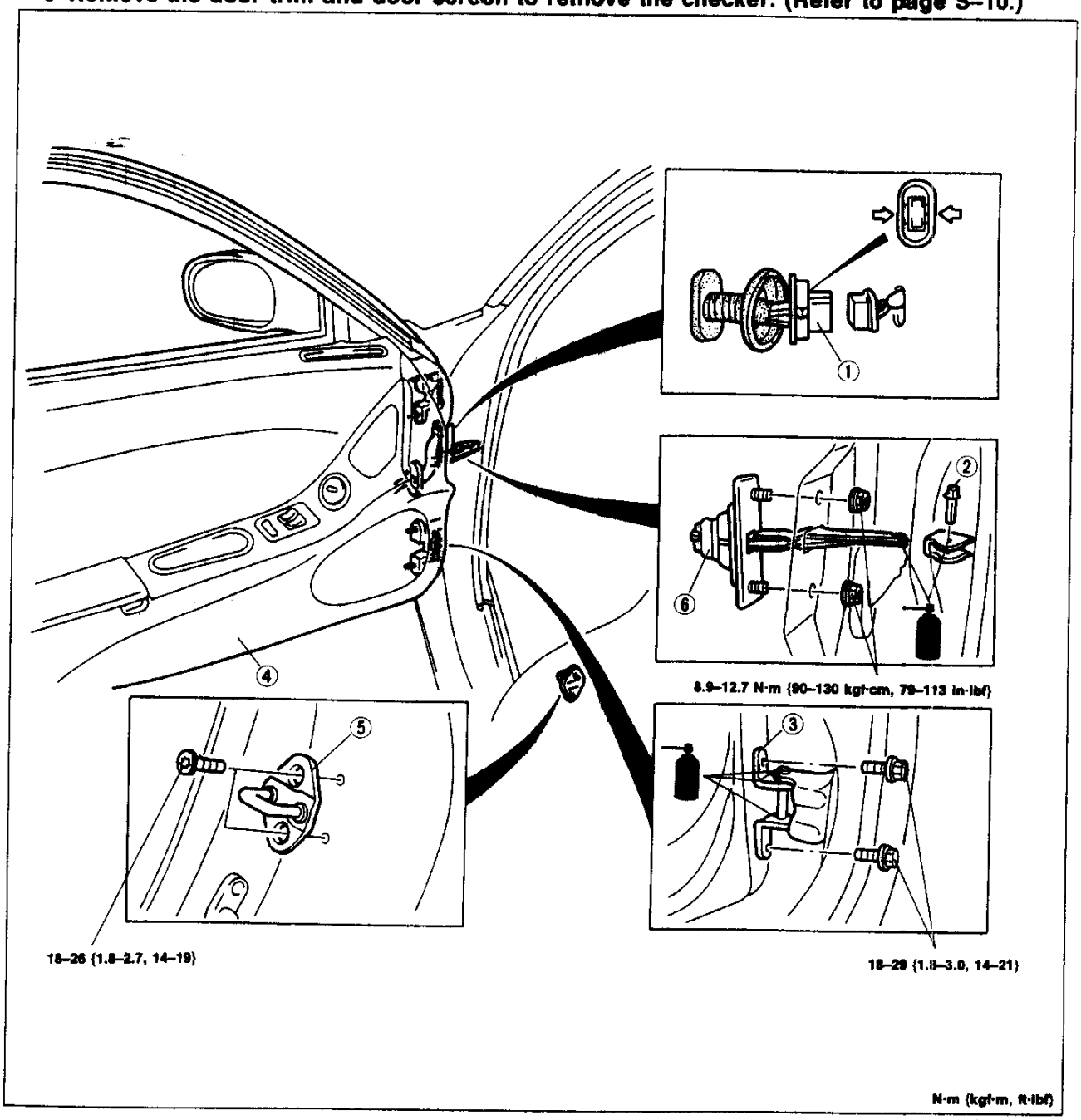
COMPONENTS

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.

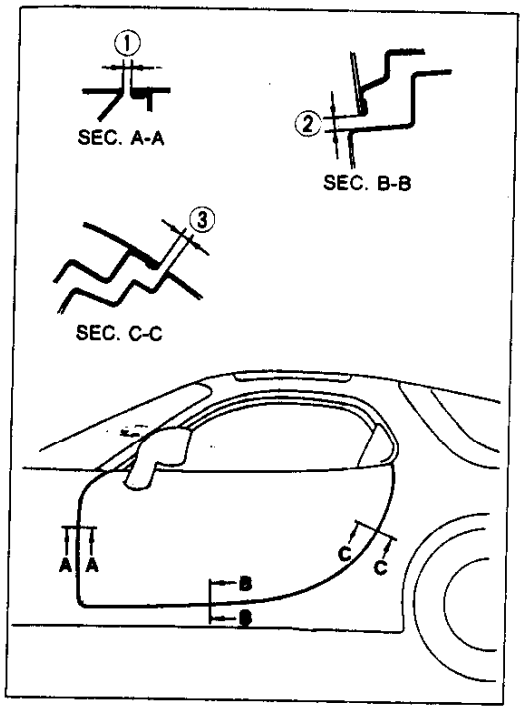
Note

- **Remove the door trim and door screen to remove the checker. (Refer to page S–10.)**

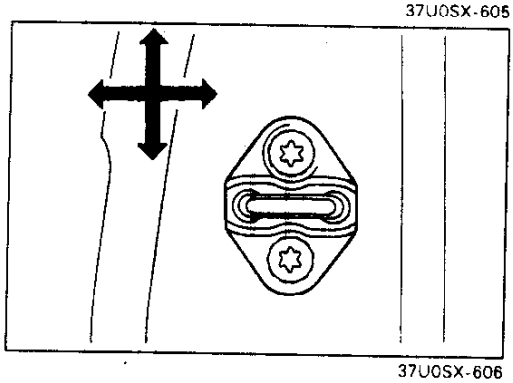


2PU0SX-008

1. Harness connector
2. Checker pin
3. Door hinge
4. Door
   Adjustment ..... page S–9
5. Door lock striker
   Adjustment ..... page S–9
6. Checker



37U0SX-605



37U0SX-606

Adjustment

Door

Adjust the door laterally or vertically by loosening the door-hinge-to-body mounting bolts and repositioning the door.

Clearance: (1) 4 ± 1 mm {0.2 ± 0.04 in}
(2) 6 ± 2 mm {0.3 ± 0.07 in}
(3) 4 ± 1 mm {0.2 ± 0.04 in}

Tightening torque:
18–29 N·m {1.8–3.0 kgf·m, 14–21 ft·lbf}

Door lock striker

1. Verify that the door can be closed easily and that there is no looseness. If there is a problem, loosen the striker mounting screws and move the striker horizontally or vertically.
2. Verify the rear offset of the door to the body. If there is a problem, move the door lock striker vertically.

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

WINDOW REGULATOR, GLASS AND GUIDE

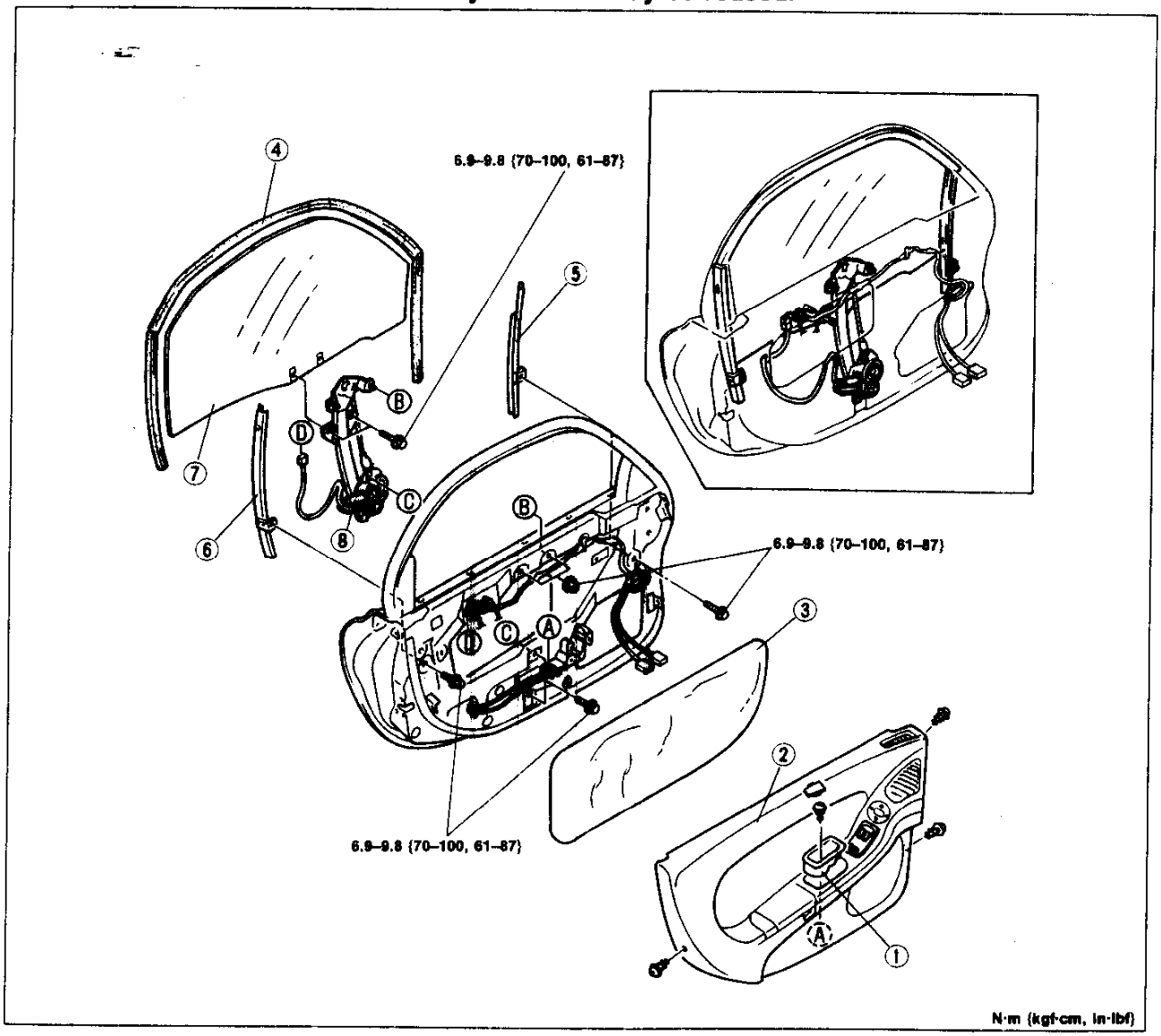
COMPONENTS

Removal / Installation

1. Lower the door glass **200 mm {0.79 in}** from the fully raised position.
2. Disconnect the negative battery cable.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.

Caution

- **Remove the door screen carefully so that it may be reused.**



1. Inner handle cover
2. Door trim
   Removal / Installation ..... page S–56
3. Door screen
4. Glass run channel
5. Glass guide A
6. Glass guide B
7. Door glass
8. Power window regulator

DOOR LOCK AND OPENER

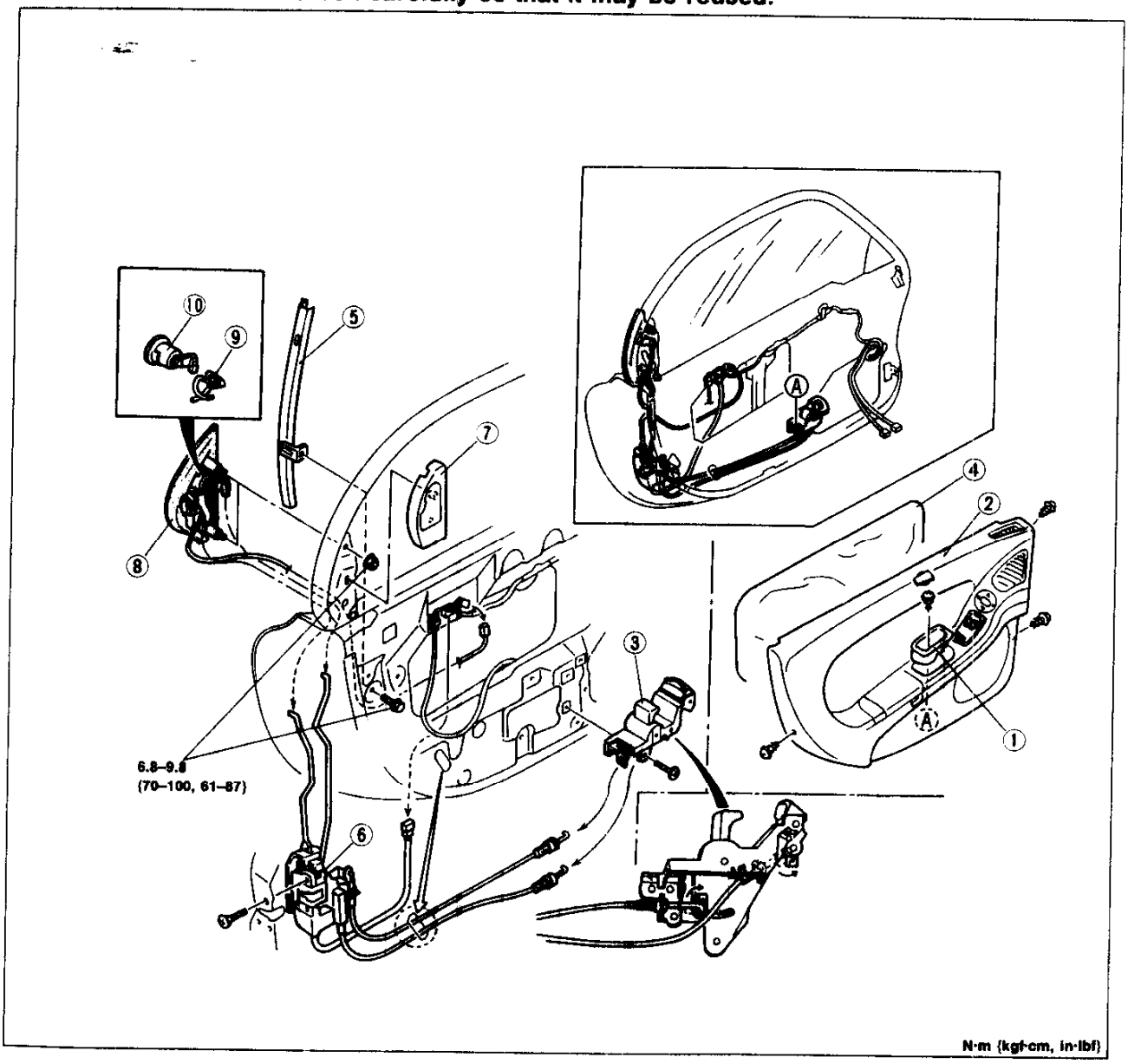
COMPONENTS

Removal / Installation

1. Raise the front door glass fully.
2. Disconnect the negative battery cable.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.

Caution

- **Remove the door screen carefully so that it may be reused.**



37U0SX-608

1. Inner handle cover
2. Door trim
   Removal / Installation ..... page S–56
3. Inner handle
4. Door screen
5. Glass guide B
6. Door lock
7. Inner garnish
8. Outer handle
9. Lock cylinder retainer
10. Lock cylinder

REAR HATCH

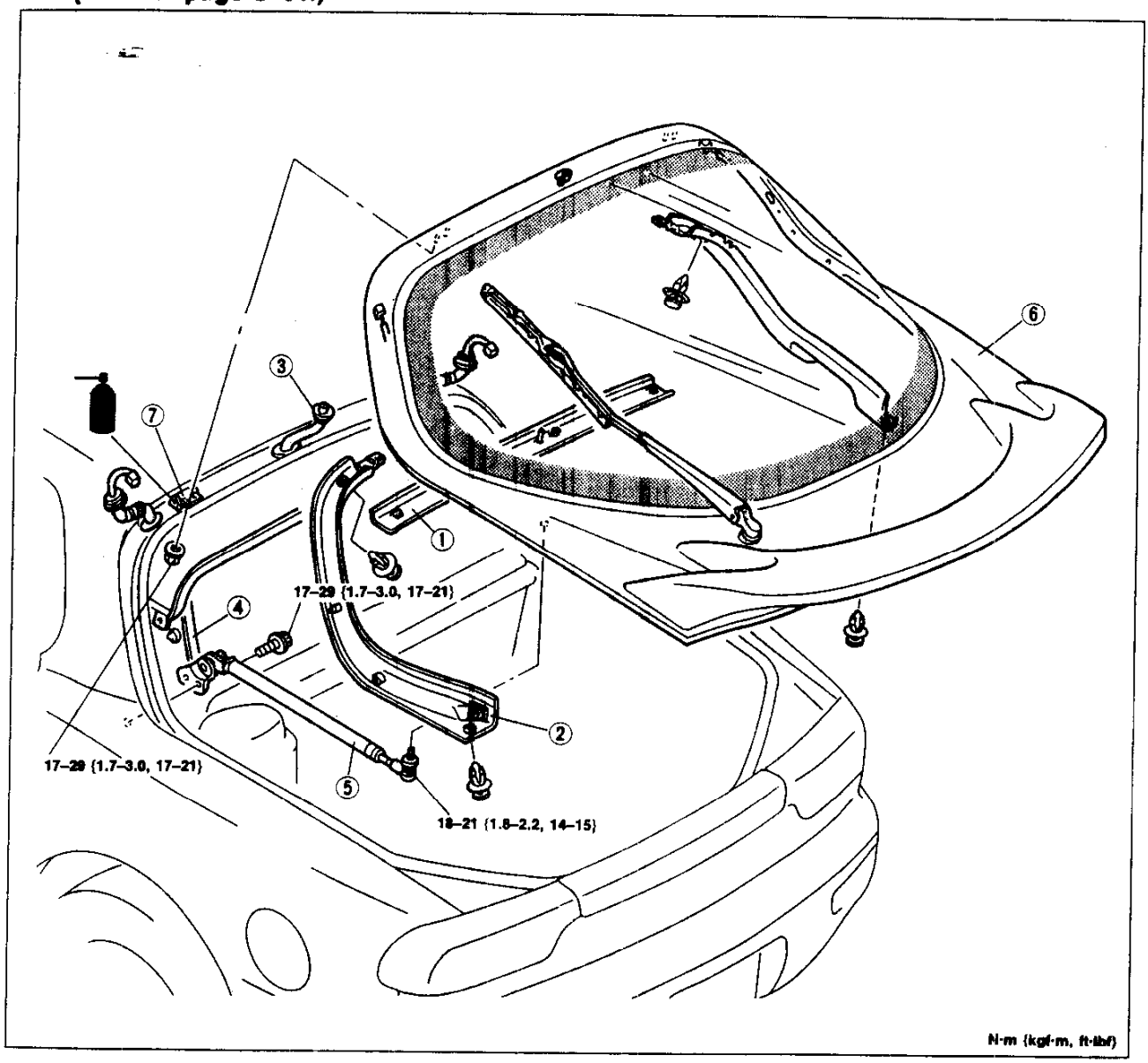
COMPONENTS

Removal / Installation

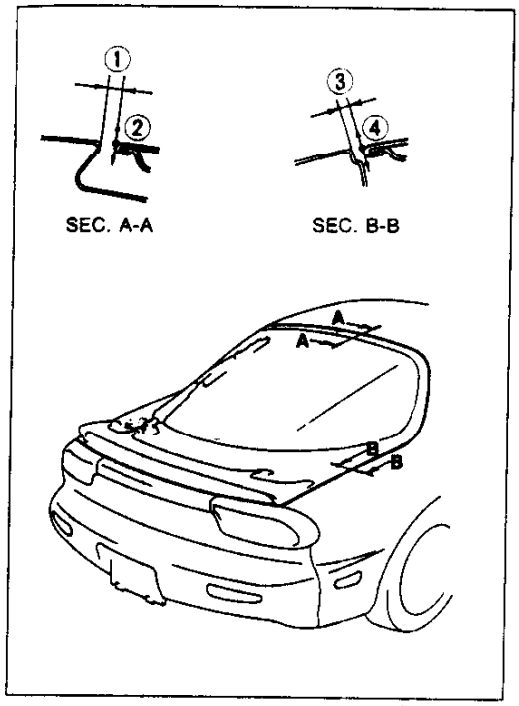
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.

Note

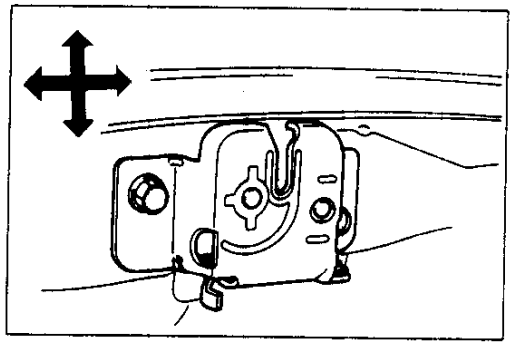
- **Remove the headliner to remove and install the rear hatch hinges. (Refer to page S–61.)**



1. Rear hatch upper trim
   Removal / Installation ..... page S–56
2. Rear hatch side trim
   Removal / Installation ..... page S–56
3. Washer pipe
4. Quarter trim
   Removal / Installation ..... page S–56
5. Stay damper
6. Rear hatch
   Adjustment ..... page S–13
7. Rear hatch hinge



37U0SX-610



37U0SX-611

Adjustment
Rear hatch

Adjust the rear hatch laterally and vertically by loosening the rear-hatch-to-hinge mounting bolts and repositioning the rear hatch.

Clearance: (1) 7 ± 1.5 mm {0.3 ± 0.06 in}
(2) 1 $^{+1.0}_{-1.5}$ mm {0.04 $^{+0.04}_{-0.06}$ in}
(3) 4 ± 2 mm {0.16 ± 0.08 in}
(4) 1 ± 2 mm {0.04 ± 0.08 in}

Tightening torque:
17–29 N·m {1.7–3.0 kgf·m, 17–21 ft·lbf}

Rear hatch lock

1. Adjust the rear hatch lock after the rear hatch has been aligned.
2. Remove the trunk end trim. (Refer to page S–56.)
3. Loosen the rear hatch lock mounting bolts, and align the lock with the striker on the rear hatch.

Tightening torque:
16–22 N·m {1.6–2.3 kgf·m, 12–19 ft·lbf}

REAR HATCH LOCK AND OPENER

PREPARATION

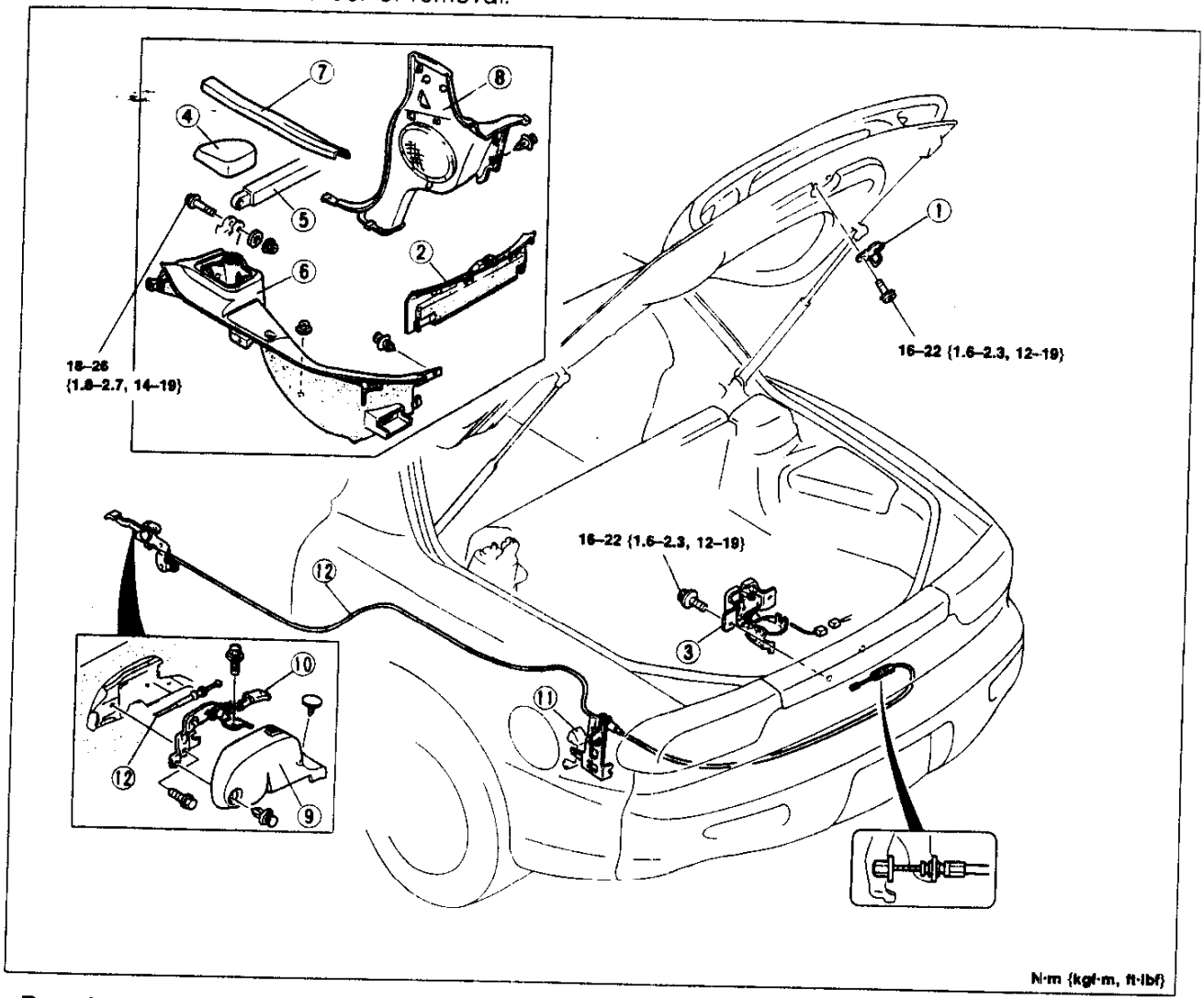
TORX tool (T40)	For installation / removal of rear hatch striker

37U0SX-691

COMPONENTS

Removal / Installation

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



37U0SX-612

Rear hatch lock

1. Rear hatch striker
2. Trunk end trim
   Removal / Installation ..... page S–56
3. Rear hatch lock
   Adjustment ..... page S–13

Rear hatch opener, Rear hatch opener cable

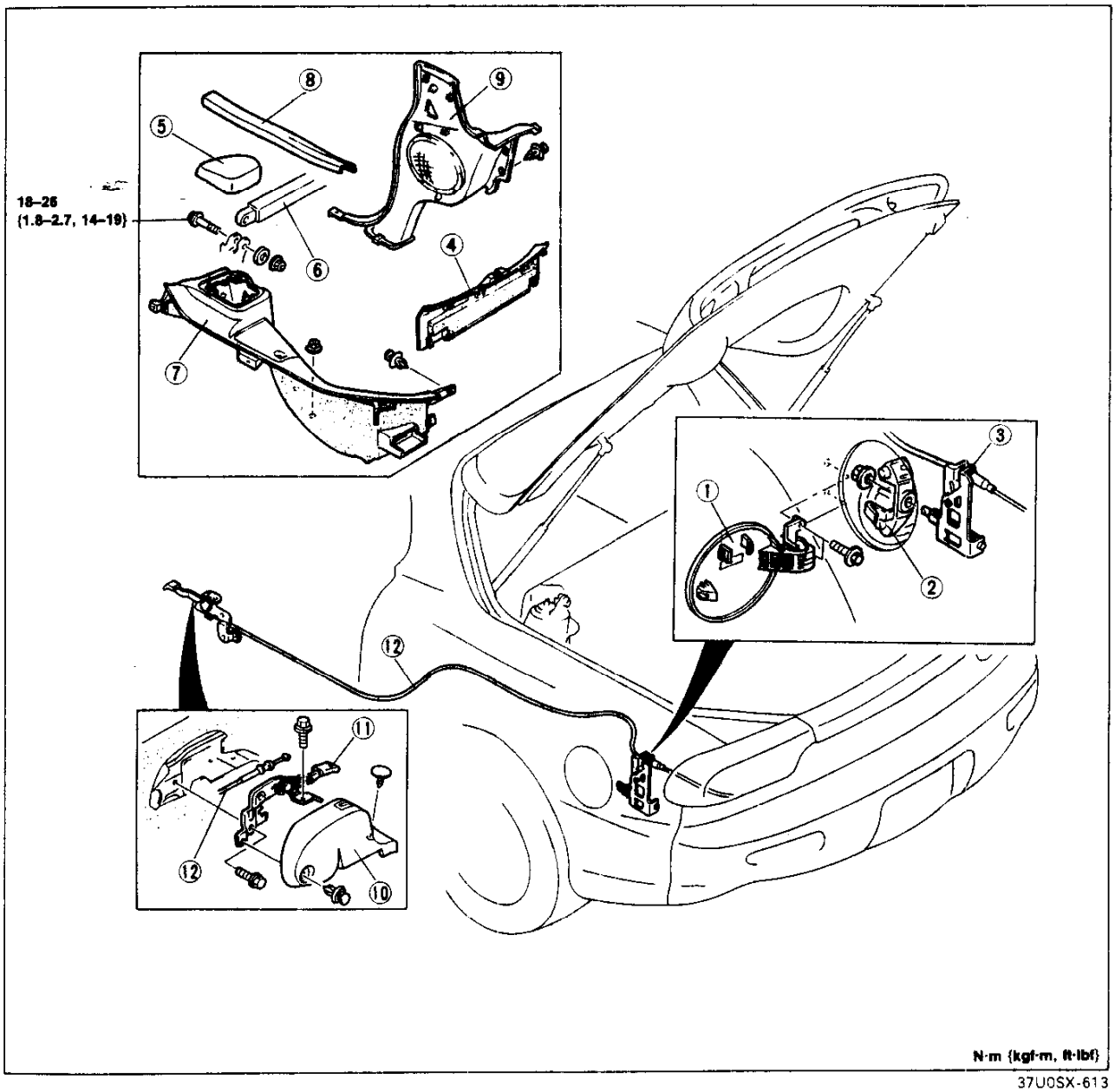
4. Suspension tower cover
5. Suspension rear strut bar
6. Trunk side trim
   Removal / Installation ..... page S–56
7. Scuff plate
   Removal / Installation ..... page S–56
8. Quarter trim
   Removal / Installation ..... page S–56
9. Opener bezel
10. Opener lever
11. Stopper bracket
12. Opener cable

FUEL-FILLER LID AND OPENER

COMPONENTS

Removal / Installation

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



Filler lid

1. Filler lid
2. Stopper bracket
3. Filler lid opener

Filler lid opener, Opener lever, Opener cable

4. Trunk end trim
   Removal / Installation ..... page S–56
5. Suspension tower cover
6. Suspension rear strut bar
7. Trunk side trim
   Removal / Installation ..... page S–56
8. Scuff plate
   Removal / Installation ..... page S–56
9. Quarter trim
   Removal / Installation ..... page S–56
10. Opener bezel
11. Opener lever
12. Opener cable

FRONT BUMPER

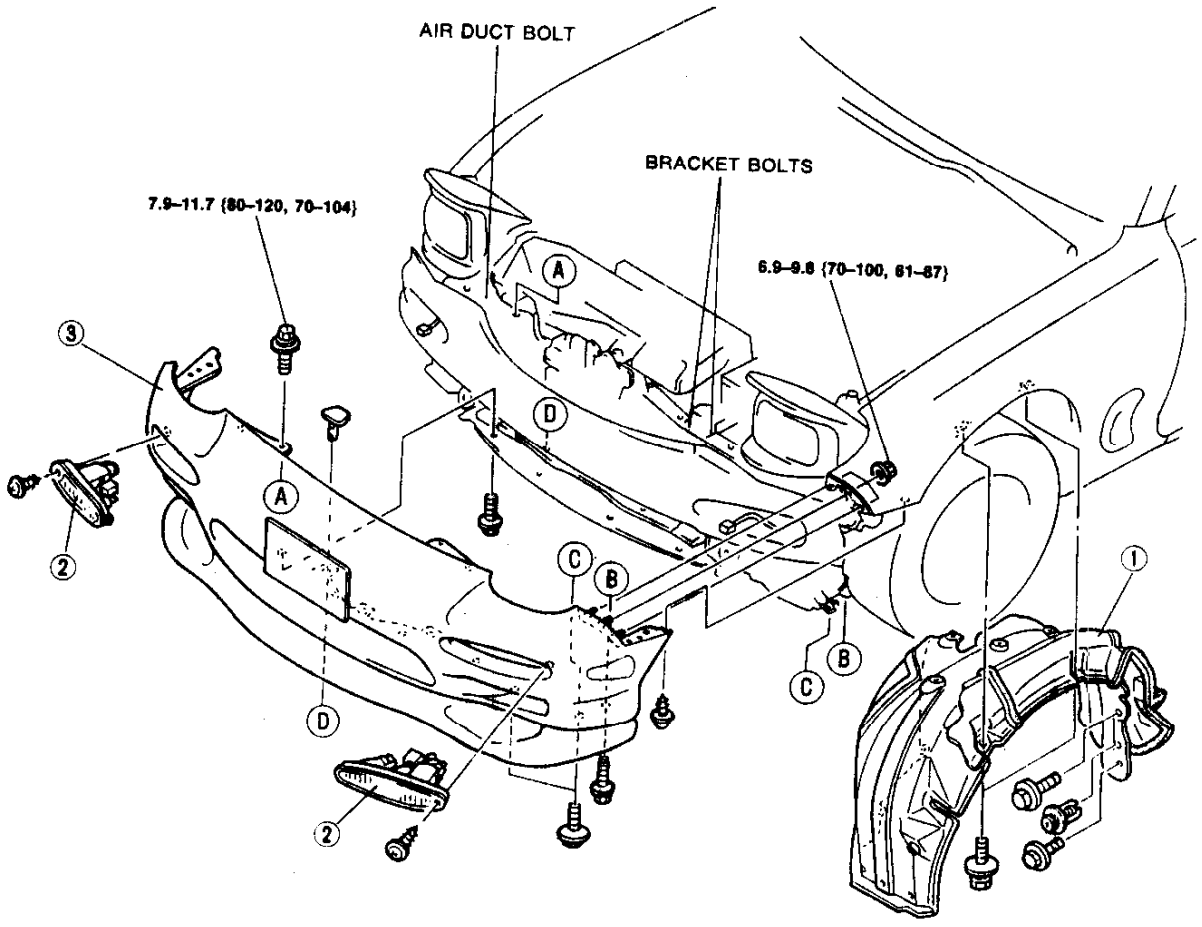
COMPONENTS

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure. (Refer to the 1993 RX-7 Body Electrical Troubleshooting Manual, Section E, when removing the front combination light.)
3. Install in the reverse order of removal.

Note

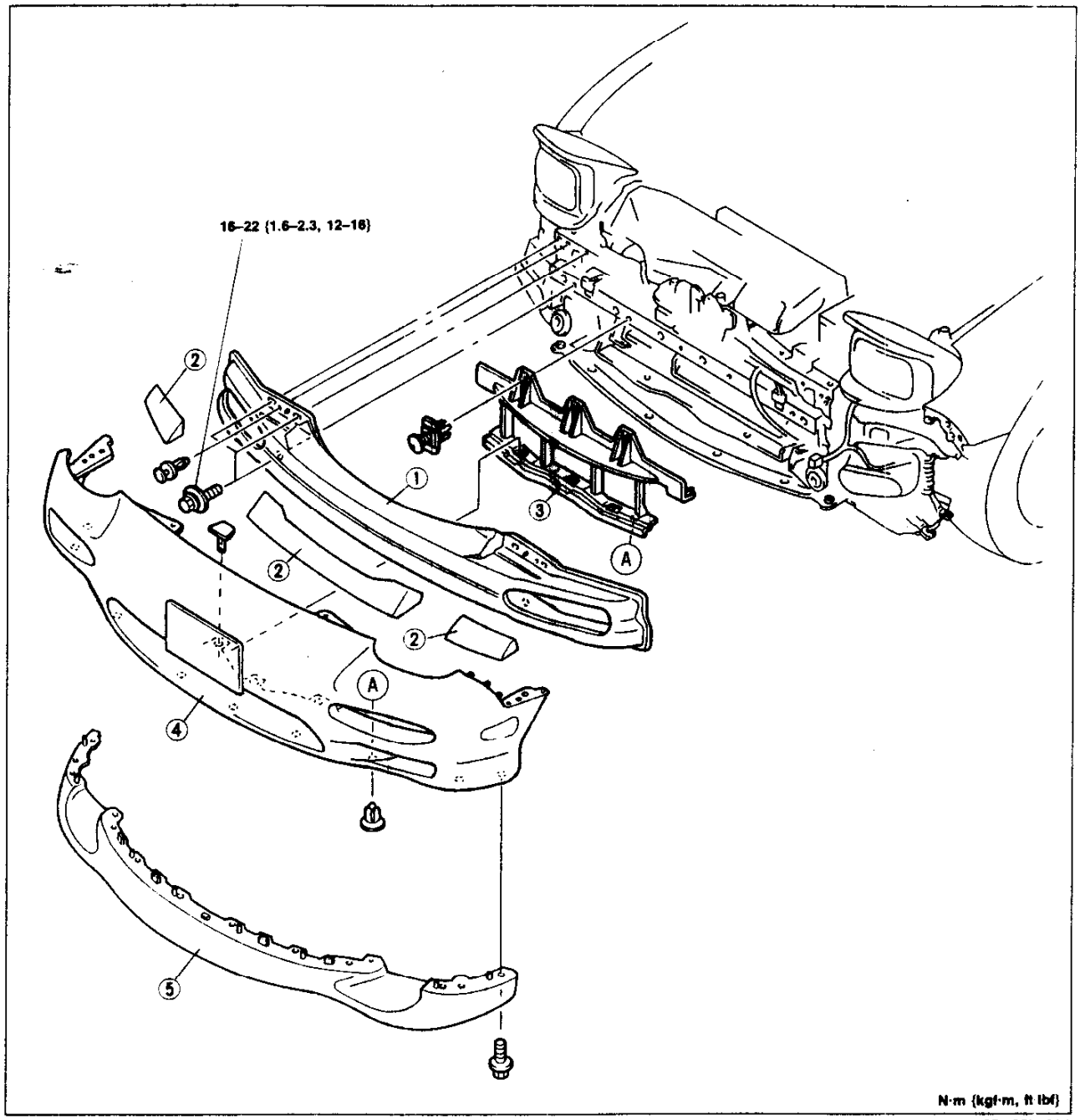
- **Remove the left air duct bolt and receiver / drier bracket bolts to remove the front bumper.**



1. Mud guard
2. Front combination light
3. Front bumper
   Disassembly / Assembly ..... page S–17

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



37U0S[illegible]-616

1. Front bumper reinforcement
2. Support foam
3. Air guide
4. Front bumper fascia
5. Front air dam

REAR BUMPER

PREPARATION

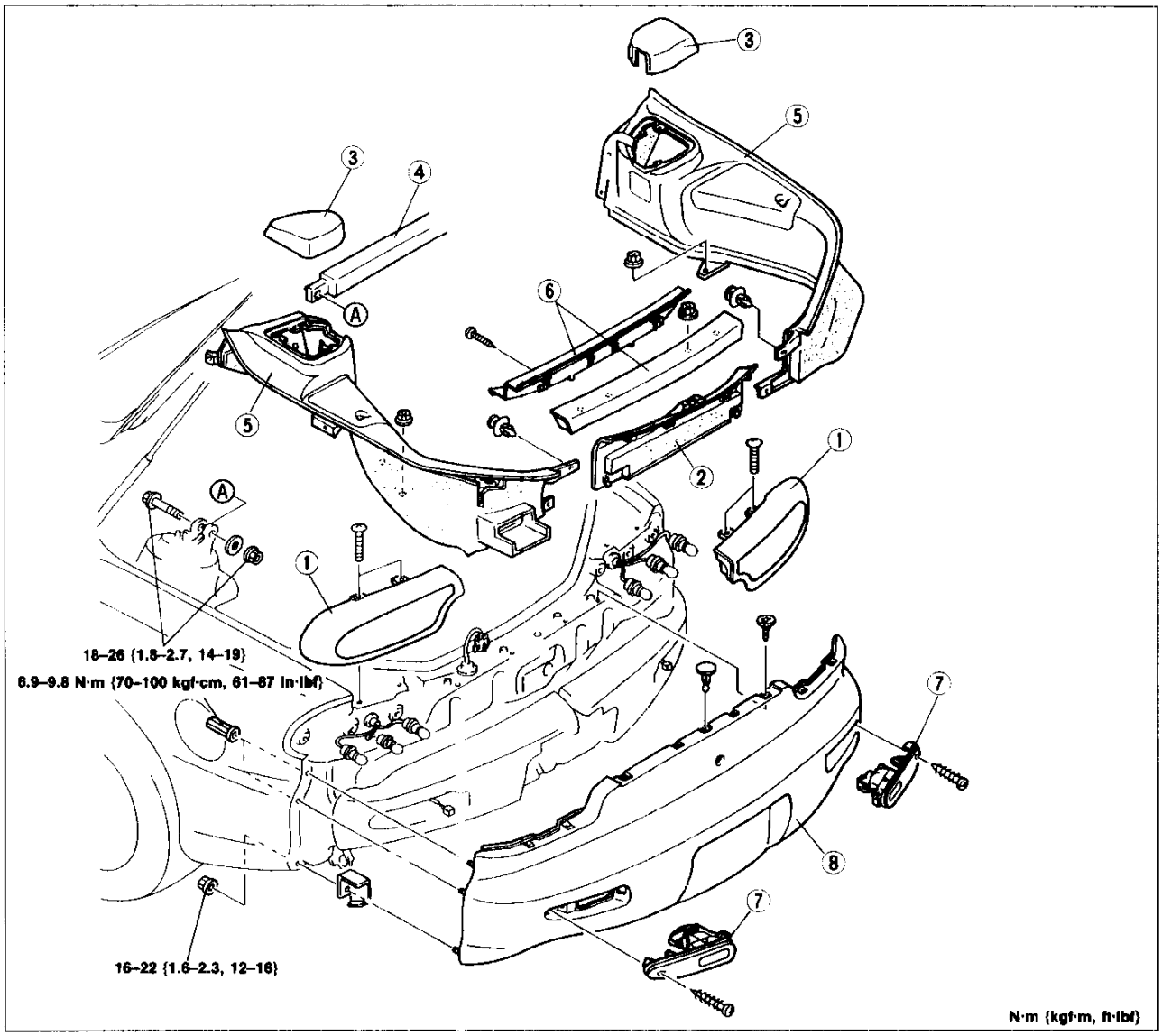
TORX tool (T30)	For installation / removal of rear bumper

37U0SX-689

COMPONENTS

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure. (Refer to the 1993 RX-7 Body Electrical Troubleshooting Manual, Section E, when removing the rear combination light, high-mount stoplight, and back-up light.)
3. Install in the reverse order of removal.

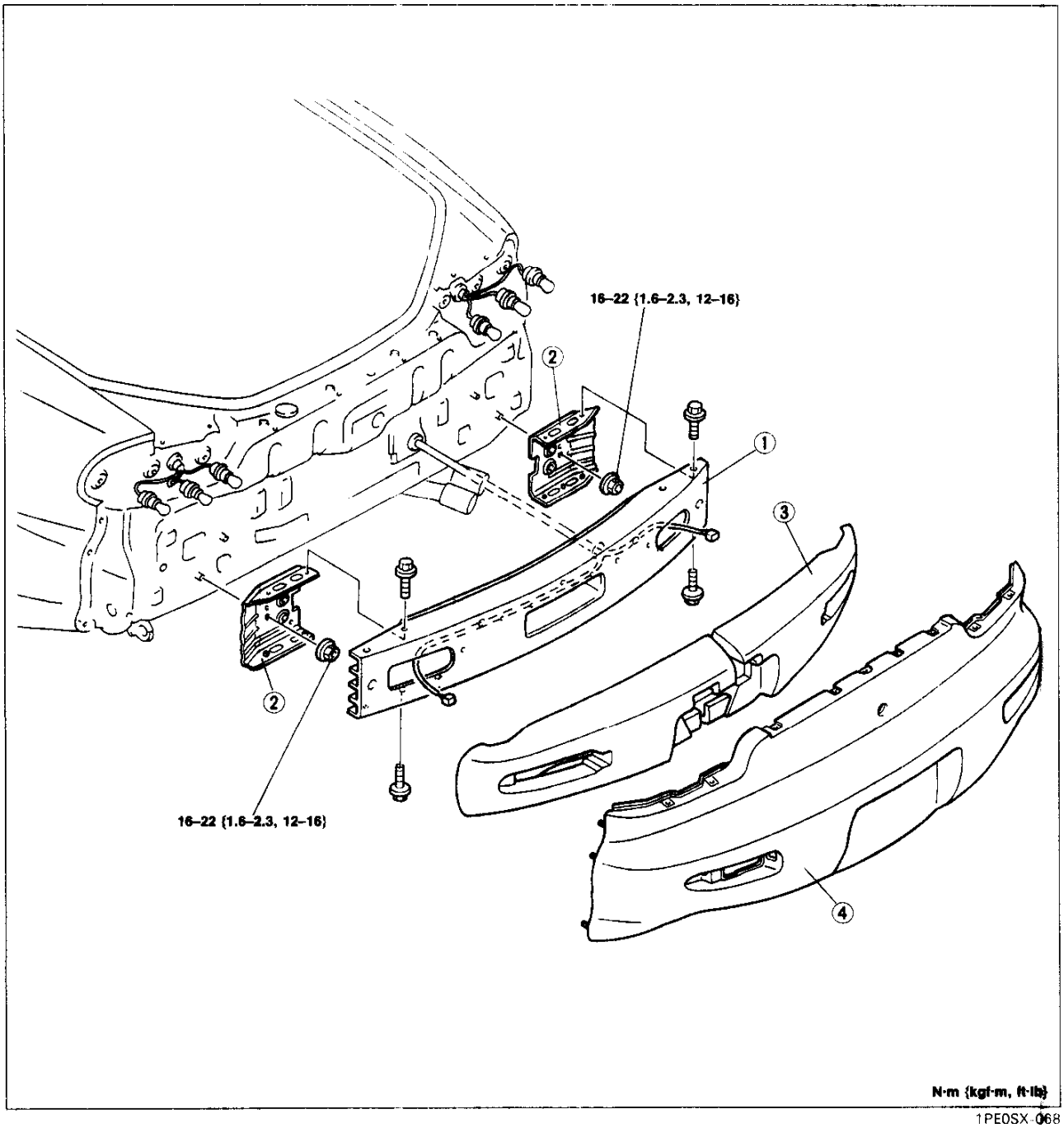


37U0SX-617

1. Rear combination light
2. Trunk end trim
   Removal / Installation ..... page S–56
3. Suspension tower bar
4. Suspension rear strut bar
5. Trunk side trim
   Removal / Installation ..... page S–56
6. High-mount stoplight
7. Back-up light
8. Rear bumper
   Disassembly / Assembly ..... page S–19

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



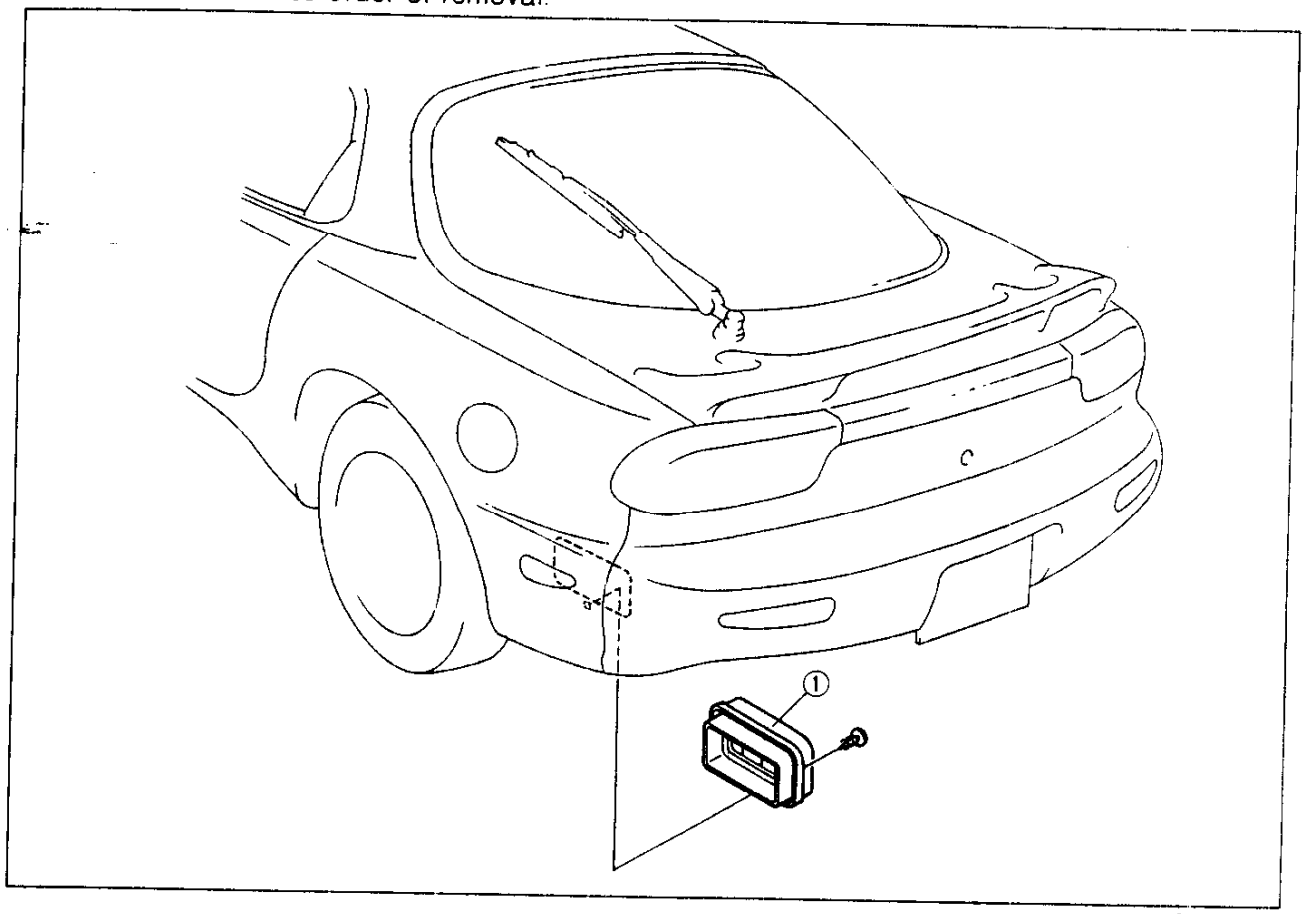
1. Rear bumper reinforcement
2. Rear bumper bracket
3. Energy-absorbing foam
4. Rear bumper fascia

EXTRACTOR CHAMBER

COMPONENTS

Removal / Installation

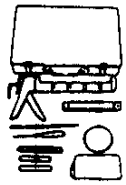
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Extractor chamber

MOLDING

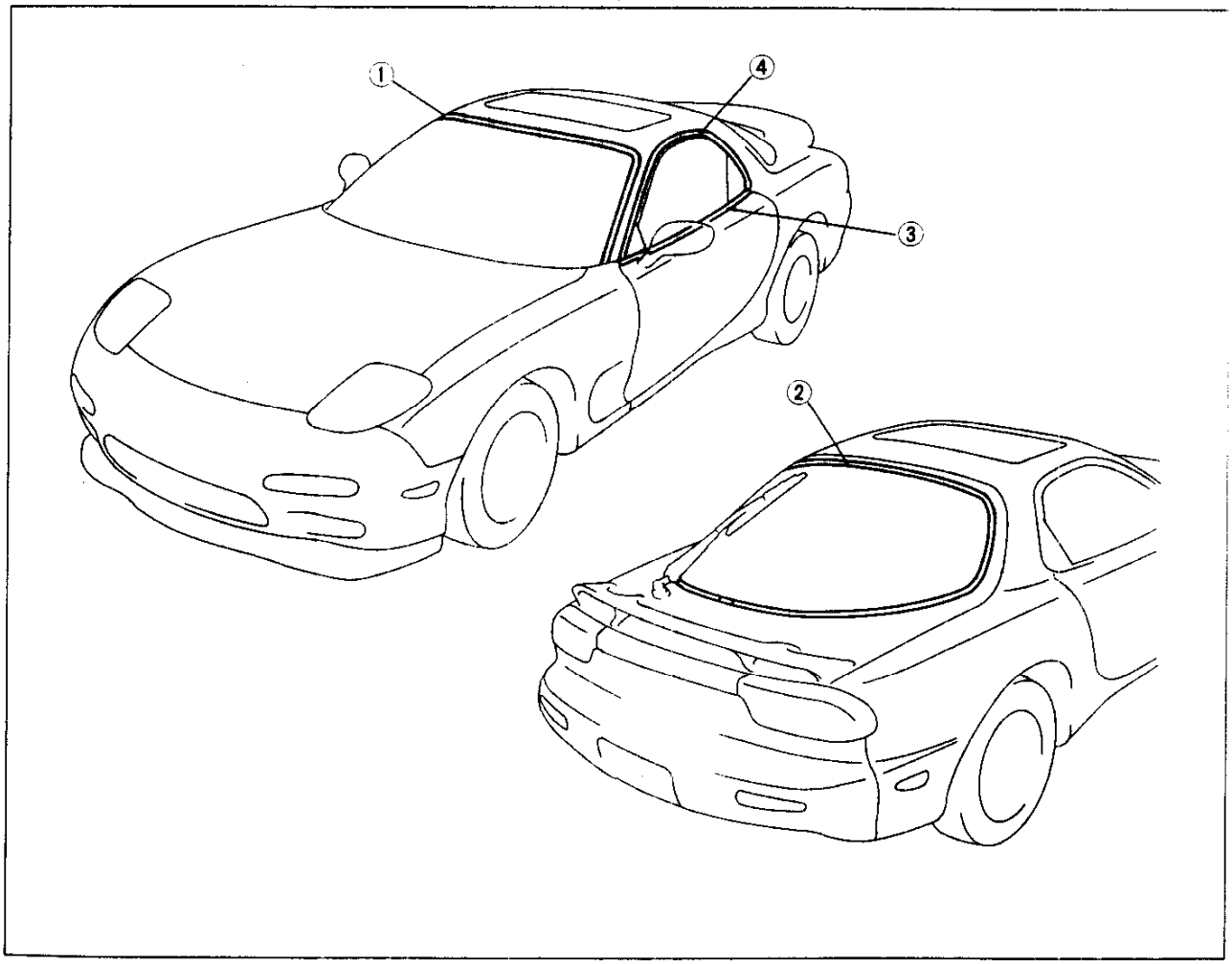
PREPARATION
SST

49 0305 870A Tool set, window 	For removal / installation of molding	49 G050 1A0 Remover, sealant 	For removal of sealant

1PE0SX-331

COMPONENTS
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**.

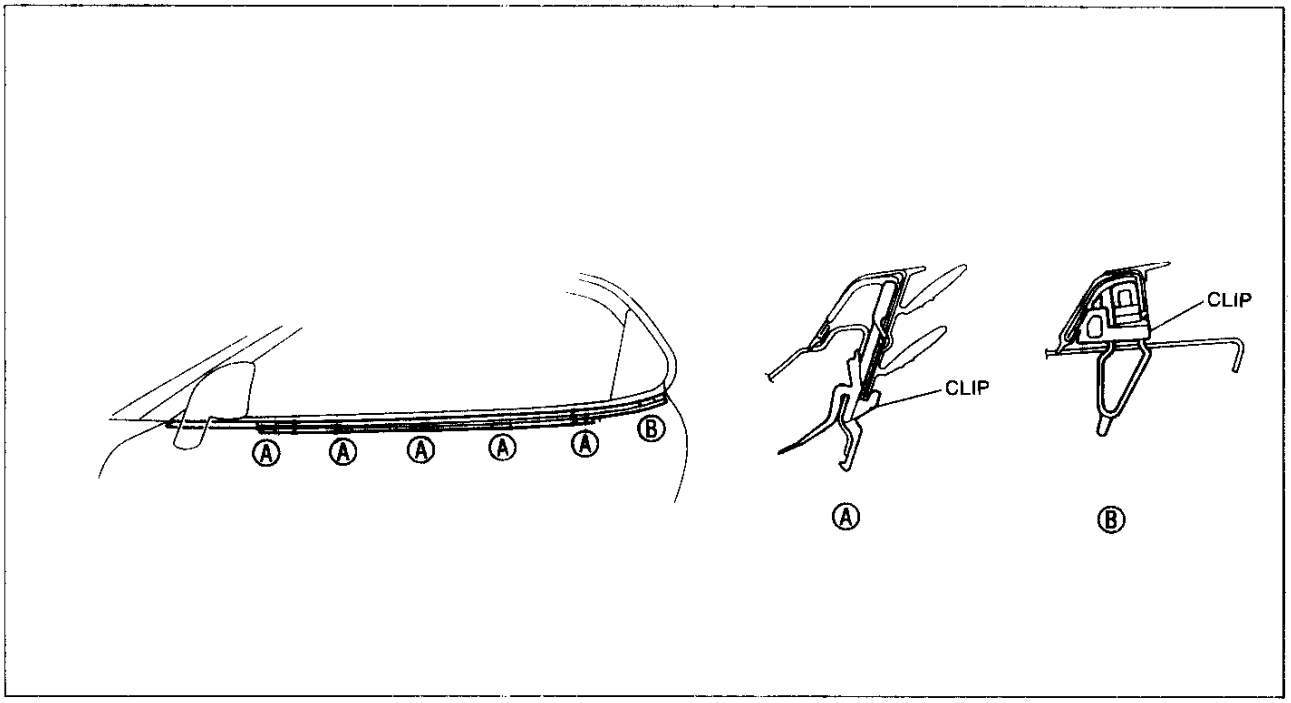


37U0SX-619

1. Windshield molding
   - Removal Note ..... page S–23
   - Installation Note ..... page S–23
2. Rear hatch molding
   - Removal Note ..... page S–23
   - Installation Note ..... page S–25
3. Beltline molding
   - Removal Note ..... page S–22
4. Drip molding
   - Removal Note ..... page S–22

Removal Note
Beltline molding

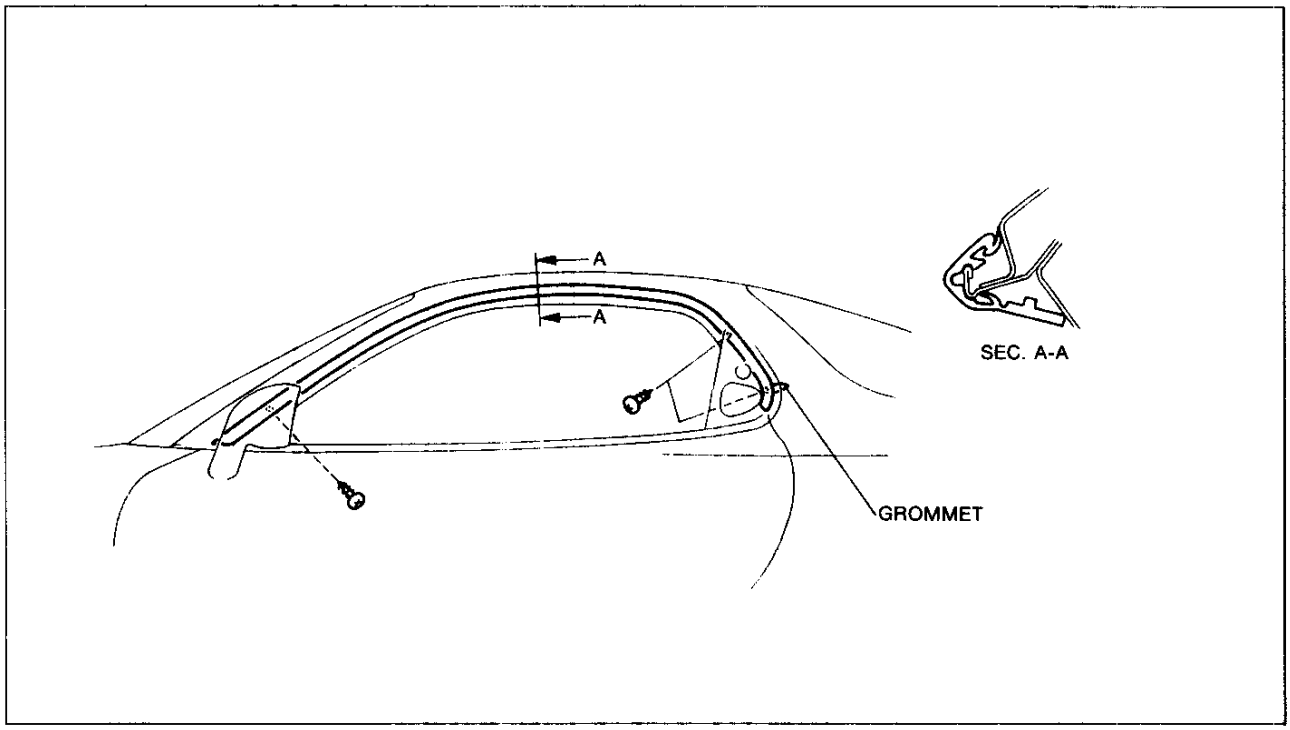
1. Lower the door glass fully.
2. Remove the power outside mirror. (Refer to page S–29.)
3. Pull the beltline molding up to disengage the clips from the body.



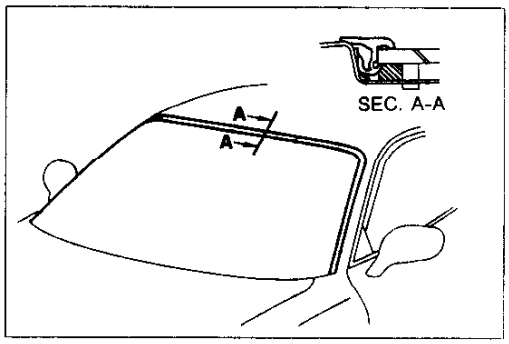
37U0SX-620

Drip molding

1. Remove the drip molding mounting screws and grommet.
2. Pull the rear of the molding forward and remove the drip molding from the body.



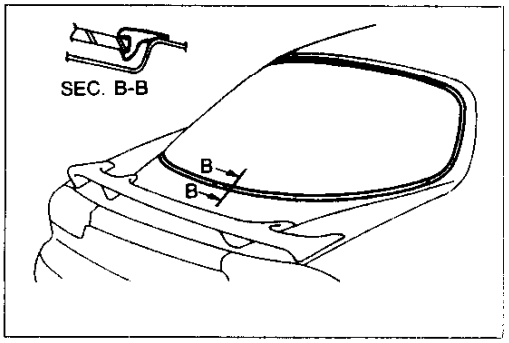
37U0SX-621



37U0SX-622

Windshield molding

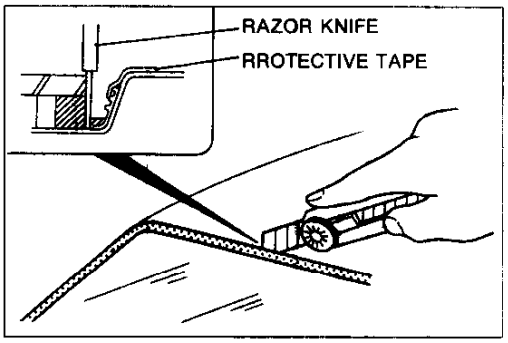
Lift the edge of the molding and cut the sealant to remove the molding.



37U0SX-623

Rear hatch molding

Lift the edge of the molding and cut the sealant to remove the molding.

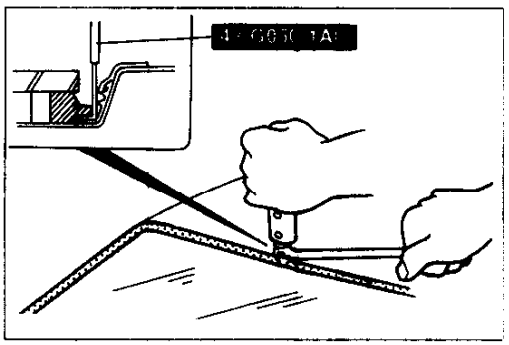


1PE0SX-072

Installation Note
Windshield molding

1. Apply protective tape along the edge of the body to protect it from damage.
2. Cut the sealant by using a razor knife as shown.

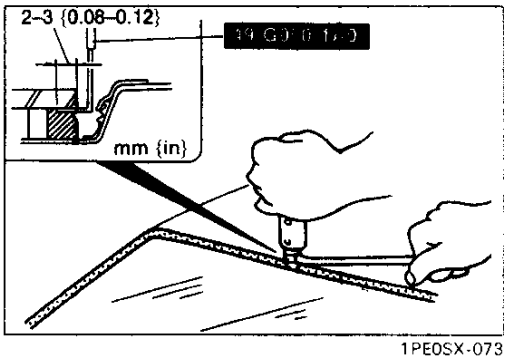
Caution
- **Do not damage the glass or body.**



1PE0SX-073

3. Insert the blade of the **SST** into the sealant, and pull on the bar to cut the sealant near the body as shown.

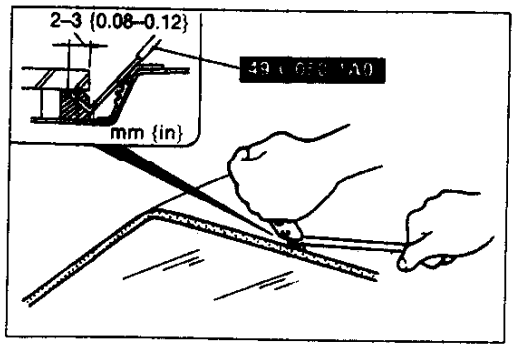
Caution
- **Do not damage the glass or body.**



1PE0SX-073

4. Insert the blade of the **SST** into the sealant, and pull on the bar to cut the sealant under the glass as shown.

Caution
- **Do not damage the glass.**



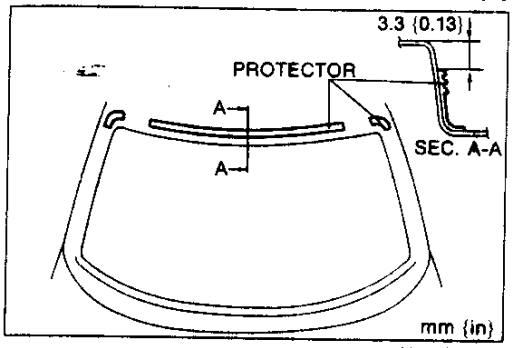
1PE0SX-075

5. Cut the sealant at an angle as shown.

Caution

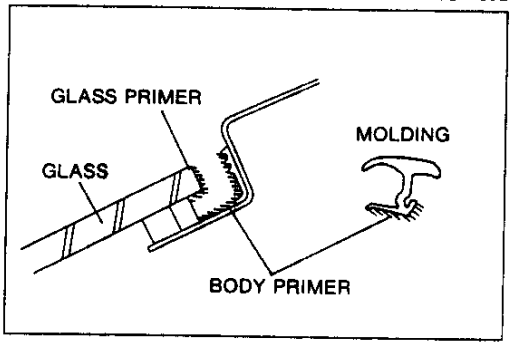
- **Do not damage the glass or body.**

6. Remove as much sealant as possible from between the body and the glass.
7. Carefully clean around the edge of the glass and the adhesion surface at the body.



37U0SX-692

8. If the protector is damaged bond a new protector onto the body, as shown.



37U0SX-693

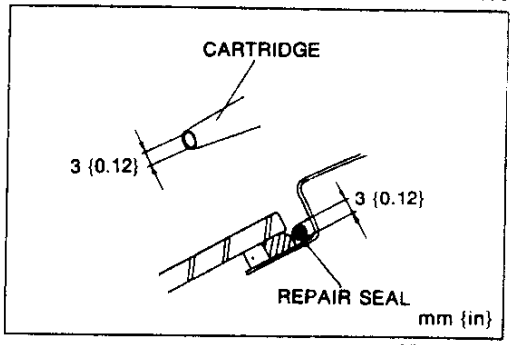
9. Brush primer onto the bonding area of the glass, the body, and the new windshield molding, and allow it to dry for **approx. 30 minutes**.

Caution

- **Keep the area free of dirt and grease. Do not touch the surface.**
- **If primer gets on the skin, remove it immediately.**

Note

- **Use only glass primer on the glass and body primer on the body and molding.**

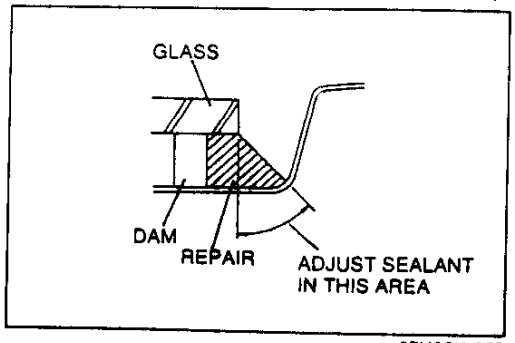


37U0SX-694

10. Apply a **3 mm {0.12 in}** bead of repair sealant between the glass and the body.

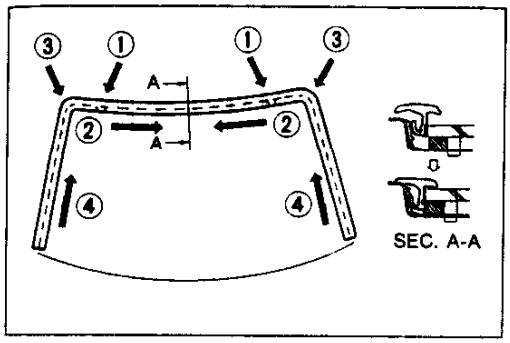
Note

- **With the repair sealant cartridge prepared as shown, use a piece of wire to break through the seal film, and then apply the sealant.**



37U0SX-695

11. Reshape the repair sealant as shown.



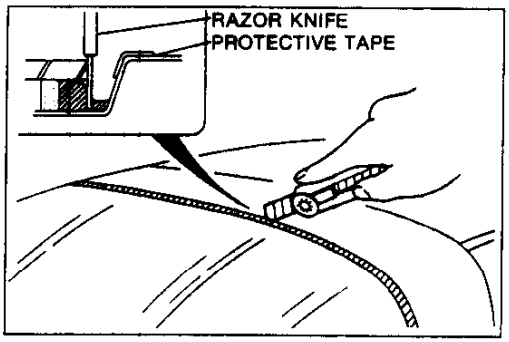
37U0SX-696

12. Install the molding.
(1) Align the white marks on the molding with the marks on the glass.
(2) Install the upper part of the molding.
(3) Install the corner parts of the molding.
(4) Install the side parts of the molding, starting from the bottom and working toward the top.

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 repeat the installation.

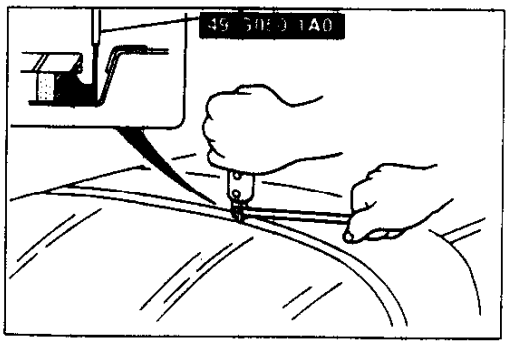


37U0SX-624

Rear hatch molding

1. Apply protective tape along the edge of the hatch to protect it from damage.
2. Cut the sealant by using a razor knife as shown.

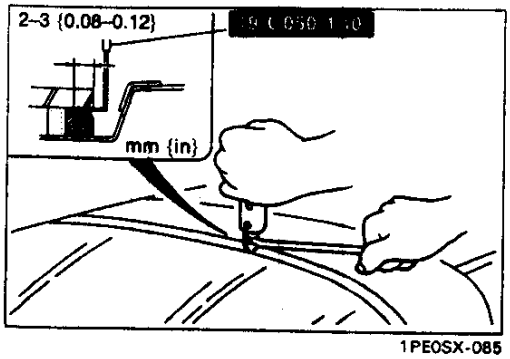
Caution
- **Do not damage the glass or hatch.**



37U0SX-625

3. Insert the blade of the **SST** into the sealant and pull on the bar to cut the sealant near the hatch as shown.

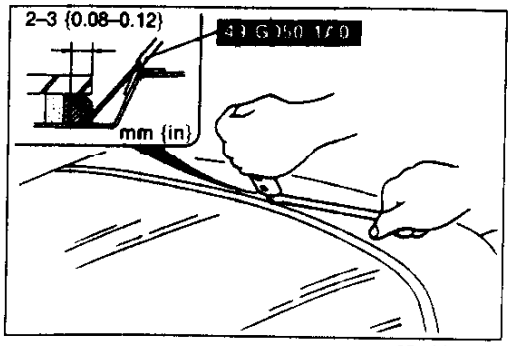
Caution
- **Do not damage the hatch.**



1PE0SX-085

4. Insert the blade of the **SST** into the sealant and pull on the bar to cut the sealant under the glass as shown.

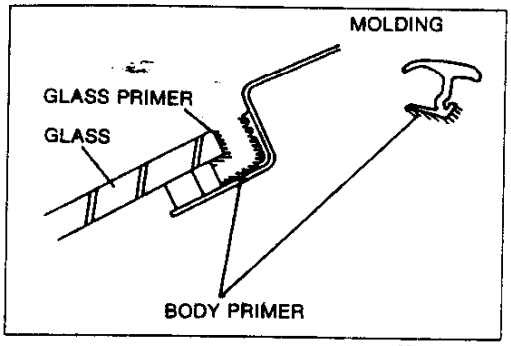
Caution
- **Do not damage the glass.**



37U0SX-626

5. Insert the blade of the **SST** into the sealant and pull on the bar to cut the sealant at an angle as shown.

Caution
- **Do not damage the glass or hatch.**

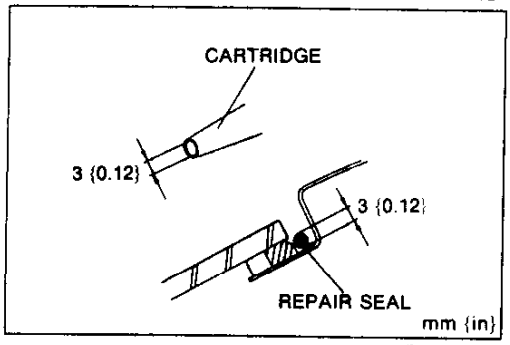


37U0SX-627

6. Brush primer onto the bonding area of the glass, the rear hatch, and the new rear hatch molding, and allow it to dry for **approx. 30 minutes.**

Caution
- **Keep the area free of dirt and grease. Do not touch the surface.**
- **If primer gets on the skin, remove it immediately.**

Note
- **Use only glass primer on the glass and body primer on the hatch and molding.**

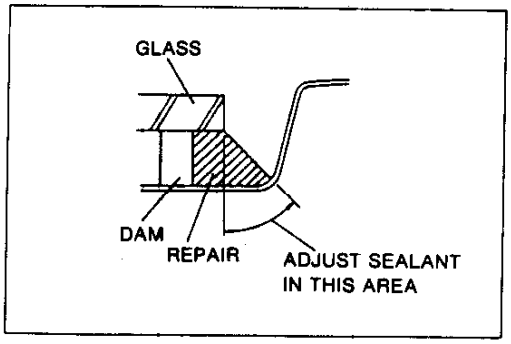


37U0SX-628

7. Apply a **3 mm {0.12 in}** bead of repair sealant between the glass and the rear hatch.

Note
- **With the repair sealant cartridge prepared as shown, use a piece of wire to break through the seal film, and then apply the sealant.**

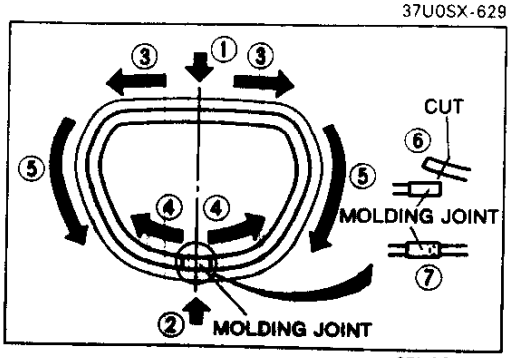
8. Reshape the repair sealant as shown.



37U0SX-629

9. Install the molding.

(1) Align the white mark on the molding with that on the upper part of the glass.
(2) Align the mark on the lower part of the glass with the molding joint.
(3) Install the upper part of the molding.
(4) Install the lower part of the molding.
(5) Install the side parts of the molding, starting from the top and working toward the bottom.
(6) Cut the molding to fit securely into the molding joint.
(7) Insert the molding into the molding joint.



37U0SX-697

Caution
- **Install the molding while the repair sealant is soft.**

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. Check for water leaks. If a leak is found, wipe the water off well and repeat the installation.

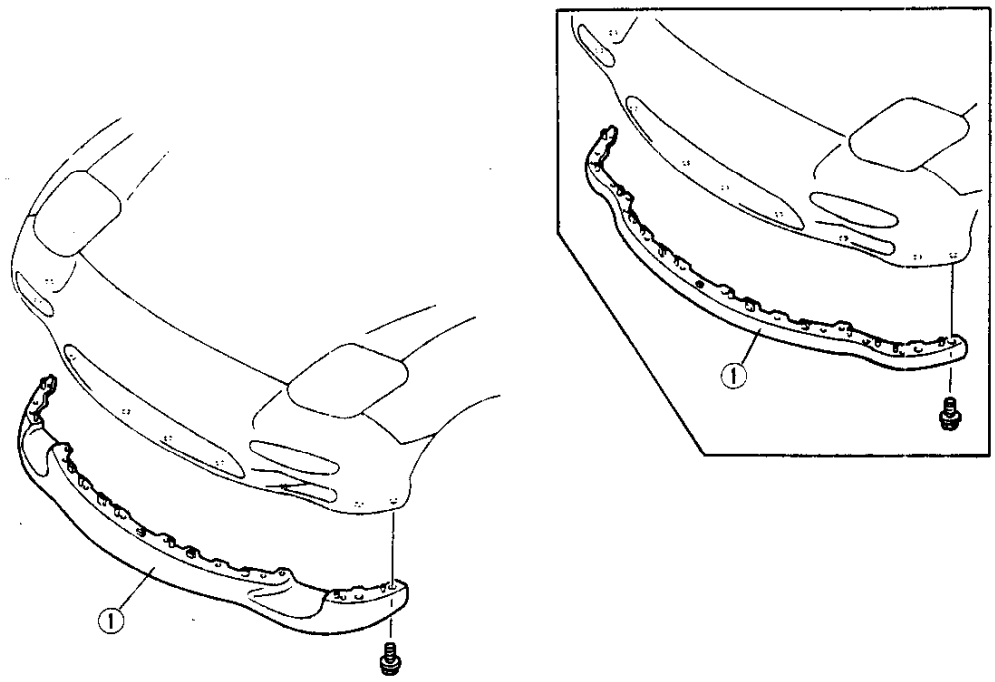
SPOILER

COMPONENTS

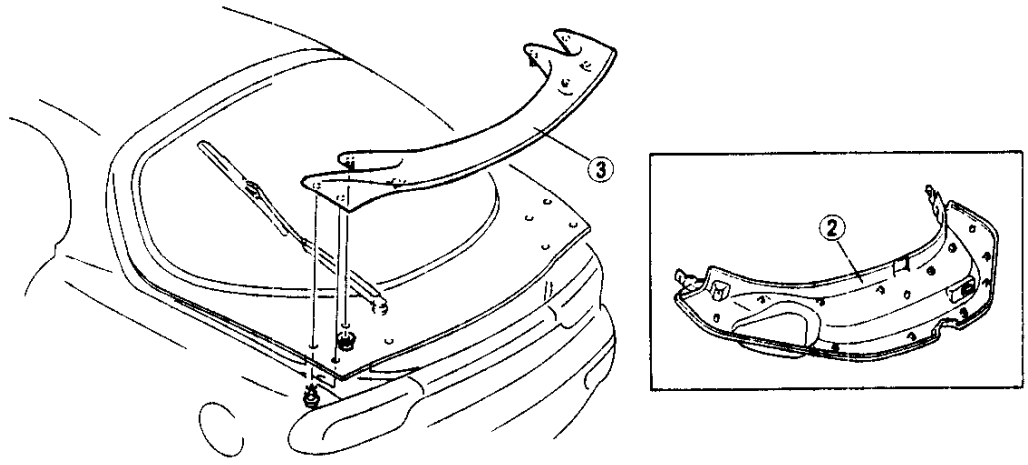
Removal / Installation

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

FRONT



REAR



37U05X-630

Front air dam
1. Front air dam

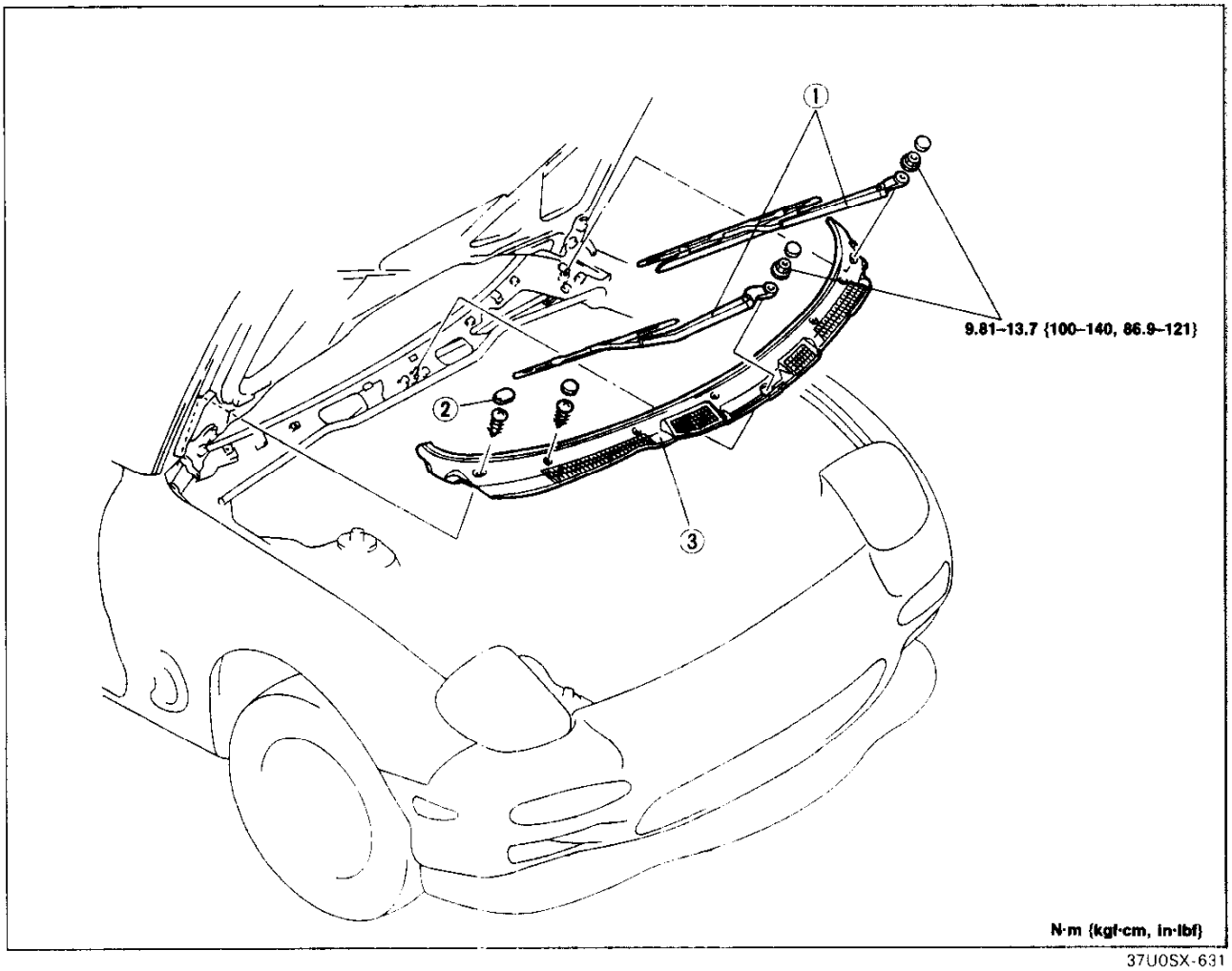
Rear spoiler
2. Rear hatch lower trim
   Removal / Installation ..... page S-56
3. Rear spoiler

COWL GRILLE

COMPONENTS

Removal / Installation

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



37U0SX-631

1. Windshield wiper arm and blade
   Adjustment ..... page S–34
2. Cowl cap
3. Cowl grille

POWER OUTSIDE MIRROR

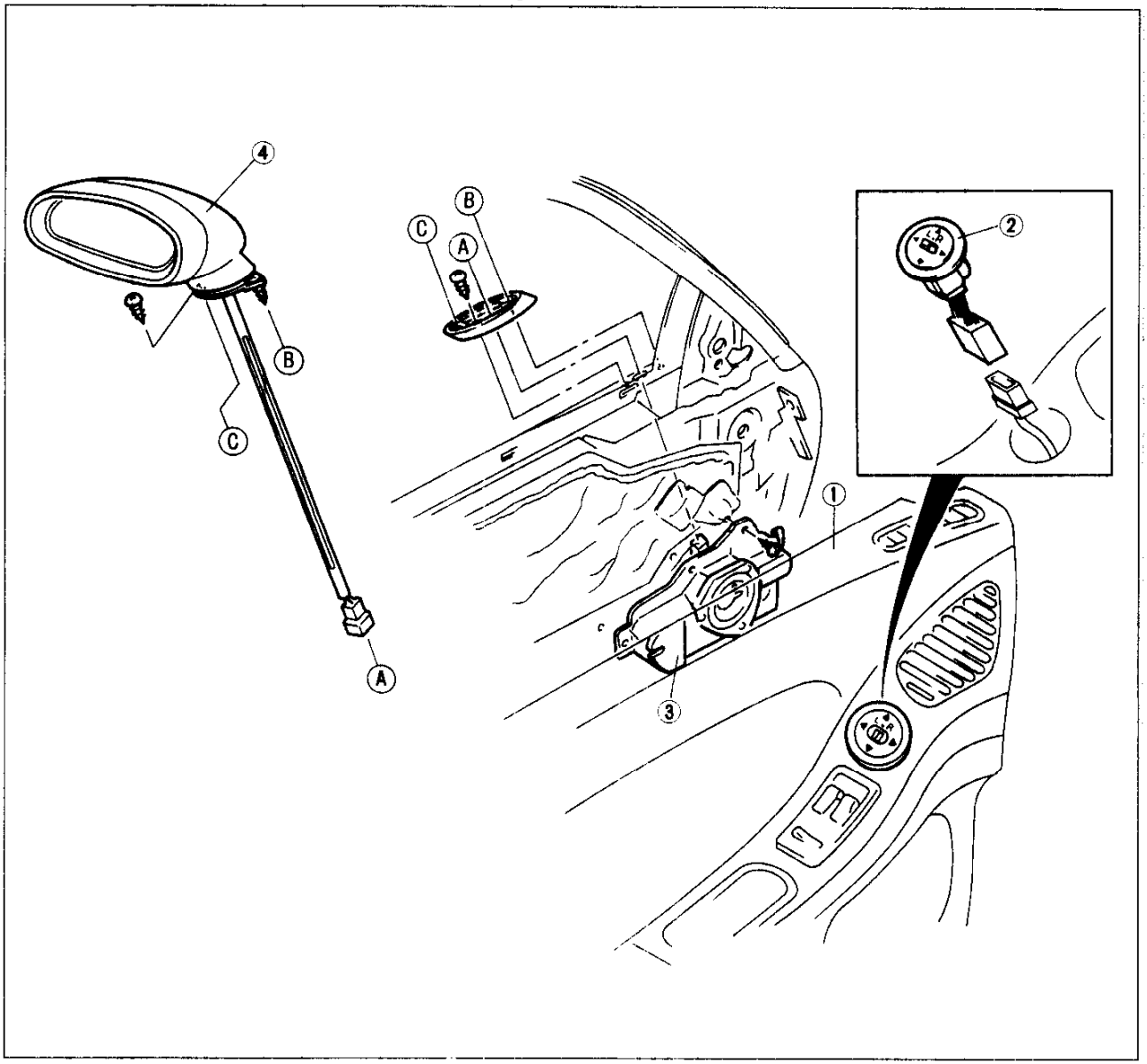
COMPONENTS

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure. (Refer to the 1993 RX-7 Body Electrical Troubleshooting Manual, Section J1, when removing the door speaker.)
3. Install in the reverse order of removal.

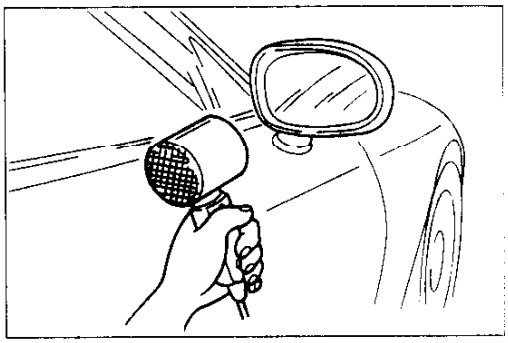
Note

- **When replacing the power outside mirror, be careful not to damage or break the plastic surrounding the harness so that it may be reused.**



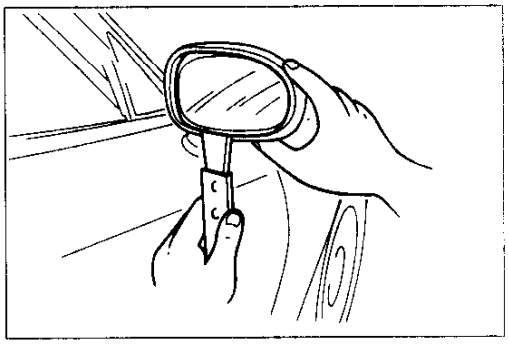
37U0SX-632

1. Door trim
   Removal / Installation ..... page S–56
2. Power outside mirror switch
3. Door speaker
4. Power outside mirror
   Replacement of mirror glass
   ..... page S–30

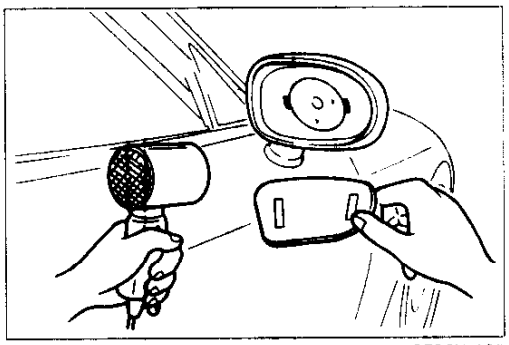

1PE0SX-118

Replacement of Mirror Glass

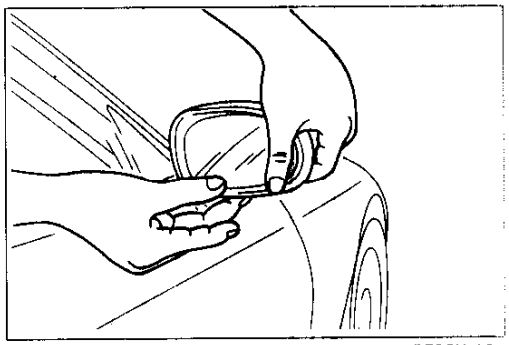
1. Warm the frame and the mirror glass by using a hot air blower.


1PE0SX-119

2. Insert a scraper between the mirror glass and the frame, and pry the glass loose.
3. Remove the remaining adhesive.


1PE0SX-120

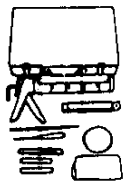
4. Warm the adhesive surface of the frame and the mirror by using a hot air blower.


1PE0SX-121

5. Install the glass on the frame and gently press on the glass to secure it.

REARVIEW MIRROR

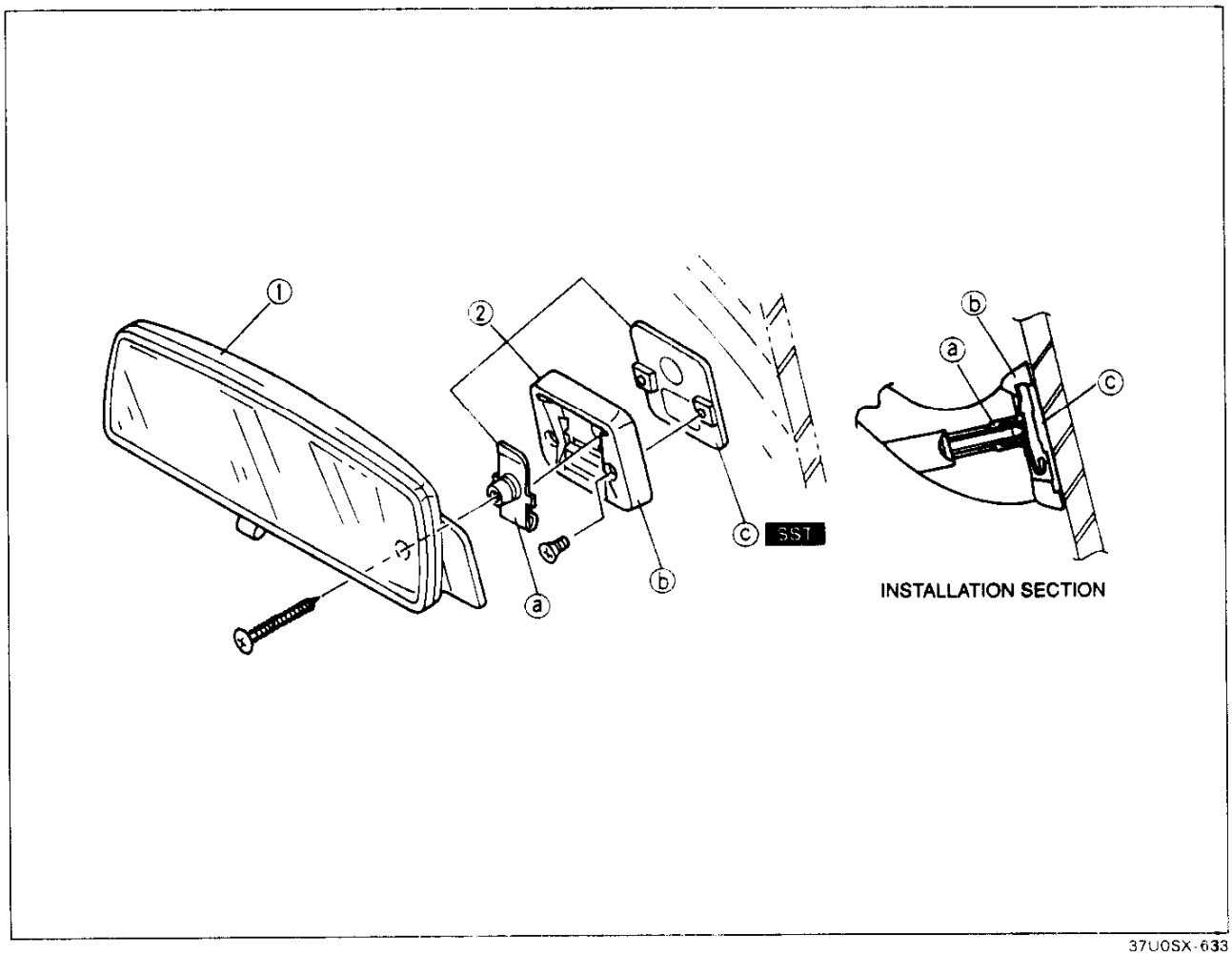
PREPARATION
SST

49 0305 870A Tool set, window		For removal / installation of mirror base

19G0SX-197

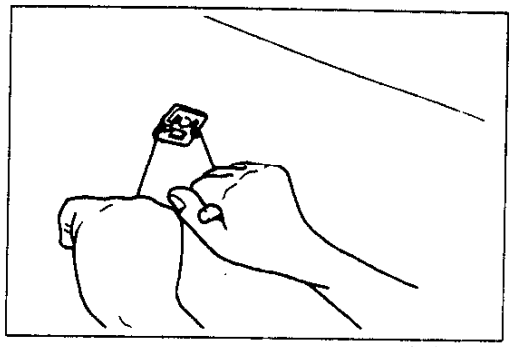
COMPONENTS
Removal / Installation

1. Remove in order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.



37U0SX-633

1. Rearview mirror
2. Mirror base assembly
   a. Holder
      Installation Note ..... page S–32
   b. Cover
   c. Base
      Removal Note ..... page S–32
      Installation Note ..... page S–32


19G0SX-199

Removal Note
Base

1. Wind each end of the wire around a bar.
2. Saw through the sealant and remove the base.

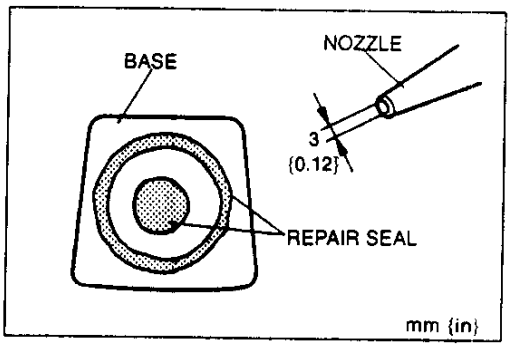
Caution
- **Use a long sawing action to spread the work over the whole length of the wire to prevent it from breaking.**

Installation Note
Base

1. Cut away all of the original sealant by using a razor knife.

Caution
- **Do not damage the glass.**

2. Clean and degrease the glass.
3. Apply primer to the glass and the base and allow it to dry for **approx. 30 minutes**.

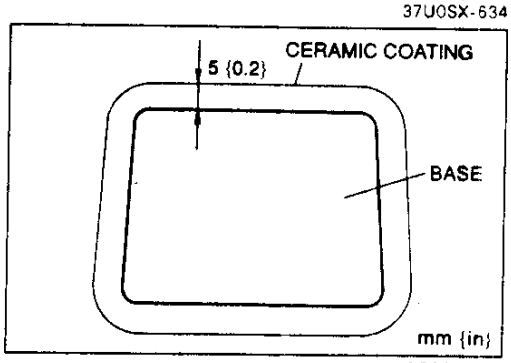


37U0SX-634

Caution
- **Keep the area free of dirt and grease. Do not touch the surface.**

Note
- **Use only glass primer on the glass and body primer on the base.**

4. Apply a **3 mm {0.12 in}** bead of repair sealant or the base.
5. Center the base in the ceramic coating and press it onto the glass.



19G0SX-201

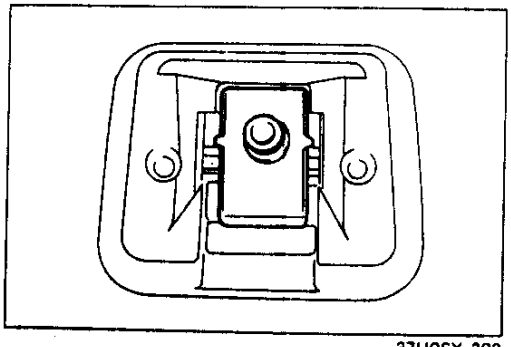
Caution
- **Remove the excessive repair sealant with ethyl alcohol.**

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

Holder

Install the holder on the cover as shown in the figure.

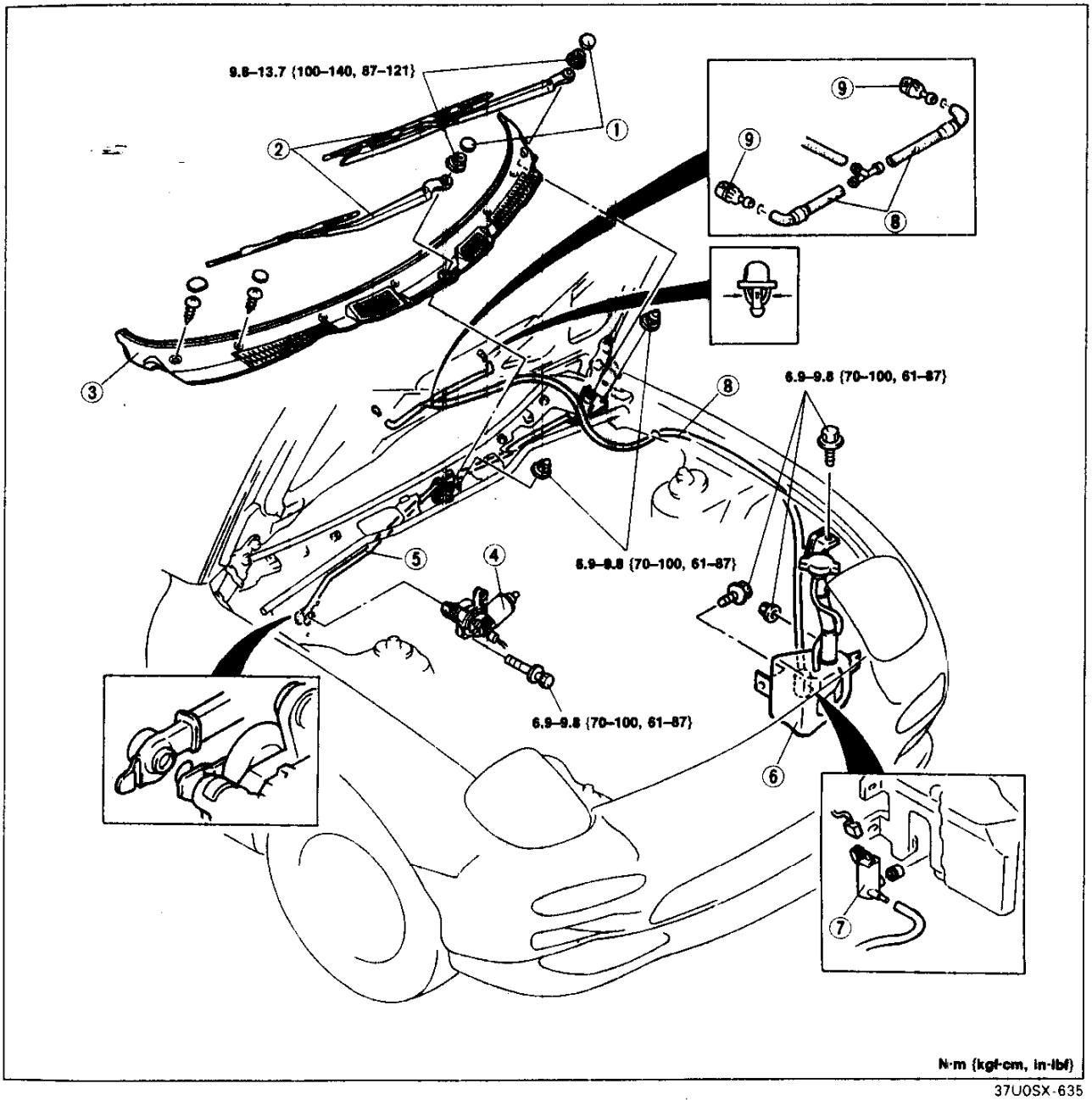

37U0SX-202

WINDSHIELD WIPER AND WASHER

COMPONENTS

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.



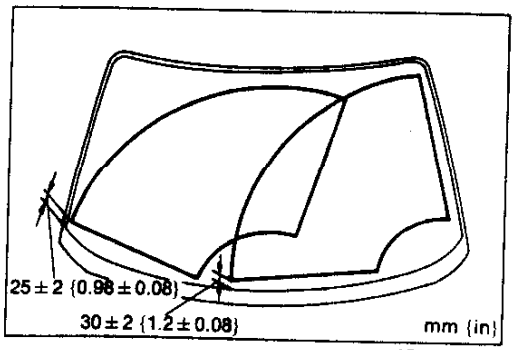
37U0SX-635

Windshield wiper

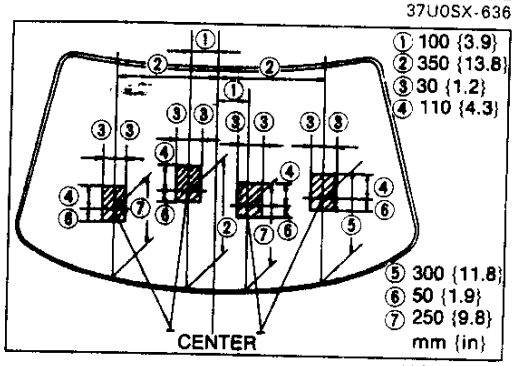
1. Wiper arm cover
2. Wiper arm and blade
   Adjustment ..... page S–34
3. Cowl grille
4. Wiper motor
   Disassembly / Assembly ..... page S–35
5. Wiper link

Windshield washer

6. Washer tank
7. Washer motor
8. Washer pipe
9. Washer nozzle
   Adjustment ..... page S–34



37U0SX-636



1PE0SX-152

Adjustment

Windshield wiper arm and blade

1. Operate the wipers once to set them in the park position.
2. Set the height of the wiper arms as shown.

Tightening torque:
9.8–13.7 N·m {100–140 kgf·cm, 87–121in·lbf}

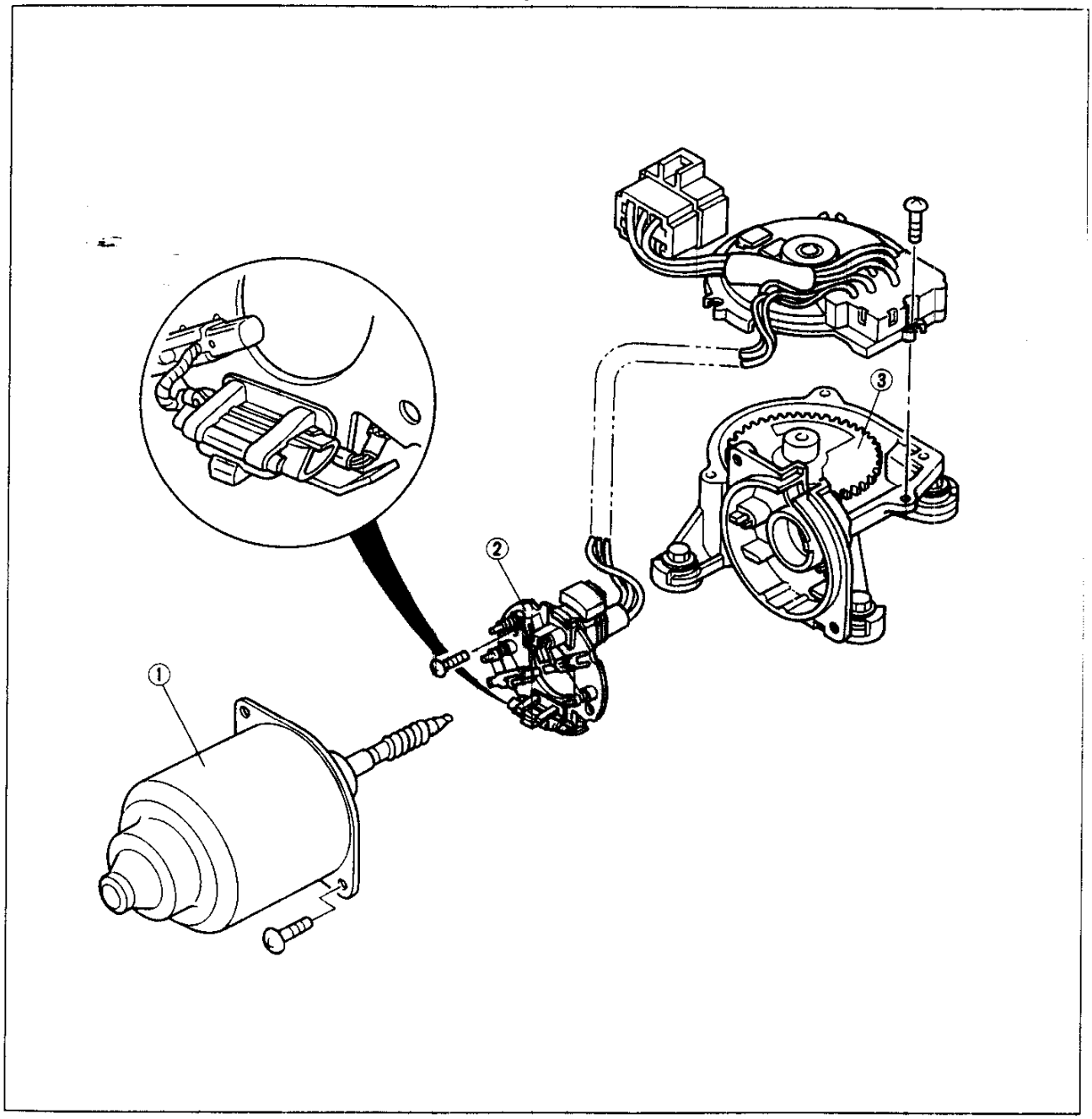
Windshield washer nozzle

Insert a needle or similar object into the nozzle hole and move the nozzle to adjust the spray direction.

WINDSHIELD WIPER MOTOR

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



37U0SX-637

1. Wiper motor
2. Brush plate holder
3. Motor gear shaft

REAR WIPER AND WASHER

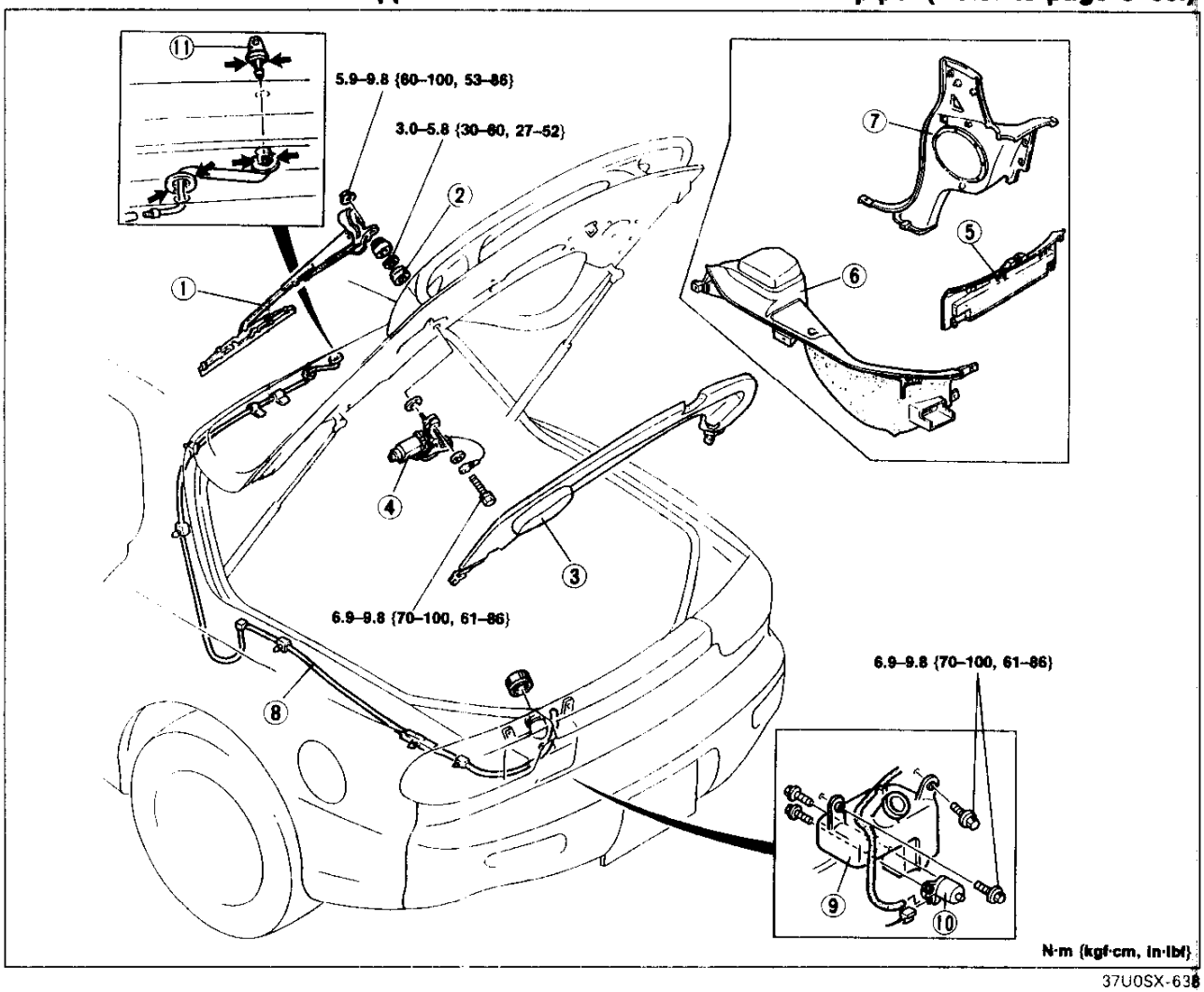
COMPONENT

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.

Note

- **Remove the rear hatch upper trim to remove the rear washer pipe. (Refer to page S–56.)**



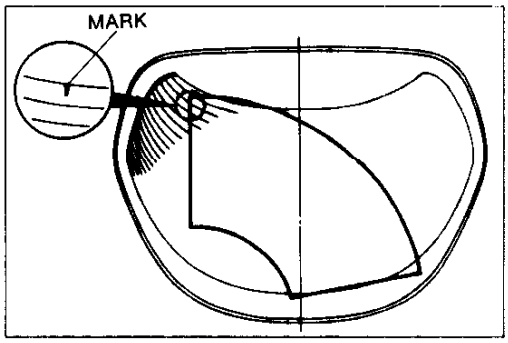
37U0SX-638

Rear wiper

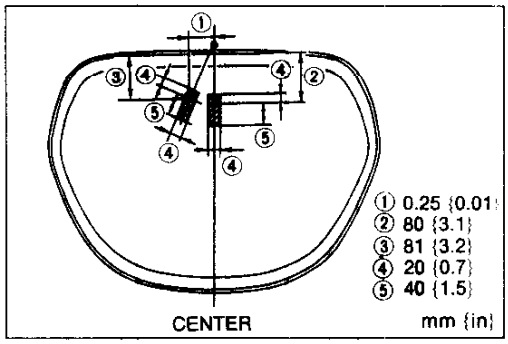
1. Wiper arm and blade
   Adjustment ..... page S–37
2. Outer bushing
3. Rear hatch lower trim
   Removal / Installation ..... page S–56
4. Wiper motor

Rear washer

5. Trunk end trim
   Removal / Installation ..... page S–56
6. Trunk side trim
   Removal / Installation ..... page S–56
7. Quarter trim
   Removal / Installation ..... page S–56
8. Washer pipe
9. Washer tank
10. Washer motor
11. Washer nozzle
    Adjustment ..... page S–37



37U0SX-639



1PE0SX-178

Adjustment

Rear wiper arm and blade

1. Operate the wiper once to set it in the park position.
2. Align the wiper arm with the mark on the glass as shown.

Tightening torque:
5.9–9.8 N·m {60–100 kgf·cm, 53–86 in·lbf}

Rear washer nozzle

Insert a needle or similar object into the nozzle hole and move the nozzle to adjust the spray direction.

HEADLIGHT CLEANER

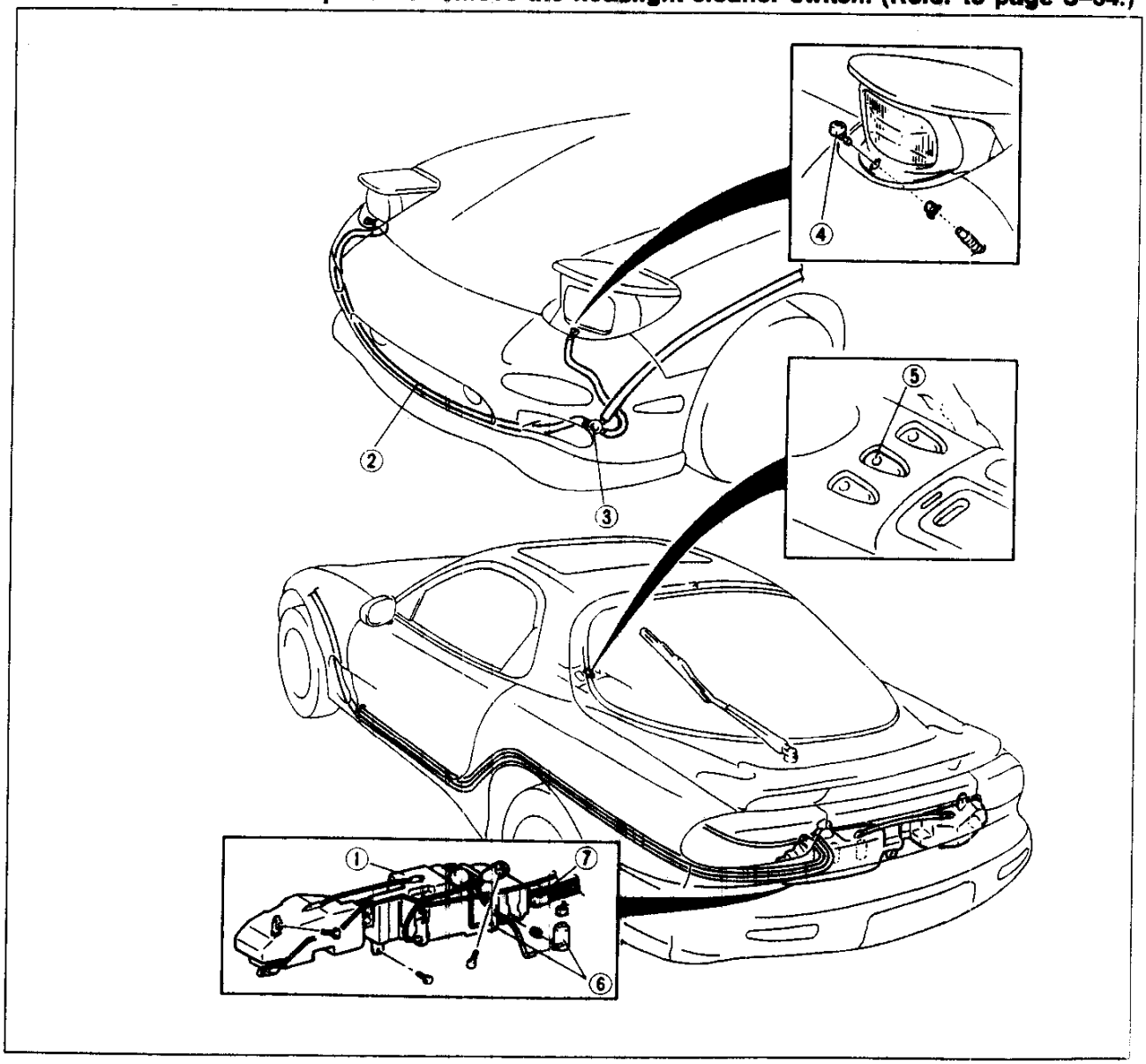
COMPONENTS

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure (Refer to the 1993 RX-7 Body Electrical Troubleshooting Manual, Section D3, when removing the headlight cleaner switch and headlight cleaner motor and relay.)
3. Install in the reverse order of removal.

Note

- **Remove the front bumper to remove the pipe assembly, check valve, and cleaner nozzle. (Refer to page S–16.)**
- **Remove the floor mat to remove the cleaner pipe assembly. (Refer to page S–60.)**
- **Remove the console panel to remove the headlight cleaner switch. (Refer to page S–54.)**



37U0SX-640

1. Front washer and headlight cleaner washer tank assembly
2. Pipe assembly
3. Check valve
4. Cleaner nozzle
5. Headlight cleaner switch
6. Headlight cleaner motor
7. Headlight cleaner relay

WINDSHIELD

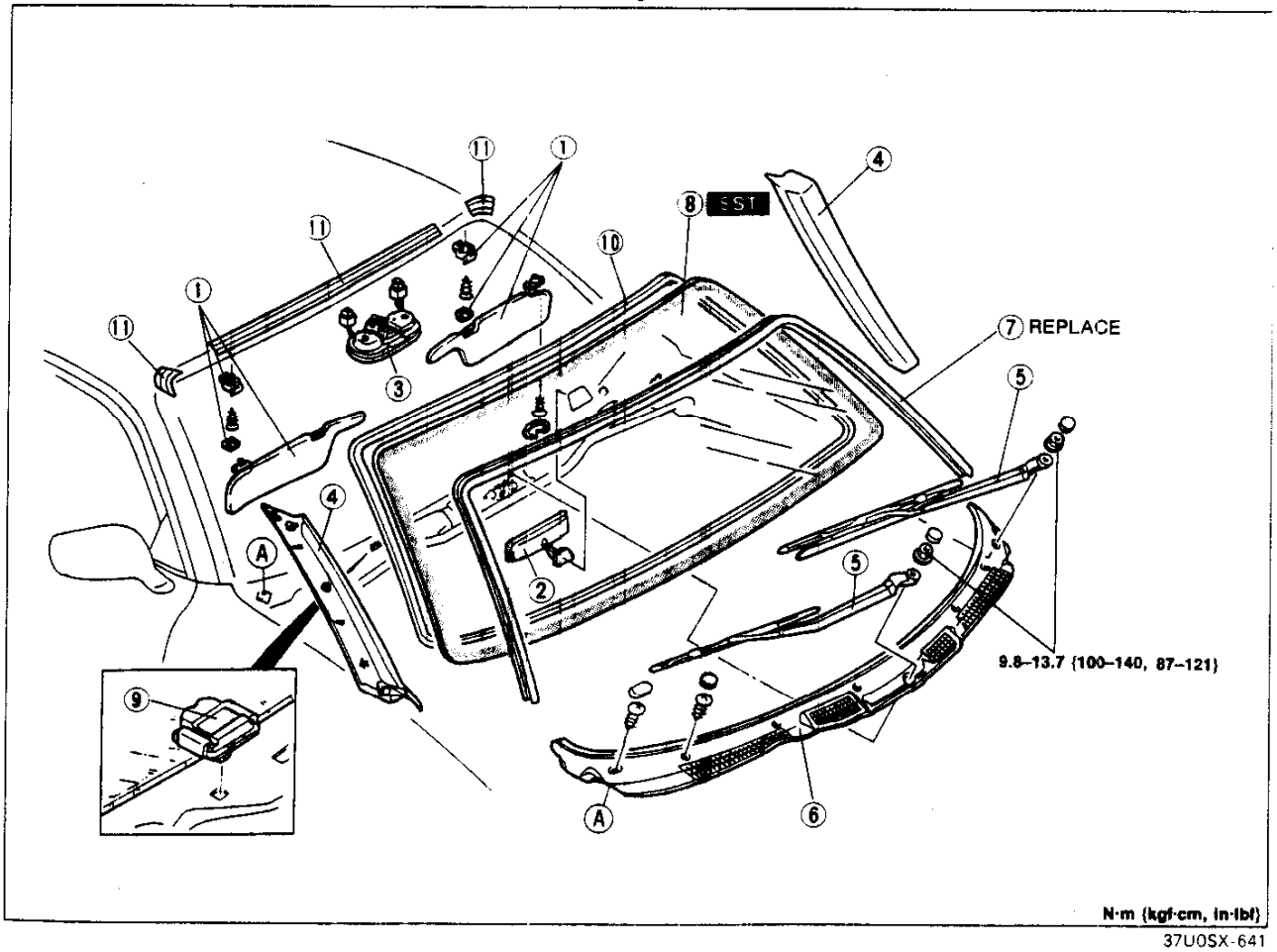
PREPARATION
SST

49 0305 870A Tool set, window		For removal / installation of windshield

01E-SX-078

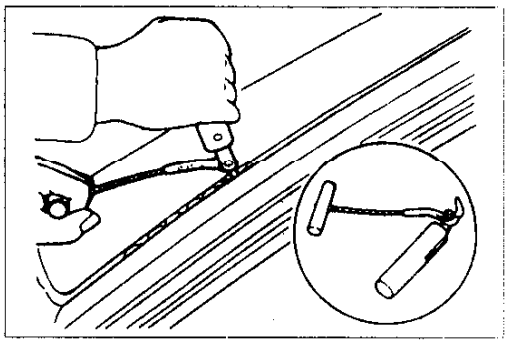
COMPONENTS
Removal / Installation

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, referring to **Installation Note**.



37U0SX-641

1. Sunvisor and adapter
2. Rearview mirror
3. Overhead console
4. A-pillar trim
   Removal / Installation ..... page S–56
5. Windshield wiper arm and blade
   Adjustment ..... page S–34
6. Cowl grille
7. Windshield molding
   Removal / Installation ..... page S–21
8. Windshield
   Removal Note ..... page S–40
   Installation Note ..... page S–40
9. Spacer
10. Dam
11. Protector

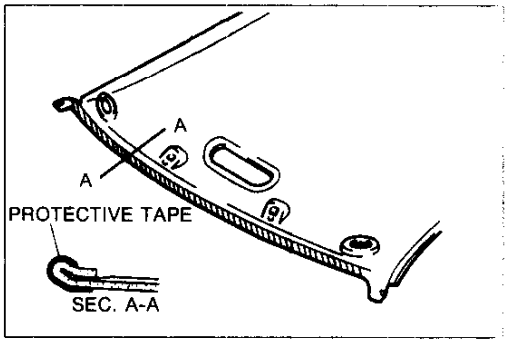


37U0SX 69

Removal Note
Windshield

If the glass will not be reused,

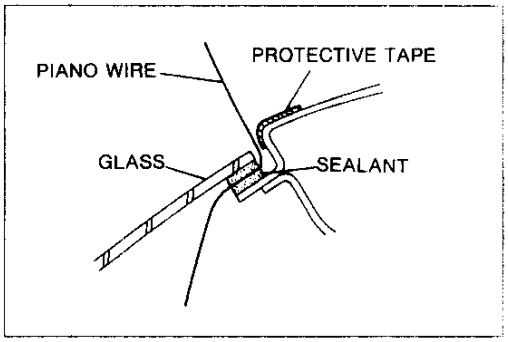
1. Use a tool like that shown in the figure and insert the blade into the sealant.
2. Pull through the sealant around the edge of the glass.
3. If the protector is damaged, remove it.
4. Remove the glass.



37U0SX 69

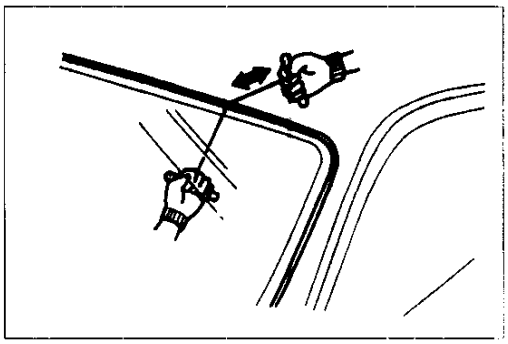
If the glass will be reused,

1. Apply protective tape along the front edge of the headliner to protect it from damage.



37U0SX-69

2. Apply protective tape along the edge of the body to protect it from damage.
3. Make a hole through the sealant from the inside of the vehicle by using an awl.
4. Pass piano wire through the hole.

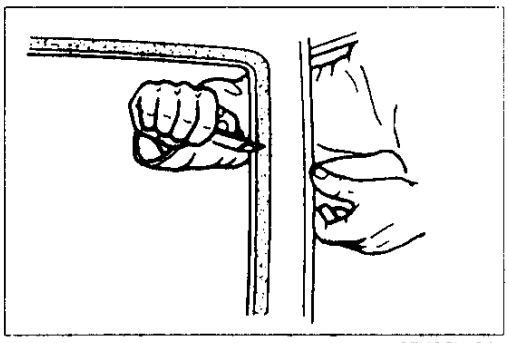


37U0SX-69

5. Wind each end of the wire around a bar.
6. Working with another person, saw through the sealant around the edge of the glass. Remove the glass.

Caution

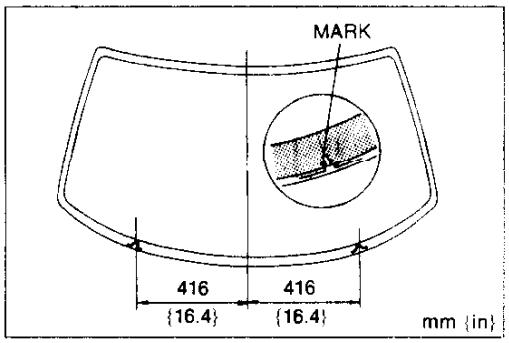
- **Use a long sawing action to spread the work over the whole length of wire to prevent it from breaking.**
- **Make sure the wire does not rub on the body or the dashboard.**



37U0SX 642

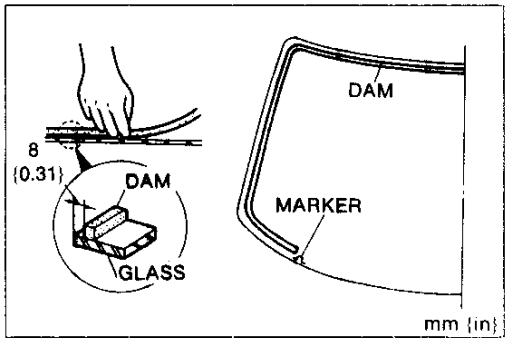
Installation Note
Windshield

1. Cut away the old sealant by using a razor knife so that **approx. 2 mm {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 apply new sealant to create a **2 mm {0.08 in}** layer.
2. Carefully clean an area **5 cm {1.97 in}** wide around the circumference of the glass and clean the bonding area on the body.



1PE0SX-198

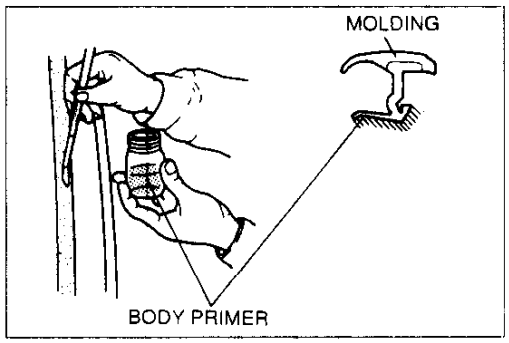
3. Mark the outer edge of the glass with a marking pen to ensure proper reinstallation.



37U0SX-643

4. Bond a new dam along the top and sides **8 mm {0.31 in}** from the edge of the glass as shown.

Caution
- **Bond the dam securely and allow it to dry.**

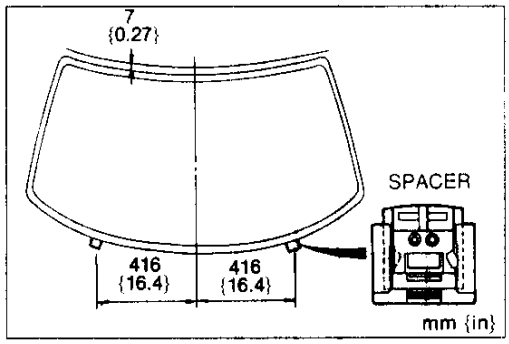


1PE0SX-200

5. Brush primer onto the bonding area of the glass, new windshield molding, and body. Allow it to dry for **approx. 30 minutes.**

Caution
- **Keep the area free of dirt and grease. Do not touch the surface.**
- **If primer gets on the skin, remove it immediately.**

Note
- **Use only glass primer on the glass and body primer on the body and molding.**

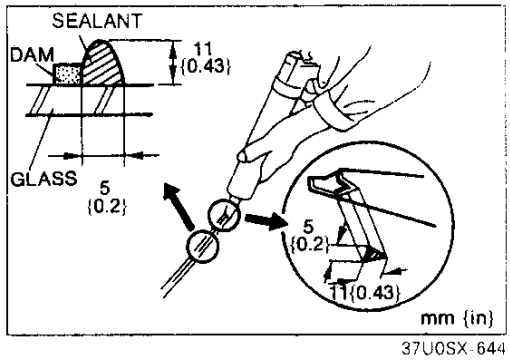


37U0SX-698

6. Install the spacers onto the body as shown.

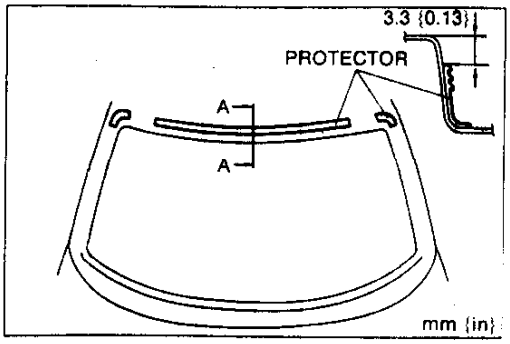
Caution
- **Replace damaged spacers.**

7. Set the glass onto the body and adjust the clearance between the top of the glass and the body to **7 mm {0.27 in}** by moving the spacers up or down.
8. Remove the glass from the body.



37U0SX-644

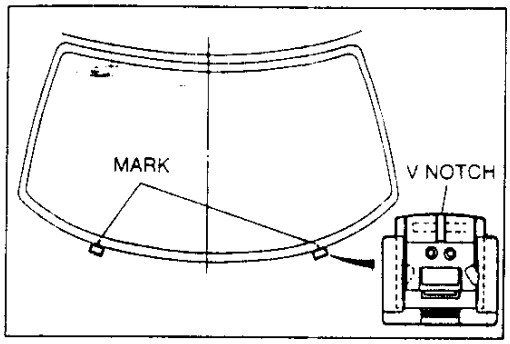
9. Prepare the nozzle of the sealant tube so that it has a flange that can run along the edge of the glass and a V from which the sealant can flow. Apply repair sealant around the entire circumference to fill the gap between the dam and the edge of the glass with a ridge of sealant **11 mm {0.43 in}** high. Keep the bead of sealant smooth and even, reshaping it where necessary with a spatula.



1PE0SX-203

10. If the protector was removed, bond a new one onto the body as shown.

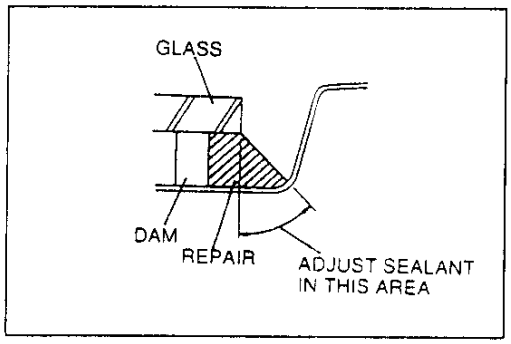
Caution
- **Bond the protector securely and allow it to dry.**



37U0SX-645

11. Align the glass marks with the notches in the spacers and install the glass onto the body.
12. Press firmly on the glass to compress the sealant.

Caution
- **Verify that the clearance between the top of the glass and the body is 8 mm {0.31 in}.**
- **Open the windows to prevent the glass from being pushed out by air pressure if a door is closed.**



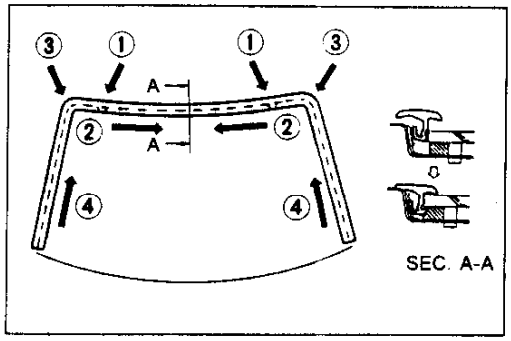
1PE0SX-205

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. Use a scraper to smooth away any sealant that oozes out. Add more sealant to any points of poor contact.

Caution
- **Adjust the upper and side sealants as shown.**



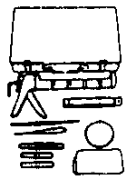
1PE0SX-336

14. Install the molding.
(1) Align the white marks on the molding with the marks on the glass.
(2) Install the upper part of the molding.
(3) Install the corners of the molding.
(4) Install the sides of the molding, starting from the bottom and working toward the top.
15. If a leak is found, wipe the water off well and remove the glass. Reinstall the glass.

REAR HATCH GLASS

PREPARATION

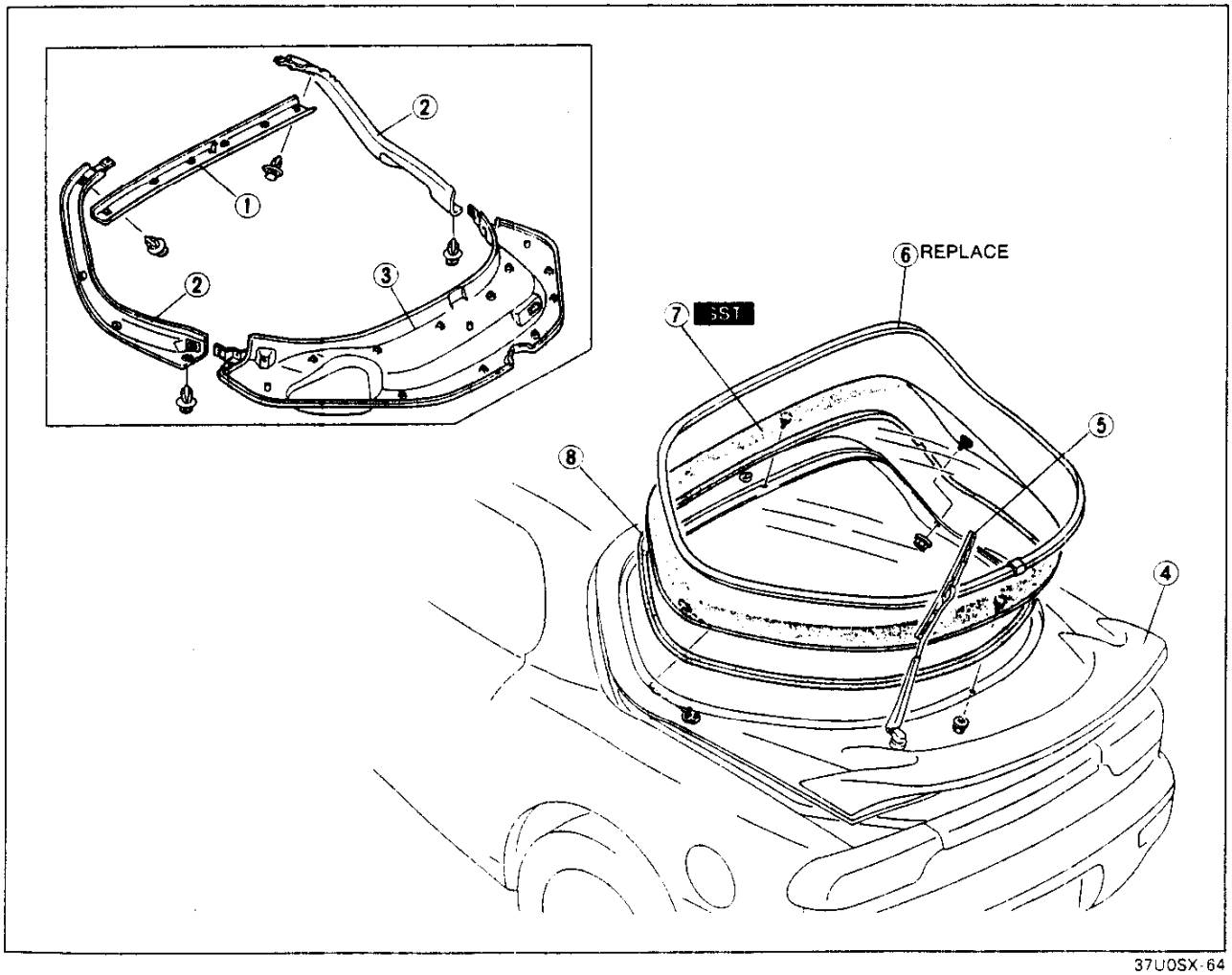
SST

49 0305 870A Tool set, window		For removal / installation of rear hatch glass

COMPONENTS

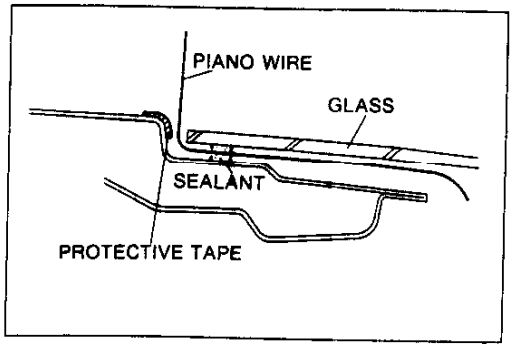
Removal / Installation

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, referring to **Installation Note**.



37U0SX-64

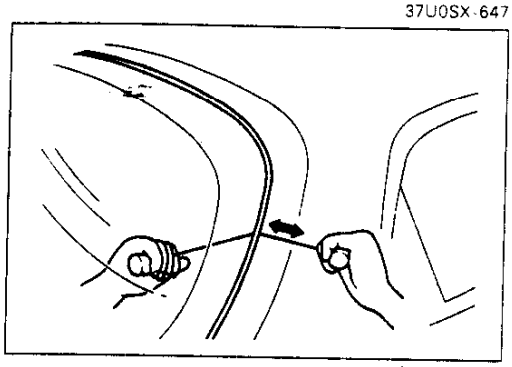
1. Rear hatch upper trim
   Removal / Installation ..... page S–56
2. Rear hatch side trim
   Removal / Installation ..... page S–56
3. Rear hatch lower trim
   Removal / Installation ..... page S–56
4. Rear spoiler
   Removal / Installation ..... page S–27
5. Rear wiper arm and blade
   Adjustment ..... page S–37
6. Rear hatch molding
   Removal / Installation ..... page S–21
7. Rear hatch glass
   Removal Note ..... page S–44
   Installation Note ..... page S–44
8. Dam



37U0SX-647

Removal Note
Rear hatch glass

1. Apply protective tape along the edge of the rear hatch to protect it from damage.
2. Make a hole through the sealant from the inside of the vehicle by using an awl.
3. Pass piano wire through the hole.

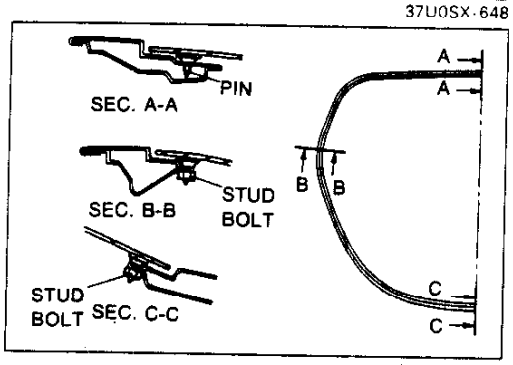


37U0SX-648

4. Wind each end of the wire around a bar.
5. Working with another person, saw through the sealant around the edge of the glass. Remove the glass.

Caution

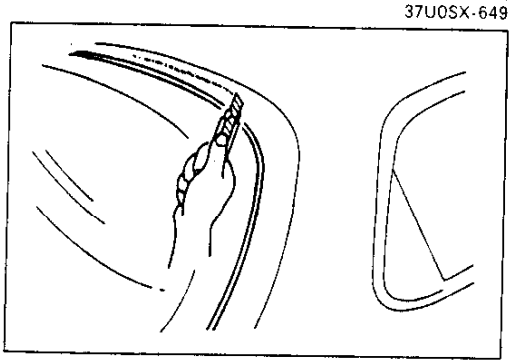
- **Use a long sawing action to spread the work over the whole length of wire to prevent it from breaking.**
- **Be careful that the wire does not rub on the rear hatch.**



37U0SX-649

Note

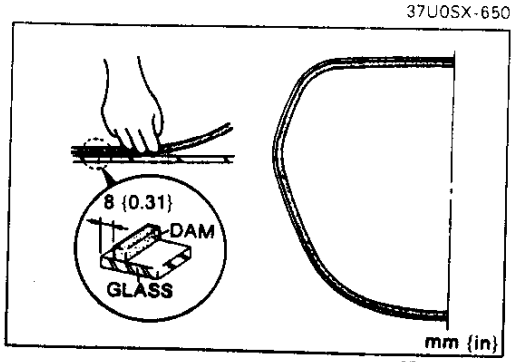
- **The rear hatch glass has locating studs at the top, bottom, and sides. If it is difficult to cut the sealant with the piano wire, use a razor knife from the inside of the vehicle where necessary.**



37U0SX-650

Installation Note
Rear hatch glass

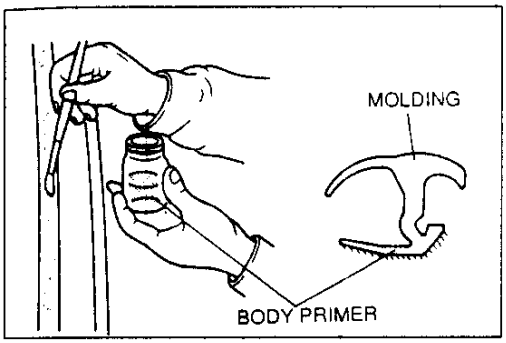
1. Cut away the old sealant by using a razor knife so that **approx. 2 mm {0.08 in}** of sealant remains around the circumference of the frame. If all the sealant has come off in any one place, apply some primer after degreasing, and allow it **30 minutes** to dry. Then put on new sealant to create a **2 mm {0.08 in}** layer.
2. Carefully clean an area **5 cm {1.97 in}** wide around the circumference of the glass and clean the bonding area on the rear hatch.
3. Bond a new dam along the circumference of the glass **8 mm {0.31 in}** from the edge.



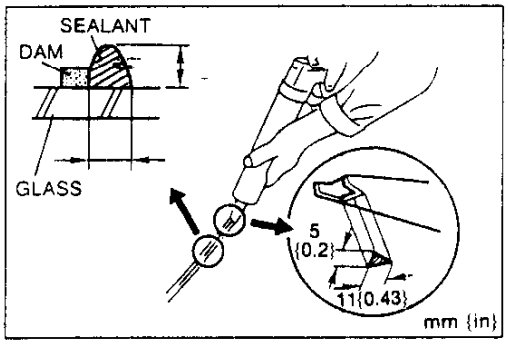
37U0SX-651

Caution

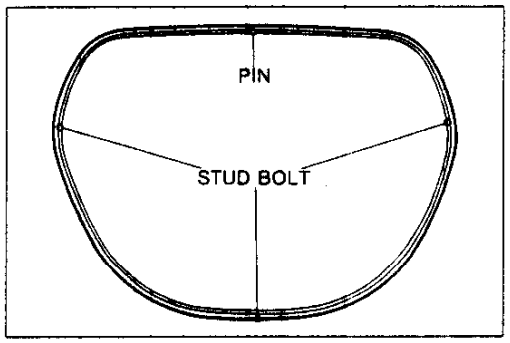
- **Bond the dam securely and allow it to dry.**



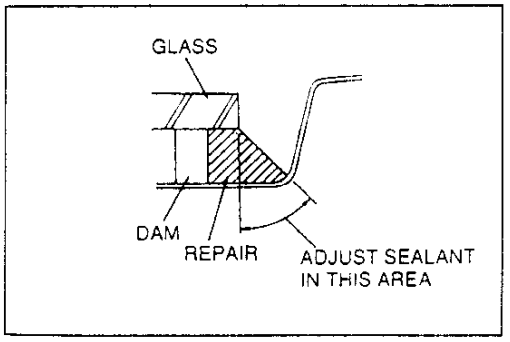
37U0SX-652



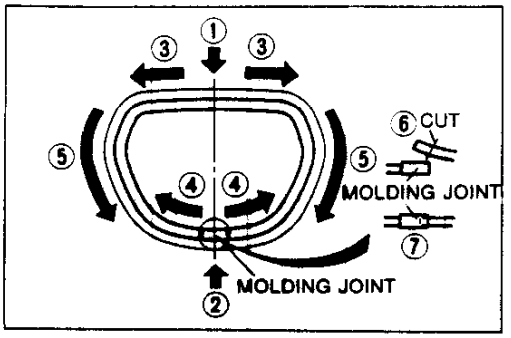
37U0SX-653



37U0SX-654



37U0SX-655



37U0SX-656

4. Brush primer onto the bonding area of the glass, new rear hatch molding, and rear hatch, and allow it to dry for **approx. 30 minutes.**

Caution
- **Keep the area free of dirt and grease. Do not touch the surface.**
- **If primer gets on the skin, remove it immediately.**

Note
- **Use only glass primer on the glass and body primer on the rear hatch and molding.**

5. 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. Apply repair sealant around the entire circumference to fill the gap between the dam and the edge of the glass with a ridge of sealant **11 mm {0.43 in}** high.
   Keep the bead of sealant smooth and even, reshaping it where necessary with a spatula.
6. Align the locating studs and install the glass onto the body.
7. Press firmly on the glass to compress the sealant. Install the nuts onto the studs.

Tightening torque:
2.0–2.9 N·m {20–30 kgf·cm, 18–26 in·lbf}

Caution
- **Verify that the clearance between the top of the glass and the rear hatch is 8 mm {0.31 in}.**
- **Open the windows to prevent the glass from being pushed out by air pressure if a door is closed.**

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

8. Use a scraper to smooth away any sealant that oozes out. Add more sealant to any points of poor contact.

Caution
- **Adjust the upper and side sealant as shown.**

9. Install the molding.
(1) Align the white mark on the molding with that on the upper part of the glass.
(2) Align the mark on the lower part of the glass with the molding joint.
(3) Install the upper part of the molding.
(4) Install the lower part of the molding.
(5) Install the side parts of the molding, starting from the top and working toward the bottom.
(6) Cut the molding to fit securely into the molding joint.
(7) Insert the molding into the molding joint.
10. If a leak is found, wipe the water off well and remove the glass. Reinstall the glass.

SLIDING SUNROOF

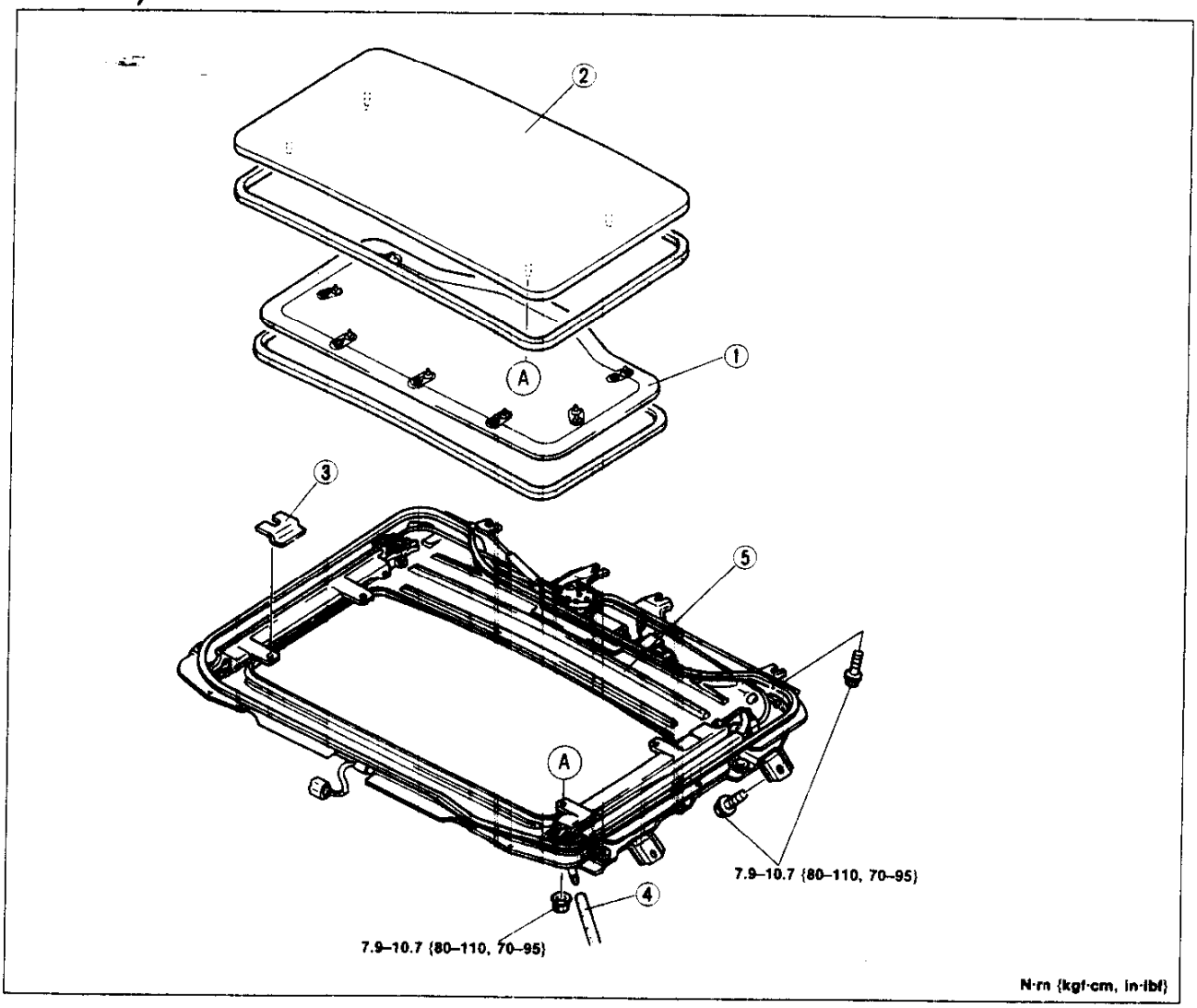
COMPONENTS

Removal / Installation

1. Open the slide panel **100 mm {3.9 in}** from the fully closed position.
2. Disconnect the negative battery cable.
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**.

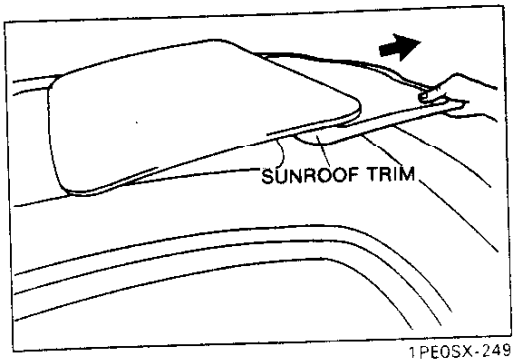
Note

- **Remove the headliner to remove and install the sunroof drive unit assembly. (Refer to page S–61.)**



37U0SX-657

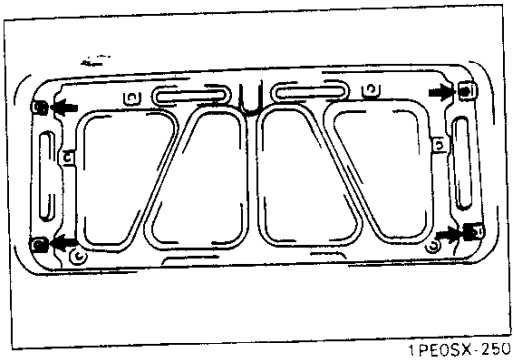
1. Sunroof trim
   - Removal Note ..... page S–47
   - Installation Note ..... page S–49
2. Slide panel
   - Removal Note ..... page S–47
   - Installation Note ..... page S–48
   - Adjustment ..... page S–53
3. Sunroof shim
4. Drain hose
   - Installation Note ..... page S–48
5. Sunroof drive unit assembly
   - Removal Note ..... page S–47
   - Installation Note ..... page S–47
   - Disassembly / Assembly ..... page S–50



1PE0SX-249

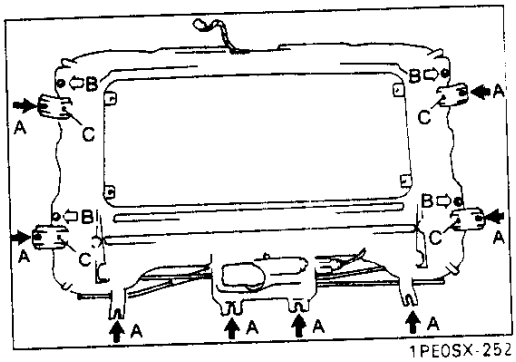
Removal Note
Sunroof trim

1. Tilt up the slide panel.
2. Disengage the fasteners at the front of the sunroof trim. Pull down the trim to remove it from the sunroof panel.
3. Pull out the sunroof trim from between the slide panel and the roof.


1PE0SX-250

Slide panel

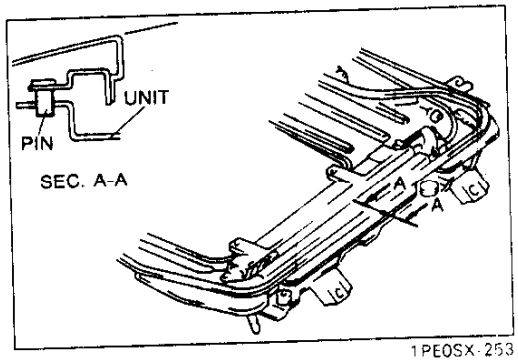
1. Fully close the slide panel by using the emergency handle (supplied in vehicle).
2. Remove the slide panel fixing nuts. Push the slide panel up from the inside and remove it from the guide.



1PE0SX-252

Sunroof drive unit assembly.

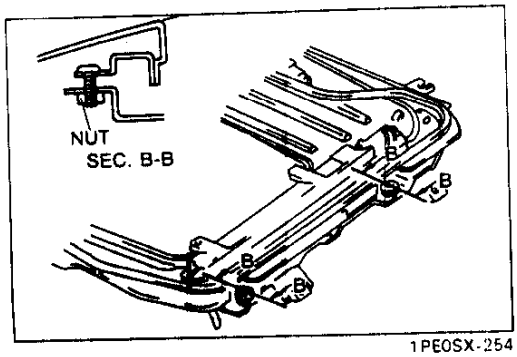
1. Remove bolts A.
2. Loosen nuts C.
3. Loosen height adjusting nuts B and remove the sunroof drive unit from the body.



1PE0SX-253

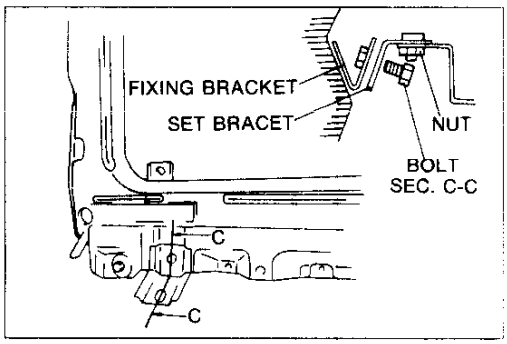
Installation Note
Sunroof drive unit assembly

1. Align the locator pins and set the sunroof drive unit to the roof panel.



1PE0SX-254

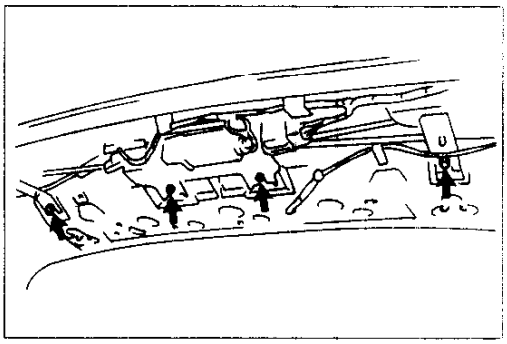
2. Loosely install the sunroof drive unit to the roof panel with the height adjusting nuts.



37U0SX-659

3. Loosen the set bracket attaching nuts. Position the set bracket so that it touches the roof panel fixing bracket. Tighten the fixing bracket bolts, then tighten the nuts.

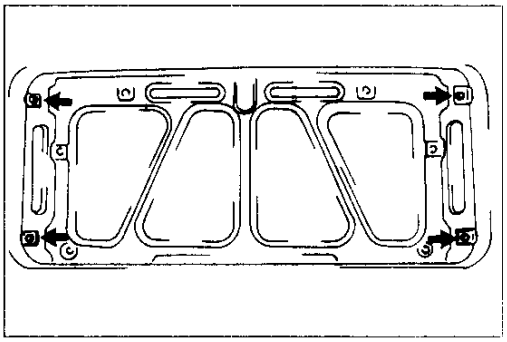
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95 in·lbf}



37U0SX-660

4. Affix the rear of the sunroof frame to the roof panel.

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



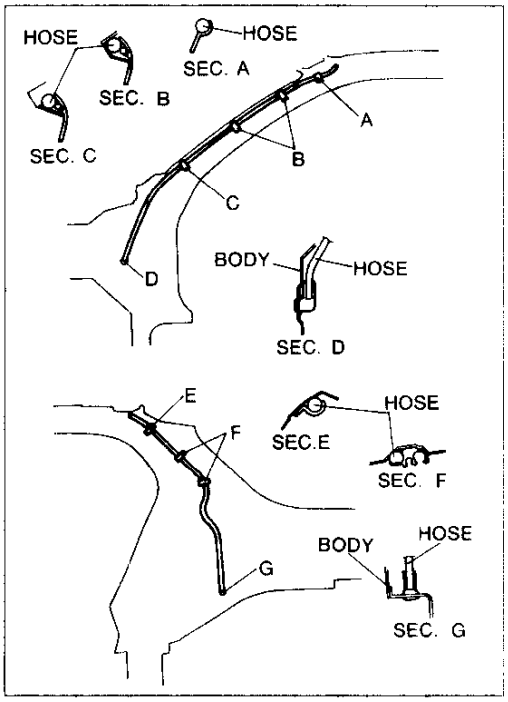
37U0SX-661

Slide panel

Install the slide panel to the guide.

Note
- **If the height difference between the slide panel and the roof panel is greater than 2.0 mm {0.08 in}, loosen the slide panel attaching nuts and insert shim(s) between the panels.**

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

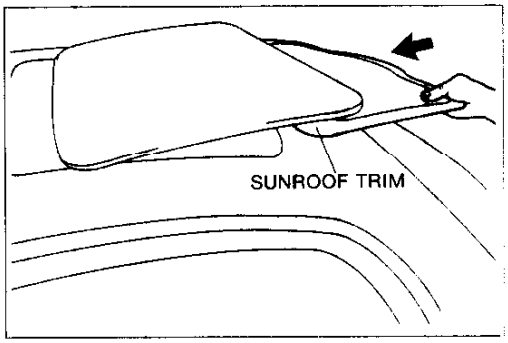


1PE0SX-260

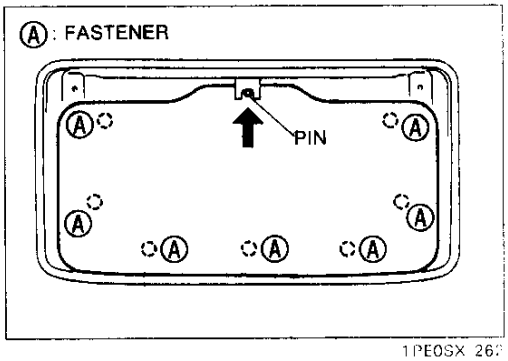
Drain hose

1. On the A-pillar side, insert one end of the hose into the sunroof frame, set the hose along the A-pillar, and insert the other end into the cowl side panel hole.
2. On the B-pillar side, insert one end of the hose into the sunroof frame and insert the other end into the rear fender panel hole via the hole in the upper part of the B-pillar.

Note
- **Apply soapy water to the drain hose and insert it fully into the sunroof frame.**



1PE0SX-261



1PE0SX-262

Sunroof trim

1. Tilt up the slide panel. Insert the sunroof trim between the slide panel and the roof panel from the rear of the vehicle.

Note

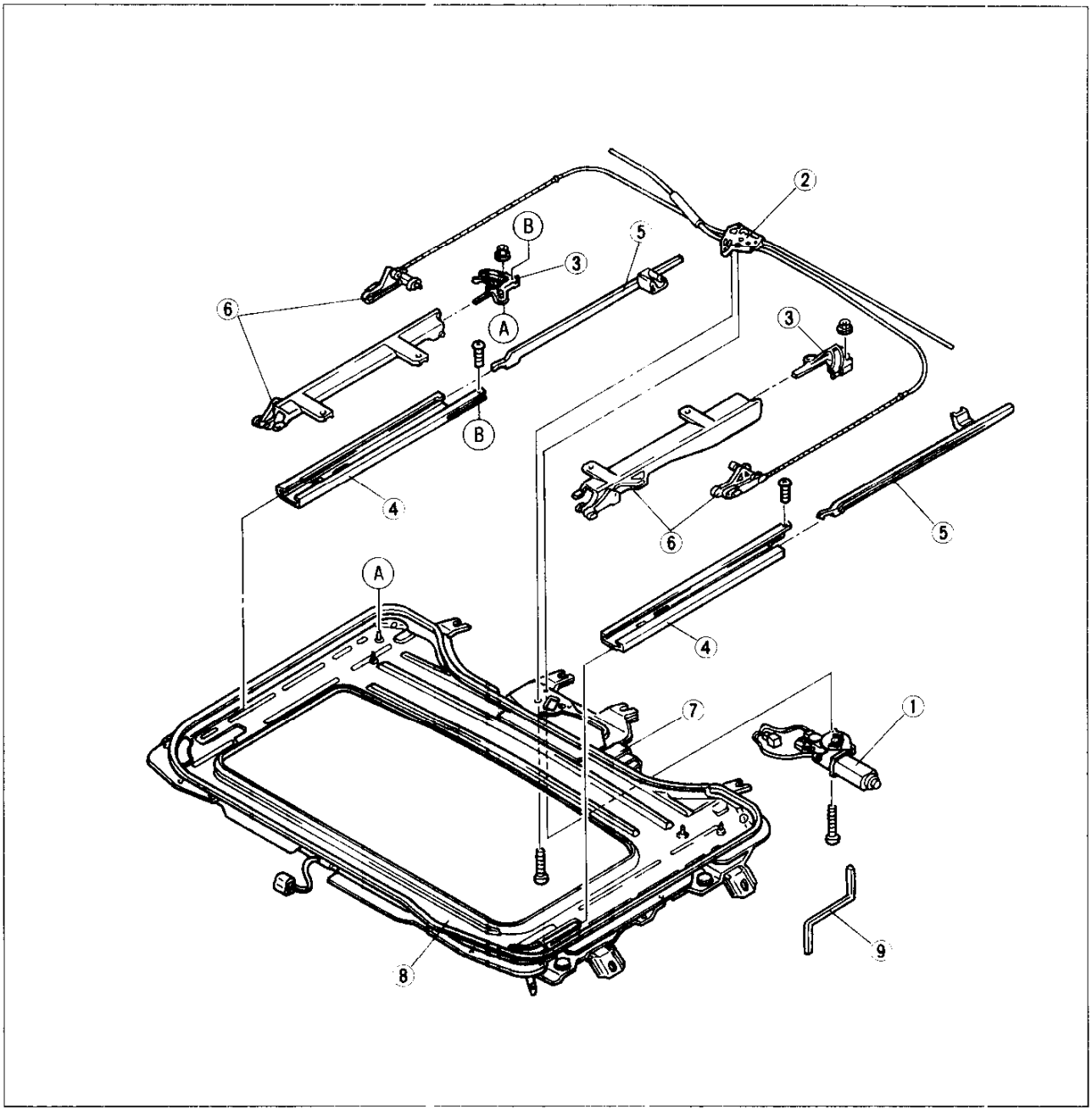
- **To locate the trim, match the sunroof trim guide pin with the notch in the slide panel trim bracket.**

2. Install the sunroof trim fasteners to the slide panel.

SLIDING SUNROOF DRIVE UNIT ASSEMBLY

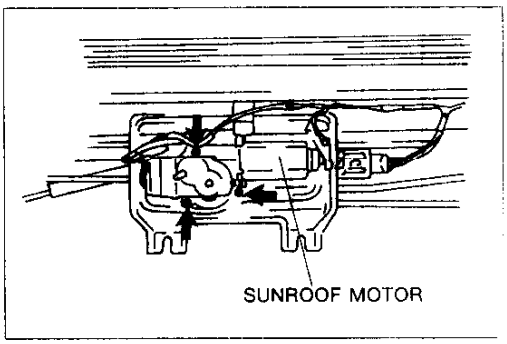
Disassembly / Assembly

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**.



37J0SX-662

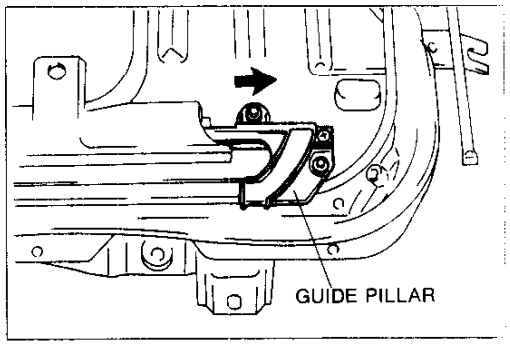
1. Sunroof motor
   - Disassembly Note ..... page S–51
   - Assembly Note ..... page S–52
   - Adjustment ..... page S–53
2. Drive unit
3. Guide pillar
   - Disassembly Note ..... page S–51
   - Assembly Note ..... page S–52
4. Guide rail
   - Disassembly Note ..... page S–51
   - Assembly Note ..... page S–52
5. Shutting assembly
   - Disassembly Note ..... page S–51
   - Assembly Note ..... page S–52
6. Guide
   - Disassembly Note ..... page S–51
   - Assembly Note ..... page S–52
7. Sunroof relay
8. Sunroof frame
9. Emergency handle



1PE0SX 26

Disassembly Note
Sunroof motor

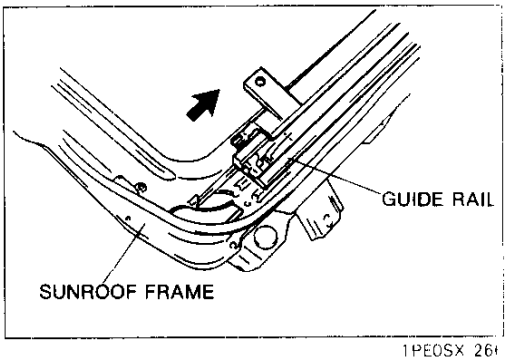
1. Remove the screws and remove the motor from the sunroof frame.
2. Disconnect the motor harness connector.



1PE0SX 26

Guide pillar

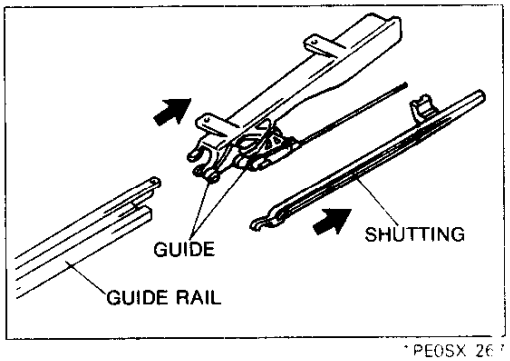
1. Remove the guide pillar mounting nuts and screw.
2. Pull the guide pillar to remove it from the guide rail.



1PE0SX 26

Guide rail

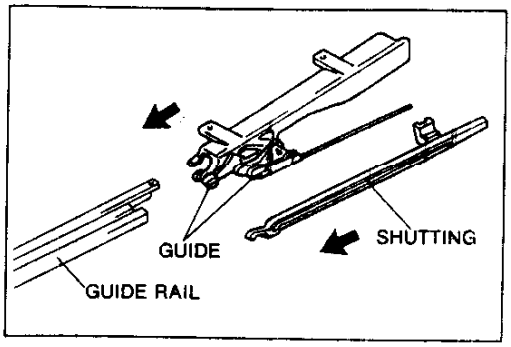
Pull the guide rail with the guide to remove them from the sunroof frame.



1PE0SX 26

Shutting assembly, guide

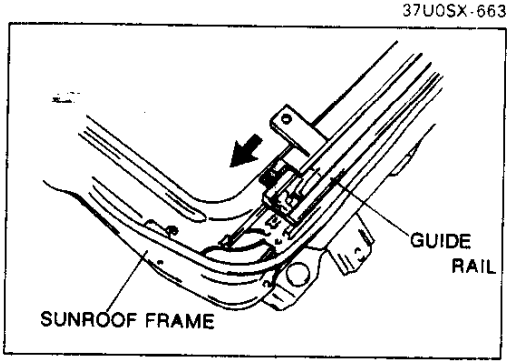
1. Pull the shutting assembly to remove it from the guide rail.
2. Pull the guide to remove it from the guide rail.



37U0SX-663

Assembly Note
Shutting assembly, guide

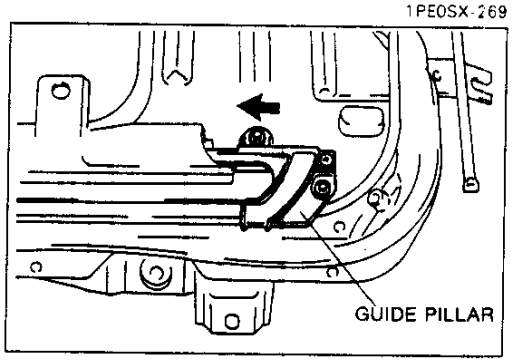
1. Insert the guide into the guide rail.
2. Insert the shutting assembly into the guide rail.



1PE0SX-269

Guide rail

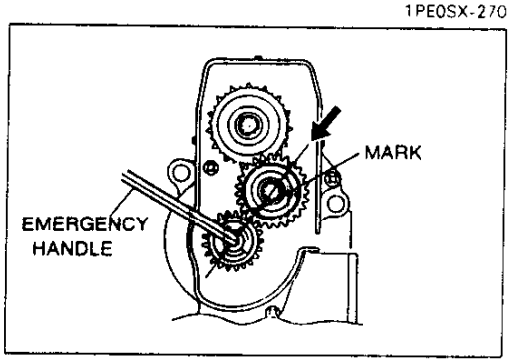
Insert the guide rail with the guide into the sunroof frame.



1PE0SX-270

Guide pillar

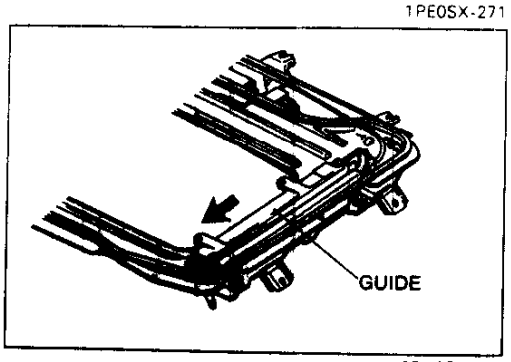
1. Insert the guide pillar into the guide rail.
2. Install the guide pillar mounting nuts and screw.



1PE0SX-271

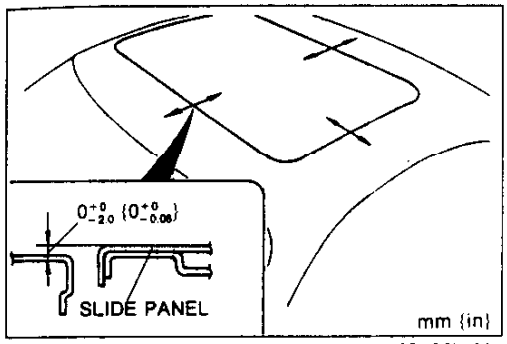
Sunroof motor

1. Remove the motor cover. Position the mark on the timing gear as shown in the figure by using the emergency handle (supplied in vehicle).



37U0SX-xxx

2. Move the guide fully forward by hand.
3. Install the motor to the sunroof frame.
4. Connect the motor harness connector.

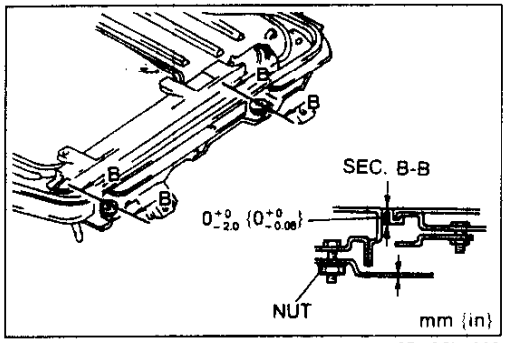


37U0SX-664

Adjustment
Slide panel
Height

Adjust the height difference between the slide panel and the roof panel according to the following procedure.

Allowable height difference: 2.0 mm {0.08 in} max.

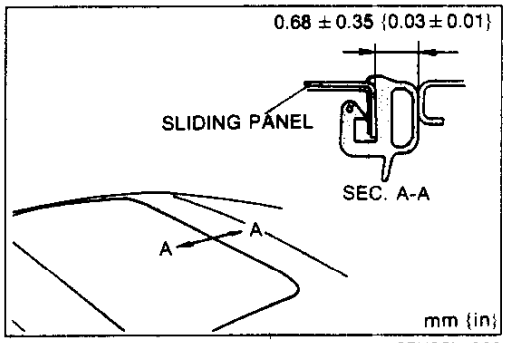


37U0SX-665

1. Remove the headliner. (Refer to page S–61.)
2. Loosen the set bracket attaching nuts.
3. Turn the height adjusting nuts to adjust the sunroof frame height.

Note
- **Clockwise rotation increases the frame height.**

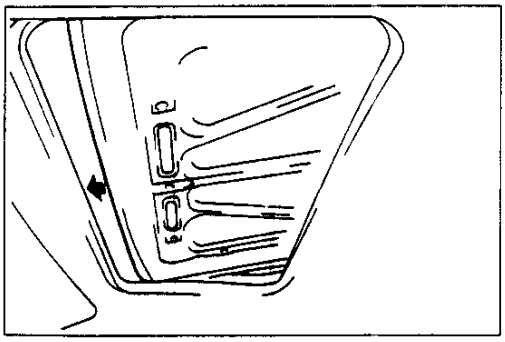
4. After adjustment, securely install the sunroof to the roof panel.



37U0SX-666

Gap

1. Verify that the slide panel does not interfere with the roof panel when operated.
2. If necessary, loosen the slide panel mounting nuts and move the panel.
3. If the above adjustment is not enough, loosen the mounting screws and bolts of the sunroof frame and set bracket and adjust again.
   (Refer to page S–47 Installation Note for the sunroof drive unit assembly.)

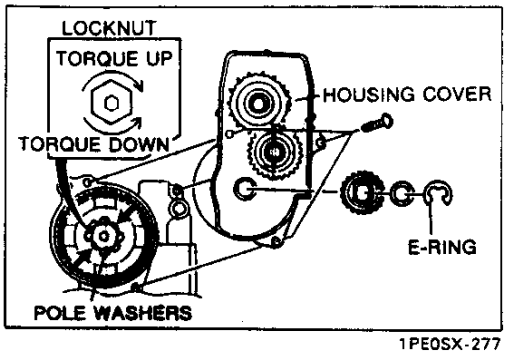

1PE0SX-276

Sunroof motor

1. Measure the operation time of the slide panel from fully open to fully closed or vice versa.

Specified time: 4–7 sec.

2. If not as specified, adjust it by turning the locknut on the sunroof motor.



1PE0SX-277

(1) Remove the housing cover attaching screw and the E-ring. Remove the housing cover from the motor.
(2) Unfold the pole washers indicated by the arrows.
(3) Hold the motor shaft with the emergency handle (supplied in vehicle) and turn the locknut to adjust the torque.
(4) Fold the pole washers against the locknut.

Note
- **Be sure to fold the pole washers.**

DASHBOARD AND CONSOLE

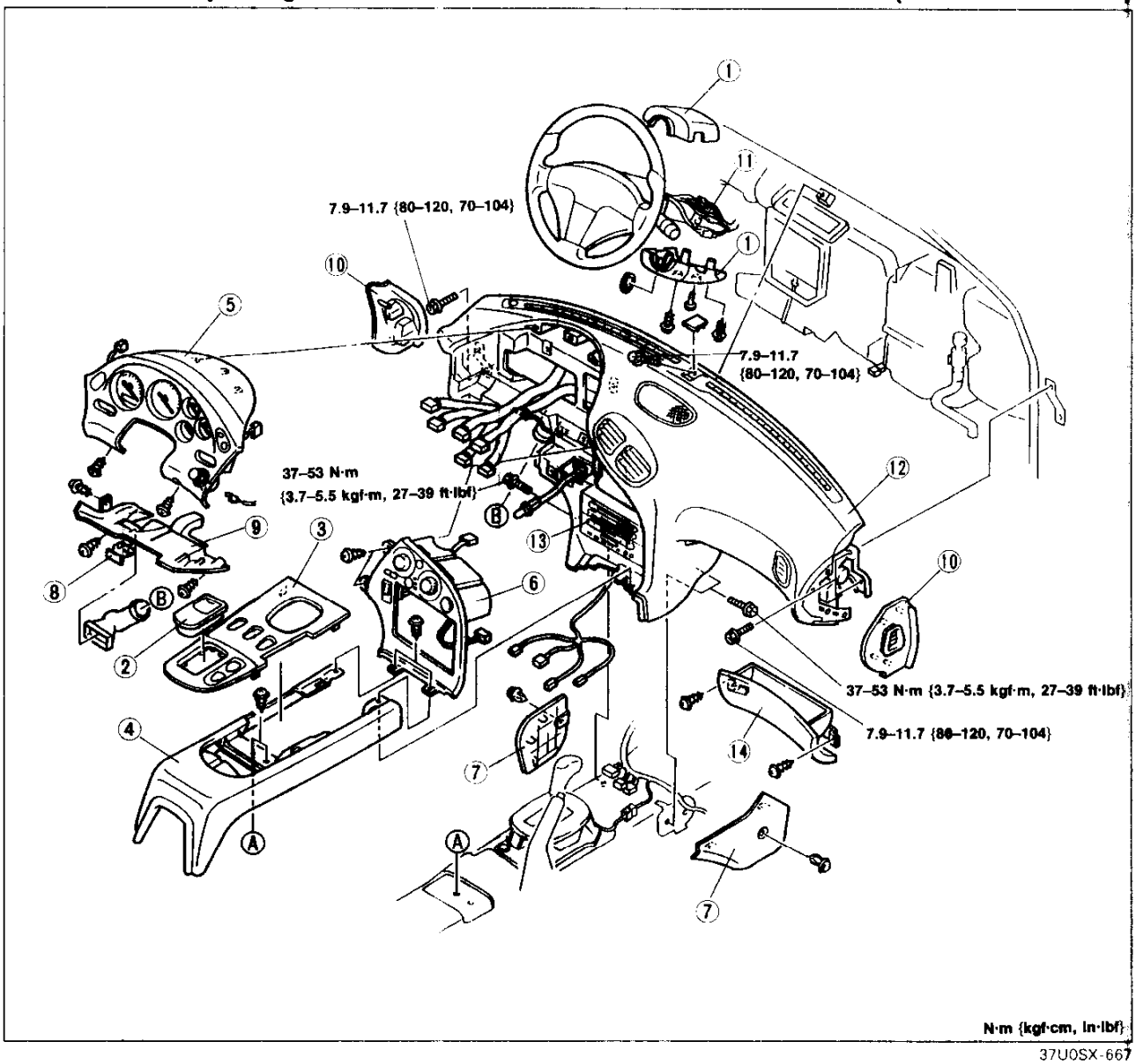
COMPONENTS

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**. (Refer to the 1993 RX-7 Body Electrical Troubleshooting Manual, Section J1, when removing the audio unit.)
3. Install in the reverse order of removal.

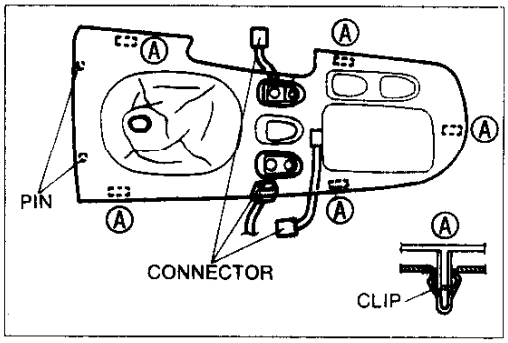
Note

- **Remove the parking brake lever to remove and install the dashboard. (Refer to Section P.)**



37U0SX-667

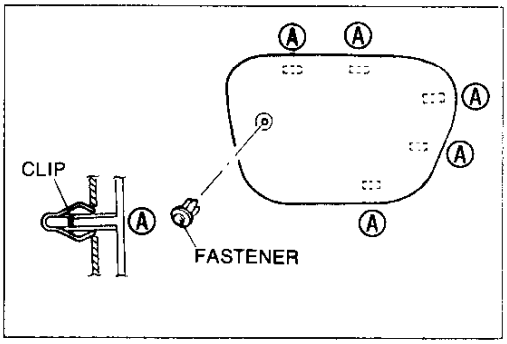
1. Column cover
2. Ashtray
3. Console panel
   Removal Note ..... page S–55
4. Rear console
5. Meter hood and instrument cluster
6. Center panel
7. Side wall
   Removal Note ..... page S–55
8. Hood release knob
   Removal / Installation ..... page S–5
9. Lower panel
10. Side panel
    Removal Note ..... page S–55
11. Steering shaft
    Removal Note ..... page S–55
12. Dashboard
13. Audio unit
14. Glove compartment



37U0SX 668

Removal Note
Console panel

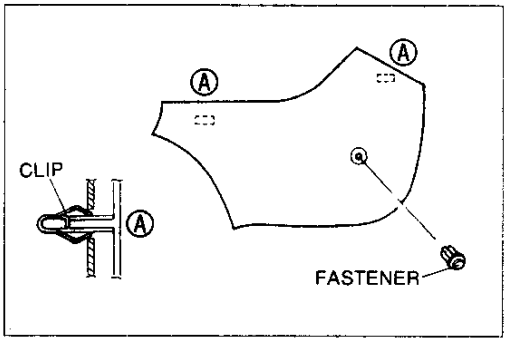
1. Remove the ashtray.
2. Insert a protected screwdriver at point A to pry out the rear of the panel.
3. Pull the console panel upward to disengage the clips from the body.
4. Remove the ashtray lamp.
5. Disconnect the harness connector from the switches.



37U0SX 694

Side wall
(driver side)

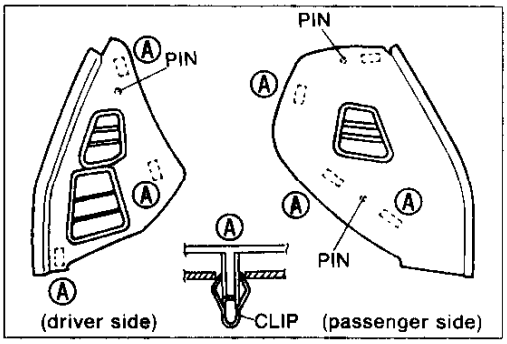
1. Remove the installation fastener.
2. Pull the side wall forward disengage the clips from the body.



37U0SX-695

(passenger side)

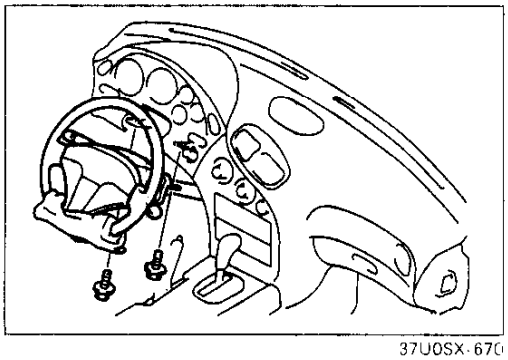
1. Remove the installation fastener.
2. Pull the side wall forward disengage the clips from the body.



37U0SX-669

Side panel

Pull the rear of the side panel forward to disengage the clips from the body.



37U0SX-670

Steering shaft

Remove the steering shaft mounting bolts to lower the shaft.

Caution

- **Protect the steering wheel with a clean rag before setting down the shaft.**

TRIM

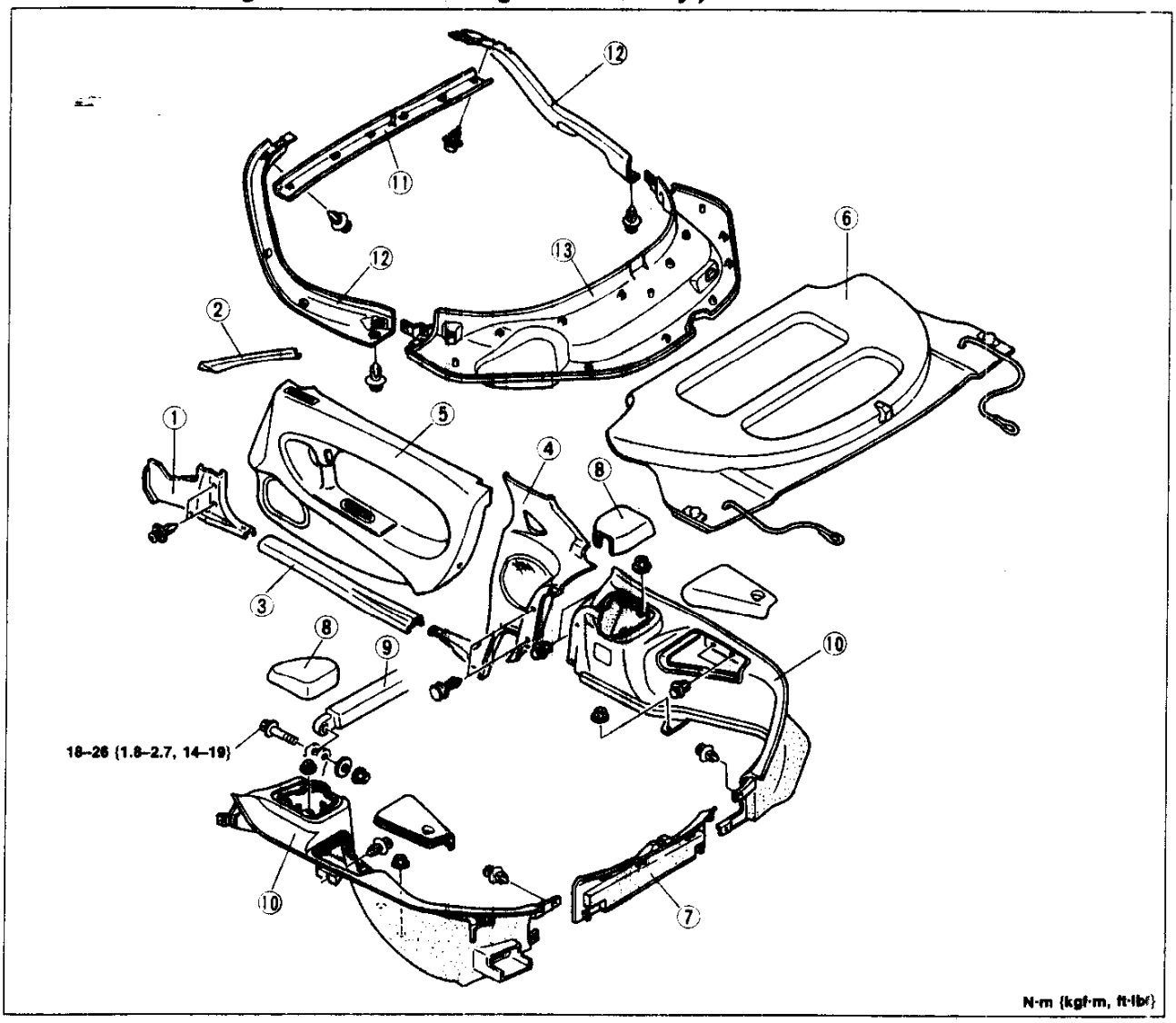
COMPONENTS

Removal / Installation

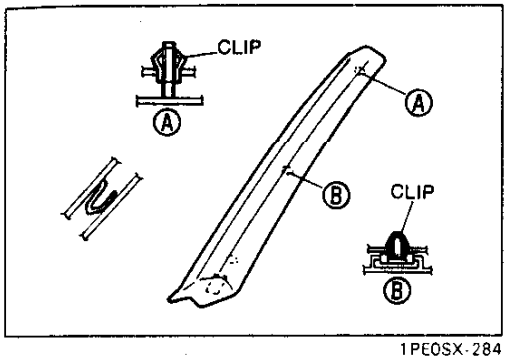
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal.

Note

- **Remove the acoustic wave guide assembly to remove and install the trunk end trim and trunk side trim. (Refer to the 1993 RX-7 Body Electrical Troubleshooting Manual, Section J1, when removing the acoustic wave guide assembly.)**



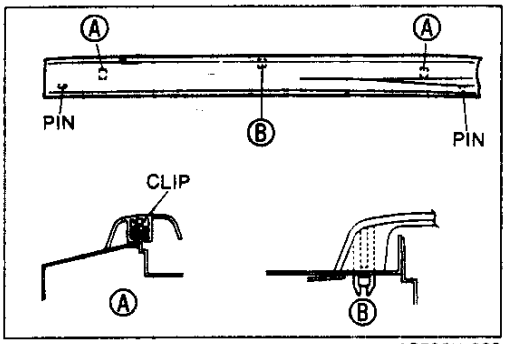
1. Front side trim
2. A-pillar trim
   Removal Note ..... page S–57
3. Scuff plate
   Removal Note ..... page S–57
4. Quarter trim
   Removal Note ..... page S–57
5. Door trim
   Removal Note ..... page S–57
6. Rear package tray
7. Trunk end trim
   Removal Note ..... page S–58
8. Suspension tower cover
9. Suspension rear strut bar
10. Trunk side trim
11. Rear hatch upper trim
    Removal Note ..... page S–58
12. Rear hatch side trim
    Removal Note ..... page S–58
13. Rear hatch lower trim
    Removal Note ..... page S–59



1PE0SX-284

Removal Note
A-pillar trim

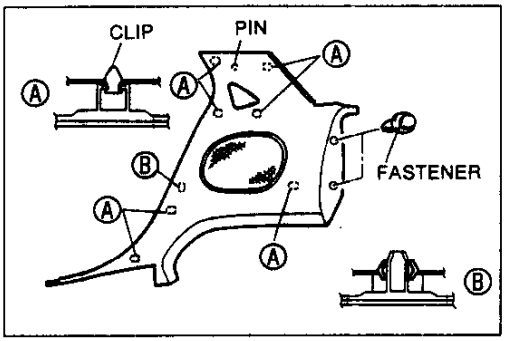
1. Remove the seaming welt.
2. Pull the A-pillar trim to disengage the clips from the body.
3. Pull the A-pillar trim up to remove it.



1PE0SX-285

Scuff plate

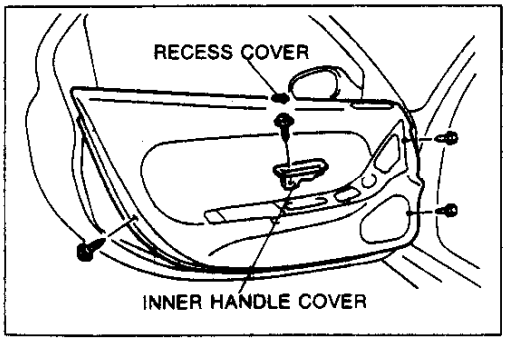
Pull the scuff plate up to disengage the clips from the body.



37U0SX-672

Quarter trim

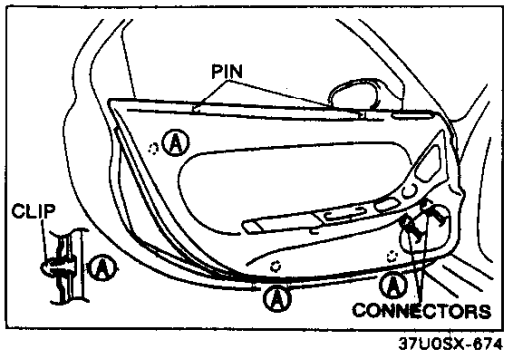
1. Remove the scuff plate.
2. Remove the seaming welt.
3. Remove the seat belt lower anchor. (Refer to page S–63.)
4. Remove the installation screw and fasteners.
5. Pull the quarter trim to disengage the clips from the body.



37U0SX-673

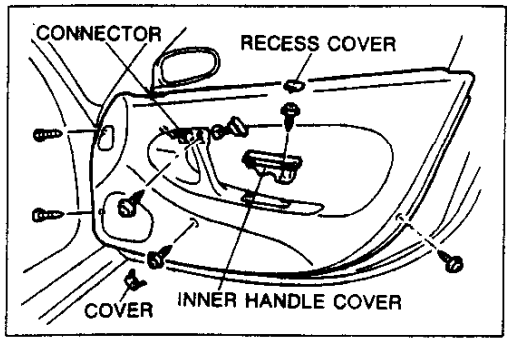
Door trim
(driver side)

1. Remove the recess cover and the installation screw.
2. Remove the inner handle cover.
3. Remove the door trim installation screws.



37U0SX-674

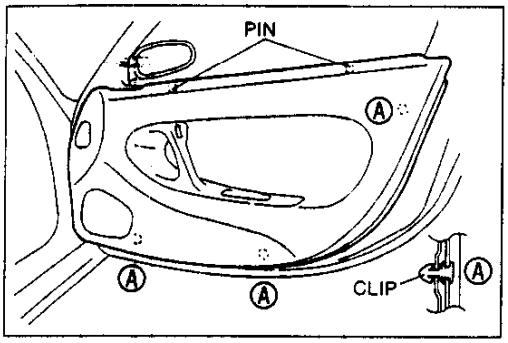
4. Pull the door trim to disengage the clips from the body.
5. Lift the door trim up to remove it.
6. Disconnect the harness connectors.



37U0SX-675

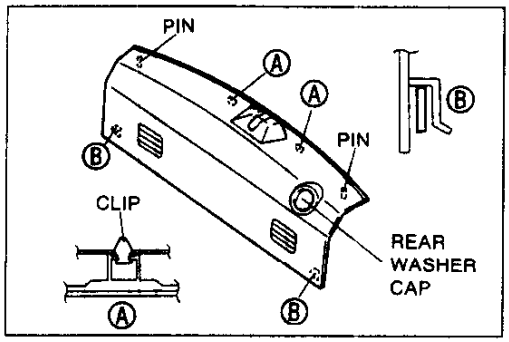
(passenger side)

1. Remove the recess cover and the installation screw.
2. Remove the inner handle.
3. Disconnect the harness connector.
4. Remove the cap and door trim mounting screws.



37U0SX-676

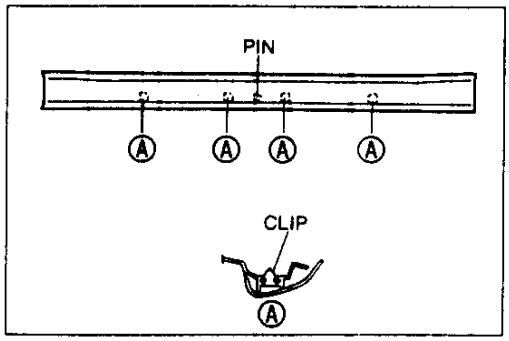
5. Pull the door trim to disengage the clips from the body.
6. Lift the door trim up to remove it.



1PE0SX-292

Trunk end trim

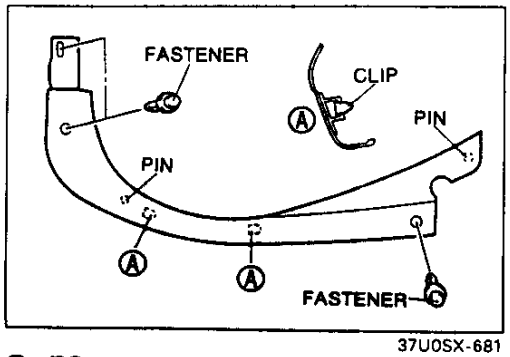
1. Remove the rear washer cap.
2. Remove the installation fasteners.
3. Pull the trunk end trim to disengage the clips from the body.
4. Lift the trunk end trim up to remove it.



37U0SX-680

Rear hatch upper trim

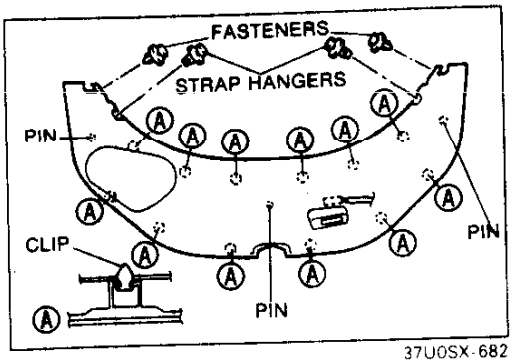
1. Remove the installation fasteners.
2. Pull the rear hatch upper trim to disengage the clips from the body.



37U0SX-681

Rear hatch side trim

1. Remove the rear hatch upper trim.
2. Remove the fasteners.
3. Pull the rear hatch side trim to disengage the clips from the body .



Rear hatch lower trim

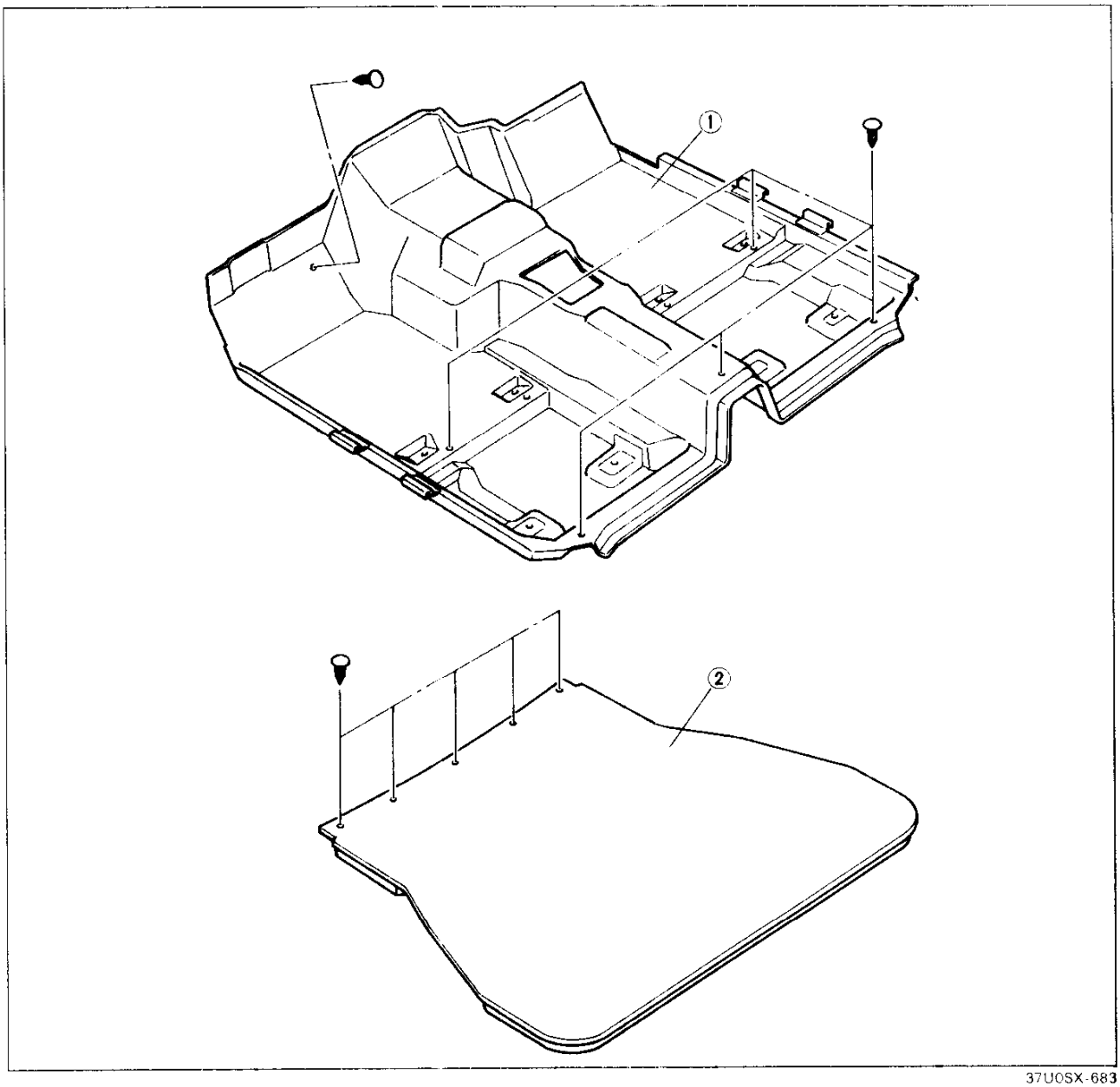
1. Remove the rear hatch side trim (page S–58).
2. Rotate the strap hangers 90° and remove them.
3. Remove the fasteners.
4. Pull the rear hatch lower trim to disengage the clips from the body.

FLOOR MAT

COMPONENTS

Removal / Installation

1. Disconnect the negative battery cable.
2. To remove the floor mat, first remove:
   a. Seats (Refer to page S–65.)
   b. Scuff plates (Refer to page S–56.)
   c. Seat belt lower anchor (Refer page S–63.)
   d. Quarter trim (Refer to page S–56.)
   e. Storage compartment (Refer to page S–67.)
   f. Dashboard and console (Refer to page S–54.)
3. Remove the remaining parts in the order shown in the figure.
4. Install in the reverse order of removal.



37U0SX-683

1. Floor mat
2. Trunk mat

HEADLINER

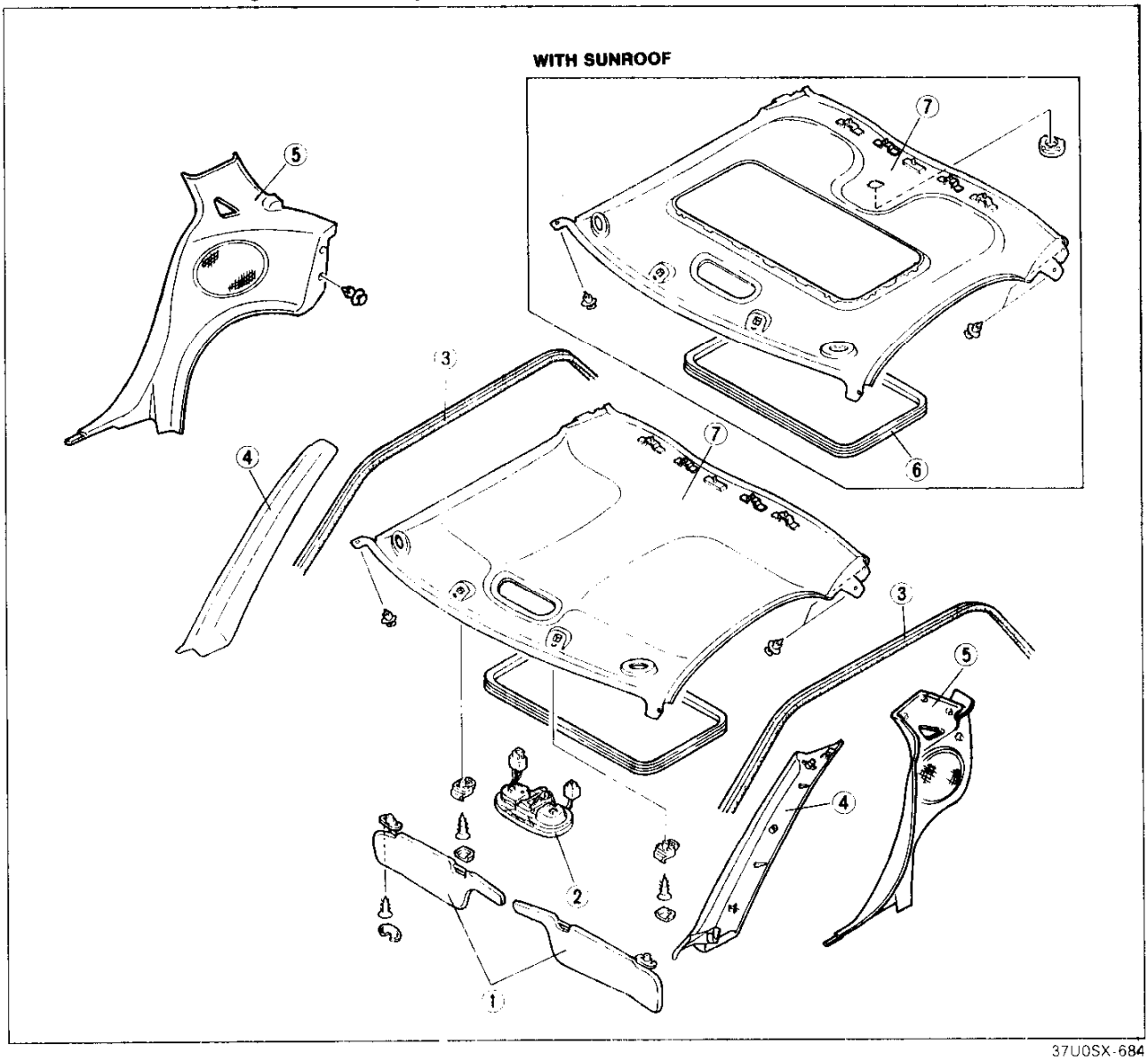
COMPONENTS

Removal / Installation

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 or removal.

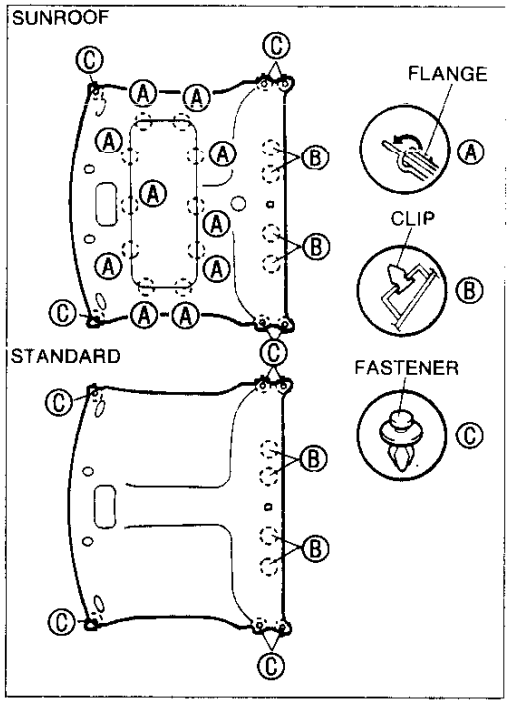
Caution

- **Do not break any fastener, clip, or locator pin during removal or installation.**

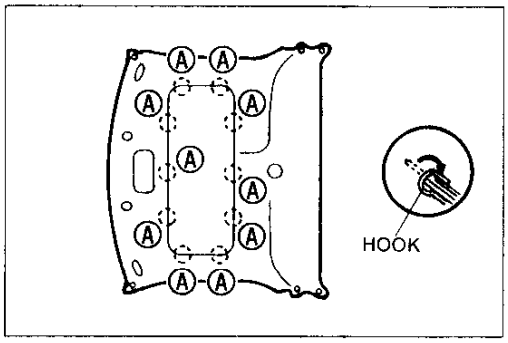


37U0SX-684

1. Sunvisor and adapter
2. Overhead console
3. Seaming welt (door)
4. A-pillar trim
   Removal / Installation ..... page S–56
5. Quarter trim
   Removal / Installation ..... page S–56
6. Seaming welt (sliding sunroof)
7. Headliner
   Removal Note ..... page S–62
   Installation Note (Sliding sunroof)
   ..... page S–62



1PE0SX 299



1PE0SX 300

Removal Note
Headliner
Standard model

1. Remove the attaching fasteners from the front of the headliner. Remove the attaching clips at the rear and sides of the headliner.
2. Remove the headliner.

Caution
- **Do not damage the headliner.**

Sunroof model

1. Carry out step 1 above.
2. Remove the seaming welt and unfold the hooks at the sunroof frame flange.
3. Remove the headliner.

Caution
- **Do not damage the headliner.**

Installation Note
Headliner
Sunroof model

1. Fold the headliner hooks against the sunroof frame flange.
2. Install the seaming welt.
3. Install the headliner.

SEAT BELT

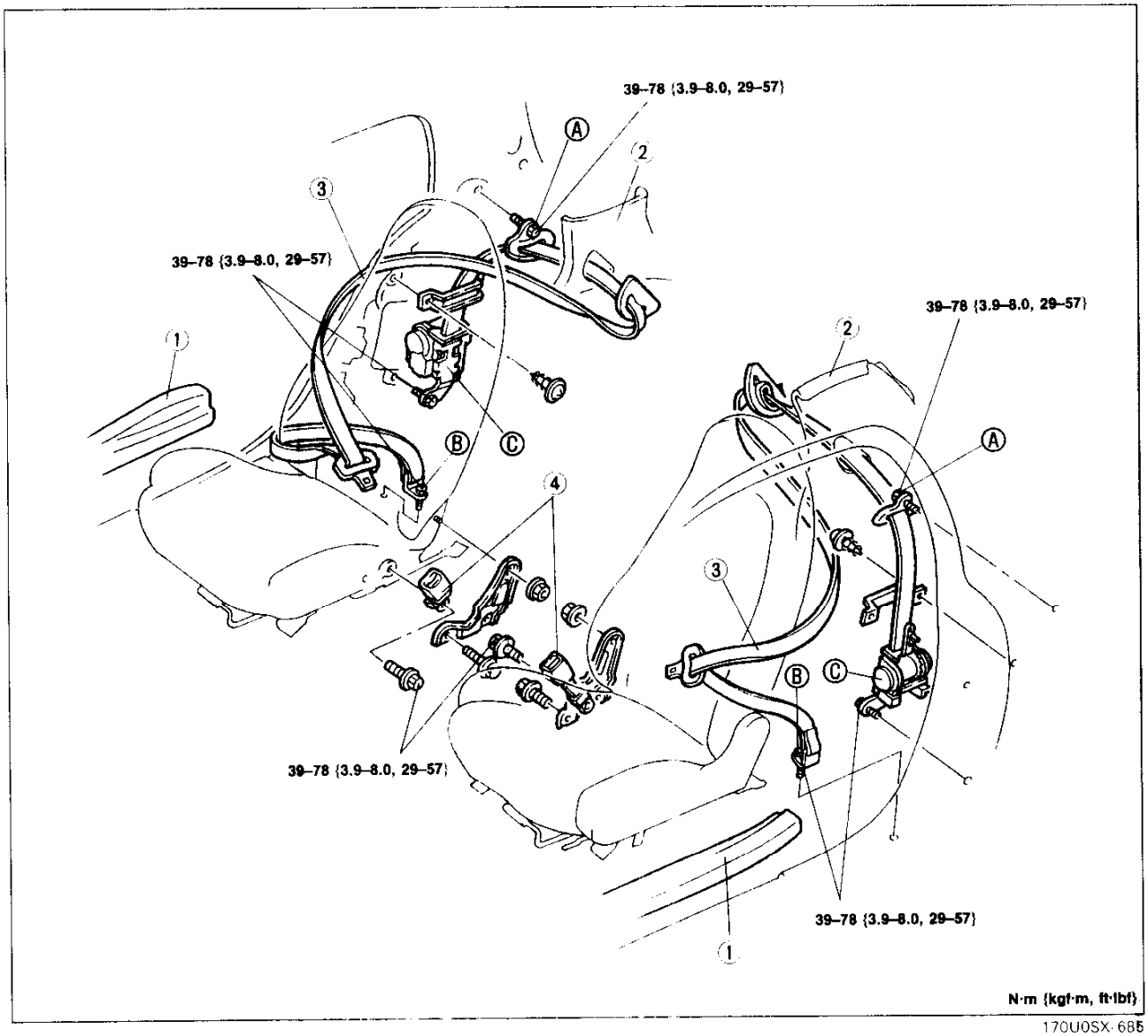
COMPONENTS

Removal / Installation

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

Caution

- **Do not disassemble the buckle or retractor assembly.**



170U0SX-685

1. Scuff plate
   Removal / Installation ..... page S–56
2. Quarter trim
   Removal / Installation ..... page S–56
3. Seat belt assembly
   A. Lower anchor
   B. Upper anchor
   C. Retractor
   Inspection ..... page S–64
4. Buckle

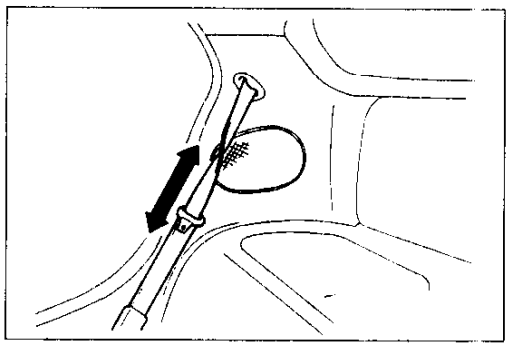
SEAT BELT

Inspection

Webbing and fittings

1. Inspect the webbing for scars and tears.
2. Inspect the fittings for deformation.
3. If any problem is found, replace the seat belt assembly.

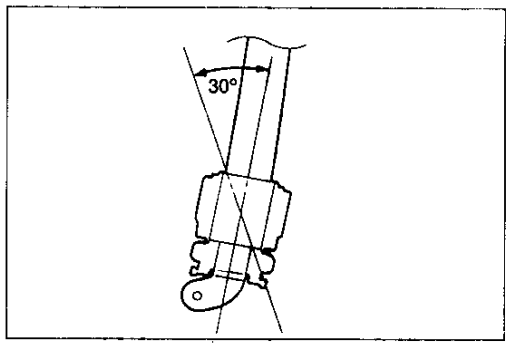
1PE0SX-302



1PE0SX-303

Emergency locking retractor (ELR)

1. Pull out the seat belt slowly and then release it. Verify that it returns smoothly.
2. Verify that the retractor locks when the belt is quickly pulled.



1PE0SX-304

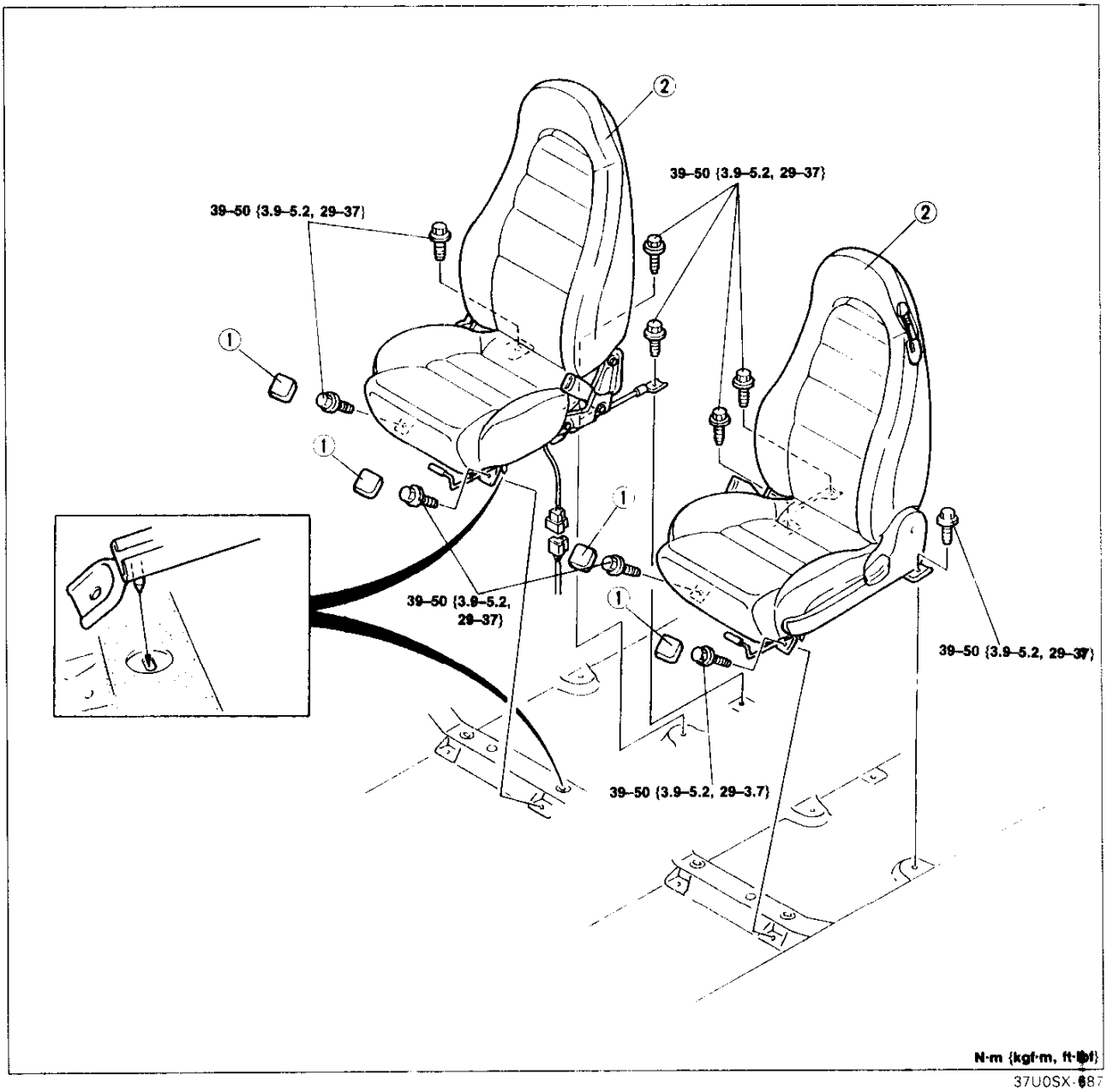
3. Remove the retractor.
4. Hold the retractor as it would be installed.
5. Slowly incline the retractor while pulling out the belt.
6. Verify that the retractor locks at angle of **approx. 30 degrees**.
7. If not as specified, replace the seat belt assembly.

SEAT

COMPONENTS

Removal / Installation

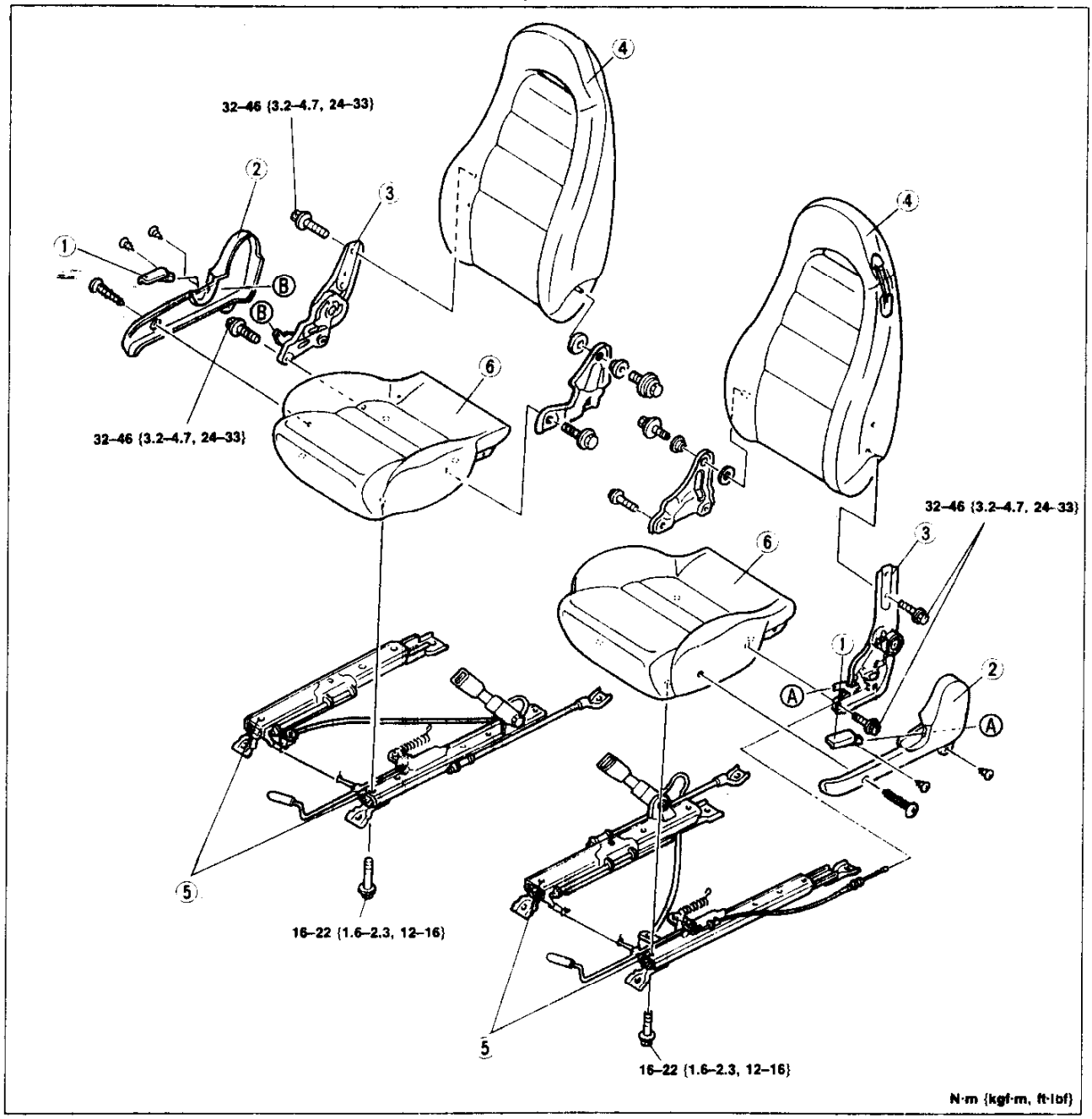
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Adjuster cover
2. Seat
   Disassembly / Assembly ..... page S–66

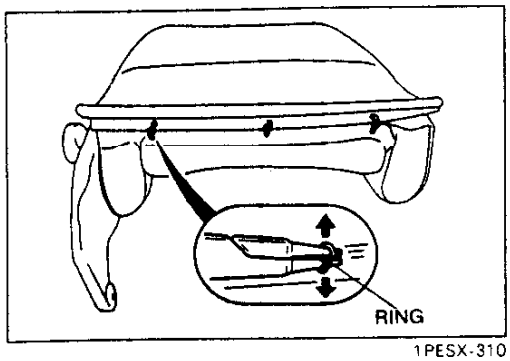
Disassembly / Assembly

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

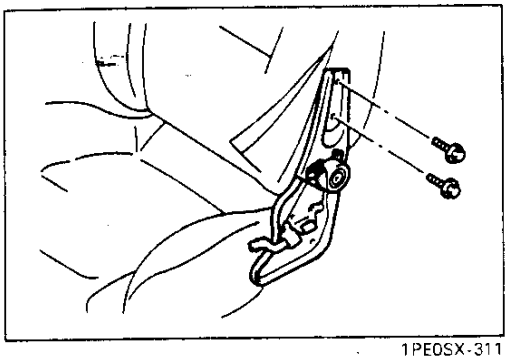


37U0SX-688

1. Knuckle knob
2. Knuckle cover
3. Recliner knuckle
   Disassembly Note ..... page S–67
4. Seat back
5. Slide adjuster
6. Seat cushion



1PESX-310



1PEOSX-311

Disassembly Note
Recliner knuckle

1. Remove the hog rings from the seat back.
2. Turn over the seat back cover to reveal the recline knuckle mounting bolts.
3. Remove the mounting bolts and the recliner knuckle.

STORAGE COMPARTMENT

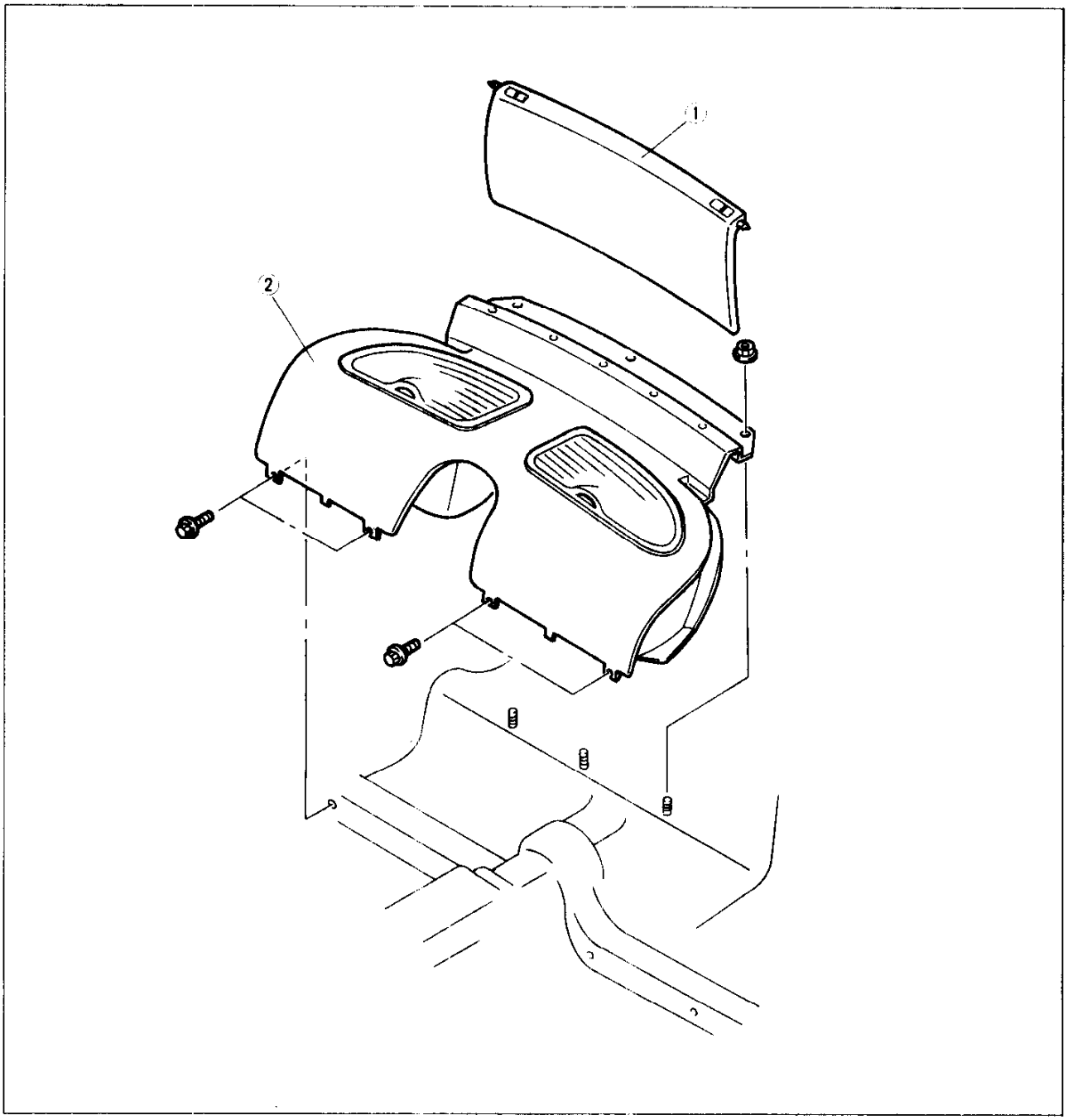
COMPONENTS

Removal / Installation

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

Note

- **Remove the quarter trim to remove and install the storage compartment. (Refer to page S–56.)**



1. Luggage compartment panel
2. Storage compartment

SPECIAL TOOLS

37USTX-001

GENERAL INFORMATION

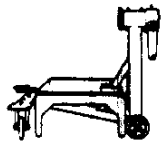
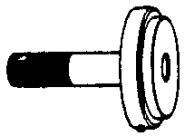
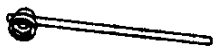
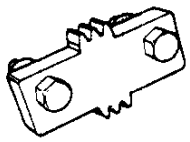
The letters A and B in the priority column indicate the degree of importance of each tool.
A.....Indispensable
The tools ranked A in this list are indispensable for performing operations satisfactorily, easily, safely, and efficiently. It is, therefore advisable that all service shops have these tools.
B.....Selective
The tools in this list are not as necessary as tools ranked A, but all service shops should have these tools to perform repairs more easily and more efficiently.

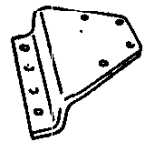
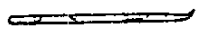
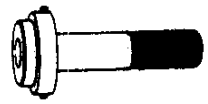
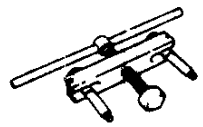
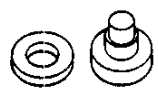
Note

- **When ordering tool sets which consist of several tools, check the list in the Special Service Tools Booklet (4063-12-87J) etc. to make sure that some tools are duplicated in other sets which may already have been purchased. If so, order only those new tools which are needed.**

97USTX-002

ENGINE

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0107 680A Engine stand	A	
49 0813 215A Puller, tubular dowel & A/T oil pump	A	
49 0813 250 Seal case	B	
49 0813 240 Installer & puller, rotor bush	A	
49 0820 035 Box wrench, flywheel	A	
49 F011 101 Brake, ring gear (Manual transmission)	A	
49 1285 071 Puller, bearing	A	
49 2113 010B Gauge set, air pump	A	

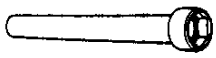
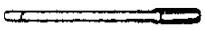
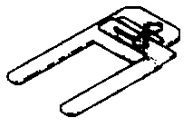
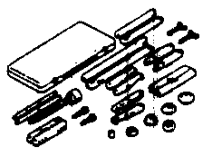
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 1114 005 Hanger, engine stand	A	
49 0813 225 Remover, oil seal	B	
49 0813 235 Puller & installer, main bearing	A	
49 0839 165 Gauge, corner seal	A	
49 1881 055A Stopper, counter weight (Automatic transmission)	A	
49 0839 305A Puller, counter weight	A	
49 F011 1A1 Installer set, bearing	A	
49 0187 280 Oil pressure gauge	B	

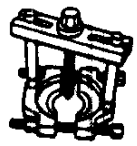
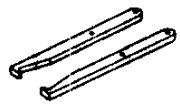
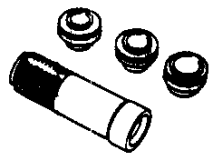
COOLING SYSTEM

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 G014 001 Wrench, oil filter	A	

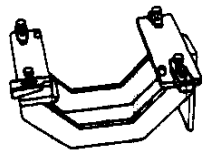
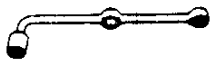
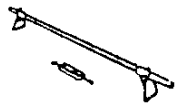
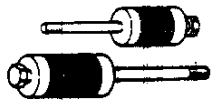
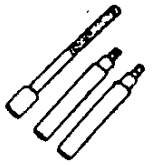
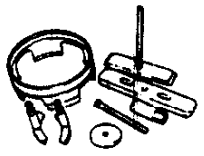
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 9200 020 V-ribbed belt tension gauge	A	

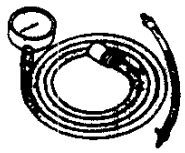
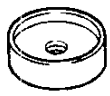
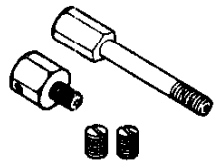
CLUTCH AND MANUAL TRANSMISSION

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 SE01 310 Centering tool, clutch disc	A	
49 1243 465A Wrench, main shaft locknut	A	
49 0862 350 Guide, shift fork assembly	B	
49 F017 101 Holder synchronizer ring	A	
49 0839 425C Puller set, bearing	A	
49 G030 795 Installer, oil seal	A	

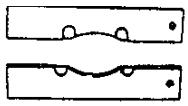
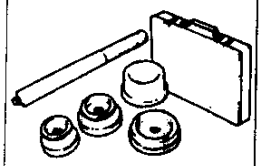
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0710 520 Puller, bearing	A	
49 0500 330 Installer, transmission bearing	A	
49 S120 440 Holder, mainshaft	A	
49 H017 101 Hook	A	
49 F401 330B Installer set, bearing	A	
49 0636 145 Puller, fan pulley boss	A	

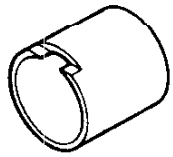
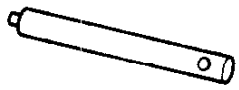
AUTOMATIC TRANSMISSION

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 U019 0A0A Hanger set, transmission	B	
49 0877 435 Special wrench	A	
49 G017 5A0 Engine support	A	
49 0378 390 Puller, oil pump	A	
49 L019 001 Bolt	A	
49 G019 0A7A Compressor set, return spring	A	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0378 400A Gauge set, oil pressure	A	
49 F019 001 Installer, oil seal	A	
49 J019 002 Cap	A	
49 B019 901 Gauge, oil pressure	A	
49 F019 0A0 Adapter set	A	

FRONT AND REAR AXLES

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 F026 103 Puller, wheel hub	A	
49 G033 105 Attachment	A	
49 F027 0A1 Installer set, bearing	A	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 H034 201 Support block	A	
49 G033 102 Handle	A	
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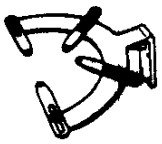
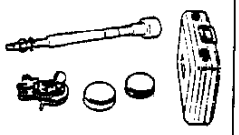
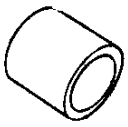
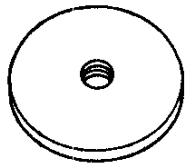
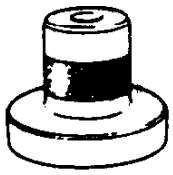
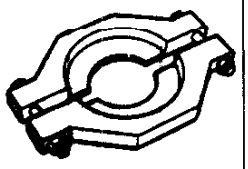
DIFFERENTIAL

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 M005 561 Hanger, diff. carrier	A	
49 B001 795 Installer, oil seal	A	
49 F027 0A0 Gauge set, pinion height adjustment	A	
49 J027 002 Collar	A	
49 8531 565 Pinion model	A	

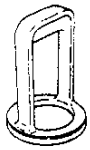
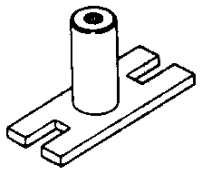
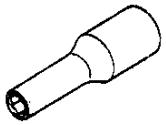
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 G030 338 Attachment E	A	
49 J027 001 Installer, bearing	A	
49 S120 710 Holder, coupling flange	B	
49 UB71 525 Installer, bearing	A	
49 U027 003 Installer, oil seal	A	

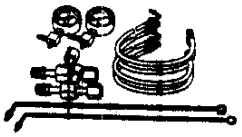
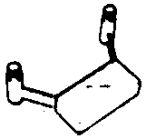
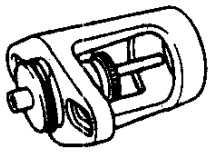
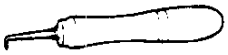
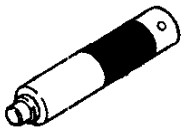
DIFFERENTIAL (CONT'D)

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 V001 795 Installer, oil seal	A	

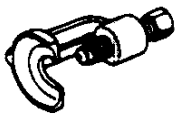
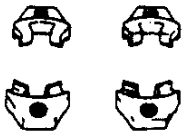
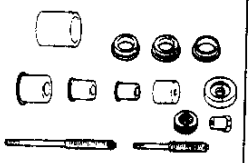
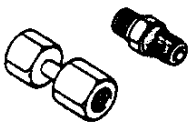
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 H027 002 Remover, bearing	A	

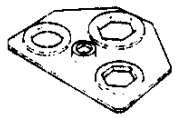
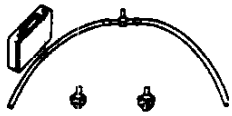
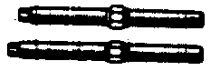
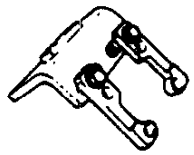
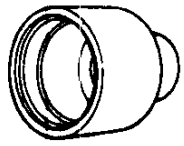
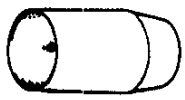
BRAKING SYSTEM

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0259 770B Wrench, flare nut	A	
49 F026 104 Installer, sensor rotor	A	
49 0221 600C Expand tool, disc brake	B	
49 B043 003 Turning lock tool	A	
49 B043 004 Socket wrench	A	
49 H028 204 Attachment	A	

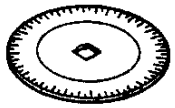
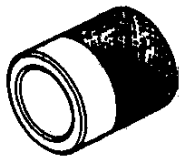
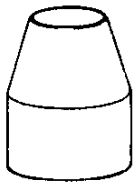
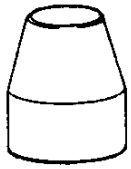
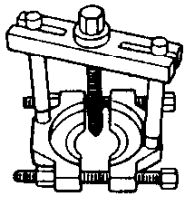
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 U043 0A0 Gauge set, oil pressure	A	
49 F033 001 Stopper, disc brake piston	A	
49 FA18 602 Wrench, disc brake piston	B	
49 B043 001 Adjust gauge	A	
49 0208 701A Boot air out tool	B	
49 B043 002 Installer, bearing	A	

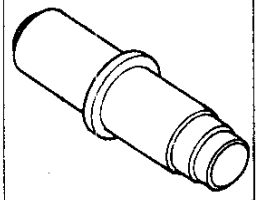
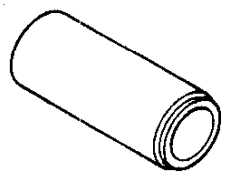
STEERING SYSTEM AND SUSPENSION

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0180 510B Attachment, preload measuring	A	
49 0118 850C Puller, ball joint	A	
49 0223 640B Arm, coil spring compressor	A	
49 1232 670A Gauge set, power steering	A	
49 H002 671 Adapter, power steering gauge	A	
49 F034 2A0 Replacer set, rubber bush	A	
49 H032 322 Adapter set, power steering	A	
49 W023 585A Adjust wrench	A	

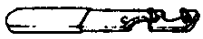
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 F032 313 Wrench	A	
49 G032 3A1 Joint hose	A	
49 0370 641 Screw, coil spring compressor	A	
49 F032 305 Handle	A	
49 F032 303 Handle	A	
49 F032 301 Hanger, power steering pump	A	
49 1243 785 Installer, boot	A	
49 F032 310 Protector	A	

STEERING SYSTEM AND SUSPENSION (CONT'D)

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 D032 316 Protractor	A	
49 H032 328 Seal ring former	A	
49 F034 210 Guide, clip	A	
49 F034 211 Guide, clip	A	
49 0710 520 Puller, bearing	A	
49 F032 304 Body	A	

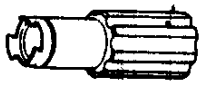
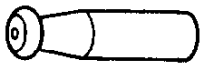
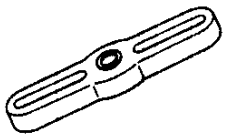
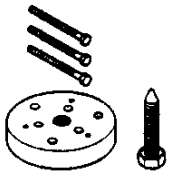
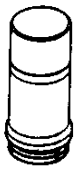
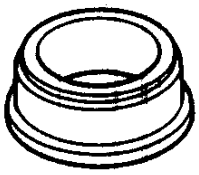
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 H032 301 Wrench	A	
49 F032 306A Body	A	
49 F032 317 Remover, oil seal	A	
49 F032 318 Installer, bearing and oil seal	A	
49 F032 319 Installer, oil seal	A	

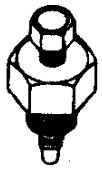
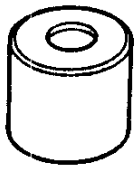
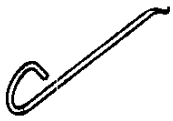
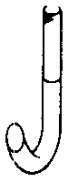
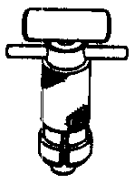
HEATER AND AIR CONDITIONER SYSTEMS

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
0000-41-0809-01 Holder, clutch	A	

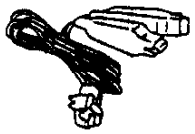
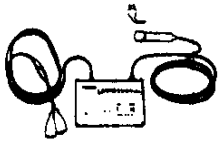
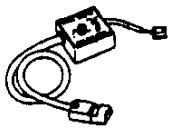
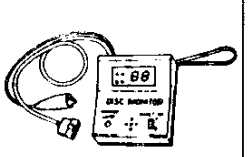
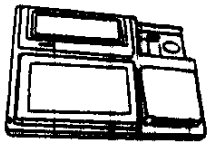
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
0000-41-0810-73 Remover & installer, seal seat	A	

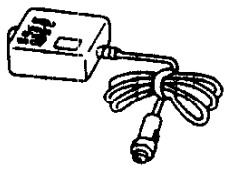
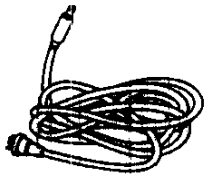
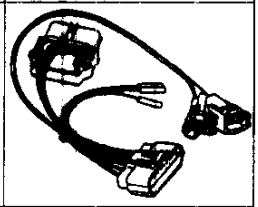
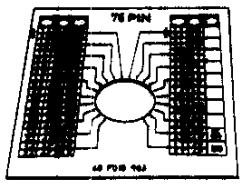
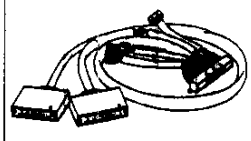
HEATER AND AIR CONDITIONER SYSTEMS (CONT'D)

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
0000-41-0812-11 Remover & installer, seal	A	
0000-41-0812-13 Protector, seal sleeve	A	
0000-41-0804-57 Universal puller body	A	
0000-41-0804-51 Universal puller arbor	A	
0000-41-0810-76 Removal set, pulley & clutch	A	
0000-41-0809-02 Puller, clutch plate	A	
0000-41-0804-43 Installer, clutch rotor bearing	A	
0000-41-0810-59 Clutch rotor driver	A	

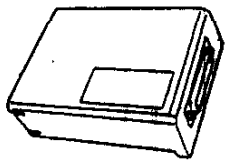
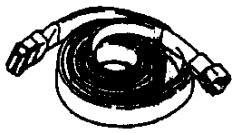
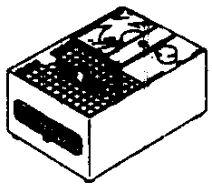
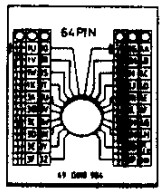
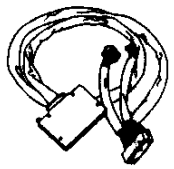
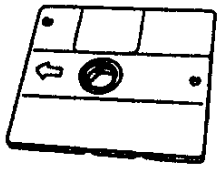
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
0000-41-0809-10 Shaft protector pilot	A	
4992-02-020 Pressure plate remover	A	
4992-02-040 Shaft seal remover	A	
0000-41-0810-77 Clutch pilot	A	
0000-41-0804-12 Remover, O-ring	A	
4992-02-010 Pressure plate holder bar	A	
4992-02-030 Seal plate remover	A	
49 L061 001 Stopper, magnetic clutch	A	

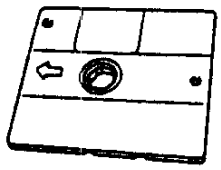
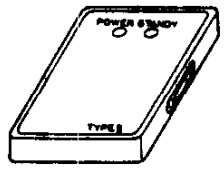
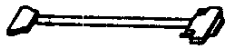
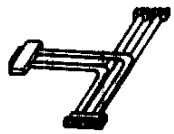
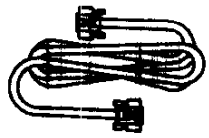
CHECKER AND OTHER EQUIPMENT

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0839 285 Checker, fuel thermometer	A	
49 L018 901 Injector checker	A	
49 F018 9A0 Compression tester	A	
49 H066 002 Deployment tool	A	
49 B019 9A0 System selector	A	
49 H066 003 Adapter harness	A	
49 H018 9A1 Self-diagnosis checker	A	
49 F088 001 DT-S1000 Base unit	A	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0305 870A Tool set, window (bond type)	A	
49 F088 002 Power unit DC-12V (49 F088 007 Power unit AC)	A	
49 F088 003 Harness power unit DC (49 F088 008 Harness power unit AC)	A	
49 H080 740 Pressure tester	A	
49 F018 003 Adapter harness	A	
49 F018 903 Sheet	A	
49 F018 902 Adapter harness	A	
49 G050 1A0 Remover, sealant	A	

CHECKER AND OTHER EQUIPMENT (CONT'D)

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 F088 004 IF-Adapter TYPE-I	A	
49 F088 005 Harness TYPE-I	A	
49 9200 162 Monitor, engine signal	A	
49 G018 904 Sheet	A	
49 H019 905 Adapter harness	A	
49 F088 019 System disk TYPE-III (V1.00)	A	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 F088 011 System disk TYPE-I (V1.00)	A	
49 F088 016 System unit TYPE-III	A	
49 F019 907 Adapter harness	A	
49 F019 906 Adapter harness 36P	A	
49 F088 017 Harness TYPE-III	A	

TECHNICAL DATA

37UTDX-001

C. ENGINE

Item				Engine model 13B (Turbo)
Type				Rotary engine
Displacement cc {cu in}				654 × 2 {40.0 × 2}
Number of rotors and arrangement				2 rotors, longitudinal
Combustion chamber type				Bathtub
Compression ratio				9.0: 1
Port timing	Intake	Open	Primary	45° BTDC
			Secondary	32° BTDC
		Close	Primary	50° ABDC
			Secondary	50° ABDC
	Exhaust	Open		75° BBDC
		Close		48° ATDC
Compression pressure kPa {kgf/cm², psi}-rpm		Minimum		686 {7.0, 100}-250
		Maximum difference between chambers		147 {1.5, 21}-250
Side housing (Front, intermediate and rear housing)		Distortion limit mm {in}		0.04 {0.002}
		Side seal wear limit mm {in}		0.10 {0.004}
		Side seal wear limit, overlapping oil seal wear mm {in}		0.01 {0.0004}
		Side seal wear limit, outside oil seal wear mm {in}		0.10 {0.004}
		Oil seal wear limit mm {in}		0.02 {0.0008}
Rotor housing		Width mm {in}		80 {3.1}
		Maximum width difference mm {in}		0.06 {0.0024}
Rotor		Width (Apex) mm {in}		79.675 {3.1368}
		Clearance of side housing to rotor mm {in}	Standard	0.12–0.21 {0.0047–0.0083}
			Min.	0.10 {0.0039}
		Diameter of corner seal groove mm {in}		11.000–11.018 {0.4331–0.4338}
		Width of side seal groove mm {in}		0.714–0.739 {0.0281–0.0291}
		Width of apex seal groove mm {in}		1.995–2.012 {0.0785–0.0792}
Apex seal and spring		Width mm {in}		2.0 {0.079}
		Height (upper and lower) mm {in}	Standard	8.5 {0.33}
			Min.	7.5 {0.295}-Refer to ENGINE INSPECTION section
		Clearance of apex seal and rotor groove mm {in}	Standard	0.051–0.101 {0.002–0.004}
			Max.	0.15 {0.0059}
		Spring free height mm {in}	Long Standard	6.25 {0.246}
			Long Min.	3.5 {0.138}
			Short Standard	3.3 {0.130}
Side seal and spring		Thickness mm {in}		0.661–0.686 {0.0260–0.0270}
		Clearance of side seal to rotor groove mm {in}	Standard	0.028–0.078 {0.0011–0.0031}
			Max.	0.10 {0.0039}
		Height mm {in}		3.0 {0.118}
		Protrusion min. mm {in}		0.50 {0.020}
		Clearance of side seal to corner seal mm {in}	Standard	0.05–0.15 {0.0020–0.0059}
			Max.	0.40 {0.016}
Corner seal and spring		Outer diameter mm {in}		10.990–11.014 {0.4327–0.4336}
		Height mm {in}		7.0 {0.276}
		Protrusion min. mm {in}		0.50 {0.020}
Rotor oil seal and spring		Height mm {in}		5.6–5.8 {0.220–0.228}
		Oil seal lip width max. mm {in}		0.50 {0.020}
		Protrusion min. mm {in}		0.50 {0.020}
Main bearing		Inner diameter mm {in}		43.025–43.050 {1.6939–1.6949}
Rotor bearing		Inner diameter mm {in}		74.025–74.050 {2.9144–2.9153}

Item			Engine model: 13B (Turbo)
Eccentric shaft	Runout max. mm {in}		0.06 {0.0027}
	End play mm {in}	Standard	0.040–0.070 {0.0016–0.0028}
		Limit	0.09 {0.0035}
	Main journal diameter mm {in}		43 {0.37}
	Clearance of main journal mm {in}	Standard	0.08–0.11 {0.0031–0.0043}...outside 0.06–0.08 {0.0023–0.0031}...inside
		Limit	0.13 {0.0051}...outside 0.11 {0.0043}...inside
	Rotor journal diameter mm {in}		74 {2.9}
	Clearance of rotor journal mm {in}	Standard	0.060–0.080 {0.0023–0.0031}
		Limit	0.10 {0.0039}
Drive belt deflection at 98 N {10 kgf, 22 lbf} mm {in}	Alternator and Air pump	Used	7.0–7.5 {0.28–0.29}
	P/S pump and A/C compressor	Used	4.5–5.0 {0.18–0.19}

D. LUBRICATING SYSTEM

Item			Engine model: 13B (Turbo)
Lubrication system			Forced-fed
Oil pump	Type		Trochoid
	Lobe clearance of outer rotor to inner rotor mm {in}	Standard	0.03–0.12 {0.0012–0.0047}
		Max.	0.15 {0.0059}
	Clearance of outer rotor to pump body mm {in}	Standard	0.20–0.25 {0.0079–0.0098}
		Max.	0.30 {0.0118}
	End float mm {in}	Standard	0.03–0.125 {0.0012–0.0049}
		Max.	0.15 {0.0059}
Pressure control valve	Relief pressure kPa {kgf/cm^2, psi}		1,080 {11.0, 156}
Oil cooler	Type		Air-cooled, with bypass valve
	Relief temperature °C {°F}		60–65 {140–149} or below
	Relief pressure dif. kPa {kgf/cm^2, psi}		349 {3.56, 50} at 60°C {140°F}
	Bypass valve protrusion mm {in}		5 {0.2} or more
Regulator valve	Relief pressure kPa {kgf/cm^2, psi}		490 {5.0, 71}
Oil filter	Type		Full flow, paper element
	Relief pressure dif. kPa {kgf/cm^2, psi}		98 {1.0, 14}
Eccentric shaft bypass valve	Relief temperature °C {°F}		60 {140} or below
	Protrusion mm {in}		.6 {0.24} or more
Engine oil	Capacity L {US qt, Imp qt}	Total (dry engine)	4.9 {5.2, 4.3} *5.4 {5.7, 4.8}
		Oil pan	4.2 {4.4, 3.7}
		Oil cooler	0.85 {0.90, 0.75}
		Oil filter	0.19 {0.20, 0.17}
			0.17 {0.18, 0.15}
	Classification		API Service SG Energy Conserving II (ECII)
	Above – 25°C {– 10°F}		10W-30
	Below 0°C {32°F}		5W-30

* R1 model

E. COOLING SYSTEM

Item		Engine model	13B (Turbo)		
Cooling method			Water-cooled, forced circulation		
Water pump	Type		Centrifugal		
	Pulley ratio (Speed)		1: 1.22		
Thermostat	Type		Wax, bottom bypass		
	Opening temperature	°C {°F}	80.5–83.5 {177–182}		
	Full-open temperature	°C {°F}	95 {203}		
	Full-open lift min.	mm {in}	8–10 {0.31–0.39}		
Radiator	Type		Corrugated fin		
Coolant filler cap	Relief pressure	kPa {kgf/cm², psi}	115–145 {1.15–1.45, 16.4–20.6}		
Electric cooling fan	Type		Electrical		
	Capacity	W	160 × 2		
	Number of blades		No1: 5, No2: 4		
	Outer diameter	mm {in}	300 {11.8}		
Drive belt deflection at 98 N {10 kgf, 22 lbf} mm {in}	Alternator and air pump	Used	7.0–7.5 {0.28–0.29}		
Coolant	Capacity	L {US qt, Imp qt}	8.8 {9.3, 7.7}		
Antifreeze solution	Protection	Mixture	Mixture percentage %		Specific gravity at 20°C {68°F}
			Water	Antifreeze	
	Above – 16°C {3°F}		65	35	1.054
	Above – 26°C {– 15°F}		55	45	1.066
	Above – 40°C {–40°}		45	55	1.078

F. FUEL AND EMISSION CONTROL SYSTEMS

Item			Specification
Idle speed*		rpm	700–750
Ignition timing	Leading	ATDC	5°
	Trailing	ATDC	20°
Air cleaner			
Element type			Oil permeated
Throttle body			
Type			Horizontal draft (2 stage-3 barrel)
Throat diameter	Primary	mm {in}	45 {1.772}
	Secondary	mm {in}	50 {1.969} × 2
Dashpot touch angle			8
Water thermovalve Operation (full open) temperature		°C {°F}	55–65 {131–149} or more
Intercooler			
Type			Air cooled
Core size {w × h × t}		mm {in}	294 × 114 × 65 {11.575 × 4.4882 × 2.5591}
Turbocharger			
System type			Sequential twin turbocharged
Cooling method			Water + engine oil
Boost control actuator			Turbo precontrol + wastegate control
Boost control method			Solenoid valve (duty-controled) × 2
Fuel tank			
Capacity		L {US gal, Imp gal}	76 {20.1, 16.7}
Fuel filter			
Type	Low-pressure		Nylon element
	High-pressure		Paper element
Pressure regulator			
Type			Diaphragm
Regulated pressure		kPa {kgf/cm², psi}	250–260 {2.5–2.6, 35.6–37.0}

* TEN terminal of diagnosis connector grounded

Item			Specification
Fuel pump			
Type			Impeller (In tank)
Output pressure		kPa {kgf/cm², psi}	490–740 {5.0–7.5, 71.1–106.7}
Injector			
Type			Side-feeding
Injection volume	Primary	cm³{cc, cu in}/min	550 {550, 33.5}
	Secondary	cm³{cc, cu in}/min	850 {850, 51.8}
Catalytic converter			
Type	Pri-converter		Metal
	Main converter		Monolithic
Air pump			
Capacity		cm³{cc}/rev	375 {375}
Output		L/min	MT 140–200, AT 160–200
Fuel			
Specification			Unleaded premium (RON95 or higher)

G. ENGINE ELECTRICAL SYSTEM

Item				Transmission	MT	AT
voltage				V	12, negative ground	
Battery	Type and capacity (20-hour rate)				55D23L (60Ah) 65D23L (55Ah)*1	55D23L (60Ah) 75D26L (65Ah)*1
Ignition system	Spark timing (test connector grounded)				Leading : ATDC 5° (BTDC – 5°) Trailing : ATDC 20° (BTDC – 20°) at idle (AT: P range)	
	Spark advance				Electronic spark advance (ESA)	
	Spark plug	Type	Leading		NGK : BUR7EQP*2, BUR6EQP, BUR7EQ, BUR6EQ	
			Trailing		NGK : BUR9EQP*2, BUR8EQP, BUR9EQ, BUR8EQ	
		Plug gap		mm {in}	1.1–1.7 {0.044–0.066}	
Alternator	Output			V-A	12–100	
	Regulated voltage			V	14.1–14.7 (With temperature gradient characteristics)	
	Brush length	Standard		mm {in}	21.5 {0.846}	
		Minimum		mm {in}	8.0 {0.315}	
Stater	Type				Direct	Reduction
	Output			V-kW	12–1.2	12–2.0
	Output (no load)	Voltage		V	11	
		Current		A	Max 90	
		Speed		rpm	Min 3000	Min 2200
	Brush length	Standard		mm {in}	17.5 {0.689}	18 {0.71}
		Minimum		mm {in}	12 {0.47}	11 {0.43}

*1 Cold area *2 Standard plug

H. CLUTCH

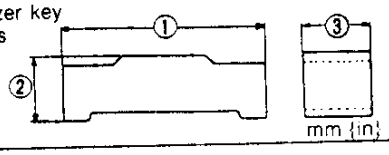
Item	Transmission	R15M-D (R5M-D)
Clutch control		Hydraulic
Clutch pedal		
Type		Suspended
Pedal ratio		6.35
Full stroke	mm {in}	135 {5.32}
Height (with carpet)	mm {in}	165.5–177.0 {6.516–6.968}
Free play	mm {in}	0.6–3.2 {0.02–0.13}
Distance from carpet when clutch is fully disengaged	mm {in}	48 {1.9} min.

Item / Transmission			R15M-D (R5M-D)
Flywheel			
Runout limit		mm {in}	0.2 {0.008}
Clutch disc			
Type			Single dry-plate
Runout limit		mm {in}	0.6 {0.024}
Wear limit		mm {in}	0.3 {0.012} from rivet head
Outer diameter		mm {in}	236 {9.29}
Inner diameter		mm {in}	160 {6.30}
Facing thickness mm {in}	Flywheel side		3.5 {0.14}
	Pressure plate side		3.5 {0.14}
Clutch cover			
Type			Diaphragm spring
Set load		N {kgf, lbf}	7.220 {736, 1619}
Clutch master cylinder	Inner diameter	mm {in}	15.87 {0.625}
Clutch release cylinder	Inner diameter	mm {in}	19.05 {0.750}
Clutch fluid			FMVSS116 DOT-3

J. MANUAL TRANSMISSION (R15M-D)

Item / Engine			13B
Specifications			
Transmission type			R15M-D (R5M-D)
Transmission control			Floor shift
Synchronization mechanism			Forward : Synchromesh Reverse : Synchromesh
Gear ratio	1st		3.483
	2nd		2.015
	3rd		1.391
	4th		1.000
	5th		0.719
	Reverse		3.288
Fianl gear ratio			4.100
Speedometer gear ratio (driven gear/drive gear)			0.304 (23/7)
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}	2.5 {2.6, 2.2}
Runout			
Mainshaft		mm {in}	0.03 {0.0012}
Clearance			
Each gear inner diameter and mainshaft outer diameter		mm {in}	0.15 {0.006}
Each clutch hub sleeve gtoove and shift fork mm {in}		Standard	0.2–0.3 {0.008–0.012}
		Maximum	0.5 {0.020.
Reverse idler gear and shaft mm {in}		Standard	0.02–0.05 {0.0008–0.0020}
		Maximum	0.15 {0.006}
Synchronizer ring (all) and flank surface of gear mm {in}		Standard	1.5 {0.059}
		Minimum	0.8 {0.031}
Control rod lever and shift rod gate		mm {in}	0.8 {0.031}
Thrust plam			
Synchronizer key and synchronizer ring (4th) mm {in}		Standard	0.66–2.0 {0.026–0.079}
		Available thrust washer thck-nesses	2.5, 3.0, 3.5 {0.098, 0.118, 0.138}

Item		Engine	13B
Thrust lock washer and C-washers (5th gear thrust play)	mm {in}	Standard	0.1–0.2 {0.004–0.008}
		Available thrust lock washer thick	6.2, 6.3, 6.4, 6.5, 6.6, 6.7 {0.244, 0.248, 0.252, 0.256, 0.260, 0.264}
C-washers and mainshaft groove	mm {in}	Standard	0–0.1 {0–0.004}
		Available C-washer thicknesses	2.9, 3.0, 3.1, 3.2 {0.114, 0.118, 0.122, 0.126}
Clutch housing and main drive gear bearing	mm {in}	Standard	0–0.1 {0–0.004}
		Available adjust shim thicknesses	0.3, 0.4, 0.5, 0.6, 0.7 {0.012, 0.016, 0.020, 0.024, 0.028}
Mainshaft front bearing	mm {in}	Standard	0–0.05 {0–0.002}
		Available adjust shim thicknesses	0.1, 0.3 {0.004, 0.012}
Countershaft front bearing	mm {in}	Bearing height	0.9–1.0 {0.035–0.039}
		Available adjust shim thicknesses	0.1, 0.3 {0.004, 0.012}

Reference			
Detent ball spring	Free length	mm {in}	22.5 {0.886}
5th/reverse retaining spring	Free length	mm {in}	73.00 {2.874}
Select lock spindle spring	Free length	mm {in}	43.25 {1.703}
Synchronizer key dimensions  mm {in}		1st and 2nd	① 18.00 {0.709}, ② 5.45 {0.215} ③ 6.00 {0.236}
		3rd, 4th 5th and Reverse	① 17.00 {0.669} ② 4.25 {0.167} ③ 5.00 {0.197}

K. AUTOMATIC TRANSMISSION

Item	Transmission	RB4A-EL
Gear ratio	1st	3.027
	2nd	1.619
	3rd	1.000
	O/D	0.694
	Reverse	2.272
Final gear ratio		3.909
Automatic transmission fluid (ATF)	Type	Dexron®II or M-III
	Capacity L {US qt, Imp qt}	8.6 {9.1, 7.6}
Torque converter	Stall torque ratio	2.200
Number of drive plates / driven plates	Reverse clutch	2/2
	High clutch	4/7
	Forward clutch	6/6
	Overrunning clutch	3/5
	Low and reverse brake	7/7
Band servo mm {in}	Servo piston outer dia. / inner dia.	80.0/50.0 {3.15/1.97}
	O/D servo piston outer dia.	72.0 {2.83}

Mechanical system test			
Engine stall speed rpm		D, S, L, R range	3,000–3,300
Time lag sec.		N → D range	Approx. below 1.0
		N → R range	Approx. below 1.2
Line pressure kPa {kgf/cm², psi}	D range	Idle	500–520 {5.0–5.4, 72–76}
		Stall	1,200–1,270 {12.2–13.0, 174–184}
	S range	Idle	500–520 {5.0–5.4, 72–76}
		Stall	1,200–1,270 {12.2–13.0, 174–184}
	L range	Idle	500–520 {5.0–5.4, 72–76}
		Stall	1,200–1,270 {12.2–13.0, 174–184}
	R range	Idle	620–650 {6.3–6.7, 90–95}
		Stall	1,510–1,570 {15.3–16.1, 218–228}

Shift point km/h {MPH}				
POWER	D range	Fully open	$D_1 \rightarrow D_2$	50–56 {31–35}
			$D_2 \rightarrow D_3$	103–111 {64–69}
			$D_3 \rightarrow$ O/D	178–188 {111–117}
		Half throttle	$D_1 \rightarrow D_2$	35–41 {22–25}
			$D_2 \rightarrow D_3$	81–93 {50–58}
			$D_3 \rightarrow$ O/D	126–144 {78–99}
			Lockup ON (D_3)	94–106 {58–66} (*81–93 {50–58})
			Lockup ON (O/D)	174–192 {108–119} (*126–144 {78–89})
		Fully closed	O/D → D_3	39–45 {24–28}
			$D_3 \rightarrow D_2$	13–19 {8–12}
			$D_2 \rightarrow D_1$	5–11 {3–7}
		Kickdown (Fully open)	O/D → D_3	142–152 {88–94}
			$D_3 \rightarrow D_2$	91–99 {57–62}
			$D_2 \rightarrow D_1$	38–44 {24–27}

Caution
- **Lockup indicates complete lockup.**
- *** mark indicates lockup points when the engine coolant temperature is above 115°C {239°F}.**

Item			Transmission	RB4A-EL
NORMAL	D range (A/C ON)	Fully open	$D_1 \rightarrow D_2$	50–56 {31–35}
			$D_2 \rightarrow D_3$	103–111 {64–69}
			$D_3 \rightarrow$ O/D	178–188 {111–117}
		Half throttle	$D_1 \rightarrow D_2$	32–38 {20–24}
			$D_2 \rightarrow D_3$	80–92 {50–57}
			$D_3 \rightarrow$ O/D	126–144 {78–89}
			Lockup ON (D_3)	94–106 {58–66} (* 80–92 {50–57})
			Lockup ON (O/D)	174–192 {108–119} (*126–144 {78–89})
		Fully closed	O/D $\rightarrow D_3$	39–45 {24–28}
			$D_3 \rightarrow D_2$	13–19 {8–12}
			$D_2 \rightarrow D_1$	5–11 {3–7}
		Kickdown (Fully open)	O/D $\rightarrow D_3$	142–152 {88–94}
			$D_3 \rightarrow D_2$	91–99 {57–62}
			$D_2 \rightarrow D_1$	38–44 {24–27}
	D range (A/C OFF)	Fully open	$D_1 \rightarrow D_2$	50–56 {31–35}
			$D_2 \rightarrow D_3$	103–111 {64–69}
			$D_3 \rightarrow$ O/D	178–188 {111–117}
		Half throttle	$D_1 \rightarrow D_2$	32–38 {20–24}
			$D_2 \rightarrow D_3$	80–92 {50–57}
			$D_3 \rightarrow$ O/D	126–144 {78–89}
			Lockup ON (D_3)	94–106 {58–66} (*80–92 {50–57})
			Lockup ON (O/D)	174–192 {108–119} (*126–144 {78–89})
		Fully closed	O/D $\rightarrow D_3$	35–41 {22–25}
			$D_3 \rightarrow D_2$	13–19 {8–12}
			$D_2 \rightarrow D_1$	5–11 {3–7}
		Kickdown (Fully open)	O/D $\rightarrow D_3$	142–152 {88–94}
			$D_3 \rightarrow D_2$	91–99 {57–62}
			$D_2 \rightarrow D_1$	38–44 {24–27}
HOLD	D range	–	O/D $\rightarrow D_3$	180–186 {112–116}
			$D_3 \rightarrow D_2$	7–13 {4–8}
			$D_2 \rightarrow D_3$	15–25 {9–16}
			Lockup ON (D_3)	94–106 {58–66} (*39–51 {24–32})
NORMAL	S range	Fully open	$S_1 \rightarrow S_2$	50–56 {31–35}
			$S_2 \rightarrow S_3$	103–111 {64–69}
		Half throttle	$S_1 \rightarrow S_2$	35–41 {22–25}
			$S_2 \rightarrow S_3$	81–93 {50–58}
			Lockup ON (S_3)	94–106 {58–66} (*81–93 {50–58})
		Fully closed	$S_3 \rightarrow S_2$	13–19 {8–12}
			$S_2 \rightarrow S_1$	5–11 {3–7}
		Kickdown (Fully open)	$S_3 \rightarrow S_2$	91–99 {57–62}
			$S_2 \rightarrow S_1$	38–44 {24–27}
HOLD		–	$S_3 \rightarrow S_2$	112–118 {70–73}

Caution

- **Lockup indicates complete lockup.**
- *** mark indicates lockup points when the engine coolant temperature is above 115°C {239°F}.**

Item			Transmission	RB4A-EL
NORMAL	L range	Fully open	$L_1 \rightarrow L_2$	50–56 {31–35}
		Half throttle	$L_1 \rightarrow L_2$	35–41 {22–25}
		Fully closed	$L_2 \rightarrow L$	5–11 {3–7}
		Kickdown (Fully open)	$L_2 \rightarrow L_1$	38–44 {24–27}
HOLD		–	$L_2 \rightarrow L_1$	45–51 {28–32}
Control valve body				
(Upper control valve body)				
Torque converter relief valve spring mm {in}		Outer diameter		9.2 {0.362}
		Free length		38.3 {1.508}
Pressure regulator valve spring mm {in}		Outer diameter		14.0 {0.551}
		Free length		29.0 {1.142}
Pressure modifier valve spring* mm {in}		Outer diameter		(A) 6.8 {0.268} (B) 6.9 {0.272} (C) 6.9 {0.272}
		Free length		(A) 31.95 {1.258} (B) 32.6 {1.283} (C) 32.8 {1.291}
Accumulator control valve spring mm {in}		Outer diameter		10.5 {0.413}
		Free length		17.0 {0.669}
Shuttle shift valve D spring mm {in}		Outer diameter		6.0 {0.236}
		Free length		26.5 {1.043}
Shift valve B spring mm {in}		Outer diameter		7.0 {0.276}
		Free length		25.0 {0.984}
4-2 sequence valve spring mm {in}		Outer diameter		6.95 {0.274}
		Free length		29.1 {1.146}
Shift valve A spring mm {in}		Outer diameter		7.0 {0.276}
		Free length		25.0 {0.984}
4-2 relay valve spring mm {in}		Outer diameter		6.95 {0.274}
		Free length		29.1 {1.146}
Overrunning clutch control valve spring mm {in}		Outer diameter		7.0 {0.276}
		Free length		23.6 {0.929}
Overrunning clutch reducing valve spring mm {in}		Outer diameter		7.0 {0.276}
		Free length		32.5 {1.280}
Pilot valve spring mm {in}		Outer diameter		9.1 {0.358}
		Free length		25.7 {1.012}
Lockup control valve spring mm {in}		Outer diameter		4.7 {0.185}
		Free length		23.4 {0.921}
Lockup modifier valve spring mm {in}		Outer diameter		4.2 {0.165}
		Free length		21.5 {0.846}
(Lower control valve body)				
Modifier accumulator valve spring mm {in}		Outer diameter		9.8 {0.39}
		Free length		30.5 {1.20}
1st reducing valve spring mm {in}		Outer diameter		6.8 {0.27}
		Free length		25.4 {1.00}
Servo charger valve spring mm {in}		Outer diameter		6.5 {0.26}
		Free length		33.2 {1.31}

*: Either A, B, or C type spring is installed at shipment. Only A type spring is available for replacement.

Item	Transmission	RB4A-EL
Accumulator		
N-D accumulator piston spring mm {in}	Outer diameter	18.0 {0.71}
	Free length	43.0 {1.69}
1-2 accumulator piston spring mm {in}	Outer diameter	29.3 {1.16}
	Free length	45.0 {1.77}
2-3 accumulator piston spring mm {in}	Outer diameter	19.5 {0.768}
	Free length	66.0 {2.60}
3-4 / N-R accumulator piston spring mm {in}	Outer diameter	18.0 {0.709}
	Free length	43.0 {1.69}
Oil pump		
Cam ring clearance mm {in}	Standard	0.010–0.024 {0.0004–0.0009}
	Maximum	0.030 {0.0012}
Rotor, vanes, and control piston clearance mm {in}	Standard	0.030–0.044 {0.0012–0.0017}
	Maximum	0.050 {0.0020}
Seal ring clearance mm {in}	Standard	0.10–0.25 {0.004–0.010}
	Maximum	0.25 {0.010}
Cam ring spring mm {in}	Outer diameter	13.7 {0.539}
	Free length	39.8 {1.567}
Reverse clutch		
Clutch clearance mm {in}	With new drive / driven plates	0.50–0.80 {0.020–0.031}
	With reusing drive / driven plates	0.50–1.20 {0.020–0.047}
Retaining plate size 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}
Return spring mm {in}	Outer diameter	11.6 {0.457}
	Free length	19.69 {0.775}
High clutch		
Clutch clearance mm {in}	With new drive / driven plates	1.8–2.2 {0.071–0.087}
	With reusing drive / driven plates	1.8–3.0 {0.071–0.118}
Retaining plate size mm {in}		3.4 {0.134}, 3.6 {0.142}, 3.8 {0.150}, 4.0 {0.157}, 4.2 {0.165}
Return spring mm {in}	Outer diameter	11.6 {0.457}
	Free length	22.3 {0.878}
Band servo		
Return spring A mm {in}	Outer diameter	40.3 {1.59}
	Free length	53.8 {2.12}
Return spring B mm {in}	Outer diameter	34.3 {1.35}
	Free length	45.6 {1.80}
Return spring C mm {in}	Outer diameter	27.6 {1.09}
	Free length	29.7 {1.17}

Item	Tranemission	RB4A-EL
Forward clutch		
Clutch clearance mm {in}	With new drive / driven plates	0.45–0.85 {0.018–0.033}
	With reusing drive / driven plates	0.45–1.85 {0.018–0.073}
Retaining plate size mm {in}		8.0 {0.315}, 8.2 {0.323}, 8.4 {0.331}, 8.6 {0.339}, 8.8 {0.346}, 9.0 {0.354}, 9.2 {0.362}
Return spring mm {in}	Outer diameter	9.7 {0.38}
	Free length	35.8 {1.41}
Overrunning clutch		
Clutch clearance mm {in}	With new drive / driven plates	1.0–1.4 {0.039–0.055}
	With reusing drive / driven plates	1.0–2.0 {0.039–0.079}
Retaining plate size 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}
Low and reverse brake		
Brake clearance mm {in}	With new drive / driven plates	0.8–1.2 {0.031–0.047}
	With reusing drive / driven plates	0.8–2.6 {0.031–0.102}
Retaining plate size mm {in}		6.2 {0.244}, 6.4 {0.252}, 6.6 {0.260}, 6.8 {0.268}, 7.0 {0.276}, 7.2 {0.283}, 7.4 {0.291}, 7.6 {0.299}, 7.8 {0.307}, 8.0 {0.315}
Return spring mm {in}	Outer diameter	11.6 {0.457}
	Free length	22.3 {0.878}
Low one-way clutch inner race		
Seal ring clearance mm {in}	Standard	0.10–0.25 {0.004–0.010}
	Maximum	0.25 {0.010}
Total end play		
Standard end play mm {in}		0.25–0.55 {0.010–0.022}
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}
Reverse clutch end play		
Standard end play mm {in}		0.55–0.90 {0.022–0.035}
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}
Torque converter distance (A)		
Torque converter distance (A) mm {in}		29.0 {1.14} min.

L. PROPELLER SHAFT

Item	Transmission model	R15M-D (R5M-D)
Length	mm {in}	863 {33.98}
Outer diameter	mm {in}	75 {3.0}
Max. permissible runout	mm {in}	0.4 {0.02}

M. FRONT AND REAR AXLES

Item			Specifications
Drive shaft			
Type		Wheel side	BJ (bell joint)
		Differential side	TJ (Tripod joint)
Outer diameter of large boot end mm {in}		Wheel side	105.3 {4.146}
		Differential side	100.5 {3.957}
Grease amount g {oz}		Wheel side	100–120 {3.53–4.23}
		Differential side	170–190 {6.01–6.70}
Shaft length*		mm {in}	791.2–801.2 {31.15–31.54}
Front axle			
Bearing play axil direction		mm {in}	0.05 {0.002} max.
Rear axle			
Bearing play axil direction		mm {in}	0.05 {0.002} max.
Differential			
Backlash (Ring gear and drive pinion)		mm {in}	0.09–0.11 {0.0035–0.0043}
Drive pinion preload (without oil seal)		N·m {kgf·cm, in·lbf}	1.3–1.7 {13–18, 12–15}
Differential oil	Grade		API Service GL–4 or 5
	Viscosity		Above –18°C {0°F} : SAE 90 Below –18°C {0°F} : SAE 80
	Capacity	L {US qt, Imp qt}	1.30 {1.38, 1.14}

* Before measuring the drive shaft length, lift the boot to equalize the pressure within it.

N. STEERING SYSTEM

Item		Specifications
Steering wheel		
Outer diameter	mm {in}	380 {15.0}
Free play	mm {in}	0–30 {0–1.18}
Wheel effort	N {kgf, lbf}	30–38 {3.0–3.9, 6.6–8.5}
Lock-to-lock	turns	2.9
Steering shaft		
Shaft type		Collapsible
Joint type		2-cross joint
Power steering system		
Gear type		Rack and pinion
Gear ratio		∞ (infinite)
Rack stroke	mm {in}	160 {6.30}
Power steering fluid		ATF DEXRON®II or M-III
Fluid capacity	L {US qt, Imp qt}	0.96 {1.01, 0.84}
Fluid pressure	kPa {kgf/cm^2, psi}	7620–8350 {77.7–85.2, 1110–1210}