TRADER



Workshop Manual

GENERAL INFORMATION

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9TGGIX-001

IMPORTANT INFORMATION

BASIC ASSUMPTIONS

This repair manual assumes that you have certain special tools that are necessary for the safe and efficient performance of service operations on Ford 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 or 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 Ford vehicles and engines can be voided if improper service or repairs are performed by persons other than those at an Authorized Ford 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.

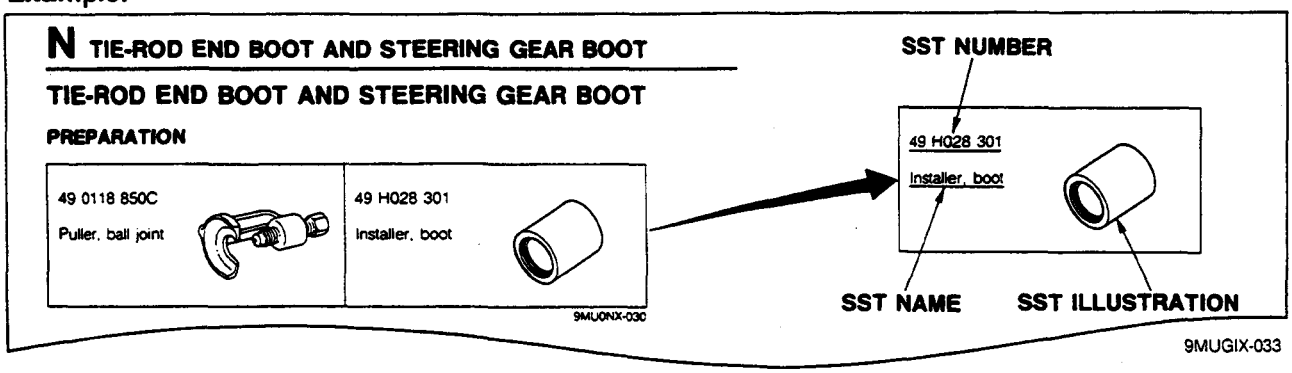
9TFGIX-001

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.

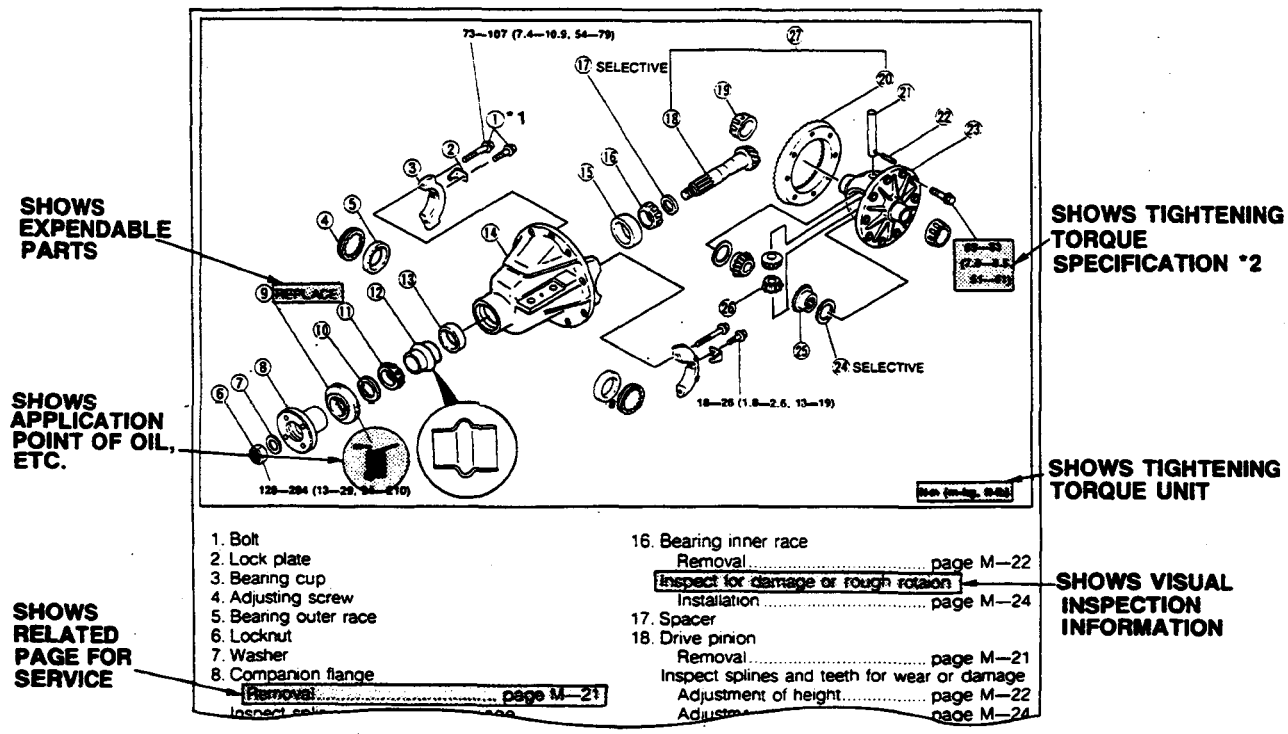
Example:



REPAIR PROCEDURE

1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and 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 numbering (ex.①) shows service procedure.
*2: Units shown in N·m (m-kg, ft-lb) unless otherwise specified.

SYMBOLS

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

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	Appropriate petroleum jelly

05UGIX-005

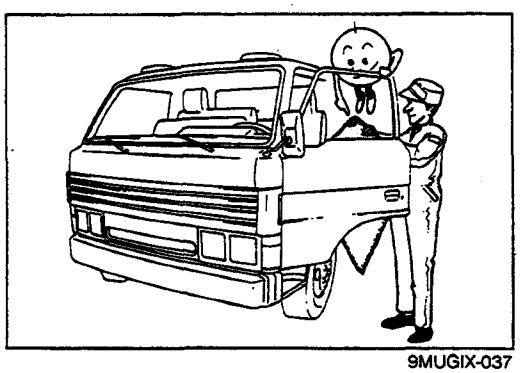
Note

- **When special 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.

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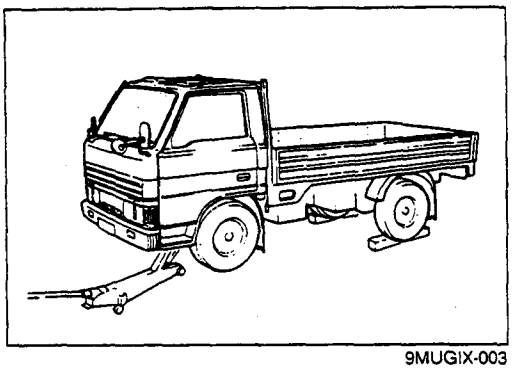


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FUNDAMENTAL PROCEDURES

PROTECTION OF THE VEHICLE

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



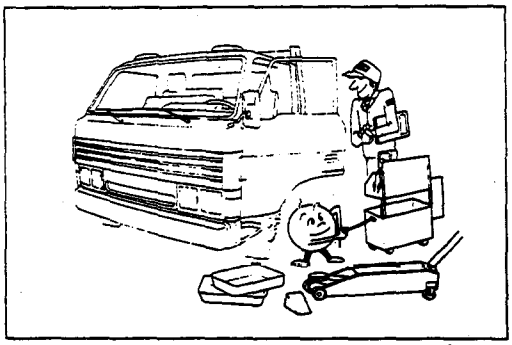
9MUGIX-003

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.

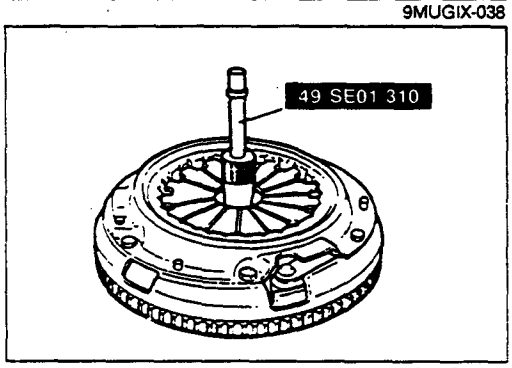
Start the engine only after making certain the engine compartment is clear of tools and people.



9MUGIX-038

PREPARATION OF TOOLS AND MEASURING EQUIPMENT

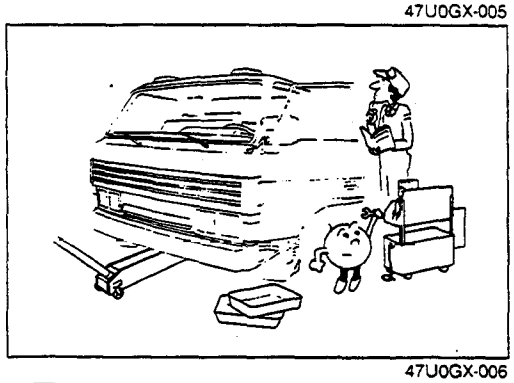
Be sure that all necessary tools and measuring equipment are available before starting any work.



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SPECIAL TOOLS

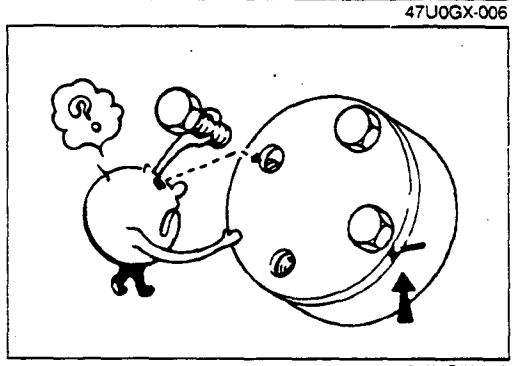
Use special tools when they are required.



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REMOVAL OF PARTS

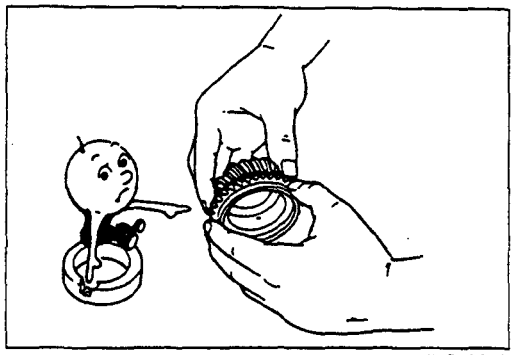
While correcting a problem, try also to determine its cause. Begin work only after first learning which parts and subassemblies must be removed and disassembled for replacement or repair.



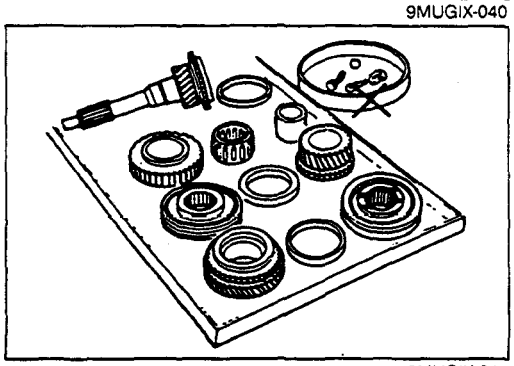
9MUGIX-039

DISASSEMBLY

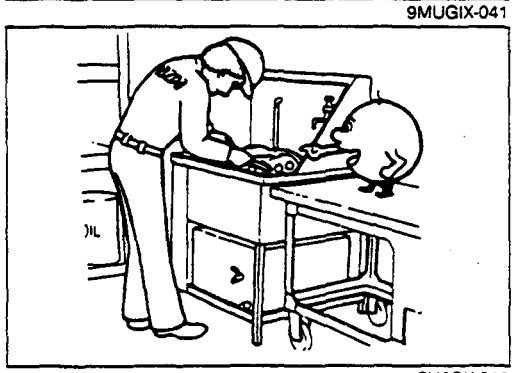
If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be disassembled in a way that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.


9MUGIX-040

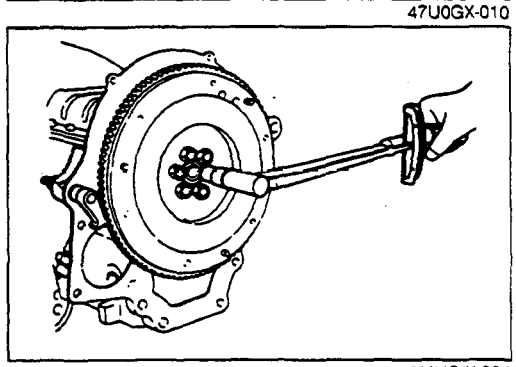
1. Inspection of parts
When removed, each part should be carefully inspected for malfunctioning, deformation, damage, and other problems.


9MUGIX-041

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

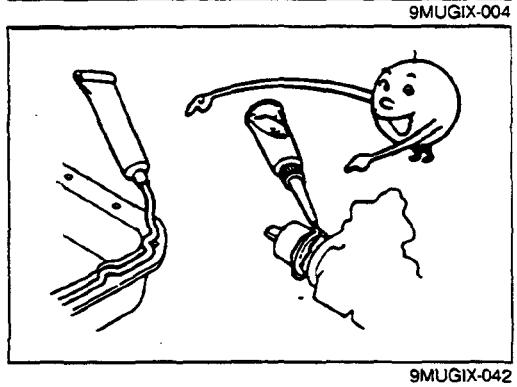

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3. Cleaning parts for reuse
All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.

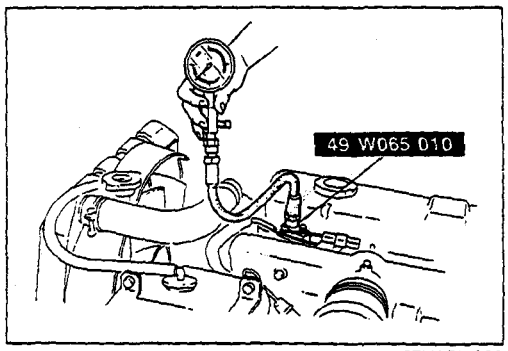

9MUGIX-004

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

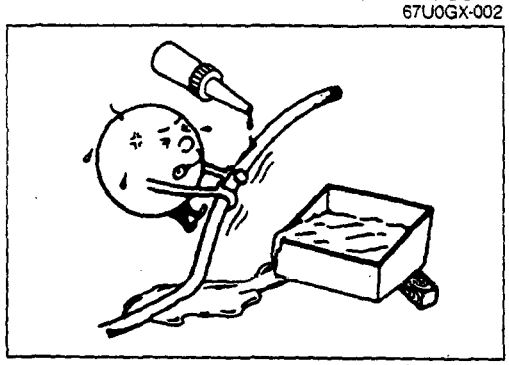
Depending on location:
1. Sealant should be applied to gaskets.
2. Oil should be applied to the moving components of parts.
3. Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



67U0GX-002

ADJUSTMENTS

Use suitable gauges and/or testers when making adjustments.



9MUGIX-005

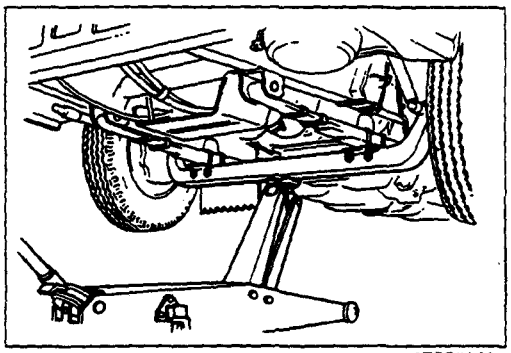
RUBBER PARTS AND TUBING

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

JACK AND SAFETY STAND (RIGID RACK) POSITIONS

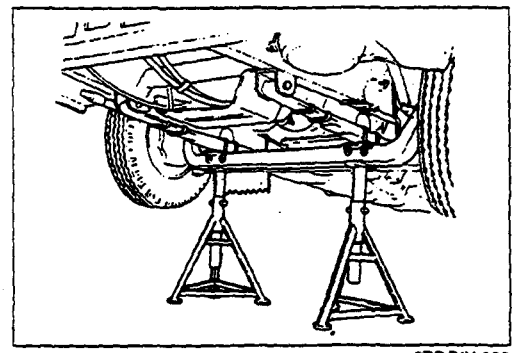
FRONT END

Jack position:
At the center of the front axle



9TFGIX-002

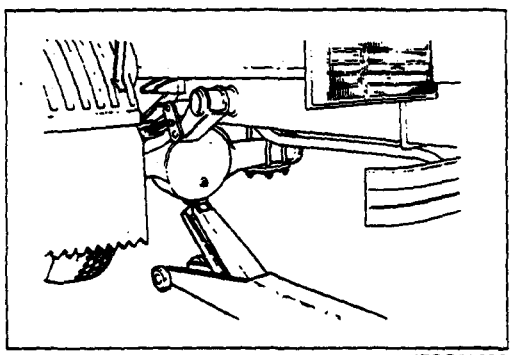
Safety stand positions:
On both sides of the front axle



9TGGIX-003

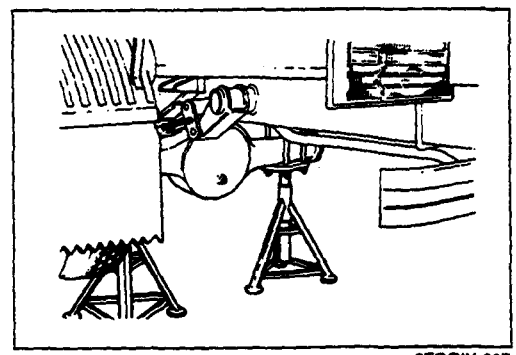
REAR END

Jack position
At the center of differential

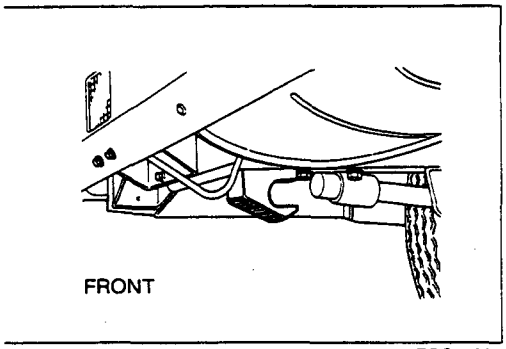


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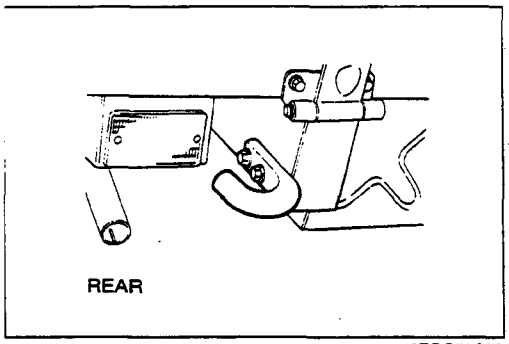
Safety stand positions
Spring clamps at both sides of the differential



9TGGIX-007



9TGGIX-008



9TGGIX-009

TOWING

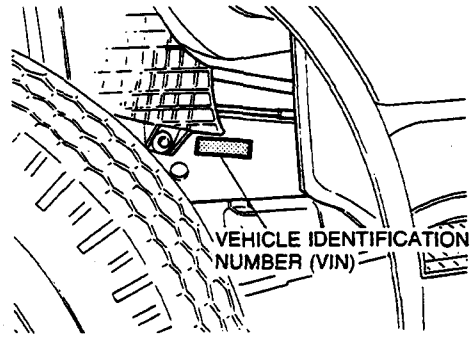
Proper towing equipment is necessary to prevent damage to the vehicle.
Laws and regulations applicable to vehicles in tow must always be observed.
If the transmission, rear axle and steering system are not damaged, the vehicle may be towed on all four wheels. If they are damaged, use a towing dolly.

Caution

- **The gearshift lever must be set a NEUTRAL, the engine key in the "ACC" position and the parking brake released. Remember that power brake assist will not be available when the engine is inoperative.**

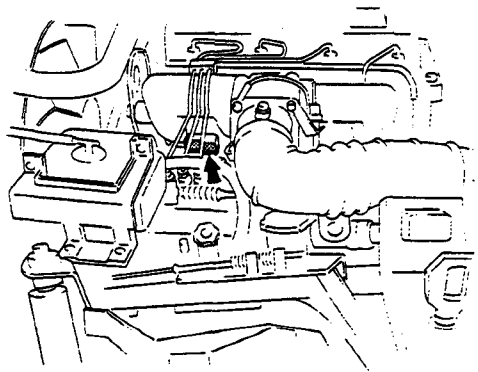
IDENTIFICATION NUMBER LOCATIONS

VEHICLE IDENTIFICATION NUMBER (VIN)

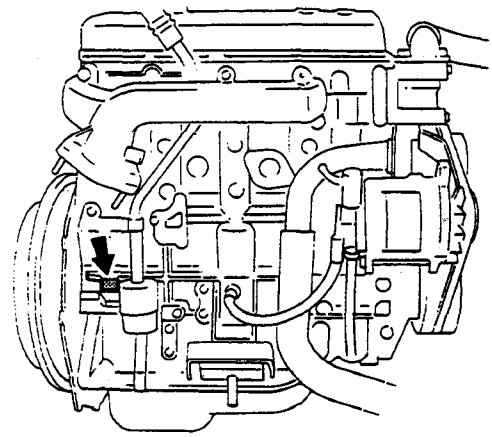


ENGINE MODEL AND NUMBER

ENGINE NUMBER



ENGINE MODEL



9TGGIX-010

UNITS

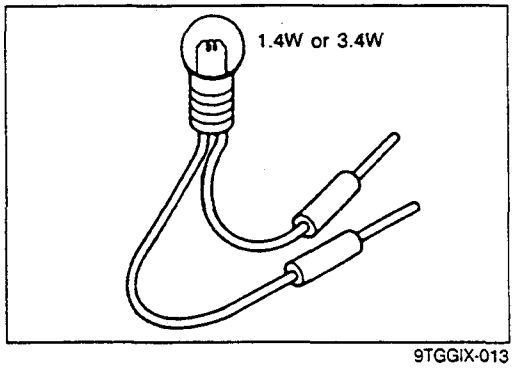
N·m (m-kg or cm-kg, ft-lb or in-lb)	Torque
rpm	Revolutions per minute
A	Ampere(s)
V	Volt(s)
Ω	Ohm(s) (resistance)
kPa (kg/cm^2, psi)	Pressure (usually positive)
mmHg (inHg)	Pressure (usually negative)
W	Watt
liters (US qt, Imp qt)	Volume
mm (in)	Length
μF	Electric capacity
°C	Centigrade
°F	Fahrenheit
T	Ton
Ft	Feet

9TGGIX-011

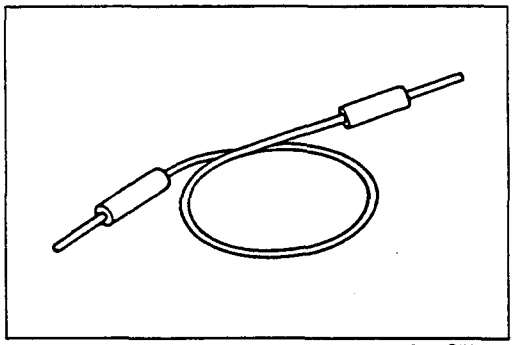
ABBREVIATIONS

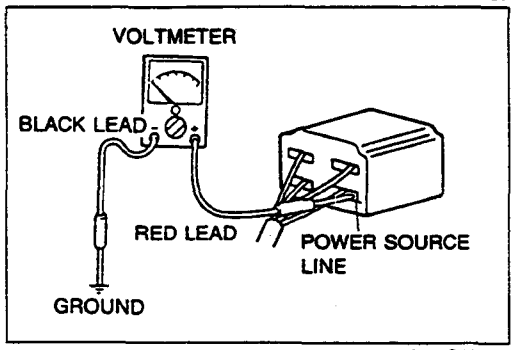
ABDC	After bottom dead center
ACC	Accessories
ASS'Y	Assembly
ATDC	After top dead center
ATF	Automatic transmission fluid
BBDC	Before bottom dead center
BTDC	Before top dead center
CAB	Cabin
ECU	Engine control unit
ELR	Emergency locking retractor
EX	Exhaust
FIG.	Figure
IG/IGN	Ignition
IN	Intake
INT	Intermittent
LH	Left hand
M	Motor
MAX	Maximum
MIN	Minimum
OFF	Switch off
OHV	Overhead valve
ON	Switch on
PCV	Positive crankcase ventilation
P/S	Power steering
PTC	Positive temperature coefficient
QSS	Quick start system
RH	Right hand
Sec.	Second(s)
SST	Special service tool
ST	Start
SW	Switch
TDC	Top dead center

9TFGIX-003

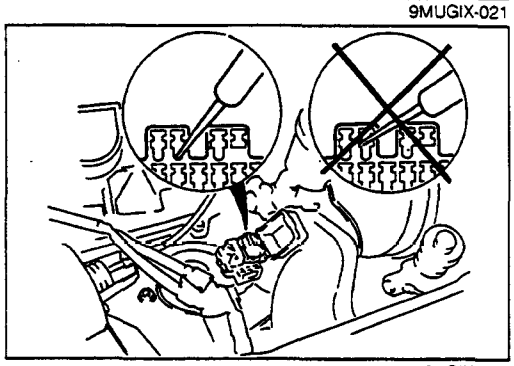


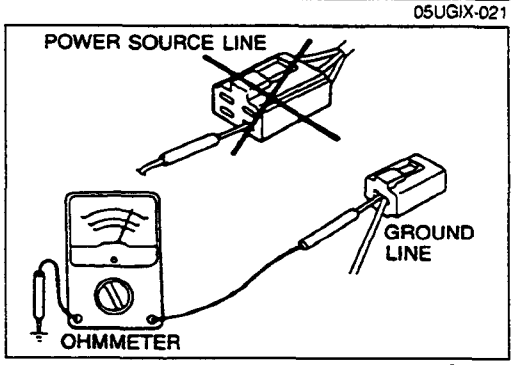
9TGGIX-013


9MUGIX-020



9MUGIX-021


05UGIX-021



9MUGIX-045

CAUTION

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 the 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 of 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.

Diagnosis Connector

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

Caution

- **Do not insert the jumper wire probe into the diagnosis connector terminal, which may damage the terminal.**

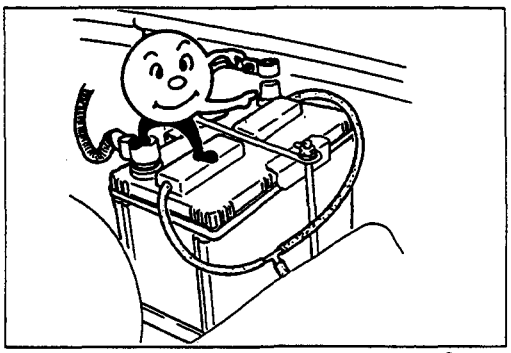
Ohmmeter

The ohmmeter is used to measure the resistance between two points in a circuit and also to check for continuity and diagnosis of 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.**

CAUTION

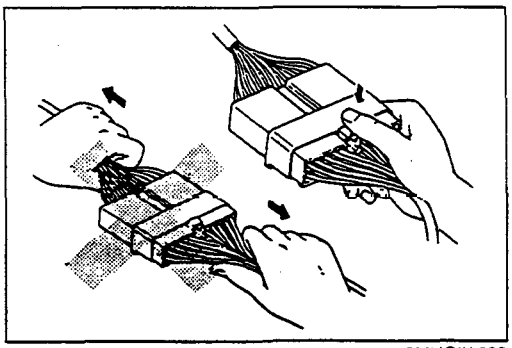


9MUGIX-022

CAUTION WITH ELECTRICAL PARTS

Battery Cable

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

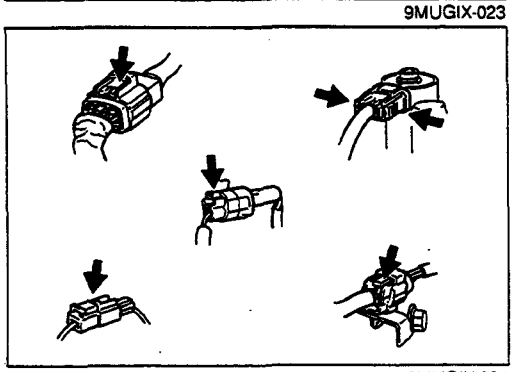


9MUGIX-023

Connectors

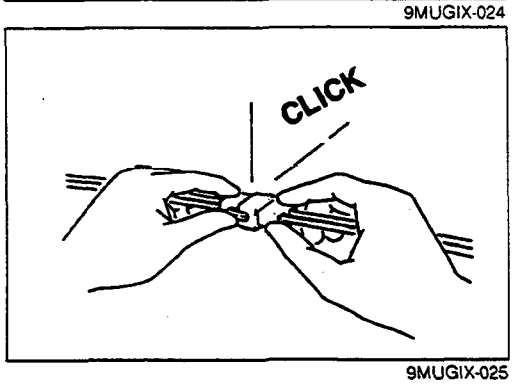
Removal of connector

Never pull on the wiring harness when disconnecting connectors.



9MUGIX-024

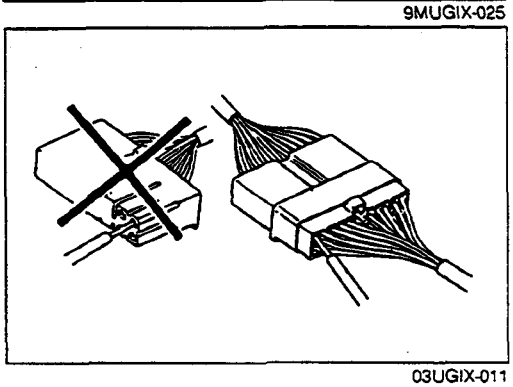
Connectors can be removed by pressing or pulling the lock lever as shown.



9MUGIX-025

Locking of connector

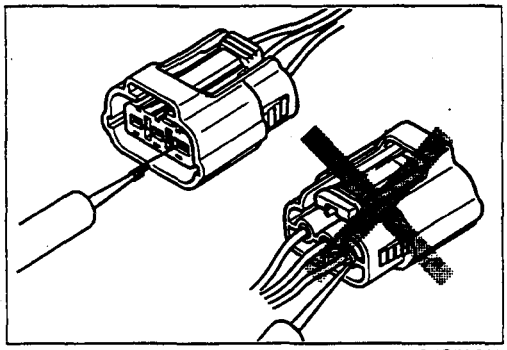
When locking connectors, make sure to listen for a click that will indicate they are securely locked.



03UGIX-011

Inspection

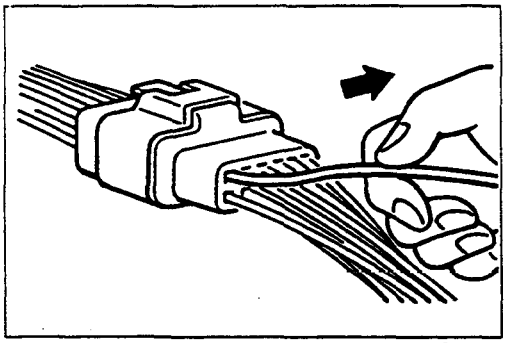
1. When a tester is used to check for continuity or to measure voltage, insert the tester probe from the wire harness side.



05UGIX-028

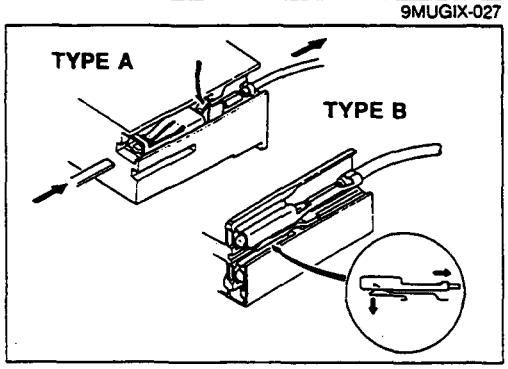
2. Check the terminals of waterproof connectors from the connector side, as they cannot be accessed from the wire harness side.

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.

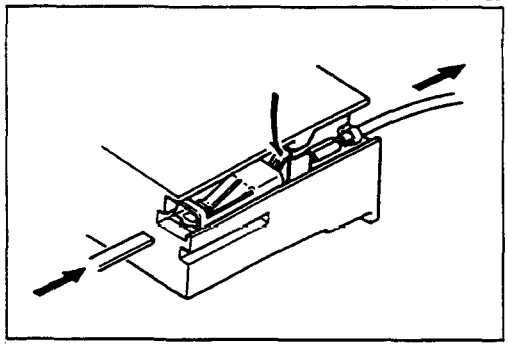


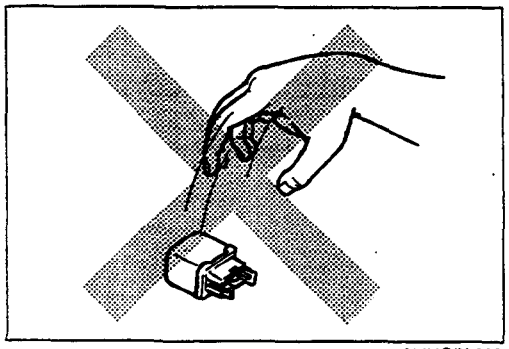
9MUGIX-028

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.

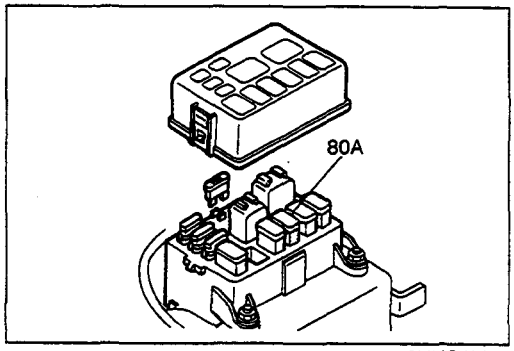




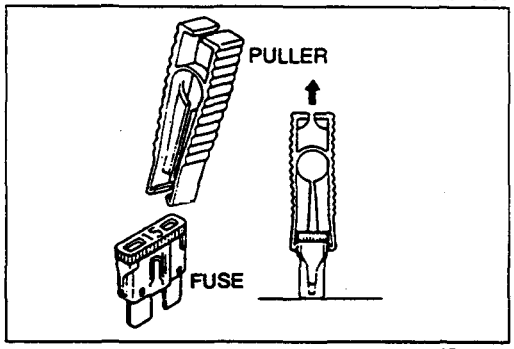
9MUGIX-030

Sensors, Switches, and Relays
Handle sensors, switches, and relays carefully. Do not drop them or strike them against other parts.

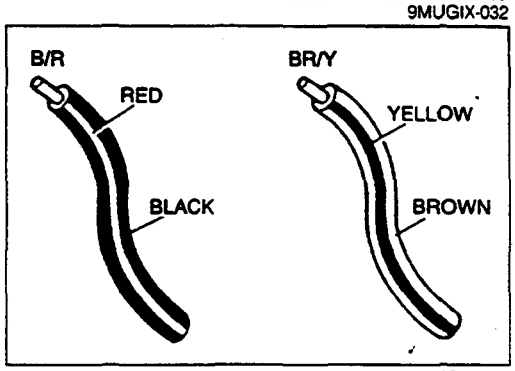
CAUTION



9MUGIX-031



9MUGIX-032



9MUGIX-029

Fuse
Replacement

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

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		—	—

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 control unit 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.

9TGGIX-014

PRE-DELIVERY INSPECTION AND SCHEDULED MAINTENANCE

PRE-DELIVERY INSPECTION TABLE..... A– 2
SCHEDULED MAINTENANCE SERVICES.. A– 3

9TG0AX-101

PRE-DELIVERY INSPECTION TABLE

1. EXTERIOR

* **INSPECT** and **ADJUST**, if necessary, the following items to the specifications:
- ☐ Glass, exterior bright metal and paint for damage or rust
- ☐ Wheel lug nuts
- ☐ Tire pressures
- ☐ All weatherstrips for damage or detachment
- ☐ Operation of tilt cab lock lever
- ☐ Door operation and alignment

* **INSTALL** the following parts:
- ☐ Outside rearview mirror(s)

2. 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
- ☐ Battery electrolyte level and specific gravity
- ☐ Engine oil level
- ☐ Oil level in steering gearbox (Manual steering)
- ☐ Power steering fluid level (if equipped)
- ☐ Brake and clutch master cylinder fluid levels
- ☐ Windshield washer reservoir fluid level
- ☐ Glow plugs (if equipped)
- ☐ Radiator coolant and specific gravity
- ☐ Tightness of water hose clamps (including heater hoses)
- ☐ Tightness of battery terminals
- ☐ Drive belt tensions
- ☐ Accelerator cable and linkage for free movement

3. INTERIOR

* **INSTALL** the following parts:
- ☐ Fuse for accessories

* **CHECK** the operations of the following items:
- ☐ Seat controls
- ☐ Seat belts and warning system (if equipped)
- ☐ Door locks
- ☐ Ignition switch and steering lock
- ☐ All lights including warning and indicator lights (if equipped)
- ☐ Warning buzzers (if equipped)
- ☐ Horn, windshield wipers and washers (if equipped)
- ☐ Radio and antenna (if equipped)
- ☐ Cigarette lighter and clock (if equipped)
- ☐ Tilt Steering (if equipped)
- ☐ Heater, defroster and air conditioner at various modes (if equipped)

* **ADJUST** antenna trimmer on radio (if equipped)

INTERIOR (cont'd)

* **CHECK** the following items:
- ☐ Presence of spare fuse
- ☐ Upholstery and interior finish

* **CHECK** and **ADJUST**, if necessary, the following items:
- ☐ Operation and fit of windows
- ☐ Pedal height and free play of brake and clutch pedals
- ☐ Parking brake

4. UNDER HOOD—ENGINE RUNNING AT OPERATING TEMPERATURE

* **CHECK** the following items:
- ☐ Operation of cold start device (if equipped)
- ☐ Idle speed
- ☐ Injection timing

5. ON HOIST

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

6. ROAD TEST

* **CHECK** the following items:
- ☐ Brake operation
- ☐ Clutch operation
- ☐ Steering control
- ☐ Operation of meters and gauges
- ☐ Squeaks, rattles or unusual noise
- ☐ Engine general performance
- ☐ Emergency locking retractors (if equipped)

7. AFTER ROAD TEST

* **REMOVE** seat and floor mat protective covers
* **CHECK** for necessary owner's information material, tools and spare tire in vehicle

9TF0AX-001

SCHEDULED MAINTENANCE SERVICES

MAINTENANCE TABLE (General RHD Models)

Chart Symbols

I : Inspect and if necessary correct, clean, or replace
A: Adjust
R: Replace or change
T : Tighten
L : Lubricate
C: Clean

- After 60,000 km (36,000 miles), continue to follow the prescribed maintenance items at the recommended intervals.
- For items marked * in this maintenance chart, please pay attention to these points.

*1 If the vehicle is operated under the following conditions, it is suggested that the engine oil and oil filter be changed more frequently.
a) Driving in dusty conditions
b) Extended periods of idling or low-speed operation
c) Driving for a prolonged period in cold temperatures, or driving short distances only
*2 If the vehicle is operated in very dusty or sandy areas, clean or replace more often than at usual recommended itervals.
*3 See page A–21 for detailed information.

Emission Control and Related Systems

The ignition and fuel systems are vitally important to the proper operation of the emissions control and related systems, as well as for efficient engine operation. It is strongly recommended that all serving related to these systems be done by your Authorized Mazda Dealer.

9TF0AX-002

Maintenance interval / Maintenance item		Kilometers (miles)												
	x1,000 km	1	5	10	15	20	25	30	35	40	45	50	55	60
	(x1,000 miles)	0.6	3	6	9	12	15	18	21	24	27	30	33	36

Engine

Engine valve clearance		I		I		I		I		I		I		I
Cylinder head bolts	HA engine	T				T				T				T
Intake and exhaust manifold		T				T				T				T
Drive belts		A	I	I	I	I	I	I	I	I	I	I	I	I
Engine oil*1	HA and SL engine	R		R		R		R		R		R		R
	SL Turbo engine	R	R	R	R	R	R	R	R	R	R	R	R	R
Oil filter*1		R		R		R		R		R		R		R
Oil bypass filter	HA and SL engine					R				R				R
	SL Turbo engine			R		R		R		R		R		R

Cooling System

Cooling system	I		I		I		I		I		I		I	
Engine coolant	(R) every 12 months													

MAINTENANCE TABLE (Cont'd)

Maintenance interval / Maintenance item	Kilometers (miles)												
	x1,000 km	1	5	10	15	20	25	30	35	40	45	50	55	60
	(x1,000 miles)	0.6	3	6	9	12	15	18	21	24	27	30	33	36
Fuel System														
Fuel lines		I		I		I		I		I		I		I
Fuel filter								R						R
Air cleaner element*2			I	I	I	I	I	R	I	I	I	I	I	R
Injection System														
Injection timing		(I) every 40,000 km (24,000 miles)												
Injection nozzle		I				I				I				I
Electrical System														
Battery electrolyte level and specific gravity				I		I		I		I		I		I
Chassis and Body														
Brake and clutch lines and connections						I				I				I
Brake fluid*3				I		I		I		R		I		I
Clutch fluid				I		I		I		R		I		I
Brake and clutch pedals				I		I		I		I		I		I
Drum brake						I				I				I
Power brake unit and hoses						I				I				I
Vacuum tank and hoses (Diesel)				I		I		I		I		I		I
Parking brake				I		I		I		I		I		I
Manual steering gear oil						I				I				I
Steering operation and gear housing						I				I				I
Power steering fluid and lines (if equipped)				I		I		I		I		I		I
Manual transmission oil		R		I		R		I		R		I		R
Transmission linkage & cables						I				I				I
Rear axle oil		R		I		R		I		R		I		R
Propeller shaft						L				L				L
Kingpin oil				I		I		I		I		I		I
Wheel bearing grease						R				R				R
Wheel nuts		T		T		T		T		T		T		T
Bolts and nuts on chassis and body		T				T				T				T
Steering linkage						L				L				L

MAINTENANCE TABLE (Australia Models)

Chart Symbols

I: Inspect and if necessary correct, clean, or replace
A: Adjust
R: Replace or change
T: Tighten
L: Lubricate
C: Clean

- After 60,000 km (36,000 miles) or 36 months, continue to follow the prescribed maintenance items at the recommended intervals.
- For items marked * in this maintenance chart, please pay attention to these points.

*1 If the vehicle is operated under the following conditions, it is suggested that the engine oil and oil filter be changed more frequently.
a) Driving in dusty conditions
b) Extended periods of idling or low-speed operation
c) Driving for a prolonged period in cold temperatures, or driving short distances only
*2 If the vehicle is operated in very dusty or sandy areas, clean or replace more often than at usual recommended itervals.
*3 See page A–21 for detailed information.

Emission Control and Related Systems

The ignition and fuel systems are vitally important to the proper operation of the emissions control and related systems, as well as for efficient engine operation. It is strongly recommended that all serving related to these systems be done by your Authorized Mazda Dealer.

9TF0AX-003

Maintenance item \ Maintenance interval		Number of months or km, whichever comes first												
	x1,000 km	1.5	5	10	15	20	25	30	35	40	45	50	55	60
	Months	—	—	6	—	12	—	18	—	24	—	30	—	36

Engine

Engine valve clearance		I		I		I		I		I		I		I
Drive belts		A	I	I	I	I	I	I	I	I	I	I	I	I
Engine oil*1	SL engine	R		R		R		R		R		R		R
	SL Turbo and TF engine	R	R	R	R	R	R	R	R	R	R	R	R	R
Oil filter*1	SL engine SL Turbo engine	R		R		R		R		R		R		R
	TF engine	R	R	R	R	R	R	R	R	R	R	R	R	R
Oil bypass filter	SL engine					R				R				R
	SL Turbo engine			R		R		R		R		R		R
	TF engine				R			R			R			R

Cooling System

Cooling system		I		I		I		I		I		I		I
Engine coolant	(R) every 12 months													

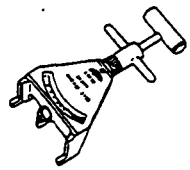
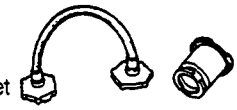
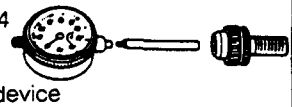
Fuel System

Fuel lines		I		I		I		I		I		I		I
Fuel filter								R						R
Air cleaner element*2			I	I	I	I	I	R	I	I	I	I	I	R

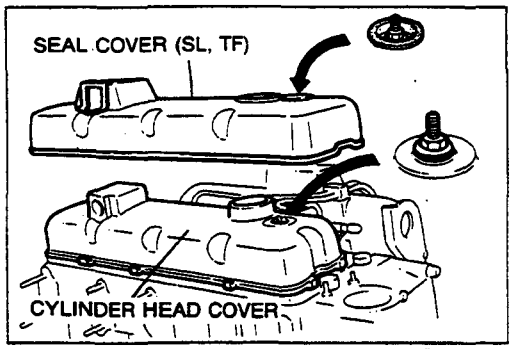
MAINTENANCE TABLE (Cont'd)

Maintenance item \ Maintenance interval	Number of months or km, whichever comes first												
	x1,000 km	1.5	5	10	15	20	25	30	35	40	45	50	55	60
	Months	—	—	6	—	12	—	18	—	24	—	30	—	36
Injection System														
Injection timing		(I) every 40,000 km												
Injection nozzle		I				I				I				I
Electrical System														
Battery electrolyte level and specific gravity		I		I		I		I		I		I		I
Chassis and Body														
Brake and clutch lines and connections		I		I		I		I		I		I		I
Brake fluid*3		I		I		I		I		R		I		I
Clutch fluid		I		I		I		I		R		I		I
Brake and clutch pedals		I		I		I		I		I		I		I
Drum brake						I				I				I
Power brake unit and hoses						I				I				I
Vacuum tank and hoses				I		I		I		I		I		I
Parking brake		I		I		I		I		I		I		I
Manual steering gear oil		I				I				I				I
Steering operation and gear housing		I		I		I		I		I		I		I
Power steering fluid and lines (if equipped)				I		I		I		I		I		I
Manual transmission oil		R		I		R		I		R		I		R
Transmission linkage & cables		I				I				I				I
Rear axle oil		R		I		R		I		R		I		R
Propeller shaft						L				L				L
Kingpin oil				I		I		I		I		I		I
Wheel bearing grease						R				R				R
Wheel nuts		T		T		T		T		T		T		T
Bolts and nuts on chassis and body		T				T				T				T
Steering linkage		I		I		L		I		L		I		L

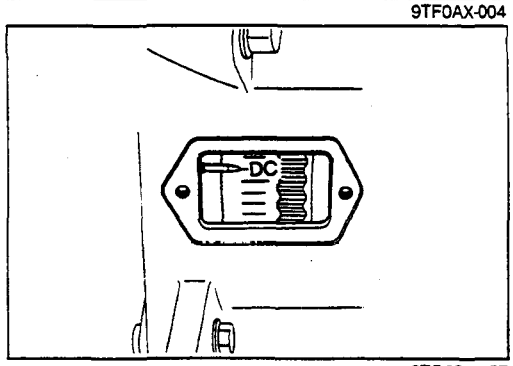
SCHEDULED MAINTENANCE SERVICES
Preparation
SST

49 9200 020 Tension guage, V-ribbed belt 	For inspection of belt tension	49 9200 145 Radiator cap tester adapter set 	For inspection of cooling system
49 9140 074 Cam lift measuring device 	For inspection of injection timing		

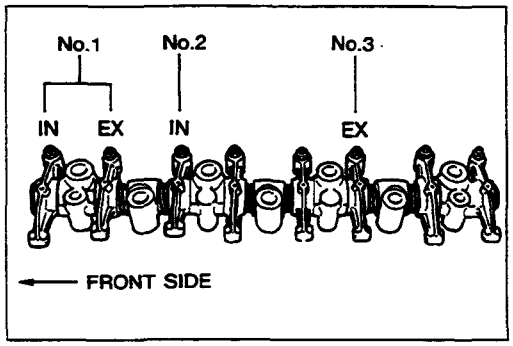
9TG0AX-002



9TF0AX-004



9TG0B2-457



9TG0B2-019

ADJUSTMENT OF ENGINE VALVE CLEARANCE

1. Remove the air intake pipe (SL Turbo).
2. Remove the seal cover (SL, TF) and the cylinder head cover.
3. Remove the cover from the clutch housing (HA, SL) or from the end plate (TF).

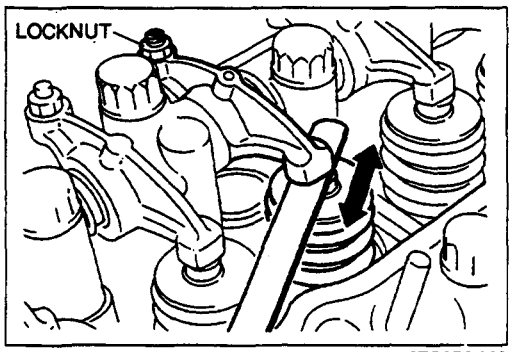
4. Turn the crankshaft clockwise and set the No.1 cylinder to compression TDC.

5. Measure the valve clearances as shown in the figure.

Valve clearance (Engine cold)

mm (in)

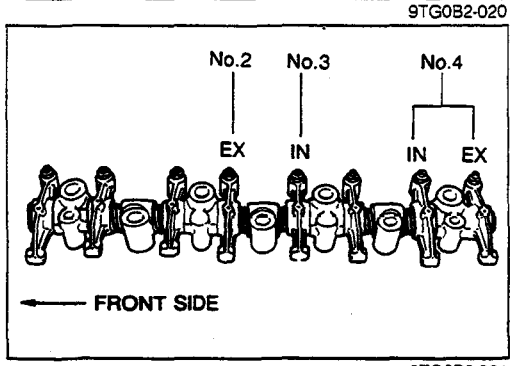
	IN	EX
HA	0.30 (0.012)	0.30 (0.012)
SL	0.30 (0.012)	0.35 (0.014)
TF	0.30 (0.012)	0.40 (0.016)



9TG0B2-020

6. If necessary, loosen the locknut and adjust the valve clearance by turning the adjusting screw.
7. Tighten the locknut.

Tightening torque:
12—17 N·m (120—170 cm-kg, 104—148 in-lb)



9TG0B2-021

8. Turn the crankshaft clockwise one full turn and set the No.4 cylinder to compression TDC.
9. Measure the remaining valve clearances as shown in the figure.

10. Install the cover.
11. Install the cylinder head cover.

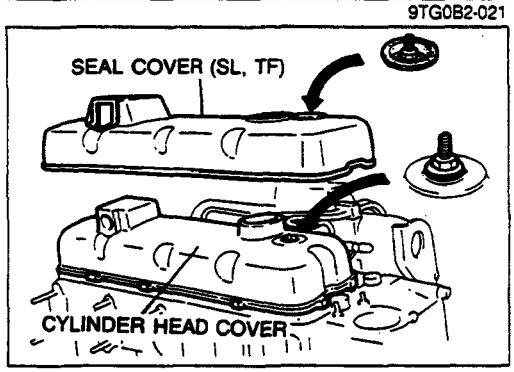
Tightening torque:
2.0—3.4 N·m (20—35 cm-kg, 17—30 in-lb)

12. Install the seal cover (SL, TF).

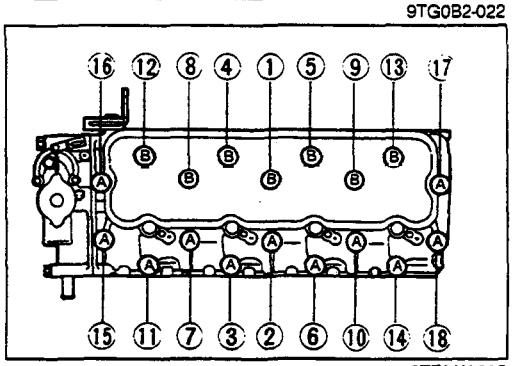
Tightening torque:
2.9—4.9 N·m (30—50 cm-kg, 26—43 in-lb)

13. Install the air intake pipe (SL Turbo).

Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)



9TG0B2-022



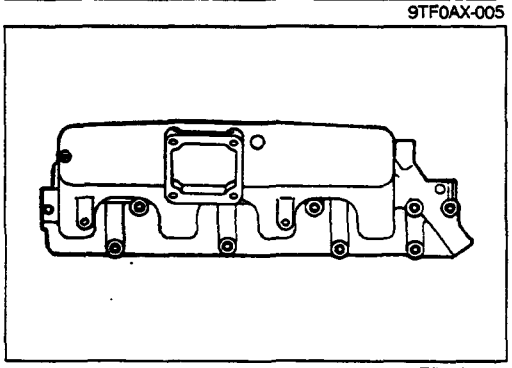
9TF0AX-005

TIGHTENING OF CYLINDER HEAD BOLTS

Note (SL, TF)
- **The cylinder head bolts are pliant type bolt. Therefore retightening after installation is not necessary.**

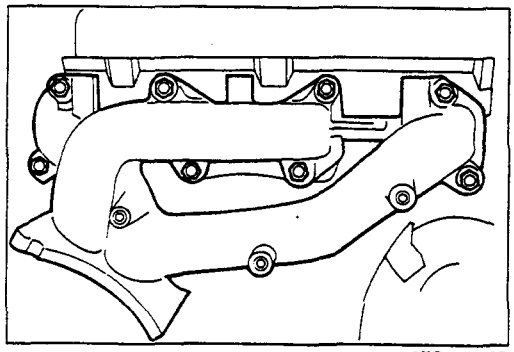
HA
1. Tighten the cylinder head bolts in the order shown in the figure.

Tightening torque:
116—123 N·m (11.8—12.5 m-kg, 85—90 ft-lb)


9TF0AX-006

TIGHTENING OF INTAKE MANIFOLD

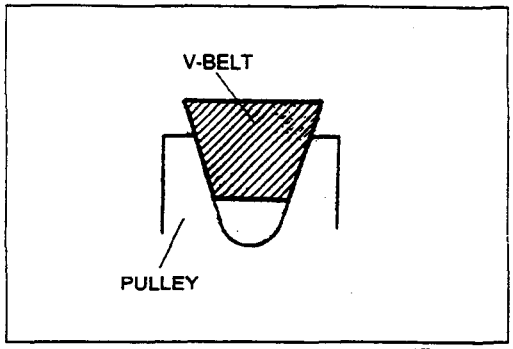
Tightening torque:
HA: 22—30 N·m (2.2—3.1 m-kg, 16—22 ft-lb)
SL: 16—24 N·m (1.6—2.4 m-kg, 12—17 ft-lb)
TF: 19—23 N·m (1.9—2.3 m-kg, 14—17 ft-lb)



9TF0AX-007

TIGHTENING OF EXHAUST MANIFOLD

Tightening torque:
HA: 26—32 N·m (2.7—3.3 m-kg, 20—24 ft-lb)
SL: 23—26 N·m (2.3—2.7 m-kg, 17—20 ft-lb)
TF: 44—48 N·m (4.5—4.9 m-kg, 33—35 ft-lb)

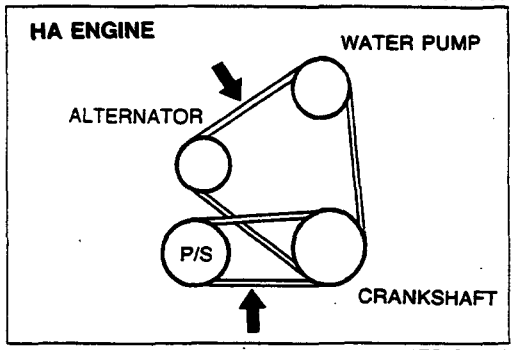


9TF0AX-008

INSPECTION AND ADJUSTMENT OF DRIVE BELTS

Inspection

1. Remove the undercover for inspection of the P/S belt.
2. Check the drive belts for wear, cracks, and fraying. Replace if necessary.
3. Verify that the drive belts are correctly mounted on the pulleys.



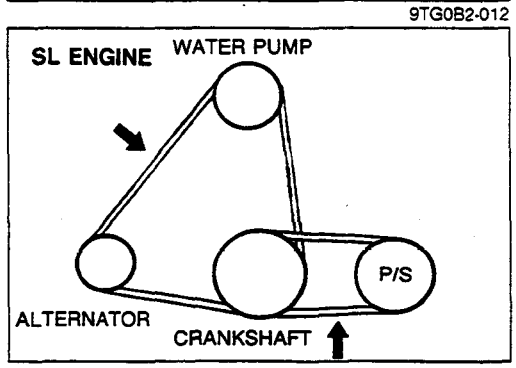
9TG0B2-012

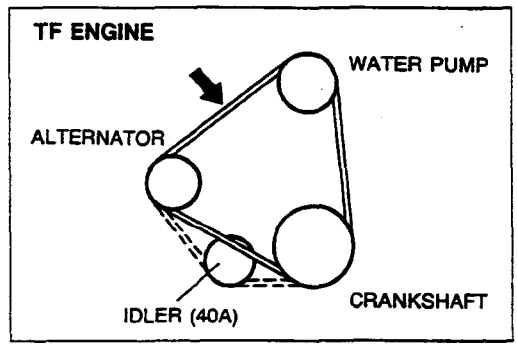
4. Check the drive belt deflection by applying moderate pressure **(98 N, 10 kg, 22 lb)** midway between the pulleys as shown. Adjust if necessary.

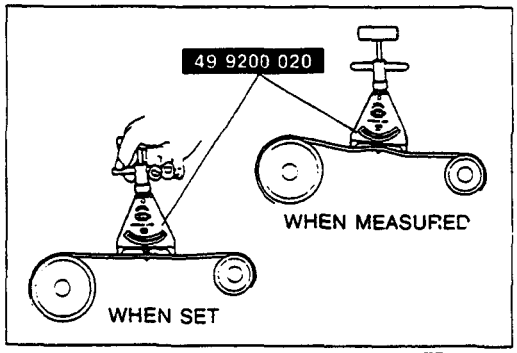
Deflection

mm (in)

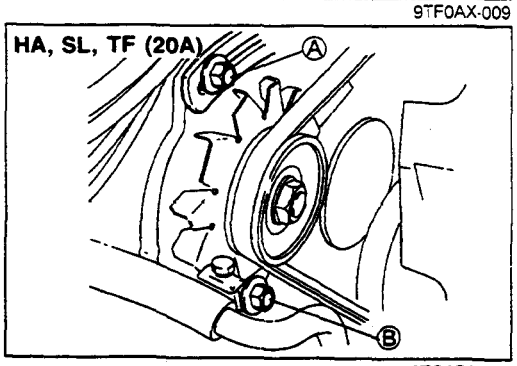
		New	Used
HA	Alternator	9.0—10.0 (0.35—0.39)	10.0—11.0 (0.39—0.43)
	P/S	9.0—11.0 (0.35—0.43)	12.0—13.0 (0.47—0.51)
SL	Alternator	9.0—10.0 (0.35—0.39)	10.0—11.0 (0.39—0.43)
	P/S	9.0—11.0 (0.35—0.43)	12.0—13.0 (0.47—0.51)
TF	Alternator	10.0—11.0 (0.39—0.43)	11.0—12.0 (0.43—0.47)



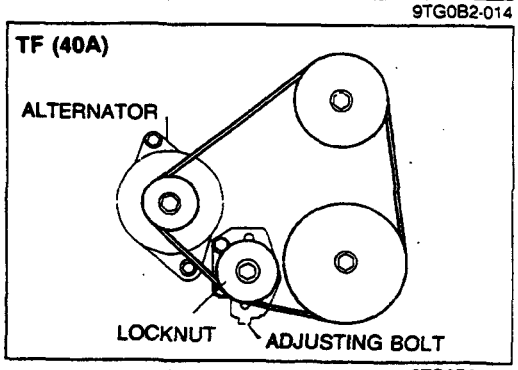




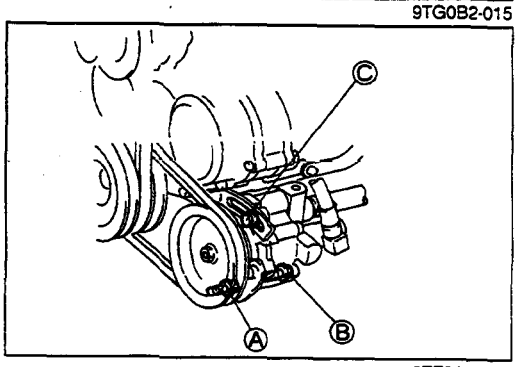
9TF0AX-009



9TG0B2-014



9TG0B2-015



9TF0AX-010

5. Check the drive belt tension with the **SST**.

Tension

N (kg, lb)

		New	Used
HA	Alternator	294—392 (30—40, 66—88)	245—294 (25—30, 55—66)
SL	Alternator	392—491 (40—50, 88—110)	343—392 (35—40, 77—88)
TF	Alternator	451—520 (46—53, 101—117)	383—520 (39—53, 86—117)

Adjustment

Caution
- **If a new belt is used, adjust the belt deflection at the midpoint of new belt specification.**

1. Alternator belt
   (i) HA, SL, TF (20A)
   Loosen alternator bolts A and B and adjust the belt deflection.

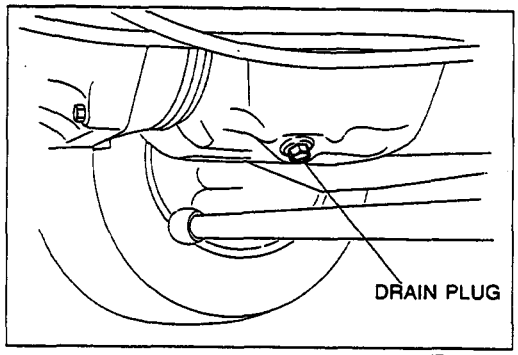
   Tightening torque:
   A: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)
   B: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

   (ii) TF (40A)
   Loosen the locknut and adjust the belt deflection by turning the adjusting bolt.

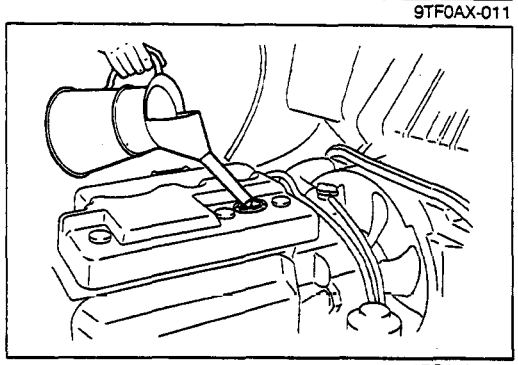
   Tightening torque:
   37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

2. P/S belt
   Loosen P/S oil pump bolts A, B, and C and adjust the belt deflection.

   Tightening torque:
   A: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)
   B: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)
   C: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



9TF0AX-011



9TG0AX-016

REPLACEMENT OF ENGINE OIL

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

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

Tightening torque:
29—41 N·m (3.0—4.2 m-kg, 22—30 ft-lb)

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

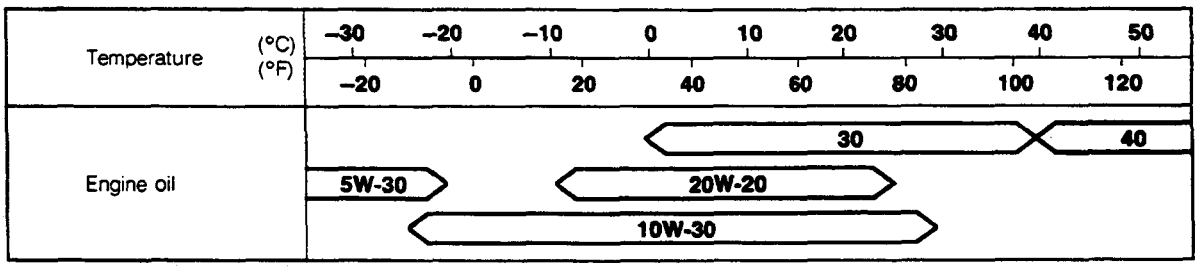
Oil pan capacity
HA, SL: 6.5 liters (6.9 US qt, 5.7 Imp qt)
TF: 7.0 liters (7.4 US qt, 6.2 Imp qt)

Note
- **The distance between the L and F marks on the level gauge represents 2.0 liters (2.11 US qt, 1.76 Imp qt).**

6. Refit the oil filler cap.
7. Run the engine and check for leaks.
8. Stop the engine and check the oil level. Add oil if necessary.

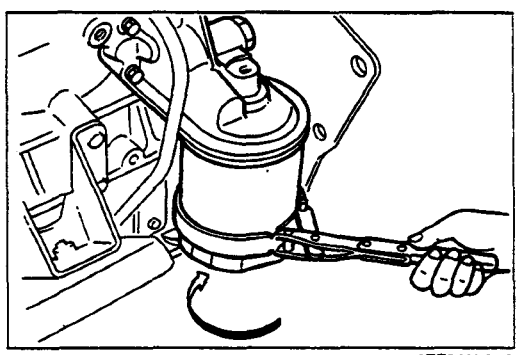
9TG0AX-017

Recommended SAE Viscosity



05U0DX-004

Anticipated ambient temperature range before succeeding oil change, °C (°F).

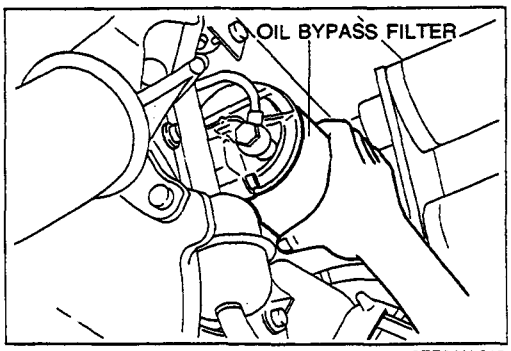


9TF0AX-012

REPLACEMENT OF OIL FILTER

1. Remove the oil filter with a suitable wrench.
2. Use a clean rag to wipe off 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 and tighten it by hand until the rubber seal contacts the base.
5. Tighten the filter 1/2 turn with a filter wrench.
6. Start the engine and check for leaks.
7. Check the oil level and add oil if necessary.

Oil filter capacity: 1.0 liter (1.06 US qt, 0.88 Imp qt)



9TF0AX-013

REPLACEMENT OF OIL BYPASS FILTER

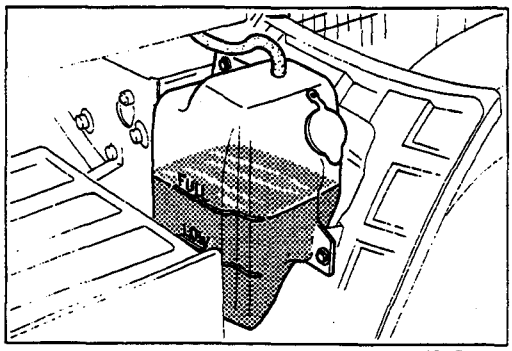
1. Remove the oil bypass filter with a suitable wrench.
2. Use a clean rag to wipe off the mounting surface on the engine.
3. Apply a small amount of clean engine oil to the rubber seal of the new filter.
4. Install the oil bypass filter and tighten it by hand.
5. Start the engine and check for leaks.
6. Check the oil level and add oil if necessary.

Oil bypass filter capacity:
0.6 liter (0.63 US qt, 0.53 Imp qt)

INSPECTION OF COOLING SYSTEM

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

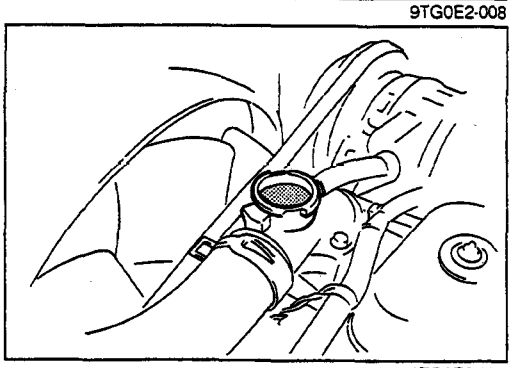
9TF0AX-014



9TG0E2-008

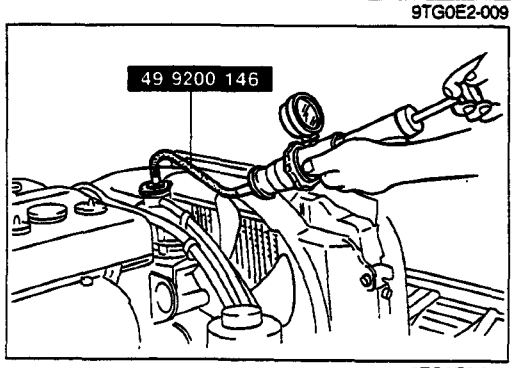
Coolant level (Engine cold)

1. Verify that the coolant level is near the coolant inlet port.
2. Verify that the coolant level in the coolant reservoir is between the FULL and LOW marks. Add coolant if necessary.


9TG0E2-009

Coolant quality

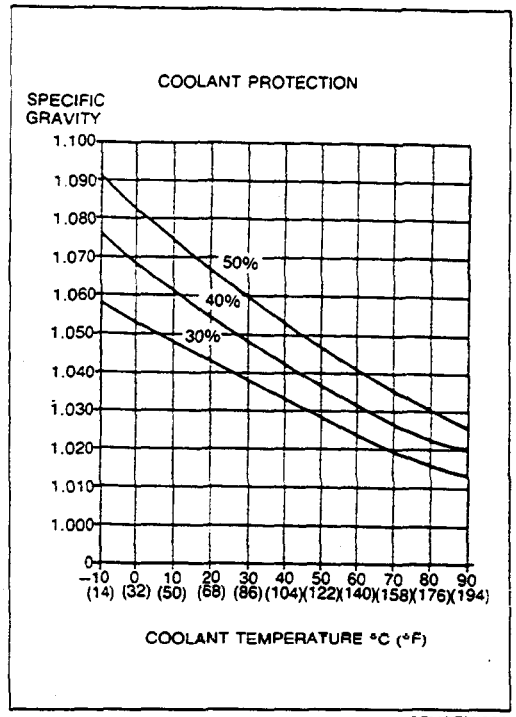
1. Verify that there is no buildup of rust or scale around the radiator cap or coolant inlet port.
2. Verify that coolant is free of oil.
   Replace the coolant if necessary.



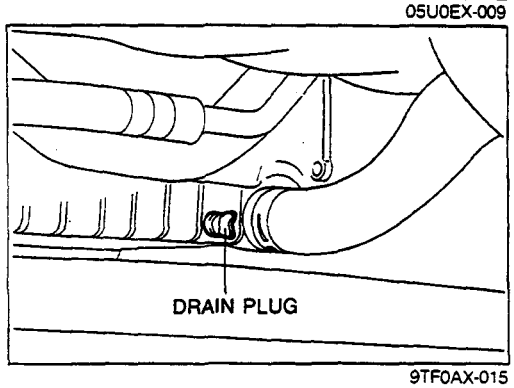
9TG0E2-010

Coolant leakage

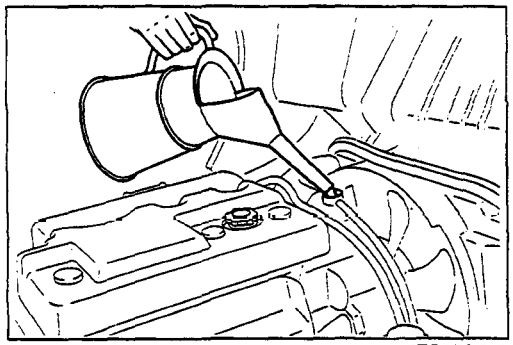
1. Connect a radiator tester (commercially available) and the **SST** to the coolant inlet port.
2. Apply **88 kPa (0.9 kg/cm^2, 13 psi)** pressure to the system.
3. Verify that the pressure is held.
   If not, check for coolant leakage.



05U0EX-009



9TF0AX-015



9TG0E2-012

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 specific gravity with a thermometer and a hydrometer.
2. Determine the coolant protection by referring to the graph shown.
   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 OF ENGINE COOLANT

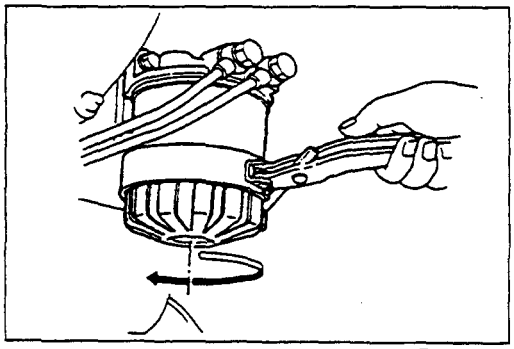
Warning
- **Never open the radiator cap while the engine is hot.**
- **Wrap a thick cloth around the cap before loosening it.**
- **Use caution when draining hot coolant.**

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

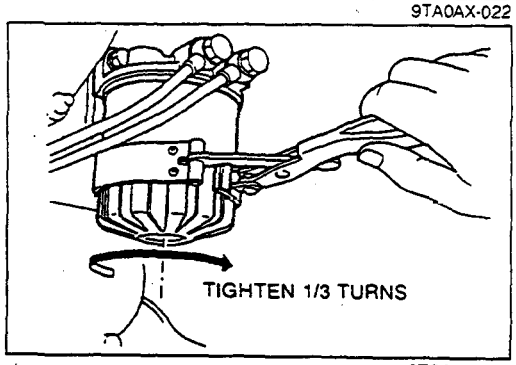
1. Remove the radiator cap and loosen the drain plug.
2. Drain the coolant into a suitable container.
3. Flush the cooling system with water until all traces of color are gone, then let the system drain completely.
4. Install the drain plug.
5. Fill with the proper amount and mixture of ethylene glycol-based coolant by referring to the table above.

Coolant capacity
With heater core: 13.5 liters (14.3 US qt, 11.9 Imp qt)
Without heater core:
12.5 liters (13.2 US qt, 11.0 Imp qt)

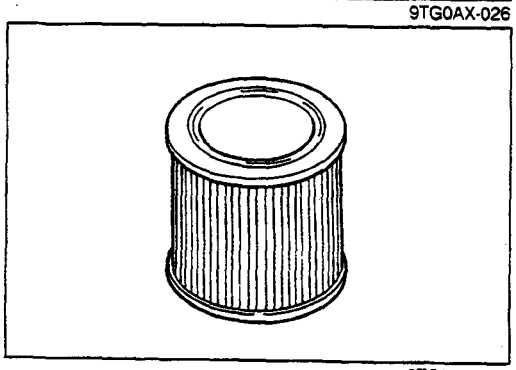
6. Run the engine, with the radiator cap removed, until the upper radiator hose is hot.
7. With the engine idling, add coolant to the radiator until it reaches the bottom of the coolant inlet port.
8. Install the radiator cap.



9TA0AX-022



9TG0AX-026



9TG0AX-027

REPLACEMENT OF FUEL FILTER

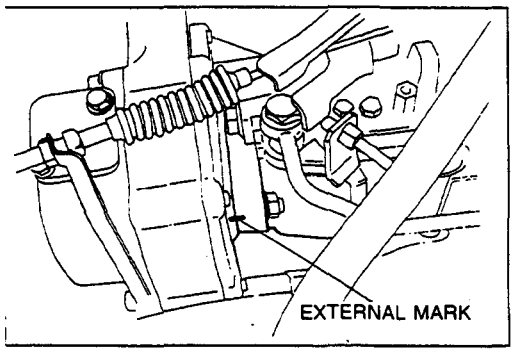
Warning
- **Keep sparks and open flames away from the fuel area.**

1. Remove the fuel filter with a fuel filter wrench.
2. Apply fuel on O-ring of the new fuel filter.
3. Install the new fuel filter and tighten it fully by hand.
4. Additionally tighten the fuel filter with a fuel filter wrench 1/3 turns.
5. Bleed air in the filter.
6. Start the engine and check for fuel leakage.

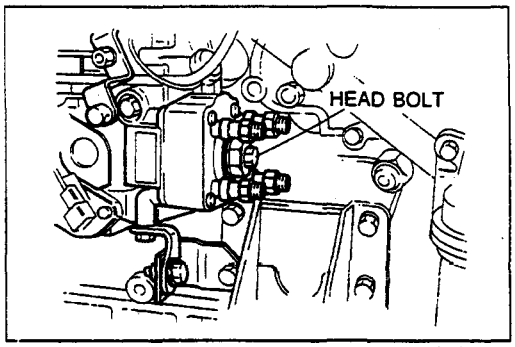
INSPECTION OF AIR CLEANER ELEMENT

Visually check that the element for excessive dirt, damage or oil. Clean or replace it if necessary.

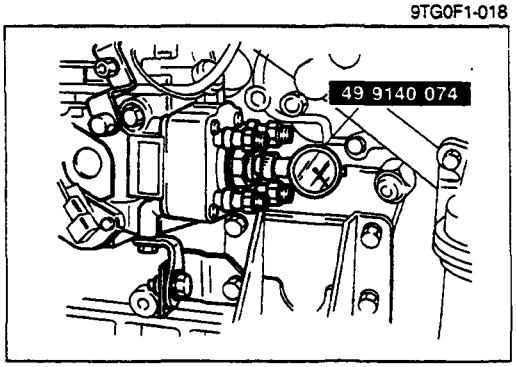
Note
- **When cleaning, first blow dust from inside then blow the dust off the outside of air cleaner element.**



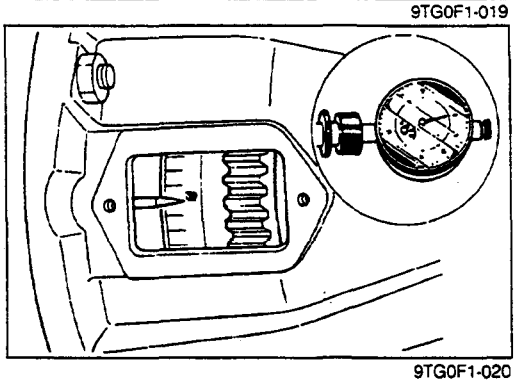
9TG0AX-030

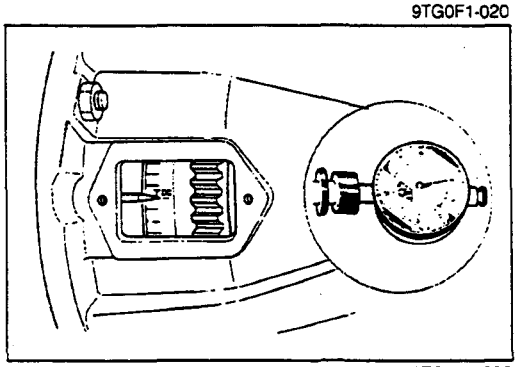


9TG0F1-018



9TG0F1-019


9TG0F1-020


9TG0AX-033

INSPECTION OF INJECTION TIMING
HA Engine
Inspection

Note
- **Usually it is enough to confirm that the external marks are aligned.**
- **Set the injection timing after installment of the injection pump.**

1. Disconnect the fuel injection pipes from the injection pump.
2. Remove the bolt and gasket from the distributor head of the injection pump.

3. Screw the **SST** into the injection pump.
   Make sure that the tip of the feeler of the measuring device is in contact with the plunger end at this time.

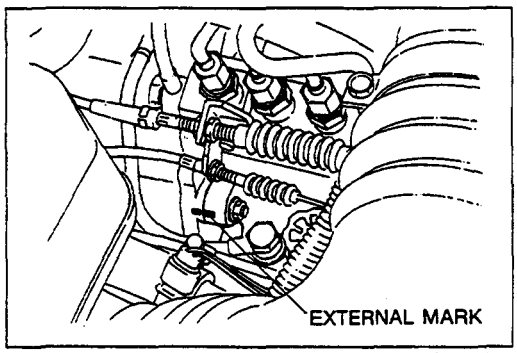
Note
- **The SST specified by Diesel Kiki Co., Ltd. is 157829—3520.**

4. Turn the flywheel to set the flywheel to **approx. 30° BTDC** and find the position in which the needle of the dial gauge does not move when the flywheel is turned.
5. When the dial gauge needle does not deflect, set the needle to "0" on the scale.

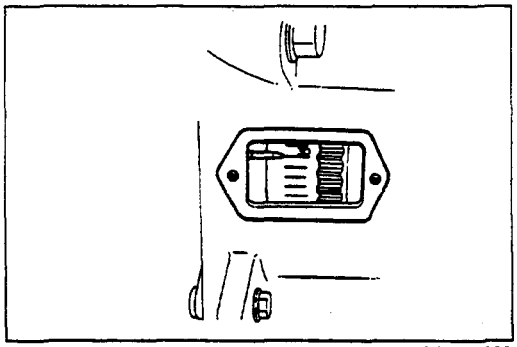
6. Turn the flywheel in the normal direction until **3° BTDC** is indicated.
   The injection timing is normal when the dial gauge needle is advanced 1.00mm (0.039 in) ahead of the value set in Step 5.

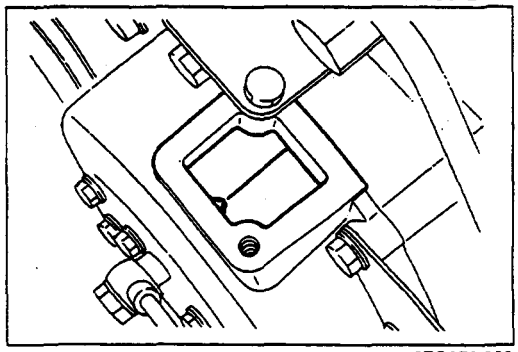
   Static injection: Cam lift 1.00mm (0.0394 in)

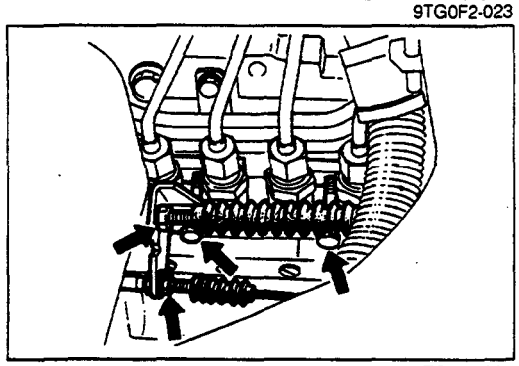
7. If the change is not as specified, adjust the injection timing.

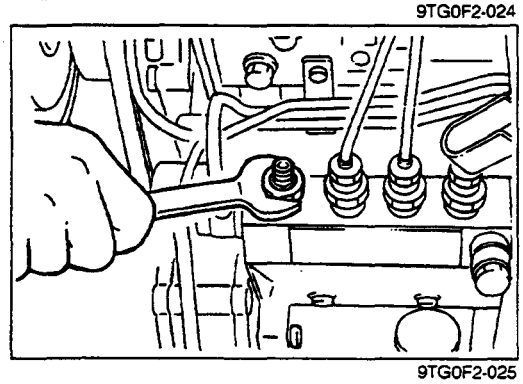


9TG0AX-031


9TG0F2-022


9TG0F2-023


9TG0F2-024


9TG0F2-025

SL, TF Engine
Inspection

Note
- **Usually it is enough to confirm that the external marks are aligned.**

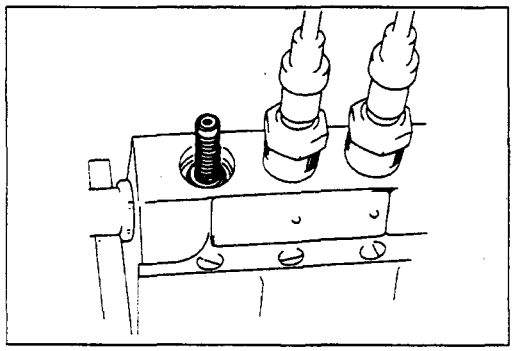
Caution
- **Direct injection engines are sensitive to injection timing. Incorrect timing will cause engine knocking or low power output.**
  Set the injection timing after installing the injection pump.

1. Remove the service hole covers from the clutch housing and the timing gear case.
2. Turn the flywheel in the direction of rotation until the indicator pin is at 30° BTDC.

3. Verify that the pointer of the timing gear case and the mark on the timer are aligned.
4. If not as specified, adjust the injection timing.

Adjustment
1. Remove the fuel stop cable from the cut lever.
2. Remove the accelerator cable from the control lever.
3. Remove the bracket.
4. Loosen injection pipes No.2—4 at the pump.

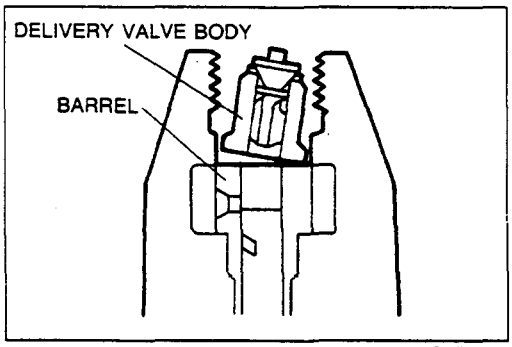
5. Remove No.1 injection pipe and the delivery valve holder.



9TG0F2-026

6. Remove the delivery valve spring seat and spring.

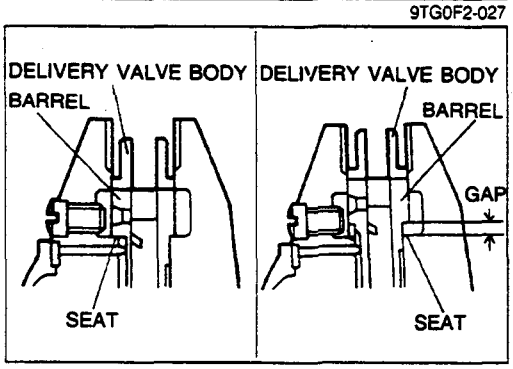
Caution
- **Do not remove the delivery valve body.**

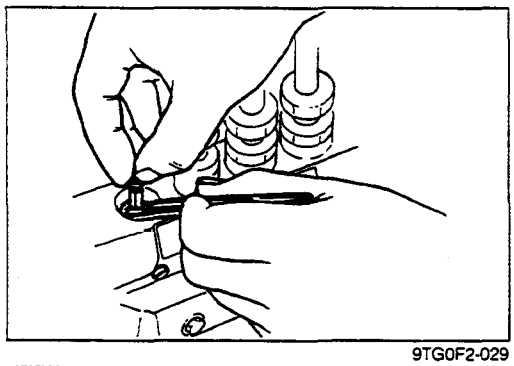


9TG0F2-027

7. Rock the delivery valve to break it loose from the barrel.

Note
- **If the delivery valve is lifted up without breaking it loose, the barrel may also be lifted out of the pump. If this happens the barrel may not reseal and may allow fuel into the engine and cause engine damage.**



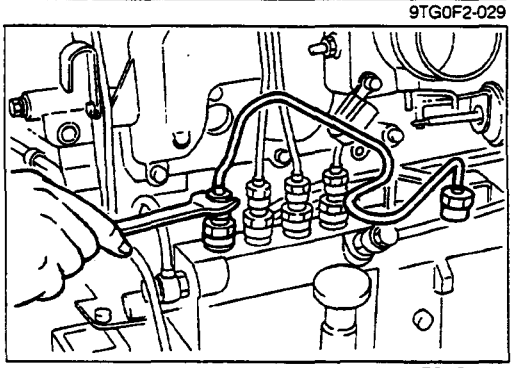


9TG0F2-029

8. Remove the delivery valve, holding the flat washer with tweezers.

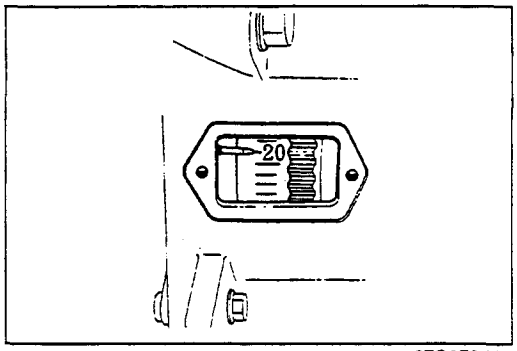
Caution
- **Do not pinch the sliding surface of the delivery valve.**

9. Reinstall the delivery valve holder.



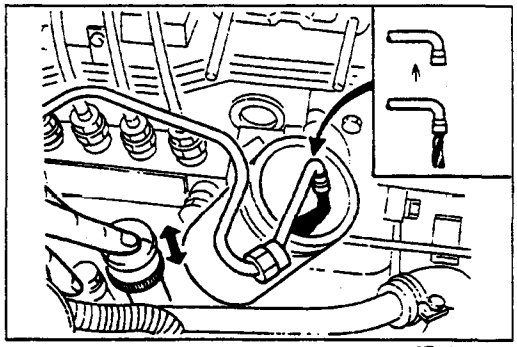
9TG0F2-030

10. Tighten No.1 injection pipe so that it points away from the pump.



9TG0F2-031

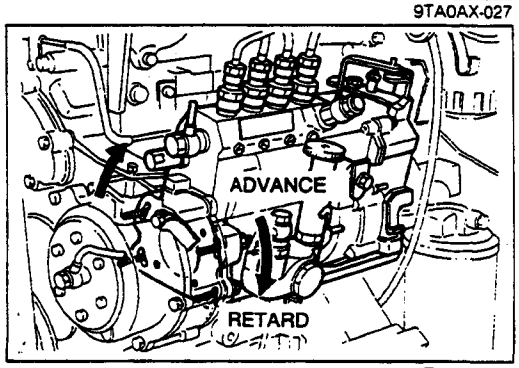
11. Turn the flywheel in the direction of rotation and set it at 20° BTDC.



9TA0AX-027

12. Place a container under No.1 injector pipe and verify that fuel is expelled when pumping the primer pump.
13. While pumping the priming pump, turn the flywheel in the normal direction of rotation and verify that fuel flow stops as specified.

Fuel stops:
SL Non-turbo: 12° BTDC
SL Turbo : 13° BTDC
TF : 11° BTDC



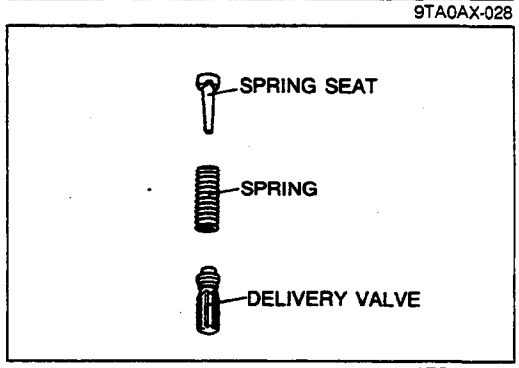
9TA0AX-028

14. If necessary, adjust the injection timing by loosening the pump mounting bolts and rotating the pump outward or inward as shown in the figure.

When advanced: turn to right (seen from front)
When retarded : turn to left (seen from front)

15. Tighten the mounting nuts.

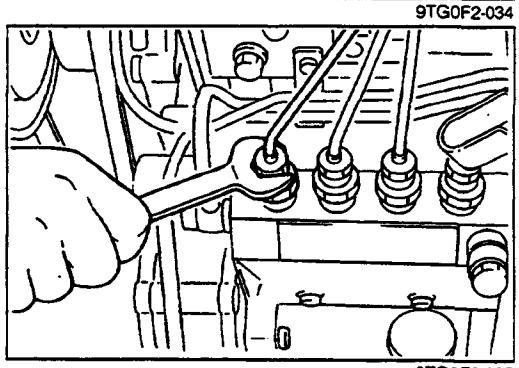
Tightening torque:
34—39 N·m (3.5—4.0 m-kg, 25—29 ft-lb)



9TG0F2-034

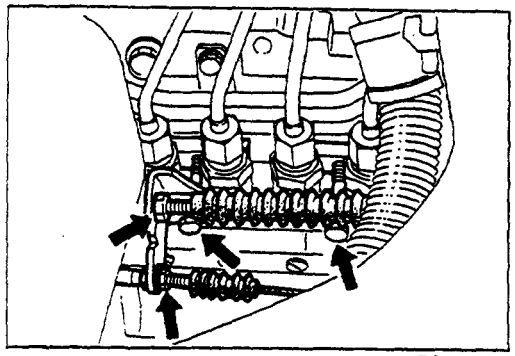
16. Mark the pump flange and pump body for future reference.
17. Install the delivery valve, spring, and spring seat.
18. Tighten the delivery valve holder.

Tightening torque:
39—44 N·m (4.0—4.5 m-kg, 29—33 ft-lb)



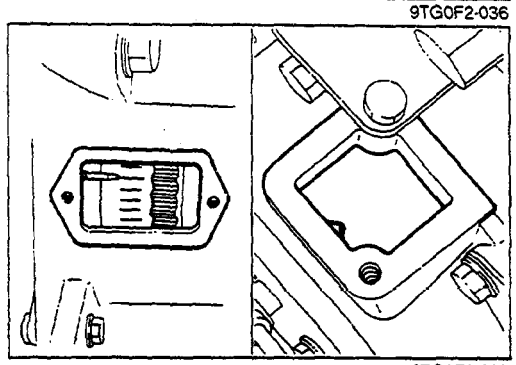
9TG0F2-035

19. Install No.1 injection pipe.



9TG0F2-036

20. Tighten injection pipes No.2—4.
21. Install the bracket.
22. Install the accelerator cable to the control lever.
23. Install the fuel stop cable to the cut lever.



9TG0F2-037

24. Install the service hole covers onto the clutch housing and the timing gear case.
25. Bleed air from the system.
26. Start the engine, and check for fuel leaks.

INSPECTION OF INJECTION NOZZLE

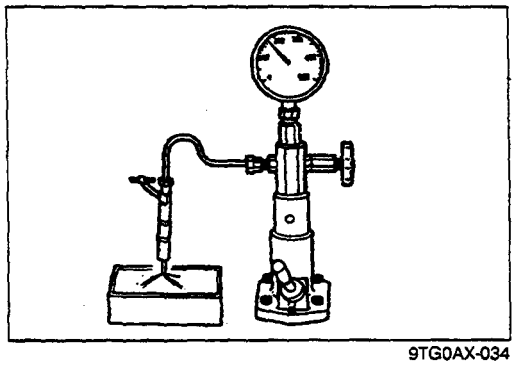
Warning

- **Do not allow your hands or any other part of the body to come into the direct path of the fuel spray when using the nozzle tester because the spray has enough force to break the skin and possibly cause blood poisoning.**

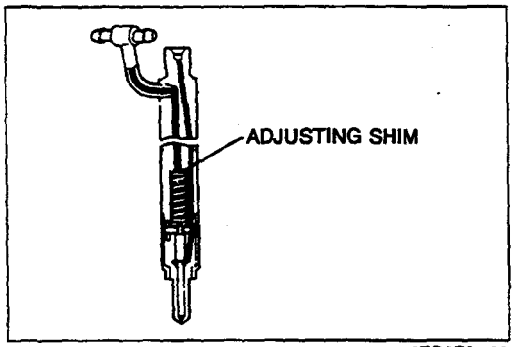
Caution

- **The nozzle tester should be set up in a clean work place.**

9TA0AX-029



9TG0AX-034



9TG0F2-100

Injection starting pressure

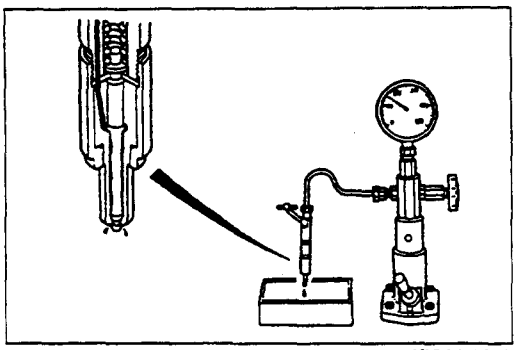
1. Connect the nozzle to a nozzle tester.
2. Pump the nozzle tester handle and note the pressure when injection is started.

Injection starting pressure
HA engine
13,244—13,734 kPa
(135—140 kg/cm^2, 1,920—1,991 psi)
SL engine
New nozzle : 17,168 kPa (175 kg/cm^2, 2,489 psi)
Used nozzle: 16,677 kPa (170 kg/cm^2, 2,417 psi)
TF engine
New nozzle : 20,580 kPa (210 kg/cm^2, 2,986 psi)
Used nozzle: 19,620 kPa (200 kg/cm^2, 2,844 psi)

3. If not within the specified pressure, adjust the starting pressure by adding or removing shims.

Note

- **If not within the specified pressure, adjust the starting pressure by adding or removing shims.**
  HA engine: Refer to page F1–20.
  SL engine : Refer to page F2–38.
  TF engine : Refer to page F3–26.

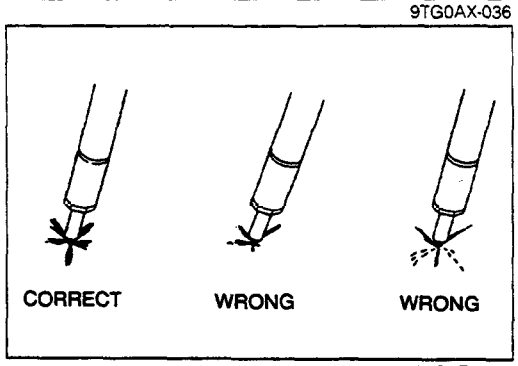


9TG0AX-036

Leakage of Injector

Apply pressure SL engine: 14,715 kPa (150 kg/cm^2, 2,133 psi), HA and TF engines: 1,962 kPa (20 kg/cm^2, 284 psi) lower than the specified injection pressure and see if the fuel leaks from the nozzle injection hole.

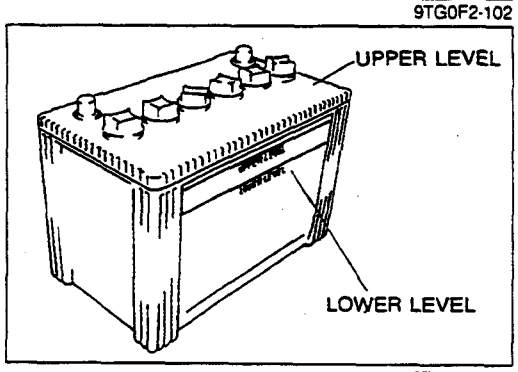
If the fuel leaks, it is necessary to disassemble, wash and recheck the nozzle or replace it.



9TG0F2-102

Atomizing Condition

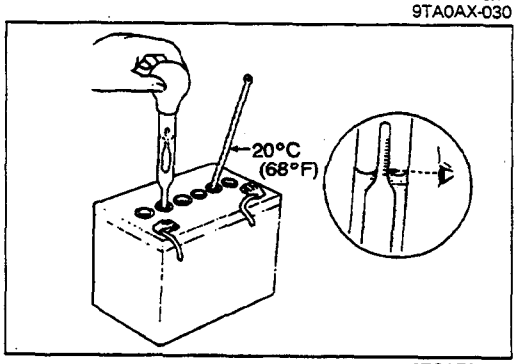
1. Connect the nozzle on the nozzle tester.
2. Air bleed by operating the nozzle tester handle several times.
3. Keeping the pressure gauge of the nozzle tester in the non-functioning condition, quickly lower the handle (lower the handle as quickly as possible so that a pulsating whistling sound can be heard). Repeat this operation several times and check the atomizing condition.
4. Make sure that the fuel is atomized uniformly and properly.
5. Make sure that the injection angle and direction are normal.
6. If the atomizing condition is incorrect, it is necessary to disassemble, wash and recheck the nozzle, or to replace it.



9TA0AX-030

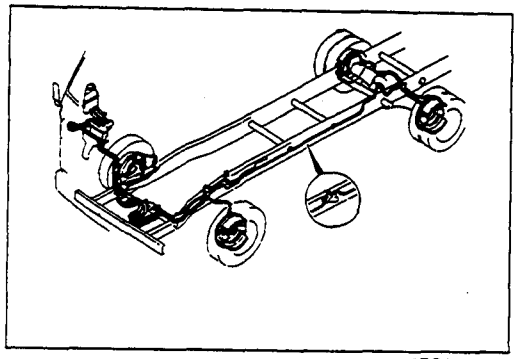
INSPECTION OF BATTERY

1. Check for corrosion on the terminals and for loose cable connections.
2. Check the electrolyte level.
   If the level is low, add distilled water to the "UPPER LEVEL" mark.



9TG0F2-016

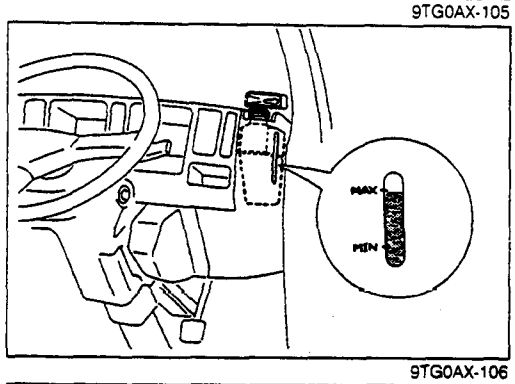
3. Check the specific gravity with a hydrometer. If the specific gravity reading is 1.23 or less, recharge the battery. (Refer to Section G.)



9TG0AX-105

INSPECTION OF BRAKE AND CLUTCH LINES, HOSES AND CONNECTIONS

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

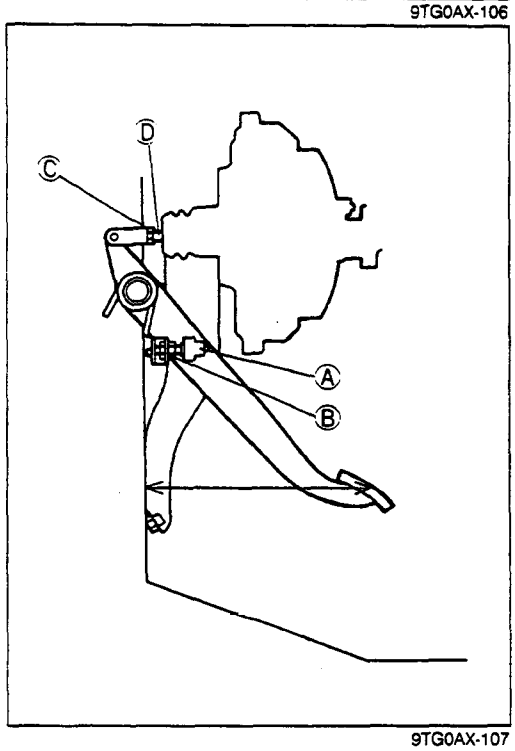


9TG0AX-106

INSPECTION OF BRAKE FLUID AND CLUTCH FLUID

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

Fluid specification: FMVSS 116: DOT-3 or SAE: J1703



9TG0AX-107

INSPECTION OF BRAKE PEDAL

Pedal Height

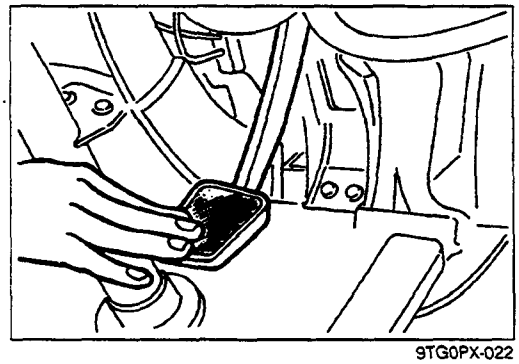
Inspection

Check that the distance from the center of the upper surface of the pedal pad to the dash panel is as specified.

Pedal height: 226—231mm (8.90—9.09 in)

Adjustment

1. Disconnect the stoplight switch connector.
2. Loosen locknut Ⓑ and turn switch Ⓐ until it does not contact the pedal.
3. Loosen locknut Ⓒ and turn rod Ⓓ to adjust the height.
4. Turn the stoplight switch until it contacts the pedal; then turn an additional 1/2 turn. Tighten locknut Ⓑ.
5. Check the pedal play and stoplight operation.



9TG0PX-022

Pedal Play

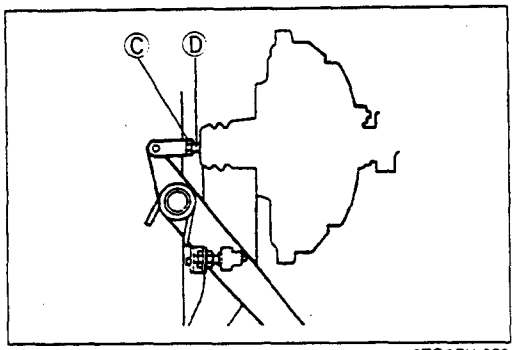
Inspection

1. Depress the pedal a few times to eliminate the vacuum in the system.
   Gently depress the pedal again by hand and check the free play (until the valve plunger contacts the stopper plate = until the power piston begins to move).

Pedal play: 9—11mm (0.35—0.43 in)

Caution (Australia payload 3,500 kg and 4,000 kg)

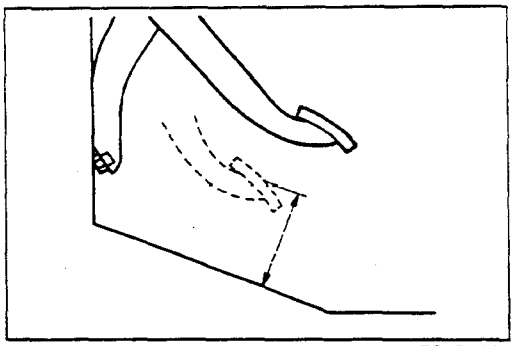
- **Do not inspect the pedal play with the ignition switch ON. The brake vacuum warning buzzer will operate when the ignition switch is ON.**



9TG0PX-023

Adjustment

1. Loosen locknut Ⓒ of push rod Ⓓ then turn the rod to adjust the free play.
2. Tighten locknut Ⓒ and check the pedal height and stoplight operation.


9TG0PX-024

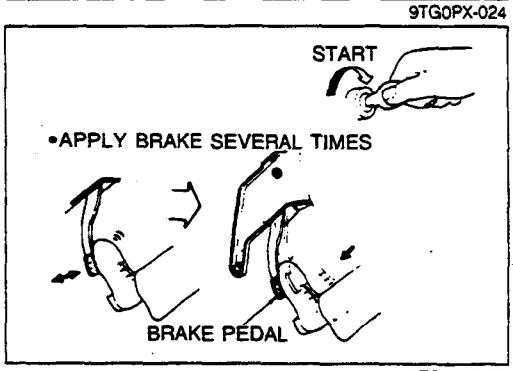
Pedal-to-floor Clearance

Inspection

1. Start the engine and depress the pedal with a force of 5.9 N (60 kg, 52 lb).
   Check that the distance from the floor panel to the center of the upper surface of the pedal pad is as specified.

   Pedal-to-floor clearance: 50mm (1.99 in) min.

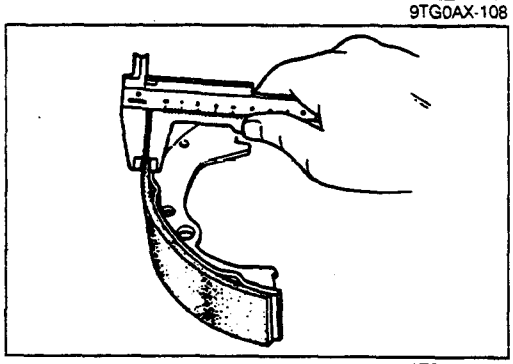
2. If the distance is less than specified, check for the following problems:
   - Air in brake system
   - Too much shoe clearance



9TG0AX-108

INSPECTION OF POWER BRAKE UNIT AND HOSES

1. Check the vacuum hoses, connectors and check-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 travel does not change. Then, while depressing brake pedal, start the engine. At this time, the pedal should go down a little.

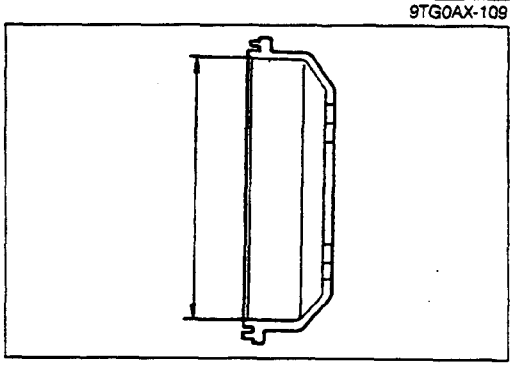

9TG0AX-109

INSPECTION OF DRUM BRAKE

Check the follwoing conditions of the brake drums and linings.

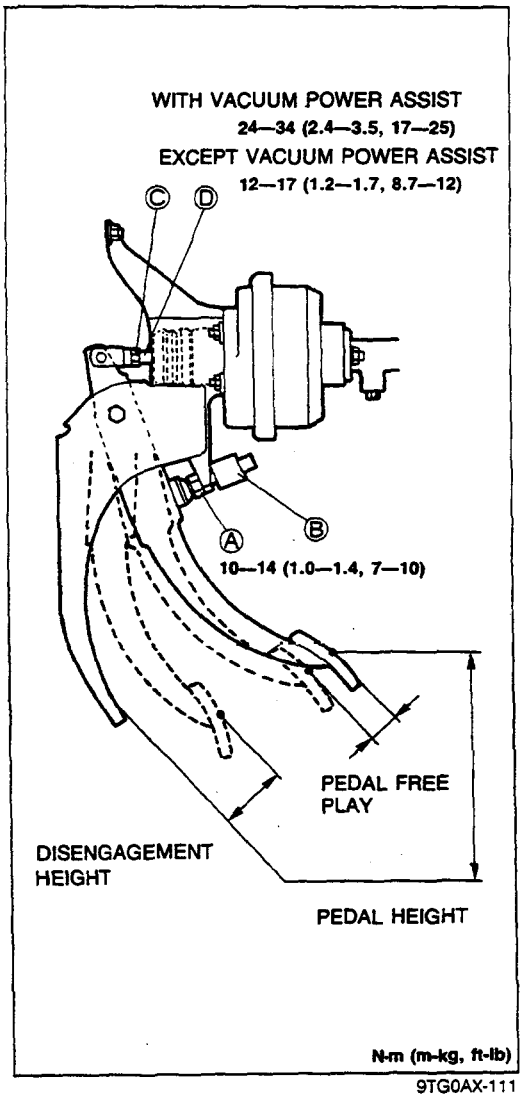
1. Check the wheel cylinder operation and inspect for leaks.
2. Check the linings for wear or damage.

   Standard lining thickness:
   Refer to Section TD
   Min: 1.0mm (0.04 in)


9TG0AX-110

3. Check condition of the inner surface and the inner diameter of the drum.

   Standard drum inner diameter:
   Refer to Section TD
   Max: Refer to Section TD



9TG0AX-111

INSPECTION OF CLUTCH PEDAL

Clutch Pedal Height

Inspection

1. Measure the distance from the upper surface of the pedal pad to the floor panel.

   Pedal height: 188—193mm (7.40—7.60 in)

2. If necessary, adjust the pedal height.

Adjustment

1. Disconnect the clutch switch connector.
2. Loosen locknuts A and turn clutch switch B until the height is correct.
3. Tighten locknuts A.

   Tightening torque:
   9.8—14 N·m (100—140 cm-kg, 87—122 in-lb)

4. After adjustment, measure the pedal free play.

Clutch Pedal Free Play

Inspection

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

   Pedal free play: 0.5—2.7mm (0.02—0.11 in)
   Total pedal free play: 5.0—11.0mm (0.20—0.43 in)

2. If necessary, adjust the pedal free play.

Adjustment

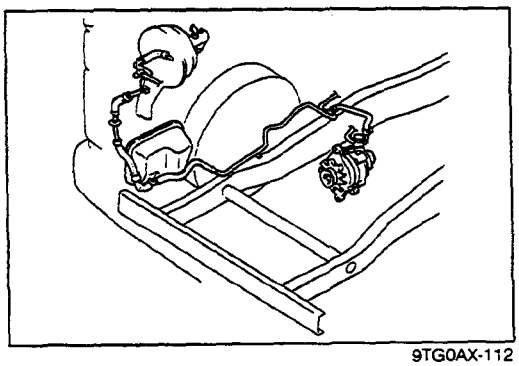
1. Loosen locknut C and turn push-rod D until pedal free play is correct.
2. Verify that the disengagement height (from the upper surface of the pedal to the floor panel) is correct when the pedal is fully depressed.

   Minimum disengagement height: 65mm (2.56 in)

3. Tighten locknut C.

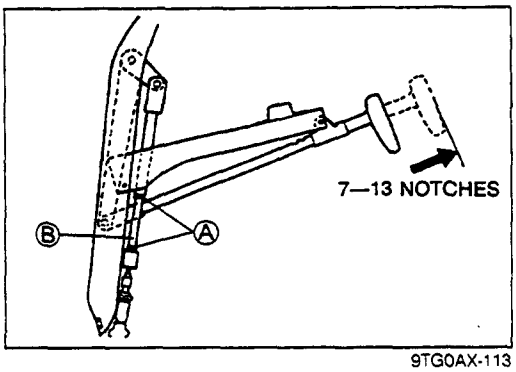
   Tightening torque:
   With vacuum power assist
   24—34 N·m (2.4—3.5 m-kg, 17—25 ft-lb)
   Except vacuum power assist
   12—17 N·m (1.2—1.7 m-kg, 8.7—12 ft-lb)

4. After adjustment, inspect the pedal height.


9TG0AX-112

INSPECTION OF VACUUM TANK AND HOSES

Check the vacuum tank for damage and check the vacuum hoses for proper attachment and connections. There should not be any leaks, cracks, chafing, abrasion, deterioration, etc. on the lines or connections.



9TG0AX-113

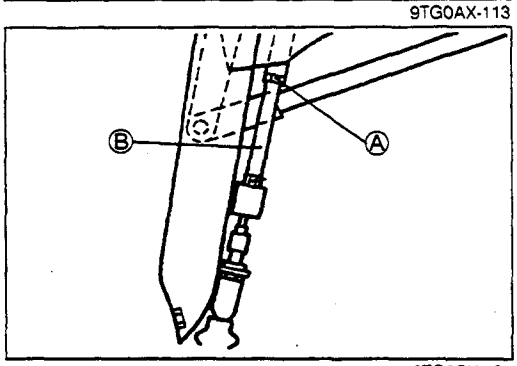
INSPECTION OF PARKING BRAKE LEVER

Inspection

Lever stroke

1. Check that the stroke is within specification when the parking brake lever is pulled with a force of **294 N (30 kg, 66 lb)**.

Stroke: 7—13 notches



9TG0PX-104

Adjustment

1. Loosen locknut Ⓐ and turn the adjusting bolt Ⓑ so that the stroke is within the above range.

Caution

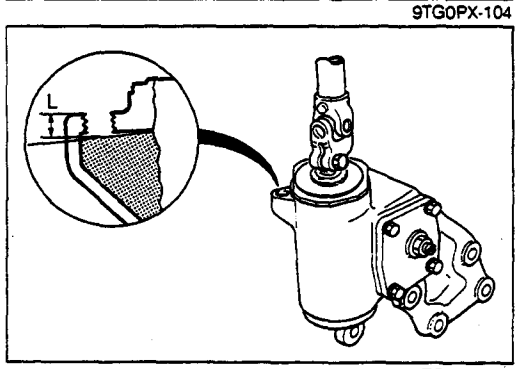
- **Before adjustment, adjust the clearance between the center brake drum and lining. (Refer to Section P.)**
- **After adjustment, make sure that the parking brake warning light illuminates when the brake lever is pulled one notch and the brakes are not dragging.**

INSPECTION OF MANUAL STEERING GEAR OIL LEVEL

1. Remove the filler plug.
2. Insert a scale through the oil filler hole.
3. Pull out the scale and measure the "L" dimension. Add the specified gear oil, if necessary.

Standard "L" dimension: 10mm (0.39 in)

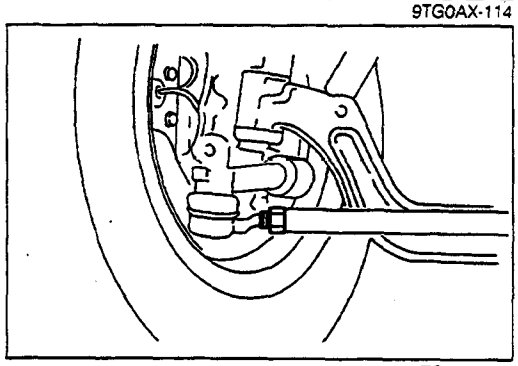
Specified gear oil: API service GL-4, Viscosity: SAE90



9TG0AX-114

INSPECTION OF STEERING LINKAGE, TIE ROD ENDS AND ARMS

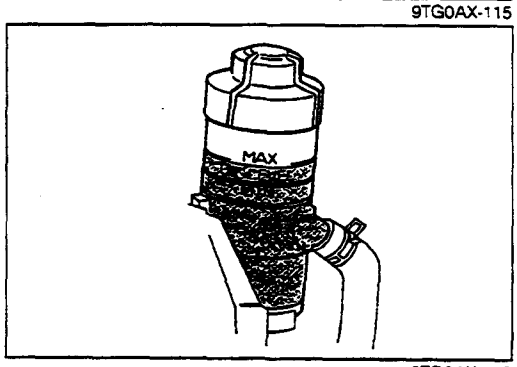
1. Check the steering linkage for looseness and damage.
2. Check the tie rod ends for excessive play.
3. Check the dust boots for damage.
4. Check the tie rod ends for looseness or grease leakage.


9TG0AX-115

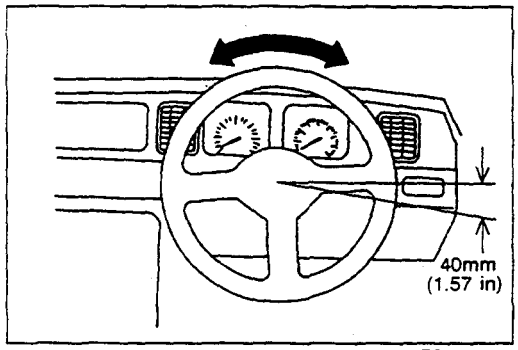
INSPECTION OF POWER STEERING FLUID AND LINES (If equipped)

1. Check the fluid hoses, lines and connections for cracks, chafing, deterioration, etc..
2. Check the fluid level on the reservoir.
   The level should be between the "MAX" and "MIN" level. Add fluid if necessary.

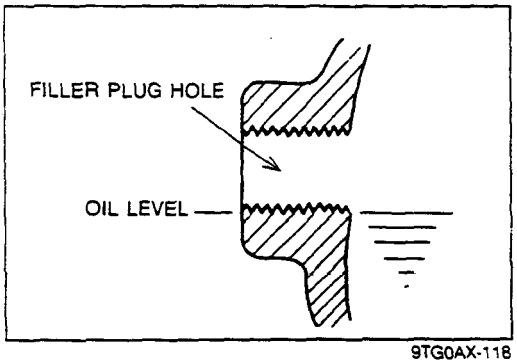
Fluid specification:
ATF M2C33-F or DEXRON-II



9TG0AX-116



9TG0AX-117



9TG0AX-118

INSPECTION OF STEERING OPERATIONS AND GEAR HOUSING

1. Check the steering wheel free play.

   Standard play: 5—20mm (0.2—0.8 in)

2. Check the steering for proper operation and looseness of the steering housing.
3. Check the steering gear housing for fluid leakage or seepage.

INSPECTION AND REPLACEMENT OF TRANSMISSION OIL

Inspection

Caution
- **Position the vehicle on level ground.**

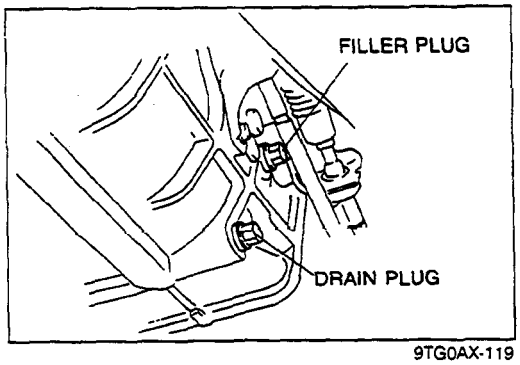
1. Remove the filler plug.
2. Verify that the oil is at the bottom of the filler plug hole. If it is low, add the specified oil from filler plug.
3. Wipe clean and apply sealant to the plug threads before installing the plug.

Tightening torque:
33—51 N·m (3.4—5.2 m-kg, 25—38 ft-lb)

Replacement

1. Remove the drain plug, and drain the oil into a suitable container.
2. Wipe clean and apply sealant to the plug threads.
3. Install the drain plug.

Tightening torque:
33—51 N·m (3.4—5.2 m-kg, 25—38 ft-lb)



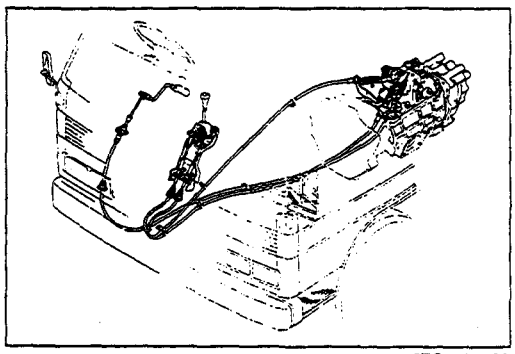
9TG0AX-119

4. Add the specified oil from the filler plug hole until the level reaches the bottom of the hole.

Specified oil:
Type: API Service GL-4 or GL-5
SAE 75W-90
Capacity: HA, SL engine without sub-transmission
3.5 liters (3.7 US qt, 3.1 Imp qt)
SL, TF engine with sub-transmission
3.3 liters (3.5 US qt, 2.9 Imp qt)

5. Apply sealant to the filler plug threads.
6. Install the filler plug.

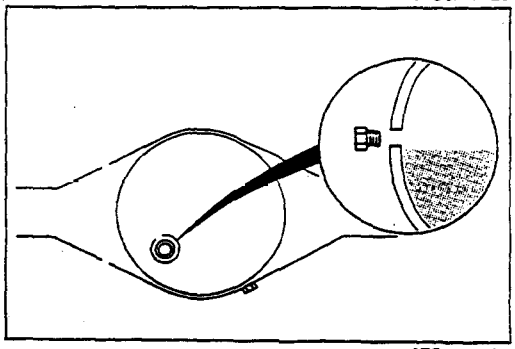
Tightening torque:
33—51 N·m (3.4—5.2 m-kg, 25—38 ft-lb)



9TG0AX-120

INSPECTION OF TRANSMISSION LINKAGE AND CABLES

Check the transmission linkage and cables for damage, twist and smooth operation.



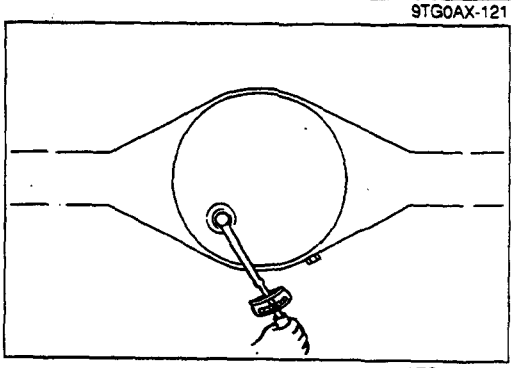
9TG0AX-121

INSPECTION AND REPLACEMENT OF DIFFERENTIAL OIL

Inspection

1. Remove the oil filler plug.
2. Verify that the oil level is at the bottom of the plug hole.
3. If low, add the specified oil.

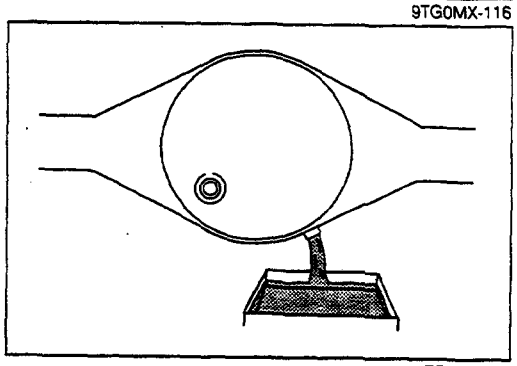
Specified oil
Type: Above −18°C (0°F): GL-5 SAE 90
Below −18°C (0°F): GL-5 SAE 80W



9TG0MX-116

4. Install a new washer and tighten the oil filler plug.

Tightening torque:
39—54 N·m (4.0—5.5 m-kg, 29—40 ft-lb)



9TF0AX-016

Replacement

1. Remove the magnetic plug and drain the differential oil.
2. Clean the magnetic plug.
3. Install a new washer and tighten the magnetic plug.

Tightening torque:
39—54 N·m (4.0—5.5 m-kg, 29—40 ft-lb)

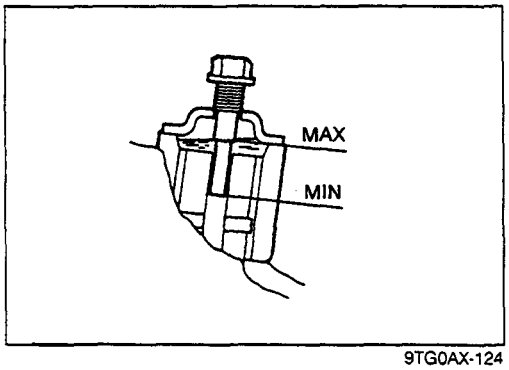
4. Remove the oil filler plug and fill the differential with the specified oil.

Specified oil
Type: Above −18°C (0°F): GL-5 SAE 90
Below −18°C (0°F): GL-5 SAE 80W
Capacity:
W type: 2.6 liters (2.7 US qt, 2.3 Imp qt)
Y type: 3.6 liters (3.8 US qt, 3.2 Imp qt)

5. Check the oil level.
6. Install a new washer and tighten the oil filler plug.

Tightening torque:
39—54 N·m (4.0—5.5 m-kg, 29—40 ft-lb)

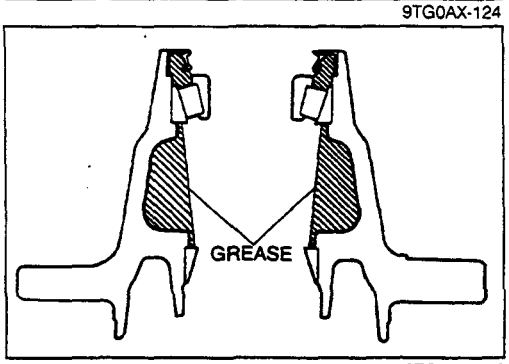
9TG0MX-118



9TG0AX-124

INSPECTION OF KINGPIN OIL

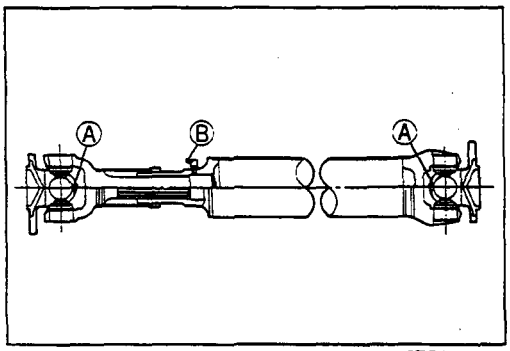
Check the kingpin oil level on the gauge.
The level should be between the "MAX" and "MIN" level.



9TG0AX-127

LUBRICATION OF FRONT WHEEL BEARINGS

1. Remove the hub and inner and outer bearing.
   Clean with solvent and inspect the bearings for damage.
2. Repack lithium grease (NLGI No.2) to the following parts.
   1) All rolling surfaces of the bearings
   2) Between the bearing and oil seal
   3) Between the bearings in the hub
3. Apply lithium grease (NLGI No.2) to the oil seal lip (use new oil seals).

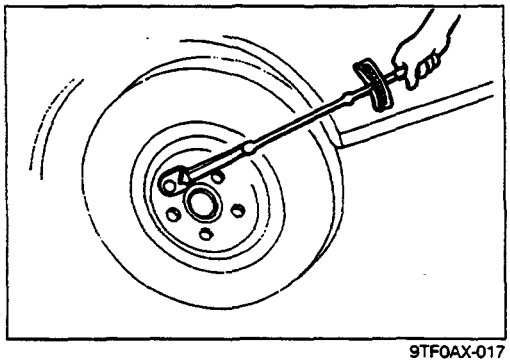


9TG0AX-128

LUBRICATION OF PROPELLER SHAFT JOINTS

Lubricate each part with the specified grease through the nipples.

Nipples....Grease
Ⓐ .....NLGI No.2
Ⓑ .....Disulphide molybdenum grease

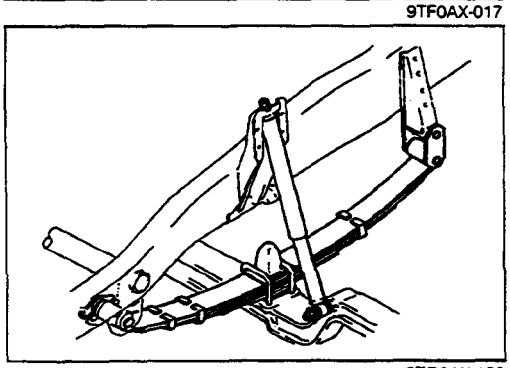

9TF0AX-017

INSPECTION OF WHEEL LUG NUT

Check the tightening torque.

Tightening torque:

Model / Item	Single rear tire N·m (m-kg, ft-lb)	Dual rear tires N·m (m-kg, ft-lb)	
Front	167—215 (17—22, 123—159)	491—735 (50—75, 362—542)	
Rear		Inside	540—784 (55—80, 398—578)
		Outside	491—735 (50—75, 362—542)


9TG0AX-130

TIGHTENING BOLTS AND NUTS ON CHASSIS AND BODY

Retighten any loose nuts and bolts on chassis and body to the specified torque.

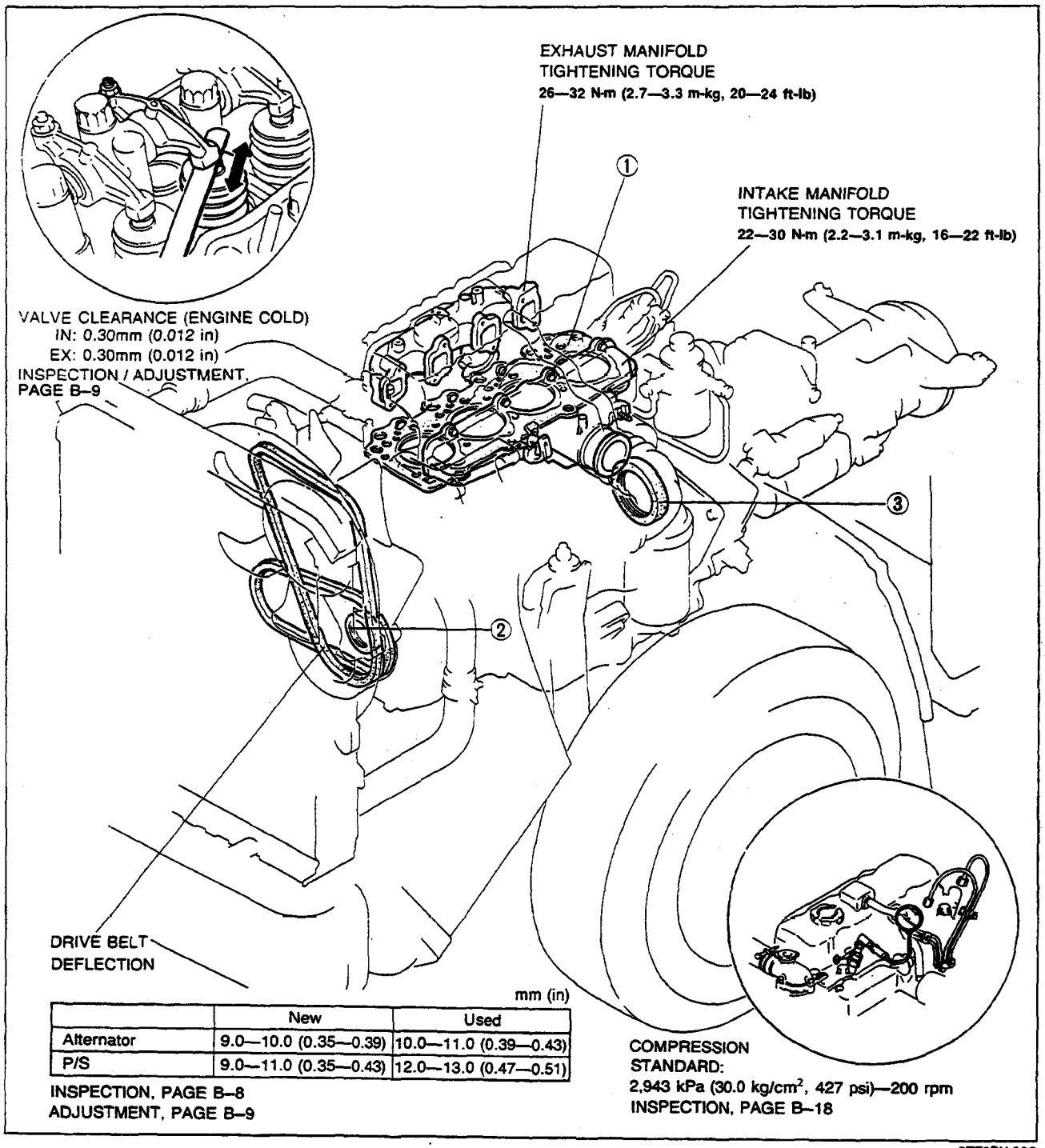
ENGINE

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HA ENGINE



	New	Used
Alternator	9.0—10.0 (0.35—0.39)	10.0—11.0 (0.39—0.43)
P/S	9.0—11.0 (0.35—0.43)	12.0—13.0 (0.47—0.51)

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3. Rear oil seal
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4. Engine
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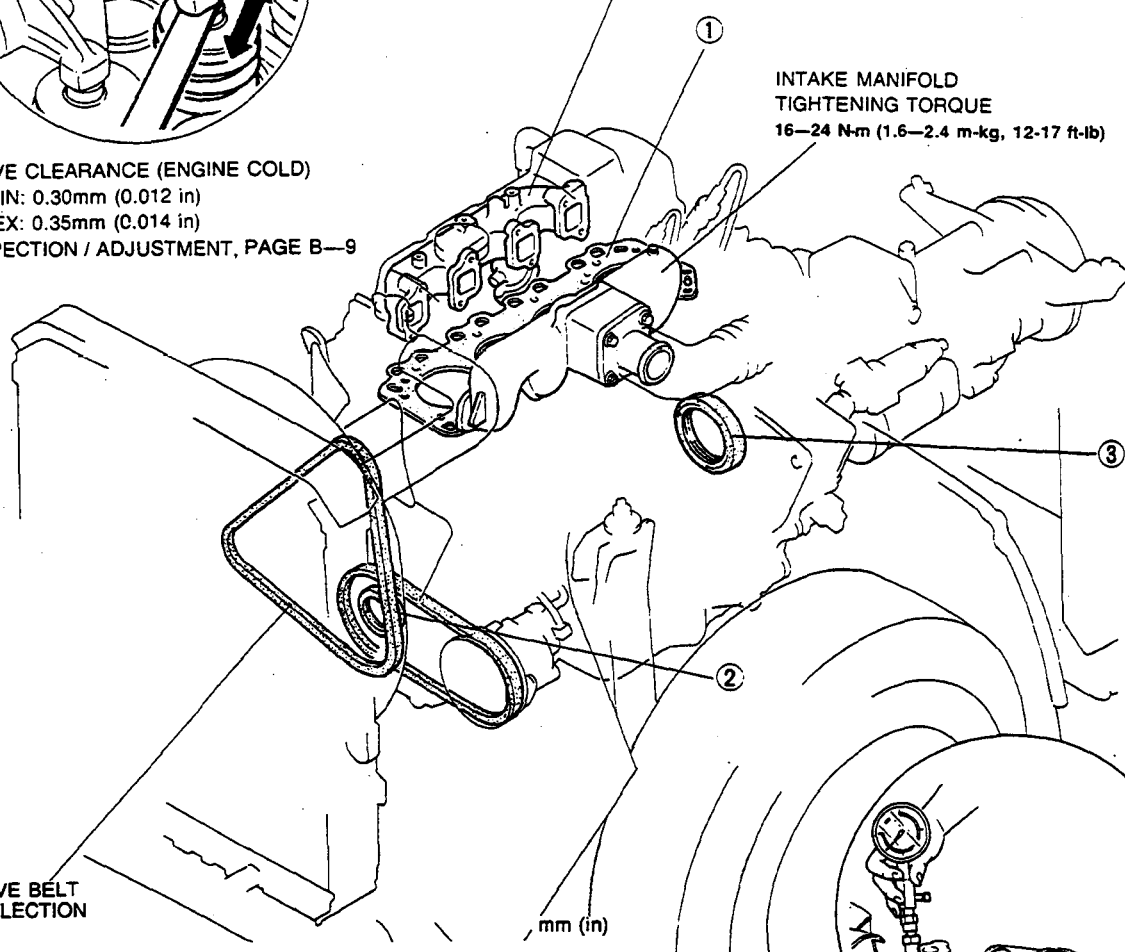
SL ENGINE



VALVE CLEARANCE (ENGINE COLD)
IN: 0.30mm (0.012 in)
EX: 0.35mm (0.014 in)
INSPECTION / ADJUSTMENT, PAGE B—9

EXHAUST MANIFOLD
TIGHTENING TORQUE
23—26 N-m (2.3—2.7 m-kg, 17—20 ft-lb)

INTAKE MANIFOLD
TIGHTENING TORQUE
16—24 N-m (1.6—2.4 m-kg, 12-17 ft-lb)

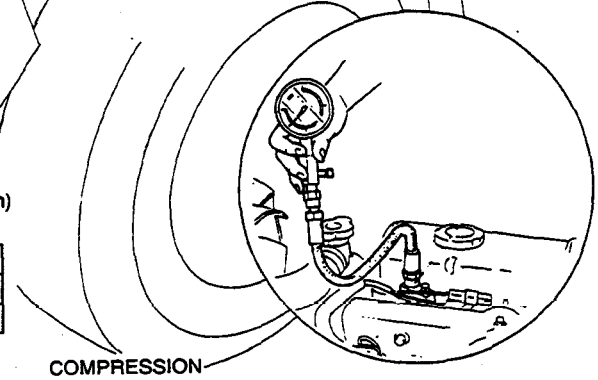


DRIVE BELT
DEFLECTION

mm (in)

	New	Used
Alternator	9.0—10.0 (0.35—0.39)	10.0—11.0 (0.39—0.43)
P/S	9.0—11.0 (0.35—0.43)	12.0—13.0 (0.47—0.51)

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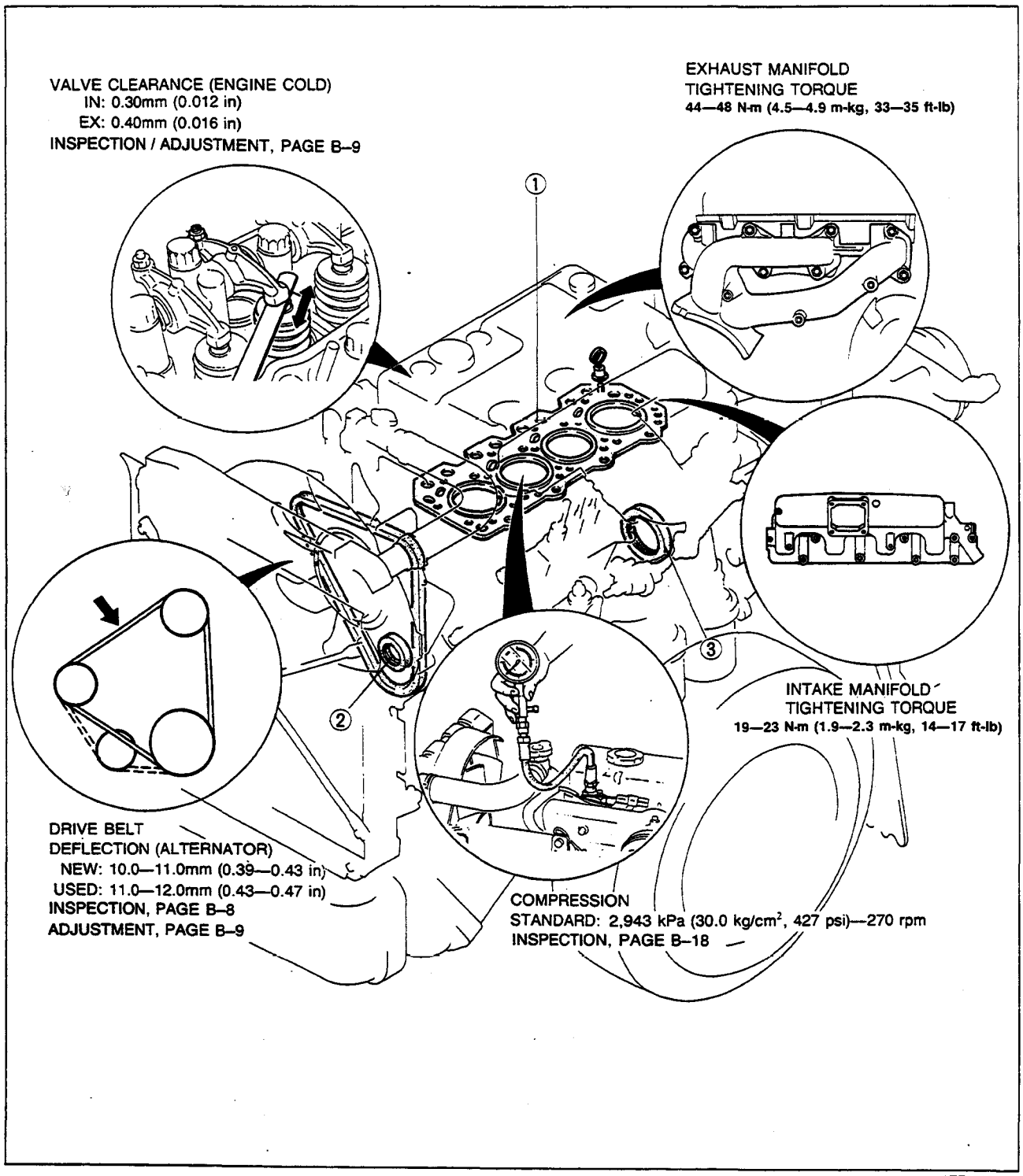


COMPRESSION
STANDARD
NON-TURBO: 2,943 kPa (30.0 kg/cm², 427 psi)-300 rpm
TURBO : 2,551 kPa (26.0 kg/cm², 370 psi)-320 rpm
INSPECTION, PAGE B–18

9TF0BX-003

1. Cylinder head gasket
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2. Front oil seal
Replacement ..... page B– 28
3. Rear oil seal
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4. Engine
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TF ENGINE



9TF0BX-004

1. Cylinder head gasket
   Replacement ..... page B– 21
2. Front oil seal
   Replacement ..... page B– 28
3. Rear oil seal
   Replacement ..... page B– 31
4. Engine
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   Installation ..... page B–127

OUTLINE

SPECIFICATIONS

Item \ Engine			HA	SL		TF
				Non-Turbo	Turbo	
Type			Diesel, 4-cycle			
Cylinder arrangement and number			In-line, 4-cylinders			
Combustion chamber			Pre-combustion chamber	Piston head		
Valve system			OHV, Gear-driven			
Displacement cc (cu in)			2,977 (181.60)	3,455 (210.76)		4,021 (245.28)
Bore x Stroke mm (in)			95.0 x 105.0 (3.74 x 4.13)	100.0 x 110.0 (3.94 x 4.33)		105.5 x 115.0 (4.15 x 4.53)
Compression ratio			21.0 : 1	18.0 : 1	17.0 : 1	18.0 : 1
Compression pressure kPa (kg/cm^2, psi)-rpm			2,943 (30.0, 427)-200	2,943 (30.0, 427)-300	2,551 (26.0, 370)-320	2,943 (30.0, 427)-270
Valve timing	IN	Open BTDC	17°	19°		18°
		Close ABDC	47°	47°		45°
	EX	Open BBDC	51°	52°		49°
		Close ATDC	13°	14°		17°
Valve clearance (Engine cold) mm (in)		IN	0.30 (0.012)			
		EX	0.30 (0.012)	0.35 (0.014)		0.40 (0.016)

9TG0B2-005

TROUBLESHOOTING GUIDE

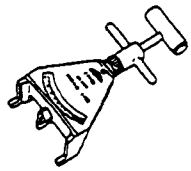
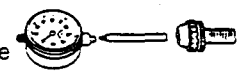
Problem	Possible Cause	Action	Page
Difficult starting	**Malfunction of engine-related components**		
	Burned valve	Replace	B–76
	Worn piston, piston rings, or cylinder	Repair or replace	B–80,81
	Failed cylinder head gasket	Replace	B–21
	Malfunction of fuel system	Refer to Section F	
	Malfunction of electrical system	Refer to Section G	
Poor idling	**Malfunction of engine-related components**		
	Improper valve clearance	Adjust	B– 9
	Poor valve to valve seat contact	Repair or replace	B–77
	Failed cylinder head gasket	Replace	B–21
	Malfunction of fuel system	Refer to Section F	
Excessive oil consumption	**Oil working up**		
	Worn piston ring groove or stuck piston ring	Replace	B–82
	Worn piston or cylinder	Repair or replace	B–80,81
	Oil working down		
	Worn valve seal	Replace	B–114,120
	Worn valve stem or guide	Replace	B–76
	Oil leakage	Refer to Section D	

Problem	Possible Cause	Action	Page
Insufficient power	**Insufficient compression**		
	Improper valve clearance	Adjust	B– 9
	Compression leakage from valve seat	Repair	B–77
	Seized valve stem	Replace	B–76
	Weak or broken valve spring	Replace	B–79
	Failed cylinder head gasket	Replace	B–21
	Cracked or distorted cylinder head	Replace	B–76
	Sticking, damaged, or worn piston rings	Replace	B–82
	Cracked or worn piston	Replace	B–81
	Malfunction of fuel system	Refer to Section F	
	Others		
	Slipping clutch	Refer to Section H	
	Dragging brakes	Refer to Section P	
	Wrong size tires	Refer to Section Q	
Abnormal combustion	**Malfunction of engine-related components**		
	Improper valve clearance	Adjust	B– 9
	Sticking or burned valve	Replace	B–76
	Weak or broken valve spring	Replace	B–79
	Carbon accumulation in combustion chamber	Eliminate carbon	—
	Malfunction of fuel system	Refer to Section F	
Engine noise	**Crankshaft- or bearing-related parts**		
	Excessive main bearing oil clearance	Repair or replace	B–92
	Main bearing seized or heat-damaged	Replace	B–85
	Excessive crankshaft end play	Repair or replace	B–94
	Excessive connecting rod bearing oil clearance	Repair or replace	B–95
	Connecting rod bearing seized or heat-damaged	Replace	B–85
	Piston-related parts		
	Worn cylinder	Repair or replace	B–80
	Worn piston or piston pin	Replace	B–83
	Seized piston	Replace	B–81
	Damaged piston ring	Replace	B–82
	Bent connecting rod	Replace	B–83
	Valves or timing-related parts		
	Improper valve clearance	Adjust	B– 9
	Broken valve spring	Replace	B–79
	Excessive valve guide clearance	Replace	B–77
	Malfunction of cooling system	Refer to Section E	
	Malfunction of fuel system	Refer to Section F	
	Others		
	Malfunction of water pump bearing	Refer to Section E	
	Improper drive belt tension	Adjust	B– 9
	Malfunction of alternator bearing	Refer to Section G	
	Exhaust gas leakage	Refer to Section F	

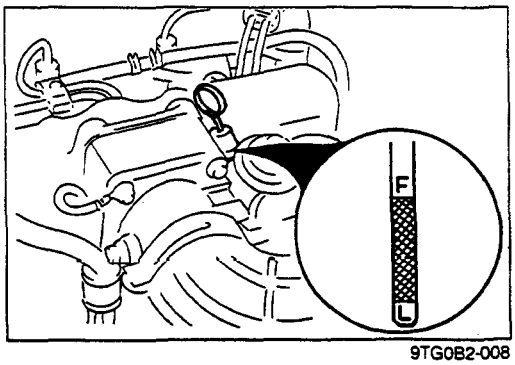
9TF0BX-005

ENGINE TUNE-UP PROCEDURE

PREPARATION
SST

49 9200 020 Tension gauge, V-ribbed belt 	For inspection of drive belt tension	49 9140 074 Cam lift, measuring device (HA) 	For inspection of injection timing

9TG0B2-007



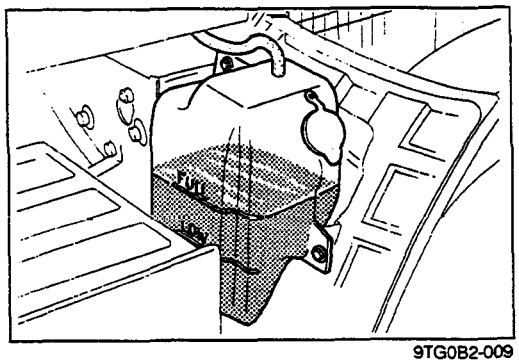
9TG0B2-008

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 gauge 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 level gauge represents 2.0 liters (2.11 US qt, 1.76 Imp qt).**

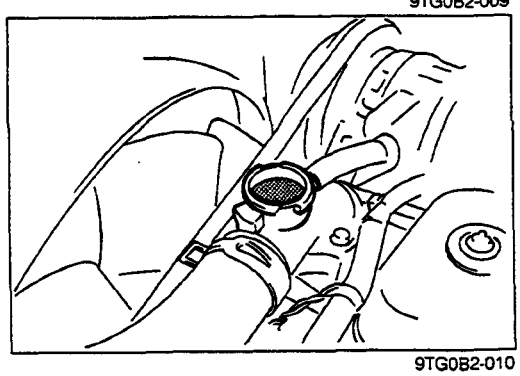
ENGINE COOLANT
Inspection
Coolant level (engine cold)

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



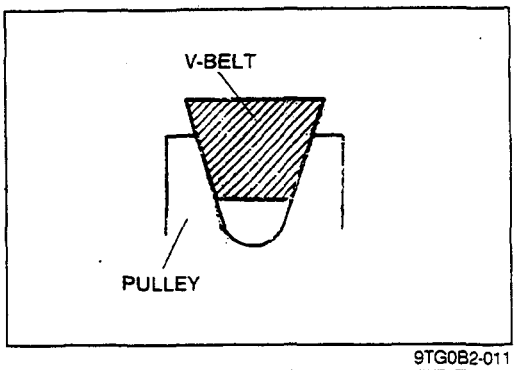
9TG0B2-009

1. Verify that the coolant level is near the coolant inlet port.
2. Verify that the coolant level in the coolant reservoir is between the FULL and LOW marks.
3. Add coolant if necessary.

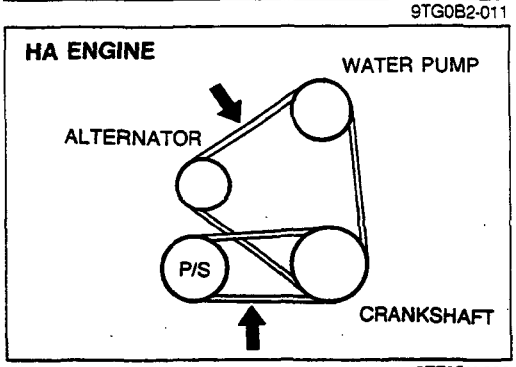


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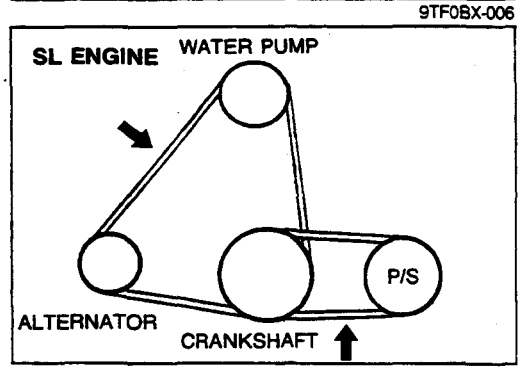
Coolant quality
1. Verify that there is no buildup of rust or scale around the radiator cap or coolant inlet port.
2. Verify that the coolant is free of oil.
3. Replace the coolant if necessary.

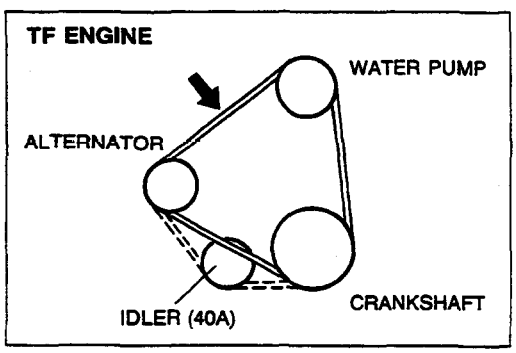


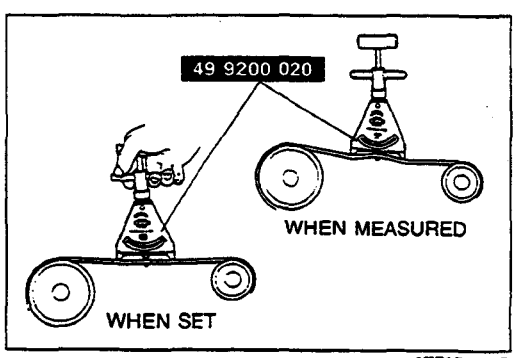
9TG0B2-011



9TF0BX-006







9TF0BX-007

DRIVE BELT

Inspection

1. Remove the undercover for inspection of the P/S belt.
2. Check the drive belts for wear, cracks, and fraying. Replace if necessary.
3. Verify that the drive belts are correctly mounted on the pulleys.

4. Check the drive belt deflection by applying moderate pressure **(98 N, 10 kg, 22 lb)** midway between the pulleys as shown. Adjust if necessary.

Deflection

mm (in)

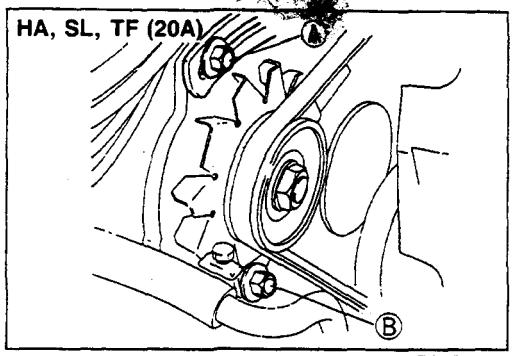
		New	Used
HA	Alternator	9.0—10.0 (0.35—0.39)	10.0—11.0 (0.39—0.43)
	P/S	9.0—11.0 (0.35—0.43)	12.0—13.0 (0.47—0.51)
SL	Alternator	9.0—10.0 (0.35—0.39)	10.0—11.0 (0.39—0.43)
	P/S	9.0—11.0 (0.35—0.43)	12.0—13.0 (0.47—0.51)
TF	Alternator	10.0—11.0 (0.39—0.43)	11.0—12.0 (0.43—0.47)

5. Check the drive belt tension with the **SST**.

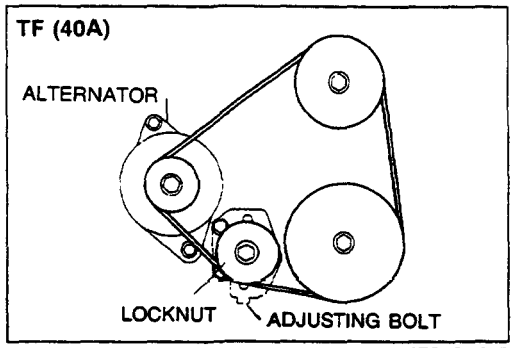
Tension

N (kg, lb)

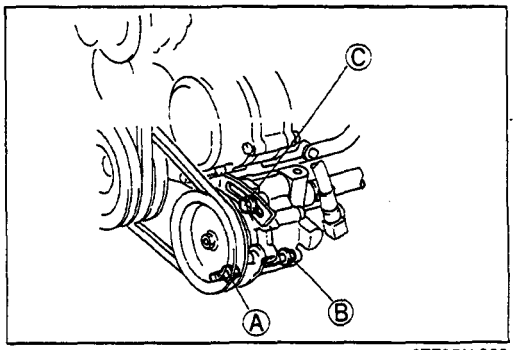
		New	Used
HA	Alternator	294—392 (30—40, 66—88)	245—294 (25—30, 55—66)
SL	Alternator	392—491 (40—50, 88—110)	343—392 (35—40, 77—88)
TF	Alternator	451—520 (46—53, 101—117)	383—520 (39—53, 86—117)



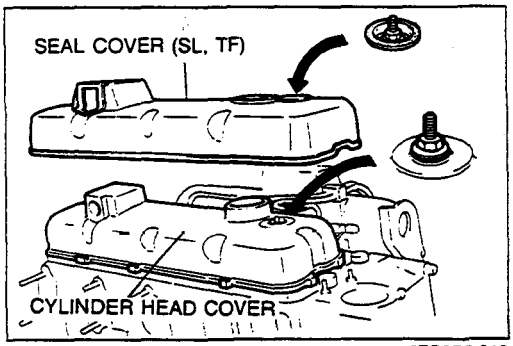
9TG0B2-014



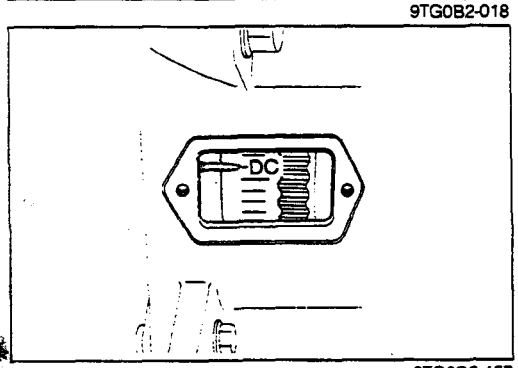
9TG0B2-015



9TF0BX-008



9TG0B2-018



9TG0B2-457

Adjustment

Caution
- **If a new belt is used, adjust the belt deflection at the midpoint of new belt specification.**

1. Alternator belt
   (i) HA, SL, TF (20A)
   Loosen alternator bolts A and B and adjust the belt deflection.

Tightening torque
A: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)
B: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

(ii) TF (40A)
Loosen the locknut and adjust the belt deflection by turning the adjusting bolt.

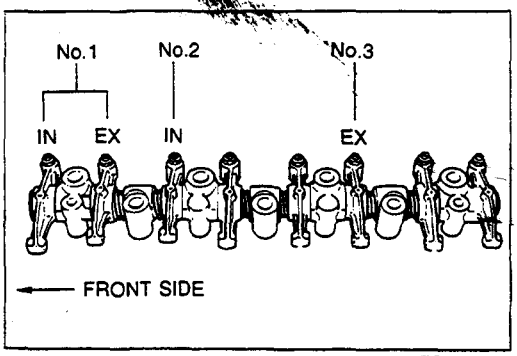
Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

2. P/S belt
Loosen P/S oil pump bolts A, B, and C and adjust the belt deflection.

Tightening torque
A: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)
B: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)
C: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

VALVE CLEARANCE
Inspection / Adjustment
1. Remove the air intake pipe (SL Turbo).
2. Remove the seal cover (SL, TF) and the cylinder head cover.
3. Remove the cover from the clutch housing (HA, SL) or from the end plate (TF).

4. Turn the crankshaft clockwise and set the No.1 cylinder to compression TDC.



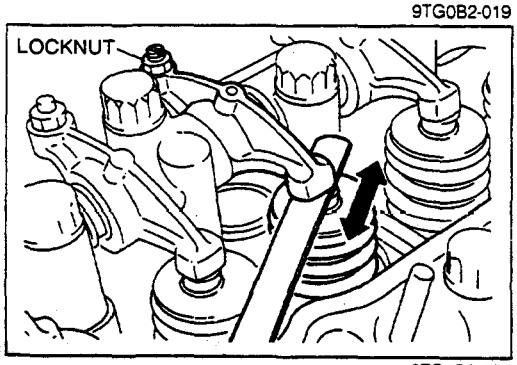
9TG0B2-019

5. Measure the valve clearance as shown in the figure.

Valve clearance (Engine cold)

mm (in)

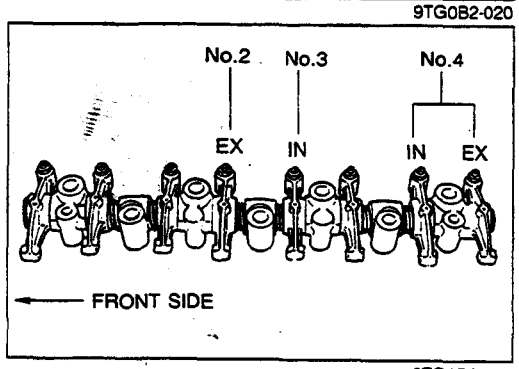
	IN	EX
HA	0.30 (0.012)	0.30 (0.012)
SL	0.30 (0.012)	0.35 (0.014)
TF	0.30 (0.012)	0.40 (0.016)



9TG0B2-020

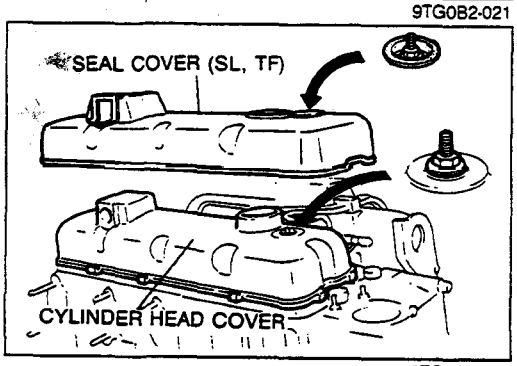
6. If necessary, loosen the locknut and adjust the valve clearance by turning the adjusting screw.
7. Tighten the locknut.

Tightening torque:
12—17 N·m (120—170 cm-kg, 104—148 in-lb)



9TG0B2-021

8. Turn the crankshaft clockwise one full turn and set the No.4 cylinder to compression TDC.
9. Measure the remaining valve clearances as shown in the figure.



9TG0B2-022

10. Install the cover.
11. Install the cylinder head cover.

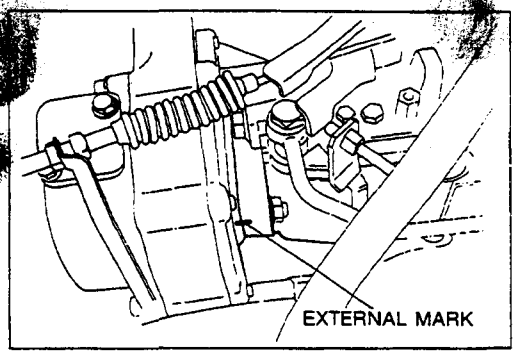
Tightening torque:
2.0—3.4 N·m (20—35 cm-kg, 17—30 in-lb)

12. Install the seal cover (SL, TF).

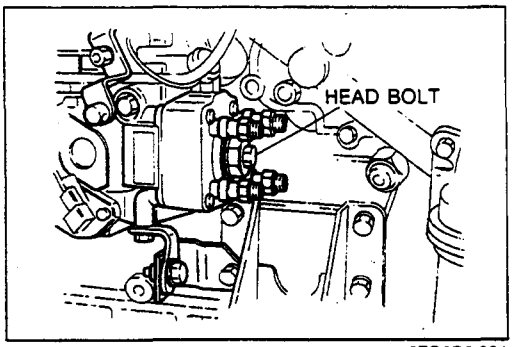
Tightening torque:
2.9—4.9 N·m (30—50 cm-kg, 26—43 in-lb)

13. Install the air intake pipe (SL Turbo).

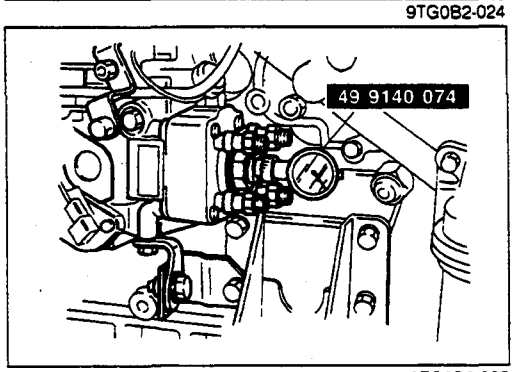
Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)



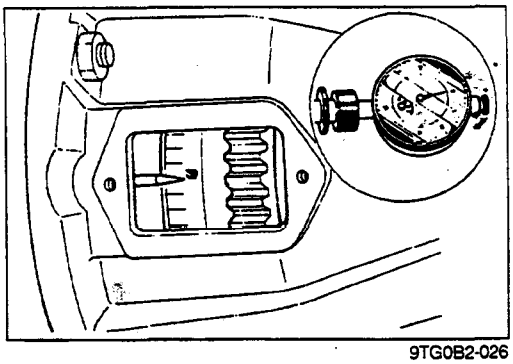
9TG0B2-023

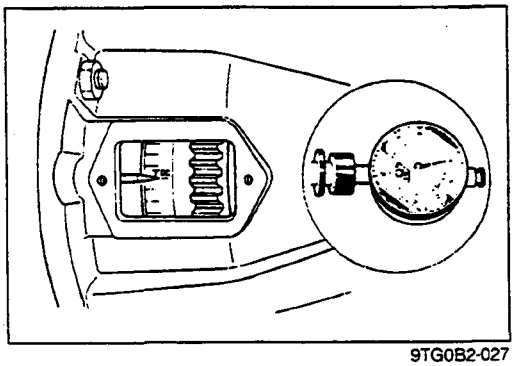


9TG0B2-024



9TG0B2-025


9TG0B2-026


9TG0B2-027

INJECTION TIMING
HA Engine
Inspection

Note
- **Usually it is enough to confirm that the external marks are aligned.**
- **Set the injection timing after installation of the injection pump.**

1. Disconnect the fuel injection pipes from the injection pump.
2. Remove the bolt and gasket from the distributor head of the injection pump.

3. Screw the **SST** into the injection pump.
4. Make sure that the tip of the feeler of the measuring device is in contact with the plunger end at this time.

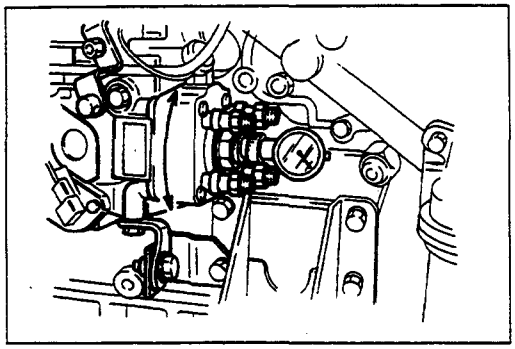
Note
- **The SST specified by Diesel Kiki Co., Ltd. is 157829-3520.**

5. Turn the flywheel and set to **approx. 30° BTDC**.
6. Find the position in which the needle of the dial gauge does not move when the flywheel is turned.
7. When the dial gauge needle does not deflect, set the needle to "0" on the scale.

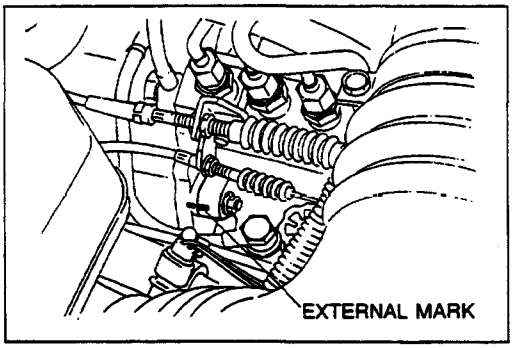
8. Turn the flywheel until **3° BTDC** is indicated.
9. The injection timing is normal when the dial gauge needle is advanced 1.00mm (0.0394 in) ahead of the valve set in Steps 7.

Static injection:
Cam lift 1.00mm (0.0394 in)

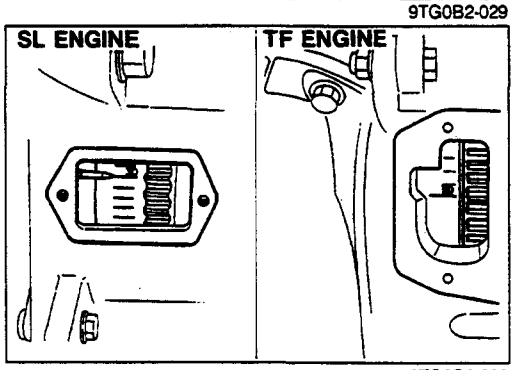
10. If the change is not as specified, adjust the injection timing.



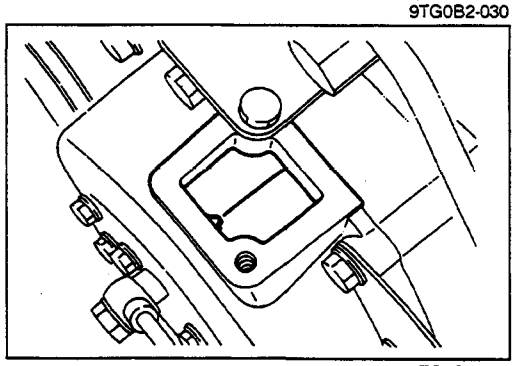
9TG0B2-028



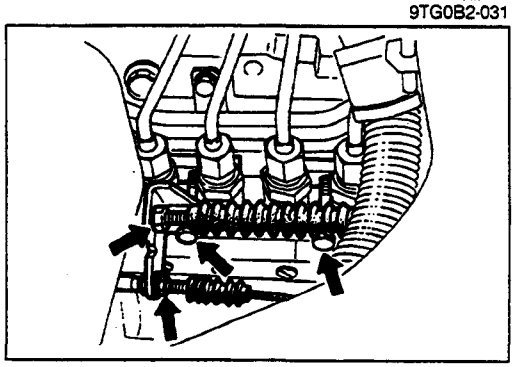
9TG0B2-029



9TG0B2-030



9TG0B2-031



9TG0B2-032

Adjustment

1. If the injection timing is faulty, turn the injection pump to a position in which the dial gauge needle indicates 1.00mm (0.0394 in).
   (1) When the cam lift is larger than 1.00mm (0.0394 in), turn the injection pump all the way in the engine revolving direction once, and then turn it in the reverse direction, adjusting the cam lift to the 1.00mm (0.0394 in) point.
   (2) If the cam lift is smaller than 1.00mm (0.0394 in), adjust the lift by turning the pump in the direction inverse to the engine revolving direction.
2. After adjustment, install the new head bolt and new gasket.

SL, TF Engine
Inspection

Caution

- **Direct injection type engine is sensitive to injection timing. Incorrect timing will cause engine knocking or low power output.**
  Set the injection timing after installation of the injection pump.

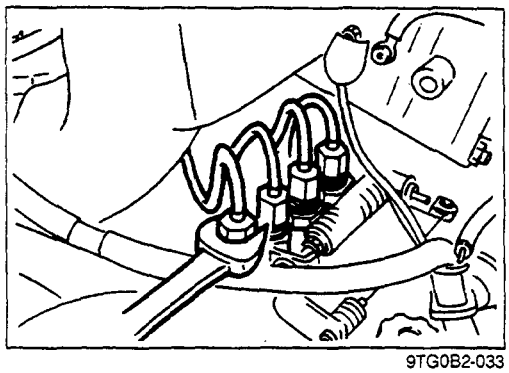
Note

- **Usually it is enough to confirm that the external marks are aligned.**

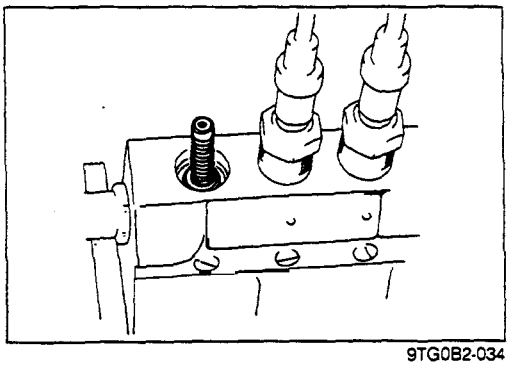
1. Remove the blind covers from the clutch housing and the timing gear case.
2. Turn the flywheel in the direction of rotation until the indicator pin comes to **30° BTDC**.
3. Verify that the pointer of timing gear case and the mark on the timer are aligned.
4. If not as specified, adjust the injection timing.

Adjustment

1. Remove the fuel stop cable from the cut lever.
2. Remove the accelerator cable from the control lever.
3. Remove bracket.
4. Loosen injection pipes No.2—4 at the pump.

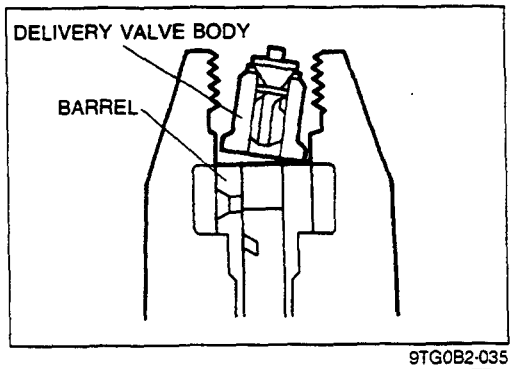

9TG0B2-033

5. Remove No.1 injection pipe and the delivery valve holder.


9TG0B2-034

6. Remove the delivery valve spring seat and spring.

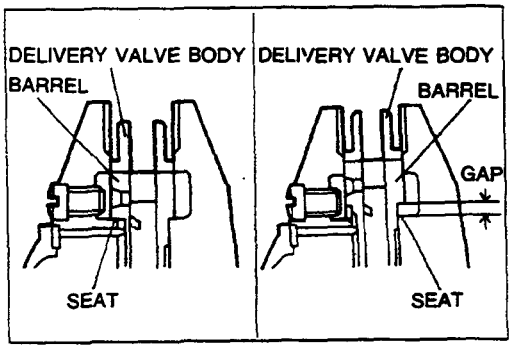
Caution
- **Do not remove the delivery valve body.**

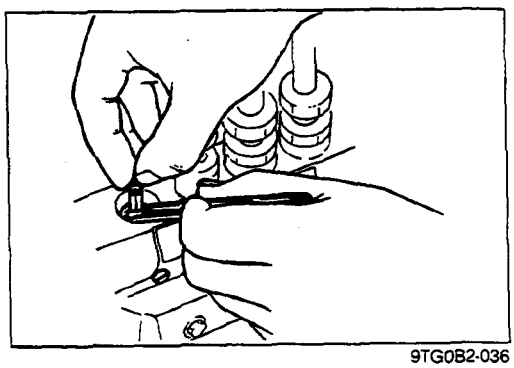


9TG0B2-035

7. Rock the delivery valve to break it loose from the barrel.

Note
- **If the delivery valve is lifted up without breaking it loose, the barrel may also be lifted out of the pump. If this happens the barrel may not reseal and may allow fuel into the engine and cause engine damage.**

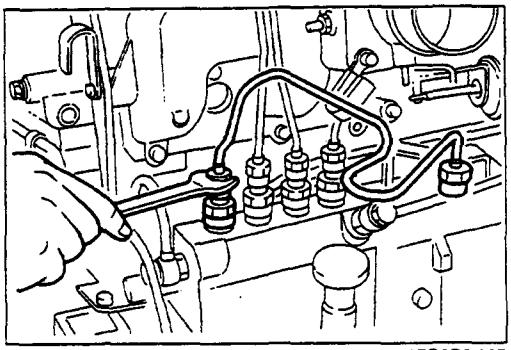



9TG0B2-036

8. Remove the delivery valve, holding the flat washer with tweezers.

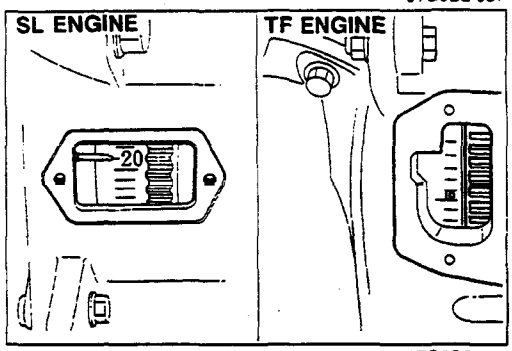
Caution
- **Do not pinch the sliding surface of the delivery valve.**

9. Install the delivery valve holder.



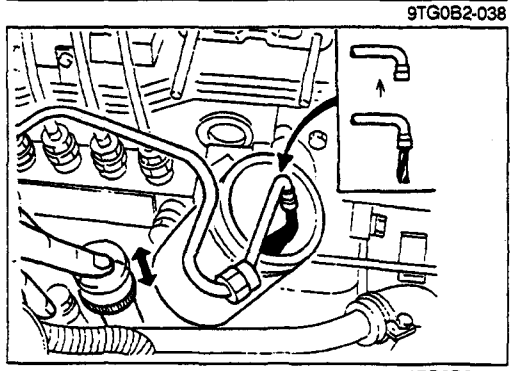
9TG0B2-037

10. Tighten No.1 injection pipe so that it points away from the pump.



9TG0B2-038

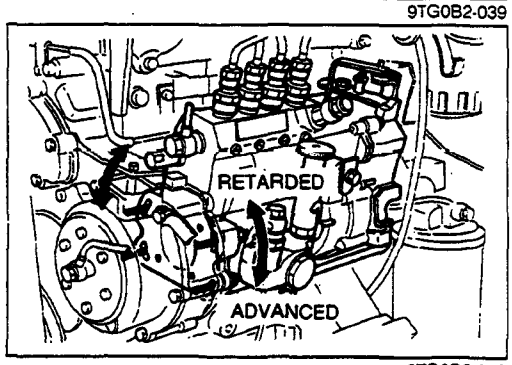
11. Turn the flywheel in the direction of rotation and set it at **20° BTDC**.



9TG0B2-039

12. Place a container under No.1 injector pipe and verify that fuel is expelled when pumping the primer pump.
13. While pumping the priming pump, turn the flywheel in the normal direction of rotation and verify that fuel flow stops as specified.

Fuel stops
SL Non-Turbo: 12° BTDC
SL Turbo : 13° BTDC
TF : 11° BTDC



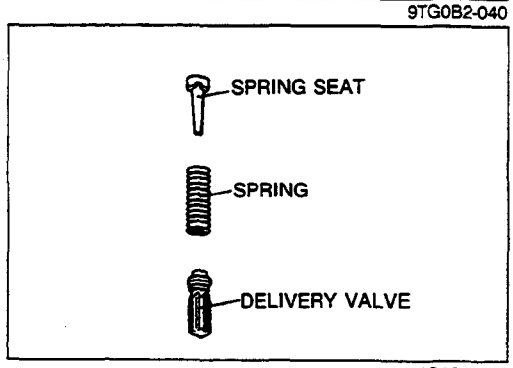
9TG0B2-040

14. If necessary, adjust the injection timing by loosening the pump mounting bolts and rotating the pump outward or inward as shown in the figure.

When advanced: turn to right (seen from front)
When retarded : turn to left (seen from front)

15. After adjustment, tighten the mounting nuts.

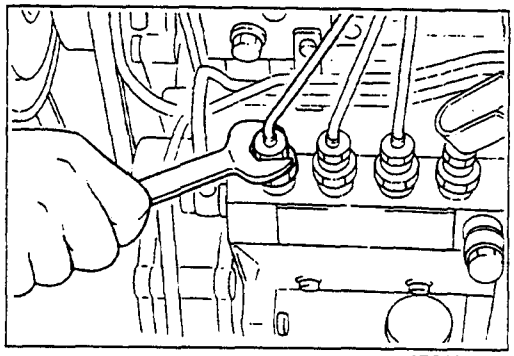
Tightening torque:
34—39 N·m (3.5—4.0 m-kg, 25—29 ft-lb)



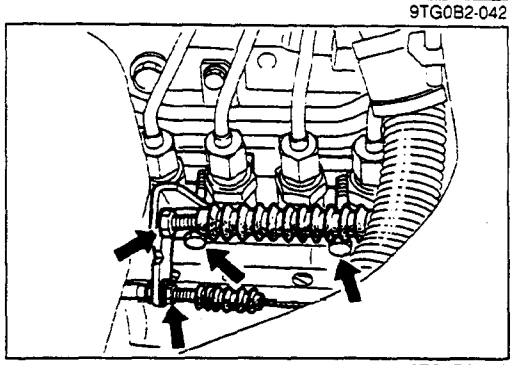
9TG0B2-041

16. Mark the pump flange and the pump body for future reference.
17. Install the delivery valve, spring, and spring seat.
18. Tighten the delivery valve holder.

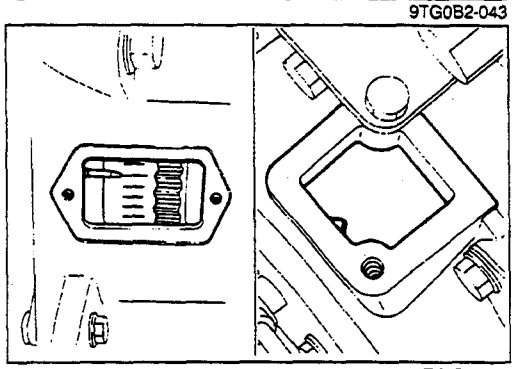
Tightening torque:
39—44 N·m (4.0—4.5 m-kg, 29—33 ft-lb)


9TG0B2-042

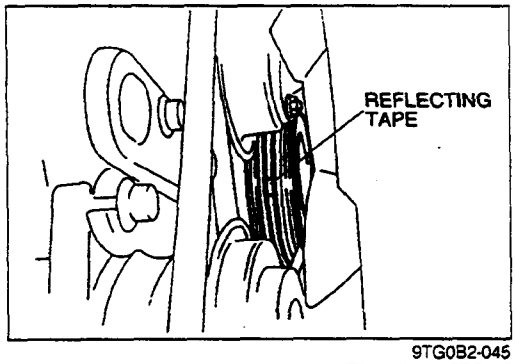
19. Install No.1 injection pipe.


9TG0B2-043

20. Tighten injection pipes No.2—4.
21. Install the bracket.
22. Install the accelerator cable to the control lever.
23. Install the fuel stop cable to the cut lever.

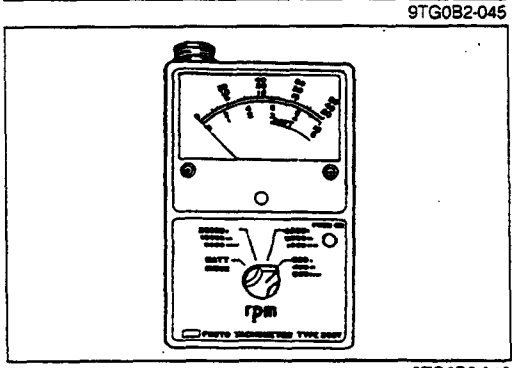

9TF0BX-009

24. Install blind covers onto the clutch housing and the timing gear case.
25. Bleed air from the system. (Refer to page B–16.)
26. Start the engine, and check for fuel leaks.



9TG0B2-045

IDLE SPEED
Adjustment
1. Attach suitable reflector tape to the crankshaft pulley.
2. Run the engine at idle to normal operating temperature.
3. Turn OFF all electrical loads.



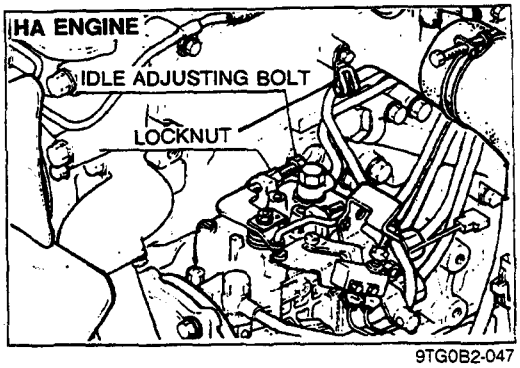
9TG0B2-046

4. Confirm the free play of the accelerator cable.

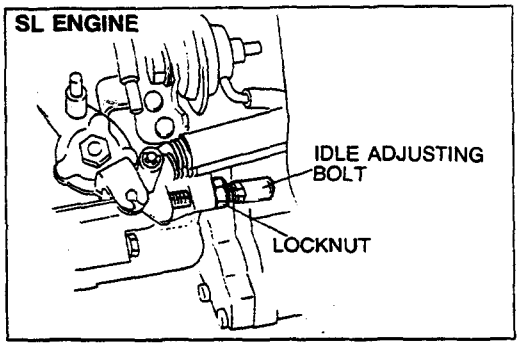
   Free play: 1—3mm (0.04—0.12 in)

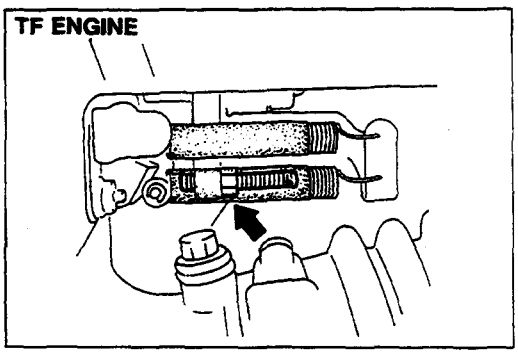
5. Aim the light of the photo tachometer onto the reflecting tape to measure the engine speed.

Idle speed	**HA**	**: 600—650 rpm**
	SL Non-Turbo	**: 620—670 rpm**
	SL Turbo	**: 660—710 rpm**
	TF	**: 620—700 rpm**



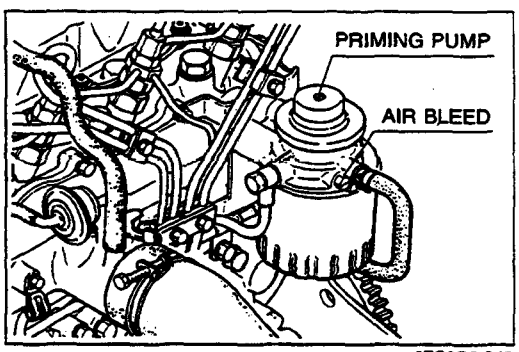
9TG0B2-047



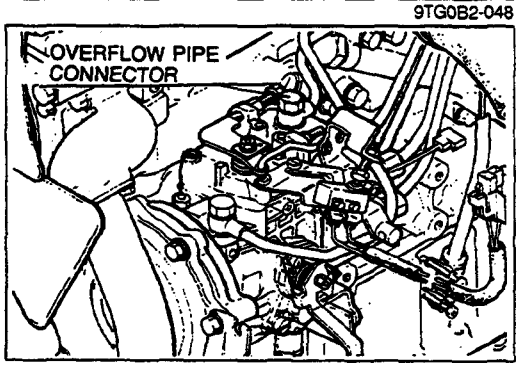


6. If not as specified, loosen the locknut of the idle adjusting bolt and adjust by turning the bolt.
7. Tighten the locknut.

Tightening torque
HA :
5.9—8.8 N·m (60—90 cm-kg, 52—78 in-lb)
SL, TF:
9.8—14 N·m (100—140 cm-kg, 87—122 in-lb)



9TG0B2-048



9TG0B2-049

AIR BLEEDING
HA Engine

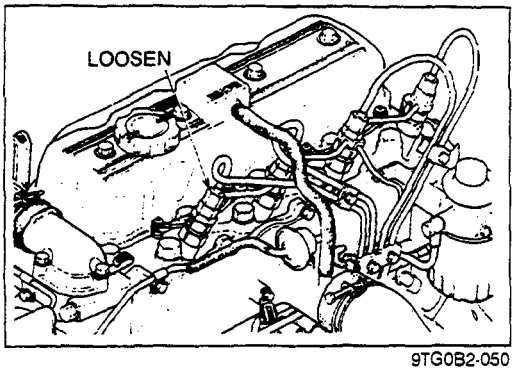
Warning
- **Keep sparks, cigarettes, and open flames away from the fuel area.**

1. Remove the air bleeder plug.
2. Pump the priming pump until clear (no air bubbles) fuel flows from the bleeder plug hole.
3. Install the air bleeder plug.

4. Loosen the overflow pipe connector of the injection pump.
5. Pump the priming pump until fuel flows from the pipe.
6. Tighten the overflow pipe connector.

Tightening torque:
20—29 N·m (2.0—3.0 m-kg, 14—22 ft-lb)

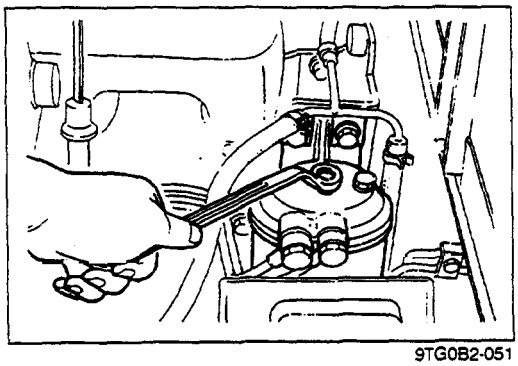
7. Start the engine and run it at idle until it runs smoothly.



9TG0B2-050

8. Stop the engine.
9. Loosen the all flare nuts of the injection pipes of injection nozzle side.
10. Confirm fuel injection from the injection pipes while cranking.
11. Tighten the nuts.

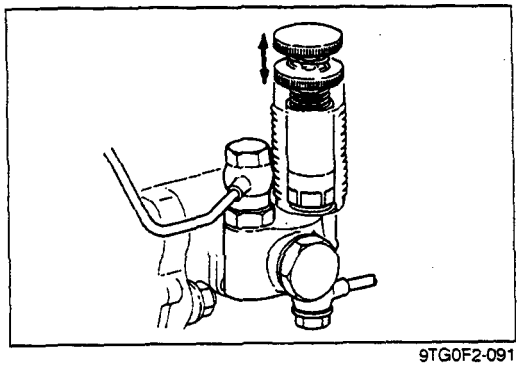
Tightening torque:
20—25 N·m (2.0—2.5 m-kg, 14—18 ft-lb)


9TG0B2-051

SL, TF Engine

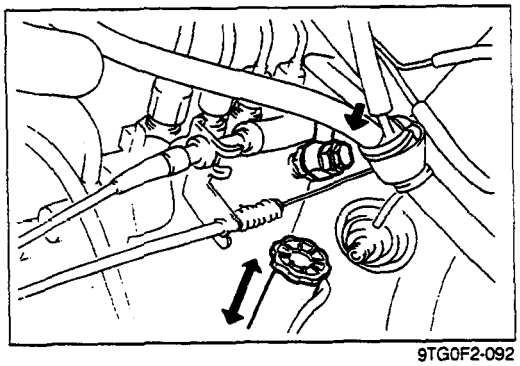
Warning
- **Keep sparks, cigarettes, and open flames away from the fuel area.**

1. Loosen the air bleeder plug.


9TG0F2-091

2. Pump the priming pump until no air is expelled.
3. Tighten the air bleeder plug.

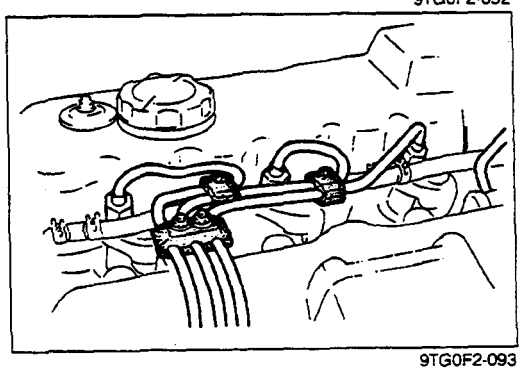
Tightening torque:
5.9—8.8 N·m (60—90 cm-kg, 52—78 in-lb)


9TG0F2-092

4. Loosen the return pipe at the injection pump, and pump the priming pump until no air is expelled.
5. Tighten the bolt.

Tightening torque:
12—15 N·m (120—150 cm-kg, 104—130 in-lb)

6. Push the priming pump down and tighten it.

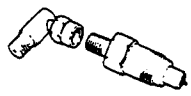
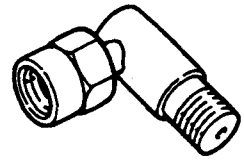
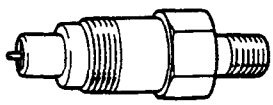
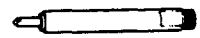

9TG0F2-093

7. Loosen the injection pipes at the injection nozzles.
8. Crank the engine, and verify that fuel is expelled from each injection pipe.
9. Tighten the injection pipes.

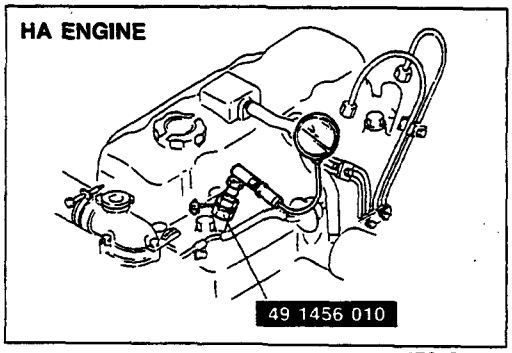
Tightening torque:
20—25 N·m (2.0—2.5 m-kg, 14—18 ft-lb)

COMPRESSION

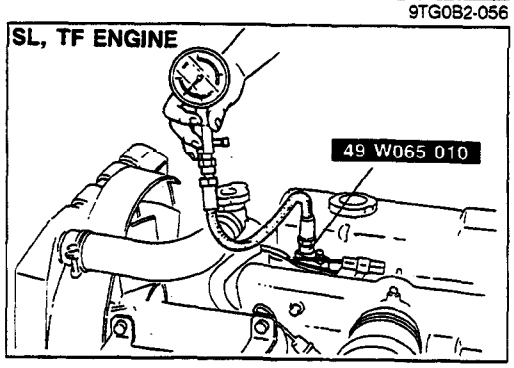
PREPARATION
SST

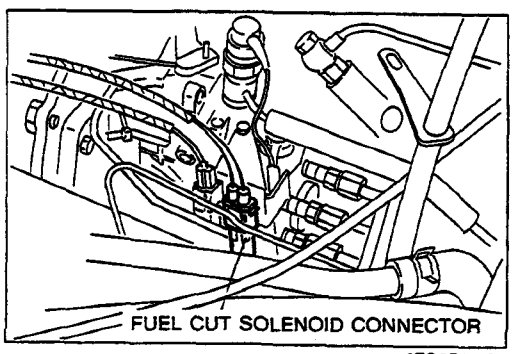
49 1456 010 Adapter set, compression gauge (HA) 	For inspection of engine compression	49 0636 011 Joint (Part of 49 1456 010) 	For inspection of engine compression
49 1456 012 Adapter (Part of 49 1456 010) 	For inspection of engine compression	49 W065 010 Adapter, compression gauge (SL, TF) 	For inspection of engine compression

9TG0B2-055



9TG0B2-056





9TG0B2-057

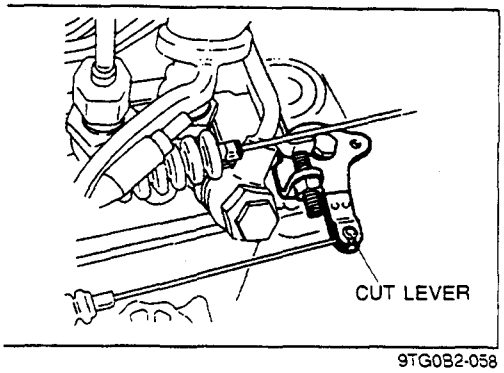
If the engine exhibits low power, poor fuel economy, or poor idle, check the following;
1. Compression.
2. Fuel system. (Refer to Section F.)

INSPECTION
1. Verify that the battery is fully charged.
   Recharge it if necessary. (Refer to Section G.)
2. Warm up the engine to normal operating temperature.
3. Turn the engine OFF.
4. Remove all the fuel injection nozzles. (Refer to Section F.)
5. Connect a compression gauge with the **SST** to the No.1 cylinder injection nozzle hole.

6. Prevent fuel injection as follows.

Warning
- **If this is not done, fuel will be pumped from the fuel injection pump while cranking.**

(1) HA
Disconnect the fuel cut solenoid connector.



9TG0B2-058

(2) SL, TF
Pull the fuel stop cable to position the cut lever to fuel stop position.

7. Crank the engine and record the maximum gauge reading.
8. Check each cylinder using the same procedure.

Compression

kPa (kg/cm², psi)-rpm

		Standard	Minimum
HA		2,943 (30.0, 427)-200	2,649 (27.0, 384)-200
SL	Non-Turbo	2,943 (30.0, 427)-300	2,649 (27.0, 384)-300
	Turbo	2,551 (26.0, 370)-320	2,256 (23.0, 327)-320
TF		2,943 (30.0, 427)-270	2,649 (27.0, 384)-270

Variation between cylinders:
294 kPa (3.0 kg/cm², 43 psi) max.

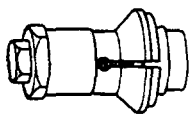
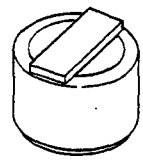
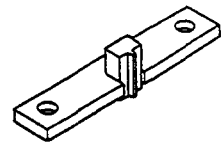
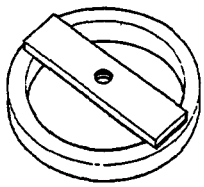
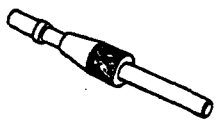
9TG0B2-059

9. If the compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder and recheck the compression.
   (1) If the compression increases, the piston, piston rings, or cylinder wall may be worn.
   (2) If the compression stays low, the valve may be stuck or seating improperly.
   (3) If the compression in adjacent cylinders stays low, the cylinder head gasket may be defective or the cylinder head distorted.
10. Connect the fuel cut solenoid connector. (HA)
11. Remove the compression gauge and the **SST**.
12. Install all the fuel injection nozzles and pipes. (Refer to Section F.)
13. Bleed the air from the fuel line. (Refer to page B–16.)

9TF0BX-010

ON-VEHICLE MAINTENANCE

PREPARATION
SST

49 0559 210 Oil seal installer and centering tool (HA) 	For installation of front oil seal	49 W011 102 Installer, oil seal (TF) 	For installation of front oil seal
49 V101 060A Brake, ring gear (HA, SL) 	For prevention of engine rotation	49 S501 062 Collar (HA) 	For prevention of engine rotation
49 W065 062 Collar (SL) 	For prevention of engine rotation	49 W011 103 Brake, ring gear (TF) 	For prevention of engine rotation
49 W011 101 Installer, oil seal (TF) 	For installation of rear oil seal	49 G030 797 Handle (TF) 	For installation of rear oil seal
49 SE01 310 Centering tool, clutch disc 	For installation of clutch disc		

9TG0B2-063

CYLINDER HEAD GASKET
Replacement

Warning
- **Keep sparks and open flame away from the fuel area.**

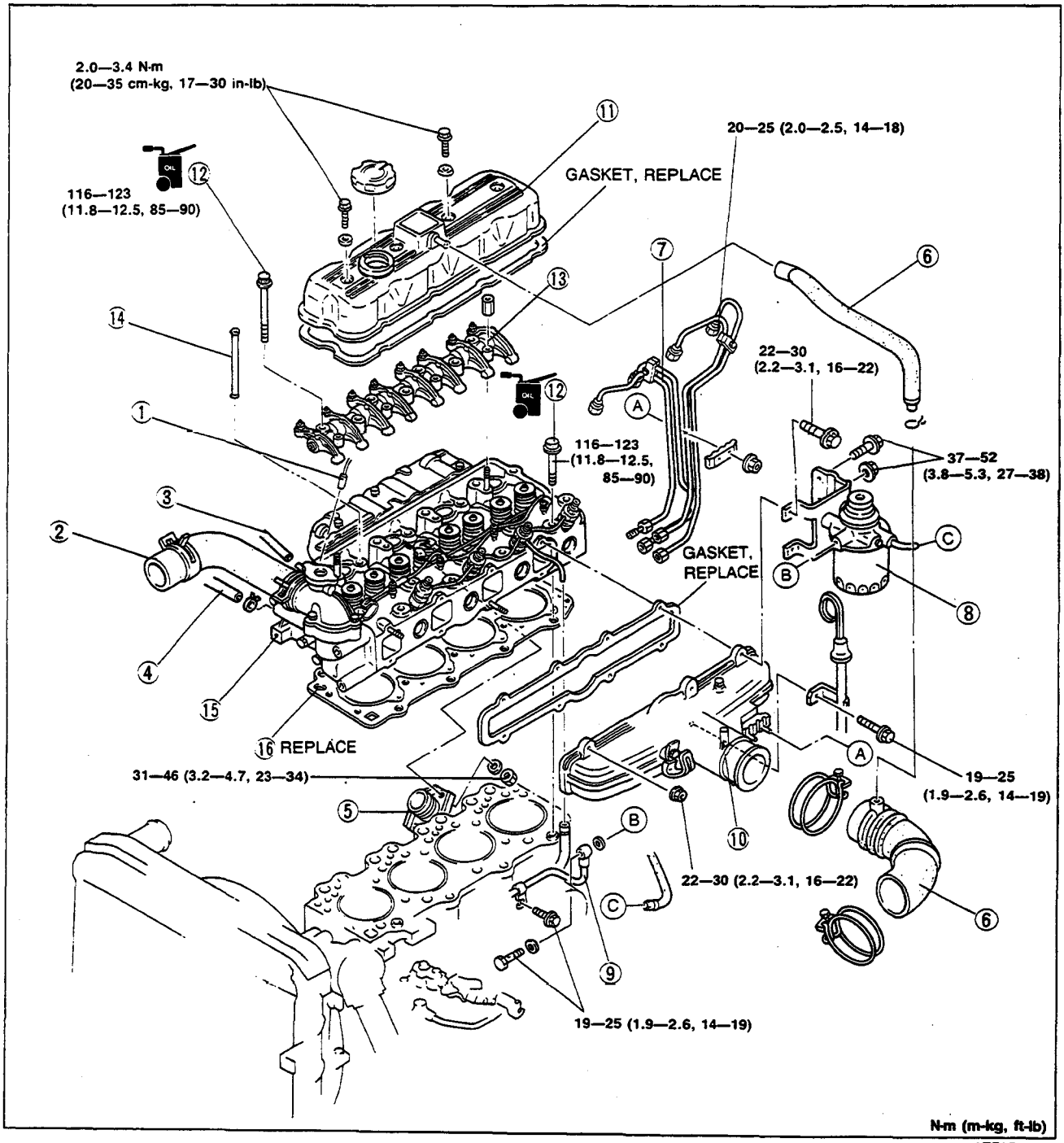
Caution
- **Position hose clamps in their original location on hoses, and squeeze the clamps lightly with large pliers to ensure a good fit.**

1. Disconnect the negative battery cable.
2. Drain the engine coolant.
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**.

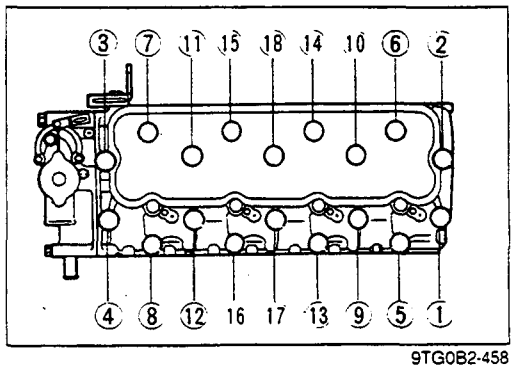
Steps After Installation
1. Fill the radiator with the specified amount and type of engine coolant. (Refer to Section E.)
2. Connect the negative battery cable.
3. Check as follows:
   (1) Engine oil and engine coolant leakage.
   (2) Compression. (Refer to page B–18.)
   (3) Drive belt deflection. (Refer to page B–8.)
4. Start the engine and let it warm up to operating temperature.
5. Recheck the engine coolant levels.

9TF0BX-011

HA Engine

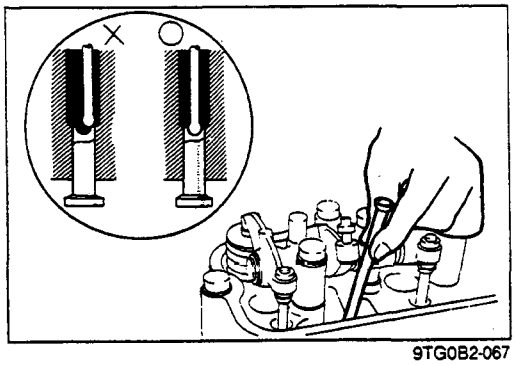


1. Harness connector
2. Upper radiator hose
3. Coolant reservoir hose
4. Heater hose
5. Exhaust pipe
6. Air hose
7. Injection pipe
8. Fuel filter body
9. Fuel pipe
10. Intake manifold assembly
11. Cylinder head cover
12. Cylinder head bolt
    - Removal Note ..... page B– 23
    - Installation Note ..... page B– 23
13. Rocker arm assembly
14. Push rod
    - Installation Note ..... page B– 23
15. Cylinder head
    - Disassembly ..... page B– 60
    - Inspection ..... page B– 76
    - Assembly ..... page B–113
16. Cylinder head gasket



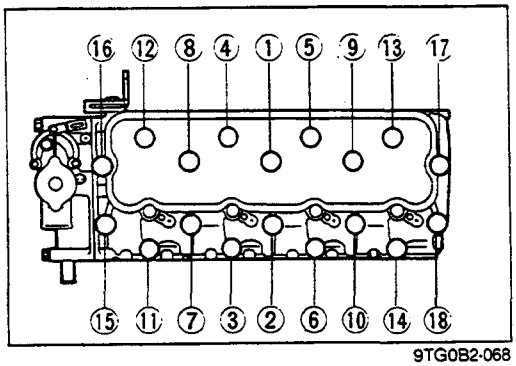
9TG0B2-458

Removal note
Cylinder head bolt
1. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.
2. Remove the cylinder head bolts.


9TG0B2-067

Installation note
Push rod
1. Insert the push rods.

Caution
- **Verify that the ends of the push rods are properly set in to the tappets.**



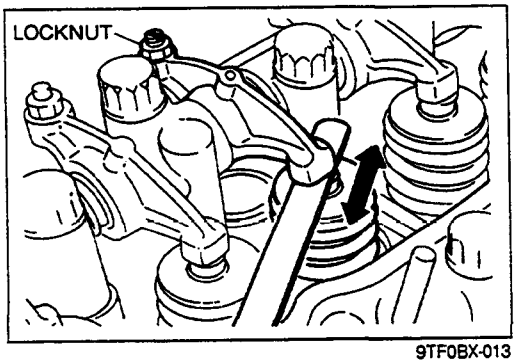
9TG0B2-068

Cylinder head bolt

Caution
- **Verify that the rocker arms and push rods are properly engaged while tightening.**

1. Apply clean engine oil to the bolt threads and seat faces.
2. Install the cylinder head bolts.
3. Tighten the cylinder head bolts in two or three steps in the order shown in the figure.

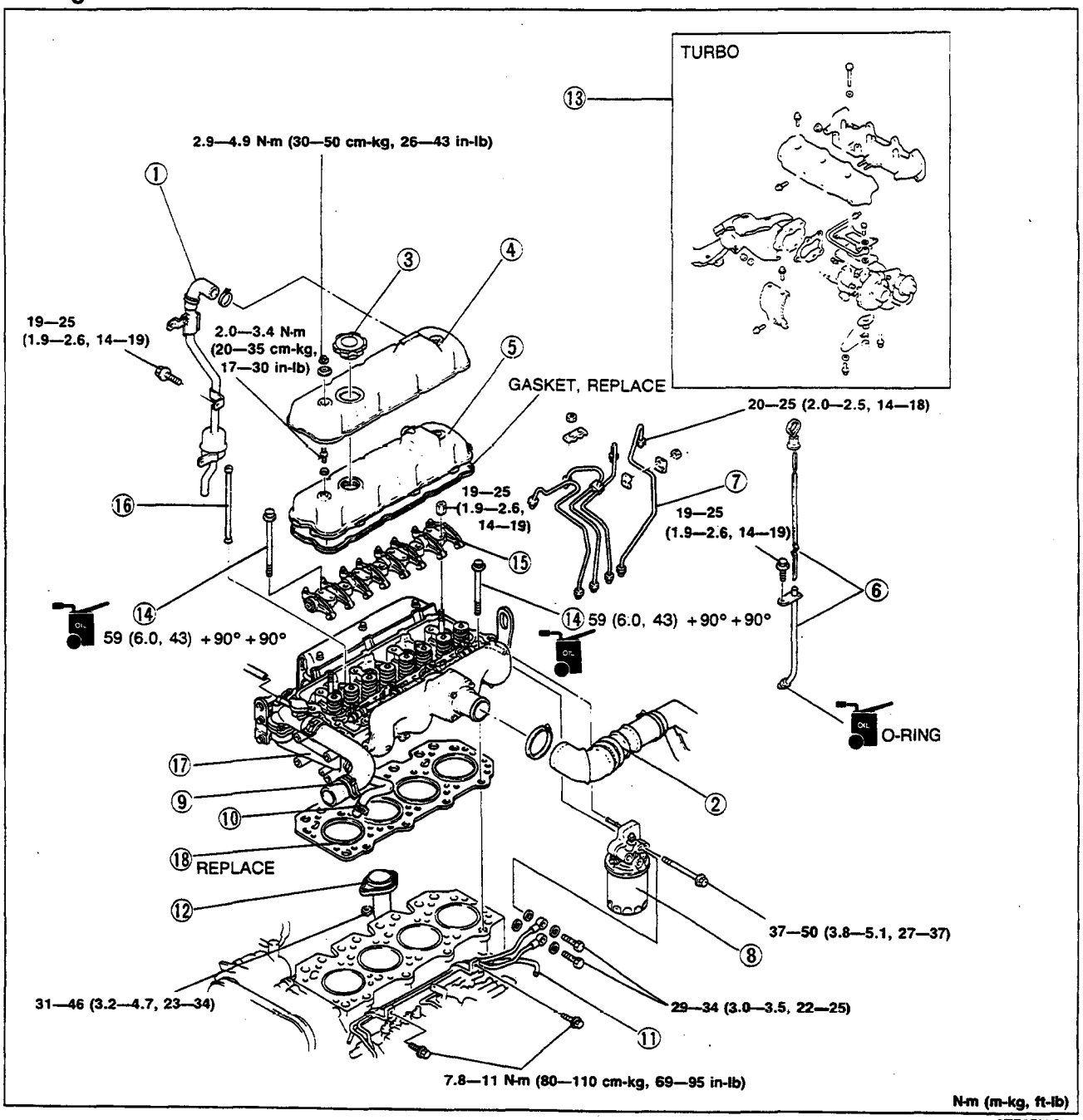
Tightening torque:
116—123 N·m (11.8—12.5 m-kg, 85—90 ft-lb)



9TF0BX-013

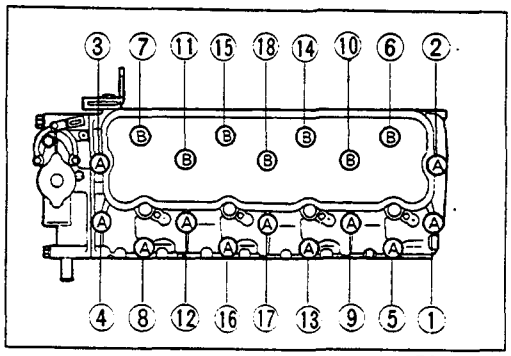
Caution
- **Adjust the valve clearance. (Refer to page B–9.)**

SL Engine



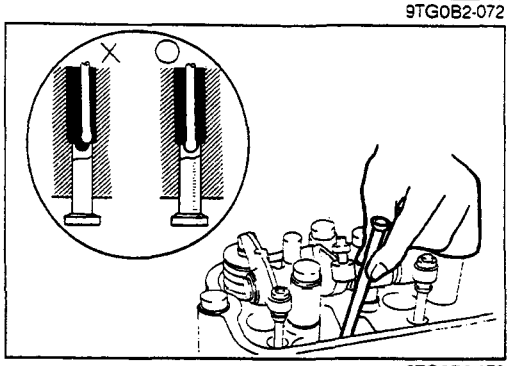
9TF0BX-014

1. Breather pipe
2. Air pipe and hose
3. Oil filler cap
4. Seal cover
5. Cylinder head cover
6. Oil level gauge and guide pipe
7. Injection pipe and fuel hose
8. Fuel filter body
9. Upper radiator hose
10. Heater hose
11. Vacuum hose
12. Front exhaust pipe
13. Turbocharger (Turbo)
    Service ..... Section F
14. Cylinder head bolt
    Removal Note ..... page B– 25
    Installation Note ..... page B– 25
15. Rocker arm assembly
16. Push rod
    Installation Note ..... page B– 25
17. Cylinder head
    Disassembly ..... page B– 60
    Inspection ..... page B– 76
    Assembly ..... page B–113
18. Cylinder head gasket



9TG0B2-072

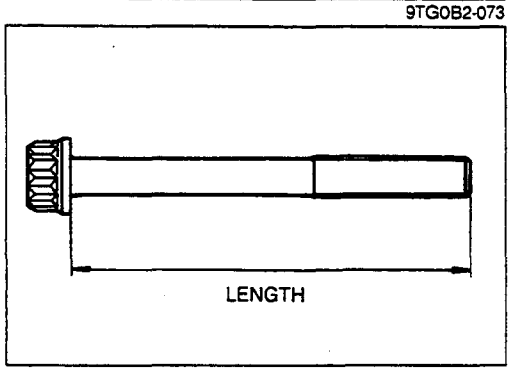
Removal note
Cylinder head bolt
1. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.
2. Remove the cylinder head bolts.



9TG0B2-073

Installation note
Push rod
1. Insert the push rods.

Caution
- **Verify that the ends of the push rods are properly set in to the tappets.**

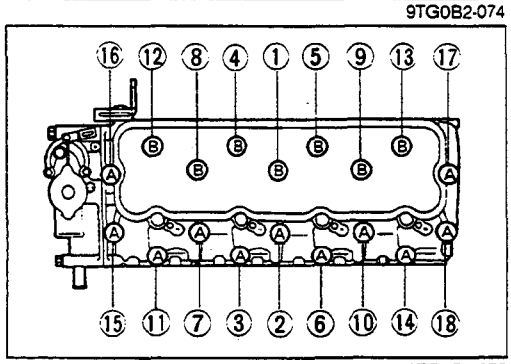


9TG0B2-074

Cylinder head bolt
1. Measure the length of the cylinder head bolt below the head. If the length exceeds the maximum, replace it.

Length
Standard Ⓐ: 121.7—122.3mm (4.791—4.815 in)
Ⓑ: 150.7—151.3mm (5.933—5.957 in)
Maximum Ⓐ: 123.0mm (4.843 in)
Ⓑ: 152.0mm (5.984 in)

Caution
- **Verify that the rocker arms and push rods are properly engaged while tightening.**

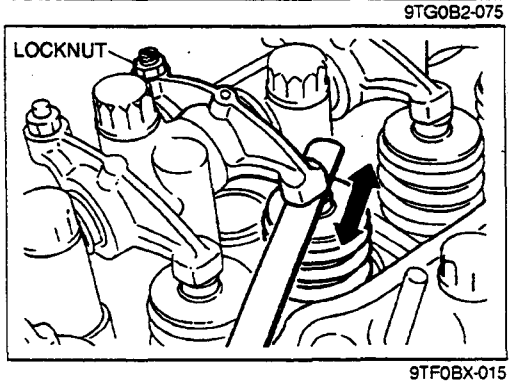


9TG0B2-075

2. Apply clean engine oil to the bolt threads and seat faces.
3. Install the cylinder head bolts.
4. Tighten the cylinder head bolts in two or three steps in the order shown in the figure.

Tightening torque: 59 N·m (6.0 m-kg, 43 ft-lb)

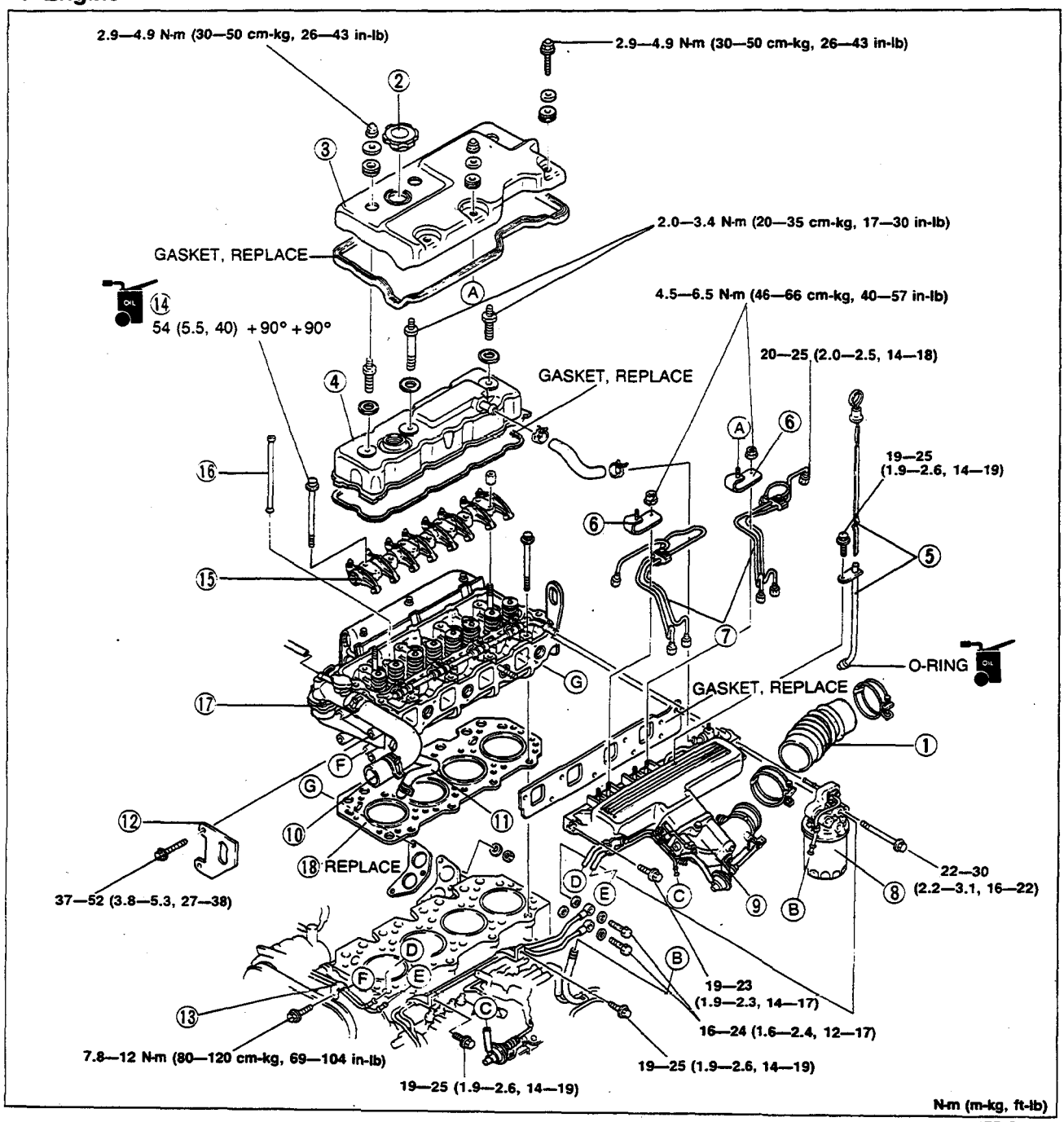
5. Make paint marks on the bolt heads as shown in the figure.
6. With the paint marks as a reference point, tighten the cylinder head bolts **another 90° ± 15°** in the tightening order.
7. Tighten the bolts **once again 90° ± 15°** in the tightening order.



9TF0BX-015

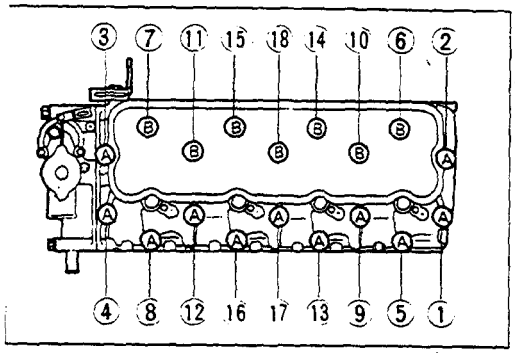
Caution
- **Adjust the valve clearance. (Refer to page B–9.)**

TF Engine



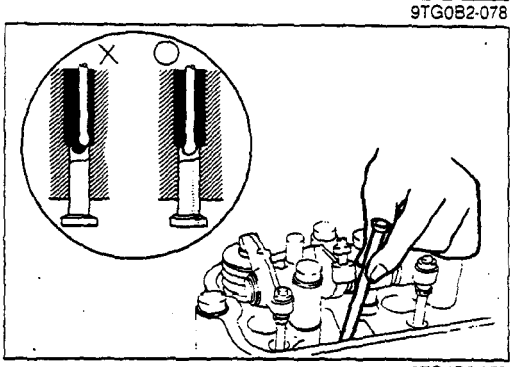
9TF0BX-016

1. Air hose
2. Oil filler cap
3. Seal cover
4. Cylinder head cover
5. Oil level gauge and guide pipe
6. Injection pipe clip
7. Injection pipe
8. Fuel filter body
9. Intake manifold
10. Upper radiator hose
11. Heater hose
12. Front engine hanger
13. Vacuum pipe
14. Cylinder head bolt
    - Removal Note..... page B– 27
    - Installation Note..... page B– 27
15. Rocker arm assembly
16. Push rod
    - Installation Note..... page B– 27
17. Cylinder head
    - Disassembly ..... page B– 60
    - Inspection ..... page B– 76
    - Assembly..... page B–113
18. Cylinder head gasket



9TG0B2-078

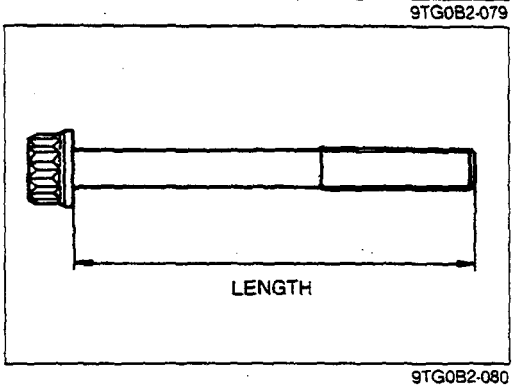
Removal note
Cylinder head bolt
1. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.
2. Remove the cylinder head bolts.



9TG0B2-079

Installation note
Push rod
1. Insert the push rods.

Caution
- **Verify that the ends of the push rods are properly set in to the tappets.**

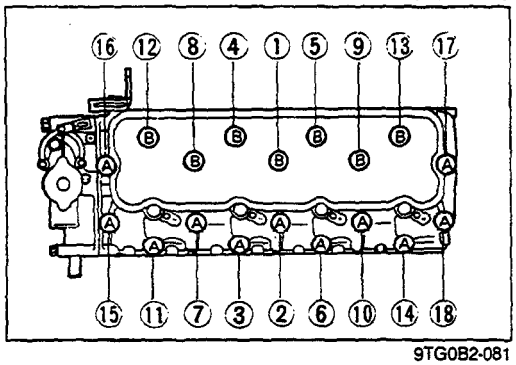


9TG0B2-080

Cylinder head bolt
1. Measure the length of the cylinder head bolt below the head. If the length exceeds the maximum, replace it.

Length
Standard Ⓐ: **130.2—130.8mm (5.126—5.150 in)**
Ⓑ: **158.2—158.8mm (6.228—6.252 in)**
Maximum Ⓐ: **131.5mm (5.177 in)**
Ⓑ: **159.5mm (6.280 in)**

Caution
- **Verify that the rocker arms and push rods are properly engaged while tightening.**



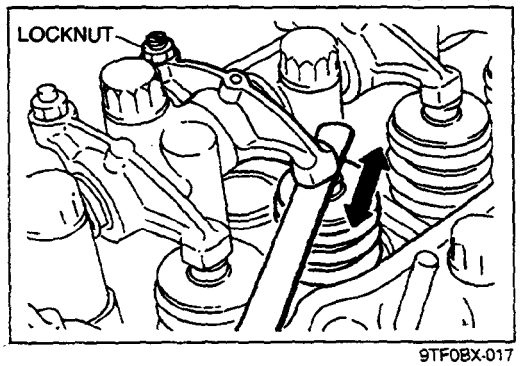
9TG0B2-081

2. Apply clean engine oil to the bolt threads and seat faces.
3. Install the cylinder head bolts.
4. Tighten the cylinder head bolts in two or three steps in the order shown in the figure.

Tightening torque: 54 N·m (5.5 m-kg, 40 ft-lb)

5. Make paint marks on the bolt heads as shown in the figure.
6. With the paint marks as a reference point, tighten the cylinder head bolts **another 90° ± 15°** in the tightening order.
7. Tighten the bolts **once again 90° ± 15°** in the tightening order.

Caution
- **Adjust the valve clearance. (Refer to page B–9.)**



9TF0BX-017

FRONT OIL SEAL
Replacement

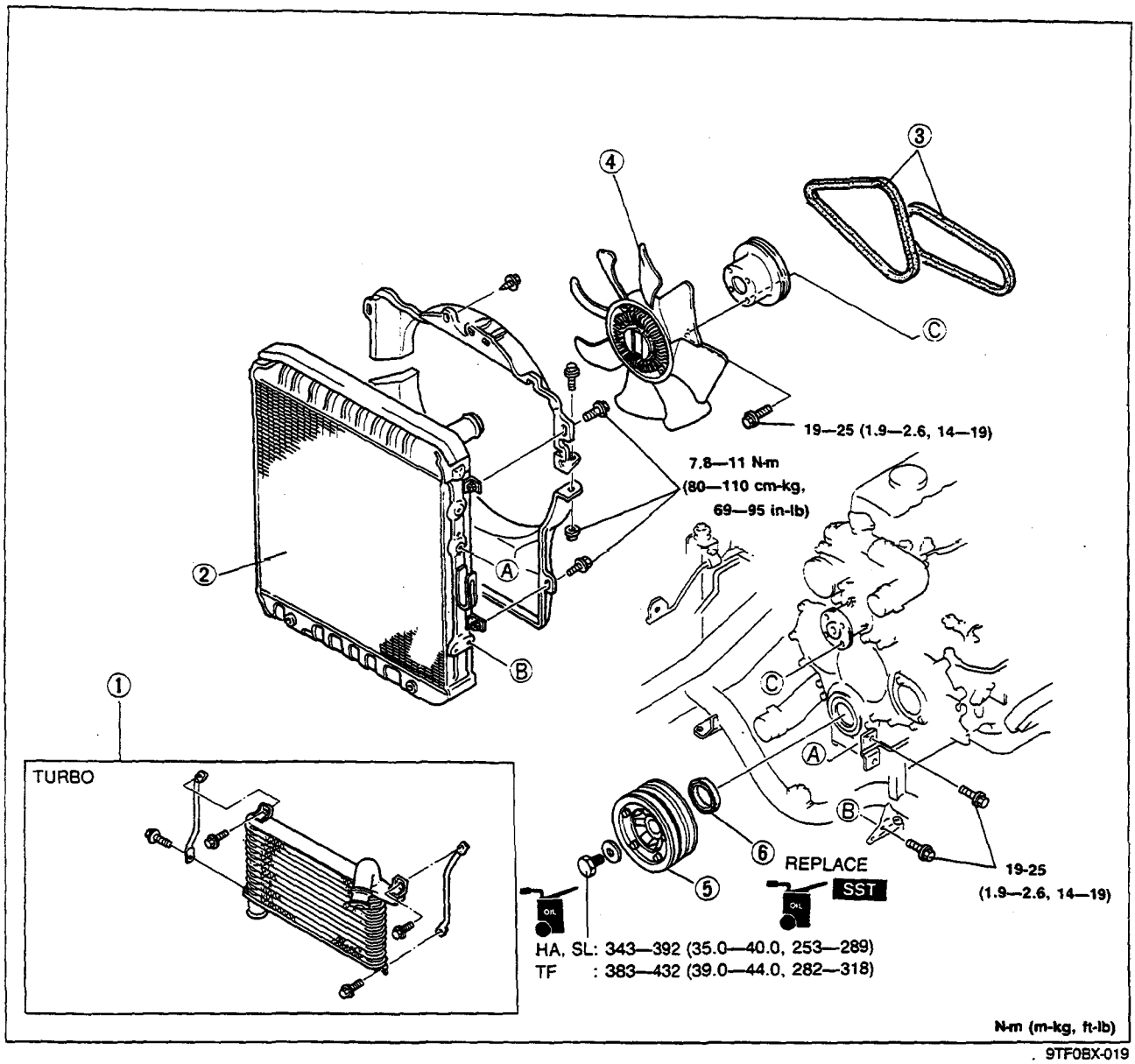
Caution
- **Position hose clamps in their original location on hoses, and squeeze the clamps lightly with large pliers to ensure a good fit.**
- **After radiator cowling installation, rotate the cooling fan by hand and verify that the fan blade does not touch the radiator cowling.**
  If the fan touches the cowling, adjust the radiator cowling mounting position.

1. Disconnect the negative battery cable.
2. Remove the undercover.
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, referring to **Installation Note**.

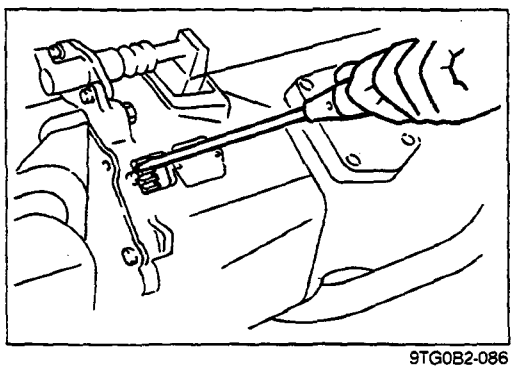
9TG0B2-083

Steps After Installation
1. Fill the radiator with the specified amount and type of engine coolant. (Refer to Section E.)
2. Install the undercover.
3. Connect the negative battery cable.
4. Start the engine and check as follows:
   (1) Engine oil and engine coolant leakage.
   (2) Drive belt deflection. (Refer to page B–8.)
5. Recheck the engine coolant levels.

9TF0BX-018



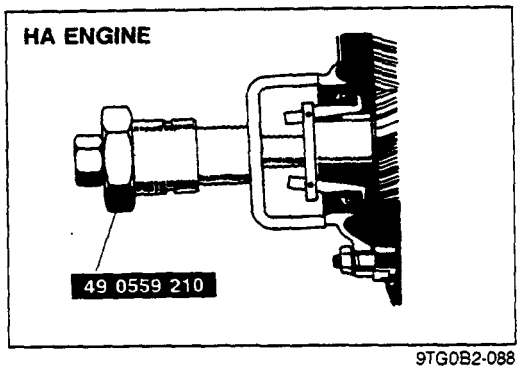
1. Intercooler (Turbo)
   Service ..... Section F
2. Radiator
   Service ..... Section E
3. Drive belt
   Adjustment ..... page B–9
4. Cooling fan
5. Crankshaft pulley
   Removal Note ..... page B–29
   Installation Note ..... page B–30
6. Oil seal
   Removal Note (HA) ..... page B–30
   Installation Note ..... page B–30


9TG0B2-086

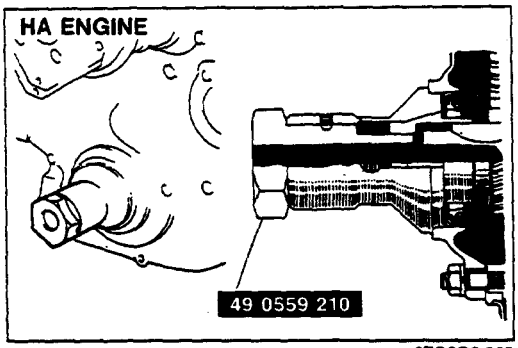
Removal note
Crankshaft pulley

Caution
- **Perform this operation with the aid of a helper.**

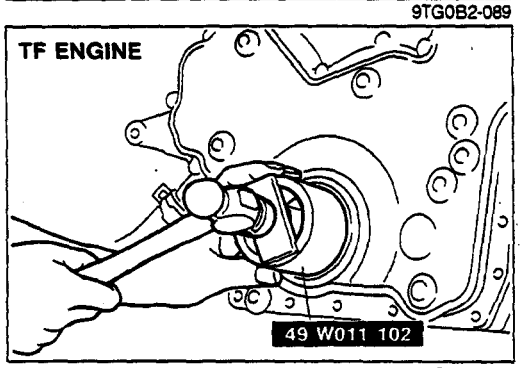
1. Remove the cover from the clutch housing (HA, SL) or from the end plate (TF).
2. Set a suitable tool against the flywheel ring gear for prevention of engine rotation.
3. Remove the pulley bolt (HA, SL) or nut (TF).
4. Remove the crankshaft pulley.



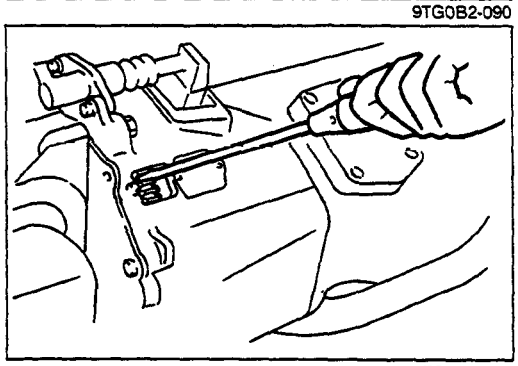
9TG0B2-088



9TG0B2-089



9TG0B2-090


9TG0B2-091

Oil seal (HA)

1. Assemble the **SST** as shown in the figure.
2. Set the **SST** against the oil seal and remove it by tightening the center bolt.

Installation note

Oil seal

1. Apply a small amount of clean engine oil to the lip of the new oil seal.
2. Push the oil seal slightly in by hand.

Caution

- **The oil seal must be tapped in until it is 6.5mm (0.26 in) inside the edge of the timing gear cover.**

3. Tap the oil seal in evenly with the **SST** (HA, TF) or a suitable pipe (SL) and a hammer.

Crankshaft pulley

1. Apply clean engine oil to the bolt threads and seat faces. (HA, SL)
2. Install the crankshaft pulley.
3. Install the bolt or nut and washer.

Caution

- **Perform this operation with the aid of a helper.**

4. Hold the flywheel and tighten the pulley bolt or nut.

Tightening torque

HA, SL: 343—392 N·m
(35.0—40.0 m-kg, 253—289 ft-lb)
TF : 383—432 N·m
(39.0—44.0 m-kg, 282—318 ft-lb)

5. Install the cover to the clutch housing or to the end plate.

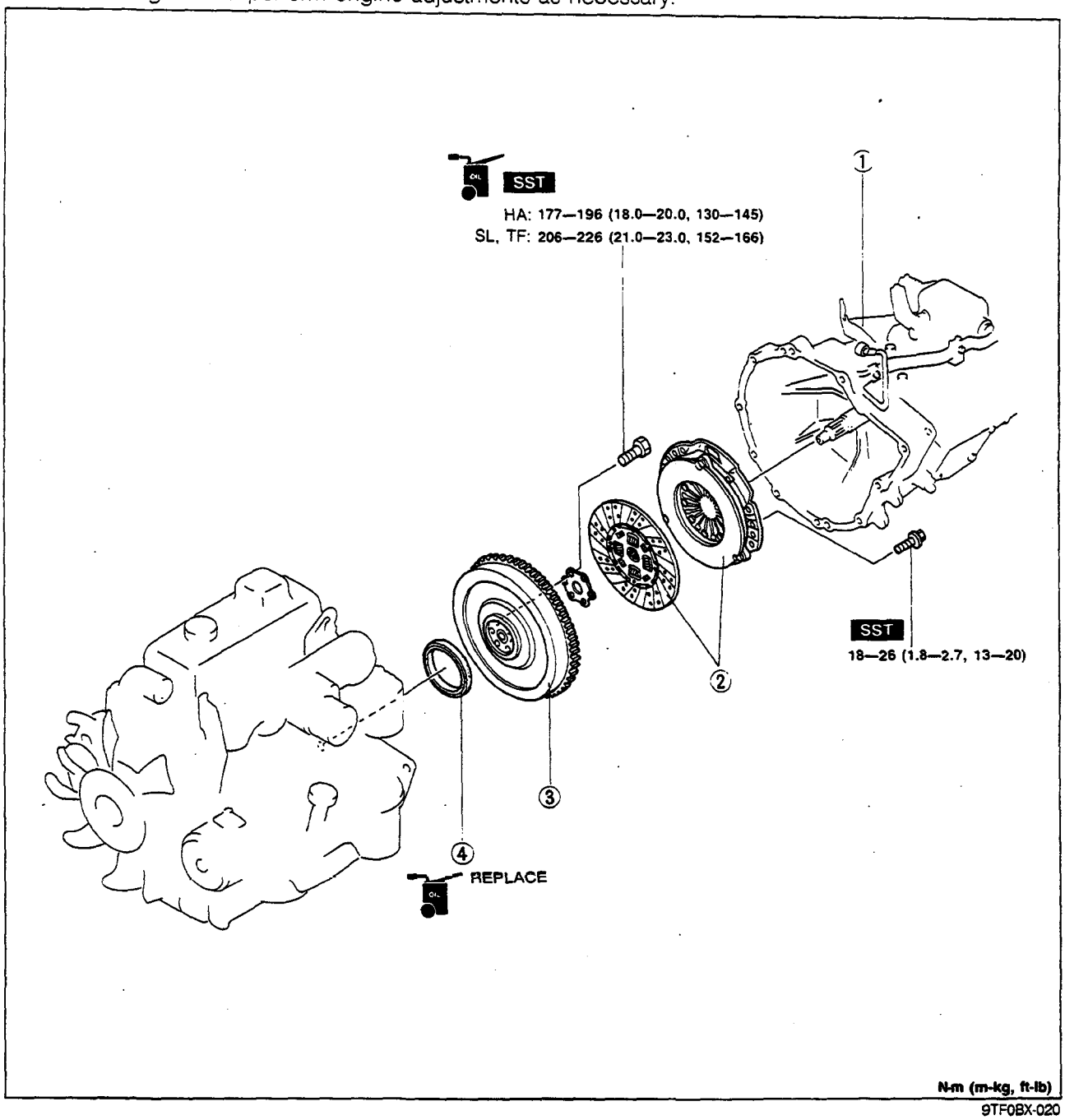
REAR OIL SEAL

Replacement

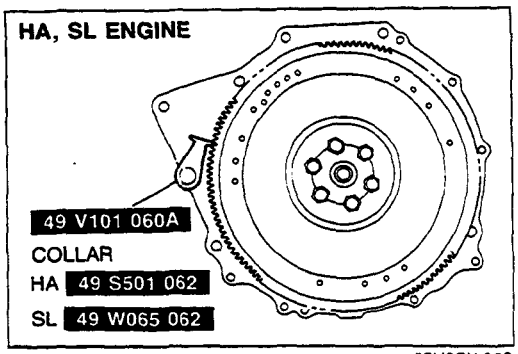
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.

Steps After Installation

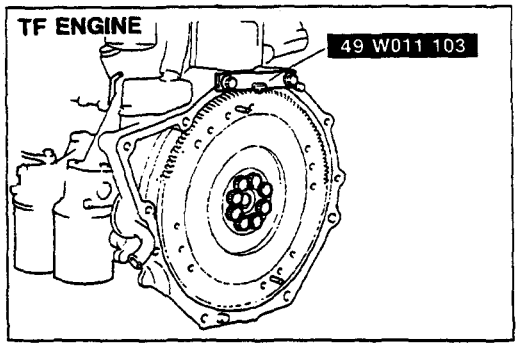
1. Connect the negative battery cable.
2. Start the engine and perform engine adjustments as necessary.

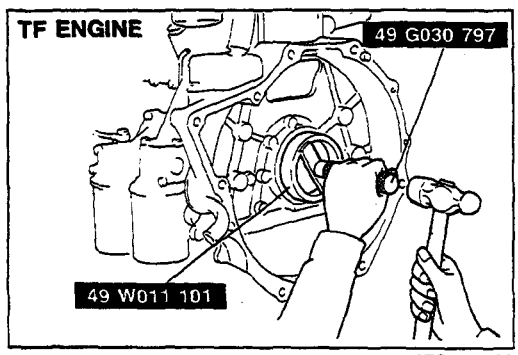


1. Transmission
   Service ..... Section J
2. Clutch cover, clutch disc
   Service ..... Section H
3. Flywheel
   Removal Note ..... page B–32
   Installation Note ..... page B–32
4. Oil seal
   Installation Note ..... page B–32

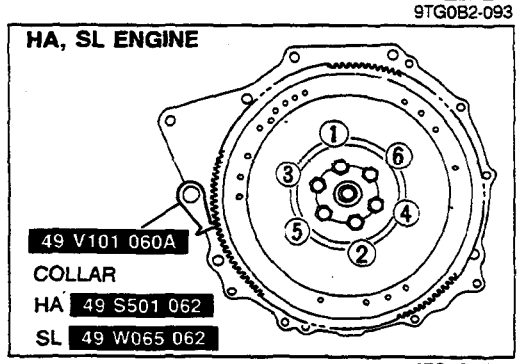


05U0BX-068

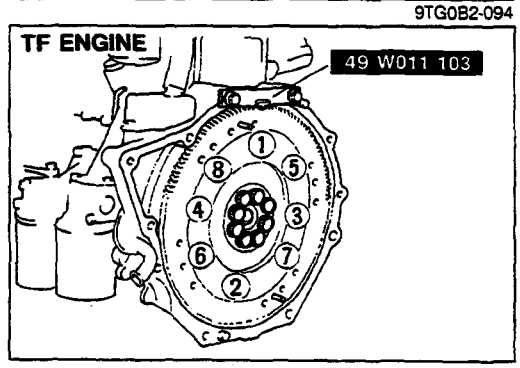




9TG0B2-093



9TG0B2-094



Removal note
Flywheel
1. Hold the flywheel with the **SST**.
2. Remove the flywheel lock bolts.
3. Remove the flywheel.

Installation note
Oil seal
1. Apply a small amount of clean engine oil to the lip of the new oil seal.
2. Push the oil seal slightly in by hand.

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

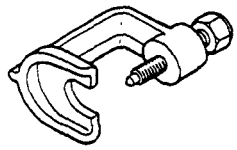
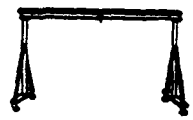
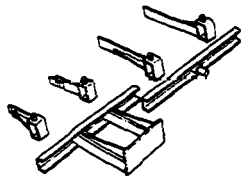
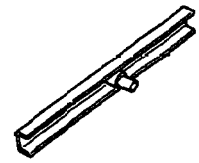
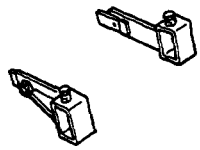
3. Tap the oil seal in evenly with the **SST** (TF) or a suitable pipe (HA, SL) and a hammer.

Flywheel
1. Apply clean engine oil to the bolt threads and seat faces.
2. Set the flywheel onto the crankshaft and loosely install the bolts.
3. Hold the flywheel with the **SST**.
4. Tighten the bolts in two or three steps in the order shown in the figure.

Tightening torque
HA:
177—196 N·m (18.0—20.0 m-kg, 130—145 ft-lb)
SL, TF:
206—226 N·m (21.0—23.0 m-kg, 152—166 ft-lb)

REMOVAL

PREPARATION
SST

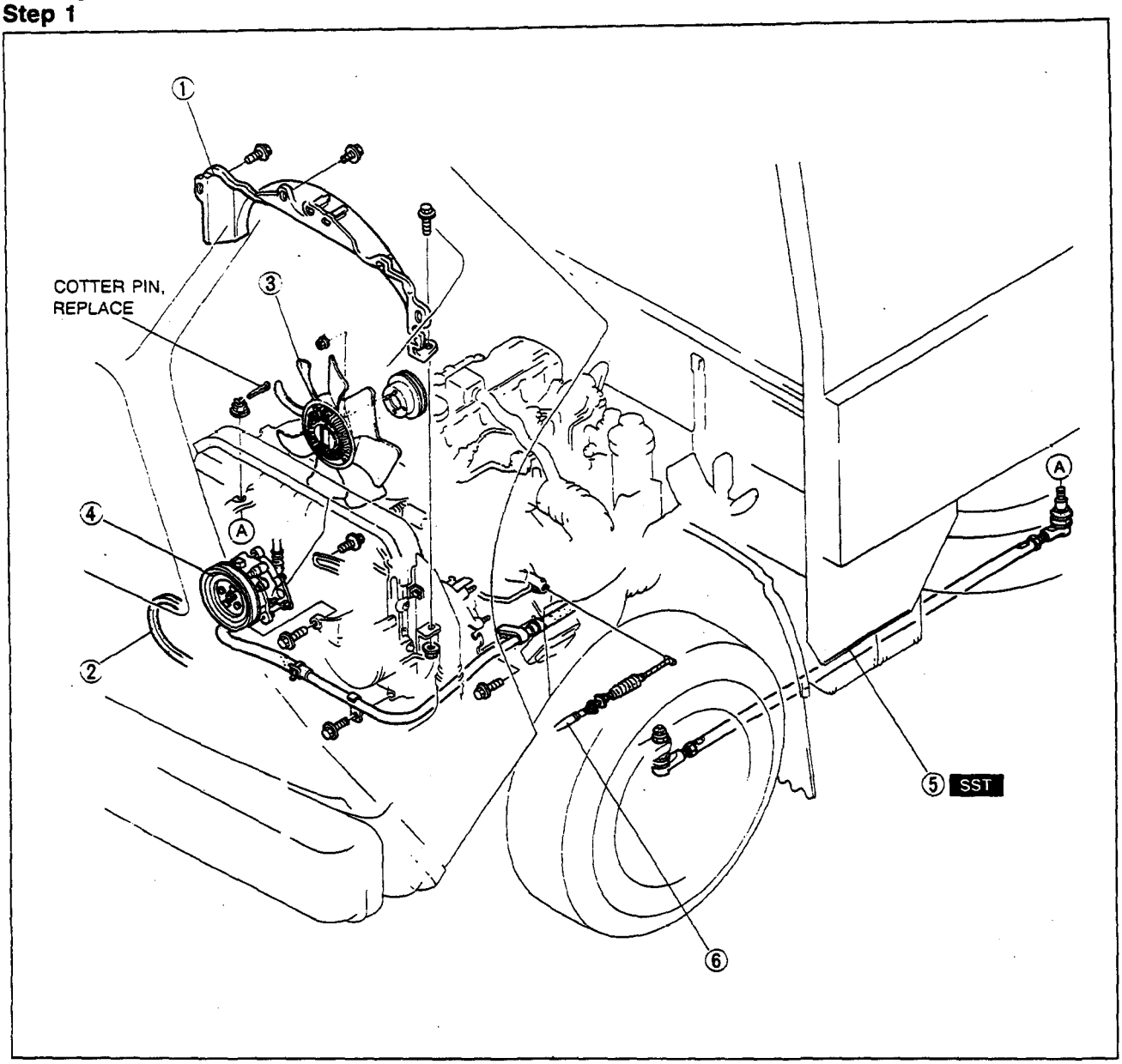
49 0727 575 Puller, socket joint 	For removal of tie-rod end	49 0259 770B Wrench, flare nut (SL Turbo) 	For disconnection of clutch hose
49 0727 000 Engine crane 	For removal of engine assembly	49 0636 000B Transmission lifter 	For removal of engine assembly
49 W017 3A0 Supporter set 	For removal of engine assembly	49 W017 303 Arm (Part of 49 W017 3A0) 	For removal of engine assembly
49 W017 305 Arm (Part of 49 W017 3A0) 	For removal of engine assembly		

9TG0B2-095

PROCEDURE
1. Disconnect the negative battery cable.
2. Remove the undercover.
3. Drain the engine coolant.
4. Remove in the order shown in the figure, referring to **Removal Note**.

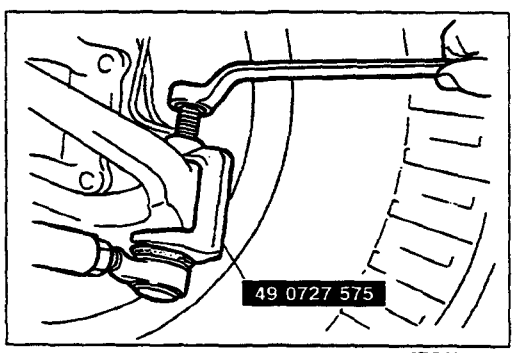
9TG0B2-096

HA Engine
Step 1



9TF0BX-021

1. Radiator cowling, upper
2. Drive belt
3. Cooling fan
4. P/S oil pump
5. Tie-rod
   Removal Note..... page B–34
6. Accelerator cable



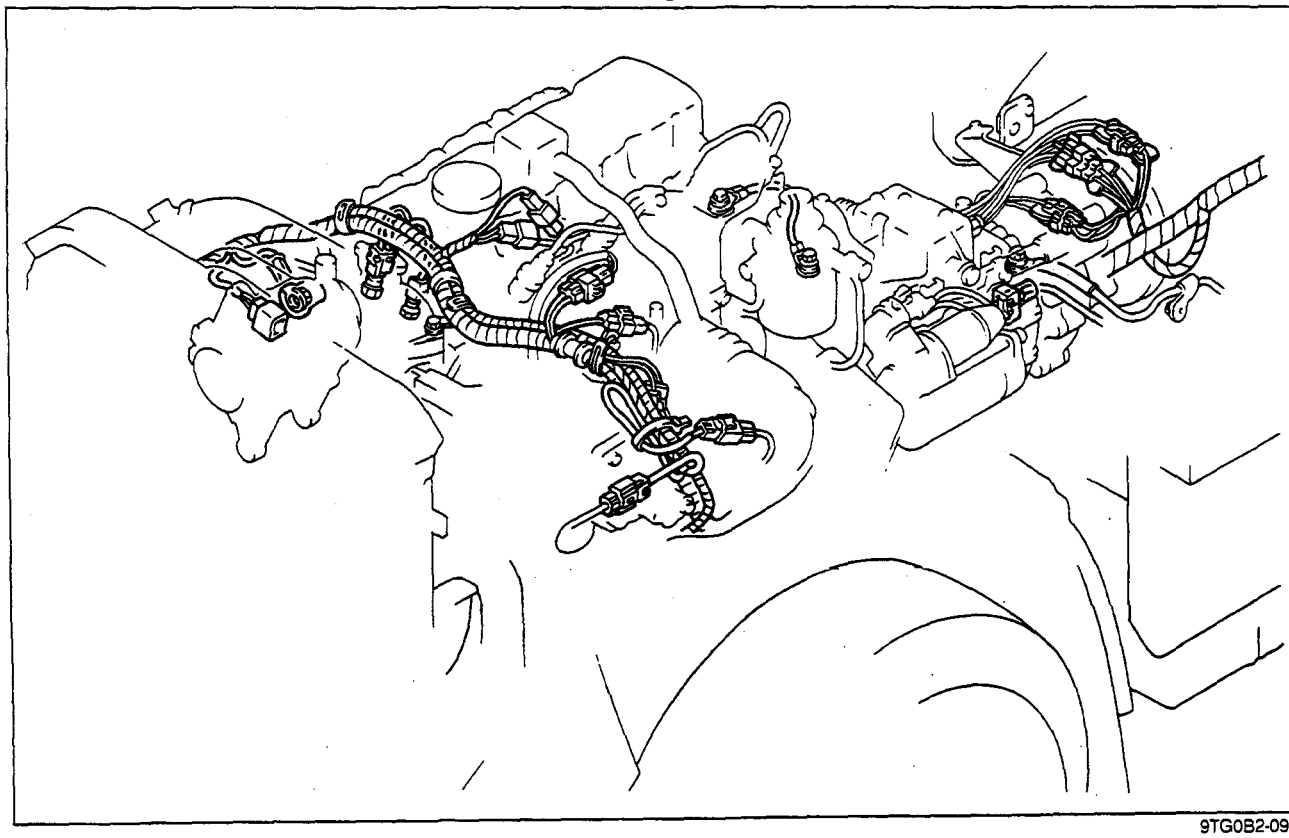
9TG0B2-102

Tie-rod
1. Remove the cotter pin and loosen the nut.
2. Separate the tie-rod end from the knuckle with the **SST**.
3. Remove the nut and tie-rod.

Caution
- **Do not reuse the cotter pin.**

Step 2

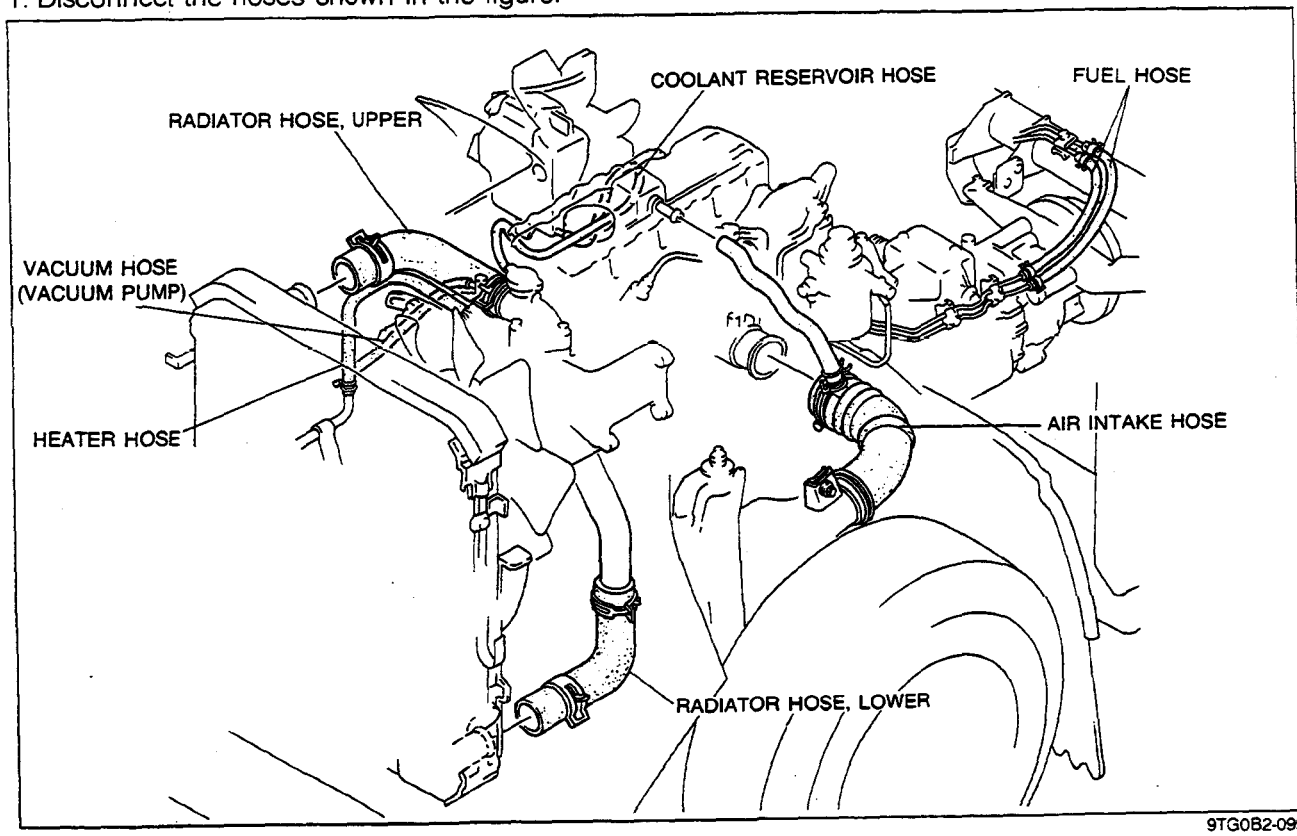
1. Disconnect the harness connectors shown in the figure.



9TG0B2-098

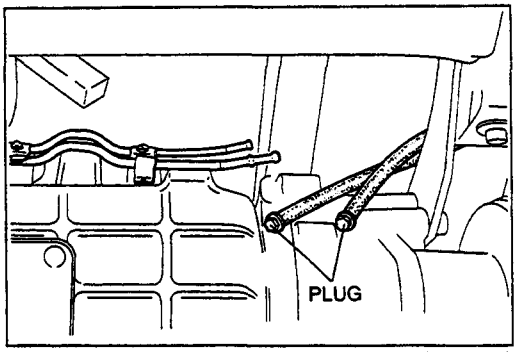
Step 3

1. Disconnect the hoses shown in the figure.



9TG0B2-099

REMOVAL



05U0BX-078

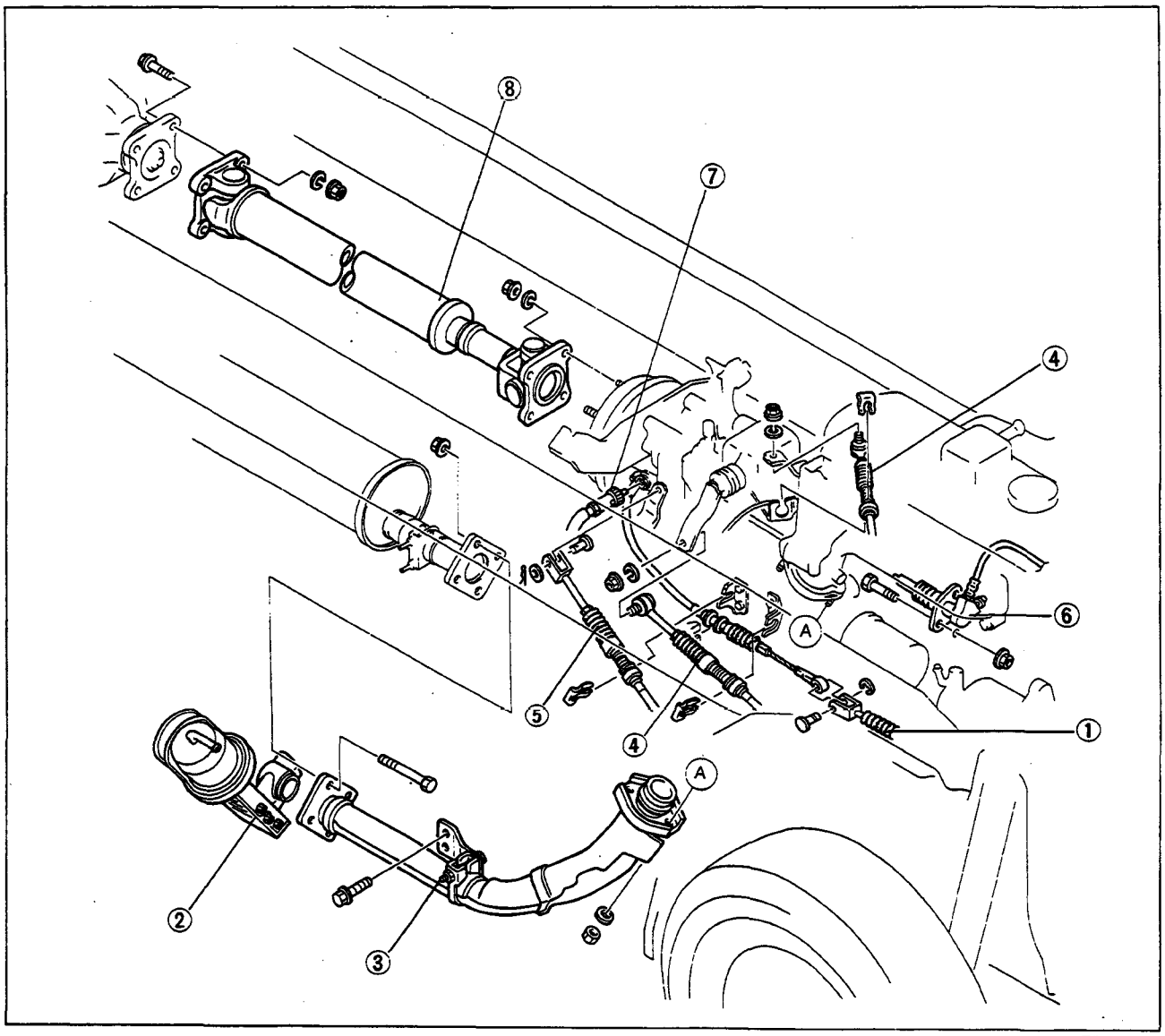
Removal note
Fuel hose

Warning
- **Keep sparks and open flame away from the fuel area.**

Caution
- **Cover the hose with a rag because fuel will spray out when disconnecting.**
- **Plug the disconnected hoses to avoid fuel leakage.**

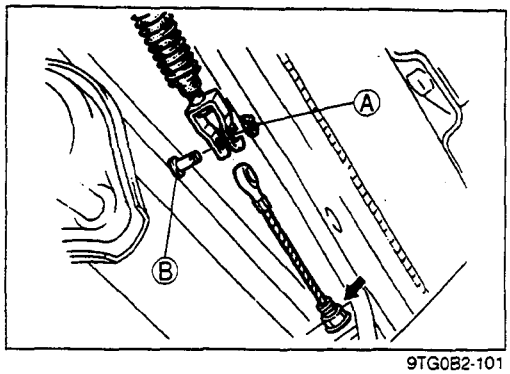
1. Disconnect the fuel hoses.

Step 4



9TF0BX-022

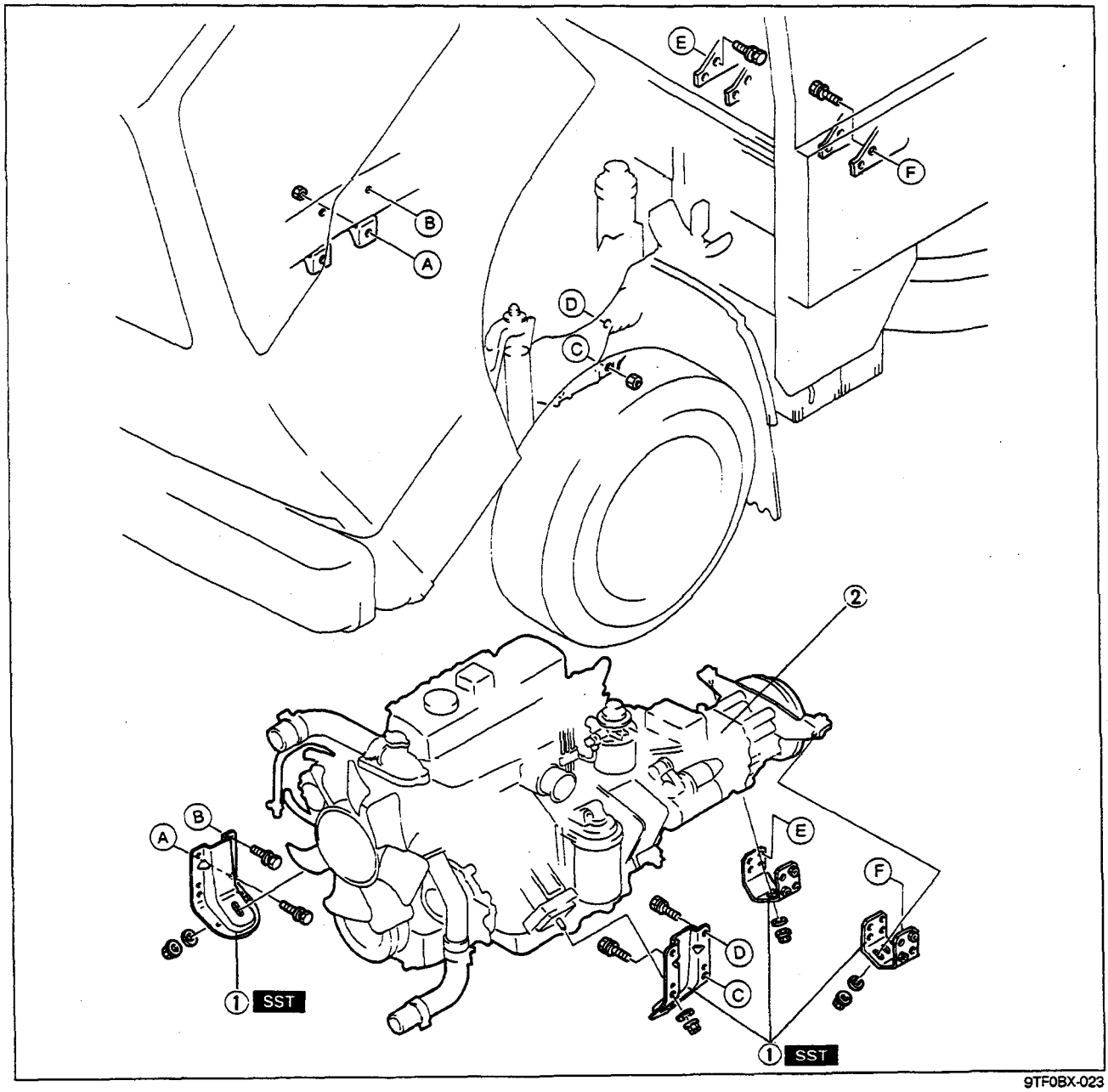
1. Parking brake cable
   Removal Note..... page B–37
2. Exhaust shutter valve
3. Front exhaust pipe
4. Shift/select cable
5. Sub-select cable
6. Clutch release cylinder
7. Speedometer cable
8. Propeller shaft
   Service..... Section L



9TG0B2-101

Removal note
Parking brake cable
1. Remove stop ring A and pin B.
2. Remove the parking brake rear cable from the frame.

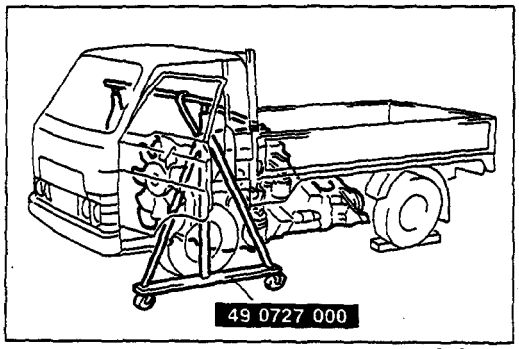
Step 5



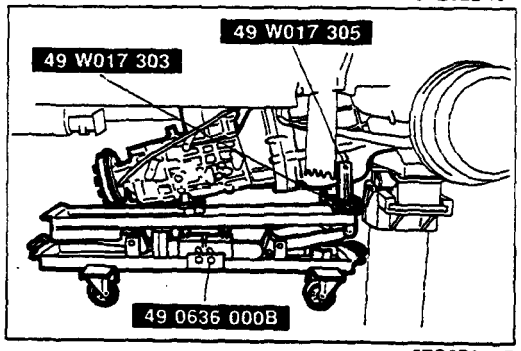
9TF0BX-023

1. Engine support bracket
   Removal Note..... page B–38
2. Engine and transmission assembly

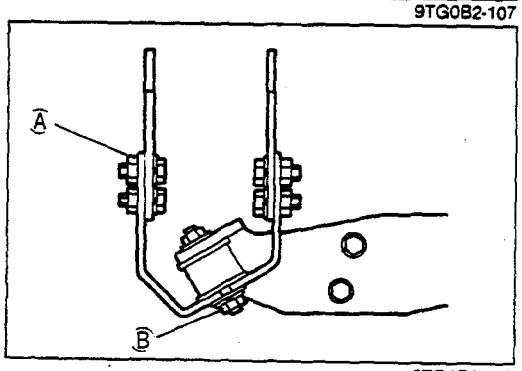
REMOVAL



9TG0B2-104



9TG0B2-107



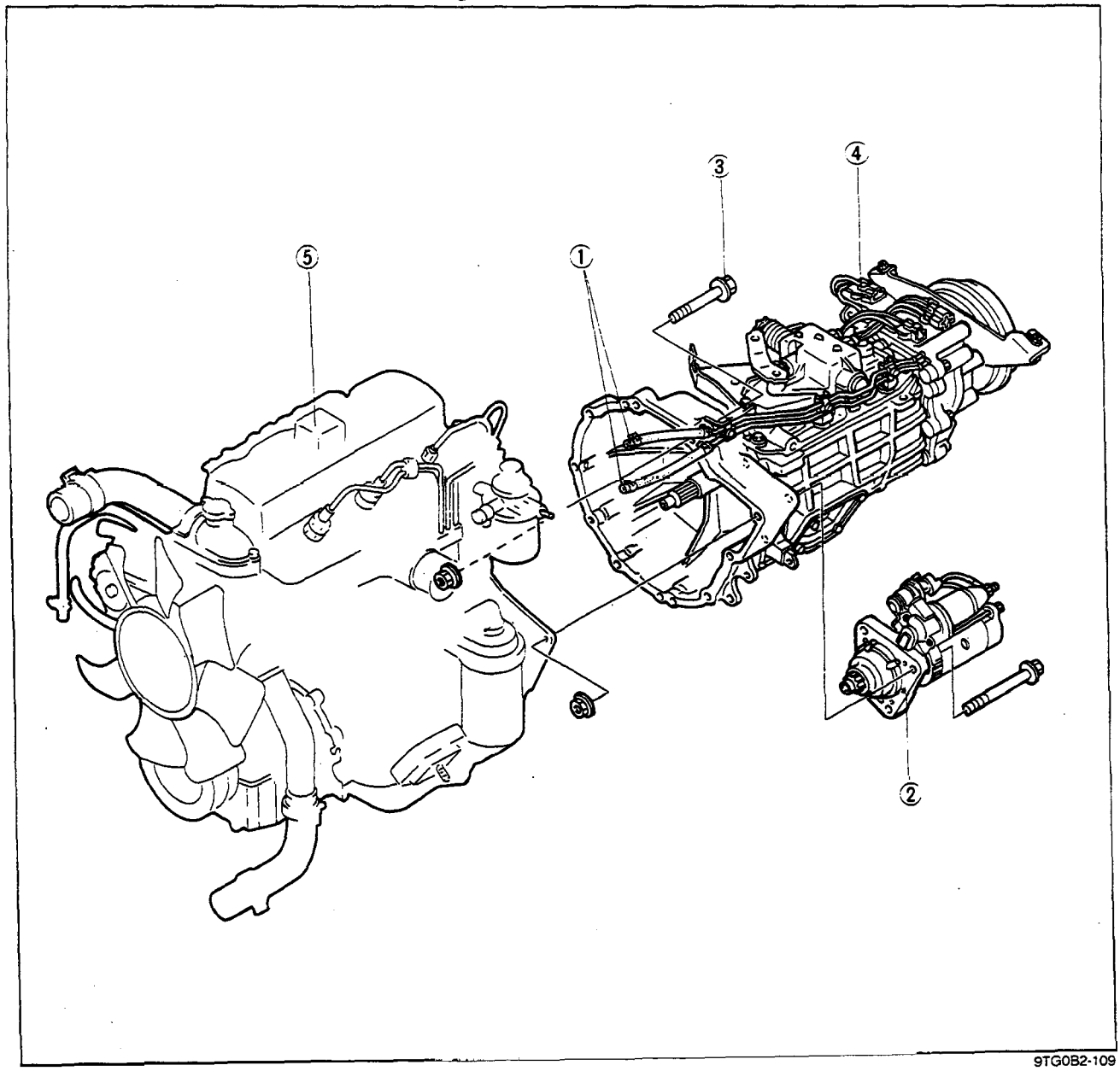
9TG0B2-108

Removal note
Engine support bracket

1. Raise the vehicle and support it on safety stands so that the distance between all wheels and the ground is at least 1 m (3.3 ft).
2. (Tilt cabin)
   Support the engine with a hoist.
   (Non-tilt cabin)
   Support the engine with the **SST**.
3. Remove the control cable holder.
4. Remove the right engine mount.
5. Remove the left engine mount.
6. Support the engine and transmission assembly with the **SST**.
7. Remove the transmission mount bracket.
8. Remove the engine and transmission assembly.

Step 6

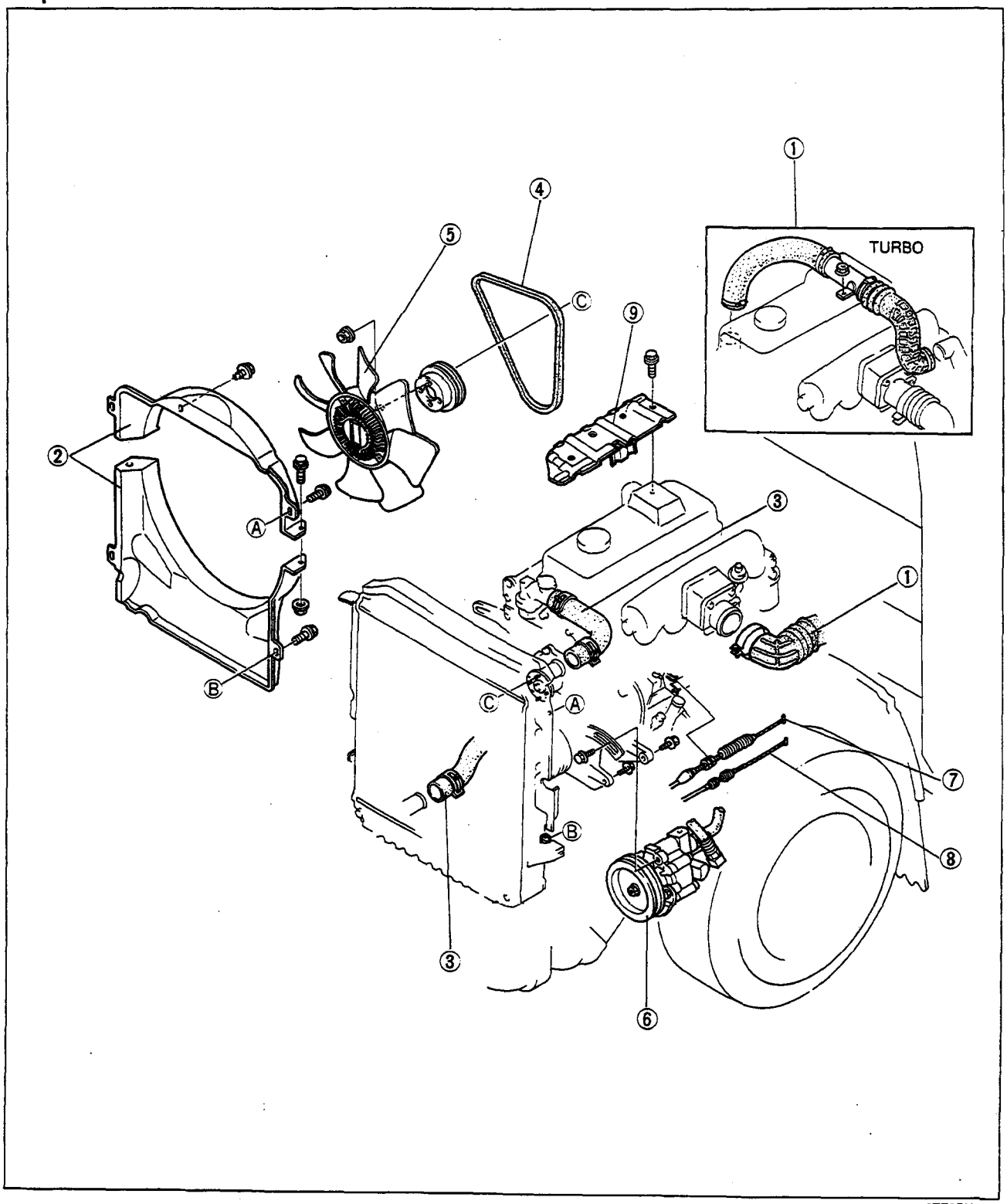
1. Disassemble in the order shown in the figure.



9TG0B2-109

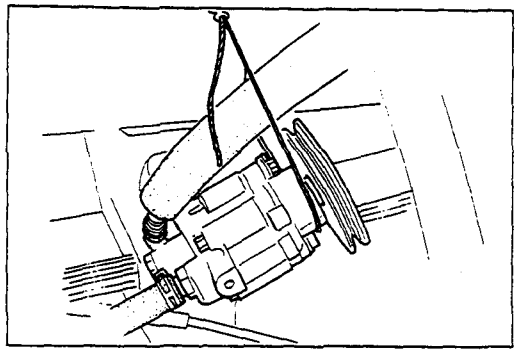
1. Fuel hose
2. Starter
3. Transmission mounting bolt
4. Transmission
5. Engine

SL Engine
Step 1



9TF0BX-024

1. Air intake hose
2. Radiator cowling
3. Radiator hose
4. Drive belt
5. Cooling fan
6. P/S oil pump
   Removal Note..... page B–41
7. Accelerator cable
8. Fuel stop cable
9. Exhaust manifold insulator


05U0BX-074

Removal note
P/S oil pump

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

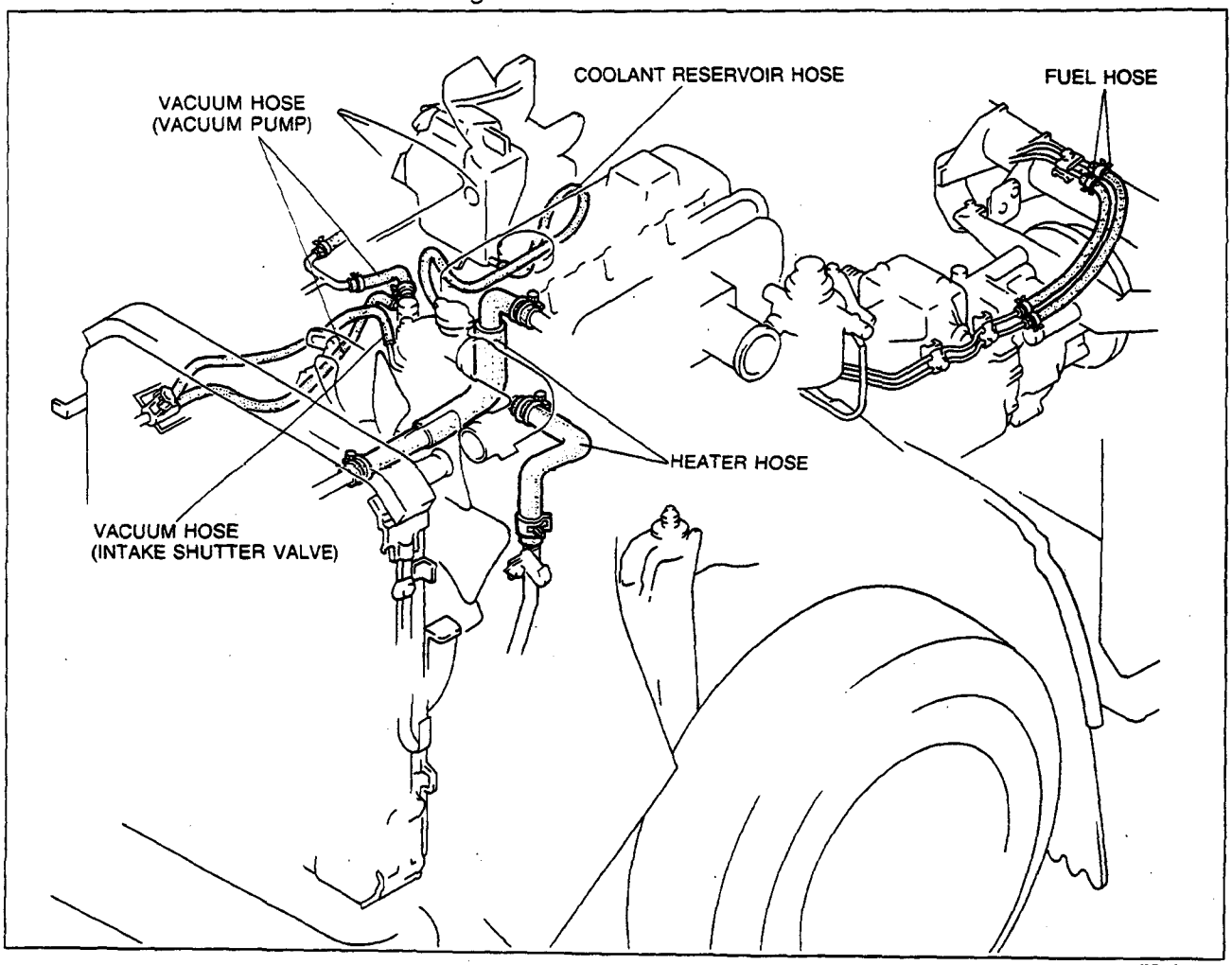
1. Remove the P/S oil pump with the hoses still connected.
2. Position the pump away from the engine and affix it with wire.

Step 2
1. Disconnect the harness connectors shown in the figure.

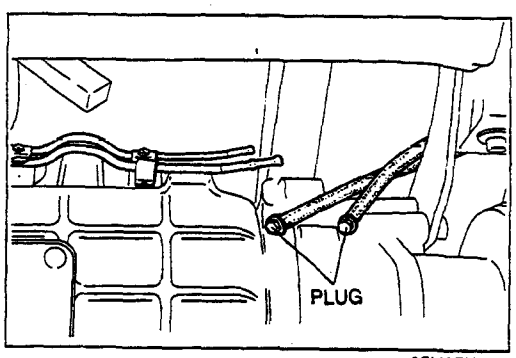

9TG0B2-111

Step 3

1. Disconnect the hoses shown in the figure.



9TG0B2-112



05U0BX-078

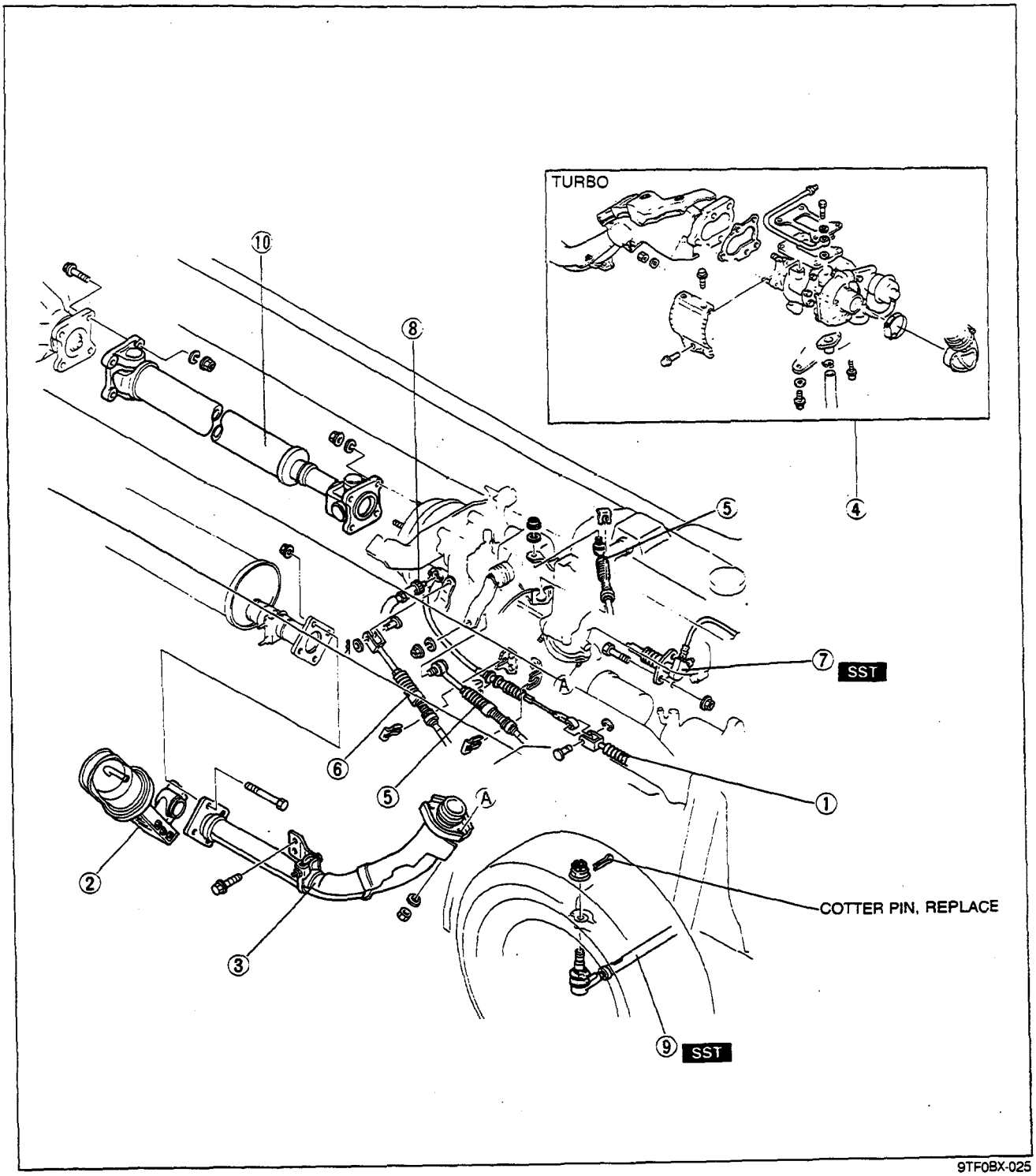
Removal note
Fuel hose

Warning
- **Keep sparks and open flame away from the fuel area.**

Caution
- **Cover the hose with a rag because fuel will spray out when disconnecting.**
- **Plug the disconnected hoses to avoid fuel leakage.**

1. Disconnect the fuel hoses.

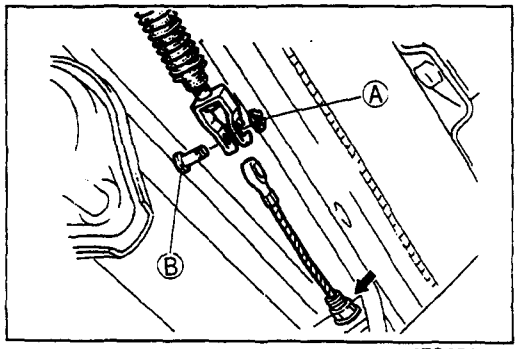
Step 4



9TF0BX-025

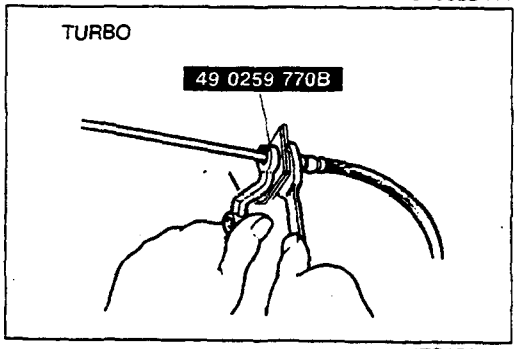
1. Parking brake cable
   Removal Note..... page B–44
2. Exhaust shutter valve
3. Front exhaust pipe
4. Turbocharger (Turbo)
   Service..... Section F
5. Shift/select cable
6. Sub-select cable
7. Clutch release cylinder
   Removal Note..... page B–44
8. Speedometer cable
9. Tie-rod
   Removal Note..... page B–44
10. Propeller shaft
    Service..... Section L

REMOVAL



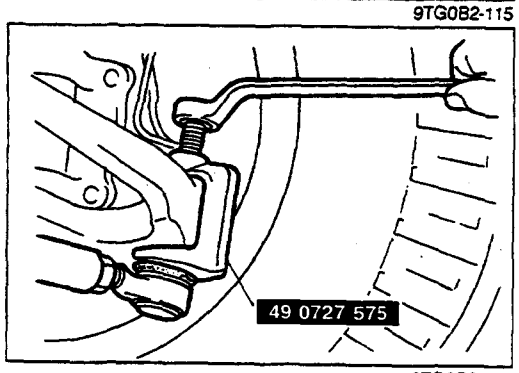
9TG0B2-114

Removal note
Parking brake cable
1. Remove stop ring A and pin B.
2. Remove the parking brake rear cable from the frame.



9TG0B2-115

Clutch release cylinder
(Non-Turbo)
1. Remove the clutch release cylinder.
(Turbo)
1. Disconnect the clutch hose with the **SST**.

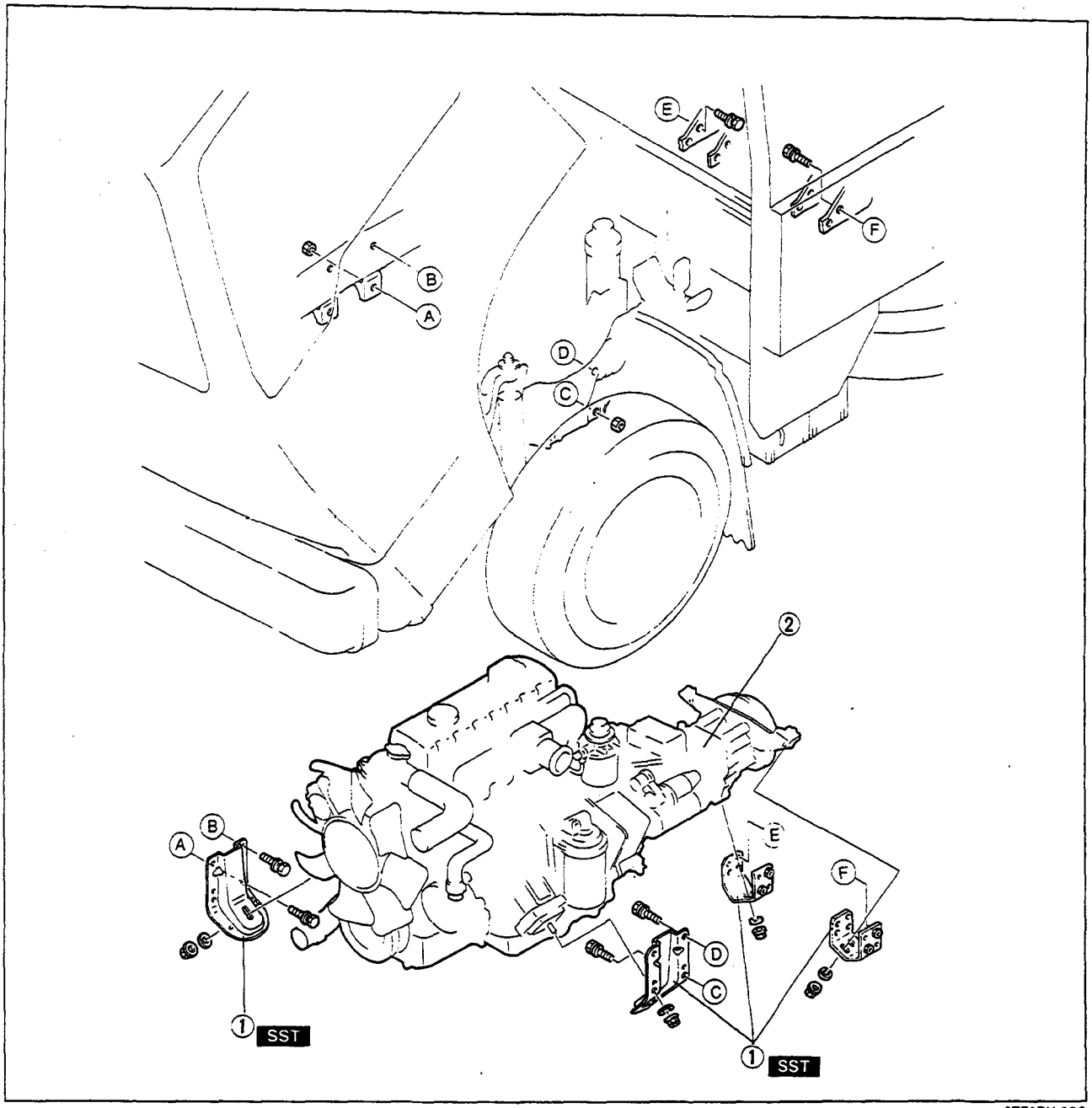


9TG0B2-116

Tie-rod
1. Remove the cotter pin and loosen the nut.
2. Separate the tie-rod end from the knuckle with the **SST**.
3. Remove the nut and tie-rod.

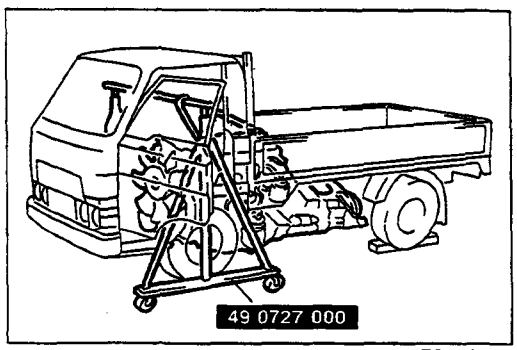
Caution
- **Do not reuse the cotter pin.**

Step 5



9TF0BX-026

1. Engine support bracket
   Removal Note..... page B–45
2. Engine and transmission assembly

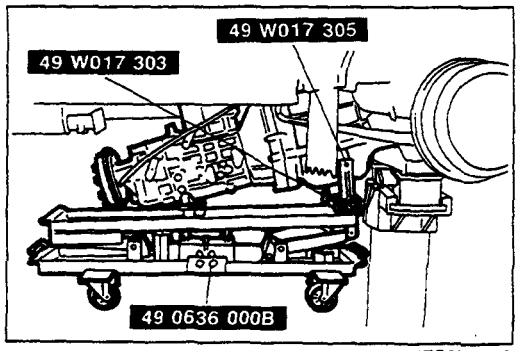


9TG0B2-118

Removal note
Engine support bracket

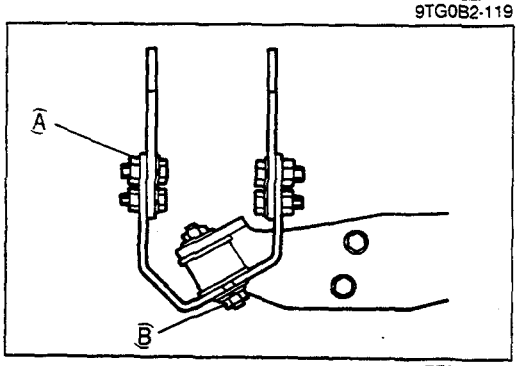
1. Raise the vehicle and support it on safety stands so that the distance between all wheels and the ground is at least 1 m (3.3 ft).
2. (Tilt cabin)
   Support the engine with a hoist.
   (Non-tilt cabin)
   Support the engine with the **SST**.

REMOVAL



9TG0B2-119

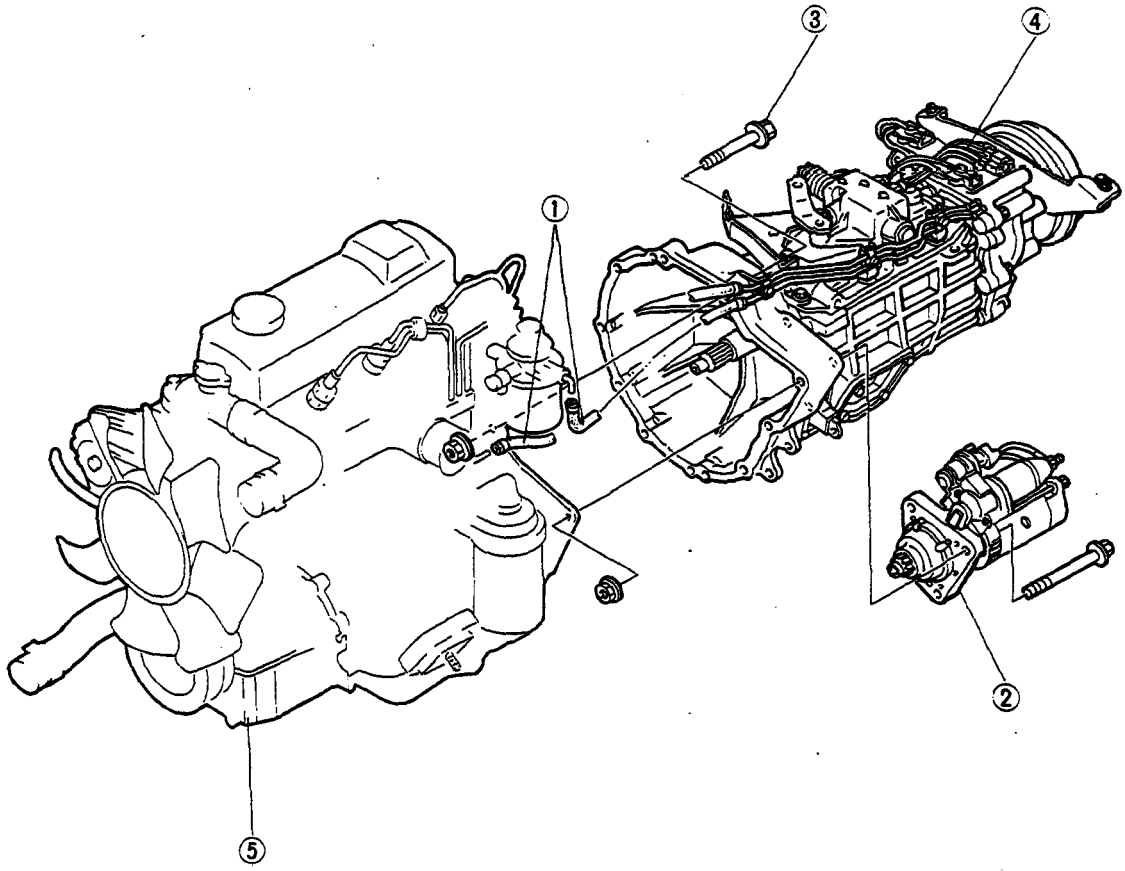
3. Remove the control cable holder.
4. Remove the right engine mount.
5. Remove the left engine mount.
6. Support the engine and transmission assembly with the **SST**.



9TF0BX-027

7. Remove the transmission mount bracket.
8. Remove the engine and transmission assembly.

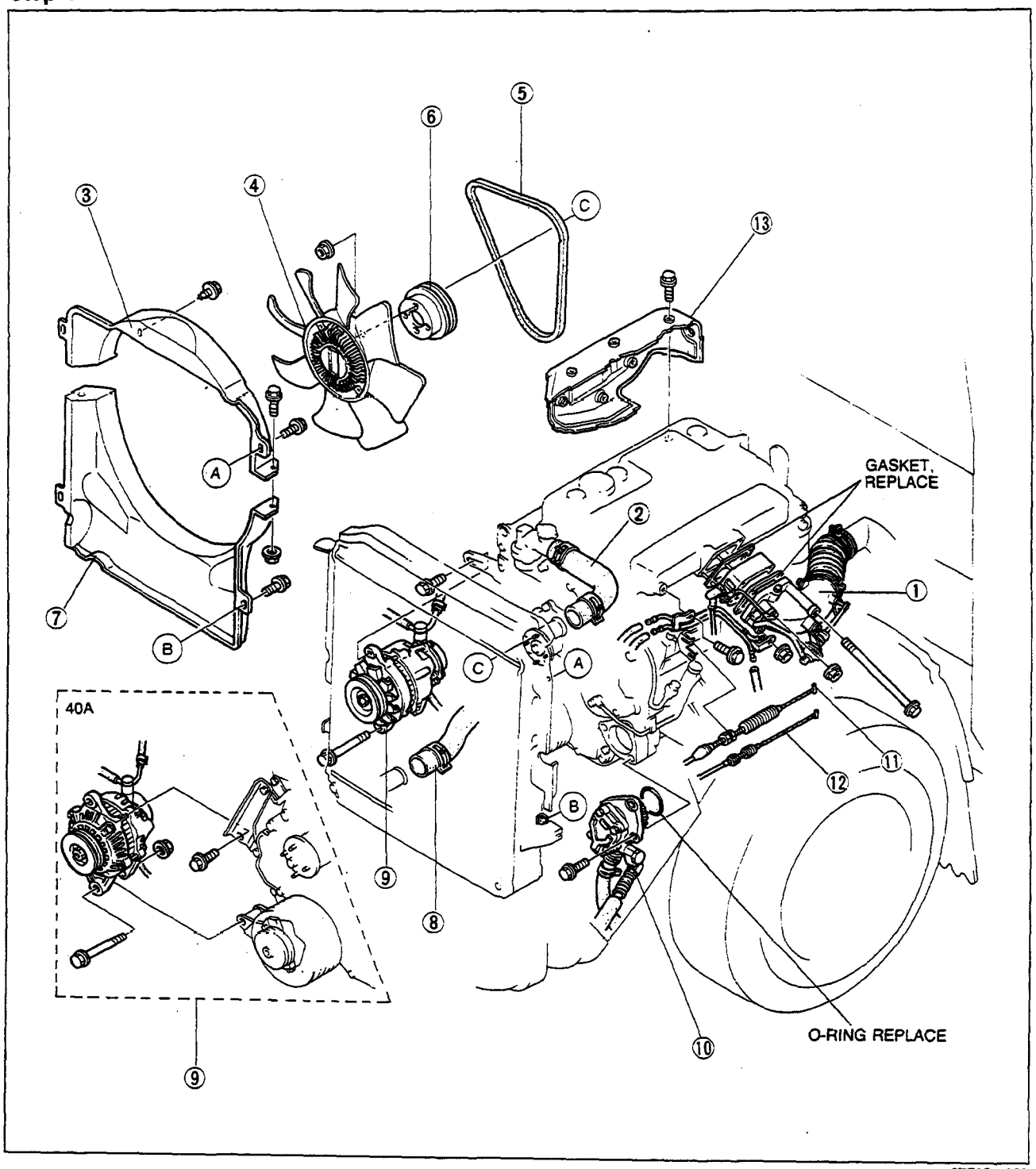
Step 6
1. Disassemble in the order shown in the figure.



9TF0BX-028

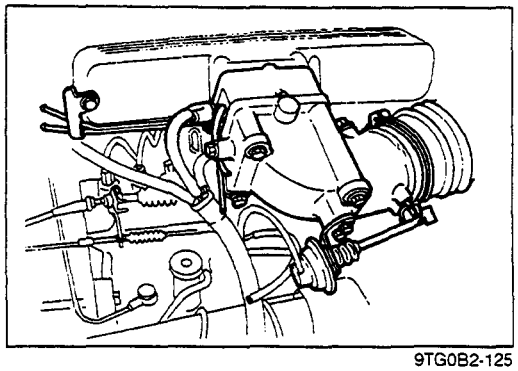
1. Fuel hose
2. Starter
3. Transmission mounting bolt
4. Transmission
5. Engine

TF Engine
Step 1



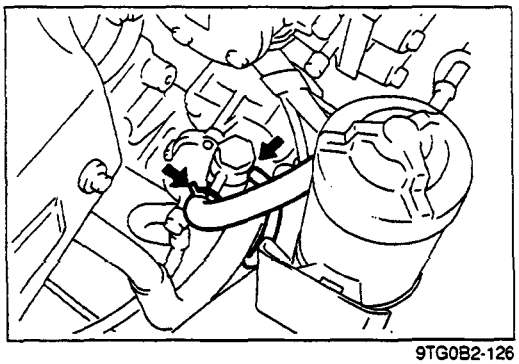
9TF0BX-029

1. Air hose, intake manifold elbow
   Removal Note..... page B–49
2. Radiator hose, upper
3. Radiator cowling, upper
4. Cooling fan
5. Drive belt
6. Water pump pulley
7. Radiator cowling, lower
8. Radiator hose, lower
9. Alternator
   Removal Note..... page B–49
10. P/S oil pump
    Removal Note..... page B–49
11. Accelerator cable
12. Fuel stop cable
13. Exhaust manifold insulator



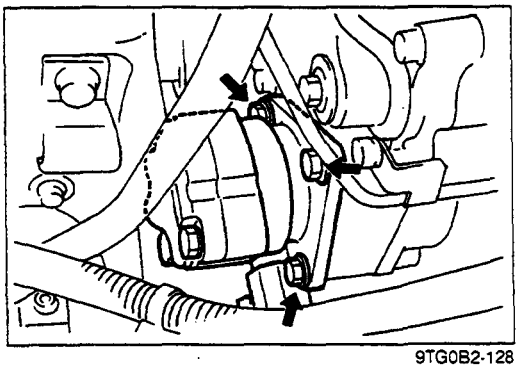
9TG0B2-125

Removal note
Air hose, intake manifold elbow
1. Disconnect the exhaust shutter valve vacuum hose.
2. Remove the vacuum pipe.
3. Disconnect the intake manifold elbow.



9TG0B2-126

Alternator
1. Disconnect the oil hose and vacuum hose shown in the figure.
2. Remove the alternator strap.
3. Remove the alternator.



9TG0B2-128

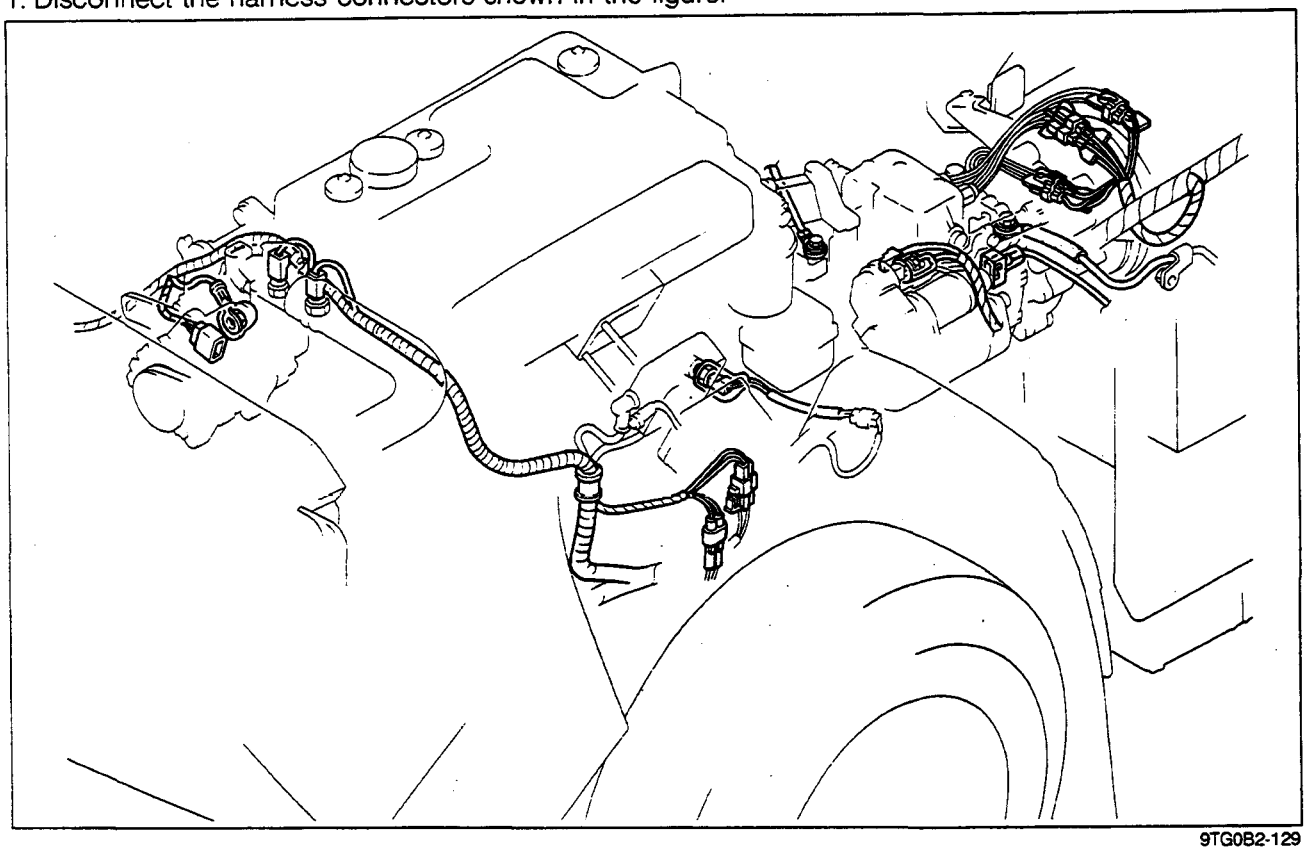
P/S oil pump

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

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

Step 2

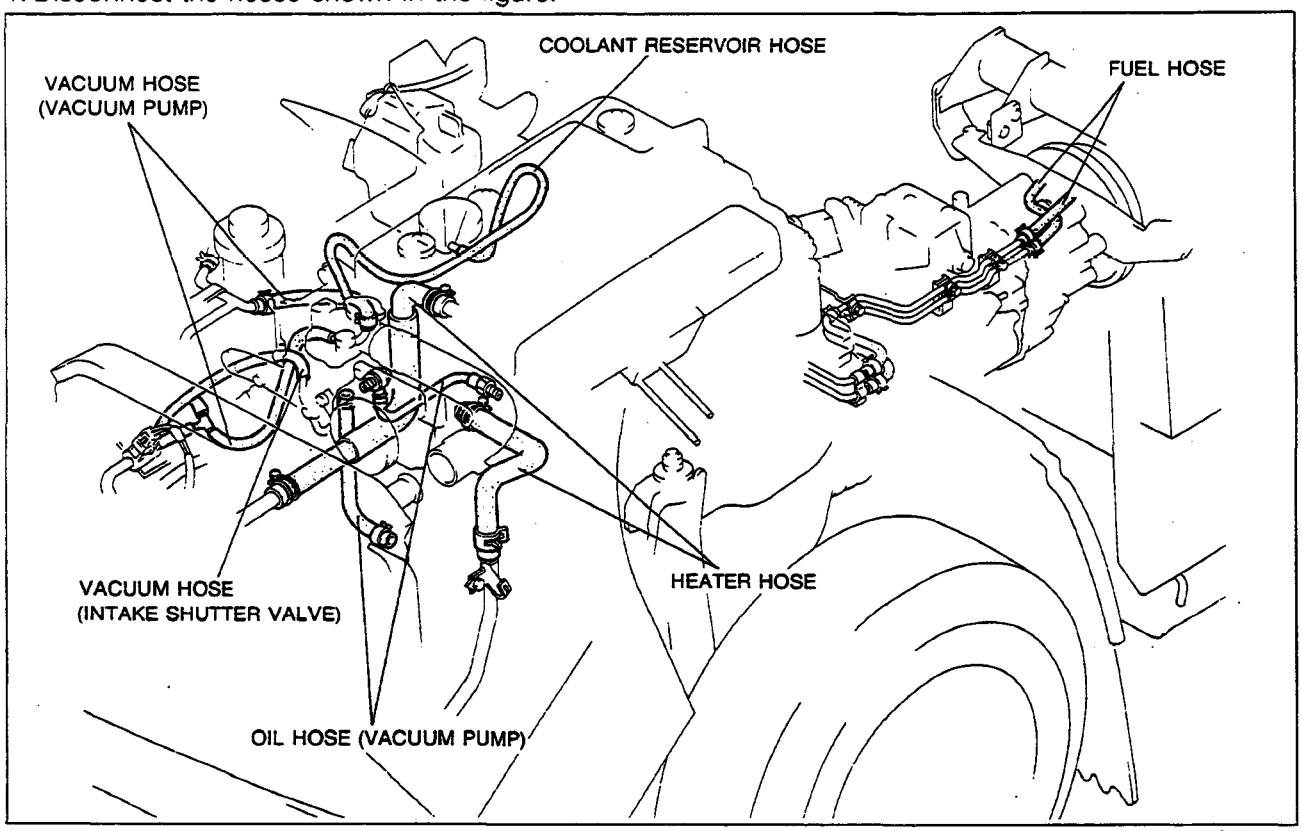
1. Disconnect the harness connectors shown in the figure.



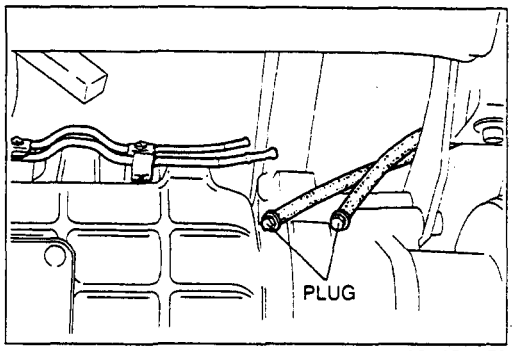
9TG0B2-129

Step 3

1. Disconnect the hoses shown in the figure.



9TG0B2-130



05U0BX-078

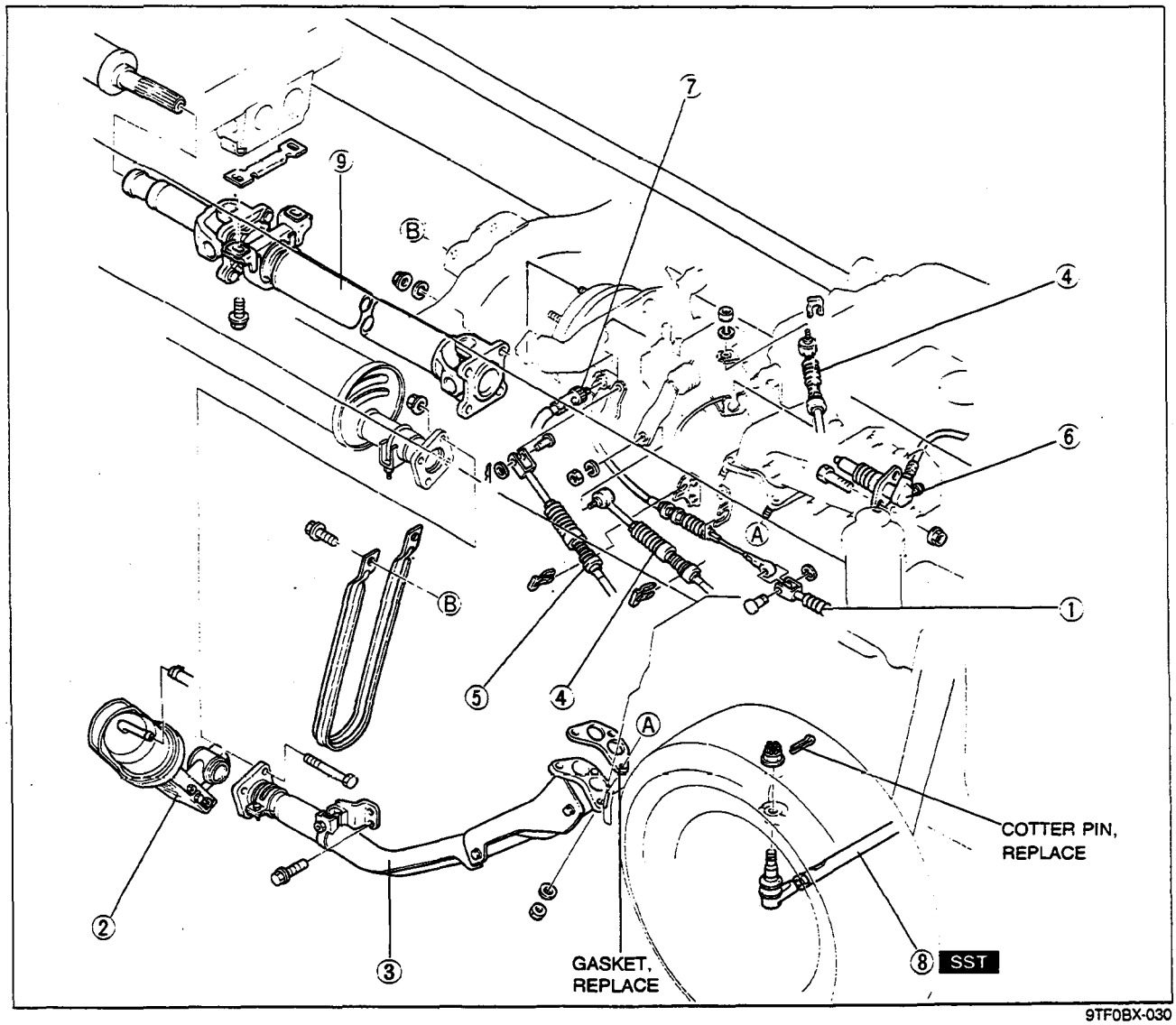
Removal note
Fuel hose

Warning
- **Keep sparks and open flame away from the fuel area.**

Caution
- **Cover the hose with a rag because fuel will spray out when disconnecting.**
- **Plug the disconnected hoses to avoid fuel leakage.**

1. Disconnect the fuel hoses.

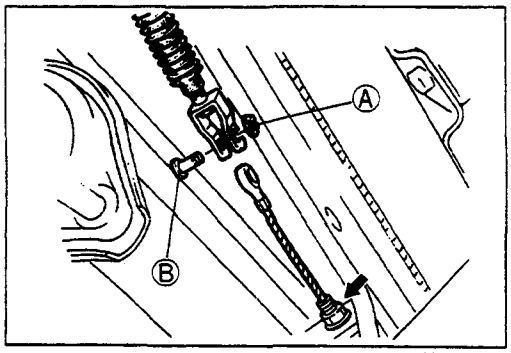
Step 4



9TF0BX-030

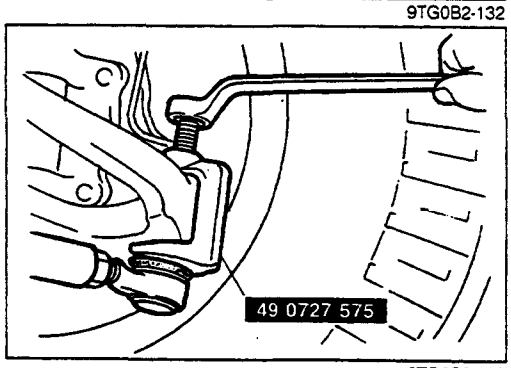
1. Parking brake cable
   Removal Note..... page B–52
2. Exhaust shutter valve
3. Front exhaust pipe
4. Shift/select cable
5. Sub-select cable
6. Clutch release cylinder
7. Speedometer cable
8. Tie-rod
   Removal Note..... page B–52
9. Propeller shaft
   Service..... Section L

REMOVAL



9TG0B2-132

Removal note
Parking brake cable
1. Remove stop ring A and pin B.
2. Remove the parking brake rear cable from the frame.

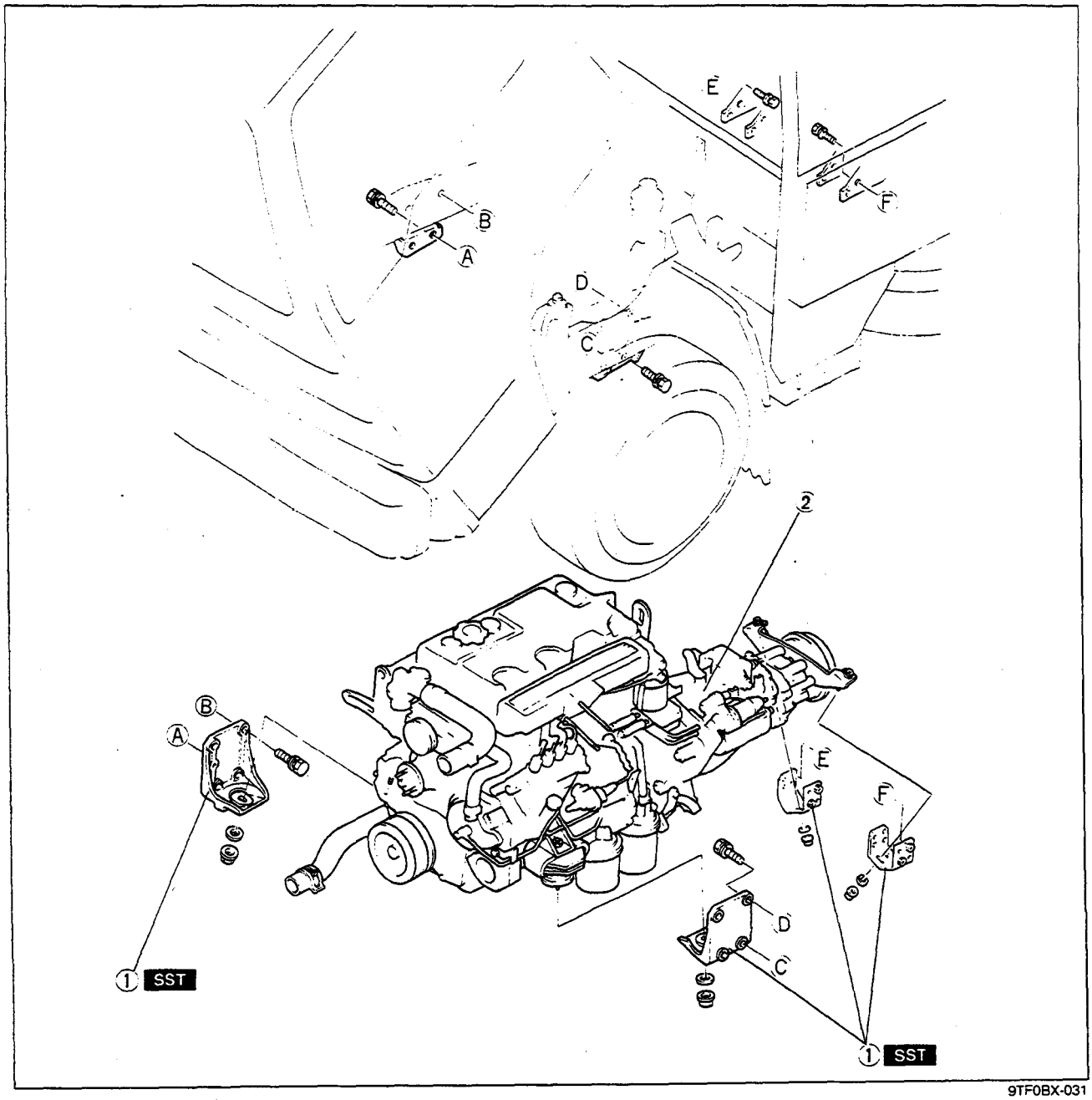


9TG0B2-133

Tie-rod
1. Remove the cotter pin and loosen the nut.
2. Separate the tie-rod end from the knuckle with the **SST**.
3. Remove the nut and tie-rod.

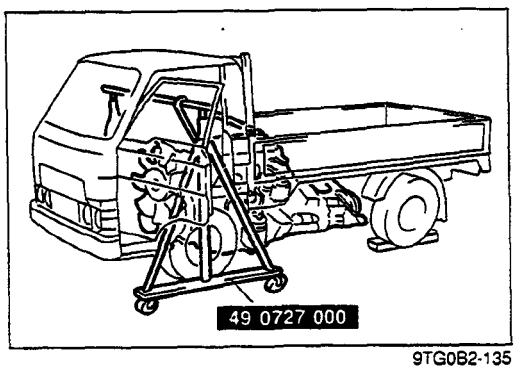
Caution
- **Do not reuse the cotter pin.**

Step 5



9TF0BX-031

1. Engine support bracket
   Removal Note..... page B–53
2. Engine and transmission assembly

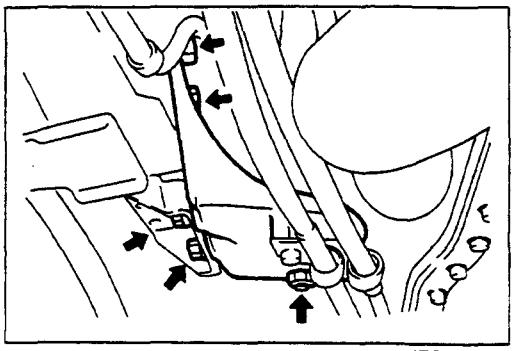


9TG0B2-135

Removal note
Engine support bracket

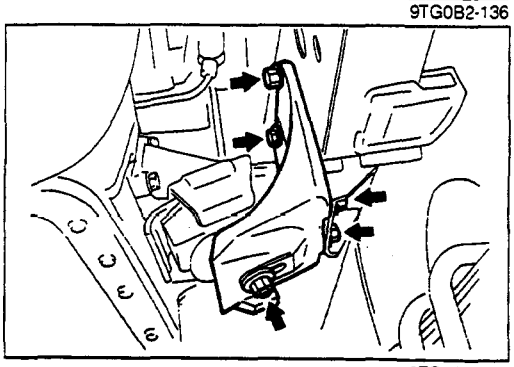
1. Raise the vehicle and support it on safety stands so that the distance between all wheels and the ground is at least 1 m (3.3 ft).
2. (Tilt cabin)
   Support the engine with a hoist.
   (Non-tilt cabin)
   Support the engine with the **SST**.

REMOVAL



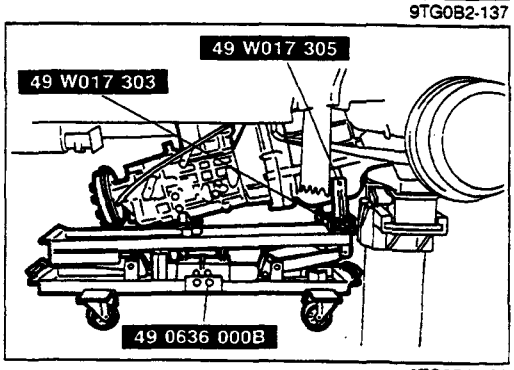
9TG0B2-136

3. Remove the control cable holder.
4. Remove the right engine mount.



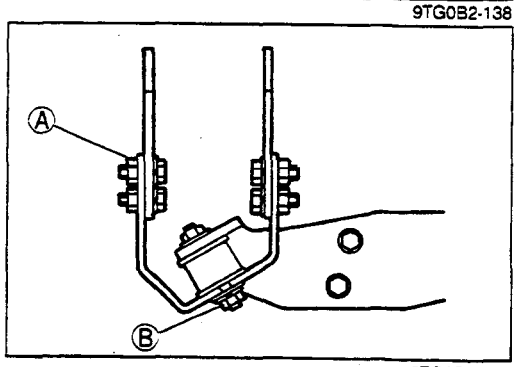
9TG0B2-137

5. Remove the left engine mount.



9TG0B2-138

6. Support the engine and transmission assembly with the **SST**.

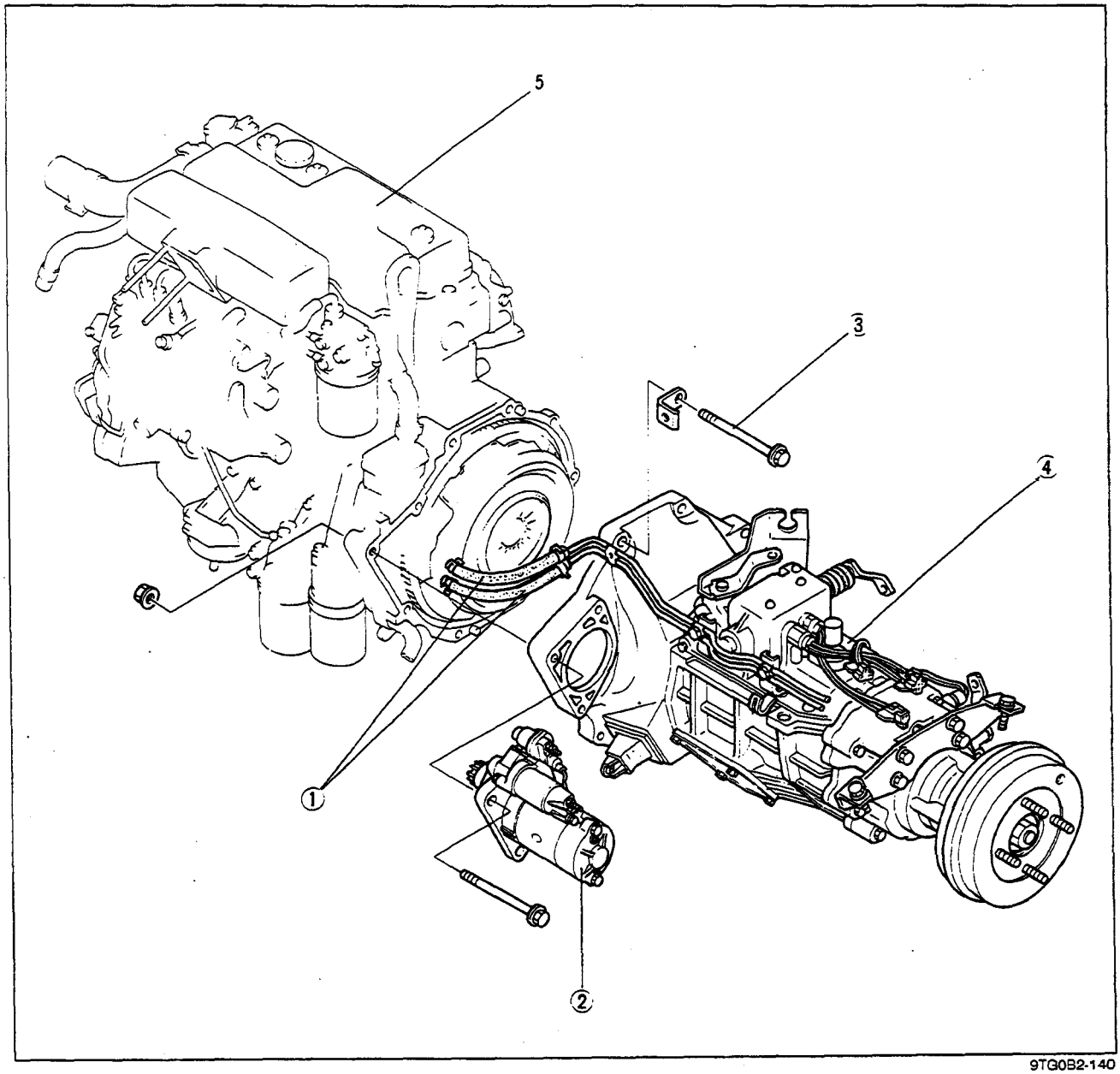


9TG0B2-139

7. Remove the transmission mount bracket.
8. Remove the engine and transmission assembly.

Step 6

1. Disassemble in the order shown in the figure.

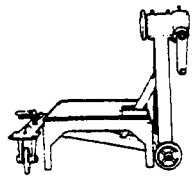
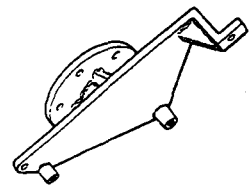
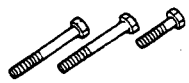
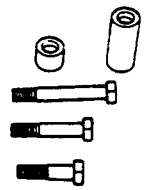
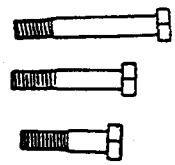


9TG0B2-140

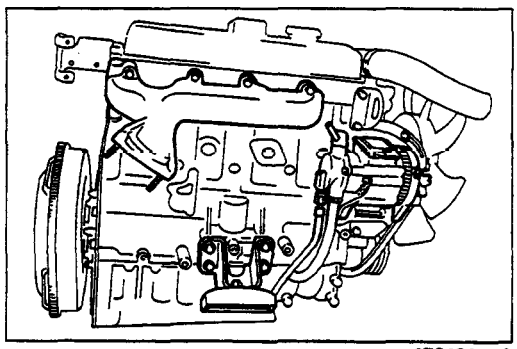
1. Fuel hose
2. Starter
3. Transmission mounting bolt
4. Transmission
5. Engine

ENGINE STAND MOUNTING

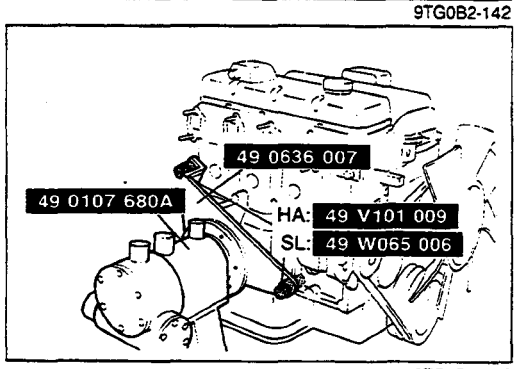
PREPARATION
SST

49 0107 680A Engine stand 	For disassembly/ assembly of engine	49 0636 007 Body 	For disassembly/ assembly of engine
49 V101 009 Bolt (HA) 	For disassembly/ assembly of engine	49 W065 006 Attachment set (SL, TF) 	For disassembly/ assembly of engine
49 W065 007 Collar A (Part of 49 W065 006) 	For disassembly/ assembly of engine	49 W065 008 Collar B (Part of 49 W065 006) 	For disassembly/ assembly of engine
49 W065 009 Bolt set (Part of 49 W065 006) 	For disassembly/ assembly of engine		

9TG0B2-141



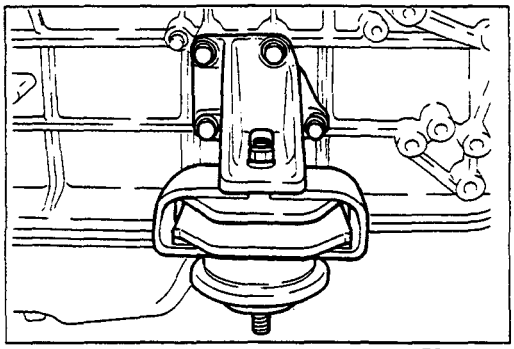
9TG0B2-142



9TG0B2-145

PROCEDURE
HA, SL Engine

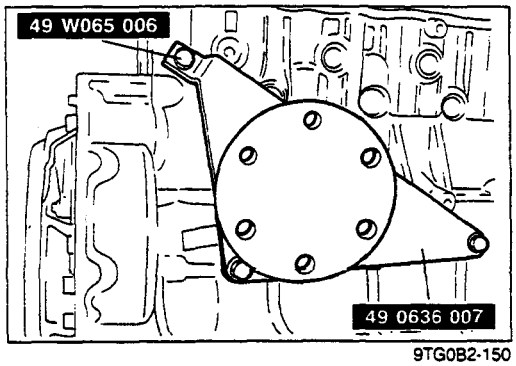
1. Remove the breather pipe (SL).
2. Remove the exhaust manifold and gasket.
3. Remove the alternator and alternator bracket.
4. Remove the right engine mount.
5. Remove the oil bypass filter and oil pipe.
6. Install the **SST (engine hanger)** to the holes shown in the figure.
7. Mount the engine on the **SST (engine stand)**.



9TG0B2-147

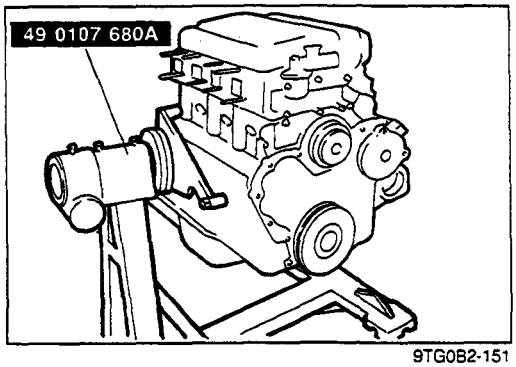
TF Engine

1. Remove the exhaust manifold and gasket.
2. Disconnect the oil hose.
3. Remove the right engine mount.



9TG0B2-150

4. Install the **SST (engine hanger)** to the holes shown in the figure.

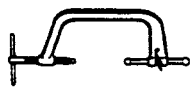
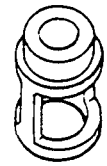
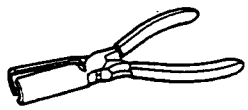
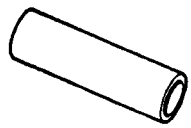
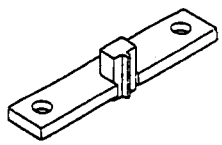
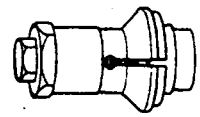
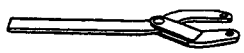
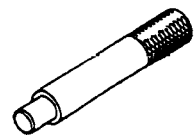
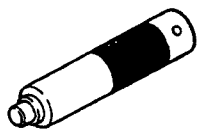
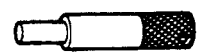
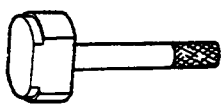
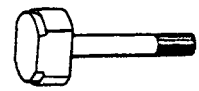


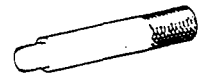
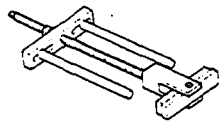
9TG0B2-151

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

DISASSEMBLY

PREPARATION
SST

49 0636 100A Arm, valve spring lifter 	For removal of valves	49 0107 222A Pivot 	For removal of valves
49 S120 170 Remover, valve seal 	For removal of valve seals	49 0636 165A Remover & installer, valve guide (HA) 	For removal of valve guides
49 0107 451A Remover & installer, valve guide (SL, TF) 	For removal of valve guides	49 V101 060A Brake, ring gear (HA, SL) 	For prevention of engine rotation
49 S501 062 Collar (HA) 	For prevention of engine rotation	49 W065 062 Collar (SL) 	For prevention of engine rotation
49 W011 103 Brake, ring gear (TF) 	For prevention of engine rotation	49 0559 210 Oil seal installer and centering tool (HA) 	For prevention of injection pump gear rotation
49 S120 710 Holder, coupling frange (TF) 	For prevention of camshaft gear rotation	49 0223 061 Remover & installer, piston pin (HA) 	For removal of piston pins
49 B043 002 Installer, bearing (SL) 	For removal of piston pins	49 0636 040 Installer, piston pin (TF) 	For removal of piston pins
49 1363 015 Replacer, cylinder liner (HA) 	For removal of cylinder liners	49 W065 015 Replacer, cylinder liner (SL) 	For removal of cylinder liners

49 W065 016 Body (Part of 49 W065 015) 	For removal of cylinder liners	49 W065 017 Handle (Part of 49 W065 015) 	For removal of cylinder liners
49 W010 1A0 Remover set, cylinder liner (TF) 	For removal of cylinder liners		

9TG0B2-152

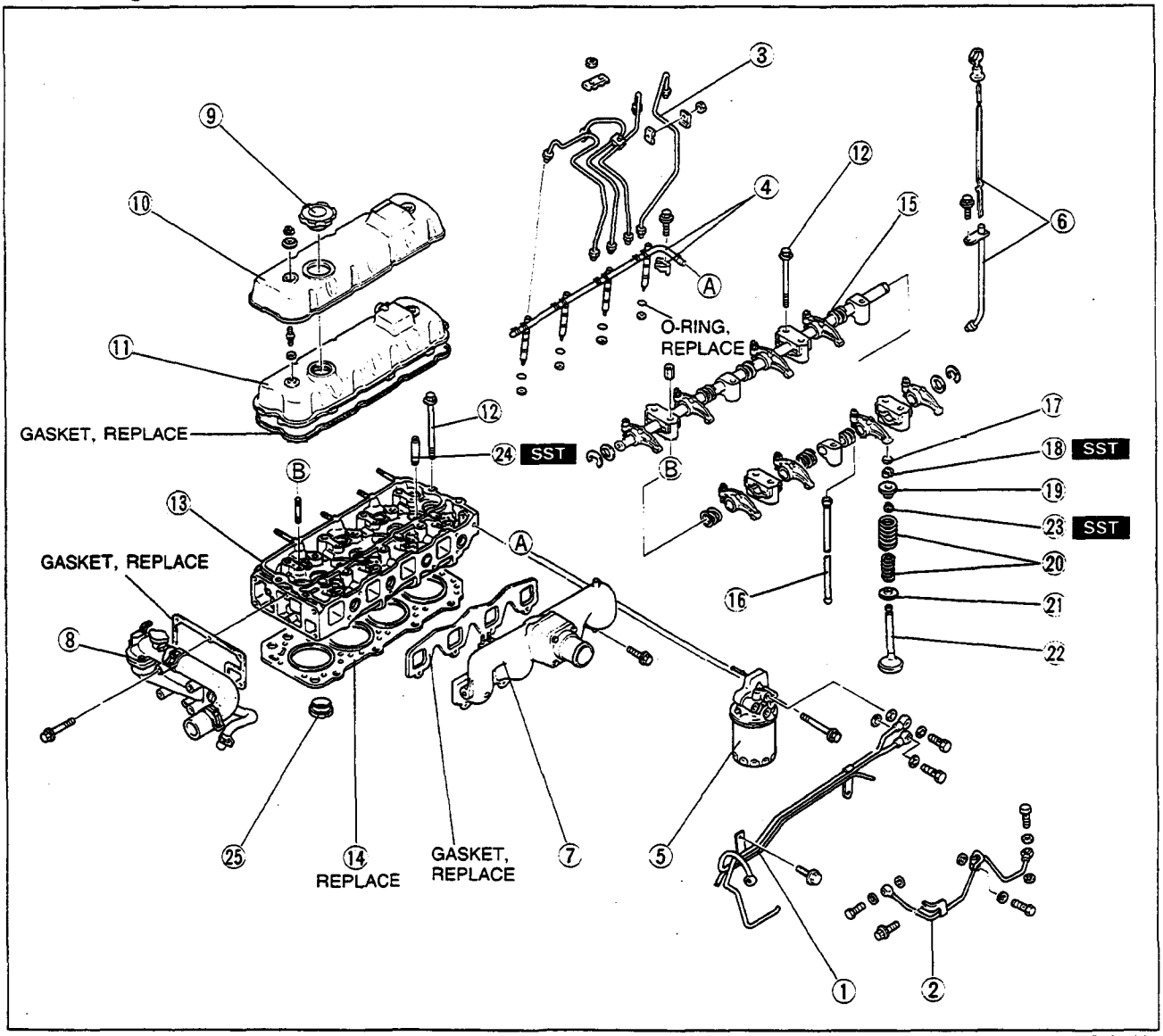
1. Code all identical parts (such as pistons, piston rings, connecting rods, and valve springs) so that they can be reinstalled in the cylinder from which they were removed.
2. Clean the parts with a steam cleaner. Blow off any remaining water with compressed air.

Note

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

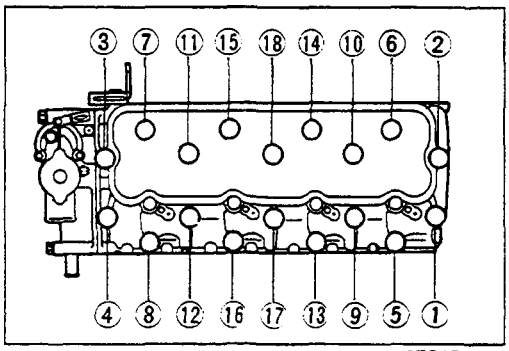
9TG0B2-153

CYLINDER HEAD
HA, SL Engine



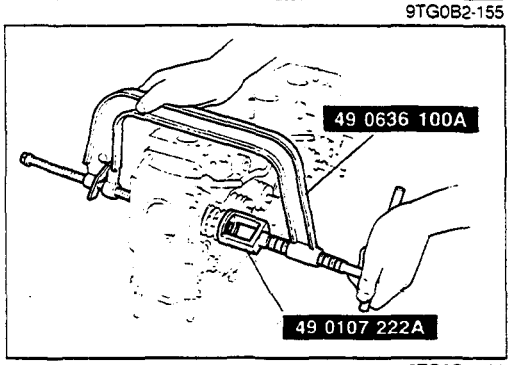
9TF0BX-032

1. Fuel pipe
2. Injection pump oil pipe (SL)
3. Injection pipe
4. Injection nozzle and nozzle holder
5. Fuel filter body
6. Oil level gauge and guide pipe
7. Intake manifold assembly
8. Water outlet housing
9. Oil filler cap
10. Seal cover (SL)
11. Cylinder head cover
12. Cylinder head bolt
    Disassembly Note ..... page B–61
13. Cylinder head
    Inspection ..... page B–76
14. Cylinder head gasket
15. Rocker arm assembly
    Inspection ..... page B–79
16. Push rod
17. Valve cap
18. Valve keeper
    Disassembly Note ..... page B–61
19. Valve spring seat, upper
20. Valve spring (outer and inner)
    Inspection ..... page B–79
21. Valve spring seat, lower
22. Valve
    Inspection ..... page B–76
23. Valve seal
    Disassembly Note ..... page B–61
    Inspect for wear or damage
24. Valve guide
    Disassembly Note ..... page B–61
25. Combustion chamber insert (HA)
    Disassembly Note ..... page B–62



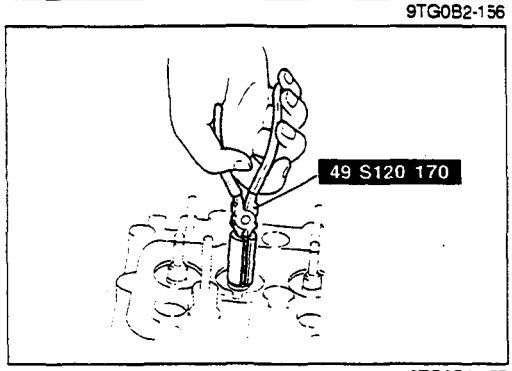
9TG0B2-155

Disassembly Note
Cylinder head bolt
1. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.
2. Remove the cylinder head bolts.



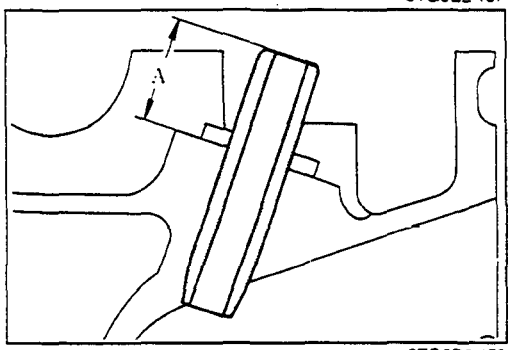
9TG0B2-156

Valve keeper
1. Set the **SST** against the upper valve spring seat as shown in the figure.
2. Remove the valve keepers.



9TG0B2-157

Valve seal
1. Remove the valve seal with the **SST**.



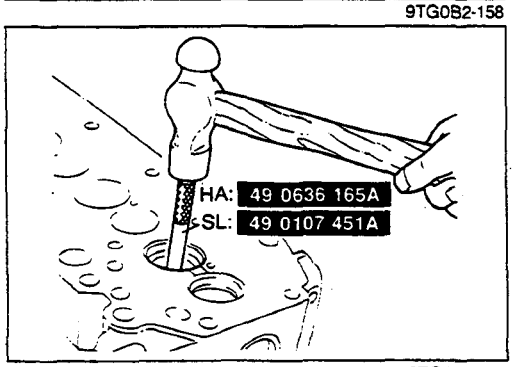
9TG0B2-158

Valve guide

Caution
- **If the valve guide is removed, it must be replaced with a new one.**

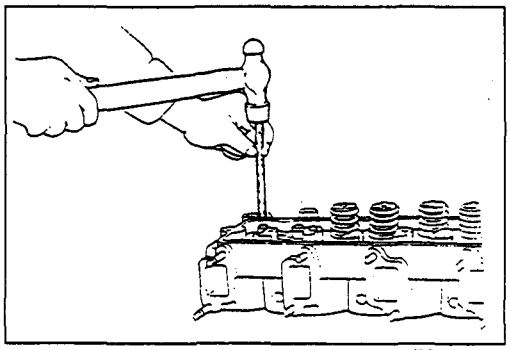
1. Measure height A of each valve guide.

Height A: 15.2—15.4mm (0.598—0.606 in)



9TG0B2-159

2. If height A is not within specification, replace the valve guide.
3. Remove the valve guide from the side opposite the combustion chamber with the **SST**.

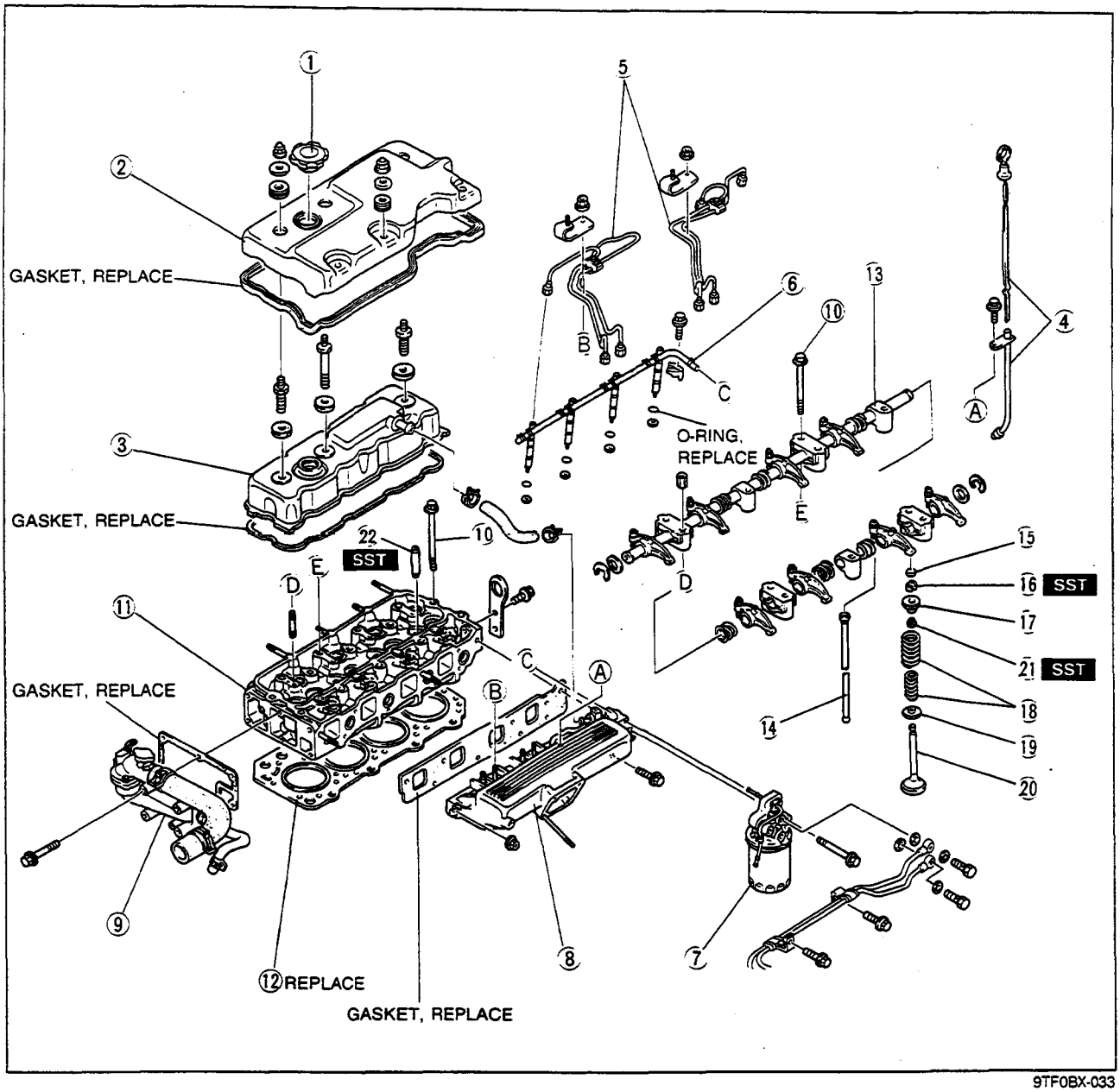


9TG0B2-160

Combustion chamber insert

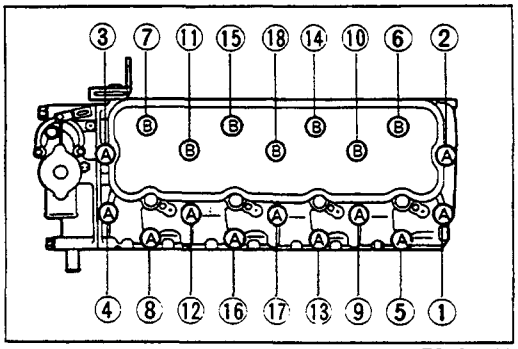
1. Inspect the combustion chamber insert for damage and cracks.
2. If necessary, remove the insert with a suitable mandrel, tapping through the nozzle hole.

TF Engine



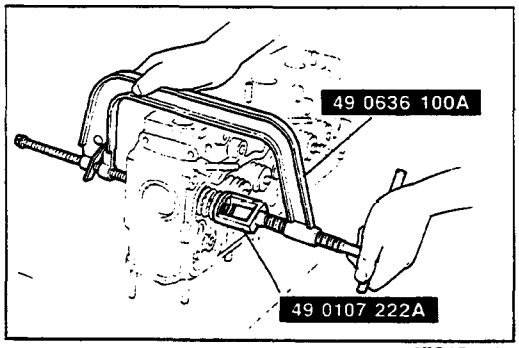
9TF0BX-033

1. Oil filler cap
2. Seal cover
3. Cylinder head cover
4. Oil level gauge and guide pipe
5. Injection pipe
6. Injection nozzle and nozzle holder
7. Fuel filter body
8. Intake manifold assembly
9. Water outlet housing
10. Cylinder head bolt
    Disassembly Note ..... page B–64
11. Cylinder head
    Inspection ..... page B–76
12. Cylinder head gasket
13. Rocker arm assembly
    Inspection ..... page B–79
14. Push rod
15. Valve cap
16. Valve keeper
    Disassembly Note ..... page B–64
17. Valve spring seat, upper
18. Valve spring (outer and inner)
    Inspection ..... page B–79
19. Valve spring seat, lower
20. Valve
    Inspection ..... page B–76
21. Valve seal
    Disassembly Note ..... page B–64
    Inspect for wear or damage
22. Valve guide
    Disassembly Note ..... page B–64



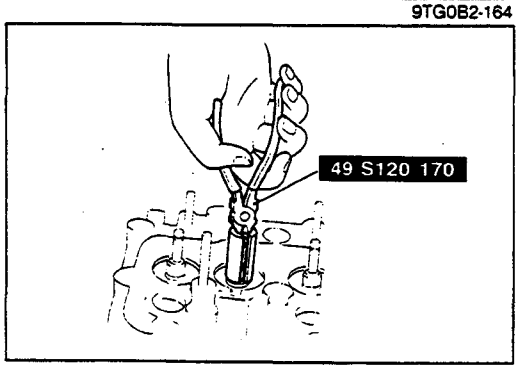
9TG0B2-163

Disassembly Note
Cylinder head bolt
1. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.
2. Remove the cylinder head bolts.



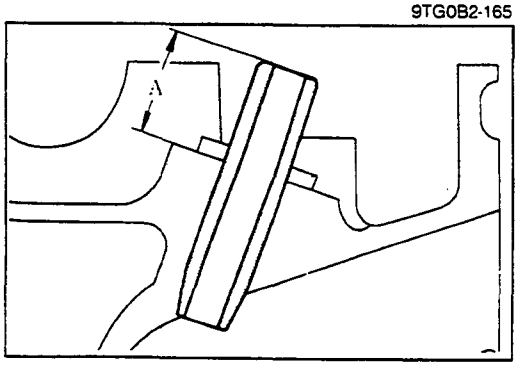
9TG0B2-164

Valve keeper
1. Set the **SST** against the upper valve spring seat as shown in the figure.
2. Remove the valve keepers.



9TG0B2-165

Valve seal
1. Remove the valve seal with the **SST**.



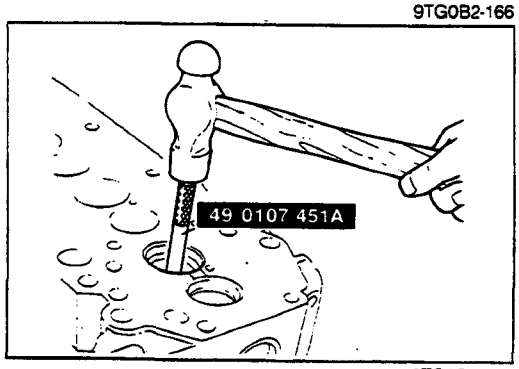
9TG0B2-166

Valve guide

Caution
- **If the valve guide is removed, it must be replaced with a new one.**

1. Measure height A of each valve guide.

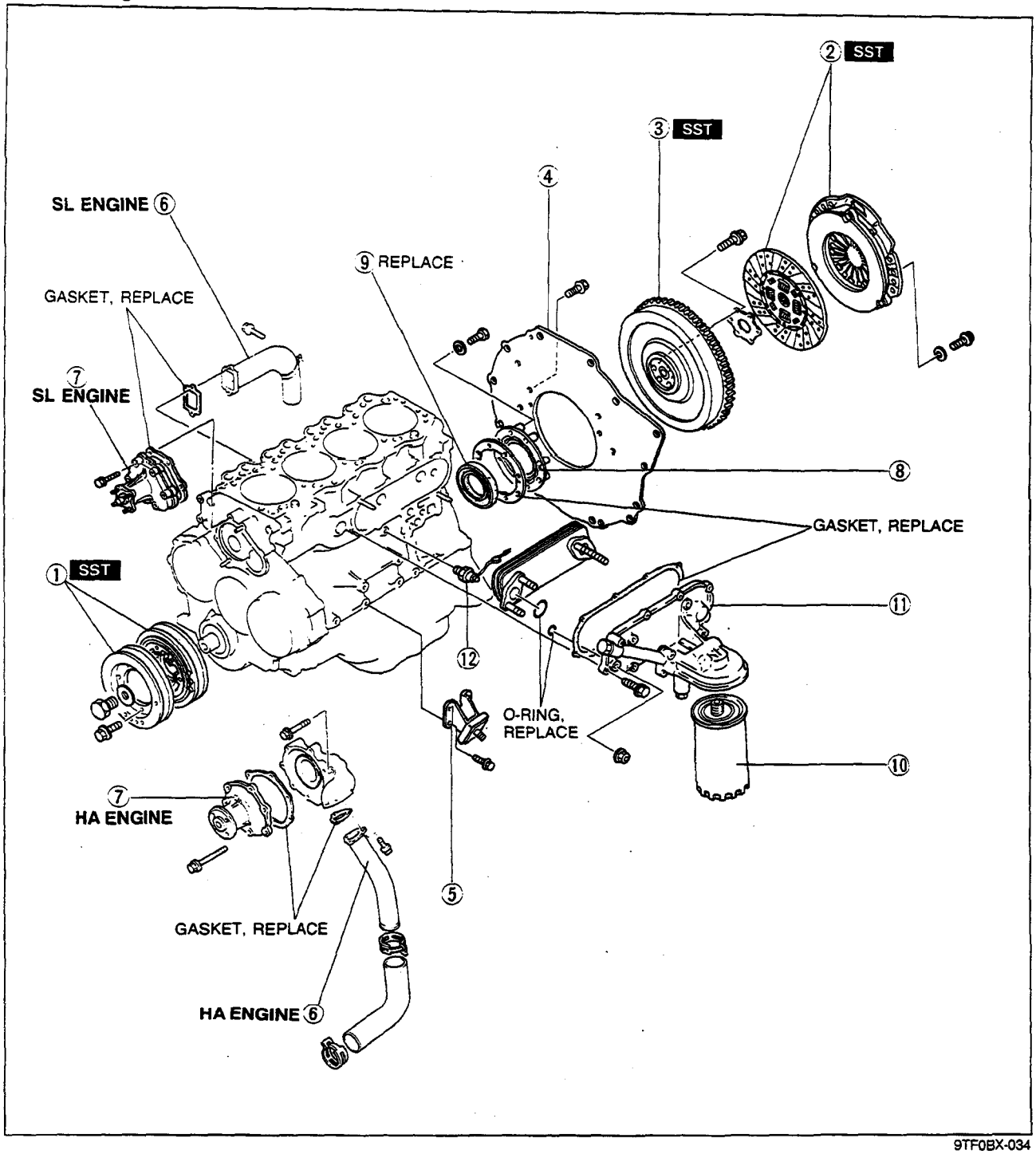
Height A: 14.2—14.4mm (0.559—0.567 in)



9TG0B2-167

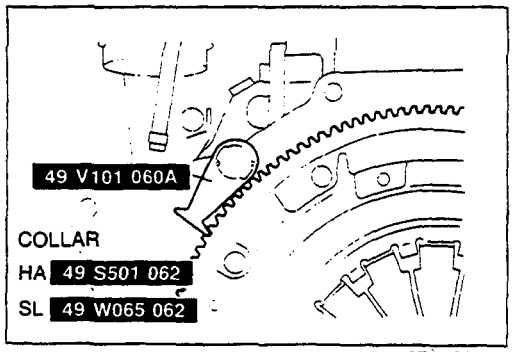
2. If height A is not within specification, replace the valve guide.
3. Remove the valve guide from the side opposite the combustion chamber with the **SST**.

CYLINDER BLOCK (EXTERNAL PARTS I)
HA, SL Engine



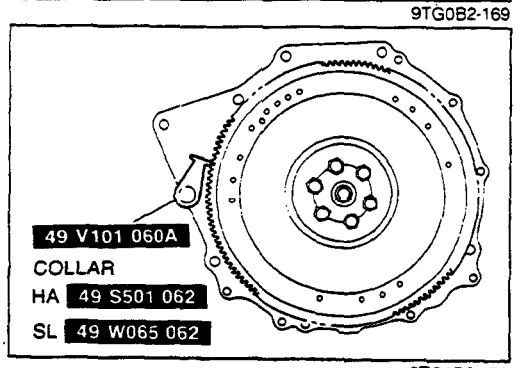
9TF0BX-034

1. Crankshaft pulley
   Disassembly Note ..... page B–66
2. Clutch cover, clutch disc
   Service ..... Section H
3. Flywheel
   Disassembly Note ..... page B–66
   Inspect for wear or damage
4. End plate
5. Left engine mount
6. Water inlet pipe
7. Water pump
   Service ..... Section E
8. Rear oil seal cap
9. Rear oil seal
10. Oil filter
11. Oil cooler
    Service ..... Section D
12. Oil pressure switch



9TG0B2-169

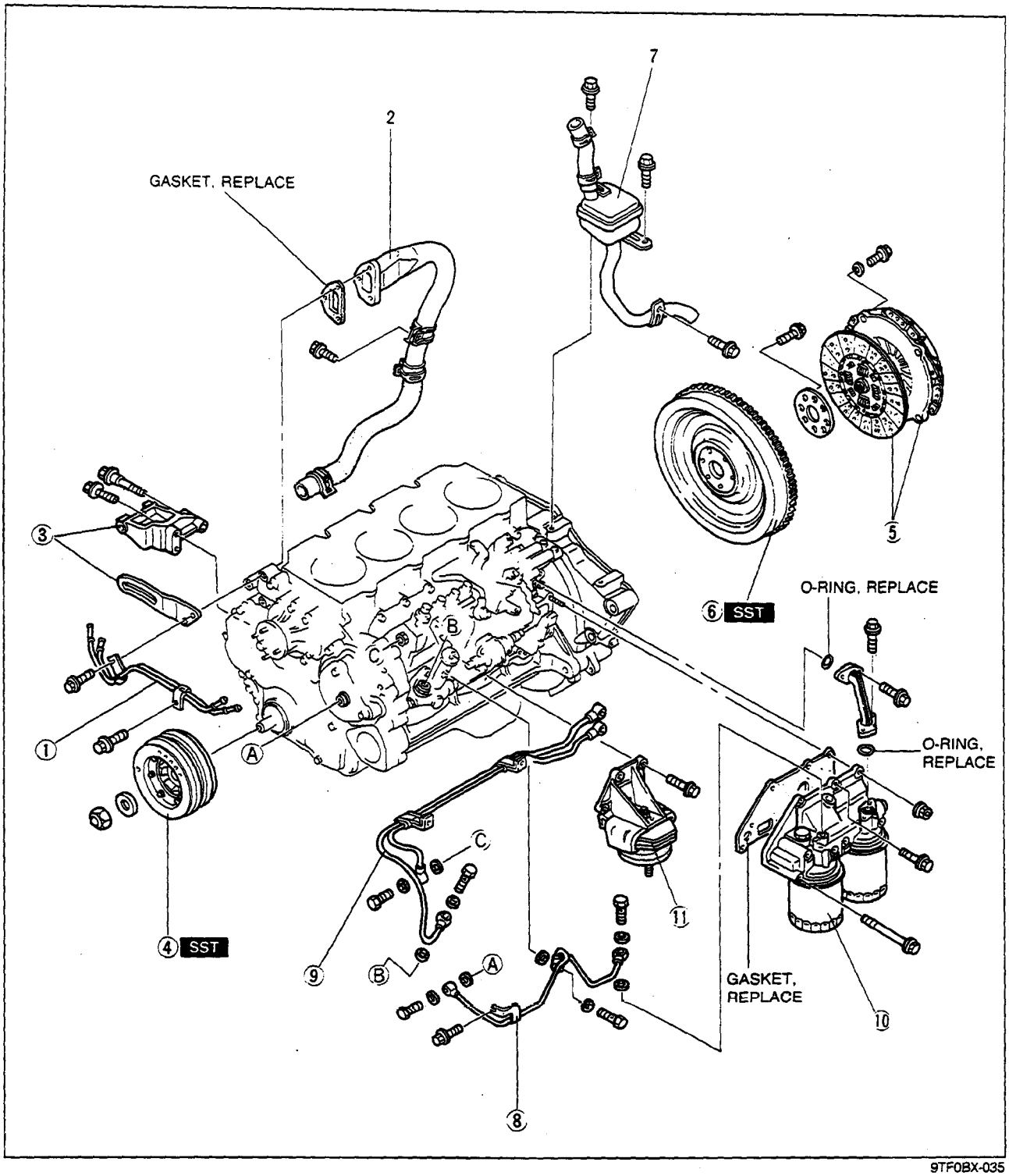
Disassembly Note
Crankshaft pulley
1. Hold the flywheel with the **SST**.
2. Loosen the pulley lock bolt.
3. Remove the lock bolt, washer, and crankshaft pulley.



9TG0B2-170

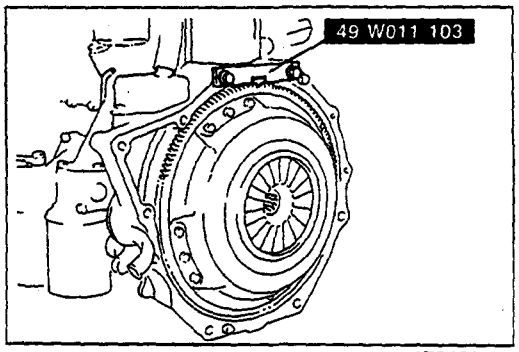
Flywheel
1. Hold the flywheel with the **SST**.
2. Loosen the flywheel lock bolts.
3. Remove the lock bolts, washers, and flywheel.

TF Engine



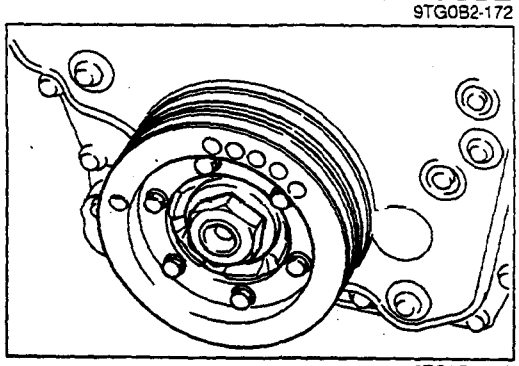
9TF0BX-035

1. Vacuum pipe
2. Water pipe
3. Alternator bracket
4. Crankshaft pulley
   Disassembly Note ..... page B–68
5. Clutch cover, clutch disc
   Service ..... Section H
6. Flywheel
   Disassembly Note ..... page B–68
   Inspect for wear or damage
7. PCV chamber
8. Oil pipe
9. Fuel pipe
10. Oil filter body
11. Left engine mount

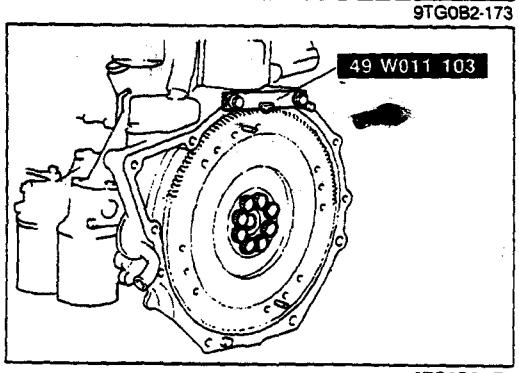


9TG0B2-172

Disassembly Note
Crankshaft pulley
1.Hold the flywheel with the **SST**.
2. Loosen the pulley locknut.


9TG0B2-173

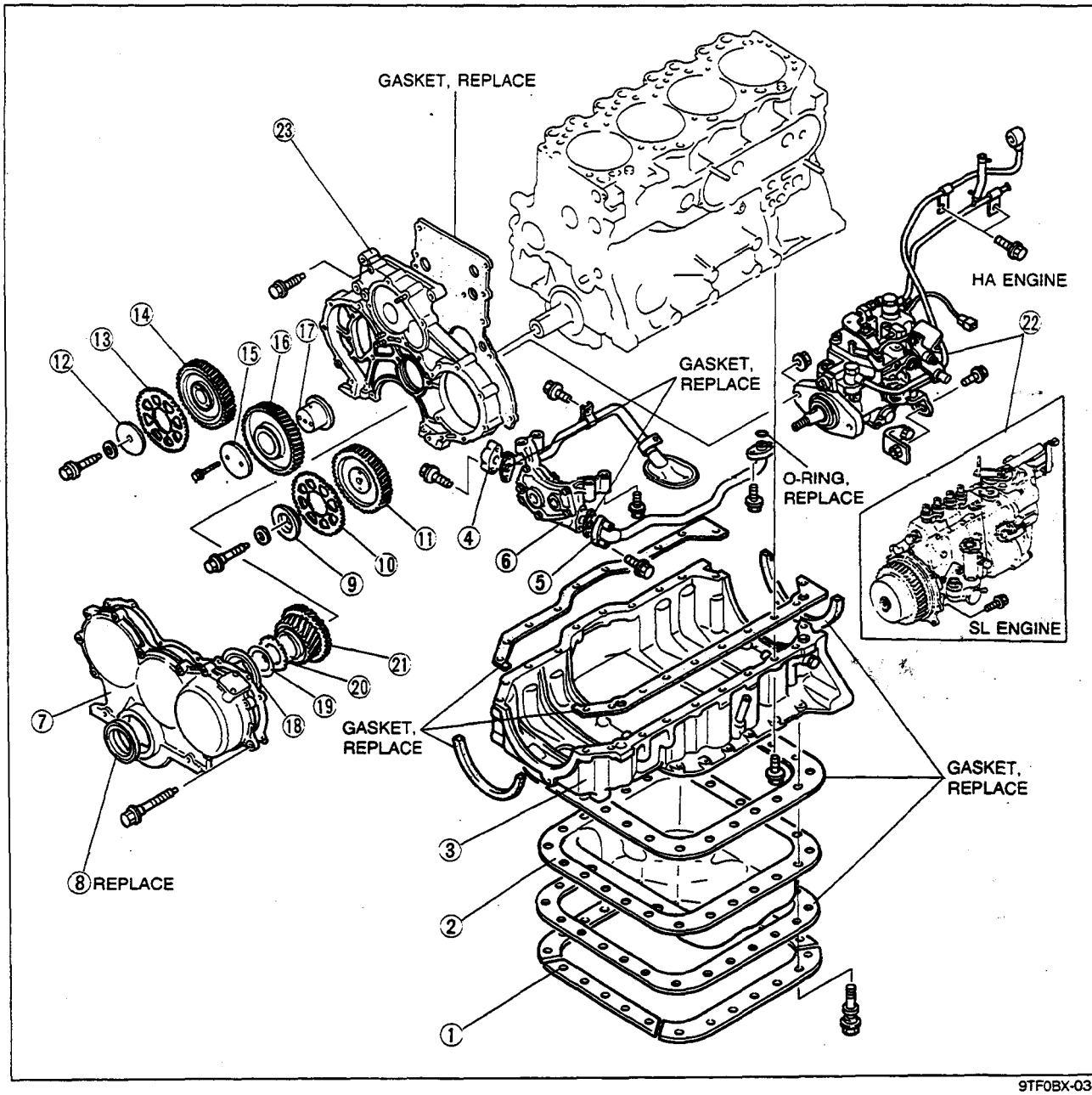
3. Remove the locknut, washer, and crankshaft pulley.



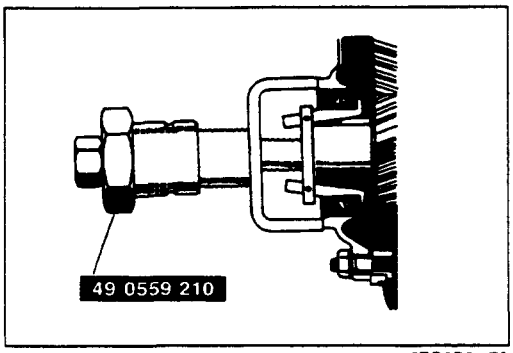
9TG0B2-174

Flywheel
1. Hold the flywheel with the **SST**.
2. Loosen the flywheel lock bolts.
3. Remove the lock bolts, washers, and flywheel.

CYLINDER BLOCK (EXTERNAL PARTS II)
HA, SL Engine



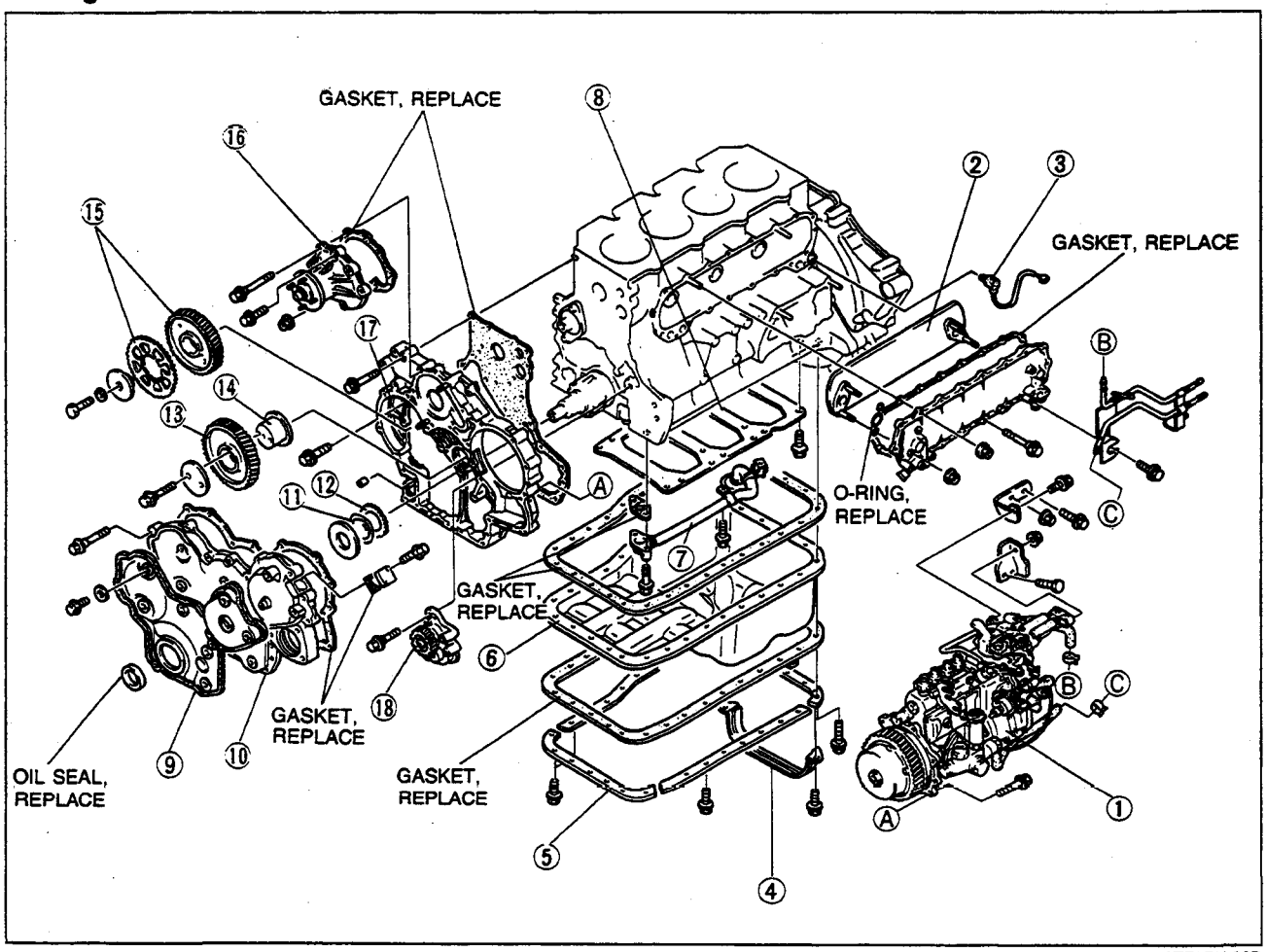
1. Stiffener
2. Oil pan
   Inspect for cracks, deformation, and damage
3. Oil pan upper block
4. Oil strainer
5. Oil pipe
6. Oil pump
   Service ..... Section D
7. Timing gear cover
8. Front oil seal
   Disassembly Note ..... page B–70
9. Lock plate (HA)
10. Friction gear (HA)
11. Injection pump gear (HA)
12. Lock plate
13. Friction gear
14. Camshaft gear
15. Thrust plate
16. Idler gear
17. Idler gear spindle
18. Oil deflector
19. Friction gear spring
20. Friction gear
21. Crankshaft timing gear
22. Fuel injection pump
    Service ..... Section F
23. Timing gear case



9TG0B2-178

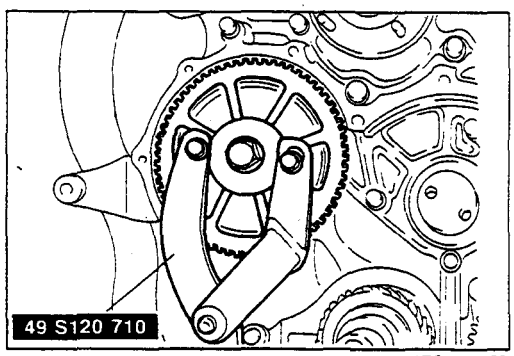
Disassembly Note
Front oil seal (HA)
1. Assemble the **SST** as shown in the figure.
2. Set the **SST** against the oil seal and remove it by tightening the center bolt.

TF Engine



9TF0BX-037

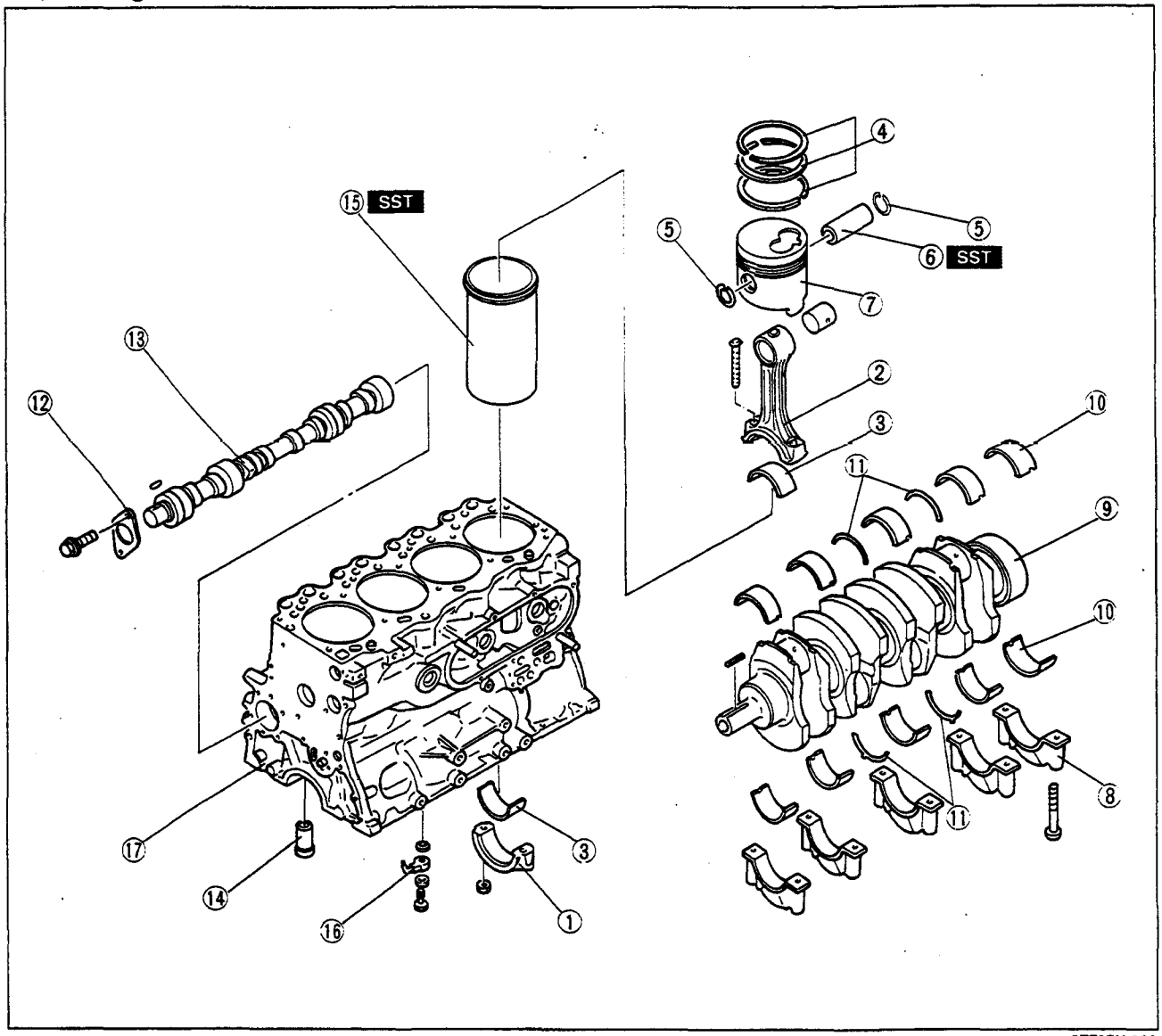
1. Fuel injection pump
2. Oil cooler
   Service ..... Section D
3. Oil pressure switch
4. Seal plate
5. Stiffener
6. Oil pan
   Inspect for cracks, deformation, and damage
7. Oil strainer
8. Stiffening plate
9. Timing gear cover insulator
10. Timing gear cover
11. Friction gear spring
12. Friction gear
13. Idler gear
14. Idler gear spindle
15. Camshaft gear and friction gear
    Disassembly Note ..... page B–71
16. Water pump
17. Timing gear case
18. Oil pump
    Service ..... Section D



9TG0B2-177

Disassembly Note
Camshaft gear and friction gear
1. Hold the camshaft gear with the **SST**.
2. Remove the camshaft gear lock bolt.
3. Remove the friction gear.
4. Remove the camshaft gear.

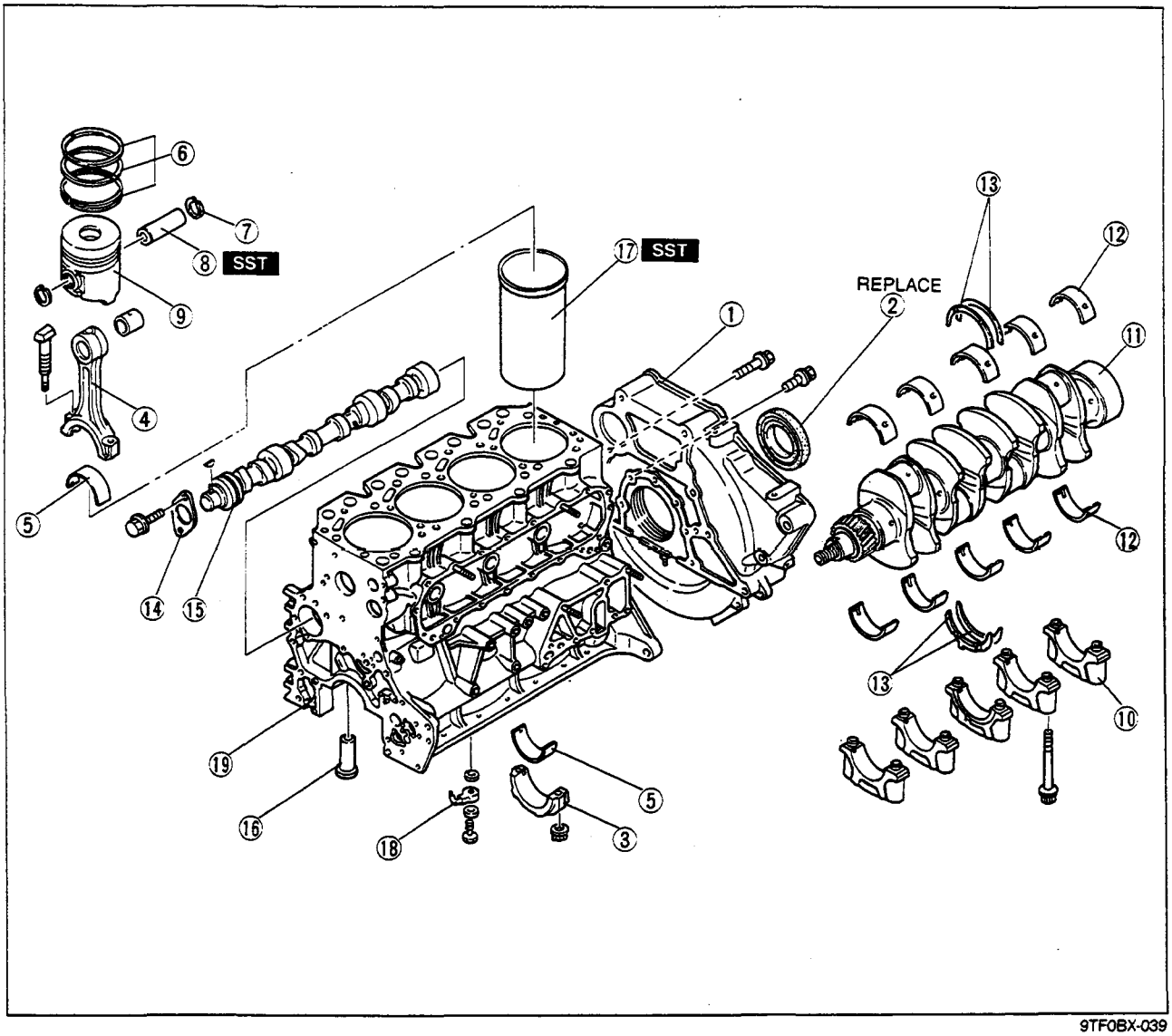
CYLINDER BLOCK (INTERNAL PARTS)
HA, SL Engine



9TF0BX-038

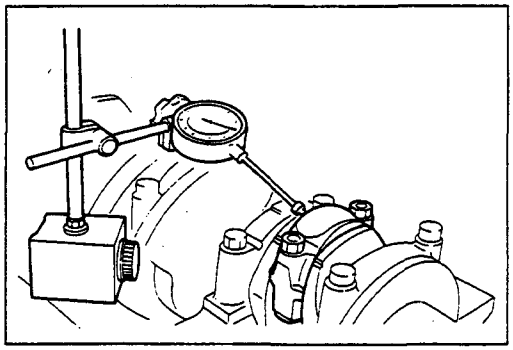
1. Connecting rod cap
   Disassembly Note ..... page B–74
2. Connecting rod
   Disassembly Note ..... page B–74
   Inspection ..... page B–83
3. Connecting rod bearing
   Inspection ..... page B–85
4. Piston ring
   Disassembly Note ..... page B–74
   Inspection ..... page B–82
5. Piston pin clip
6. Piston pin
   Disassembly Note ..... page B–74
   Inspection ..... page B–83
7. Piston
   Inspection ..... page B–81
8. Main bearing cap
   Disassembly Note ..... page B–75
9. Crankshaft
   Disassembly Note ..... page B–75
   Inspection ..... page B–84
10. Main bearing
    Inspection ..... page B–85
11. Thrust bearing
12. Camshaft thrust plate
13. Camshaft
    Inspection ..... page B–85
14. Tappet
    Inspection ..... page B–87
15. Cylinder liner
    Disassembly Note ..... page B–75
    Inspection ..... page B–80
16. Oil jet
    Inspection ..... page B–87
17. Cylinder block
    Inspection ..... page B–80

TF Engine



9TF0BX-039

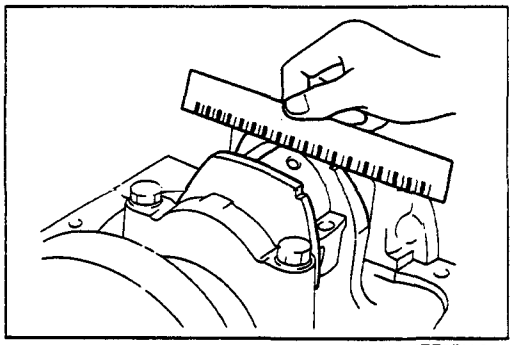
1. End plate
2. Rear oil seal
3. Connecting rod cap
   Disassembly Note ..... page B–74
4. Connecting rod
   Disassembly Note ..... page B–74
   Inspection ..... page B–83
5. Connecting rod bearing
   Inspection ..... page B–85
6. Piston ring
   Disassembly Note ..... page B–74
   Inspection ..... page B–82
7. Piston pin clip
8. Piston pin
   Disassembly Note ..... page B–74
   Inspection ..... page B–83
9. Piston
   Inspection ..... page B–81
10. Main bearing cap
    Disassembly Note ..... page B–75
11. Crankshaft
    Disassembly Note ..... page B–75
    Inspection ..... page B–84
12. Main bearing
    Inspection ..... page B–85
13. Thrust bearing
14. Camshaft thrust plate
15. Camshaft
    Inspection ..... page B–85
16. Tappet
    Inspection ..... page B–87
17. Cylinder liner
    Disassembly Note ..... page B–75
    Inspection ..... page B–80
18. Oil jet
    Inspection ..... page B–87
19. Cylinder block
    Inspection ..... page B–80



9TF0BX-040

Disassembly Note
Connecting rod cap

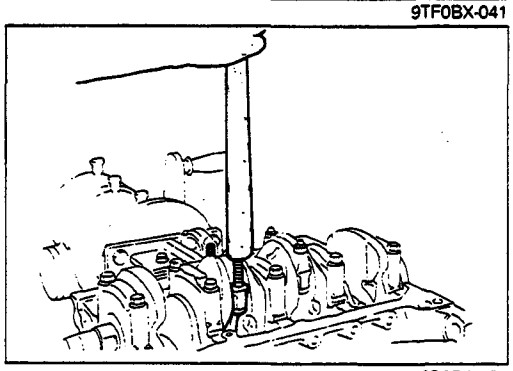
1. Before removing the connecting rod caps, measure the connecting rod side clearance. (Refer to page B–96.)



9TF0BX-041

Connecting rod

1. Before removing the connecting rods, measure the connecting rod oil clearance. (Refer to page B–95.)

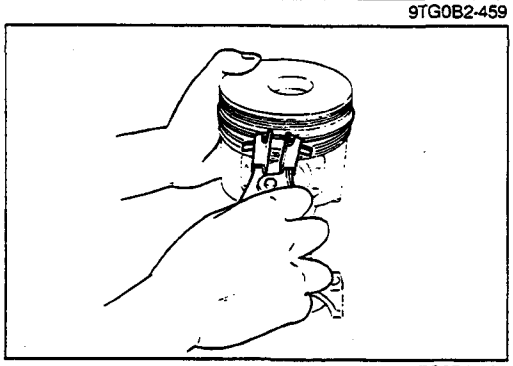


9TG0B2-459

2. Remove the Plastigage from the crankpin journals.

Caution
- **Do not scratch the crankpin journal or the cylinder liner.**
- **Protect the connecting rod bolts with rubber sleeves to prevent damage to the crankpin journal.**

3. Use the handle of a hammer to remove the piston and connecting rod assembly through the top of the cylinder block.

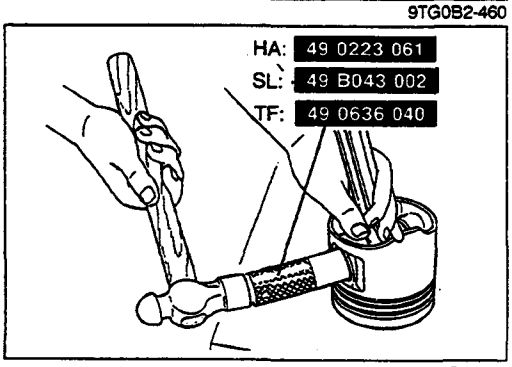


9TG0B2-460

Piston ring

Caution
- **Do not apply excessive tension, which may cause a ring to break.**

1. Remove the piston rings with a piston ring expander (commercially available).

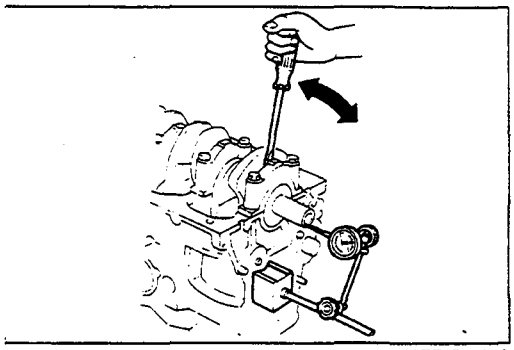


05U0BX-114

Piston pin

Caution
- **Mark the connecting rod direction for proper reassembly.**

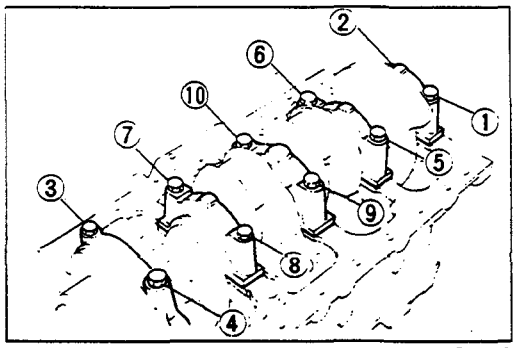
1. Remove the piston pin with the **SST**.



9TF0BX-042

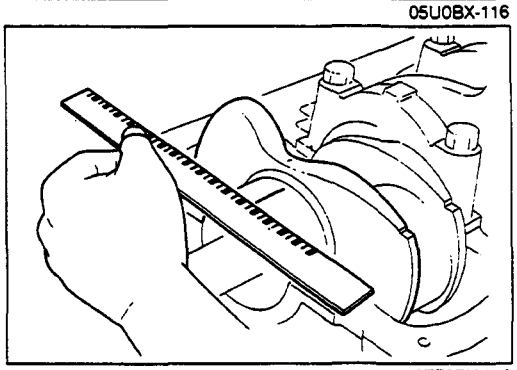
Main bearing cap

1. Before removing the main bearing caps, measure the crankshaft end play. (Refer to page B–94.)



05U0BX-116

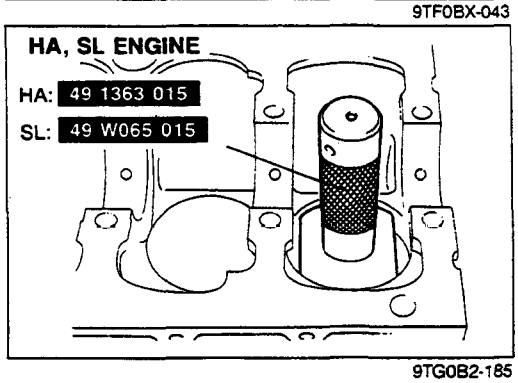
2. Loosen the main bearing cap bolts in two or three steps in the order shown in the figure.
3. Remove the main bearing caps.



9TF0BX-043

Crankshaft

1. Before removing the crankshaft, measure the main bearing oil clearances. (Refer to page B–92.)



9TG0B2-185

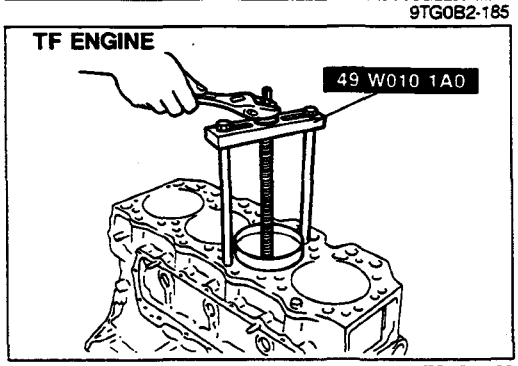
Cylinder liner

1. Mark the cylinder liner and the cylinder block for proper reassembly.

Note

- **If necessary, remove the cylinder liner with the SST.**

2. Remove the cylinder liner by hand.



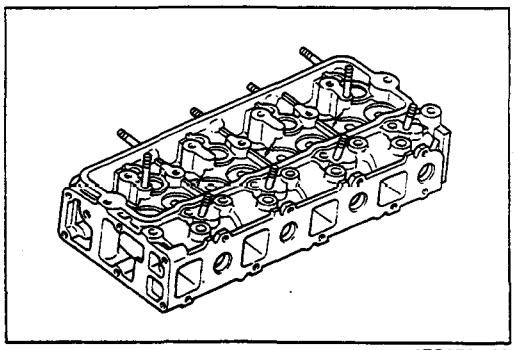
9TG0B2-186

INSPECTION / REPAIR

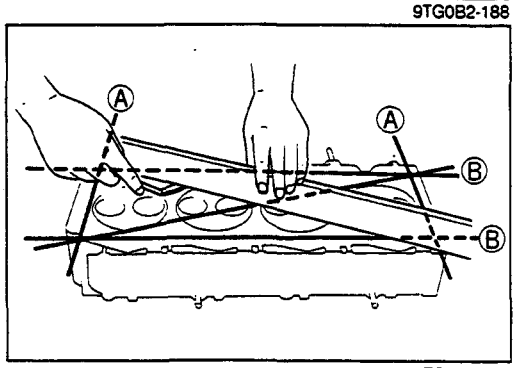
1. Clean all parts, being sure to remove all gasket fragments, dirt, oil or grease, carbon, moisture residue, and other foreign materials.
2. Inspection and repairs must be performed in the order specified.

Caution
- **Do not damage the joints or friction surfaces of aluminum alloy components (such as the pistons).**

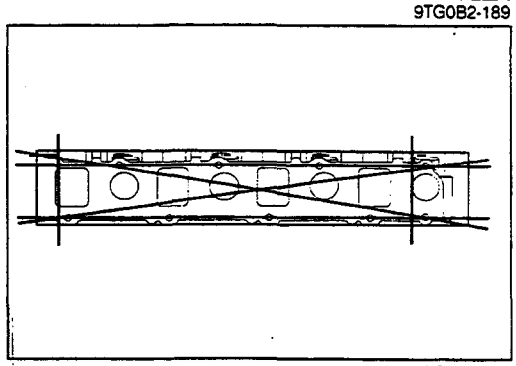
9TG0B2-187



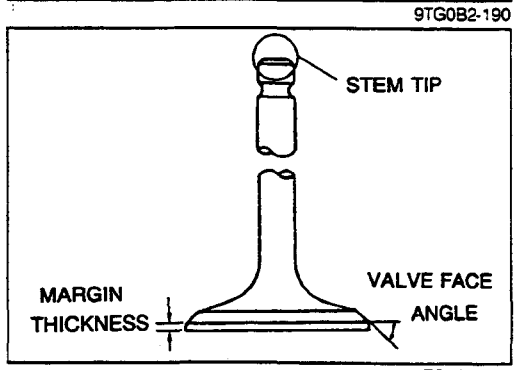
9TG0B2-188



9TG0B2-189



9TG0B2-190



9TG0B2-191

CYLINDER HEAD

1. Inspect the cylinder head for damage, cracks, and leakage of water and oil. Replace the cylinder head if necessary.
2. Measure the cylinder head distortion in the six directions shown in the figure.

Distortion Ⓐ: 0.10mm (0.004 in) max.
Ⓑ: 0.25mm (0.010 in) max.

3. If the cylinder head distortion exceeds specification, replace the cylinder head.

4. Measure the manifold contact surface distortion in the four directions shown in the figure.

Distortion: 0.10mm (0.004 in) max.

5. If distortion exceeds specification, replace the cylinder head.

VALVE MECHANISM

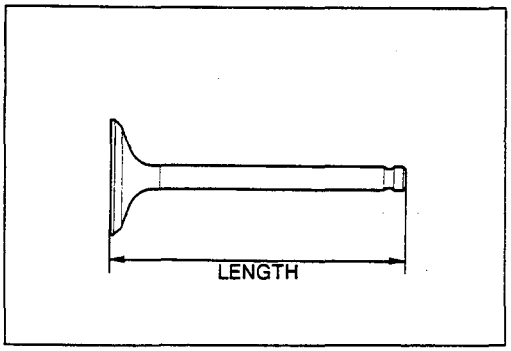
Valve and Valve Guide

1. Inspect each valve for the following. Replace or resurface the valve as necessary.
   (1) Damaged or bent stem.
   (2) Rough or damaged face.
   (3) Damaged or unevenly worn stem tip.
2. Measure the valve head margin thickness of each valve. Replace valves as necessary.

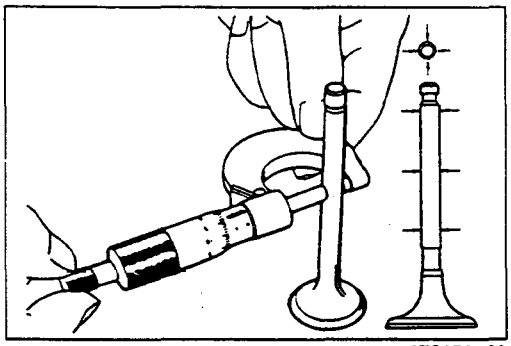
Margin thickness

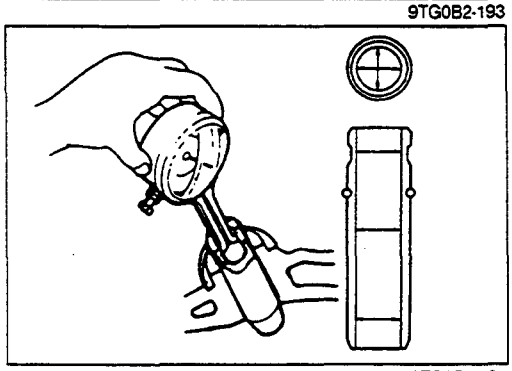
mm (in) min.

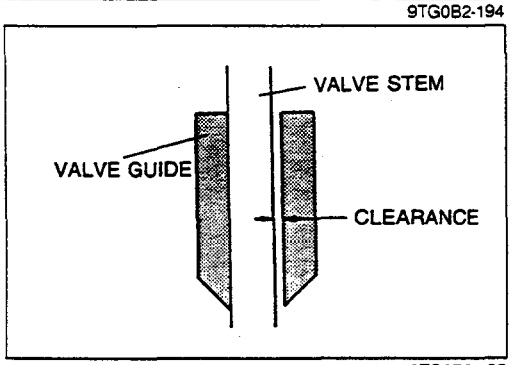
	HA	SL	TF
IN		1.0 (0.039)	
EX	1.0 (0.039)	1.2 (0.047)	1.5 (0.059)



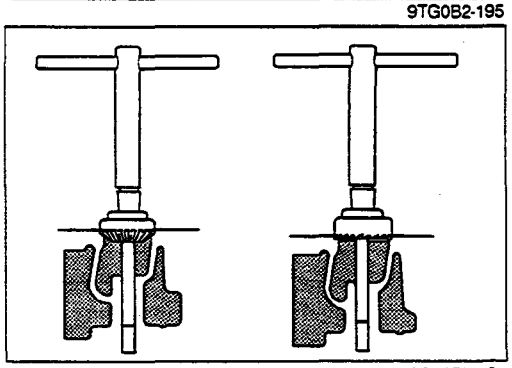
9TG0B2-192


9TG0B2-193


9TG0B2-194



9TG0B2-195


05U0BX-131

3. Measure the length of each valve at the points shown.

Length

mm (in)

		Standard	Minimum
HA	IN	114.6 (4.512)	114.1 (4.492)
	EX	114.6 (4.512)	114.1 (4.492)
SL	IN	114.6 (4.512)	114.1 (4.492)
	EX	114.5 (4.508)	114.0 (4.488)
TF	IN	119.7 (4.713)	119.2 (4.693)
	EX	119.3 (4.697)	118.8 (4.677)

4. Measure the stem diameter of each valve.

Diameter

mm (in)

HA	IN	8.955—8.980 (0.3526—0.3535)
	EX	8.935—8.960 (0.3518—0.3528)
SL TF	IN	8.965—8.980 (0.3530—0.3535)
	EX	8.945—8.960 (0.3522—0.3528)

5. Measure the inner diameter of each valve guide at the points shown.

Inner diameter
IN : 9.018—9.033mm (0.3550—0.3556 in)
EX: 9.018—9.033mm (0.3550—0.3556 in)

6. Subtract the outer diameter of the valve stem from the inner diameter of the corresponding valve guide to calculate the valve stem to guide clearance.

Clearance

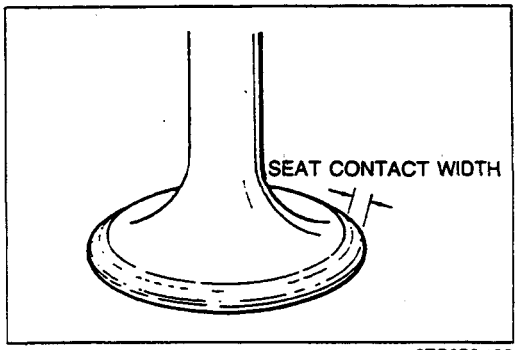
mm (in)

		Standard	Maximum
HA	IN	0.038—0.078 (0.0015—0.0031)	0.127 (0.0050)
	EX	0.058—0.098 (0.0023—0.0039)	
SL TF	IN	0.038—0.068 (0.0015—0.0027)	
	EX	0.058—0.088 (0.0023—0.0035)	

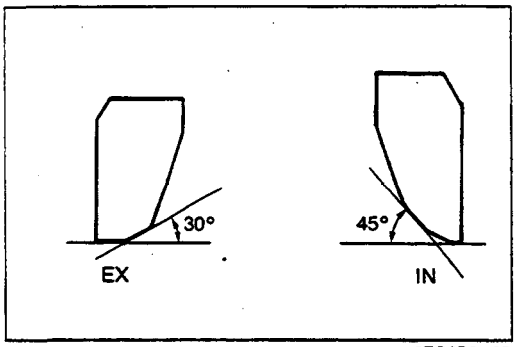
7. If the clearance exceeds specification, replace the valve and/or valve guide.

Valve Seat

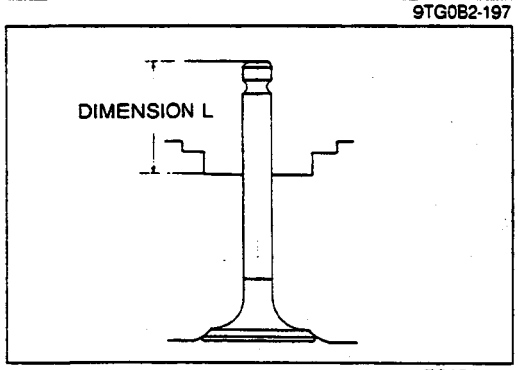
1. Inspect the contact surface of each valve seat and valve face for the following.
   (1) Roughness.
   (2) Damage.
2. If necessary, resurface the valve seat with a **45° (IN) or 30° (EX)** valve seat cutter and/or resurface the valve face.
3. Apply a thin coat of Prussian blue to the valve face.
4. Inspect the valve seating by pressing the valve against the seat.
   (1) If blue does not appear 360° around the valve face, replace the valve.
   (2) If blue does not appear 360° around the valve seat, resurface the seat.



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5. Measure the seat contact width.

Width

mm (in)

	IN	EX
HA	2.0 (0.079)	2.0 (0.079)
SL, TF	1.7 (0.067)	1.7 (0.067)

6. Verify that the valve seating position is at the center of the valve face.
7. If the seating position is too high or too low, correct the valve seat with valve seat cutter.
8. Seat the valve to the valve seat with lapping compound.

9. Inspect the sinking of the valve seat.
10. Measure the protruding length **(dimension L)** of the valve stem.

Dimension L

mm (in)

	IN	EX
HA	48.05 (1.892)	48.05 (1.892)
SL	48.05 (1.892)	47.95 (1.888)
TF	48.40 (1.906)	48.40 (1.906)

(1) If **dimension L** is as below, no correction needed.

	IN	EX
HA	48.05—48.55 (1.892—1.911)	48.05—48.55 (1.892—1.911)
SL	48.05—48.55 (1.892—1.911)	47.95—48.45 (1.888—1.907)
TF	48.40—48.90 (1.906—1.925)	48.40—48.90 (1.906—1.925)

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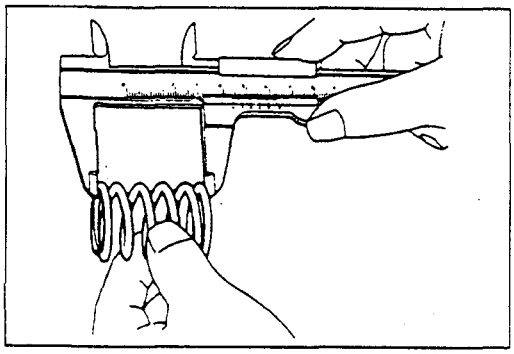
(2) If **dimension L** is as below, adjust with washer on spring seat area of cylinder head.

	IN	EX
HA	48.55—49.55 (1.911—1.951)	48.55—49.55 (1.911—1.951)
SL	48.55—49.55 (1.911—1.951)	48.45—49.45 (1.907—1.947)
TF	48.90—49.90 (1.925—1.965)	48.90—49.90 (1.925—1.965)

(3) If **dimension L** is more than as below, replace cylinder head.

	IN	EX
HA	49.55 (1.951)	49.55 (1.951)
SL	49.55 (1.951)	49.45 (1.947)
TF	49.90 (1.965)	49.90 (1.965)

9TG0B2-200



9TG0B2-201

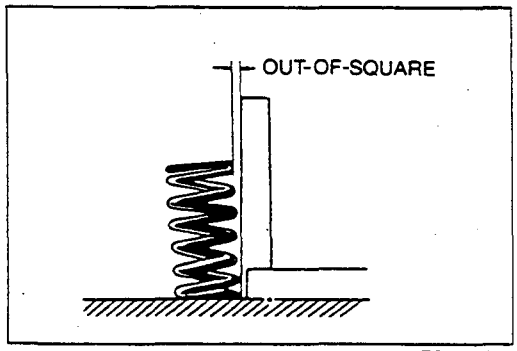
Valve Spring

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

Free length

mm (in)

			Standard	Minimum
HA	IN	Inner	44.1 (1.736)	43.1 (1.697)
		Outer	55.7 (2.193)	54.7 (2.154)
	EX	Inner	44.1 (1.736)	43.1 (1.697)
		Outer	55.7 (2.193)	54.7 (2.154)
SL (Non-Turbo)	IN	Inner	46.6 (1.835)	45.6 (1.795)
		Outer	53.1 (2.091)	52.1 (2.051)
	EX	Inner	46.6 (1.835)	45.6 (1.795)
		Outer	53.1 (2.091)	52.1 (2.051)
SL (Turbo)	IN	Inner	46.6 (1.835)	45.6 (1.795)
		Outer	53.1 (2.091)	52.1 (2.051)
	EX	Inner	49.4 (1.945)	48.4 (1.906)
		Outer	56.1 (2.209)	55.1 (2.169)
TF	IN	Inner	51.4 (2.024)	50.4 (1.984)
		Outer	59.5 (2.343)	58.5 (2.303)
	EX	Inner	51.4 (2.024)	50.4 (1.984)
		Outer	59.5 (2.343)	58.5 (2.303)

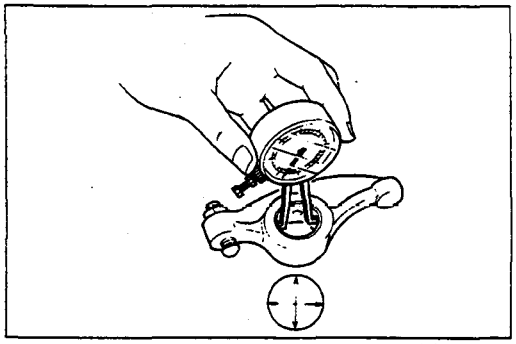


9TG0B2-202

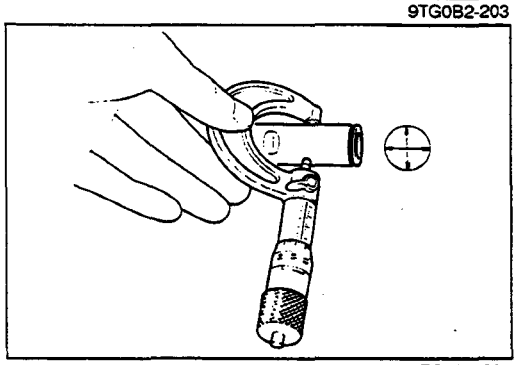
Out-of-square

mm (in) max.

		Outer	Inner
HA	IN	1.37 (0.0539)	1.25 (0.0492)
	EX	1.37 (0.0539)	1.25 (0.0492)
SL (Non-Turbo)	IN	1.85 (0.0728)	1.63 (0.0642)
	EX	1.85 (0.0728)	1.63 (0.0642)
SL (Turbo)	IN	1.85 (0.0728)	1.63 (0.0642)
	EX	1.96 (0.0772)	1.72 (0.0677)
TF	IN	2.07 (0.0815)	1.79 (0.0705)
	EX	2.07 (0.0815)	1.79 (0.0705)



9TG0B2-203



9TG0B2-204

ROCKER ARM ASSEMBLY

1. Check for wear or damage to the contact surfaces of the rocker arm and shaft. Replace if necessary.
2. Measure the rocker arm inner diameter.

Inner diameter

mm (in)

HA	15.876—15.896 (0.6250—0.6258)
SL (Non-Turbo)	19.000—19.021 (0.7480—0.7489)
SL (Turbo)	23.000—23.021 (0.9055—0.9063)
TF	21.000—21.021 (0.8268—0.8276)

3. Measure the rocker arm shaft diameter.

Diameter

mm (in)

HA	15.835—15.860 (0.6234—0.6244)
SL (Non-Turbo)	18.959—18.980 (0.7464—0.7472)
SL (Turbo)	22.959—22.980 (0.9039—0.9047)
TF	20.959—20.980 (0.8252—0.8260)

4. Subtract the outer diameter of the rocker shaft from the inner diameter of the rocker arm to calculate the rocker arm to shaft clearance.

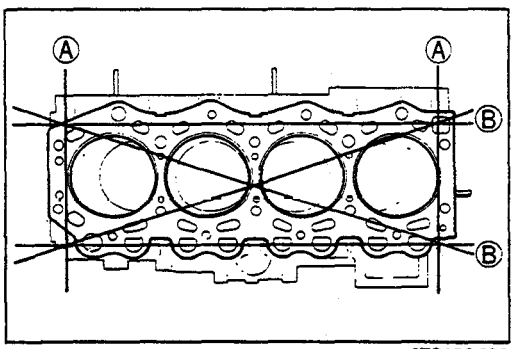
Clearance

mm (in)

	Standard	Maximum
HA	0.016—0.061 (0.0006—0.0024)	0.07 (0.003)
SL, TF	0.020—0.062 (0.0008—0.0024)	

5. If the clearance exceeds the maximum, replace the rocker arm and/or shaft.

9TG0B2-205

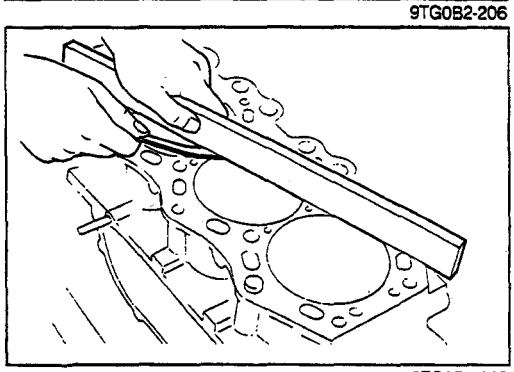


9TG0B2-206

CYLINDER BLOCK

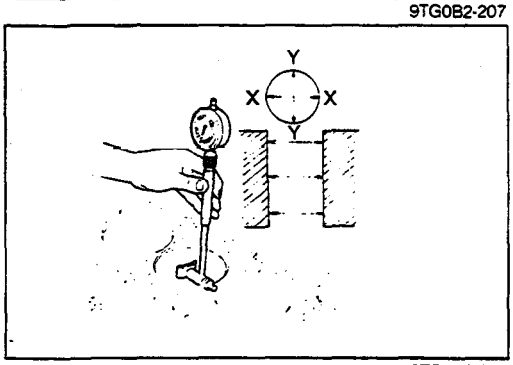
1. Inspect the cylinder block for the following. Repair or replace the cylinder block as necessary.
   (1) Leakage damage.
   (2) Cracks.
   (3) Scoring of cylinder liner.
2. Measure the distortion of the deck of the cylinder block in the six directions shown in the figure.

Distortion: Ⓐ : 0.10mm (0.004 in) max.
Ⓑ : 0.25mm (0.010 in) max.



9TG0B2-207

3. If the distortion exceeds specification, replace the cylinder block.



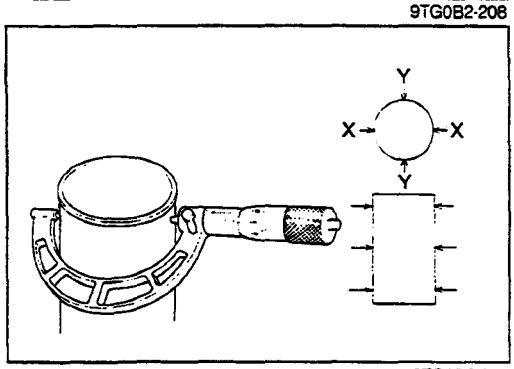
9TG0B2-208

4. Measure each cylinder liner bore in X and Y directions at three levels (upper, middle, and lower) as shown.

Cylinder liner bore diameter

mm (in)

	Mark	Bore diameter
HA	—	98.500— 98.526 (3.8779—3.8790)
SL	A	103.500—103.513 (4.0748—4.0753)
	B	103.513—103.525 (4.0753—4.0758)
TF	A	109.000—109.013 (4.2913—4.2918)
	B	109.013—109.026 (4.2918—4.2924)



9TG0B2-209

5. Measure each cylinder liner outer diameter in X and Y directions at three levels (upper, middle, and lower) as shown.

Cylinder liner outer diameter

mm (in)

	Mark	Outer diameter
HA	—	98.530— 98.580 (3.8791—3.8811)
SL	A	103.474—103.487 (4.0738—4.0743)
	B	103.487—103.500 (4.0743—4.0748)
TF	A	108.974—108.987 (4.2903—4.2908)
	B	108.987—109.000 (4.2908—4.2913)

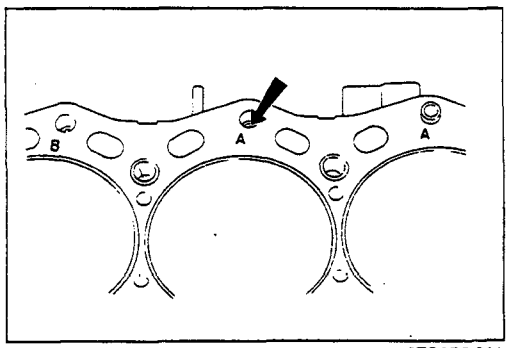
6. Subtract the cylinder liner outer diameter from the cylinder bore diameter to calculate the cylinder block to cylinder liner clearance.

Clearance

mm (in)

HA	−0.004—−0.080 (−0.0002—−0.0031)
SL, TF	0.013—0.039 (0.0005—0.0015)

7. If the clearance exceeds specification, replace the cylinder liner.

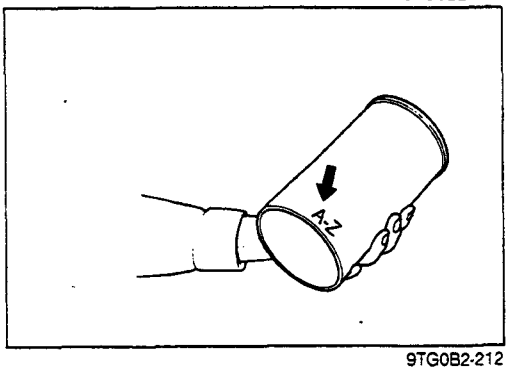


9TG0B2-210

9TG0B2-211

Caution (SL, TF)

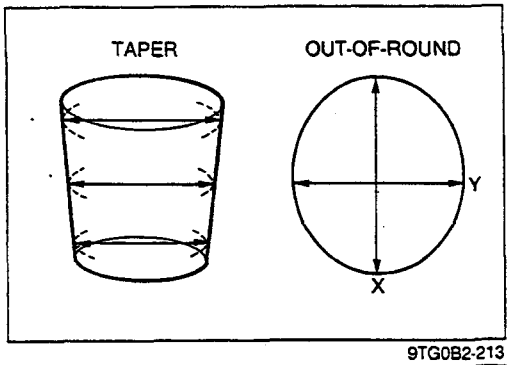
- **When replacing a cylinder liner, replace it with one with the same mark (A or B), and verify that it agrees with the mark on the cylinder block.**



9TG0B2-212

8. If the difference between measurements of the cylinder liner exceeds the maximum taper, replace the cylinder liner.

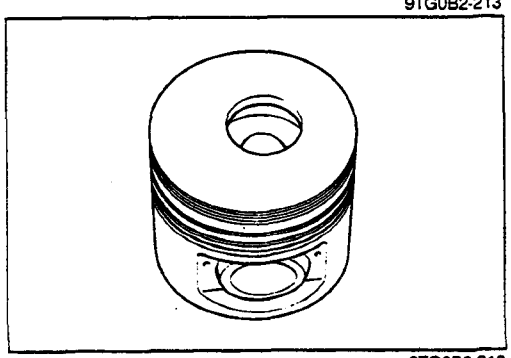
Taper: 0.03mm (0.0012 in) max.



9TG0B2-213

9. If the difference between measurements X and Y of the cylinder liner exceeds the maximum out-of-round, replace the cylinder liner.

Out-of-round: 0.03mm (0.0012 in) max.



9TG0B2-213

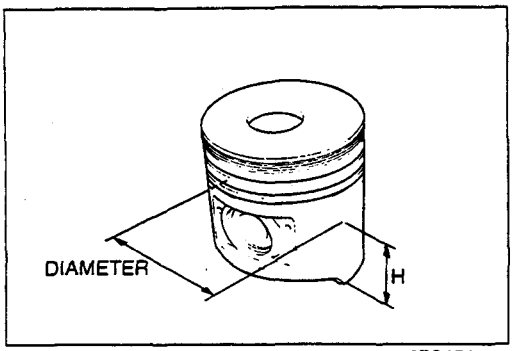
PISTON, PISTON RING, AND PISTON PIN

Piston

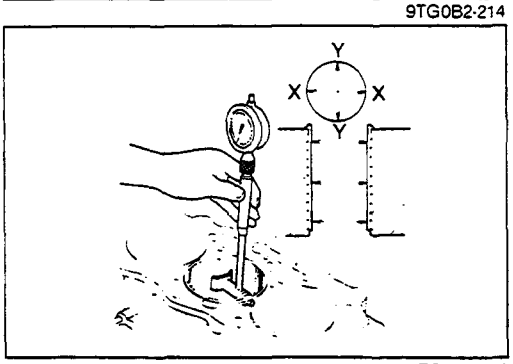
Caution

- **If the piston is replaced, the piston rings must also be replaced.**

1. Inspect the outer circumferences of all pistons for seizure or scoring. Replace pistons as necessary.



9TG0B2-214



9TG0B2-215

2. Measure the diameter of each piston at a right angle **(90°)** to the piston pin at **point H** (shown in the chart) as measured from the bottom of the piston.

Diameter

mm (in)

	Mark	Diameter
HA H=22.0 (0.866)	—	94.967—94.993 (3.7389—3.7399)
SL H=27.0 (1.063)	Y	99.950—99.963 (3.9350—3.9355)
	Z	99.937—99.950 (3.9345—3.9350)
TF H=27.0 (1.063)	Y	105.445—105.458 (4.1514—4.1519)
	Z	105.432—105.445 (4.1509—4.1514)

3. Measure each cylinder liner inner diameter in X and Y directions at three levels (upper, middle, and lower) as shown.

Cylinder liner inner diameter

mm (in)

	Mark	Inner diameter
HA	—	95.025—95.050 (3.7411—3.7421)
SL	Y	100.013—100.026 (3.9375—3.9380)
	Z	100.000—100.013 (3.9371—3.9375)
TF	Y	105.516—105.533 (4.1542—4.1548)
	Z	105.499—105.516 (4.1535—4.1542)

4. Subtract the piston diameter from the cylinder liner inner diameter to calculate the piston to cylinder liner clearance.

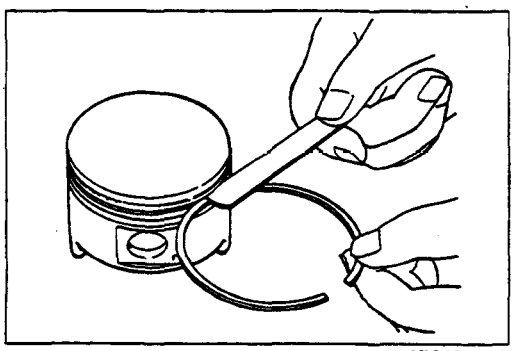
Clearance

mm (in)

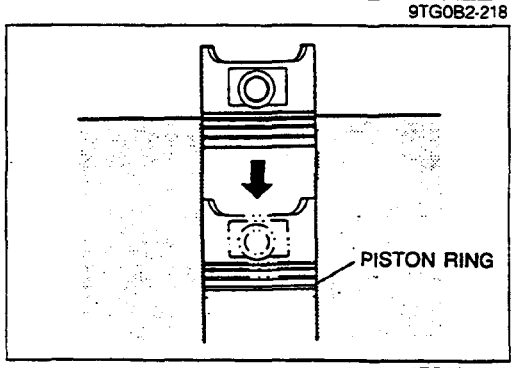
HA	0.032—0.083 (0.0013—0.0033)
SL	0.050—0.076 (0.0020—0.0030)
TF	0.058—0.084 (0.0023—0.0033)

5. If the clearance exceeds specification, replace the piston and/or the cylinder liner.

9TG0B2-216



9TG0B2-218



9TG0B2-219

Piston and Piston Rings

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

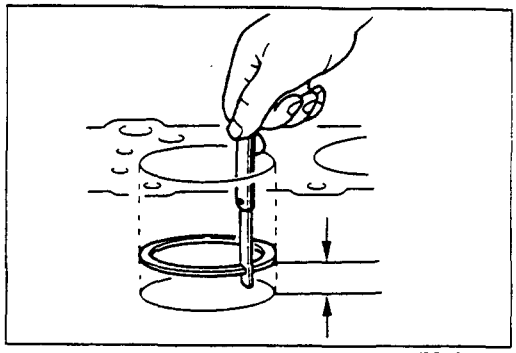
Clearance

mm (in)

	Top	Second	Oil
HA	0.05—0.18 (0.0020—0.0071)	0.04—0.08 (0.0016—0.0031)	0.03—0.07 (0.0012—0.0028)
SL	0.06—0.10 (0.0024—0.0039)	0.04—0.08 (0.0016—0.0031)	0.03—0.07 (0.0012—0.0028)
TF	0.173—0.213 (0.0068—0.0084)	0.04—0.08 (0.0016—0.0031)	0.03—0.07 (0.0012—0.0028)

Maximum: 0.30mm (0.012 in)

2. If the clearance exceeds the maximum, replace the piston.
3. Inspect the piston rings for damage, abnormal wear, or breakage. Replace the piston rings if necessary.
4. Insert the piston ring into the cylinder liner by hand and use the piston to push it to the bottom of the ring travel.



9TG0B2-220

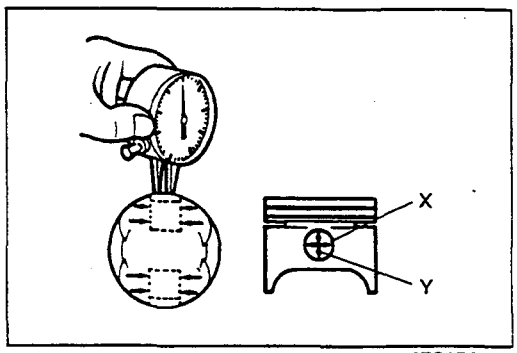
5. Measure the end gap of each piston ring with a feeler gauge. Replace the piston ring if necessary.

End gap

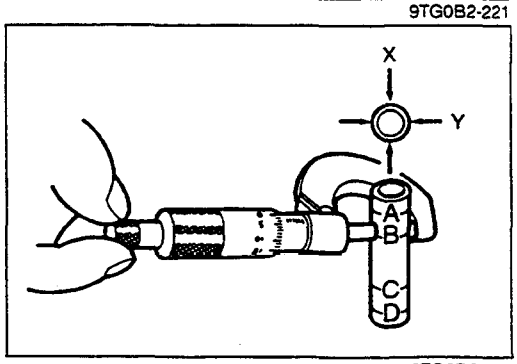
mm (in)

	Top	Second	Oil
HA	0.40—0.60 (0.016—0.024)	0.40—0.60 (0.016—0.024)	0.40—0.60 (0.016—0.024)
SL (Non-Turbo)	0.30—0.40 (0.012—0.016)	0.40—0.55 (0.016—0.022)	0.20—0.40 (0.008—0.016)
SL (Turbo)	0.30—0.45 (0.012—0.018)	0.30—0.50 (0.012—0.020)	0.30—0.50 (0.012—0.020)
TF	0.30—0.40 (0.012—0.016)	0.40—0.55 (0.016—0.022)	0.20—0.40 (0.008—0.016)

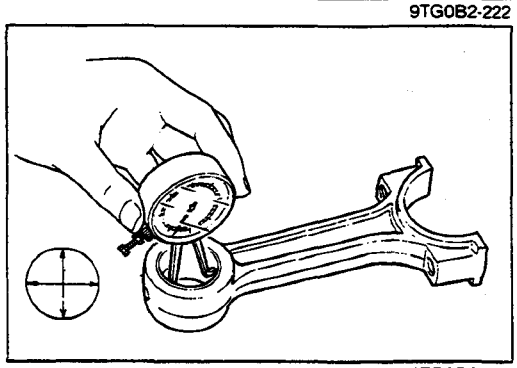
Maximum: 1.5mm (0.059 in)



9TG0B2-221



9TG0B2-222



9TG0B2-223

Piston and Piston Pin

1. Measure each piston pin bore diameter in X and Y directions at four points.

Diameter

mm (in)

HA	29.996—30.008 (1.1809—1.1814)
SL	33.996—34.008 (1.3384—1.3389)
TF	34.996—35.008 (1.3778—1.3783)

2. Measure each piston pin diameter in X and Y directions at four points.

Diameter

mm (in)

HA	29.994—30.000 (1.1809—1.1811)
SL	33.993—34.000 (1.3383—1.3386)
TF	34.993—35.000 (1.3777—1.3780)

3. Calculate the piston pin to piston clearance.

Clearance

mm (in)

HA	−0.004—0.014 (−0.0002—0.0006)
SL, TF	−0.004—0.015 (−0.0002—0.0006)

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

CONNECTING ROD

1. Measure each connecting rod bushing inner diameter.

Diameter

mm (in)

HA	30.012—30.033 (1.1816—1.1824)
SL	34.012—34.033 (1.3391—1.3399)
TF	35.012—35.033 (1.3784—1.3792)

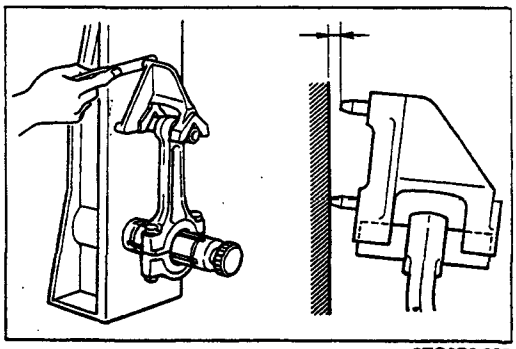
2. Calculate the clearance between the connecting rod bushing and piston pin.

Clearance

mm (in)

	Standard	Maximum
HA	0.012—0.039 (0.0005—0.0015)	0.05 (0.0020)
SL, TF	0.012—0.040 (0.0005—0.0016)	

9TG0B2-224



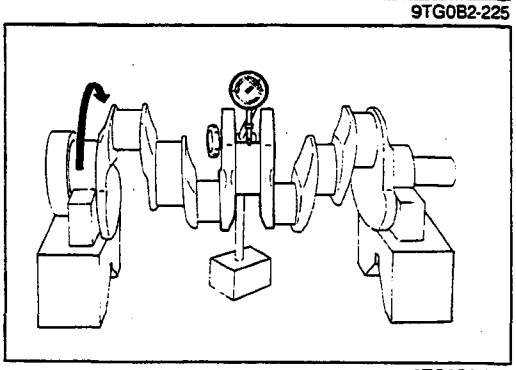
9TG0B2-225

3. Measure each connecting rod for bending. Repair or replace the connecting rod if necessary.

Bending

mm (in)

HA	0.05 (0.0020) max./ 100 (3.94)
SL, TF	0.10 (0.0039) max./ 100 (3.94)

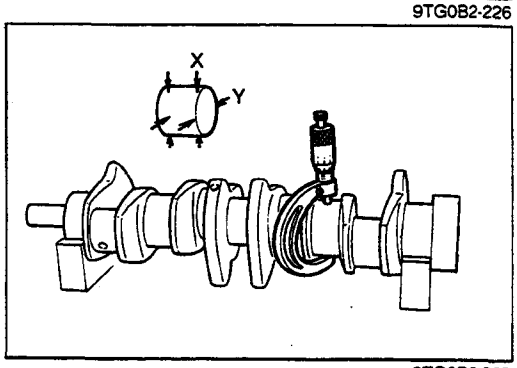


9TG0B2-226

CRANKSHAFT

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

Runout: 0.05mm (0.0020 in) max.



9TG0B2-227

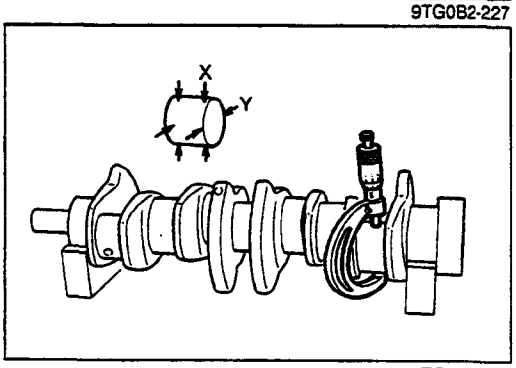
4. Measure each journal diameter in X and Y directions at two points.

Main journal diameter

mm (in)

HA, SL		75.805—75.825 (2.9844—2.9852)
TF	No.1,2,4,5	78.980—79.000 (3.1094—3.1102)
	No.3	78.954—78.974 (3.1084—3.1092)

Out-of-round: 0.003mm (0.00012 in) max.



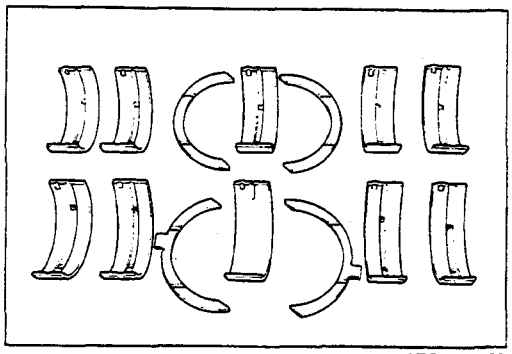
9TG0B2-228

Crankpin journal diameter

mm (in)

HA, SL	61.112—61.125 (2.4060—2.4065)
TF	63.987—64.000 (2.5192—2.5197)

Out-of-round: 0.003mm (0.00012 in) max.



9TG0B2-229

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

Undersize bearing:
0.254mm (0.0100 in), 0.508mm (0.0200 in), 0.762mm (0.0300 in)

Main journal diameter undersize

mm (in)

	Bearing size	Journal diameter
HA, SL	0.254 (0.0100) undersize	75.551—75.571 (2.9744—2.9752)
	0.508 (0.0200) undersize	75.297—75.317 (2.9644—2.9652)
	0.762 (0.0300) undersize	75.043—75.063 (2.9544—2.9552)
TF	0.254 (0.0100) undersize	No.1, 2, 4, 5: 78.726—78.746 (3.0994—3.1002) No.3 : 78.700—78.720 (3.0984—3.0992)
	0.508 (0.0200) undersize	No.1, 2, 4, 5: 78.472—78.492 (3.0894—3.0902) No.3 : 78.446—78.466 (3.0884—3.0892)
	0.762 (0.0300) undersize	No.1, 2, 4, 5: 78.218—78.238 (3.0794—3.0802) No.3 : 78.192—78.212 (3.0784—3.0792)

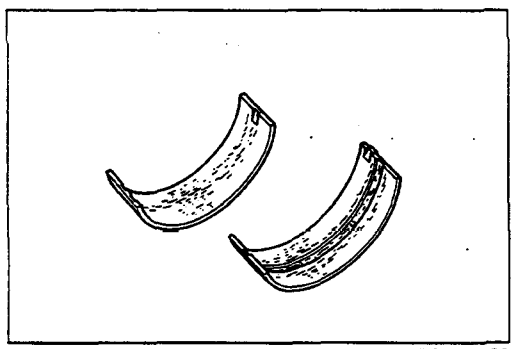
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Crankpin journal diameter undersize

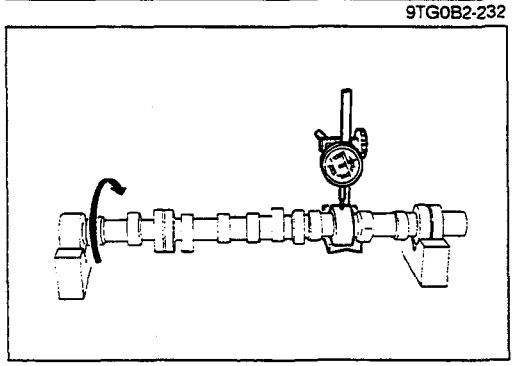
mm (in)

	Bearing size	Journal diameter
HA, SL	0.254 (0.0100) undersize	60.858—60.871 (2.3960—2.3965)
	0.508 (0.0200) undersize	60.604—60.617 (2.3860—2.3865)
	0.762 (0.0300) undersize	60.350—60.363 (2.3760—2.3765)
TF	0.254 (0.0100) undersize	63.733—63.746 (2.5092—2.5097)
	0.508 (0.0200) undersize	63.479—63.492 (2.4992—2.4997)
	0.762 (0.0300) undersize	63.225—63.238 (2.4892—2.4897)

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9TG0B2-232



9TG0B2-233

BEARING

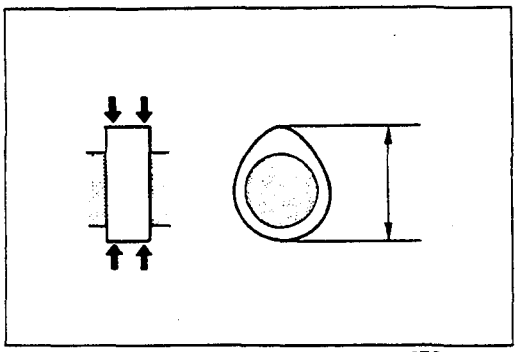
Main Bearing and Connecting Rod Bearing

1. Check the main bearings and the connecting rod bearings for peeling, scoring, and other damage.
2. Replace as necessary.

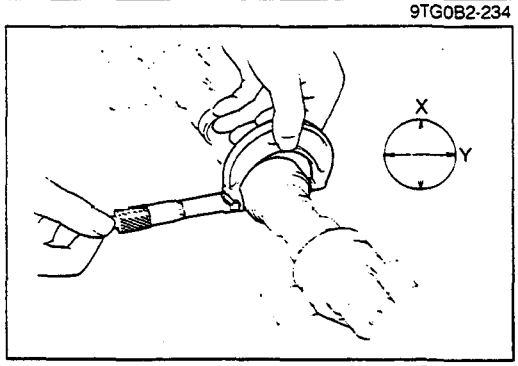
CAMSHAFT

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

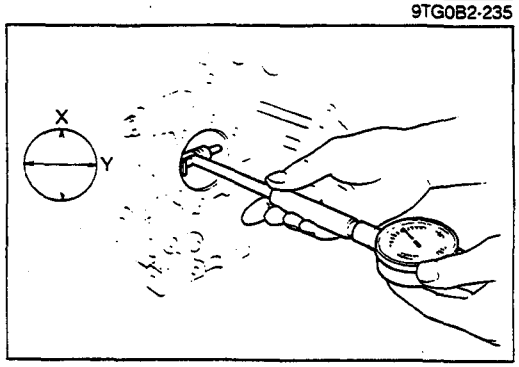
Runout: 0.08mm (0.0031 in) max.



9TG0B2-234



9TG0B2-235



9TG0B2-236

3. Inspect the camshaft for wear or damage. Replace the camshaft if necessary.
4. Measure the cam lobe heights at the two points as shown.

Height

mm (in)

		Standard	Minimum
HA	IN	42.580 (1.6764)	42.080 (1.6567)
	EX	42.580 (1.6764)	42.080 (1.6567)
SL	IN	44.116 (1.7368)	43.616 (1.7172)
	EX	44.116 (1.7368)	43.616 (1.7172)
TF	IN	48.415 (1.9061)	47.915 (1.8864)
	EX	48.547 (1.9113)	48.047 (1.8916)

5. Measure the journal diameters in X and Y directions shown.

Diameter

mm (in)

HA SL	No.1	51.910—51.940 (2.0437—2.0449)
	No.2	51.660—51.690 (2.0339—2.0350)
	No.3	51.410—51.440 (2.0240—2.0252)
	No.4	51.160—51.190 (2.0142—2.0154)
TF	No.1	58.410—58.440 (2.2996—2.3008)
	No.2	58.160—58.190 (2.2898—2.2909)
	No.3	57.910—57.940 (2.2799—2.2811)
	No.4	57.660—57.690 (2.2701—2.2713)

6. Measure the camshaft bore diameters in X and Y directions shown.

Diameter

mm (in)

HA SL	No.1	52.000—52.030 (2.0472—2.0484)
	No.2	51.750—51.780 (2.0374—2.0386)
	No.3	51.500—51.530 (2.0276—2.0287)
	No.4	51.250—51.280 (2.0177—2.0189)
TF	No.1	58.500—58.530 (2.3031—2.3043)
	No.2	58.250—58.280 (2.2933—2.2945)
	No.3	58.000—58.030 (2.2835—2.2846)
	No.4	57.750—57.780 (2.2736—2.2748)

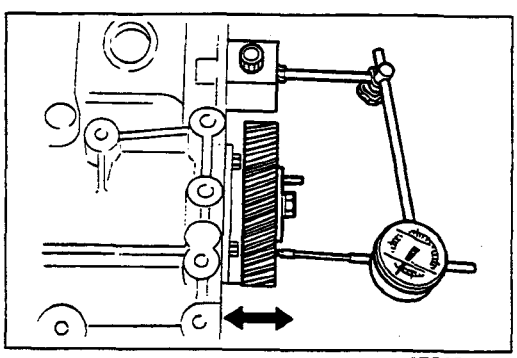
7. Subtract the camshaft journal diameter from the camshaft bore diameter to calculate the camshaft journal to bore clearance.

Clearance
Standard : 0.06—0.12mm (0.0024—0.0047 in)
Maximum: 0.145mm (0.0057 in)

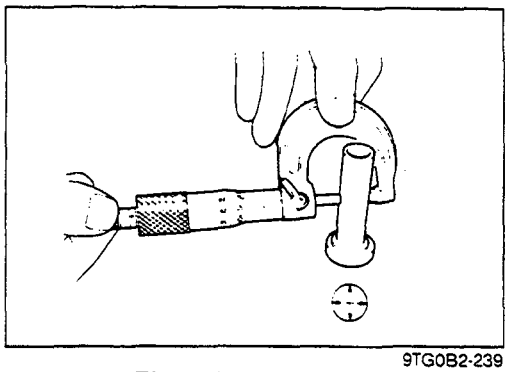
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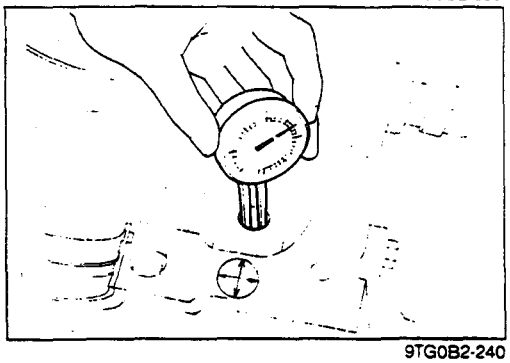
8. If the clearance exceeds the maximum, replace the camshaft and/or cylinder block.
9. Measure the camshaft end play. If the end play exceeds the maximum, replace the camshaft and/or the cylinder head.

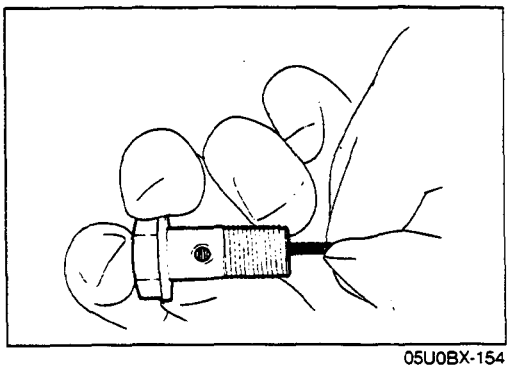
End play
Standard : 0.02—0.18mm (0.0008—0.0071 in)
Maximum: 0.30mm (0.012 in)

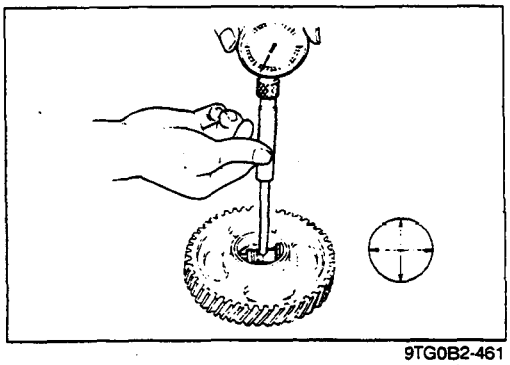


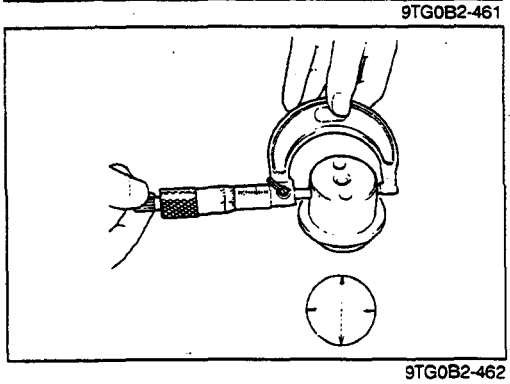
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9TG0B2-240


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9TG0B2-461


9TG0B2-462

TAPPET

1. Inspect the tappets for wear or damage. Replace the tappet if necessary.
2. Measure the tappet outer diameter.

Diameter

mm (in)

HA, SL	14.218—14.233 (0.5598—0.5604)
TF	15.518—15.533 (0.6109—0.6115)

3. Measure the tappet bore diameter of the cylinder block.

Diameter

mm (in)

HA, SL	14.288—14.319 (0.5625—0.5637)
TF	15.588—15.619 (0.6137—0.6149)

4. Subtract the tappet outer diameter from the tappet bore diameter to calculate the tappet to tappet bore clearance.

Clearance
Standard : 0.055—0.101mm (0.0022—0.0040 in)
Maximum: 0.15mm (0.006 in)

5. If the clearance exceeds the maximum, replace the tappet and/or cylinder block.

OIL JET

1. Push the check ball and verify that it moves smoothly.
2. Blow through the oil jet and verify that air flows.

IDLER GEAR

1. Measure the idler gear inner diameter.

Diameter: 44.009—44.034mm (1.7326—1.7336 in)

2. Measure the idler gear spindle outer diameter.

Diameter: 43.950—43.975mm (1.7303—1.7313 in)

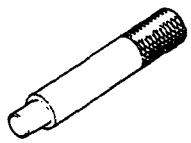
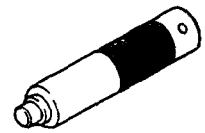
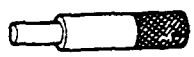
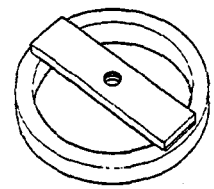
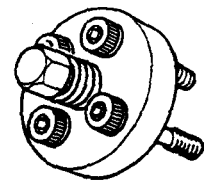
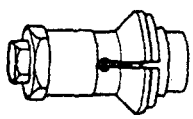
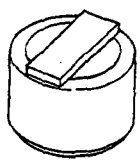
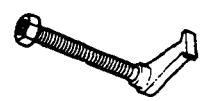
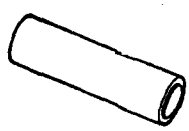
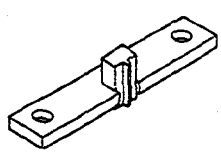
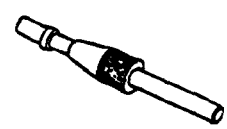
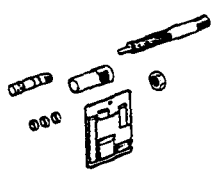
3. Subtract the spindle outer diameter from the idler gear inner diameter to calculate the spindle to idler gear clearance.

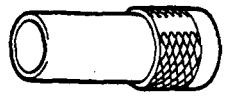
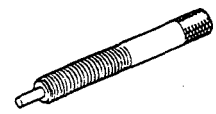
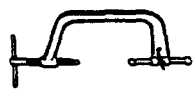
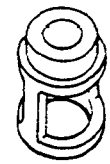
Clearance
Standard : 0.034—0.084mm (0.0013—0.0033 in)
Maximum: 0.15mm (0.006 in)

4. If the clearance exceeds the maximum, replace the idler gear and/or spindle.

ASSEMBLY

PREPARATION
SST

49 0223 061 Remover & installer, piston pin (HA) 	For installation of piston pins	49 B043 002 Installer, bearing (SL) 	For installation of piston pins
49 0636 040 Installer, piston pin (TF) 	For installation of piston pins	49 W011 101 Installer, oil seal (TF) 	For installation of rear oil seal
49 G030 797 Handle (TF) 	For installation of rear oil seal	49 SE01 157 Extractor (HA) 	For prevention of injection pump gear rotation
49 0559 210 Oil seal installer and centering tool (HA) 	For installation of front oil seal	49 S120 710 Holder, coupling frange (TF) 	For prevention of camshaft gear rotation
49 W011 102 Installer, oil seal (TF) 	For installation of front oil seal	49 V101 060A Brake, ring gear (HA, SL) 	For prevention of engine rotation
49 S501 062 Collar (HA) 	For prevention of engine rotation	49 W065 062 Collar (SL) 	For prevention of engine rotation
49 W011 103 Brake, ring gear (TF) 	For prevention of engine rotation	49 SE01 310 Centering tool, clutch disc 	For installation of clutch disc
49 L012 0A0 Installer set, valve seal & valve guide 	For installation of valve guides and valve seals	49 L012 001 Installer (Part of 49 L012 0A0) 	For installation of valve seals

49 L012 002 Body (Part of 49 L012 0A0) 	For installation of valve guides and valve seals	49 L012 003 Installer (Part of 49 L012 0A0) 	For installation of valve guides
49 L012 004 Nut (Part of 49 L012 0A0) 	For installation of valve guides	49 L012 007 Spacer (Part of 49 L012 0A0) 	For installation of valve seals
49 0636 100A Arm, valve spring lifter 	For installation of valves	49 0107 222A Pivot 	For installation of valves

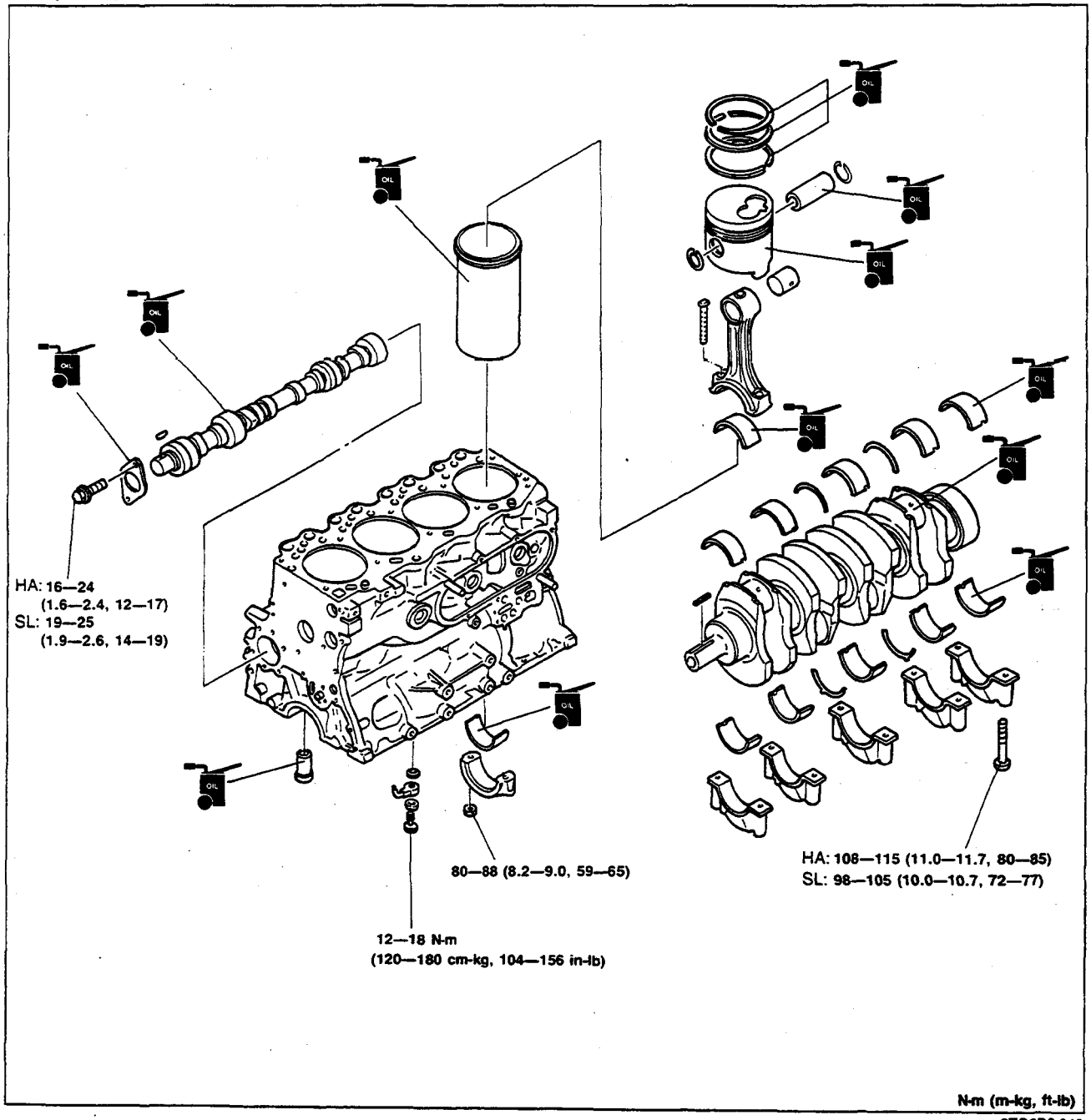
9TG0B2-241

1. Clean all parts before reinstallation.
2. Apply new engine oil to all sliding and rotating parts.
3. Replace bearings if they are peeling, burned, or otherwise damaged.
4. Tighten all bolts and nuts to the specified torques.

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

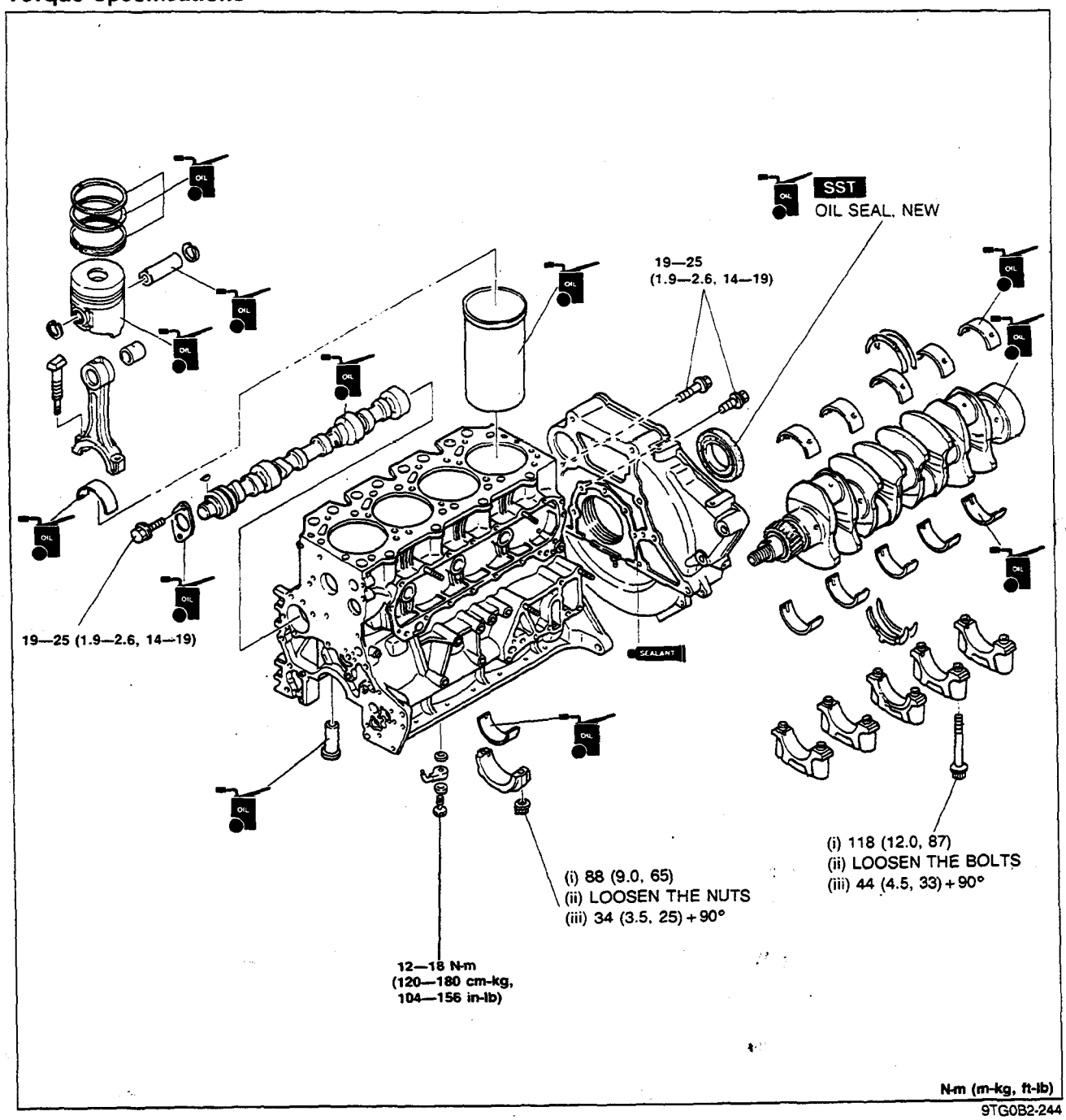
9TG0B2-242

CYLINDER BLOCK (INTERNAL PARTS)
HA, SL Engine
Torque Specifications

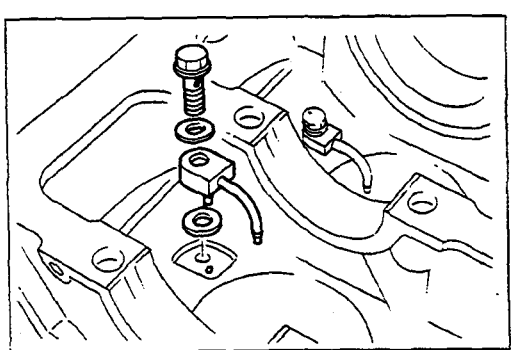


9TG0B2-243

TF Engine
Torque Specifications



9TG0B2-244

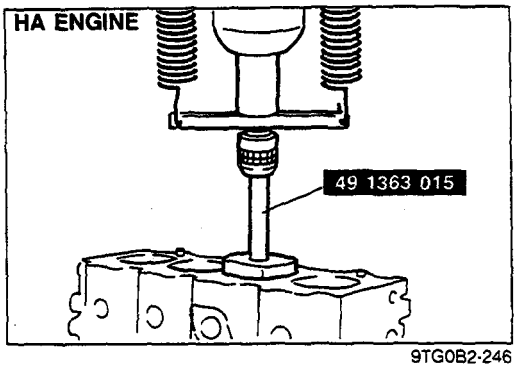


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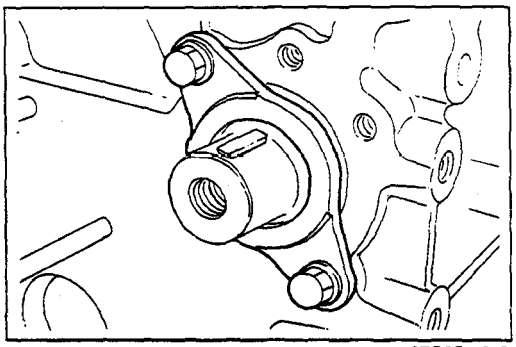
Oil Jet

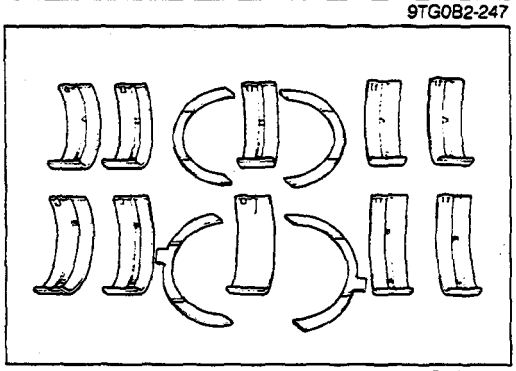
1. Install the oil jets.

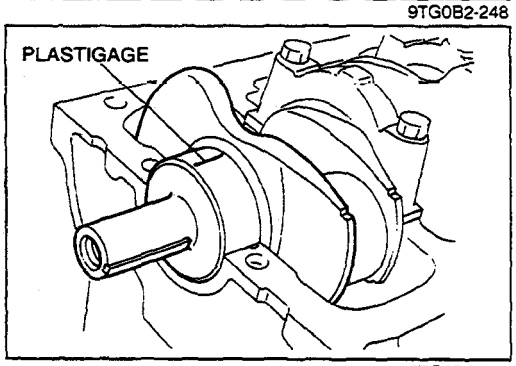
Tightening torque:
12—18 N·m (120—180 cm-kg, 104—156 in-lb)



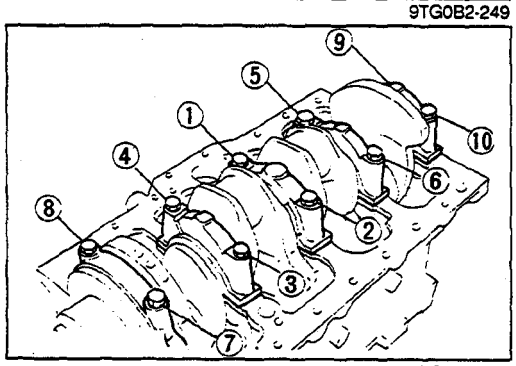
9TG0B2-246


9TG0B2-247


9TG0B2-248



9TG0B2-249



9TG0B2-250

Cylinder Liner

1. Apply engine oil to the cylinder liner.

Caution
- **Do not use a hammer.**
- **Align the marks on the cylinder liner and the cylinder block when installing.**

2. Install the cylinder liner into the cylinder block with the **SST** (HA) or by hand.

Pressure force (HA):
9,810—29,430 N (1,000—3,000 kg, 2,200—6,600 lb)

Tappet

1. Apply clean engine oil to the tappet.
2. Install the tappet in the cylinder block.

Camshaft

1. Apply engine oil to the camshaft journals and cam faces.
2. Install the camshaft in the cylinder block.
3. Apply engine oil to the thrust plate.
4. Install the thrust plate with the flat side facing the cylinder block.

Tightening torque
HA : 16—24 N·m (1.6—2.4 m-kg, 12—17 ft-lb)
SL, TF: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

Crankshaft

1. Before installing the crankshaft, inspect the main bearing oil clearances as follows.
   (1) Remove all foreign material and oil from the journals and bearings.

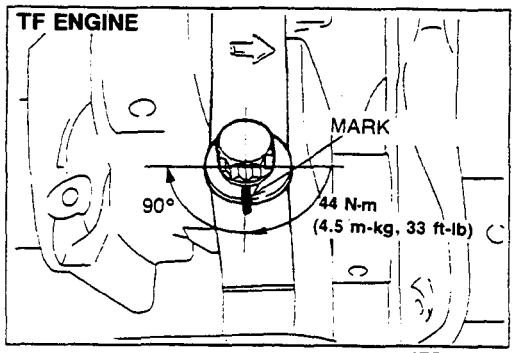
Caution
- **Install the no grooved main bearing in the No.3 (center) main bearing cap.**
- **Install the thrust bearings with the oil groove facing the crankshaft.**

   (2) Install the upper main bearings and thrust bearings.
   (3) Set the crankshaft in the cylinder block.

Caution
- **Do not rotate the crankshaft when measuring the oil clearances.**

   (4) Position Plastigage atop the journals in the axial direction.
   (5) Install the lower main bearings and the main bearing caps according to the cap number and ⇦ mark.
   (6) Tighten the main bearing cap bolts in two or three steps in the order shown in the figure.

Tightening torque
HA: 108—115 N·m (11.0—11.7 m-kg, 80—85 ft-lb)
SL : 98—105 N·m (10.0—10.7 m-kg, 72—77 ft-lb)
TF : 118 N·m (12.0 m-kg, 87 ft-lb)

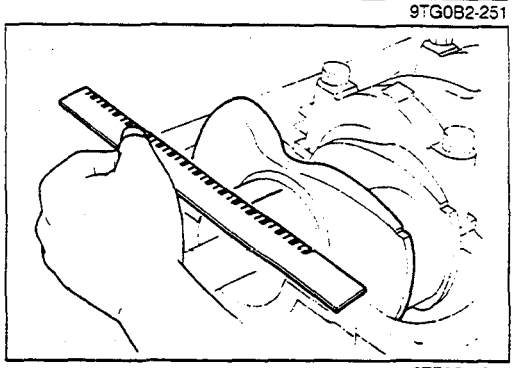


9TG0B2-251

(7) **TF Engine**
(i) Loosen the bolts in the reverse of tightening order.
(ii) Retighten the bolts in two or three steps in the tightening order.

Tightening torque: 44 N·m (4.5 m-kg, 33 ft-lb)

(iii) Tighten the bolts approx. 90° further in the tightening order.

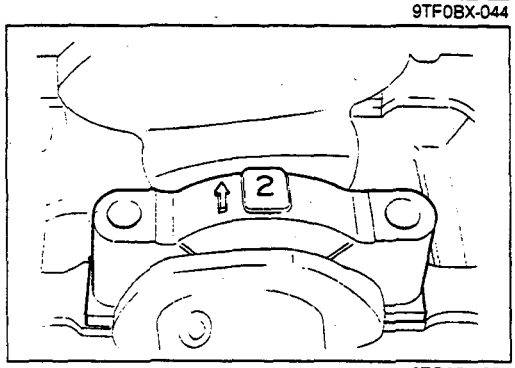

9TF0BX-044

(8) Remove the main bearing caps, and measure the Plastigage at each journal at the widest point for the smallest clearance, and at the narrowest point for the largest clearance.
(9) If oil clearance exceeds specification, grind the crankshaft and install undersize main bearings.
(Refer to page B–84.)

Oil clearance

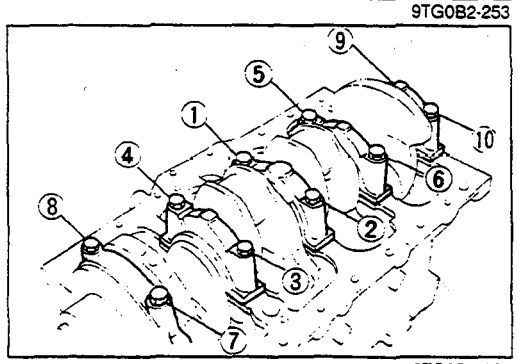
mm (in)

		Standard	Maximum
HA, SL		0.058—0.092 (0.0023—0.0036)	0.12 (0.005)
TF	No.1,2,4,5	0.058—0.092 (0.0023—0.0036)	0.12 (0.005)
	No.3	0.084—0.118 (0.0033—0.0046)	0.15 (0.006)



9TG0B2-253

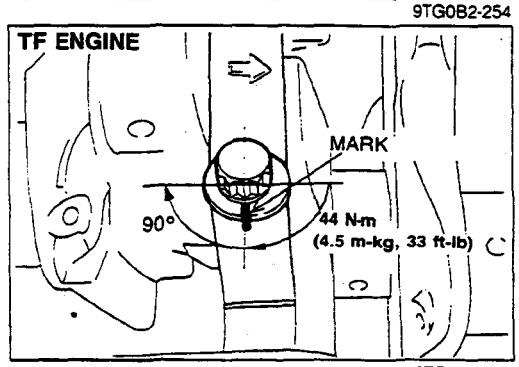
2. Apply a liberal amount of clean engine oil to the main bearings, thrust bearings and main journals.
3. Install the crankshaft and the main bearing caps according to the cap number and ⇦ mark.



9TG0B2-254

4. Tighten the main bearing cap bolts in two or three steps in the order shown in the figure.

Tightening torque
HA: 108—115 N·m (11.0—11.7 m-kg, 80—85 ft-lb)
SL: 98—105 N·m (10.0—10.7 m-kg, 72—77 ft-lb)
TF: 118 N·m (12.0 m-kg, 87 ft-lb)

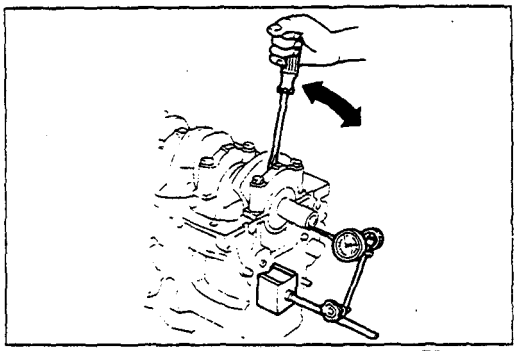


9TG0B2-255

5. **TF Engine**
(i) Loosen the bolts in the reverse of tightening order.
(ii) Retighten the bolts in two or three steps in the tightening order.

Tightening torque: 44 N·m (4.5 m-kg, 33 ft-lb)

(iii) Tighten the bolts approx. 90° further in the tightening order.


9TG0B2-256

6. Measure the crankshaft end play.

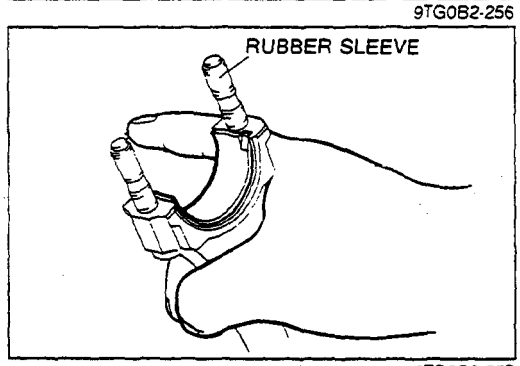
End play
Standard : 0.14—0.39mm (0.0055—0.0154 in)
Maximum: 0.40mm (0.016 in)

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

Thrust bearing width
Standard:
2.275—2.325mm (0.0896—0.0915 in)
0.178mm (0.0070 in) oversize:
2.453—2.503mm (0.0966—0.0985 in)

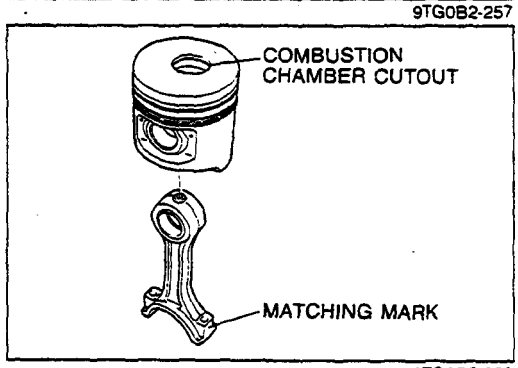
Piston and Connecting Rod

Caution
- **Protect the connecting rod bolts with rubber sleeves to prevent damage to the crankpin journal.**



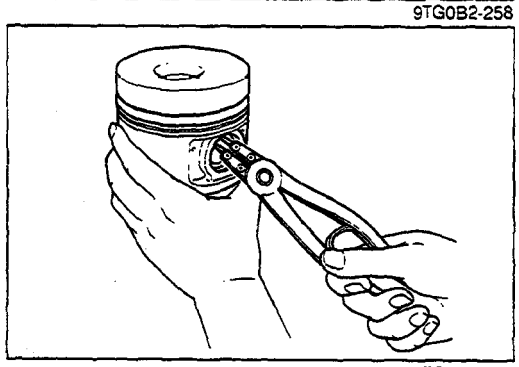
9TG0B2-257

1. Install one piston pin clip into the clip groove in the piston.
2. Assemble the piston and the connecting rod so that the piston combustion chamber cutout and the connecting rod mark are faces at the same side.
3. Heat the piston to 50—60°C (122—140°F).
4. Apply clean engine oil to the piston pin.
5. Install the piston pin from the side opposite the clip. If the pin cannot be installed smoothly, replace the piston and/or connecting rod.

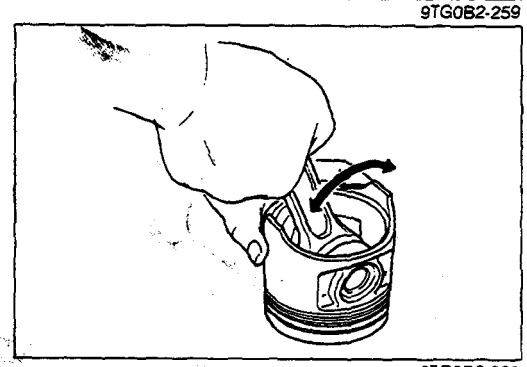


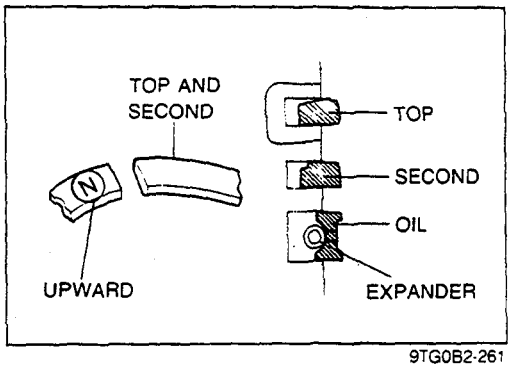
9TG0B2-258

6. Install the second clip into the clip groove in the piston.


9TG0B2-259

7. Check the oscillation torque of the connecting rod. If the large end does not drop by its own weight, replace the piston, connecting rod, and/or piston pin.


9TG0B2-260



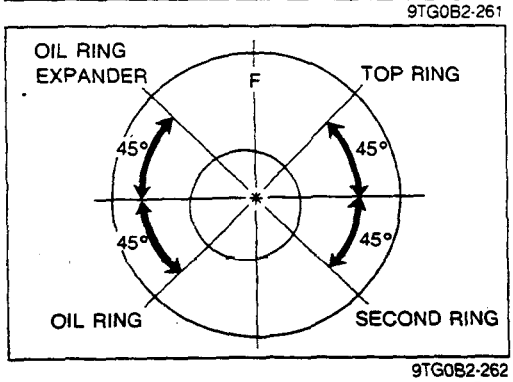
9TG0B2-261

8. Apply clean engine oil to the piston rings.
9. Install the coil expander under the oil ring and set the end gaps approx. 90° apart.
10. Install the oil ring to the piston.

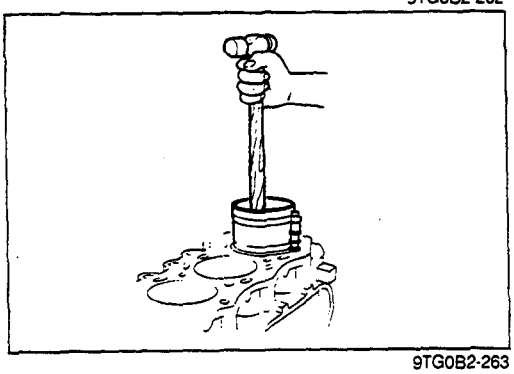
Caution
- **The top and second rings must be installed with the N mark upward.**

11. Using a piston ring expander (commercially available), install the second ring to the piston; then install the top ring.

12. Verify that the piston rings turns smoothly.
13. Position the end gaps of the rings as shown in the figure.



9TG0B2-262



9TG0B2-263

14. Apply clean engine oil to the cylinder liner walls and pistons.
15. Check the piston rings for correct end gap alignment.
16. Insert each piston assembly into the cylinder block with the marks (Y or Z) facing the front of the engine. Use a piston ring compressor (commercially available).
17. Remove the rubber sleeves from the connecting rod bolts.

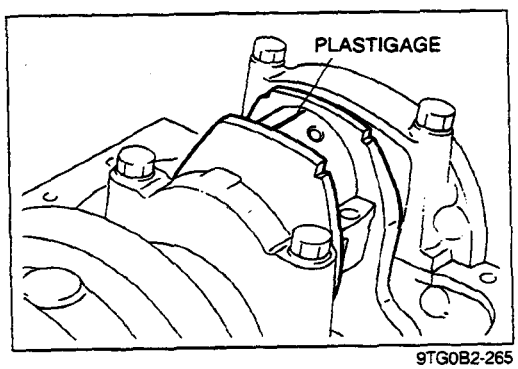
18. Measure the connecting rod bearing oil clearance.

Caution
- **Align the marks on the cap and the connecting rod when installing the connecting rod cap.**

(1) Remove all foreign material and oil from the journals and bearings.

Caution
- **Do not rotate the crankshaft when measuring the oil clearances.**

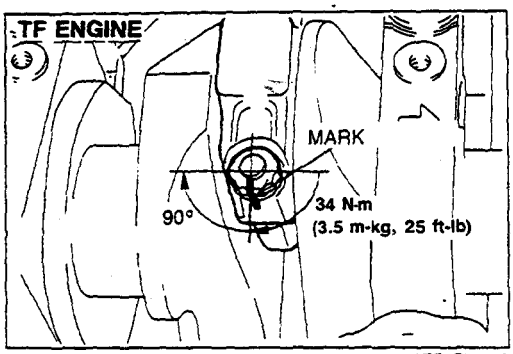
9TG0B2-264



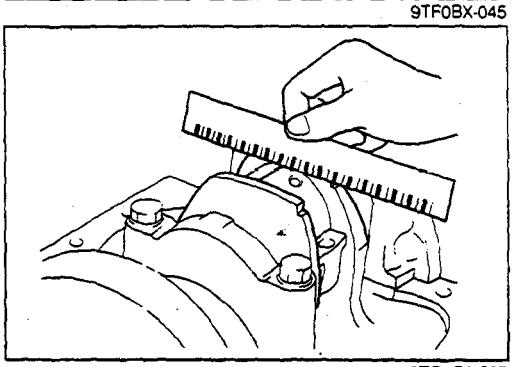
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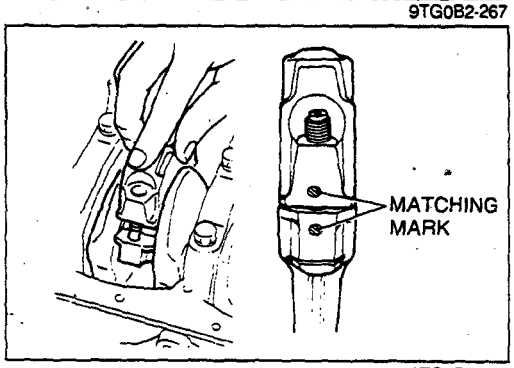
(2) Position Plastigage atop the journals in the axial direction.
(3) Install the connecting rod bearing and cap with the marks aligned.
(4) Tighten the nuts in two or three steps.

Tightening torque
HA, SL: 80—88 N·m (8.2—9.0 m-kg, 59—65 ft-lb)
TF : 88 N·m (9.0 m-kg, 65 ft-lb)

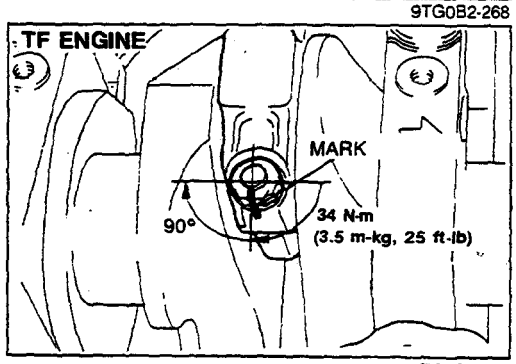


9TF0BX-045

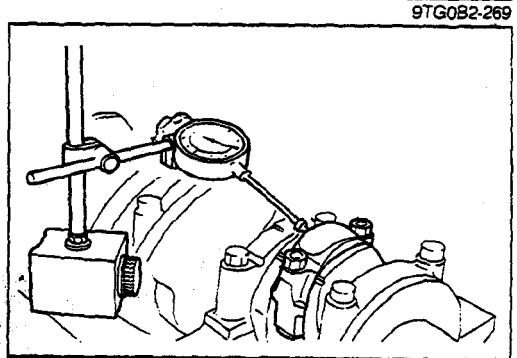

9TG0B2-267



9TG0B2-268



9TG0B2-269


9TG0B2-270

(5) **TF Engine**
(i) Loosen the connecting rod nuts.
(ii) Retighten the nuts in two or three steps.

Tightening torque: 34 N·m (3.5 m-kg, 25 ft-lb)

(iii) Tighten the nuts approx. 90°.
(6) Remove the connecting rod caps, and measure the Plastigage at each journal at the widest point for the smallest clearance, and at the narrowest point for the largest clearance.
(7) If oil clearance exceeds specification, grind the crankshaft and install undersize main bearings.
(Refer to page B–84.)

Oil clearance

mm (in)

HA, SL	0.038—0.074 (0.0015—0.0029)
TF	0.040—0.076 (0.0016—0.0030)

Maximum: 0.10mm (0.004 in)

19. Apply a liberal amount of clean engine oil to the connecting rod bearings and crankpin journals.
20. Install the connecting rod bearings and caps with the marks aligned; and tighten the nuts in two or three steps.

Tightening torque
HA, SL: 80—88 N·m (8.2—9.0 m-kg, 59—65 ft-lb)
TF : 88 N·m (9.0 m-kg, 65 ft-lb)

21. **TF Engine**
(i) Loosen the connecting rod nuts.
(ii) Retighten the nuts in two or three steps.

Tightening torque: 34 N·m (3.5 m-kg, 25 ft-lb)

(iii) Tighten the nuts approx. 90° further.

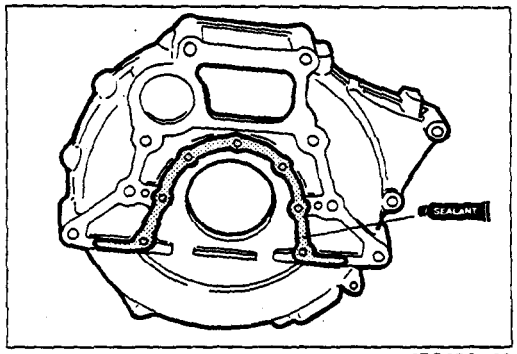
22. Measure the connecting rod side clearance.

Side clearance

mm (in)

	Standard	Maximum
HA	0.239—0.330 (0.0094—0.0130)	0.40 (0.016)
SL	0.239—0.379 (0.0094—0.0149)	
TF	0.200—0.400 (0.0079—0.0157)	0.50 (0.020)

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

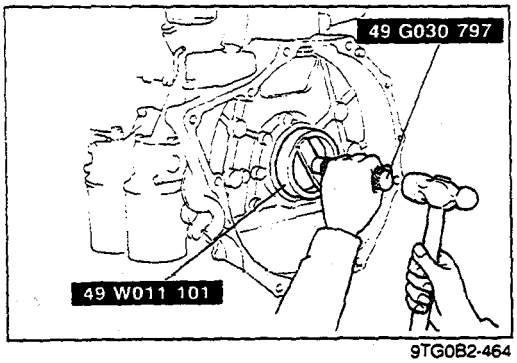


9TG0B2-463

End Plate (TF)

1. Apply silicone sealant to the shaded areas shown, then install the end plate.

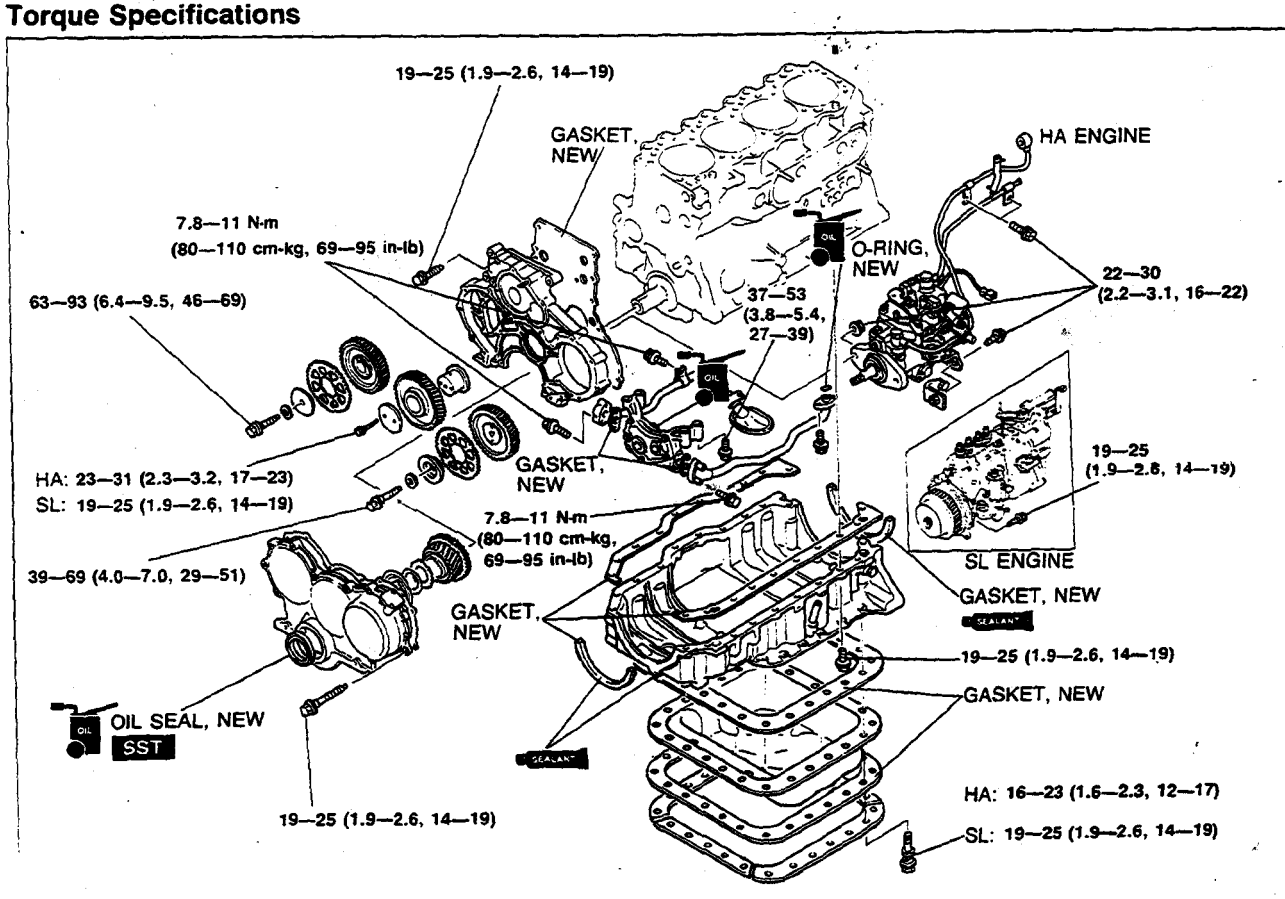
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



9TG0B2-464

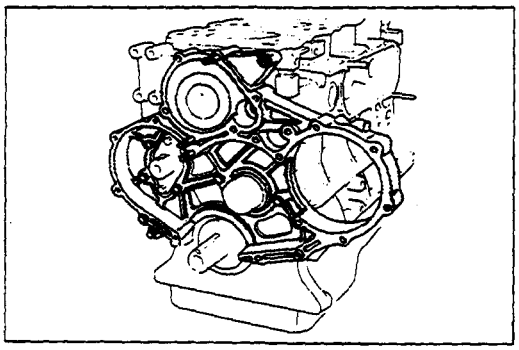
2. Apply a small amount of clean engine oil to the lip of the new oil seal.
3. Install the oil seal with the **SST** and a hammer.

CYLINDER BLOCK (EXTERNAL PARTS II)
HA, SL Engine
Torque Specifications



N·m (m-kg, ft-lb)

9TG0B2-271

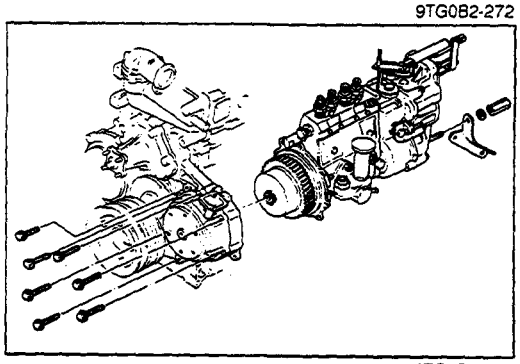


9TG0B2-272

Timing Gear Case

1. Install the timing gear case and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

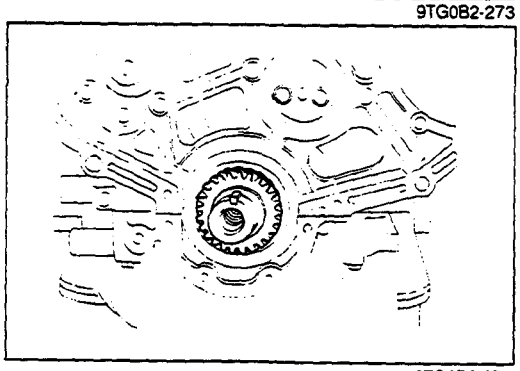


9TG0B2-273

Fuel Injection Pump

1. Install the fuel injection pump.

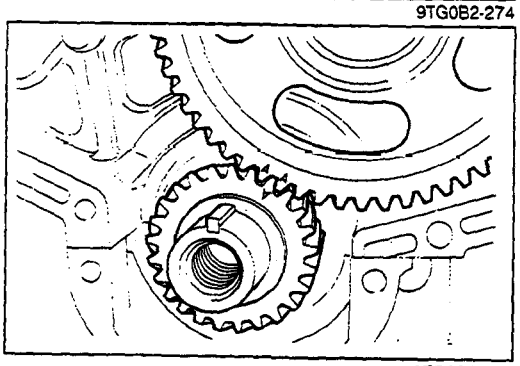
Tightening torque
HA: 22—30 N·m (2.2—3.1 m-kg, 16—22 ft-lb)
SL: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



9TG0B2-274

Crankshaft Timing Gear

1. Align the Woodruff key, and install the crankshaft gear.
2. Install the friction gear, friction gear spring, and oil deflector.

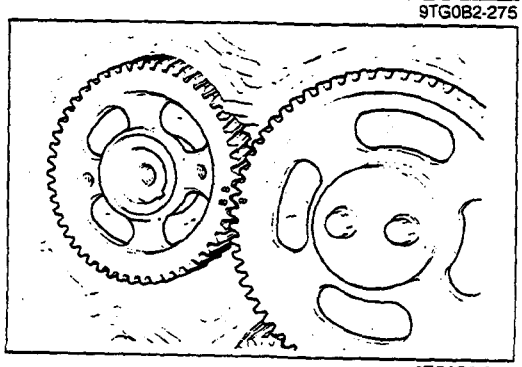


9TG0B2-275

Idler Gear

1. Install the idler gear spindle.
2. Align the marks, and install the idler gear and thrust plate.

Tightening torque
HA: 23—31 N·m (2.3—3.2 m-kg, 17—23 ft-lb)
SL: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

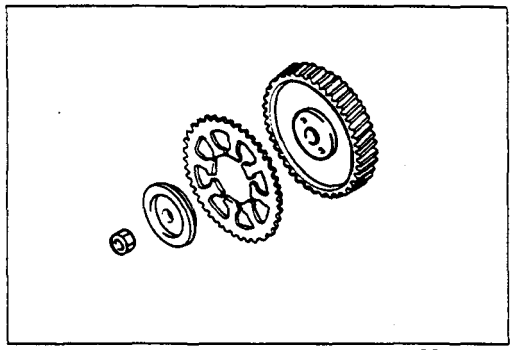


9TG0B2-276

Camshaft Gear and Injection Pump Gear

1. Align the marks, and install the camshaft gear, lock plate, and friction gear.

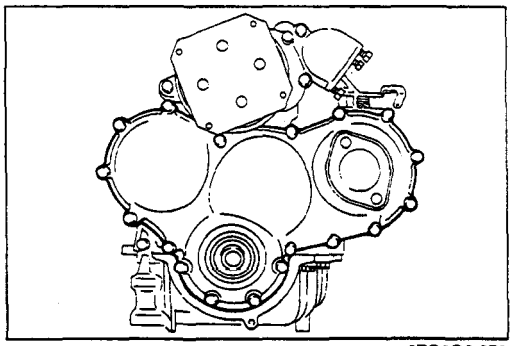
Tightening torque:
63—93 N·m (6.4—9.5 m-kg, 46—69 ft-lb)



9TG0B2-277

2. **HA Engine**
   (1) Align the marks, and install the injection pump gear.
   (2) Install the friction gear and lock plate.

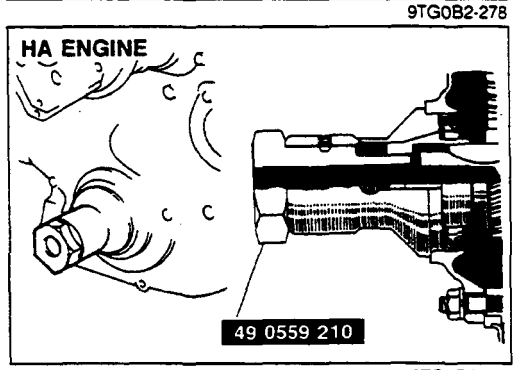
Tightening torque:
39—69 N·m (4.0—7.0 m-kg, 29—51 ft-lb)



9TG0B2-278

Timing Gear Cover
1. Install the timing gear cover and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

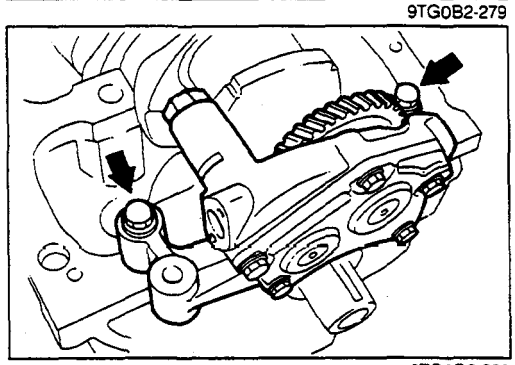


9TG0B2-279

2. Apply a small amount of clean engine oil to the lip of the new oil seal.
3. Push the oil seal slightly in by hand.

Caution
- **The oil seal must be pressed in until it is 6.5mm (0.26 in) inside the edge of the timing gear cover.**

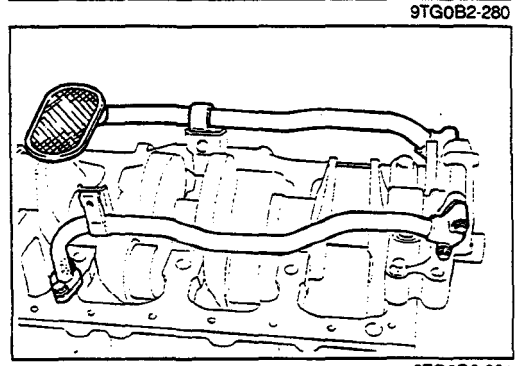
4. Press the oil seal in evenly with the **SST** (HA) or a suitable pipe (SL) and a hammer.



9TG0B2-280

Oil Pump
1. Apply clean engine oil to the oil pump driven gear.
2. Install the oil pump.

Tightening torque:
37—53 N·m (3.8—5.4 m-kg, 27—39 ft-lb)



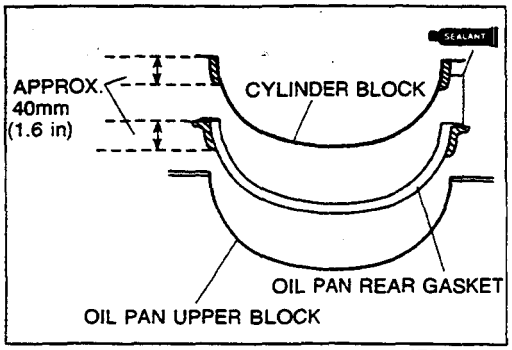
9TG0B2-281

Oil Strainer and Oil Pipe
1. Install the oil strainer and a new gasket.

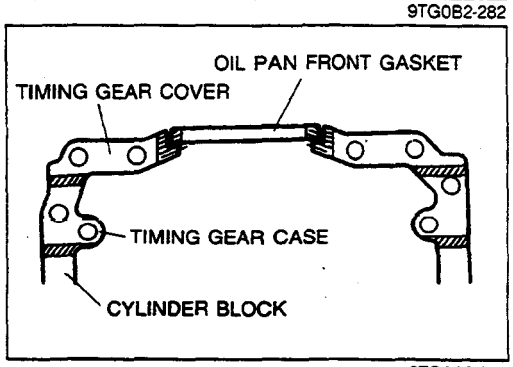
Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)

2. Install the oil pipe and a new gasket (oil pump side) and a new O-ring (cylinder block side).

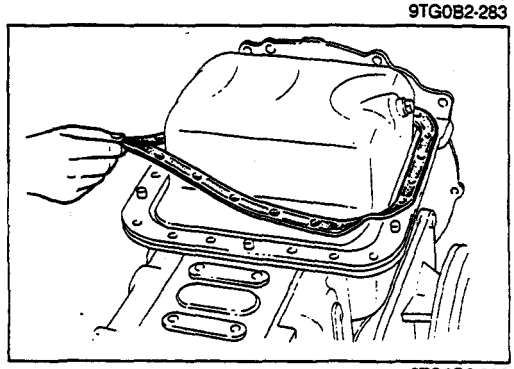
Tightening torque
Ⓐ: 7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)
Ⓑ: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



9TG0B2-282



9TG0B2-283



9TG0B2-285

Oil Pan Upper Block

Caution
- **The oil pan upper block must be secured within 30 minutes after the sealant is applied.**

1. Apply silicone sealant as shown to the shaded areas of a new oil pan gasket (front and rear).
2. Install the gaskets onto the cylinder block.
3. Apply silicone sealant to the shaded areas of the cylinder block.
4. Install the oil pan upper block and a new gasket.

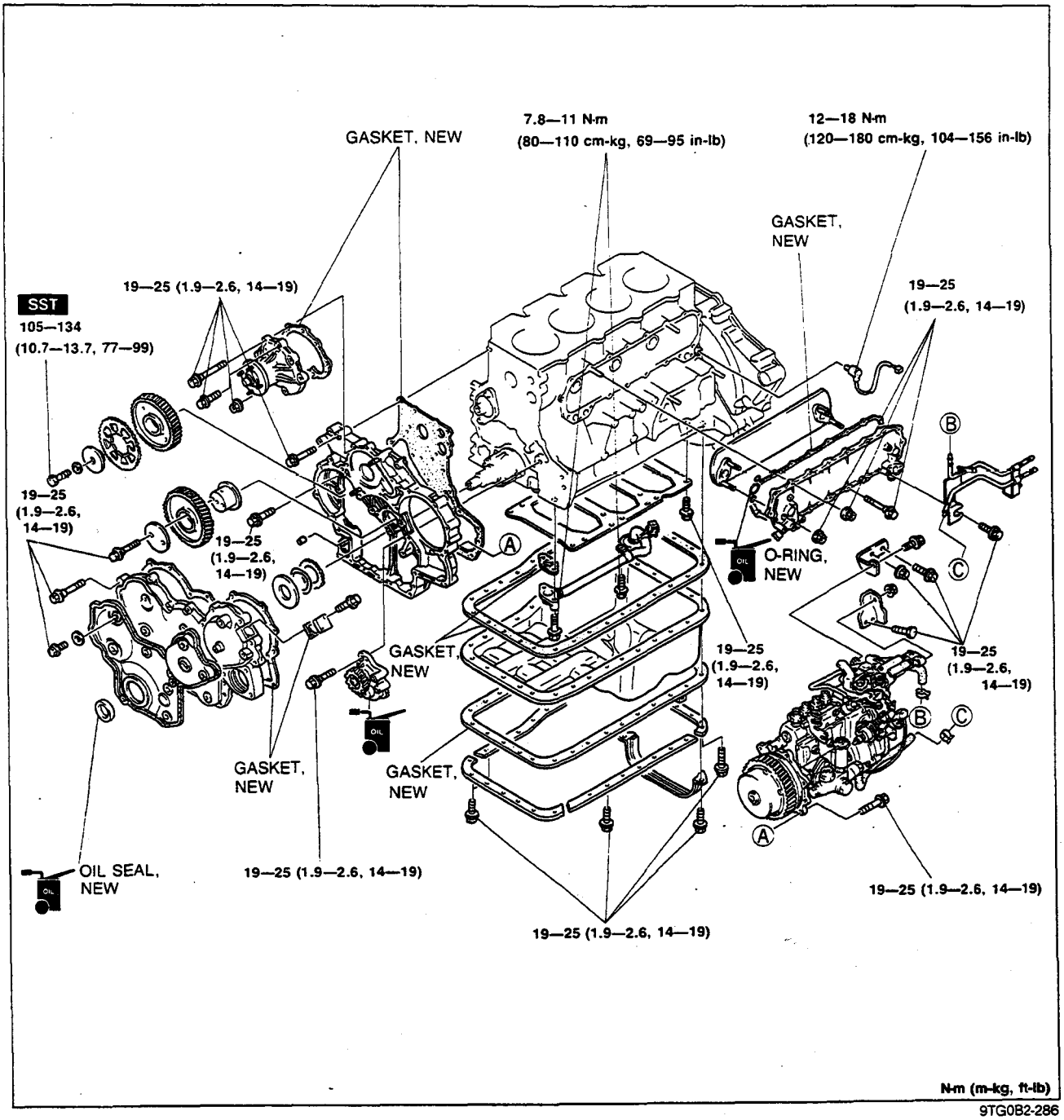
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

Oil Pan

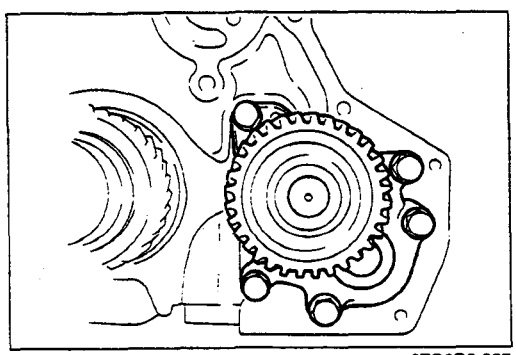
1. Install the oil pan and a new gasket.
2. Install the stiffener.

Tightening torque
HA: 16—23 N·m (1.6—2.3 m-kg, 12—17 ft-lb)
SL: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

TF Engine
Torque Specifications



9TG0B2-286

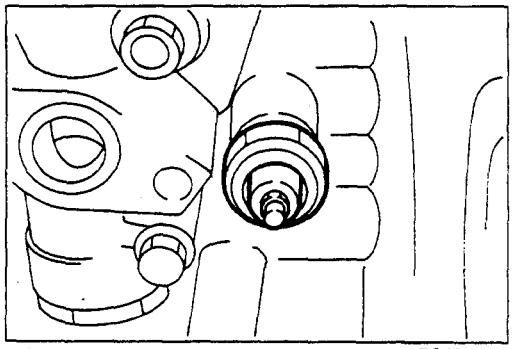


9TG0B2-287

Oil Pump

1. Apply engine oil to the rotor, then install the oil pump and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

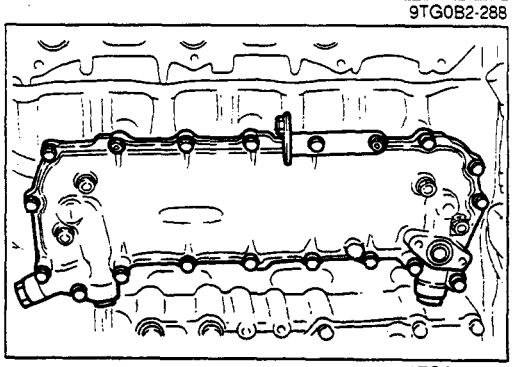


9TG0B2-288

Oil Pressure Switch

1. Install the oil pressure switch.

Tightening torque:
12—18 N·m (120—180 cm-kg, 104—156 in-lb)

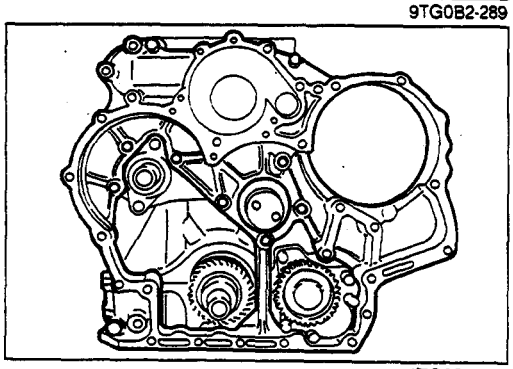


9TG0B2-289

Oil Cooler

1. Install the oil cooler and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

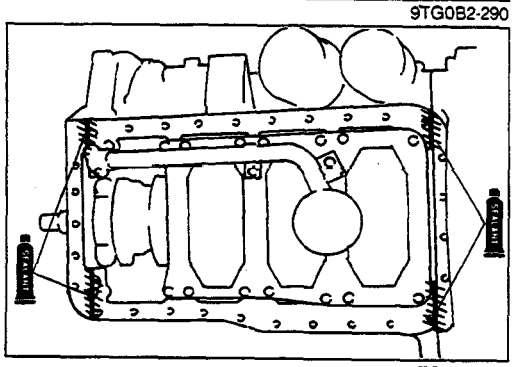


9TG0B2-290

Timing Gear Case

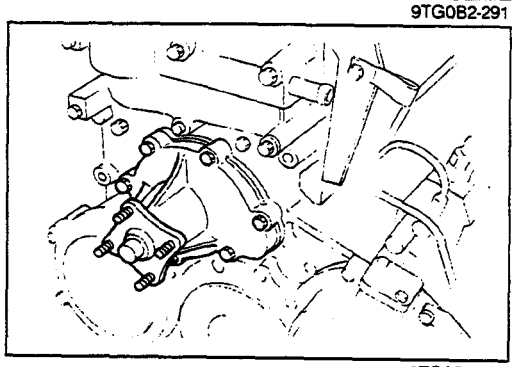
1. Install the timing gear case.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



9TG0B2-291

2. Apply silicone sealant as shown to the shaded areas of the timing gear case and the cylinder block.

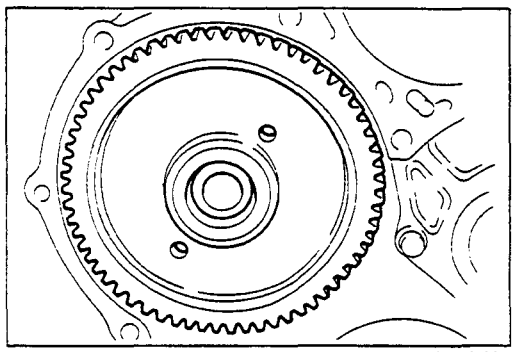


9TG0B2-465

Water Pump

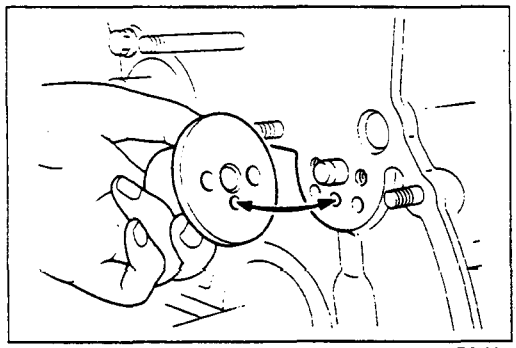
1. Install the water pump and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

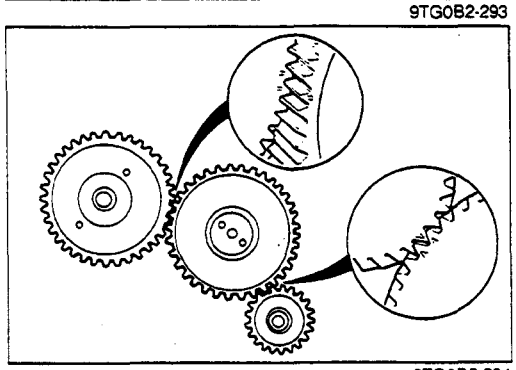

9TG0B2-292

Timing Gear Train

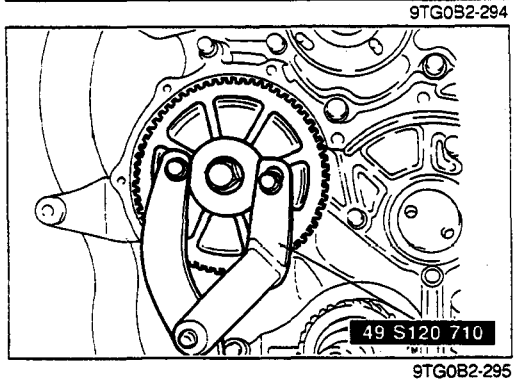
1. Align the Woodruff key, and install the cam gear.


9TG0B2-293

2. Align the idler gear spindle oil hole and the cylinder block oil hole.


9TG0B2-294

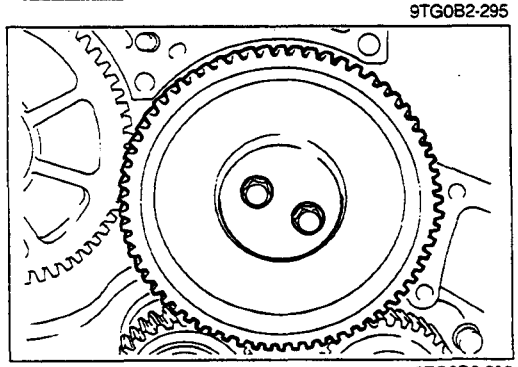
3. Install the idler gear as shown in the figure.



9TG0B2-295

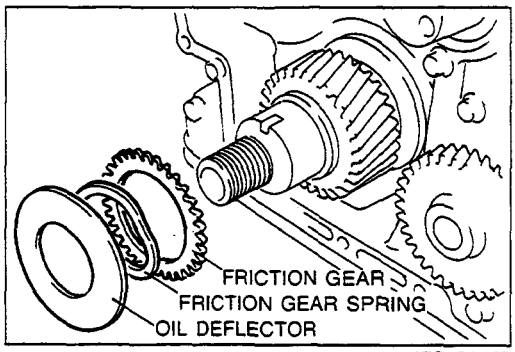
4. Install the friction plate and washer to the cam gear, and affix them with the **SST**.
5. Install and tighten the lock bolt.

Tightening torque:
63—93 N·m (6.4—9.5 m-kg, 46—69 ft-lb)


9TG0B2-296

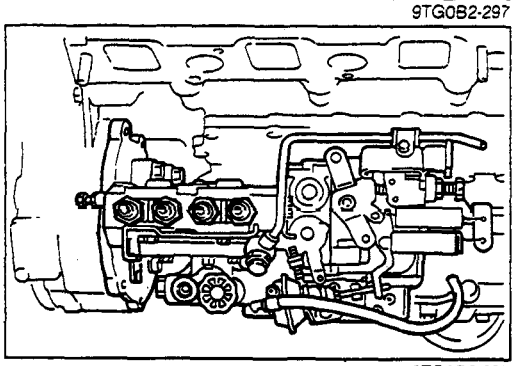
6. Install the idler gear and thrust plate.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



9TG0B2-297

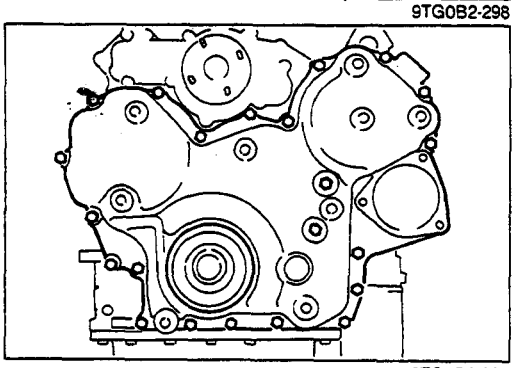
7. Install the friction gear, gear spring and oil deflector on the crankshaft.


9TG0B2-298

Fuel Injection Pump

1. Align the marks of the idler gear and the injection pump gear.
2. Install the fuel injection pump.

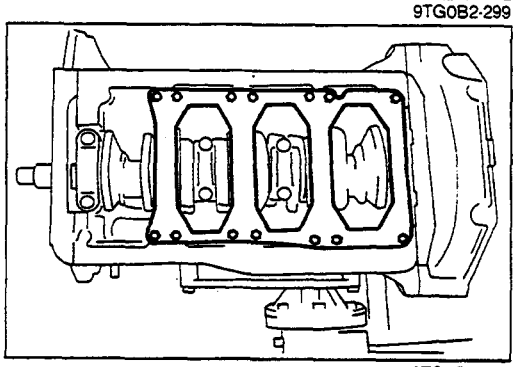
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-299

Timing Gear Cover

1. Install the timing gear cover and a new gasket.

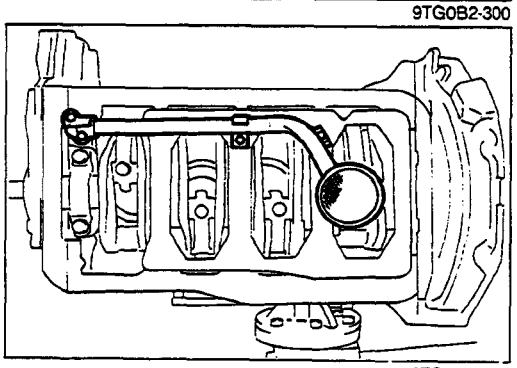
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-300

Stiffening Plate

1. Install the stiffening plate.

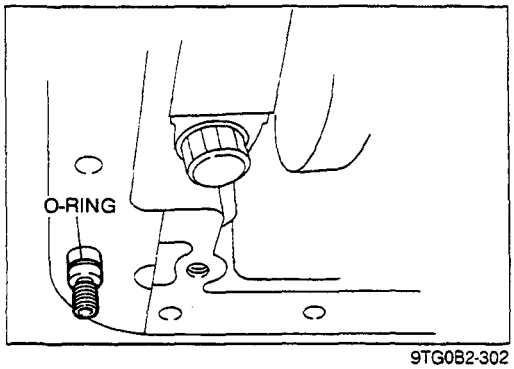
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-301

Oil Strainer

1. Install the oil strainer and a new gasket.

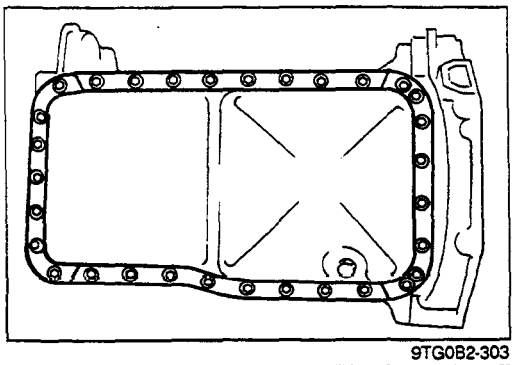
Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)



9TG0B2-302

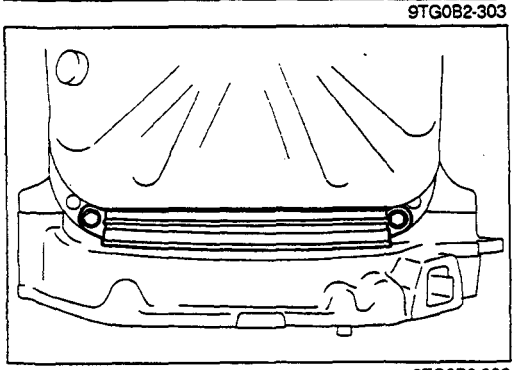
Oil Pan

1. Install new O-rings on the bolts.


9TG0B2-303

2. Install a new gasket.
3. Install the oil pan.
4. Install the stiffener and a new gasket.

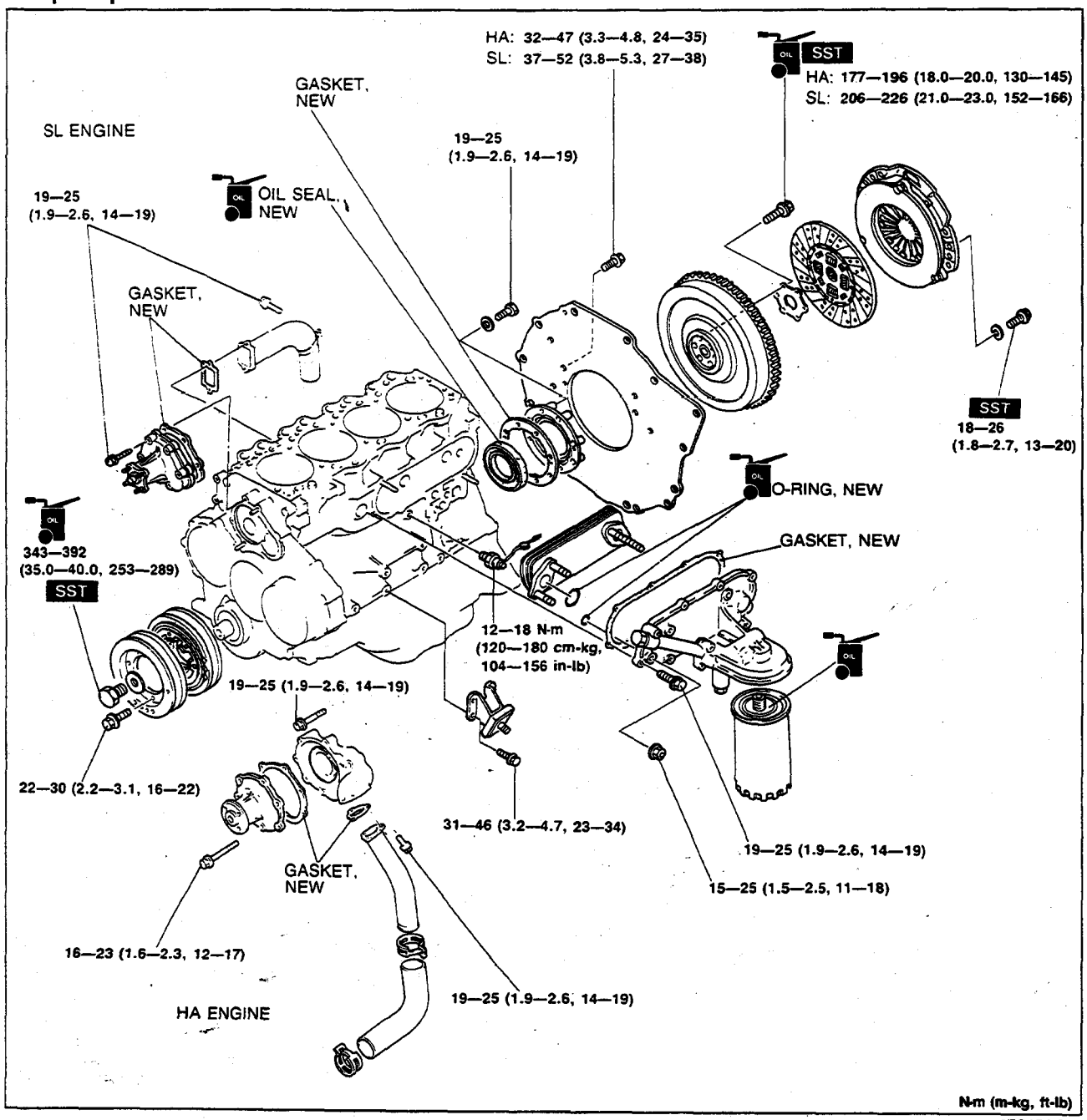
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-306

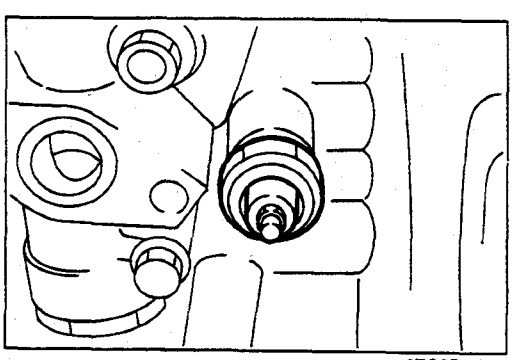
5. Install the seal plate.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

CYLINDER BLOCK (EXTERNAL PARTS I)
HA, SL Engine
Torque Specifications



9TG0B2-307

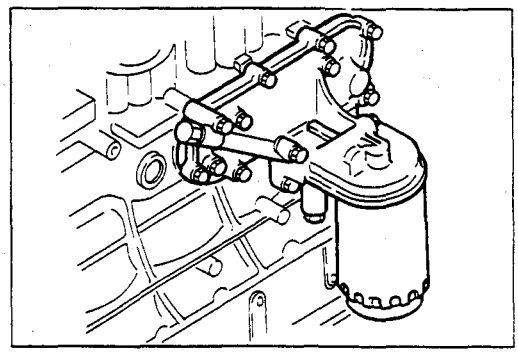


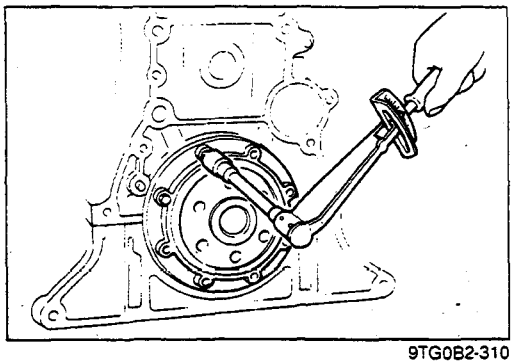
9TG0B2-308

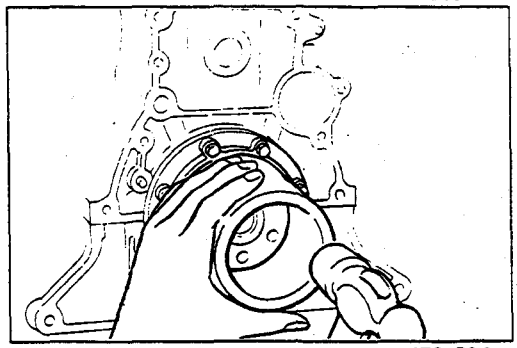
Oil Pressure Switch

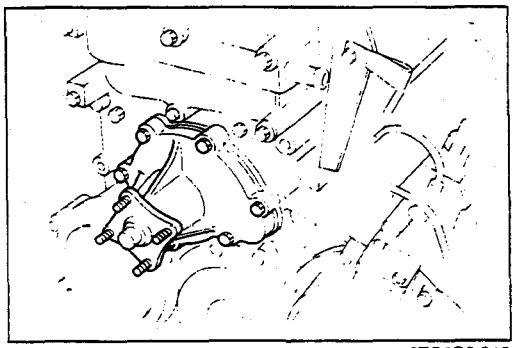
1. Install the pressure switch.

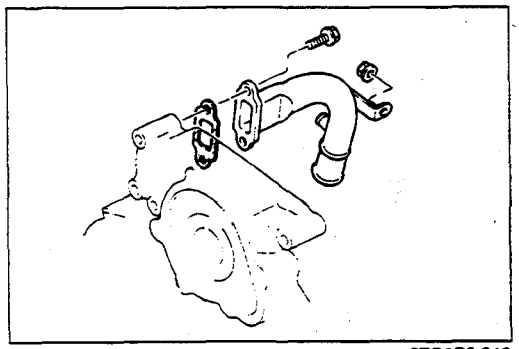
Tightening torque:
12—18 N·m (120—180 cm-kg, 104—156 in-lb)


9TG0B2-309


9TG0B2-310


9TG0B2-311


9TG0B2-312


9TG0B2-313

Oil Cooler, Oil Filter

1. Install the oil cooler and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

2. Apply a small amount of clean engine oil to the rubber seal of the new filter.
3. Install the oil filter and tighten it by hand until the rubber seal contacts the base.
4. Tighten the filter 1/2-turn with a filter wrench.

Rear Oil Seal Cap

1. Install the rear oil seal cap and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

2. Apply a small amount of clean engine oil to the lip of the new oil seal.
3. Push the oil seal slightly in by hand.

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

4. Press the oil seal in evenly with a suitable pipe and a hammer.

Water Pump

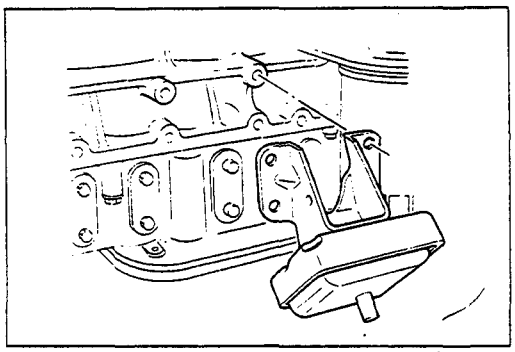
1. Install the water pump and a new gasket.

Tightening torque
HA: 16—23 N·m (1.6—2.3 m-kg, 12—17 ft-lb)
SL: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

Water Inlet Pipe

1. Install the water inlet pipe and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

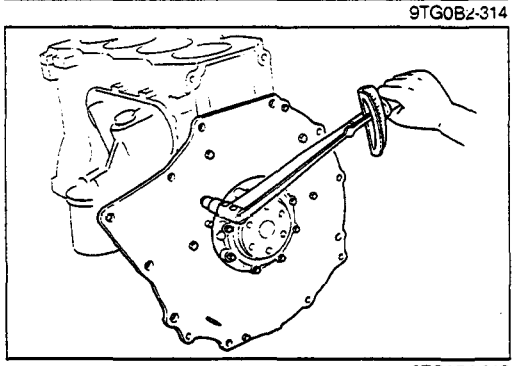


9TG0B2-314

Left Engine Mount

1. Install the left engine mount.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

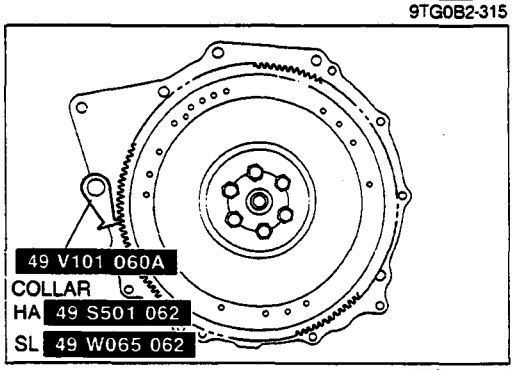


9TG0B2-315

End Plate

1. Install the end plate.

Tightening torque
HA: 32—47 N·m (3.3—4.8 m-kg, 24—35 ft-lb)
SL: 37—52 N·m (3.3—5.3 m-kg, 27—38 ft-lb)

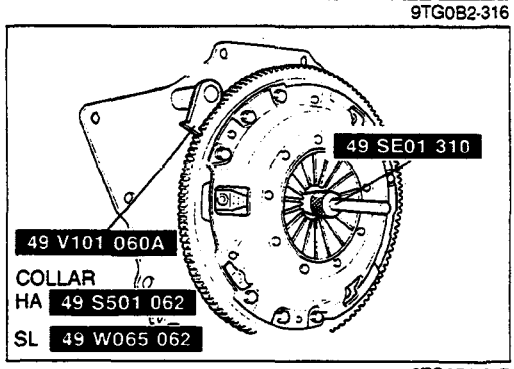


9TG0B2-316

Flywheel

1. Apply clean engine oil to the bolt threads and seat faces.
2. Set the flywheel onto the crankshaft, and loosely install the bolts.
3. Hold the flywheel with the **SST**.
4. Tighten the bolts in two or three steps in the order shown in the figure.

Tightening torque
HA:
177—196 N·m (18.0—20.0 m-kg, 130—145 ft-lb)
SL:
206—226 N·m (21.0—23.0 m-kg, 152—166 ft-lb)

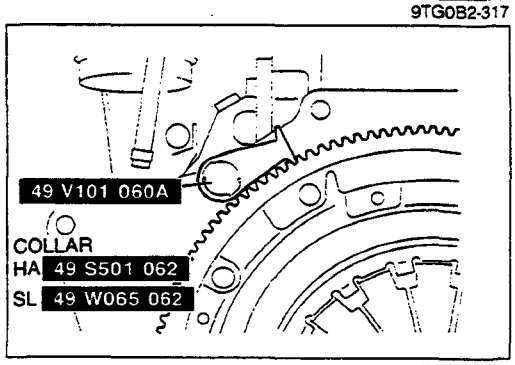


9TG0B2-317

Clutch Disc and Clutch Cover

1. Install the clutch disc and the clutch cover using the **SST**. (Refer to Section H.)

Tightening torque:
18—26 N·m (1.8—2.7 m-kg, 13—20 ft-lb)



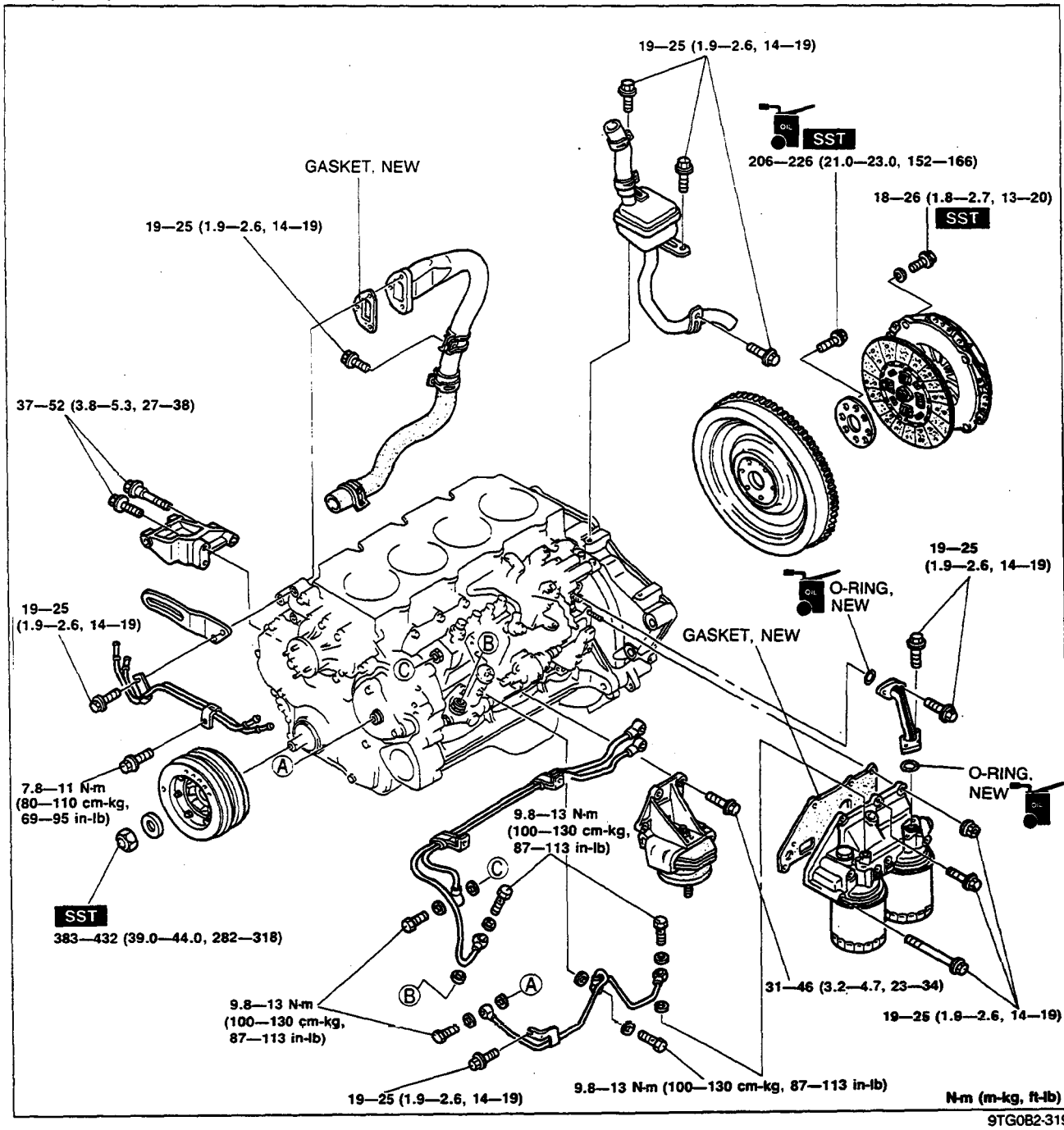
9TG0B2-318

Crankshaft Pulley

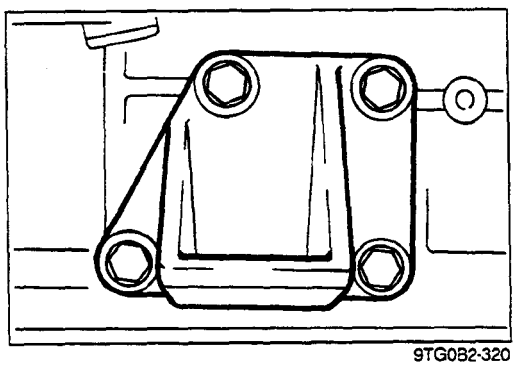
1. Apply clean engine oil to the bolt threads and seat faces.
2. Install the crankshaft pulley.
3. Hold the flywheel with the **SST**.
4. Install the washer and lock bolt.

Tightening torque:
343—392 N·m (35.0—40.0 m-kg, 253—289 ft-lb)

TF Engine
Torque Specifications



9TG0B2-319

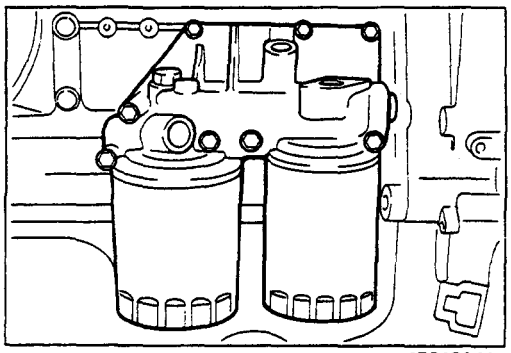


9TG0B2-320

Engine Mount

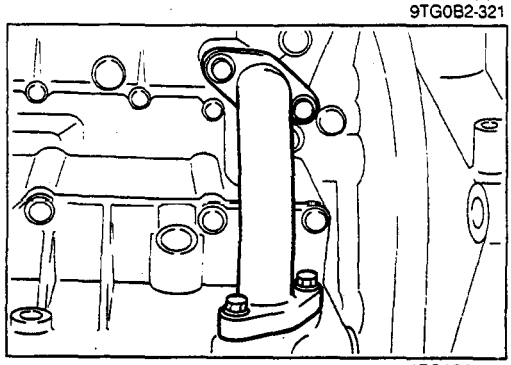
1. Install the left engine mount.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)


9TG0B2-321

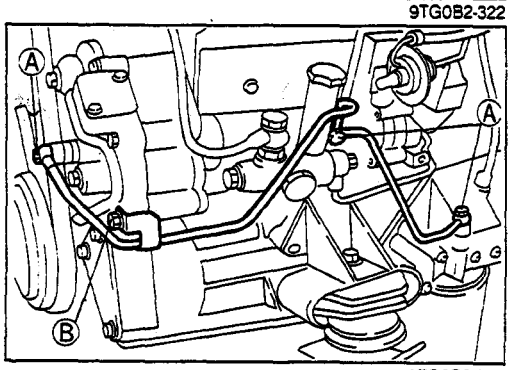
Oil Filter Assembly
1. Install the oil filter and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-322

2. Install the oil pipe and a new O-ring.

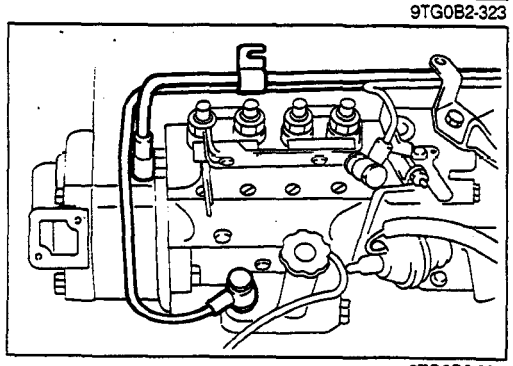
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



9TG0B2-323

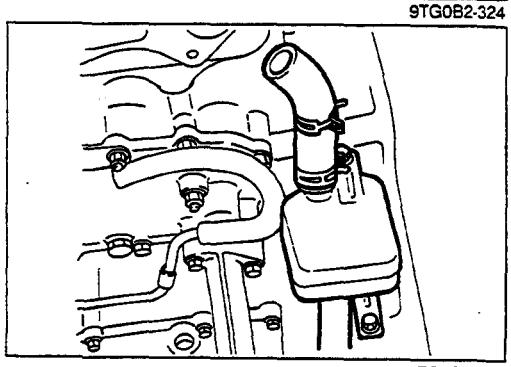
Injection Pump Oil Pipe
1. Install the injection pump oil pipe.

Tightening torque
Ⓐ: 9.8—13 N·m (100—130 cm-kg, 87—113 in-lb)
Ⓑ: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-324

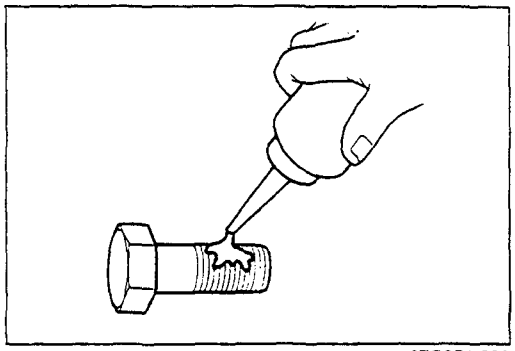
Fuel Pipe
1. Install the fuel pipe.

Tightening torque:
9.8—13 N·m (100—130 cm-kg, 87—113 in-lb)


9TG0B2-325

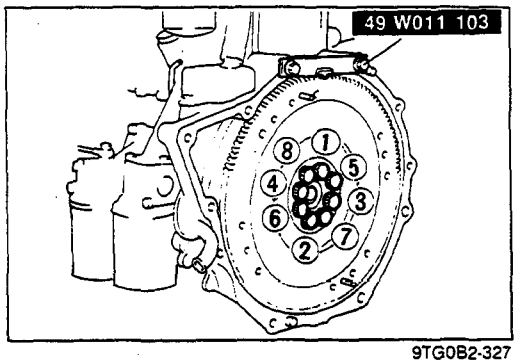
PCV Chamber
1. Install the PCV chamber.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-326

Flywheel

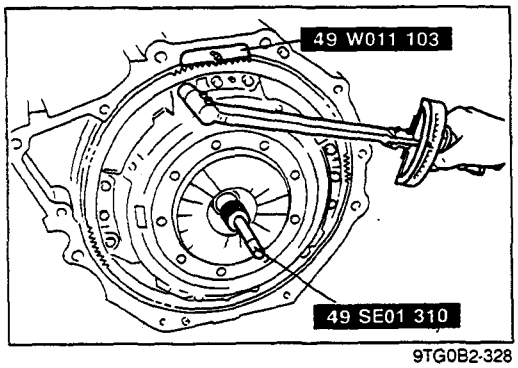
1. Apply clean engine oil to the bolt threads and seat faces.



9TG0B2-327

2. Set the flywheel onto the crankshaft, and loosely install the bolts.
3. Hold the flywheel with the **SST**.
4. Tighten the bolts in two or three steps in the order shown in the figure.

Tightening torque:
206—226 N·m (21.0—23.0 m-kg, 152—166 ft-lb)

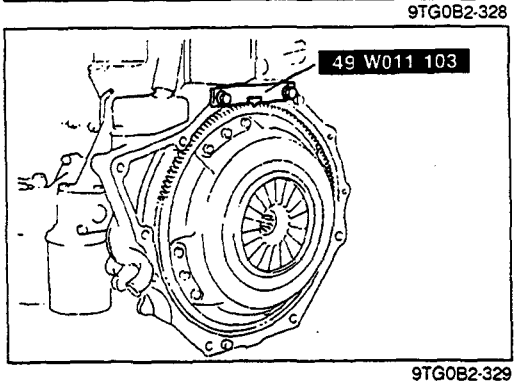


9TG0B2-328

Clutch Disc and Clutch Cover

1. Install the clutch disc and the clutch cover with the **SST**. (Refer to Section H.)

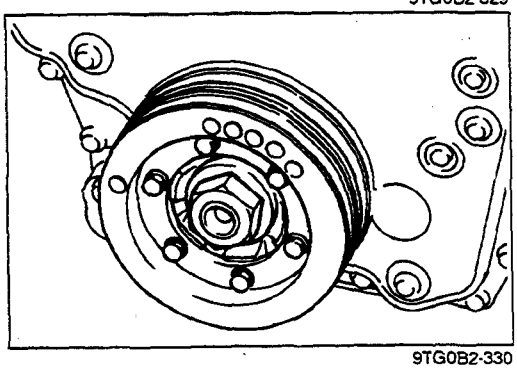
Tightening torque:
18—26 N·m (1.8—2.7 m-kg, 13—20 ft-lb)



9TG0B2-329

Crankshaft Pulley

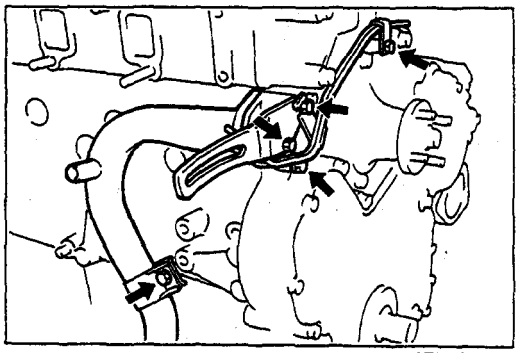
1. Install the crankshaft pulley.
2. Hold the flywheel with the **SST**.


9TG0B2-330

3. Install the washer and locknut.

Tightening torque:
383—432 N·m (39.0—44.0 m-kg, 282—318 ft-lb)

ASSEMBLY



9TG0B2-331

Water Inlet Pipe

1. Install the water inlet pipe and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

Alternator Bracket

1. Install the alternator bracket.

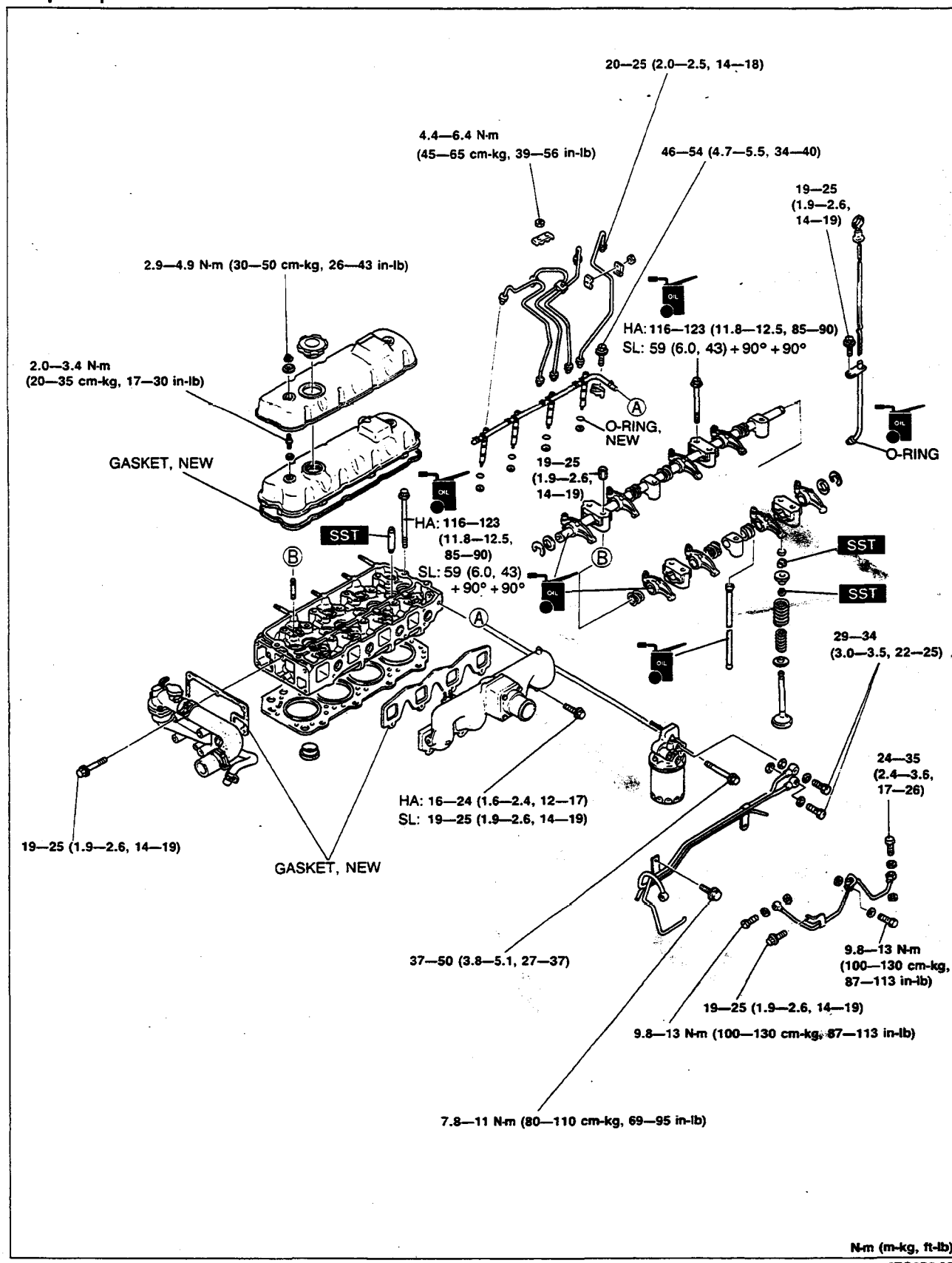
Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

Vacuum Pipe

1. Install the vacuum pipe.

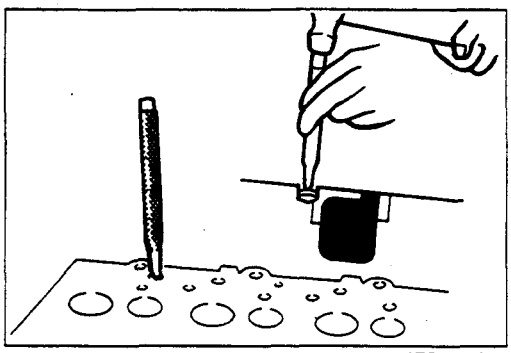
Tightening torque:
9.8—13 N·m (100—130 cm-kg, 87—113 in-lb)

CYLINDER HEAD
HA, SL Engine
Torque Specifications



N·m (m-kg, ft-lb)

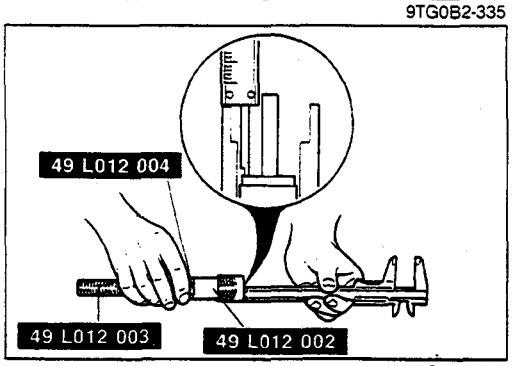
9TG0B2-333



9TG0B2-335

Combustion Chamber Insert (HA)

1. Place the insert into position of the cylinder head and adjust the position in relation to the welsh washer.
   Set the welsh washer with the projected portion directed toward the cylinder head gasket side.
2. Calk the welsh washer by lightly striking its center with a punch.



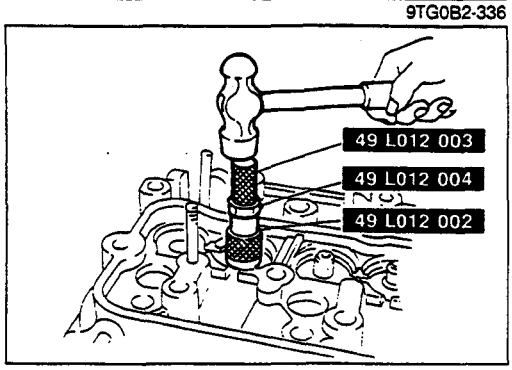
9TG0B2-336

Valve Guide

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

   Depth L: 15.2—15.4mm (0.598—0.606 in)

2. Tighten the locknut.

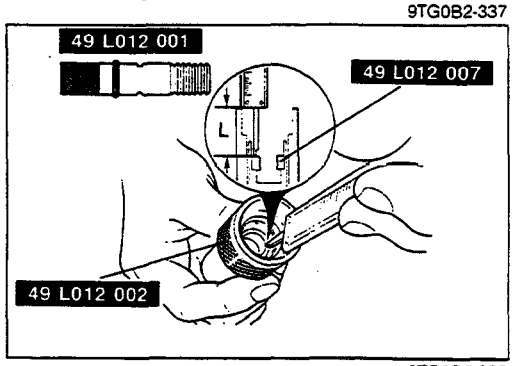


9TG0B2-337

3. Tap the valve guide in from the side opposite the combustion chamber until the **SST** contacts the cylinder head.
4. Verify that the valve guide height is within specification.

   Height: 15.2—15.4mm (0.598—0.606 in)

5. If not within specification, repeat Steps 1—4.

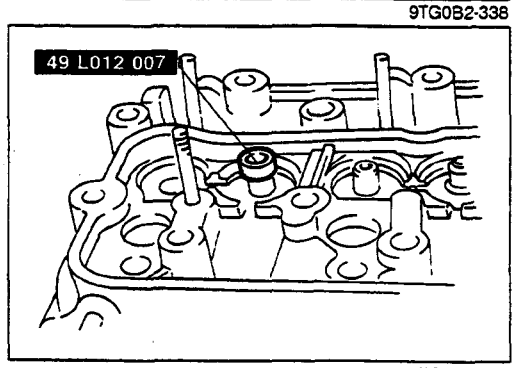


9TG0B2-338

Valve Seal

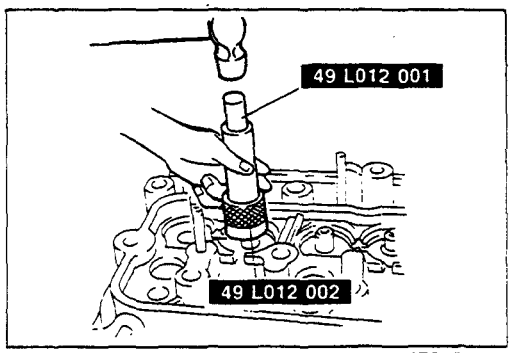
1. Assemble the **SST** so that depth **L** is as specified.

   Depth L: 16.5—16.9mm (0.650—0.665 in)



9TG0B2-339

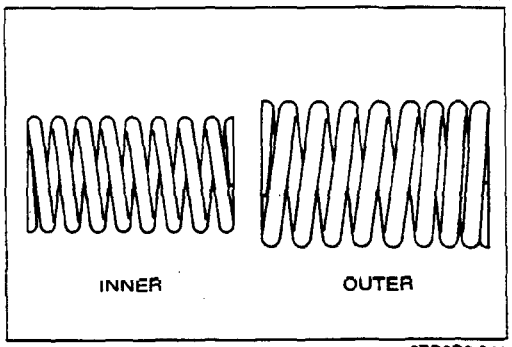
2. Slide the valve seal onto the valve guide.
3. Set the **SST** against the valve seal.



9TG0B2-340

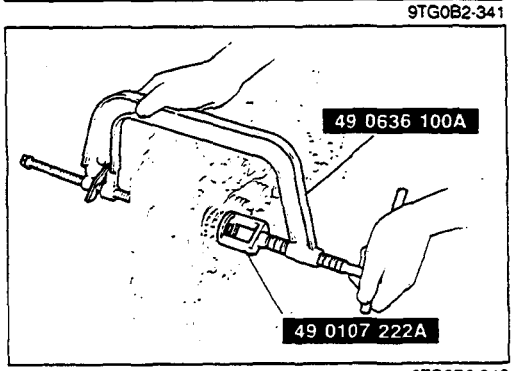
Caution
- **Do not use a hammer.**

4. Press the valve seal on until the **SST** contacts the cylinder head.



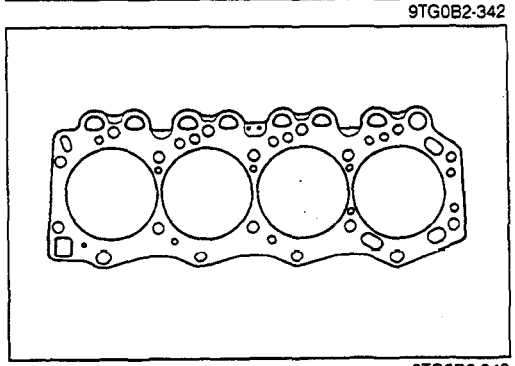
9TG0B2-341

Valve, Valve Spring and Valve Spring Seat
1. Install the lower spring seat.
2. Install the valve.
3. Install the valve springs (outer and inner) and the upper spring seat.



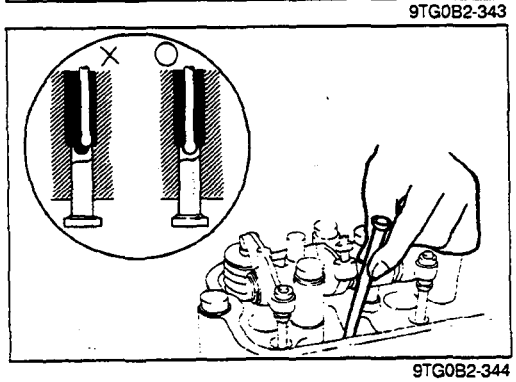
9TG0B2-342

4. Compress the valve spring with the **SST**.
5. Install the valve keepers.
6. Remove the **SST**.
7. Tap the end of the valve stem lightly two or three times with a plastic hammer to verify that the keepers are all fully seated.
8. Install the valve caps.



9TG0B2-343

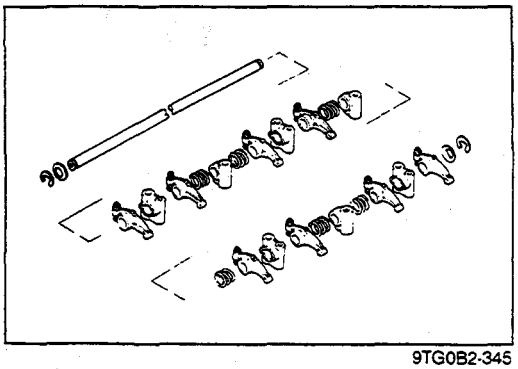
Cylinder Head Gasket
1. Remove all foreign material from the deck of the cylinder block.
2. Place the new cylinder head gasket in position.



9TG0B2-344

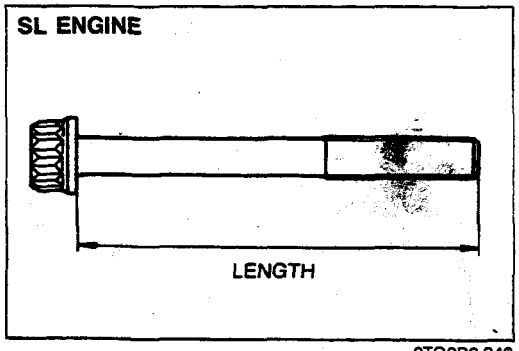
Cylinder Head
1. Install the cylinder head assembly.
2. Apply clean engine oil to the push rod.
3. Install the push rods.

Caution
- **Verify that the ends of the push rods are properly set in to the tappets.**



9TG0B2-345

4. Apply clean engine oil to the rocker arms and shaft.
5. Assemble the rocker arms, springs, and shaft.
6. Install the rocker arm and shaft assembly onto the cylinder head.

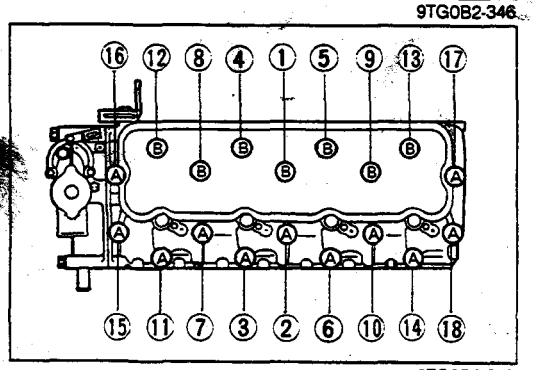


9TG0B2-346

7. **SL Engine**
   (1) Measure the length of the cylinder head bolt below the head.
   If the length exceeds the maximum, replace the bolt.

Length

Standard	**Ⓐ: 121.7—122.3mm (4.791—4.815 in)**	
	Ⓑ: 150.7—151.3mm (5.933—5.957 in)	
Maximum	**Ⓐ: 123.0mm (4.843 in)**	
	Ⓑ: 152.0mm (5.984 in)	

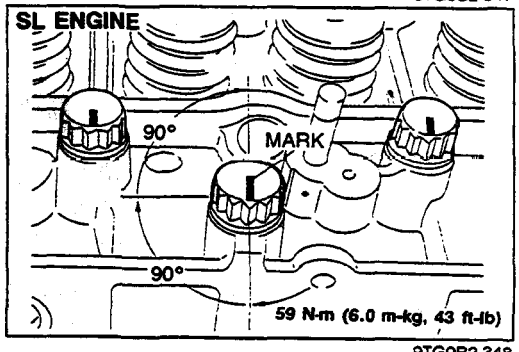


9TG0B2-347

Caution
- **Verify that the rocker arms and push rods are properly engaged while tightening.**

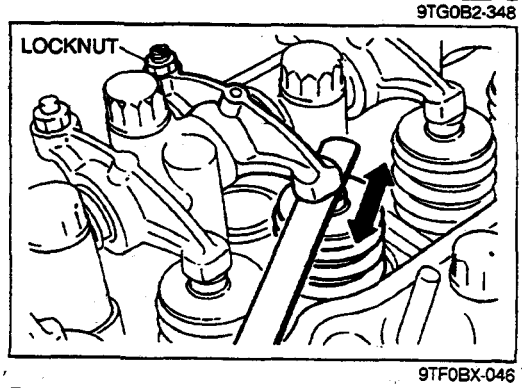
8. Apply clean engine oil to the bolt threads and seat faces.
9. Install the cylinder head bolts.
10. Tighten the bolts in two or three steps in the order shown in the figure.

Tightening torque
HA: 116—123 N·m (11.8—12.5 m-kg, 85—90 ft-lb)
SL: 59 N·m (6.0 m-kg, 43 ft-lb)



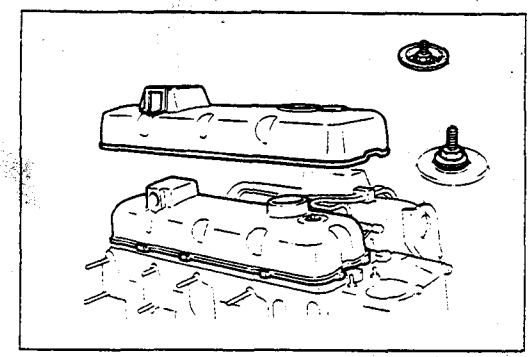
9TG0B2-348

11. **SL Engine**
   (1) Make paint marks on the bolt heads as shown in the figure.
   (2) With the paint marks as a reference point, tighten the cylinder head bolts **another 90° ± 15°** in the tightening order.
   (3) Tighten the bolts **once again 90° ± 15°** in the tightening order.



9TF0BX-046

12. Adjust the valve clearance. (Refer to page B–9.)


9TG0B2-350

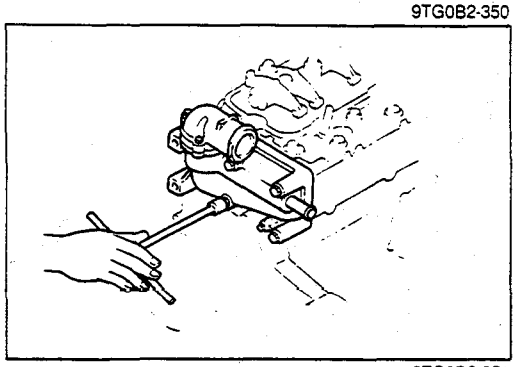
Cylinder Head Cover
1. Install the cylinder head cover and a new gasket.

Tightening torque:
2.0—3.4 N·m (20—35 cm-kg, 17—30 in-lb)

Seal Cover (SL)
1. Install the seal cover.

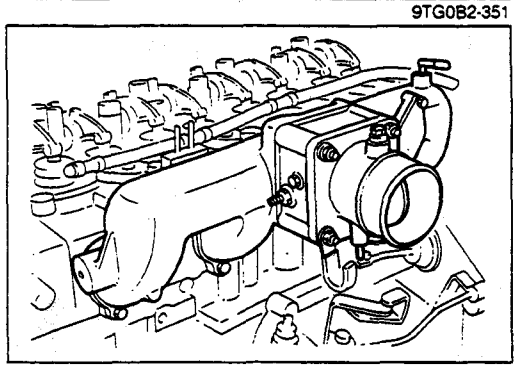
Tightening torque:
2.9—4.9 N·m (30—50 cm-kg, 26—43 in-lb)

2. Install the oil filler cap.


9TG0B2-351

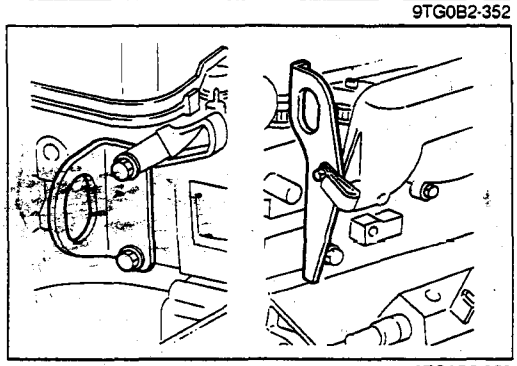
Water Outlet Housing
1. Install the water outlet housing and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-352

Intake Manifold Assembly
1. Install the intake manifold assembly and a new gasket.

Tightening torque
HA: 16—24 N·m (1.6—2.4 m-kg, 12—17 ft-lb)
SL: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

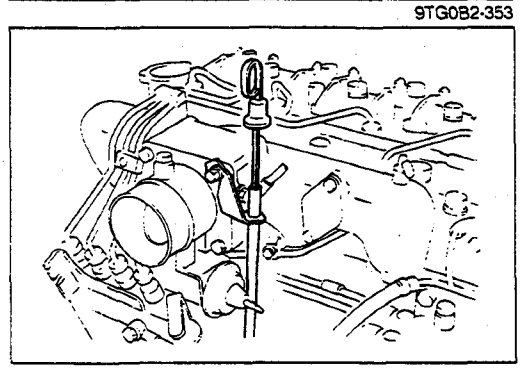

9TG0B2-353

Engine Hanger
1. Install the front (right) engine hanger.

Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

2. Install the front (left) engine hanger.

Tightening torque:
64—89 N·m (6.5—9.1 m-kg, 47—66 ft-lb)

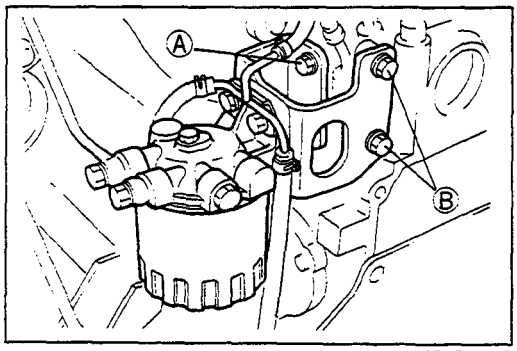

9TG0B2-354

Oil Level Gauge and Guide Pipe
1. Apply clean engine oil to a new O-ring and install the oil level gauge guide pipe.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

2. Install the oil level gauge.

ASSEMBLY



9TG0B2-355

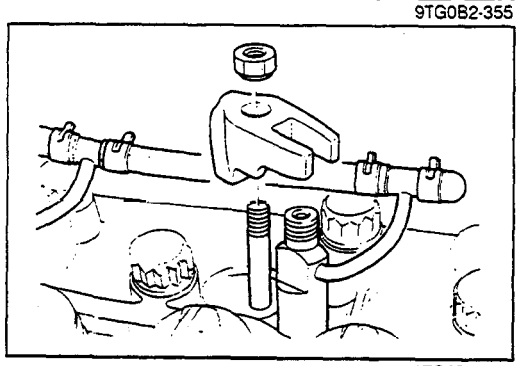
Fuel Filter Body

1. Install the rear engine hanger (fuel filter bracket).

Tightening torque
Ⓐ: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)
Ⓑ: 37—50 N·m (3.8—5.1 m-kg, 27—37 ft-lb)

2. Install the fuel filter body.

Tightening torque:
37—50 N·m (3.8—5.1 m-kg, 27—37 ft-lb)

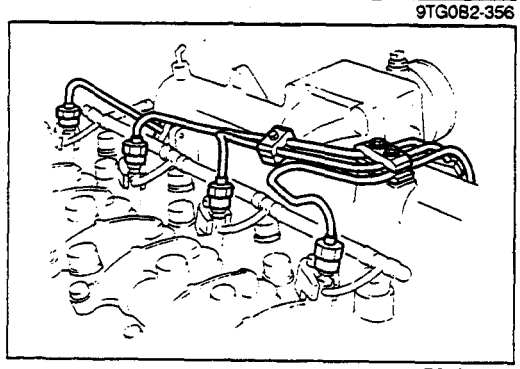


9TG0B2-356

Injection Nozzle and Nozzle Holder

1. Install the injection nozzle and a new O-ring.
2. Install the injection nozzle holder.

Tightening torque:
46—54 N·m (4.7—5.5 m-kg, 34—40 ft-lb)



9TG0B2-357

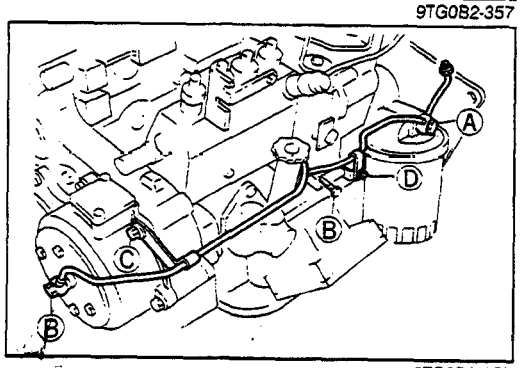
Injection Pipe

1. Install the injection pipe.

Tightening torque:
20—25 N·m (2.0—2.5 m-kg, 14—18 ft-lb)

2. Install the injection pipe clip.

Tightening torque:
4.4—6.4 N·m (45—65 cm-kg, 39—56 in-lb)

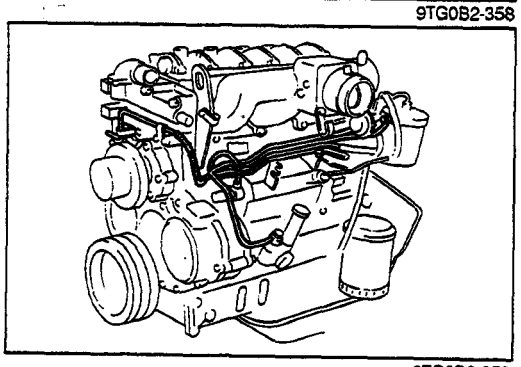


9TG0B2-358

Injection Pump Oil Pipe (SL)

1. Install the injection pump oil pipe.

Tightening torque
Ⓐ: 24—35 N·m (2.4—3.6 m-kg, 17—26 ft-lb)
Ⓑ: 9.8—13 N·m (100—130 cm-kg, 87—113 in-lb)
Ⓒ: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)
Ⓓ: 7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)



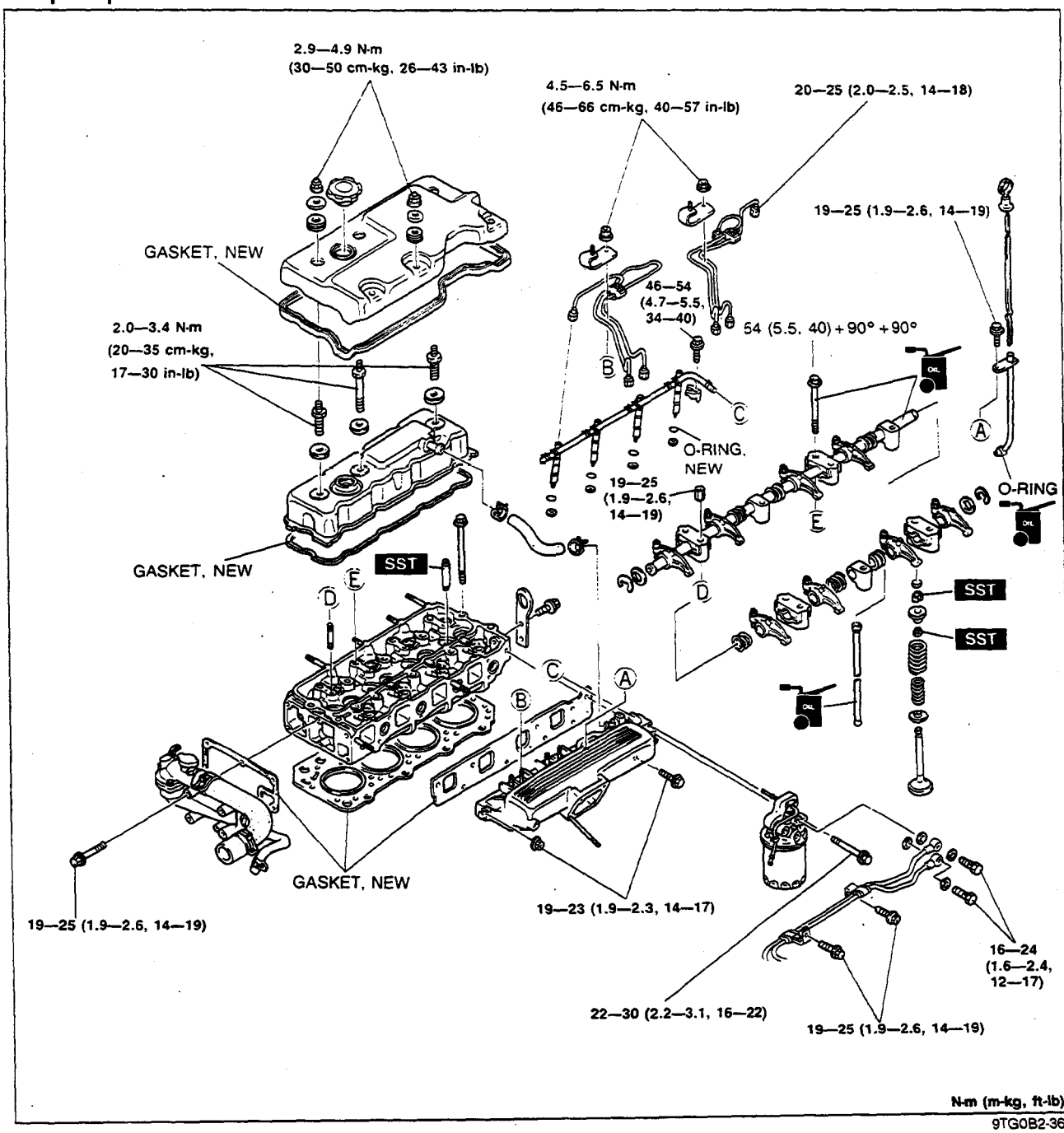
9TG0B2-359

Fuel Pipe

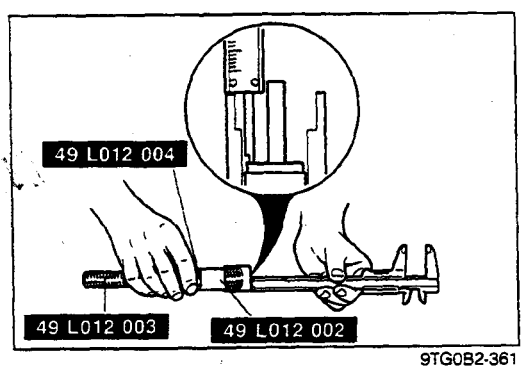
1. Install the fuel pipe.

Tightening torque
Connect bolt:
29—34 N·m (3.0—3.5 m-kg, 22—25 ft-lb)
Bracket:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)

TF Engine
Torque Specifications



9TG0B2-360



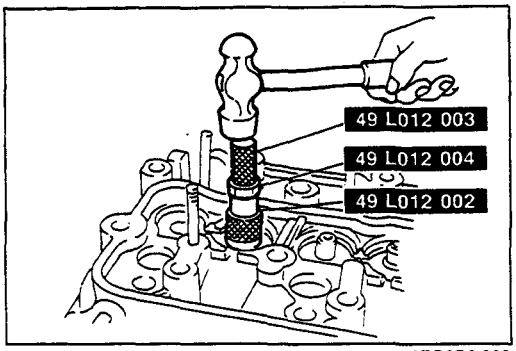
9TG0B2-361

Valve Guide

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

   Depth L: 14.2—14.4mm (0.559—0.567 in)

2. Tighten the locknut.

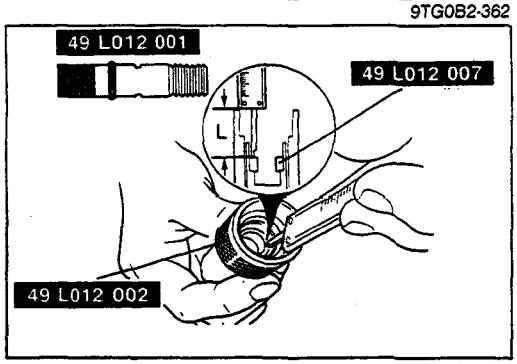


9TG0B2-362

3. Tap the valve guide in from the side opposite the combustion chamber until the **SST** contacts the cylinder head.
4. Verify that the valve guide height is within specification.

Height: 14.2—14.4mm (0.559—0.567 in)

5. If not within specification, repeat Steps 1—4.

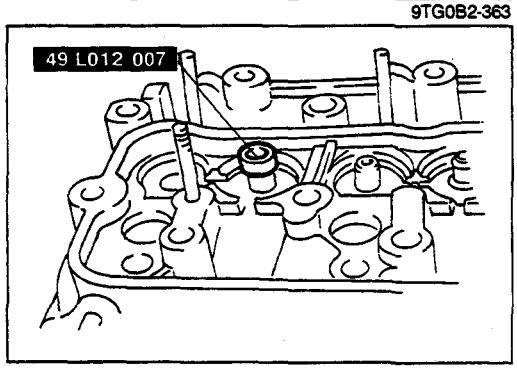


9TG0B2-363

Valve Seal

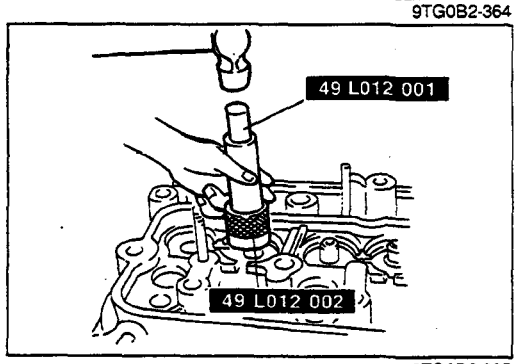
1. Assemble the **SST** so that depth **L** is as specified.

Depth L: 15.5—15.9mm (0.610—0.626 in)



9TG0B2-364

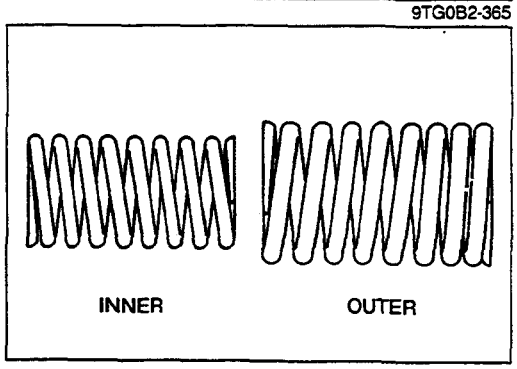
2. Slide the valve seal onto the valve guide.
3. Set the **SST** against the valve seal.



9TG0B2-365

Caution
- **Do not use a hammer.**

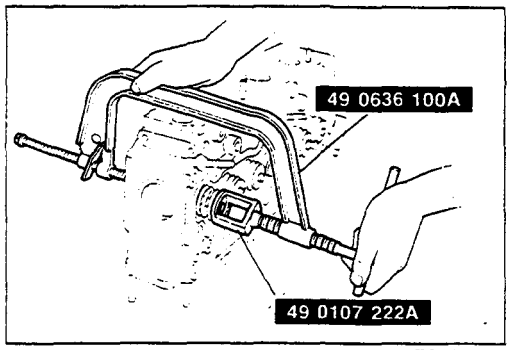
4. Press the valve seal on until the **SST** contacts the cylinder head.



9TG0B2-366

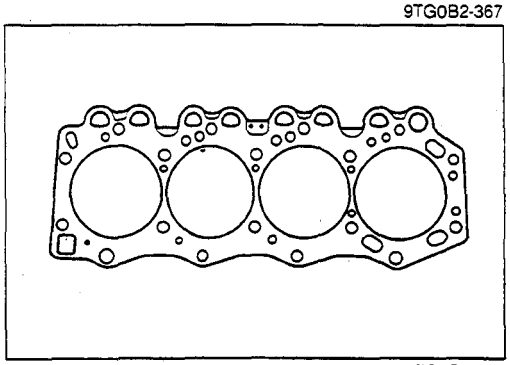
Valve, Valve Spring and Valve Spring Seat

1. Install the lower spring seat.
2. Install the valve.
3. Install the valve springs (outer and inner) and the upper spring seat.



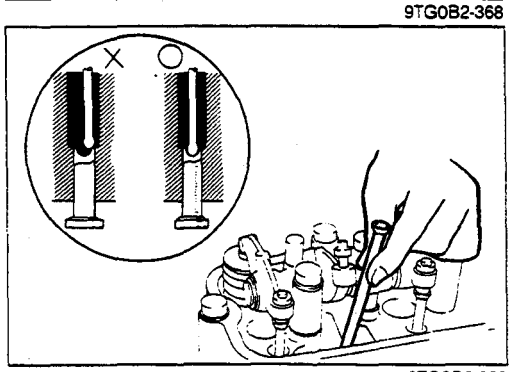
9TG0B2-367

4. Compress the valve spring with the **SST**.
5. Install the valve keepers.
6. Remove the **SST**.
7. Tap the end of the valve stem lightly two or three times with a plastic hammer to verify that the keepers are all fully seated.
8. Install the valve caps.


9TG0B2-368

Cylinder Head Gasket

1. Remove all foreign material from the deck of the cylinder block.
2. Place the new cylinder head gasket in position.

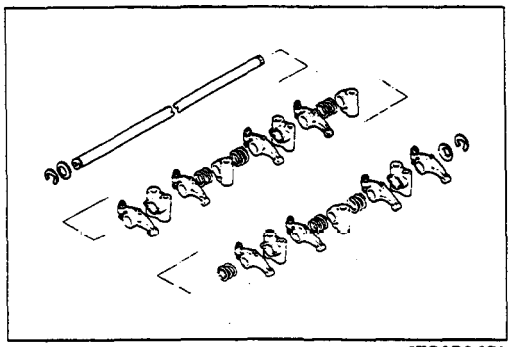

9TG0B2-369

Cylinder Head

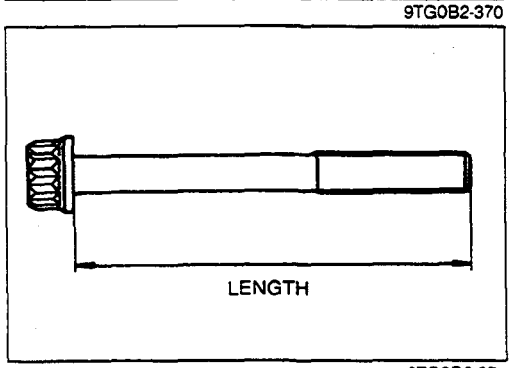
1. Install the cylinder head assembly.
2. Apply clean engine oil to the push rod.
3. Install the push rods.

Caution

- **Verify that the ends of the push rods are properly set in to the tappets.**


9TG0B2-370

4. Apply clean engine oil to the rocker arms and shaft.
5. Assemble the rocker arms, springs, and shaft.
6. Install the rocker arm and shaft assembly onto the cylinder head.

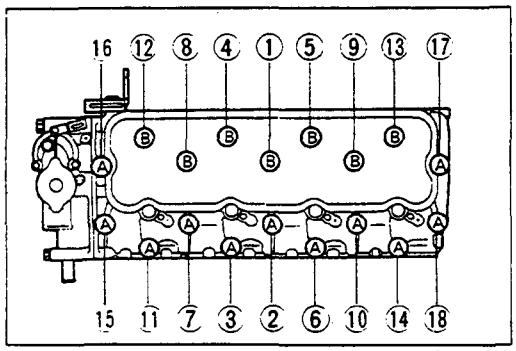


9TG0B2-371

7. Measure the length of the cylinder head bolt below the head. If the length exceeds the maximum, replace the bolt.

Length

Standard Ⓐ: **130.2—130.8mm (5.126—5.150 in)**
Ⓑ: **158.2—158.8mm (6.228—6.252 in)**
Maximum Ⓐ: **131.5mm (5.177 in)**
Ⓑ: **159.5mm (6.280 in)**

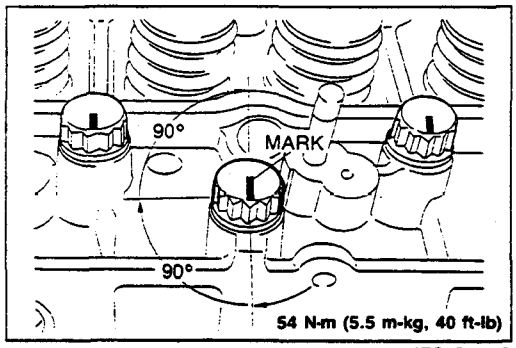


9TG0B2-372

Caution
- **Verify that the rocker arms and push rods are properly engaged while tightening.**

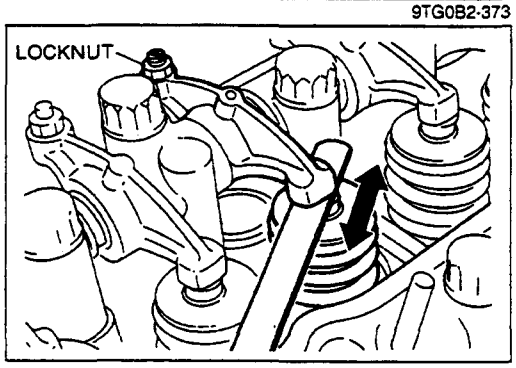
8. Apply clean engine oil to the bolt threads and seat faces.
9. Install the cylinder head bolts.
10. Tighten the bolts in two or three steps in the order shown in the figure.

Tightening torque: 54 N·m (5.5 m-kg, 40 ft-lb)



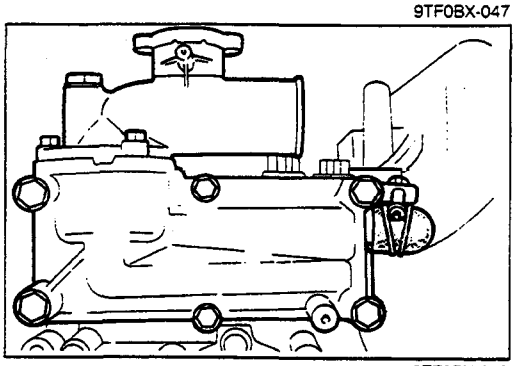
9TG0B2-373

11. Make paint marks on the bolt heads as shown in the figure.
12. With the paint marks as a reference point, tighten the cylinder head bolts **another 90° ± 15°** in the tightening order.
13. Tighten the bolts **once again 90° ± 15°** in the tightening order.



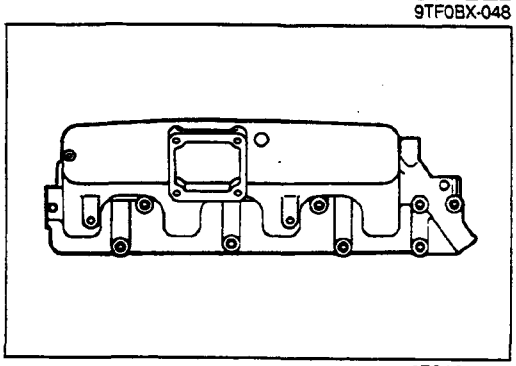
9TF0BX-047

14. Adjust the valve clearance. (Refer to page B–9.)


9TF0BX-048

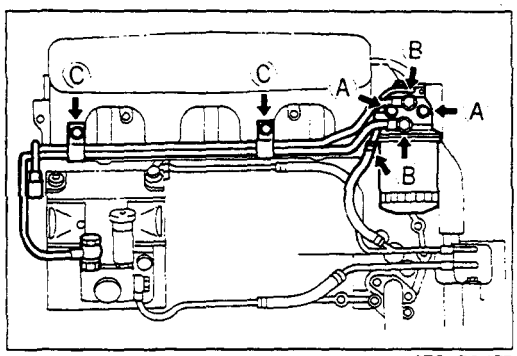
Water Outlet Housing
1. Install the water outlet housing.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-376

Intake Manifold Assembly
1. Install the intake manifold assembly and a new gasket.

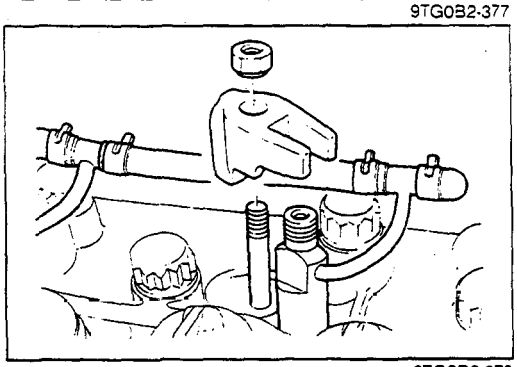
Tightening torque:
19—23 N·m (1.9—2.3 m-kg, 14—17 ft-lb)



9TG0B2-377

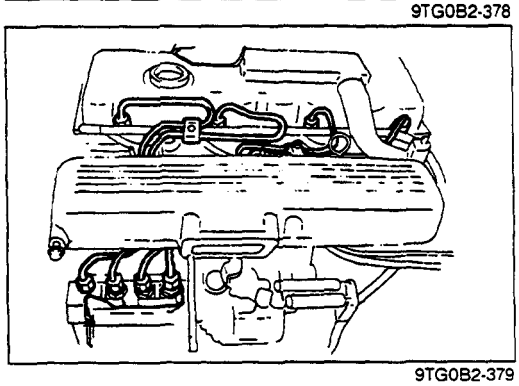
Fuel Filter Body
1. Install the fuel filter body.

Tightening torque
Ⓐ: 22—30 N·m (2.2—3.1 m-kg, 16—22 ft-lb)
Ⓑ: 16—24 N·m (1.6—2.4 m-kg, 12—17 ft-lb)
Ⓒ: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-378

Injection Nozzle and Nozzle Holder
1. Install the injection nozzle and a new O-ring.
2. Install the injection nozzle holder.

Tightening torque:
46—54 N·m (4.7—5.5 m-kg, 34—40 ft-lb)

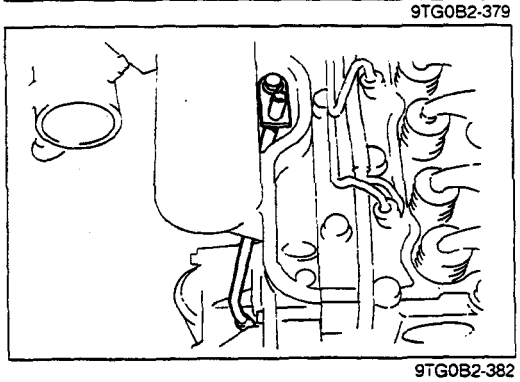

9TG0B2-379

Injection Pipe
1. Install the injection pipe.

Tightening torque:
25—29 N·m (2.5—3.0 m-kg, 18—22 ft-lb)

2. Install the injection pipe clip.

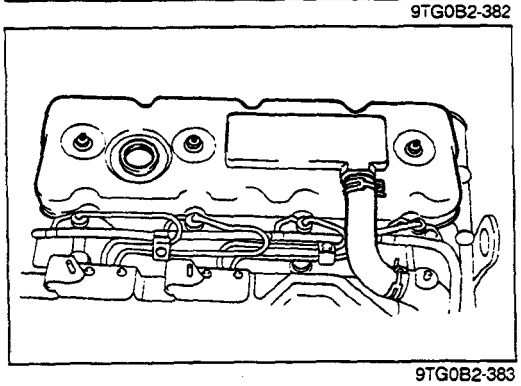
Tightening torque:
4.4—6.4 N·m (45—65 cm-kg, 39—56 in-lb)


9TG0B2-382

Oil Level Gauge and Guide Pipe
1. Apply clean engine oil to a new O-ring and install the oil level gauge guide pipe.

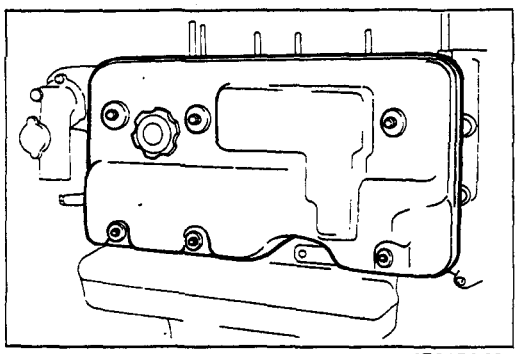
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

2. Install the oil level gauge.


9TG0B2-383

Cylinder Head Cover
1. Install the cylinder head cover and a new gasket.

Tightening torque:
3.4—5.4 N·m (35—55 cm-kg, 30—48 in-lb)



9TG0B2-384

Seal Cover

1. Install the seal cover.

Tightening torque:
2.0—3.4 N·m (20—35 cm-kg, 17—30 in-lb)

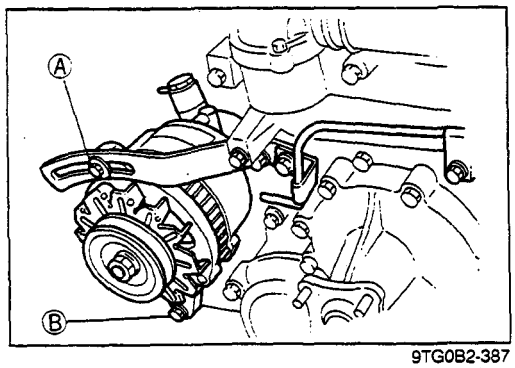
2. Install the filler cap.

ENGINE STAND DISMOUNTING

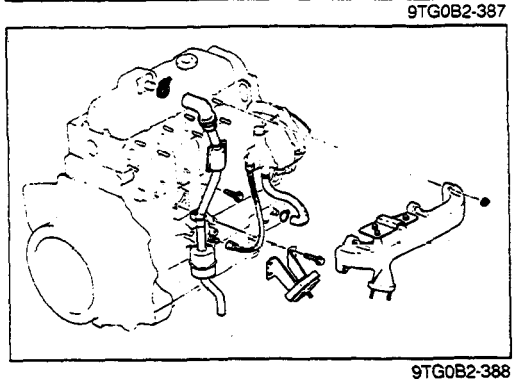
PROCEDURE

1. Remove the engine from the **SST (engine stand)**.
2. Remove the **SST (engine hanger)** from the engine.
3. Install the parts as follows.

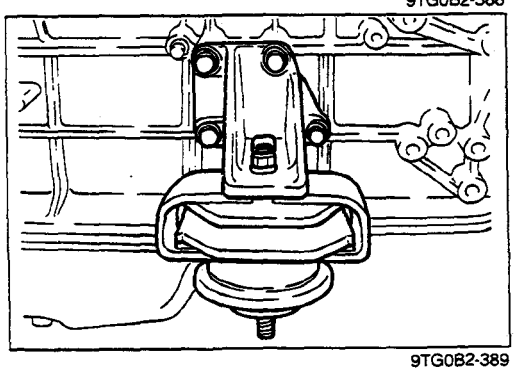
9TG0B2-385



9TG0B2-387



9TG0B2-388



9TG0B2-389

HA, SL Engine

1. Install the oil bypass filter and connect the oil pipe.

Tightening torque
Filter body:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)
Oil pipe:
16—24 N·m (1.6—2.4 m-kg, 12—17 ft-lb)

9TG0B2-386

2. Install the alternator bracket.

Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

3. Install the alternator.

Tightening torque
Ⓐ: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)
Ⓑ: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

4. Install the right engine mount.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

5. Install the exhaust manifold and a new gasket.

Tightening torque
HA: 26—32 N·m (2.7—3.3 m-kg, 20—24 ft-lb)
SL: 23—26 N·m (2.3—2.7 m-kg, 17—20 ft-lb)

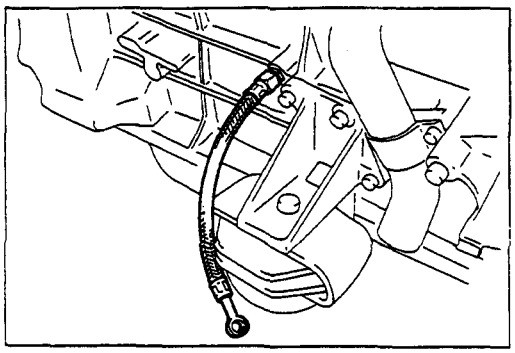
6. Install the breather pipe (SL).

Tightening torque
Ⓐ: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)
Ⓑ: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

TF Engine

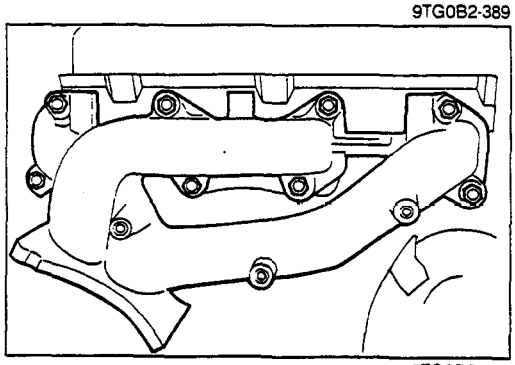
1. Install the right engine mount.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)



9TG0B2-389

2. Connect the oil hose.



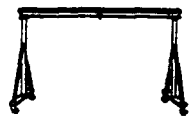
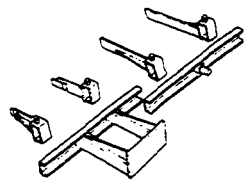
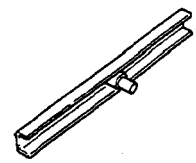
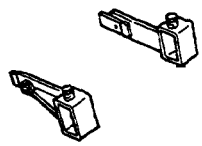
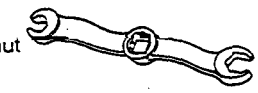
9TG0B2-390

3. Install the exhaust manifold and a new gasket.

Tightening torque:
44—48 N·m (4.5—4.9 m-kg, 33—35 ft-lb)

INSTALLATION

PREPARATION
SST

49 0727 000 Engine crane 	For installation of engine assembly	49 0636 000B Transmission lifter 	For installation of engine assembly
49 W017 3A0 Supporter set 	For installation of engine assembly	49 W017 303 Arm (Part of 49 W017 3A0) 	For installation of engine assembly
49 W017 305 Arm (Part of 49 W017 3A0) 	For installation of engine assembly	49 0259 770B Wrench, flare nut (SL Turbo) 	For connection of clutch hose

9TG0B2-391

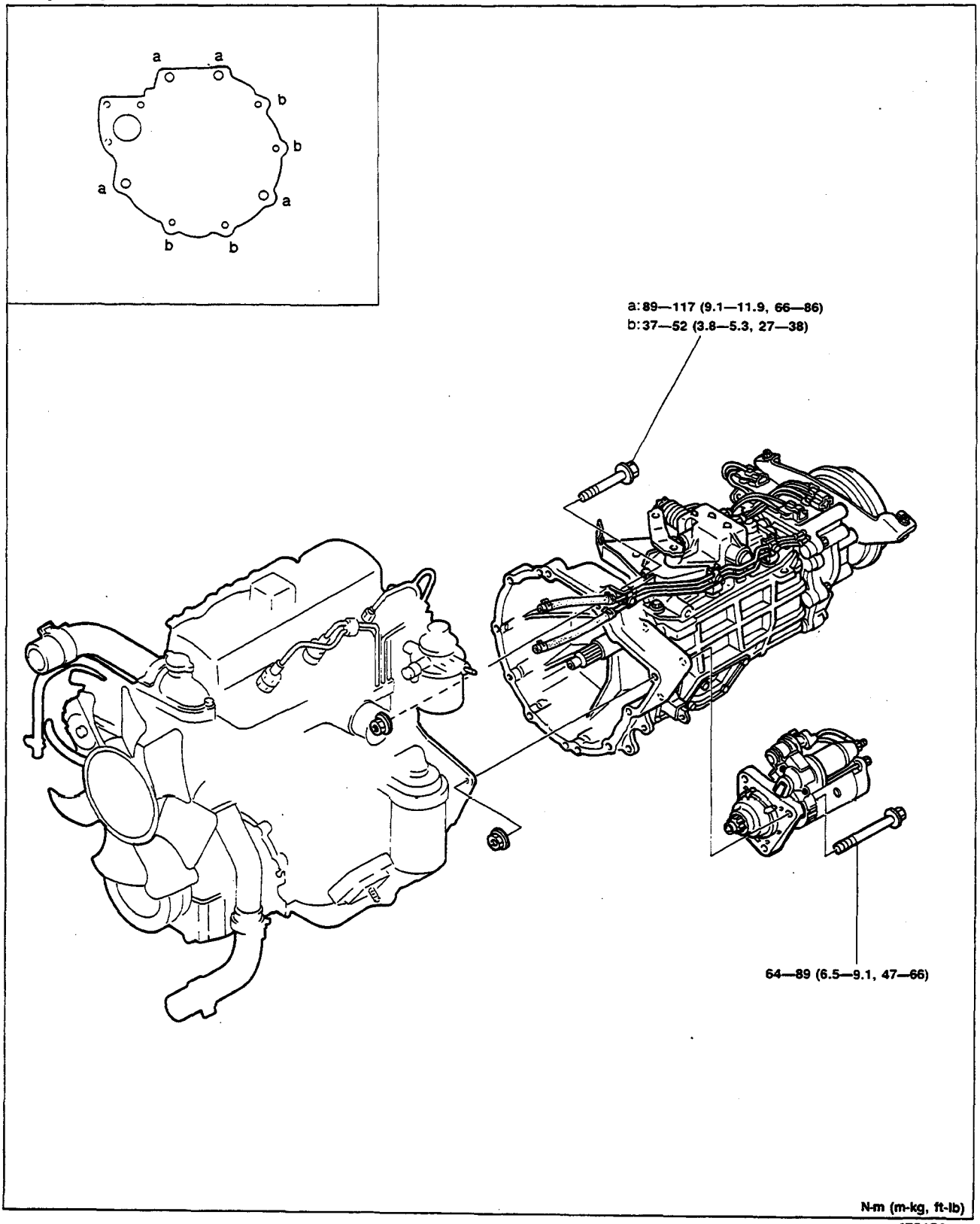
PROCEDURE
1. Tighten all bolts and nuts to the specified torques.

9TG0B2-392

HA Engine

Step 1
1. Assemble the engine and transmission.

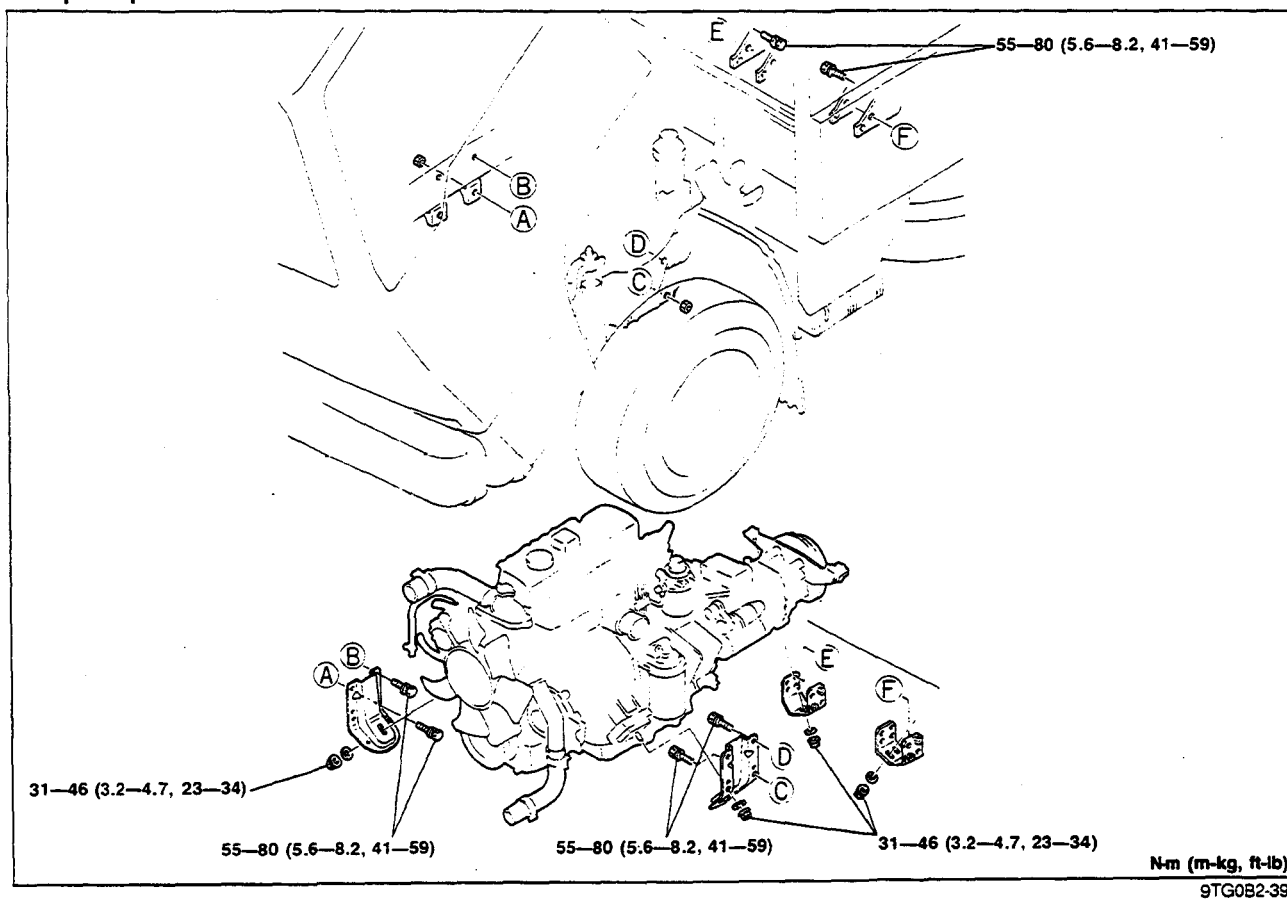
Torque Specifications



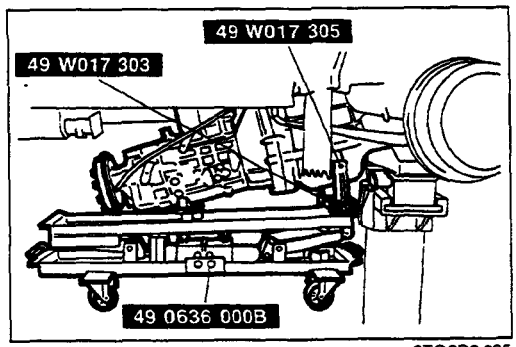
Step 2

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

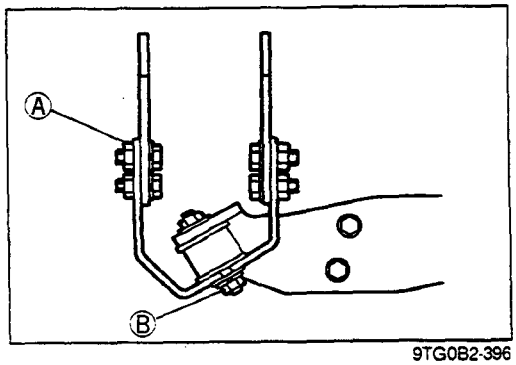
Torque Specifications



9TG0B2-394



9TG0B2-395


9TG0B2-396

Engine and transmission assembly
1. Set the engine on the **SST**.
2. Lift the engine into the engine compartment.
3. Mount the engine bracket to the vehicle.

Tightening torque:
55—80 N·m (5.6—8.2 m-kg, 41—59 ft-lb)

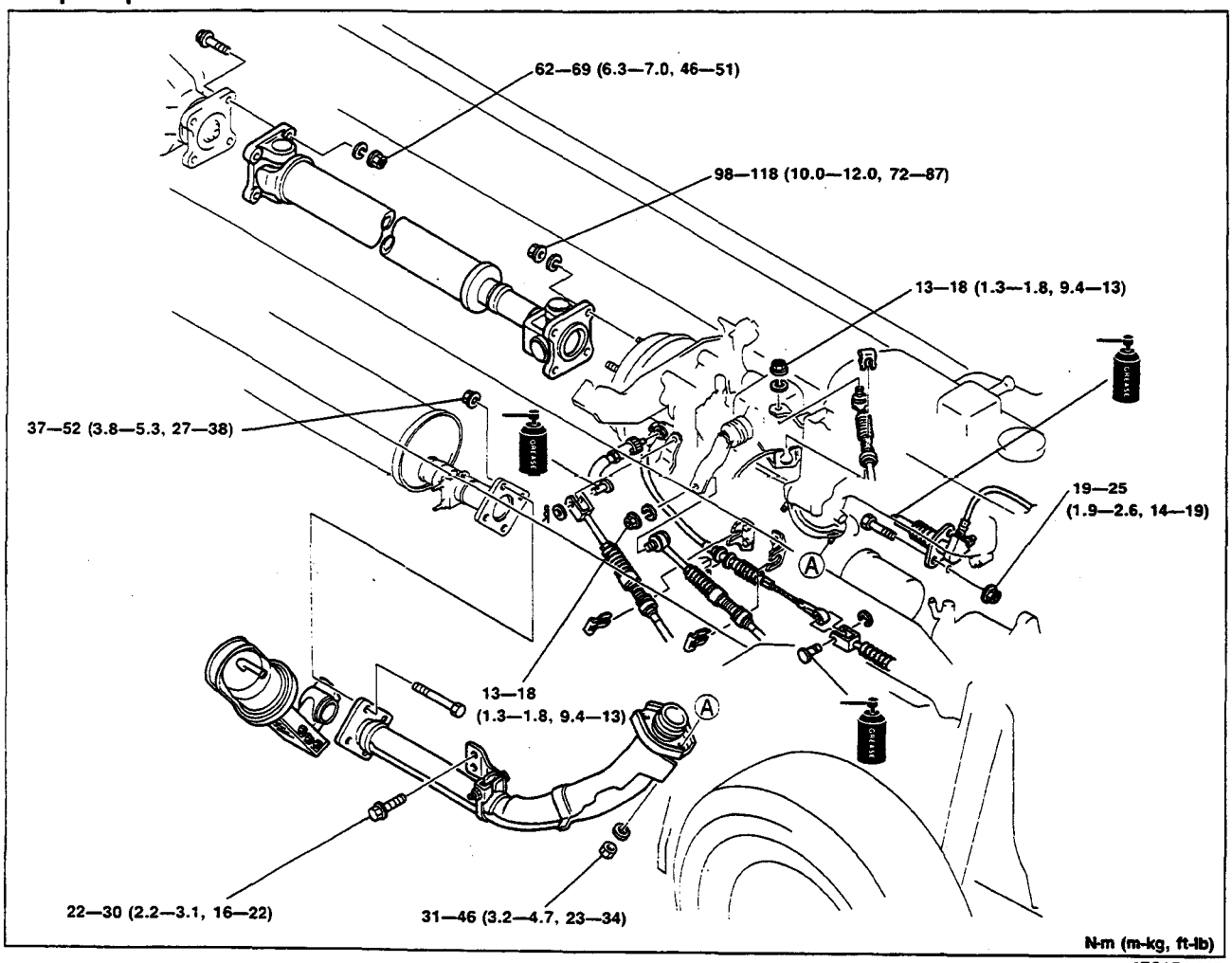
4. Lower the engine and align the engine mount rubber with the engine bracket.
5. Install the engine mount nuts and loosely tighten them.
6. Install and tighten the transmission mount bracket.

Tightening torque
Ⓐ: 55—80 N·m (5.6—8.2 m-kg, 41—59 ft-lb)
Ⓑ: 31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

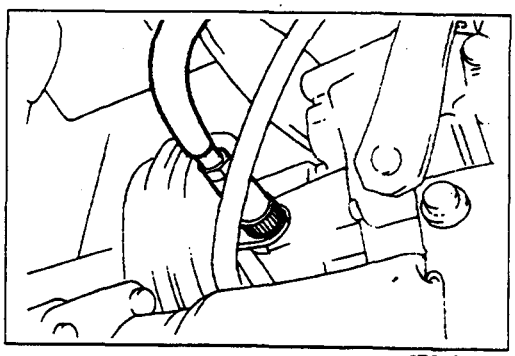
7. Tighten the engine mount nuts.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

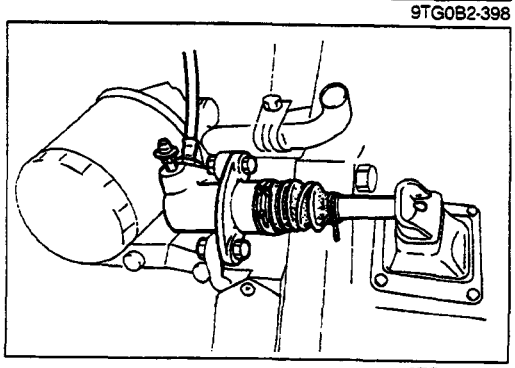
Step 3
Torque Specifications



9TG0B2-397



9TG0B2-398



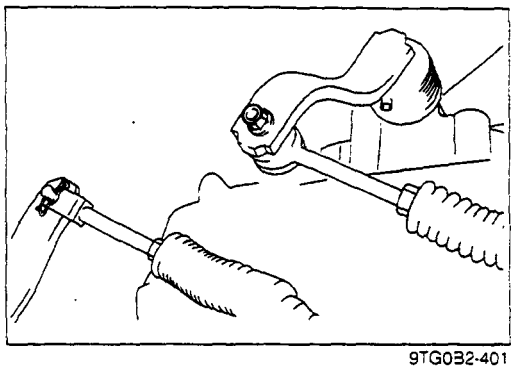
9TG0B2-400

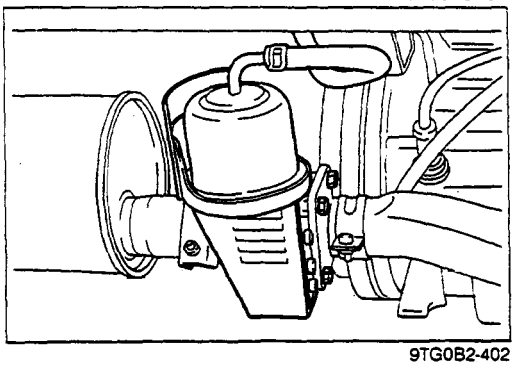
Propeller shaft
1. Install the propeller shaft. (Refer to Section L.)

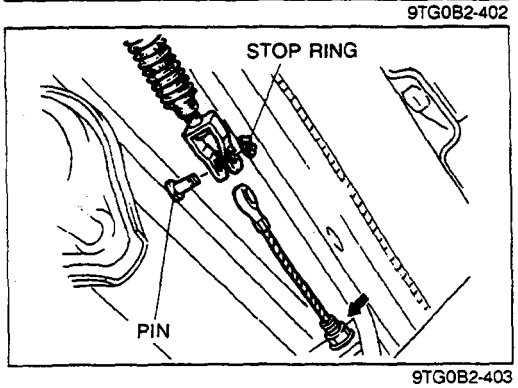
Speedometer cable
1. Install the speedometer cable.

Clutch release cylinder
1. Install the clutch release cylinder.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)


9TG0B2-401


9TG0B2-402



9TG0B2-403

Sub-select cable
1. Install the sub-select cable. (Refer to Section J.)

Shift/select cable
1. Install the shift/select cable.

Tightening torque:
13—18 N·m (1.3—1.8 m-kg, 9.4—13 ft-lb)

Front exhaust pipe
1. Install the front exhaust pipe.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)....Pipe
22—30 N·m (2.2—3.1 m-kg, 16—22 ft-lb)....Bracket

Exhaust shutter valve
1. Install the exhaust shutter valve.

Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

Parking brake cable
1. Mount the parking brake rear cable to the vehicle frame.

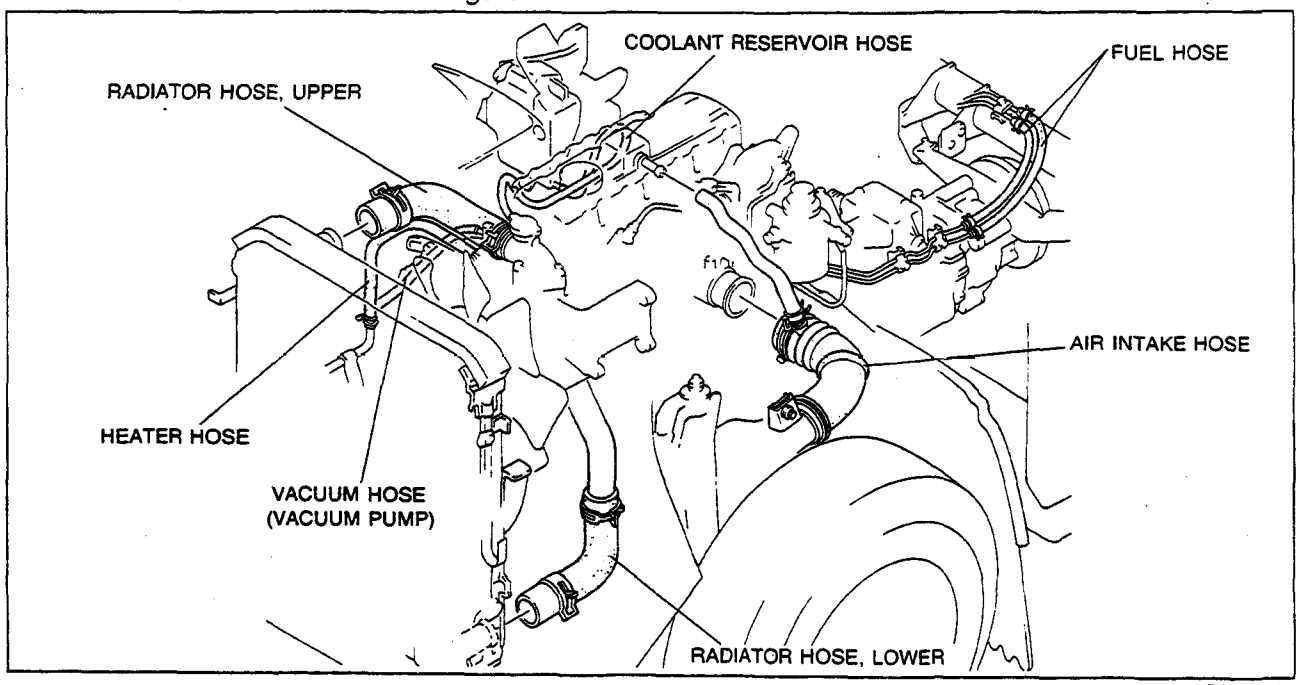
Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

2. Connect the front and rear cable with the pin and install the stop ring.

Step 4

Caution
- **Position hose clamps in their original location on hoses, and squeeze the clamps lightly with large pliers to ensure a good fit.**

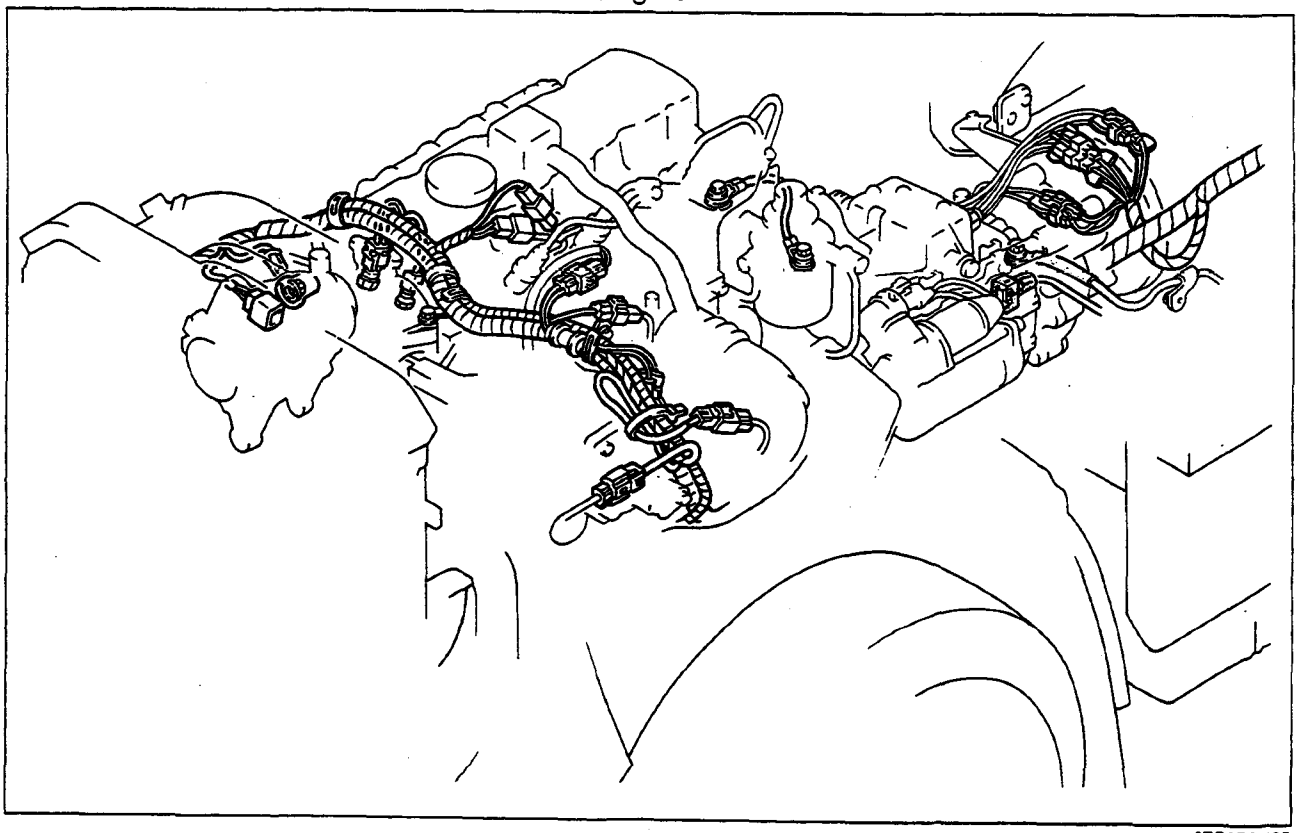
1. Connect the hoses shown in the figure.



9TG0B2-404

Step 5

1. Connect the harness connectors shown in the figure.



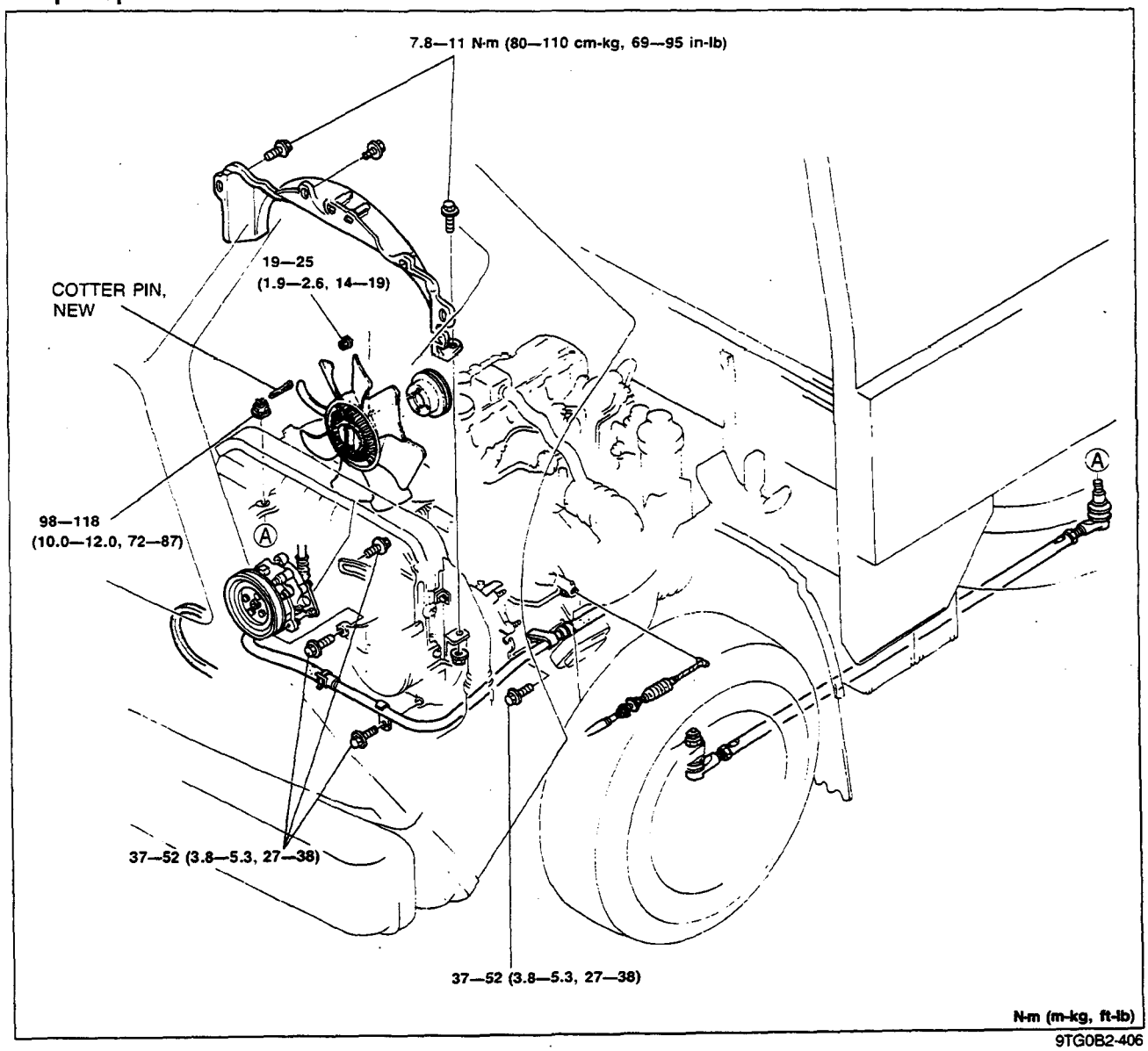
9TG0B2-405

Step 6

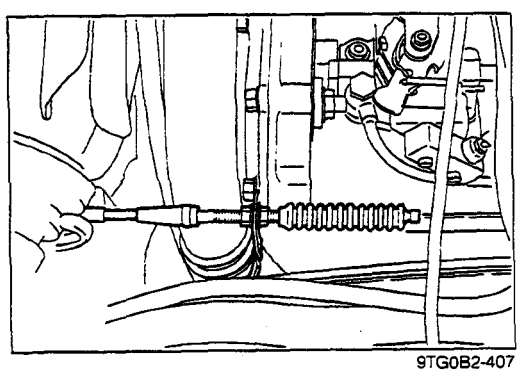
Caution

- **After radiator cowling installation, rotate the cooling fan by hand and verify that the fan blade does not touch the radiator cowling.**
  If the fan touches the cowling, adjust the radiator cowling mounting position.

Torque Specifications



9TG0B2-406



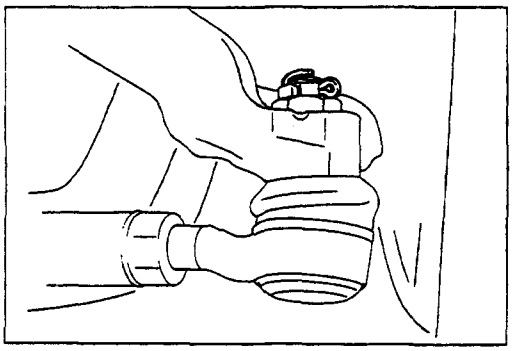
9TG0B2-407

Accelerator cable

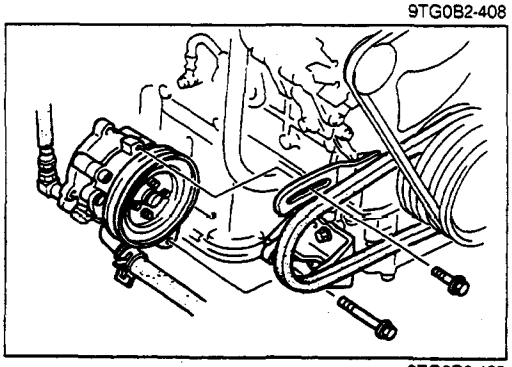
1. Install the accelerator cable.
2. Adjust the cable deflection by turning the adjusting nut.

Deflection: 1—3mm (0.04—0.12 in)

INSTALLATION



9TG0B2-408



9TG0B2-409

Tie-rod
1. Apply grease to the ball joint of the tie-rod end.
2. Install the tie-rod to the knuckle.
3. Install the nut and a new cotter pin.

Tightening torque:
98—118 N·m (10.0—12.0 m-kg, 72—87 ft-lb)

P/S oil pump
1. Install the P/S oil pump and loosely tighten the mounting bolts.

Drive belt
1. Install the drive belts.

Cooling fan
1. Install the cooling fan.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

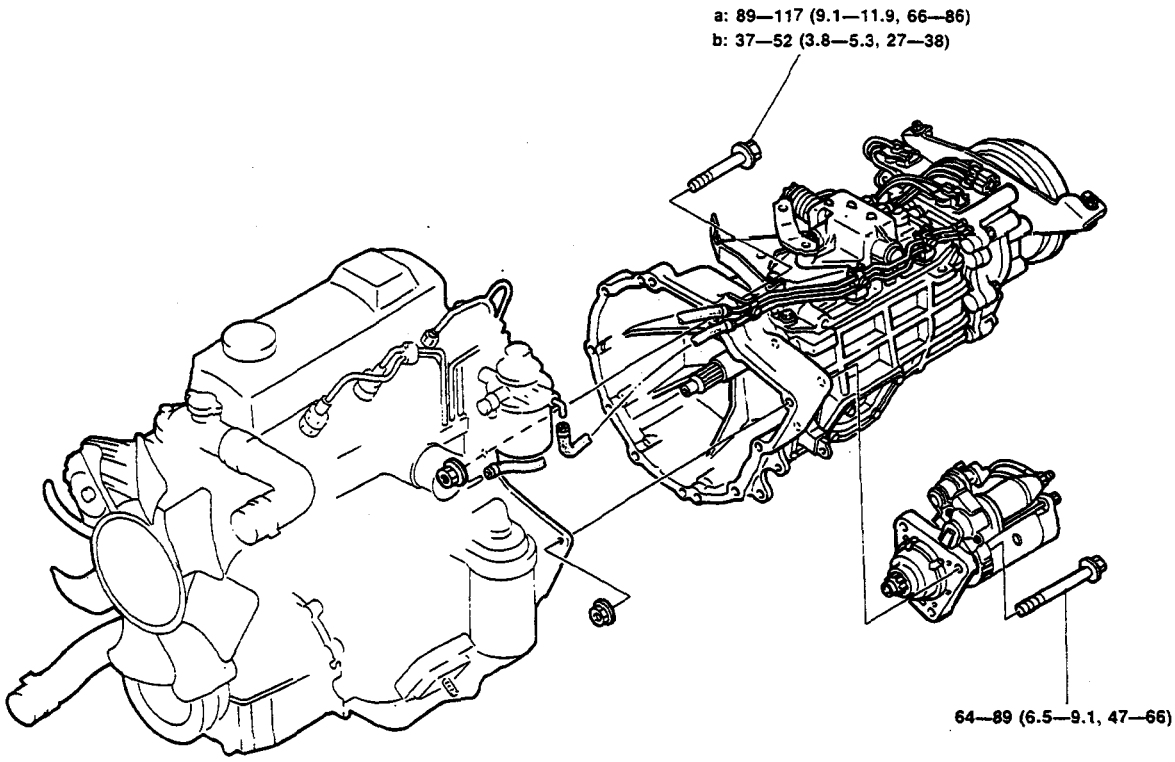
Radiator cowling, upper
1. Install the upper radiator cowling.

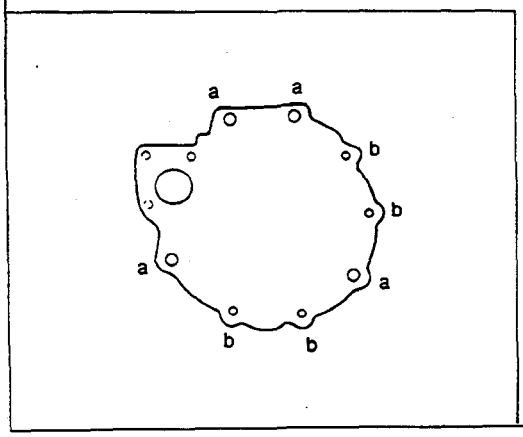
Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)

9TG0B2-410

SL Engine
Step 1
1. Assemble the engine and transmission.

Torque Specifications



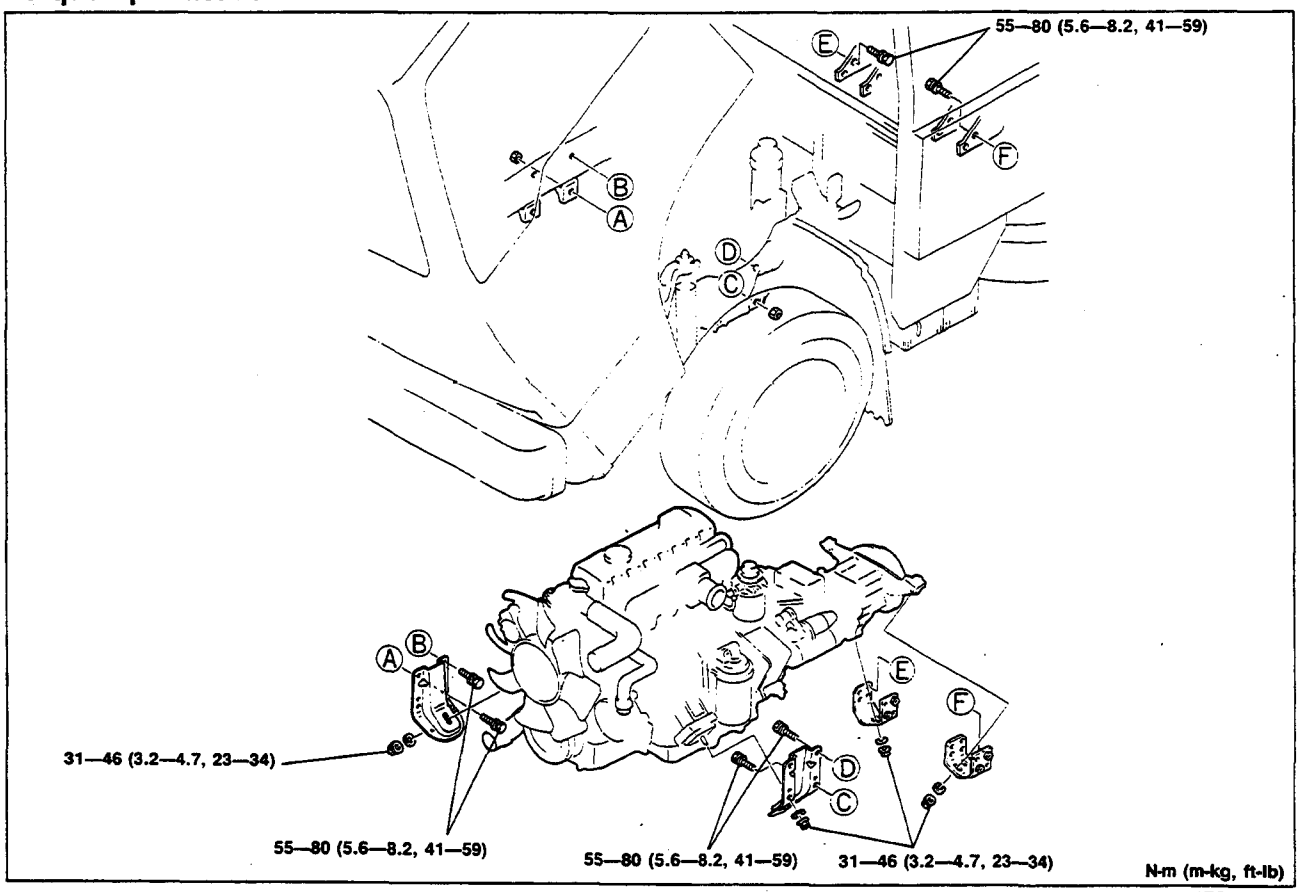


N·m (m-kg, ft-lb)
9TF0BX-049

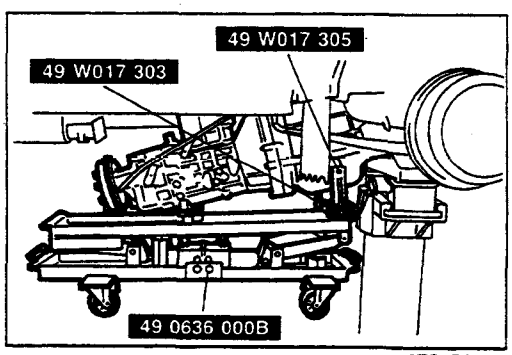
Step 2

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

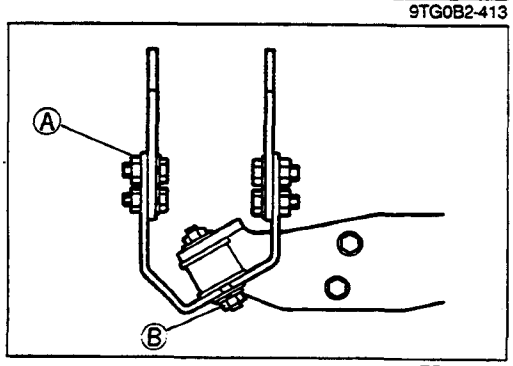
Torque Specifications



9TG0B2-412



9TG0B2-413



9TF0BX-050

Engine and transmission assembly
1. Set the engine on the **SST**.
2. Lift the engine into the engine compartment.
3. Mount the engine bracket to the vehicle.

   Tightening torque:
   55—80 N·m (5.6—8.2 m-kg, 41—59 ft-lb)

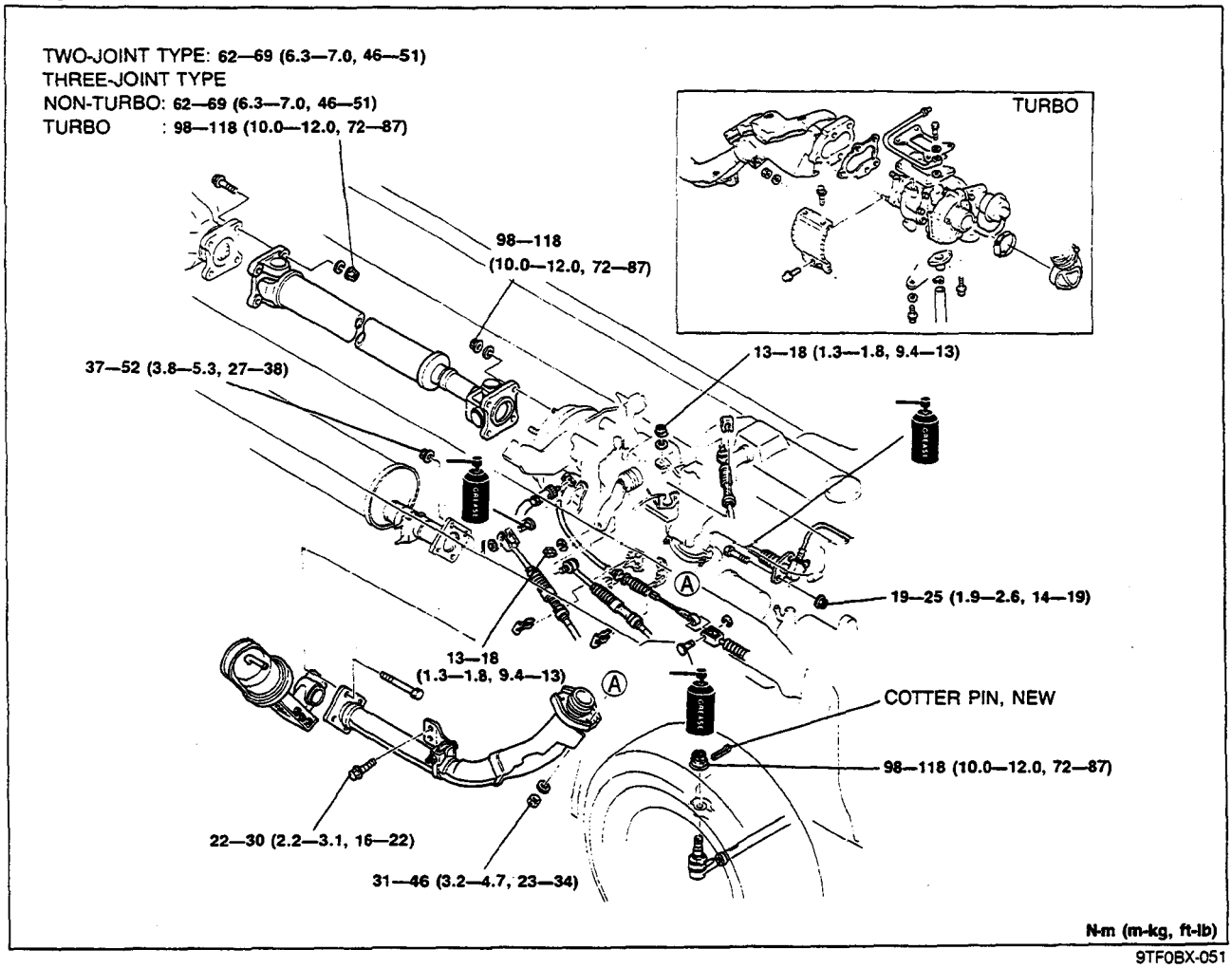
4. Lower the engine and align the engine mount rubber with the engine bracket.
5. Install the engine mount nuts and loosely tighten them.
6. Install and tighten the transmission mount bracket.

   Tightening torque
   Ⓐ: 55—80 N·m (5.6—8.2 m-kg, 41—59 ft-lb)
   Ⓑ: 31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

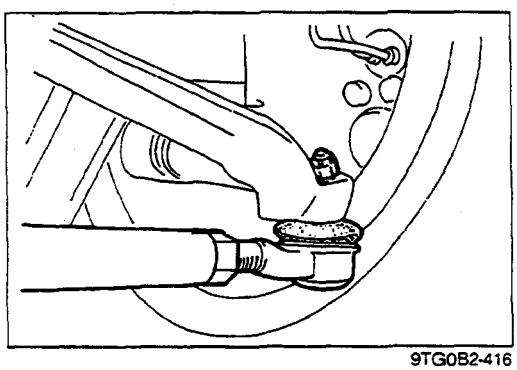
7. Tighten the engine mount nuts.

   Tightening torque:
   31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

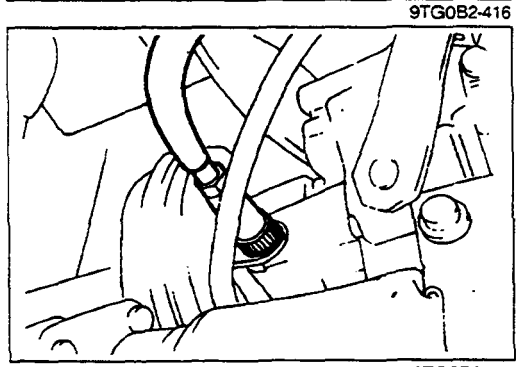
Step 3
Torque Specifications



9TF0BX-051



9TG0B2-416



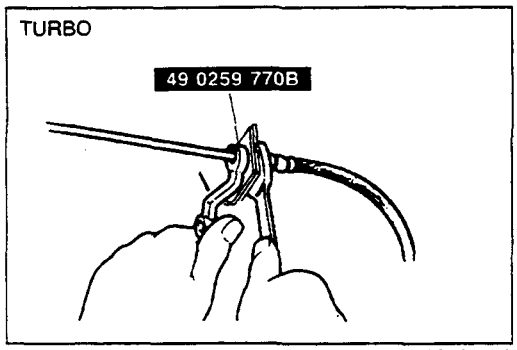
9TG0B2-417

Propeller shaft
1. Install the propeller shaft. (Refer to Section L.)

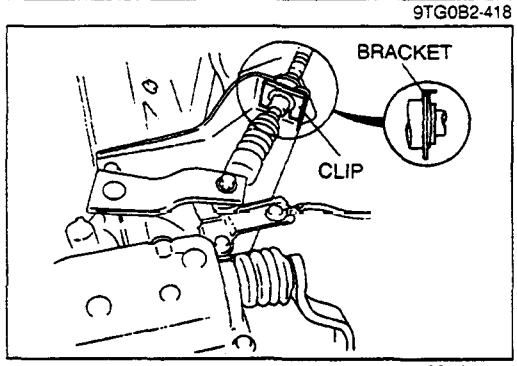
Tie-rod
1. Apply grease to the ball joint of the tie-rod end.
2. Install the tie-rod to the knuckle.
3. Install the nut and a new cotter pin.

Tightening torque:
98—118 N·m (10.0—12.0 m-kg, 72—87 ft-lb)

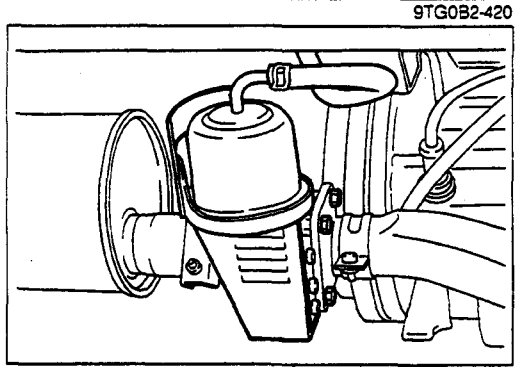
Speedometer cable
1. Install the speedometer cable.

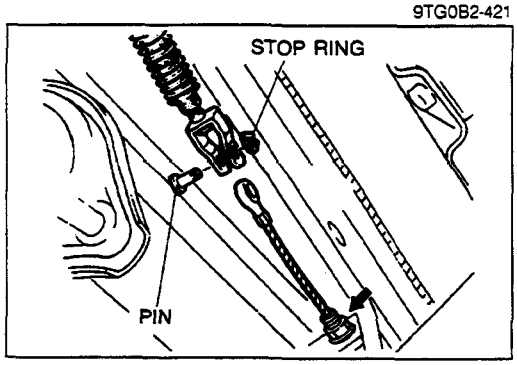


9TG0B2-418



9TG0B2-420


9TG0B2-421



9TG0B2-422

Clutch release cylinder
(Non-Turbo)
1. Install the clutch release cylinder.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

(Turbo)
1. Connect the clutch hose with the **SST**.

Tightening torque:
22—26 N·m (2.2—2.7 m-kg, 16—20 ft-lb)

Sub-select cable
1. Install the sub-select cable. (Refer to Section J.)

Shift/select cable
1. Install the shift/select cable.

Turbocharger (Turbo)
1. Install the turbocharger. (Refer to Section F.)

Front exhaust pipe
1. Install the front exhaust pipe.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)....Pipe
22—30 N·m (2.2—3.1 m-kg, 16—22 ft-lb)....Bracket

Exhaust shutter valve
1. Install the exhaust shutter valve.

Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

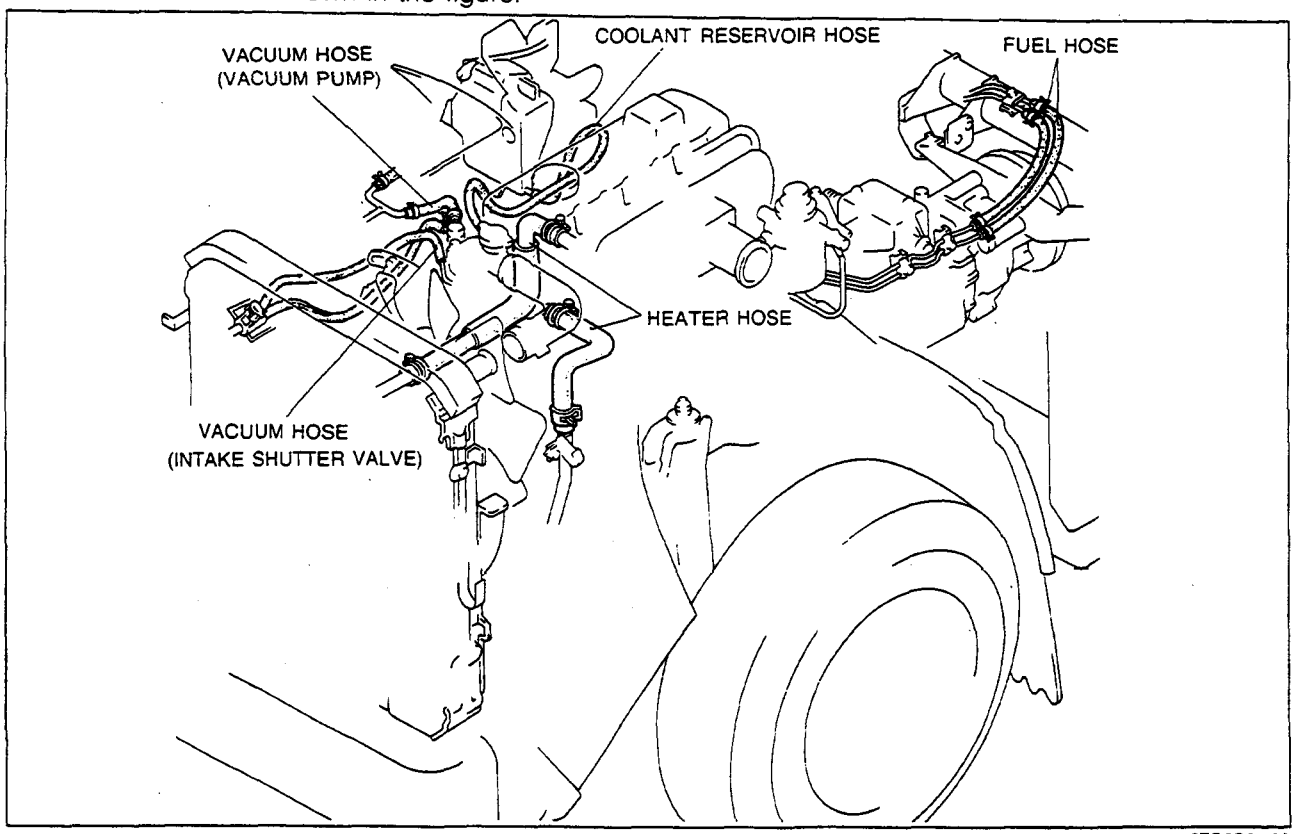
Parking brake cable
1. Mount the parking brake rear cable to the vehicle frame.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

2. Connect the front and rear cable with the pin and install the stop ring.

Step 4

1. Connect the hoses shown in the figure.



9TG0B2-423

Step 5

1. Connect the harness connectors shown in the figure.

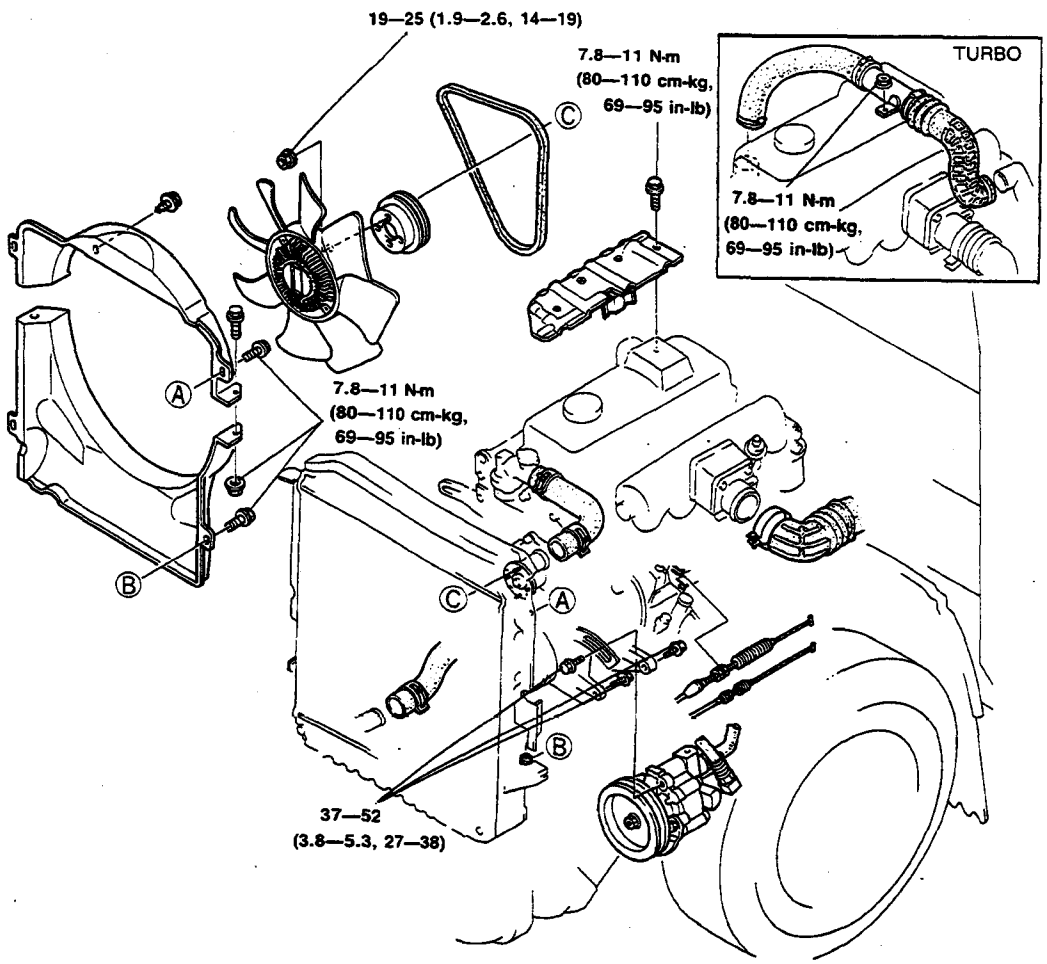


9TG0B2-424

Step 6

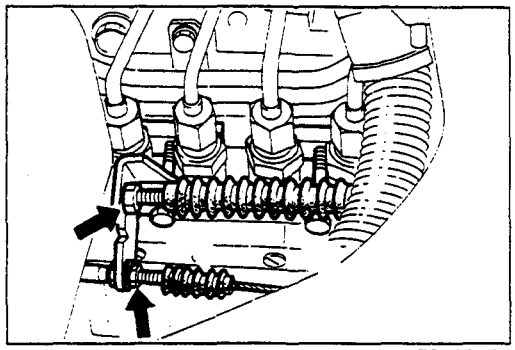
Caution
- **Position hose clamps in their original location on hoses, and squeeze the clamps lightly with large pliers to ensure a good fit.**
- **After radiator cowling installation, rotate the cooling fan by hand and verify that the fan blade does not touch the radiator cowling.**
  If the fan touches the cowling, adjust the radiator cowling mounting position.

Torque Specifications

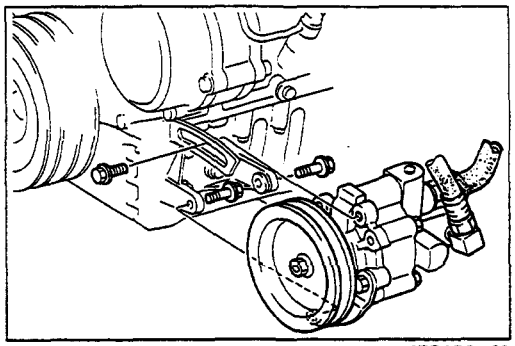


N·m (m-kg, ft-lb)

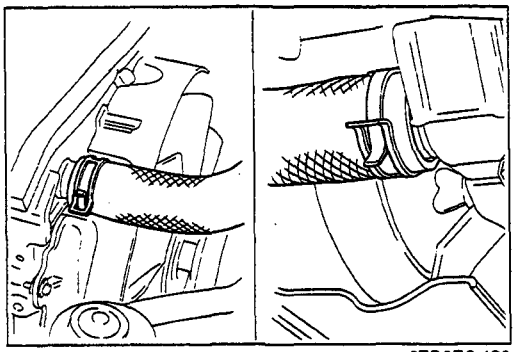
9TG0B2-425



9TG0B2-427



9TG0B2-429



9TG0B2-430

Fuel stop cable
1. Install the fuel stop cable.

Accelerator cable

1. Install the accelerator cable.
2. Adjust the cable deflection by turning the adjusting nut.

Deflection: 1—3mm (0.04—0.12 in)

P/S oil pump
1. Install the P/S oil pump and loosely tighten the mounting bolts.

Drive belt
1. Install the drive belts.

Cooling fan
1. Install the cooling fan.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

Radiator hose
1. Connect the upper and lower radiator hoses.

Radiator cowling
1. Install the radiator cowling.

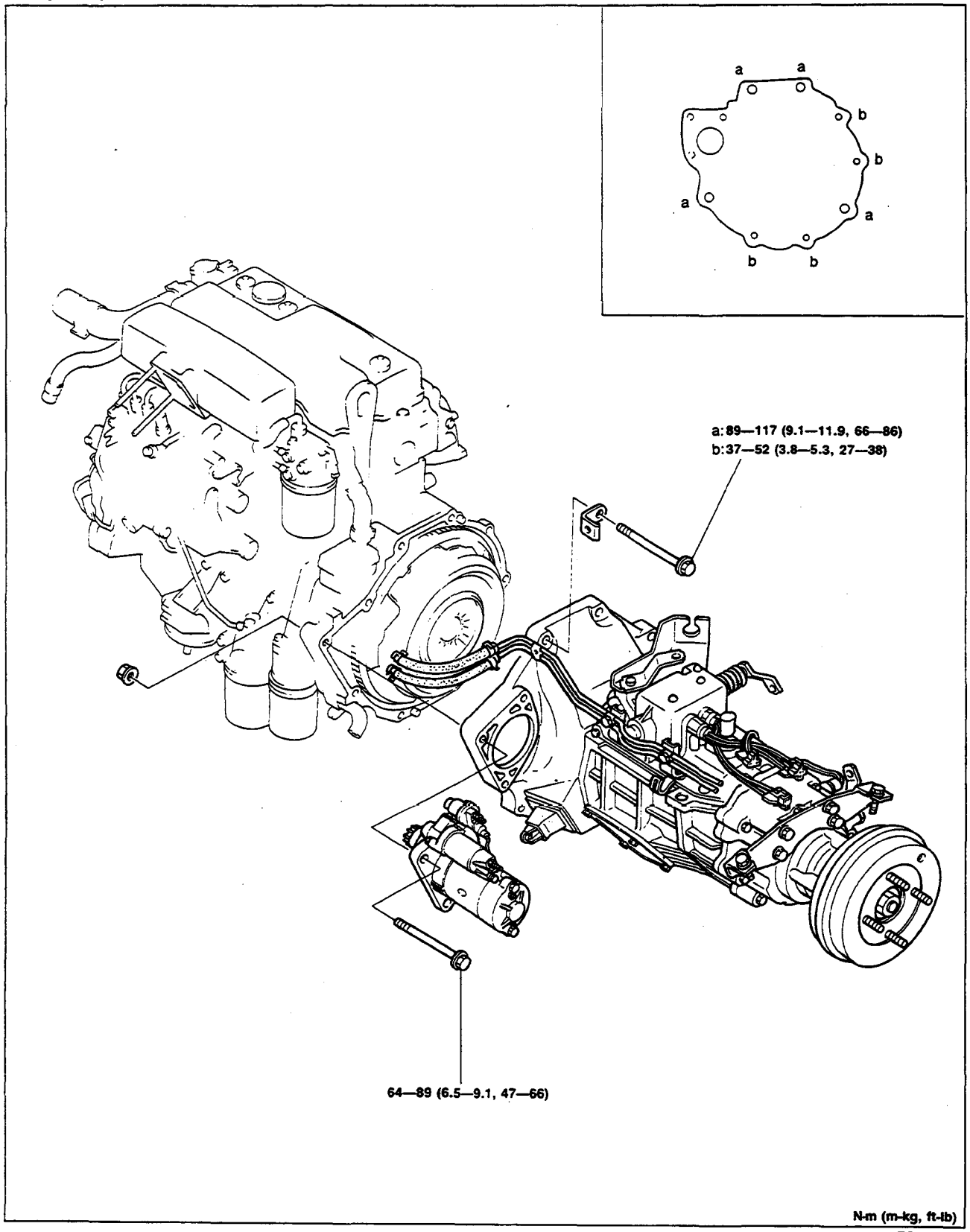
Exhaust manifold insulator
1. Install the exhaust manifold insulator.

Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)

Air intake hose
1. Install the air intake pipe and hose.

TF Engine
Step 1
1. Assemble the engine and transmission.

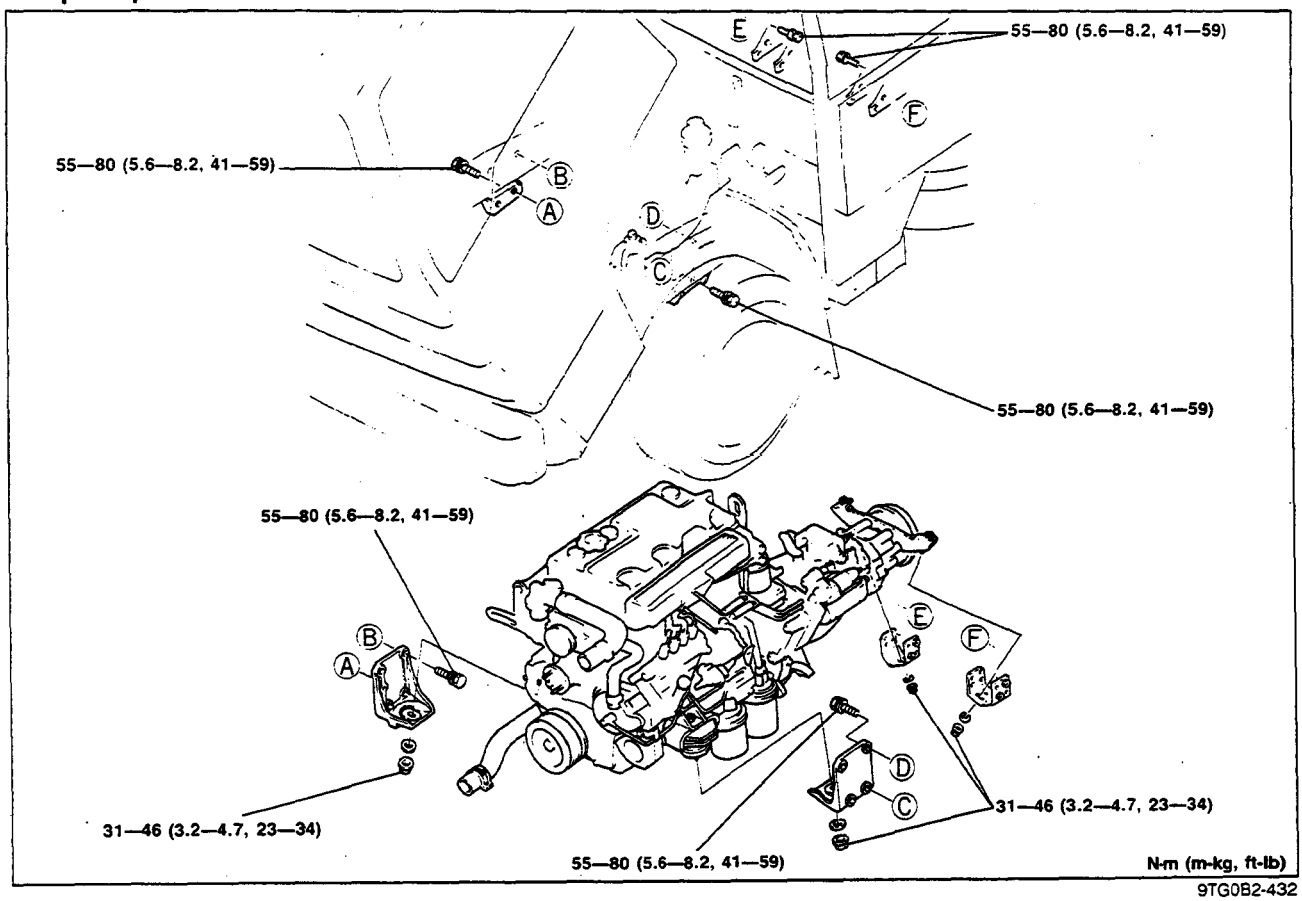
Torque Specifications



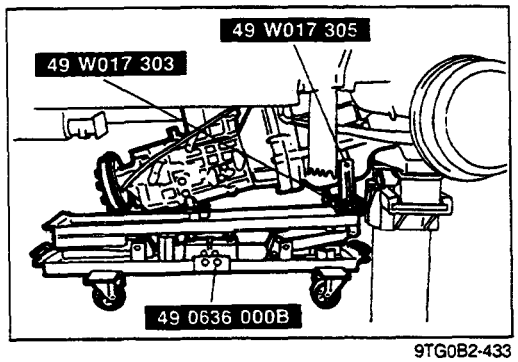
Step 2

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

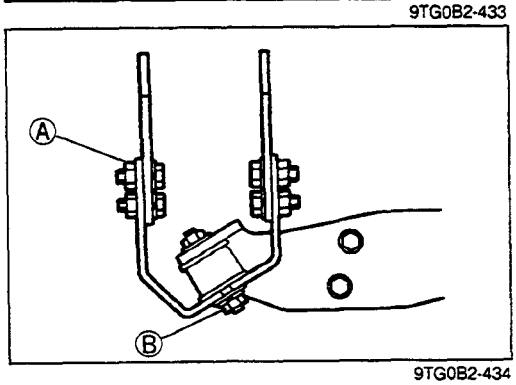
Torque Specifications



9TG0B2-432



9TG0B2-433



9TG0B2-434

Engine and transmission assembly
1. Set the engine on the **SST**.
2. Lift the engine into the engine compartment.
3. Mount the engine bracket to the vehicle.

Tightening torque:
55—80 N·m (5.6—8.2 m-kg, 41—59 ft-lb)

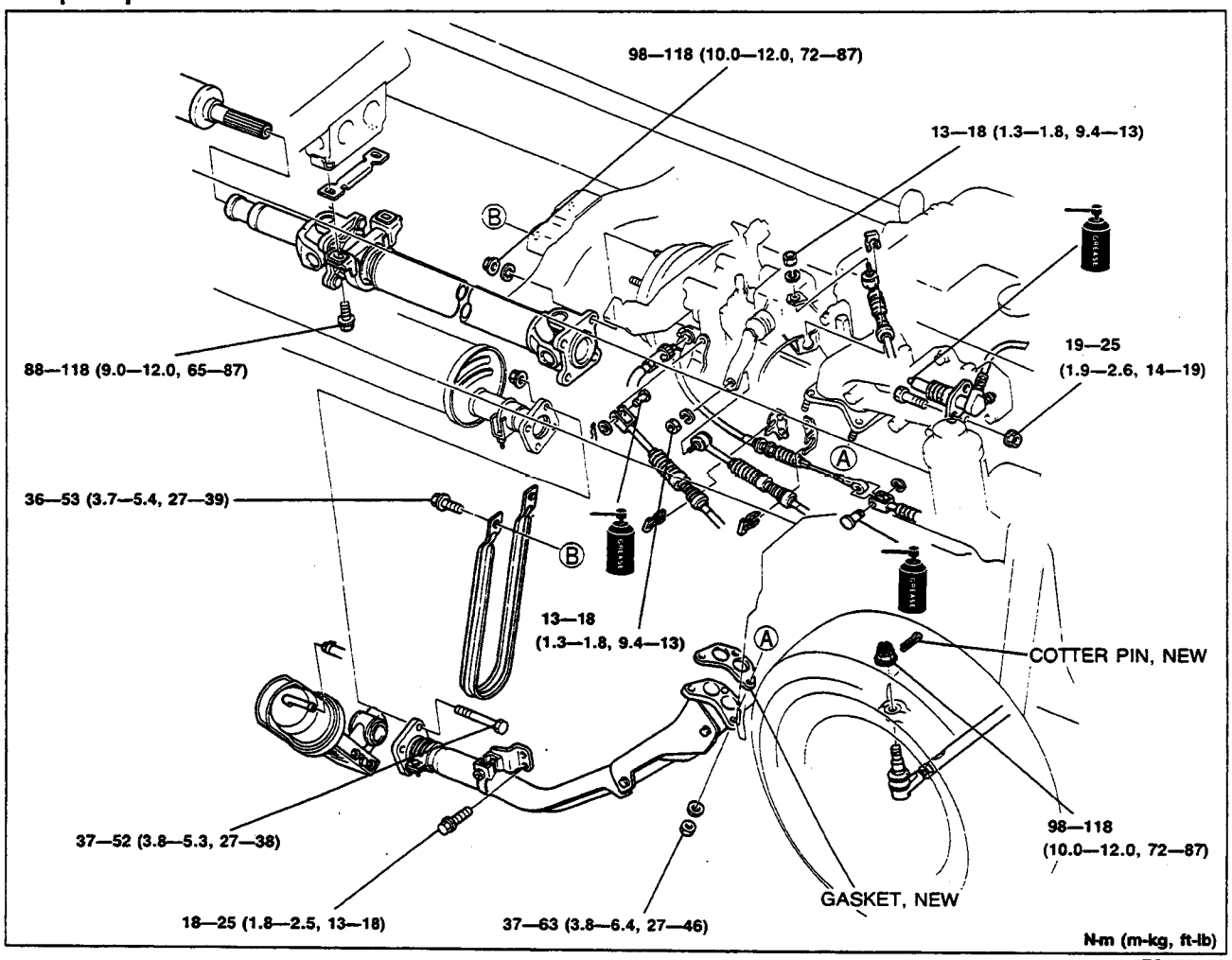
4. Lower the engine and align the engine mount rubber with the engine bracket.
5. Install the engine mount nuts and loosely tighten them.
6. Install and tighten the transmission mount bracket.

Tightening torque
Ⓐ: 55—80 N·m (5.6—8.2 m-kg, 41—59 ft—lb)
Ⓑ: 31—46 N·m (3.2—4.7 m-kg, 23—34 ft—lb)

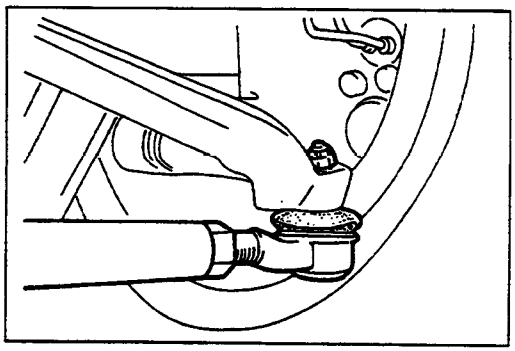
7. Tighten the engine mount nuts.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

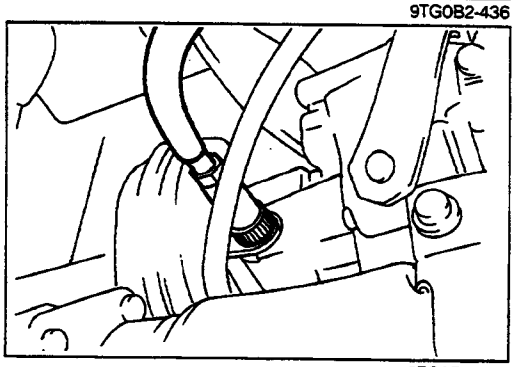
Step 3
Torque Specifications



9TG0B2-435



9TG0B2-436



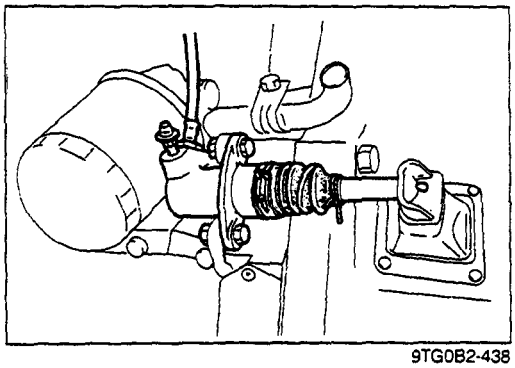
9TG0B2-437

Propeller shaft
1. Install the propeller shaft. (Refer to Section L.)

Tie-rod
1. Apply grease to the ball joint of the tie-rod end.
2. Install the tie-rod to the knuckle.
3. Install the nut and a new cotter pin.

Tightening torque:
98—118 N·m (10.0—12.0 m-kg, 72—87 ft-lb)

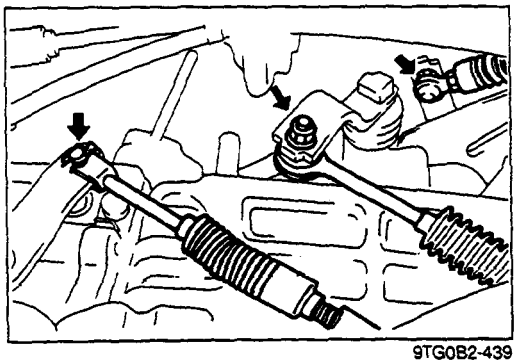
Speedometer cable
1. Install the speedometer cable.



9TG0B2-438

Clutch release cylinder
1. Install the clutch release cylinder.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

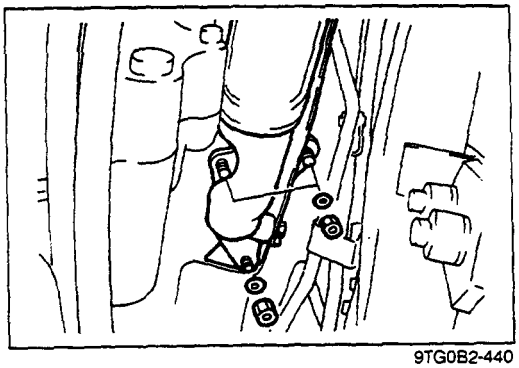


9TG0B2-439

Sub-select cable
1. Install the sub-select cable. (Refer to Section J.)

Shift/select cable
1. Install the shift/select cable.

Tightening torque:
13—18 N·m (1.3—1.8 m-kg, 9.4—13 ft-lb)



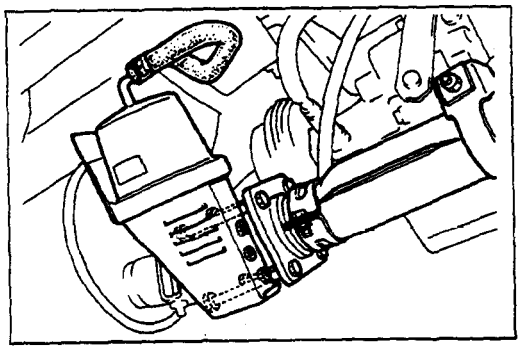
9TG0B2-440

Front exhaust pipe
1. Install the front exhaust pipe.

Tightening torque:
37—63 N·m (3.8—6.4 m-kg, 27—46 ft-lb)

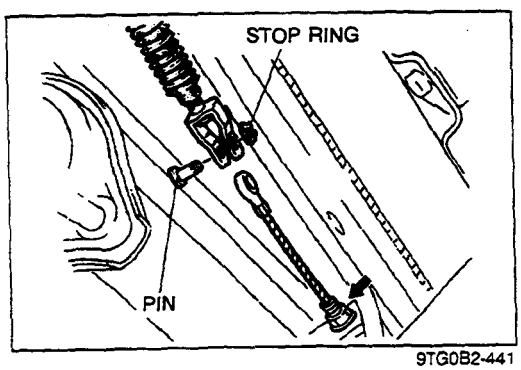
2. Install the bracket to the transmission.

Tightening torque:
18—25 N·m (1.8—2.5 m-kg, 13—18 ft-lb)



Exhaust shutter valve
1. Install the exhaust shutter valve.

Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



9TG0B2-441

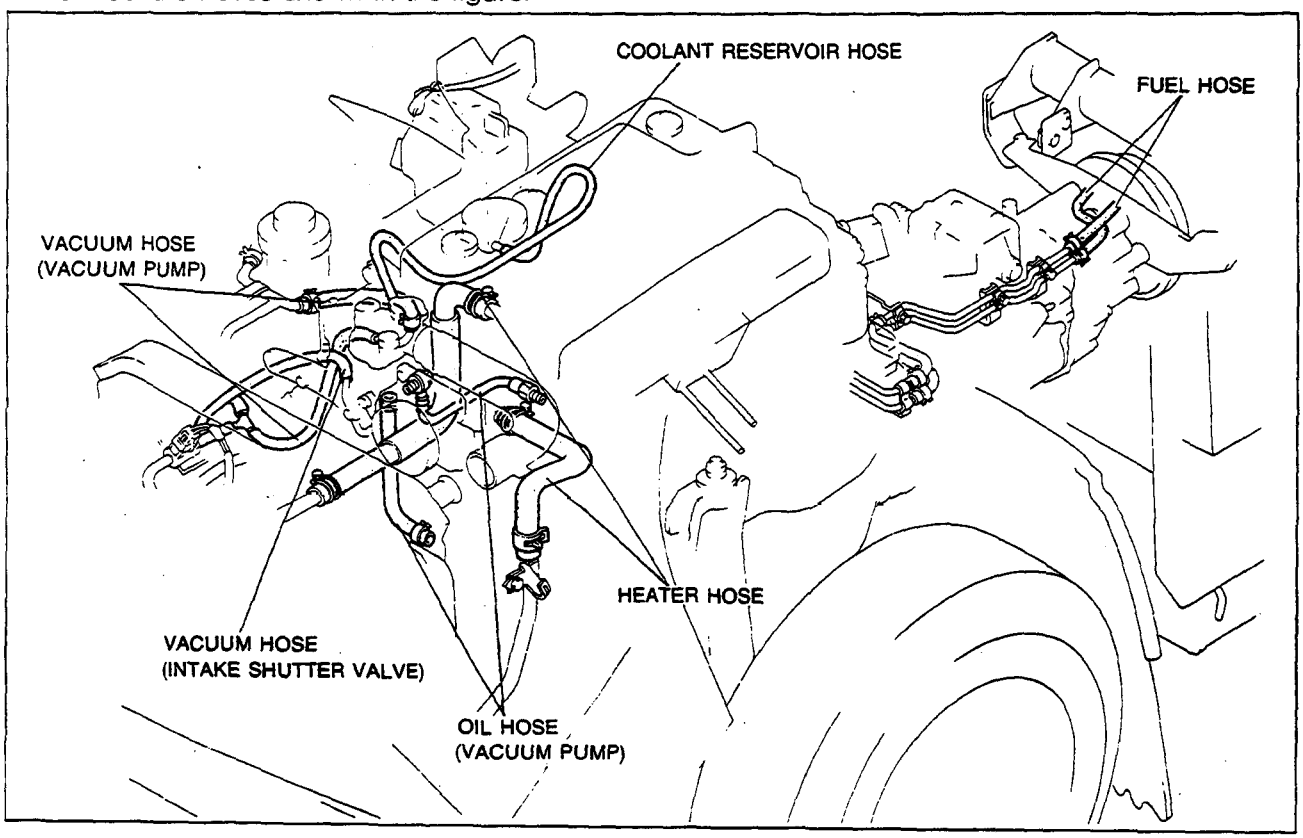
Parking brake cable
1. Mount the parking brake rear cable to the vehicle frame.

Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

2. Connect the front and rear cable with the pin and install the stop ring.

Step 4

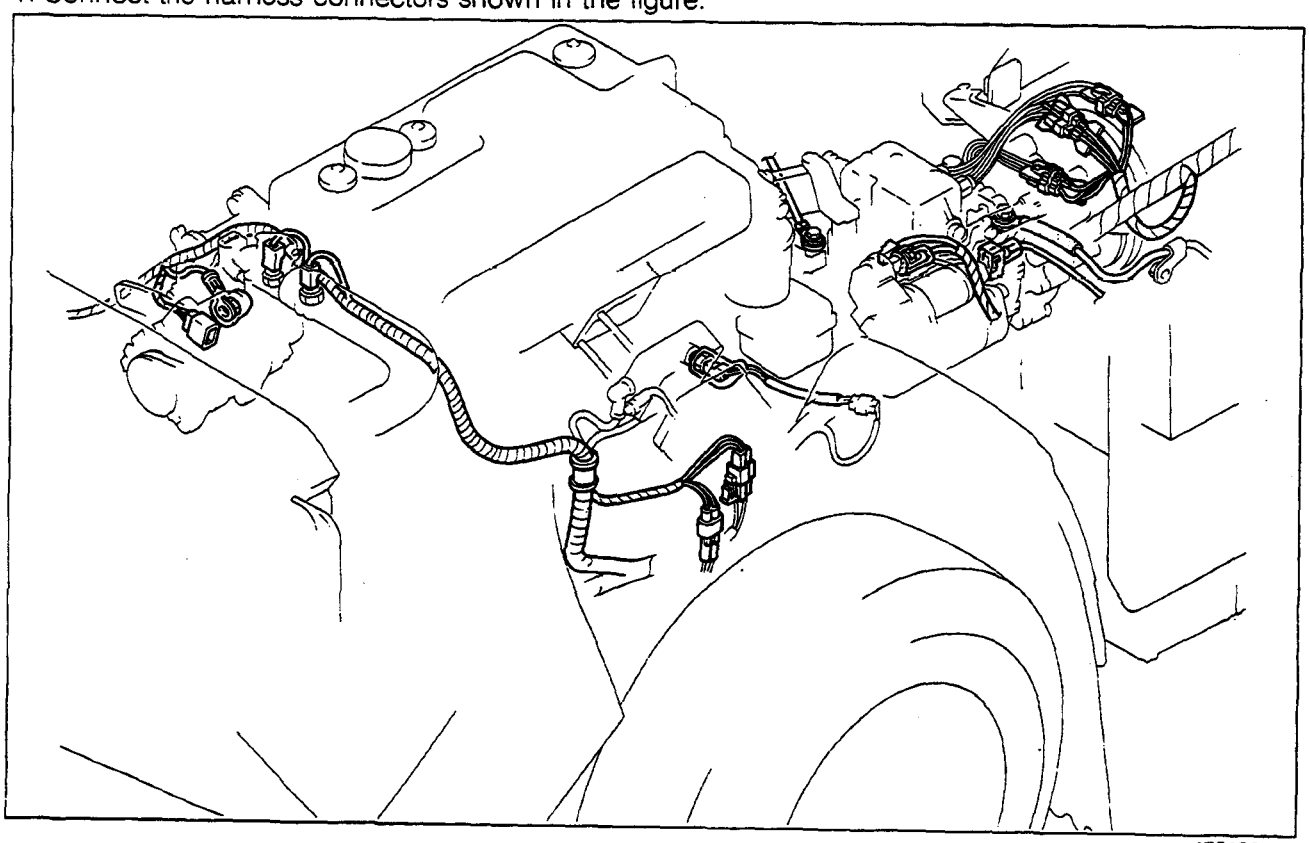
1. Connect the hoses shown in the figure.



9TG0B2-442

Step 5

1. Connect the harness connectors shown in the figure.

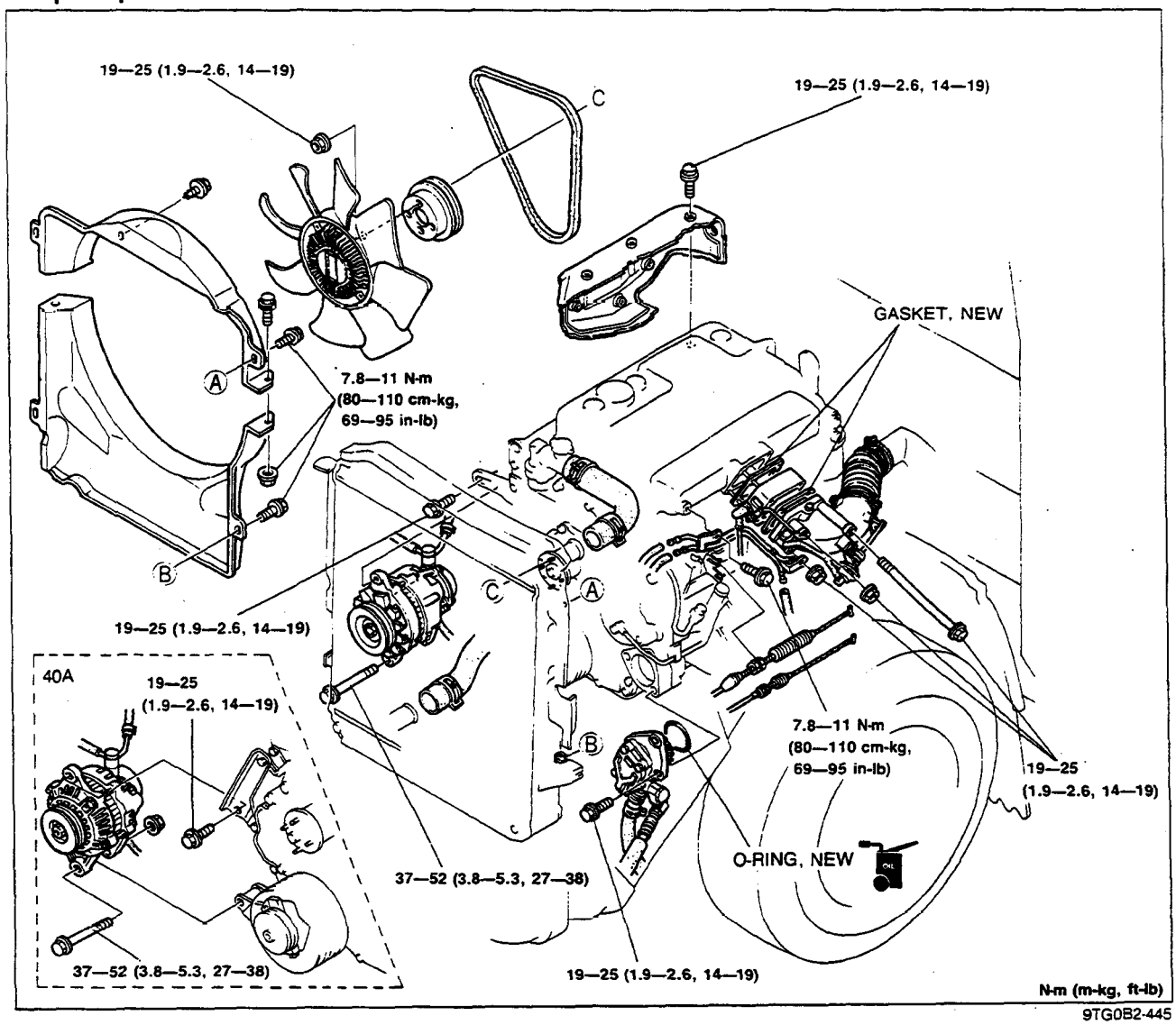


9TG0B2-443

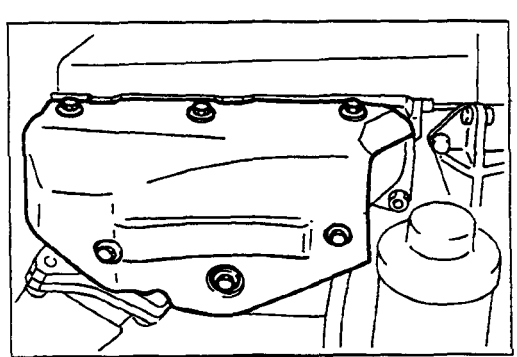
Step 6

Caution
- **Position hose clamps in their original location on hoses, and squeeze the clamps lightly with large pliers to ensure a good fit.**
- **After radiator cowling installation, rotate the cooling fan by hand and verify that the fan blade does not touch the radiator cowling.**
  If the fan touches the cowling, adjust the radiator cowling mounting position.

Torque Specifications



9TG0B2-445

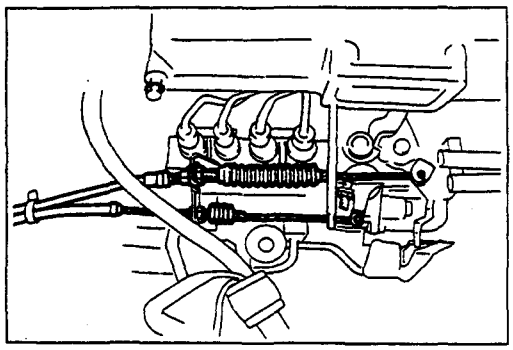


9TG0B2-446

Exhaust manifold insulator

1. Install the exhaust manifold insulator.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

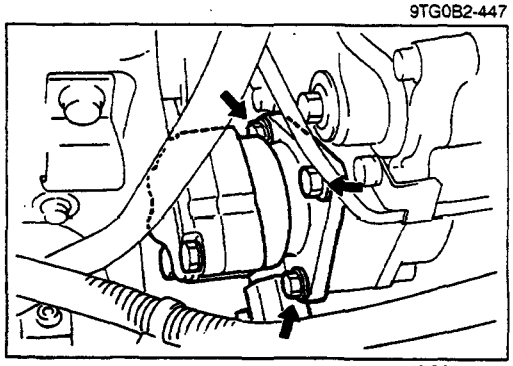


9TG0B2-447

Fuel stop cable
1. Install the fuel stop cable.

Accelerator cable
1. Install the accelerator cable.
2. Adjust the cable deflection by turning the adjusting nut.

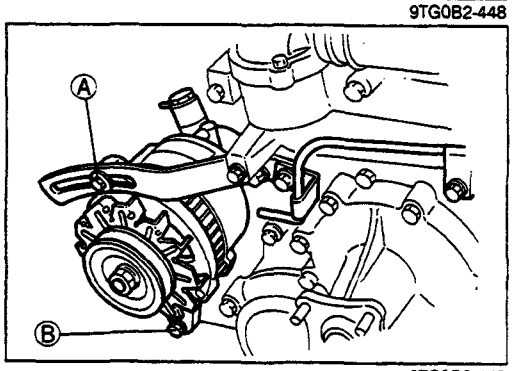
Deflection: 1—3mm (0.04—0.12 in)



9TG0B2-448

P/S oil pump
1. Install the P/S oil pump and new O-ring.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



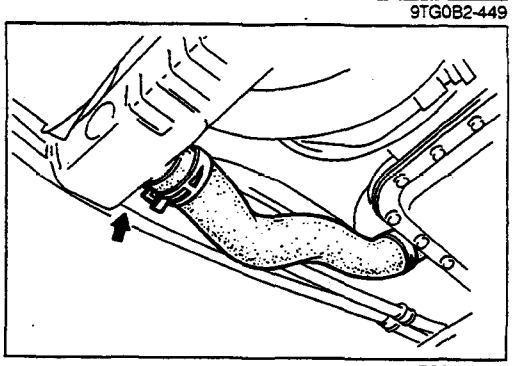
9TG0B2-449

Alternator
1. Install the alternator strap.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

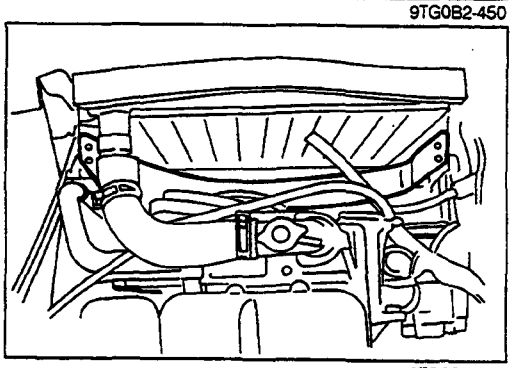
2. Install the alternator.

Tightening torque
Ⓐ: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)
Ⓑ: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



9TG0B2-450

Radiator hose, lower
1. Connect the lower radiator hose.



9TG0B2-451

Radiator cowling, lower
1. Install the lower radiator cowling.

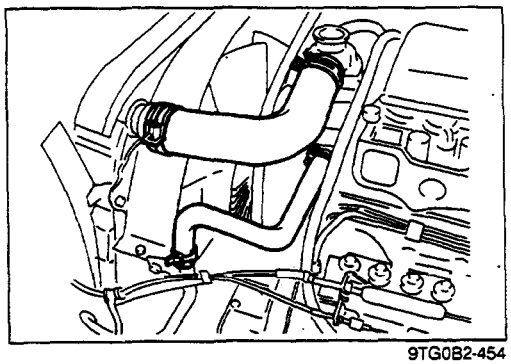
Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)

Drive belt
1. Install the drive belts.

Cooling fan
1. Install the cooling fan.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

9TG0B2-452

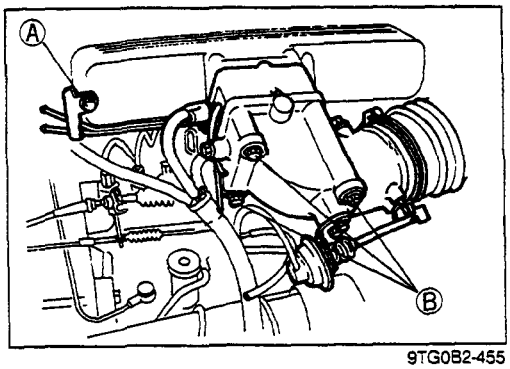


9TG0B2-454

Radiator cowling, upper
1. Install the upper radiator cowling.

Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)

Radiator hose, upper
1. Connect the upper radiator hose.



9TG0B2-455

Air hose, intake manifold elbow
1. Install the intake manifold elbow and air heater and a new gasket.
2. Install the vacuum pipe.

Tightening torque
Ⓐ: 7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)
Ⓑ: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

3. Connect the vacuum hose.

Steps After Installation

1. Install the undercover.
2. If the engine oil was drained, fill with the specified amount and type of engine oil. (Refer to Section D.)
3. Fill the radiator with the specified amount and type of engine coolant. (Refer to Section E.)
4. If the transmission oil was drained, fill with the specified amount and type of transmission oil. (Refer to Section J.)
5. Adjust the drive belt deflection. (Refer to page B–9.)
6. Bleed the air from the fuel system. (Refer to page B–16.)
7. Bleed the air from the clutch system. (Refer to Section H.)
8. Connect the negative battery cable.
9. Start the engine and check the following.
   (1) Engine oil, transmission oil, and engine coolant leakage.
   (2) Injection timing, idle speed. (Refer to page B–11.)
10. Perform a road test.
11. Recheck the engine oil and engine coolant levels.

9TF0BX-052

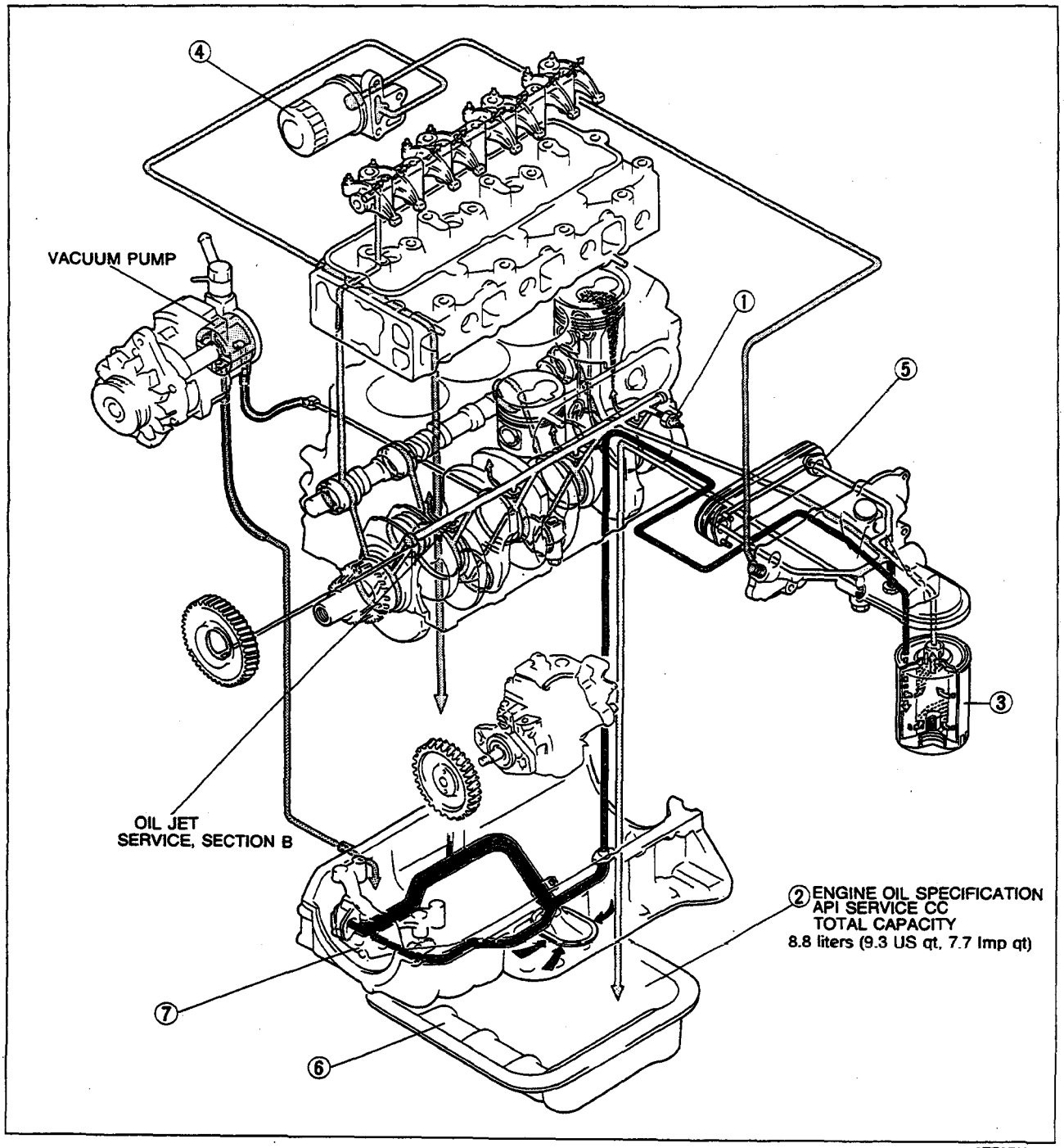
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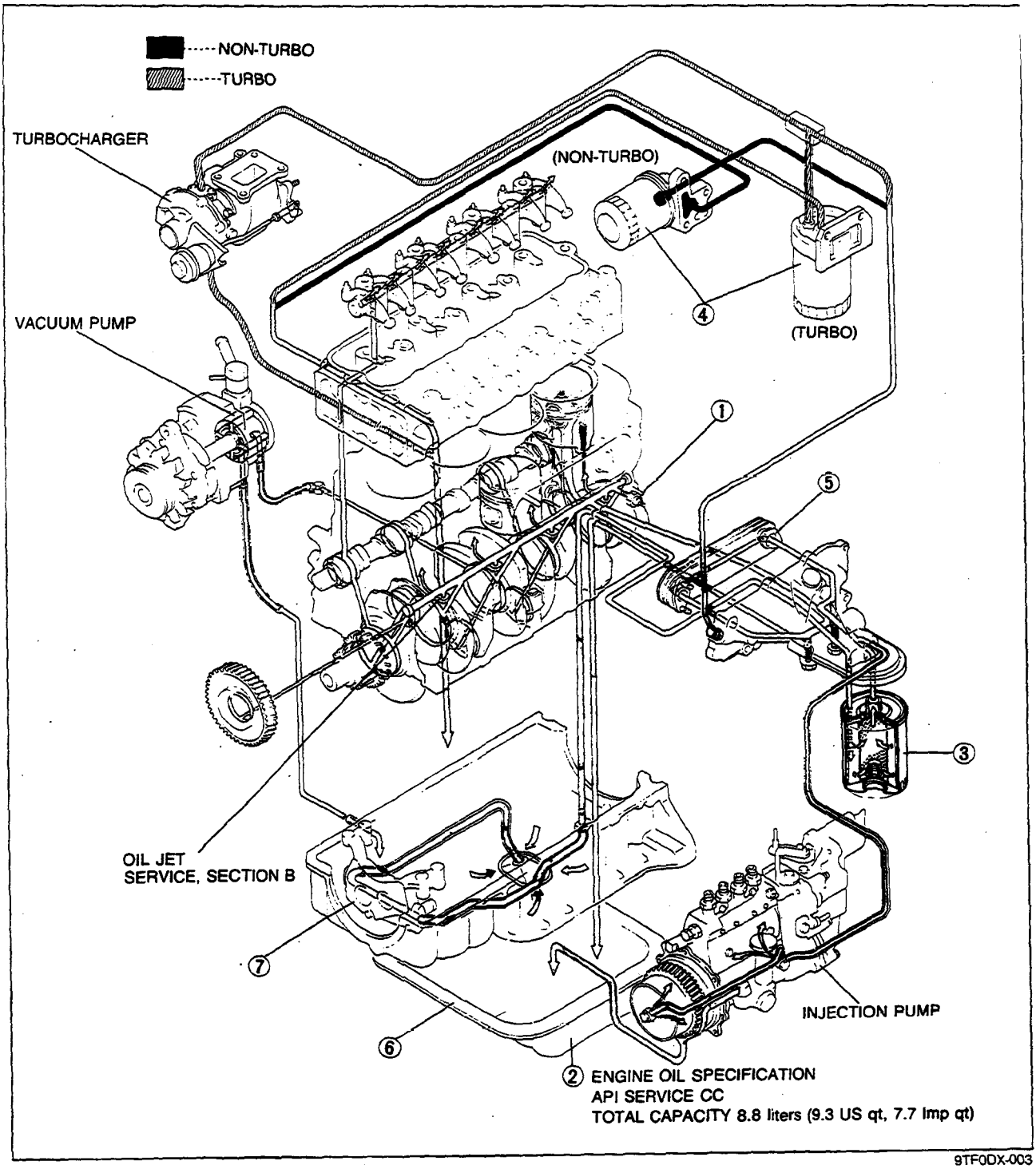
HA ENGINE



9TF0DX-002

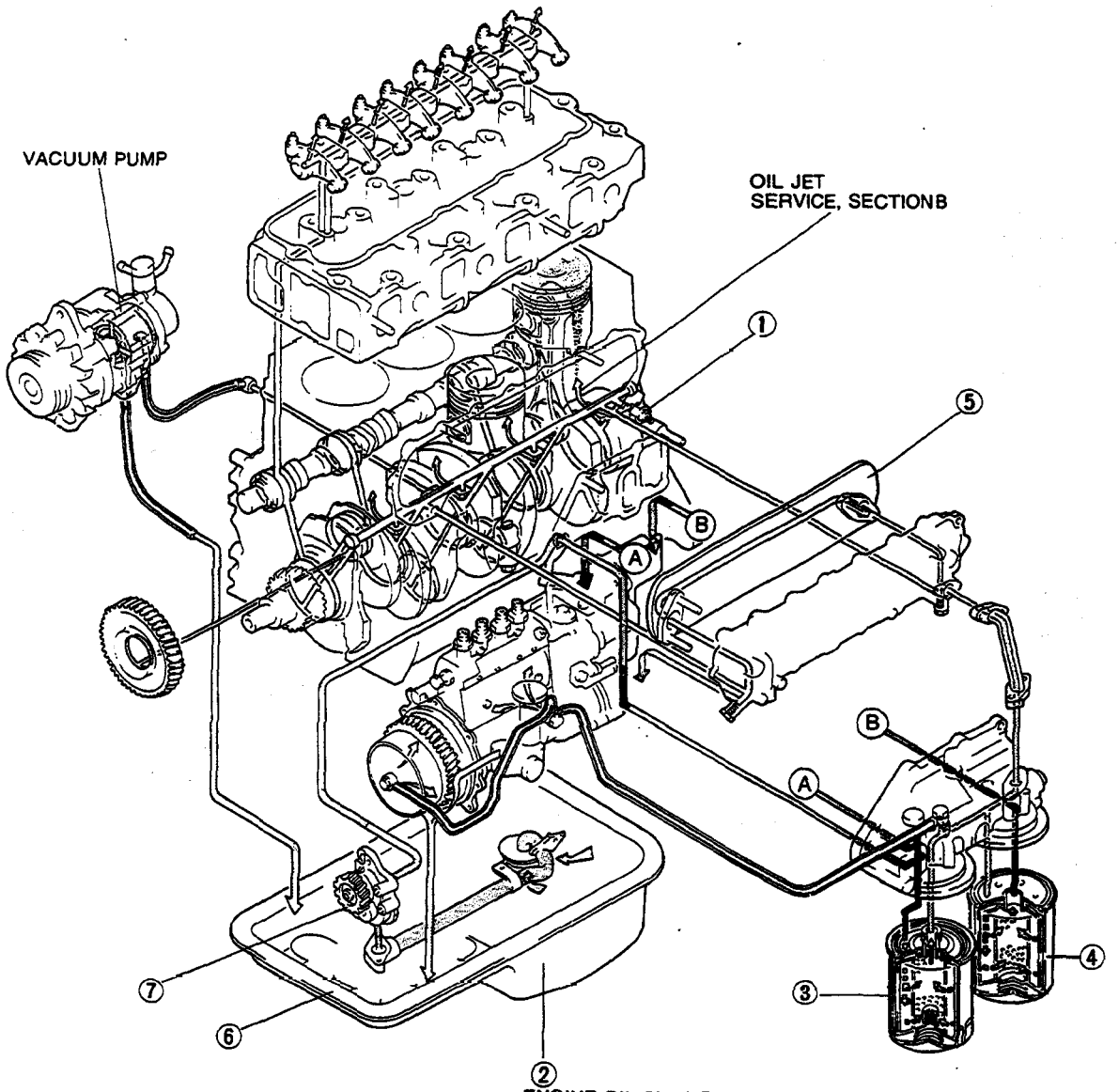
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SL ENGINE



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TF ENGINE



9TF0DX-004

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OUTLINE

SPECIFICATIONS

Item \ Engine		HA	SL	TF
Lubrication system		Force-fed type		
Oil pump	Type	Positive displacement gear		
	Regulating pressure kPa (kg/cm², psi)	608—667 (6.2—6.8, 88—97)		—
Oil filter	Type	Full-flow, paper element		
	Relief pressure differential kPa (kg/cm², psi)	78—118 (0.8—1.2, 11—17)		
	Regulating pressure kPa (kg/cm², psi)	—		608—667 (6.2—6.8, 88—97)
Oil bypass filter	Type	Paper element		
Oil cooler	Type	Water-cooled		
Oil capacity	Total (dry engine) liters (US qt, Imp qt)	8.8 (9.3, 7.7)		9.3 (9.8, 8.2)
	Oil pan liters (US qt, Imp qt)	6.5 (6.9, 5.7)		7.0 (7.4, 6.2)
	Oil filter liter (US qt, Imp qt)	1.0 (1.06, 0.88)		
	Oil bypass filter liter (US qt, Imp qt)	0.6 (0.63, 0.53)		
Engine oil		API service CC		

9TG0D2-005

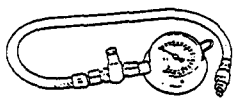
TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Engine hard starting	Improper viscosity engine oil Insufficient engine oil	Replace Add oil	D- 7 D- 7
Excessive oil consumption	Oil working up or down Oil leakage	Refer to Section B Repair	 —
Oil pressure low	Insufficient oil Oil leakage Worn and/or damaged oil pump gear Worn plunger (inside oil pump) or weak spring Clogged oil strainer Excessive main bearing or connecting rod bearing clearance	Add oil Repair Replace Replace Clean Refer to Section B	D- 7 — D-17 D-17 —
Warning lamp (oil pressure) illuminates while engine running	Oil pressure drop Insufficient oil Malfunction of oil pressure switch Malfunction of oil level sensor Malfunction of electrical system	As described above Add oil Refer to Section T Refer to Section T Refer to Section T	— D- 7

9TF0DX-005

OIL PRESSURE

PREPARATION
SST

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

05U0DX-006

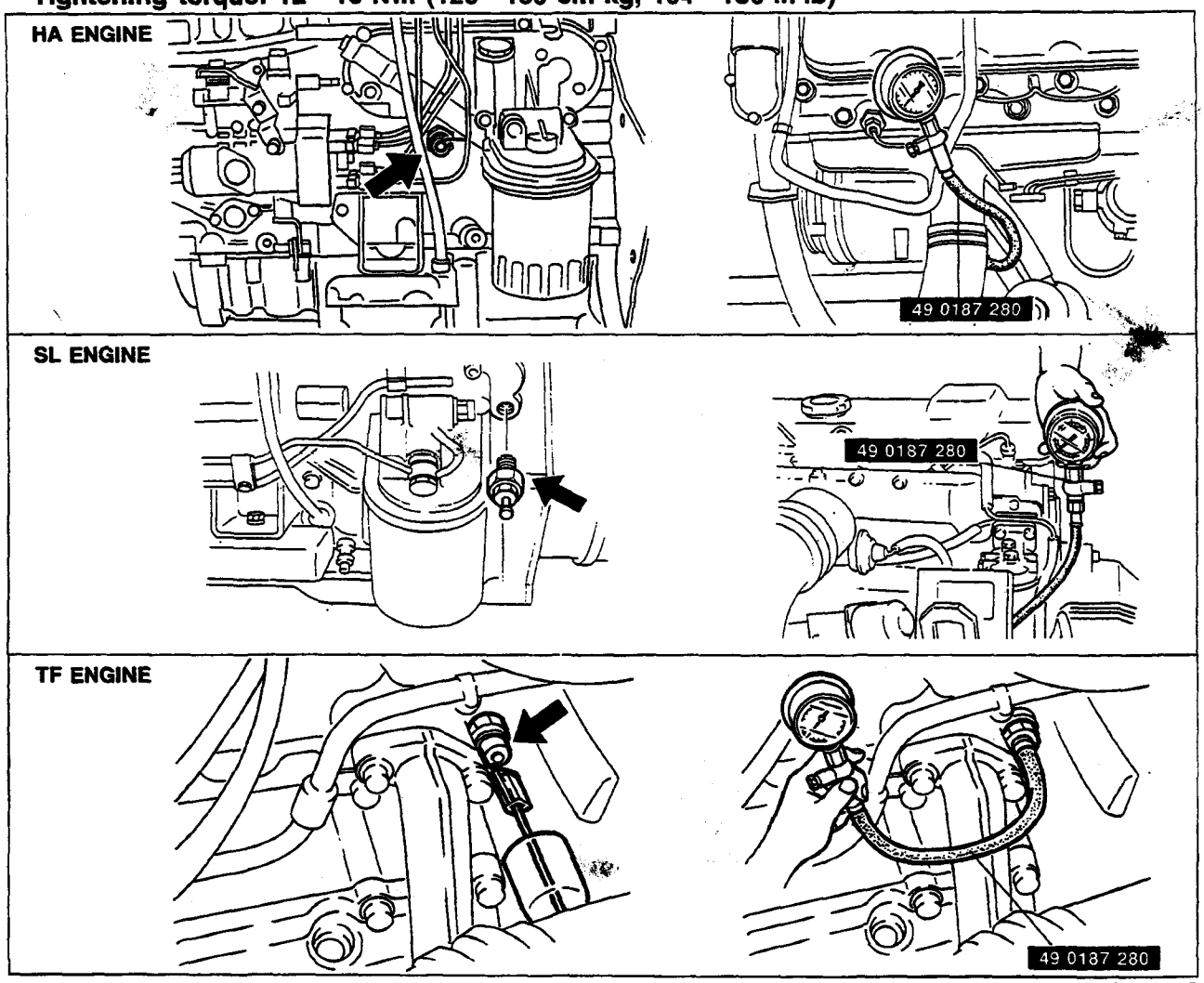
INSPECTION

1. Remove the oil pressure switch.
2. Screw the **SST** into the oil pressure switch installation hole.
3. Warm up the engine to normal operating temperature.
4. Run the engine at **3,600 rpm**, and note the gauge reading.

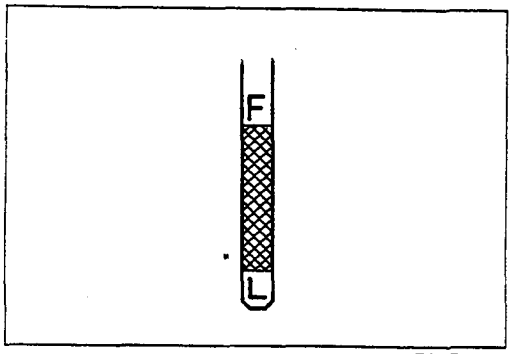
Oil pressure: 373 kPa (3.8 kg/cm^2, 54 psi) min.

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

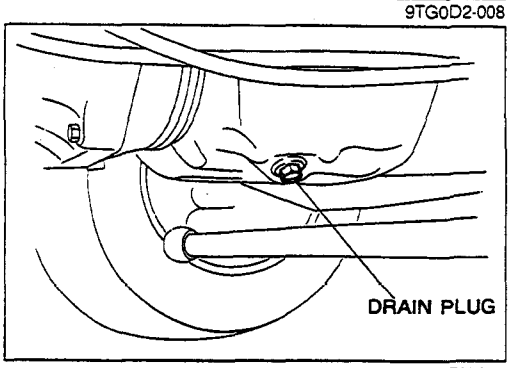
Tightening torque: 12—18 N·m (120—180 cm-kg, 104—156 in-lb)



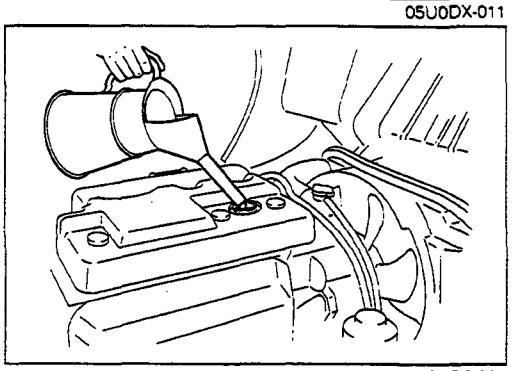
9TG0D2-007



9TG0D2-008



05U0DX-011



9TG0D2-009

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 gauge 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 level gauge represents 2.0 liters (2.11 USqt, 1.76 Imp qt).**

REPLACEMENT

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

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

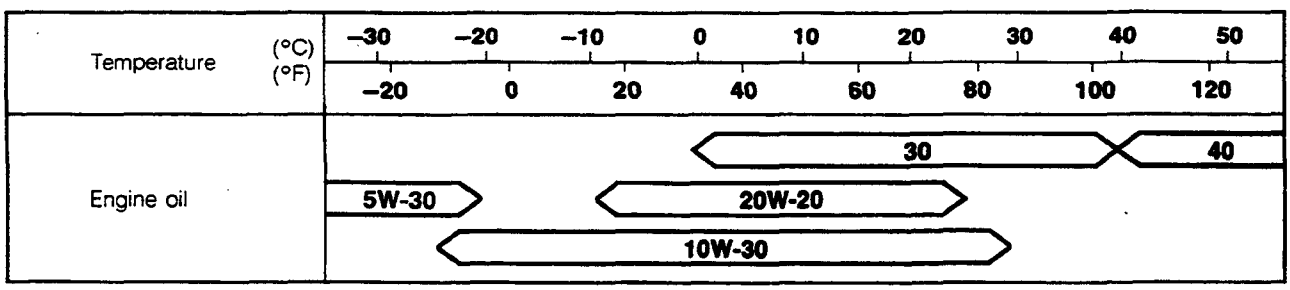
Tightening torque:
29—41 N·m (3.0—4.2 m-kg, 22—30 ft-lb)

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

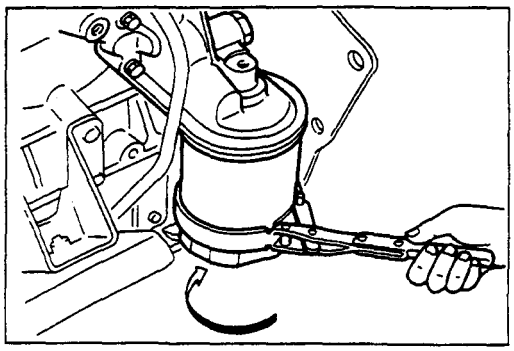
Oil pan capacity
HA, SL: 6.5 liters (6.9 US qt, 5.7 Imp qt)
TF: 7.0 liters (7.4 US qt, 6.2 Imp qt)

6. Refit the oil filler cap.
7. Run the engine and check for leaks.
8. Stop the engine and check the oil level. Add oil if necessary.

Recommended SAE Viscosity



Anticipated ambient temperature range before succeeding oil change, °C (°F).

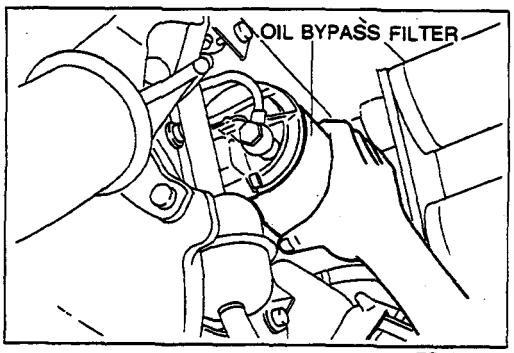

9TF0DX-006

OIL FILTER

REPLACEMENT

1. Remove the oil filter with a suitable wrench.
2. Use a clean rag to wipe off 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 and tighten it by hand until the rubber seal contacts the base.
5. Tighten the filter 1/2 turn with a filter wrench.
6. Start the engine and check for leaks.
7. Check the oil level and add oil if necessary.

Oil filter capacity: 1.0 liter (1.06 US qt, 0.88 Imp qt)



9TG0D2-013

OIL BYPASS FILTER

REPLACEMENT

1. Remove the oil bypass filter with a suitable wrench.
2. Use a clean rag to wipe off 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 bypass filter and tighten it by hand.
5. Start the engine and check for leaks.
6. Check the oil level and add oil if necessary.

Oil bypass filter capacity:
0.6 liter (0.63 US qt, 0.53 Imp qt)

OIL COOLER

REMOVAL / INSTALLATION

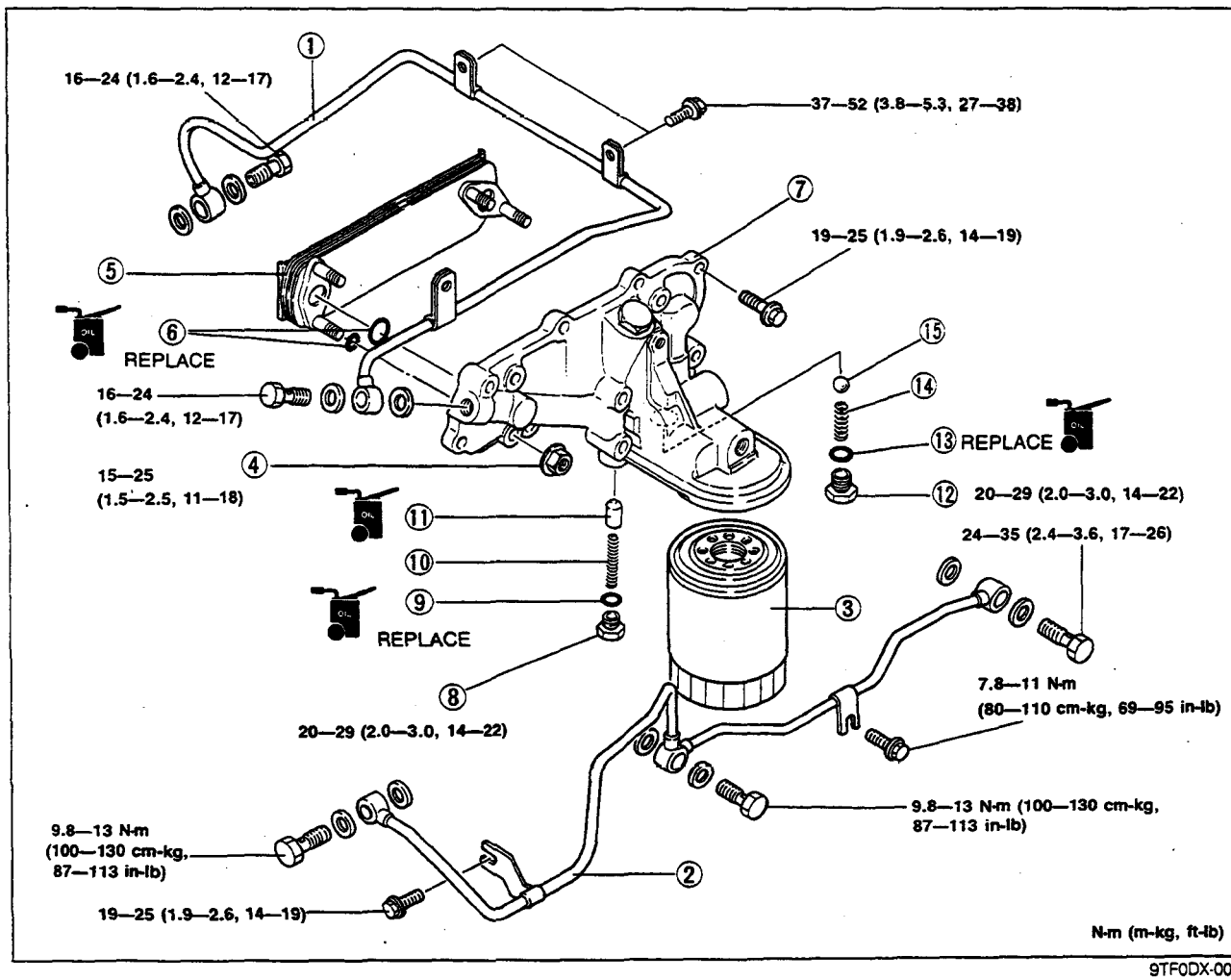
1. Disconnect the negative battery cable.
2. Drain the engine oil.
3. Drain the engine coolant.
4. Remove in the order shown in the figure.
5. Install in the reverse order of removal.

Steps After Installation

1. Fill the radiator with the specified amount and type of engine coolant. (Refer to Section E.)
2. Fill with the specified amount and type of engine oil. (Refer to page D–7.)
3. Connect the negative battery cable.
4. Start the engine and check for leaks.
5. Check the engine oil and engine coolant levels.

9TF0DX-007

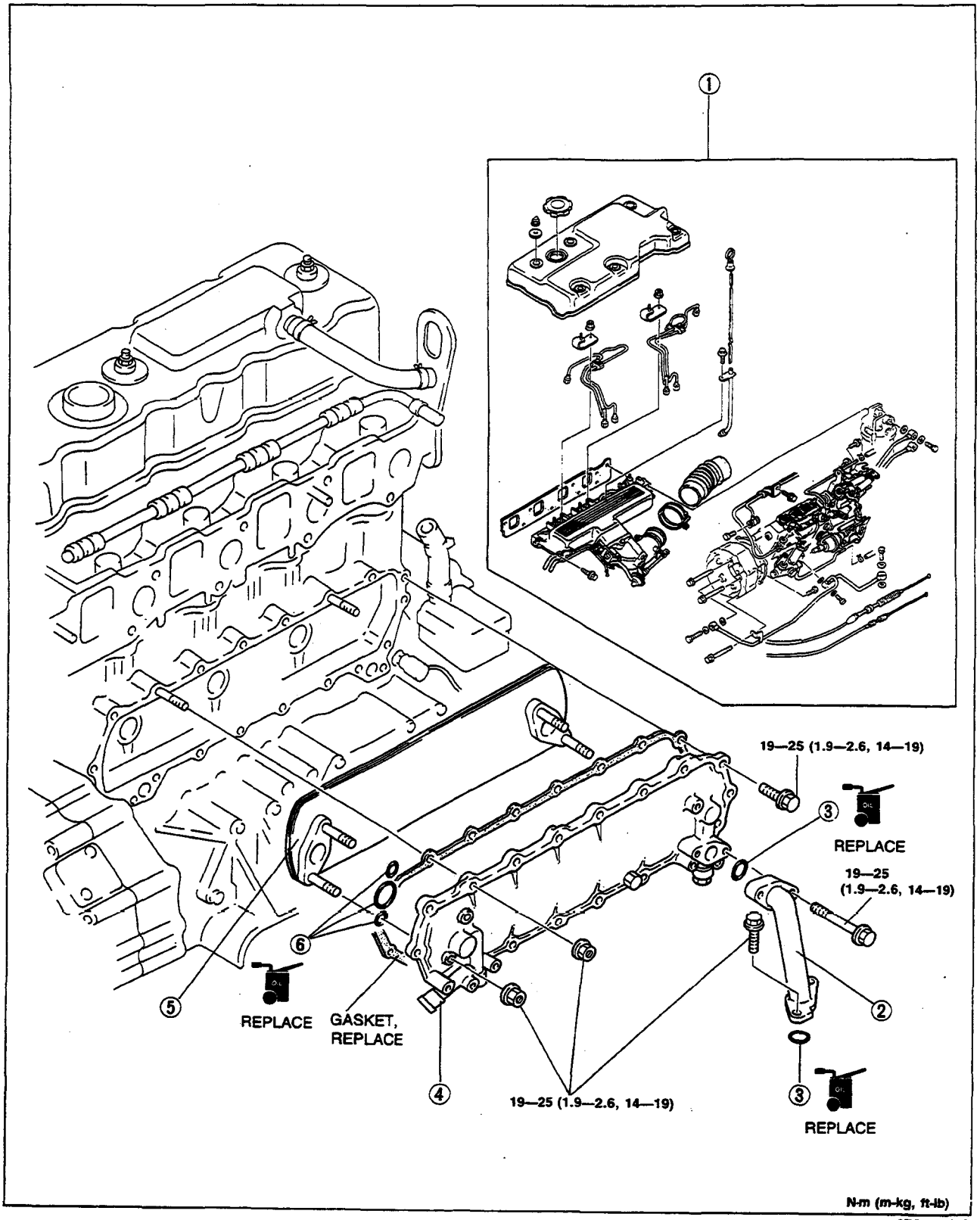
HA, SL Engine



9TF0DX-008

1. Oil pipe (Oil bypass filter)
2. Oil pipe (Fuel injection pump)
3. Oil filter
   Removal / Installation..... page D– 8
4. Oil cooler installation nut
5. Oil cooler
6. O-ring
7. Oil cooler cover
8. Screw
9. O-ring
10. Pressure spring
11. Control plunger
12. Screw
13. O-ring
14. Relief valve spring
15. Steel ball

TF Engine



9TG0D2-017

1. Intake manifold and fuel injection pump
   Service..... Section F3
2. Oil pipe
3. O-ring
4. Oil cooler cover
5. Oil cooler
6. O-ring

OIL PAN

REMOVAL / INSTALLATION

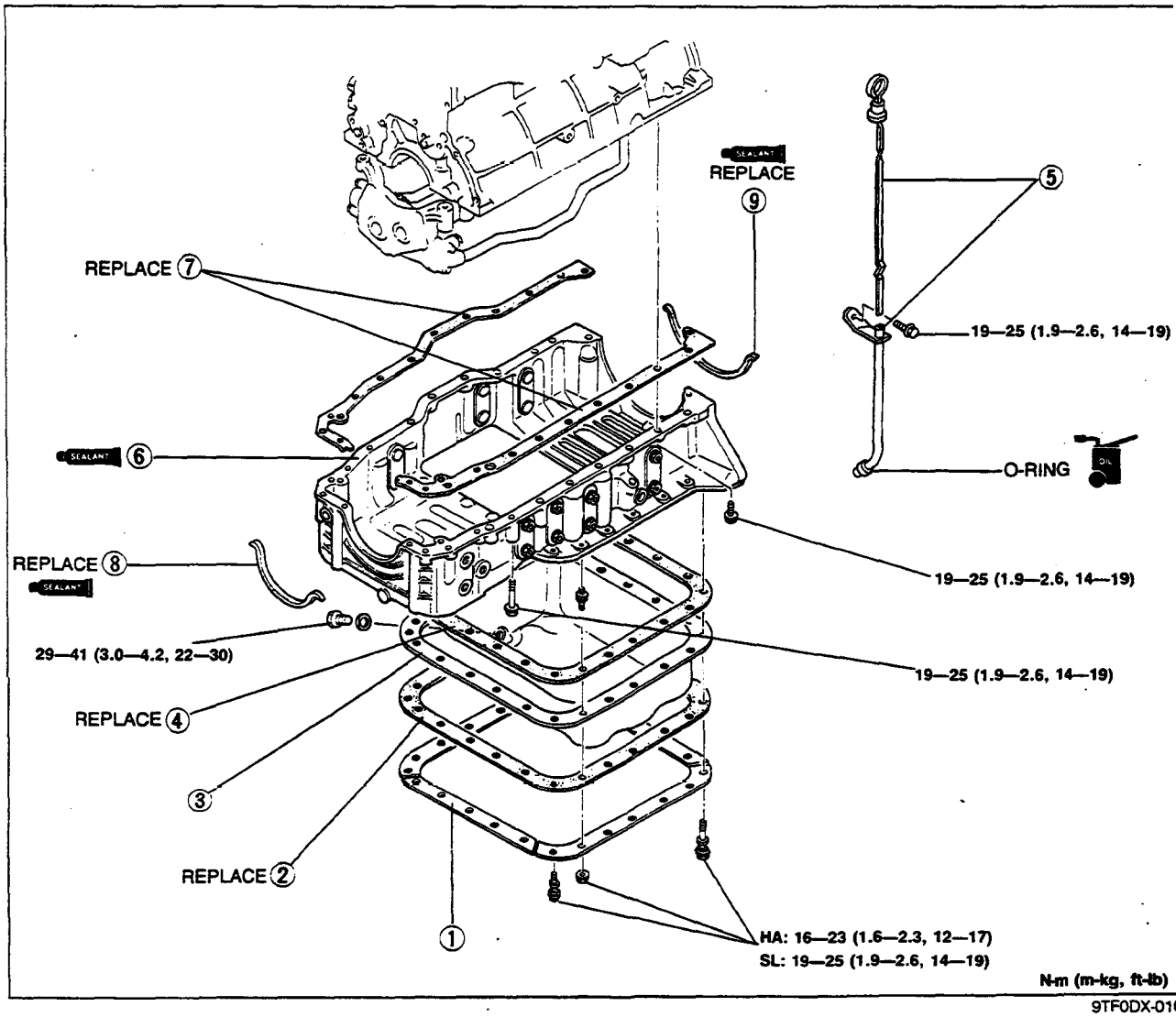
1. Disconnect the negative battery cable.
2. Drain the engine oil.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal, referring to **Installation Note**.

Steps After Installation

1. Fill with the specified amount and type of engine oil. (Refer to page D–7.)
2. Connect the negative battery cable.
3. Start the engine and check for leaks.
4. Check the oil level and add oil if necessary.

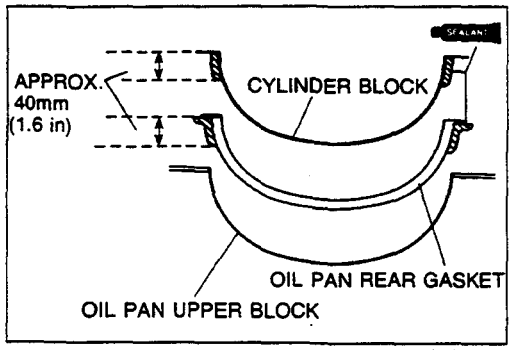
9TF0DX-00

HA, SL Engine

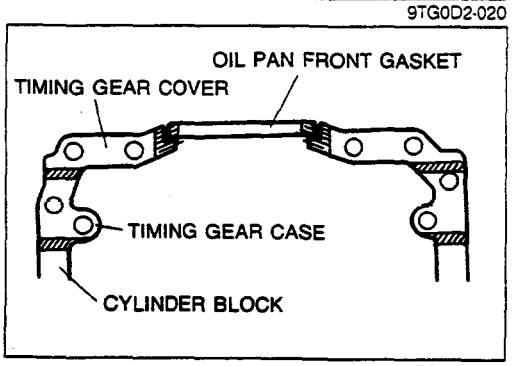


9TF0DX-01

1. Stiffener
2. Rubber gasket
3. Oil pan
   Inspect for cracks, deformation, and damage
4. Rubber gasket
5. Oil level gauge and pipe
6. Oil pan upper block
   Installation Note..... page D–12
7. Gasket
8. Oil pan gasket, front
9. Oil pan gasket, rear
   Installation Note..... page D–12



9TG0D2-020



9TG0D2-021

Installation Note
Oil pan gasket, rear

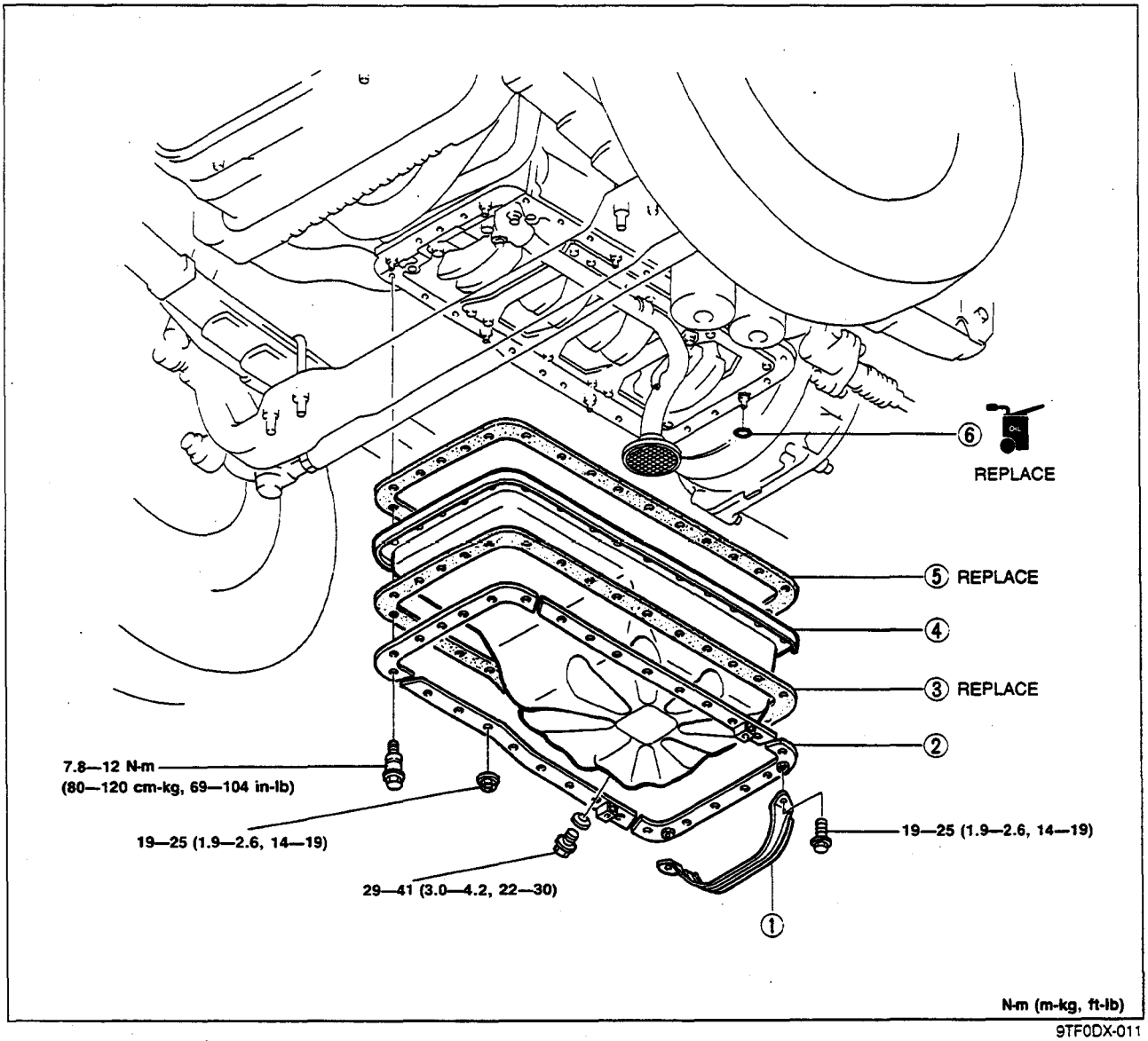
Caution
- **The oil pan upper block must be secured within 30 minutes after the sealant is applied to the oil pan rear gasket.**

1. Apply silicone sealant to the shaded areas of the new oil pan rear gasket.
2. Install the oil pan rear gasket to the oil pan upper block.

Oil pan upper block
1. Apply silicone sealant to the shaded areas of the cylinder block.
2. Install the oil pan upper block and new gaskets.

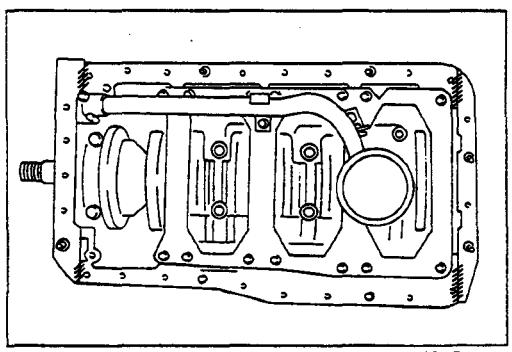
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

TF Engine



9TF0DX-011

1. Seal plate
2. Stiffener
3. Rubber gasket
4. Oil pan
   Inspect for cracks, deformation, and damage
   Installation Note..... page D–13
5. Rubber gasket
6. O-ring



9TG0D2-024

Installation Note
Oil pan

Caution
- **The oil pan must be secured within 30 minutes after the sealant is applied to the cylinder block.**

1. Apply silicone sealant to the shaded areas of the cylinder block.
2. Install the oil pan and a new gasket.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

OIL PUMP

REMOVAL / INSTALLATION

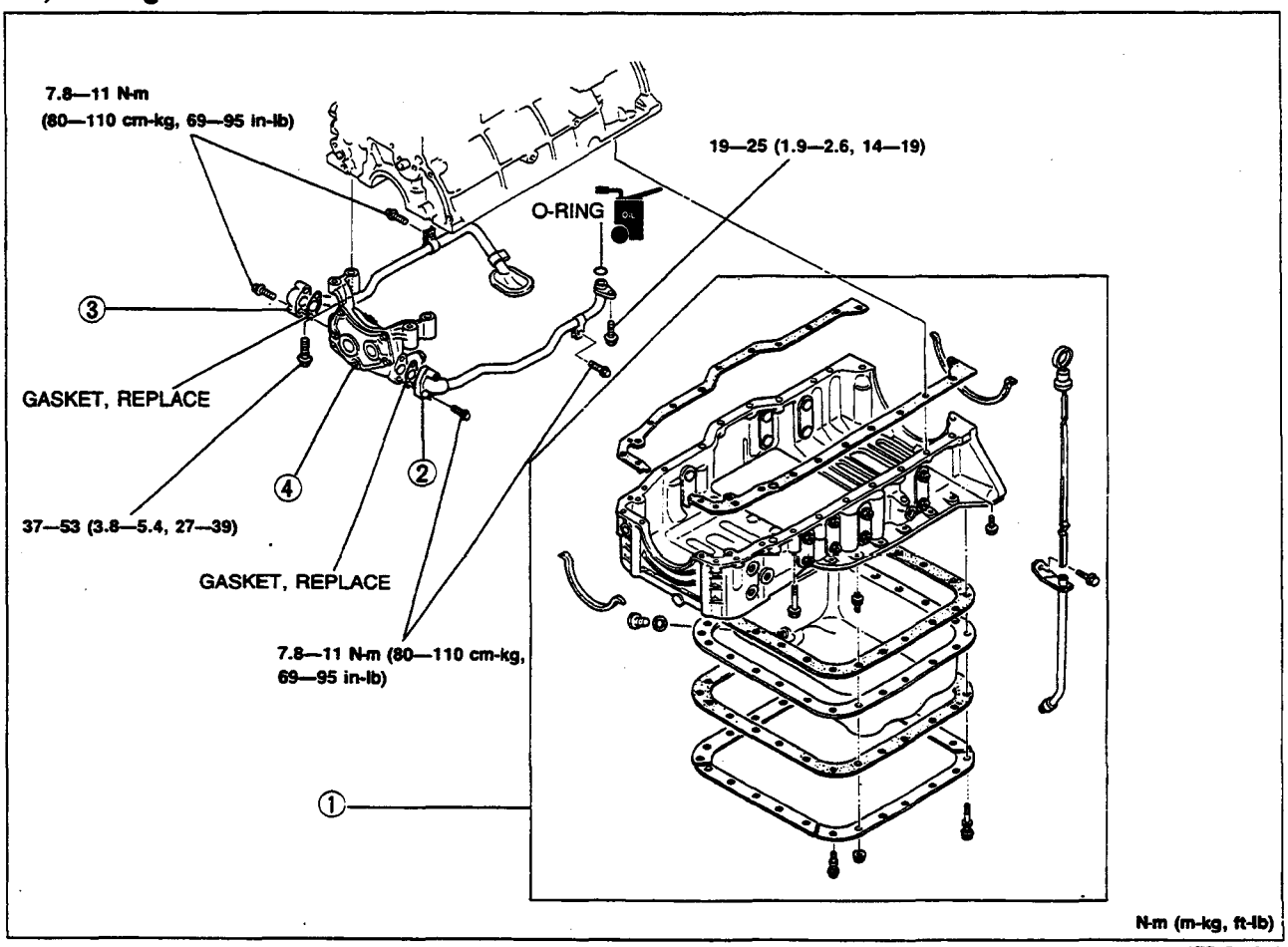
Caution
- **Position the hose clamp in the original location on the hose, and squeeze the clamp lightly with large pliers to ensure a good fit.**
- **After radiator cowling installation, rotate the cooling fan by hand and verify that the fan blade does not touch the radiator cowling.**
  It the fan touches the cowling, adjust the radiator cowling mounting position.

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

Steps After Installation
1. Fill with the specified amount and type of engine oil. (Refer to page D–7.)
2. Connect the negative battery cable.
3. Start the engine and check for leaks.
4. Check the oil level and add oil if necessary.

9TF0DX-012

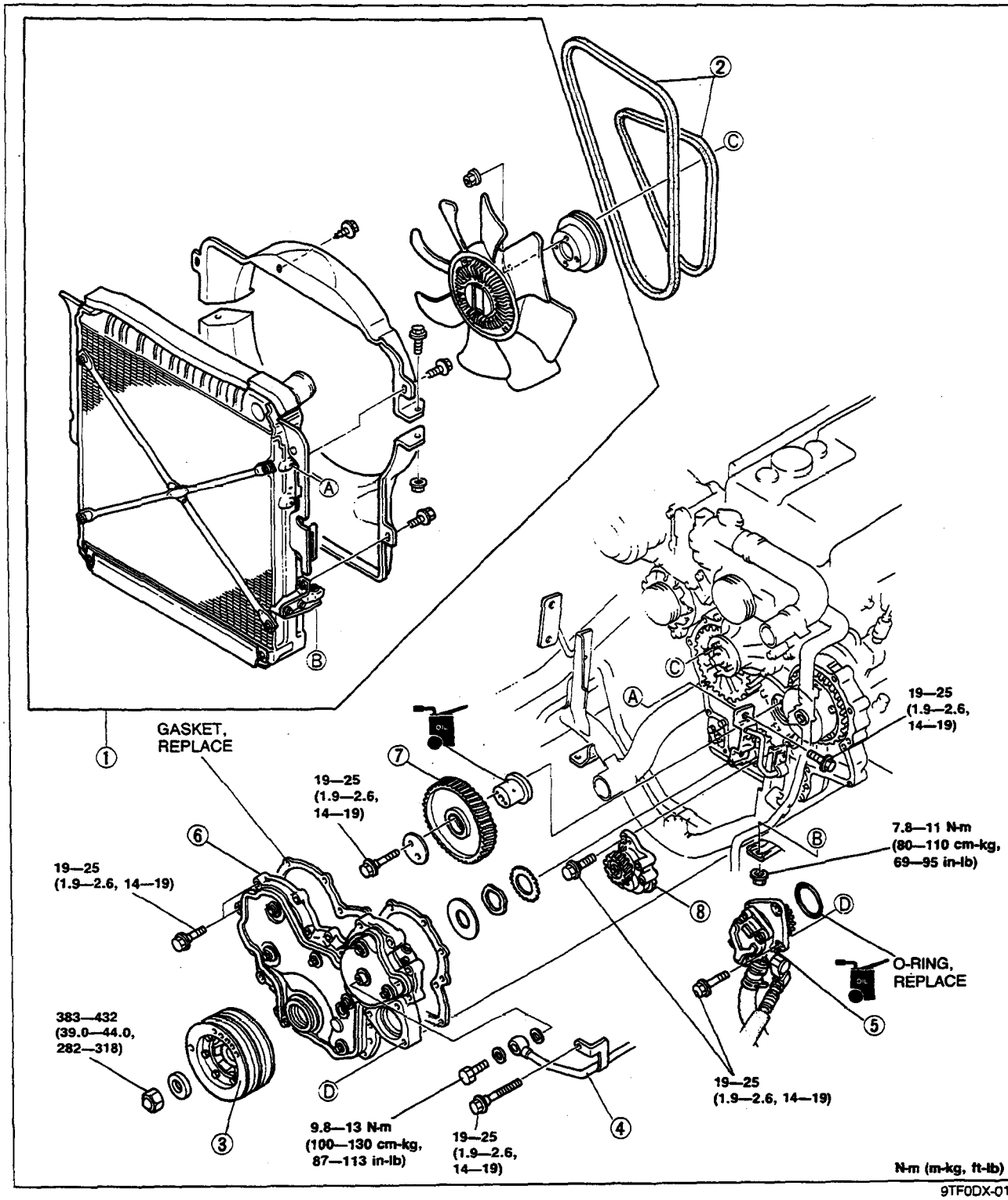
HA, SL Engine



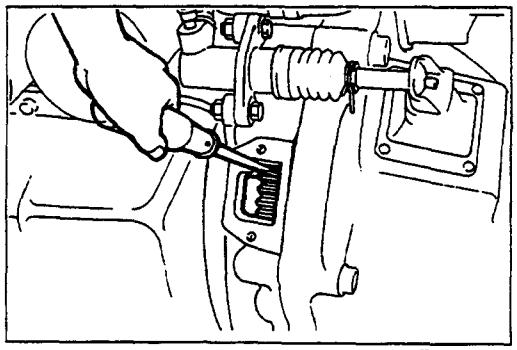
9TF0DX-013

1. Oil pan
   Removal / Installation..... page D–11
2. Oil pipe
3. Oil strainer
4. Oil pump
   Disassembly / Inspection / Assembly..... page D–17

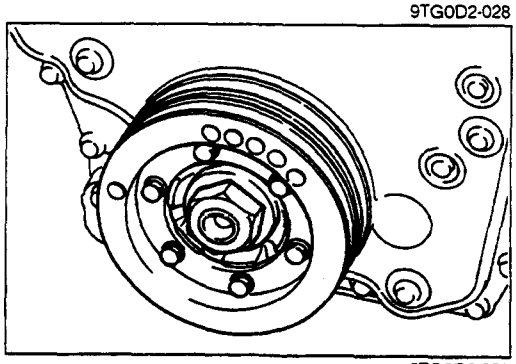
TF Engine



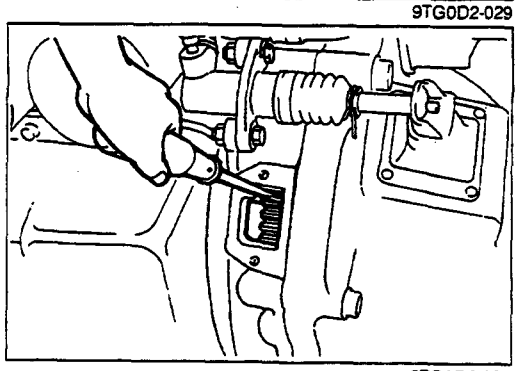
1. Radiator
   Service ..... Section E
2. Drive belt
   Adjustment ..... Section B
3. Crankshaft pulley
   Removal Note ..... page D–16
   Installation Note..... page D–16
4. Oil pipe (Fuel injection pump)
5. P/S oil pump
6. Timing gear cover
7. Idler gear
8. Oil pump
   Disassembly / Inspection / Assembly..... page D–17



9TG0D2-028



9TG0D2-029



9TG0D2-030

Removal Note
Crankshaft pulley

Caution
- **This operation must be performed by two people.**

1. Remove the blind cover from the end plate.
2. Set a screwdriver or a suitable tool against the flywheel ring gear to prevent the engine from rotating.
3. Loosen the pulley locknut.
4. Remove the crankshaft pulley.

Installation Note
Crankshaft pulley

1. Install the crankshaft pulley.
2. Install the locknut and washer.

Caution
- **This operation must be performed by two people.**

3. Prevent the engine from rotating and tighten the locknut.

Tightening torque:
383—432 N·m (39.0—44.0 m-kg, 282—318 ft-lb)

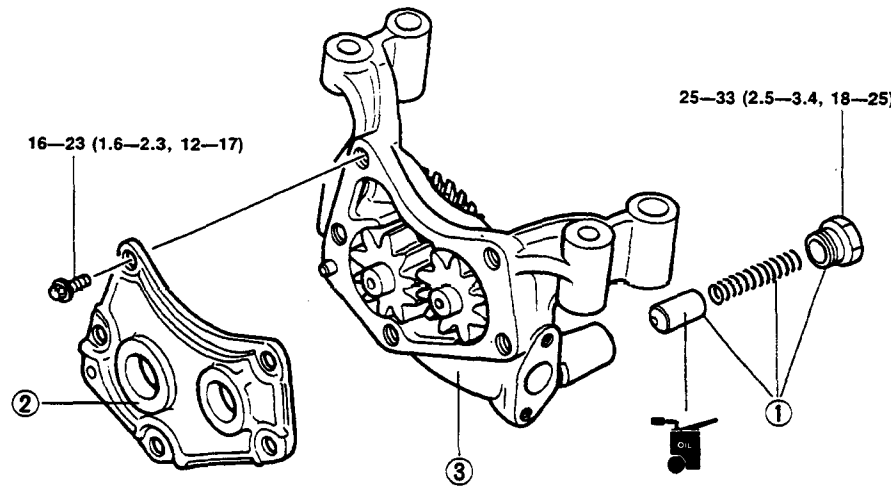
4. Install the blind cover to the end plate.

DISASSEMBLY / INSPECTION / ASSEMBLY

Caution
- **If a problem is found, replace the pump as a unit.**

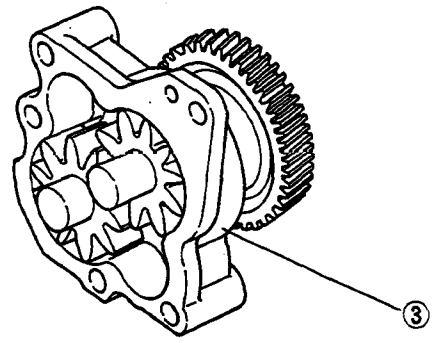
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly Note**.

HA, SL ENGINE



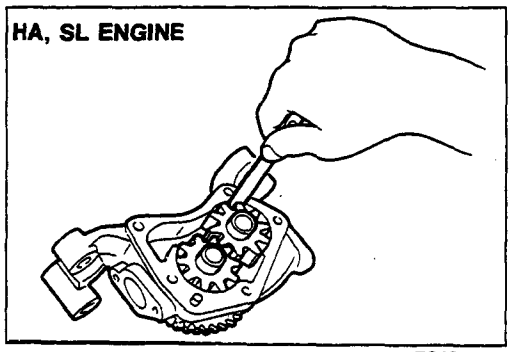
N-m (m-kg, ft-lb)

TF ENGINE

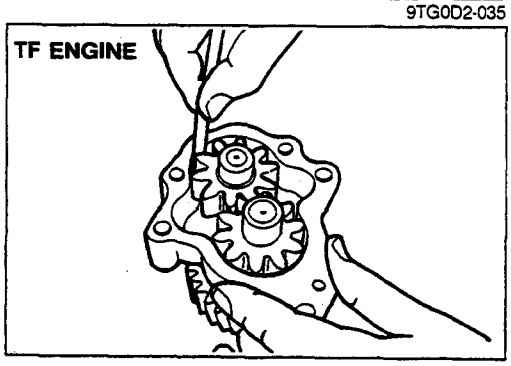


9TG0D2-032

1. Relief valve (HA, SL)
   Inspect for wear or damage
2. Pump cover (HA, SL)
3. Pump body



9TG0D2-035

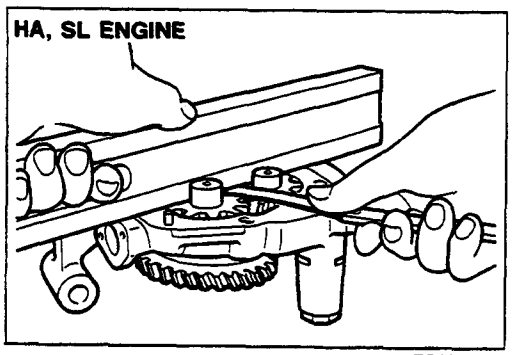


INSPECTION

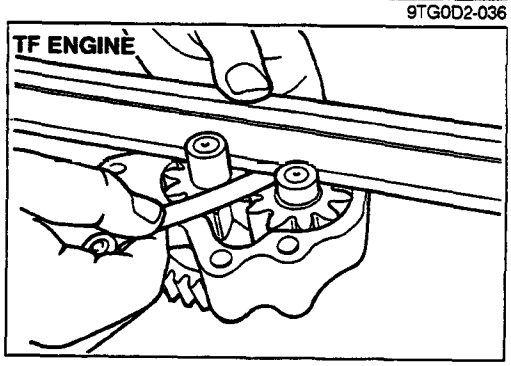
Rotor Clearance

1. Measure the rotor to pump body clearance.

Clearance
Standard : 0.10—0.19mm (0.0039—0.0075 in)
Maximum: 0.20mm (0.0079 in)



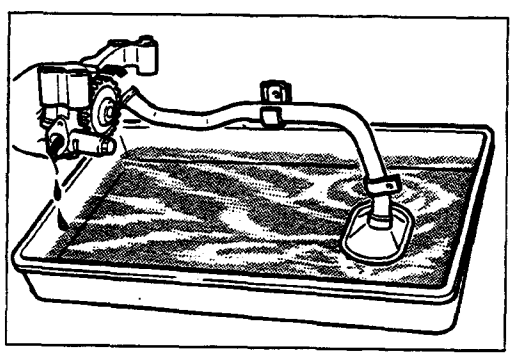
9TG0D2-036



2. Measure the side clearance (between the rotor and the edge of the pump body).

Clearance
Standard : 0.04—0.09mm (0.0016—0.0035 in)
Maximum: 0.15mm (0.0059 in)

3. If the clearance exceeds the maximum, replace the oil pump assembly.



9TG0D2-038

Operation Check (HA, SL)

1. Install the relief valve to the pump body.
2. Install the oil strainer to the pump body.
3. Submerge the oil strainer in engine oil as shown in the figure.
4. Rotate the oil pump driven gear counterclockwise by hand and verify that engine oil flows.

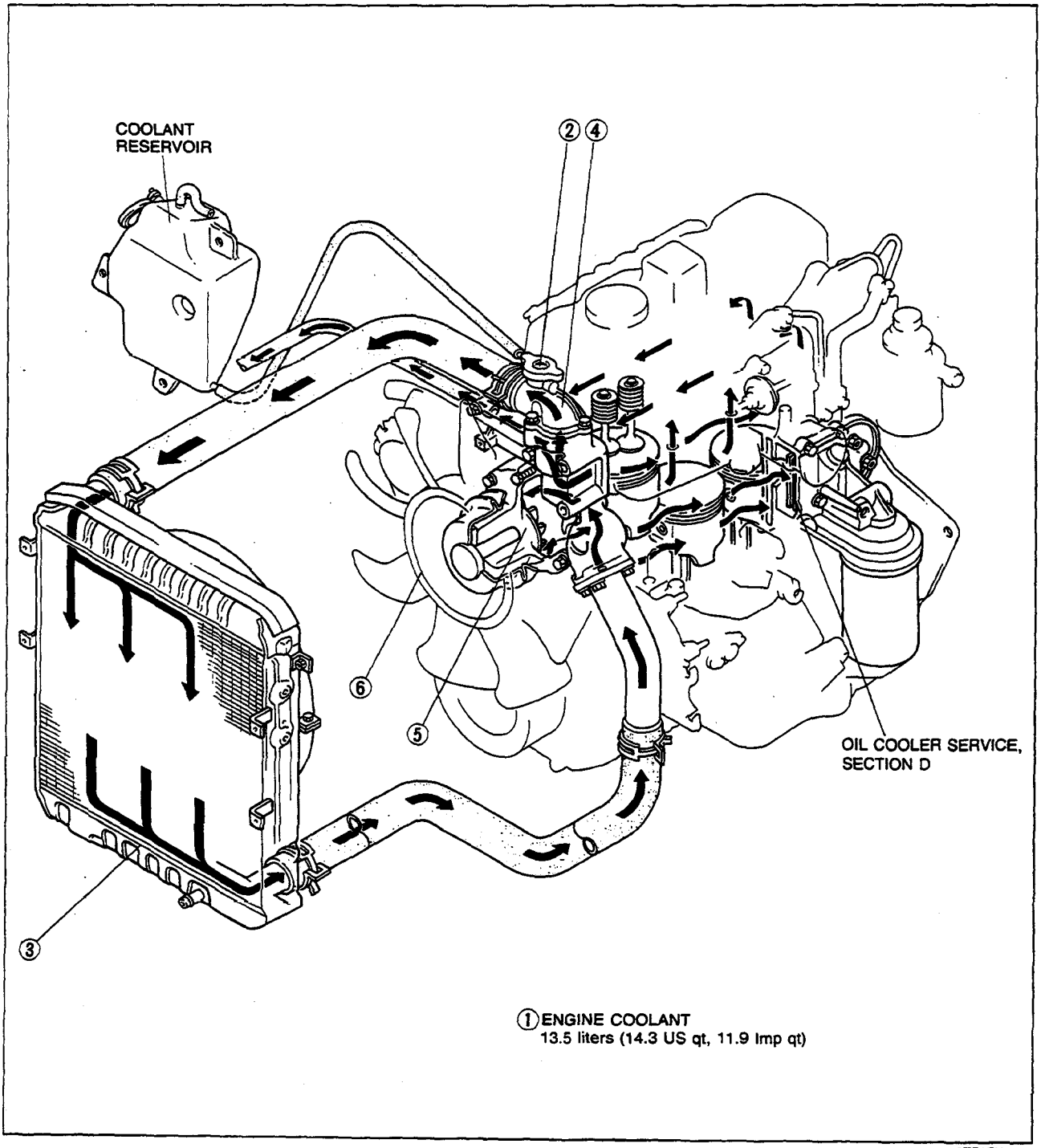
COOLING SYSTEM

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HA ENGINE ..... E– 2
SL ENGINE ..... E– 3
TF ENGINE ..... E– 4
OUTLINE ..... E– 5
SPECIFICATIONS ..... E– 5
TROUBLESHOOTING GUIDE ..... E– 5
ENGINE COOLANT ..... E– 6
PREPARATION ..... E– 6
INSPECTION ..... E– 6
REPLACEMENT ..... E– 7
RADIATOR CAP ..... E– 8
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INSPECTION ..... E– 8
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THERMOSTAT E–10
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9TF0EX-001

INDEX

HA ENGINE

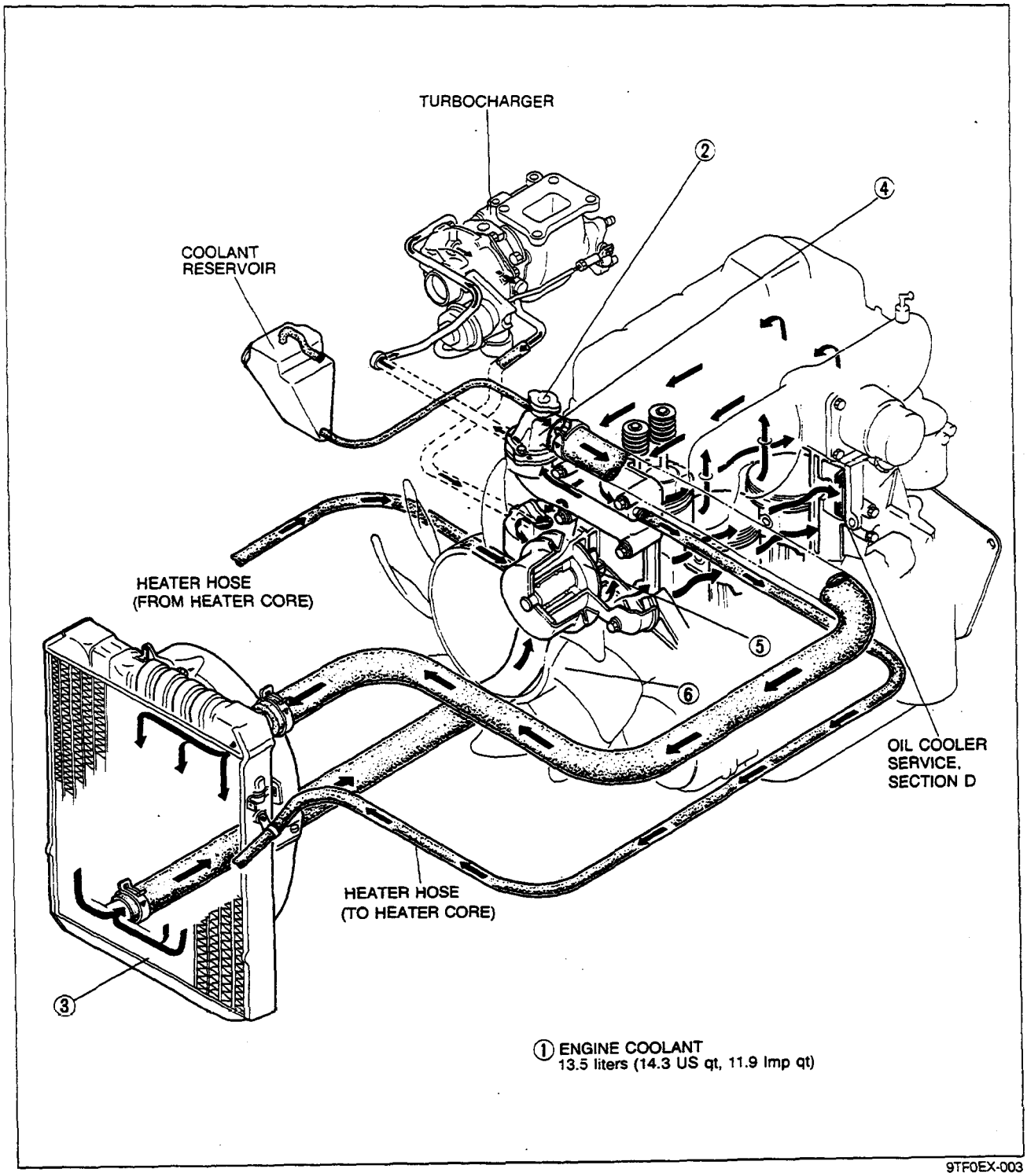


① ENGINE COOLANT
13.5 liters (14.3 US qt, 11.9 Imp qt)

9TF0EX-002

1. Engine coolant
Inspection ..... page E– 6
Replacement ..... page E– 7
2. Radiator cap
Inspection ..... page E– 8
3. Radiator
Removal / Installation ..... page E– 9
4. Thermostat
Removal / Inspection / Installation ..... page E–10
5. Water pump
Removal / Installation ..... page E–11
6. Cooling fan
Inspection ..... page E–12
Removal / Installation ..... page E–12

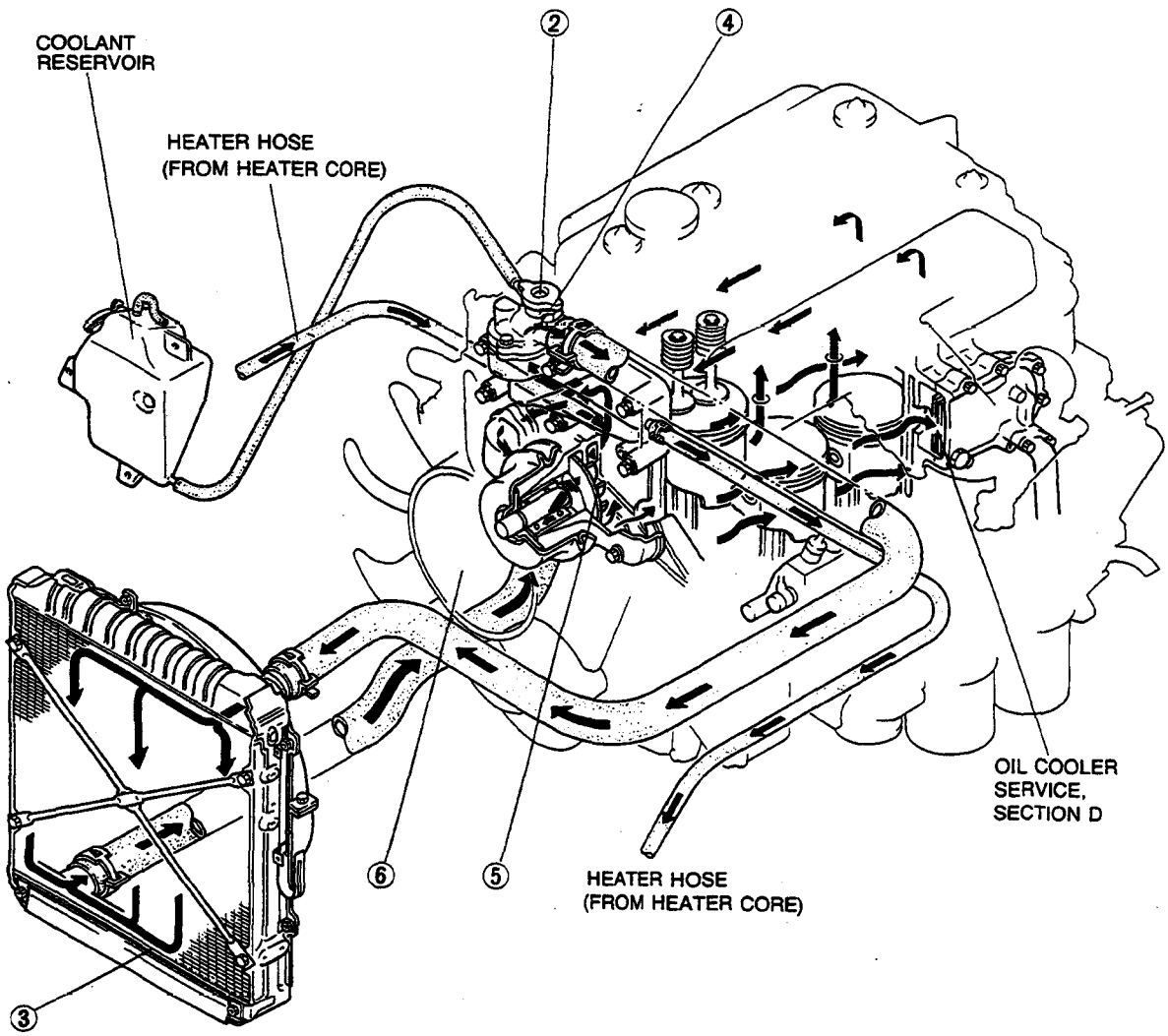
SL ENGINE



9TF0EX-003

1. Engine coolant
Inspection ..... page E– 6
Replacement ..... page E– 7
2. Radiator cap
Inspection ..... page E– 8
3. Radiator
Removal / Installation ..... page E– 9
4. Thermostat
Removal / Inspection / Installation ..... page E–10
5. Water pump
Removal / Installation ..... page E–11
6. Cooling fan
Inspection ..... page E–12
Removal / Installation ..... page E–12

TF ENGINE



① ENGINE COOLANT
13.5 liters (14.3 US qt, 11.9 Imp qt)

9TF0EX-004

1. Engine coolant
Inspection ..... page E– 6
Replacement ..... page E– 7
2. Radiator cap
Inspection ..... page E– 8
3. Radiator
Removal / Installation ..... page E– 9
4. Thermostat
Removal / Inspection / Installation ..... page E–10
5. Water pump
Removal / Installation ..... page E–11
6. Cooling fan
Inspection ..... page E–12
Removal / Installation ..... page E–12

OUTLINE

SPECIFICATIONS

Item \ Engine			HA	SL	TF
Cooling system			Water-cooled, forced circulation		
Coolant capacity		liters (US qt, Imp qt)	13.5 (14.3, 11.9)		
Water pump	Type		Centrifugal		
	Water seal		Unified mechanical seal		
Thermostat	Type		Wax		
	Opening temperature	°C (°F)	80.5—83.5 (177—182)		
	Full-open temperature	°C (°F)	95 (203)		
	Full-open lift	mm (in)	8.5 (0.33) min.		
Radiator	Type		Corrugated fin		
	Cap valve opening pressure	kPa (kg/cm², psi)	74—103 (0.75—1.05, 11—15)		
Cooling fan	Type		Thermomodulated		
	Blade	Number	8		
		Outer diameter mm (in)	410 (16.1)	Non-Turbo : 410 (16.1) Turbo: 420 (16.5)	420 (16.5)

9TF0EX-005

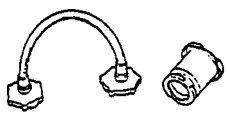
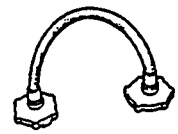
TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Overheating	Coolant level insufficient	Add coolant	E– 7
	Coolant leakage	Repair	—
	Radiator fins clogged	Clean	E– 9
	Radiator cap malfunction	Replace	E– 8
	Cooling fan malfunction	Replace	E–12
	Thermostat malfunction	Replace	E–10
	Water passage clogged	Clean	E– 7
	Water pump malfunction	Replace	E–11
Corrosion	Impurities in coolant	Replace	E– 7
Warning buzzer sounds while engine running	Coolant level insufficient	Add coolant	E– 7
	Malfunction of coolant level sensor	Refer to Section T	
	Malfunction of electrical system	Refer to Section T	

9TF0EX-006

ENGINE COOLANT

PREPARATION
SST

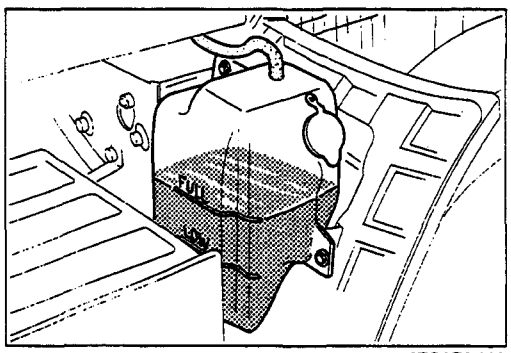
49 9200 145 Adapter set, radiator cap tester		For inspection of cooling system pressure	49 9200 146 Adapter A (Part of 49 9200 145)		For inspection of cooling system pressure

05U0EX-005

INSPECTION

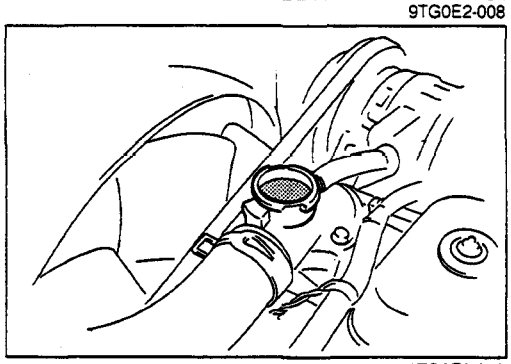
Warning
- **Never remove the radiator cap while the engine is hot.**
- **Wrap a thick cloth around the cap before removing it.**
- **When removing the radiator cap, loosen it slowly to the first stop until the pressure in the radiator is released, and then remove it.**

9TG0E2-007



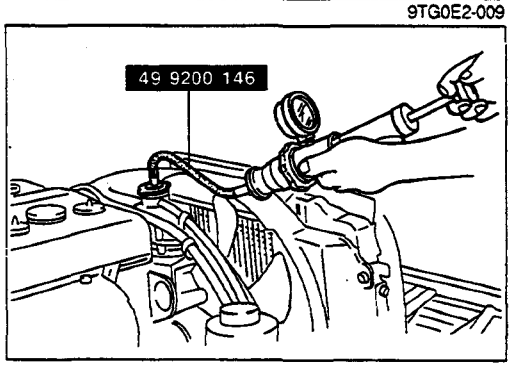
9TG0E2-008

Coolant Level (Engine Cold)
1. Verify that the coolant level is near the coolant inlet port.
2. Verify that the coolant level in the coolant reservoir is between the FULL and LOW marks. Add coolant if necessary.



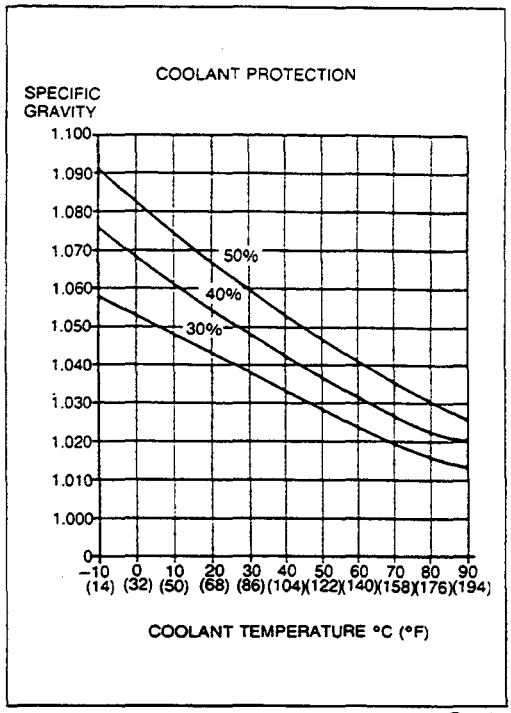
9TG0E2-009

Coolant Quality
1. Verify that there is no buildup of rust or scale around the radiator cap or coolant inlet port.
2. Verify that coolant is free of oil.
   Replace the coolant if necessary.



9TG0E2-010

Coolant Leakage
1. Connect a radiator tester (commercially available) and the **SST** to the coolant inlet port.
2. Apply **88 kPa (0.9 kg/cm^2, 13 psi)** pressure to the system.
3. Verify that the pressure is held.
   If not, check for coolant leakage.



05U0EX-009

Coolant Protection

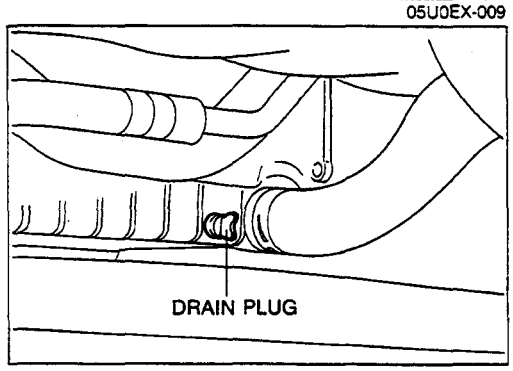
Caution
- **Do not use alcohol- or methanol-based coolant.**
- **Use only soft (demineralized) water in the coolant mixture.**

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

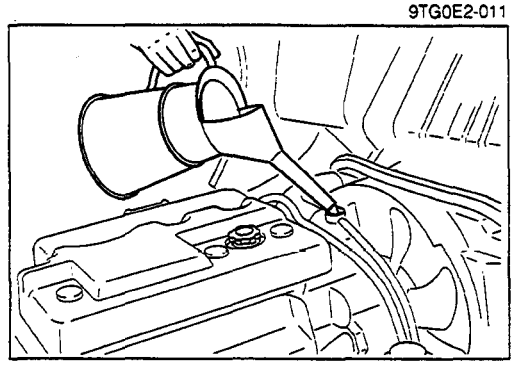
Antifreeze solution mixture percentage

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



9TG0E2-011



9TF0EX-007

REPLACEMENT

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

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

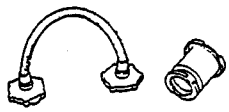
1. Remove the radiator cap and loosen the drain plug.
2. Drain the coolant into a suitable container.
3. Flush the cooling system with water until all traces of color are gone, then let the system drain completely.
4. Install the drain plug.
5. Fill with the proper amount and mixture of ethylene glycol-based coolant by referring to the table above.

   Coolant capacity:
   13.5 liters (14.3 US qt, 11.9 Imp qt)

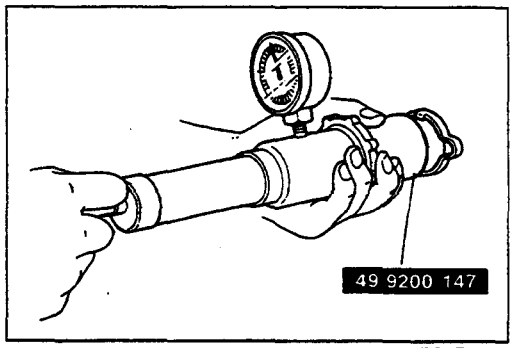
6. Run the engine, with the radiator cap removed, until the upper radiator hose is hot.
7. With the engine idling, add coolant to the radiator until it reaches the bottom of the coolant inlet port.
8. Install the radiator cap.

RADIATOR CAP

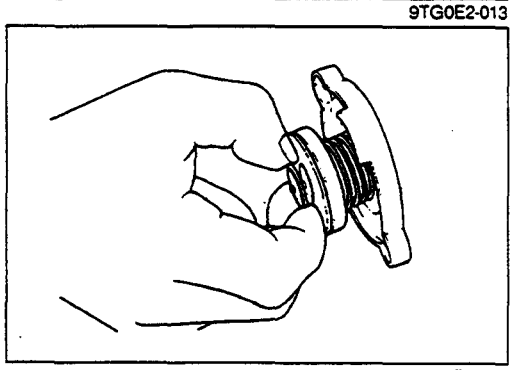
PREPARATION
SST

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



9TG0E2-013



05U0EX-013

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) with the **SST**. Apply pressure gradually to **74—103 kPa (0.75—1.05 kg/cm^2, 11—15 psi)**.
3. Wait about **10 sec.**. Verify that the pressure has not decreased.

Negative Pressure Valve

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

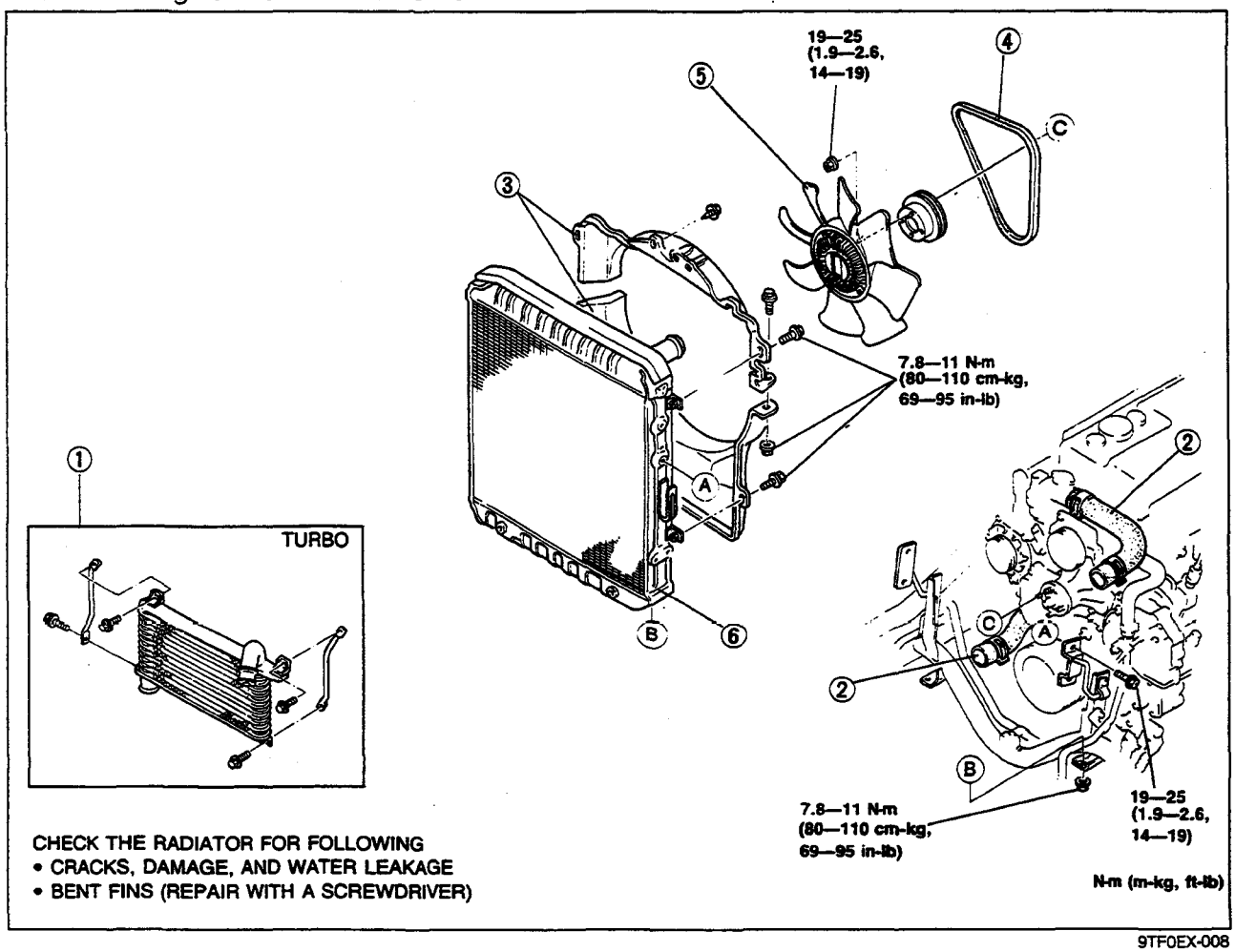
RADIATOR

REMOVAL / INSTALLATION

Caution
- **Position the hose clamp in the original location on the hose, and squeeze the clamp lightly with large pliers to ensure a good fit.**
- **After radiator cowling installation, rotate the cooling fan by hand and verify that the fan blade does not touch the radiator cowling.**
  It the fan touches the cowling, adjust the radiator cowling mounting position.

1. Disconnect the negative battery cable.
2. Drain the engine coolant.
3. Remove the undercover.
4. Remove in the order shown in the figure.
5. Install in the reverse order of removal.

Steps After Installation
1. Install the undercover.
2. Fill the radiator with the specified amount and type of engine coolant. (Refer to page E–7.)
3. Connect the negative battery cable.
4. Start the engine and check for leaks.



9TF0EX-008

1. Intercooler
   Service ..... Section F2
2. Radiator hose
3. Radiator cowling
4. Cooling fan drive belt
   Adjustment ..... Section B
5. Cooling fan
6. Radiator

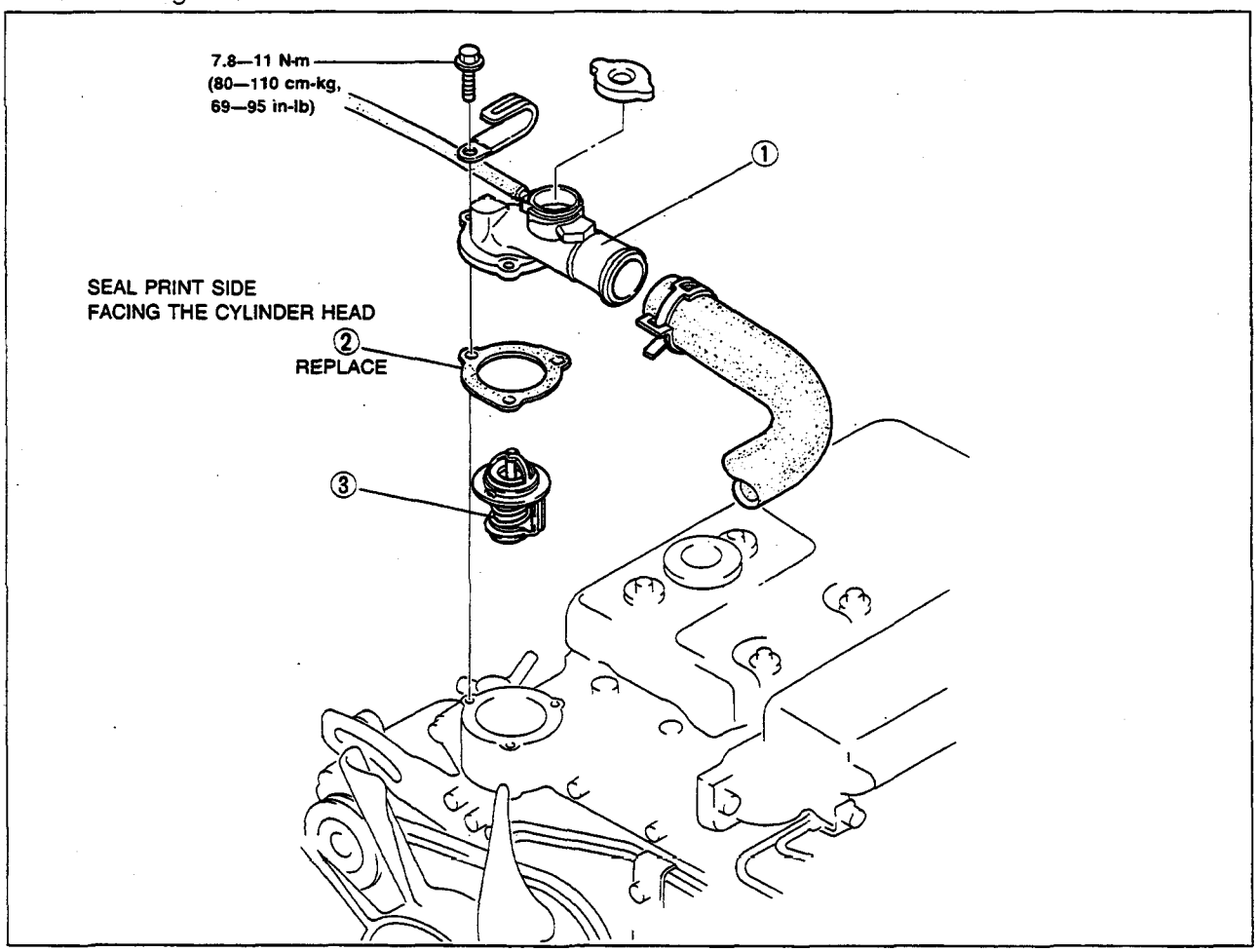
THERMOSTAT

REMOVAL / INSPECTION / 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.

Steps After Installation

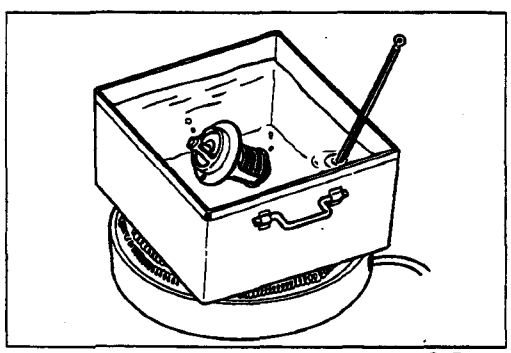
1. Fill the radiator with the specified amount and type of engine coolant. (Refer to page E–7.)
2. Connect the negative battery cable.
3. Start the engine and check for leaks.



9TF0EX-009

1. Thermostat cover
2. Gasket
3. Thermostat

Inspection ..... page E–10



9TG0E2-016

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: 8.5mm (0.33 in) min.

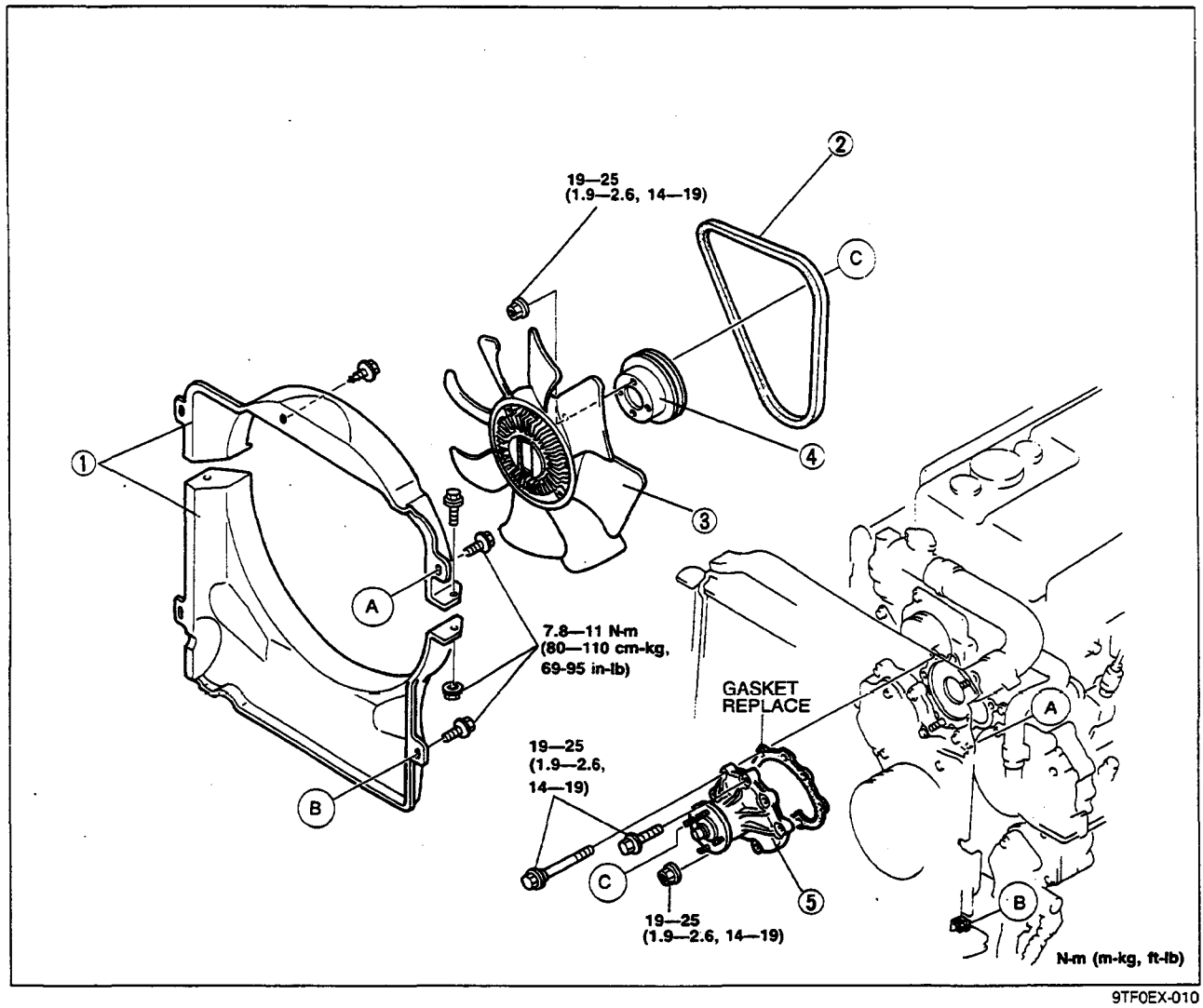
WATER PUMP

REMOVAL / INSTALLATION

Caution
- **Do not disassemble the water pump. If a problem is found, replace the pump as a unit.**
- **After radiator cowling installation, rotate the cooling fan by hand and verify that the fan blade does not touch the radiator cowling.**
  If the fan touches the cowling, adjust the radiator cowling mounting position.

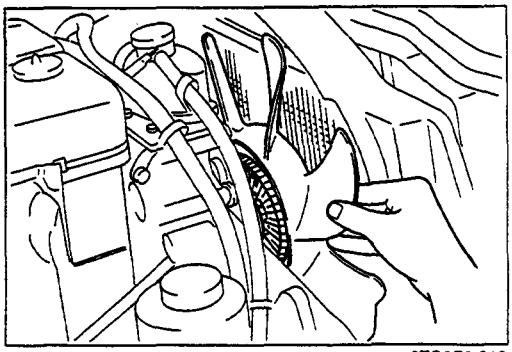
1. Disconnect the negative battery cable.
2. Drain the engine coolant.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.

Steps After Installation
1. Fill the radiator with the specified amount and type of engine coolant. (Refer to page E–7.)
2. Connect the negative battery cable.
3. Start the engine and check for leaks.



9TF0EX-010

1. Radiator cowling
2. Water pump drive belt
   Adjustment ..... Section B
3. Cooling fan
4. Water pump pulley
5. Water pump
   Inspect for cracked and damaged mounting surface, bearing condition, and leakage


9TG0E2-018

COOLING FAN

INSPECTION

1. Inspect for the follwing. Replace if necessary.
   (1) Fluid leakage from the fan drive.
   (2) Deformation of the bimetal.
   (3) Cracks and damage of the fan blade.
2. Warm up the engine and stop it.
3. With the engine stopped, turn the fan by hand and verify that resistance felt.
4. Replace the fan drive if necessary.

REMOVAL / INSTALLATION

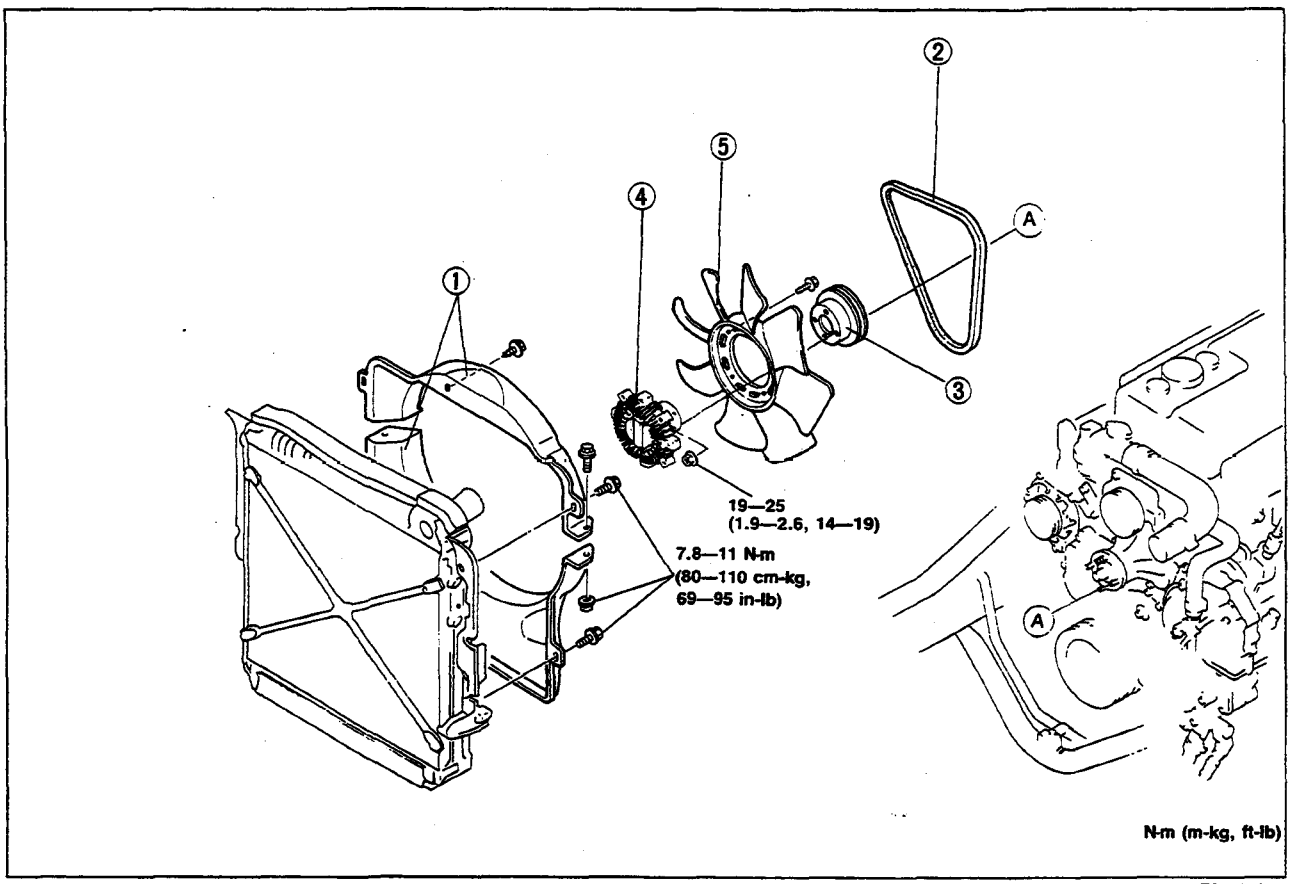
Caution

- **After radiator cowling installation, rotate the cooling fan by hand and verify that the fan blade does not touch the radiator cowling.**
  If the fan touches the cowling, adjust the radiator cowling mounting position.

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

Steps After Installation

1. Connect the negative battery cable.



9TF0EX-011

1. Radiator cowling
2. Cooling fan drive belt
   Adjustment ..... Section B
3. Water pump pulley
4. Fan drive
5. Fan blade

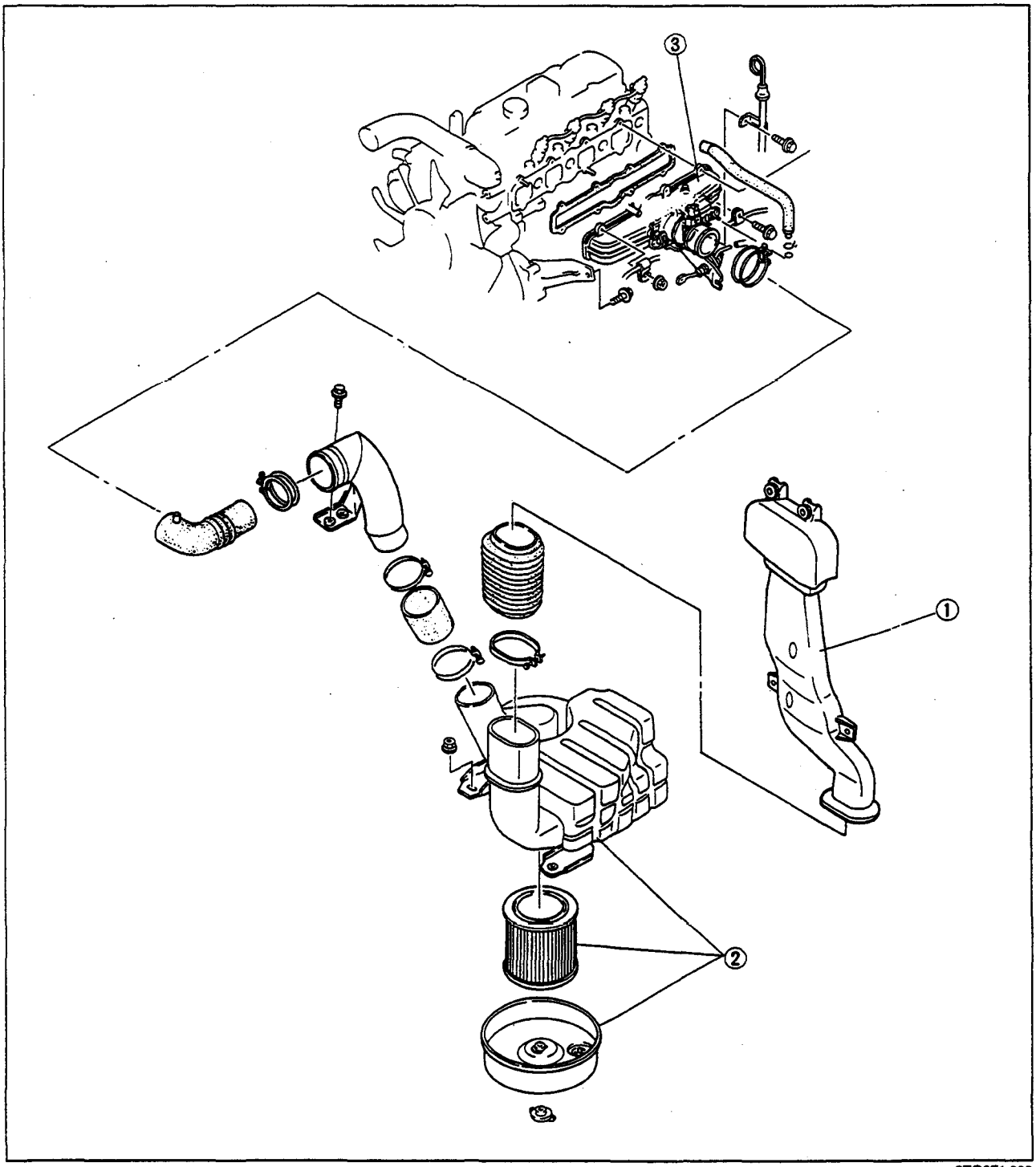
FUEL AND EMISSION CONTROL SYSTEMS (HA ENGINE)

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9TG0F1-001

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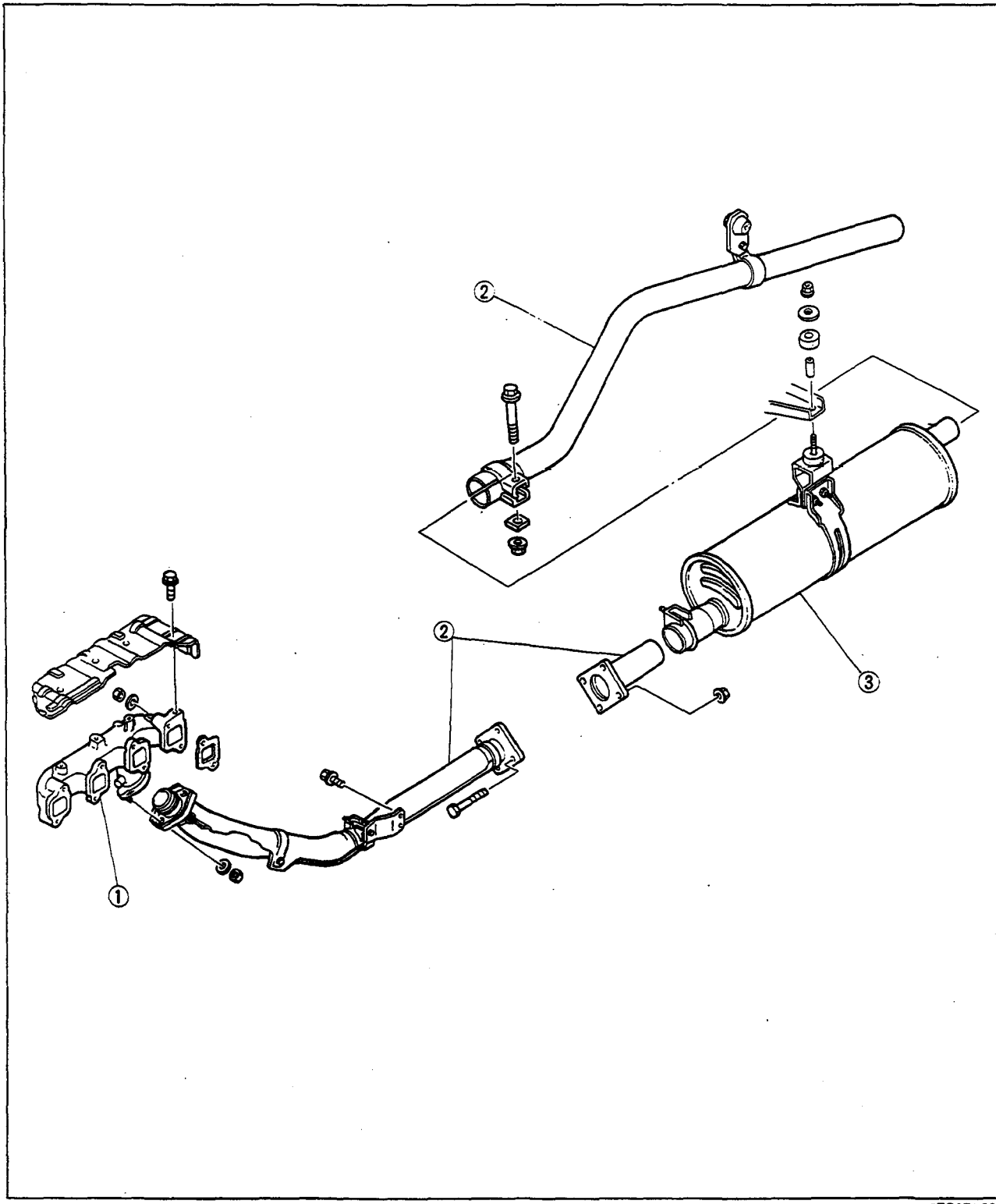
INTAKE DEVICES



9TG0F1-002

1. Fresh air duct
   Removal / Inspection / Installation ..... page F1–11
2. Air cleaner
   Removal / Inspection / Installation ..... page F1–11
   Inspection of element
3. Intake manifold
   Removal / Inspection / Installation ..... page F1–11

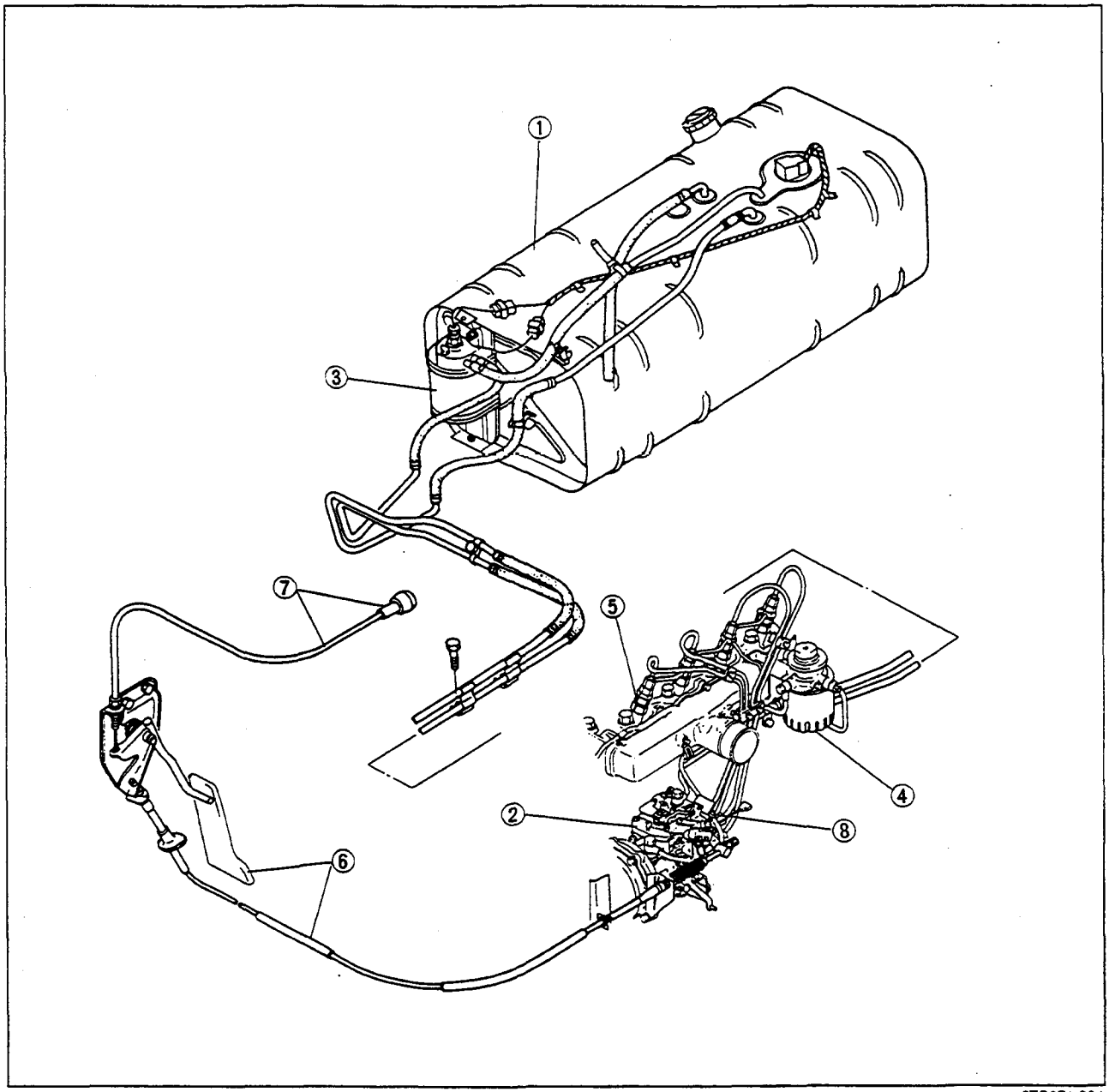
EXHAUST DEVICES



9TG0F1-003

1. Exhaust manifold
   Removal / Inspection / Installation ..... page F1–26
2. Exhaust pipe
   Removal / Inspection / Installation ..... page F1–26
3 Silencer
   Removal / Inspection / Installation ..... page F1–26

FUEL DEVICES

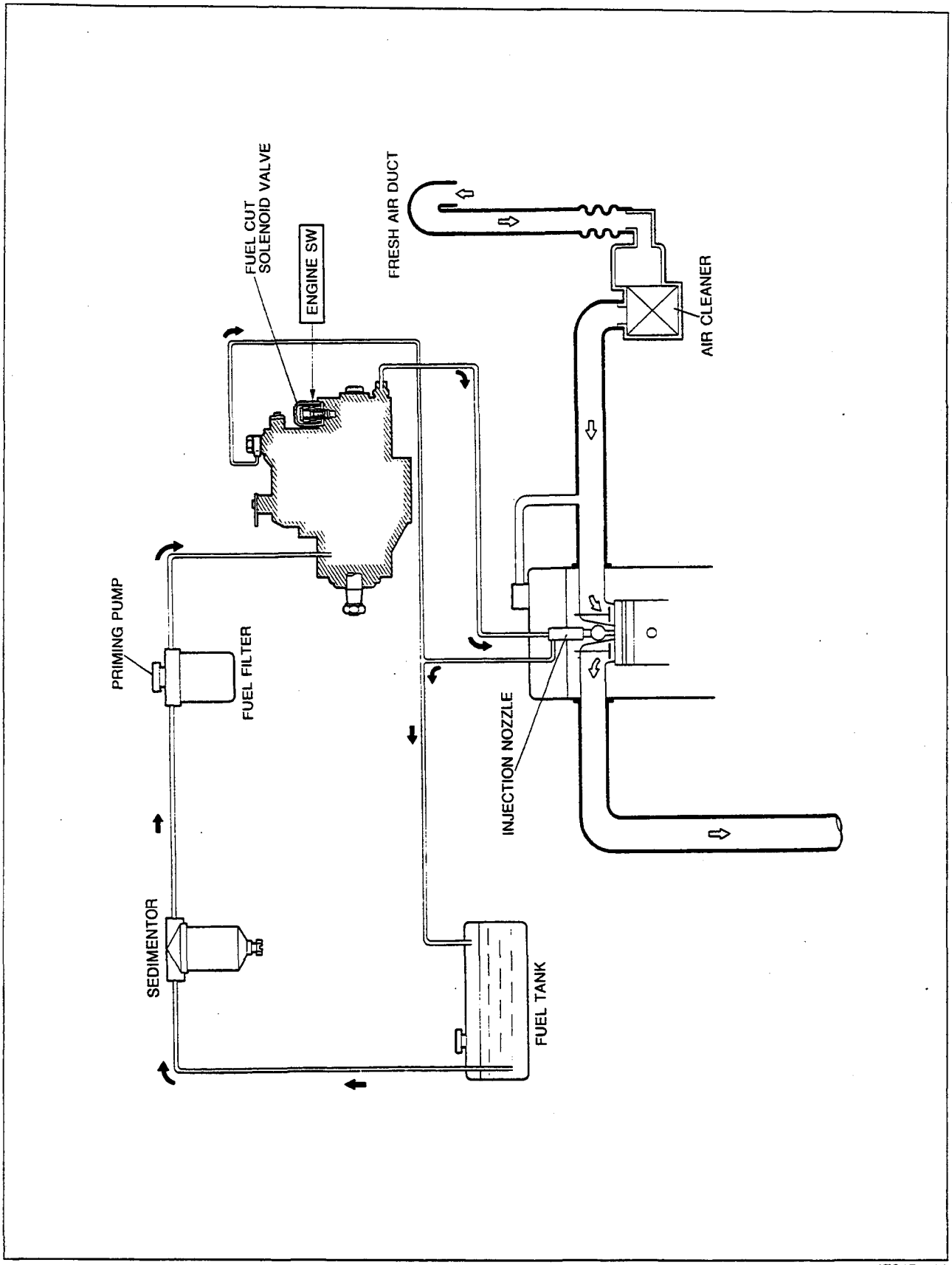


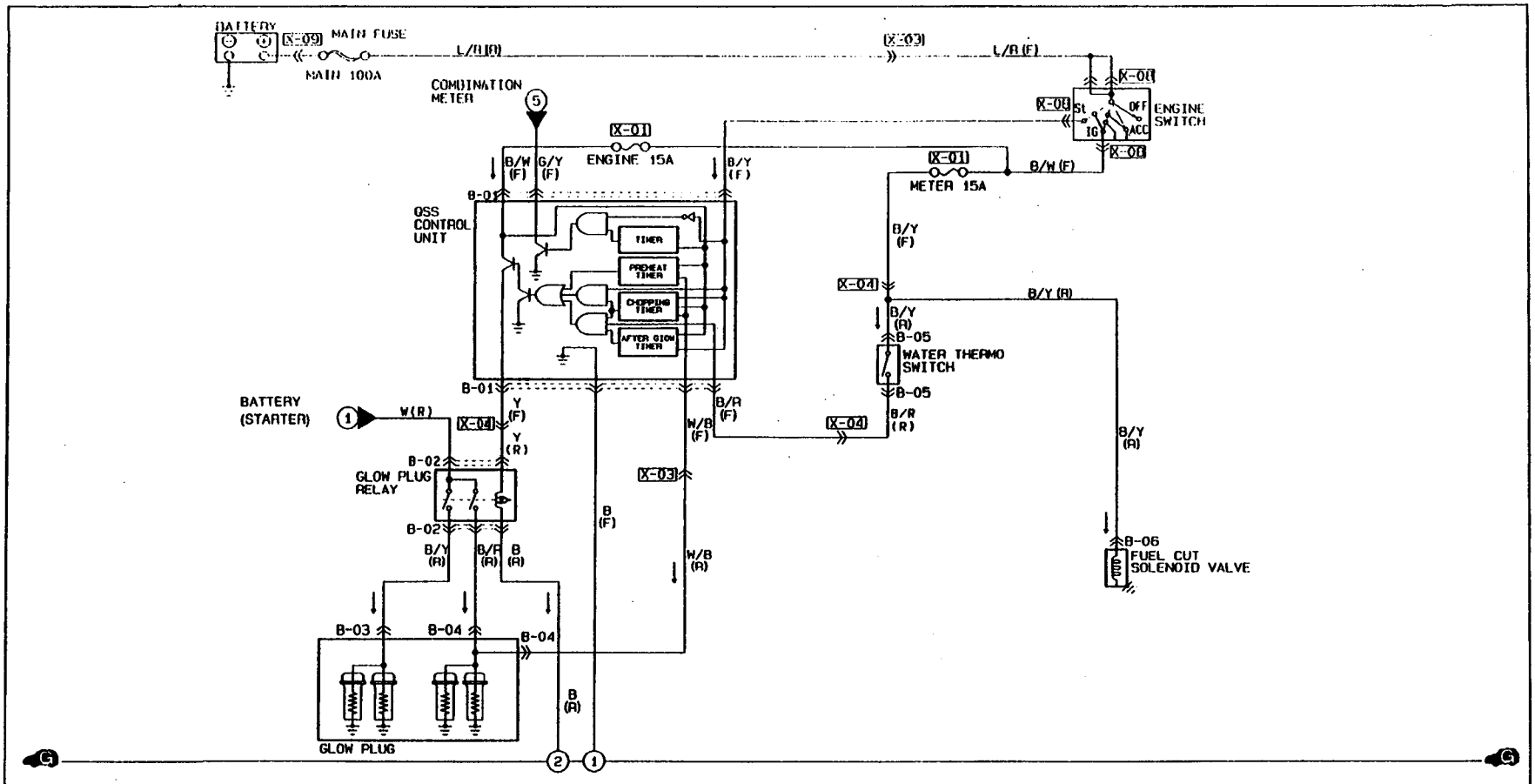
9TG0F1-004

1. Fuel tank
Removal / Inspection / Installation ..... page F1–13
2. Injection pump
Removal / Installation ..... page F1–14
3. Sedimentor
Draining water ..... page F1–16
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OUTLINE

SYSTEM DIAGRAM





B-01 GSS CONTROL UNIT (F)	B-02 GLOW PLUG RELAY (A)	B-03 GLOW PLUG (A)	B-04 GLOW PLUG (A)	B-05 WATER THERMO SWITCH (A)	B-06 FUEL CUT SOLENOID VALVE (A)	
G/Y, *, B/W, *, B/R Y, *, B, B/Y, *, W/B	W, B B/Y, B/R, Y	B/Y	B/R, W/B	B/Y B/R	B/Y	

NOTE: *···NOT USED

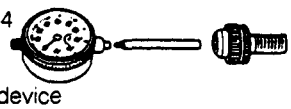
TROUBLESHOOTING GUIDE

Trouble	Possible Cause	Action
Hard starting	**Fuel filter**	
	Clogged	Replace
	Water or air in fuel filter	Repair
	Fuel injection pump	
	Faulty fuel cut solenoid	Replace
	Faulty injection timing	Adjust
	Air in injection pump	Repair
	Faulty stop lever position	Adjust
	Trouble inside pump	Replace
	Fuel injection nozzle	
	Seized needle valve	Replace
	Fuel dripping from nozzle	Replace
	Faulty valve opening pressure	Adjust
	Faulty glow plug	Replace
Rough idling	**Fuel filter**	
	Clogged	Replace
	Water or air in fuel filter	Repair
	Fuel injection pump	
	Refer to "Hard starting"	
	Fuel injection nozzle	
	Seized needle valve	Replace
	Faulty valve opening pressure	Adjust
	Improper mounting to nozzle holder	Repair
	Leakage of nozzle holder copper washer	Replace
	Fuel injection pipe	
	Cracks	Replace
	Leaking from joint	Repair
	Improper idle speed adjustment	Adjust
Engine knocking	Faulty injection timing	Adjust
	Low quality fuel	Replace
	Faulty injection nozzle opening pressure	Adjust
	Seized needle valve of injection nozzle	Replace
	Fuel dripping from injection nozzle	Replace
High fuel consumption	**Fuel injection pump**	
	Faulty full load adjust screw	Adjust
	Faulty injection timing	Adjust
	High idling speed	Adjust
	Fuel injection nozzle	
	Faulty valve opening pressure	Repair
	Fuel dripping from nozzle	Replace
	Leakage of nozzle holder copper washer	Replace
	Fuel leaking from joint	Repair
	Clogged fuel filter	Replace
	Clogged air cleaner	Replace
Poor acceleration	**Fuel injection nozzle**	
	Clogged air cleaner	Adjust
	Seized needle valve	Replace
	Fuel dripping from nozzle	Replace
	Fuel injection pump	
	Refer to "Hard starting"	
	Fuel injection pipe	
	Refer to "Rough idling"	
	Fuel filter	
	Water, air, etc., in the fuel filter	Adjust
	Clogged	Replace

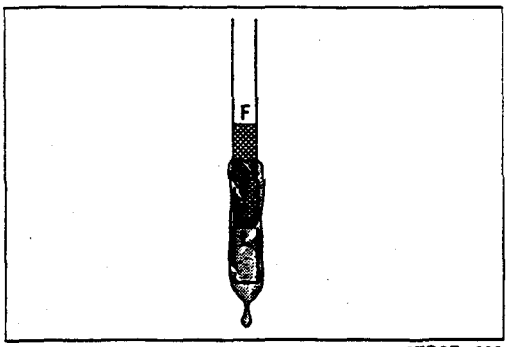
9TG0F1-007

ENGINE TUNE-UP

PREPARATION
SST

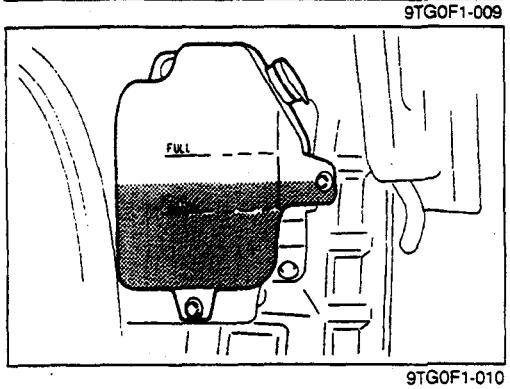
49 9140 074  Cam lift measuring device	For inspection of injection timing

9TG0F1-008



9TG0F1-009

BASIC INSPECTION
Engine Oil
Check the engine oil level and condition with the level gauge. Add or change oil, if necessary.

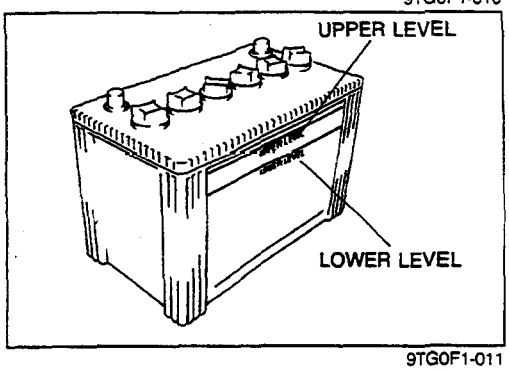


9TG0F1-010

Coolant

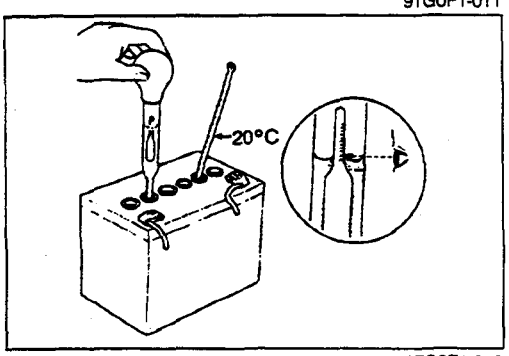
Warning
- **Never remove the radiator cap while the engine is hot.**
- **Wrap a thick cloth around the cap while carefully removing it.**

Verify that the coolant level is near the radiator inlet port and that the level in the reservoir is between the FULL and LOW marks. Add coolant as necessary.



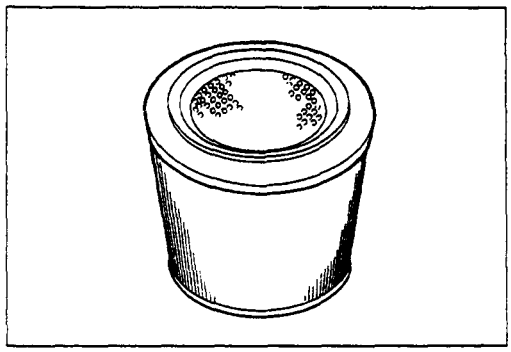
9TG0F1-011

Battery
1. Check for corrosion on the terminals and for loose cable connections.
2. Check the electrolyte level.
   If the level is too low, add distilled water to the "UPPER LEVEL" mark.



9TG0F1-012

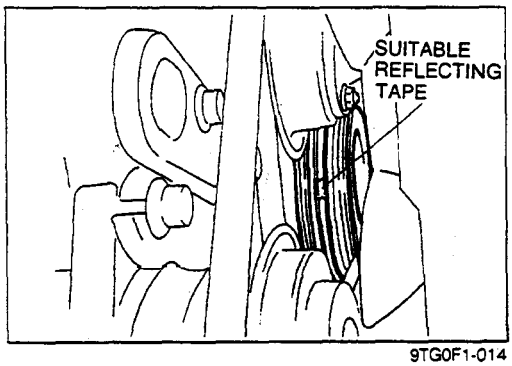
3. Check the specific gravity with a hydrometer.
   If the specific gravity reading is 1.23 or less, recharge the battery. (Refer to Section G.)



9TG0F1-013

Air Cleaner Element

Visually check the air cleaner element for excessive dirt, damage or oil. Clean with compressed air if necessary.

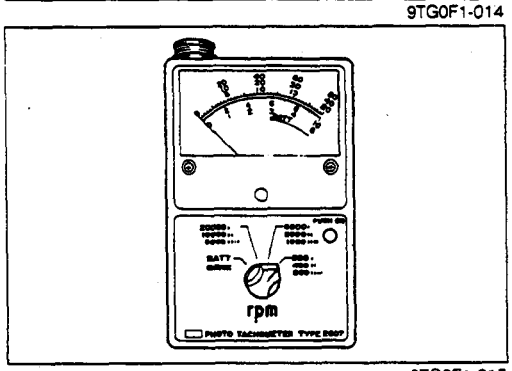


9TG0F1-014

ADJUSTMENT

Idle Speed

1. Attach suitable reflector tape to the crankshaft pulley.
2. Run the engine at idle at normal operating temperature. Turn off all unnecessary electrical loads.



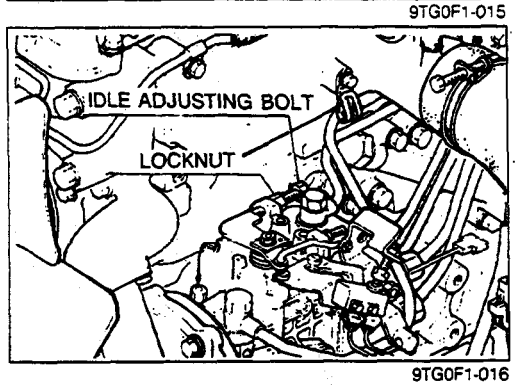
9TG0F1-015

3. Confirm the free play of the accelerator cable.

   Free play: 1.0—3.0mm (0.039—0.118 in)

4. Aim the light of the photo tachometer onto the reflecting tape to measure the engine speed.

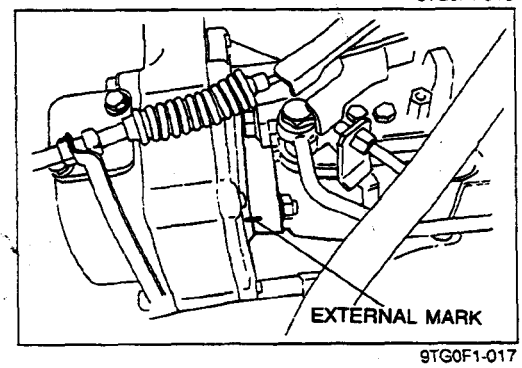
   Idle speed: 600—650 rpm



9TG0F1-016

5. If not as specified loosen the locknut of the idle adjusting bolt and turn the bolt to adjust the idle.
6. Tighten the locknut.

   Tightening torque:
   5.9—8.8 N·m (0.6—0.9 m-kg, 4.3—7.2 ft-lb)



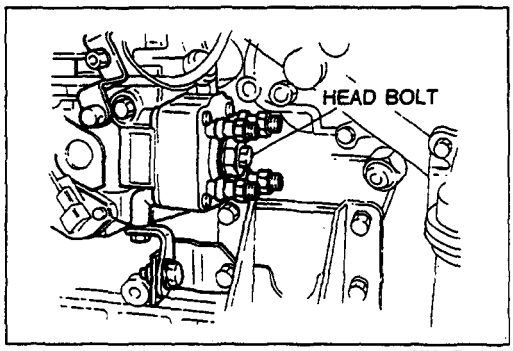
9TG0F1-017

Injection Timing

Inspection

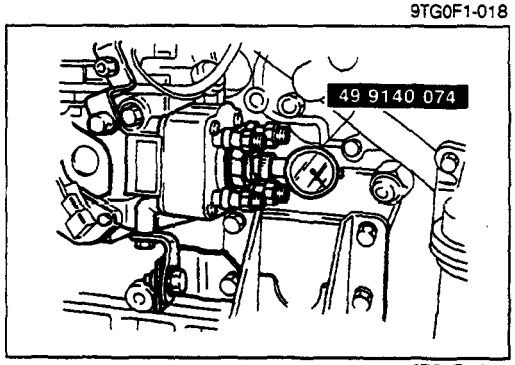
Note

- **Usually it is enough to confirm that the external marks are aligned.**
- **Set the injection timing after installment of the injection pump.**



9TG0F1-018

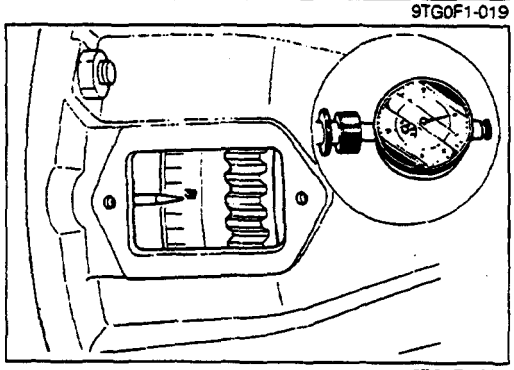
1. Disconnect the fuel injection pipes from the injection pump.
2. Remove the bolt and gasket from the distributor head of the injection pump.



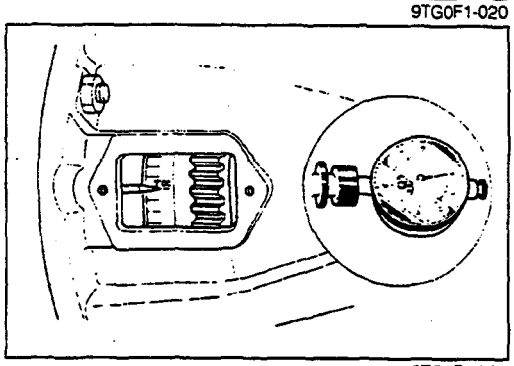
9TG0F1-019

3. Screw the **SST** into the injection pump.
   Make sure that the tip of the feeler of the measuring device is in contact with the plunger end at this time.

   Note
   - **The SST specified by Diesel Kiki Co., Ltd. is 157829—3520.**


9TG0F1-020

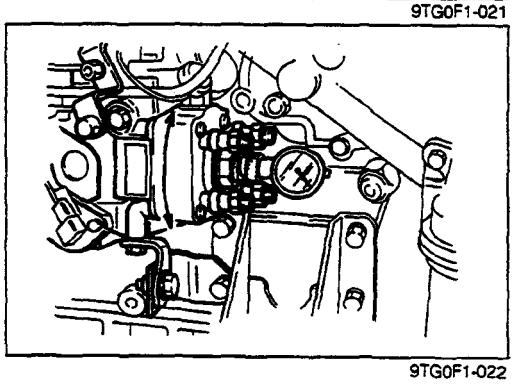
4. Turn the flywheel to set the flywheel to **approx. 30° BTDC** and find the position in which the needle of the dial gauge does not move when the flywheel is turned.
5. When the dial gauge needle does not deflect, set the needle to "0" on the scale.


9TG0F1-021

6. Turn the flywheel in the normal direction until **3° BTDC** is indicated.
   The injection timing is normal when the dial gauge needle is advanced 1.00mm (0.039 in) ahead of the value set in Step 5.

   Static injection: Cam lift 1.00mm (0.0394 in)

7. If the change is not as specified, adjust the injection timing.


9TG0F1-022

Adjusting Injection Pump

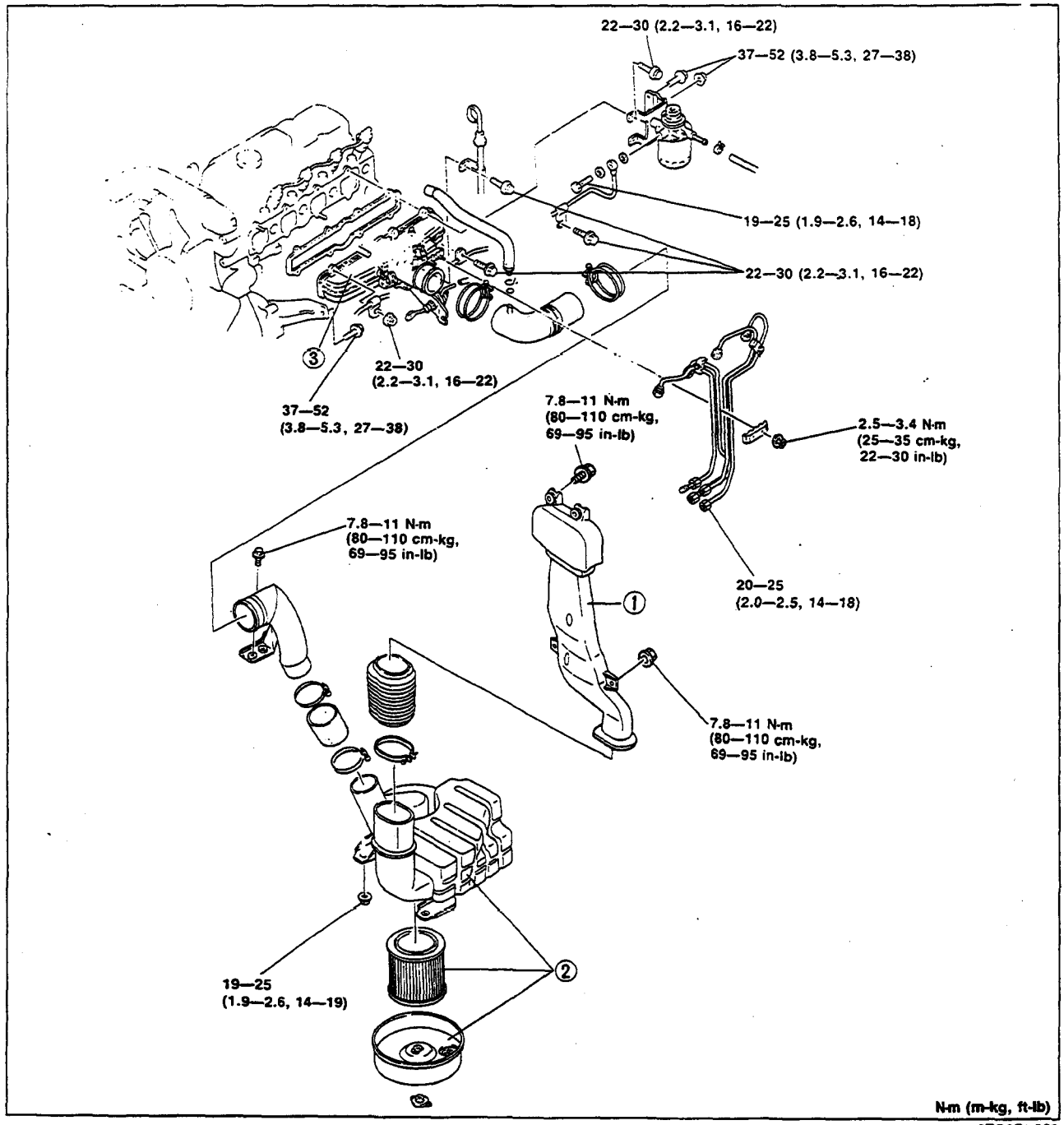
1. If the injection timing is faulty, turn the injection pump to a position in which the dial gauge needle indicates 1.00mm (0.039 in).
   When the cam lift is larger than 1.00mm (0.039 in), turn the injection pump all the way in the engine revolving direction once, and then turn it in the reverse direction, adjusting the cam lift to the 1.00mm (0.039 in) point.
   If the cam lift is smaller than 1.00mm (0.039 in), adjust the lift by turning the pump in the direction inverse to the engine revolving direction.
2. After the adjustment, install the head bolt and gasket.
3. Use a new head bolt and gasket.

INTAKE AIR SYSTEM

COMPONENTS

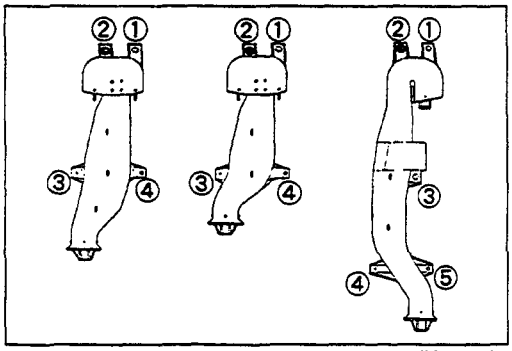
Removal / Inspection / Installation

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.



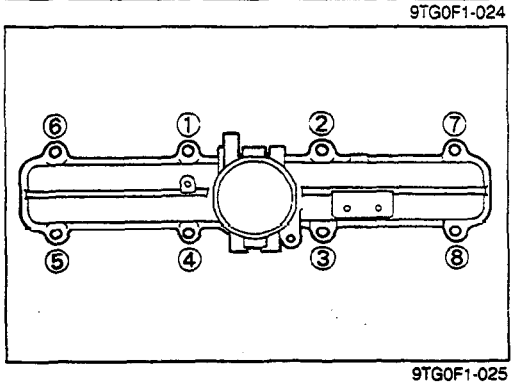
9TG0F1-023

1. Fresh air duct
   Check for contamination, cracks and other damage
   Installation Note ..... page F1–12
2. Air cleaner
   Inspection of element ..... page F1– 9
3. Intake manifold
   Check for contamination, cracks and other damage
   Installation Note ..... page F1–12



9TG0F1-024

Installation Note
Fresh air duct
Install in the order shown in the figure.



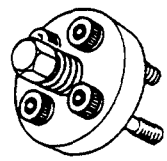
9TG0F1-025

Intake manifold
1. Use a new gasket.
2. Tighten in the order shown in the figure.

Tightening torque:
22—31 N·m (2.2—3.1 m-kg, 15—22 ft-lb)

FUEL SYSTEM

PREPARATION
SST

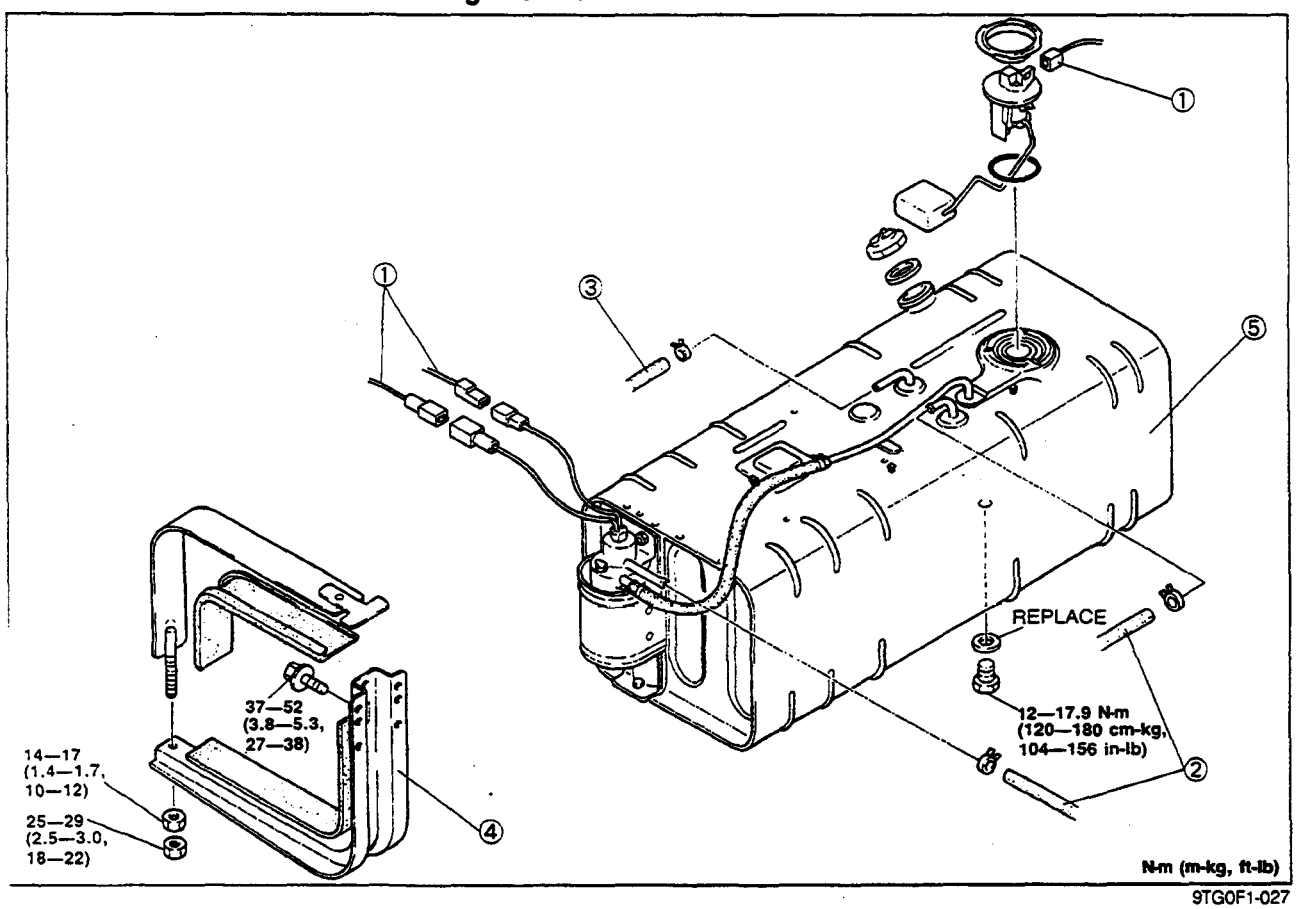
49 SE01 157 Extractor		For removal of injection pump

9TG0F1-026

FUEL TANK
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.

Warning
- **Keep sparks, cigarettes, and open flames away from the fuel tank.**

Note
- **Drain the fuel before removing the fuel tank.**



9TG0F1-027

1. Connector
2. Fuel hose
3. Evaporative hose
   Be sure the air flows through the hose each side
4. Fuel tank strap
5. Fuel tank
   Check for contamination, cracks and other damage

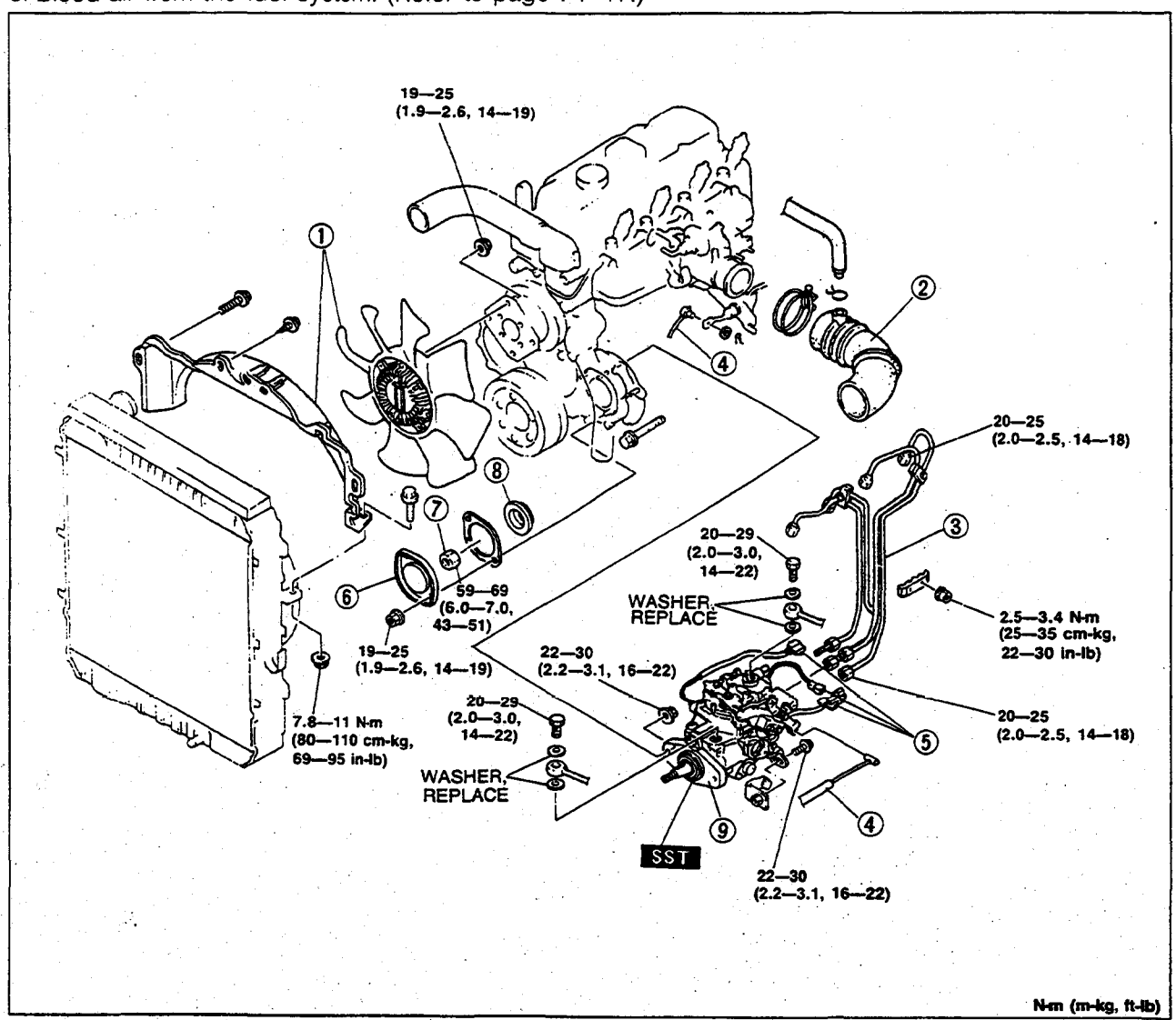
INJECTION PUMP

Note
- **Special tools and testers are required for service of the injection pump. The pump should be serviced only by an authorized Diesel Kiki distributor.**

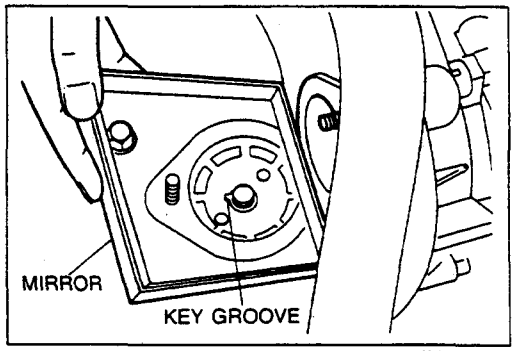
Removal / Installation

Warning
- **Keep sparks cigarettes, and open flames away from the injection pump.**

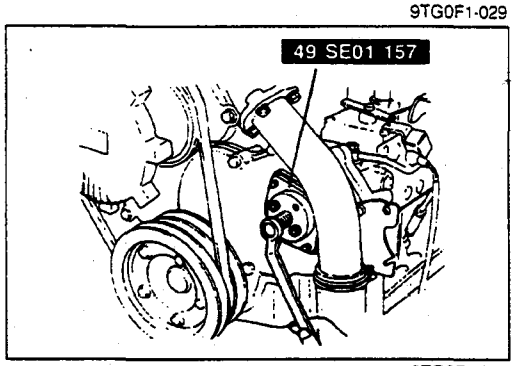
1. Remove the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.
4. Adjust the injection timing. (Refer to page F1–9.)
5. Bleed air from the fuel system. (Refer to page F1–17.)



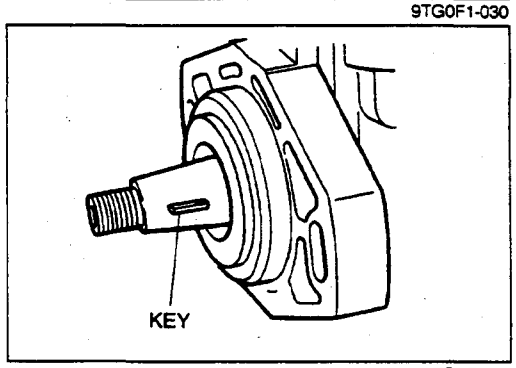
1. Fan and upper cooling fan shroud
2. Air hose
3. Injection pipe
4. Accelerator pipe, Idle-up cable
5. Harness
6. Pump cover
7. Locknut
8. Washer
9. Injection pump



9TG0F1-029



9TG0F1-030



9TG0F-031

Removal Note

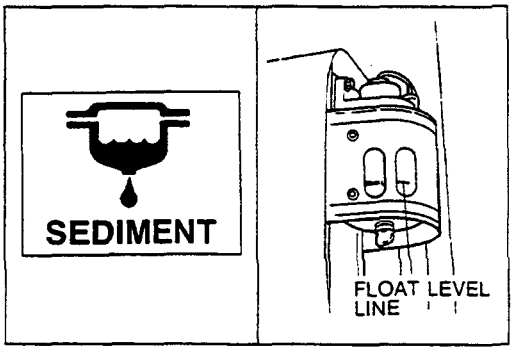
1. Before removal the injection pump, turn the flywheel through the clutch cover timing hole until the key is at the top position. Use a mirror to see key.
2. Attach the **SST**. (Use the side marked M.)
3. Turn the **SST** bolt to push the pump free of the drive gear.

Caution

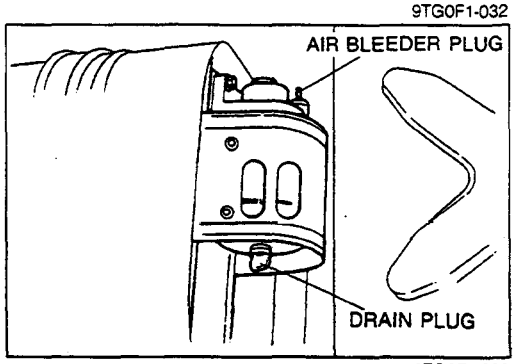
- **Do not drop the key into the gear case.**

Installation Note

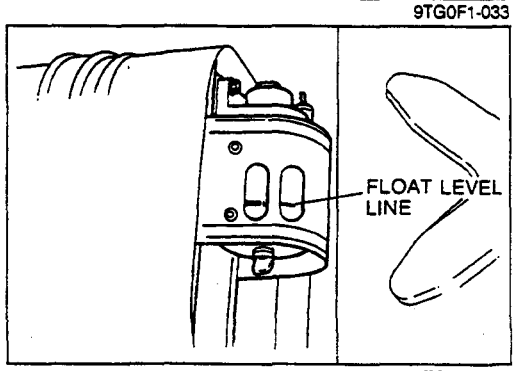
Before installing the key into the driveshaft of the injection pump, lightly tab the key groove of the shaft with a hammer to assure that the key is tightly held in the key groove.



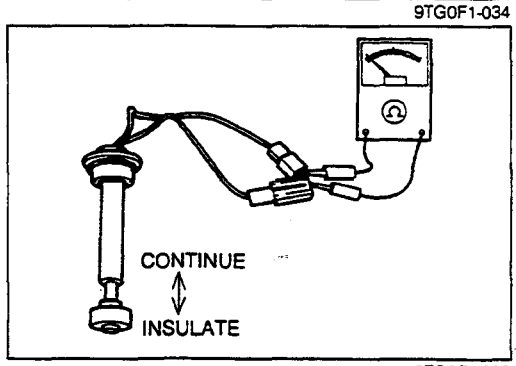
9TG0F1-032



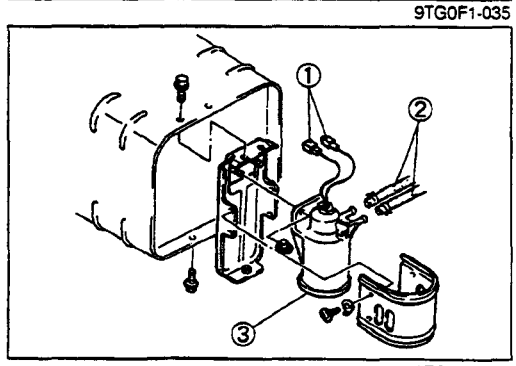
9TG0F1-033



9TG0F1-034



9TG0F1-035



9TG0F1-036

SEDIMENTOR

Draining water

Note

- **Drain water when the sedimentor warning light is illuminated or when the float ring has risen near the float level line.**

1. Loosen the drain plug.
2. Loosen the air bleeder plug.
3. After all of the water has been drained, install the drain plug.
4. Pump the priming pump at the fuel filter until clear (no air bubbles) fuel is expelled from the air bleeder plug. Tighten the bleeder plug.

Inspection

1. Visually check the sedimentor for damage and fuel leakage. Repair or replace, if necessary.
2. Check the position of the float ring. If the ring is near the float level line, drain the water.

SEDIMENTOR SENSOR (DETECTOR)

Inspection

1. Remove the sedimentor sensor from sedimentor.
2. Check continuity of the detector.

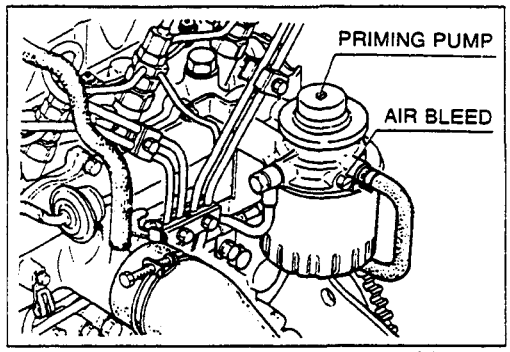
Float	Continuity
Up	Yes
Down	No

Replacement

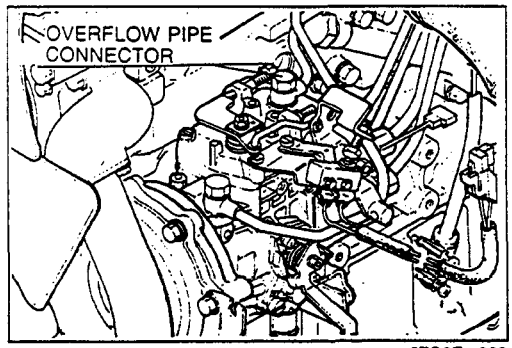
Warning

- **Keep sparks, cigarettes, and open flames away from the sedimentor.**

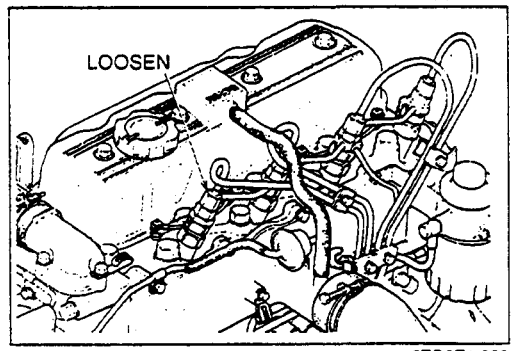
1. Disconnect the terminals.
2. Remove the fuel hoses.
3. Remove the sedimentor.
4. Install in the reverse order of removal.



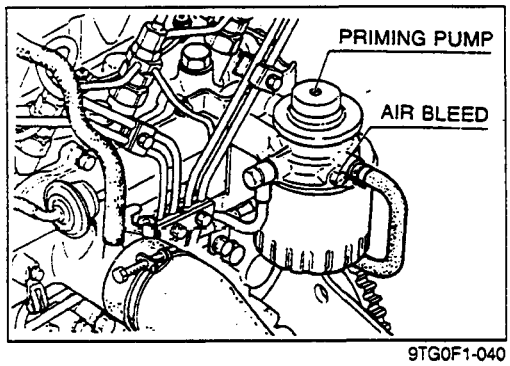
9TG0F1-037



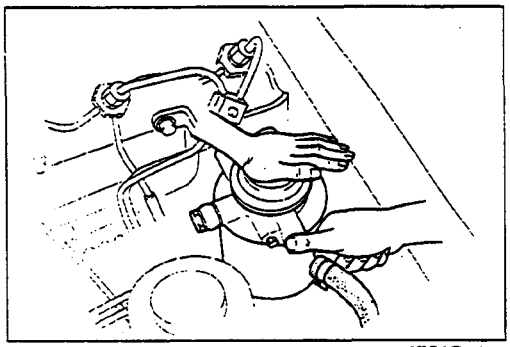
9TG0F1-038



9TG0F1-039



9TG0F1-040


9TG0F1-041

FUEL FILTER
Air Bleeding

Warning
- **Keep sparks, cigarettes, and open flames away from the fuel filter.**

1. Remove the air bleeder plug.
2. Pump the priming pump until clear (no air bubbles) fuel flows from the bleeder plug hole.
3. Install the air bleeder plug.

4. Loosen the overflow pipe connector of the injection pump.
5. Pump the priming pump until fuel flows from the pipe.
6. Tighten the overflow pipe connector.

Tightening torque:
20—29 N·m (2.0—3.0 m-kg, 14—22 ft-lb)

7. Start the engine and run it at idle until it runs smoothly. Stop the engine.

8. Loosen the all flare nuts of the injection pipes of injection nozzle side.
9. Confirm fuel injection from the injection pipes while cranking.
10. Tighten the nuts.

Tightening torque:
20—25 N·m (2.0—2.5 m-kg, 14—18 ft-lb)

Inspection of priming pump

Warning
- **Keep sparks, cigarettes, and open flames away from the fuel filter.**

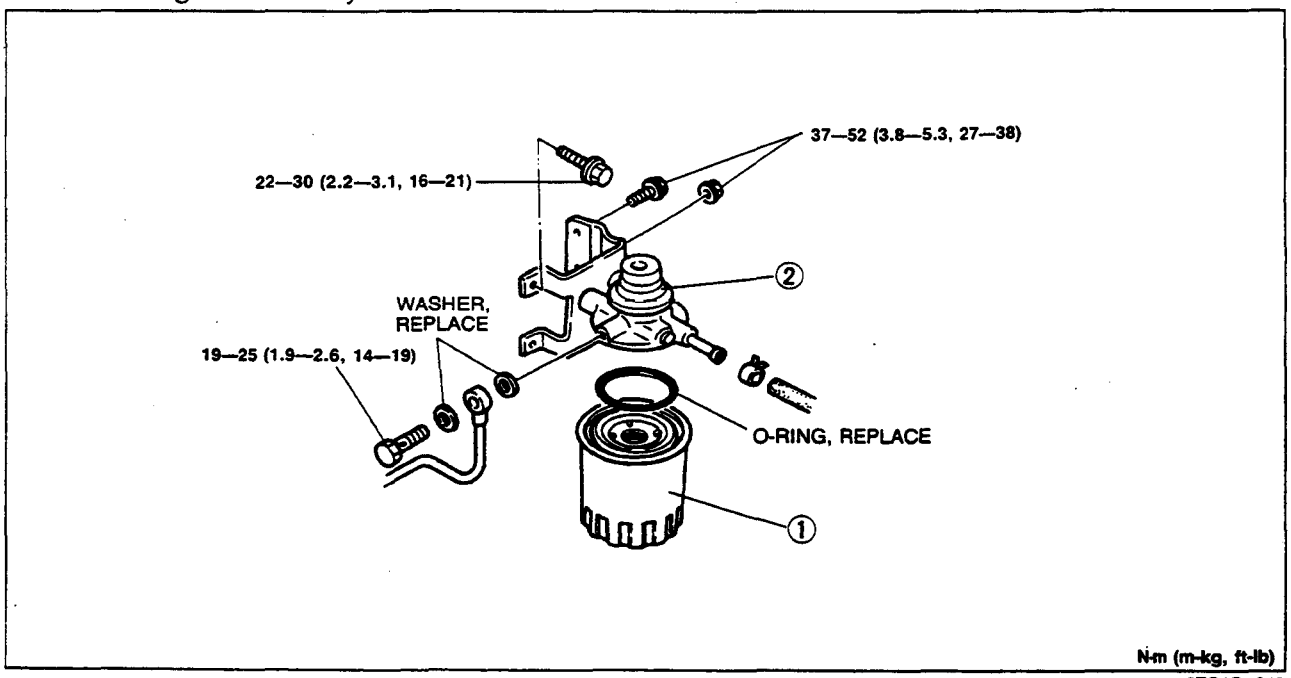
1. Remove the air bleeder plug and verify that fuel flows from the bleeder plug hole while pumping the priming pump. If it does not, continue with step 2.

2. Remove the fuel hose from the inlet side of the filter.
3. Place a finger over the inlet part and verify that vacuum is felt when the pump in operated.
4. Replace the priming pump if not as specified.

Replacement

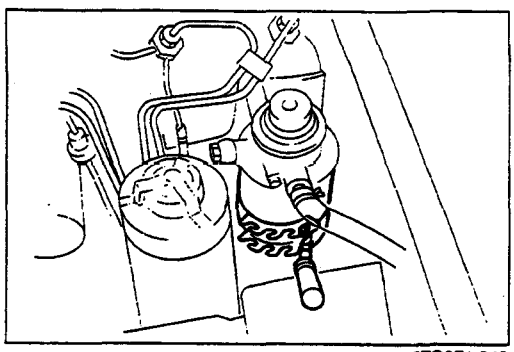
Warning
- **Keep sparks, cigarettes, and open flames away from the priming pump.**

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Bleed air from the fuel system. (Refer to page F1–17.)
4. Run the engine and verify that there are no fuel leaks.

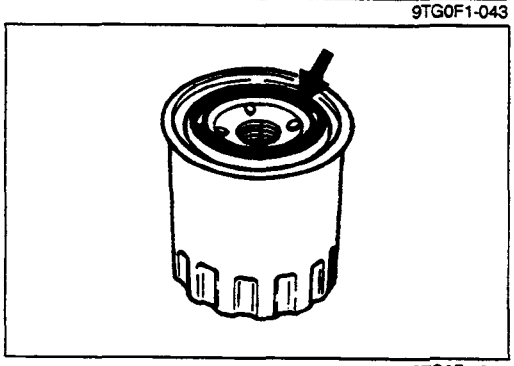


9TG0F1-042

1. Filter element
   Removal Note ..... page F1–18
   Installation Note ..... page F1–18
2. Fuel filter body



9TG0F1-043



9TG0F1-044

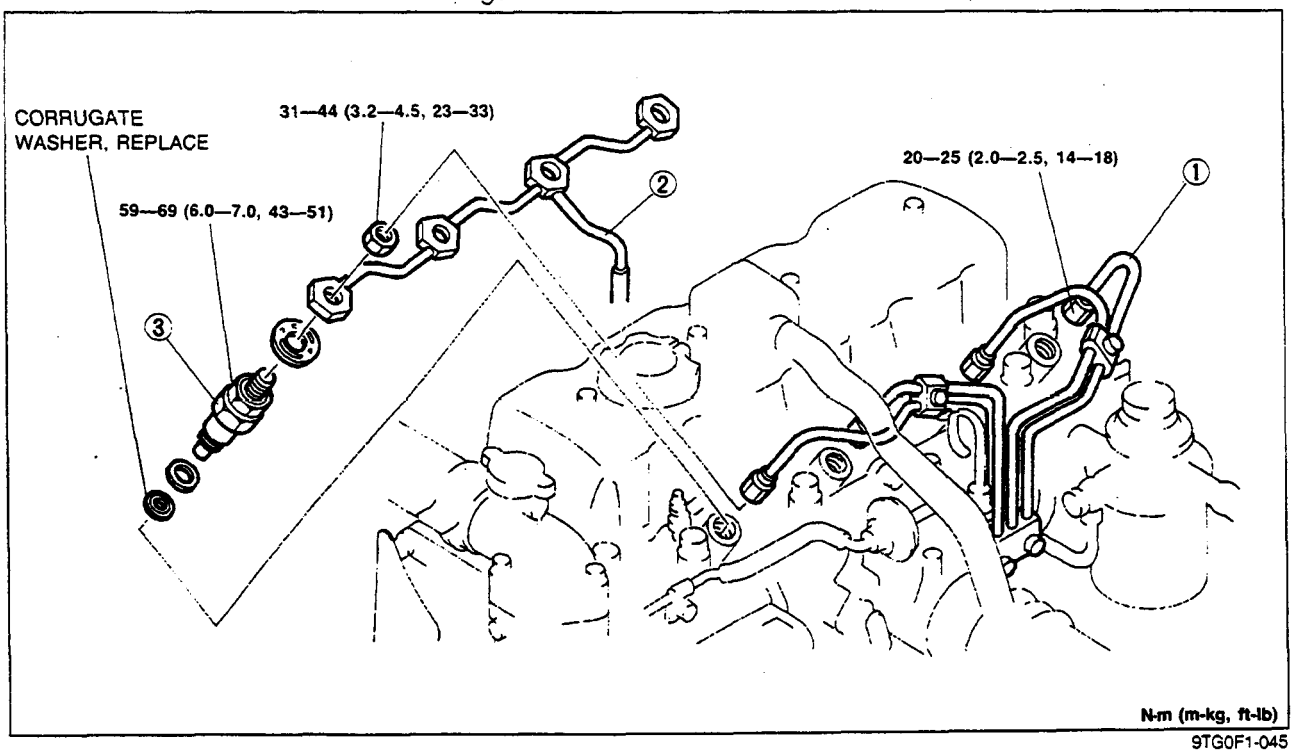
Removal Note
1. Remove the filter element with an oil filter wrench.

Installation Note
1. Apply fuel to the O-ring.
2. Install the filter element and tighten by hand, then tighten with an oil filter wrench an additional 1/3-turn.

INJECTION NOZZLE
Removal

Warning
- **Keep sparks, cigarettes, and open flames away from the fuel area.**

1. Remove the negative battery cable.
2. Remove in the order shown in the figure.



9TG0F1-045

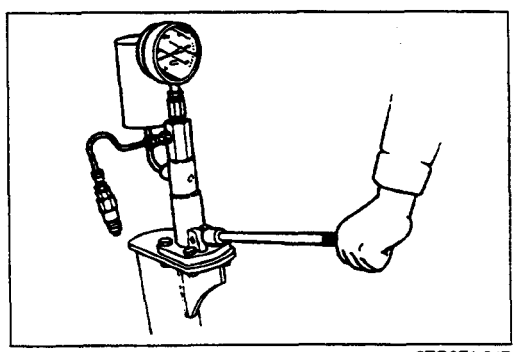
1. Injection pipe
2. Return pipe
3. Injection nozzle

Inspection

Warning
- **Do not allow your hands or any other part of the body to come into the direct path of the spray when using the nozzle tester because the spray has enough force to break the skin and possibly cause blood poisoning.**

Caution
- **The nozzle tester should be set up in a clean work place.**

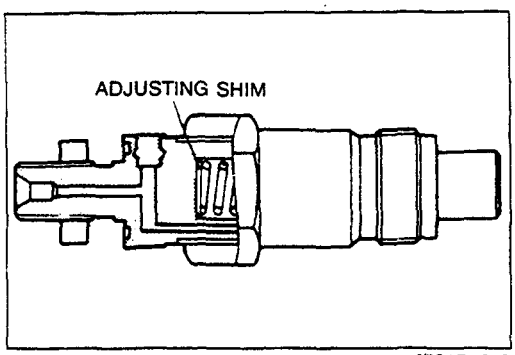
9TG0F1-046



9TG0F1-047

Injection starting pressure
1. Connect the nozzle to a nozzle tester.
2. Pump the nozzle tester handle and note the pressure when injection is started.

Injection starting pressure:
13,244—13,734 kPa
(135—140 kg/cm^2, 1,920—1,991 psi)

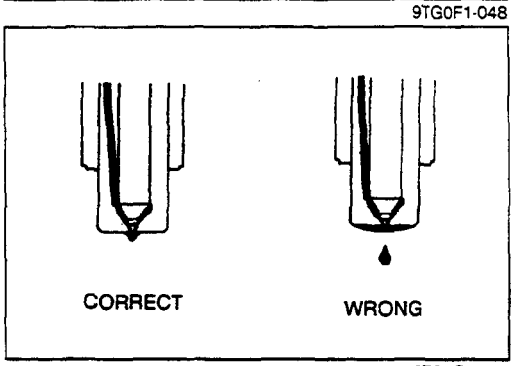


9TG0F1-048

3. If not within the specified pressure, adjust the starting pressure by adding or removing shims.

Note

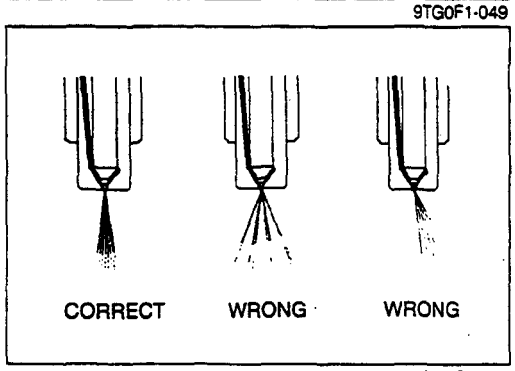
- **Shims are available in thicknesses of 0.5mm (0.0197 in) to 1.45mm (0.0571 in) in 0.04mm (0.0016 in) increments. Adding 0.04mm (0.0016 in) shim thickness increases injection starting pressure approx. 471 kPa (4.8 kg/cm^2, 68 psi).**



9TG0F1-049

Leakage of injector

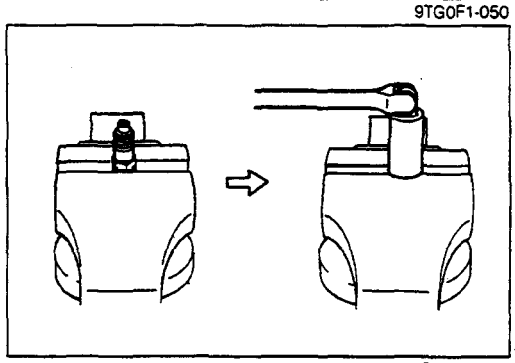
1. Connect the nozzle to a nozzle tester.
2. Apply pressure 1,962 kPa (20 kg/cm^2, 284 psi) lower than the specified injection pressure, and verify that no fuel leaks from the injection nozzle.
3. If fuel leaks, disassemble, clean and recheck the nozzle, or replace it.



9TG0F1-050

Atomizing condition

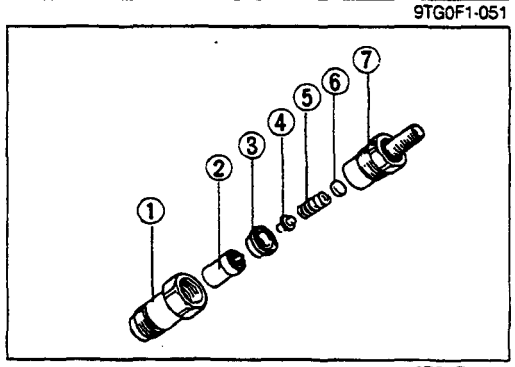
1. Connect the nozzle on the nozzle tester.
2. Air bleed by operating the nozzle tester handle several times.
3. Keeping the pressure gauge of the nozzle tester in the non-functioning condition, quickly lower the handle (lower the handle as quickly as possible so that a pulsating whistling sound can be heard). Repeat this operation several times and check the atomizing condition.
4. Verify that the fuel is atomized uniformly and properly.
5. Verify that the injection angle and direction are normal.
6. If the atomizing condition is incorrect, it is necessary to disassemble, wash and recheck the nozzle, or to replace it.



9TG0F1-051

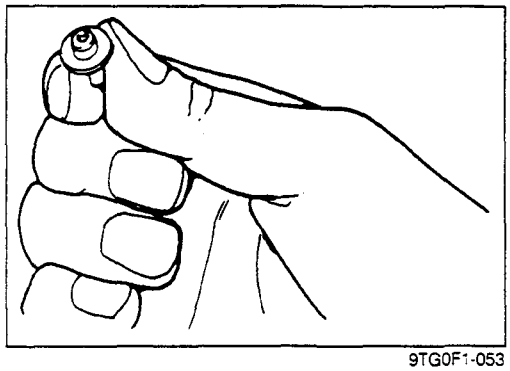
Disassembly

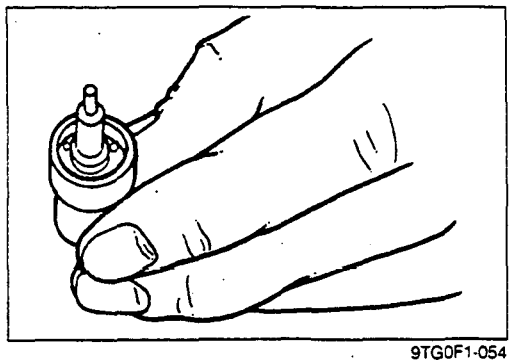
1. Clamp the nozzle in a vise as shown in the figure.

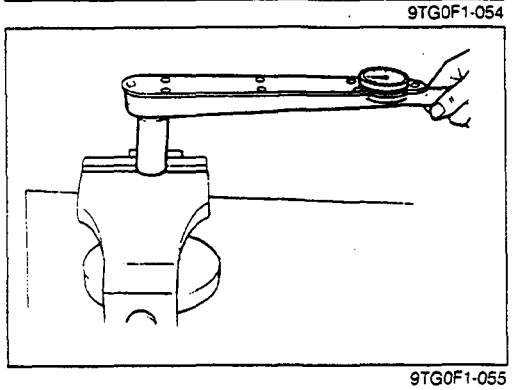


9TG0F1-052

2. Disassemble as shown in the figure.
   ①Retaining nut
   ②Nozzle body
   ③Distance piece
   ④Pressure pin
   ⑤Pressure spring
   ⑥Shim
   ⑦Nozzle holder


9TG0F1-053


9TG0F1-054


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Checking Injection Nozzle

1. Verify that the seat of the pressure pin and other parts are free of damage.

2. Verify that the nozzle body is not damaged.
   Hold the nozzle body upright and insert the needle valve approximately two-thirds of the way into the body. Verify that the needle valve drops into the body under its own weight when released.

Assembly

1. Assemble in the reverse order of disassembly.

   Tightening torque:
   78—98 N·m (8.0—10.0 m-kg, 58—72 ft-lb)

2. Retest the nozzle after assembly.

Installation

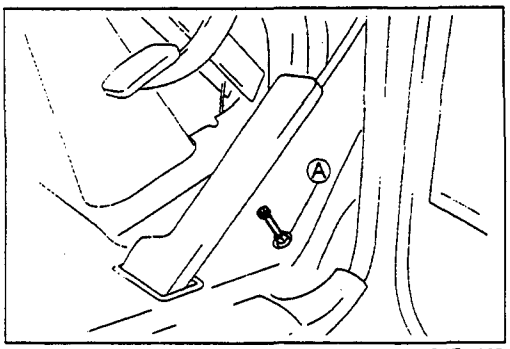
Caution
- **Do not reuse the copper washers.**
- **Tighten the nozzle into the cylinder head to the specified torque.**

1. Install in the reverse order of removal.

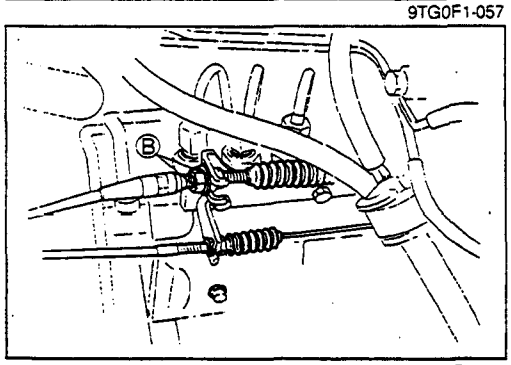
   Tightening torque:
   59—69 N·m (6.0—7.0 m-kg, 43—51 ft-lb)

2. Run the engine and check for fuel leakage.

9TG0F1-056



9TG0F1-057



9TG0F1-058

ACCELERATOR PEDAL, ACCELERATOR CABLE

Inspection / Adjustment

1. Verify that the control lever of injection pump is in the fully-open position when the accelerator pedal is fully depressed.
2. Loosen nut A and adjust the stop bolt if necessary.

Tightening torque:
6.9—9.8 N·m (0.7—1.0 m-kg, 5.1—7.2 ft-lb)

3. Check the free play of the accelerator cable.

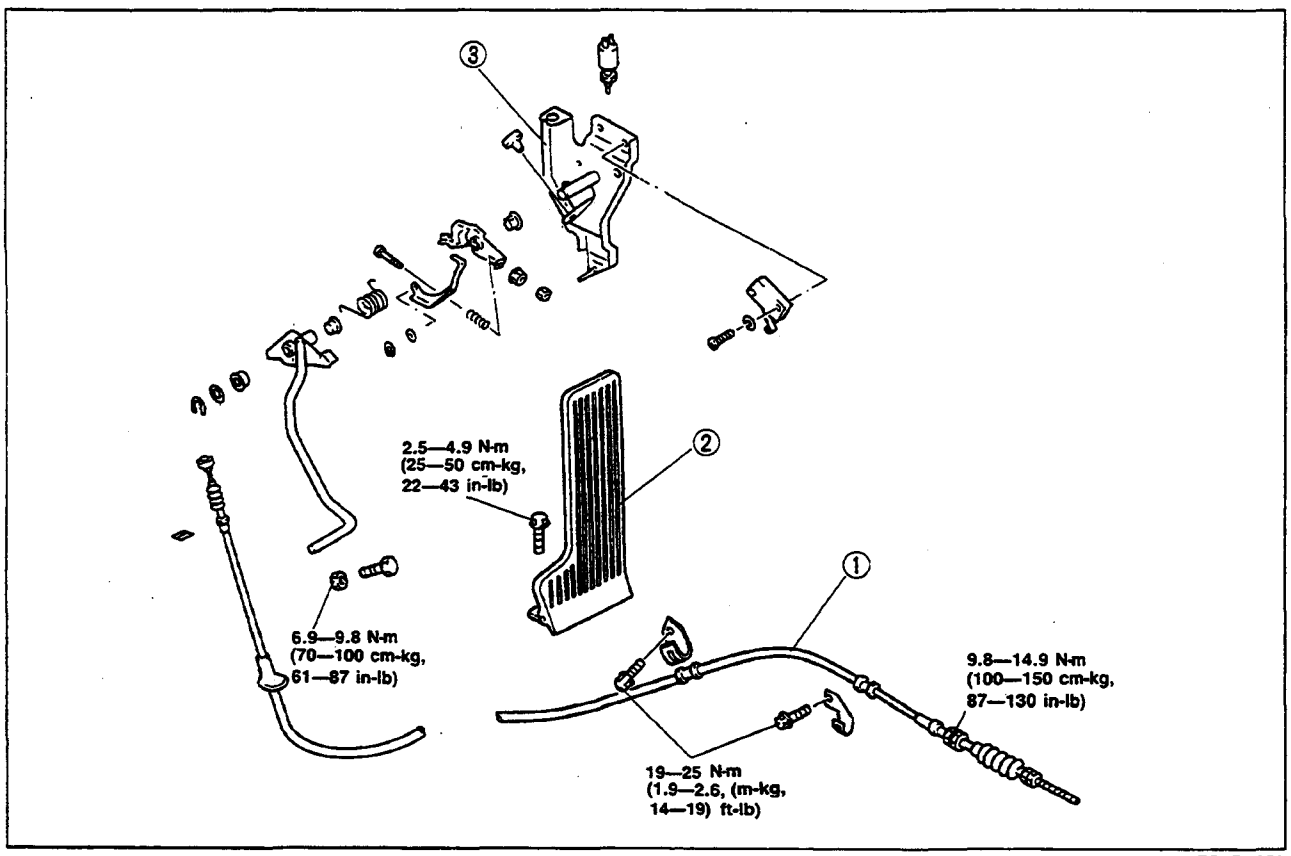
Free play: 1.0—3.0mm (0.039—0.12 in)

4. Adjust nuts B if necessary.

Tightening torque:
9.8—15 N·m (1.0—1.5 m-kg, 7.2—11 ft-lb)

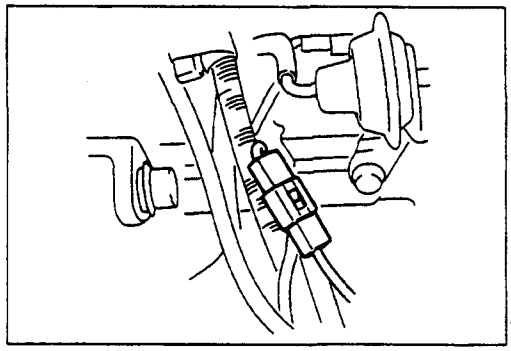
Removal / Installation

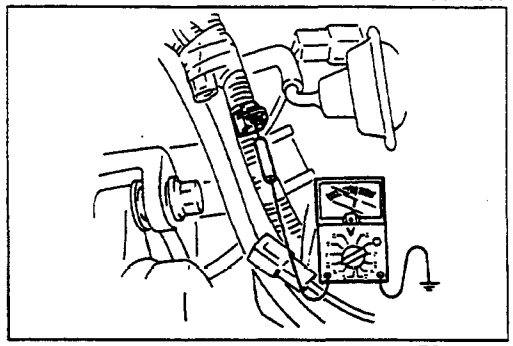
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.

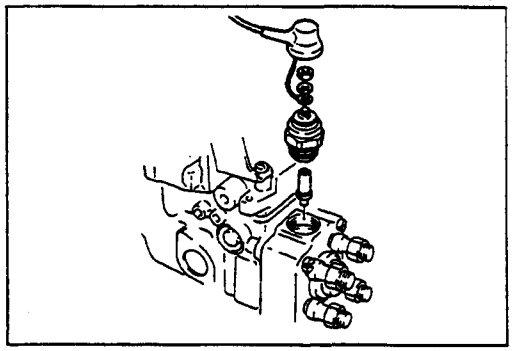


9TG0F1-059

1. Accelerator cable
2. Accelerator pedal
3. Bracket


9TG0F1-060


9TG0F1-061


9TG0F1-062

FUEL CUT CONTROL SYSTEM

SYSTEM OPERATION

1. Verify that the engine stops when the fuel cut solenoid valve connector is disconnected.

FUEL CUT SOLENOID VALVE

Inspection

1. Verify that the fuel cut solenoid valve clicks when the engine switch is turned ON and OFF.
2. If it does not, disconnect the fuel cut solenoid valve and check the voltage to the valve.

Engine switch	Voltage
ON	12V
OFF	0V

3. If as specified, replace the fuel cut solenoid valve.

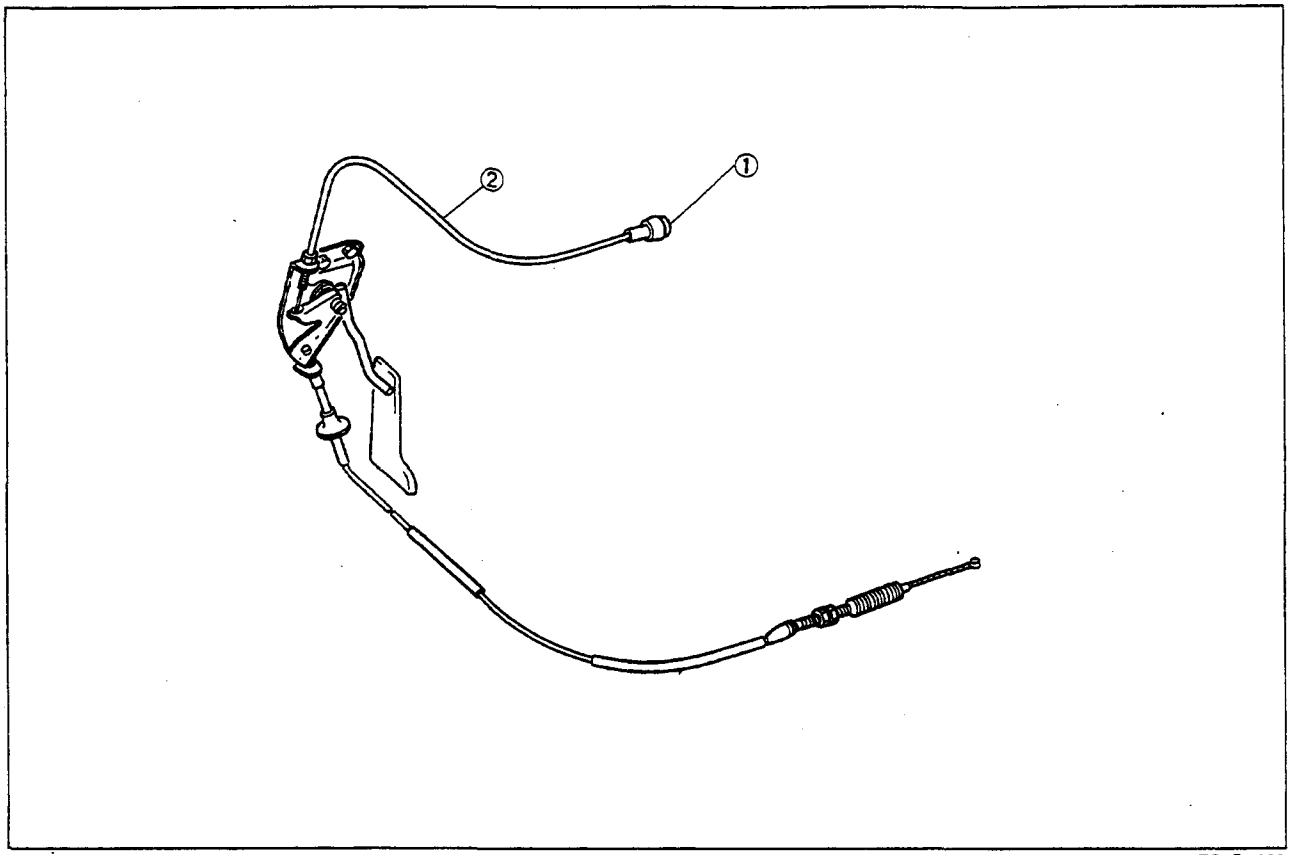
Replacement

1. Disconnect the fuel cut solenoid valve connector.
2. Remove the fuel cut solenoid valve from the injection pump.
3. Install in the reverse order of removal.

Tightening torque:
39—44 N·m (4.0—4.5 m-kg, 29—33 ft-lb)

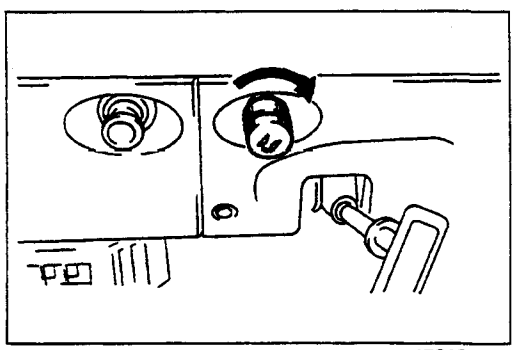
IDLE SPEED CONTROL SYSTEM

STRUCTURAL VIEW

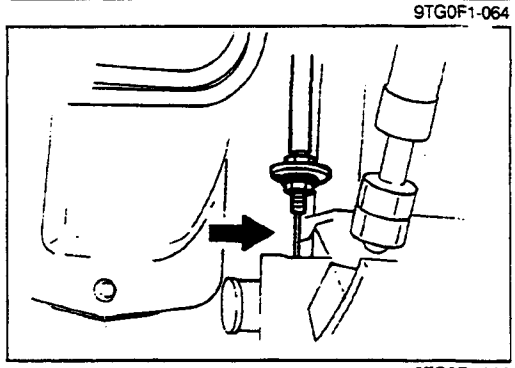


9TG0F1-063

1. Idling knob
   Removal / Installation ..... page F1–25
2. Idling cable
   Inspection / Adjustment..... page F1–24
   Removal / Installation ..... page F1–25



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IDLING KNOB, IDLING CABLE

1. Verify that the control lever of the injection pump is at idle position when the idling knob is not turned.
2. Verify that the idle speed increases when the knob is turned clockwise.
3. Check the free play of the cable when the idling knob is not turned.

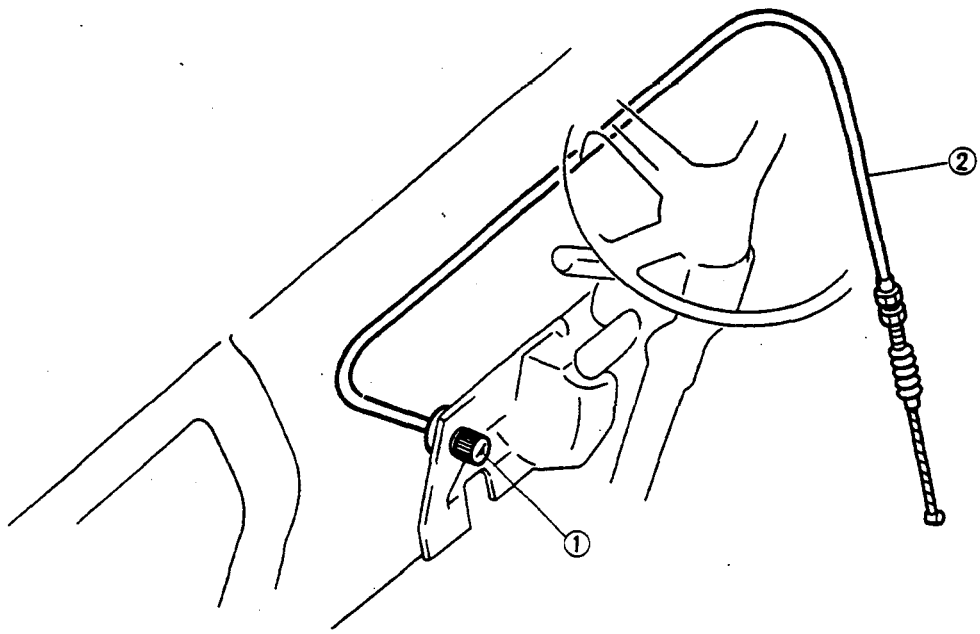
   Free play: 0—5mm (0—0.2 in)

4. If not as specified, loosen the locknuts and adjust the free play.

   Tightening torque:
   11—15 N·m (1.0—1.5 m-kg, 8—11 ft-lb)

Removal / Installation

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



9TG0F1-066

1. Idling knob
2. Idling cable

EXHAUST SYSTEM

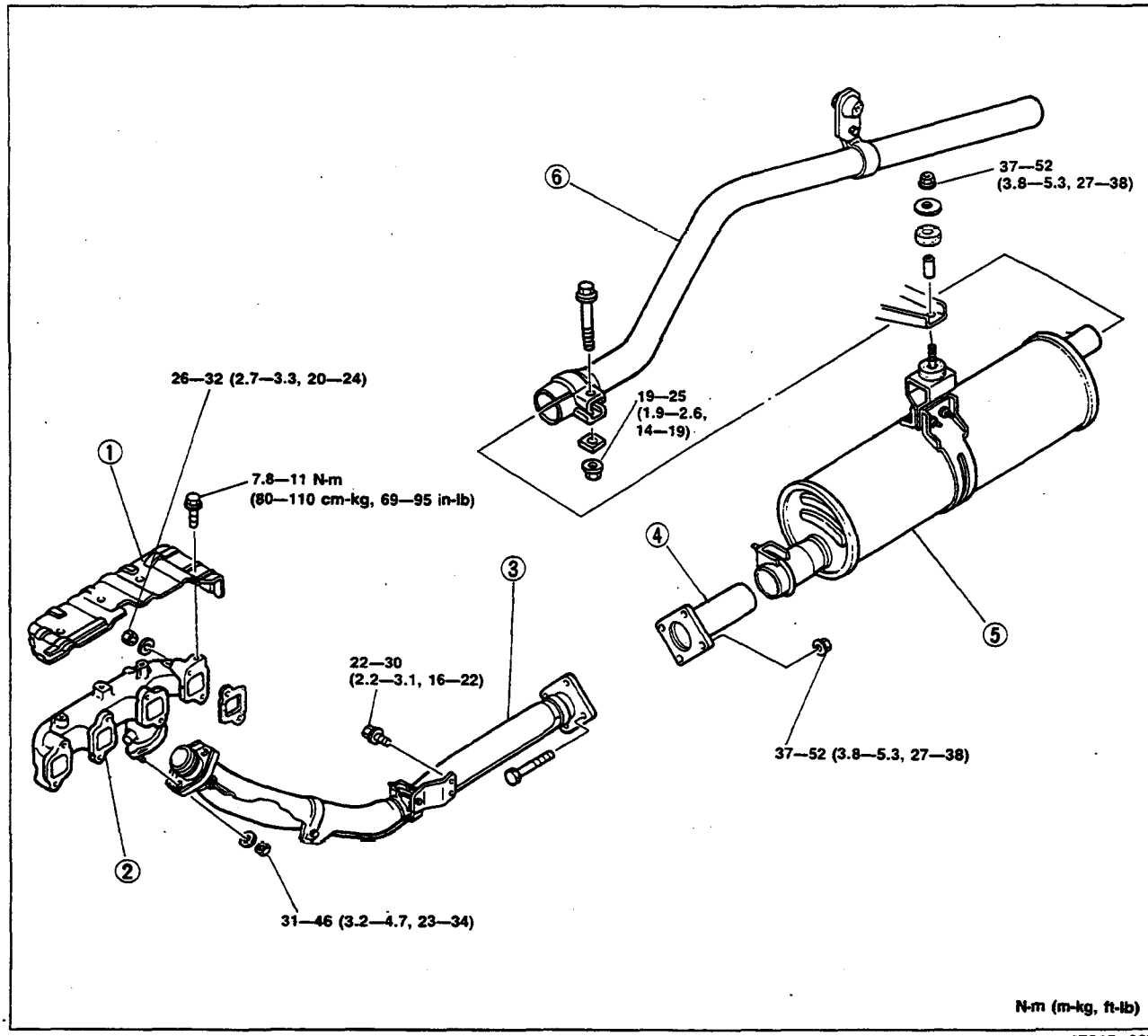
COMPONENTS

Vehicle Inspection

1. Run the engine and verify that there is no exhaust leakage.

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.



9TG0F1-067

1. Exhaust manifold insulator
2. Exhaust manifold
   Check for contamination, cracks and other damage
3. Front pipe assembly
   Check for contamination, cracks and other damage
4. Middle pipe assembly
   Check for contamination, cracks and other damage
5. Main silencer
   Check for contamination, cracks and other damage
6. Tail pipe assembly
   Check for contamination, cracks and other damage

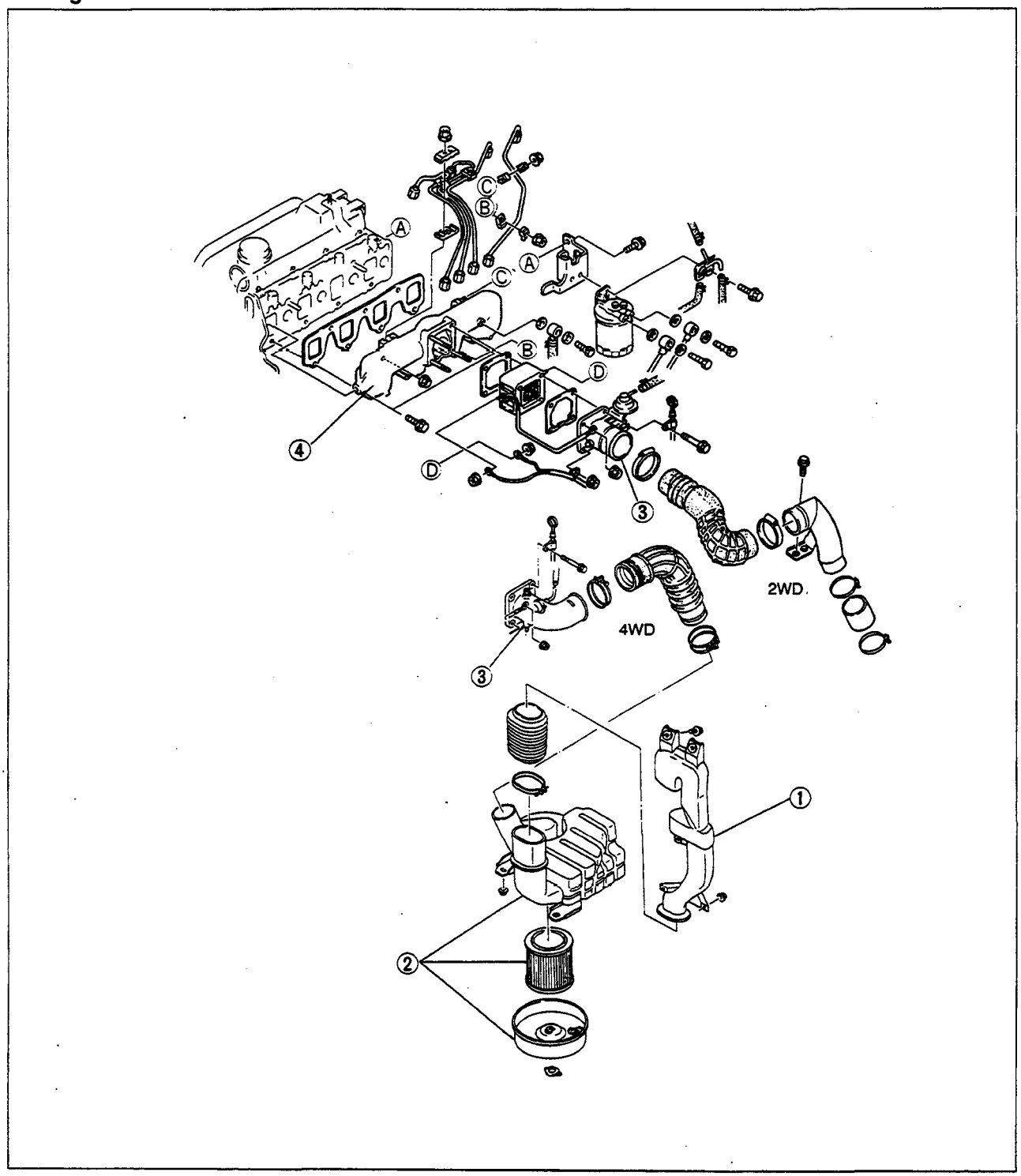
FUEL AND EMISSION CONTROL SYSTEMS (SL, SL TURBOCHARGED ENGINE)

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ACCELERATOR SWITCH F2–53
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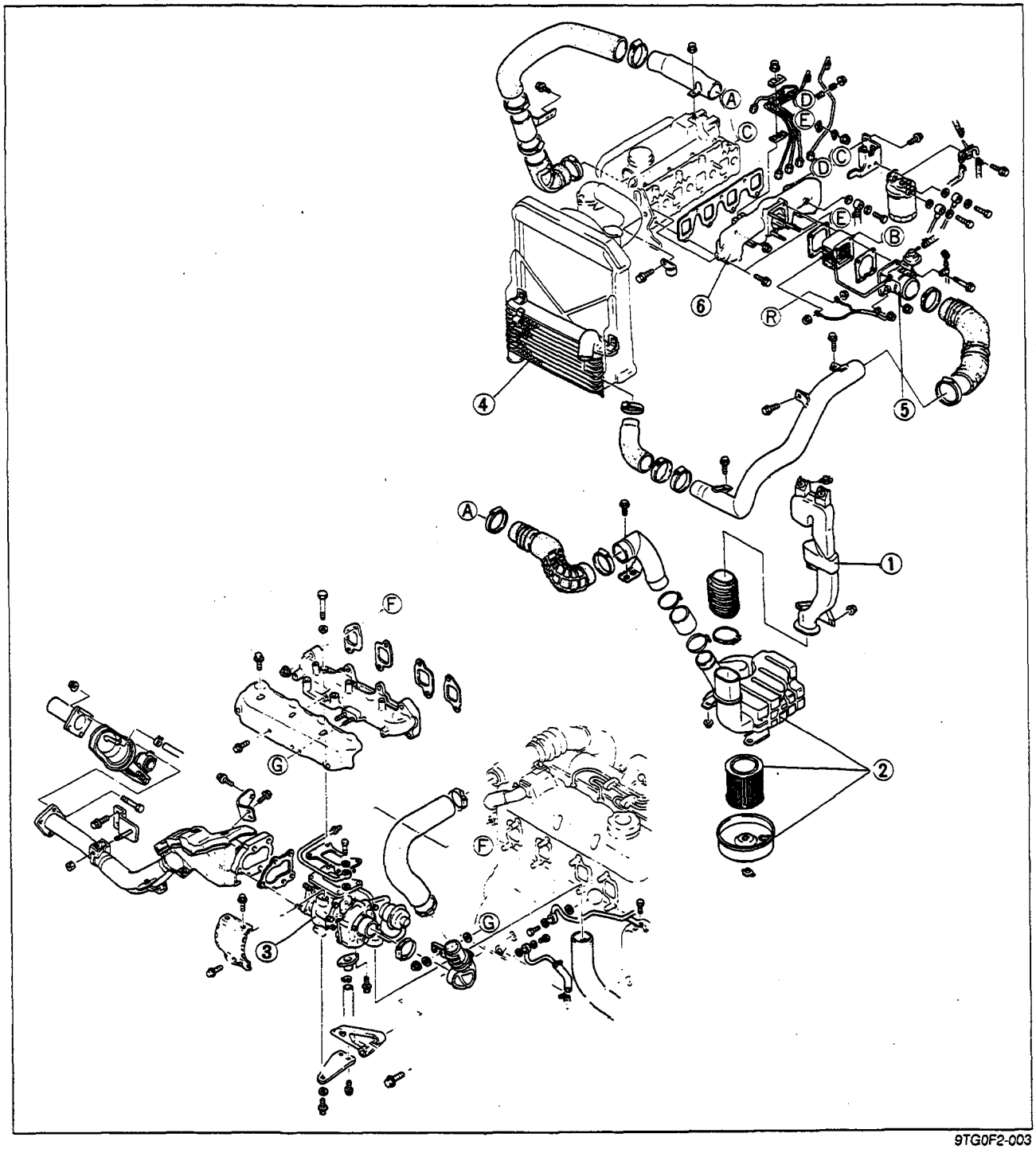
INTAKE DEVICES
SL Engine



9TG0F2-002

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2. Air cleaner
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3. Intake shutter valve
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4. Intake manifold
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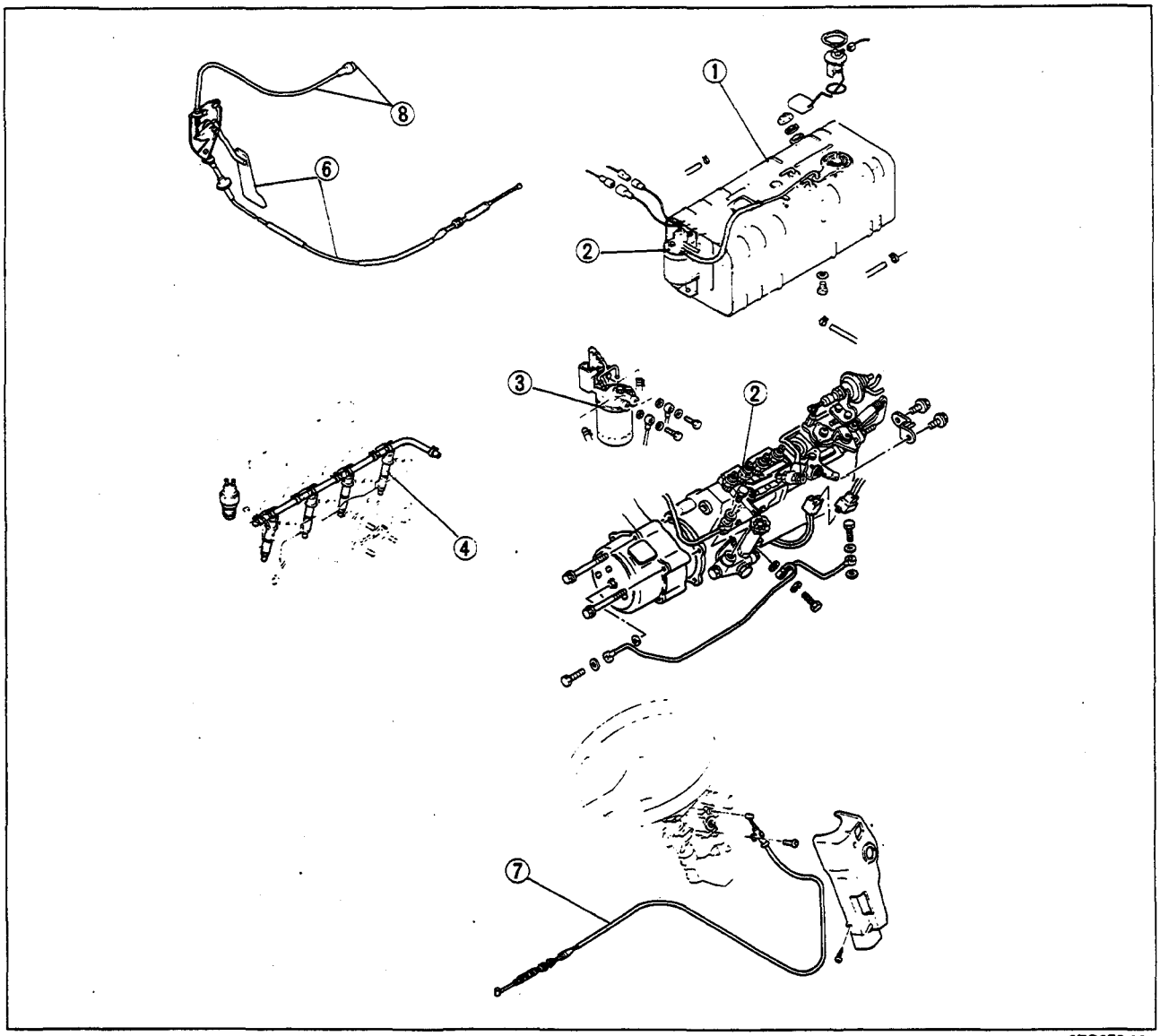
SL Turbocharged Engine



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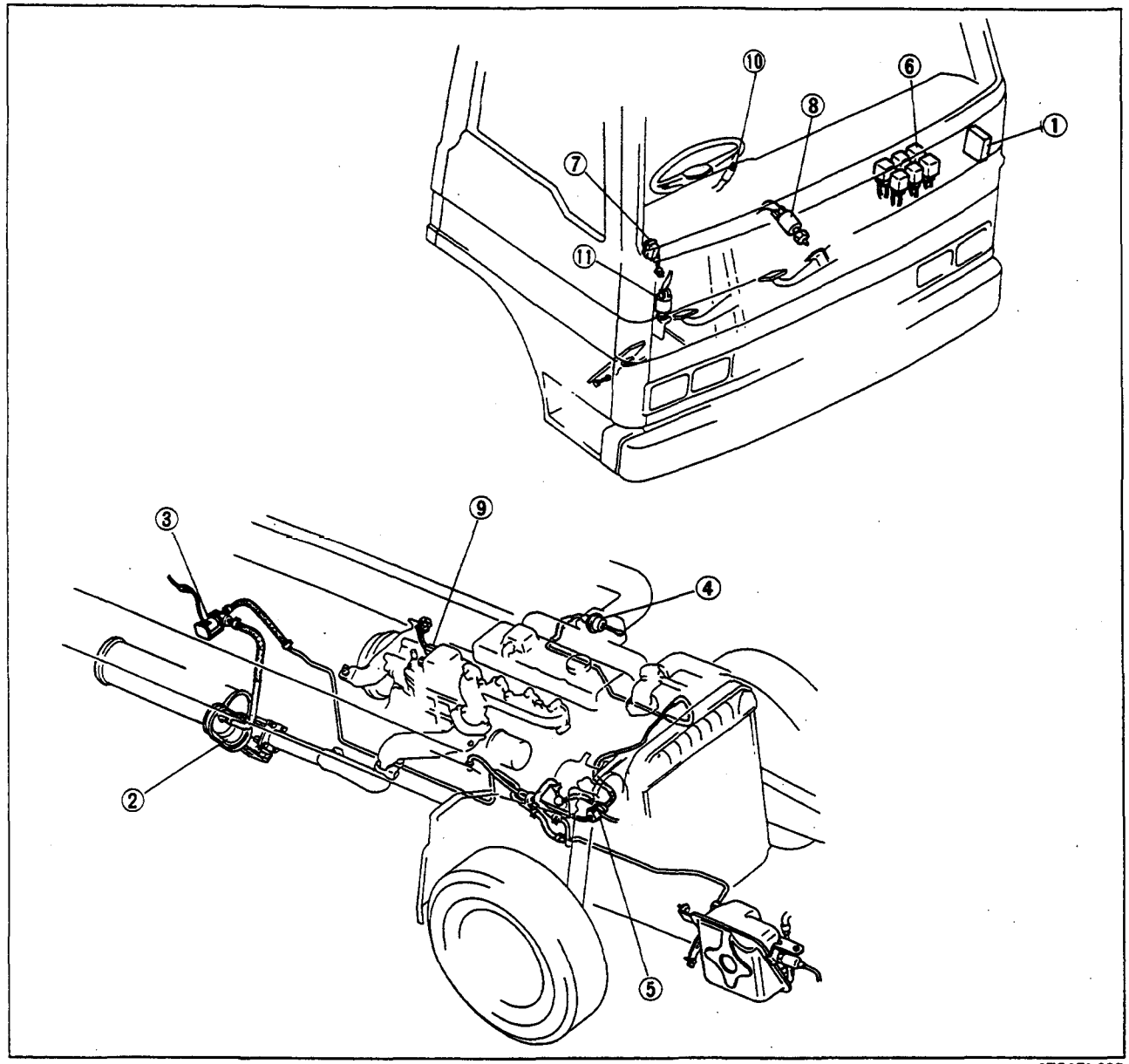
FUEL DEVICES



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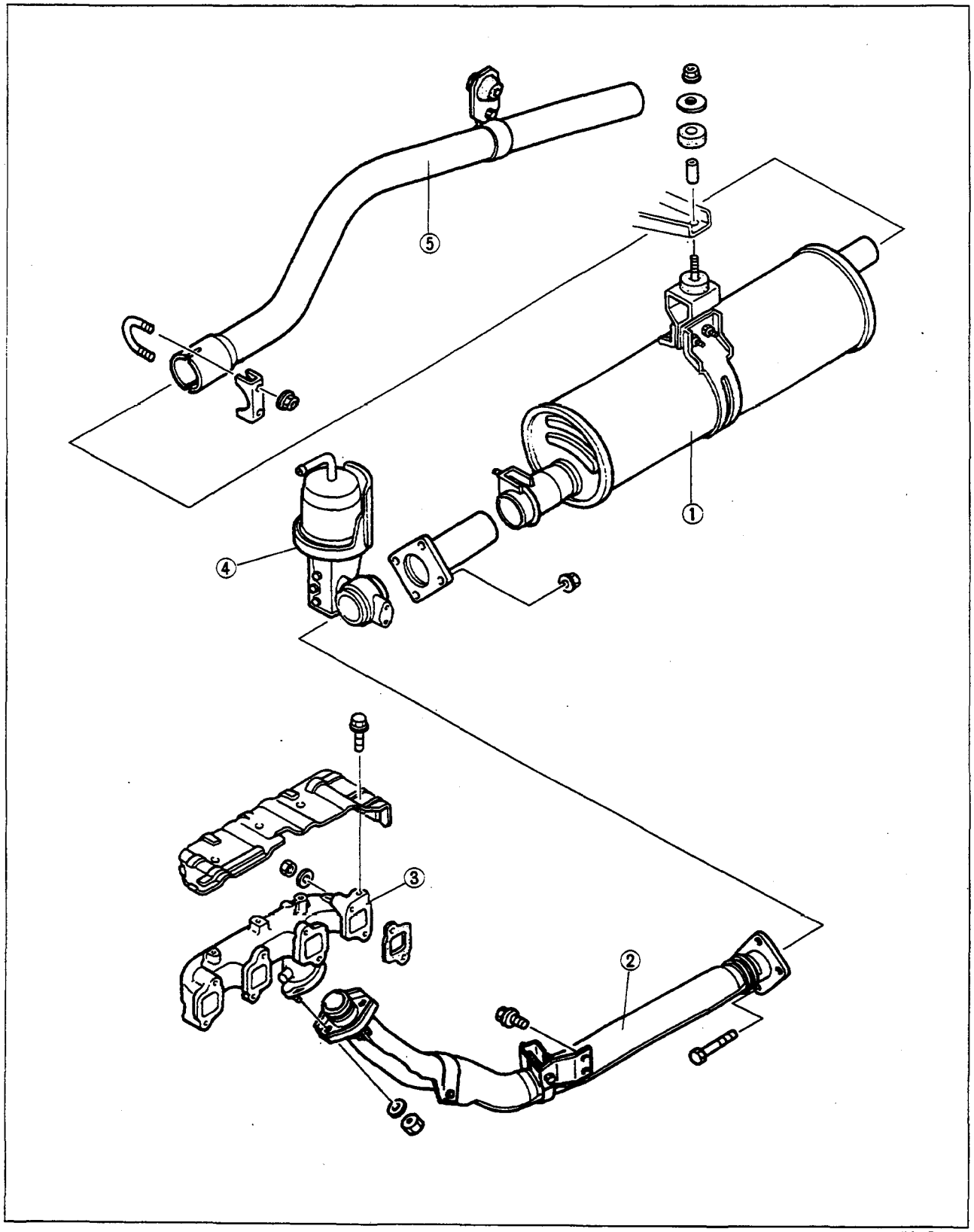
EXHAUST CONTROLLED HEATING DEVICES



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10. Exhaust brake switch
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EXHAUST DEVICES



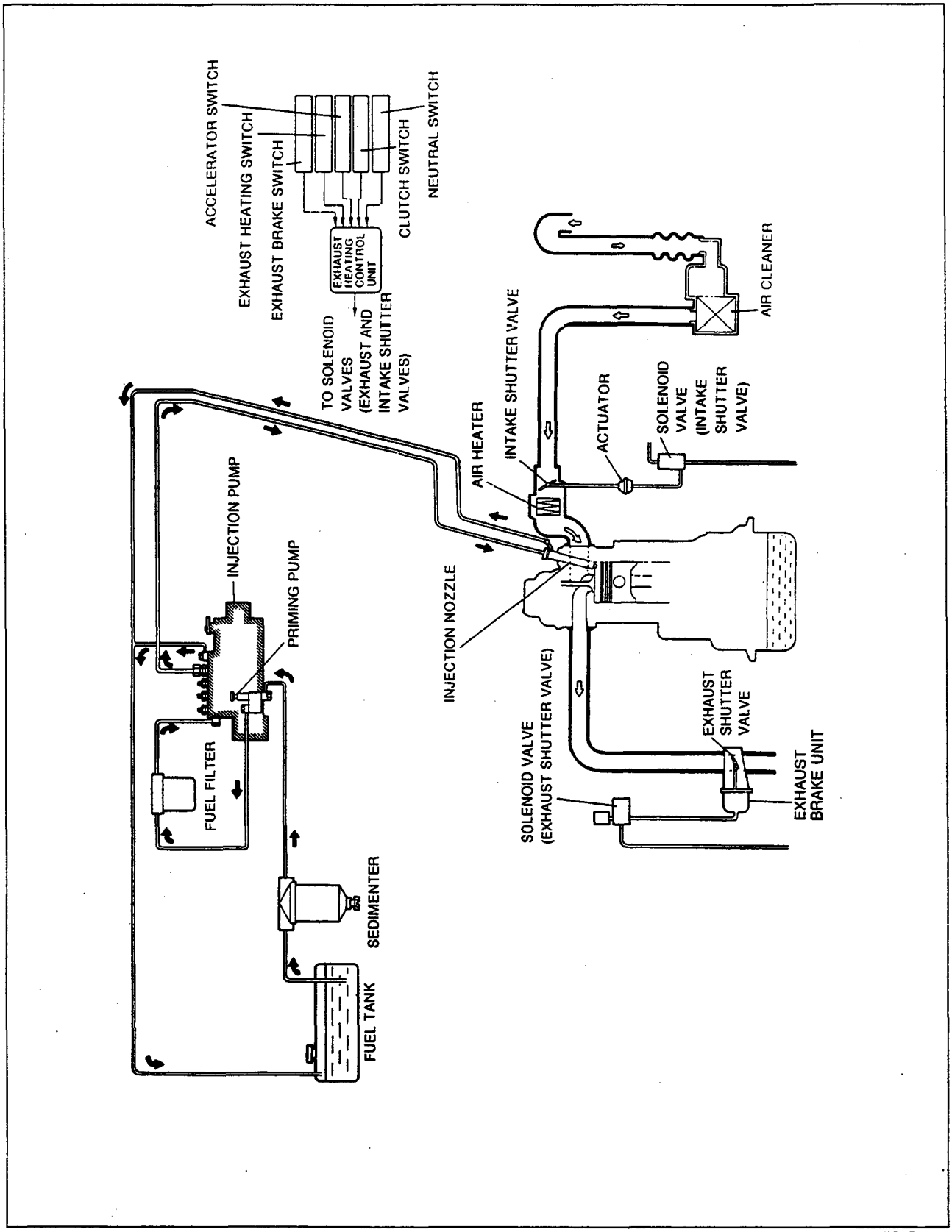
9TG0F2-006

1. Main silencer
2. Exhaust pipe
3. Exhaust manifold
4. Exhaust brake unit
5. Tail pipe

MEMO

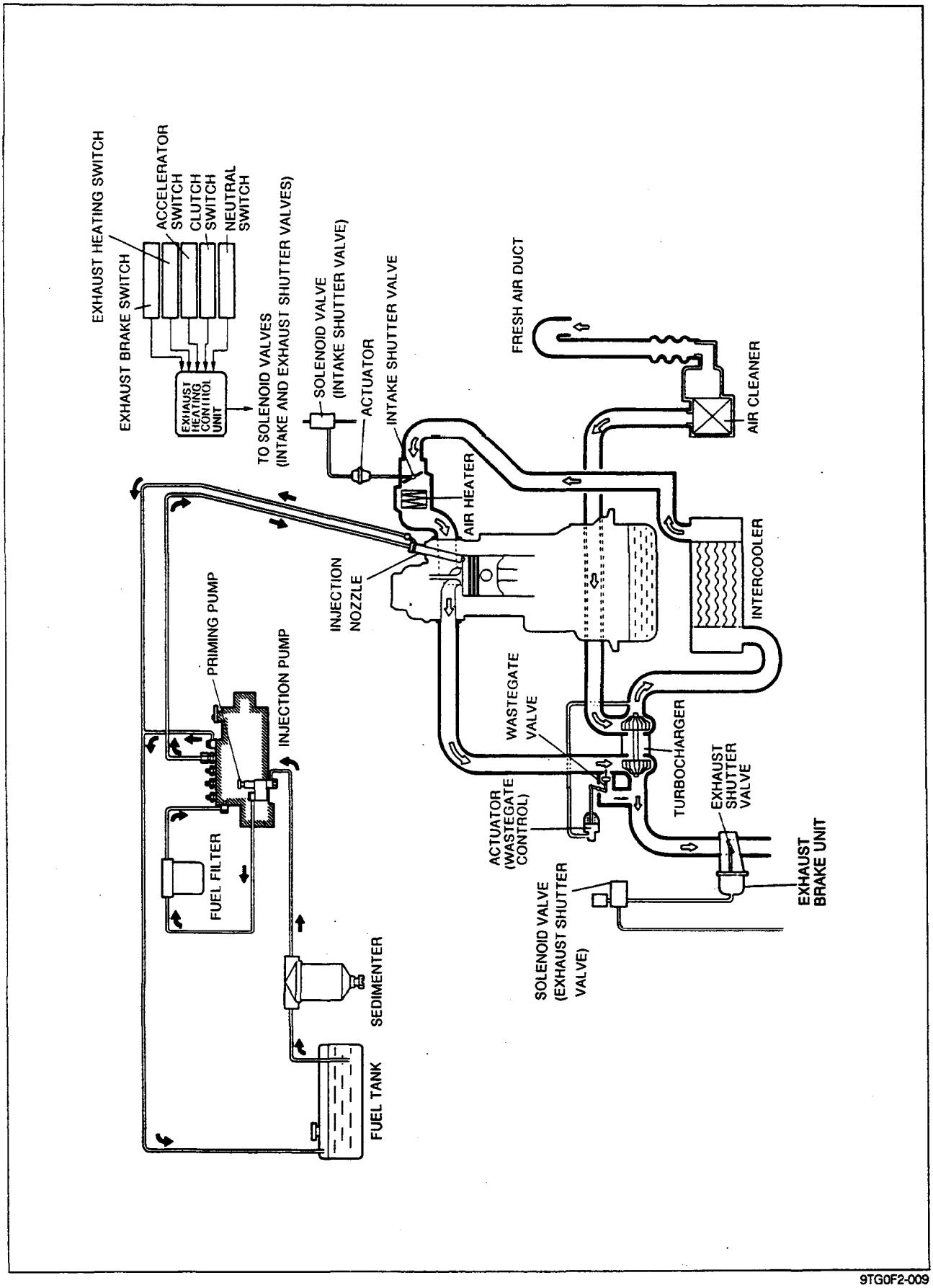
OUTLINE

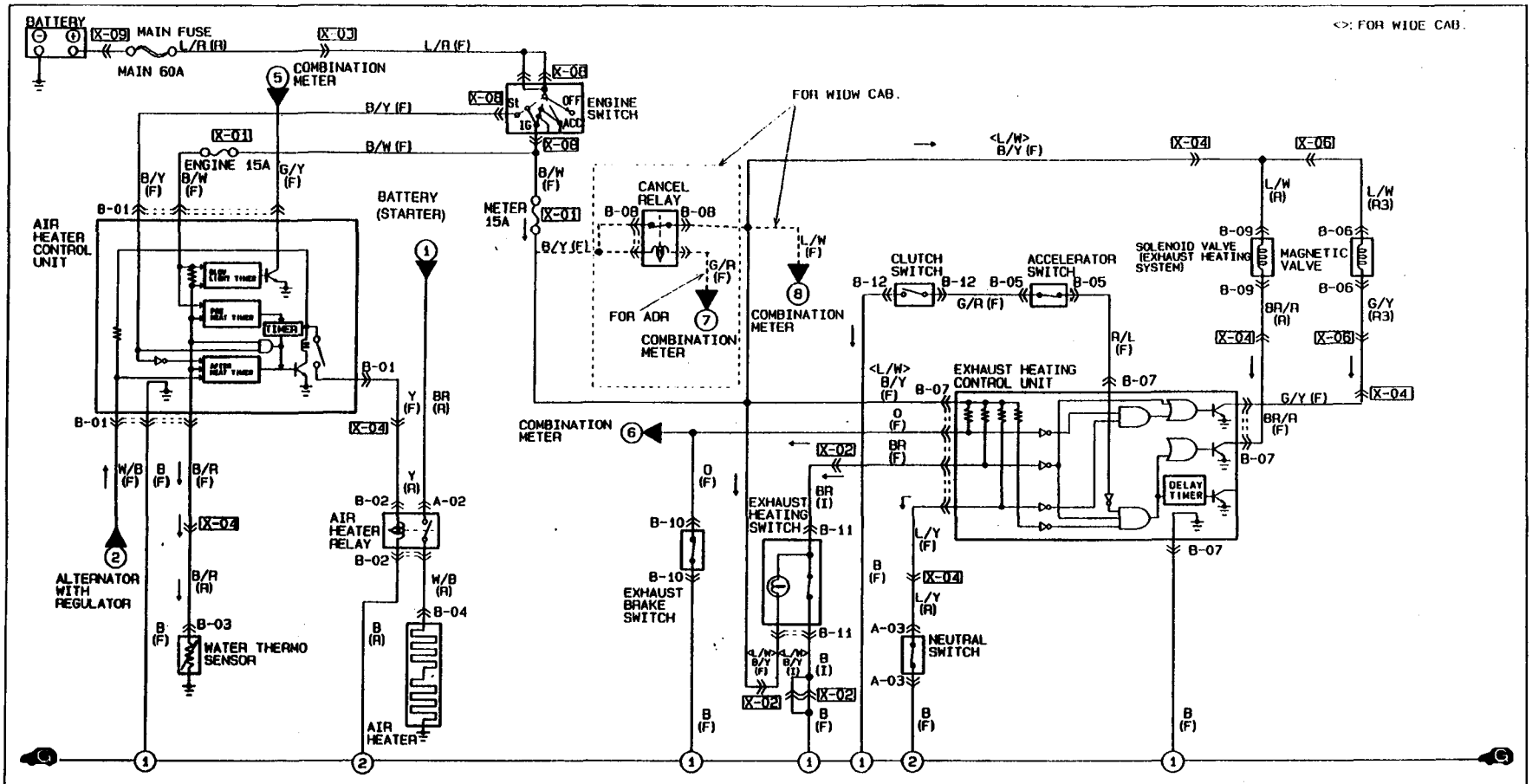
SYSTEM DIAGRAM
SL Engine



9TG0F2-008

SL Turbocharged Engine



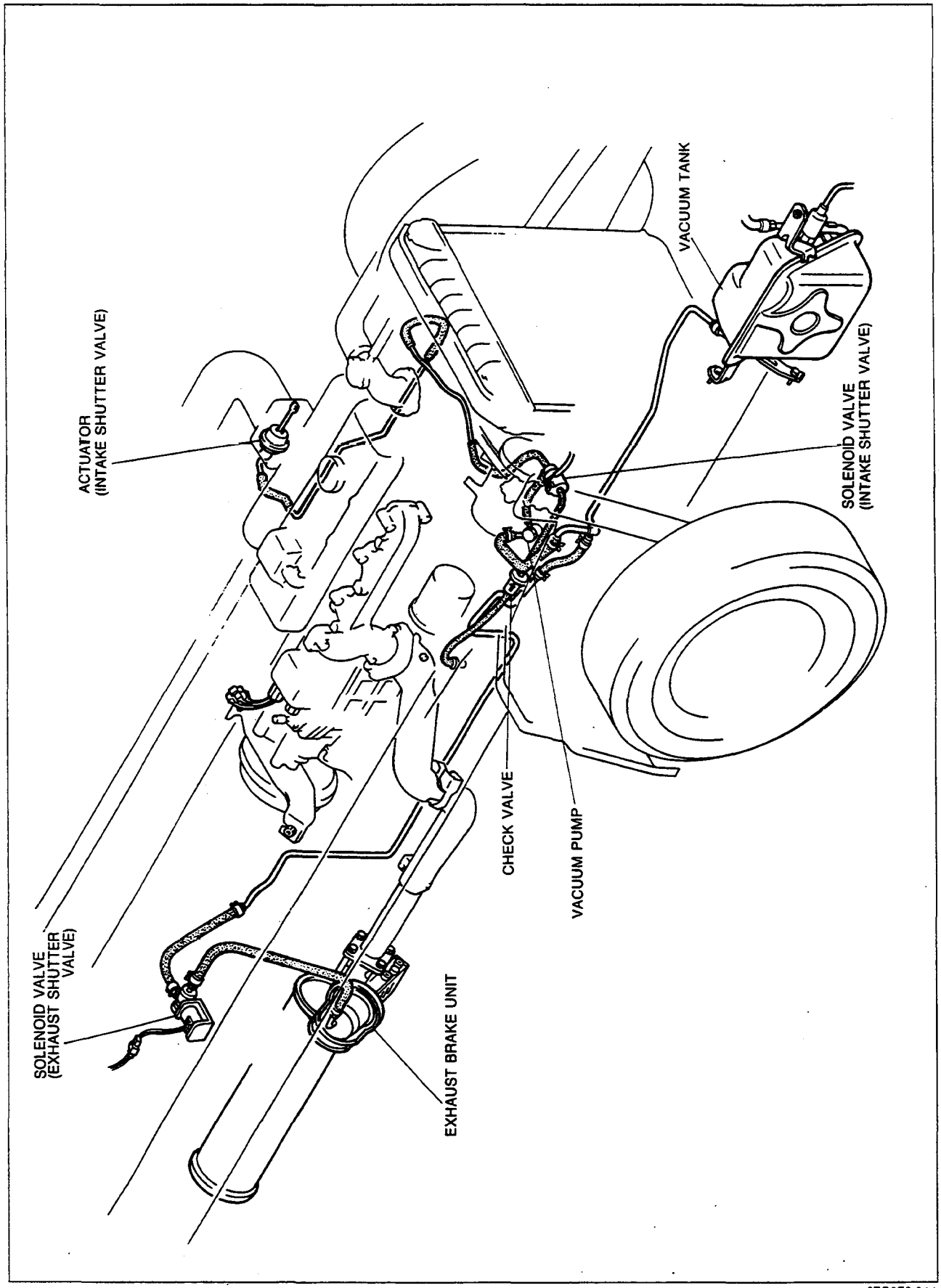


B-01 AIR HEATER CONTROL UNIT (F)	B-02 AIR HEATER RELAY (A)	B-03 WATER THERMO SENSOR (A)	B-04 AIR HEATER (A)	B-05 ACCELERATOR SWITCH (F)	B-06 MAGNETIC VALVE (A3)	B-07 EXHAUST HEATING CONTROL UNIT (F)
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A-02 STARTING MOTOR (B) & FUSIBLE LINK (A)						

( ): FOR CREW CAB.

NOTE: ✱···NOT USED

VACUUM HOSE ROUTING DIAGRAM

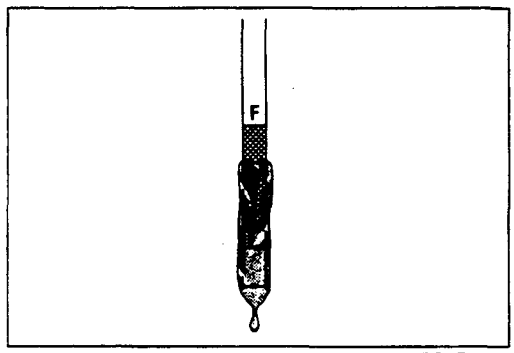


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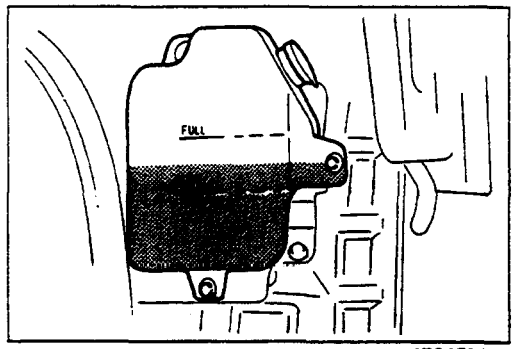
TROUBLESHOOTING GUIDE

Trouble	Possible Cause	Action
Hard starting	Malfunction of stop system	Adjust or replace
	Air in injection pipe, injection pump, fuel filter or sedimentor	Bleed air
	Clogged fuel line or fuel filter	Replace
	Incorrect injection timing	Adjust
	Seized or leaking delivery valve	Replace or clean
	Incorrect injection starting pressure	Adjust
	Malfunction of injection nozzle	Clean or replace
	Malfunction of feed pump	Clean or replace
	Malfunction of governor	Replace
	Malfunction of injection pump	Replace
Rough idling	Incorrect idling speed	Adjust
	Incorrect injection timing	Adjust
	Clogged fuel line or fuel filter	Clean or replace
	Leak in fuel line or fuel filter	Repair or replace
	Air in injection pipe, injection pump, fuel filter or sedimentor	Bleed air
	Seized or leaking delivery valve	Replace or clean
	Incorrect injection starting pressure	Adjust
	Malfunction of injection nozzle	Clean or replace
	Malfunction of feed pump	Clean or replace
	Malfunction of timer	Replace
	Malfunction of injection pump	Replace
Engine knocking	Incorrect injection timing	Adjust
	Incorrect injection starting pressure	Adjust
	Malfunction of injection nozzle	Clean or adjust
	Low quality of fuel	Drain and replace
Excessive exhaust smoke	Incorrect injection timing	Adjust
	Water in injection pump, fuel filter or sedimentor	Drain
	Incorrect injection starting pressure	Adjust
	Clogged air cleaner	Clean or replace
	Malfunction of delivery valve	Clean or replace
	Malfunction of injection pump	Replace
Poor acceleration	Low quality of fuel	Drain and replace
	Incorrect injection timing	Adjust
	Clogged fuel line or fuel filter	Clean or replace
	Air in injection pump or fuel filter	Air bleed
	Clogged air cleaner	Clean or replace
	Malfunction of delivery valve	Clean or replace
	Incorrect injection starting pressure	Adjust
	Malfunction of injection nozzle	Clean or replace
	Malfunction of feed pump	Clean or replace
	Malfunction of injection pump	Replace
	Malfunction of governor	Replace
High fuel consumption	Incorrect injection timing	Adjust
	High idling speed	Adjust
	Incorrect injection starting pressure	Adjust
	Clogged air cleaner	Clean or replace
	Clogged fuel filter	Replace
	Malfunction of injection nozzle	Clean or replace
Engine does not stop	Malfunction of fuel stop system	Adjust or repair

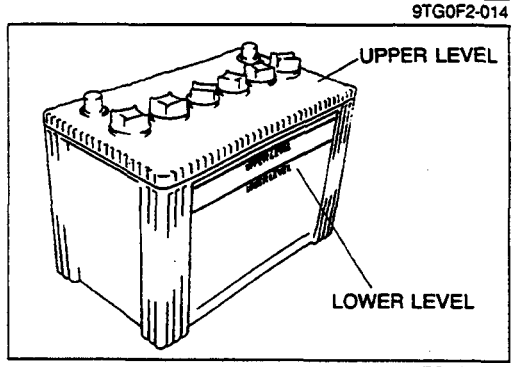
9TG0F2-012



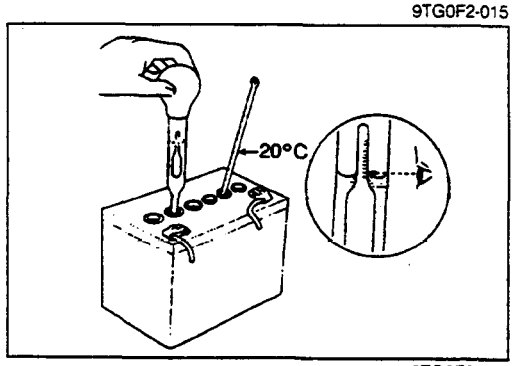
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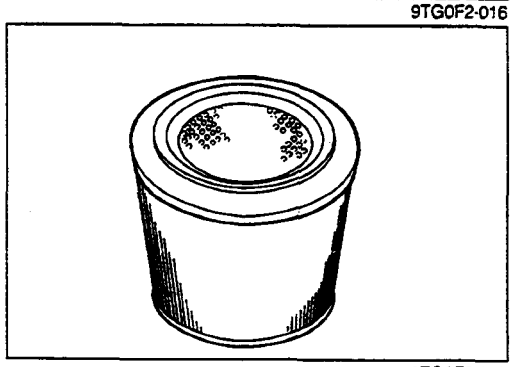
9TG0F2-014



9TG0F2-015



9TG0F2-016



9TG0F2-017

ENGINE TUNE-UP

BASIC INSPECTION

Engine Oil

Check the engine oil level and condition with the level gauge. Add or change oil if necessary.

Coolant

Warning

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

Verify that the coolant level is near the radiator inlet port, and that the level in the reservoir is between the FULL and LOW marks. Add coolant as necessary.

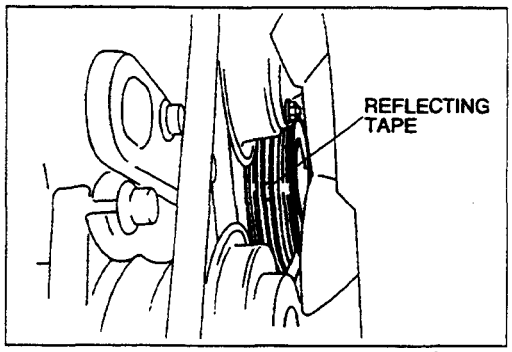
Battery

1. Check for corrosion on the terminals and for loose cable connections.
2. Check the electrolyte level.
   If the level is low, add distilled water to the "UPPER LEVEL" mark.

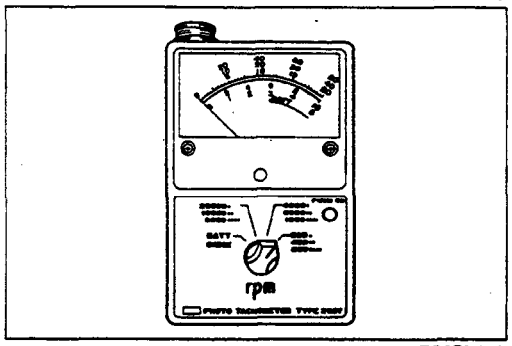
3. Check the specific gravity with a hydrometer. If the specific gravity reading is 1.23 or less, recharge the battery. (Refer to Section G.)

Air cleaner

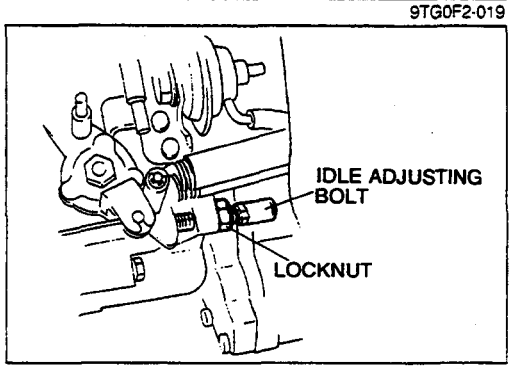
Visually check the air cleaner element for excessive dirt, damage or oil. Clean with compressed air if necessary.



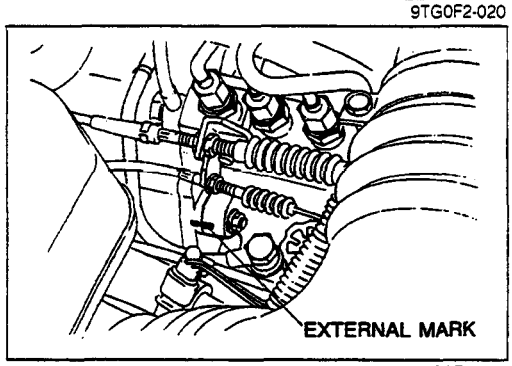
9TG0F2-018



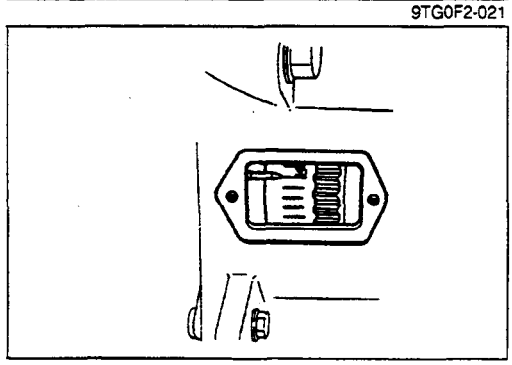
9TG0F2-019



9TG0F2-020



9TG0F2-021


9TG0F2-022

ADJUSTMENT

Idle Speed

1. Attach suitable reflecting tape to the crankshaft pulley.
2. Run the engine at idle at normal operating temperature. Turn off all unnecessary electrical loads.
3. Verify the free play of the accelerator cable.

   Free play: 1.0—3.0mm (0.039—0.118 in)

4. Aim the light of the photo tachometer onto the reflecting tape to measure the engine speed.

   Idle speed: 620—670 rpm (SL)
   660—710 rpm (SL Turbocharged Engine)

5. If not as specified, loosen the locknut of the idle adjusting bolt and turn the bolt to adjust the idle.
6. Tighten the locknut.

   Tightening torque:
   9.8—14 N·m (100—140 cm-kg, 87—121 in-lb)

Injection Timing Inspection

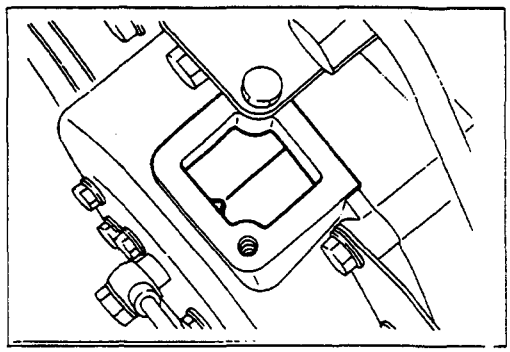
Note

- **Usually it is enough to confirm that the external marks are aligned.**

Caution

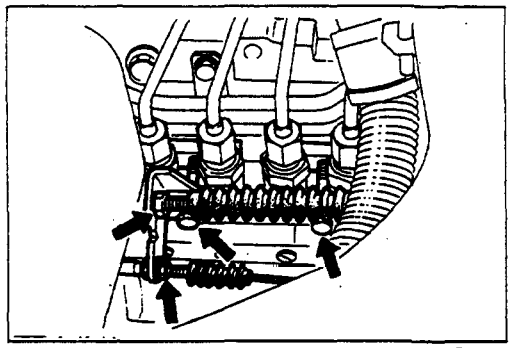
- **Direct injection engines are sensitive to injection timing. Incorrect timing will cause engine knocking or low power output.**
  Set the injection timing after installing the injection pump.

1. Remove the service hole covers from the clutch housing and the timing gear case.
2. Turn the flywheel in the direction of rotation until the indicator pin is at 30° BTDC.



9TG0F2-023

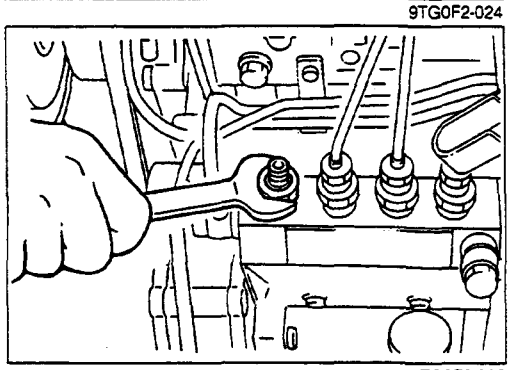
3. Verify that the pointer of the timing gear case and the mark on the timer are aligned.
4. If not as specified, adjust the injection timing.



9TG0F2-024

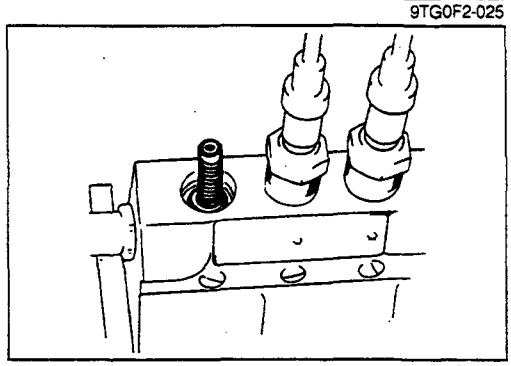
Adjustment

1. Remove the fuel stop cable from the cut lever.
2. Remove the accelerator cable from the control lever.
3. Remove the bracket.
4. Loosen injection pipes No.2—4 at the pump.



9TG0F2-025

5. Remove No.1 injection pipe and the delivery valve holder.

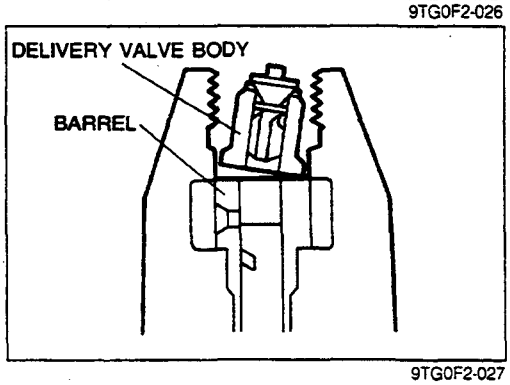


9TG0F2-026

6. Remove the delivery valve spring seat and spring.

Caution

- **Do not remove the delivery valve body.**

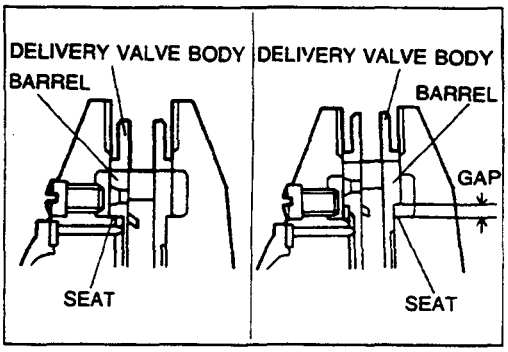


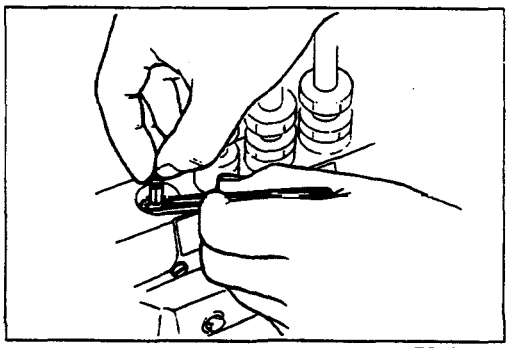
9TG0F2-027

7. Rock the delivery valve to break it loose from the barrel.

Note

- **If the delivery valve is lifted up without breaking it loose, the barrel may also be lifted out of the pump. If this happens the barrel may not reseal and may allow fuel into the engine and cause engine damage.**

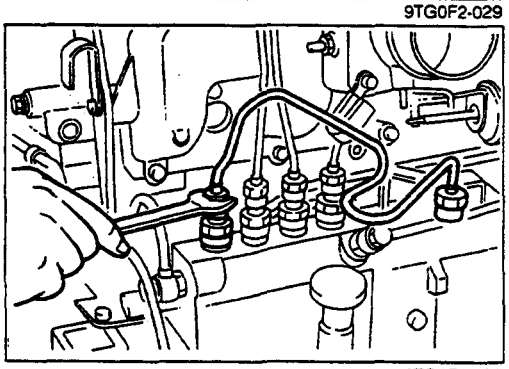



9TG0F2-029

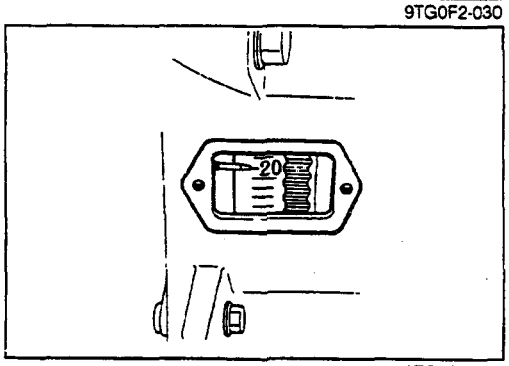
8. Remove the delivery valve, holding the flat washer with tweezers.

Caution
- **Do not pinch the sliding surface of the delivery valve.**

9. Reinstall the delivery valve holder.

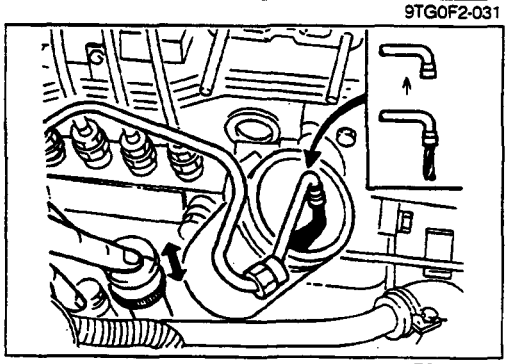

9TG0F2-030

10. Tighten No.1 injection pipe so that it points away from the pump.



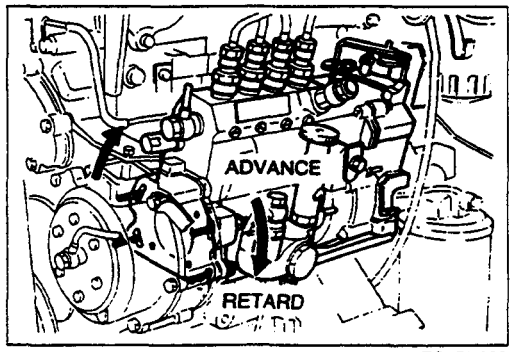
9TG0F2-031

11. Turn the flywheel in the direction of rotation and set it at 20° BTDC.


9TG0F2-032

12. Place a container under No.1 injector pipe and verify that fuel is expelled when pumping the primer pump.
13. While pumping the priming pump, turn the flywheel in the normal direction of rotation and verify that fuel flow stops as specified.

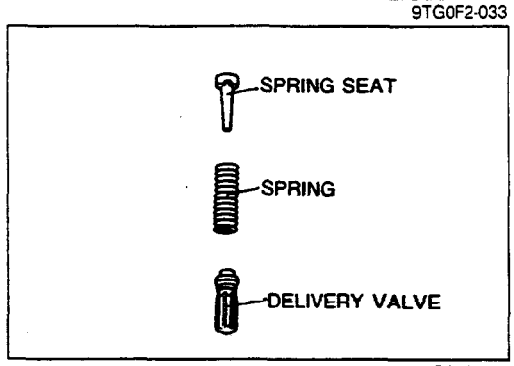
Fuel stops:
12° BTDC (SL Engine), 13° BTDC (SL Turbocharged Engine)



9TG0F2-033

14. If necessary, adjust the injection timing by loosening the pump mounting bolts and rotating the pump outward or inward as shown in the figure.
15. Tighten the mounting nuts.

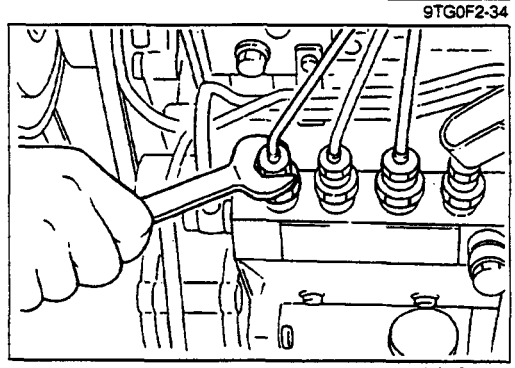
Tightening torque:
34—39 N·m (3.5—4.0 m-kg, 25—29 ft-lb)



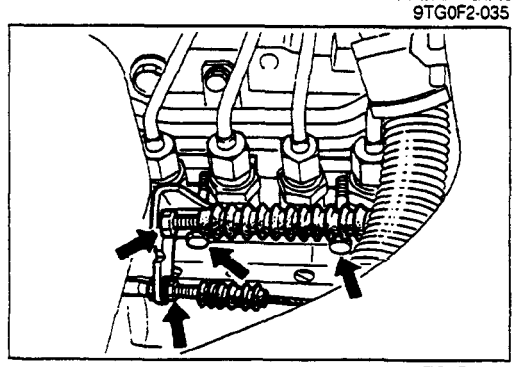
9TG0F2-34

16. Mark the pump flange and pump body for future reference.
17. Install the delivery valve, spring, and spring seat.
18. Tighten the delivery valve holder.

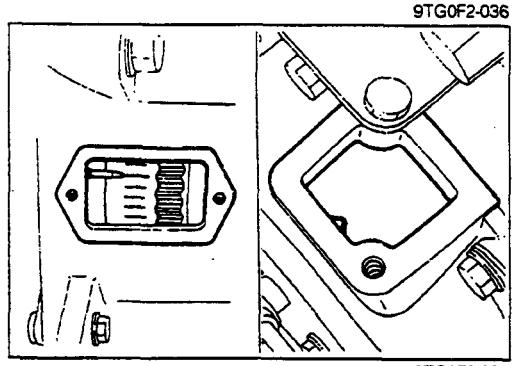
Tightening torque:
39—44 N·m (4.0—4.5 m-kg, 29—33 ft-lb)


9TG0F2-035

19. Install No.1 injection pipe.


9TG0F2-036

20. Tighten injection pipes No.2—4.
21. Install the bracket.
22. Install the accelerator cable to the control lever.
23. Install the fuel stop cable to the cut lever.


9TG0F2-037

24. Install the service hole covers onto the clutch housing and the timing gear case.
25. Bleed air from the system. (Refer to page F2–35.)
26. Start the engine, and check for fuel leaks.

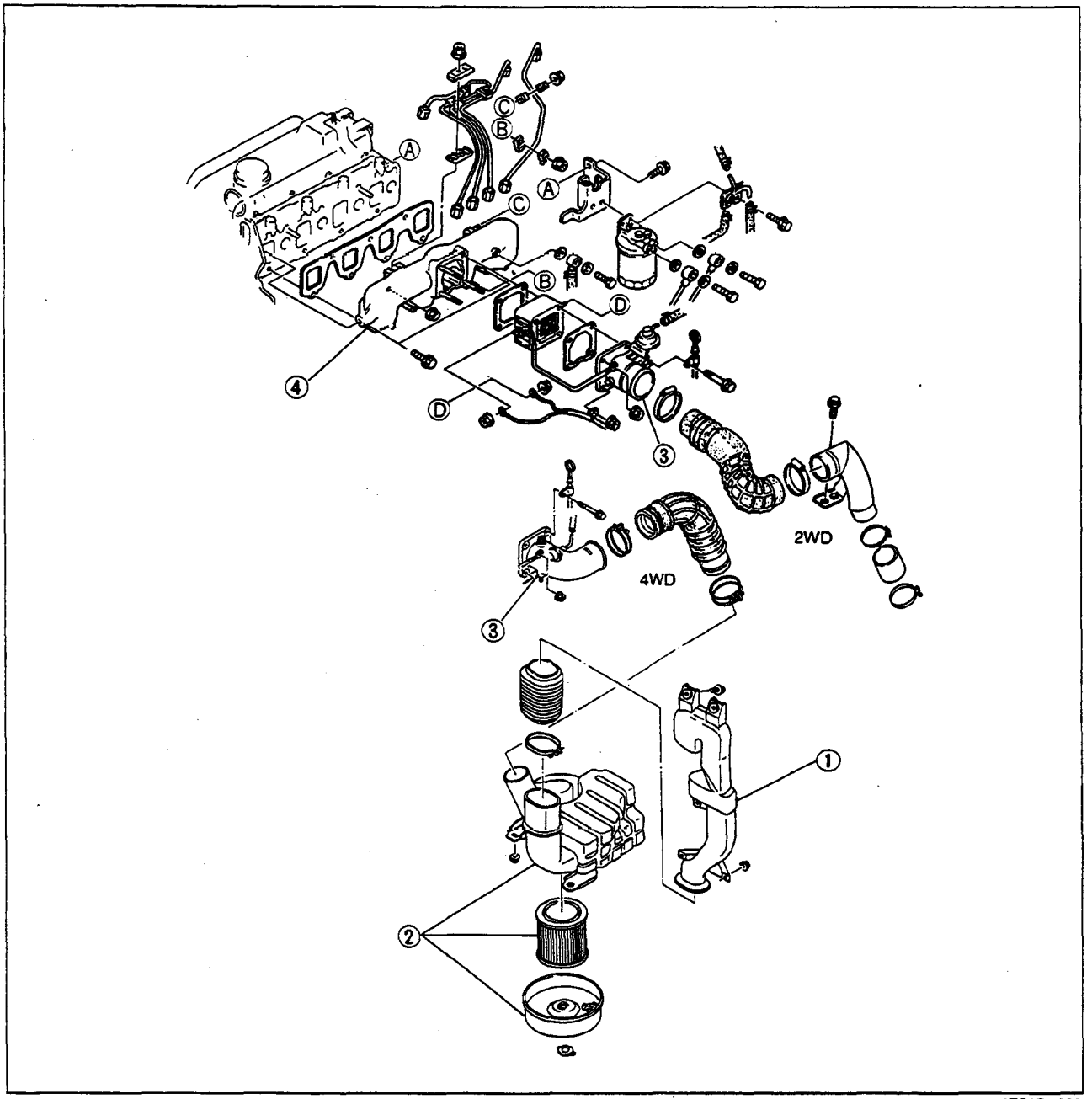
INTAKE AIR SYSTEM

COMPONENTS

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**.

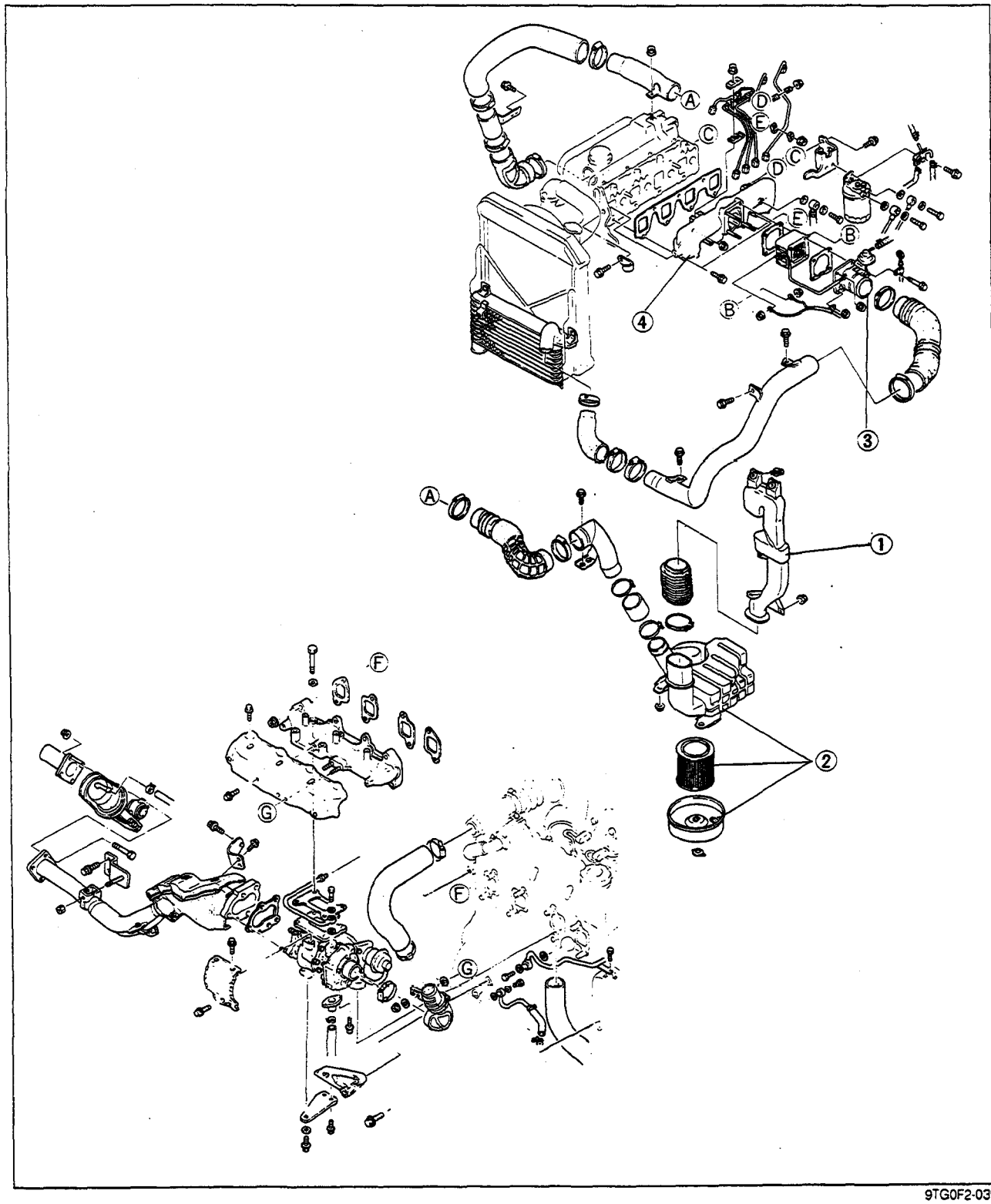
SL Engine



9TG0F2-038

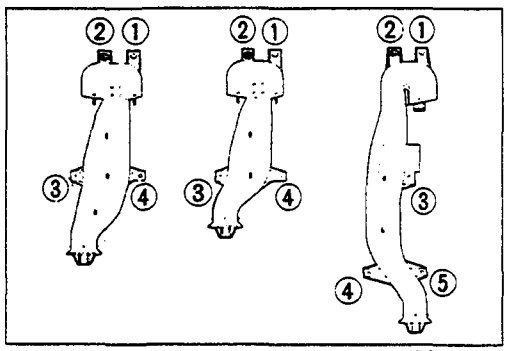
1. Fresh air duct
   Check for contamination, cracks and other damage ..... page F2–18
   Installation Note ..... page F2–20
2. Air cleaner
   Inspection ..... page F2–13
3. Intake shutter valve
   Inspection ..... page F2–49
4. Intake manifold
   Check for contamination, cracks and other damage ..... page F2–18
   Installation Note ..... page F2–20

SL Turbocharged Engine



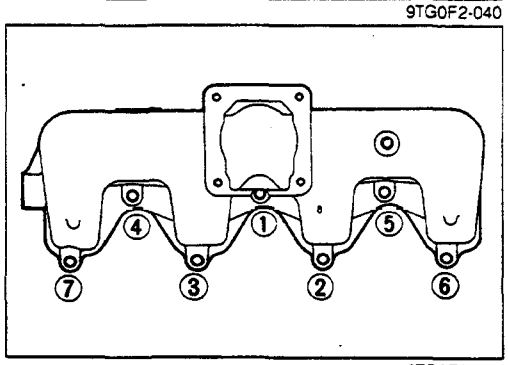
9TG0F2-039

1. Fresh air duct
   Check for contamination, cracks and other damage ..... page F2–19
   Installation Note ..... page F2–20
2. Air cleaner
   Inspection ..... page F2–13
3. Intake shutter valve
   Inspection ..... page F2–51
4. Intake manifold
   Check for contamination, cracks and other damage ..... page F2–19
   Installation Note ..... page F2–20



9TG0F2-040

Installation note
Fresh air duct
Install in the order shown in the figure.



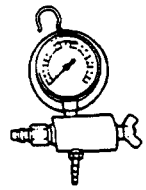
9TG0F2-041

Intake manifold
1. Use a new gasket.
2. Tighten in the order shown in the figure.

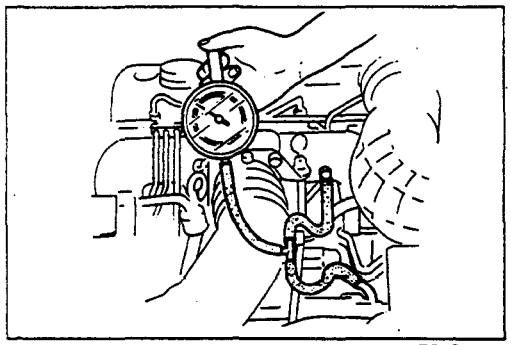
Tightening torque:
22—31 N·m (2.2—3.1 m-kg, 15—22 ft-lb)

TURBOCHARGER

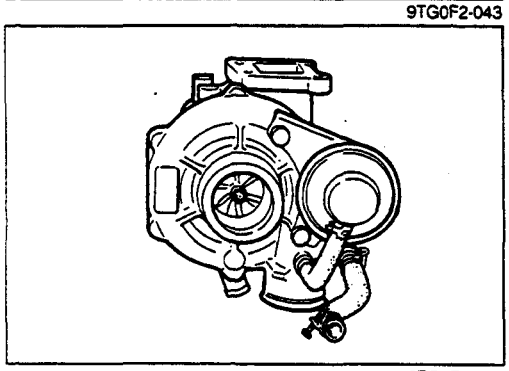
PREPARATION
SST

49 H080 740 Pressure tester		For inspection of wastegate

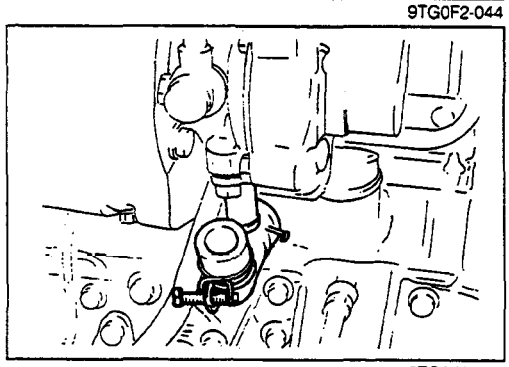
9TG0F2-042



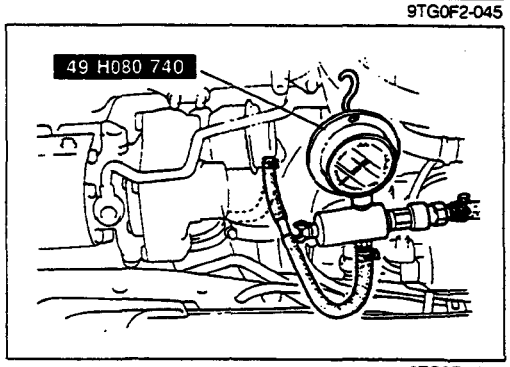
9TG0F2-043



9TG0F2-044



9TG0F2-045



9TG0F2-046

TURBOCHARGER
On-vehicle Inspection
Turbocharger boost pressure

1. Disconnect the air hose from the wastegate.
2. Connect a pressure gauge as shown.
3. Connect a tachometer to the engine.
4. Warm up the engine to operating temperature.
5. Increase the engine speed to **4,000 rpm** and verify that the boost pressure is within specification.

Boost pressure:
41.2—49.1 kPa (0.42—0.5 kg/cm^2, 6.0—7.1 psi)

Turbine wheel

1. Allow the engine to cool.
2. Remove the air hose.
3. Verify that the rotor assembly turns smoothly.
4. If there is excessive load or noise, replace the turbocharger.

Oil passage

1. Allow the engine to cool.
2. Remove the oil return pipe.
3. Verify that carbonized oil has not blocked the oil passage of the turbocharger or the oil return pipe.
4. If the oil passage is clogged, replace the turbocharger and return pipe as necessary.

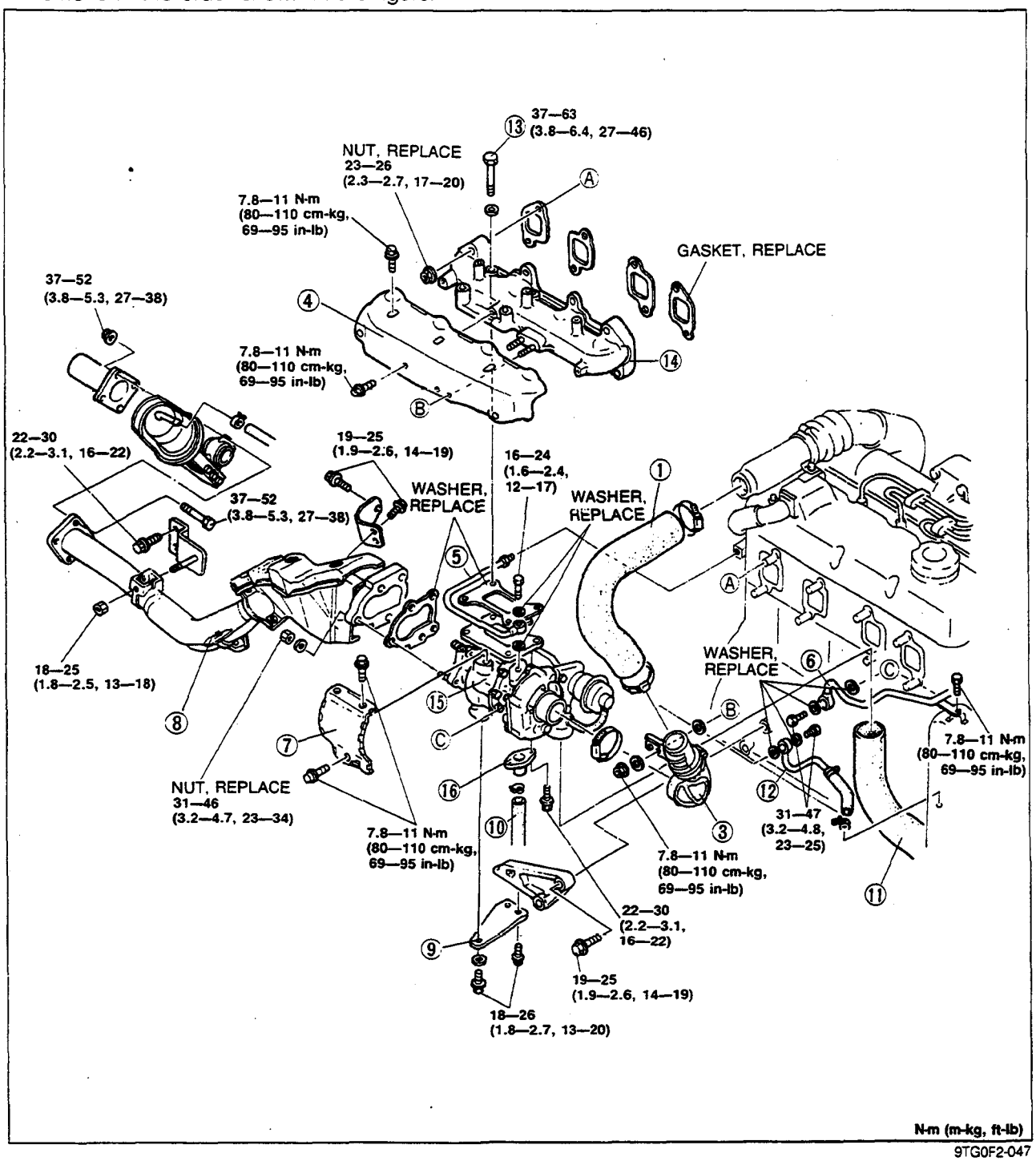
Wastegate

1. Allow the engine to cool.
2. Remove the wastegate actuator hose and attach the **SST**.
3. Adjust the compressed air pressure to **135 kPa (1.38 kg/cm^2, 19.6 psi)**.
4. Verify that the rod moves when disconnecting and reconnecting the air supply hose.

Caution
- **Do not apply more than 196 kPa (2.0 kg/cm^2, 28 psi) of air pressure.**

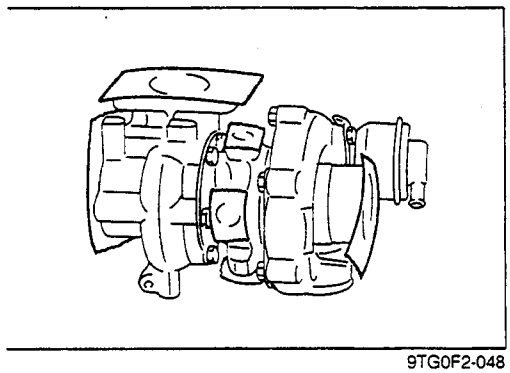
Removal

1. Drain the engine oil and coolant.
2. Remove in the order shown in the figure.

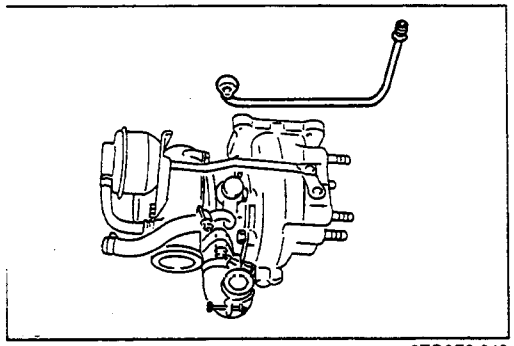


9TG0F2-047

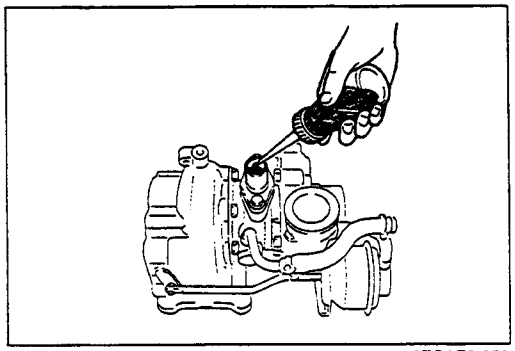
1. Air intake hose
2. Change rod bracket
3. Joint rubber
4. Heat insulator
5. Oil pipe
6. Water pipe
7. Insulator
8. Front pipe
9. Turbo bracket spring
10. Oil hose
11. Joint hose
12. Water hose
13. Stud bolt
14. Exhaust manifold
15. Turbocharger
16. Oil pipe



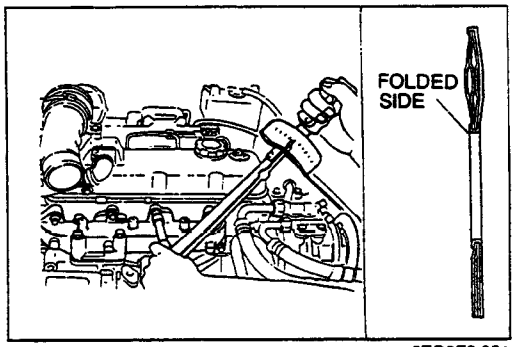
9TG0F2-048



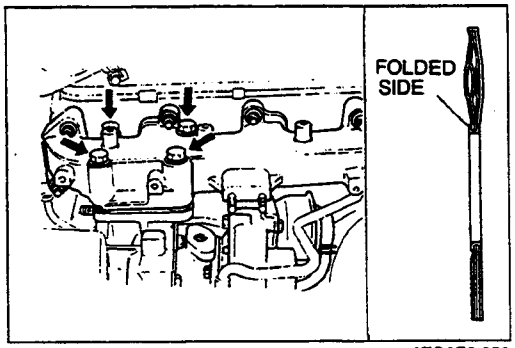
9TG0F2-049



9TG0F2-050



9TG0F2-051



9TG0F2-052

Caution

Note the following when removing, installing, and handling the turbocharger.

- **Do not drop the turbocharger.**
- **Do not bend the wastegate actuator mounting or rod.**
- **Cover the intake, exhaust, and oil passages to prevent dirt or other objects from entering.**

Inspection

After removing the turbocharger, check the oil feed pipe and oil return pipe for clogging. Replace if necessary.

Installation

1. Pour in **25 cc** of oil through the oil inlet of the turbocharger.
2. Install the exhaust manifold using a new gasket and nuts.

Note

- **Install the gasket with the folded side facing the cylinder head.**

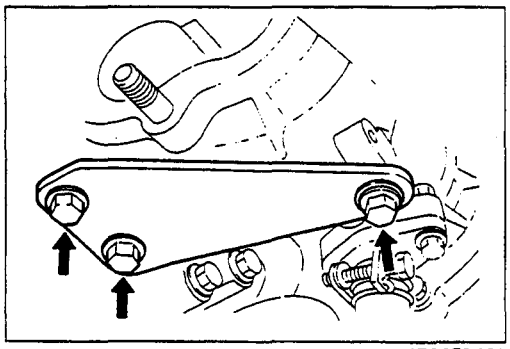
Tightening torque:
22.6—26.5 N·m (2.3—2.7 m-kg, 17—19 ft-lb)

3. Install the turbocharger and a new gasket.

Note

- **Install the gasket with the folded side facing the exhaust manifold.**

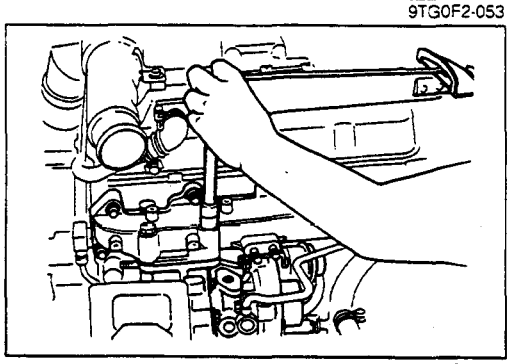
4. Loosely tighten the bolts.



9TG0F2-053

5. Install the turbocharger flex bracket.

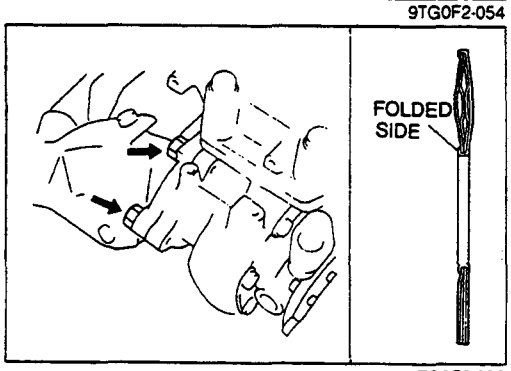
Tightening torque:
17.7—26.5 N·m (1.8—2.7 m-kg, 13—19 ft-lb)



9TG0F2-054

6. Tightening the turbocharger mounting bolts.

Tightening torque:
37.3—62.8 N·m (3.8—6.4 m-kg, 28—46 ft-lb)

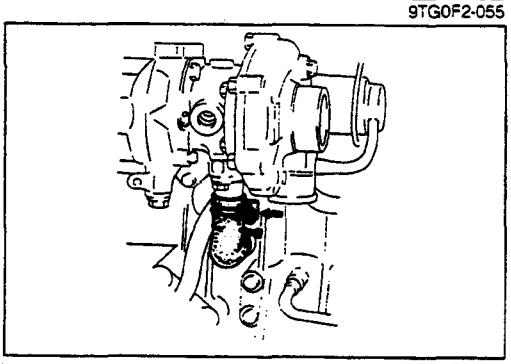


9TG0F2-055

7. Install the front exhaust pipe using a new gasket and nuts.

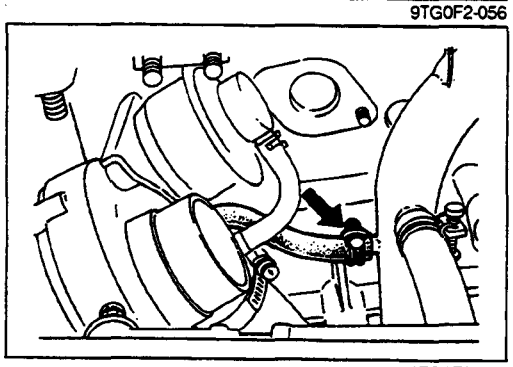
Note
- **Install the gasket with the folded side facing the turbocharger.**

Tightening torque:
37.3—62.8 N·m (3.8—6.4 m-kg, 28—46 ft-lb)



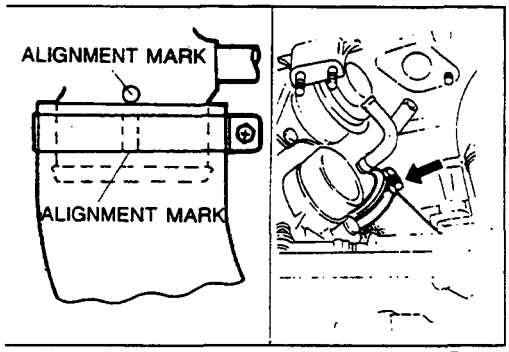
9TG0F2-056

8. Connect the oil hose.



9TG0F2-057

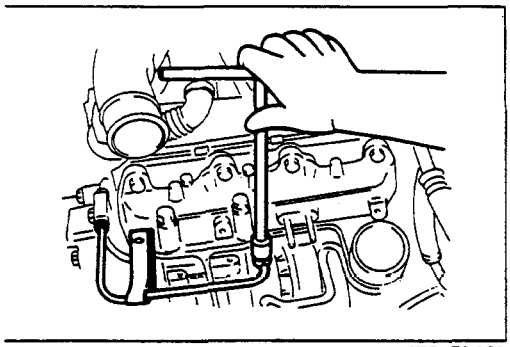
9. Connect the water hose.



9TG0F2-058

10. Connect the joint hose with the alignment mark matched, and tighten the hose clamp.

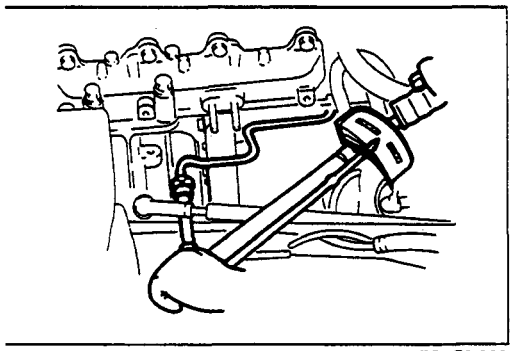
Tightening torque:
3.9—4.9 N·m (40—50 cm-kg, 35—43 in-lb)



9TG0F2-059

11. Install the oil pipe and a new washer.

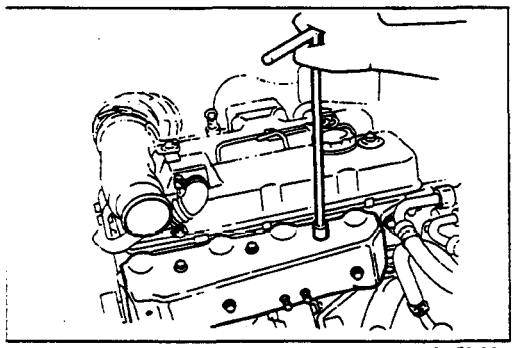
Tightening torque:
15.7—23.5 N·m (1.6—2.4 m-kg, 12—17 ft-lb)



9TG0F2-060

12. Install the water pipe and a new washer.

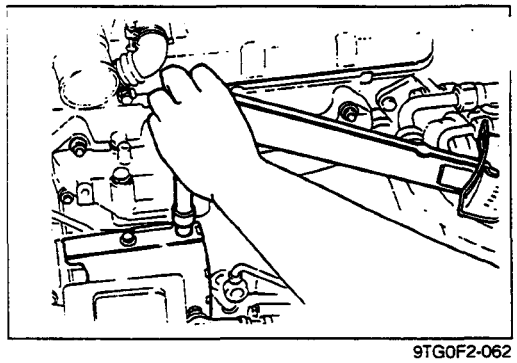
Tightening torque:
15.7—23.5 N·m (1.6—2.4 m-kg, 12—17 ft-lb)



9TG0F2-061

13. Install the exhaust manifold heat insulator.

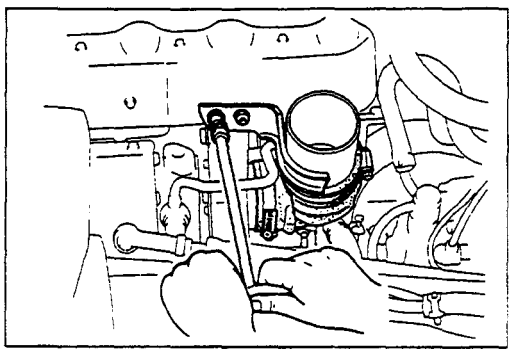
Tightening torque:
7.8—10.8 N·m (0.8—1.1 m-kg, 5.8—8.0 ft-lb)



9TG0F2-062

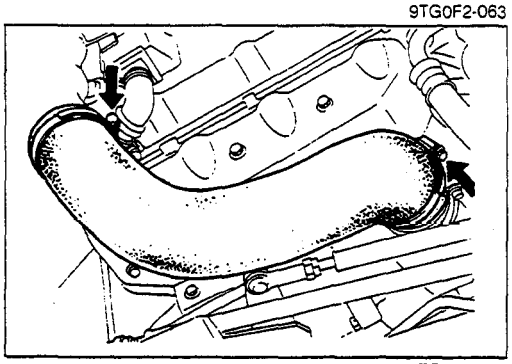
14. Install the turbocharger heat insulator.

Tightening torque:
7.8—10.8 N·m (0.8—1.1 m-kg, 5.8—8.0 ft-lb)



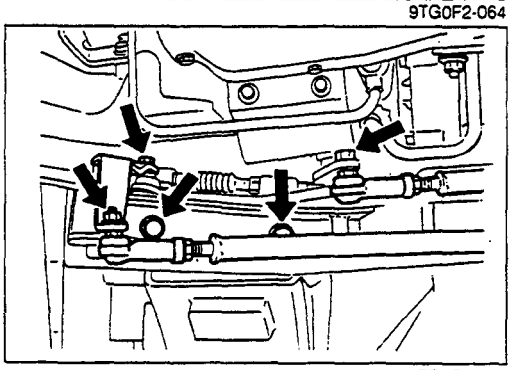
9TG0F2-063

15. Connect the joint rubber.



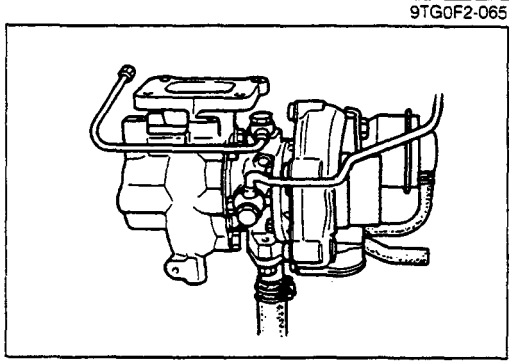
9TG0F2-064

16. Connect the air intake hose.



9TG0F2-065

17. Connect the counter lever bracket, change rod, and select rod.
18. Fill the radiator and subtank with coolant.
19. Fill the engine with the specified amount and type of engine oil. (Refer to Section D2.)



9TG0F2-066

After Installation

1. Start the engine and let it idle.
2. Check for engine oil and coolant leakage.

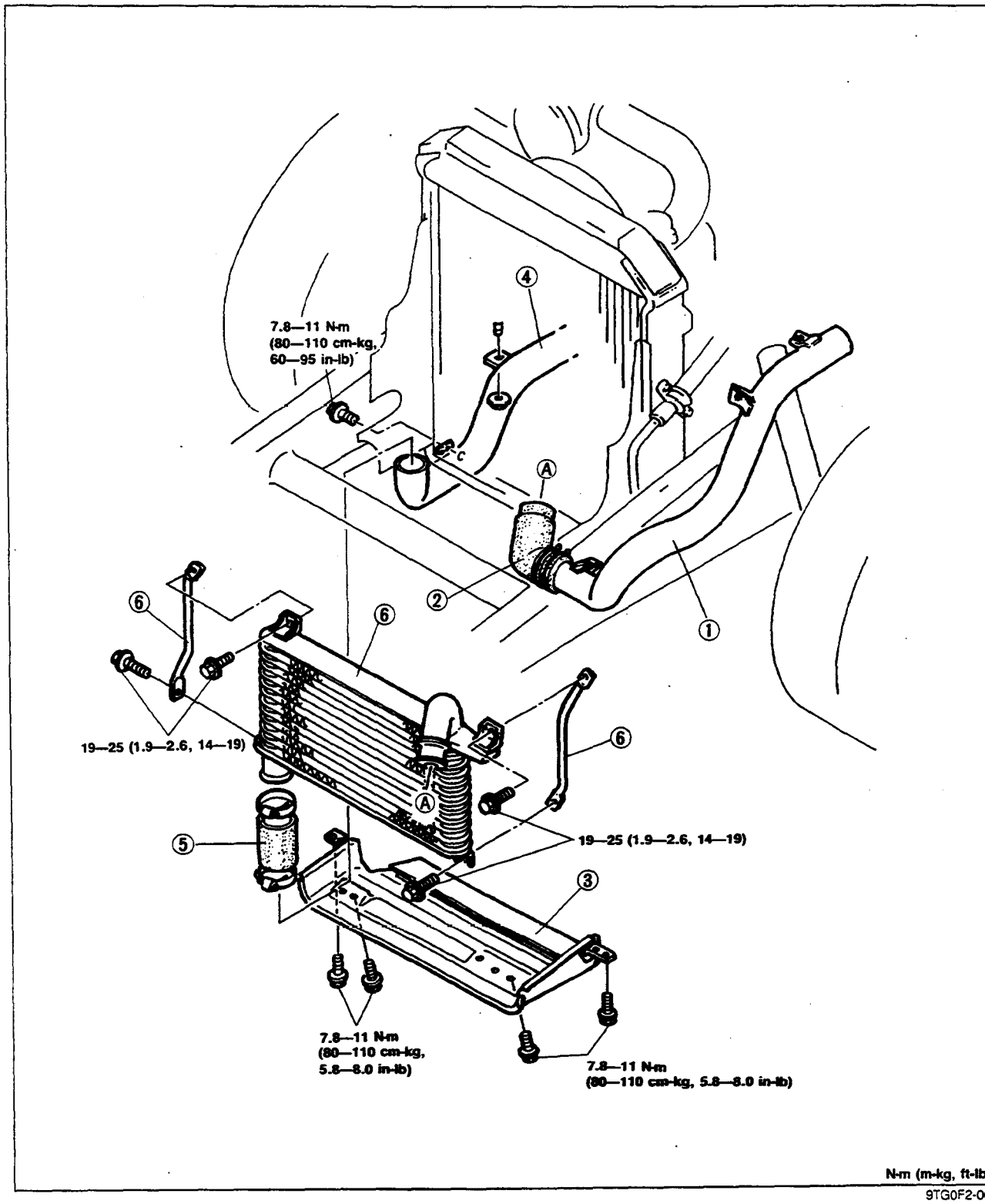
Caution

- **Let the engine idle for a few minutes to lubricate the turbocharger.**

INTERCOOLER

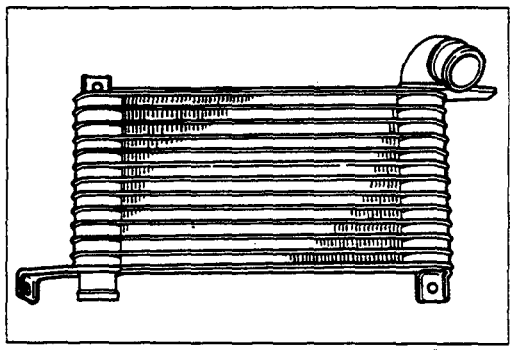
Removal / Installation

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

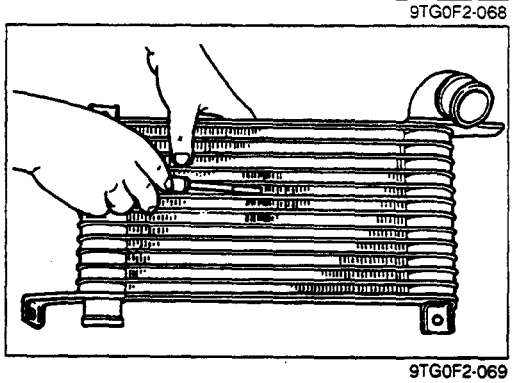


9TG0F2-067

1. Air intake pipe
2. Joint rubber (Outlet side)
3. Under cover
4. Air intake pipe
5. Joint rubber (Inlet side)
6. Intercooler, Intercooler stay



9TG0F2-068



9TG0F2-069

Inspection and Repair

1. Inspect the intercooler for cracks, restriction, or damage.

2. Repair bent fins with a screwdriver.

Caution

- **Be careful not to break the fins when repairing them.**

FUEL SYSTEM

FUEL TANK

Removal / Inspection / Installation

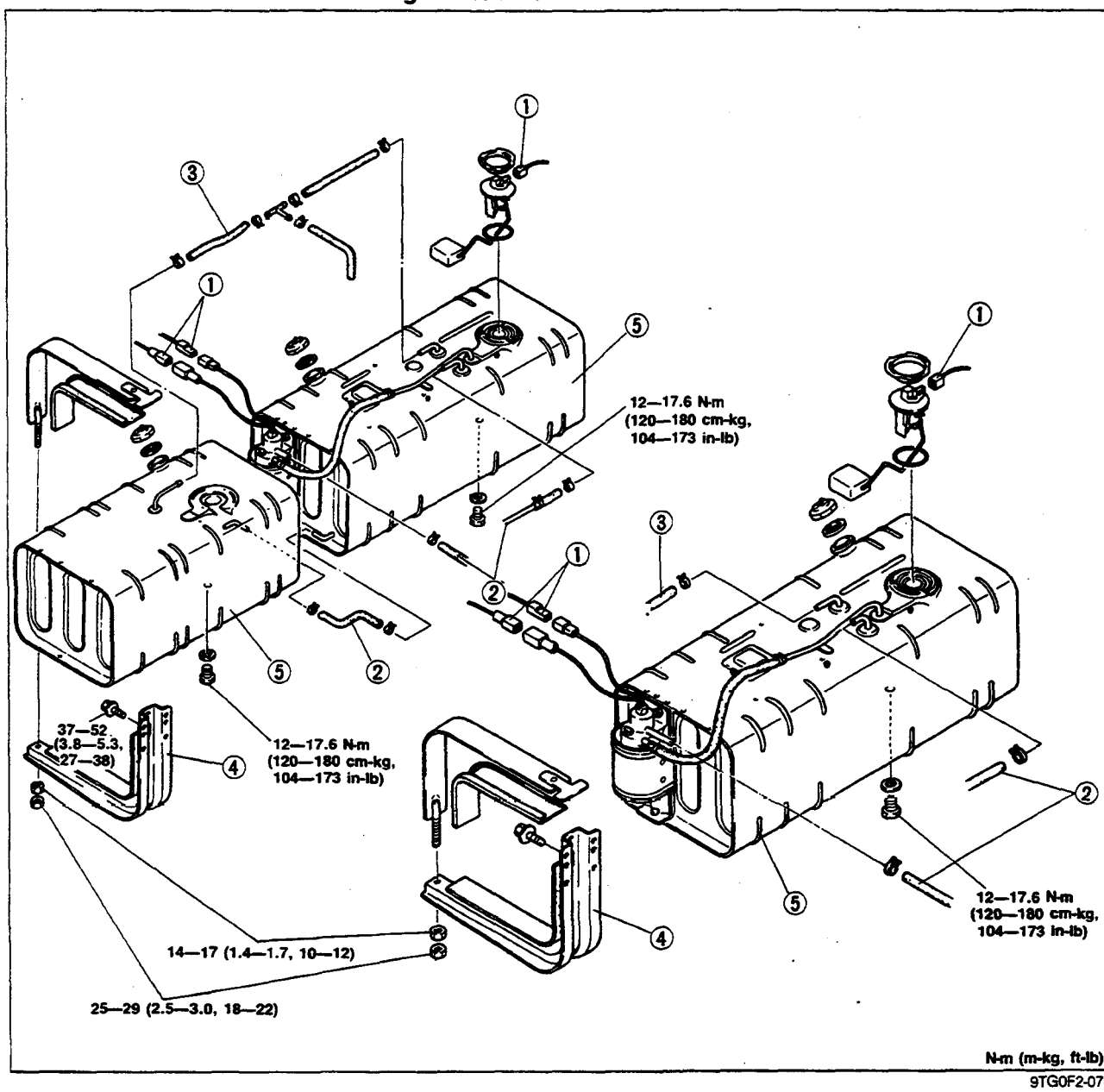
1. Remove in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal.

Warning

- **Keep sparks, cigarettes, and open flames away from the fuel tank.**

Note

- **Drain the fuel before removing the fuel tank.**



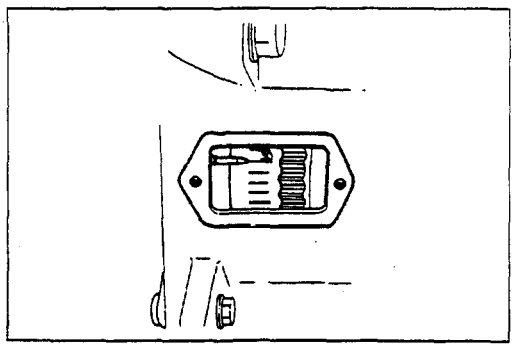
9TG0F2-070

1. Connector
2. Fuel hose
3. Evaporative hose
   Verify air flows in both directions
4. Fuel tank strap
5. Fuel tank
   Check for contamination, corrosion and other damage

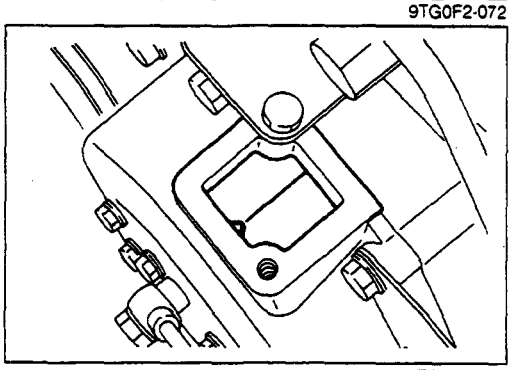
INJECTION PUMP
Removal

Note
- **The in-line type pump used on the SL and SL turbocharged engines is removed with the drive gear. When replacing the pump be sure it is properly timed.**
- **Special tools and testers are required for service of the injection pump. The pump should be serviced only by an authorized Diesel Kiki distributor.**

9TG0F2-071



9TG0F2-072



9TG0F2-073

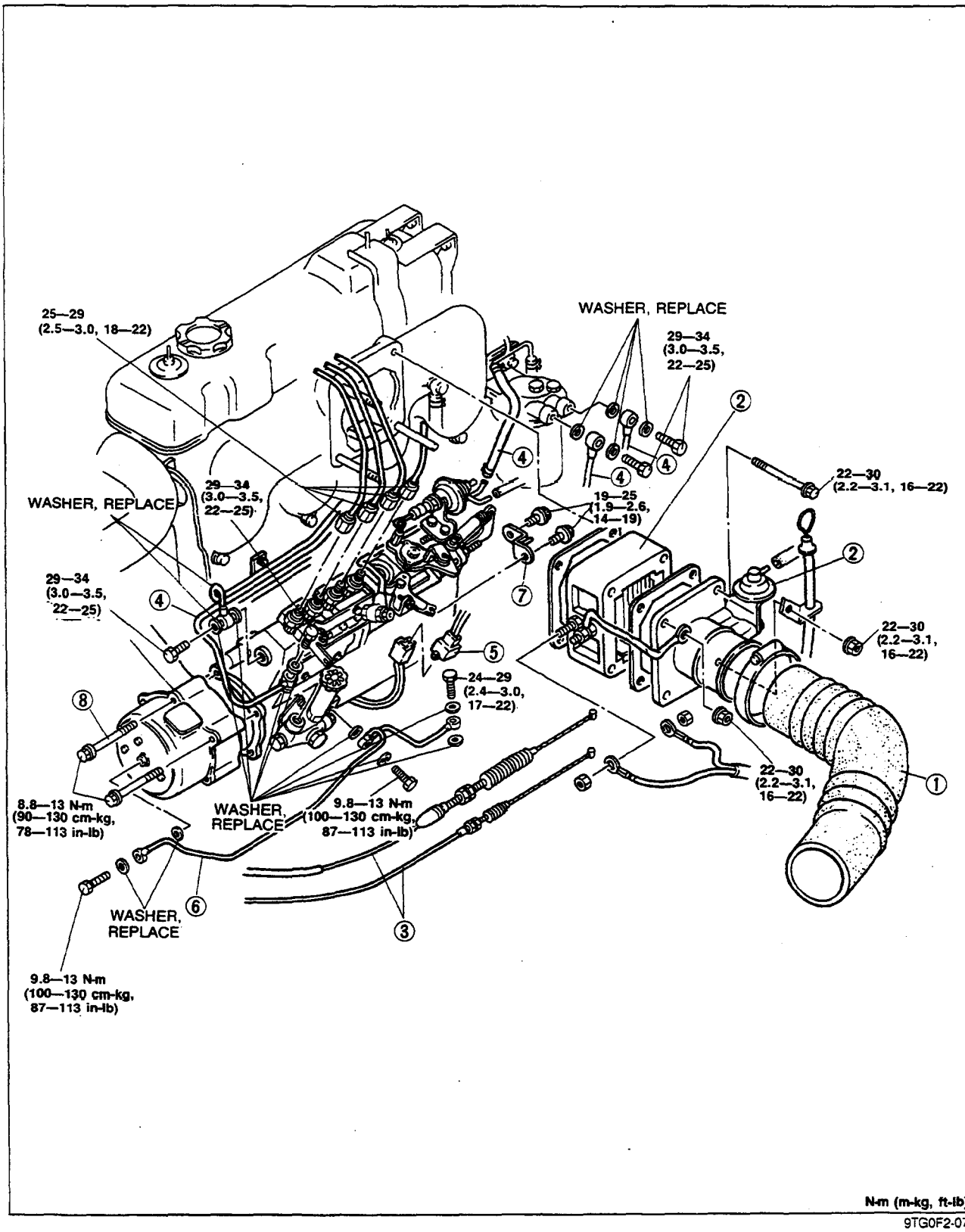
Caution
- **Before remove injection pump, perform the following.**

1. Remove the negative battery cable.
2. Remove the cover from the flywheel, and turn the flywheel until No.1 cylinder is at to 30° BTDC.
3. Remove the cover from the gear case, and confirm that the mark on the timer and the pointer are aligned.

Note
- **If they are not agreed, No.4 cylinder is at 30° BTDC.**

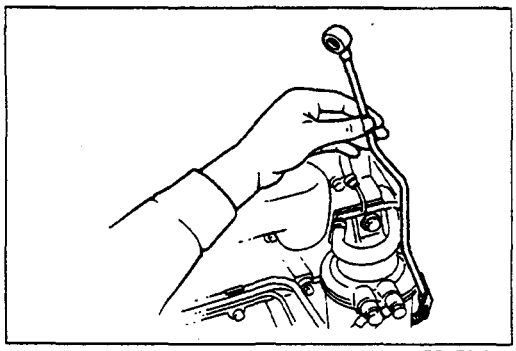
4. Remove in the order shown in the figure.
(Refer to page F2–31.)

Caution
- **Cover the intake manifold and injection pipes after removal.**
- **After removing the pump, do not turn the engine.**



9TG0F2-074

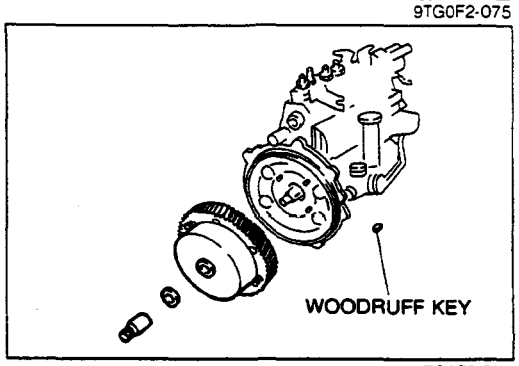
1. Air hose
2. Intake shutter valve, Air heater
3. Fuel stop cable, Accelerator cable
4. Fuel hose, Fuel pipe
   Removal Note..... page F2–32
5. Harness
6. Oil pipe
7. Bracket
8. Bolts
9. Fuel injection pump



9TG0F2-075

Removal note

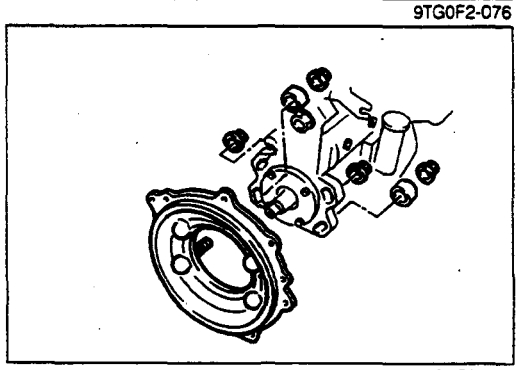
Note
- **When removing the fuel pipe from the bottom of the feed pump, remove it at the feed pump side and quickly hold the pipe up to prevent fuel leakage.**



9TG0F2-076

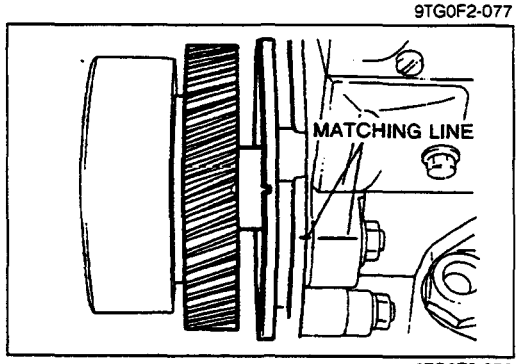
Disassembly / Assembly

1. Affix the timer in a vise and remove the timer bolt.
2. Remove the timer and gear assembly from the pump.
3. Remove the woodruff key from the pump shaft.



9TG0F2-077

4. Remove the flange plate.

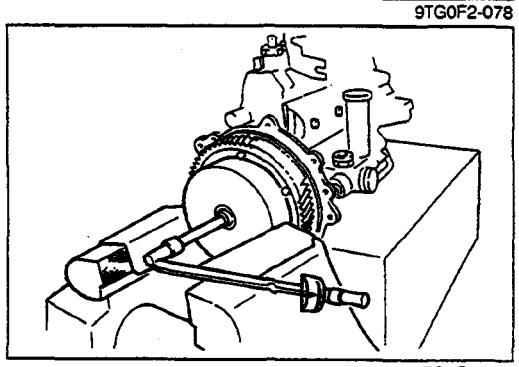


9TG0F2-078

5. Affix the pump in a vise, and install the flange plate.
6. Align the marks on the pump and flange plate, and tighten the mounting nuts.

Tightening torque:
34—39 N·m (3.5—4.0 m-kg, 25—29 ft-lb)

7. Install the woodruff key, and install the timer and gear assembly onto the pump shaft.



9TG0F2-079

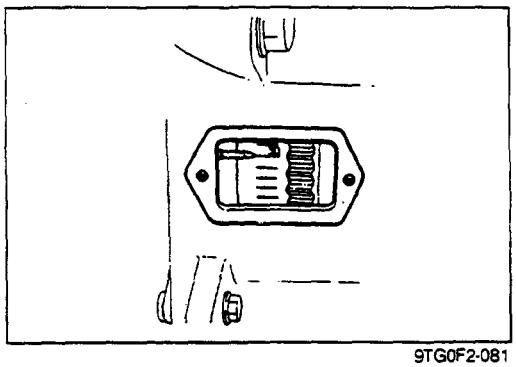
8. Affix the timer in a vise, and tighten the nut.

Tightening torque:
59—69 N·m (6.0—7.0 m-kg, 43—51 ft-lb)

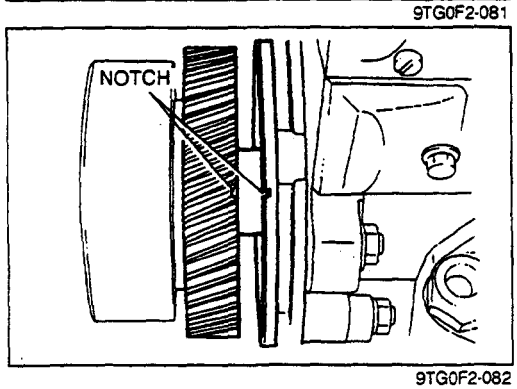
Installation

1. Install in the reverse order of removal, referring to **Installation Note**.
2. Adjust the injection timing. (Refer to page F2–14.)
3. Bleed air from the fuel system. (Refer to page F2–35.)

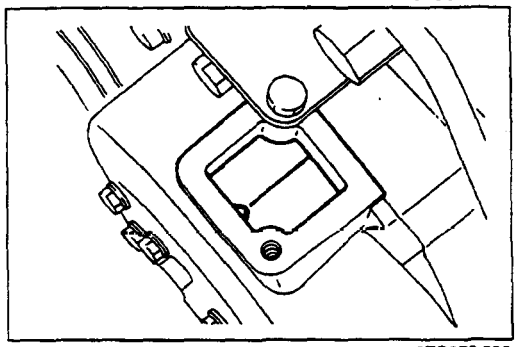
9TG0F2-080



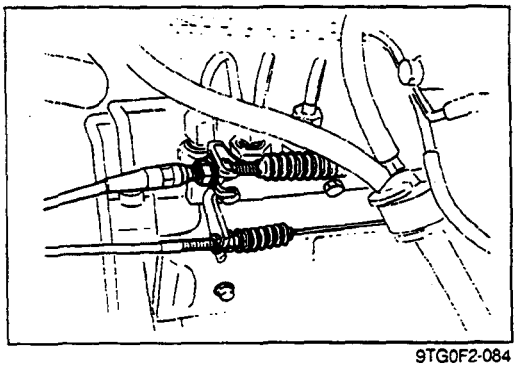
9TG0F2-081



9TG0F2-082



9TG0F2-083



9TG0F2-084

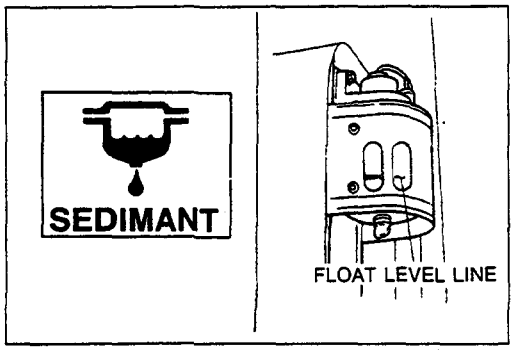
Installation note

Injection pump

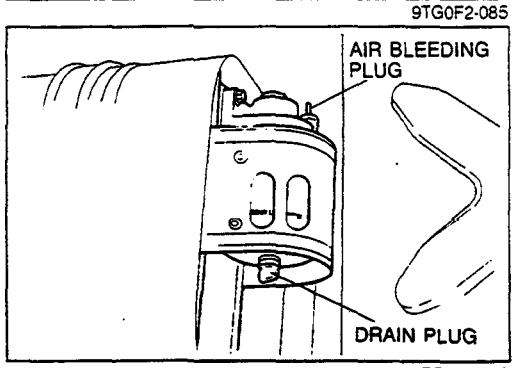
1. Before installing the injection pump, verify that No.1 cylinder is at 30° BTDC.
2. Align the notches of the flange plate and the injection pump gear.
3. Install the injection pump.
4. Verify that the mark on the timer and the tab of the timing gear case are aligned.

Accelerator cable, fuel stop cable

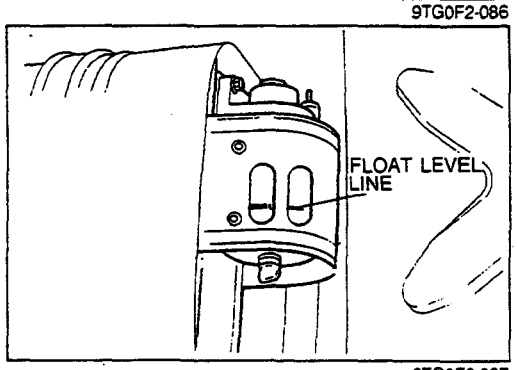
1. After installing the accelerator cable, adjust the free play of the cable. (Refer to page F2–40.)
2. After installing the fuel stop cable, adjust the free play of the cable. (Refer to page F2–41.)



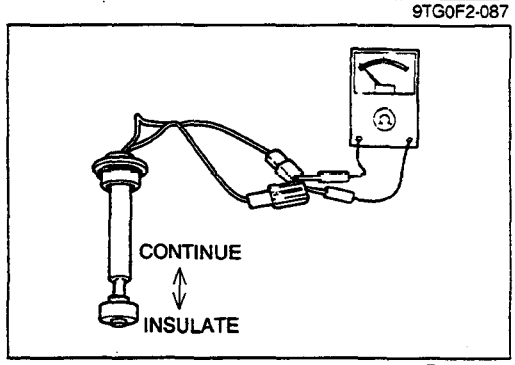
9TG0F2-085



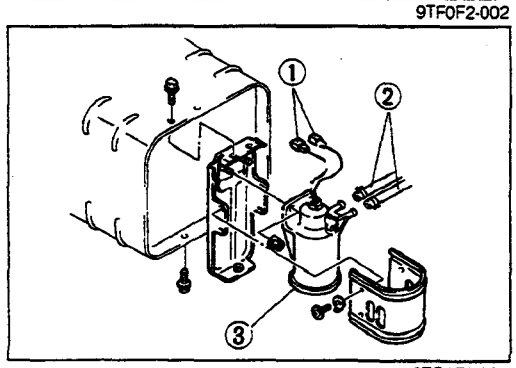
9TG0F2-086



9TG0F2-087



9TF0F2-002



9TG0F2-089

SEDIMENTOR
Draining Water

Note
- **Drain the water when the sedimentor warning light is illuminated or when the float ring has risen near the float level line.**

1. Loosen the drain plug.
2. Loosen the air bleeder plug.
3. After all of the water has been drained, install the drain plug.
4. Pump the priming pump at the fuel filter until clear (no air bubbles) fuel is expelled from the air bleeder plug. Tighten the bleeder plug.

Inspection
1. Visually check the sedimentor for damage and fuel leakage. Repair or replace it if necessary.
2. Check the position of the float ring. If the ring is near the float level line, drain the water.

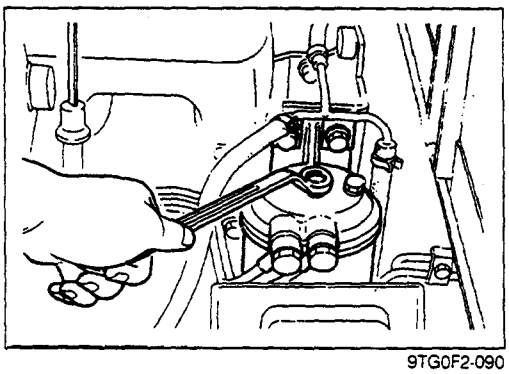
SEDIMENTOR SENSOR (DETECTOR)
Inspection
1. Remove the sedimentor sensor from the sedimentor.
2. Check continuity of the detector.

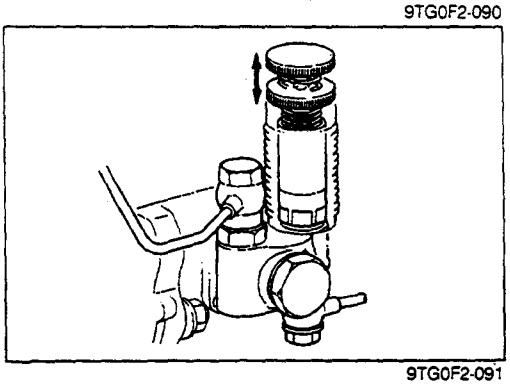
Float	Continuity
Up	Yes
Down	No

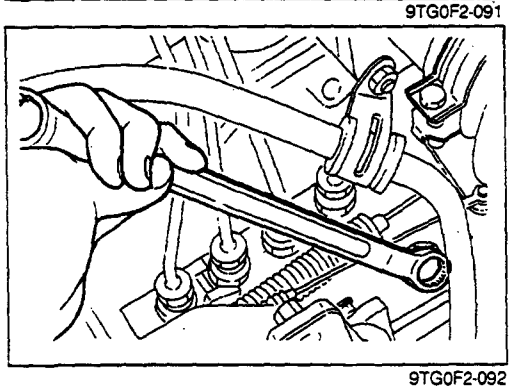
Replacement

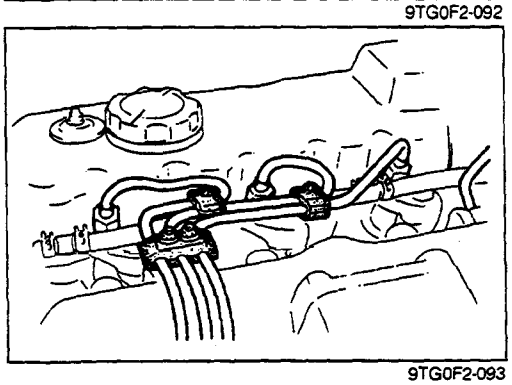
Warning
- **Keep sparks, cigarettes, and open flames away from the sedimentor.**

1. Disconnect the connectors.
2. Remove the fuel hoses.
3. Remove the sedimentor.
4. Install in the reverse order of removal.


9TG0F2-090


9TG0F2-091


9TG0F2-092


9TG0F2-093

FUEL FILTER
Air Bleeding

Warning
- **Keep sparks, cigarettes, and open flames away fro the fuel filter.**

1. Loosen the air bleeder plug.
2. Pump the priming pump until no air is expelled.
3. Tighten the air bleeder plug.

Tightening torque:
5.9—8.8 N·m (60—90 cm-kg, 52—78 in-lb)

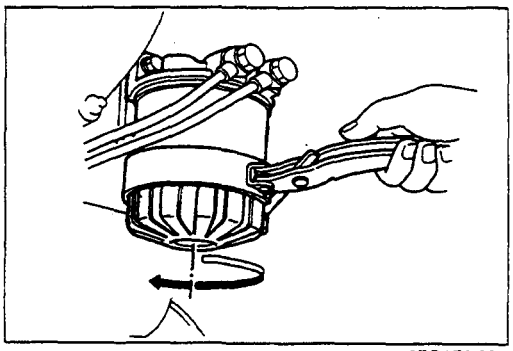
4. Loosen the return pipe at the injection pump, and pum the priming pump until no air is expelled.
5. Tighten the bolt.

Tightening torque:
12—15 N·m (120—150 cm-kg, 104—130 in-lb)

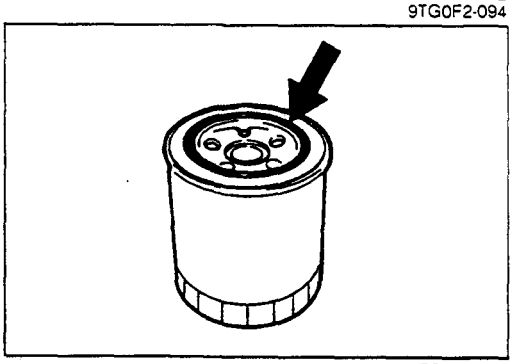
6. Push the priming pump down and tighten it.

7. Loosen the injection pipes at the injection nozzles.
8. Crank the engine, and verify that fuel is expelled from eac injection pipe.
9. Tighten the injection pipes.

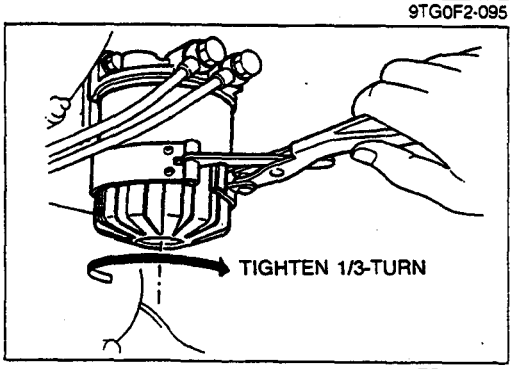
Tightening torque:
20—25 N·m (2.0—2.5 m-kg, 14—18 ft-lb)



9TG0F2-094



9TG0F2-095



9TG0F2-096

Replacement

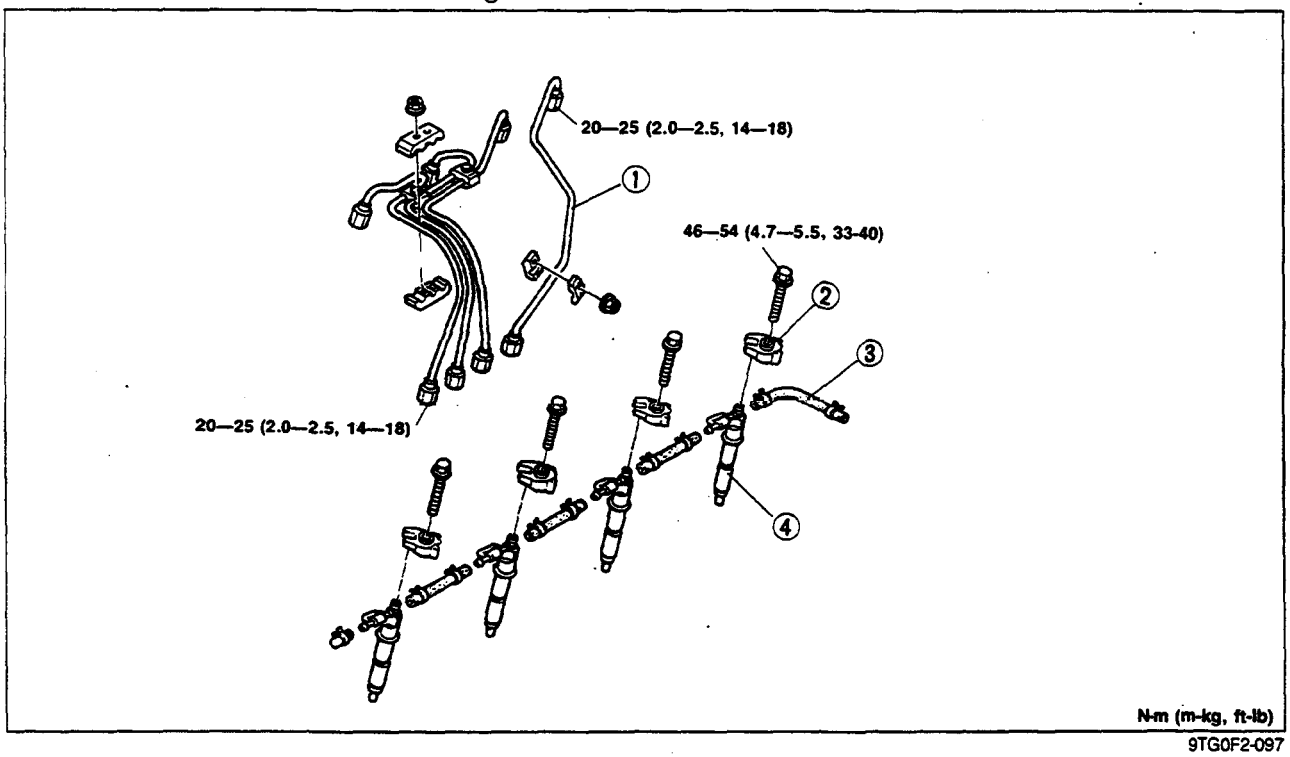
Warning
- **Keep sparks, cigarettes and open flames away from the fuel filter.**

1. Remove the filter with a filter wrench.
2. Apply fuel to the O-ring.
3. Install the filter and tighten by hand, then tighten with filter wrench an additional 1/3-turn.
4. Bleed air from the filter. (Refer to page F2–35.)
5. Start the engine, and verify that there is no fuel leakage around the filter.

INJECTION NOZZLE
Removal

Warning
- **Keep sparks, cigarettes, and open flames away from the fuel area.**

1. Remove the negative battery cable.
2. Remove in the order shown in the figure.



9TG0F2-097

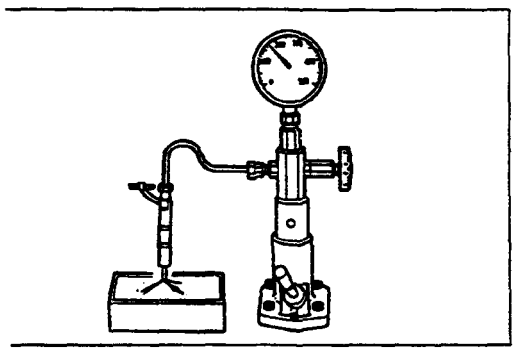
1. Injection pipe
2. Nozzle holder bracket
3. Fuel return hose
4. Injection nozzle

Inspection

Warning
- **Do not allow your hands or any other part of the body to come into the direct path of the fuel spray when using the nozzle tester because the spray has enough force to break the skin and possibly cause blood poisoning.**

Caution
- **The nozzle tester should be set up in a clean work place.**

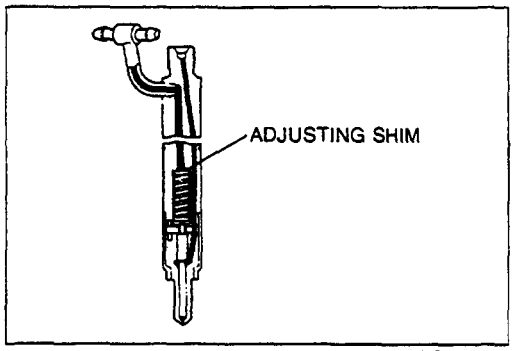
9TG0F2-098



9TG0F2-099

Injection starting pressure
1. Connect the nozzle to a nozzle tester.
2. Pump the nozzle tester handle and note the pressure when injection is started.

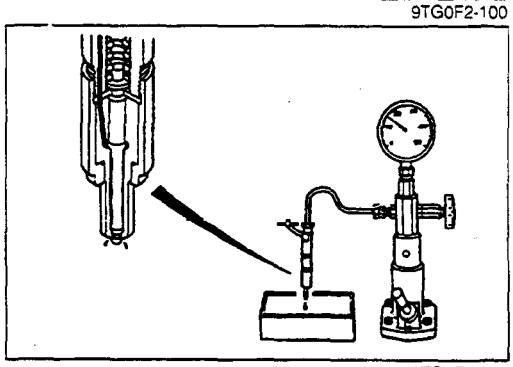
Injection starting pressure
New nozzle : 17,168 kPa (175 kg/cm^2, 2,489 psi)
Used nozzle: 16,677 kPa (170 kg/cm^2, 2,417 psi)



9TG0F2-100

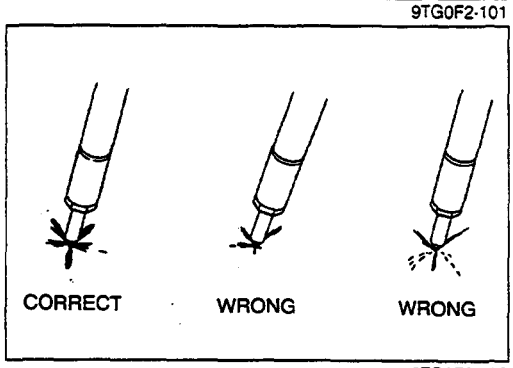
3. If not within the specified pressure, adjust the starting pressure by adding or removing shims.

Note
- **Shims 0.06 are available in 0.05mm (0.002 in) steps, from 0.5 to 1.5mm (0.02 to 0.06 in). Changing shim thickness by 0.05mm (0.002 in), changes the injection pressure approx. 491 kPa (5.0 kg/cm^2, 71 psi).**



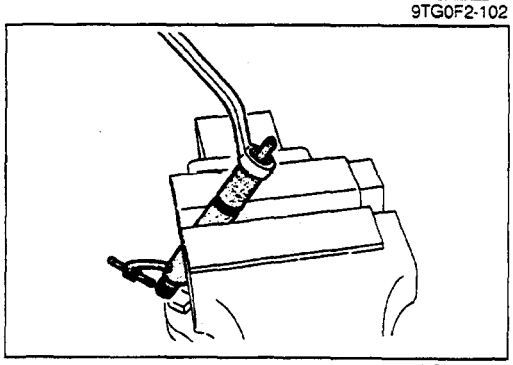
9TG0F2-101

Leakage of injector
Apply pressure 4,715 kPa (150 kg/cm^2, 2,133 psi) and see if the fuel leaks from the nozzle injection hole.
If the fuel leaks, it is necessary to disassemble, wash and recheck the nozzle or replace it.



9TG0F2-102

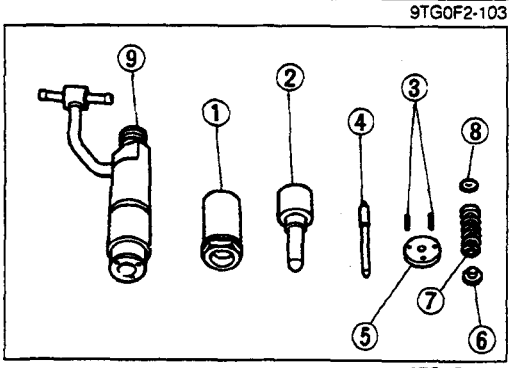
Atomizing condition
1. Connect the nozzle on the nozzle tester.
2. Air bleed by operating the nozzle tester handle several times.
3. Keeping the pressure gauge of the nozzle tester in the non-functioning condition, quickly lower the handle (lower the handle as quickly as possible so that a pulsating whistling sound can be hard). Repeat this operation several times and check the atomizing condition.
4. Make sure that the fuel is atomized uniformly and properly.



9TG0F2-103

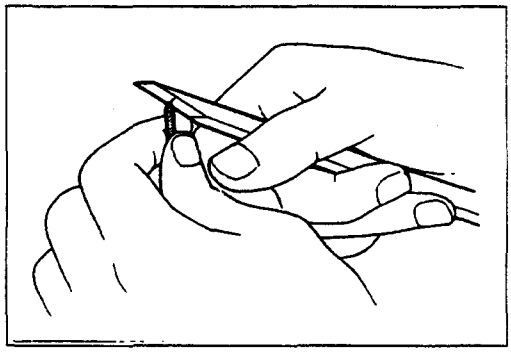
5. Make sure that the injection angle and direction are normal.
6. If the atomizing condition is incorrect, it is necessary to disassemble, wash and recheck the nozzle, or to replace it.

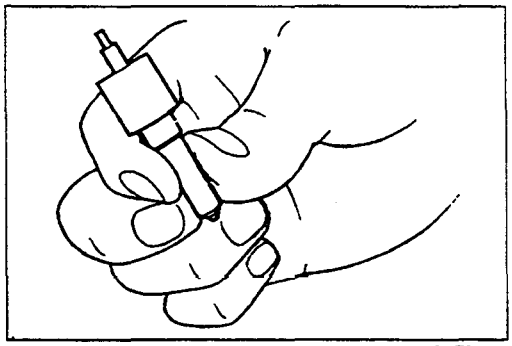
Disassembly
1. Clamp the nozzle in a vise as shown in the figure.

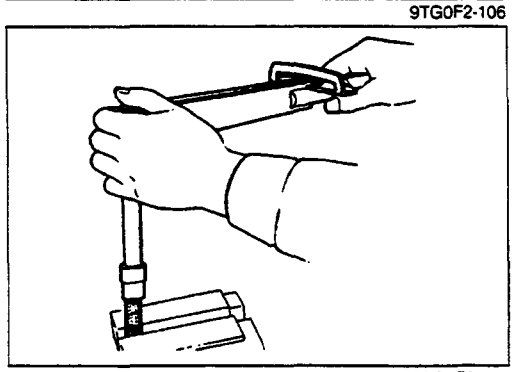


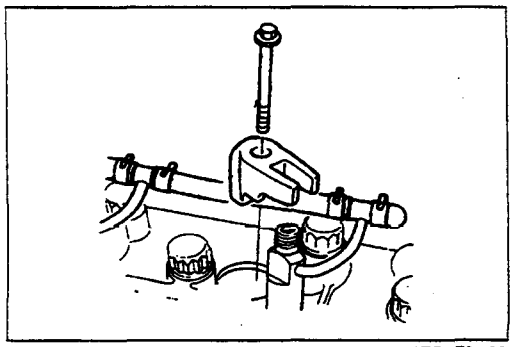
9TG0F2-104

2. Disassemble as shown in the figure.
   ①Retaining ring
   ②Nozzle body
   ③Guide pin
   ④Needle valve
   ⑤Distance piece
   ⑥Pressure pin
   ⑦Pressure spring
   ⑧Shim
   ⑨Nozzle holder


9TG0F2-105


9TG0F2-106


9TG0F2-107


9TG0F2-108

Cleaning
1. Clean the nozzle with new fuel.
2. Clean the carbon fixed on nozzle with a hard lumber.
3. Inspect for damaged or pitted parts, repair or replace as necessary.

4. Verify that the nozzle body is not damaged.
   Hold the nozzle body upright and insert the needle valve approximately two-thirds of the way into the body. Verify that the needle valve drops into the body under it's own weight when released.

Assembly
1. Assemble in the reverse order of disassembly.

   Tightening torque:
   29—39 N·m (3.0—4.0 m-kg, 22—29 ft-lb)

2. Retest the nozzle after assemble.
   (Refer to page F2–37.)

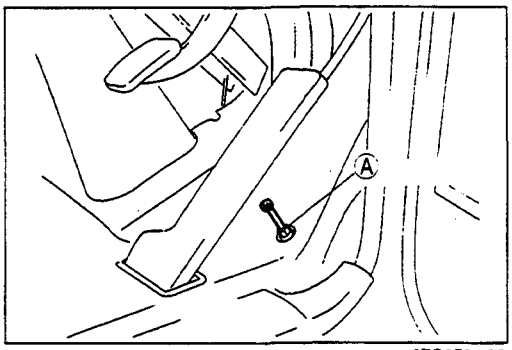
Installation

Caution
- **Use new gaskets and O-rings.**

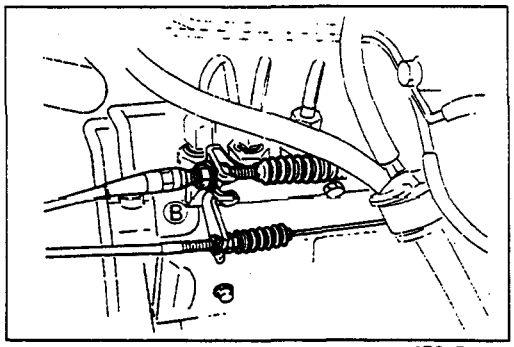
1. Install in the reverse order of removal.

   Tightening torque
   Retainer bolt:
   46—54 N·m (4.7—5.5 m-kg, 34—40 ft-lb)
   Nozzle nut:
   20—25 N·m (2.0—2.5 m-kg, 14—18 ft-lb)

2. Run the engine and check for fuel leakage.



9TG0F2-109



9TG0F2-110

ACCELERATOR PEDAL, ACCELERATOR CABLE

Inspection / Adjustment

1. Verify that the control lever of the injection pump is in the full-open position when the accelerator pedal is fully depressed.
2. Loosen nut A and adjust the stop bolt, if necessary.

Tightening torque:
6.9—9.8 N·m (70—100 cm-kg, 61—87 in-lb)

3. Check the free play of the accelerator cable.

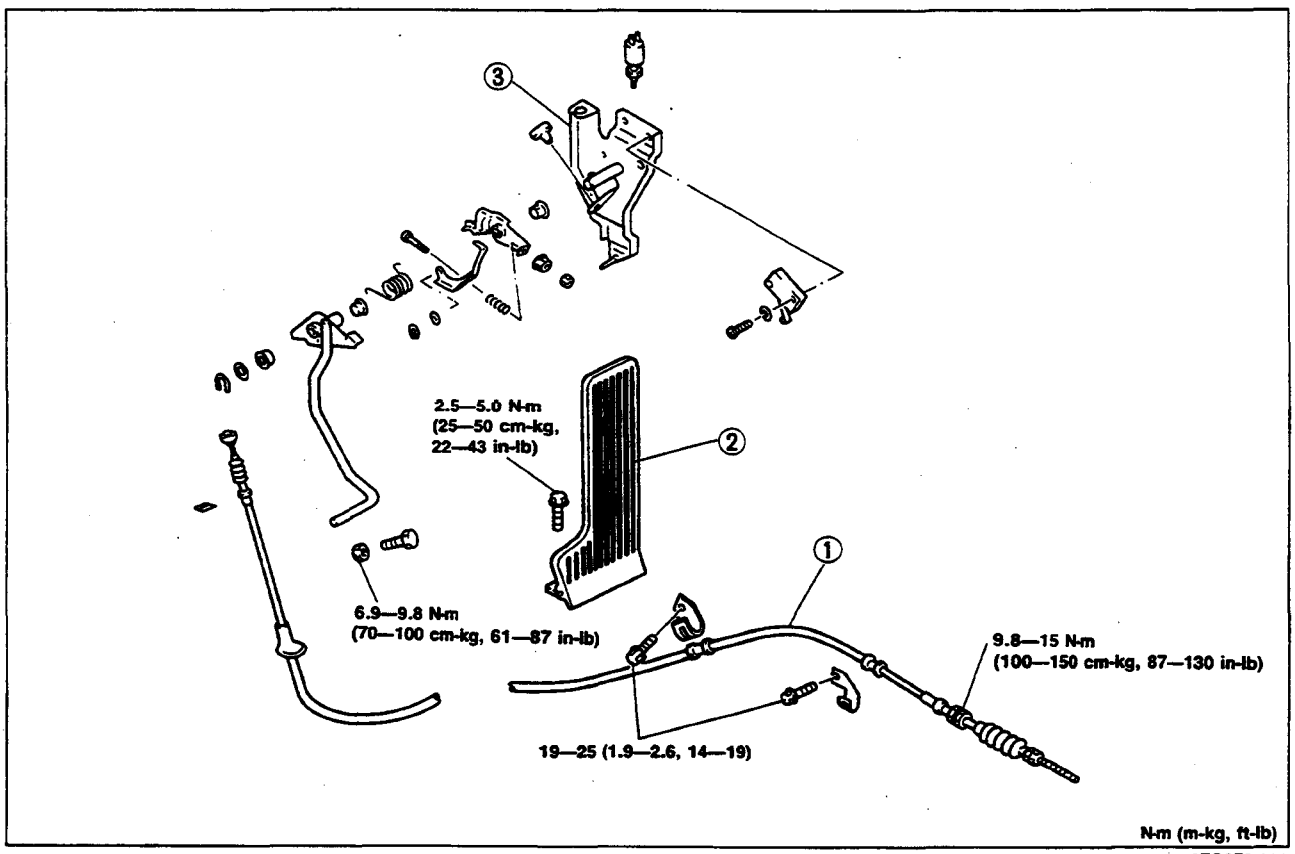
Free play: 1.0—3.0mm (0.039—0.12 in)

4. Adjust nuts B if necessary.

Tightening torque:
9.8—15 N·m (100—150 cm-kg, 87—130 in-lb)

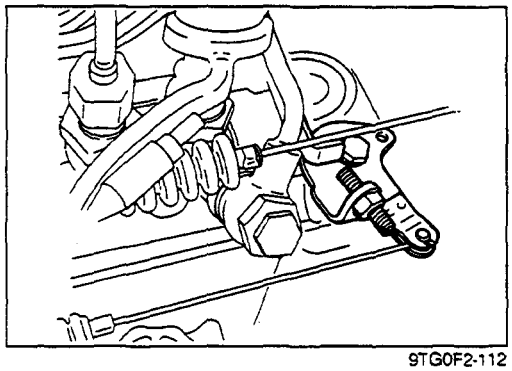
Removal / Installation

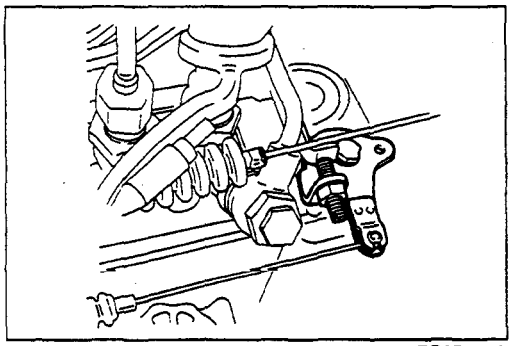
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.

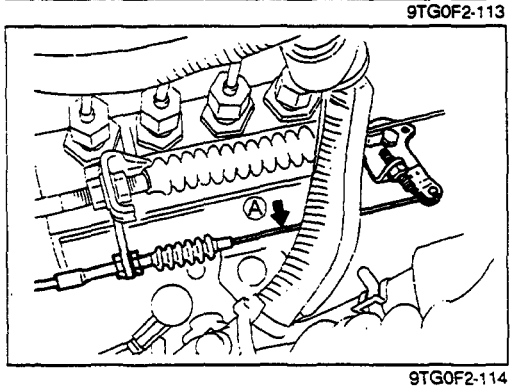


9TG0F2-111

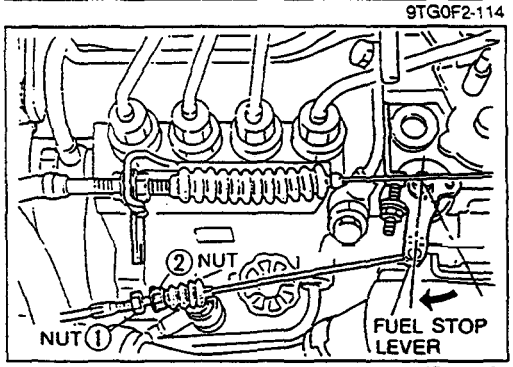
1. Accelerator cable
2. Accelerator pedal
3. Bracket


9TG0F2-112

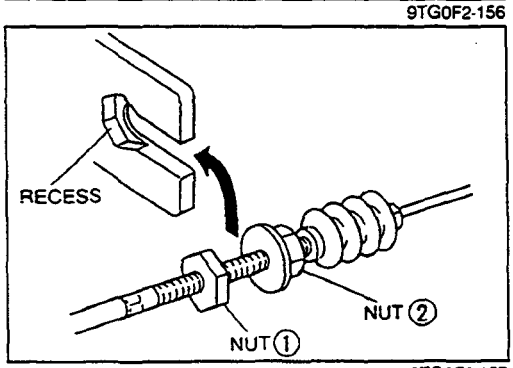

9TG0F2-113



9TG0F2-114



9TG0F2-156



9TG0F2-157

FUEL CUT CONTROL SYSTEM

SYSTEM OPERATION

1. Turn the engine switch OFF and verify that the stop lever is at the fuel stop position.
2. Turn the engine switch ON and verify that the stop lever is at the fuel inject position.
3. Run the engine.
4. Turn the engine switch OFF and be sure the engine will stop.

FUEL STOP CABLE

Inpection

1. Check the cable for damage or rust.
2. Turn the engine switch OFF.
3. Move the fuel stop lever to make the fuel line close.
4. Check the free play of cable in condition of tensed Ⓐ position of the fuel stop cable.

   Free play: 0—2mm (0—0.078 in)

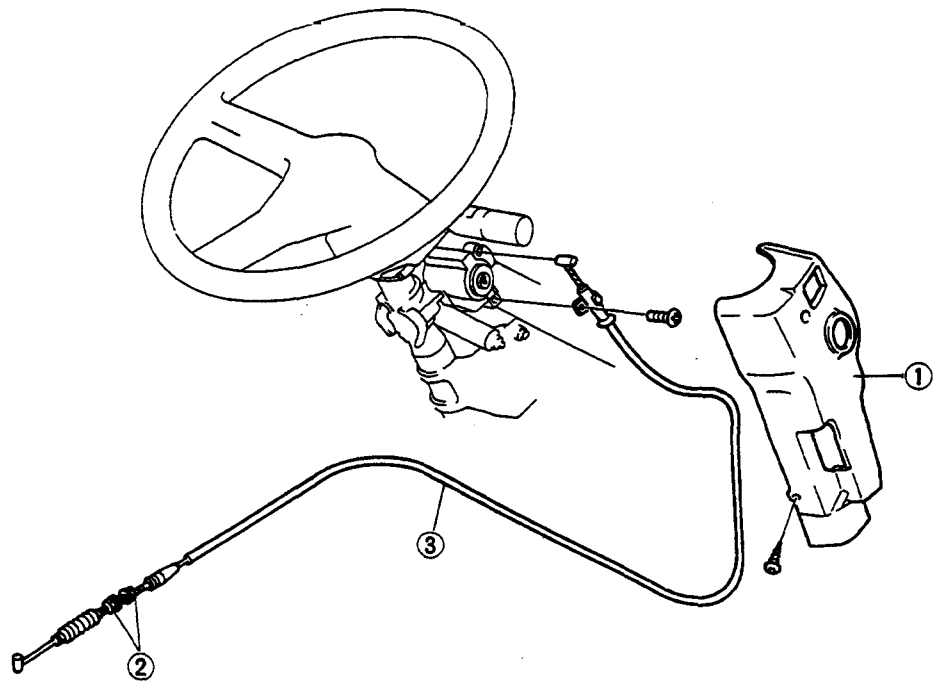
5. Verify that the engine stops when turn the engine switch OFF.
6. If not as specified, adjust the cable as follows.

Adjustment

1. Turn the engine switch OFF.
2. Loosen nut ② and remove the fuel stop cable from the bracket.
3. Pull the fuel stop cable and verify that the fuel stop lever is at the fuel stop position.
4. Adjust nut ① so that there is no clearance between it and the outside of the bracket.
5. Install the cable into the bracket, fitting nut ① into the recess.
6. Check the free play of the cable as above.
7. If not as specified perform steps 2—5 again.
8. If as specified, tighten nut ②.
9. Verify that the engine stops when turning the engine switch OFF.

Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Adjust the free play of the fuel stop cable.

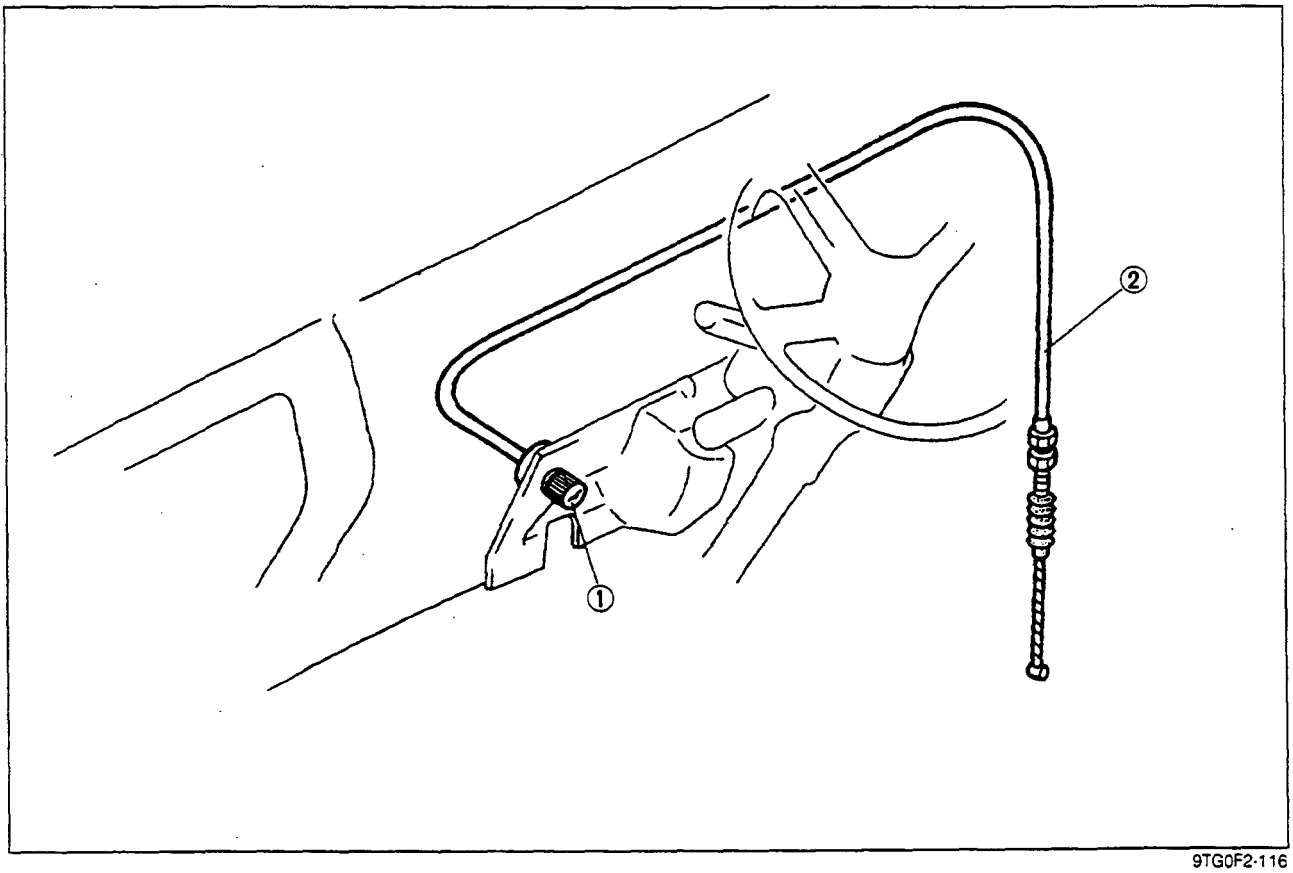


9TG0F2-115

1. Steering column cover
2. Locknuts
3. Fuel stop cable

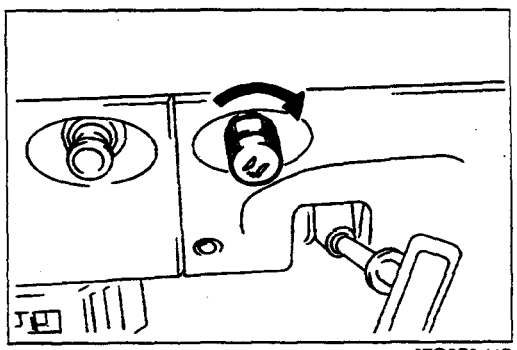
IDLE SPEED CONTROL SYSTEM

STRUCTURAL VIEW

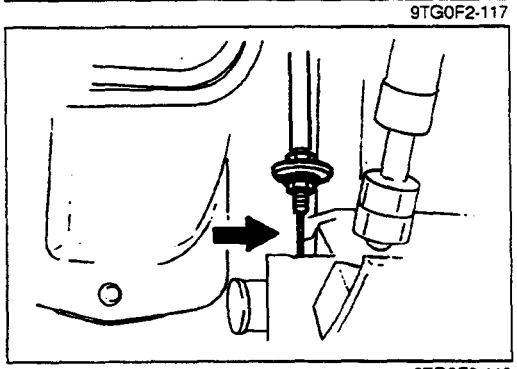


9TG0F2-116

1. Idling knob
   Removal / Installation ..... page F2–44
2. Idling cable
   Adjustment ..... page F2–43
   Removal / Installation ..... page F2–44



9TG0F2-117



9TG0F2-118

IDLING KNOB, IDLING CABLE

Adjustment

1. Verify that the control lever of the injection pump is at the idle position when the idling knob is not turned.
2. Verify that the idle speed increases when the knob is turned clockwise.
3. Check the free play of the cable when the idling knob is not turned.

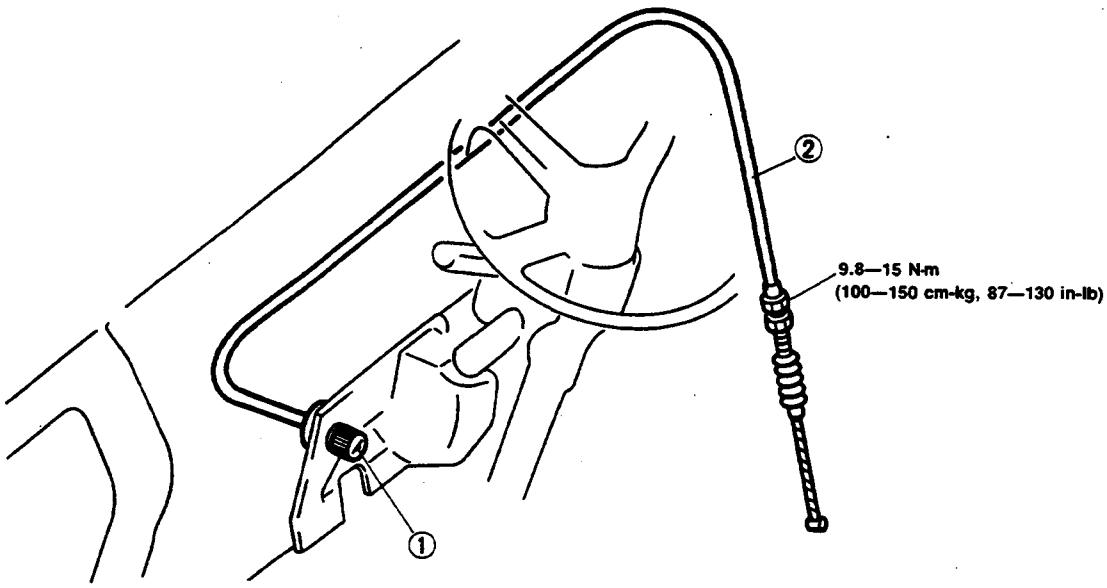
   Free play: 0—5mm (0—0.2 in)

4. If not specified, loosen the locknuts and adjust the free play.

   Tightening torque:
   9.8—15 N·m (100—150 cm-kg, 87—130 in-lb)

Removal / Installation

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



9TG0F2-119

1. Idling knob
2. Idling cable

EXHAUST SYSTEM

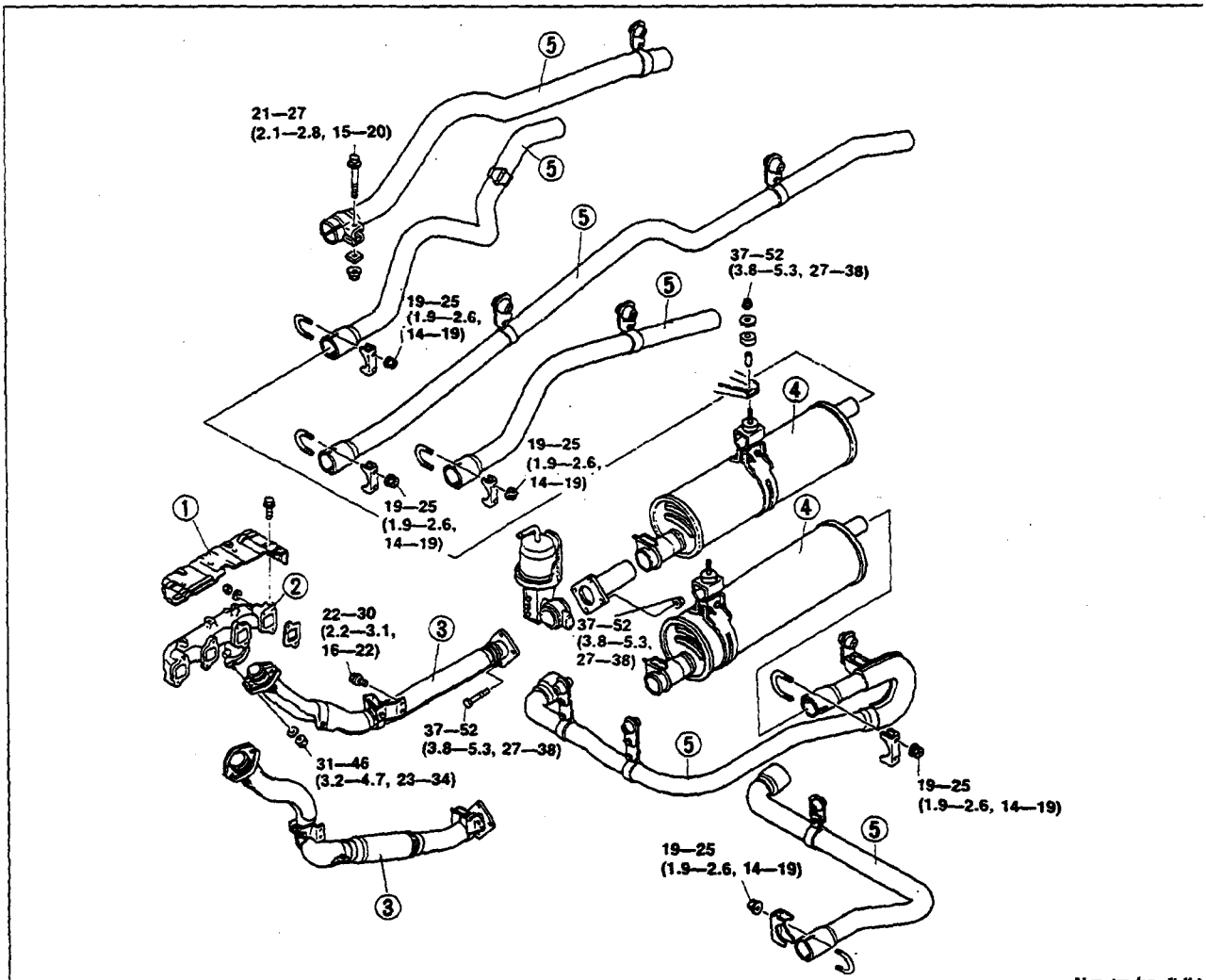
COMPONENTS

Vehicle Inspection

1. Run the engine and verify that there is no exhaust leakage.

Removal / Inspection / Installation

1. Removal 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.

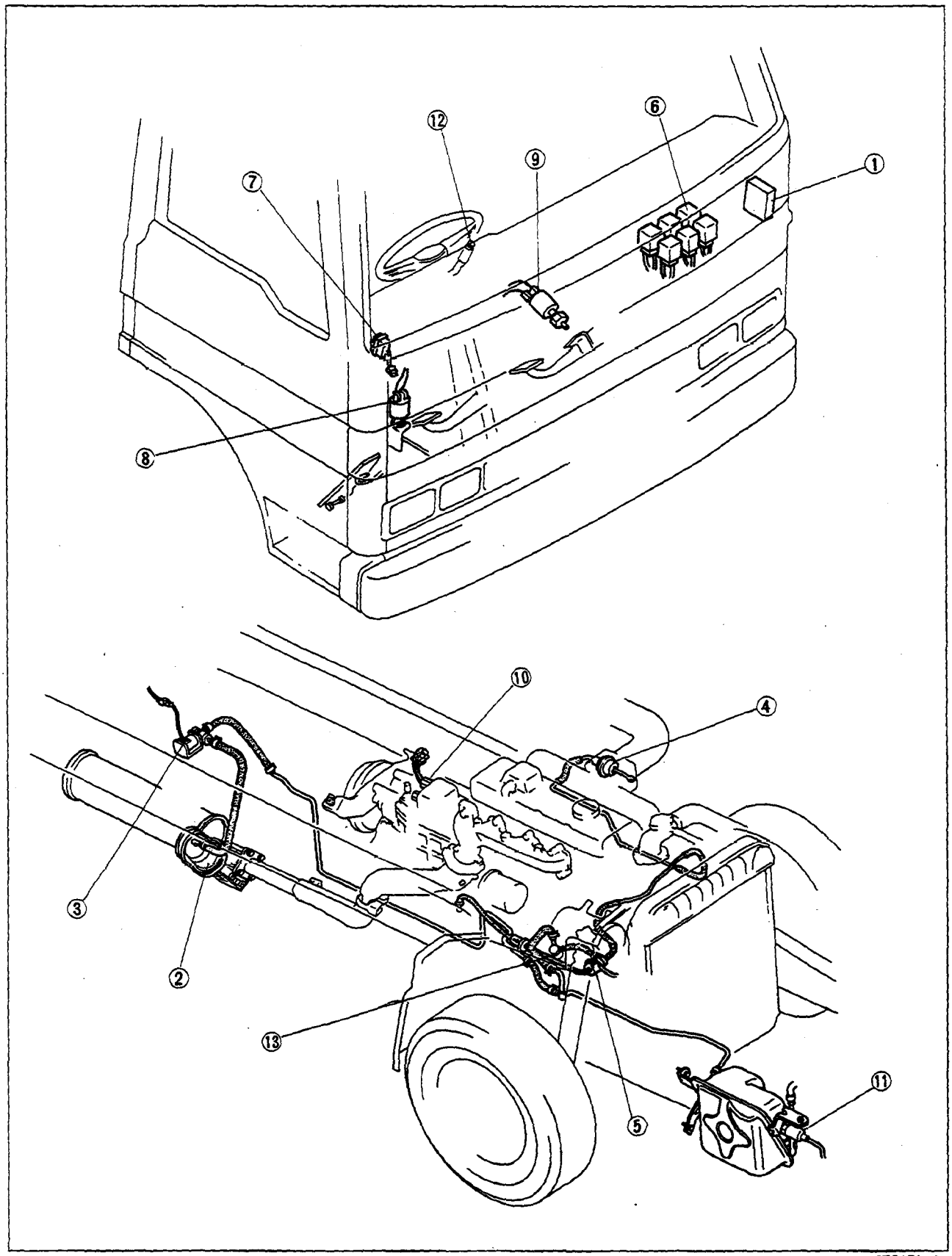


9TG0F2-12

1. Exhaust manifold insulator (SL engine only)
   SL turbocharged engine,
   refer to page F2–22
2. Exhaust manifold (SL engine only)
   Check for contamination, cracks and other damage
   SL turbocharged engine,
   refer to page F2–22
3. Front pipe assembly (SL engine only)
   Check for contamination, cracks and other damage
   SL turbocharged engine,
   refer to page F2–22
4. Main silencer
   Check for contamination, cracks and other damage
5. Tail pipe assembly
   Check for contamination, cracks and other damage

EXHAUST CONTROLLED HEATING SYSTEM

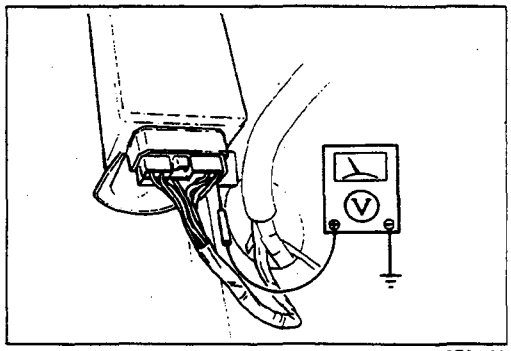
STRUCTURAL VIEW



9TG0F2-121

1. Exhaust heating control unit
Inspection ..... page F2–48
Replacement..... page F2–49
2. Exhaust brake unit
Removal..... page F2–49
Inspection ..... page F2–49
Installation..... page F2–50
3. Magnetic valve (for exhaust shutter valve)
Removal..... page F2–50
Inspection ..... page F2–50
Installation..... page F2–50
4. Intake shutter valve actuator
Inspection ..... page F2–51
Replacement..... page F2–51
5. Solenoid valve (for intake shutter valve)
Inspection ..... page F2–52
6. Cancel relay (pay load above 3.5t only)
Removal..... page F2–52
Inspection ..... page F2–52
Installation..... page F2–52
7. Exhaust heating switch
Removal..... page F2–5
Inspection ..... page F2–5
Installation..... page F2–5
8. Accelerator switch
Inspection ..... page F2–5
Replacement..... page F2–5
9. Clutch switch
Inspection ..... page F2–5
Replacement..... page F2–5
10. Neutral switch
Inspection ..... page F2–5
Replacement..... page F2–5
11. Vacuum switch (pay load above 3.5t only)
Inspection..... Section T
12. Exhaust brake switch
Inspection ..... page F2–5
13. Vacuum pump
Removal..... Section F
Inspection..... Section F
Installation..... Section F

9TG0F2-122



9TG0F2-123

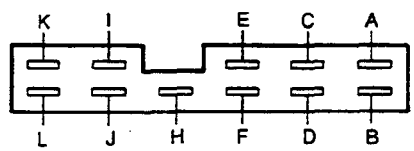
EXHAUST HEATING CONTROL UNIT

Inspection

1. Measure the terminal voltage of the exhaust heating control unit when the vacuum switch connector disconnected.
2. If not as specified repair the wire harness or replace the control unit.

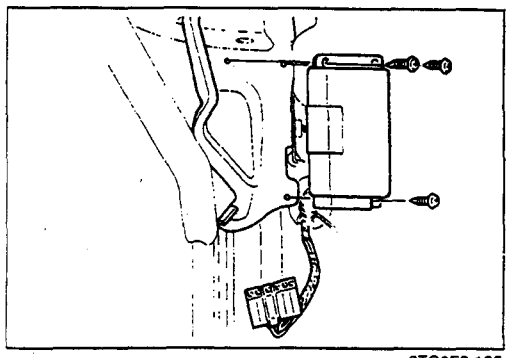
Terminal	Colour of wire	Connected to	Conditions of measuring (engine switch ON)	Voltage	Possible cause
A	BR	Exhaust heating switch	Exhaust heating switch OFF	Approx. 12V	Exhaust heating switch (Refer to page F2–53) Wire harness
			Exhaust heating switch ON	Approx. 0V	
B	R/L	Clutch switch	Accelerator and clutch pedal released	Approx. 0V	Clutch switch (Refer to page F2–54) Accelerator switch (Refer to page F2–53) Wire harness
			Accelerator or clutch pedal depressed	Approx. 0V	
C	—	—	—	—	—
D	L/Y	Neutral switch	Neutral	Approx. 12V	Neutral switch (Refer to page F2–54) Wire harness
			In gear	Approx. 0V	
E	O	Exhaust brake switch	Exhaust brake switch OFF	Approx. 12V	Exhaust brake switch (Refer to page F2–55) Wire harness
			Exhaust brake switch ON	Approx. 0V	
F	B/Y, L/W*	Exhaust brake switch Exhaust heating switch	Constant	Approx. 12V	Exhaust brake switch (Refer to page F2–55) Exhaust heating switch (Refer to page F2–53) Wire harness
H	B	Ground	Constant	Approx. 0V	Wire harness
I	G/Y	Magnetic valve (for exhaust shutter valve)	• Accelerator and clutch pedal released • Exhaust heating switch ON	Less than approx. 1V	Magnetic valve (Refer to page F2–50) Wire harness
			• Accelerator and clutch pedal released • Neutral • Exhaust brake switch ON	Less than approx. 1V	
			Except above conditions	Approx. 12V	
J	—	—	—	—	—
K	R/BR	Solenoid valve (Intake shutter valve)	• Accelerator pedal depressed less than half or clutch pedal depressed or both depressed • Exhaust heating switch ON	Less than approx. 1V	Solenoid valve (Refer to page F2–52) Wire harness
			Except above conditions	Approx. 12V	

Connector



9TG0F2-124

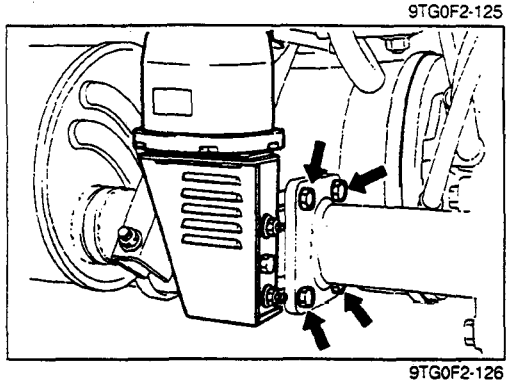
*.... Pay load above 3.5t only



9TG0F2-125

Replacement

1. Disconnect the connector from the exhaust heating control unit.
2. Remove the exhaust heating control unit.
3. Install in the reverse order of removal.



9TG0F2-126

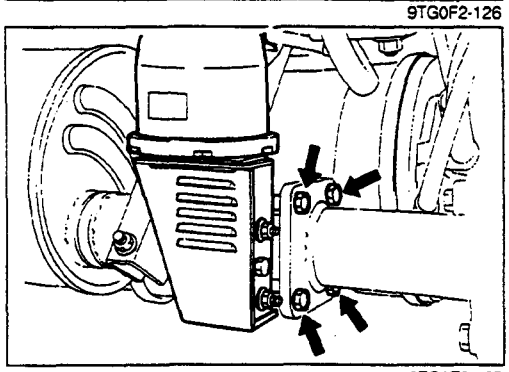
EXHAUST BRAKE UNIT (POWER CHAMBER)

Removal

1. Disconnect the vacuum hose from the exhaust brake unit.
2. Remove the exhaust brake unit assembly.

Note

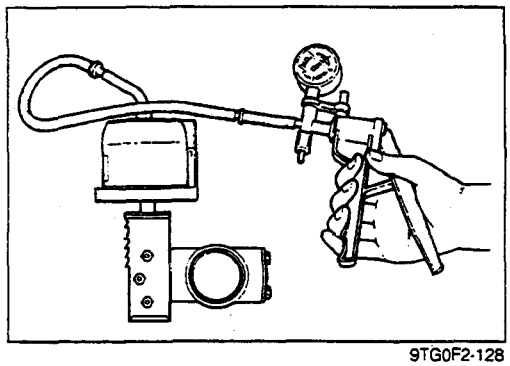
- **It is difficult to remove the exhaust brake unit when the exhaust shutter valve is open. Connect a vacuum pump to hold the valve closed to remove it.**



9TG0F2-127

Inspection

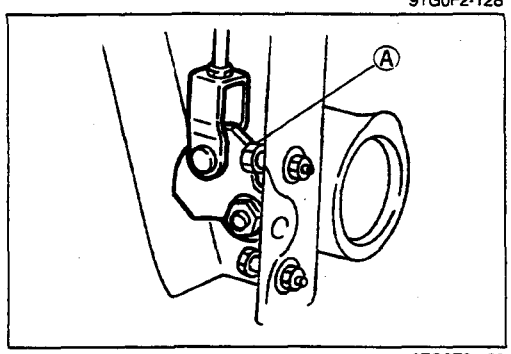
1. Remove the exhaust brake unit assembly.
2. Remove the service hole cover.



9TG0F2-128

3. Connect a vacuum pump and check the following.

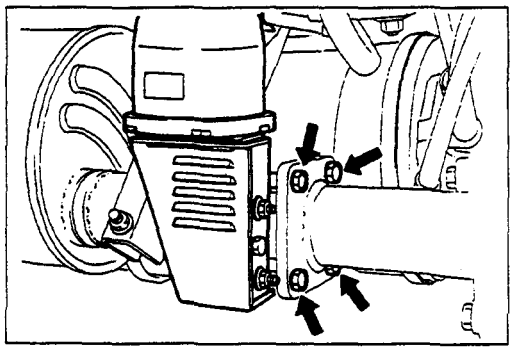
Starts closing: 100 mmHg (3.9 inHg)
Fully closed : 350 mmHg (13.8 inHg)

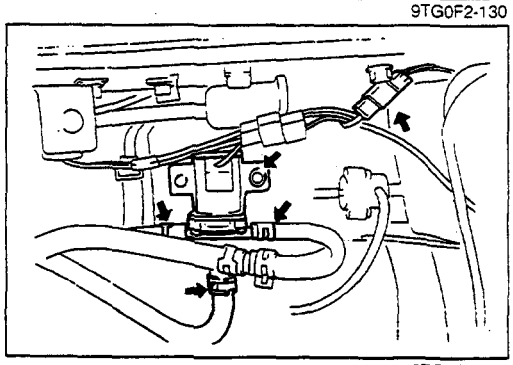


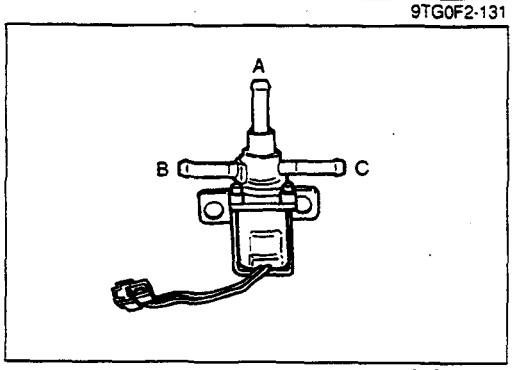
9TG0F2-129

4. When fully closed, adjust the gap of the valve by turning bolt A.

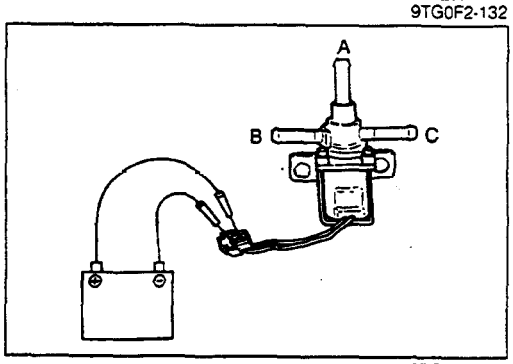
Gap: 0.2—0.4mm (0.007—0.015 in)


9TG0F2-130

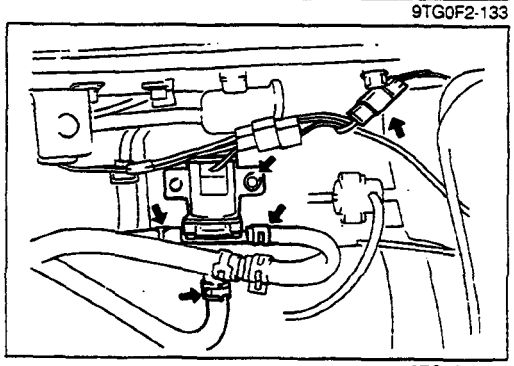

9TG0F2-131



9TG0F2-132



9TG0F2-133


9TG0F2-134

Installation

Note
- **After installing the exhaust brake unit, the vacuum warning buzzer may ring until vacuum is built up.**

Install in the reverse order of removal.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

MAGNETIC VALVE (FOR EXHAUST SHUTTER VALVE)
Removal
1. Remove the vacuum hose from the magnetic valve.
2. Disconnect the connector from the magnetic valve.
3. Remove the magnetic valve.

Inspection
1. Verify air flow through the valve.

A—B: Flow
A—C: No flow
B—C: No flow

2. Connect 12V to the valve and verify air flow.

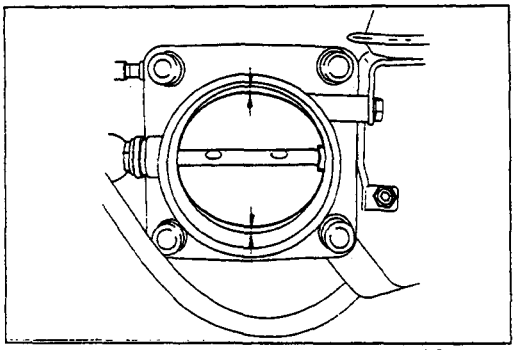
A—B: No flow
A—C: Flow
B—C: No flow

Installation

Note
- **After installing the magnetic valve, the vacuum warning buzzer may ring until vacuum is built up.**

Install in the reverse order of removal.

Tightening torque:
43—61 N·m (4.4—6.2 m-kg, 32—45 ft-lb)


9TG0F2-135

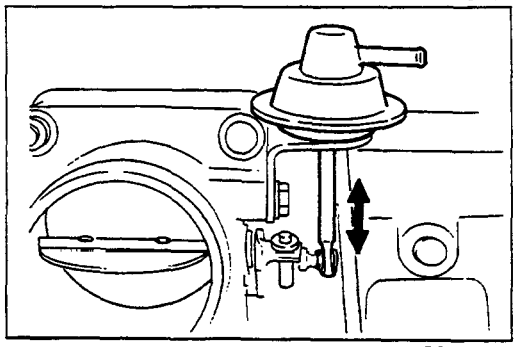
INTAKE SHUTTER VALVE

Inspection

1. Verify that the clearance at both sides of the valve is as specified when the valve is fully closed.

   Clearance: 5.7 ± 0.2mm (0.224 ± 0.007 in)

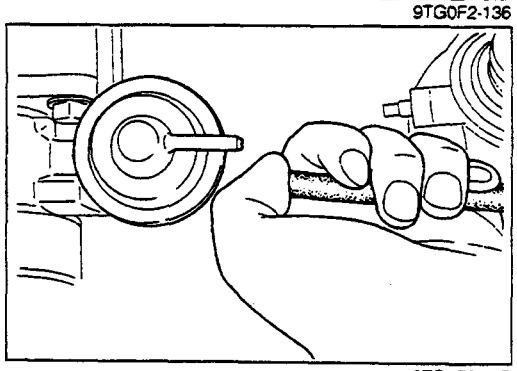
2. If not as specified, adjust by turning the adjusting screw.


9TG0F2-136

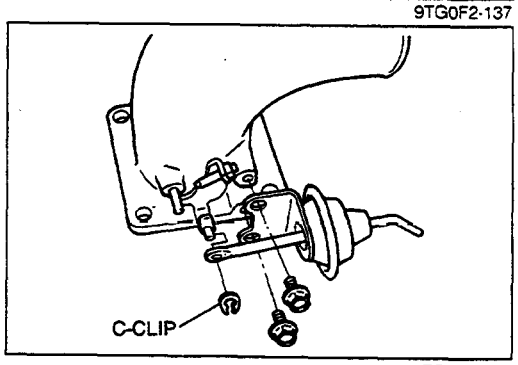
INTAKE SHUTTER VALVE ACTUATOR

Inspection

1. Remove the vacuum hose from the actuator.
2. Verify that the rod of the actuator moves smoothly when moved by hand.
3. Start the engine and run it at idle.


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4. Verify that there is vacuum at the vacuum hose. If not, check the intake shutter valve solenoid valve.
   (Refer to page F2–52.)
5. Install the vacuum hose, and verify that the actuator rod is pulled.



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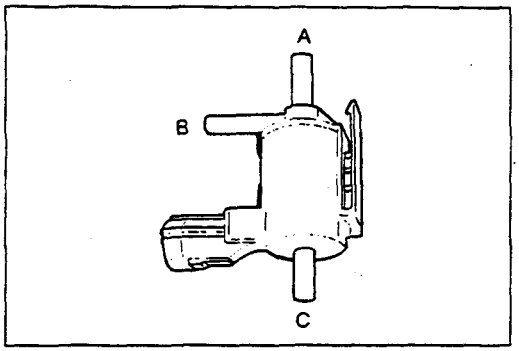
Replacement

Note

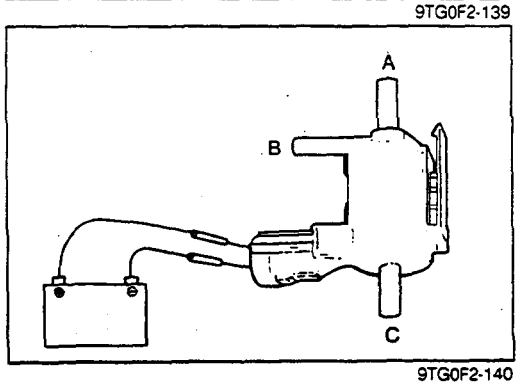
- **After installing the actuator, the vacuum warning buzzer may ring until vacuum is built up.**

1. Disconnect the vacuum hose from the actuator.
2. Remove the C-clip.
3. Remove the actuator.
4. Install in the reverse order of removal.

Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)



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9TG0F2-140

SOLENOID VALVE (INTAKE SHUTTER VALVE)

Inspection

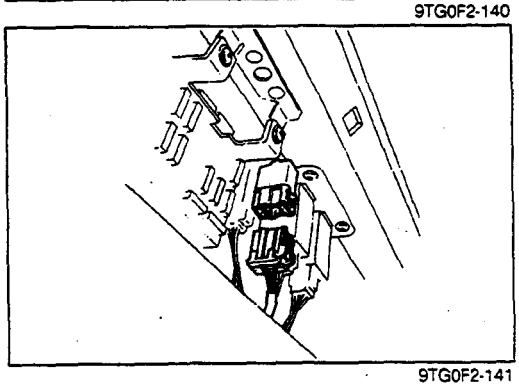
Note
- **After installing the solenoid valve, the vacuum warning buzzer may ring until vacuum is built up.**

1. Remove the solenoid valve.
2. Verify air flow through the valve.

A—B: No flow
A—C: No flow
B—C: Flow

3. Connect 12V to the valve and verify air flow.

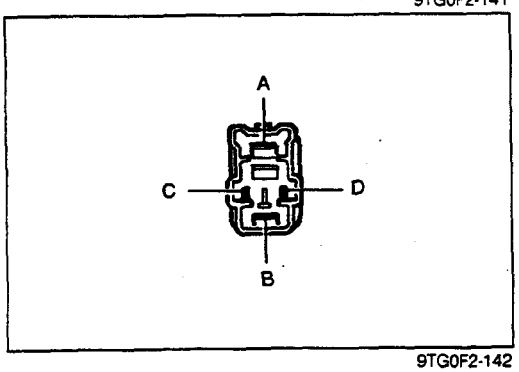
A—B: Flow
A—C: No flow
B—C: No flow


9TG0F2-141

CANCEL RELAY

Removal

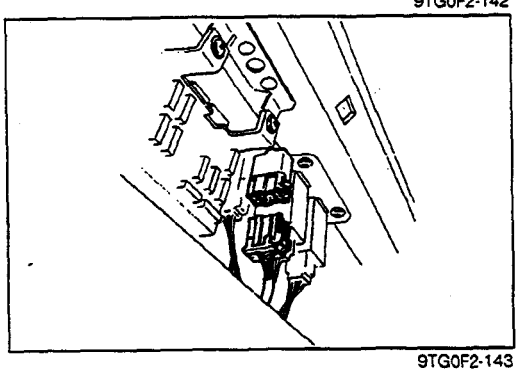
Remove as shown in the figure.



9TG0F2-142

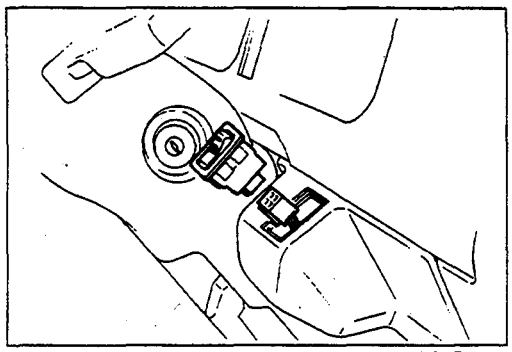
Inspection

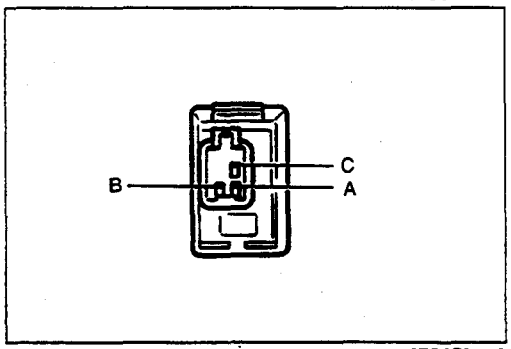
1. Disconnect the cancel relay.
2. Check for continuity between terminals A and D of the relay.
3. Connect 12V between terminals B and C, and verify that there is no continuity between terminals A and D.
4. If not as specified, replace the cancel relay.


9TG0F2-143

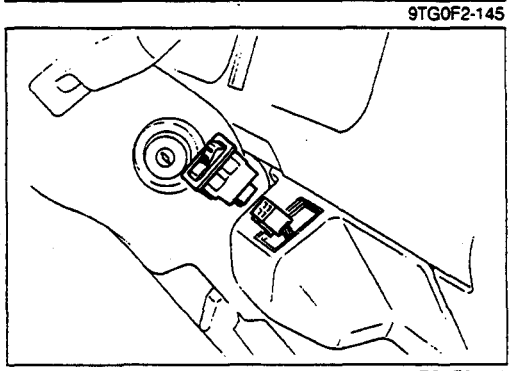
Installation

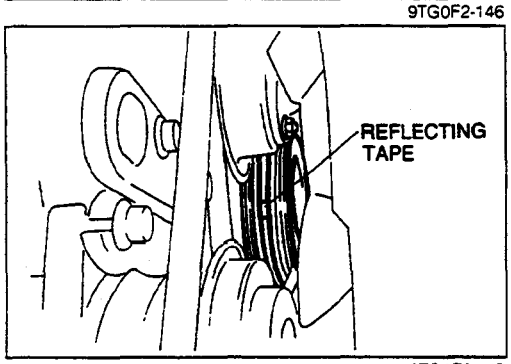
Install in the reverse order of removal.


9TG0F2-144

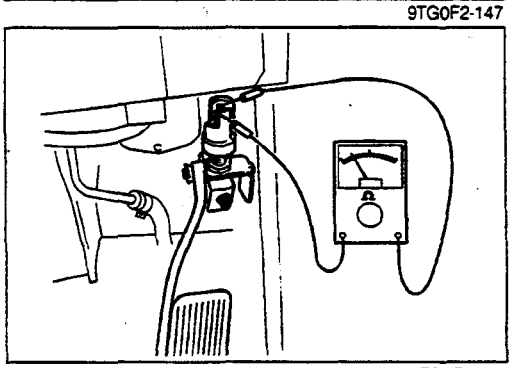


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9TG0F2-147


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EXHAUST HEATING SWITCH

Removal

Remove as shown in the figure.

Inspection

1. Remove the exhaust heating switch.
2. Check continuity between terminals of the switch.

Switch	Terminal		
	A—B	A—C	B—C
OFF	Continuity	No continuity	No continuity
ON	Continuity	Continuity	Continuity

Note

- **When checking continuity between A and B, and B and C, connect the negative (–) tester lead to terminal B.**

Installation

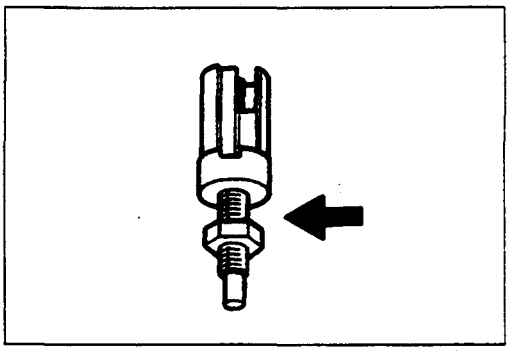
Install in the reverse order of removal.

ACCELERATOR SWITCH

Inspection

1. Run the engine until it is at normal operating temperature.
2. Stop the engine and affix reflecting tape to the crankshaft pulley.
3. Start the engine.
4. Disconnect the accelerator switch connector.
5. Connect a photo tachometer.
6. Verify that there is no continuity of the switch when the accelerator is not depressed.
7. Depressed the accelerator, and verify that there is continuity at the specified speed.

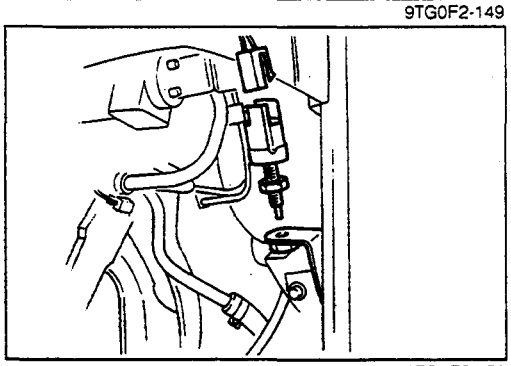
Specified speed: 800—1,000 rpm



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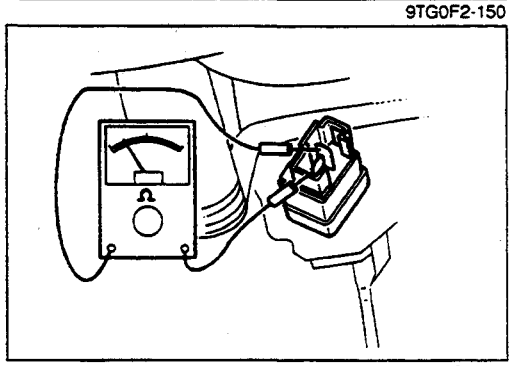
8. If not as specified, loosen the locknut and adjust the switch.
9. After adjusting, tightening the locknut.

Tightening torque:
14—18 N·m (1.4—1.8 m-kg, 10—13 ft-lb)



9TG0F2-150

Replacement
1. Disconnect the accelerator switch connector.
2. Loosen the locknut and remove the switch.
3. Install the new accelerator switch.
4. Adjust the accelerator switch. (Refer to page F2–53.)
5. Tighten the locknut.

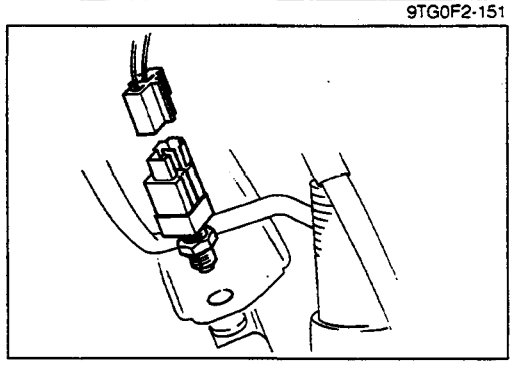


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CLUTCH SWITCH

Inspection
1. Disconnect the clutch switch connector.
2. Check continuity of the switch.

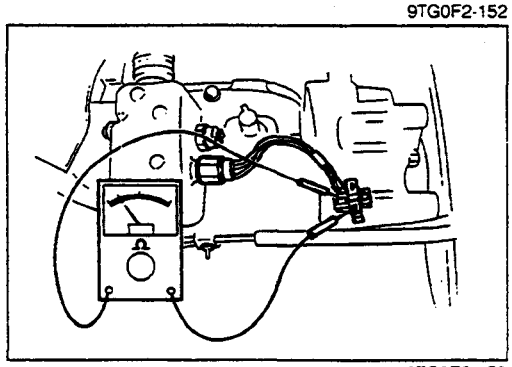
Clutch pedal	Continuity
Depressed	No
Released	Yes



9TG0F2-152

Replacement
1. Disconnect the clutch switch connector.
2. Loosen the locknut and remove the clutch switch.
3. Install the new clutch switch.
4. Adjust the switch as shown in "Inspection" above.
5. Tighten the locknut.

Tightening torque:
14—18 N·m (1.4—1.8 m-kg, 10—13 ft-lb)



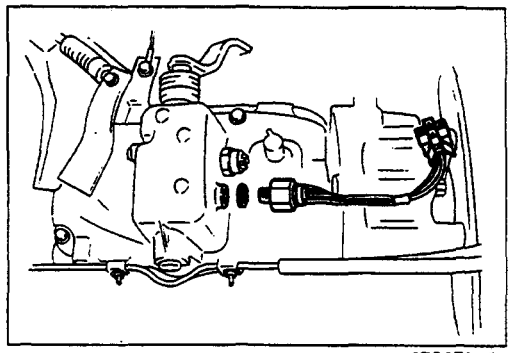
9TG0F2-153

NEUTRAL SWITCH

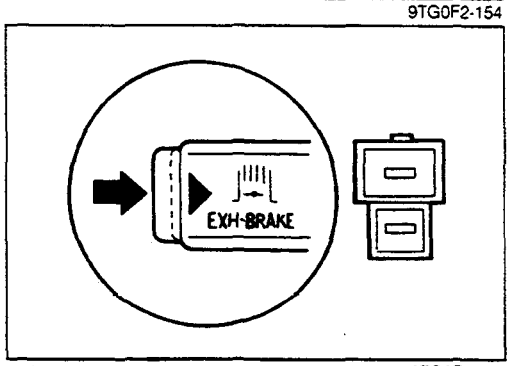
Inspection
1. Disconnect the neutral switch connector at the upper part of the transmission.
2. Check continuity of the switch.

Transmission	Continuity
Neutral	No
In gear	Yes

3. If not as specified replace the neutral switch.



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9TG0F2-155

Replacement

1. Disconnect the neutral switch connector at the upper part of the transmission.
2. Remove the neutral switch.
3. Install in the reverse order of removal.

Tightening torque:
14—18 N·m (1.4—1.8 m-kg, 10—13 ft-lb)

EXHAUST BRAKE SWITCH

Inspection

1. Remove the steering column cover.
2. Disconnect the exhaust brake switch connector.
3. Check continuity of the switch.

Exhaust brake switch	Continuity
OFF	No
ON	Yes

4. If not as specified, replace the switch. (Refer to Section T.)

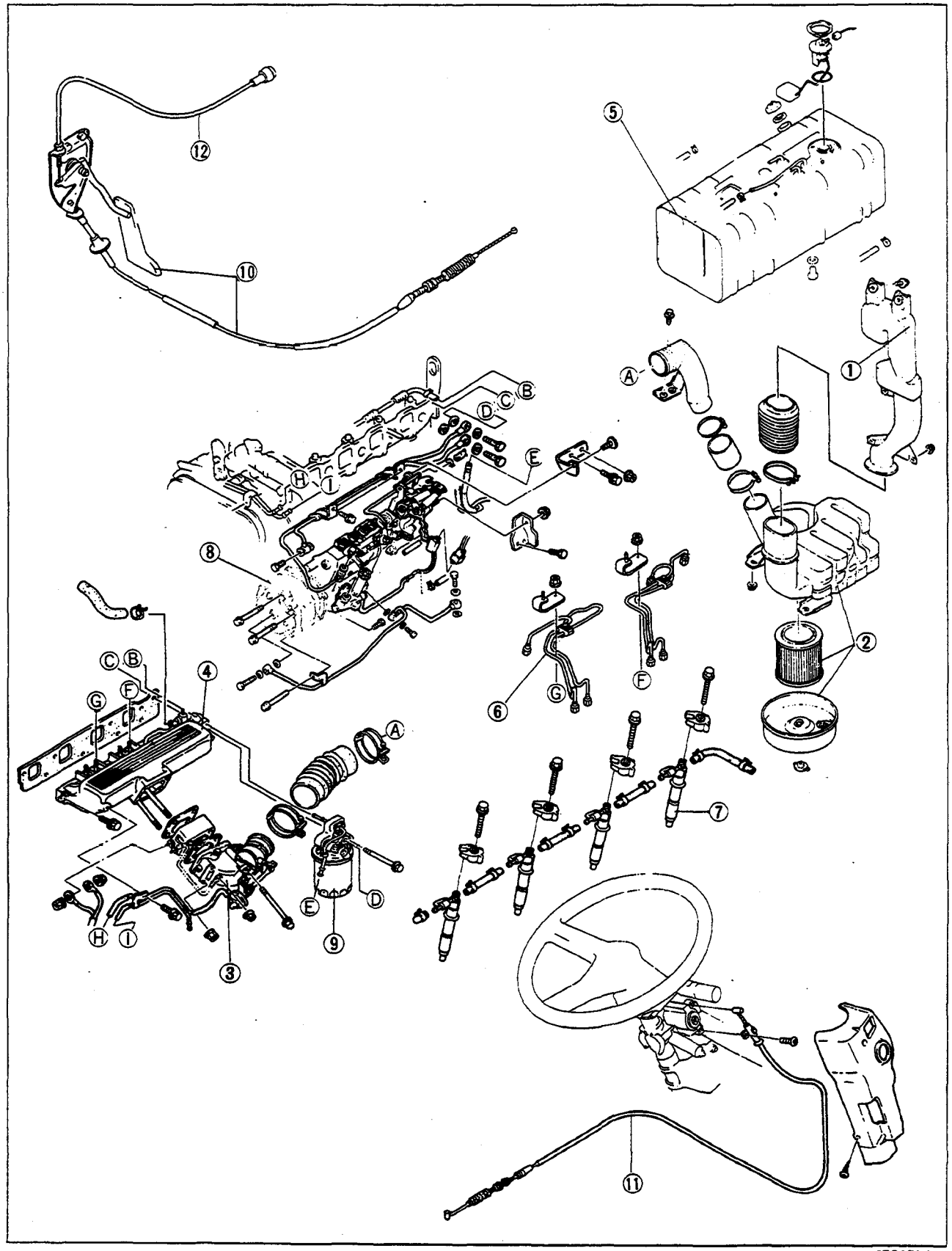
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INTAKE AND FUEL DEVICES

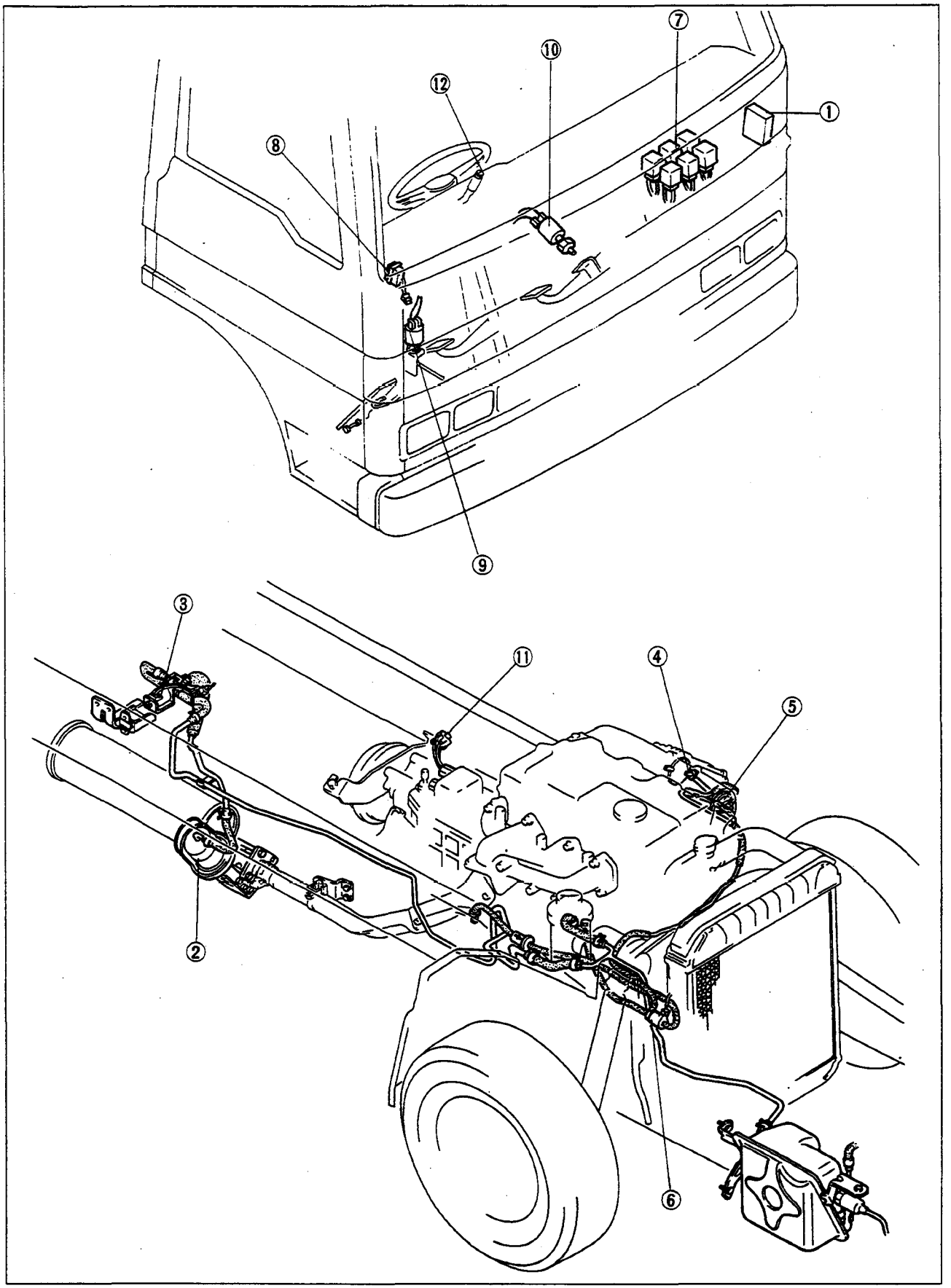


9TG0F3-002

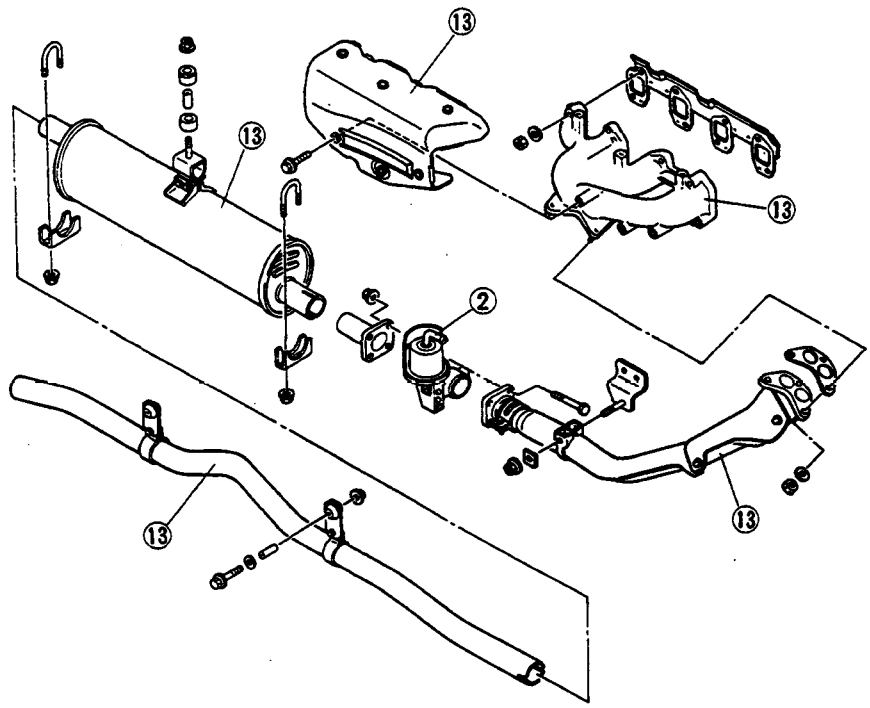
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EXHAUST AND EXHAUST CONTROLLED HEATING DEVICES



9TG0F3-004

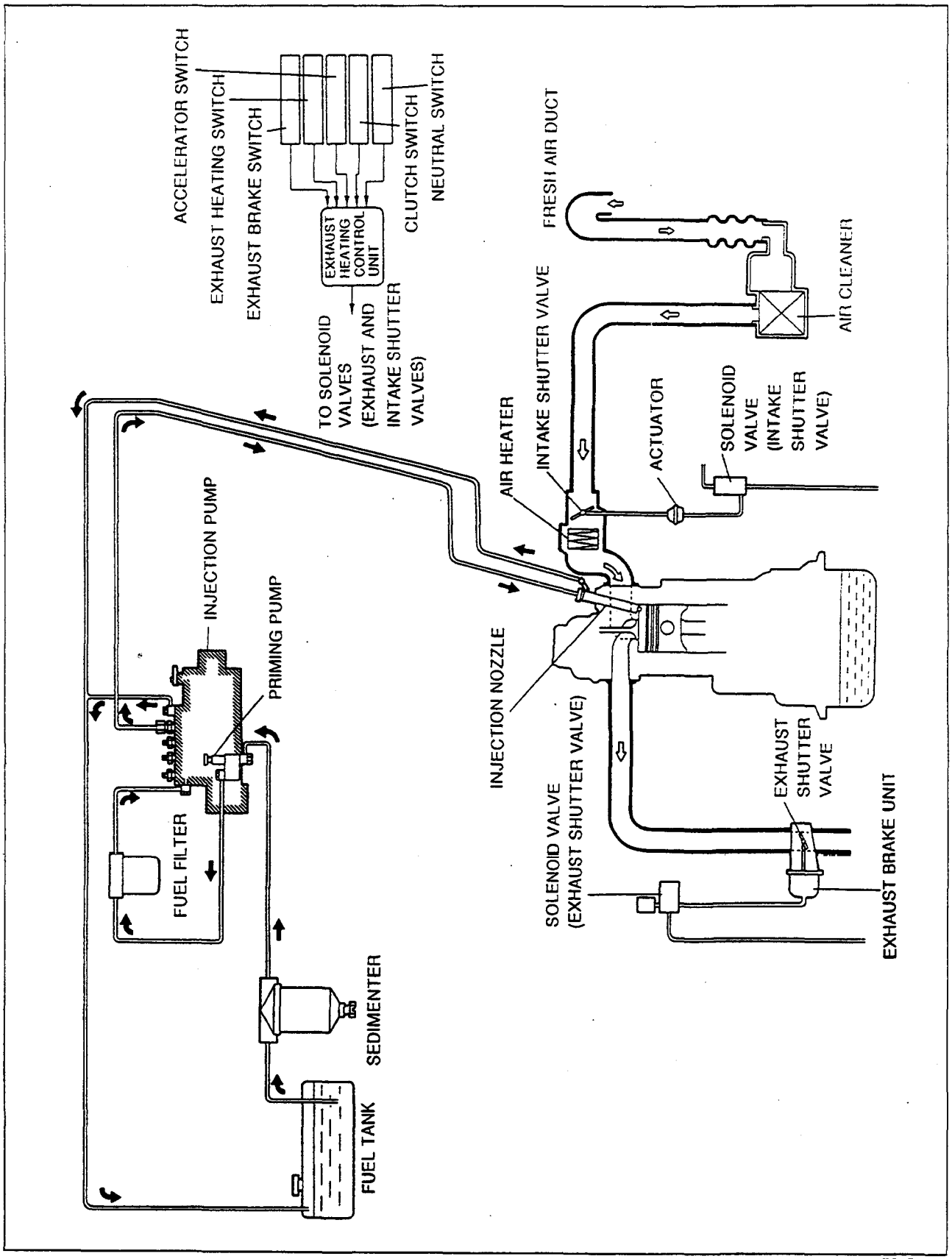


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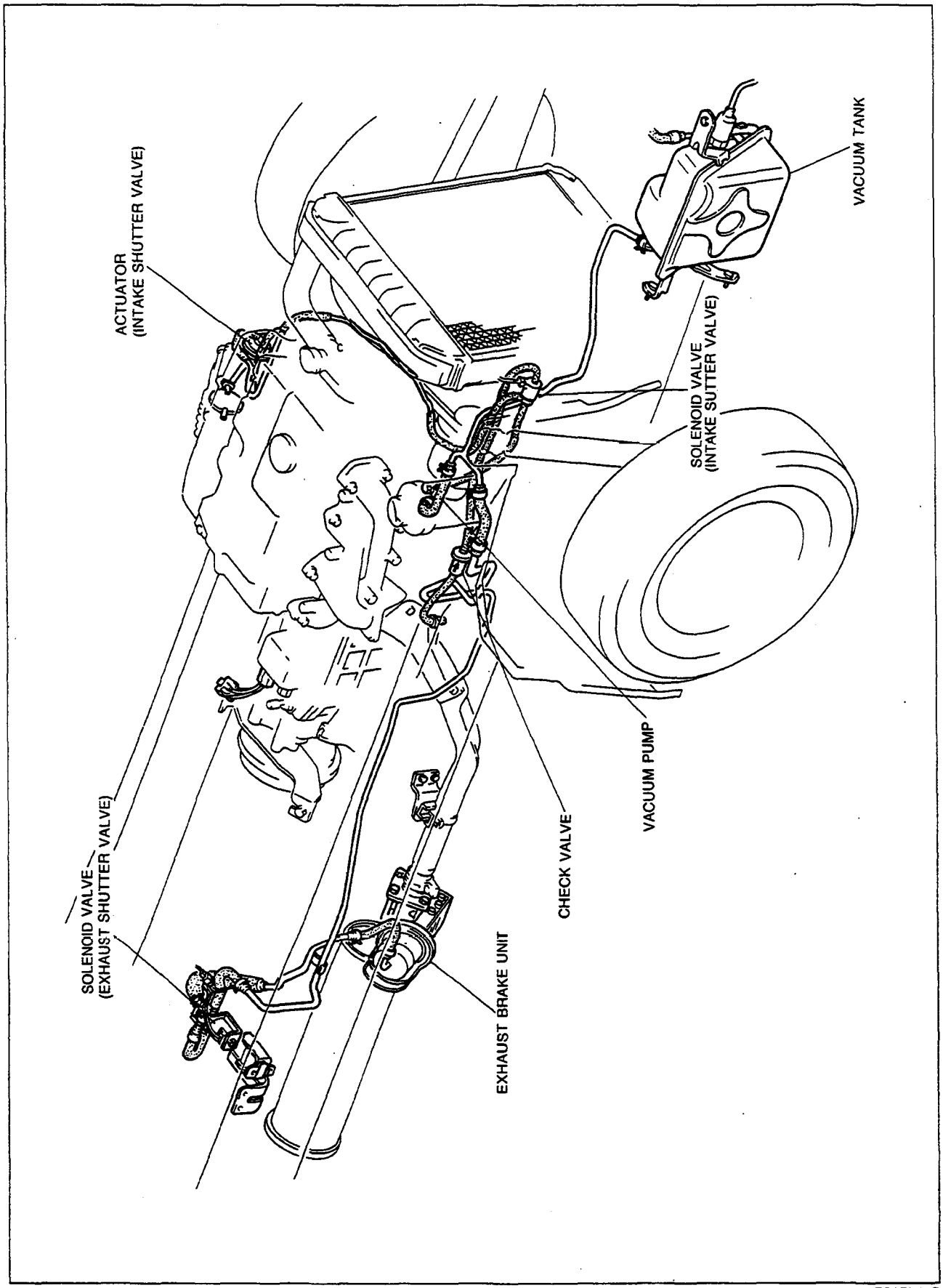
OUTLINE

SYSTEM DIAGRAM

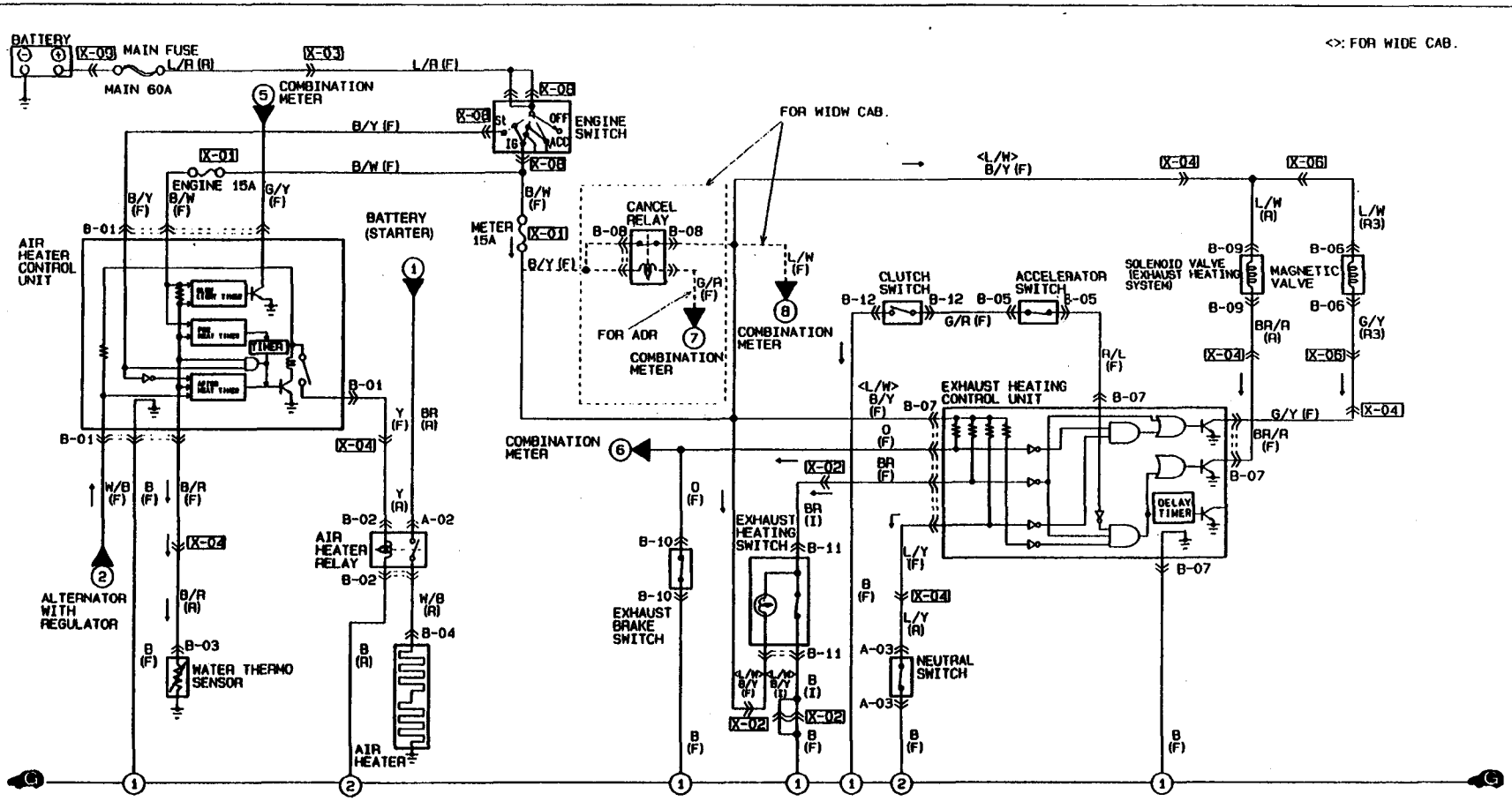


9TG0F3-006

VACUUM HOSE ROUTING DIAGRAM



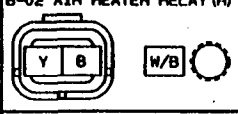
9TG0F3-007



B-01 AIR HEATER CONTROL UNIT (F)

G/Y	N		B/W	B/R	N
Y	N	B	B/Y	W/B	N

B-02 AIR HEATER RELAY (A)



B-03 WATER THERMO SENSOR (A)



B-04 AIR HEATER (A)



B-05 ACCELERATOR SWITCH (F)



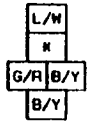
B-06 MAGNETIC VALVE (R3)



B-07 EXHAUST HEATING CONTROL UNIT (F)

BR/R	G/Y		O	N	BR
N	N	B	L/W	L/Y	R/L

B-08 CANCEL RELAY (F)



B-09 SOLENOID VALVE (EXHAUST HEATING SYSTEM) (A)



B-10 EXHAUST BRAKE SWITCH (F)



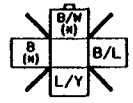
B-11 EXHAUST HEATING SWITCH (I)



B-12 CLUTCH SWITCH (F)



A-03 NEUTRAL SWITCH (A)



( ): FOR CREW CAB.

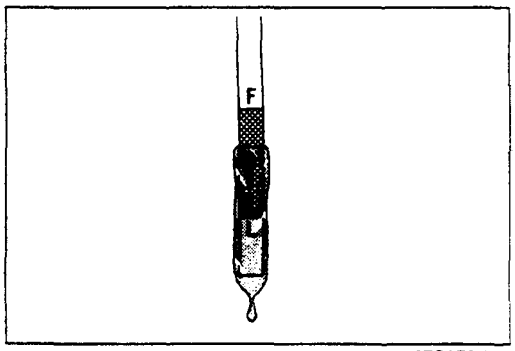
A-02 STARTING MOTOR (B) & FUSIBLE LINK (R)



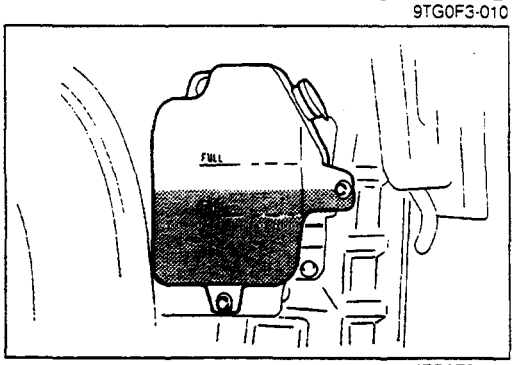
TROUBLESHOOTING GUIDE

Trouble	Possible Cause	Action
Hard starting	Malfunction of stop system	Adjust or replace
	Air in injection pipe, injection pump, fuel filter or sedimentor	Bleed air
	Clogged fuel line or fuel filter	Replace
	Incorrect injection timing	Adjust
	Seized or leaking delivery valve	Replace or clean
	Incorrect injection starting pressure	Adjust
	Malfunction of injection nozzle	Clean or replace
	Malfunction of feed pump	Clean or replace
	Malfunction of governor	Replace
	Malfunction of injection pump	Replace
Rough idling	Incorrect idling speed	Adjust
	Incorrect injection timing	Adjust
	Clogged fuel line or fuel filter	Clean or replace
	Leak in fuel line or fuel filter	Repair or replace
	Air in injection pipe, injection pump, fuel filter or sedimentor	Bleed air
	Seized or leaking delivery valve	Replace or clean
	Incorrect starting pressure	Adjust
	Malfunction of injection nozzle	Clean or replace
	Malfunction of feed pump	Clean or replace
	Malfunction of timer	Replace
	Malfunction injection pump	Replace
Engine knocking	Incorrect injection timing	Adjust
	Incorrect injection starting pressure	Adjust
	Malfunction of injection nozzle	Clean or adjust
	Low quality of fuel	Drain and replace
Excessive exhaust smoke	Incorrect injection timing	Adjust
	Water in injection pump, fuel filter or sedimentor	Drain
	Incorrect injection starting pressure	Adjust
	Clogged air cleaner	Clean or replace
	Malfunction of delivery valve	Clean or replace
	Malfunction injection pump	Replace
Poor acceleration	Low quality of fuel	Drain and replace
	Incorrect injection timing	Adjust
	Clogged fuel line or fuel filter	Clean or replace
	Air in injection pump or fuel filter	Air bleed
	Clogged air cleaner	Clean or replace
	Malfunction of delivery valve	Clean or replace
	Incorrect injection starting pressure	Adjust
	Malfunction of injection nozzle	Clean or replace
	Malfunction of feed pump	Clean or replace
	Malfunction of injection pump	Replace
	Malfunction of governor	Replace
High fuel consumption	Incorrect injection timing	Adjust
	High idling speed	Adjust
	Incorrect injection starting pressure	Adjust
	Clogged air cleaner	Clean or replace
	Clogged fuel filter	Replace
	Malfunction of injection nozzle	Clean or replace
Engine does not stop	Malfunction of	Adjust or repair

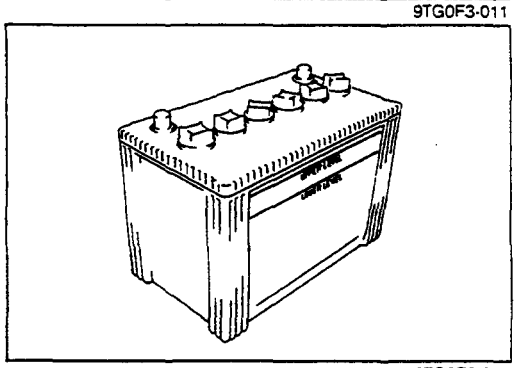
9TG0F3-009

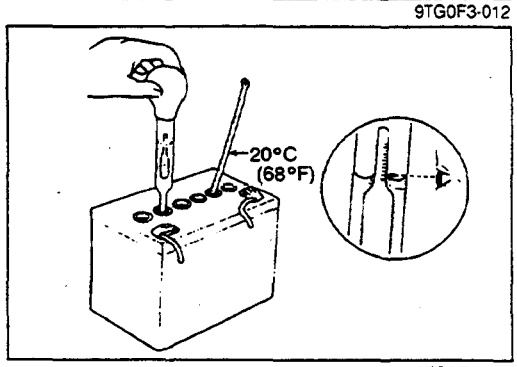


9TG0F3-010

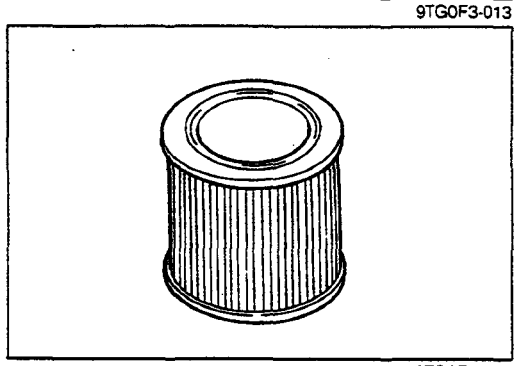


9TG0F3-011


9TG0F3-012



9TG0F3-013


9TG0F3-014

ENGINE TUNE-UP

BASIC INSPECTION

Engine Oil

Check the engine oil level and condition with the level gauge. Add or change oil if necessary.

Coolant

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

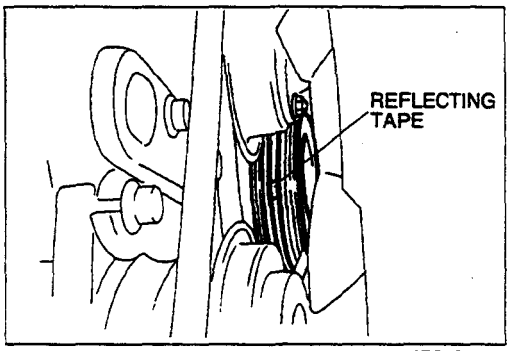
Verify that the coolant level is near the radiator inlet port, and that the level in the reservoir is between the FULL and LOW marks. Add coolant as necessary.

Battery

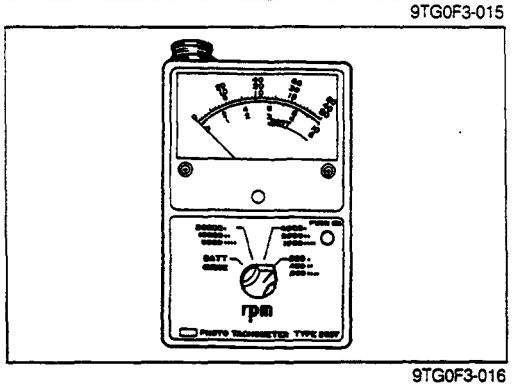
1. Check for corrosion on the terminals and for loose cable connections.
2. Check the electrolyte level.
   If the level is low, add distilled water to the "UPPER LEVEL" mark.
3. Check the specific gravity with a hydrometer. If the specific gravity reading is 1.23 or less, charge the battery. (Refer to Section G.)

Air Cleaner

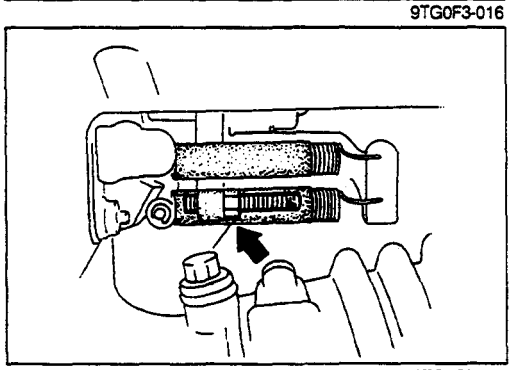
Visually check the air cleaner element for excessive dirt, damage or oil. Clean with compressed air if necessary.

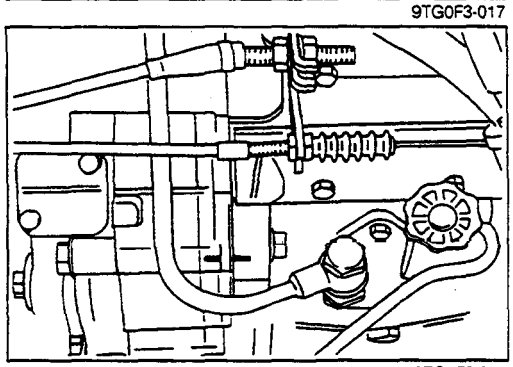


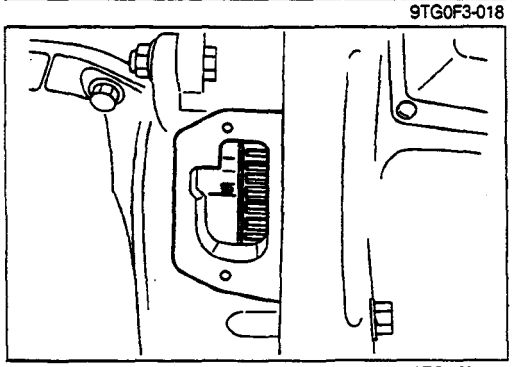
9TG0F3-015



9TG0F3-016


9TG0F3-017


9TG0F3-018


9TG0F3-019

ADJUSTMENT

Idle Speed

1. Attach suitable reflecting tape to the crankshaft pulley.
2. Run the engine at idle at normal operating temperature. Turn off all unnecessary electrical load.
3. Verify the free play of the accelerator cable.

   Free play: 1.0—3.0mm (0.039—0.118 in)

4. Aim the light of the photo tachometer onto the reflecting tape to measure the engine speed.

   Idle speed: 620—700 rpm

5. If not as specified, loosen the locknut of idle adjust bolt and then adjust turning the bolt.
6. Tighten the locknut.

   Tighting torque:
   9.8—14 N·m (100—140 cm-kg, 87—121 in-lb)

Injection Timing Inspection

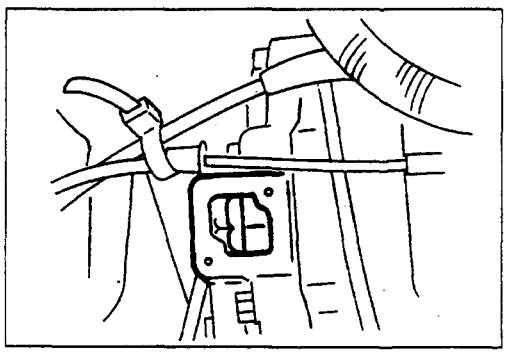
Note

- **Usually it is enough to confirm that the external marks are aligned.**

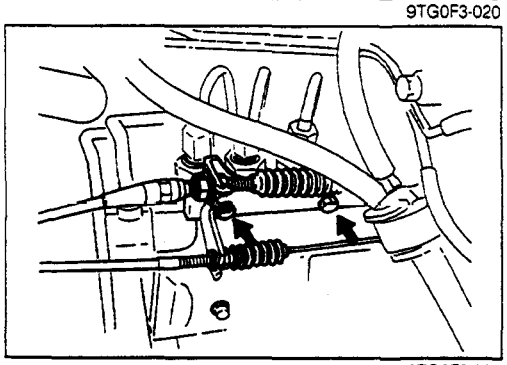
Caution

- **Direct injection engine is sensitive to injection timing. Incorrect timing will cause engine knocking or low power output. Set the injection timing after installing the injection pump.**

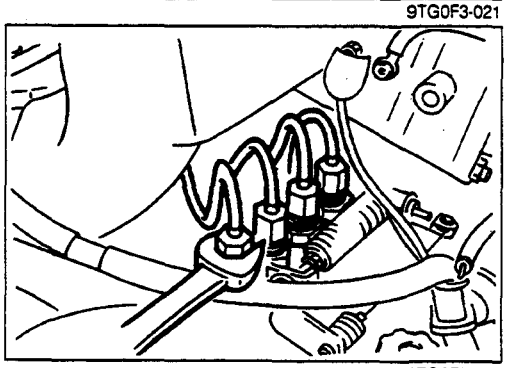
1. Remove the service hole covers from the clutch housing and the timing gear case.
2. Turn the flywheel in the direction of rotation until the indicator pin is at 30° BTDC.


9TG0F3-020

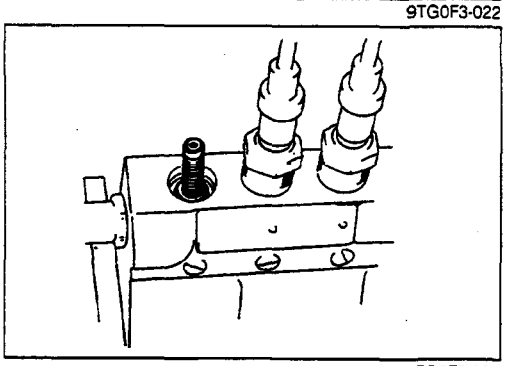
3. Verify that the pointer of the timing gear case and the mark on the timer are aligned.
4. If not as specified, adjust the injection timing.


9TG0F3-021

Adjustment
1. Remove the fuel stop cable from the cut lever.
2. Remove the accelerator cable from the control lever.
3. Remove the bracket.
4. Loosen injection pipes No.2—4 at the pump.

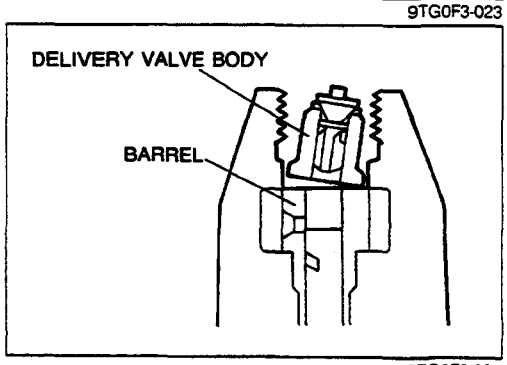

9TG0F3-022

5. Remove No.1 injection pipe and the delivery valve holder.


9TG0F3-023

6. Remove the delivery value spring seat and spring.

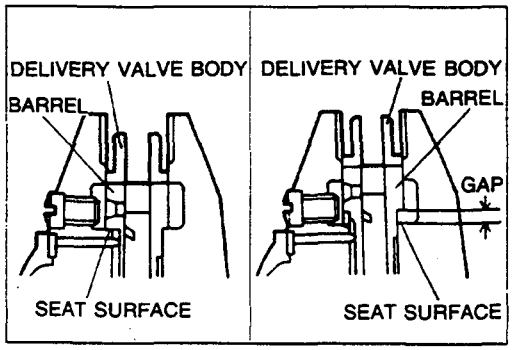
Caution
- **Do not remove the delivery valve body.**

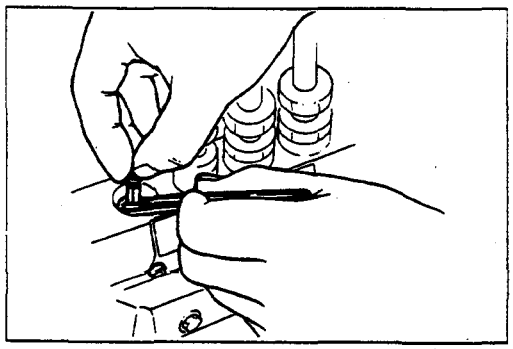


9TG0F3-024

7. Rock the delivery valve to break it loose from the barrel.

Note
- **If the delivery valve is lifted up without breaking it loose, the barrel may also be lifted out of the pump. If this happens the barrel may not reseal and may allow fuel into the engine and cause engine damage.**

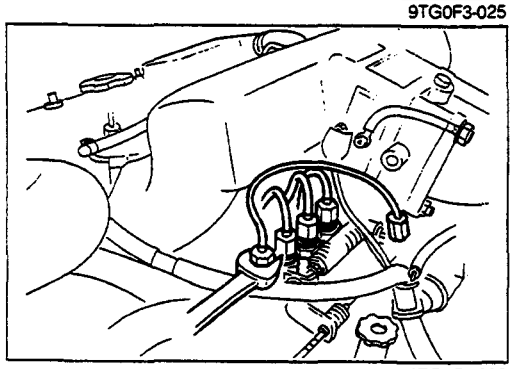



9TG0F3-025

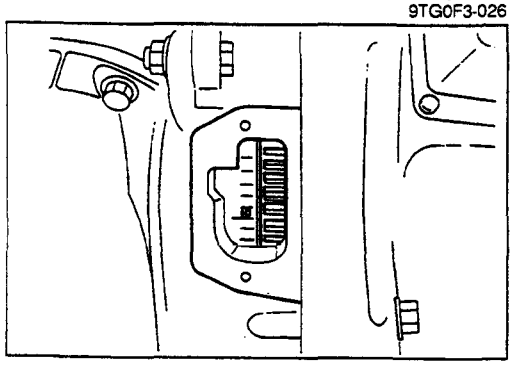
8. Remove the delivery valve, holding the flat washer with tweezers.

Caution
- **Do not pinch the sliding surface of the delivery valve.**

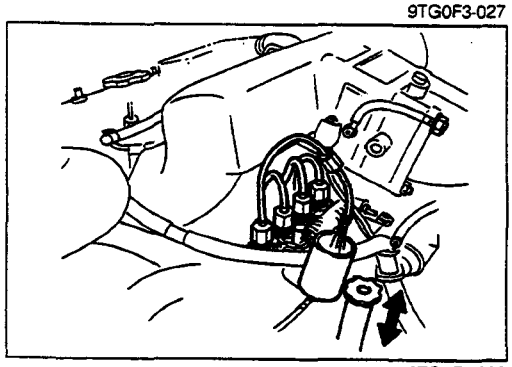
9. Reinstall the delivery valve holder.


9TG0F3-026

10. Tighten No.1 injection pipe so that it points away from the pump.

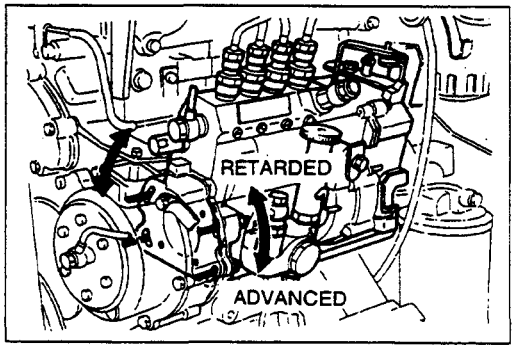

9TG0F3-027

11. Turn the flywheel in the direction of rotation and set it at 20° BTDC.


9TG0F3-028

12. Place a container under No.1 injection pipe and verify that fuel is expelled when pumping the primer pump.
13. While pumping the priming pump, turn the flywheel in the normal direction of rotation and verify that fuel flow stops as specified.

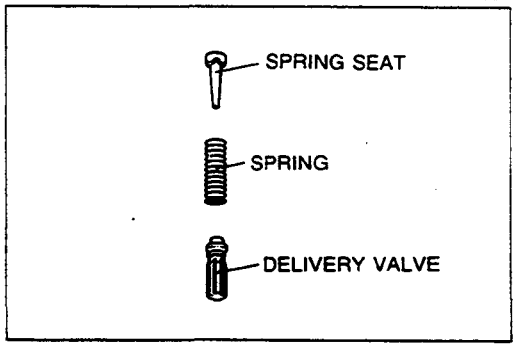
Fuel stops: 12° BTDC (SL Engine),
13° BTDC (SL Turbocharged Engine)



9TG0F3-029

14. If necessary, adjust the injection timing by loosening the mounting bolts and rotating the pump outward pump or inward as shown in the figure.
15. After adjustment, tighten nuts.

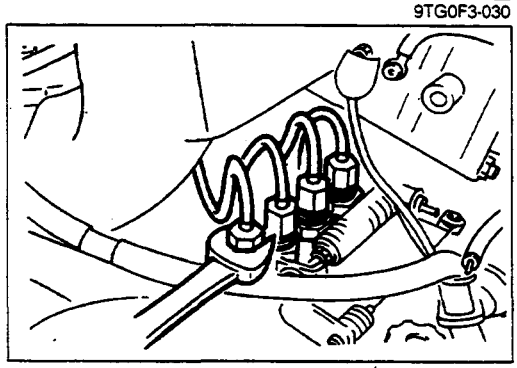
Tighten torque:
34—39 N·m (3.5—4.0 m-kg, 25—29 ft-lb)



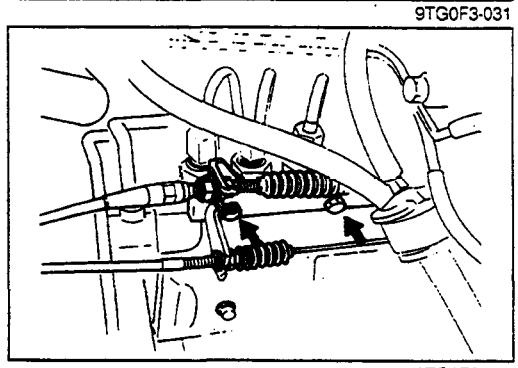
9TG0F3-030

16. Make the pump flange and pump body for future reference.
17. Install the delivery valve, spring, and spring seat.
18. Tighten the delivery valve holder.

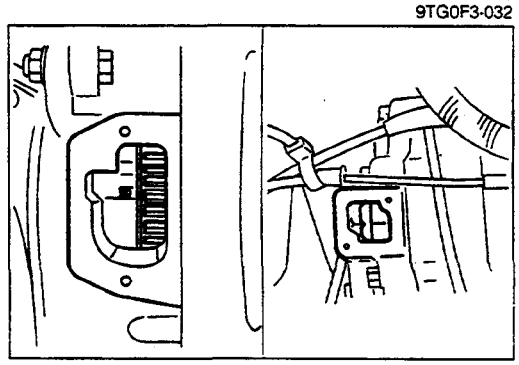
Tighten torque
39—44 N·m (4.0—4.5 m-kg, 29—33 ft-lb)


9TG0F3-031

19. Install No.1 injection pipe.


9TG0F3-032

20. Tighten injection pipes No.2—4.
21. Install the bracket.
22. Install the accelerator cable to the control lever.
23. Install the fuel stop cable to the cut lever.


9TG0F3-033

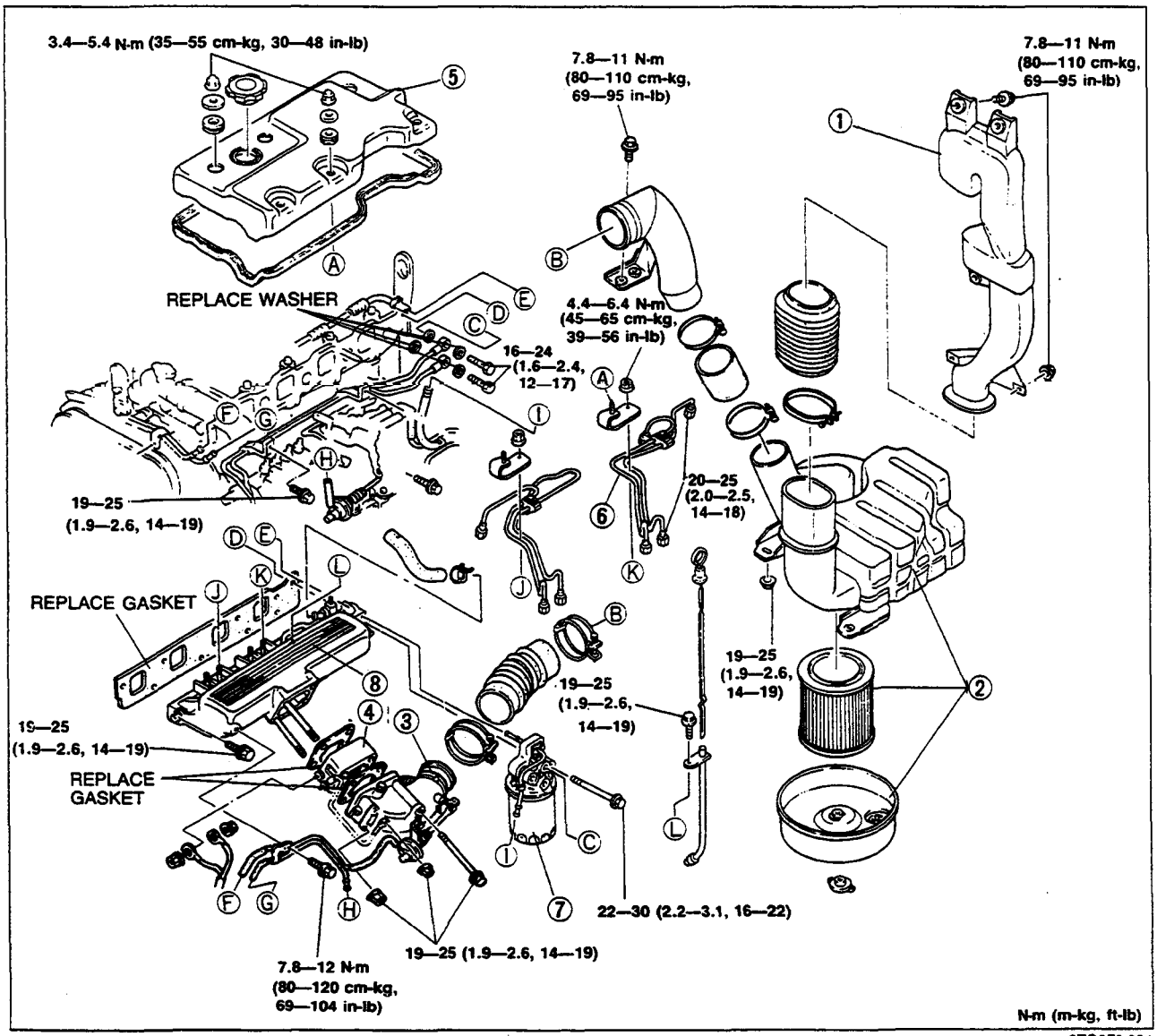
24. Install the service hole covers onto the clutch housing and the timing gear case.
25. Bleed air from the system. (Refer to page F3–23.)
26. Start the engine, and check for fuel leaks.

INTAKE AIR SYSTEM

COMPONENTS

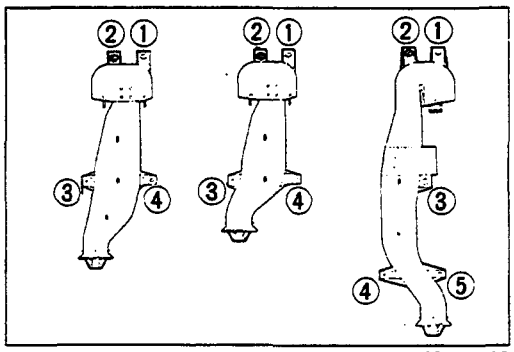
Removal / Inspection / Installation

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.



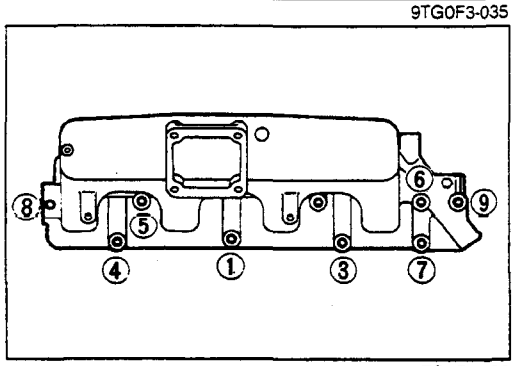
9TG0F3-034

1. Fresh air duct
   Check for contamination, cracks and other damage
   Installation Note ..... page F3–16
2. Air cleaner
   Inspection ..... page F3–10
3. Intake shutter valve
   Inspection ..... page F3–40
4. Air heater
   Inspection ..... Section G
5. Seal cover
   Visually check the seal cover for contamination, cracks or other damage
6. Injection pipe
   Check for contamination, cracks and other damage
7. Fuel filter
   Replace element ..... page F3–24
8. Intake manifold
   Check for contamination, cracks and other damage
   Installation Note ..... page F3–16



9TG0F3-035

Installation note
Fresh air duct
Install in the order shown in the figure.



9TG0F3-036

Intake manifold
1. Use a new gasket.
2. Tighten in the order shown in the figure.

Tightening torque:
22—31 N·m (2.2—3.1 m-kg, 15—22 ft-lb)

FUEL SYSTEM

FUEL TANK

Removal / Inspection / Installation

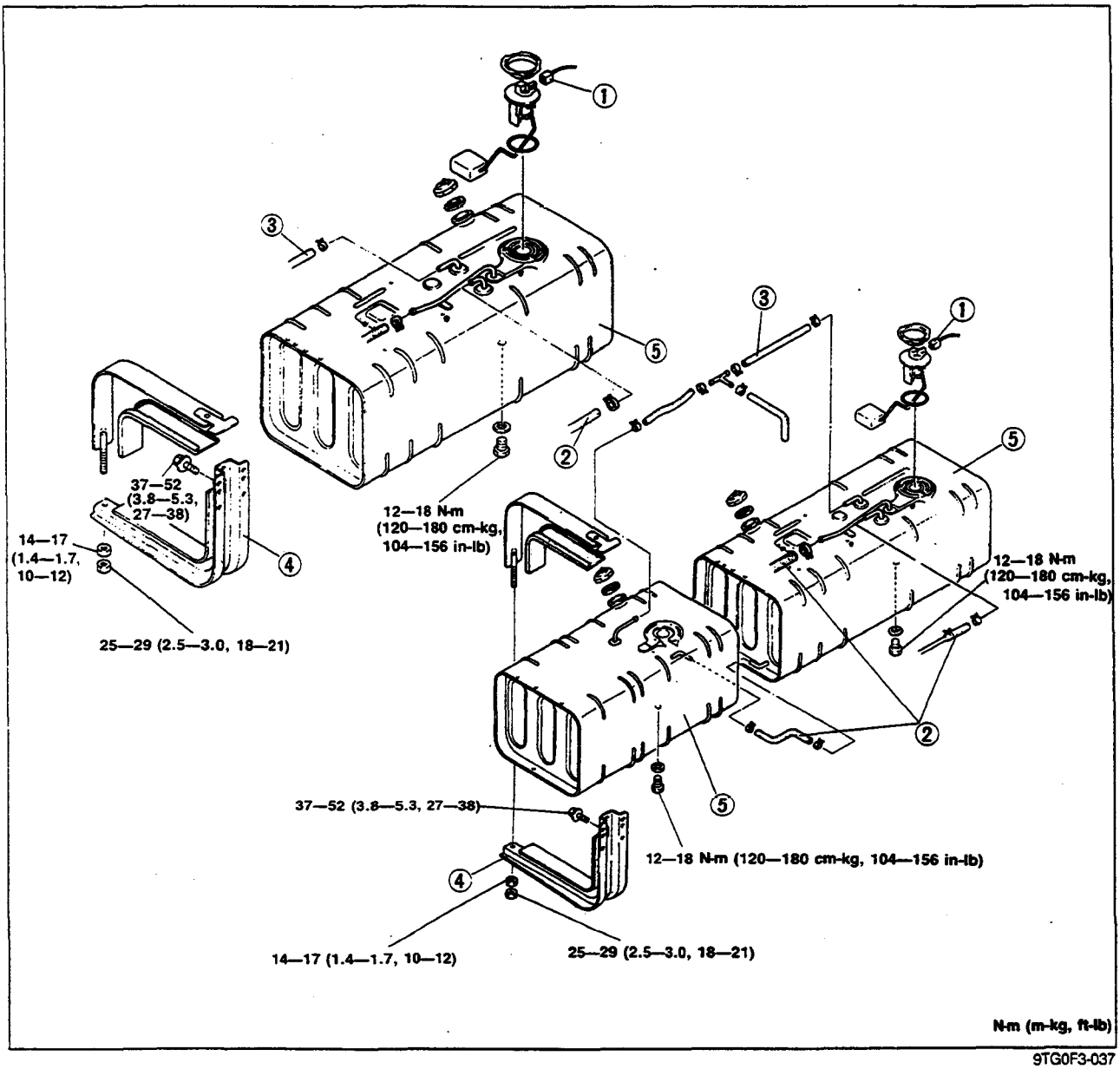
1. Remove in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal.

Warning

- **Keep sparks cigarettes, and open flames away from the fuel tank.**

Note

- **Drain the fuel before removing the fuel tank.**



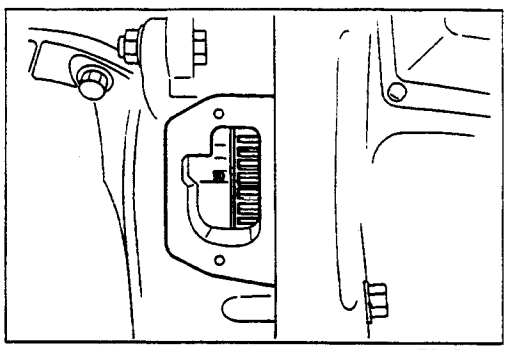
9TG0F3-037

1. Connector
2. Fuel hose
3. Evaporative hose
   Be sure the air flows through the hose each side
4. Fuel tank strap
5. Fuel tank
   Check for contamination, corrosion and other damage

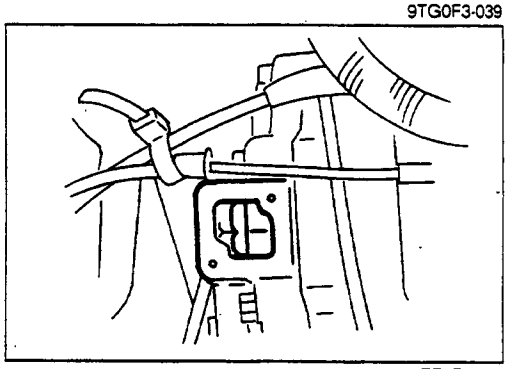
INJECTION PUMP
Removal

Note
- **The in-line type pump used on the SL and SL turbocharged engines are removed with the drive gear. When replacing the pump, be sure it is properly timed.**
- **Special tools and testers are required for service of the injection pump. The pump should be serviced only by an authorized Diesel Kiki distributor.**

9TF0F3-001



9TG0F3-039



9TF0F3-002

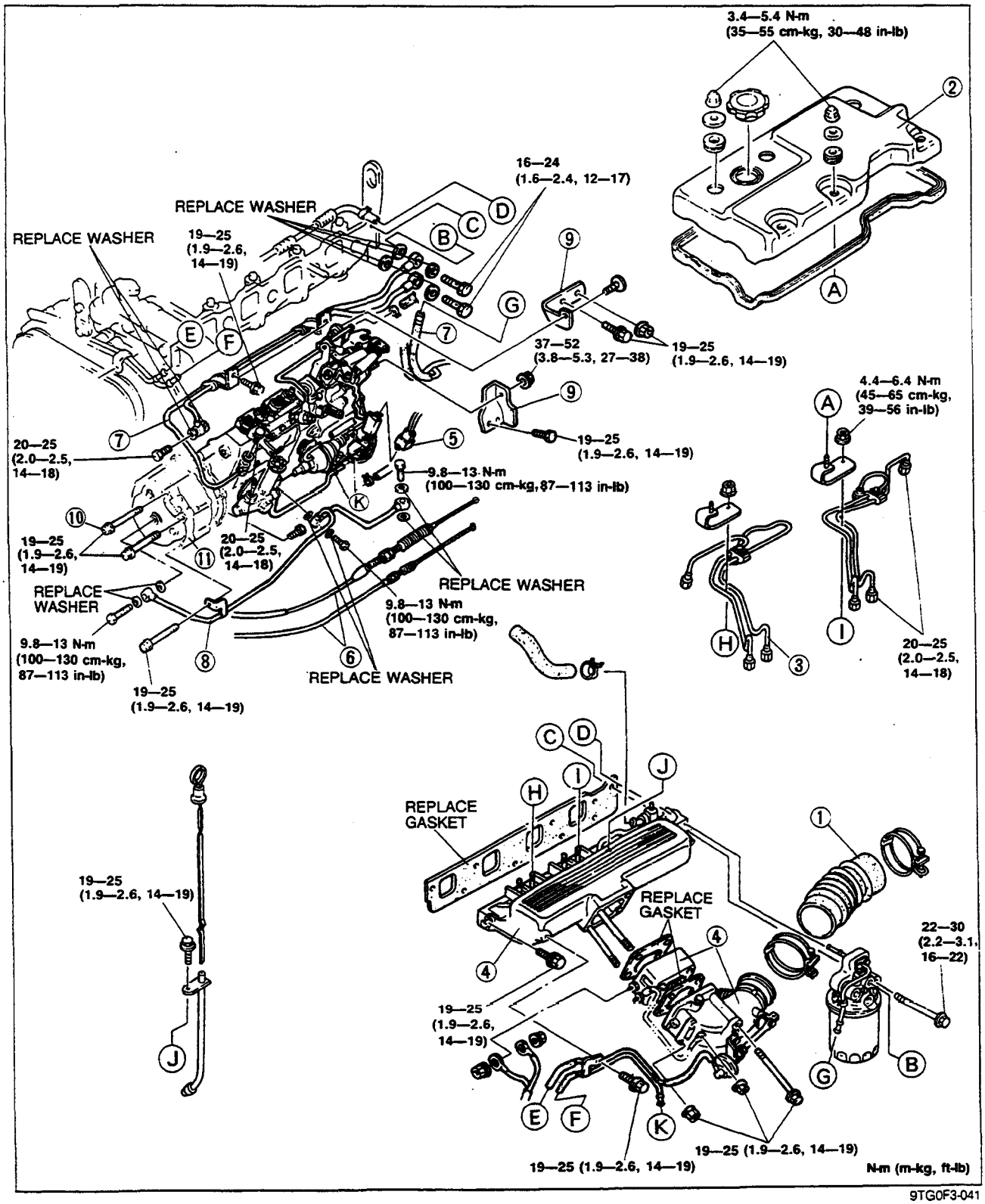
Caution
- **Before removing the injection pump, perform the following procedure.**

1. Remove the negative battery cable.
2. Remove the cover from the flywheel, and turn the flywheel until No.1 cylinder is at 30° BTDC.
3. Remove the cover from the gear case, and verify that the mark on the timer and the pointer are aligned.

Note
- **If they are not aligned, No.4 cylinder is at 30° BTDC.**

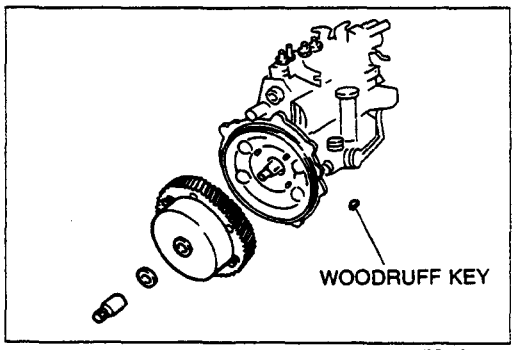
4. Remove in the order shown in the figure.
(Refer to page F3–19.)

Caution
- **Cover the intake manifold and injection pipes after removed.**
- **After removing the pump, do not turn the engine.**



9TG0F3-041

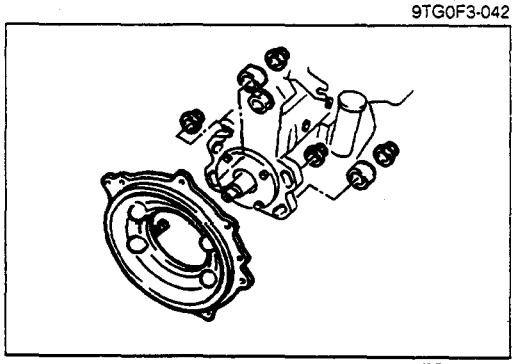
1. Air hose
2. Seal cover
3. Injection pipe
4. Intake manifold, air heater, intake shutter valve
5. harness
6. Fuel stop cable, accelerator cable
7. Fuel hose, pipe
8. Oil pipe
9. Bracket
10. Bolt and nut for installation pump
11. Injection pump assembly



9TG0F3-042

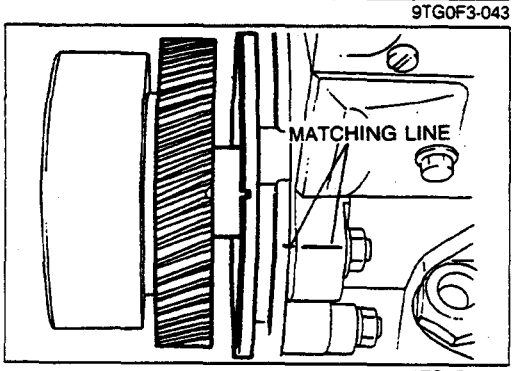
Disassembly / Assembly

1. Affix the timer in a vise and remove the timer bolt.
2. Remove the timer and gear assembly from the pump.
3. Remove the woodruff key from the pump shaft.



9TG0F3-043

4. Remove the flange plate.

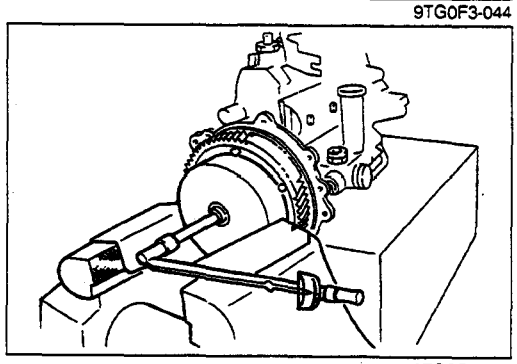


9TG0F3-044

5. Affix the pump in a vise, and install the flange plate.
6. Align the marks on the pump and flange plate, and tighten the mounting nuts.

Tightening torque:
34—39 N·m (3.5—4.0 m-kg, 25—29 ft-lb)

7. Install the woodruff key, and install the timer and gear assembly onto the pump shaft.



9TG0F3-045

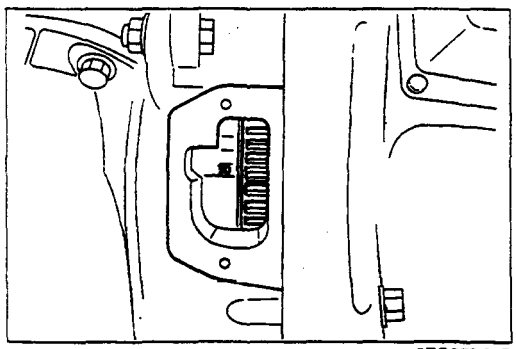
8. Affix the timer in a vise, and tighten the nut.

Tightening torque:
59—69 N·m (6.0—7.0 m-kg, 43—51 ft-lb)

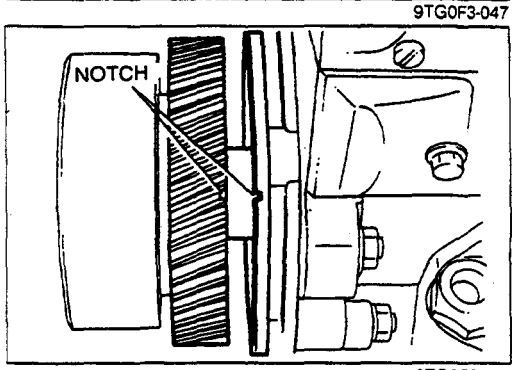
Installation

1. Install in the reverse order of removal, referring to **Installation note**.
2. Adjust the injection timing. (Refer to page F3–11)
3. Bleed air from the fuel system. (Refer to page F3–23.)

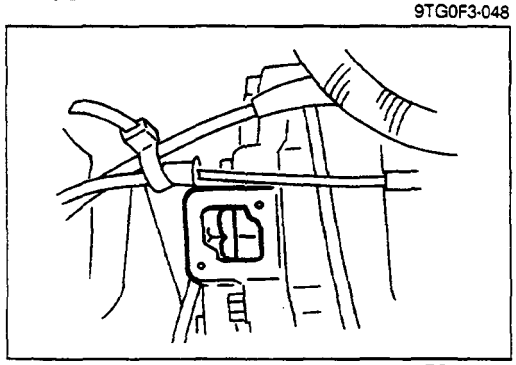
9TG0F3-046



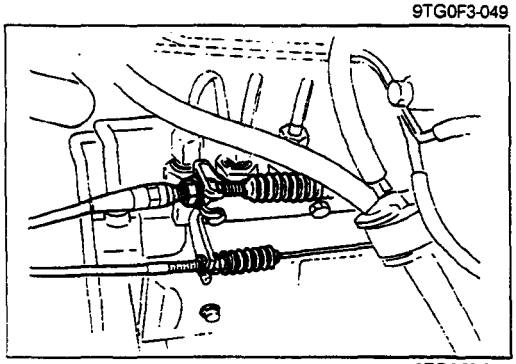
9TG0F3-047



9TG0F3-048



9TG0F3-049



9TG0F3-050

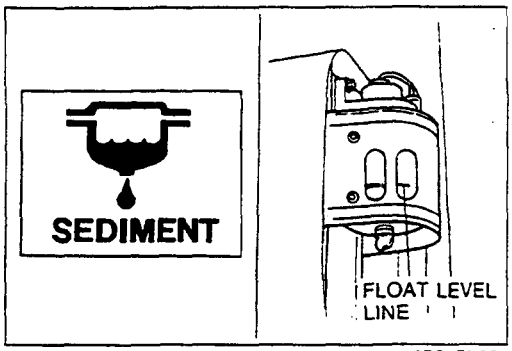
Installation note

Injection pump

1. Before installing the injection pump, verify that No.1 cylinder is at 30° BTDC.
2. Align the notches of the flange plate and the injection pump gear.
3. Install the injection pump.
4. Verify that the mark on the timer and the tab of the timing gear case are aligned.

Accelerator cable, fuel stop cable

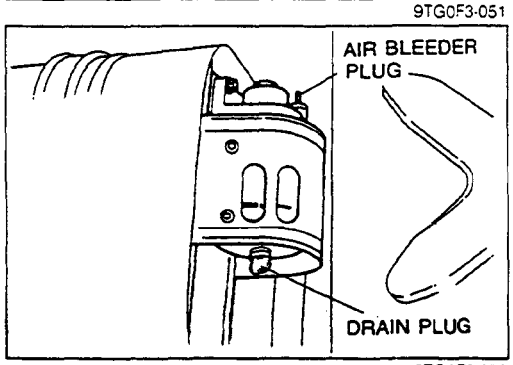
1. After installing the accelerator cable, adjust the free play of the cable. (Refer to page F3–28.)
2. After installing the fuel stop cable, adjust the free play of the cable. (Refer to page F3–30.)



9TG0F3-051

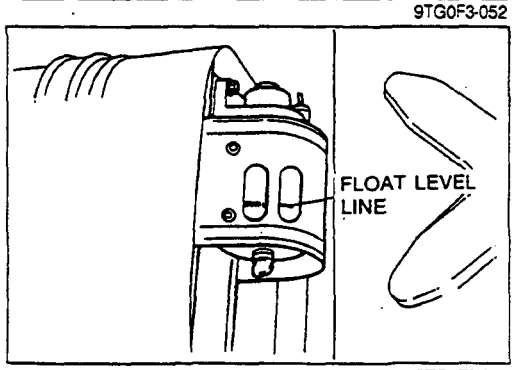
SEDIMENTOR
Draining Water

Note
- **Drain the water when the sedimentor warning light is illuminated or the float ring has risen near the float level line.**



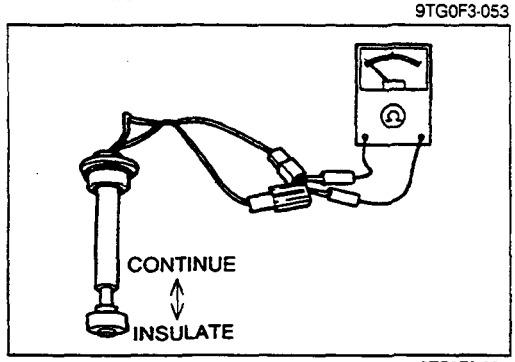
9TG0F3-052

1. Loosen the drain plug.
2. Loosen the air bleeding plug.
3. When water has been drained, pump the fuel with the priming pump installed on the fuel filter.
4. Loosen the bleeder screw of fuel filter and bleed the air.



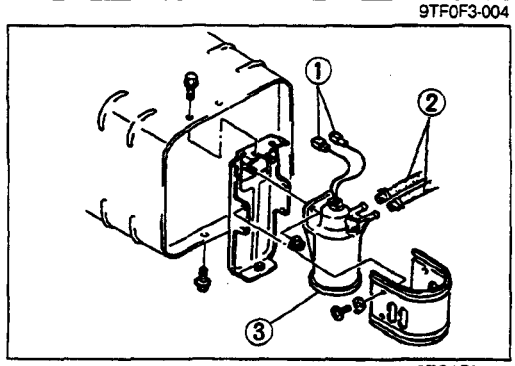
9TG0F3-053

Inspection
1. Visually check the sedimentor for damage and fuel leakage. Repair or replace, if necessary.
2. Check the position of the float ring and if the ring is near the float level line, drain the water.



9TF0F3-004

SEDIMENTOR SENSOR (DETECTOR)
Inspection
1. Remove the sedimentor sensor from the sedimentor.
2. Verify that there is continuity with ohmmeter, when the float up.

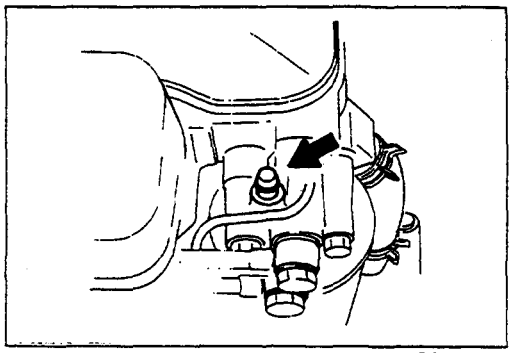


9TG0F3-055

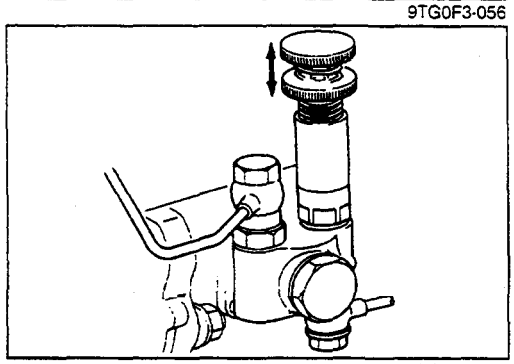
Replacement

Warning
- **Keep sparks, cigarettes and open flames away from sedimentor.**

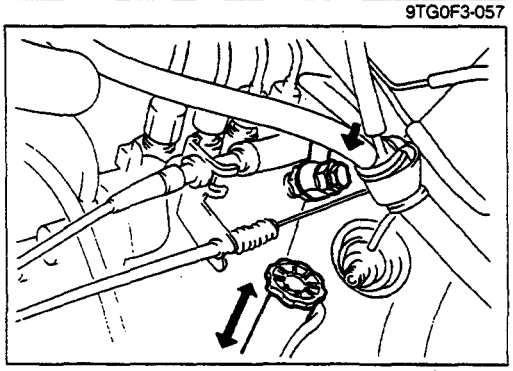
1. Disconnect the connectors.
2. Remove the fuel hoses.
3. Remove the sedimentor.
4. Install in the reverse order of removal.



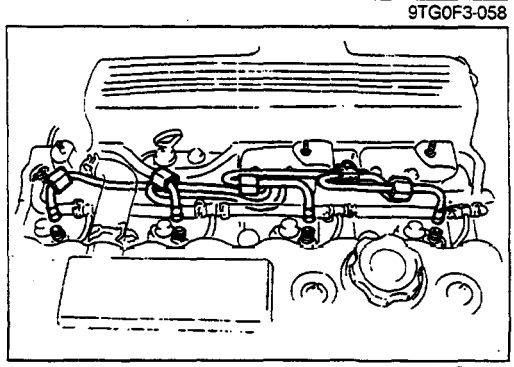
9TG0F3-056



9TG0F3-057



9TG0F3-058



9TG0F3-059

FUEL FILTER
Air Breeding

Warning
- **Keep sparks, cigarettes and open flames away from the fuel filter.**

1. Loosen the air bleeder plug.
2. Pump the priming pump until no air is expelled.
3. Tighten the air bleeder plug.

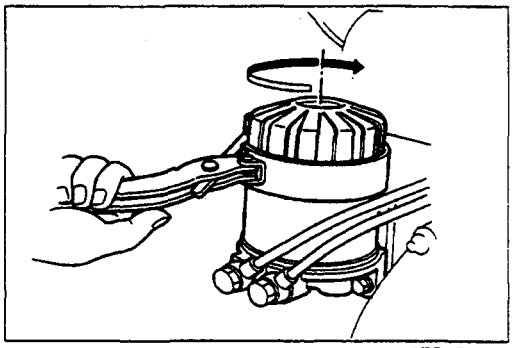
Tightening torque:
5.9—8.8 N·m (60—90 cm-kg, 52—78 in-lb)

4. Loosen the return pipe at the injection pump, and pump the priming pump until no air is expelled.
5. Tighten bolt.

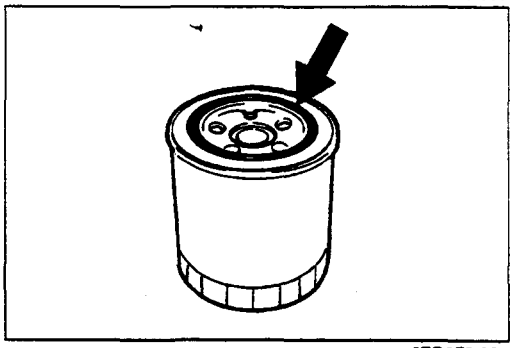
Tightening torque:
12—15 N·m (120—150 cm-kg, 104—130 in-lb)

6. Push the priming pump down and tighten it.
7. Loosen the injection pipes at the injection nozzles.
8. Crank the engines, and verify that fuel is expelled from each injection pipe.
9. Tighten the injection pipes.

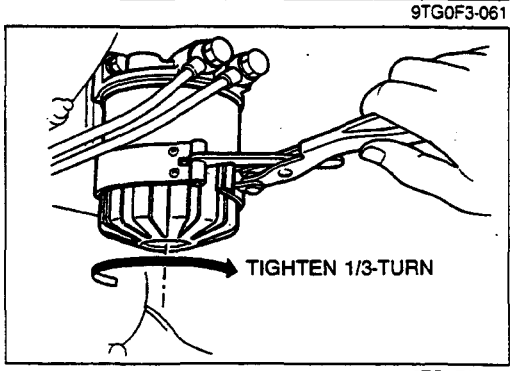
Tightening torque:
20—25 N·m (2.0—2.5 m-kg, 14—18 ft-lb)



9TG0F3-060



9TG0F3-061



9TG0F3-062

Replacement

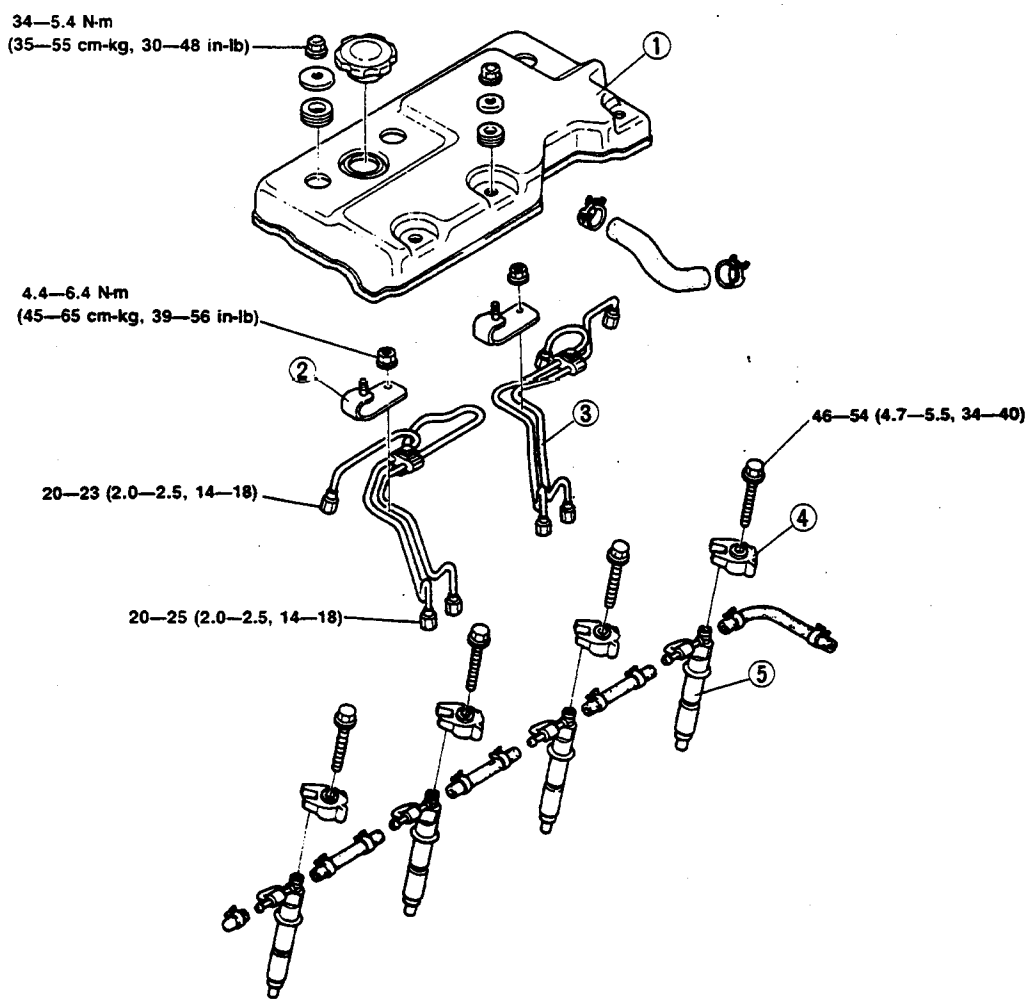
Warning
- **Keep sparks, cigarettes and open flames away.**

1. Remove the filter with a filter wrench.
2. Apply to the O-ring.
3. Install the filter and tighten by hand. Then tighten with filter wrench an additional 1/3-turn.
4. Bleed air from the filter. (Refer to page F3–23.)
5. Start the engine, and verify that there is no fuel leakage around the filter.

NJECTION NOZZLE
Removal

Warning
- **Keep sparks, cigarettes and open flames away from the fuel area.**

1. Remove the negative battery cable.
2. Remove in the order shown in the figure.



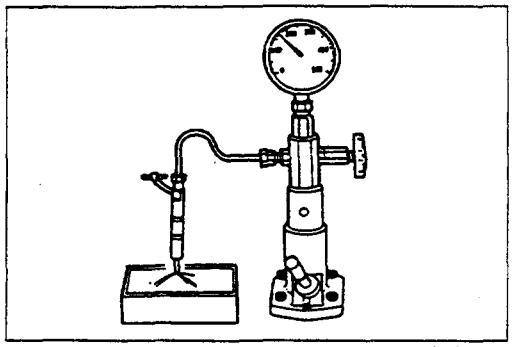
9TG0F3-063

1. Seal cover
2. Injection pipe holder
3. Injection pipe
4. Holder bracket
5. Injection nozzle

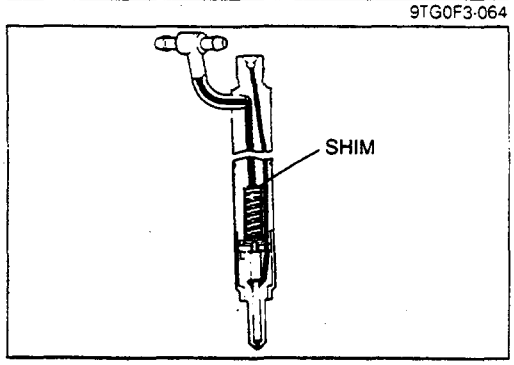
Inspection

Warning
- **Do not allow your hands or any other part of the body to come into the direct path of the spray when using the nozzle tester because the spray has enough force to break the skin and possibly cause blood poisoning.**

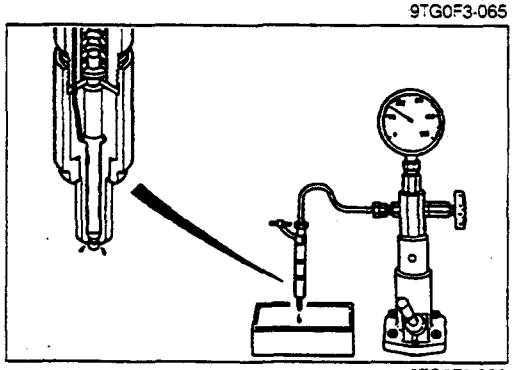
Caution
- **The nozzle tester should be set up in a clean work place.**



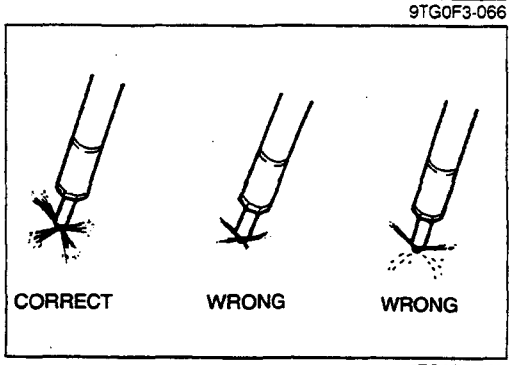
9TG0F3-064



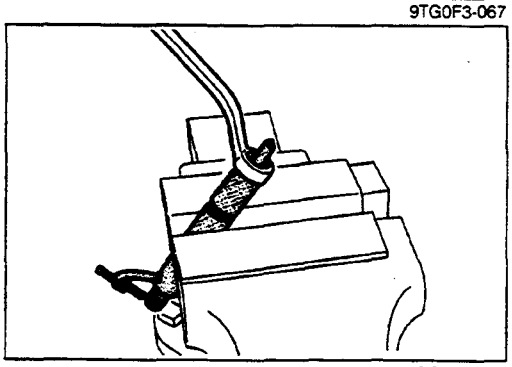
9TG0F3-065



9TG0F3-066



9TG0F3-067



9TG0F3-068

Injection starting pressure

1. Connect the nozzle to a nozzle tester.
2. Pump the nozzle tester handle and note the pressure when injection is started.

Injection starting pressure
New nozzle 20,580 kPa (210 kg/cm^2, 2,986 psi)
Used nozzle 19,620 kPa (200 kg/cm^2, 2,844 psi)

3. If not within the specified pressure, adjust the starting pressure by adding or removal.

Note

- **Shims are available in 0.05mm (0.002 in) steps, from 0.5 to 1.45mm (from 0.02 to 0.057 in). Changing shim thickness by 0.05mm (0.002 in), changes the injection pressure approx. 491 kPa (5.0 kg/cm^2, 71 psi).**

Leakage of injector

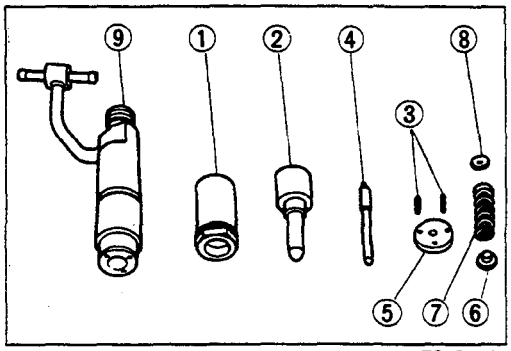
Apply pressure 1,962 kPa (20 kg/cm^2, 284 psi) lower than the specified injection pressure, and see if the fuel leaks from the nozzle injection hole.
If the fuel leaks, it is necessary to disassemble, wash and recheck the nozzle or replace it.

Atomizing condition

1. Connect the nozzle on the nozzle tester.
2. Bleed the air by operating the nozzle tester handle several times.
3. Keeping the pressure gauge of the nozzle tester in the non-functioning condition, quickly lower the handle (lower the handle as quickly as possible so that a pulsating whistling, sound can be hard). Repeat this operation several times and check the atomizing condition.
4. Verify that the fuel is atomized uniformly and properly.
5. Verify that the injection angle and direction are normal.
6. If the atomizing condition is incorrect, it is necessary to disassemble, wash and recheck the nozzle, or to replace it.

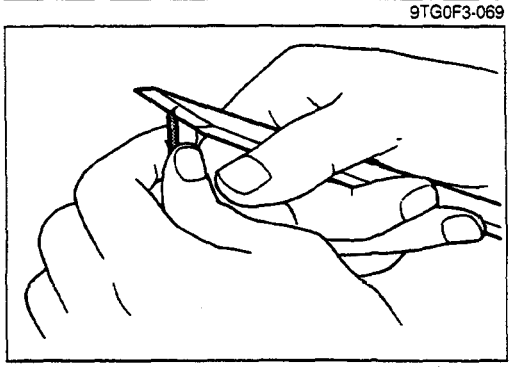
Disassembly

1. Clamp the nozzle in a vise as shown in the figure.

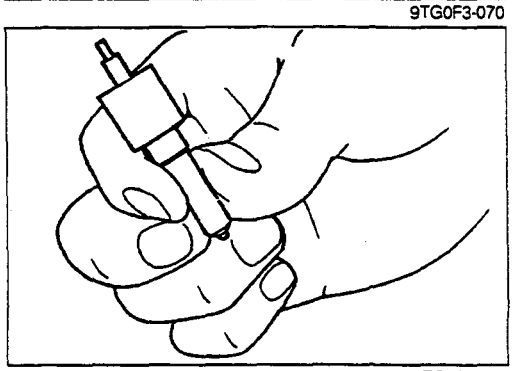


9TG0F3-069

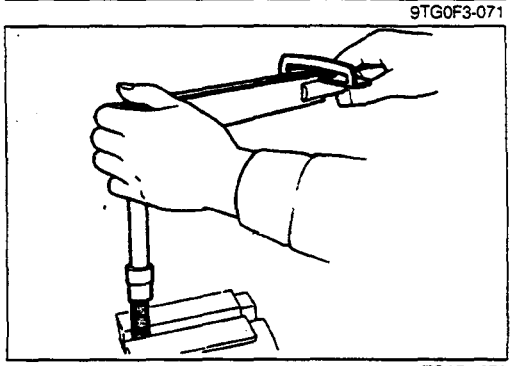
2. Disassemble as shown in the figure.
   ①Retaining ring
   ②Nozzle body
   ③Guide pin
   ④Needle valve
   ⑤Distance piece
   ⑥Pressure pin
   ⑦Pressure spring
   ⑧Shim
   ⑨Nozzle holder


9TG0F3-070

Cleaning
1. Clean the nozzle with new fuel.
2. Clean the carbon fixed on nozzle with a hard lumber.
3. Inspect for damaged or pitted parts, repair or replace as necessary.


9TG0F3-071

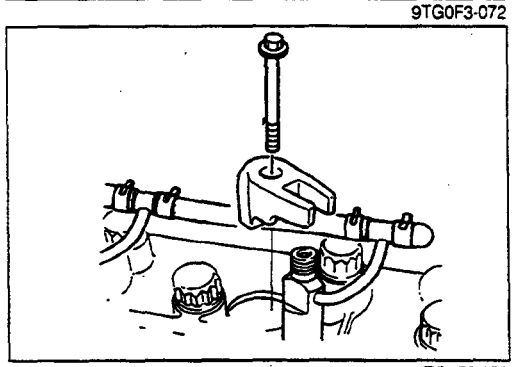
4. Verify that the nozzle body is not damaged.
   Hold the nozzle body upright and insert the needle valve approximately two-thirds of the way into the body. Verify that the needle valve drops into the body under it's own weight when released.


9TG0F3-072

Assembly
1. Assemble in the reverse order of disassembly.

   Tightening torque:
   29—39 N·m (3.0—4.0 m-kg, 22—29 ft-lb)

2. Retest the nozzle after assemble. (Refer to page F3–26.)


9TG0F3-073

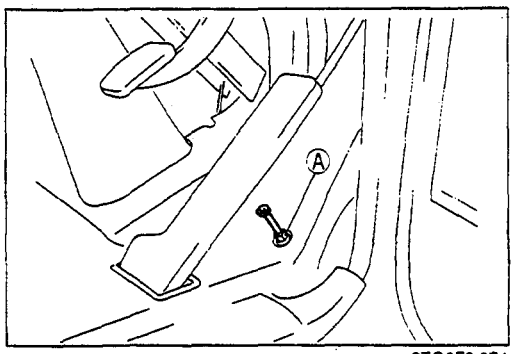
Installation

Caution
- **Use new gaskets and O-rings.**

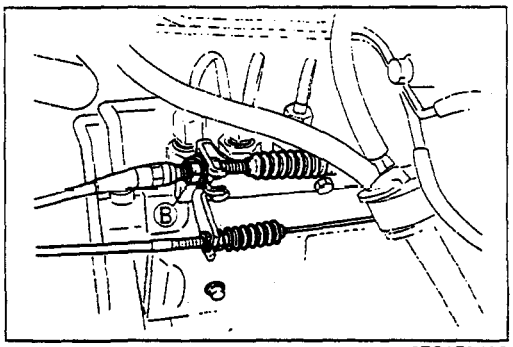
1. Install in the reverse order of removal.

   Tightening torque:
   Retainer bolt:
   46—54 N·m (4.7—5.5 m-kg, 34—40 ft-lb)
   Nozzle nut:
   20—25 N·m (2.0—2.5 m-kg, 14—18 ft-lb)

2. Run the engine and check for fuel leakage.



9TG0F3-074



9TG0F3-075

ACCELERATOR PEDAL, ACCELERATOR CABLE

Inspection / Adjustment

1. Verify that the control lever of the injection pump is in the fully-open position when the accelerator pedal is fully depressed.
2. Loosen nut Ⓐ and adjust the stop bolt, if necessary.

Tightening torque
6.9—9.8 N·m (70—100 m-kg, 61—87 in-lb)

3. Check the free play of the accelerator cable.

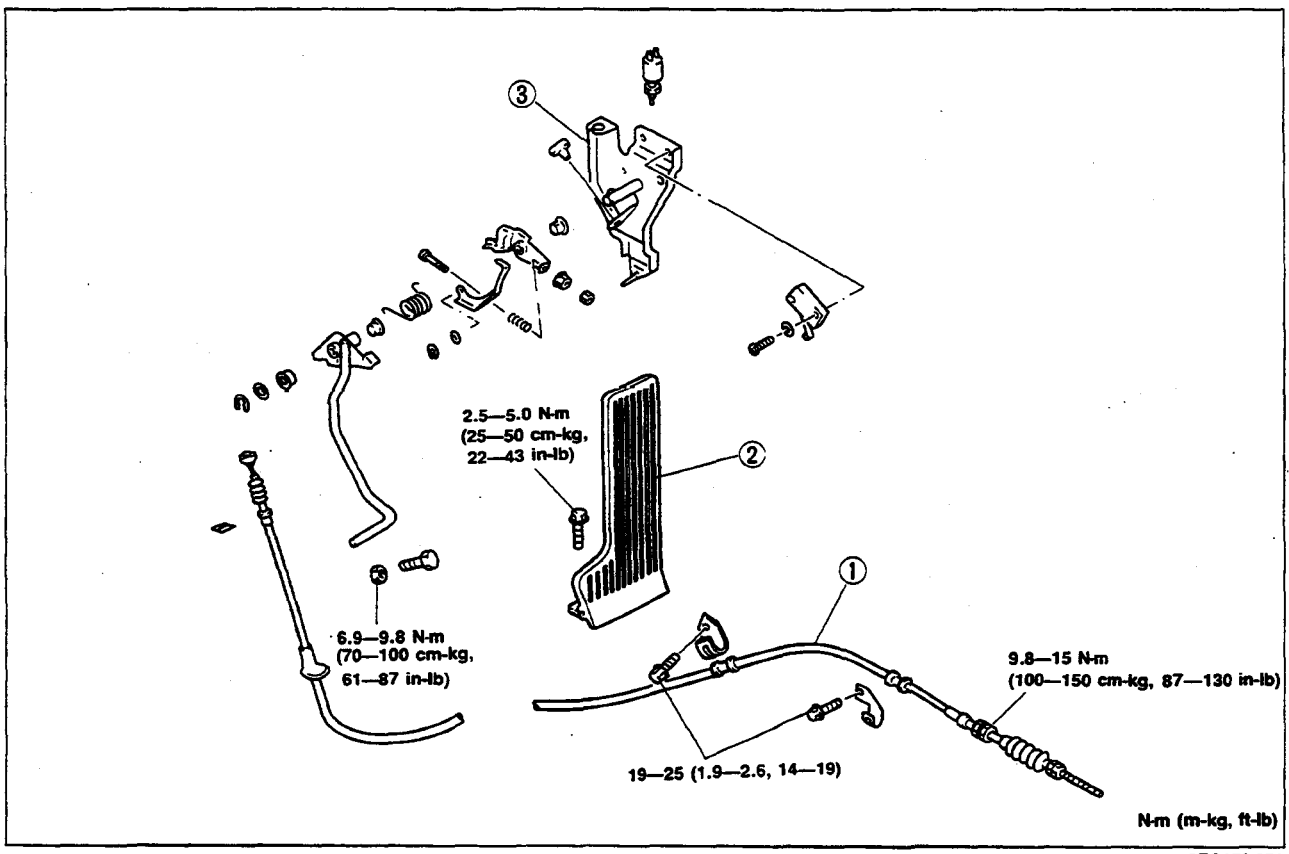
Free play 1.0—3.0mm (0.039—0.12 in)

4. Adjust the nuts Ⓑ, if necessary.

Tightening torque:
9.8—15 N·m (100—150 cm-kg, 87—130 in-lb)

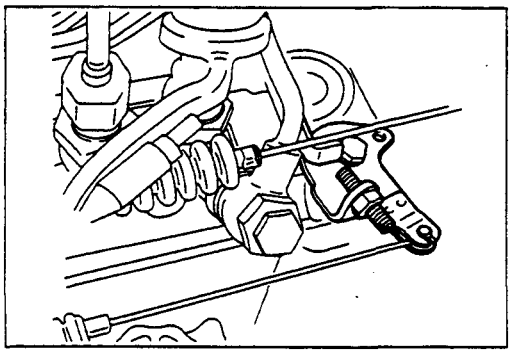
Removal / Installation

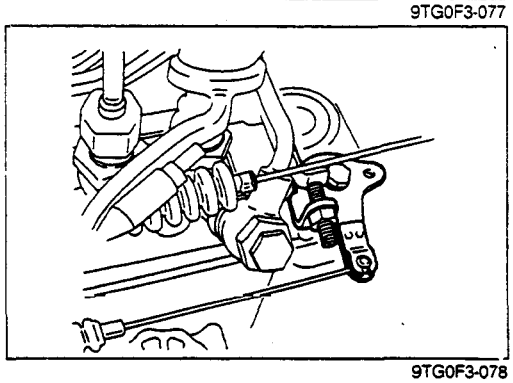
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.

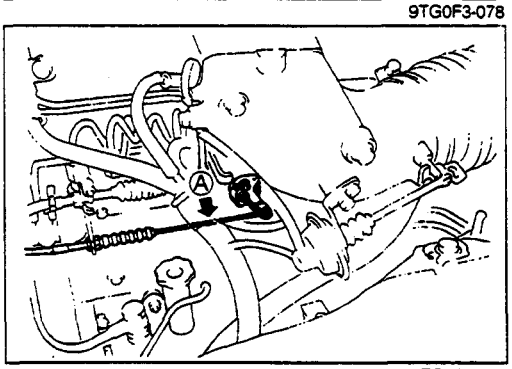


9TG0F3-076

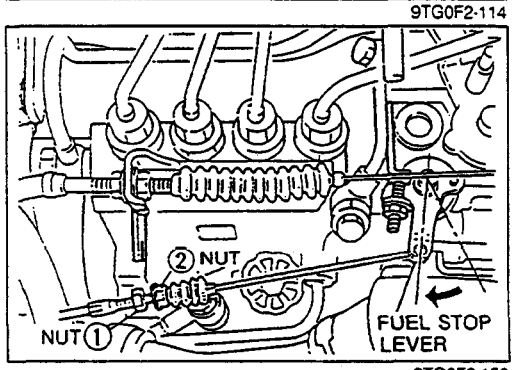
1. Accelerator cable
2. Accelerator pedal
3. Bracket


9TG0F3-077

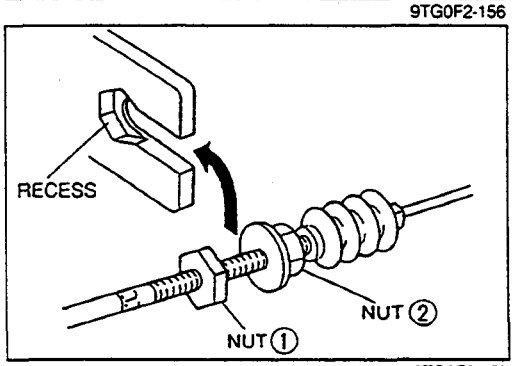

9TG0F3-078



9TG0F2-114



9TG0F2-156



9TG0F2-157

FUEL CUT CONTROL SYSTEM

SYSTEM OPERATION

1. Turn the engine switch OFF and verify that the stop lever is at the fuel stop position.
2. Turn the engine switch ON and verify that the stop lever is at the fuel inject position.
3. Run the engine.
4. Turn the engine switch OFF and verify that the engine will stop.

FUEL STOP CABLE

Inpection

1. Check the cable for damage or rust.
2. Turn the engine switch OFF.
3. Move the fuel stop lever to make the fuel line close.
4. Check the free play of cable in condition of tensed Ⓐ position of the fuel stop cable.

   Free play: 0—2mm (0—0.078 in)

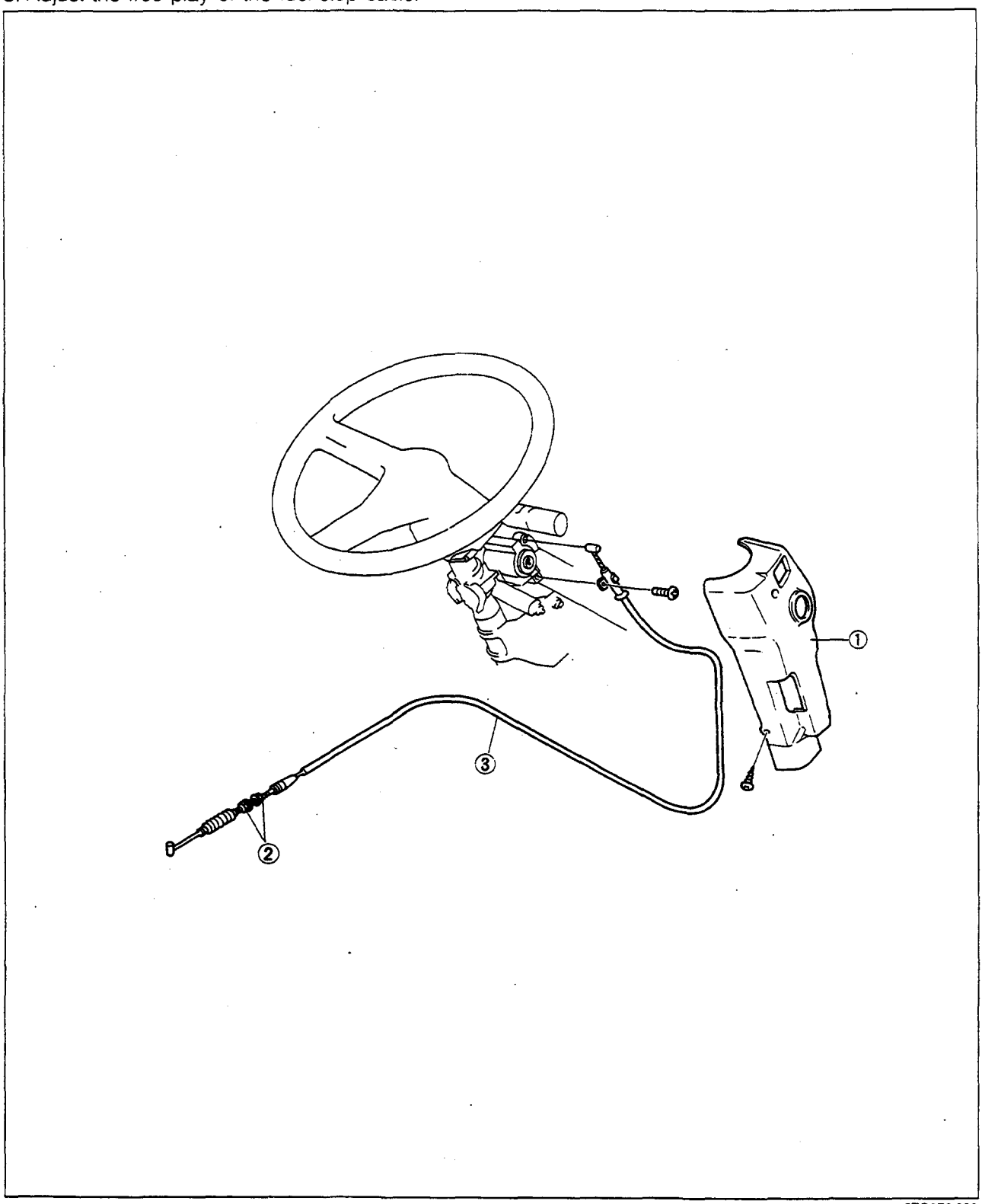
5. Verify that the engine stops when turn the engine switch OFF.
6. If not as specified, adjust the cable as follows.

Adjustment

1. Turn the engine switch OFF.
2. Loosen nut ② and remove the fuel stop cable from the bracket.
3. Pull the fuel stop cable and verify that the fuel stop lever is at the fuel stop position.
4. Adjust nut ① so that there is no clearance between it and the outside of the bracket.
5. Install the cable into the bracket, fitting nut ① into the recess.
6. Check the free play of the cable as above.
7. If not as specified perform steps 2—5 again.
8. If as specified, tighten nut ②.
9. Verify that the engine stops when turning the engine switch OFF.

Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Adjust the free play of the fuel stop cable.

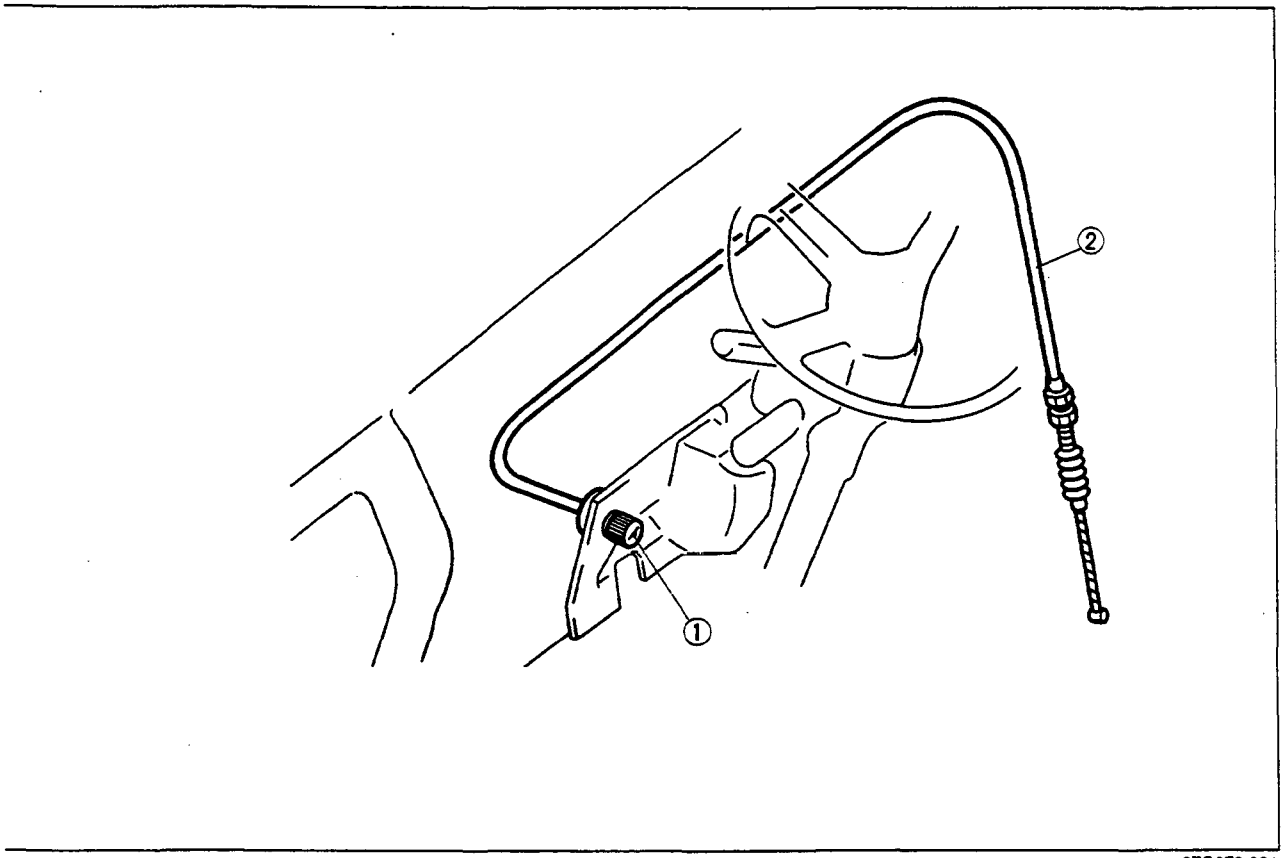


9TG0F3-080

1. Steering column cover
2. Locknuts
3. Fuel stop cable

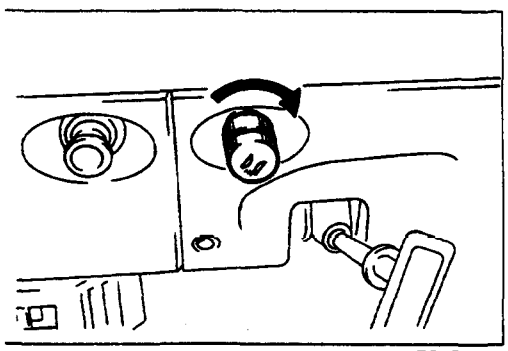
IDLE SPEED CONTROL SYSTEM

STRUCTURAL VIEW

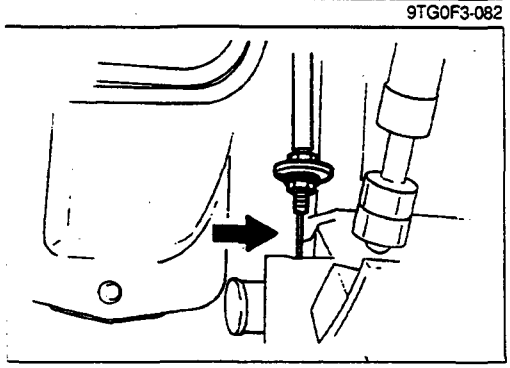


9TG0F3-081

1. Idling knob
   Removal / Installation ..... page F3–32
2. Idling cable
   Inspection / Adjustment..... page F3–31
   Removal / Installation ..... page F3–32



9TG0F3-082



9TG0F3-083

IDLING KNOB, IDLING CABLE

Adjustment

1. Verify that the control lever of the injection pump is at the idle position when the idling knob is not turned.
2. Verify that the idle speed increases when the knob is turned clockwise.
3. Check the free play of the cable when the idling knob is not turned.

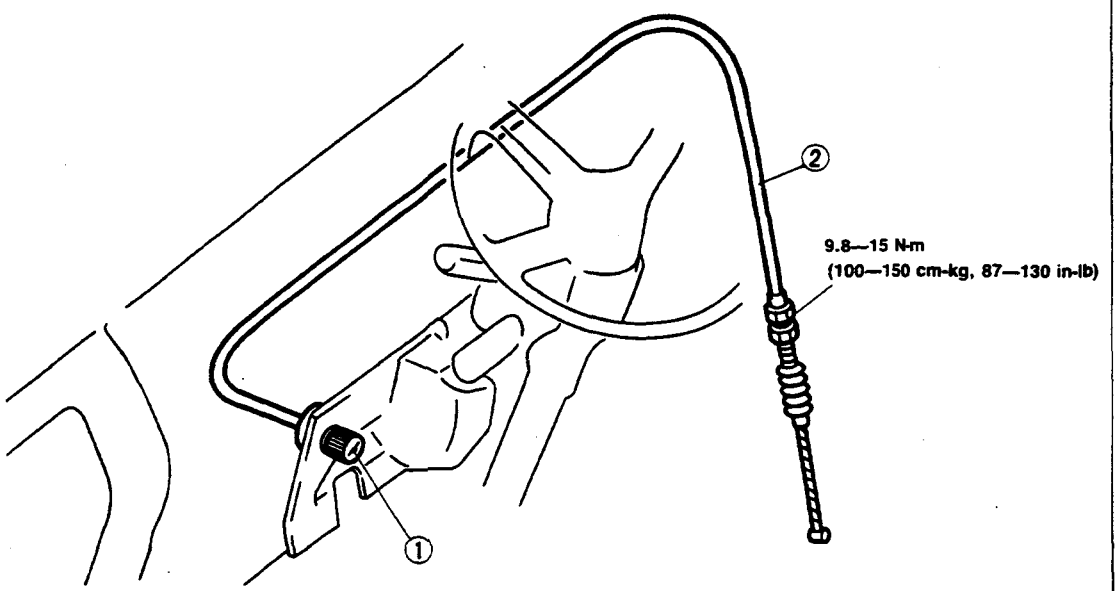
   Free play: 0—5mm (0—0.2 in)

4. If not as specified, loosen the locknuts and adjust the free play.

   Tightening torque:
   9.8—15 N·m (100—150 cm-kg, 87—130 in-lb)

Removal / Installation

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



9TG0F3-084

1. Idling knob
2. Idling cable

EXHAUST SYSTEM

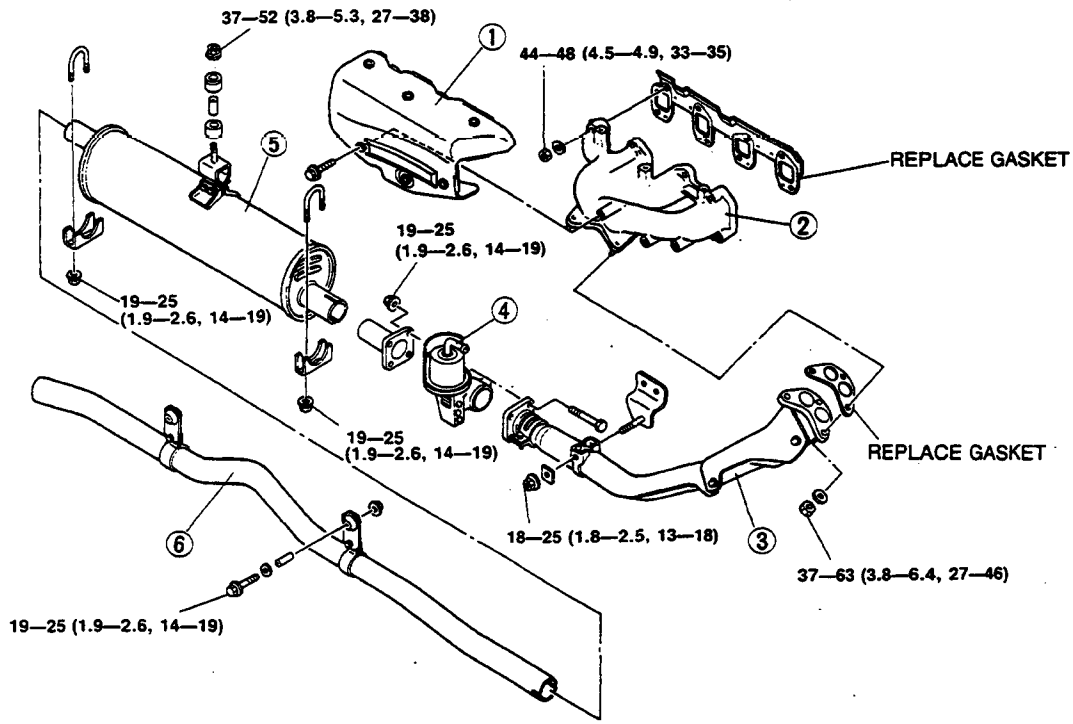
COMPONENTS

Vehicle Inspection

1. Run the engine and verify that there is no exhaust leakage.

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.



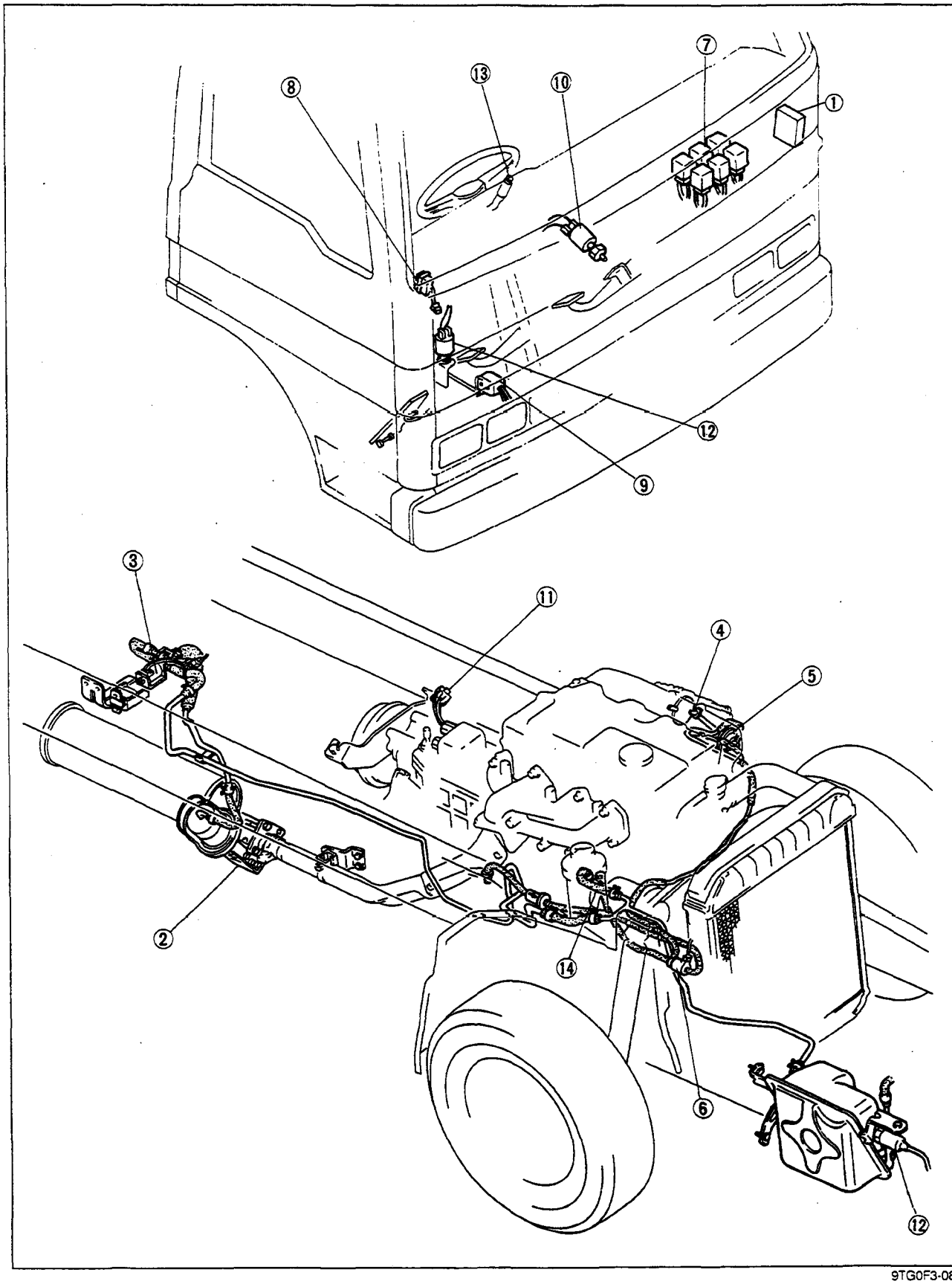
9TG0F3-085

1. Exhaust manifold insulator
2. Exhaust manifold
   Check for contamination, cracks and other damage
3. Front pipe assembly
   Check for contamination cracks and other damage
4. Exhaust brake unit
   Inspection ..... page F3–38
5. Main silencer assembly
   Check for contamination, cracks and other corrosion
6. Tail pipe assembly
   Check for contamination, cracks and other damage

MEMO

EXHAUST CONTROLLED HEATING SYSTEM

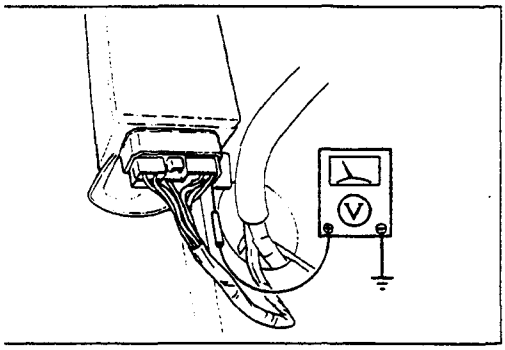
STRUCTURAL VIEW



9TG0F3-086

1. Exhaust heating control unit
Inspection ..... page F3–37
Replacement ..... page F3–38
2. Exhaust brake unit
Removal ..... page F3–38
Inspection ..... page F3–38
Installation ..... page F3–39
3. Magnetic valve (Exhaust shutter valve)
Removal ..... page F3–39
Inspection ..... page F3–39
Installation ..... page F3–39
4. Intake shutter valve
Inspection ..... page F3–40
Removal / Installation ..... page F3–15
5. Intake shutter valve actuator
Inspection ..... page F3–40
Replacement ..... page F3–40
6. Solenoid valve (for intake shutter valve)
Inspection ..... page F3–41
7. Cancel relay (pay load above 3.5t only)
Removal ..... page F3–41
Inspection ..... page F3–41
Installation ..... page F3–41
8. Exhaust heating switch
Removal ..... page F3–42
Inspection ..... page F3–42
Installation ..... page F3–42
9. Accelerator switch
Inspection ..... page F3–42
Replacement ..... page F3–43
10. Clutch switch
Inspection ..... page F3–43
Replacement ..... page F3–43
11. Neutral switch
Inspection ..... page F3–43
Replacement ..... page F3–44
12. Vacuum switch (pay load above 3.5t only)
Inspection ..... Section T
13. Exhaust brake switch
Inspection ..... page F3–44
Replacement ..... Section T
14. Vacuum pump
Removal ..... Section P
Inspection ..... Section P
Installation ..... Section P

9TG0F3-087



9TG0F3-088

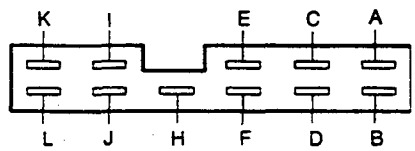
EXHAUST HEATING CONTROL UNIT

Inspection

1. Measure the terminal voltage of the exhaust heating control unit when the vacuum switch connector disconnected.
2. If not as specified, repair the wire harness or replace the control unit.

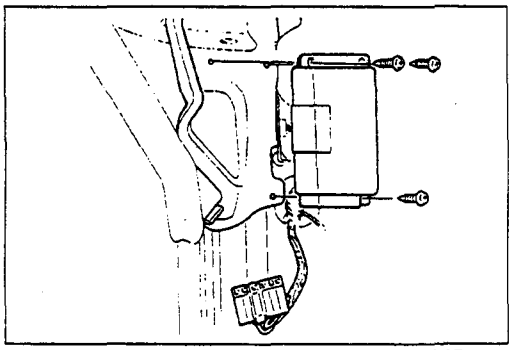
Terminal	Color of wire	Connected to	Conditions of measuring (engine sw ON)	Voltage	Possible cause
A	BR	Exhaust heating switch	Exhaust heating switch OFF	Approx. 12V	Exhaust heating switch (Refer to page F3–42) Wire harness
			Exhaust heating switch ON	Approx. 0V	
B	R/L	Clutch switch	Accelerator and clutch pedal released	Approx. 0V	Clutch switch (Refer to page F3–43) Accelerator switch (Refer to page F3–42) Wire harness
			Accelerator or clutch pedal depressed	Approx. 0V	
C	—	—	—	—	—
D	L/Y	Neutral switch	Neutral	Approx. 12V	Neutral switch (Refer to page F3–43) Wire harness
			In gear	Approx. 0V	
E	O	Exhaust brake switch	Exhaust brake switch OFF	Approx. 12V	Exhaust brake switch (Refer to page F3–44) Wire harness
			Exhaust brake switch ON	Approx. 0V	
F	B/Y, L/W*	Exhaust brake switch Exhaust heating switch	Constant	Approx. 12V	Exhaust brake switch (Refer to page F3–44) Exhaust heating switch (Refer to page F3–42) Wire harness
H	B	Ground	Constant	Approx. 0V	Wire harness
I	G/Y	Magnetic valve (for exhaust shutter valve)	• Accelerator and clutch pedal released • Exhaust heating switch ON	Less than approx. 2V	Magnetic valve (Refer to page F3–39) Wire harness
			• Accelerator and clutch pedal released • Neutral • Exhaust brake switch ON	Less than approx. 1V	
			Except above conditions	Approx. 12V	
J	—	—	—	—	—
K	R/BR	Solenoid valve (Intake shutter valve)	• Accelerator pedal depressed less than half or clutch pedal depressed or both depressed • Exhaust heating switch ON	Less than approx. 1V	Solenoid valve (Refer to page F3–40) Wire harness
			Except above conditions	Approx. 12V	

Connector

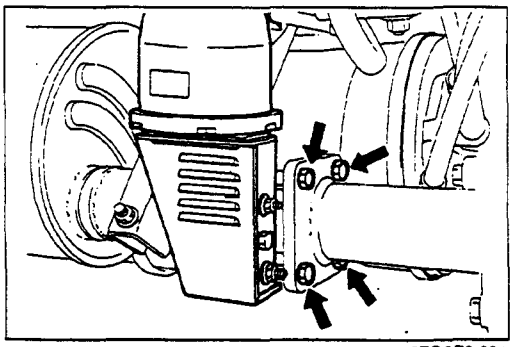


9TG0F3-089

*.... Pay load above 3.5t only


9TG0F3-090

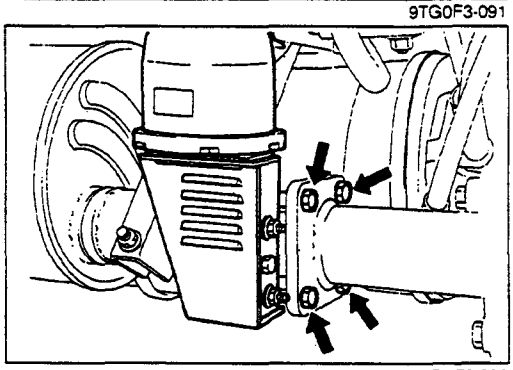
Replacement
1. Disconnect the connector from the exhaust heating control unit.
2. Remove the exhaust heating control unit.
3. Install in the reverse order of removal.


9TG0F3-091

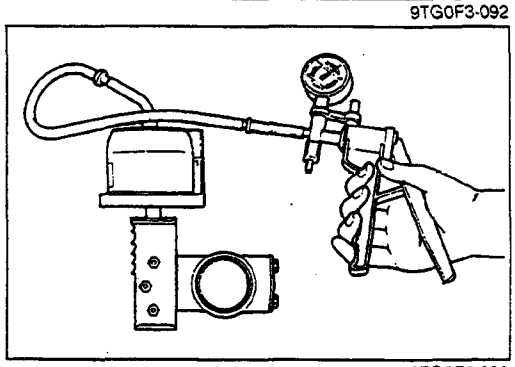
EXHAUST BRAKE UNIT (POWER CHAMBER)

Removal
1. Disconnect the vacuum hose from the exhaust brake unit.
2. Remove the exhaust brake unit assembly.

Note
- **It is difficult to remove the exhaust brake unit when the exhaust shutter valve is open. Connect a vacuum pump to hold the valve closed to remove it.**

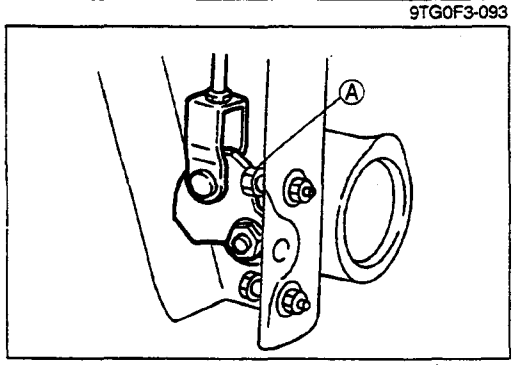

9TG0F3-092

Inspection
1. Remove the exhaust brake unit assembly.
2. Remove the service hole cover.


9TG0F3-093

3. Connect a vacuum pump and check the following.

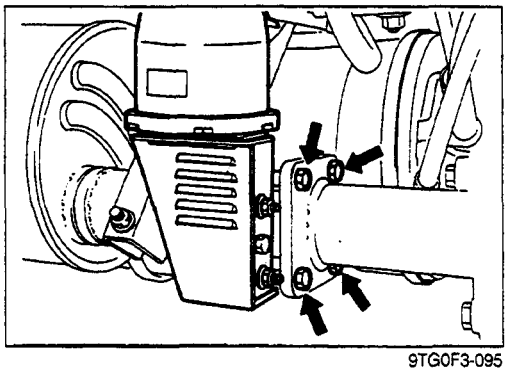
Starts closing 100mmHg (3.9 inHg)
Fully closing 350mmHg (13.8 inHg)

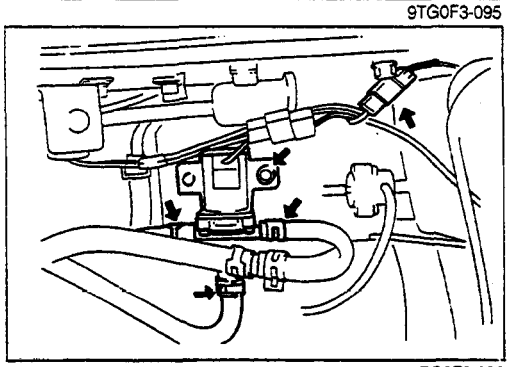


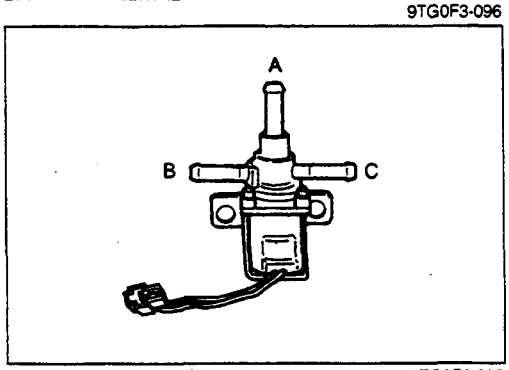
9TG0F3-094

4. When fully closed adjust the gap of the valve by turning bolt Ⓐ.

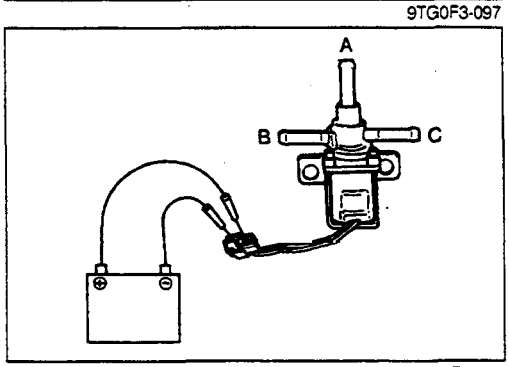
Gap 0.2—0.4mm (0.007—0.015 in)


9TG0F3-095

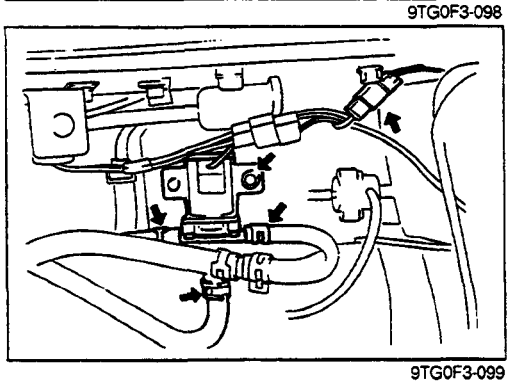

9TG0F3-096



9TG0F3-097



9TG0F3-098


9TG0F3-099

Installation

Note
- **After installing the exhaust brake unit, the vacuum warning buzzer may ring until vacuum is built up.**

Install in the reverse order of removal.

Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

MAGNETIC VALVE (FOR EXHAUST SHUTTER VALVE)

Removal

1. Remove the vacuum hose from the magnetic valve.
2. Disconnect the connector from the magnetic valve.
3. Remove the magnetic valve.

Inspection

1. Verify air flow through the valve.

A—B: Flow
A—C: No flow
B—C: No flow

2. Connect 12V to the valve and verify air flow.

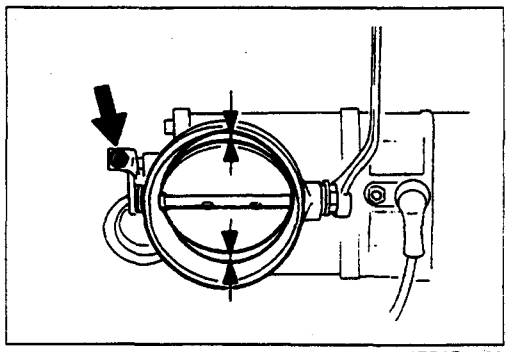
A—B: No flow
A—C: Flow
B—C: No flow

Installation

Note
- **After installing the magnetic valve, the vacuum warning buzzer may ring until vacuum is built up.**

Install in the reverse order of removal.

Tightening torque:
43—61 N·m (4.4—6.2 m-kg, 32—45 ft-lb)


9TG0F1-100

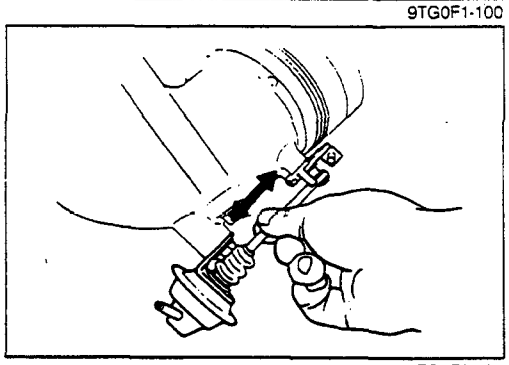
INTAKE SHUTTER VALVE

Inspection

1. Verify that the clearance at both sides of the valve is as specified when the valve is fully closed.

   Clearance: 5.7 ± 0.2mm (0.224 ± 0.007 in)

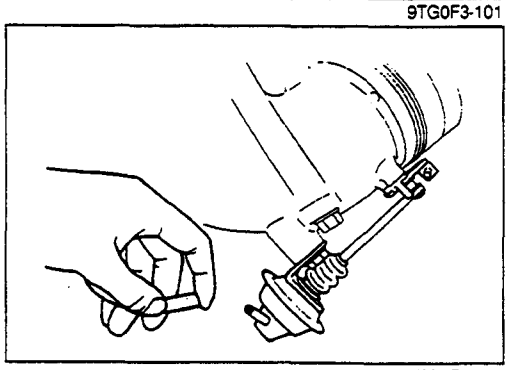
2. If not as specified, adjust by turning the adjusting screw.


9TG0F3-101

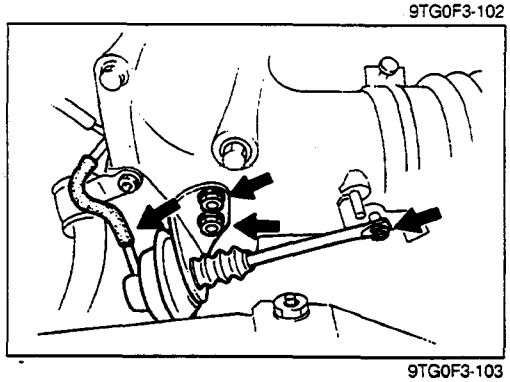
INTAKE SHUTTER VALVE ACTUATOR

Inspection

1. Remove the vacuum hose from the actuator.
2. Verify that the rod of the actuator smoothly when moved by hand.
3. Start the engine and run it at idle.


9TG0F3-102

4. Verify that there is vacuum at the vacuum hose. If not, check the intake shutter solenoid valve. (Refer to page F3–41.)
5. Install the vacuum hose, and verify that the actuator rod is pulled.


9TG0F3-103

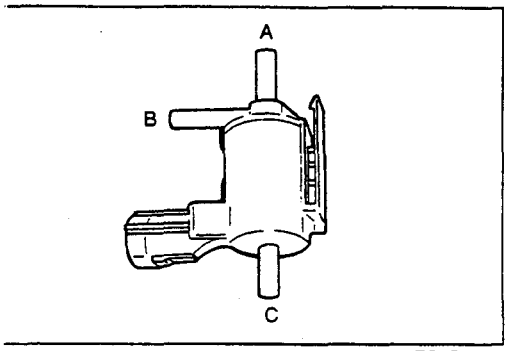
Replacement

Note

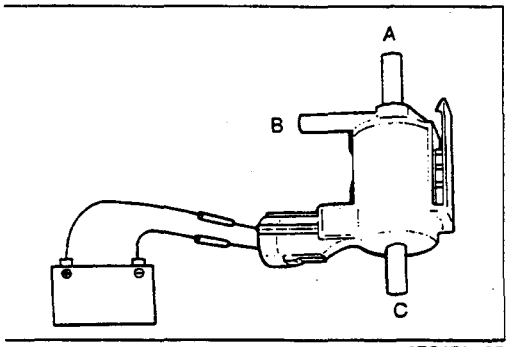
- **After installing the actuator, the vacuum warning buzzer may ring until vacuum is built up.**

1. Disconnect the vacuum hose from the actuator.
2. Remove the C-clip.
3. Remove the actuator.
4. Install in the reverse order of removal.

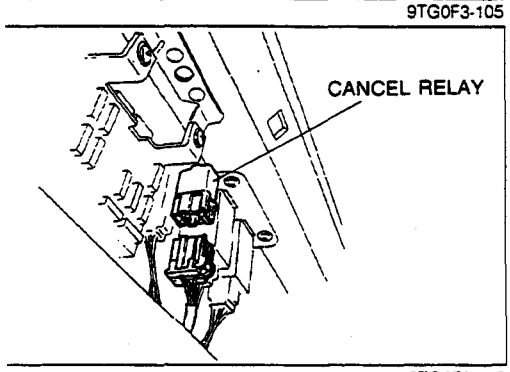
Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)



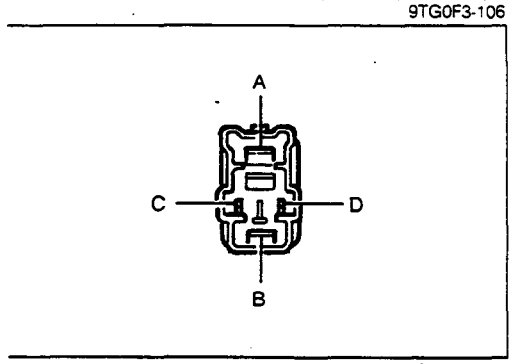
9TG0F3-104



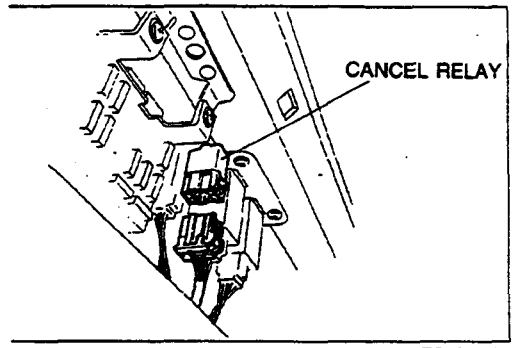
9TG0F3-105



9TG0F3-106



9TG0F3-107



9TG0F3-108

SOLENOID VALVE (INTAKE SHUTTER VALVE)

Inspection

Note
- **After installing the solenoid valve, the vacuum warning buzzer may ring until vacuum is built up.**

1. Remove the solenoid valve.
2. Check the bleeding condition of each pipe by breathing. It is normal if it is the same as following.

A—B: No bleeding
A—C: No bleeding
B—C: Bleeding

3. Check the bleeding condition of each pipe by breathing when there is battery voltage between terminals of the solenoid valve. It is normal if it is the same as following.

A—B: Bleeding
A—C: No bleeding
B—C: No bleeding

CANCEL RELAY

Removal

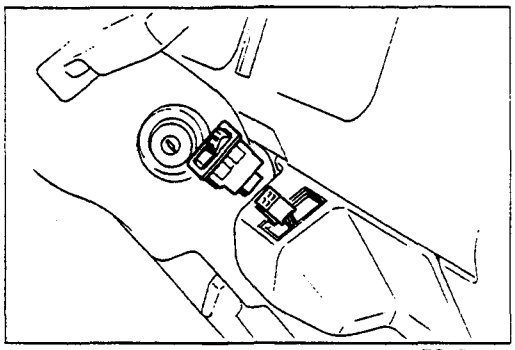
Remove as shown in the figure.

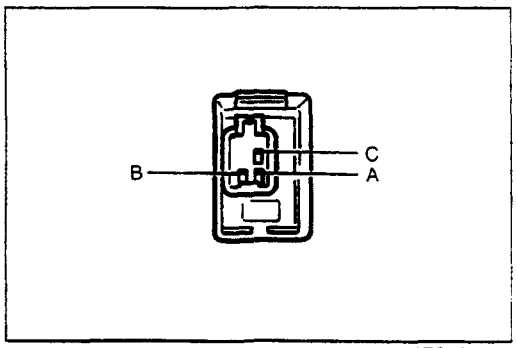
Inspection

1. Disconnect the cancel relay.
2. Check for continuity between terminals A and D of the relay.
3. Connect 12V between terminals B and C, and verify that there is no continuity between terminal A and D.
4. If there is faulty, replace the cancel relay.

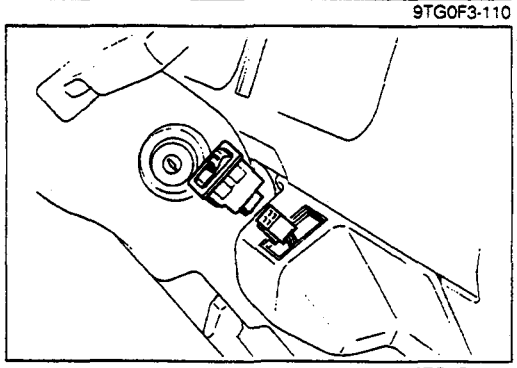
Installation

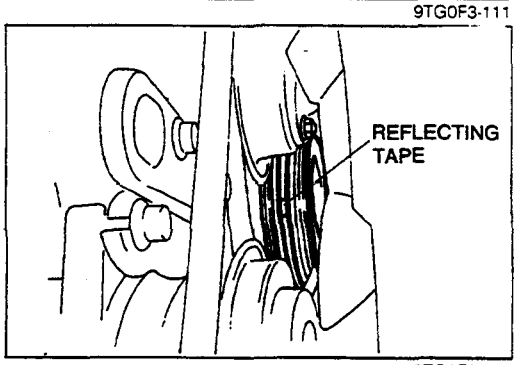
Install in the reverse order of removal.


9TG0F3-109

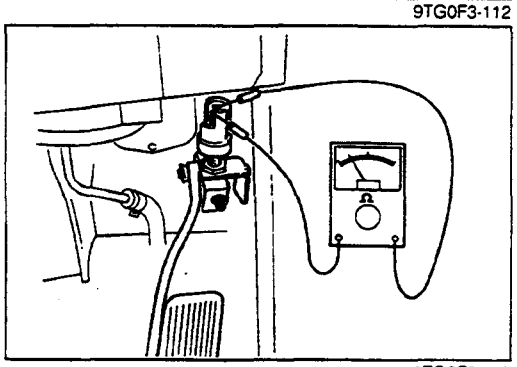


9TG0F3-110


9TG0F3-111



9TG0F3-112


9TG0F3-113

EXHAUST HEATING SWITCH

Removal

Remove in the order shown in the figure.

Inspection

1. Remove the exhaust heating switch.
2. Check continuity between terminals of the switch.

Switch	Terminal		
	A—B	A—C	B—C
OFF	Continuity	No continuity	No continuity
ON	Continuity	Continuity	Continuity

Note

- **When checking continuity between A and B, B and C, connect the negative tester load to terminal B.**

Installation

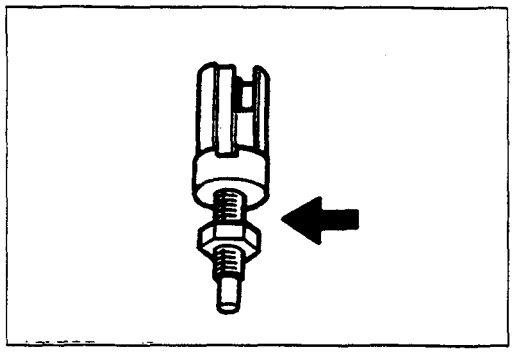
Install in the reverse order of removal.

ACCELERATOR SWITCH

Inspection

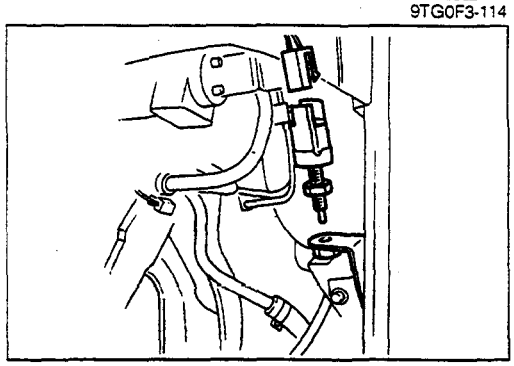
1. Run the engine to normal operating temperature.
2. Stop the engine and affix reflecting tape to the crankshaft pulley.
3. Start the engine.
4. Disconnect the accelerator switch connector.
5. Connect a photo tachometer.
6. Verify that there is no continuity of the switch when the accelerator is not depressed.
7. Depress the accelerator and verify that there is continuity at the specified speed.

Specified speed: 800—1,000 rpm

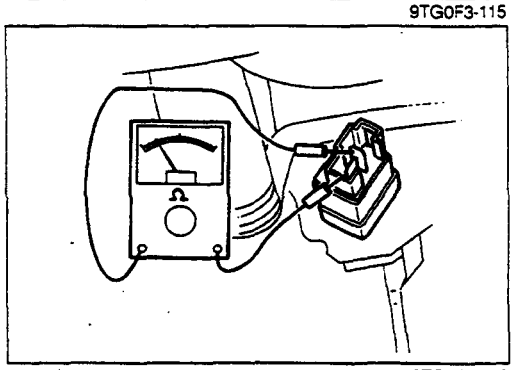

9TG0F3-114

8. If not as specified, loosen the locknut and adjust the switch.
9. After adjusting, tighten the locknut.

Tightening torque:
14—18 N·m (1.4—1.8 m-kg, 10—13 ft-lb)

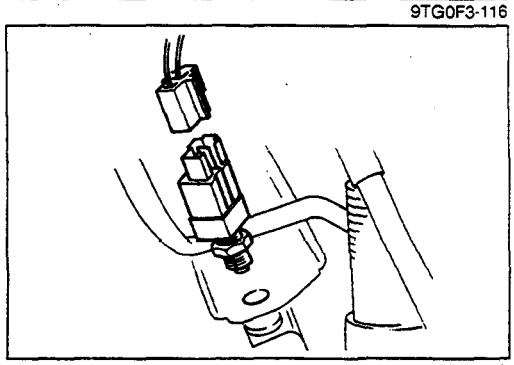

9TG0F3-115

Replacement
1. Disconnect the accelerator switch connector.
2. Loosen the locknut and remove the switch.
3. Install the new accelerator switch.
4. Adjust the accelerator switch. (Refer to page F3–42.)
5. Tighten the locknut.


9TG0F3-116

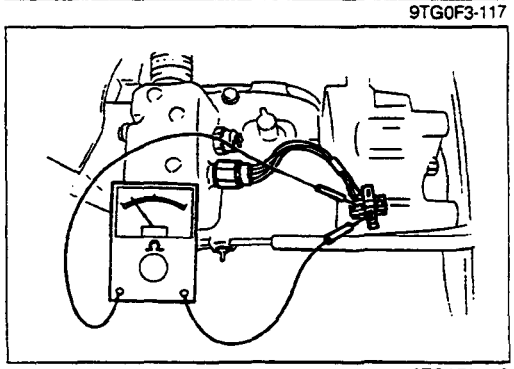
CLUTCH SWITCH
Inspection
1. Disconnect the clutch switch connector.
2. Check continuity of the switch.

Clutch pedal	Continuity
Depressed	No
Released	Yes


9TG0F3-117

Replacement
1. Disconnect the clutch switch connector.
2. Loosen the locknut and remove the clutch switch.
3. Install the new clutch switch.
4. Adjust the switch as shown in "Inspection" above.
5. Tighten the locknut.

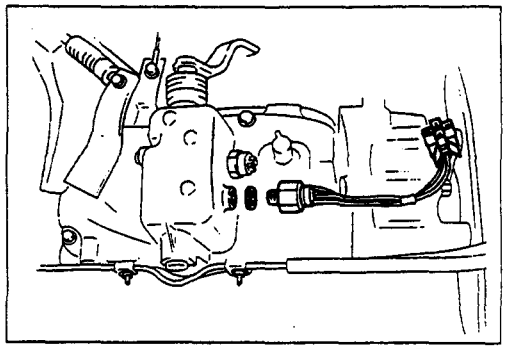
Tightening torque:
14—18 N·m (1.4—1.8 m-kg, 10—13 ft-lb)


9TG0F3-118

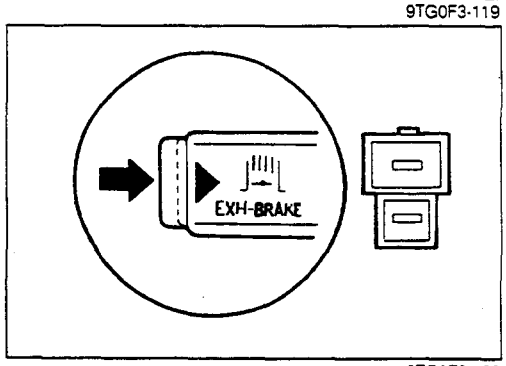
NEUTRAL SWITCH
Inspection
1. Disconnect the neutral switch connector at the upper part of the transmission.
2. Check continuity of the switch.

Transmission	Continuity
Neutral	No
In gear	Yes

3. If not as specified, replace the neutral switch.



9TG0F3-119



9TG0F3-120

Replacement

1. Disconnect the neutral switch connector at the upper part of the transmission.
2. Remove the neutral switch.
3. Install in the reverse order of removal.

Tightening torque:
14—18 N·m (1.4—1.8 m-kg, 10—13 ft-lb)

EXHAUST BRAKE SWITCH

Inspection

1. Remove the steering column cover.
2. Disconnect the exhaust brake switch connector.
3. Check continuity of the switch.

Exhaust brake switch	Continuity
OFF	No
ON	Yes

4. If not as specified, replace the switch. (Refer to Section T.)

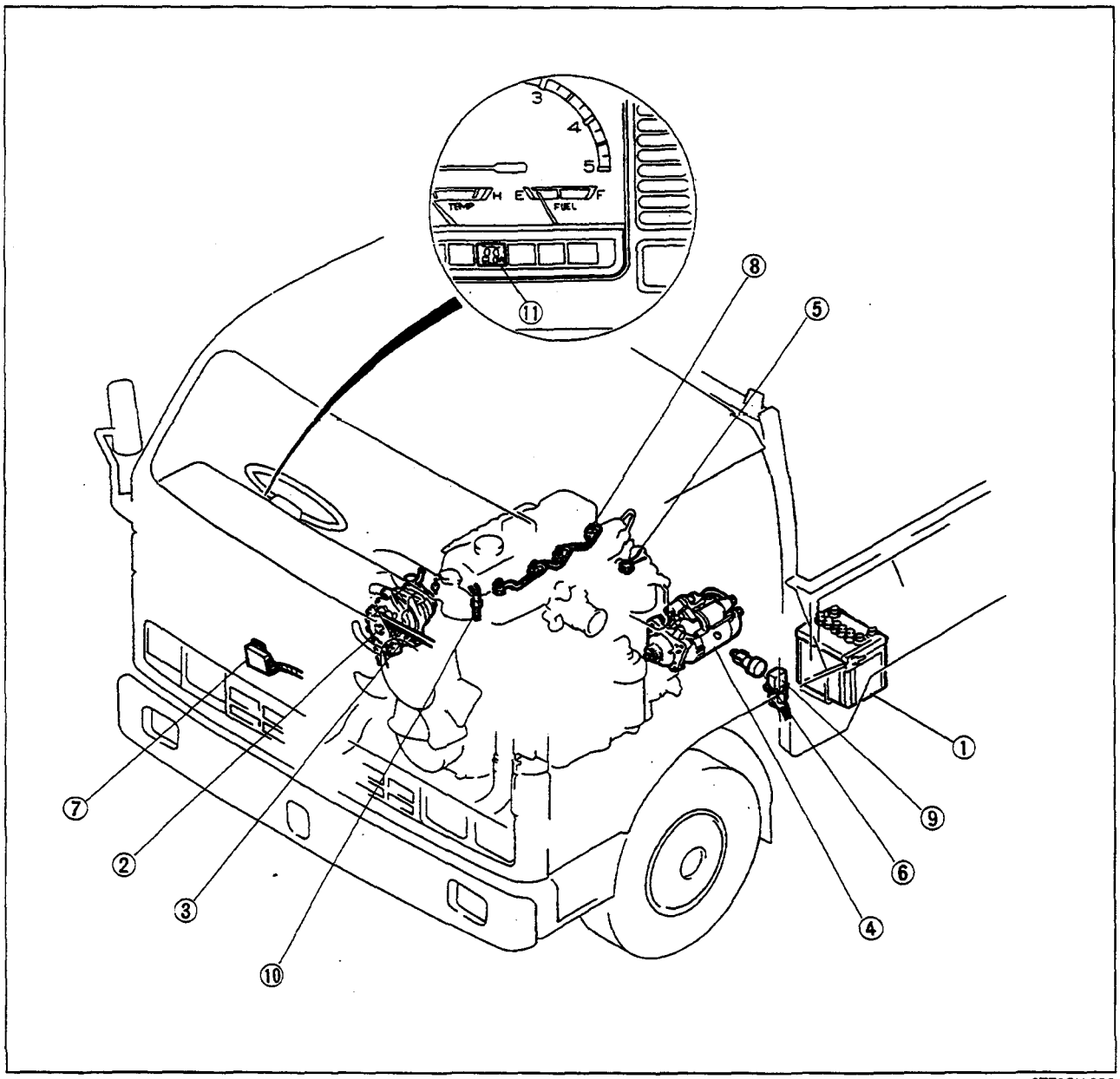
ENGINE ELECTRICAL SYSTEM

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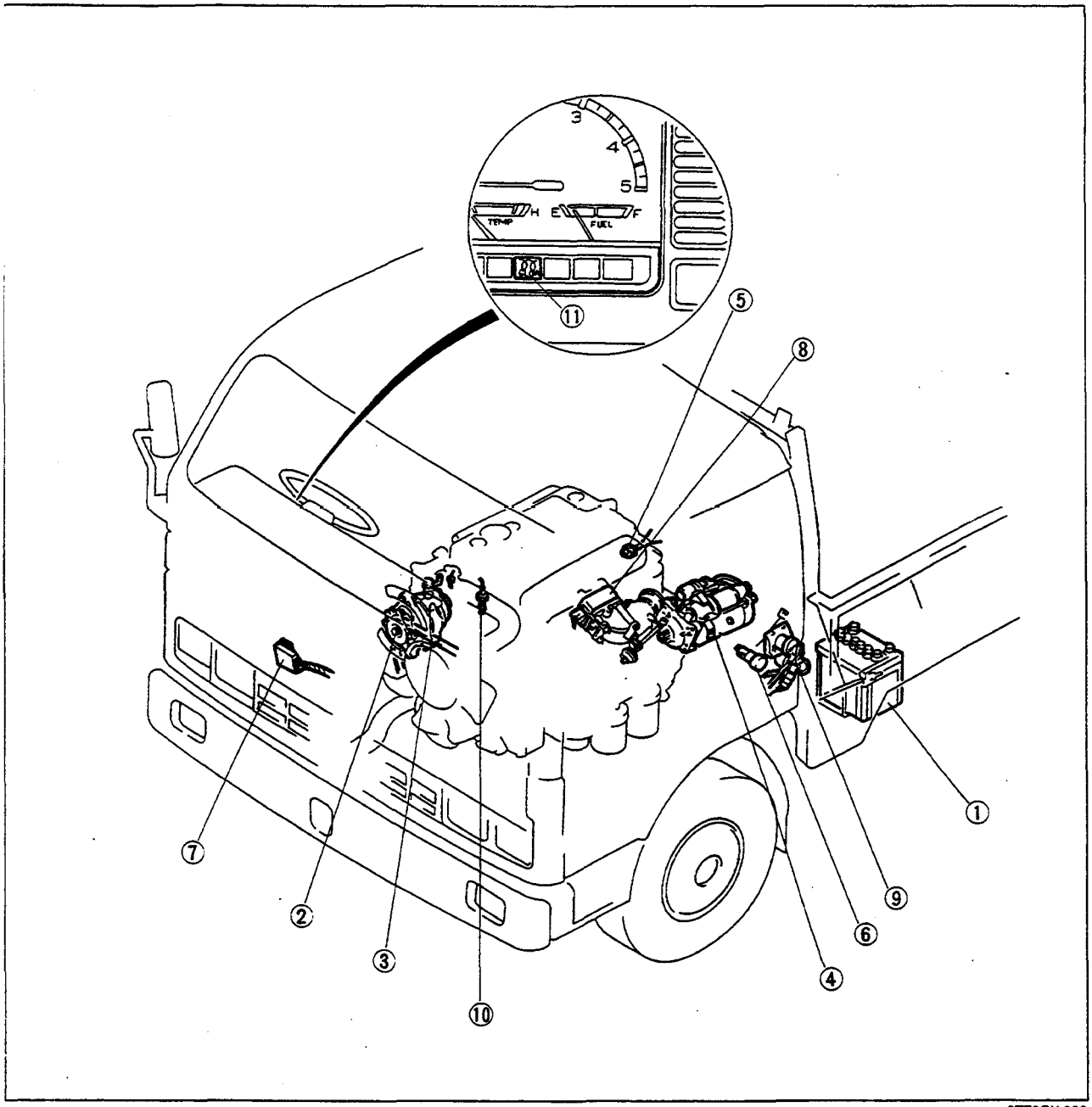
HA ENGINE



9TF0GX-002

1. Battery
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   - Charging ..... page G– 5
2. Alternator
   - Inspection (On-vehicle) ..... page G– 5
   - Removal / Installation ..... page G– 7
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   - Inspection ..... page G– 8
3. Drive belt
   - Inspection / Adjustment ..... page G–10
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5. Neutral switch
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   - Inspection ..... page G–16
7. QSS control unit
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8. Glow plug
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9. Glow plug relay
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10. Water thermosensor
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11. Glow indicator lamp
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SL, TF ENGINES



9TF0GX-003

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Charging ..... page G– 5
2. Alternator
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8. Air heater
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9. Air heater relay
Inspection ..... page G–20
10. Water thermosensor
Inspection ..... page G–21
11. Glow indicator lamp
Inspection ..... page G–26

TROUBLESHOOTING

Trouble	Possible Cause	Action to be Taken
Starting motor does not turn, or turns too slowly to start the engine	Battery and related parts	
	• Faulty contact of battery terminal	Clean and tighten
	• Faulty grounding of negative cable	Clean and repair
	• Voltage drop caused by discharging	Charge
	• Insufficient voltage caused by faulty battery	Replace
	Engine switch	
	• Faulty contact on engine switch	Replace
	• Loose engine switch wiring and connectors	
	• Broken wire between engine switch and magnetic switch	Repair or Replace
	Magnetic switch and related parts	
	• Loose wiring and connectors	Repair
	• Broken wire of magnetic switch pull-in coil	Replace
	• Faulty contact of magnetic switch contact plate	Replace
	• Broken wire of magnetic switch holding coil	Replace
	Starting motor and related parts	
	• Faulty contact of brushes	Repair or replace
	• Fatigued brush spring	Replace
	• Faulty grounding of field coil	Replace
	• Faulty soldering of field coil	Repair
	• Faulty commutator	Repair or replace
	• Faulty grounding of armature	Replace
	• Wear on parts	Replace
Starting motor turns, but the engine does not start	Insufficient battery capacity	Charge
	Air heater system and related parts (in cold)	
	• Faulty air heater control unit	Replace
	• Faulty air heater relay	Replace
	• Faulty air heater	Replace
	• Faulty water thermosensor	Replace
	• Broken or grounded of harness in air heater system and related parts	Repair or replace
	Quick start system and related parts	
	• Faulty QSS control unit	Replace
	• Faulty glow plug relay	Replace
	• Faulty glow plug	Replace
	• Faulty water thermosensor	Replace
	• Broken or grounded of harness in QSS and related parts	Repair or replace
Starting motor turns, but pinion gear does not mesh with ring gear	• Tip of overrunning clutch pinion is worn	Replace
	• Raced overrunning clutch drive spring	Replace
	• Raced overrunning clutch	Replace
	• Faulty sliding surface of spline	Repair or replace
	• Worn bushing	Replace
	• Worn ring gear	Replace
Starting motor turns continuously and does not stop	• Sticking contact plate of magnetic switch	Replace
	• Layer short of magnetic switch coil	Replace
	• Engine (ignition) switch does not return properly	Replace
Battery discharge	• Loose drive belt	Adjust
	• Grounded or broken stator coil	Replace
	• Faulty contact between brush and slip ring	Clean and replace
	• Faulty rectifier	Replace
	• Faulty IC regulator	Replace
	• Insufficient or unsuitable battery electrolyte	Adjust
	• Faulty battery electrode (internal short circuit)	Replace
	• Faulty contact of battery terminal	Clean and tighten
	• Excessive electric load	Check power consumption
Overcharged battery	• Faulty IC regulator	Replace

9TG0G1-004

CHARGING SYSTEM

BATTERY

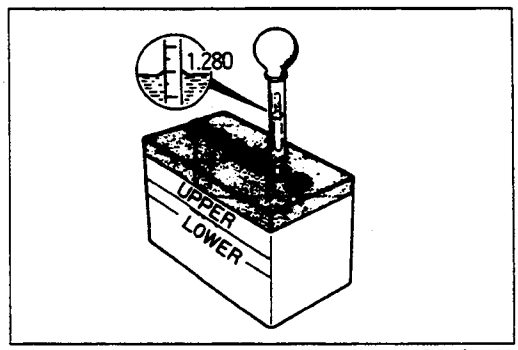
Inspection

Terminal and Cable

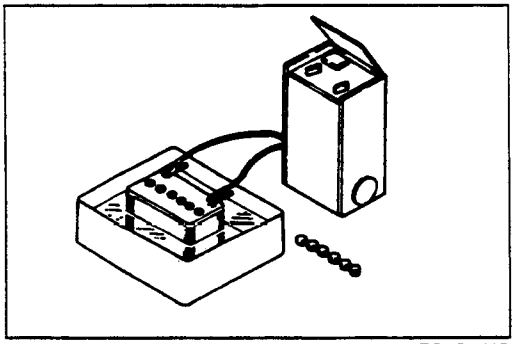
1. Check the tightness of the terminals to ensure good electrical connections. Clean the terminals and coat them with grease after tightening the terminal.
2. Inspect for corroded or frayed battery cables.
3. Check the rubber protector on the positive terminal for proper coverage.

Tightening torque: 37—52 (3.8—5.3, 27—38) N·m (m-kg, ft-lb)

9TG0G1-005



9TG0G1-006



9TG0G1-007

Electrolyte Level

1. Check that the electroyte level lies between the upper and lower lines.
2. If low, add distilled water by the "UPPER LEVEL". Do not overfill.

Specific Gravity

1. Measure the specific gravity by using a hydrometer.
2. If the specific gravity reading is less than standard, recharge the battery.

Standard specific gravity: 1.27—1.29 (20°C (68°F))

Charging

1. Remove the battery cover and battery from the vehicle.
2. Remove all the vent caps.
3. Perform a charge.

Standard Current

Battery	Charging Electric Current (A)	Rapid Charging Electric Current (A)
55D26R	5—6	30
75D26R	6—7	30

4. Add distilled water if necessary while charging.
5. Cool the battery not to exceed the electrolyte temperature over **55°C (131°F)** while charging.
6. Charge once more if the specific gravity is under fully charged gravity.

Warning

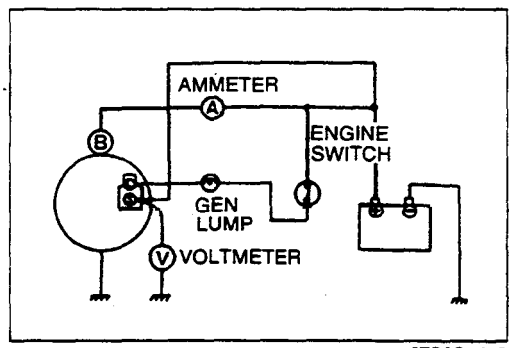
- **When charging, keep fire away from the battery.**
- **When charging on vehicle, disconnect the battery cable.**

9TG0G1-008

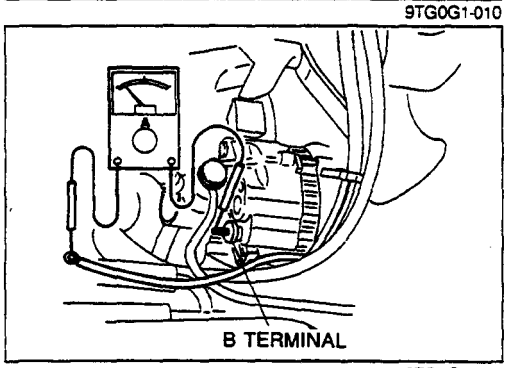
ALTERNATOR

Caution
- **Be sure the battery connections are not reversed, because this will damage the rectifier.**
- **Do not use high-voltage testers such as a megger, because they will damage the rectifier.**
- **Remember that battery voltage is always applied to the alternator B terminal.**
- **Do not ground the L terminal while the engine is running.**
- **Do not start the engine while the connector is disconnected from the L and S terminals.**

9TG0G1-009



9TG0G1-010



9TG0G1-011

Inspection (On-vehicle)

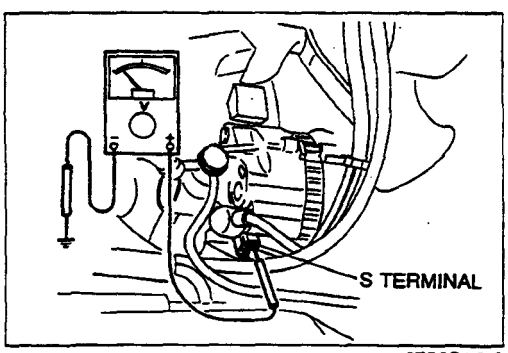
Checking no-load adjustment voltage

1. Check to be sure that the battery is fully charged.
2. Connect an ammeter and a voltmeter as shown in the figure. Be sure that the voltmeter reading is 0V.
3. Turn the ignition key to ON, and then check to be sure that the voltmeter reading is significantly lower than the battery voltage (0.5—4V). If the voltmeter reading is the same as the battery voltage, there may be a malfunction in the alternator.
4. Short circuit the terminals of the ammeter, and then start the engine. After starting, discontinue the short circuiting.

   Caution
   - **Be careful, when starting the motor, that the current of the starter doesn't flow to the ammeter.**

5. Under no-load conditions, increase the alternator speed to 5,000 rpm (engine speed of 2,000—2,500 rpm).
6. Read the indication shown by the voltmeter and the ammeter.

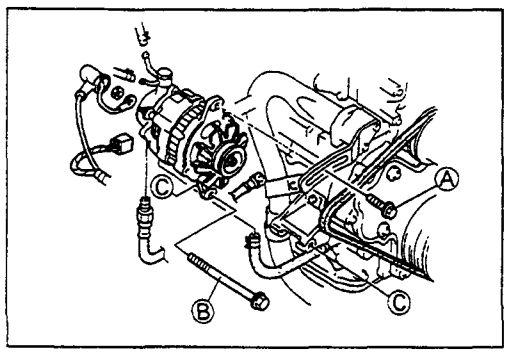
   Ammeter: 5A or less
   Voltmeter (adjustment voltage):
   14.4 ± 0.3V (at 20°C (68°F))



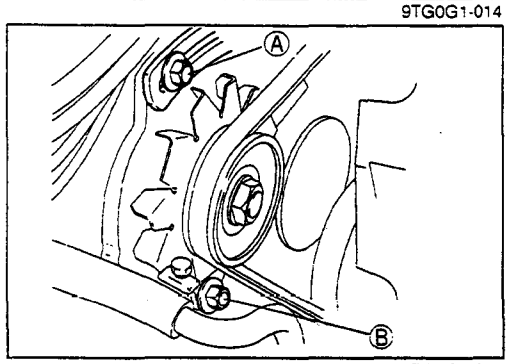
9TG0G1-013

CHECKING OUTPUT

1. Disconnect the negative battery cable.
2. Connect an ammeter and a voltmeter as shown in the figure.
3. Connect the negative battery cable.
4. Start the engine.
5. Apply a load by turning on the headlights.
6. Gradually increase the engine speed, and read the output current.
   If the voltage is higher than the battery voltage and there is an output current, there is no problem.



9TG0G1-014



9TG0G1-015

Removal / Installation

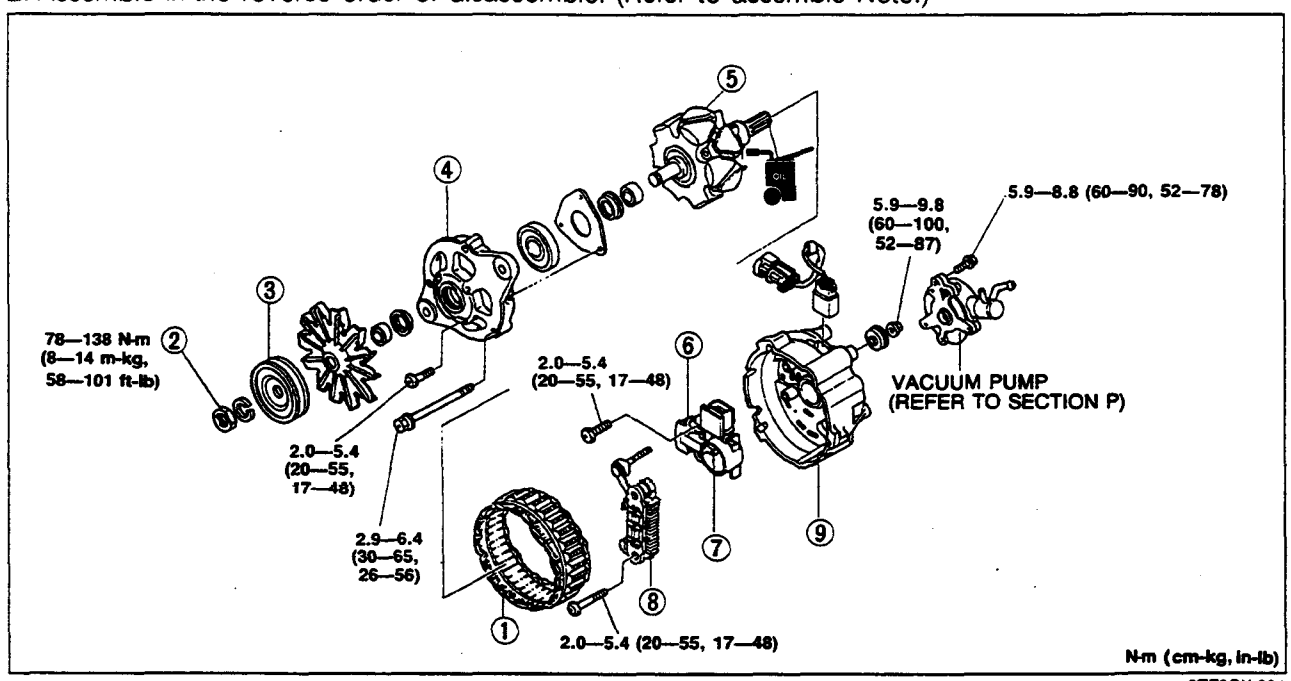
1. Disconnect the negative battery terminal.
2. Disconnect the alternator wiring (B terminal and LS connector).
3. Remove the bolt Ⓐ.
4. Remove the drive belt.
5. Disconnect the vacuum hose and oil hose.
6. Remove the bolt Ⓑ.
7. Remove the alternator.
8. Install in the reverse of removal.
9. Adjust the tension of drive belt. (Refer to page G–10.)
10. Tighten the bolt Ⓐ and bolt Ⓑ.

Tightening torque:

Bolt Ⓐ
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)
Bolt Ⓑ
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

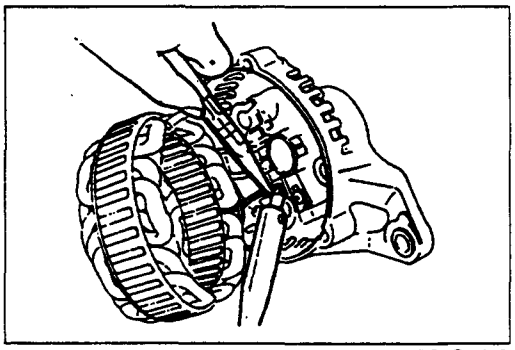
Disassembly / Assembly

1. Disassemble in the numbered order shown in the figure. (Refer to disassemble Note.)
2. Assemble in the reverse order of disassemble. (Refer to assemble Note.)



9TF0GX-004

1. Stator
   Inspection..... page G– 8
2. Nut set
3. Pulley
4. Front bracket
5. Rotor
   Inspection..... page G– 8
6. Regulator
   Disassemble Note..... page G– 8
   Assemble Note..... page G– 8
7. Brushes
   Inspection..... page G– 9
8. Rectifier
   Inspection..... page G– 9
9. Rear bracket



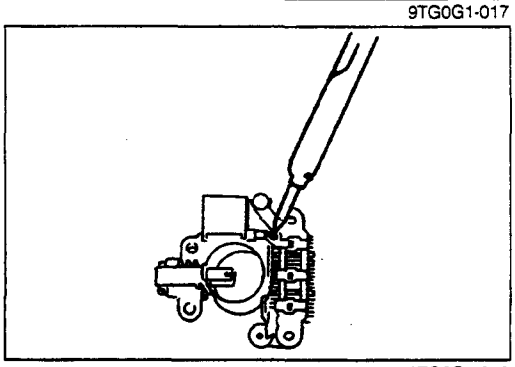
9TG0G1-017

Disassemble note / Assemble note

1. Use a soldering iron to disconnect the stator lead wiring.

Caution

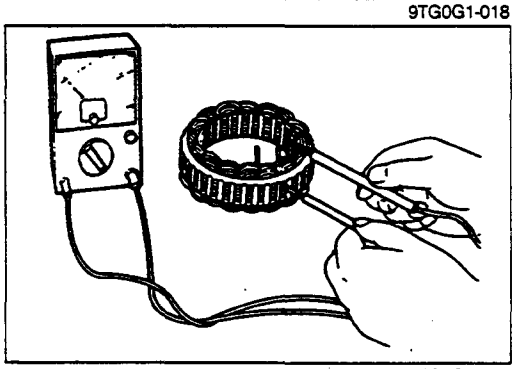
- **Do the disconnecting quickly, using the soldering iron no more than about 5 seconds, because the rectifier may become damaged if the inside is overheated.**



9TG0G1-018

Brush Hoder ans IC Regulator Assembly

1. Use a soldering iron to disconnect the brush holder and IC regulator assembly from the rectifier.



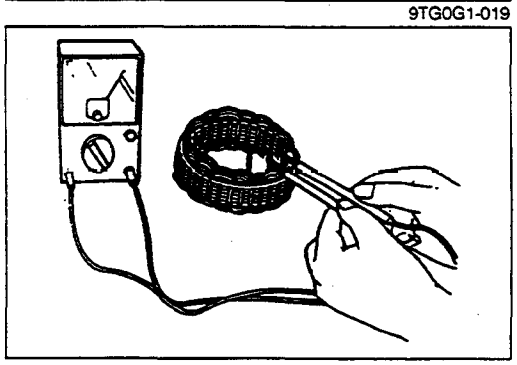
9TG0G1-019

Inspection

Inspect the following parts, and repair or replace if a problem is found.

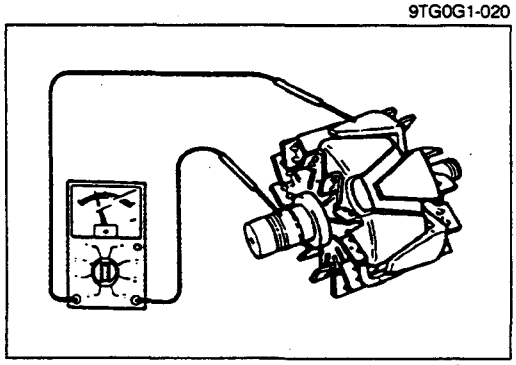
Stator

1. Use a circuit tester to check for continuity between the core and each lead wire.
   No-continuity is the normal condition.



9TG0G1-020

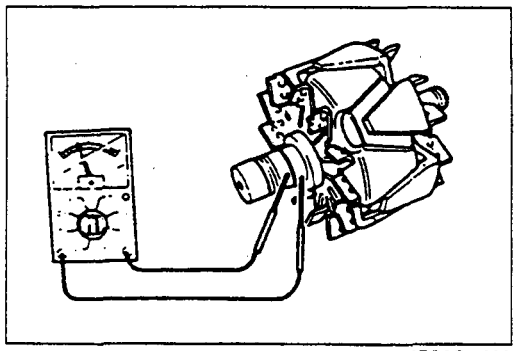
2. Use a circuit tester to check for continuity between lead wires.
   Continuity is the normal condition.



9TG0G1-021

Rotor

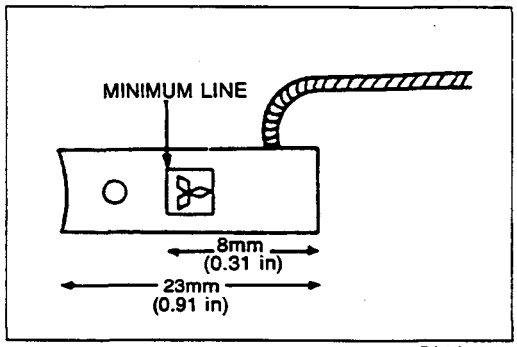
1. Use a circuit tester to check for continuity beween the core and each slip ring.
   No-continuity is the normal condition.



9TG0G1-022

2. Use an ohmmeter to check the resistance between each slip rings.

Resistance: 2.5—3.5Ω (20°C (68°F))

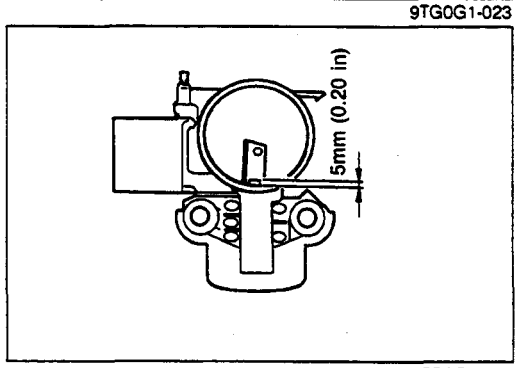


9TG0G1-023

Brushes

1. If the brushes are worn almost to or beyond the limit, replace them.

Minimum: 8mm (0.31 in)

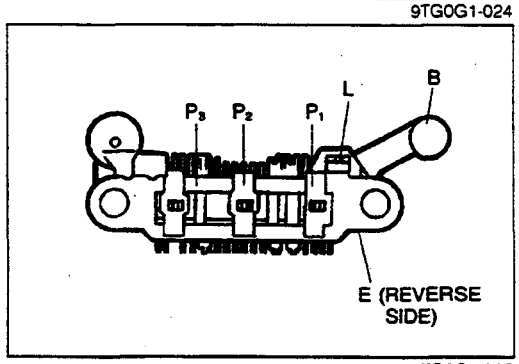


9TG0G1-024

2. When install new brush, pull lead wire to put brush into approx. 5mm (0.2 in) holder and install with soldering iron.

Caution

- **Replace both brushes in the same time.**

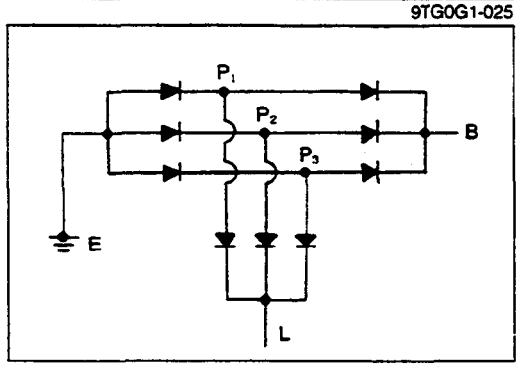


9TG0G1-025

Rectifier

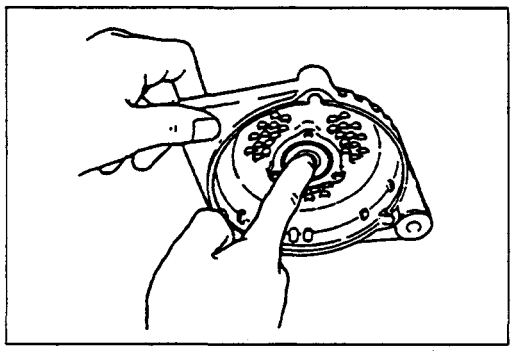
1. Check for continuity of the diodes by using an ohmmeter.

Negative terminal	Positive terminal	Continuity
E	P1, P2, P3	Yes
B		No
L		No
P1, P2, P3	E	No
	B	Yes
	L	Yes

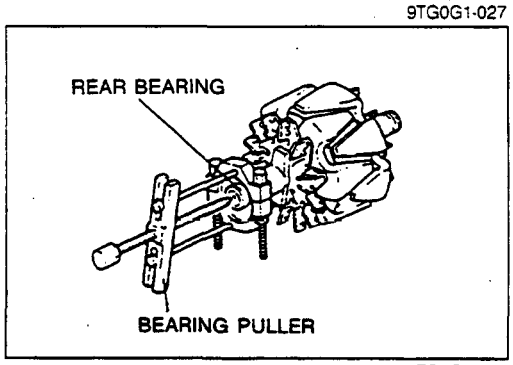


9TG0G1-026

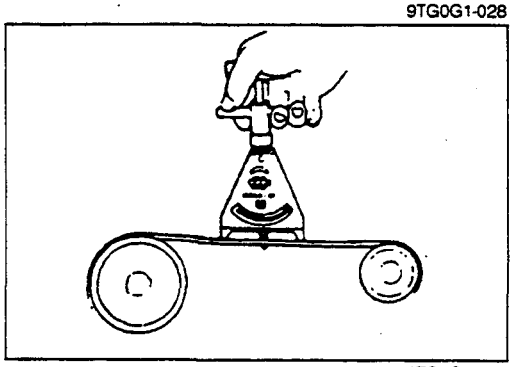
2. Replace the rectifier.



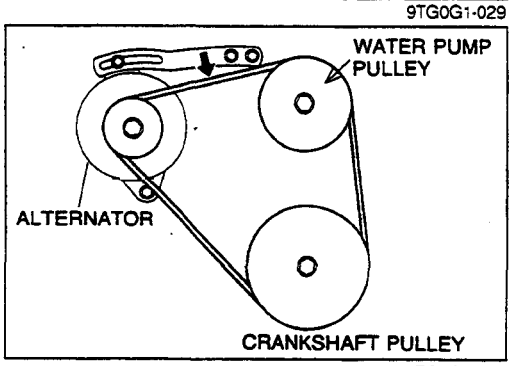
9TG0G1-027



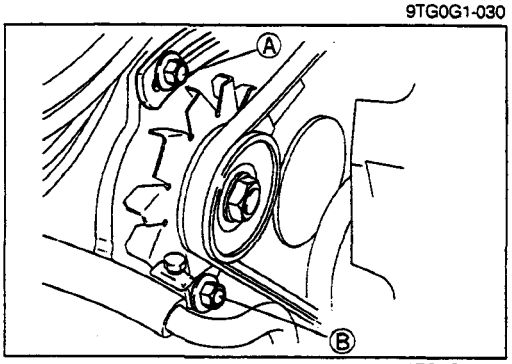
9TG0G1-028



9TG0G1-029



9TG0G1-030



9TG0G1-031

Front bearing

1. Check the bearing for improper rotation and/or abnormal noise.
   Replace if necessary.

Rear bearing

1. Check the bearing for improper rotation and/or abnormal noise.
   Replace if necessary.

DRIVE BELT

Inspection

1. Visually check for wear, damage and injury on connection between belt and pulley or damage on pulley.
   Replace if necessary.
2. Check the drive belt tension with tension gauge.

Tension

(N (kg, lb))

Engine type	HA	SL	SL (4WD)	TF
Used one	245–294 (25–30, 55–66)	343–392 (35–40, 77–88)	373–471 (38–48, 83–106)	383–520 (39–53, 86–117)
New one	294–392 (30–40, 66–88)	392–491 (40–50, 88–110)	471–569 (48–58, 110–128)	451–520 (46–53, 101–117)

3. Check the drive belt deflection by applying moderate pressure (10 kg load) midway between the pulleys.

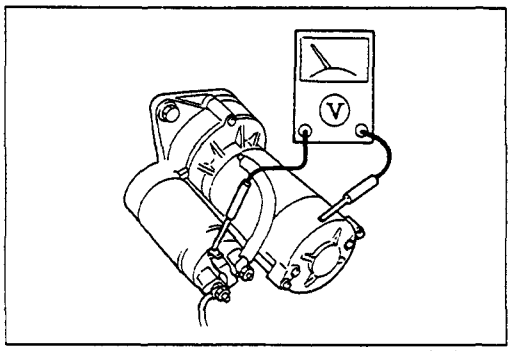
Deflection

Used one: 10—11mm (0.39—0.43 in)
14—16mm (0.55—0.63 in) (SL 4WD)
11—12mm (0.43—0.49 in) (TF engine)
New One: 9—10mm (0.35—0.39 in)
12—14mm (0.47—0.55 in) (SL 4WD)
10—11mm (0.39—0.43 in) (TF engine)

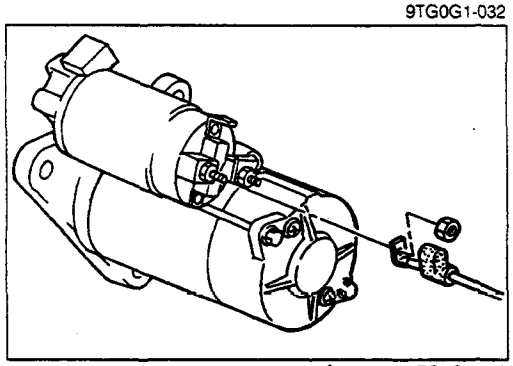
Adjustment

1. Loosen bolts A and B.
2. Move the alternator in or out to adjust the belt deflection. (Refer to inspection part.)
3. Tighten bolts A and B to the specified torque.

Torque: Ⓐ 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)
Ⓑ 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



9TG0G1-032



9TG0G1-033

STARTER

STARTER

Inspection (On-vehicle)

1. Use a fully charged battery.
2. Turn the engine switch to the start position.
3. Check that the starter operates smoothly.
4. If the starter does not operate, check the voltage between S terminal and ground by using a voltmeter.
5. If the voltage is 8V or more, the starter is malfunctioning.
6. If less than 8V, the wiring harness is malfunctioning.

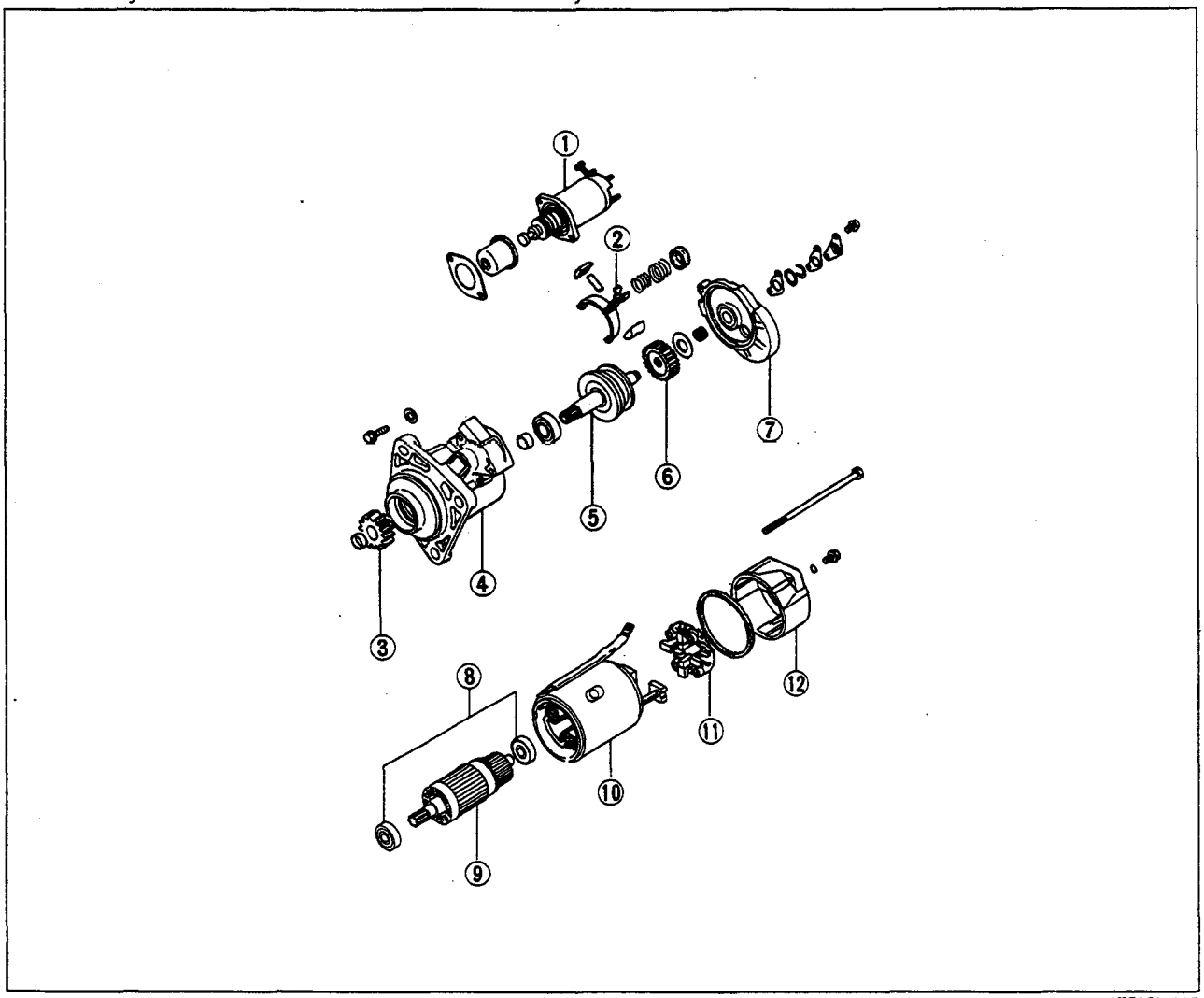
Removal / Installation

1. Disconnect the negative battery cable.
2. Disconnect the wiring from the starter.
3. Remove the starter bolts.
4. Draw out the starter from lower side of the vehicle.
5. Install in the reverse order of removal.

Tightening torque:
64—89 N·m (6.5—9.1 m-kg, 47—66 ft-lb)

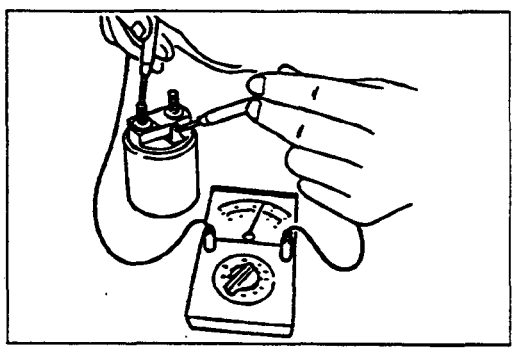
Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assembly is in the reverse order of disassembly.



9TF0GX-005

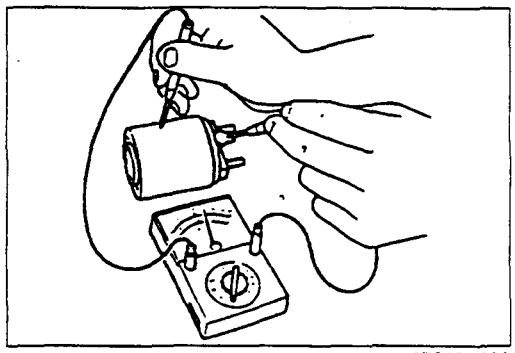
1. Magnetic switch
   Inspection ..... page G–12
2. Lever
3. Pinion gear
4. Front bracket
5. Overrunning clutch
6. Driving gear
7. Center bracket
8. Bearing
9. Armature
   Inspection ..... page G–13
10. Yoke (field coil)
    Inspection ..... page G–16
    Replacing
    (brush) ..... page G–17
11. Brushes and brush holder
    Inspection ..... page G–16
    Replacing
    (brush) ..... page G–17
12. Rear bracket



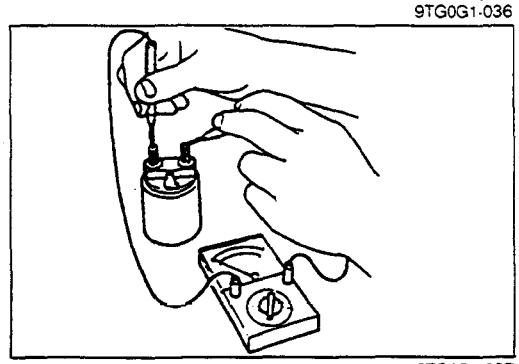
9TG0G1-035

Magnetic Switch

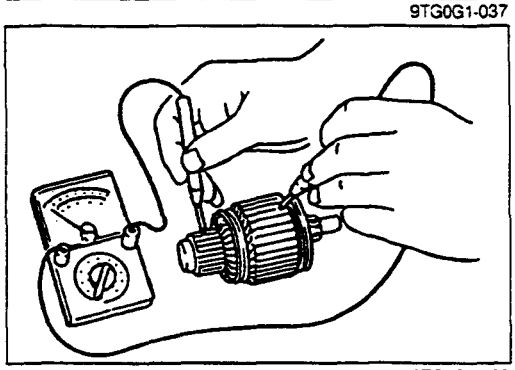
1. Verify that there is continuity between Ⓢ and Ⓜ terminal by using a circuit tester.
   Replace if necessary.


9TG0G1-036

2. Check for continuity between the Ⓢterminal and the body with a circuit tester.
   Replace the magnetic switch if there is no continuity.

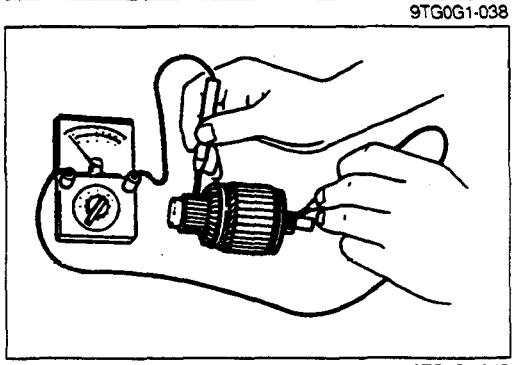

9TG0G1-037

3. Check for continuity between the Ⓜand Ⓑterminal. Replace the magnetic switch if there is continuity.

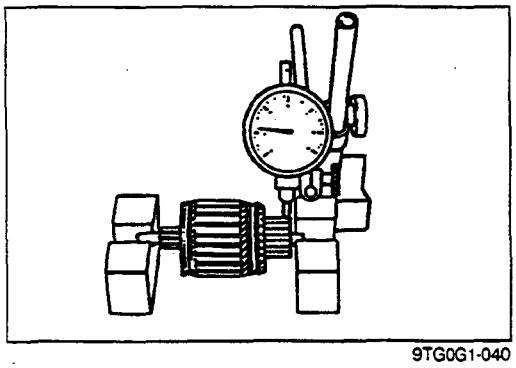

9TG0G1-038

Armature

1. Ground of armature coil
   Check for continuity beween the commutator and the core with a circuit tesrer. Replace the armature if there is continuity.


9TG0G1-039

2. Insulation of armature coil
   Check for continuity between the commutator and the shaft with a circuit tester. Replace the armature if there is continuity.

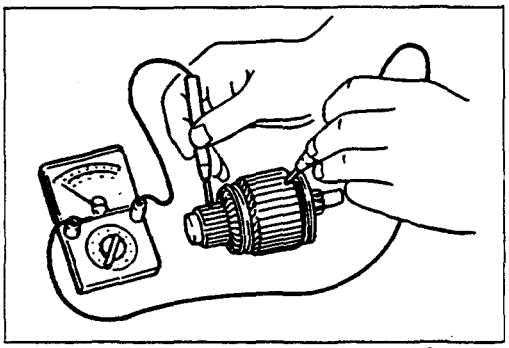

9TG0G1-040

3. Vibration of the commutator
   (1) Place the armature on V blocks, and measure the vibration by using a dial gauge.
   (2) If the vibration is at limit or more, repair with a lathe so that it becomes standard or replace the armature.

Standard vibration	mm (in)	0.05 (0.002)
Limit	mm (in)	0.1 (0.004)

Note

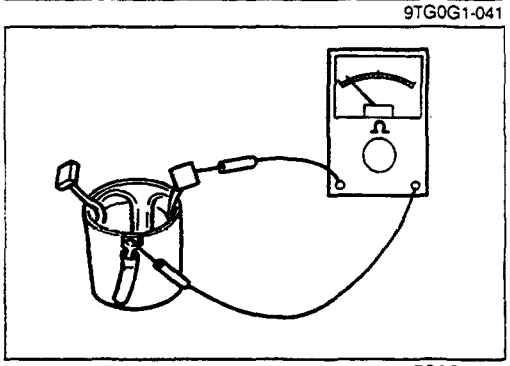
- **Before checking, be sure that there is no play in the bearings.**



9TG0G1-041

4. Check the segment groove depth. If the depth of the mold between segments is limit depth or less, undercut the grooves by standard depth.

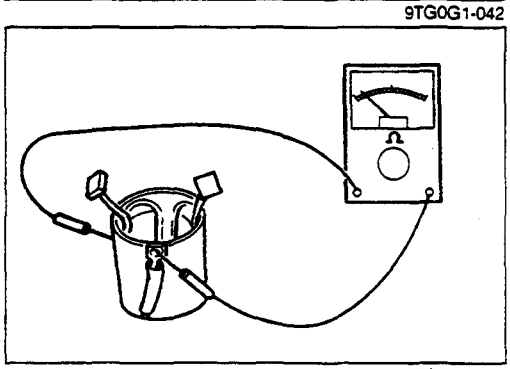
Standard depth: 0.5—0.8mm (0.020—0.031 in)
Limit depth: 0.2mm (0.008 in)



9TG0G1-042

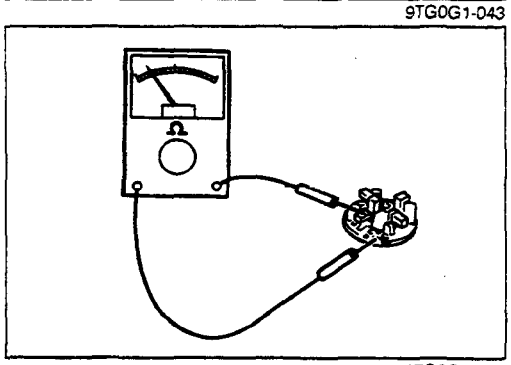
Field Coil

1. Wiring damage
   (1) Check for continuity between the connector and brushes by using a circuit tester.
   (2) Replace the yoke assembly if there is no continuity.



9TG0G1-043

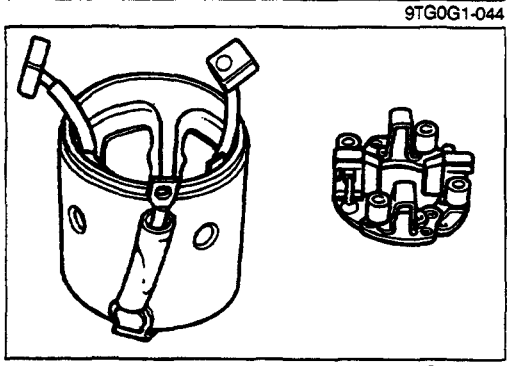
2. Ground of the field coil
   (1) Check for continuity between the connector and yoke by using a circuit tester.
   (2) Repair or replace the yoke assembly if there is continuity.
3. Installation of the field coil
   Replace the yoke assembly if the field coil is loose.



9TG0G1-044

Brushes and Brush Holder

1. Check for continuity between the insulated brush and the plate with a circuit tester. Replace the brush holder if there is continuity.

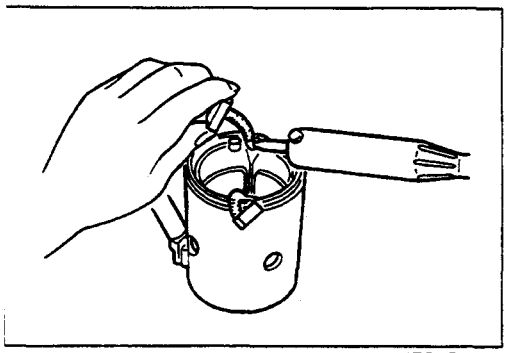


9TG0G1-045

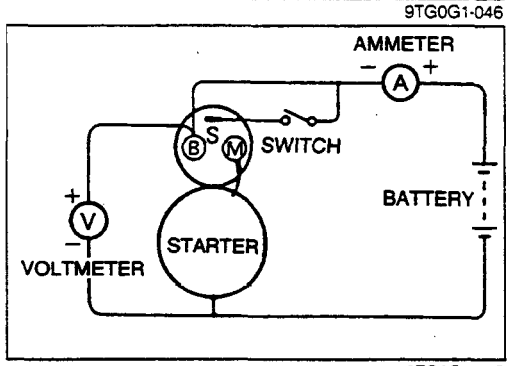
2. If the brushes are worn beyond the wear limit or if the wear is near the limit, replace the brushes.

Limit of brush: 11mm (0.43 in)

Note
- **New one: 18mm (0.71 in)**



9TG0G1-046



9TG0G1-047

Replacing Brush

Brush holder

1. When replacing the brush, replace the whole holder assembly.

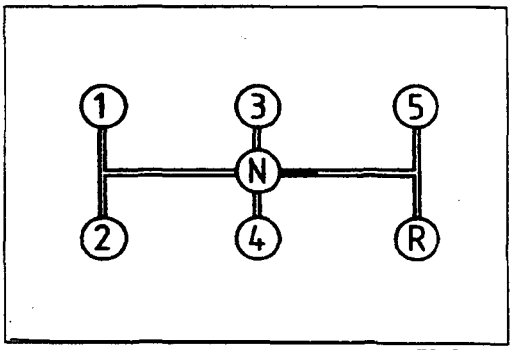
Yoke

1. Cut off the root of brush wire on yoke.
2. Solder a new brush around the cut part of the wire.

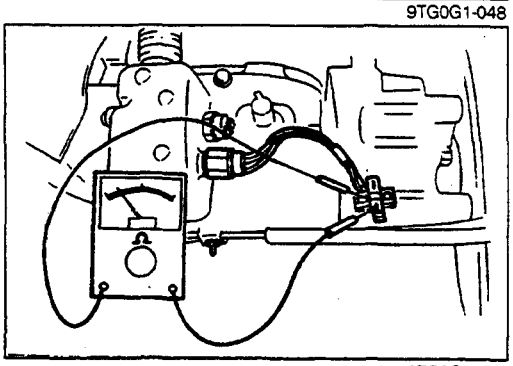
No-load Test

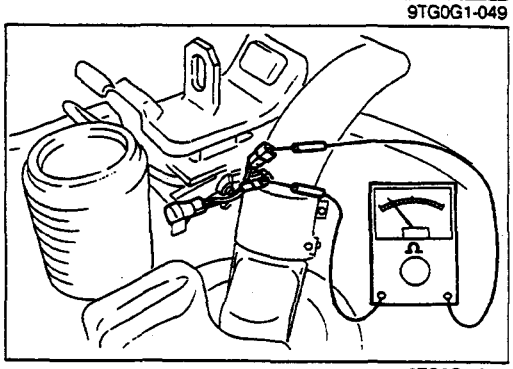
1. Connect the starter and the battery as shown in the figure.
2. If the conditions below are met when the starter is operated, the starter is functioning properly.

Output (kW)	2.7
Terminal voltage (V)	11
Electric current (A)	Less than 120
Rotating speed (rpm)	More than 4,000



9TG0G1-048


9TG0G1-049


9TG0G1-050

SUB-STARTER SYSTEM

Installation Starting System

1. Place the transmission in neutral and turn the engine switch ON.
2. Depress the sub-starter switch and verify that the engine starts.
3. If the engine does not start, check the neutral switch, sub-starter switch, and wire harness.

Inspection

Neutral switch

1. Disconnect the neutral switch connector.
2. Check continuity between terminals A and B.

Transmission	Continuity
Neutral	Yes
In gear	No

Sub-starter switch

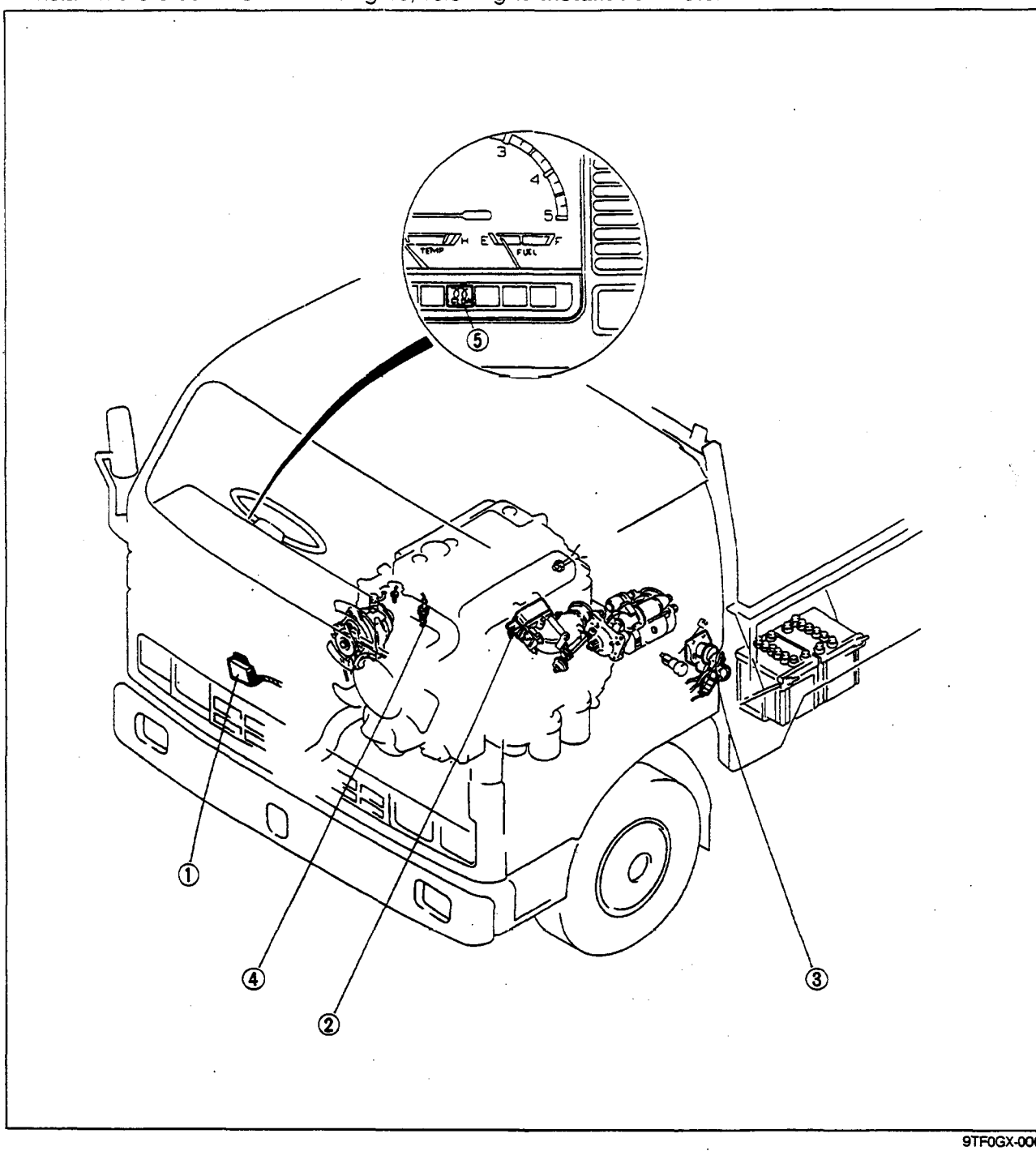
1. Disconnect the sub-starter switch connector.
2. Check continuity between terminals of the switch.

Sub-starter switch	Continuity
ON	Yes
OFF	No

AIR HEATER SYSTEM

STRUCTURAL VIEW
Removal / Installation

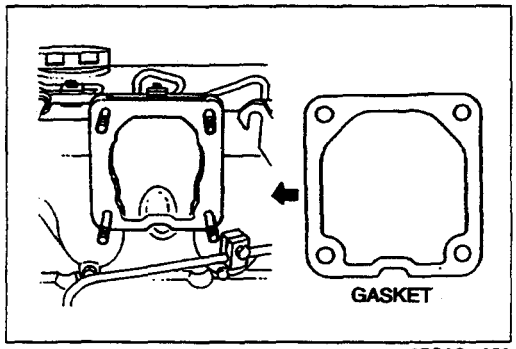
1. Remove in the order shown in the figure.
   Install in the order shown in the figure, referring to **Installation Note**.



9TF0GX-006

1. Air heater control unit
   Inspection..... page G–21
2. Air heater
   Inspection..... page G–22
   Installation Note ..... page G–20
3. Air heater relay
   Inspection..... page G–22
4. Water thermosensor
   Inspection..... page G–23
5. Glow indicator
   Inspection..... page G–23

AIR HEATER SYSTEM



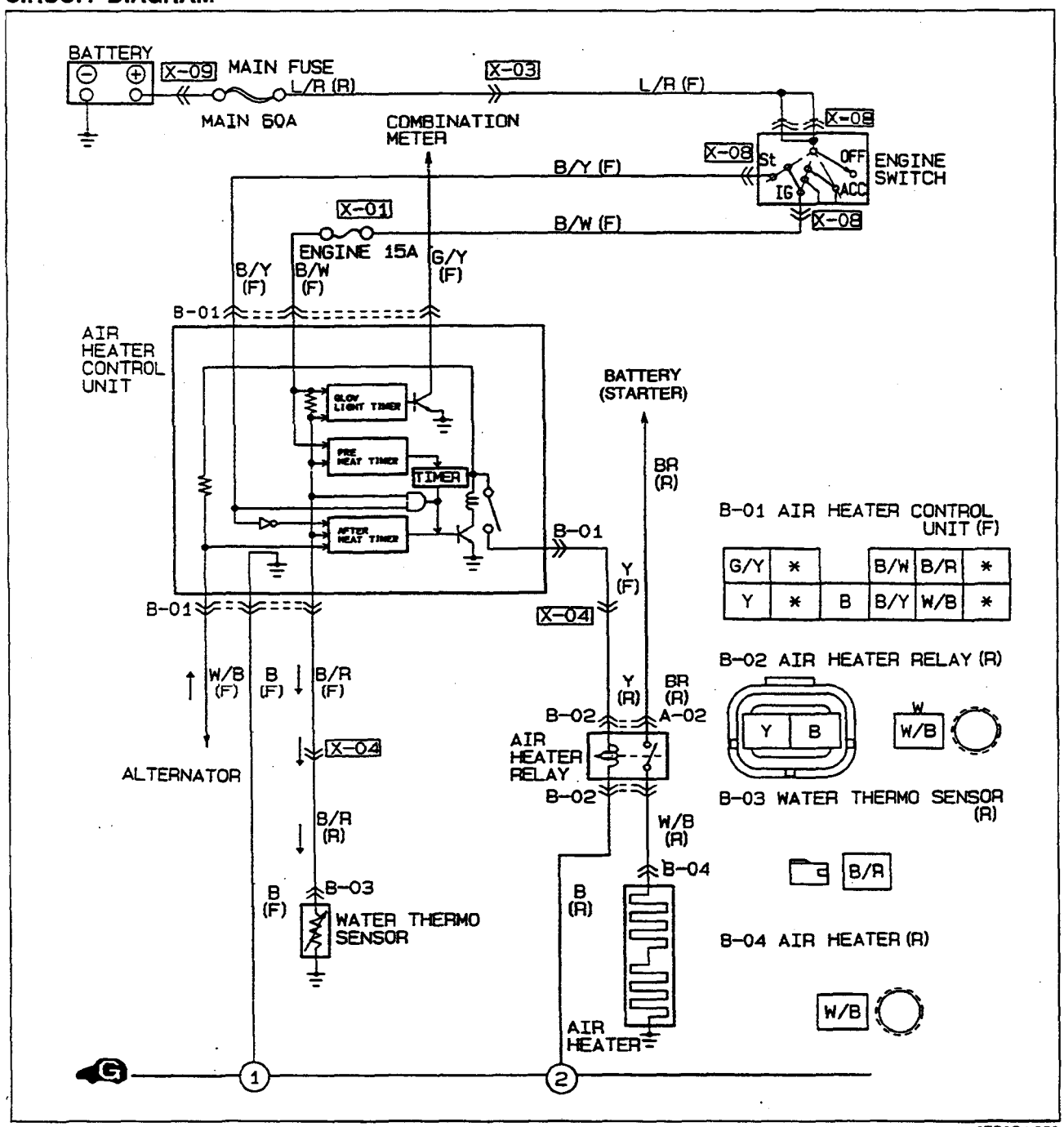
9TG0G1-052

Installation note
Air heater

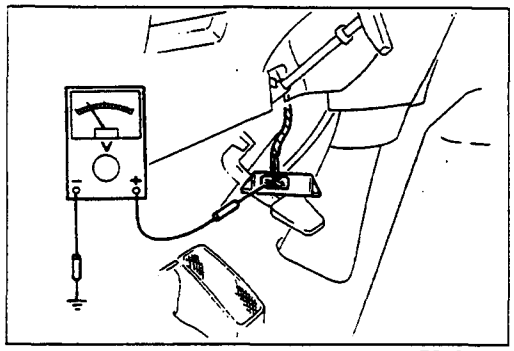
1. Replace the gaskets on both side of the air heater with new ones.

Caution
- **Install the gaskets in the direction shown in the figure.**

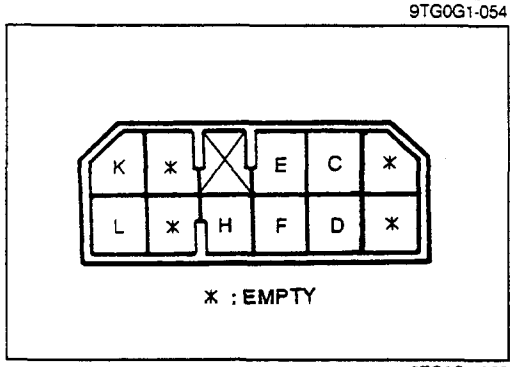
CIRCUIT DIAGRAM



9TG0G1-053



9TG0G1-054



9TG0G1-055

AIR HEATER CONTROL UNIT

Inspection

1. Remove control unit.
2. Measure the voltage at each terminal of the control unit.
3. If there is a problem, check and repair or replace the device connected to the terminal. If there is no problem on the devices, replace the control unit.

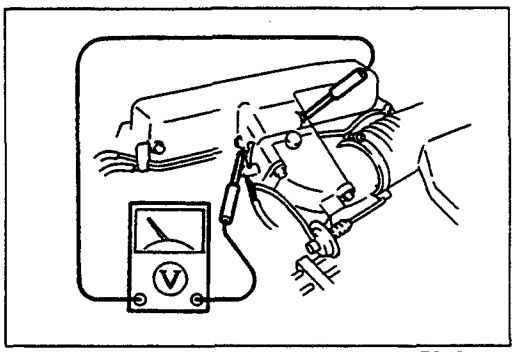
Terminal	Connection to	Test condition		Voltage (V)
C	Water thermosensor	Engine switch ON	Coolant temperature approx. 20°C (68°F)	3—4
			Coolant temperature approx. 80°C (176°F)	2—3
D	Alternator	Engine switch ON		0
		Engine running		Approx. 12
E	Engine switch (IG1)	Engine switch ON or ST		Approx. 12
		Engine switch ACC or OFF		0
F	Engine switch (ST)	Engine switch ST		Approx. 12
		Engine switch ON, ACC or OFF		0
H	Ground	Always		0
K	Glow indicator lamp	Coolant temperature less than 20°C (68°F)*1	Engine SW ON for approx. 2 seconds*2	0
			Engine SW ON after approx. 2 seconds*2	Approx. 12
L	Air heater relay	Coolant temperature less than 20°C (68°F)*2	Engine SW ON for approx. 7 seconds*2	Approx. 12
			Engine SW ON*2	Approx. 12
			Engine switch on for 60 sec. after cranking.*1	Approx. 12
		Anything else		0

9TG0G1-056

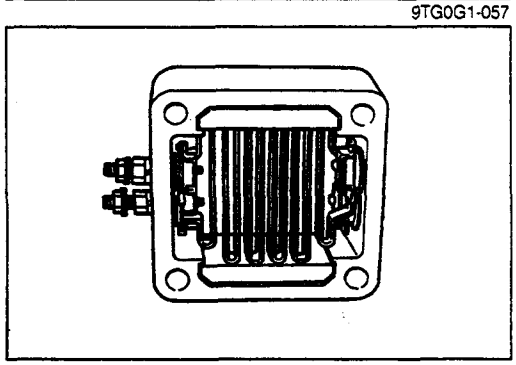
Note

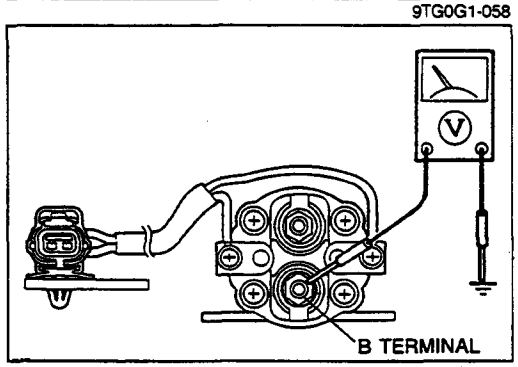
*1 **When the temperature of the engine coolant is more than 20°C (68°F), disconnect the water thermosensor connector, and connect approx. 600Ω resistance to the vehicle harness.**

*2 **Times shown are based on engine coolant approx. 20°C (68°F).**

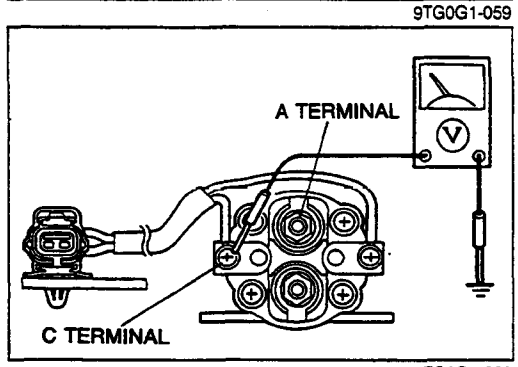


9TG0G1-057

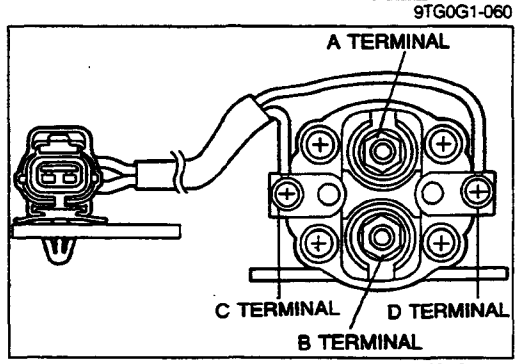

9TG0G1-058



9TG0G1-059



9TG0G1-060



9TG0G1-061

AIR HEATER

Inspection

1. Disconnect the air heater connector.
2. Measure the resistance between the terminals.

Resistance

Terminal	Resistance (Ω)
A — B	0.053—0.064

3. Remove the air heater, and check for contamination of the heating element.
4. If necessary, wash with water.

Caution

- **After washing with water, dry with compressed air.**

AIR HEATER RELAY

Inspection

Voltage inspection

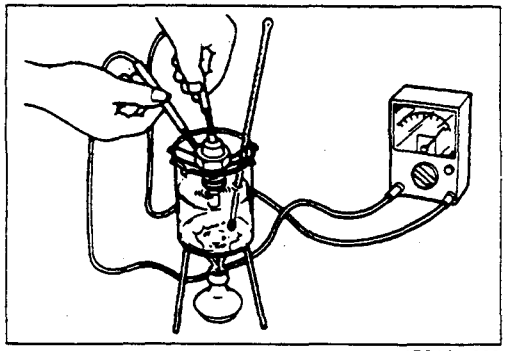
1. Check the engine coolant temperature.
2. If the temperature is more than 20°C (68°F), cut the connector of water thermosensor and connect a resistance (600Ω) to the wiring harness.
3. Check the voltage of the relay B terminal with circuit tester.

Standard voltage: Approx. 12V

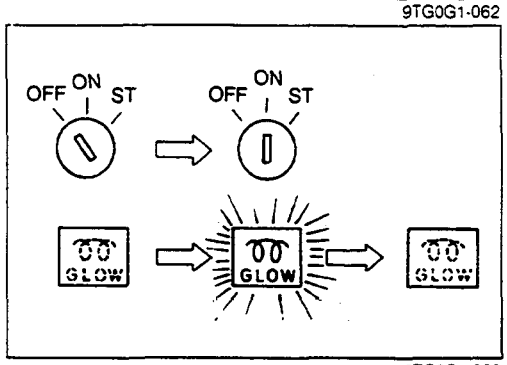
4. Be sure the voltage of the relay A terminal is appox.12V for 7 seconds after engine switch is ON.
5. If not as specified, be sure the voltage of the relay C terminal is appox.12V for 7 seconds after engine switch is ON.
6. If as specified, perform the resistance inspection as follows. If not as specified, check the air heater control unit.
7. Connect the water thermosensor.

Resistance inspection

1. Disconnect the negative battery terminal.
2. Remove the air heater relay.
3. Verify that there is continuity between the C (wiring color is white) and D (wiring color is black) terminal.
4. Verify that there is continuity between A and B terminal, when apply the battery voltage beween C and D terminal.
5. If not as specified, replace the relay.



9TG0G1-062



9TG0G1-063

WATER THERMOSENSOR

Inspection

1. Remove the water thermosensor.
2. Place the thermosensor in water with a thermometer and heat the water gradually.
3. Measure the resistance as shown.

Standard resistance

Water temperature (°C (°F))	Resistance (Ω)
0 (32)	1,860
40 (104)	207—255
80 (176)	46.8—55.2
100 (212)	25.2—30.8

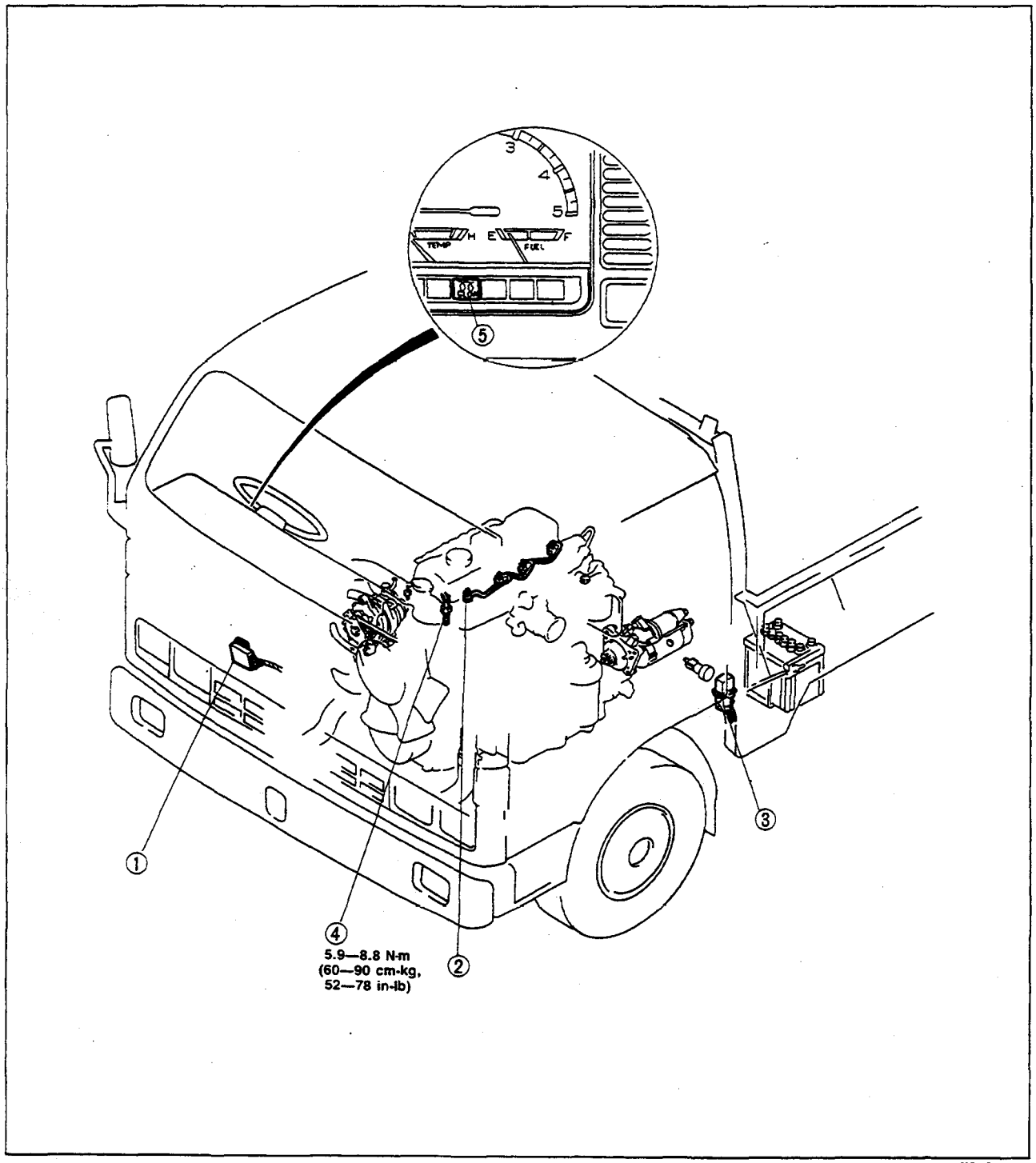
GLOW INDICATOR LAMP

Inspection

1. Turn the engine switch ON and verify that the GLOW indicator flashes for a few seconds.

QUICK START SYSTEM (QSS)

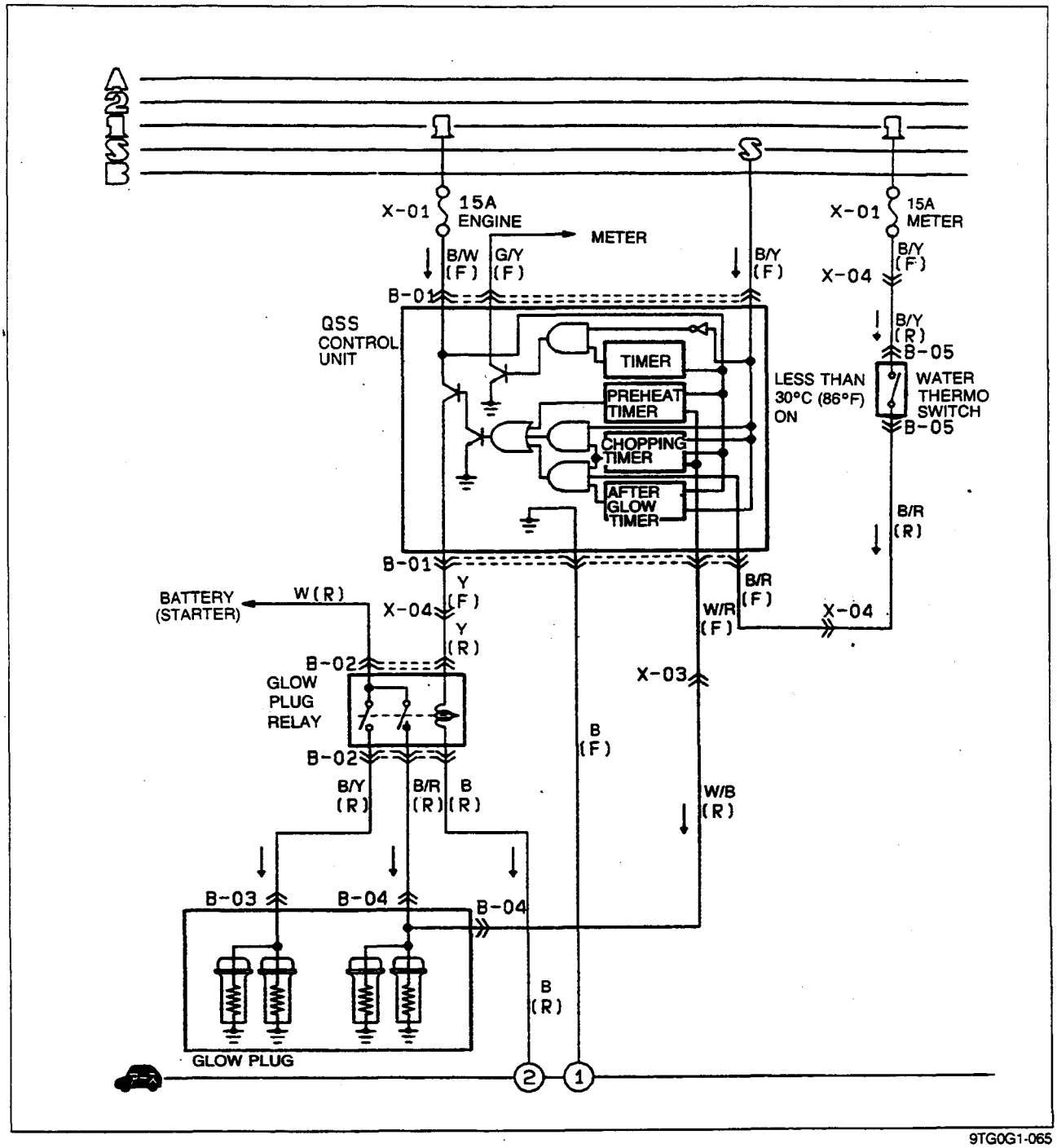
STRUCTURAL VIEW
Removal / Installation



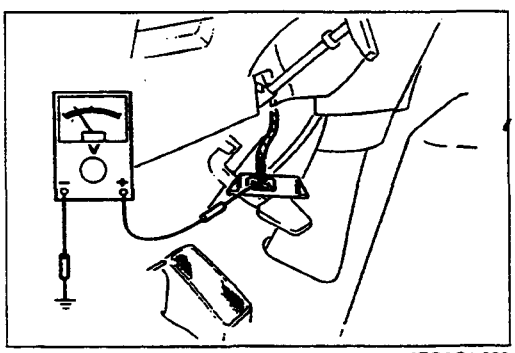
9TF0GX-007

1. QSS control unit
   Inspection..... page G–25
2. Glow plug
   Inspection..... page G–26
3. Glow plug relay
   Inspection..... page G–27
4. Water thermosensor
   Inspection..... page G–27
5. Glow indicator lamp
   Inspection..... page G–27

CIRCUIT DIAGRAM



9TG0G1-065

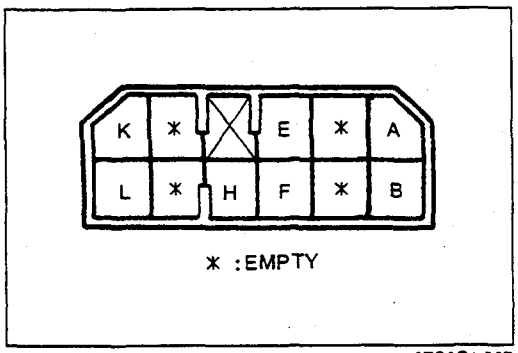


9TG0G1-066

QSS CONTROL UNIT

Inspection

1. Remove the QSS control unit.
2. Measure the voltage at each terminal of the control unit.



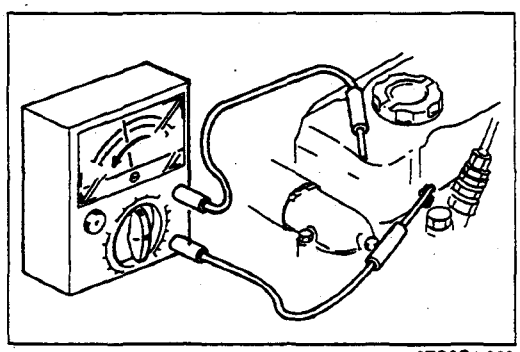
9TG0G1-067

3. If there is a problem, check and repair or replace the device connected to the terminal. If there is no problem on the devices replace the control unit.

Terminal	Connection to	Test condition		Voltage (V)
A	Water thermosensor	Engine switch ON	Coolant temperature less than 30°C (86°F)	Approx. 12
			Coolant temperature more than 30°C (86°F)	0
B	Glow plug	After engine switch ON for approx. 6 sec.		Approx. 12
		Engine switch ON after approx. 6 sec.		0
		Cranking		Approx. 12↔0
		After cranking, for approx. 15 sec. coolant temperature is less than 30°C (86°F)		Approx. 12↔0
E	Engine switch	Engine switch ON or ST		Approx. 12
		Engine switch ACC or OFF		0
F	Engine switch	Engine switch ST		Approx. 12
		Engine switch ON, ACC or OFF		0
H	Ground	Constant		0
K	Glow indicator lamp	After Engine switch ON, for approx. 3 sec.		0
		Engine switch ON, after approx. 3 sec.		Approx. 12
L	Glow plug relay	After engine switch ON, for approx. 6 sec.		Approx. 12
		The engine switch ON, after approx. 6 sec.		0
		Cranking		Approx. 12↔0
		After cranking, for approx. 15 sec. coolant temperature is less than 30°C (86°F)		Approx. 12↔0

9TG0G1-068

Note
• 12↔0V: Indicates voltage fluctuates between 12V and 0V.

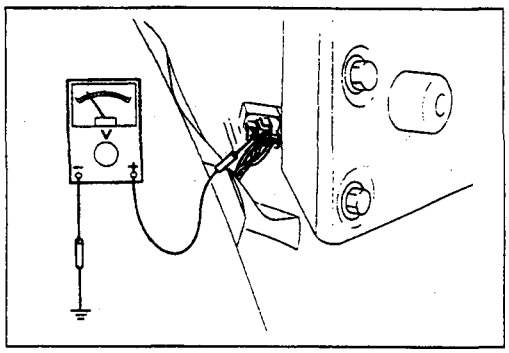


9TG0G1-069

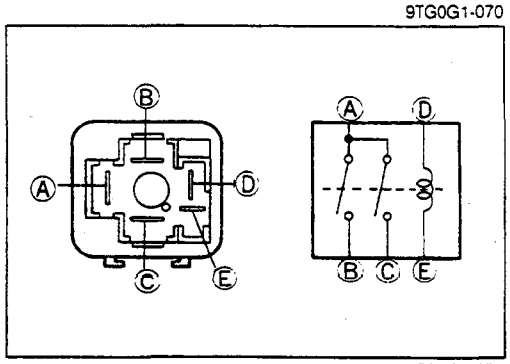
GLOW PLUG
Inspection
1. Disconnect the glow plug connector.
2. Measure resistance between the glow plug positive terminal and the cylinder head.

   Resistance: Approx. 0.1Ω (20°C (68°F))

3. Reconnect the glow plug connector.



9TG0G1-070



9TG0G1-071

GLOW PLUG RELAY

Inspection

Voltage

1. Remove the glow plug relay.
2. Check terminal voltage from the back of the relay connector.

Terminal	Test condition	Voltage-(V)
A	Constant	Approx. 12
B	For approx. 6 sec. after engine switch ON.	Approx. 12
	More than approx. 6 sec. after engine switch ON	0
C	Cranking	Approx. 12↔0
D	For approx. 15 sec. after cranking when the coolant temperature is less than 30°C (86°F).	Approx. 12↔0
E	Always	0

Note

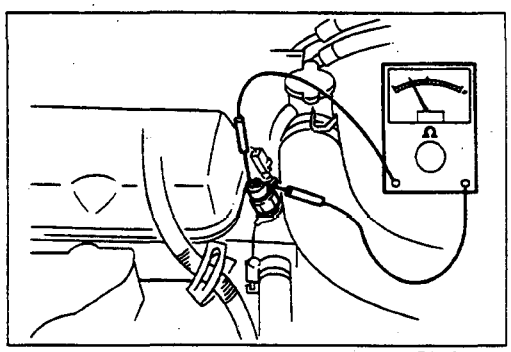
- **12↔0V: Indicates voltage fluctuates between 12V and 0V.**

Operation

1. Disconnect the negative battery terminal.
2. Remove the glow plug relay.
3. Measure resistance between terminals D and E.

   Resistance: Approx. 13Ω

4. Apply 12V between terminals D and E, and verify that there are continuity beween terminals A and B, and A and C.



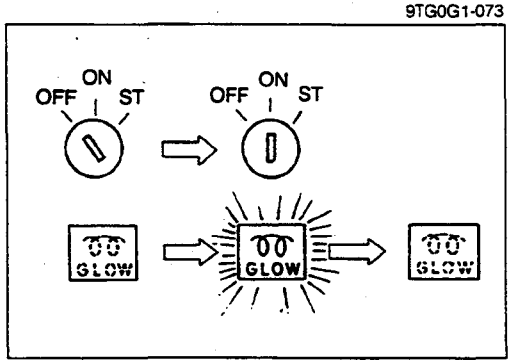
9TG0G1-073

WATER THERMOSENSOR

Inspection

1. Disconnect the thermosensor connector.
2. Check continuity between the terminals.

Coolant temp.	Continuity
Less than 30°C (86°F)	Yes
More than 30°C (86°F)	No



9TG0G1-074

GLOW INDICATOR LAMP

Inspection

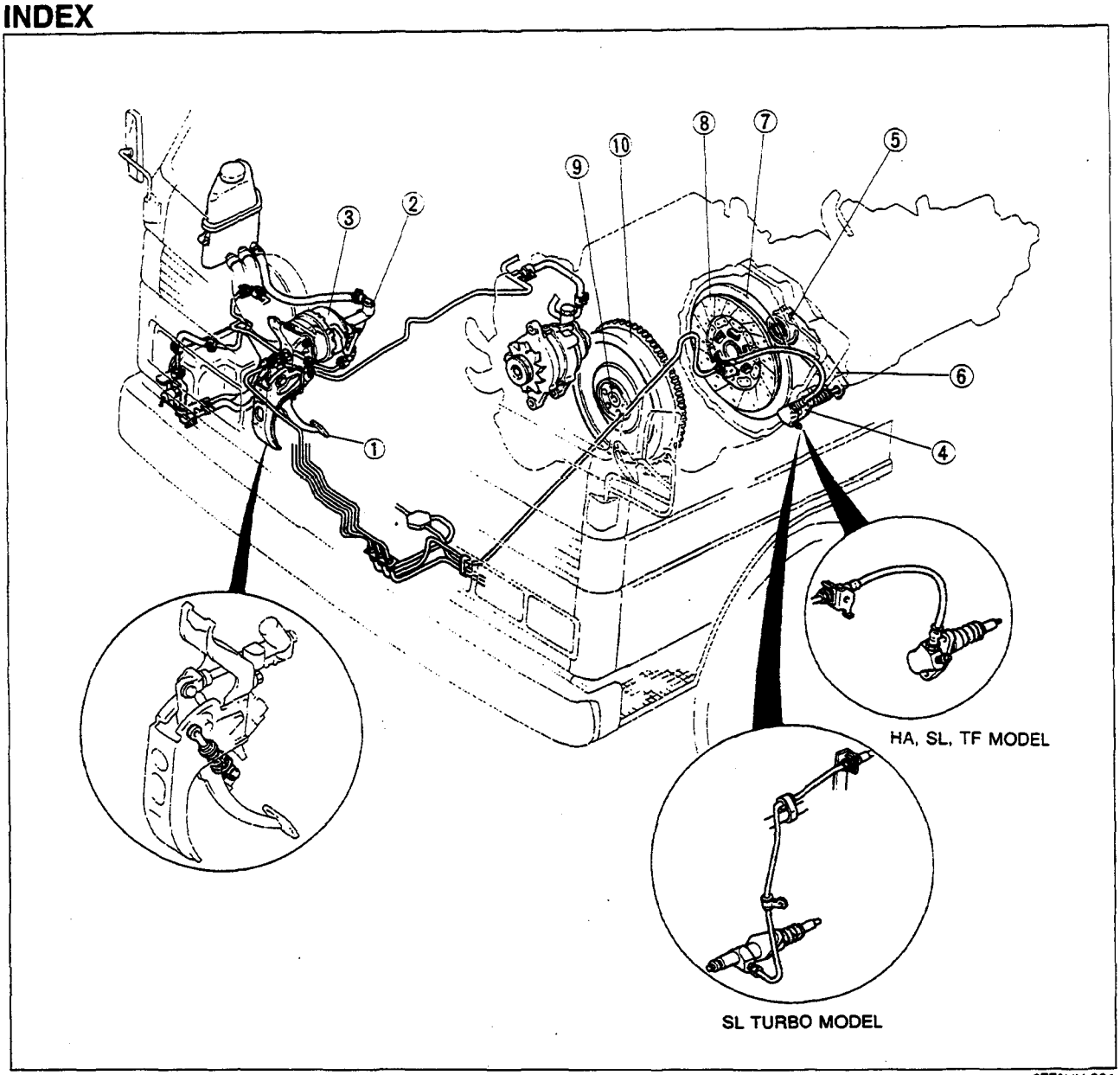
1. When the engine switch ON, verify that the GLOW indicator lamp flashes for a few seconds.

CLUTCH

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TROUBLESHOOTING GUIDE ..... H– 3
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REPLACEMENT ..... H– 4
CLUTCH PEDAL ..... H– 5
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6. Clutch release fork
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9. Pilot bearing
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10. Flywheel
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Inspection..... page H–22

OUTLINE

SPECIFICATIONS

Item \ Engine/Transmission Model			HA	SL	SL Turbo	TF
			W5M-R	←	Z5M-R	W5M-R
Clutch control			Hydraulic			
Vacuum power assist	Type		Vacuum booster			
	Size	mm (in)	114.3 (4.5)			
Clutch cover	Type		Diaphragm spring			
	Set load	N (kg, lb)	5248 (535, 1177)	6229 (635, 1397)	7652 (780, 1716)	6377 (650, 1430)
Clutch disc	Outer diameter	mm (in)	260 (10.24)		275 (10.83)	
	Inner diameter	mm (in)	170 (6.69)		180 (7.09)	
	Thickness	Pressure plate side mm (in)	3.8 (0.15)			
		Flywheel side mm (in)	3.5 (0.14)			
Clutch pedal	Type		Suspended			
	Pedal ratio		5.6			
	Full stroke	mm (in)	153 (6.02)			
	Height	mm (in)	188—193 (7.40—7.60)			
Master cylinder inner diameter		mm (in)	15.87 (0.62)			
Release cylinder inner diameter		mm (in)	22.22 (0.87)			
Clutch fluid			SAE J1703 or FMVSS116 DOT-3			

9TF0HX-002

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Slipping	Clutch disc facing worn excessively	Replace	H–18, 21
	Clutch disc facing surface hardened or oil on surface	Repair or replace	H–18
	Pressure plate damaged	Repair or replace	H–18
	Diaphragm spring damaged or weakened	Replace	H–18
	Insufficient clutch pedal play	Adjust	H– 5
	Clutch pedal sticking	Repair or replace	H– 6
	Flywheel damaged	Repair or replace	H–18, 22
Faulty disengagement	Excessive runout or damaged clutch disc	Replace	H–18, 21
	Clutch disc splines rusted or worn	Remove rust or replace	H–18
	Oil on facing	Repair or replace	H–18
	Diaphragm spring weakened	Replace	H–18
	Excessive clutch pedal play	Adjust	H– 5
	Insufficient clutch fluid	Add fluid	H– 3
	Leakage of clutch fluid	Locate and repair or replace	—
Clutch vibrates when accelerating	Oil on facing	Repair or replace	H–18
	Torsion springs weakened	Replace	H–18
	Clutch disc facing hardened or damaged	Repair or replace	H–18
	Clutch disc facing rivets loose	Replace	H–18
	Pressure plate damaged or excessive runout	Replace	H–18
	Flywheel surface hardened or damaged	Repair or replace	H–18
	Loose or worn engine mount	Tighten or replace	—
Clutch pedal sticking	Pedal shaft not properly lubricated	Lubricate or replace	H– 6
Abnormal noise	Clutch release bearing damaged	Replace	H–18, 21
	Poor lubrication of release bearing sleeve	Lubricate or replace	H–18
	Torsion springs weakened	Replace	H–18
	Excessive crankshaft end play	Repair	Refer to Section B
	Pilot bearing worn or damaged	Replace	H–18, 22
	Worn pivot points of release fork	Repair or replace	H–18

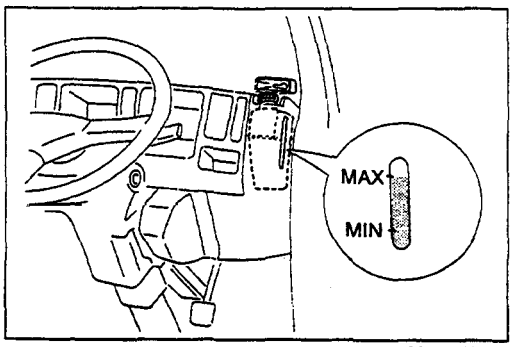
9TG0HX-004

CLUTCH FLUID

PREPARATION
SST

49 0259 770B Wrench, flare nut 	For air bleeding

03U0HX-005



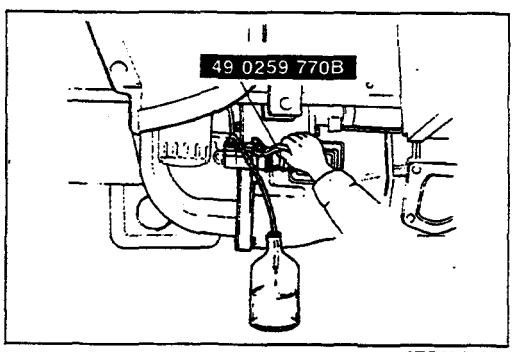
03U0HX-006

REPLACEMENT

Note
- **A common reservoir is used for the clutch and brake system fluids.**
- **The fluid in the reservoir must be maintained at the 3/4 level or higher during replacement.**

Caution
- **Be careful not to spill the fluid on a painted surface. If this should happen, wash it off immediately.**
- **Do not mix different brands of fluid.**
- **Do not reuse the clutch fluid that was drained.**

1. Drain the brake fluid from the master cylinder through a wheel cylinder.
2. Remove the bleeder cap from the clutch release cylinder and attach a vinyl hose to the bleeder plug.

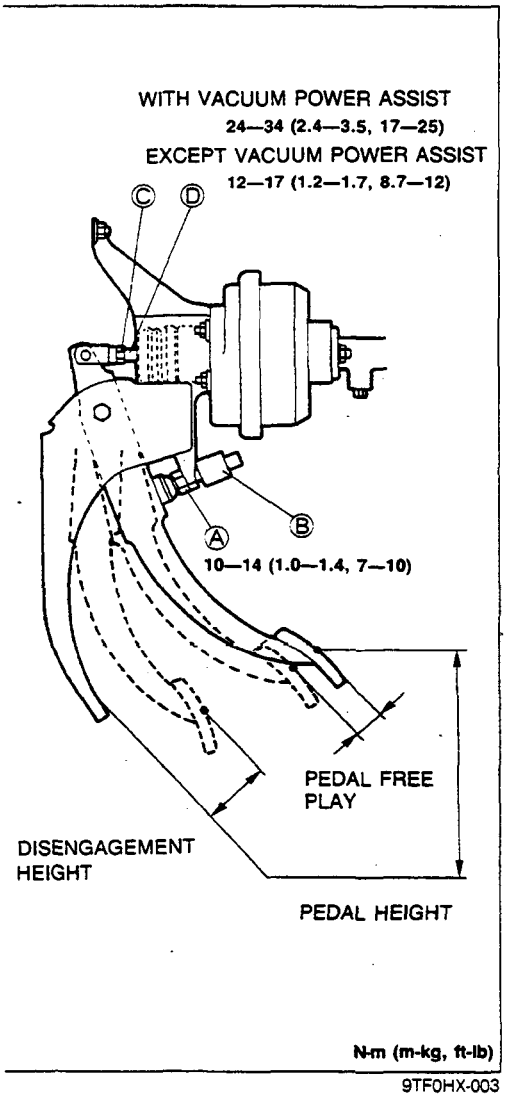


9TG0HX-005

3. Place the other end of the vinyl hose in a clear container.
4. Slowly pump the clutch pedal several times.
5. With the clutch pedal depressed, loosen the bleeder screw with the **SST** to let the fluid escape. Close the bleeder screw with the **SST**.
6. Repeat Steps 4 and 5 until only clean fluid is seen.
7. Tighten the bleeder screw.

Tightening torque:
5.9—8.8 N·m (60—90 cm-kg, 52—78 in-lb)

8. Add fluid to the MAX mark.
9. Slowly pump the clutch pedal several times. Verify that there is no fluid leakage.
10. Verify operation of the clutch system.
11. Verify operation of the brake system.



9TF0HX-003

CLUTCH PEDAL

ADJUSTMENT

Clutch Pedal Height

Inspection

1. Measure the distance from the upper surface of the pedal pad to the floor panel.

   Pedal height: 188—193mm (7.40—7.60 in)

2. If necessary, adjust the pedal height.

Adjustment

1. Disconnect the clutch switch connector.
2. Loosen locknuts A and turn clutch switch B until the height is correct.
3. Tighten locknuts A.

   Tightening torque:
   9.8—14 N·m (100—140 cm-kg, 87—122 in-lb)

4. After adjustment, measure the pedal free play.

Clutch Pedal Free Play

Inspection

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

   Pedal free play: 0.5—2.7mm (0.02—0.11 in)
   Total pedal free play: 5.0—11.0mm (0.20—0.43 in)

2. 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 to the floor panel) is correct when the pedal is fully depressed.

   Minimum disengagement height: 65mm (2.56 in)

3. Tighten locknut C.

   Tightening torque:
   With vacuum power assist
   24—34 N·m (2.4—3.5 m-kg, 17—25 ft-lb)
   Except vacuum power assist
   12—17 N·m (1.2—1.7 m-kg, 8.7—12 ft-lb)

4. After adjustment, inspect the pedal height.

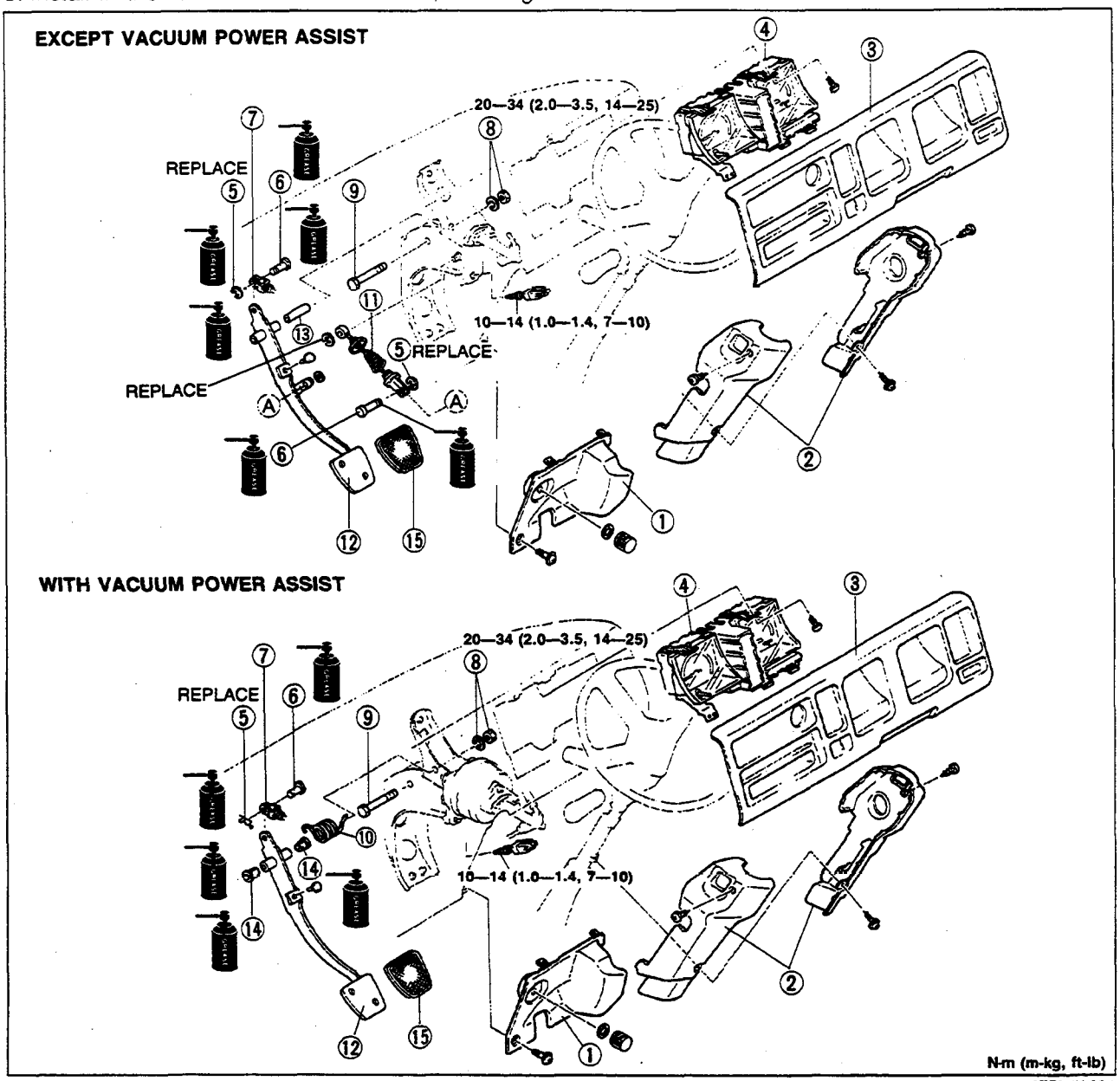
REMOVAL / INSPECTION / INSTALLATION

1. Remove in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.

Note

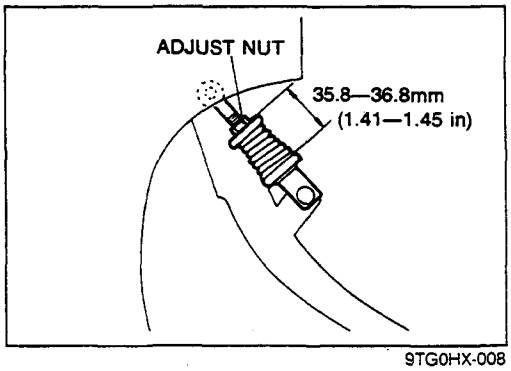
- **Apply lithium based grease to the bushing and pins before installation.**

3. Install in the reverse order of removal, referring to **Installation Note**.



9TF0HX-004

1. Cover
2. Column cover
3. Meter cover
4. Instrument cluster
5. Retaining ring
6. Pin
7. Push rod
8. Nut and washer
9. Bolt
10. Spring (With vacuum power assist)
11. Assist spring (Except vacuum power assist)
    Installation Note..... page H–7
12. Clutch pedal
    Adjustment..... page H–5
13. Spacer (Except vacuum power assist)
14. Bushing (With vacuum power assist)
15. Pedal pad



9TG0HX-008

Installation Note

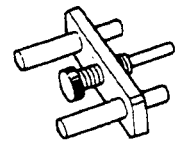
Assist Spring (Except vacuum power assist)

1. Adjust the length of the assist spring by turning the adjusting nut, after installing the clutch pedal.

   Standard: 35.8—36.8mm (1.41—1.45 in)

CLUTCH MASTER CYLINDER

PREPARATION
SST

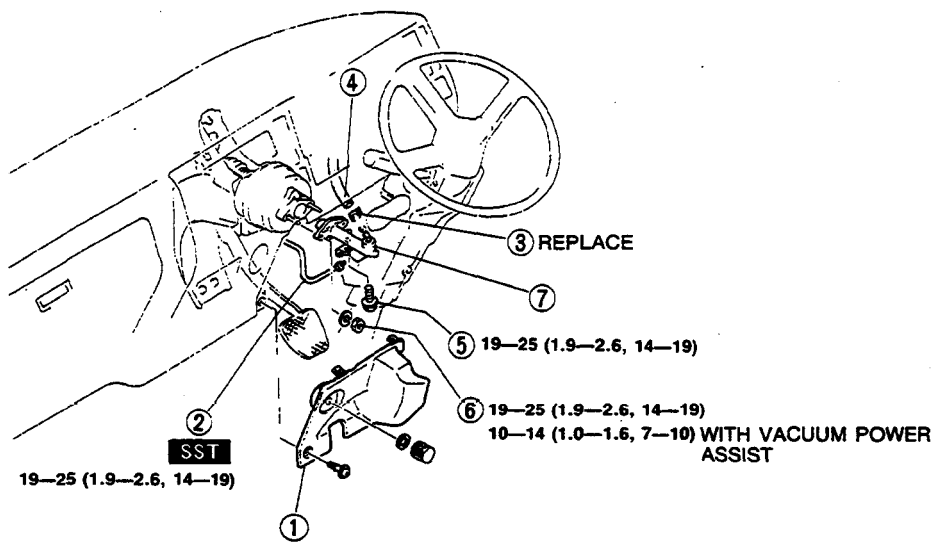
49 0259 770B Wrench, flare nut 	For disconnecting and connecting clutch pipe	49 F043 001 Adjust gauge 	For adjustment of push rod

9TG0HX-009

REMOVAL / INSPECTION / INSTALLATION

Caution
- **Clutch fluid will damage painted surfaces. Be sure to use a container or rags to collect it. If fluid does get on a painted surface, wipe it off immediately with a rag.**

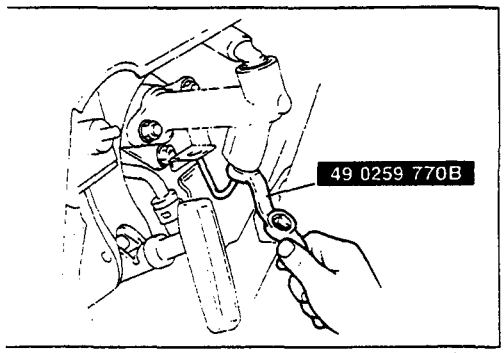
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal, referring to **Installation Note**.



N·m (m-kg, ft-lb)

9TF0HX-005

1. Cover
2. Clutch pipe
   Removal Note ..... page H– 9
   Installation Note..... page H– 9
3. Clip
4. Clutch hose
   Removal Note ..... page H– 9
5. Bolt
6. Nut
7. Clutch master cylinder
   Overhaul..... page H–11
   Check for fluid leakage from cylinder bore
   Air bleeding..... page H–10

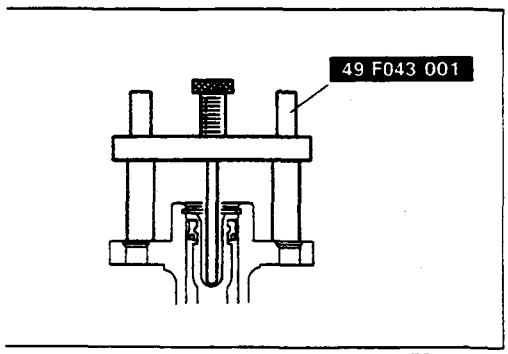


03U0HX-016

Removal Note
Clutch pipe
1. Disconnect the clutch pipe with the **SST**.

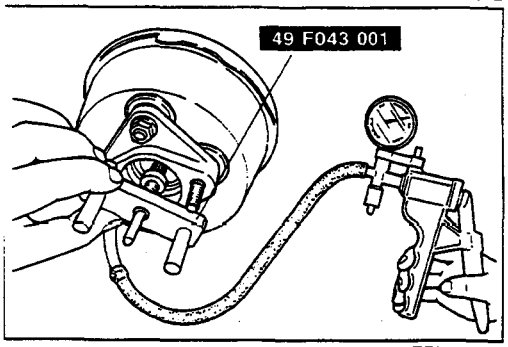
Clutch hose
1. Disconnect the clutch hose from the master sylinder.
2. Plug the outlet of the clutch hose.

9TG0HX-011



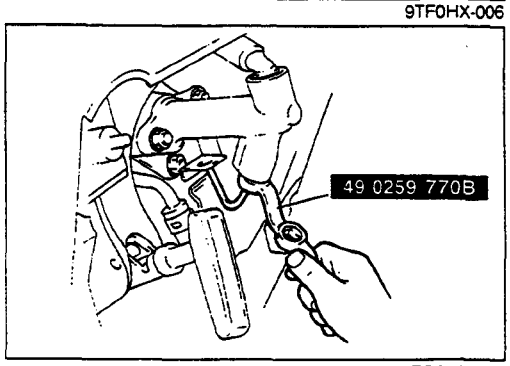
9TG0HX-012

Installation Note
Push rod (With vacuum power assist)
1. Set the **SST** on the clutch master cylinder.
2. Turn the adjusting bolt, until the end of the bolt contacts the piston.



9TF0HX-006

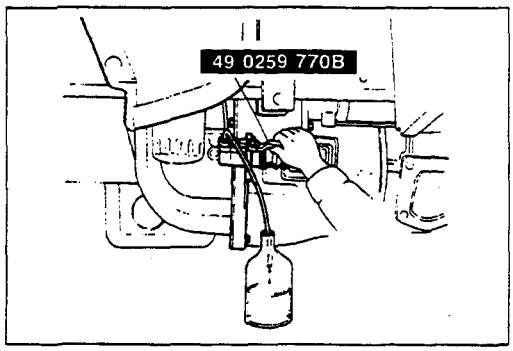
3. Apply a vacuum of 500 mmHg (19.7 inHg) to the vacuum power assist using a vacuum pump.
4. Turn over the **SST** and set it on the vacuum power assist.
5. Verify that the clearance between the **SST** and the push rod is 0.1—0.3mm (0.004—0.012 in). Adjust the push rod if necessary.



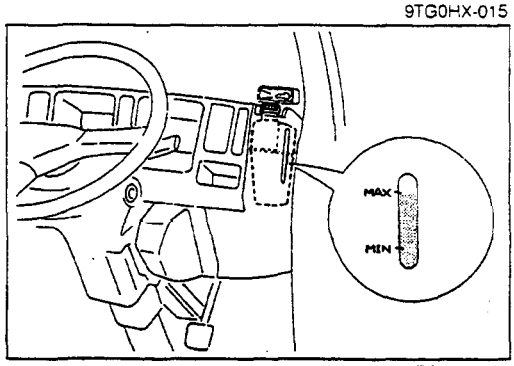
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Clutch pipe
1. Tighten the clutch pipe with the **SST**.

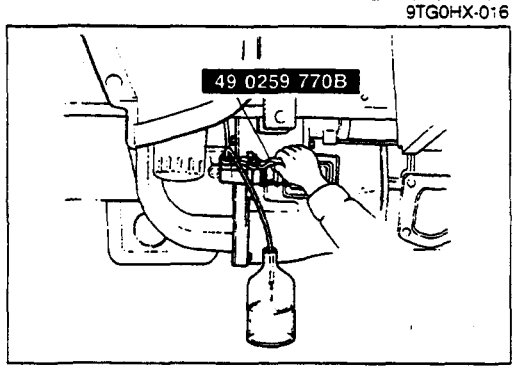
Tightening torque:
19—26 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



9TG0HX-015



9TG0HX-016



9TG0HX-017

Air Bleeding

1. After installation, bleed the clutch system. (Refer to below.)

Inspection and Adjustment
Clutch pedal height and free play
(Refer to page H–5.)

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

- **Clutch fluid will damage a painted surface. If fluid does get on a painted surface, wipe it off immediately.**
- **Do not mix different brands of clutch fluid.**
- **Do not reuse the clutch fluid that was drained.**

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 clear container.
3. Slowly pump the clutch pedal several times.
4. While depressing the pedal, loosen the bleeder screw with the **SST** to let fluid and air escape.
   Close the bleeder screw with the **SST**.
5. Repeat Steps 3 and 4 until no air bubbles are seen in the fluid.
6. Tighten the bleeder screw.

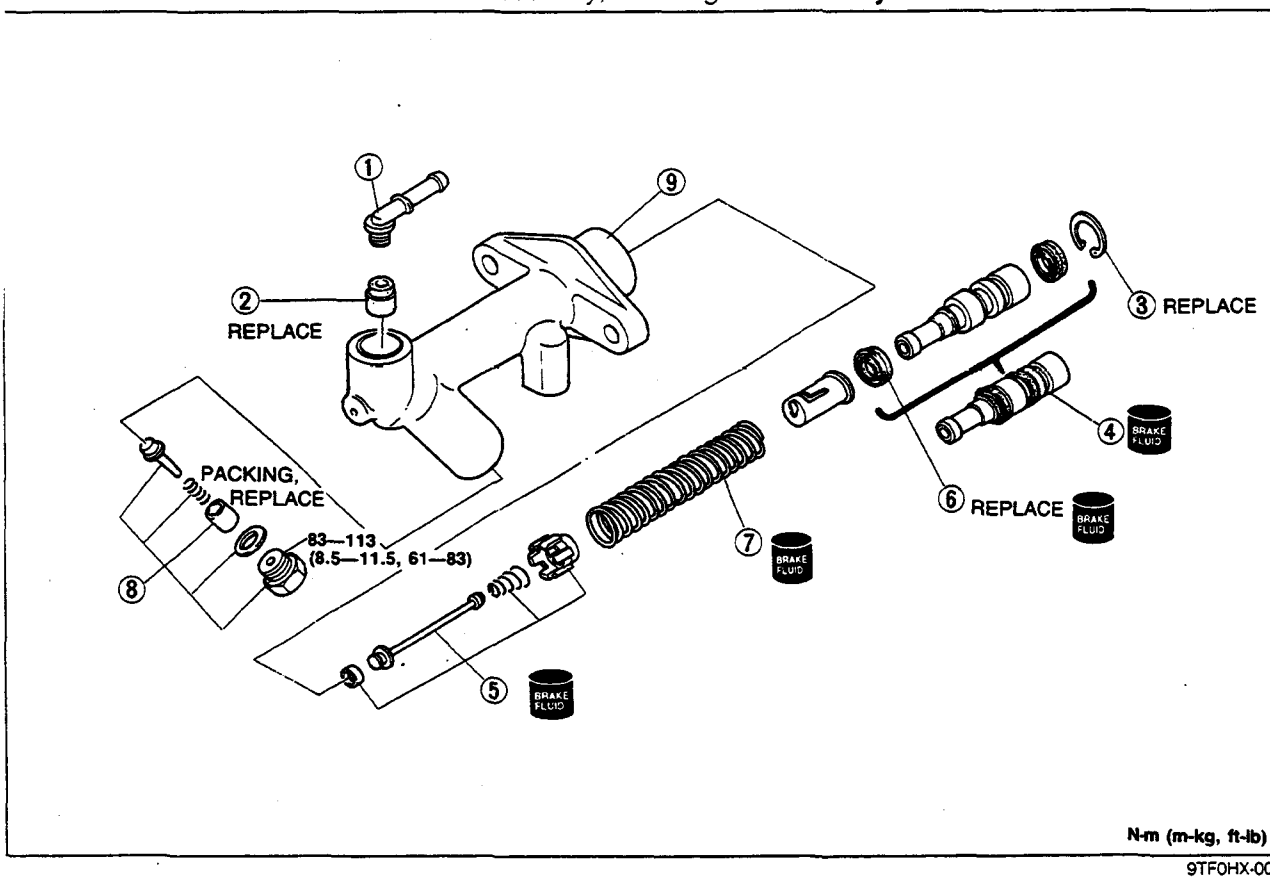
Tightening torque:
5.9—8.8 N·m (60—90 cm-kg, 52—78 in-lb)

7. Verify clutch operation.
8. Verify that there is no fluid leakage.

OVERHAUL

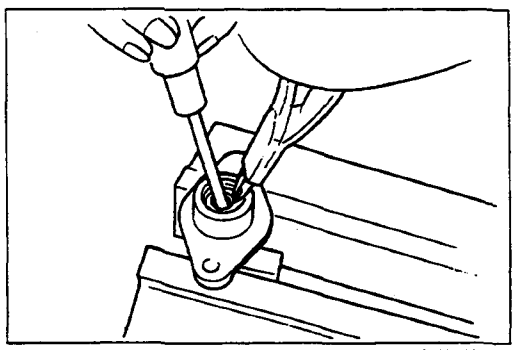
Caution
- **Clean the disassembled parts in solvent and blow through all ports and passages with compressed air.**

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**.



9TF0HX-007

1. Joint
2. Bushing
3. Snap ring
   Disassembly Note ..... page H–11
   Assembly Note ..... page H–12
4. Piston and secondary cup assembly
   Disassembly Note ..... page H–12
   Assembly Note ..... page H–12
   Inspect for wear, scoring and cracks
5. Spacer
6. Primary cup
   Inspect for wear and cracks
7. Return spring
8. One-way check valve
9. Master cylinder body
   Inspect cylinder bore for scoring and corrosion

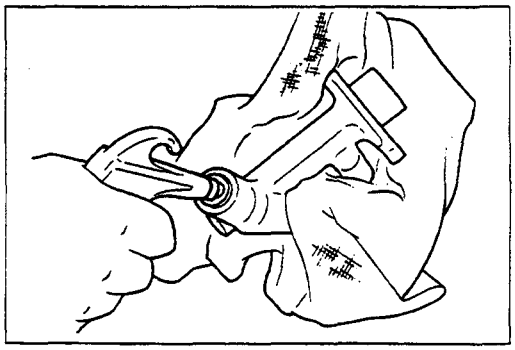


03U0HX-018

Disassembly Note
Snap ring

Caution
- **Do not damage the push rod contact surface of the piston.**

1. Press the piston down and remove the snap ring with snap-ring pliers.



9MU0HX-019

Piston and secondary cup assembly

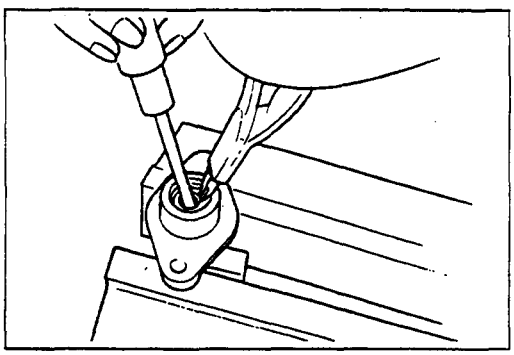
Caution
- **Hold a rag over the master cylinder to prevent the piston and secondary cup assembly from jumping out.**

1. Remove the piston and secondary cup assembly, spacer, and primary cup by applying compressed air through the clutch pipe installation hole.

Assembly Note

Caution
- **Before assembly, make sure all parts are completely clean.**
- **Do not mix different brands of clutch fluid.**
- **Do not reuse the clutch fluid that was drained.**
- **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 to do so.**

03U0HX-019



03U0HX-021

Snap ring

Caution
- **Do not damage the push rod contact surface of the piston.**

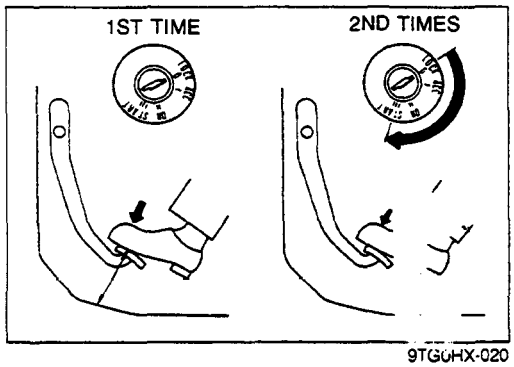
1. While pressing the piston, install the snap ring.

VACUUM POWER ASSIST

INSPECTION

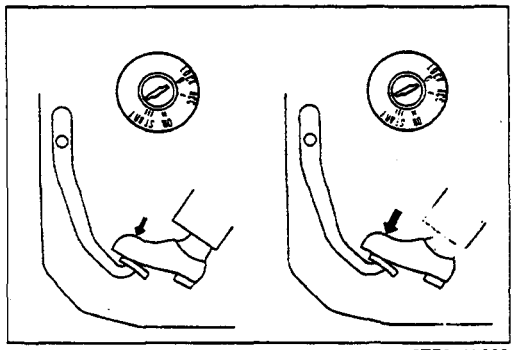
Note
- **This inspection is performed to determine if the vacuum power assist is functioning.**
- **If a problem is found, replace the vacuum power assist assembly.**

9TG0HX-019



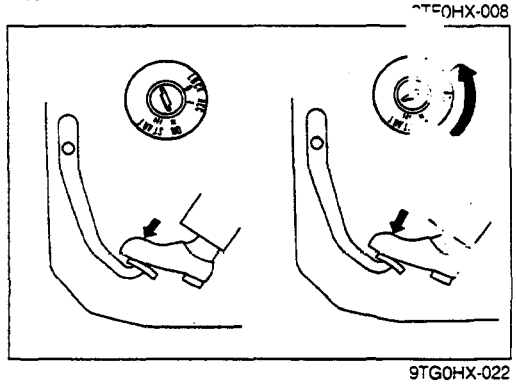
9TG0HX-020

Function Check
1. With the engine stopped, depress the pedal a few times, and confirm that the pedal height does not change.
2. Start the engine, and confirm that the pedal depression force is reduced.



9TG0HX-008

Vacuum Loss Check
1. Start the engine.
2. Stop the engine, after 1 or 2 minutes, and depress the pedal several times.
3. Verify that the pedal depression force becomes higher.

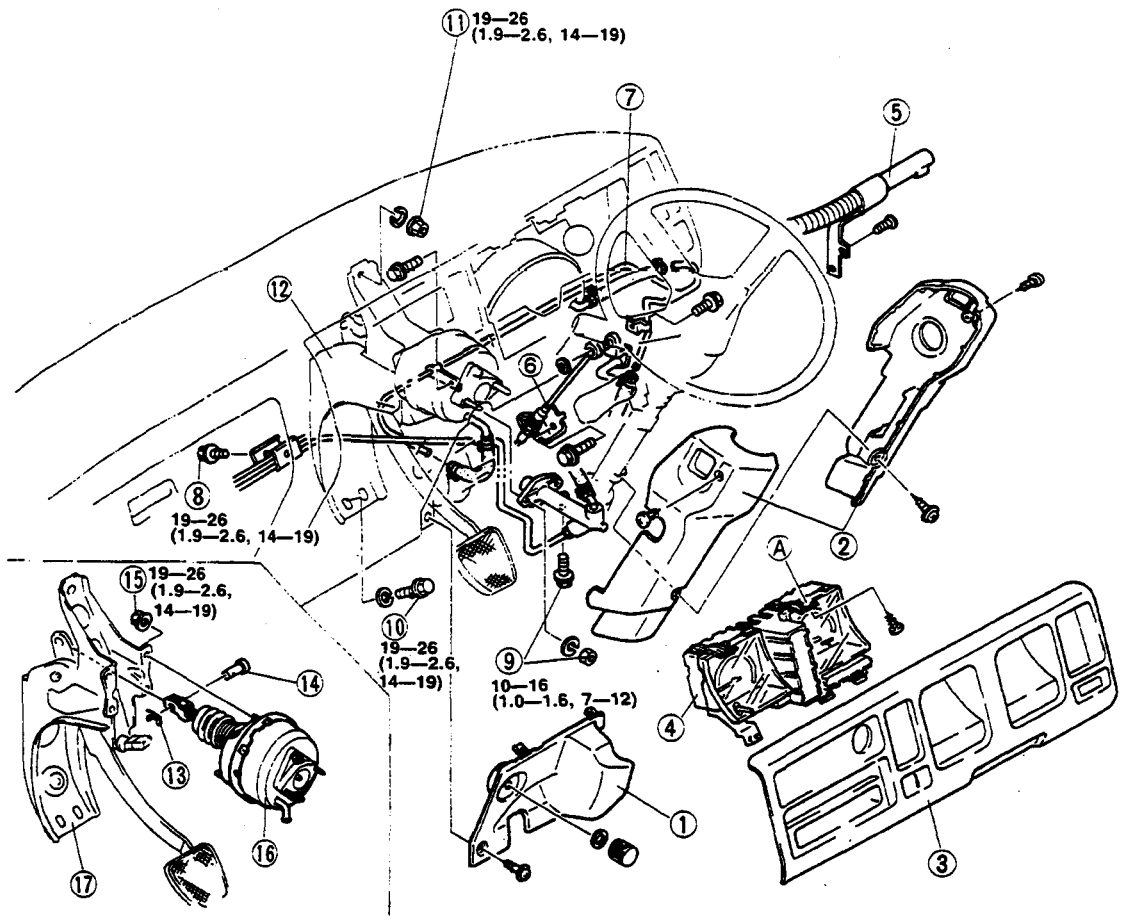


9TG0HX-022

Vacuum Loss Check (Loaded Condition)
1. Start the engine, and depress the pedal.
2. With the pedal held depressed, stop the engine.
3. Hold the pedal down for about 30 seconds.
4. Confirm the pedal height does not change.

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**.



N-m (m-kg, ft-lb)

9TF0HX-009

1. Cover
2. Column cover
3. Meter cover
4. Instrument cluster
5. Duct
6. Sub-select cable
7. Vacuum pipe
8. Bolt
9. Bolt/Nut
10. Bolt
11. Nut
12. Vacuum power assist/ clutch pedal assembly
13. Retaining ring
14. Pin
15. Nut
16. Vacuum power assist Installation note.. page H–9
17. Clutch pedal assembly

CLUTCH RELEASE CYLINDER

PREPARATION
SST

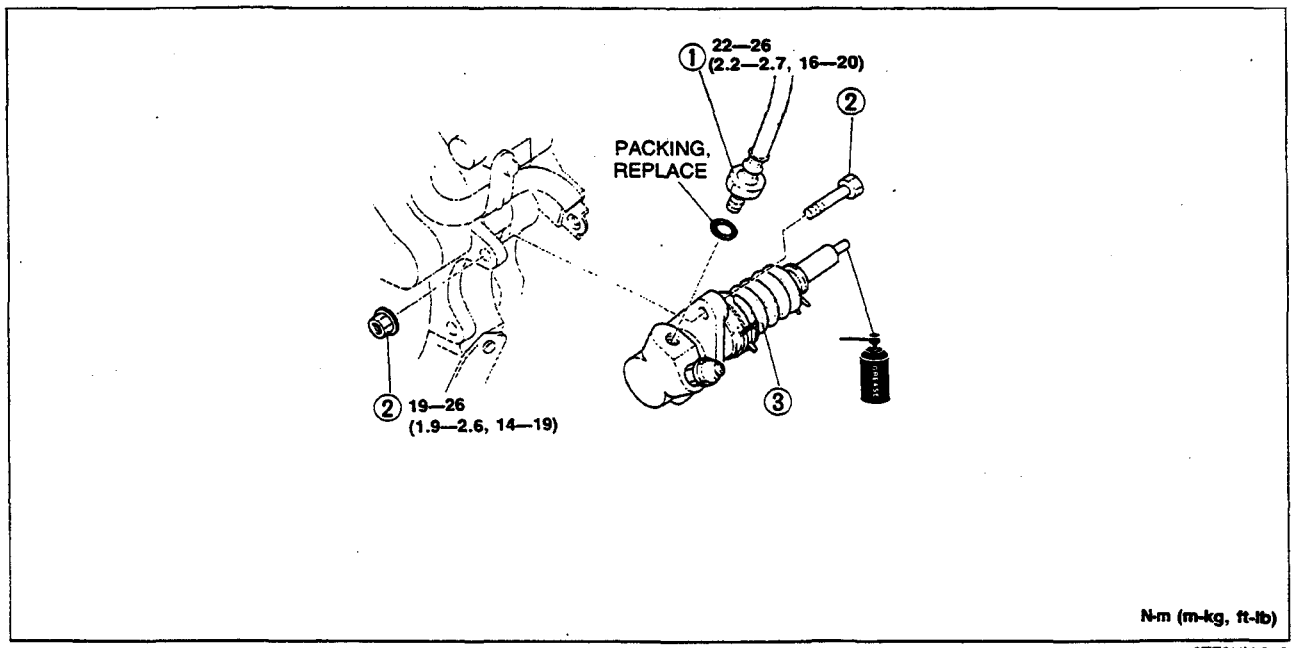
49 0259 770B Wrench, flare nut		For disconnecting and connecting clutch pipe

03U0HX-022

REMOVAL / INSTALLATION

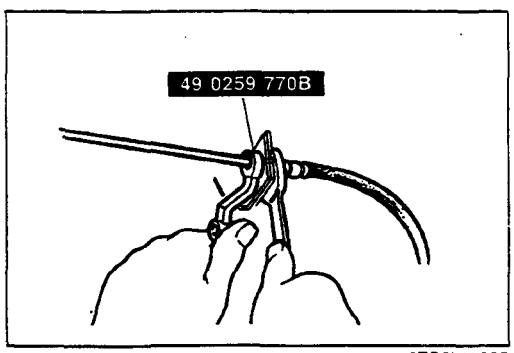
Caution
- **Clutch fluid will damage painted surfaces. Be sure to use a container or rags to collect it. If fluid does get on a painted surface, wipe it off immediately with a rag.**

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.



9TF0HX-010

1. Flexible hose
   - Removal Note ..... page H–15
   - Installation Note..... page H–16
2. Bolt/Nut
3. Clutch release cylinder
   - Remove boot and check for fluid leakage
   - Overhaul..... page H–16

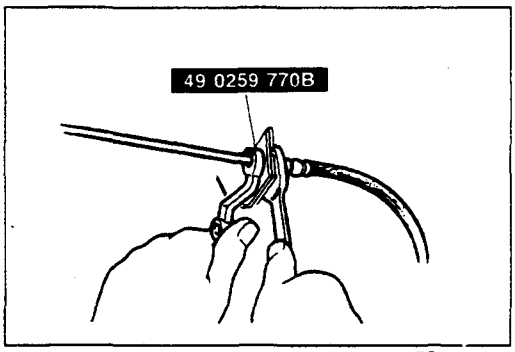


9TG0HX-025

Removal Note
Flexible hose

Caution
- **After removing the flexible hose, plug the pipe from the master cylinder to avoid fluid leakage.**

1. Disconnect the flexible hose with the **SST**.



9TG0HX-026

Installation Note
Flexible hose
1. Tighten the flexible hose with the **SST**.

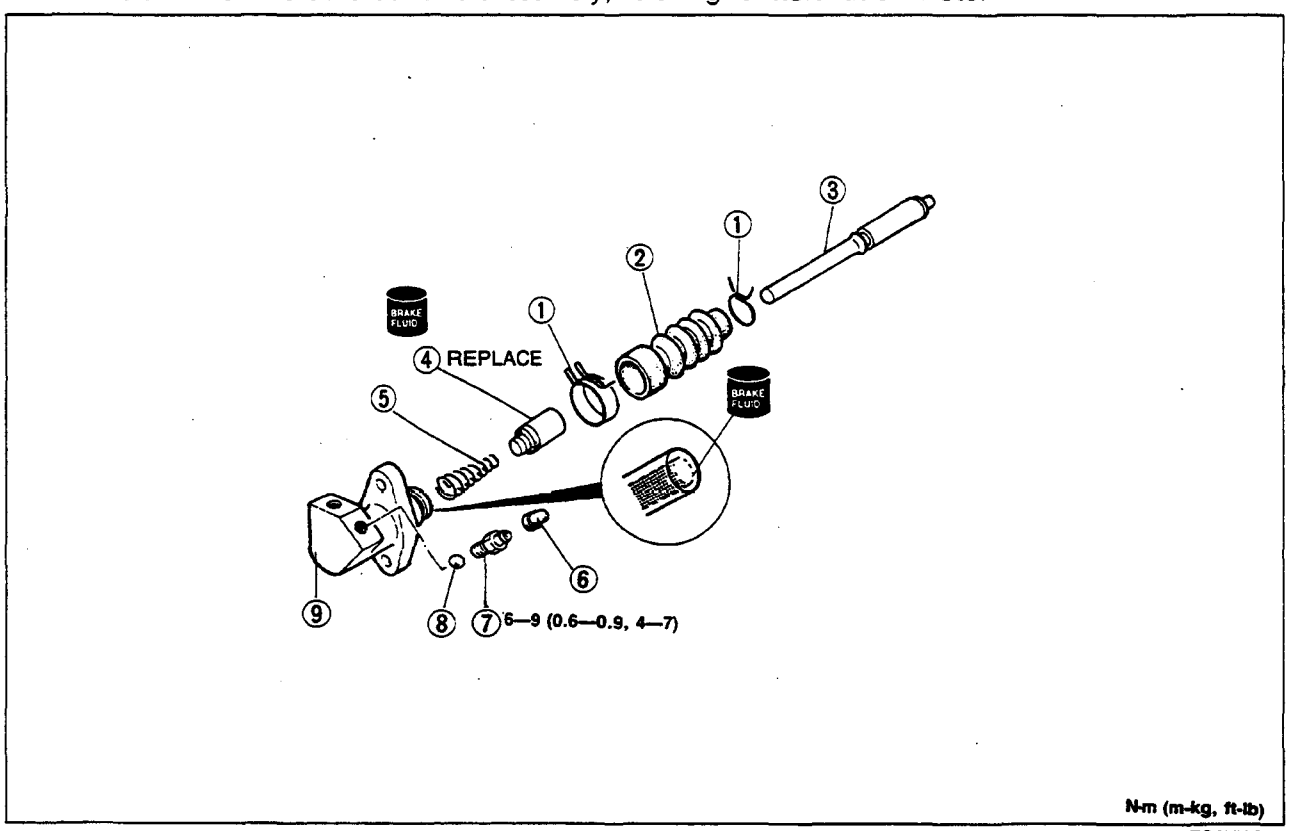
Tightening torque:
22—26 N·m (2.2—2.7 m-kg, 16—20 ft-lb)

Air Bleeding
1. After installation, bleed the clutch system.
(Refer to page H–10.)

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, referring to **Installation Note**.

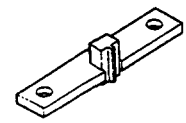
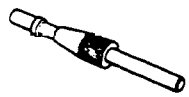
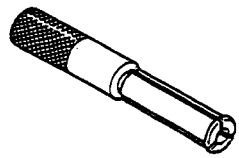


9TG0HX-027

1. Boot band
2. Boot
3. Push rod
4. Piston and cup assembly
   Inspect for wear, scoring and cracks
5. Return spring
6. Bleeder cap
7. Bleeder screw
8. Steel ball
9. Release cylinder body
   Inspect cylinder bore for scoring and corrosion

CLUTCH UNIT

PREPARATION
SST

49 E301 060 Brake, ring gear (HA, SL engine) 	For prevention of engine rotation	49 W011 103 Brake, ring gear (TF engine) 	For prevention of engine rotation
49 S501 062 Collar (HA engine) 	For prevention of engine rotation	49 W065 062 Collar (SL engine) 	For prevention of engine rotation
49 SE01 310 Clutch disc centering tool 	For alignment of clutch disc	49 1285 071 Puller, bearing 	For removal of pilot bearing
49 B011 103 Chuck (Part of 49 1285 071) 	For removal of pilot bearing		

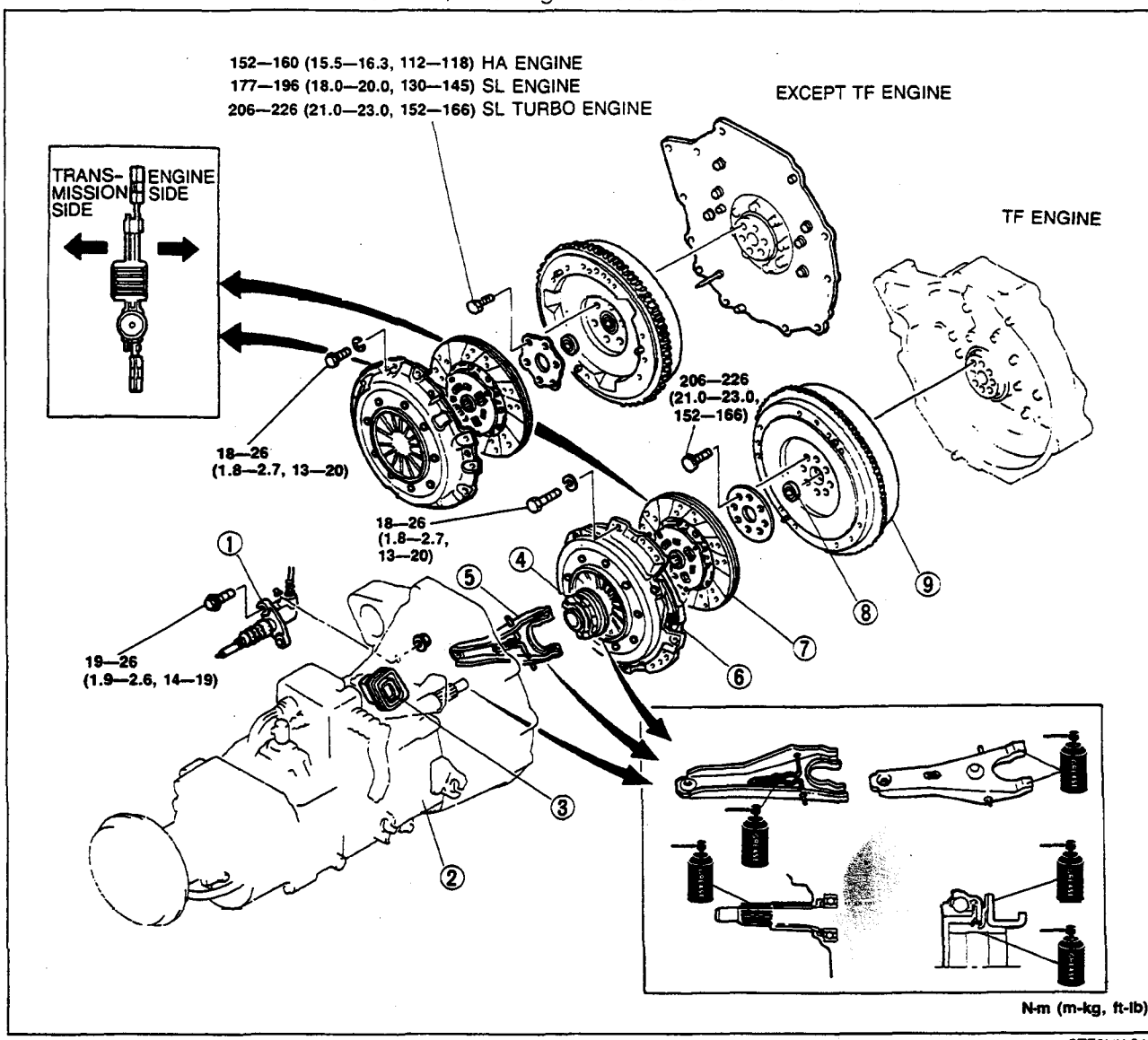
9TF0HX-011

CLUTCH UNIT

REMOVAL / INSTALLATION

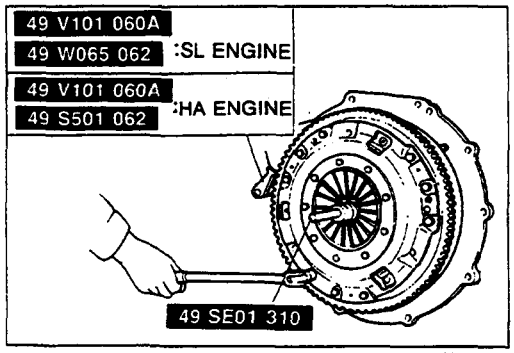
Note
- **Remove the clutch release cylinder with the flexible hose connected.**
- **Do not remove the pilot bearing if not necessary.**

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**.

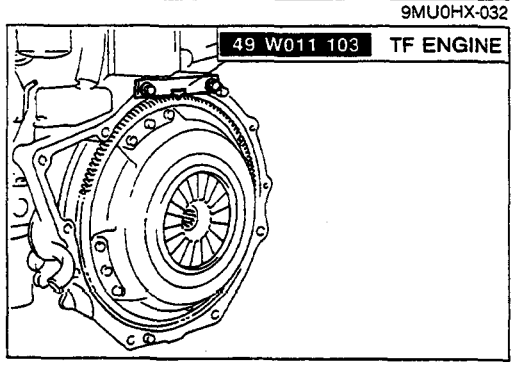


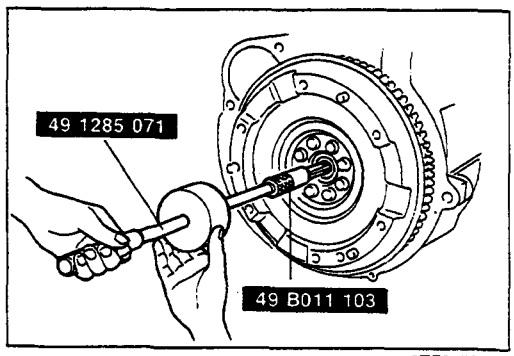
9TF0HX-012

1. Clutch release cylinder
2. Transmission and transfer case
   Service ..... Section J1, J2
3. Boot
4. Clutch release bearing
   Inspection ..... page H–21
5. Clutch release fork
6. Clutch cover
   Removal Note ..... page H–19
   Inspection ..... page H–21
   Installation Note ..... page H–21
7. Clutch disc
   Removal Note ..... page H–19
   Inspection ..... page H–21
   Installation Note ..... page H–20
8. Pilot bearing
   Inspection ..... page H–19
   Removal Note ..... page H–22
   Installation Note ..... page H–20
9. Flywheel
   Removal Note ..... page H–19
   Inspection ..... page H–22
   Installation Note ..... page H–20

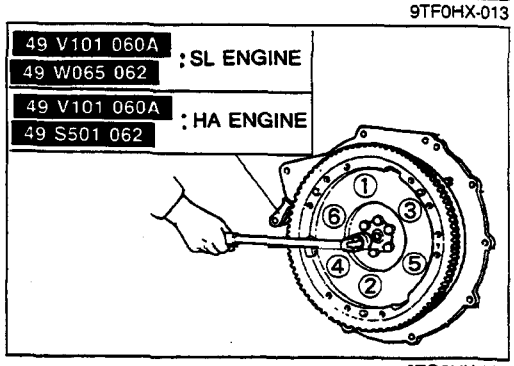


9MU0HX-032

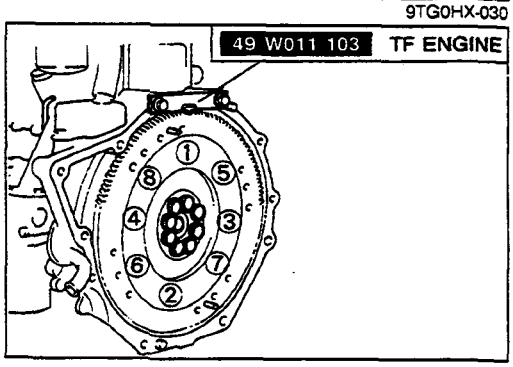




9TF0HX-013



9TG0HX-030



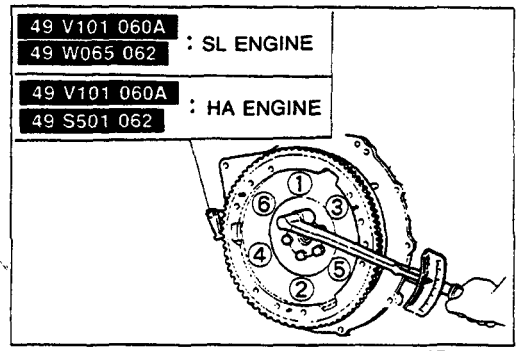
Removal Note
Clutch cover and disc
1. Install the **SST**.
2. Loosen each bolt one turn at a time in a crisscross pattern until spring tension is released. Then remove the clutch cover and disc.

Pilot bearing
1. Remove the pilot bearing with the **SST**.

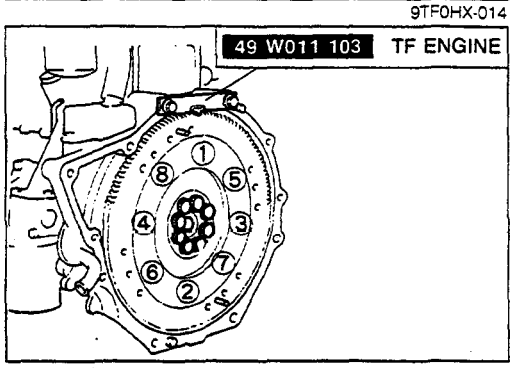
Flywheel

Note
- **After removing the flywheel, inspect for oil leakage past the crankshaft rear oil seal. If necessary, replace the oil seal. (Refer to Section B.)**

1. Hold the flywheel with the **SST**.
2. Remove the bolts and remove the flywheel.



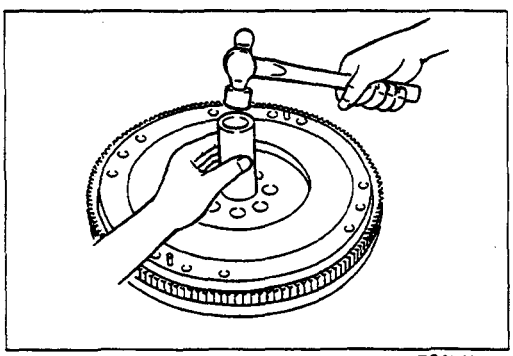
9TF0HX-014



Installation Note
Flywheel

1. Install the flywheel and **SST**.
2. Tighten the bolts in the pattern shown.

Tightening torque:
152—160 N·m (15.5—16.3 m-kg, 112—118 ft-lb)
HA engine
177—196 N·m (18.0—20.0 m-kg, 130—145 ft-lb)
SL engine
206—226 N·m (21.0—23.0 m-kg, 152—166 ft-lb)
SL Turbo, TF engine

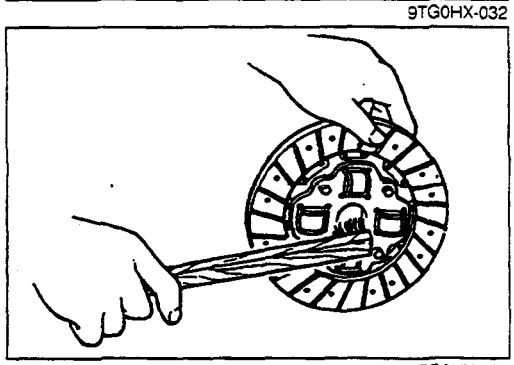


9TG0HX-032

Pilot bearing

Note
- **Install the pilot bearing flush with the flywheel.**

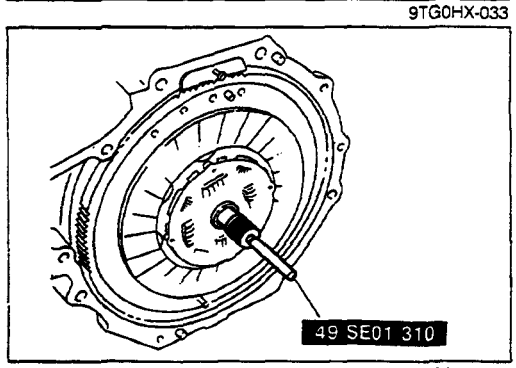
1. Install the new bearing with the suitable pipe.



9TG0HX-033

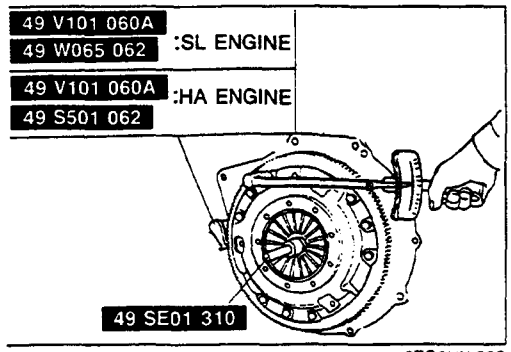
Clutch disc

1. Clean the clutch disc splines and main drive gear splines; then apply organic molybdenum grease.

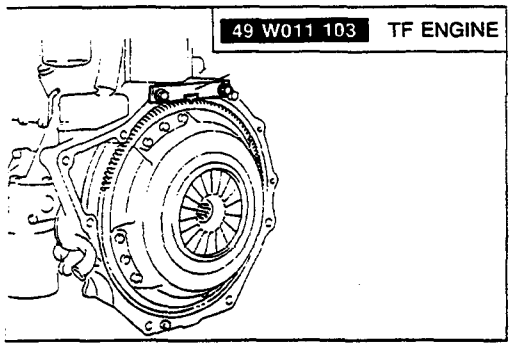


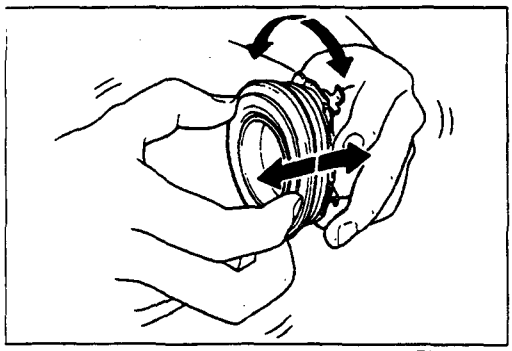
9TG0HX-034

2. Hold the clutch disc in position with the **SST**.

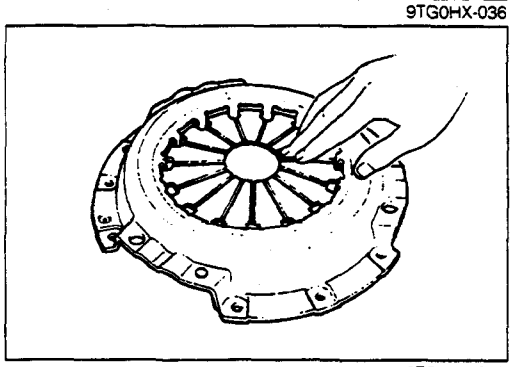


9TG0HX-035

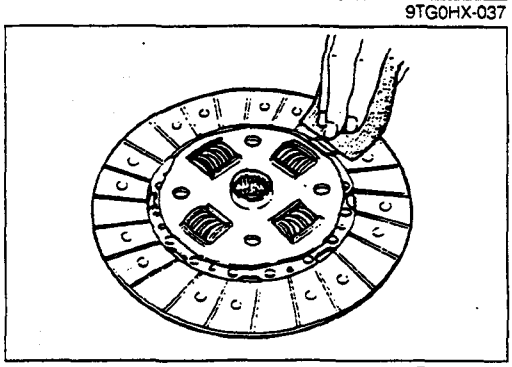




9TG0HX-036



9TG0HX-037



9TG0HX-038

Clutch cover

1. Install the **SST**.
2. Align the dowel holes with the flywheel dowels.
3. Tighten the bolts evenly and gradually in a cross pattern.

Tightening torque:
18—26 N·m (1.8—2.7 m-kg, 13—20 ft-lb)

RELEASE BEARING

INSPECTION

Note
- **The clutch release bearing is a sealed bearing and must not be washed.**

1. Turn the bearing while applying force in the axial direction. If the bearing sticks or has excessive resistance, replace it.

CLUTCH COVER

INSPECTION

Note
- **Minor scoring or burning should be removed with emery paper.**

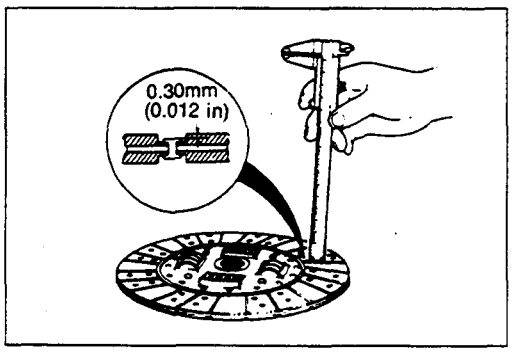
1. Inspect the contact surface of the clutch disc for scoring, cracks, and burning. Repair or replace as necessary.
2. Inspect the contact surface of the clutch release bearing for wear and cracks.
   If there is wear or cracks, replace the clutch cover.

CLUTCH DISC

INSPECTION

Note
- **Use sandpaper if the trouble is minor.**

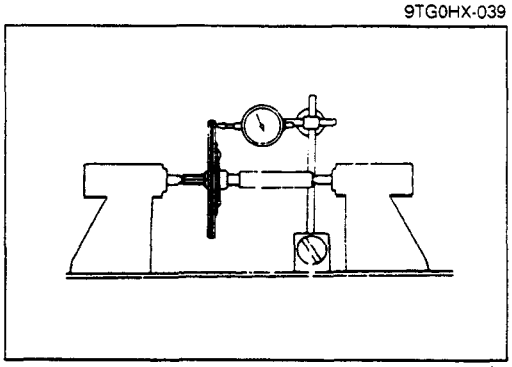
1. Inspect the lining surface for burning and oil contamination. Replace the clutch disc if it is badly burned or oil soaked.
2. Inspect for loose facing rivets.
   Replace the clutch disc if either is loose.



9TG0HX-039

3. Measure the thickness of the lining at a rivet head on both sides with vernier calipers.
   Replace the disc if the thickness is less than minimum.

   Minimum thickness: 0.3mm (0.012 in)



03U0HX-034

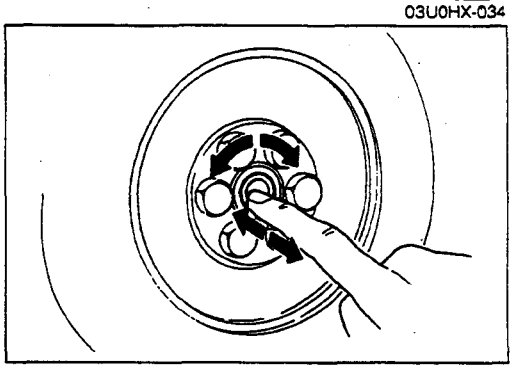
4. Measure the clutch disc runout with a dial indicator.
   Replace the clutch disc if runout is excessive.

   Maximum runout: 0.7mm (0.027 in)

PILOT BEARING

INSPECTION

1. Turn the bearing while applying force in the axial direction.
   If the bearing sticks or has excessive resistance, replace it.



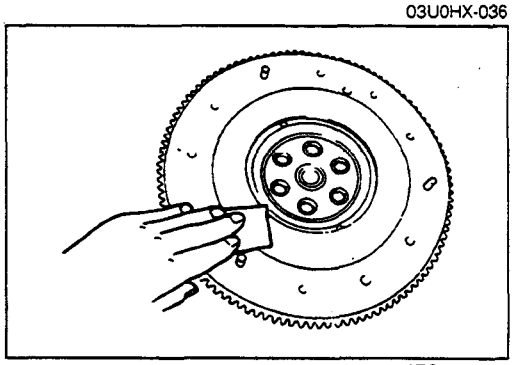
03U0HX-036

FLYWHEEL

INSPECTION

Note
- **Minor scoring or burning should be removed with emery paper.**

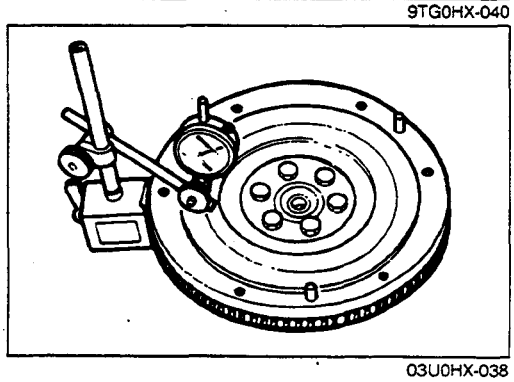
1. Inspect the contact surface of the clutch disc for scoring, cracks, and burning. Repair or replace as necessary.



9TG0HX-040

2. Inspect the ring gear teeth for wear and damage. If necessary, replace the ring gear.
3. Measure the flywheel runout with a dial indicator. Replace the flywheel if runout is excessive.

   Maximum runout: 0.2mm (0.008 in)



03U0HX-038

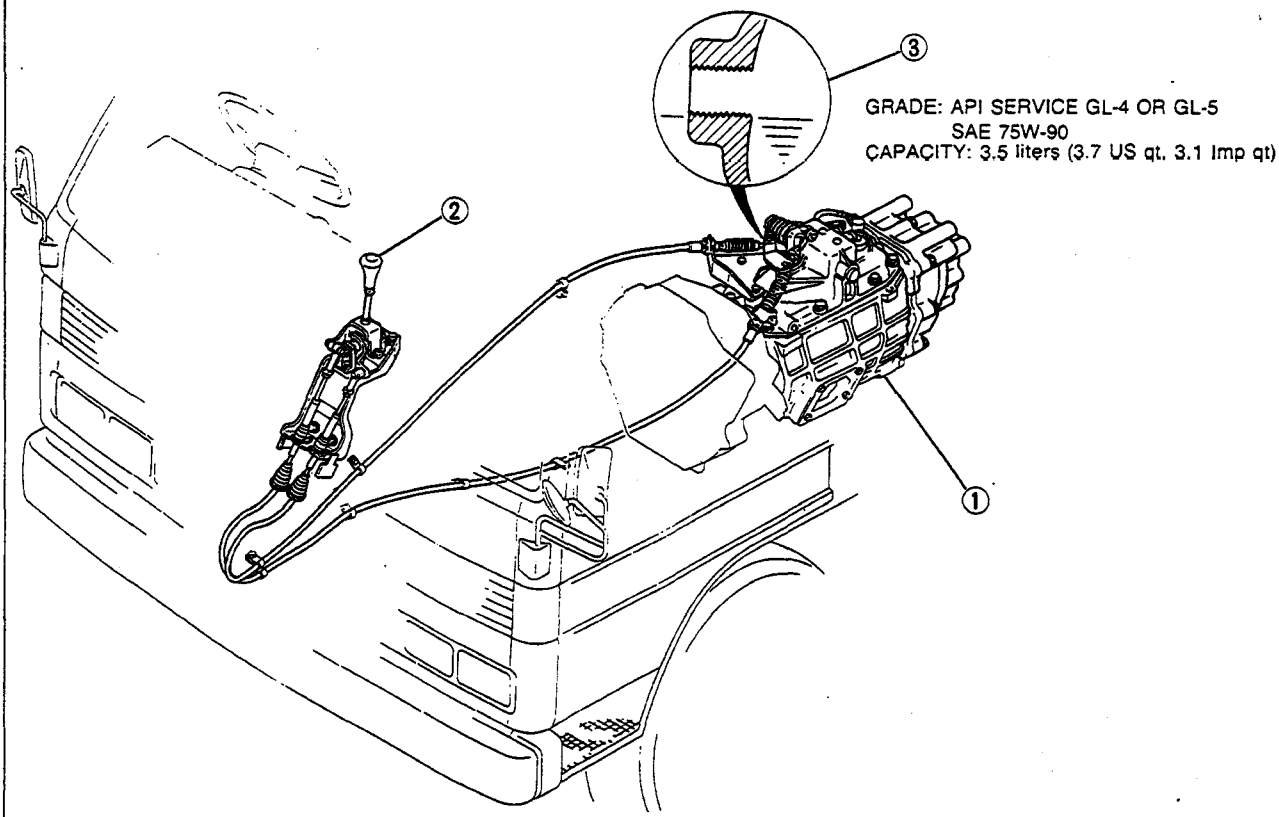
MANUAL TRANSMISSION (W5M-R)

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WITHOUT SUB-TRANSMISSION

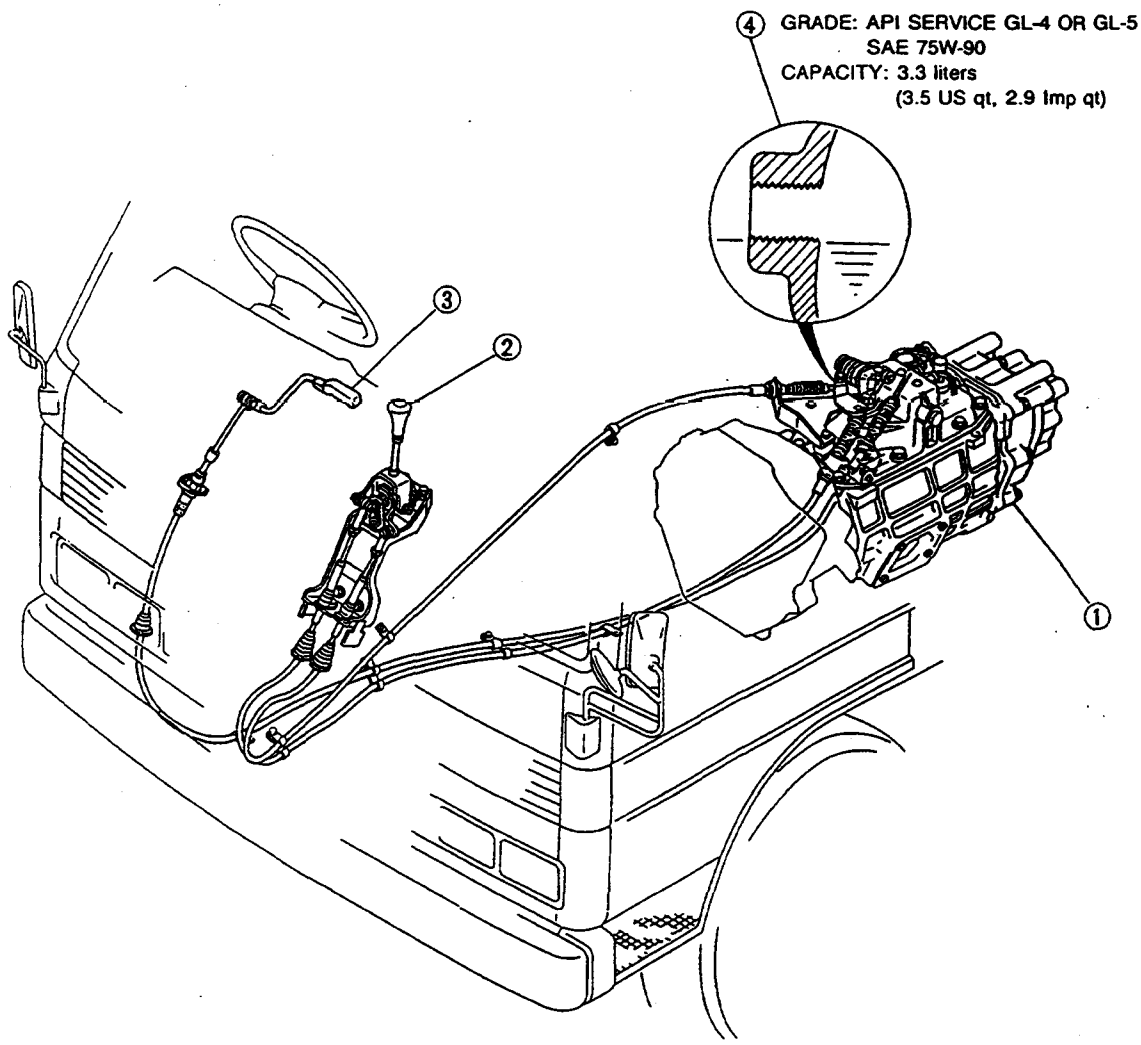


9TF0J1-002

1. Transmission
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Disassembly..... page J1–17
Inspection..... page J1–28
Assembly ..... page J1–31

2. Shift mechanism (Transmission)
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3. Transmission oil
Inspection..... page J1–13
Replacement..... page J1–13

WITH SUB-TRANSMISSION

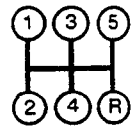
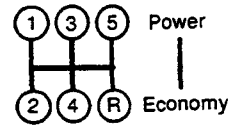


9TF0J1-003

1. Transmission
Removal / Installation ..... page J1–14
Disassembly ..... page J1–17
Inspection ..... page J1–28
Assembly ..... page J1–31
2. Shift mechanism (Transmission)
Removal / Installation ..... page J1–47
3. Shift mechanism (Sub-transmission)
Removal / Installation ..... page J1–29
4. Transmission oil
Inspection ..... page J1–13
Replacement ..... page J1–13

OUTLINE

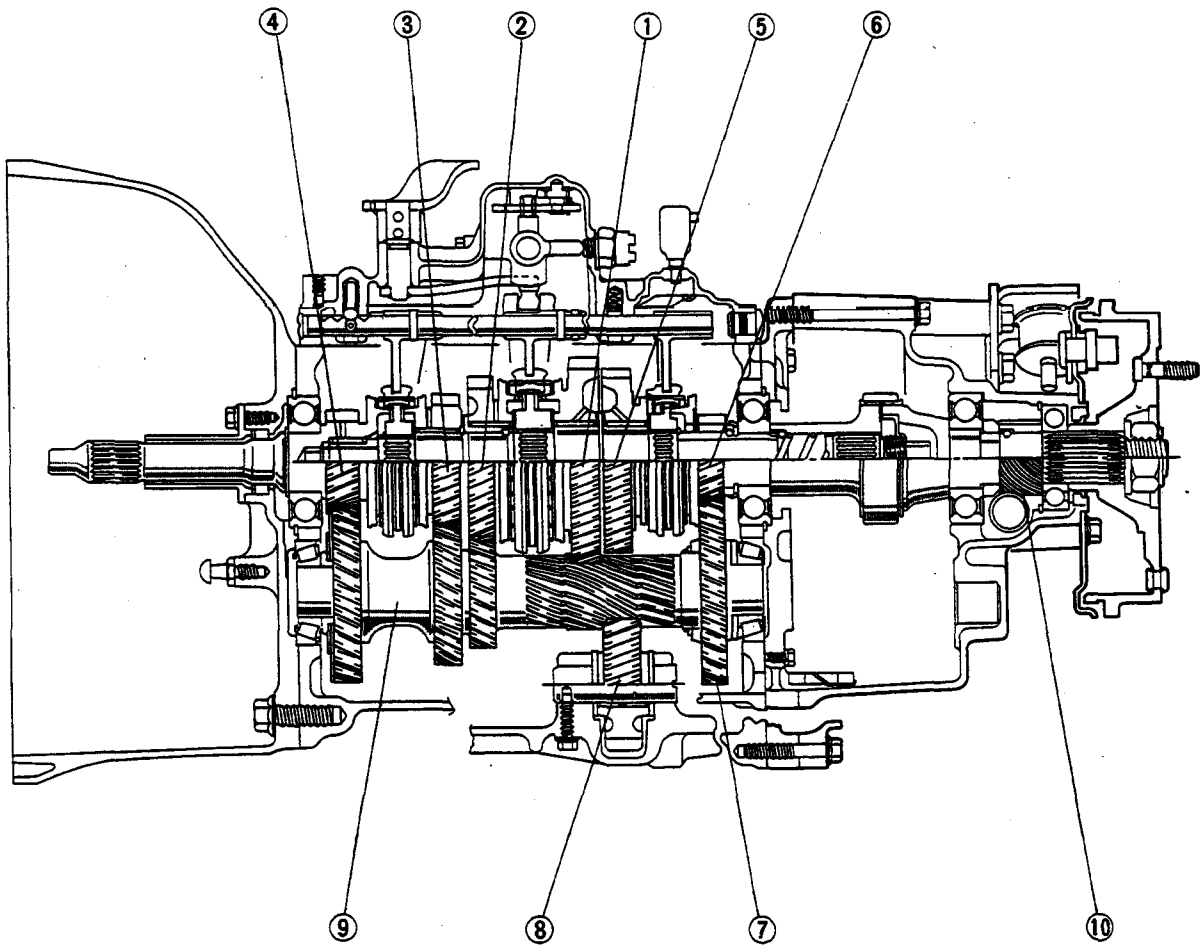
SPECIFICATIONS

Transmission models / Engine			W5M-R Without sub-transmission			W5M-R With sub-transmission
			HA	SL	TF	
Transmission mesh system			Forward: Synchromesh Reverse: Constant-mesh			
Sub-transmission mesh system			—			Synchromesh
Shift pattern						
Gear ratio	Transmission	1st	5.833		5.478	
		2nd	2.855		3.075	
		3rd	1.651		1.637	
		4th	1.000		1.000	
		5th	0.800		0.794	
		Reverse	5.372		5.197	
	Sub-transmission	Economy	—			0.804
		Power	—			1.000
Oil	Type		API Service GL-4 or GL-5 SAE 75W-90			
	Capacity liters (US qt, Imp qt)		3.5 (3.7, 3.1)			3.3 (3.5, 2.9)

9TF0J1-004

STRUCTURAL VIEW

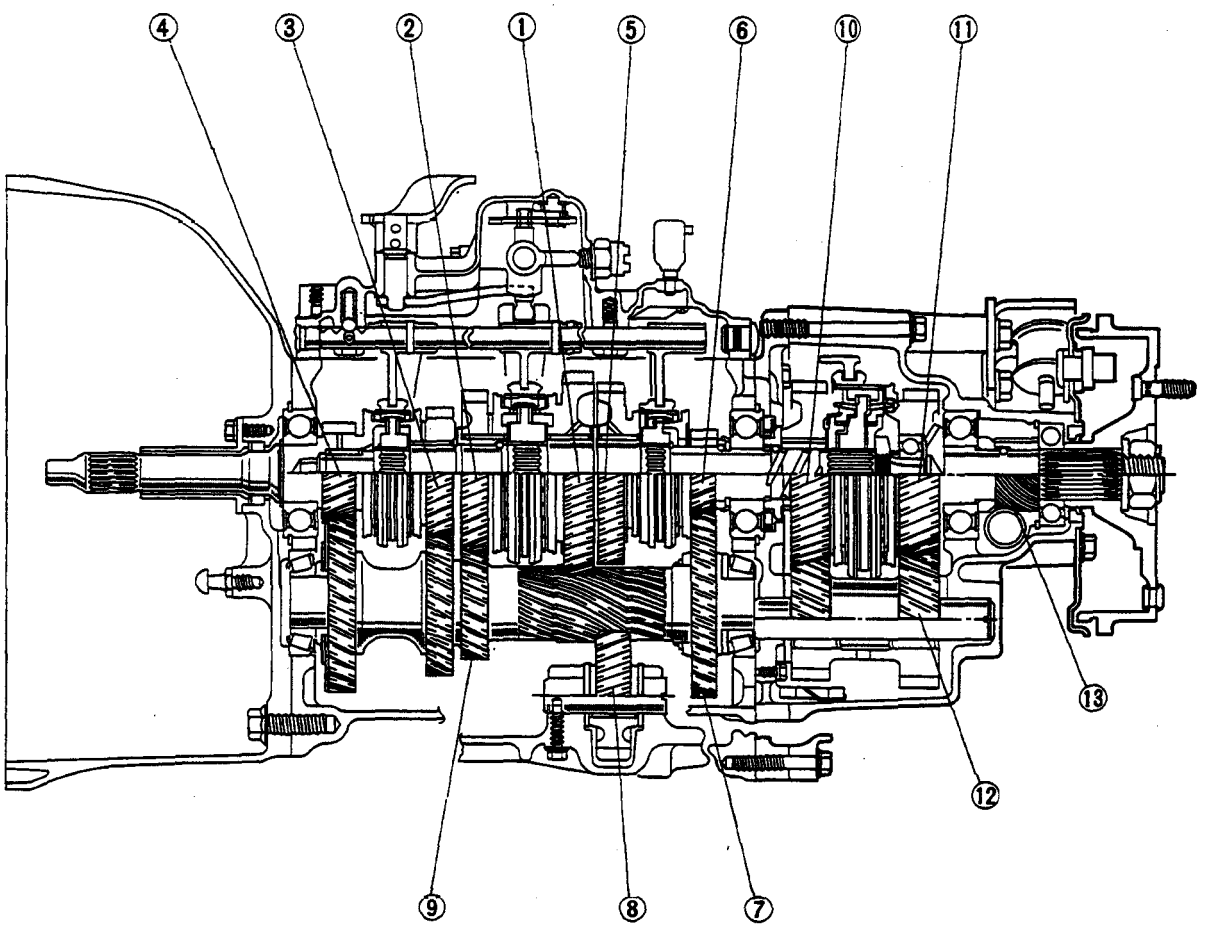
W5M-R
WITHOUT SUB-TRANSMISSION



9TF0J1-005

1. 1st gear
2. 2nd gear
3. 3rd gear
4. Main drive gear (4th gear)
5. Reverse gear
6. 5th gear
7. Counter 5th gear
8. Reverse idler gear
9. Countershaft gear
10. Speedometer drive gear

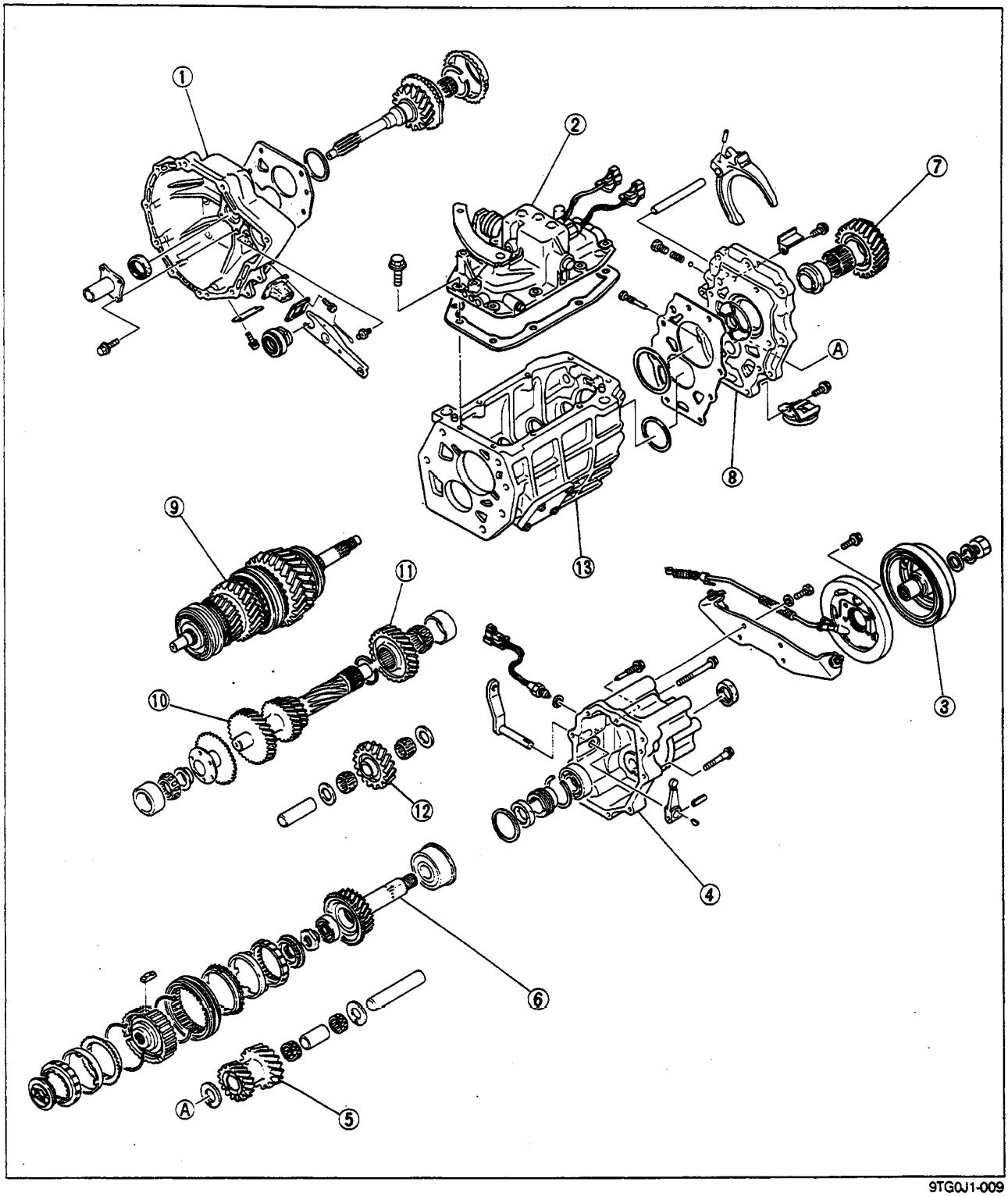
W5M-R
WITH SUB-TRANSMISSION



9TG0J1-007

1. 1st gear
2. 2nd gear
3. 3rd gear
4. Main drive gear (4th gear)
5. Reverse gear
6. 5th gear
7. Counter 5th gear
8. Reverse idler gear
9. Countershaft gear
10. High gear
11. Output shaft
12. Counter high gear
13. Speedometer drive gear

COMPONENTS

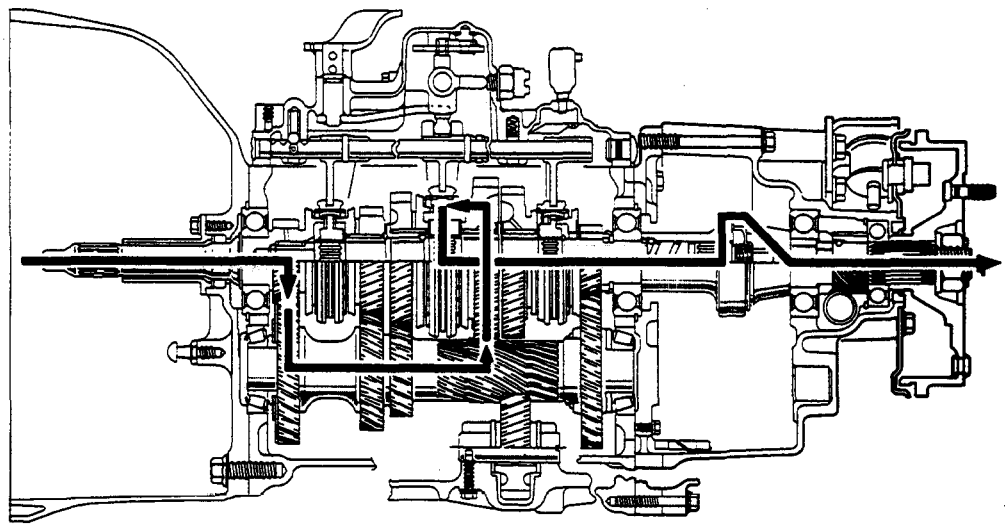


9TG0J1-009

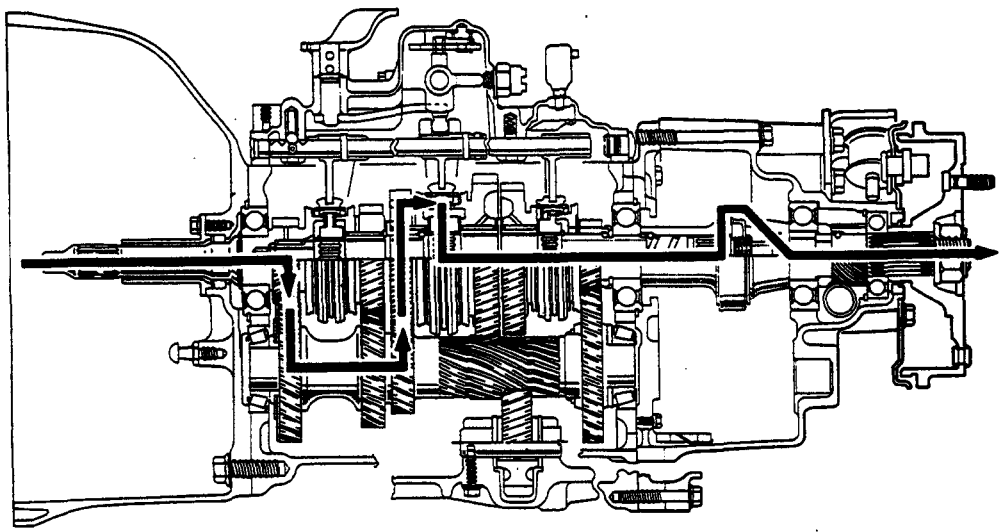
1. Clutch housing
2. Top cover
3. Center brake drum
4. Rear housing
5. Counter high gear
6. Output shaft
7. High gear
8. Case adapter
9. Main shaft assembly
10. Countershaft gear
11. Counter 5th gear
12. Reverse idler gear
13. Transmission case

POWERFLOW
(Without Sub-transmission)

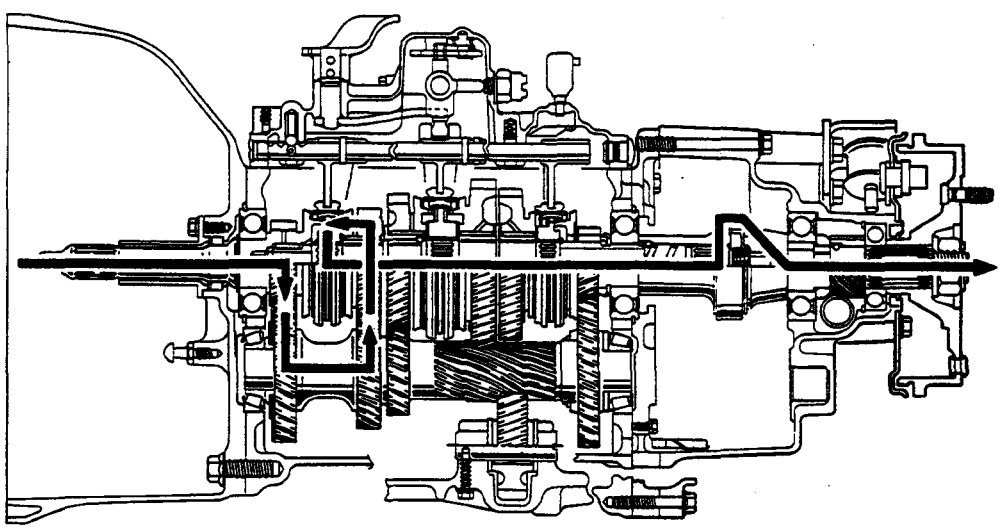
1ST



2ND

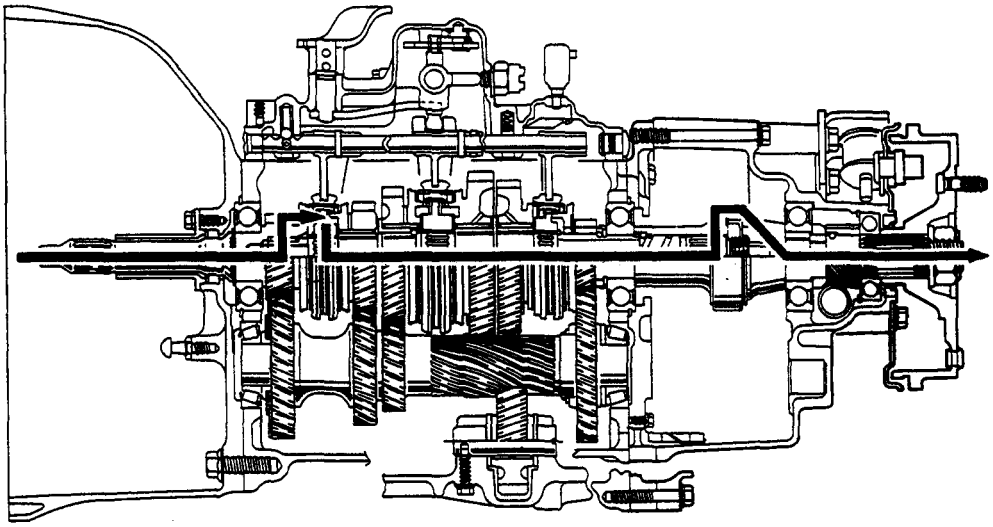


3RD

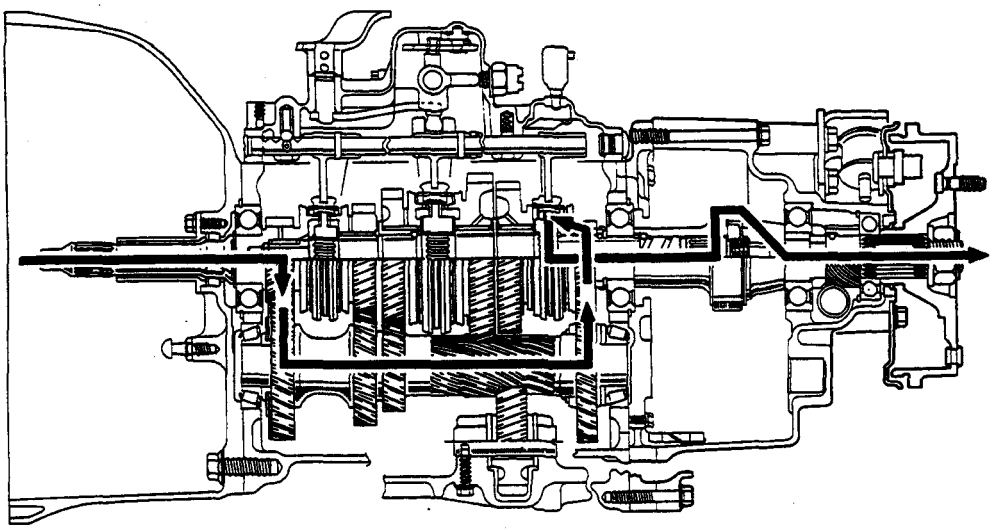


9TG0J1-010

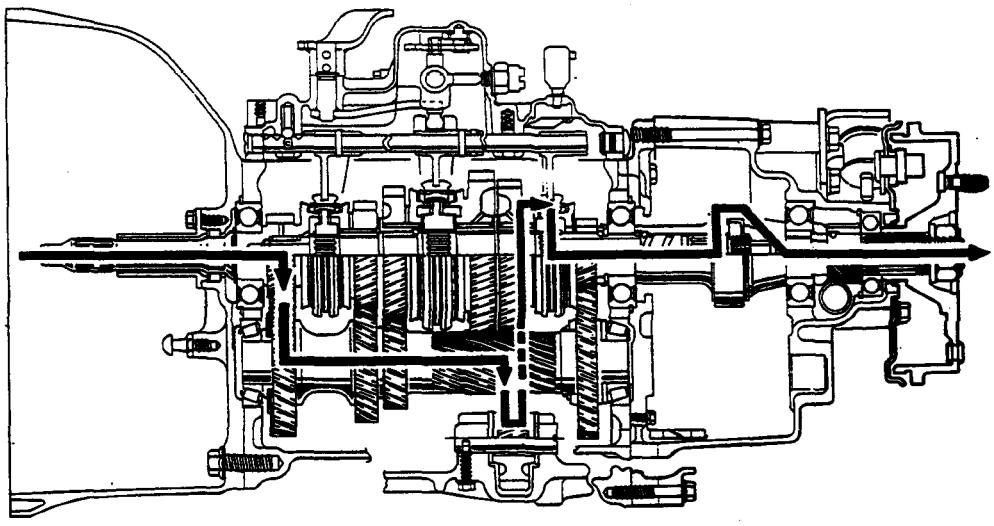
4TH



5TH



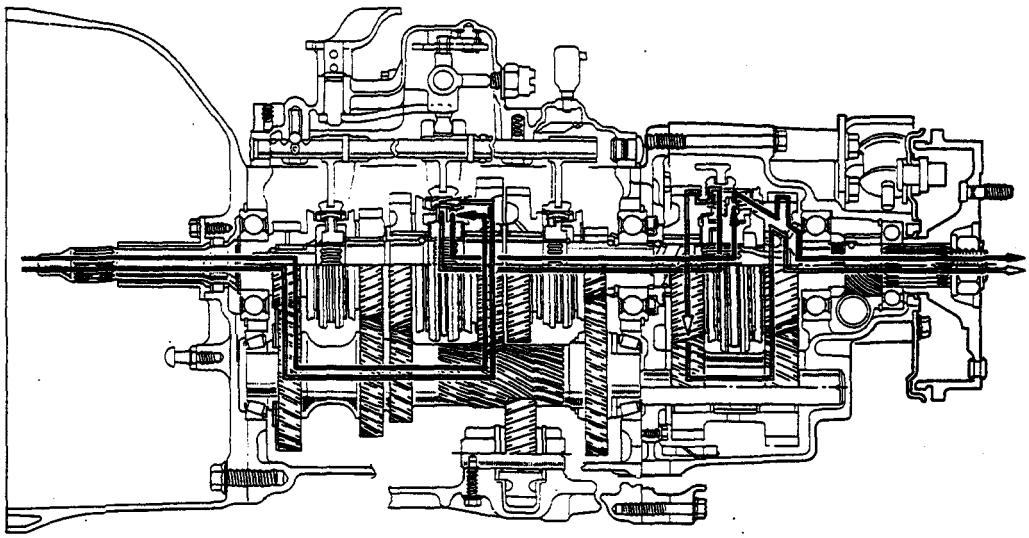
REVERSE



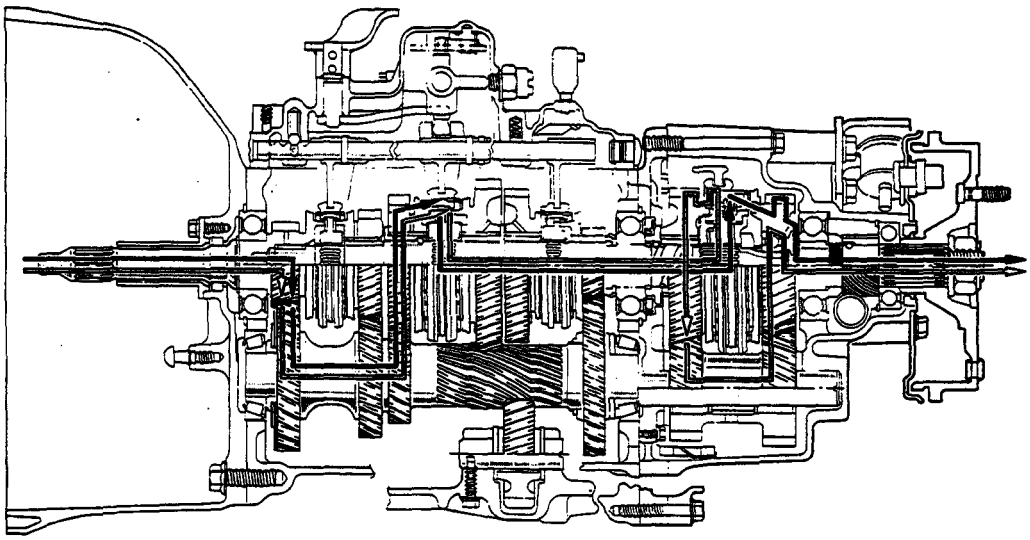
POWERFLOW
(With Sub-transmission)

Power : ➡
Economy: ⇨

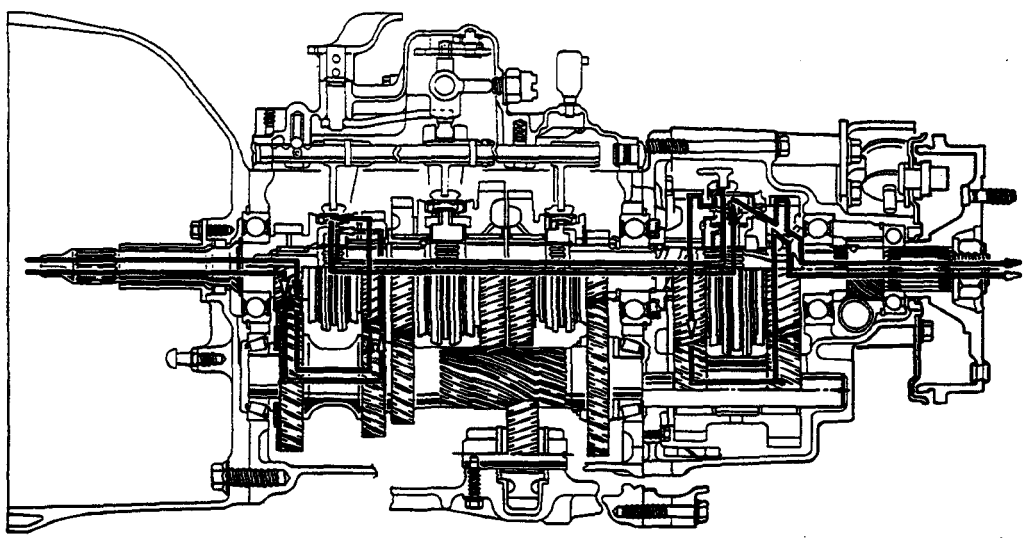
1ST



2ND



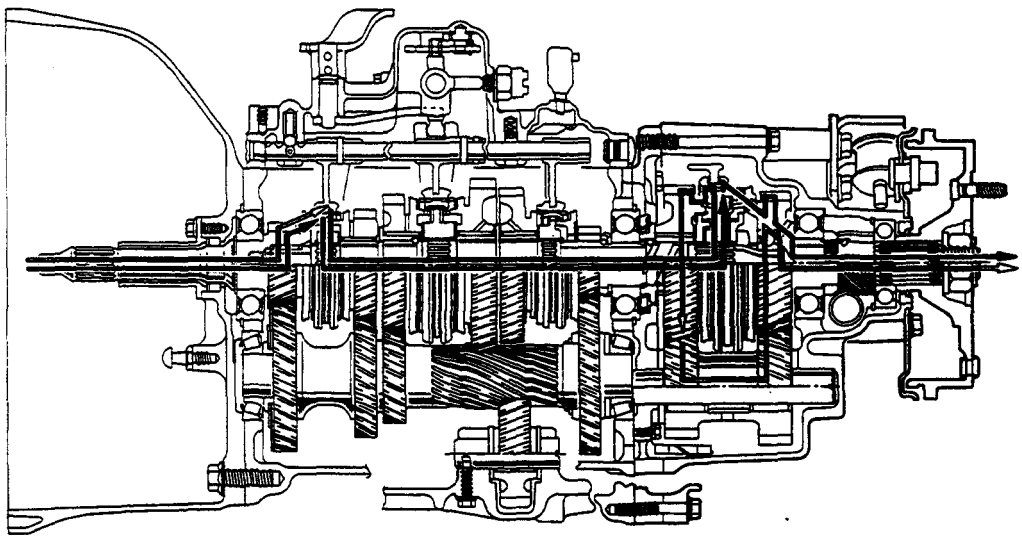
3RD



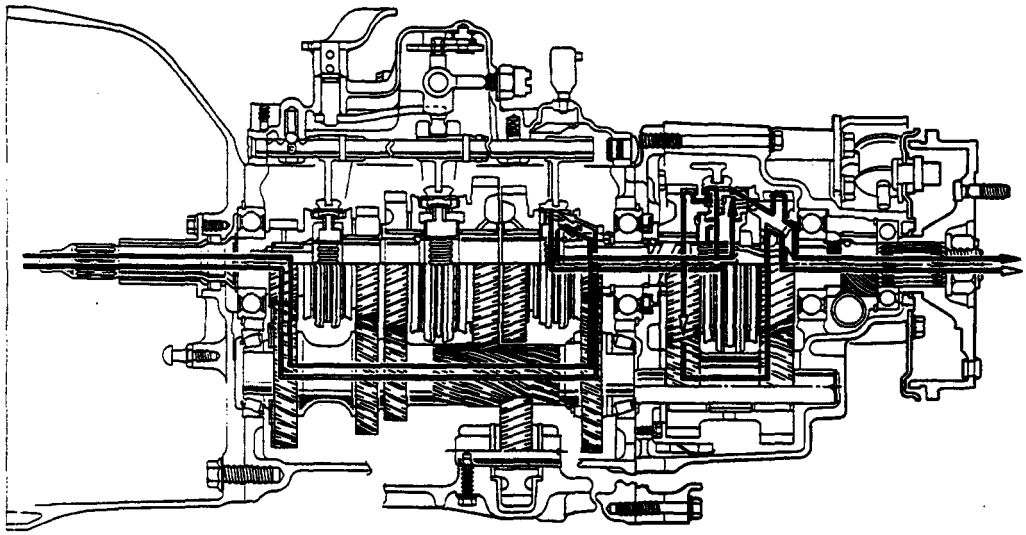
9TG0J1-011

Power : ➡
Economy: ⇨

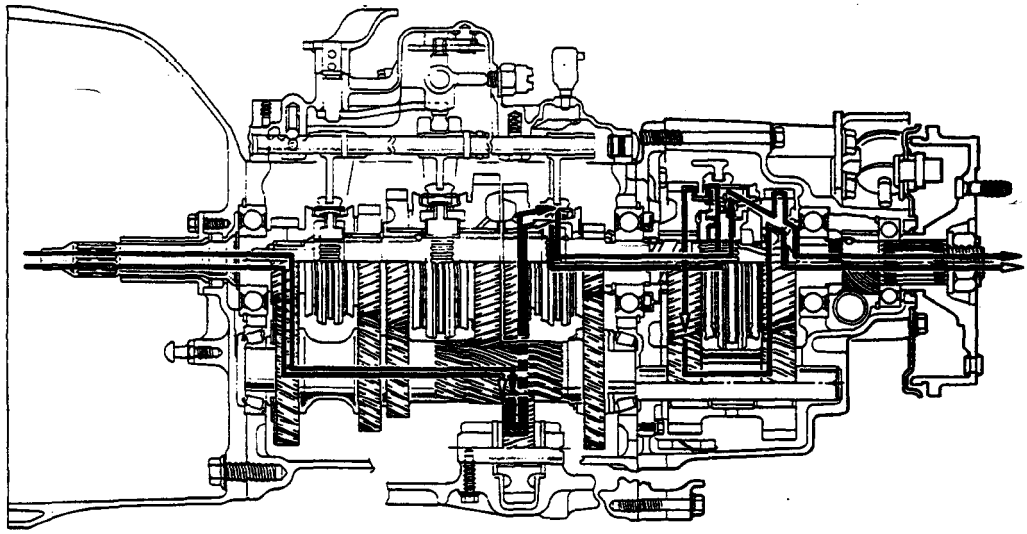
4TH



5TH



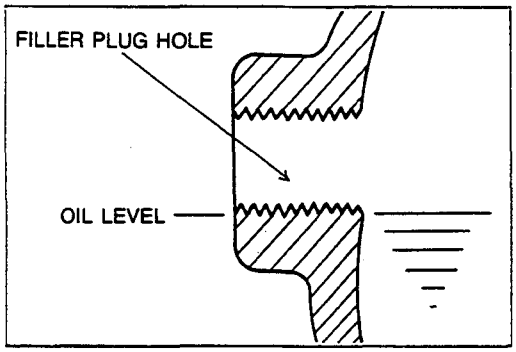
REVERSE



TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Abnormal noise	Insufficient oil	Add oil	J1–13
	Deterioration of oil quality	Replace with specified oil	J1–13
	Worn bearing	Replace	J1–31
	Worn contact surface of countershaft gear	Replace	J1–29
	Worn contact surface of gear	Replace	J1–28
	Excessive gear backlash	Replace	—
	Damaged gear teeth	Replace	J1–28
	Foreign matter in transmission	Repair or replace	—
Difficult to shift	Bent shift rod	Replace	—
	Insufficient oil	Add oil	J1–13
	Deterioration of oil quality	Replace with specified oil	J1–13
	Worn or loose shift fork and shift rod	Replace	—
	Worn synchronizer ring	Replace	J1–30
	Worn synchronizer cone of gear	Replace	J1–30
	Poor contact of synchronizer ring and gear cone	Replace	J1–30
	Excessive longitudinal play of gears	Replace	—
	Worn bearing	Replace	J1–31
	Fatigued synchronizer key spring	Replace	—
Jumps out of gear	Weak detent ball spring	Replace	—
	Worn shift fork	Replace	J1–30
	Worn clutch hub sleeve	Replace	J1–29
	Excessive gear backlash	Replace	—
	Worn bearing	Replace	J1–31
Shift lever does not function smoothly or is difficult to operate	Sticking control cable	Replace	J1–47
	Malfunction of control cable ball joint	Replace	J1–47
Selector lever does not function smoothly or is difficult to operate	Sticking control cable	Replace	J1–49
	Malfunction of control cable ball joint	Replace	J1–49

9TF0J1-005



9TG0J1-013

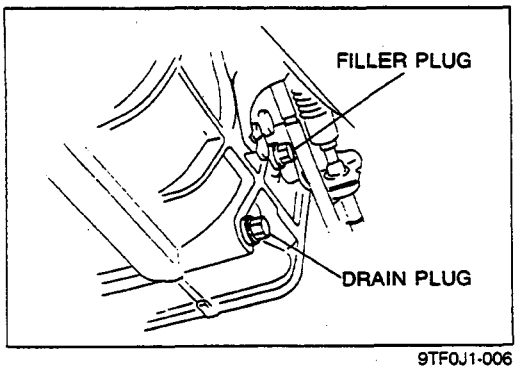
TRANSMISSION OIL

INSPECTION

Caution
- **Position the vehicle on level ground.**

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 from filler plug.
3. Wipe clean and apply sealant to the plug threads before installing the plug.

Tightening torque:
33—51 N·m (3.4—5.2 m-kg, 25—38 ft-lb)



9TF0J1-006

REPLACEMENT

1. Remove the drain plug, and drain the oil into a suitable container.
2. Wipe clean and apply sealant to the plug threads.
3. Install the drain plug.

Tightening torque:
33—51 N·m (3.4—5.2 m-kg, 25—38 ft-lb)

4. Add the specified oil from the filler plug hole until the level reaches the bottom of the hole.

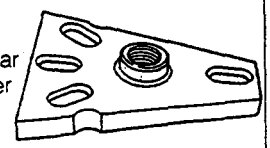
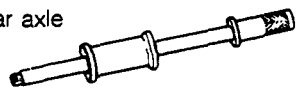
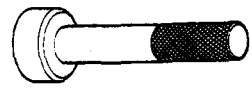
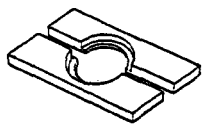
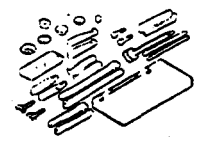
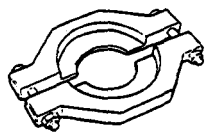
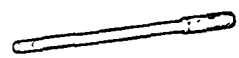
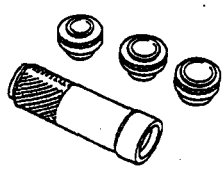
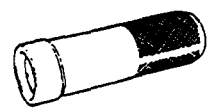
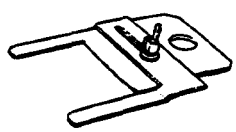
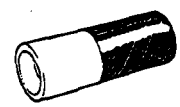
Specified oil:
Type API Service GL-4 or GL-5
SAE 75W-90
Capacity Without sub-transmission
3.5 liters (3.7 US qt, 3.1 Imp qt)
With sub-transmission
3.3 liters (3.5 US qt, 2.9 Imp qt)

5. Apply sealant to the filler plug threads.
6. Install the filler plug.

Tightening torque:
33—51 N·m (3.4—5.2 m-kg, 25—38 ft-lb)

TRANSMISSION

PREPARATION
SST

49 S120 710 Holder, coupling flange 	For removal of center brake drum locknut	49 8501 631A Attachment, rear axle shaft puller 	For removal of center brake drum
49 0223 630B Puller, rear axle shaft 	For removal of center brake drum	49 0500 330 Installer, transmission bearing 	For installation of oil seal
49 W017 101 Remover, clutch hub 	For removal of clutch hub, bearing	49 0839 425C Puller set, bearing 	For removal of bearing
49 H027 002 Remover, bearing 	For removal of spacer	49 0862 350 Guide, shift fork assembly 	For installation of interlock pin
49 F401 330B Installer set, bearing 	For installation of bearing	49 F401 331 Body (Part of 49 F401 330B) 	For installation of bearing
49 F401 337A Attachment C (Part of 49 F401 330B) 	For installation of bearing	49 0600 330 Installer, transmission bearing 	For installation of bearing
49 W501 445 Holder, synchronizer ring 	For installation of bearing	49 F015 002 Installer, water seal 	For installation of bearing

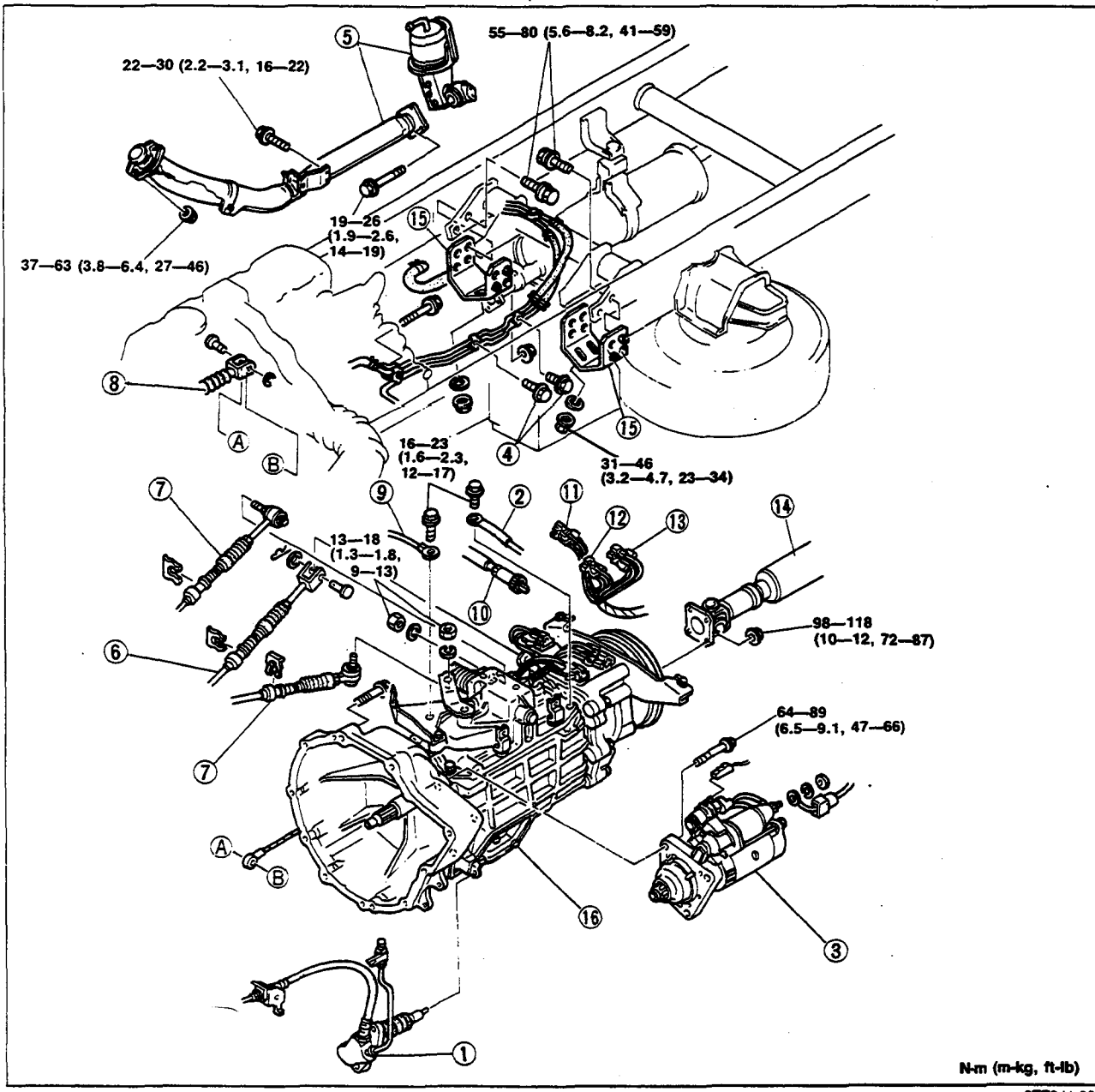
9TF0J1-007

REMOVAL / INSTALLATION

1. Disconnect the negative battery cable.
2. Raise the vehicle and support it with safety stands.

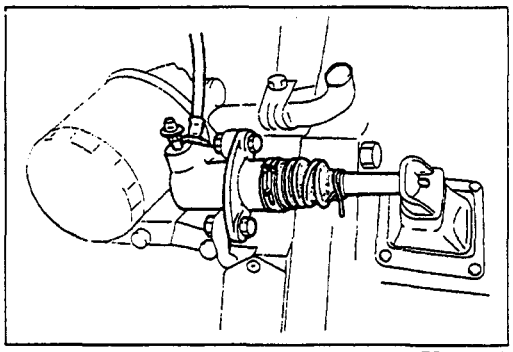
9TG0J1-016

3. Drain the transmission oil into a suitable container.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Add the specified amount of the specified transmission oil. (Refer to page J1–13.)
7. Warm up the engine and transmission, and inspect for oil leakage and transmission operation.



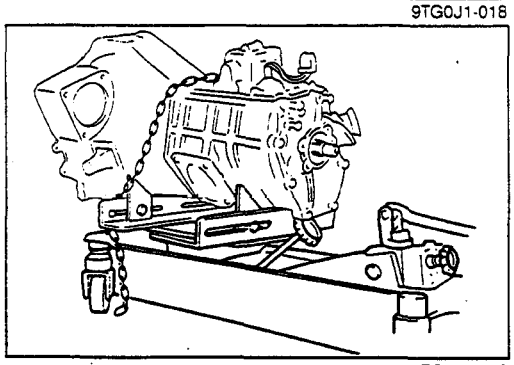
9TF0J1-008

1. Clutch release cylinder
   Removal Note ..... page J1–16
2. Ground wire
   Installation Note ..... page J1–16
3. Starter
4. Fuel pipe clip bolt
5. Exhaust pipe and power chamber
6. Sub-selector cable
7. Shift/selector cable
8. Parking brake cable
9. Ground wire
   Installation Note ..... page J1–16
10. Speedometer cable
11. Backup lamp switch connector
12. Neutral switch connector
13. Sub-transmission switch connector
14. Propeller shaft
    Service ..... Section L
15. Transmission mount bracket
16. Transmission
    Removal Note ..... page J1–16
    Disassembly ... page J1–17
    Inspection ..... page J1–28
    Assembly ..... page J1–31
    Installation Note ..... page J1–16



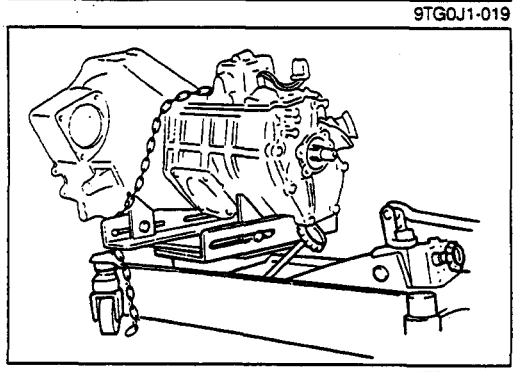
9TG0J1-018

Removal Note
Clutch release cylinder
1. Remove the bolt and nut shown in the figure.
2. Move the clutch release cylinder out of the way to remove the transmission.



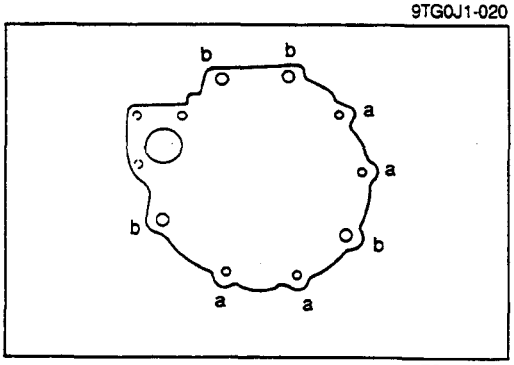
9TG0J1-019

Transmission
1. Support the engine with a jack under the oil pan.
2. Support the transmission with a transmission jack.
3. Remove the transmission mount bolts.
4. Remove the transmission from under the vehicle.



9TG0J1-020

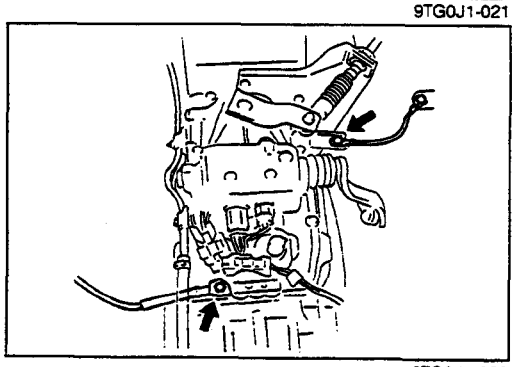
Installation Note
Transmission
1. Install the transmission with the transmission jack.



9TG0J1-021

2. Tighten the transmission mount bolts.

Tightening torque
a: 89—117 N·m (9.1—11.9 m-kg, 66—86 ft-lb)
b: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



9TG0J1-022

Ground wire
1. Install the ground wires.

Tightening torque:
16—23 N·m (1.6—2.3 m-kg, 12—17 ft-lb)

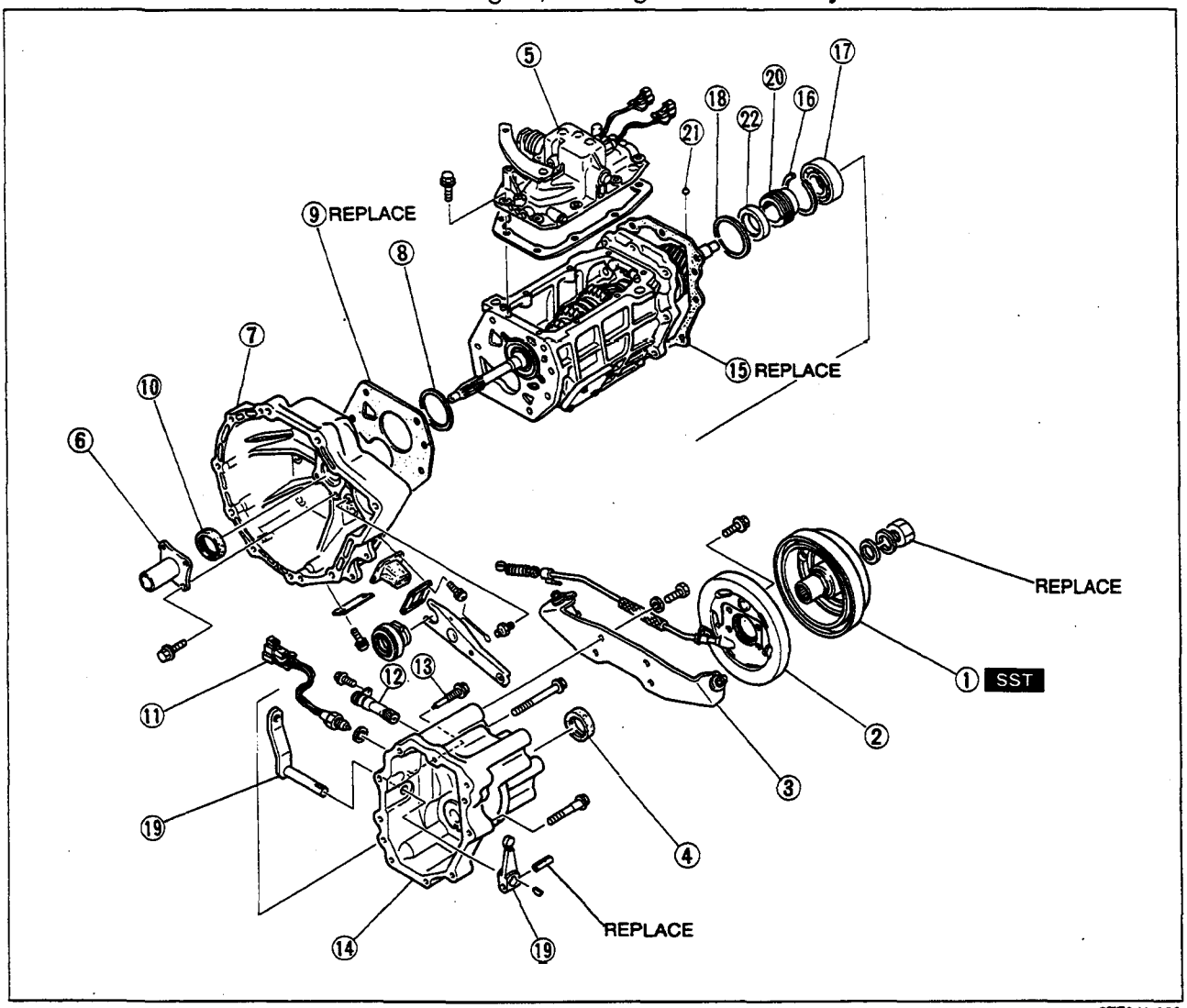
DISASSEMBLY

Precaution

1. Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvents before disassembly.
2. Clean the removed parts with cleaning solvent, and dry with compressed air.
   Clean out all holes and passages with a compressed air, and check that there are no obstructions.
3. Wear eye protection when using compressed air to clean components.

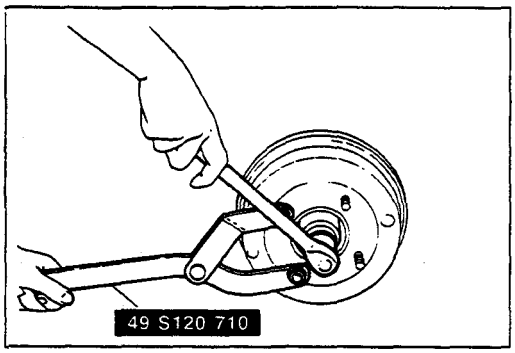
Housing Components

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



9TF0J1-009

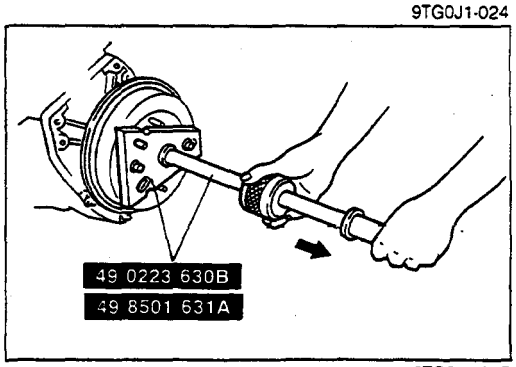
1. Center brake drum
   Disassembly Note
   ..... page J1–18
2. Center brake assembly
3. Transmission mount
4. Oil seal
   Inspect for damage
   Replace if necessary
   On-vehicle replacement
   ..... page J1–18
5. Top cover
   Disassembly ... page J1–27
   Assembly..... page J1–33
6. Front cover
7. Clutch housing
8. Adjustment shim
9. Gasket
10. Oil seal
    Inspect for damage
    Replace if necessary
11. Sub-transmission switch
12. Speedometer driven gear
13. Bolt
14. Rear housing
    Disassembly Note
    ..... page J1–18
15. Gasket
16. Snap ring
17. Ball bearing
    Disassembly Note
    ..... page J1–18
18. Adjustment shim
19. Shift lever
20. Speedometer drive gear
21. Ball
22. Spacer



9TG0J1-024

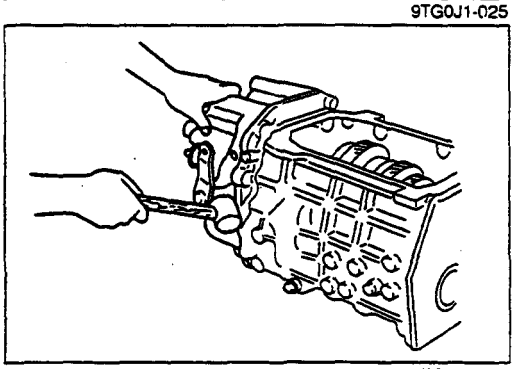
Disassembly Note
Center brake drum

1. Hold the center brake drum with the **SST**, and remove the locknut.



9TG0J1-025

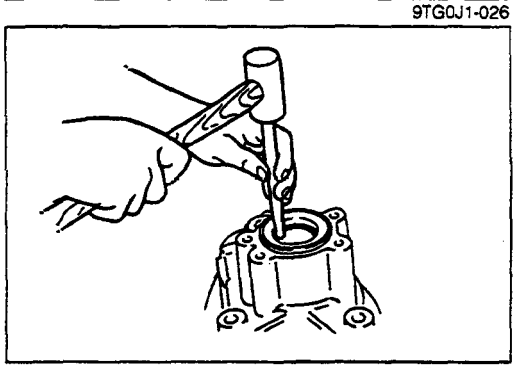
2. Remove the center brake drum with the **SST**.



9TG0J1-026

Rear housing

1. Remove the rear housing. If necessary, tap the housing with a plastic hammer.

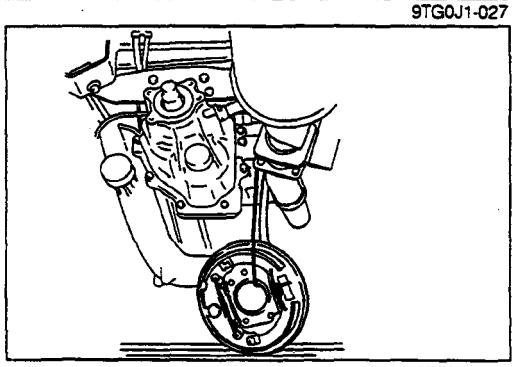


9TG0J1-027

Ball bearing

Caution
- **Do not damage the oil seal.**

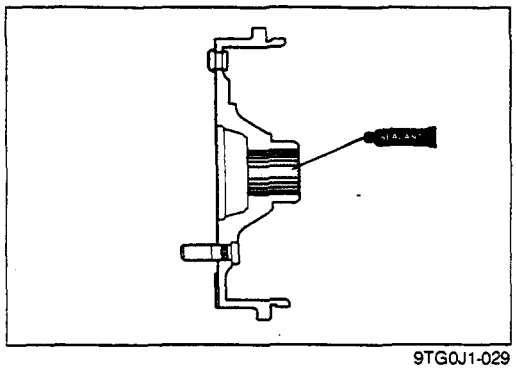
1. Remove the ball bearing with a brass bar and a hammer.



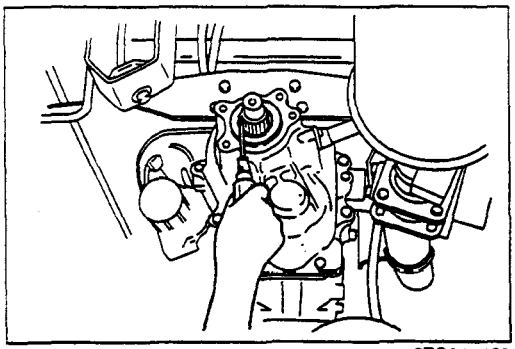
9TF0J1-010

On-vehicle replacement
Oil seal (rear)

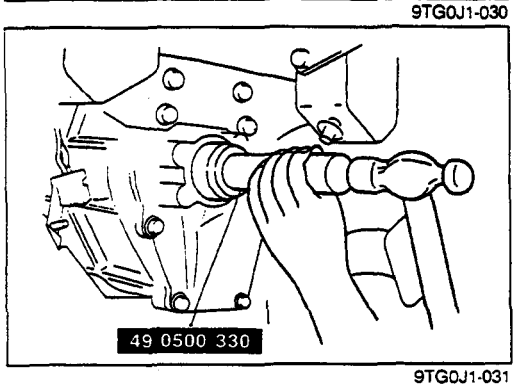
1. Remove the propeller shaft. (Refer to Section L.)
2. Remove the center brake drum. (Refer to page J1–18.)
3. Remove the center brake assembly, and suspend it with a rope.



9TG0J1-029



9TG0J1-030



9TG0J1-031

Caution
- **Do not damage the mainshaft splines.**

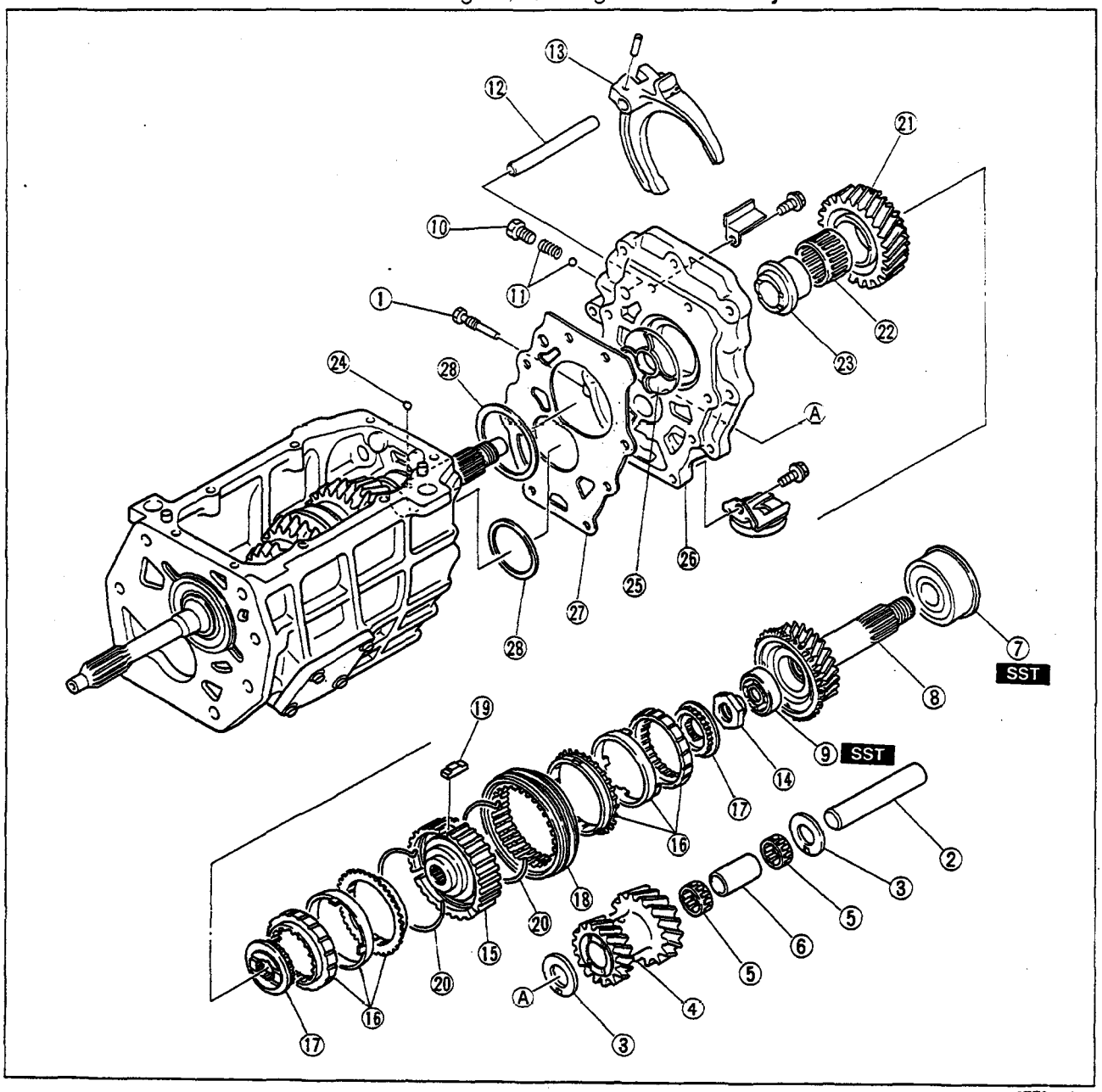
4. Remove the oil seal.
5. Apply transmission oil to outer periphery and lip of the new oil seal.

6. Install the new oil seal with the **SST**.
7. Install the center brake assembly.

8. Apply sealant to center brake drum splines, and install it.
9. Install the propeller shaft. (Refer to Section L.)

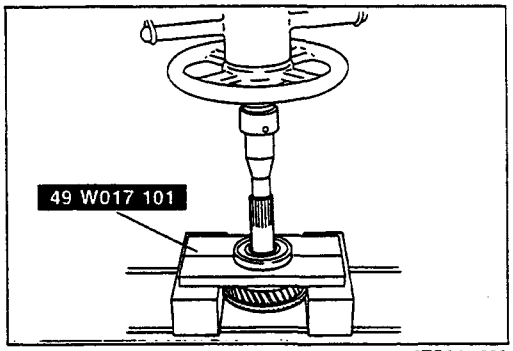
Sub-transmission Parts

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



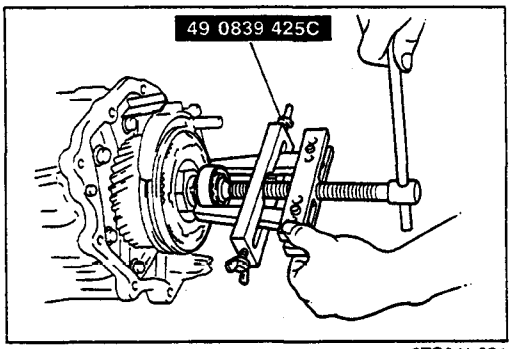
9TF0J1-011

1. Mounting bolt
2. Counter gear shaft
3. Thrust washer
4. Counter high gear
   Inspection..... page J1–28
5. Needle bearing
   Inspection..... page J1–31
6. Spacer
7. Output shaft bearing
   Disassembly Note
   ..... page J1–21
   Inspection..... page J1–31
8. Output shaft
   Inspection..... page J1–28
9. Bearing
   Disassembly Note
   ..... page J1–21
   Inspection..... page J1–31
10. Cap plug
11. Steel ball and spring
12. Shift rod
13. Shift fork
14. Locknut
    Disassembly Note
    ..... page J1–21
15. Clutch hub assembly
16. Double cone assembly
    Inspection..... page J1–30
17. Inner cone hub
18. Clutch hub sleeve
19. Synchronizer key
20. Synchronizer key spring
21. High gear
    Inspection..... page J1–28
22. Needle bearing
    Inspection..... page J1–31
23. Gear sleeve
24. Steel ball
25. Scoop ring
26. Case adapter
27. Gasket
28. Adjustment shim



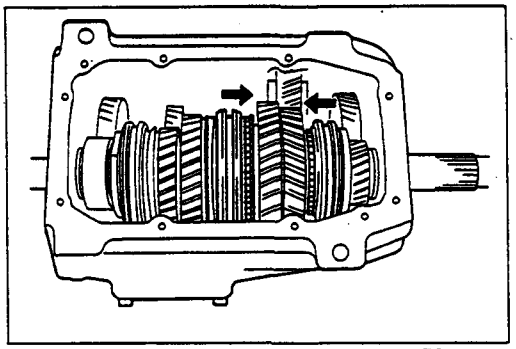
9TG0J1-033

Disassembly Note
Output shaft bearing
1. Remove the bearing from the output shaft with the **SST**.

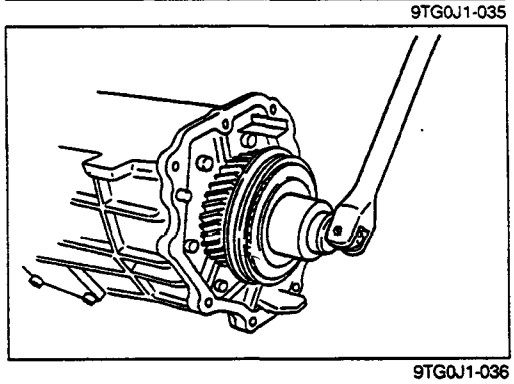


9TG0J1-034

Bearing
1. Remove the bearing with the **SST**.


9TG0J1-035

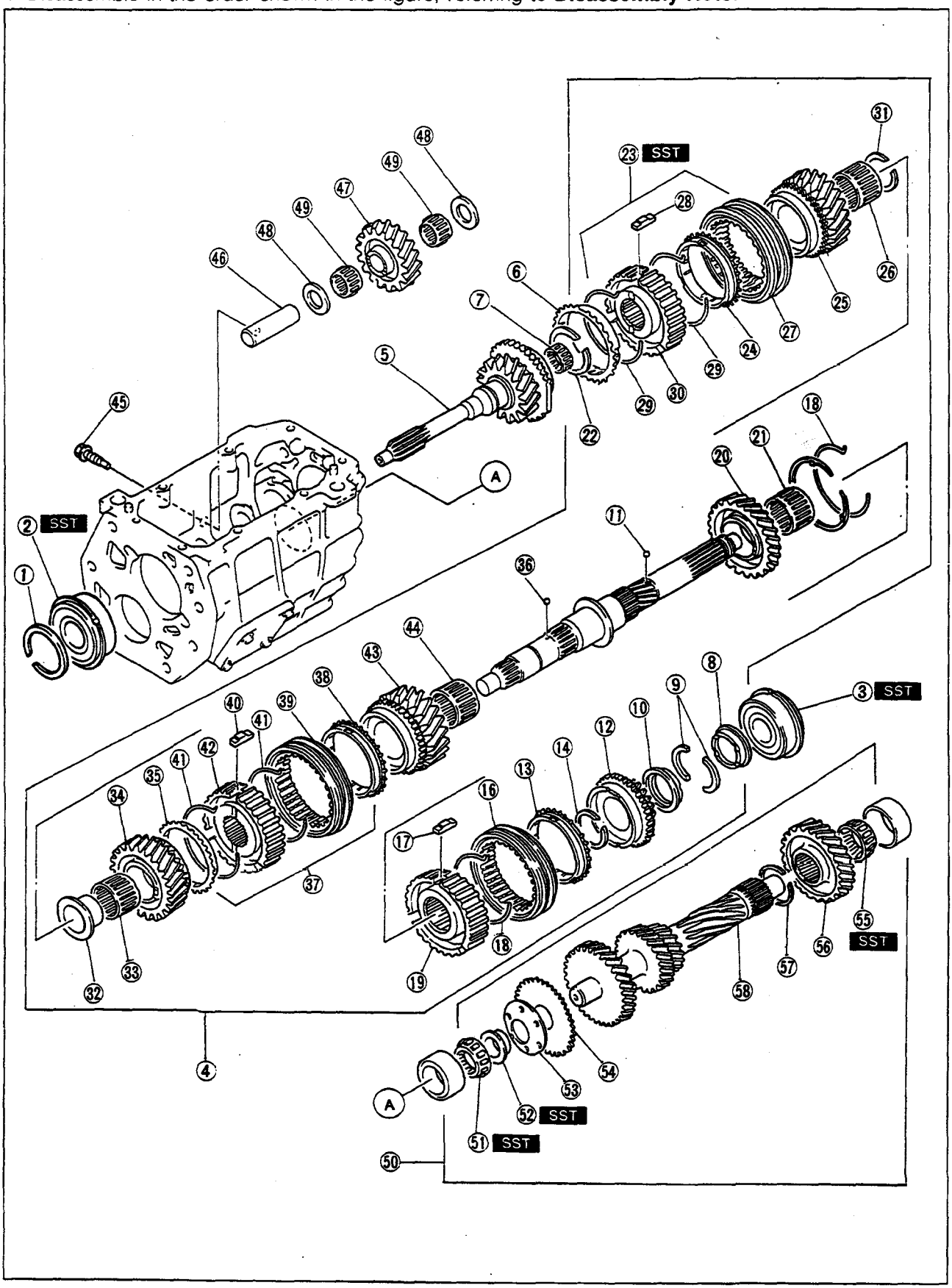
Locknut
1. Uncrimp the tab of the locknut.
2. Shift the clutch hub sleeves to 1st gear and reverse gear to put the gears in a double-engaged condition.


9TG0J1-036

3. Remove the locknut.

Main shaft

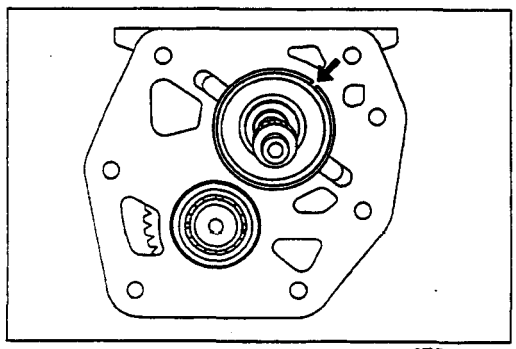
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.



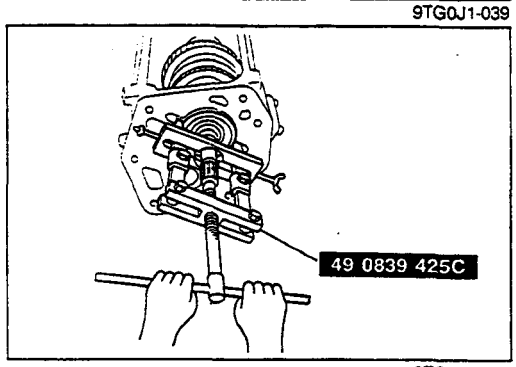
9TG0J1-037

1. Snap ring
2. Main drive gear bearing
   Disassembly Note ..... page J1–23
   Inspection..... page J1–31
3. Mainshaft bearing
   Disassembly Note ..... page J1–24
   Inspection..... page J1–31
4. Mainshaft assembly
   Disassembly Note ..... page J1–24
5. Main drive gear
   Disassembly Note ..... page J1–24
   Inspection..... page J1–28
6. Synchronizer ring (4th)
   Inspection..... page J1–30
7. Needle bearing
   Inspection..... page J1–31
8. Retaining ring
9. C-washer
10. Thrust lock washer
11. Steel ball
12. 5th gear
    Inspection..... page J1–28
13. Synchronizer ring (5th)
    Inspection..... page J1–30
14. Snap ring
15. Clutch hub assembly (5th/reverse)
16. Clutch hub sleeve
17. Synchronizer key
18. Synchronizer key spring
19. Clutch hub
20. Reverse gear
    Inspection..... page J1–28
21. Needle bearing
    Inspection..... page J1–31
22. Snap ring
23. Clutch hub assembly (3rd/4th)
    Disassembly Note ..... page J1–24
24. Synchronizer ring (3rd)
    Inspection..... page J1–30
25. 3rd gear
    Inspection..... page J1–28
26. Needle bearing
    Inspection..... page J1–31
27. Clutch hub sleeve
28. Synchronizer key
29. Synchronizer key spring
30. Clutch hub
31. Snap ring
32. Gear sleeve
33. Needle bearing
    Inspection..... page J1–31
34. 2nd gear
    Inspection..... page J1–28
35. Synchronizer ring (2nd)
    Inspection..... page J1–30
36. Steel ball
37. Clutch hub assembly (1st/2nd)
38. Synchronizer ring (1st)
    Inspection..... page J1–30
39. Clutch hub sleeve
40. Synchronizer key
41. Synchronizer key spring
42. Clutch hub
43. 1st gear
    Inspection..... page J1–28
44. Needle bearing
    Inspection..... page J1–31
45. Mounting bolt
46. Reverse idler gear shaft
47. Reverse idler gear
    Inspection..... page J1–28
48. Thrust washer
49. Needle bearing
    Inspection..... page J1–31
50. Countershaft assembly
    Disassembly Note ..... page J1–25
51. Countershaft front bearing
    Disassembly Note ..... page J1–25
    Inspection..... page J1–31
52. Spacer
    Disassembly Note ..... page J1–26
53. Diaphragm spring
54. Friction gear
55. Countershaft rear bearing
    Disassembly Note ..... page J1–26
    Inspection..... page J1–31
56. Counter 5th gear
    Inspection..... page J1–28
57. Snap ring
58. Countershaft
    Inspection..... page J1–29

9TF0J1-012



9TG0J1-039

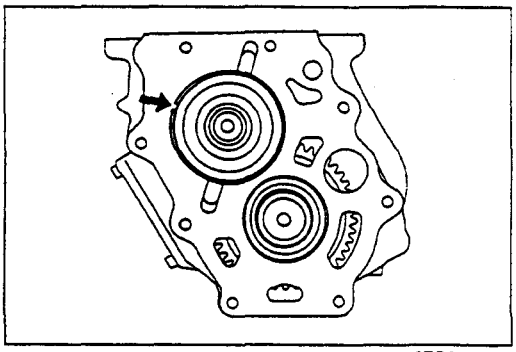


9TG0J1-040

Disassembly Note
Main drive gear bearing

1. Turn the bearing snap ring so that the ends are **90°** to the case grooves.

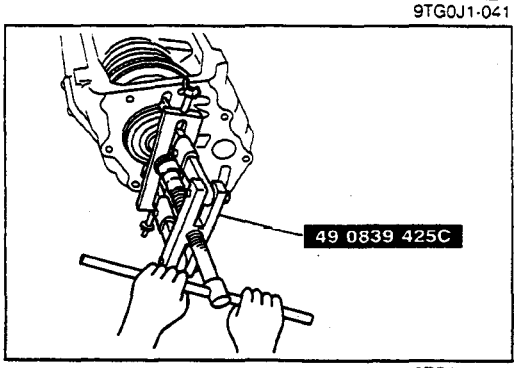
2. Remove the main drive gear bearing with the **SST**.



9TG0J1-041

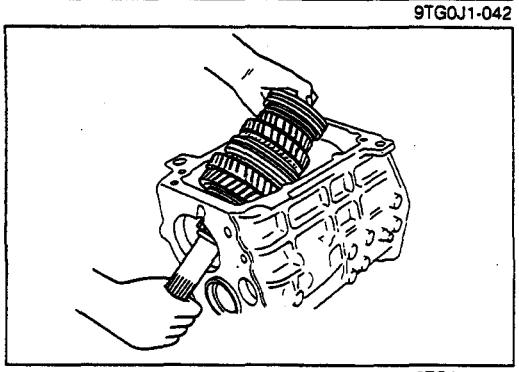
Mainshaft bearing

1. Turn the bearing snap ring so that the ends are **90°** to the case grooves.



9TG0J1-042

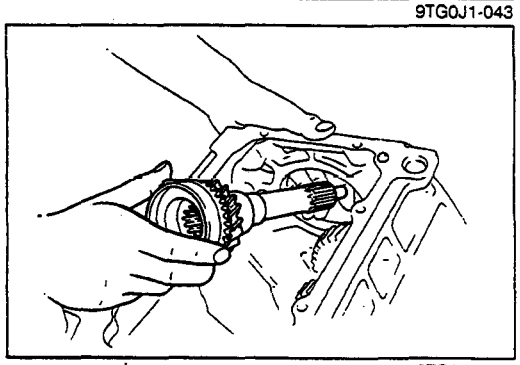
2. Remove the mainshaft bearing with the **SST**.



9TG0J1-043

Mainshaft assembly

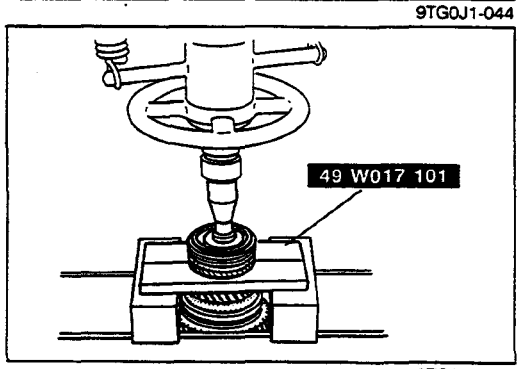
1. Remove the mainshaft assembly from the transmission case.



9TG0J1-044

Main drive gear

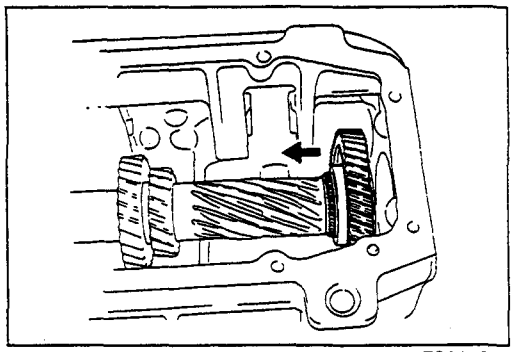
1. Remove the main drive gear from the transmission case.



9TG0J1-045

Clutch hub assembly (3rd/4th)

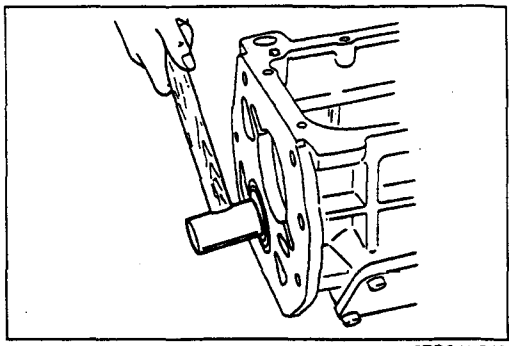
1. Remove the clutch hub assembly with the **SST**.



9TG0J1-046

Countershaft assembly

1. Remove the snap ring from the counter 5th gear and move the counter 5th gear toward the front of the transmission.

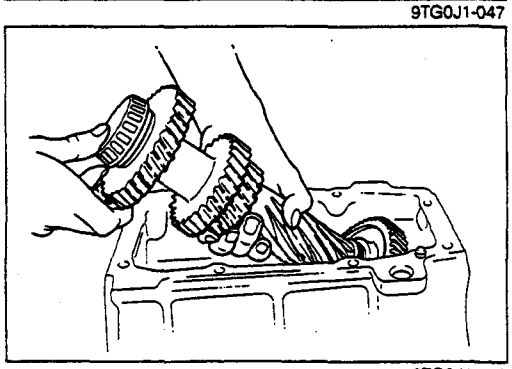


9TG0J1-047

Caution

- **Do not tap the bearing inner race.**

2. Gently strike the front of the countershaft with a brass hammer and remove the bearing outer race from the rear.

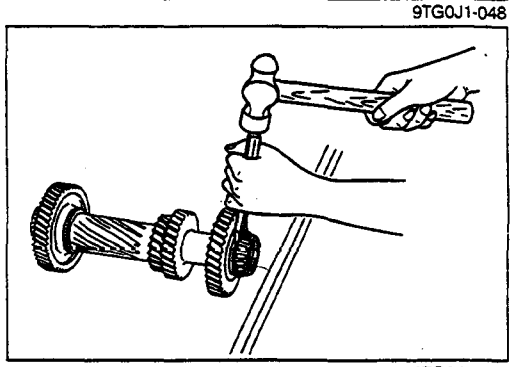


9TG0J1-048

3. Remove the countershaft assembly from the transmission case.

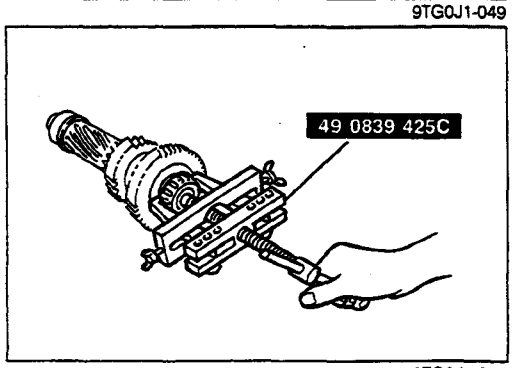
Countershaft front bearing

1. Move the bearing away from the spacer with a chisel and a hammer.

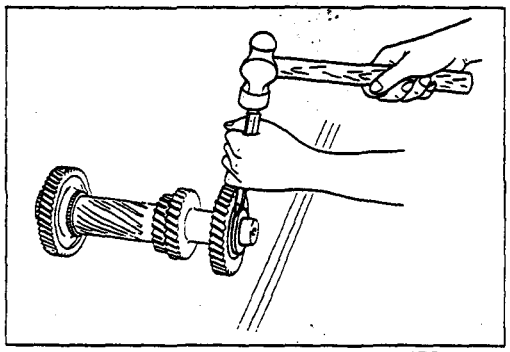


9TG0J1-049

2. Remove the bearing with the **SST**.



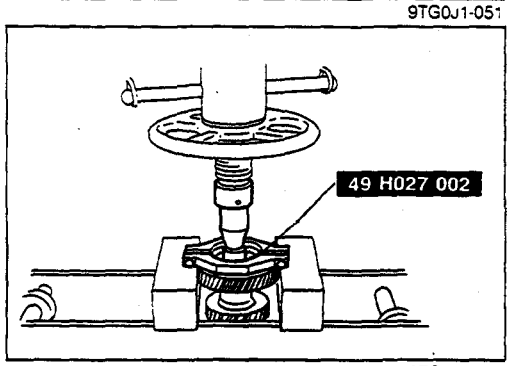
9TG0J1-050



9TG0J1-051

Spacer

1. Move the spacer away from the diaphragm spring with a chisel and a hammer.

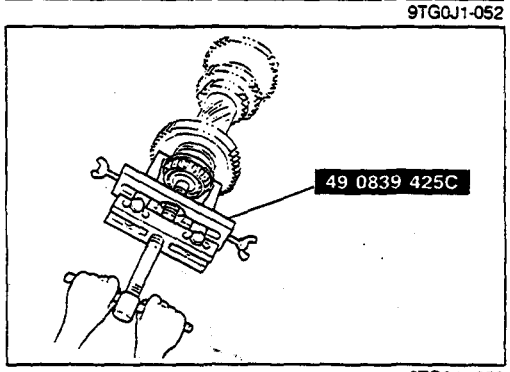


9TG0J1-052

Note

- **Do not reuse the diaphragm spring.**

2. Remove the spacer, diaphragm spring and friction gear with the **SST**.



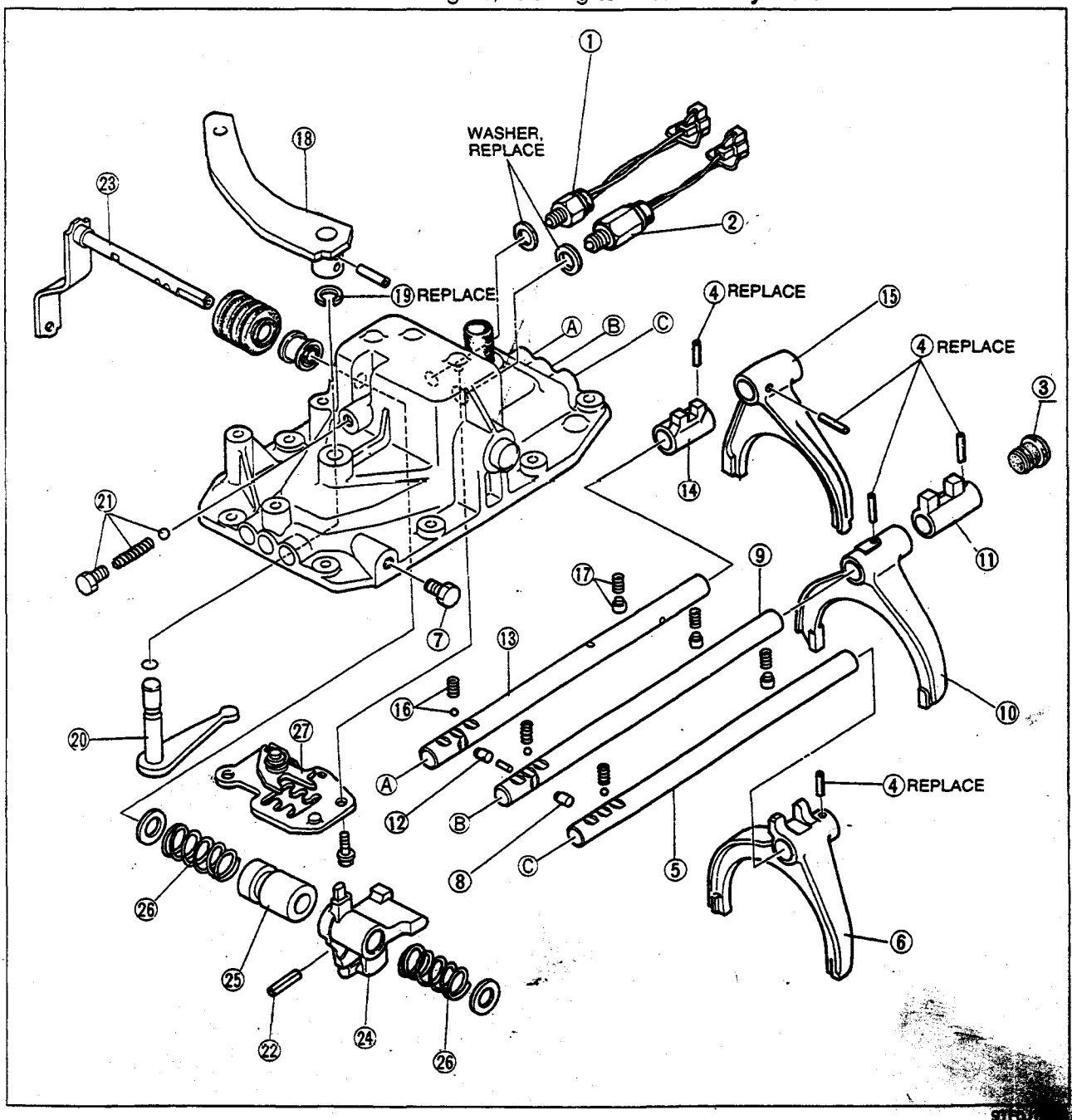
9TG0J1-053

Countershaft rear bearing

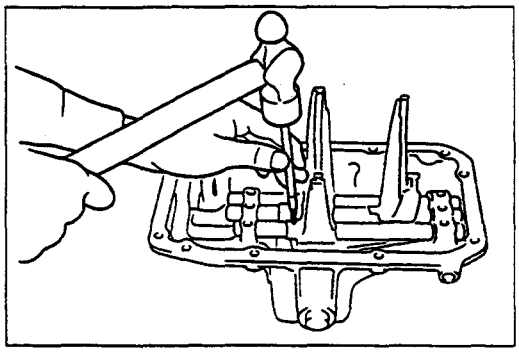
1. Remove the bearing and thrust washer with the **SST**.

Top Cover

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

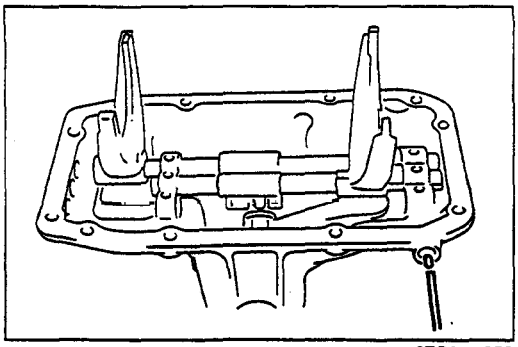


1. Backup light switch
2. Neutral switch
3. Rubber plug
4. Roll pin
   Disassembly Note ..... page J1–28
5. Shift rod
6. Shift fork (1st/2nd)
7. Cap plug
8. Interlock pin
   Disassembly Note ..... page J1–28
9. Shift rod
10. Shift fork (3rd/4th)
11. Shift rod end
12. Interlock pin
    Disassembly Note ..... page J1–28
13. Shift rod
14. Shift rod end
15. Shift fork (5th/reverse)
16. Steel ball and spring
17. Spring seat and spring
18. Selector lever
19. Snap ring
20. Selector arm
21. Cap plug ball and spring
22. Roll pin
    Disassembly Note ..... page J1–28
23. Shift lever
24. Change lever
25. Reverse lock stopper
26. Spring(s)
27. Change guide plate



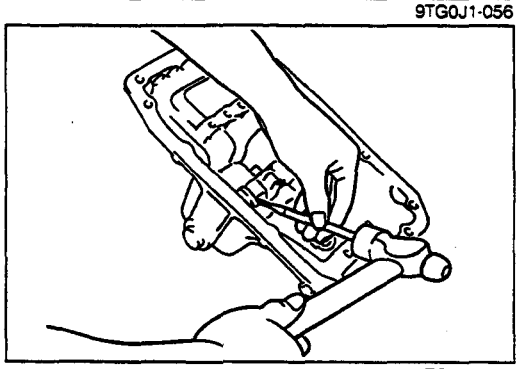
9TG0J1-055

Disassembly Note
Roll pin
1. Remove the roll pins with a pin punch.



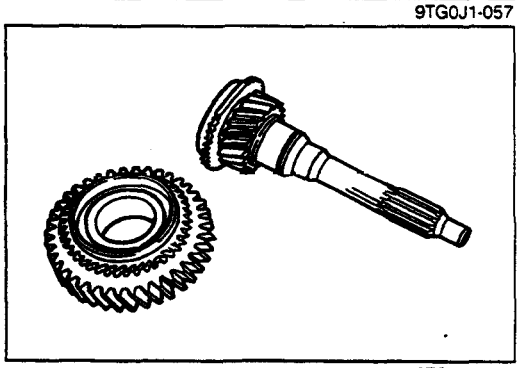
9TG0J1-056

Interlock pin
1. Remove the interlock pin with a magnet.



9TG0J1-057

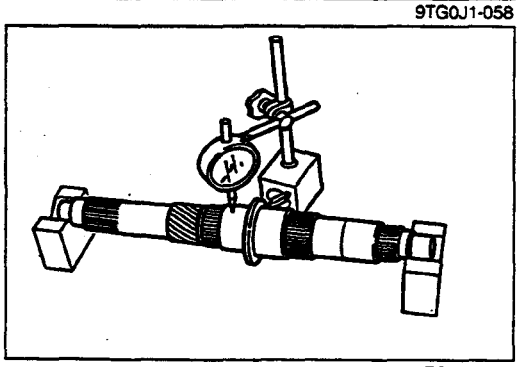
Roll pin
1. Align the groove, then remove the roll pin with a pin punch.



9TG0J1-058

INSPECTION
Inspect all parts and repair or replace as necessary.

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.

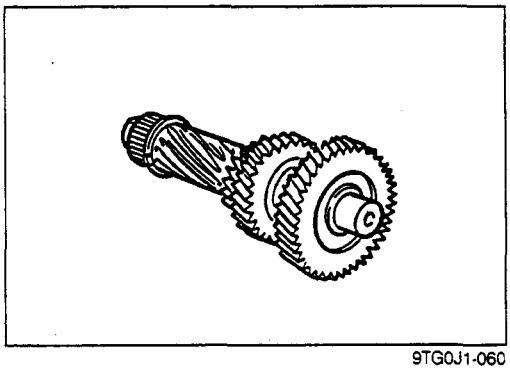


9TG0J1-059

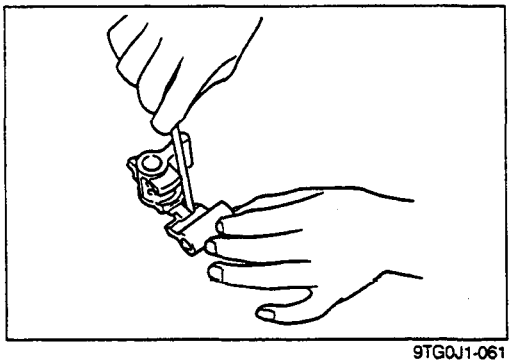
Mainshaft
1. Measure the mainshaft runout.

Runout: 0.035mm (0.0014 in) max.

2. Inspect splines for damage and wear.

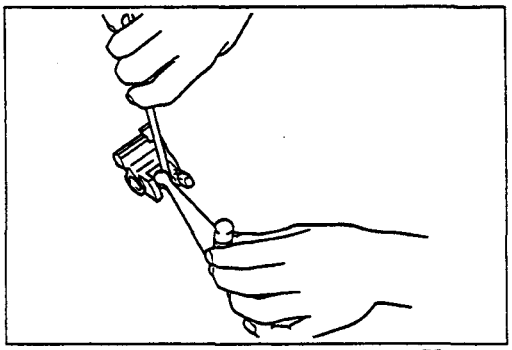

9TG0J1-060

Countershaft
1. Inspect gear teeth for damage, wear, and cracks.
2. Inspect splines for damage and wear.


9TG0J1-061

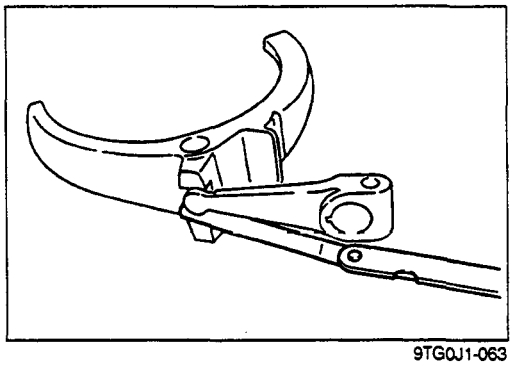
Shift rod end and change lever
1. Measure the clearance between the shift rod ends and change lever.

Clearance: 0.8mm (0.031 in) max.


9TG0J1-062

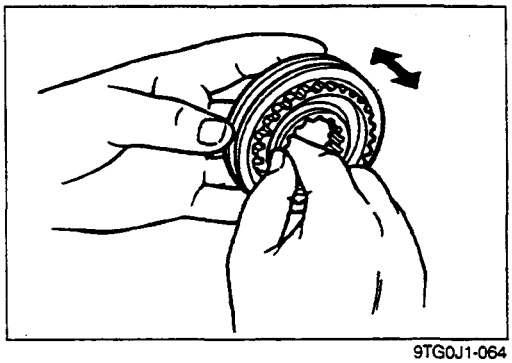
Selector lever and change lever
1. Measure the clearance between the selector lever and change lever.

Clearance: 0.8mm (0.031 in) max.

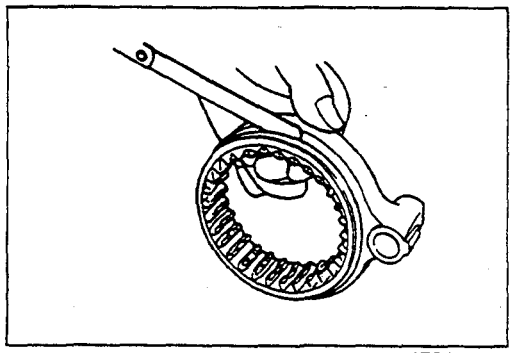

9TG0J1-063

Inner shift lever and shift fork
1. Measure the clearance between the inner shift lever and shift fork.

Clearance: 0.8mm (0.031 in) max.


9TG0J1-064

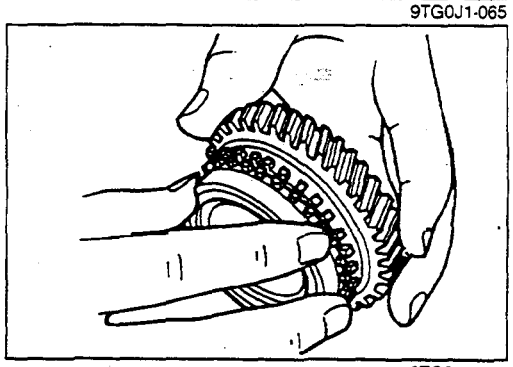
Clutch hub assembly
1. Inspect for clutch hub sleeve and hub operation.
2. Inspect individual gear teeth for damage, wear, and cracks.
3. Inspect synchronizer key for damage, wear, and cracks.



9TG0J1-065

4. Measure the clearance between the hub sleeve and release fork.

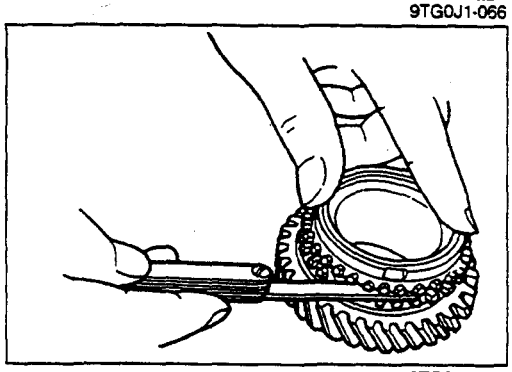
Clearance: 0.8mm (0.031 in) max.



9TG0J1-066

Synchronizer ring

1. Inspect individual synchronizer ring teeth for damage, wear, and cracks.
2. Inspect taper surface for wear and cracks.



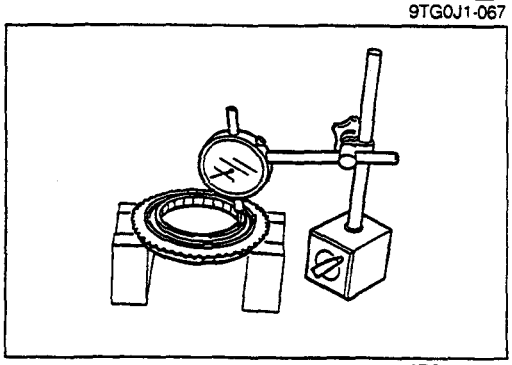
9TG0J1-067

Note

- **Set the synchronizer ring squarely in the gear; then measure around the circumference.**

3. Measure the clearance between the synchronizer ring and flank surface of gear.

Clearance: 1.0mm (0.039 in) min.



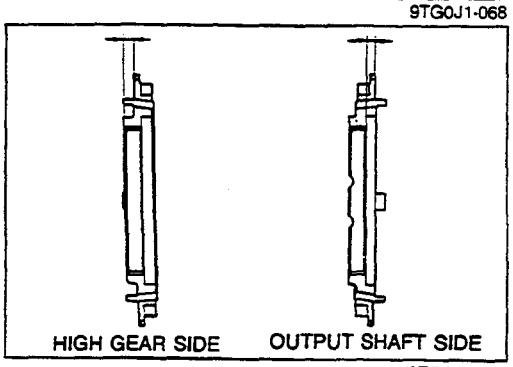
9TG0J1-068

Double cone

Note

- **If a problem exists, replace the assembly.**

1. Inspect individual teeth for damage, wear, and cracks.
2. Inspect taper surface for wear and cracks.



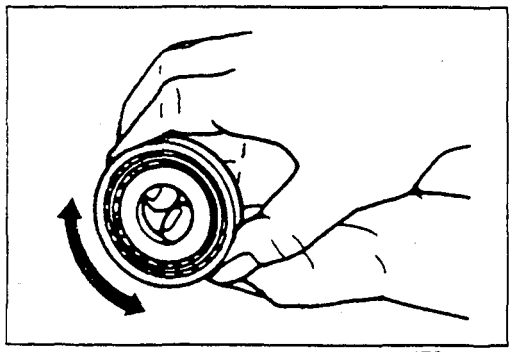
9TG0J1-069

Note

- **Measure around the circumference.**

3. Measure the height between inner cone and outer cone as shown in the figure.

High gear side: 4.7mm (0.185 in) min.
Output shaft side: 3.6mm (0.142 in) min.



9TG0J1-070

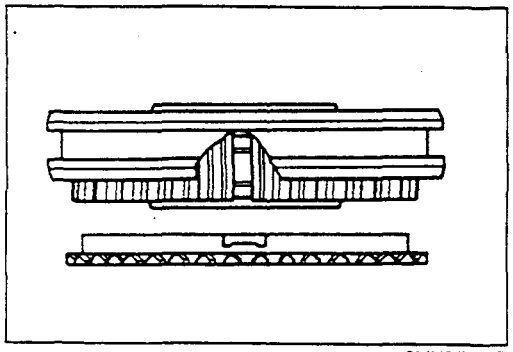
Bearing
Inspect for damage and rough rotation.

ASSEMBLY

Precaution

1. All O-rings and gaskets must be replaced with the new ones included in the overhaul kit.
2. 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.

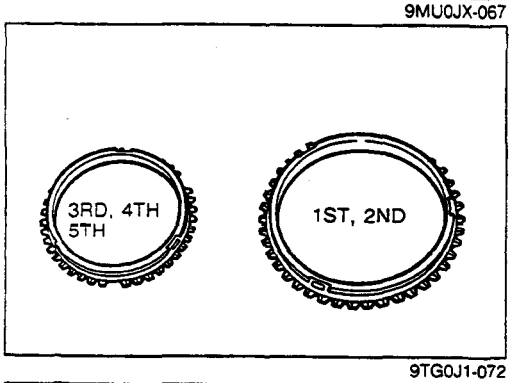
9TG0J1-071



9MU0JX-067

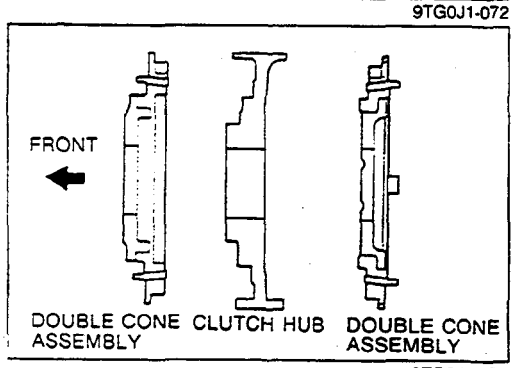
Clutch hub

Caution
- **Align the synchronizer ring grooves with the clutch hub keys during installation.**



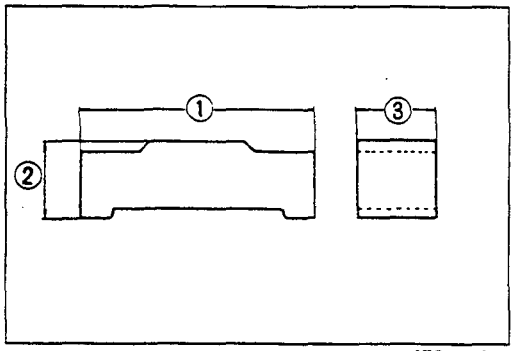
9TG0J1-072

Note
- **The synchronizer rings have the same basic shape. Carefully note these distinguishing features.**
  a) 3rd, 4th and 5th synchronizer rings are the same.
  b) 1st and 2nd synchronizer rings are the same.



9TG0J1-073

- **Install the double cones as shown in the figure.**



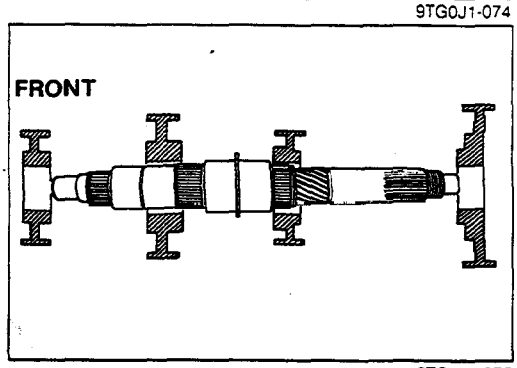
9TG0J1-074

- **There are three types of synchronizer keys.**

Standard dimensions are as follows:

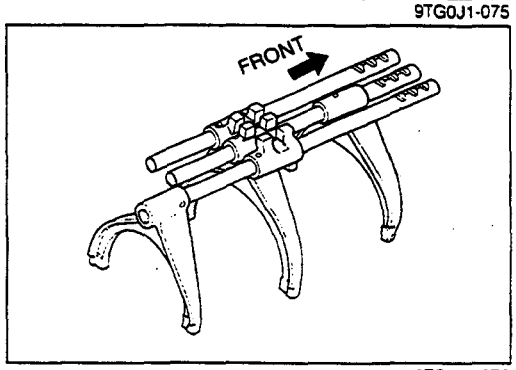
mm (in)

	①	②	③
1st and 2nd	18 (0.709)	5.45 (0.215)	6 (0.236)
3rd, 4th, 5th and Rev.	17 (0.669)	4.25 (0.167)	5 (0.197)
Sub-Transmission	22 (0.866)	7.77 (0.306)	6 (0.236)



9TG0J1-075

- **Install the clutch hubs as shown in the figure.**



9TG0J1-076

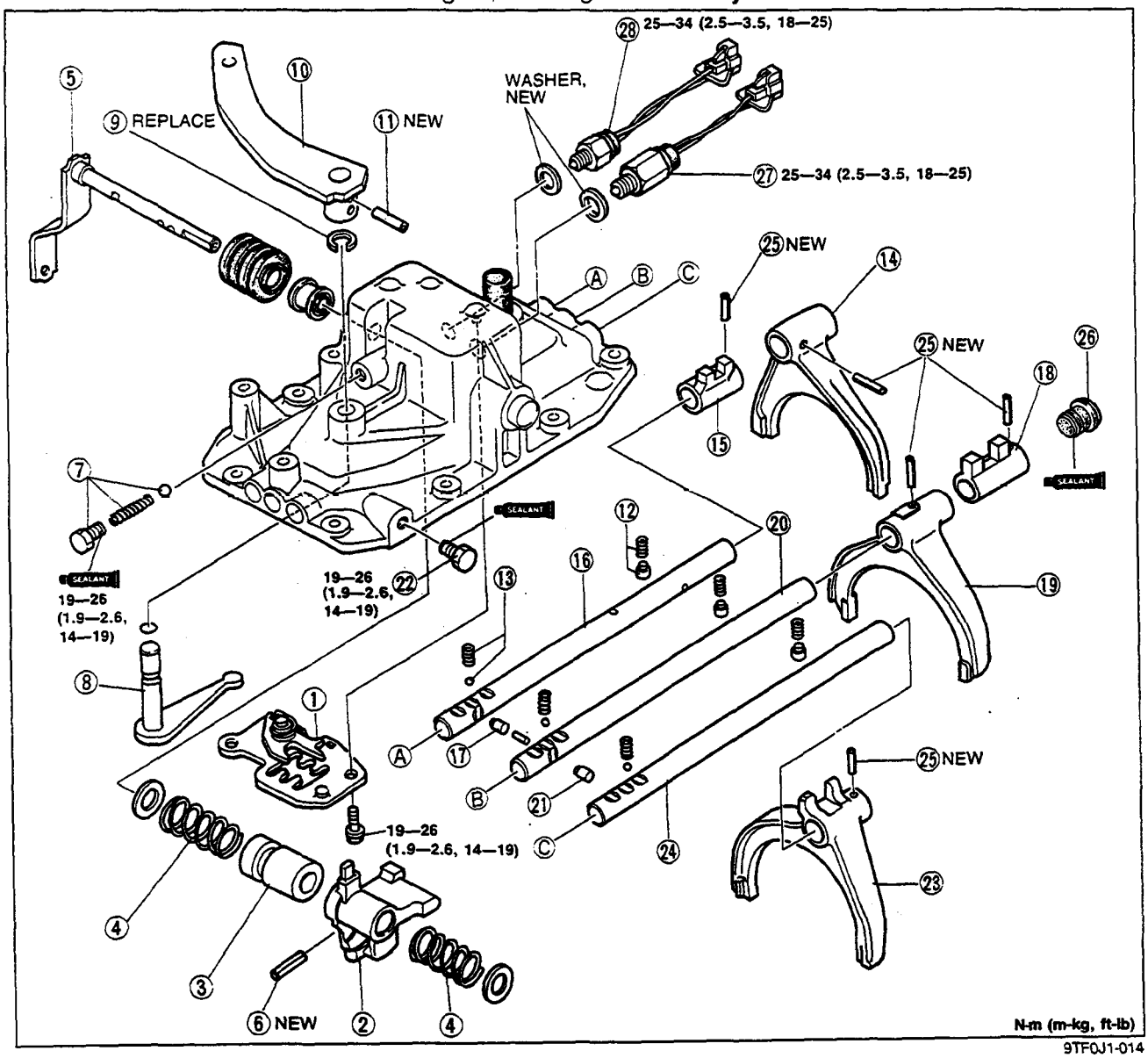
Shift fork, shift rod and shift rod end.

Note

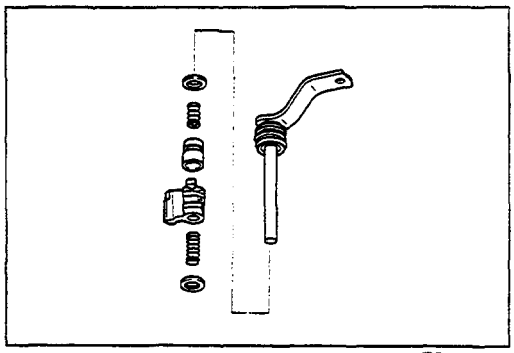
- **Install the shift forks, shift rods and shift rod ends as shown in the figure.**

Top Cover

1. Assemble in the order shown in the figure, referring to **Assembly Note**.



1. Change guide plate
2. Change lever
   Assembly Note
   ..... page J1–34
3. Reverse lock stopper
   Assembly Note
   ..... page J1–34
4. Spring(s)
   Assembly Note
   ..... page J1–34
5. Shift lever
6. Roll pin (change lever)
   Assembly Note
   ..... page J1–34
7. Cap plug, ball and spring
8. Selector arm
9. Snap ring
10. Selector lever
11. Roll pin (selector lever)
    Assembly Note
    ..... page J1–34
12. Spring seat and spring
13. Steel ball and spring
14. Shift fork (5th/reverse)
15. Shift rod end
16. Shift rod
    Assembly Note
    ..... page J1–34
17. Interlock pin
    Assembly Note
    ..... page J1–34
18. Shift rod end
19. Shift fork (3rd/4th)
20. Shift rod
    Assembly Note
    ..... page J1–34
21. Interlock pin
    Assembly Note
    ..... page J1–34
22. Cap plug
23. Shift fork (1st/2nd)
24. Shift rod
    Assembly Note
    ..... page J1–34
25. Roll pin
    Assembly Note
    ..... page J1–35
26. Rubber plug
27. Neutral switch
28. Backup light switch

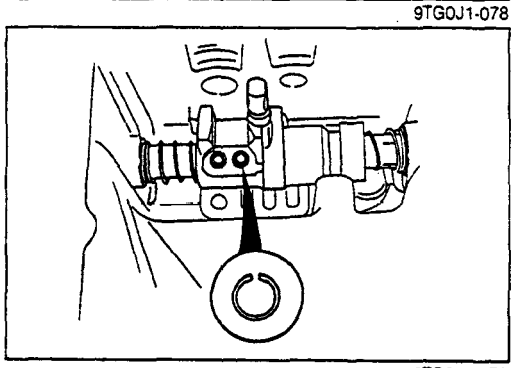


9TG0J1-078

Assembly Note

Change lever, reverse lock stopper and spring

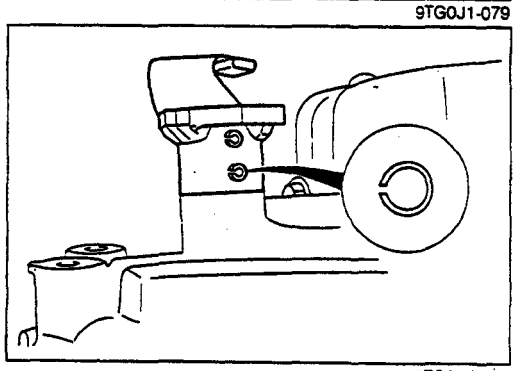
1. Install the change lever, reverse lock stopper and springs in the proper direction.



9TG0J1-079

Roll pin (change lever)

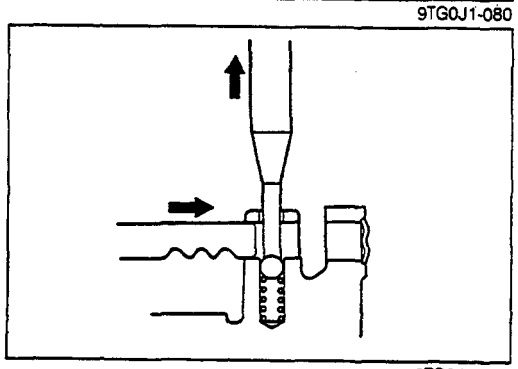
1. Install the roll pins as shown in the figure.



9TG0J1-080

Roll pin (Selector lever)

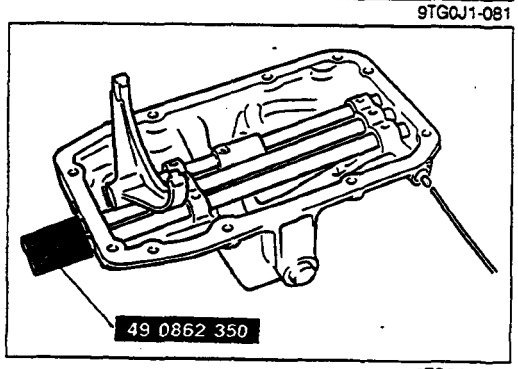
1. Install the roll pins as shown in the figure.



9TG0J1-081

Shift rod

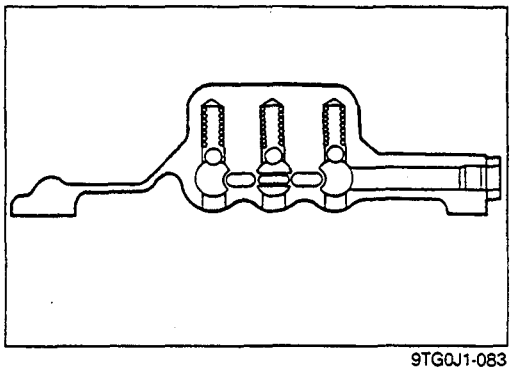
1. Slide the shift rod into the top cover while pushing the ball downward as shown in the figure.



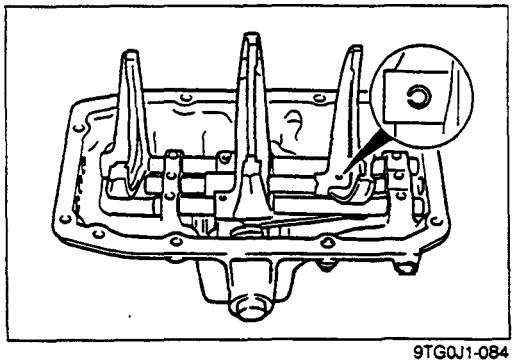
9TG0J1-082

Interlock pin

1. Slide the **SST** into the top cover to guide the interlock pin, and insert the pin.



9TG0J1-083



9TG0J1-084

Note

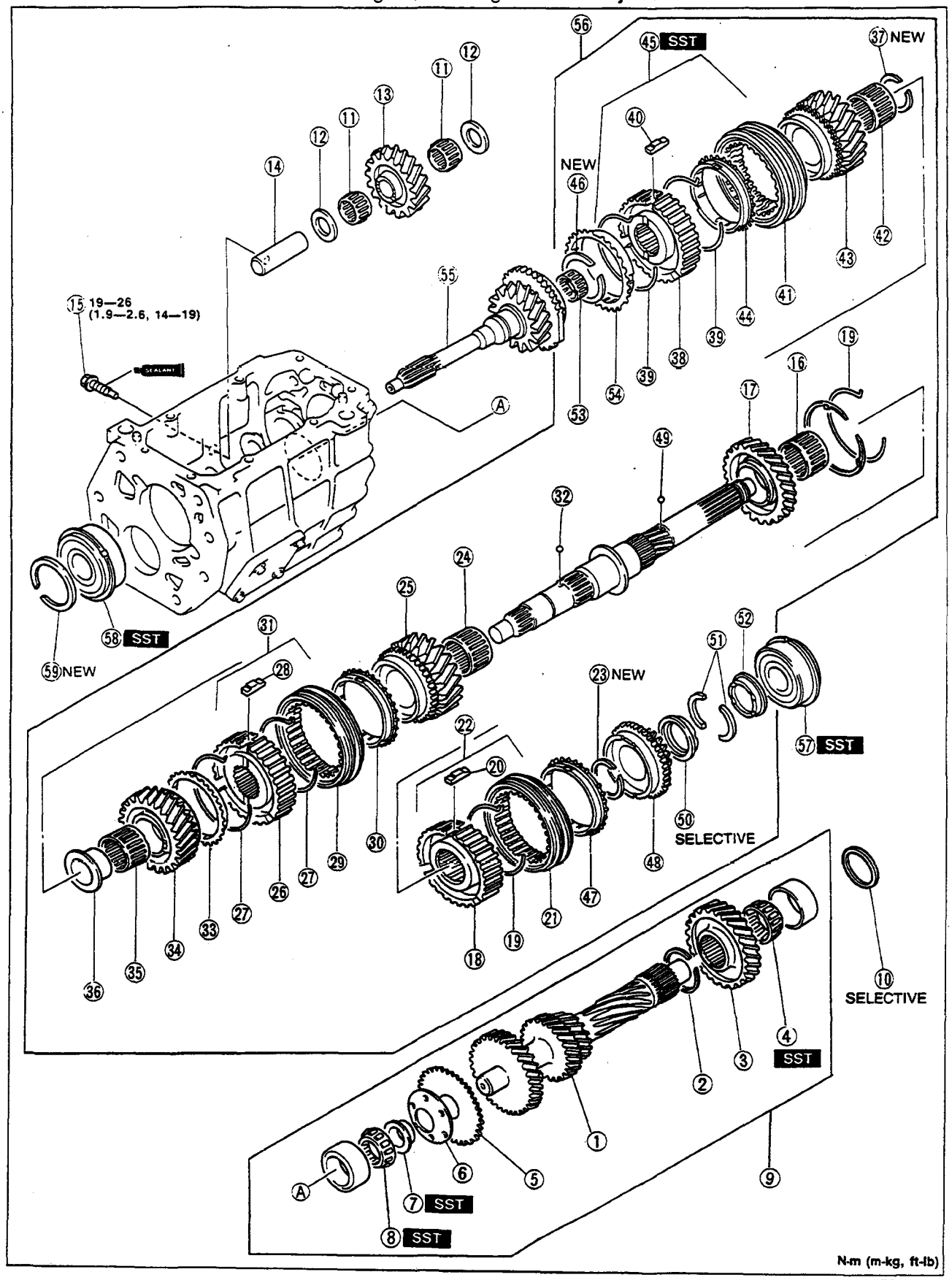
- **The interlock pins must be installed as shown.**

Roll pin

1. Install the roll pin as shown in the figure.

Mainshaft

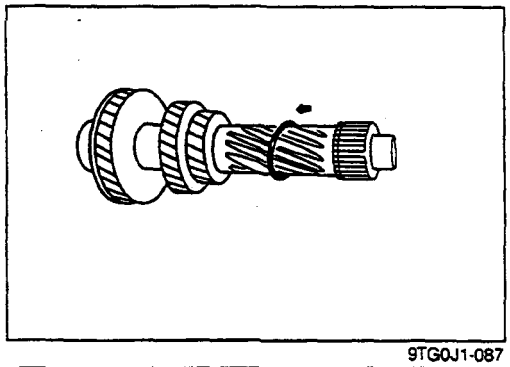
1. Assemble in the order shown in the figure, referring to **Assembly Note**.



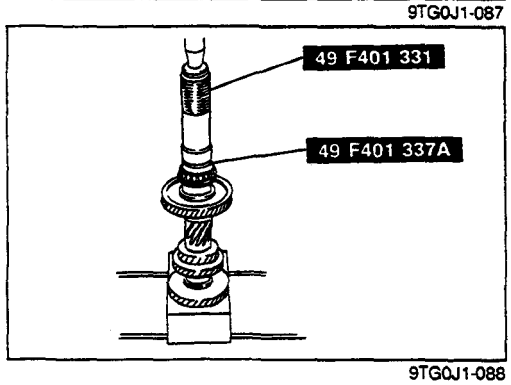
9TG0J1-085

1. Countershaft
2. Snap ring
   Assembly Note
   ..... page J1–37
3. Counter 5th gear
4. Countershaft rear bearing
   Assembly Note
   ..... page J1–37
5. Friction gear
6. Diaphragm spring
7. Spacer
   Assembly Note
   ..... page J1–38
8. Countershaft front bearing
   Assembly Note
   ..... page J1–38
9. Countershaft assembly
   Assembly Note
   ..... page J1–38
10. Adjustment shim
    Assembly Note
    ..... page J1–38
11. Needle bearing
12. Thrust washer
13. Reverse idler gear
14. Reverse idler gear shaft
15. Mounting bolt
    Assembly Note
    ..... page J1–39
16. Needle bearing
17. Reverse gear
18. Clutch hub
19. Synchronizer key spring
20. Synchronizer key
21. Clutch hub sleeve
22. Clutch hub assembly (5th/reverse)
23. Snap ring
24. Needle bearing
25. 1st gear
26. Clutch hub
27. Synchronizer key spring
28. Synchronizer key
29. Clutch hub sleeve
30. Synchronizer ring (1st)
31. Clutch hub assembly (1st/2nd)
32. Steel ball
33. Synchronizer ring (2nd)
34. 2nd gear
35. Needle bearing
36. Gear sleeve
37. Snap ring
38. Clutch hub
39. Synchronizer key spring
40. Synchronizer key
41. Clutch hub sleeve
42. Needle bearing
43. 3rd gear
44. Synchronizer ring (3rd)
45. Clutch hub assembly (3rd/4th)
    Assembly Note
    ..... page J1–39
46. Snap ring
47. Synchronizer ring (5th)
48. 5th gear
49. Steel ball
50. Thrust lock washer
    Assembly Note
    ..... page J1–39
51. C-washer
52. Retaining ring
53. Needle bearing
54. Synchronizer ring (4th)
55. Main drive gear
56. Mainshaft assembly
57. Mainshaft bearing
    Assembly Note
    ..... page J1–39
58. Main drive gear bearing
    Assembly Note
    ..... page J1–40

9TF0J1-015



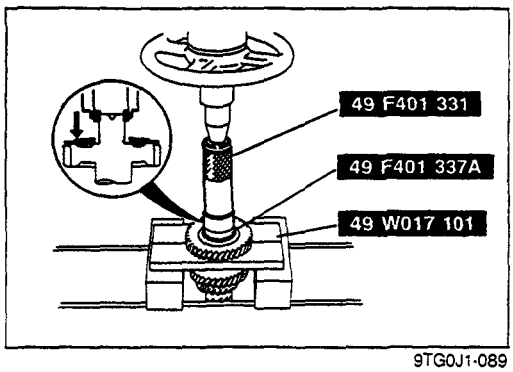
9TG0J1-087



9TG0J1-088

Assembly Note
Snap ring
1. Install a new snap ring as shown in the figure.

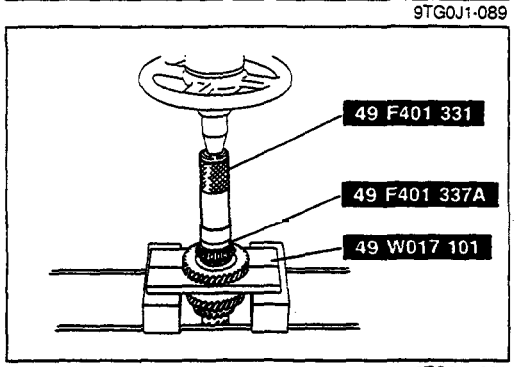
Countershaft rear bearing
1. Press the bearing inner race onto the countershaft with the **SST**.



9TG0J1-089

Spacer

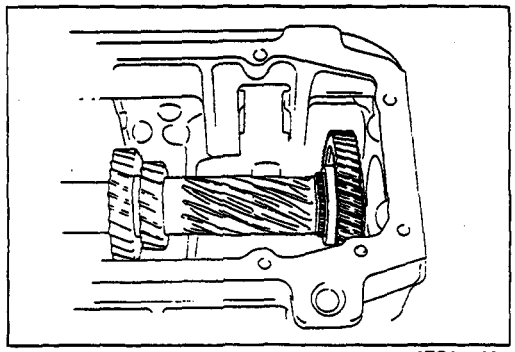
1. Install the new spacer with the **SST**.



9TG0J1-090

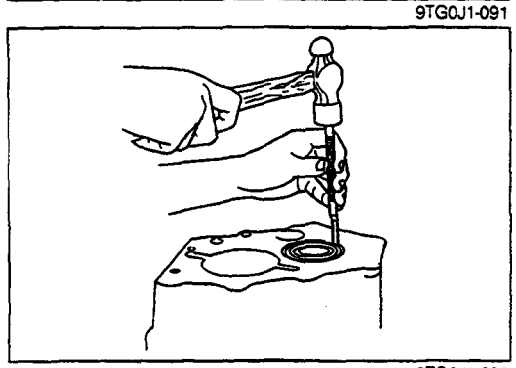
Countershaft front bearing

1. Press the bearing inner race onto the countershaft with the **SST**.


9TG0J1-091

Countershaft assembly

1. Set the countershaft assembly in the transmission case.
2. Set the counter 5th gear to its normal position and fit the snap ring.

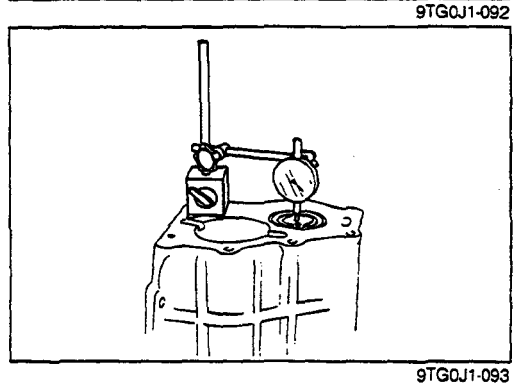

9TG0J1-092

Adjustment shim

1. Install the clutch housing.

   Tightening torque:
   120—155 N·m (12.2—15.8 m-kg, 88—114 ft-lb)

2. Drive in the rear bearing outer race with a punch or similar tool.


9TG0J1-093

3. Measure the depth of the rear bearing outer race in the transmission case. Select a shim(s) plus to adjust the clearance between the outer race and the case adapter to specification.

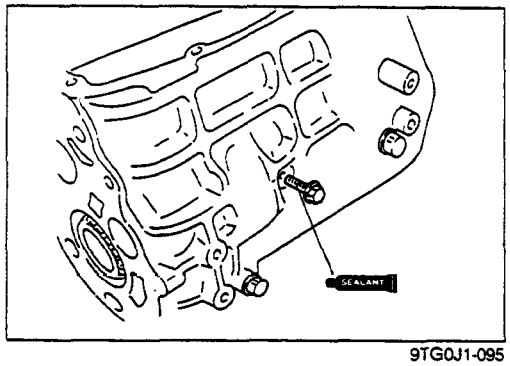
   Specification:
   Measured depth + 0.3mm (0.012 in) =
   0.01—0.05mm (0.0004—0.0019 in)

Adjustment shim thickness

mm (in)

0.50 (0.020)	0.55 (0.022)	0.60 (0.024)
0.65 (0.026)	0.70 (0.028)	0.75 (0.030)
0.80 (0.031)	0.85 (0.033)	0.90 (0.035)
0.95 (0.037)	1.00 (0.039)	1.05 (0.041)
1.10 (0.043)	1.15 (0.045)	1.20 (0.047)
1.25 (0.049)	1.30 (0.051)	1.35 (0.053)
1.40 (0.055)	1.45 (0.057)	1.50 (0.059)

4. Remove the clutch housing.



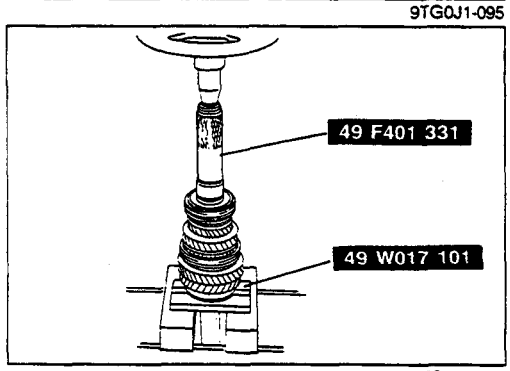
9TG0J1-095

9TG0J1-094

Mounting bolt

1. Align the reverse idler gear shaft with the mounting bolt hole.
2. Apply sealant to the mounting bolt, then install the bolt.

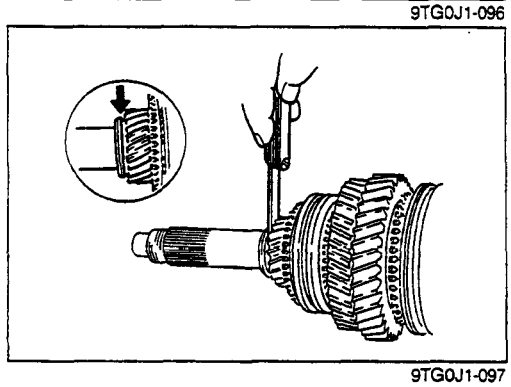
Tightening torque:
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



9TG0J1-096

Clutch hub assembly (3rd/4th)

1. Set the mainshaft with a press.
2. Install the clutch hub assembly with the **SST**.



9TG0J1-097

Thrust lock washer

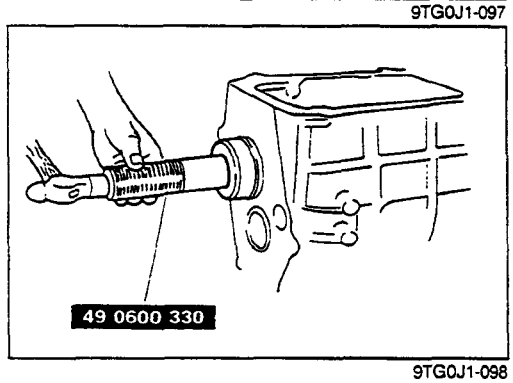
1. Push the C-washers toward 5th gear and measure the clearance between the C-washers and the thrust lock washer. If the clearance is not as specified, select the proper thrust lock washer.

Standard: 0.35—0.45mm (0.014—0.018 in)

Thrust lock washer thickness

mm (in)

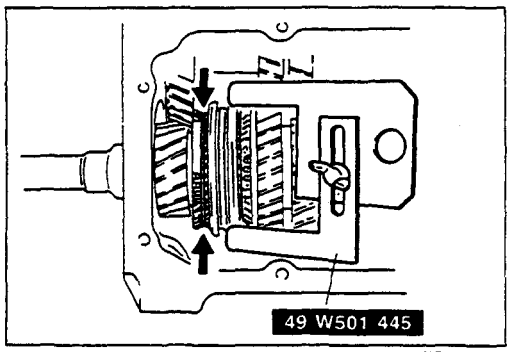
5.0 (0.197)	5.1 (0.201)	5.2 (0.205)
5.3 (0.209)	5.4 (0.213)	5.5 (0.217)



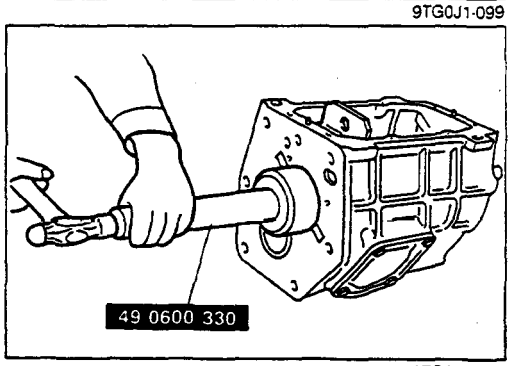
9TG0J1-098

Mainshaft bearing

1. Install the mainshaft bearing with the **SST**.



9TG0J1-099



9TG0J1-100

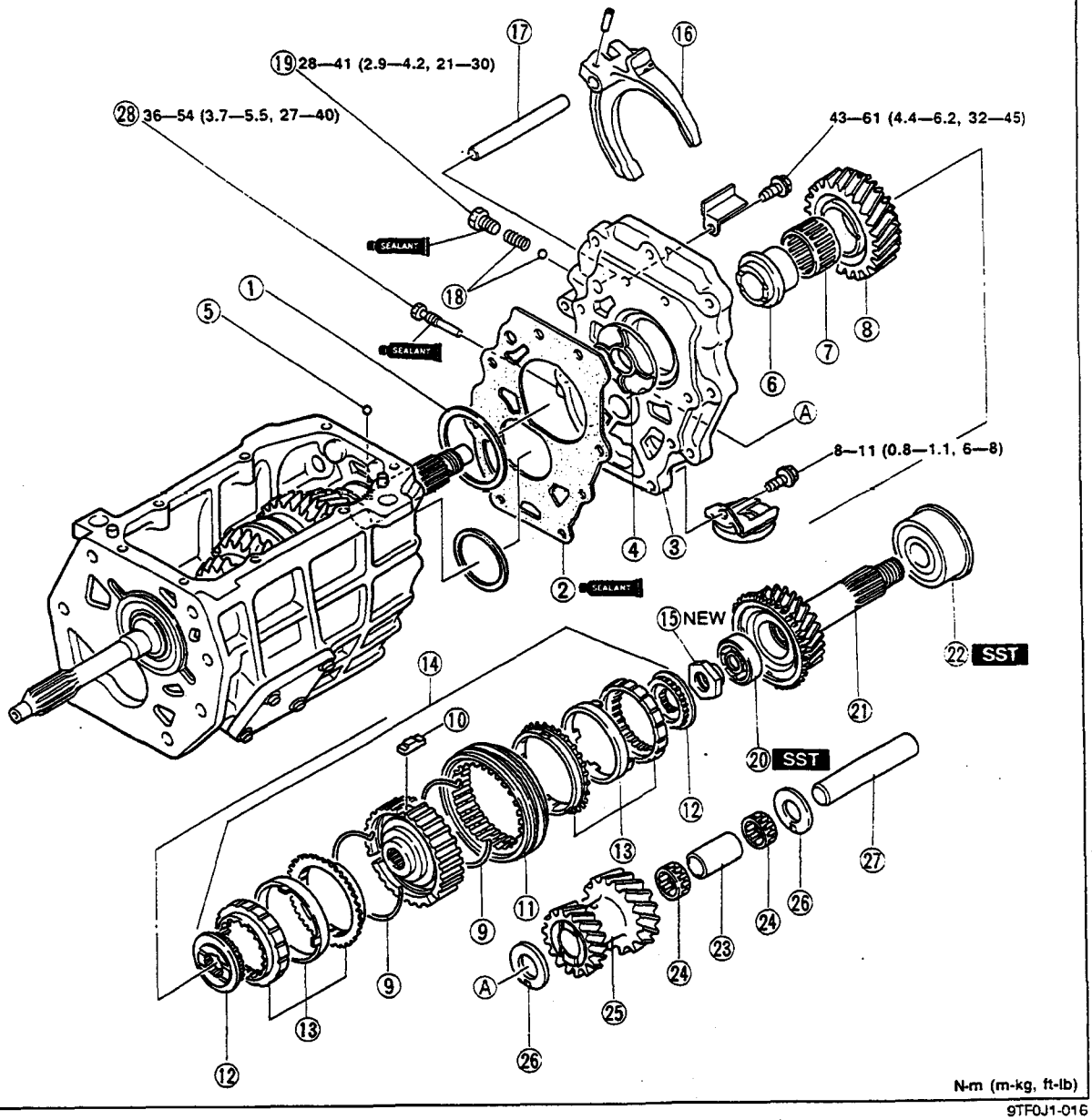
Main drive gear bearing

1. Install the **SST** between the 4th synchronizer ring and synchromesh gear on the main drive gear.

2. Install the main drive gear bearing with the **SST**.

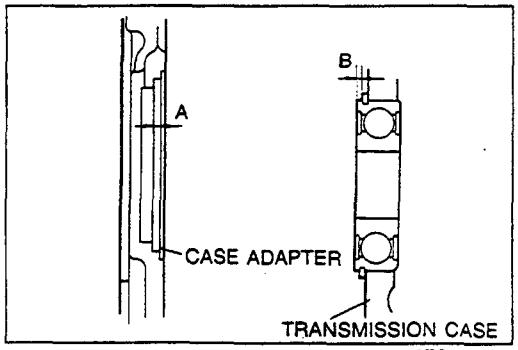
Sub-transmission Parts

1. Assemble in the order shown in the figure, referring to **Assembly Note**.

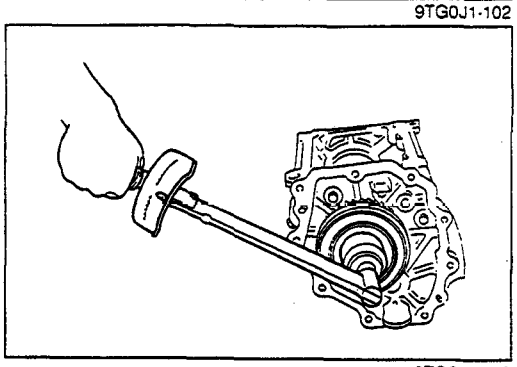


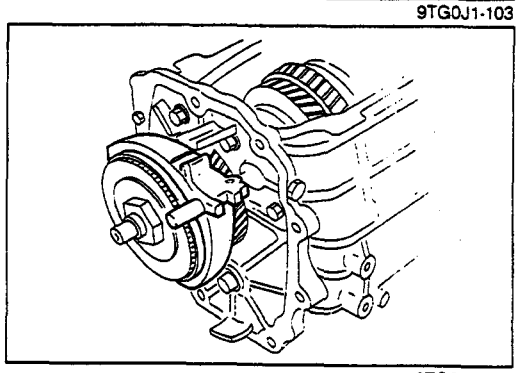
9TF0J1-016

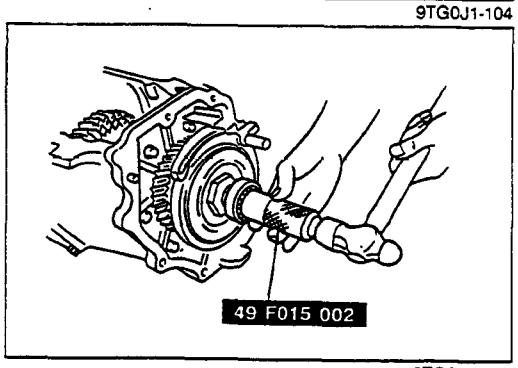
1. Adjustment shim
   Assembly Note
   ..... page J1–42
2. Gasket
3. Case adapter
4. Scoop ring
5. Steel ball
6. Gear sleeve
7. Needle bearing
8. High gear
9. Synchronizer key spring
10. Synchronizer key
11. Clutch hub sleeve
12. Inner cone hub
13. Double cone assembly
14. Clutch hub assembly
15. Locknut
    Assembly Note
    ..... page J1–42
16. Shift fork
    Assembly Note
    ..... page J1–42
17. Shift rod
    Assembly Note
    ..... page J1–42
18. Steel ball and spring
19. Cap plug
20. Bearing
    Assembly Note
    ..... page J1–42
21. Output shaft
22. Output shaft bearing
    Assembly Note
    ..... page J1–42
23. Spacer
24. Needle bearing
25. Counter high gear
26. Thrust washer
27. Counter gear shaft
28. Mounting bolt
    Assembly Note
    ..... page J1–43



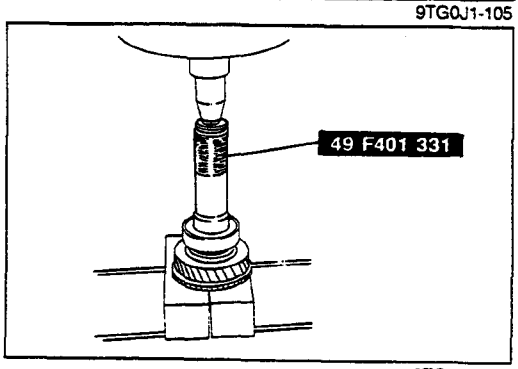
9TG0J1-102


9TG0J1-103


9TG0J1-104



9TG0J1-105



9TG0J1-106

Assembly Note

Adjustment shim

1. After measuring dimensions A and B shown in the figure, use an adjustment shim(s) with the thickness corresponding to the value of A plus gasket thickness 0.3mm (0.012 in) minus B, so that bearing end play will be within specification.

Bearing end play: 0—0.1mm (0—0.004 in)

Adjustment shim thickness:

0.8 (0.031)	0.9 (0.035)	1.0 (0.039)
1.1 (0.043)	1.2 (0.047)	

Locknut

1. Slide the clutch hub sleeves onto 1st and reverse gears to lock the mainshaft.
2. Tighten the new locknut.

Tightening torque:
157—235 N·m (16—24 m-kg, 116—174 ft-lb)

3. Use a chisel to stake the locknut.

Shift fork and shift rod

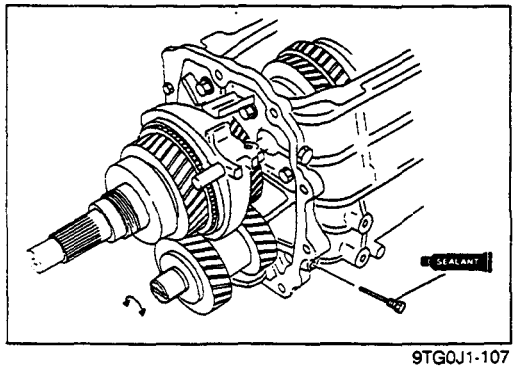
1. Install the shift fork and shift rod into the case adapter.

Bearing

1. Install the bearing with the **SST**.

Output shaft bearing

1. Install the bearing with the **SST**.



9TG0J1-107

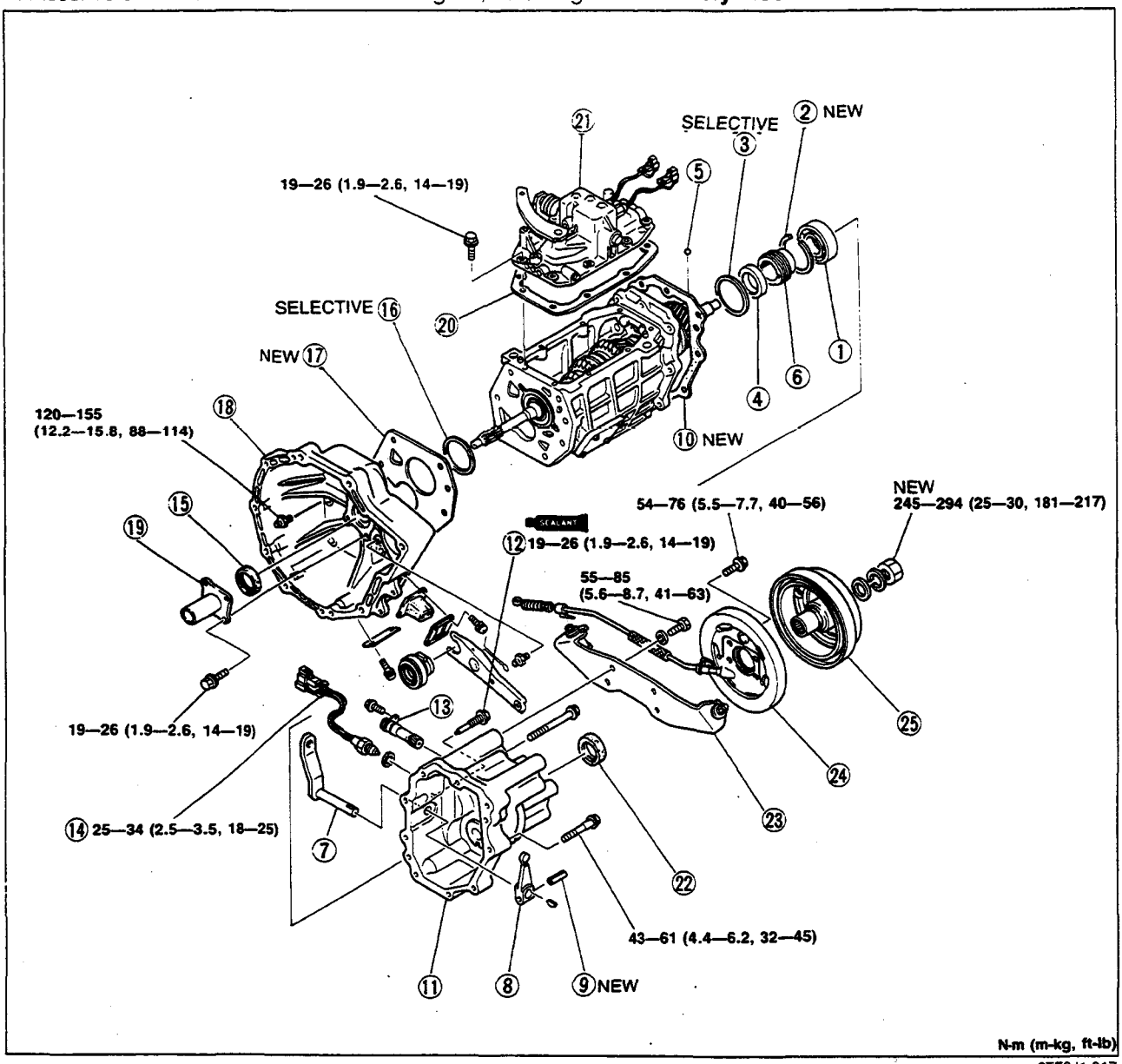
Mounting bolt

1. Align the counter gear shaft with the mounting bolt hole.
2. Apply sealant to the mounting bolt, then install the bolt.

Tightening torque:
36—54 N·m (3.7—5.5 m-kg, 27—40 ft-lb)

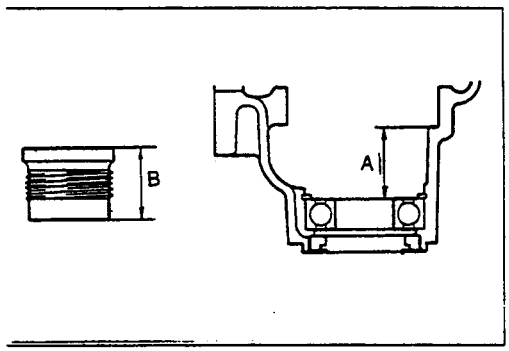
Housing Components

1. Assemble in the order shown in the figure, referring to **Assembly Note**.



9TF0J1-017

1. Bearing
2. Snap ring
3. Adjustment shim
   Assembly Note
   ..... page J1–45
4. Spacer
5. Steel ball
6. Speedometer drive gear
7. Outer shift lever
   Assembly Note
   ..... page J1–45
8. Inner shift lever
   Assembly Note
   ..... page J1–45
9. Roll pin
   Assembly Note
   ..... page J1–45
10. Gasket
11. Rear housing
    Assembly Note
    ..... page J1–45
12. Lock bolt
    Assembly Note
    ..... page J1–45
13. Speedometer driven gear
14. Sub-transmission switch
15. Oil seal
16. Adjustment shim
    Assembly Note
    ..... page J1–46
17. Gasket
18. Clutch housing
19. Front cover
20. Gasket
21. Top cover
22. Oil seal
    Assembly Note
    ..... page J1–46
23. Transmission mount
24. Center brake assembly
25. Center brake drum
    Assembly Note
    ..... page J1–46



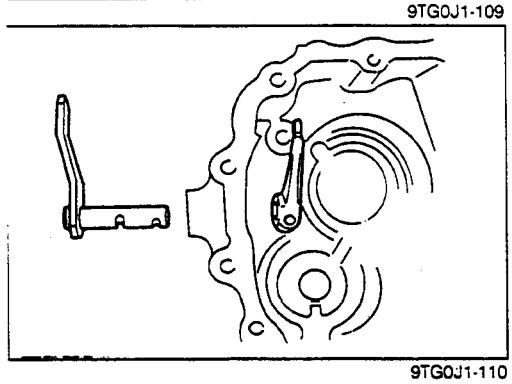
9TG0J1-109

Assembly Note
Adjustment shim
1. After measuring dimensions A and B shown in the figure, use an adjustment shim(s) with the thickness corresponding to the value of A minus B, so that bearing end play will be within specification.

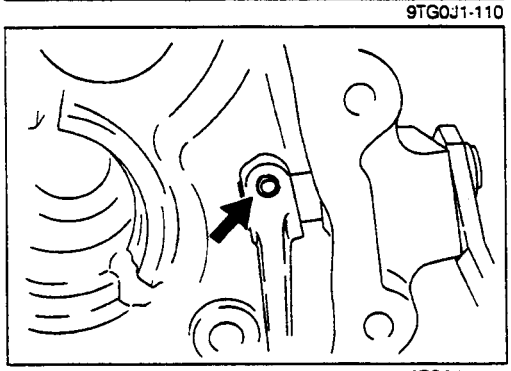
Bearing end play: 0—0.1mm (0—0.004 in)

Adjustment shim thickness:

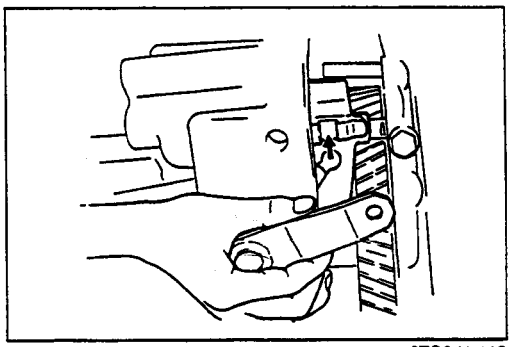
0.8 (0.031)	0.9 (0.035)	1.0 (0.039)
1.1 (0.043)	1.2 (0.047)	


9TG0J1-110

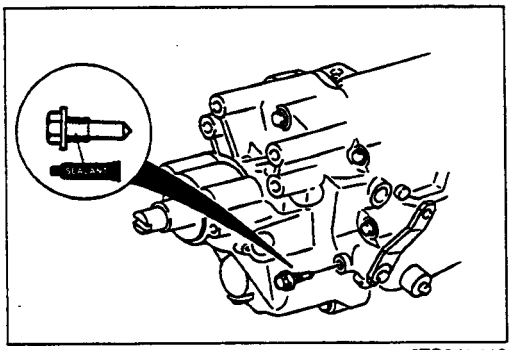
Outer and inner shift lever
1. Install the shift lever as shown in the figure.


9TG0J1-111

Roll pin
1. Install the roll pin as shown in the figure.

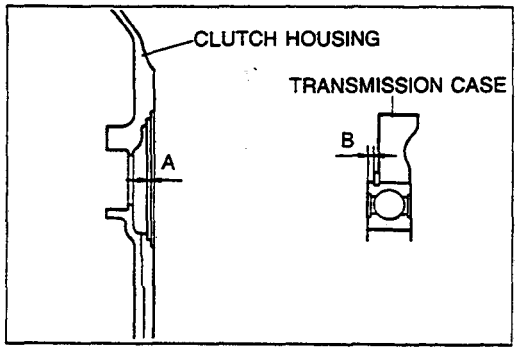

9TG0J1-112

Rear housing
1. Align the thrust washer silent of the counter gear and the rear housing groove.
2. Align the inner shift lever and shift fork groove, and install the rear housing.

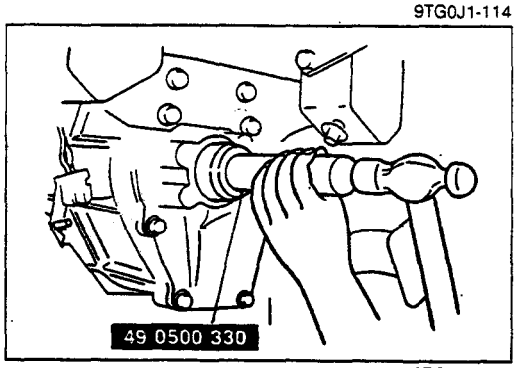


9TG0J1-113

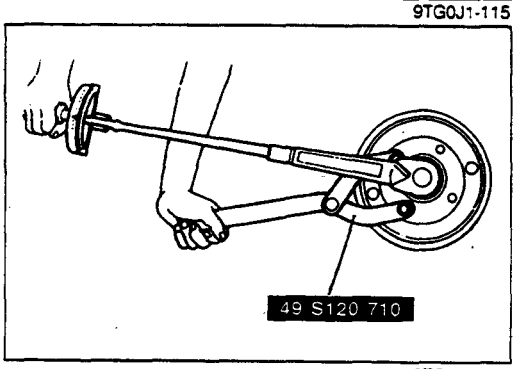
Lock bolt
1. Align the shift lever groove with the lock bolt hole, and install the lock bolt.



9TG0J1-114



9TG0J1-115



9TG0J1-116

Adjustment shim

1. After measuring dimensions A and B shown in the figure, use an adjustment shim(s) with the thickness corresponding to the value of A plus gasket thickness 0.3mm (0.012 in) minus B, so that bearing end play will be within specification.

Bearing end play: 0—0.1mm (0—0.004 in)

Adjustment shim thickness:

0.8 (0.031)	0.9 (0.035)	1.0 (0.039)
1.1 (0.043)	1.2 (0.047)	

Oil seal

Caution
- **Do not damage the mainshaft spline.**

1. Install the oil seal with the **SST**.

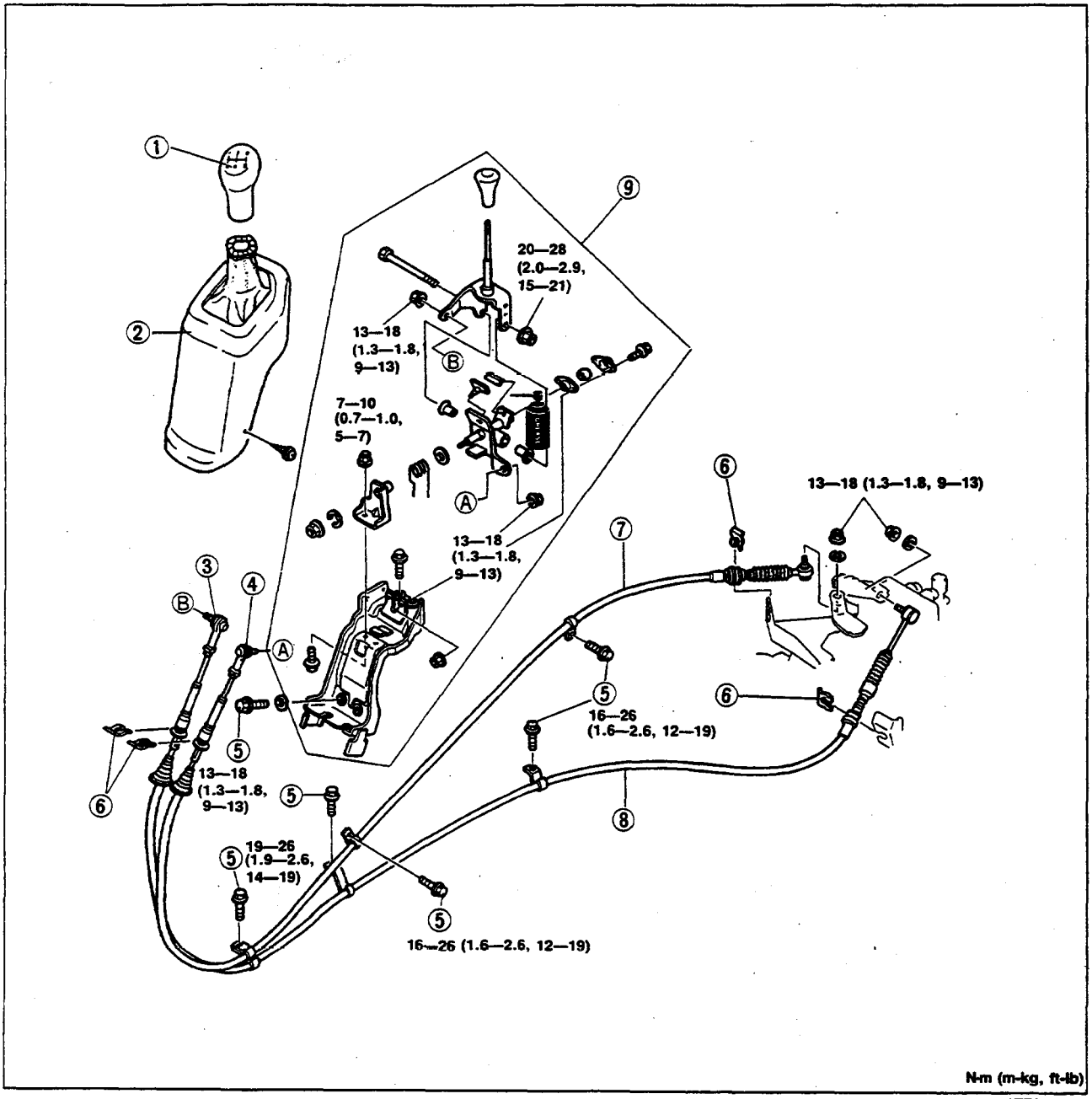
Center brake drum

1. Install the center brake drum.
2. Hold the drum with the **SST**, and tighten the locknut.

SHIFT MECHANISM (TRANSMISSION)

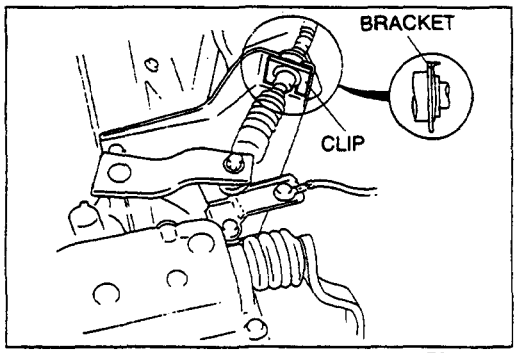
REMOVAL / INSTALLATION

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



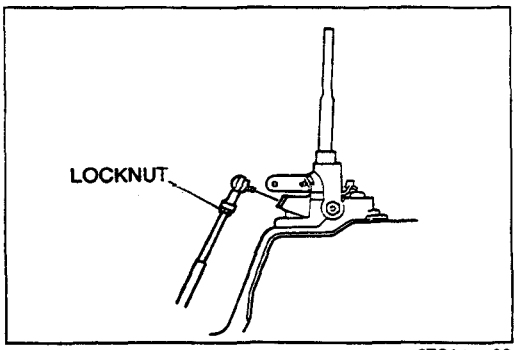
9TF0J1-018

1. Shift knob
   Installation Note ..... page J1—48
2. Console
3. Shift cable ball joint
   Installation Note ..... page J1—48
4. Selector cable ball joint
   Installation Note ..... page J1—48
5. Bolt
6. Clip
   Installation Note ..... page J1—48
7. Selector cable
   Inspect boots for damage
   Inspect cable for damage and function
8. Shift cable
   Inspect boots for damage
   Inspect cable for damage and function
9. Shift lever assembly



9TG0J1-118

Installation Note
Clips
1. Install the clips as shown in the figure.



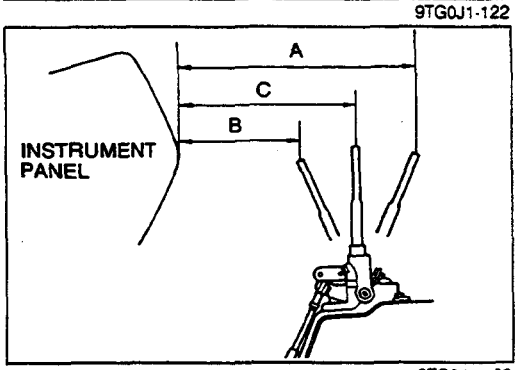
9TG0J1-122

Selector cable ball joint
1. Loosen the locknut.

Note
- **The shift lever will be set in neutral position by force of the spring.**

2. Set the shift lever in neutral position.
3. Turn the ball joint so that the selector cable aligns with the installation hole of the shift lever.
4. Tighten the locknut.

Tightening torque:
10—15 N·m (1.0—1.5 m-kg, 7—11 ft-lb)



9TG0J1-123

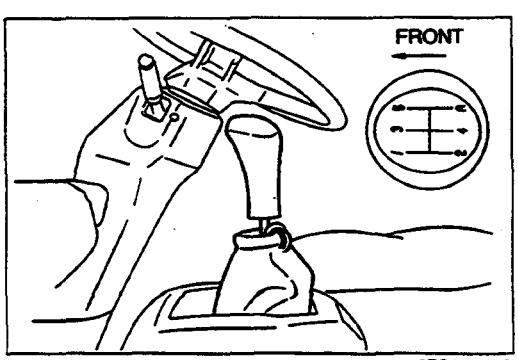
Shift cable ball joint
1. Measure A and B shown in the figure.
2. Caluculate the neutral position of the shift lever as follows:

$$\textbf{Neutral position C} = \textbf{B} + \frac{\textbf{A} - \textbf{B}}{\textbf{2}}$$

3. Hold the shift lever in neutral position.
4. Loosen the shift cable locknut.
5. Turn the ball joint so that the shift cable aligns with the installation hole of the shift lever.
6. Tighten the locknut.

Tightening torque:
10—15 N·m (1.0—1.5 m-kg, 7—11 ft-lb)

7. After installation, verify that the shift lever operates smoothly.



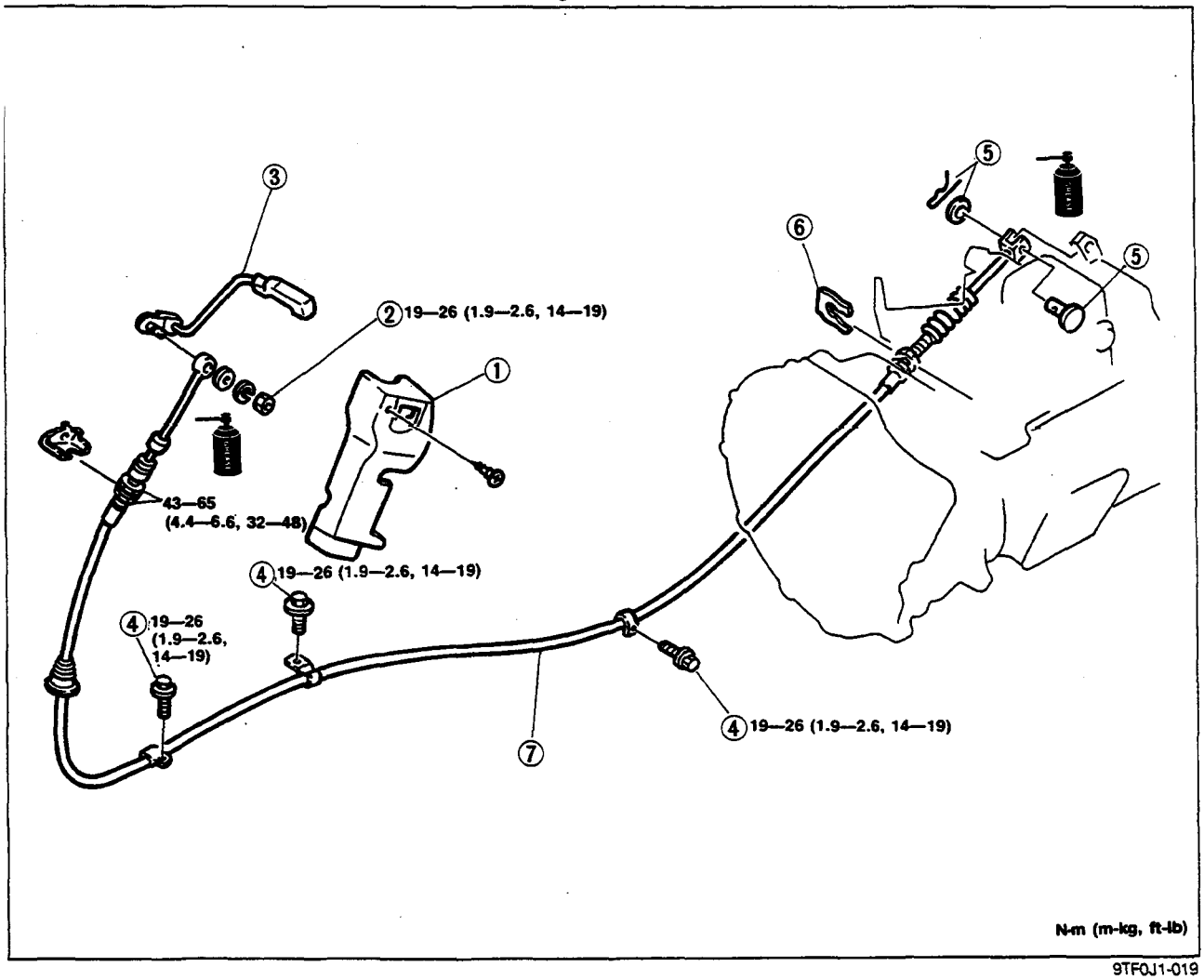
9TG0J1-119

Shift knob
1. Install the shift knob as shown in the figure.

SHIFT MECHANISM (SUB-TRANSMISSION)

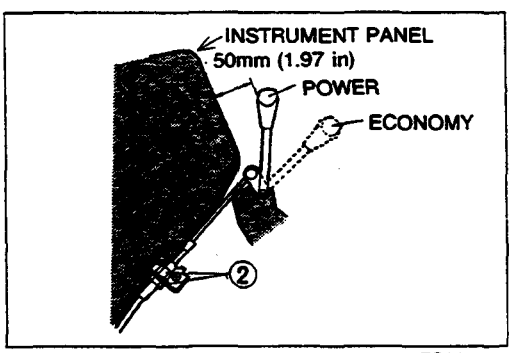
REMOVAL / INSTALLATION

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



9TF0J1-019

1. Steering column cover
2. Nut
   Installation Note ..... page J1–49
3. Selector lever
4. Bolt
5. Spring pin and pin
6. Clip
   Installation Note ..... page J1–48
7. Sub-selector cable
   Inspect boot for damage
   Inspect cable for damage and function



9TG0J1-121

Installation Note
Nut

1. Shift the selector lever to POWER position.
2. Adjust the position of the lever as shown in the figure.

Tightening torque:
43—65 N·m (4.4—6.6 m-kg, 32—48 ft-lb)

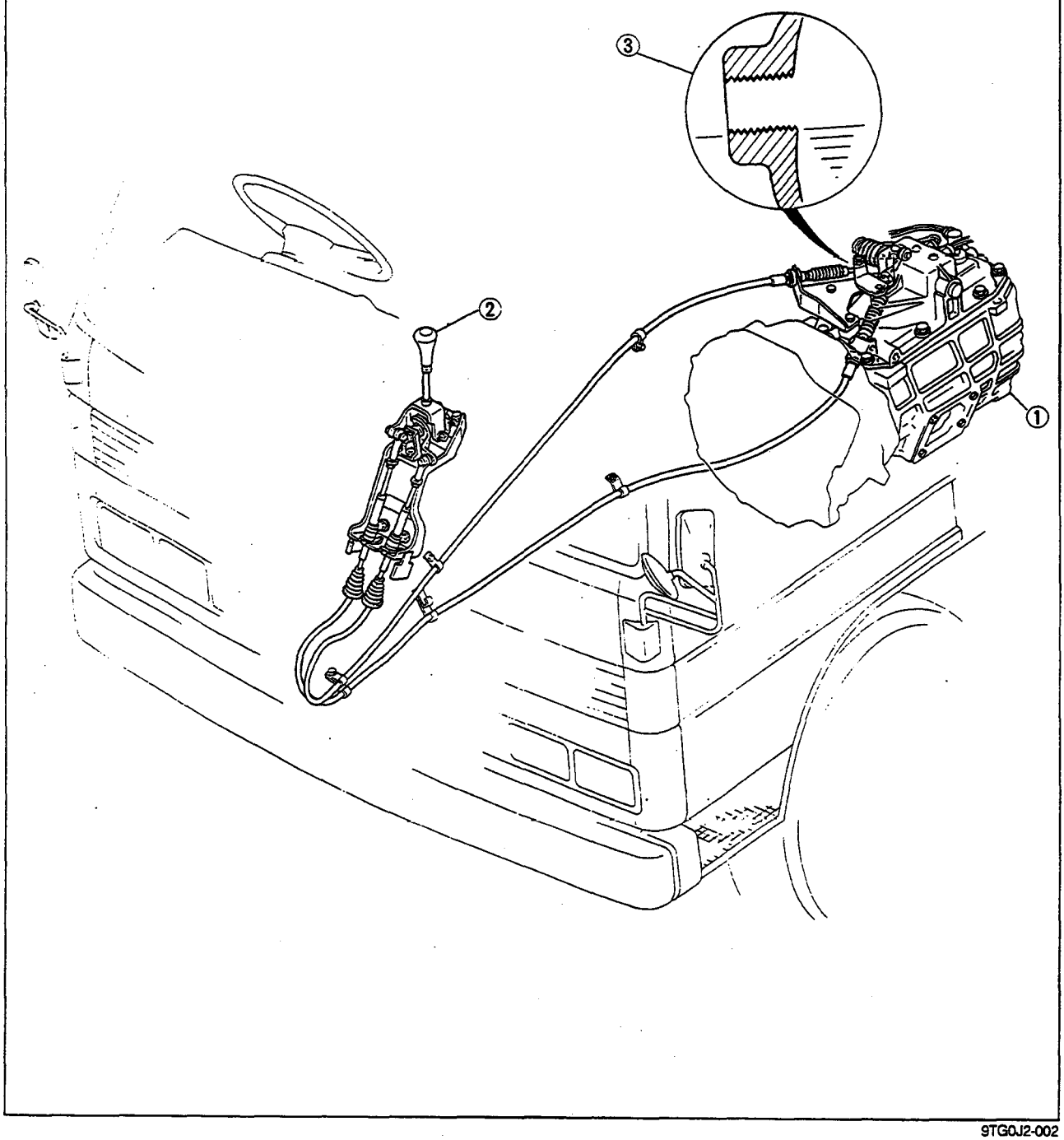
MANUAL TRANSMISSION (Z5M-R)

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SPECIFICATION J2– 4
STRUCTURAL VIEW J2– 5
COMPONENTS J2– 7
POWERFLOW J2– 8
TROUBLESHOOTING GUIDE J2–12
TRANSMISSION OIL J2–13
INSPECTION J2–13
REPLACEMENT J2–13
TRANSMISSION J2–14
PREPARATION J2–14
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DISASSEMBLY J2–18
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REMOVAL / INSTALLATION J2–47
SHIFT MECHANISM (SUB-TRANSMISSION) J2–49
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9TG0J2-001

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WITHOUT SUB-TRANSMISSION

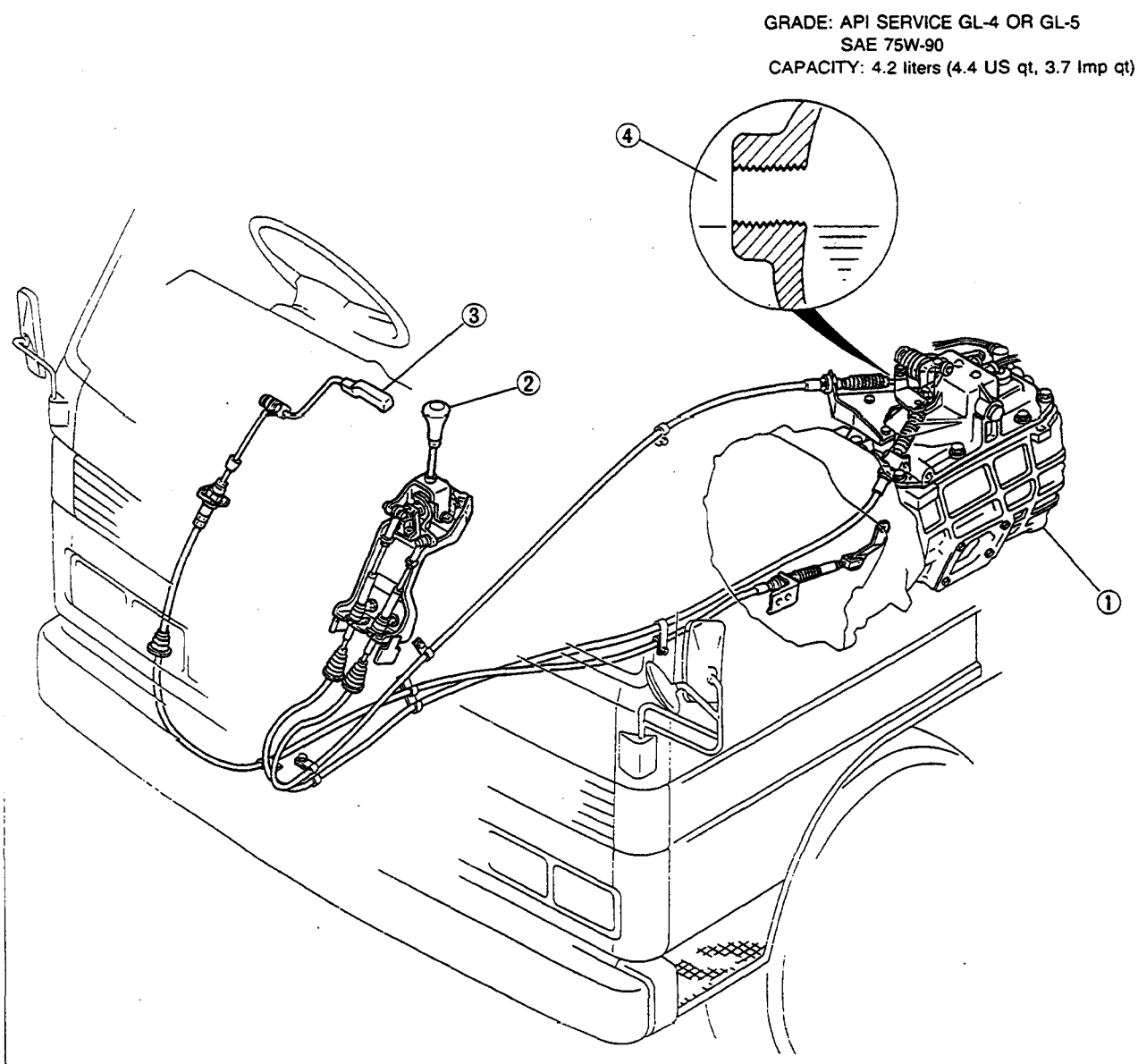


9TG0J2-002

1. Transmission
Removal / Installation ..... page J2–14
Disassembly ..... page J2–18
Inspection ..... page J2–30
Assembly ..... page J2–33
2. Shift mechanism (Transmission)
Removal / Installation ..... page J2–47
3. Transmission oil
Inspection ..... page J2–13
Replacement ..... page J2–13

INDEX

WITH SUB-TRANSMISSION

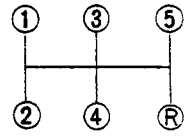
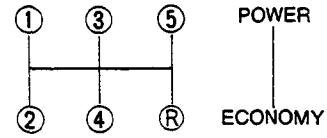


9TG0J2-003

1. Transmission
Removal / Installation ..... page J2–14
Disassembly..... page J2–18
Inspection..... page J2–30
Assembly ..... page J2–33
2. Shift mechanism (Transmission)
Removal / Installation ..... page J2–47
3. Shift mechanism (Sub-transmission)
Removal / Installation ..... page J2–49
4. Transmission oil
Inspection..... page J2–13
Replacement..... page J2–13

OUTLINE

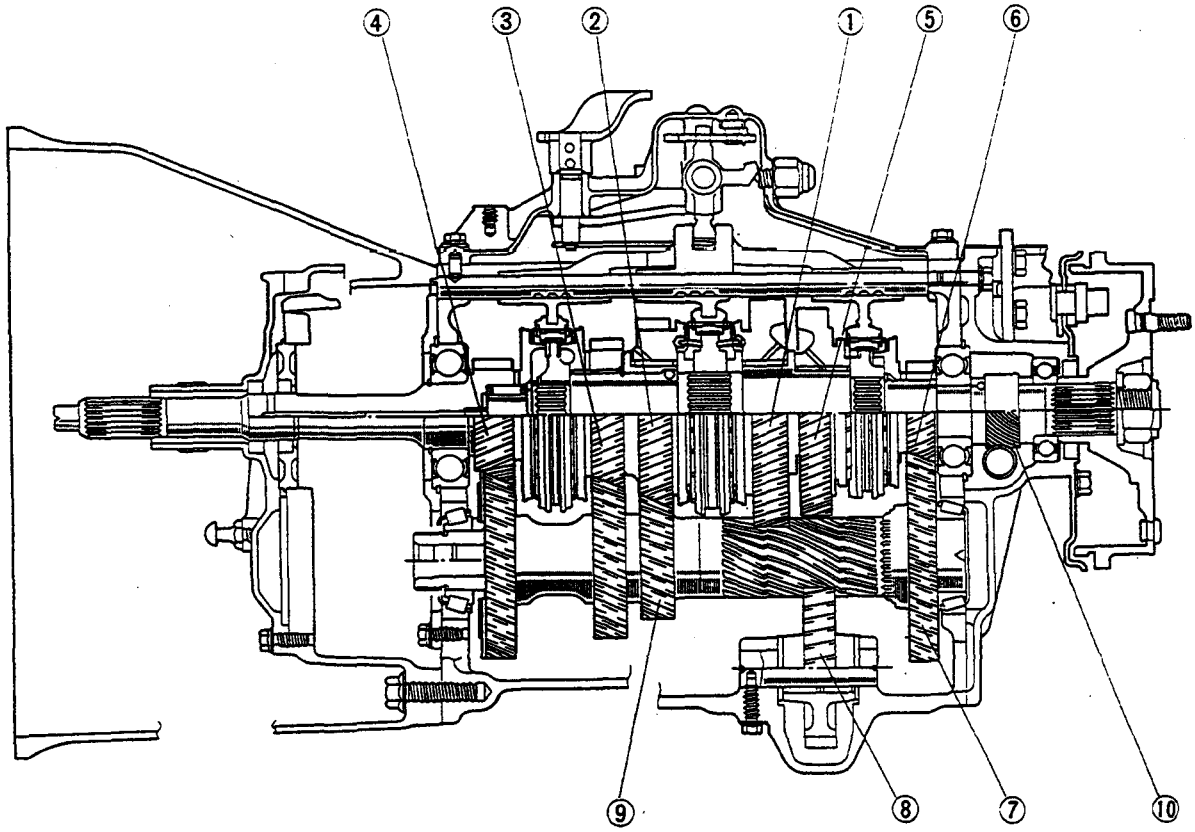
SPECIFICATIONS

Item \ Transmission model			Z5M-R	
			Without Sub-Transmission	With Sub-Transmission
Engine			SL Turbo	
Transmission mesh system			Forward: Synchromesh Reverse: Constant-mesh	
Sub-transmission mesh system			—	Synchromesh
Shift pattern				
Gear ratio	Transmission	1st	5.862	
		2nd	2.954	
		3rd	1.661	
		4th	1.000	
		5th	0.783	
		Rev	5.318	
	Sub-transmission	Economy	—	0.812
		Power	—	1.000
Oil	Type		API Service GL-4 or GL-5 SAE 75W-90	
	Capacity liters (US qt, Imp qt)		4.5 (4.8, 4.0)	4.2 (4.4, 3.7)

9TG0J2-004

STRUCTURAL VIEW

WITHOUT SUB-TRANSMISSION

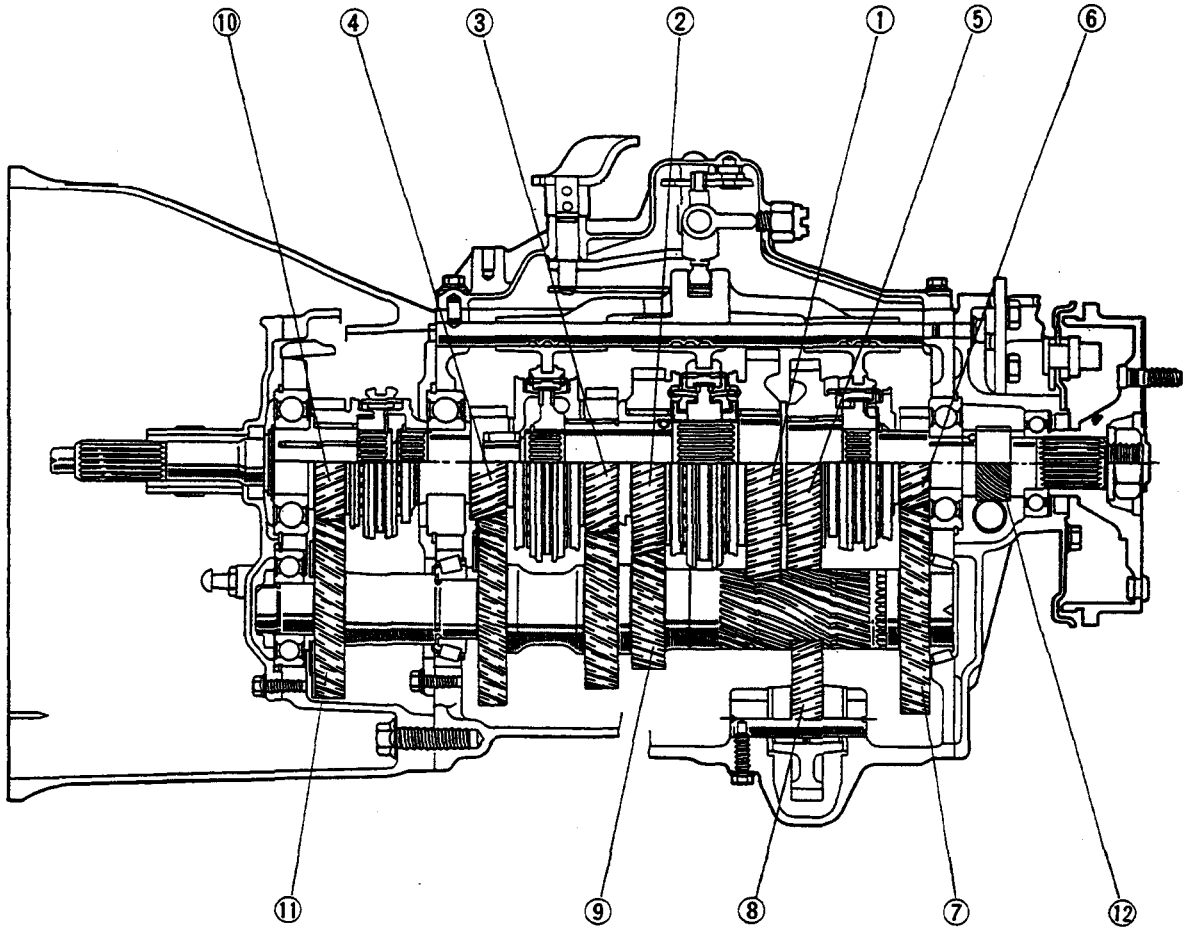


9TG0J2-005

1. 1st gear
2. 2nd gear
3. 3rd gear
4. Main drive gear (4th gear)
5. Reverse gear
6. 5th gear
7. Counter 5th gear
8. Reverse idler gear
9. Countershaft gear
10. Speedometer drive gear

STRUCTURAL VIEW

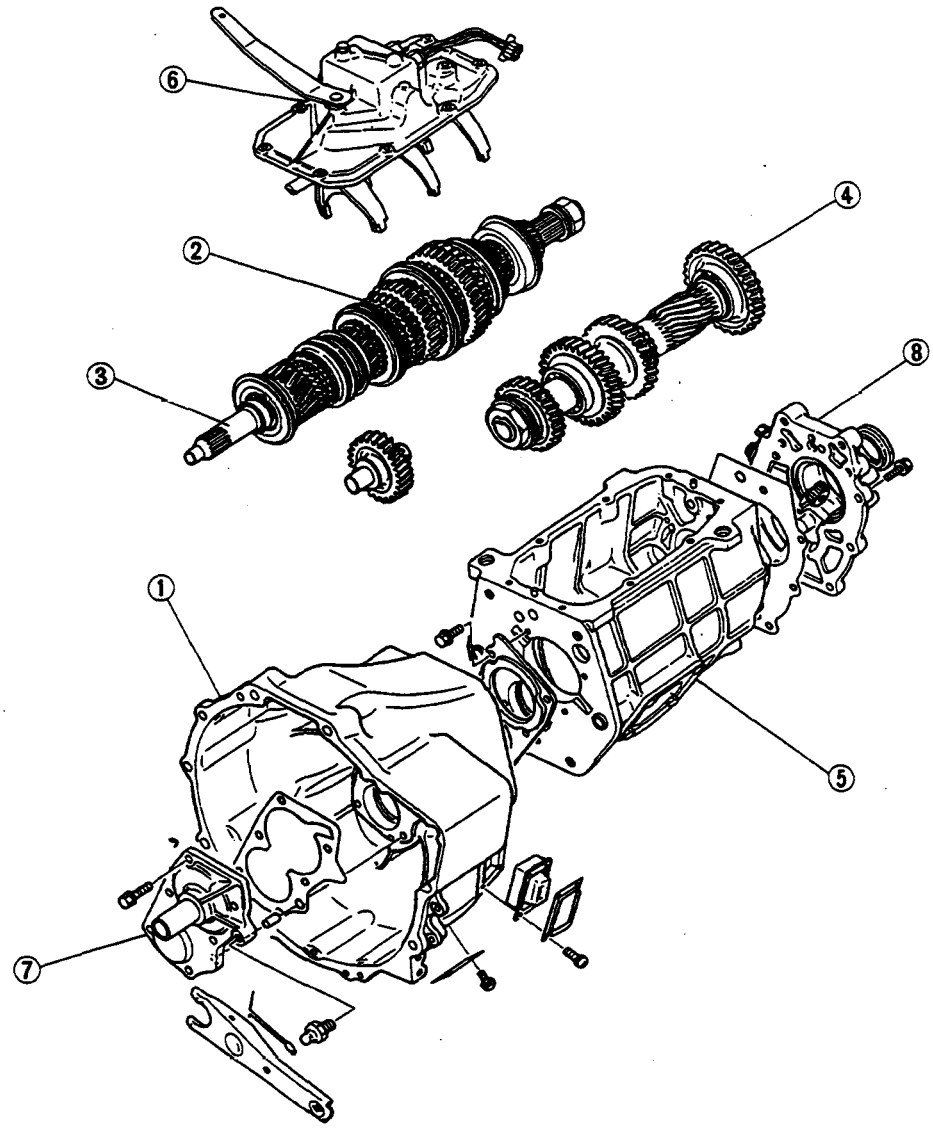
WITH SUB-TRANSMISSION



9TG0J2-006

1. 1st gear
2. 2nd gear
3. 3rd gear
4. Main drive gear (4th gear)
5. Reverse gear
6. 5th gear
7. Counter 5th gear
8. Reverse idler gear
9. Countershaft gear
10. High gear
11. Counter high gear
12. Speedometer drive gear

COMPONENTS

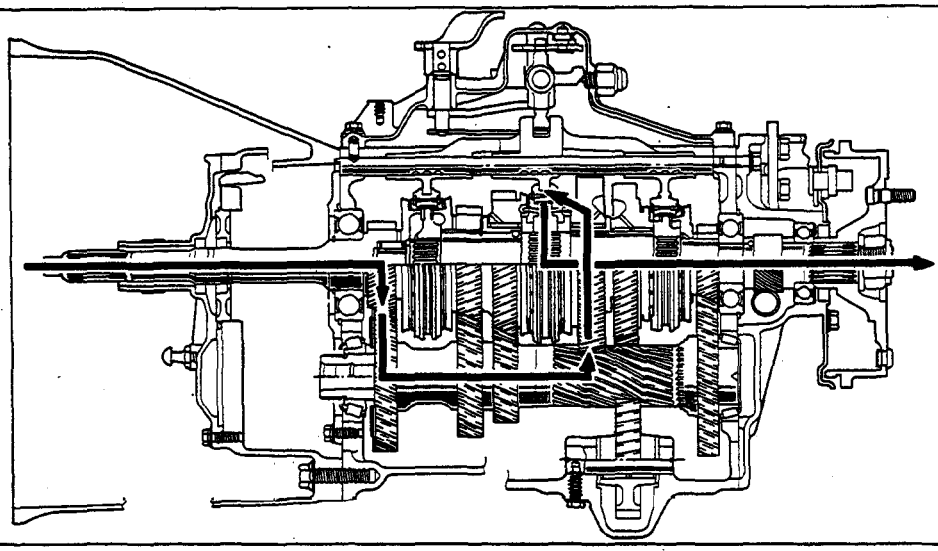


9TG0J2-007

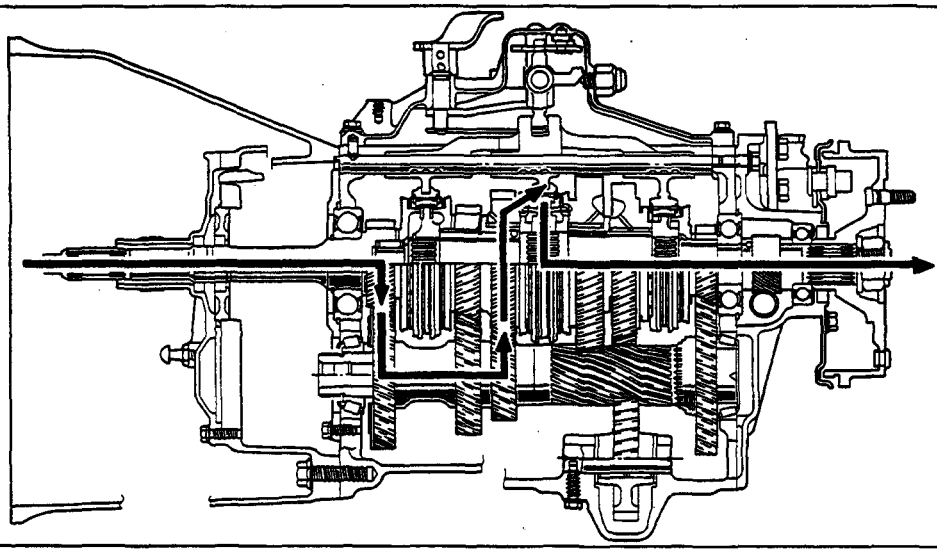
1. Clutch housing
2. Mainshaft assembly
3. High gear
4. Countershaft assembly
5. Transmission case
6. Top cover assembly
7. Front cover
8. Rear cover

POWERFLOW
Without Sub-Transmission

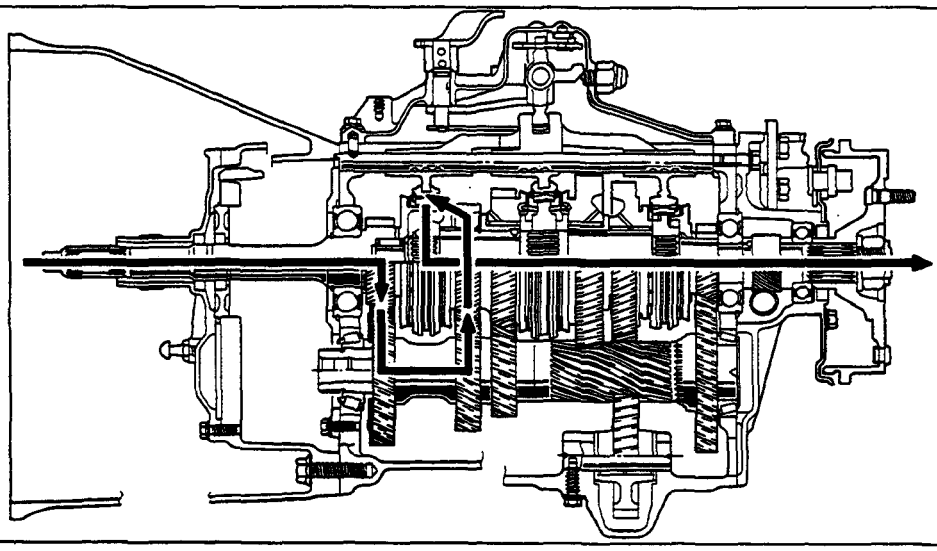
1ST



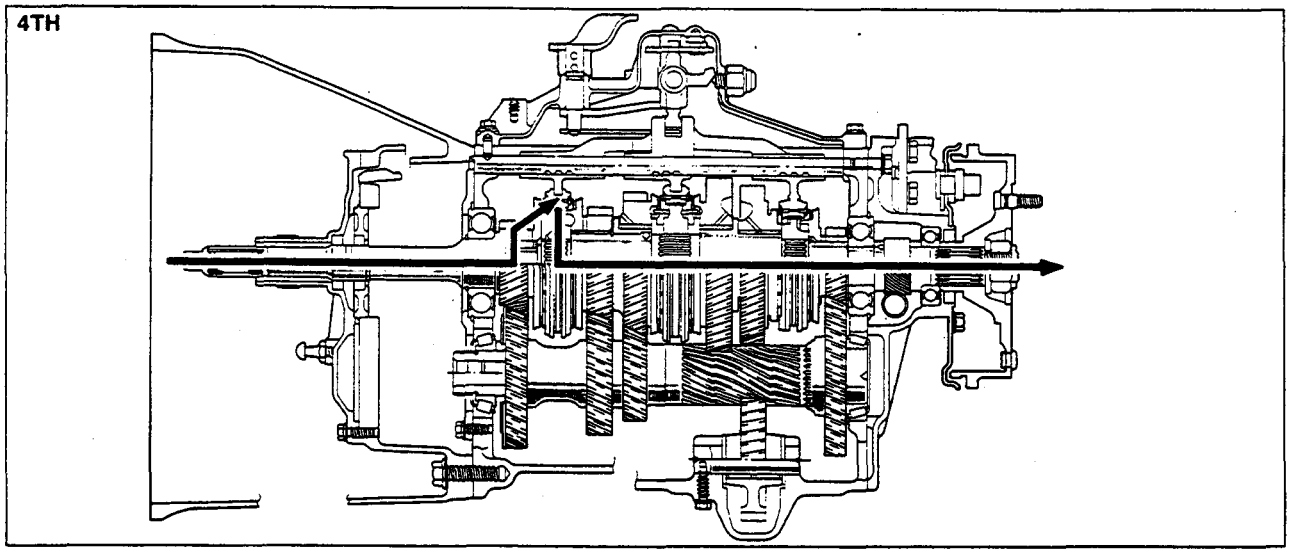
2ND

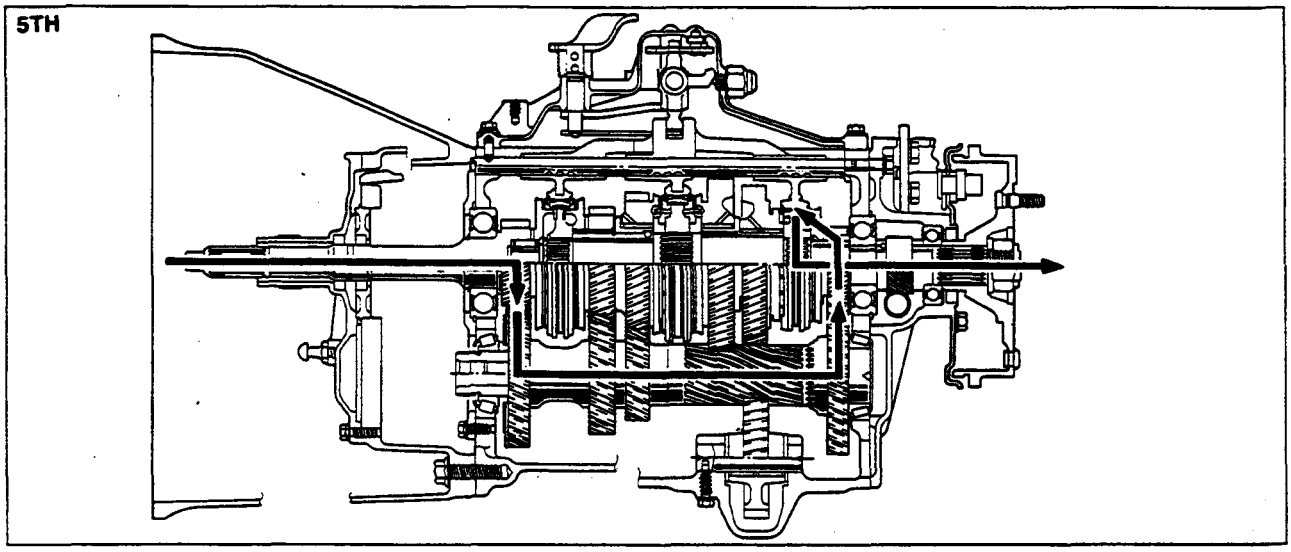


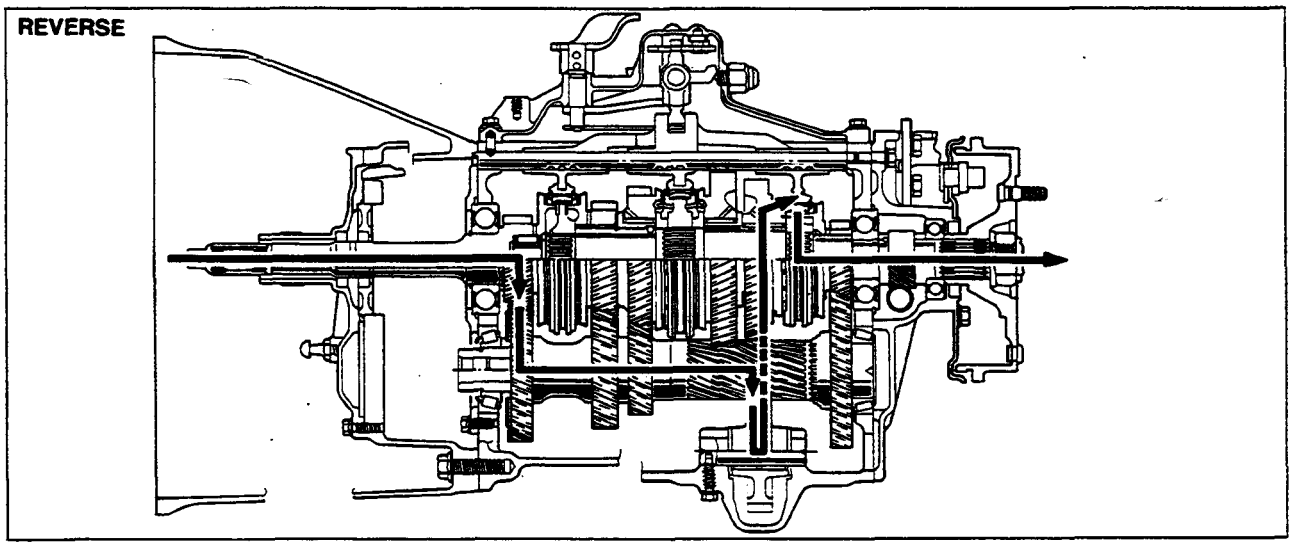
3RD



9TG0J2-008


4TH

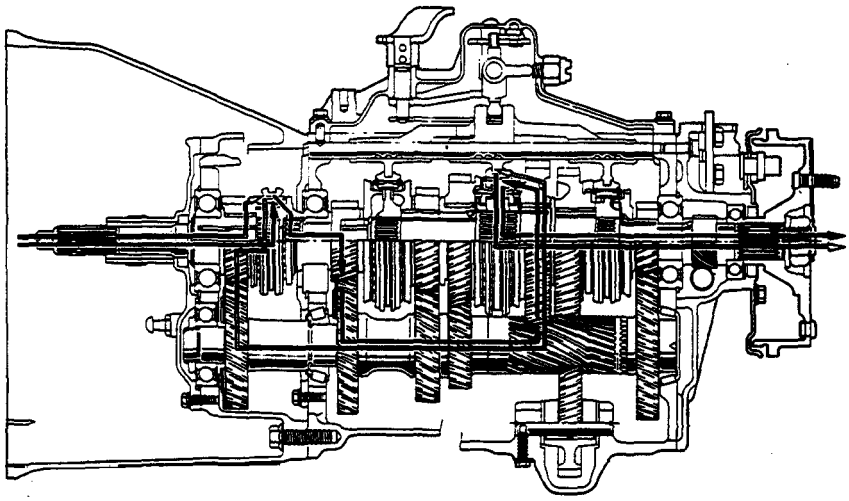

5TH


REVERSE

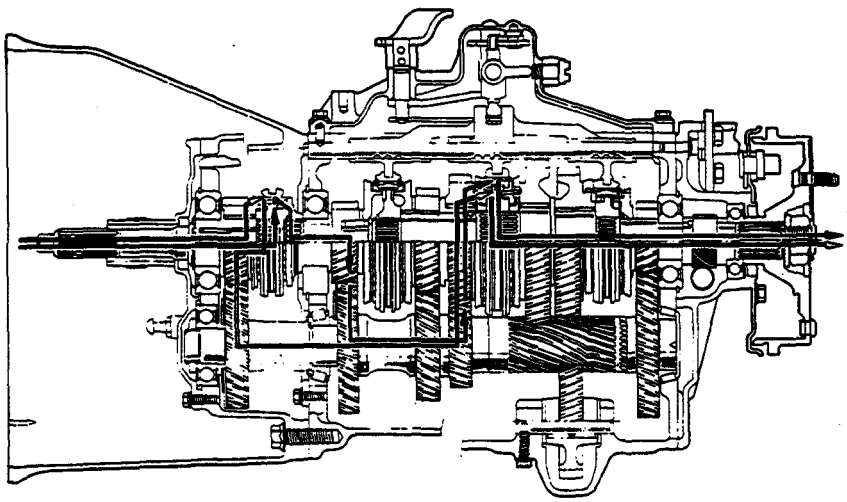
Power : ➡
Economy: ⇨

With Sub-Transmission

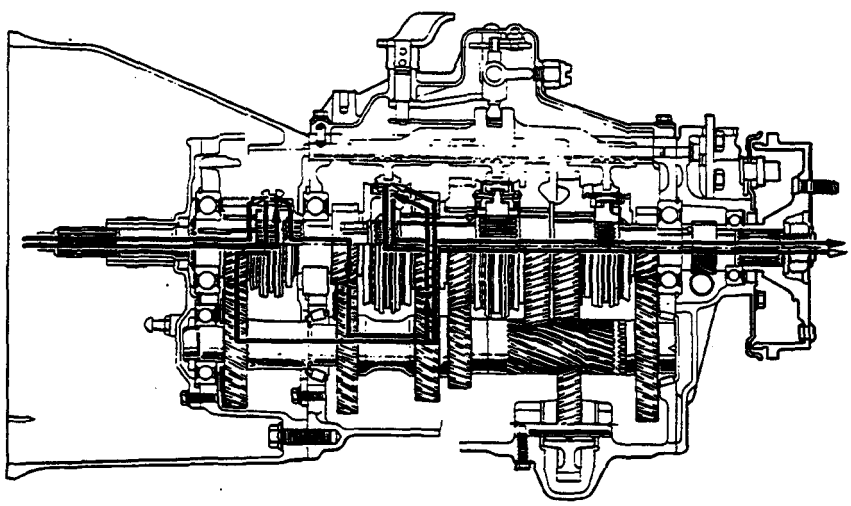
1ST



2ND



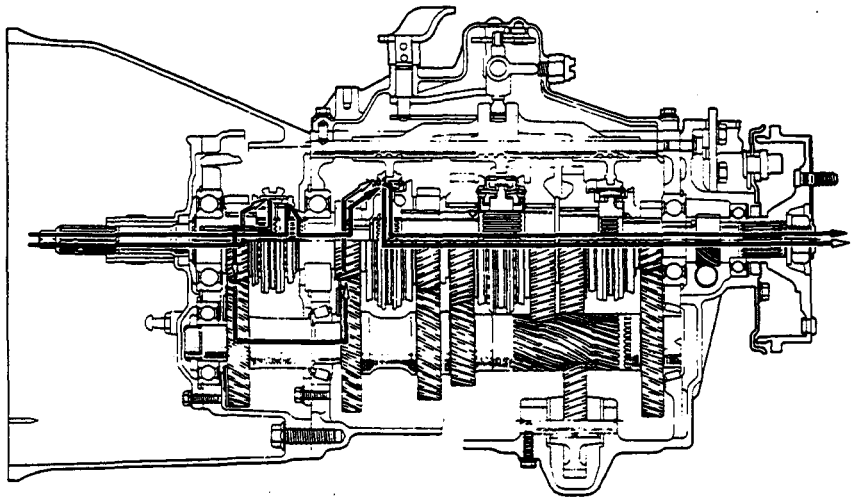
3RD



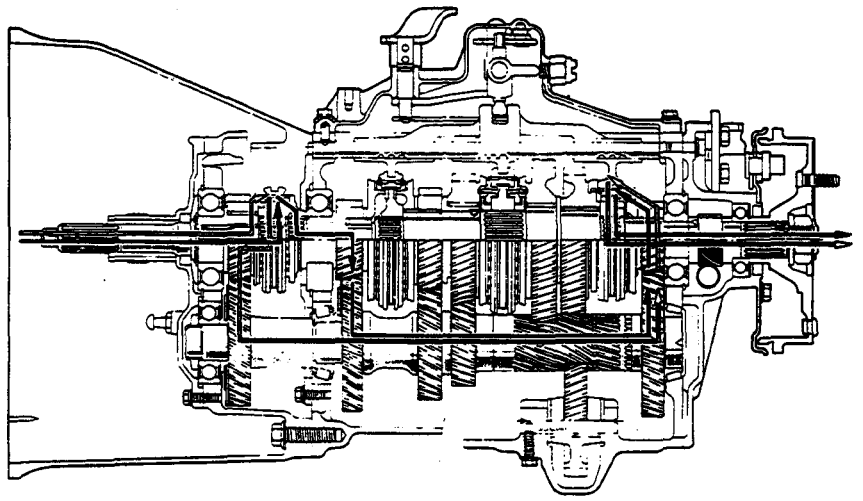
9TG0J2-009

Power : ➡
Economy: ⇨

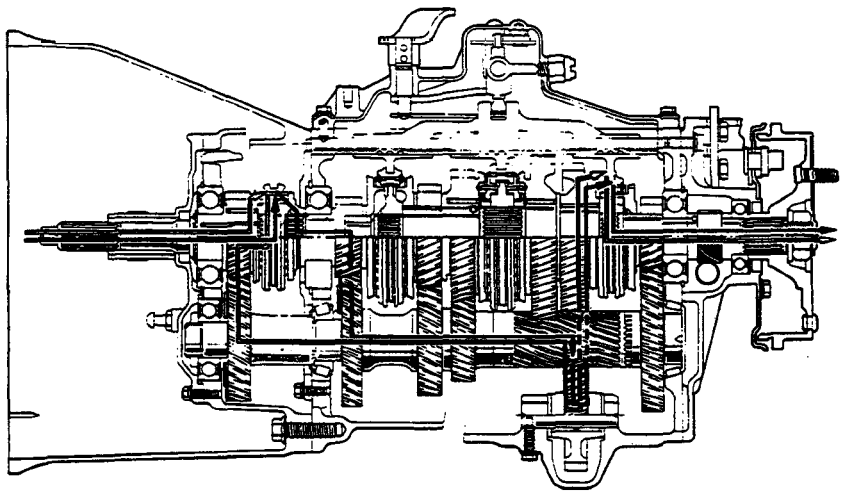
4TH



5TH



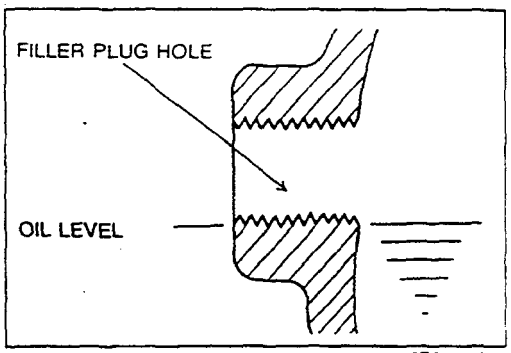
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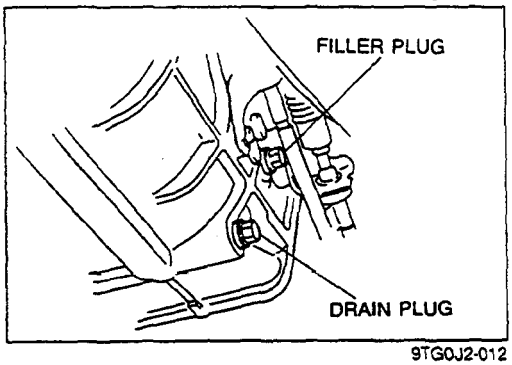
TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Abnormal noise	Insufficient oil	Add oil	J2–13
	Deterioration of oil quality	Replace with specified oil	J2–13
	Worn bearing	Replace	J2–32
	Worn contact surface of countershaft gear	Replace	J2–30
	Worn contact surface of gear	Replace	J2–30
	Excessive gear backlash	Replace	—
	Damaged gear teeth	Replace	J2–30
	Foreign matter in transmission	Repair or replace	
Difficult to shift	Bent shift rod	Replace	—
	Insufficient oil	Add oil	J2–13
	Deterioration of oil quality	Replace with specified oil	J2–13
	Worn or loose shift fork and shift rod	Replace	—
	Worn synchronizer ring	Replace	J2–31
	Worn synchronizer cone of gear	Replace	J2–31
	Poor contact of synchronizer ring and gear cone	Replace	J2–31
	Excessive longitudinal play of gears	Replace	—
	Worn bearing	Replace	J2–32
	Fatigued synchronizer key spring	Replace	—
Jumps out of gear	Weak detent ball spring	Replace	—
	Worn shift fork	Replace	J2–31
	Worn clutch hub sleeve	Replace	J2–31
	Excessive gear backlash	Replace	—
	Worn bearing	Replace	J2–32
Shift lever does not function smoothly or is difficult to operate	Stuck control cable	Replace	J2–47
	Malfunction of control cable ball joint	Replace	J2–47
Selector lever does not function smoothly or is difficult to operate	Stuck control cable	Replace	J2–49
	Malfunction of control cable ball joint	Replace	J2–49

9TG0J2-010



9TG0J2-011



9TG0J2-012

TRANSMISSION OIL

INSPECTION

Caution
- **Position the vehicle on level ground.**

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 from filler plug.

Specified oil:
Type API Service GL-4 or GL-5
SAE 75W-90

3. Wipe clean and apply sealant to the plug threads before installing the plug.

Tightening torque:
33—51 N·m (3.4—5.2 m-kg, 25—38 ft-lb)

REPLACEMENT

1. Remove the drain plug, and drain the oil into a suitable container.
2. Wipe clean and apply sealant to the plug threads.
3. Install the drain plug.

Tightening torque:
33—51 N·m (3.4—5.2 m-kg, 25—38 ft-lb)

4. Add the specified oil from the filler plug hole until the level reaches the bottom of the hole.

Specified oil:
Type API Service GL-4 or GL-5
SAE 75W-90
Capacity Without sub-transmission
4.5 liters (4.8 US qt, 4.0 Imp qt)
With sub-transmission
4.2 liters (4.4 US qt, 3.7 Imp qt)

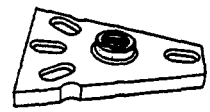
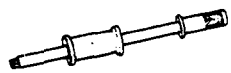
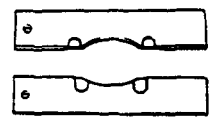
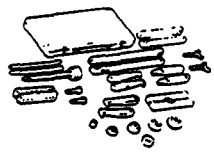
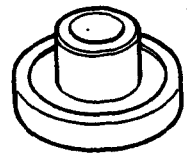
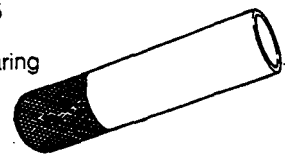
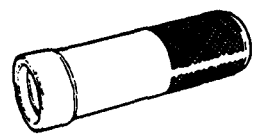
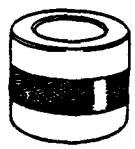
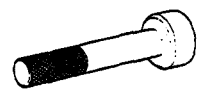
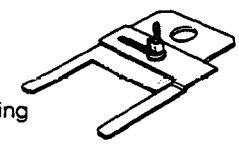
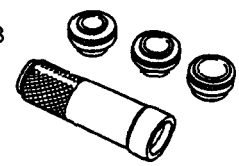
5. Apply sealant to the filler plug threads.
6. Install the filler plug.

Tightening torque:
33—51 N·m (3.4—5.2 m-kg, 25—38 ft-lb)

9TG0J2-013

TRANSMISSION

PREPARATION
SST

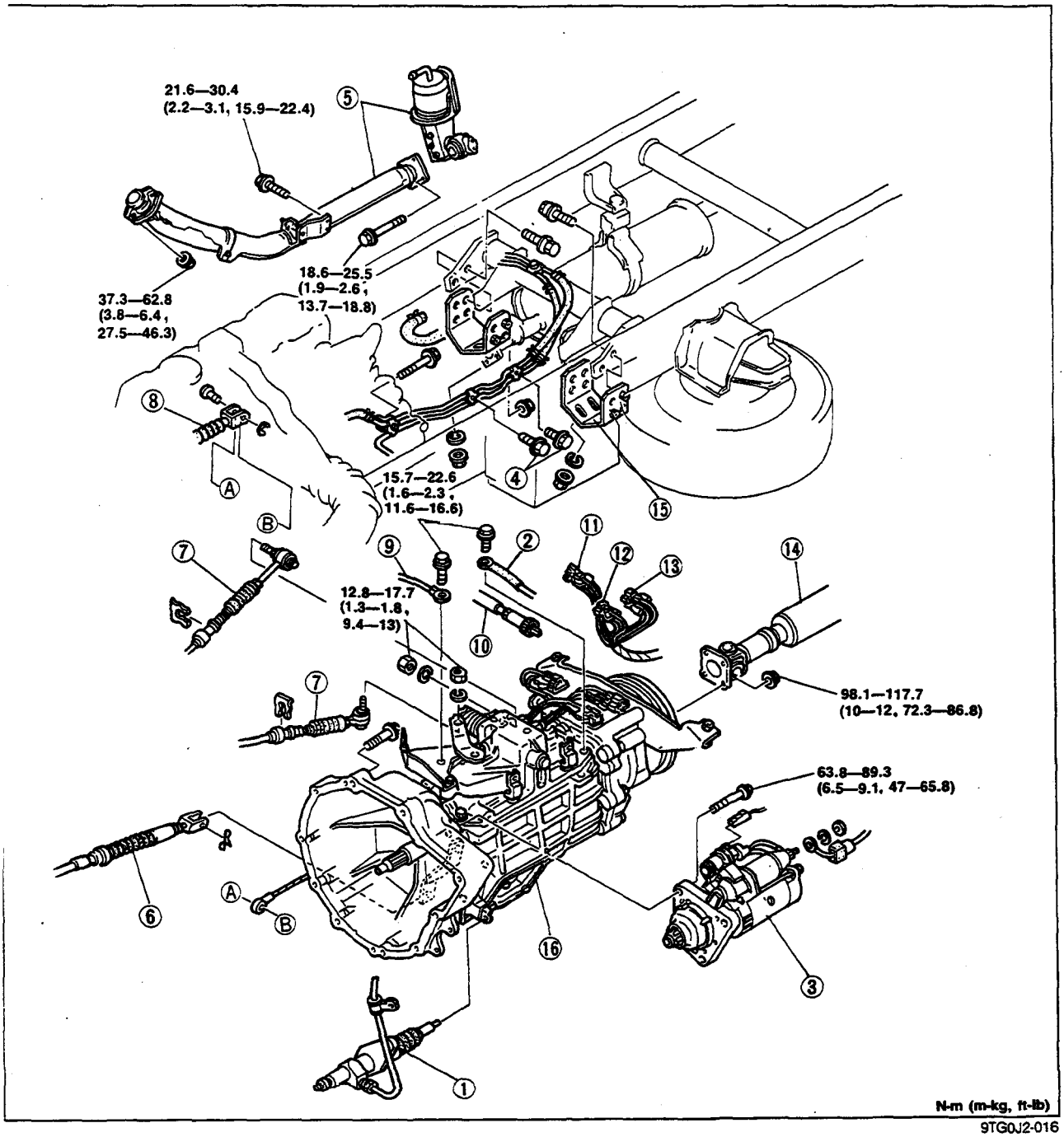
49 S120 710 Holder, coupling flange 	For removal of center brake drum locknut	49 8501 631A Attachment, rear axle shaft puller 	For removal of center brake drum
49 0223 630B Puller, rear axle shaft 	For removal of center brake drum locknut	49 F026 103 Puller, wheel hub 	For removal of clutch hub
49 0839 425C Puller set, bearing 	For removal of bearing	49 H025 001 Installer, bearing 	For installation of bearing
49 0727 415 Installer, bearing 	For installation of bearing	49 F401 331 Body (Part of 49 F401 330B) 	For installation of bearing
49 S120 620 Installer, rear shaft bearing 	For installation of bearing	49 0600 330 Installer, transmission bearing 	For installation of bearing
49 W501 445 Holder, synchronizer ring 	For installation of bearing	49 F401 330B Installer set, bearing 	For installation of clutch hub

9TG0J2-014

REMOVAL / INSTALLATION

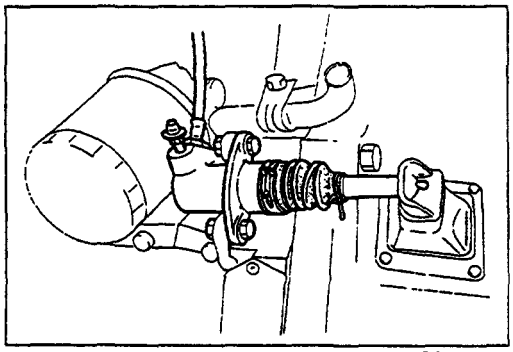
1. Disconnect the negative battery cable.
2. Raise the vehicle and support it with safety stands.
3. Drain the transmission oil into a suitable container.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Add the specified amount of the specified transmission oil. (Refer to page J2–13.)
7. Warm up the engine and transmission, and inspect for oil leakage and transmission operation.

9TG0J2-015



9TG0J2-016

1. Clutch release cylinder
   Removal Note ..... page J2–16
2. Ground wire
   Installation Note ..... page J2–17
3. Starter
4. Fuel pipe clip bolt
5. Exhaust pipe and power chamber
6. Sub-selector cable
7. Shift/selector cable
8. Parking brake cable
9. Ground wire
   Installation Note ..... page J2–17
10. Speedometer cable
11. Back-up light switch connector
12. Neutral switch connector
13. Sub-transmission switch connector
14. Propeller shaft
    Service ..... Section L
15. Transmission mount bracket
16. Transmission
    Removal Note ..... page J2–16
    Disassembly ..... page J2–18
    Inspection ..... page J2–30
    Assembly ..... page J2–33
    Installation Note ..... page J2–16

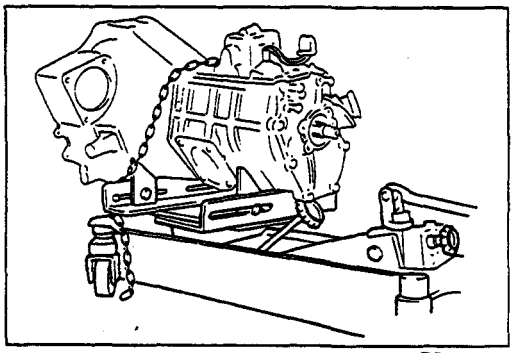


9TG0J2-017

Removal Note
Clutch release cylinder
1. Remove the mounting bolts and nuts.
2. Move the clutch release cylinder out of the way to remove the transmission.

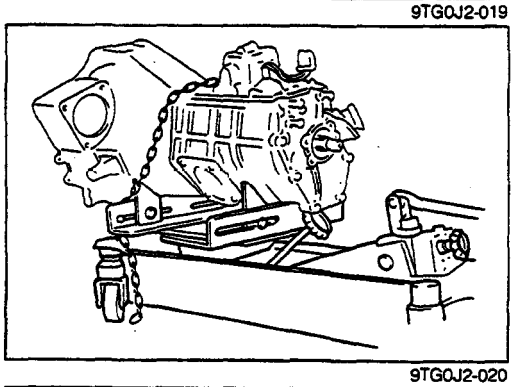
Transmission
1. Support the engine with a jack under the oil pan.
2. Support the transmission with a transmission jack.
3. Remove the transmission mounting bolts.
4. Remove the transmission from under the vehicle.

9TG0J2-018



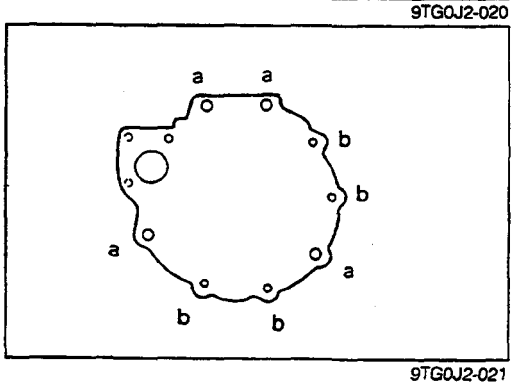
9TG0J2-019

4. Remove the transmission from under the vehicle.



9TG0J2-020

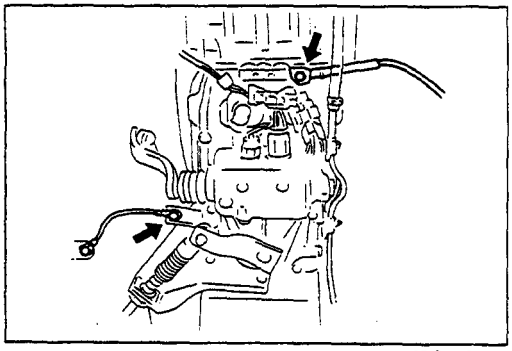
Installation Note
Transmission
1. Install the transmission with the transmission jack.



9TG0J2-021

2. Tighten the transmission mounting bolts.

Tightening torque:
a: 89—117 N·m (9.1—11.9 m-kg, 66—86 ft-lb)
b: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



9TG0J2-022

Ground wire

1. Install the ground wires.

Tightening torque:
16—23 N·m (1.6—2.3 m-kg, 12—17 ft-lb)

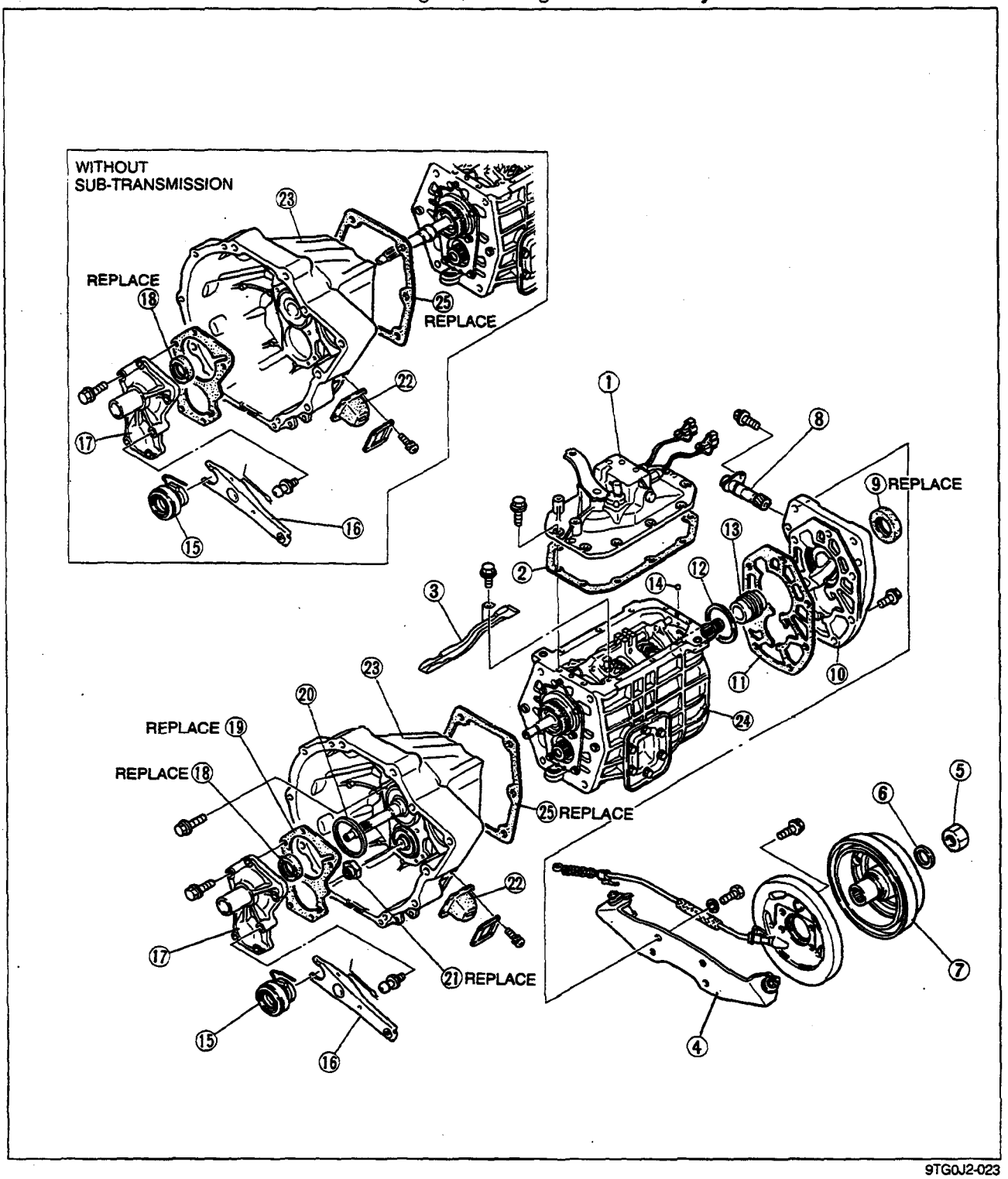
DISASSEMBLY

Precaution

1. Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvent before disassembly.
2. Clean the removed parts (except sealed bearings) and all sealing surfaces with cleaning solvent, and dry with compressed air.
   Clean out all holes and passages with a compressed air, and check that there are no obstructions.
3. Wear eye protection when using compressed air to clean components.

Housing Components

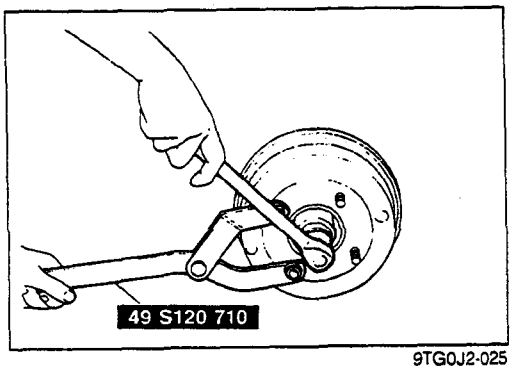
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.



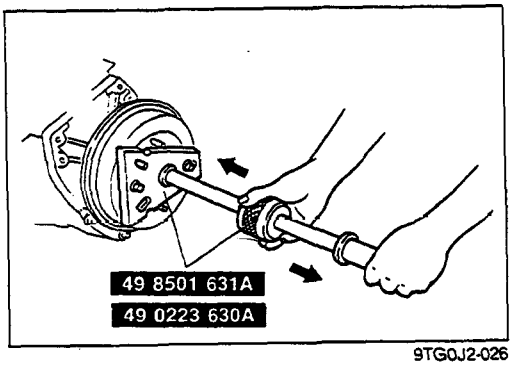
9TG0J2-023

1. Top cover assembly
   Disassembly ..... page J2–21
2. Gasket
3. Oil guide
4. Transmission mount
5. Locknut (Rear)
6. Washer
7. Center brake drum
   Disassembly Note ..... page J2–19
8. Speedometer driven gear
9. Oil seal (Rear)
   Inspect for damage
   On-vehicle replacement ..... page J2–20
10. Rear cover
11. Gasket
12. Adjustment shim
13. Speedometer drive gear
14. Steel ball
15. Release bearing
    Inspection ..... page J2–32
16. Release fork
17. Front cover
18. Oil seal (Front)
    Inspect for damage
19. Gasket
20. Adjustment shim
21. Locknut (Front)
    Disassembly Note ..... page J2–19
22. Dust boot
23. Clutch housing assembly
    Disassembly ..... page J2–22
24. Transmission case assembly
    Disassembly ..... page J2–26
25. Gasket

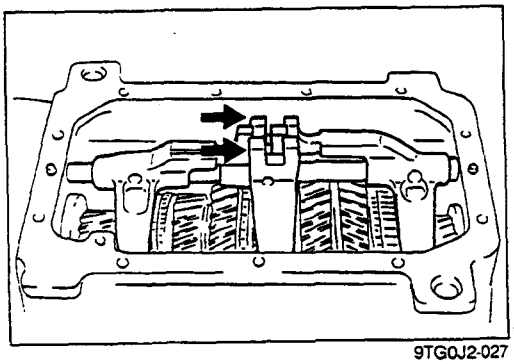
9TG0J2-024



9TG0J2-025



9TG0J2-026



9TG0J2-027

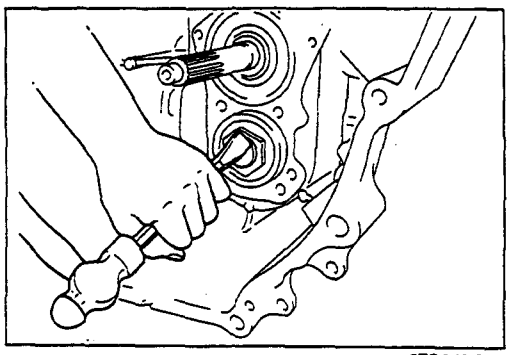
Disassembly Note
Center brake drum

1. Hold the center brake drum with the **SST**, and remove the locknut.

2. Remove the center brake drum with the **SST**.

Locknut (Front)

1. Shift the gears so that the transmission is locked.



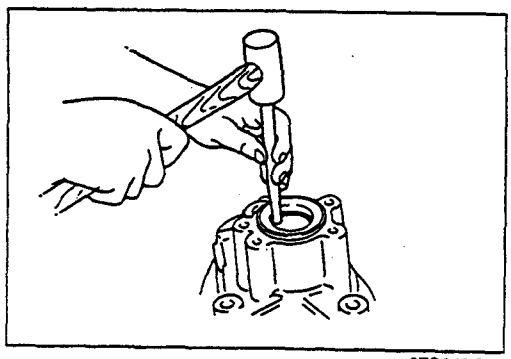
9TG0J2-028

Note
- **Do not reuse the locknut.**

2. Uncrimp the locknut and remove it from the counter high gear.

On-vehicle replacement
Oil seal (Rear)
1. Remove the propeller shaft. (Refer to Section L.)
2. Remove the center brake drum. (Refer to page J2–19.)
3. Remove the center brake assembly, and suspend it with a rope.

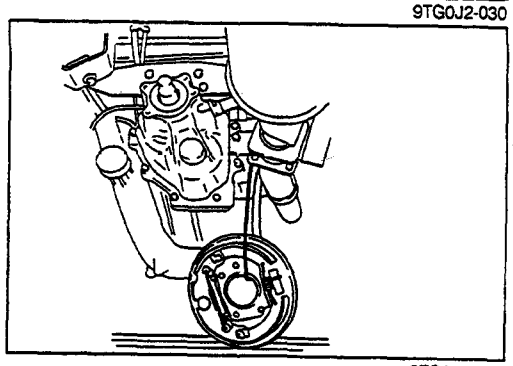
9TG0J2-029



9TG0J2-030

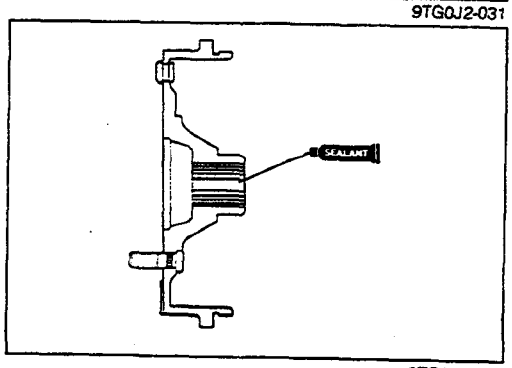
Caution
- **Do not damage the mainshaft splines.**

4. Remove the oil seal.
5. Apply transmission oil to outer edge and lip surface of the new oil seal.



9TG0J2-031

6. Install the new oil seal with the **SST**.
7. Install the center brake assembly.

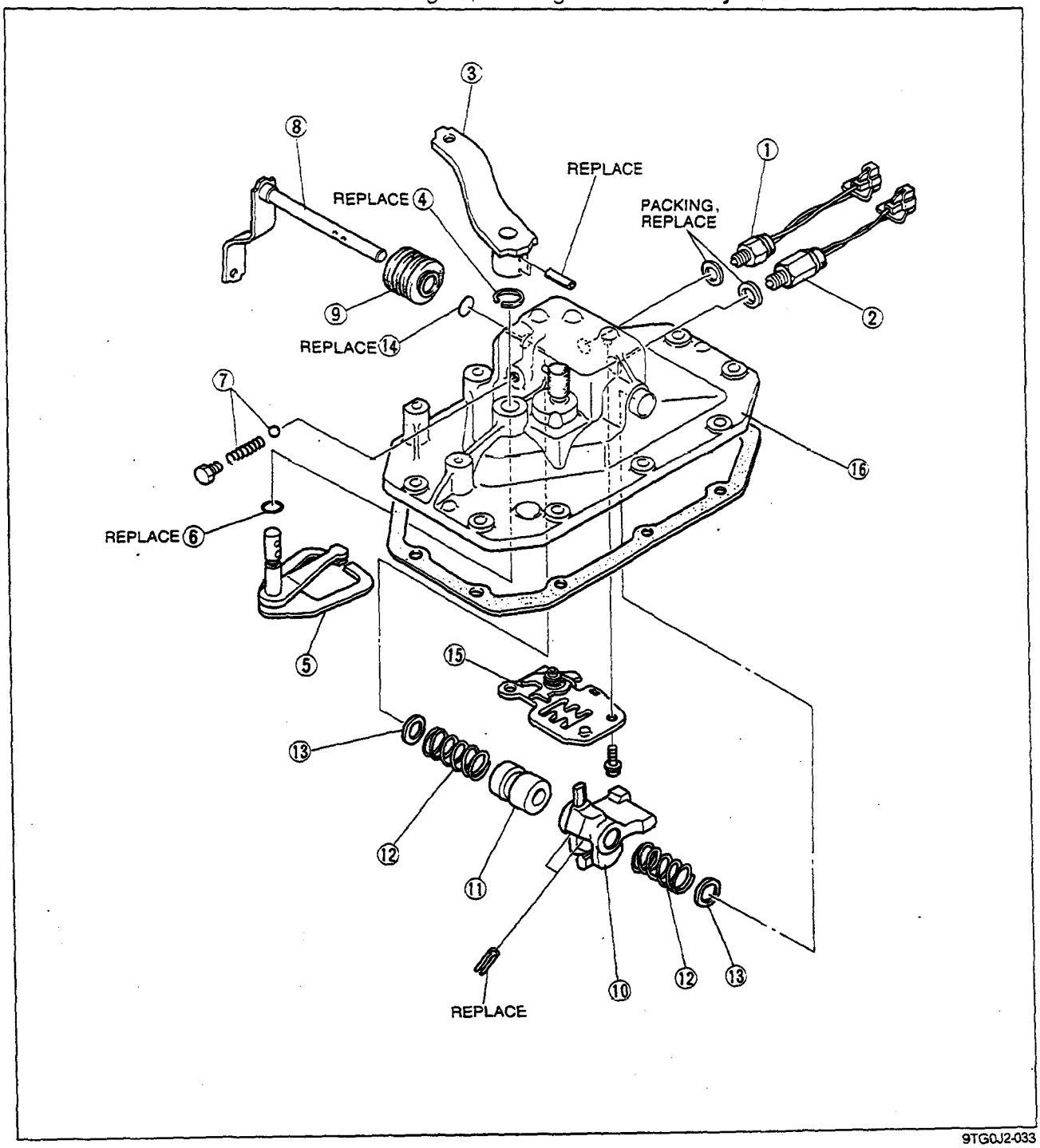


9TG0J2-032

8. Apply sealant to the center brake drum splines, and install the drum.
9. Install the propeller shaft. (Refer to Section L.)

Top Cover Components

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

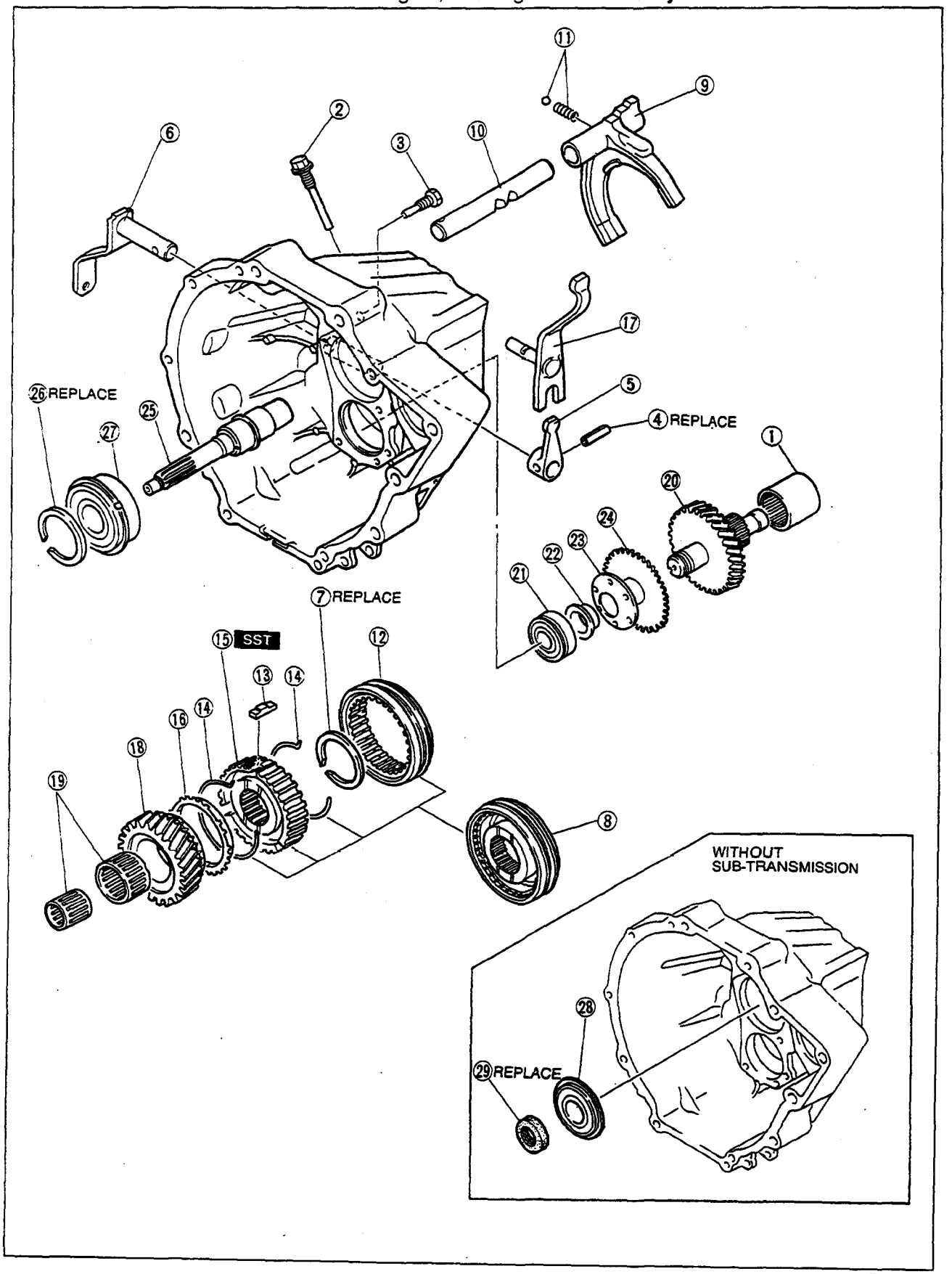


9TG0J2-033

1. Back-up light switch
2. Neutral switch
3. Select lever
4. Snap ring
5. Selection arm
   Inspection..... page J2–31
6. O-ring
7. Spring and steel ball
8. Control lever
9. Dust boot
10. Change lever
    Inspection..... page J2–30
11. Reverse lock stopper
12. Spring
13. Washer
14. Oil seal
15. Guide plate
16. Top cover

Sub-transmission Components

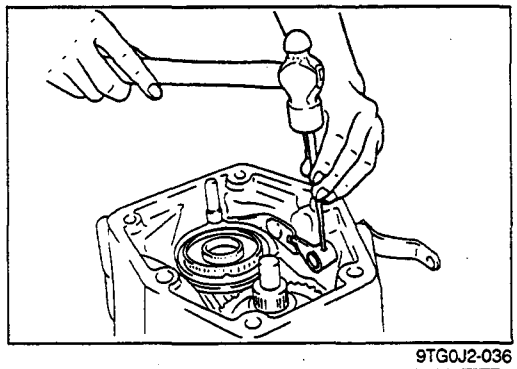
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.



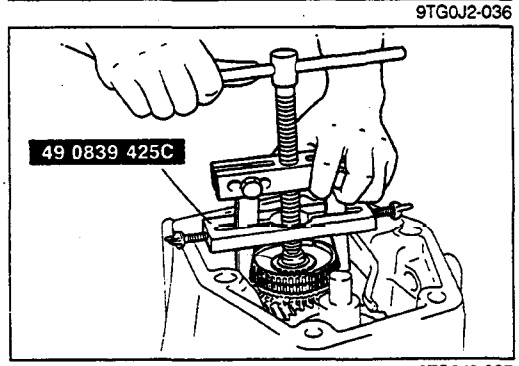
9TG0J2-034

1. Sleeve joint
2. Shift rod set bolt
3. Counter lever set bolt
4. Roll pin
5. Inner shift lever
   Disassembly Note ..... page J2–23
6. Outer shift lever
7. Snap ring
8. Clutch hub assembly
   Disassembly Note ..... page J2–23
   Inspection ..... page J2–31
9. Shift fork
   Inspection ..... page J2–31
10. Shift fork rod
11. Steel ball and spring
12. Hub sleeve
13. Synchronizer key
14. Synchronizer key spring
15. Clutch hub
16. Synchronizer ring (High gear)
    Inspection ..... page J2–31
17. Counter lever
18. High gear
    Inspection ..... page J2–30
19. Needle bearing
    Inspection ..... page J2–32
20. Counter high gear
    Disassembly Note ..... page J2–23
    Inspection ..... page J2–30
21. Ball bearing
    Inspection ..... page J2–32
22. Spacer
    Disassembly Note ..... page J2–24
23. Diaphragm spring
24. Friction gear
25. Input shaft
    Disassembly Note ..... page J2–24
26. Snap ring
27. Ball bearing
    Inspection ..... page J2–32
28. Guide cover
29. Oil seal

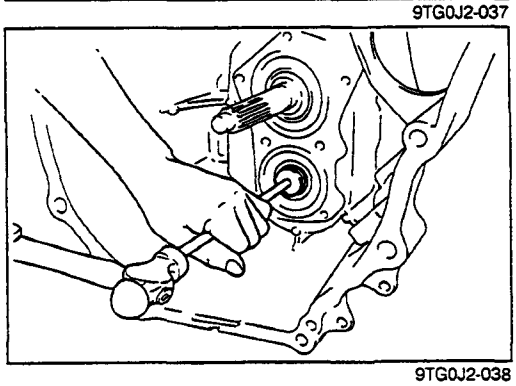
9TG0J2-035



9TG0J2-036



9TG0J2-037



9TG0J2-038

Disassembly Note

Inner shift lever (Roll pin)

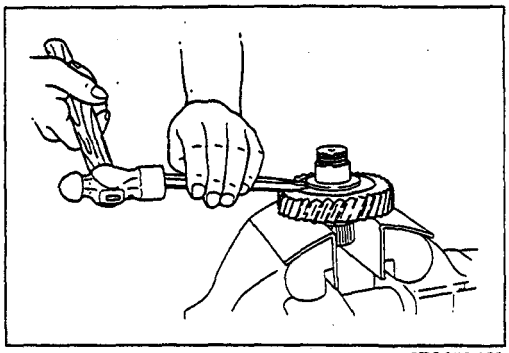
1. Remove the roll pin and remove the inner shift lever from the outer shift lever.

Clutch hub assembly

1. Use the **SST** to remove the clutch hub if it is tight.

Counter high gear

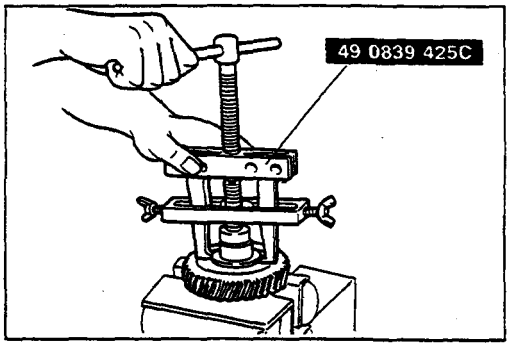
1. Remove the counter high gear assembly by driving it out the front.

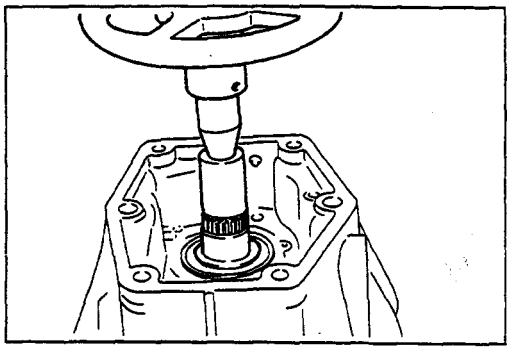


9TG0J2-039

Spacer

1. Remove the spacer from the counter high gear with the chisel and the **SST**.

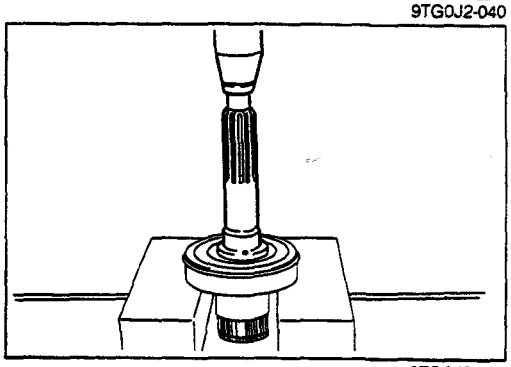




9TG0J2-040

Input shaft

1. Remove the input shaft assembly with a press.

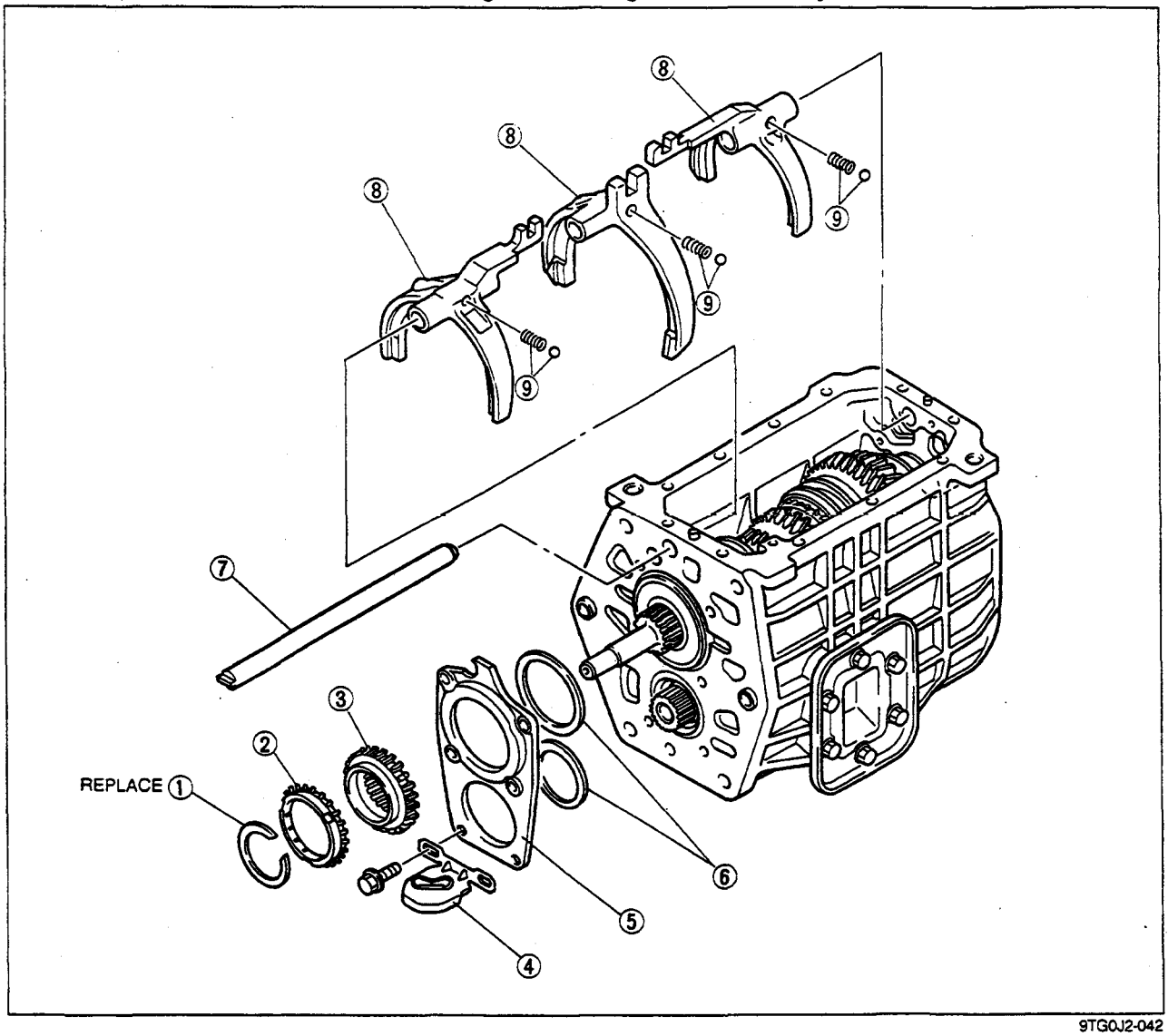


9TG0J2-041

2. Remove the snap ring.
3. Remove the input shaft with a press.

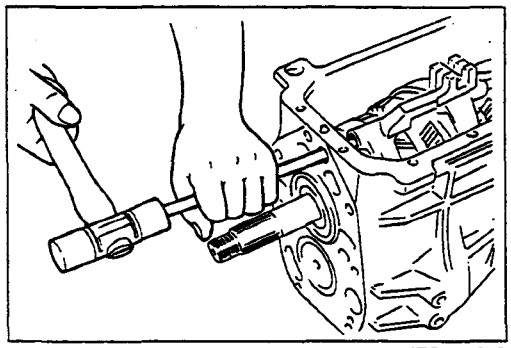
Shift Components

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



9TG0J2-042

1. Snap ring
2. Synchronizer ring
   (Input clutch)
   Inspection..... page J2–31
3. Input clutch
4. Magnet
5. Bearing cover
6. Adjustment shim
7. Shift rod
   Disassembly Note..... page J2–25
8. Shift fork
   Inspection..... page J2–31
9. Steel ball and spring



9TG0J2-043

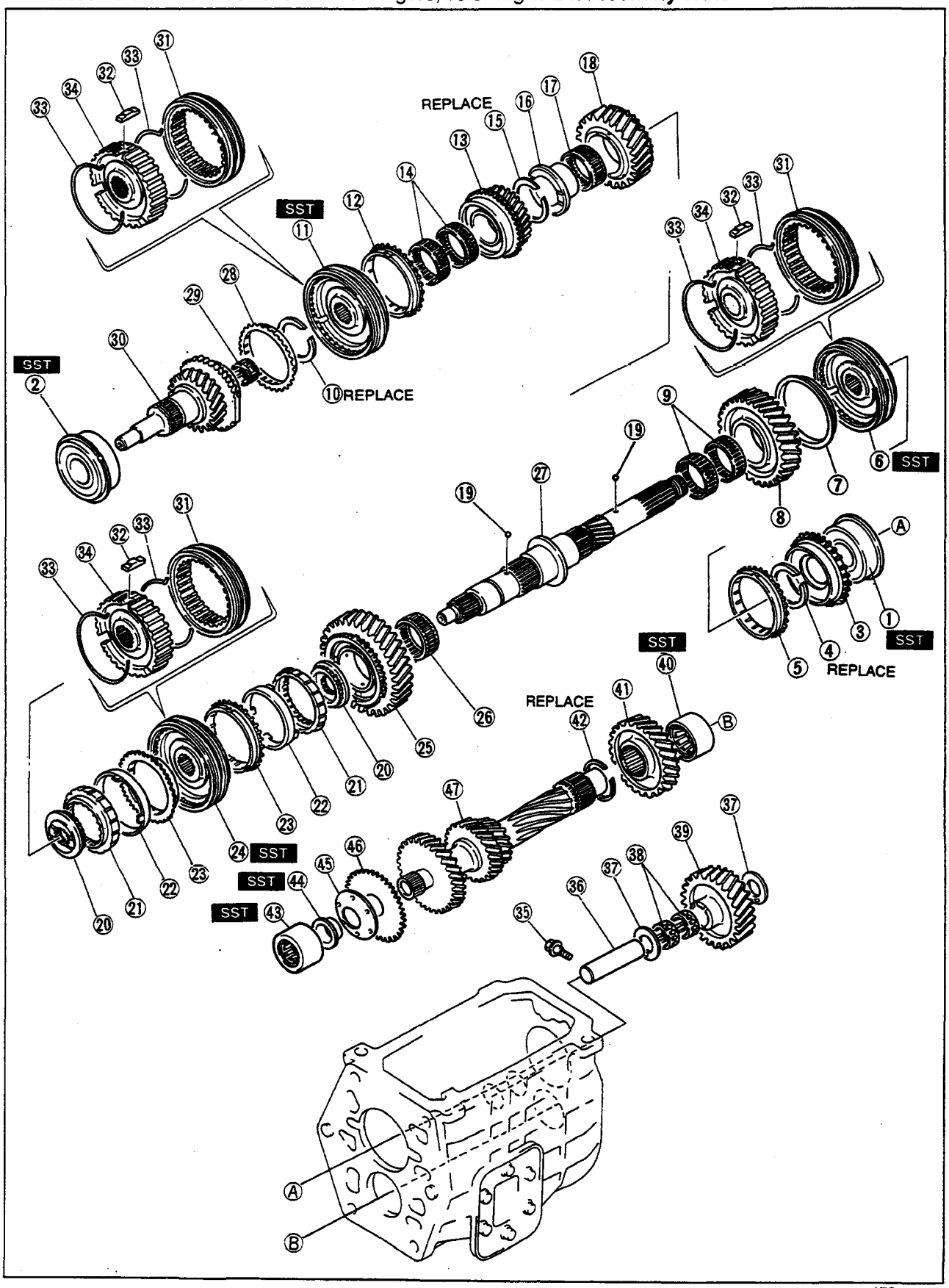
Disassembly Note
Shift rod

Note
- **The steel detent balls will come out. Be careful not to lose them.**

1. Remove the shift rod with the suitable bar and a plastic hammer.

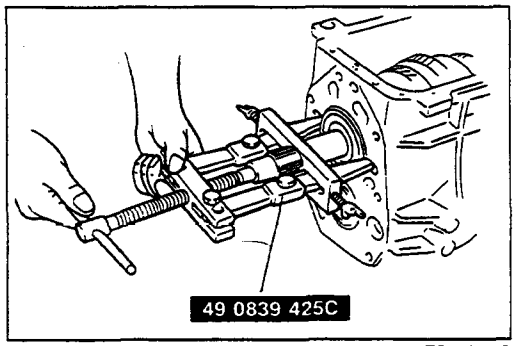
Mainshaft Components

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

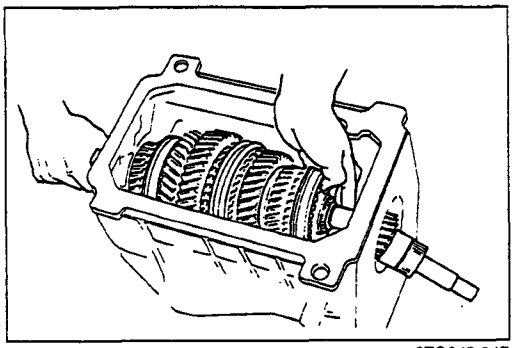


1. Mainshaft bearing
   Disassembly Note ..... page J2–27
   Inspection ..... page J2–32
2. Main drive gear bearing
   Disassembly Note ..... page J2–27
3. 5th gear
   Inspection ..... page J2–30
4. Snap ring
5. Synchronizer ring (5th)
   Inspection ..... page J2–31
6. Clutch hub assembly (5th/reverse)
   Disassembly Note ..... page J2–28
   Inspection ..... page J2–31
7. Retaining ring
8. Reverse gear
   Inspection ..... page J2–30
9. Needle bearing
   Inspection ..... page J2–32
10. Snap ring
11. Clutch hub assembly (3rd/4th)
    Disassembly Note ..... page J2–28
    Inspection ..... page J2–31
12. Synchronizer ring (3rd)
    Inspection ..... page J2–31
13. 3rd gear
    Inspection ..... page J2–30
14. Needle bearing
    Inspection ..... page J2–32
15. Snap ring
16. Gear sleeve
17. Needle bearing
    Inspection ..... page J2–32
18. 2nd gear
    Inspection ..... page J2–30
19. Steel ball
20. Inner cone hub
21. Inner cone
22. Double cone
    Inspection ..... page J2–32
23. Outer cone
24. Clutch hub assembly (1st/2nd)
    Disassembly Note ..... page J2–28
    Inspection ..... page J2–31
25. 1st gear
    Inspection ..... page J2–30
26. Needle bearing
    Inspection ..... page J2–32
27. Mainshaft
    Inspection ..... page J2–30
28. Synchronizer ring (4th)
    Inspection ..... page J2–31
29. Needle bearing
    Inspection ..... page J2–32
30. Main drive gear
    Inspection ..... page J2–30
31. Hub sleeve
32. Synchronizer key
33. Synchronizer key spring
34. Clutch hub
35. Bolt
36. Reverse idler gear shaft
37. Thrust washer
38. Needle bearing
    Inspection ..... page J2–32
39. Reverse idler gear
    Inspection ..... page J2–30
40. Countershaft bearing (Rear)
    Disassembly Note ..... page J2–29
    Inspection ..... page J2–32
41. Counter 5th gear
    Inspection ..... page J2–30
42. Snap ring
43. Countershaft bearing (Front)
    Disassembly Note ..... page J2–29
    Inspection ..... page J2–32
44. Spacer
    Disassembly Note ..... page J2–29
45. Diaphragm spring
46. Friction gear
47. Countershaft gear
    Inspection ..... page J2–30

9TG0J2-045



9TG0J2-046



9TG0J2-047

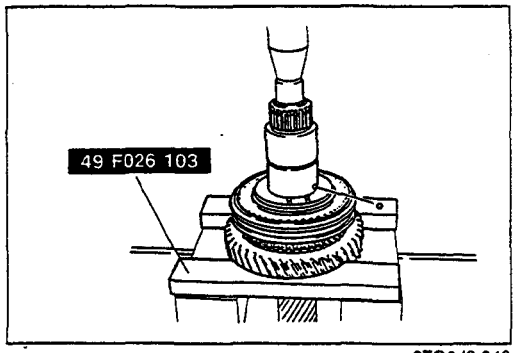
Disassembly Note

Mainshaft bearing and main drive gear bearing

1. Turn the bearing snap rings so that the ends are **90°** to the case grooves.
2. Remove the mainshaft bearing and main drive gear bearing with the **SST**.

Mainshaft assembly

1. Remove the mainshaft assembly from the transmission case.

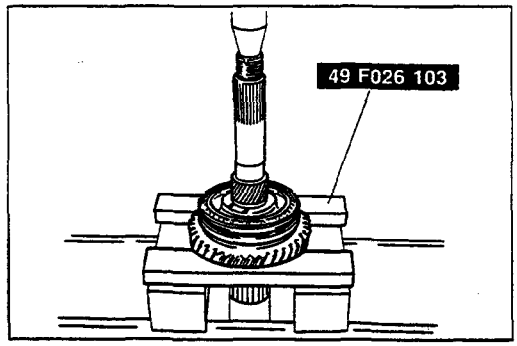


9TG0J2-048

Clutch hub assembly (1st/2nd)

Caution
- **Hold the mainshaft with one hand so that it does not fall.**

1. Press the mainshaft out of the clutch hub assembly (1st/2nd) and 2nd gear with the **SST**.

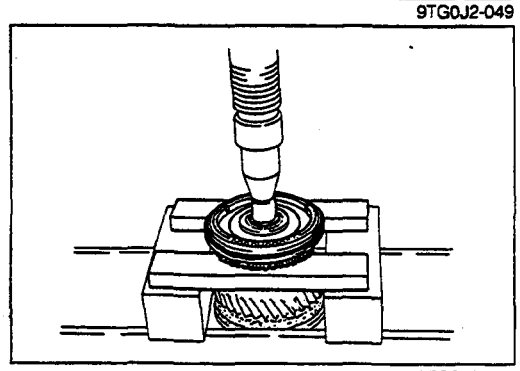


9TG0J2-049

Clutch hub assembly (5th/Reverse)
1. Position the **SST** between 1st and reverse gears.

Caution
- **Hold the mainshaft with one hand so that it does not fall.**

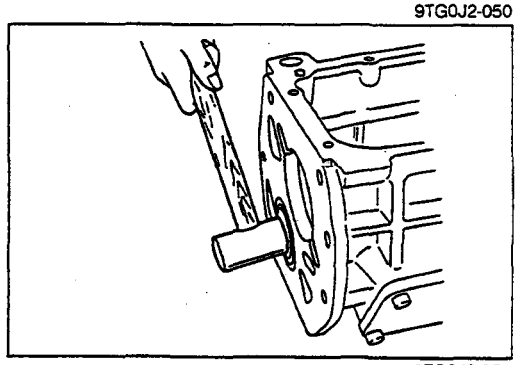
2. Press the mainshaft out of the clutch hub assembly (5th/reverse) and reverse gear.


9TG0J2-050

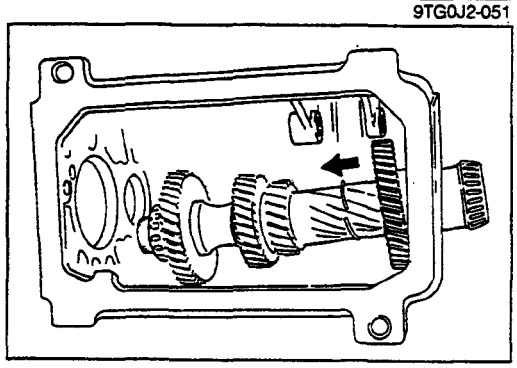
Clutch hub assembly (3rd/4th)
1. Position the **SST** between 2nd and 3rd gears.

Caution
- **Hold the mainshaft with one hand so that it does not fall.**

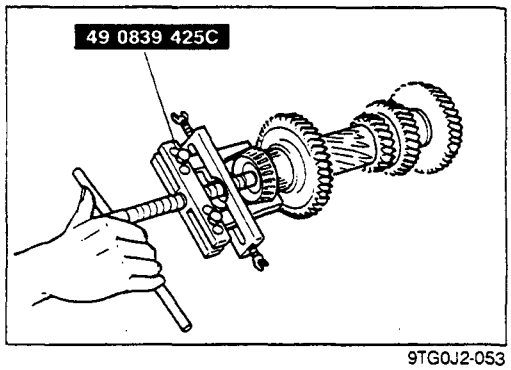
2. Press the mainshaft out of the clutch hub assembly (3rd/4th) and 3rd gear.


9TG0J2-051

Countershaft assembly
1. Remove the snap ring from the counter 5th gear and move the gear toward the front of the transmission.
2. Strike the countershaft at the front with a brass hammer to remove the bearing outer race from the rear.


9TG0J2-052

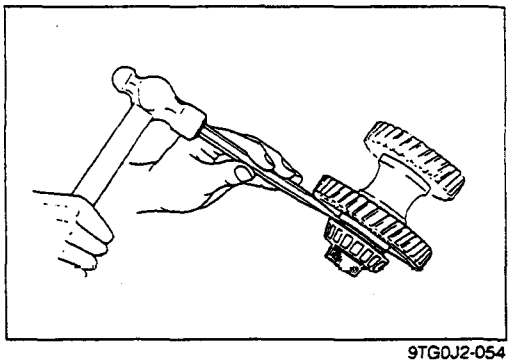
3. Remove the countershaft assembly from the transmission case.



9TG0J2-053

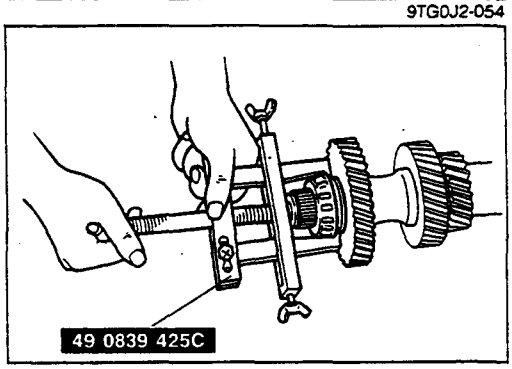
Countershaft bearing

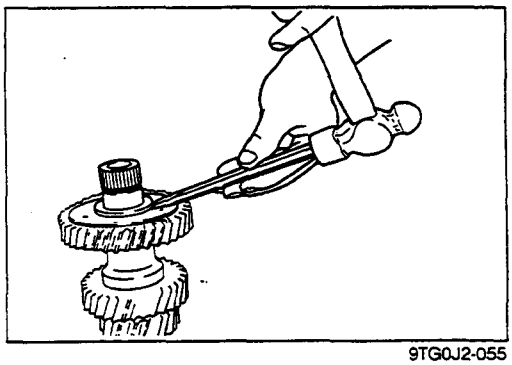
1. Remove the rear bearing inner race with the **SST**.



9TG0J2-054

2. Move the front bearing away from the spacer with a chisel.
3. Remove the front bearing with the **SST**.





9TG0J2-055

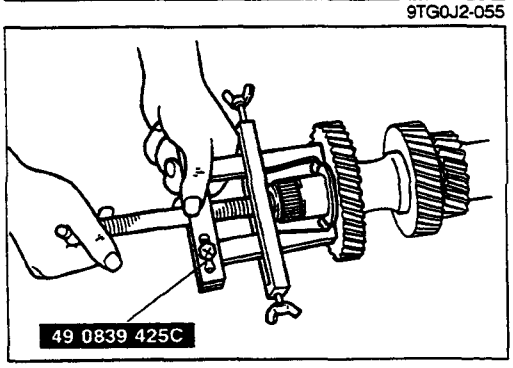
Spacer

1. Move the spacer away from the diaphragm spring with a chisel.

Note

- **Do not reuse the diaphragm spring.**

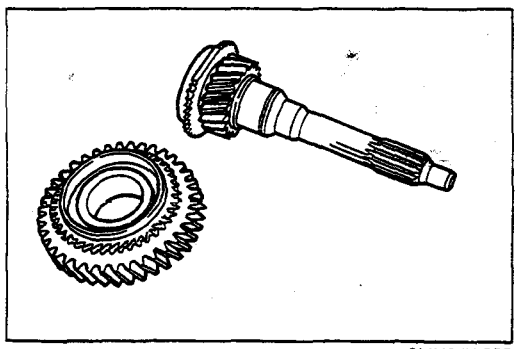
2. Remove the spacer with the **SST**.



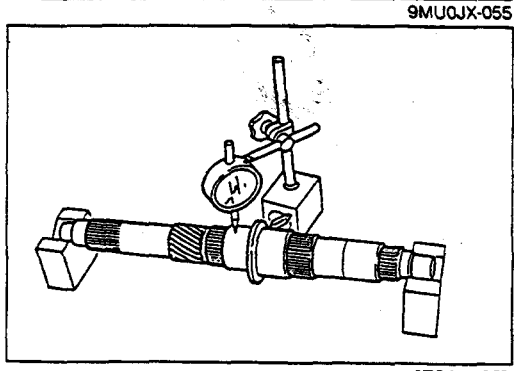
INSPECTION

Inspect all parts, and repair or replace as necessary.

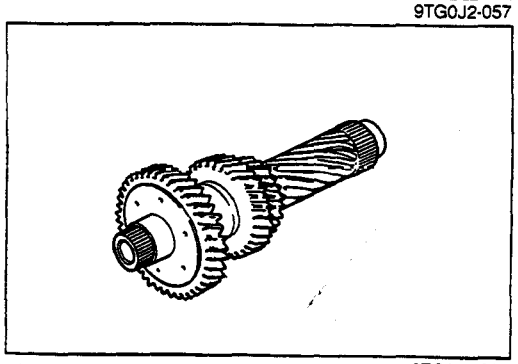
9TG0J2-056



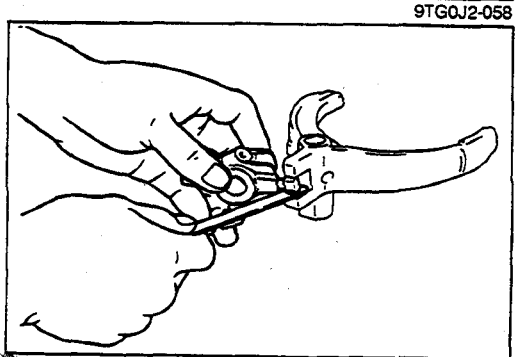
9MU0JX-055



9TG0J2-057



9TG0J2-058



9TG0J2-059

Each gear and main drive gear

1. Inspect the synchronizer cones for wear.
2. Inspect the gear teeth for damage, wear, and cracks.
3. Inspect the synchronizer ring matching teeth for damage or wear.
4. Inspect the main drive gear splines for damage and wear.

Mainshaft

1. Measure the mainshaft runout.

   Runout: 0.035mm (0.0014 in) max.

2. Inspect the splines for damage and wear.

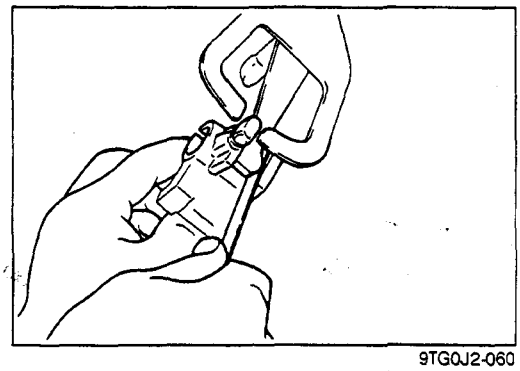
Countershaft

1. Inspect gear teeth for damage, wear and cracks.
2. Inspect the splines for damage and wear.

Shift fork and change lever

1. Measure the clearance between the shift fork and the change lever.

   Clearance: 0.8mm (0.032 in) max.

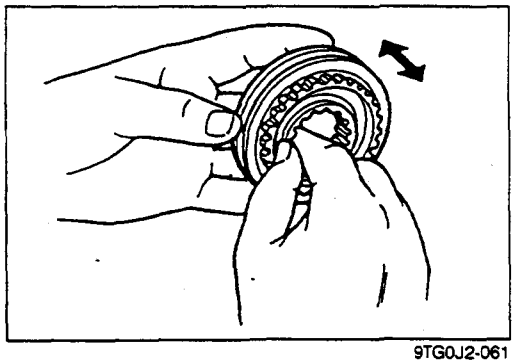


9TG0J2-060

Selection arm and change lever

1. Measure the clearance between the selection arm and the change lever.

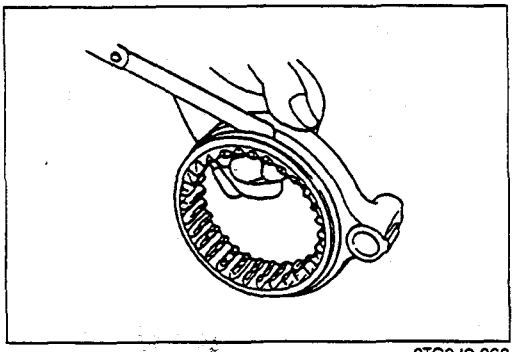
Clearance: 0.8mm (0.032 in) max.



9TG0J2-061

Clutch hub assembly

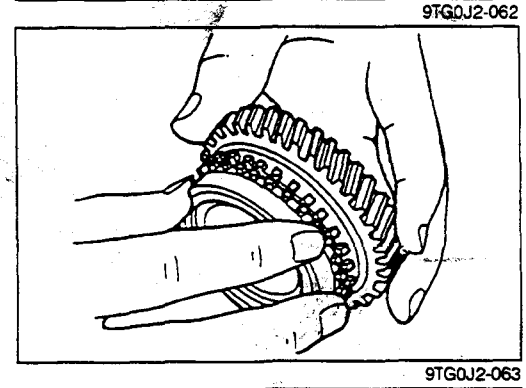
1. Inspect the clutch hub sleeve and hub operation.
2. Inspect the gear teeth for damage, wear and cracks.
3. Inspect the synchronizer keys for damage, wear and cracks.



9TG0J2-062

4. Measure the clearance between the hub sleeve and the release fork.

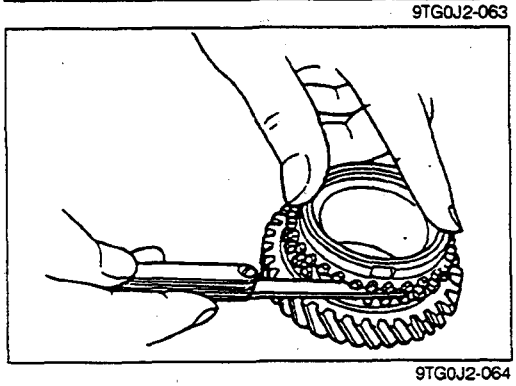
Clearance: 0.8mm (0.031) max.



9TG0J2-063

Synchronizer ring

1. Inspect individual synchronizer ring teeth for damage, wear and cracks.
2. Inspect the taper surface for wear and cracks.



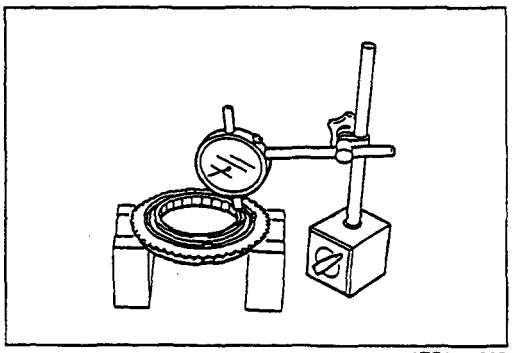
9TG0J2-064

Note

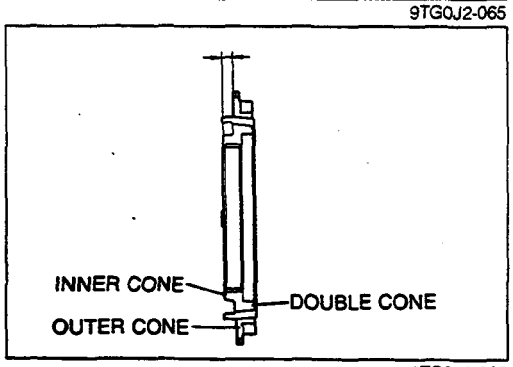
- **Set the synchronizer ring squarely in the gear; then measure around the circumference.**

3. Measure the clearance between the synchronizer ring and the flank surface of the gear.

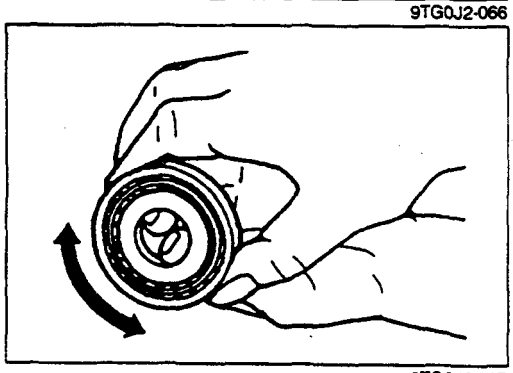
Clearance: 1.0mm (0.039 in) min.



9TG0J2-065



9TG0J2-066



9TG0J2-067

Double cone

Note
- **If not as specified, replace the assembly.**

1. Inspect the teeth for damage, wear and cracks.
2. Inspect the taper surface for wear and cracks.

Note
- **Measure around the circumference.**

3. Measure the height between the inner cone and the outer cone as shown in the figure.

Height: 2.8mm (0.110 in) min.

Bearing

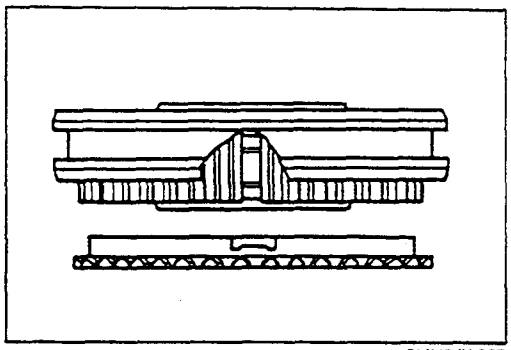
1. Inspect for damage or rough rotation.

ASSEMBLY

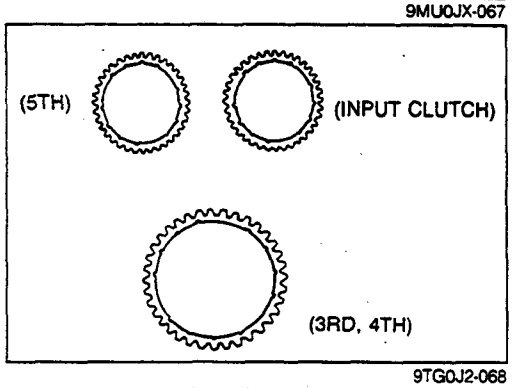
Precaution

1. All O-rings and gasket must be replaced with the new ones supplied in the overhaul kit.
2. 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.

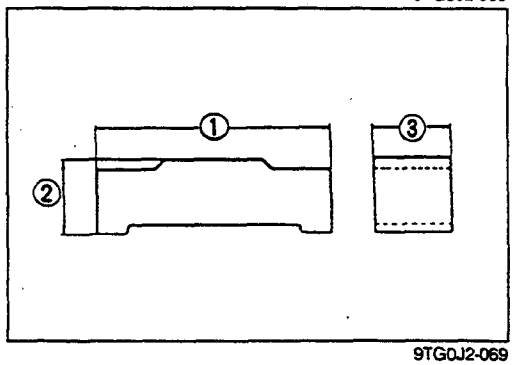
9MU0JX-066



9MU0JX-067



9TG0J2-068



9TG0J2-069

Clutch hub

Caution

- **Align the synchronizer ring grooves with the clutch hub keys during installation.**

Note

- **The synchronizer rings have the same basic shape. Carefully note these distinguishing features.**
  - **a) Sub-transmission synchronizer rings are the smallest.**
  - **b) 5th synchronizer ring is next larger.**
  - **c) 3rd and 4th are the biggest and are exactly the same.**

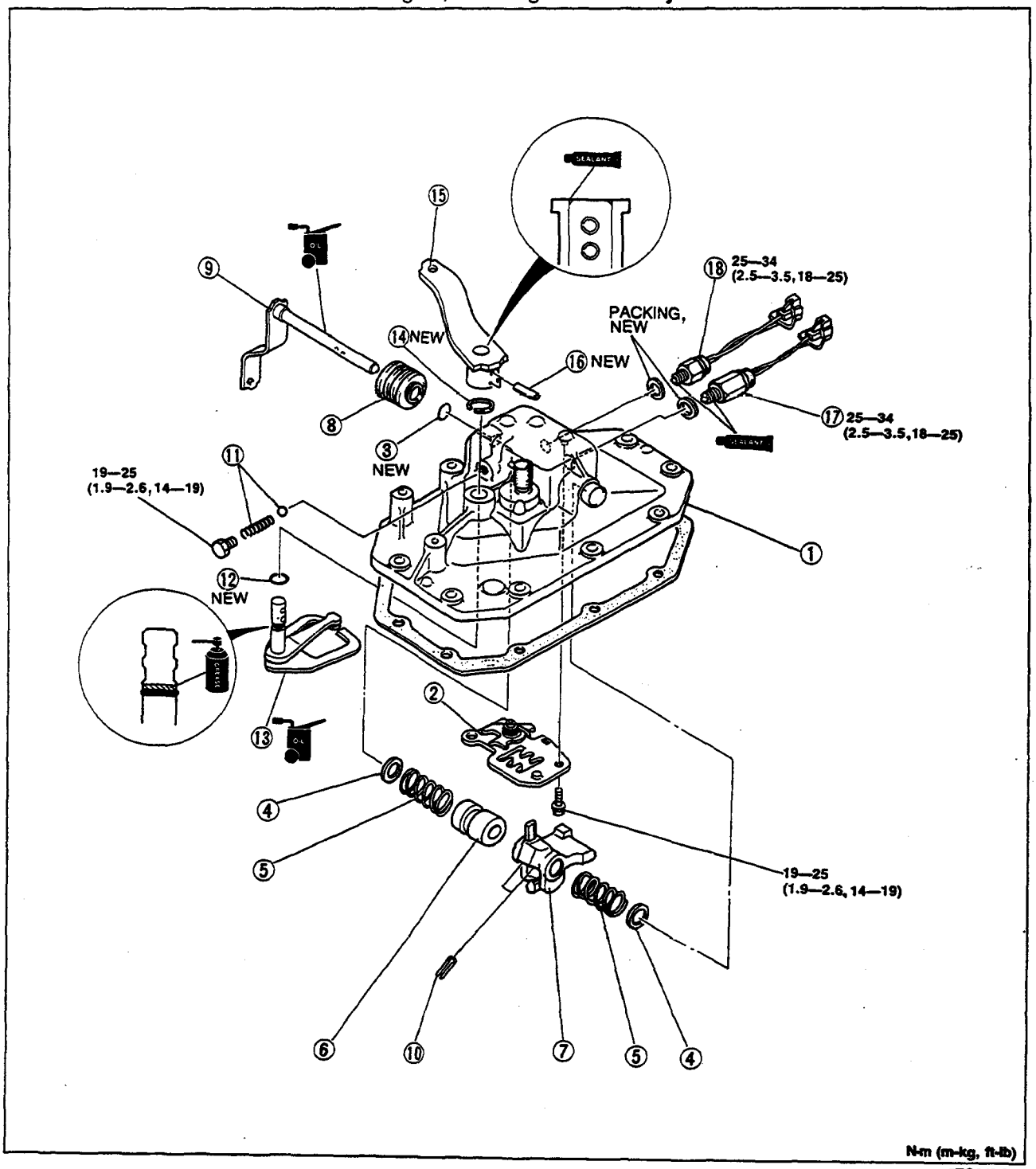
- **There are two types of synchronizer keys. Standard dimensions are as follows:**

mm (in)

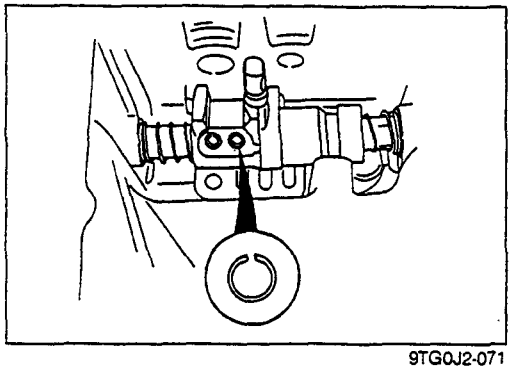
	①	②	③
1st, 2nd, 3rd, 4th, 5th and Reverse	18 (0.709)	5.45 (0.215)	6 (0.236)
Sub-transmission	17 (0.670)	4.25 (0.167)	5 (0.197)

Top Cover Components

1. Assemble in the order shown in the figure, referring to **Assembly Note**.

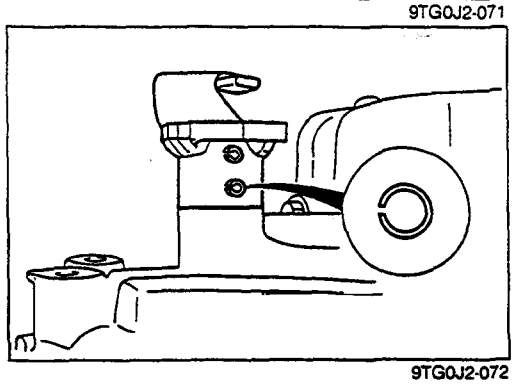


1. Top cover
2. Guide plate
3. Oil seal
4. Washer
5. Spring
6. Reverse lock stopper
7. Change lever
8. Dust boot
9. Control lever
10. Roll pin (Change lever) Assembly Note ..... page J2–35
11. Steel ball and spring
12. O-ring
13. Selection arm
14. Snap ring
15. Select lever
16. Roll pin (Select lever) Assembly Note ..... page J2–35
17. Neutral switch
18. Backup light switch



9TG0J2-071

Assembly Note
Roll pin (Change lever)
1. Install the roll pins as shown in the figure.

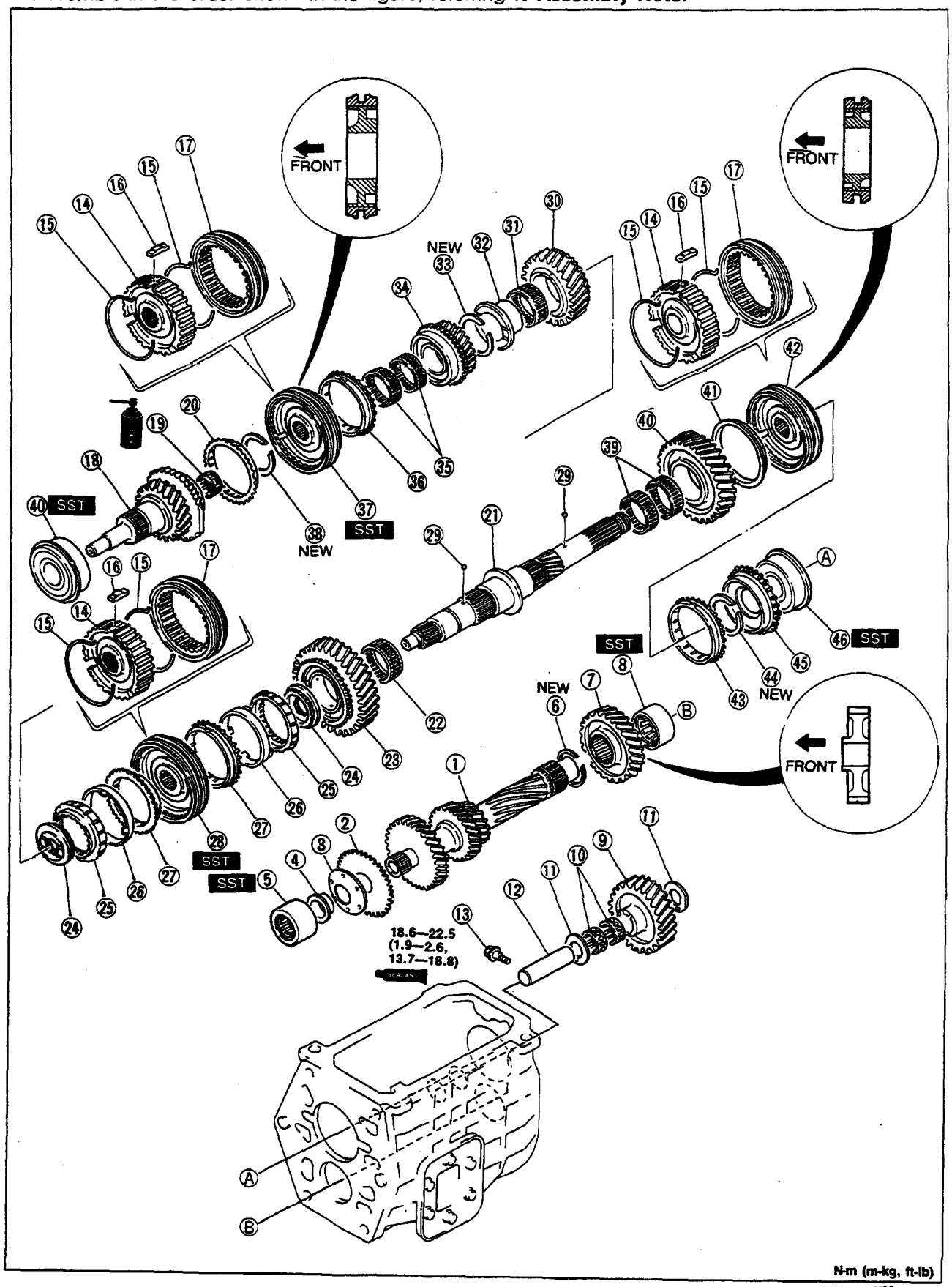


9TG0J2-072

Roll pin (Select lever)
1. Install the roll pins as shown in the figure.

Mainshaft Components

1. Assemble in the order shown in the figure, referring to **Assembly Note**.

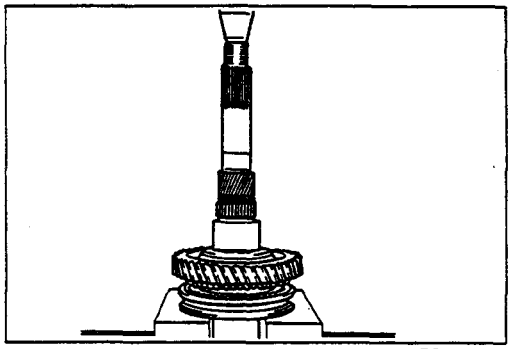


N·m (m-kg, ft-lb)

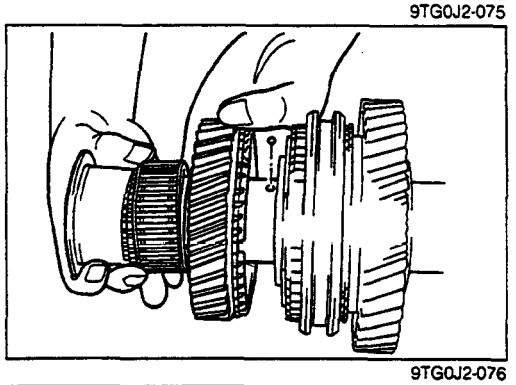
9TG0J2-073

1. Countershaft gear
2. Friction gear
3. Diaphragm spring
4. Spacer
   Assembly Note
   ..... page J2–38
5. Countershaft bearing (Front)
   Assembly Note
   ..... page J2–38
6. Snap ring
7. Counter 5th gear
8. Countershaft bearing (Rear)
   Assembly Note
   ..... page J2–38
9. Reverse idler gear
10. Needle bearing
11. Thrust washer
12. Reverse idle gear shaft
13. Bolt
14. Clutch hub
15. Synchronizer key spring
16. Synchronizer key
17. Hub sleeve
18. Main drive gear
19. Needle bearing
20. Synchronizer ring (4th)
21. Mainshaft
22. Needle bearing
23. 1st gear
24. Inner cone hub
25. Inner cone
26. Duble cone
27. Outer cone
28. Clutch hub assembly (1st/2nd)
    Assembly Note
    ..... page J2–37
29. Steel ball
30. 2nd gear
    Assembly Note
    ..... page J2–37
31. Needle bearing
32. Gear sleeve
33. Snap ring
34. 3rd gear
35. Needle bearing
36. Synchronizer ring (3rd)
37. Clutch hub assembly (3rd/4th)
    Assembly Note
    ..... page J2–37
38. Snap ring
39. Needle bearing
40. Reverse gear
41. Retaining ring
42. Clutch hub assembly
43. Synchronizer ring (5th)
44. Snap ring
45. 5th gear
46. Mainshaft bearing
    Assembly Note
    ..... page J2–38
47. Main drive gear bearing
    Assembly Note
    ..... page J2–39

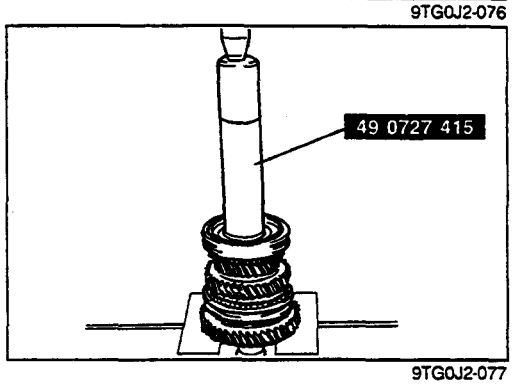
9TG0J2-074



9TG0J2-075



9TG0J2-076



9TG0J2-077

Assembly note
Clutch hub assembly (1st/2nd)

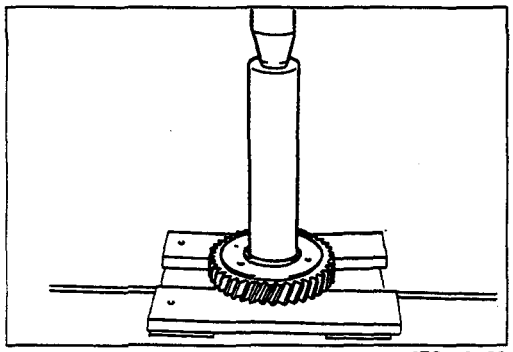
1. Set the 1st gear and the 1st/2nd clutch hub assembly on the press, then press in the mainshaft.

2nd gear

1. Install the steel ball, and then install the gear sleeve, needle bearing, and 2nd gear.

Clutch hub assembly (3rd/4th)

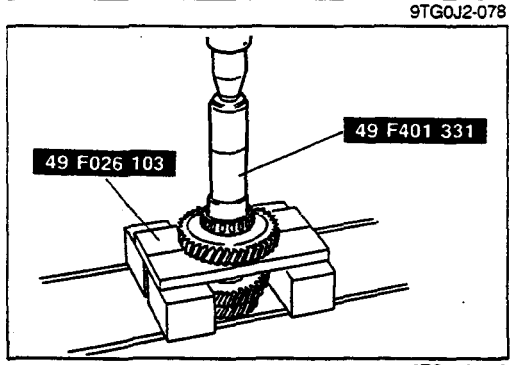
1. Set the 3rd gear and 3rd/4th clutch hub assembly on the mainshaft, then press on the 3rd/4th clutch hub assembly on with the **SST**.



9TG0J2-078

Spacer

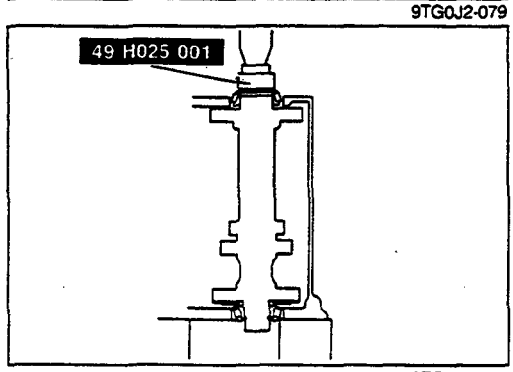
1. Install the new spacer with a suitable pipe.



9TG0J2-079

Countershaft bearing (Front)

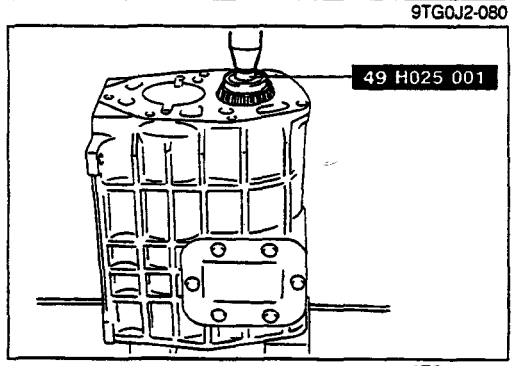
1. Install the countershaft bearing with the **SST**.



9TG0J2-080

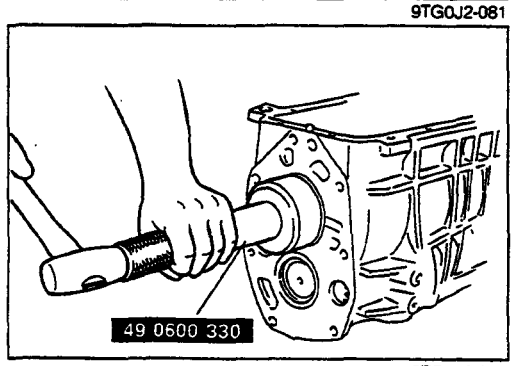
Countershaft bearing (Rear)

1. Install the new snap ring and counter 5th gear.
2. Set the countershaft gear in the transmission case.
3. Set the counter 5th gear into position and fit the snap ring.



9TG0J2-081

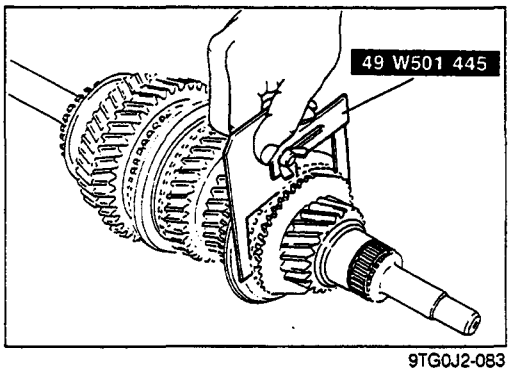
3. Install the countershaft bearing with the **SST**.



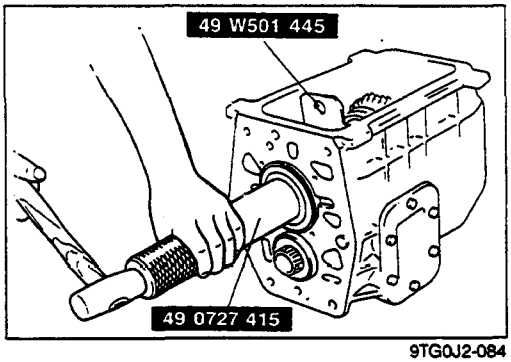
9TG0J2-082

Mainshaft bearing

1. Install the mainshaft bearing with the **SST**.



9TG0J2-083



9TG0J2-084

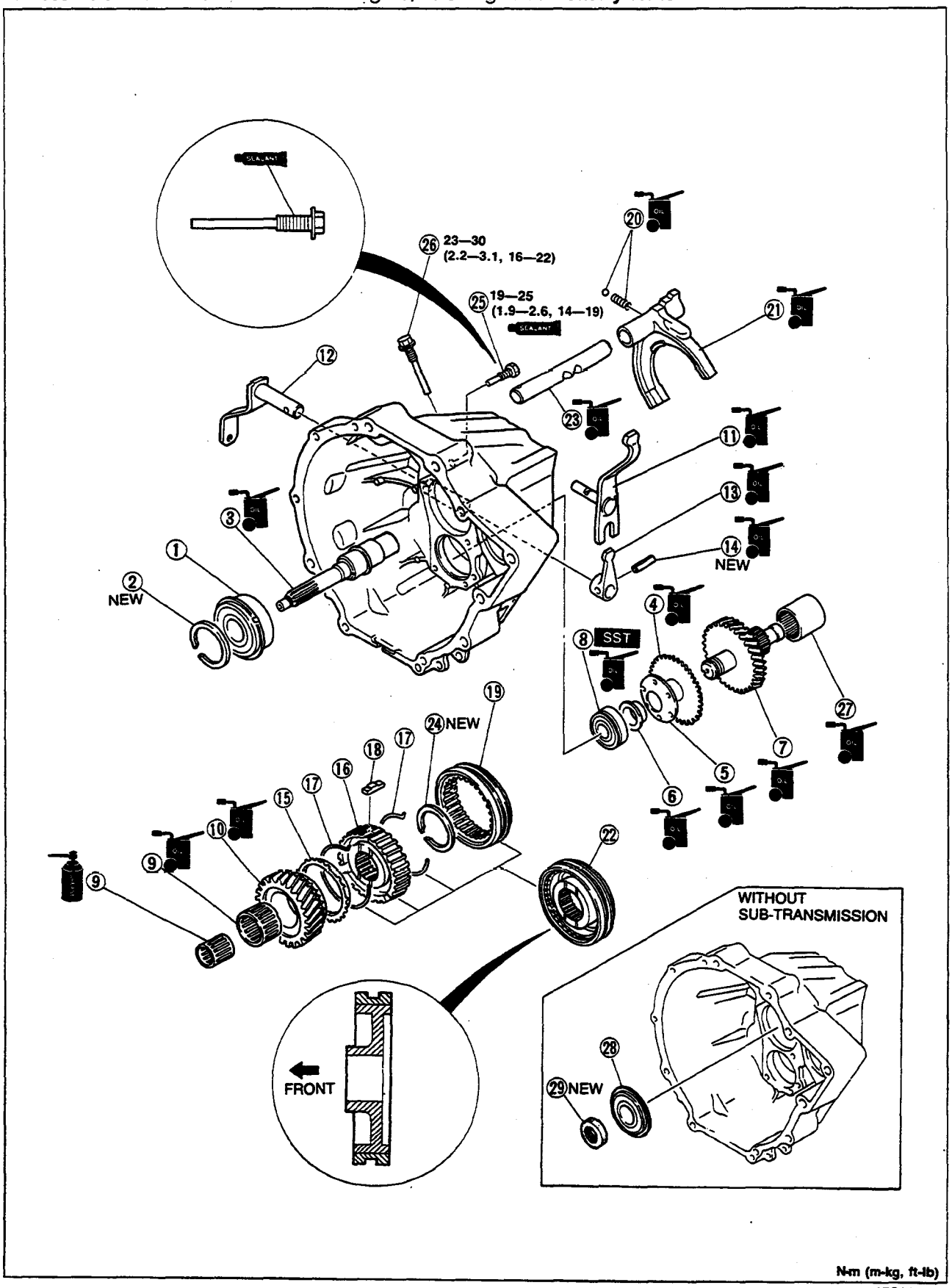
Main drive gear bearing

1. Set the **SST** between the 4th synchronizer ring and the synchromesh gear on the main drive gear.

2. Install the main drive gear bearing with the **SST**.

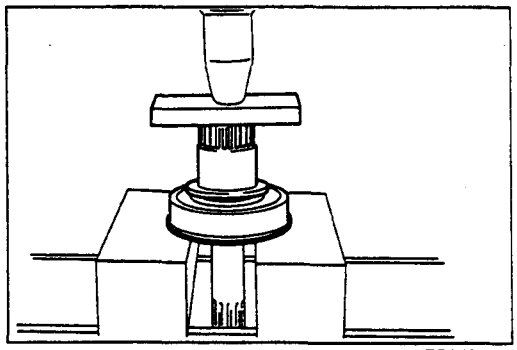
Sub-Transmission Components

1. Assemble in the order shown in the figure, referring to **Assembly Note**.

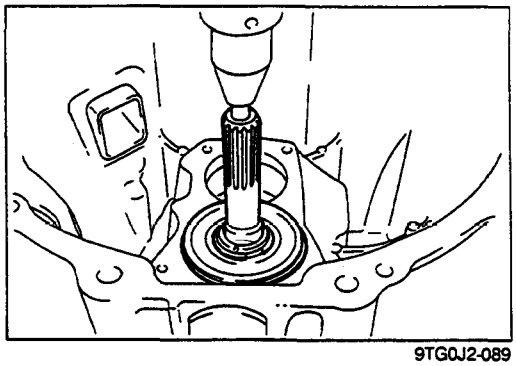


1. Input shaft bearing
   Assembly Note..... page J2–41
2. Snap ring
3. Input shaft
   Assembly Note..... page J2–41
4. Friction gear
5. Diaphragm spring
6. Spacer
   Assembly Note..... page J2–41
7. Counter high gear
8. Bearing (Counter high gear)
   Assembly Note..... page J2–42
9. Needle bearing
10. High bear
11. Counter lever
12. Outer shift lever
13. Inner shift lever
14. Roll pin
    Assembly Note..... page J2–42
15. Synchronizer ring
16. Clutch hub
17. Synchronizer key spring
18. Synchronizer key
19. Hub
20. Steel ball and spring
21. Shift fork
22. Clutch hub assembly
    Assembly Note..... page J2–42
23. Shift rod
24. Snap ring
25. Counter lever set bolt
26. Shift rod set bolt
27. Sleeve joint
28. Guide cover
29. Oil seal

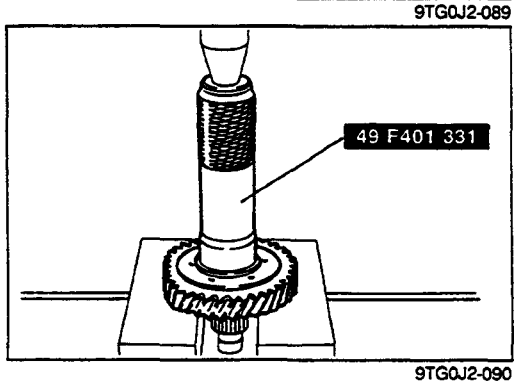
9TG0J2-087



9TG0J2-088



9TG0J2-089

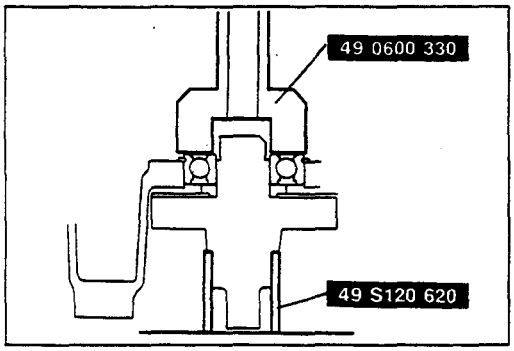


9TG0J2-090

Assembly Note
Input shaft bearing
1. Press the ball bearing onto the input shaft with a press.
2. Install the snap ring.

Input shaft
1. Press the input shaft into the clutch housing with a press.

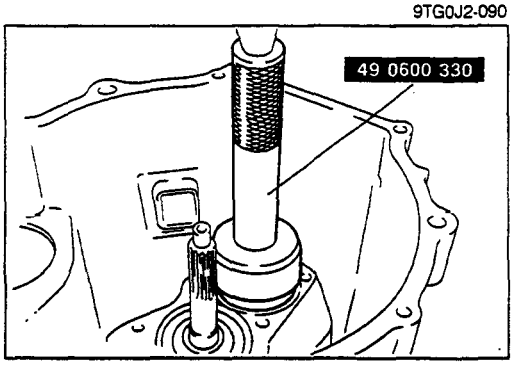
Spacer
1. Press the friction gear, diaphragm spring and spacer onto the counter high gear with the **SST** and a press.

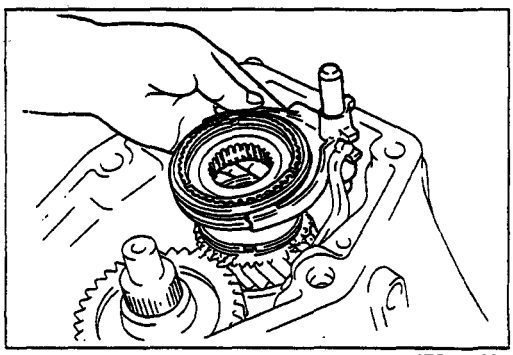


9TG0J2-090

Bearing (Counter high gear)

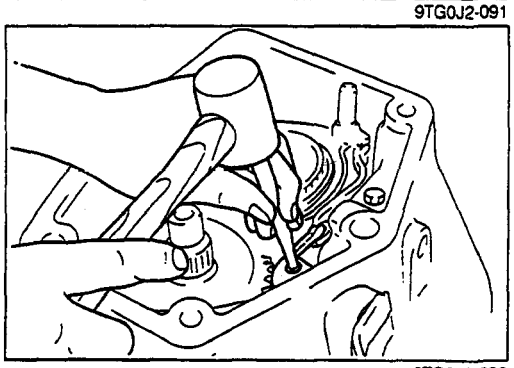
1. Slide the counter high gear assembly into position from the rear side of the clutch housing.
2. Press the bearing onto the counter high gear with the **SST** and a press.




9TG0J2-091

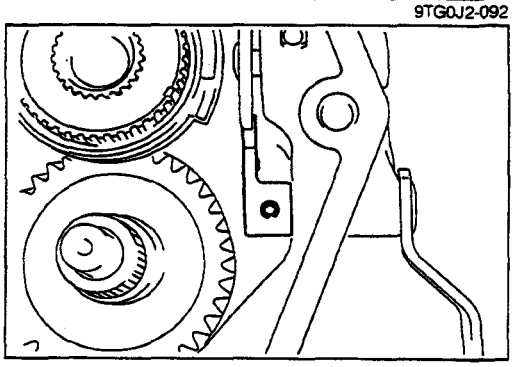
Clutch hub assembly

1. With the shift fork on the hub sleeve, install it to the high gear.


9TG0J2-092

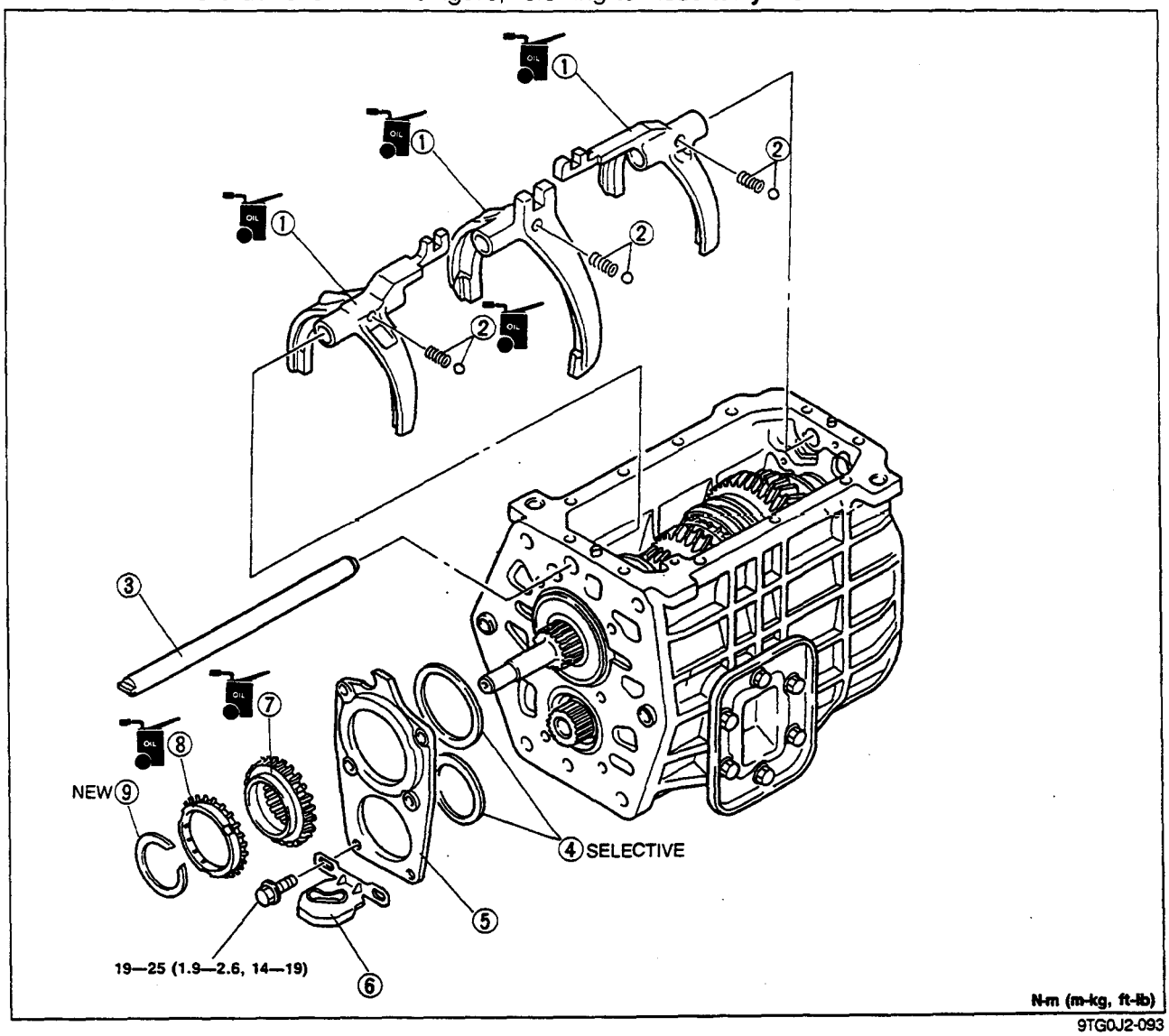
Roll pin

1. Install the roll pin as shown in the figure.



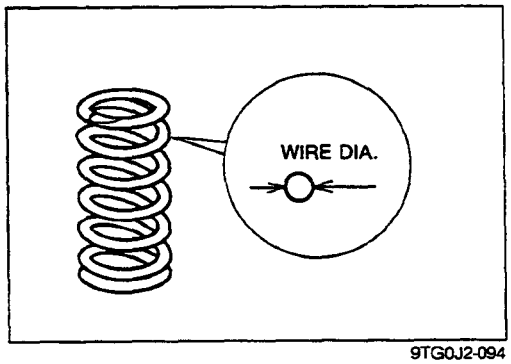
Shift Components

1. Assemble in the order shown in the figure, referring to **Assembly Note**.



9TG0J2-093

1. Shift fork
2. Steel ball and spring
   Assembly Note..... page J2–43
3. Shift fork rod
   Assembly Note..... page J2–44
4. Adjustment shim
   Assembly Note..... page J2–44
5. Bearing cover
6. Magnet
7. Input clutch
8. Synchronizer ring (Input clutch)
9. Snap ring

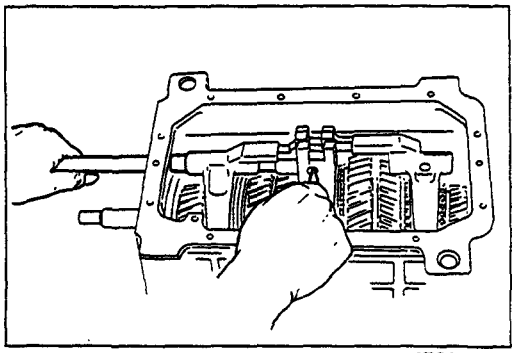


9TG0J2-094

Assembly Note
Spring

Note
- **There are two types of springs; be sure to install them correctly.**

Wire dia.	Shift fork
ϕ1.4mm (0.055 in)	3RD, 4TH and 5TH, Rev.
ϕ1.8mm (0.070 in)	1ST, 2ND



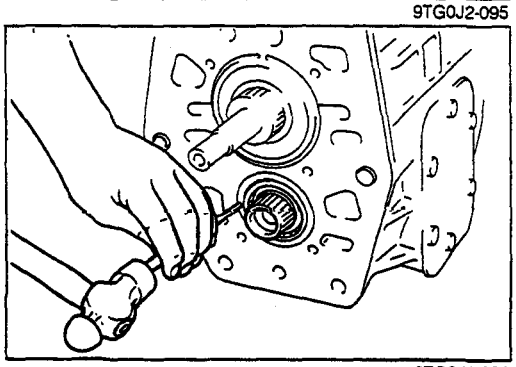
9TG0J2-095

Shift rod

1. Slide the shift rod into the shift fork while pressing the ball downward as shown in the figure.

Note

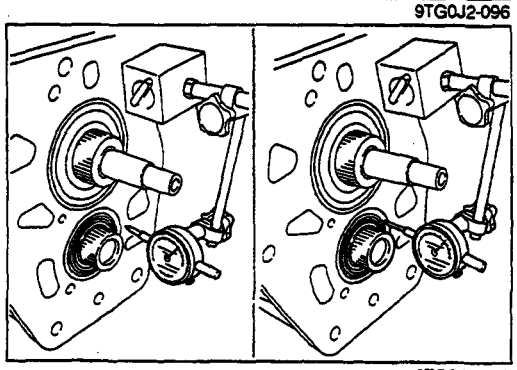
- **The steel detent balls will come out easily, be careful not to lose them.**



9TG0J2-096

Adjustment shim (Countershaft)

1. Temporarily tighten the rear cover and tap in the bearing outer race with a copper hammer.



9TG0J2-097

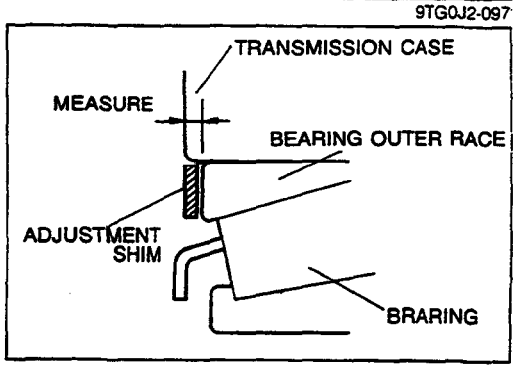
2. Measure the clearance between the bearing outer race and the transmission case.
   If not within specification, adjust the clearance by installing the proper adjustment shim(s).

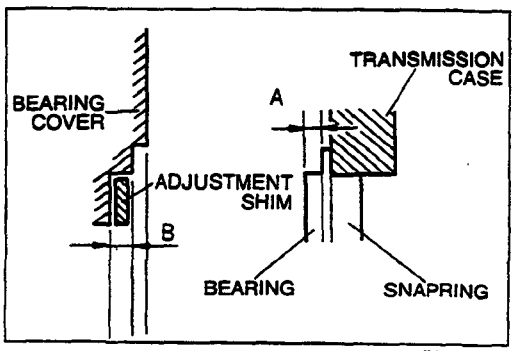
Standard clearance:
0.005mm—0.055mm (0.0002 in—0.002 in)

Adjusting shim thickness:

mm (in)

0.1 (0.004)	0.15 (0.006)
0.3 (0.012)	1.0 (0.039)





9TG0J2-098

Adjustment shim (Mainshaft)

1. After measuring dimensions A and B shown in the figure, use an adjustment shim(s), as specified below, of the thickness corresponding to the value of A minus B, so that bearing end play will be within specification.

Bearing end play: 0—0.1mm (0—0.004 in)

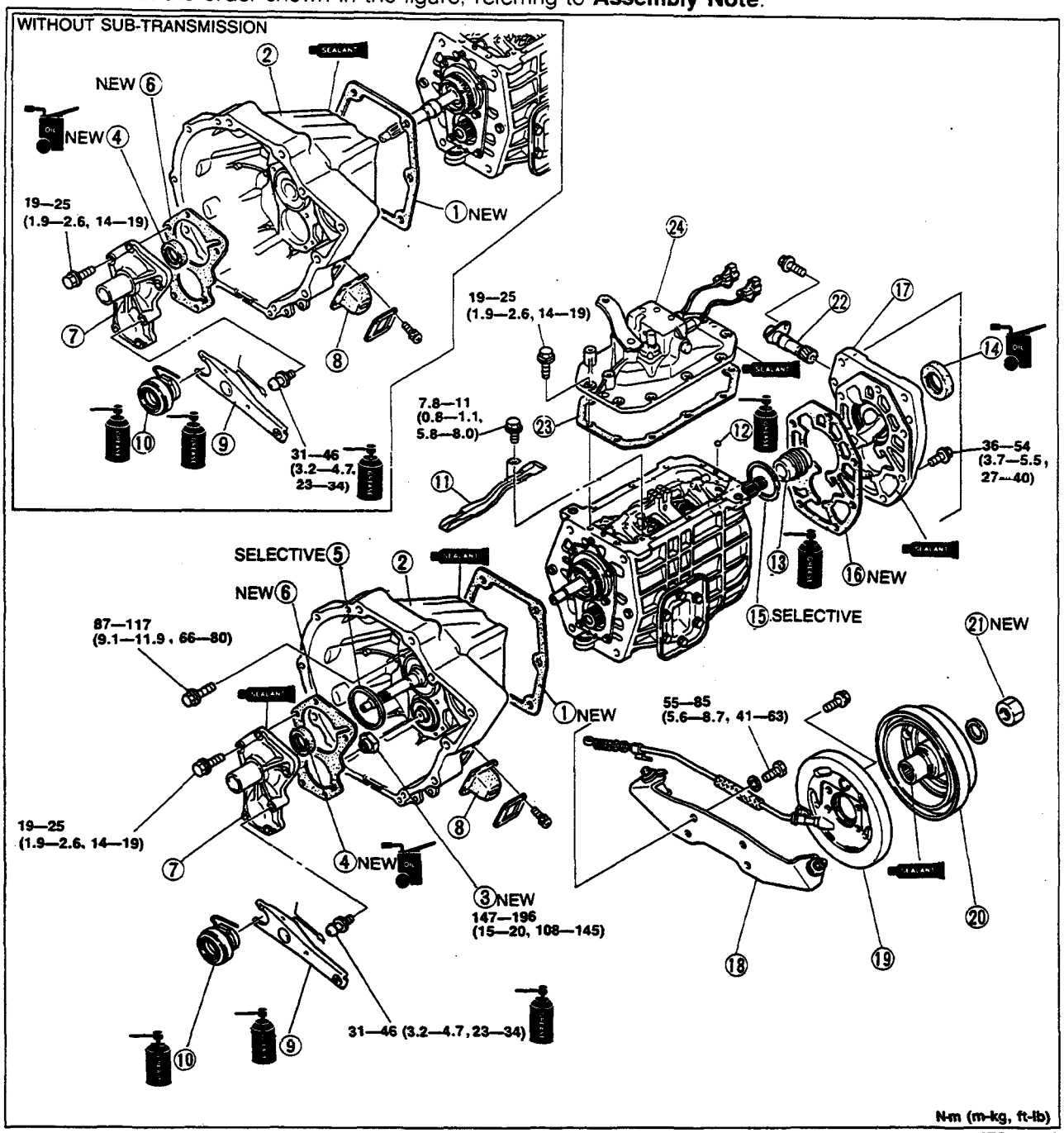
Adjustment shim thickness:

mm (in)

0.1 (0.004)	0.3 (0.012)

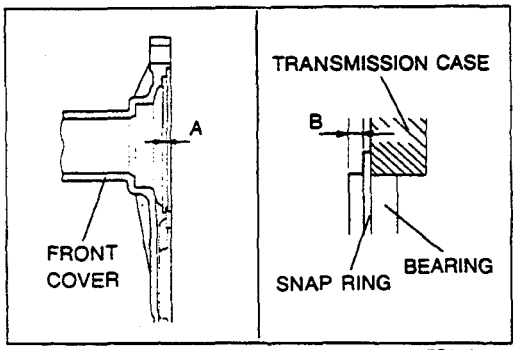
Housing Components

1. Assemble in the order shown in the figure, referring to **Assembly Note**.

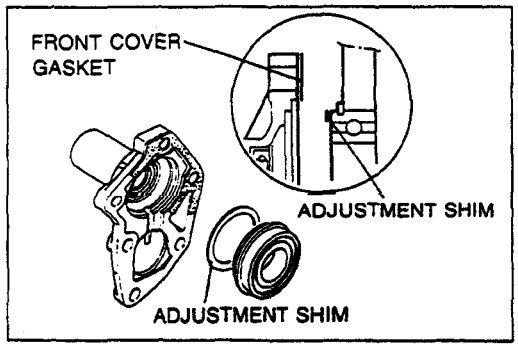


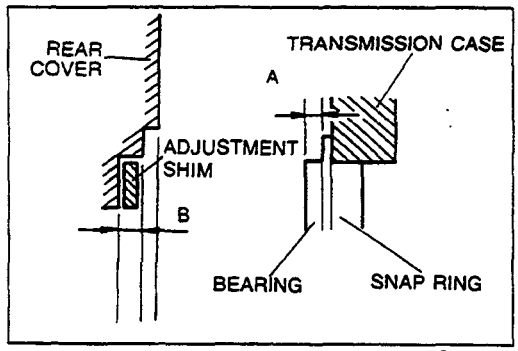
9TG0J2-099

1. Gasket
2. Clutch housing assembly
3. Locknut
4. Oil seal
5. Adjustment shim (Front)
   Assembly Note
   ..... page J2–46
6. Gasket
7. Front cover
8. Dust boot
9. Release fork
10. Release bearing
11. Oil guide
12. Steel ball
13. Speedometer drive gear
14. Oil seal
    Assembly Note
    ..... page J2–46
15. Adjustment shim (Rear)
    Assembly Note
    ..... page J2–46
16. Gasket
17. Rear cover
18. Transmission mount
19. Center brake assembly
20. Center brake drum
    Assembly Note
    ..... page J2–46
21. Locknut
22. Speedometer driven gear
23. Gasket
24. Top cover assembly

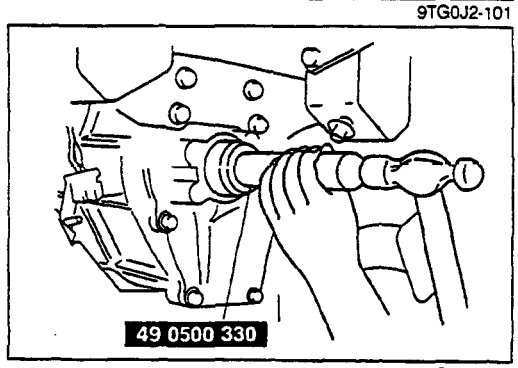


9TG0J2-100

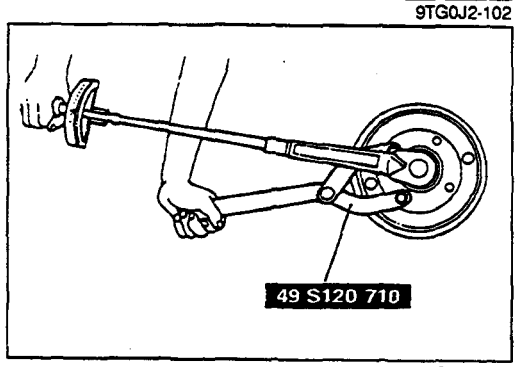




9TG0J2-101



9TG0J2-102



9TG0J2-103

Assembly Note

Adjustment shim (Front)

1. After measuring dimensions A and B shown in the figure, use an adjustment shim(s), as specified below, of the thickness corresponding to the value of A plus gasket thickness 0.3mm (0.012 in) minus B, so that bearing end play will be within specification.

Bearing end play: 0—0.1mm (0—0.004 in)

Adjustment shim thickness:

mm (in)

0.1 (0.004)	0.3 (0.012)
0.6 (0.024)	0.7 (0.028)
0.8 (0.031)	0.9 (0.035)
1.0 (0.039)	

Adjustment shim (Rear)

1. After measuring dimensions A and B shown in the figure, use an adjustment shim(s), as specified below, of the thickness corresponding to the value of A plus gasket thickness 0.3mm (0.012 in) minus B, so that bearing end play will be within specification.

Bearing end play: 0—0.1mm (0—0.004 in)

Adjustment shim thickness:

mm (in)

0.8 (0.031)	0.9 (0.035)
1.0 (0.039)	1.1 (0.043)
1.2 (0.047)	

Oil Seal

Caution

- **Do not damage the mainshaft splines.**

1. Install the oil seal with the **SST**.

Center brake drum

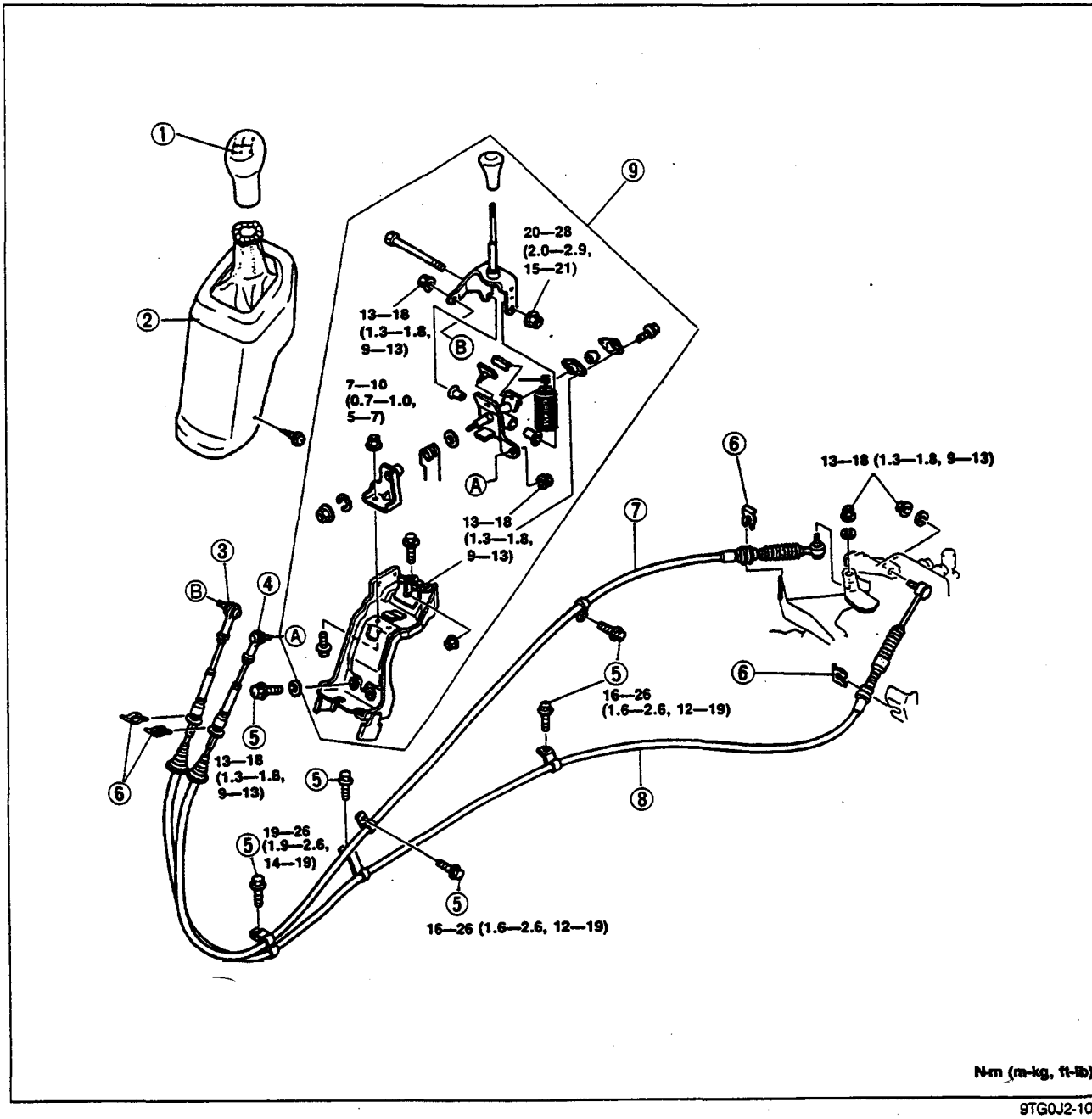
1. Install the center brake drum.
2. Hold the drum with the **SST**, and tighten the locknut.

Tightening torque:
245—294 N·m (25—30 m-kg, 180—216 ft-lb)

SHIFT MECHANISM (TRANSMISSION)

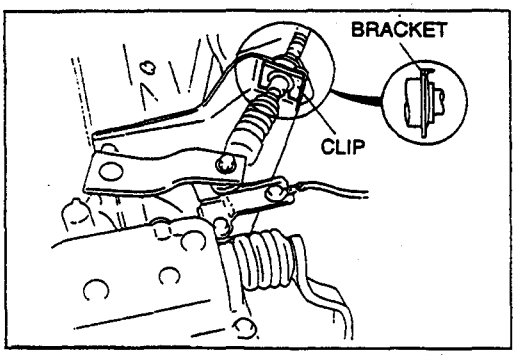
REMOVAL / INSTALLATION

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, referring to **Installation Note**.



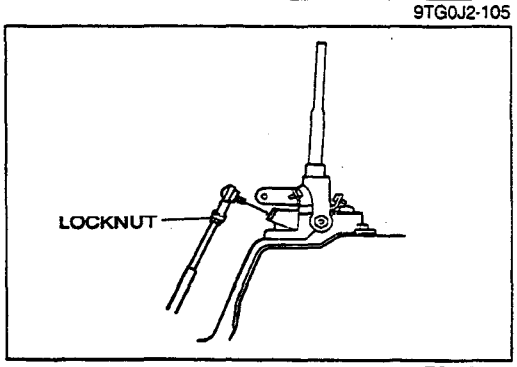
9TG0J2-104

1. Shift knob
   Installation Note ..... page J2—48
2. Console
3. Shift cable ball joint
   Installation Note ..... page J2—48
4. Selector cable ball joint
   Installation Note ..... page J2—48
5. Bolt
6. Clip
   Installation Note ..... page J2—48
7. Selector cable
   Inspect boots for damage
   Inspect cable for damage and function
8. Shift cable
   Inspect boots for damage
   Inspect cable for damage and function
9. Shift lever assembly



9TG0J2-105

Installation Note
Clip
1. Install the clips as shown in the figure.



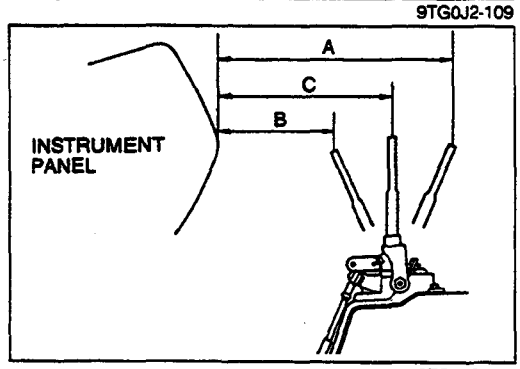
9TG0J2-109

Selector cable ball joint
1. Loosen the locknut.

Note
- **The shift lever will be set in neutral position by force of the spring.**

2. Set the shift lever in neutral position.
3. Turn the ball joint so that the selector cable aligns with the installation hole of the shift lever.
4. Tighten the locknut.

Tightening torque:
10—15 N·m (1.0—1.5 m-kg, 7—11 ft-lb)



9TG0J2-110

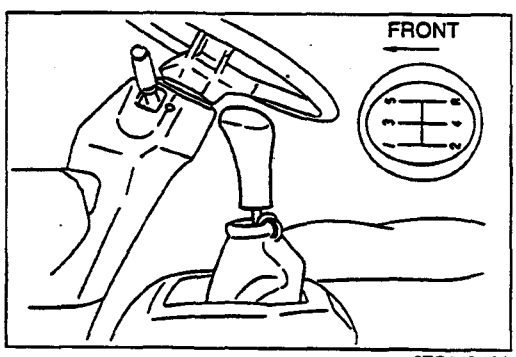
Shift cable ball joint
1. Measure A and B shown in the figure.
2. Caluculate the neutral position of the shift lever as follows:

$$\textbf{Neutral position C} = \textbf{B} + \frac{\textbf{A} - \textbf{B}}{2}$$

3. Hold the shift lever in neutral position.
4. Loosen the shift cable locknut.
5. Turn the ball joint so that the shift cable aligns with the installation hole of the shift lever.
6. Tighten the locknut.

Tightening torque:
10—15 N·m (1.0—1.5 m-kg, 7—11 ft-lb)

7. After installation, verify that the shift lever operates smoothly.



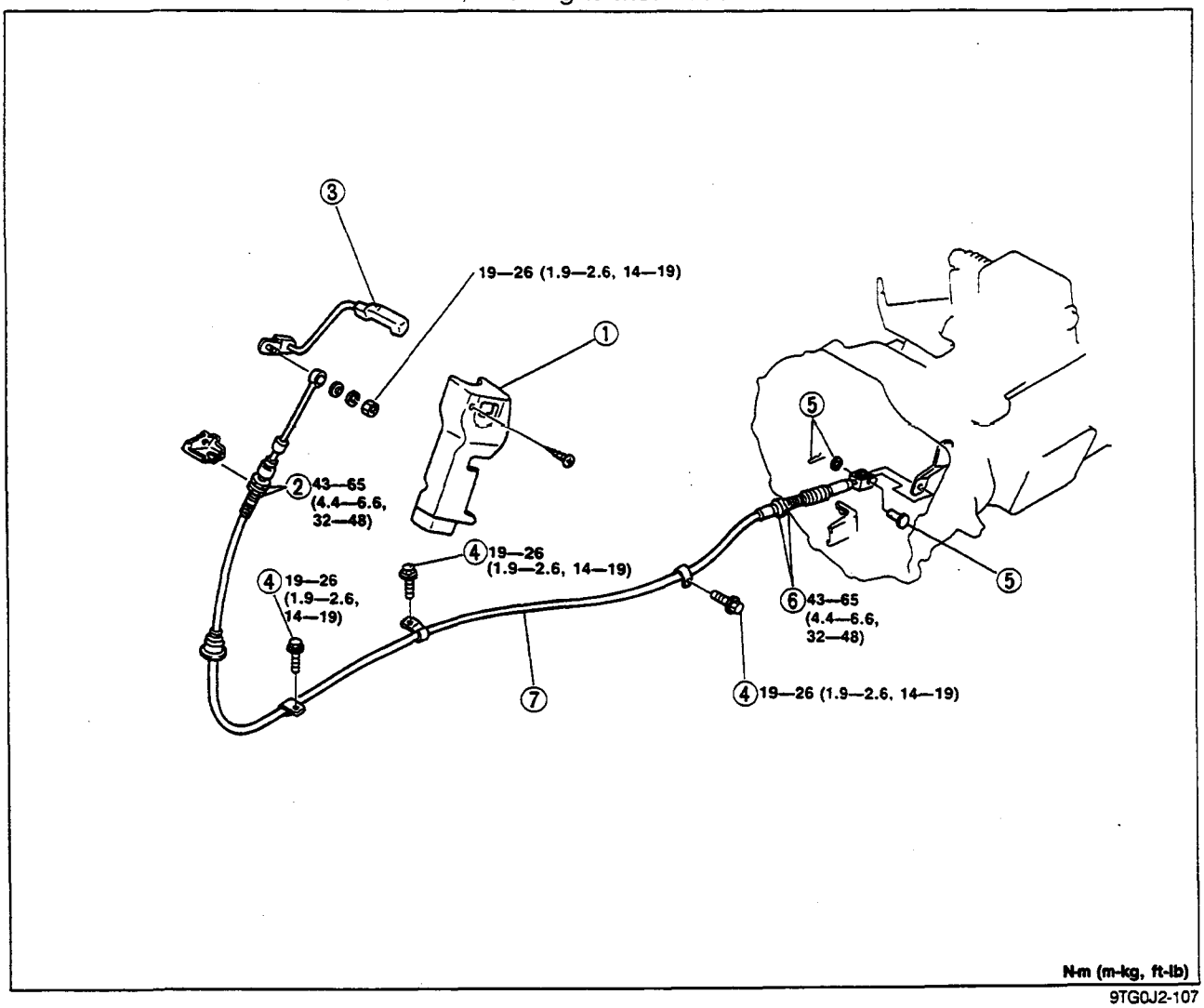
9TG0J2-106

Shift knob
1. Install the shift knob as shown in the figure.

SHIFT MECHANISM (SUB-TRANSMISSION)

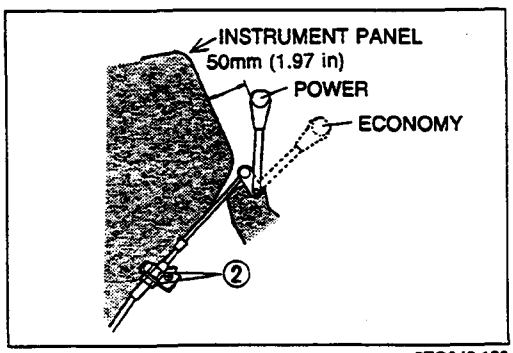
REMOVAL / INSTALLATION

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, referring to **Installation Note**.



9TG0J2-107

1. Steering column cover
2. Nut
   Installation Note ..... page J2—49
3. Selector lever
4. Bolt
5. Spring pin and pin
6. Nut
7. Sub-selector cable
   Inspect boot for damage
   Inspect cable for damage and function



9TG0J2-108

Installation Note

Nut (Selector lever side)

1. With the selector lever at power position, turn the nuts to adjust the position of the lever shown in the figure.

Tightening torque:
43—65 N·m (4.4—6.6 m-kg, 32—48 ft-lb)

PROPELLER SHAFT

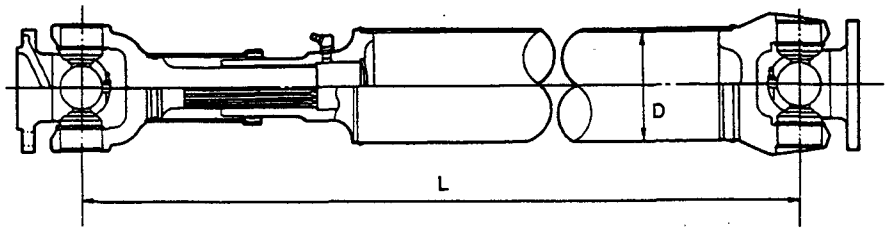
OUTLINE ..... **L– 2**
SPECIFICATIONS ..... **L– 2**
TROUBLESHOOTING GUIDE ..... **L– 3**
PROPELLER SHAFT ..... **L– 3**
PREPARATION ..... **L– 3**
REMOVAL / INSPECTION / INSTALLATION .. **L– 4**
OVERHAUL ..... **L– 5**
LUBRICATION **L–11**

9TF0LX-001

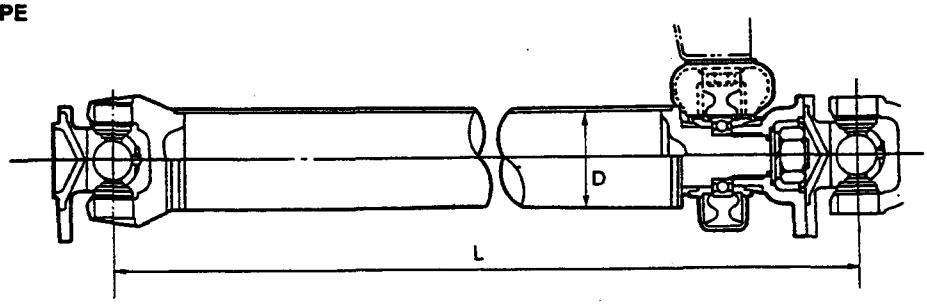
OUTLINE

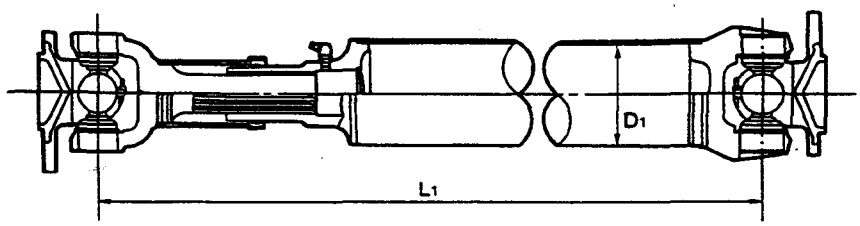
SPECIFICATIONS

TWO-JOINT TYPE



THREE-JOINT TYPE





9TG0LX-002

Item \ Engine type		HA, SL		SL Turbo		TF	
Item \ Cargo box length (ft)		10	14	14	17	14	17
Length mm (in)	L	883—892 (34.76—35.12)	735 (28.94)	754 (29.68)	999 (39.33)	713 (28.07)	958 (37.72)
	L_1	—	968—983 (38.11—38.70)	914—928 (35.98—36.54)	1,279—1,289 (50.35—50.75)	921—928 (36.26—36.54)	1,281—1,288 (50.43—50.71)
Outer diameter mm (in)	D	82.6 (3.25)		90.0 (3.54)			
	D_1	—	82.6 (3.25)	90.0 (3.54)			

9TF0LX-002

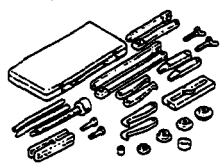
TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Vibration	Faulty assembly of sliding joint	Repair	L– 6
	Bent propeller shaft	Replace	L– 6
	Improperly installed universal joint snap ring	Repair	L– 6
	Worn or damaged center bearing	Replace	L– 6
	Loose center bearing mounting bolts	Tighten	L– 6
	Loose yoke mounting bolts	Tighten	L– 4
	Worn sliding joint splines	Replace	L– 6
	Improperly assembled center bearing yoke	Repair	L– 6
Abnormal noise	Worn or damaged bearing cup	Replace	L– 6
	Improperly installed universal joint snap ring	Repair	L– 6
	Worn or damaged center bearing	Replace	L– 6
	Loose yoke mounting bolts	Tighten	L– 4
	Worn or damaged sliding joint splines	Replace	L– 6
	Insufficient grease	Greace	L–11

9TF0LX-003

PROPELLER SHAFT

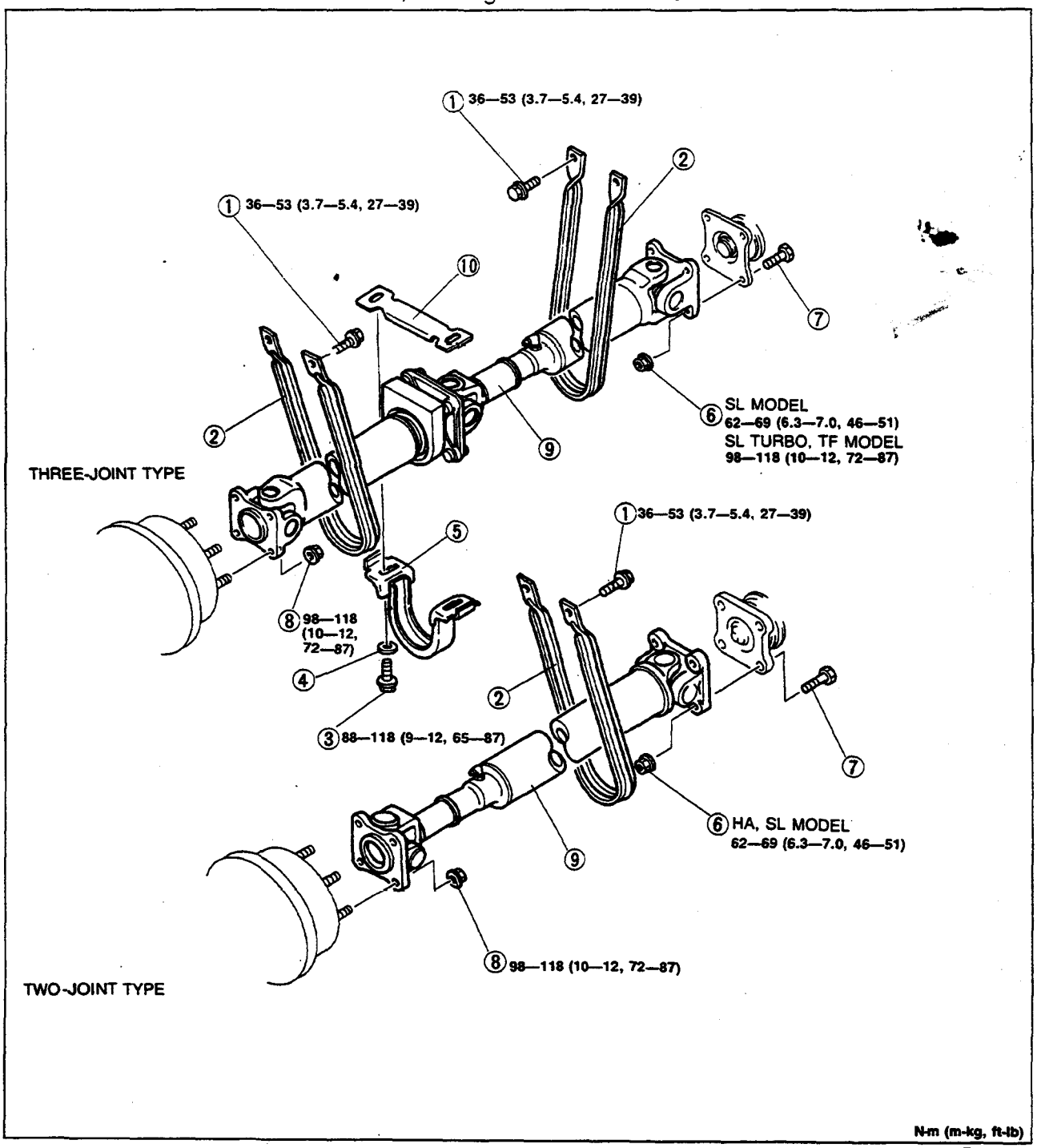
PREPARATION
SST

49 0839 425C Puller set, bearing		For removal of center companion flange and center bearing

9TG0LX-005

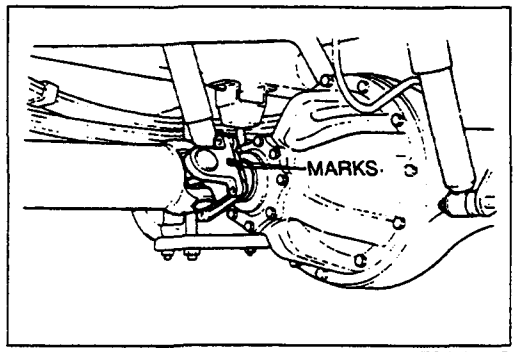
REMOVAL / INSPECTION / INSTALLATION

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**.



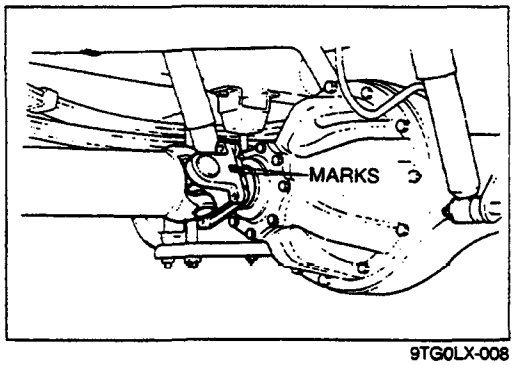
9TF0LX-004

1. Bolt
2. Safety loop
3. Bolt
4. Washer
5. Center bearing bracket
6. Nut
7. Bolt
8. Nut
9. Propeller shaft
   - Removal Note ..... page L–5
   - Overhaul ..... page L–5
   - Installation Note ..... page L–5
10. Plate



9TG0LX-007

Removal Note
Propeller shaft
1. Mark the yoke, parking brake drum, and companion flange for correct reassembly.



9TG0LX-008

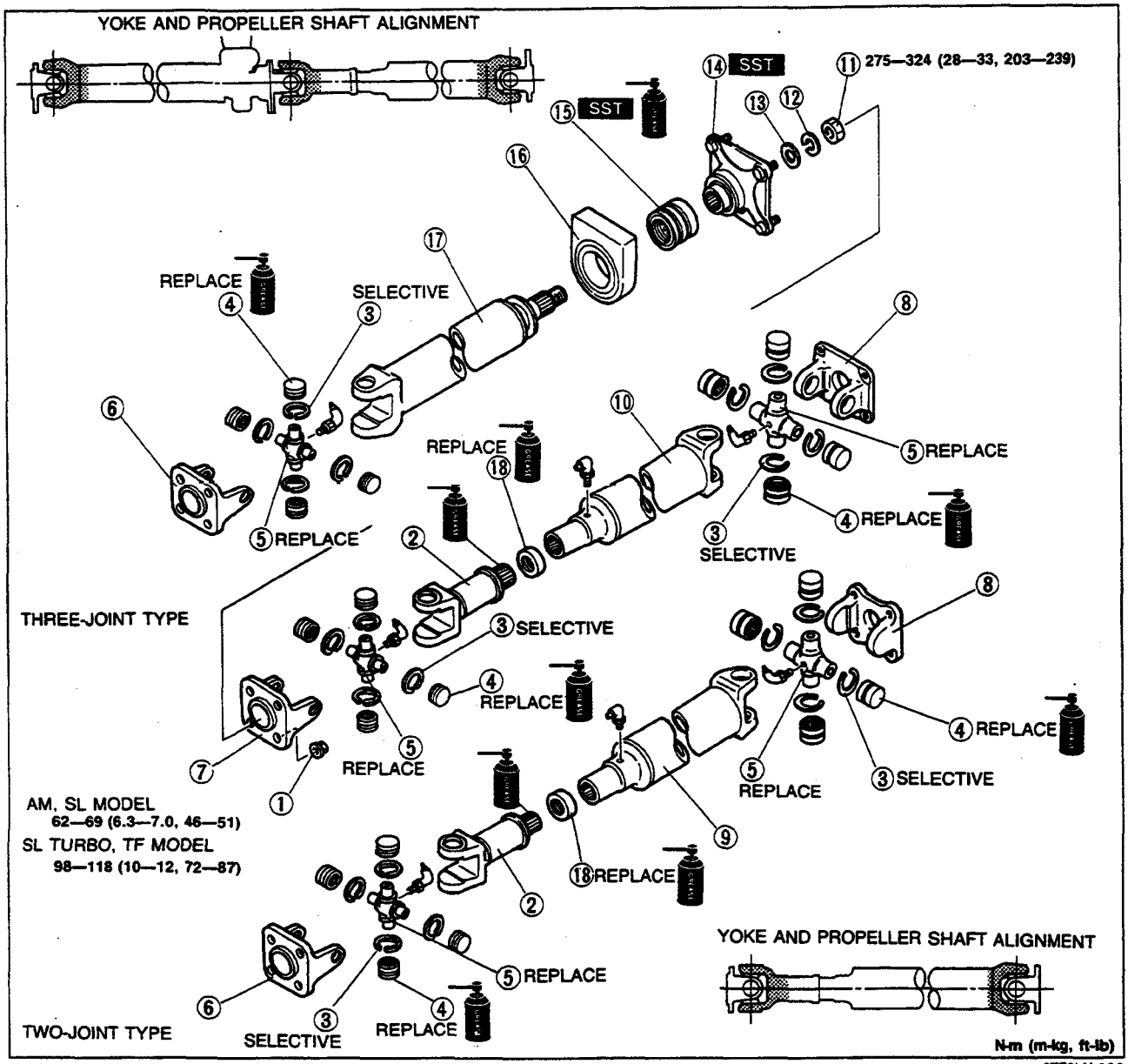
Installation Note
Propeller shaft
1. Align the marks and install the propeller shaft.

OVERHAUL

Caution
- **Use pads in the vise to prevent damaging the part.**
- **Do not remove the oil seal if not necessary.**

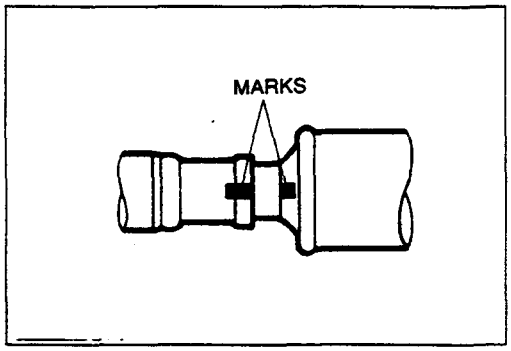
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.
4. Lubricate the propeller shaft after assembling, referring to page L–11.

9TF0LX-005



9TF0LX-006

1. Nut (Yoke)
2. Sliding joint
   - Disassembly Note ..... page L–7
   - Inspect splines for wear and damage
3. Snap ring
   - Disassembly Note ..... page L–7
   - Assembly Note ..... page L–9
4. Bearing cup
   - Disassembly Note ..... page L–7
   - Inspect for wear, damage and rotation
   - Assembly Note ..... page L–9
5. Spider
   - Inspect for wear and damage
6. Front yoke
7. Center yoke
8. Rear yoke
9. Propeller shaft
   - Inspection ..... page L–8
10. Propeller shaft No.2
    - Inspection ..... page L–8
11. Flange nut
12. Lock washer
13. Washer
14. Center companion flange
    - Disassembly Note ..... page L–7
    - Assembly Note ..... page L–9
15. Center bearing
    - Disassembly Note ..... page L–8
    - Inspect for damage and rough rotation
    - Assembly Note ..... page L–8
16. Center bearing rubber
    - Assembly Note ..... page L–9
17. Propeller shaft No.1
    - Inspection ..... page L–8
18. Oil seal

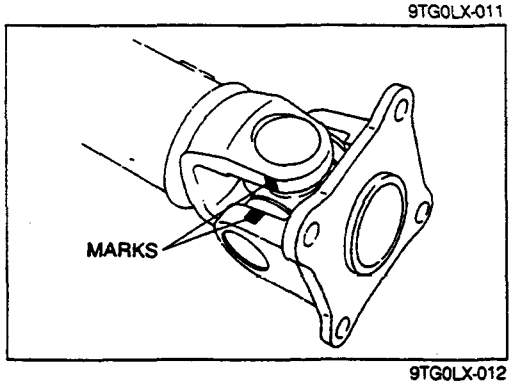


9TG0LX-011

Disassembly Note
Sliding joint
1. Mark the sliding joint and propeller shaft for proper reassembly.

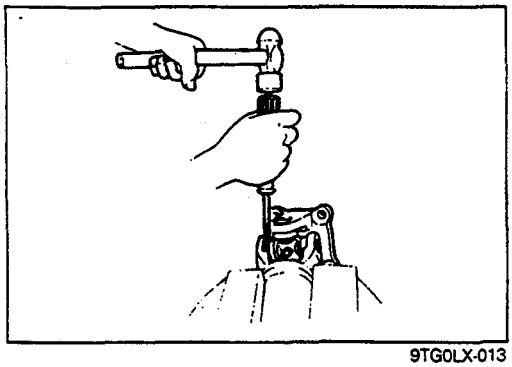
Caution
- **Replace the sliding joint and propeller shaft as a set if necessary.**

2. Remove the sliding joint.

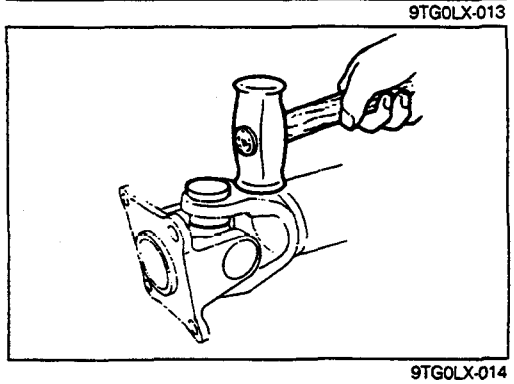


9TG0LX-012

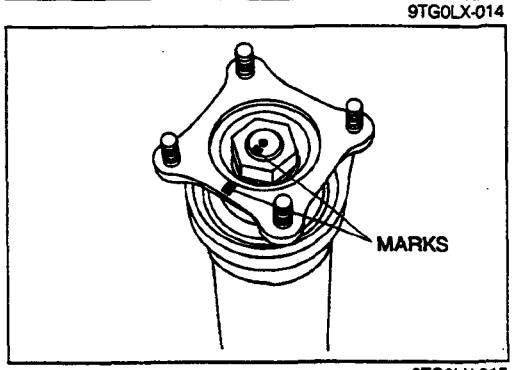
Snap ring
1. Mark the yoke and propeller shaft for proper reassembly.
2. Clamp the propeller shaft in a vise.
3. Remove the snap ring.


9TG0LX-013

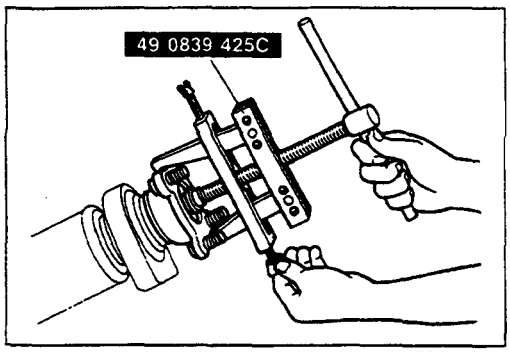
Bearing cup
1. Push one bearing cup out of the propeller shaft by tapping the propeller shaft yoke.
2. Remove the opposite bearing cup in the same manner.
3. Separate the propeller shaft and yoke.
4. Clamp the yoke in a vise.
5. Remove the bearing cups and the spider from the yoke as in Steps 1 and 2.


9TG0LX-014

Center companion flange
1. Mark the flange and shaft for proper reassembly.
2. Clamp the center companion flange in a vise.
3. Remove the flange nut and lock washer.

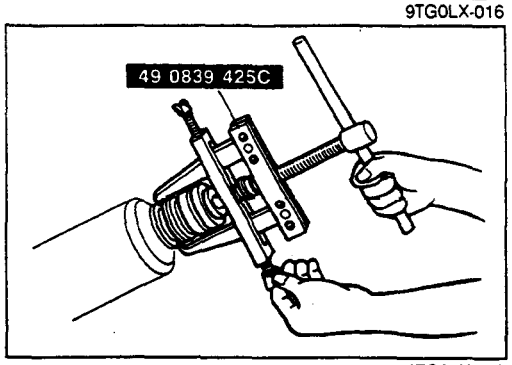


9TG0LX-015



9TG0LX-016

4. Remove the companion flange with the **SST**.

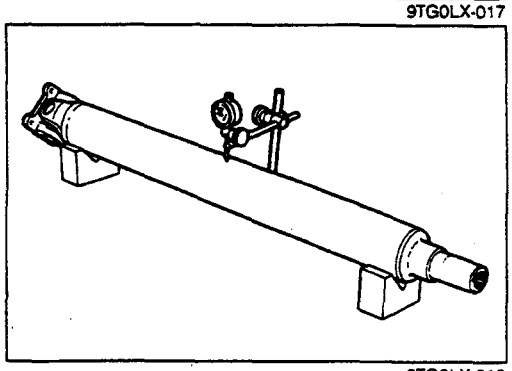


9TG0LX-017

Center bearing

Caution
- **Do not damage the oil seal.**

1. Remove the center bearing with the **SST**.

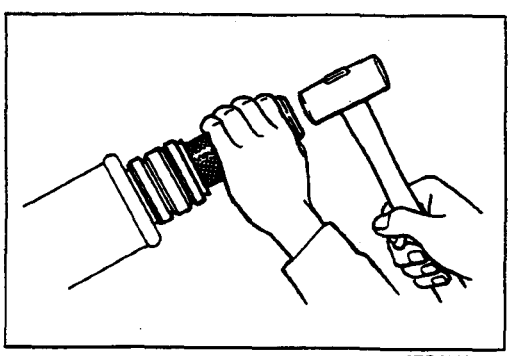

9TG0LX-018

Inspection
Propeller shaft

Caution
- **Measure the runout of No.1 and No.2 propeller shafts.**
- **Replace the propeller shaft as an assembly if runout is excessive.**

1. Measure the propeller shaft runout with a dial indicator.

Runout: 0.5mm (0.02 in) max.

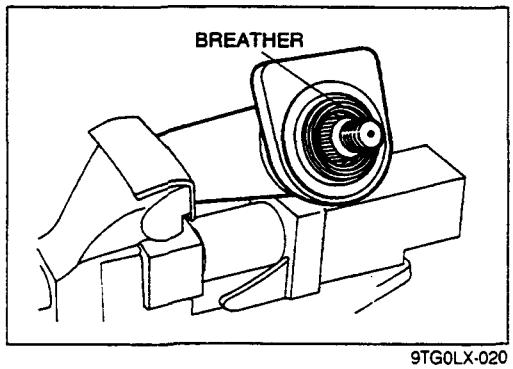

9TG0LX-019

Assembly Note
Center bearing

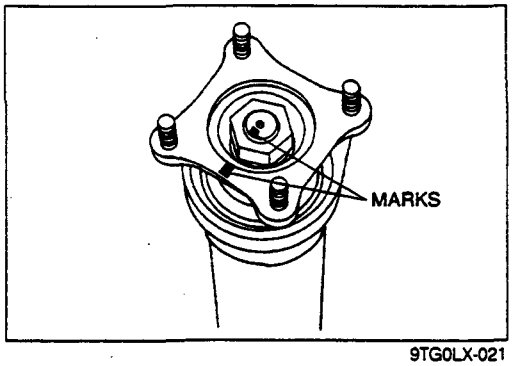
Caution
- **Face the oil seal breather rearward.**

1. Install the center bearing onto the propeller shaft with a suitable pipe and a hammer.

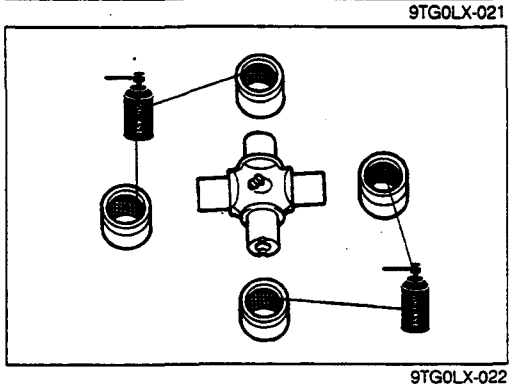
Pipe diameter: 45mm (1.77 in)

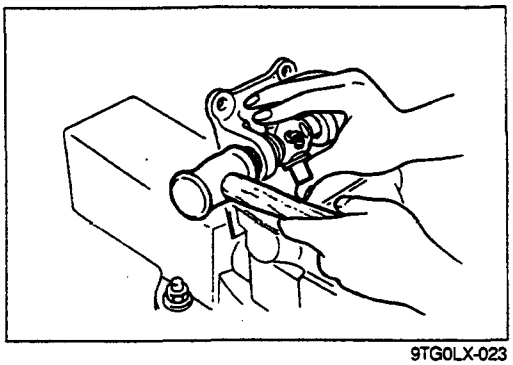


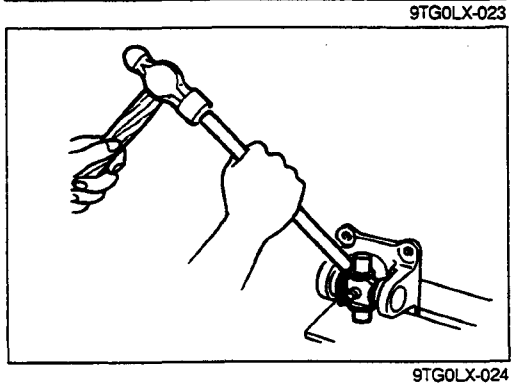
9TG0LX-020



9TG0LX-021


9TG0LX-022


9TG0LX-023


9TG0LX-024

Center bearing rubber

Caution
- **Face the oil seal breather upward.**

1. Install the center bearing rubber.

Center companion flange

1. Align the marks on the flange and shaft, and install the center companion flange.

Bearing cup

Caution
- **Do not reuse the snap ring, bearing cup, or spider.**

1. Apply lithium based grease to the bearing rollers inside the bearing cups.
2. Clamp the yoke in a vise.

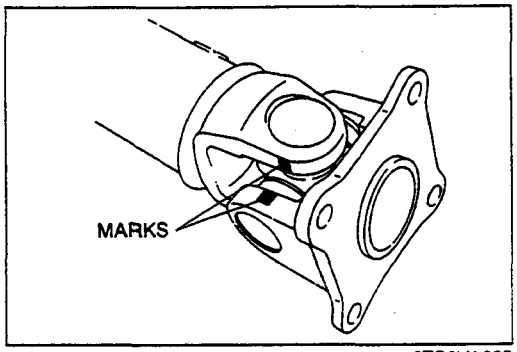
Note
- **Install the spider with the grease nipple toward the propeller shaft.**

3. Set the new spider into the yoke and tap in a bearing cup using the spider to hold the rollers.
4. Slide the yoke to the opposite side and install the other bearing cup.

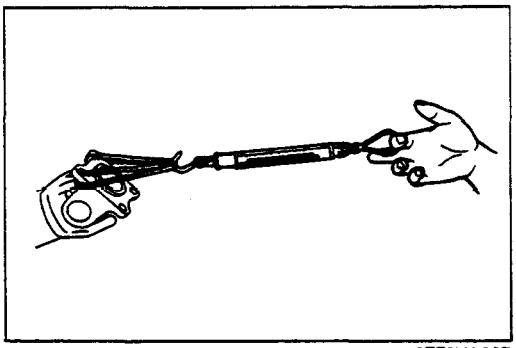
Snap ring

Caution
- **Use only new snap rings and ones of the same thickness.**

1. Install the thinnest snap rings.



9TG0LX-025


9TF0LX-007

Caution
- **Align the marks on the propeller shaft and yoke.**

2. Install the yoke to the propeller shaft.
3. Lightly tap around the universal joint with a plastic hammer to assure the installation.

4. Measure the starting torque of the spider.

		Starting torque	Scale reading
HA, SL	Front yoke	0.49—1.37 N·m (5—14 cm-kg, 4.34—12.15 in-lb)	7.65—21.58 N (0.78—2.20 kg, 1.72—4.84 lb)
	Center yoke		8.14—22.86 N (0.83—2.33 kg, 1.83—5.13 lb)
	Rear yoke		8.14—22.86 N (0.83—2.33 kg, 1.83—5.13 lb)
SL Turbo, TF		0.78—1.76 N·m (8—18 cm-kg, 6.94—15.62 in-lb)	11.28—25.41 N (1.15—2.59 kg, 2.53—5.70 lb)

5. Install different snap rings to adjust the starting torque if necessary.

Snap ring thickness:

mm (in)

HA, SL		
1.45 (0.057)	1.48 (0.058)	1.50 (0.059)
1.54 (0.061)	1.57 (0.062)	1.60 (0.063)
1.63 (0.064)		

SL Turbo, TF		
2.00 (0.079)	2.03 (0.080)	2.06 (0.081)
2.09 (0.082)	2.12 (0.083)	2.15 (0.085)
2.18 (0.086)	2.21 (0.087)	2.24 (0.088)

LUBRICATION

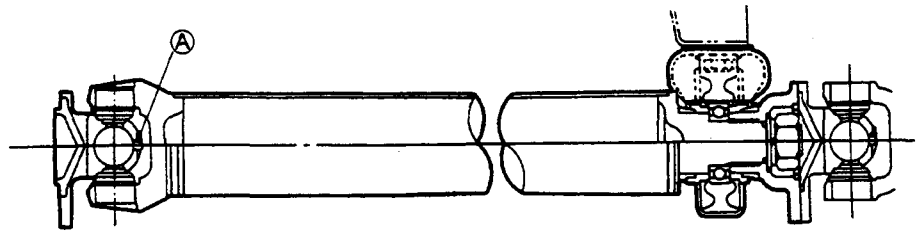
1. Lubrication fittings are installed to make possible regular lubrication. The type of grease used for the universal joints and slip yoke is different.

Lubricant

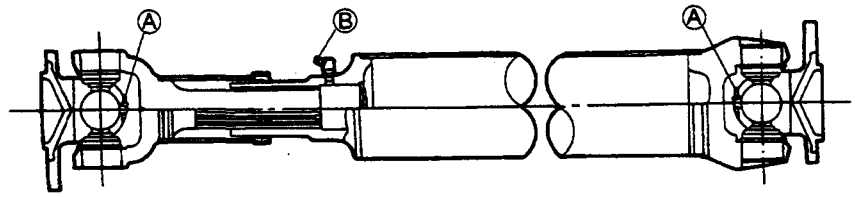
For fitting Ⓐ..... Lithium based grease
For fitting Ⓑ..... Disulphide molybdenum grease

THREE-JOINT TYPE

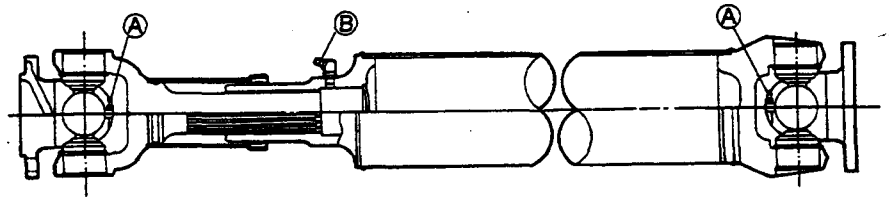
PROPELLER SHAFT NO.1



PROPELLER SHAFT NO.2



TWO-JOINT TYPE



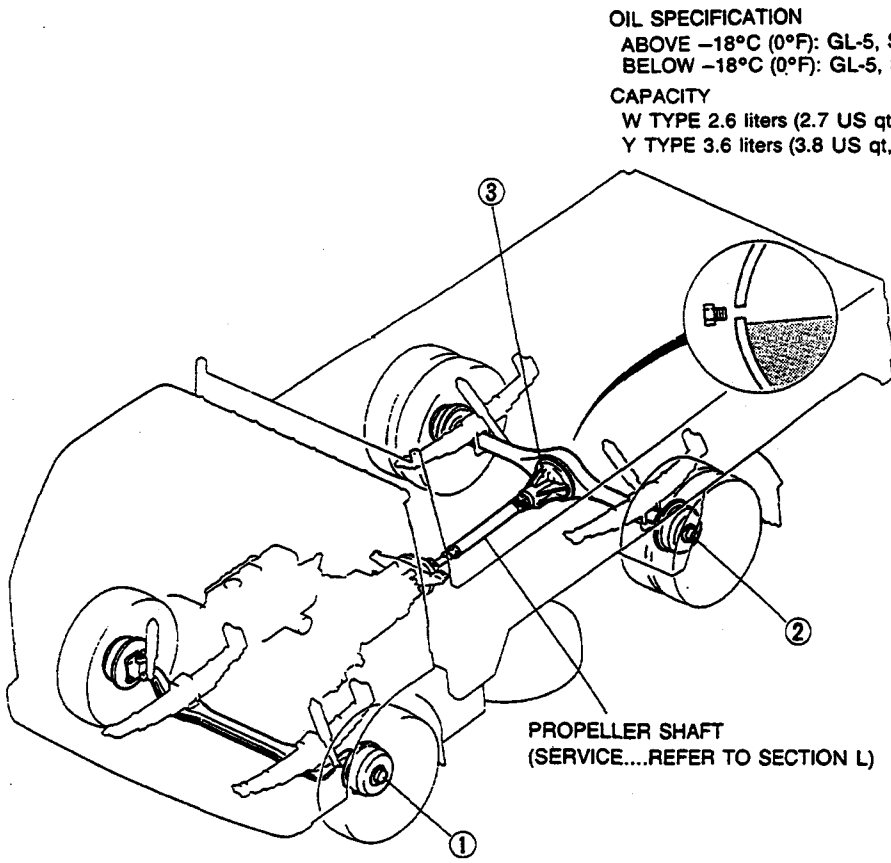
9TG0LX-027

FRONT AND REAR AXLES

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TROUBLESHOOTING GUIDE ..... **M– 4**
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PREPARATION ..... **M– 4**
WHEEL HUB, STEERING KNUCKLE ..... **M– 5**
REAR AXLE **M–15**
PREPARATION **M–15**
REAR AXLE **M–15**
DIFFERENTIAL **M–20**
PREPARATION **M–20**
DIFFERENTIAL OIL **M–23**
OIL SEAL **M–24**
DIFFERENTIAL **M–26**

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1. Front axle
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Steering knuckle
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2. Rear axle
Preinspection ..... page M–15
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3. Differential
Differential oil ..... page M–23
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Removal / Installation ..... page M–26
Overhaul ..... page M–28

OUTLINE

SPECIFICATIONS

Model / Item								
	Engine type		**HA**		**SL**			**SL Turbo**
	Cargo box length	**ft**	**10**		**14**			
	Cabin style		**Std. cabin**		**Wide cabin**			
	Body style		**Truck**		**Crew cabin**		**Truck**	
Item	**Pay load**	**t**	**1.5**	**2**	**2.75**		**3**	**4**
Front axle								
Bearing preload	Pull scale reading	N (kg, lb)	10.8—29.4 (1.1—3.0, 2.4—6.6)					
Rear axle								
Bearing preload	Pull scale reading	N (kg, lb)	10.8—29.4 (1.1—3.0, 2.4—6.6)					
Rear axle shaft	Length	mm (in)	739.5 (29.11)	798 (31.42)	780.5 (30.73)			806 (31.73)
	Outer diameter	mm (in)	32 (1.26)	36 (1.42)	36 (1.42)			38 (1.50)
Differential								
Reduction gear			Hypoid gear					
Differential gear			Straight bevel gear					
Reduction ratio			5.857	6.142	6.571			6.571
Oil	Grade		API GL-5					
	Viscosity	Above −18°C (0°F)	SAE 90					
		Below −18°C (0°F)	SAE 80W					
	Amount	liters (US qt, Imp qt)	2.6 (2.7, 2.3)					3.6 (3.8, 3.2)

Model / Item						
	Engine type		**SL Turbo**	**TF**		
	Cargo box length	**ft**	**17**	**14**		**17**
	Cabin style		**Wide cabin**			
	Body style		**Truck**	**Crew cabin**	**Truck**	
Item	**Pay load**	**t**	**4**	**3.5**	**4**	
Front axle						
Bearing preload	Pull scale reading	N (kg, lb)	10.8—29.4 (1.1—3.0, 2.4—6.6)			
Rear axle						
Bearing preload	Pull scale reading	N (kg, lb)	10.8—29.4 (1.1—3.0, 2.4—6.6)			
Rear axle shaft	Length	mm (in)	806 (31.73)			
	Outer diameter	mm (in)	38 (1.50)			
Differential						
Reduction gear			Hypoid gear			
Differential gear			Straight bevel gear			
Reduction ratio			6.571	6.833		
Oil	Grade		API GL-5			
	Viscosity	Above −18°C (0°F)	SAE 90			
		Below −18°C (0°F)	SAE 80W			
	Amount	liters (US qt, Imp qt)	3.6 (3.8, 3.2)			

9TF0MX-003

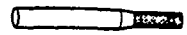
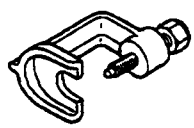
TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Abnormal noise	Worn or damaged pinion and side gear	Replace	M–28
	Excessive side gear backlash	Replace	M–28
	Worn or damaged side bearing	Adjust or replace	M–28
	Worn or damaged drive pinion bearing	Replace	M–28
	Worn or damaged ring gear	Replace	M–28
	Excessive ring gear backlash	Adjust	M–39
	Insufficient oil	Add	M–23
	Defective oil	Replace	M–23
	Poor contact of ring gear teeth	Adjust	M–40
	Worn side gear spline	Replace	M–28
	Worn companion flange spline	Replace	M–28
	Worn drive pinion spline	Replace	M–28
	Worn pinion shaft	Replace	
	Worn or damaged wheel bearing	Replace	M–6, 16
Oil leakage	Insufficient sealant on differential carrier	Correct	M–26
	Damaged oil seal	Replace	M–24
	Loose drain plug	Tighten	M–23
Steering heavy	Binding kingpin	Replace	M–10
	Insufficient kingpin oil	Add	M–10
	Steering unit related problem	—	Section N
Steering wheel pulls	Improperly adjusted front wheel bearing preload	Adjust	M– 5
	Steering unit related problem	—	Section N
Steering wheel vibration	Worn or improperly adjusted front wheel bearing	Replace or adjust	M– 5
	Worn kingpin	Replace	M–10
	Steering unit related problem	—	Section N
Excessive steering wheel play	Improperly adjusted front wheel bearing preload	Adjust	M– 5
	Worn kingpin	Replace	M–10
	Steering unit related problem	—	Section N

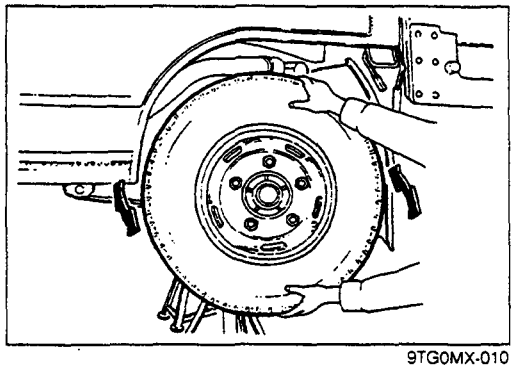
9TF0MX-004

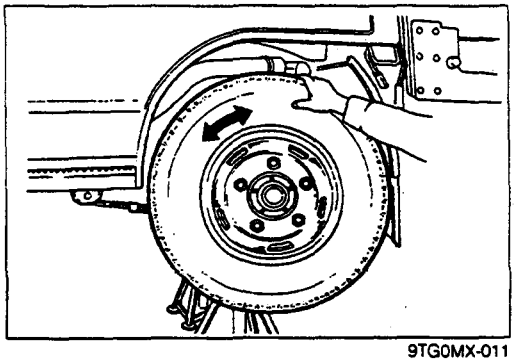
FRONT AXLE

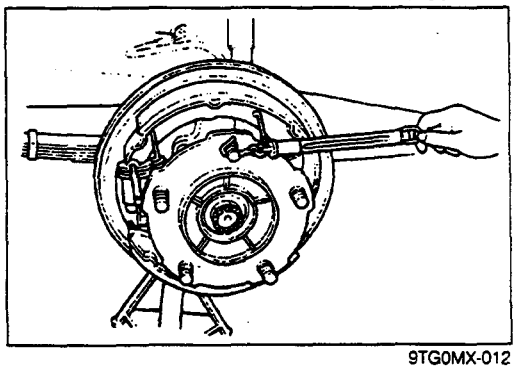
PREPARATION
SST

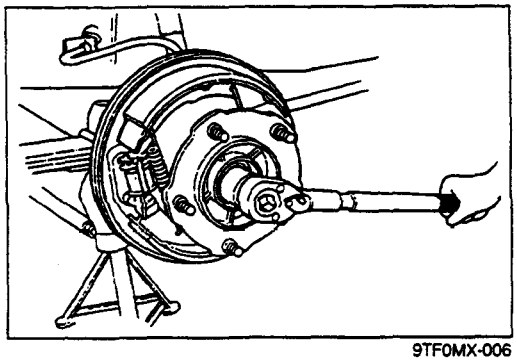
49 1316 610 Puller & installer, kingpin bushing		For removal and installation of kingpin bushing	49 1316 600 Guide, kingpin 	For installation of kingpin
49 0727 575 Puller, socket joint		For removal of drag link and tie-rod end		

9TF0MX-005


9TG0MX-010


9TG0MX-011


9TG0MX-012


9TF0MX-006

WHEEL HUB, STEERING KNUCKLE

Preinspection

Wheel bearing play

1. Push and pull the tire in the axial direction to check the wheel bearing play.

Note
- **If the play remains after the brake is depressed, it indicates ball joint play.**

2. Verify that there is no abnormal noise and that the tire rotates smoothly when rotated by hand.
3. Adjust the wheel bearing preload as necessary.

Preload Adjustment

1. Remove the wheel and tire.
2. Remove the hub cap.

Note
- **Do not remove the screw mounted type brake drum.**
- **Verify that the brake shoes do not drag.**
- **If there is drag, adjust the shoe clearance.**

3. Remove the brake drum. (Refer to page M–6.)
4. Remove the stop retainer.
5. Loosen the hub nut until it can be turned by hand.
6. Attach a pull scale to a wheel lug bolt, and measure the frictional force while turning.
   Then tighten the hub nut until the preload is as specified.

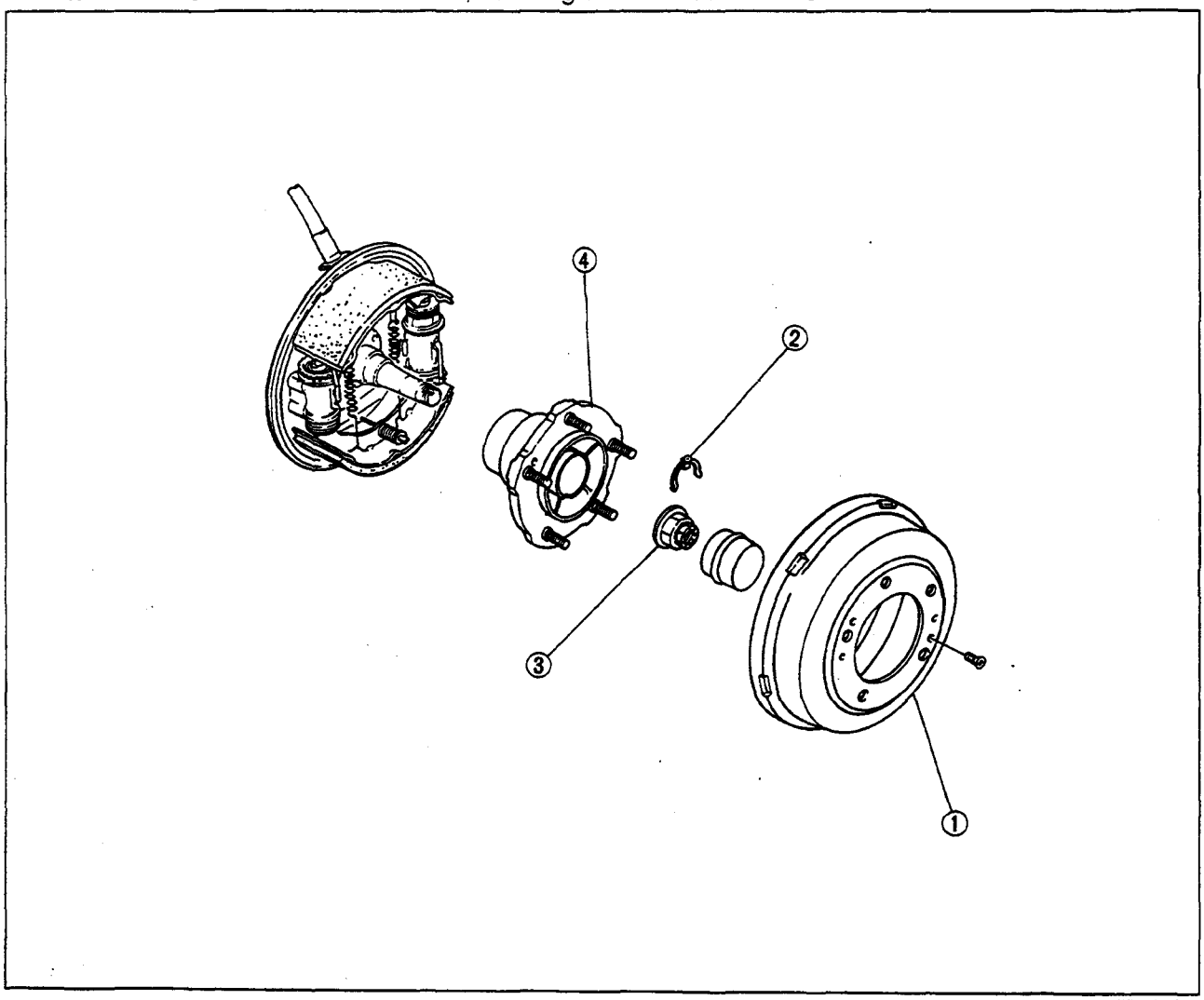
Preload: Frictional force plus
11—30 N (1.1—3.0 kg, 2.4—6.6 lb)

7. Install in the reverse order of removal.

WHEEL HUB

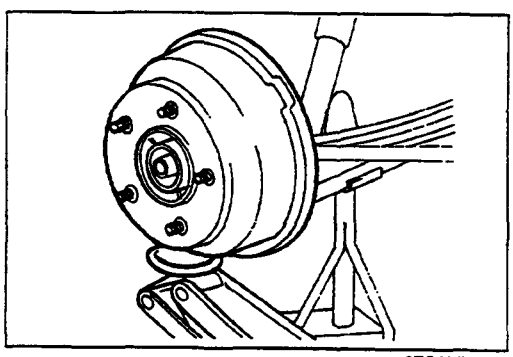
Removal / Inspection / Installation

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**.



9TF0MX-007

1. Brake drum
   - Removal Note ..... page M–6
   - Service ..... Section P
2. Stop retainer
3. Hub nut
   - Installation Note ..... page M–7
4. Wheel hub
   - Removal Note ..... page M–7
   - Disassembly / Inspection / Assembly ..... page M–7



9TG0MX-015

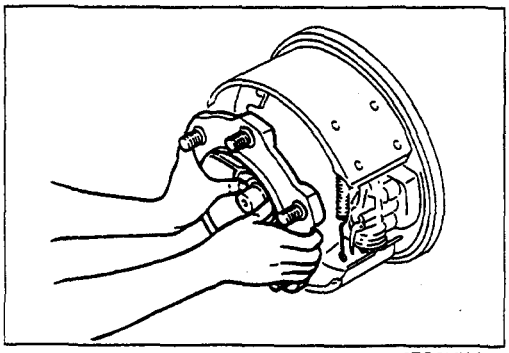
Removal Note

Brake drum

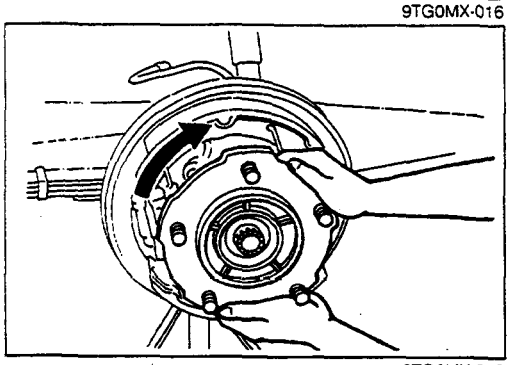
1. Support the brake drum with a jack and remove it.

Caution

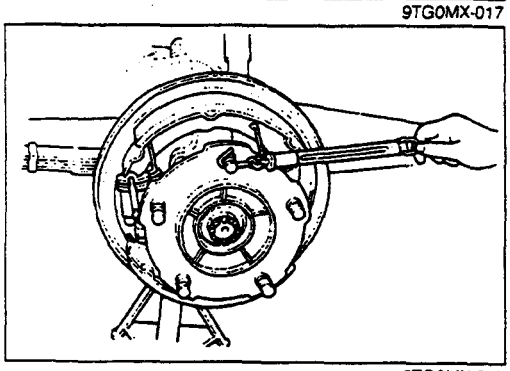
- **Do not damage the oil seal.**



9TG0MX-016



9TG0MX-017



9TG0MX-018

Wheel hub

Caution
- ***Do not drop the bearing inner race.***

1. Remove the wheel hub from the steering knuckle.

Installation Note
Hub nut
1. Temporarily install the hub nut to the specified torque.

Tightening torque:
29—39 N·m (3—4 m-kg, 22—29 ft-lb)

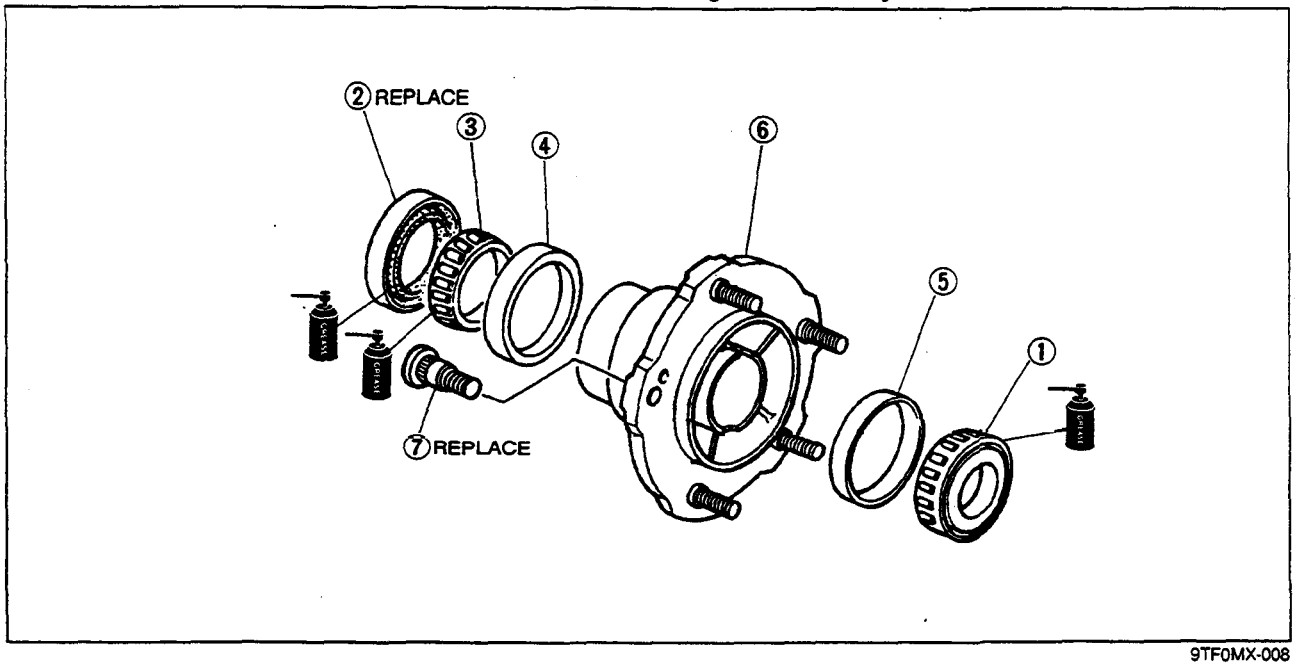
2. Turn the wheel hub several times to seat the bearings fully.
3. Loosen the hub nut until it can be turned by hand.

4. Attach a pull scale to a wheel hub bolt, and measure the frictional force while turning. Tighten the locknut until the preload is as specified.

Preload: Frictional force plus
11—30 N (1.1—3.0 kg, 2.4—6.6 lb)

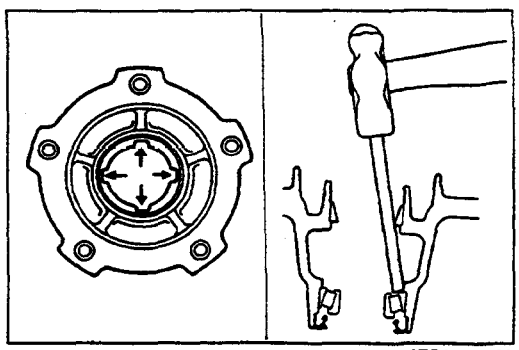
Disassembly / Inspection / Assembly

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**.



9TF0MX-008

1. Bearing inner race (Outer)
   Inspect for damage and rotation
2. Oil seal
   Assembly Note ..... page M–9
3. Bearing inner race (Inner)
   Inspect for damage and rotation
4. Bearing outer race (Inner)
   Disassembly Note..... page M–8
   Assembly Note ..... page M–9
5. Bearing outer race (Outer)
   Disassembly Note..... page M–8
   Assembly Note ..... page M–9
6. Wheel hub
7. Hub bolt
   Disassembly Note..... page M–9
   Assembly Note ..... page M–9



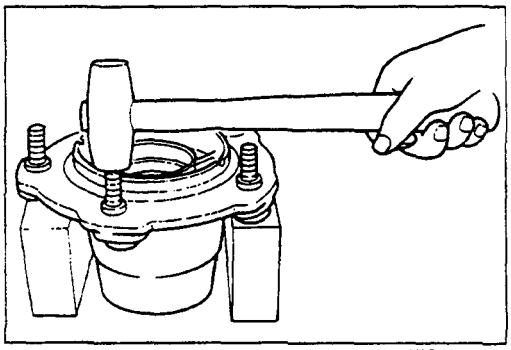
9TG0MX-020

Disassembly Note
Bearing outer race

Caution
- **Replace the inner and outer race as a set.**
- **Do not reuse the removed oil seal.**

Note
- **When removing the bearing outer race (Inner), the inner race (Inner) and oil seal will also come out.**

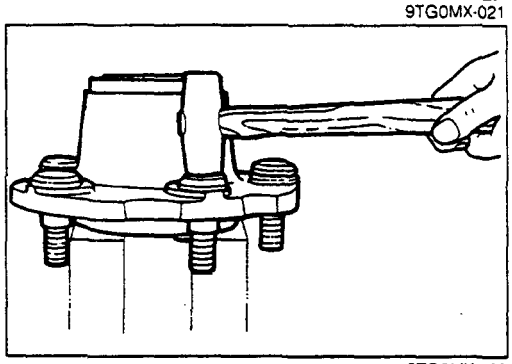
1. Tap the bearing outer race at the notches in the wheel hub (shown by arrows) with a brass bar and a hammer to remove it.


9TG0MX-021

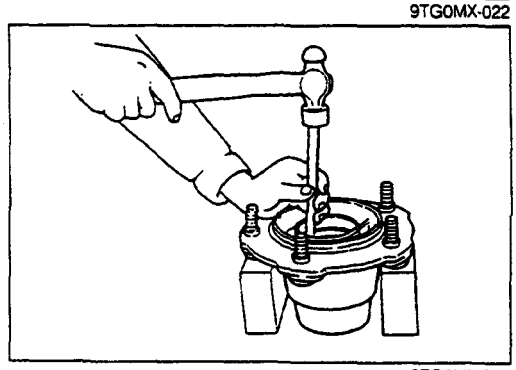
Hub bolt

Caution
- **Do not remove the hub bolt if not necessary.**
- **Do not reuse a removed hub bolt.**

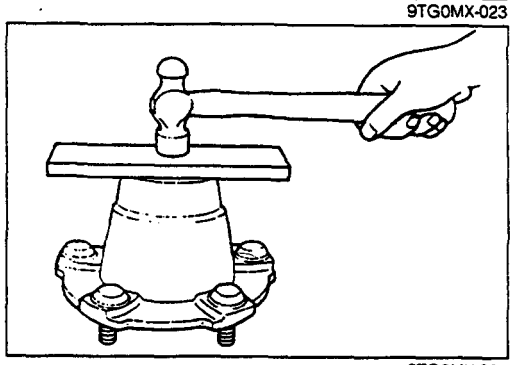
1. Remove the hub bolts with a brass hammer.


9TG0MX-022

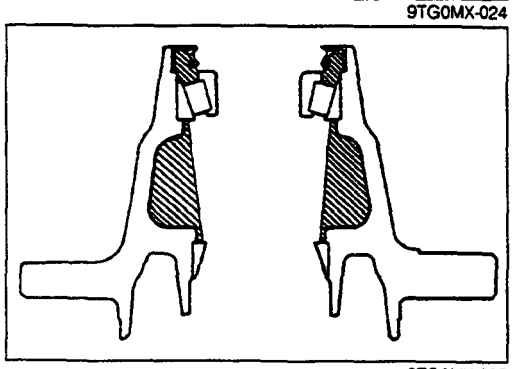
Assembly Note
Hub bolt
1. Install the hub bolts with a brass hammer.


9TG0MX-023

Bearing outer race
1. Install the bearing outer race with a brass bar and a hammer.


9TG0MX-024

Oil seal
1. Apply grease around the new oil seal lip.
2. Drive the oil seal into the wheel hub with a suitable plate and a hammer.

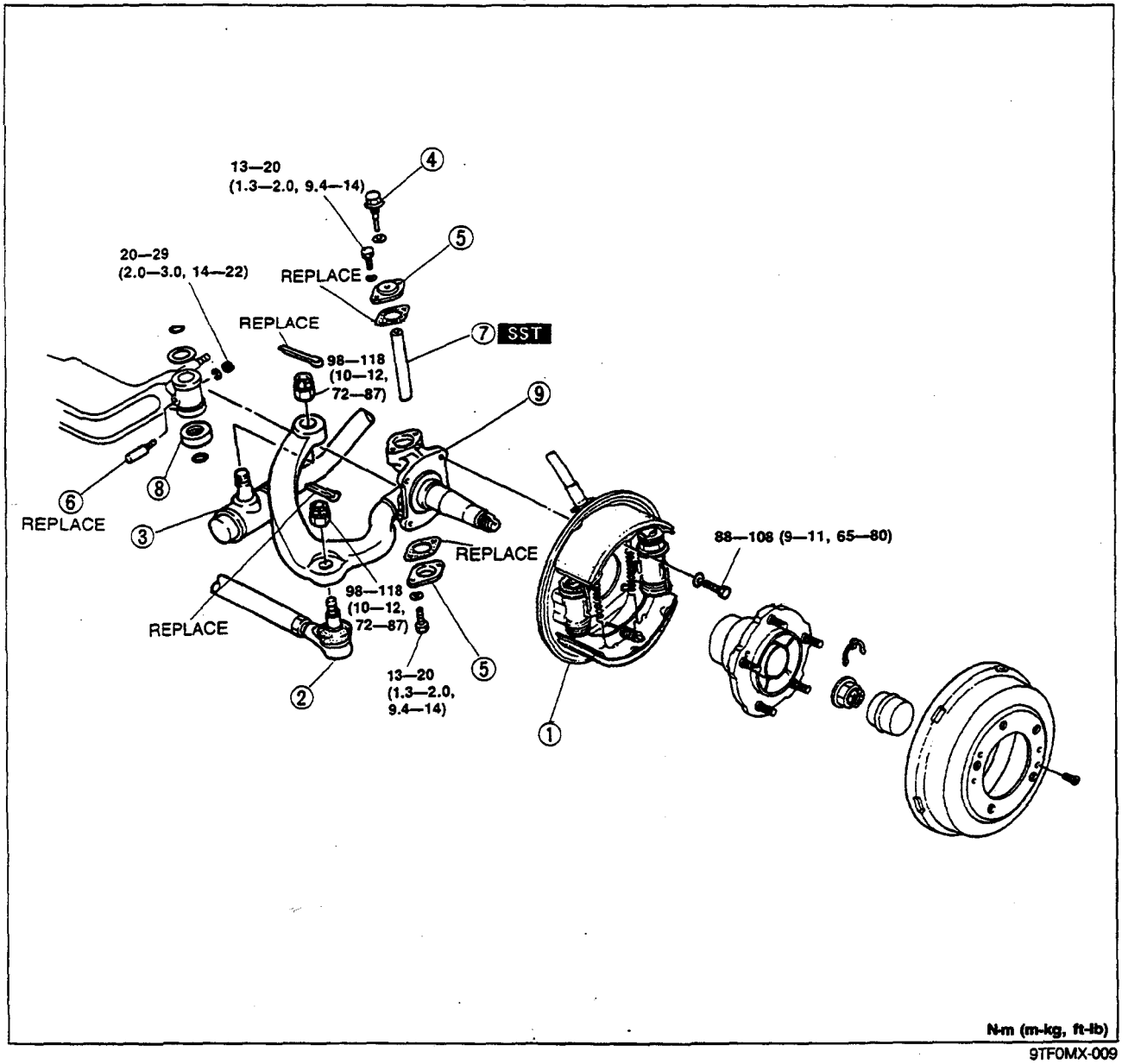

9TG0MX-025

3. Pack grease into the shaded areas shown in the figure.

STEERING KNUCKLE

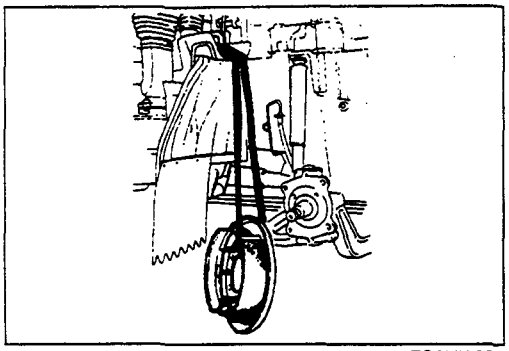
Removal / Inspection / Installation

1. Remove the wheel hub assembly. (Refer to page M–6.)
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**.

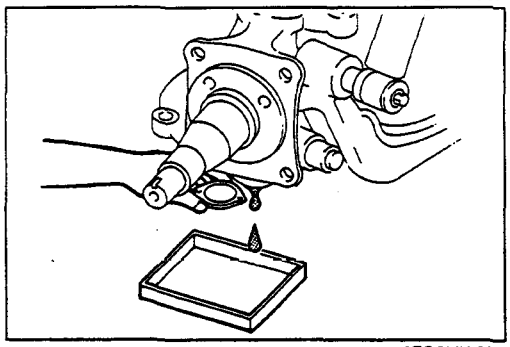


9TF0MX-009

1. Brake backing plate
   - Removal Note ..... page M–11
   - Service ..... Section P
2. Tie-rod ball joint
   - Service ..... Section N
3. Drag link ball joint
   - Service ..... Section N
4. Kingpin oil level gauge
   - Installation Note ..... page M–13
5. Kingpin cap
   - Removal Note ..... page M–11
6. Lock pin
   - Removal Note ..... page M–11
7. Kingpin
   - Removal Note ..... page M–11
   - Inspection ..... page M–11
   - Installation Note ..... page M–12
8. Kingpin bearing
   - Inspect for damage and rotation
9. Steering knuckle
   - Disassembly / Inspection / Assembly ..... page M–13
   - Installation Note ..... page M–12


9TG0MX-027

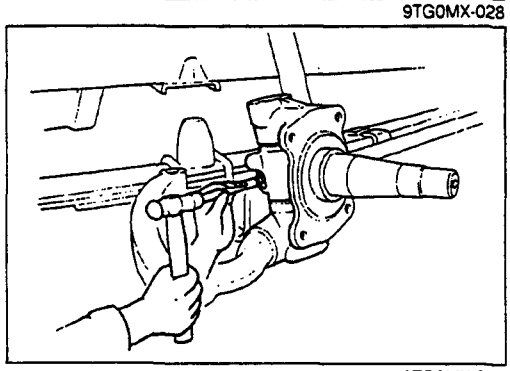
Removal Note
Brake backing plate
1. Remove the brake backing plate from the knuckle spindle.
2. Suspend it by a rope to prevent excessive brake hose tension.


9TG0MX-028

Kingpin cap

Note
- **Prepare a suitable drip pan.**

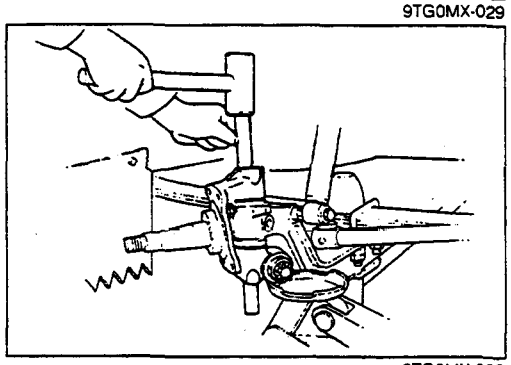
1. Remove the upper and lower kingpin caps.


9TG0MX-029

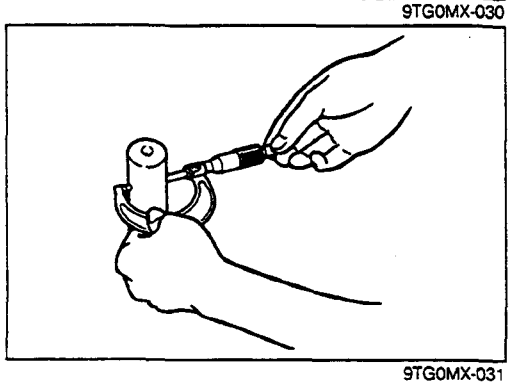
Lock pin

Caution
- **Do not reuse the removed lock pin.**

1. Remove the lock pin with a hammer.

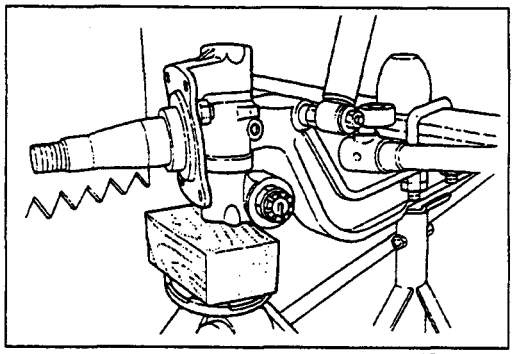

9TG0MX-030

Kingpin
1. Remove the kingpin with a brass bar and a hammer.

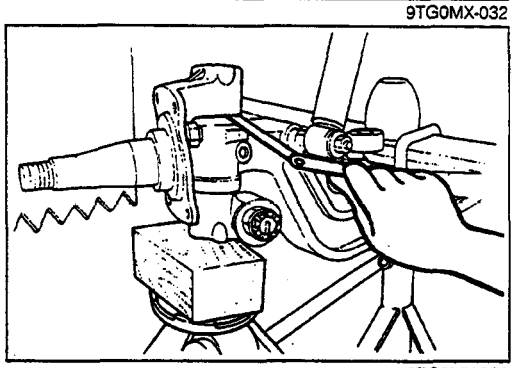

9TG0MX-031

Inspection
Kingpin bushing and kingpin clearance
1. Measure the kingpin bushing inner diameter and kingpin outer diameter with a micrometer, then figure out the clearance between them.

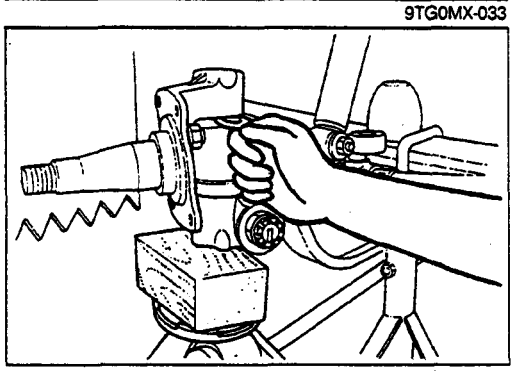
Clearance: 0.01—0.04mm (0.0004—0.0016 in)



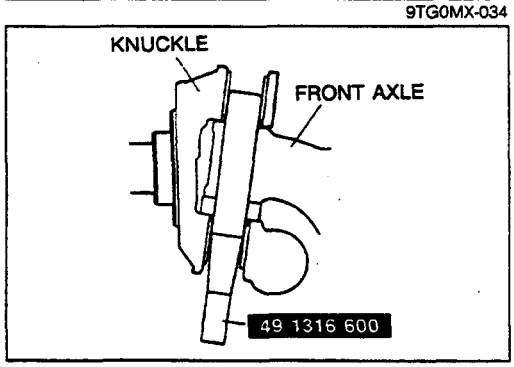
9TG0MX-032



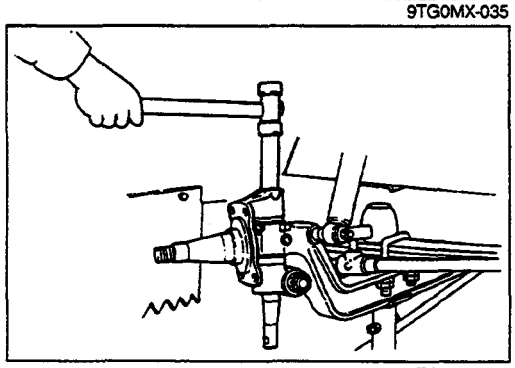
9TG0MX-033



9TG0MX-034



9TG0MX-035



9TG0MX-036

Installation Note
Steering knuckle

Note
- **Install the kingpin bearing with the oil seal face downward.**

1 Install the knuckle and kingpin bearing to the front axle.
2. Lightly jack up the steering knuckle.

3. Measure clearance between the front axle and the knuckle with a feeler gauge.

4. Adjust the clearance to the specification by selecting the proper adjustment shim(s).

Clearance: 0.20—0.35mm (0.008—0.014 in)

Caution
- **Use a maximum of three shims.**

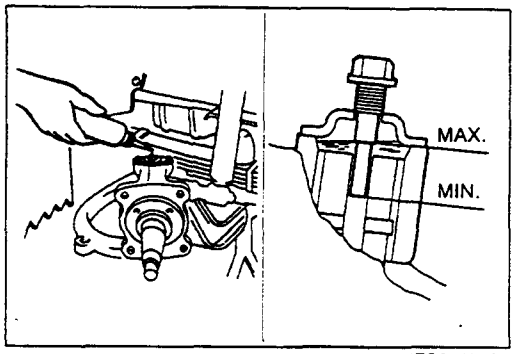
Adjustment shim thickness:

mm (in)

0.35 (0.014)	0.5 (0.020)
0.6 (0.024)	0.7 (0.028)

Kingpin
1. Align the front axle and the knuckle with a **SST**.

2. Index the kingpin lock groove to the hole in the front axle, and install the kingpin with a plastic hammer.



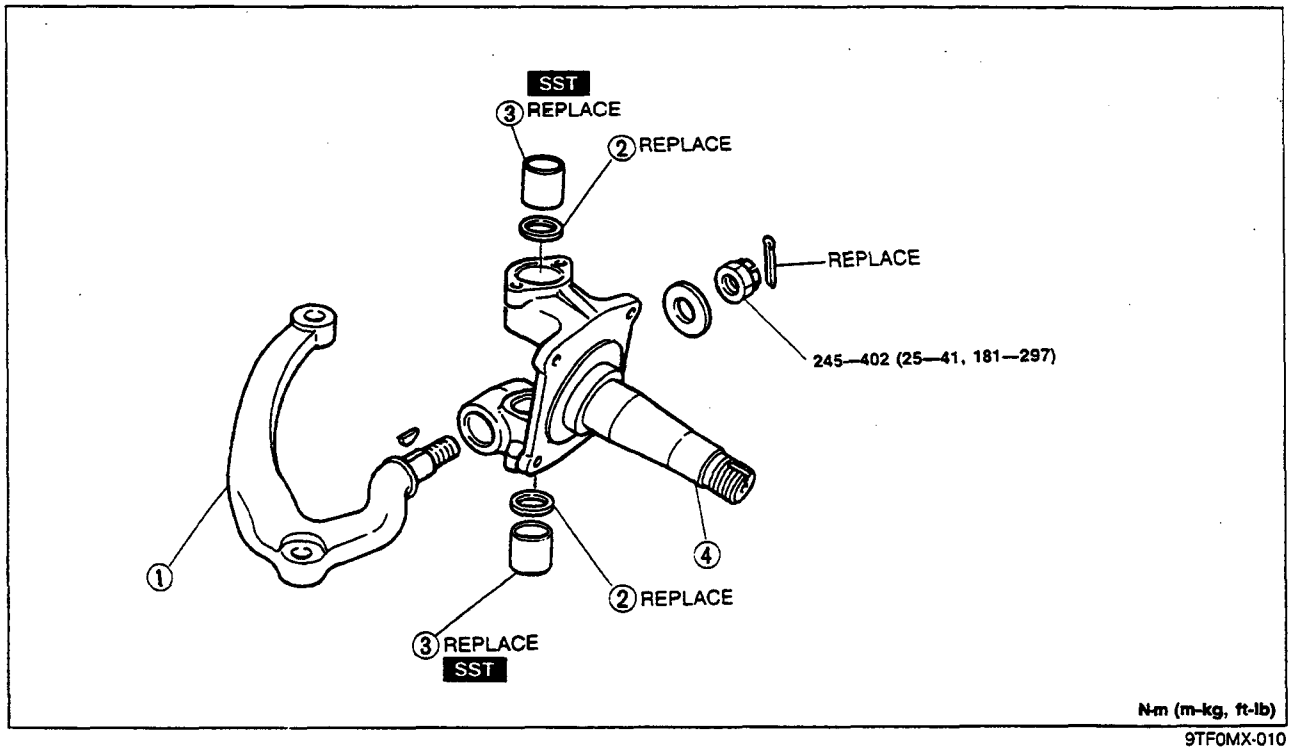
9TG0MX-037

Kingpin oil level gauge

Caution
- **Do not screw in the level gauge when measuring the oil level.**

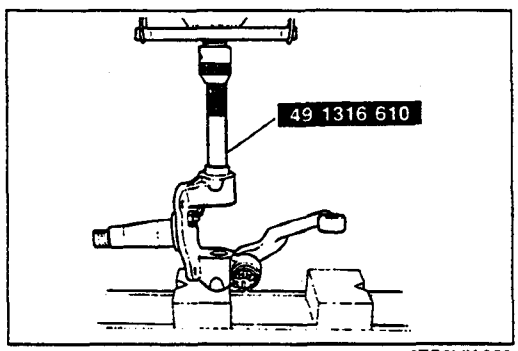
1. Pour in kingpin oil to the level marked on the level gauge as shown.

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**.



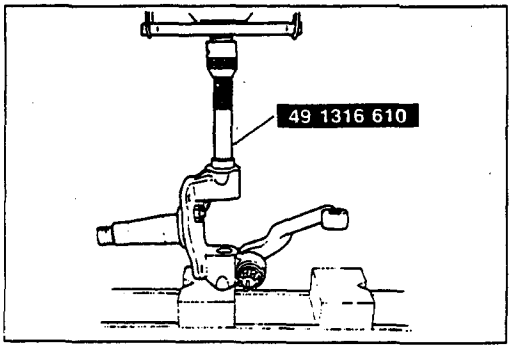
9TF0MX-010

1. Knuckle arm
   Inspect for damage and cracking
2. O-ring
3. Kingpin bushing
   Disassembly Note..... page M–13
   Assembly Note ..... page M–14
4. Steering knuckle
   Inspect for damage and cracking

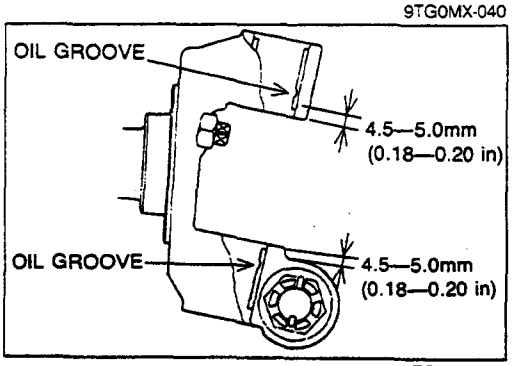


9TG0MX-039

Disassembly Note
Kingpin bushing
1. Remove the kingpin bushing with the **SST** and a press.



9TG0MX-040



9TG0MX-041

Assembly Note
Kingpin bushing

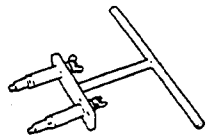
Caution
- **Install the kingpin bushing with the oil groove toward the front axle.**

1. Install the kingpin bushing with the **SST** and a press.

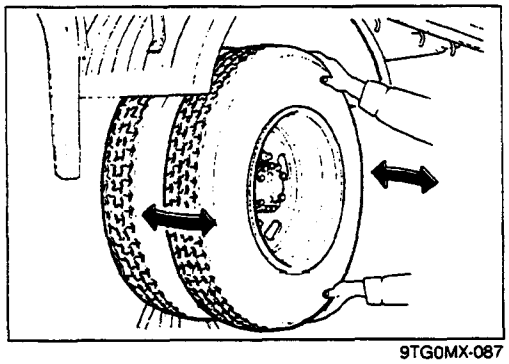
2. When installing, allow **4.5—5.0mm (0.18—0.20 in)** clearance between the end of the bushing and the matching surface of the knuckle.

REAR AXLE

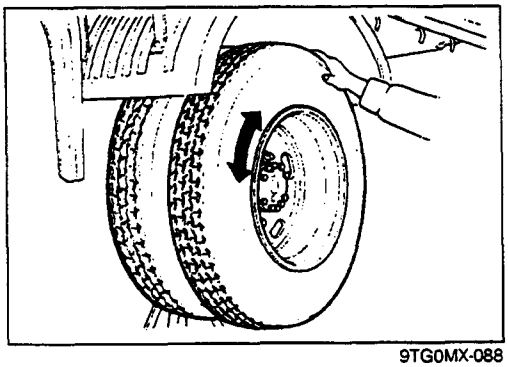
PREPARATION
SST

49 W033 106 Wrench, locknut		For removal and installation of locknut

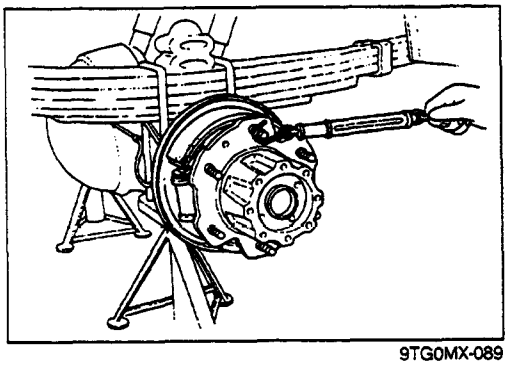
9TG0MX-086



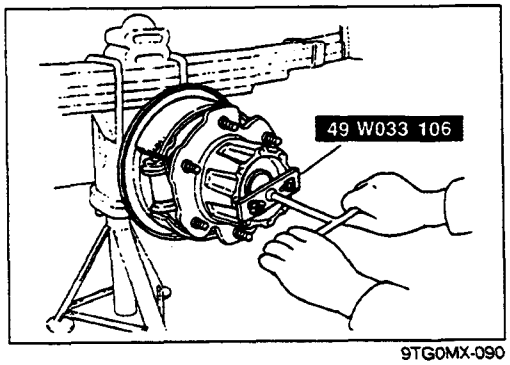
9TG0MX-087



9TG0MX-088



9TG0MX-089



9TG0MX-090

REAR AXLE
Preinspection
Wheel bearing play

1. Push and pull the tire in the axial direction to check the wheel bearing play.
2. Check that there is no abnormal noise and that the tire rotates smoothly when rotated by hand.
3. Adjust the wheel bearing preload as necessary.

Preload Adjustment

1. Remove the wheel and tire assembly.
2. Remove the brake drum.
3. Remove the axle shaft.
4. Remove the set plate.
5. Loosen the hub nut until it can be turned by hand.
6. Tighten the locknut with the **SST** until the preload is as specified.

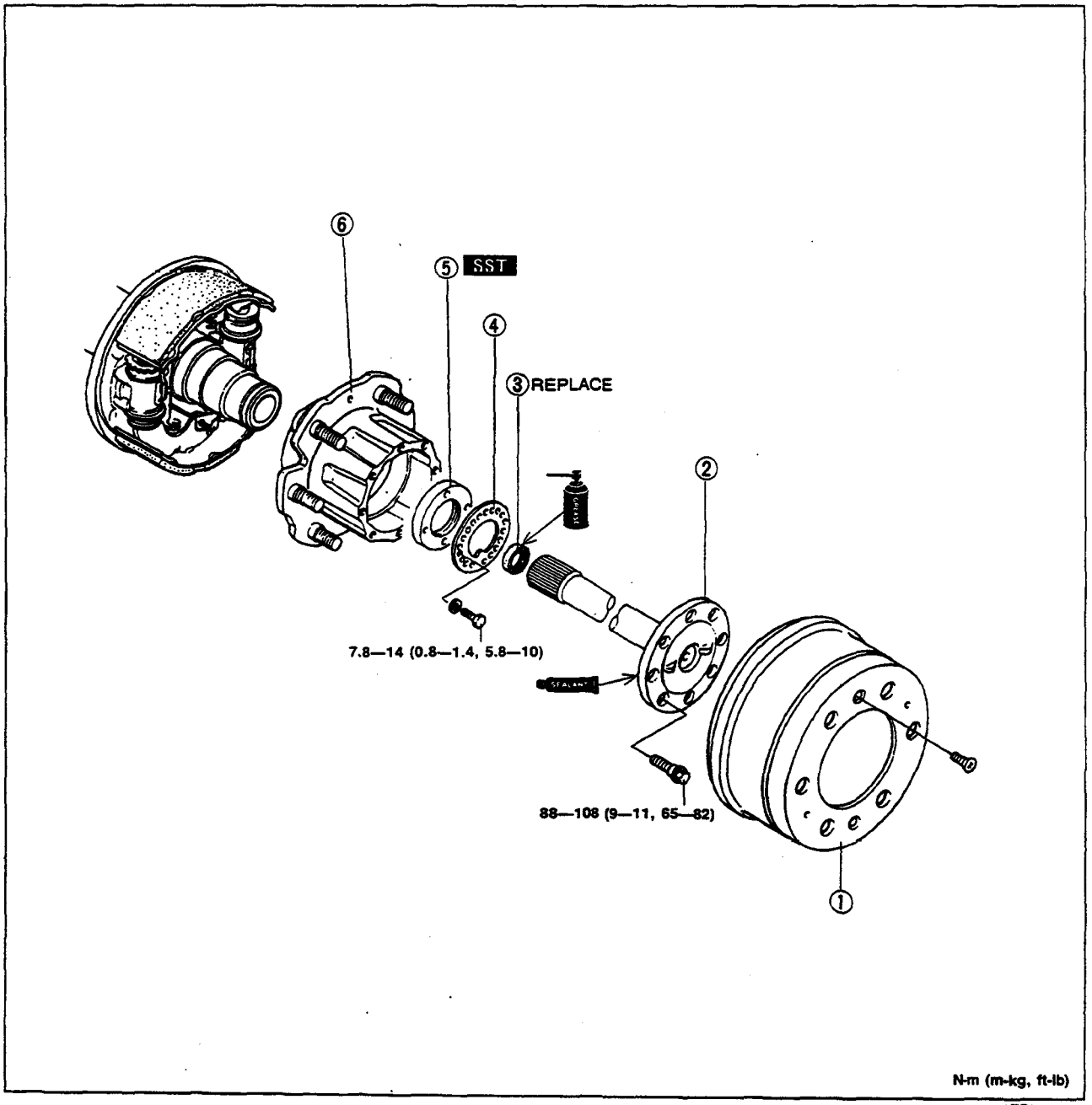
   Preload: Frictional force plus 11—30 N (1.1—3.0 kg, 2.4—6.6 lb)

7. Install in the reverse order of removal.

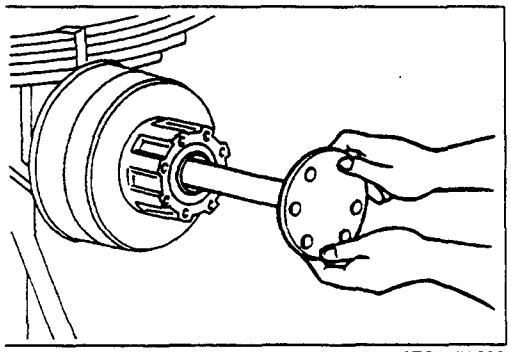
Removal / Inspection / Installation

Caution
- **Do not remove the oil seal if not necessary.**

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



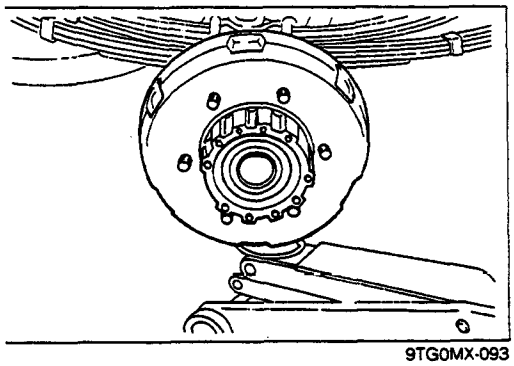
1. Brake drum
   Removal Note ..... page M–17
2. Axle shaft
   Removal Note ..... page M–17
3. Oil seal
   Installation Note ..... page M–18
4. Set plate
5. Locknut
6. Wheel hub
   Removal Note ..... page M–17
   Inspect for damage and cracks
   Disassembly / Inspection / Assembly ..... page M–18
   Installation Note ..... page M–17


9TG0MX-092

Removal Note
Axle shaft

Caution
- **Do not damage the axle housing oil seal.**

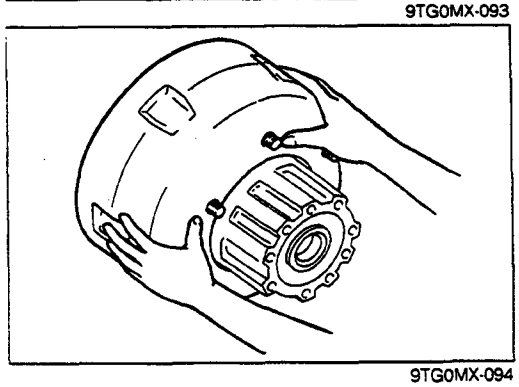
1. Pull out the axle shaft straight out of the axle housing.


9TG0MX-093

Brake drum
1. Support the brake drum with a jack.

Caution
- **Do not damage the oil seal.**

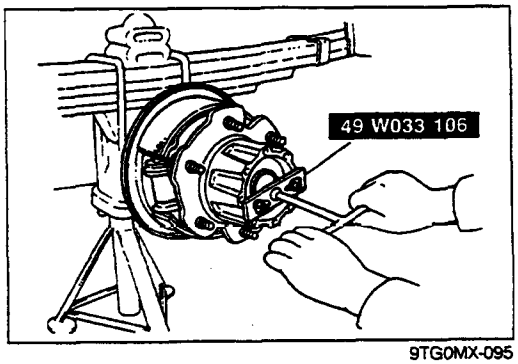
2. Remove the brake drum.


9TG0MX-094

Wheel hub

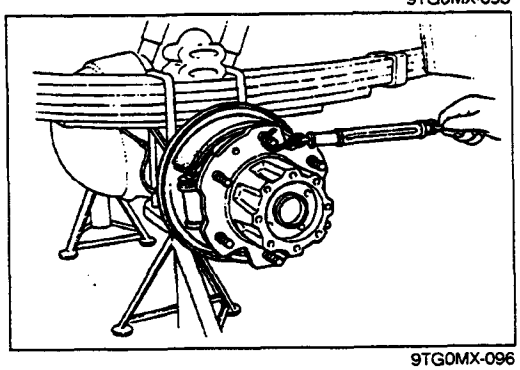
Caution
- **Do not drop the bearing inner race.**

1. Remove the wheel hub from the axle housing.



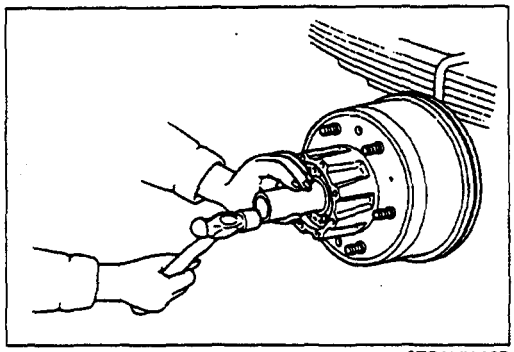
9TG0MX-095

Installation Note
Wheel hub
1. Tighten the locknut with the **SST**.
2. Turn the wheel hub several times to seat the bearings.
3. Loosen the locknut until it can be turned by hand.


9TG0MX-096

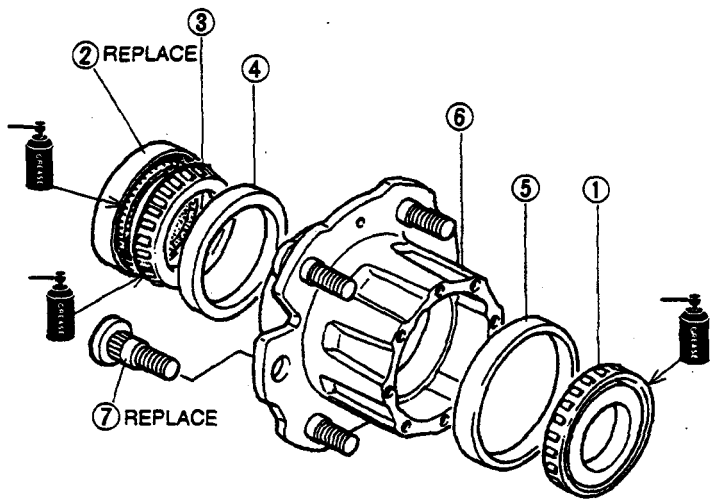
4. Attach a pull scale to a wheel hub bolt, and measure the frictional force while turning. Tighten the bearing locknut with the **SST** until the preload is as specified.

Preload: Frictional force plus
11—30 N (1.1—3.0 kg, 2.4—6.6 lb)


9TG0MX-097

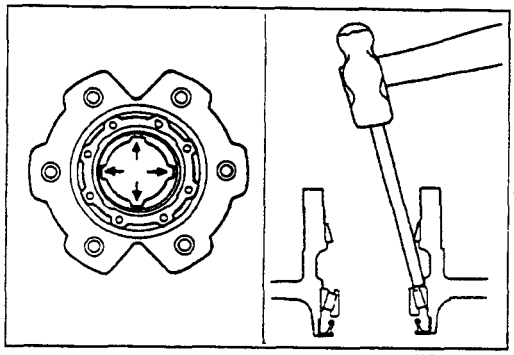
Oil seal
1. Apply grease to the lip of the new oil seal.
2. Install the oil seal into the axle housing with a suitable pipe and a hammer.

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**.



9TF0MX-012

1. Bearing inner race (Outer)
   Inspect for damage and rotation
2. Oil seal
   Assembly Note ..... page M–19
3. Bearing inner race (Inner)
   Inspect for damage and rotation
4. Bearing outer race (Inner)
   Disassembly Note..... page M–19
   Assembly Note ..... page M–19
5. Bearing outer race (Outer)
   Inspect for damage or wear
   Assembly Note ..... page M–19
6. Wheel hub
7. Hub bolt
   Disassembly Note..... page M–19

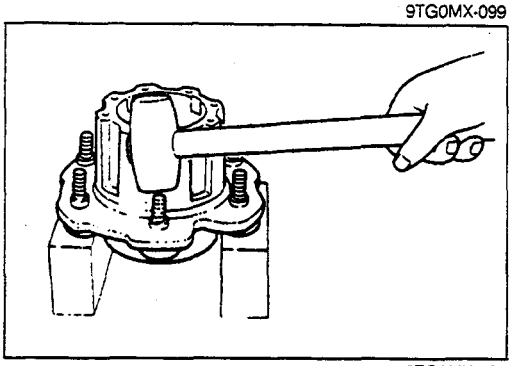

9TG0MX-099

Disassembly Note
Bearing outer race (Inner)

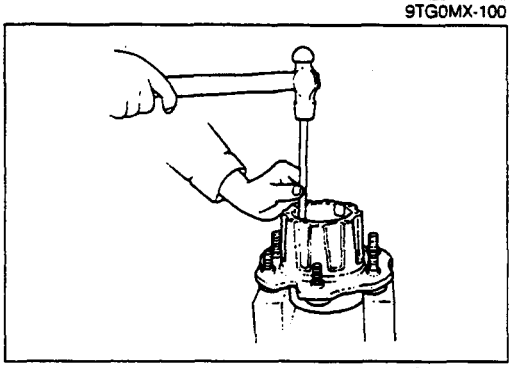
Caution
- **Replace the inner and outer race as a set.**
- **Do not reuse the removed oil seal.**

Note
- **When removing the bearing outer race (Inner), the inner race and oil seal will also come out.**

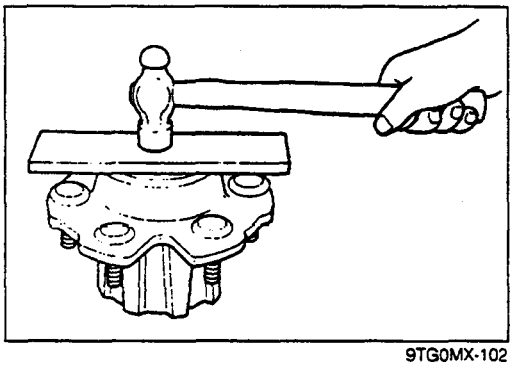
1. Tap the bearing outer race at the notches in the wheel hub (shown by arrows) with a brass bar and a hammer.


9TG0MX-100

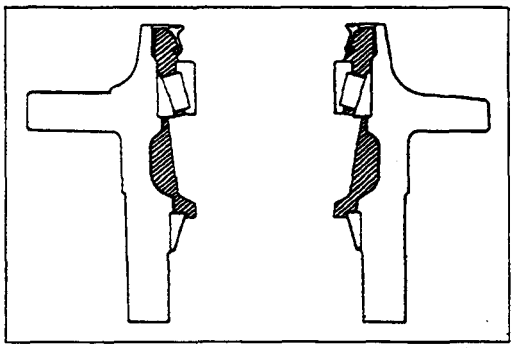
Hub bolt
1. Remove the hub bolts with a brass hammer.


9TG0MX-101

Assembly Note
Bearing outer race
1. Apply grease to the new bearing outer race.
2. Install the outer race with a brass bar and a hammer.


9TG0MX-102

Oil seal
1. Apply grease to the lip of the new oil seal.
2. Drive the oil seal into the wheel hub with a suitable plate and a hammer.

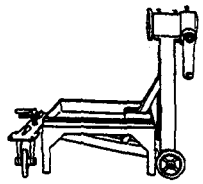
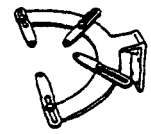
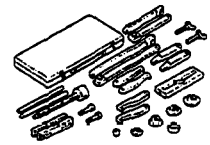
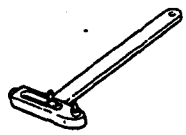

9TG0MX-103

3. Pack grease into the shaded areas shown in the figure.

DIFFERENTIAL

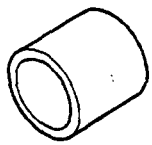
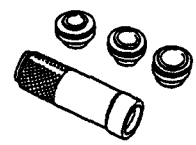
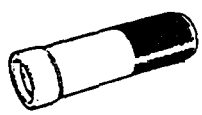
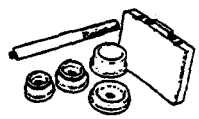
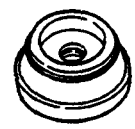
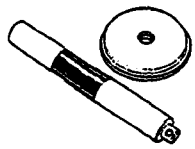
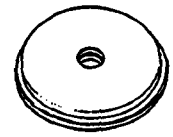
PREPARATION
SST

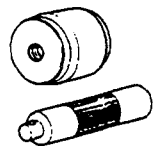
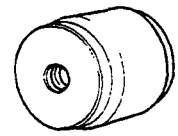
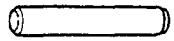
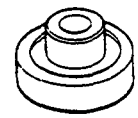
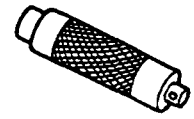
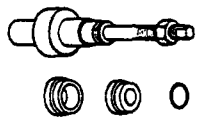
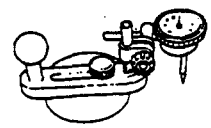
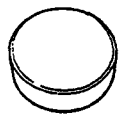
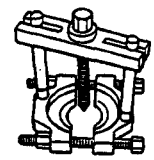
For W and Y type

49 0107 680A Engine stand 	For installation of differential carrier	49 M005 561 Hanger, diff. carrier 	For support of differential carrier
49 S120 710 Holder, coupling flange 	For removal and installation of locknut	49 0839 425C Puller set, bearing 	For removal of companion flange and bearing
49 0259 720 Wrench, diff. side bearing adjusting nut 	For adjustment of drive pinion and ring gear backlash		

9TG0MX-112

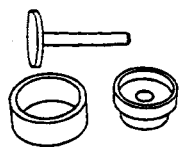
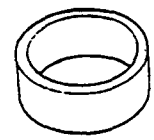
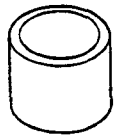
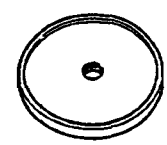
For W type

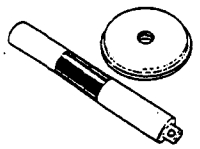
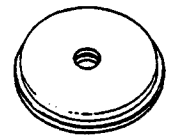
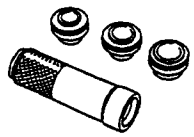
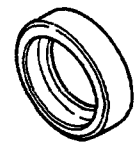
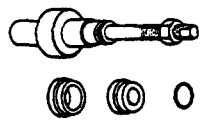
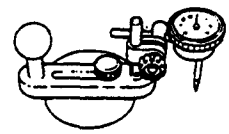
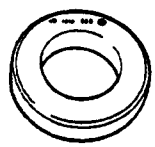
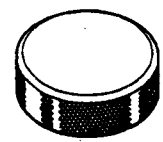
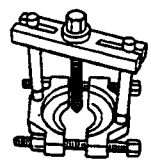
49 U027 003 Installer, oil seal 	For installation of side bearing inner race	49 F401 330B Installer set, bearing 	For installation of *rear bearing* inner race
49 F401 331 Body (Part of 49 F401 330B) 	For *installation of* rear bearing inner race	49 F401 336B Attachment B (Part of 49 F401 330B) 	For installation of pilot bearing inner race
49 F027 0A1 Installer set, bearing 	For installation of front bearing outer race	49 F027 007 Attachment for bearing ϕ72 (Part of 49 F027 0A1) 	For installation of front bearing outer race
49 W033 1A0 Installer set, bearing 	For installation of rear bearing outer race	49 W033 101 Body (Part of 49 W033 1A0) 	For installation of *rear bearing* outer race

49 W027 0A0 Installer set, oil seal 	For installation of oil seal	49 W027 001 Body (Part of 49 W027 0A0) 	For installation of oil seal
49 0552 087 Installer, camshaft bushing 	For installation of pilot bearing outer race (No stopper)	49 H033 101 Remover, bearing 	For installation of pilot bearing outer race (With stopper)
49 G030 795 Installer, oil seal 	For installation of rear bearing outer race	49 G030 797 Handle (Part of 49 G030 795) 	For installation of rear bearing outer race
49 1363 565 Pinion model 	For measurement of pinion height	49 0727 570 Gauge body, pinion height 	For measurement of pinion height
49 F027 0A0 Gauge set, pinion height adjusting 	For measurement of pinion height	49 0305 555 Gauge block (Part of 49 F027 0A0) 	For measurement of pinion height
49 W027 004 Gauge block 	For measurement of pinion height	49 0710 520 Puller, bearing 	For removal of pilot bearing inner race

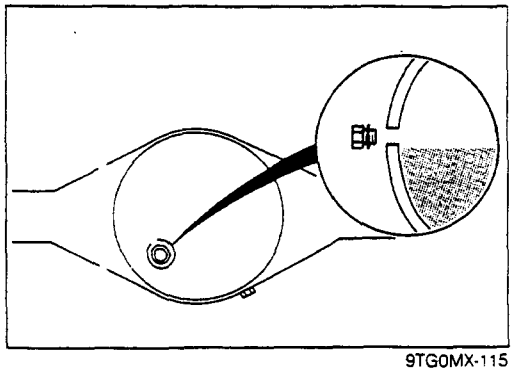
9TG0MX-113

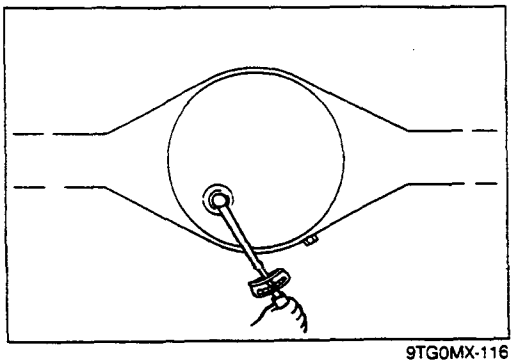
For Y type

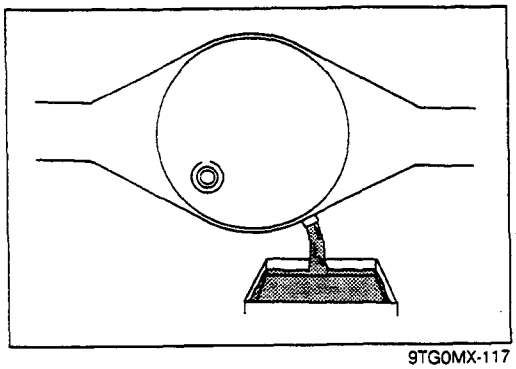
49 S231 625 Puller & Installer set, lower arm bushing 	For installation of side bearing inner race	49 S231 626 Support block (Part of 49 S231 625) 	For installation of side bearing inner race
49 W027 003 Installer, bearing 	For installation of rear bearing inner race	49 W033 105 Installer, oil seal 	For installation of rear bearing outer race

49 W033 1A0 Installer set, bearing 	For installation of front bearing outer race	49 W033 101 Body (Part of 49 W033 1A0) 	For installation of front bearing outer race
49 F401 330B Installer set, bearing 	For installation of pilot bearing	49 F401 335A Attachment A (Part of 49 F401 330B) 	For installation of pilot bearing inner race
49 F401 337A Attachment C (Part of 49 F401 330B) 	For installation of pilot bearing outer race	49 G033 107 Installer, dust cover 	For installation of oil seal
49 G030 795 Installer, oil seal 	For installation of rear bearing outer race	49 G030 797 Handle (Part of 49 G030 795) 	For installation of rear bearing outer race
49 1363 565 Pinion model 	For measurement of pinion height	49 0727 570 Gauge body, pinion height 	For measurement of pinion height
49 1316 555 Gauge block 	For measurement of pinion height	49 Y001 555 Gauge block 	For measurement of pinion height
47 0710 520 Puller, bearing 	For removal of pilot bearing inner race		

9TG0MX-114


9TG0MX-115


9TG0MX-116


9TG0MX-117

DIFFERENTIAL OIL

Inspection

1. Remove the oil filler plug.
2. Verify that the oil level is at the bottom of the plug hole.
3. If low, add the specified oil.

Specified oil
Type:
Above −18°C (0°F): GL-5 SAE 90
Below −18°C (0°F): GL-5 SAE 80W

4. Install a new washer and tighten the oil filler plug.

Tightening torque:
39—54 N·m (4.0—5.5 m-kg, 29—40 ft-lb)

Replacement

1. Remove the magnetic plug and drain the differential oil.
2. Clean the magnetic plug.
3. Install a new washer and tighten the magnetic plug.

Tightening torque:
39—54 N·m (4.0—5.5 m-kg, 29—40 ft-lb)

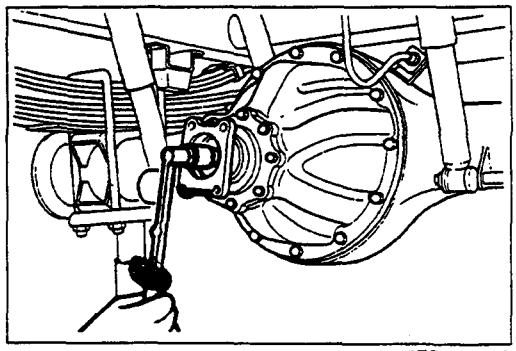
4. Remove the oil filler plug and fill the differential with the specified oil.

Specified oil
Type:
Above −18°C (0°F): GL-5 SAE 90
Below −18°C (0°F): GL-5 SAE 80W
Capacity:
W type: 2.6 liters (2.7 US qt, 2.3 Imp qt)
Y type: 3.6 liters (3.8 US qt, 3.2 Imp qt)

5. Check the oil level.
6. Install a new washer and tighten the oil filler plug.

Tightening torque:
39—54 N·m (4.0—5.5 m-kg, 29—40 ft-lb)

9TF0MX-013

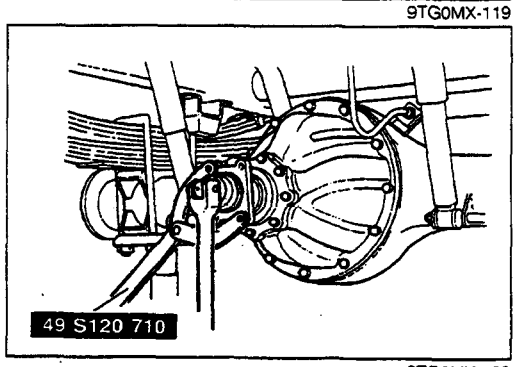

9TG0MX-119

OIL SEAL

Replacement

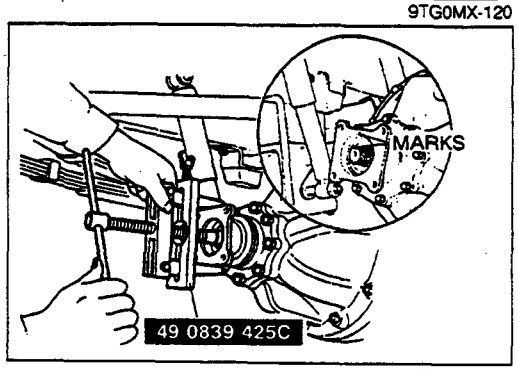
1. Remove the propeller shaft. (Refer to Section L.)
2. Measure the rotation starting torque of the drive pinion (within the range of the drive pinion to ring gear backlash).

Note
- **Make a notation of this torque for proper reassembly.**



9TG0MX-120

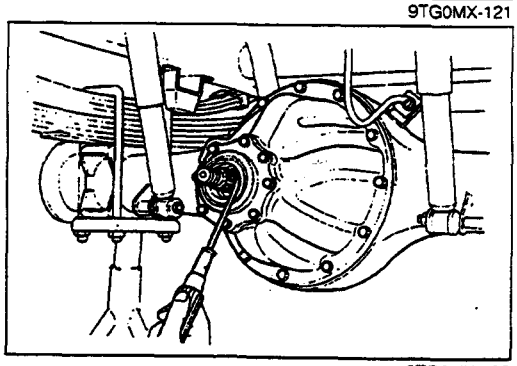
3. Hold the companion flange with the **SST** and remove the locknut.



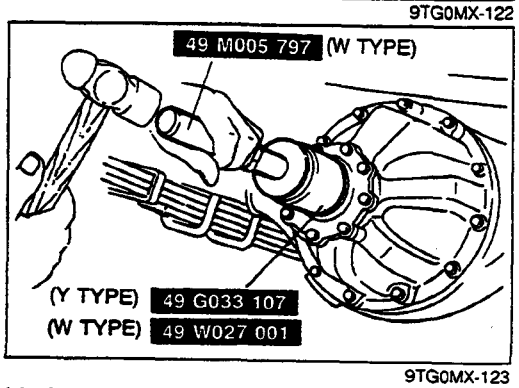
9TG0MX-121

Note
- **Mark the companion flange and the drive pinion for proper reassembly.**

4. Remove the companion flange with the **SST**.


9TG0MX-122

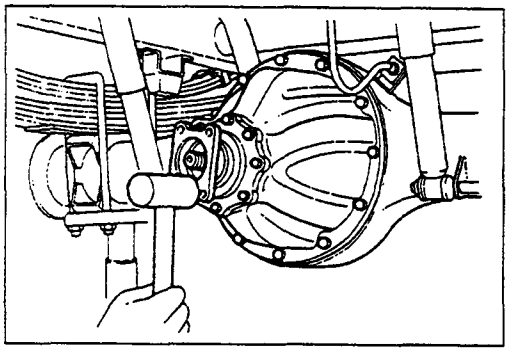
5. Pry out the oil seal.



9TG0MX-123

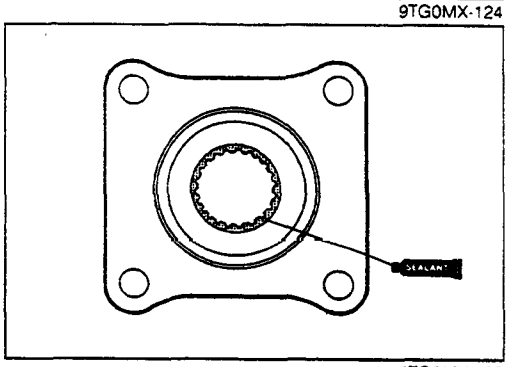
Note
- **Apply a thin coat of differential oil to the lip of the oil seal.**

6. Install the new oil seal with the **SST**.



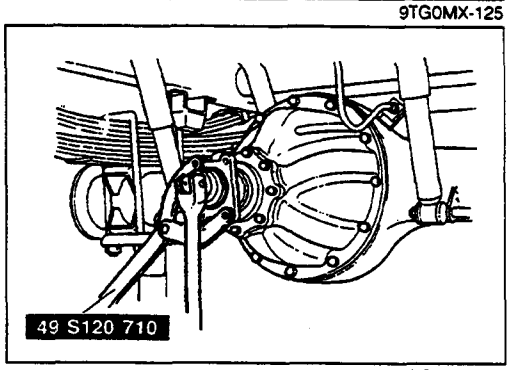
9TG0MX-124

7. Install the companion flange with a brass hammer.



9TG0MX-125

8. Apply 0.5cc of sealant around the companion flange splines.



9TG0MX-126

Note

	W type	Y type
Tightening torque	235—392 N·m (24—40 m-kg, 174—289 ft-lb)	275—392 N·m (28—40 m-kg, 203—289 ft-lb)
Drive pinion preload	0.8—1.6 N·m (8—16 cm-kg, 7—14 in-lb)	2.6—3.4 N·m (27—35 cm-kg, 23—30 in-lb)

Caution

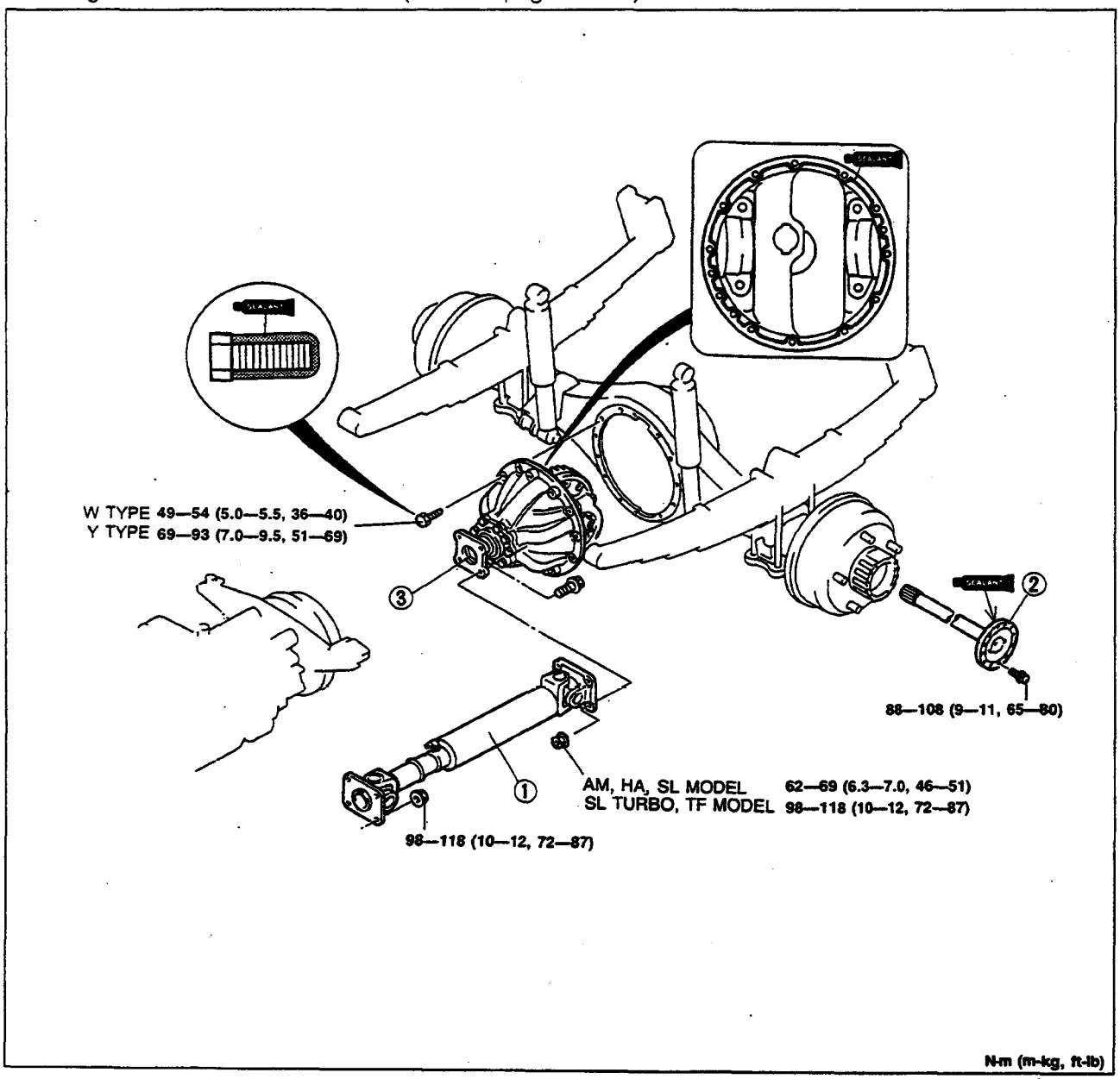
- **If the specified preload cannot be obtained, remove the differential and replace the distance piece or adjust the shim thickness and check it again.**

9. Hold the companion flange with the **SST**, and tighten locknut and new washer until the specified drive pinion preload is obtained.
10. Install the propeller shaft. (Refer to Section L.)

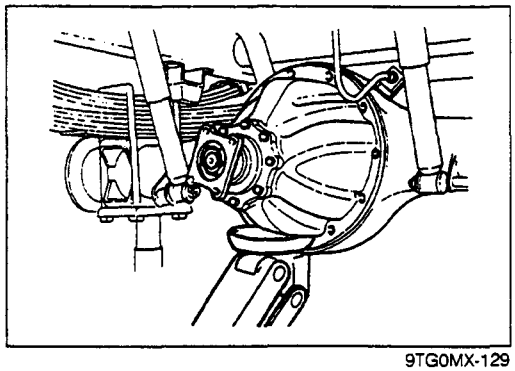
DIFFERENTIAL
Removal / Installation

Caution
- **Remove the old sealant before applying new sealant.**
- **Install the differential carrier within 10 minutes after application of the sealant.**
- **After installation, let the sealant cure more than 30 minutes before filling the differential with the specified type and quality of oil.**

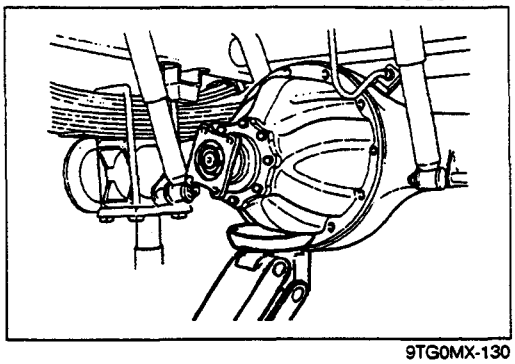
1. Remove the magnetic plug and drain the gear oil.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.
4. Add gear oil and check the level. (Refer to page M–23.)



1. Propeller shaft
   Service ..... Section L
2. Rear axle shaft
   Removal Note ..... page M–17
3. Differential
   Removal Note ..... page M–27
   Overhaul ..... page M–28
   Installation Note ..... page M–27



9TG0MX-129



9TG0MX-130

Removal Note
Differential assembly

Note
- **If removal is difficult, tap the differential rib with a brass hammer.**

1. Support the differential assembly with a jack during removal.

Installation Note
Differential assembly

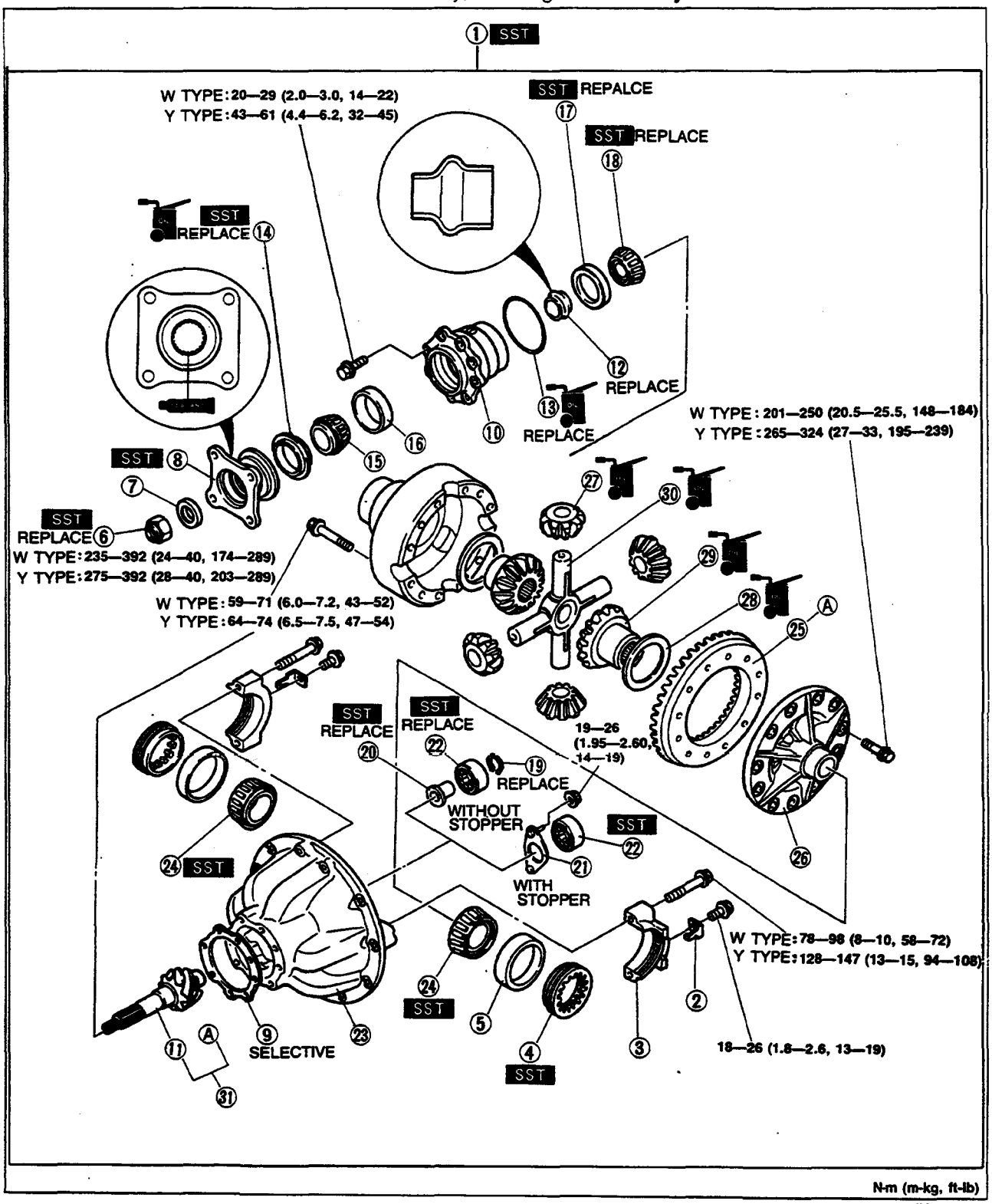
1. Apply gasket to the differential housing mounting surfaces and mounting bolts.
2. Support the differential assembly with a jack during installation.

Tightening torque:
W type: 49—54 N·m (5.0—5.5 m-kg, 36—40 ft-lb)
Y type: 69—93 N·m (7.0—9.5 m-kg, 51—69 ft-lb)

Overhaul

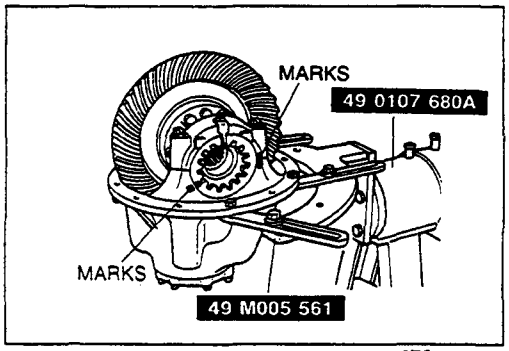
Caution
- **Use protective plates in the vise to prevent damaging parts.**

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**.



1. Differential gear assembly
   Disassembly Note ..... page M–30
2. Lock plate
   Assembly Note ..... page M–41
3. Bearing cap
   Disassembly Note ..... page M–30
   Assembly Note ..... page M–39
4. Adjusting screw
   Disassembly Note ..... page M–30
   Assembly Note ..... page M–39
5. Side bearing outer race
   Disassembly Note ..... page M–30
6. Locknut (Flange)
   Disassembly Note ..... page M–30
   Assembly Note ..... page M–37
7. Washer
8. Companion flange
   Disassembly Note ..... page M–30
   Inspect for damage and wear of splines
   Assembly Note ..... page M–37
9. Adjustment shim
   Assembly Note ..... page M–36
10. Bearing housing
   Disassembly Note ..... page M–30
   Assembly Note ..... page M–38
11. Drive pinion
   Disassembly Note ..... page M–31
   Inspect for damage and wear of splines
   Inspect for damage, wear and chipped teeth
12. Collapsible spacer
13. O-ring
14. Oil seal
   Assembly Note ..... page M–37
15. Front bearing inner race
   Inspect for damage and rotation
16. Front bearing outer race
   Disassembly Note ..... page M–31
   Assembly Note ..... page M–32
17. Rear bearing outer race
   Disassembly Note ..... page M–31
   Assembly Note ..... page M–32
18. Rear bearing inner race
   Disassembly Note ..... page M–31
   Assembly Note ..... page M–36
19. Snap ring (W type, no stopper)
20. Pilot bearing inner race
   (W type, no stopper)
   Disassembly Note ..... page M–31
   Assembly Note ..... page M–36
21. Stopper plate (W type, with stopper)
22. Pilot bearing outer race
   Disassembly Note ..... page M–32
   Assembly Note ..... page M–38
23. Differential carrier
24. Side bearing inner race
   Disassembly Note ..... page M–32
   Inspect for damage and rotation
   Assembly Note ..... page M–39
25. Ring gear
   Disassembly Note ..... page M–32
   Inspect for damage, wear and chipped teeth
   Assembly Note ..... page M–39
26. Gear case
   Disassembly Note ..... page M–32
   Assembly Note ..... page M–38
27. Pinion gear
   Inspect for damage, wear and chipped teeth
28. Thrust washer
29. Side gear
   Inspect for damage, wear and chipped teeth
30. Pinion shaft
31. Final gear set

9TF0MX-015

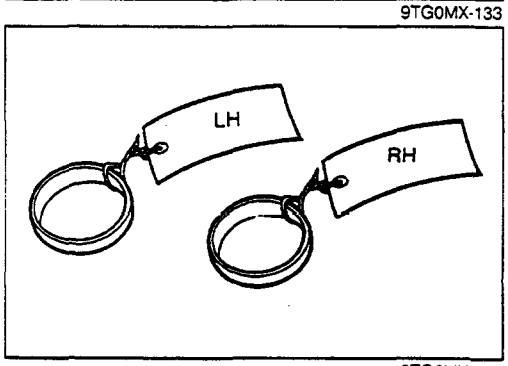


9TG0MX-133

Disassembly Note
Differential gear assembly
1. Mount the differential gear assembly on the **SST**.

Bearing cap
1. Mark the bearing cap and the carrier for proper reassembly.

Adjusting screw
1. Mark the adjusting screw and the carrier for proper reassembly.

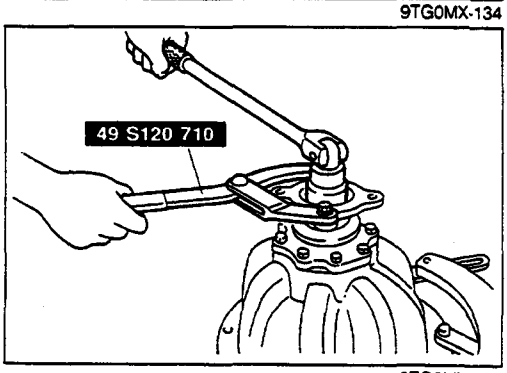


9TG0MX-134

Side bearing outer race

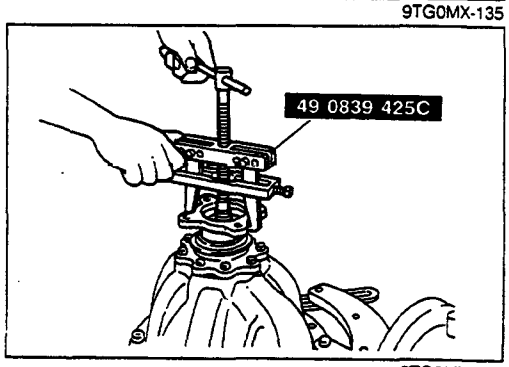
Note
- **Identify the left and right side bearing outer races for proper reassembly.**

1. Remove the side bearing outer races.



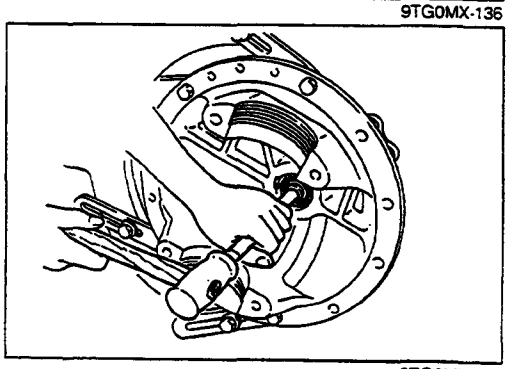
9TG0MX-135

Locknut
1. Hold the companion flange with the **SST**, and remove the locknut.

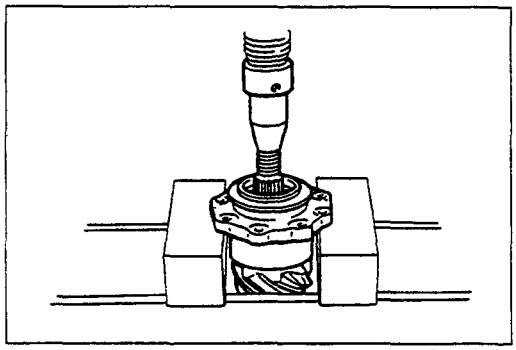


9TG0MX-136

Companion flange
1. Pull the companion flange off with the **SST**.


9TG0MX-137

Bearing housing
1. Drive the bearing housing from the carrier by tapping the drive pinion with a brass bar and a hammer.

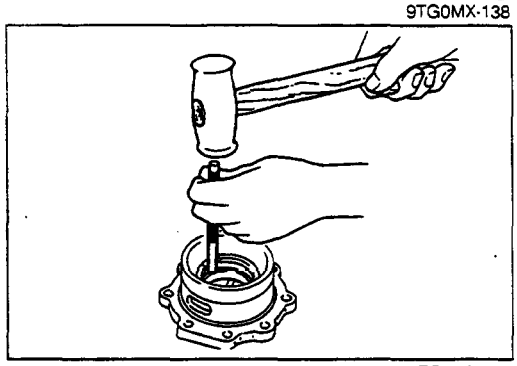


9TG0MX-138

Drive pinion

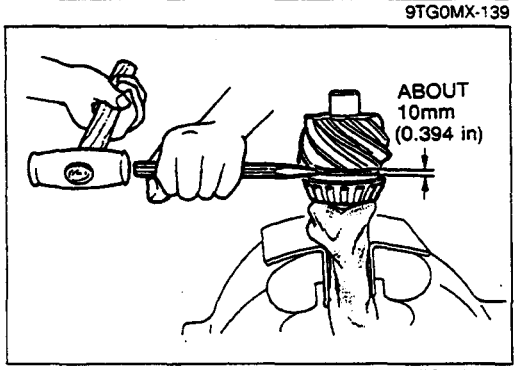
Note
- **Hold the drive pinion with a hand so that it does not fall.**

1. Push the drive pinion out of the bearing housing with the **SST** and press.



9TG0MX-139

Bearing outer race
1. Remove the front and rear bearing outer races with a brass bar and a hammer.

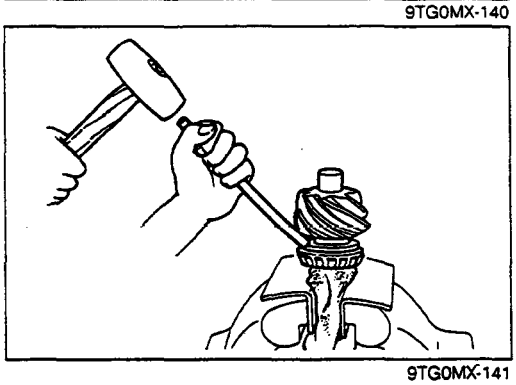


9TG0MX-140

Rear bearing inner race
1. Protect the drive pinion with a rag and place it in a vise.

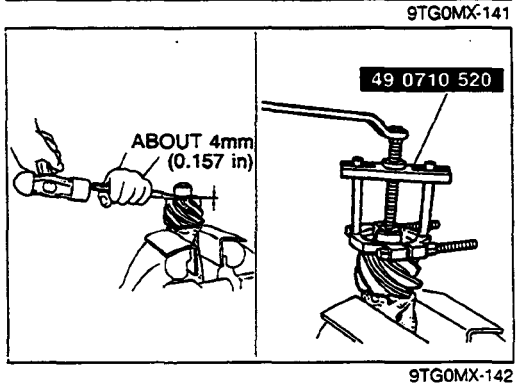
Caution
- **Do not damage the drive pinion gear with the chisel.**

2. Make **approx. 10mm (0.39 in)** of clearance between the drive pinion gear and the bearing inner race with a chisel. (W type)



9TG0MX-141

3. Remove the bearing inner race with a brass bar and a hammer.

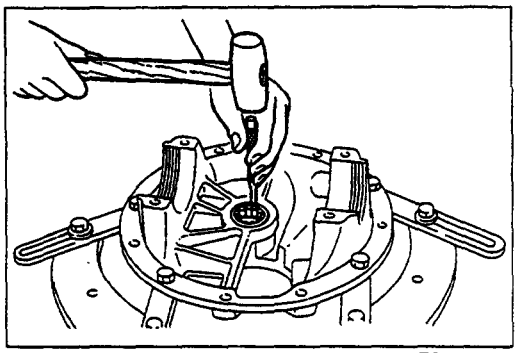


9TG0MX-142

Pilot bearing inner race (W type, no stopper)
1. Protect the drive pinion with a rag and place it in a vise.

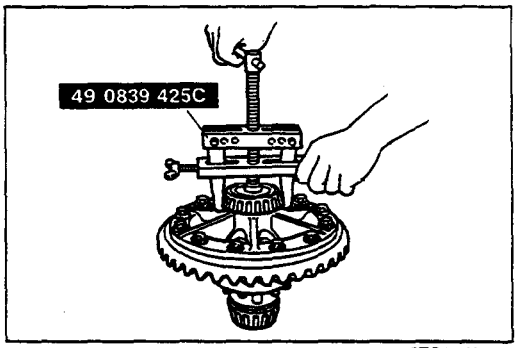
Caution
- **Do not damage the drive pinion gear with the chisel.**

2. Make **approx. 4mm (0.16 in)** of clearance between the drive pinion and the pilot bearing inner race.
3. Remove the pilot bearing inner race from the drive pinion with the **SST**.


9TG0MX-143

Pilot bearing outer race

1. Remove the pilot bearing outer race from the carrier with a brass bar and a hammer.

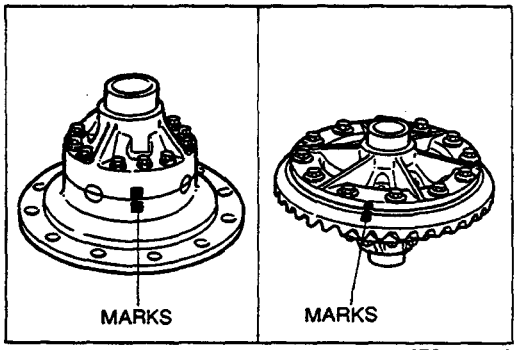


9TG0MX-144

Side bearing inner race

Note
- **Identify the left and right side bearing inner races for proper reassembly.**

1. Remove the side bearing inner race from the gear case with the **SST**.



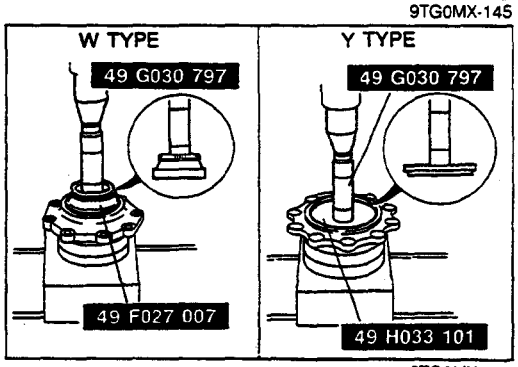
9TG0MX-145

Ring gear

1. Mark the ring gear and the gear case for proper reassembly.

Gear case

1. Mark the gear case for proper reassembly.

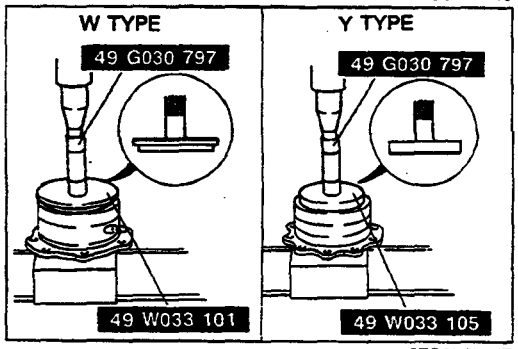


9TG0MX-146

Assembly Note

Front bearing outer race

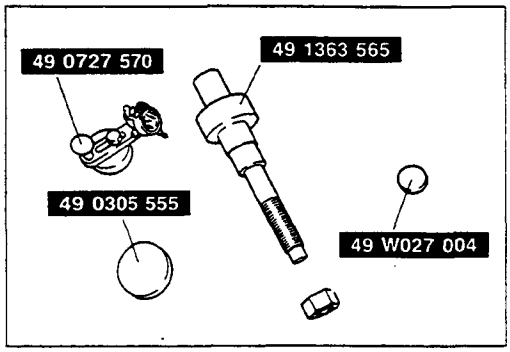
1. Press the front bearing outer race into the bearing housing with the **SST** and a press.



9TG0MX-147

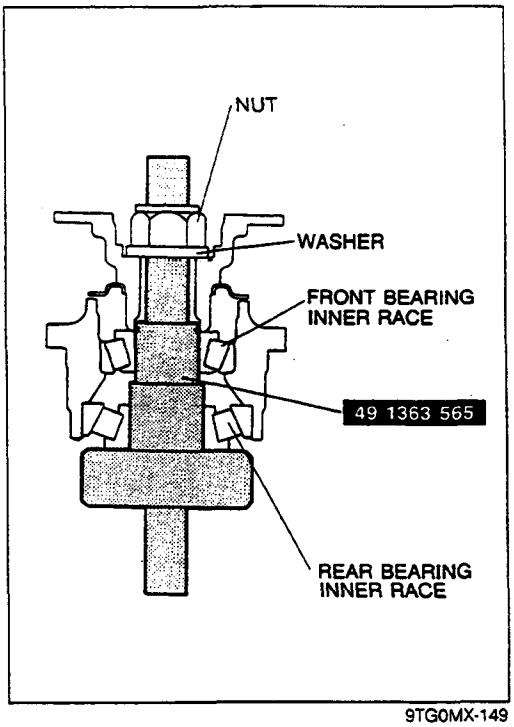
Rear bearing outer race

1. Press the new rear bearing outer race into the bearing housing with the **SST** and a press.



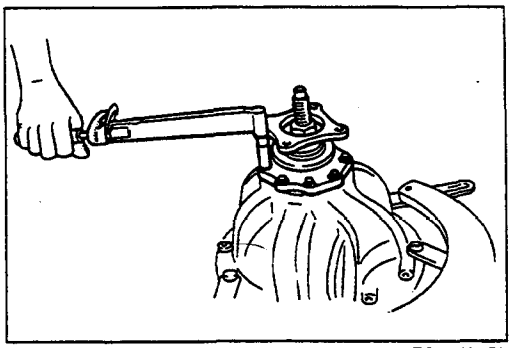
9TG0MX-148

[W type]
Adjustment of pinion height
1. Adjust the pinion height as follows with the **SST**.



9TG0MX-149

(1) Slide the new rear bearing inner race onto the **SST**, then install them into the carrier.
(2) Install the front bearing inner race, companion flange and washer onto the **SST**, and tighten the nut so that the **SST** can still be turned by hand.

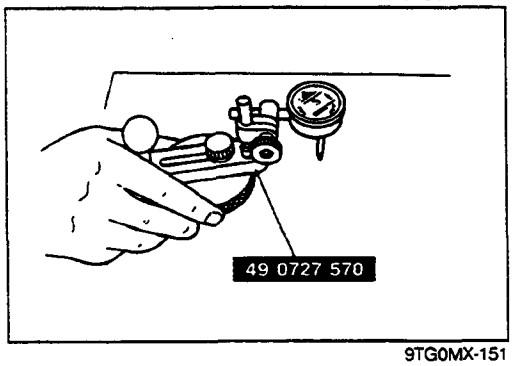


9TG0MX-150

Caution
- **Do not install the adjustment shim.**

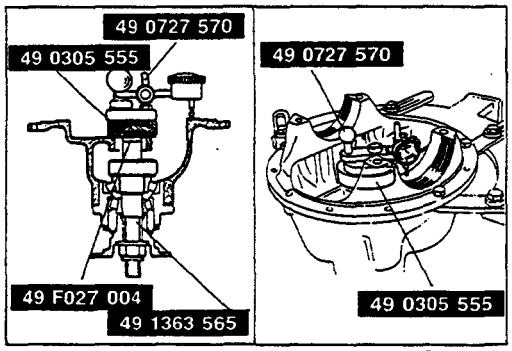
(3) Install the bearing housing assembly into the carrier.

Tightening torque:
20—29 N·m (2.0—3.0 m-kg, 15—22 ft-lb)



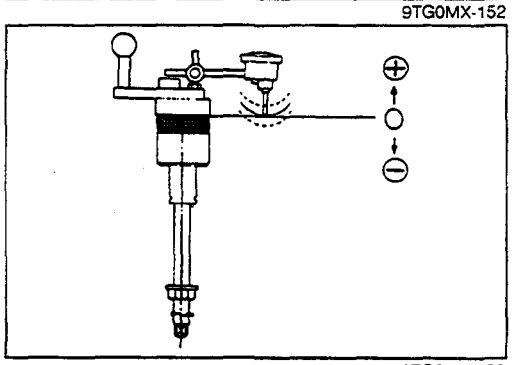
9TG0MX-151

(4) Place the **SST** on the surface plate and set the dial indicator to zero.



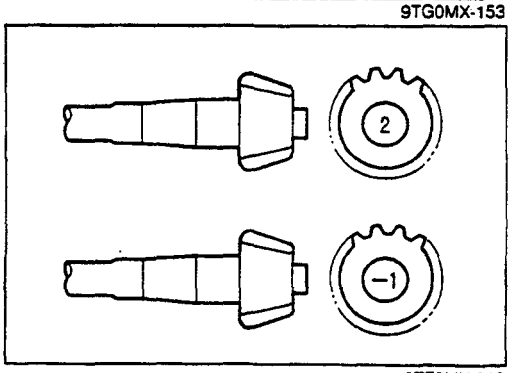
9TG0MX-152

(5) Set the **SST** as shown in the figure.
(6) Place the feeler of the dial indicator so that it contacts where the side bearing is installed in the carrier. Measure the lowest position on the left and right sides.


9TG0MX-153

(7) Add the two (left and right) values obtained in Step 6 and divide the total by 2.
Divide the number marked at the end of the drive pinion by 100 (No number indicates zero).
Figure the pinion height adjustment value.

Drive pinion end mark
2: +0.02mm (0.0008 in)
–1: –0.01mm (–0.0004 in)



9TF0MX-016

Example

- **The two values obtained in Step 6 are 0.18mm (0.007 in) and 0.26mm (0.010 in) and the drive pinion end mark is 2.**

$$\frac{0.18 + 0.26}{2} - \frac{2}{100} = 0.20$$

$$\left(\frac{0.007 + 0.010}{2} - 0.0008 = 0.008\right)$$

The drive pinion adjustment value is 0.20mm (0.008 in).

- **Select the proper adjustment shims and install them between the bearing housing and the carrier. (Refer to page M–38.)**

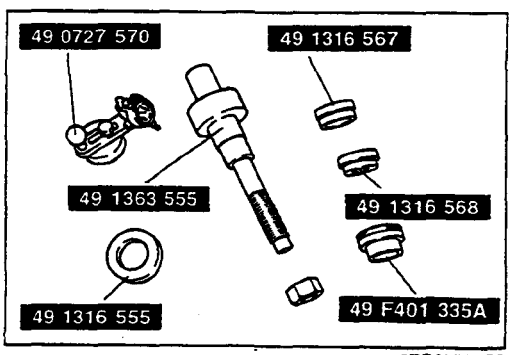
Note

- **Select adjustment shims within 0 ± 0.03mm (0 ± 0.001 in) of the specified thickness.**
- **Use a maximum of five shims.**

Adjustment shim thickness:

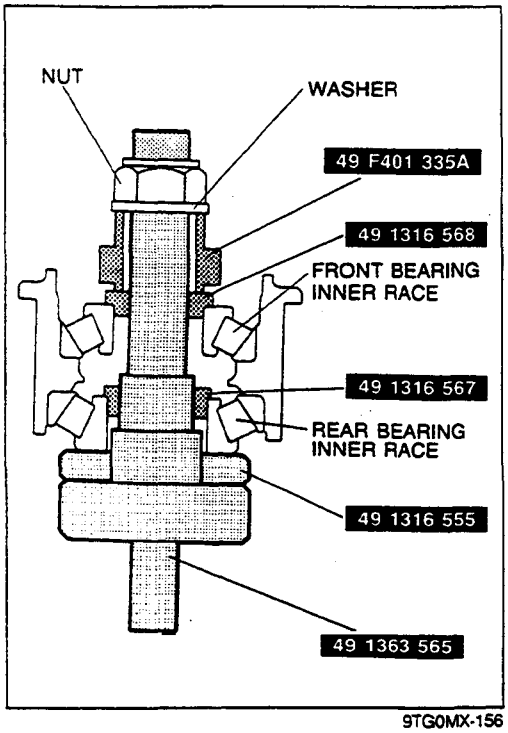
mm (in)

0.1 (0.004)	0.15 (0.006)



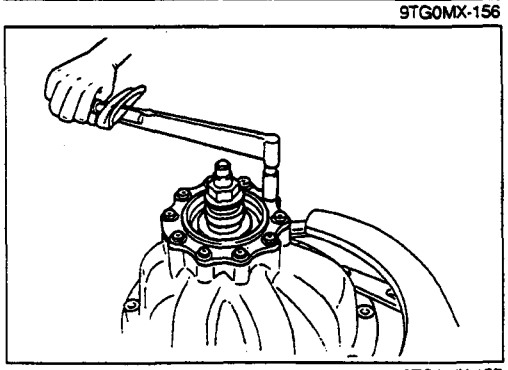
9TG0MX-155

[Y type]
Adjustment of pinion height
1. Adjust the pinion height as follows with the **SST**.



9TG0MX-156

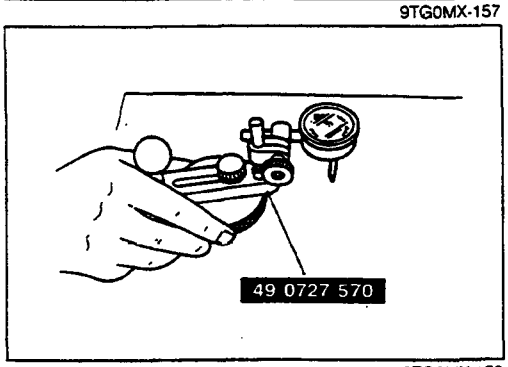
(1) Slide the **SST** (49 1316 555), new rear bearing inner race, and the **SST** (49 1316 567) onto the **SST** (49 1363 565). Install the assembly into the carrier.
(2) Install the front bearing inner race, **SST** (49 1316 568), **SST** (49 F401 335A), and the washer onto the **SST** (49 1363 565). Tighten the nut so that the **SST** (49 1363 565) can still be turned by hand.


9TG0MX-157

Caution
- **Do not install the adjustment shim.**

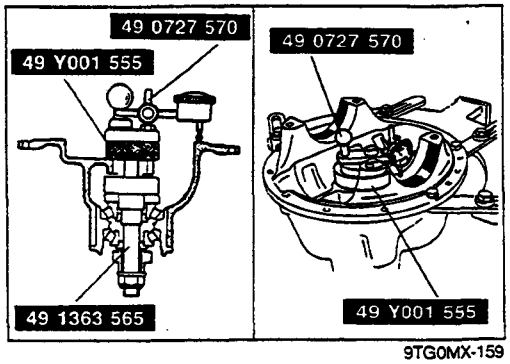
(3) Install the bearing housing assembly into the carrier.

Tightening torque:
43—61 N·m (4.4—6.2 m-kg, 32—45 ft-lb)



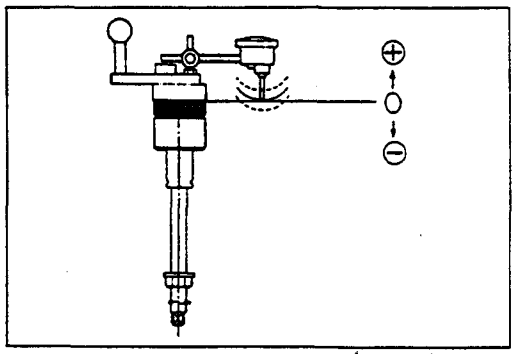
9TG0MX-158

(4) Place the **SST** on the surface plate and set the dial indicator to zero.

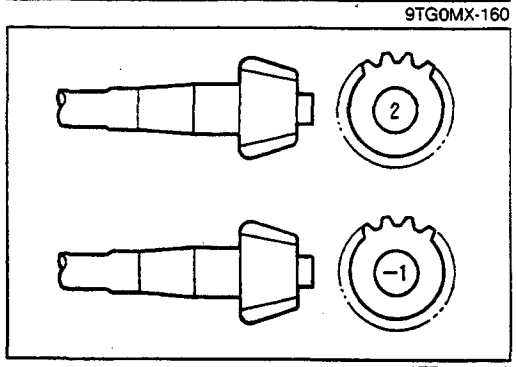


9TG0MX-159

(5) Set the **SST** as shown in the figure.
(6) Place the feeler of the dial indicator so that it contacts where the side bearing is installed in the carrier. Measure the lowest position on the left and right sides.



9TG0MX-160



9TF0MX-017

(7) Add the two (left and right) values obtained in Step 6 and divide the total by 2.
Divide the number marked at the end of the drive pinion by 100 (No number indicates zero). Figure the pinion height adjustment value.

Drive pinion end mark
2: +0.02mm (0.0008 in)
-1: -0.01mm (-0.0004 in)

Example
- **The two values obtained in Step 6 are 0.18mm (0.007 in) and 0.26mm (0.010 in) and the drive pinion end mark is 2.**

$$\frac{0.18 + 0.26}{2} - \frac{2}{100} = 0.20$$

$$\left(\frac{0.007 + 0.010}{2} - 0.0008 = 0.008\right)$$

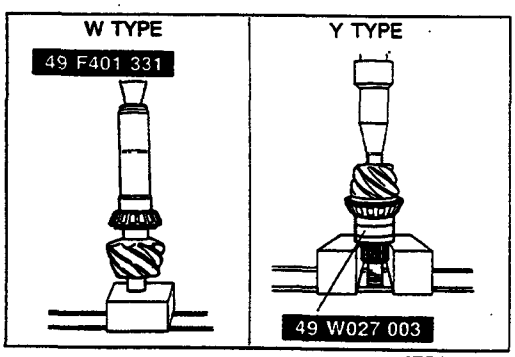
The drive pinion adjustment value is 0.20mm (0.008 in).
- **Select the proper adjustment shims and install them between the bearing housing and the carrier. (Refer to page M-38.)**

Note
- **Select adjustment shims within 0 ± 0.03mm (0 ± 0.001 in) of the specified thickness.**
- **Use a maximum of five shims.**

Adjustment shim thickness:

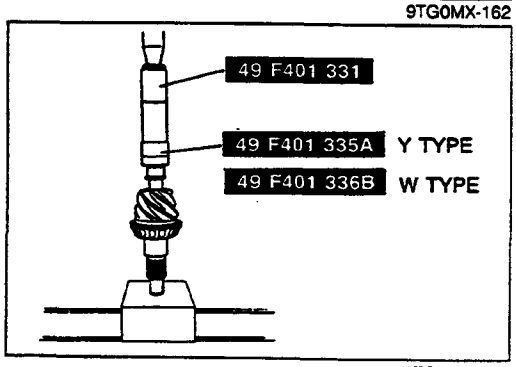
mm (in)

0.1 (0.004)	0.15 (0.006)



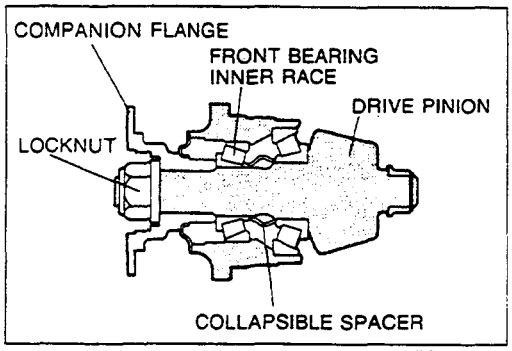
9TG0MX-162

[W and Y type]
Rear bearing inner race
1. Install the rear bearing inner race with the **SST** and a press.

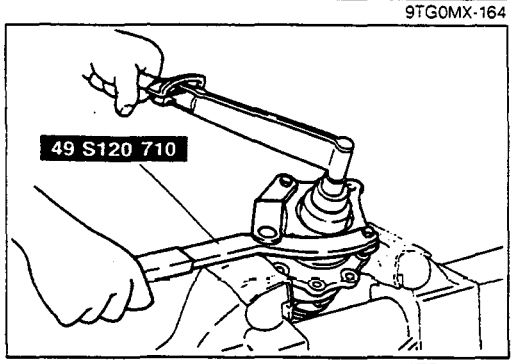


9TG0MX-163

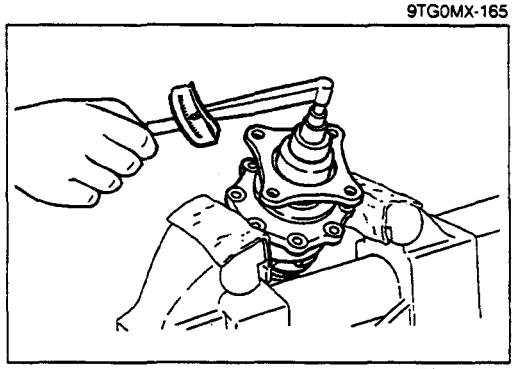
[Y type and W type (no stopper)]
Pilot bearing inner race
1. Install the pilot bearing inner race with the **SST** and a press.

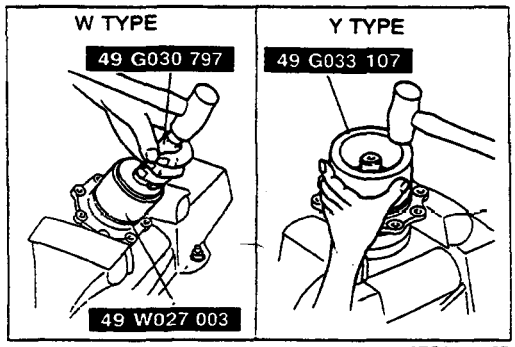


9TG0MX-164

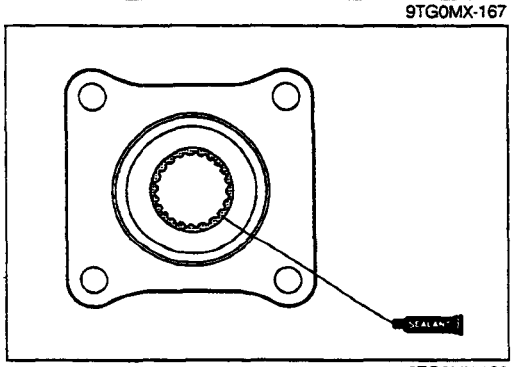


9TG0MX-165


9TG0MX-166



9TG0MX-167


9TG0MX-168

Adjustment of drive pinion preload

Caution
- **Do not install the oil seal.**

1. Install the drive pinion, new collapsible spacer, front bearing inner race, companion flange, washer, and new locknut onto the bearing housing. Temporarily tighten the locknut.
2. Place the bearing housing in a vise.
3. Turn the companion flange by hand to seat the bearings.

Note
- **Make a notion of this torque for proper assembly.**
- **If the specified preload cannot be obtained, reassemble and check it again.**

4. Hold the flange with the **SST** and tighten the locknut to the lowest value of the specified torque to obtain the specified preload.

	W type	Y type
Tightening torque	235—392 N·m (24—40 m-kg, 174—289 ft-lb)	275—392 N·m (28—40 m-kg, 203—289 ft-lb)
Preload	0.8—1.6 N·m (8—16 cm-kg, 7—14 in-lb)	2.6—3.4 N·m (27—35 cm-kg, 23—30 in-lb)

5. Remove the locknut, washer, and companion flange.

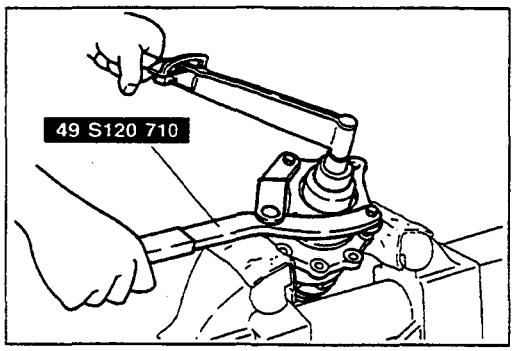
Oil seal

Note
- **Apply gear oil to the lip of the new oil seal.**
- **Push the oil seal fully into the carrier.**

1. Install the new oil seal into the carrier with the **SST**.

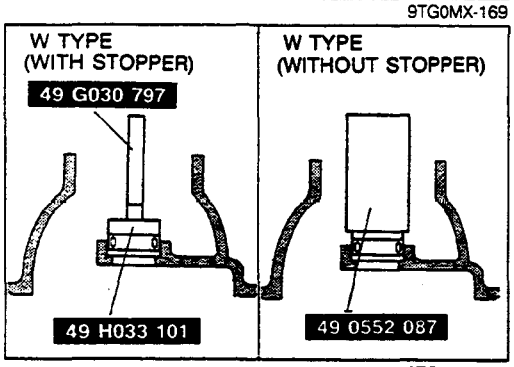
Companion flange

1. Install the companion flange to the drive pinion. After installation, apply 0.5 cc (0.03 cu in) of sealant around the splines of the companion flange.



9TG0MX-169

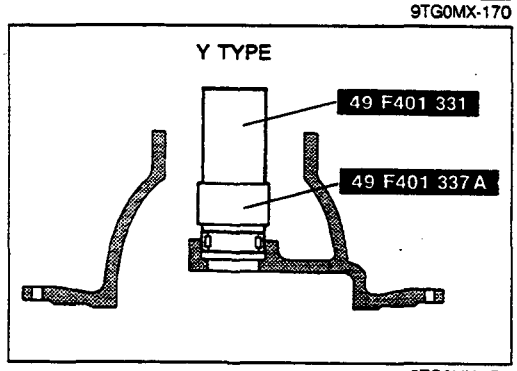
2. Install the washer and locknut onto the drive pinion.
3. Hold the flange with the **SST** and tighten the locknut to the torque obtained in "drive pinion preload adjustment" in Step 3.



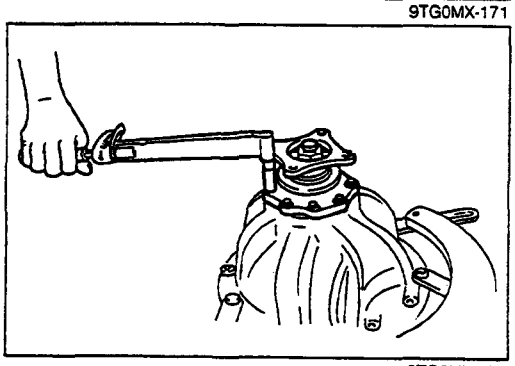
9TG0MX-170

Pilot bearing outer race
1. Install the pilot bearing outer race into the carrier with the **SST**.
2. Install the stopper plate into the carrier.
(W type, with stopper)

Tightening torque:
19—26 N·m (1.95—2.60 m-kg, 14—19 ft-lb)

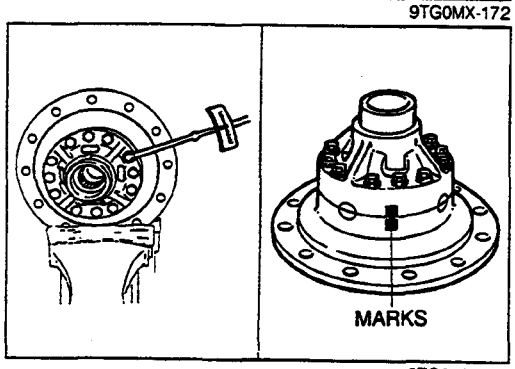


9TG0MX-171


9TG0MX-172

Bearing housing
1. Install the adjustment shim(s), selected in "pinion height adjustment", and the bearing housing to the carrier.

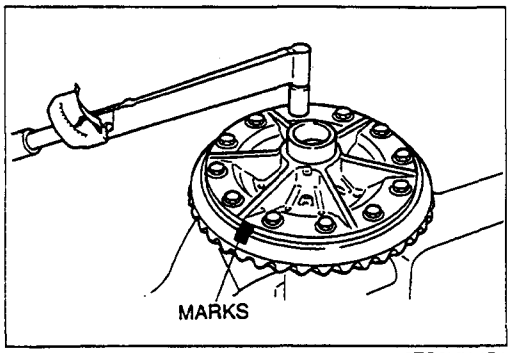
Tightening torque:
W type: 20—29 N·m (2.0—3.0 m-kg, 14—22 ft-lb)
Y type: 43—61 N·m (4.4—6.2 m-kg, 32—45 ft-lb)



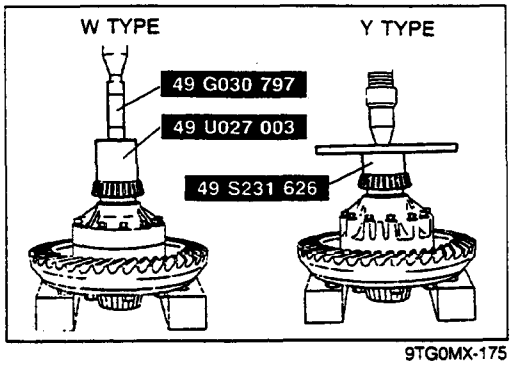
9TG0MX-173

Gear case
1. Align the marks and assemble the gear case.

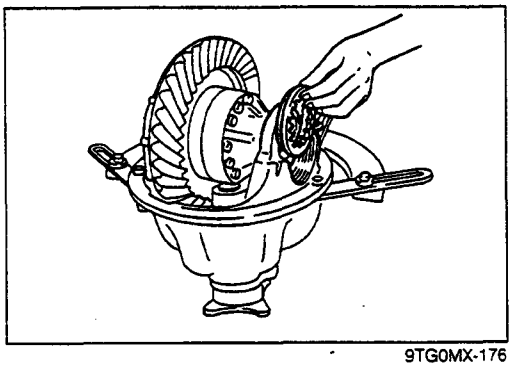
Tightening torque:
W type: 59—71 N·m (6.0—7.2 m-kg, 43—52 ft-lb)
Y type: 64—74 N·m (6.5—7.5 m-kg, 47—54 ft-lb)

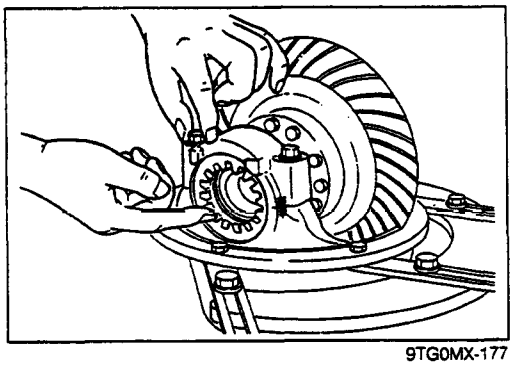


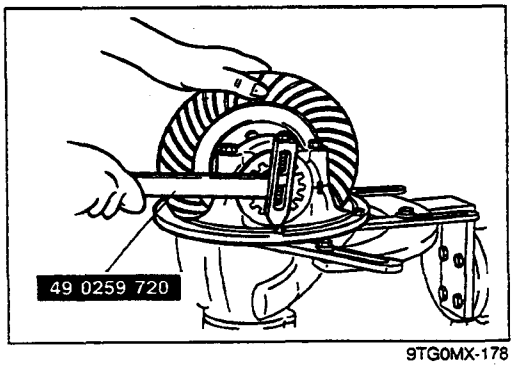
9TG0MX-174



9TG0MX-175


9TG0MX-176


9TG0MX-177



9TG0MX-178

Ring gear

1. Align the marks on the ring gear and the gear case and assemble them.

Tightening torque:
W type:
201—250 N·m (20.5—25.5 m-kg, 148—184 ft-lb)
Y type:
265—324 N·m (27—33 m-kg, 195—239 ft-lb)

Side bearing inner race

Note
- **Install the side bearing inner races on their respective sides.**

1. Install the side bearing inner races with the **SST** and a press.

Adjusting screw

Note
- **Install the adjusting screws on their respective sides.**
- **Align the adjusting screw and the differential carrier threads.**

1. Install the adjusting screws to the differential carrier.

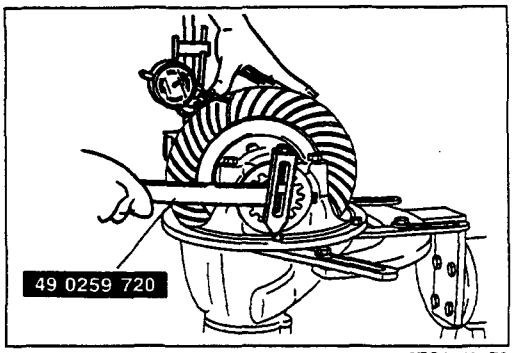
Bearing cap

Note
- **Align the bearing cap and the adjusting screw threads.**

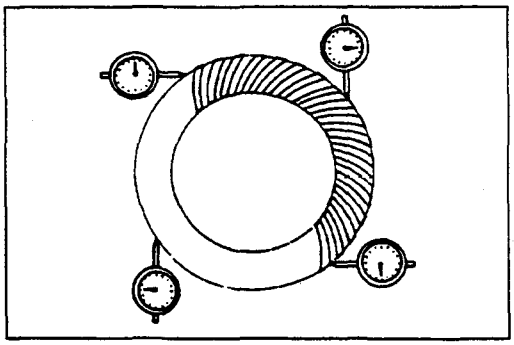
1. Install the bearing cap, and apply a small amount of thread-locking compound (W type), then temporarily tighten the bolts.

Adjustment of backlash

1. While turning the ring gear, tighten the left and right adjusting screws alternately with the **SST** to reduce the backlash.
2. Mark the ring gear at four points at 90° intervals.
3. Mount a dial indicator to the carrier so that the feeler comes in contact at a right angle with one of the ring gear teeth.
4. Hold the companion flange, and turn the ring gear and measure the backlash at the four marked points. Verify that one backlash is within the specified value and that the backlash variation is less than 0.11mm (0.0043 in).



9TG0MX-179


9TG0MX-180

Note
- **The backlash variation is the difference between the maximum and minimum backlashes.**

Backlash:
Standard:
W type: 0.25—0.27mm (0.0098—0.011 in)
Y type: 0.24—0.27mm (0.0094—0.011 in)
Backlash variation: 0.11mm (0.0043 in)

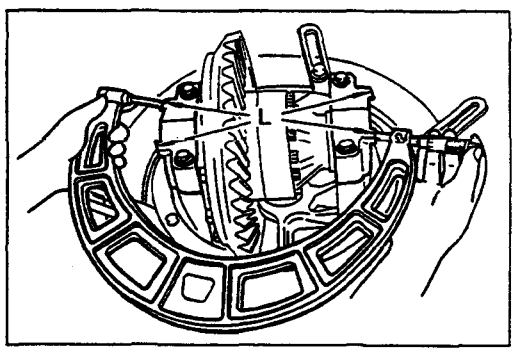
Note
- **For adjustment, loosen one side adjusting screw and tighten the opposite side screw to the same amount.**

5. If the backlash is not as specified, readjust it by turning the adjusting screws alternately with the **SST**.

Note
- **Tighten the adjusting screws equally when the distance between the pilot sections on the bearing caps is low and loosen when the distance is high.**

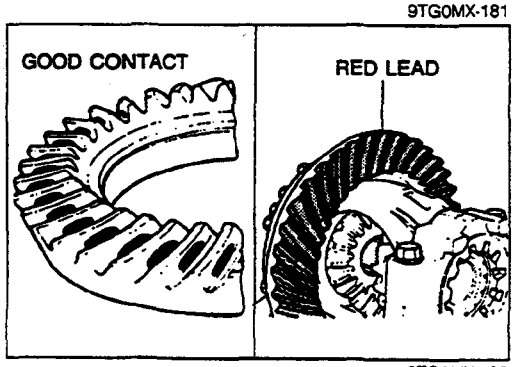
6. Measure the distance between the pilot sections on the bearing caps (L) with a micrometer.

Distance (L)
W type: 279.5 $^{+0}_{-0.08}$ mm (11.00 $^{+0}_{-0.003}$ in)
Y type: 289.5 $^{+0.10}_{-0.05}$ mm (11.40 $^{+0.004}_{-0.002}$ in)



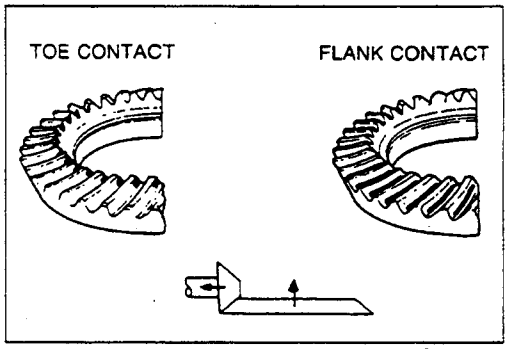
9TG0MX-181

7. After adjustment of distance (L), recheck that the backlash is as specified.



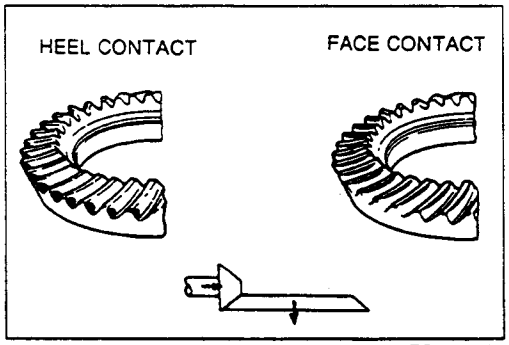
9TG0MX-182

Inspection and adjustment of teeth contact
1. Coat both surfaces of 6—8 teeth of the ring gear with a thin coat of red lead.
2. While moving the ring gear back and forth by hand, rotate the drive pinion several times and check the tooth contact.
3. If the tooth contact is good, wipe off the red lead.
4. If it is not good, adjust the pinion height, and then adjust the backlash.



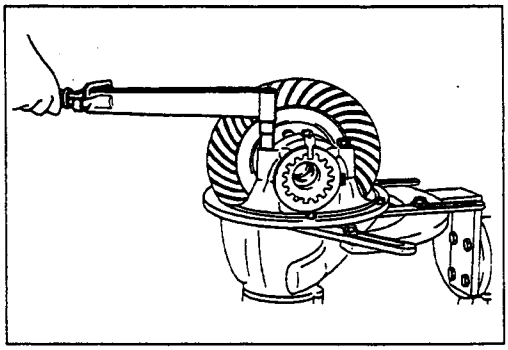
9TG0MX-183

(1) Toe and flank contact
Replace the adjustment shim with a thinner one to move the drive pinion outward.



9TG0MX-184

(2) Heel and face contact
Replace the adjustment shim with a thicker one to bring the drive pinion in.

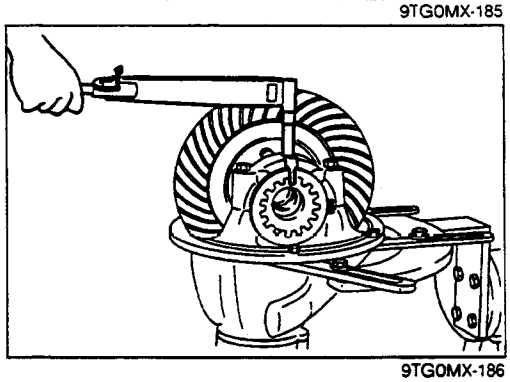


9TG0MX-185

Lock plate

1. Tighten the bearing cap bolts to the specified torque.

Tightening torque:
W type: 79—98 N·m (8—10 m-kg, 58—72 ft-lb)
Y type : 128—147 N·m (13—15 m-kg, 94—108 ft-lb)



9TG0MX-186

2. Install the lock plates on the bearing caps.

Tightening torque:
18—25 N·m (1.8—2.6 m-kg, 13—19 ft-lb)

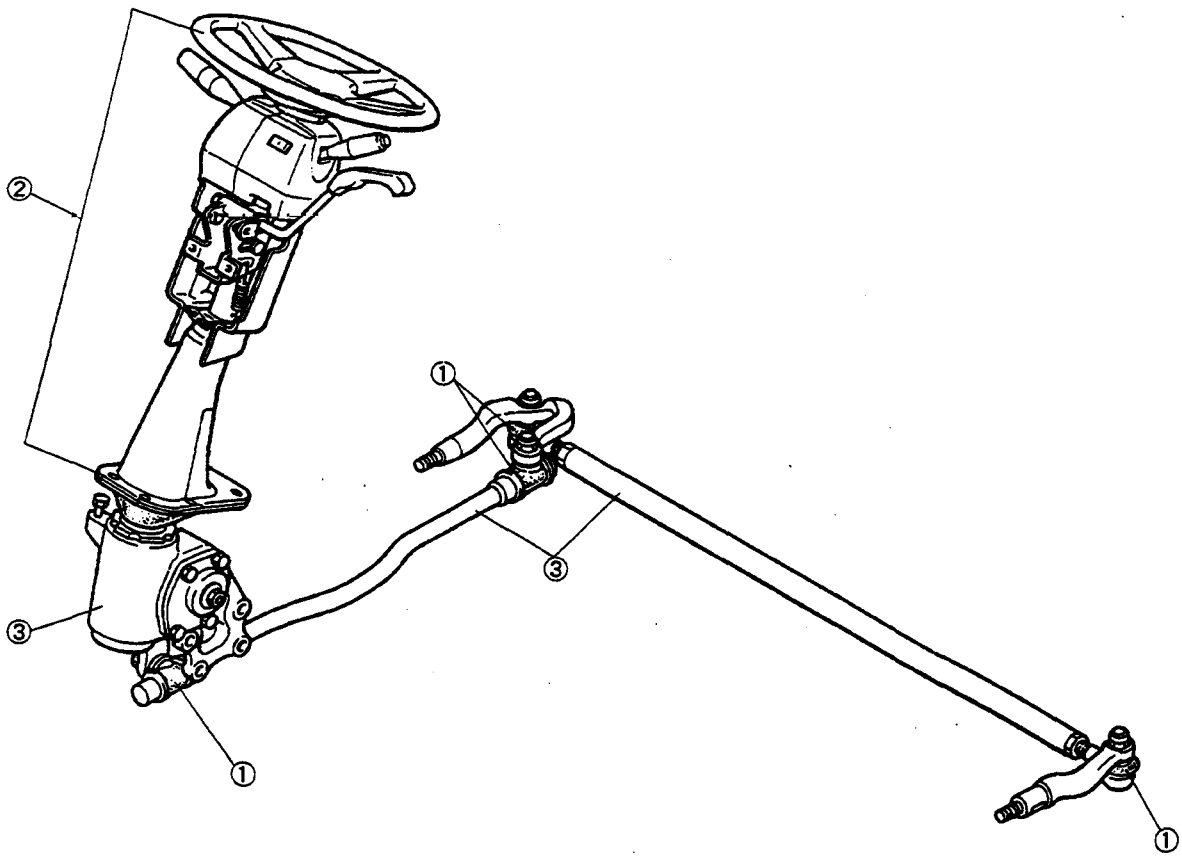
STEERING SYSTEM

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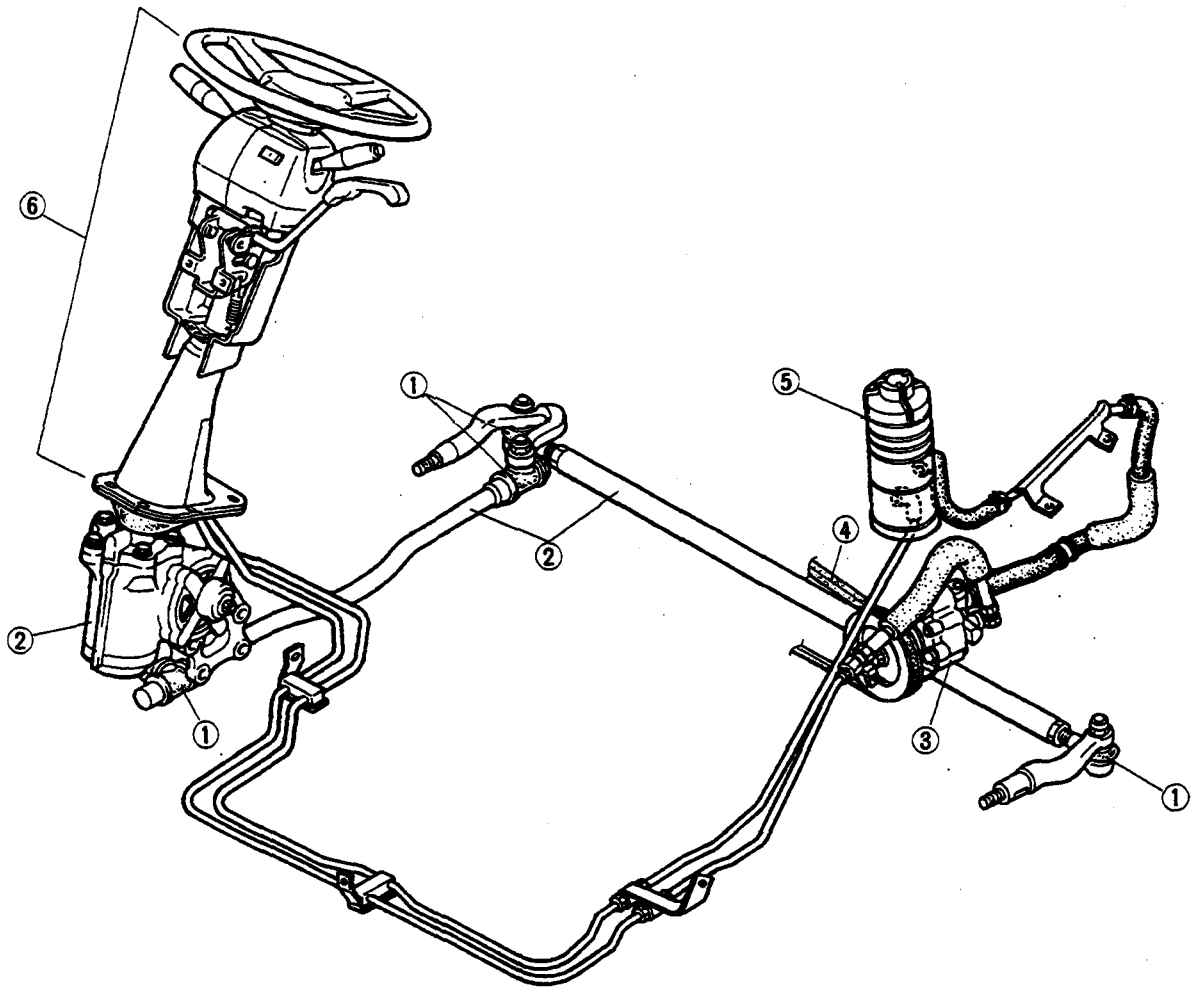
MANUAL STEERING



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2. Steering wheel and column
On-vehicle inspection..... page N–11
Removal / Installation..... page N–12
Disassembly / Inspection / Assembly..... page N–13
3. Steering gear and linkage
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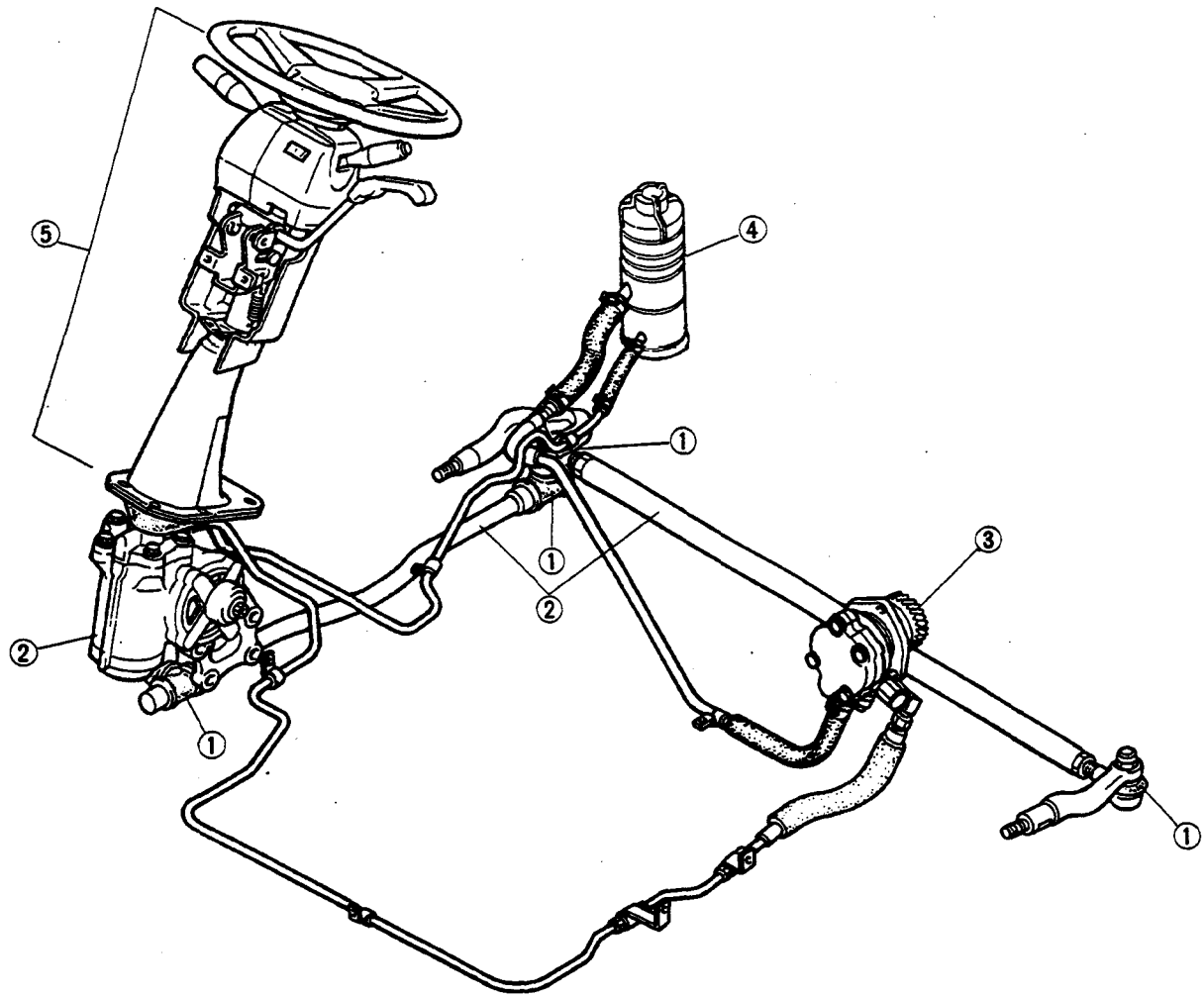
POWER STEERING (3.5 L TURBO ENGINE MODEL)



9TF0NX-003

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2. Steering gear and linkage
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3. Power steering oil pump
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5. Power steering fluid
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6. Steering wheel and column
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POWER STEERING (4.0 L ENGINE MODEL)



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   Removal / Installation..... page N– 8
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   Removal / Inspection / Installation ..... page N–28
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3. Power steering oil pump
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4. Power steering fluid
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5. Steering wheel and column
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OUTLINE

SPECIFICATIONS

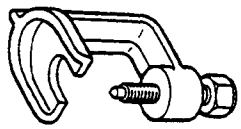
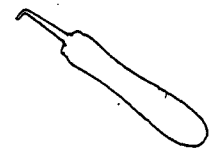
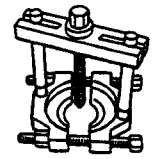
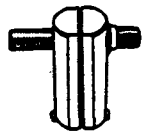
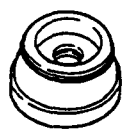
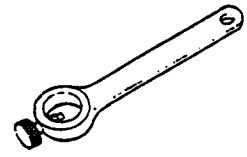
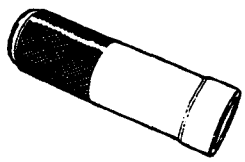
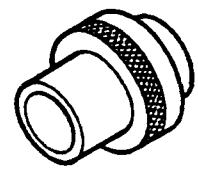
Item \ Type		MANUAL STEERING	POWER STEERING
Steering wheel	Outer diameter mm (in)	430 (16.93)	
	Lock-to-lock turns	3.9, 4.2	3.9, 4.2
Steering shaft and joint	Shaft type	Collapsible	
	Joint type	1-cross joint (standard), 2-cross joint (tilt)	
	Range of up/down movement mm (in)	*30 (1.18)	
	Amount of tilt mm (in)	*50 (1.97)	
Steering gear	Type	Ball nut	
	Gear ratio	28—33	22.6
Oil	Type	API service GL-4, SAE90	ATF M2C33F or DEXRON-II
	Capacity liters (US qt, Imp qt)	0.94 (0.99, 0.83)	2.0 (2.11, 1.76)

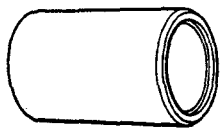
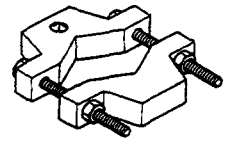
* ..... if equipped

9TF0NX-005

MANUAL STEERING

PREPARATION
SST

49 0727 575 Puller, socket joint 	For removal of ball joint	49 0208 701A Air out tool, boot 	For removal of dust seal
49 W023 585A Adjust wrench 	For removal and installation of adjusting plug	49 0710 520 Puller, bearing 	For removal of inner race
49 FT01 361 Remover, bearing 	For removal of outer race	49 W032 201 Remover, bearing 	For removal of outer race
49 F027 005 Attachment for bearing ϕ62 (Part of 49 F027 0A1) 	For installation of outer race	49 0180 510B Attachment, preload measuring 	For adjustment of worm shaft preload
49 F401 331 Body 	For installation of inner race and oil seal	49 H025 003 Installer, bearing 	For installation of inner race

49 W023 785 Installer boot 	For installation of tie-rod end boot	49 F017 1A0 Universal wrench 	For removal and installation of locknut

9TG0NX-007

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page/Section
Steering feels heavy Jack up the front of vehicle (front tires off ground) and turn steering wheel	**Light (Jacked-up)**		
	Incorrect tire pressure	Adjust	Section Q
	Irregular tire wear	Replace	Section Q
	Heavy (Jacked-up)		
	Faulty lubrication, abnormal wear, presence of foreign matters and stuck or damaged ball joints of steering system	Lubricate or replace	N– 8
	Improper adjustment of steering worm shaft preload	Adjust	N–20
	Malfunctioning or damaged steering gear	Replace	N–15
	Insufficient oil in gear box	Lubricate	N–20
	Worn or damaged kingpin bushing	Replace	Section R
	Stuck kingpin	Replace	Section R
	Insufficient kingpin oil	Lubricate	Section R
Steering wheel pulls to one side	Deformed steering linkage	Replace	N–15
	Improper adjustment of front wheel bearing preload	Adjust	Section R
	Twisted front axle	Replace	Section M
	Fatigued front springs	Replace	Section R
	Faulty wheel alignment (toe-in)	Adjust	Section R
	Incorrect tire pressure	Adjust	Section Q
	Irregular tire wear	Replace	Section Q
	Dragging brakes	Adjust	Section P
General instability while driving	Deformed steering linkage	Replace	N–15
	Worn or damaged joints of steering system	Replace	N– 8
	Improper adjustment of steering worm shaft preload	Adjust	N–20
	Improper adjustment of front wheel bearing preload	Adjust	Section M
	Fatigued front spring	Replace	Section R
	Loose U-bolts	Tighten	Section R
	Malfunctioning of shock absorber	Replace	Section R
	Faulty wheel alignment (toe-in)	Adjust	Section R
	Incorrect tire pressure	Adjust	Section Q
	Deformed or unbalanced wheels	Repair or replace	Section Q
Steering wheel effort uneven	Malfunctioning steering gear	Replace	N–15
	Malfunctioning joints of steering system	Replace	N– 8
	Steering linkage does not operate smoothly	Replace	N–15
Excessive steering wheel play	Improper adjustment of gear box backlash	Adjust	N–20
	Worn steering gear	Replace	N–15
	Worn or damaged joints of steering system	Replace	N– 8
	Loose steering gear mounting bolts	Tighten	N–15
	Worn kingpin	Replace	Section R
	Improper adjustment of front wheel bearing preload	Adjust	Section R
Poor steering wheel return	Stuck or damaged steering joints	Repair or replace	N– 8
	Improper adjustment of steering worm shaft preload	Adjust	N–20
	Incorrect tire pressure	Adjust	Section Q
	Malfunctioning suspension system	Repair or replace	Section R

TROUBLESHOOTING GUIDE (Cont'd)

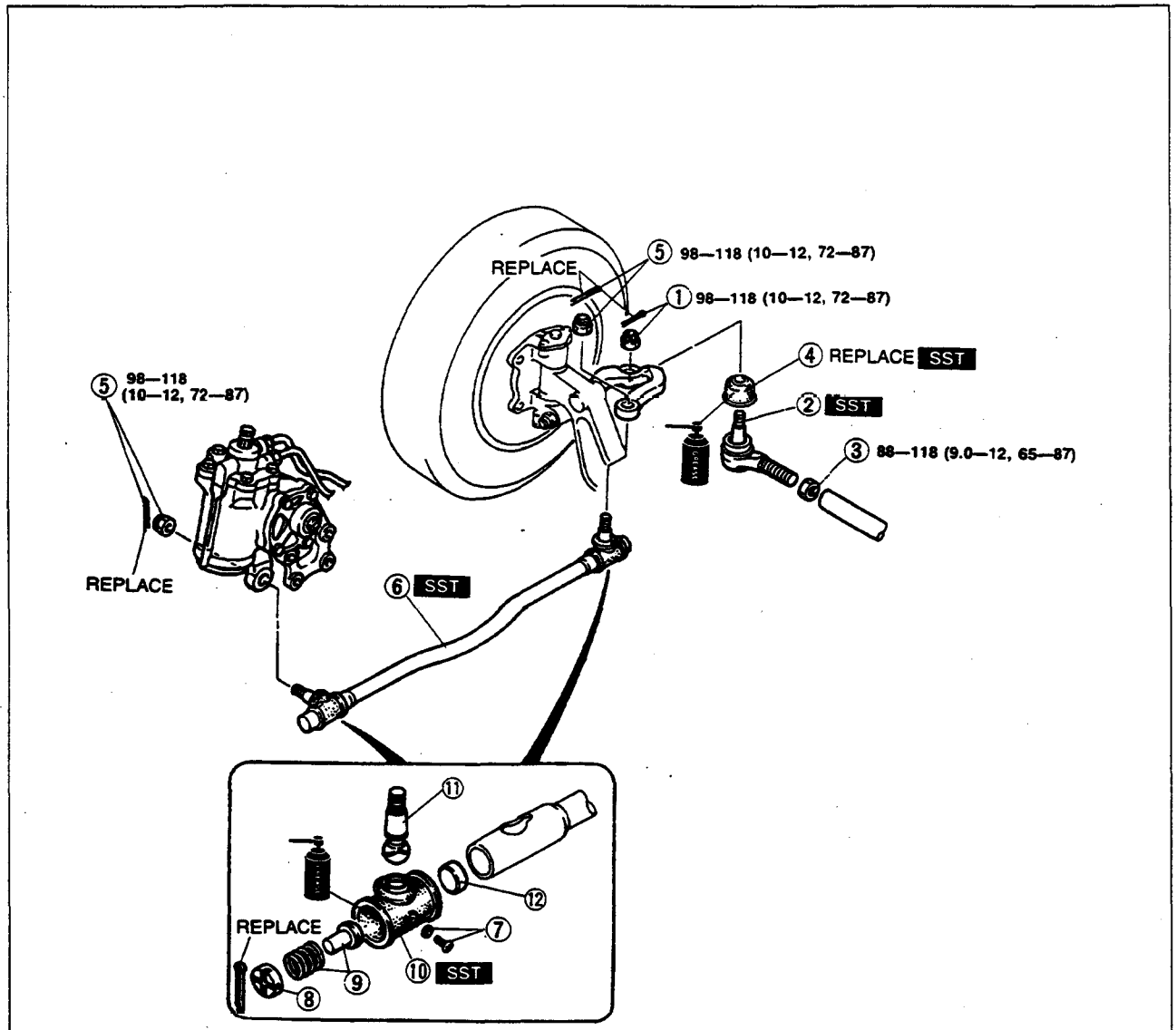
Problem	Possible Cause	Action	Page/Section
"Shimmy" occurs (Steering wheel vibrates left/right)	Deformed steering linkage	Replace	N–15
	Loose steering gear mounting bolts	Tighten	N–15
	Worn or damaged steering joints	Replace	N– 8
	Improper adjustment of steering worm shaft preload	Adjust	N–20
	Worn or improper adjustment of front wheel bearing preload	Adjust or replace	Section M
	Worn kingpin bushing	Replace	Section M
	Worn kingpin	Replace	Section M
	Incorrect tire pressure	Adjust	Section Q
	Irregular tire wear	Replace	Section Q
	Depth of tire tread is different between left and right tires	Replace	Section Q
	Deformed or unbalanced wheels	Repair or replace	Section Q
	Malfunctioning or loose shock absorbers	Replace or tighten	Section R
	Loose U-bolts	Tighten	Section R
	Faulty wheel alignment (toe-in)	Adjust	Section R
Abnormal noise from steering system	Loose or worn steering linkage	Tighten or replace	N–15
	Worn steering joints	Replace	N– 8
	Loose steering gear mounting bolts	Tighten	N–15
	Obstruction near steering column	Repair	N–12
	Malfunctioning steering gear	Replace	N–15
	Improper adjustment of gear box backlash	Adjust	N–20

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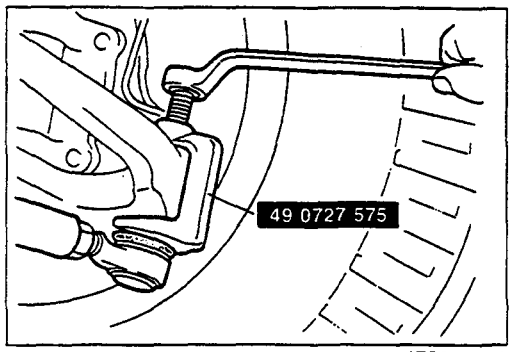
BOOT

Removal / Installation

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.

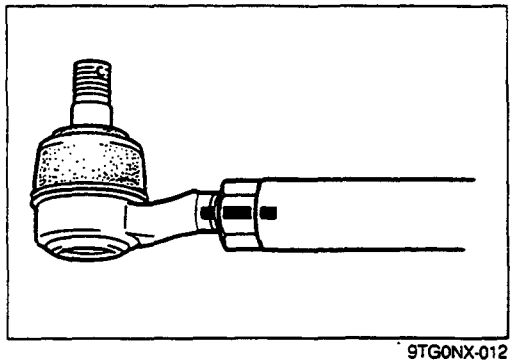


1. Cotter pin, nut
2. Tie-rod end
   Removal note ..... page N– 9
3. Locknut
   Removal note ..... page N– 9
4. Tie-rod end boot
   Removal note ..... page N– 9
   Installation note ..... page N–10
5. Cotter pin, nut
6. Drag link
   Removal note ..... page N– 9
7. Plug
8. End plug
   Installation note ..... page N–10
9. Spring, ball seat
10. Dust seal
    Removal note ..... page N– 9
11. Ball stud
12. Ball seat

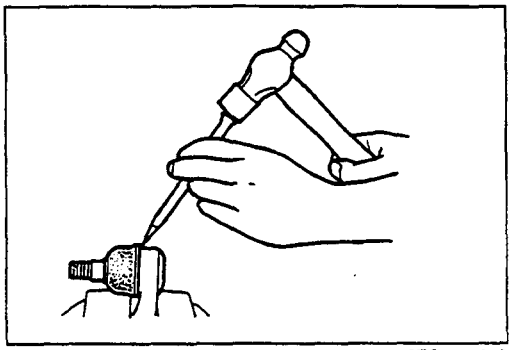


9TG0NX-011

Removal note
Tie-rod end
1. Separate the tie-rod end from the knuckle arm with the **SST**.

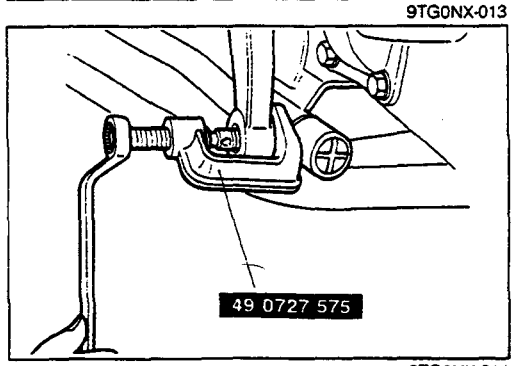

9TG0NX-012

Locknut
1. Mark the tie-rod end locknut for reference during installation before loosening.


9TG0NX-013

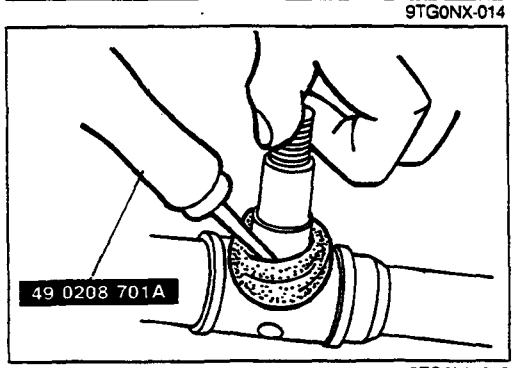
Tie-rod end boot
1. Secure the tie-rod end in a vise. Place a chisel against the boot and hold it at the angle shown. Remove the boot.

Caution
- **Do not scar the part where the boot attaches to the tie-rod end.**



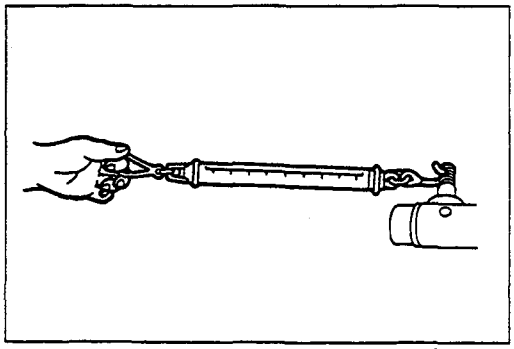
9TG0NX-014

Drag link
1. Separate the drag link with the **SST**.

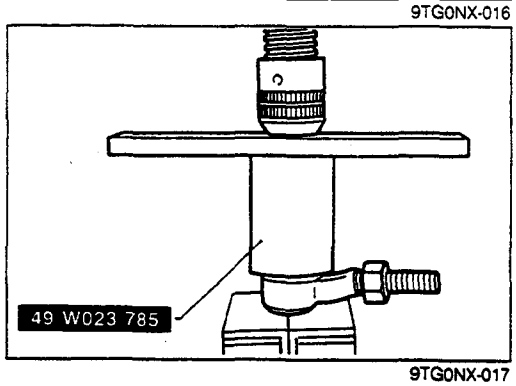


9TG0NX-015

Dust seal
1. Remove the dust seal with the **SST**.



9TG0NX-016



9TG0NX-017

Installation note

End plug

1. Fit a grease nipple in the plug hole and apply grease (lithium base NLGI No.2).

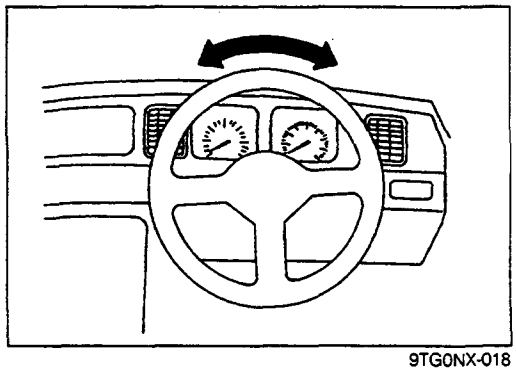
   Note
   - **Tighten the end plug fully and then loosen it before the adjustment.**

2. Adjust the starting torque of the ball stud by turning the end plug.

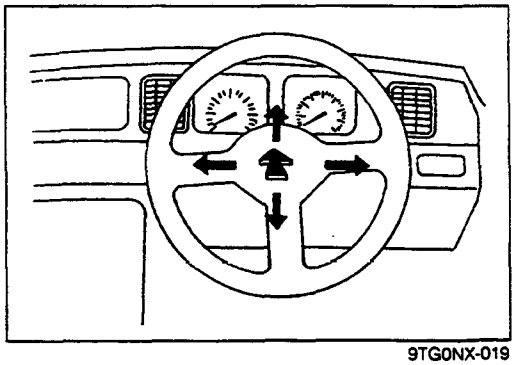
   Starting torque: 5—15 kg (11—33 lb)

Tie-rod end boot

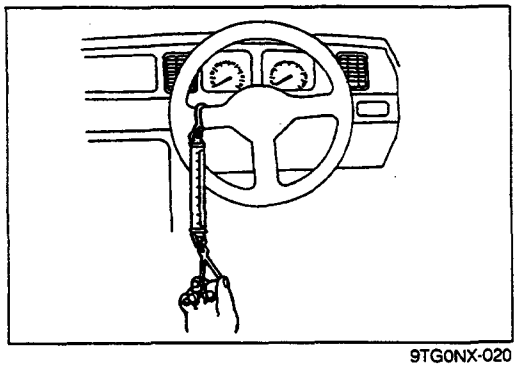
1. Put a small amount of grease (lithium base NLGI No.2) into the new boot and set it onto the tie-rod end. Install the boot to the tie-rod end with the **SST** and a press.



9TG0NX-018



9TG0NX-019



9TG0NX-020

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 free play is within specification.

   Free play: 0—40mm (0—1.57 in)

Looseness or play of steering wheel

1. Move the steering wheel in directions 1, 2, and 3 to check for column bearing wear, steering shaft joint play, steering wheel looseness, and column looseness.

Steering wheel effort

1. With the vehicle on a hard level surface, move the steering wheel to put the wheels in the straight-ahead position.

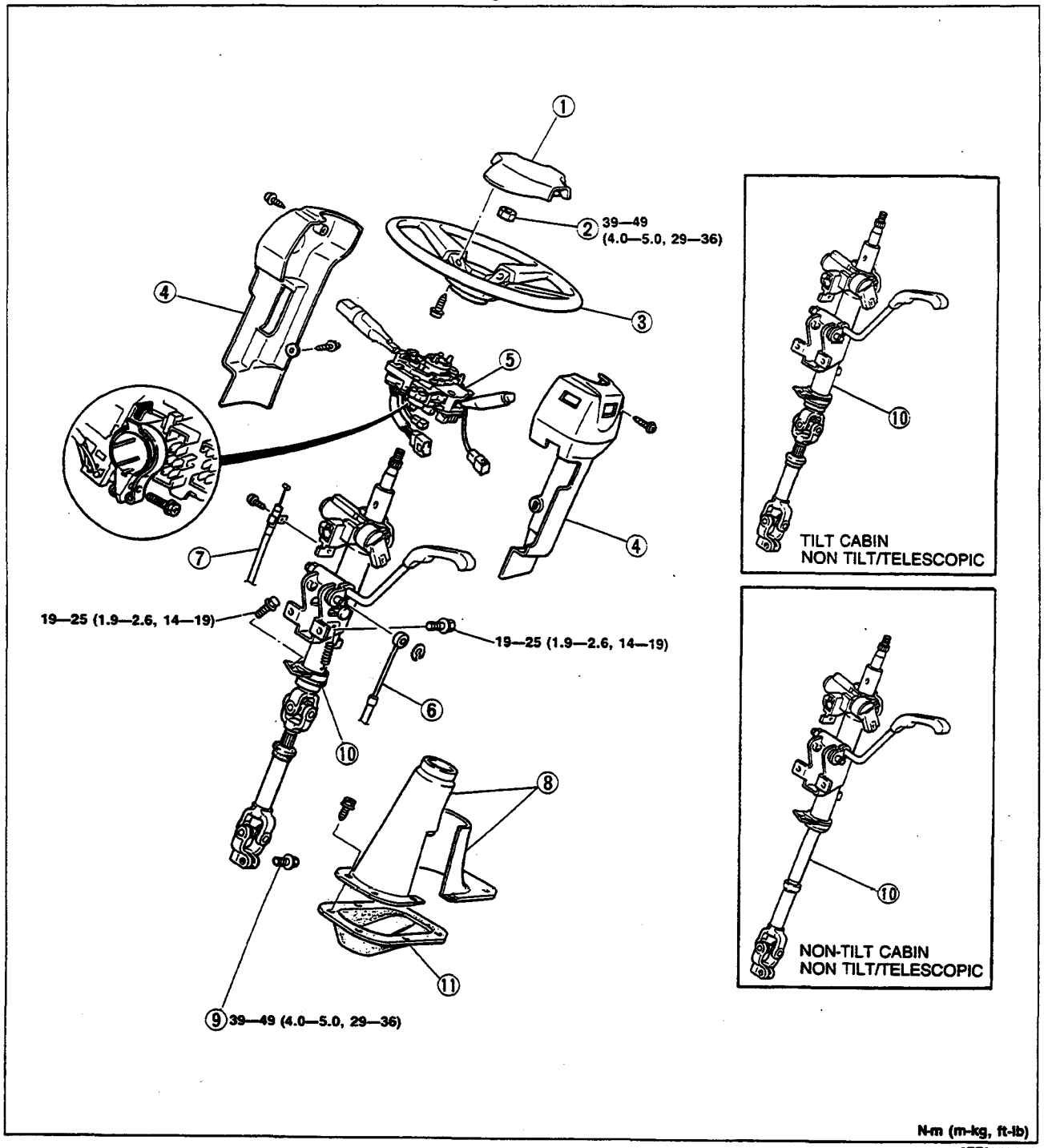
   Note
   - **Measure after turning the steering wheel to the left and right 5 times or more.**

2. Measure the steering wheel effort by connecting a pull scale to the outer circumference of the steering wheel.

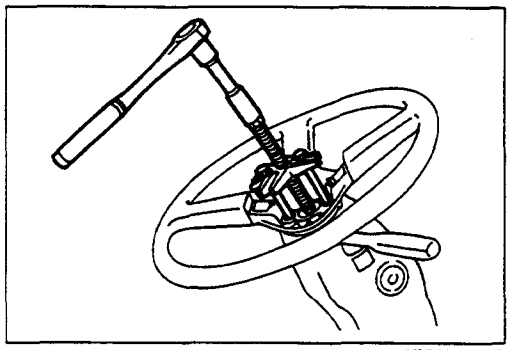
   Steering wheel effort: 245 N (25 kg, 55 lb) Max.

Removal / Installation

1. Remove the lower panel (left and center). (Refer to Section S.)
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.



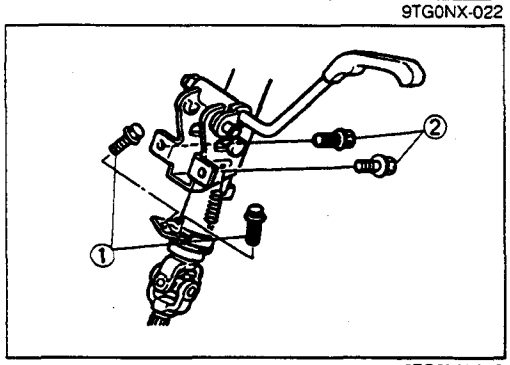
1. Horn cover
2. Locknut
3. Steering wheel
   Removal note ..... page N–13
4. Column cover
5. Combination switch
6. Sub-transmission selection cable
7. Fuel stop cable (4.0 L, 3.5 L Turbo engine)
8. Joint cover
9. Fixing bolt
10. Steering shaft
    Installation note ..... page N–13
11. Dust boot



9TG0NX-022

Removal note
Steering wheel
1. Remove the steering wheel with a suitable puller.

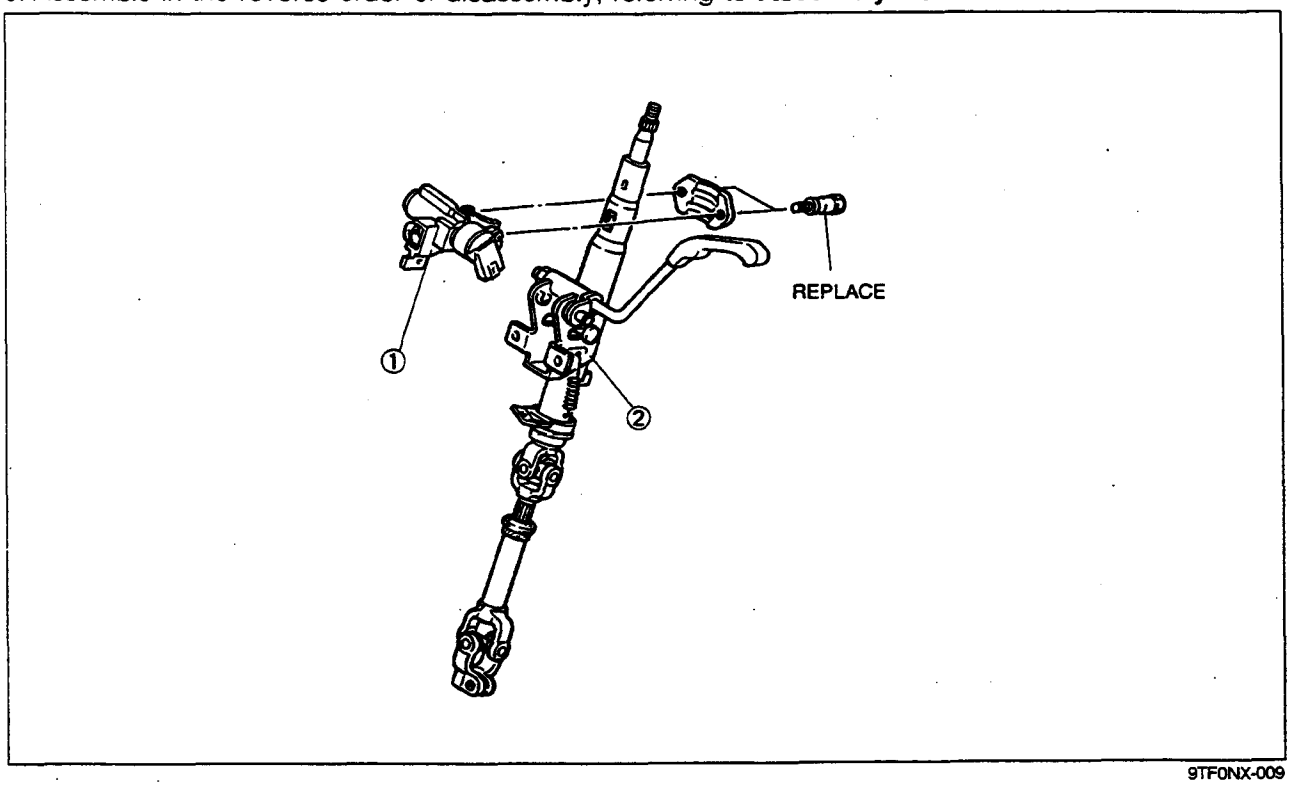
Caution
- **Do not try to remove the steering wheel by hitting the shaft with a hammer. The column will collapse.**



9TG0NX-023

Installation note
Steering shaft
1. Tighten the bolts in the order shown in the figure.

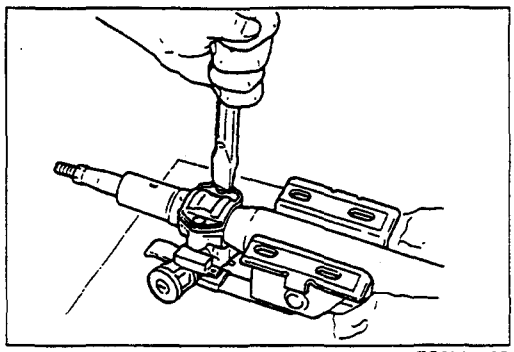
Disassembly / Inspection / Assembly
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



9TF0NX-009

1. Steering lock assembly
   - Disassembly note ..... page N–14
   - Inspection ..... page N–14
   - Assembly note ..... page N–14

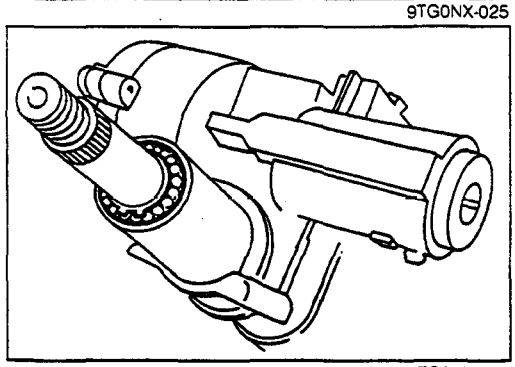
2. Steering shaft
   - Inspection ..... page N–14



9TG0NX-025

Disassembly note
Steering lock assembly

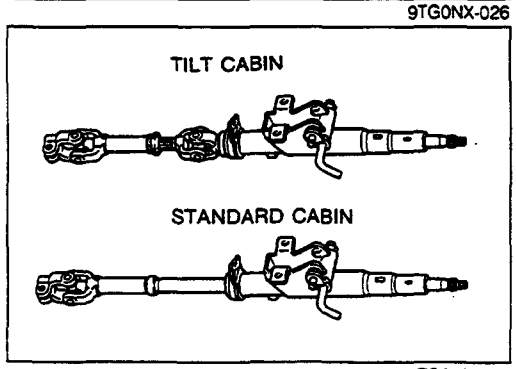
1. Use a chisel to make a groove in the heads of the steering lock mounting bolts. Remove the bolts with a screwdriver.
2. Remove the steering lock assembly.



9TG0NX-026

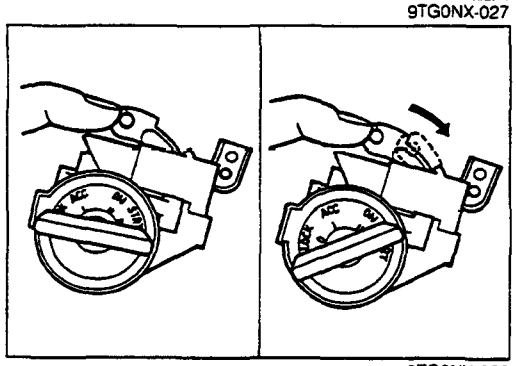
Inspection
Steering shaft

1. Column bearing damage.



9TG0NX-027

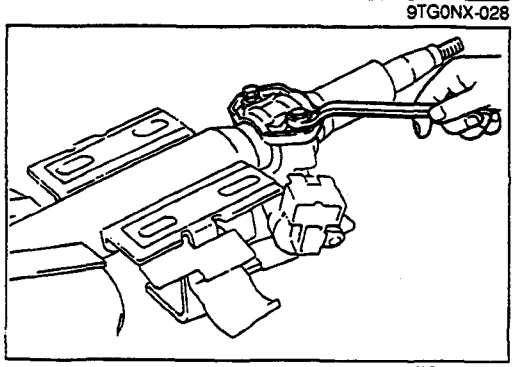
2. Operation and damage of steering shaft and joint.



9TG0NX-028

Steering lock assembly (3.5 L TURBO and 4.0 L Engine type)

1. Verify that the cable connector moves only as shown in the figure when the key is in the **LOCK** and **ACC** position.



9TG0NX-029

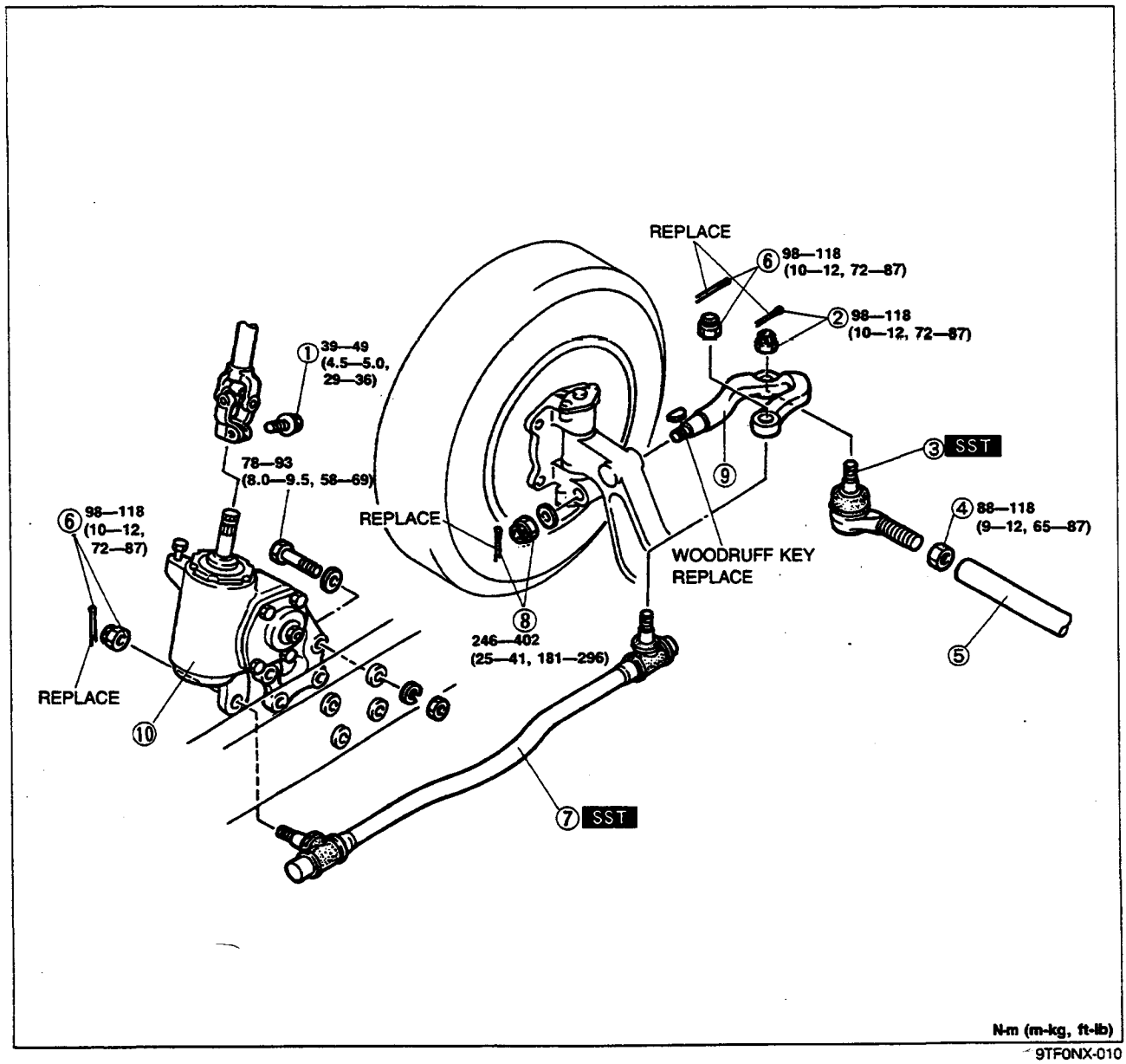
Assembly note
Steering lock assembly

1. Install the steering lock assembly on the jacket. Install new steering lock mounting bolts. Tighten the bolts until the heads break off.

STEERING GEAR AND LINKAGE

Removal / Inspection / Installation

1. Loosen the wheel lug nuts.
2. Jack up the front of the vehicle and support it with safety stands.
3. Remove the wheel.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Inspect all parts and repair or replace as necessary.
6. Install in the reverse order of removal.



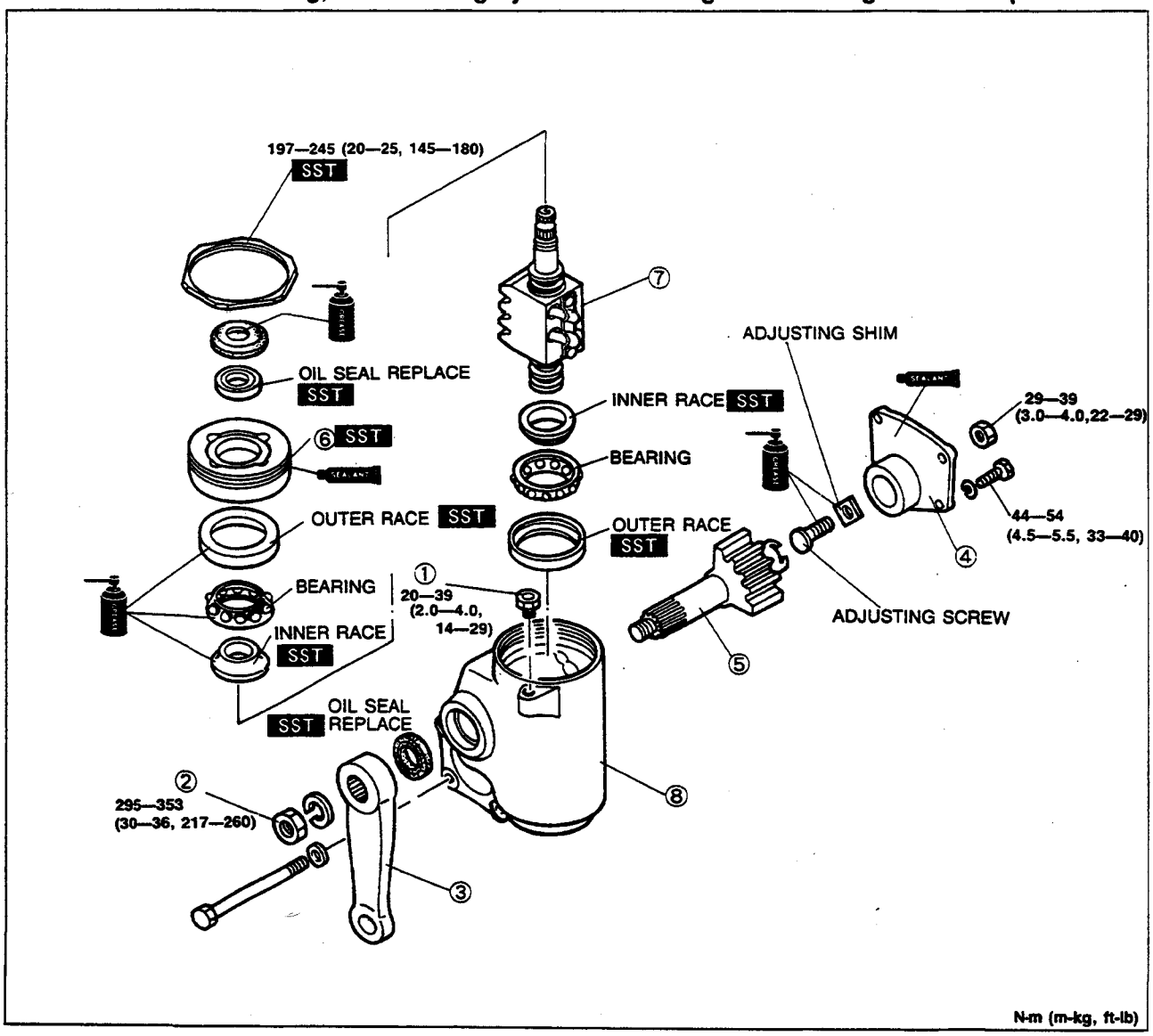
1. Fixing bolt
2. Cotter pin, nut
3. Tie-rod end
   - Removal note ..... page N– 9
   - Inspect for damage
   - Inspect operation of ball joint
4. Locknut
   - Removal note ..... page N– 9
5. Tie-rod
   - Inspect for bending
6. Cotter pin, nut
7. Drag link
   - Removal note ..... page N– 9
   - Inspect for bending
   - Inspect operation of ball stud
8. Cotter pin, nut
9. Knuckle arm
10. Steering gear
    - Disassembly / Inspection / Assembly ..... page N–16

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**.

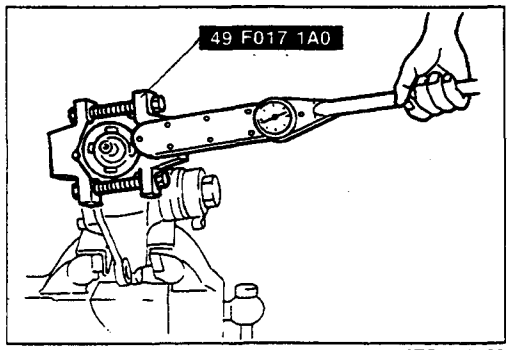
Note

- **Before disassembling, clean throughly and drain the gear oil through the filler port.**



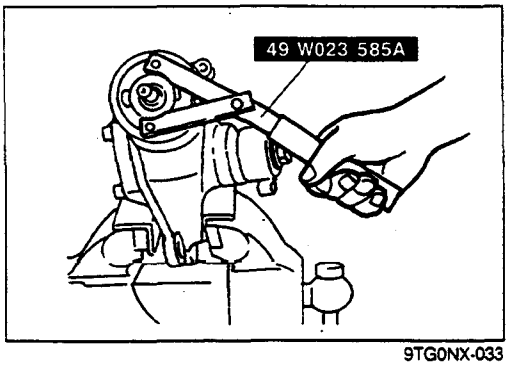
9TG0NX-031

1. Filler port plug
2. Locknut
3. Pitman arm
   - Disassembly note ..... page N–30
   - Assembly note ..... page N–36
4. Side cover
   - Disassembly note ..... page N–30
   - Inspect bushing for damage and corrosion
   - Assembly note ..... page N–34
5. Sector shaft
   - Disassembly note ..... page N–30
   - Inspection ..... page N–18
   - Assembly note ..... page N–34
6. Adjusting plug
   - Disassembly note ..... page N–17
   - Assembly note ..... page N–19
7. Worm ball nut assembly
   - Disassembly note ..... page N–17
   - Inspection ..... page N–18
   - Assembly note ..... page N–19
8. Gear housing
   - Disassembly note ..... page N–18
   - Inspect bushing for damage and corrosion
   - Assembly note ..... page N–19, 20



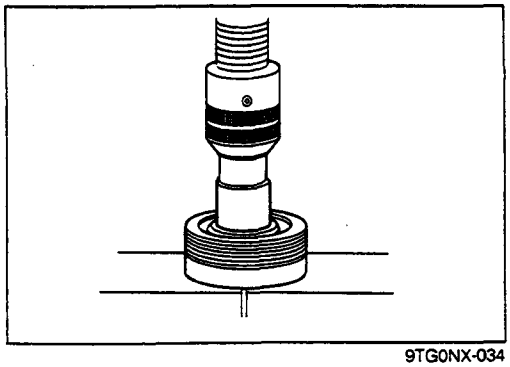
9TG0NX-032

Disassembly note
Adjusting plug
1. Remove the locknut with the **SST**.

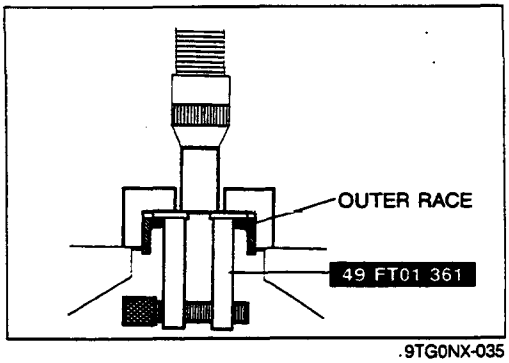


9TG0NX-033

2. Remove the adjusting plug with the **SST**.

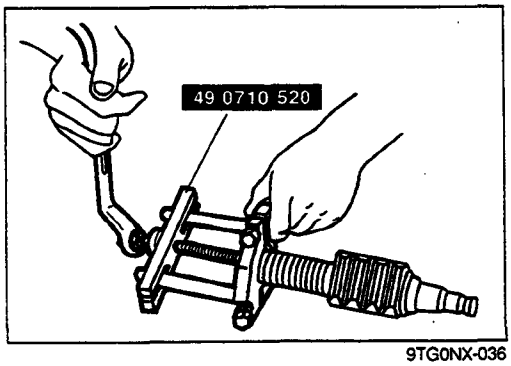

9TG0NX-034

3. Press the oil seal out with a **23mm (15/16 in)** socket from the front side as shown.



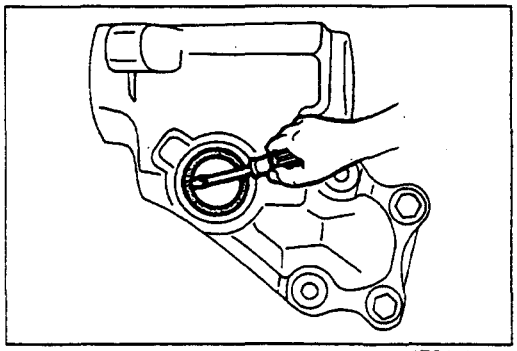
.9TG0NX-035

4. Press the outer race out with a socket and the **SST** as shown.



9TG0NX-036

Worm ball nut assembly
1. Remove the two inner races with the **SST**.



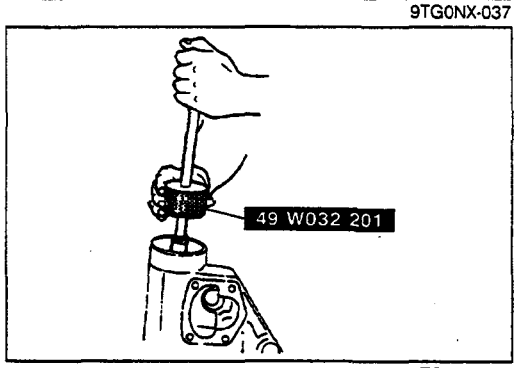
9TG0NX-037

Gear housing

1. Remove the oil seal with a screwdriver.

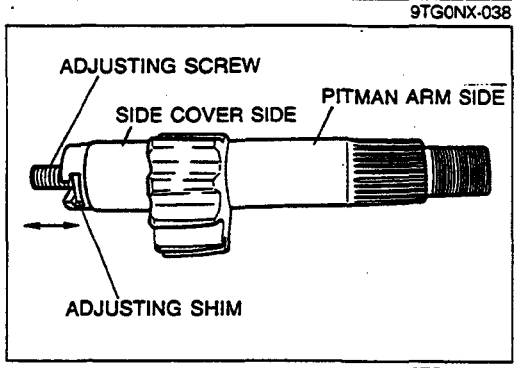
Caution

- **Do not damage the bushing or the inside of the gear housing.**



9TG0NX-038

2. Remove the outer race with the **SST**.



9TG0NX-039

Inspection

Sector shaft

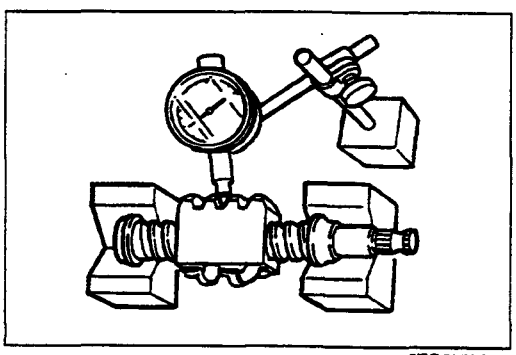
1. Set the adjusting screw and the adjustment shim in the T-groove.
2. Measure the clearance with a feeler gauge in the axial direction.
3. If the clearance exceeds specification, adjust it with the adjustment shims supplied in the adjustment shim kit.

Clearance in axial direction:
0—0.1mm (0—0.004 in)
Available adjustment shims:
1.95mm (0.077 in), 2.00mm (0.079 in), 2.05mm (0.081 in)

4. Measure the outer diameter.

Limit: 35.94mm (1.41 in)

5. Check for damage and wear of the teeth.



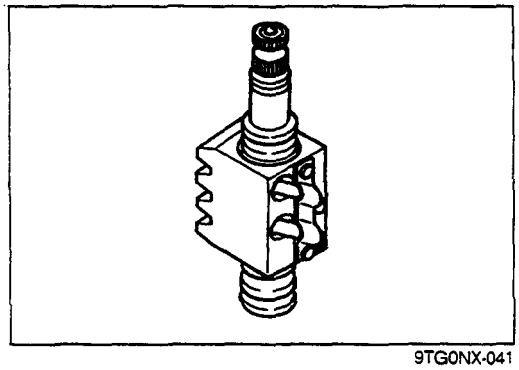
9TG0NX-040

Worm ball nut assembly

1. Measure the play in the vertical direction as shown.

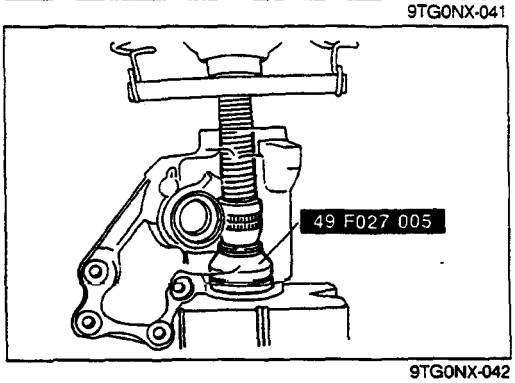
Limit: 0.05mm (0.002 in)

2. Check for damage and wear of the teeth.



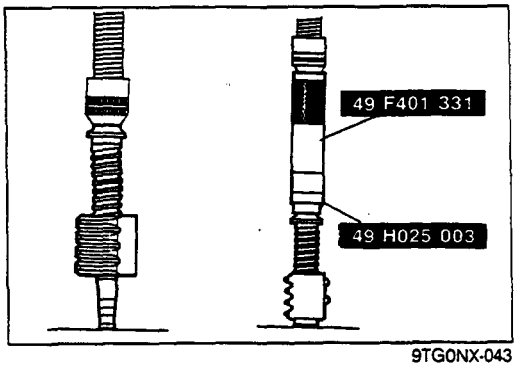
9TG0NX-041

3. Verify that the worm ball nut turns and moves down by its own weight when holding the shaft as shown.



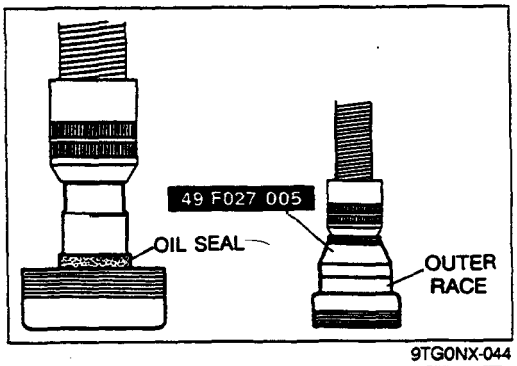
9TG0NX-042

Assembly note
Gear housing
1. Press the outer race in with the **SST** as shown.



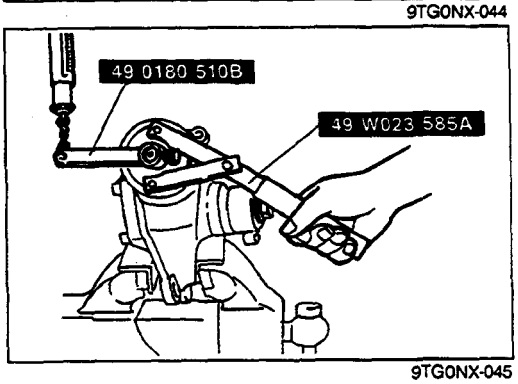
9TG0NX-043

Worm ball nut assembly
1. Press the two inner races on with the **SST** as shown.



9TG0NX-044

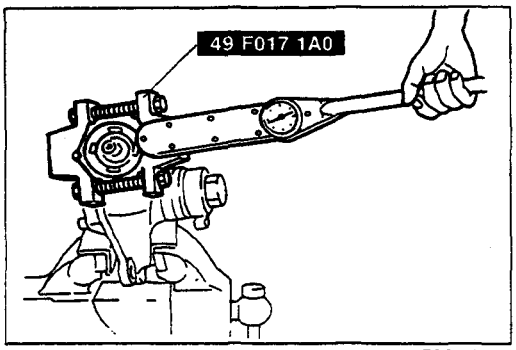
Adjusting plug
1. Press the oil seal in with a **23mm (15/16 in)** socket as shown.
2. Press the outer race on with the **SST** as shown.
3. Insert the worm ball nut assembly into the gear housing.
4. Verify that the worm ball nut assembly turns smoothly.



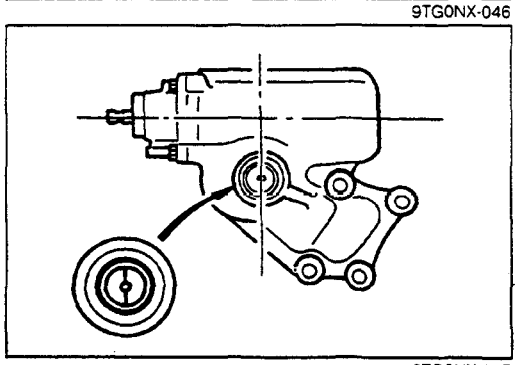
9TG0NX-045

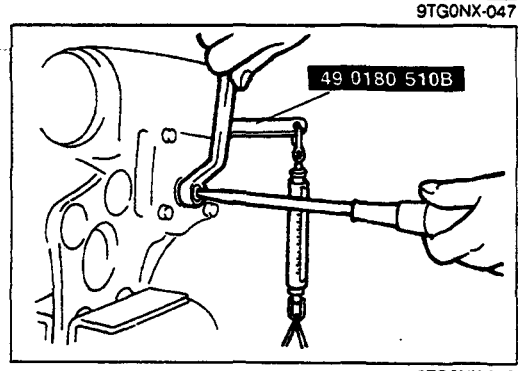
5. Turn the adjusting plug with the **SST**.
6. Measure the worm shaft preload with the **SST** and a pull scale.
7. Turn the adjusting plug to obtain the specified preload.

Worm shaft preload (without sector shaft):
Pull scale reading:
2.9—6.9 N (0.3—0.7 kg, 0.7—1.5 lb)

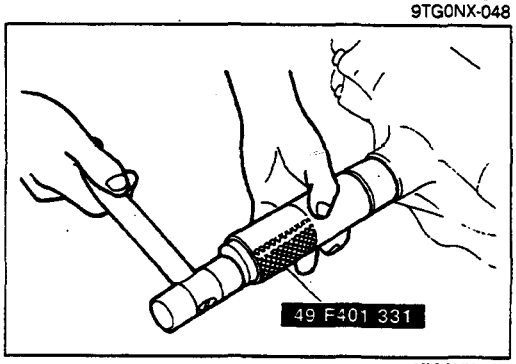


9TG0NX-046

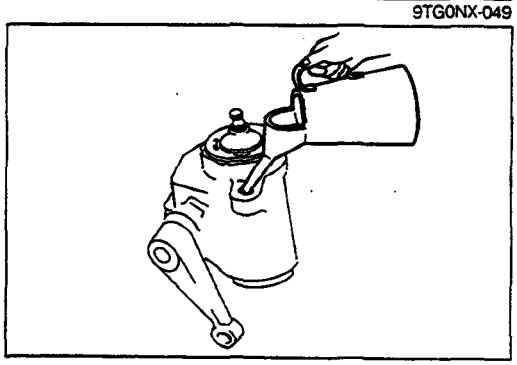

9TG0NX-047



9TG0NX-048



9TG0NX-049


9TG0NX-050

8. Tighten the locknut with the **SST**.

Tightening torque (When using the SST):
177—206 N·m (18—21 m-kg, 131—151 ft-lb)

9. Verify the worm shaft preload.

Adjustment of preload

Note
- **The following adjustment is made after the sector shaft is installed.**

1. Turn the worm shaft counterclockwise until it no longer turns.
2. Turn it clockwise 2—3 turns.
3. This position puts the steering gear in the straight-ahead position.

Note
- **At this position, the slit of the sector shaft end and the axis of the worm shaft cross are at a right angle.**

4. Turn the adjusting bolt.
5. Measure the worm shaft preload in the straight-ahead position with the **SST** and a pull scale.
6. Turn the adjusting bolt to obtain the specified preload.

Worm shaft preload (after sector shaft installed)
Pull scale reading
6.9—11 N (0.7—1.1 kg, 1.5—2.4 lb)

7. Loosen the adjusting bolt one full turn, and then tighten it a half turn.
8. Tighten the locknut.
9. Verify the worm shaft preload.

Gear housing

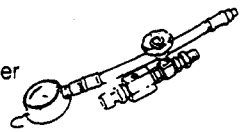
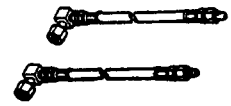
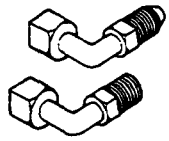
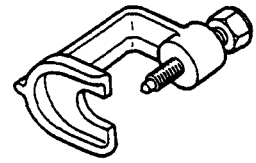
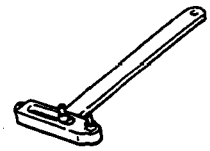
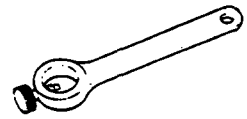
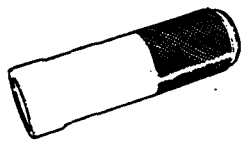
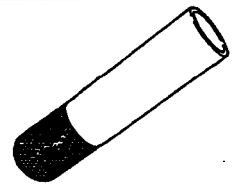
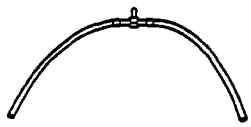
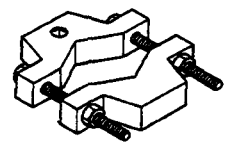
1. Tap the oil seal in with the **SST** and a plastic hammer.

2: Fill the gear housing with gear oil.

Gear oil specification: API Service GL-4, SAE 90
Amount: 0.94 liter (0.99 US qt, 0.83 Imp qt)

ENGINE SPEED SENSING POWER STEERING

PREPARATION
SST

49 1232 670A Gauge set, power steering 	For inspection of fluid pressure	49 H002 671 Adapter, power steering gauge 	For inspection of fluid pressure
49 W032 302 Adapter 	For inspection of fluid pressure	49 0727 575 Puller, socket joint 	For removal of ball joint
49 0208 701A Air out tool, boot 	For removal of dust seal	49 0259 720 Wrench, diff. side bearing adjust nut 	For removal and installation of adjusting plug
49 H032 327 Installer, bearing and oil seal 	For removal of bearing and oil seal	49 0180 510B Attachment, preload measuring 	For adjustment of worm shaft preload
49 F401 331 Body 	For installation of oil seal	49 0727 415 Installer, bearing 	For installation of oil seal
49 G032 317 Hose (Part of 49 G032 3A1) 	For hermetic inspection	49 G032 316 Adapter 	For hermetic inspection
49 F015 002 Installer, water seal 	For installation of oil seal	49 F017 1A0 Universal wrench 	For installation of locknut

9TG0NX-051

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- 8
	Improper worm shaft preload	Adjust	N-35
	Malfunctioning or damaged steering gear	Replace	N-28
	Leakage of fluid	Repair or replace	N-24
	Low fluid level or air in fluid	Add fluid or bleed air	N-23
	Insufficient oil pump pressure	Replace	N-37
	Clogged fluid pipe	Repair or replace	—
	Loose or damaged oil pump drive belt	Adjust or replace	N-46
	Damaged oil pump drive gear (4.0 L Engine)	Replace	N-43
	Incorrect tire pressure	Adjust	Section Q
	Improperly adjusted wheel alignment	Adjust	Section R
Steering wheel pulls to one side	Dragging brake	Repair	Section P
	Incorrect tire pressure	Adjust	Section Q
	Unevenly worn tires	Replace	Section Q
	Weak front spring	Replace	Section R
	Improperly adjusted wheel alignment	Adjust	Section R
General instability while driving	Damaged steering linkage	Replace	N-28
	Worn or damaged steering ball joints	Replace	N- 8
	Improper worm shaft preload	Adjust	N-35
	Incorrect tire pressure	Adjust	Section Q
	Damaged or unbalanced wheel	Adjust or replace	Section Q
	Weak front spring	Replace	Section R
	Malfunctioning shock absorber	Replace	Section R
	Improperly adjusted wheel alignment	Adjust	Section R
Steering effort not uniform	Loose oil pump drive belt	Adjust or replace	N-46
	Malfunctioning steering gear	Replace	N-28
	Malfunctioning steering joint	Replace	N- 8
	Malfunctioning steering linkage	Replace	N-28
Excessive steering wheel play	Worn steering gear	Replace	N-28
	Worn or damaged steering joint	Replace	N- 8
	Loose steering gear mounting bolts	Tighten	N-28
	Improperly adjusted steering gear backlash	Adjust	N-35
	Weak kingpin	Replace	Section M
	Improperly adjusted front wheel bearing preload	Adjust	Section M
Poor steering wheel return	Stuck or damaged steering joint	Replace	N- 8
	Improperly adjusted worm shaft preload	Adjust	N-35
	Steering shaft contacting something	Repair or replace	N-12
	Incorrect tire pressure	Adjust	Section Q
	Improperly adjusted front wheel alignment	Adjust	Section R
Shimmy (Steering wheel vibrates left/right)	Damaged steering linkage	Replace	N-28
	Loose steering gear mounting bolts	Tighten	N-28
	Worn or damaged steering joint	Replace	N- 8
	Improperly adjusted worm shaft preload	Adjust	N-35
	Damaged or worn front wheel bearing	Replace	Section M
	Excessive tire 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
	Malfunctioning shock absorber	Replace	Section R
	Loose shock absorber mounting bolts	Tighten	Section R
	Cracked or worn suspension bushings	Replace	Section R
	Improperly adjusted front wheel alignment	Adjust	Section R

TROUBLESHOOTING GUIDE (Cont'd)

Problem	Possible Cause	Action	Page/Section
Abnormal noise from steering system	Loose steering gear mounting bolts	Tighten	N–28
	Malfunctioning steering gear	Replace	N–28
	Loose or damaged steering linkage	Tighten or replace	N–28
	Worn steering joint	Replace	N– 8
	Obstruction near steering column	Repair or replace	N–12
	Improperly adjusted steering gear backlash	Adjust	N–35
	Loose oil pump	Tighten	N–37
	Loose oil pump bracket	Tighten	N–37
	Loose oil pump pulley	Tighten	N–37
	Loose or over tight oil pump drive belt	Adjust	N–46
	Worn or damaged oil pump drive gear (4.0 L Engine)	Replace	N–43
	Air in system	Bleed air	N–23
	Malfunctioning oil pump	Replace	N–37
	Obstruction near steering column or pressure hose	Adjust or replace	—

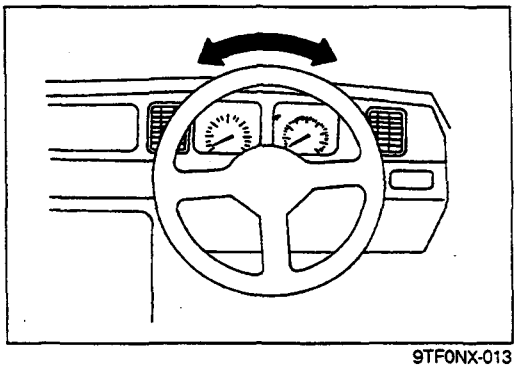
9TF0NX-012

AIR BLEEDING

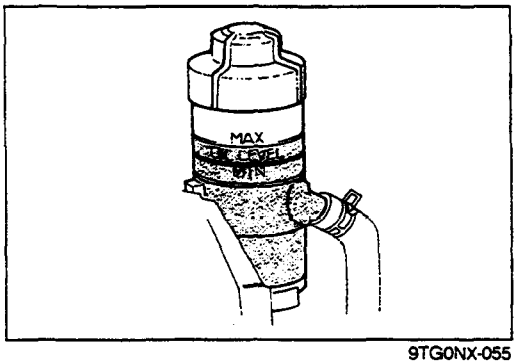
Caution

- **While air bleeding, add fluid to ensure the proper fluid level, thus preventing air from getting into fluid.**

9TG0NX-053

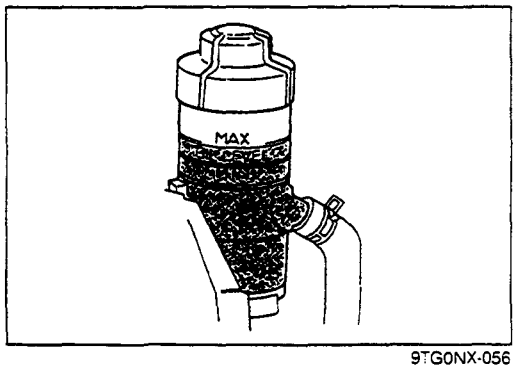


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9TG0NX-055

1. Jack up the front of the vehicle and support it with safety stands.
2. Check the fluid level. (Refer to page N–24.)
3. Turn the steering wheel fully to the left and right several times with the engine not running.
4. Recheck the fluid level. If the level has dropped, add fluid.
5. Repeat Steps 3 and 4 until the fluid level stabilizes.
6. Start the engine and let it idle.
7. Turn the steering wheel fully to the left and right several times.
8. Verify that the fluid is not foamy and that the fluid level has not dropped.
9. Add fluid if necessary and repeat Steps 7 and 8.



9TG0NX-056

POWER STEERING FLUID

Inspection

Fluid level

1. 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 M2C33F or DEXRON-II

Fluid leakage

1. Start the engine. Turn the steering wheel fully to the left and right to apply fluid pressure. Check for fluid leakage.

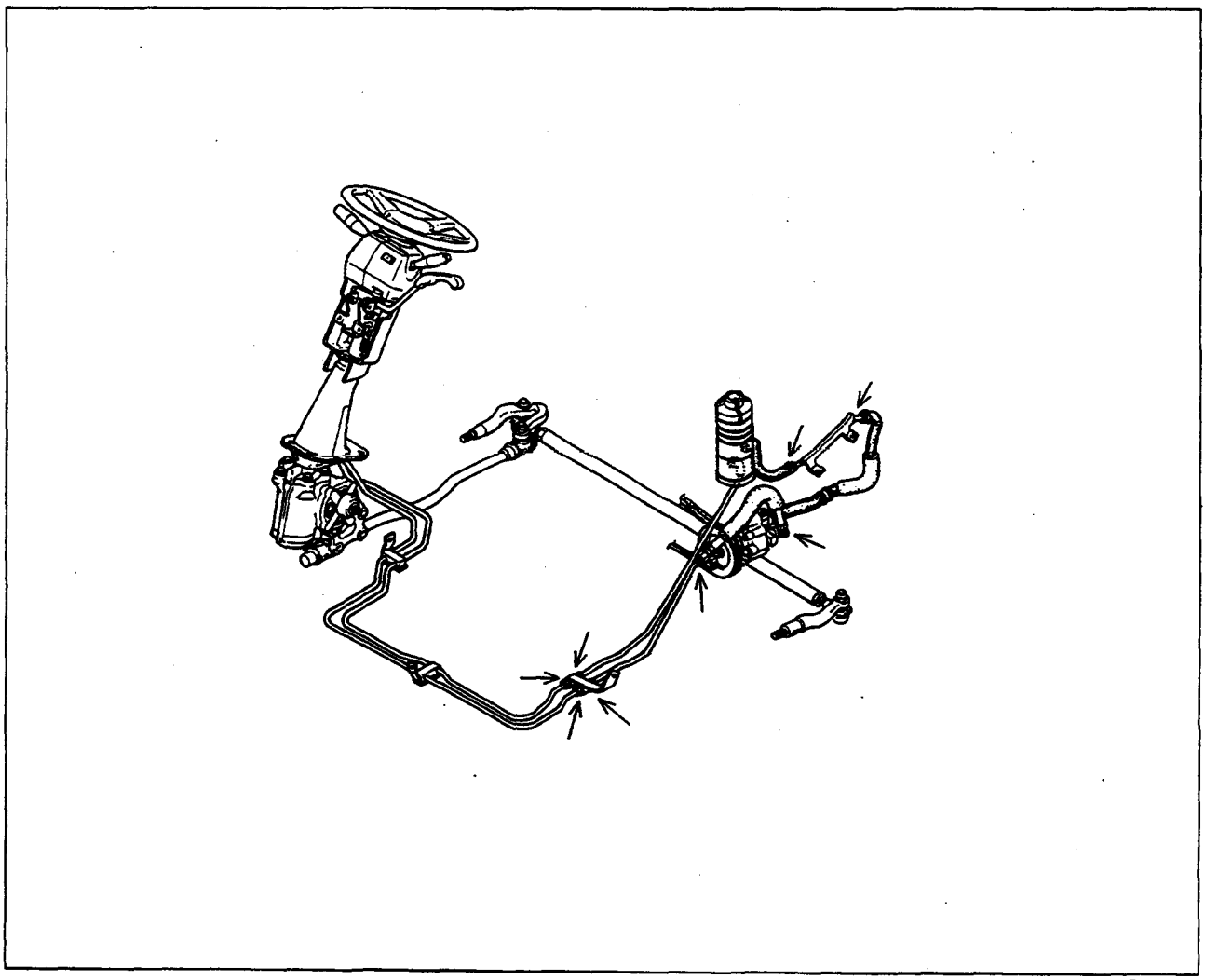
Caution

- **To prevent damage to the steering system, do not keep the steering wheel in the fully turned position for more than 15 seconds.**

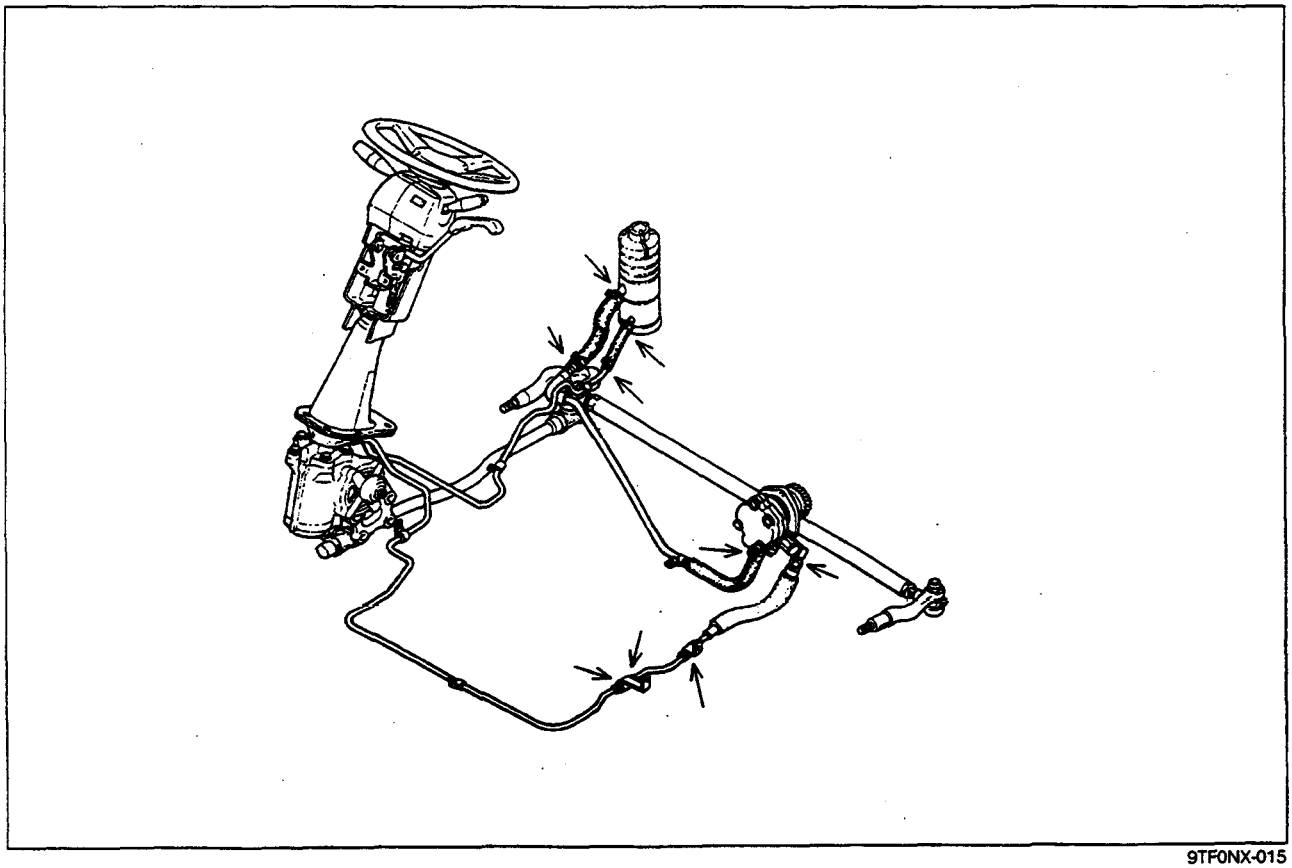
Note

- **The points where fluid leakage may occur are indicated by arrows in the figure.**

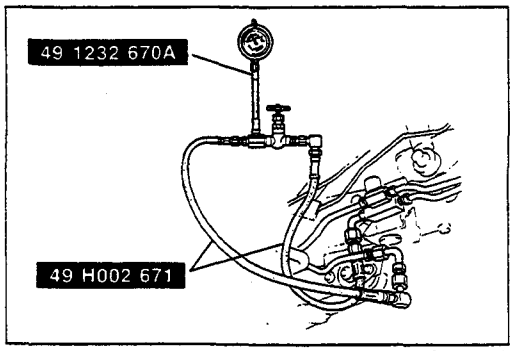
3.5 L TURBO MODEL


9TF0NX-014

4.0 L ENGINE MODEL



9TF0NX-015



9TG0NX-060

Fluid pressure

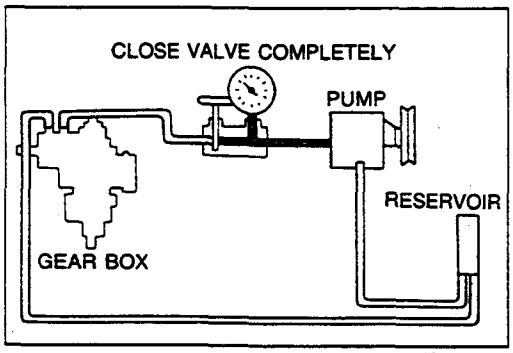
1. Assemble the **SST** as shown in the figure.

Tightening torque:
39—49 N·m (4.0—5.0 m-kg, 29—36 ft-lb)

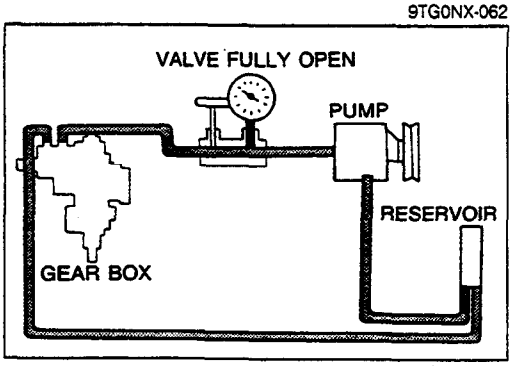
Note
- **Before disconnecting the hose, make marks at the connections for proper reinstallation.**

2. Disconnect the high-pressure hose. Attach the **SST**.
3. Bleed the air from the system. (Refer to page N–23.)

9TF0NX-016



9TG0NX-062



9TG0NX-063

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—140°F)**.
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 below specification, replace the oil pump assembly.

Oil pump fluid pressure:
10,301 kPa (105 kg/cm^2, 1,493 psi)

Caution
- **If the valve is left closed for more than 15 seconds, the fluid temperature will increase excessively and adversely affect the oil pump.**

6. Open the gauge valve fully again and increase the engine speed to **1,000—1,500 rpm**.
7. Turn the steering wheel fully to the left and right and measure the fluid pressure generated by the gear housing. If the pressure is below specification, replace the gear housing assembly.

Gear housing fluid pressure:
10,301 kPa (105 kg/cm^2, 1,493 psi)

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.**

8. Remove the gauge set. Install and tighten the high-pressure hose to the specified torque.

Tightening torque:
31—48 N·m (3.2—4.9 m-kg, 23—35 ft-lb)

9. Bleed the air from the system. (Refer to page N–23.)

9TF0NX-017

STEERING WHEEL AND COLUMN

On-vehicle Inspection

Steering wheel play

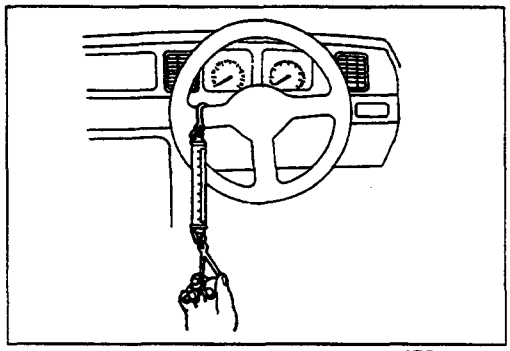
1. Refer to page N–11.

Steering wheel effort

1. With the vehicle on a hard level surface, move the steering wheel to put the wheels in the straight-ahead position.
2. Start the engine and warm the power steering fluid to **50—60°C (122—140°F)**.

Note
- **To raise the fluid temperature, turn the steering wheel fully left and right several times.**

9TF0NX-018



9TG0NX-066

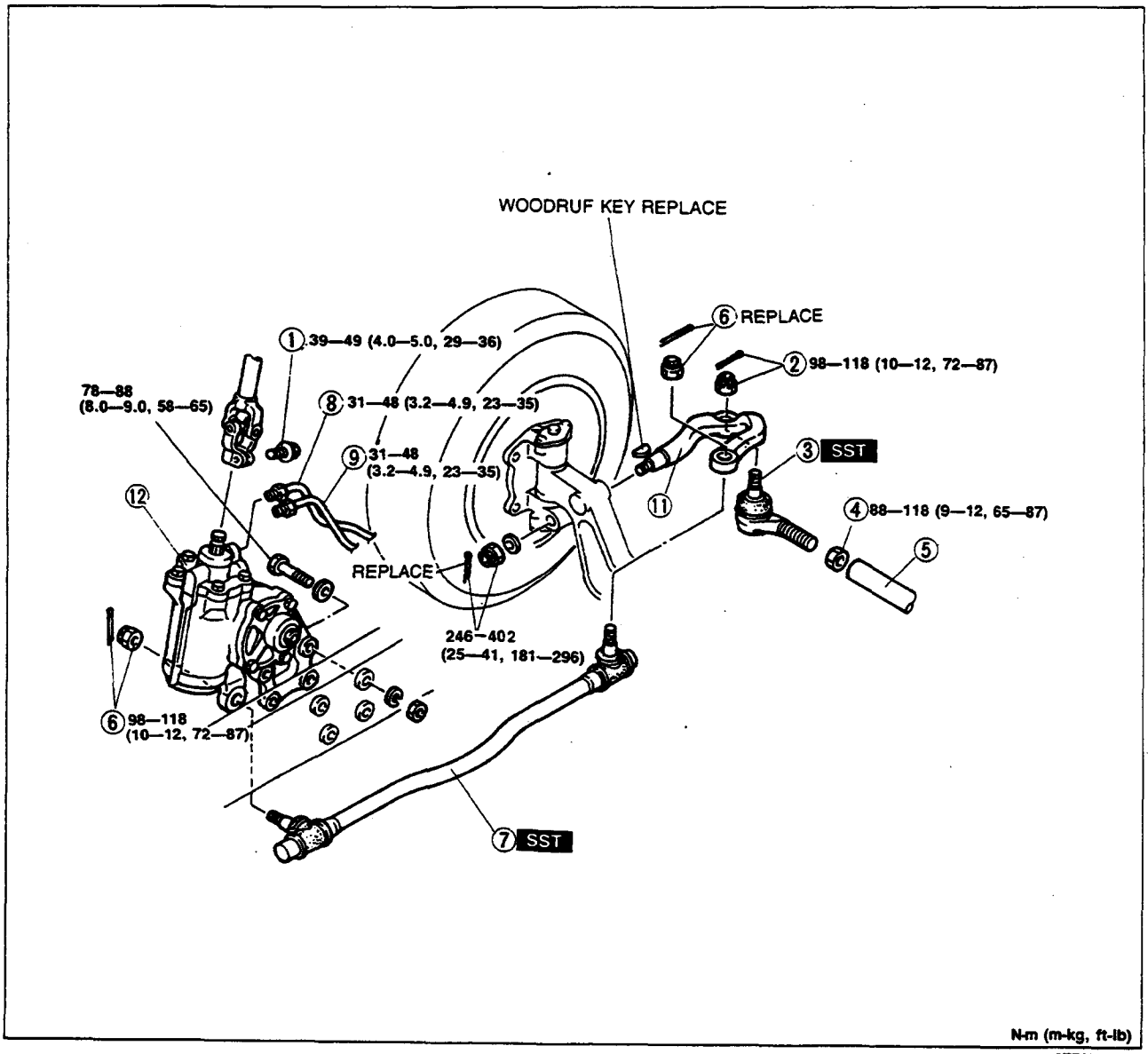
3. With the engine running at idle speed, attach a pull scale to the outermost point of the steering wheel spoke. Then, starting with the wheels in the straight-ahead position, check the steering effort required to turn the steering wheel to the left and to the right.
4. If the measured value exceeds specification, check the following: fluid level, air in system, fluid leakage at hose or connections, function of oil pump and gearbox, and tire pressure.

Steering wheel effort: 39 N (4.0 kg, 8.8 lb) or less

STEERING GEAR AND LINKAGE

Removal / Inspection / Installation

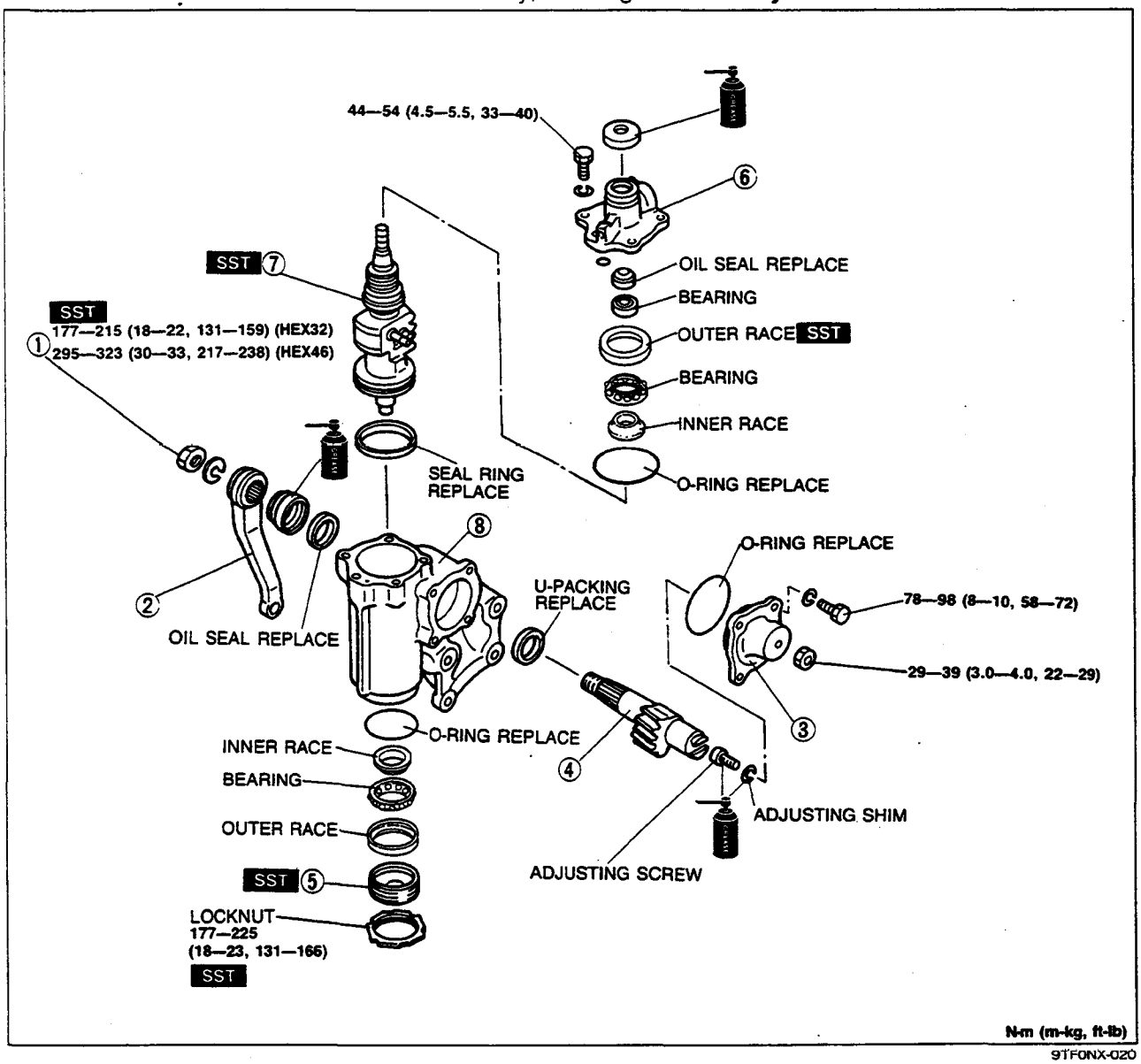
1. Loosen the wheel lug nuts.
2. Jack up the front of the vehicle and support it with safety stands.
3. Remove the wheels.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Inspect for all parts and repair or replace as necessary.
6. Install in the reverse order of removal.



1. Fixing bolt
2. Cotter pin, nut
3. Tie-rod end
   - Removal note ..... page N– 9
   - Inspect for damage
   - Inspect operation of ball joint
4. Locknut
   - Removal note ..... page N– 9
5. Tie-rod
   - Inspect for bending
6. Cotter pin, nut
7. Drag link
   - Removal note ..... page N– 9
   - Inspect for bending
   - Inspect operation of ball stud
8. Pressure pipe
9. Return pipe
10. Cotter pin, nut
11. Knuckle arm
12. Steering gear
    - Disassembly / Inspection / Assembly ..... page N–29

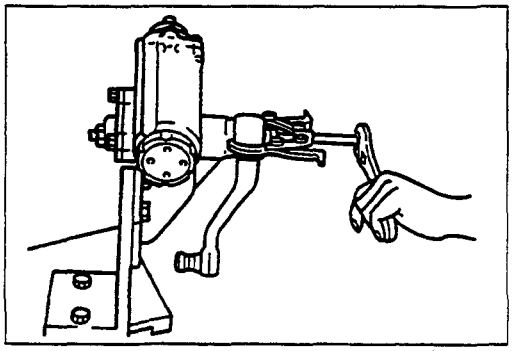
Disassembly / Inspection / Assembly

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



9TF0NX-020

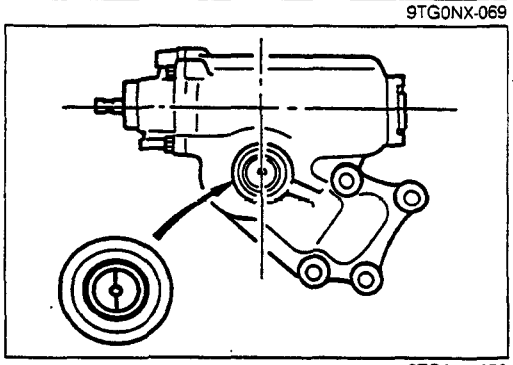
1. Locknut
2. Pitman arm
   - Disassembly note ..... page N–30
   - Assembly note ..... page N–36
3. Side cover
   - Disassembly note ..... page N–30
   - Inspect bearing for damage or corrosion
   - Assembly note ..... page N–34
4. Sector shaft
   - Disassembly note ..... page N–30
   - Inspection ..... page N–32
   - Assembly note ..... page N–34
5. Adjusting plug
   - Disassembly note ..... page N–30
   - Assembly note ..... page N–34
6. Valve housing
   - Disassembly note ..... page N–31
   - Inspect for damage
   - Assembly note ..... page N–33
7. Worm ball nut assembly
   - Disassembly note ..... page N–31
   - Inspection ..... page N–33
   - Assembly note ..... page N–32
8. Gear housing
   - Disassembly note ..... page N–31
   - Inspect for damage
   - Assembly note ..... page N–33, 35



9TG0NX-069

Disassembly note
Pitman arm
1. Remove the pitman arm with a suitable puller.

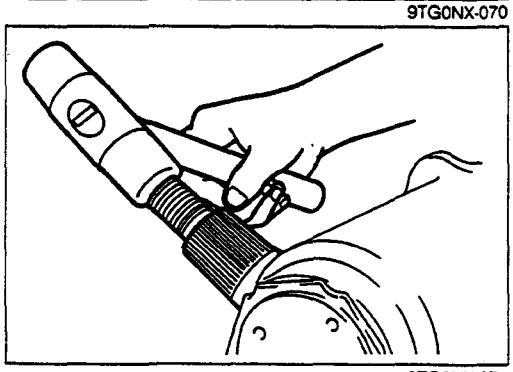
Caution
- **Do not hit the pitman arm and do not use a chisel.**



9TG0NX-070

Sector shaft, Side cover
1. Turn the worm shaft counterclockwise until it no longer turns.
2. Turn it clockwise 2—3 turns.
3. This position sets the steering gear in the straight-ahead position.

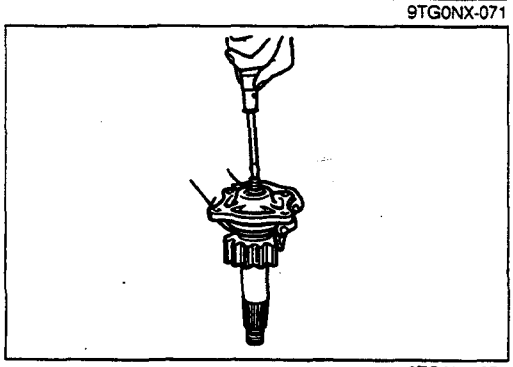
Note
- **At this position, the slit of the sector shaft end and the axis of the worm shaft cross at a right angle.**



9TG0NX-071

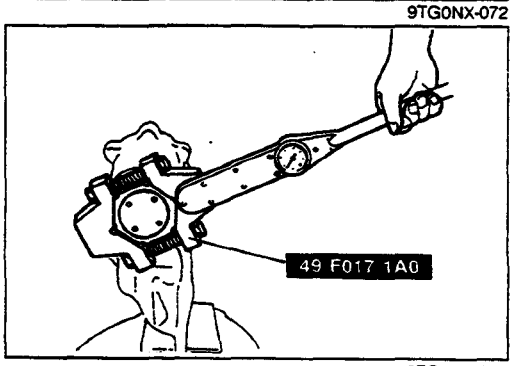
4. Remove the side cover and the sector shaft together by striking the sector shaft end with a plastic hammer.

Caution
- **Before removing, remove all dirt and oil from the serrations of the sector shaft.**



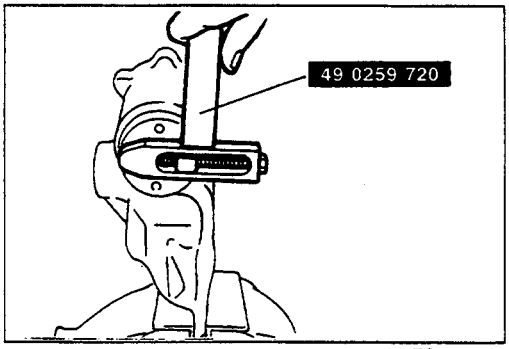
9TG0NX-072

5. Remove the side cover from the sector shaft by turning the adjusting screw clockwise as shown.



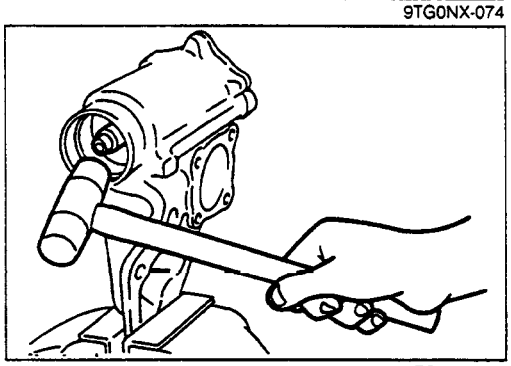
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Adjusting plug
1. Remove the locknut with the **SST**.



9TG0NX-074

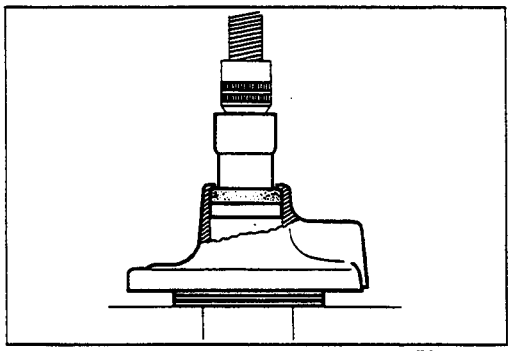
2. Remove the adjusting plug with the **SST**.


9TG0NX-075

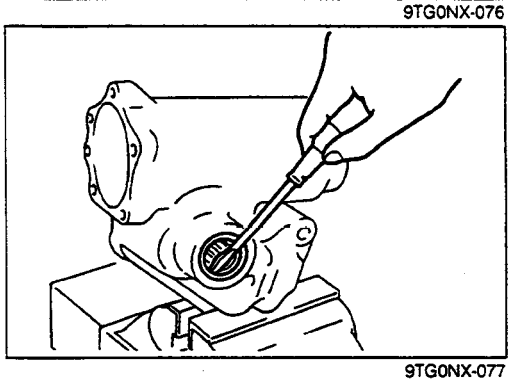
Valve housing, Worm ball nut assembly

Caution
- **Do not damage the inside of the gear housing and the worm ball nut assembly.**

1. Remove the valve housing and the worm ball nut assembly together by hitting the worm shaft end with a plastic hammer.


9TG0NX-076

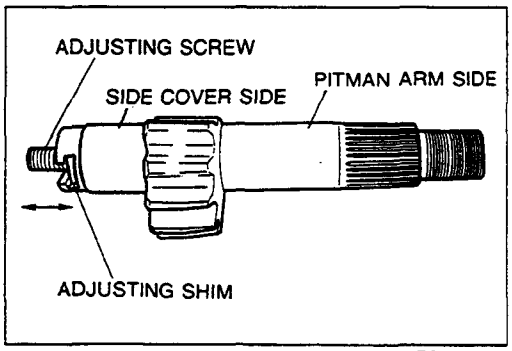
2. Press the ball bearing and the oil seal out with the a socket.
3. Remove the outer race with a screwdriver.


9TG0NX-077

Gear housing

1. Remove the oil seal, the U-packing and the O-ring with a screwdriver.

Caution
- **Do not remove the needle bearing.**
- **Do not damage the inside of the gear housing or the needle bearing.**



9TG0NX-078

Inspection
Sector shaft
1. Set the adjusting screw and the adjustment shim in the T-groove.
2. Measure the clearance with a feeler gauge in the axial direction.
3. If the clearance exceeds specification, adjust it with the adjustment shims supplied in the adjustment shim kit.

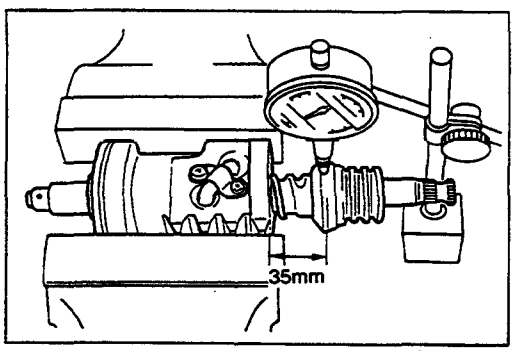
Clearance in axial direction:
0—0.1mm (0—0.004 in)
Available adjustment shims:
1.95mm (0.077 in), 2.00mm (0.079 in), 2.05mm (0.081 in)

4. Measure the outer diameter.

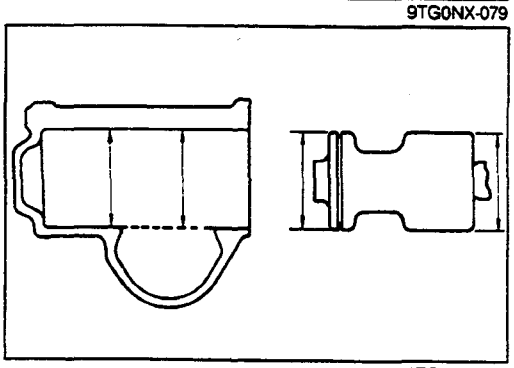
Limit:

Models	Side cover side	Pitman arm side
General RHD (10 ft, 2,000 kg)	34.95mm (1.38 in)	34.95mm (1.38 in)
Others	39.94mm (1.57 in)	44.39mm (1.75 in)

5. Check for damage and wear of the teeth and the shaft.



9TG0NX-079

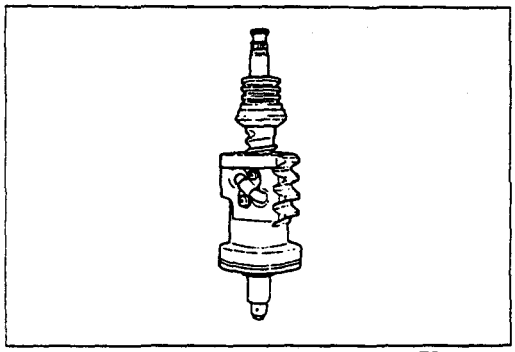

9TG0NX-080

Worm ball nut assembly
1. Measure the play in the vertical direction as shown.

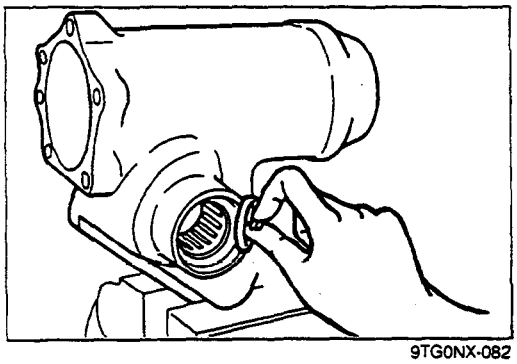
Limit: 0.4mm (0.016 in)

2. Measure the clearance of gear housing inner diameter and worm ball nut assembly outer diameter.

Limit: 0.15mm (0.006 in)


9TG0NX-081

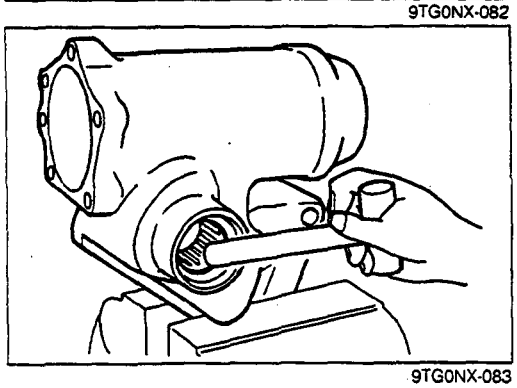
3. Verify that the worm ball nut turns and moves down by its own weight when holding the shaft as shown.
4. Check for damage of the worm ball nut assembly.


9TG0NX-082

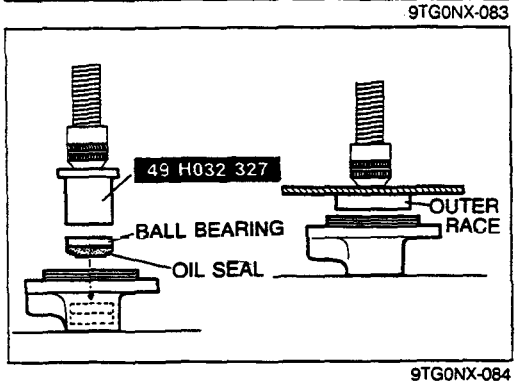
Assembly note
Gear housing
1. Apply ATF to a new O-ring, and install it into the gear housing.
2. Apply ATF to the U-packing, and install it into the gear housing as shown.

Note
- **Pinch the U-packing as shown to install it. Smooth it into place by hand after installation.**
- **Install the U-packing into position with a hammer handle.**

Caution
- **Do not damage the inside of the gear housing or the needle bearing.**


9TG0NX-083

Valve housing
1. Press the oil seal and the ball bearing in with the **SST** and apply ATF to the oil seal.
2. Press the outer race in with a flat plate.

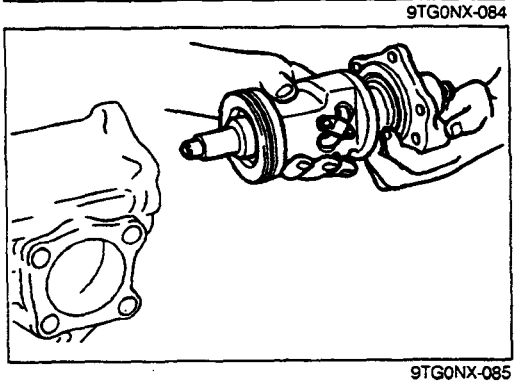


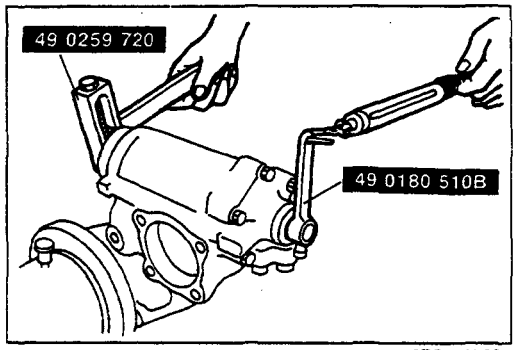
9TG0NX-084

Worm ball nut assembly

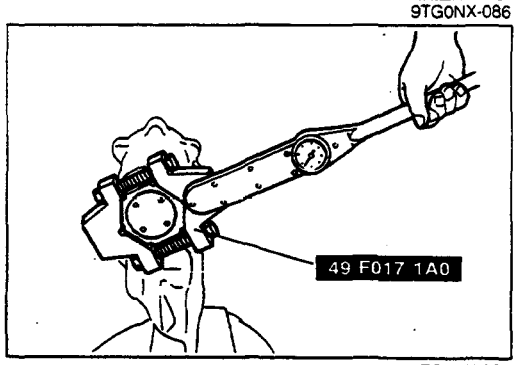
Caution
- **Do not damage the seal ring.**
- **Before inserting, set the rack position in the center position of the worm shaft.**

1. Apply ATF to the seal ring, then insert the worm ball nut assembly and the valve housing into the gear housing together.


9TG0NX-085



9TG0NX-086



9TG0NX-087

Adjusting plug

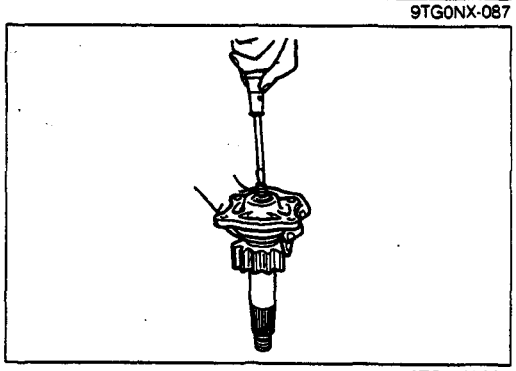
1. Install the inner race on the worm shaft.
2. Apply ATF to the O-ring.
3. Install the adjusting plug and the outer race by hand.
4. Verify that the worm shaft turns smoothly.
5. Turn the adjusting plug with the **SST**.
6. Measure the worm shaft preload with the **SST** and a pull scale.
7. Turn the adjusting plug to obtain the specified preload.

Worm shaft preload (without sector shaft)
Pull scale reading:
3.9—5.9 N (0.4—0.6 kg, 0.9—1.3 lb)

8. Tighten the locknut with the **SST**.

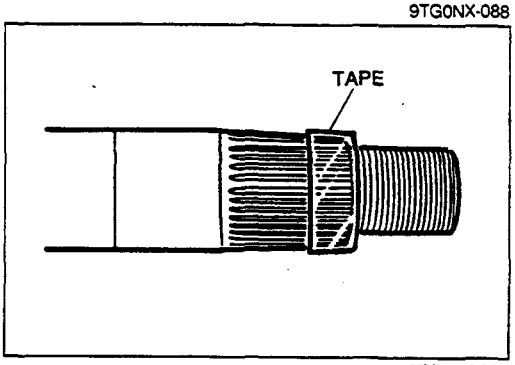
Tightening torque (When using the SST):
167—196 N·m (17—20 m-kg, 123—144 ft-lb)

9. Verify the worm shaft preload.


9TG0NX-088

Sector shaft, side cover

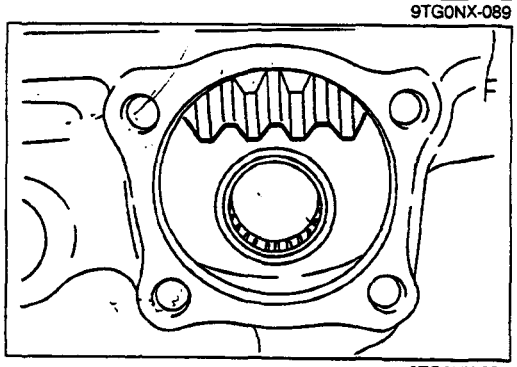
1. Insert the sector shaft into the side cover.
2. Turn the adjusting bolt counterclockwise with a screwdriver until it no longer turns. Return one turn.
3. Temporarily tighten the locknut.



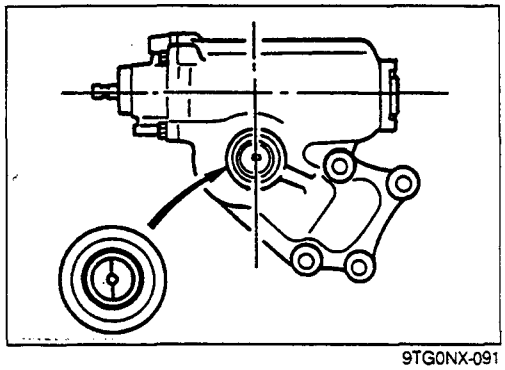
9TG0NX-089

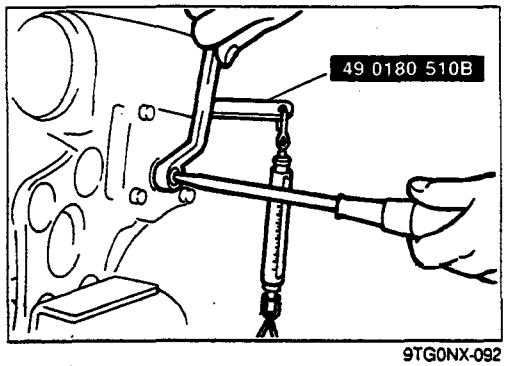
Caution

- **Not to damage the needle bearing, use tape on the sector shaft as shown.**


9TG0NX-090

4. Center the worm shaft teeth as shown in the figure.
5. Tilt the worm shaft teeth down as shown.
6. Install the sector shaft and the side cover into the gear housing.
7. Verify that the worm shaft turns **approx. 5 turns** lock-to-lock.


9TG0NX-091



9TG0NX-092

Adjustment of preload

Caution
- **The following adjustment is made after the sector shaft is installed.**

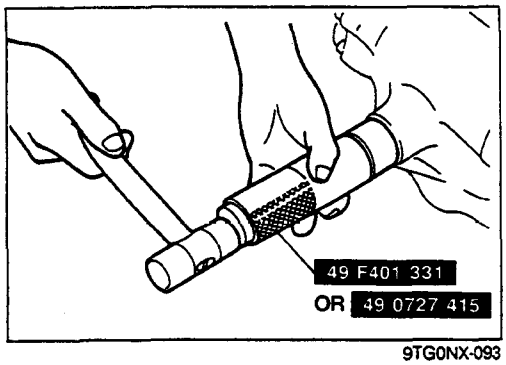
1. Turn the worm shaft counterclockwise until it no longer turns.
2. Turn it clockwise 2—3 turns.
3. This sets the steering gear in the straight-ahead position.

Note
- **At this position, the slit of the sector shaft end and the axis of the worm shaft cross at a right angle.**

4. Turn the adjusting bolt.
5. Measure the worm shaft preload in the straight-ahead position with the **SST** and a pull scale.
6. Turn the adjusting bolt to obtain the specified preload.

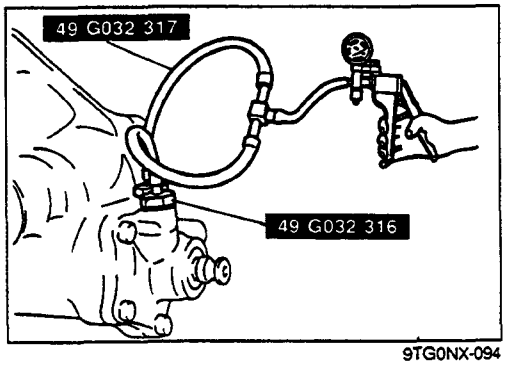
Worm shaft preload (after sector shaft installed)
Pull scale reading
5.9—7.8 N (0.6—0.8 kg, 1.3—1.8 lb)

7. Loosen the adjusting bolt one full turn and then tighten it a half turn.
8. Tighten the locknut
9. Verify the worm shaft preload.



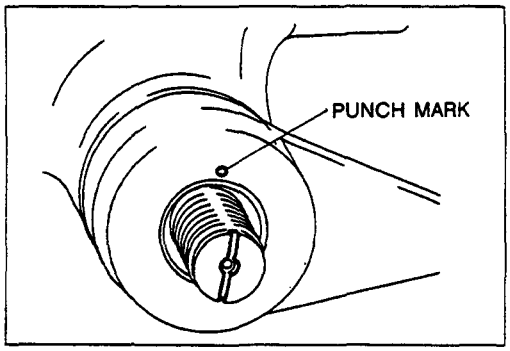
9TG0NX-093

Gear housing
1. Tap the oil seal in with the **SST** and a plastic hammer.



9TG0NX-094

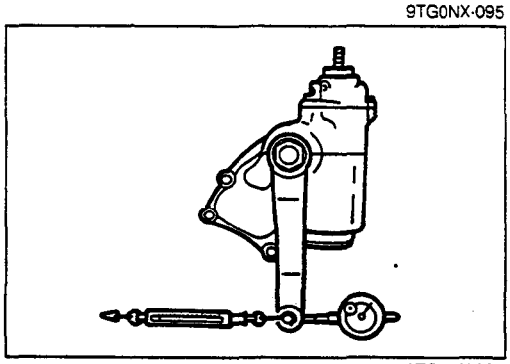
Hermetic inspection
1. Connect the **SST** to the cylinder housing.
2. Connect a vacuum pump to the **SST**.
3. Apply **400 mmHg (15.7 inHg)** vacuum.
4. Verify that vacuum is held for at least **30 sec**.



9TG0NX-095

Pitman arm

1. Align the slit of the sector shaft end and the punch mark as shown and install the pitman arm.


9TG0NX-096

Measurement of the backlash

1. Set the steering gear in the straight-ahead position.
2. Pull the pitman arm with the specified force.
3. Measure the backlash.

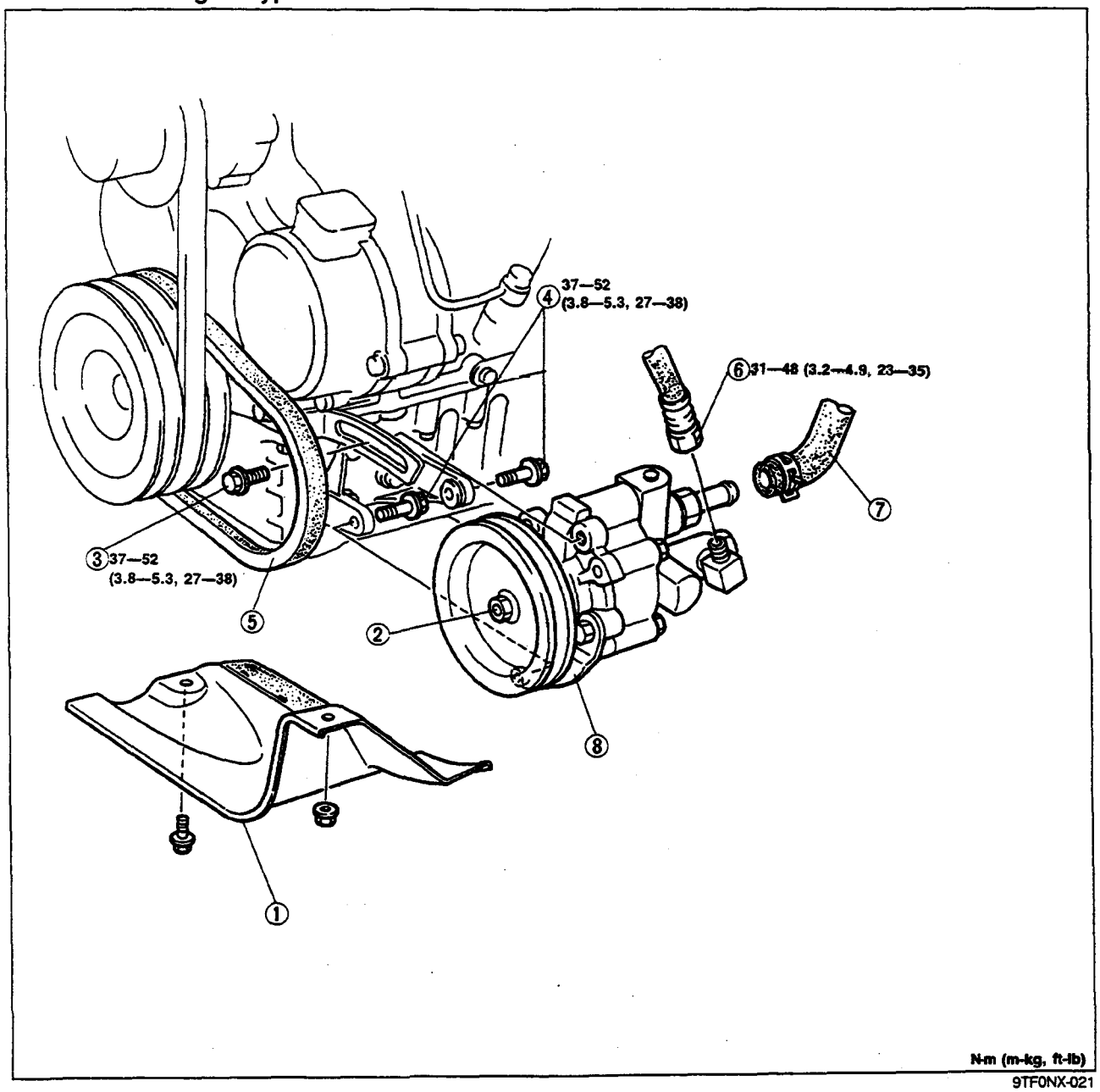
Specified force: 20 N (2.0 kg, 4.4 lb)
Backlash: 0.25mm (0.010 in) max.

POWER STEERING OIL PUMP

Removal / Installation

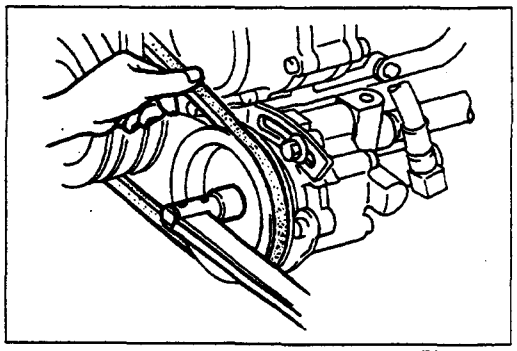
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.

3.5 L TURBO Engine type



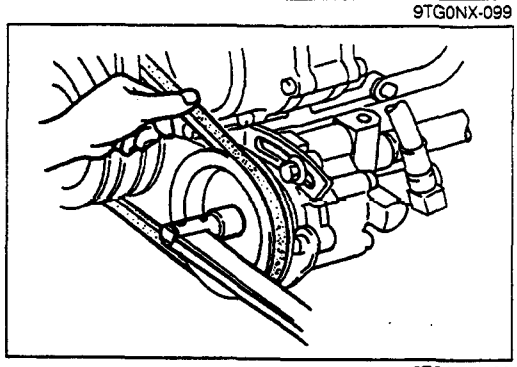
9TF0NX-021

1. Pump protector
2. Locknut (Do not remove if not necessary)
   - Removal note ..... page N–38
   - Installation note ..... page N–38
3. Strap bolt
4. Bolt
5. Drive belt
   - Inspection ..... page N–46
   - Adjustment ..... page N–46
   - Replacement ..... page N–47
6. Pressure pipe
7. Return hose
8. Oil pump assembly
   - Disassembly / Inspection / Assembly ..... page N–39



9TG0NX-099

Removal note
Locknut
1. Push the drive belt as shown and loosen the locknut.



9TG0NX-100

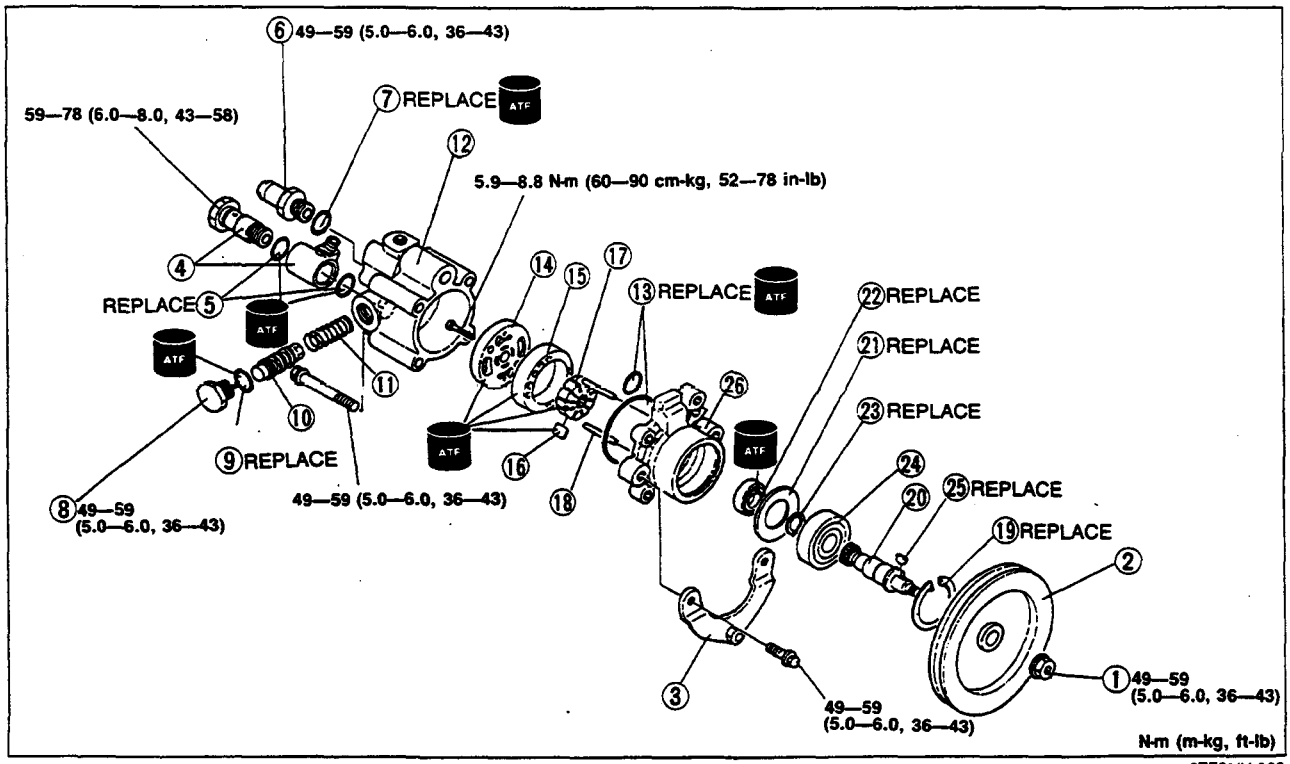
Installation note
Locknut
1. Push the drive belt as shown and tighten the locknut to the specified torque.

Tightening torque:
49—59 N·m (5.0—6.0 m-kg, 36—43 ft-lb)

Disassembly / Inspection / Assembly

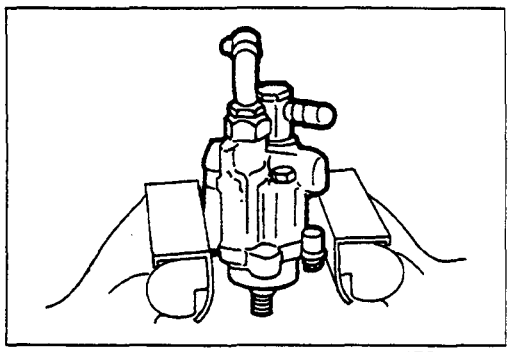
1. The following procedures show replacement of the O-ring, bearing, Woodruff key, and oil seal. If a problem is found in other parts, replace the oil pump assembly.
2. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
3. Inspect all parts and repair or replace as necessary.
4. Assemble in the reverse order of disassembly, referring to **Assembly Note**.

3.5 L TURBO Engine type



9TF0NX-022

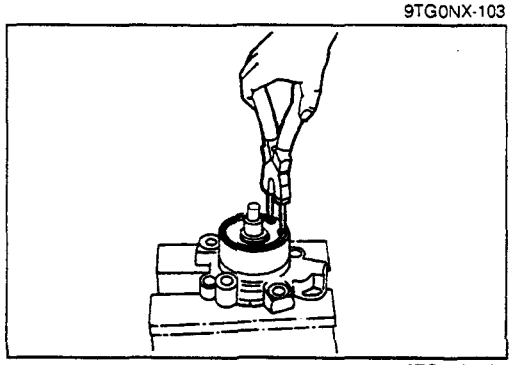
1. Locknut
2. Pulley
3. Bracket
4. Connector (Return)
5. O-ring
6. Connector (Pressure)
7. O-ring
8. Plug
9. O-ring
10. Control valve assembly
    Inspect for damage and wear
11. Spring
    Inspect for damage
12. Rear body
    Inspect for damage and wear
13. O-ring
14. Pressure plate
    Inspect for damage and wear
    Assembly note ..... page N–42
15. Cam ring
    Inspect for damage and wear
    Assembly note ..... page N–42
16. Vane
    Inspect for wear
    Assembly note ..... page N–42
17. Rotor
    Inspect for damage and wear
    Assembly note ..... page N–42
18. Pin
19. Snap ring
    Disassembly note ..... page N–40
20. Driveshaft
    Disassembly note ..... page N–40
    Inspect for damage and wear
    Assembly note ..... page N–41
21. Retaining ring
22. Oil seal
    Disassembly note ..... page N–41
23. Snap ring
24. Bearing
    Inspect operation
25. Woodruff key
    Disassembly note ..... page N–40
    Assembly note ..... page N–41
26. Front body
    Inspect for damage
    Inspect operation of needle bearing
    Assembly note ..... page N–41



9TG0NX-103

Disassembly note

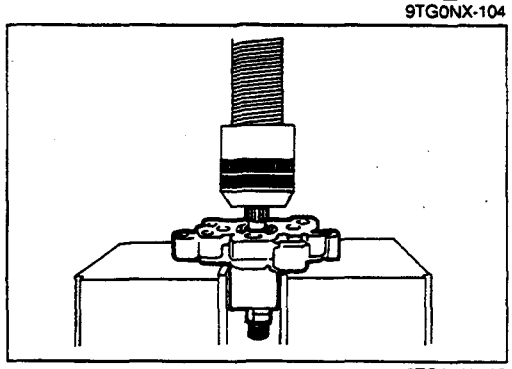
Caution
- **When securing the oil pump in a vise, use protective plates as shown in the figure.**



9TG0NX-104

Snap ring

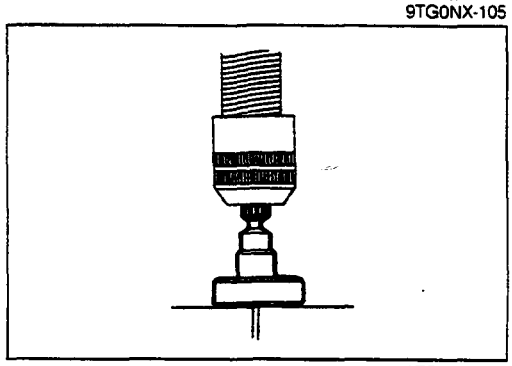
1. Remove the snap ring with snap-ring pliers.



9TG0NX-105

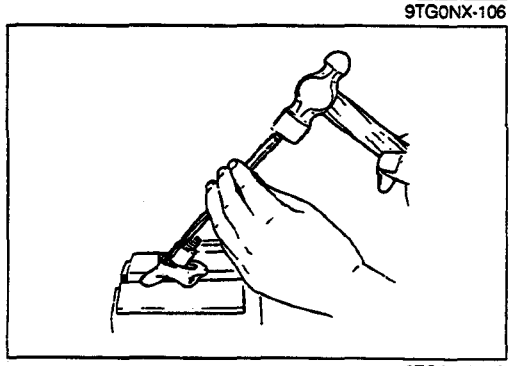
Driveshaft

1. Press the driveshaft and bearing out as shown.
2. Remove the snap ring.



9TG0NX-106

3. Press the bearing out as shown.



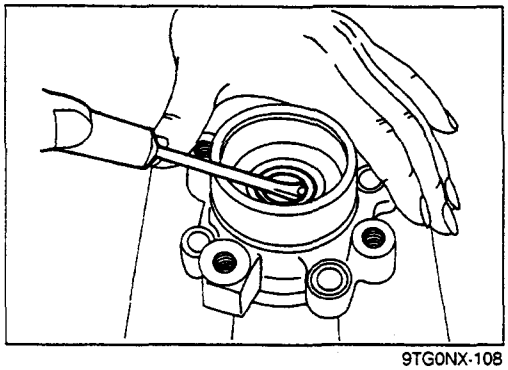
9TG0NX-107

Woodruff key (If necessary)

1. Secure the driveshaft in a vise with rag as shown.

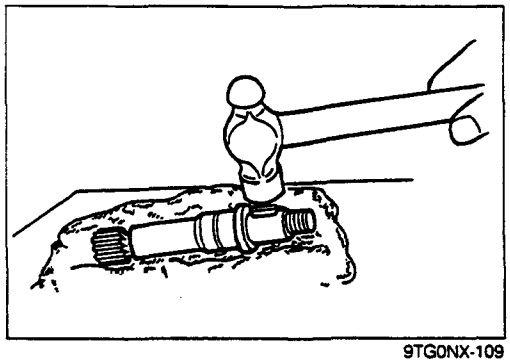
Caution
- **Do not damage the shaft.**
- **Do not remove the woodruff key if it is not defective.**

2. Remove the Woodruff key with a chisel and a hammer.


9TG0NX-108

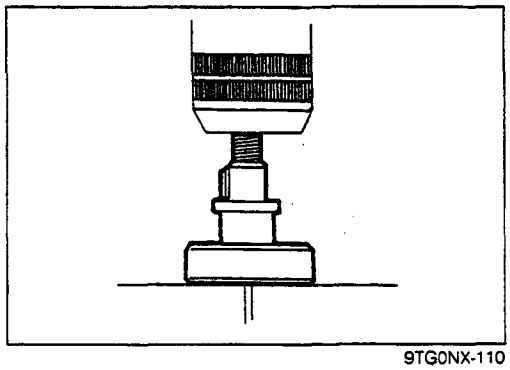
Oil seal
1. Secure the front body in a vise.
2. Remove the oil seal with a screwdriver.

Caution
- **Do not damage the front body and the needle bearing.**

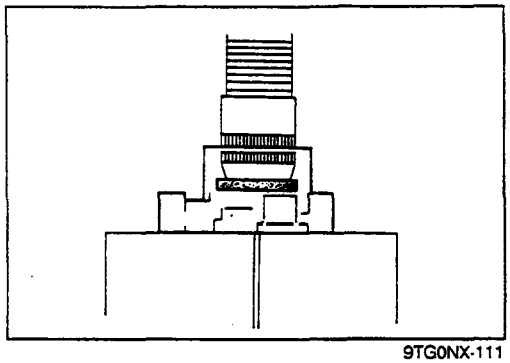

9TG0NX-109

Assembly note
Woodruff key
1. Tap the Woodruff key into the shaft.

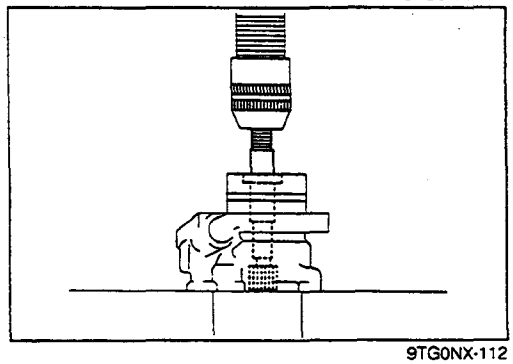
Caution
- **Not to damage the shaft, use a rag under the shaft for protection.**


9TG0NX-110

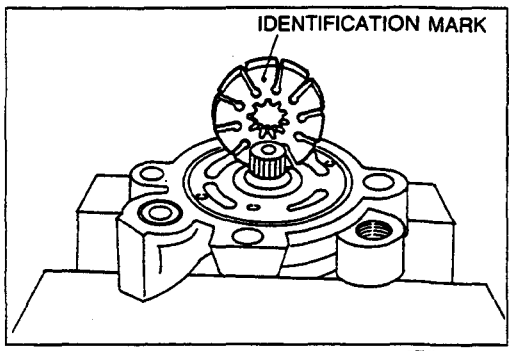
Driveshaft
1. Press the bearing on as shown.
2. Install the snap ring.


9TG0NX-111

Front body
1. Press the oil seal in as shown.

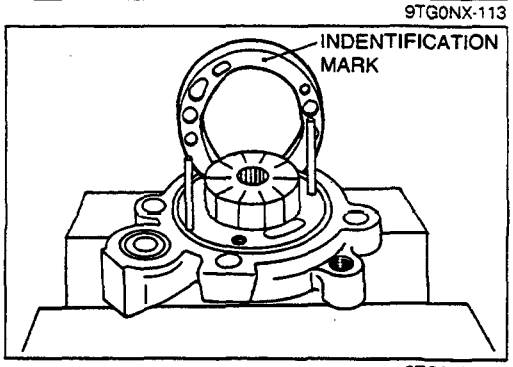

9TG0NX-112

2. Press the driveshaft and the bearing in as shown.
3. Install the snap ring.



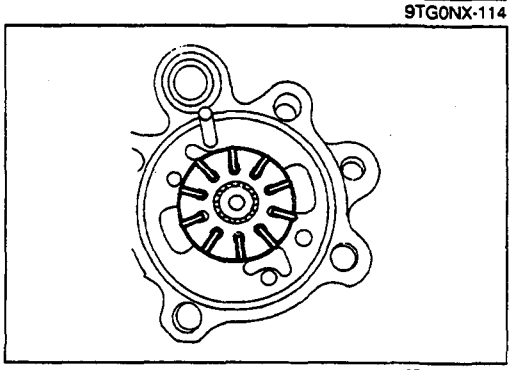
9TG0NX-113

Rotor
1. Apply ATF to the rotor and install it with the identification mark facing the front body as shown.

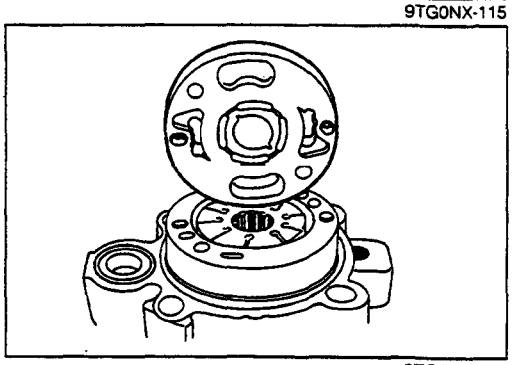


9TG0NX-114

Cam ring
1. Install the pin.
2. Apply ATF to the cam ring and install it with the identification mark facing the front body as shown.


9TG0NX-115

Vane
1. Apply ATF to the vanes and place them in the rotor with the rounded edges against the cam ring.

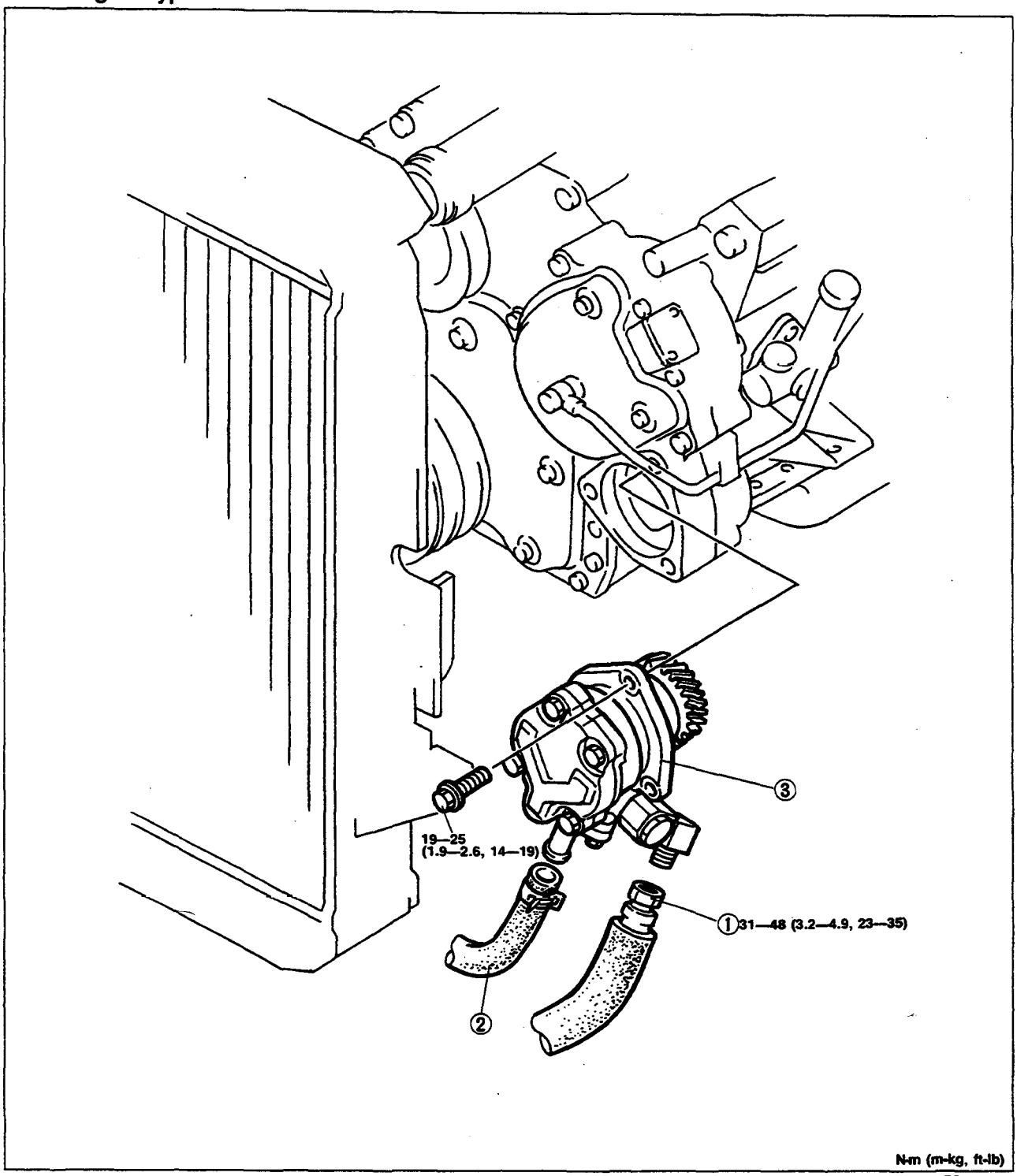

9TG0NX-116

Pressure plate
1. Apply ATF to the pressure plate and install it.

Removal / Installation

1. Remove the radiator cowling (upper and lower) and the cooling fan. (Refer to Section E.)
2. Remove in the order shown.
3. Install in the reverse order of removal.

4.0 L Engine type

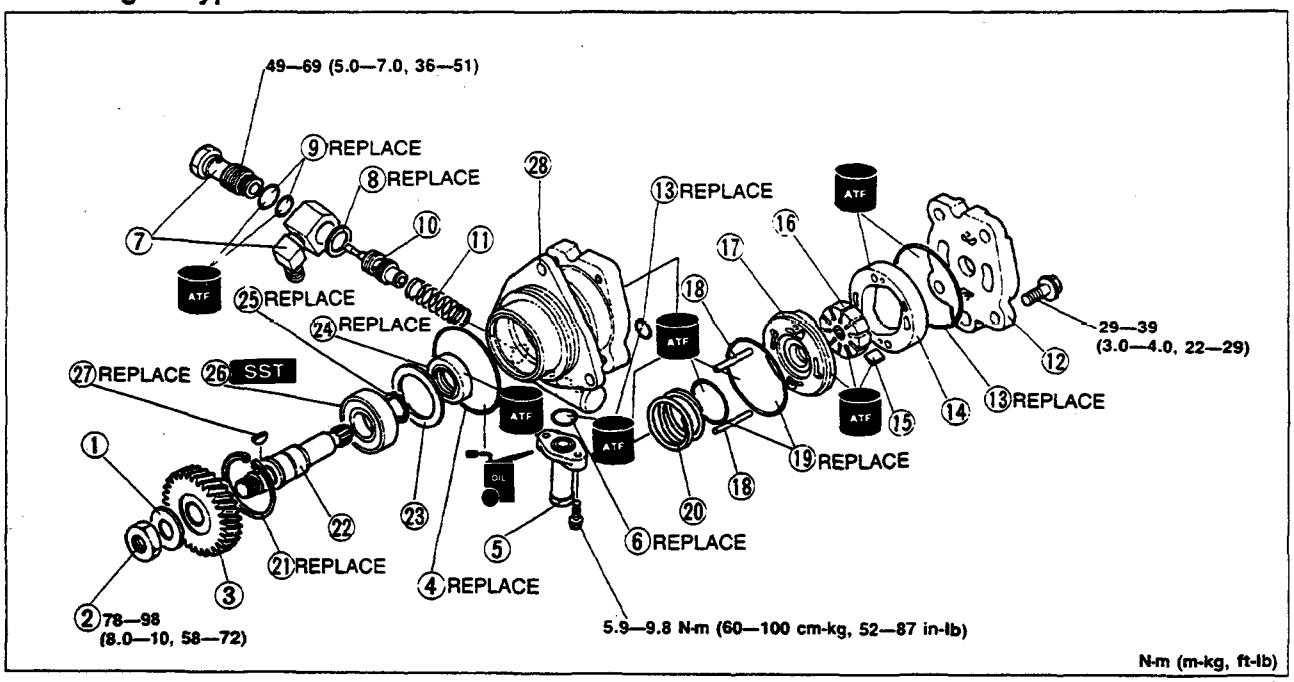


1. Pressure pipe
2. Return hose
3. Oil pump assembly
   Disassembly / Inspection / Assembly ..... page N–44

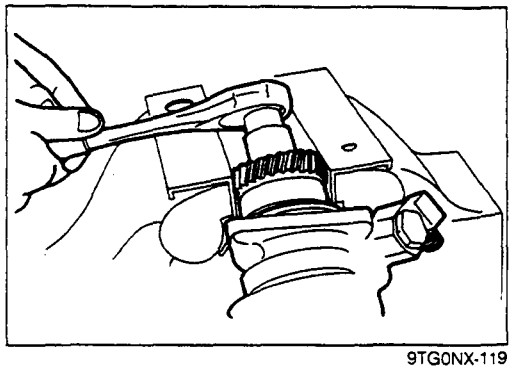
Disassembly / Inspection / Assembly

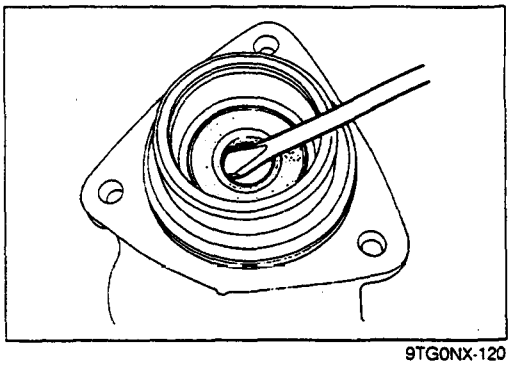
1. The following procedures show replacement of the O-ring, bearing, Woodruff key, and oil seal. If a problem is found in other parts, replace the oil pump assembly.
2. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
3. Inspect for all parts and replace as necessary.
4. Assemble in the reverse order of disassembly, referring to **Assembly Note**.

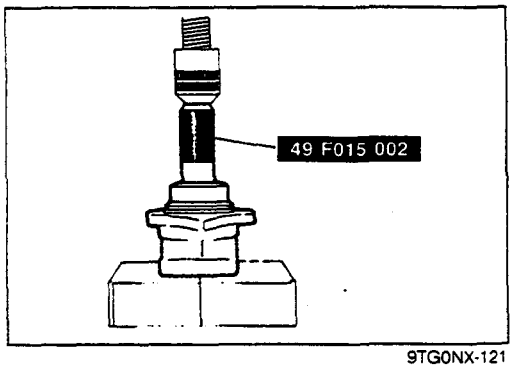
4.0 L Engine type



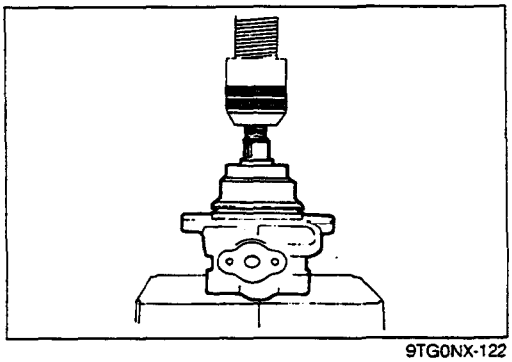
1. Locknut
   - Disassembly note ..... page N–45
   - Assembly note ..... page N–46
2. Washer
3. Drive gear
   - Inspect for damage
4. O-ring
5. Suction pipe
6. O-ring
7. Connector
8. Spacer
9. O-ring
10. Control valve assembly
    - Inspect for damage and wear
11. Spring
    - Inspect for damage
12. Rear body
    - Inspect for damage
13. O-ring
14. Cam ring
    - Inspect for damage and wear
    - Assembly note ..... page N–46
15. Vane
    - Inspect for wear
    - Assembly note ..... page N–42
16. Rotor
    - Inspect for damage and wear
    - Assembly note ..... page N–45
17. Pressure plate
    - Inspect for damage and wear
    - Assembly note ..... page N–42
18. Pin
19. Spring
    - Inspect for damage
20. Snap ring
    - Disassembly note ..... page N–40
21. Driveshaft
    - Disassembly note ..... page N–40
    - Inspect for damage and wear
    - Assembly note ..... page N–41
22. Spacer
23. Oil seal
    - Disassembly note ..... page N–45
24. Snap ring
25. Bearing
    - Inspect for operation
26. Woodruff key
    - Disassembly note ..... page N–40
    - Assembly note ..... page N–41
27. Front body
    - Inspect for damage and wear
    - Assembly note ..... page N–45

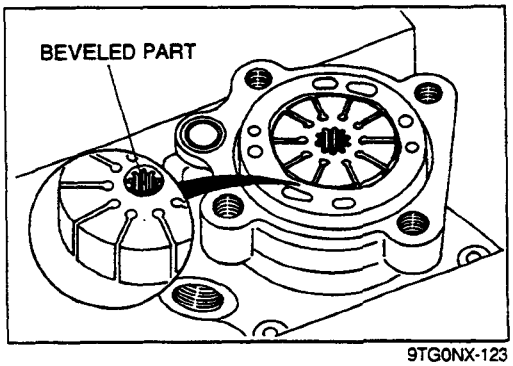

9TG0NX-119


9TG0NX-120



9TG0NX-121


9TG0NX-122



9TG0NX-123

Disassembly note
Locknut
1. Secure the oil pump use in a vise.

Caution
- **Not to damage the pump, use protective plates.**

2. Remove the washer with a chisel and a hammer.

Caution
- **Do not damage the driveshaft or the drive gear.**

3. Remove the locknut.

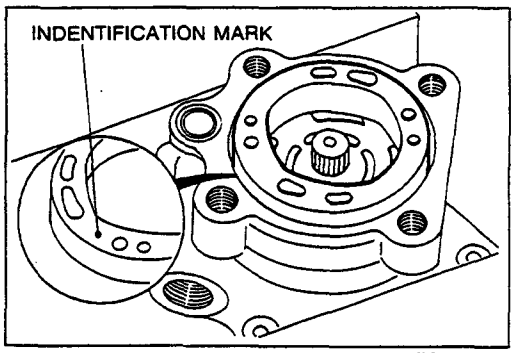
Oil seal
1. Remove the oil seal with a screwdriver as shown.

Caution
- **Do not damage the front body or the bushing.**

Assembly note
Front body
1. Press the oil seal in with the **SST**.

2. Press the driveshaft and the bearing in together as shown.
3. Install the snap ring.

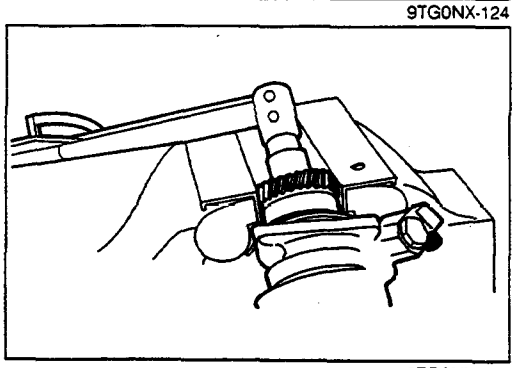
Rotor
1. Apply ATF to the rotor and install it with the beveled side facing the front body as shown.



9TG0NX-124

Cam ring

1. Apply ATF to the cam ring and install it with the identification mark facing the front body as shown.


9TG0NX-125

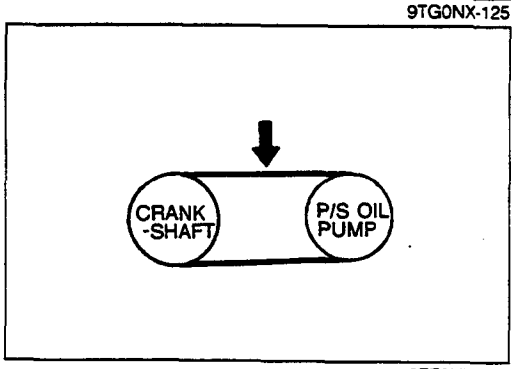
Locknut

1. Secure the oil pump in a vise.

Caution

- **Do not damage the pump, use protective plates.**

2. Install the washer.
3. Tighten the locknut.
4. Pry up the washer to lock the nut.



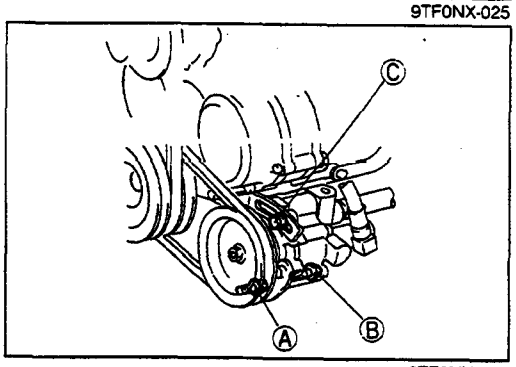
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DRIVE BELT

Inspection

1. Check the drive belt for wear, cracks, and fraying. Replace if necessary.
2. Check the drive belt deflection by applying moderate pressure **(98 N, 10 kg, 22 lb)** midway between the pulleys. Adjust if necessary.

Deflection (Depressed at 98 N [10 kg, 22 lb])
New : 9—11mm (0.35—0.43 in)
Used: 12—13mm (0.47—0.51 in)



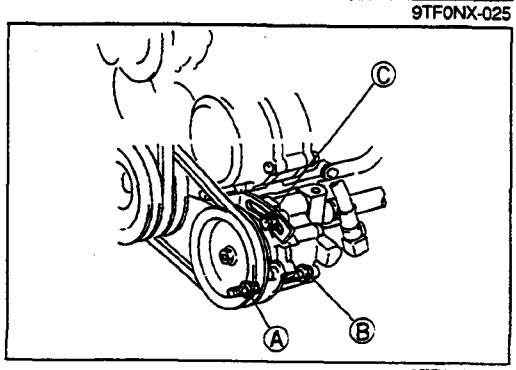
9TF0NX-025

Adjustment

3.5 L Turbo Engine type

1. Loosen bolts A and B and strap bolt C.
2. Move the oil pump until the correct deflection is obtained and tighten strap bolt C.
3. Tighten bolts A and B.

Tightening torque (A, B, C):
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



9TF0NX-026

Replacement

3.5 L Turbo Engine type

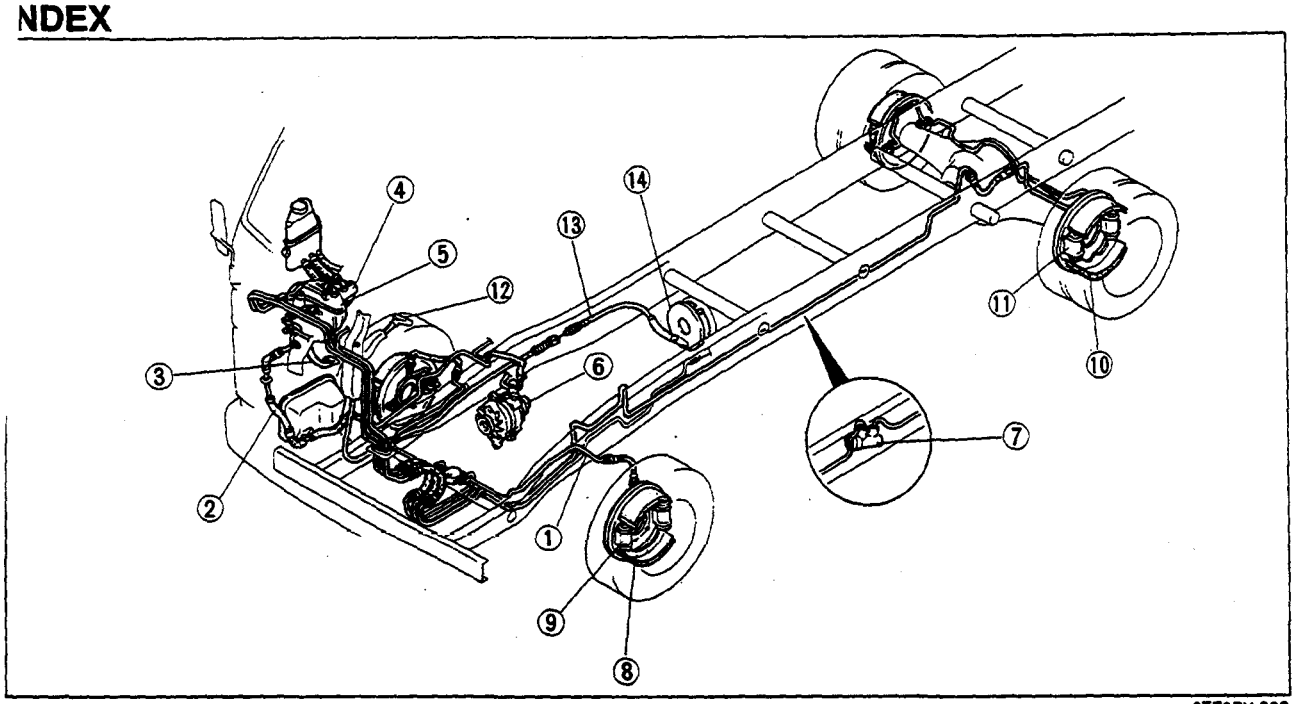
1. Loosen bolts A and B and strap bolt C.
2. Remove and replace the drive belt.
3. Adjust the deflection. (Refer to above.)

BRAKING SYSTEM

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EXHAUST BRAKE SYSTEM
Refer to Section F2 and F3.

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OUTLINE

OUTLINE OF CONSTRUCTION

1. Front drum brake (2-leading type) and rear drum brake (Dual 2-leading type) are used on all models.
2. A tandem diaphragm power brake unit is used on all models.

9TG0PX-003

SPECIFICATIONS

Item		Engine type	HA	SL, SL TURBO	TF
Brake pedal	Type		Suspended		
	Pedal lever ratio		4.5		
	Maximum stroke	mm (in)	149.2 (5.87)		
Master cylinder	Type		Tandem		
	Cylinder inner diameter	mm (in)	26.8 (1.06)		
	Reservoir capacity	cc (cu in)	182 (11.1)		
Front brake (Drum)	Type		2-leading		
	Wheel cylinder inner diameter	mm (in)	28.5 (1.12)		
	Lining dimensions		Refer to next page		
	Drum inner diameter		Refer to next page		
	Shoe clearance adjustment		Manual adjustment		
Rear brake (Drum)	Type		Dual 2-leading		
	Wheel cylinder inner diameter	mm (in)	25.4 (1.00)		
	Lining dimensions		Refer to next page		
	Drum inner diameter		Refer to next page		
	Shoe clearance adjustment		Manual adjustment		
Power brake unit	Type		Tandem diaphragm		
	Diameter	mm (in)	(a) 188+215 (7.4+8.5) (b) 213+240 (8.4+9.4)		
Parking brake	Type		Center brake		
	Operating type		Stick type		
	Lever ratio		5.125		
	Maximun notch number		20		
	Lining dimensions (Length x width x thickness)	mm (in)	190.6x35.0x3.6 (7.5x1.38x0.13)		
	Drum inner diameter	mm (in)	190 (7.48)		
Auxiliary brake system			—	Exhaust brake system	
Rear braking force control device			Load-sensing G-valve		
Brake fluid			FMVSS 116: DOT 3, SAE: J1703		

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(a): Payload 1,500 kg and 2,000 kg
(b): Except payload 1,500 kg and 2,000 kg

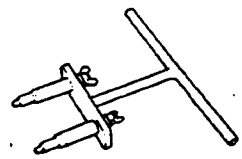
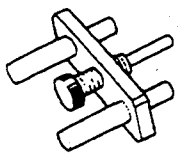
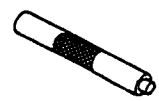
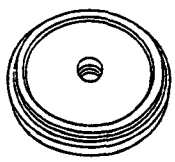
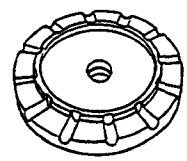
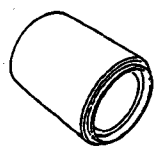
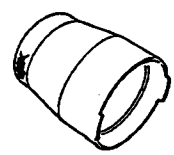
Lining and Drum Dimensions

Engine	Body type	Rear wheel	Front brake: Lining dimensios mm (in) (Length x width x thickness)	Front brake: Drum inner diameter mm (in)	Rear brake: Lining dimensions mm (in) (Length x width x thickness)	Rear brake: Drum inner diameter mm (in)
HA	10 feet cargo deck	Single	293.1x60x6.6 (11.53x2.36x0.26)	300 (11.81)	229.3x75.0x6.0 (9.02x2.95x0.24)	228.6 (9.00)
SL	10 feet cargo deck	Dual	307.0x75.0x8.0 (12.09x2.95x0.31)	320 (12.60)	304.0x75.0x8.0 (12.09x2.95x0.31)	320 (12.60)
SL	14 feet cargo deck	Dual	307.0x90.0x8.0 (12.09x3.54x0.31)	320 (12.60)	307.0x90.0x8.0 (12.09x3.54x0.31)	320 (12.60)
SL TURBO	14 and 17 feet cargo deck	Dual	334.9x110.0x10.5 (13.18x4.33x0.41)	320 (12.60)	334.9x110.0x10.5 (13.18x4.33x0.41)	320 (12.60)
TF	14 and 17 feet cargo deck	Dual	334.9x110.0x10.5 (13.18x4.33x0.41)	320 (12.60)	334.9x110.0x10.5 (13.18x4.33x0.41)	320 (12.60)

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BRAKE SYSTEM

PREPARATION
SST

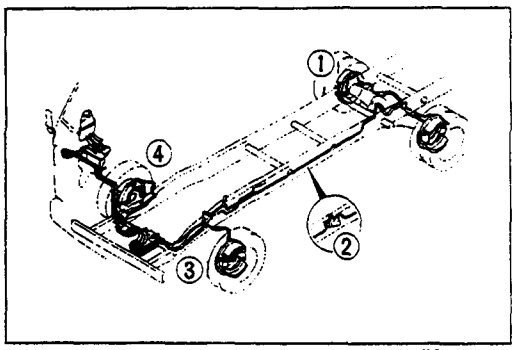
49 0259 770B Wrench, flare nut 	For removal and installation of brake pipe	49 W033 106 Wrench, locknut 	For removal and installation of hub locknut
49 F043 001 Adjust gauge 	For adjustment of clearance between master cylinder and power brake unit	49 G030 797 Handle 	For disassembly and assembly of power brake unit
49 L043 001 Retainer setting tool 	For disassembly and assembly of power brake unit	49 L043 002 Retainer setting tool 	For disassembly and assembly of power brake unit
49 L043 003 Retainer setting tool 	For disassembly and assembly of power brake unit	49 L034 004 Protector 	For disassembly and assembly of power brake unit

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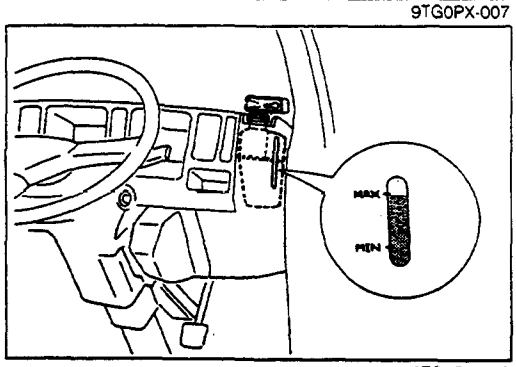
TROUBLESHOOTING GUIDE

Problem	Possible cause	Remedy	Page
Poor braking	Leakage of brake fluid	Repair	—
	Air in system	Air bleed	P– 6
	Worn lining	Replace	P–27,32
	Brake fluid, grease, oil, or water on lining	Clean or replace	P–27,32
	Hardening of lining surface or poor contact	Grind or replace	P–27,32
	Malfunction of master cylinder or wheel cylinder	Repair or replace	P–12,28,33
	Malfunction of power brake unit	Repair or replace	P–18
	Malfunction of check valve (vacuum hose)	Repair or replace	P–17,24
	Damaged vacuum hose	Replace	P– 9
	Deterioration of flexible hose	Replace	P– 7
	Malfunction of LSGV	Replace	P–26
	Worn drum	Replace	P–28,33
	Malfunction of vacuum pump	Inspect	P–22
	Overloaded	Correct	—
	Wheel and tire related problem	—	Section Q
Brakes pull to one side	Worn lining	Replace	P–27,32
	Brake fluid, grease, oil, or water on lining	Clean or replace	P–27,32
	Hardening of lining surface or poor contact	Grind or replace	P–27,32
	Abnormal wear or distortion of drum, or lining	Repair or replace	P–28,33
	Looseness of backing plate mounting bolts	Tighten	P–28,33
	Malfunction of wheel cylinder	Repair or replace	P–28,33
	Malfunction of master cylinder	Repair or replace	P–12
	Wheel and tire related problem	—	Section Q
	Looseness of wheel bearing or improper adjustment of preload	Replace or adjust	Section M
Brakes do not release	No brake pedal play	Adjust	P–10
	Improperly adjusted push rod clearance	Adjust	P–12
	Clogged master cylinder return port	Clean	—
	Weak shoe return spring	Replace	P–28,33
	Wheel cylinder not returning properly	Clean or replace	P–28,33
	Improperly adjusted pedal height	Adjust	P–10
	Improperly adjusted wheel bearing preload	Adjust	Section M
Pedal goes too far (too much pedal stroke)	Improperly adjusted pedal play	Adjust	P–10
	Worn pad or lining	Replace	P–27,32
	Air in system	Air bleed	P– 6
Excessive steering wheel play	Brake drag	Repair	—
	Steering related problem	—	Section N
	Wheel and tire related problem	—	Section Q
	Suspension related problem	—	Section R
Vacuum warning buzzer is operating (Australia payload 3,500 kg and 4,000 kg)	Malfunction of vacuum pump	Inspect	P–22
	Damaged vacuum hose	Repair or replace	P– 9
	Malfunction of check valve (vacuum hose)	Repair or replace	P–17,24
	Faulty vacuum switch	Inspect	Section T
Abnormal noise or vibration during braking	Worn lining	Replace	P–27,32
	Deteriorated lining	Grind or replace	P–27,32
	Brakes do not release	Repair	—
	Foreign material or scratches on drum contact surface	Clean	—
	Looseness of backing plate mounting bolts	Tighten	P–28,33
	Damaged drum contact surface	Replace	P–28,33
	Poor contact of lining	Repair or replace	P–27,32
	Insufficient grease on sliding parts	Apply grease	—
	Looseness of wheel bearing or improper adjustment of preload	Replace or adjust	Section M

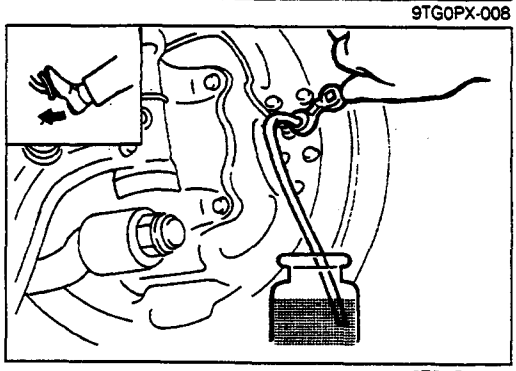
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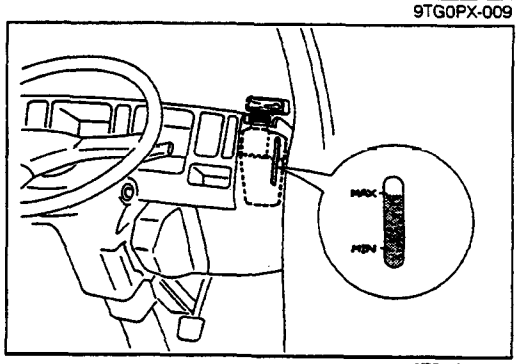


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9TG0PX-008


9TG0PX-009



9TG0PX-010

AIR BLEEDING

Caution
- **Air bleeding must be done from the wheel cylinder farthest from the master cylinder. (Bleed air in the order shown in the figure.)**
- **Do not perform air bleeding with the ignition switch ON because the brake vacuum decreases by depressing the brake pedal during working and the vacuum warning buzzer will operate when the ignition switch is ON. (Australia 3,500 kg and 4,000 kg)**

1. Fill the reserve tank with brake fluid.

Caution
- **Be careful not to spill brake fluid onto other parts.**

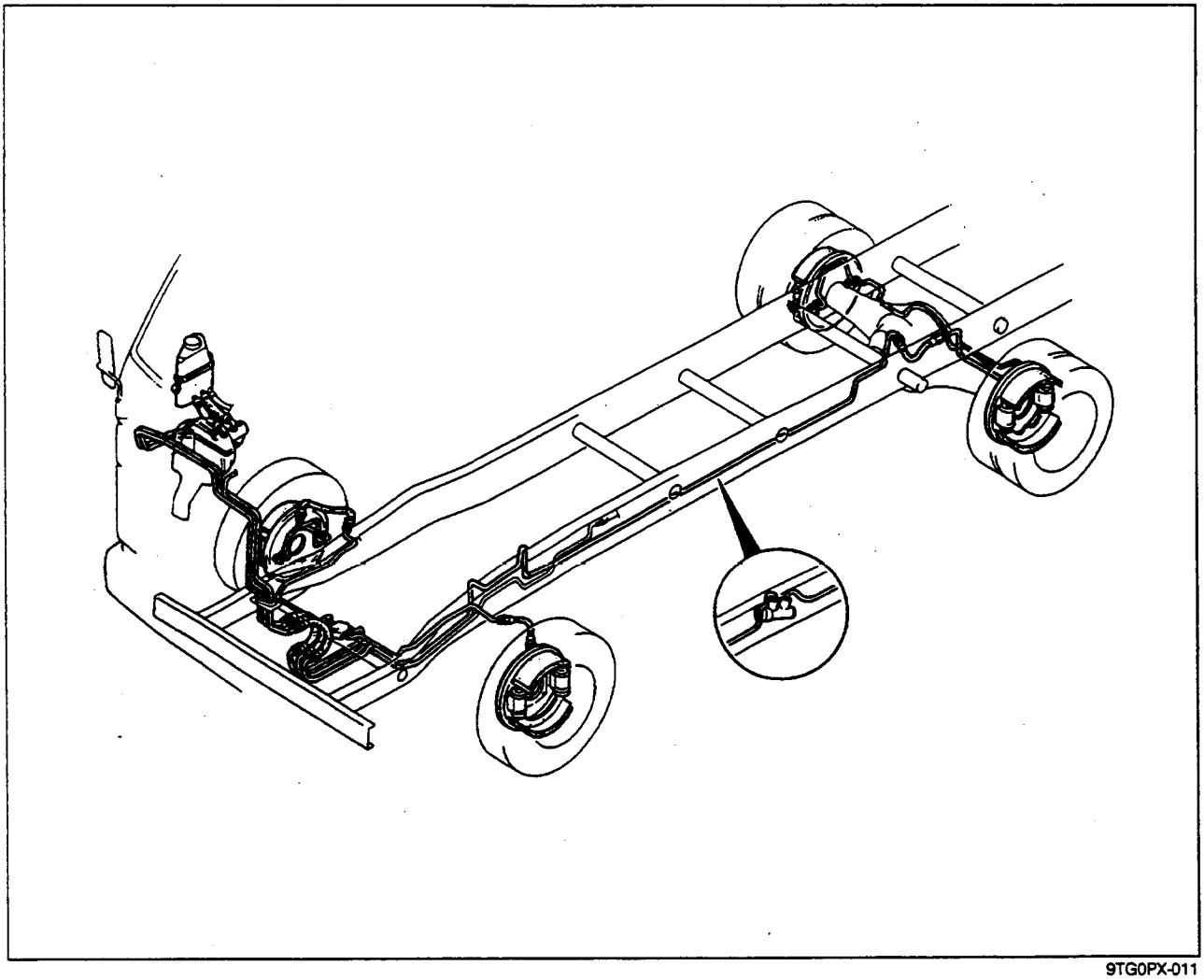
2. After removing the bleeder cap, connect one end of a transparent vinyl tube to the bleeder screw and place the other end in a receptacle.
3. One person should depress the brake pedal a few times, and then hold it in the depressed position.
4. A second person should loosen the bleeder screw, drain out the fluid, and retighten the screw.

Tightening torque:
5.9—8.8 N·m (0.6—0.9 m-kg, 4.3—6.5 ft-lb)

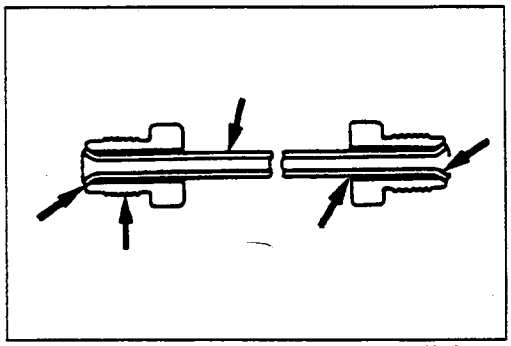
Note
- **The two people should stay in voice contact with each other.**

5. Repeat steps 3 and 4 until no air bubbles are seen.
6. Bleed air at all the bleeder screws as described before.
7. After bleeding the air, add brake fluid to the reserve tank up to the specified level if necessary.

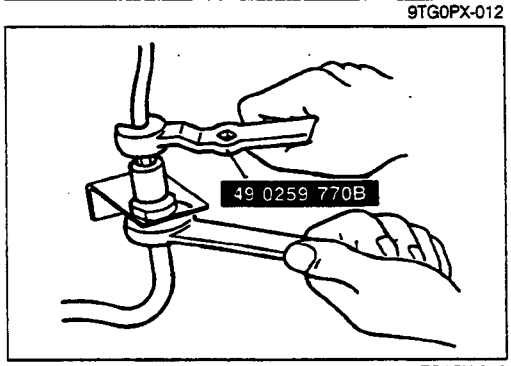
BRAKE HYDRAULIC LINE



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9TG0PX-012



9TG0PX-013

On-vehicle Inspection

Check for the following and replace parts as necessary.

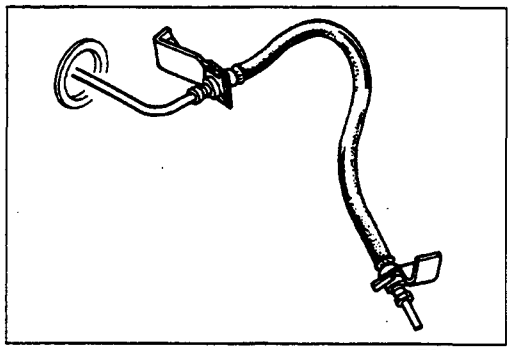
1. Cracking, damage, or corrosion of brake pipe
2. Damage of brake pipe threads
3. Scars, cracks, or swelling of flexible hose
4. All lines for fluid leakage
5. Looseness or damage of pipe and hose connection

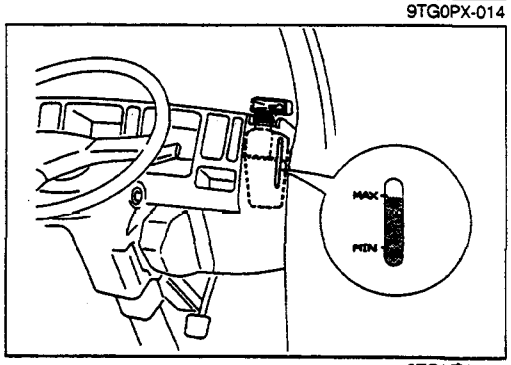
Removal / Installation

Removal / Installation note

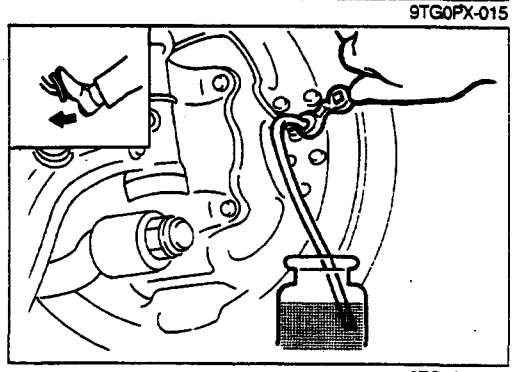
1. Remove or install the brake pipe with the **SST**.
2. Tighten the flare nut to the specified torque.

Flare nut tightening torque:
13—22 N·m (1.3—2.2 m-kg, 9.4—16 ft-lb)


9TG0PX-014



9TG0PX-015


9TG0PX-016

3. Secure the brake pipe firmly, with a clip so that it does not contact other parts.
4. When connecting the brake pipe with the joints, do not overtighten it.
5. When connecting the flexible hose, do not twist it.
6. After installation, check that the flexible hose does not contact other parts when the vehicle bounces or when the steering wheel is turned fully right or left.
7. Bleed the air from the brake system when the pipe or hose is removed.

BRAKE FLUID

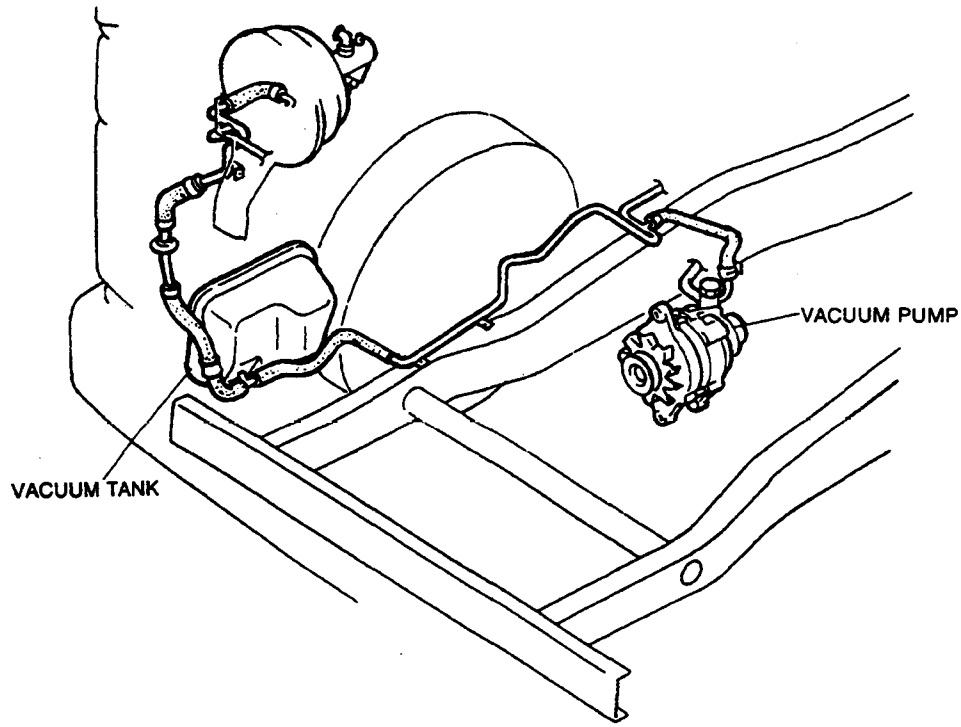
On-vehicle Inspection

1. Check that the fluid level in the reserve tank is between Max and Min.
   If necessary, add brake fluid up to the specified level.

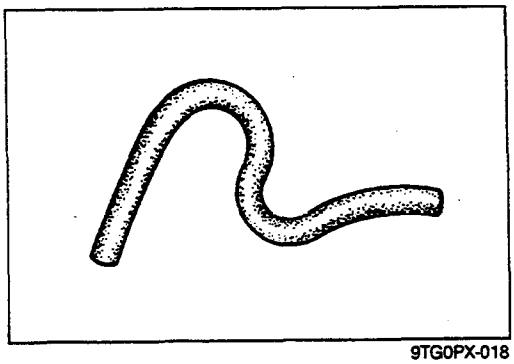
Replacement

1. Operate the same procedure as air bleeding.
   (Refer to page P–6.)
2. Repeat the operation until the new fluid comes out from the bleeder.

VACUUM LINE



9TG0PX-017



9TG0PX-018

On-vehicle Inspection

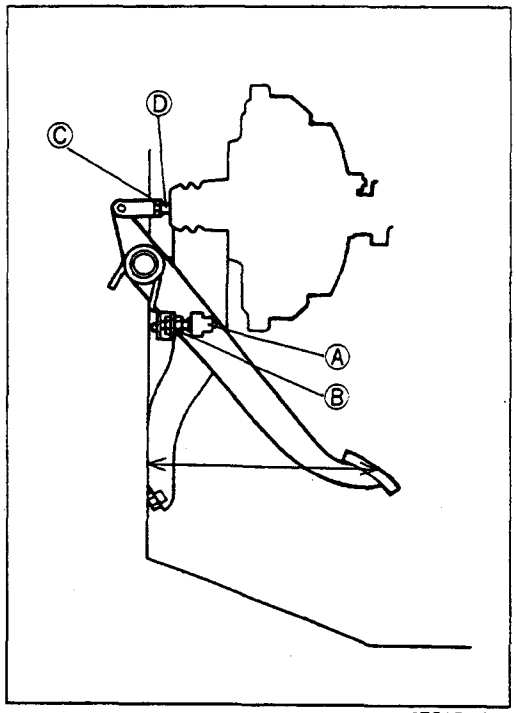
Check for the following and replace parts as necessary.

1. Cracking, damage, or corrosion of vacuum pipe
2. Scars, cracks, or swelling of vacuum hose
3. Looseness of pipe and hose connection
4. All lines for vacuum leakage
5. Cracking or damage of vacuum tank

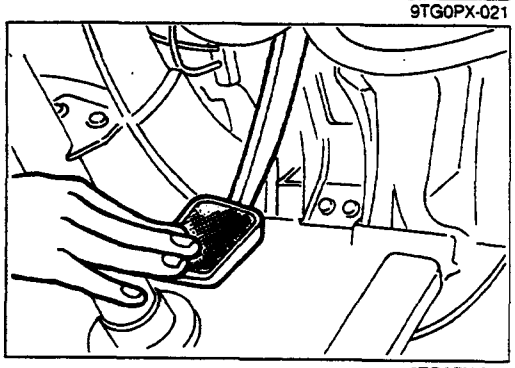
Note (Australia payload 3,500 kg and 4,000 kg)

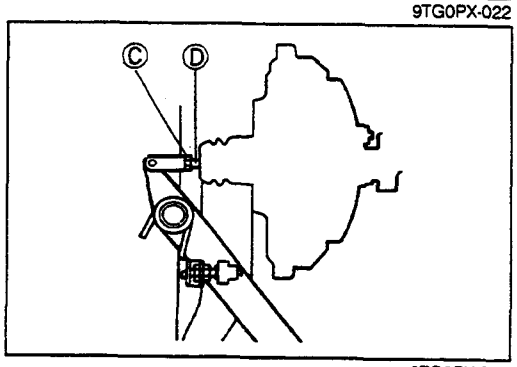
- **A vacuum switch is equipped in the vacuum tank. When the vacuum amount in the tank becomes less than the specification, the switch activates the brake vacuum warning buzzer to notify a driver it.**

9TG0PX-019

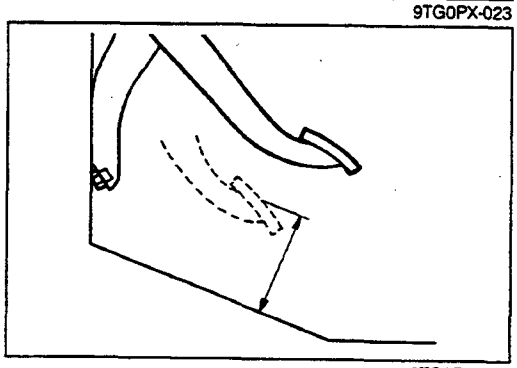


9TG0PX-021


9TG0PX-022



9TG0PX-023


9TG0PX-024

BRAKE PEDAL

On-vehicle Inspection

Pedal height

Inspection

Check that the distance from the center of the upper surface of the pedal pad to the dash panel is as specified.

Pedal height: 226—231mm (8.90—9.09 in)

Adjustment

1. Disconnect the stoplight switch connector.
2. Loosen locknut Ⓑ and turn switch Ⓐ until it does not contact the pedal.
3. Loosen locknut Ⓒ and turn rod Ⓓ to adjust the height.
4. Turn the stoplight switch until it contacts the pedal; then turn an additional 1/2 turn. Tighten locknut Ⓑ.
5. Check the pedal play and stoplight operation.

Pedal play

Inspection

1. Depress the pedal a few times to eliminate the vacuum in the system.
   Gently depress the pedal again by hand and check the free play (until the valve plunger contacts the stopper plate = until the power piston begins to move).

   Pedal play: 9—11mm (0.35—0.43 in)

   Caution (Australia payload 3,500 kg and 4,000 kg)
   - **Do not inspect the pedal play with the ignition switch ON. The brake vacuum warning buzzer will operate when the ignition switch is ON.**

Adjustment

1. Loosen locknut Ⓒ of push rod Ⓓ then turn the rod to adjust the free play.
2. Tighten locknut Ⓒ and check the pedal height and stoplight operation.

Pedal-to-floor clearance

Inspection

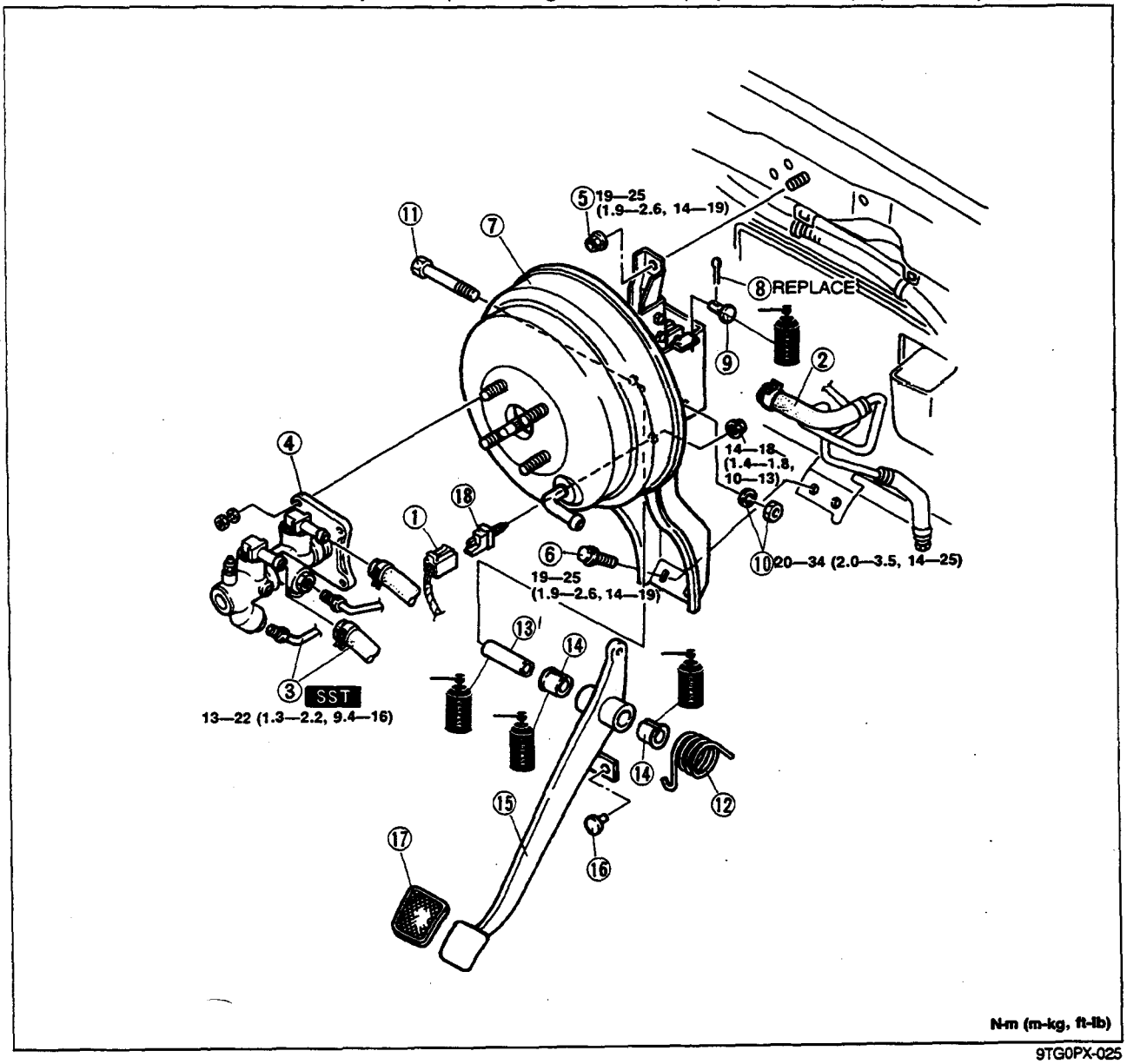
1. Start the engine and depress the pedal with a force of 5.9 N (60 kg, 52 lb).
   Check that the distance from the floor panel to the center of the upper surface of the pedal pad is as specified.

   Pedal-to-floor clearance: 50mm (1.99 in) min.

2. If the distance is less than specified, check for the following problems:
   - Air in brake system
   - Too much shoe clearance

Removal / Inspection / Installation

1. Remove the meter set. (Refer to Section S.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.
4. Inspect all parts and repair or replace as necessary.
5. After installation, check and adjust the pedal height and free play if necessary. (Refer to page P–10.)



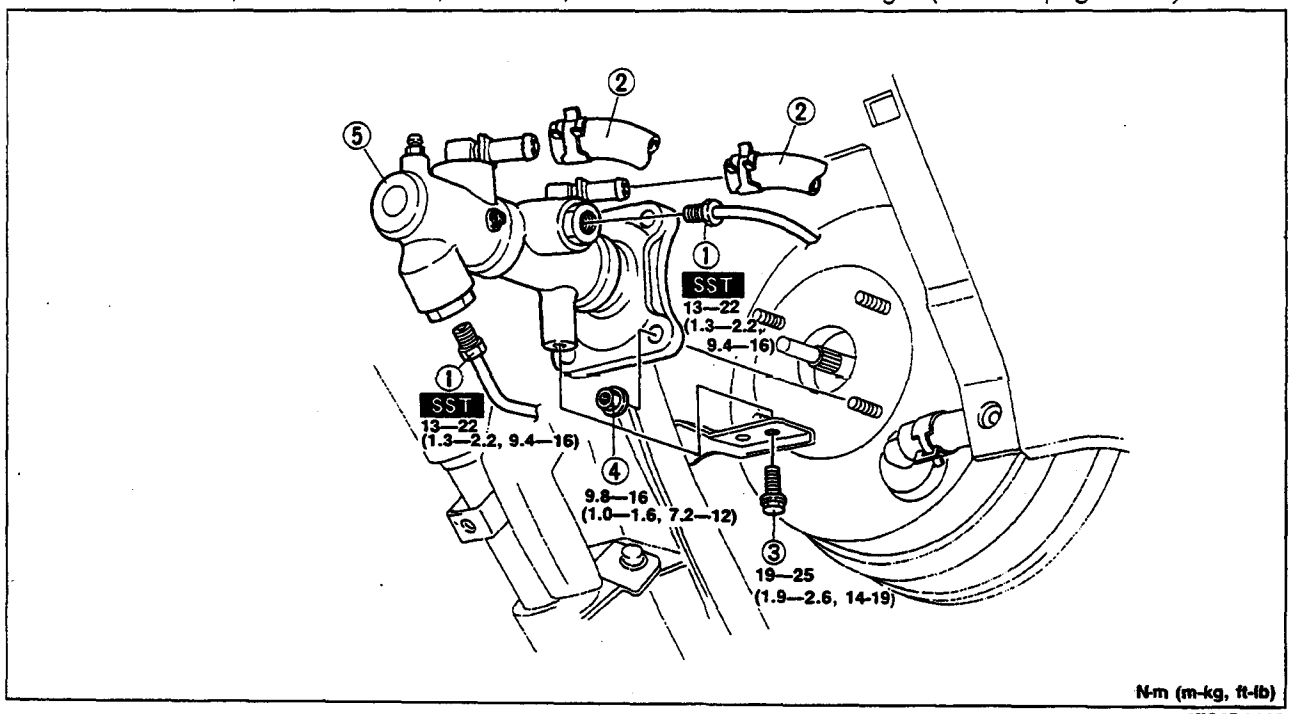
9TG0PX-025

1. Coupler (Stoplight switch)
2. Vacuum hose
3. Brake pipe and hose
4. Master cylinder
   Removal / Installation ..... page P–12
5. Nut
6. Bolt
7. Power brake unit and pedal assembly
8. Snap pin
9. Clevis pin
10. Nut and washer
11. Bolt
12. Return spring
    Inspect for weakness or damage
13. Spacer
14. Bushing
    Inspect for weakness or damage
15. Brake pedal
    Inspect for bending or damage
16. Stop rubber
    Inspect for wear
17. Pedal pad
    Inspect for wear
18. Stoplight switch

MASTER CYLINDER

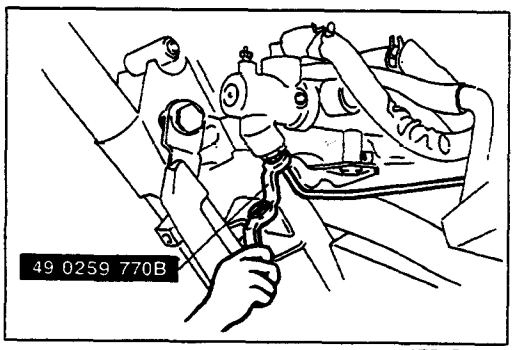
Removal / Installation

1. Remove the lower panel.
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, add brake fluid, bleed air, and check for fluid leakage. (Refer to page P–6.)

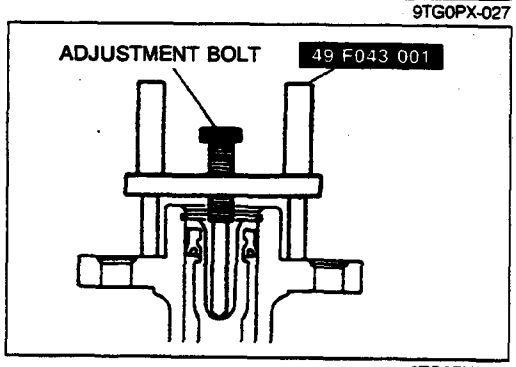


9TG0PX-026

1. Brake pipe
   Removal note ..... below
2. Brake hose
3. Bolt
4. Nut
5. Master cylinder
   Installation note ..... below
   Disassembly / Inspection / Assembly ..... page P–14



9TG0PX-027



9TG0PX-028

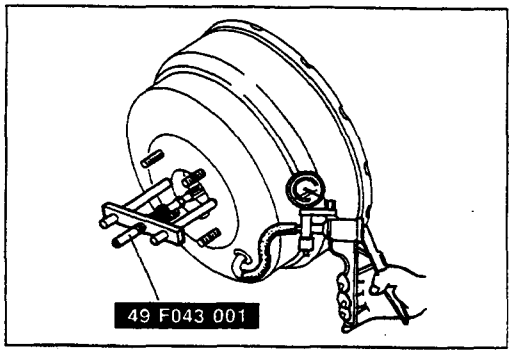
Removal note
Brake pipe

1. Disconnect the brake pipe from the master cylinder with the **SST**.

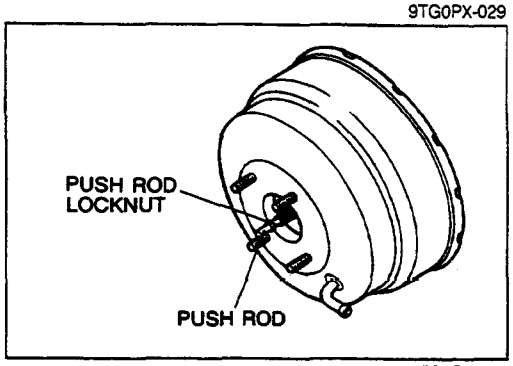
Caution
- **Brake fluid will damage painted surfaces. If it does get on a painted surface, wipe it off immediately.**

Installation note
Master cylinder
Push rod clearance
Inspection

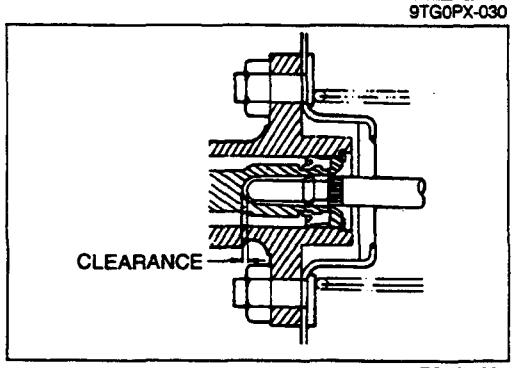
1. Place the **SST** atop the master cylinder. Turn the adjustment bolt until it bottoms in the piston.



9TG0PX-029



9TG0PX-030



9TG0PX-031

2. Apply a vacuum of 500 mmHg (19.7 inHg) to the vacuum power assist with a vacuum pump.
3. Invert the **SST** used in step 1, and place it on top of the vacuum power assist.
4. Check the clearance between the end of the **SST** and the push rod of the power brake unit.
5. If it is not 0mm (0 in), loosen the push rod locknut, and turn the push rod to make the adjustment.

Adjustment

1. Loosen the push rod locknut.
2. Turn the tip of the push rod and adjust the push rod clearance.
3. Recheck the clearance.

Note

- **By making the above adjustment, the clearance between the push rod and piston (after installation of the master cylinder and the power brake unit) will be as shown in the table below.**

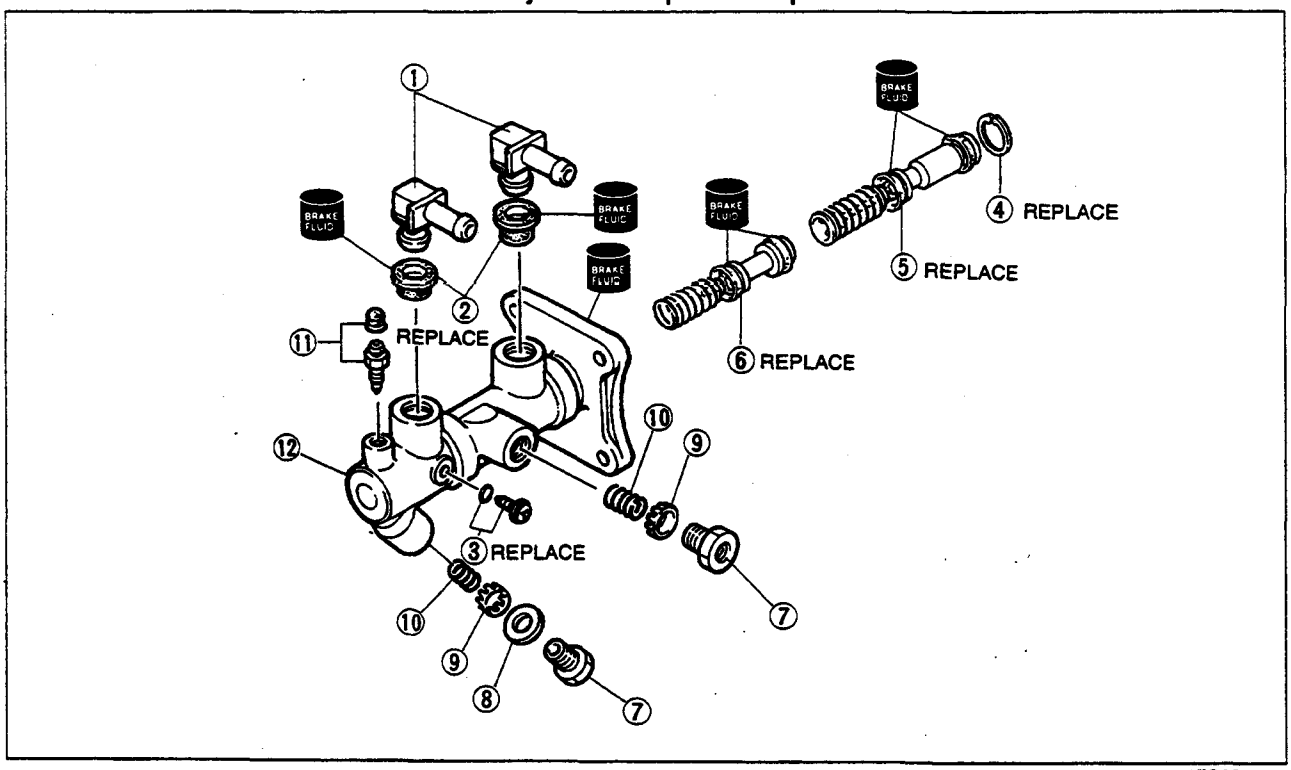
	Push rod-to-piston clearance
When no vacuum applied to unit	0.4—0.6mm (0.016—0.024 in)
When vacuum applied to unit is approx. 500 mmHg (19.7 inHg)	0.1—0.3mm (0.004—0.012 in)

Disassembly / Inspection / Assembly

1. Remove the brake fluid from the master cylinder.
2. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
3. Assemble in the reverse order of removal, referring to **Assembly Note**.
4. Inspect all parts and repair or replace as necessary.

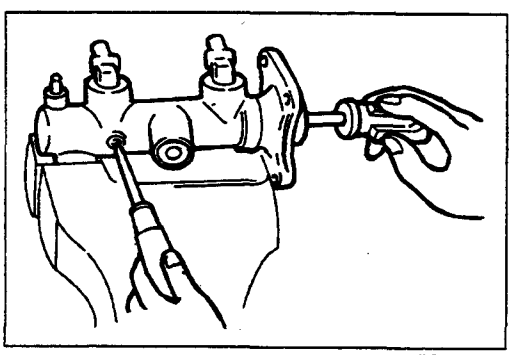
Caution

- **Do not let foreign material enter the cylinder.**
- **Do not scratch the inside of the cylinder or piston cups.**



9TG0PX-032

1. Hose connector
2. Bushing
   Inspect for wear or damage
3. Stopper screw and O-ring
   Disassembly note ..... below
   Assembly note ..... page P–15
4. Snap ring
5. Primary piston assembly
   Inspect piston cups for damage
6. Secondary piston assembly
   Inspect piston cups for damage
   Disassembly note ..... page P–15
7. Joint bolt
8. O-ring
9. Oil seal
10. Spring
    Inspect for wear
11. Bleeder cap and screw
12. Cylinder body
    Inspect for crack or damage

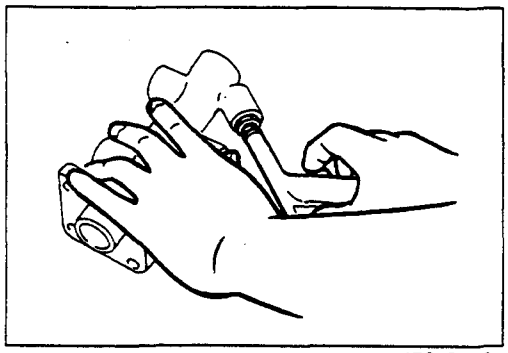


9TG0PX-033

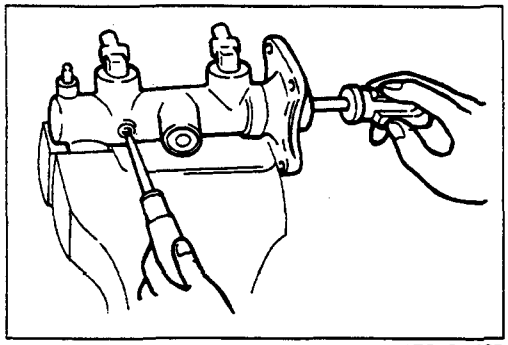
Disassembly note

Stopper screw

1. Push the primary piston assembly in fully, then remove the stopper screw.



9TG0PX-034



9TG0PX-035

Secondary piston assembly
Remove the secondary piston assembly by gradually blowing compressed air into the cylinder.

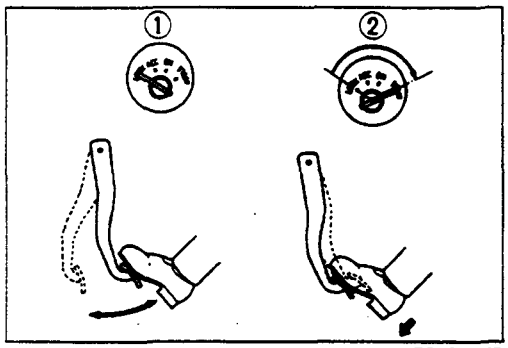
Caution
- **Use a rag to catch the secondary piston assembly.**

Assembly note
Stopper screw
1. Push the primary piston assembly in fully.
2. Install and tighten the stopper screw.
3. Push and release the piston to verify that it is held by the stopper screw.

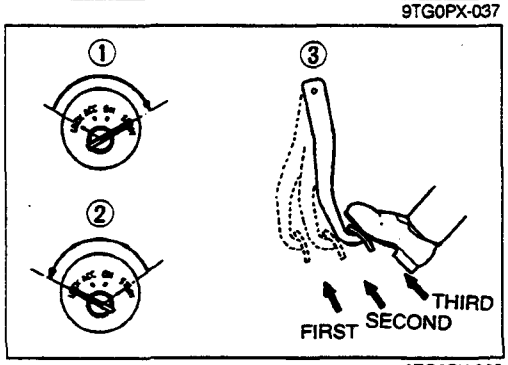
POWER BRAKE UNIT
On-vehicle Inspection

Note
- **Following inspections are simple method to roughly inspect the power brake unit function. If the unit is defective, repair or replace the power brake unit.**

9TG0PX-036



9TG0PX-037

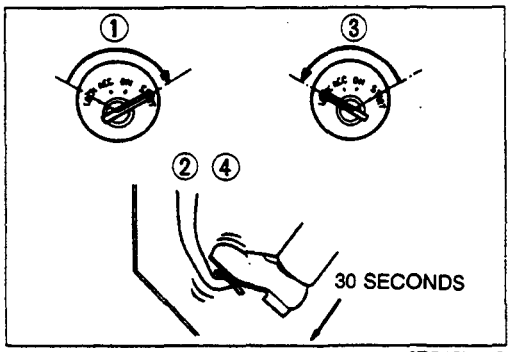


9TG0PX-038

Power brake unit function check
(Method-without tester)
Step 1
1. With the engine stopped, depress the 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.

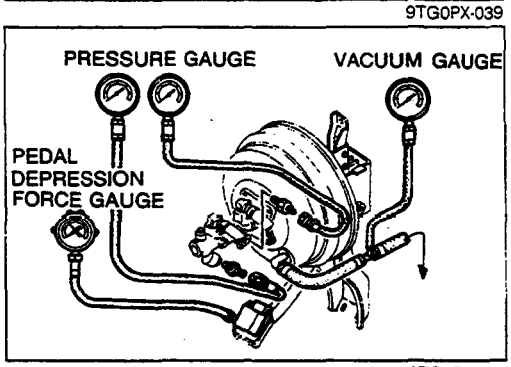
Step 2
1. Start the engine.
2. Stop the engine after it has run for **1 or 2 minutes**.
3. Depress the pedal with the usual force.
4. If the first pedal stroke is long and becomes shorter with subsequent strokes, the unit is operating.

Note
- **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.**



9TG0PX-039

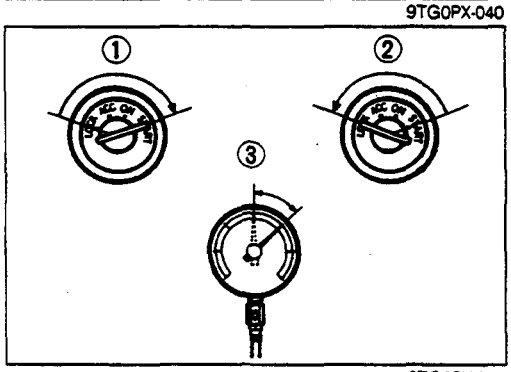
Step 3
1. Start the engine.
2. Depress the pedal with the usual force.
3. Stop the engine with the pedal held depressed.
4. Hold the pedal down for **about 30 seconds**.
5. If the pedal height does not change, the unit is operating.



9TG0PX-040

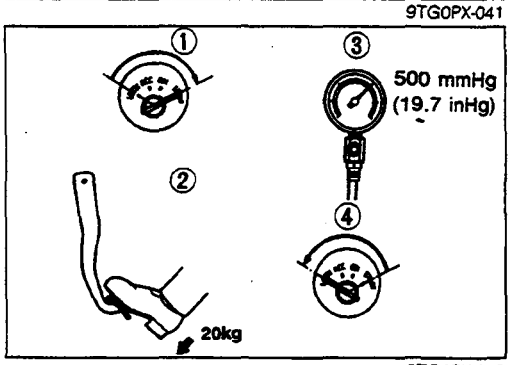
Function check (Method-using tester)
Preparation
1. Connect a pressure gauge, vacuum gauge, and pedal depression force gauge as shown in the figure and bleed the air from the pressure gauge.

Note
- **Use commercially available gauges and pedal depression force gauge.**



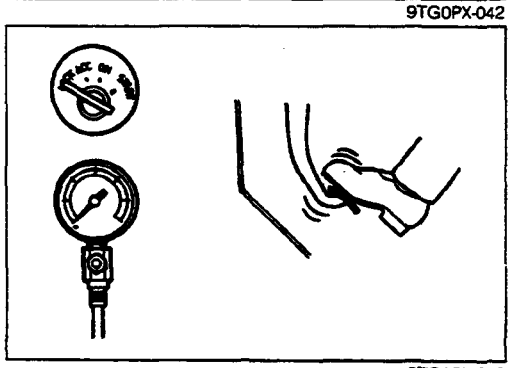
9TG0PX-041

a) Checking for vacuum loss
Unloaded condition
1. Start the engine.
2. Stop the engine when the vacuum gauge reading reaches **500 mmHg (19.7 inHg)**.
3. Observe the vacuum gauge for **15 seconds**. If the gauge shows **475—500 mmHg (18.7—19.7 inHg)**, the unit is operating.



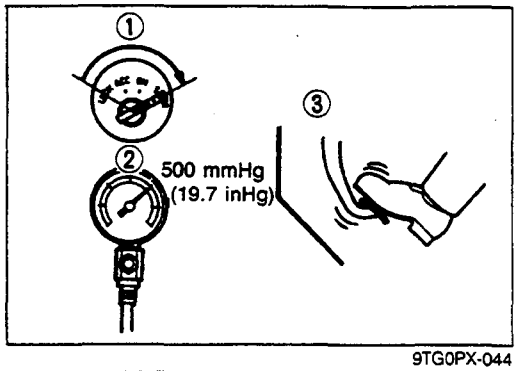
9TG0PX-042

Loaded condition
1. Start the engine.
2. Depress the brake pedal with a force of **196 N (20 kg, 44 lb)**.
3. With the brake pedal depressed, stop the engine when the vacuum gauge reading reaches **500 mmHg (19.7 inHg)**.
4. Observe the vacuum gauge for **15 seconds**. If the gauge shows **475—500 mmHg (18.7—19.7 inHg)**, the unit is operating.


9TG0PX-043

b) Checking for hydraulic pressure
1. If with the engine stopped (vacuum **0 mmHg**) the fluid pressure is within specification, the unit is operating.

Pedal force	Fluid pressure	Diameter of unit
196 N (20 kg, 44 lb)	589 kPa (6.0 kg/cm^2, 85 psi)	213+240mm (8.4+9.4 in)
196 N (20 kg, 44 lb)	687 kPa (7.0 kg/cm^2, 100 psi)	188+215mm (7.4+8.5 in)



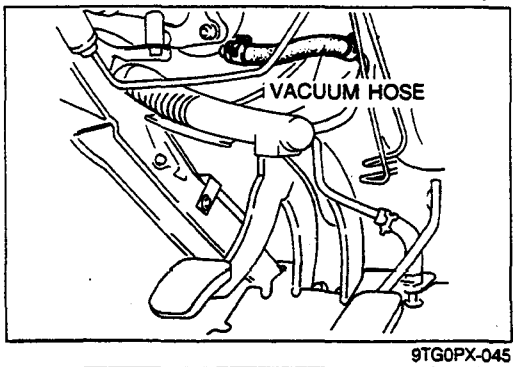
9TG0PX-044

2. Start the engine. Depress the brake pedal when the vacuum reaches **500 mmHg (19.7 inHg)**. If the fluid pressure is within specification, the unit is operating.

Pedal force	Fluid pressure	Diameter of unit
196 N (20 kg, 44 lb)	6,180 kPa (63.0 kg/cm², 896 psi)	188+215mm (7.4+8.5 in)
196 N (20 kg, 44 lb)	6,278 kPa (64.0 kg/cm², 910 psi)	213+240mm (8.4+9.4 in)

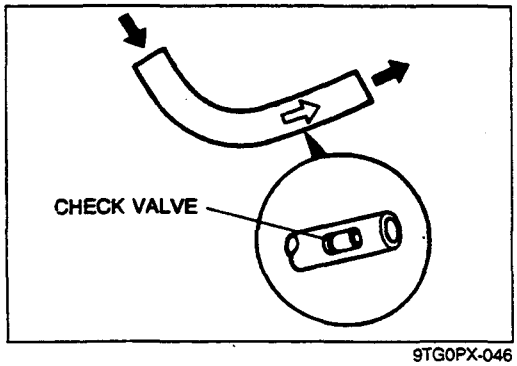
Inspection of check valve

1. Disconnect the vacuum hose from the power brake unit.



9TG0PX-045

2. Apply suction and pressure to the hose from the power brake unit side.
   Check that air flows only toward the vacuum pump.



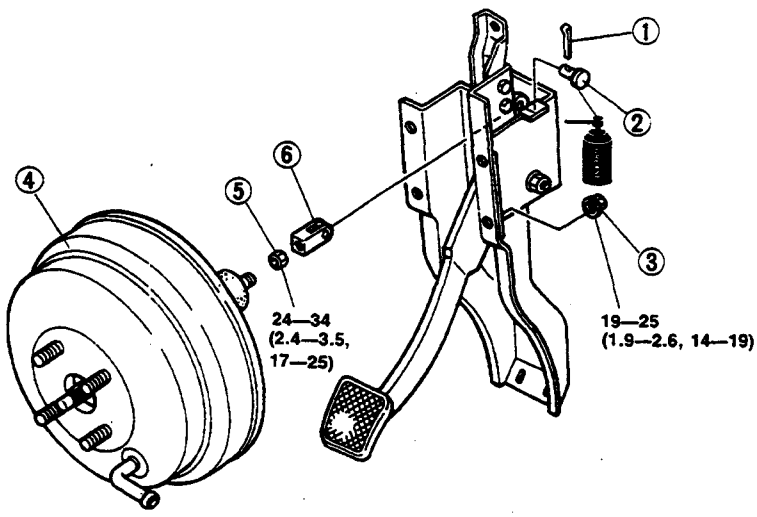
9TG0PX-046

Note

- **If the air passes in both directions or not at all, replace the check valve along with the hose.**

Removal / Installation

1. Remove the power brake unit and pedal assembly. (Refer to page P–11.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.
4. Take the following steps after installation:
   (1) Add break fluid.
   (2) Bleed the air from the system. (Refer to page P–6.)
   (3) Check all parts for fluid leakage.
   (4) Check and adjust the break pedal. (Refer to page P–10.)
   (5) Check function of the power break unit. (Refer to page P–15.)



N·m (m-kg, ft-lb)

9TG0PX-047

1. Snap pin
2. Clevis pin
3. Nut
4. Power break unit
   Disassembly / Inspection / Assembly ..... page P–19
5. Nut
6. Operating lever

Disassembly / Inspection / Assembly

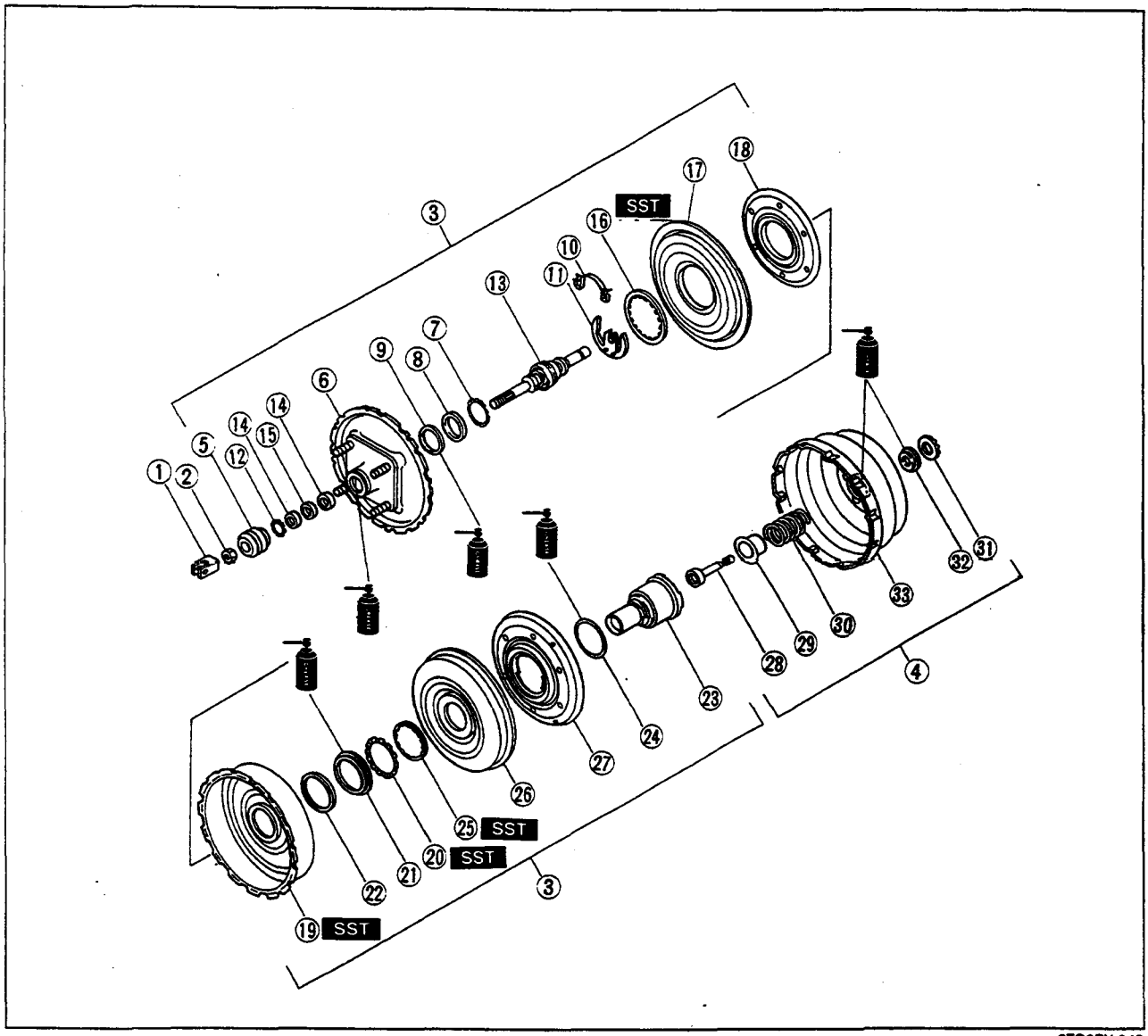
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.

Caution

- **Remove all the retainers with a screwdriver. When removing them, do not damage the valve body or diaphragm.**

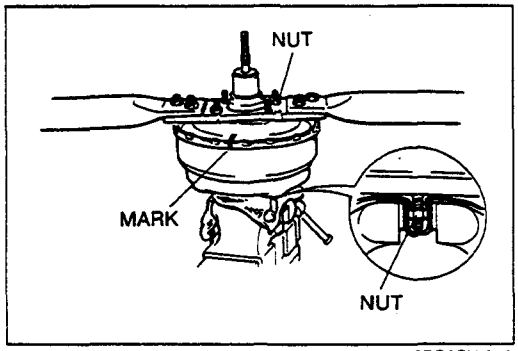
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of removal, referring to **Assembly Note**.

9TG0PX-048



9TG0PX-049

1. Clevis
2. Nut
3. Rear shell assembly
   Disassembly Note
   ..... page P–20
   Assembly Note. page P–22
4. Front shell assembly
   Disassembly Note
   ..... page P–20
   Assembly Note. page P–22
5. Boot
6. Rear shell
   Inspect for scratches, scores, pits dents, and other damage
7. Retainer (rear shell)
8. Bearing
9. Seal
10. Retainer (valve body)
11. Stop key
    Assembly Note. page P–21
12. Retainer (valve rod)
13. Valve rod assembly
14. Air filter
15. Silencer
16. Retainer (rear diaphragm)
    Assembly Note. page P–21
17. Rear diaphragm
    Inspect for cuts and other damage
18. Rear diaphragm plate
    Disassembly Note
    ..... page P–20
    Assembly Note. page P–21
19. Center plate
    Assembly Note. page P–21
20. Retainer (center plate)
    Assembly Note. page P–20
21. Seal
22. Bearing
23. Valve body
    Disassembly Note
    ..... page P–20
    Inspect for cracks and other damage
24. O-ring
25. Retainer (front diaphragm)
    Assembly Note. page P–20
26. Front diaphragm
    Inspect for cuts and other damage
27. Front diaphragm plate
28. Push rod
29. Disc
30. Return spring
31. Retainer (front shell)
32. Seal
33. Front shell

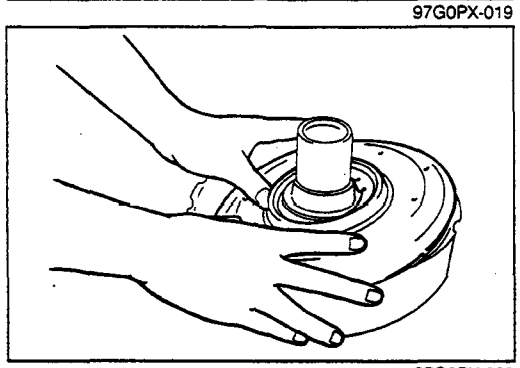


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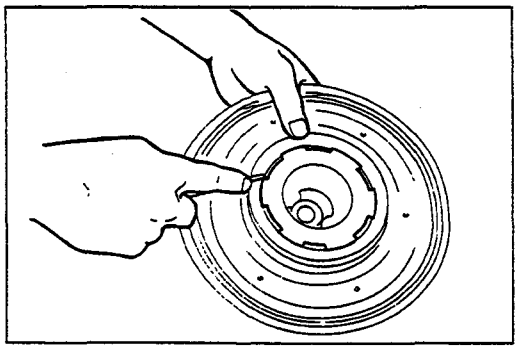
Disassembly note
Front and Rear Shell Assembly
1. Secure the front shell studs in a vise after attaching suitable nuts to them to prevent damage to the studs.
2. Before separating the front and rear shell assemblies, make matching marks to be used in reassembly.
3. Fit a wrench onto the rear shell studs, and fasten it with two suitable nuts.

Caution
- **The rear shell is spring loaded; loosen it carefully.**

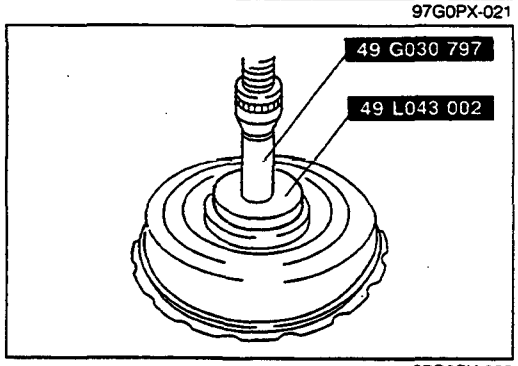
4. Rotate the rear shell counterclockwise to unlock.


97G0PX-020

Rear diaphragm plate
Remove the diaphragm plate while holding it at an angle.

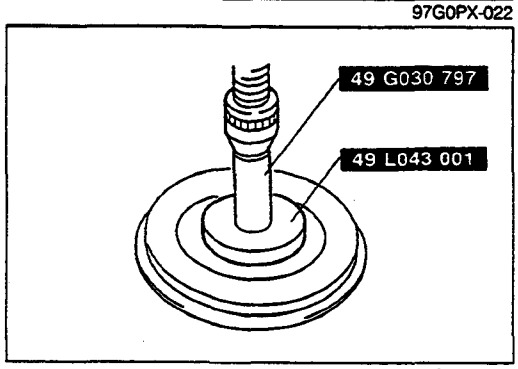

97G0PX-021

Valve body
1. Pry up the diaphragm plate.
2. Remove the valve body.



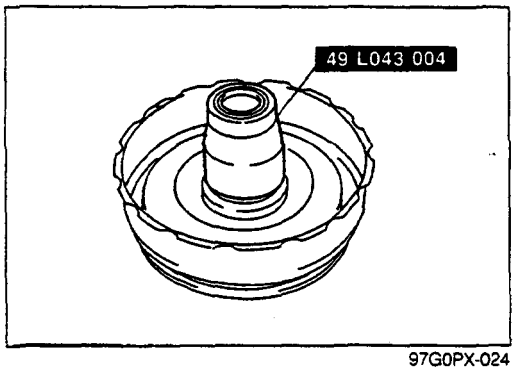
97G0PX-022

Assembly note
Retainer (center plate)
1. Fit the seal to the bearing.
2. Apply grease to the inner surface of the center plate.
3. Install the seal and bearing to the center plate.
4. Press in the retainer with the **SST**.
5. Apply grease to the seal lip.



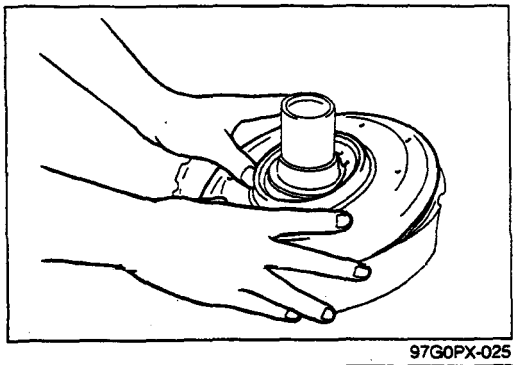
97G0PX-023

Retainer (front diaphragm)
Press in the retainer with the **SST**.

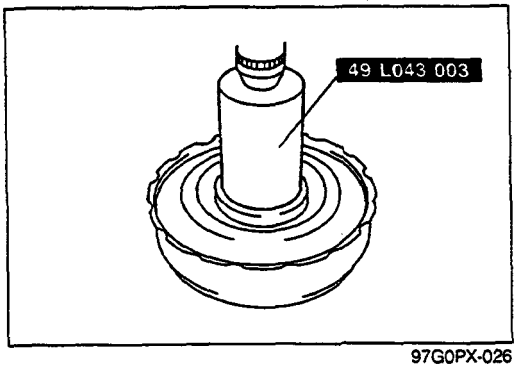


97G0PX-024

Center plate
1. Apply grease to the outer surface of the **SST**.
2. Install the **SST** to the valve body to protect the seal from damage.
3. Install the center plate.

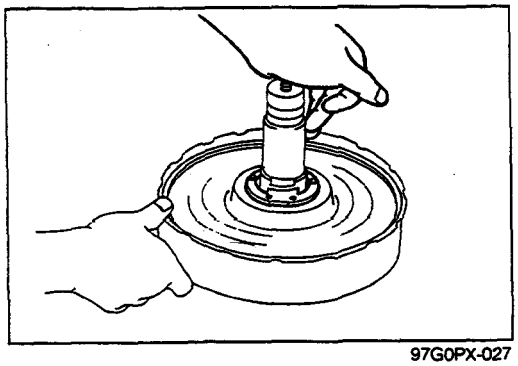

97G0PX-025

Rear diaphragm plate
Install the diaphragm plate while holding it at an angle.

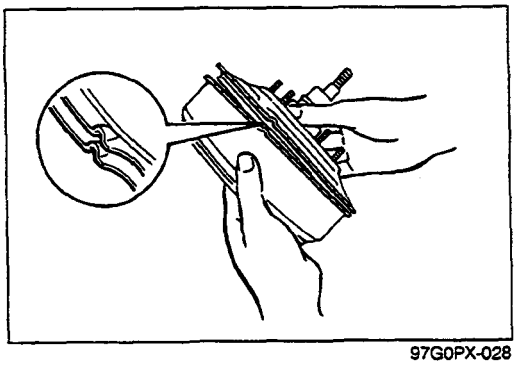


97G0PX-026

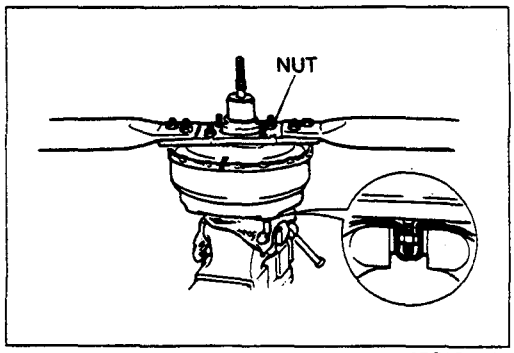
Retainer (rear diaphram)
Press in the retainer with the **SST**.


97G0PX-027

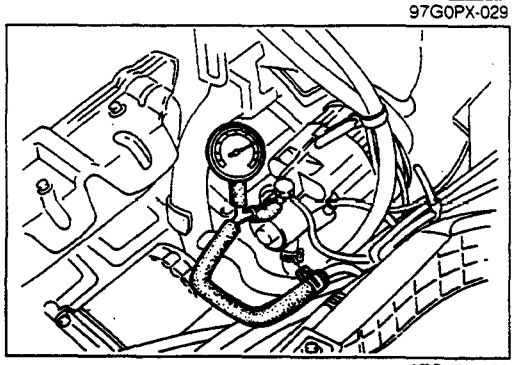
Stop key
Install the stop key while pushing the valve rod.


97G0PX-028

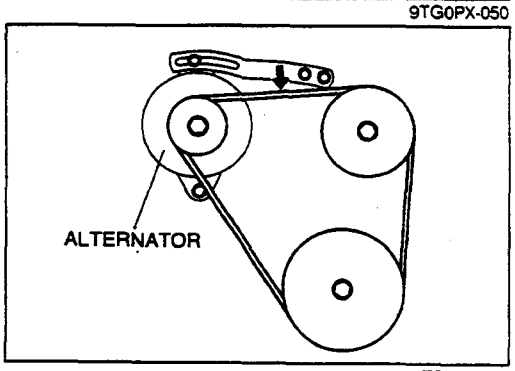
Rear shell assembly and center plate
Align the notches of the rear shell and the center plate.



97G0PX-029



9TG0PX-050



9TF0PX-006

Front and rear shell assembly

1. Align the notches of the rear shell and front shell.
2. Apply **500 mmHg (19.7 inHg)** vacuum to pull the rear shell assembly into the front shell.
3. Fit a wrench onto the rear shell studs and fasten it with two suitable nuts.
4. Rotate the rear shell assembly clockwise until the marks are aligned.

VACUUM PUMP

On-vehicle Inspection

Function check

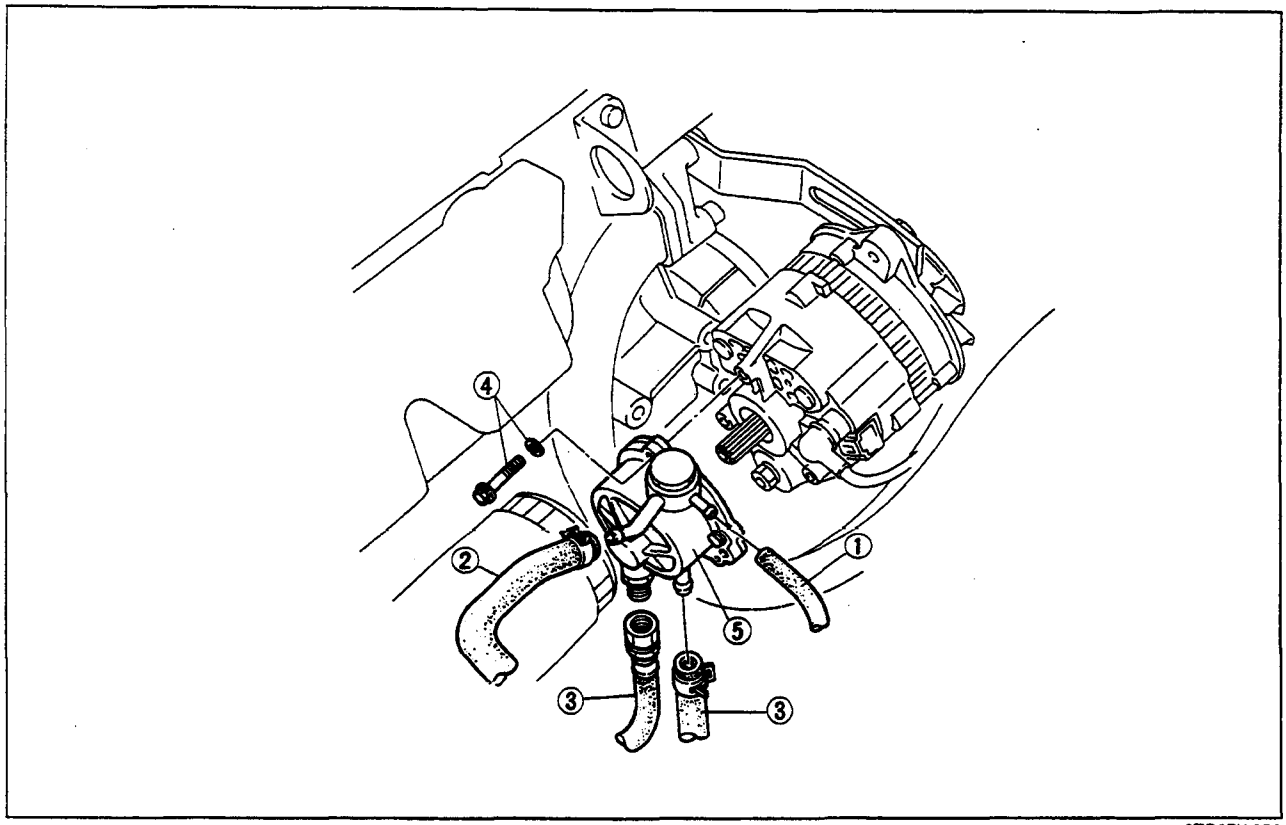
1. Warm up the engine.
2. Disconnect the vacuum hose from the vacuum pump and connect a vacuum gauge as shown in the figure, then check the vacuum.

Vacuum specification (In 20 seconds)
1,500 rpm: –440 mmHg (–17.3 inHg)
3,000 rpm: –580 mmHg (–22.8 inHg)
Maximum vacuum
–700 mmHg (–27.6 inHg) or more

3. If the pressure is less than specified, check for the following.
   (1) Tension of the alternator drive belt
   (Refer to Section G.)
   (2) Shortage of the lubrication oil pressure
   (Refer to Section B.)

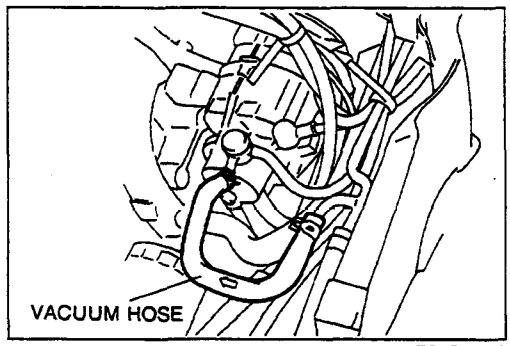
Removal / Installation

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

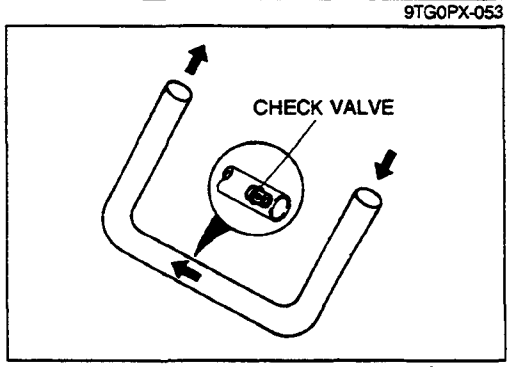


9TG0PX-052

1. Intake hose
2. Vacuum hose
   Inspection ..... below
3. Oil hose
4. Bolt and washer
5. Vacuum pump assembly
   Disassembly / Assembly ..... page P–24
   Inspection ..... page P–24



9TG0PX-053



9TG0PX-054

Inspection
Vacuum hose
Function check

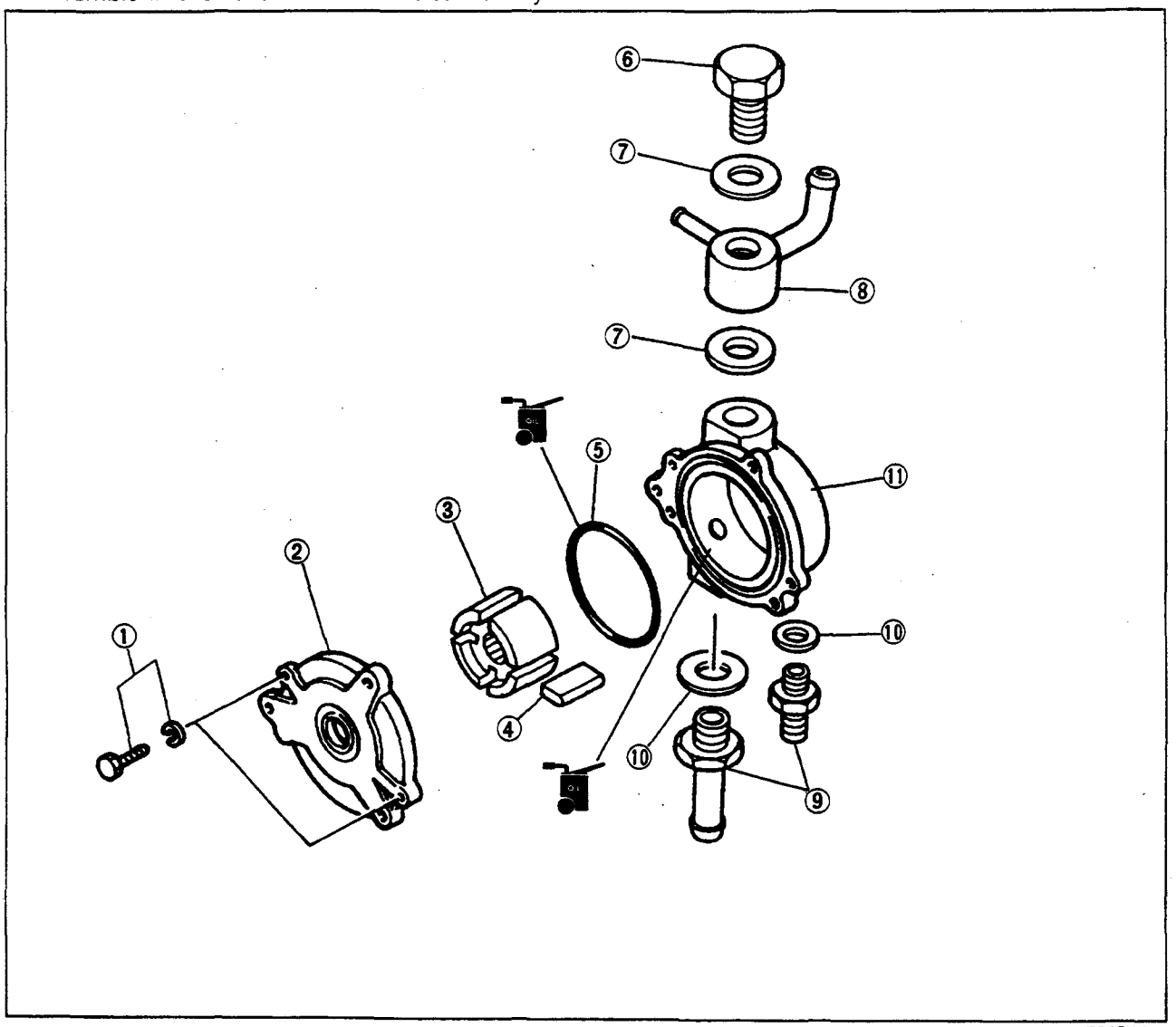
1. Disconnect the vacuum hose.
2. Apply suction and pressure to the hose from the vacuum tank side.
   Check that air flows only toward the vacuum pump.

Note

- **If the air passes in both directions or not at all, replace the check valve along with the hose.**

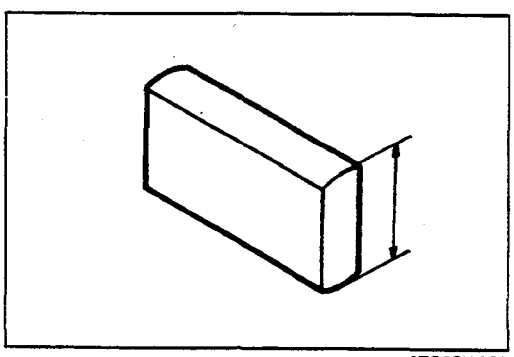
Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



9TG0PX-055

1. Bolt and washer
2. Bracket
3. Rotor
4. Vane
   Inspection..... below
5. O-ring
6. Set bolt
7. Washer
8. Connector
9. Joint
10. O-ring
11. Pump housing



9TG0PX-056

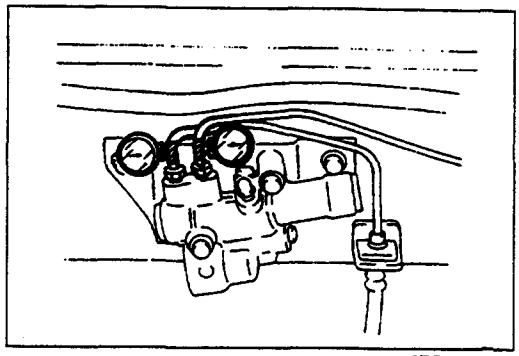
Inspection

Check the following and replace if necessary.

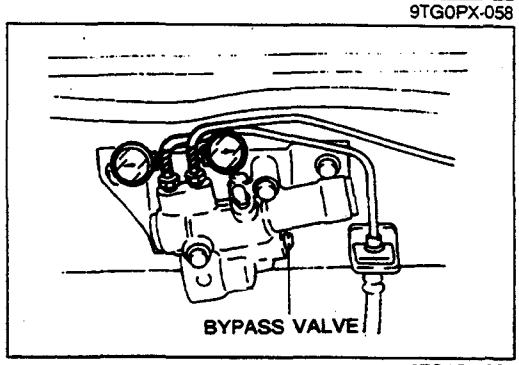
1. Worn or damaged rotor
2. Worn or damaged vane

Limit: Vane height 7.6mm (0.299 in)
Vane width 4.9mm (0.193 in)

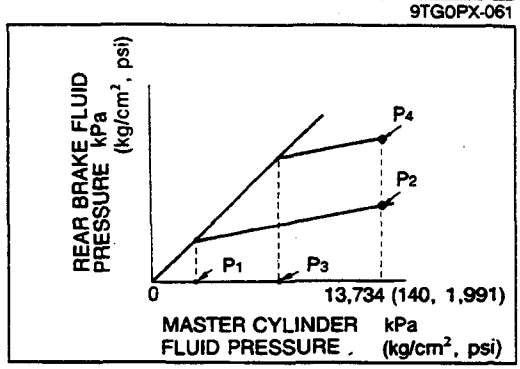
3. Worn or damaged housing



9TG0PX-058



9TG0PX-061



9TG0PX-062

LOAD-SENSING G-VALVE (LSGV) (EXCEPT LHD 14 AND 17 FEET CARGO DECK)

On-vehicle Inspection

Function check

1. Connect pressure gauges (commercially available) to the input and output sides of the LSGV as shown.
2. Bleed the air from the bleeder screw.
3. Jack up the rear of the vehicle so that it is at an angle of 15 degrees (rear tires 50—60 cm (19.69—23.82 in) above the ground).
4. Open the bypass valve of the LSGV.

Caution
- **Do not turn the valve more than 360°.**

5. Gently depress the brake pedal until the master cylinder pressure becomes P_1.
6. Close the bypass valve and confirm the P_1 value won't change.
7. Apply additional pressure until the master cylinder pressure becomes 13,734 kPa (140 kg/cm² 1,991 psi), and then measure output fluid pressure P_2.
8. After the measurement, release the input side fluid pressure.
9. Change P_1 to P_3 and follow step 4 to 8.
10. If the measured value is within the standard fluid pressure shown in the table below, the LSGV is good.
    If the value is out of standard, replace the LSGV assembly.

kPa (kg/cm², psi)

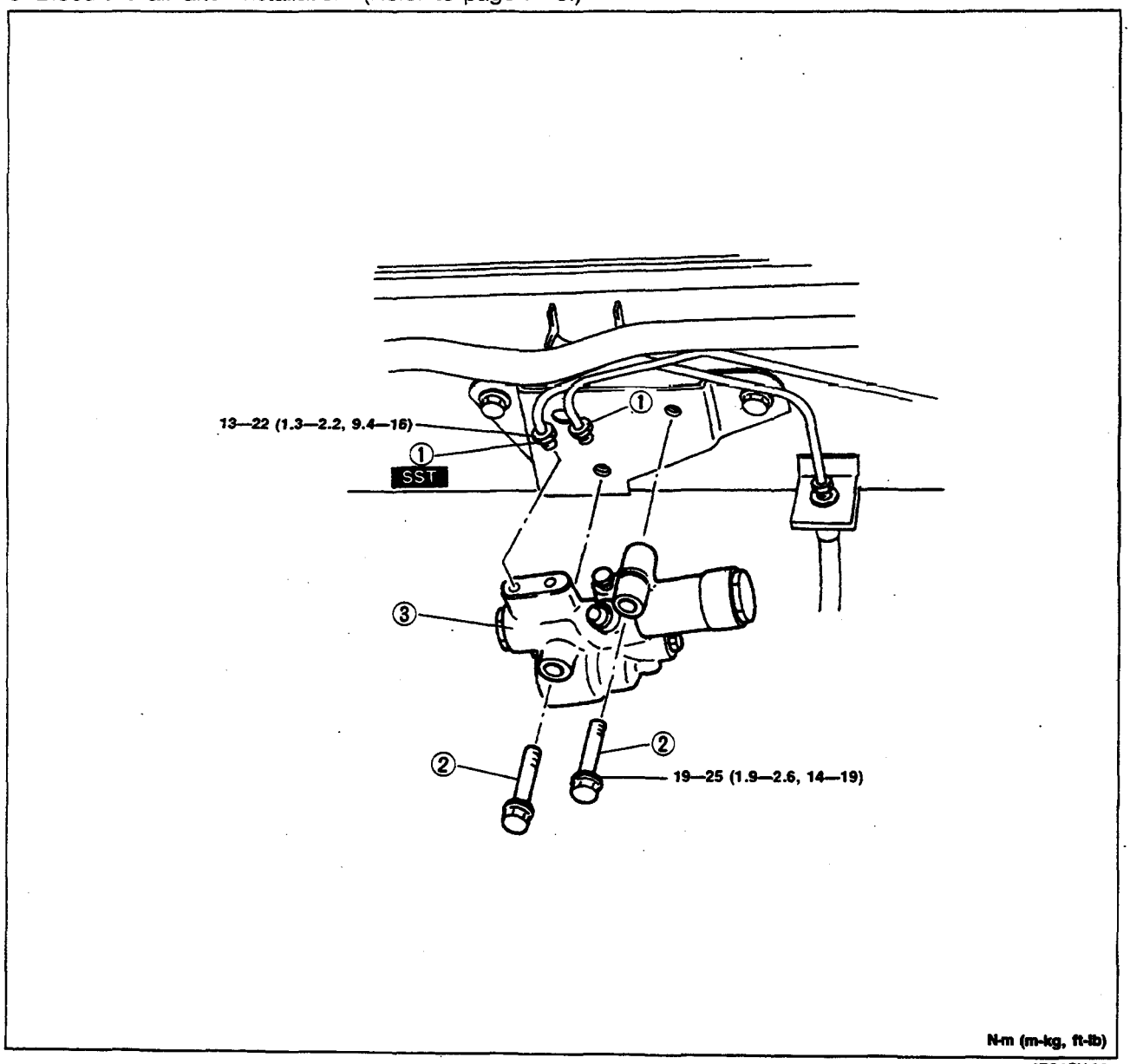
	Part No.	P_1	P_2	P_3	P_4
Type 1	W210 43 900	98 (10, 14)	4,120 (42, 597)—4,905 (50, 711)	3,139 (32, 455)	10,595 (108, 1,536) min
Type 2	W211 43 900	98 (10, 14)	4,807 (49, 697)—5,592 (57, 811)	4,905 (50, 711)	10,595 (108, 1,536) min
Type 3	W221 43 900	98 (10, 14)	4,807 (49, 697)—5,592 (57, 811)	4,905 (50, 711)	11,772 (120, 1,706) min
Type 4	W840 43 900	98 (10, 14)	4,513 (46, 654)—5,297 (54, 768)	3,531 (36, 512)	13,832 (141, 2,005) min

9TF0PX-007

Type 1: 10 feet cargo deck (rear single tire)
Type 2: 10 feet cargo deck (rear double tire)
Type 3: 14 feet cargo deck (SL engine)
Type 4: 14 feet cargo deck and 17 feet cargo deck (SL TURBO and TF engines)

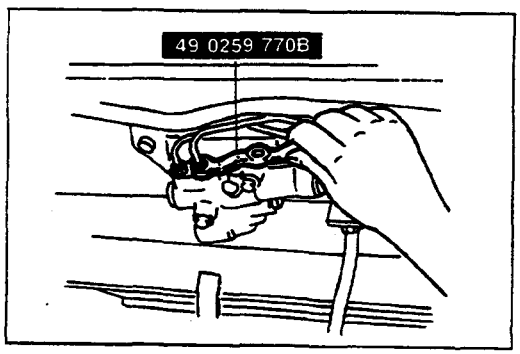
Removal / Installation

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal.
3. Bleed the air after installation. (Refer to page P–6.)



9TG0PX-064

1. Brake pipe
   Removal note ..... below
2. Bolt
3. Load-sensing G-valve (LSGV)

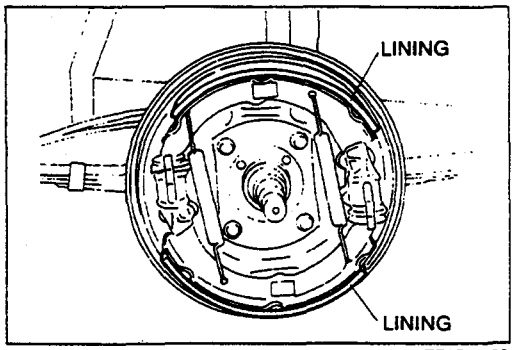


9TG0PX-065

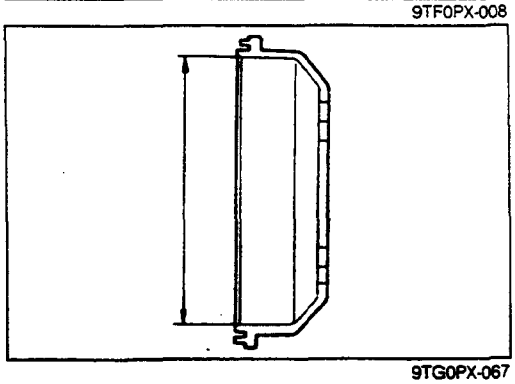
Removal note

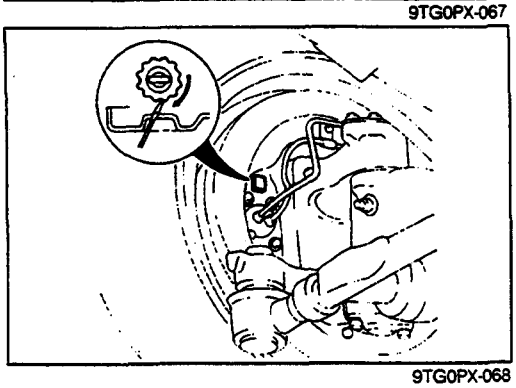
Brake pipe

1. Remove the break pipe with the **SST**.



9TF0PX-008


9TG0PX-067


9TG0PX-068

FRONT BRAKE (DRUM)

On-vehicle Inspection

Lining thickness and drum inner diameter

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheels and tires.
3. Remove the brake drum. (Refer to page P–28.)
4. Inspect the lining. If the thickness is less than specified, replace the shoe.

   Thickness: 1.0mm (0.04 in) min.

5. Measure the drum inner diameter. If the diameter exceeds the limit, replace the drum.

   Diameter limit: Refer to Section TD

Adjustment

Adjustment of brake shoes

1. Remove the rubber plug from the backing plate.
2. Place a screwdriver against the adjuster through hole and turn the adjuster in the direction of the arrow until the drum is locked.
3. Turn the adjuster in the reverse direction from the locked position 5 notches.
4. Confirm the parking brake function.

Replacement

Replacement of brake shoes

Refer to page P–28.

Caution

- **Replace the left and right shoes at the same time.**

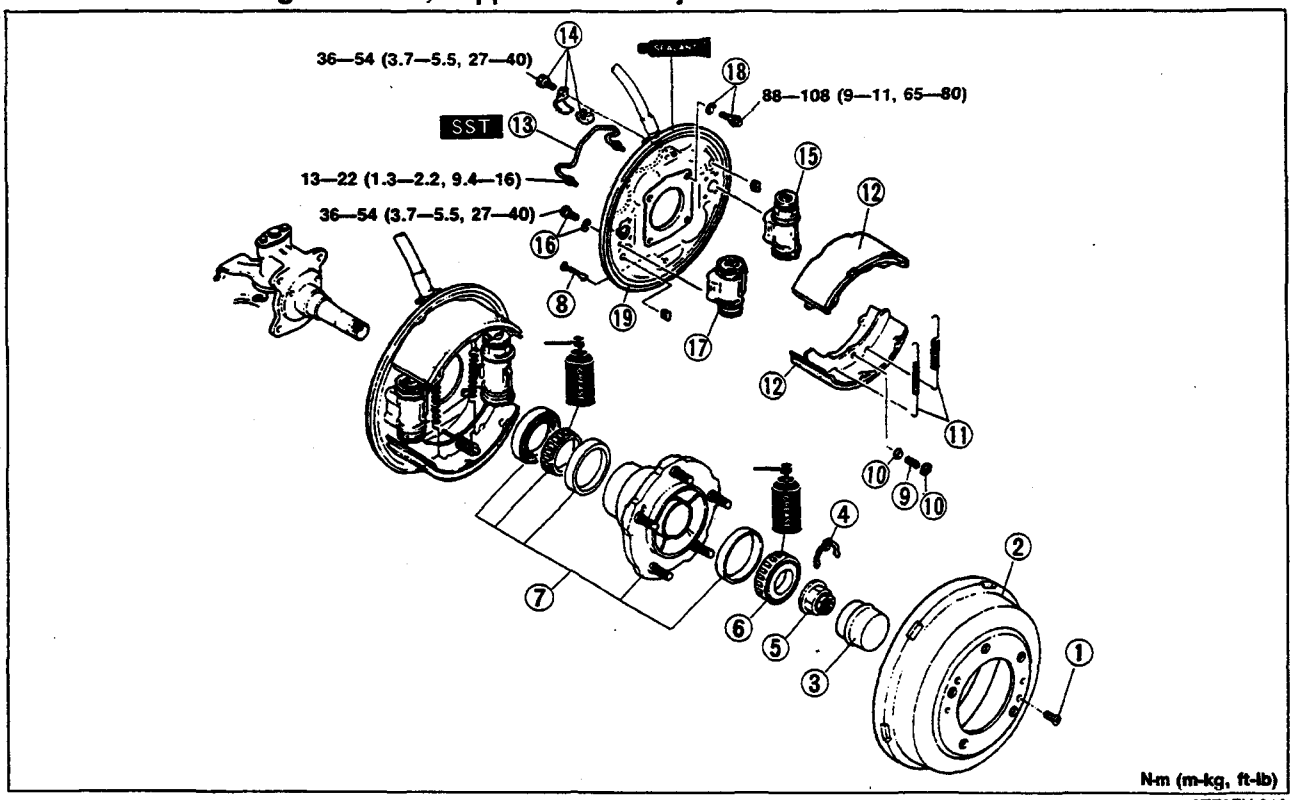
9TF0PX-009

Removal / Inspection / Installation

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheels and tires.
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. Inspect all parts and repair or replace as necessary.
6. After installation, take the following steps:
   (1) Air bleeding (Refer to page P–6.)
   (2) Inspect for brake fluid leakage
   (3) Adjustment of brake shoe clearance
   (4) Inspect for the parking brake function and the brake drag.

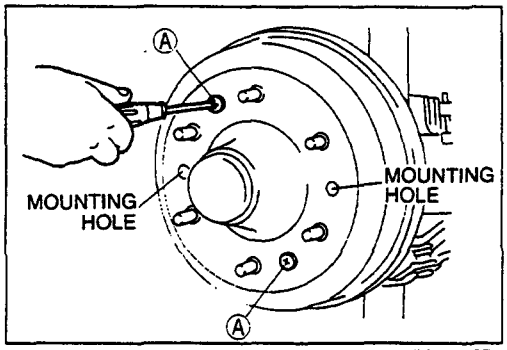
Caution

- **Use a specially designed vacuum cleaner or equivalent to clean the brake assembly.**
- **When removing the drum, support it with a jack.**



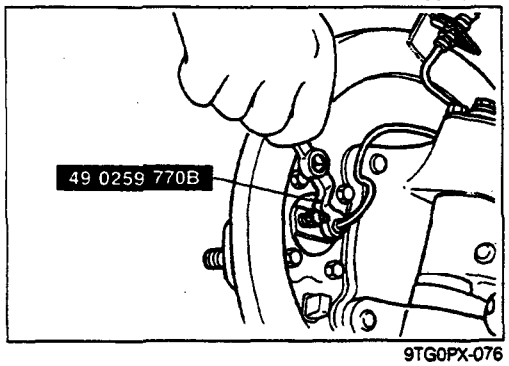
9TF0PX-010

1. Set screw
2. Brake drum
   Removal note ..... page P–29
   Inspection ..... page P–29
3. Hub cap
4. Stop retainer
5. Locknut
   Installation note ..... page P–29
6. Bearing
   Inspect for wear or damage
7. Front hub
8. Hold pin
9. Set spring
   Inspect for weakness or deformation
10. Cup
11. Return spring
    Inspect for weakness or deformation
12. Brake shoe
    Installation note ..... page P–29
    Inspection ..... page P–30
13. Brake pipe
    Removal note ..... page P–29
14. Bolt, pipe clip
15. Wheel cylinder
    Disassembly / Inspection / Assembly ..... page P–31
16. Bolt and washer
17. Wheel cylinder
    Disassembly / Inspection / Assembly ..... page P–31
18. Bolt and washer
19. Backing plate
    Inspect for deformation or damage



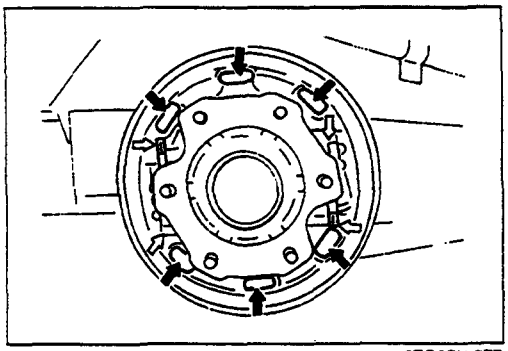
9TG0PX-072

Removal note
Brake drum
1. Remove the brake drum with the set screw tightened into the hole Ⓐ, if the drum is hard to remove.

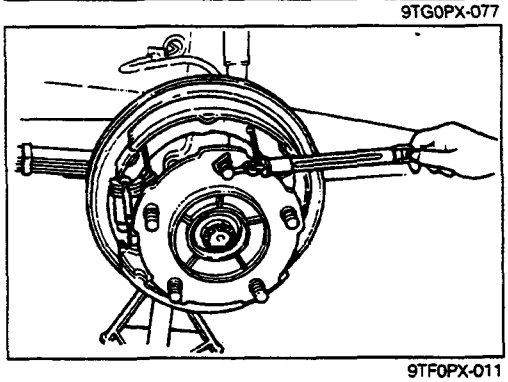


9TG0PX-076

Brake pipe
1. Remove the brake pipe with the **SST**.


9TG0PX-077

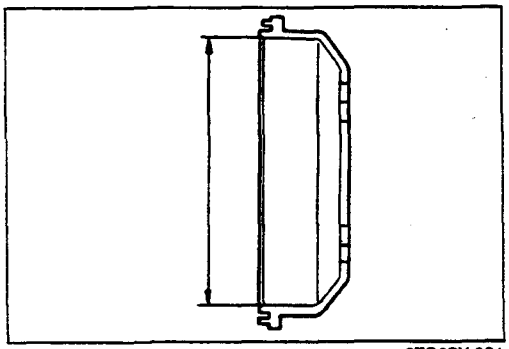
Installation note
Brake shoe
1. Before installation, apply grease to the wheel cylinder and anchor sliding parts (⇨), the projections of the backing plate (➡).
2. Install the brake shoe.


9TF0PX-011

Locknut
1. Loosely tighten the locknut to the hub spindle.
2. Rotate the front hub 2—3 times to settle the bearing.
3. Measure the bearing preload. If necessary, tighten (or loosen) the locknut.

   Bearing preload (Scale reading):
   11—29 N (1.1—3.0 kg, 2.4—6.6 lb)

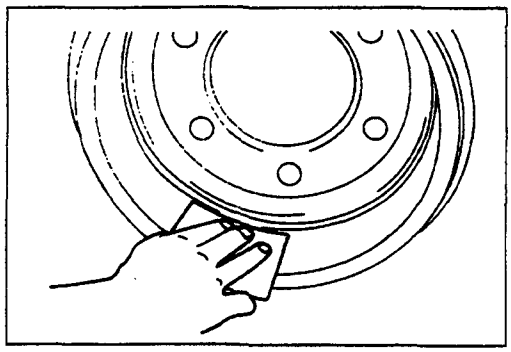
4. Install the stop retainer.


9TG0PX-081

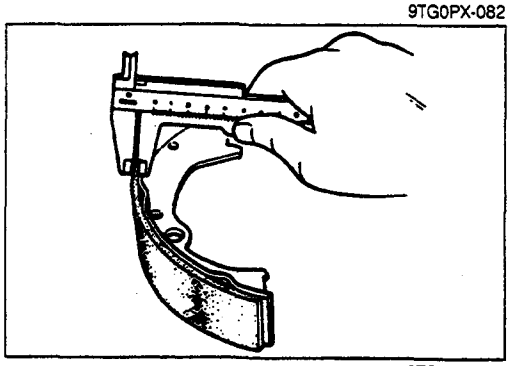
Inspection
Brake drum
1. Measure the drum inner diameter.

   Diameter limit: Refer to Section TD

   Caution
   - **If there are extremely uneven wear, grind (within the limit) or replace the drum.**



9TG0PX-082



9TG0PX-083

2. Check the contact of drum and lining.
   Apply chalk to the inside of the drum and rub the shoe against the drum.

   Note: Check for extremely poor contact.

   Caution
   - **If there are extremely uneven wear, grind (within the limit) or replace the drum.**
   - **After the check, wipe off the chalk.**

Brake shoe

1. Inspect for peeling, cracks, or abnormal wear of the lining. If necessary, replace the brake shoe.
2. Measure thickness of the lining. If thickness is less than specified, replace the brake shoe.

   Lining thickness: 1.0mm (0.04 in) min.

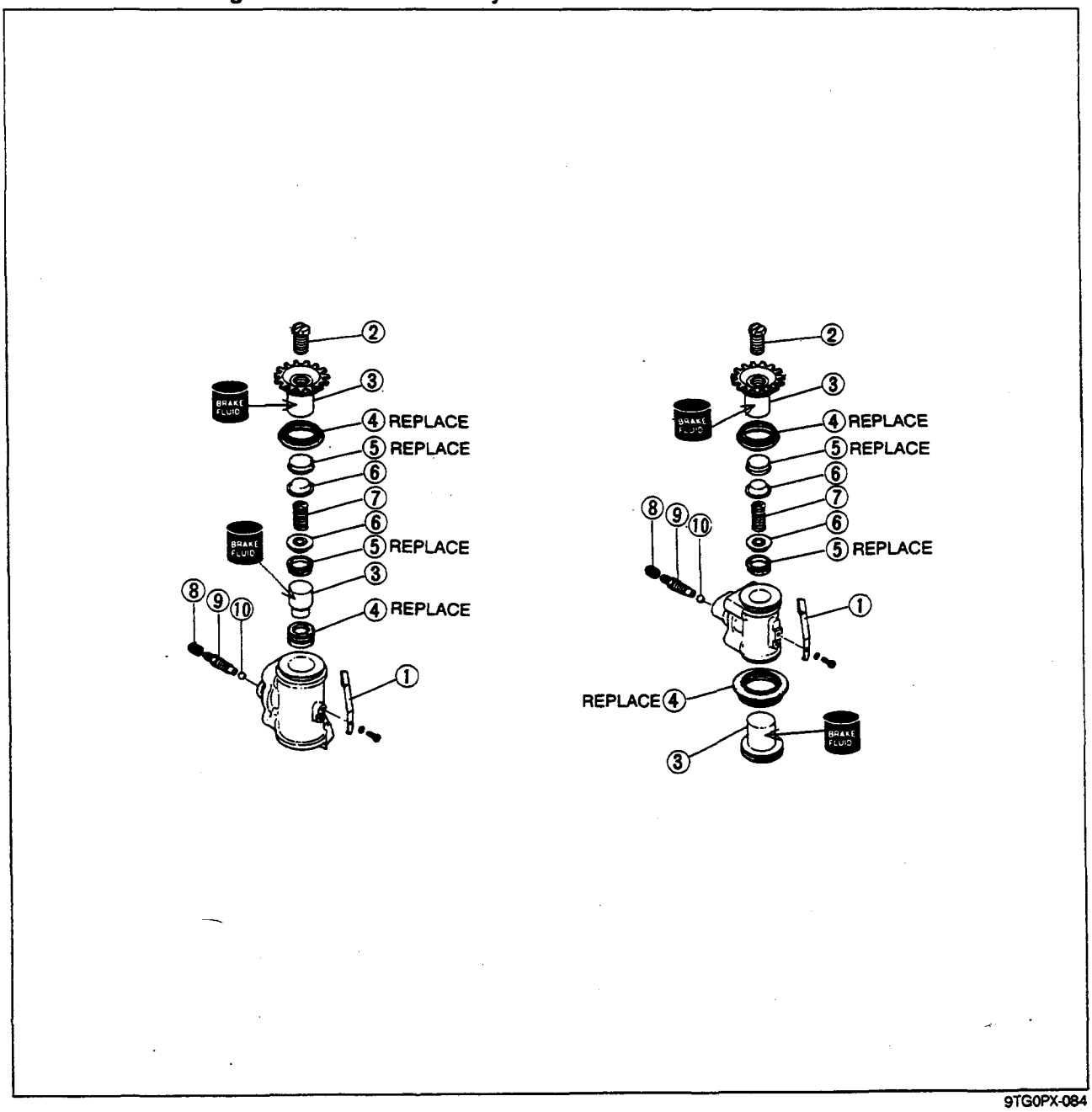
WHEEL CYLINDER

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.
3. Inspect all parts and repair or replace as necessary.

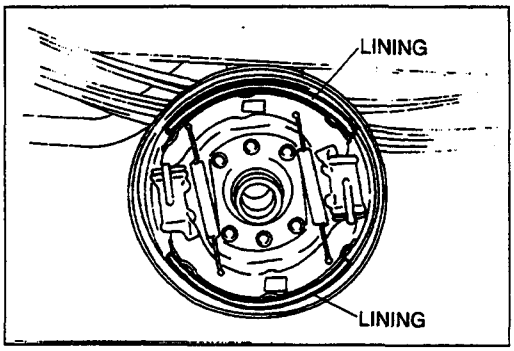
Caution

- **Do not let foreign material enter the cylinder.**

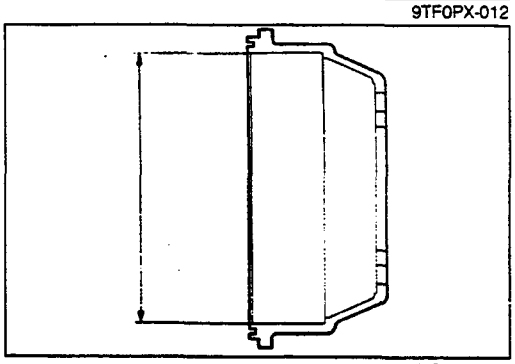


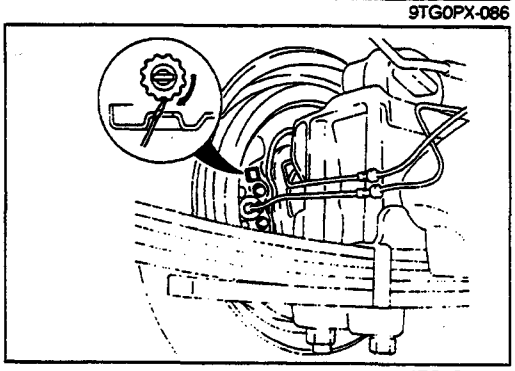
9TG0PX-084

1. Spring
   Inspect for deformation or weakness
2. Adjusting screw
3. Pistons
   Inspect for damage
4. Dust boots
5. Piston rubber cups
6. Feeling block
7. Spring
   Inspect for deformation or weakness
8. Bleeder cap
9. Bleeder screw
10. Steel ball



9TF0PX-012


9TG0PX-086


9TG0PX-087

REAR BRAKE (DRUM)

On-vehicle Inspection

Lining thickness and drum inner diameter

1. Jack up the rear of the vehicle and support it with safety stands.
2. Remove the wheels and tires.
3. Remove the brake drum. (Refer to page P–33.)
4. Inspect the lining. If the thickness is less than specified, replace the shoe.

   Thickness: 1.0mm (0.04 in) min.

5. Measure the drum inner diameter. If the diameter exceeds the limit, replace the drum.

   Diameter limit: Refer to Section TD

Adjustment

Adjustment of brake shoes

1. Remove the rubber plug from the backing plate.
2. Place a screwdriver against the adjuster through hole and turn the adjuster in the direction of the arrow until the drum is locked.
3. Turn the adjuster in the reverse direction from the locked position 5 notches.
4. Inspect for the parking brake function and the brake drag.

Replacement

Replacement of brake shoes

Refer to page P–33.

Caution

- **Replace the left and right shoes at the same time.**

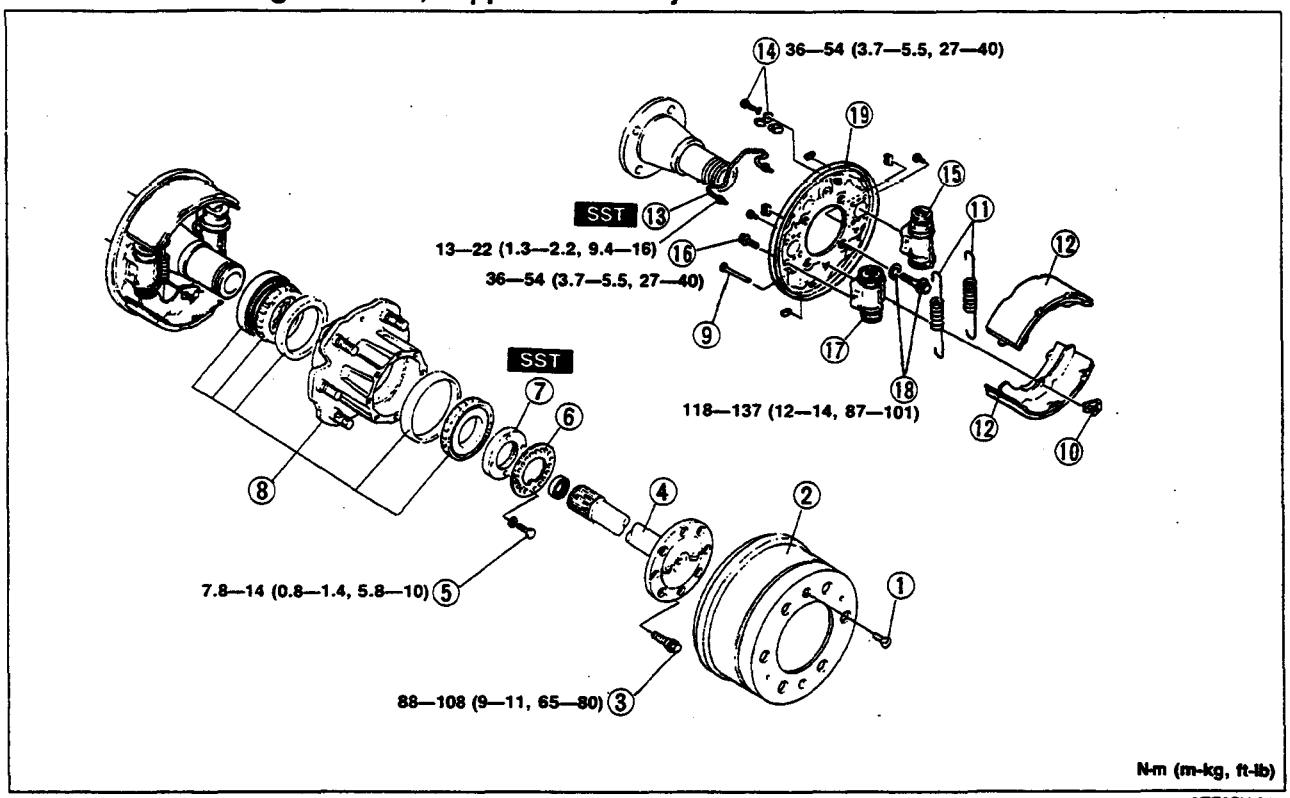
9TF0PX-013

Removal / Inspection / Installation

1. Jack up the rear of the vehicle and support it with safety stands.
2. Remove the wheels and tires.
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. Inspect all parts and repair or replace as necessary.
6. After installation, take the following steps:
   (1) Air bleeding (Refer to page P–6.)
   (2) Inspect for brake fluid leakage
   (3) Adjustment of brake shoe clearance
   (4) Inspect for the parking brake function and the brake drag.

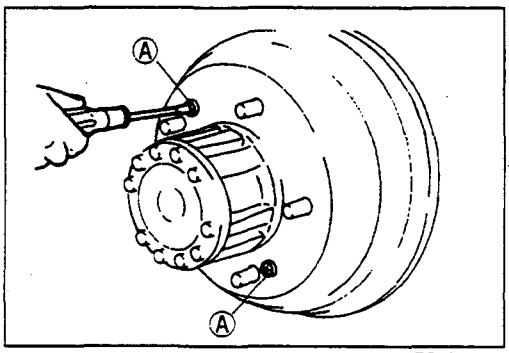
Caution

- **Use a specially designed vacuum cleaner or equivalent to clean the brake assembly.**
- **When removing the drum, support it with a jack.**



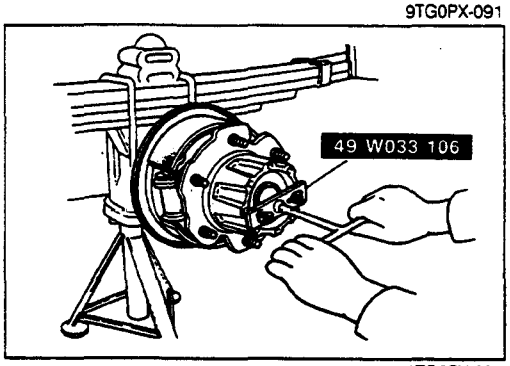
9TF0PX-014

1. Set screw
2. Brake drum
   Removal note ..... page P–34
   Inspection ..... page P–35
3. Bolt
4. Rear axle shaft
5. Bolt
6. Set plate
7. Locknut
   Removal note ..... page P–34
   Installation note ..... page P–34
8. Rear hub
9. Hold pin
10. Set spring
    Inspect for deformation or weakness
11. Return spring
    Inspect for deformation or weakness
12. Brake shoe
    Installation note ..... page P–34
    Inspection ..... page P–35
13. Brake pipe
    Removal note ..... page P–34
14. Bolt, pipe clip
15. Wheel cylinder
    Disassembly / Inspection / Assembly ..... page P–36
16. Bolt and washer
17. Wheel cylinder
    Disassembly / Inspection / Assembly ..... page P–36
18. Bolt and washer
19. Backing plate
    Inspect for deformation or damage



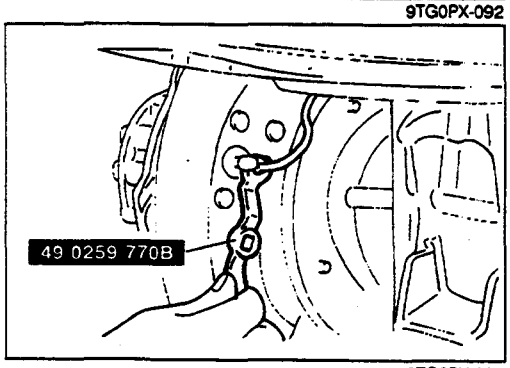
9TG0PX-091

Removal note
Brake drum
1. Remove the brake drum with the set screw tightened into the hole Ⓐ, if the drum is hard to remove.



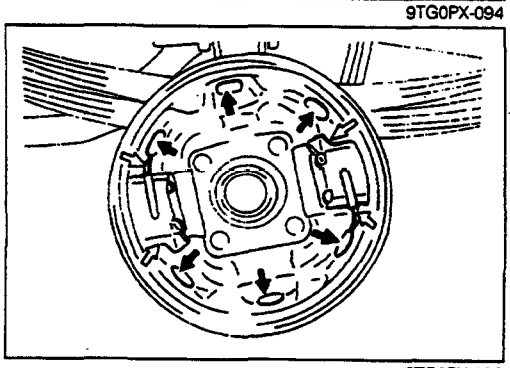
9TG0PX-092

Locknut
1. Remove the locknut with the **SST**.

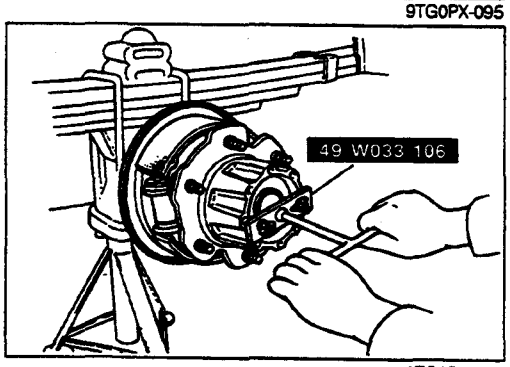


9TG0PX-094

Brake pipe
1. Remove the brake pipe with the **SST**.

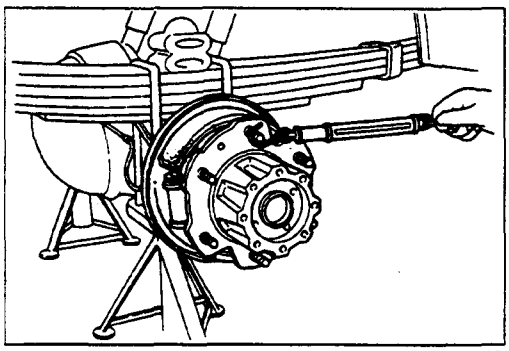

9TG0PX-095

Installation note
Brake shoe
1. Before installation, apply grease to the wheel cylinder and anchor sliding parts (⇨), the projections of the backing plate (➡).



9TG0PX-096

Locknut
1. Tighten the locknut with the **SST**.


9TG0PX-097

2. Turn the rear hub 2—3 times to settle the bearing.
3. Loosen the locknut until it can be moved manually.
4. Measure the bearing preload.

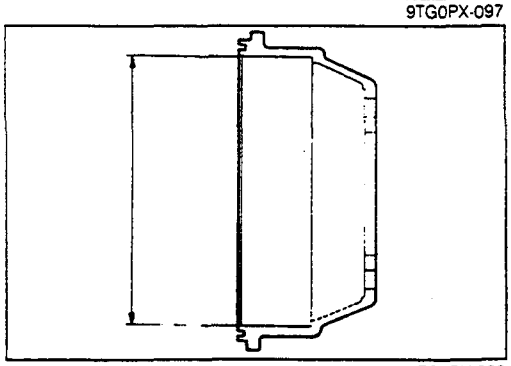
Bearing preload (Scale reading):
11—29 N (1.1—3.0 kg, 2.4—6.6 lb)

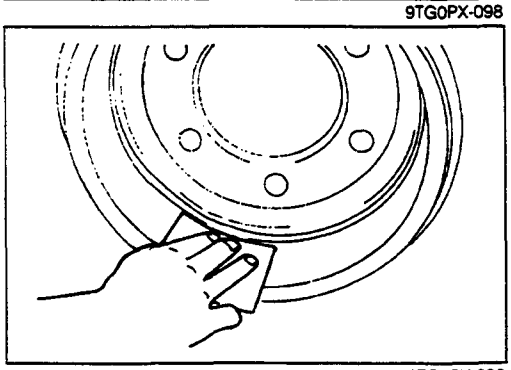
5. Tighten the locknut and adjust the bearing preload.

Inspection
Brake drum
1. Measure the drum inner diameter.

Diameter limit: Refer to Section TD.

Caution
- **If there are extremely uneven wear, grind (within the limit) or replace the drum.**

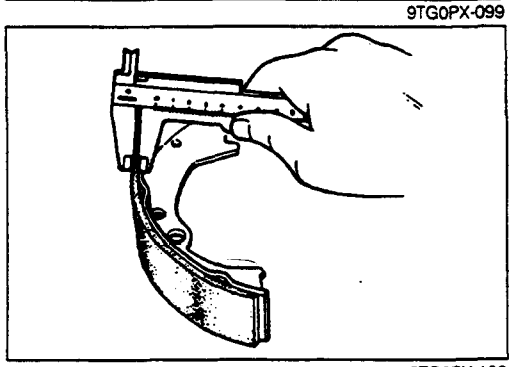

9TG0PX-098


9TG0PX-099

2. Check the contact of drum and lining. Apply chalk to the inside of the drum and rub the shoe against the drum.

Note
- **Check for extremely bad contact.**

Caution
- **If there are extremely uneven wear, grind (within the limit) or replace the drum.**
- **After the check, wipe off the chalk.**


9TG0PX-100

Brake shoe
1. Inspect for peeling, cracks, or abnormal wear of the lining. If necessary, replace the brake shoe.
2. Measure thickness of the lining. If thickness is less than specified, replace the brake shoe.

Lining thickness: 1.0mm (0.04 in) min.

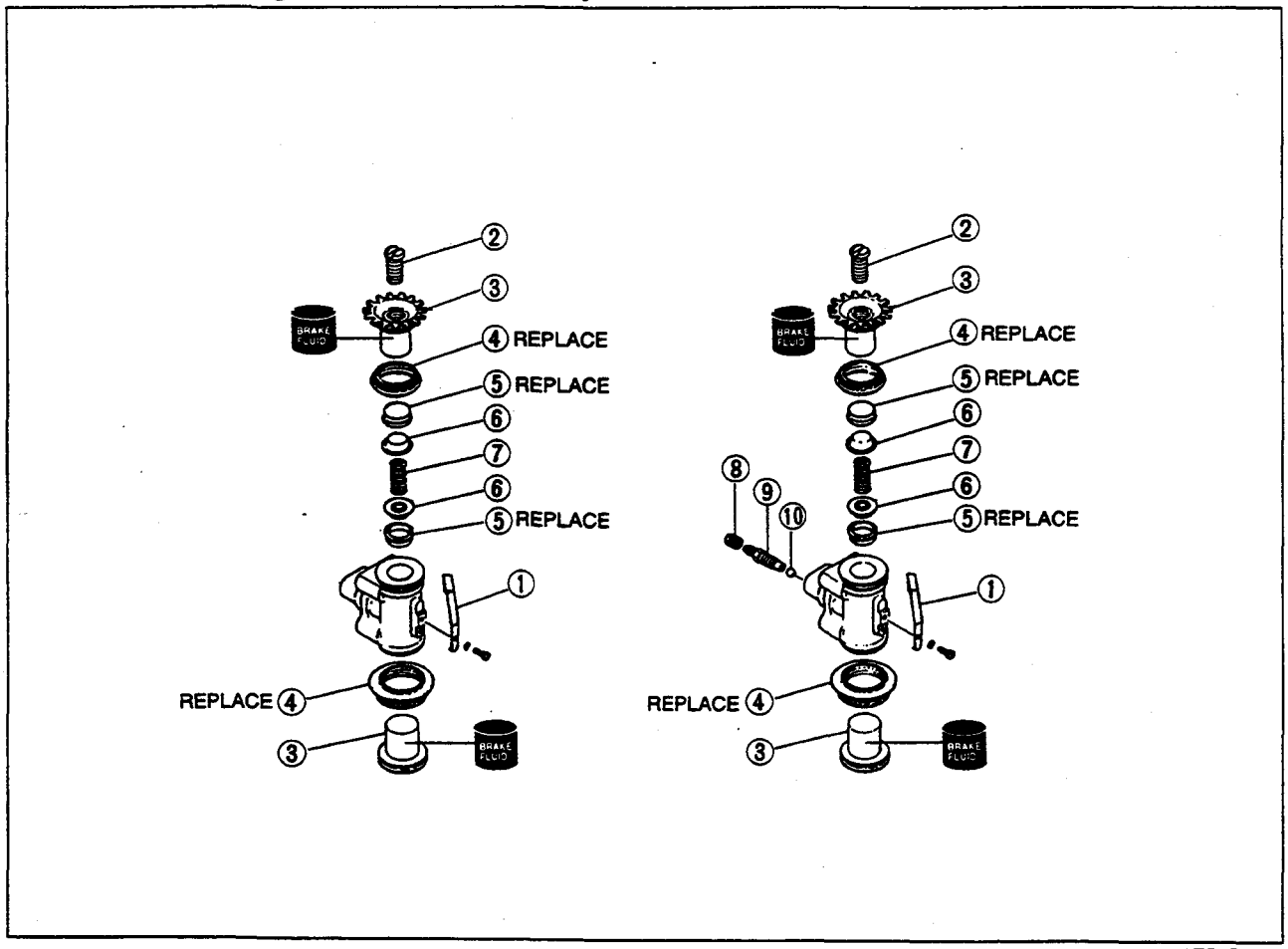
WHEEL CYLINDER

Disassembly / Inspection / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.
3. Inspect all parts and repair or replace as necessary.

Caution

- **Do not let foreign material enter the cylinder.**

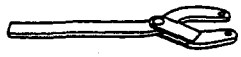


9TG0PX-101

1. Spring
   Inspect for deformation or weakness
2. Adjusting screw
3. Pistons
   Inspect for damage
4. Dust boots
5. Piston rubber cups
6. Feeling block
7. Spring
   Inspect for deformation or weakness
8. Bleeder cap
9. Bleeder screw
10. Steel ball

PARKING BRAKE SYSTEM

PREPARATION
SST

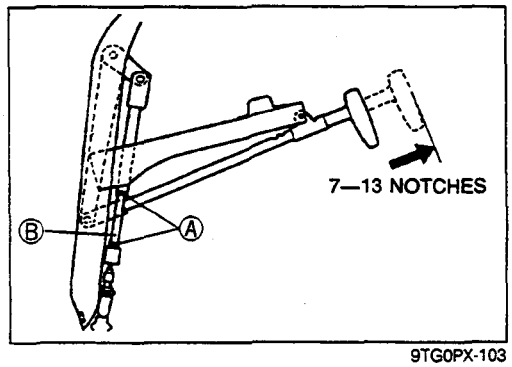
49 S120 710 Coupling flange holder 	For removal and installation of center brake drum

9TG0PX-118

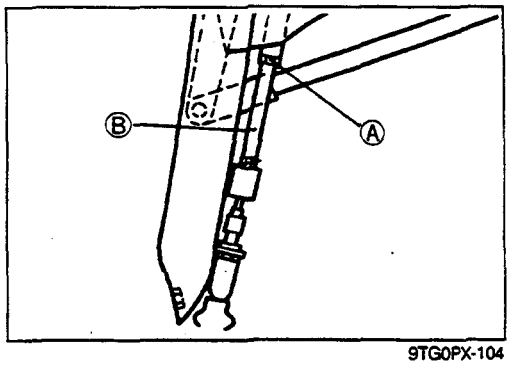
TROUBLESHOOTING GUIDE

Problem	Possible cause	Remedy	Page
Brakes do not release	Improper returning or adjusted parking brake cable	Replace or adjust	Below
Poor parking braking	Too much lever stroke	Adjust	Below
	Hardened or damaged brake cable	Repair or replace	P–39
	Surface hardening or poor contact of center brake shoe	Clean or replace	P–40
	Worn center brake drum	Grind or replace	P–41

9TF0PX-015



9TG0PX-103



9TG0PX-104

PARKING BRAKE LEVER
On-vehicle Inspection
Lever stroke

1. Check that the stroke is within specification when the parking brake lever is pulled with a force of **294 N (30 kg, 66 lb)**.

Stroke: 7—13 notches

Adjustment

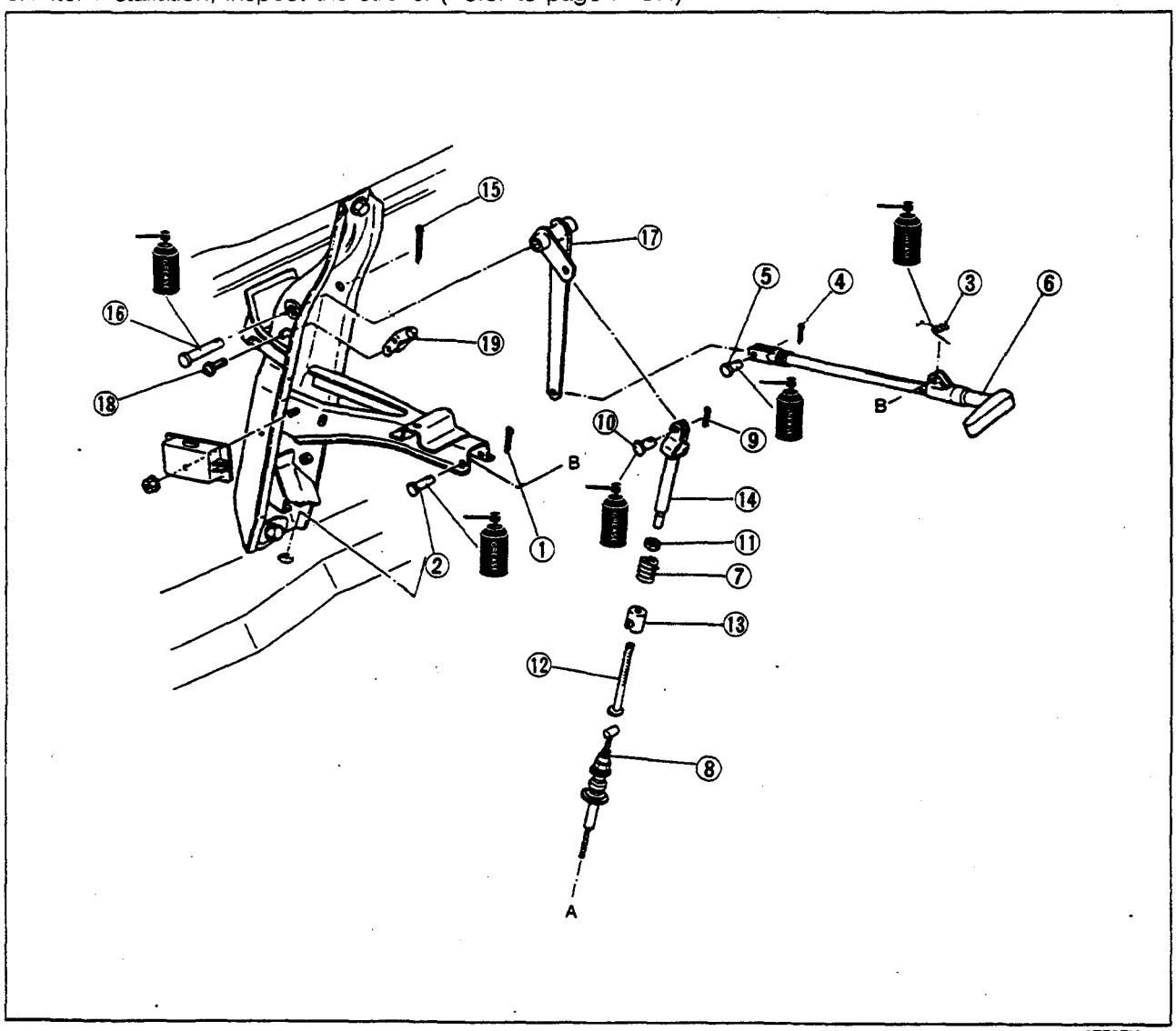
1. Loosen locknut Ⓐ and turn the adjusting bolt Ⓑ so that the stroke is within the above range.

Caution

- **Before adjustment, adjust the clearance between the center brake drum and lining. (Refer to page P–41.)**
- **After adjustment, make sure that the parking brake warning light illuminates when the brake lever is pulled one notch and the brakes are not dragging.**

Removal / Inspection / Installation

1. Release the parking brake.
2. Remove the lower panel. (Refer to Section S.)
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.
5. Inspect all parts and repair or replace as necessary.
6. After installation, inspect the stroke. (Refer to page P–37.)



9TF0PX-016

1. Split pin
2. Clevis pin
3. Return spring
   Inspect for deformation or weakness
4. Split pin
5. Clevis pin
6. Parking brake rod
   Inspect for wear or damage of ratchet pawl
7. Spring
   Inspect for deformation or weakness
8. Front cable
   Removal / Inspection / Installation ..... page P–39
9. Split pin
10. Clevis pin
11. Nut
12. Adjusting bolt
13. Joint
14. Tension rod
    Inspect for damage or deformation
15. Split pin
16. Clevis pin
17. Parking brake lever
    Inspect for damage or deformation
18. Screw
19. Parking brake switch
    Inspection ..... Section T

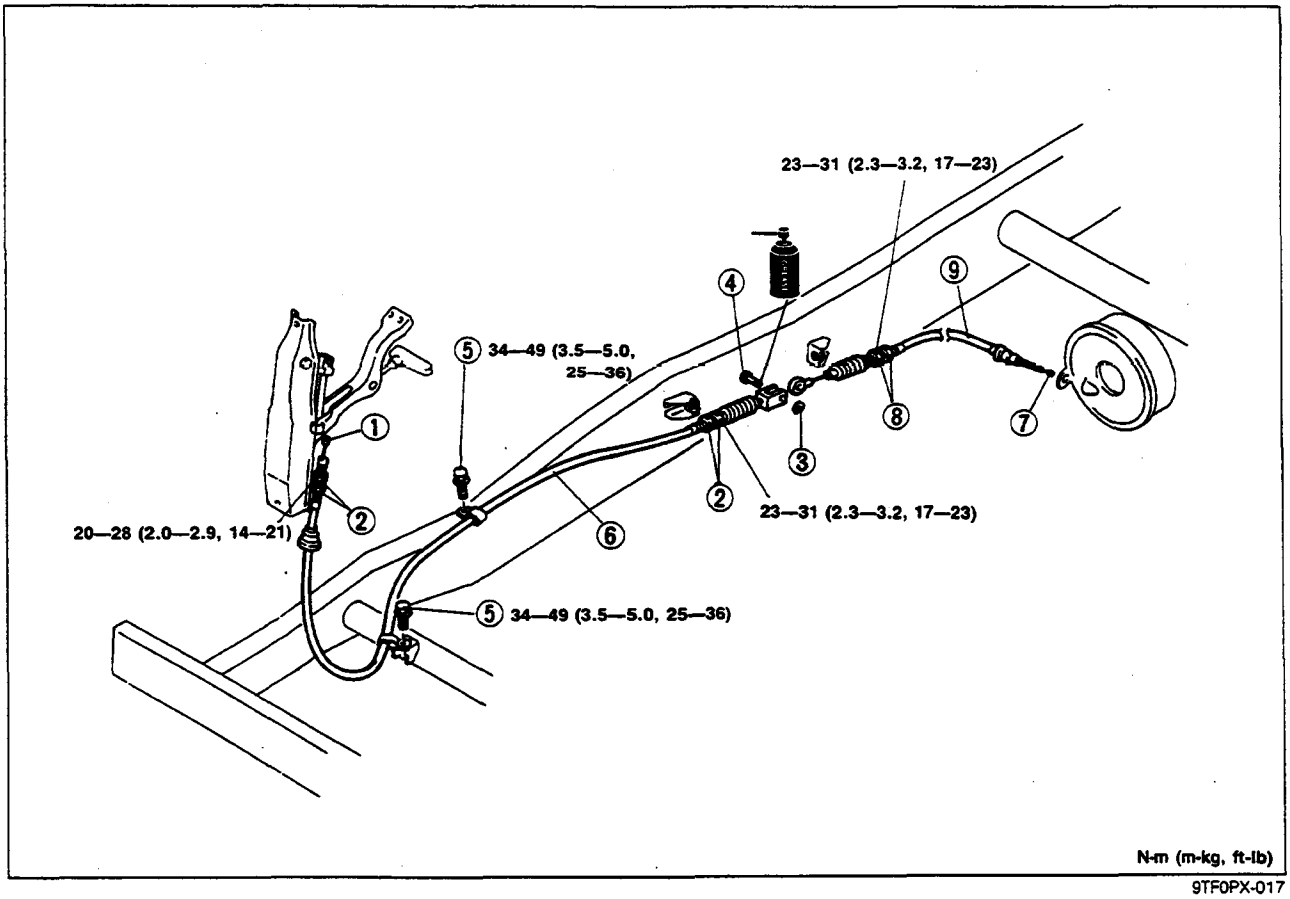
PARKING BRAKE CABLE

Removal / Inspection / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Inspect all parts and repair or replace as necessary.
4. After installation, adjust the parking brake lever stroke. (Refer to page P–37.)

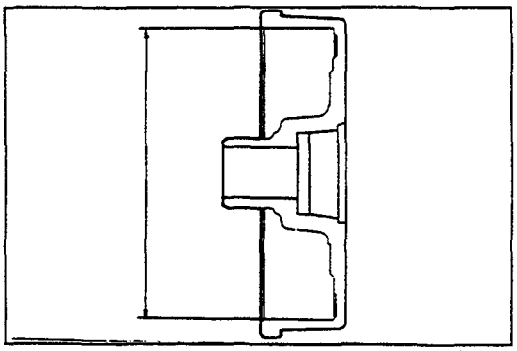
Caution

- **When installing the parking cable, do not twist it.**

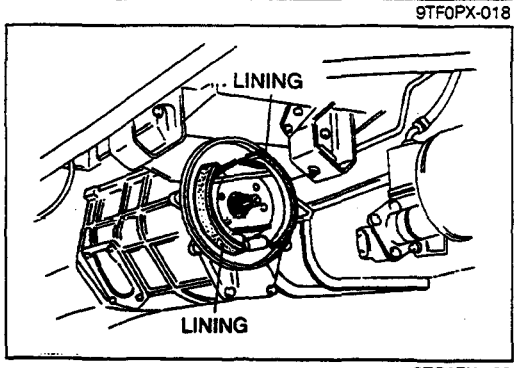


9TF0PX-017

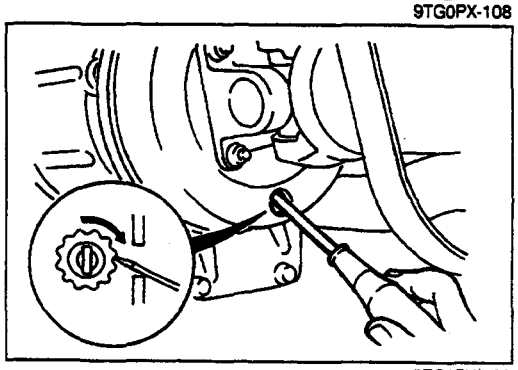
1. Front cable end
2. Nuts
3. Stop ring
4. Clevis pin
5. Bolt
6. Front cable
   Inspect for damage
7. Rear cable end
8. Nuts
9. Rear cable
   Inspect for damage



9TF0PX-018



9TG0PX-108



9TG0PX-109

CENTER BRAKE

On-vehicle Inspection

Lining thickness and drum inner diameter

1. Jack up the vehicle and support it with safety stands.
2. Remove the center brake drum. (Refer to page P–41.)
3. Inspect the drum inner diameter.

Diameter: 190mm (7.48 in)
Limit : 191mm (7.52 in)

4. Visual inspect the lining thickness.

Thickness: 3.6mm (0.14 in)
Limit : 1.0mm (0.04 in)

Adjustment

Center brake shoe clearance

1. Remove the plug.
2. Place a screwdriver against the adjuster through hole and turn the adjuster in the direction of the arrow until the drum is locked.
3. Turn the adjuster in the reverse direction from the locked position 6—7 notches.

Replacement

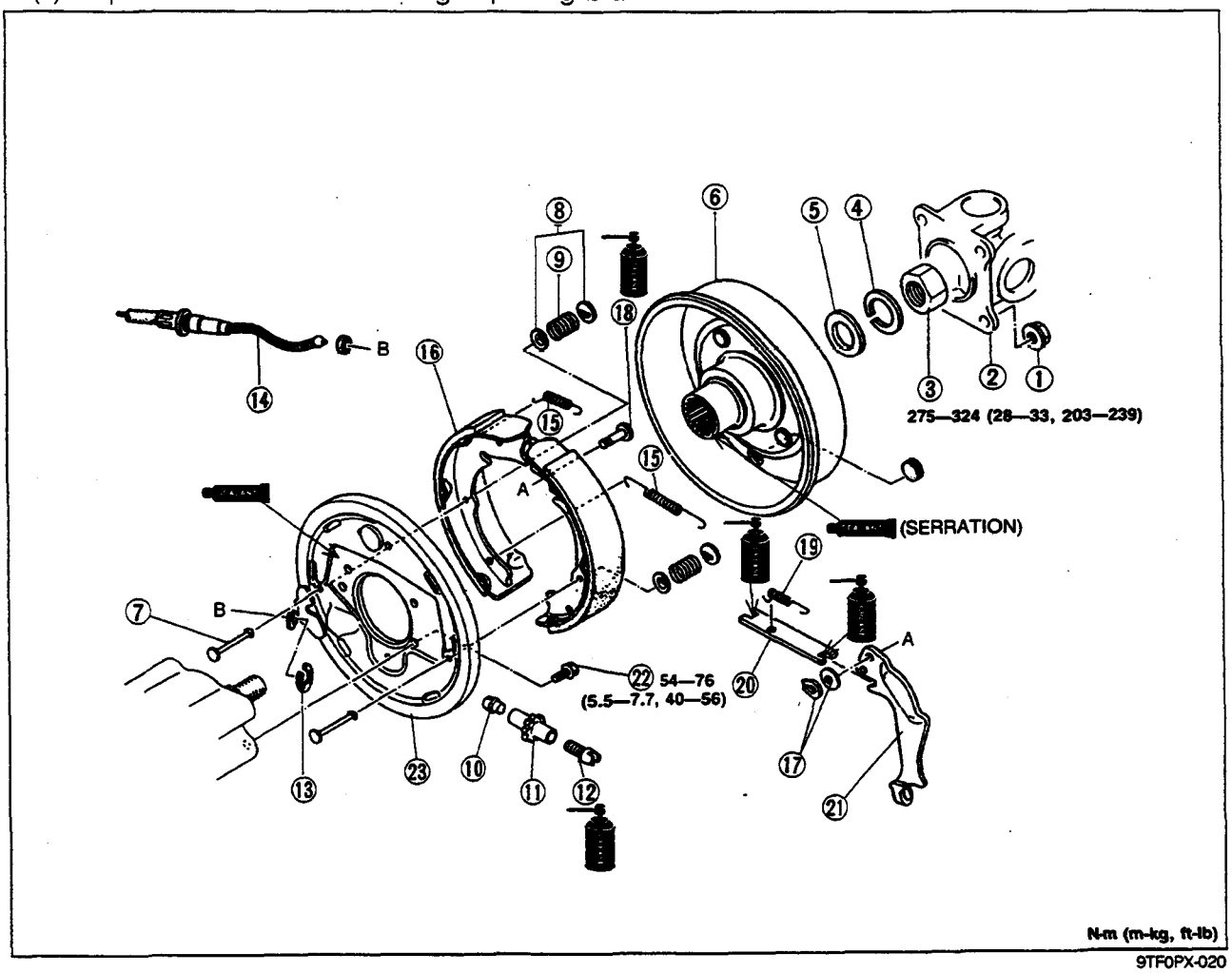
Replacement of center brake shoe

Refer to page P–41.

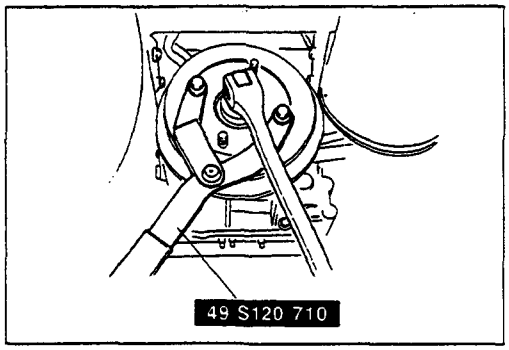
9TF0PX-019

Removal / Inspection / Installation

1. Jack up the vehicle and support it with safety stands.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal.
4. Inspect all parts and repair or replace as necessary.
5. After installation, take the following steps:
   (1) Adjustment of center brake shoe (Refer to page P–40.)
   (2) Adjustment of parking brake lever stroke (Refer to page P–37.)
   (3) Inspection for function and drag of parking brake

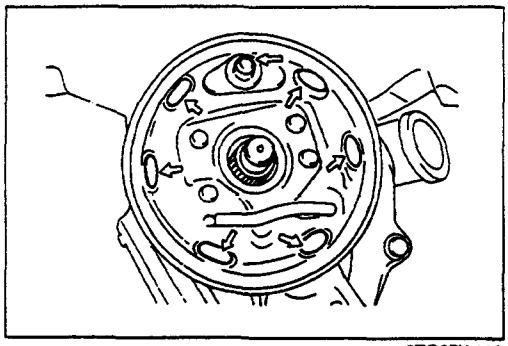


1. Nut
2. Propellershaft
3. Locknut
   Removal note ..... page P–42
4. Washer
5. Oil seal
6. Center brake drum
   Inspection ..... page P–43
7. Hold pin
8. Stop plate
9. Spring
   Inspect for weakness or deformation
10. Sleeve
11. Adjusting nut
12. Adjusting screw
13. Stop retainer
14. Parking cable
15. Return spring
    Inspect for weakness or deformation
16. Center brake shoe
    Installation note..... page P–42
    Inspection ..... page P–42
17. Retainer
18. Pin
19. Return spring
    Inspect for weakness or deformation
20. Strut
21. Lever
22. Bolt
23. Backing plate
    Inspect for damage



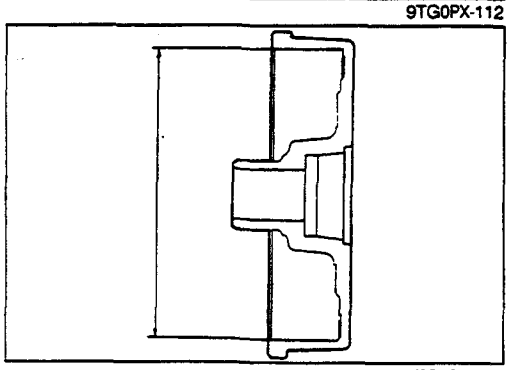
9TG0PX-111

Removal note
Locknut
1. Remove the locknut with the drum locked with the **SST**.



9TG0PX-112

Installation note
Center brake shoe
1. Before installation, apply grease to all sliding parts (⇨).

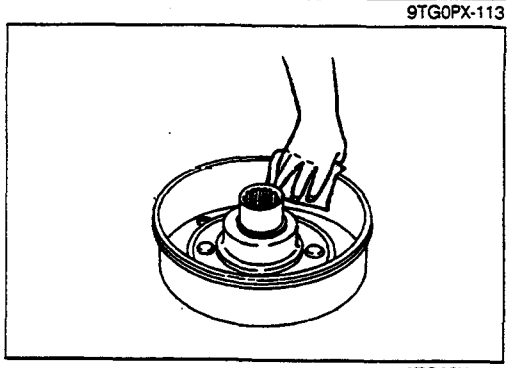


9TG0PX-113

Inspection
Brake drum
1. Measure the brake drum inner diameter.

Standard diameter: 190mm (7.48 in)
Limit diameter : 191mm (7.52 in)

Caution
- **If there are extremely uneven wear, grind (within the limit) or replace the drum.**

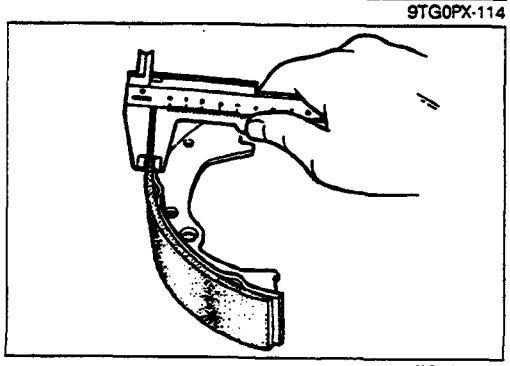


9TG0PX-114

2. Check the contact of drum and lining.
Apply chalk to the inside of the drum and rub the shoe against the drum.

Note
- **Check for extremely bad contact.**

Caution
- **If there are extremely uneven wear, grind (within the limit) or replace the drum.**
- **After the check, wipe off the chalk.**



9TG0PX-115

Brake shoe
1. Inspect for peeling, cracks, or abnormal wear of the lining. If necessary, replace the brake shoe.
2. Measure thickness of the lining. If thickness is less than specified, replace the brake shoe.

WHEELS AND TIRES

OUTLINE ..... Q– 2
SPECIFICATION ..... Q– 2
TROUBLESHOOTING GUIDE ..... Q– 3
WHEELS AND TIRES ..... Q– 4
SPECIAL NOTES ABOUT WHEELS AND TIRES ..... Q– 4
NOTES REGARDING TIRE REPLACEMENT. Q– 4
INSPECTION / ADJUSTMENT ..... Q– 4
REMOVAL / INSTALLATION ..... Q– 7

9TF0QX-001

OUTLINE

SPECIFICATION

Single tire

Specifications		Wheel			Tire	
		Size	Offset mm (in)	Diameter of pitch circle mm (in)	Size	Tire pressure kPa (kg/cm², psi)
3.0L	Front	5.50Fx15	30 (1.181)	184.15 (7.25)	7.00—15—10	392 (4.00, 55)
	Rear					417 (4.25, 60)

9TF0QX-002

Dual tires

Specifications				Wheel			Tire	
				Size	Offset mm (in)	Diameter of pitch circle mm (in)	Size	Tire pressure kPa (kg/cm², psi)
2,000 kg	3.5L		Front	4.50Ex16	108 (4.252)	203.2 (8)	6.50—16—10	491 (5.00, 71)
				5.50Fx16	115 (4.528)		6.50R16—10	540 (5.50, 78)
			Rear	4.50Ex16	108 (4.252)		6.50—16—8	417 (4.25, 60)
							6.50—16—10	441 (4.50, 64)
				5.50Fx16	115 (4.528)		6.50R16—10	491 (5.00, 71)
2,750 kg	3.5L		Front	5.50Fx16	115 (4.528)	203.2 (8)	7.00—16—10	466 (4.75, 68)
							7.00—16—12	466 (4.75, 68)
							7.00R16—10	441 (4.50, 64)
			Rear				7.00—16—10	491 (5.00, 71)
							7.00—16—12	515 (5.25, 75)
							7.00R16—10	540 (5.50, 78)
3,000 kg	3.5L		Front	5.50Fx16	115 (4.528)	203.2 (8)	7.00—16—10	515 (5.25, 75)
							7.00—16—12	540 (5.50, 78)
							7.00R16—10	515 (5.25, 75)
			Rear				7.00—16—10	491 (5.00, 71)
							7.00—16—12	515 (5.25, 75)
							7.00R16—10	515 (5.25, 75)
3,500 kg	4.0L		Rear	6.00GSx16	127 (5)	222.25 (8.75)	7.50—16—12	441 (4.50, 64)
							7.50R16—12	441 (4.50, 64)
			Rear				7.50—16—12	540 (5.50, 78)
							7.50R16—12	589 (6.00, 85)
4,000 kg	3.5L 4.0L	14 feet body	Front Rear	6.00GSx16	127 (5)	222.25 (8.75)	7.50—16—12	564 (5.75, 82)
							7.50R16—12	638 (6.50, 93)
		17 feet body	Front Rear	6.00GSx16	127 (5)	222.25 (8.75)	7.50—16—10	515 (5.25, 75)
							7.50—16—12	564 (5.75, 82)
							7.50R16—12	638 (6.50, 93)

9TF0QX-003

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Excessive or irregular tire wear	Refer to page Q–7 for details		
Premature tire wear	Incorrect tire pressure	Adjust	Q–2
Tire squeal	Incorrect tire pressure Tire deterioration	Adjust Replace	Q–2 —
Road noise or body vibration	Incorrect tire pressure Unbalanced wheel Deformed wheel or tire Irregular tire wear	Adjust Adjust Repair or replace Replace	Q–2 Q–8 — —
"Shake" occurs (Steering wheel vibrates up/down)	Excessive tire and wheel runout Loose lug nuts Unbalanced wheel Cracked or worn engine mounting rubber Cracked or worn transmission mounting rubber	Replace Tighten Adjust or replace Replace Replace	— Q–5 Q–8 Section C Sections J1,J2,K
"Shimmy" occurs (Steering wheel vibrates left/right)	Cracked or worn steering gear mounting rubber Loose steering gear mounting bolts Stuck or damaged steering ball joint Excessive tire and wheel runout Loose lug nuts Unbalanced wheel Incorrect tire pressure Unevenly worn tires Malfunction of shock absorber Loose shock absorber mounting bolts Struck or damaged lower arm ball joint Cracked or worn suspension bushings Damaged or worn front wheel bearing Impropery 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–5 Q–8 Q–2 — Section R Section R Section R Section R Section M Section R
Uneven (one-sided) braking	Unequal tire pressures	Adjust	Q–2
Steering wheel doesn't return properly or pulls to left or right	Incorrect tire pressure Irregular tire wear (left/right) Unequal tire pressures Different types or brands of tires mixed (left/right) Loose lug nuts	Adjust Replace Adjust Replace Tighten	Q–2 — Q–2 — Q–5
General driving instability	Unequal tire pressures Damaged or unbalanced wheel Loose lug nuts	Adjust Replace or adjust Tighten	Q–2 Q–8 Q–5
Excessive steering wheel play	Loose lug nuts	Tighten	Q–5

9TF0QX-004

WHEELS AND TIRES

SPECIAL NOTES ABOUT WHEELS AND TIRES

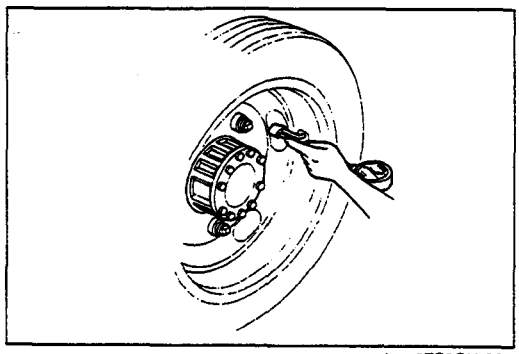
1. Do not use wheels or tires other than the specified types.

NOTES REGARDING TIRE REPLACEMENT

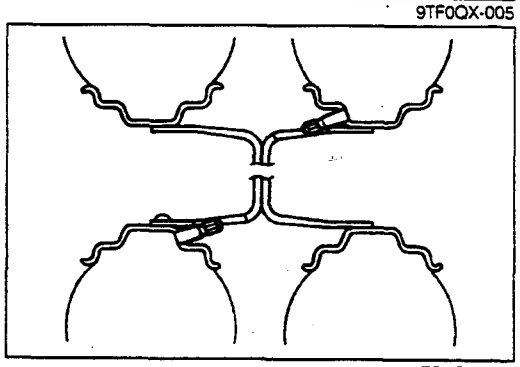
Note the following points when tires are to be removed from or mounted onto the wheels.

1. Be careful not to damage the tire bead, the rim bead, and 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.
4. Remove all 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 a little higher pressure than specified level. 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.

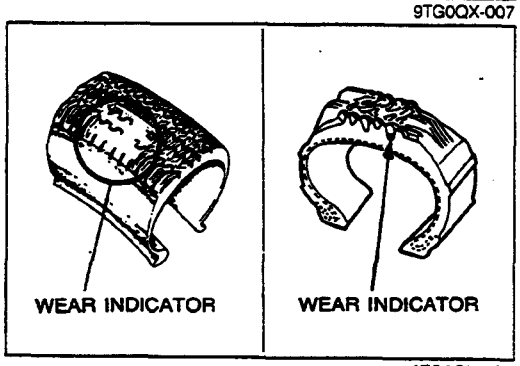
9TG0QX-005



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9TG0QX-007



9TG0QX-008

INSPECTION / ADJUSTMENT

Air pressure

1. Check the air pressure of all tires, including the spare tire, with an air pressure gauge.
2. Adjust the air pressure if necessary.

Air pressure: Refer to page Q–2.

Caution

- **The air pressure must be measured when the tire is cold.**

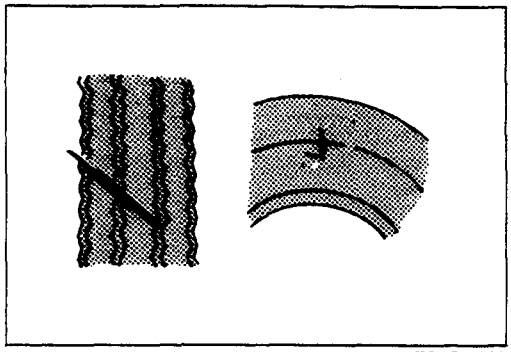
Air leakage

1. Verify that there is no air leakage from valve stem.

Tire wear

1. Measure the depth of tread.

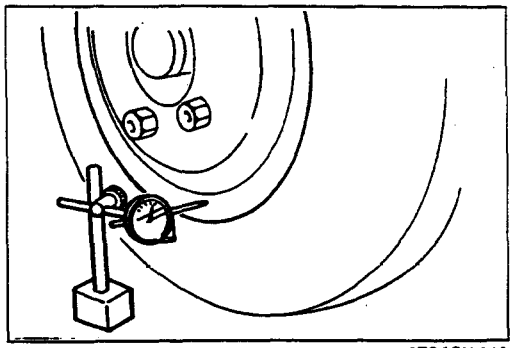
Remaining tread limit
Ordinary tires: 1.6mm (0.063 in)
Snow tires: 50% of tread
(Tire should be replace if wear indicators are exposed.)



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Visual inspection

1. Check for cracks, damage, and foreign matter (such as metal pieces, nails, and stones) in tire and cracks, deformation, and damage to the wheel.
2. Replace the tire or wheel if necessary.

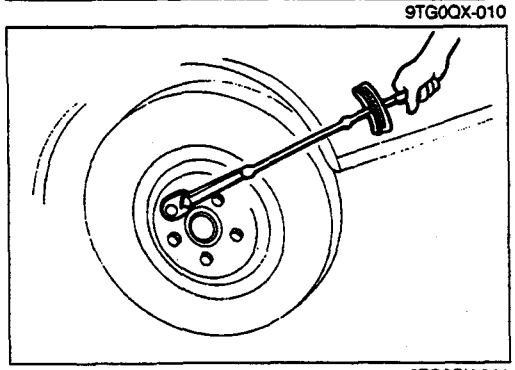


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Wheel runout

1. Set the probe of a dial indicator against the wheel, and turn the wheel one full revolution.

Wheel runout: Horizontal 3.0mm (0.120 in) max.
Vertical 2.5mm (0.098 in) max.



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Wheel lug nut

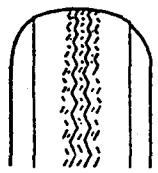
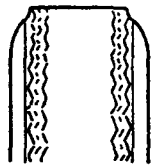
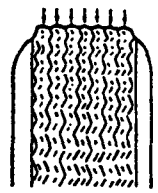
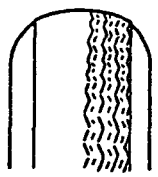
1. Check the tightening torque.

Tightening torque:

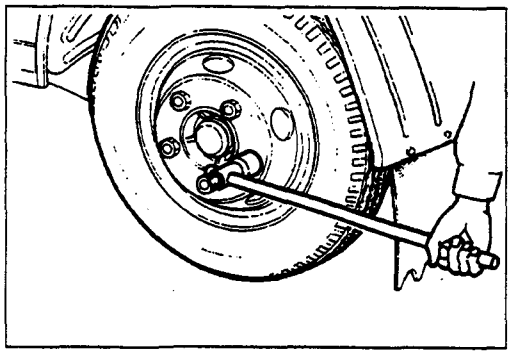
Item \ Model	Single rear tire N·m (m-kg, ft-lb)	Dual rear tires N·m (m-kg, ft-lb)	
Front	167—215 (17—22, 123—159)	491—735 (50—75, 362—542)	
Rear		Inside	540—784 (55—80, 398—578)
		Outside	491—735 (50—75, 362—542)

Abnormal tire wear

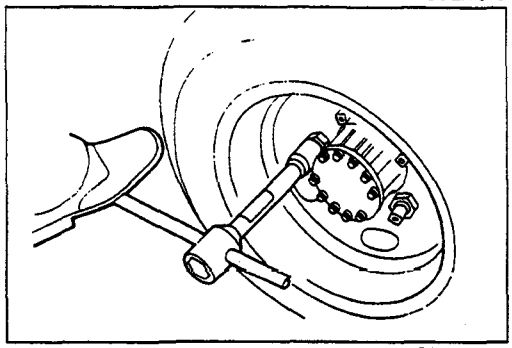
1. Refer to the chart below for the possible causes and actions.

Wear pattern	Possible cause	Action
SHOULDER WEAR 	Underinflation (both sides worn) Incorrect camber (one side worn) Hard cornering Lack of rotation	Adjust tire pressure Repair or replace axle and suspension parts Reduce speed Rotate tires
CENTER WEAR 	Overinflation Lack of rotation	Adjsut tire pressure Rotate tires
FEATHERED EDGE 	Incorrect toe-in	Adjust toe-in
UNEVEN WEAR 	Incorrect camber or caster Malfunctioning suspension Unbalanced wheel Out-of-round brake drum or disc Lack of rotation Other mechanical conditions	Repair or replace axle and suspension parts Repair or replace Balance or replace Correct or replace Rotate tire Correct or replace

9TG0QX-012



9TG0QX-013



9TG0QX-014

REMOVAL / INSTALLATION

Removal

Caution
- **The left wheel lug nuts are left-hand threaded.**

1. Loosen/Remove the lug nuts. (Single/Dual tires)
2. Loosen the inner lug nuts. (Dual tires)

Caution
- **Block the opposite diagonal tire.**

3. Jack up the vehicle and support it with safety stands.

4. Remove the tire(s).

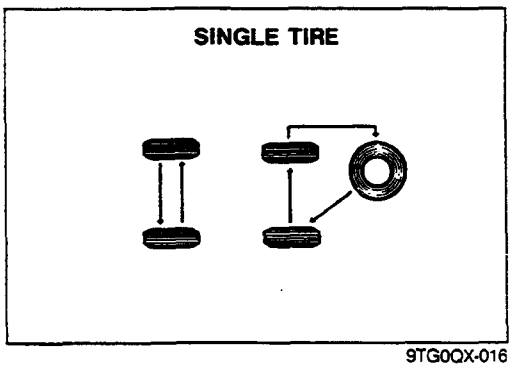
Installation

1. Clean the wheel-to-hub contact surfaces.
2. Set the wheels so that the air valves of the inner tire and outer tire are not be in the same position (Dual tires).
3. Tighten the lug nuts in two or three times steps in a criss-cross fashion. Tighten to the specified torque.

Tightening torque: Refer to page Q–5.

Caution
- **Tighten the lug nuts to the specified torque again when the vehicle has run about 1,000 km (600 miles).**
- **Never apply oil to the nuts, bolts, or wheels; doing so might cause looseness or seizure of the lug nuts.**

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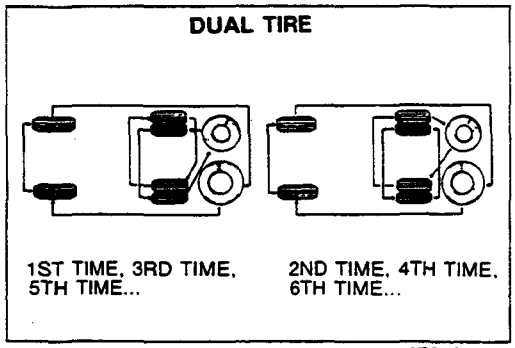


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Tire Rotation

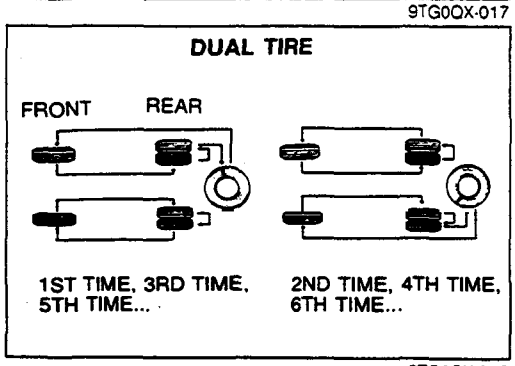
1. To prolong tire life and assure uniform tire wear, rotate the tires every 6,000 km (3,750 miles), sooner if irregular wear develops.

Caution
- **After rotating the tires, adjust each tire to the specified air pressure. (Refer to page Q–2.)**



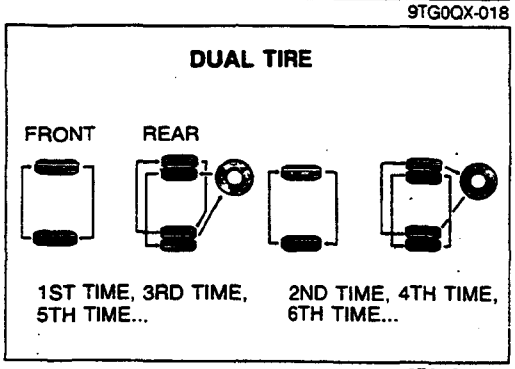
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When the front wheels are different from rear wheels in size.



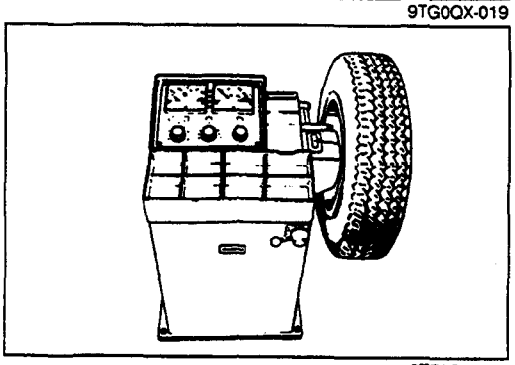
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When the front and rear wheels are the same in size and number of plies.



9TG0QX-019

When the front tires are different from rear tires in number of plies.



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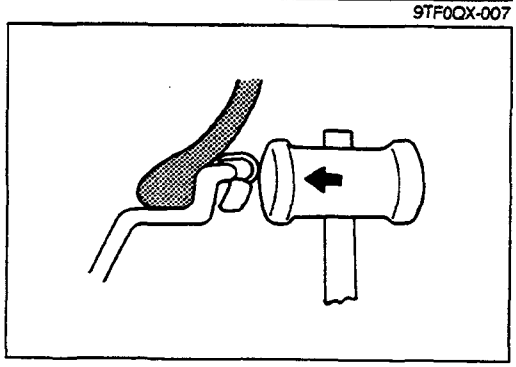
Wheel Balance Adjustment

1. 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): 30 g (1.06 oz)
Balance weight: 100 g (3.5 oz) max.

Caution

- **Do not use more than two balance weights on each side.**
- **Attach the balance weights tightly.**



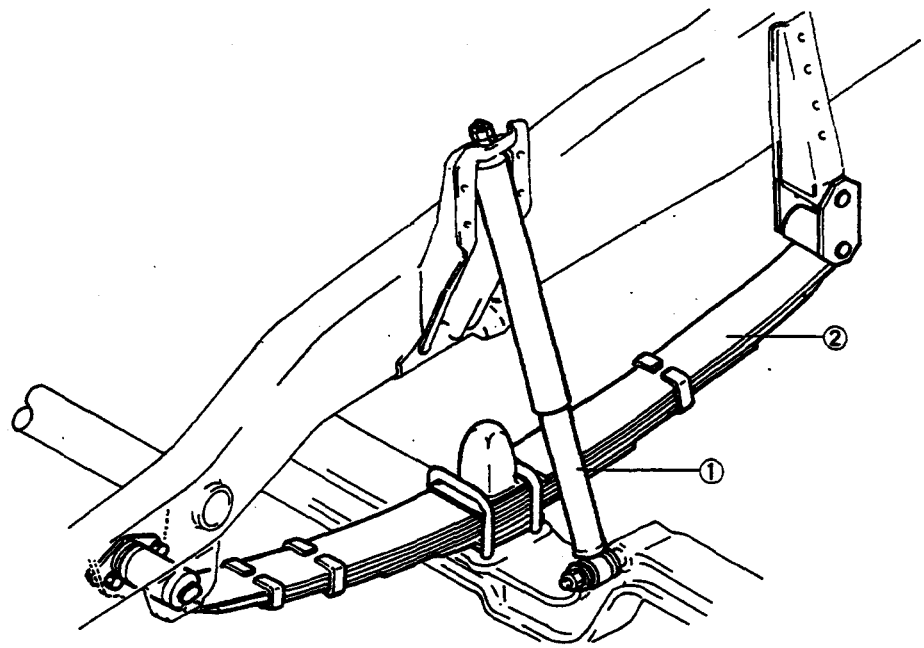
SUSPENSION

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PREINSPECTION ..... R- 8
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9TF0RX-001

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FRONT SUSPENSION

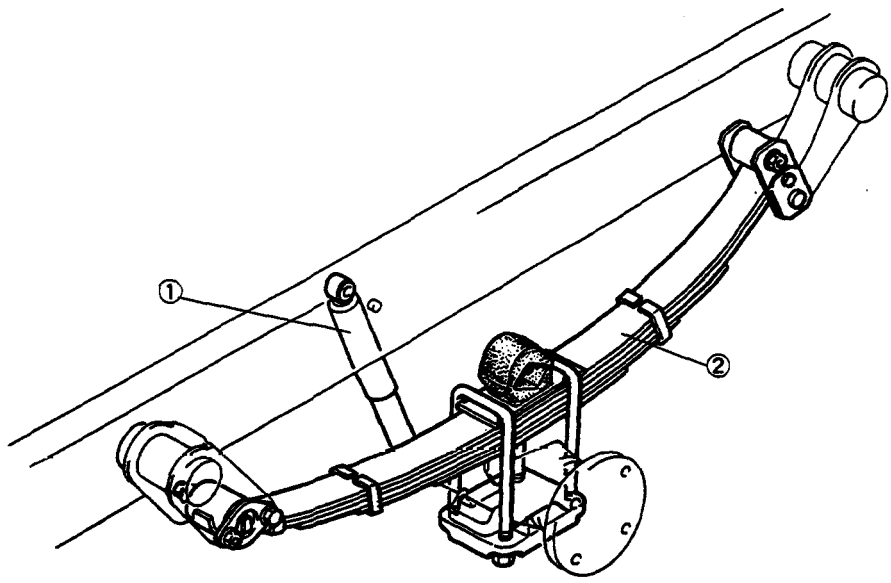


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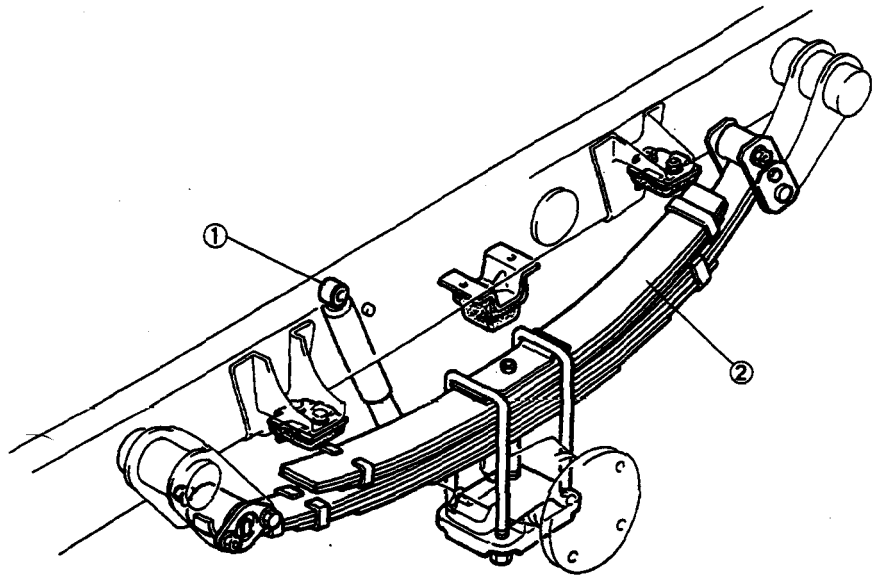
1. Front shock absorber
   Removal / Inspection / Installation ..... page R–13
   Inspection ..... page R–13
2. Front leaf spring
   Removal / Inspection / Installation ..... page R–14

REAR SUSPENSION

SINGLE LEAF SPRING



DOUBLE LEAF SPRING



9TF0RX-003

1. Rear shock absorber
   Removal / Inspection / Installation ..... page R–18
   Inspection ..... page R–18

2. Rear leaf spring
   Removal / Inspection / Installation ..... page R–19

OUTLINE

OUTLINE OF CONSTRUCTION

1. The front and rear suspension is a leaf spring suspension.

SPECIFICATIONS

Item		Specifications
Front Suspension		
Suspension type		Leaf spring
Spring	Type	Semielliptic leaf spring
	Dimension	See next page
Shock absorber type		Cylindrical double-acting
Rear Suspension		
Suspension type		Leaf spring
Spring	Type	Semielliptic leaf spring
	Dimension	See next page
Shock absorber type		Cylindrical double-acting

9TF0RX-004

Wheel Alignment (*1Unladen condition)

Item \ Body		Truck	Truck and Crew cab
Cargo deck		10 feet	14, 17 feet
Cabin type		Standrd cabin	Wide cabin
Front wheel alignment			
Total toe-in	mm (in)	0—3 (0—0.12)	←
	degree	0°—0.3°	←
Camber		0°40' ± 30'	←
Caster		2°30' ± 20'	←
King-pin angle		7°00'	←
Maximum steering angle	Inner	38° ± 2°	42° ± 2°
	Outer	29° ± 2°	31° ± 2°
Rear wheel alignment			
Total toe-in	mm (in)	0 (0)	←
	degree	0°00'	←
Camber		0°00'	←

9TF0RX-005

*1 Fuel tank full; radiator coolant and engine oil at specified level, and spare tire, jack and tools in designated position

Leaf Spring Dimensions (Refer to page R–6 for Spring Applications)

Front leaf spring

	Front spring dimensions Length x Width x Thickness mm (in)			Front spring dimensions Length x Width x Thickness mm (in)	
A	1,367 x 70 x 7	(53.8 x 2.8 x 0.28)	C	1,367 x 70 x 7	(53.8 x 2.8 x 0.28)
	1,145 x 70 x 7	(45.1 x 2.8 x 0.28)		1,146 x 70 x 8	(45.1 x 2.8 x 0.31)
	860 x 70 x 8	(33.9 x 2.8 x 0.31)		1,090 x 70 x 8	(42.9 x 2.8 x 0.31)
	690 x 70 x 8	(27.2 x 2.8 x 0.31)		784 x 70 x 8	(30.9 x 2.8 x 0.31)
	520 x 70 x 8	(20.5 x 2.8 x 0.31)		584 x 70 x 8	(23.0 x 2.8 x 0.31)
	340 x 70 x 8	(13.4 x 2.8 x 0.31)		384 x 70 x 8	(15.1 x 2.8 x 0.31)
	200 x 70 x 7	(7.9 x 2.8 x 0.28)		208 x 70 x 8	(8.2 x 2.8 x 0.31)
B	1,367 x 70 x 7	(53.8 x 2.8 x 0.28)	D	1,374 x 70 x 8	(54.1 x 2.8 x 0.31)
	1,156 x 70 x 8	(45.5 x 2.8 x 0.31)		1,150 x 70 x 8	(45.3 x 2.8 x 0.31)
	784 x 70 x 8	(30.9 x 2.8 x 0.31)		818 x 70 x 8	(32.2 x 2.8 x 0.31)
	584 x 70 x 8	(23.0 x 2.8 x 0.31)		668 x 70 x 8	(26.3 x 2.8 x 0.31)
	384 x 70 x 8	(15.1 x 2.8 x 0.31)		518 x 70 x 8	(20.4 x 2.8 x 0.31)
	208 x 70 x 8	(8.2 x 2.8 x 0.31)		368 x 70 x 8	(14.5 x 2.8 x 0.31)
				260 x 70 x 7	(10.2 x 2.8 x 0.28)
				160 x 70 x 7	(6.3 x 2.8 x 0.28)

9TF0RX-006

Rear leaf spring

	Rear spring dimensions: Length x Width x Thickness mm (in)			
	Main		Auxiliary	
E	1,498 x 70 x 9	(59.0 x 2.8 x 0.35)	—	
	1,246 x 70 x 9	(49.1 x 2.8 x 0.35)		
	970 x 70 x 9	(38.2 x 2.8 x 0.35)		
	830 x 70 x 10	(32.7 x 2.8 x 0.39)		
	700 x 70 x 10	(27.6 x 2.8 x 0.39)		
	570 x 70 x 11	(22.4 x 2.8 x 0.43)		
	410 x 70 x 11	(16.1 x 2.8 x 0.43)		
	260 x 70 x 11	(10.2 x 2.8 x 0.43)		
F	1,506 x 70 x 10	(59.3 x 2.8 x 0.39)	950 x 70 x 12	(37.4 x 2.8 x 0.47)
	1,248 x 70 x 10	(49.1 x 2.8 x 0.39)	900 x 70 x 12	(35.4 x 2.8 x 0.47)
	880 x 70 x 10	(34.6 x 2.8 x 0.39)	900 x 70 x 12	(35.4 x 2.8 x 0.47)
	660 x 70 x 11	(26.0 x 2.8 x 0.43)	850 x 70 x 13	(33.5 x 2.8 x 0.51)
	380 x 70 x 11	(15.0 x 2.8 x 0.43)		
G	1,506 x 70 x 10	(59.3 x 2.8 x 0.39)	950 x 70 x 12	(37.4 x 2.8 x 0.47)
	1,253 x 70 x 10	(49.3 x 2.8 x 0.39)	900 x 70 x 12	(35.4 x 2.8 x 0.47)
	880 x 70 x 10	(34.6 x 2.8 x 0.39)	850 x 70 x 13	(33.5 x 2.8 x 0.51)
	660 x 70 x 11	(26.0 x 2.8 x 0.43)		
	380 x 70 x 11	(15.0 x 2.8 x 0.43)		
H	1,506 x 70 x 10	(59.3 x 2.8 x 0.39)	950 x 70 x 12	(37.4 x 2.8 x 0.47)
	1,253 x 70 x 10	(49.3 x 2.8 x 0.39)	900 x 70 x 12	(35.4 x 2.8 x 0.47)
	880 x 70 x 10	(34.6 x 2.8 x 0.39)	900 x 70 x 12	(35.4 x 2.8 x 0.47)
	660 x 70 x 11	(26.0 x 2.8 x 0.43)	850 x 70 x 13	(33.5 x 2.8 x 0.51)
	380 x 70 x 11	(15.0 x 2.8 x 0.43)		
I	1,506 x 70 x 10	(59.3 x 2.8 x 0.39)	950 x 70 x 13	(37.4 x 2.8 x 0.51)
	1,248 x 70 x 10	(49.1 x 2.8 x 0.39)	900 x 70 x 13	(35.4 x 2.8 x 0.51)
	940 x 70 x 10	(37.0 x 2.8 x 0.39)	900 x 70 x 13	(35.4 x 2.8 x 0.51)
	760 x 70 x 11	(30.0 x 2.8 x 0.43)	850 x 70 x 13	(33.5 x 2.8 x 0.51)
	520 x 70 x 11	(20.5 x 2.8 x 0.43)		
	300 x 70 x 11	(11.8 x 2.8 x 0.43)		

9TF0RX-007

Leaf Spring Applications

Engine	Body	Cabin	Cargo deck length (feet)	Cargo deck height/ Rear tire	Payload (ton)	Front	Rear
HA	Truck	Std	10	High/Single	1.5	A	E
SL	Truck	Wide	10	High/Double	2.0	B	G
SL	Crew cab	Wide	14	High/Double	2.75	B	H
SL	Truck	Wide	14	High/Double	3.0	C	F
SL TURBO	Truck	Wide	14	High/Double	4.0	D	I
SL TURBO	Truck	Wide	17	High/Double	4.0	D	I
SL TURBO	Truck	Wide	17	High/Double	4.0	D	I
TF	Crew cab	Wide	14	High/Double	3.5	D	I
TF	Truck	Wide	14	High/Double	4.0	D	I
TF	Truck	Wide	17	High/Double	4.0	D	I

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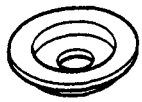
TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Body "rolls"	Malfunction of shock absorber	Replace	R–13, 18
Poor riding comfort	Malfunction of shock absorber Weak leaf spring	Replace Replace	R–13, 18 R–14, 19
Body leans	Malfunction of shock absorber Weak leaf spring	Replace Replace	R–13, 18 R–14, 19
Abnormal noise from suspension system	Looseness of peripheral connections Malfunction of shock absorber	Tighten Replace	— R–13, 18
General instability	Malfunction of shock absorber Improperly adjusted wheel alignment Steering system related problem Wheel and tire related problem	Replace Adjust — —	R–13, 18 R– 8 Section N Section Q
Steering feel heavy	Improperly adjusted wheel alignment Steering system related problem Wheel and tire related problem	Adjust — —	R– 8 Section N Section Q
Steering wheel pulls to one side	Weak leaf spring Improperly adjusted wheel alignment Steering system related problem Brake system related problem Wheel and tire related problem	Replace Adjust — — —	R–14, 19 R– 8 Section N Section P Section Q
"Shimmy" occurs (Steering wheel vibrates left/right)	Malfunction of shock absorber Loose shock absorber fastener Improperly adjusted wheel alignment Malfunction of wheel bearing Steering system related problem Wheel and tire related problem	Replace Tighten Adjust Replace — —	R–13, 18 R–13, 18 R– 8 Section M Section N Section Q
Poor steering wheel return	Improperly adjusted wheel alignment Steering system related problem Wheel and tire related problem	Adjust — —	R– 8 Section N Section Q

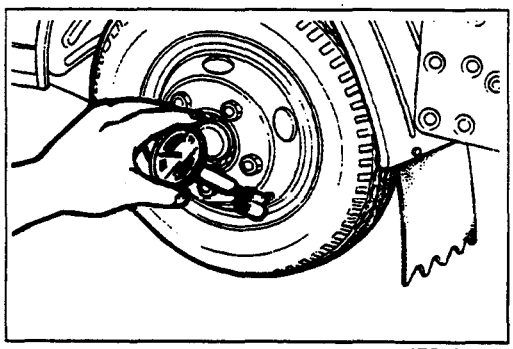
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WHEEL ALIGNMENT

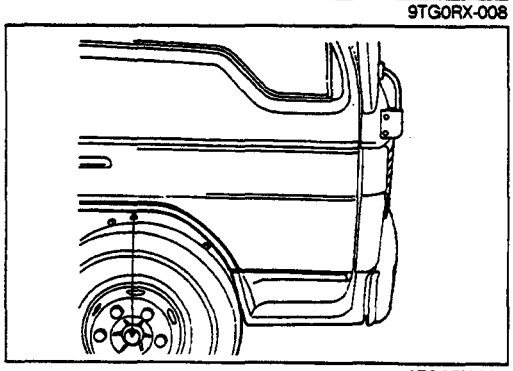
PREPARATION
SST

49 0559 605A Adapter, caster/ camber gauge		For adjustment of wheel alignment

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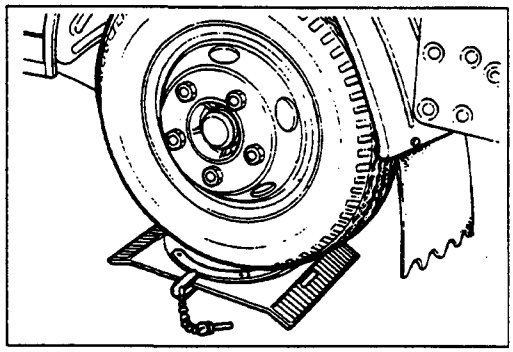
9TG0RX-008



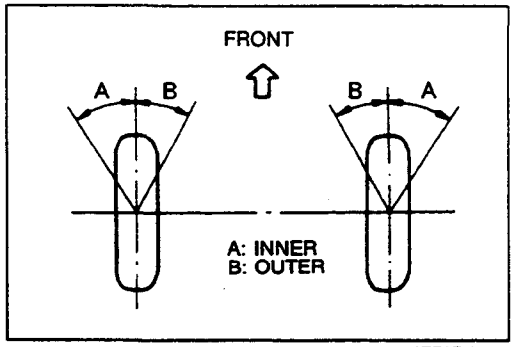
9TG0RX-009

PREINSPECTION

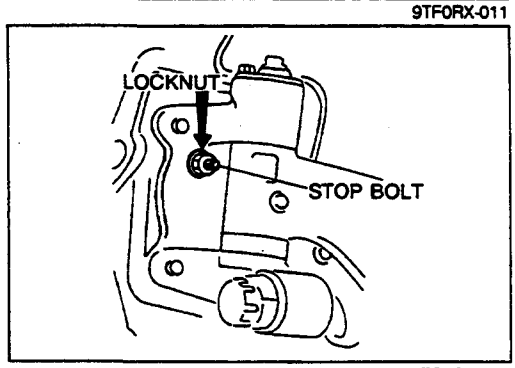
1. Locate the vehicle on level ground in an unloaded condition and set the wheels straight-ahead.
2. Check the tire inflation and bring to recommended pressure.
3. Inspect the front wheel bearing play and correct it if necessary.
4. Inspect the wheel and tire runout.
5. Shake the vehicle and check the operation of the shock absorber.
6. Verify that the difference between the left and right sides of the vehicle (from the fender brim to the center of the wheel) is less than 15mm (0.59 in).



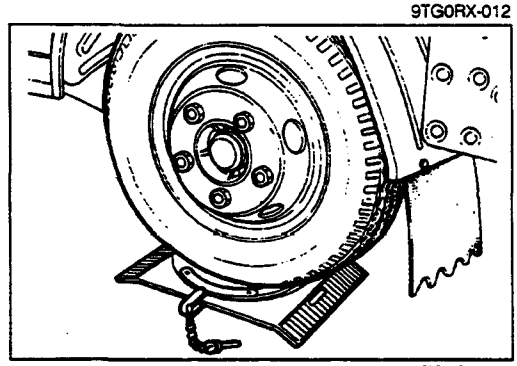
9TG0RX-010



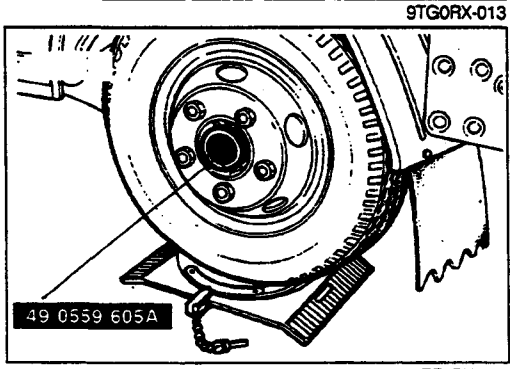
9TF0RX-011



9TG0RX-012



9TG0RX-013



9TF0RX-012

FRONT WHEEL ALIGNMENT

Steering Angle

Inspection

1. Lock the turning-radius gauge at 0° position.
2. Place the front wheels on the turning-radius gauge at the center, then unlock the gauge.

Note

- **When using a portable turning-radius gauge, place a suitable stands under the rear wheels to keep the vehicle level.**

3. Check the steering angle.

Standard steering angle:

	10 feet cargo deck	14 and 17 feet cargo deck
	Standard cabin	Wide cabin
Inner	38° ± 2°	42° ± 2°
Outer	29° ± 2°	31° ± 2°

Adjustment

1. Loosen the steering stop bolt locknut.
2. Turn the stop bolt and adjust the steering angle.
3. Tighten the stop bolt locknut to the specified torque.

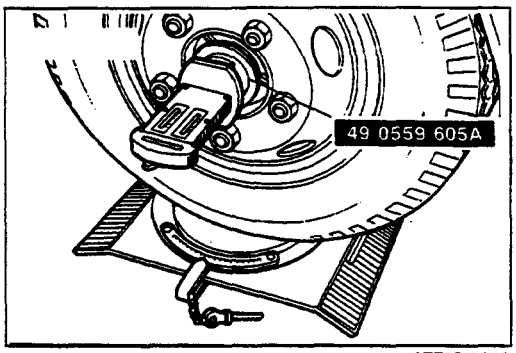
Tightening torque:
59—88 N·m (6—9 m-kg, 43—65 ft-lb)

Camber/Caster/King-pin Angle

Inspection

1. Place the front wheels on the turning-radius gauge.

2. Remove the wheel cap.
3. Attach the **SST** to the wheel hub.



9TF0RX-013

4. Attach the caster/camber gauge to the **SST** and measure the camber, caster, and king-pin angle.

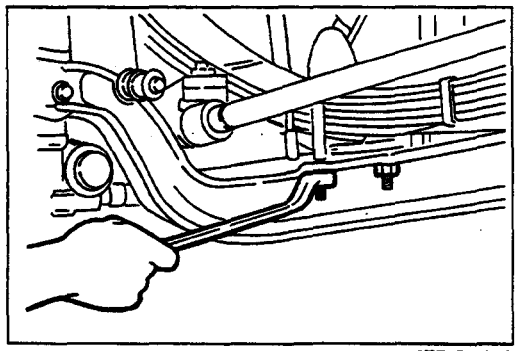
Standard angle
Camber angle : 0°40' ± 30'
Caster angle : 2°30' ± 20'
King-pin angle: 7°00'

Adjustment (Caster)

Caution
- **Adjustment of the camber and king-pin angles are not possible. Check the king-pin and front axle component parts and repair or replace them if necessary.**

1. Jack up the front axle and support the front frame with safety stands.

Warning
- **Support the front axle with the jack.**

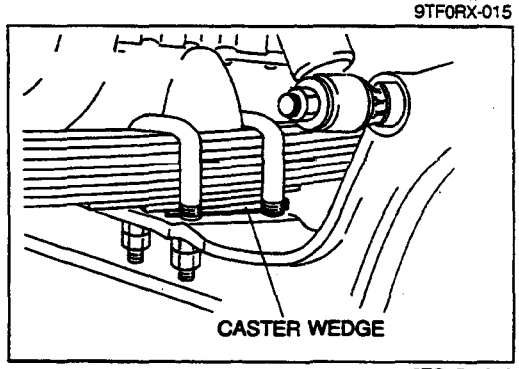

9TF0RX-015

2. Remove the leaf spring U-bolts.

9TF0RX-014

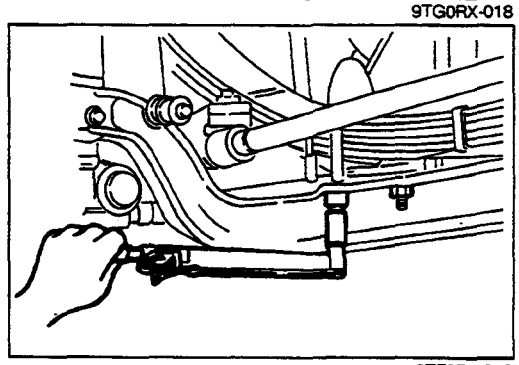
3. Lower the front axle and replace the caster wedge.

Caster wedge	
Part No.	**Change of Angle**
W023 34 142A	0°20'
W023 34 143A	0°50'
W023 34 144A	1°20'
W023 34 145A	1°50'
W023 34 146A	2°20'
W023 34 147A	2°50'



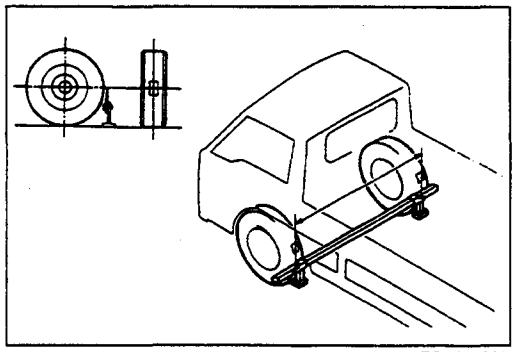
9TG0RX-018

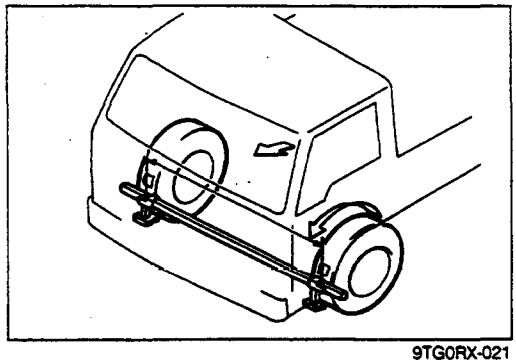
Caution
- **When installing the caster wedge, face the thicker end toward the rear.**
- **Use only one caster wedge can be installed on one side.**

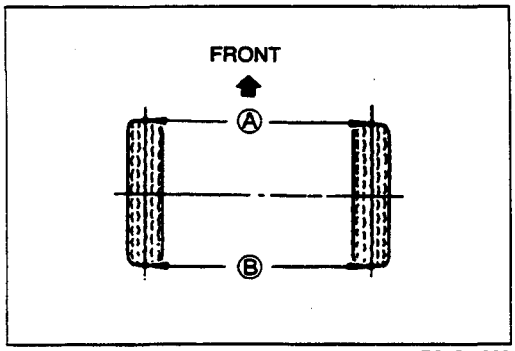

9TF0RX-016

4. Install the U bolt.
5. Lower the vehicle and tighten the U-bolt to the specified torque.

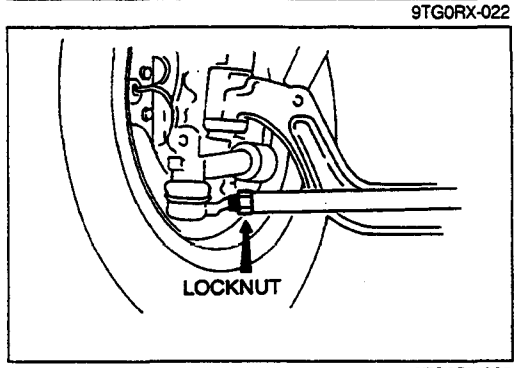
Tightening torque:
118—147 N·m (12—15 m-kg, 87—108 ft-lb)


9TG0RX-020

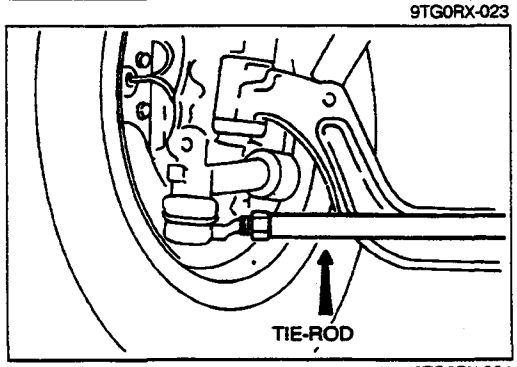

9TG0RX-021



9TG0RX-022



9TG0RX-023



9TG0RX-024

Total Toe-in
Inspection

1. Shake the vehicle to stabilize the vehicle height.
2. Place a toe-in gauge at the rear of the front tires and align the height of the gauge with the center of the front wheels.
3. Mark the tires in the center of the tire tread at the rear of the wheels.
4. Measure the distance between marks (B).
5. Push the vehicle forward to turn the front wheels 180°.
6. Measure the distance between the marks now toward the front of the vehicle (A).
7. If the difference between B and A is not as specified, adjust the toe-in.

Total toe-in: 3 ± 3mm (0.12 ± 0.12 in)

Adjustment

1. Loosen the tie-rod locknuts.

Note
- **The right tie-rod locknut is left-hand threaded.**

2. Turn the left and right tie-rods equally to adjust the toe-in.

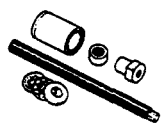
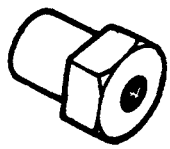
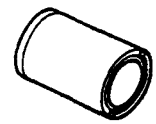
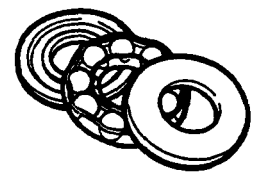
Note
- **To increase the toe-in, turn both tie-rods toward the rear.**
- **One turn of both tie-rods changes the toe-in about 3mm (0.12 in).**

3. Tighten the tie-rod locknuts to the specified torque.

Tightening torque:
88—118 N·m (9—12 m-kg, 65—87 ft-lb)

FRONT SUSPENSION (LEAF SPRING)

PREPARATION
SST

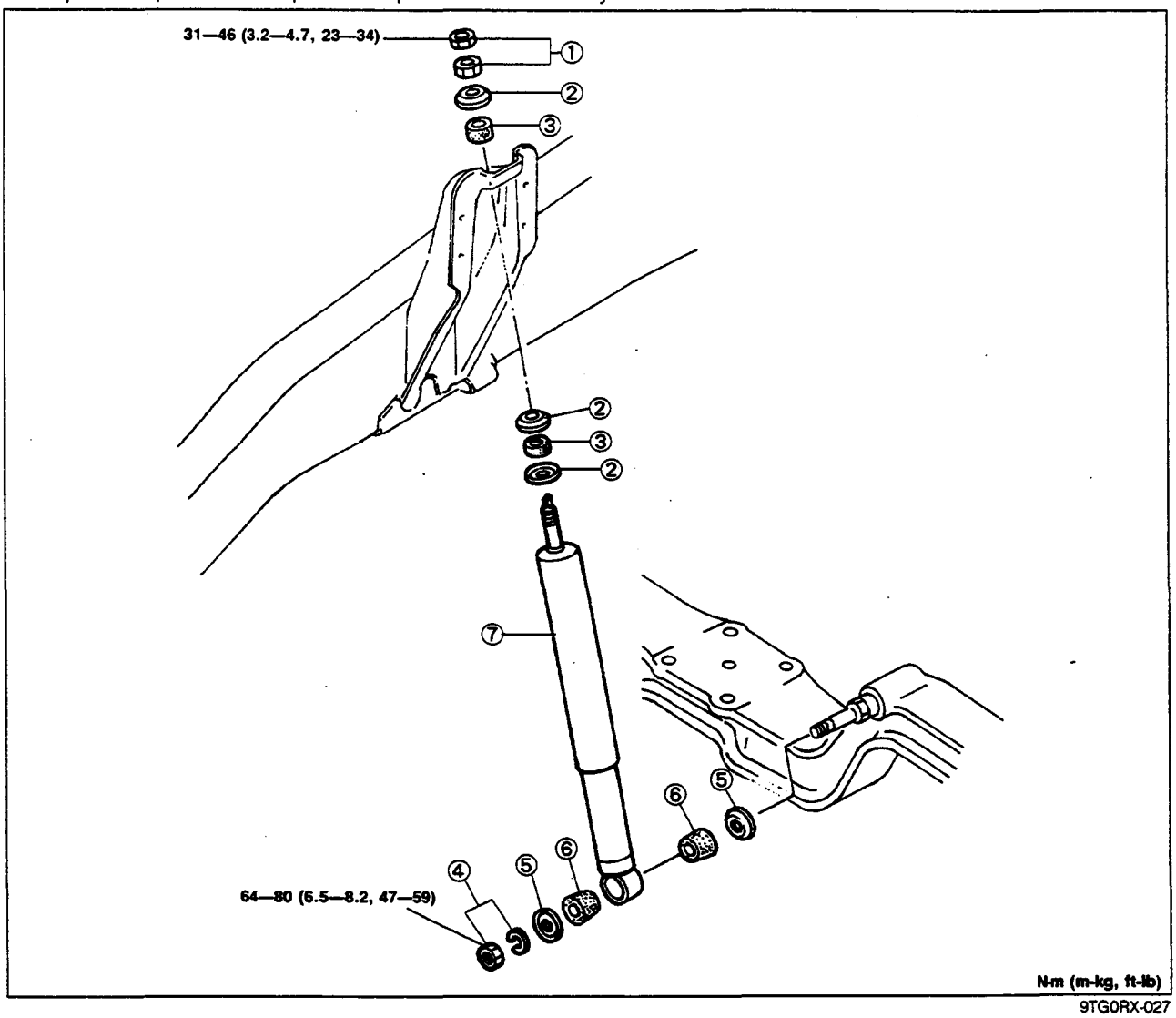
49 W038 0A0 Installer set, shackle pin bushing 	For removal and installation of shackle pin bushing	49 W038 001 Shaft (Part of 49 W038 0A0) 	For removal and installation of shackle pin bushing
49 W038 002 Nut (Part of 49 W038 0A0) 	For removal and installation of shackle pin bushing	49 W038 003 Support block (Part of 49 W038 0A0) 	For removal and installation of shackle pin bushing
49 W038 004 Attachment (Part of 49 W038 0A0) 	For removal and installation of shackle pin bushing	49 W038 005 Bearing (Part of 49 W038 0A0) 	For removal and installation of shackle pin bushing

9TF0RX-017

FRONT SHOCK ABSORBER

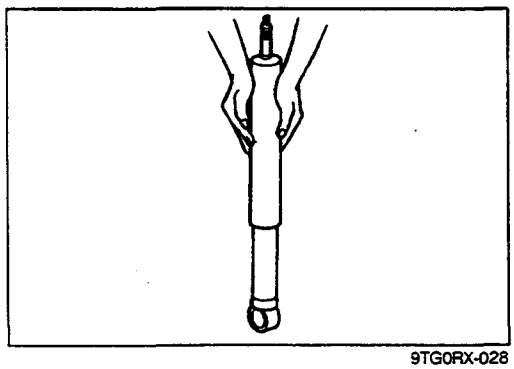
Removal / Inspection / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Inspect all parts and repair or replace as necessary.



9TG0RX-027

1. Nut
2. Retainer
3. Bushing
   Inspect for damage and deterioration
4. Nut and washer
5. Retainer
6. Bushing
   Inspect for damage and deterioration
7. Shock absorber
   Inspection..... below



9TG0RX-028

Inspection

Shock absorber

Check for the following and replace as necessary.

(1) Oil leakage from shock absorbers

(2) Poor operation of shock absorbers

① Depress the shock absorbers several times to check for no binding or noise.

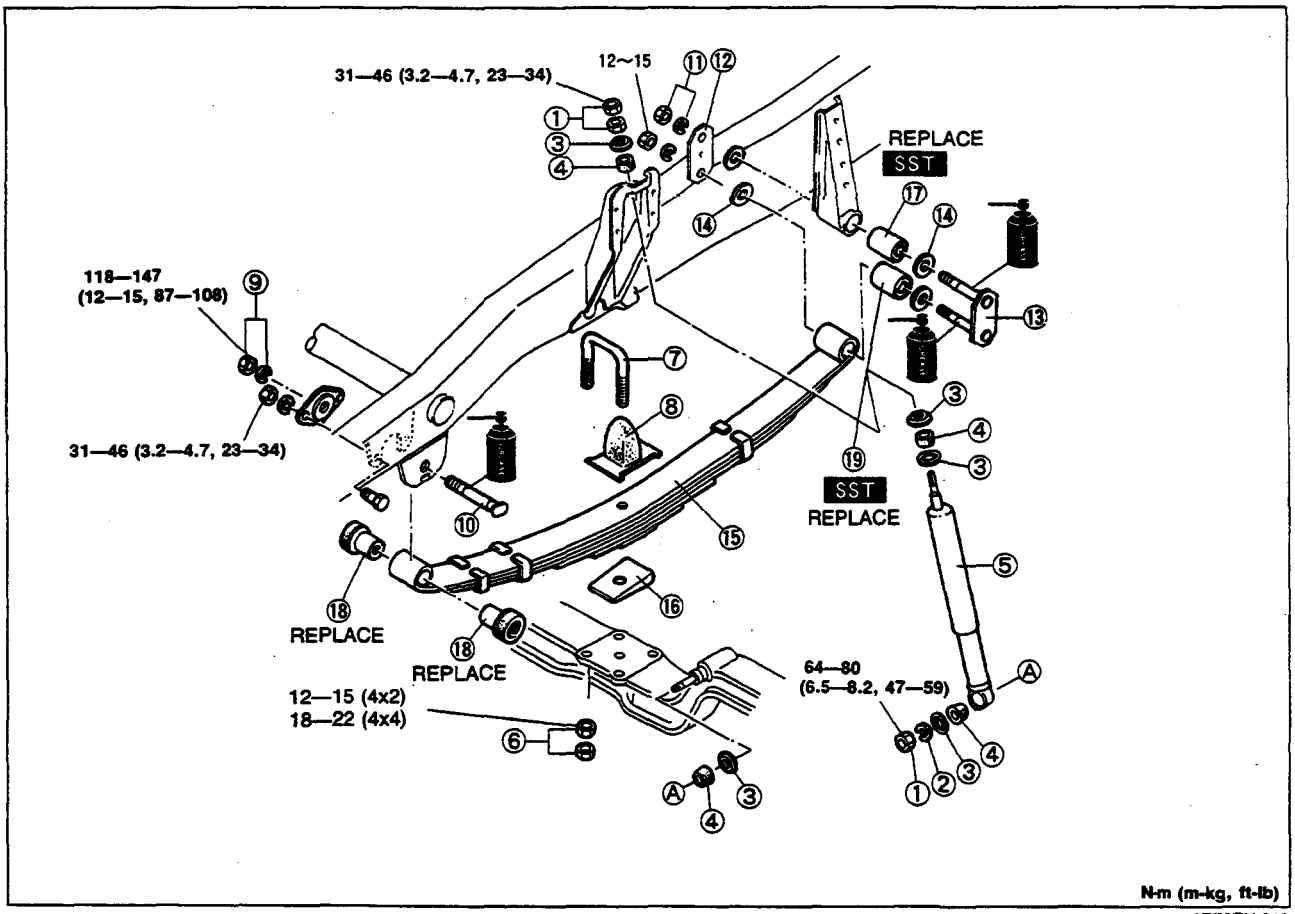
FRONT LEAF SPRING

Removal / Inspection / Installation

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the front wheels.
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. Inspect all parts and repair or replace as necessary.
6. After installation, check the front wheel alignment. (Refer to page R–8.)

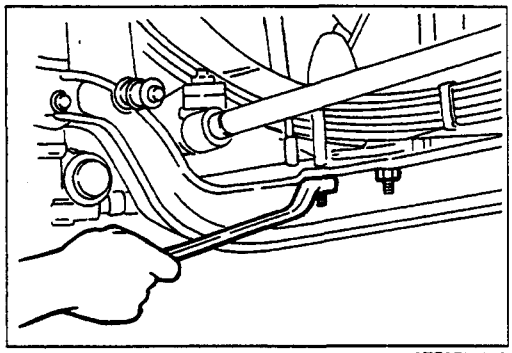
Caution

- **Tighten the mounting nuts of the shackle pin and spring pin to the specified torque with the vehicle lowered and in an unladen condition.**



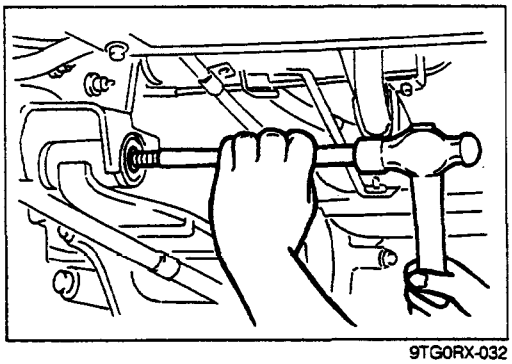
9TF0RX-018

1. Nut
2. Washer
3. Retainer
4. Bushing
   Inspect for damage and deterioration
5. Shock absorber
6. Nut
7. U-bolt
   Removal note ..... page R–15
8. Bound stop
   Inspect for damage and deterioration
9. Nut and washer
10. Spring pin
    Removal note ..... page R–15
11. Nut and washer
12. Shackle plate
13. Shackle pin
    Removal note ..... page R–15
14. Thrust washer
15. Leaf spring assembly
    Inspect for weakness of spring
16. Caster wedge
    Installation note ..... page R–16
17. Shackle pin bushing
    Removal note ..... page R–15
    Installation note ..... page R–16
18. Spring bushing (Front)
    Removal note ..... page R–15
    Installation note ..... page R–16
19. Spring bushing (Rear)
    Removal note ..... page R–15
    Installation note ..... page R–16



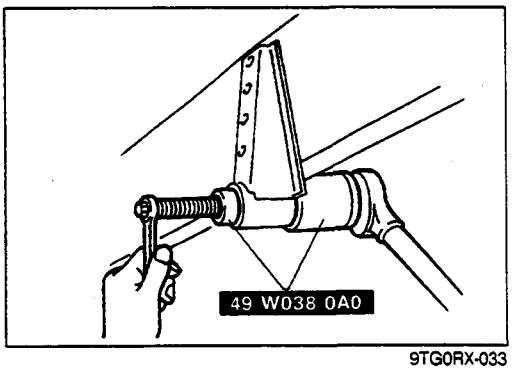
9TF0RX-019

Removal note
U-bolt
1. Jack up the front axle.
2. Remove the U-bolt mounting nuts.
3. Remove the U-bolt and the bound stop.
4. Lower the front axle.



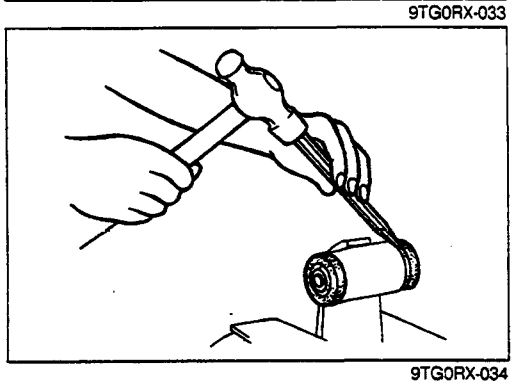
9TG0RX-032

Spring pin and shackle pin
1. Remove the spring pin and shackle pin with a brass bar.



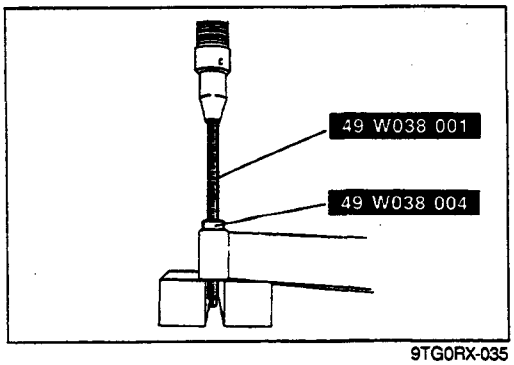
9TG0RX-033

Shackle pin bushing
1. Remove the shackle pin bushing from the frame with the **SST**.



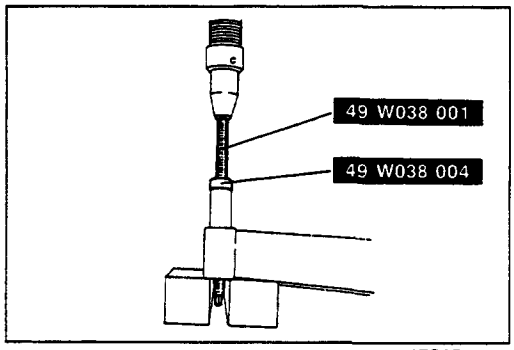
9TG0RX-034

Spring bushings (Front side)
1. Remove one side of the bushing with a chisel.
2. Remove the remaining bushing with a suitable pipe.



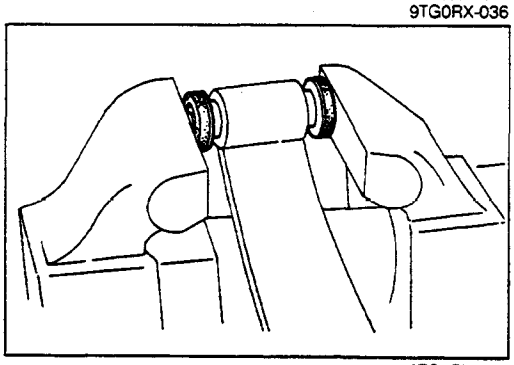
9TG0RX-035

Spring bushing (Rear side)
1. Remove the bushing with the **SST** and a press.



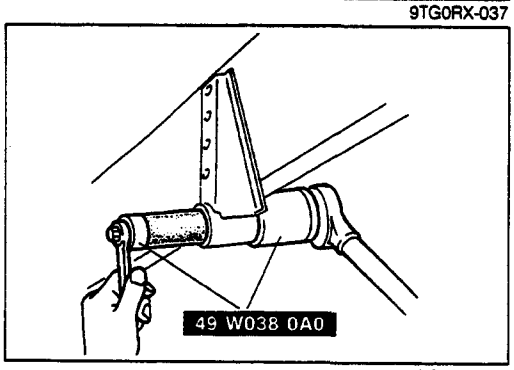
9TG0RX-036

Installation note
Sring bushing (Rear side)
1. Install the bushing with the **SST** and a press.



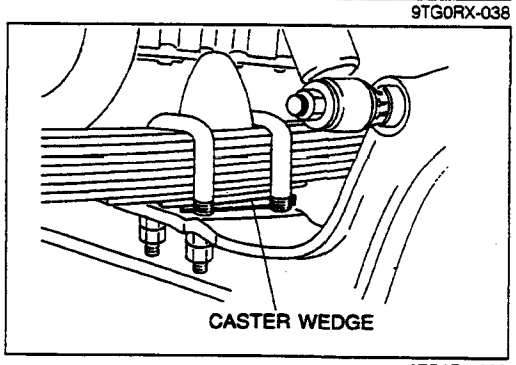
9TG0RX-037

Spring bushings (Front side)
1. Install the bushings with a vise.



9TG0RX-038

Shackle pin bushing
1. Install the new bushing into the frame with the **SST**.

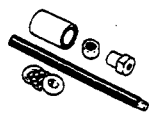
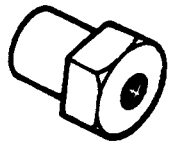
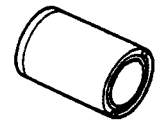
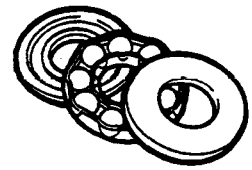


9TG0RX-039

Caster wedge
1. Install the caster wedge with the thicker side facing toward rear.

REAR SUSPENSION (LEAF SPRING)

PREPARATION
SST

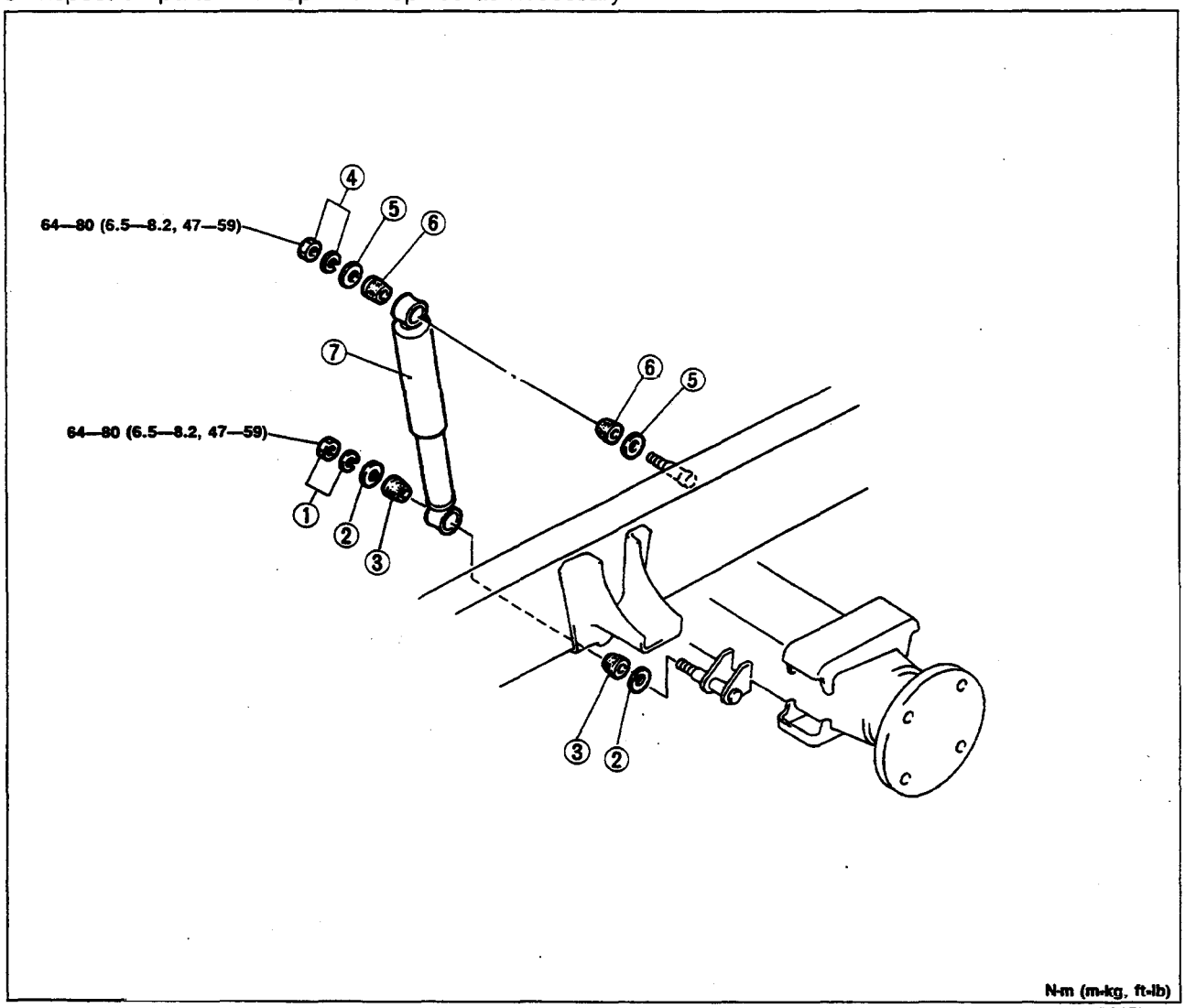
49 W038 0A0 Installer, shackle pin bushing 	For removal and installation of shackle pin bushing	49 W038 001 Shaft (Part of 49 W038 0A0) 	For removal and installation of shackle pin bushing
49 W038 002 Nut (Part of 49 W038 0A0) 	For removal and installation of shackle pin bushing	49 W038 003 Support block (Part of 49 W038 0A0) 	For removal and installation of shackle pin bushing
49 W038 004 Attachment (Part of 49 W038 0A0) 	For removal and installation of shackle pin bushing	49 W038 005 Bearing (Part of 49 W038 0A0) 	For removal and installation of shackle pin bushing

9TG0RX-056

REAR SHOCK ABSORBER

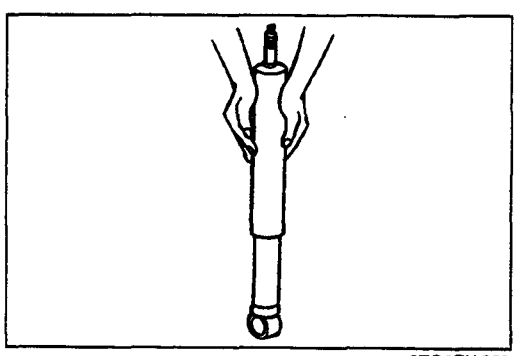
Removal / Inspection / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Inspect all parts and repair or replace as necessary.



9TG0RX-057

1. Nut and washer
2. Retainer
3. Bushing
   Inspect for damage and deterioration
4. Nut and washer
5. Retainer
6. Bushing
   Inspect for damage and deterioration
7. Shock absorber
   Inspection..... below



9TG0RX-058

Inspection

Shock absorber

Check for the following and replace parts as necessary.

(1) Oil leakage from shock absorbers

(2) Poor operation of the absorbers

① Depress the shock absorbers several times to check for no binding or noise.

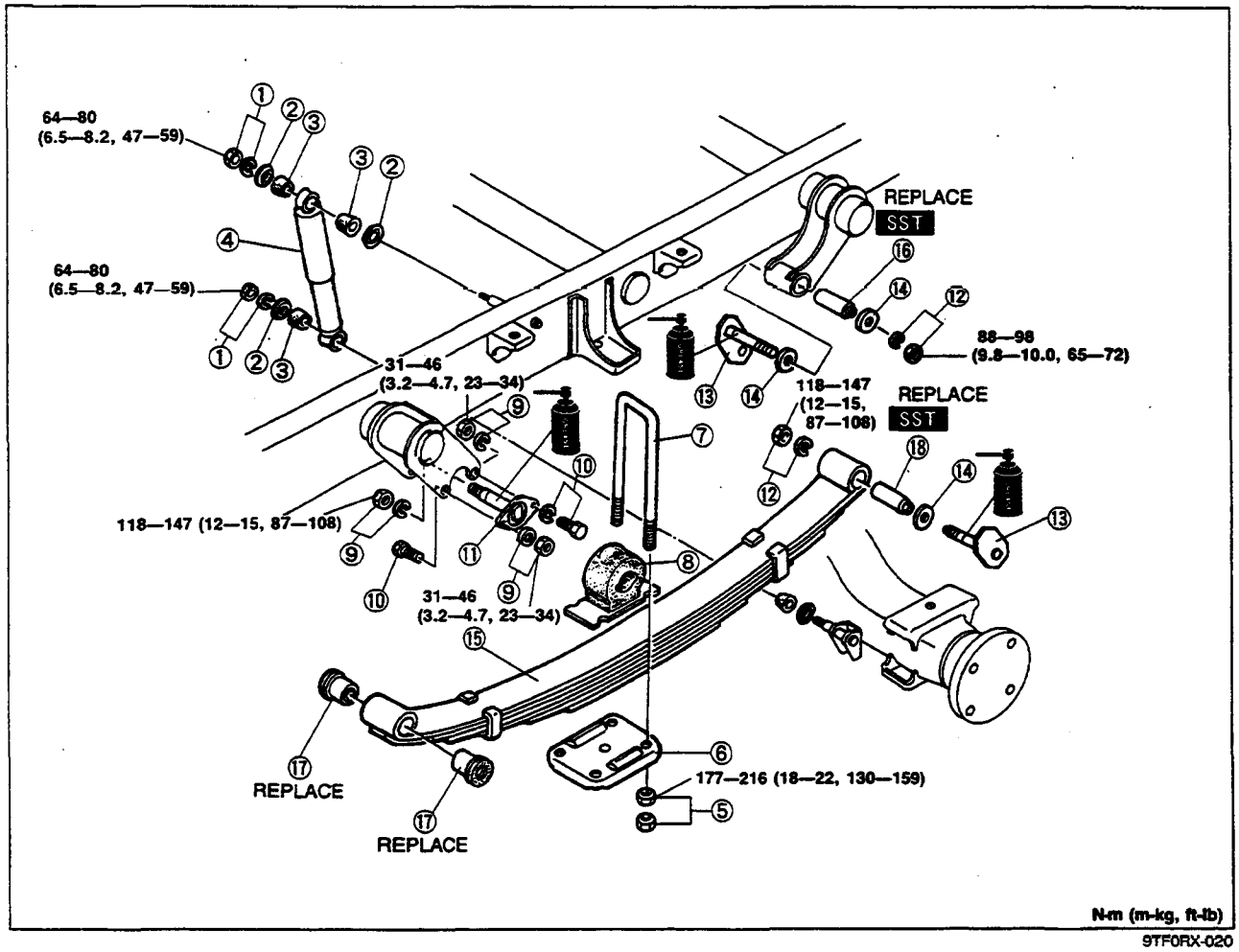
REAR LEAF SPRING

Removal / Inspection / Installation

1. Jack up the rear of the vehicle and support it with safety stands.
2. Remove the wheels.
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. Inspect all parts and repair or replace as necessary.

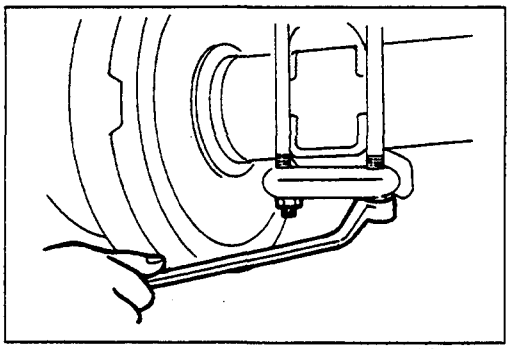
Caution

- **Tighten the mounting nuts of the shackle pin and spring pin to the specified torque with the vehicle lowered and in an unladen condition.**



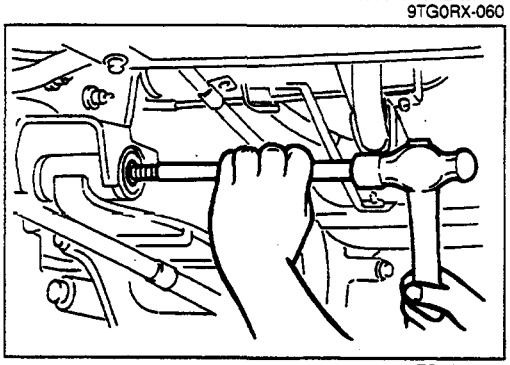
9TF0RX-020

1. Nut and washer
2. Retainer
3. Bushing
   Inspect for damage and deterioration
4. Shock absorber
5. Nut
6. Spring clamp
7. U-bolt
   Removal note ..... page R–20
8. Bound stop
   Inspect for damage and deterioration
9. Nut and washer
10. Bolt and washer
11. Spring pin
    Removal note ..... page R–20
12. Nut and washer
13. Shackle pin
    Removal note ..... page R–20
14. Thrust washer
15. Leaf spring assembly
    Inspect for weakness of spring
16. Shackle pin bushing
    Removal note ..... page R–20
    Installation note ..... page R–21
17. Spring bushing (front)
    Removal note ..... page R–20
    Installation note ..... page R–21
18. Spring bushing (rear)
    Removal note ..... page R–20
    Installation note ..... page R–21



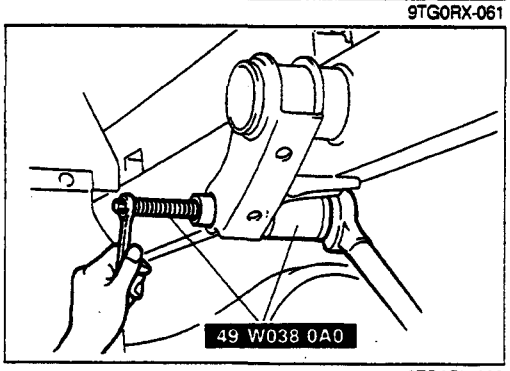
9TG0RX-060

Removal note
U-bolt
1. Jack up the rear axle.
2. Remove the U-bolt mounting nuts.
3. Remove the U-bolts and bound stops.
4. Lower the rear axle.



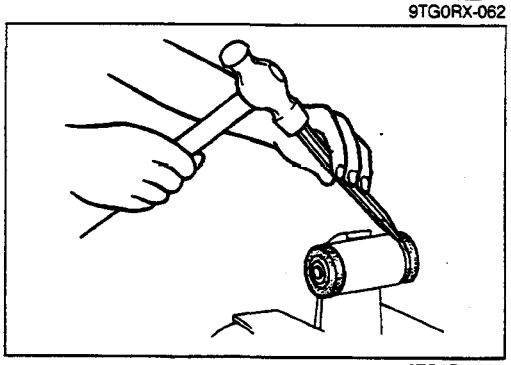
9TG0RX-061

Spring pin and shackle pin
1. Remove the spring pin and shackle pin with a brass bar.



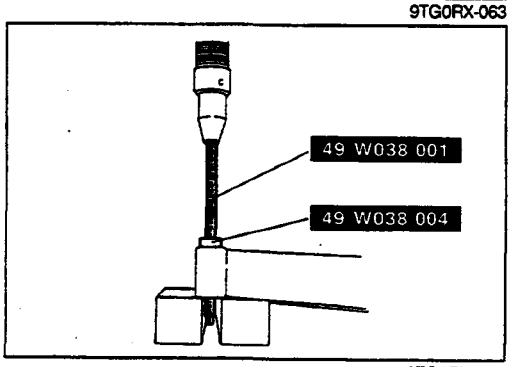
9TG0RX-062

Shackle pin bushing
1. Remove the shackle pin bushing from the frame with the **SST**.



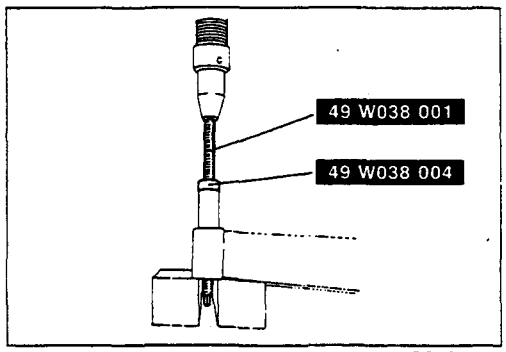
9TG0RX-063

Spring bushings (Front side)
1. Remove one side of the bushing with a chisel.
2. Remove the remaining bushing with a suitable pipe.



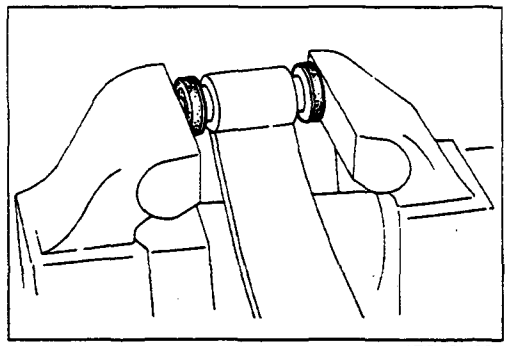
9TG0RX-064

Spring bushing (Rear side)
1. Remove the bushing with the **SST** and a press.



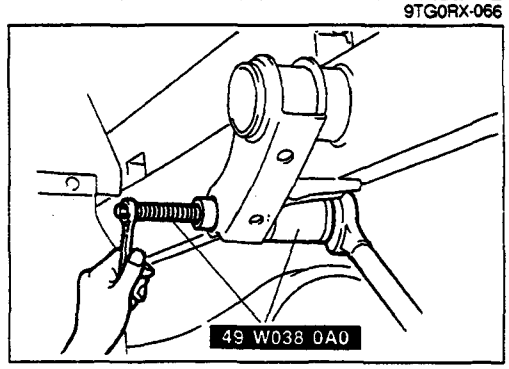
9TG0RX-065

Installation note
Spring bushing (Rear side)
1. Install the new bushing with the **SST** and a press.



9TG0RX-066

Spring bushing (Front side)
1. Install the new rubber bushing with a vise.



9TG0RX-067

Shackle pin bushing
1. Install the new bushing into the frame with the **SST**.

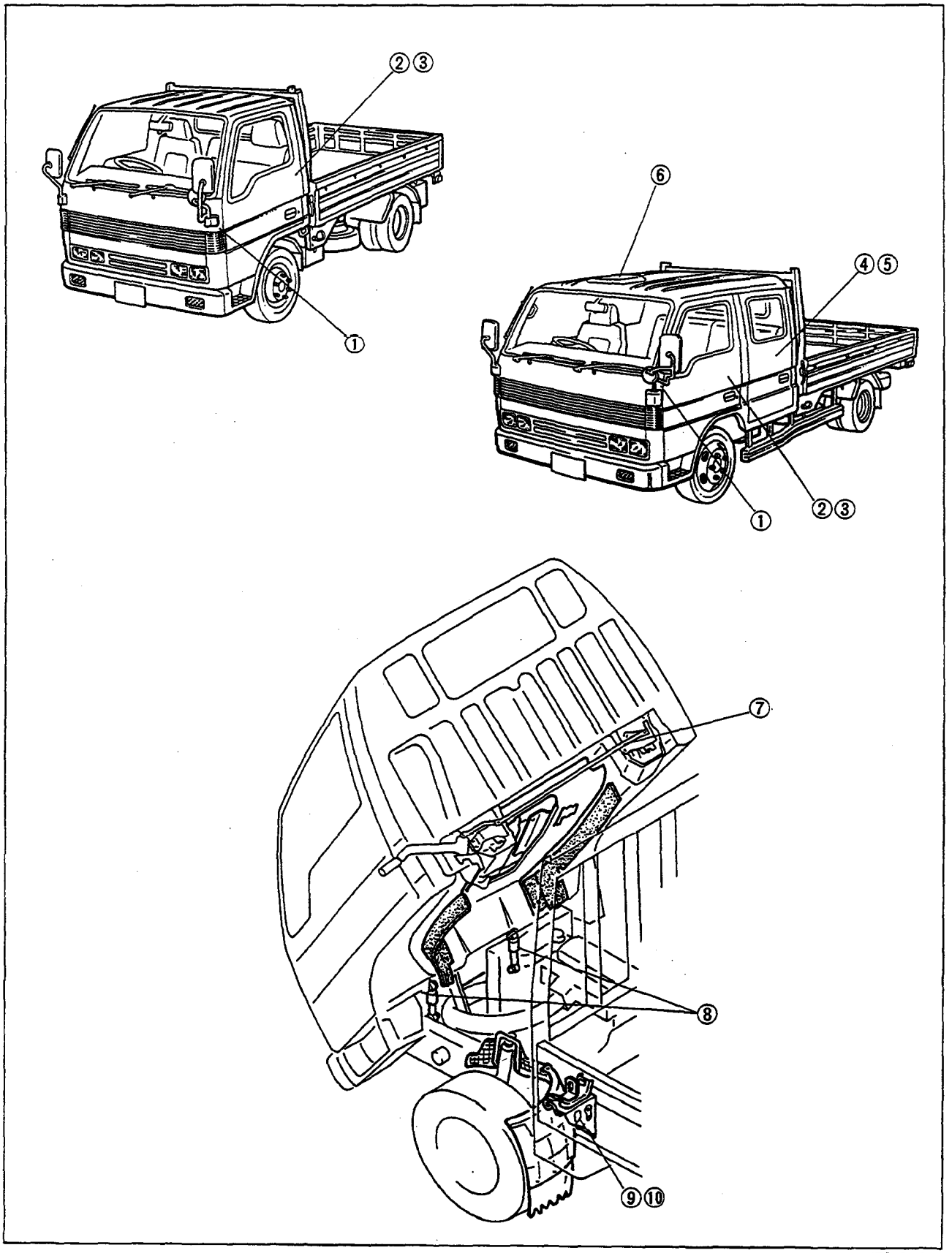
BODY

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FRONT DOOR ..... **S– 8**
FRONT WINDOW REGULATOR AND GLASS **S–10**
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9TG0SX-001

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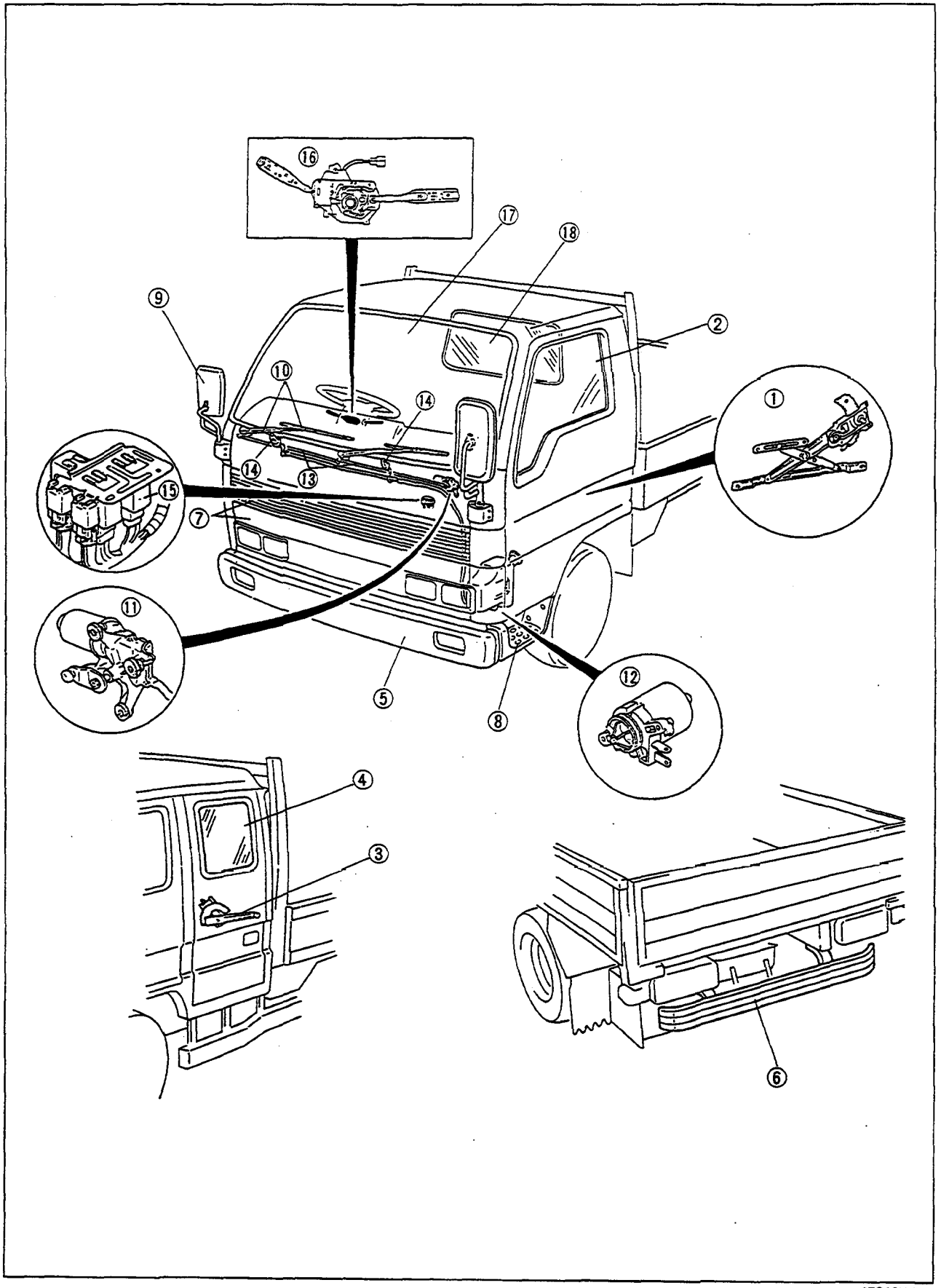


9TG0SX-002

1. Front fender panel
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2. Front door
Removal / Installation ..... page S– 8
Adjustment ..... page S– 9
3. Front door lock and opener
Removal / Installation ..... page S–12
4. Rear door
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5. Rear door lock and opener
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10. Rear cabin mount (without damper)
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9TG0SX-003

EXTERIOR

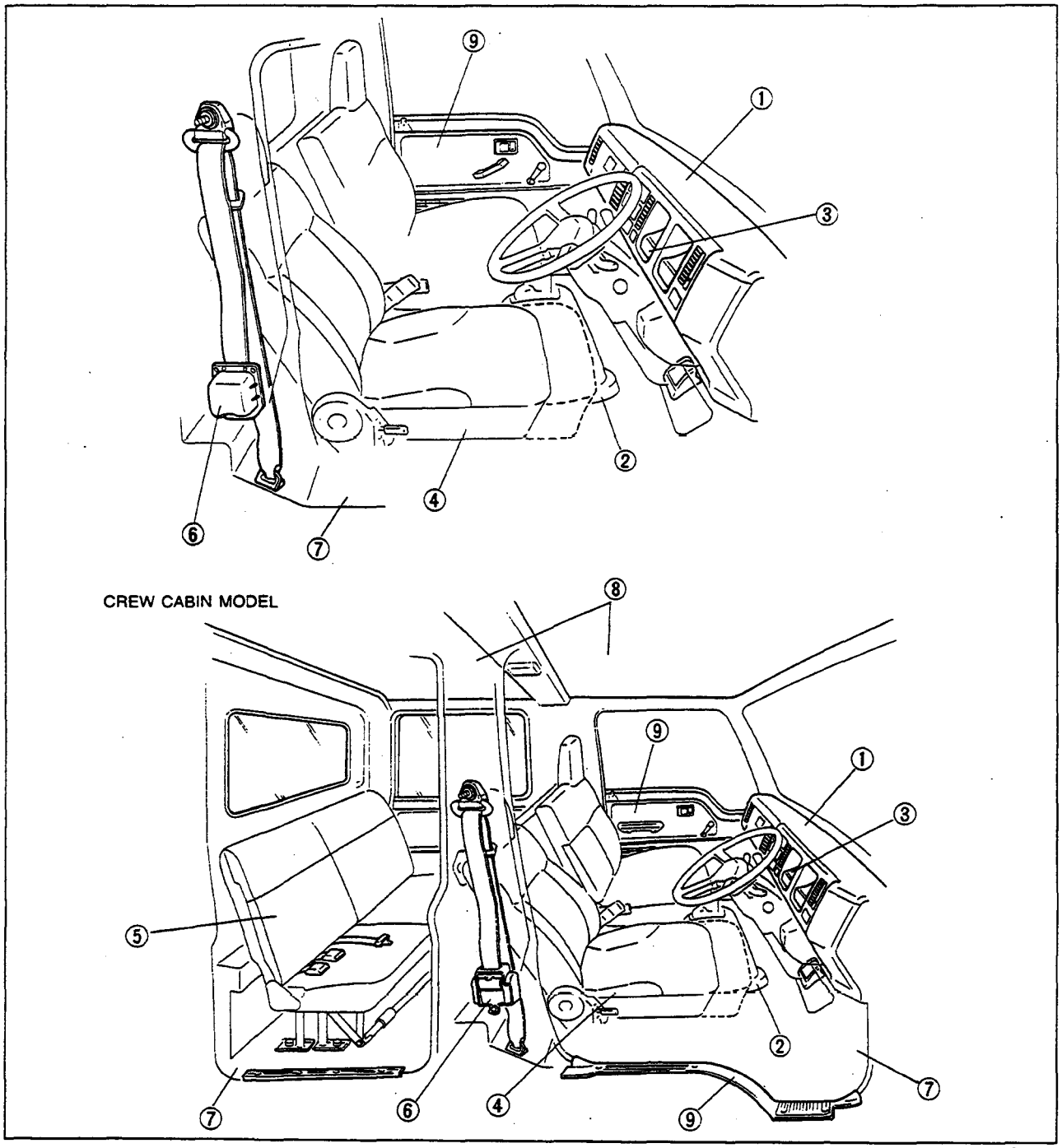


9TG0SX-004

1. Front window regulator
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2. Front window glass
Removal / Installation ..... page S–10
3. Rear window regulator
Removal / Installation ..... page S–15
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Removal / Installation ..... page S–29
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14. Washer nozzle
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17. Windshield
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9TG0SX-005

INTERIOR



9TG0SX-006

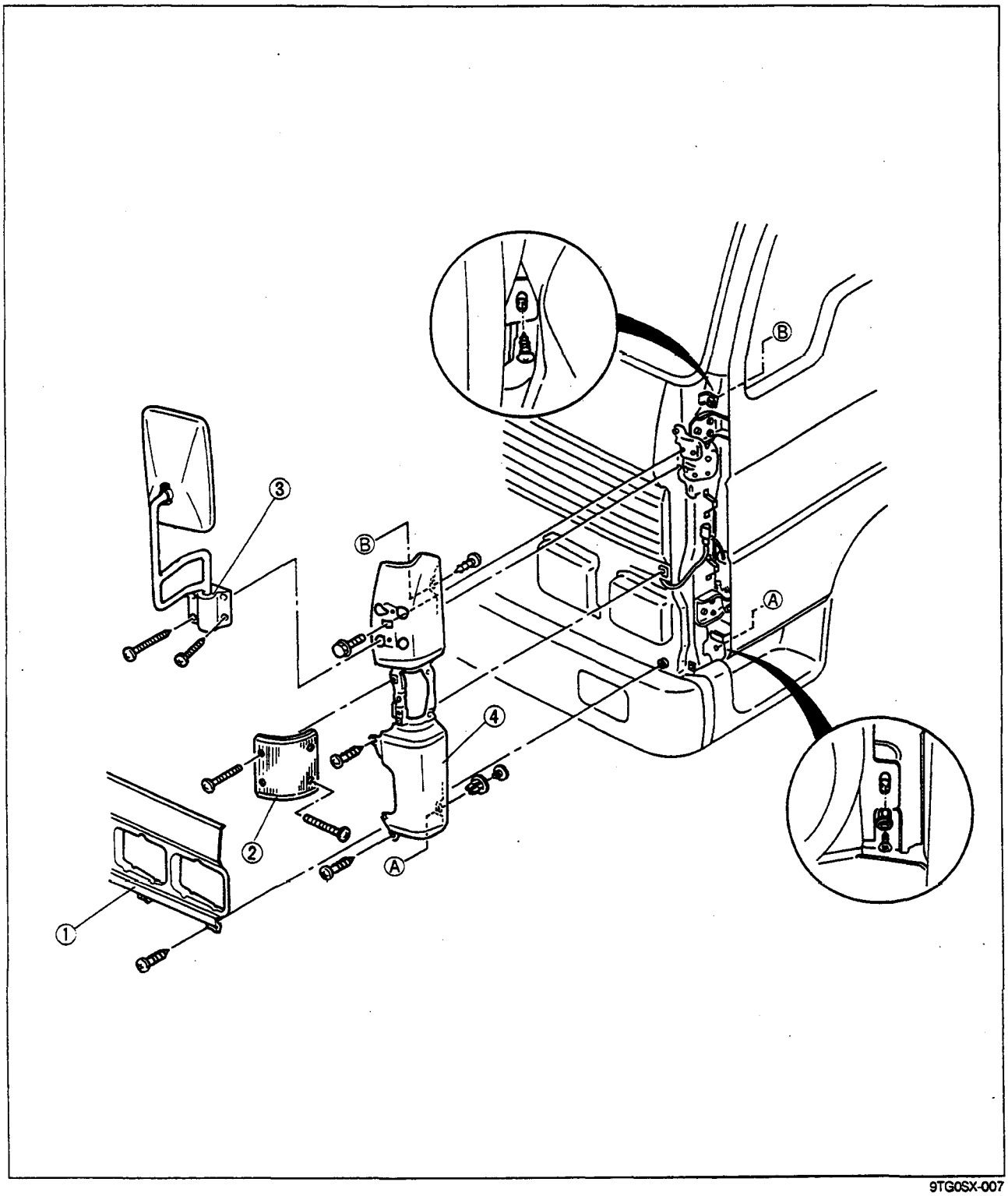
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   Removal / Installation ..... page S–50
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   Installation ..... page S–65
9. Trim
   Removal / Installation ..... page S–68

FRONT FENDER PANEL

COMPONENTS

Removal / Installation

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



9TG0SX-007

1. Radiator grille
2. Front combination light
3. Mirror
4. Front fender panel

FRONT DOOR

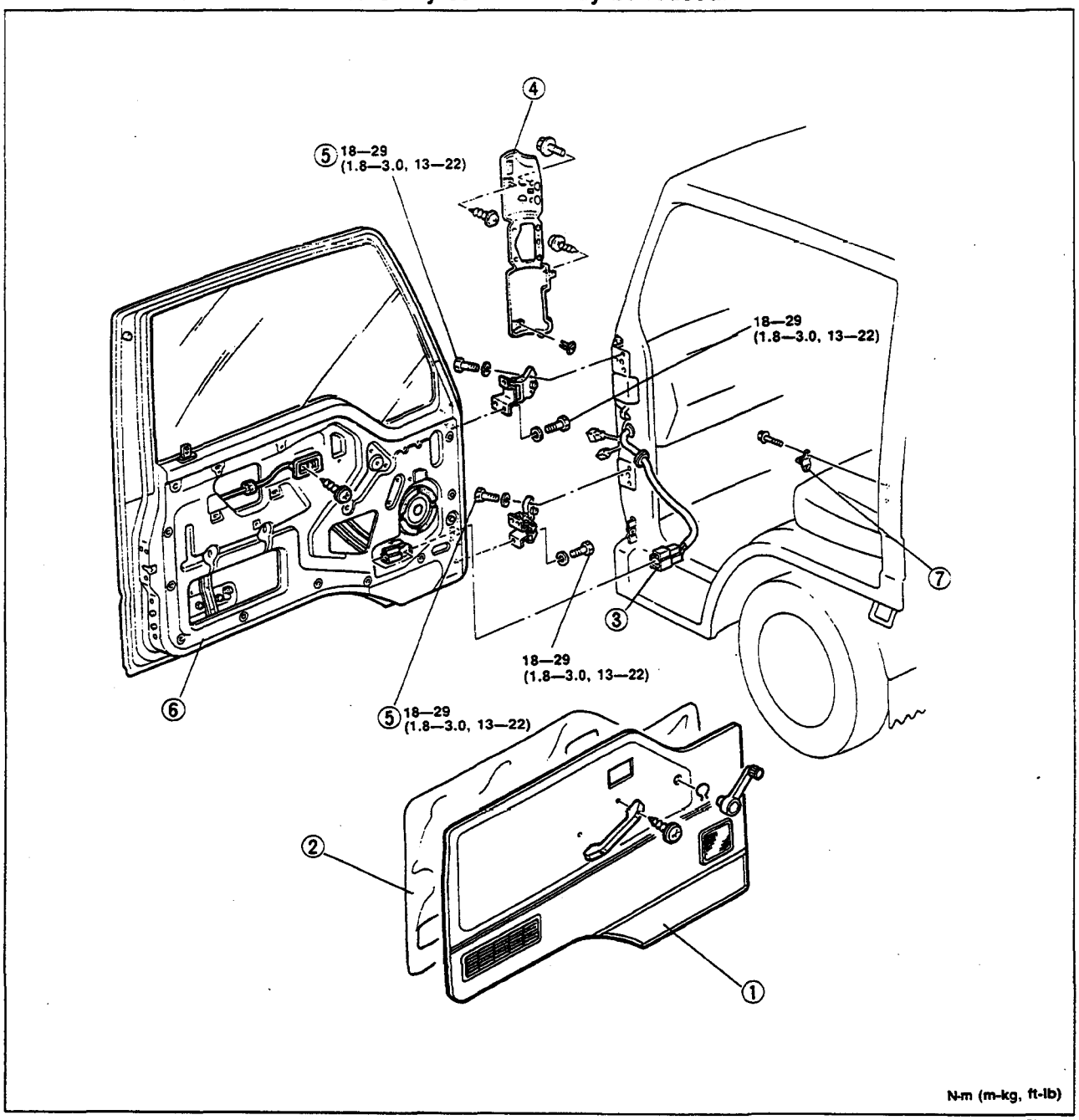
COMPONENTS

Removal / Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal, referring to **Installation Note**.

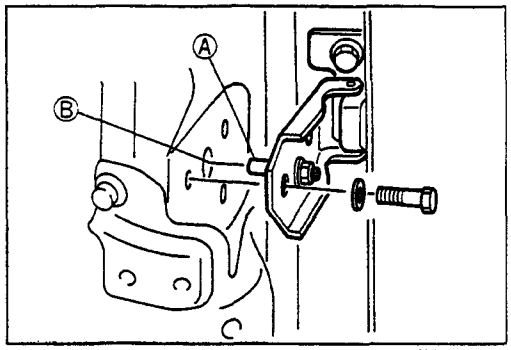
Caution

- **Remove the door screen carefully so that it may be reused.**

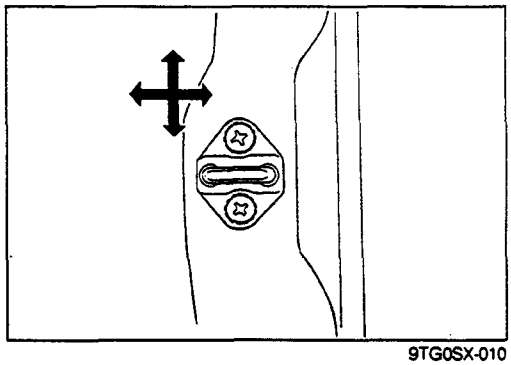


9TG0SX-008

1. Trim (with door speaker model)
2. Door screen (with door speaker model)
3. Connector (door speaker)
4. Front fender panel
5. Bolt
6. Front door
   - Installation Note ..... page S–9
   - Adjustment ..... page S–9
7. Door lock striker
   - Adjustment ..... page S–9



9TG0SX-009


9TG0SX-010

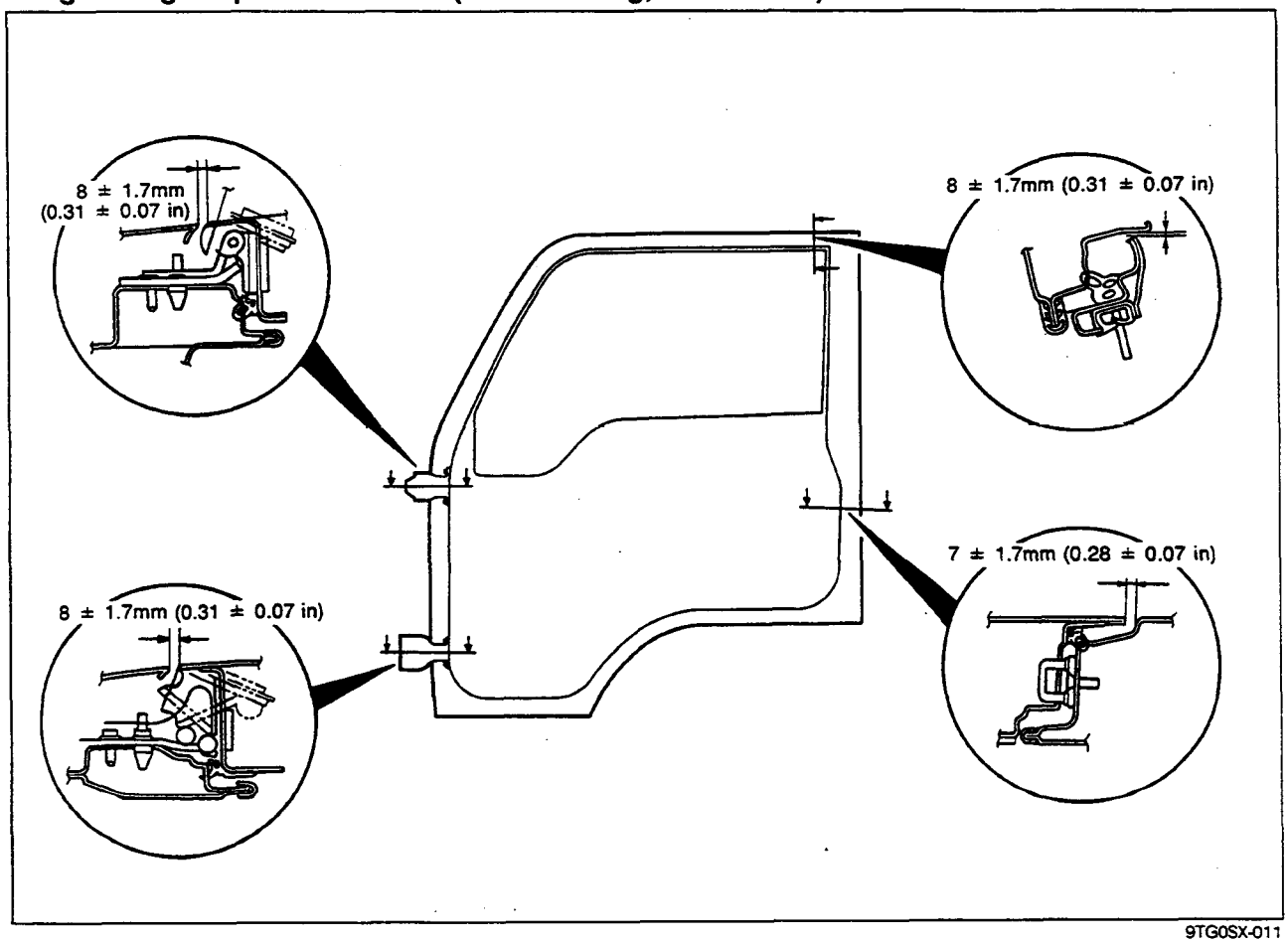
Installation note
Front door
1. Align the pin and install the front door.

Adjustment
Door lock striker
1. Check if the door can be closed easily and whether there is any looseness. If there is a problem, loosen the striker mounting screws and adjust by moving the striker down or laterally.
2. Check the rear offset of the door to the body or rear door (crew cabin). If there is a problem, adjust by moving the door lock striker laterally.

Tightening torque:
18—26 N·m (1.8—2.7 m-kg, 13—20 ft-lb)

Front door
1. Loosen the hinge bolts and adjust as shown in the figure.

Tightening torque: 18—29 N·m (1.8—3.0 m-kg, 13—22 ft-lb)



9TG0SX-011

FRONT WINDOW REGULATOR AND GLASS

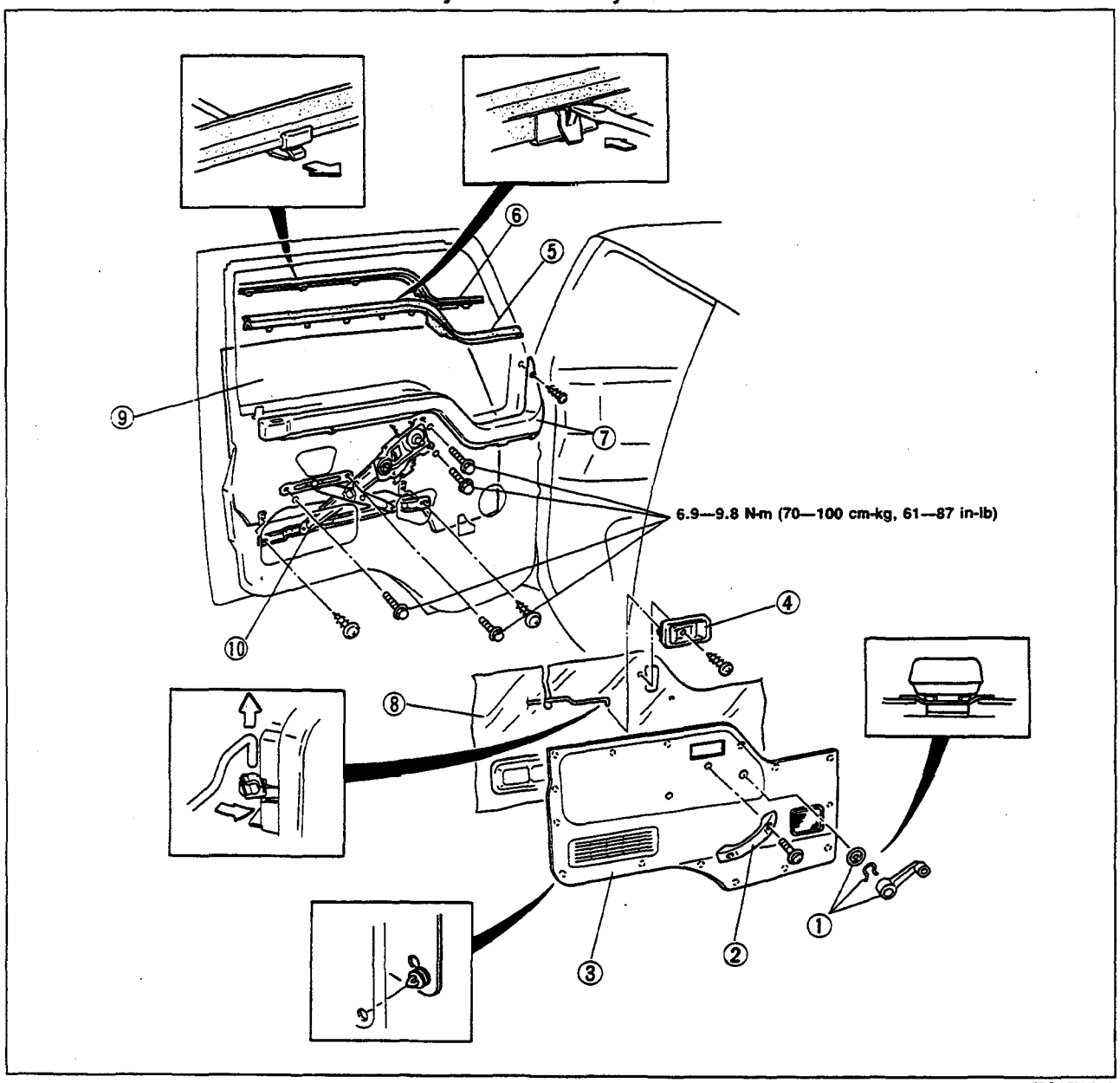
COMPONENTS

Removal / Installation

1. Raise the door glass **approx. 115mm (4.53 in)** from the fully open 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.

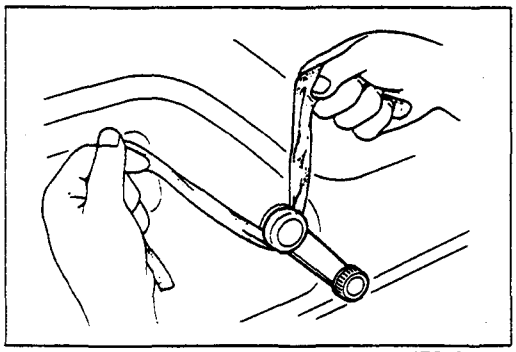
Caution

- **Remove the door screen carefully so that it may be reused.**

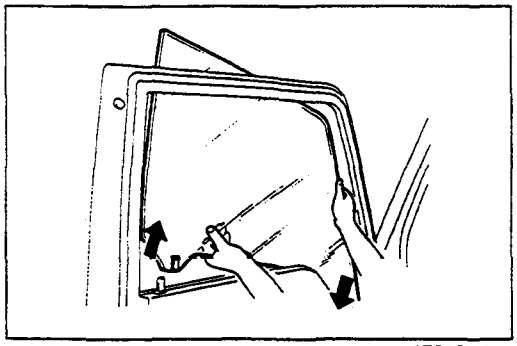


9TG0SX-012

1. Regulator handle
   Removal Note..... page S–11
2. Armrest
3. Door trim
4. Inner handle
5. Inner weatherstrip
6. Outer weatherstrip
7. Cover
8. Door screen
9. Front door glass
   Removal Note..... page S–11
10. Window regulator



9TG0SX-013



9TG0SX-014

Removal note

Regulator handle

1. Remove the regulator handle with a rag as shown in the figure.

Front door glass

1. Remove the door glass from the door while lifting the rear of the glass.

FRONT DOOR LOCK AND OPENER

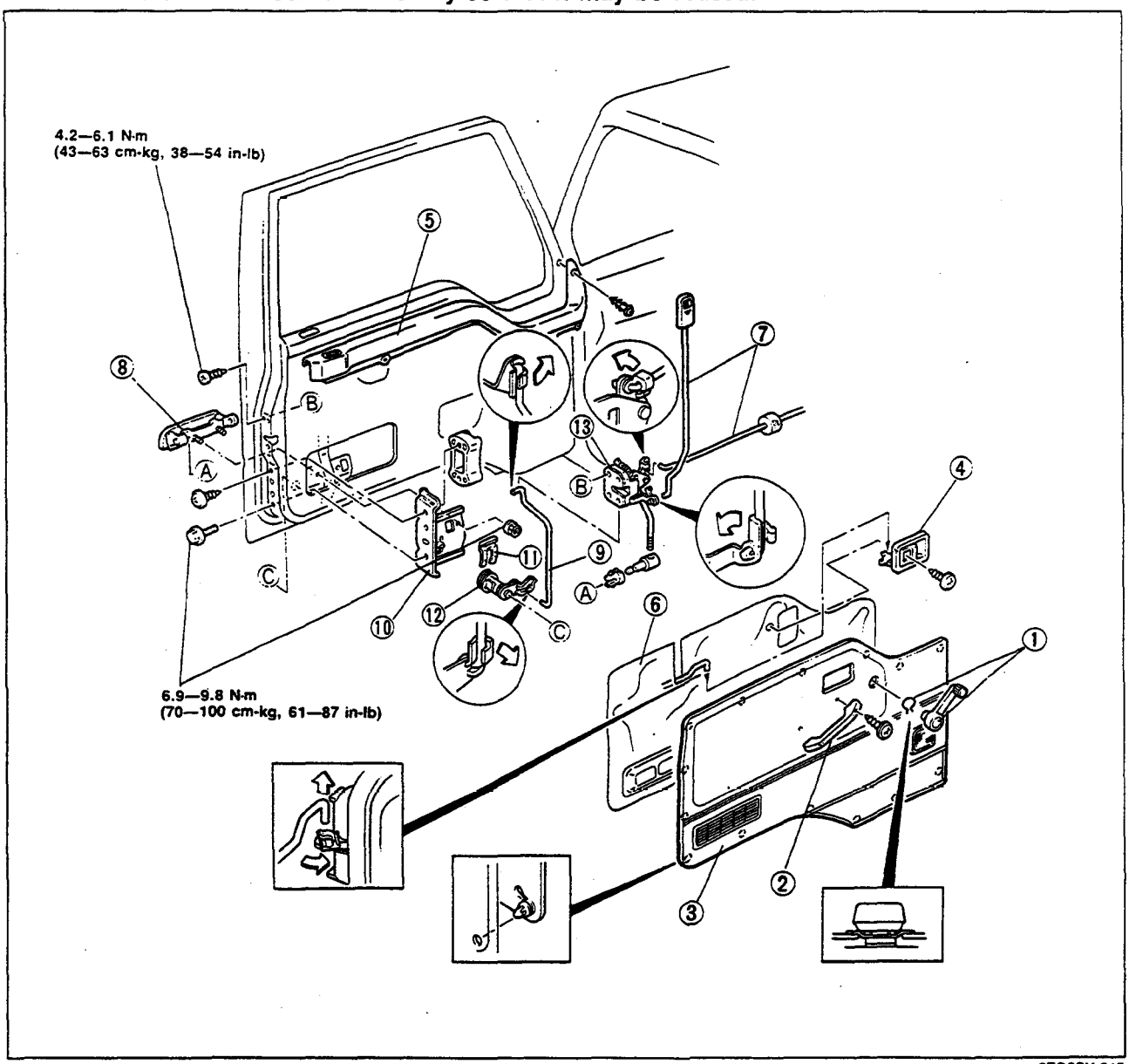
COMPONENTS

Removal / Installation

1. Raise the door glass fully.
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.

Caution

- **Remove the door screen carefully so that it may be reused.**



9TG0SX-015

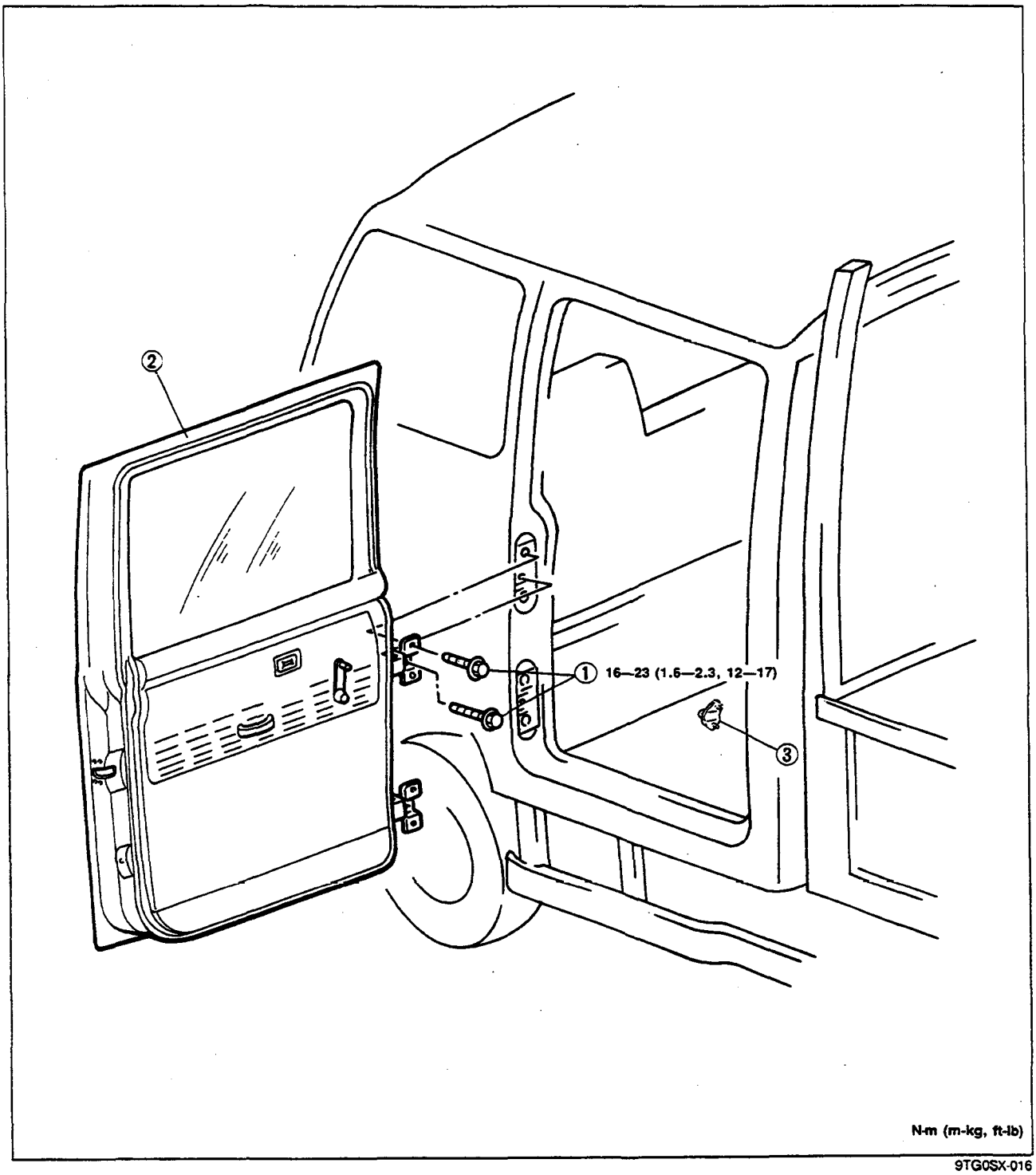
1. Regulator handle
   Removal Note..... page S–11
2. Armrest
3. Door trim
4. Inner handle
5. Cover
6. Door screen
7. Opener link
8. Outer door handle
9. Door lock link
10. Bracket
11. Lock cylinder retainer
12. Lock cylinder
13. Door lock assembly

REAR DOOR

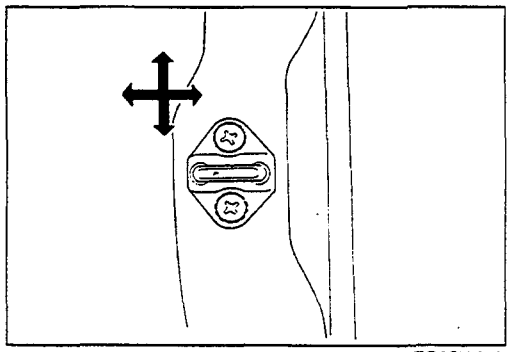
COMPONENTS

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.



1. Bolt
2. Rear door
   Adjustment..... page S–14
3. Door lock striker
   Adjustment..... page S–14



9TG0SX-017

Adjustment

Door lock striker

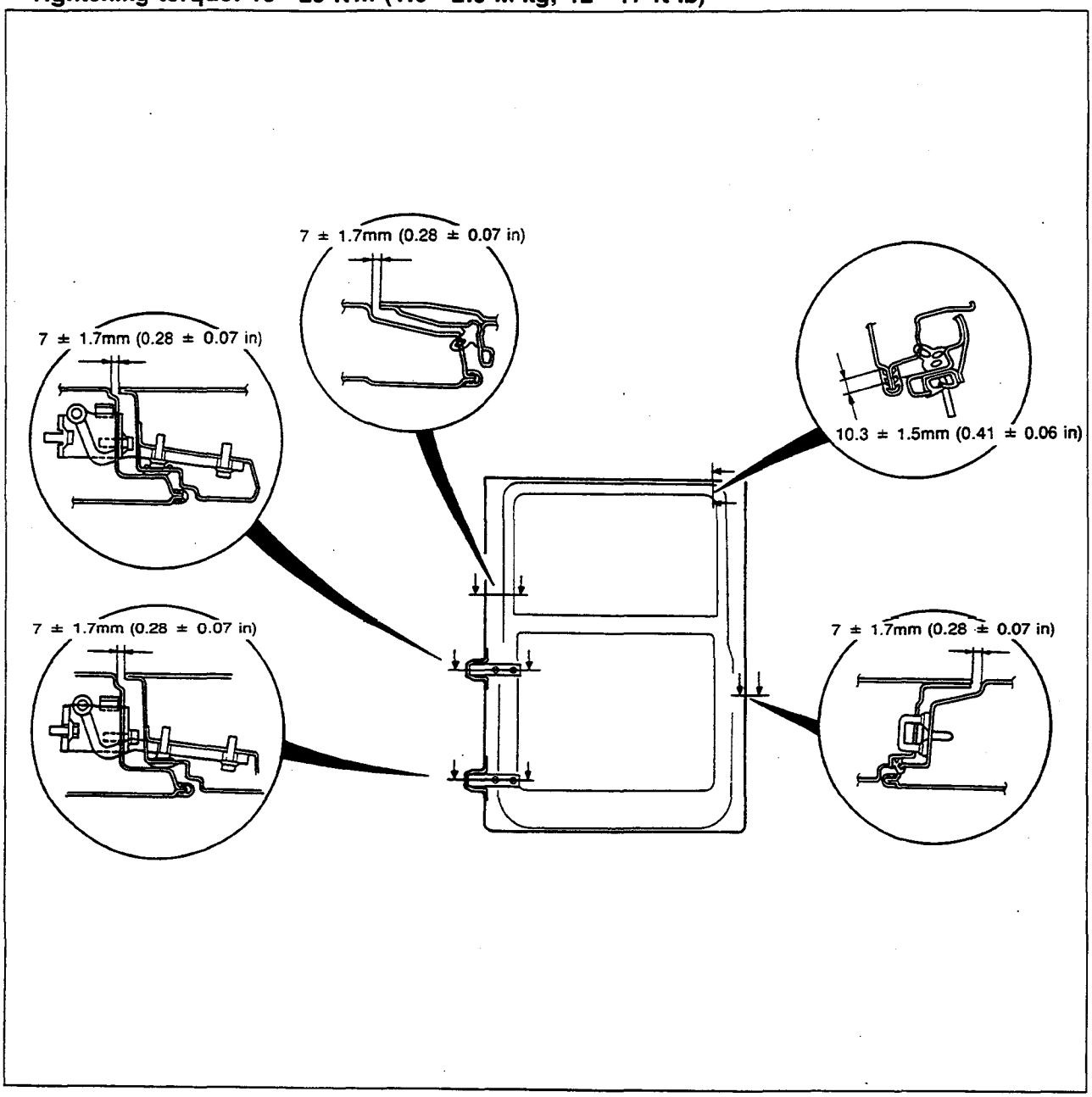
1. Check if the door can be closed easily and whether there is any looseness. If there is a problem, loosen the striker mounting screws and adjust by moving the striker down or laterally.
2. Check the rear offset of the door to the body or front door (crew cabin). If there is a problem, adjust by moving the door lock striker laterally.

Tightening torque:
18—26 N·m (1.8—2.7 m-kg, 13—20 ft-lb)

Rear door

1. Loosen the hinge bolts and adjust as shown in the figure.

Tightening torque: 16—23 N·m (1.6—2.3 m-kg, 12—17 ft-lb)



9TG0SX-018

REAR WINDOW REGULATOR AND GLASS

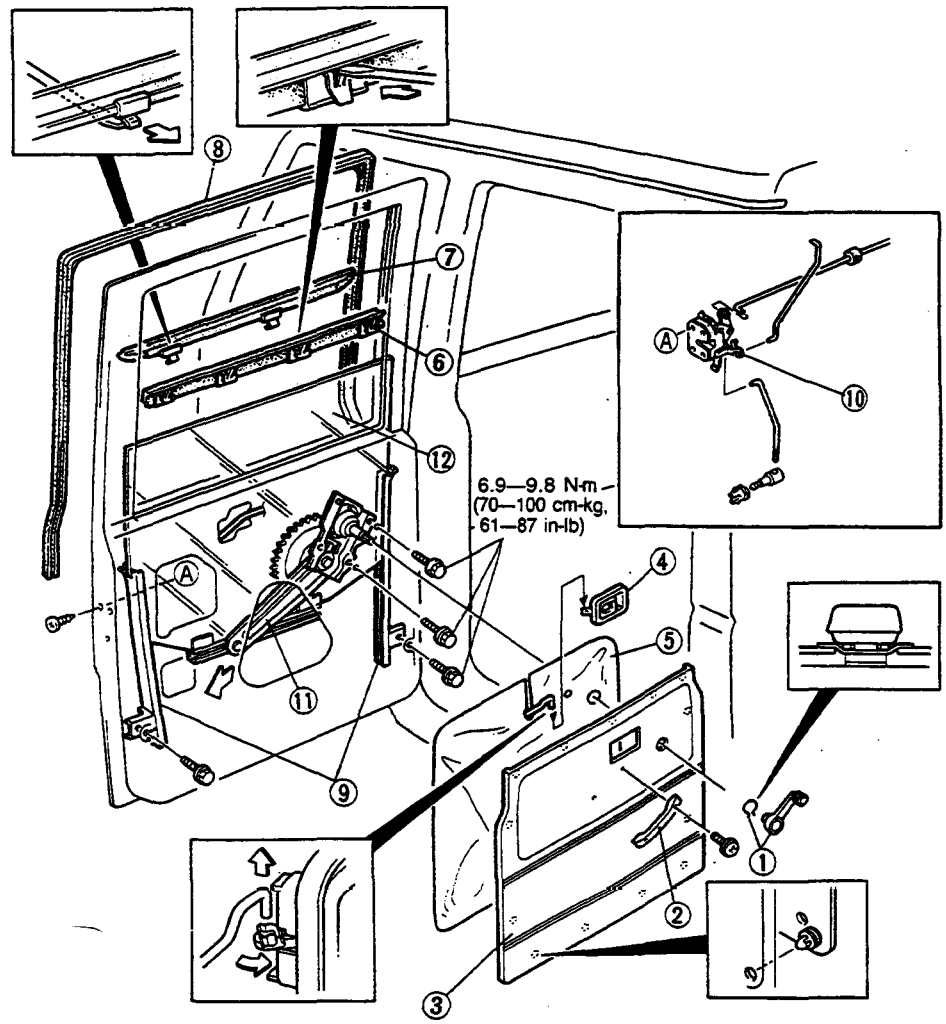
COMPONENTS

Removal / Installation

1. Open the rear door glass fully.
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.

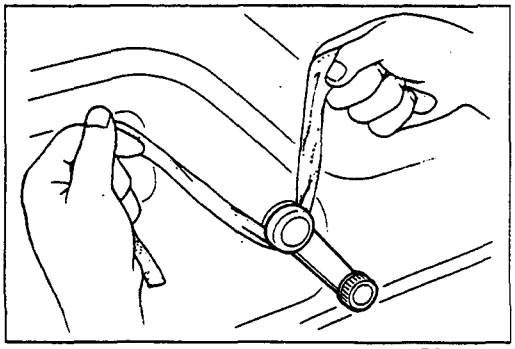
Caution

- **Remove the door screen carefully so that it may be reused.**



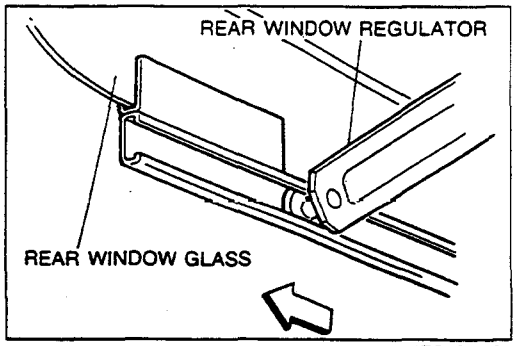
9TG0SX-019

1. Regulator handle
   Removal Note..... page S–16
2. Armrest
3. Door trim
4. Inner handle
5. Door screen
6. Inner weatherstrip
7. Outer weatherstrip
8. Run channel
9. Glass guide
10. Rear door lock assembly
11. Rear window regulator
    Removal Note..... page S–16
12. Rear window glass
    Removal Note..... page S–16



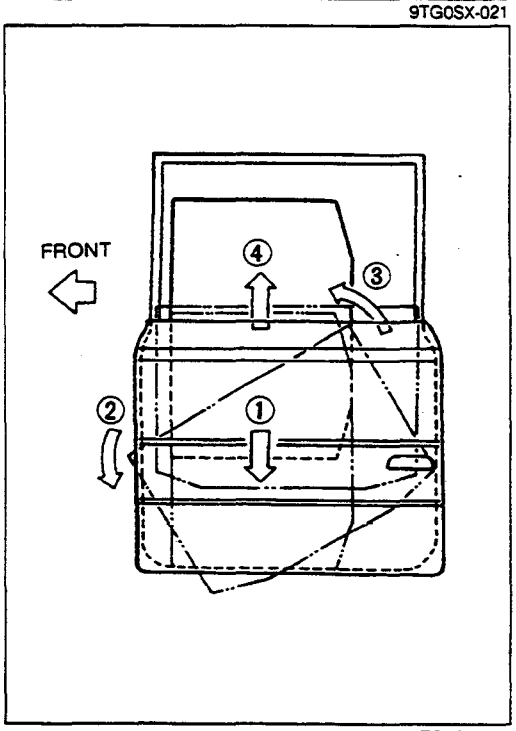
9TG0SX-020

Removal note
Regulator handle
1. Remove the regulator handle with a rag as shown in the figure.



9TG0SX-021

Rear window regulator
1. Remove the regulator as shown in the figure.



9TG0SX-022

Rear window glass
1. Remove the glass from the door by moving it in the order shown in the figure.

REAR DOOR LOCK AND OPENER

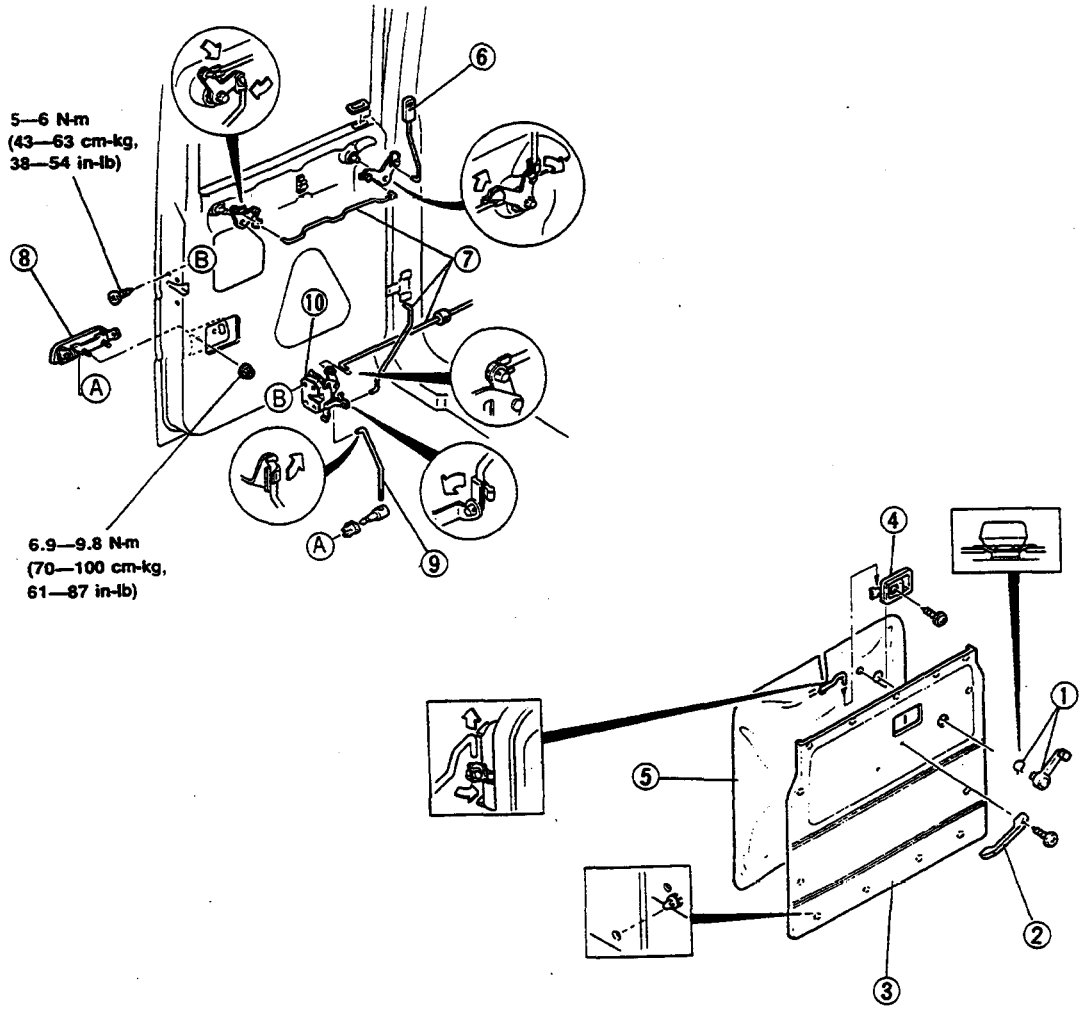
COMPONENTS

Removal / Installation

1. Raise the door glass fully.
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.

Caution

- **Remove the door screen carefully so that it may be reused.**



9TG0SX-023

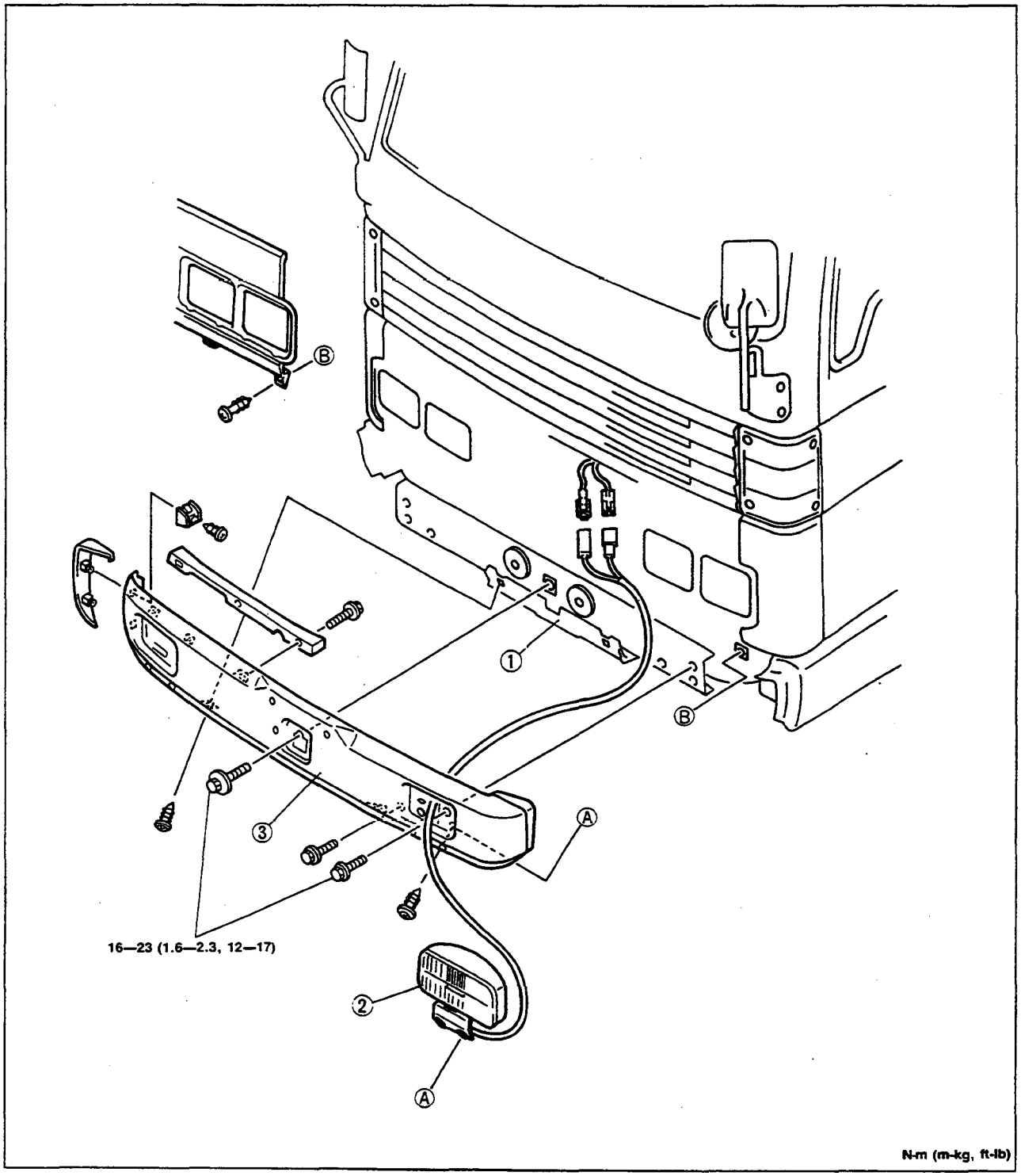
1. Regulator handle
   Removal Note..... page S–16
2. Armrest
3. Door trim
4. Inner handle
5. Door screen
6. Opener link
7. Door lock link 1
8. Outer door handle
9. Door lock link 2
10. Door lock assembly

FRONT BUMPER

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.



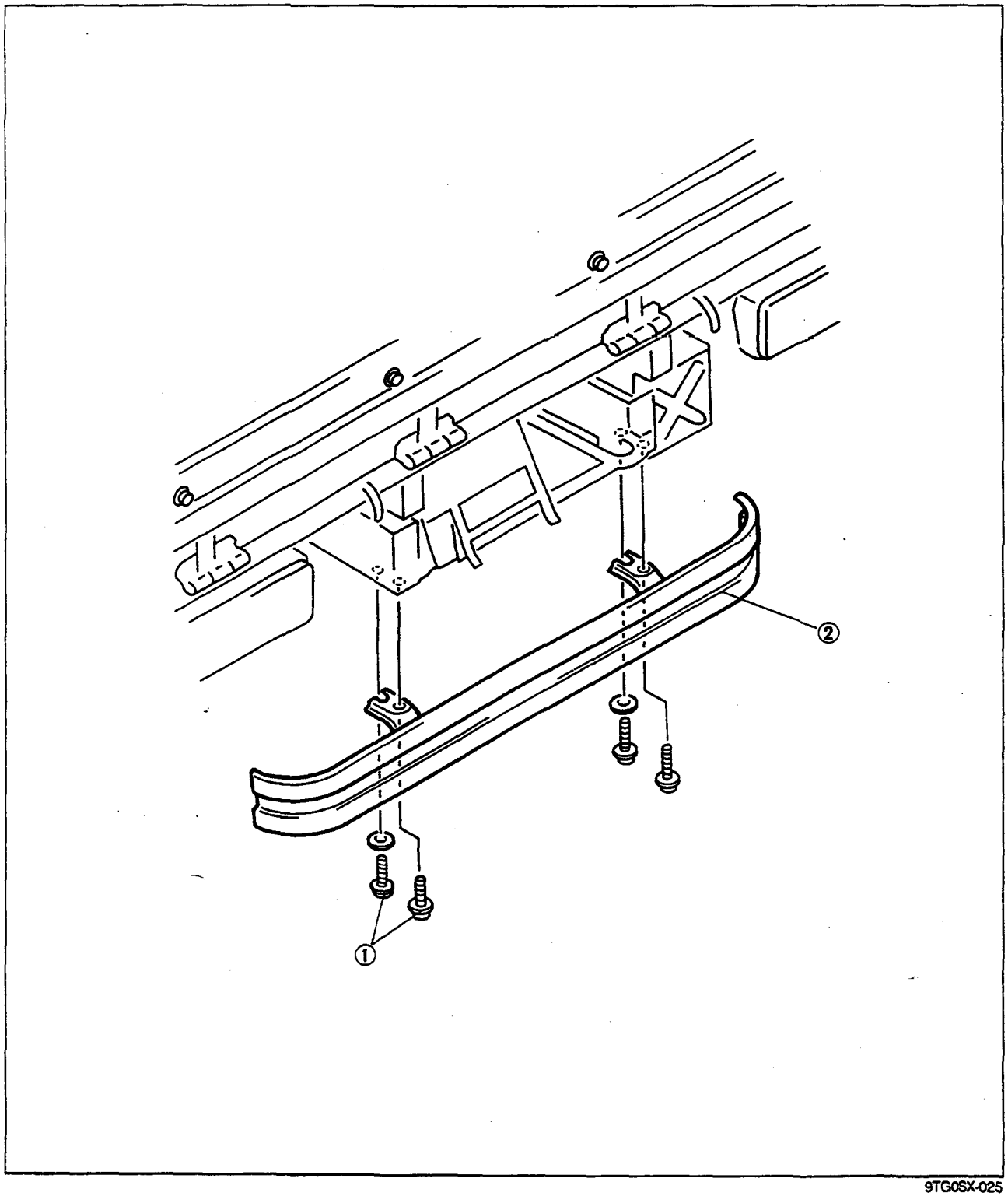
1. Undercover
2. Fog light
3. Front bumper assembly

REAR BUMPER

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.



9TG0SX-025

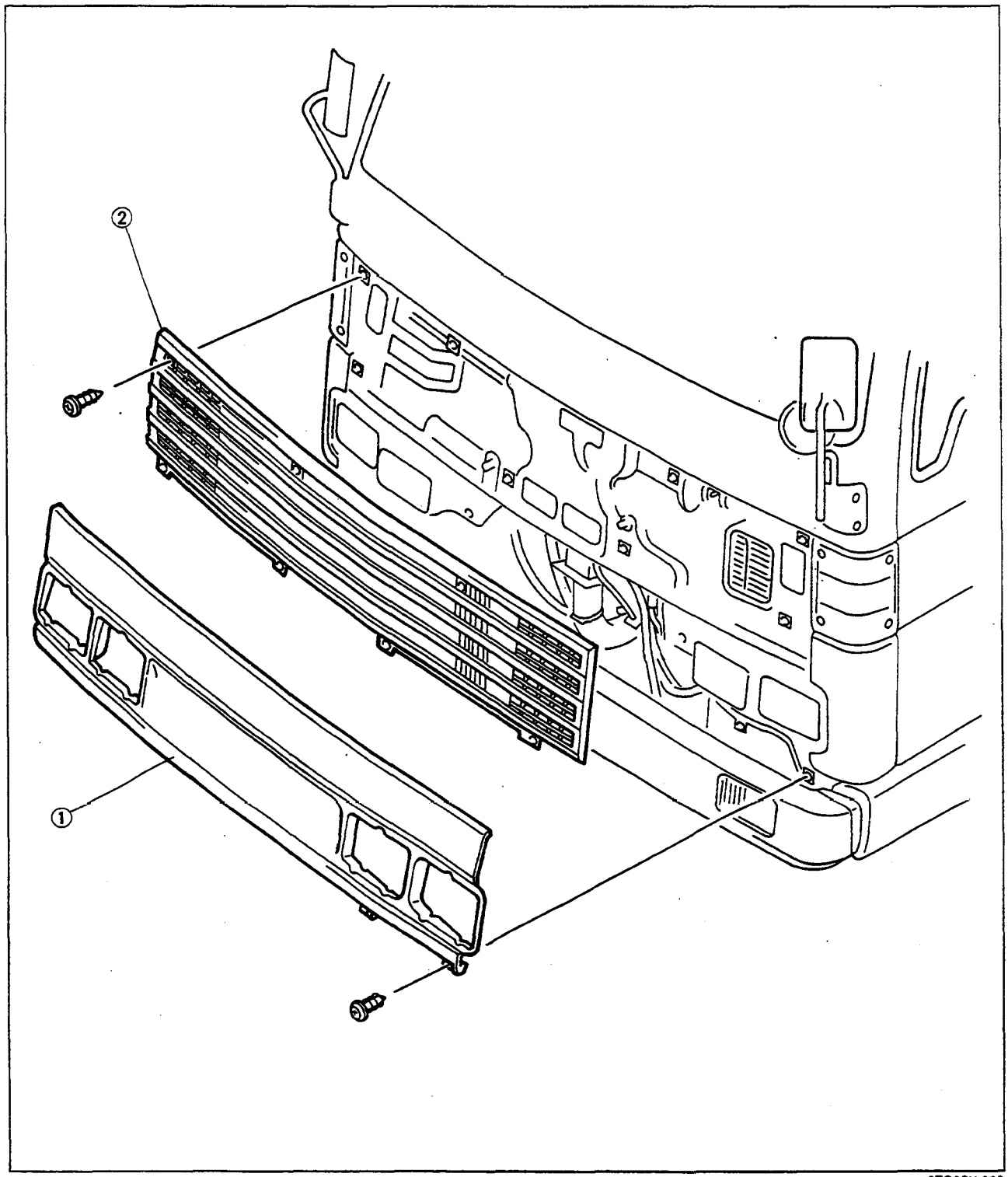
1. Bolt
2. Rear bumper

RADIATOR GRILLE/FRONT GRILLE

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.



9TG0SX-026

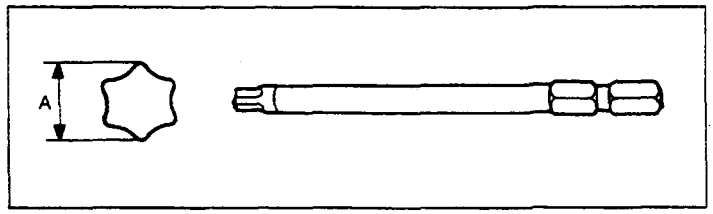
1. Radiator grille
2. Front grille

STEP

PREPARATION

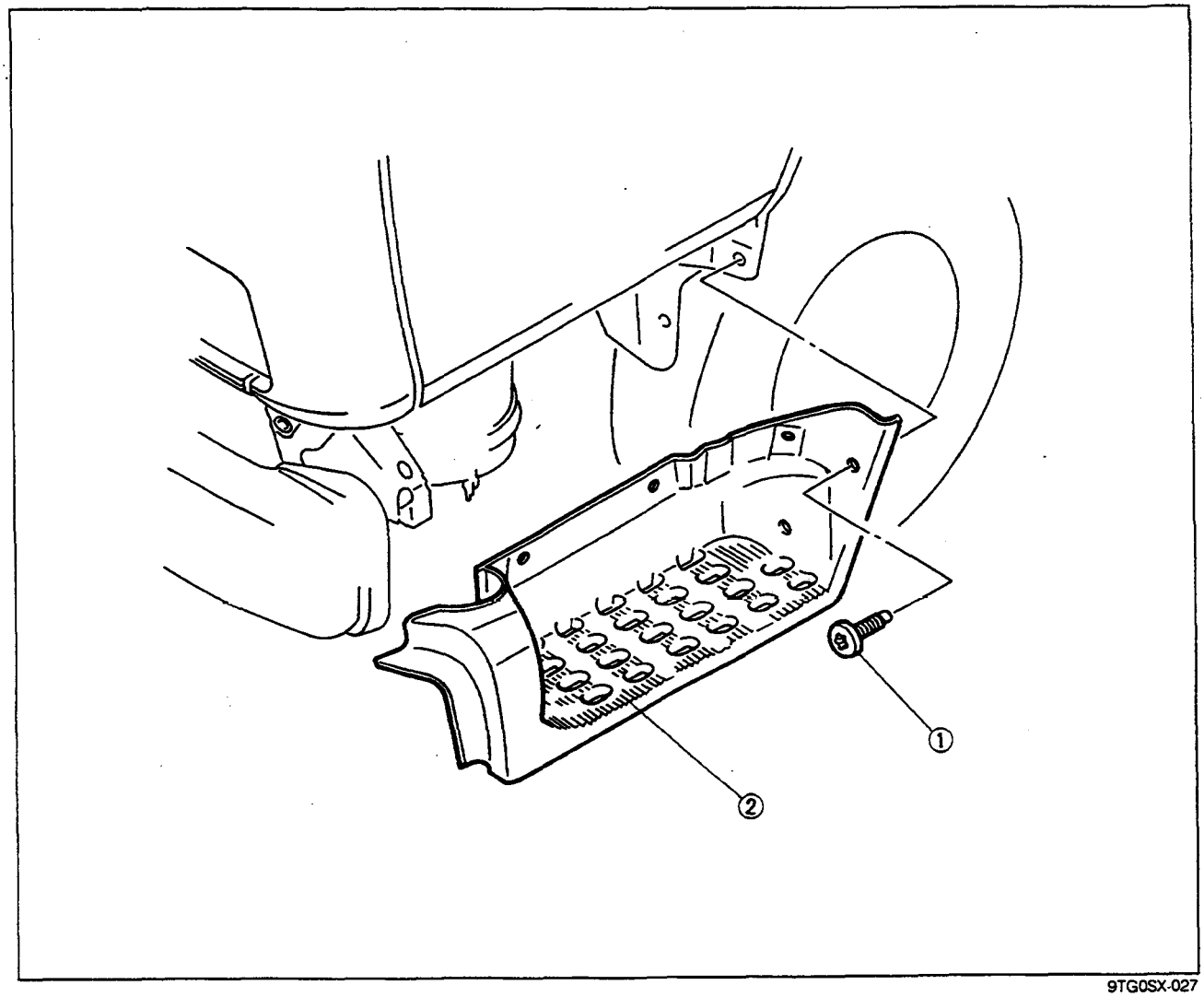
*1 Torx wrench	For removal and installation of step

*1
Torx wrench
specification



Torx wrench	A
T30	5.5mm (0.22 in)

STEP
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.



9TG0SX-027

1. Torx screw
2. Step

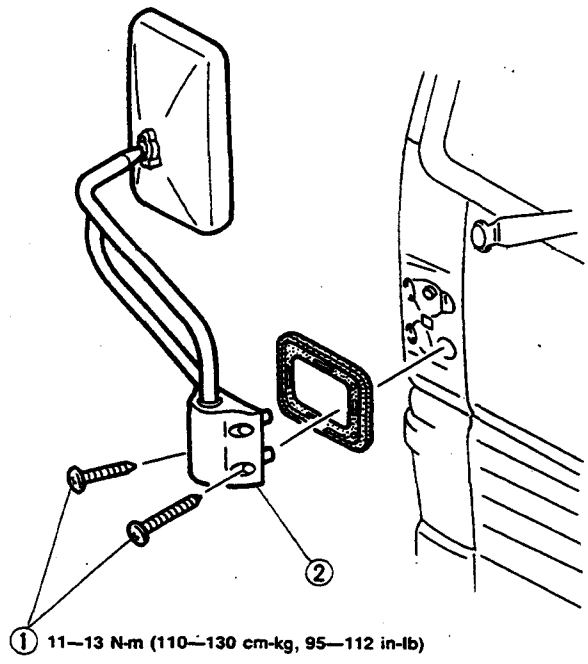
MIRROR

MIRROR

Removal / Installation

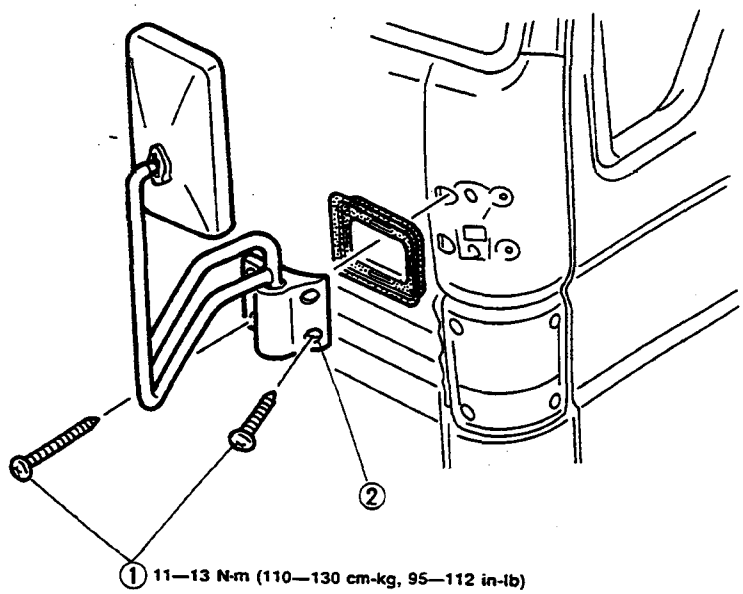
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.

RIGHT



① 11—13 N·m (110—130 cm-kg, 95—112 in-lb)

LEFT



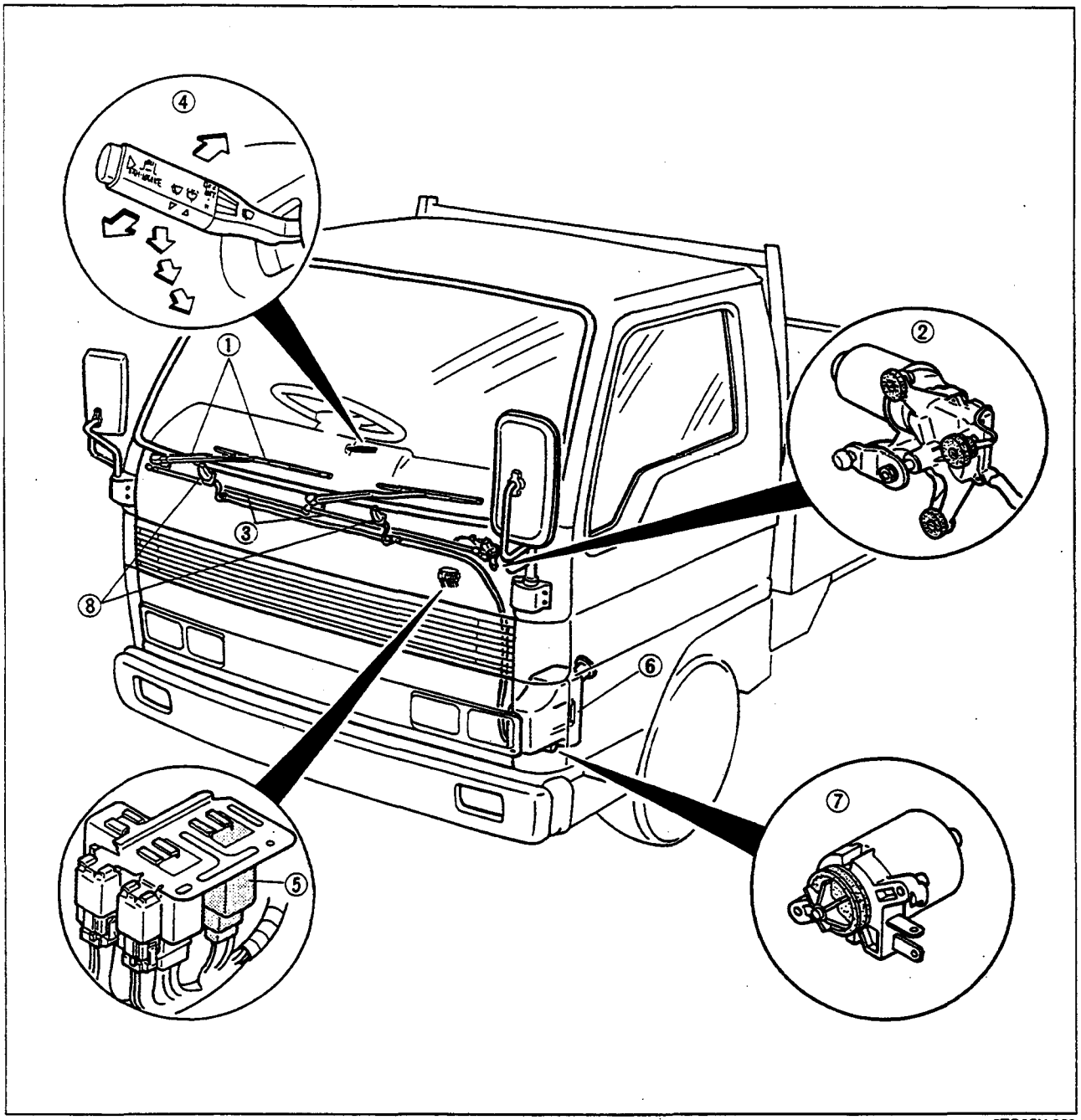
① 11—13 N·m (110—130 cm-kg, 95—112 in-lb)

9TG0SX-028

1. Bolt
2. Mirror

WINDSHIELD WIPER AND WASHER

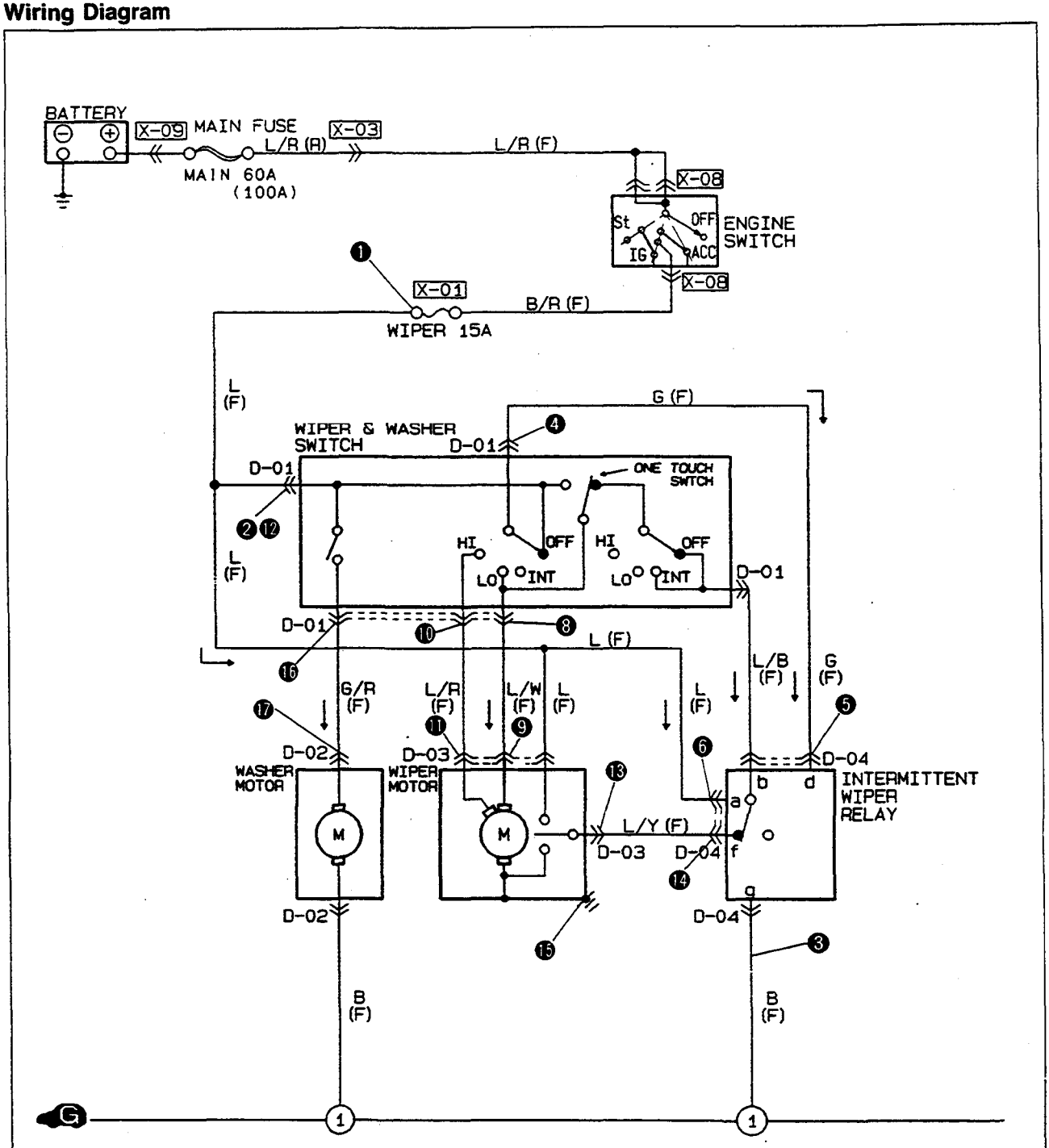
STRUCTURAL VIEW



9TG0SX-029

1. Wiper arm and blade
   - Removal / Installation ..... page S–29
   - Adjustment ..... page S–32
2. Wiper motor and bracket
   - Removal / Installation ..... page S–29
   - Disassembly / Assembly ..... page S–33
   - Inspection ..... page S–33
3. Wiper link assembly
   - Removal / Installation ..... page S–30
4. Wiper and washer switch
   - Inspection ..... page S–34
5. Intermittent wiper relay
   - Inspection ..... page S–34
6. Washer tank assembly
   - Removal / Installation ..... page S–29
7. Washer motor
   - Removal / Installation ..... page S–29
   - Inspection ..... page S–34
8. Washer nozzle
   - Removal / Installation ..... page S–31
   - Adjustment ..... page S–32

TROUBLESHOOTING GUIDE
Wiring Diagram



D-01 WIPER & WASHER SWITCH (F) RHD

L	G	G/R
L/R	L/B	L/W

D-02 WASHER MOTOR (F)

B
G/R

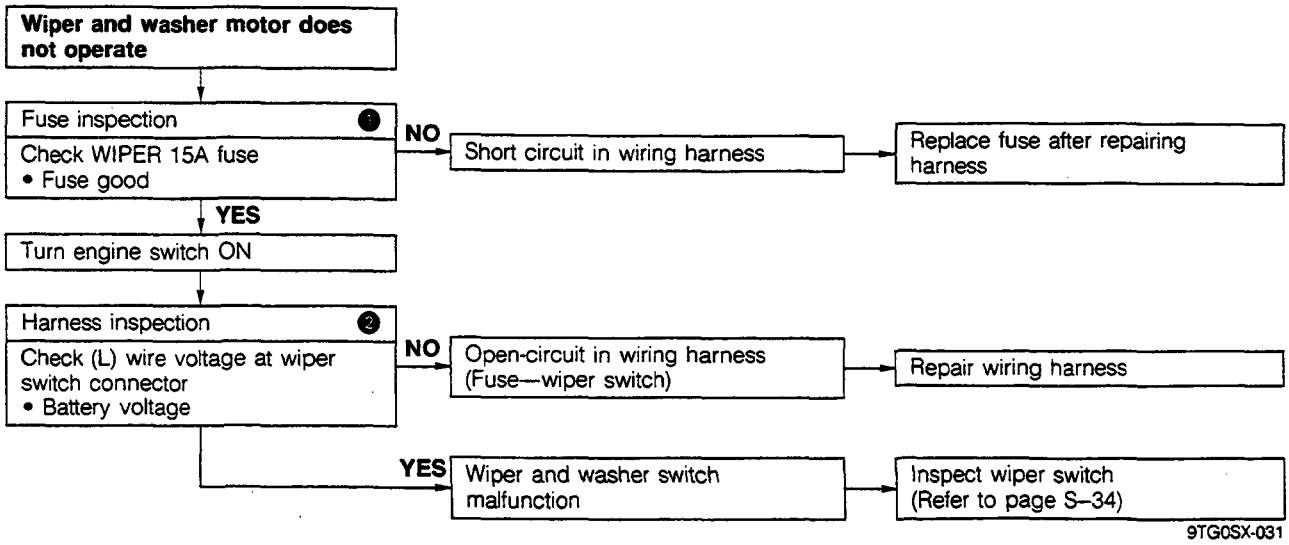
D-03 WIPER MOTOR (F)

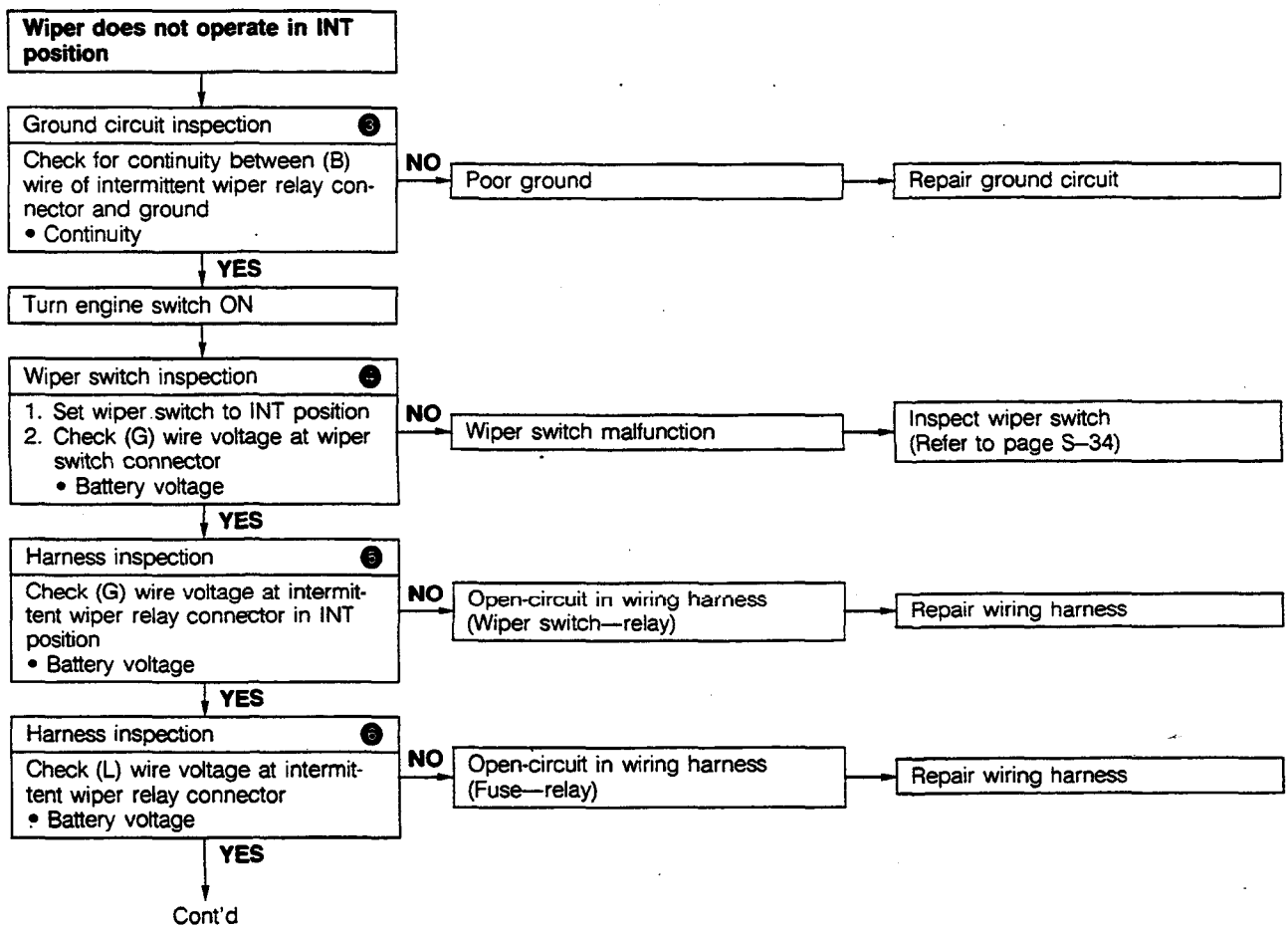
L/W	L/R
L	L/Y

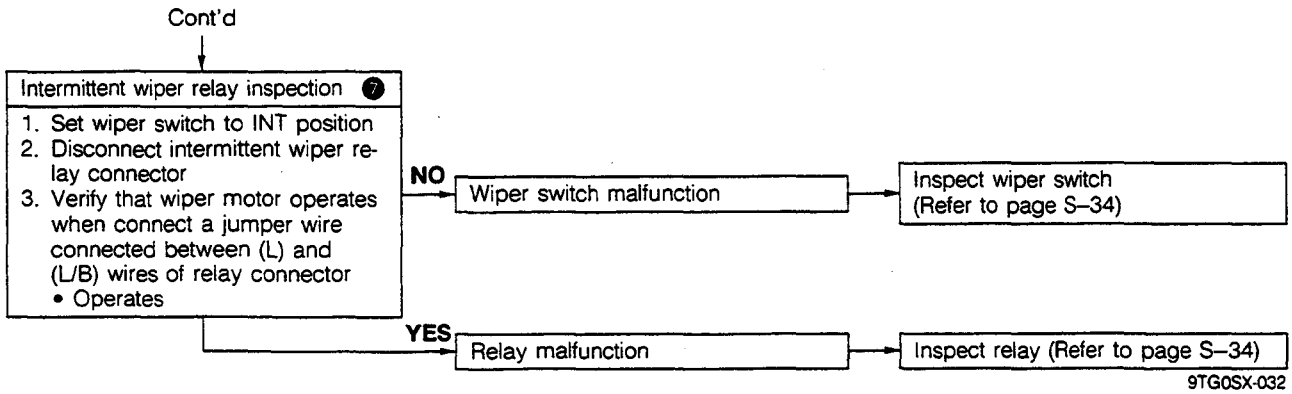
D-04 INTERMITTENT WIPER RELAY (F)

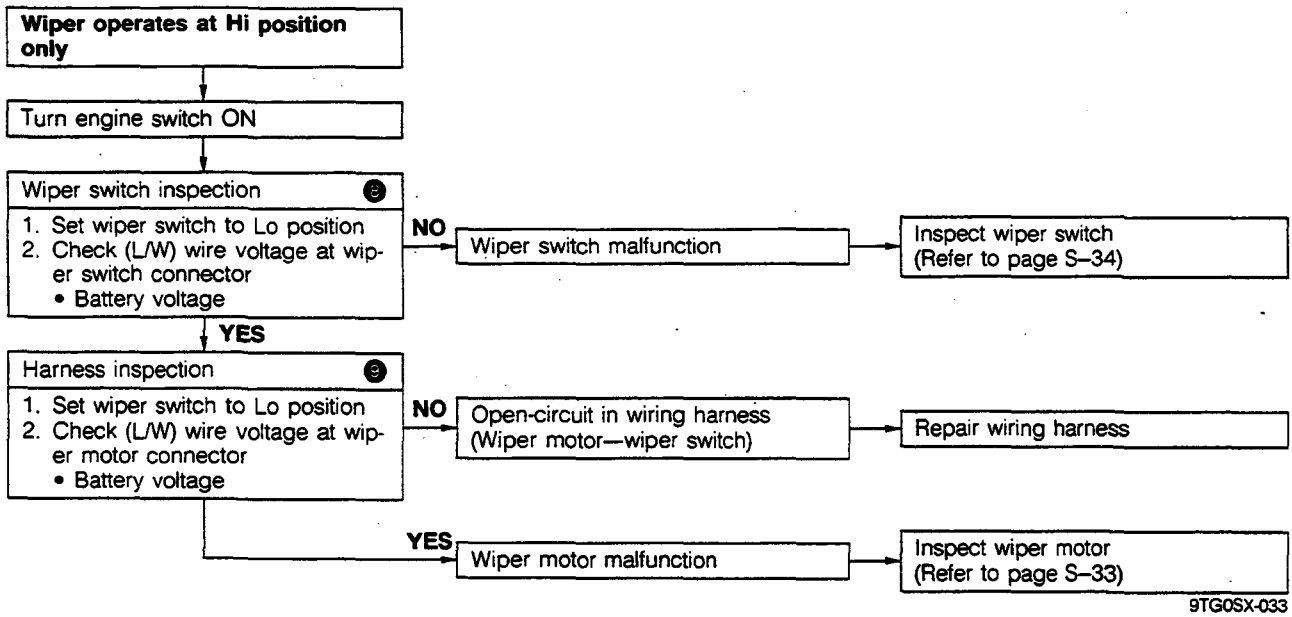
G			A
B			L
*	L/Y	G	L/B
H	F	D	B

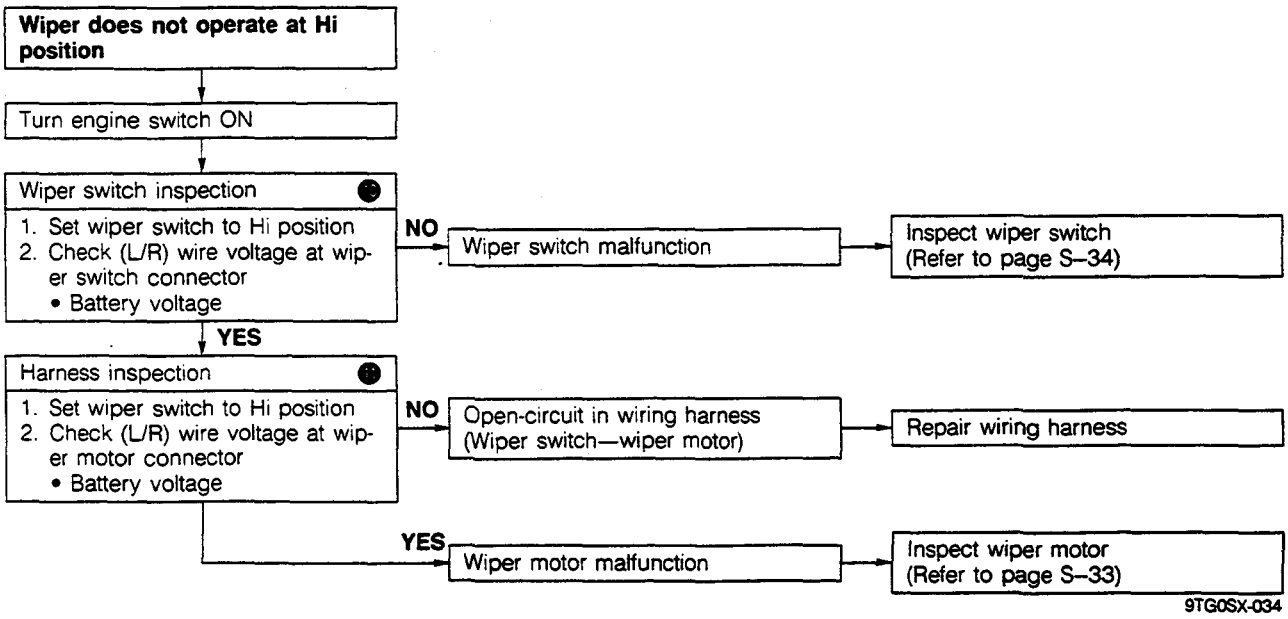
9TG0SX-030

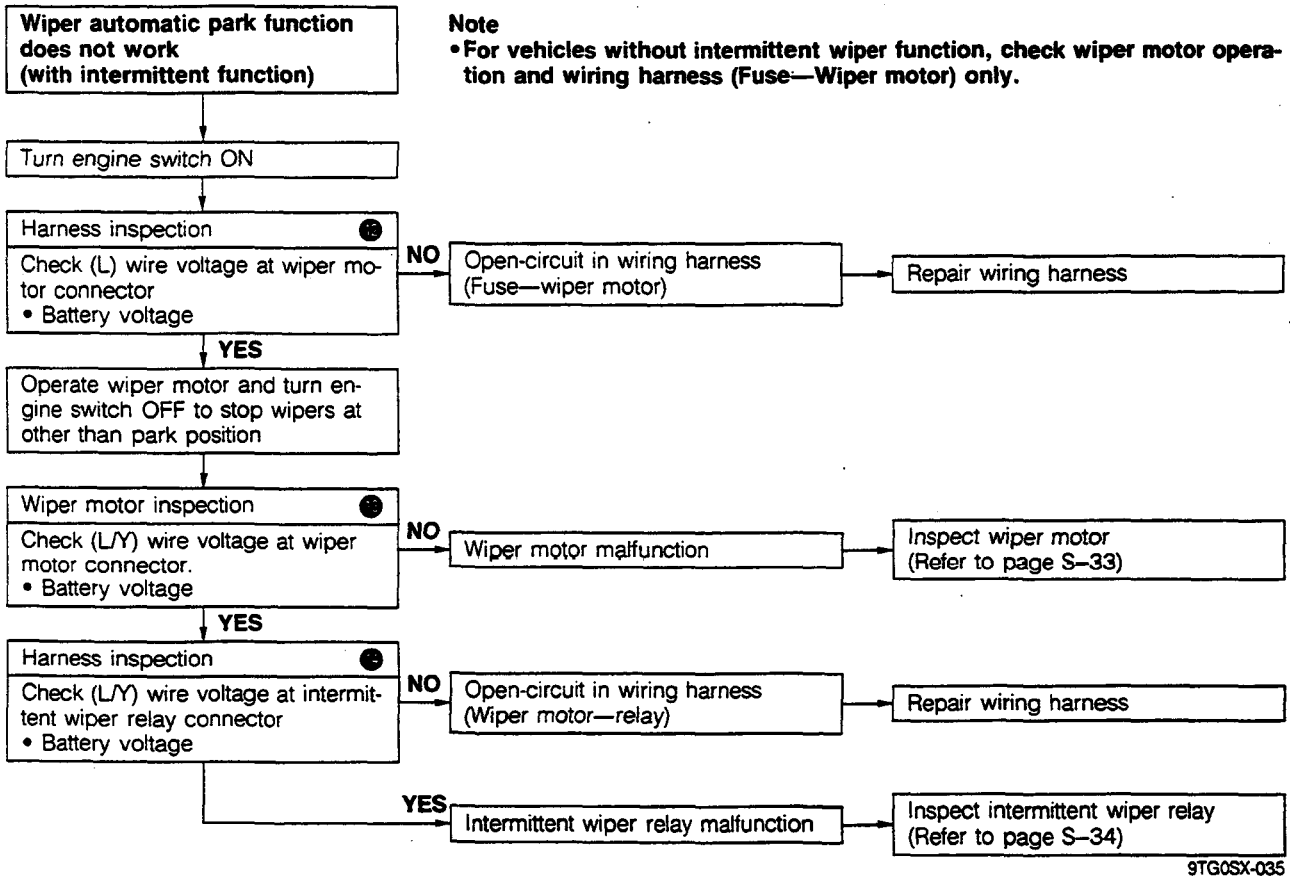

Wiper and washer motor does not operate
Fuse inspection ❶
Check WIPER 15A fuse
• Fuse good
NO
Short circuit in wiring harness
Replace fuse after repairing harness
YES
Turn engine switch ON
Harness inspection ❷
Check (L) wire voltage at wiper switch connector
• Battery voltage
NO
Open-circuit in wiring harness (Fuse—wiper switch)
Repair wiring harness
YES
Wiper and washer switch malfunction
Inspect wiper switch (Refer to page S–34)
9TG0SX-031


Wiper does not operate in INT position
Ground circuit inspection ❸
Check for continuity between (B) wire of intermittent wiper relay connector and ground
• Continuity
NO
Poor ground
Repair ground circuit
YES
Turn engine switch ON
Wiper switch inspection ❹
1. Set wiper switch to INT position
2. Check (G) wire voltage at wiper switch connector
• Battery voltage
NO
Wiper switch malfunction
Inspect wiper switch (Refer to page S–34)
YES
Harness inspection ❺
Check (G) wire voltage at intermittent wiper relay connector in INT position
• Battery voltage
NO
Open-circuit in wiring harness (Wiper switch—relay)
Repair wiring harness
YES
Harness inspection ❻
Check (L) wire voltage at intermittent wiper relay connector
• Battery voltage
NO
Open-circuit in wiring harness (Fuse—relay)
Repair wiring harness
YES
Cont'd


Cont'd
Intermittent wiper relay inspection ❼
1. Set wiper switch to INT position
2. Disconnect intermittent wiper relay connector
3. Verify that wiper motor operates when connect a jumper wire connected between (L) and (L/B) wires of relay connector
• Operates
NO
Wiper switch malfunction
Inspect wiper switch (Refer to page S–34)
YES
Relay malfunction
Inspect relay (Refer to page S–34)
9TG0SX-032


Wiper operates at Hi position only
Turn engine switch ON
Wiper switch inspection ❽
1. Set wiper switch to Lo position
2. Check (L/W) wire voltage at wiper switch connector
• Battery voltage
NO
Wiper switch malfunction
Inspect wiper switch (Refer to page S–34)
YES
Harness inspection ❾
1. Set wiper switch to Lo position
2. Check (L/W) wire voltage at wiper motor connector
• Battery voltage
NO
Open-circuit in wiring harness (Wiper motor—wiper switch)
Repair wiring harness
YES
Wiper motor malfunction
Inspect wiper motor (Refer to page S–33)
9TG0SX-033


Wiper does not operate at Hi position
Turn engine switch ON
Wiper switch inspection
1. Set wiper switch to Hi position
2. Check (L/R) wire voltage at wiper switch connector
• Battery voltage
NO
Wiper switch malfunction
Inspect wiper switch (Refer to page S–34)
YES
Harness inspection
1. Set wiper switch to Hi position
2. Check (L/R) wire voltage at wiper motor connector
• Battery voltage
NO
Open-circuit in wiring harness (Wiper switch—wiper motor)
Repair wiring harness
YES
Wiper motor malfunction
Inspect wiper motor (Refer to page S–33)
9TG0SX-034


Wiper automatic park function does not work (with intermittent function)
Note
• For vehicles without intermittent wiper function, check wiper motor operation and wiring harness (Fuse—Wiper motor) only.
Turn engine switch ON
Harness inspection
Check (L) wire voltage at wiper motor connector
• Battery voltage
NO
Open-circuit in wiring harness (Fuse—wiper motor)
Repair wiring harness
YES
Operate wiper motor and turn engine switch OFF to stop wipers at other than park position
Wiper motor inspection
Check (L/Y) wire voltage at wiper motor connector.
• Battery voltage
NO
Wiper motor malfunction
Inspect wiper motor (Refer to page S–33)
YES
Harness inspection
Check (L/Y) wire voltage at intermittent wiper relay connector
• Battery voltage
NO
Open-circuit in wiring harness (Wiper motor—relay)
Repair wiring harness
YES
Intermittent wiper relay malfunction
Inspect intermittent wiper relay (Refer to page S–34)
9TG0SX-035

One touch function does not operate → Wiper switch malfunction → Inspect wiper switch (Refer to page S–34)

9TG0SX-036

Wiper continues to operate when switch OFF → Wiper switch malfunction → Inspect wiper switch (Refer to page S–34)

9TG0SX-037

Washer motor does not operate (Wiper operates OK)

Ground circuit inspection (E)
Check continuity between (B) wire at washer motor connector and ground
• Continuity

NO → Poor ground → Repair ground circuit

YES

Turn engine switch ON

Washer switch inspection (F)
1. Turn washer switch ON
2. Check (G/R) wire voltage at washer switch connector
   • Battery voltage

NO → Washer switch malfunction → Inspect washer switch (Refer to page S–34)

YES

Harness inspection (G)
1. Turn washer switch ON
2. Check (G/R) wire voltage at washer motor connector
   • Battery voltage

NO → Open-circuit in wiring harness (Washer switch—washer motor) → Repair wiring harness

YES → Washer motor malfunction → Inspect washer motor (Refer to page S–34)

9TG0SX-038

Washer continues to operate when switch OFF → Washer switch malfunction → Inspect washer switch (Refer to page S–34)

9TG0SX-039

COMPONENTS

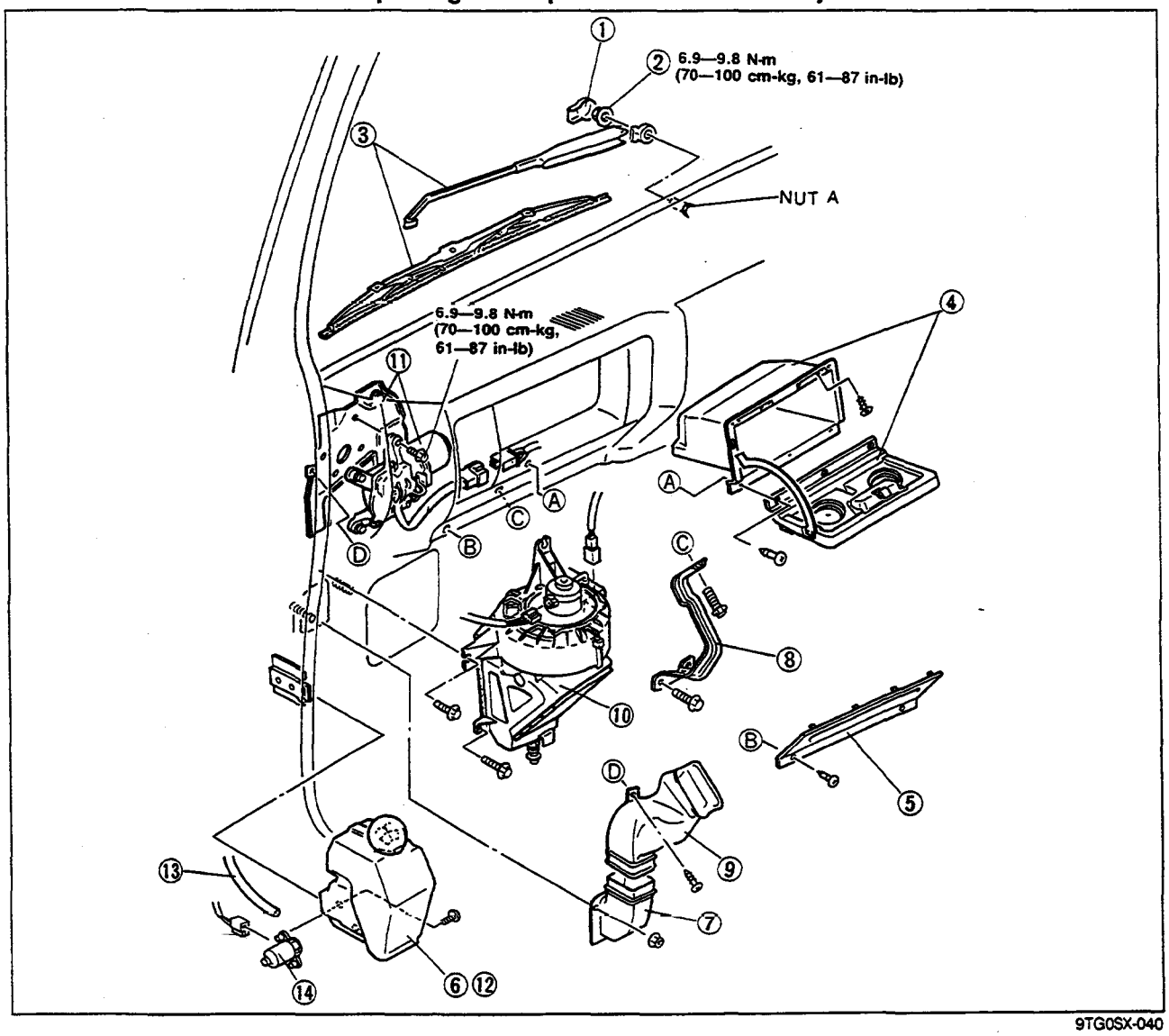
Removal / Installation

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

Wiper arm and blade, wiper motor, washer motor

Caution

- **Do not remove nut A if replacing the wiper arm and blade only.**



9TG0SX-040

Wiper arm and blade

1. Wiper arm cover
2. Nuts
3. Wiper arm and blade
   Adjustment ..... page S–32

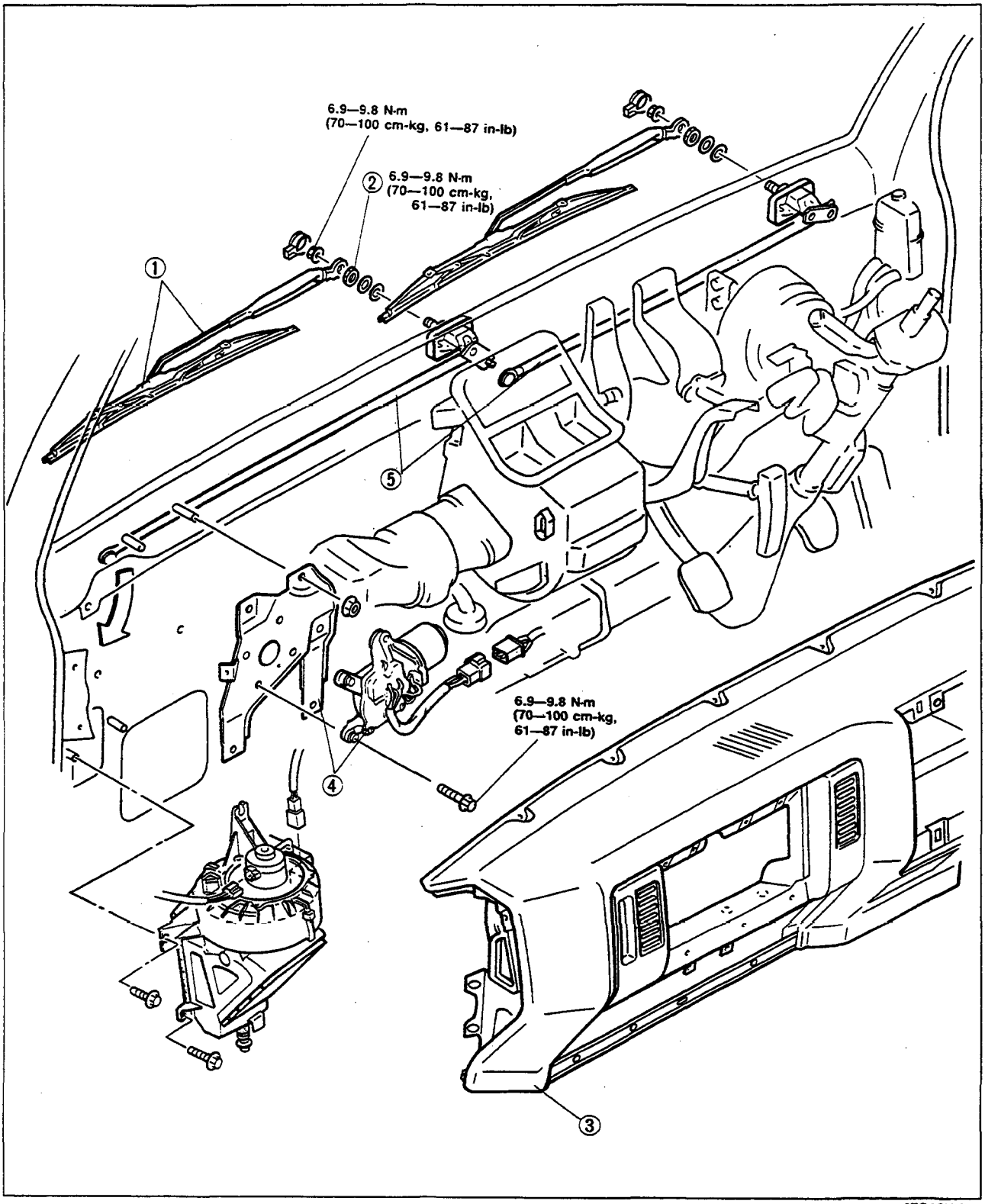
Wiper motor

4. Glove box
5. Lower panel
6. Washer tank assembly
7. Fresh air duct
8. Bracket
9. Duct A
10. Blower unit
11. Wiper motor and bracket
    Installation Note ..... page S–31
    Disassembly / Assembly ..... page S–33
    Inspection ..... page S–33

Washer motor

12. Washer tank assembly
13. Washer pipe
14. Washer motor
    Inspection ..... page S–34

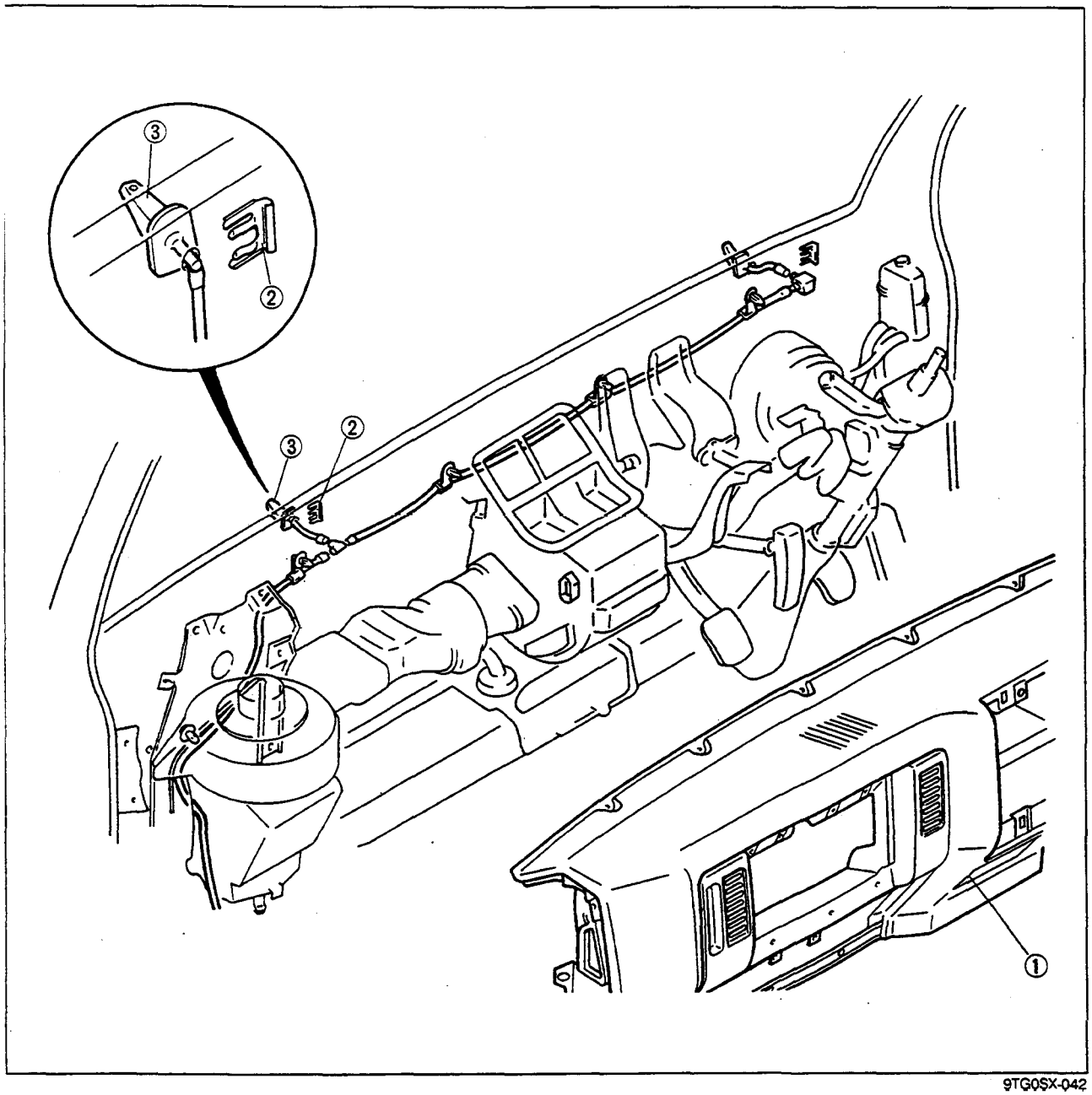
Windshield wiper link assembly



9TG0SX-041

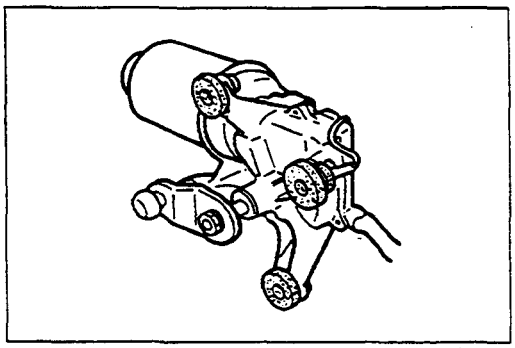
1. Wiper arm and blade
   Adjustment ..... page S–32
2. Nut
3. Instrument panel
   Removal / Installation ..... page S–50
4. Wiper motor and bracket
   Installation Note ..... page S–31
   Disassembly / Assembly ..... page S–33
   Inspection ..... page S–33
5. Windshield wiper link assembly

Washer nozzle



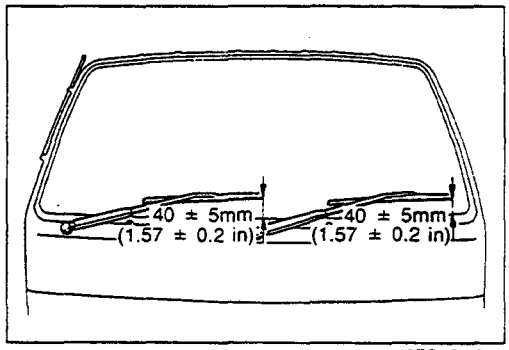
9TG0SX-042

1. Instrument panel
   Removal / Installation ..... page S–50
2. Clip
3. Washer nozzle
   Adjustment ..... page S–32

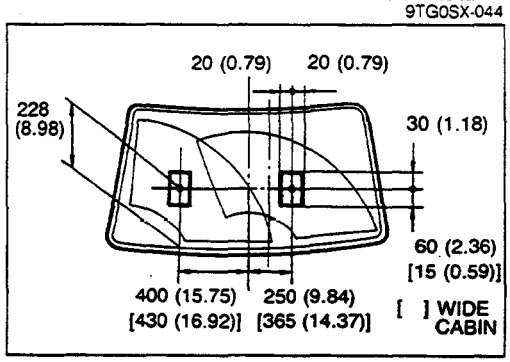


9TG0SX-043

Installation note
Wiper motor and bracket
1. Align the wiper motor arm as shown in the figure.



9TG0SX-044



9TG0SX-045

Adjustment

Wiper arm height

1. Turn the wiper switch from ON to OFF to set the wiper arm park position.
2. Adjust the arm height as shown in the figure.

Height: 40 ± 5mm (1.57 ± 0.2 in)

Tightening torque:
9.8—14 N·m (100—140 cm-kg, 87—121 in-lb)

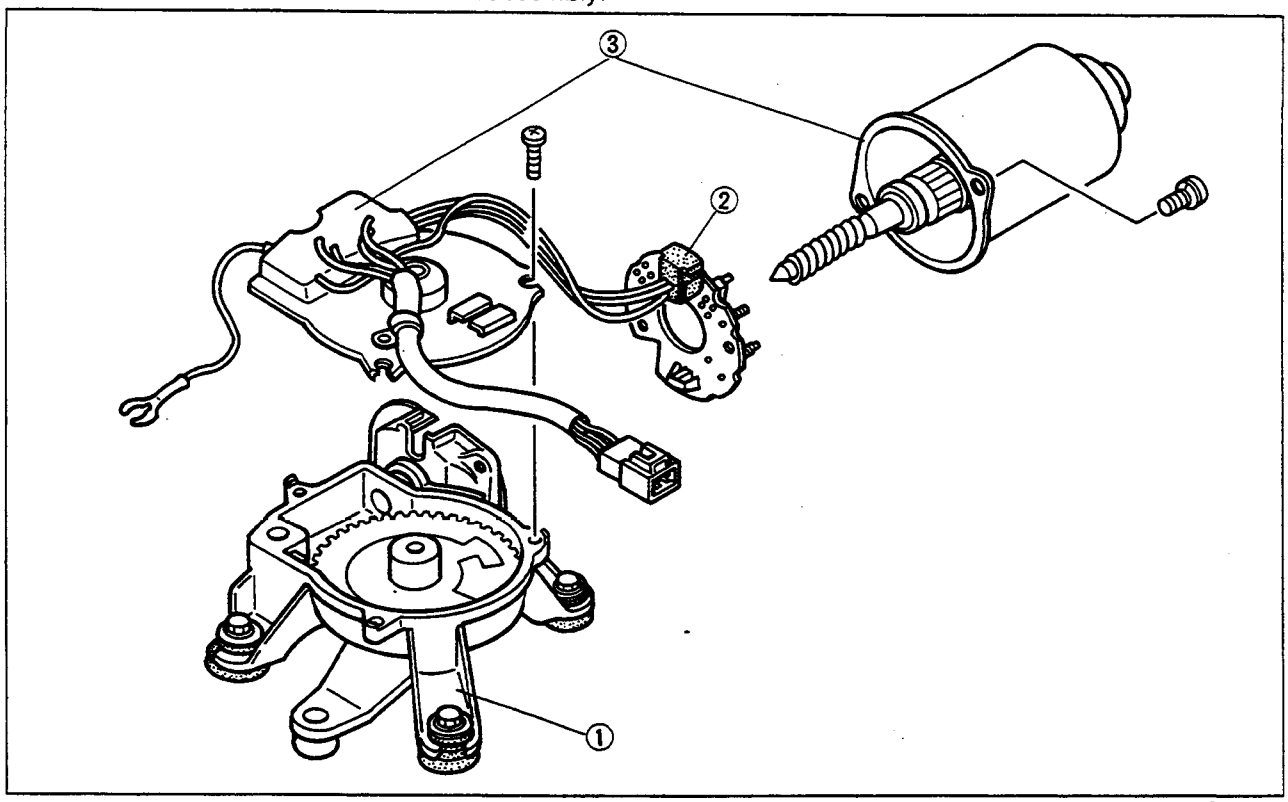
Washer spray

1. Insert a needle or similar object into the nozzle hole and move the nozzle to change the direction of spray.

WIPER MOTOR

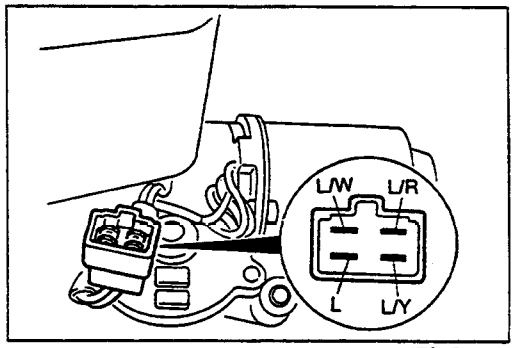
Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



9TG0SX-049

1. Bracket
2. Brush holder plate
3. Motor assembly



9TG0SX-050

Inspection

Continuity

1. Remove the blower motor.
2. Disconnect the wiper motor connector.
3. Check continuity between terminals.

Terminal	L/R	L/Y	L/W	L
Auto-stop position	○	○	○	
Other position	○		○	
		○		○

4. If not as specified, replace the wiper motor.

Operation

Note

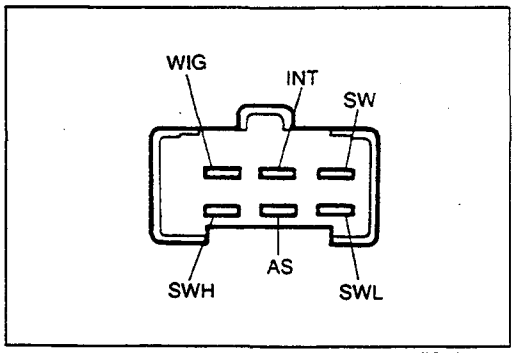
- **Connect the negative battery terminal to the motor ground wire if checking out of the vehicle.**

1. Disconnect the wiper motor connector.
2. Verify motor operation when appling 12V to the terminals of the motor connector.

12V applied to	Motor operation
(L/W) wire	Rotates at low speed
(L/R) wire	Rotates at high speed

3. If not as specified, replace the wiper motor.

9TG0SX-048



9TG0SX-052

WIPER AND WASHER SWITCH

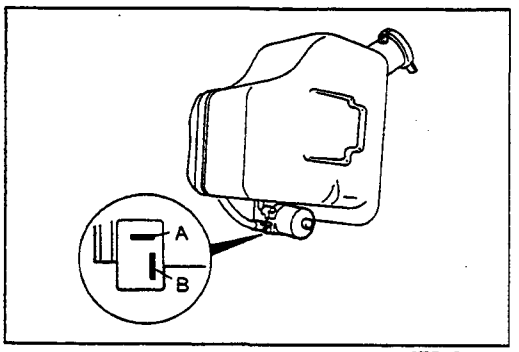
Inspection

1. Check continuity between terminals.

Wiper		AS	SWL	SWH	WIG	INT	SW
OFF		O—O					
	One touch: ON		O		—O		
INT		O—O			O—	—O	
Lo			O		—O		
Hi				O	—O		
Washer: ON					O—		—O

O—O: Indicates continuity

2. If not as specified, replace the switch.



9TG0SX-046

WASHER MOTOR

Inspection

Continuity

1. Disconnect the washer motor connector.
2. Check for continuity between terminals of washer motor connector.
3. If not as specified, replace the washer motor.

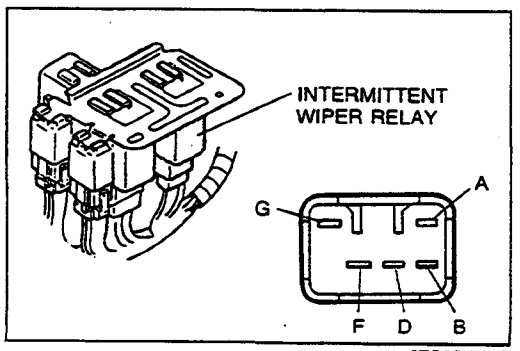
Operation

1. Disconnect the washer motor connector.
2. Connect 12V to B terminal and ground A terminal. Verify motor operation.

Terminal	Connection	Motor operation
A	Ground	Operates
B	12V	

3. If not as specified, replace the washer motor.

9TG0SX-047



9TG0SX-048

INTERMITTENT WIPER RELAY

Inspection

1. Connect a jumper wire between A and D terminals of the relay connector, and connect a voltmeter to B terminal of the relay connector.
2. Turn the engine switch ON and measure the voltage.

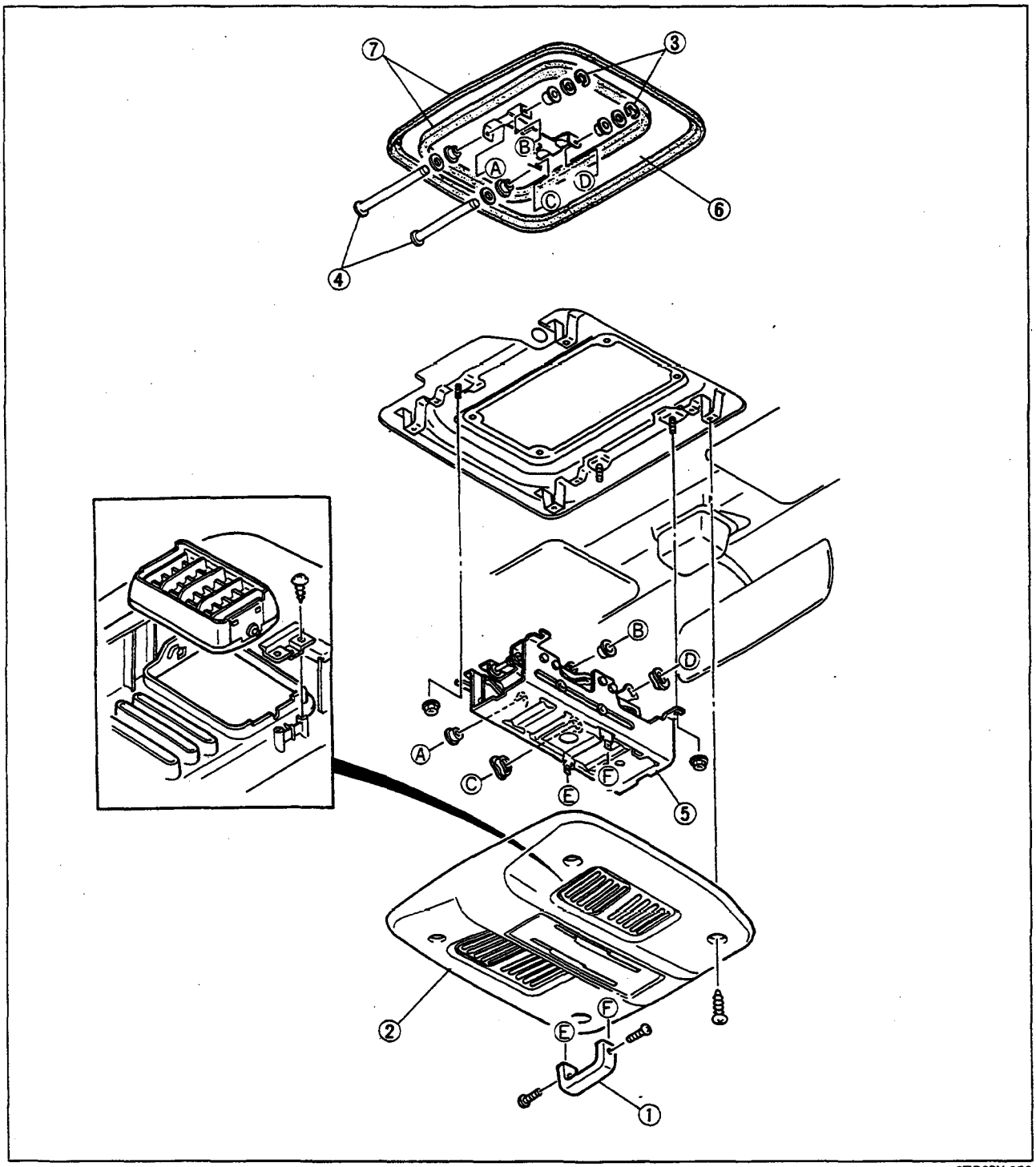
Voltmeter reading:
Battery voltage 1 time/approx. 5 sec.

ROOF VENTILATOR

COMPONENTS

Removal / Installation

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



9TG0SX-053

1. Lever
2. Ventilator grille
3. Retaining ring
4. Shaft
5. Lever assembly
6. Roof lid assembly
7. Seal rubber

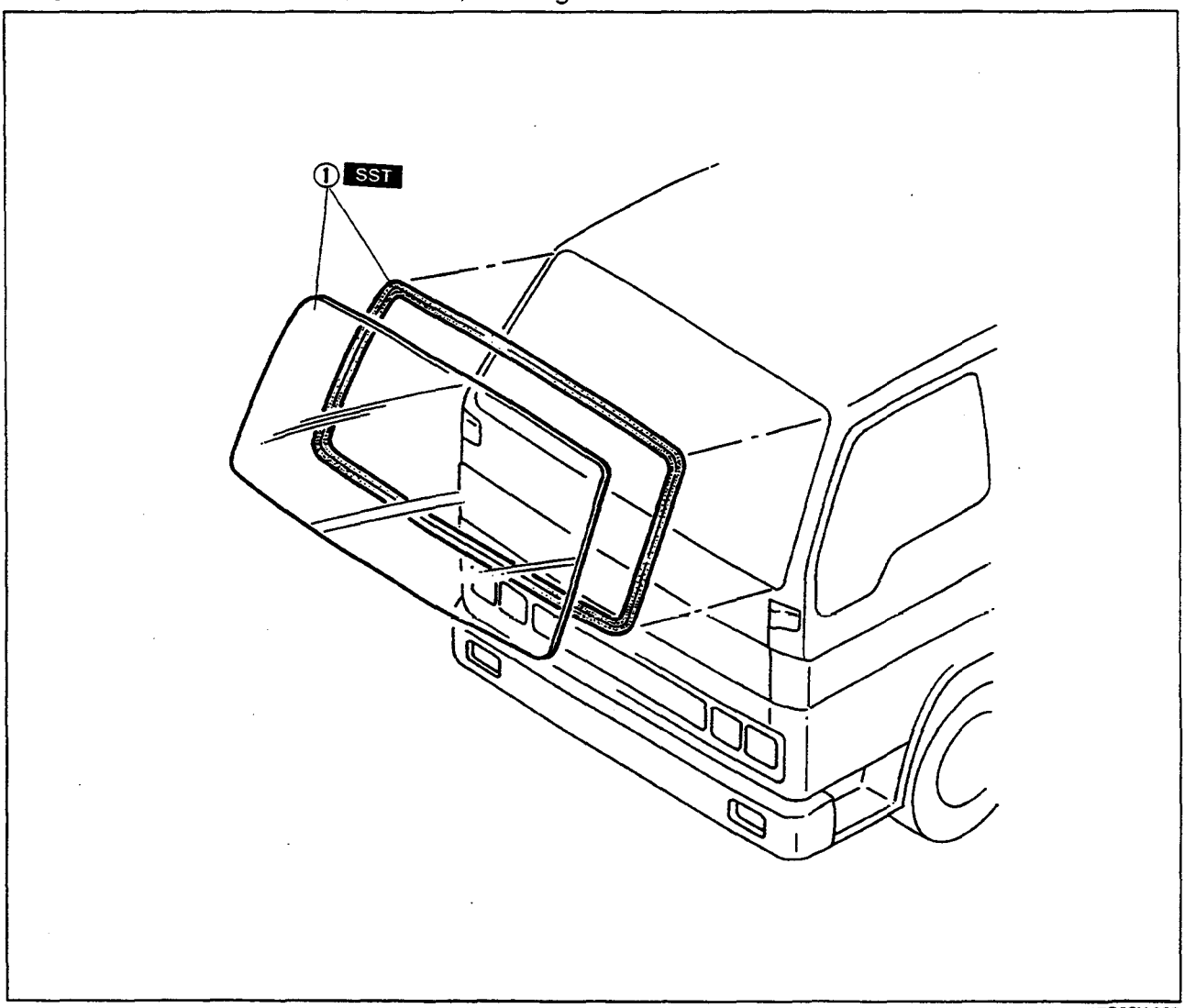
WINDSHIELD

PREPARATION
SST

49 0259 866 Insert tool, windshield		For removal and installation of windshield

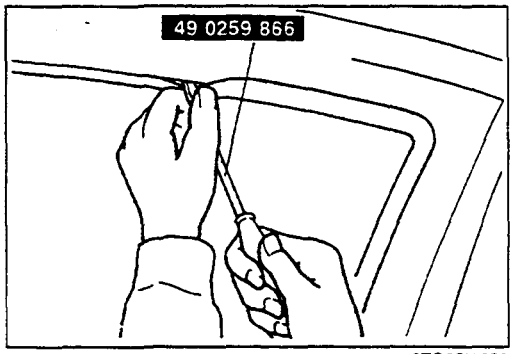
9TG0SX-054

COMPONENTS
Removal / Installation
1. Disconnect the negative battery cable.
2. Remove the rearview mirror, wiper arm and blade.
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**.



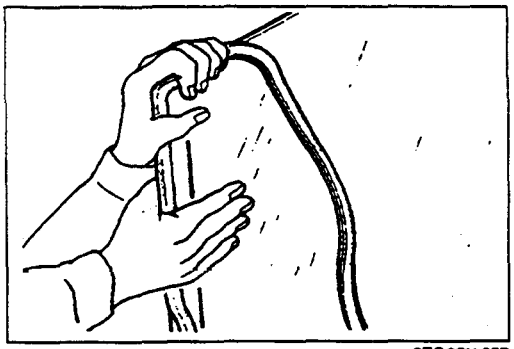
9TG0SX-055

1. Windshield and weatherstrip
   Removal Note ..... page S–37
   Installation Note ..... page S–37

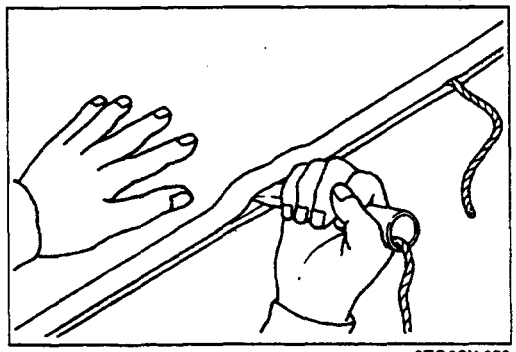


9TG0SX-056

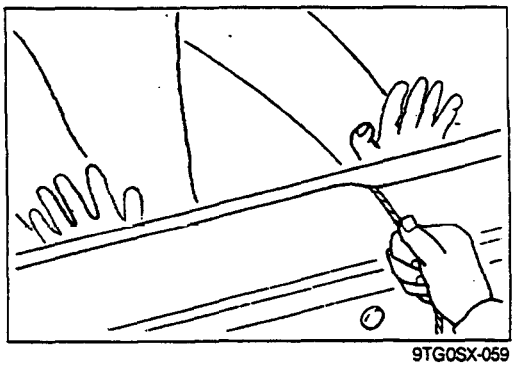
Removal note
Windshield and weatherstrip
1. Pry the weatherstrip outward from within the cabin with **SST**.
2. Remove the windshield together with the weatherstrip.


9TG0SX-057

Installation note
Windshield and weatherstrip
1. Remove the sealant from the body surface.
2. Fit the weatherstrip onto the windshield.

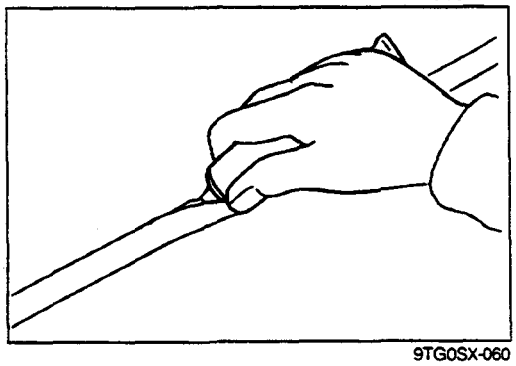

9TG0SX-058

3. Insert heavy string around the weatherstrip.
4. Apply soapy water to ensure smooth installation between the weatherstrip and the body.
5. Locate the glass and weatherstrip squarely in the windshield frame.


9TG0SX-059

Note
- **The following operation must be done with a partner.**

6. Tap lightly on the outside of the windshield while pulling the string to install the weatherstrip around the entire circumference.
7. Move the glass by hands on the inside and outside of the glass if it is not properly seated.


9TG0SX-060

8. Protect the body around the window flame with masking tape.
9. Fill with sealant between the weatherstrip and body and between the weatherstrip and glass around the entire circumference.

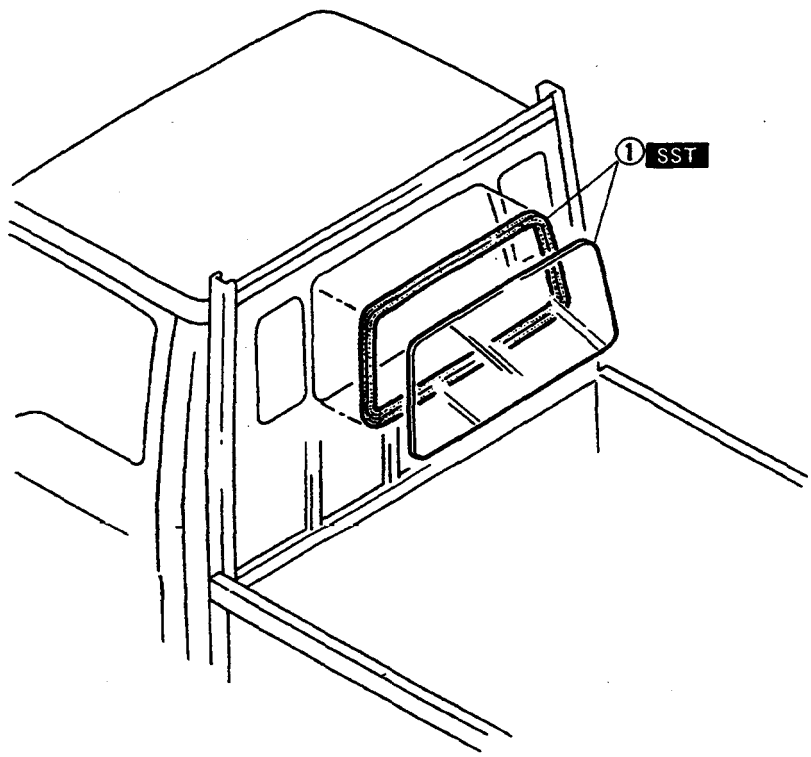
BACK WINDOW

PREPARATION
SST

49 0259 866 Insert tool, windshield		For removal and installation of windshield

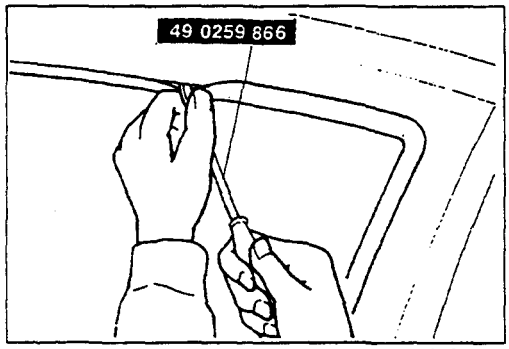
9TG0SX-061

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**.



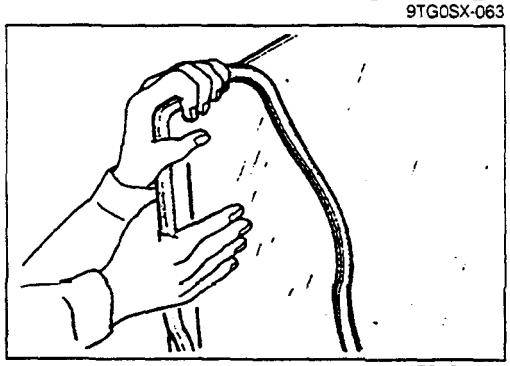
9TG0SX-062

1. Back window and weatherstrip
   Removal Note..... page S–39
   Installation Note..... page S–39

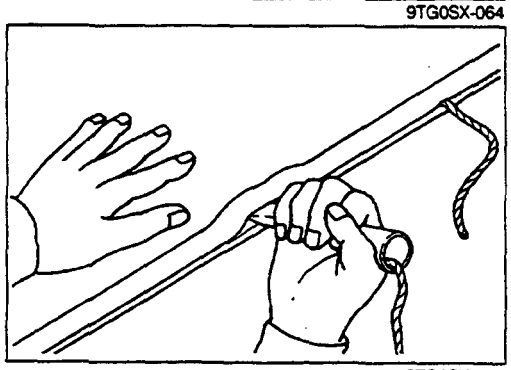


9TG0SX-063

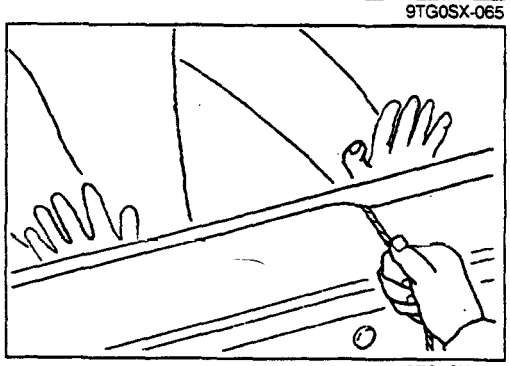
Removal note
Back window and weatherstrip
1. Pry the weatherstrip outward from within the cabin with **SST**.
2. Remove the back window together with the weatherstrip.


9TG0SX-064

Installation note
Back window and weatherstrip
1. Remove the sealant from the body surface.
2. Fit the weatherstrip onto the back window.

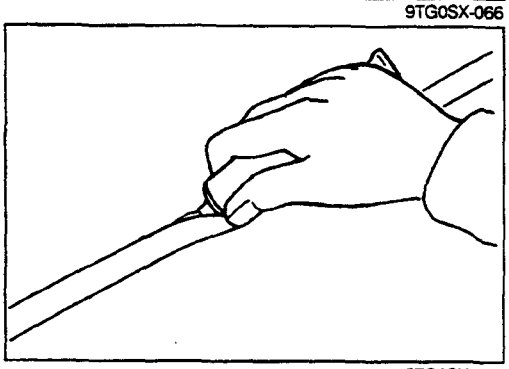

9TG0SX-065

3. Insert heavy string around the weatherstrip.
4. Apply soapy water to ensure smooth installation between the weatherstrip and the body.
5. Locate the glass and weatherstrip squarely in the window frame.


9TG0SX-066

Note
- **The following operation must be done by the partner.**

6. Tap lightly on the outside of the back window while pulling the string to install the weatherstrip around the entire circumference.
7. Move the glass by hands on the inside and the outside of the glass if it is not properly seated.


9TG0SX-067

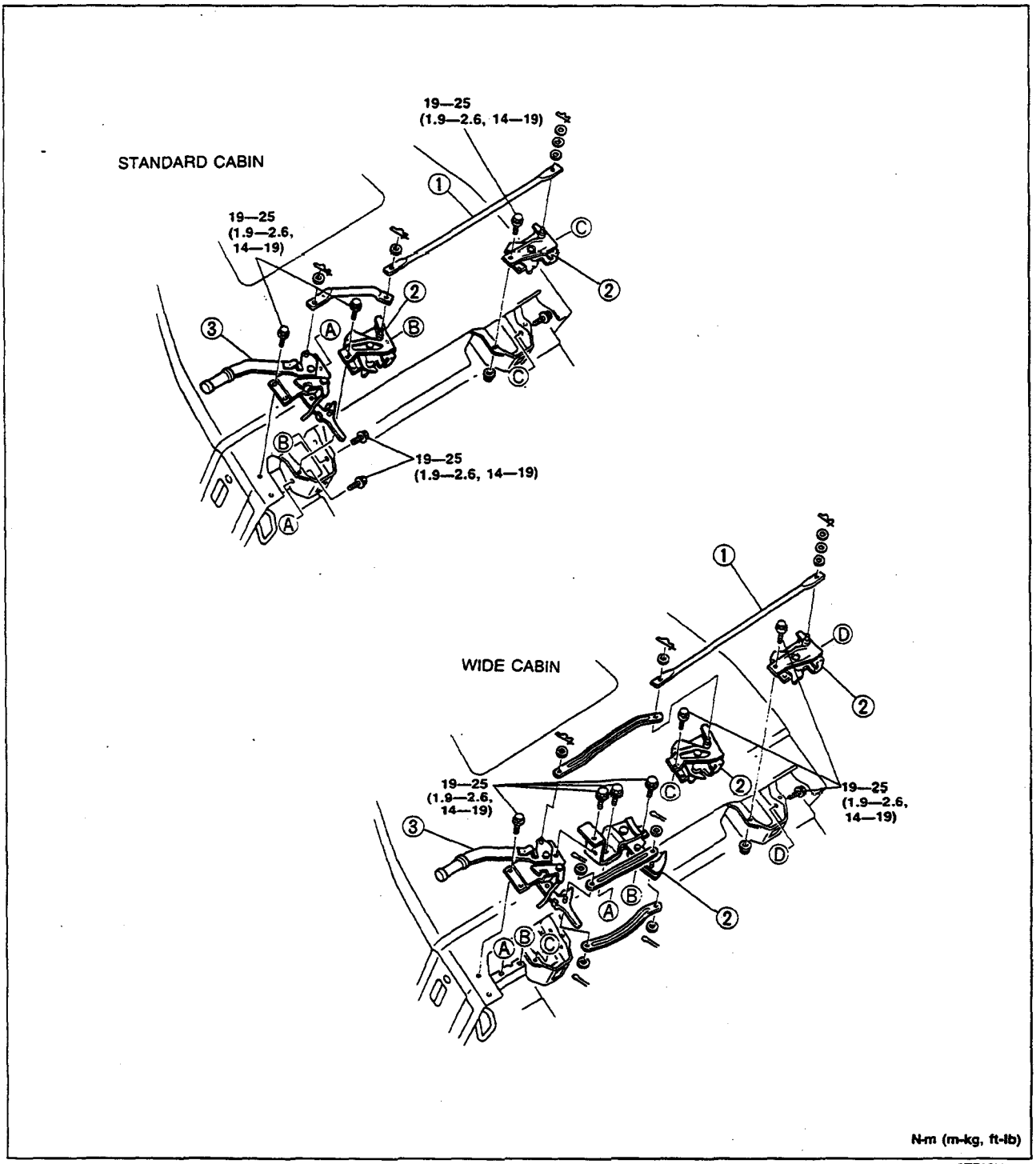
8. Protect the body around the window flame with masking tape.
9. Fill with sealant between the weatherstrip and body and between the weatherstrip and glass around the entire circumference.

TILT LOCK SYSTEM

COMPONENTS

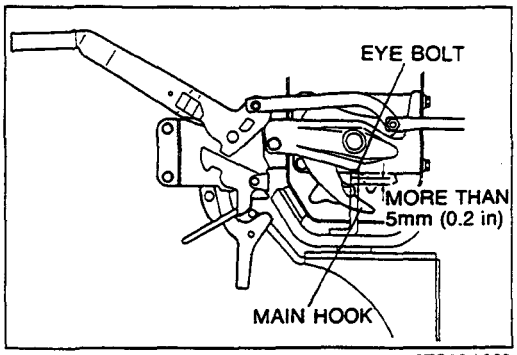
Removal / Installation

1. Disconnect the negative battery cable.
2. Tilt the cabin and verify that it is securely locked in position.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.

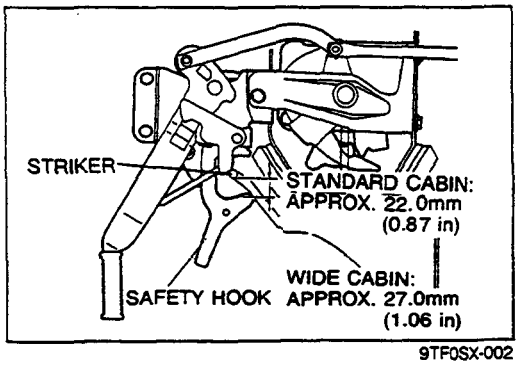


9TF0SX-001

1. Rod
2. Hook assembly
3. Lock lever assembly



9TG0SX-069



9TF0SX-002

Inspection

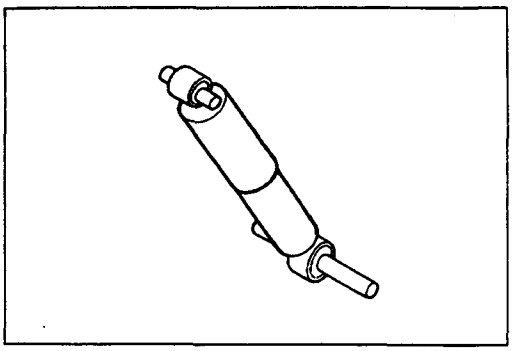
1. Lower the cabin and measure the clearance between the main hook and eye bolt.

   Clearance: 5mm (0.2 in) min.

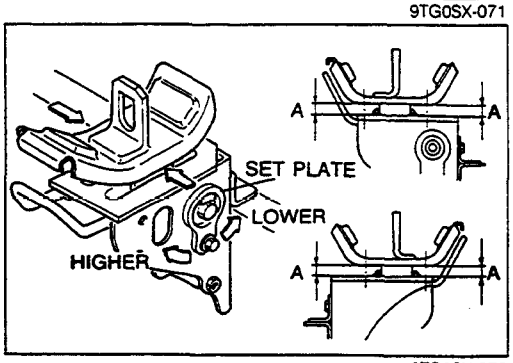
2. Verify that when the main hook is completely locked, the clearance between safety hook and striker is as specified.

   Clearance:
   Wide cabin approx. 27.0mm (1.06 in)
   Standard cabin approx. 22.0mm (0.87 in)

3. If clearance is not within specification, check for a worn main hook or worn eye bolt, and check the lock installation.



9TG0SX-071



9TG0SX-072

CABIN MOUNT

DAMPER

Inspection (On-vehicle)

1. Verify that there is no oil leakage from the damper. Replace the damper if it is leaking.

CABIN MOUNT (With rear cabin damper)

Inspection (On-vehicle)

1. Check for heights A as shown in the figure.

Height:

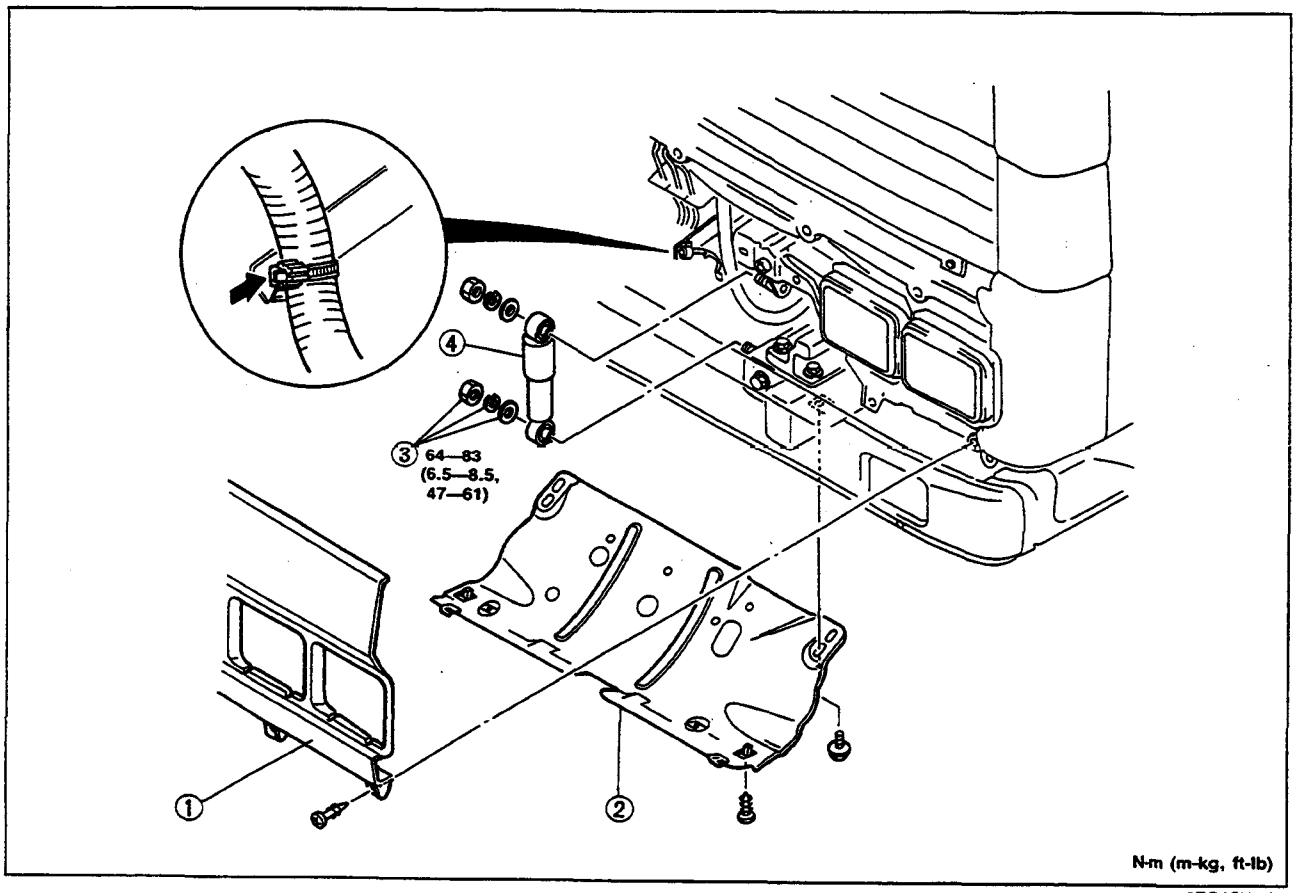
Wide cabin	**43.0 ± 1.0mm (1.69 ± 0.04 in)**
Standard cabin	**26.4 ± 1.0mm (1.04 ± 0.04 in)**

Caution

- **Loosen the damper mounting bolts when adjusting**

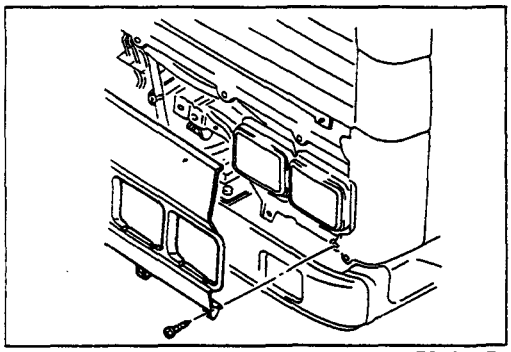
2. Adjust the height by moving the set plate if not as specified.

FRONT CABIN DAMPER



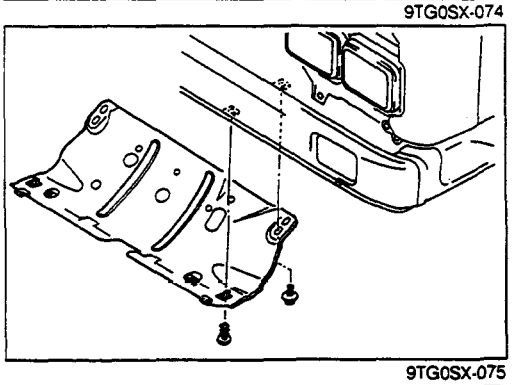
9TG0SX-073

1. Radiator grille
2. Undercover
3. Nut, lock washer, washer
4. Front cabin damper
   Inspection (On-vehicle) ..... page S–42

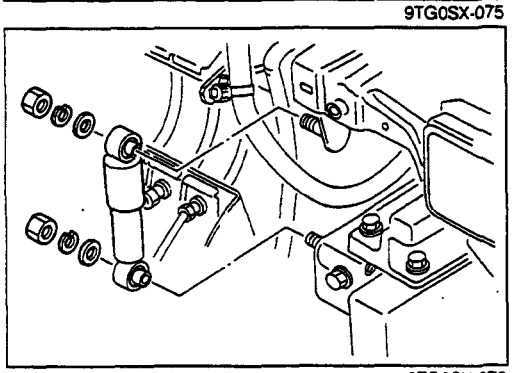

9TG0SX-074

Removal

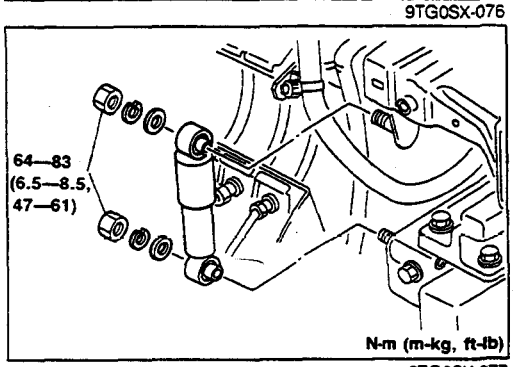
1. Remove the radiator grille.


9TG0SX-075

2. Remove the undercover.


9TG0SX-076

3. Remove the nuts and front cabin damper.

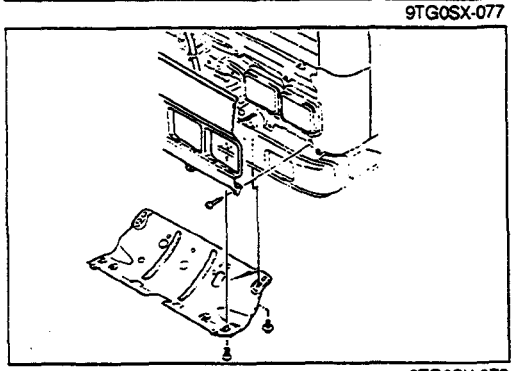


9TG0SX-077

Installation

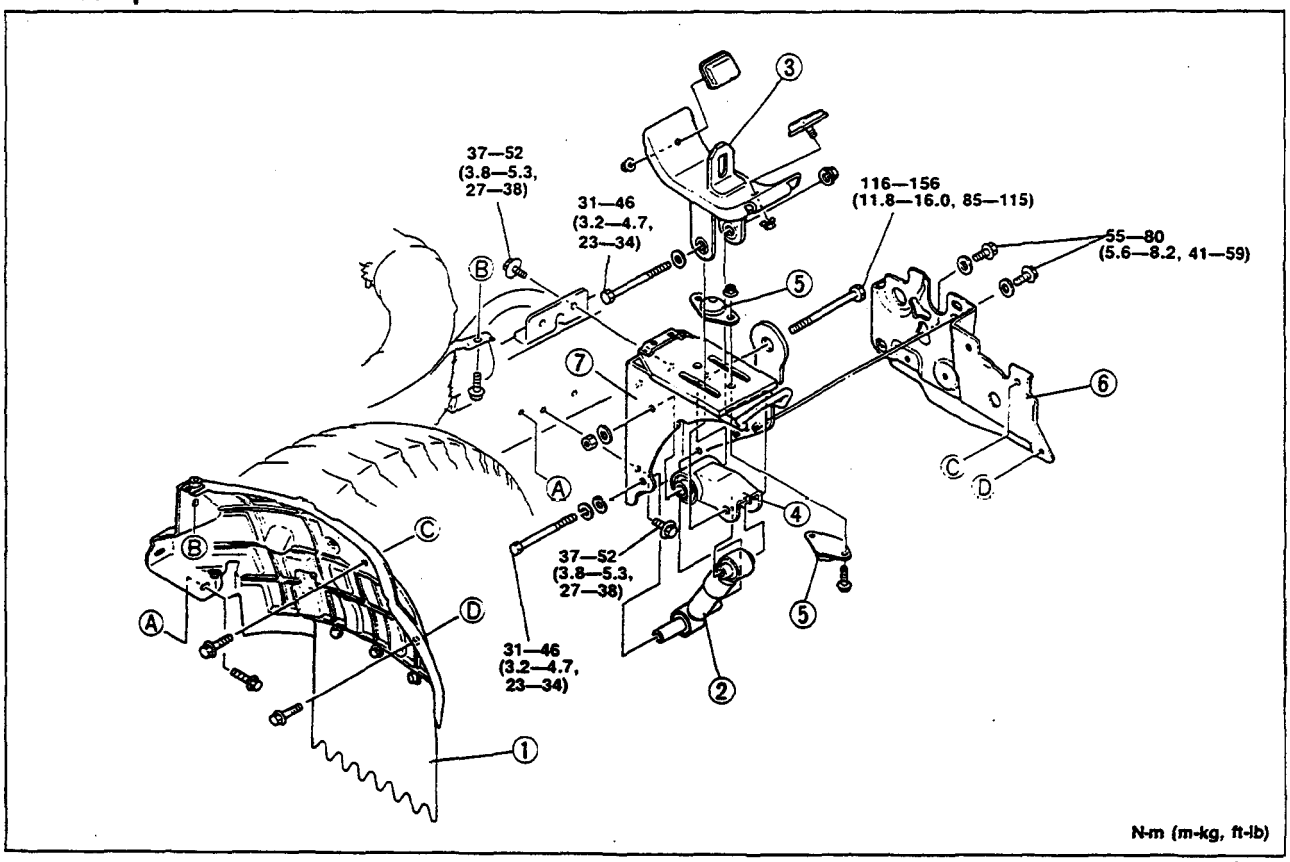
1. Install the damper between the frame and cabin.
2. Install nuts and tighten to the specified torque.

Tightening torque:
64—83 N·m (6.5—8.5 m-kg, 47—61 ft-lb)


9TG0SX-078

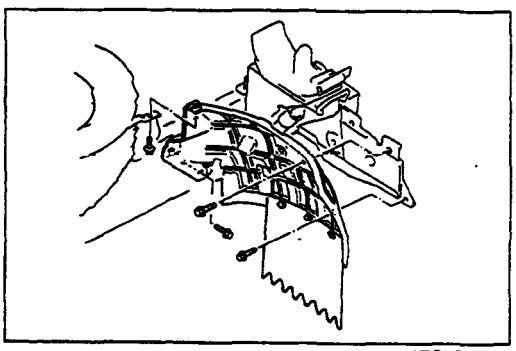
3. Install the undercover and radiator grille.

REAR CABIN MOUNT
With damper

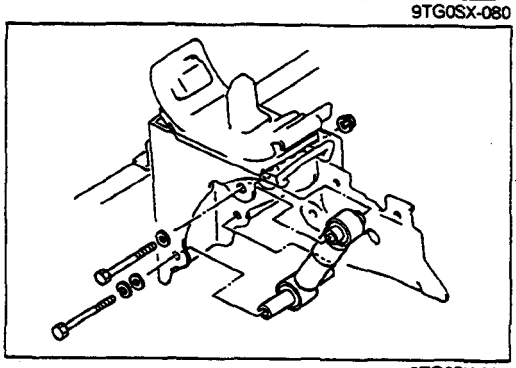


9TG0SX-079

1. Mud guard and flap
2. Rear cabin damper
   Inspection (On-vehicle) ..... page S–42
3. Wedge
4. Arm assembly
5. Stopper rubber
6. Front flap bracket
7. Cabin mount bracket



9TG0SX-080



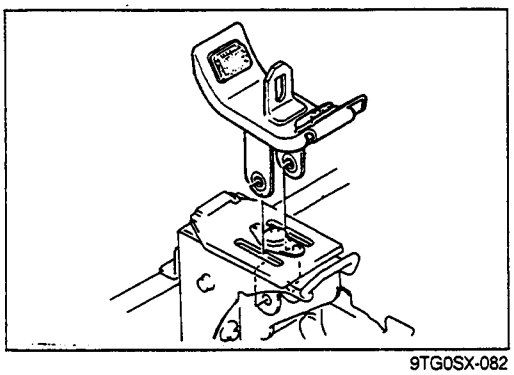
9TG0SX-081

Removal

Caution
- **Securely lock the cabin when raised.**
- **Disconnect the negative battery cable.**

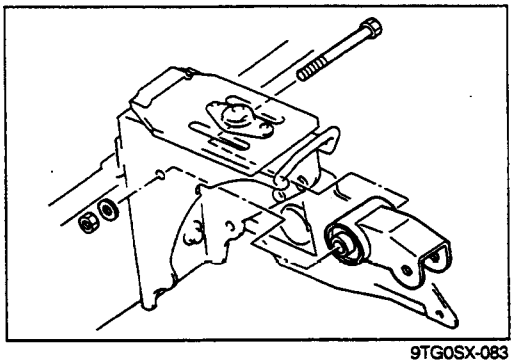
1. Remove the mud guard flap.

2. Remove the damper mounting bolts and damper.



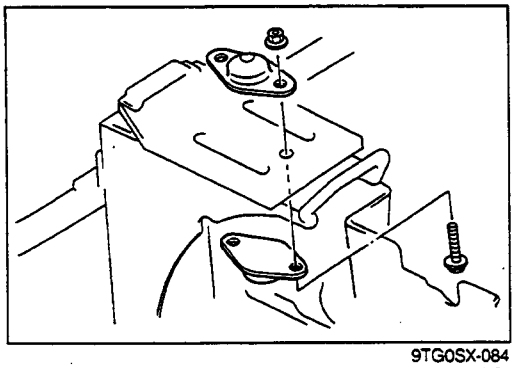
9TG0SX-082

3. Remove the wedge.



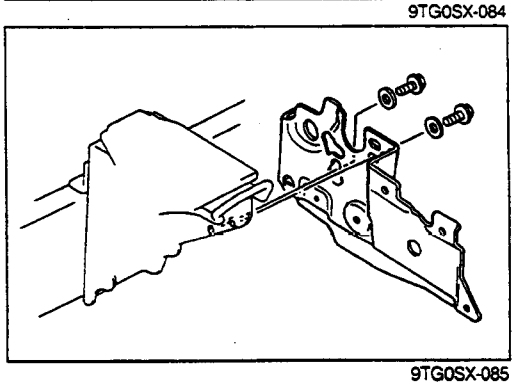
9TG0SX-083

4. Remove the arm mounting bolts and arm.



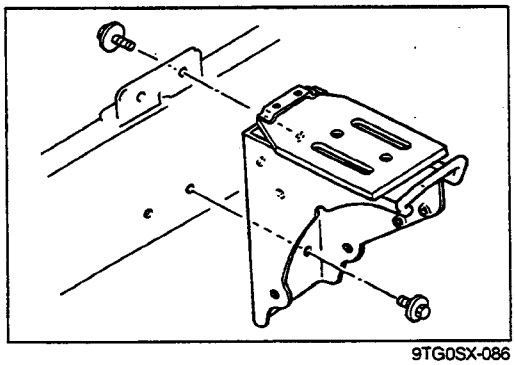
9TG0SX-084

5. Remove the nuts and stopper rubber.



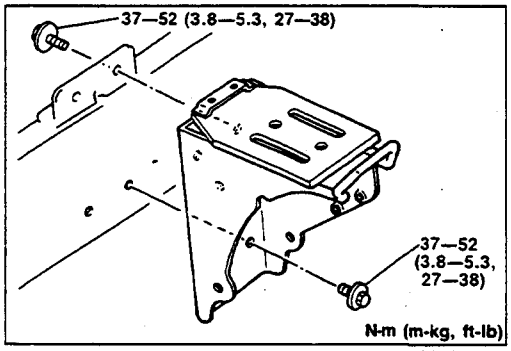
9TG0SX-085

6. Remove the front flap bracket.



9TG0SX-086

7. Remove the cabin mount bracket.

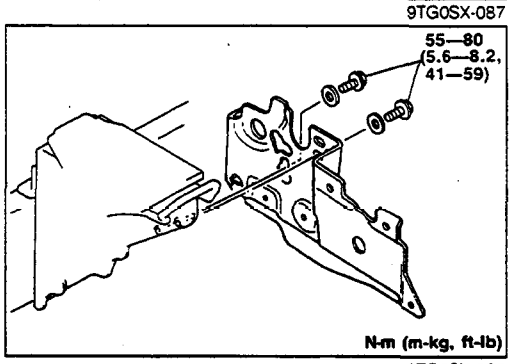


9TG0SX-087

Installation

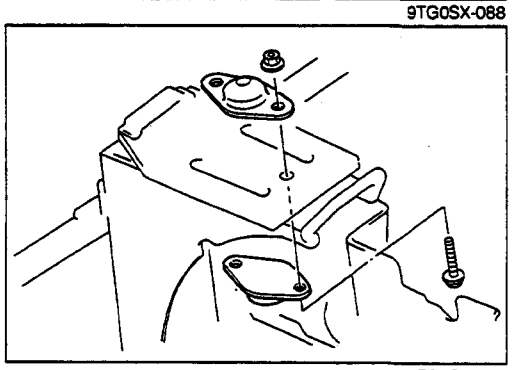
1. Install the cabin mount bracket.

Tightening torque:
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



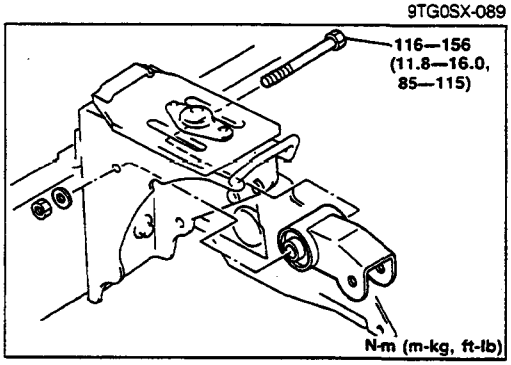
9TG0SX-088

2. Install the front flap bracket.



9TG0SX-089

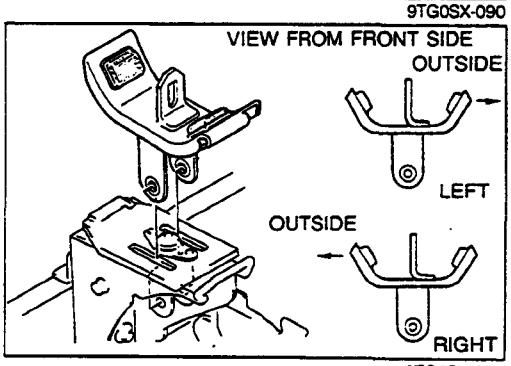
3. Install the stopper rubber.



9TG0SX-090

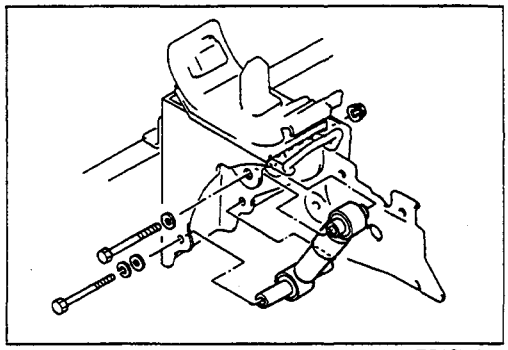
4. Install the arm and bolt.

Tightening torque:
116—156 N·m (11.8—16.0 m-kg, 85—115 ft-lb)

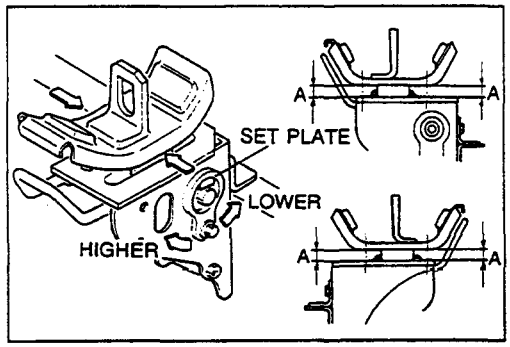


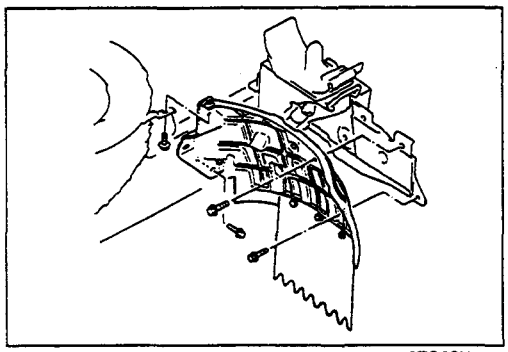
9TG0SX-091

5. Install the wedge as shown in the figure.



9TG0SX-092





9TG0SX-094

6. Install the damper and loosely tighten the bolts.
7. Check for heights A as shown in the figure.
   (Refer to page S–42.)
8. Adjust the height by moving the set plate if not as specified.
9. Tighten the bolt with specified torque.

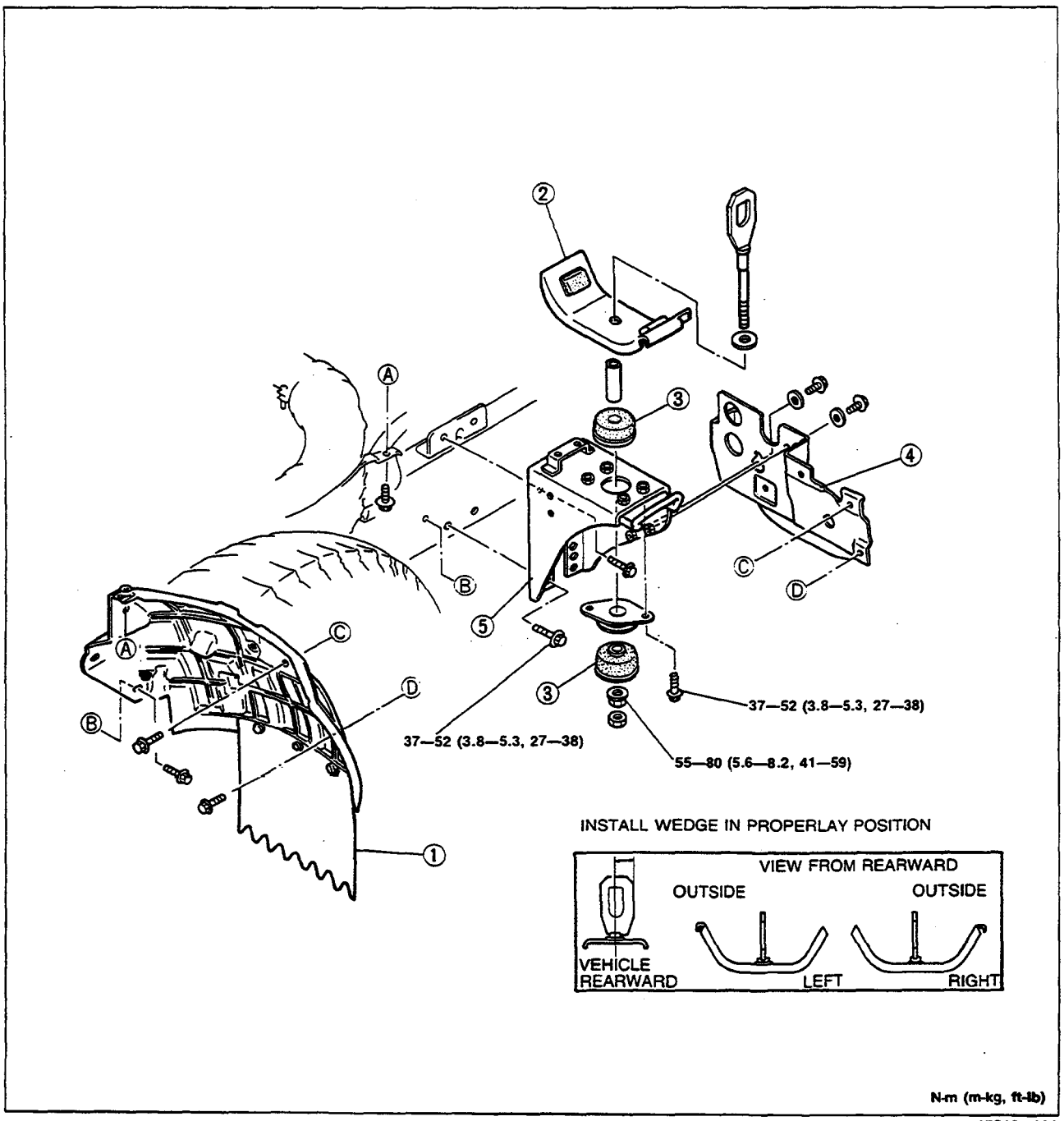
Tightening torque:
31—46 N·m (3.2—4.7 m-kg, 23—34 ft-lb)

10. Install the mud guard flap.

REAR CABIN MOUNT
Without Damper
Removal / Installation

Caution
- **Securely lock the cabin while raised.**

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



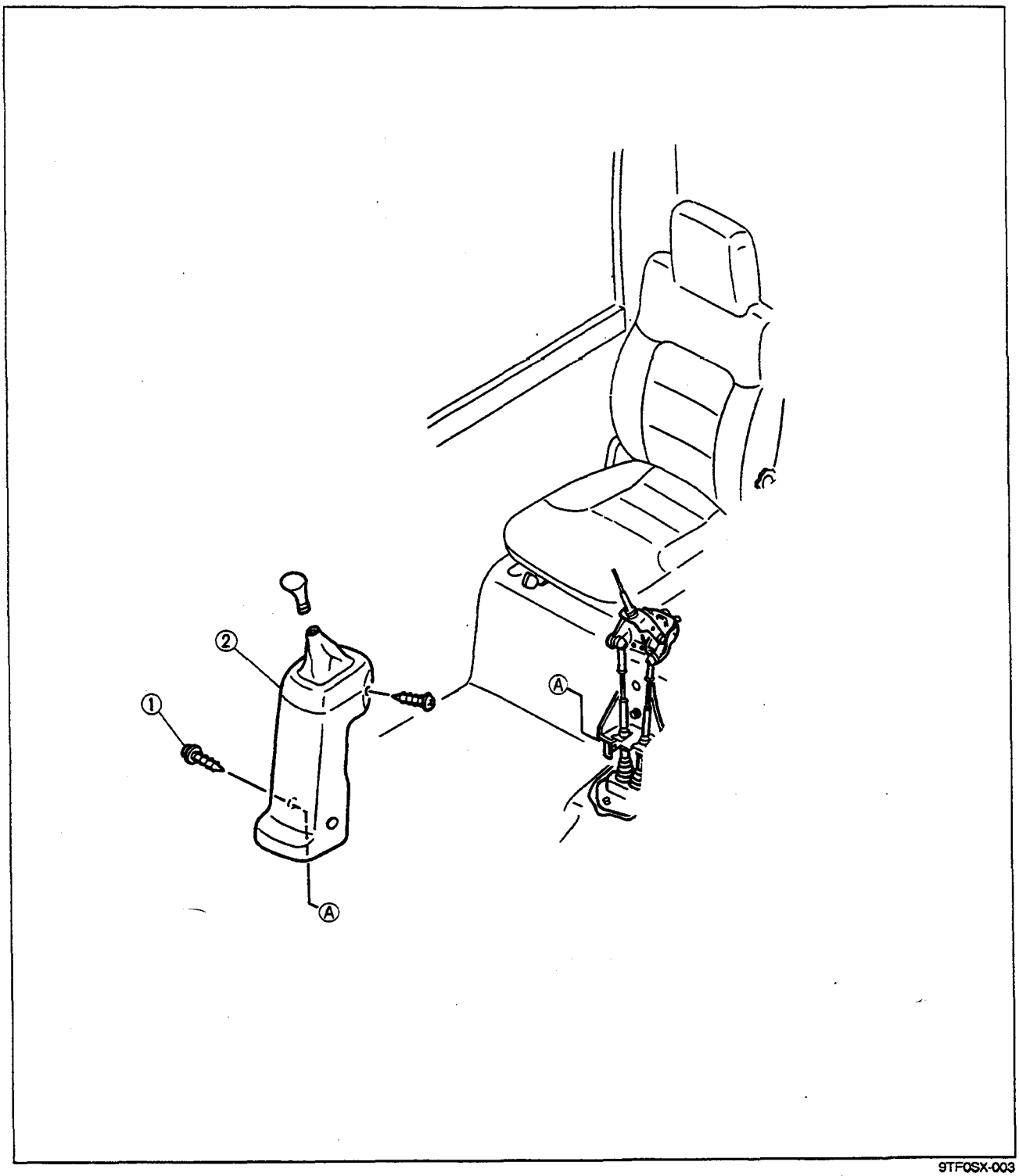
1. Mud guard and flap
2. Wedge
3. Bushing
4. Front flap bracket
5. Rear cabin bracket

CONSOLE

COMPONENTS

Removal / Installation

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



9TF0SX-003

Console

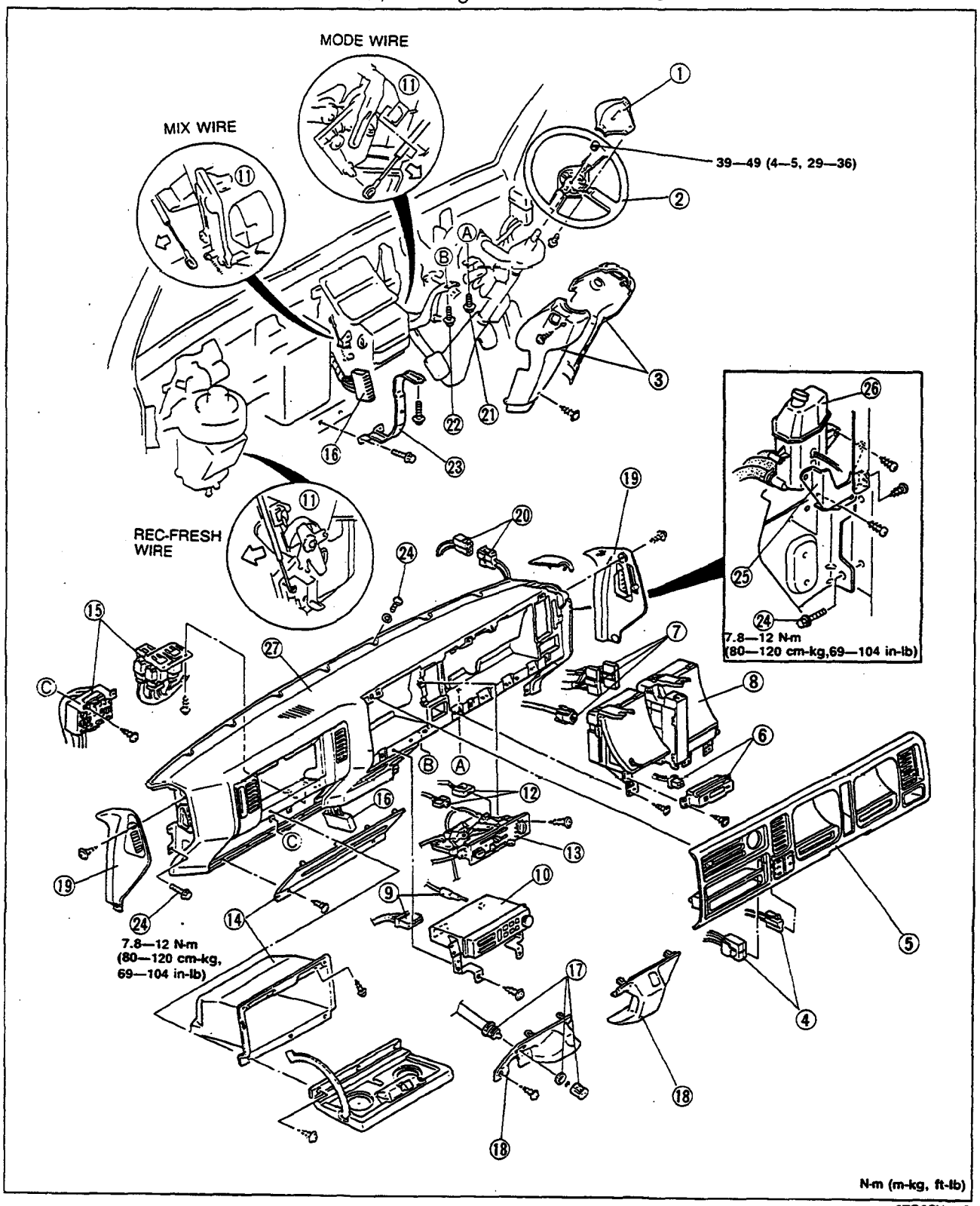
1. Screws
2. Console

INSTRUMENT PANEL

COMPONENTS

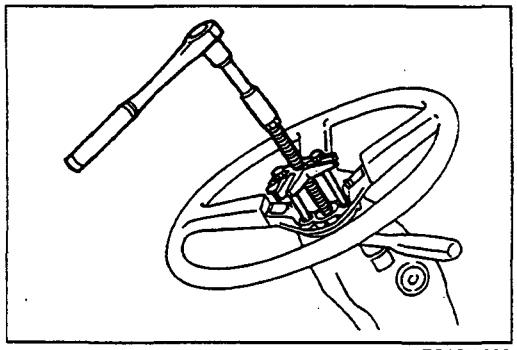
Removal / Installation

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**.

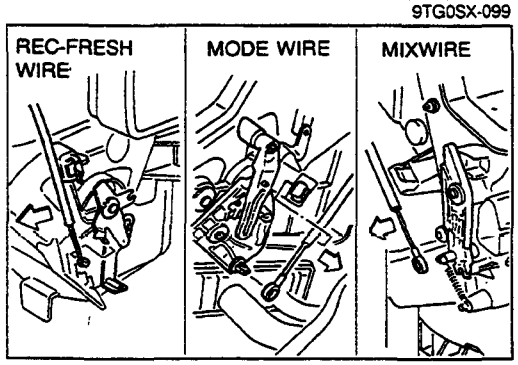


1. Horn cover
2. Steering wheel
   Removal Note ..... page S–51
   Installation Note ..... page S–52
3. Steering column cover
4. Connectors
   (fog light switch, exhaust heating switch)
5. Instrument cluster panel
6. Clock
7. Connector (meter), speedometer cable
8. Instrument cluster (meter)
9. Connector (audio), antenna feeder
10. Audio
11. Heater control wire
    Removal Note ..... page S–51
    Installation Note ..... page S–52
12. Connector (heater control unit)
13. Heater control unit
14. Lower panel, glove box
15. Fuse box, relay assembly
16. Connector
    (for instrument panel harness: 21-pin)
17. Idling knob, cable
18. Lower panel
19. Side panel
20. Connector (brake fluid level sensor)
21. Steering bracket mounting bolt
22. Parking brake bracket mounting bolt
23. Bracket
24. Instrument panel mounting bolt
    Installation Note ..... page S–51
25. Brake reserve tank bracket
26. Brake reserve tank
27. Instrument panel

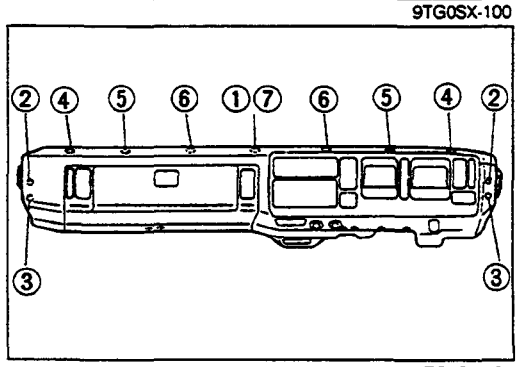
9TG0SX-098



9TG0SX-099



9TG0SX-100



9TG0SX-101

Removal note
Steering wheel
1. Remove the steering wheel with a steering wheel puller.

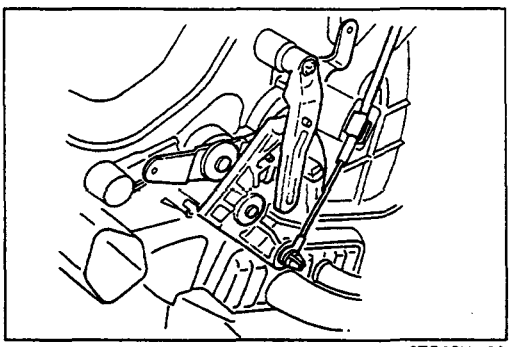
Heater control wire
1. Disconnect the REC-FRESH wire from the blower unit door link.
2. Disconnect the MODE and MIX wires from the heater unit door links.

Installation note
Instrument panel mounting bolt
1. Tighten the instrument panel mounting bolts in the order shown in the figure.

Heater control wire

Caution
- **Connect the heater control wires to the correct positions.**
- **Do not bend or twist the wires when installing.**
- **After installation, move the lever to verify that the wire is securely attached.**

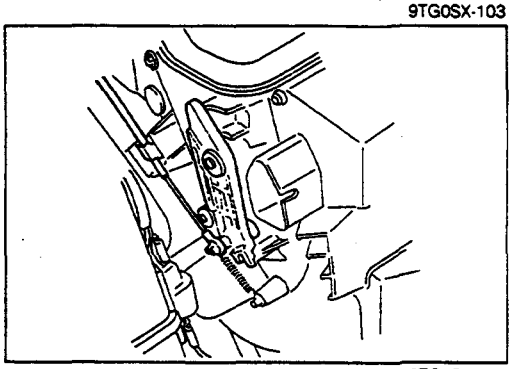
9TG0SX-102



9TG0SX-103

MODE wire
Adjustment
1. Set the MODE lever to DEF position.
2. Set the MODE door link to DEF position as shown in the figure, and connect the wire.
3. Clamp the wire.

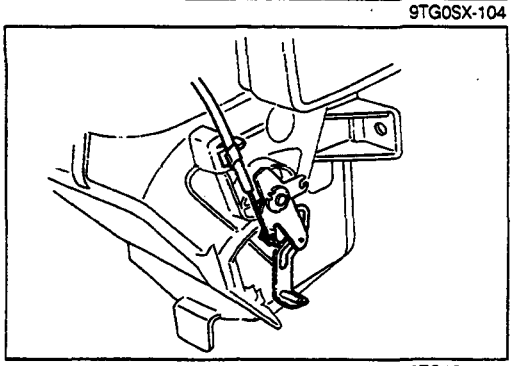
Caution
- **After installation, move the MODE lever to verify that it moves the full stroke from DEF to VENT.**



9TG0SX-104

MIX wire
Adjustment
1. Set the MIX lever to maximum hot position.
2. Set the MIX door link to maximum hot position as shown in the figure, and connect the wire.
3. Clamp the wire.

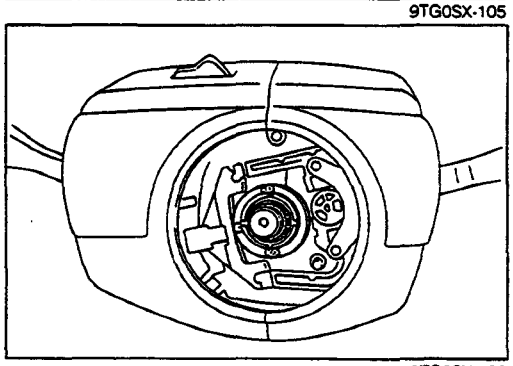
Caution
- **After installation, move the MIX lever to verify that it moves the full stroke from HOT to COLD.**



9TG0SX-105

REC-FRESH wire
Adjustment
1. Set the REC-FRESH lever to REC position.
2. Set the REC-FRESH door link to REC position as shown in the figure, and connect the wire.
3. Clamp the wire.

Caution
- **After installation, move the REC-FRESH lever to verify that it moves the full stroke from REC to FRESH.**



9TG0SX-106

Steering wheel
1. Set the cancel cam as shown in the figure.

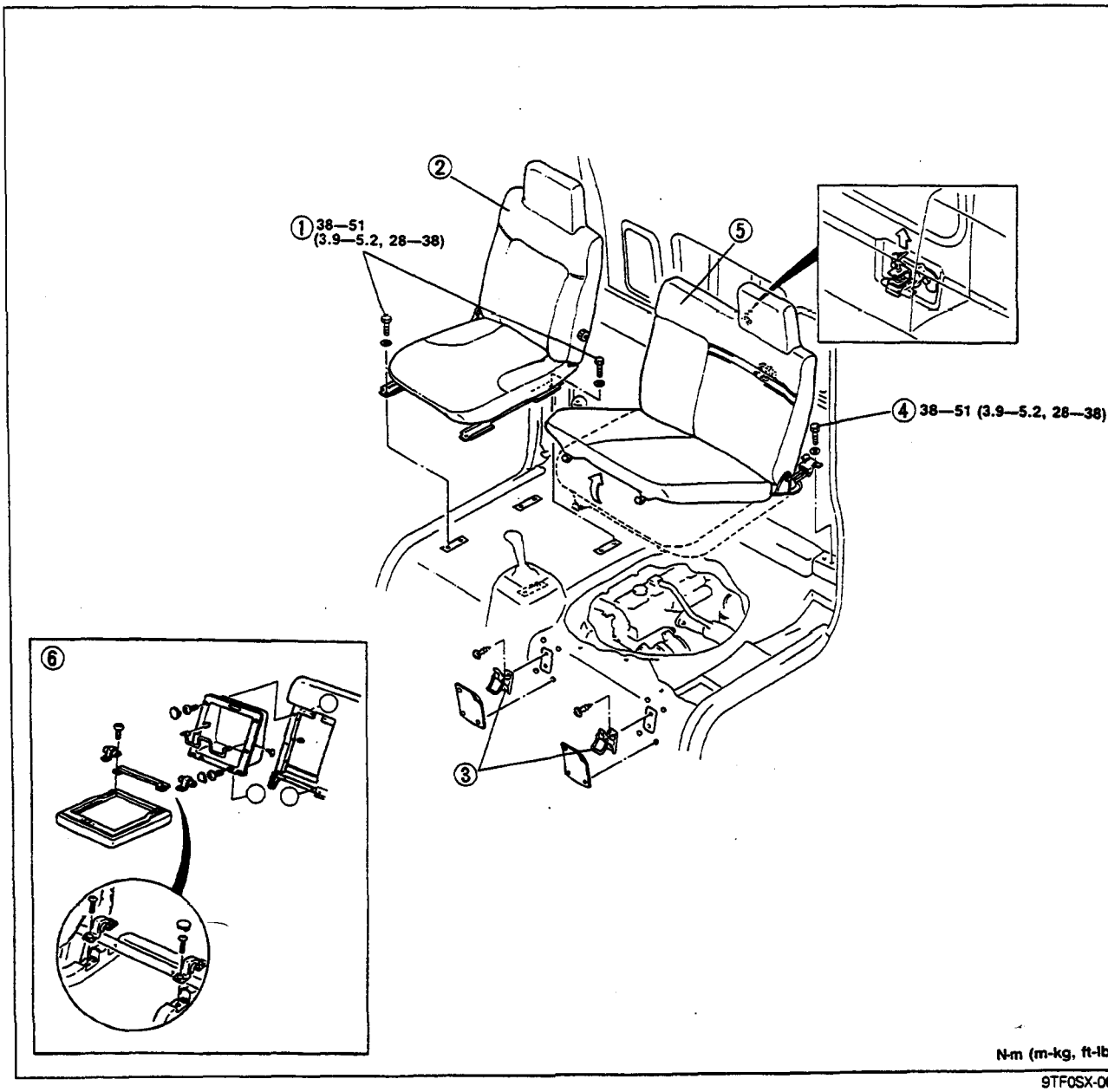
SEAT

SEAT

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, referring to **Installation Note**.

Front seat

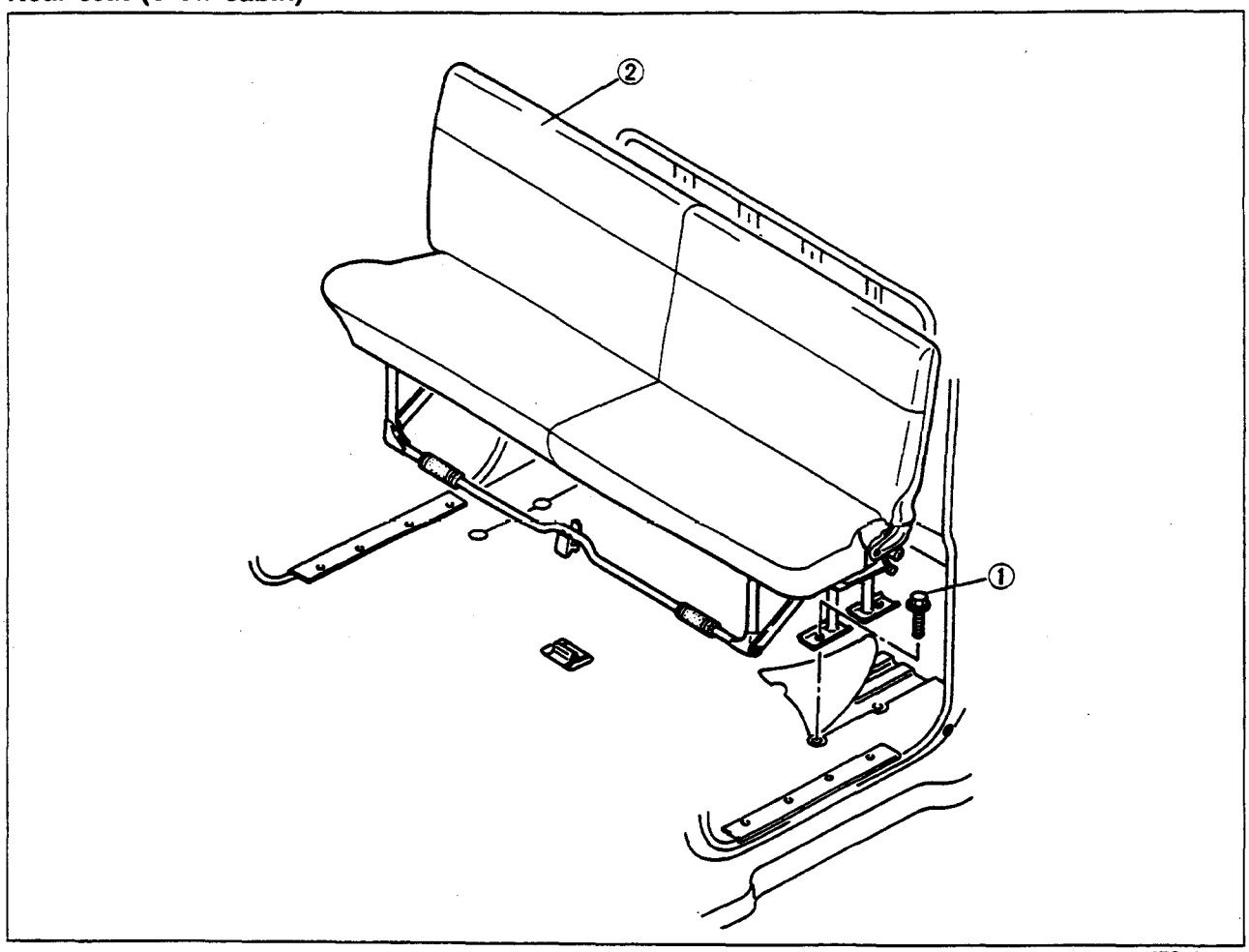


Driver seat
1. Seat mounting bolt
2. Driver seat
   Installation Note ..... page S–54
   Disassembly / Assembly..... page S–55

Passenger seat
3. Shutter lever
4. Mounting bolt
5. Passenger seat
   Installation Note ..... page S–54
   Disassembly /Assembly ..... page S–56, 57

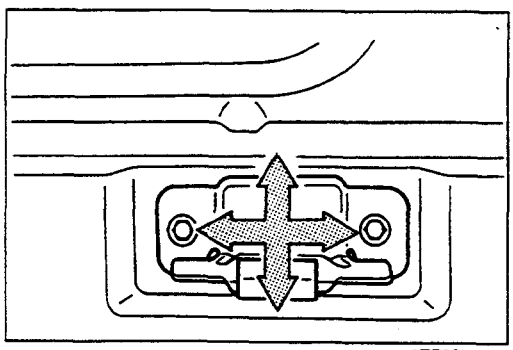
Seatback tray
6. Seatback tray

Rear seat (Crew cabin)

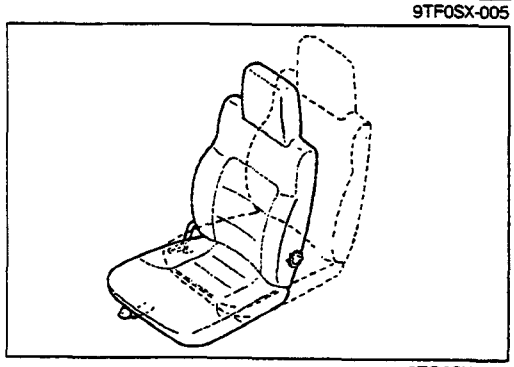


9TG0SX-108

1. Mounting bolt
2. Rear seat



9TF0SX-005



9TG0SX-110

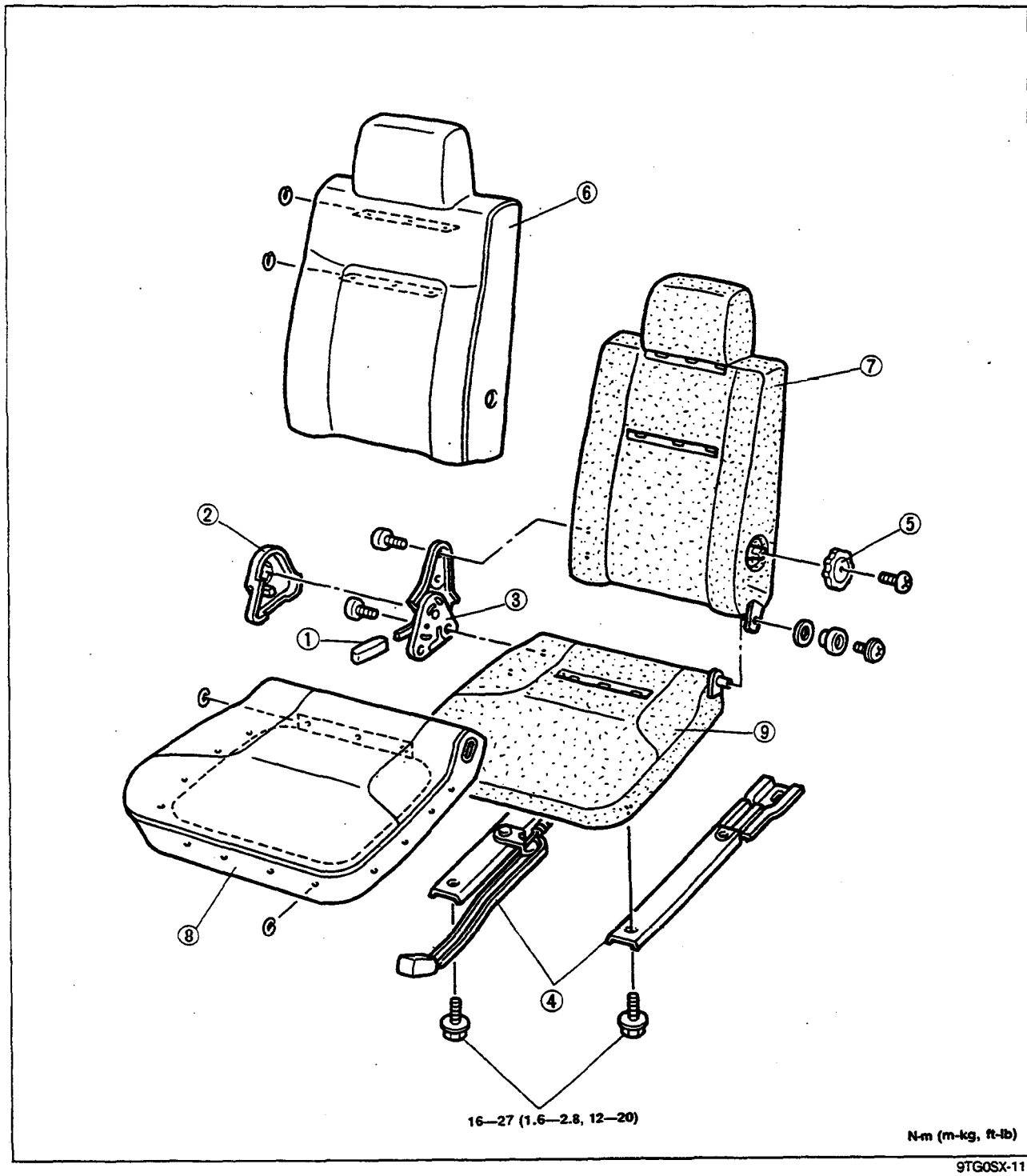
Installation note
Passenger seat
1. Verify that the seatback lock is securely locked after installation.
2. Adjust the seatback striker if necessary.

Driver seat
1. Verify that the seat slides smoothly.

Disassembly / Assembly

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

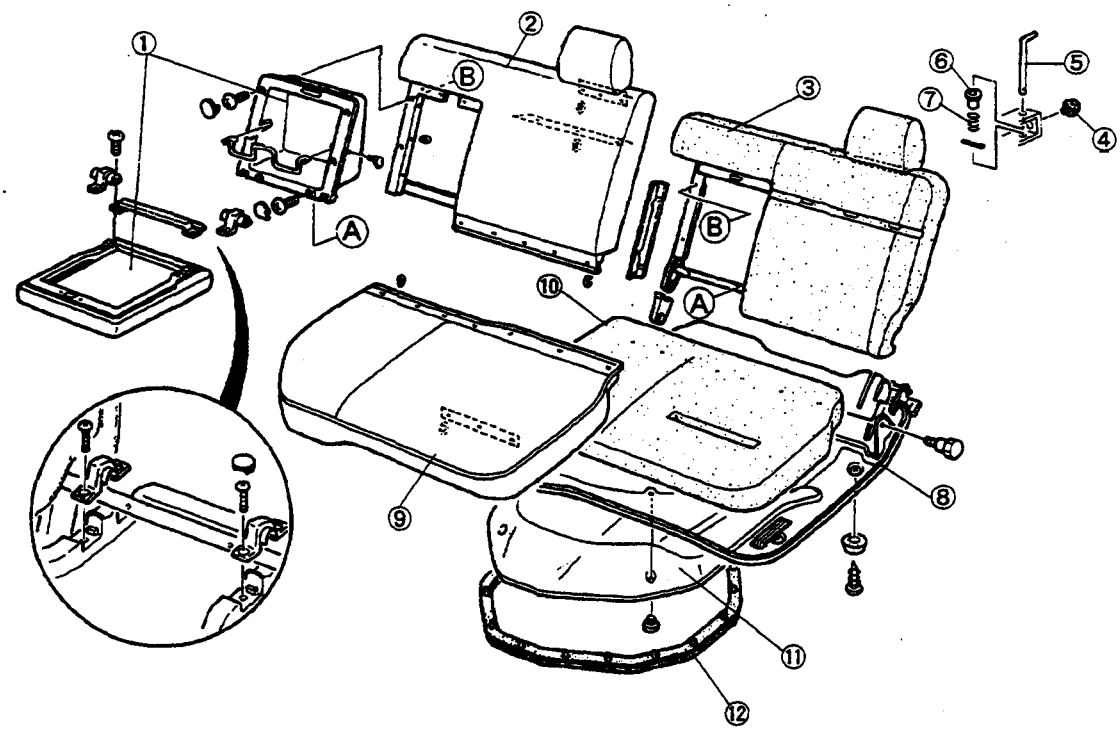
Driver seat



9TG0SX-111

1. Knuckle knob
2. Knuckle cover
3. Reclining knuckle
4. Adjuster
5. Lumbar support dial
6. Seatback trim
7. Seatback cushion
8. Seat cushion trim
9. Seat cushion

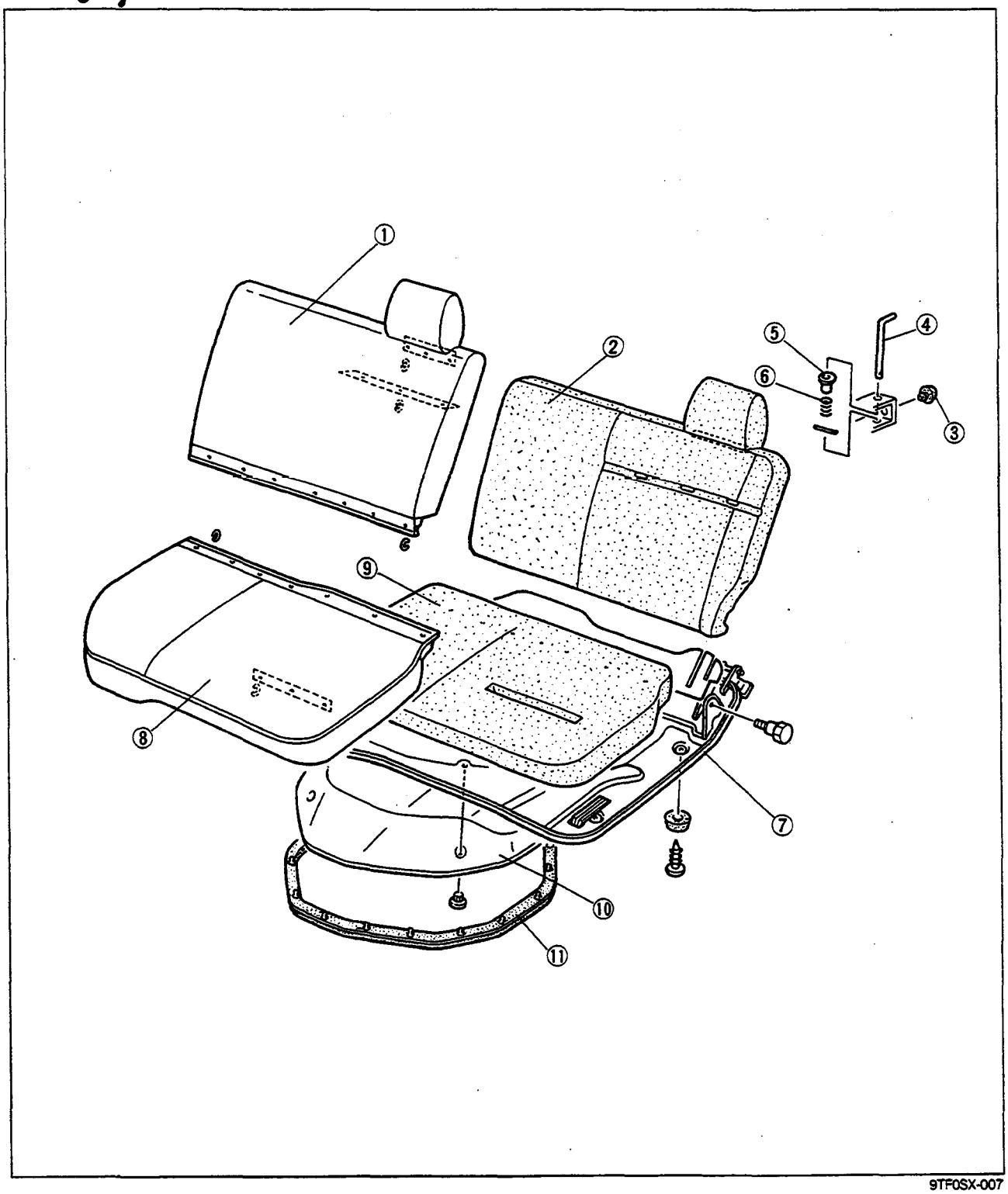
Passenger seat (with seatback tray)



9TF0SX-006

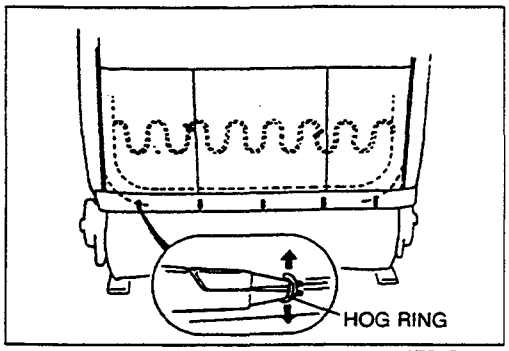
1. Seatback tray
2. Front seatback trim
3. Front seatback cushion
4. Rubber
5. Lock pin
6. Bushing
7. Spring
8. Plate
9. Front seat trim
10. Front seat cushion
11. Insulator
    Disassembly Note..... page S–58
12. Rubber seal
    Disassembly Note..... page S–58

Passenger seat



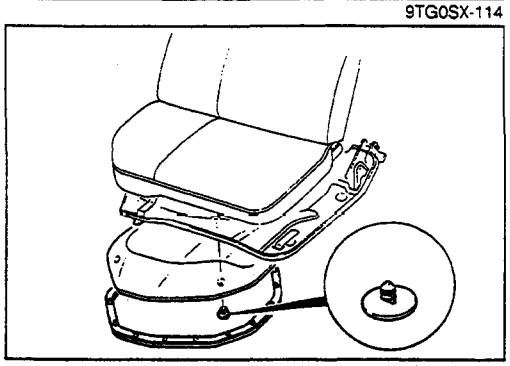
9TF0SX-007

1. Front seatback trim
2. Front seatback cushion
3. Rubber
4. Lock pin
5. Bushing
6. Spring
7. Plate
8. Front seat trim
9. Front seat cushion
10. Insulator
    Disassembly Note..... page S–58
11. Rubber seal
    Disassembly Note..... page S–58

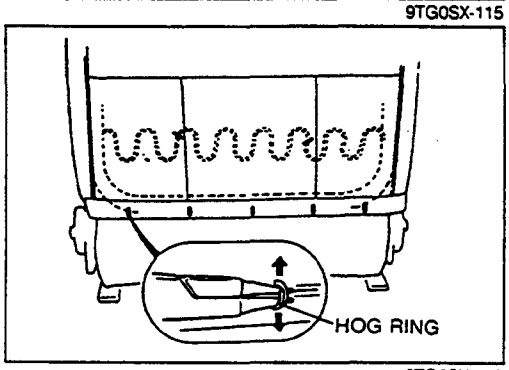


9TG0SX-114

Disassembly note
Insulator
1. Remove the hog rings from the seatback and seat cushion.
2. Remove the seat cushion cover.

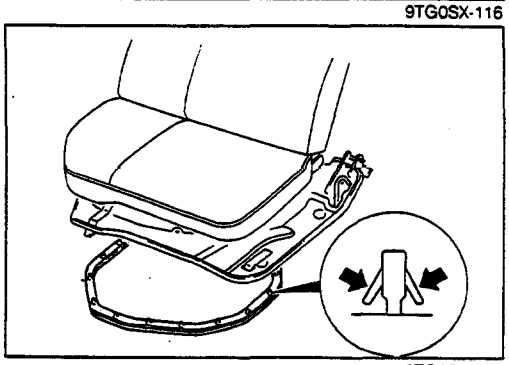

9TG0SX-115

3. Remove the fasteners and insulator.



9TG0SX-116

Rubber seal
1. Remove the hog rings from the seatback and seat cushion.
2. Remove the seat cushion cover.


9TG0SX-117

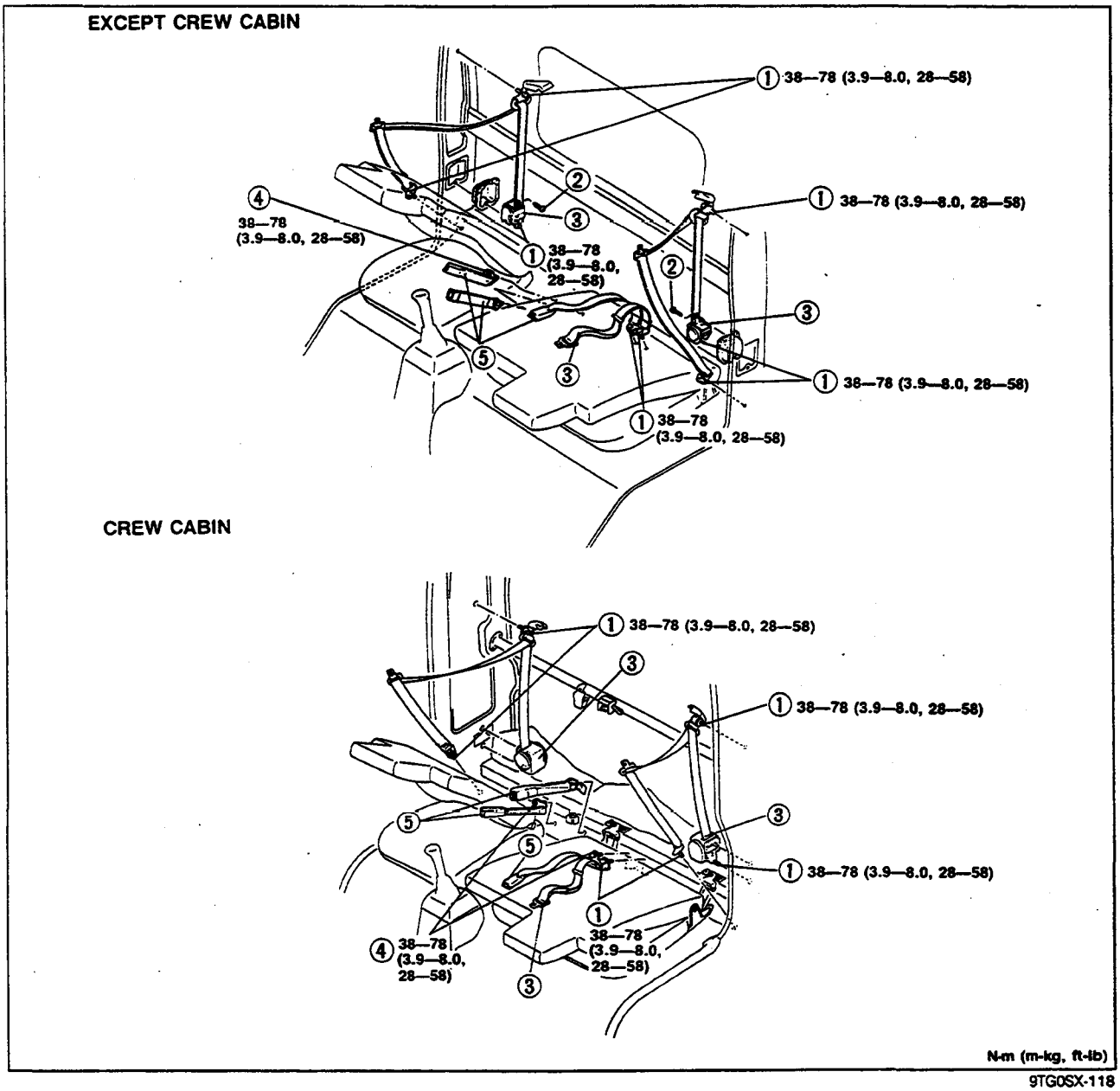
3. Remove the rubber seal fasteners as shown in the figure.

SEAT BELT

SEAT BELT
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.

Caution
- **Do not disassemble the buckle and retractor assembly.**

Front seat belt

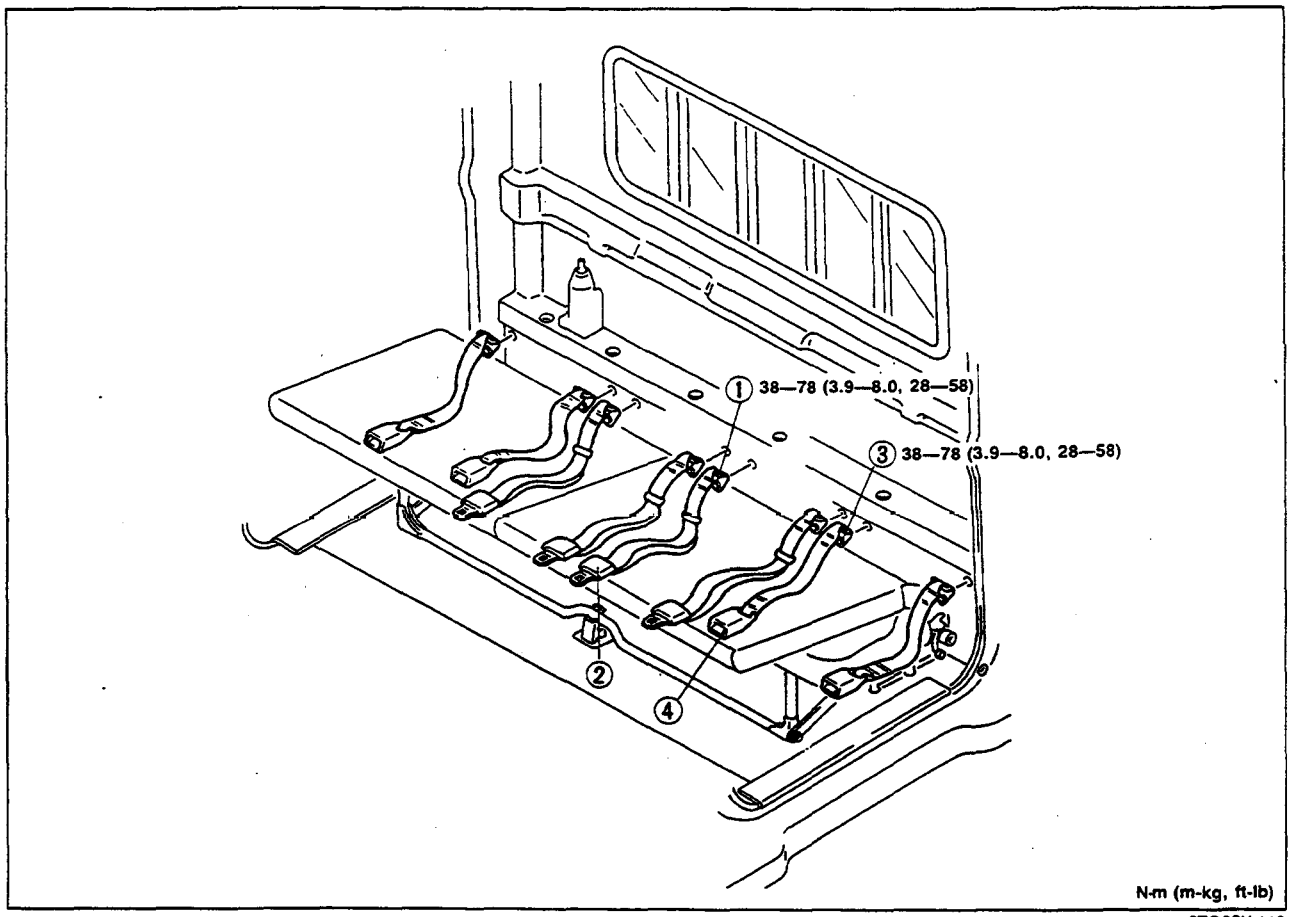


9TG0SX-118

Front seat belt
1. Bolt
2. Screw
3. Front seat belt
   Inspection ..... page S–60

Buckle
4. Bolt
5. Buckle

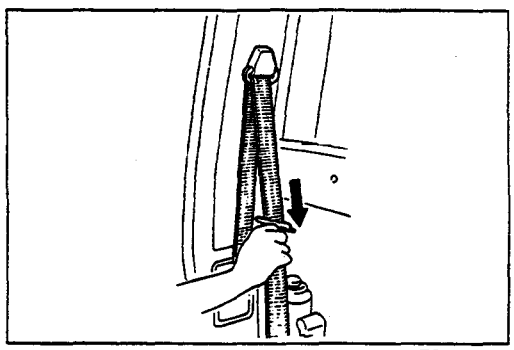
Rear seat belt



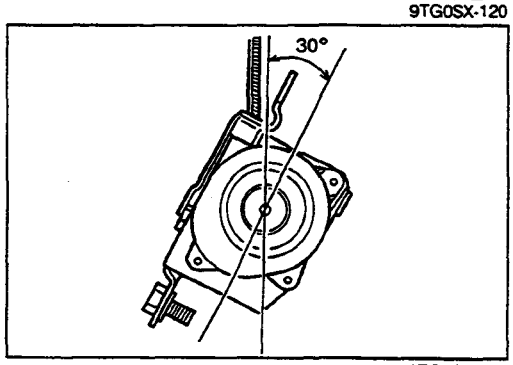
9TG0SX-119

Rear seat belt
1. Bolt
2. Rear seat belt

Buckle
3. Bolt
4. Buckle



9TG0SX-120



9TG0SX-121

Inspection

Emergency locking retractor (ELR)

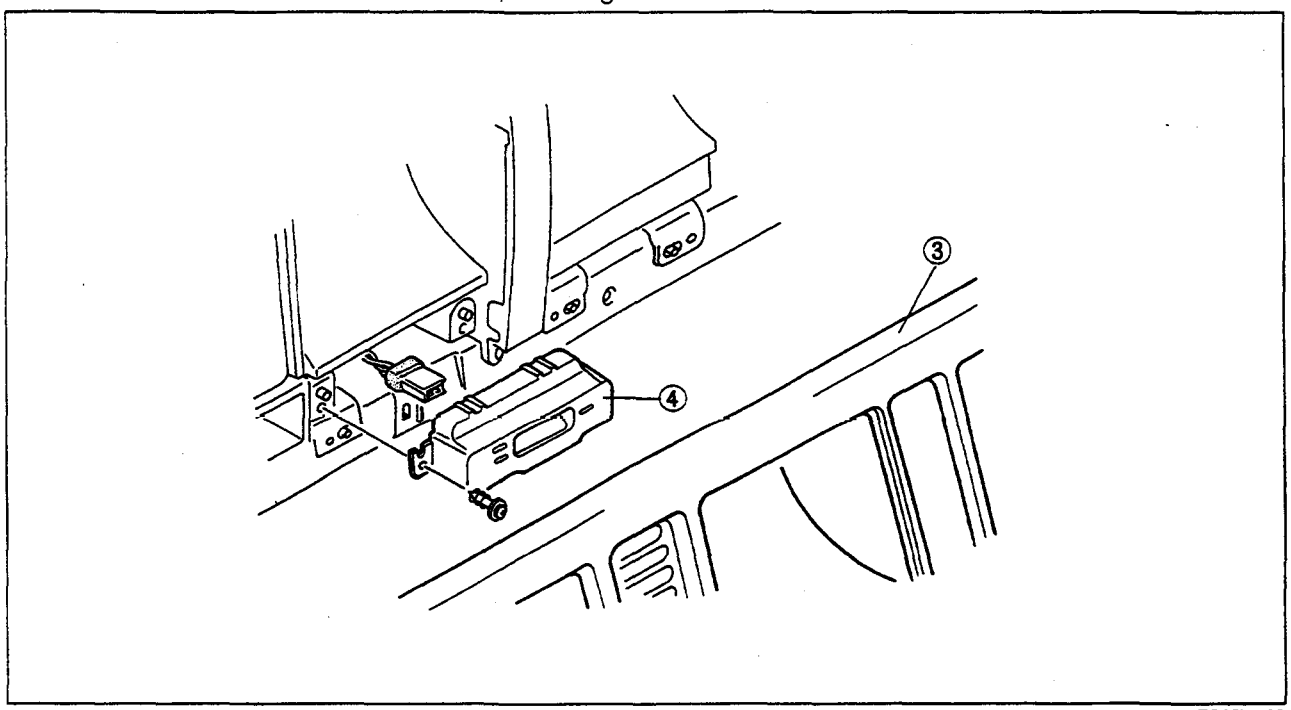
1. Verify that the belt can be pulled out smoothly and that it moves smoothly when worn.
2. Verify that the retractor locks when quickly pulling the belt.
3. Remove the retractor.
4. Hold the retractor as it is installed.
5. Slowly incline the retractor while pulling out the belt.
6. Verify that the retractor locks at **Approx. 30 degrees** inclination.

CLOCK

CLOCK

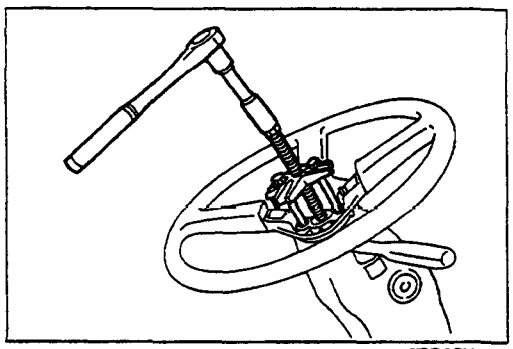
Removal / Installation

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**.



9TG0SX-122

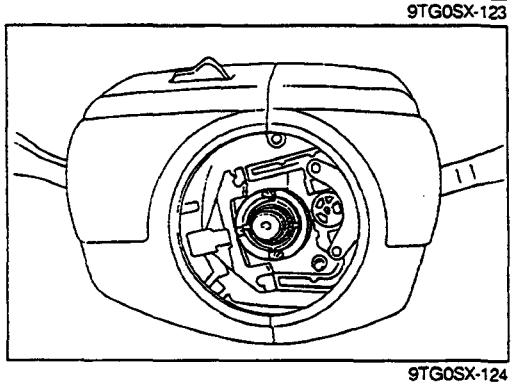
1. Steering column
2. Steering wheel
   Removal Note ..... page S–61
   Installation Note ..... page S–61
3. Instrument cluster panel
4. Clock



9TG0SX-123

Removal note
Steering wheel

1. Remove the steering wheel with a steering wheel puller.



9TG0SX-124

Installation note
Steering wheel

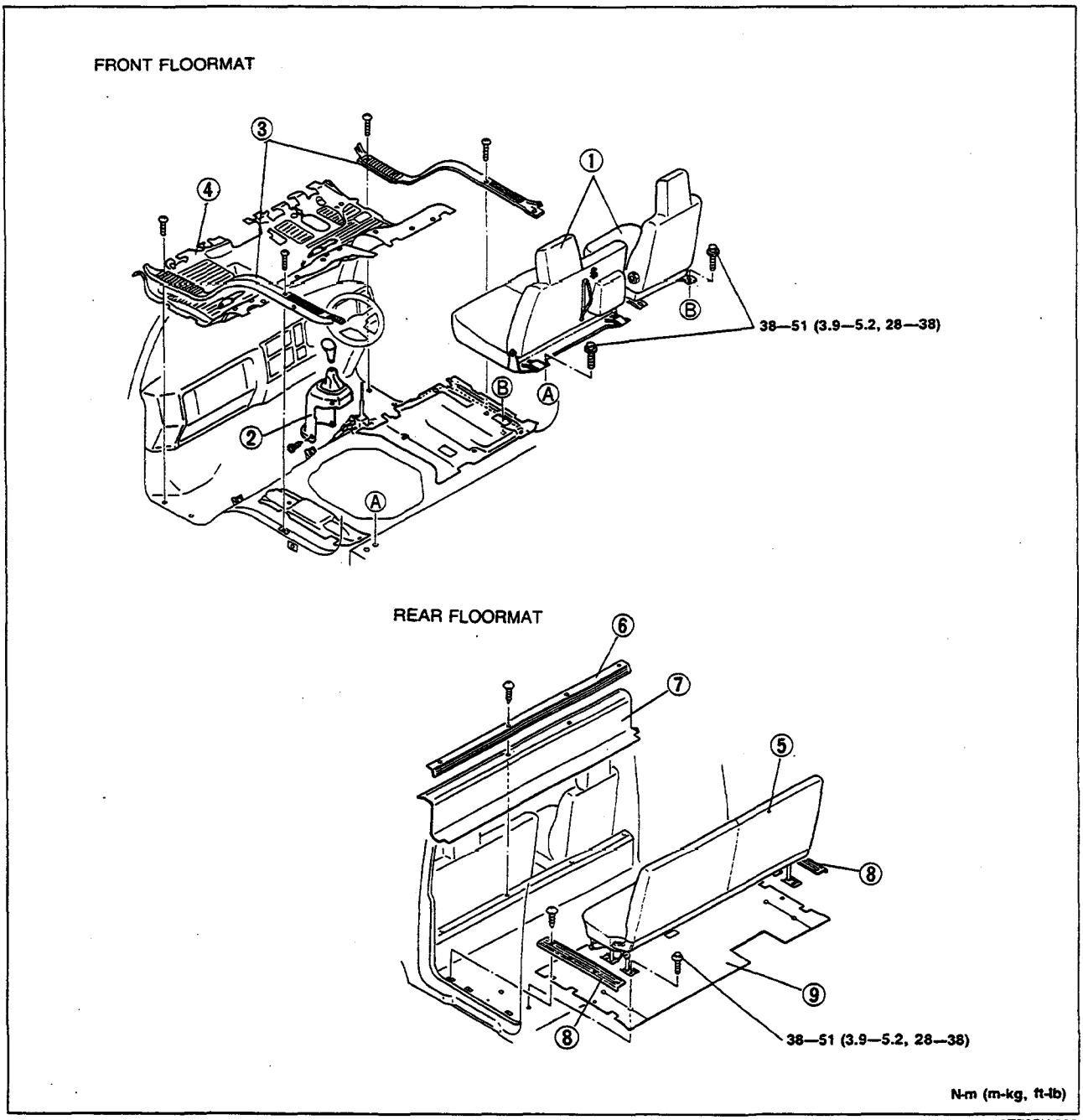
1. Set the cancel cam as shown in the figure.

FLOORMAT

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.



Front floormat

1. Front seat
   Removal / Installation ..... page S–53
2. Console
   Removal / Installation ..... page S–49
3. Scuff plate
4. Front floormat

Rear floormat

5. Rear seat
   Removal / Installation ..... page S–54
6. Brim plate
7. Back plate mat
8. Mat side plate
9. Rear floormat

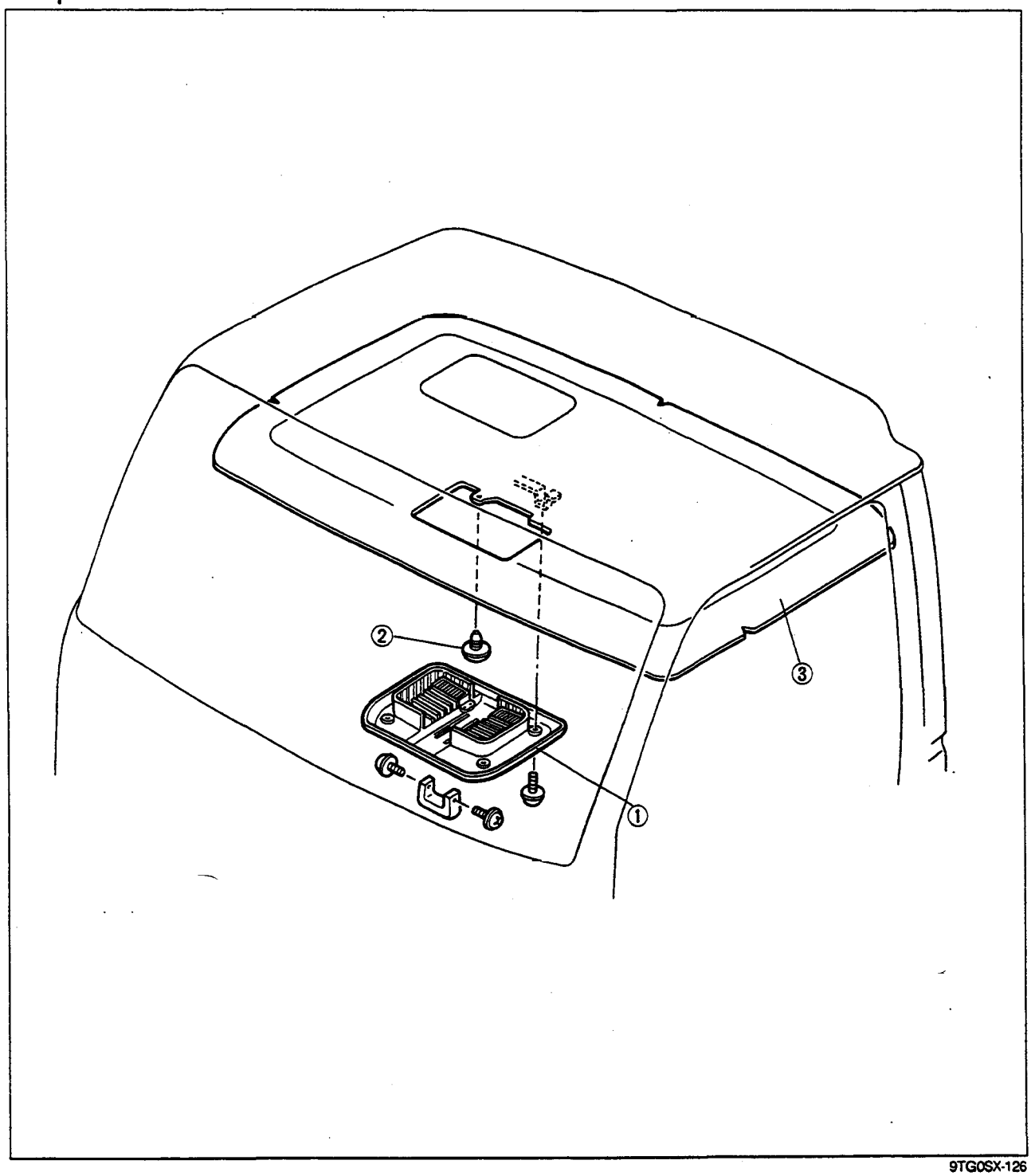
HEADLINER

HEADLINER

Removal

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure.

Except crew cabin

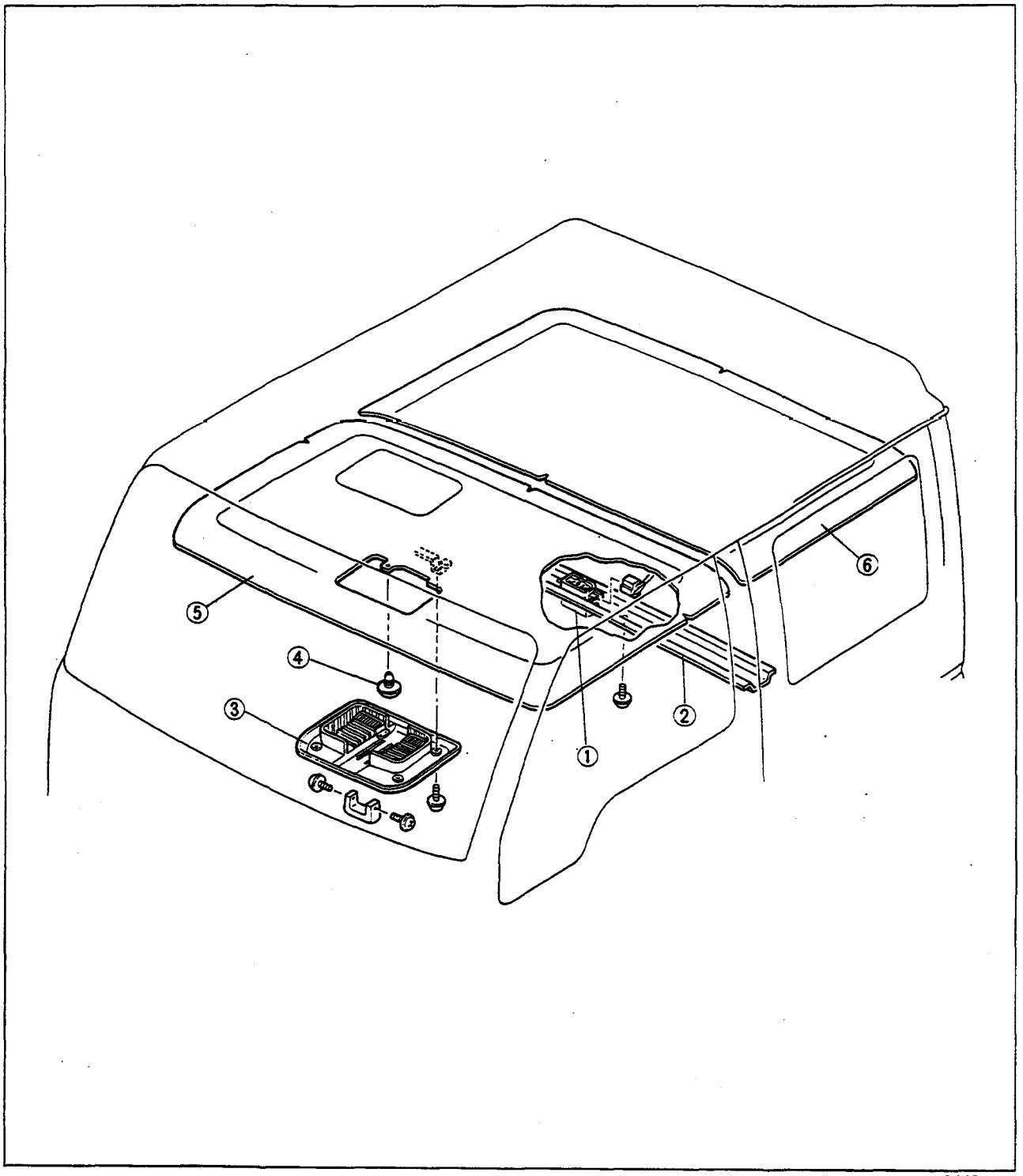


9TG0SX-126

1. Roof ventilator grille
2. Fastener
3. Headliner

Installation ..... page S–65

Crew cabin



9TG0SX-127

1. Rear interior lamp
   Service ..... Section T
2. Roof reinforcement

Front headliner

3. Roof ventilator grille
4. Fastener
5. Front headliner
   Installation ..... page S–66

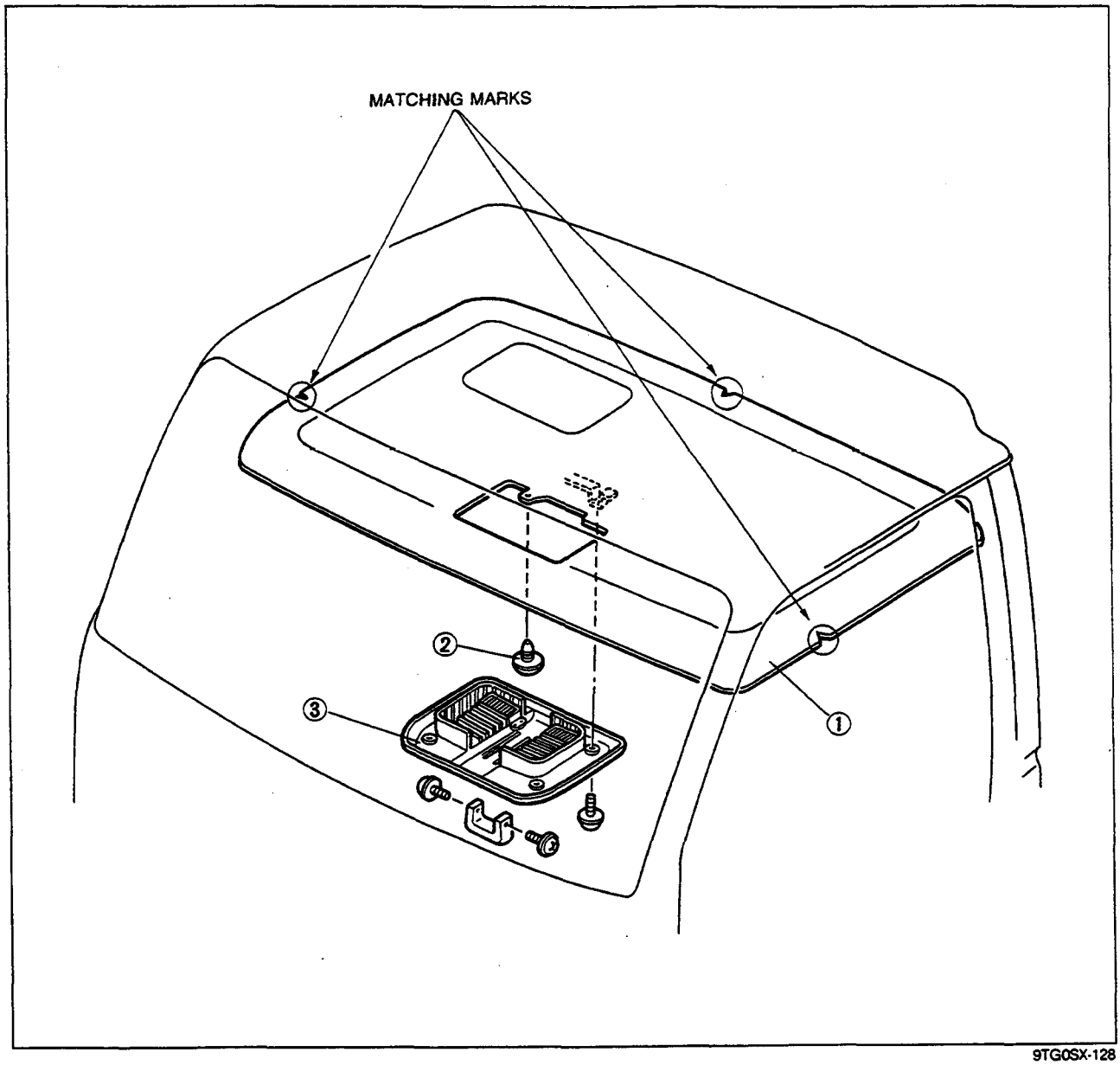
Rear headliner

6. Rear headliner
   Installation ..... page S–66

Installation

1. Install in the reverse order of removal, referring to **Installation Note**.

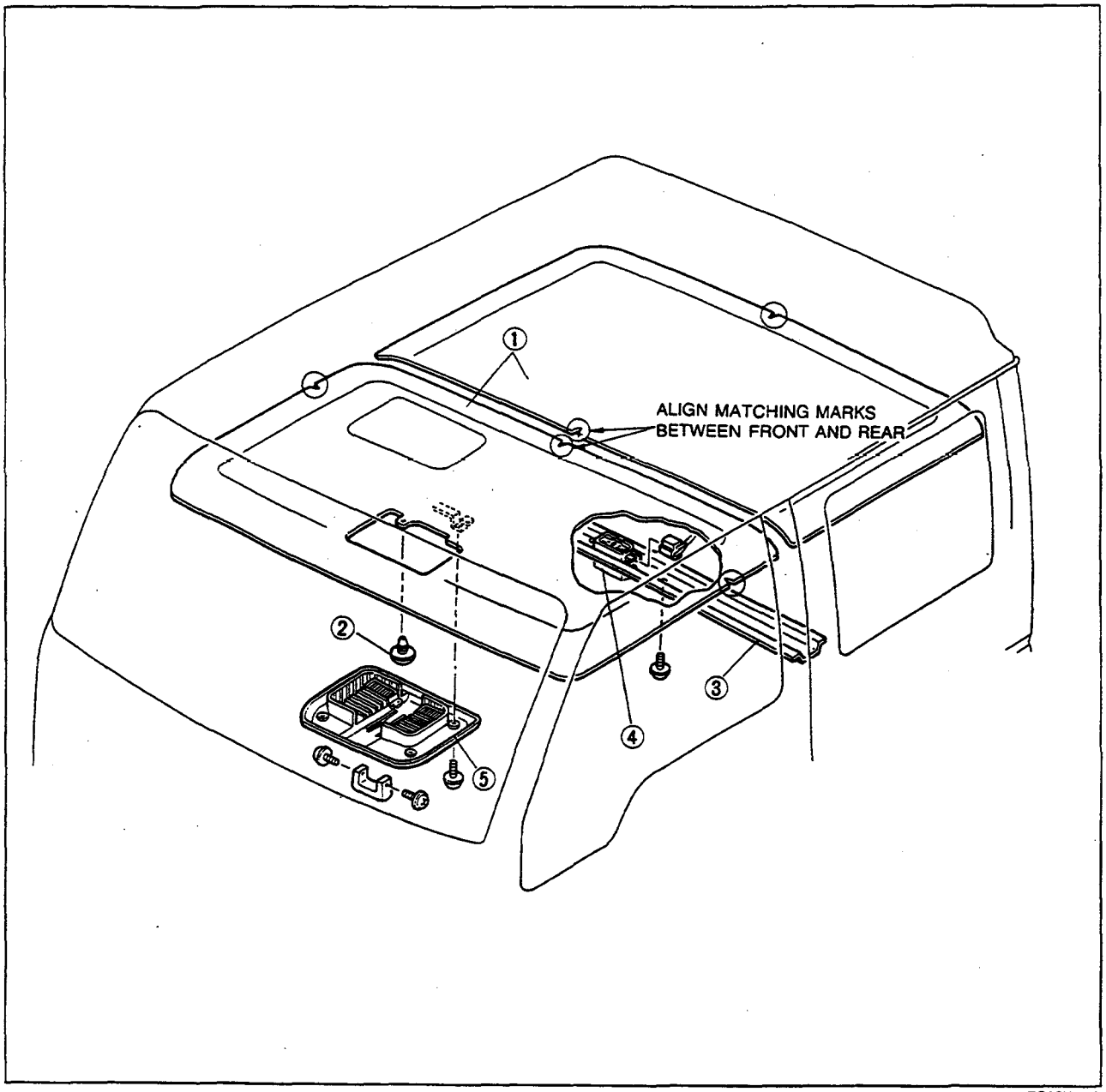
Except crew cabin



9TG0SX-128

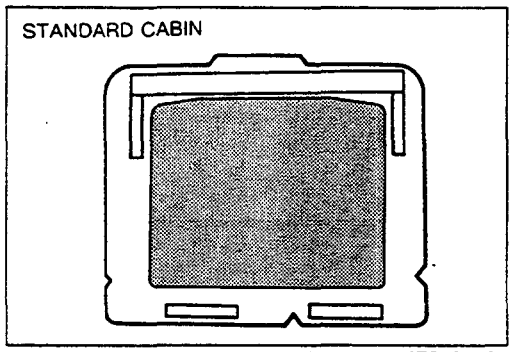
1. Headliner
   Installation Note ..... page S–67
2. Fastener
3. Roof ventilator grille

Crew cabin

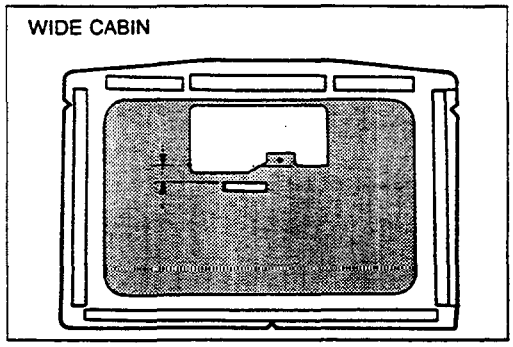


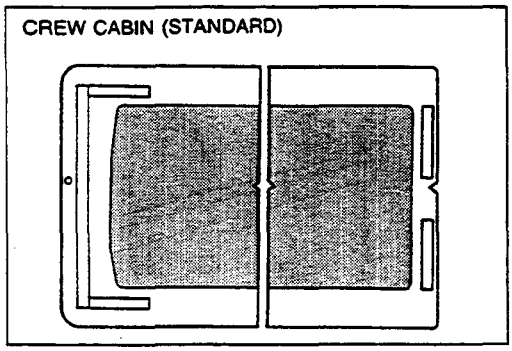
9TG0SX-129

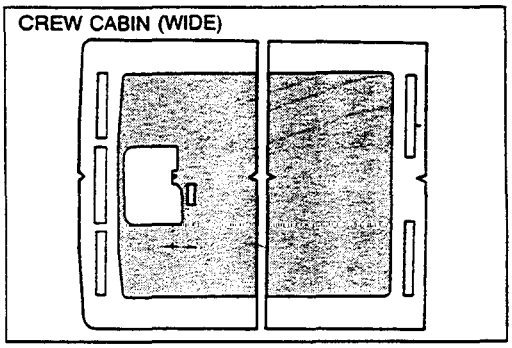
1. Headliner
   Installation Note ..... page S–67
2. Fastener
3. Roof reinforcement
4. Rear interior lamp
5. Roof ventilator grille



9TG0SX-130

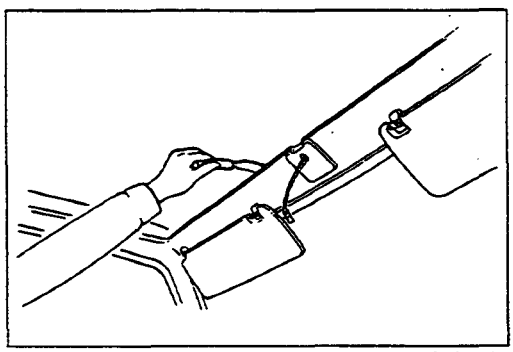






Installation note
Headliner

1. Remove the protective sheet (shaded area) from the headliner.



9TG0SX-131

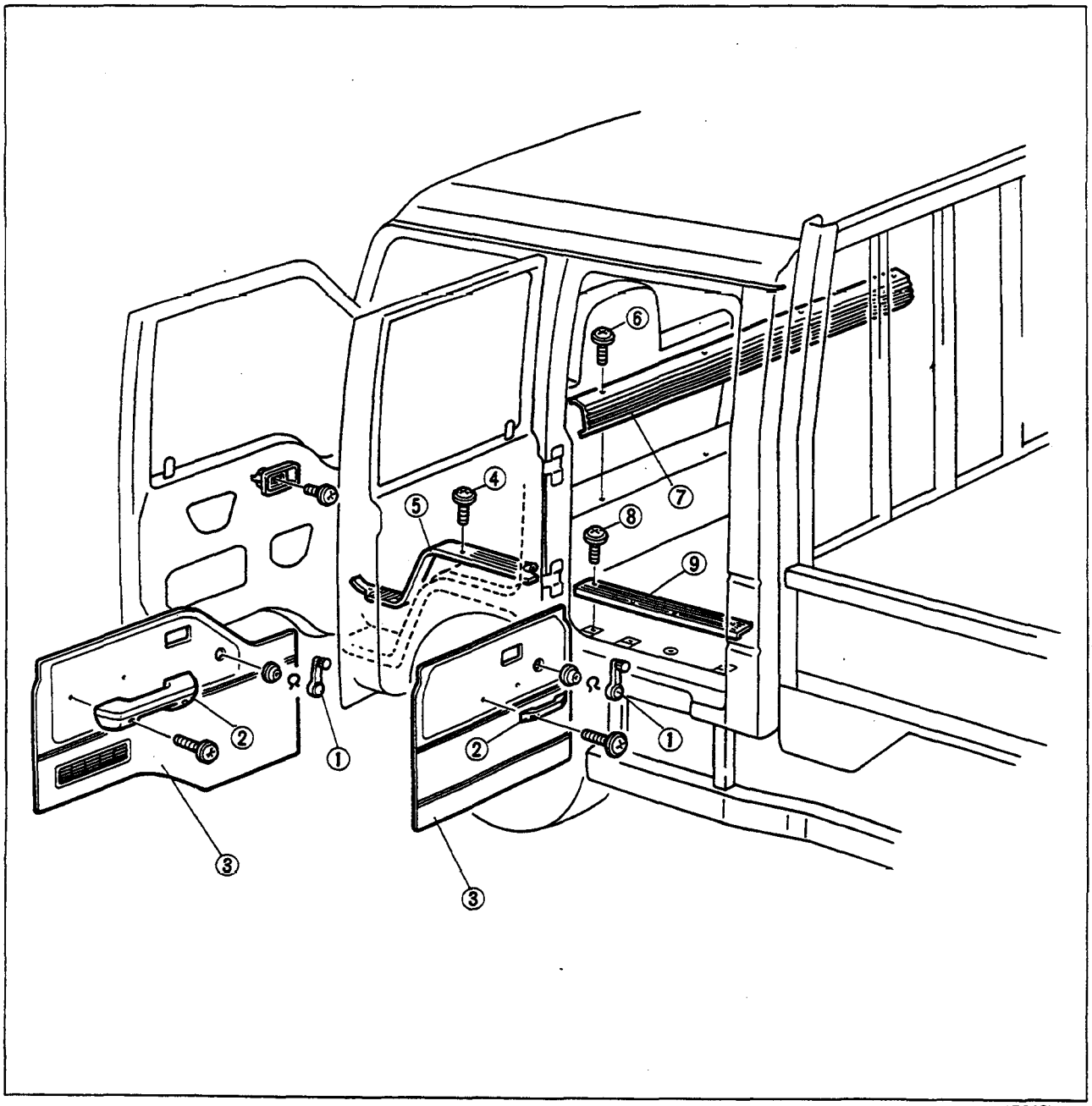
2. Push the headliner into place with a flat tool.

TRIM

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.



9TG0SX-132

Door trim
1. Regulator handle
   Removal Note..... page S–11
2. Armrest
3. Door trim

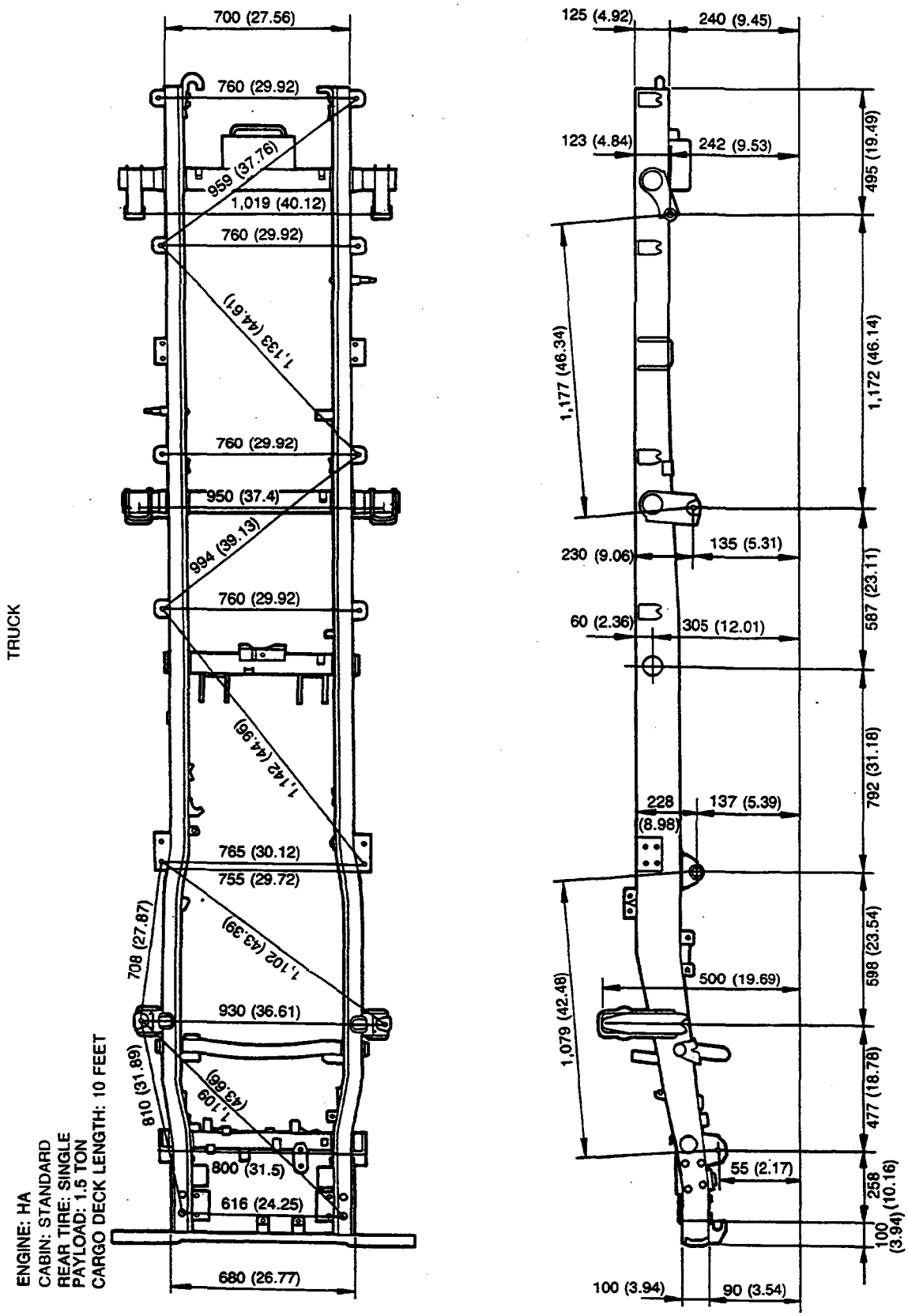
Scuff plate
4. Screw
5. Scuff plate

Brimplate (crew cabin)
6. Screw
7. Brimplate

Mat side plate (crew cabin)
8. Screw
9. Mat side plate

UNDERBODY DIMENSIONS

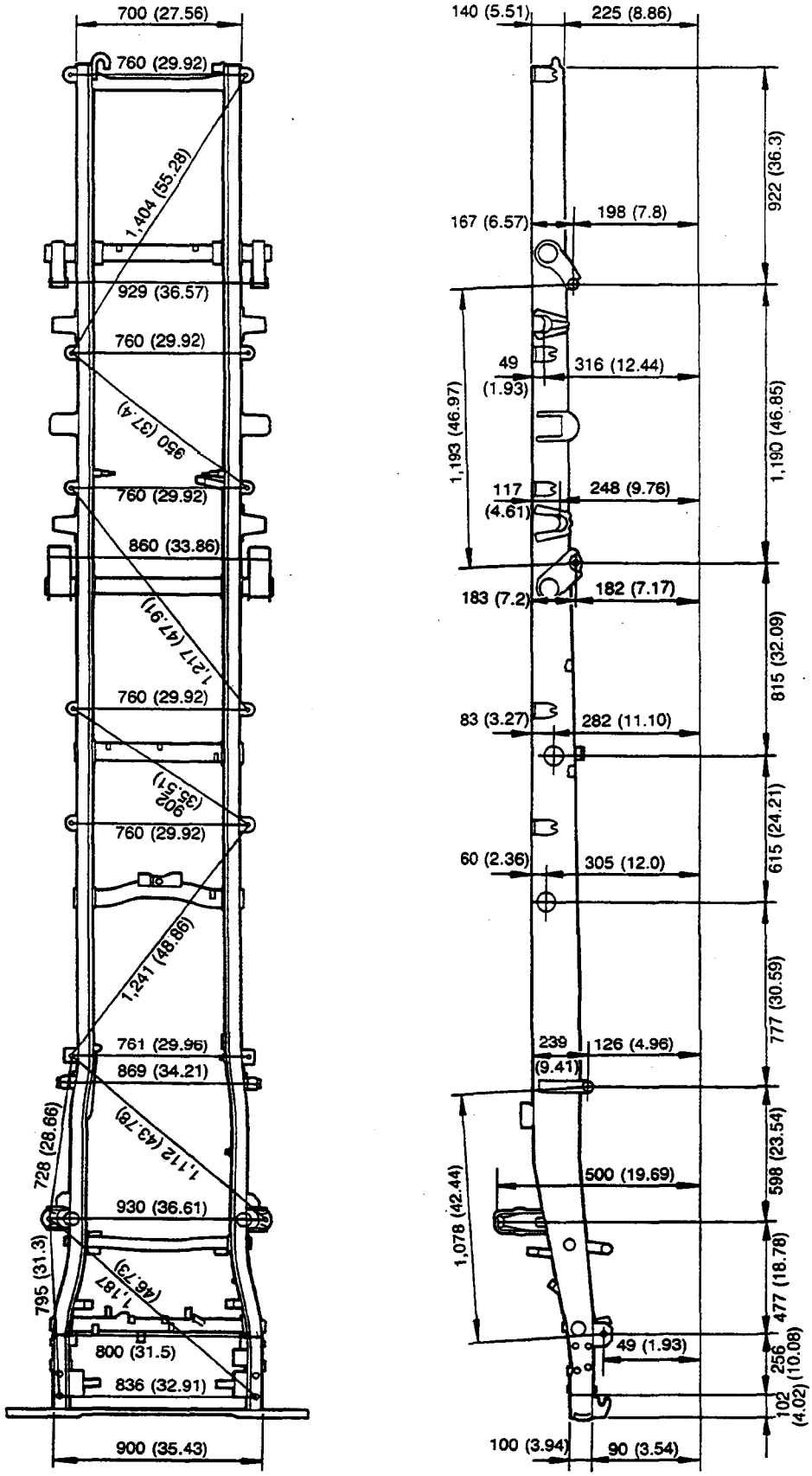
mm (in)



UNDERBODY DIMENSIONS

TRUCK OR CREW CABIN

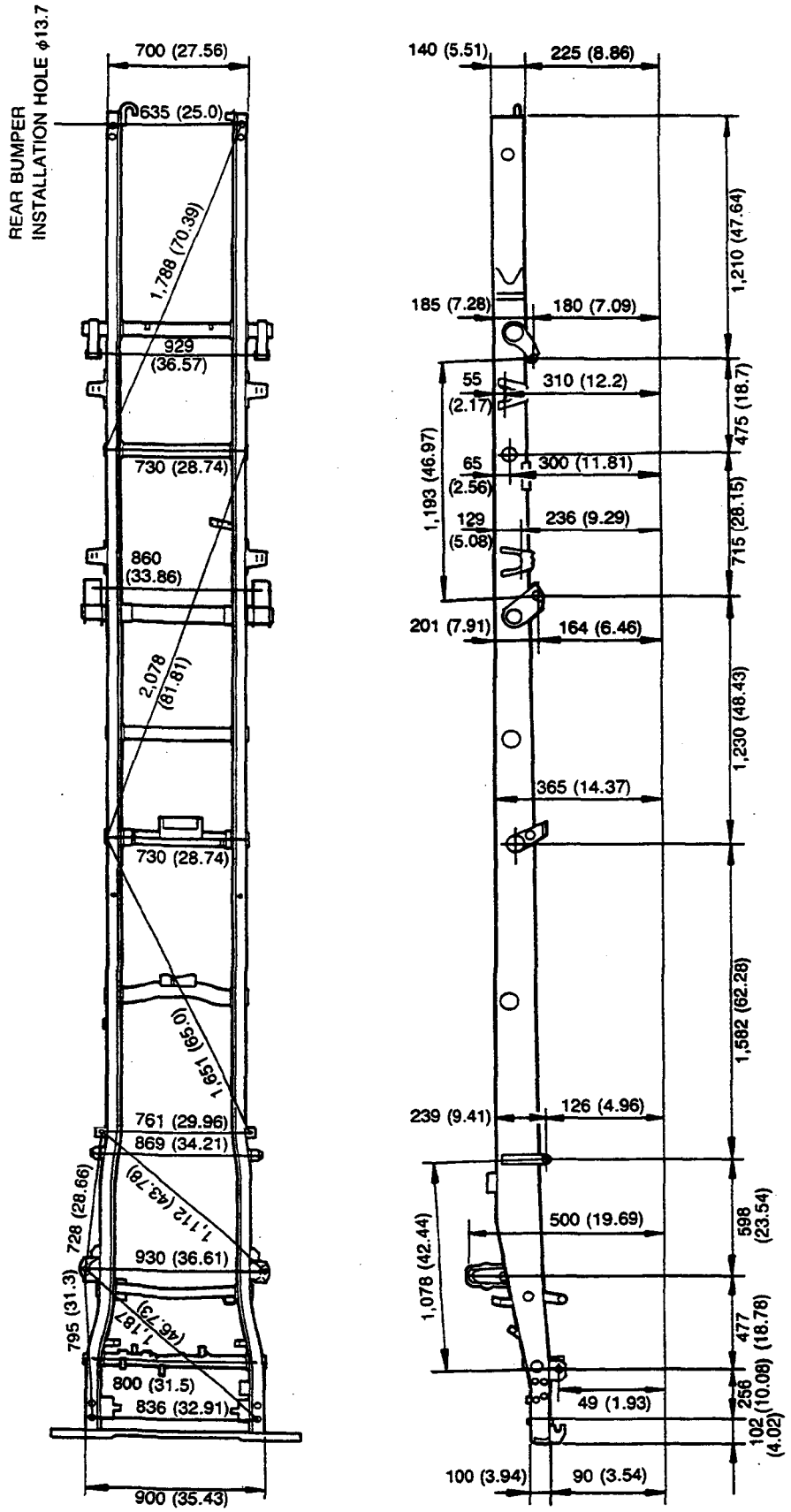
ENGINE: SL
CABIN: WIDE, CREW STANDARD
REAR TIRE: DOUBLE
PAY LOAD: 2.75 TON, 3 TON, OR 4 TON
CARGO DECK LENGTH: 14 FEET



TRUCK

ENGINE: SL
CABIN: WIDE
REAR TIRE: DOUBLE
PAYLOAD: 4 TON
CARGO DECK LENGTH: 17 FEET

mm (in)

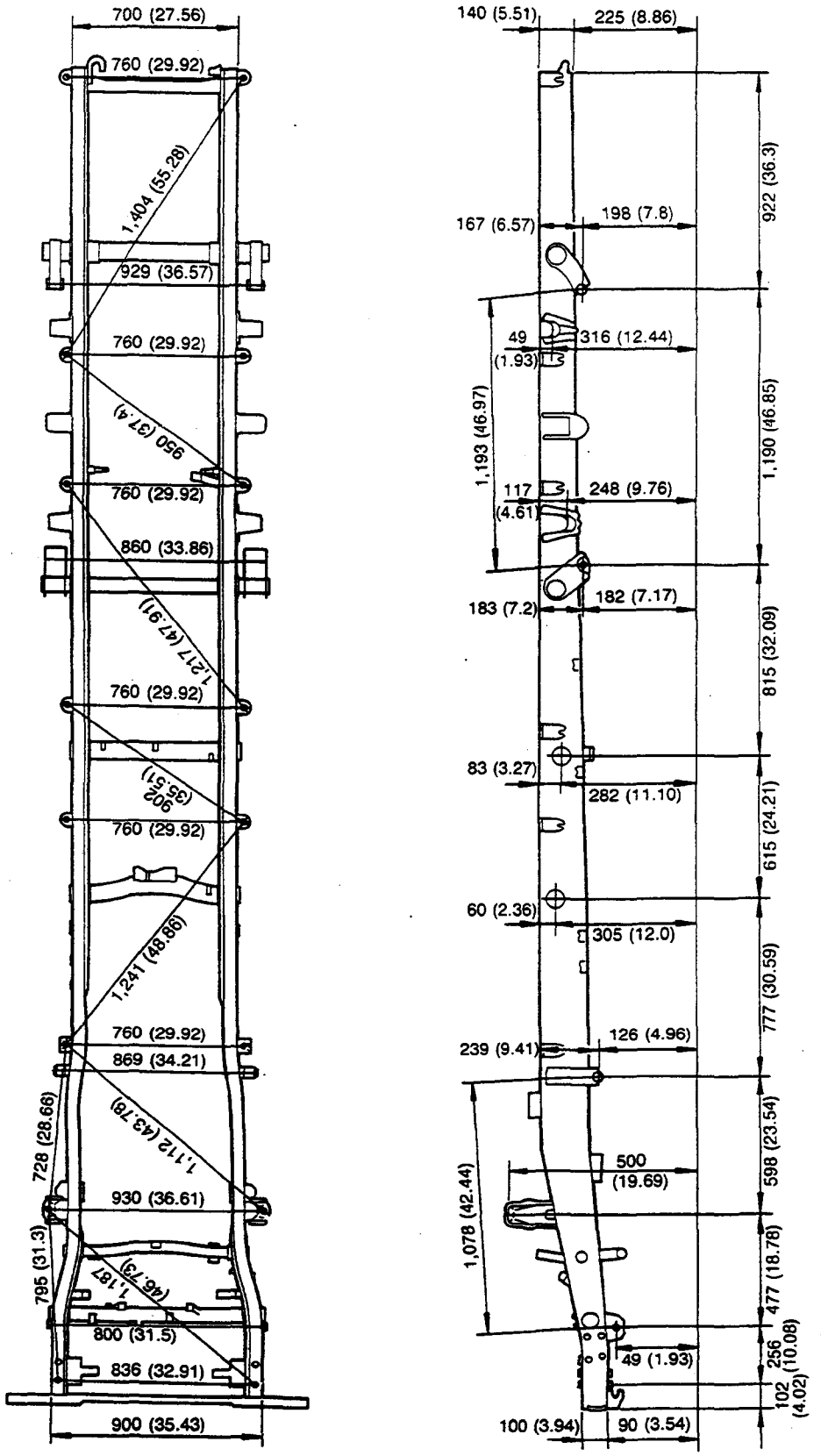


UNDERBODY DIMENSIONS

TRUCK OR CREW CABIN

ENGINE: TF
CABIN: WIDE, CREW WIDE
REAR TIRE: DOUBLE
PAYLOAD: 3.5 TON OR 4 TON
CARGO DECK LENGTH: 14 FEET

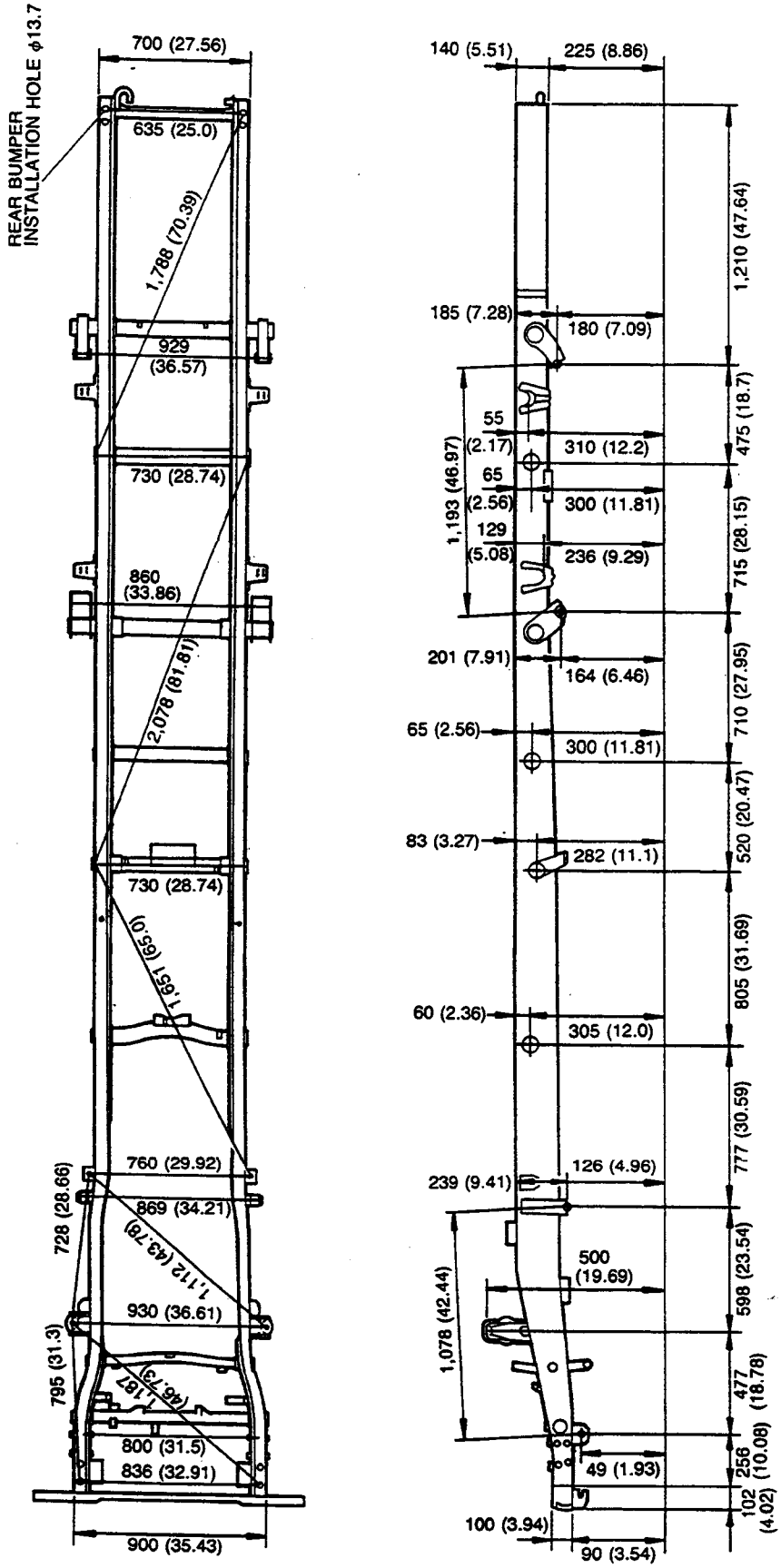
mm (in)



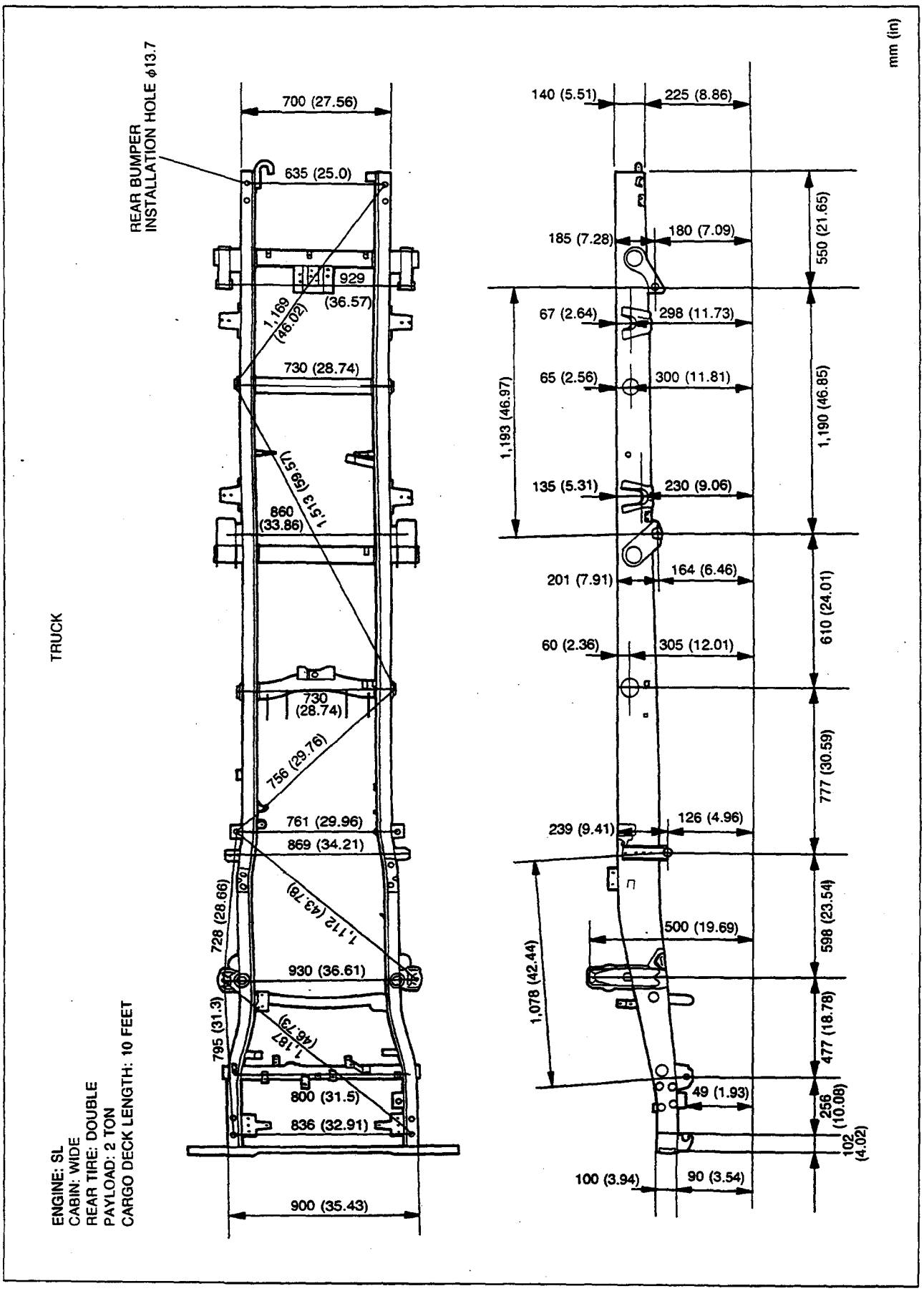
TRUCK

ENGINE: TF
CABIN: WIDE
REAR TIRE: DOUBLE
PAYLOAD: 4 TON
CARGO DECK LENGTH: 17 FEET

mm (in)



UNDERBODY DIMENSIONS



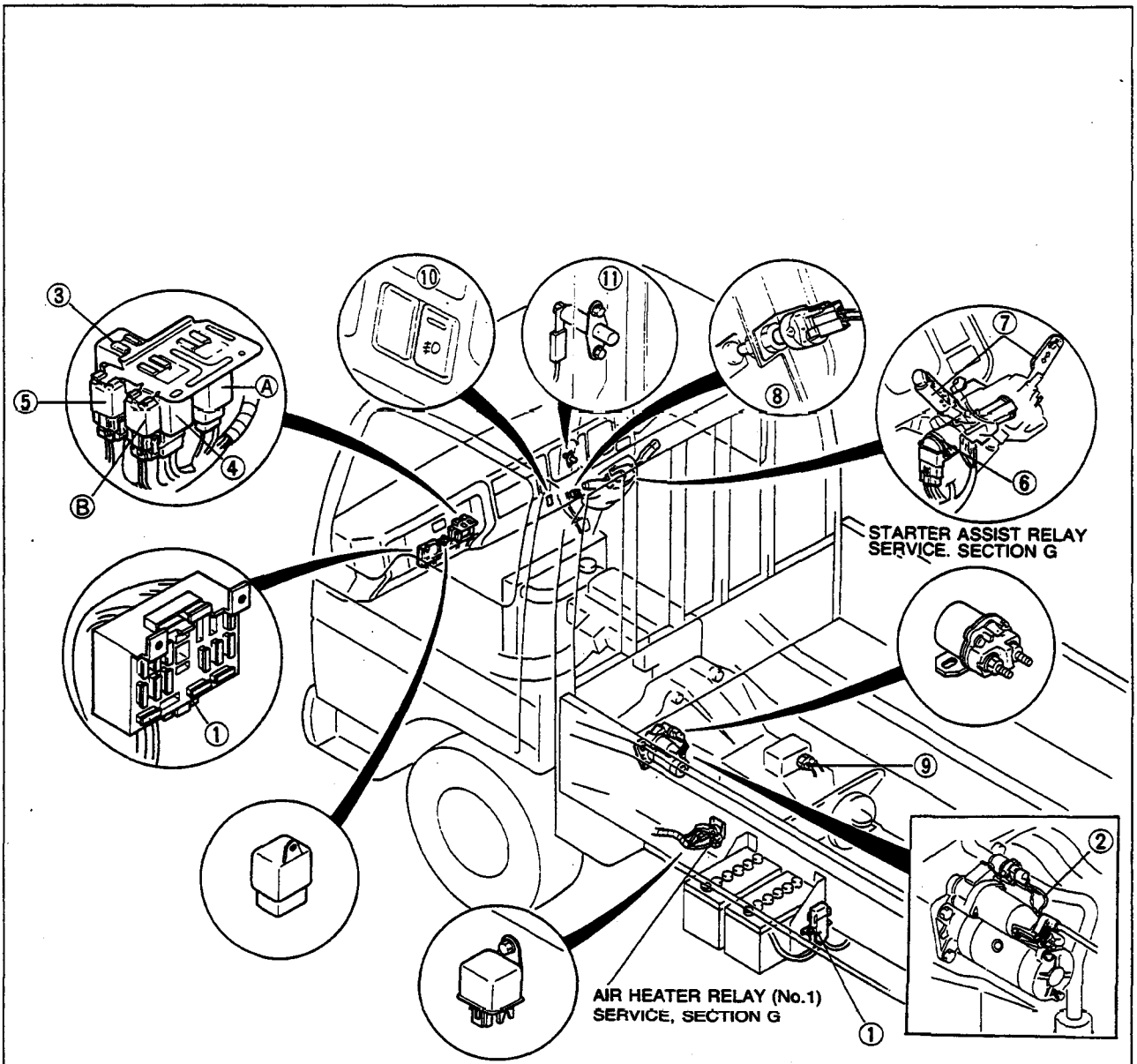
BODY ELECTRICAL SYSTEM

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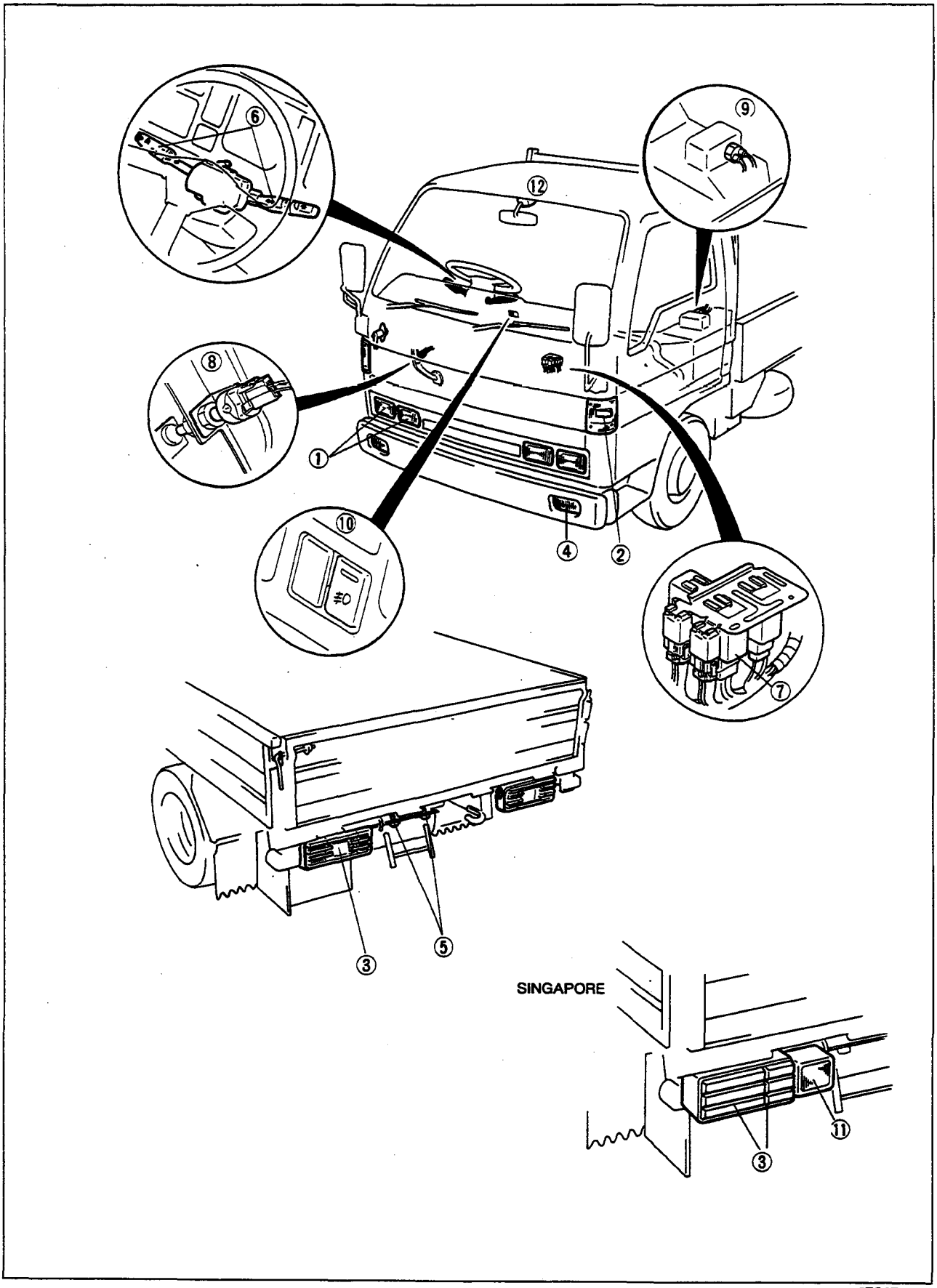
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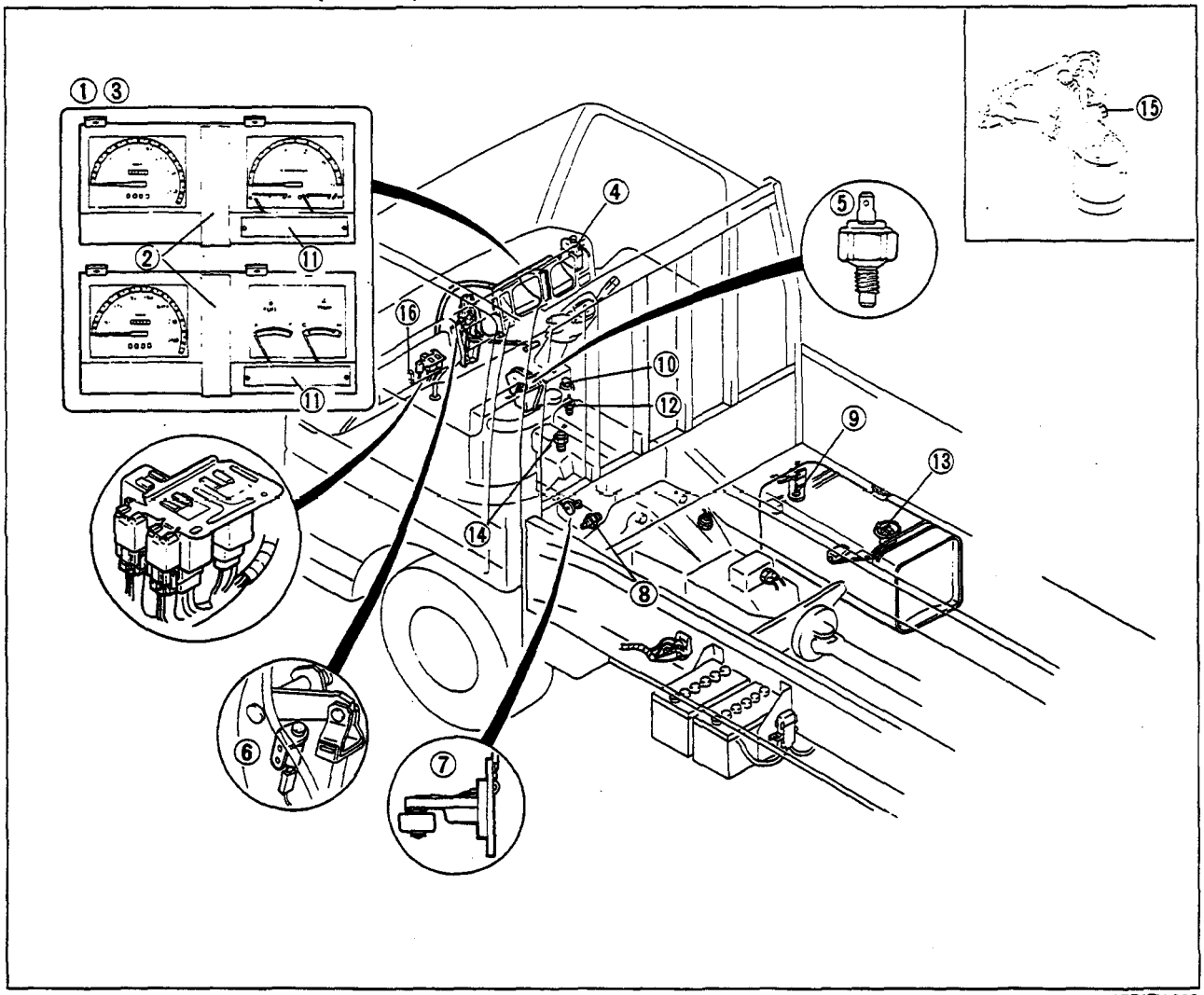


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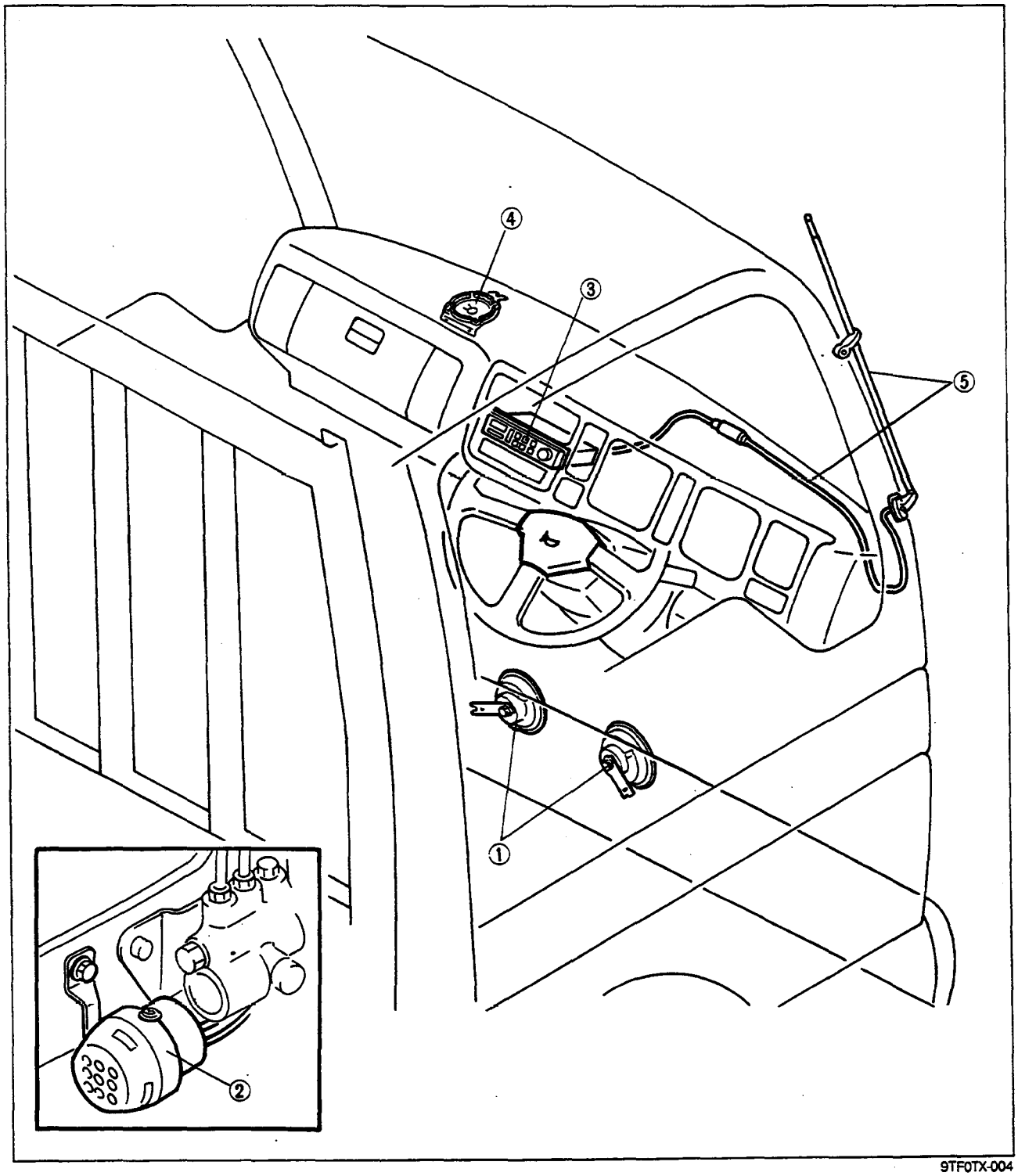
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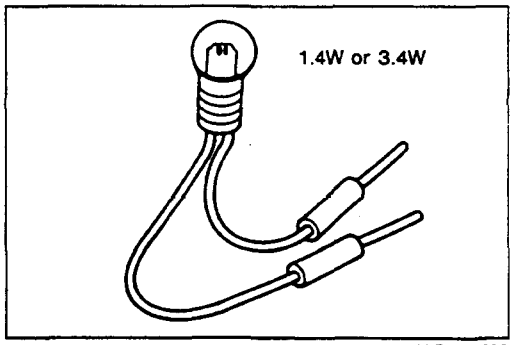
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OUTLINE

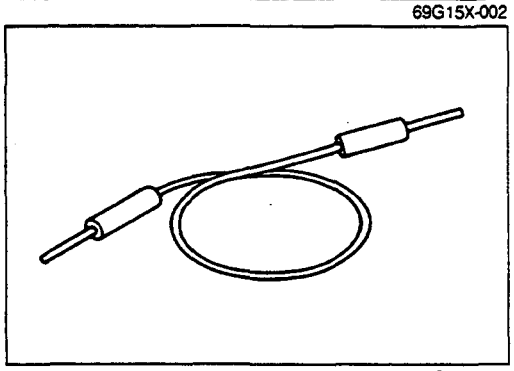
HOW TO USE THIS SECTION

Understanding will be easier if this section is used in conjunction with the **WIRING DIAGRAMS**.

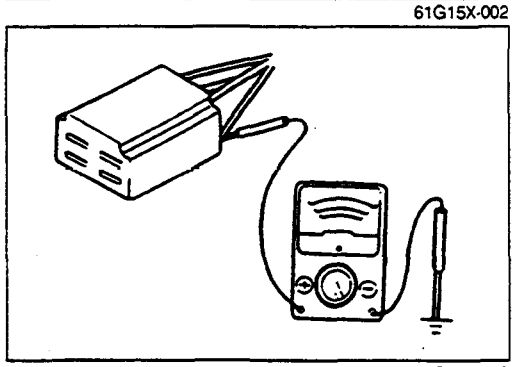
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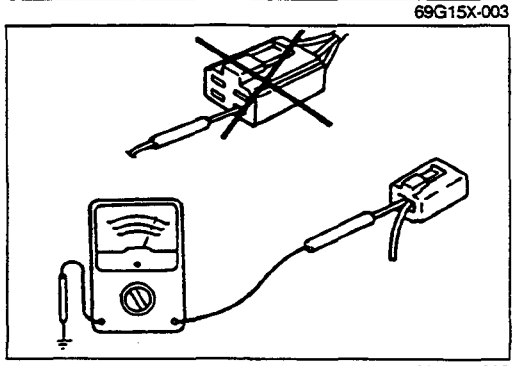
69G15X-002



61G15X-002



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63U15X-005

ELECTRICAL TROUBLESHOOTING TOOLS

Test Light

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

Caution

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

Jumper Wire

The jumper wire is used for testing by short-circuiting switch terminals and for verifying the condition of ground connections.

Caution

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

Voltmeter

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

Ohmmeter

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

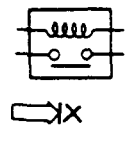
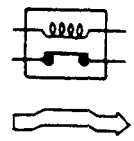
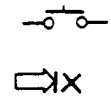
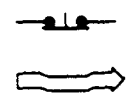
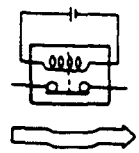
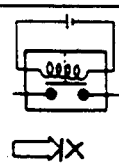
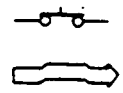
Caution

- **Do not attempt to connect the ohmmeter to any circuit to which voltage is applied because this may burn or otherwise damage the ohmmeter.**

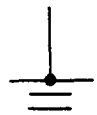
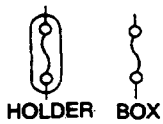
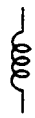
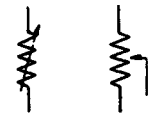
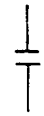
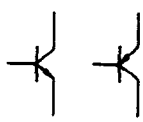
ELECTRICAL SYMBOLS

Switches and Relays

There is an NC (normally closed) and NO (normally open) indication for switches and relays which shows when no change of operation conditions has occurred.

	Relay		Switch	
	NO type relay	NC type relay	NO switch	NC switch
Not in operation (No power supply)	 STOP	 FLOW	 STOP	 FLOW
In operation (Power supply)	 FLOW	 STOP	 FLOW	 STOP

Other Electrical Symbols

		 HOLDER BOX	
BATTERY	BODY GROUND	FUSE	FUSIBLE LINK
			
MOTOR	COIL, SOLENOID	RESISTOR	VARIABLE RESISTOR
			
THERMISTER	DIODE	CONDENSER	LIGHT
			
TRANSISTOR	SPEAKER	CIGARETTE LIGHTER	HEATER

69G15X-009

FUSE

DESCRIPTION

The main fuse block is behind the battery. The fuse box is behind the lower panel.
The fuses are color-coded by average rating.

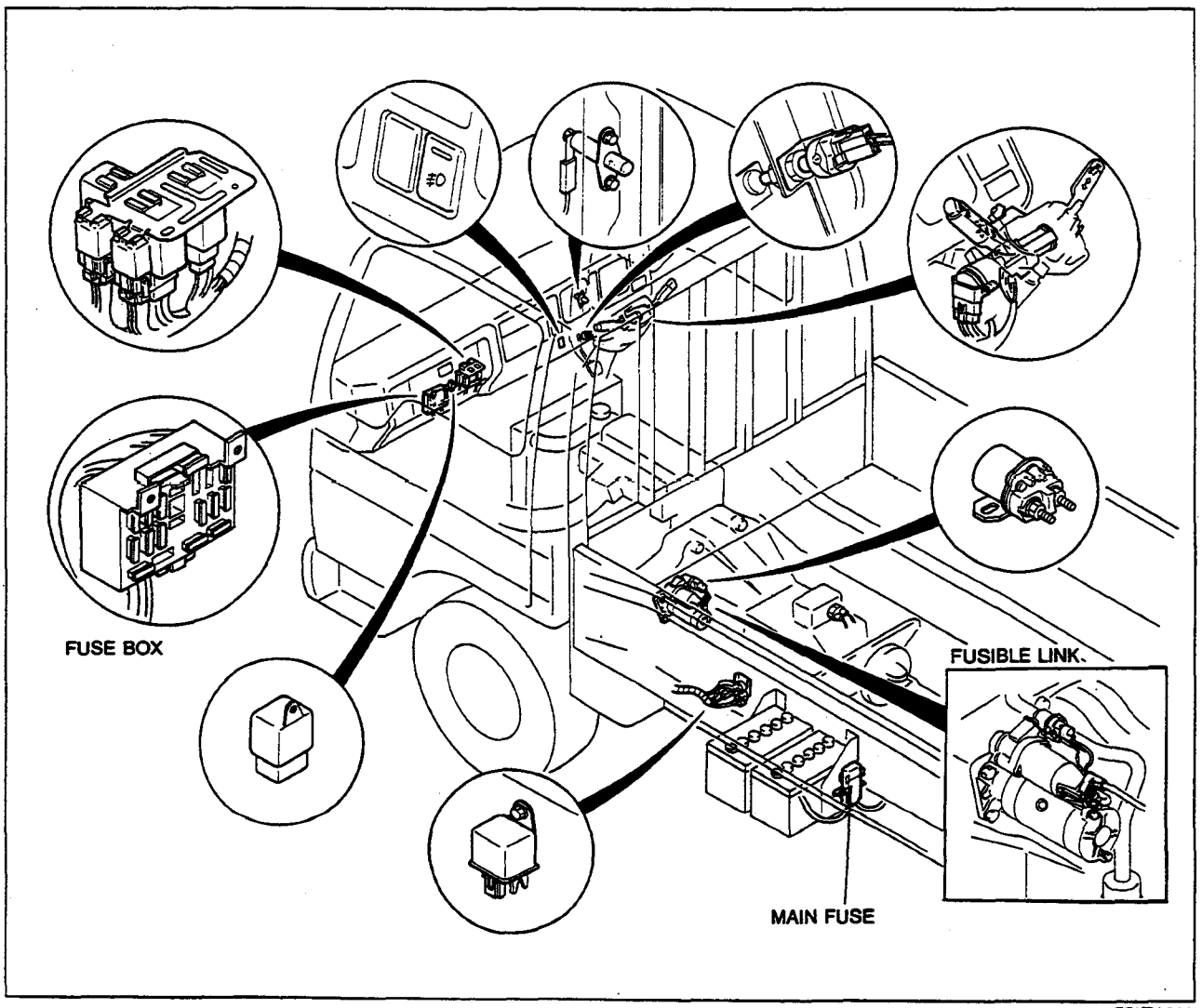
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FUSES

Specifications

Main fuse block

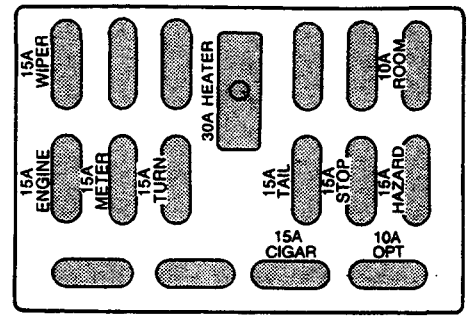
Fuse	Housing color	Protected circuit
MAIN 100A	Blue	Glow plug, Engine switch, Alternator. Circuits protected in fuse box
MAIN 60A	Yellow	Engine switch, Alternator, Air heater, Circuits protected in fuse box
HEAD 30A	Pink	Alternator, Headlight
WORKING LAMP 30A	Pink	Working lamp



9TF0TX-006

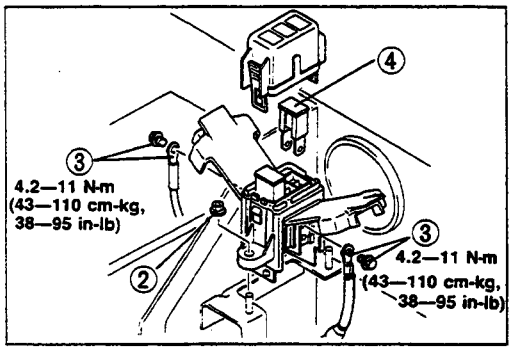
Fuse box

Fuse	Color	Protected circuit
WIPER 15A	Blue	Wiper and washer system
HEATER 30A	Green	Heater
ROOM 10A	Red	Interior lamp system, Radio
ENGINE 15A	Blue	Air heater system, QSS system
METER 15A	Blue	Back-up light, Instrument cluster (meter), Exhaust brake system, Exhaust heating system, Fuel cut solenoid
TURN 15A	Blue	Turn lights
TAIL 15A	Blue	Instrument panel control, Taillights, License plate lights, Fog lights, Combination lights
STOP 15A	Blue	Horn, Stoplights
HAZARD 15A	Blue	Hazard lights
CIGAR 15A	Blue	Radio, Cigar lighter
OPT 10A	Red	—

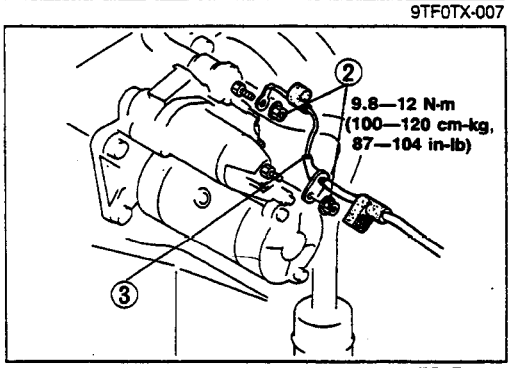


9TG0TX-011

Fusible link; Circuit protected QSS or air heater system.



9TF0TX-007



9TG0TX-013

Removal / Installation

Main fuse

1. Disconnect the negative battery cable.
2. Remove the main fuse box attaching nuts.
3. Remove the bolts and wiring harness from the main fuse box.
4. Pull out the MAIN 100A or MAIN 60A fuse from the main fuse box.
5. Install the reverse order of removal.

Tightening torque:
MAIN 100A, MAIN 60A fuse
4.2—11 N·m (43—110 cm-kg, 38—95 in-lb)

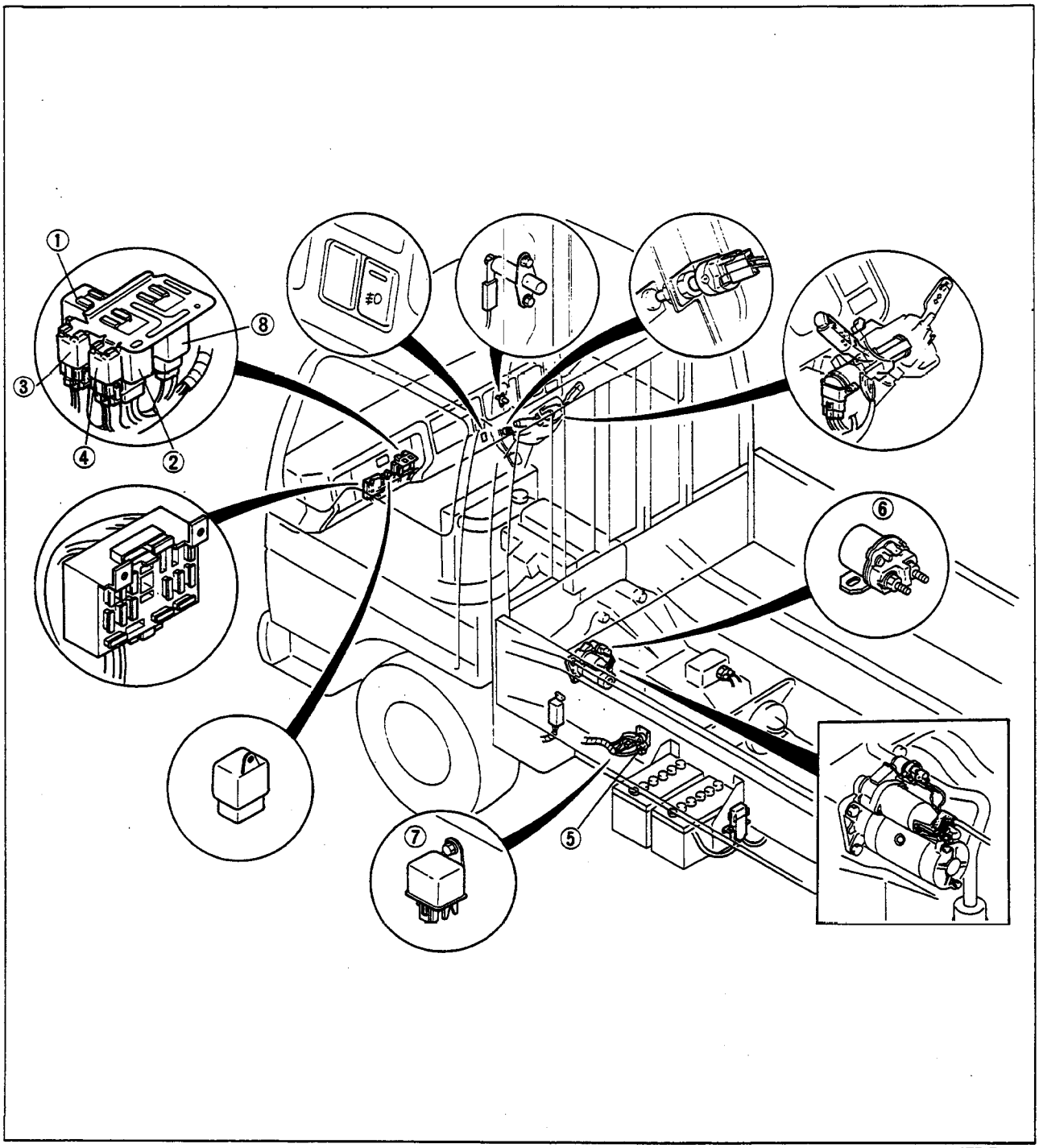
Fusible link

1. Disconnect the negative battery cable.
2. Remove the nuts.
3. Remove the fusible link from the stater.
4. Install in the reverse order of removal.

Tightening torque:
9.8—12 N·m (100—120 cm-kg, 87—104 in-lb)

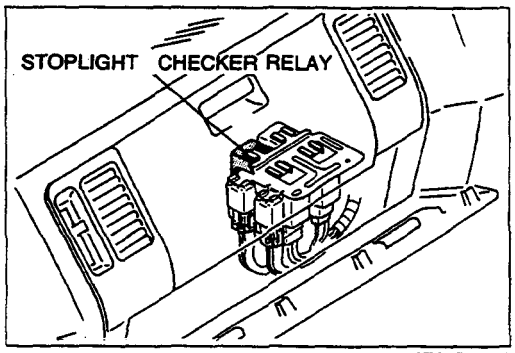
RELAY

STRUCTURAL VIEW

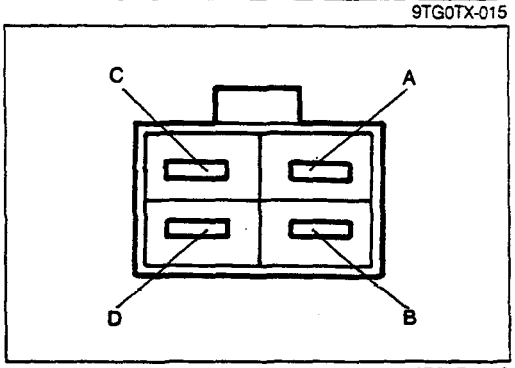


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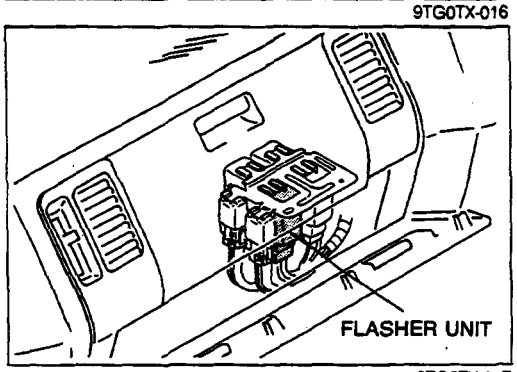
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5. Air heater relay
   Service ..... Section G
6. Assist relay
   Service ..... Section G
7. Glow plug relay
   Service ..... Section G
8. Intermittent wiper relay
   Service ..... Section S



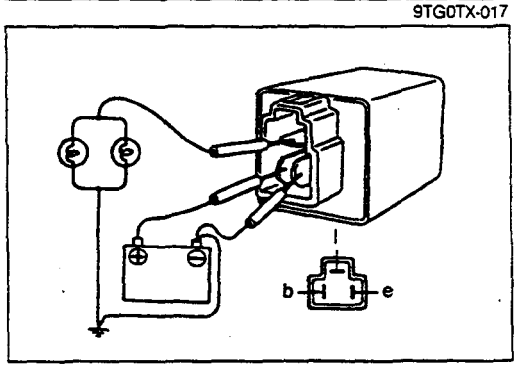
9TG0TX-015



9TG0TX-016



9TG0TX-017



STOPLIGHT CHECKER RELAY

Inspection

1. Check continuity between terminals of the stoplight checker relay.

Note

- **Set the tester to x1,000Ω range.**

Terminal		Continuity	Terminal		Continuity
+	−		+	−	
A	B	○	B	A	○
A	C	X	C	A	○
A	D	○	D	A	○
B	C	X	C	B	○
B	D	○	D	B	○
C	D	○	D	C	X

2. Replace the relay if not as specified.

FLASHER UNIT

Inspection

1. Connect 12V to terminal b and ground terminal e.
2. Connect the test lamp between terminal l and a ground, and verify that the test lamp glows.

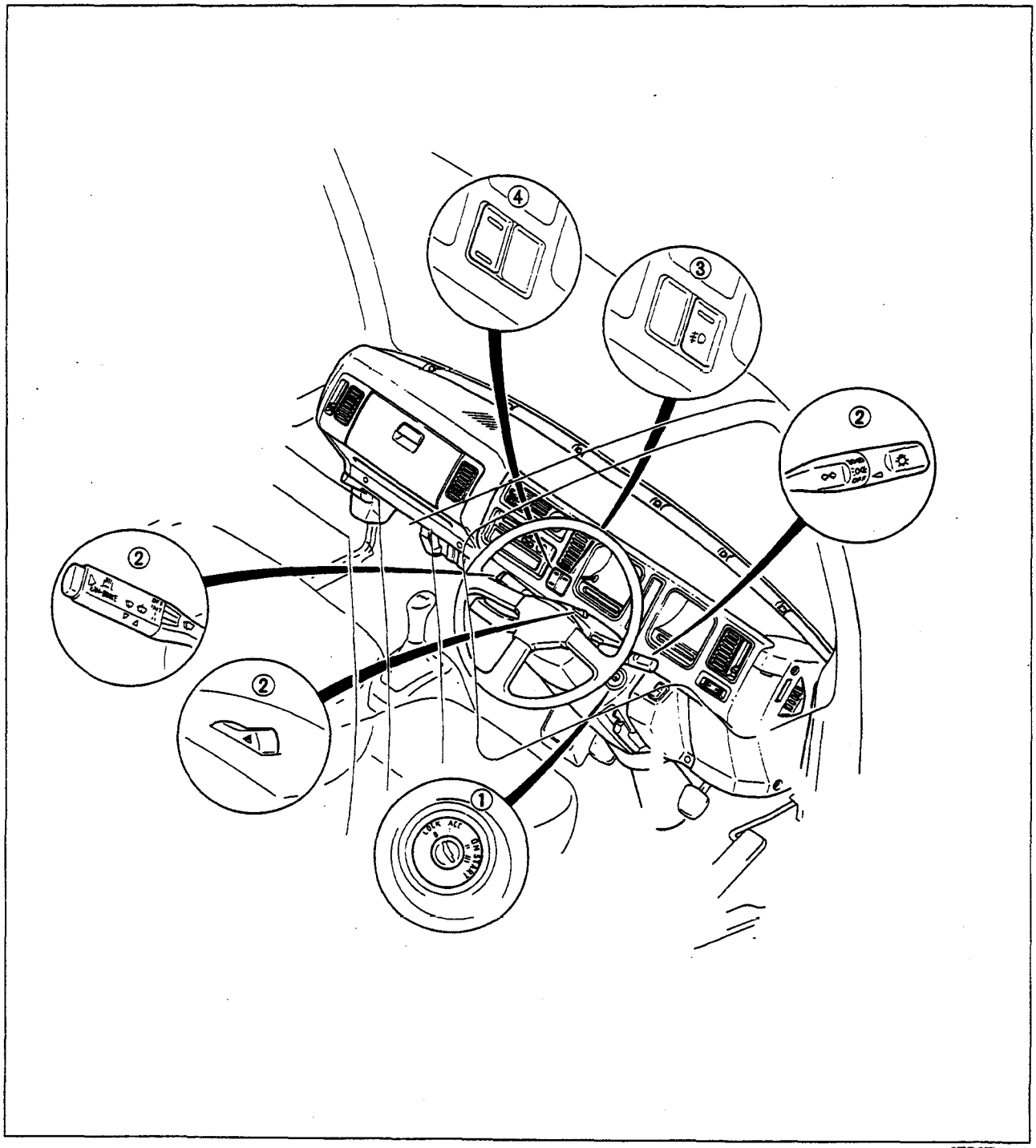
Caution

- **Apply the battery voltage to terminals properly.**

3. Replace the flasher unit if not as specified.

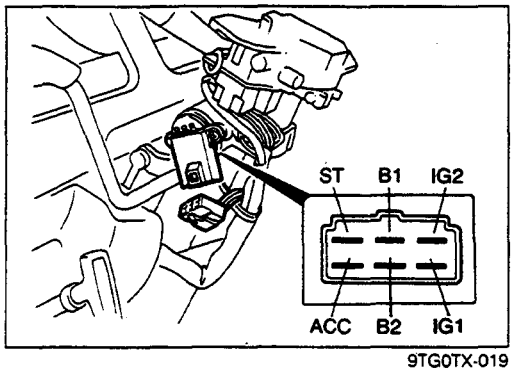
SWITCHES

STRUCTURAL VIEW



9TG0TX-018

1. Engine switch
   - Inspection ..... page T–17
   - Removal / Installation ..... page T–17
2. Combination switch
   (Including hazard warning switch)
   - Removal / Installation ..... page T–18
   - Disassembly / Assembly ..... page T–18
   - Inspection ..... page T–19
3. Fog light switch
   - Inspection ..... page T–42
4. Exhaust heating switch
   - Service ..... Section F2, F3



9TG0TX-019

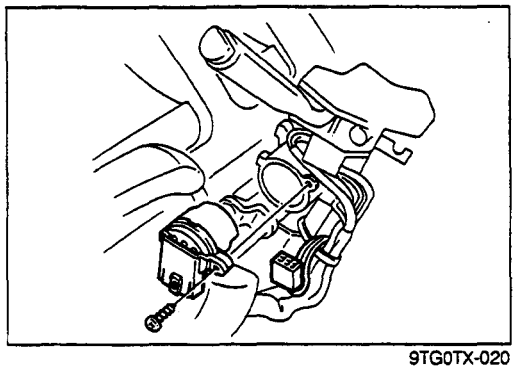
ENGINE SWITCH

Inspection

1. Check continuity between terminals of the engine switch.

Engine switch	B1	B2	ACC	IG1	IG2	ST
OFF						
ACC	○		○			
ON	○		○	○		
		○			○	
STA	○			○		
		○				○

2. Replace the engine switch if not as specified.


9TG0TX-020

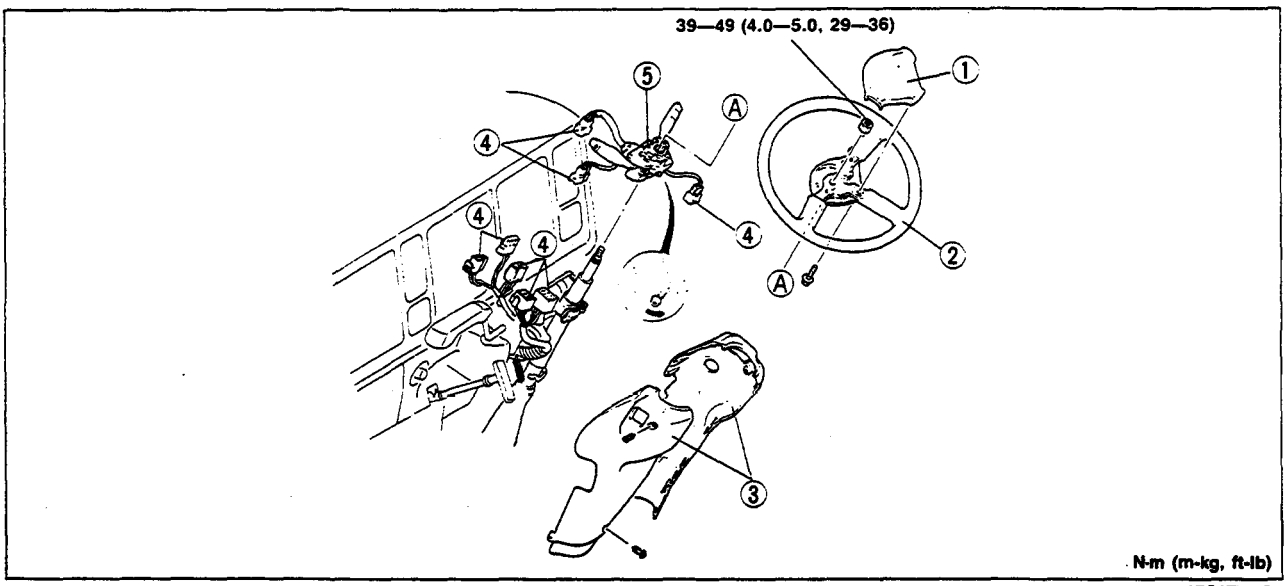
Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the steering column cover.
3. Disconnect the engine switch connector.
4. Remove the engine switch.
5. Install in the reverse order of removal.

COMBINATION SWITCH

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.

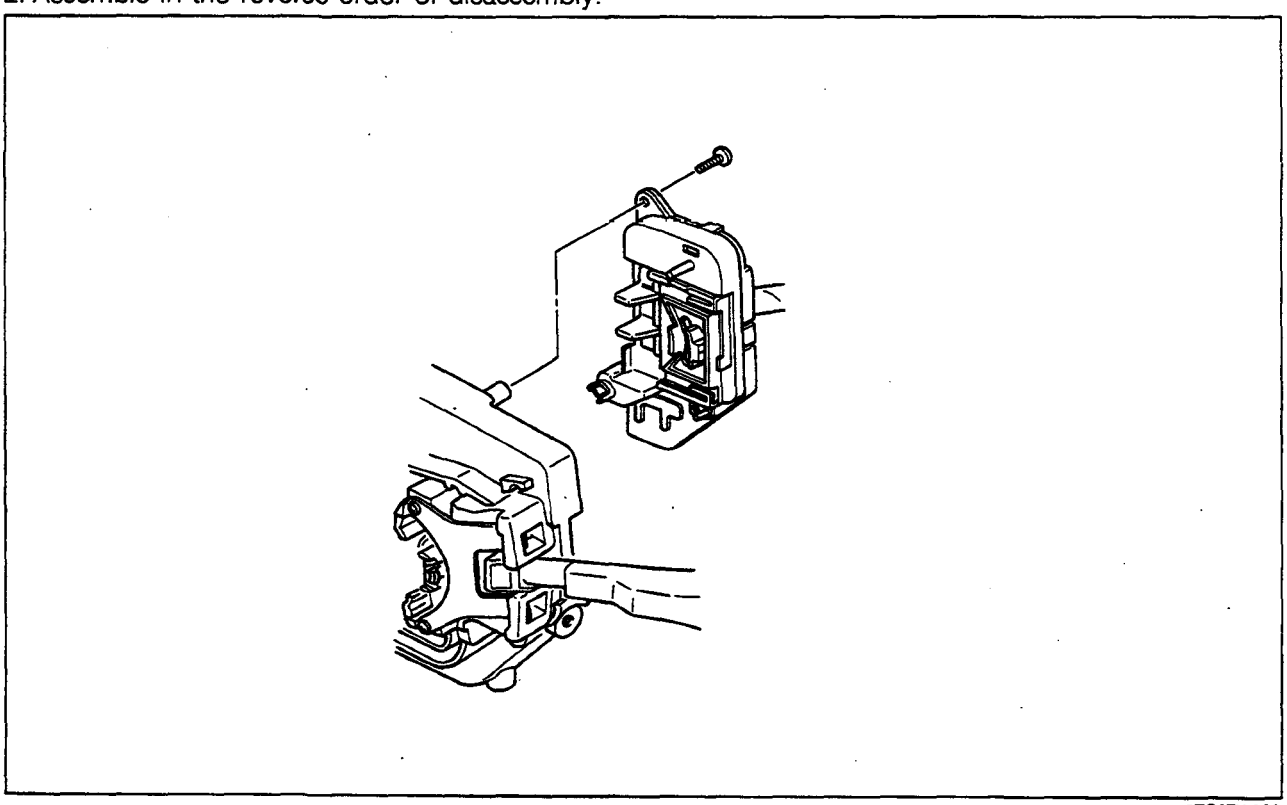


9TG0TX-021

1. Horn cap
2. Steering
3. Steering column cover
4. Connector (Combination switch)
5. Combination switch
   Disassembly / Assembly ..... page T–18
   Inspection ..... page T–19

Disassembly / Assembly

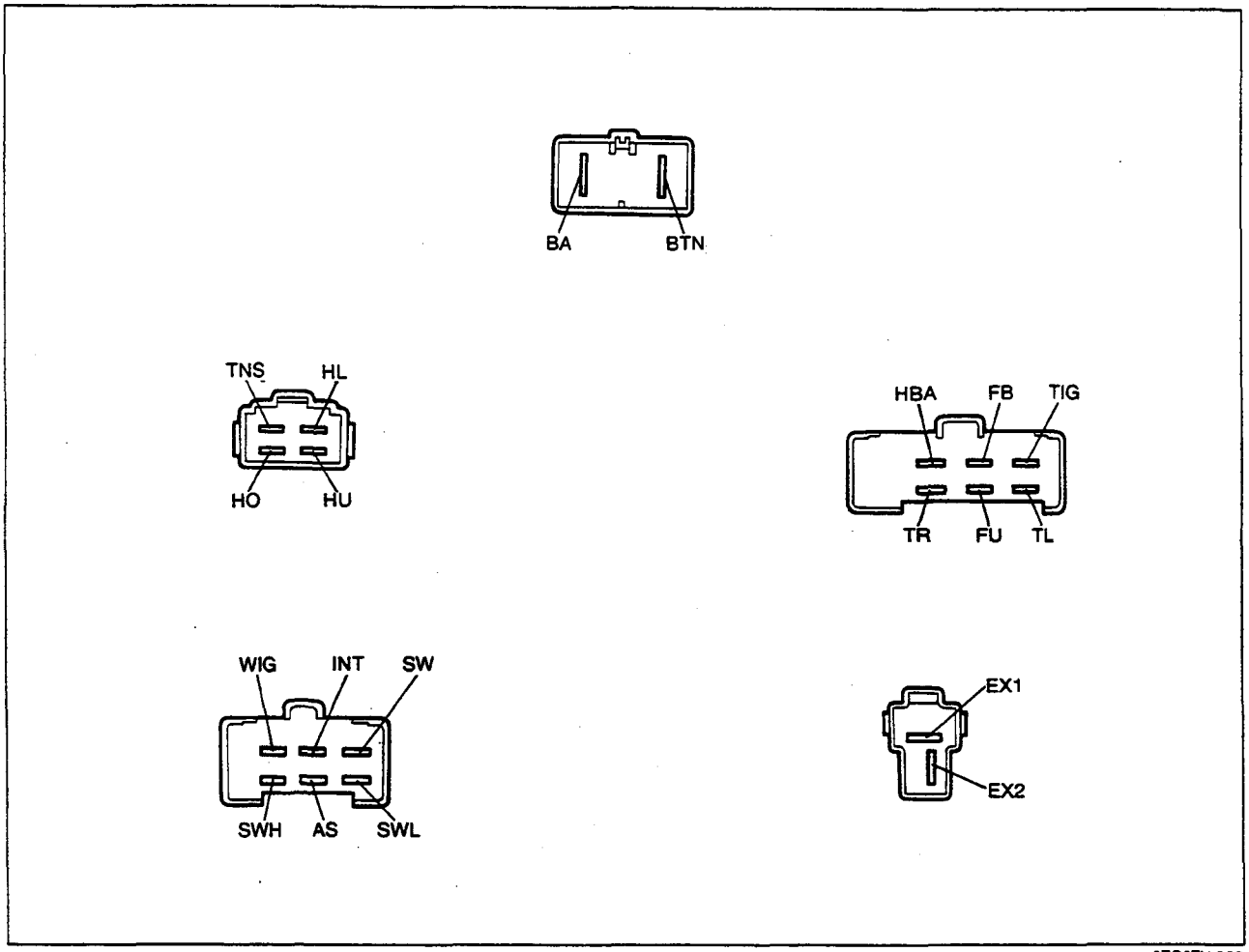
1. Remove the light switch unit.
2. Assemble in the reverse order of disassembly.



9TG0TX-022

Inspection

1. Check continuity between terminals of the combination switch.



9TG0TX-023

Light switch

Light switch		BTN	TNS	BA	HL	HU
OFF						
	Passing			○——	——○	
Small light		○—	—○			
	Passing	○—	—○	○—	——○	
ON	Low	○—	—○	○—	—○	
	High	○—	—○	○—	——○	
	Passing	○—	—○	○—	——○	

Turn and hazard warning switch

Hazard	Turn	FU	TL	TR	TIG	HBA	FB
OFF	Right	○—	——	—○	○—	——	—○
	Neutral				○—	——	—○
	Left	○—	—○		○—	——	—○
ON	—	○—	—○	—○		○—	—○

Wiper and washer switch

Wiper		AS	SWL	SWH	WIG	INT	SW
OFF		○—	—○				
	One touch: ON		○—	——	—○		
INT		○—	—○		○—	—○	
Low			○—	——	—○		
High				○—	—○		
Washer: ON					○—	——	—○

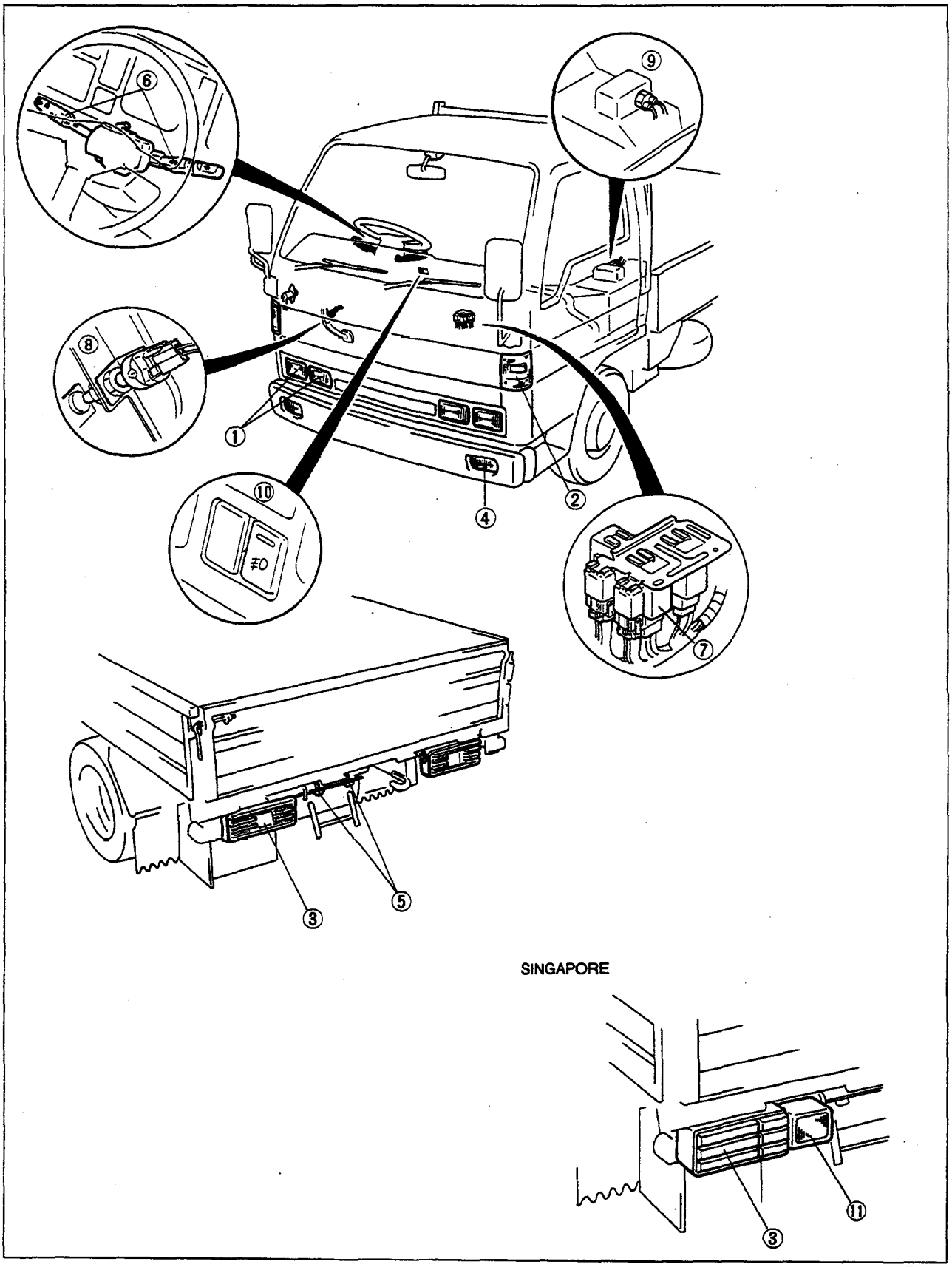
Exhaust brake switch

Exhaust brake switch	EX1	EX2
OFF		
ON	○—	—○

○——○: Indicates continuity

EXTERIOR LIGHTING SYSTEM

STRUCTURAL VIEW



9TG0TX-024

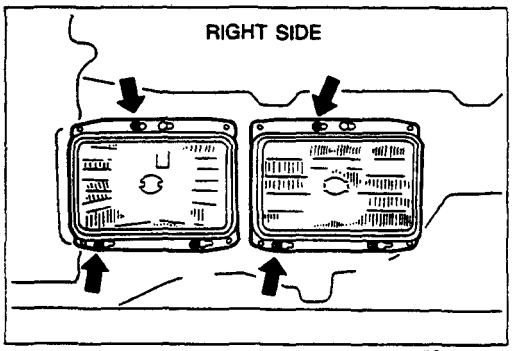
1. Headlight
Aiming ..... page T–22
Troubleshooting ..... page T–23
Removal / Installation ..... page T–36
2. Front combination light
Removal / Inspection / Installation ..... page T–37
1) Turn and hazard warning light
Troubleshooting ..... page T–25
Removal / Inspection / Installation ..... page T–37
2) Small light control system
Troubleshooting ..... page T–28
Removal / Inspection / Installation ..... page T–37
3. Rear combination light
Removal / Inspection / Installation ..... page T–39
1) Turn and hazard warning light
Troubleshooting ..... page T–25
Removal / Inspection / Installation ..... page T–39
2) Small light control system
Troubleshooting ..... page T–28
Removal / Inspection / Installation ..... page T–39
3) Back-up light
Troubleshooting ..... page T–30
Removal / Inspection / Installation ..... page T–39
4) Stoplight
Troubleshooting ..... page T–32
Removal / Inspection / Installation ..... page T–39
4. Fog light
Troubleshooting ..... page T–34
Removal / Inspection / Installation ..... page T–38
5. License plate light
Troubleshooting ..... page T–28
Removal / Inspection / Installation ..... page T–41
6. Combination switch
Removal / Installation ..... page T–18
Disassembly / Assembly ..... page T–18
Inspection ..... page T–19
7. Flasher unit
Inspection ..... page T–15
8. Stoplight switch
Inspection ..... page T–41
9. Back-up light switch
Inspection ..... page T–41
10. Fog light switch
Inspection ..... page T–42
11. Back-up light
Troubleshooting ..... page T–30
Removal / Inspection / Installation ..... page T–40

9TG0TX-025

SPECIFICATIONS

Light		Bulb (W)		Remarks
		RHD	Australia	
Headlight	Inside	50	45	
	Outside	40/60	45/60	
Front combination light	Position light	5		
	Turn and hazard warning light	21		
Rear combination light	Taillight	5		SINGAPORE Turn and hazard warning light: 27W Stoplight: 27W Taillight: 8W Back-up light: 23W
	Stoplight	21		
	Turn and hazard warning light	21		
	Back-up light	21		
License plate light		7.5		
Fog light		35		

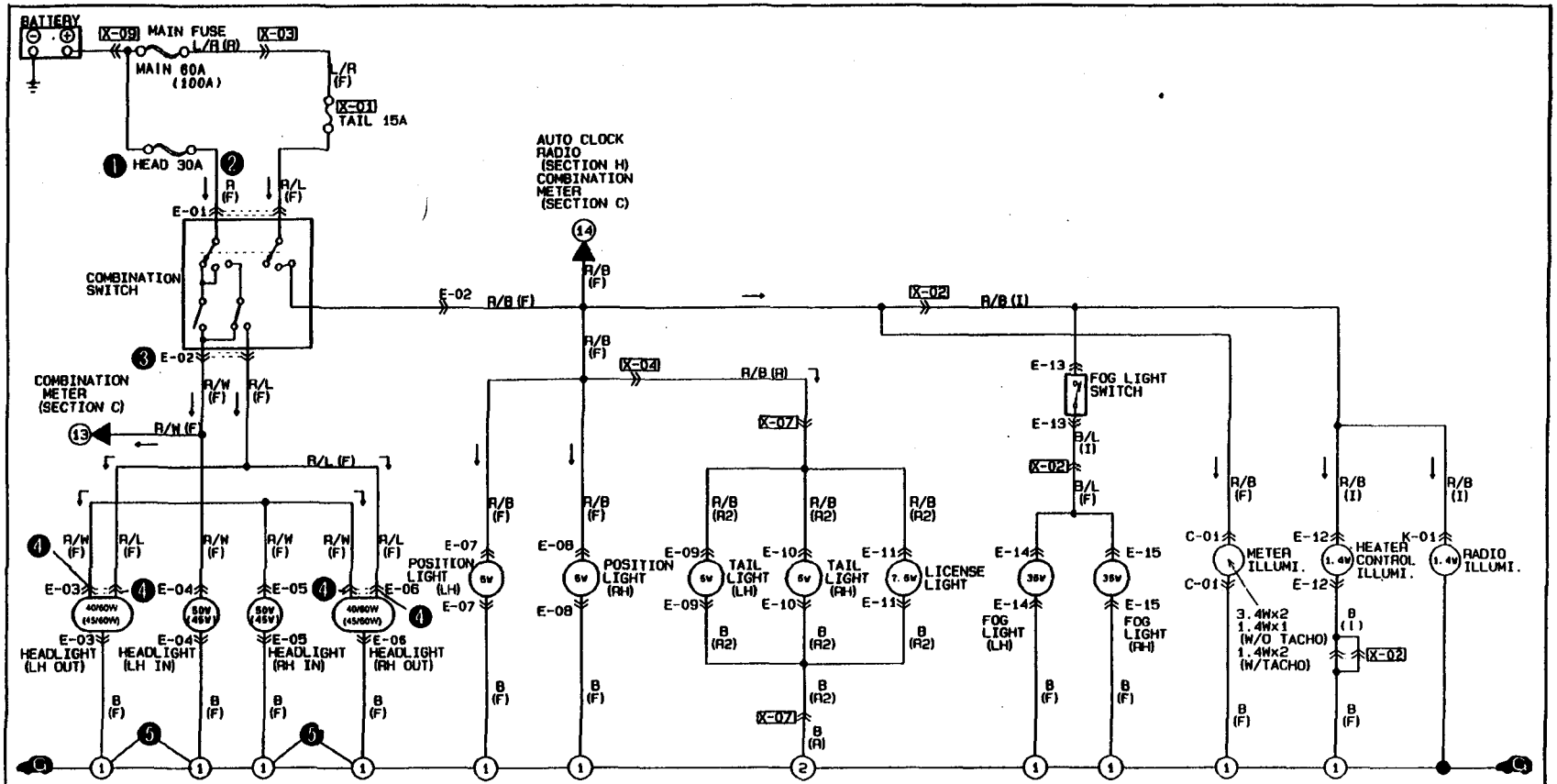
9TF0TX-009



0TG0TX-027

AIMING

1. Adjust the tire air pressures to specification.
2. Position the unloaded vehicle on a flat, level surface.
3. Adjust the headlights to meet local vehicle regulations. To adjust, turn the adjusting screws.



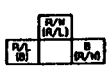
E-01 COMBINATION SWITCH (F)



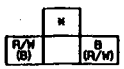
E-02 COMBINATION SWITCH (F)



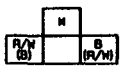
E-03 HEADLIGHT (LH OUT) (F)



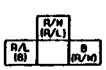
E-04 HEADLIGHT (LH IN) (F)



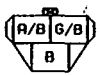
E-05 HEADLIGHT (RH IN) (F)



E-06 HEADLIGHT (RH OUT) (F)



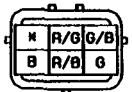
E-07 POSITION LIGHT (LH) (F)



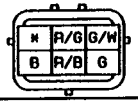
E-08 POSITION LIGHT (RH) (F)



E-09 TAIL LIGHT (LH) (R2)



E-10 TAIL LIGHT (RH) (R2)



E-11 LICENSE LIGHT (LH) (R2)



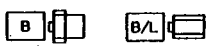
E-12 HEATER CONTROL ILLUMI. (I)



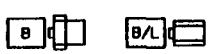
E-13 FOG LIGHT SWITCH (I)



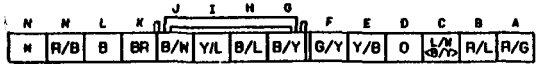
E-14 FOG LIGHT (LH) (F)



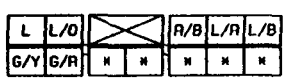
E-15 FOG LIGHT (RH) (F)



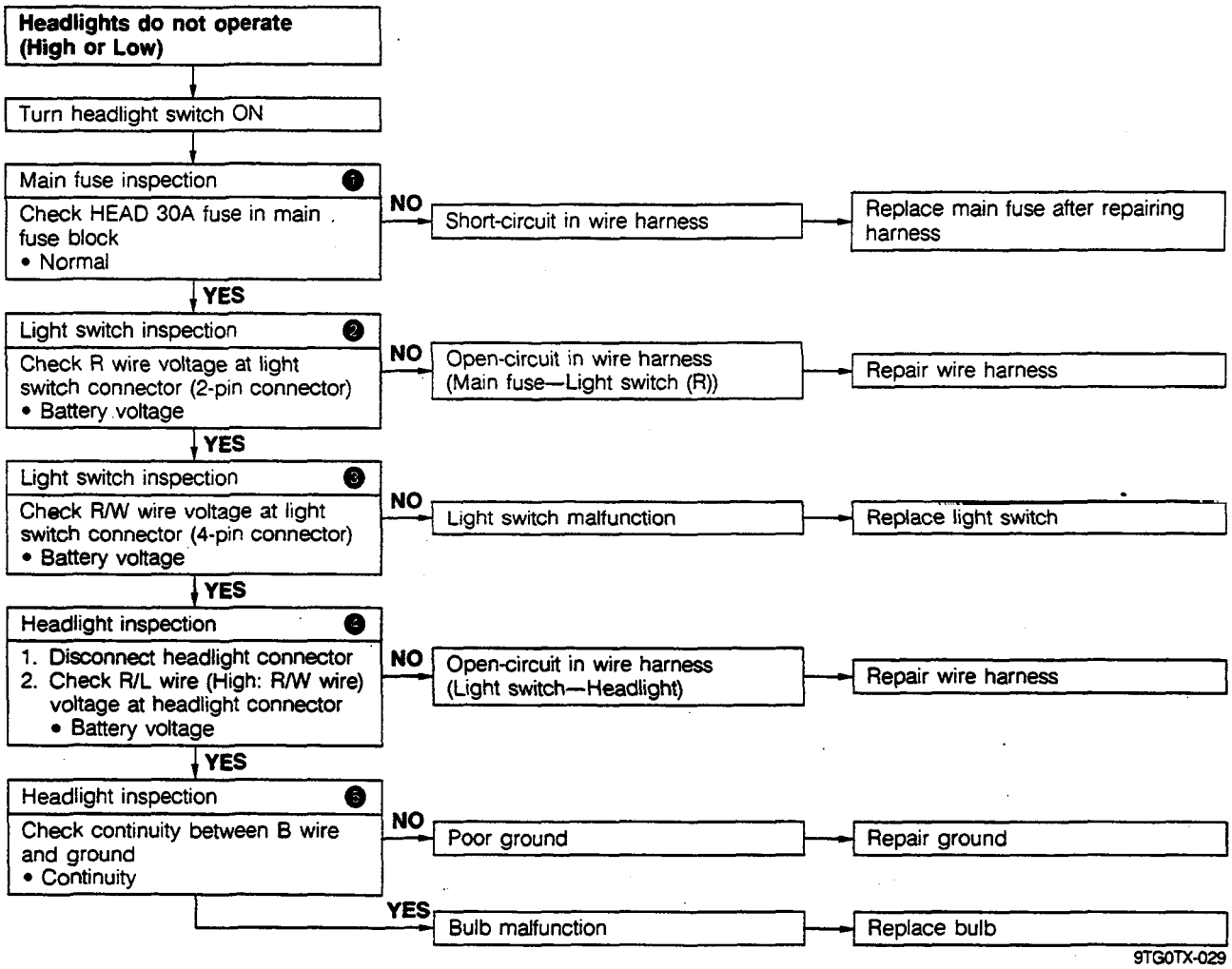
C-01 METER ILLUMI. (F)

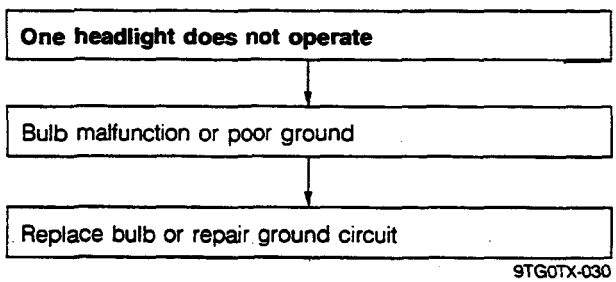


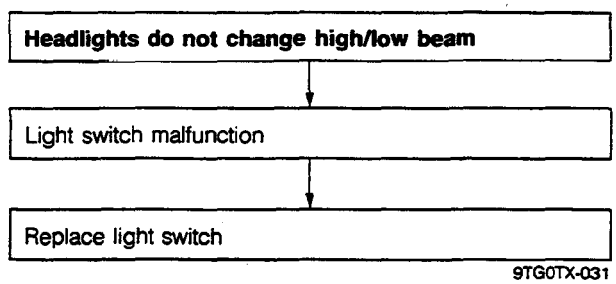
K-01 RADIO ILLUMI. (I)



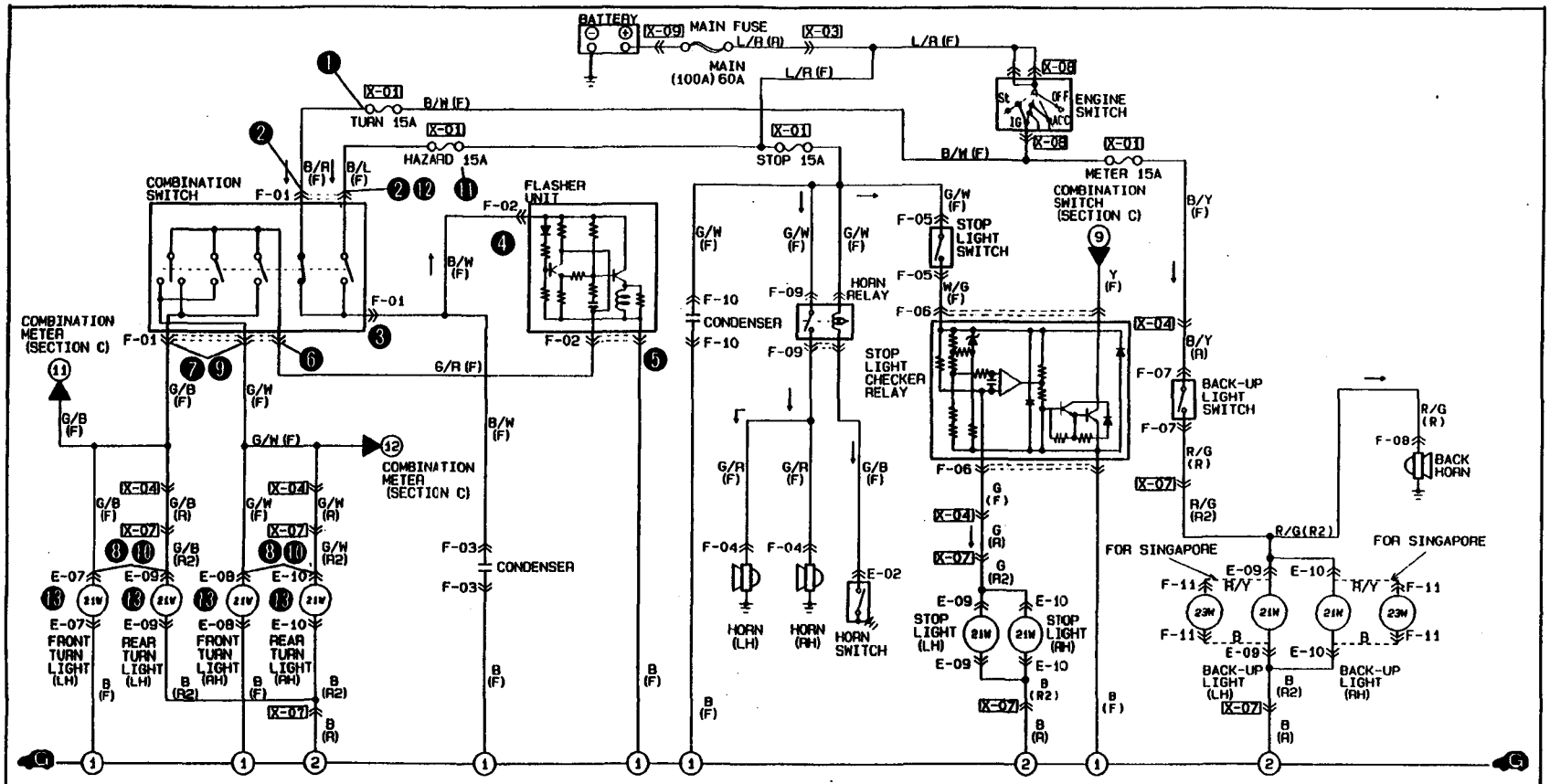
NOTE: H···NOT USED


Headlights do not operate (High or Low)
Turn headlight switch ON
Main fuse inspection ❶
Check HEAD 30A fuse in main fuse block
• Normal
NO
Short-circuit in wire harness
Replace main fuse after repairing harness
YES
Light switch inspection ❷
Check R wire voltage at light switch connector (2-pin connector)
• Battery voltage
NO
Open-circuit in wire harness (Main fuse—Light switch (R))
Repair wire harness
YES
Light switch inspection ❸
Check R/W wire voltage at light switch connector (4-pin connector)
• Battery voltage
NO
Light switch malfunction
Replace light switch
YES
Headlight inspection ❹
1. Disconnect headlight connector
2. Check R/L wire (High: R/W wire) voltage at headlight connector
• Battery voltage
NO
Open-circuit in wire harness (Light switch—Headlight)
Repair wire harness
YES
Headlight inspection ❺
Check continuity between B wire and ground
• Continuity
NO
Poor ground
Repair ground
YES
Bulb malfunction
Replace bulb
9TG0TX-029


One headlight does not operate
Bulb malfunction or poor ground
Replace bulb or repair ground circuit
9TG0TX-030

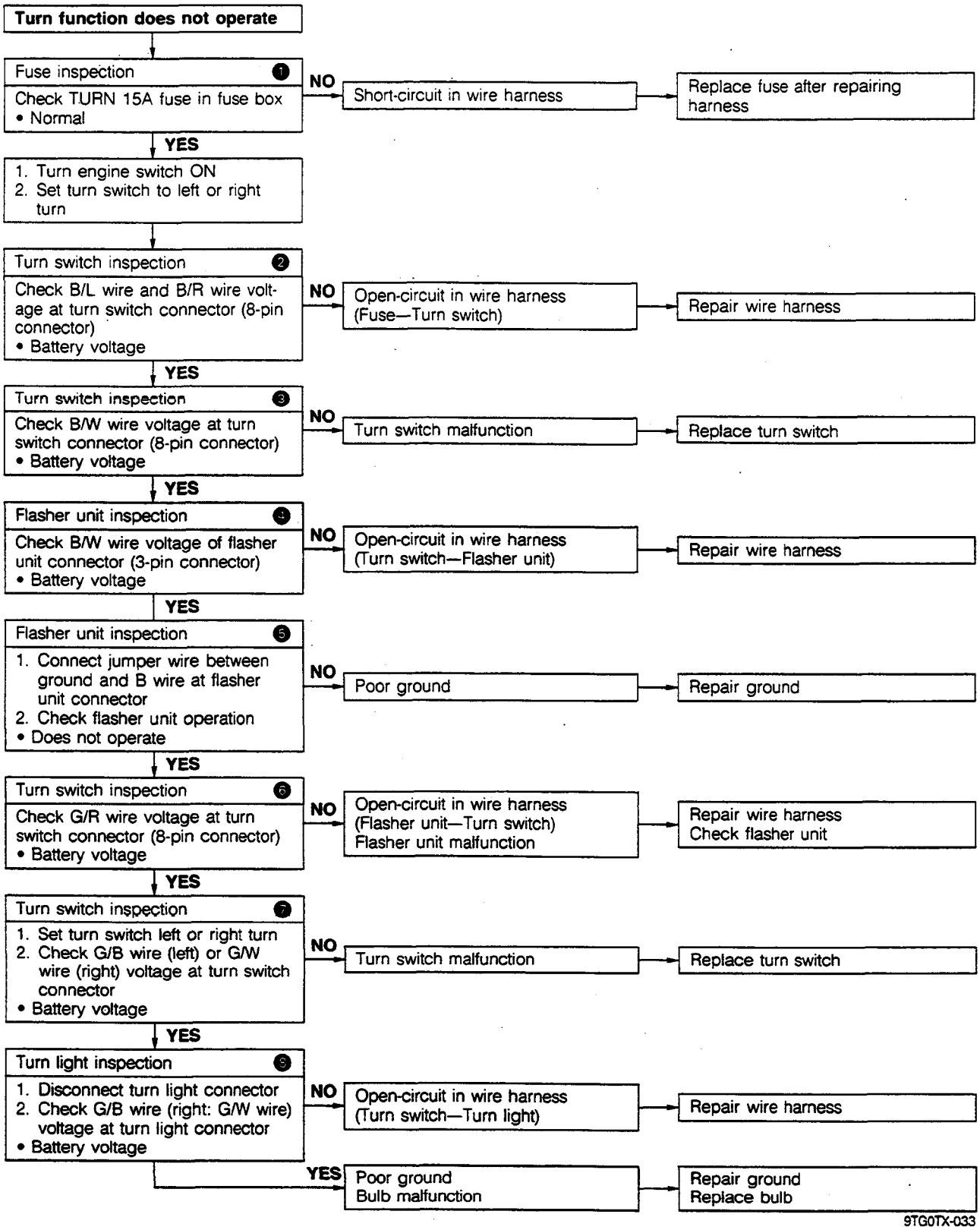

Headlights do not change high/low beam
Light switch malfunction
Replace light switch
9TG0TX-031

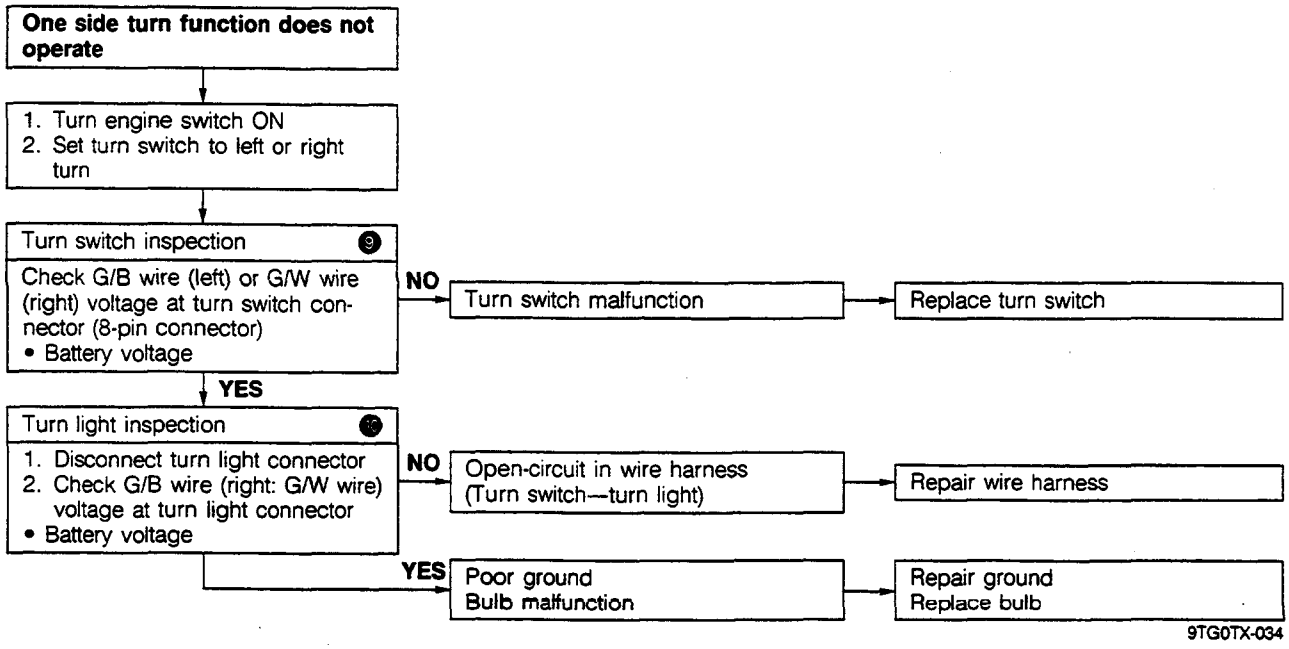
Turn and Hazard Warning Light
Wiring diagram

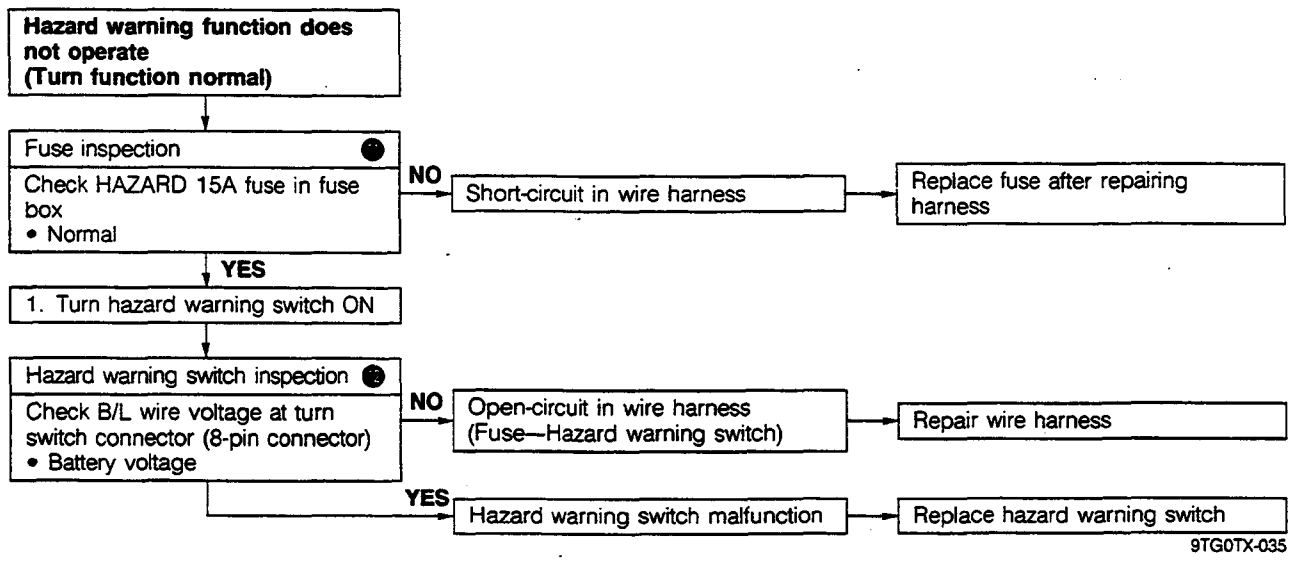


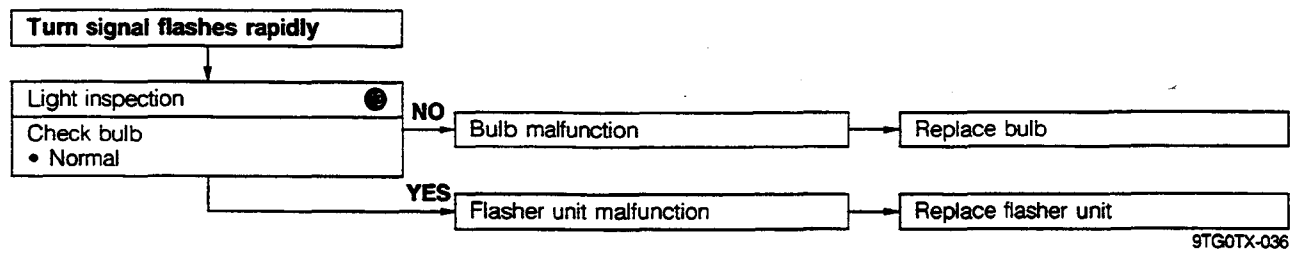
F-01 COMBINATION SWITCH (F)	F-02 FLASHER UNIT (F)	F-03 CONDENSER (F)	F-04 HORN (F)	F-05 STOP LIGHT SWITCH (F)	F-06 STOP LIGHT CHECKER RELAY (F)	F-07 BACK-UP LIGHT SWITCH (A)
F-08 BACK HORN (A2)	F-09 HORN RELAY (F)	F-10 CONDENSER (F)	F-11 BACK-UP LIGHT (FOR SINGAPORE)	E-02 HORN SWITCH (F)	E-07 FRONT TURN LIGHT (LH) (F)	E-08 FRONT TURN LIGHT (RH) (F)
E-09 REAR COMBINATION LIGHT (LH) (A2)	E-10 REAR COMBINATION LIGHT (RH) (A2)					

NOTE *···NOT USED

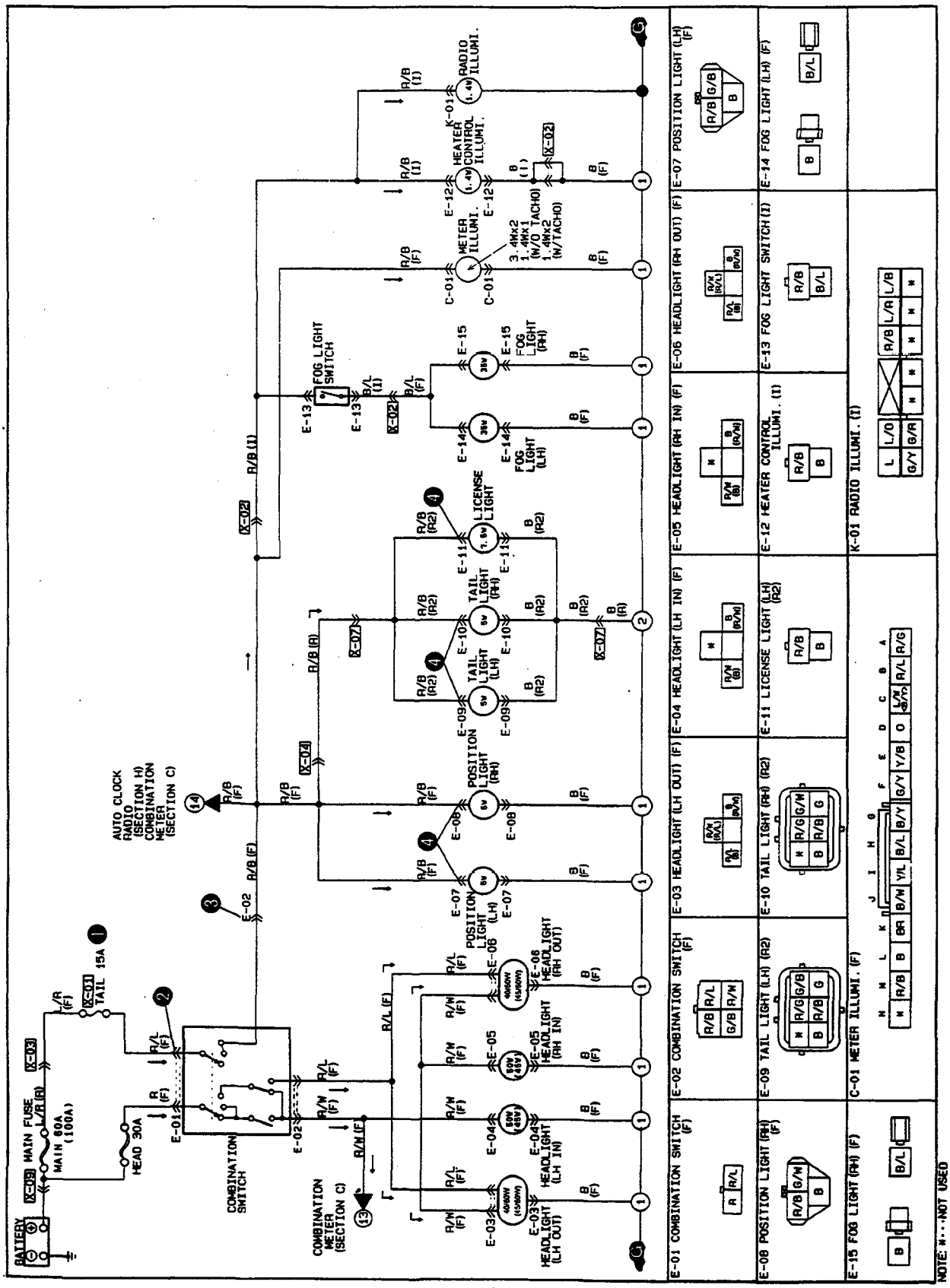

Turn function does not operate
Fuse inspection ❶
Check TURN 15A fuse in fuse box
• Normal
NO
Short-circuit in wire harness
Replace fuse after repairing harness
YES
1. Turn engine switch ON
2. Set turn switch to left or right turn
Turn switch inspection ❷
Check B/L wire and B/R wire voltage at turn switch connector (8-pin connector)
• Battery voltage
NO
Open-circuit in wire harness (Fuse—Turn switch)
Repair wire harness
YES
Turn switch inspection ❸
Check B/W wire voltage at turn switch connector (8-pin connector)
• Battery voltage
NO
Turn switch malfunction
Replace turn switch
YES
Flasher unit inspection ❹
Check B/W wire voltage of flasher unit connector (3-pin connector)
• Battery voltage
NO
Open-circuit in wire harness (Turn switch—Flasher unit)
Repair wire harness
YES
Flasher unit inspection ❺
1. Connect jumper wire between ground and B wire at flasher unit connector
2. Check flasher unit operation
• Does not operate
NO
Poor ground
Repair ground
YES
Turn switch inspection ❻
Check G/R wire voltage at turn switch connector (8-pin connector)
• Battery voltage
NO
Open-circuit in wire harness (Flasher unit—Turn switch)
Flasher unit malfunction
Repair wire harness
Check flasher unit
YES
Turn switch inspection ❼
1. Set turn switch left or right turn
2. Check G/B wire (left) or G/W wire (right) voltage at turn switch connector
• Battery voltage
NO
Turn switch malfunction
Replace turn switch
YES
Turn light inspection ❽
1. Disconnect turn light connector
2. Check G/B wire (right: G/W wire) voltage at turn light connector
• Battery voltage
NO
Open-circuit in wire harness (Turn switch—Turn light)
Repair wire harness
YES
Poor ground
Bulb malfunction
Repair ground
Replace bulb
9TG0TX-033


One side turn function does not operate
1. Turn engine switch ON
2. Set turn switch to left or right turn
Turn switch inspection ⑨
Check G/B wire (left) or G/W wire (right) voltage at turn switch connector (8-pin connector)
• Battery voltage
NO
Turn switch malfunction
Replace turn switch
YES
Turn light inspection ⑩
1. Disconnect turn light connector
2. Check G/B wire (right: G/W wire) voltage at turn light connector
• Battery voltage
NO
Open-circuit in wire harness (Turn switch—turn light)
Repair wire harness
YES
Poor ground
Bulb malfunction
Repair ground
Replace bulb
9TG0TX-034

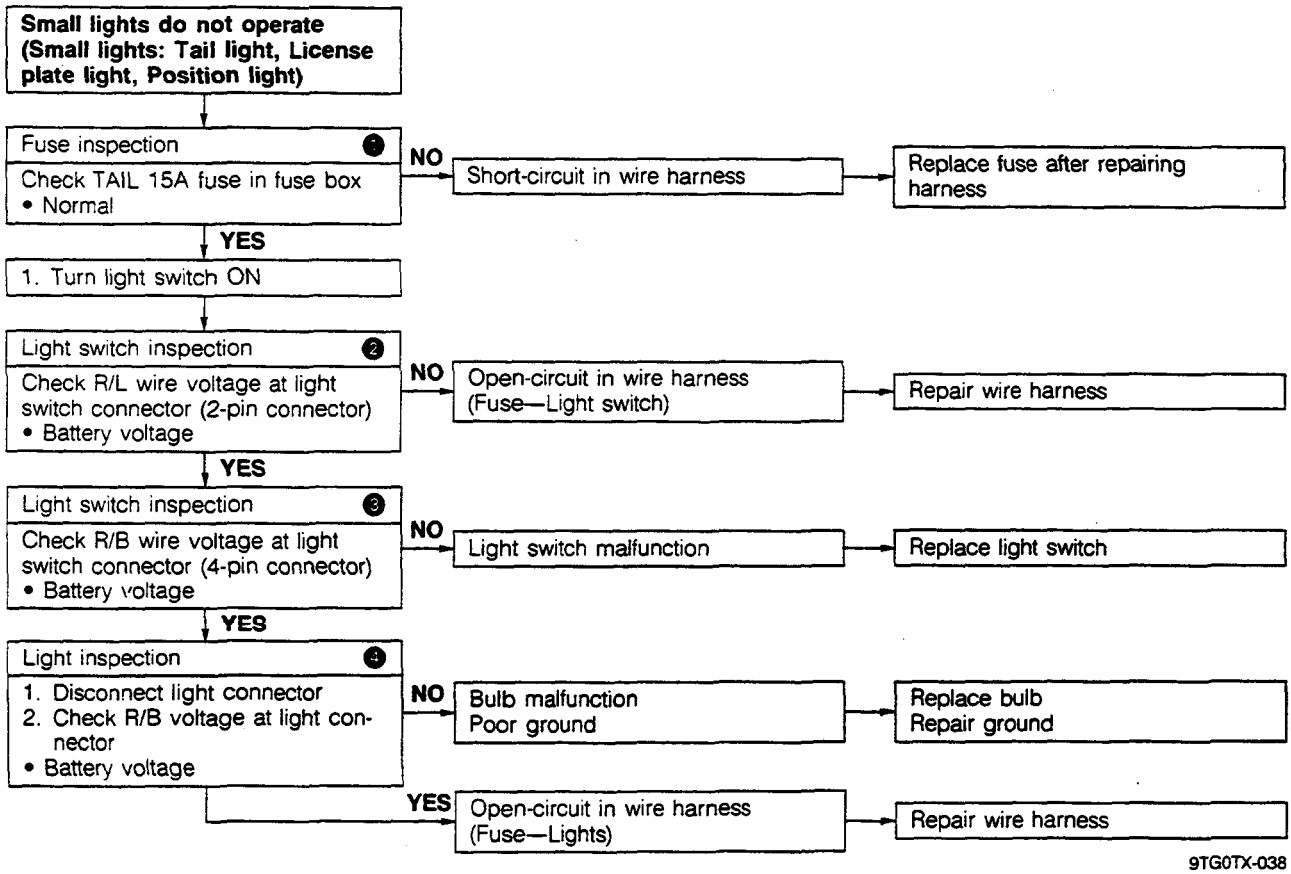

Hazard warning function does not operate (Turn function normal)
Fuse inspection ⑪
Check HAZARD 15A fuse in fuse box
• Normal
NO
Short-circuit in wire harness
Replace fuse after repairing harness
YES
1. Turn hazard warning switch ON
Hazard warning switch inspection ⑫
Check B/L wire voltage at turn switch connector (8-pin connector)
• Battery voltage
NO
Open-circuit in wire harness (Fuse—Hazard warning switch)
Repair wire harness
YES
Hazard warning switch malfunction
Replace hazard warning switch
9TG0TX-035


Turn signal flashes rapidly
Light inspection ⑬
Check bulb
• Normal
NO
Bulb malfunction
Replace bulb
YES
Flasher unit malfunction
Replace flasher unit
9TG0TX-036

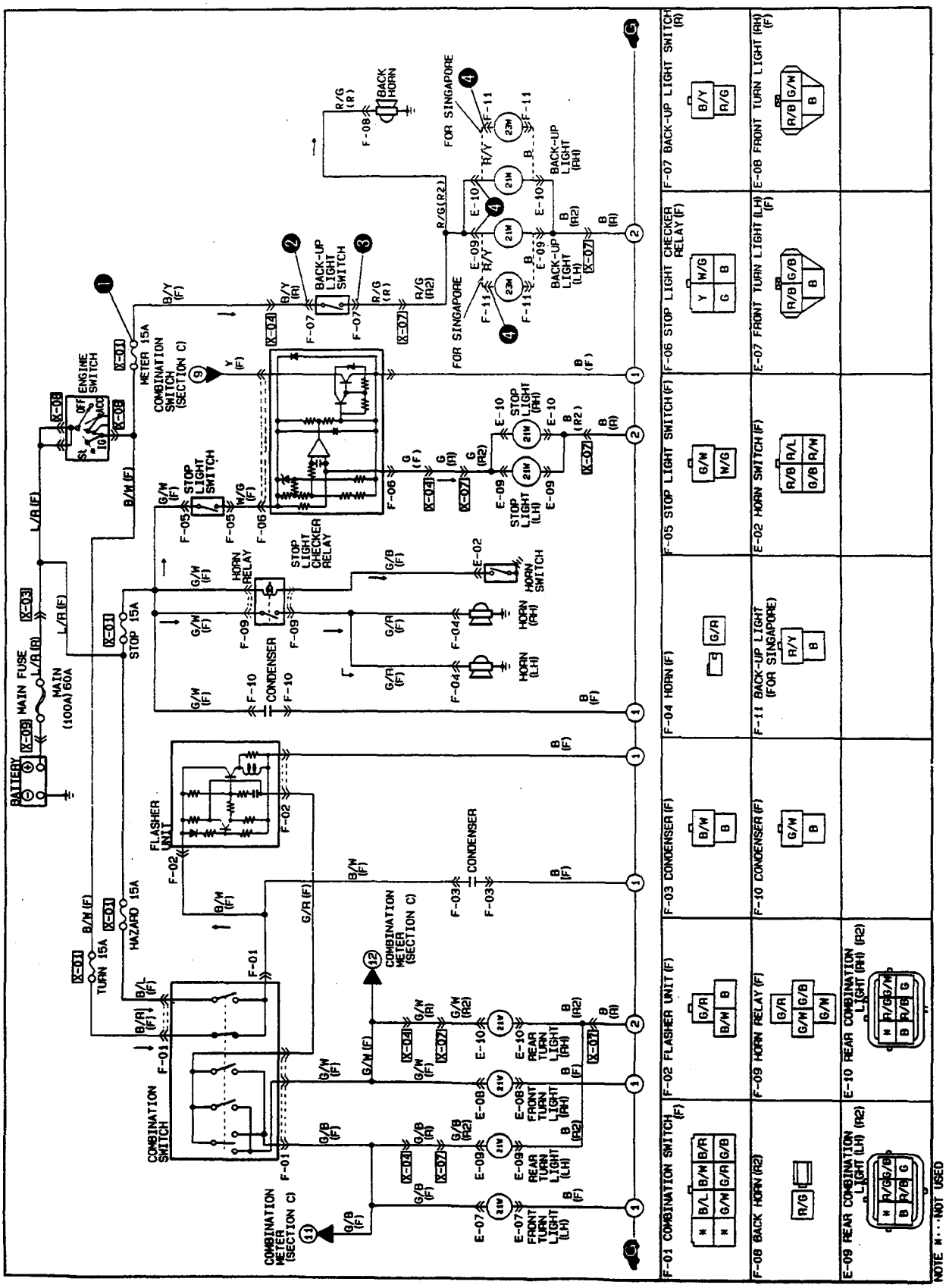
Small Light Control System
Wiring diagram



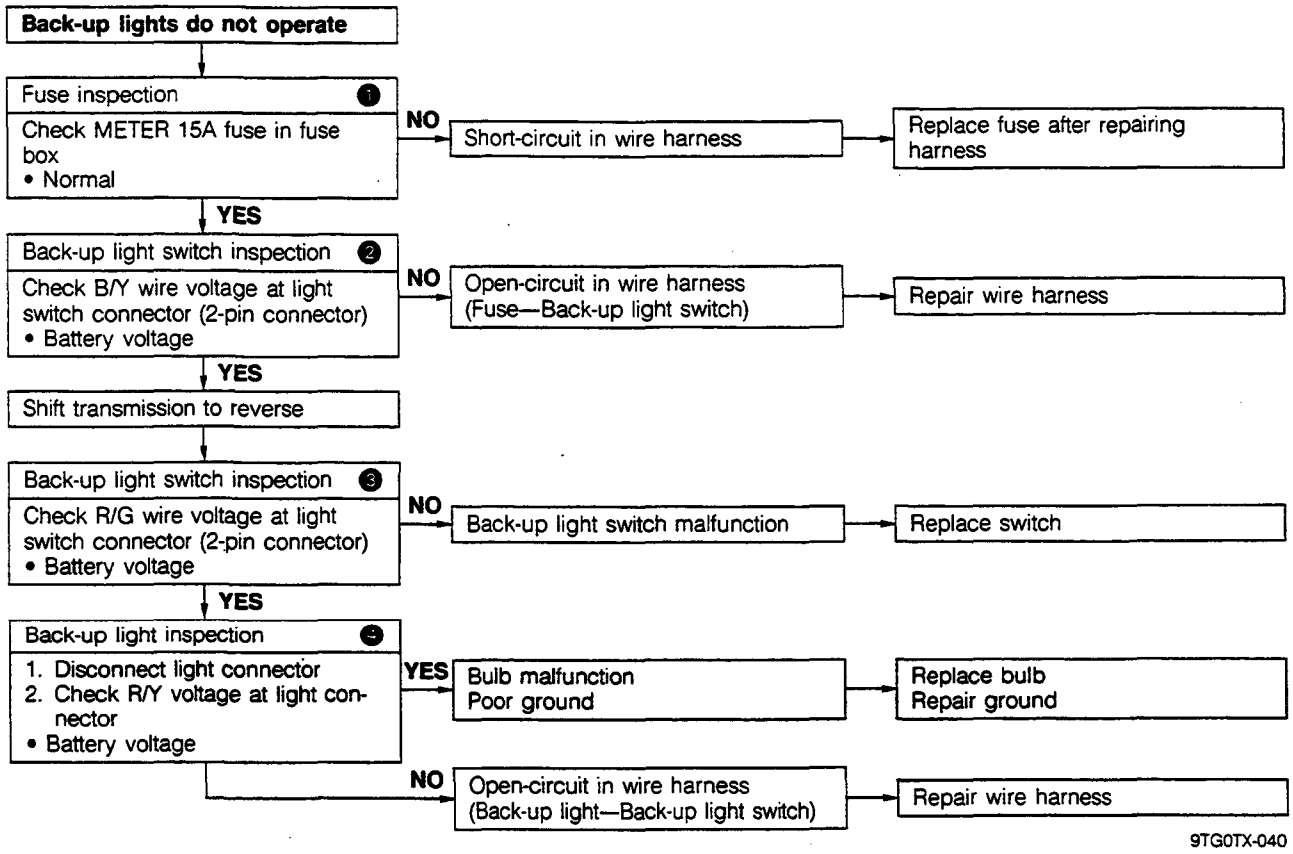
9TG0TX-037

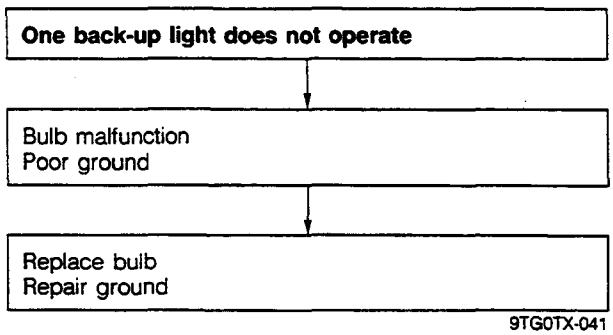

Small lights do not operate (Small lights: Tail light, License plate light, Position light)
Fuse inspection
1
Check TAIL 15A fuse in fuse box
• Normal
NO
Short-circuit in wire harness
Replace fuse after repairing harness
YES
1. Turn light switch ON
Light switch inspection
2
Check R/L wire voltage at light switch connector (2-pin connector)
• Battery voltage
NO
Open-circuit in wire harness (Fuse—Light switch)
Repair wire harness
YES
Light switch inspection
3
Check R/B wire voltage at light switch connector (4-pin connector)
• Battery voltage
NO
Light switch malfunction
Replace light switch
YES
Light inspection
4
1. Disconnect light connector
2. Check R/B voltage at light connector
• Battery voltage
NO
Bulb malfunction
Poor ground
Replace bulb
Repair ground
YES
Open-circuit in wire harness (Fuse—Lights)
Repair wire harness
9TG0TX-038

Back-up Light
Wiring diagram

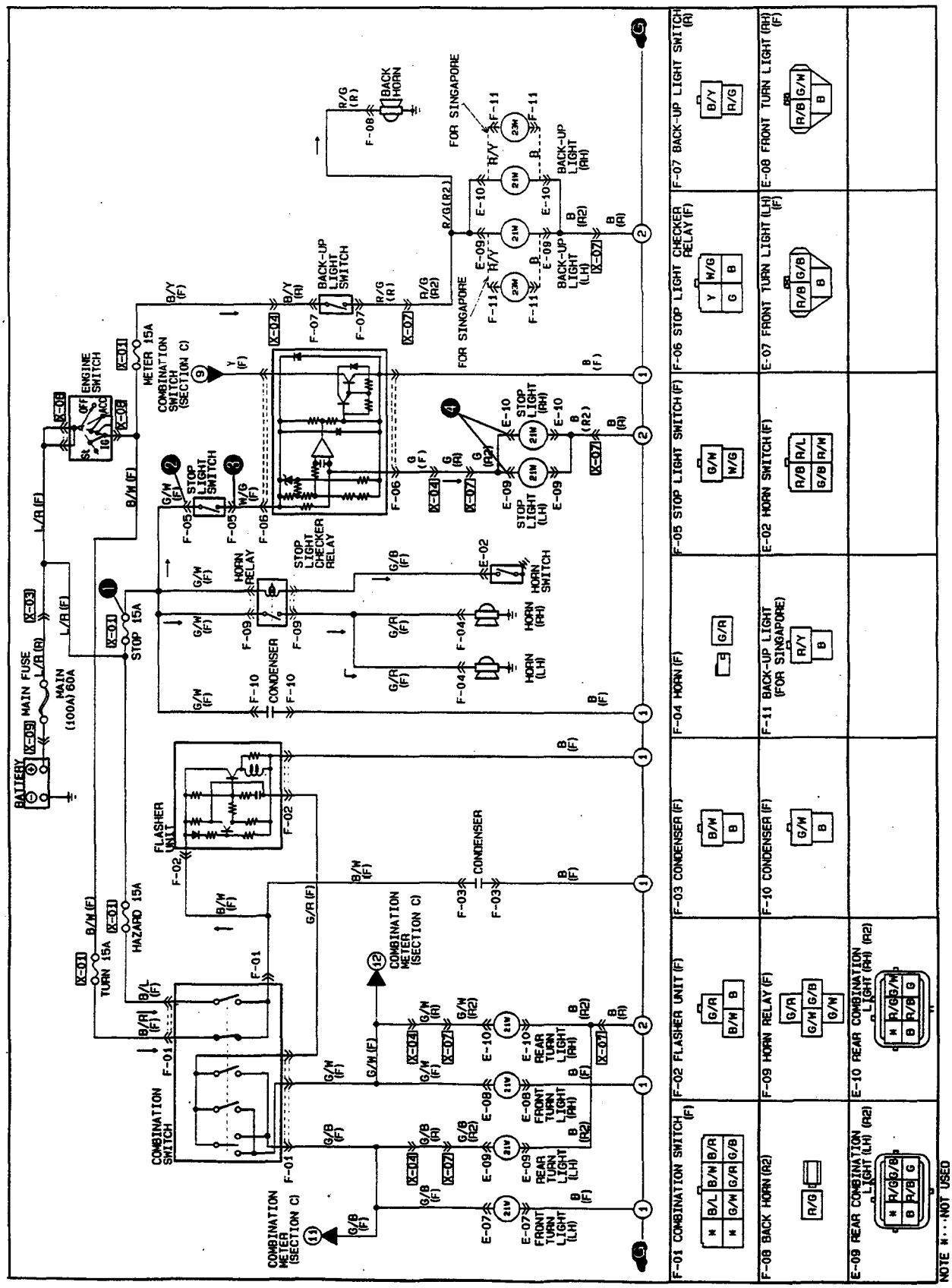


9TG0TX-039

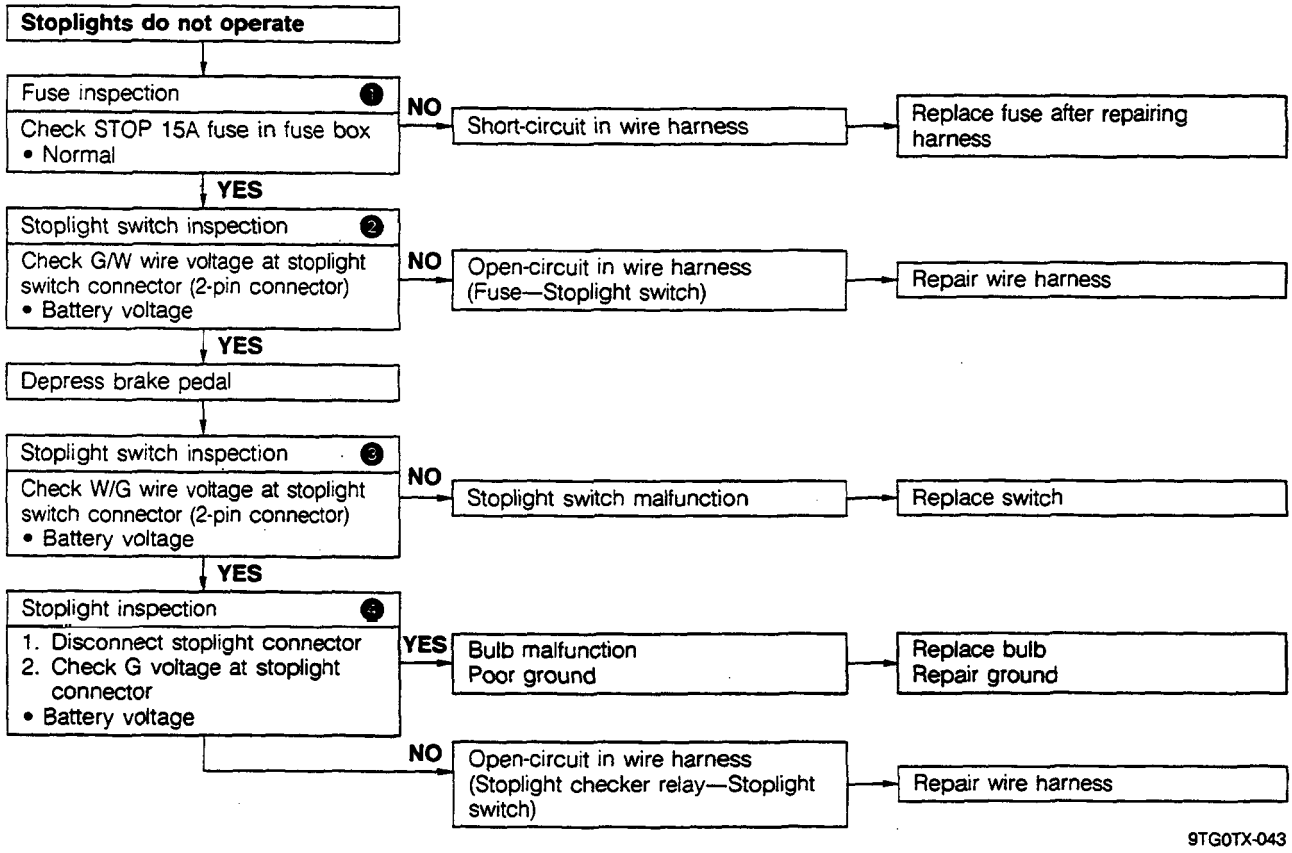

Back-up lights do not operate
Fuse inspection ❶
Check METER 15A fuse in fuse box
• Normal
NO
Short-circuit in wire harness
Replace fuse after repairing harness
YES
Back-up light switch inspection ❷
Check B/Y wire voltage at light switch connector (2-pin connector)
• Battery voltage
NO
Open-circuit in wire harness (Fuse—Back-up light switch)
Repair wire harness
YES
Shift transmission to reverse
Back-up light switch inspection ❸
Check R/G wire voltage at light switch connector (2-pin connector)
• Battery voltage
NO
Back-up light switch malfunction
Replace switch
YES
Back-up light inspection ❹
1. Disconnect light connector
2. Check R/Y voltage at light connector
• Battery voltage
YES
Bulb malfunction
Poor ground
Replace bulb
Repair ground
NO
Open-circuit in wire harness (Back-up light—Back-up light switch)
Repair wire harness
9TG0TX-040


One back-up light does not operate
Bulb malfunction
Poor ground
Replace bulb
Repair ground
9TG0TX-041

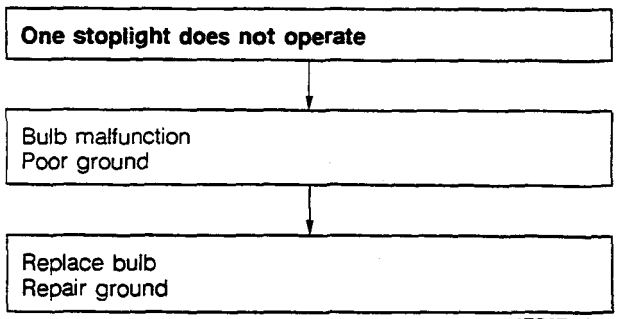
Stoplight
Wiring diagram



9TG0TX-042

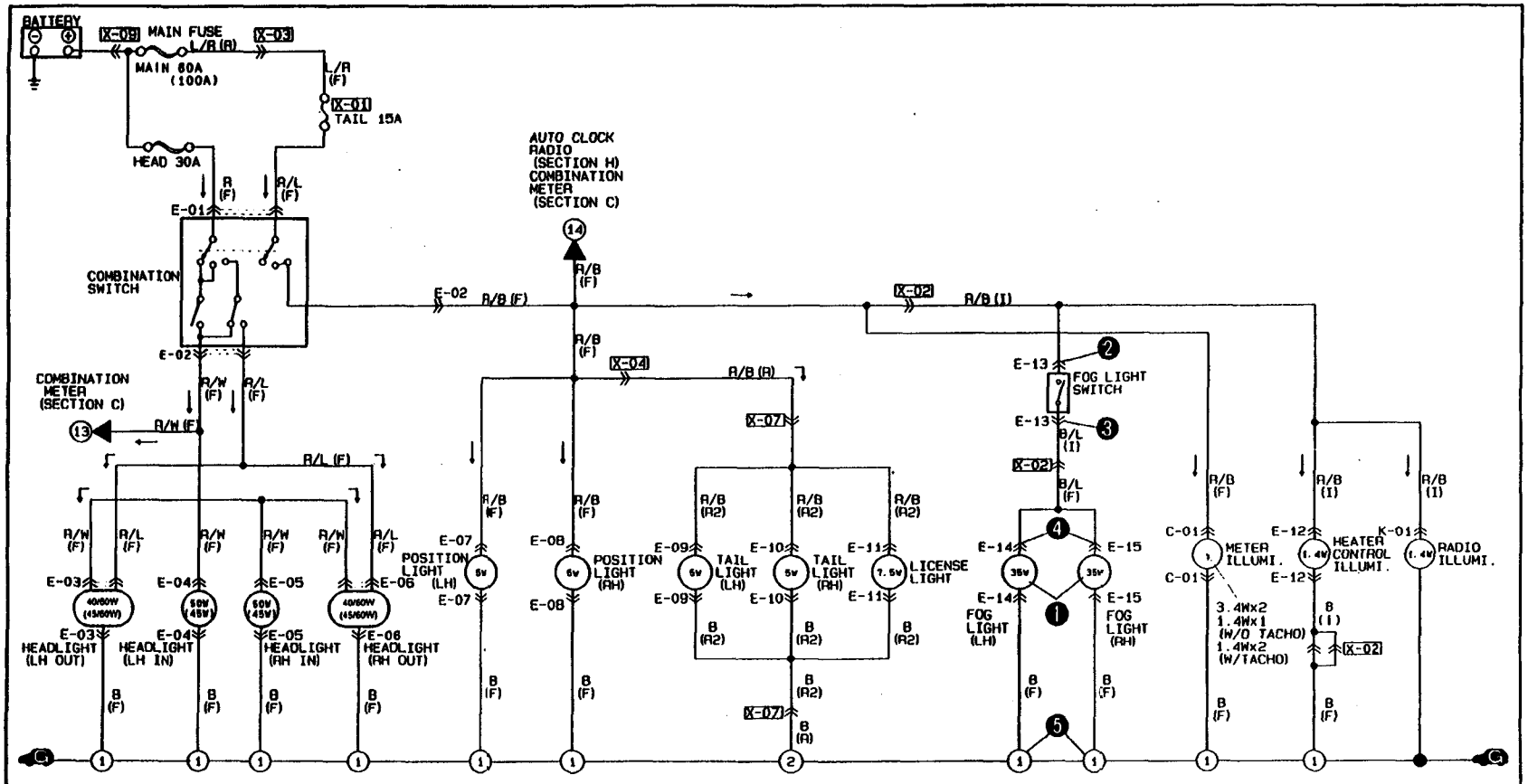


9TG0TX-043



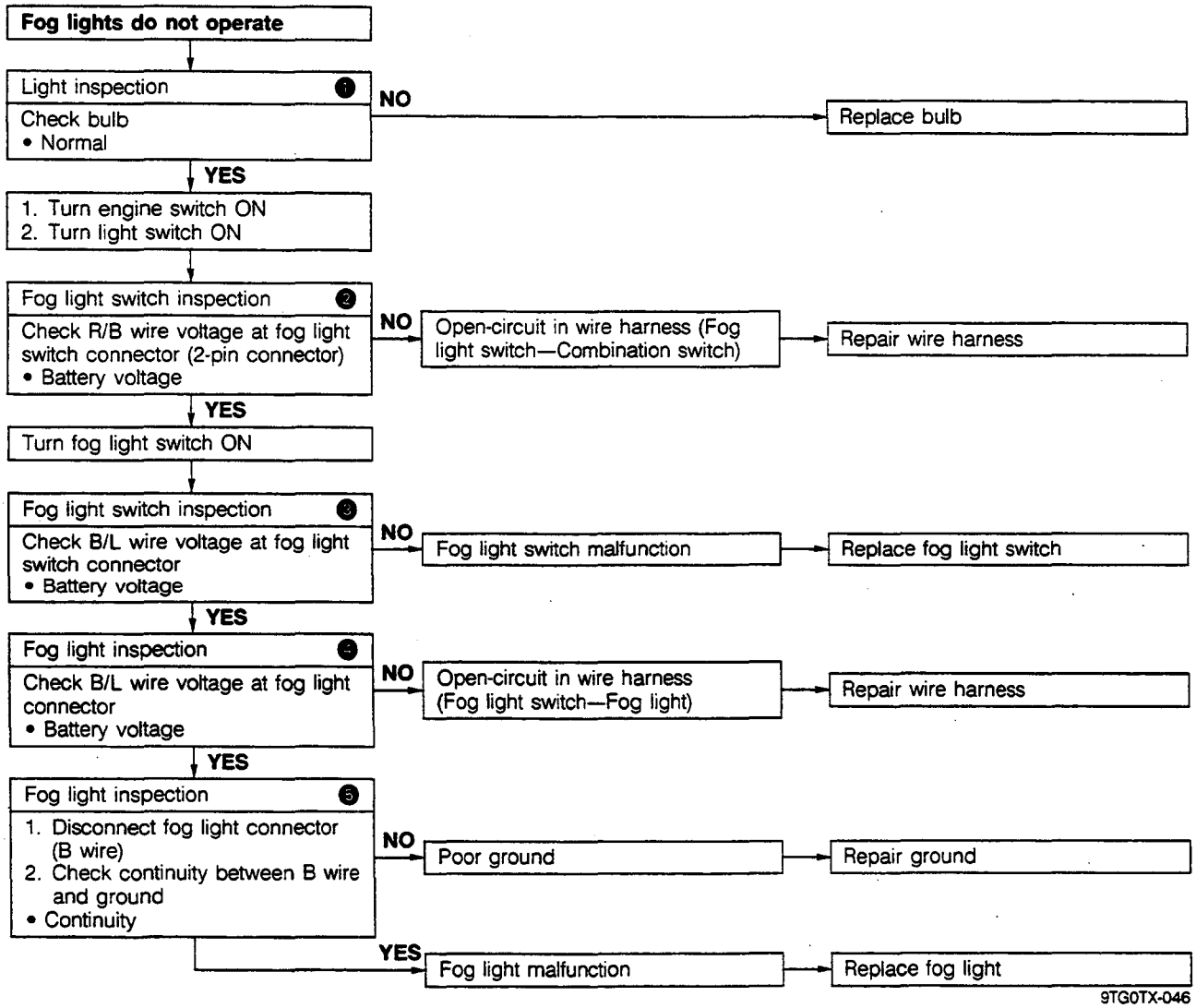
9TG0TX-044

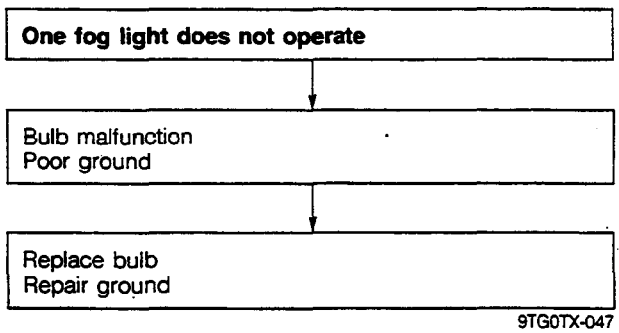
Fog Light
Wiring diagram



E-01 COMBINATION SWITCH (F)	E-02 COMBINATION SWITCH (F)	E-03 HEADLIGHT (LH OUT) (F)	E-04 HEADLIGHT (LH IN) (F)	E-05 HEADLIGHT (RH IN) (F)	E-06 HEADLIGHT (RH OUT) (F)	E-07 POSITION LIGHT (LH) (F)
E-08 POSITION LIGHT (RH) (F)	E-09 TAIL LIGHT (LH) (R2)	E-10 TAIL LIGHT (RH) (R2)	E-11 LICENSE LIGHT (LH) (R2)	E-12 HEATER CONTROL ILLUMI. (I)	E-13 FOG LIGHT SWITCH (I)	E-14 FOG LIGHT (LH) (F)
E-15 FOG LIGHT (RH) (F)	C-01 METER ILLUMI. (F)			K-01 RADIO ILLUMI. (I)		

NOTE: N···NOT USED

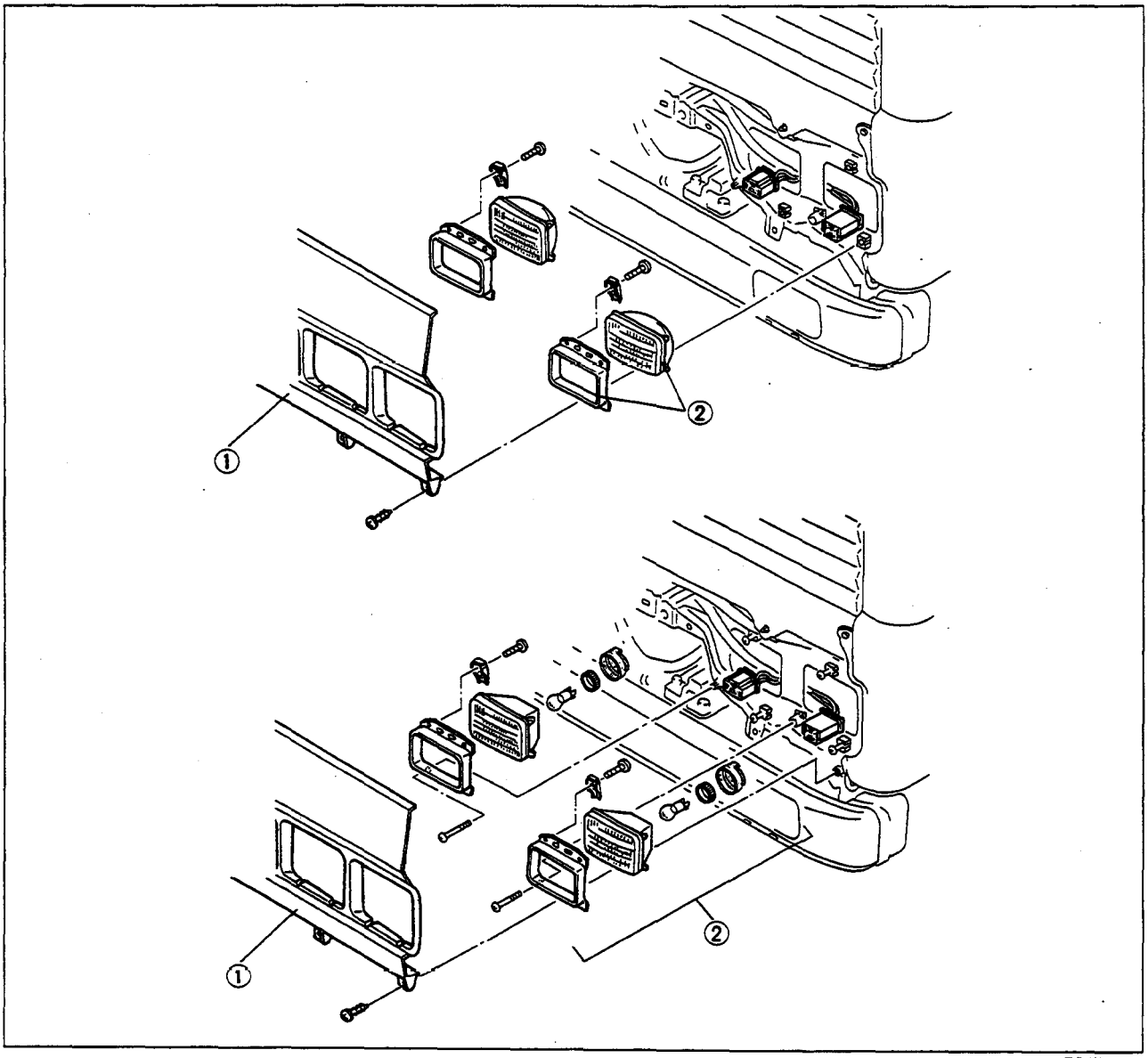

Fog lights do not operate
Light inspection ❶
Check bulb
• Normal
NO
Replace bulb
YES
1. Turn engine switch ON
2. Turn light switch ON
Fog light switch inspection ❷
Check R/B wire voltage at fog light switch connector (2-pin connector)
• Battery voltage
NO
Open-circuit in wire harness (Fog light switch—Combination switch)
Repair wire harness
YES
Turn fog light switch ON
Fog light switch inspection ❸
Check B/L wire voltage at fog light switch connector
• Battery voltage
NO
Fog light switch malfunction
Replace fog light switch
YES
Fog light inspection ❹
Check B/L wire voltage at fog light connector
• Battery voltage
NO
Open-circuit in wire harness (Fog light switch—Fog light)
Repair wire harness
YES
Fog light inspection ❺
1. Disconnect fog light connector (B wire)
2. Check continuity between B wire and ground
• Continuity
NO
Poor ground
Repair ground
YES
Fog light malfunction
Replace fog light
9TG0TX-046


One fog light does not operate
Bulb malfunction
Poor ground
Replace bulb
Repair ground
9TG0TX-047

HEADLIGHT

Removal / Installation

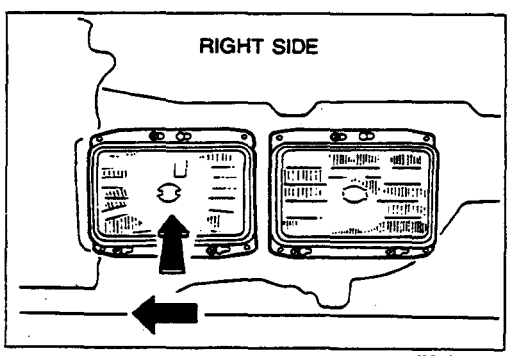
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal.



9TG0TX-048

1. Radiator grille
2. Headlight

Removal Note ..... page T–36



9TG0TX-049

Removal note

Headlight

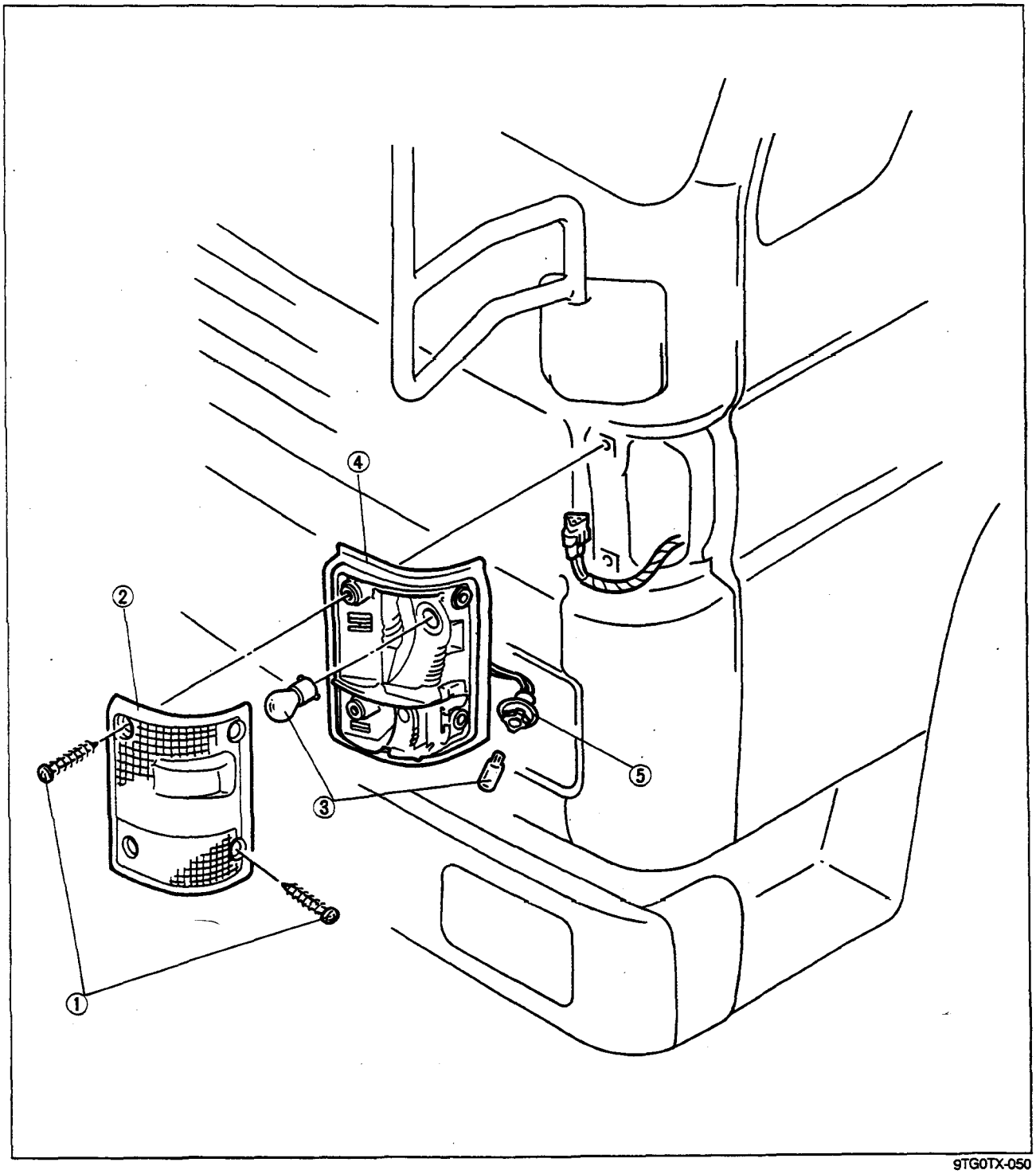
1. To remove, push the headlight and slide it to right or left.

Right headlight: Slide to left
Left headlight : Slide to right

FRONT COMBINATION LIGHT

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.



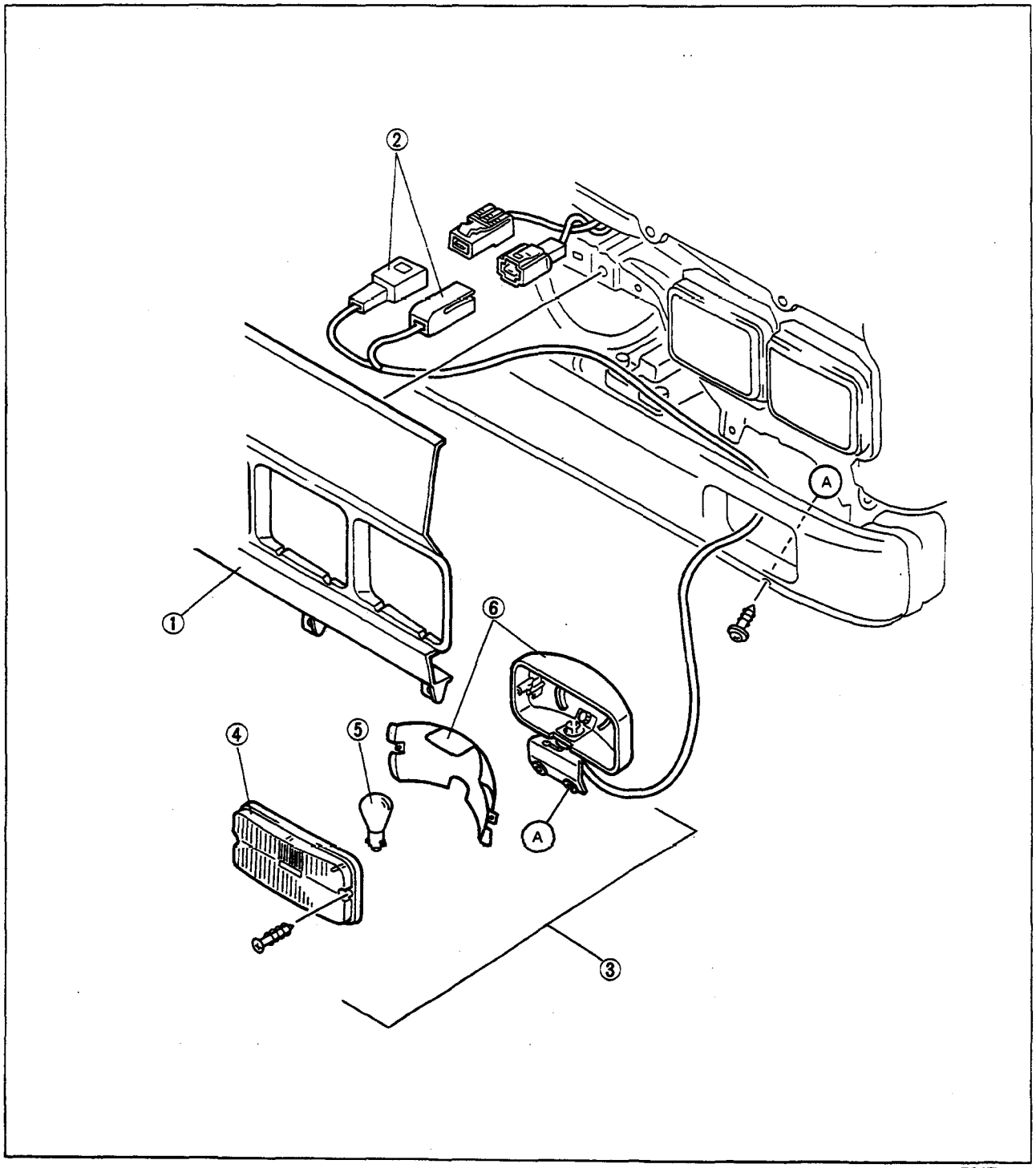
9TG0TX-050

1. Screws
2. Lens
3. Bulb
   Inspect for failure and poor contact
4. Housing
5. Socket

FOG LIGHT

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.



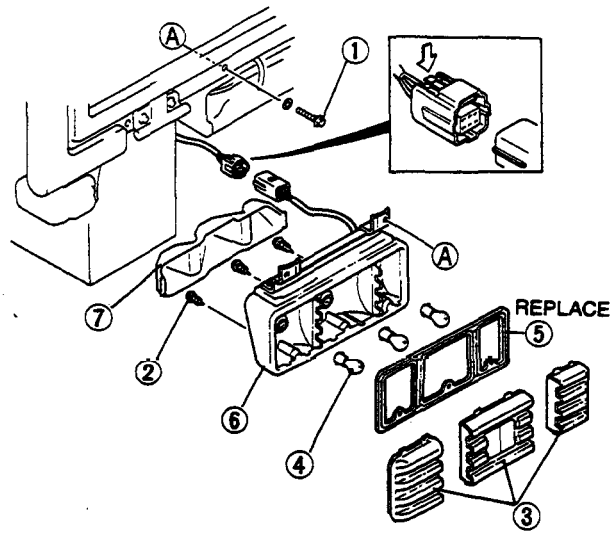
9TG0TX-051

1. Radiator grille
2. Connector
3. Fog light assembly
4. Lens
5. Bulb
   Inspect for failure and poor contact
6. Fog light body assembly

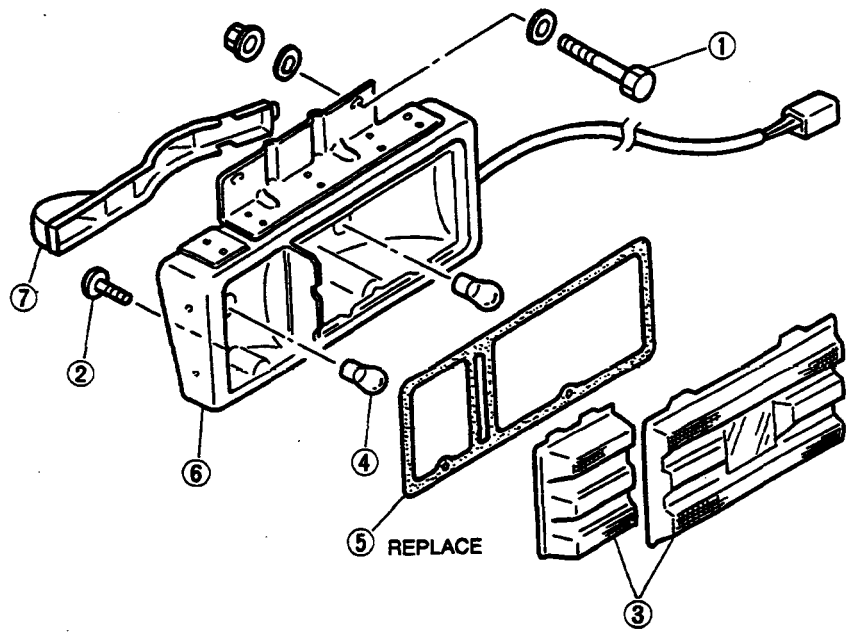
REAR COMBINATION LIGHT

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.



SINGAPORE



9TF0TX-010

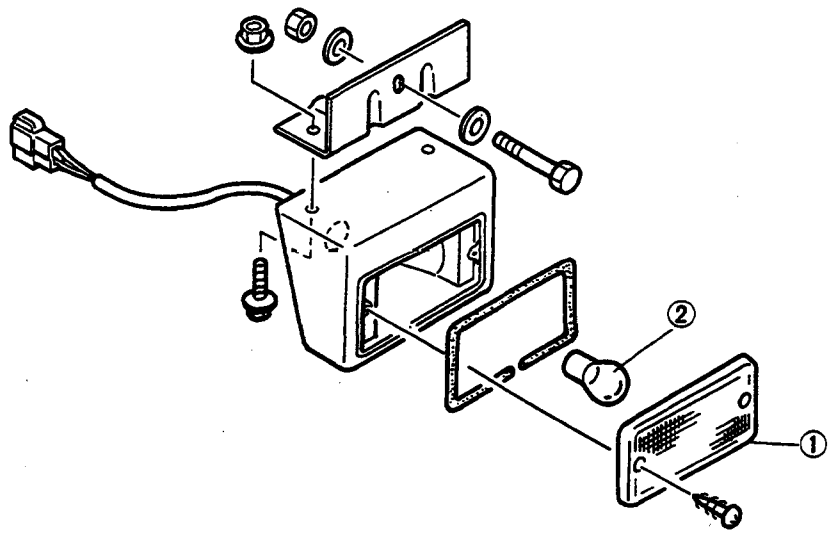
1. Bolts
2. Screws
3. Lens
4. Bulb
   Inspect for failure and poor contact
5. Gasket
6. Housing
7. Cover

BACK-UP LIGHT

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.

SINGAPORE



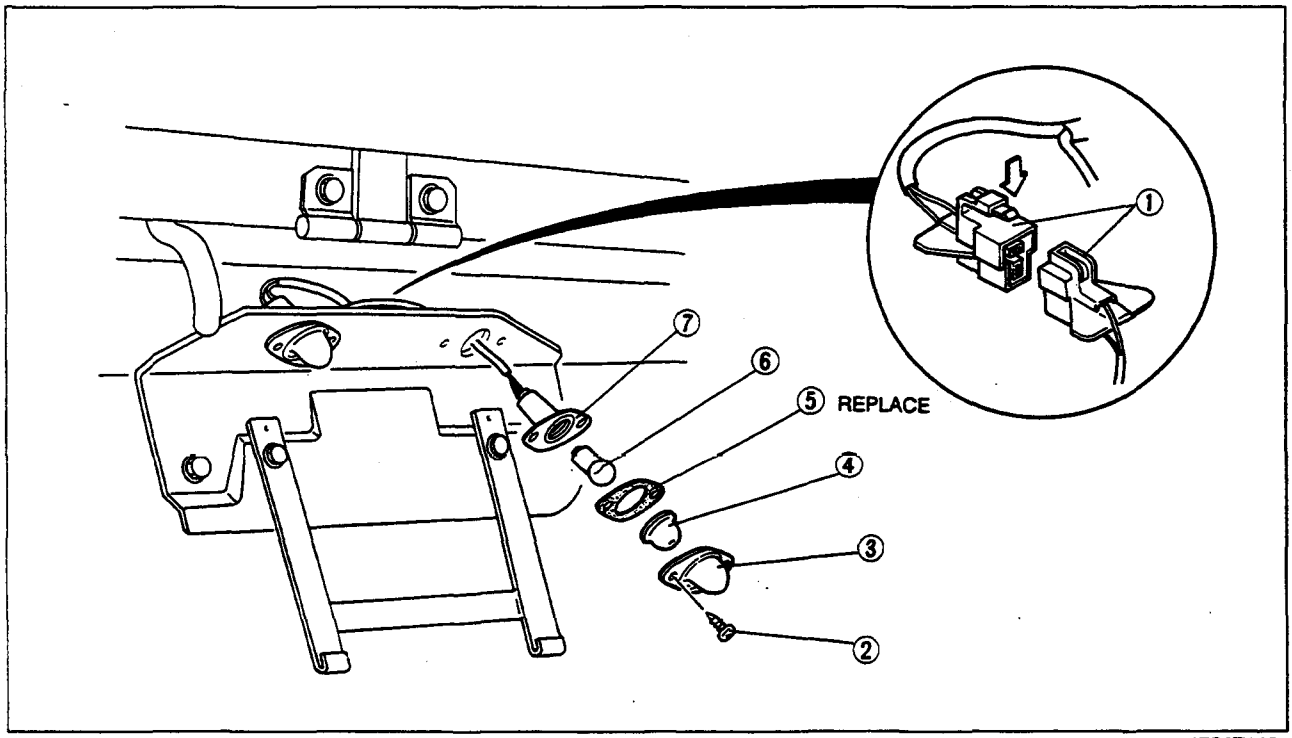
9TG0TX-053

1. Lens
2. Bulb
   Inspect for failure and poor contact

LICENSE PLATE LIGHT

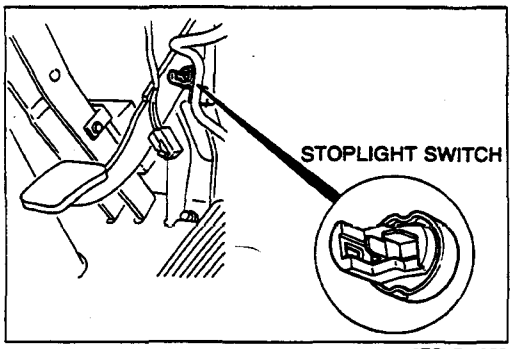
Removal / Inspection / Installation

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.

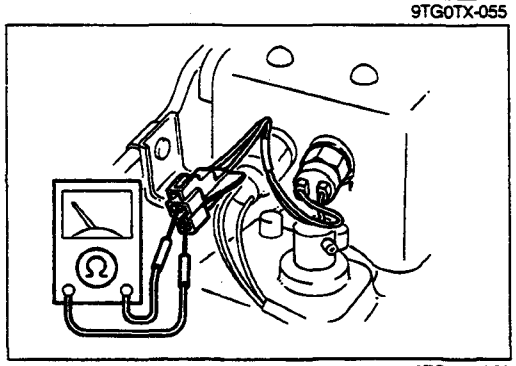


9TG0TX-054

1. Connector
2. Screws
3. Cover
4. Lens
5. Gasket
6. Bulb
   Inspect for failure and poor contact
7. Socket



9TG0TX-055



9TG0TX-056

STOPLIGHT SWITCH

Inspection

1. Disconnect the stoplight switch connector.
2. Check continuity of the stoplight switch.

Brake pedal	Continuity
Depressed	Yes
Released	No

3. Replace the stoplight switch, if not as spcified.

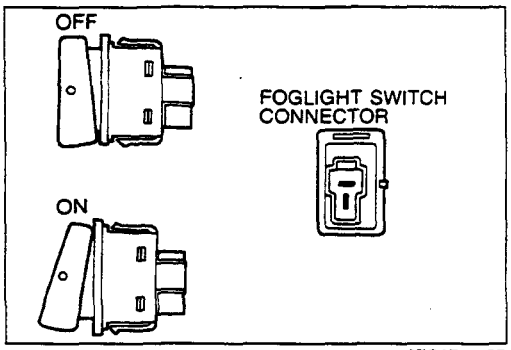
BACK-UP LIGHT SWITCH

Inspection

1. Disconnect the backup light switch connector.
2. Check continuity of the back-up light switch.

Transmission	Continuity
Reverse	Yes
Other gears	No

3. Replace the back-up light switch, if not as specified.



9TG0TX-057

FOG LIGHT SWITCH

Inspection

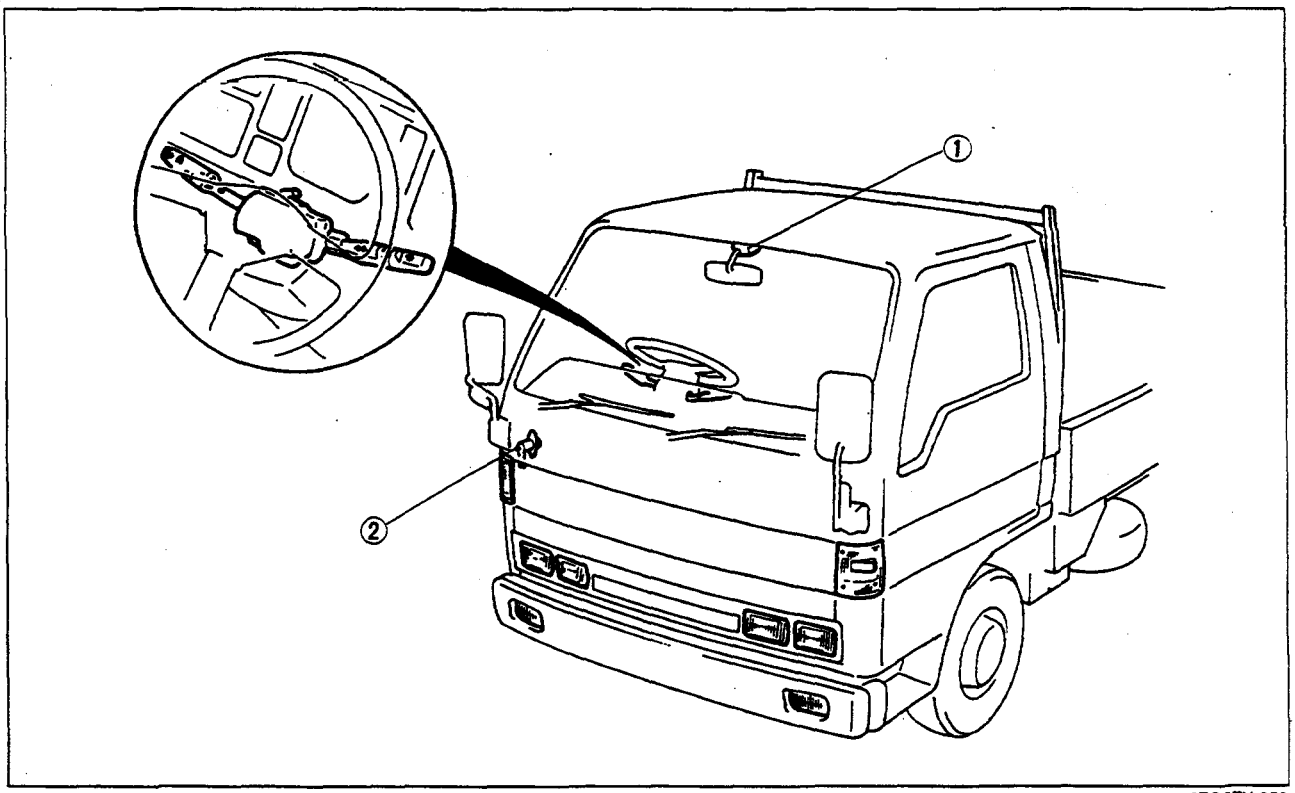
1. Remove the fog light switch.
2. Disconnect the fog light switch connector.
3. Check continuity of the fog light switch.

Switch	Continuity
ON	Yes
OFF	No

4. Replace the fog light switch if not as specified.

INTERIOR LIGHTING SYSTEM

STRUCTURAL VIEW



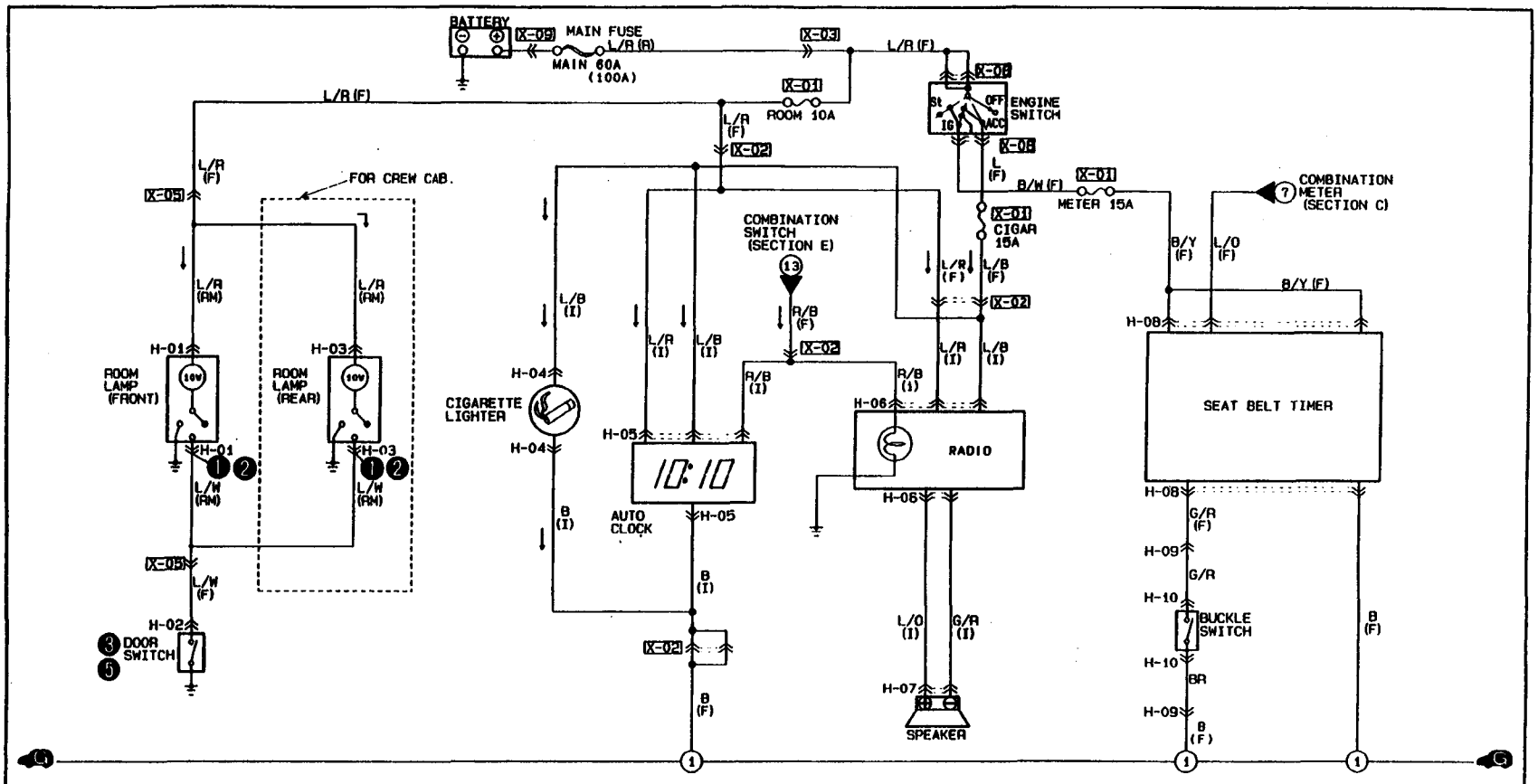
9TG0TX-058

1. Interior lamp
   Troubleshooting ..... page T–43
   Removal / Inspection / Installation ..... page T–46
2. Door switch
   Inspection ..... page T–46

SPECIFICATIONS

Lamp	Bulb (W)	Remark
Interior lamp	10	Front interior lamp
	10	Rear interior lamp (Crew cab.)

9TG0TX-059



H-01 ROOM LAMP (FRONT) (RM) 4 L/R / L/W	H-02 DOOR SWITCH (F) L/W	H-03 ROOM LAMP (REAR) (RM) 4 L/W / L/R	H-04 CIGARETTE LIGHTER L/B / B	H-05 AUTO CLOCK (I) R/B, B / L/B, L/R	H-06 RADIO (I) L, L/O, ✕, R/B, L/R, L/B / G/Y, G/R, ✕, ✕, ✕, ✕
H-07 SPEAKER (I) G/R / L/O	H-08 SEAT BELT TIMER (F) B/Y, B/Y, B / ✕, G/R, L/O	H-09 BUCKLE SWITCH CORD (F G/R, G/R / B, BR	H-10 BUCKLE SWITCH G/R / BR		

NOTE: ✕ ... NOT USED.

Interior lamp does not operate (Switch: ON position)

Set lamp switch to DOOR position

Interior lamp switch inspection ❶

1. Connect a jumper wire between ground and L/W wire at interior lamp connector
2. Check that lamp comes ON
• Comes ON

YES → Poor ground → Repair ground

NO → Interior lamp assembly malfunction → Replace lamp assembly

9TG0TX-061

Interior lamp does not operate (Switch: Door position)

Set lamp switch to DOOR position

Interior lamp switch inspection ❷

1. Connect a jumper wire between ground and L/W wire at interior lamp connector
2. Check that lamp comes ON
• Comes ON

NO → Interior lamp assembly malfunction → Replace lamp assembly

YES

Remove door switch

Door switch inspection ❸

Check door switch continuity

Door switch	Continuity
Switch depressed	No
Switch repleased	Yes

NO → Door switch malfunction → Replace door switch

YES → Poor ground
Open-circuit in wire harness
(Door switch—Interior lamp assembly) → Repair ground
Repair harness

9TG0TX-062

Interior lamp stays ON (Switch: Door position)

Interior lamp switch inspection ❹

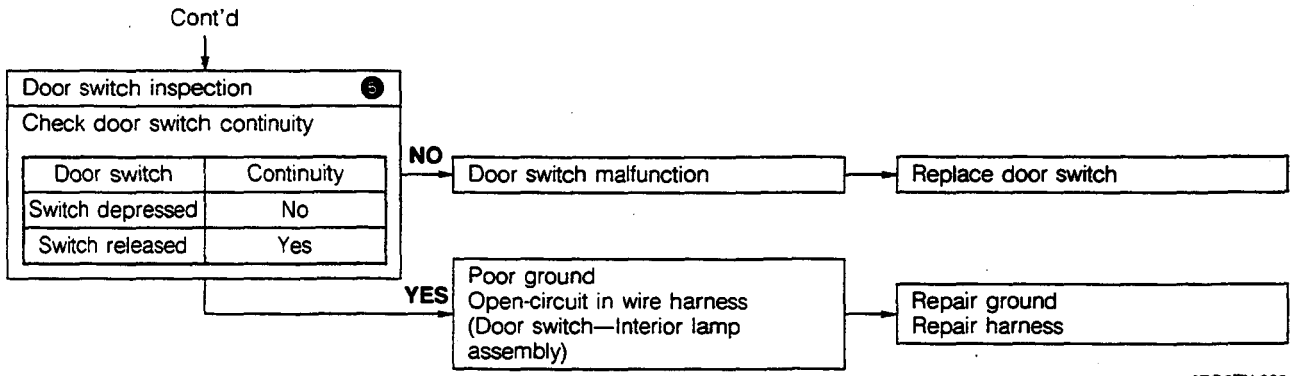
1. Disconnect interior lamp assembly connector
2. Check that lamp goes OFF
• Goes OFF

NO → Interior lamp assembly malfunction → Replace lamp assembly

YES

Remove door switch

Cont'd

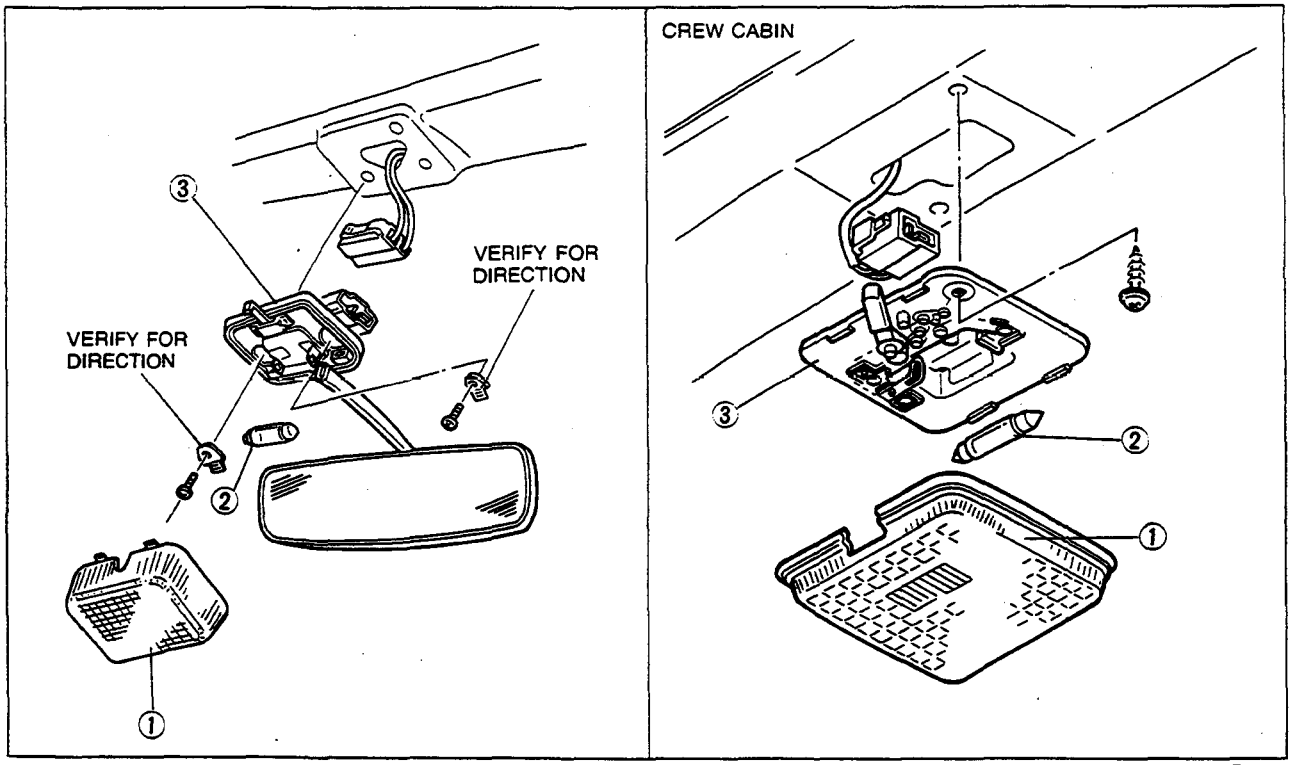

Cont'd
Door switch inspection ⑤
Check door switch continuity
Door switch | Continuity
Switch depressed | No
Switch released | Yes
NO
Door switch malfunction
Replace door switch
YES
Poor ground
Open-circuit in wire harness
(Door switch—Interior lamp assembly)
Repair ground
Repair harness

9TG0TX-063

INTERIOR LAMP

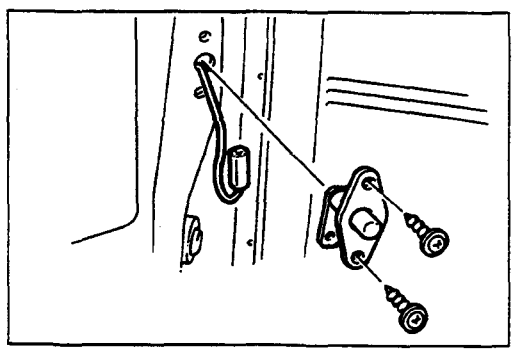
Removal / Inspection / Installation

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.

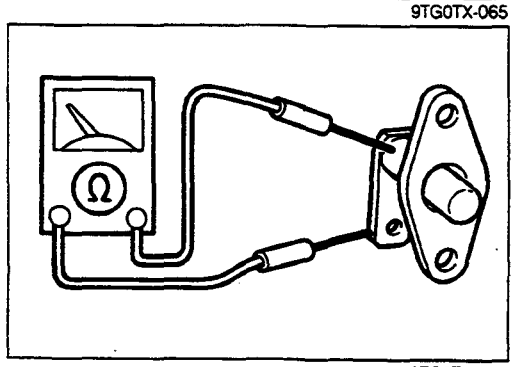


9TG0TX-064

1. Lens
2. Bulb
   Inspect for failure and poor contact
3. Interior lamp assembly



9TG0TX-065



9TG0TX-066

DOOR SWITCH

Inspection

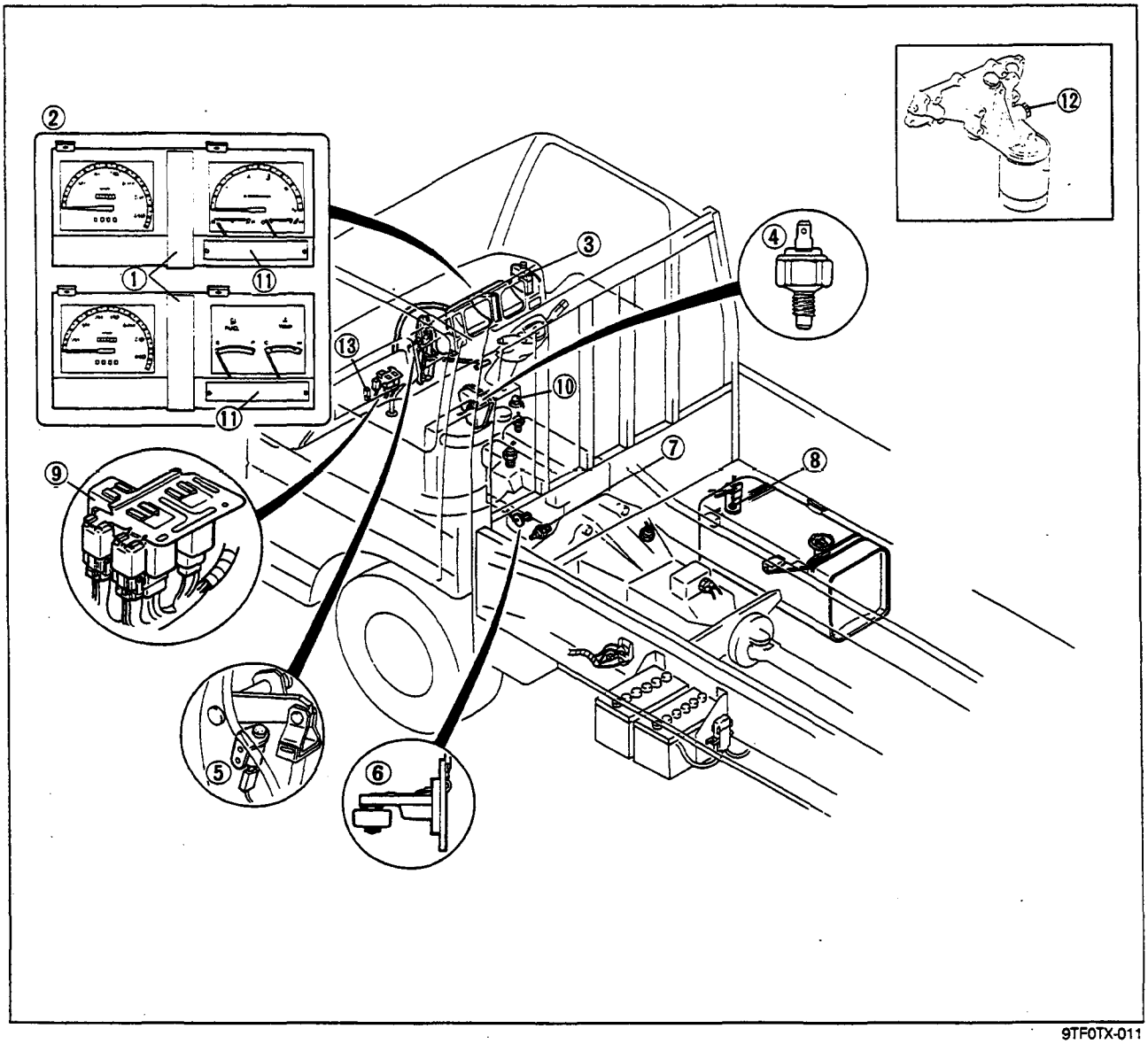
1. Remove the door switch.
2. Check continuity of the door switch.

Switch	Continuity
Switch depressed	No
Switch released	Yes

3. Replace the door switch if not as specified.

WARNING SYSTEM

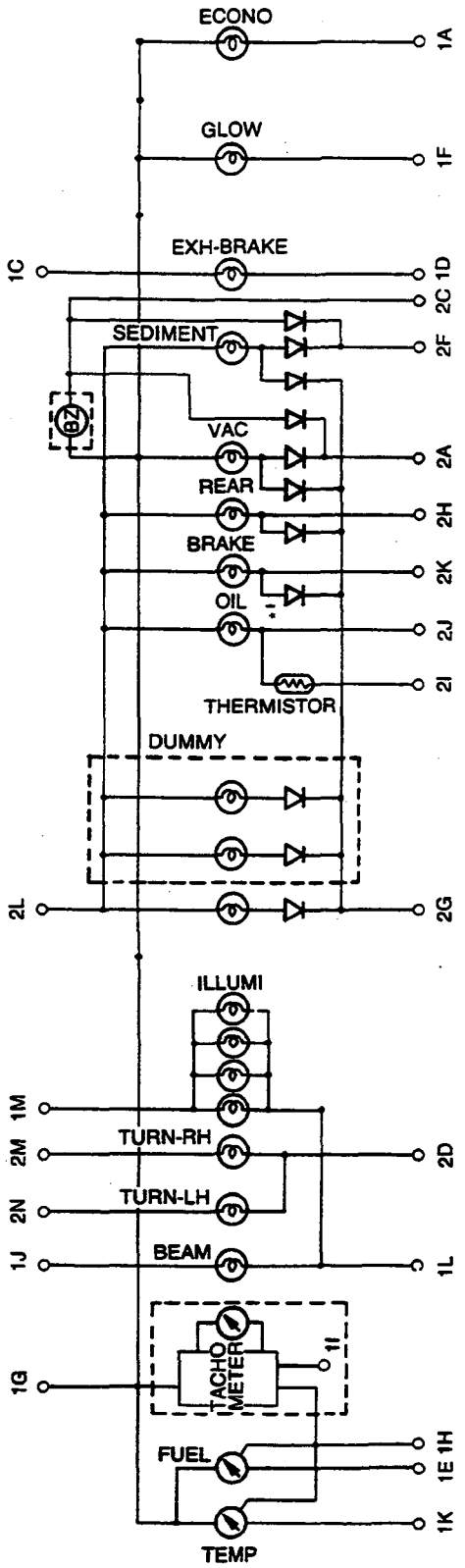
STRUCTURAL VIEW



9TF0TX-011

1. Warning lamp
   - Troubleshooting ..... page T–48
   - Inspection ..... page T–58
2. Warning buzzer
   - Troubleshooting ..... page T–57
   - Removal / Installation ..... page T–69
   - Inspection ..... page T–61
3. Brake fluid level sensor
   - Inspection ..... page T–60
   - Removal / Installation ..... page T–60
4. Vacuum switch
   - Troubleshooting ..... page T–56
5. Parking brake switch
   - Inspection ..... page T–60
6. Oil level sensor
   - Removal / Installation ..... page T–61
   - Inspection ..... page T–61
7. Oil pressure switch
   - Inspection ..... page T–58
8. Sedimentor sensor
   - Inspection ..... page T–62
9. Stoplight checker relay
   - Inspection ..... page T–60
10. Coolant level sensor
    - Inspection ..... page T–62
11. Indicator lamp
    - Inspection ..... page T–58
    - Inspection ..... page T–62
12. Oil bypass alarm switch
    - Inspection ..... page T–59
13. Coolant warning unit
    - Inspection ..... page T–59

TROUBLESHOOTING
Warning Lamp
Wiring diagram

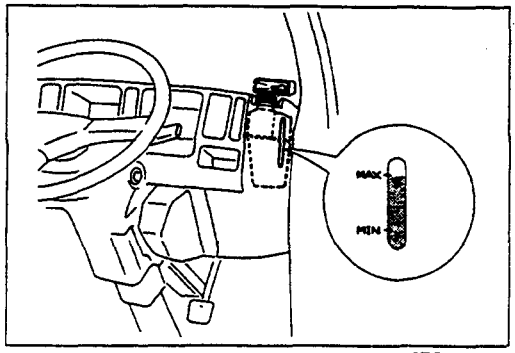


TERMINAL	CONNECTION TO
1A	SUB-MISSION SWITCH
1B	—
1C	FUSE
1D	EXHAUST BRAKE SWITCH
1E	FUEL GAUGE SENDER UNIT
1F	QSS CONTROL UNIT AIR HEATER CONTROL UNIT
1G	FUSE
1H	GROUND
1I	PICK-UP SENSOR
1J	COMBINATION SWITCH
1K	WATER THERMOSENSOR
1L	GROUND
1M	COMBINATION SWITCH
1N	—

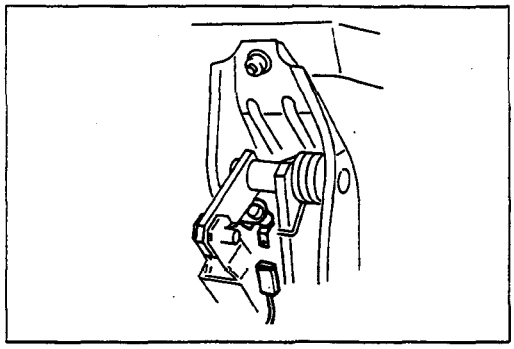
TERMINAL	CONNECTION TO
2A	VACUUM SWITCH
2B	—
2C	COOLANT WARNING UNIT
2D	GROUND
2E	—
2F	ALTERNATOR
2G	ALTERNATOR
2H	STOPLIGHT CHECKER RELAY
2I	OIL LEVEL SENSOR OIL BYPASS ALARM SWITCH
2J	OIL PRESSURE SWITCH
2K	BRAKE FLUID LEVEL SENSOR PARKING BRAKE SWITCH
2L	FUSE
2M	COMBINATION SWITCH
2N	COMBINATION SWITCH

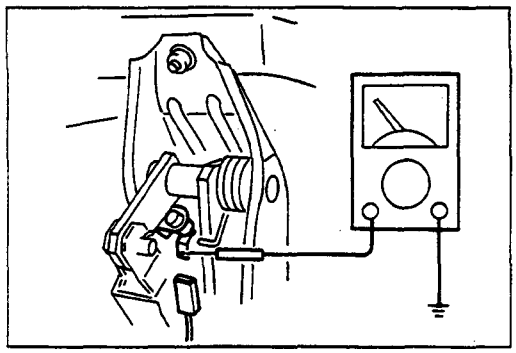
*1 AUSTRALIA

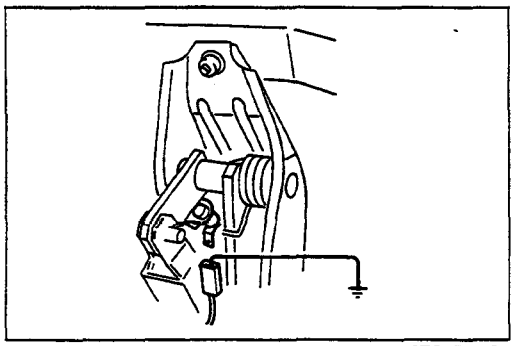
9TG0TX-068



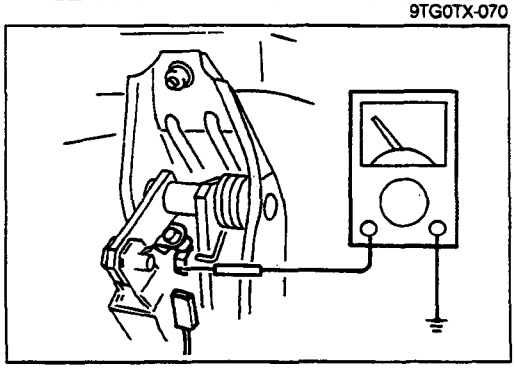
9TG0TX-069







9TG0TX-070



Brake warning lamp

Brake warning lamp comes ON after engine started

Start engine

↓

Check brake fluid level
• Between MIN—MAX

NO → Add brake fluid

↓ YES

1. Disconnect parking brake switch connector
2. Check that lamp goes OFF

• Goes OFF

NO → Open-circuit in wire harness (Parking brake switch—Warning lamp)

↓ YES

Check continuity between switch and ground

Brake lever	Continuity
Pulled	Yes
Released	No

NO → Check and adjust parking brake switch
Parking brake switch malfunction

↓ YES

Check brake fluid level sensor
(Refer to page T–60)

Brake warning lamp does not operate parking brake set

1. Disconnect parking brake switch connector
2. Connect a jumper wire between ground and switch connector
3. Check that lamp comes ON

• Comes ON

NO → Open-circuit in wire harness (Switch—Lamp)

↓ YES

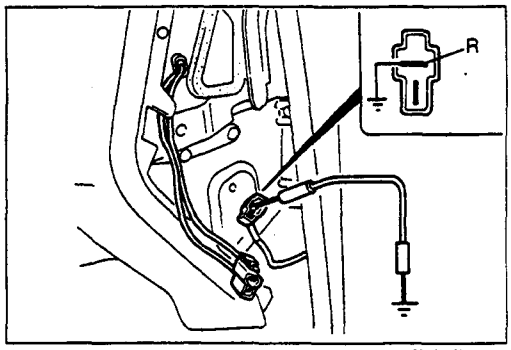
Check continuity between switch and ground

Brake lever	Continuity
Pulled	Yes
Released	No

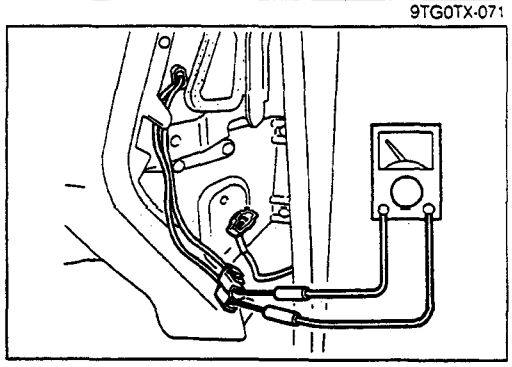
NO → Check and adjust parking brake switch
Parking brake switch malfunction

↓ YES

Poor ground



9TG0TX-071



Brake warning lamp does not operate when brake fluid level below MIN

1. Disconnect brake fluid level sensor connector
2. Connect a jumper wire between R wire at sensor connector and ground
3. Check that lamp comes ON
• Comes ON

NO → Open-circuit in wire harness (Sensor—Lamp)

YES ↓

Check continuity of brake fluid level sensor

Brake fluid	Continuity
Below MIN	Yes
Above MIN	No

NO → Brake fluid level sensor malfunction

YES → Poor ground

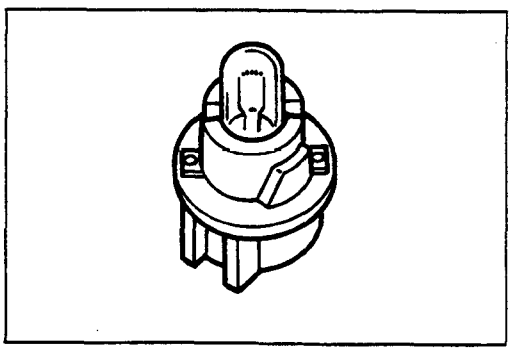
Alternator warning lamp

Alternator warning lamp comes ON after engine started

Check alternator output voltage (Refer to Section G)
• Normal

NO → Alternator malfunction

YES → Short-circuit in wire harness (Alternator—Lamp)



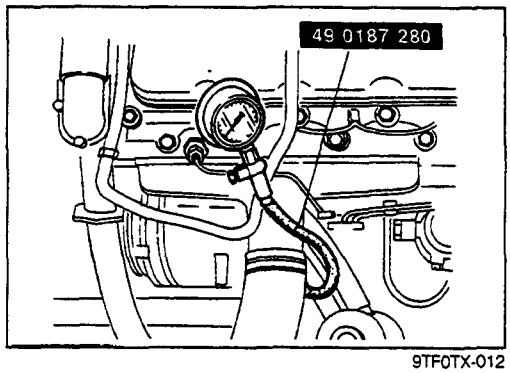
Alternator warning lamp does not operate when engine switch ON

Check if bulb burned
• Normal

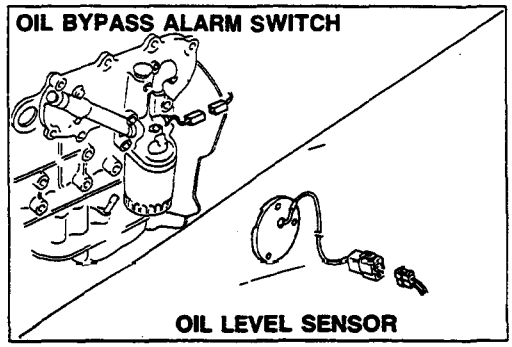
NO → Replace bulb

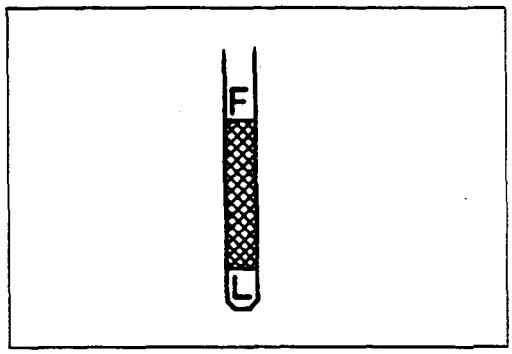
YES → Open-circuit in wire harness (Alternator—Lamp)

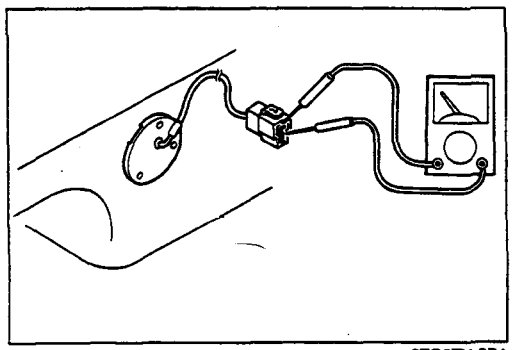
9TG0TX-072



9TF0TX-012







9TG0TX-074

Oil pressure warning lamp

Oil pressure warning lamp comes ON after engine started

Set pressure gauge to engine

↓

Start engine

↓

1. Disconnect oil bypass alarm switch and oil level sensor connectors
2. Check that lamp goes OFF
   • Goes OFF

NO → Short-circuit in wire harness (Switch—Lamp or sensor—Lamp)

YES

↓

Connect oil bypass alarm switch connector

↓

Check engine oil level
• Between L—F

NO → Add engine oil

YES

↓

Check continuity of oil level sensor

Oil level	Continuity
Below L	Yes
Above L	No

NO → Oil level sensor malfunction

Caution
- **Check oil level sensor continuity after warm-up the engine.**

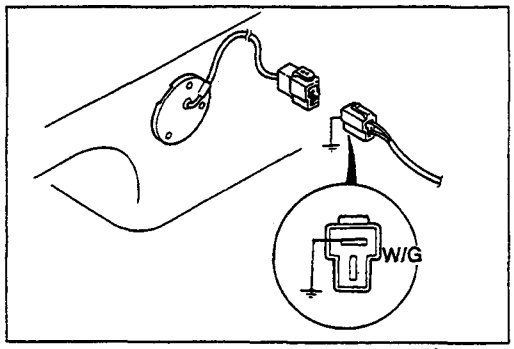
YES

↓

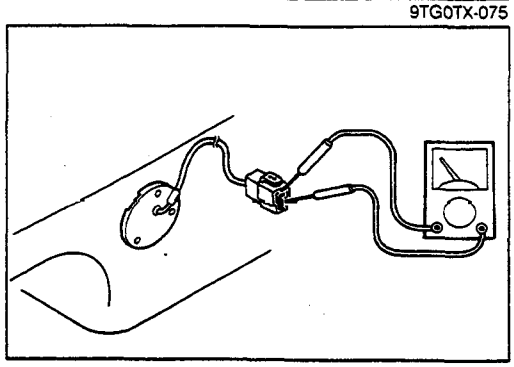
Check oil pressure (Refer to Section D)

NO → Check oil pump (Refer to Section D)

YES → Check oil pressure switch (Refer to page T–58)
Check oil bypass alarm switch (Refer to page T–59)



9TG0TX-075



Oil pressure warning lamp does not come ON when oil level below L (Diesel)

Caution
- **Check oil level sensor continuity after warm-up the engine.**

1. Disconnect oil level sensor connector
2. Connect a jumper wire between W/G wire at sensor connector and ground
3. Check that lamp comes ON
- Comes ON

NO → Open-circuit in wire harness (Sensor—Lamp)

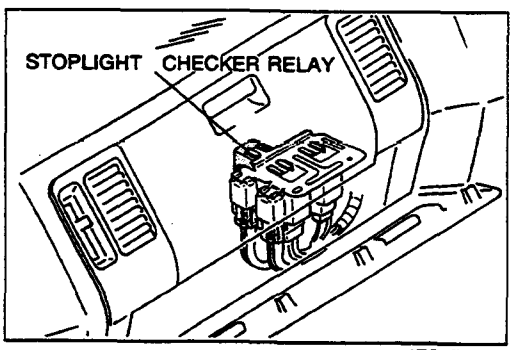
YES

Check continuity of oil level sensor

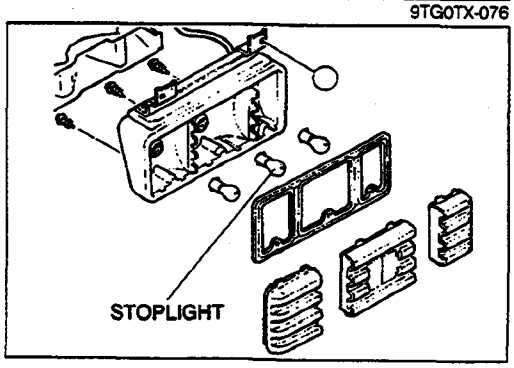
Oil level	Continuity
Below L	Yes
Above L	No

NO → Oil level sensor malfunction

YES → Poor ground



9TG0TX-076



Stoplight warning lamp

Stoplight warning lamp comes ON after engine started

1. Disconnect stoplight checker relay connector
2. Check that lamp goes OFF
- Goes OFF

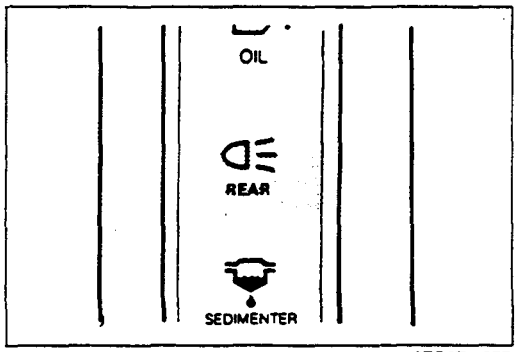
NO → Short-circuit in wire harness (Relay—Lamp)

YES

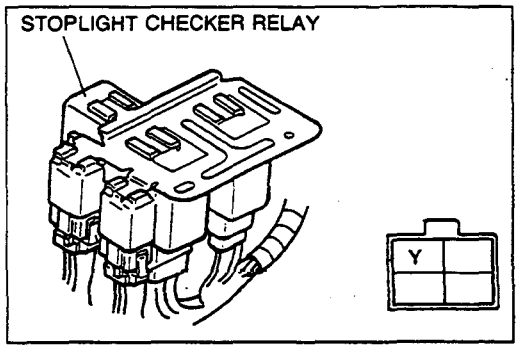
Check if stoplight burned
- Normal

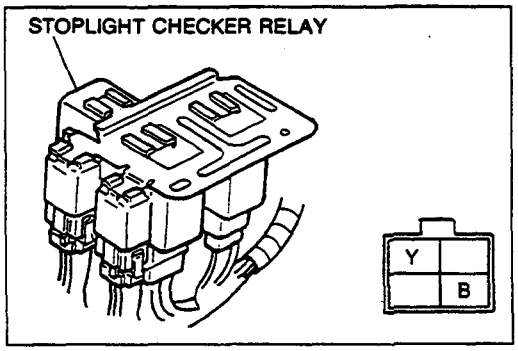
NO → Replace stoplight

YES → Check stoplight checker relay (Refer to page T–60)



9TG0TX-077





Stoplight warning lamp does not operate when stoplight failed

Check that lamp comes ON while engine switch ON
• Comes ON

NO → Bulb burned

YES ↓

Disconnect stoplight checker relay connector, and ground Y wire at relay connector

1. Start engine
2. Check that lamp comes ON
• Comes ON

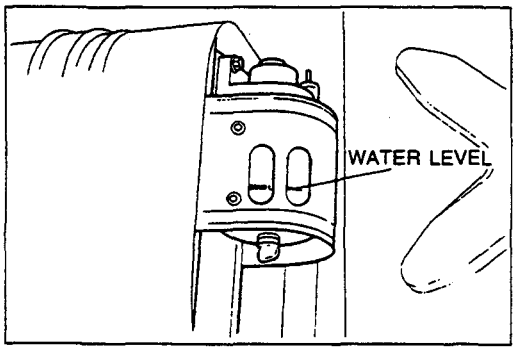
NO → Open-circuit in wire harness (Relay—Lamp)

YES ↓

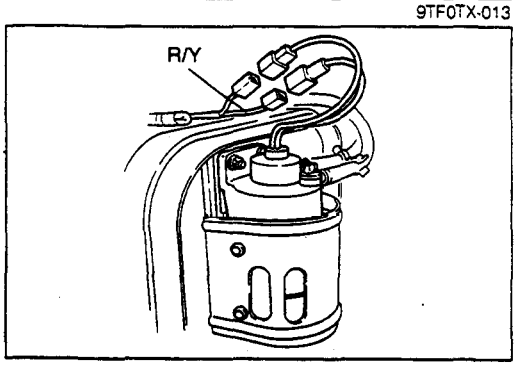
1. Connect a jumper wire between Y wire and B wire at relay connector
2. Check that lamp comes ON
• Comes ON

NO → Poor ground

YES → Check stoplight checker relay (Refer to page T–60)



9TF0TX-013



Sedimentor warning lamp

Sedimentor warning lamp comes ON with buzzer after engine started

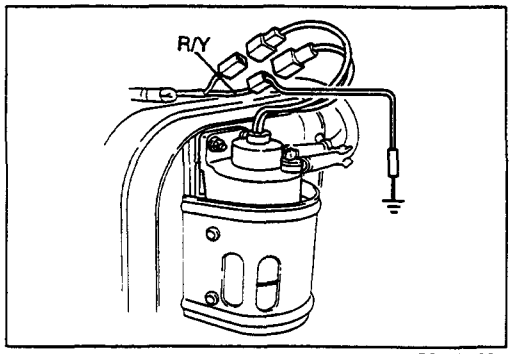
Check sedimentor water level
• Water level high
NO → Drain water (Refer to Section F1, F2, F3)

YES

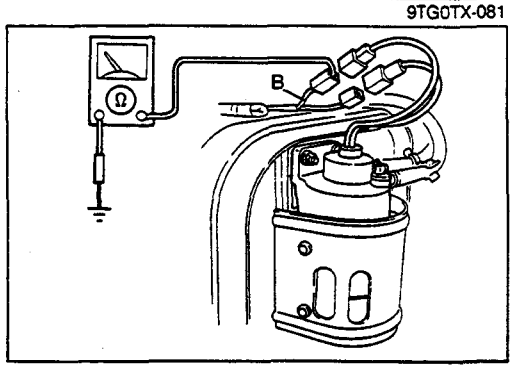
1. Disconnect sedimentor sensor connector (R/Y wire)
2. Check that lamp goes OFF and buzzer stops
• Lamp goes OFF and buzzer stops

NO → Short-circuit in wire harness (R/Y wire—Instrument cluster)

YES → Check sedimentor sensor (Refer to page T–62)



9TG0TX-081



Sedimentor warning lamp and buzzer do not operate when water level high

1. Disconnect sedimentor sensor connector (R/Y wire)
2. Connect a jumper wire between R/Y wire at sensor connector and ground
3. Check that lamp comes ON and buzzer sounds
- Lamp comes ON and buzzer sounds

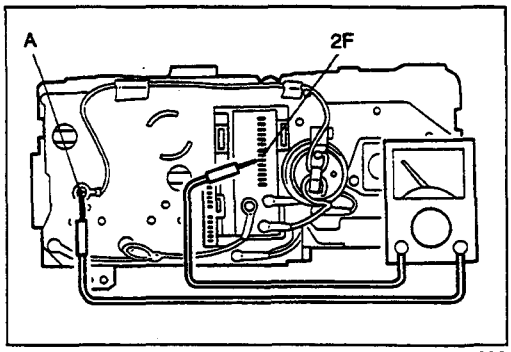
NO → Open-circuit in wire harness (R/Y wire—Instrument cluster)

YES ↓

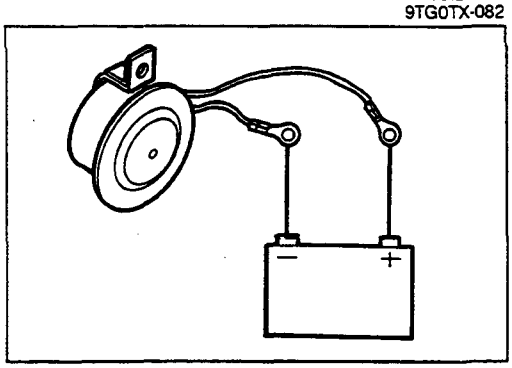
Check cintinuity between B wire at sensor connector and ground
- Continuity

NO → Poor ground

YES → Check sedimentor sensor (Refer to page T–62)



9TG0TX-082



Sedimentor warning lamp comes ON without buzzer after engine started

Check continuity between 2F terminal at instrument cluster and buzzer A terminal as shown in the figure
- Continuity

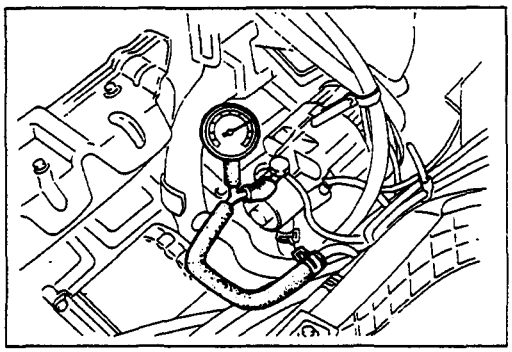
NO → Instrument cluster malfunction

YES ↓

Check buzzer operation (Refer to page T–61)
- Normal

NO → Buzzer malfunction

YES → Short-circuit in instrument cluster


9TF0TX-014

Vacuum warning lamp

Vacuum warning lamp comes ON with buzzer after engine started

Connect vacuum gauge between vacuum pump and vacuum tank

↓

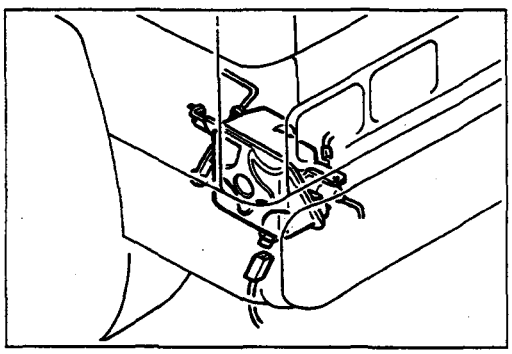
Start engine

↓

Check vacuum
- **Specified vacuum**
  –440 mmHg (–17.32 inHg)/1,500 rpm
  –580 mmHg (–22.83 inHg)/3,000 rpm
  max –700 mmHg (–27.56 inHg) or more

NO → Check vacuum pump (Refer to Section P) Vacuum leakage from vacuum hose

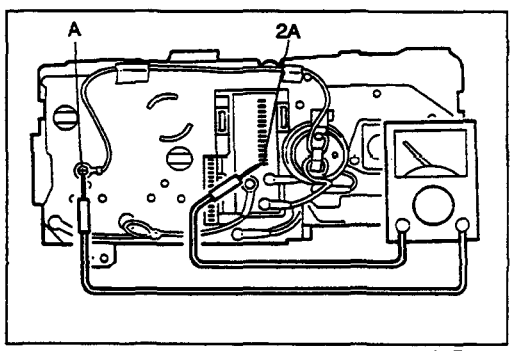
YES



1. Disconnect vacuum switch connector
2. Check that lamp goes OFF and buzzer stops
- Goes OFF and buzzer stops

YES → Vacuum switch malfunction

NO → *Short-circuit in wire harness (Vacuum switch—Instrument cluster)*



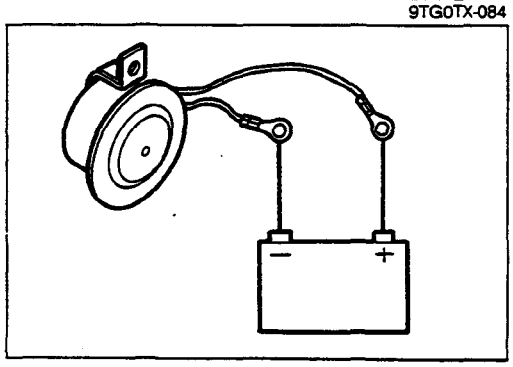
9TG0TX-084

Vacuum warning lamp comes ON without buzzer after engine started

Check continuity between 2A terminal at instrument cluster and buzzer A terminal as shown in the figure
- Continuity

NO → Instrument cluster malfunction

YES



Check buzzer operation (Refer to page T–61)
- Normal

NO → Buzzer malfunction

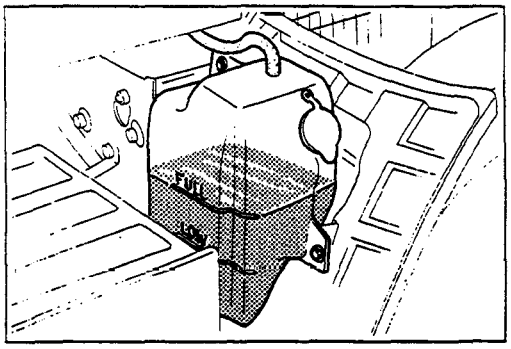
YES → Short-circuit in instrument cluster

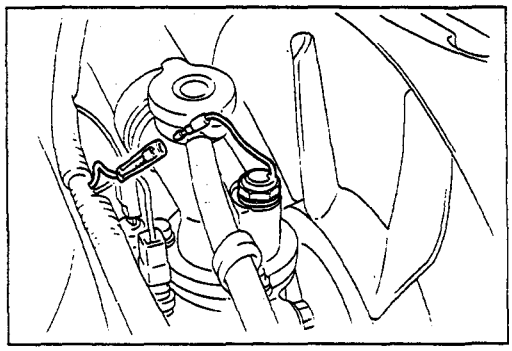
Warning buzzer

Warning buzzer sounds

Note
- **If vacuum warning lamp comes ON with buzzer operation, refer to page T–56 for troubleshooting.**
- **If sedimentor warning lamp comes ON with buzzer operation, refer to page T–54 for troubleshooting.**

9TG0TX-085





Check engine coolant level
• Between L and F
→ NO → Add coolant

YES ↓

1. Disconnect coolant level sensor connector
2. Check that buzzer stops
• Stops
→ YES → Coolant level sensor malfunction

NO ↓

1. Disconnect coolant warning unit connector
2. Check that buzzer stops
• Stops
→ YES → Coolant warning unit malfunction

NO → Short-circuit in wire harness (Sensor—Unit)
Short-circuit in instrument cluster

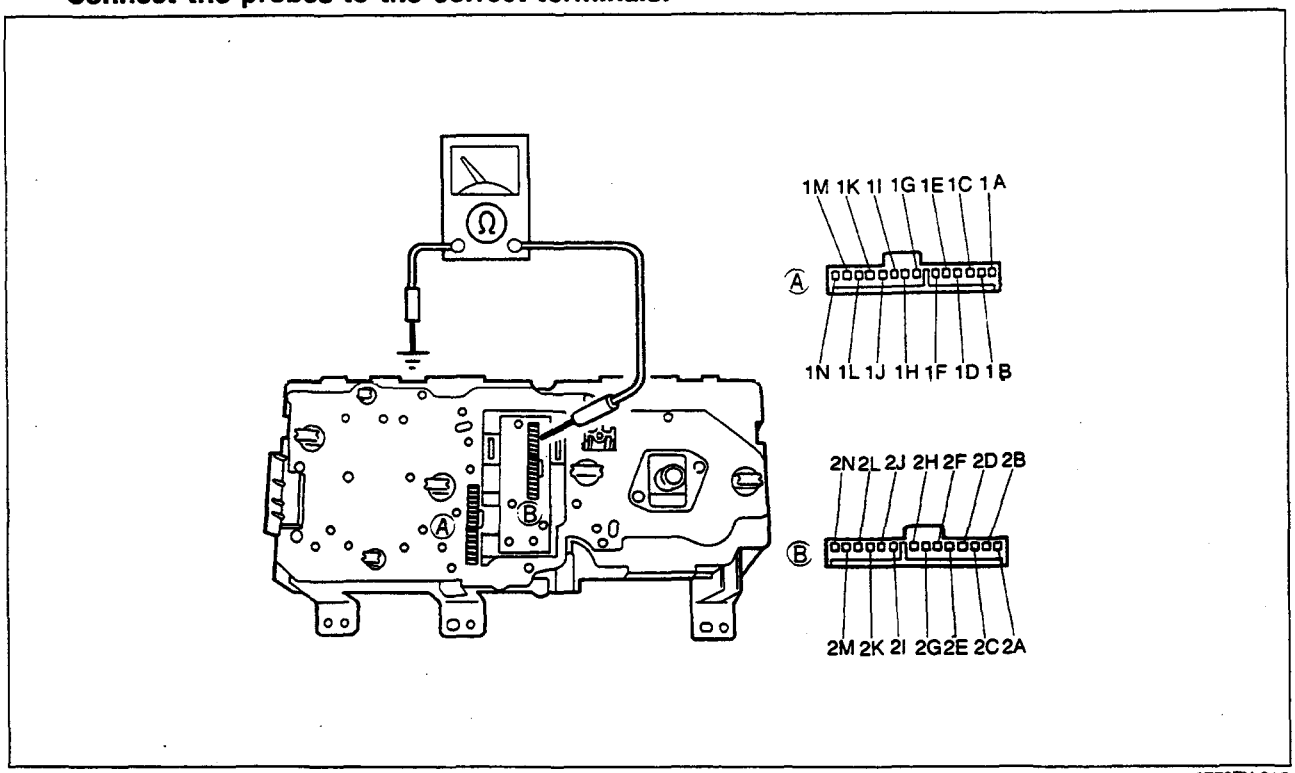
WARNING AND INDICATOR LAMP

Inspection

1. Check continuity with an ohmmeter.

Caution

- **Connect the probes to the correct terminals.**



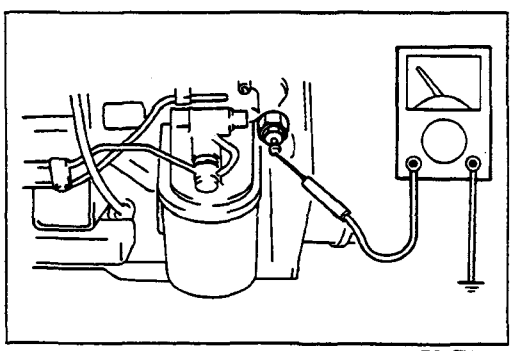
9TF0TX-015

Warning lamp

Lamp		Ohmmeter connection to	
		+ probe	– probe
Sedimentor warning		2F	2L
Stoplight warning (REAR)		2H	
Oil pressure warning	Pressure	2J	
	Oil level	2I	
	Bypass alarm		
Alternator warning (CHARGE)		2G	
Brake warning		2K	
Vacuum warning		2A	1G

Indicator lamp

Lamp		Ohmmeter connection to	
		+ probe	– probe
ECONO indicator		1A	1G
High beam indicator (BEAM)		1L	1J
Glow indicator		1F	1G
Air heater indicator (GLOW)		1F	
Exhaust brake indicator		1D	1C
Turn indicator	Left	2N	2D
	Right	2M	



9TG0TX-088

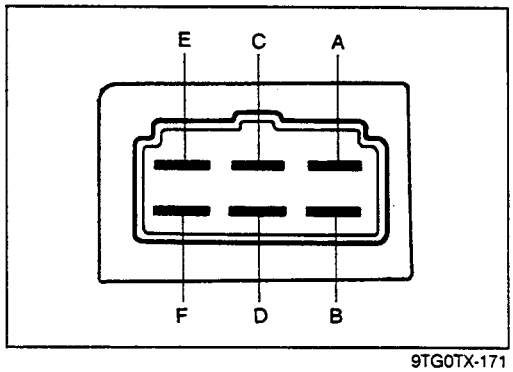
OIL PRESSURE SWITCH

Inspection

1. Disconnect the oil pressure switch connector.
2. Check continuity of the switch.

Engine condition	Continuity
Stopped	Yes
Running	No

3. Replace the oil pressure switch if not as specified.



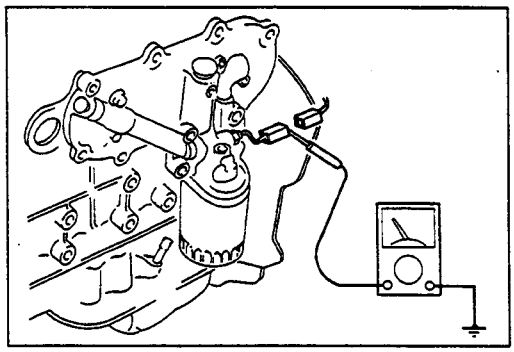
9TG0TX-171

COOLANT WARNING UNIT

Inspection

1. Check the voltage (except terminals D and F) or continuity (only terminals D and F).

Terminal	Connection to	Test condition	Specification
A	Warning buzzer	Engine switch: ON (Disconnect coolant level sensor connector)	Battery voltage
B	Engine switch	Engine switch: ON	Battery Voltage
C	—	—	—
D	Coolant level sensor	Cooling system in normal	∞
		Others	0Ω
E	—	—	—
F	Ground	Constant	0Ω


9TG0TX-172

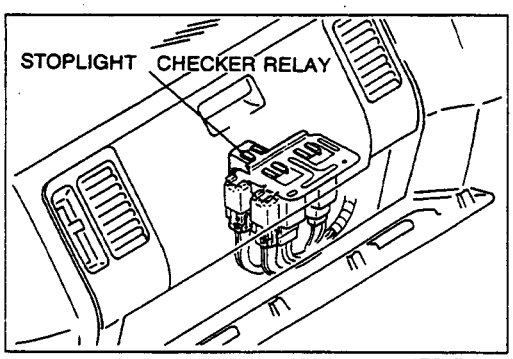
OIL BYPASS ALARM SWITCH

Inspection

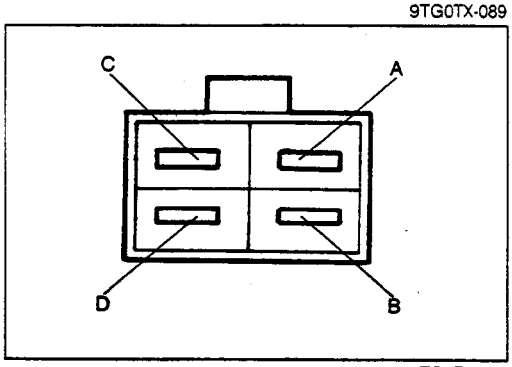
1. Disconnect the oil bypass alarm switch connector.
2. Check continuity between the switch and ground.

Continuity: No continuity

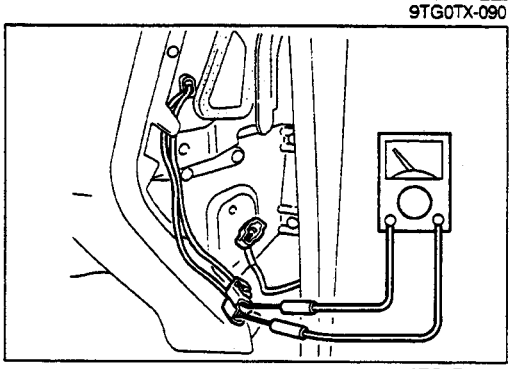
3. If there is continuity, check lubrication system for clogged.
4. Replace the oil bypass alarm switch if the lubrication system in normal.

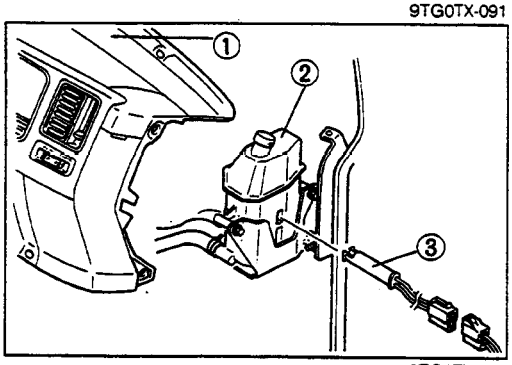


9TG0TX-089

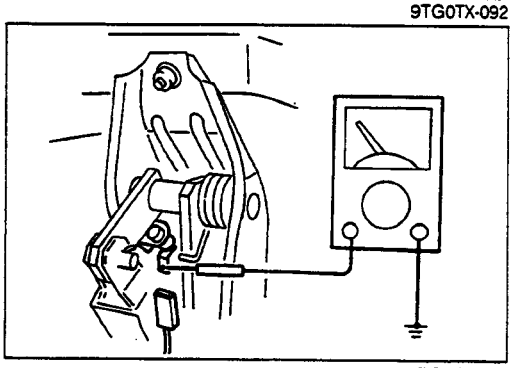


9TG0TX-090


9TG0TX-091



9TG0TX-092


9TG0TX-093

STOPLIGHT CHECKER RELAY

Inspection

1. Check continuity between terminal of the stoplight checker relay.

Note
- **Set the tester to x1,000Ω range.**

Terminal		Continuity	Terminal		Continuity
+	–		+	–	
A	B	○	B	A	○
A	C	X	C	A	○
A	D	○	D	A	○
B	C	X	C	B	○
B	D	○	D	B	○
C	D	○	D	C	X

2. Replace the relay if not as specified.

BRAKE FLUID LEVEL SENSOR

Inspection

1. Check continuity of the brake fluid sensor.

Brake fluid level	Continuity
Below MIN	Yes
Above MIN	No

2. Replace brake fluid sensor if not as specified.

Removal / Installation

1. Remove the instrument panel. (Refer to Section S.)
2. Remove the brake reserve tank.
3. Remove the brake fluid level sensor.
4. Install in the reverse order of removal.

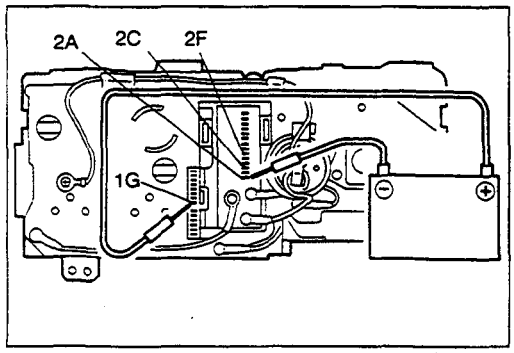
PARKING BRAKE SWITCH

Inspection

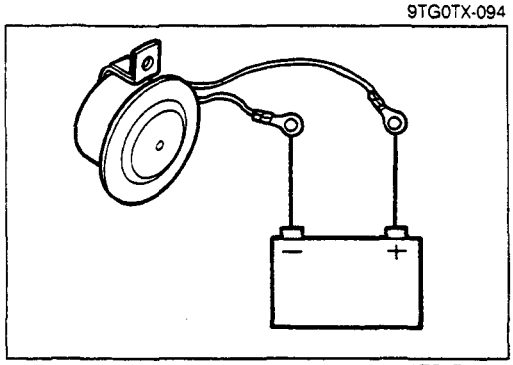
1. Disconnect the parking brake switch connector.
2. Check continuity between the parking brake switch and ground.

Brake lever	Continuity
Pulled	Yes
Released	No

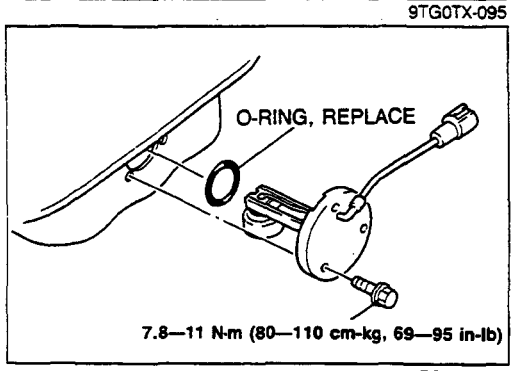
3. Replace the parking brake switch if not as specified.



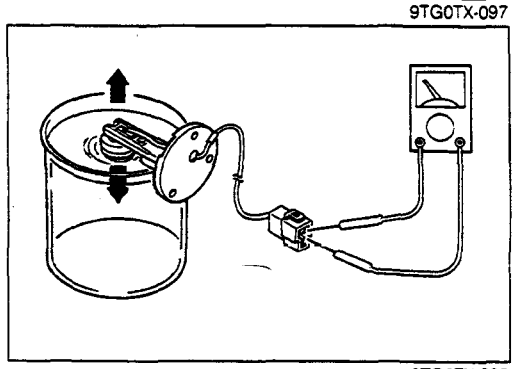
9TG0TX-094



9TG0TX-095



9TG0TX-097



9TG0TX-098

WARNING BUZZER

Inspection

1. Connect the battery to instrument cluster as shown below, and verify that the buzzer sounds.

Battery connection to		Buzzer	Remark
12V	Ground		
1G	2A	Sounds	Vacuum warning
	2F		Sedimentor warning
	2C		Coolant level warning

2. If the buzzer does not operate, remove it and apply 12V to the buzzer. Verify that the buzzer sounds.
3. If the buzzer does not sound, replace it.
4. If the buzzer sounds, replace the meter printed.

OIL LEVEL SENSOR

Removal / Installation

1. Drain the engine oil.
2. Remove the bolts.
3. Remove the oil level sensor
4. Install in the reverse order of removal.

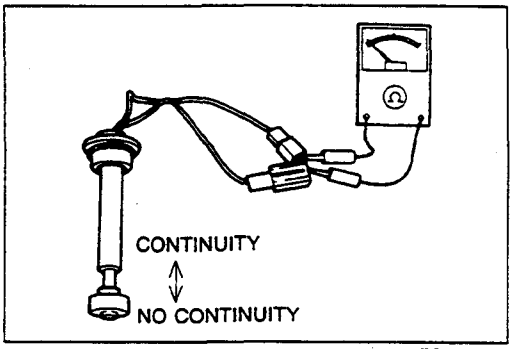
Tightening torque:
7.8—11 N·m (80—110 cm-kg, 69—95 in-lb)

Inspection

1. Place the oil level sensor and a thermometer in a container of water.
2. Gradually heat the water.
3. Check for continuity of the sensor.

Float	Continuity
Up	No
Down	Yes

4. Replace the oil level sensor, if not as specified.

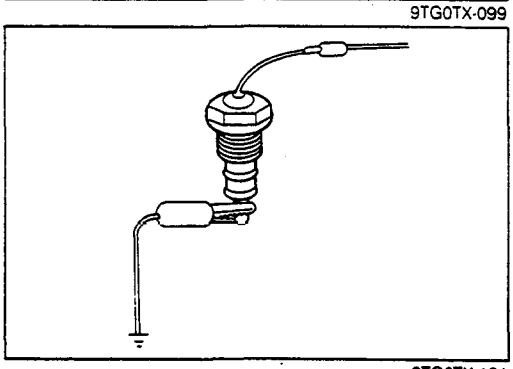


9TG0TX-099

SEDIMENTOR SENSOR

Inspection

1. Remove the sedimentor sensor from the sedimentor.
2. Connect an ohmmeter to the sedimentor sensor.
3. Verify that there is continuity when the float is up.
4. Replace the sedimentor sensor if not as specified.



9TG0TX-101

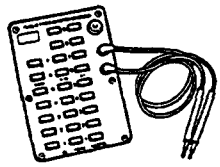
COOLANT LEVEL SENSOR

Inspection

1. Remove the level sensor and reconnect the connector.
2. With the sensor not grounded to the body, start the engine.
3. After checking that the warning lamp illuminates, ground the threaded part of the sensor.
4. If the warning lamp remains illuminated, the sensor is normal. If it does not, the sensor is faulty and should be replaced.

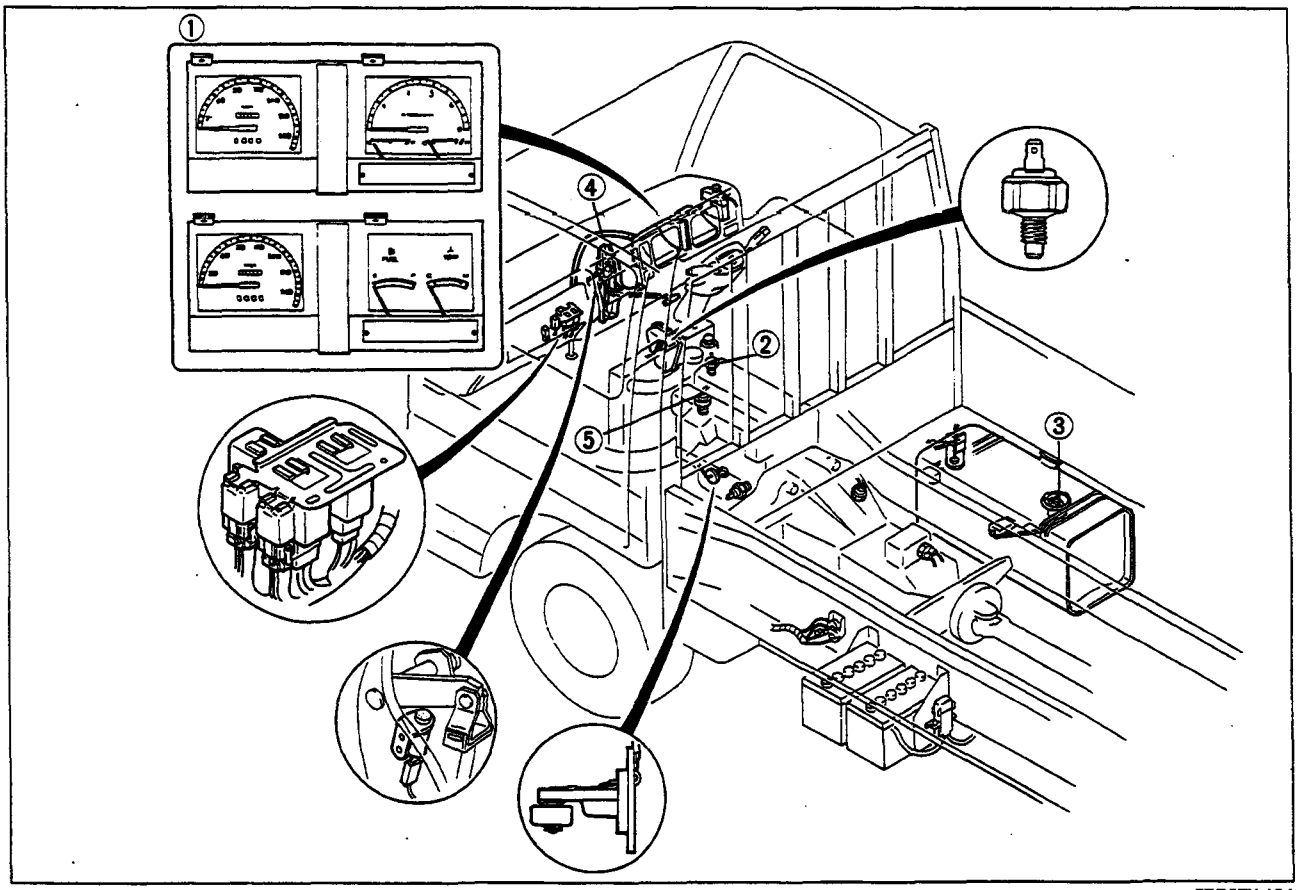
INSTRUMENT CLUSTER (METER)

PREPARATION
SST

49 0839 285 Checker, fuel and thermometer		For inspection of fuel gauge and water temperature gauge

9TG0TX-103

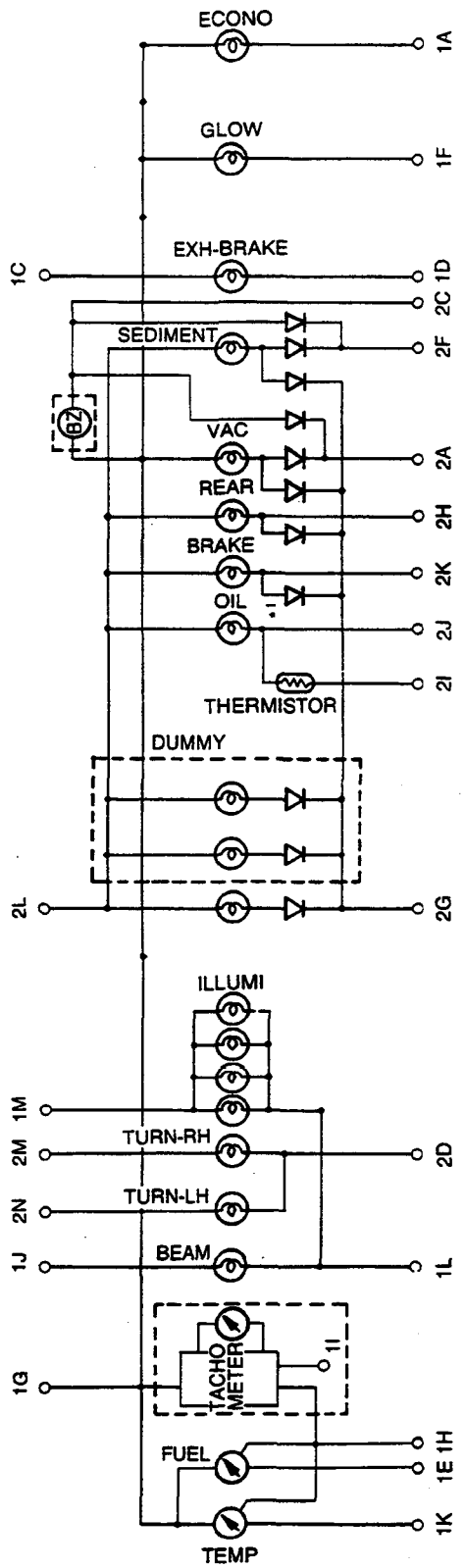
STRUCTURAL VIEW



9TG0TX-104

1. Instrument cluster (meter)
   - Removal / Installation ..... page T–68
   - Disassembly / Assembly ..... page T–69
   - 1) Speedometer
     - Troubleshooting ..... page T–65
     - Inspection ..... page T–70
   - 2) Tachometer
     - Troubleshooting ..... page T–65
     - Inspection ..... page T–70
   - 3) Water temperature gauge
     - Troubleshooting ..... page T–66
     - Inspection ..... page T–70
   - 4) Fuel gauge
     - Troubleshooting ..... page T–67
     - Inspection ..... page T–70
   - 5) Warning and indicator lamp
     - Troubleshooting ..... page T–48
     - Inspection ..... page T–58
   - 6) Odometer
   - 7) Trip meter
2. Water thermosensor
   - Removal / Installation ..... page T–71
   - Inspection ..... page T–71
3. Fuel gauge sender unit
   - Removal / Installation ..... page T–71
   - Inspection ..... page T–71
4. Speedometer cable
   - Removal / Installation ..... page T–68
5. Pickup sensor
   - Inspection ..... page T–72

TROUBLESHOOTING
Wiring Diagram



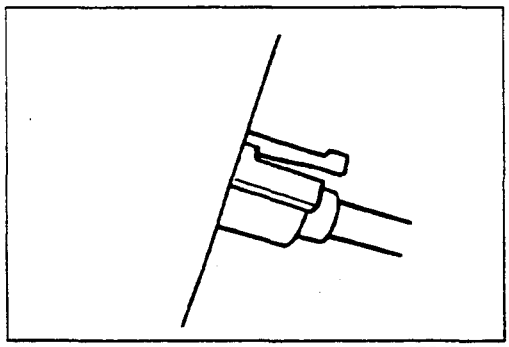
TERMINAL	CONNECTION TO	TERMINAL	CONNECTION TO
1A	SUB-MISSION SWITCH	2A	VACUUM SWITCH
1B	—	2B	—
1C	FUSE	2C	COOLANT WARNING UNIT
1D	EXHAUST BRAKE SWITCH	2D	GROUND
1E	FUEL GAUGE SENDER UNIT	2E	—
1F	QSS CONTROL UNIT AIR HEATER CONTROL UNIT	2F	ALTERNATOR
1H	GROUND	2H	STOPLIGHT CHECKER RELAY
1I	PICK-UP SENSOR	2I	OIL LEVEL SENSOR OIL BYPASS ALARM SWITCH
1J	COMBINATION SWITCH	2J	OIL PRESSURE SWITCH
1K	WATER THERMOSENSOR	2K	BRAKE FLUID LEVEL SENSOR PARKING BRAKE SWITCH
1L	GROUND	2L	FUSE
1M	COMBINATION SWITCH	2M	COMBINATION SWITCH
1N	—	2N	COMBINATION SWITCH

*1 AUSTRALIA

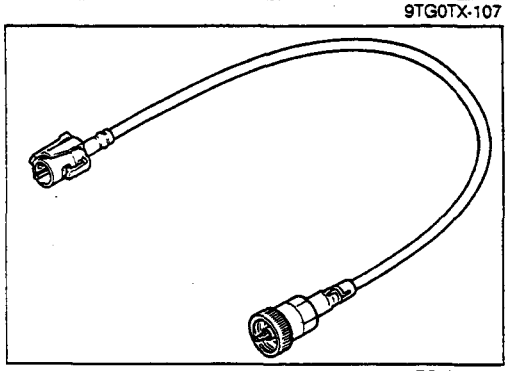
9TG0TX-105

Speedometer does not operate or indication incorrect

9TG0TX-106



9TG0TX-107



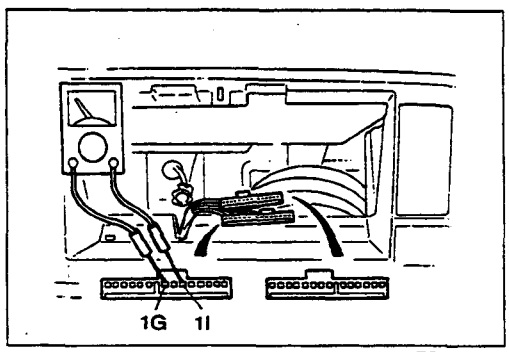
9TG0TX-108

Step 1
1. Verify that the speedometer cable is properly connected.

Step 2
1. Disconnect the speedometer cable from the instrument cluster and transmission case.
2. Verify that the cable and gear spine easily when turned by hand.
3. If the cable or gear is stiff, replace the speedometer cable or gear.
4. If the speedometer cable and gear are OK, replace the speedometer.

Tachometer does not operate

9TG0TX-109



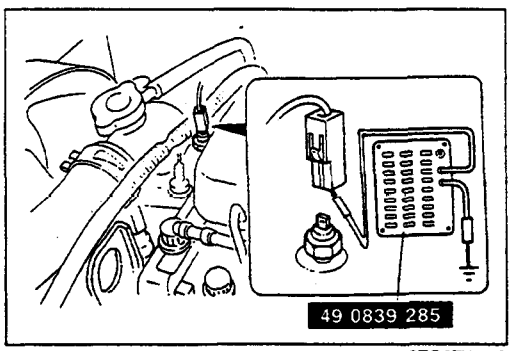
9TG0TX-110

1. Remove the instrument cluster.
2. Connect a test tachometer between terminals 1G and 1I of the harness side connector.
3. Start the engine.
4. Check that the test tachometer indicates engine speed.

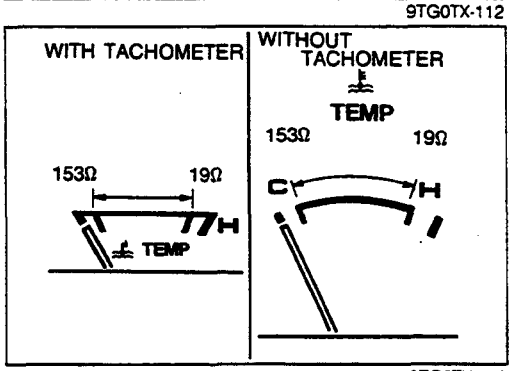
Indicates rpm	Action
Yes	Replace tachometer
No	Repair wire harness (Instrument cluster—Pickup sensor)

Water temperature gauge does not operate

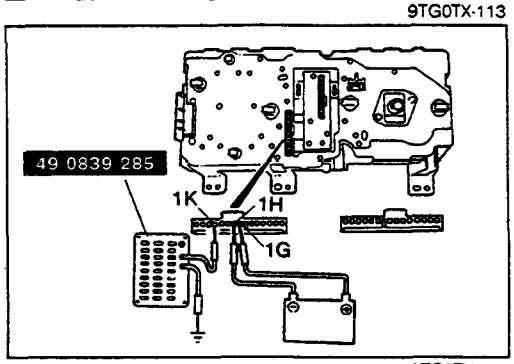
9TG0TX-111



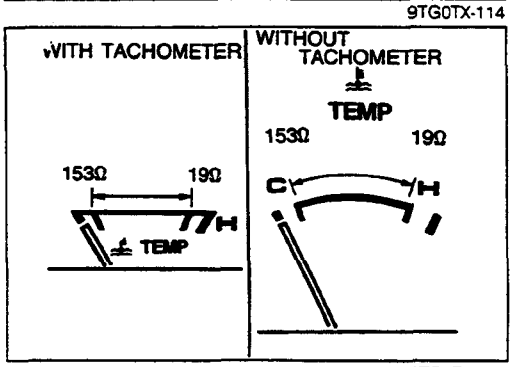
9TG0TX-112



9TG0TX-113



9TG0TX-114



9TG0TX-115

Step 1

1. Disconnect the connector from the water thermosensor.
2. Connect the red lead of the **SST** to the connector, and the black lead to a body ground.
3. Set the **SST** to the resistance values shown in the figure.
4. Turn the engine switch ON, and check that the needle indicates the correct values.

Gauge displays correct	Action
Yes	Replace water thermosensor
No	Go to Step 2

Caution

- **Continue the above checks for at least two minutes each to correctly judge the condition.**
- **The allowable indication error is twice the width of the needle.**

Step 2

1. Remove the instrument cluster.
2. Apply 12V to terminal 1G and ground terminal 1H.
3. Connect the red lead of the **SST** to terminal 1K and the black lead to a negative battery terminal.
4. Set the **SST** to the resistance values shown in the figure.
5. Verify that the needle indicates the correct values.

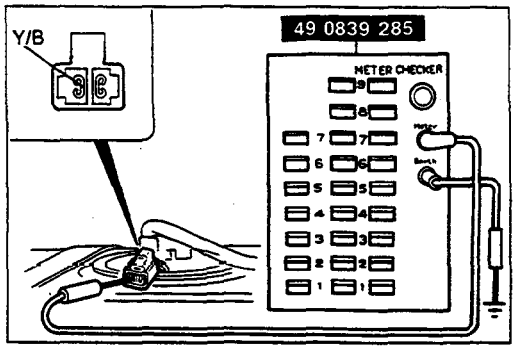
Indicates correct	Action
Yes	Repair wire harness (Instrument cluster—Water thermosensor)
No	Replace water temperature gauge

Caution

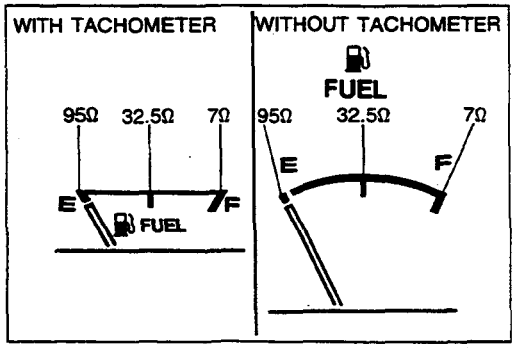
- **Continue the above checks for at least two minutes each to correctly judge the condition.**
- **The allowable indication error is twice the width of the needle.**

Fuel gauge does not operate

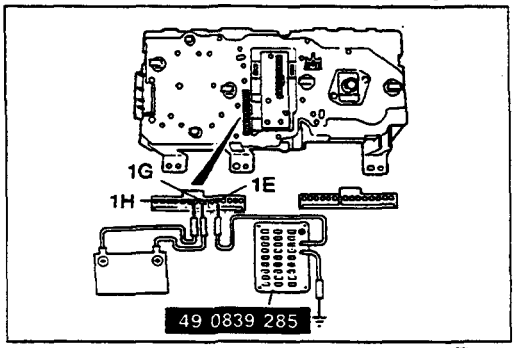
9TG0TX-116



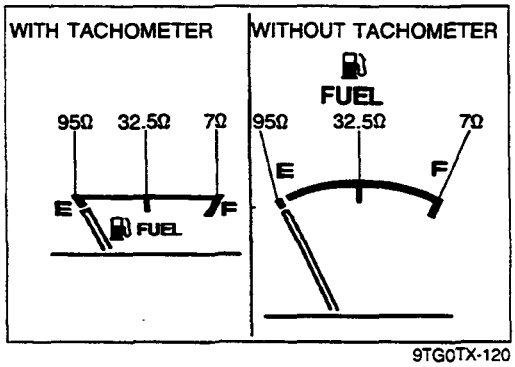
9TG0TX-117



9TG0TX-118



9TG0TX-119



9TG0TX-120

Step 1

1. Disconnect the connector from fuel gauge sender unit.
2. Connect the red lead of the **SST** to the terminal-wire (Y/B) and the black lead to a body ground.
3. Set the **SST** to the resistance values shown in the figure.
4. Turn the engine switch ON, and verify that the needle indicates the correct values.

Indicates correct	Action
Yes	Replace fuel gauge sender unit (in fuel tank)
No	Go to Step 2

Caution

- **Continue the above checks for at least two minutes each to correctly judge the condition.**
- **The allowable indication error is twice the width of the needle.**

Step 2

1. Remove the instrument cluster.
2. Apply 12V to terminal 1G and ground terminal 1H.
3. Connect the red lead of the **SST** to terminal 1E and the black lead to a negative battery terminal.
4. Set the **SST** to the resistance values shown in the figure.
5. Verify that the needle indicates the correct values.

Indicates correct	Action
Yes	Repair wire harness (Instrument cluster—fuel gauge sender unit)
No	Replace fuel gauge sender unit

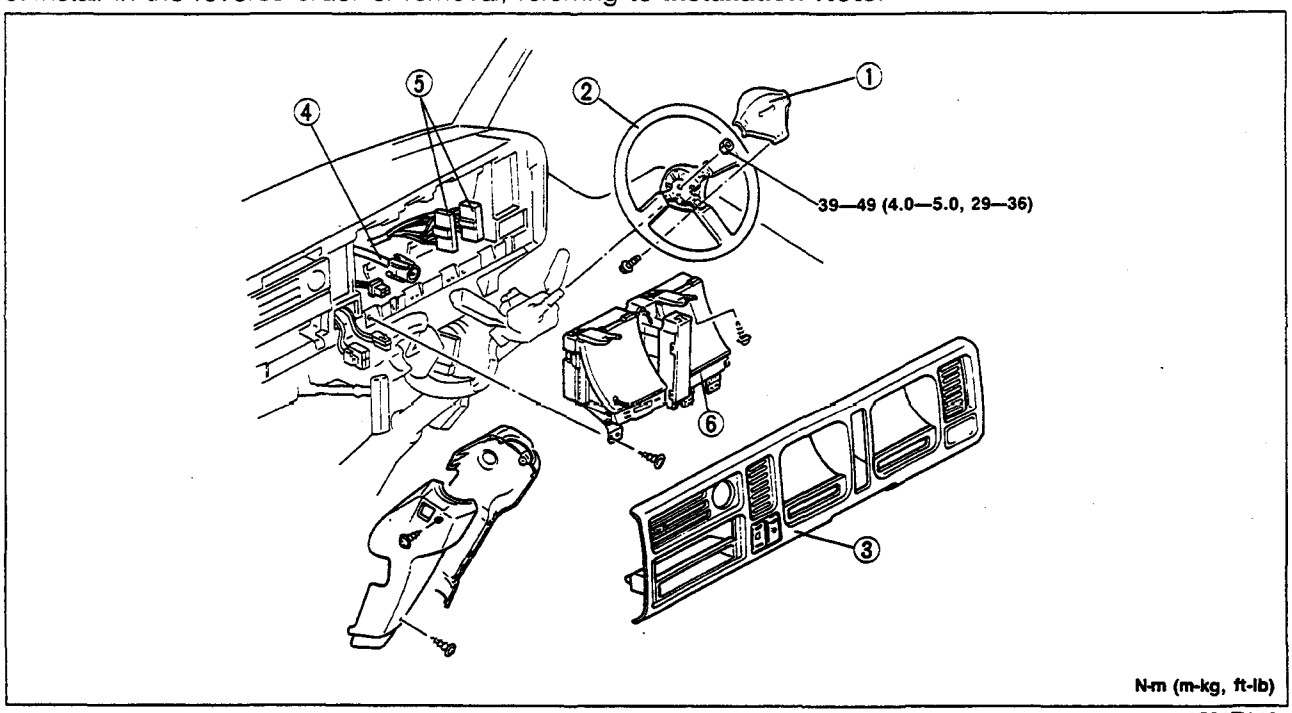
Caution

- **Continue the above checks for at least two minutes each to correctly judge the condition.**
- **The allowable indication error is twice the width of the needle.**

INSTRUMENT CLUSTER (METER)

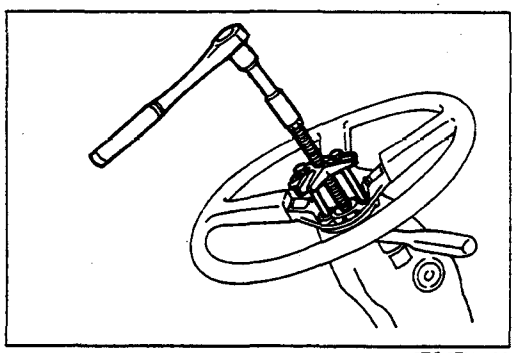
Removal / Installation

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**.



9TG0TX-121

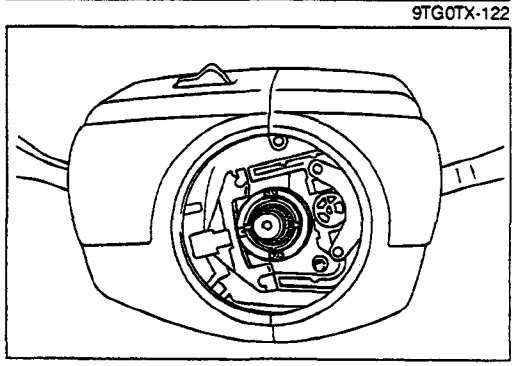
1. Steering column
2. Steering wheel
   - Removal Note ..... page T–68
   - Installation Note ..... page T–68
3. Meter panel
4. Speedometer cable
5. Connector
6. Instrument cluster (meter)
   - Troubleshooting ..... page T–64
   - Disassembly / Assembly ..... page T–69
   - Inspection ..... page T–70



9TG0TX-122

Removal note
Steering wheel

1. Remove the steering wheel with a steering wheel puller.



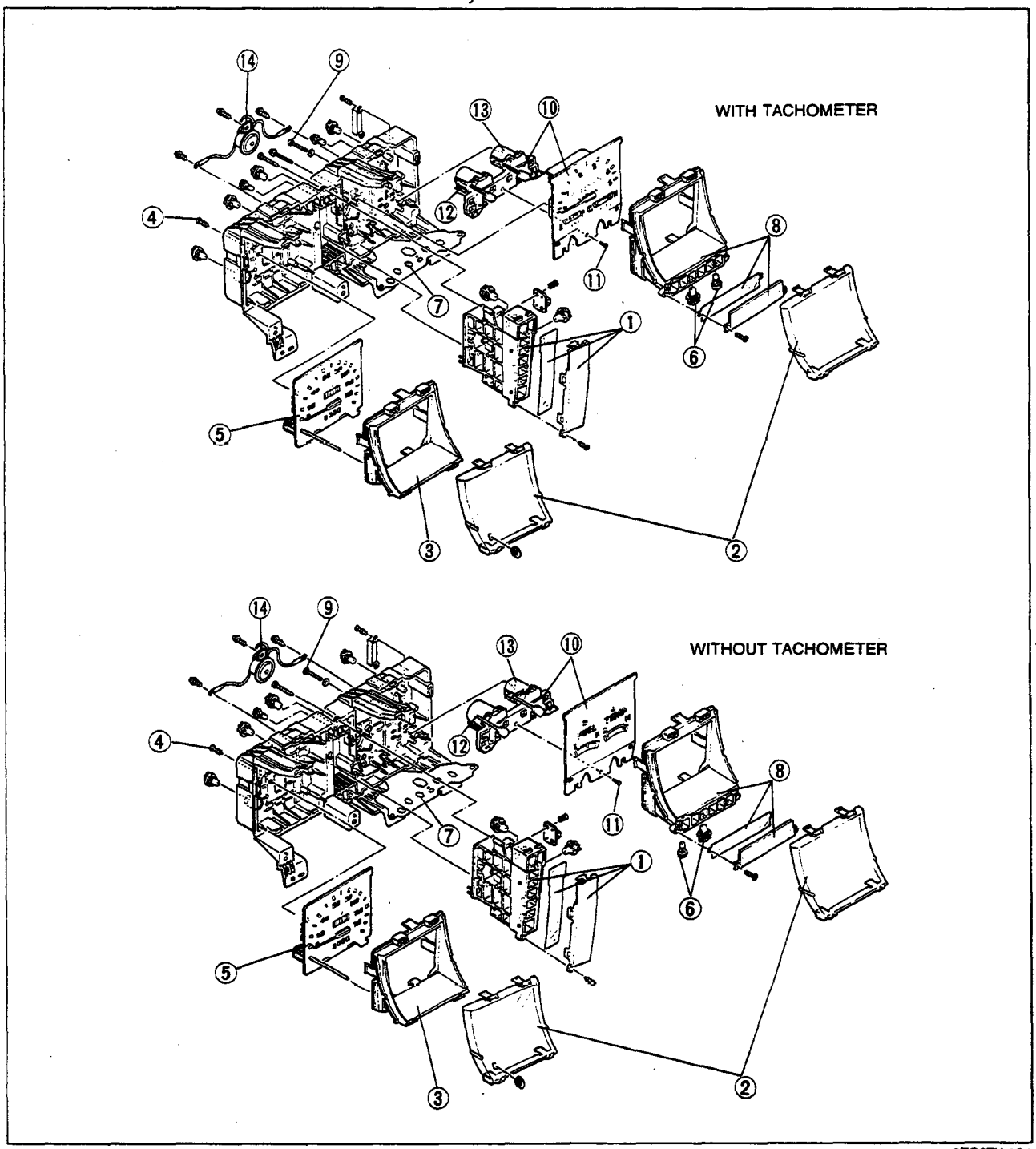
9TG0TX-123

Installation note
Steering wheel

1. Set the cancel cam as shown in the figure.

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



1. Warning lamp assembly
   Inspection..... page T–58
2. Cover
3. Meter hood

Speedometer

4. Screws
5. Speedometer
   Inspection..... page T–70

Tachometer/gauge ass'y

6. Bulbs
7. Meter printed circuit
8. Indicator lamp assembly
   Inspection..... page T–58
9. Screws
10. Tachometer/gauge assembly
    Inspection..... page T–70
11. Screws
12. Fuel gauge
    Inspection..... page T–70
13. Water temperature gauge
    Inspection..... page T–70

Warning buzzer

14. Warning buzzer
    Inspection..... page T–61

Standard indication (rpm)	Allowable range (rpm)
1,000	800—1,060
2,000	1,970—2,150
3,000	3,000—3,180
4,000	4,000—4,240
5,000	5,000—5,300
6,000	6,000—6,360
7,000	7,000—7,420

9TG0TX-125

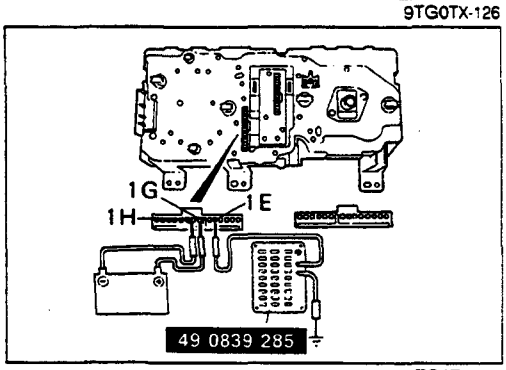
km/h

Standard indication	Allowable rage
40	40—43
80	80—84

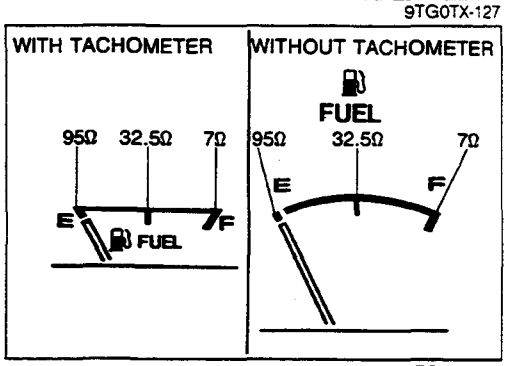
mph

Standard indication	Allowable range
20	20—22
50	50—53
80	80—84

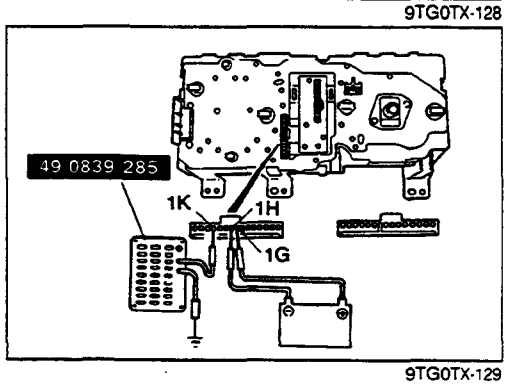
9TG0TX-126



9TG0TX-127



9TG0TX-128



9TG0TX-129

Inspection

Tachometer

1. Connect a test tachometer to the engine, and start the engine.
2. Check the tachometer for allowable indication error. Replace if necessary.

Caution

- **When removing or installing the tachometer, do not drop it or subject it to sharp shocks.**

Speedometer

1. Using a speedometer tester, check the speedometer for allowable indication error, and check the operation of the odometer. Replace if necessary.
2. Check the speedometer for fluctuation and/or abnormal noise.

Caution

- **If significant fluctuation occurs or the speedometer does not move at all, remove the speedometer cable. If it is normal, replace the speedometer assembly.**
- **Tire wear and improper inflation will increase speedometer error.**

Fuel gauge

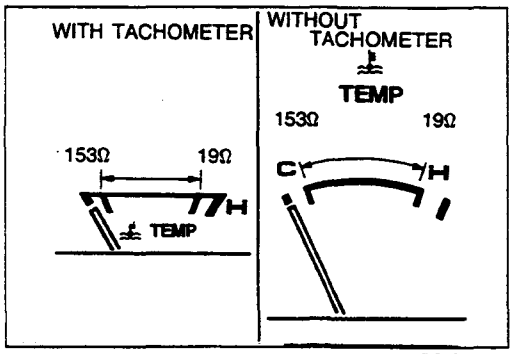
1. Remove the instrument cluster.
2. Apply 12V to terminal 1G and ground terminal 1H.
3. Connect the red lead of the **SST** to terminal 1E and the black lead to a negative battery terminal.
4. Set the **SST** to the resistance values shown in the figure.
5. Verify that the needle indicates the correct values.

Caution

- **Continue the above checks for at least two minutes each to correctly judge the condition.**
- **The allowable indication error is twice the width of the needle.**

Water Temperature Gauge

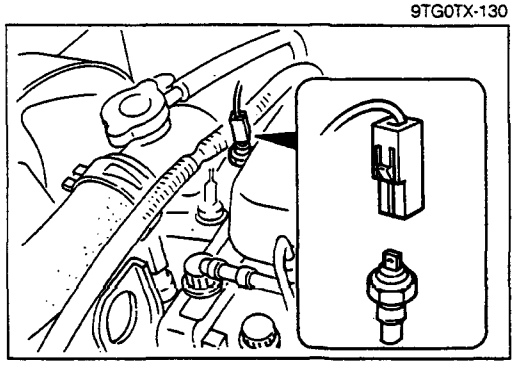
1. Remove the instrument cluster.
2. Apply 12V to terminal 1G and ground terminal 1H.
3. Connect the red lead of the **SST** to terminal 1K and the black lead to a negative battery terminal.



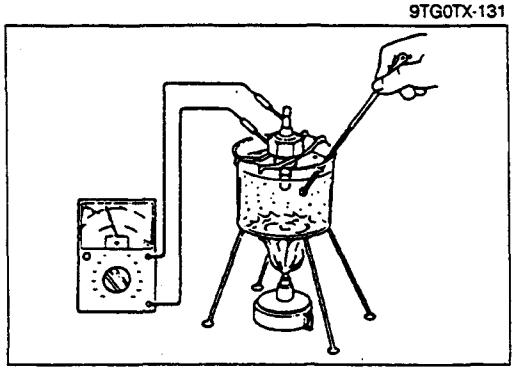
9TG0TX-130

4. Set the **SST** to the resistance values shown in the figure.
5. Turn the engine switch ON, and verify that the needle indicates the correct values.

Caution
- **Continue the above checks for at least two minutes each to correctly judge the condition.**
- **The allowable indication error is twice the width of the needle.**


9TG0TX-131

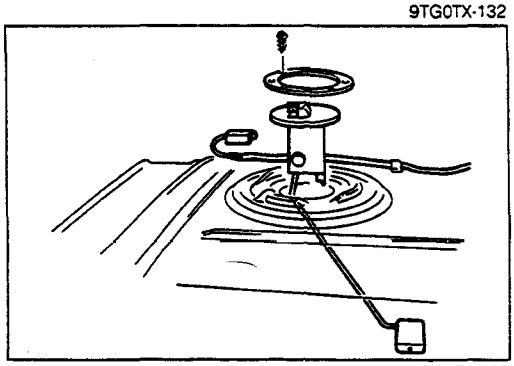
WATER THERMOSENSOR
Removal / Installation
1. Disconnect the connector from the water thermosensor.
2. Remove the sensor.
3. Install in the reverse order of removal.


9TG0TX-132

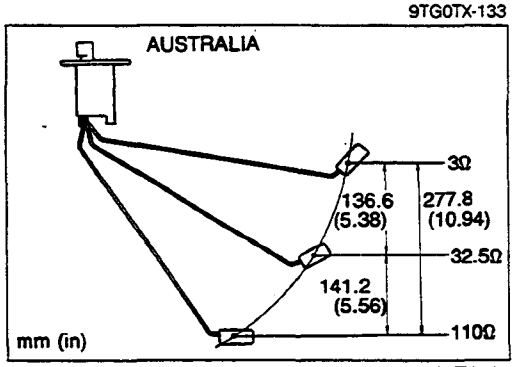
Inspection
1. Place the water thermosensor and a thermometer in water, and gradually heat the water.
2. Measure the resistance of the sensor with an ohmmeter.

Resistance: 190—260Ω at 50°C (122°F)

3. Replace the water thermosensor if not as specified.

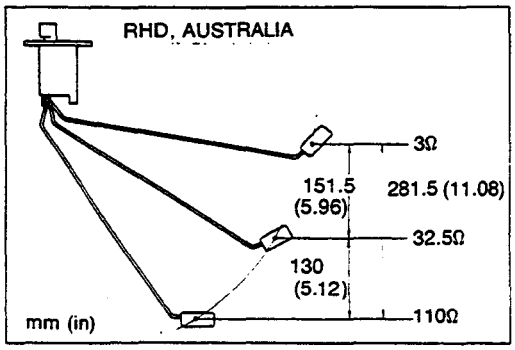

9TG0TX-133

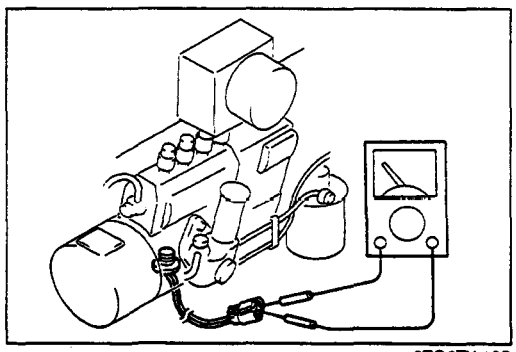
FUEL GAUGE SENDER UNIT
Removal / Installation
1. Disconnect the connector from the fuel gauge sender unit.
2. Remove the screws and remove the fuel gauge sender unit from the fuel tank.
3. Install in the reverse order of removal.



9TG0TX-134

Inspection
1. Connect an ohmmeter between the terminals of the fuel gauge sender unit.
2. Measure the resistance while slowly moving the unit from point E to point F.
3. Replace the fuel gauge sender unit if not as specified.





PICKUP SENSOR

Inspection

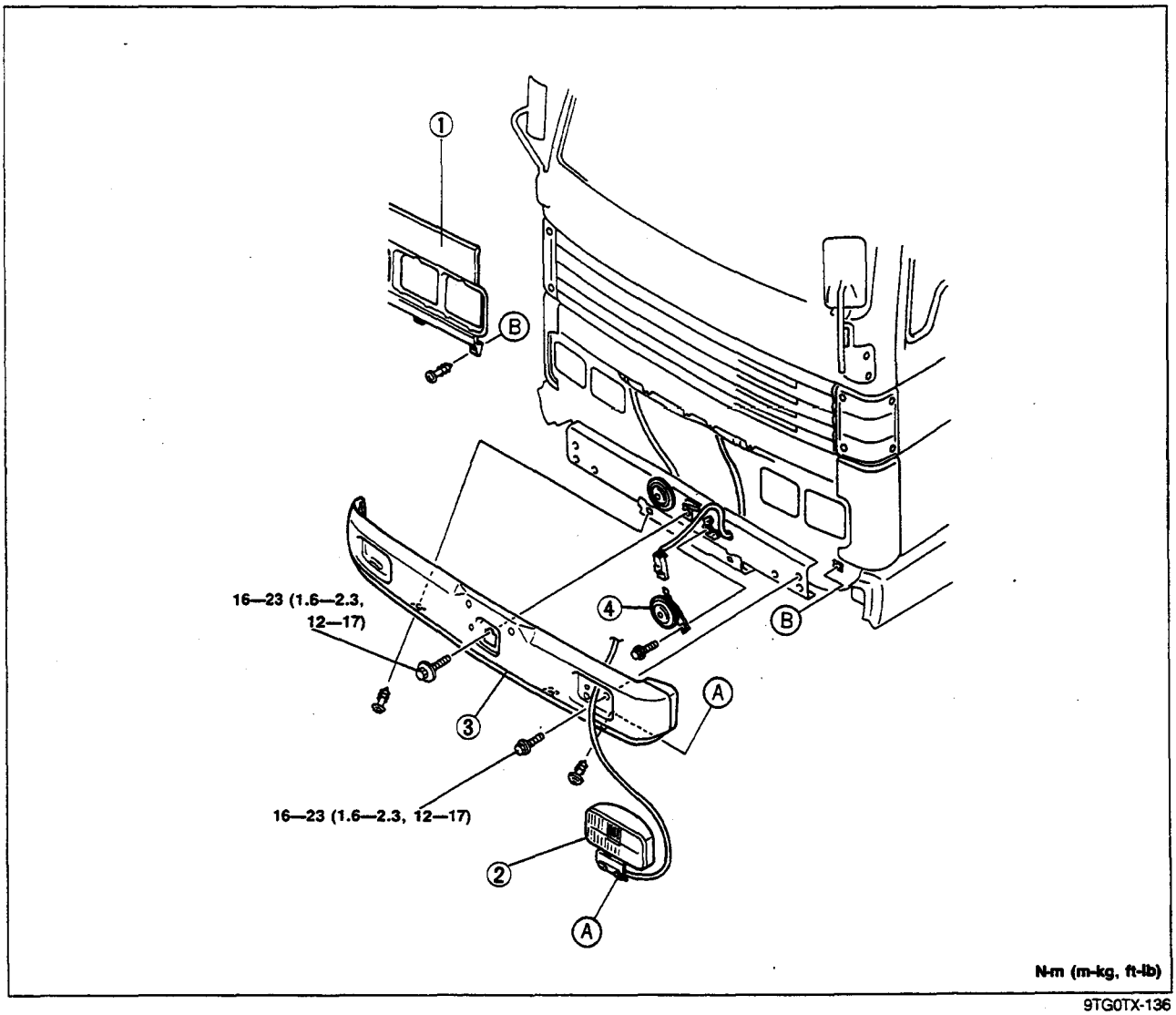
1. Disconnect the pickup sensor connector.
2. Check for continuity with an ohmmeter.
3. Replace the pickup sensor if ther is no continuity.

HORN

HORN

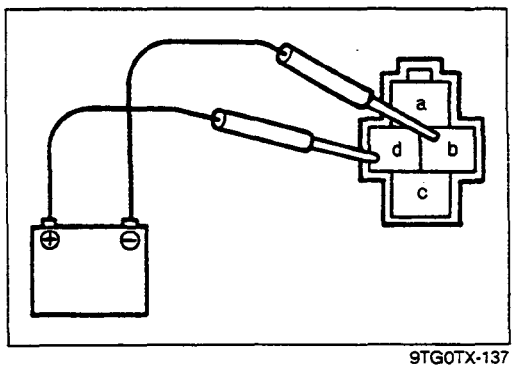
Removal / Installation

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



9TG0TX-136

1. Radiator grille
2. Fog light
   Removal / Inspection / Installation ..... page T–38
3. Front bumper
4. Horn



9TG0TX-137

HORN RELAY

Inspection

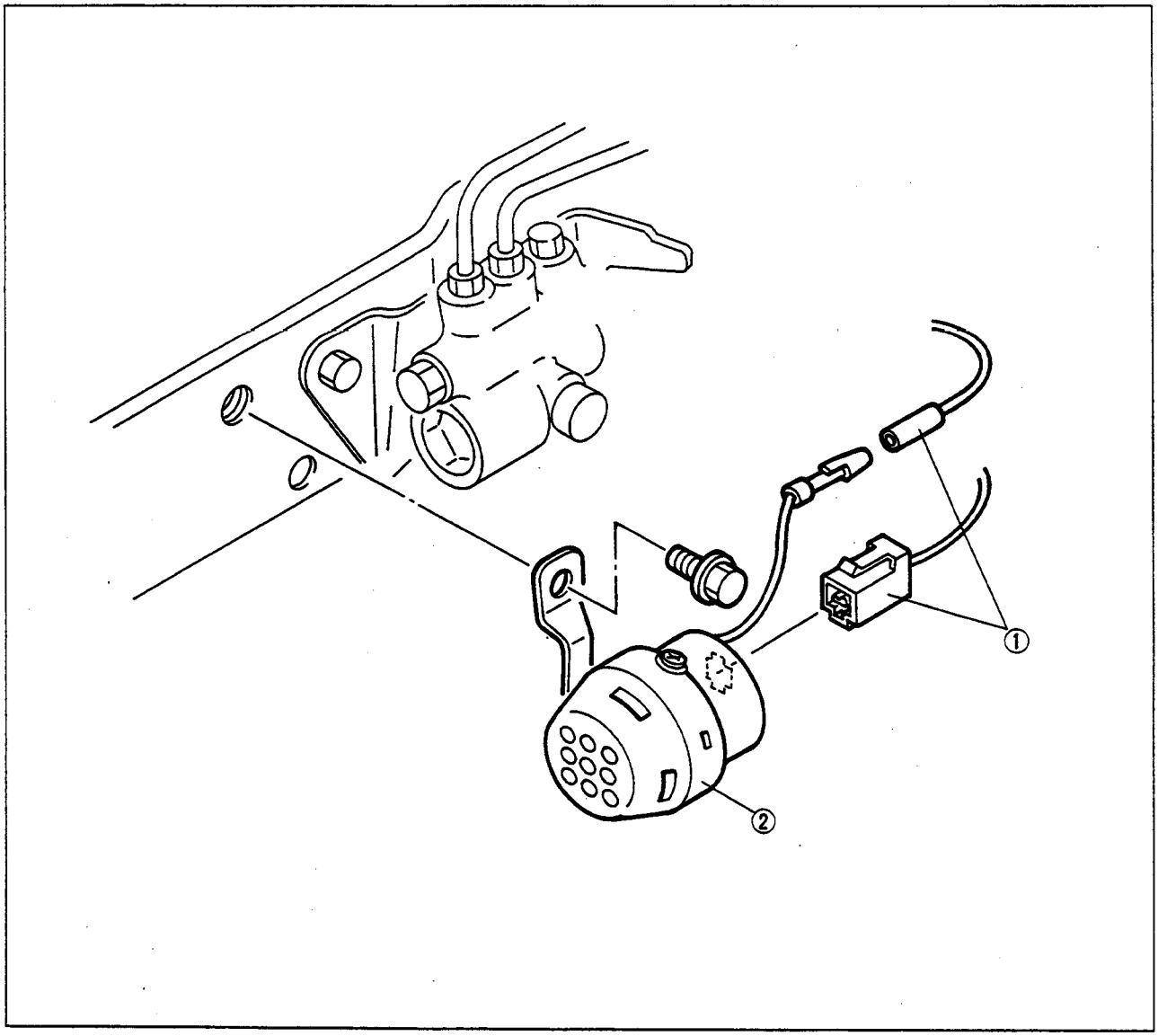
1. Apply 12V to D terminal and ground B terminal, and check continuity between A and C terminals.
2. Replace horn relay if not as specified.

BACKING WARNING HORN

BACKING WARNING HORN

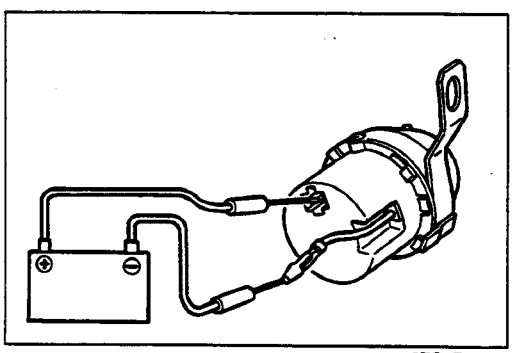
Removal / Installation

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



9TG0TX-138

1. Connector
2. Backing warning horn
   Inspection ..... page T–74



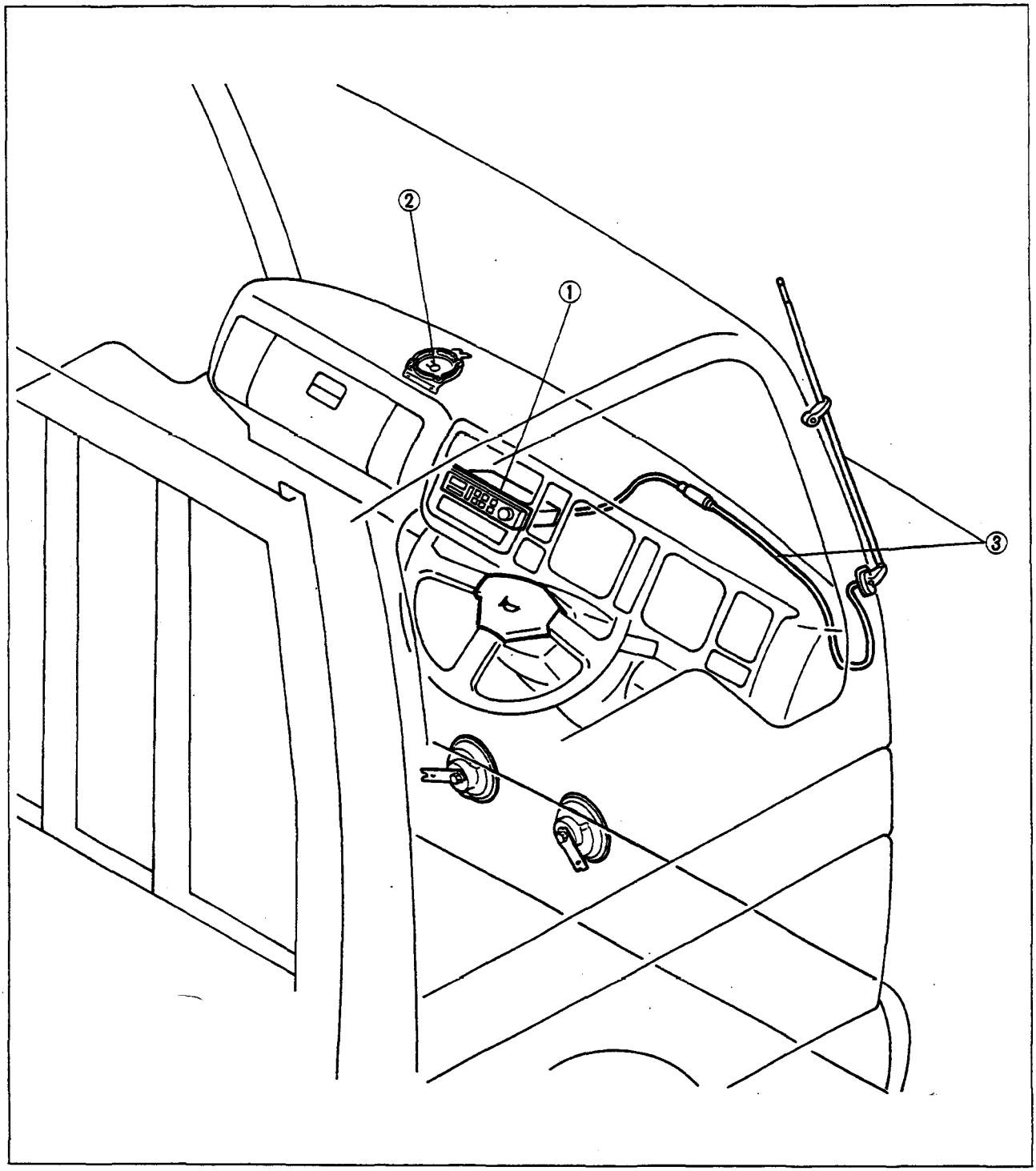
9TG0TX-139

Inspection

1. Disconnect the connector from the backing warning horn.
2. Connect the battery to the backing warning horn as shown in the figure.
3. Verify that the horn operates.
4. Replace the backing warning horn if not as specified.

AUDIO

STRUCTURAL VIEW



9TF0TX-016

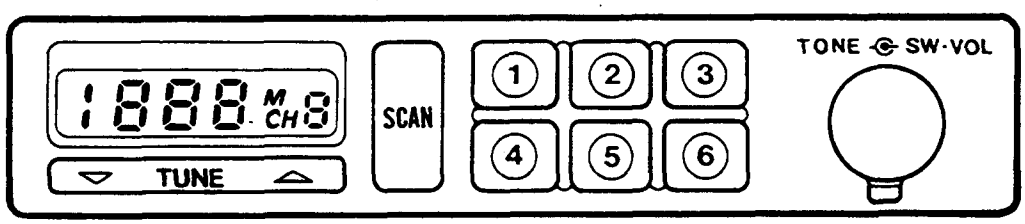
1. Audio unit
   - Troubleshooting ..... page T–78
   - Removal / Installation ..... page T–88
2. Speaker
   - Troubleshooting ..... page T–78
   - Removal / Installation ..... page T–89
   - Inspection ..... page T–90
3. Antenna feeder
   - Troubleshooting ..... page T–78
   - Removal / Installation ..... page T–91
   - Inspection ..... page T–91

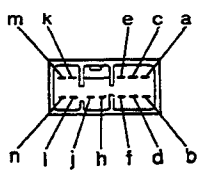
SPECIFICATIONS

			AM radio	AM/FM radio	Remark
Frequency band	AM (kHz)		531—1,602	531—1,602	
	FM (MHz)		—	87.9—107.9	
Band step	AM (kHz)		9	9	
	FM (kHz)		—	100	
Amplifier output			5W x 1	25W x 2	
Function of Radio	Memory	AM	⑥	⑥	
		FM	—	⑥	
	Seek function		○ (up and down)	○ (up and down)	
	Scan function		○ (up only)	—	
	Auto-memory		—	○	
Dark current		(mA)	Max 3	Max 3	

9TF0TX-017

DESCRIPTIONS
AM Radio

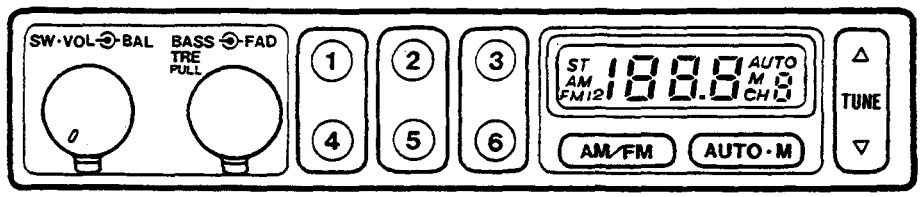


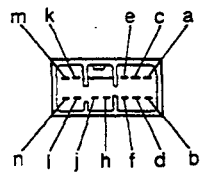


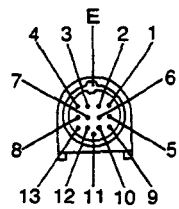
a	(+) 13.2V (ACC)
b	
c	
d	
e	
f	
h	
j	
k	SPEAKER (+)
l	SPEAKER (–)
m	SPEAKER (+)
n	SPEAKER (–)

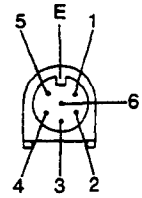
9TG0TX-142

AM/FM Radio





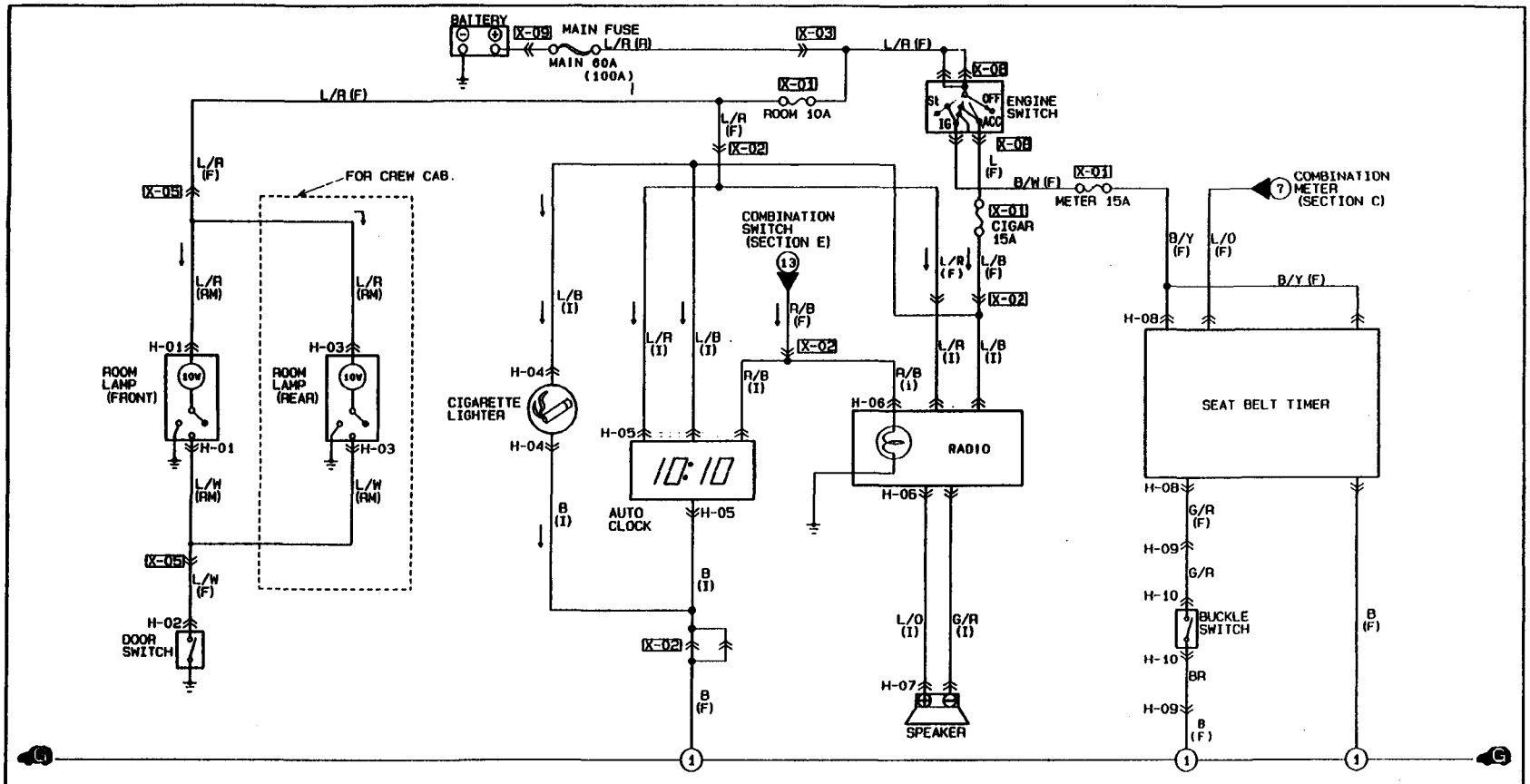


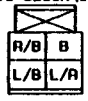
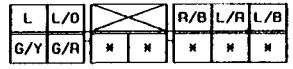
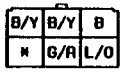


a	(+) 13.2V (ACC)
b	
c	BACK-UP
d	
e	ILLUMINATION
f	
h	
j	
k	SPEAKER (+)
l	SPEAKER (–)
m	SPEAKER (+)
n	SPEAKER (–)

1	OUTPUT (+)
2	INPUT (+)
3	OUTPUT (+)
4	INPUT (+)
5	SIGNAL GROUND
6	ILLUMINATION
7	(+) 13.2V (ACC)
8	BATTERY
9	SYSTEM ON
10	SYSTEM OFF (DECK)
11	SYSTEM OFF (AUX)
12	
13	SYSTEM MUTE
E	GROUND

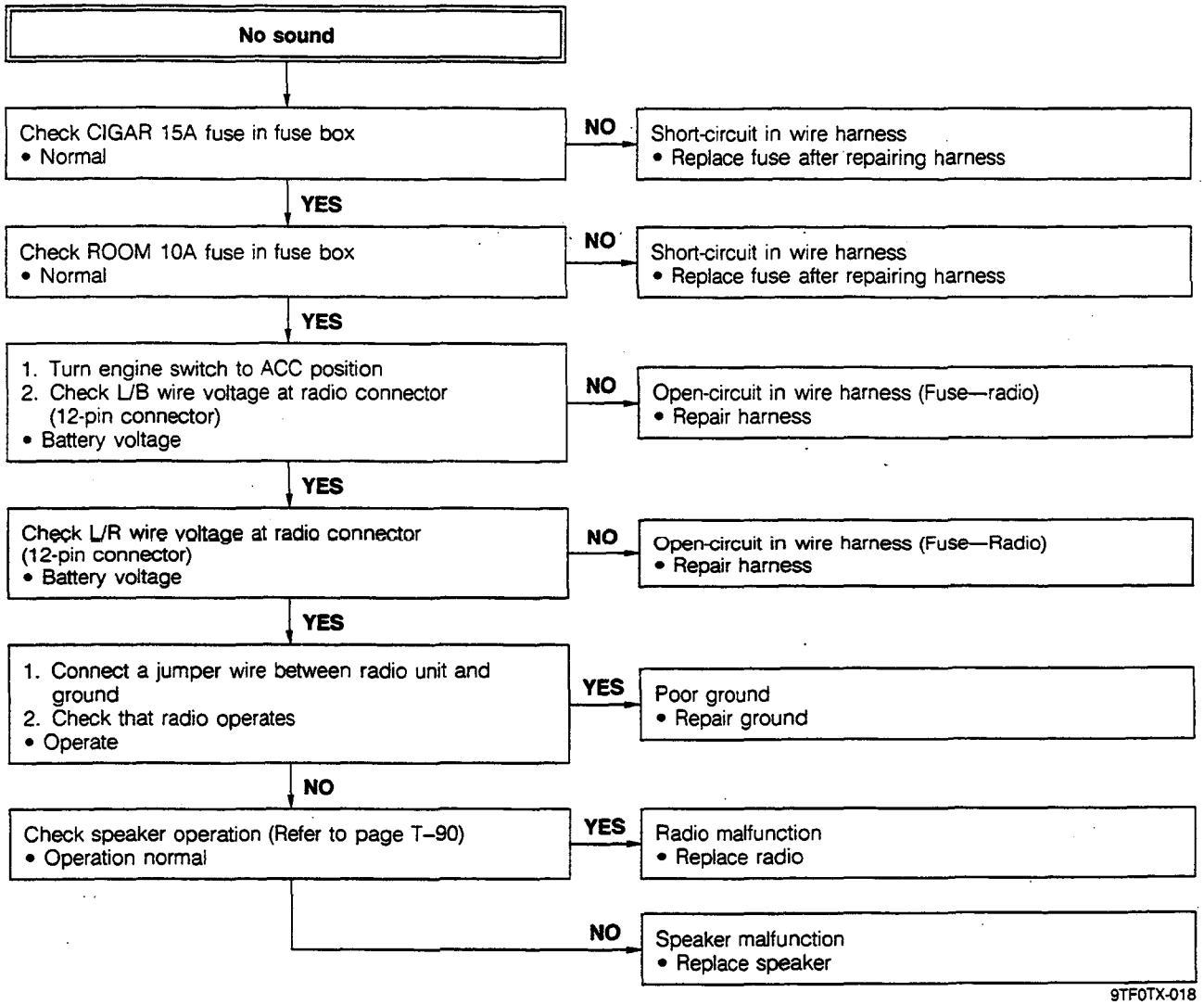
1	OUTPUT (+)
2	(+) 13.2V CONTROL POWER
3	OUTPUT (+)
4	OUTPUT (–)
5	OUTPUT (–)
6	GROUND
E	SHIELD GROUND

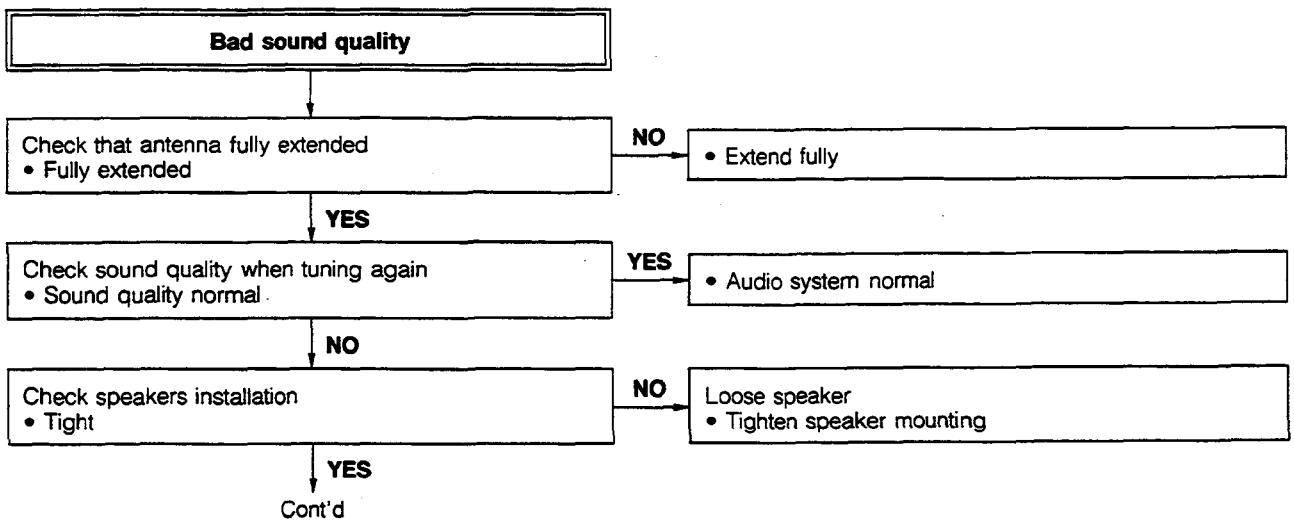


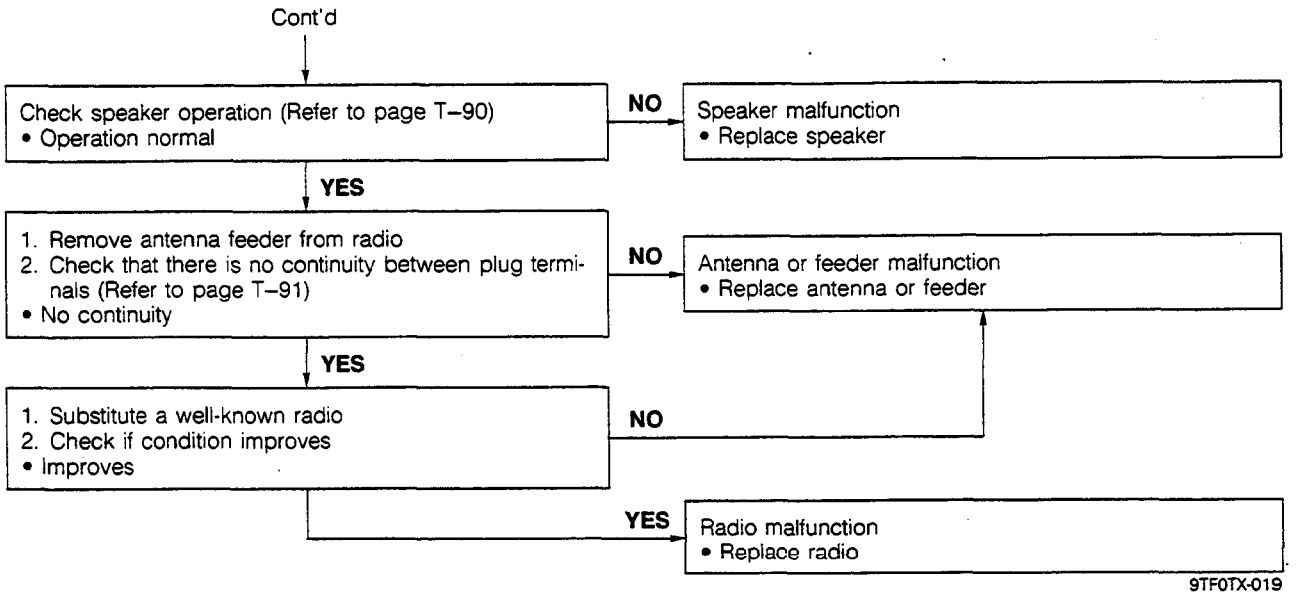
H-01 ROOM LAMP (FRONT) (RM) 	H-02 DOOR SWITCH (F) 	H-03 ROOM LAMP (REAR) (RM) 	H-04 CIGARETTE LIGHTER 	H-05 AUTO CLOCK (I) 	H-06 RADIO (I) 
H-07 SPEAKER (I) 	H-08 SEAT BELT TIMER (F) 	H-09 BUCKLE SWITCH CORD (F 	H-10 BUCKLE SWITCH 		

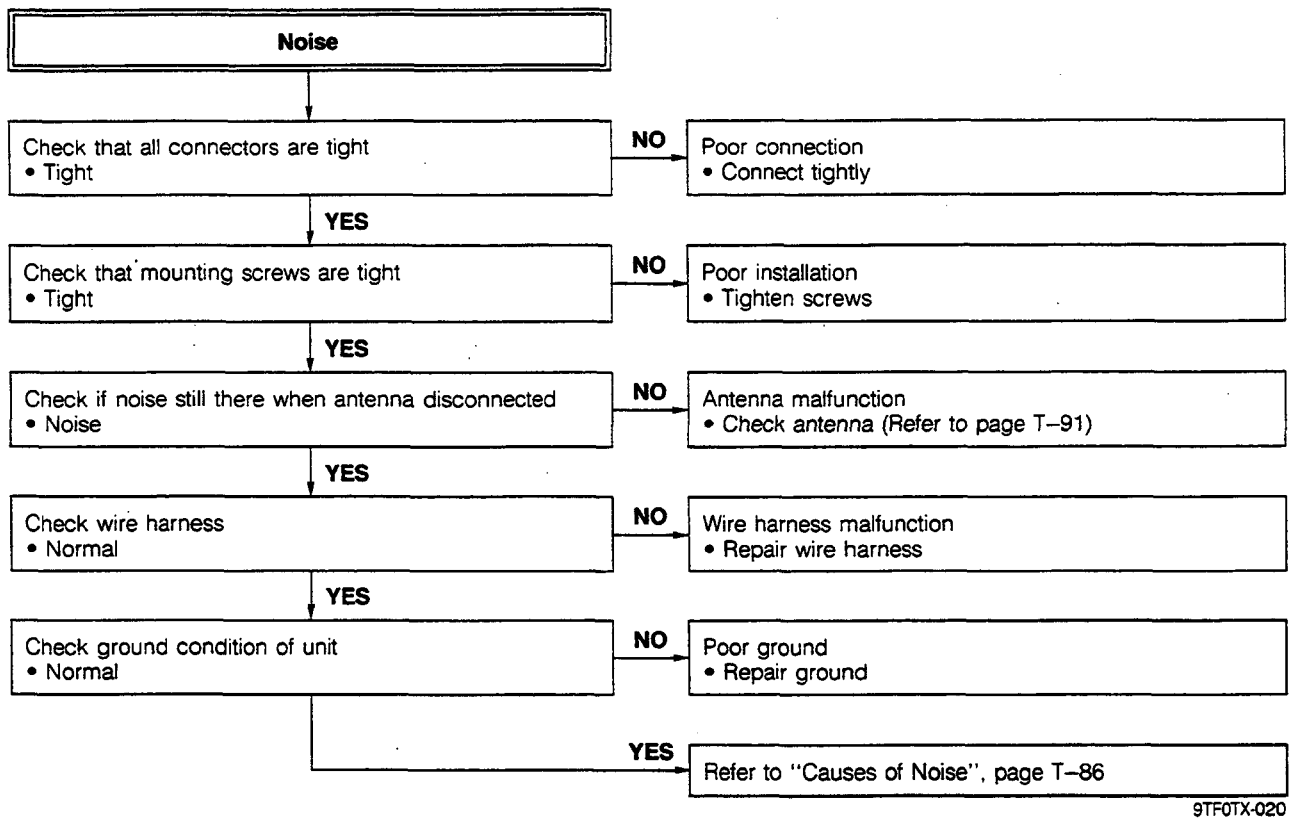
NOTE: ✱···NOT USED

AM Radio

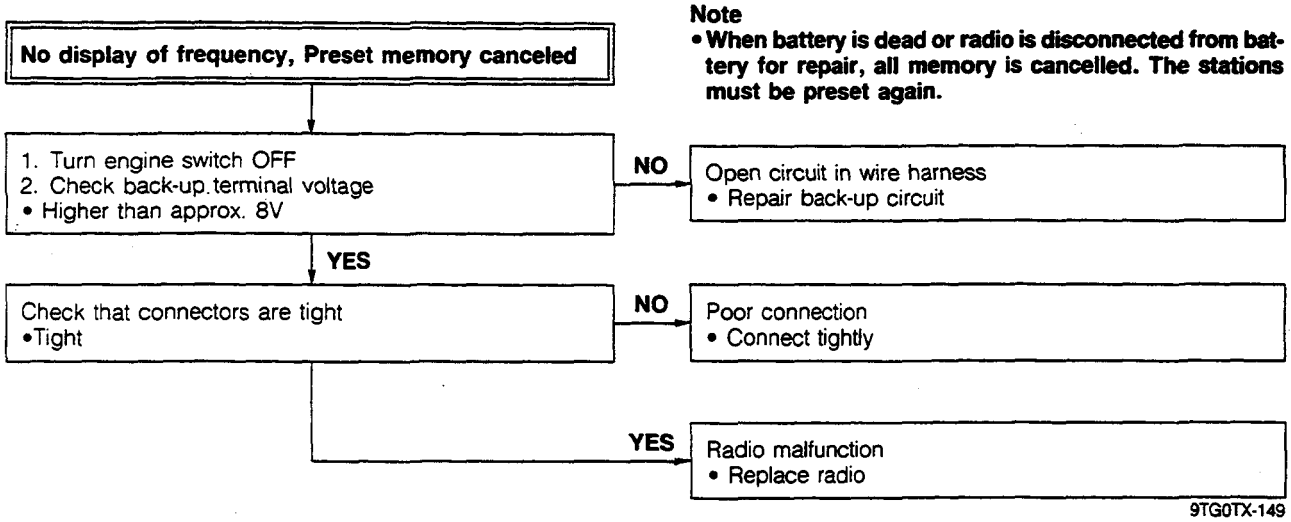

No sound
Check CIGAR 15A fuse in fuse box
• Normal
NO
Short-circuit in wire harness
• Replace fuse after repairing harness
YES
Check ROOM 10A fuse in fuse box
• Normal
NO
Short-circuit in wire harness
• Replace fuse after repairing harness
YES
1. Turn engine switch to ACC position
2. Check L/B wire voltage at radio connector (12-pin connector)
• Battery voltage
NO
Open-circuit in wire harness (Fuse—radio)
• Repair harness
YES
Check L/R wire voltage at radio connector (12-pin connector)
• Battery voltage
NO
Open-circuit in wire harness (Fuse—Radio)
• Repair harness
YES
1. Connect a jumper wire between radio unit and ground
2. Check that radio operates
• Operate
YES
Poor ground
• Repair ground
NO
Check speaker operation (Refer to page T–90)
• Operation normal
YES
Radio malfunction
• Replace radio
NO
Speaker malfunction
• Replace speaker
9TF0TX-018


Bad sound quality
Check that antenna fully extended
• Fully extended
NO
• Extend fully
YES
Check sound quality when tuning again
• Sound quality normal
YES
• Audio system normal
NO
Check speakers installation
• Tight
NO
Loose speaker
• Tighten speaker mounting
YES
Cont'd


Cont'd
Check speaker operation (Refer to page T–90)
• Operation normal
NO
Speaker malfunction
• Replace speaker
YES
1. Remove antenna feeder from radio
2. Check that there is no continuity between plug terminals (Refer to page T–91)
• No continuity
NO
Antenna or feeder malfunction
• Replace antenna or feeder
YES
1. Substitute a well-known radio
2. Check if condition improves
• Improves
NO
YES
Radio malfunction
• Replace radio
9TF0TX-019


Noise
Check that all connectors are tight
• Tight
NO
Poor connection
• Connect tightly
YES
Check that mounting screws are tight
• Tight
NO
Poor installation
• Tighten screws
YES
Check if noise still there when antenna disconnected
• Noise
NO
Antenna malfunction
• Check antenna (Refer to page T–91)
YES
Check wire harness
• Normal
NO
Wire harness malfunction
• Repair wire harness
YES
Check ground condition of unit
• Normal
NO
Poor ground
• Repair ground
YES
Refer to "Causes of Noise", page T–86
9TF0TX-020

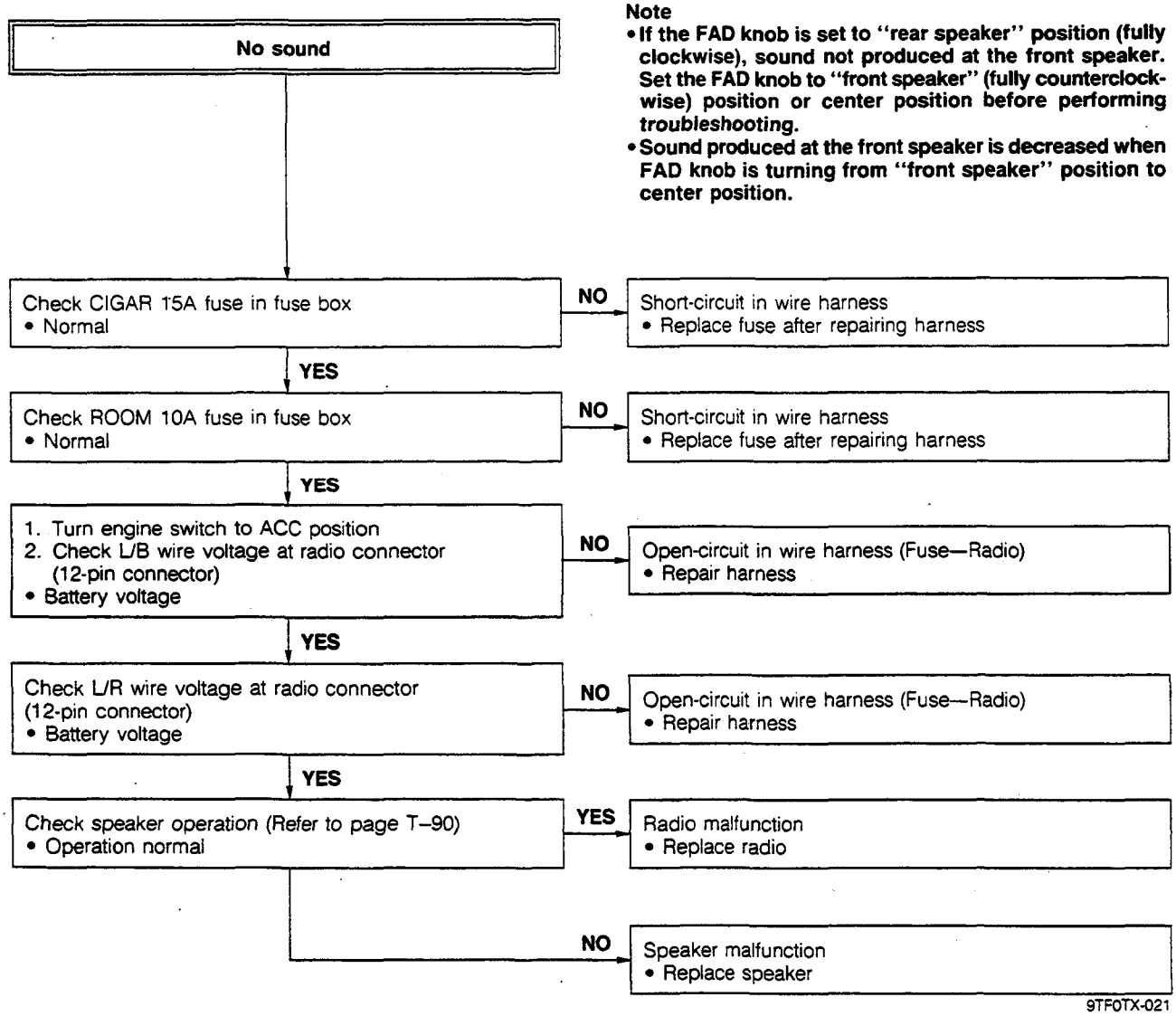
Note
- **When battery is dead or radio is disconnected from battery for repair, all memory is cancelled. The stations must be preset again.**

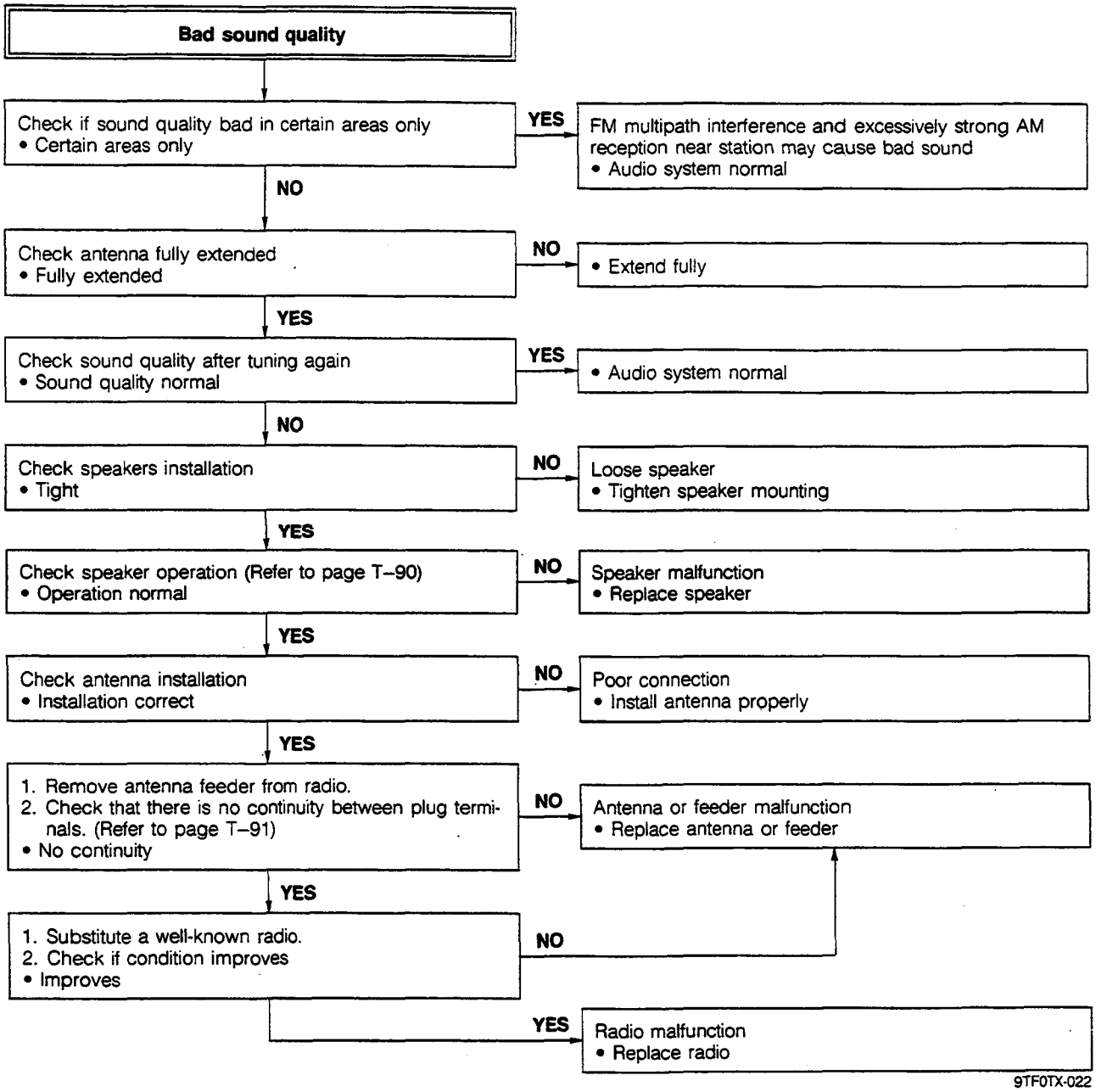


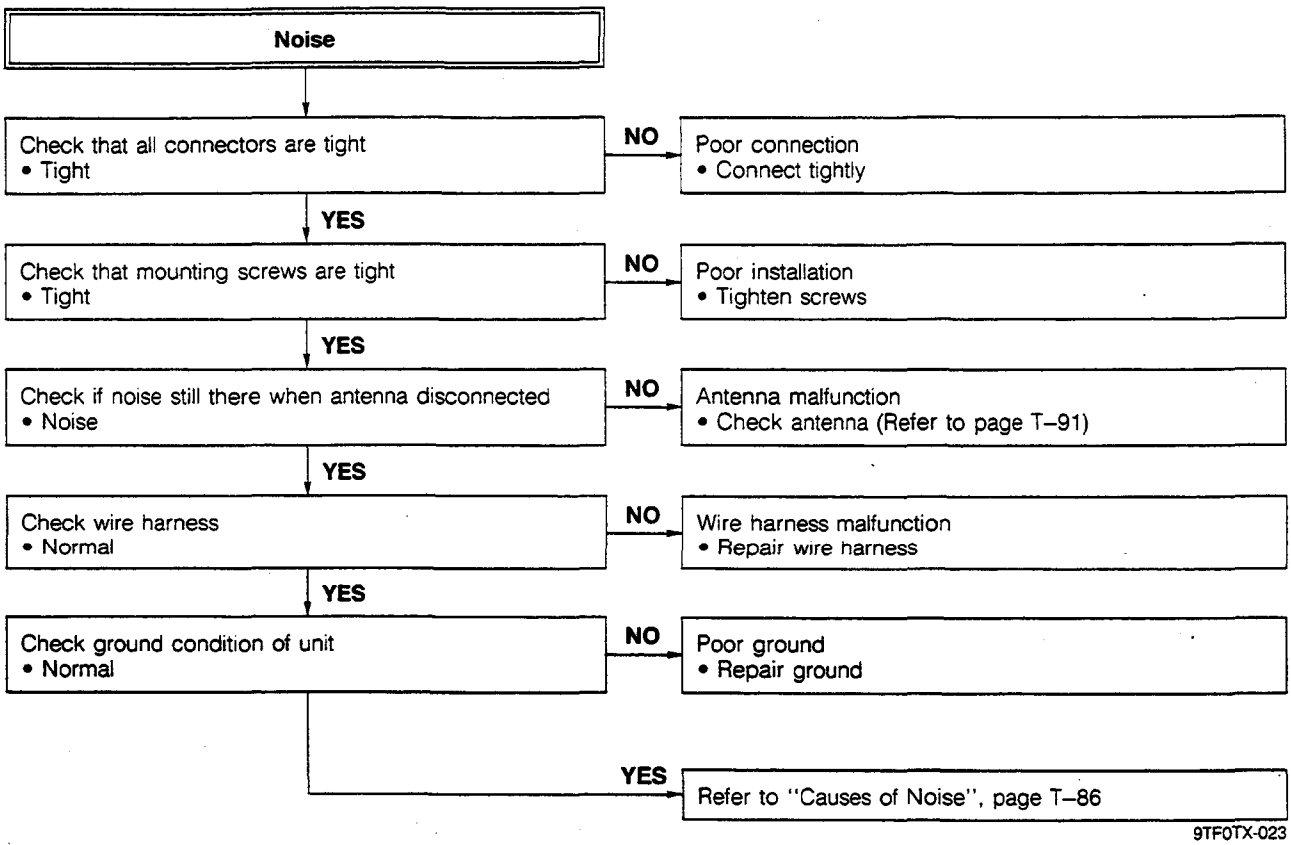
9TG0TX-149

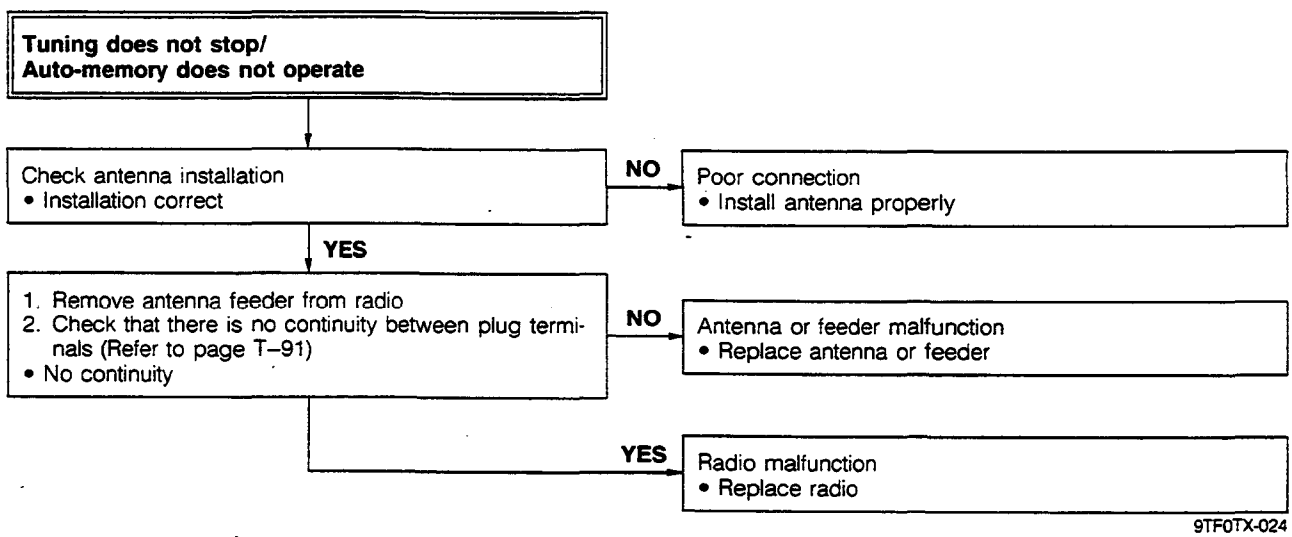
AM/FM Radio

Note
- **If the FAD knob is set to "rear speaker" position (fully clockwise), sound not produced at the front speaker. Set the FAD knob to "front speaker" (fully counterclockwise) position or center position before performing *troubleshooting*.**
- **Sound produced at the front speaker is decreased when FAD knob is turning from "front speaker" position to center position.**

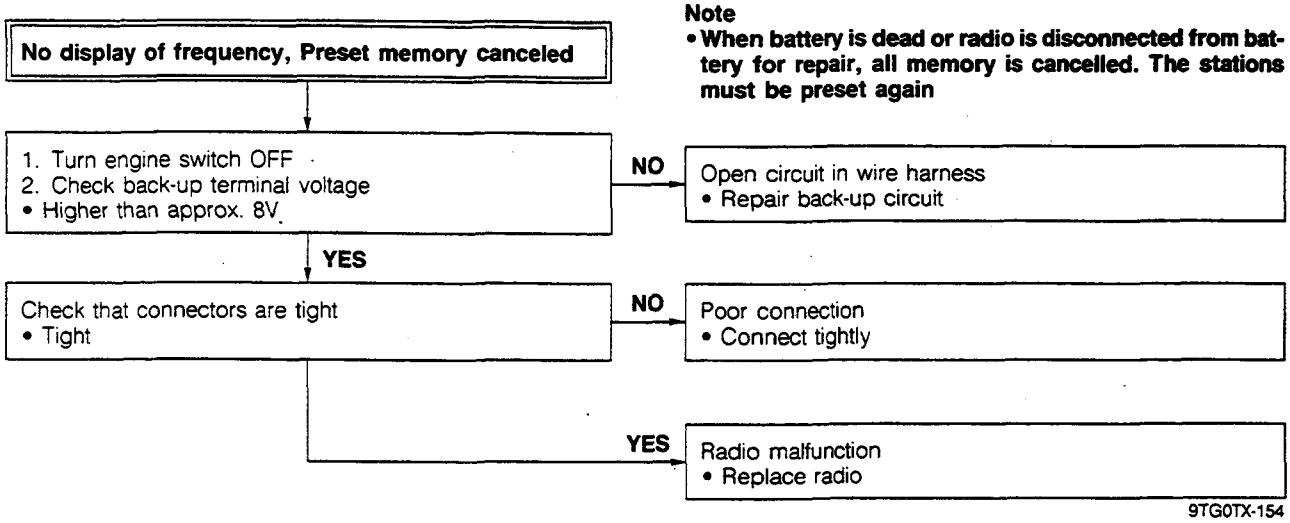



Bad sound quality
Check if sound quality bad in certain areas only
• Certain areas only
YES
FM multipath interference and excessively strong AM reception near station may cause bad sound
• Audio system normal
NO
Check antenna fully extended
• Fully extended
NO
• Extend fully
YES
Check sound quality after tuning again
• Sound quality normal
YES
• Audio system normal
NO
Check speakers installation
• Tight
NO
Loose speaker
• Tighten speaker mounting
YES
Check speaker operation (Refer to page T–90)
• Operation normal
NO
Speaker malfunction
• Replace speaker
YES
Check antenna installation
• Installation correct
NO
Poor connection
• Install antenna properly
YES
1. Remove antenna feeder from radio.
2. Check that there is no continuity between plug terminals. (Refer to page T–91)
• No continuity
NO
Antenna or feeder malfunction
• Replace antenna or feeder
YES
1. Substitute a well-known radio.
2. Check if condition improves
• Improves
NO
YES
Radio malfunction
• Replace radio
9TF0TX-022


Noise
Check that all connectors are tight
• Tight
NO
Poor connection
• Connect tightly
YES
Check that mounting screws are tight
• Tight
NO
Poor installation
• Tighten screws
YES
Check if noise still there when antenna disconnected
• Noise
NO
Antenna malfunction
• Check antenna (Refer to page T–91)
YES
Check wire harness
• Normal
NO
Wire harness malfunction
• Repair wire harness
YES
Check ground condition of unit
• Normal
NO
Poor ground
• Repair ground
YES
Refer to "Causes of Noise", page T–86
9TF0TX-023


Tuning does not stop/
Auto-memory does not operate
Check antenna installation
• Installation correct
NO
Poor connection
• Install antenna properly
YES
1. Remove antenna feeder from radio
2. Check that there is no continuity between plug terminals (Refer to page T–91)
• No continuity
NO
Antenna or feeder malfunction
• Replace antenna or feeder
YES
Radio malfunction
• Replace radio
9TF0TX-024

Note
- **When battery is dead or radio is disconnected from battery for repair, all memory is cancelled. The stations must be preset again**

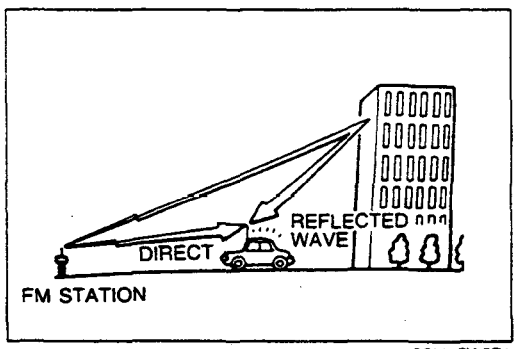


Causes of Noise

When the radio receives a signal from a station, there may be some noise interference. The cause could be
1. Defective audio system
2. The vehicle itself inducts noise. (called outside noise.)
3. Noise from other cars or neon signs, for example. (ambience noise.)

Since ambience noise is a temporary occurence, this section does not deal with it. For noise problems, first, the cause of the noise must be determined through troubleshooting guide. Once it has been determined, refer to the suppression chart to find the proper procedure for eliminating the noise.

9TG0TX-162

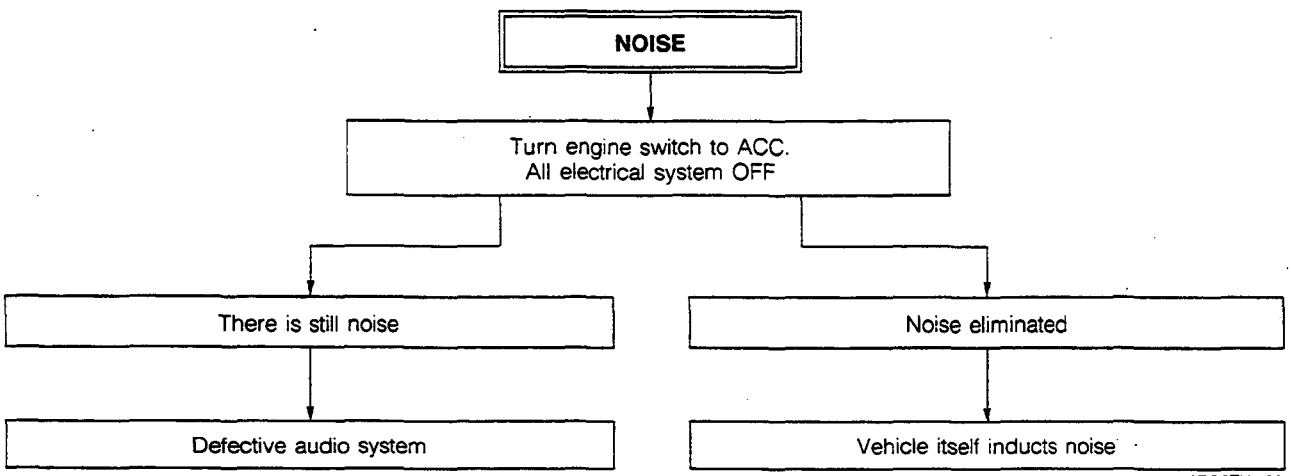


93U15X-071

FM multipath

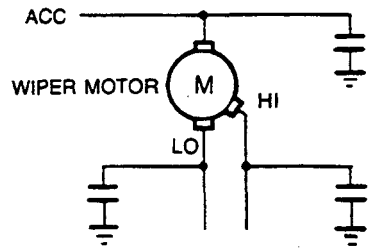
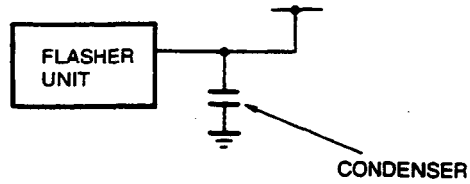
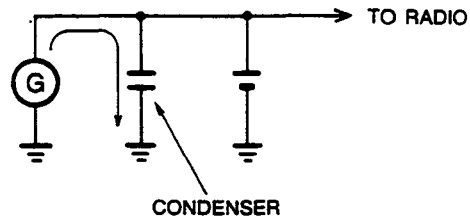
FM waves can cause a problem called multipath receiving. This happens when the radio picks up a direct wave and reflected wave at the same time. This results in a "Dead Spot" or distorted sound.

Troubleshooting



9TG0TX-163

Noise Suppression Chart

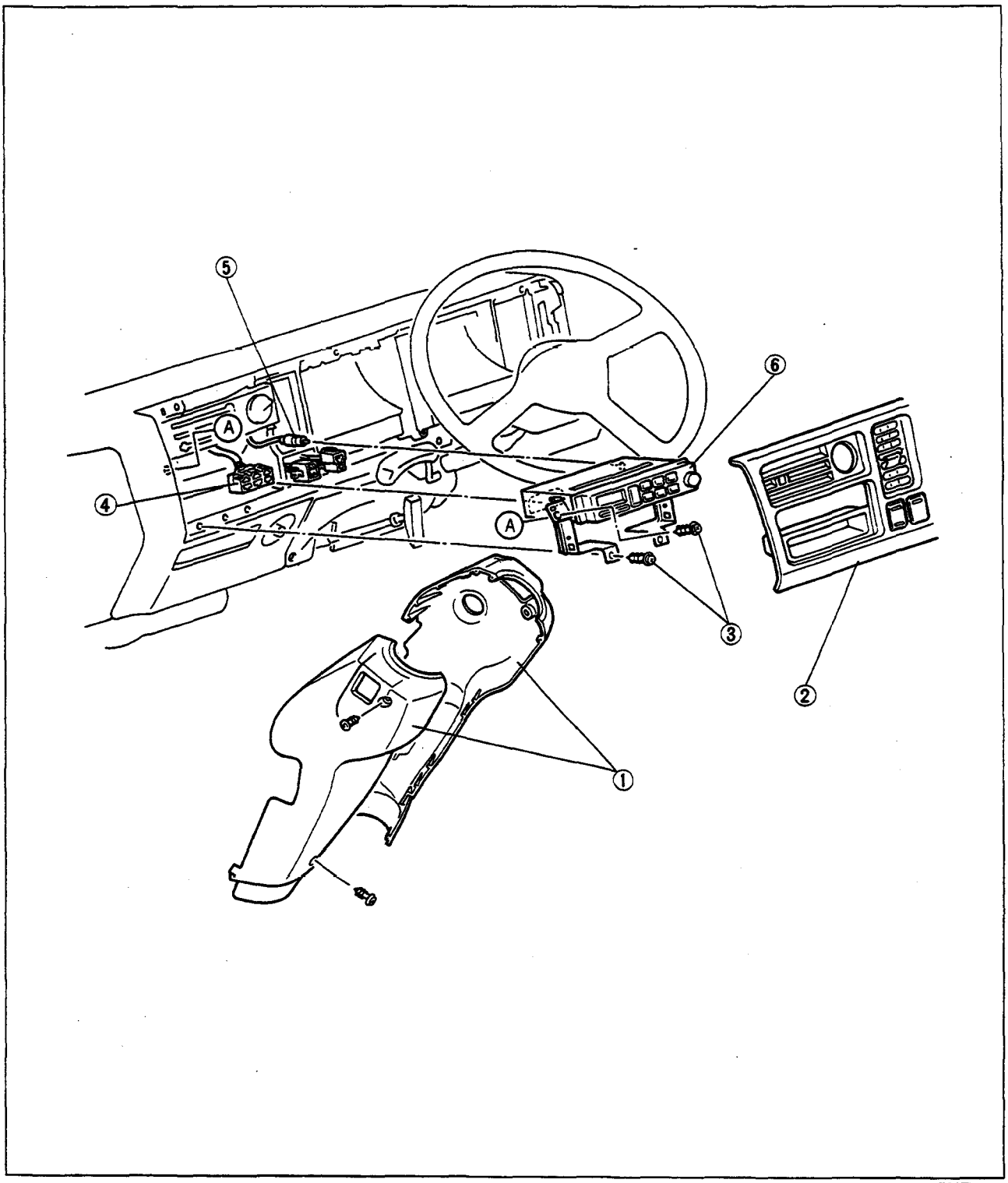
Cause	Remedy
Motor noise (Wiper, washer, for example.)	1. Check grounding. 2. Install condensers to motor circuit. 
Turn signal noise	Connect condenser to power line of flasher unit.  **Note** **• Condenser should be placed near flasher unit.**
Alternator noise	Connect condenser near alternator. 

9TG0TX-164

AUDIO UNIT

Removal / Installation

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



9TF0TX-025

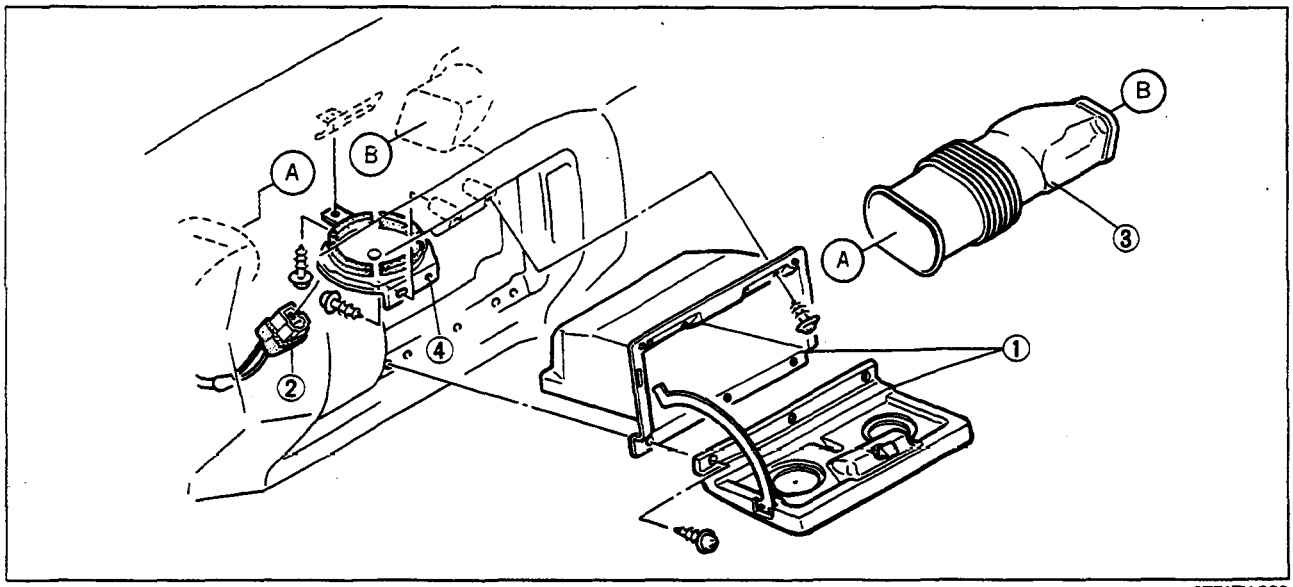
1. Steering column cover
2. Meter panel
3. Screws
4. Connectors
5. Antenna feeder
   Removal / Installation ..... page T–91
   Inspection ..... page T–91
6. Audio unit/Radio

SPEAKER

Removal / Installation

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

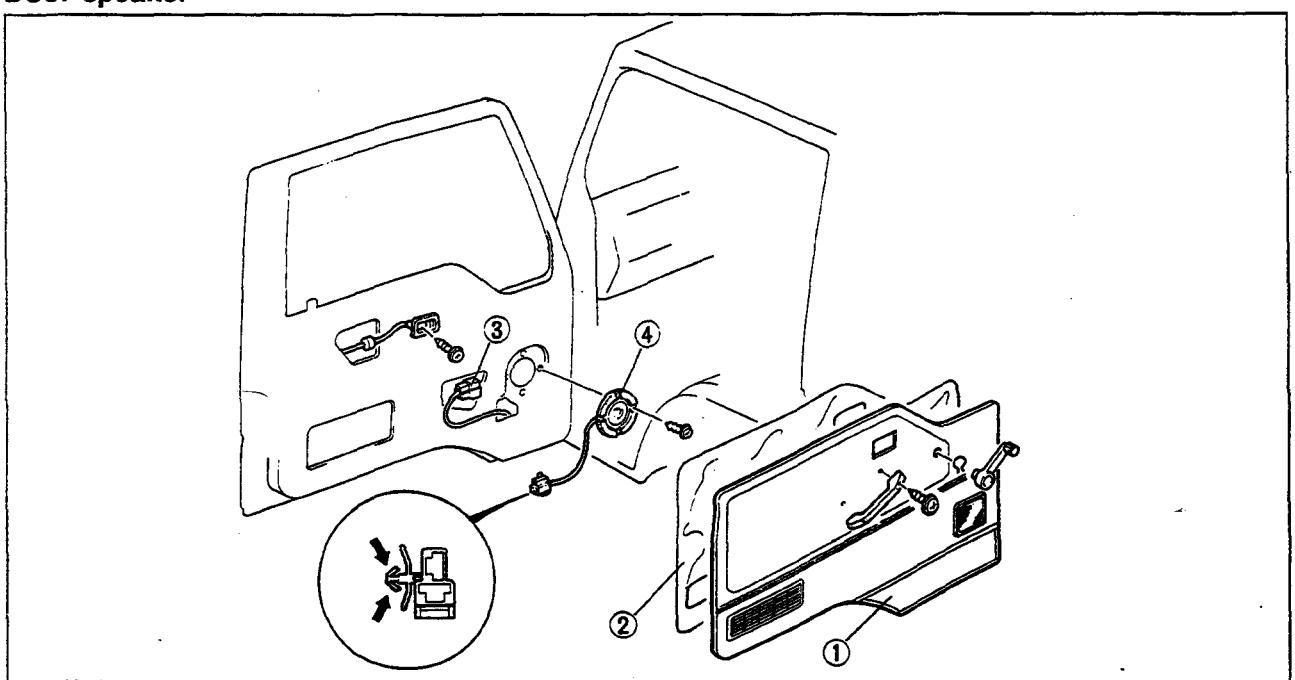
Instrument panel speaker



9TF0TX-026

1. Glove box
2. Connectors
3. Duct
4. Speaker
   Inspection ..... page T–90

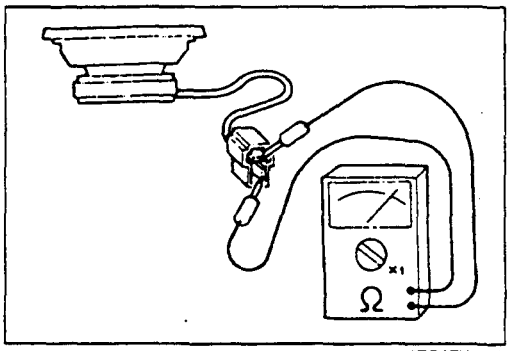
Door speaker



CAUTION
- **REMOVE DOOR SCREEN CAREFULLY SO THAT IT MAY BE REUSED.**

9TF0TX-027

1. Door trim
2. Door screen
3. Connectors
4. Speaker
   Inspection ..... page T–90



9TG0TX-168

Inspection

Caution
- **Use an ohmmeter at x1Ω range.**

1. Check for resistance of the speaker.

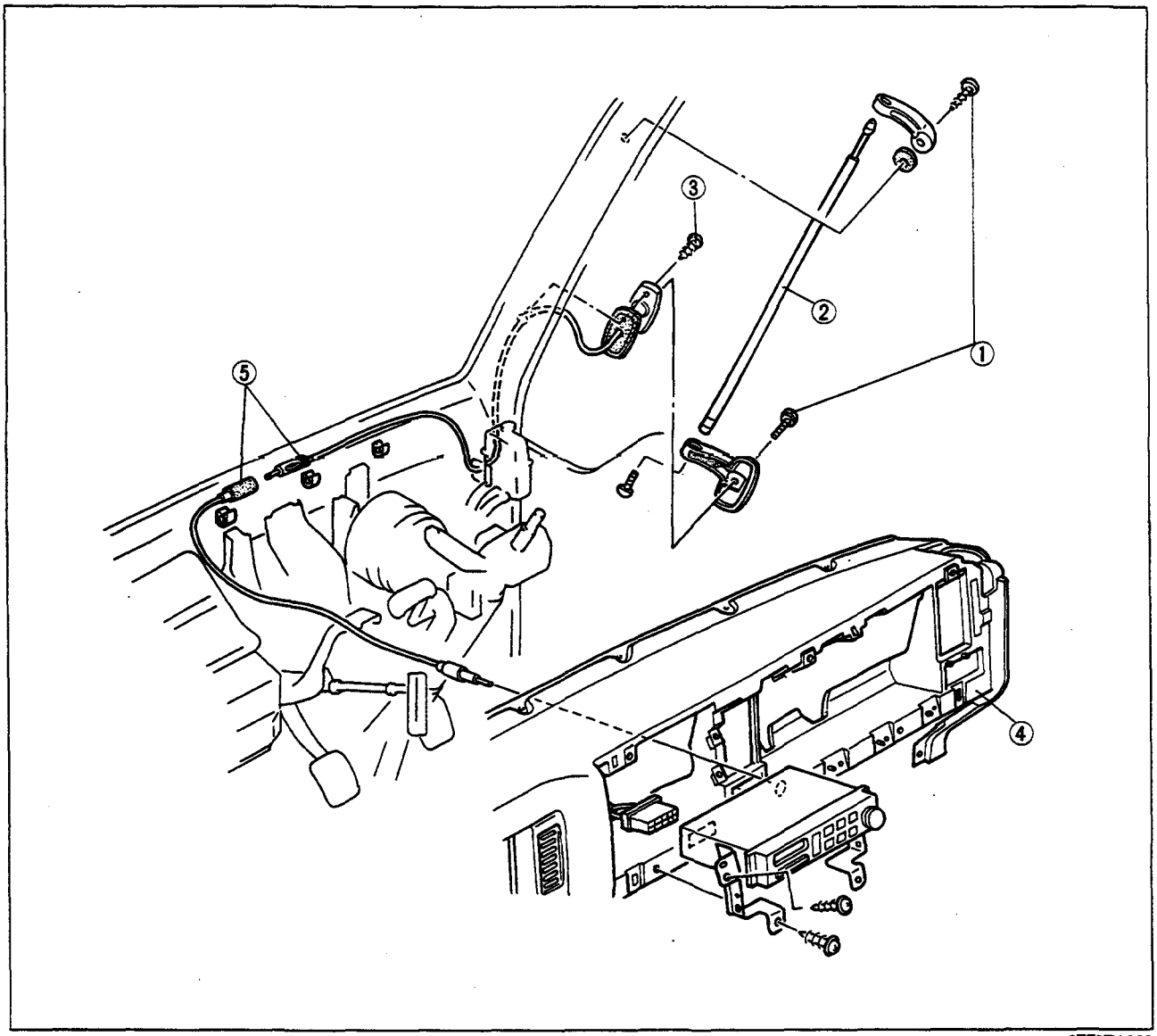
   Resistance: 4Ω

2. Verify that the speaker clicks when the ohmmeter is connected to the speaker terminal.
3. Replace the speaker if not as specified.

ANTENNA FEEDER

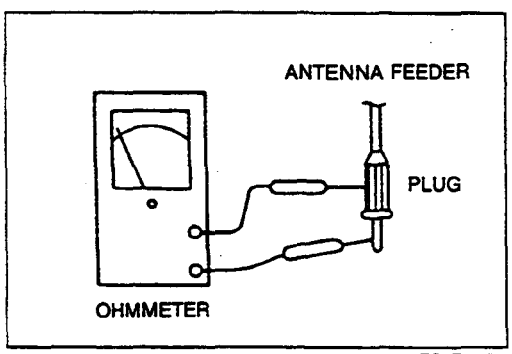
Removal / Installation

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



9TF0TX-028

1. Screws
2. Antenna
3. Screws
4. Instrument panel
   Service..... Section S
5. Antenna feeder
   Inspection ..... page T–91



9TG0TX-170

Inspection

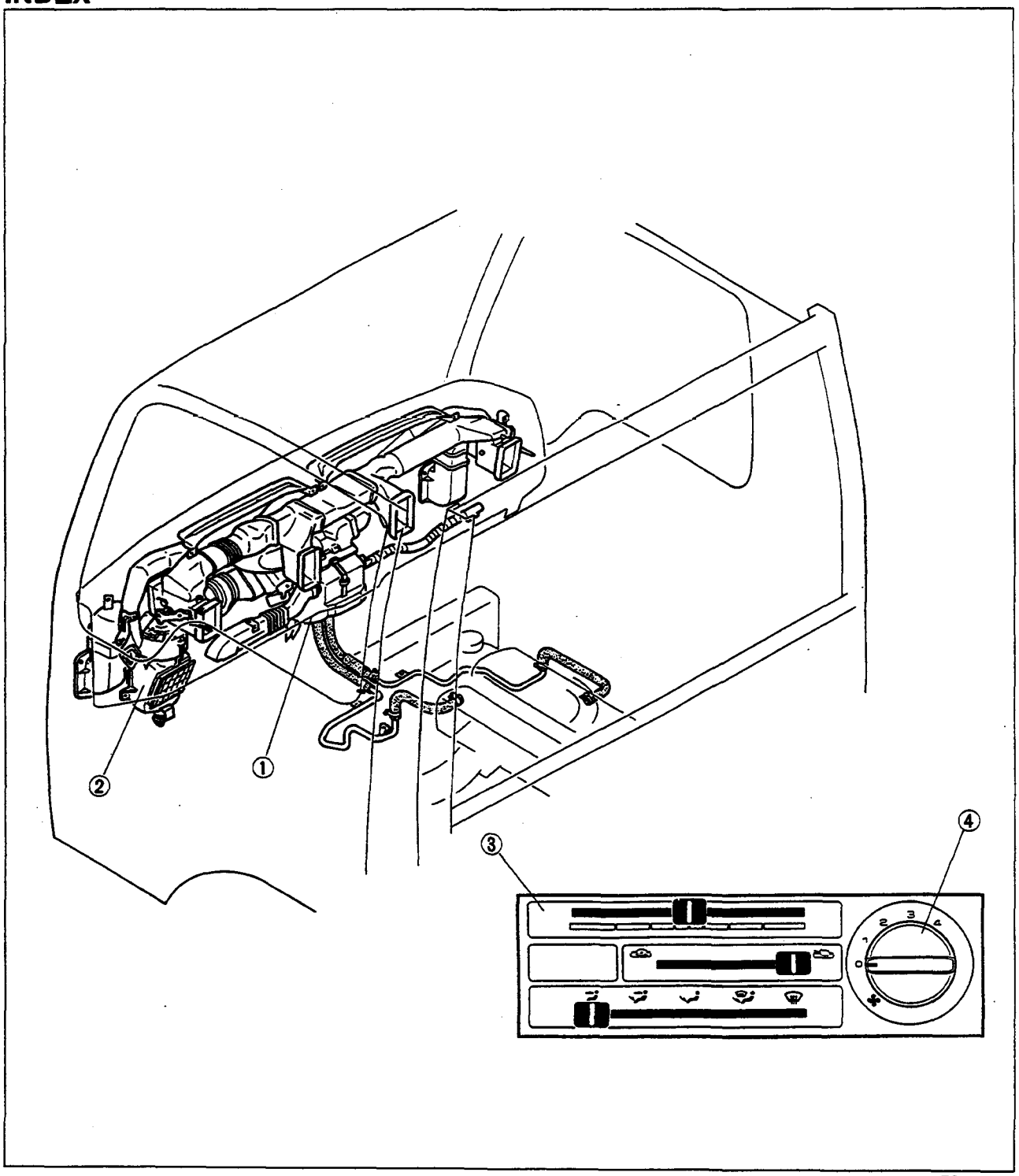
1. Check that there is no continuity between the plug terminals.
2. Replace the antenna feeder if not as specified.

HEATER AND AIR CONDITIONER SYSTEM

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TROUBLESHOOTING GUIDE ..... **U– 3**
WIRING DIAGRAM ..... **U– 3**
FRONT HEATER ..... **U– 7**
STRUCTURAL VIEW ..... **U– 7**
FRONT HEATER UNIT ..... **U– 8**
FRONT BLOWER UNIT **U–10**
HEATER CONTROL UNIT **U–13**

9TG0UX-001

INDEX



9TG0UX-002

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2. Front blower unit
Removal / Installation..... page U–10
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3. Heater control unit
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4. Fan switch
Inspection..... page U–16

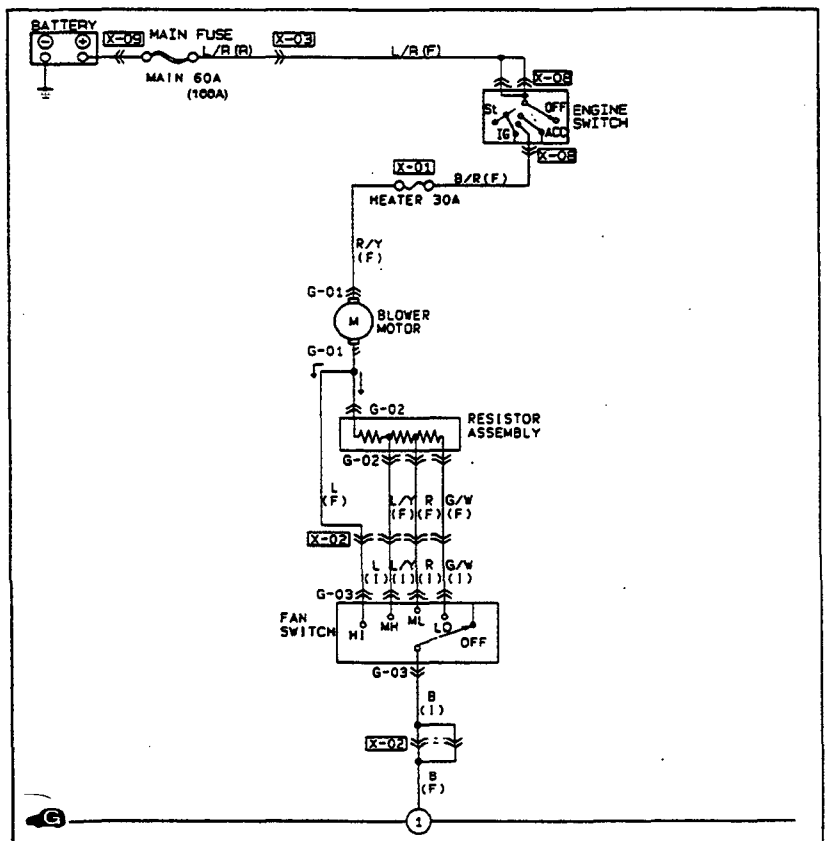
TROUBLESHOOTING

TROUBLESHOOTING GUIDE

System	Symptom	Reference page
Front heater	Blower motor operates if fan switch is OFF	U–4
	Blower motor does not operate if fan switch is "1" position	U–4
	Blower motor does not operate if fan switch is "2" position	U–4
	Blower motor does not operate if fan switch is "3" position	U–5
	Blower motor does not operate if fan switch is "4" position	U–5
	Blower motor does not operate	U–5
	Mode control does not operate	U–6
	Air temperature does not change	U–6

9TF0UX-001

WIRING DIAGRAM



G-01 BLOWER MOTOR (F)	G-02 RESISTOR ASSEMBLY (F)	G-03 FAN SWITCH (I)	
R/Y / L	R / G/W / L/Y / L	R / G/W / B / L/Y / L / *	

NOTE: *···NOT USED

9TG0UX-004

Symptom	Blower motor operates if fan switch is OFF

1. Disconnect resister assembly connector
2. Turn engine switch ON, and check that blower motor does not run

NG → Short circuit in wiring harness (Blower motor—resister assembly; L wire)
• Repair wiring harness

OK ↓

1. Turn engine switch OFF
2. Connect resister assembly connector
3. Disconnect fan switch connector
4. Turn engine switch ON, and check that blower motor does not run

NG → Short circuit in wiring harness (Resister assembly—fan switch; G/W, R, L/Y, L wire)
• Repair wiring harness

OK ↓

Fan switch malfunction
• Check fan switch (Refer to page U–16)

9TG0UX-005

Symptom	Blower motor does not operate if fan switch is "1" position

1. Turn engine switch ON
2. Set fan switch "1" position
3. Check that there is 0V at G/W wire voltage of resister assembly connector

OK → Resister assembly malfunction
• Check resister assembly (Refer to page U–12)

NG ↓

1. Check that there is 0V at G/W wire voltage of fan switch connector

OK → Open circuit in wiring harness (Resister assembly—fan switch; G/W wire)

NG ↓

Fan switch malfunction
• Check fan switch (Refer to page U–16)

9TG0UX-006

Symptom	Blower motor does not operate if fan switch is "2" position

1. Turn engine switch ON
2. Set fan switch "2" position
3. Check that there is 0V at R wire voltage of resister assembly connector

OK → Resister assembly malfunction
• Check resister assembly (Refer to page U–12)

NG ↓

1. Check that there is 0V at R wire voltage of fan switch connector

OK → Open circuit in wiring harness (Resister assembly—fan switch; R wire)

NG ↓

Fan switch malfunction
• Check fan switch (Refer to page U–16)

9TG0UX-007

Symptom	Blower motor does not operate if fan switch is "3" position

1. Turn engine switch ON
2. Set fan switch "3" position
3. Check that there is 0V at L/Y wire voltage of resister assembly connector

→ OK → Resister assembly malfunction
•Check resister assembly (Refer to page U–12)

↓ NG

1. Check that there is 0V at L/Y wire voltage of fan switch connector

→ OK → Open circuit in wiring harness
(Resister assembly—fan switch; L/Y wire)

↓ NG

Fan switch malfunction
•Check fan switch (Refer to page U–16)

9TG0UX-008

Symptom	Blower motor does not operate if fan switch is "4" position

1. Turn engine switch ON
2. Set fan switch "4" position
3. Check that there is 0V at L wire voltage of blower motor connector

→ OK → Blower motor malfunction
•Check blower motor (Refer to page U–12)

↓ NG

1. Check that there is 0V at L wire voltage of fan switch connector

→ OK → Open circuit in wiring harness
(Resister assembly—fan switch; L wire)

↓ NG

Fan switch malfunction
•Check fan switch (Refer to page U–16)

9TG0UX-009

Symptom	Blower motor does not operate

1. Check that heater fuse is normal

→ NG → Short circuit in wiring harness
•Check wiring harness

↓ OK

1. Turn engine switch ON
2. Check that there is 12V at R/Y wire of blower motor connector

→ NG → Open circuit in wiring harness
(Heater fuse—blower motor; R/Y wire)
•Repair wiring harness

↓ OK

1. Turn fan switch "3" position
2. Check that there is 12V at L wire of blower motor connector

→ NG → Blower motor malfunction
•Check blower motor (Refer to page U–12)

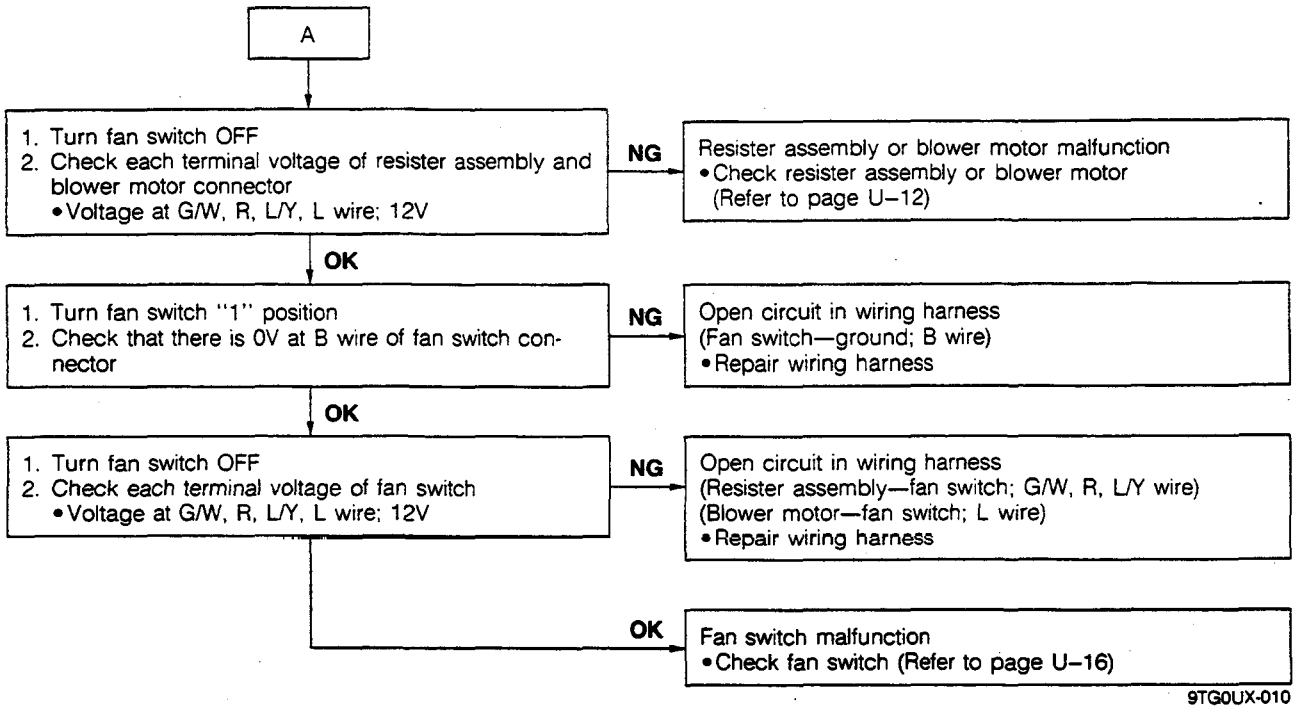
↓ OK

1. Check that there is 12V at L wire of resister assembly connector

→ NG → Open circuit in wiring harness
(Blower motor—resister assembly; L wire)
•Repair wiring harness

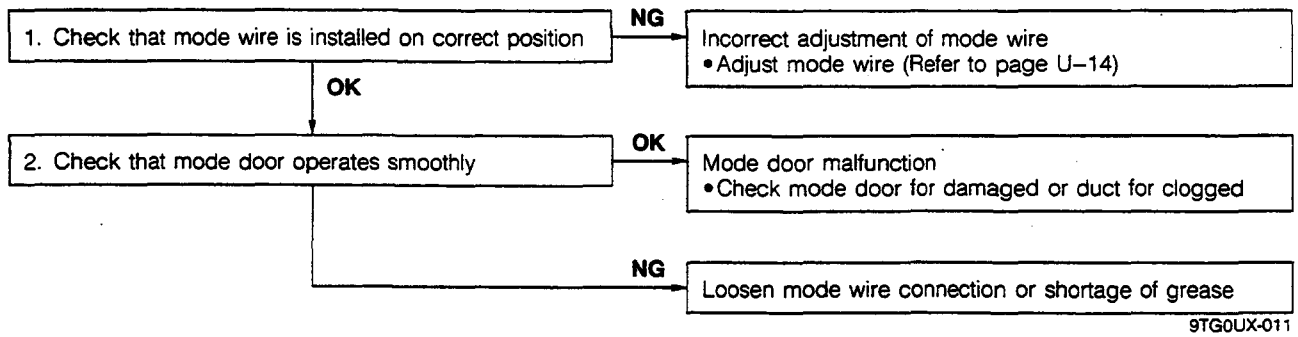
↓ OK

A



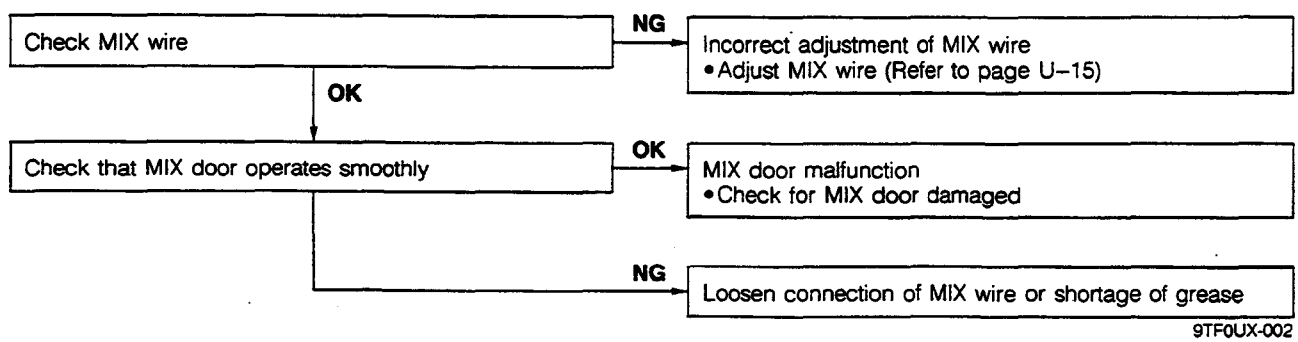
9TG0UX-010

Symptom	Mode control does not operate



9TG0UX-011

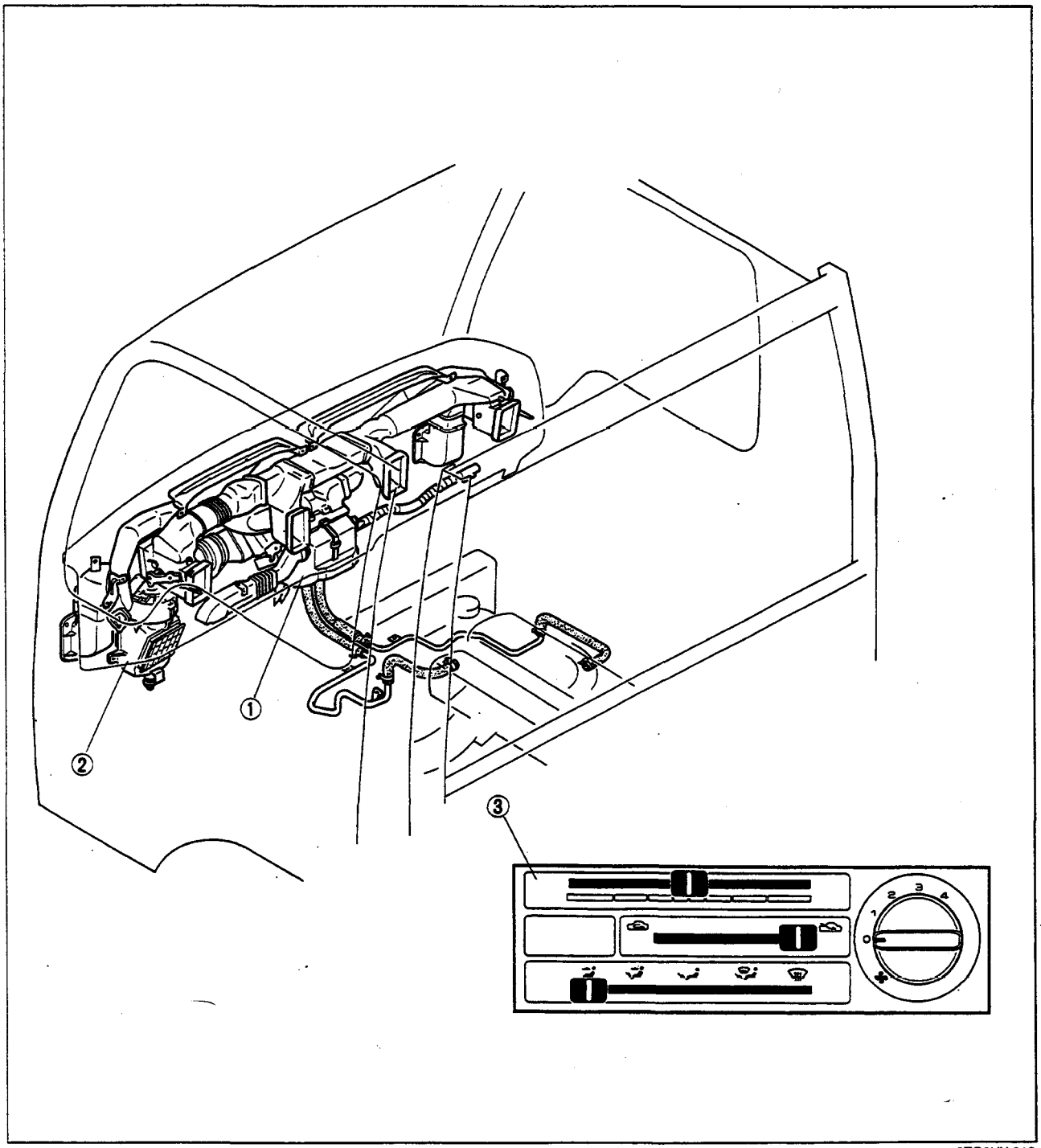
Symptom	Air temperature does not change



9TF0UX-002

FRONT HEATER

STRUCTURAL VIEW



9TG0UX-013

1. Front heater unit
   - Removal / Installation..... page U– 8
   - Disassembly / Assembly..... page U– 9
   - Inspection..... page U– 9
2. Front blower unit
   - Removal / Installation..... page U–10
   - Disassembly / Assembly..... page U–12
   - Inspection..... page U–12
3. Heater control unit
   - Removal / Installation..... page U–13
   - Disassembly / Assembly..... page U–16
   - Inspection..... page U–16

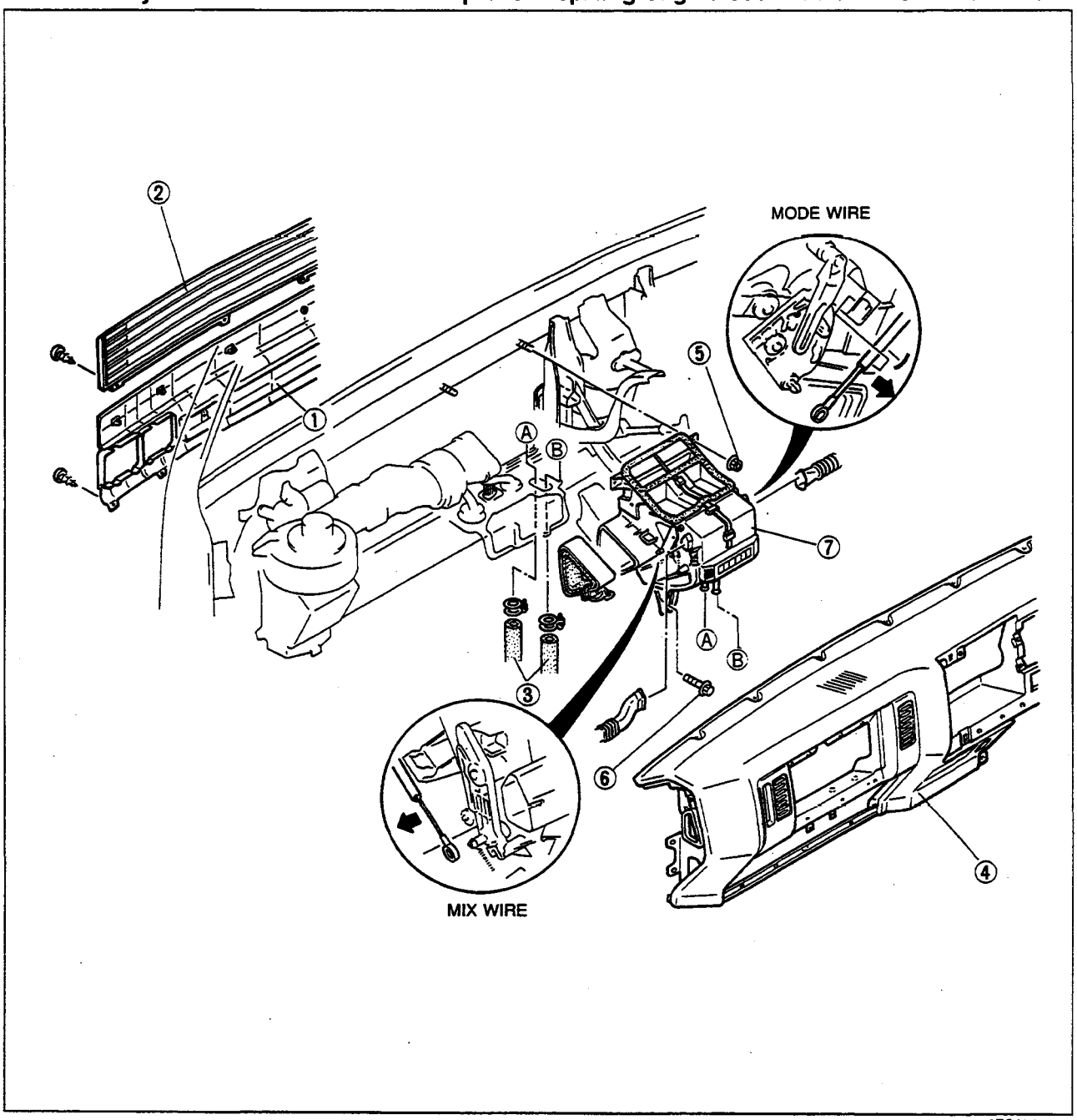
FRONT HEATER UNIT

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.

Caution

- **Carefully remove the heater unit to prevent spilling engine coolant from the heater core.**

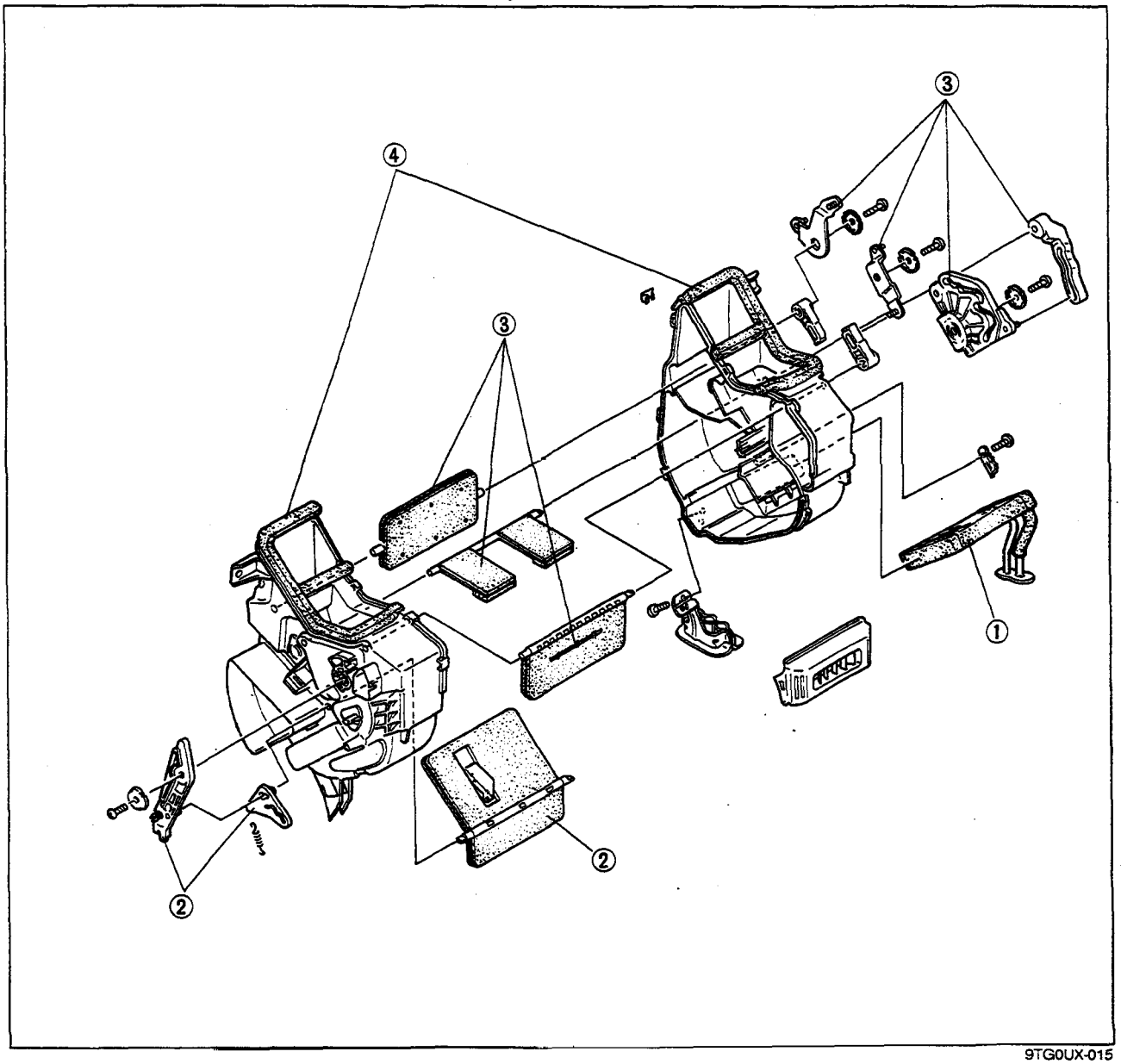


9TG0UX-014

1. Radiator grille
2. Front grille
3. Water hose
4. Instrument panel
   Service..... Section S
5. Nuts
6. Bolts
7. Front heater unit
   Disassembly / Assembly..... page U– 9
   Inspection..... page U– 9

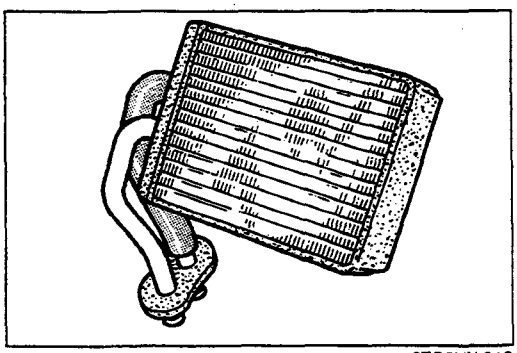
Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



9TG0UX-015

1. Heater core
   Inspection..... page U– 9
2. MIX door assembly
3. MODE door assembly
4. Heater unit case



9TG0UX-016

Inspection

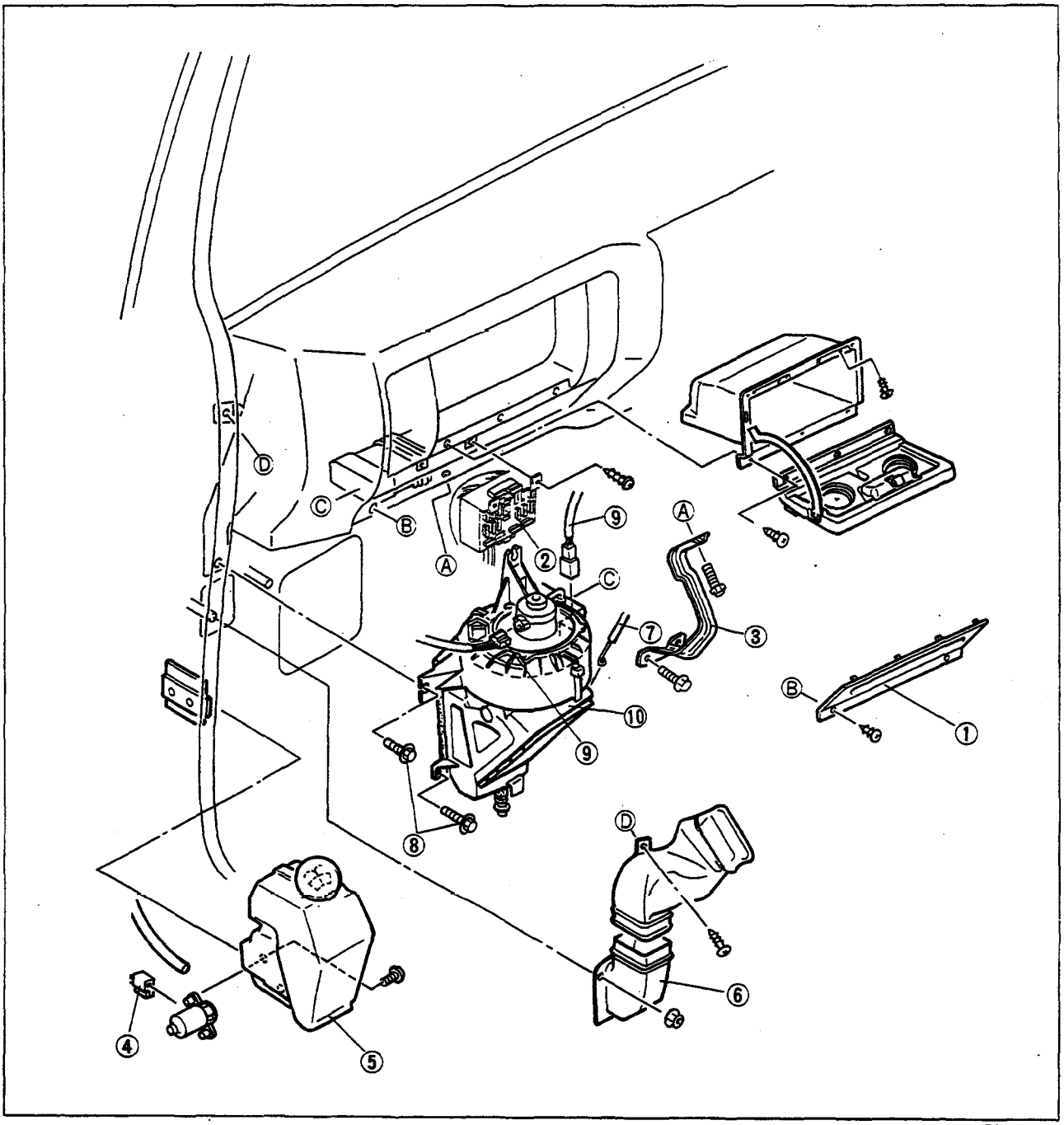
Heater core

1. Check the heater core fins for blockage.
2. If the fins are clogged, clean them.
3. Check the fittings for cracks or damage.
4. Replace the heater core if necessary.

FRONT BLOWER UNIT

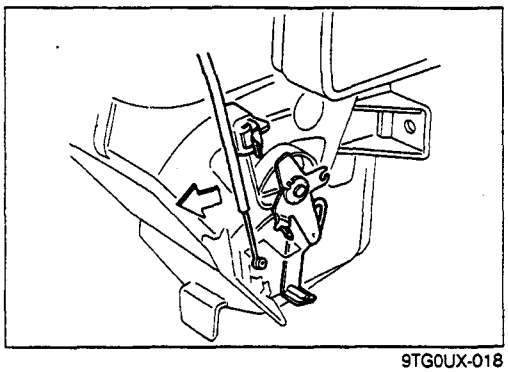
Remove / Installation

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**.

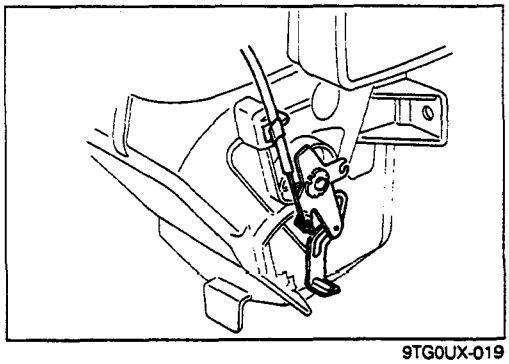


9TG0UX-017

1. Lower panel
2. Fuse box
3. Bracket
4. Washer motor connector
5. Washer tank
6. Natural duct
7. REC-FRESH wire
   - Removal Note ..... page U–11
   - Installation Note..... page U–11
8. Bolts
9. Connector
10. Front blower unit
    - Disassembly / Assembly..... page U–12
    - Inspection..... page U–12



9TG0UX-018



9TG0UX-019

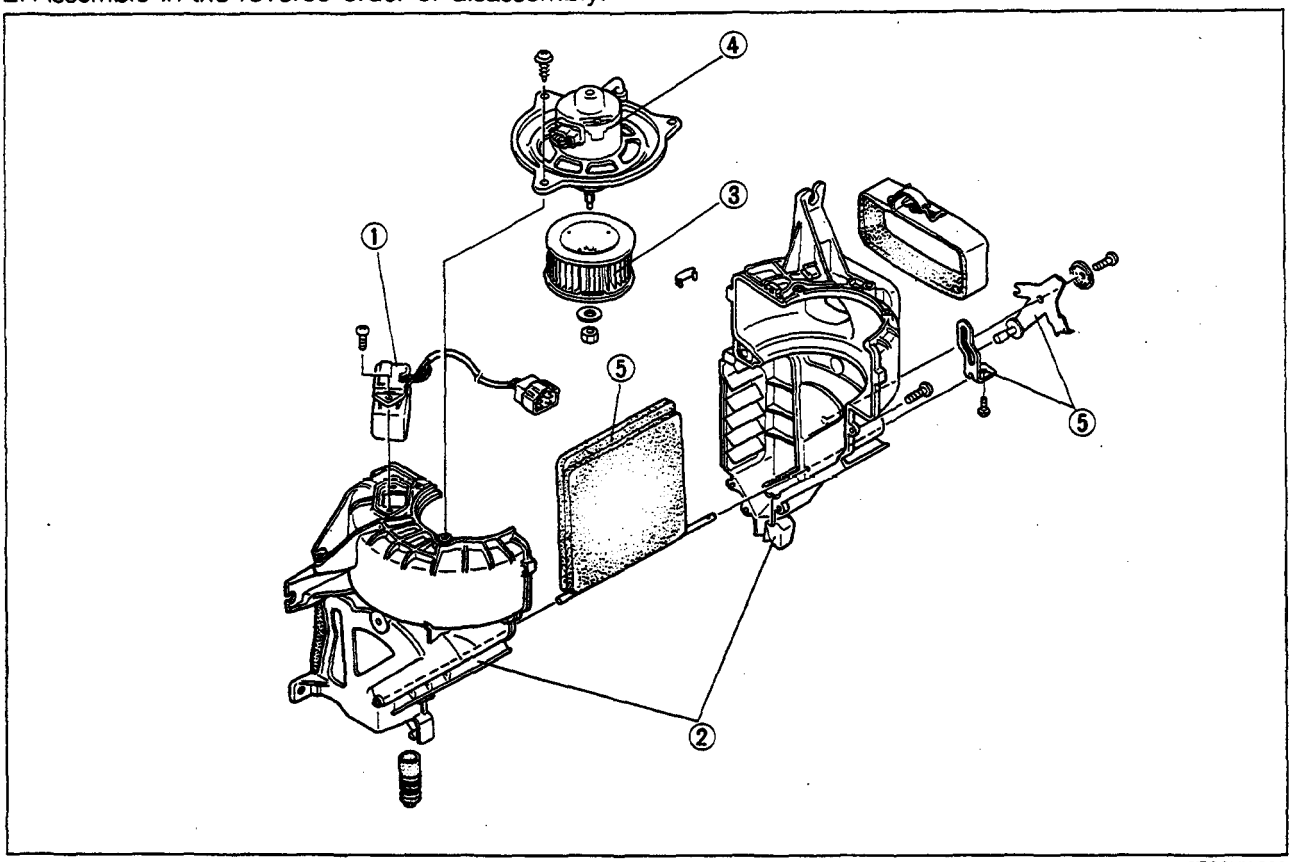
Removal note
REC-FRESH wire
1. Disconnect the REC-FRESH wire from the door link.

Installation note
REC-FRESH wire
1. Set the REC-FRESH lever to REC position.
2. Set the REC-FRESH door link to REC position as shown in the figure, and connect the wire.
3. Clamp the wire.

Caution
- **After installation, move the REC-FRESH lever to be sure the wire is securely attached, and that it moves the full stroke from REC to FRESH.**

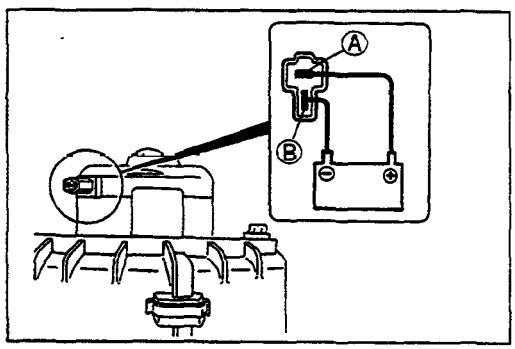
Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.

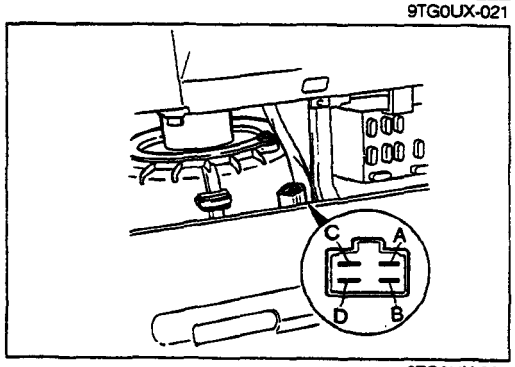


9TG0UX-020

1. Resister assembly
   Inspection ..... page U–12
2. Blower unit case
3. Blower fan
4. Blower motor
   Inspection ..... page U–12
5. REC-FRESH door assembly



9TG0UX-021



9TG0UX-022

Inspection

Blower motor

1. Remove the grove box.
2. Disconnect the blower motor connector.
3. Apply 12V to A terminal and ground B terminal. Check that the motor operates.

Terminal	Apply voltage	Motor condition
A	12V	Operate
B	Ground	

Resister assembly

1. Remove the grove box.
2. Disconnect the resister assembly connector.
3. Check for continuity between terminals.

A	B	C	D
○	○		
○		○	
○			○

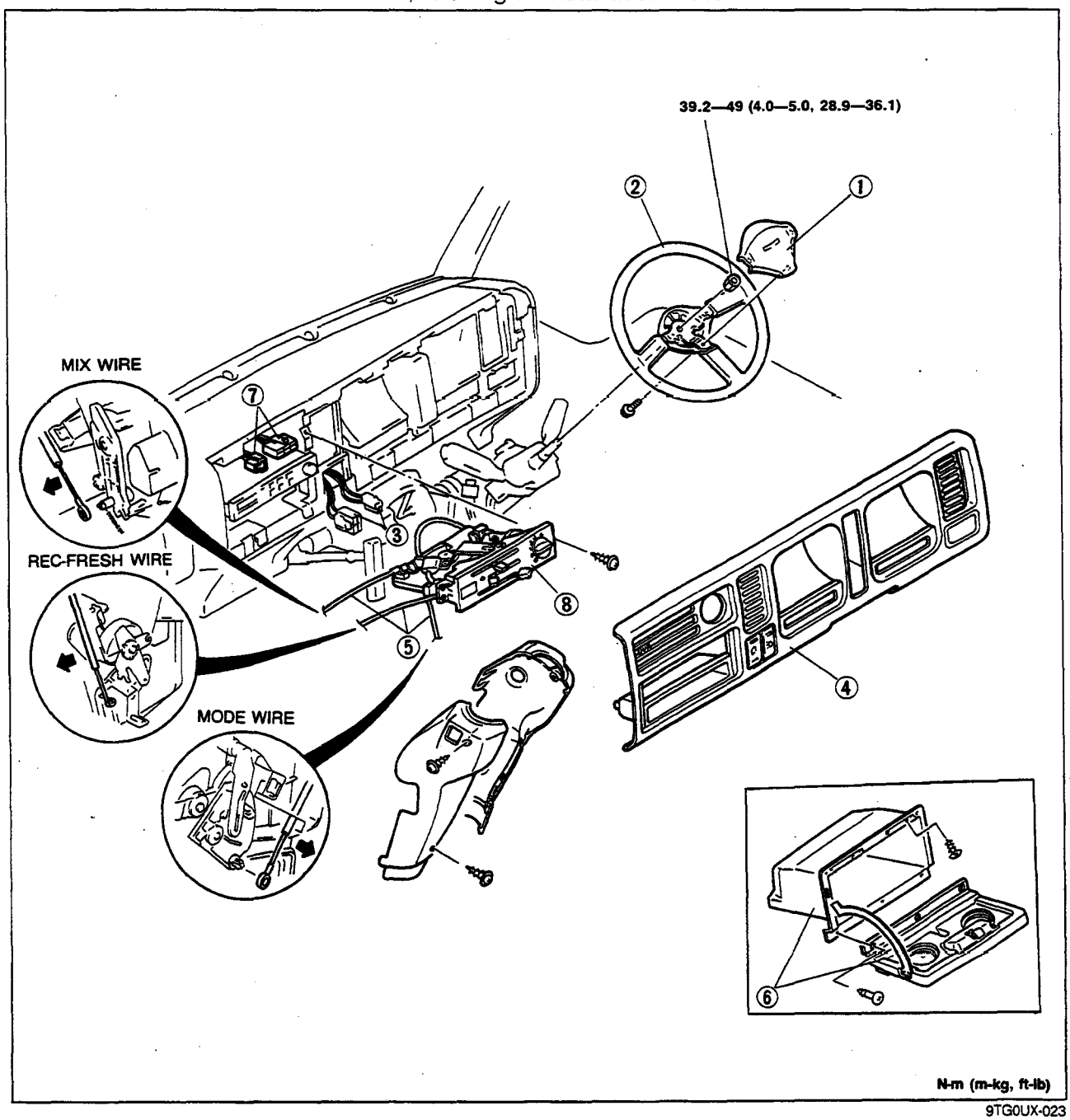
○—○: Indicates continuity

4. If not as specified, replace the resister assembly.

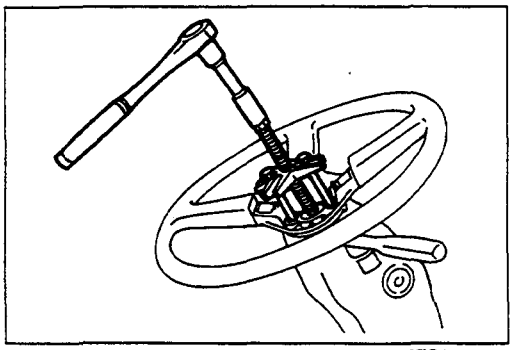
HEATER CONTROL UNIT

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**.

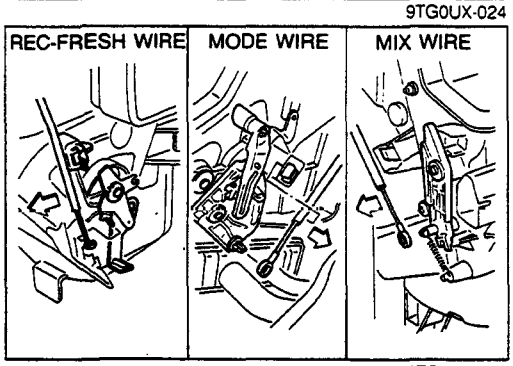


1. Steering column
2. Steering wheel
   - Removal Note ..... page U–14
   - Installation Note..... page U–15
3. Connector
4. Meter panel
5. Heater control wire
   - Removal Note ..... page U–14
   - Installation Note..... page U–14
6. Grove box
7. Connector (for heater control unit)
8. Heater control unit
   - Disassembly / Assembly..... page U–16
   - Inspection..... page U–16



9TG0UX-024

Removal note
Steering wheel
1. Remove the steering wheel with a steering wheel puller.



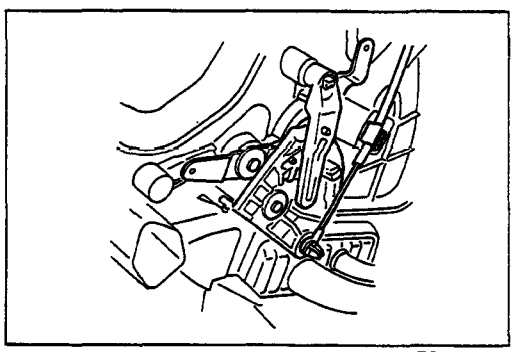
9TG0UX-025

Heater control wire
1. Disconnect the REC-FRESH wire from the blower unit door link.
2. Disconnect the MODE wire and MIX wire from the heater unit door links.

Installation note
Heater control wire

Caution
- **Connect the heater control wires to the correct position.**
- **Do not bend and twist the wires when installing.**
- **After installation, move the lever to be sure that the wire is securely attached.**

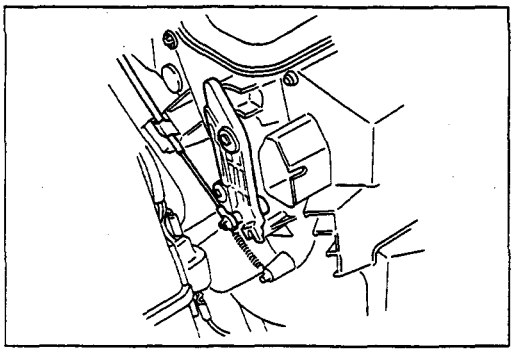
9TG0UX-026



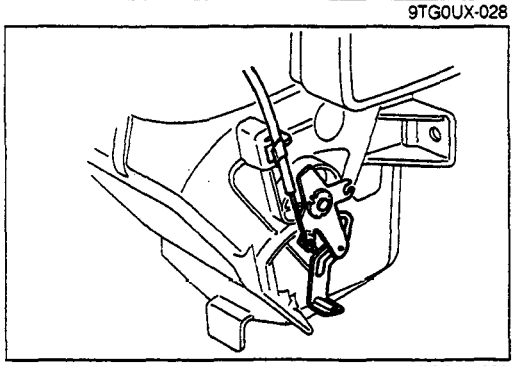
9TG0UX-027

MODE wire
Adjustment
1. Set the MODE lever to DEF position.
2. Set the MODE door link to DEF position as shown in the figure, and connect the wire.
3. Clamp the wire.

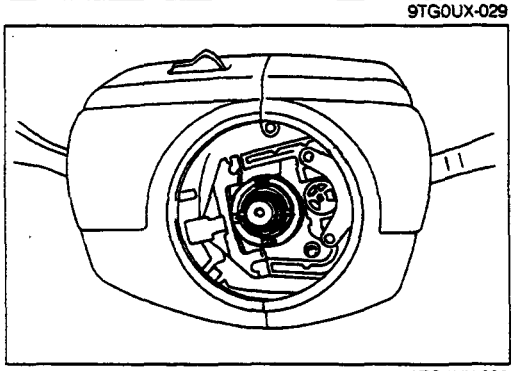
Caution
- **After installation, move the MODE lever to be sure that it moves the full stroke from DEF to VENT.**



9TG0UX-028



9TG0UX-029



9TG0UX-030

MIX wire
Adjustment
1. Set the MIX lever to MAX-HOT position.
2. Set the MIX door link to MAX-HOT position as shown in the figure, and connect the wire.
3. Clamp the wire.

Caution
- **After installation, move the MIX lever to be sure that it moves the full stroke from HOT to COLD.**

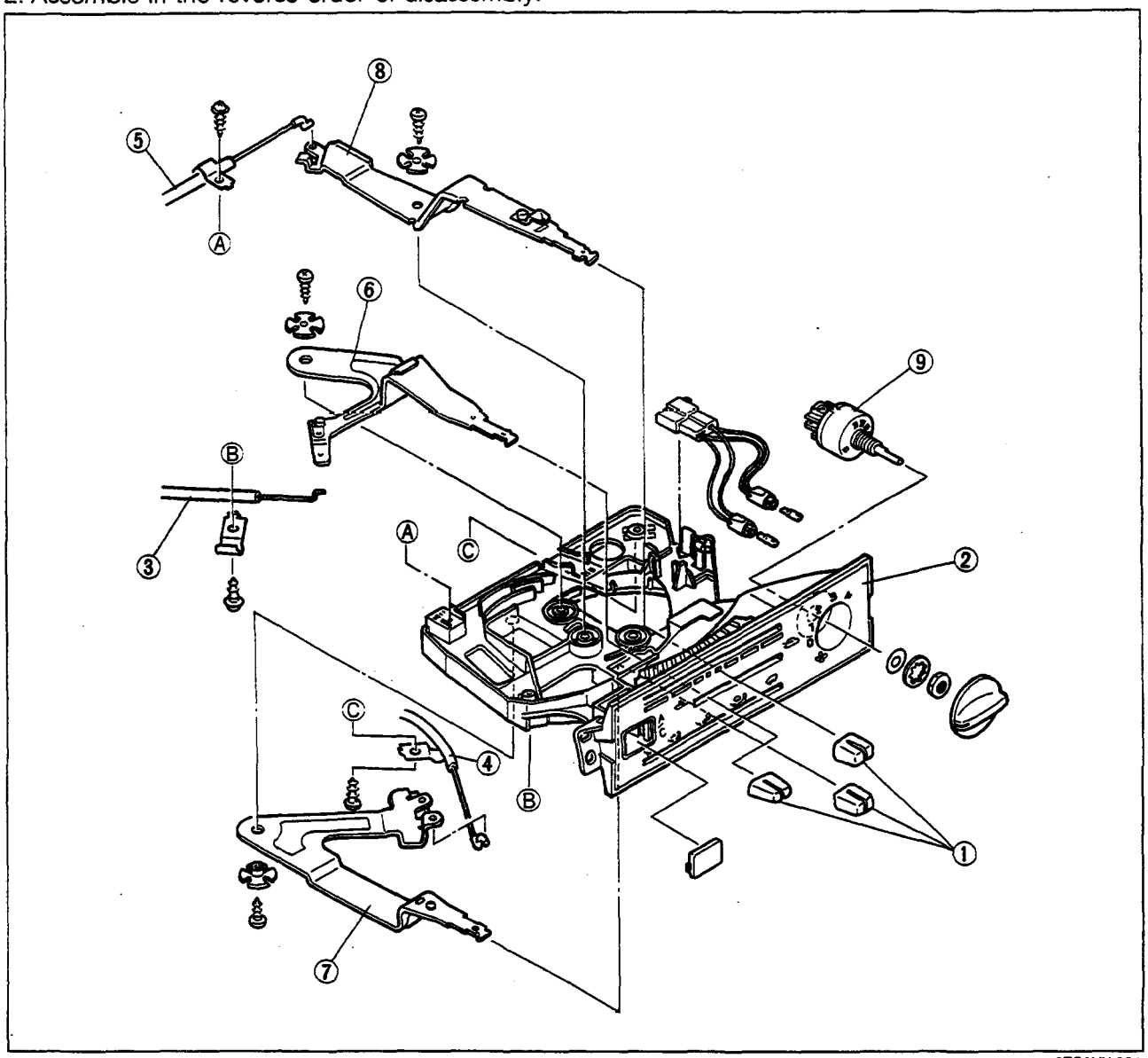
REC-FRESH wire
Adjustment
1. Set the REC-FRESH lever to REC position.
2. Set the REC-FRESH door link to REC position as shown in the figure, and connect the wire.
3. Clamp the wire.

Caution
- **After installation, move the REC-FRESH lever to be sure that it moves the full stroke from REC to FRESH.**

Steering wheel
1. Set the cansel cam as shown in the figure.

Disassembly / Assembly

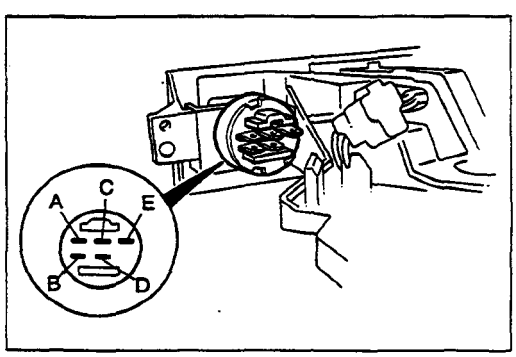
1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



9TG0UX-031

1. Knob
2. Switch body
3. REC-FRESH wire
4. MODE wire
5. MIX wire
6. REC-FRESH lever
7. MODE lever
8. MIX lever
9. Fan switch

Inspection ..... page U–16



9TG0UX-032

Inspection

Fan switch

1. Check for continuity between the terminals.

Switch position	A	B	C	D	E
OFF					
1			○		○
2	○				○
3		○			○
4				○	○

○—○: Indicates continuity

TECHNICAL DATA

A. MEASUREMENTS ..... TD– 2
B. ENGINE ..... TD– 3
D. LUBRICATION SYSTEM ..... TD– 8
E. COOLING SYSTEM ..... TD– 9
F. FUEL AND EMISSION CONTROL SYSTEM (HA, SL, SL TURBOCHARGED, TF ENGINES) TD–10
G. ENGINE ELECTRICAL SYSTEM (HA, SL, SL TURBOCHARGED, TF ENGINES) TD–10
H. CLUTCH TD–11
J. TRANSMISSION TD–12
L. PROPELLER SHAFT TD–13
M. FRONT AND REAR AXLES TD–13
N. STEERING TD–14
P. BRAKING SYSTEM TD–15
Q. WHEELS AND TIRES TD–16
R. SUSPENSION TD–17
S. BODY TD–19
T. BODY ELECTRICAL SYSTEM TD–19

9TFTDX-001

A. MEASUREMENTS
General Models (RHD)

Item			Specifications				
Engine			HA	SL		SL TURBO	SL
Body			Truck				Crew cab
Cabin			Standard	Wide			
Cargo deck length		(feet)	10		14	17	14
Cargo deck height/ Rear tire			High/Single	High/Double			
Payload		(ton)	1.5	2.0	3.0	4.0	2.75
Overall length		mm (in)	4,740 (186.61)	4,800 (188.98)	6,010 (236.61)	6,915 (272.24)	6,010 (236.61)
Overall width		mm (in)	1,690 (66.54)	2,015 (79.33)	2,015 (79.33)	2,200 (86.61)	2,015 (79.33)
Overall height		mm (in)	1,980 (77.95)	2,155 (84.84)	2,180 (85.82)	2,195 (86.42)	2,155 (84.84)
Wheelbase		mm (in)	2,505 (98.62)	2,510 (98.81)	3,335 (131.30)	3,940 (155.12)	3,335 (131.30)
Track	Front	mm (in)	1,410 (55.51)	1,650 (64.96)	1,650 (64,96)	1,655 (65.35)	1,650 (64.96)
	Rear	mm (in)	1,405 (55.31)	1,470 (57.87)	1,470 (57.87)	1,495 (48.86)	1,495 (58.86)

Australia Models

Item			Specifications							
Engine			SL			TF		SL TURBO		TF
Body			Truck		Crew cab	Truck				Crew cab
Cabin			Wide							
Cargo deck length		(feet)	10	14			17	14	17	14
Cargo deck height/ Rear tire			High/Double							
Payload		(ton)	2.0	3.0	2.75	4.0				3.5
Overall length		mm (in)	4,660 (183.46)	5,890 (231.89)	5,890 (231.89)	5,890 (231.89)	6,790 (267.32)	5,890 (231.89)	6,790 (267.32)	5,890 (231.89)
Overall width		mm (in)	1,990 (78.35)	1,990 (78.35)	2,015 (79.33)	1,990 (78.35)	1,990 (78.35)	1,990 (78.35)	1,990 (78.35)	1,990 (78.35)
Overall height		mm (in)	2,095 (82.48)	3,225 (126.97)	3,205 (126.18)	3,255 (128.15)	3,255 (128.15)	3,255 (128.15)	3,255 (128.15)	3,255 (128.15)
Wheelbase		mm (in)	2,510 (98.82)	3,335 (131.30)	3,335 (131.30)	3,335 (131.30)	3,490 (137.40)	3,335 (131.30)	3,940 (155.12)	3,335 (131.30)
Track	Front	mm (in)	1,650 (64.96)	1,650 (64.96)	1,650 (64.96)	1,655 (65.16)	1,655 (65.16)	1,655 (65.16)	1,655 (65.16)	1,655 (65.16)
	Rear	mm (in)	1,470 (57.87)	1,470 (57.87)	1,470 (57.87)	1,495 (58.86)	1,495 (58.86)	1,495 (58.86)	1,495 (58.86)	1,495 (58.86)

B. ENGINE

Item \ Engine				HA	SL		TF
					Non-Turbo	Turbo	
Type				Diesel, 4-cycle			
Cylinder arrangement and number				In-line, 4-cylinders			
Type of combustion chamber				Pre-combustion chamber	Piston head		
Valve system				OHV, gear-driven			
Bore x stroke mm (in)				95.0 x 105.0 (3.74 x 4.13)	100.0 x 110.0 (3.94 x 4.33)		105.5 x 115.0 (4.15 x 4.53)
Total piston displacement cc (cu in)				2,977 (181.60)	3,455 (210.76)		4,021 (245.28)
Compression ratio				21.0 : 1	18.0 : 1	17.0 : 1	18.0 : 1
Compression pressure kPa (kg/cm², psi)-rpm	Standard			2,943 (30.0, 427)—200	2,943 (30.0, 427)—300	2,551 (26.0, 370)—320	2,943 (30.0, 427)—270
	Minimum			2,649 (27.0, 384)—200	2,649 (27.0, 384)—300	2,256 (23.0, 327)—320	2,649 (27.0, 384)—270
	Variation between cylinders			294 (3.0, 43) max.			
Valve timing	IN	Open	BTDC	17°	19°		18°
		Close	ABDC	47°	47°		45°
	EX	Open	BBDC	51°	52°		49°
		Close	ATDC	13°	14°		17°
Valve clearance (Engine cold) mm (in)	IN			0.30 (0.012)			
	EX			0.30 (0.012)	0.35 (0.014)		0.40 (0.016)
Cylinder head							
Distortion mm (in)				0.10 (0.004) max. [Longitudinal direction 0.25 (0.010) max.] [Manifold contact surface 0.10 (0.004) max.]			
Valve and valve guide							
Valve head diameter mm (in)	IN			44.9—45.1 (1.768—1.776)	45.4—45.6 (1.787—1.795)		46.9—47.1 (1.846—1.854)
	EX			37.4—37.6 (1.472—1.480)	38.2—38.4 (1.504—1.512)		40.9—41.1 (1.610—1.618)
Valve head margin thickness mm (in)	IN			1.0 (0.039) min.			
	EX			1.0 (0.039) min.	1.2 (0.047) min.		1.5 (0.059) min.
Valve face angle	IN			45°			
	EX			30°			
Valve length mm (in)	IN	Standard		114.6 (4.512)			119.7 (4.713)
		Minimum		114.1 (4.492)			119.2 (4.693)
	EX	Standard		114.6 (4.512)	114.5 (4.508)		119.3 (4.697)
		Minimum		114.1 (4.492)	114.0 (4.488)		118.8 (4.677)
Valve stem diameter mm (in)	IN			8.955—8.980 (0.3526—0.3535)	8.965—8.980 (0.3530—0.3535)		
	EX			8.935—8.960 (0.3518—0.3528)	8.945—8.960 (0.3522—0.3528)		
Guide inner diameter mm (in)	IN			9.018—9.033 (0.3550—0.3556)			
	EX			9.018—9.033 (0.3550—0.3556)			
Valve stem-to-guide clearance mm (in)	IN			0.038—0.078 (0.0015—0.0031)	0.038—0.068 (0.0015—0.0027)		
	EX			0.058—0.098 (0.0023—0.0039)	0.058—0.088 (0.0023—0.0035)		
	Maximum			0.127 (0.0050)			
Guide projection (Height "A") mm (in)	IN			15.2—15.4 (0.598—0.606)			14.2—14.4 (0.559—0.567)
	EX			15.2—15.4 (0.598—0.606)			14.2—14.4 (0.559—0.567)
Valve seat							
Seat angle	IN			45°			
	EX			30°			

Item \ Engine				HA	SL Non-Turbo	SL Turbo	TF
Seat contact width mm (in)			IN	2.0 (0.079)	1.7 (0.067)		
			EX	2.0 (0.079)	1.7 (0.067)		
Seat sinking (measure valve protruding length) mm (in)	IN		Standard	48.05 (1.892)			48.40 (1.906)
			Maximum	49.55 (1.951)			49.90 (1.965)
	EX		Standard	48.05 (1.892)	47.95 (1.888)		48.40 (1.906)
			Maximum	49.55 (1.951)	49.45 (1.947)		49.90 (1.965)
Valve spring							
Free length mm (in)	IN	Outer	Standard	55.7 (2.193)	53.1 (2.091)		59.5 (2.343)
			Minimum	54.7 (2.154)	52.1 (2.051)		58.5 (2.303)
		Inner	Standard	44.1 (1.736)	46.6 (1.835)		51.4 (2.024)
			Minimum	43.1 (1.697)	45.6 (1.795)		50.4 (1.984)
	EX	Outer	Standard	55.7 (2.193)	53.1 (2.091)	56.1 (2.209)	59.5 (2.343)
			Minimum	54.7 (2.154)	52.1 (2.051)	55.1 (2.169)	58.5 (2.303)
		Inner	Standard	44.1 (1.736)	46.6 (1.835)	49.4 (1.945)	51.4 (2.024)
			Minimum	43.1 (1.697)	45.6 (1.795)	48.4 (1.906)	50.4 (1.984)
Out-of square mm (in)	IN		Outer	1.37 (0.0539) max.	1.85 (0.0728) max.		2.07 (0.0815) max.
			Inner	1.25 (0.0492) max.	1.63 (0.0642) max.		1.79 (0.0705) max.
	EX		Outer	1.37 (0.0539) max.	1.85 (0.0728) max.	1.96 (0.0772) max.	2.07 (0.0815) max.
			Inner	1.25 (0.0492) max.	1.63 (0.0642) max.	1.72 (0.0677) max.	1.79 (0.0705) max.
Setting load/height N (kg, lb)/mm (in)	IN		Outer	318—336 (32.4—34.2, 71.3—75.2)/ 40.3 (1.59)	236—262 (24.1—26.7, 53.0—58.7)/40.3 (1.59)		303—342 (30.9—34.9, 68.0—76.8)/ 41.9 (1.65)
			Inner	119—130 (12.1—13.3, 26.6—29.3)/ 37.8 (1.49)	149—165 (15.2—16.8, 33.4—37.0)/37.8 (1.49)		191—216 (19.5—22.0, 42.9—48.4)/ 39.4 (1.55)
	EX		Outer	318—336 (32.4—34.2, 71.3—75.2)/ 40.3 (1.59)	236—262 (24.1—26.7, 53.0—58.7)/ 40.3 (1.59)	228—251 (23.2—25.6, 51.0—56.3)/ 40.3 (1.59)	303—342 (30.9—34.9, 68.0—76.8)/ 41.9 (1.65)
			Inner	119—130 (12.1—13.3, 26.6—29.3)/ 37.8 (1.49)	149—165 (15.2—16.8, 33.4—37.0)/ 37.8 (1.49)	159—175 (16.2—17.8, 35.6—39.2)/ 37.8 (1.49)	191—216 (19.5—22.0, 42.9—48.4)/ 39.4 (1.55)
Camshaft							
Camlobe height mm (in)	IN		Standard	42.580 (1.6764)	44.116 (1.7368)		48.415 (1.9061)
			Minimum	42.080 (1.6567)	43.616 (1.7172)		47.915 (1.8864)
	EX		Standard	42.580 (1.6764)	44.116 (1.7368)		48.547 (1.9113)
			Minimum	42.080 (1.6567)	43.616 (1.7172)		48.047 (1.8916)
Journal diameter mm (in)	No.1			51.910—51.940 (2.0437—2.0449)			58.410—58.440 (2.2996—2.3008)
	No.2			51.660—51.690 (2.0339—2.0350)			58.160—58.190 (2.2898—2.2909)
	No.3			51.410—51.440 (2.0240—2.0252)			57.910—57.940 (2.2799—2.2811)
	No.4			51.160—51.190 (2.0142—2.0154)			57.660—57.690 (2.2701—2.2713)
Cylinder block camshaft bore diameter mm (in)	No.1			52.000—52.030 (2.0472—2.0484)			58.500—58.530 (2.3031—2.3043)
	No.2			51.750—51.780 (2.0374—2.0386)			58.250—58.280 (2.2933—2.2945)
	No.3			51.500—51.530 (2.0276—2.0287)			58.000—58.030 (2.2835—2.2846)
	No.4			51.250—51.280 (2.0177—2.0189)			57.750—57.780 (2.2736—2.2748)

Item		Engine	HA	SL Non-Turbo	SL Turbo	TF
Camshaft bearing oil clearance mm (in)	Standard		0.06—0.12 (0.0024—0.0047)			
	Maximum		0.145 (0.0057)			
Camshaft runout mm (in)			0.08 (0.0031) max.			
Camshaft end play mm (in)	Standard		0.02—0.18 (0.0008—0.0071)			
	Maximum		0.30 (0.012)			
Rocker arm and rocker arm shaft						
Rocker arm inner diameter mm (in)			15.876—15.896 (0.6250—0.6258)	19.000—19.021 (0.7480—0.7489)	23.000—23.021 (0.9055—0.9063)	21.000—21.021 (0.8268—0.8276)
Rocker arm shaft diameter mm (in)			15.835—15.860 (0.6234—0.6244)	18.959—18.980 (0.7464—0.7472)	22.959—22.980 (0.9039—0.9047)	20.959—20.980 (0.8252—0.8260)
Rocker arm-to-shaft clearance mm (in)	Standard		0.016—0.061 (0.0006—0.0024)	0.020—0.062 (0.0008—0.0024)		
	Maximum		0.07 (0.003)			
Tappet						
Tappet outer diameter mm (in)			14.218—14.233 (0.5598—0.5604)			15.518—15.533 (0.6109—0.6115)
Cylinder block tappet bore diameter mm (in)			14.288—14.319 (0.5625—0.5637)			15.588—15.619 (0.6137—0.6149)
Tappet-to-cylinder block clearance mm (in)	Standard		0.055—0.101 (0.0022—0.0040)			
	Maximum		0.15 (0.006)			
Push rod						
Push rod runout mm (in)			0.40 (0.016) max.			
Cylinder block						
Distortion mm (in)			0.10 (0.004) max. [Longitudinal direction 0.25 (0.010) max.]			
Cylinder liner bore diameter mm (in)	A		98.500—98.526 (3.8779—3.8790)	103.500—103.513 (4.0748—4.0753)		109.000—109.013 (4.2913—4.2918)
	B			103.513—103.525 (4.0753—4.0758)		109.013—109.026 (4.2918—4.2924)
Cylinder liner outer diameter mm (in)	A		98.530—98.580 (3.8791—3.8811)	103.474—103.487 (4.0738—4.0743)		108.974—108.987 (4.2903—4.2908)
	B			103.487—103.500 (4.0743—4.0748)		108.987—109.000 (4.2908—4.2913)
Cylinder block-to-cylinder liner clearance mm (in)			−0.004—−0.080 (−0.0002—−0.0031)	0.013—0.039 (0.0005—0.0015)		
Liner protrusion above cylinder block mm (in)			−0.101—0 (−0.0040—0)	0—0.09 (0—0.0035)		
Cylinder liner inner diameter mm (in)	Y		95.025—95.050 (3.7411—3.7421)	100.013—100.026 (3.9375—3.9380)		105.516—105.533 (4.1542—4.1548)
	Z			100.000—100.013 (3.9371—3.9375)		105.499—105.516 (4.1535—4.1542)
Cylinder liner taper and out-of-round mm (in)			0.03 (0.0012) max.			
Piston						
Piston diameter mm (in) [Measured at 90° to pin bore axis at point H from the bottom of the piston]	Y		94.967—94.993 (3.7389—3.7399) H=22.0 (0.866)	99.950—99.963 (3.9350—3.9355) H=27.0 (1.063)		105.445—105.458 (4.1514—4.1519) H=27.0 (1.063)
	Z			99.937—99.950 (3.9345—3.9350) H=27.0 (1.063)		105.432—105.445 (4.1509—4.1514) H=27.0 (1.063)
Piston-to-cylinder liner clearance mm (in)			0.032—0.083 (0.0013—0.0033)	0.050—0.076 (0.0020—0.0030)		0.058—0.084 (0.0023—0.0033)
Piston pin bore diameter mm (in)			29.996—30.008 (1.1809—1.1814)	33.996—34.008 (1.3384—1.3389)		34.996—35.008 (1.3778—1.3783)
Piston ring						
Thickness mm (in)	Top		2.363—2.383 (0.0930—0.0938)	2.470—2.490 (0.0972—0.0980)		
	Second		2.363—2.383 (0.0930—0.0938)	1.970—1.990 (0.0776—0.0783)		
	Oil		4.743—4.763 (0.1867—0.1875)	4.470—4.490 (0.1760—0.1768)		

Item		Engine	HA	SL		TF
				Non-Turbo	Turbo	
End gap measured in cylinder mm (in)		Top	0.40—0.60 (0.016—0.024)	0.30—0.40 (0.012—0.016)	0.30—0.45 (0.012—0.018)	0.30—0.40 (0.012—0.016)
		Second	0.40—0.60 (0.016—0.024)	0.40—0.55 (0.016—0.022)	0.30—0.50 (0.012—0.020)	0.40—0.55 (0.016—0.022)
		Oil	0.40—0.60 (0.016—0.024)	0.20—0.40 (0.008—0.016)	0.30—0.50 (0.012—0.020)	0.20—0.40 (0.008—0.016)
		Maximum	1.5 (0.059)			
Ring groove width in piston mm (in)		Top	2.433—2.543 (0.0958—0.1001)	2.550—2.570 (0.1004—0.1012)		2.663—2.683 (0.1048—0.1056)
		Second	2.423—2.443 (0.0954—0.0962)	2.030—2.050 (0.0799—0.0807)		
		Oil	4.793—4.813 (0.1887—0.1895)	4.520—4.540 (0.1780—0.1787)		
Piston ring-to-ring land clearance mm (in)		Top	0.05—0.18 (0.0020—0.0071)	0.06—0.10 (0.0024—0.0039)		0.173—0.213 (0.0068—0.0084)
		Second	0.04—0.08 (0.0016—0.0031)			
		Oil	0.03—0.07 (0.0012—0.0028)			
		Maximum	0.30 (0.012)			
Piston pin						
Diameter mm (in)			29.994—30.000 (1.1809—1.1811)	33.993—34.000 (1.3383—1.3386)		34.993—35.000 (1.3777—1.3780)
Connecting rod-to-piston pin clearance mm (in)			0.012—0.039 (0.0005—0.0015)	0.012—0.040 (0.0005—0.0016)		
Piston-to-piston pin clearance mm (in)			−0.004—0.014 (−0.0002—0.0006)	−0.004—0.015 (−0.0002—0.0006)		
Connecting rod						
Length (Center to center) mm (in)			178.000—178.050 (7.0079—7.0098)			183.500—183.550 (7.2244—7.2264)
Bending mm (in)			0.05 (0.0020) max./100 (3.94)	0.10 (0.0039) max./100 (3.94)		
Small end bore (Bush inner diameter) mm (in)			30.012—30.033 (1.1816—1.1824)	34.012—34.033 (1.3391—1.3399)		35.012—35.033 (1.3784—1.3792)
Big end bore mm (in)			64.833—64.846 (2.5525—2.5530)			68.100—68.113 (2.6811—2.6816)
Big end width mm (in)			34.521—34.621 (1.3591—1.3630)			37.000—37.100 (1.4567—1.4606)
Connecting rod side clearance mm (in)		Standard	0.239—0.330 (0.0094—0.0130)	0.239—0.379 (0.0094—0.0149)		0.200—0.400 (0.0079—0.0157)
		Maximum	0.40 (0.016)			0.50 (0.020)
Crankshaft						
Crankshaft runout mm (in)			0.05 (0.0020) max.			
Main journal diameter mm (in)	Standard size		75.805—75.825 (2.9844—2.9852)			No.1, 2, 4, 5: 78.980—79.000 (3.1094—3.1102) No.3: 78.954—78.974 (3.1084—3.1092)
	0.254 (0.0100) undersize		75.551—75.571 (2.9744—2.9752)			No.1, 2, 4, 5: 78.726—78.746 (3.0994—3.1002) No. 3: 78.700—78.720 (3.0984—3.0992)
	0.508 (0.0200) undersize		75.297—75.317 (2.9644—2.9652)			No. 1, 2, 4, 5: 78.472—78.492 (3.0894—3.0902) No.3: 78.446—78.466 (3.0884—3.0892)

Item \ Engine		HA	SL		TF
			Non-Turbo	Turbo	
Main journal diameter mm (in)	0.762 (0.0300) undersize	75.043—75.063 (2.9544—2.9552)			No. 1, 2, 4, 5: 78.218—78.238 (3.0794—3.0802) No. 3: 78.192—78.212 (3.0784—3.0792)
Main journal taper mm (in)		0.006 (0.00024) max.			
Main journal out-of-round mm (in)		0.003 (0.00012) max.			
Crankpin journal diameter mm (in)	Standard size	61.112—61.125 (2.4060—2.4065)			63.987—64.000 (2.5192—2.5197)
	0.254 (0.0100) undersize	60.858—60.871 (2.3960—2.3965)			63.733—63.746 (2.5092—2.5097)
	0.508 (0.0200) undersize	60.604—60.617 (2.3860—2.3865)			63.479—63.492 (2.4992—2.4997)
	0.762 (0.0300) undersize	60.350—60.363 (2.3760—2.3765)			63.225—63.238 (2.4892—2.4897)
Crankpin taper mm (in)		0.006 (0.00024) max.			
Crankpin out-of-round mm (in)		0.003 (0.00012) max.			
Main bearing					
Main journal bearing oil clearance mm (in)	Standard	0.058—0.092 (0.0023—0.0036)			No. 1, 2, 4, 5: 0.058—0.092 (0.0023—0.0036) No. 3: 0.084—0.118 (0.0033—0.0046)
	Maximum	0.12 (0.005)			No.1, 2, 4, 5: 0.12 (0.005) No.3: 0.15 (0.006)
Available undersize bearing mm (in)		0.254 (0.0100), 0.508 (0.0200), 0.762 (0.0300)			
Crankpin bearing					
Crankpin bearing oil clearance mm (in)	Standard	0.038—0.074 (0.0015—0.0029)			0.040—0.076 (0.0016—0.0030)
	Maximum	0.10 (0.004)			
Available undersize bearing mm (in)		0.254 (0.0100), 0.508 (0.0200), 0.762 (0.0300)			
Thrust bearing					
Crankshaft end play mm (in)	Standard	0.14—0.39 (0.0055—0.0154)			
	Maximum	0.40 (0.016)			
Bearing width mm (in)	Standard size	2.275—2.325 (0.0896—0.0915)			
	0.178 (0.0070) oversize	2.453—2.503 (0.0966—0.0985)			
Timing gear					
Timing gear backlash mm (in)	Standard	0.06—0.18 (0.0024—0.0071)			
	Maximum	0.30 (0.012)			
Idler gear end play mm (in)		0.05—0.18 (0.0020—0.0071)			
Idler gear bush inner diameter mm (in)		44.009—44.034 (1.7326—1.7336)			
Idler gear spindle outer diameter mm (in)		43.950—43.975 (1.7303—1.7313)			
Bush-to-spindle clearance mm (in)	Standard	0.034—0.084 (0.0013—0.0033)			
	Maximum	0.15 (0.006)			

D. LUBRICATION SYSTEM

Item \ Engine			HA	SL	TF
Lubrication method			Force-fed		
Oil pump					
Type			Positive displacement gear		
Regulating pressure	kPa (kg/cm², psi)		608—667 (6.2—6.8, 88—97)		—
Oil pressure	kPa (kg/cm², psi)—3,600 rpm		373 (3.8, 54) min.		
Rotor tooth to body clearance	mm (in)	Standard	0.10—0.19 (0.0039—0.0075)		
		Maximum	0.20 (0.0079)		
Side clearance	mm (in)	Standard	0.04—0.09 (0.0016—0.0035)		
		Maximum	0.15 (0.0059)		
Oil filter					
Type			Full-flow, paper element		
Relief pressure differential	kPa (kg/cm², psi)		78—118 (0.8—1.2, 11—17)		
Regulating pressure	kPa (kg/cm², psi)		—		608—667 (6.2—6.8, 88—97)
Oil bypass filter					
Type			Paper element		
Oil cooler					
Type			Water cooled		
Oil pressure switch					
Activation pressure	kPa (kg/cm², psi)		20—39 (0.2—0.4, 2.8—5.7)		
Engine oil					
Capacity	liters (US qt, Imp qt)	Total (dry engine)	8.8 (9.3, 7.7)		9.3 (9.8, 8.2)
		Oil pan	6.5 (6.9, 5.7)		7.0 (7.4, 6.2)
		Oil filter	1.0 (1.06, 0.88)		
		Oil bypass filter	0.6 (0.63, 0.53)		
Grade			API Service CC		
Viscosity number	Above 40°C (104°F)		SAE 40		
	0°C—40°C (32°F—104°F)		SAE 30		
	−10°C—25°C (14°F—77°F)		SAE 20W-20		
	−25°C—30°C (−13°F—86°F)		SAE 10W-30		
	Below −20°C (−4°F)		SAE 5W-30		

E. COOLING SYSTEM

Item \ Engine			HA	SL		TF
				Non-Turbo	Turbo	
Cooling method			Water-cooled, forced circulation			
Water pump						
Type			Centrifugal			
Impeller diameter		mm (in)	80 (3.15)			
Number of impeller blades			6			
Water seal type			Unified mechanical seal			
Thermostat						
Type			Wax			
Start to open		°C (°F)	80.5—83.5 (177—182)			
Full open		°C (°F)	95 (203)			
Lift		mm (in)	8.5 (0.33) min.			
Radiator						
Type			Corrugated fin			
Cap valve opening pressure		kPa (kg/cm², psi)	74—103 (0.75—1.05, 11—15)			
Cooling system checking pressure		kPa (kg/cm², psi)	88 (0.9, 13)			
Cooling fan						
Type			Thermo modulated			
Number of blades			4x2:8, 4x4:10			
Outer diameter		mm (in)	4x2: 410 (16.1), 4x4: 390 (15.4)			420 (16.5)
Coolant						
Capacity	liters (US qt, Imp qt)	With heater core	13.5 (14.3, 11.9)			
		Without heater core	12.5 (13.2, 11.0)			

	Protection	Mixture percentage (volume) %		Specific gravity of mixture at 20°C (68°F)
		Water	Solution	
Antifreeze solution	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

F. FUEL AND EMISSION CONTROL SYSTEM (HA, SL, SL TURBOCHARGED, TF ENGINES)

Item \ Engine		HA	SL	SL Turbocharged	TF
Idle speed	rpm	600—650	620—670	660—710	620—700
Injection pump	Type	VE type	PE-A type		
	Injection timing °BTDC	3	12	13	11
	Cam lift mm	2.2	8		
	Plunger diameter mm (in)	10.0 (0.39)	9.0 (0.35)		9.5 (0.37)
	Delivery valve diameter mm (in)	5.0 (0.195)	6.0 (0.23)		
Injection nozzle	Type	Throttle type	Hole type		
	Injection holes quantity	1	5	4	
	Injection hole diameter mm (in)	1 (0.039)	0.27 (0.011)	0.34 (0.013)	0.31 (0.012)
	Injection pressure kPa (kg/cm², psi)	13.2—13.7 (135—140, 1.92—1.99)	16.7—17.2 (170—175, 2.42—2.49)		19.6—20.1 (200—205, 2.92—2.99)
Fuel tank capacity liters (US gal, Imp gal)		100 (26.4, 22.0), 100 + 70 (26.4 + 18.5, 22.0 + 15.4)			
Fuel filter type		Paper element			
Air cleaner type		Paper element			

G. ENGINE ELECTRICAL SYSTEM (HA, SL, SL TURBOCHARGED, TF ENGINES)

Item \ Engine		HA	SL		TF
			Non-Turbo	Turbo	
Voltage		12V, negative ground			
Battery	Type and capacity (20-hour rate)	55E26R: 60Ah×2			75D26R: 65Ah×2
Alternator	Type	Alternating			
	Output V-A	12-50			
	Regulator type	IC regulator			
Starter	Type	Electromagnetic push-in type			
	Output V-kW	12-2.7			
Glow plug	Type	Sheathed type	—		
	Voltage V	10.5			
	Ampere A	16.5			
Air heater	Voltage V	—	11		
	Capacity A-kW		190-2.1		

H. CLUTCH

Item \ Engine type				HA	SL	SL Turbo	TF
Operation method				Hydraulic			
Clutch pedal	Type			Suspended			
	Pedal ratio			5.6			
	Full stroke		mm (in)	153 (6.02)			
	Height		mm (in)	188—193 (7.40—7.60)			
	Free play		mm (in)	5—11 (0.02—0.11)			
	Disengagement height		mm (in)	65 (2.56)			
Clutch cover	Type			Diaphragm spring			
	Set load		N (kg, lb)	5,248 (535, 1,177)	6,229 (635, 1,397)	7,652 (780, 1,716)	6,377 (650, 1,430)
Clutch disc	Type			Single dry plate			
	Diameter	Outer	mm (in)	260 (10.24)		275 (10.83)	
		Inner	mm (in)	170 (6.69)		180 (7.09)	
	Runout		mm (in)	1.0 (0.04)			
	Wear limit		mm (in)	0.3 (0.01)			
Master cylinder	Inner diameter		mm (in)	15.87 (0.62)			
Release cylinder	Inner diameter		mm (in)	22.22 (0.87)			
Flywheel	Runout		mm (in)	0.2 (0.008)			
Vacuum power assist	Type			Vacuum booster			
	Size		mm (in)	114.3 (4.5)			

J. TRANSMISSION

Item \ Engine type		HA, SL	SL Turbo	TF
Change lever position			Floor shift	
Gear ratio	1st	5.833	5.863	5.478
	2nd	2.855	2.954	3.075
	3rd	1.651	1.661	1.637
	4th	1.000	1.000	1.000
	5th	0.800	0.783	0.794
	Reverse	5.372	5.318	5.197
Sub-transmission gear ratio (If equipped)	Power	—	1.000	1.000
	Economy	—	0.812	0.804
Specified oil			API Service GL-4 or GL-5 SAE 75W-90	
Capacity liters (US qt, Imp qt)		3.5 (3.7, 3.1)	4.2 (4.4, 3.7)... without sub-transmission 4.5 (4.8, 4.0)... with sub-transmission	3.5 (3.7, 3.1)... without sub-transmission 3.3 (3.5, 2.9)... with sub-transmission
Mainshaft				
Runout limit mm (in)		0.035 (0.0014)		
Synchronizer ring				
Clearance between ring and flank surface of gear mm (in)	Standard	1.5 (0.059)		
	Limit	1.0 (0.039)		
Shift fork				
Clearance between fork and sleeve mm (in)	Standard	0.380—0.528 (0.0150—0.0208)		
	Limit	0.8 (0.0315)		
Clearance between fork and change lever mm (in)	Standard	0.2—0.4 (0.0079—0.0157)		
	Limit	0.8 (0.0315)		
Bearing end play				
Mainshaft front		0—0.1 (0—0.004)	0—0.1 (0—0.004)	0—0.1 (0—0.004)
Mainshaft rear		0—0.1 (0—0.004)	0—0.1 (0—0.004)	0—0.1 (0—0.004)
Countershaft front		—	0.005—0.055 (0.0002—0.002)	—
Countershaft rear		0.01—0.05 (0.0004—0.0019)	—	0.01—0.05 (0.0004—0.0019)
Sub-transmission front		—	0—0.1 (0—0.004)	—
Sub-transmission rear		0—0.1 (0—0.004)	—	0—0.1 (0—0.004)

L. PROPELLER SHAFT

Item \ Engine type		HA, SL	SL Turbo, TF
Max. permissible runout	mm (in)	0.5 (0.0197)	
Starting torque of the universal	N·m (cm-kg, in-lb)	0.49—1.37 (5—14, 4.34—12.15)	0.78—1.76 (8—18, 6.94—15.62)
Adjustment snap ring	mm (in)	1.45 (0.057), 1.48 (0.058), 1.50 (0.059), 1.54 (0.061), 1.57 (0.062), 1.60 (0.063), 1.63 (0.064)	2.00 (0.079), 2.03 (0.080), 2.06 (0.081), 2.09 (0.082), 2.12 (0.083), 2.15 (0.085), 2.18 (0.086), 2.21 (0.087), 2.24 (0.088)

M. FRONT AND REAR AXLES

Item \ Engine type					HA	SL	SL Turbo	TF
Front axle								
Wheel bearing preload				N·m (cm-kg, in-lb)	0.11—0.29 (1.1—3.0, 0.95—2.60)			
Clearance between king-pin and bush				mm (in)	0.01—0.04 (0.0004—0.0016)			
Clearance between front axle and steering knuckle				mm (in)	0.20—0.35 (0.008—0.014)			
Kingpin bearing preload				N (kg, lb)	—			
Adjustment shim				mm (in)	0.35 (0.014), 0.5 (0.020), 0.6 (0.024), 0.7 (0.028)			
Rear axle								
Wheel bearing preload				N·m (cm-kg, in-lb)	0.11—0.29 (1.1—3.0, 0.95—2.60)			
Driving and Differential								
Type					Banjo type			
Final gear ratio	10 ft	Std. cab.	Truck	1.5t	5.857	—	—	—
	10 ft	Wide cab.	Truck	2t	—	5.857	—	—
	14 ft	Wide cab.	Truck	3t	—	6.142	—	—
	14 ft	Wide cab.	Truck	4t	—	—	6.571	6.833
	14 ft	Std. cab.	Crew cab.	2.75t	—	6.142	—	—
	14 ft	Wide cab.	Crew cab.	3.5t	—	—	—	6.833
	17 ft	Wide cab.	Truck	4t	—	—	6.571	6.833

Item \ Engine type		HA, SL	SL Turbo, TF
Specified oil		API Service GL-5	
−18°C (0°F) or below		SAE 80W	
−18°C (0°F) or above		SAE 90	
Capacity	liters (US qt, Imp qt)	2.6 (2.7, 2.3)	3.6 (3.8, 3.2)
Pinion height	mm (in)	0 ± 0.025 (0 ± 0.001)	
Adjustment shim	mm (in)	0.10 (0.004), 0.15 (0.006)	
Drive pinion bearing preload	N·m (cm-kg, in-lb)	0.8—1.6 (8—16, 7—14)	2.6—3.4 (27—35, 23—30)
Side bearing preload (Case spread)	mm (in)	279.42—279.50 (11.001—11.004)	289.92—290.000 (11.414—11.417)
Backlash of ring gear and drive pinion mm (in)	Standard	0.25—0.27 (0.0098—0.011)	0.24—0.27 (0.0094—0.011)
	Max. allowable variation	0.11 (0.0043)	

N. STEERING

Item \ Gear type		Manual	Power
Shaft type		Regular type	
Shaft joint type	Non-tilt steering	1-joint	
	Tilt steering	2-joints	
Wheel diameter	mm (in)	430 (16.9)	
Lock to lock turns		3.9 or 4.2	3.9, 4.2 or 4.5
Range of up/down movement (Telescopic steering)	mm (in)	30 (1.18) (At steering wheel center position)	
Amount of tilt	mm (in)	50 (1.97) (At steering wheel center position)	
Free play of steering wheel	mm (in)	0—40 (0—1.57)	
Steering wheel operation force	kg (lb)	25 (55) or less (With wheels and tires on the ground)	4 (8.8) or less (With wheels and tires on the ground)
Steering gear	Type	Ball nut	
	Gear ratio	28—33	22.6
	Backlash mm (in)	0.25 (0.010) (Backlash between worm gear and sector shaft)	
	Worm bearing preload kg (lb)	0.7—1.1 (1.5—2.4)	0.6—0.8 (1.3—1.8)
Oil	Type	API Service GL-4, SAE 90	ATF M2C33F or DEXRON-II
	Capacity liters (US qt, Imp qt)	0.94 (0.99, 0.83)	2.0 (2.11, 1.76)

P. BRAKING SYSTEM

Item			Engine type	HA	SL, SL TURBO	TF
Brake pedal	Type			Suspended		
	Pedal lever ratio			4.5		
	Maximum stroke	mm (in)		149.2 (5.87)		
	Pedal height	mm (in)		226—231 (8.90—9.09)		
	Pedal play	mm (in)		9—11 (0.35—0.43)		
	Pedal-to-floor clearance	mm (in)		50 (1.99) min.		
Master cylinder	Type			Tandem		
	Cylinder inner diameter	mm (in)		26.8 (1.06)		
	Reservoir capacity	cc (cu in)		182 (11.1)		
	Push-rod-to-piston clearance	mm (in)		0 (0)		
Front brake (Drum)	Type			2-leading		
	Wheel cylinder inner diameter	mm (in)		28.5 (1.12)		
	Lining dimension			Refer to next page		
	Lining thickness limit	mm (in)		1.0 (0.04)		
	Drum inner diameter		Standard	Refer to next page		
			Limit	Refer to next page		
	Shoe clearance adjustment			Turn the adjuster in the reverse direction from locked position 5 notches		
Rear brake (Drum)	Type			Dual 2-leading		
	Wheel cylinder inner diameter	mm (in)		25.4 (1.00)		
	Lining dimension			Refer to next page		
	Lining thickness limit	mm (in)		1.0 (0.04)		
	Drum inner diameter		Standard	Refer to next page		
			Limit	Refer to next page		
	Shoe clearance adjustment			Turn the adjuster in the reverse direction from locked position 5 notches		
Power brake unit	Type			Tandem diaphragm		
	Diameter	mm (in)		(a): 188+215 (7.4+8.5) (b): 213+240 (8.4+9.4)		
	Fluid pressure per treading force kPa (kg/cm^2, psi)/N (kg, lb)		Vacuum 0 mmHg	(a): 687 (7.0, 100)/196 (20, 44) (b): 589 (6.0, 85)/196 (20, 44)		
			Vacuum 500 mmHg	(a): 6,180 (63, 896)/196 (20, 44) (b): 6,278 (64, 910)/196 (20, 44)		
Parking brake	Type			Center brake		
	Operating type			Stick type		
	Lever ratio			5.125		
	Lever stroke		Maximum	20 notches		
			When pulled at 294 N (30 kg, 66 lb)	7—13 notches		
	Lining dimensions (Length x width x thickness)	mm (in)		190.6 x 35.0 x 3.6 (7.5 x 1.38 x 0.14)		
	Lining thickness limit	mm (in)		1.0 (0.04)		
	Drum inner diameter	mm (in)	Standard	190 (7.48)		
			Limit	191 (7.52)		
	Shoe clearance adjustment			Turn the adjuster in the reverse direction from locked position 6—7 notches		
Auxiliary brake system				—	Exhaust brake system	
Rear braking force control device				*Load-sensing G-valve (LSGV)		
Brake fluid				FMVSS 116: DOT 3, SAE: J1703		

(a): Payload 1,500 kg and 2,000 kg
(b): Except payload 1,500 kg and 2,000 kg

Lining and Drum Dimensions

Engine	Body type	Rear wheel	Front brake: Lining dimensions mm (in) (Length x width x thickness)	Front brake: Drum inner diameter mm (in) Std.	Front brake: Drum inner diameter mm (in) Limit	Rear brake: Lining dimensions mm (in) (Length x width x thickness)	Rear brake: Drum inner diameter mm (in) Std.	Rear brake: Drum inner diameter mm (in) Limit
HA	10 feet cargo deck	Single	293.1x60x6.6 (11.53x2.36x0.26)	300 (11.81)	301 (11.85)	229.3x75.0x6.0 (9.02x2.95x0.24)	228.6 (9.00)	229.6 (9.04)
SL	10 feet cargo deck	Dual	307.0x75.0x8.0 (12.09x2.95x0.31)	320 (12.60)	321 (12.64)	304.0x75.0x8.0 (12.09x2.95x0.31)	320 (12.60)	321 (12.64)
SL	14 feet cargo deck	Dual	307.0x90.0x8.0 (12.09x3.54x0.31)	320 (12.60)	321 (12.64)	307.0x90.0x8.0 (12.09x3.54x0.31)	320 (12.60)	321 (12.64)
SL TURBO / TF	14 and 17 feet cargo deck	Dual	334.9x110.0x10.5 (13.18x4.33x0.41)	320 (12.60)	321 (12.64)	334.9x110.0x10.5 (13.18x4.33x0.41)	320 (12.60)	321 (12.64)

Q. WHEELS AND TIRES

Single tire

Specifications		Wheel: Size	Wheel: Offset mm (in)	Wheel: Diameter of pitch circle mm (in)	Tire: Size	Tire: Tire pressure kPa (kg/cm², psi)
3.0L	Front	5.50Fx15	30 (1.181)	184.15 (7.25)	7.00—15—10	392 (4.00, 55)
	Rear					417 (4.25, 60)

Dual tires

Specifications				Wheel: Size	Wheel: Offset mm (in)	Wheel: Diameter of pitch circle mm (in)	Tire: Size	Tire: Tire pressure kPa (kg/cm², psi)
2,000 kg	3.5L		Front	4.50Ex16	108 (4.252)	203.2 (8)	6.50—16—10	491 (5.00, 71)
				5.50Fx16	115 (4.528)		6.50R16—10	540 (5.50, 78)
			Rear	4.50Ex16	108 (4.252)		6.50—16—8	417 (4.25, 60)
							6.50—16—10	441 (4.50, 64)
				5.50Fx16	115 (4.528)		6.50R16—10	491 (5.00, 71)
2,750 kg	3.5L		Front	5.50Fx16	115 (4.528)	203.2 (8)	7.00—16—10	466 (4.75, 68)
							7.00—16—12	466 (4.75, 68)
							7.00R16—10	441 (4.50, 64)
			Rear				7.00—16—10	491 (5.00, 71)
							7.00—16—12	515 (5.25, 75)
							7.00R16—10	540 (5.50, 78)
3,000 kg	3.5L		Front	5.50Fx16	115 (4.528)	203.2 (8)	7.00—16—10	515 (5.25, 75)
							7.00—16—12	540 (5.50, 78)
							7.00R16—10	515 (5.25, 75)
			Rear				7.00—16—10	491 (5.00, 71)
							7.00—16—12	515 (5.25, 75)
							7.00R16—10	515 (5.25, 75)
3,500 kg	4.0L		Front	6.00GSx16	127 (5)	222.25 (8.75)	7.50—16—12	441 (4.50, 64)
							7.50R16—12	441 (4.50, 64)
			Rear				7.50—16—12	540 (5.50, 78)
							7.50R16—12	589 (6.00, 85)
4,000 kg	3.5L 4.0L	14 feet body	Front Rear	6.00GSx16	127 (5)	222.25 (8.75)	7.50—16—12	564 (5.75, 82)
							7.50R16—12	638 (6.50, 93)
	3.5L 4.0L	17 feet body	Front Rear	6.00GSx16	127 (5)	222.25 (8.75)	7.50—16—10	515 (5.25, 75)
							7.50—16—12	564 (5.75, 82)
							7.50R16—12	638 (6.50, 93)

Wheels and Tires

Item			Specifications
Wheel runout	Horizontal	mm (in)	3.0 (0.120) max.
	Vertical	mm (in)	2.5 (0.098) max.
Maximum unbalance (at rim edge)		g (oz)	30 (1.06)
Remaining tread limit	Ordinary tires	mm (in)	1.6 (0.063)
	Snow tires		50% of tread

R. SUSPENSION

Item		Specifications
Front Suspension		
Suspension type		Leaf spring
Spring	Type	Semielliptic leaf spring
	Dimension	See next page
Shock absorber type		Cylindrical double-acting
Rear Suspension		
Suspension type		Leaf spring
Spring	Type	Semielliptic leaf spring
	Dimension	See next page
Shock absorber type		Cylindrical double-acting

Wheel Alignment (*[1]Unladen condition)

Item / Body		Truck	Truck and Crew cab
Cargo deck		10 feet	14, 17 feet
Cabin type		Standard cabin	Wide cabin
Front wheel alignment			
Total toe-in	mm (in)	0—3 (0—0.12)	←
	degree	0°—0.3°	←
Camber		0°40' ± 30'	←
Caster		2°30' ± 20'	←
King-pin angle		7°00'	←
Maximum steering angle	Inner	38° ± 2°	42° ± 2°
	Outer	29° ± 2°	31° ± 2°
Rear wheel alignment			
Total toe-in	mm (in)	0 (0)	←
	degree	0°00'	←
Camber		0°00'	←

*[1] Fuel tank full, radiator coolant and engine oil at specified level, and spare tire, jack and tools in designated position

Leaf Spring Dimensions (Refer to page R–6 for Spring Applications)

Front leaf spring

	Front spring dimensions Length x Width x Thickness mm (in)			Front spring dimensions Length x Width x Thickness mm (in)	
A	1,367 x 70 x 7	(53.8 x 2.8 x 0.28)	C	1,367 x 70 x 7	(53.8 x 2.8 x 0.28)
	1,145 x 70 x 7	(45.1 x 2.8 x 0.28)		1,146 x 70 x 8	(45.1 x 2.8 x 0.31)
	860 x 70 x 8	(33.9 x 2.8 x 0.31)		1,090 x 70 x 8	(42.9 x 2.8 x 0.31)
	690 x 70 x 8	(27.2 x 2.8 x 0.31)		784 x 70 x 8	(30.9 x 2.8 x 0.31)
	520 x 70 x 8	(20.5 x 2.8 x 0.31)		584 x 70 x 8	(23.0 x 2.8 x 0.31)
	340 x 70 x 8	(13.4 x 2.8 x 0.31)		384 x 70 x 8	(15.1 x 2.8 x 0.31)
	200 x 70 x 7	(7.9 x 2.8 x 0.28)		208 x 70 x 8	(8.2 x 2.8 x 0.31)
B	1,367 x 70 x 7	(53.8 x 2.8 x 0.28)	D	1,374 x 70 x 8	(54.1 x 2.8 x 0.31)
	1,156 x 70 x 8	(45.5 x 2.8 x 0.31)		1,150 x 70 x 8	(45.3 x 2.8 x 0.31)
	784 x 70 x 8	(30.9 x 2.8 x 0.31)		818 x 70 x 8	(32.2 x 2.8 x 0.31)
	584 x 70 x 8	(23.0 x 2.8 x 0.31)		668 x 70 x 8	(26.3 x 2.8 x 0.31)
	384 x 70 x 8	(15.1 x 2.8 x 0.31)		518 x 70 x 8	(20.4 x 2.8 x 0.31)
	208 x 70 x 8	(8.2 x 2.8 x 0.31)		368 x 70 x 8	(14.5 x 2.8 x 0.31)
				260 x 70 x 7	(10.2 x 2.8 x 0.28)
				160 x 70 x 7	(6.3 x 2.8 x 0.28)

Rear leaf spring

	Rear spring dimensions: Length x Width x Thickness mm (in)			
	Main		Auxiliary	
E	1,498 x 70 x 9	(59.0 x 2.8 x 0.35)	—	
	1,246 x 70 x 9	(49.1 x 2.8 x 0.35)		
	970 x 70 x 9	(38.2 x 2.8 x 0.35)		
	830 x 70 x 10	(32.7 x 2.8 x 0.39)		
	700 x 70 x 10	(27.6 x 2.8 x 0.39)		
	570 x 70 x 11	(22.4 x 2.8 x 0.43)		
	410 x 70 x 11	(16.1 x 2.8 x 0.43)		
	260 x 70 x 11	(10.2 x 2.8 x 0.43)		
F	1,506 x 70 x 10	(59.3 x 2.8 x 0.39)	950 x 70 x 12	(37.4 x 2.8 x 0.47)
	1,248 x 70 x 10	(49.1 x 2.8 x 0.39)	900 x 70 x 12	(35.4 x 2.8 x 0.47)
	880 x 70 x 10	(34.6 x 2.8 x 0.39)	900 x 70 x 12	(35.4 x 2.8 x 0.47)
	660 x 70 x 11	(26.0 x 2.8 x 0.43)	850 x 70 x 13	(33.5 x 2.8 x 0.51)
	380 x 70 x 11	(15.0 x 2.8 x 0.43)		
G	1,506 x 70 x 10	(59.3 x 2.8 x 0.39)		
	1,253 x 70 x 10	(49.3 x 2.8 x 0.39)	950 x 70 x 12	(37.4 x 2.8 x 0.47)
	880 x 70 x 10	(34.6 x 2.8 x 0.39)	900 x 70 x 12	(35.4 x 2.8 x 0.47)
	660 x 70 x 11	(26.0 x 2.8 x 0.43)	850 x 70 x 13	(33.5 x 2.8 x 0.51)
	380 x 70 x 11	(15.0 x 2.8 x 0.43)		
H	1,506 x 70 x 10	(59.3 x 2.8 x 0.39)	950 x 70 x 12	(37.4 x 2.8 x 0.47)
	1,253 x 70 x 10	(49.3 x 2.8 x 0.39)	900 x 70 x 12	(35.4 x 2.8 x 0.47)
	880 x 70 x 10	(34.6 x 2.8 x 0.39)	900 x 70 x 12	(35.4 x 2.8 x 0.47)
	660 x 70 x 11	(26.0 x 2.8 x 0.43)	850 x 70 x 13	(33.5 x 2.8 x 0.51)
	380 x 70 x 11	(15.0 x 2.8 x 0.43)		
I	1,506 x 70 x 10	(59.3 x 2.8 x 0.39)		
	1,248 x 70 x 10	(49.1 x 2.8 x 0.39)	950 x 70 x 13	(37.4 x 2.8 x 0.51)
	940 x 70 x 10	(37.0 x 2.8 x 0.39)	900 x 70 x 13	(35.4 x 2.8 x 0.51)
	760 x 70 x 11	(30.0 x 2.8 x 0.43)	900 x 70 x 13	(35.4 x 2.8 x 0.51)
	520 x 70 x 11	(20.5 x 2.8 x 0.43)	850 x 70 x 13	(33.5 x 2.8 x 0.51)
	300 x 70 x 11	(11.8 x 2.8 x 0.43)		

S. BODY

Item \ Cabin type		Standard	Wide
Tilt lock			
Clearance between main hook and eye bolt	mm (in)	5 (0.20) min.	
Clearance between safety hook and striker	mm (in)	Approx. 22.0 (0.87)	Approx. 27.0 (1.06)
Cabin mount			
Clearance between wedge and cabin mount bracket	mm (in)	26.4 ± 1.0 (1.04 ± 0.04)	43.0 ± 1.0 (1.69 ± 0.04)

T. BODY ELECTRICAL SYSTEM

Item		Specification (W)		
		RHD	AUSTRALIA	SINGAPORE
		12V	12V	12V
Headlights	Outside	40/60	45/60	40/60
	Inside	50	45	50
Turn signal lights	Front	21		
	Rear	21	21	27
Tail lights		5	5	8
License plate lights		7.5		
Stoplights		21	21	27
Back-up lights		21	21	23
Interior lights		10		
Fog lights (If equipped)		35		
Indicator and warning lights				
Hazard		1.4 x 2		
Turn signals		1.4 x 2		
High beam		3.4		
Rear		2		
Brake		1.4		
Econo		1.4		
Glow		1.4		
Charge		2		
Oil		1.4		
Sediment		2		
Vac		1.4		
Exhaust brake		1.4		

SPECIAL TOOLS

GENERAL INFORMATION ..... ST- 2
ENGINE ..... ST- 3
CLUTCH AND TRANSMISSION ..... ST- 5
DIFFERENTIAL ..... ST- 6
FRONT AND REAR AXLES ..... ST- 8
BRAKING SYSTEM ..... ST- 8
STEERING AND SUSPENSION ..... ST- 8
CHECKER AND OTHER EQUIPMENT ST-10

9TFSTX-001

GENERAL INFORMATION

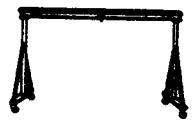
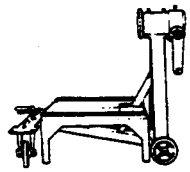
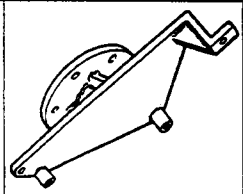
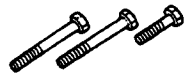
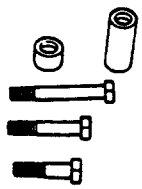
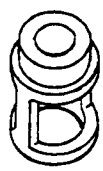
The letters A and B in the priority column indicate the degree of importance of each tool.
A.....Indispensable
The tools ranked A in this list are indispensable for performing operations satisfactorily, easily, safely, and efficiently. It is, therefore advisable that all service shops have these tools.
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.

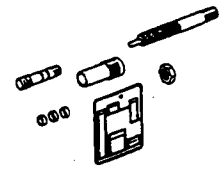
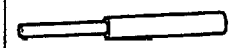
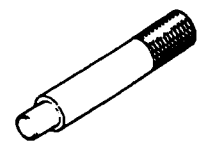
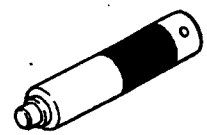
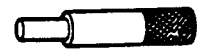
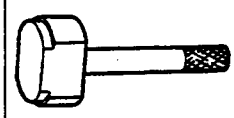
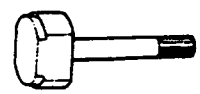
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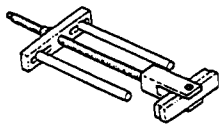
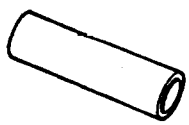
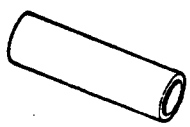
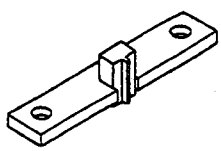
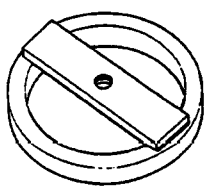
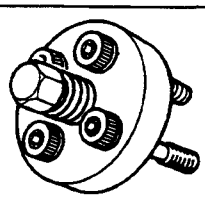
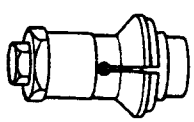
- **When ordering tool sets that consist of several tools, check the List in the Parts Catalogue to make sure that some tools are not duplicated in other sets you may already have. If they are, instead of ordering the set, order only those new tools that are needed.**

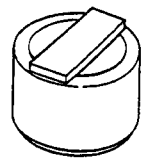
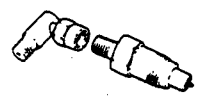
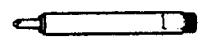
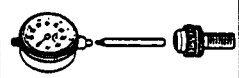
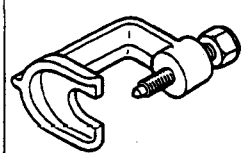
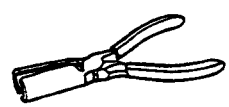
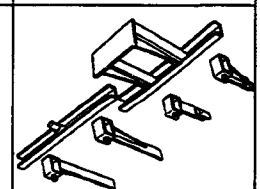
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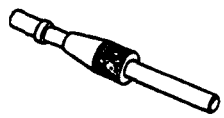
ENGINE (HA, SL, TF, AM)

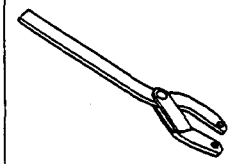
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0727 000 Engine crane	B	
49 0636 000B Transmission lifter	B	
49 0107 680A Engine stand	A	
49 0636 007 Body	A	
49 V101 009 Bolt (HA)	A	
49 W065 006 Attachment set (SL, TF)	A	
49 0636 100A Arm, valve spring lifter	A	
49 0107 222A Pivot	A	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 L012 0A0 Installer set, valve seal & valve guide	A	
49 0636 165A Remover & installer, valve guide (HA)	A	
49 0107 451A Remover & installer, valve guide (SL, TF)	A	
49 0223 061 Remover & installer, piston pin (HA)	B	
49 B043 002 Installer, bearing (SL)	B	
49 0636 040 Piston pin installer (TF)	B	
49 1363 015 Replacer, cylinder liner (HA)	A	
49 W065 015 Replacer, cylinder liner (SL)	A	

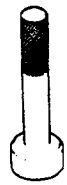
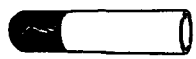
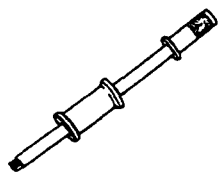
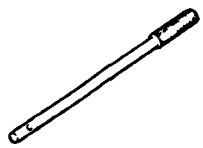
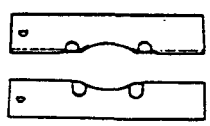
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W010 1A0 Remover set, cylinder liner (TF)	A	
49 V101 060A Brake, ring gear (HA, SL)	A	
49 S501 062 Collar (HA)	A	
49 W065 062 Collar (SL)	A	
49 W011 103 Brake, ring gear (TF)	A	
49 W011 101 Installer, oil seal (TF)	A	
49 SE01 157 Extractor (HA)	A	
49 0559 210 Oil seal installer and centering tool (HA)	A	

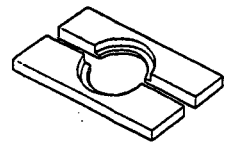
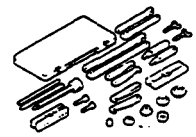
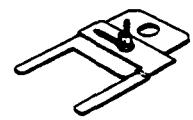
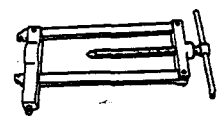
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W011 102 Installer, oil seal (TF)	A	
49 1456 010 Adapter set, compression gauge (HA)	A	
49 W065 010 Adapter, compression gauge (SL, TF)	A	
49 9140 074 Cam lift, measuring device (HA)	A	
49 9200 145 Radiator cap tester adapter set	A	
49 0727 575 Puller, socket joint	B	
49 S120 170 Remover, valve seal	A	
49 W017 3A0 Supporter set	B	

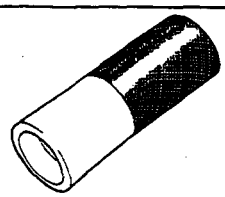
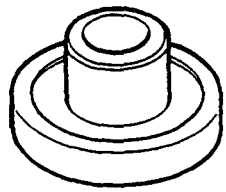
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 SE01 310 Centering tool, clutch disc	A	
49 G030 797 Handle (TF)	A	

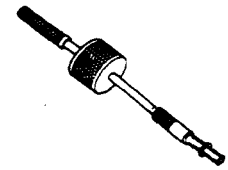
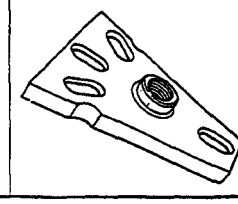
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 S120 710 Holder, coupling frange	A	
—	—	—

CLUTCH AND TRANSMISSION

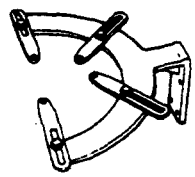
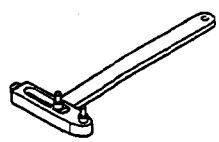
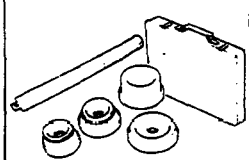
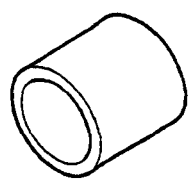
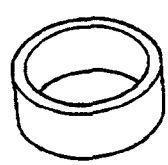
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0600 330 Installer, bearing	A	
49 0727 415 Installer, main shaft front & rear bearing	A	
49 0223 630B Puller, hear axle shaft	B	
49 0862 350 Guide, shift fork assy	A	
49 F026 103 Puller, wheel hub	A	

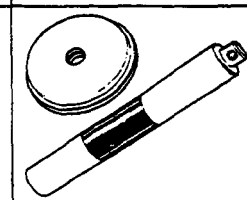
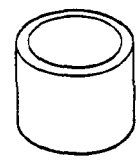
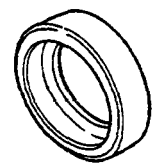
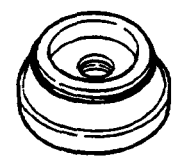
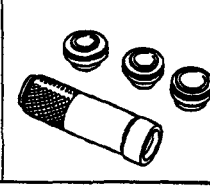
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W017 101 Remover, clutch hub	A	
49 0839 425C Puller set, bearing	A	
49 W501 445 Holder, synchronizer ring	B	
49 0600 620B Puller, main drive shaft bearing	A	
49 0500 330 Installer, transmission bearing	A	

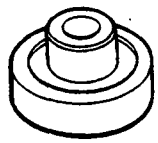
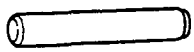
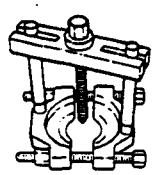
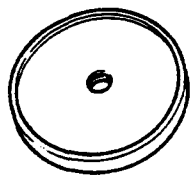
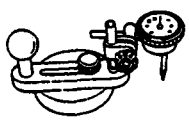
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 F015 002 Installer, water seal	A	
49 H025 001 Bearing, installer	A	

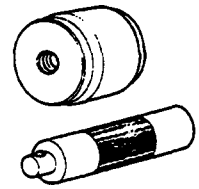
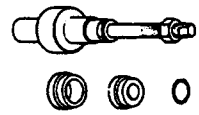
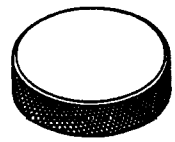
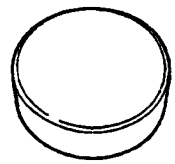
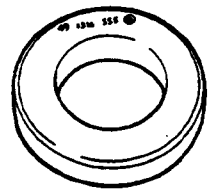
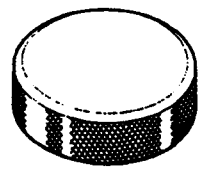
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 1285 071 Puller, bearing	A	
49 8501 631A Attachment, rear shaft puller	B	

DIFFERENTIAL

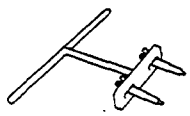
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 M005 561 Hanger, differential carrier	A	
49 0259 720 Wrench, side bearing adjust nut	B	
49 F027 0A1 Installer set, bearing	A	
49 U027 003 Installer, oil seal (W type)	A	
49 S231 626 Suppoet block (Y type)	A	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W033 1A0 Installer set, bearing	A	
49 W027 003 Installer, bearing (Y type)	A	
49 G033 107 Installer, dust cover	B	
49 F027 007 Attachment ϕ72 (W type)	A	
49 F401 330B Installer set, bearing	A	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 H033 101 Remover, bearing (W type)	A	
49 0552 087 Installer, camshaft bush (W type)	A	
49 G030 795 Installer, oil seal	A	
49 0710 520 Puller, bearing	A	
49 W003 105 Installer, oil seal (Y type)	A	
49 0727 570 Gauge body, pinion height adjust	A	

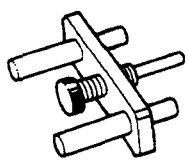
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W027 0A0 Installer set, oil seal (W type)	A	
49 1363 565 Pinion model	A	
49 0305 555 Gauge block (W type)	A	
49 W027 004 Gauge block (W type)	A	
49 1316 555 Gauge block (Y type)	A	
49 Y001 555 Gauge block (Y type)	A	

FRONT AND REAR AXLES

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W033 106 Wrench, locknut	A	
49 1316 600 Guide, king pin	A	

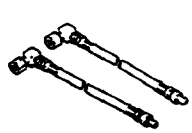
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 1316 610 Puller & installer, king pin bush	A	
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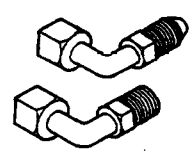
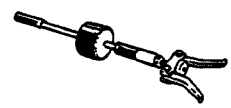
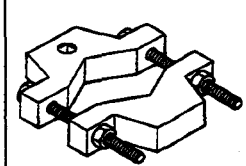
BRAKING SYSTEM

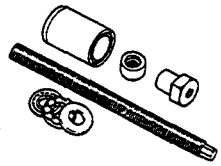
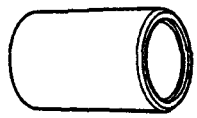
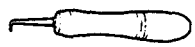
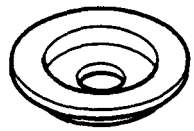
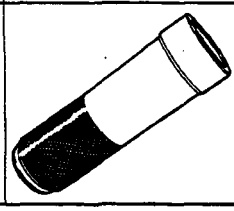
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 F043 001 Adjust gauge	A	

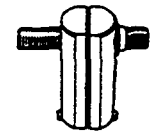
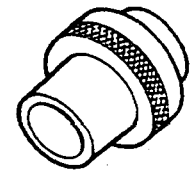
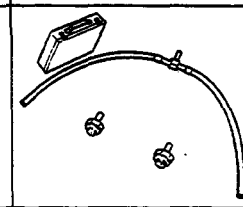
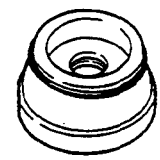
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0259 770B Wrench, flare nut	A	

STEERING AND SUSPENSION

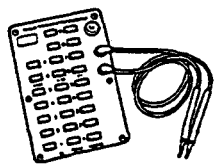
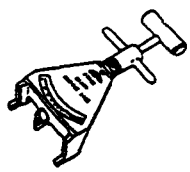
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0180 510B Attachment, preload measuring	B	
49 1232 670A Gauge set, power steering	A	
49 H002 671 Adapter	A	

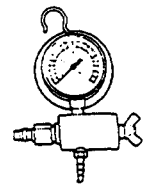
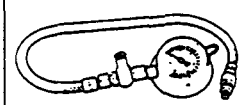
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W032 302 Adapter	A	
49 W032 2A0 Remover set, bearing	A	
49 F017 1A0 Universal wrench	A	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W038 0A0 Replacer set, rubber bush	A	
49 W023 785 Installer, dust boot	A	
49 0208 701A Boot air out tool	B	
49 0559 605A Adapter, caster camber gauge	A	
49 H032 327 Installer, bearing and oil seal	A	
49 F401 331 Body	A	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W023 585A Adjust wrench	A	
49 FT01 361 Remover bearing	A	
49 H025 003 Bearing installer	A	
49 G032 3A1 Joint hose	A	
49 G032 316 Adapter	A	
49 F027 005 Attachment for bearing ϕ62	A	

TESTER AND OTHERS

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0259 866 Inserting tool, window glass	B	
49 0839 285 Checker, fuel and thermometor	A	
49 9200 020 Tension gauge, V-ribbed belt	B	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 H080 740 Pressure tester	A	
49 0187 280 Gauge, oil pressure	B	
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For HA

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For SL, SL Turbo, TF

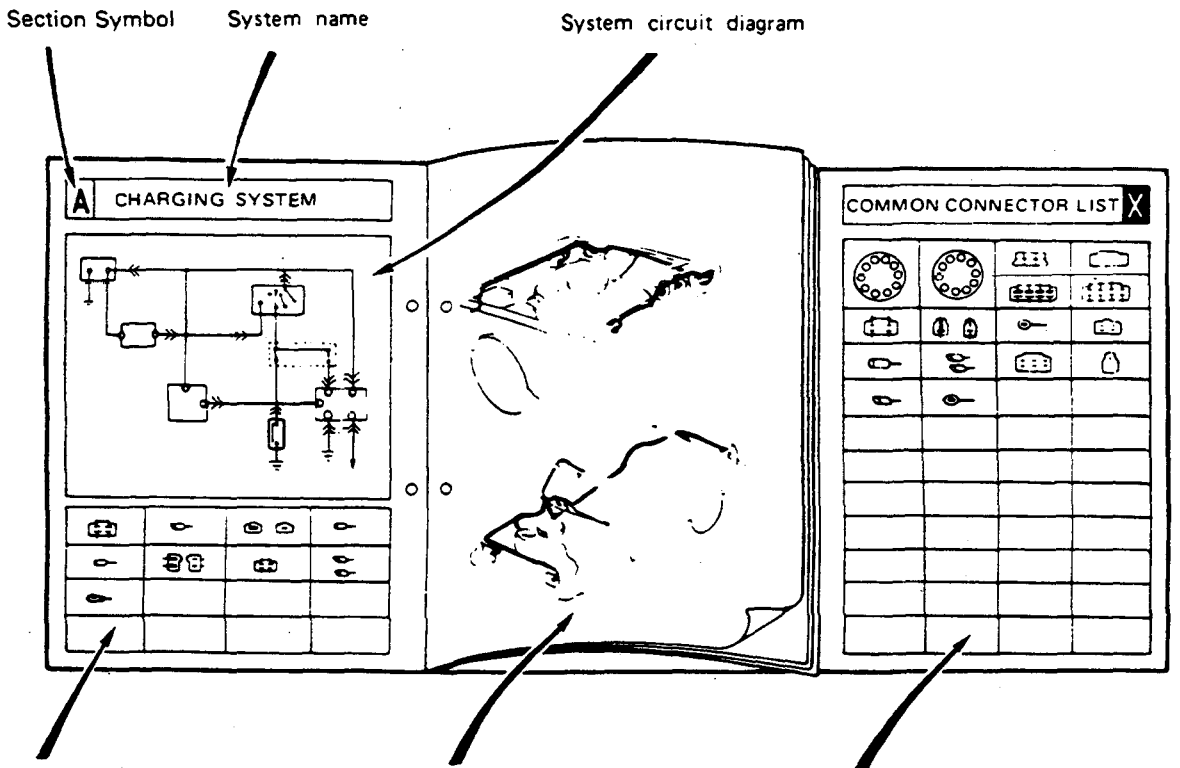
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HOW TO USE THIS WIRING DIAGRAM

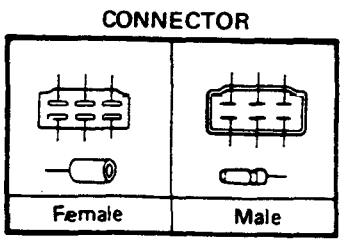
The complete electrical system is divided into charging system, ignition system, etc.

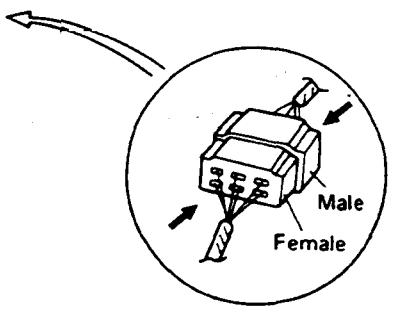
Each system is shown on both the right and left pages as described below.

When reading the wiring diagram, the following should be noted:



- Connector diagram identifies the exclusive applicable connectors for the circuit.
- Right page illustrates the actual location of each connector and the routing diagram of the harness.
- The last page, "Section X", illustrates common connectors related to each system.



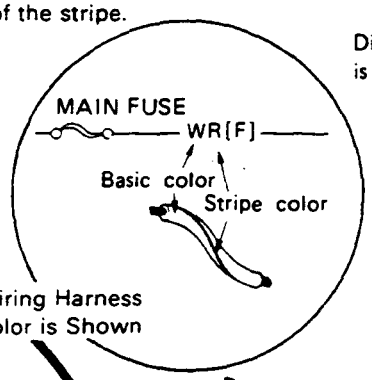


View of connector

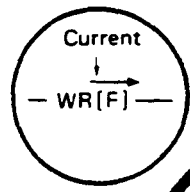
WIRING COLOR CODE

Wiring color code is indicated with alphabetical letter(s). The first letter indicates the basic color of the wire, and second letter (if any) indicates the color of the stripe.

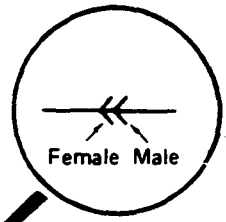
CODE	COLOR	CODE	COLOR
B	Black	LG	Light green
BR	Brown	O	Orange
G	Green	R	Red
L	Blue	Y	Yellow
LB	Light blue	W	White



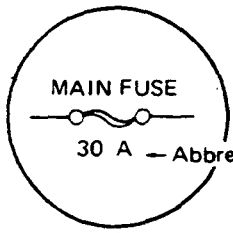
Direction of current is shown by the arrow

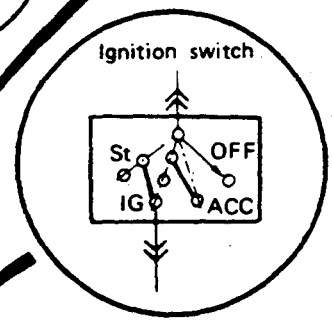


CONNECTOR

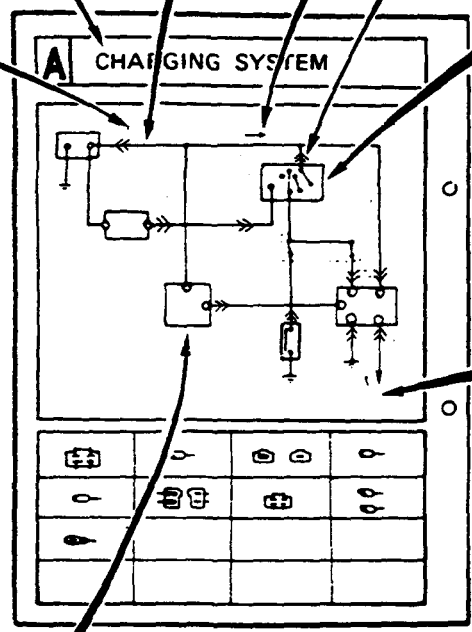


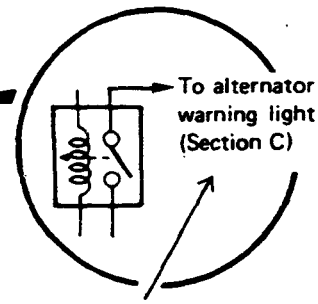
The same main fuse and fuses are indicated on each page.





Circuit is shown with the ignition switch off.

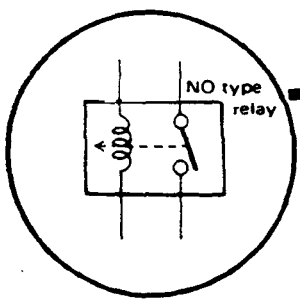




Legend in the parenthesis ( ) indicates the reference section.

ABBREVIATIONS USED IN THIS BOOKLET

Abbr.	Term	Abbr.	Term
St	Start	A	Ampere
IGN	Ignition	W	Watt
ACC	Accessory	R	Resistance
AS	Auto stop	Tr	Transistor
INT	Intermittent	M	Motor
Lo	low	SW	Switch
Mi	Middle	Sq	Square per millimeter
Hi	High		
RH	Right hand	EC-AT	Electrically Automatic transaxle
LH	Left hand		
FR	Front right	MT	Manual transaxle
FL	Front left		
RR	Rear right	NO	Normal opened
RL	Rear left	NC	Normal coised
V	Volt	A/C	Air Conditioner
P/S	Power Steering	AT	Automatic Transaxle



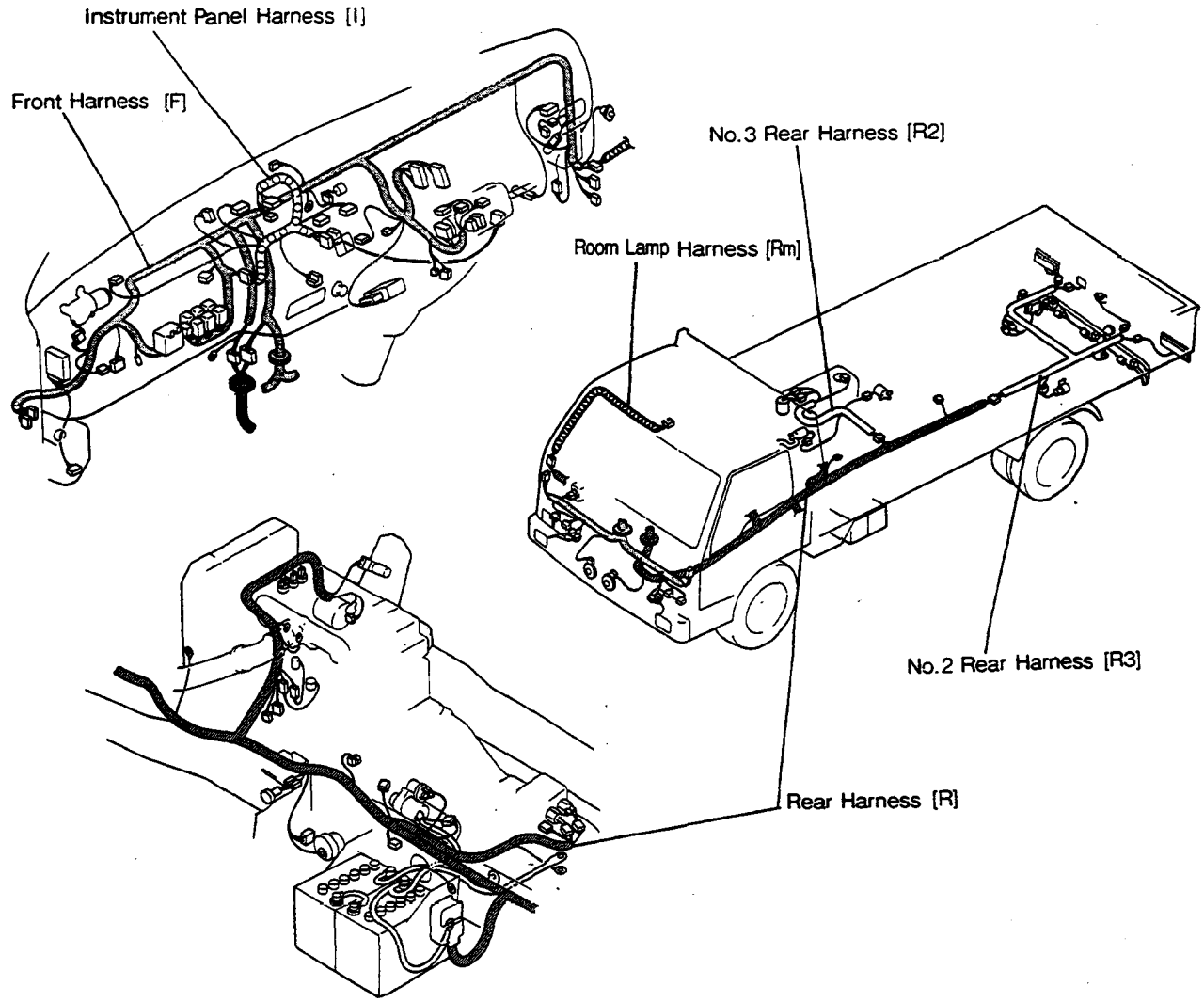
The relays and switches are identified as NC (normal closed), or NO (normal opened), to indicate their normal position when they are not in operation.

	Relay		Switch	
	NO type relay	NC type relay	NO switch	NC switch
Not in operation	Stop	Flow	Stop	Flow
In operation	Flow	Stop	Flow	Stop

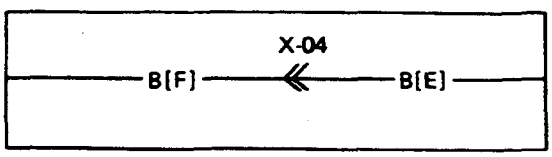
HARNESS SYMBOLS

Each harness is distinguished by a symbol to indicate which harness it is.

DESCRIPTION OF HARNESS	SYMBOLS	DESCRIPTION OF HARNESS	SYMBOLS
Front Harness	[F]	No.3 Rear Harness	[R3]
Instrument Panel Harness	[I]		
Rear Harness	[R]		
Room Lamp Harness	[Rm]		
No.2 Rear Harness	[R2]		



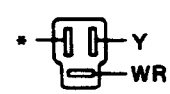
EXAMPLE OF CIRCUIT DIAGRAM



- It is seen from the above that the male-side black line of the X-04 shows the engine harness and the female-side black line shows the front harness.
- It is seen from the above that the X-04 connector is a connector connecting the engine and the front harness.

EXAMPLE OF CONNECTOR

C-03 Fuel Tank Unit [R]

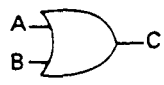
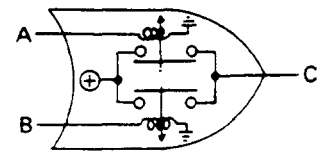
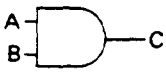
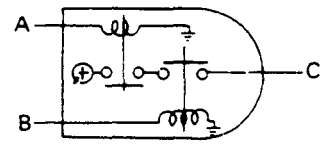
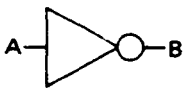
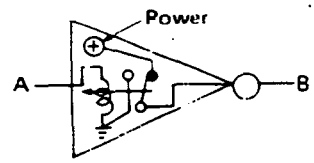
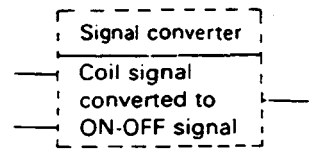


- This sign(*) means "empty"—Not used.
- It is seen from the above that this connector (C-03) is in the rear harness.

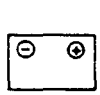
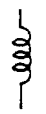
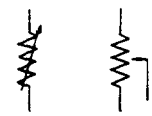
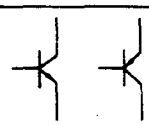
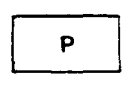
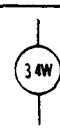
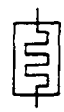
SYMBOLS IN THIS WIRING DIAGRAM

LOGICAL SYMBOLS

The logical symbols are of four kinds: OR, AND, INV (Inverter), PROCESS.
The circuit operation can be easily read by understanding these symbols.

OR 	In case of input to either A or B, an output comes out from C. When A and B are OFF (0V), C is OFF (0V). When either A or B is ON (12V), C is ON (12V). This is shown in the relay circuit on the right.	
AND 	In case of input to both A and B, an output comes out from C. When A and B are ON (12V), C is ON (12V). When either A or B is OFF (0V), C is OFF (0V). This is shown in the relay circuit on the right.	
INV. (Inverter) 	In case of input to A, B is grounded. When A is OFF (0V), B is ON (12V). When A is ON (12V), B is OFF (0V). This is shown in the relay circuit on the right.	
	PROCESS makes a simplified representation of complicated functions of the circuit. Functions mainly used: 1. Detection of signals 2. Conversion of signals The process of the full transistor ignition control unit is as shown at the right.	

GRAPHIC SYMBOLS

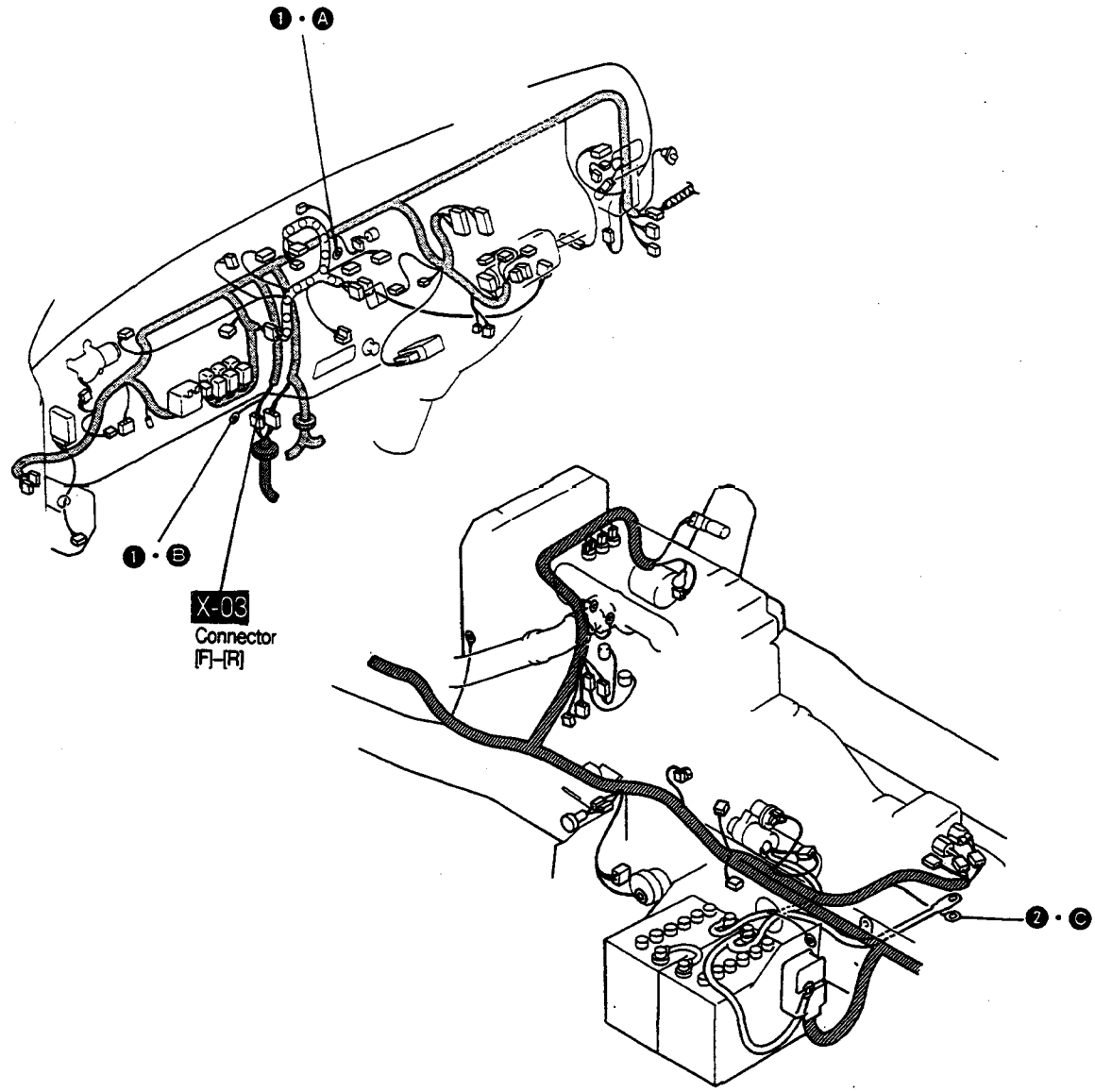
				
Battery	Ground	Fuse	Main Fuse	Motor
				
Coil solenoid	Resistance	Variable resistance	Thermister	Diode
				
Condenser	Transistor	Pump	Lamp	Horn
				
Speaker	Cigarette lighter	Heater	Illuminated Diode	Zener Diode

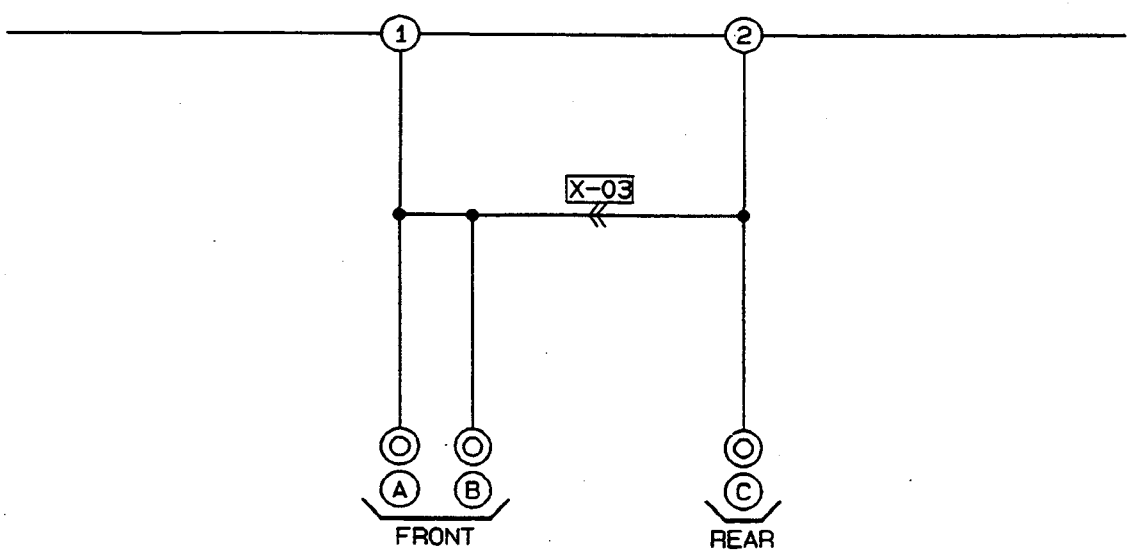
PARTS INDEX PI

PARTS NAME	SECTION
Ⓐ Accelerator Switch	B-2
Air Heater Control Unit	B-2
Air Heater	B-2
Air Heater Relay	B-2
Alternator With Regulator	A
Auto Clock	H
Ⓑ Back Horn	F
Back-up Light Switch	F
Back-up Light	F
Battery	A-H
Blower motor	G
Brake Fluid Level Switch	C
Ⓒ Cancel Relay	B-2
Cigarette Lighter	H
Clutch Switch	B-2
Condenser	F
Combination Meter	C
Combination Switch	E, F
Coolant Level Sensor	C
Coolant Level Unit	C
Ⓓ Door Switch	H
Ⓔ Engine Switch	A-H
Exhaust Brake Switch	B-2
Exhaust Heating Switch	B-2
Exhaust Heating Control Unit	B-2
Ⓕ Fan Switch	G
Flasher Unit	F
Fog Light Switch	E
Front Turn Light	F
Fuel Cut Solnoid Valve	B-1
Fuel Tank Gauge Unit	C
Fusible Link	A
Ⓖ Glow Plug Relay	B-2
Glow Plug	B-2
Ⓗ Headlight	E
Horn Relay	F
Horn Switch	F
Horn	F
Ⓘ Illumination Lamps	E
Heater Control Illum.	
Meter Illumi.	
Radio Illumi.	
Intermittent Wiper Relay	D
Ⓛ License Light	E
Ⓜ Magnetic Valve	B-2
Main Fuse	A-H

PARTS NAME	SECTION
Ⓝ Neutral Switch	A, B-2
Ⓞ Oil Bypass Switch	C
Oil Level Sensor	C
Oil Pressure Switch	C
Ⓟ P/E Select Switch	C
PTO Switch	C
Parking Brake Switch	C
Pick Up Sensor	C
Position Light	E
Ⓠ QSS Control Unit	B-1
Ⓡ Radio	H
Rear Turn Light	F
Resister Assembly	G
Room Lamp	H
Ⓢ Sedimentor Level Sensor	C
Solenoid Valve	B-2
Speaker	H
Starting Motor	A
Stop Light Checker Relay	F
Stop Light Switch	F
Stop Light	F
Sub Mission Switch	C
Sub Starting Switch	A
Ⓣ Tail Light	E
Ⓥ Vacuum Switch	C
Ⓦ Washer Motor	D
Water Thermo switch	B-1
Water Thermo Sensor	B-2, C
Wiper & Washer Switch	D
Wiper Motor	D

JC | ■ GROUND CIRCUIT

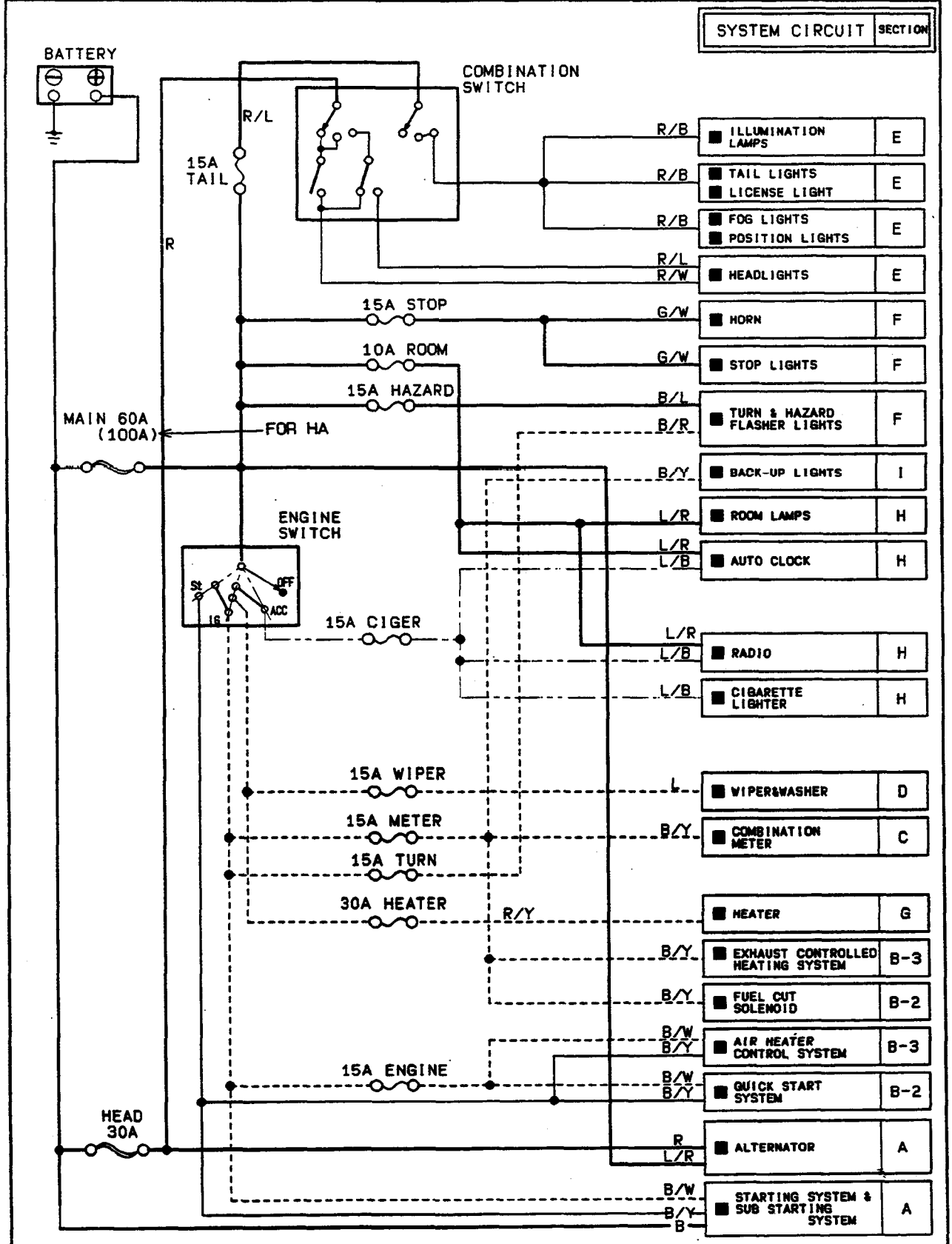




W

■ ELECTRICAL WIRING SCHEMATIC

Note: ——— Current from Battery
– – – Current from IG Terminal of Ignition Switch
–·–·– Current from ACC Terminal of Ignition Switch
——— Others

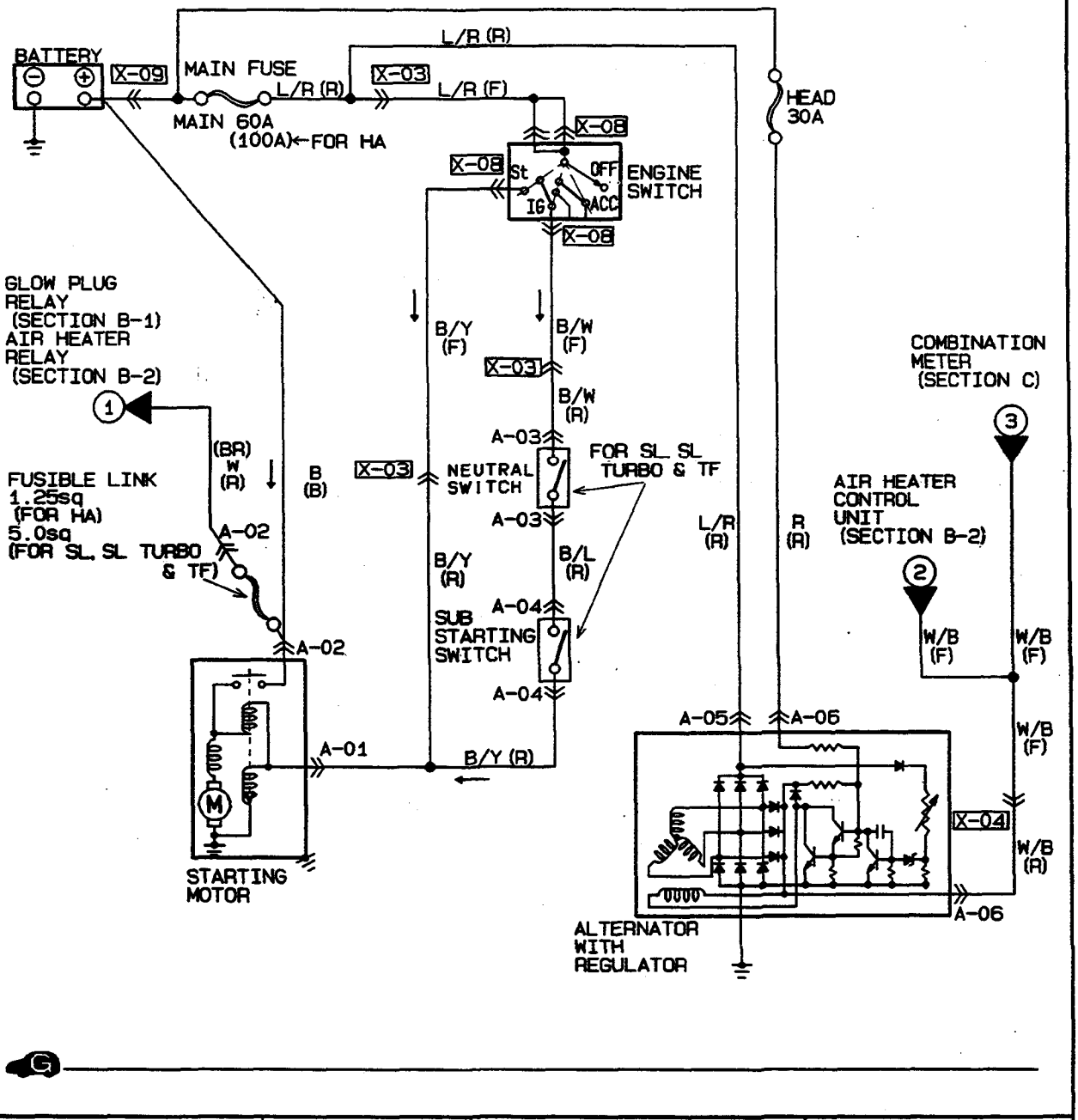


WIRING DIAGRAM

A

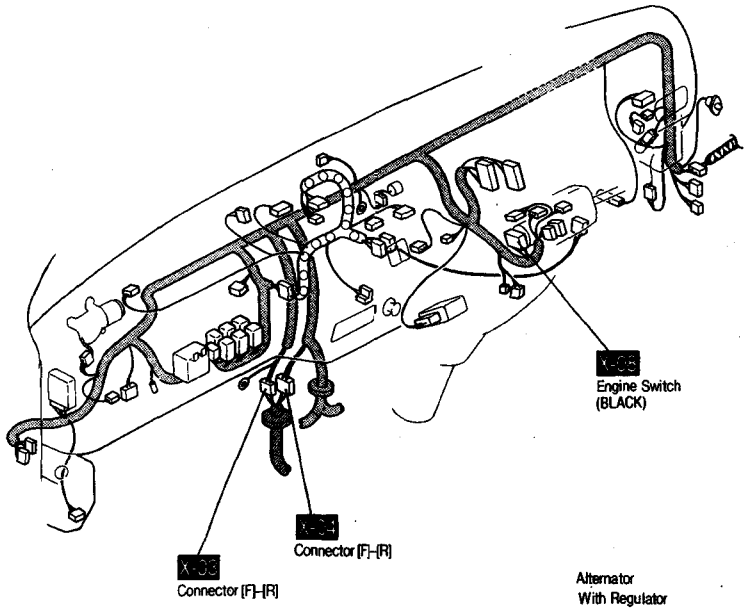
■ STARTING SYSTEM ■ SUB STARTING SYSTEM
■ CHARGING SYSTEM

( ): FOR SL, SL TURBO & TF

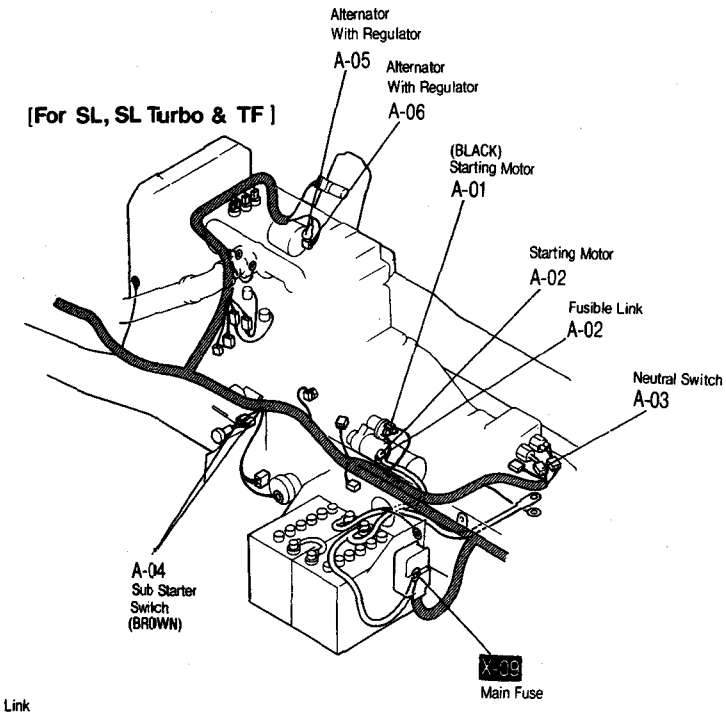


A-01 STARTING MOTOR (R) B/Y	A-02 STARTING MOTOR (B) & FUSIBLE LINK (R) FUSIBLE LINK 1.25sq (FOR HA) (R) (B) B — B — W FUSIBLE LINK 5.0sq (FOR SL, SL TURBO & TF) BR — BR	A-03 NEUTRAL SWITCH (R) (FOR SL, SL TURBO & TF) B/W, B, B/L, L/Y
A-04 SUB STARTING SWITCH (R) B/Y — B/L		
A-05 ALTERNATOR WITH REGULATOR (R) L/R	A-06 ALTERNATOR WITH REGULATOR (R) R — W/B	

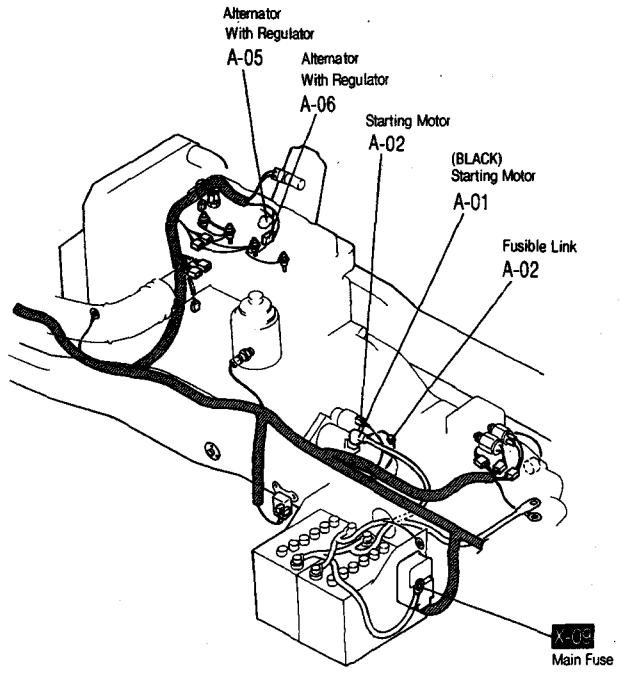
NOTE: *···NOT USED



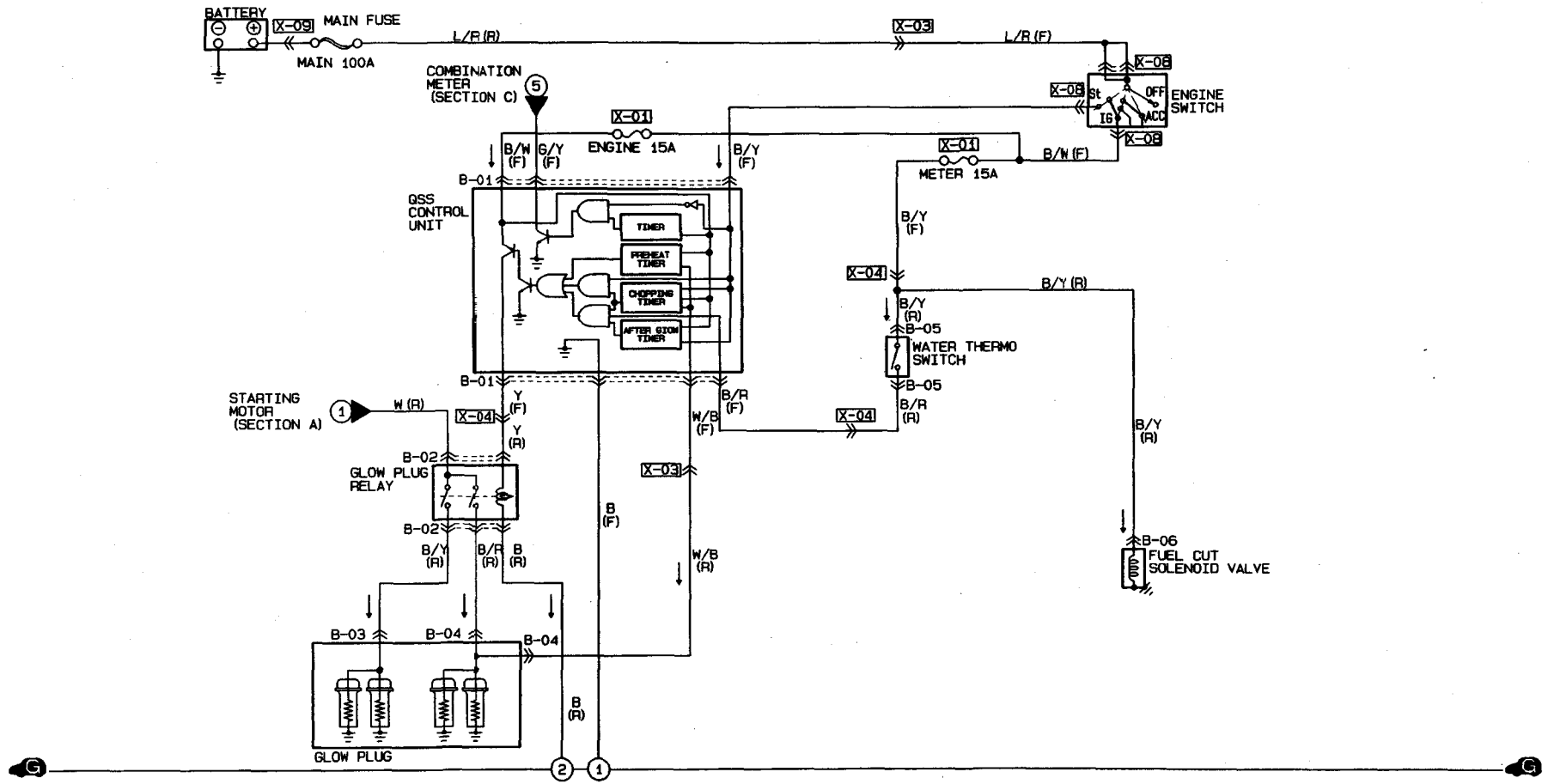
[For SL, SL Turbo & TF]



[For HA]

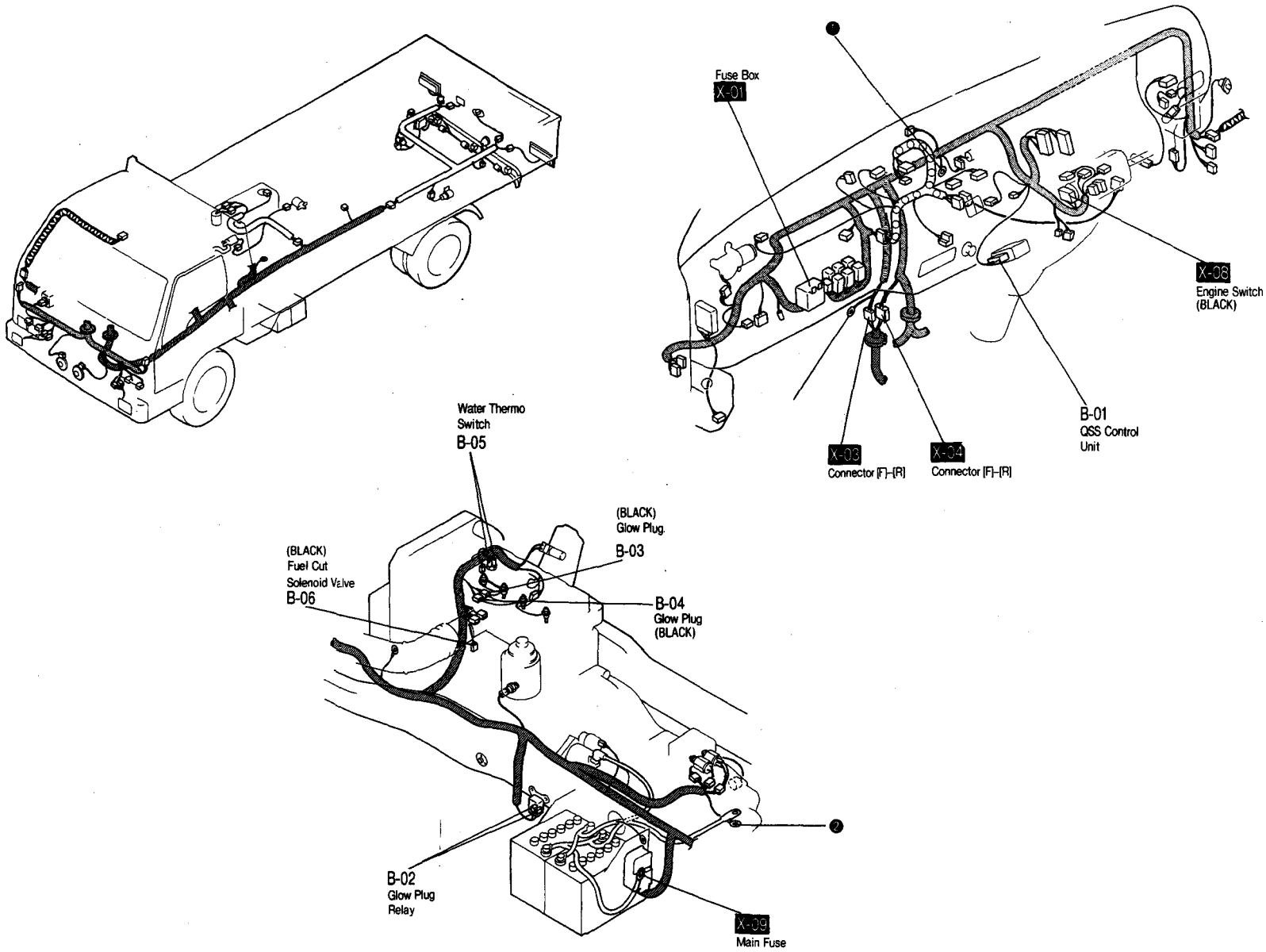


B-1 FOR HA ■QUICK START SYSTEM (QSS) ■ FUEL CUT SOLENOID B-1

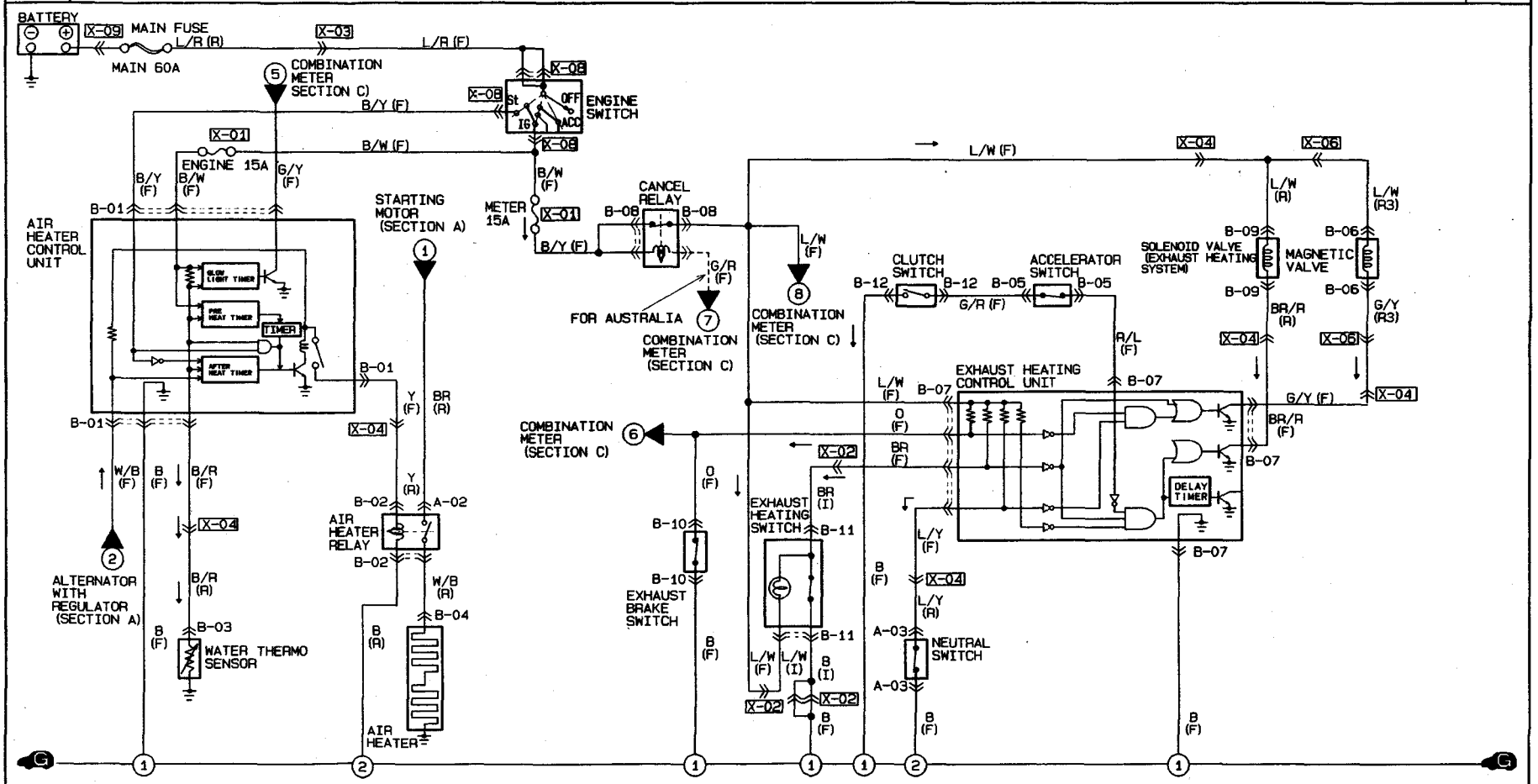


B-01 QSS CONTROL UNIT (F)	B-02 GLOW PLUG RELAY (R)	B-03 GLOW PLUG (R)	B-04 GLOW PLUG (R)	B-05 WATER THERMO SWITCH (R)	B-06 FUEL CUT SOLENOID VALVE (R)	
G/Y * B/W * B/R Y * B B/Y * W/B	W B B/Y B/R Y	B/Y	B/R W/B	B/Y B/R	B/Y	

NOTE: *···NOT USED


Fuse Box
X-01
X-08
Engine Switch
(BLACK)
B-01
QSS Control
Unit
X-03
Connector [F]-[R]
X-04
Connector [F]-[R]
Water Thermo
Switch
B-05
(BLACK)
Glow Plug
B-03
(BLACK)
Fuel Cut
Solenoid Valve
B-06
B-04
Glow Plug
(BLACK)
B-02
Glow Plug
Relay
X-09
Main Fuse

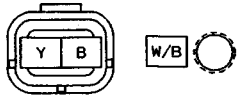
B-2 FOR SL, SL TURBO & TF ■ AIR HEATER CONTROL SYSTEM ■ EXHAUST CONTROLLED HEATING SYSTEM B-2



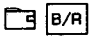
B-01 AIR HEATER CONTROL UNIT (F)

G/Y	*		B/W	B/R	*
Y	*	B	B/Y	W/B	*

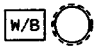
B-02 AIR HEATER RELAY (R)



B-03 WATER THERMO SENSOR (R)



B-04 AIR HEATER (R)



B-05 ACCELERATOR SWITCH (F)



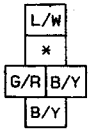
B-06 MAGNETIC VALVE (R3)



B-07 EXHAUST HEATING CONTROL UNIT (F)

BR/R	G/Y		O	*	BR
*	*	B	L/W	L/Y	R/L

B-08 CANCEL RELAY (F)



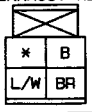
B-09 SOLENOID VALVE (EXHAUST HEATING SYSTEM) (R)



B-10 EXHAUST BRAKE SWITCH (F)



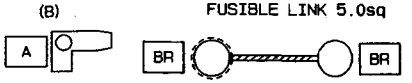
B-11 EXHAUST HEATING SWITCH (I)



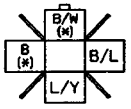
B-12 CLUTCH SWITCH (F)



A-02 STARTING MOTOR (B) & FUSIBLE LINK (R)

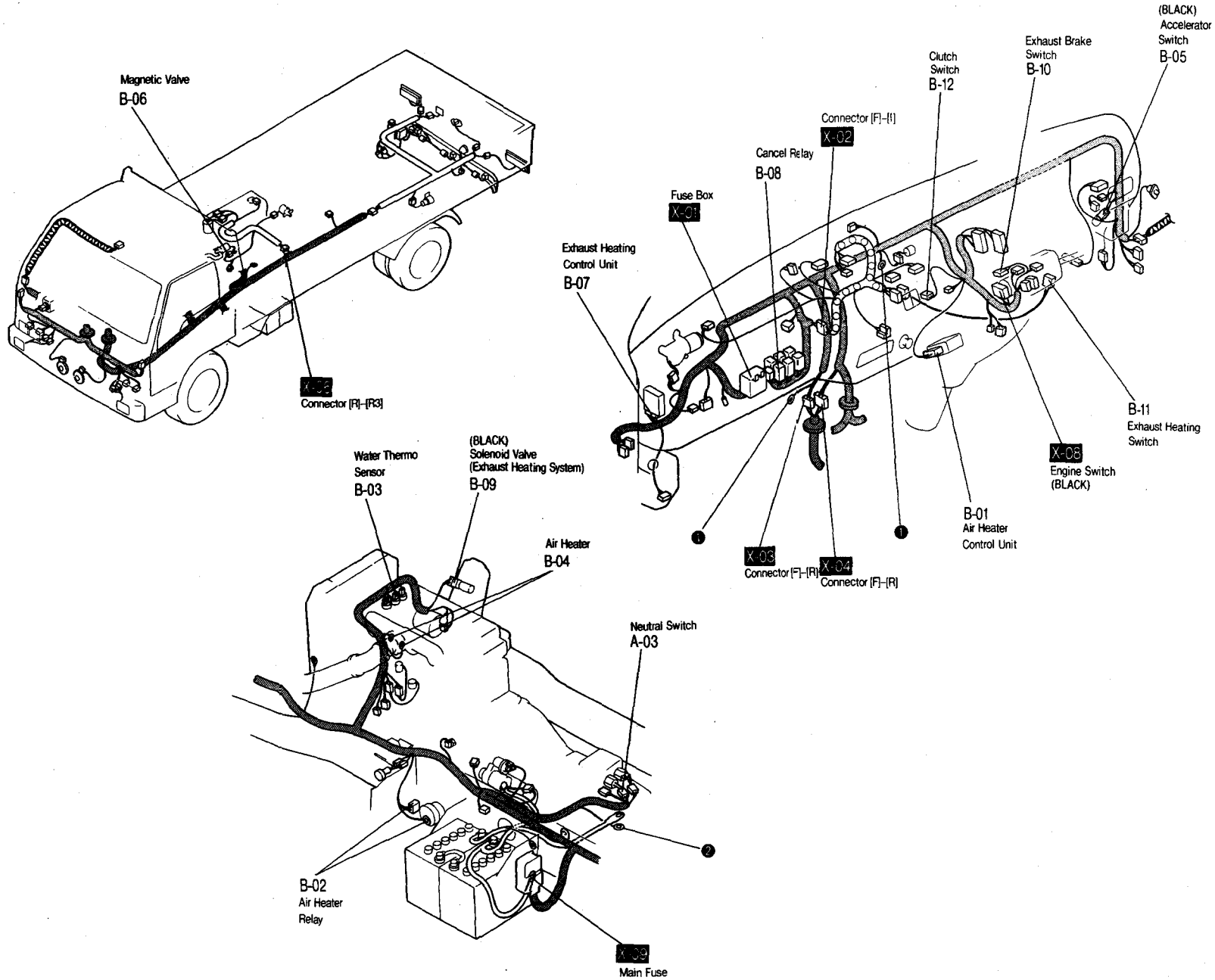


A-03 NEUTRAL SWITCH (R)



( ): FOR CREW CAB.

NOTE: *···NOT USED

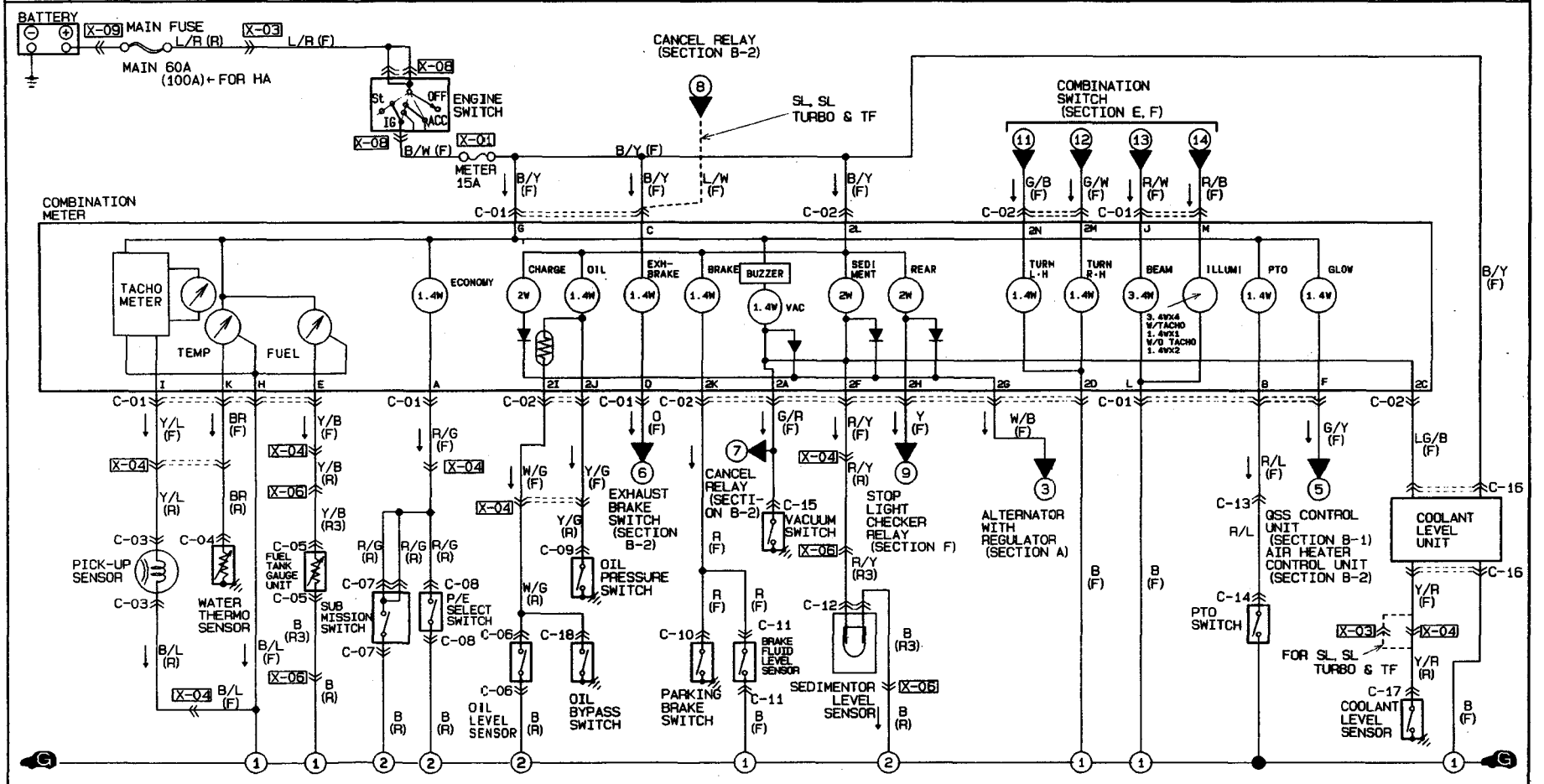

Magnetic Valve
B-06
Connector [R]–[R3]
(BLACK)
Accelerator
Switch
B-05
Exhaust Brake
Switch
B-10
Clutch
Switch
B-12
Connector [F]–[I]
X-02
Cancel Relay
B-08
Fuse Box
X-01
Exhaust Heating
Control Unit
B-07
B-11
Exhaust Heating
Switch
X-08
Engine Switch
(BLACK)
B-01
Air Heater
Control Unit
X-03
Connector [F]–[R]
X-04
Connector [F]–[R]
Water Thermo
Sensor
B-03
(BLACK)
Solenoid Valve
(Exhaust Heating System)
B-09
Air Heater
B-04
Neutral Switch
A-03
B-02
Air Heater
Relay
X-09
Main Fuse

C

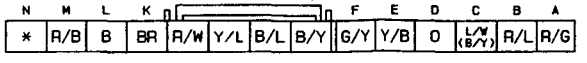
■METER & WARNING LAMPS

( ): FOR HA

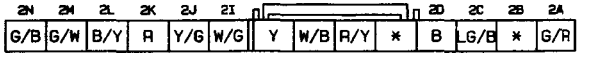
C



C-01 COMBINATION METER (F)



C-02 COMBINATION METER (F)



C-03 PICK UP SENSOR (R)



C-04 WATER THERMO SENSOR (R)



C-05 FUEL TANK GAUGE UNIT (R3)



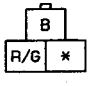
C-06 OIL LEVEL SENSOR (R)



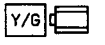
C-07 SUB MISSION SWITCH (R)



C-08 P/E SELECT SWITCH (R)



C-09 OIL PRESSURE SWITCH (R)



C-10 PARKING BRAKE SWITCH (F)



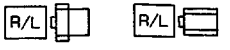
C-11 BRAKE FLUID LEVEL SENSOR (F)



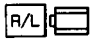
C-12 SEDIMENTOR LEVEL SENSOR (R3)



C-13 PTO SWITCH CORD (F)



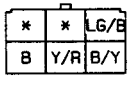
C-14 PTO SWITCH



C-15 VACUUM SWITCH (F) (FOR AUSTRALIA)



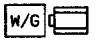
C-16 COOLANT LEVEL UNIT (F)



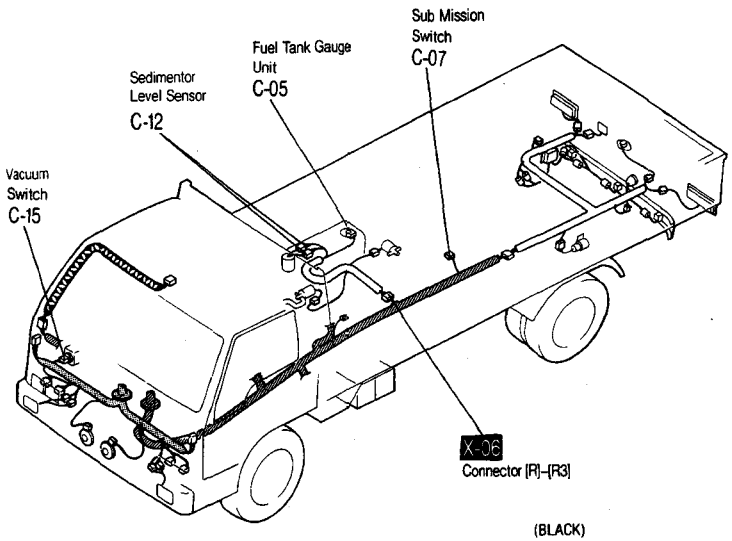
C-17 COOLANT LEVEL SENSOR (R)

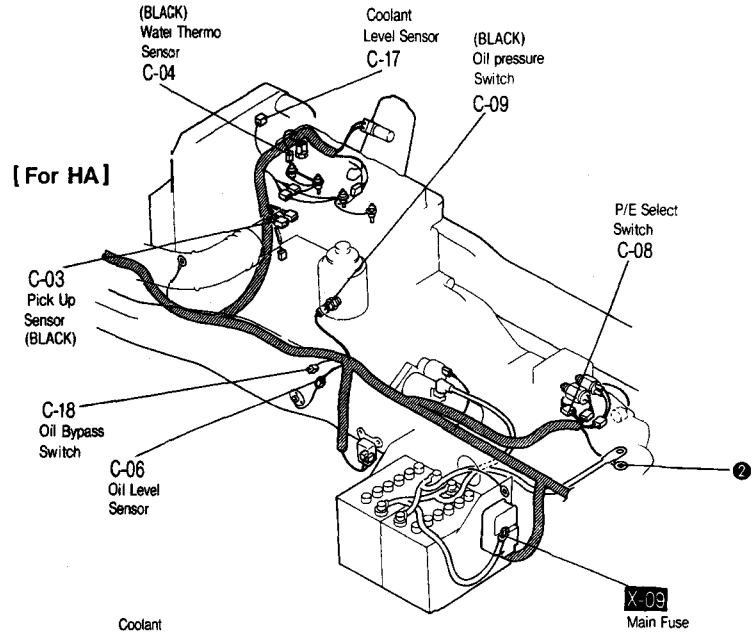


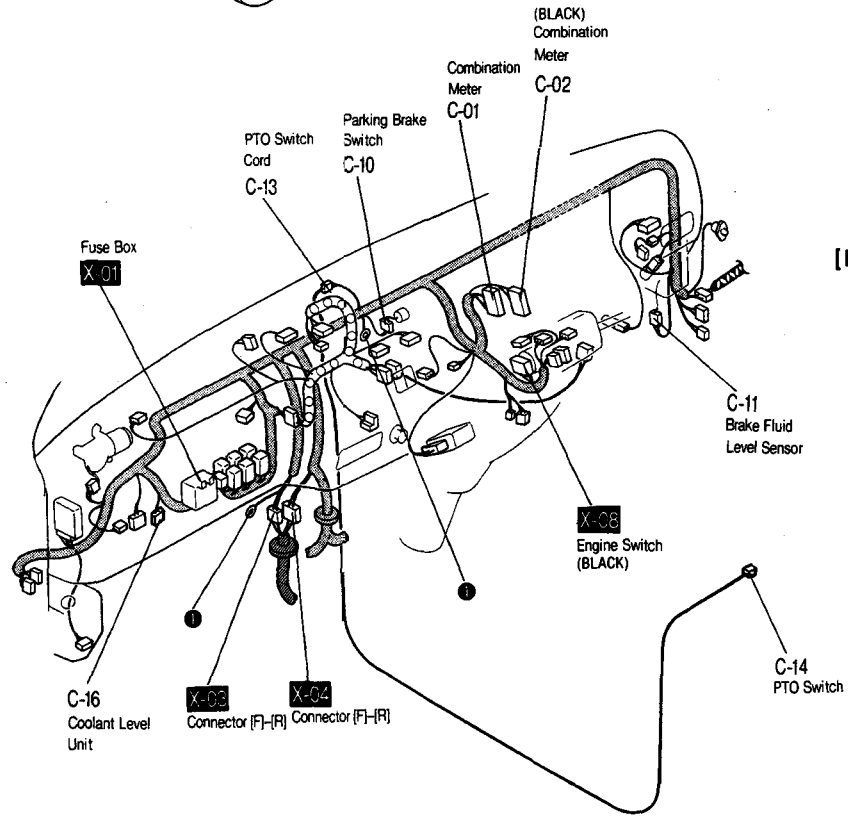
C-18 OIL BYPASS SWITCH (R)

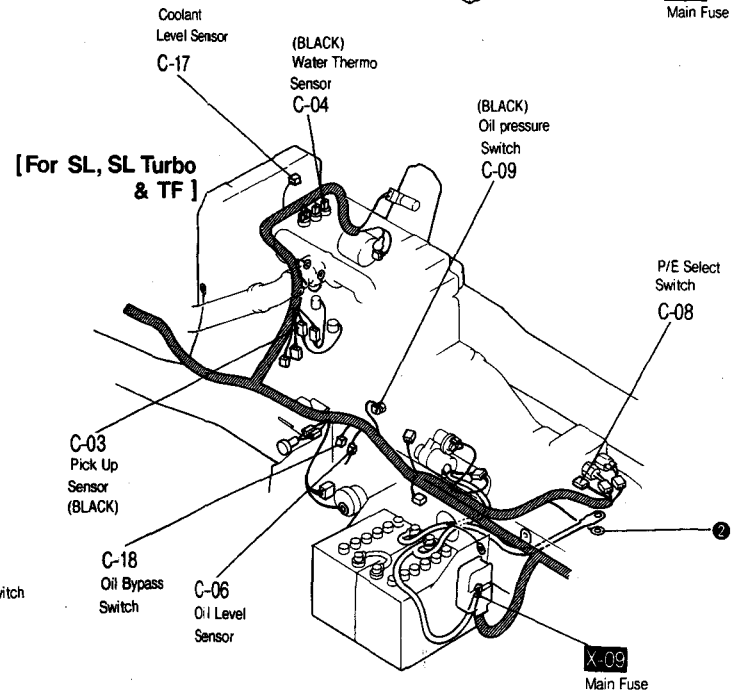


NOTE: *···NOT USED


Sub Mission Switch C-07
Fuel Tank Gauge Unit C-05
Sedimentor Level Sensor C-12
Vacuum Switch C-15
X-06
Connector [R]-[R3]

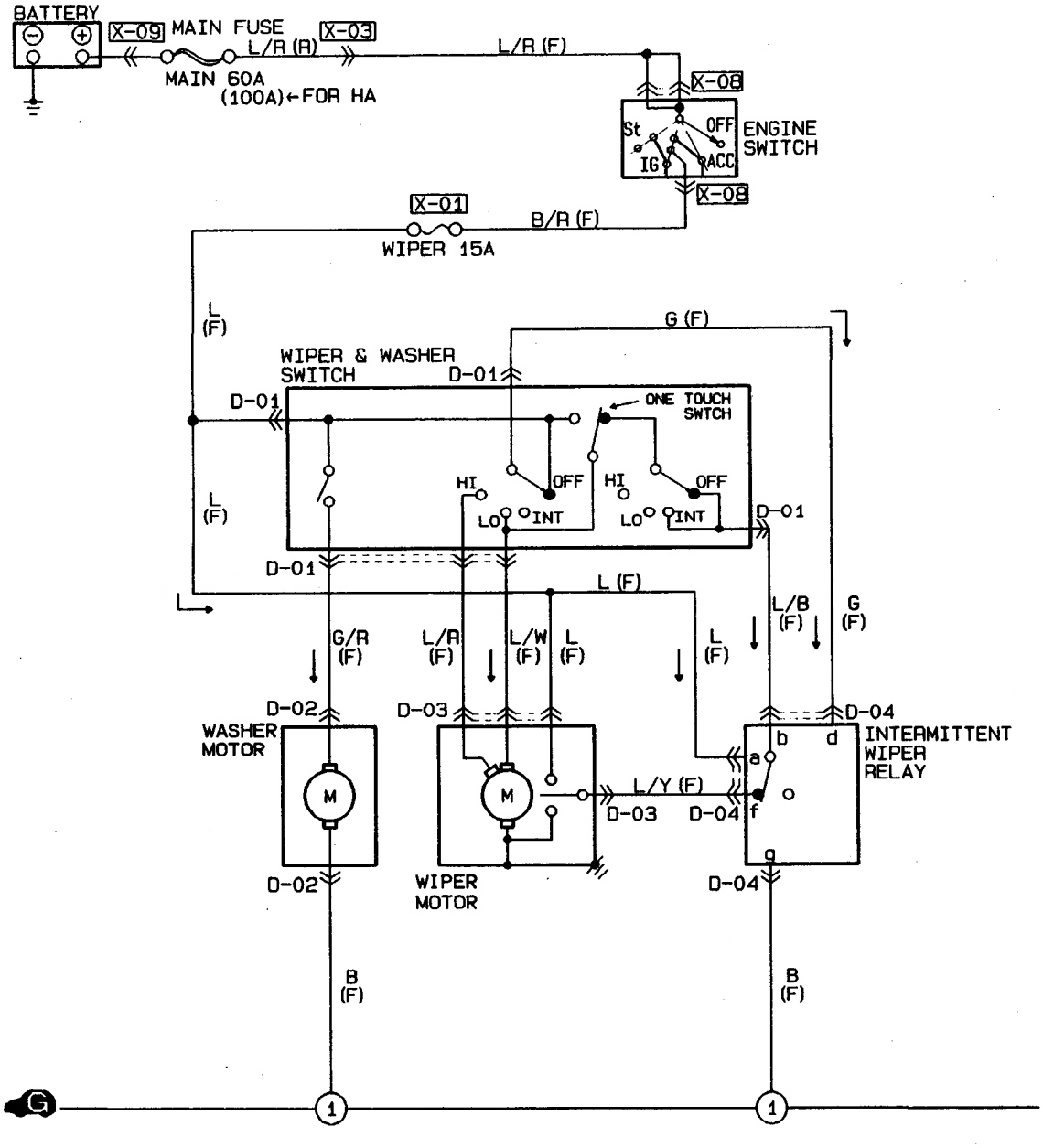

[For HA]
(BLACK) Water Thermo Sensor C-04
Coolant Level Sensor C-17
(BLACK) Oil pressure Switch C-09
P/E Select Switch C-08
C-03 Pick Up Sensor (BLACK)
C-18 Oil Bypass Switch
C-06 Oil Level Sensor
X-09
Main Fuse


(BLACK) Combination Meter C-02
Combination Meter C-01
Parking Brake Switch C-10
PTO Switch Cord C-13
Fuse Box X-01
C-11 Brake Fluid Level Sensor
X-08
Engine Switch (BLACK)
C-14 PTO Switch
C-16 Coolant Level Unit
X-03
Connector [F]-[R]
X-04
Connector [F]-[R]


[For SL, SL Turbo & TF]
Coolant Level Sensor C-17
(BLACK) Water Thermo Sensor C-04
(BLACK) Oil pressure Switch C-09
P/E Select Switch C-08
C-03 Pick Up Sensor (BLACK)
C-18 Oil Bypass Switch
C-06 Oil Level Sensor
X-09
Main Fuse

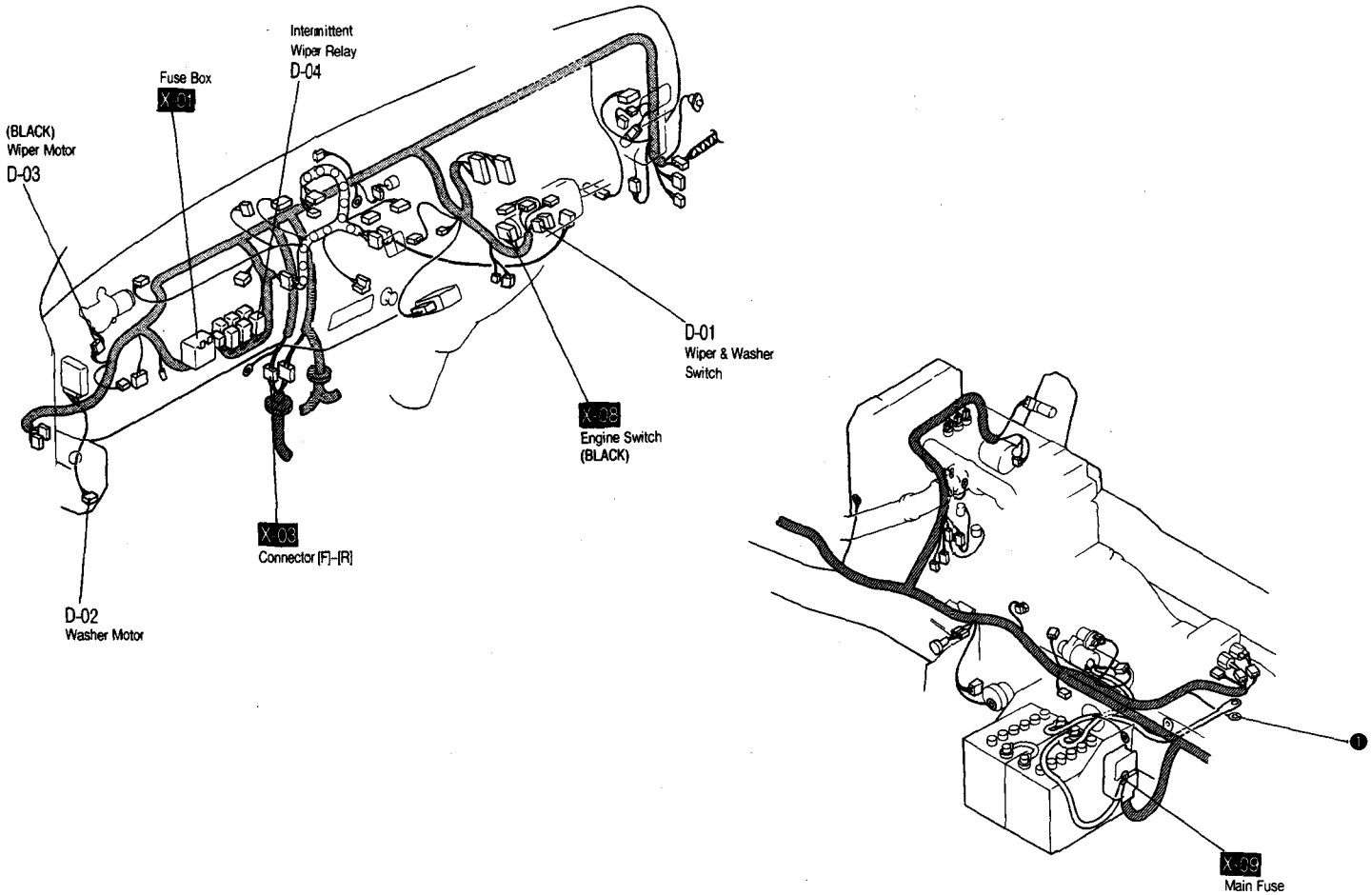
WIRING DIAGRAM

D ■ WIPER & WASHER



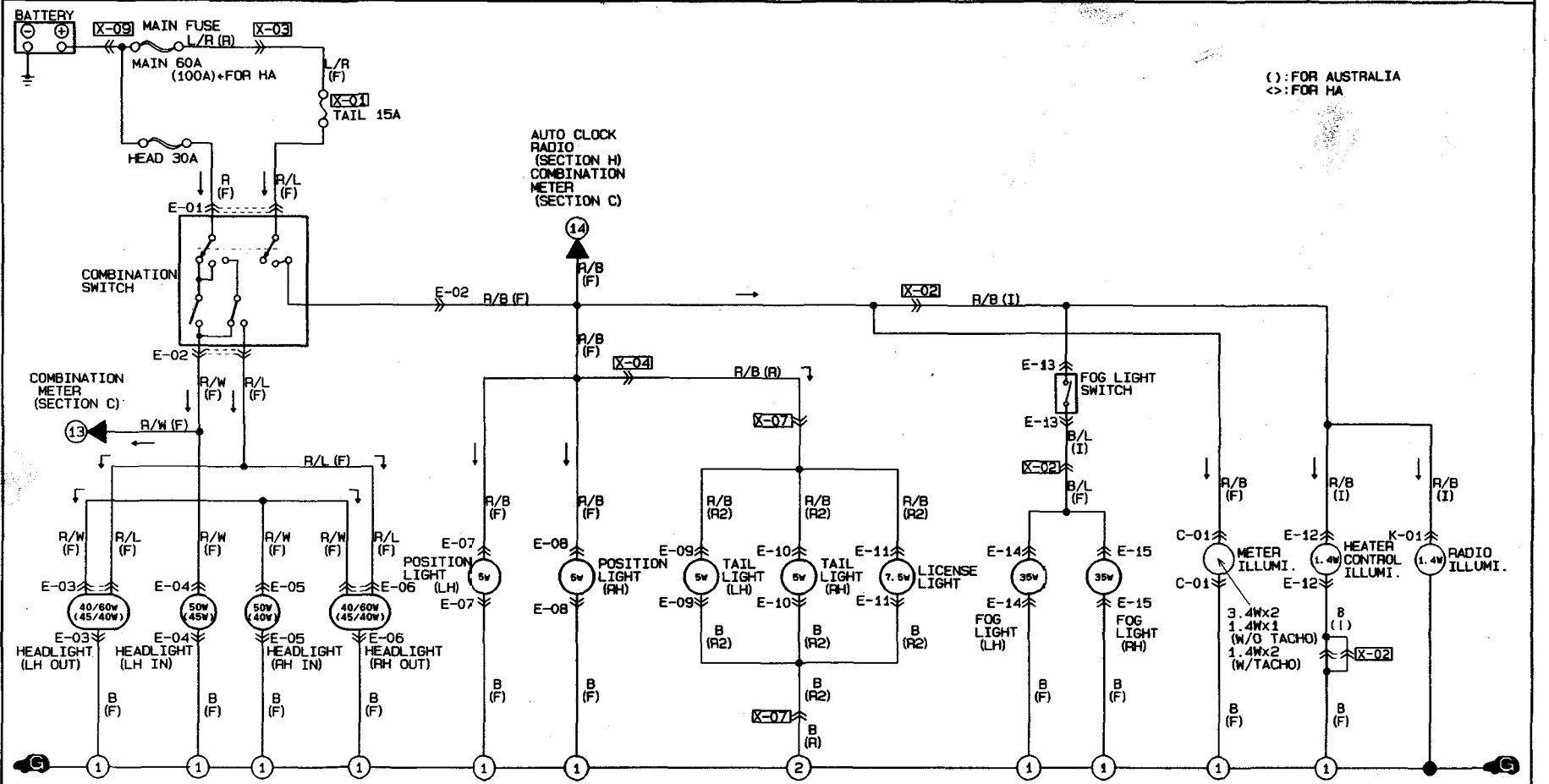
D-01 WIPER & WASHER SWITCH (F)	D-02 WASHER MOTOR (F)	D-03 WIPER MOTOR (F)	D-04 INTERMITTENT WIPER RELAY (F)
L / G / G/R L/R / L/B / L/W	B G/R	L/W / L/R L / L/Y	G: B / A: L * / L/Y / G / L/B H F D B

NOTE: *···NOT USED

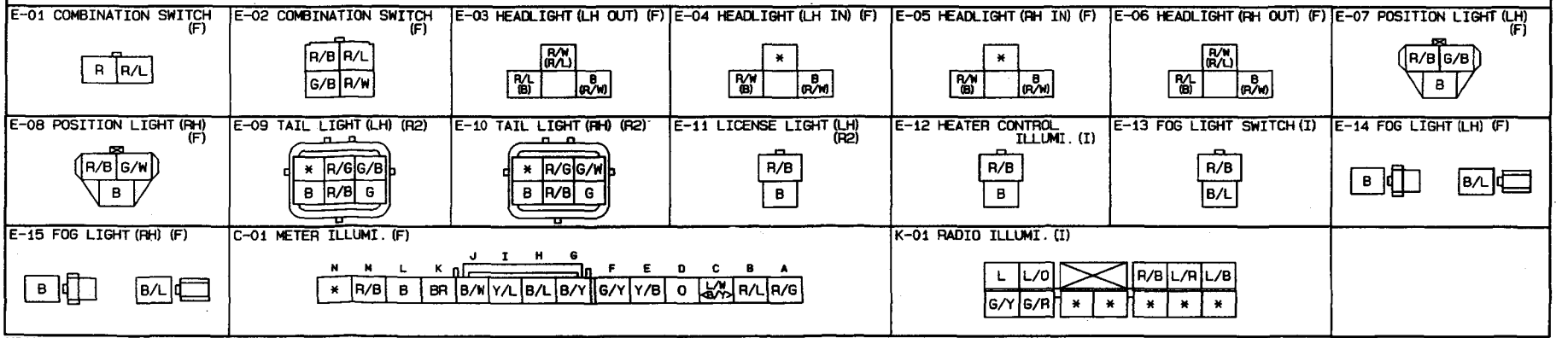

Intermittent
Wiper Relay
D-04
Fuse Box
X-01
(BLACK)
Wiper Motor
D-03
D-01
Wiper & Washer
Switch
X-08
Engine Switch
(BLACK)
X-03
Connector [F]-[R]
D-02
Washer Motor
X-09
Main Fuse

WIRING DIAGRAM

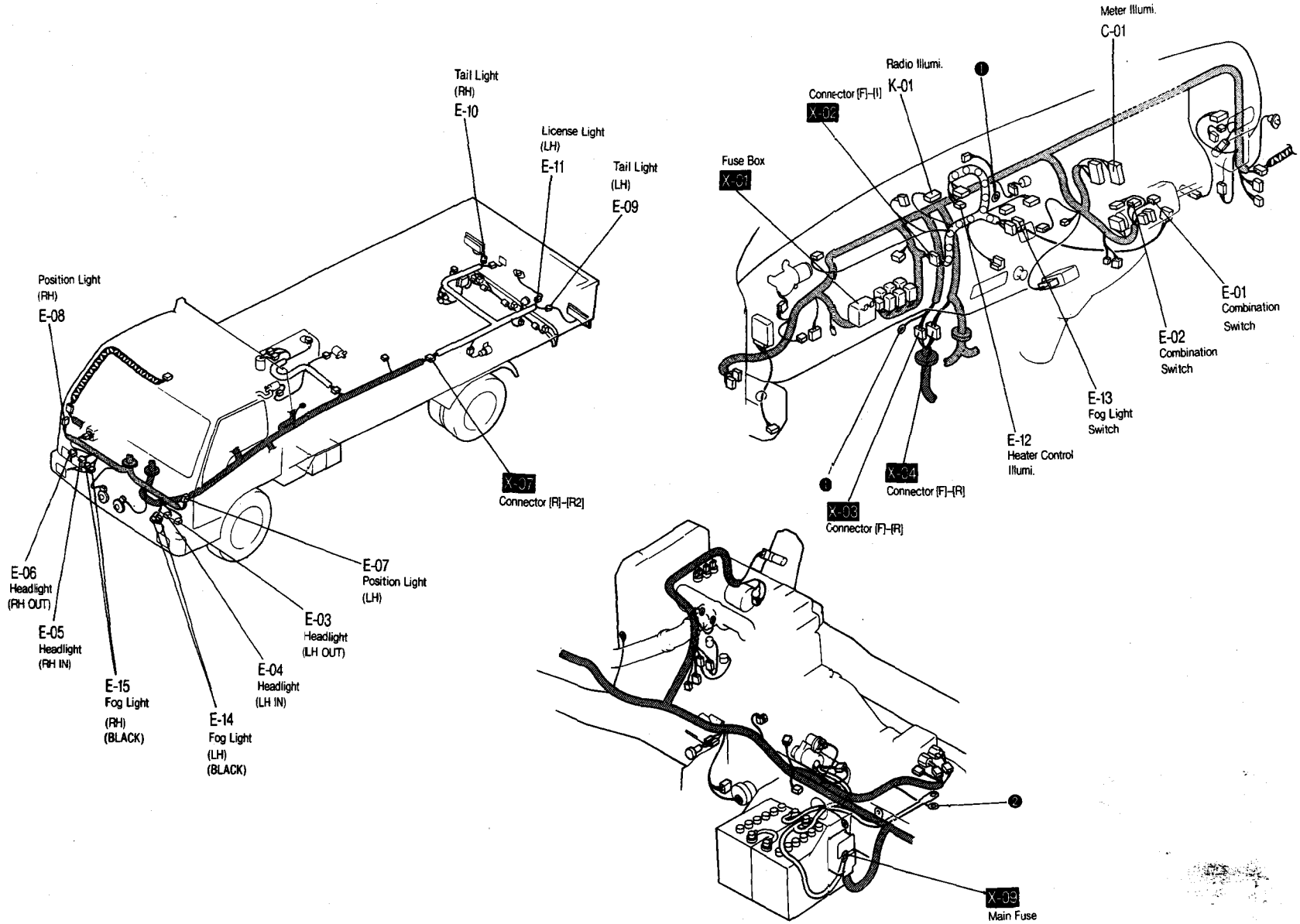
E ■ HEADLIGHTS ■ POSITION LIGHTS ■ TAIL LIGHTS ■ LICENSE LIGHT ■ FOG LIGHTS ■ ILLUMINATION LAMPS E



():FOR AUSTRALIA
<>:FOR HA

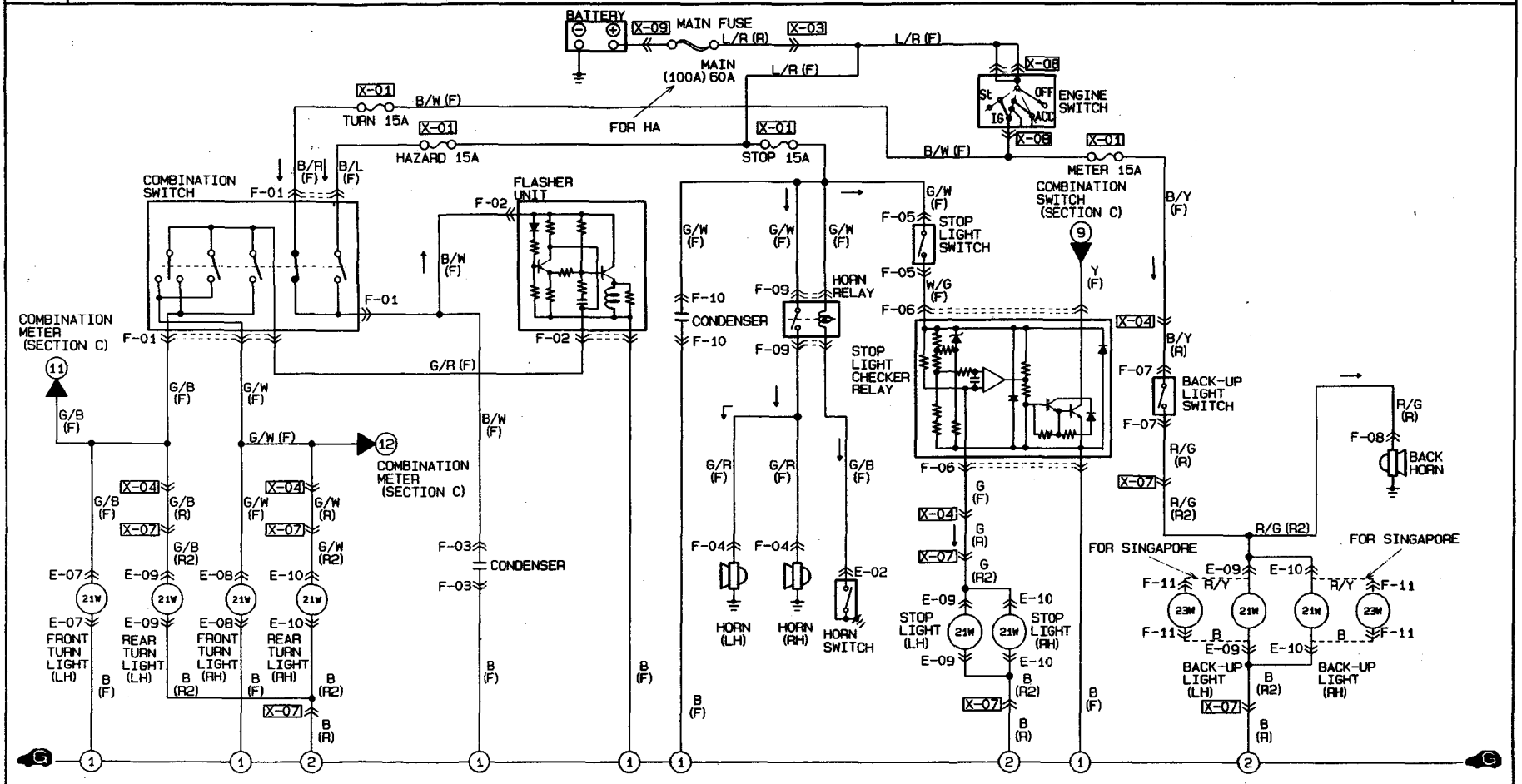


NOTE: *···NOT USED


Tail Light
(RH)
E-10
License Light
(LH)
E-11
Tail Light
(LH)
E-09
Position Light
(RH)
E-08
X-07
Connector [R]-[R2]
E-06
Headlight
(RH OUT)
E-05
Headlight
(RH IN)
E-15
Fog Light
(RH)
(BLACK)
E-14
Fog Light
(LH)
(BLACK)
E-04
Headlight
(LH IN)
E-03
Headlight
(LH OUT)
E-07
Position Light
(LH)
Meter Illumi.
C-01
Radio Illumi.
K-01
Connector [F]-[I]
X-02
Fuse Box
X-01
E-01
Combination
Switch
E-02
Combination
Switch
E-13
Fog Light
Switch
E-12
Heater Control
Illumi.
X-04
Connector [F]-[R]
X-03
Connector [F]-[R]
X-09
Main Fuse

WIRING DIAGRAM

F ■ TURN & HAZARD FLASHER LIGHTS ■ BACK-UP LIGHTS ■ STOP LIGHTS ■ HORN ■ BACK HRON F

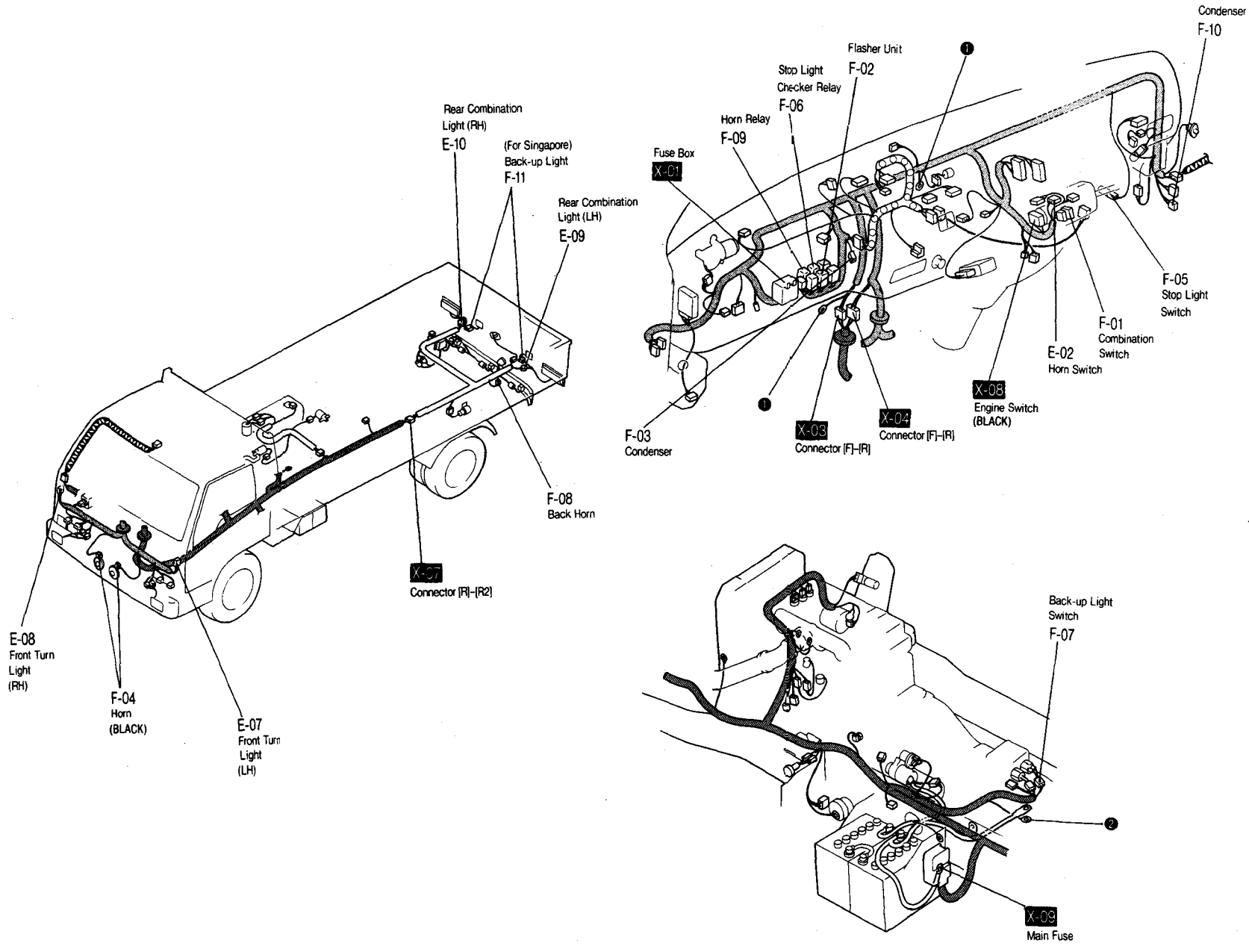


F-01 COMBINATION SWITCH (F)	F-02 FLASHER UNIT (F)	F-03 CONDENSER (F)	F-04 HORN (F)	F-05 STOP LIGHT SWITCH (F)	F-06 STOP LIGHT CHECKER RELAY (F)	F-07 BACK-UP LIGHT SWITCH (R)
* B/L B/W B/R * G/W G/R G/B	G/R B/W B	B/W B	G/R	G/W W/G	Y W/G G B	B/Y R/G

F-08 BACK HORN (R2)	F-09 HORN RELAY (F)	F-10 CONDENSER (F)	F-11 BACK-UP LIGHT (FOR SINGAPORE)	E-02 HORN SWITCH (F)	E-07 FRONT TURN LIGHT (LH) (F)	E-08 FRONT TURN LIGHT (RH) (F)
R/G	G/R G/W G/B G/W	G/W B	R/Y B	R/B R/L G/B R/W	R/B G/B B	R/B G/W B

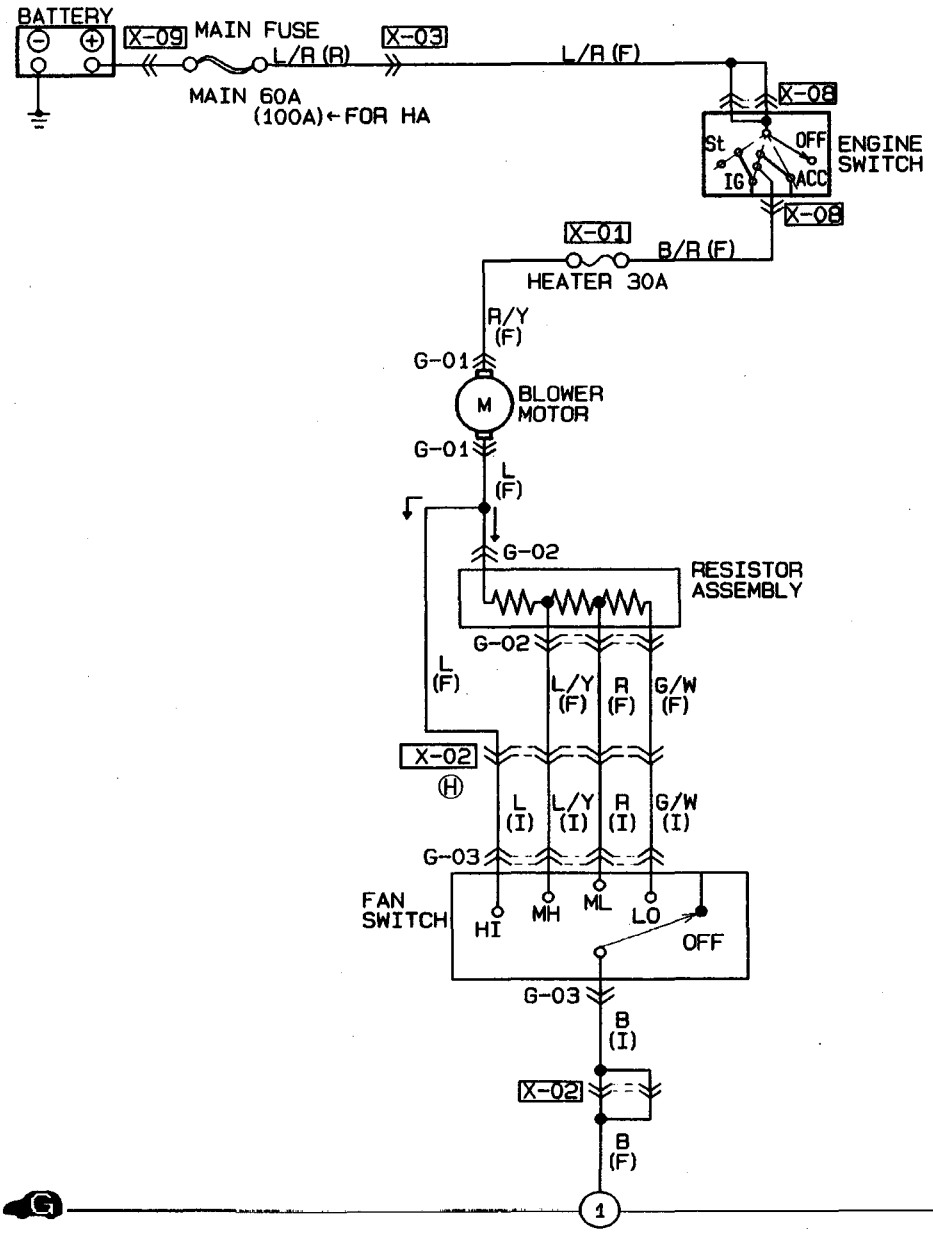
E-09 REAR COMBINATION LIGHT (LH) (R2)	E-10 REAR COMBINATION LIGHT (RH) (R2)
* R/G G/B B R/B G	* R/G G/W B R/B G

NOTE *···NOT USED


Condenser
F-10
Flasher Unit
F-02
Stop Light
Checker Relay
F-06
Horn Relay
F-09
Fuse Box
X-01
Rear Combination
Light (RH)
E-10
(For Singapore)
Back-up Light
F-11
Rear Combination
Light (LH)
E-09
F-05
Stop Light
Switch
F-01
Combination
Switch
E-02
Horn Switch
X-08
Engine Switch
(BLACK)
F-03
Condenser
X-03
Connector [F]-[R]
X-04
Connector [F]-[R]
F-08
Back Horn
X-07
Connector [R]-[R2]
E-08
Front Turn
Light
(RH)
F-04
Horn
(BLACK)
E-07
Front Turn
Light
(LH)
Back-up Light
Switch
F-07
X-09
Main Fuse

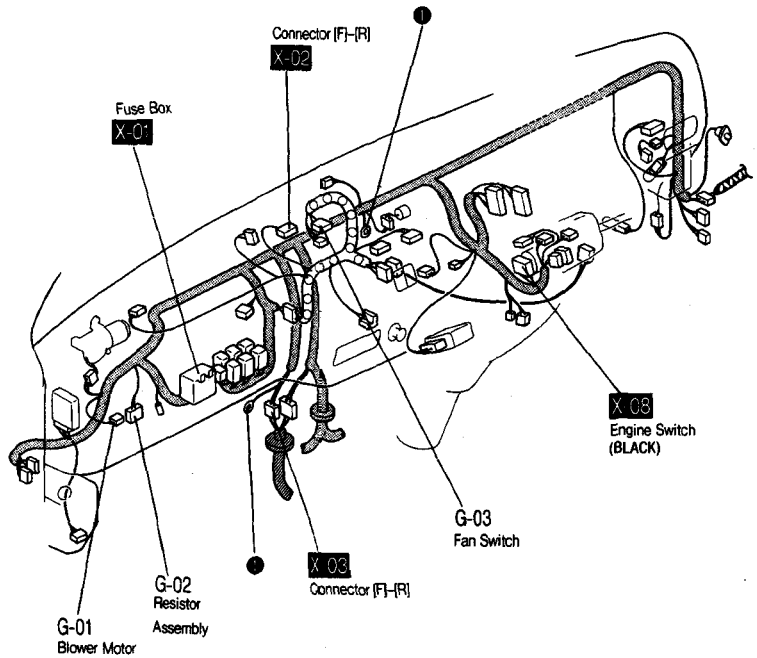
WIRING DIAGRAM

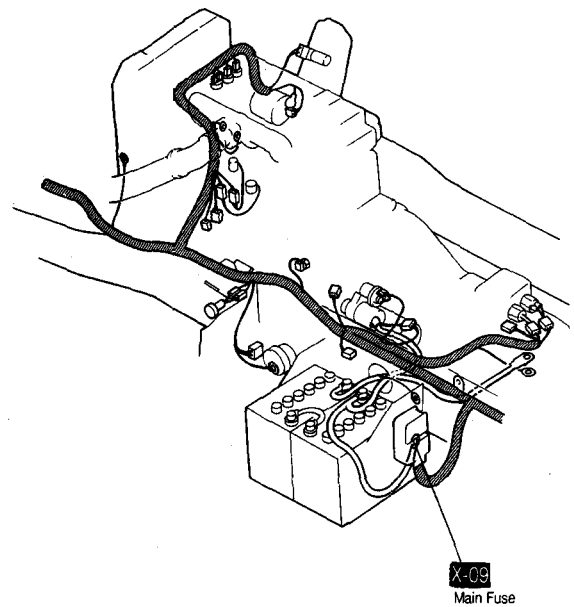
G ■ HEATER



G-01 BLOWER MOTOR (F)	G-02 RESISTOR ASSEMBLY (F)	G-03 FAN SWITCH (I)	
R/Y L	R G/W L/Y L	R G/W B L/Y L *	

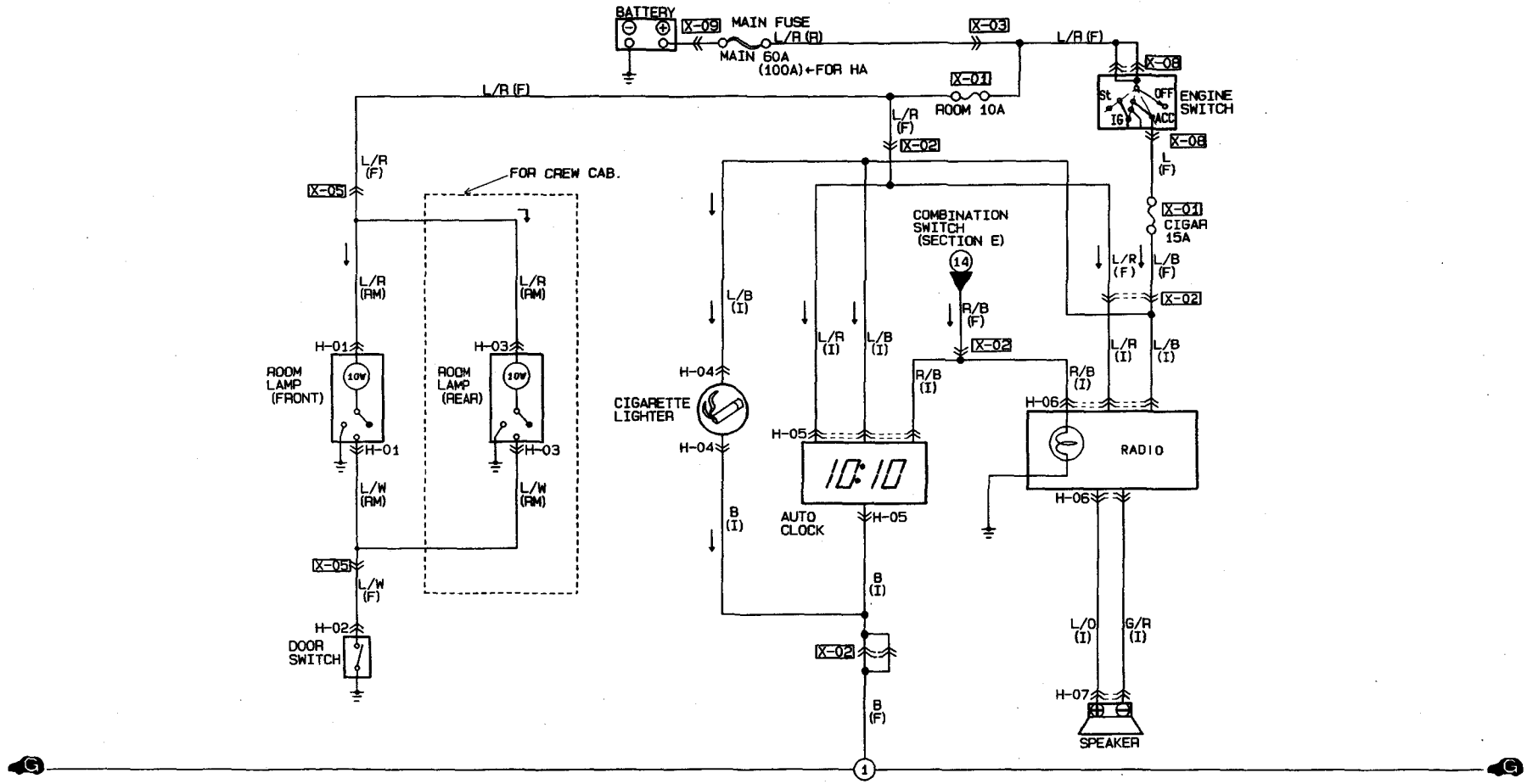
NOTE: *···NOT USED


Connector [F]-[R]
X-02
Fuse Box
X-01
X-08
Engine Switch
(BLACK)
G-03
Fan Switch
X-03
Connector [F]-[R]
G-02
Resistor
Assembly
G-01
Blower Motor


X-09
Main Fuse

WIRING DIAGRAM

H ■ ROOM LAMPS ■ CIGARETTE LIGHTER ■ AUTO CLOCK ■ RADIO H



H-01 ROOM LAMP (FEONT) (RM)	H-02 DOOR SWITCH (F)	H-03 ROOM LAMP (REAR) (RM)	H-04 CIGARETTE LIGHTER	H-05 AUTO CLOCK (I)	H-06 RADIO (I)
L/R / L/W	L/W	L/W / L/R	L/B / B	R/B B / L/B L/R	L L/O / G/Y G/R / * * / R/B L/R L/B / * * *

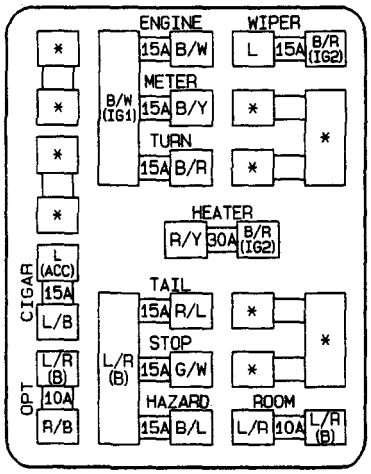
H-07 SPEAKER (I)
G/R / L/O

NOTE: *···NOT USED

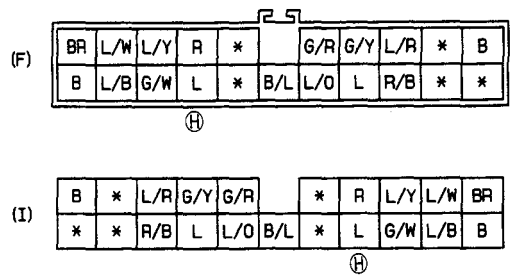
■ COMMON CONNECTOR LIST ( ): FOR SL, SL TURBO & TF

X

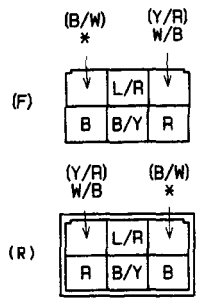
X-01 FUSE BOX (F)



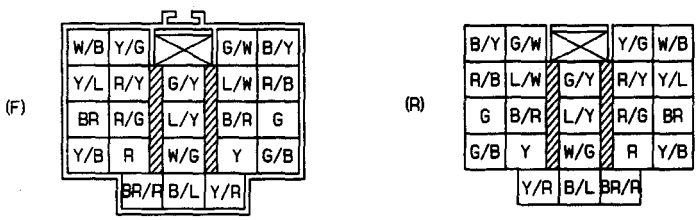
X-02 CONNECTOR BETWEEN FRONT (F) AND INSTRUMENT PANEL HARNESS (I)



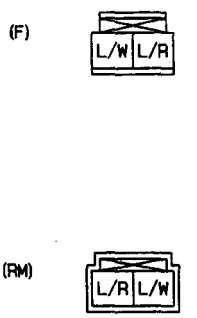
X-03 CONNECTOR BETWEEN FRONT (F) AND REAR HARNESS (R)



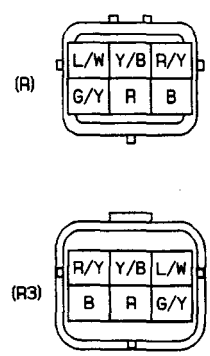
X-04 CONNECTOR BETWEEN FRONT (F) AND REAR HARNESS (R)



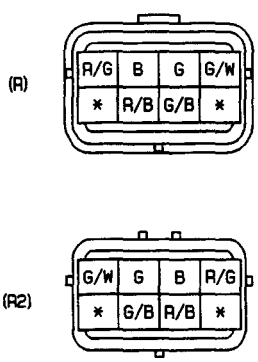
X-05 CONNECTOR BETWEEN FRONT (F) AND ROOM HARNESS (RM)



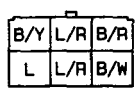
X-06 CONNECTOR BETWEEN REAR HARNESS (R) AND NO.3 REAR HARNESS (R3)



X-07 CONNECTOR BETWEEN REAR HARNESS (R) AND NO.2 REAR HARNESS (R2)



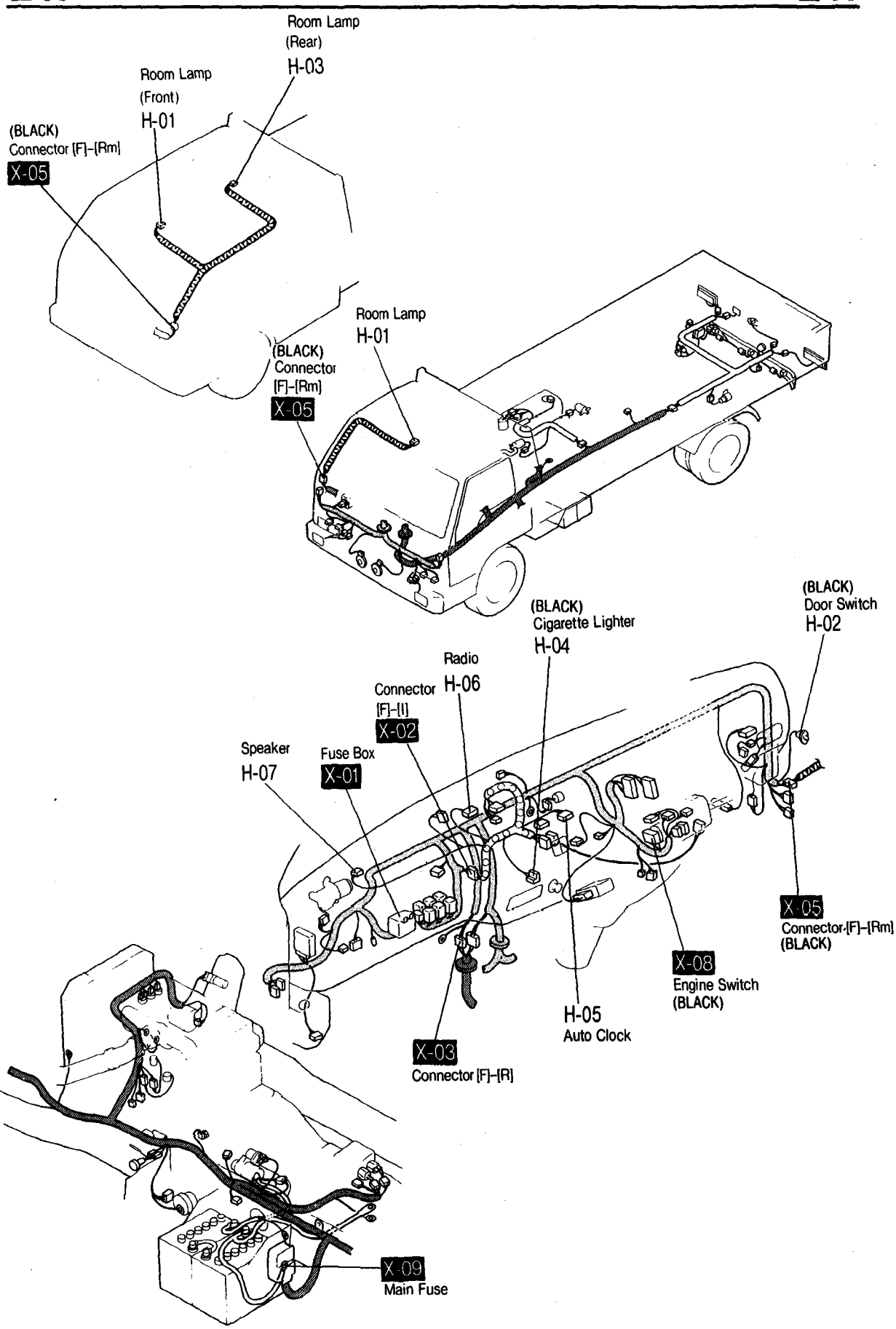
X-08 ENGINE SWITCH (F)

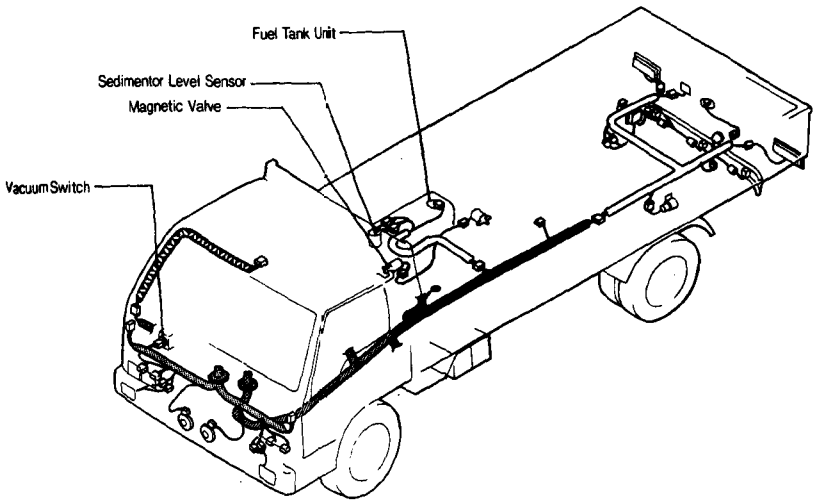


X-09 MAIN FUSE (B) (+SIDE)

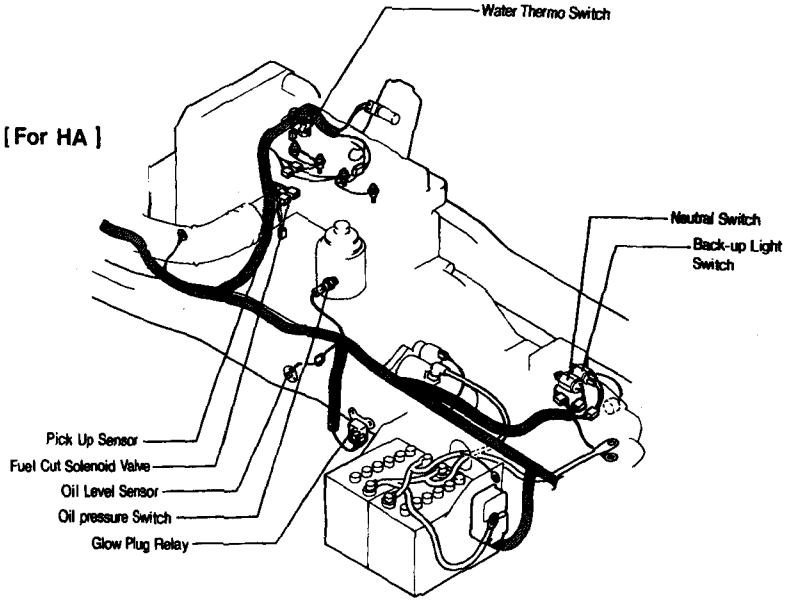


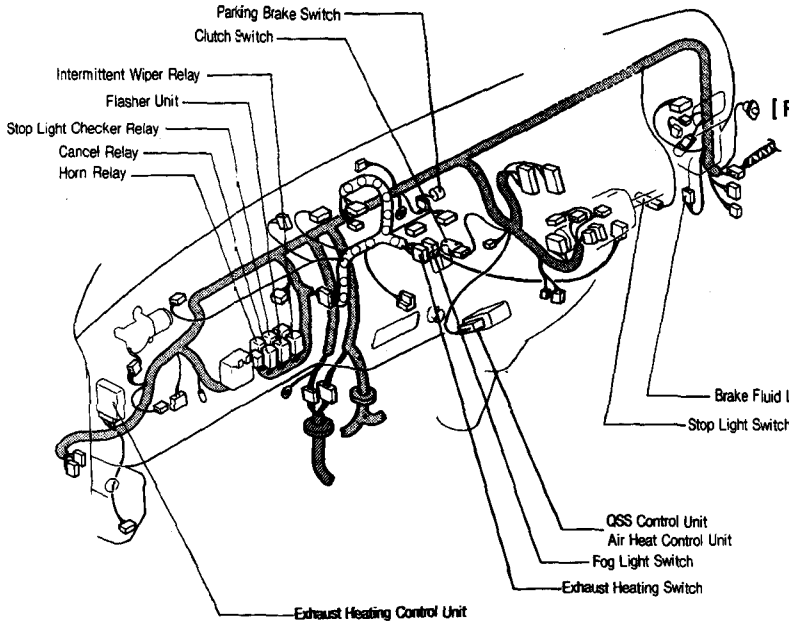
NOTE: *···NOT USED


Room Lamp
(Rear)
H-03
Room Lamp
(Front)
H-01
(BLACK)
Connector [F]-[Rm]
X-05
Room Lamp
H-01
(BLACK)
Connector
[F]-[Rm]
X-05
(BLACK)
Cigarette Lighter
H-04
(BLACK)
Door Switch
H-02
Radio
H-06
Connector
[F]-[I]
X-02
Speaker
H-07
Fuse Box
X-01
X-05
Connector-[F]-[Rm]
(BLACK)
X-08
Engine Switch
(BLACK)
H-05
Auto Clock
X-03
Connector [F]-[R]
X-09
Main Fuse



[For HA]





[For SL, SL Turbo & TF]

