



Repair Manual

T3000 T3500 T4000



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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.

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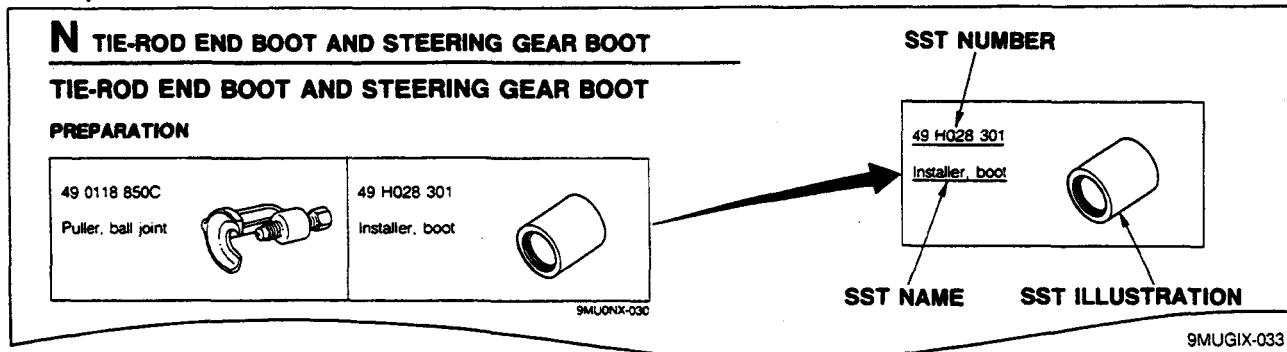
HOW TO USE THIS MANUAL

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.

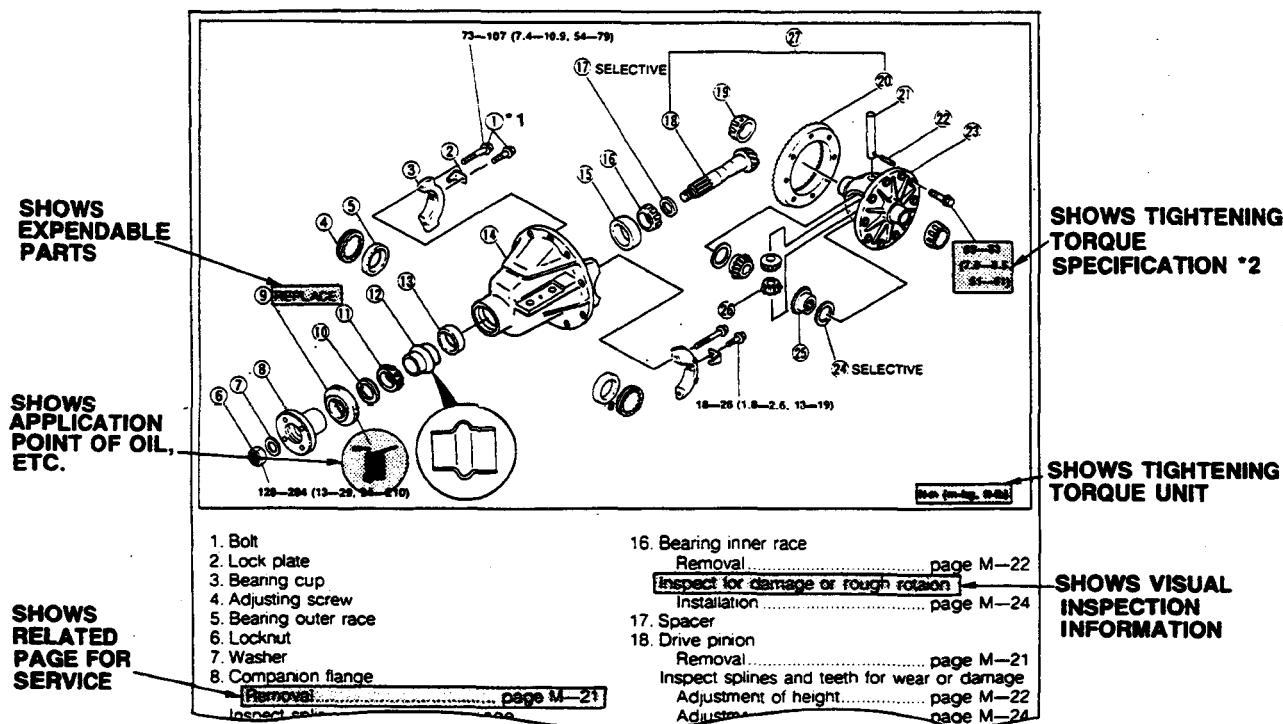
Example:



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

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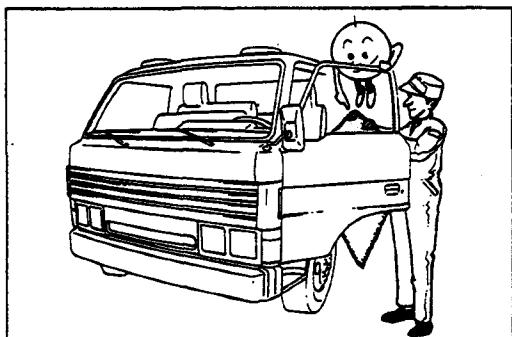
Note

- 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.

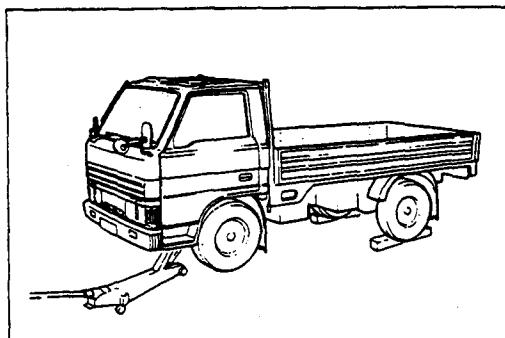
9MUGIX-036

**FUNDAMENTAL PROCEDURES****PROTECTION OF THE VEHICLE**

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

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FUNDAMENTAL PROCEDURES



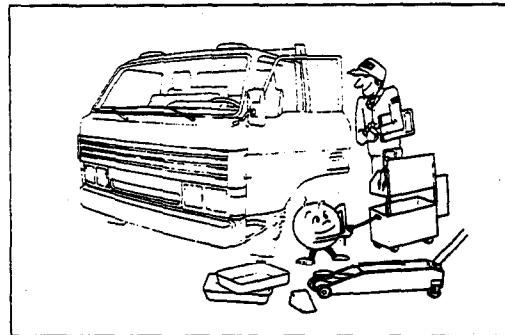
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A WORD ABOUT SAFETY

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.

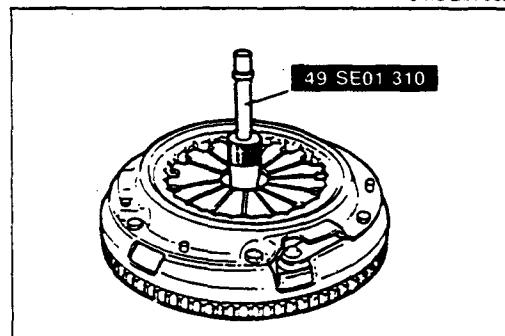
Start the engine only after making certain the engine compartment is clear of tools and people.



9MUGIX-038

PREPARATION OF TOOLS AND MEASURING EQUIPMENT

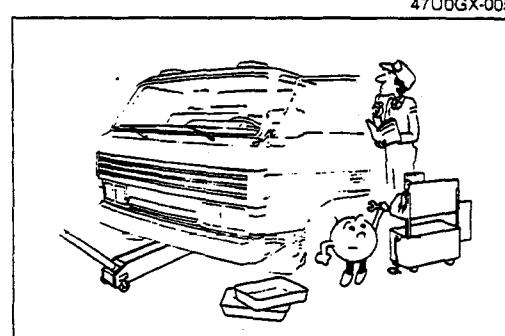
Be sure that all necessary tools and measuring equipment are available before starting any work.



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SPECIAL TOOLS

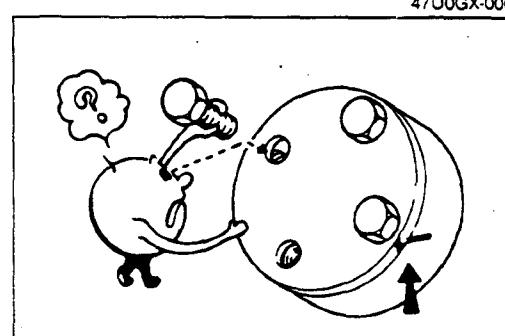
Use special tools when they are required.



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REMOVAL OF PARTS

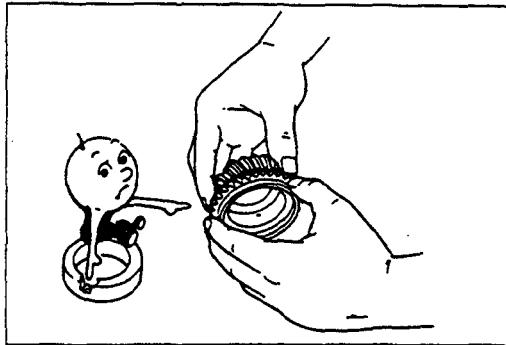
While correcting a problem, try also to determine its cause. Begin work only after first learning which parts and subassemblies must be removed and disassembled for replacement or repair.



9MUGIX-039

DISASSEMBLY

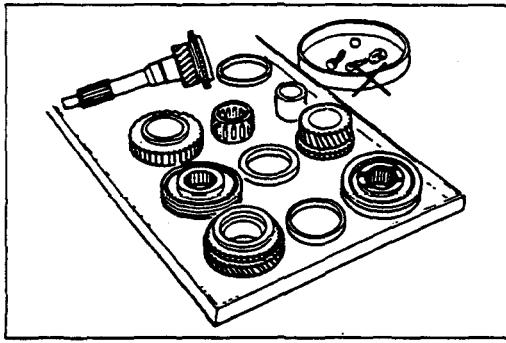
If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be disassembled in a way that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.



9MUGIX-040

1. Inspection of parts

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

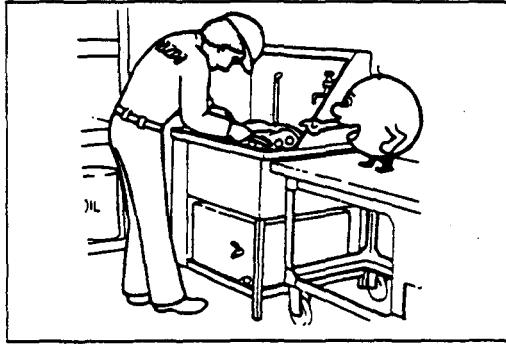


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2. Arrangement of parts

All disassembled parts should be carefully arranged for reassembly.

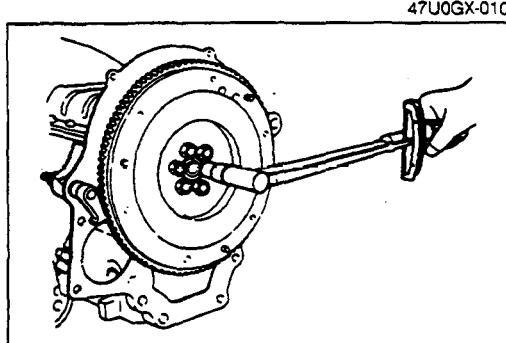
Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.



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3. Cleaning parts for reuse

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



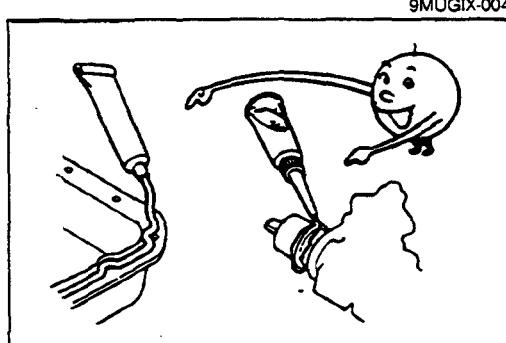
9MUGIX-004

REASSEMBLY

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

If removed, these parts should be replaced with new ones:

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

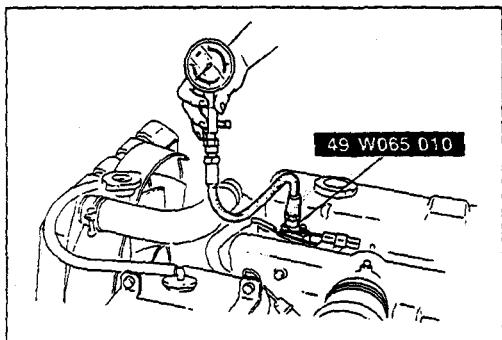


9MUGIX-042

Depending on location:

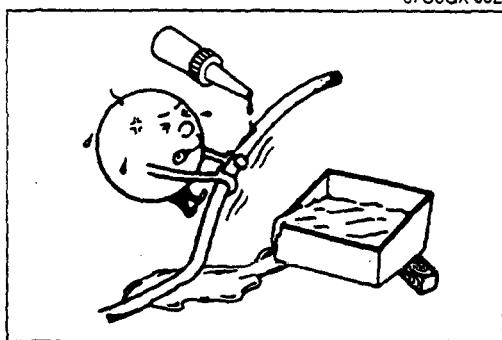
1. Sealant should be applied to gaskets.
2. Oil should be applied to the moving components of parts.
3. Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.

FUNDAMENTAL PROCEDURES



ADJUSTMENTS

Use suitable gauges and/or testers when making adjustments.

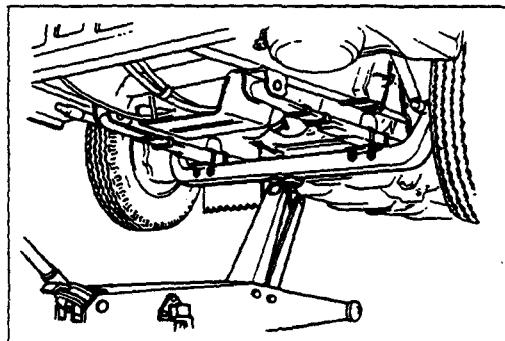


RUBBER PARTS AND TUBING

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

JACK AND SAFETY STAND (RIGID RACK) POSITIONS**FRONT END****Jack position:**

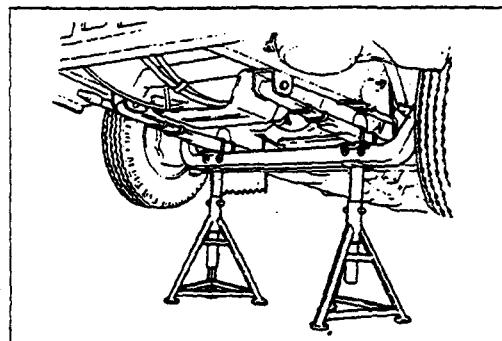
At the center of the front axle



9TFCIX-002

Safety stand positions:

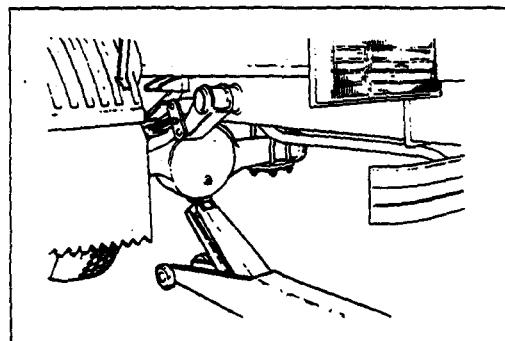
On both sides of the front axle



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REAR END**Jack position:**

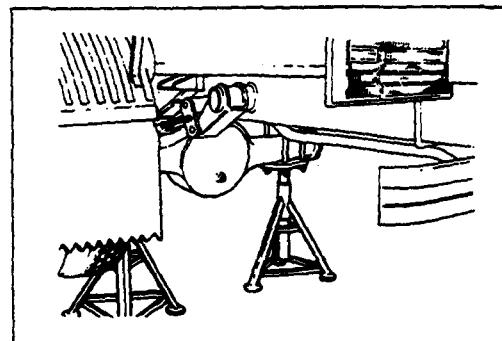
At the center of differential



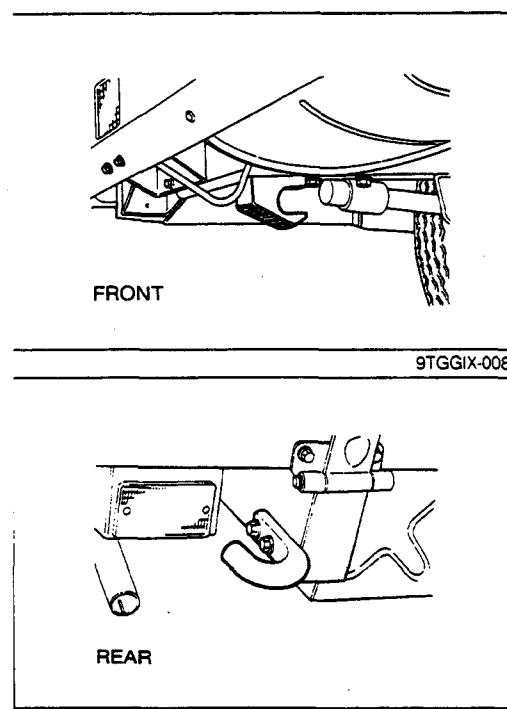
9TGGIX-006

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.

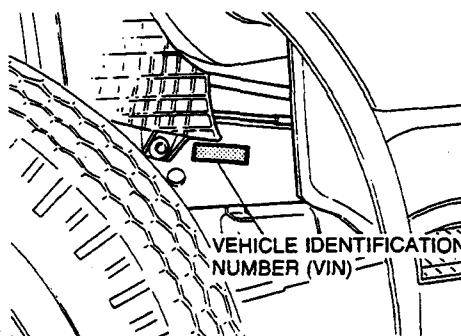
If the transmission, rear axle and steering system are not damaged, the vehicle may be towed on all four wheels. If they are damaged, use a towing dolly.

Caution

- The gearshift lever must be set at 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.

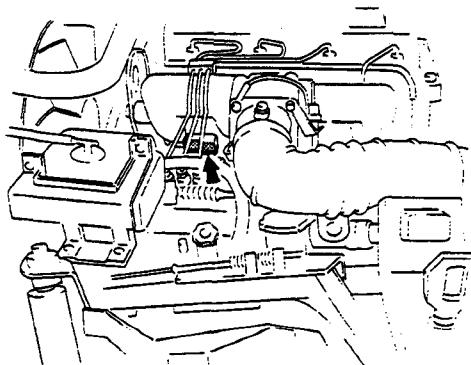
IDENTIFICATION NUMBER LOCATIONS

VEHICLE IDENTIFICATION NUMBER (VIN)

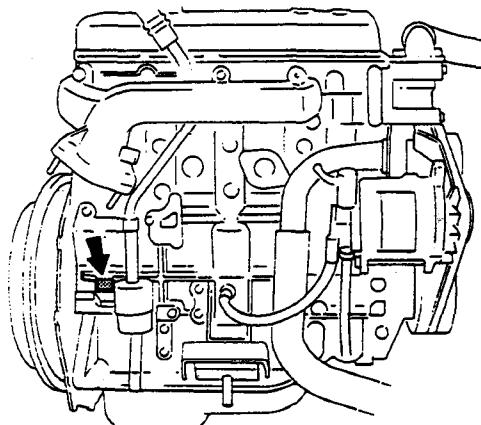


ENGINE MODEL AND NUMBER

ENGINE NUMBER



ENGINE MODEL



9TGGIX-010

GI-9

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

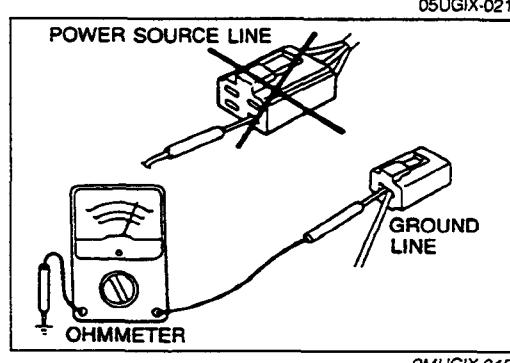
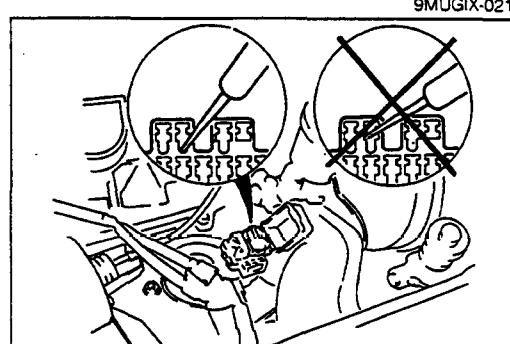
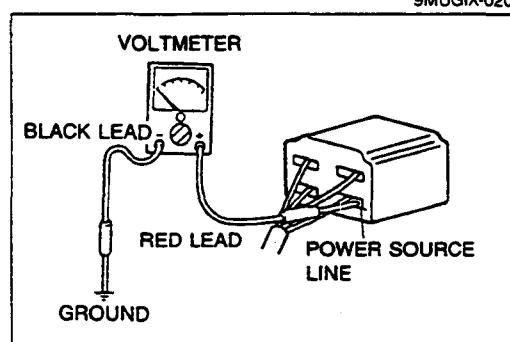
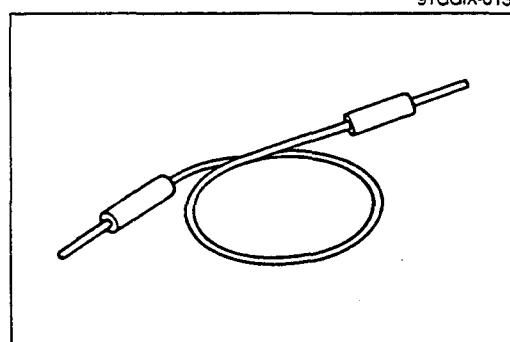
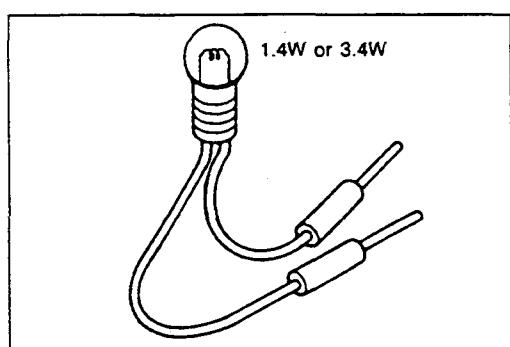
CAUTION**CAUTION****ELECTRICAL TROUBLESHOOTING TOOLS****Test Light**

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.

**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

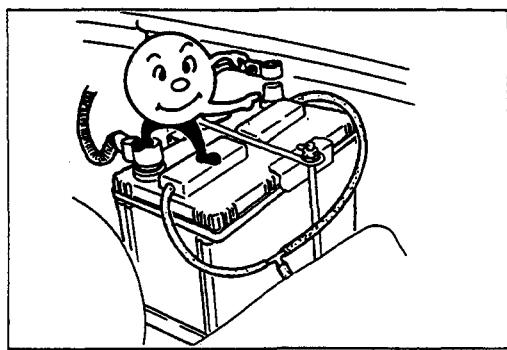
The ohmmeter is used to measure the resistance between two points in a circuit and also to check for continuity and diagnosis of short circuits.

Caution

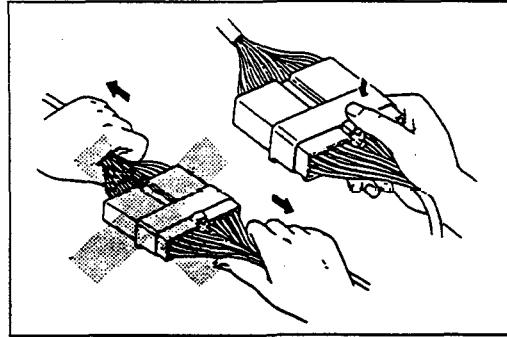
- Do not attempt to connect the ohmmeter to any circuit to which voltage is applied; this may burn or otherwise damage the ohmmeter.

CAUTION**CAUTION WITH ELECTRICAL PARTS****Battery Cable**

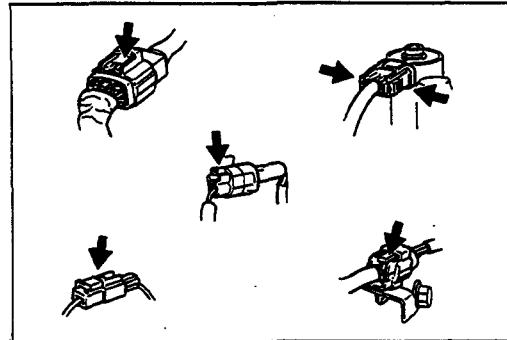
Before disconnecting connectors or replacing electrical parts, disconnect the negative battery cable.



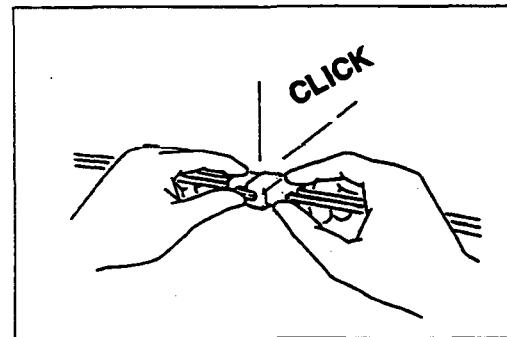
9MUGIX-022



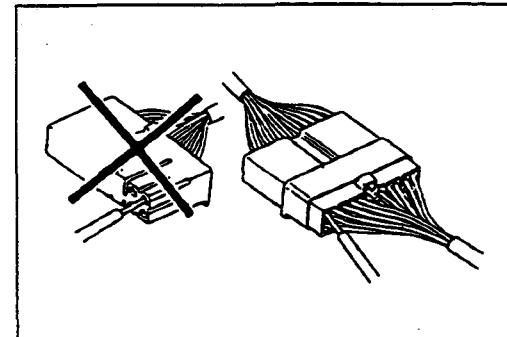
9MUGIX-023



9MUGIX-024



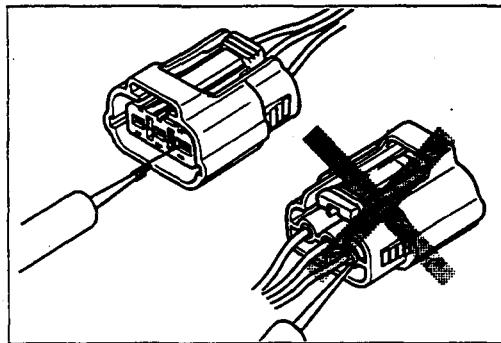
9MUGIX-025



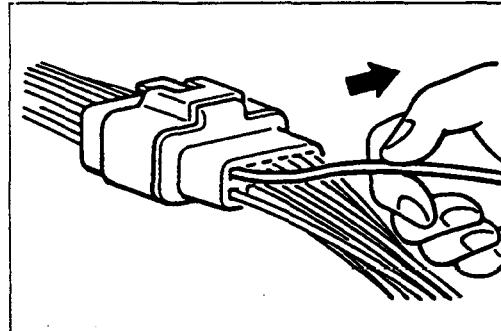
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Inspection

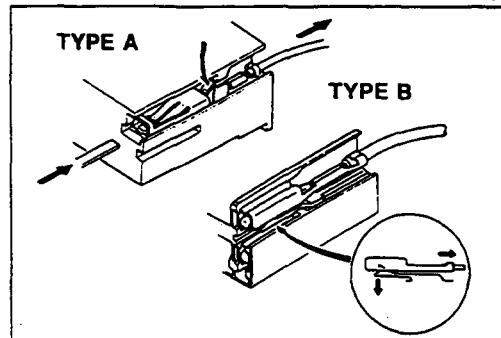
1. When a tester is used to check for continuity or to measure voltage, insert the tester probe from the wire harness side.

CAUTION

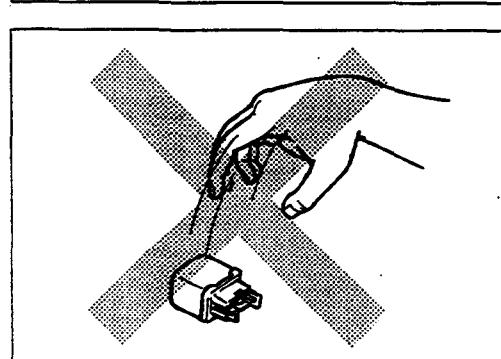
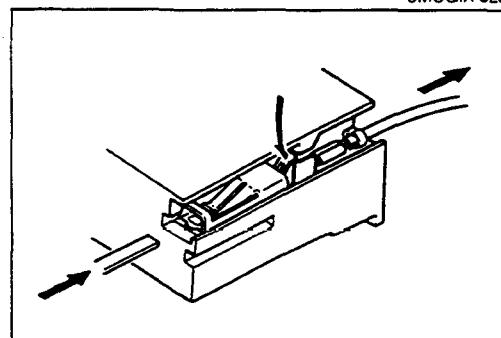
05UGIX-028



9MUGIX-027



9MUGIX-028



9MUGIX-030

- 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.**

Terminals**Inspection**

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

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.

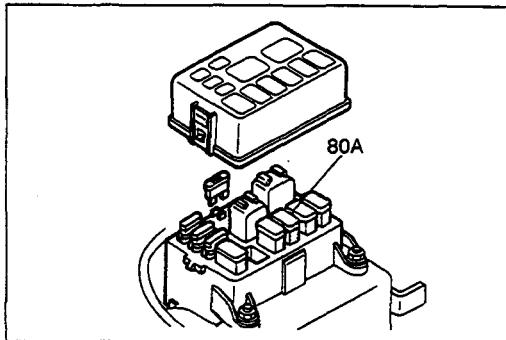
<Male>

Same as the female type.

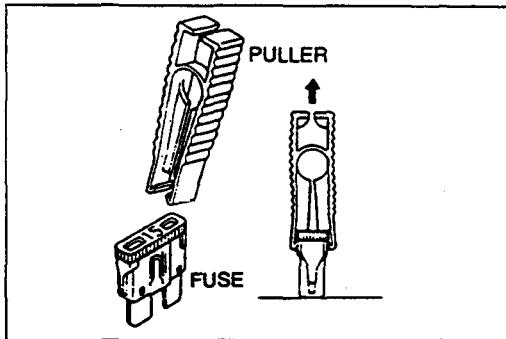
Sensors, Switches, and Relays

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

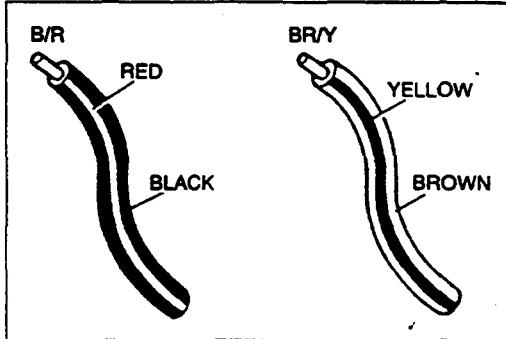
CAUTION



9MUGIX-031



9MUGIX-032



9MUGIX-029

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**

9TGOAX-101

A PRE-DELIVERY INSPECTION TABLE

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

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 intervals.
- *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 item	Maintenance interval	Kilometers (miles)											
		x1,000 km (x1,000 miles)	1 0.6	5 3	10 6	15 9	20 12	25 15	30 18	35 21	40 24	45 27	50 30

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
*1 Engine oil	HA and SL engine	R	R	R	R	R	R	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		R
Oil bypass filter	HA and SL engine				R			R		R		R		R
	SL Turbo engine			R	R	R	R	R	R	R	R	R	R	R

Cooling System

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

A SCHEDULED MAINTENANCE SERVICES

MAINTENANCE TABLE (Cont'd)

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

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		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		I	R	I		I	
Brake and clutch pedals		I		I		I		I		I		I	
Drum brake				I			I			I		I	
Power brake unit and hoses				I			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		I	
Steering operation and gear housing				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	I	R	I	R	I	R
Transmission linkage & cables				I			I			I		I	
Rear axle oil	R	I	R	I	R	I	R	I	R	I	R	I	R
Propeller shaft				L			L			L		L	
Kingpin oil		I	I	I	I	I	I	I	I	I	I	I	I
Wheel bearing grease				R			R		R				R
Wheel nuts	T	T	T	T	T	T	T	T	T	T	T	T	T
Bolts and nuts on chassis and body	T		T				T		T			T	
Steering linkage				L			L		L			L	

SCHEDULED MAINTENANCE SERVICES

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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 intervals.
- *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.

9TFOAX-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
Maintenance item	Months	—	—	6	—	12	—	18	—	24	—	30	—	36

Engine

Engine valve clearance	I	I	I	I	I	I	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	R	R	R	R	R
	SL Turbo and TF engine	R	R	R	R	R	R	R	R	R	R	R	R
Oil filter* ¹	SL engine	R	R	R	R	R	R	R	R	R	R	R	R
	SL Turbo engine	R	R	R	R	R	R	R	R	R	R	R	R
Oil bypass filter	TF engine	R	R	R	R	R	R	R	R	R	R	R	R
	SL engine				R			R		R		R	R
	SL Turbo engine			R	R	R	R	R	R	R	R	R	R
	TF engine			R		R		R		R		R	R

Cooling System

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

Fuel System

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

A**SCHEDULED MAINTENANCE SERVICES****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
Maintenance item	Months	—	—	6	—	12	—	18	—	24	—	30	—	36

Injection System

Injection timing	(I) every 40,000 km												
Injection nozzle	I	I	I	I	I	I	I	I	I	I	I	I	I

Electrical System

Battery electrolyte level and specific gravity	I	I	I	I	I	I	I	I	I	I	I	I	I
--	---	---	---	---	---	---	---	---	---	---	---	---	---

Chassis and Body

Brake and clutch lines and connections	I	I	I	I	I	I	I	I	I	I	I	I	I
Brake fluid* ³	I	I	I	I	I	I	R	I	I	I	I	I	I
Clutch fluid	I	I	I	I	I	I	R	I	I	I	I	I	I
Brake and clutch pedals	I	I	I	I	I	I	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	I	I	I	I	I	I
Parking brake	I	I	I	I	I	I	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	I	I	I	I	I	I
Power steering fluid and lines (if equipped)		I	I	I	I	I	I	I	I	I	I	I	I
Manual transmission oil	R	I	R	I	R	I	R	I	R	I	R	I	R
Transmission linkage & cables	I		I		I		I		I		I		I
Rear axle oil	R	I	R	I	R	I	R	I	R	I	R	I	R
Propeller shaft			L			L		L		L		L	
Kingpin oil		I	I	I	I	I	I	I	I	I	I	I	I
Wheel bearing grease				R			R		R		R		R
Wheel nuts	T	T	T	T	T	T	T	T	T	T	T	T	T
Bolts and nuts on chassis and body	T			T			T		T		T		T
Steering linkage	I	I	L	I	I	L	I	L	I	L	I	L	

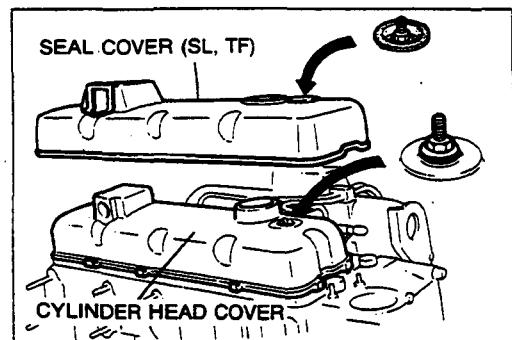
SCHEDULED MAINTENANCE SERVICES

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SCHEDULED MAINTENANCE SERVICES

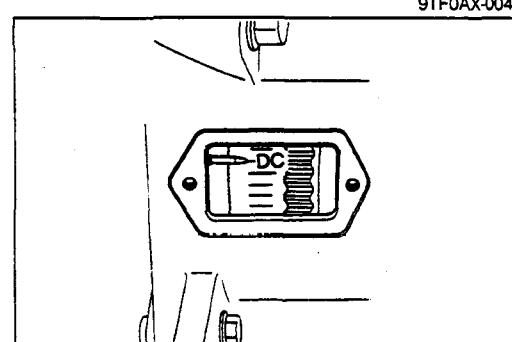
Preparation SST

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

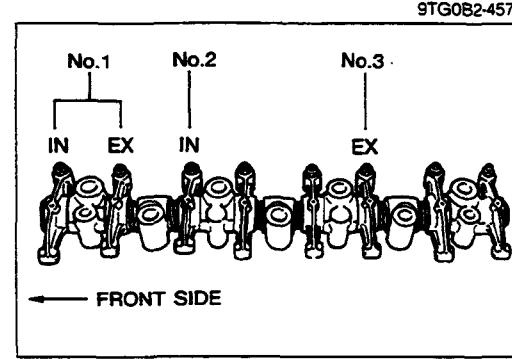


ADJUSTMENT OF ENGINE VALVE CLEARANCE

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.

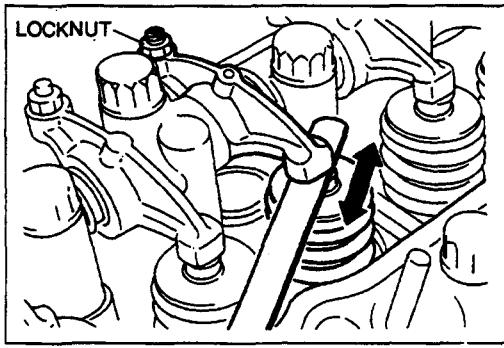
Valve clearance (Engine cold)

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)

A

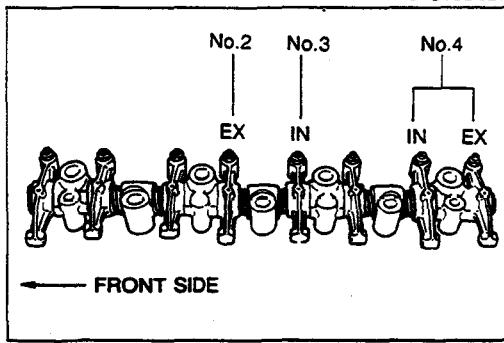
SCHEDULED MAINTENANCE SERVICES



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)



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)

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)

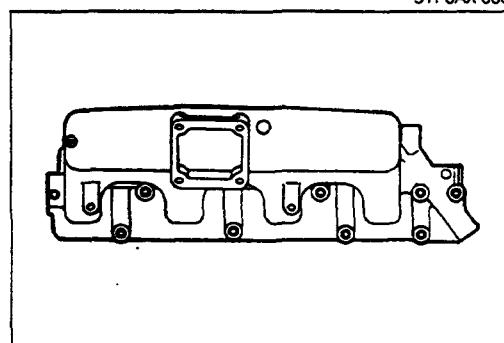
TIGHTENING OF INTAKE MANIFOLD

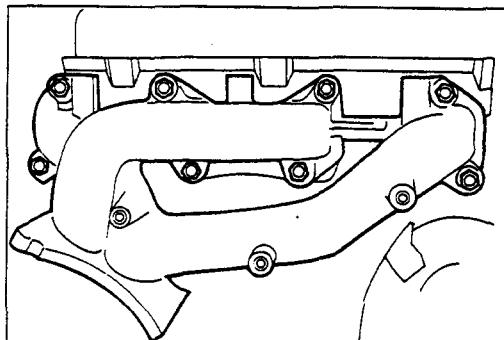
Tightening torque:

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)

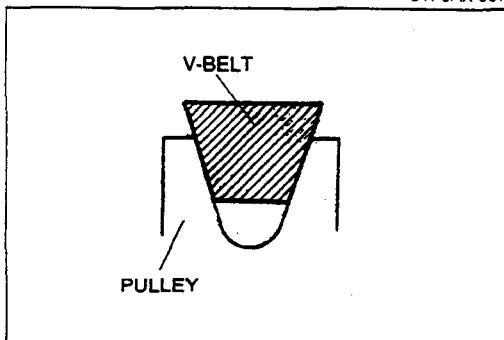




TIGHTENING OF EXHAUST MANIFOLD

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)



INSPECTION AND ADJUSTMENT OF DRIVE BELTS

Inspection

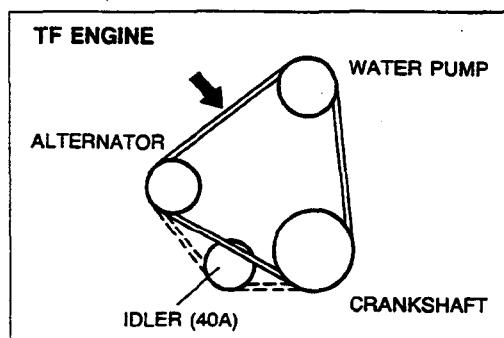
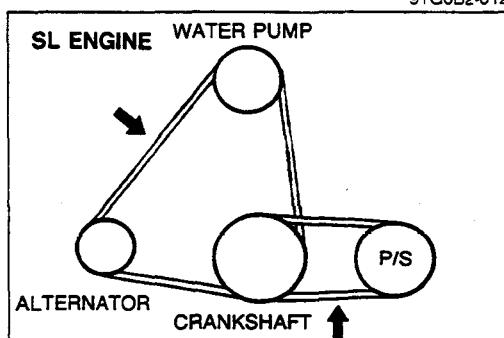
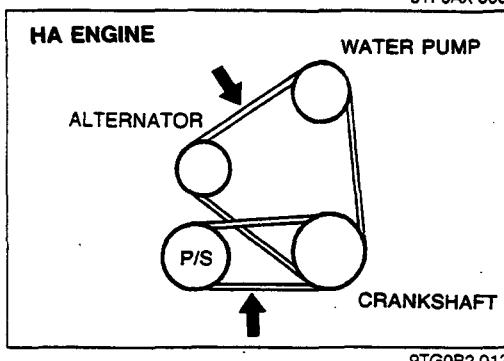
1. Remove the undercover for inspection of the P/S belt.
2. Check the drive belts for wear, cracks, and fraying. Replace if necessary.
3. Verify that the drive belts are correctly mounted on the pulleys.

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

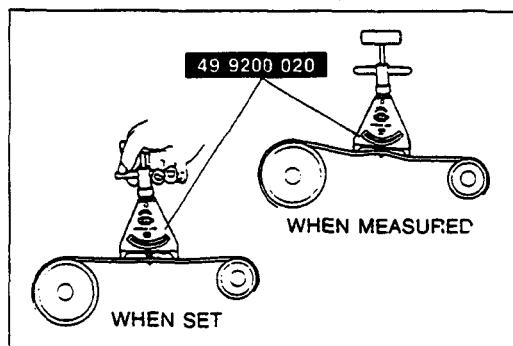
mm (in)

		New	Used
		mm (in)	mm (in)
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)

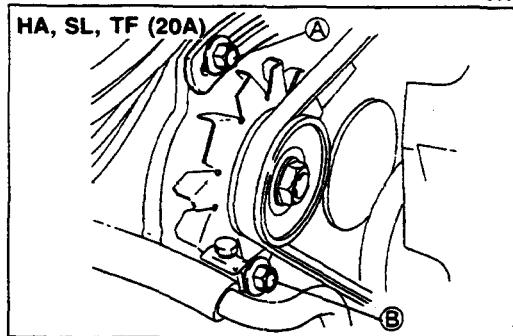


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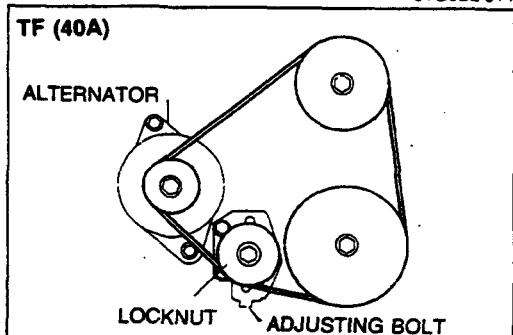
SCHEDULED MAINTENANCE SERVICES



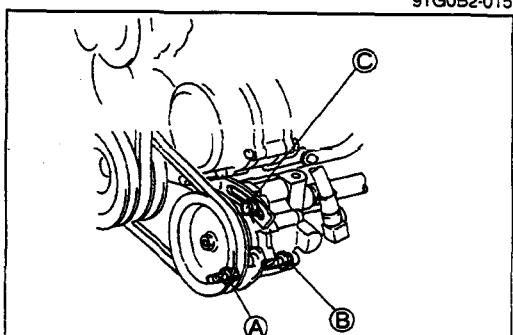
9TFOAX-009



9TG0B2-014



9TG0B2-015



9TFOAX-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:

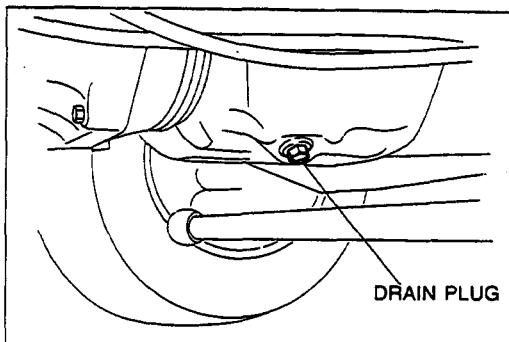
A: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

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

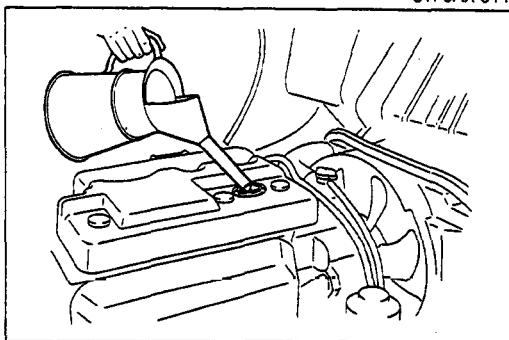
C: 37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

SCHEDULED MAINTENANCE SERVICES

A



9TFOAX-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).

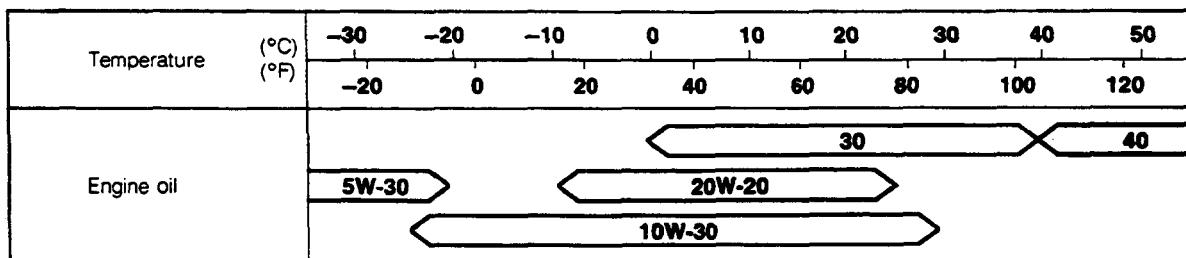
6. Refit the oil filler cap.

7. Run the engine and check for leaks.

8. Stop the engine and check the oil level. Add oil if necessary.

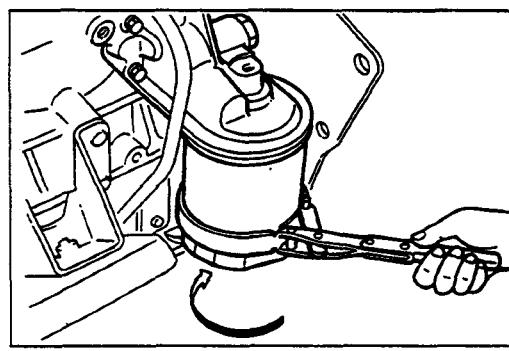
9TG0AX-017

Recommended SAE Viscosity



05U0DX-004

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

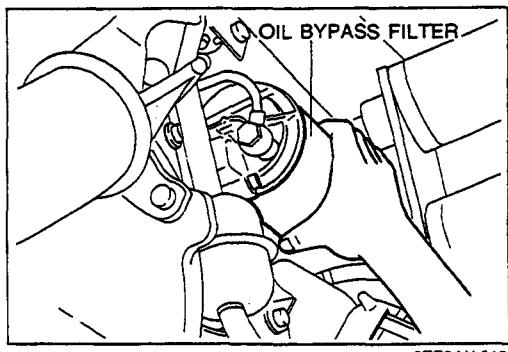


9TFOAX-012

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)



9TFOAX-013

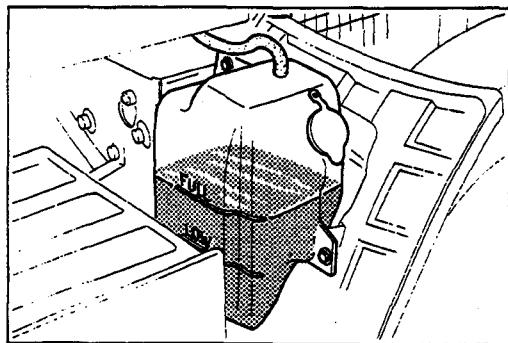
REPLACEMENT OF OIL BYPASS FILTER

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.

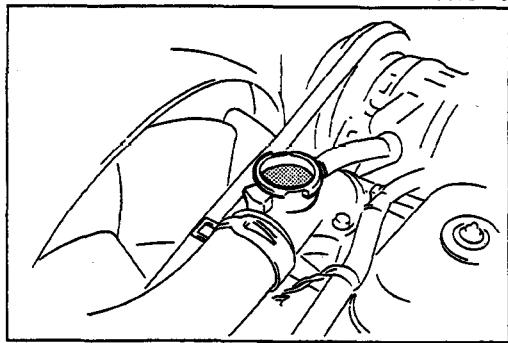
9TFOAX-014



9TG0E2-008

Coolant level (Engine cold)

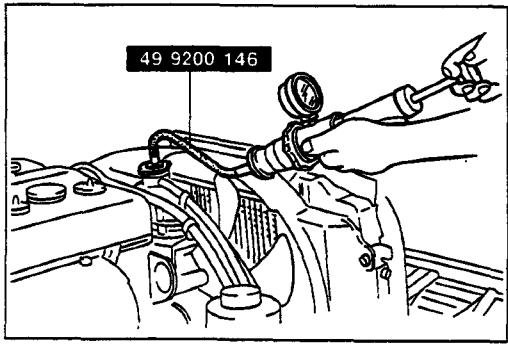
1. Verify that the coolant level is near the coolant inlet port.
2. Verify that the coolant level in the coolant reservoir is between the FULL and LOW marks. Add coolant if necessary.



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.



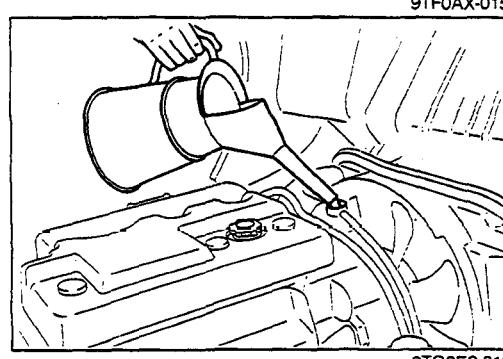
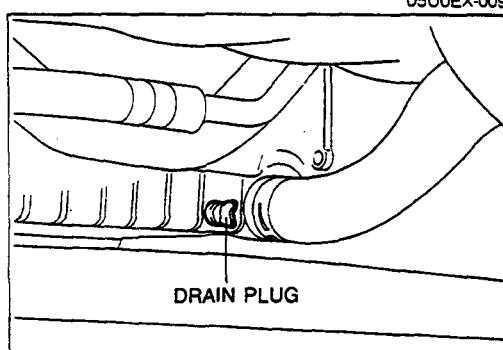
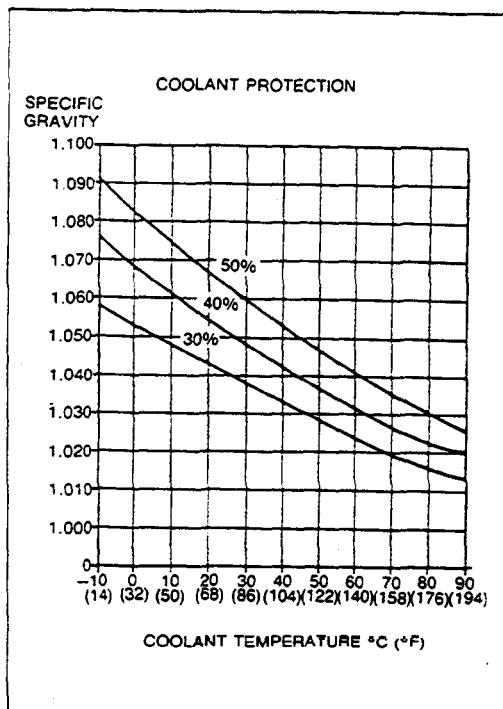
9TG0E2-010

Coolant leakage

1. Connect a radiator tester (commercially available) and the **SST** to the coolant inlet port.
2. Apply **88 kPa (0.9 kg/cm², 13 psi)** pressure to the system.
3. Verify that the pressure is held.
If not, check for coolant leakage.

SCHEDULED MAINTENANCE SERVICES

A



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.

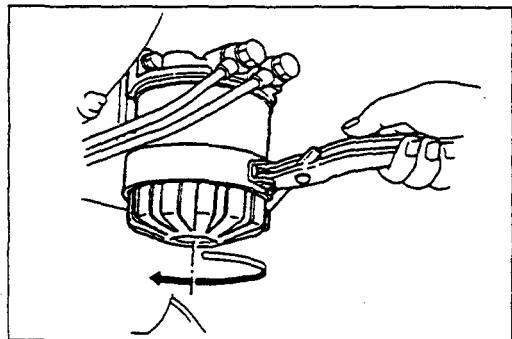
Coolant capacity

With heater core: 13.5 liters (14.3 US qt, 11.9 Imp qt)

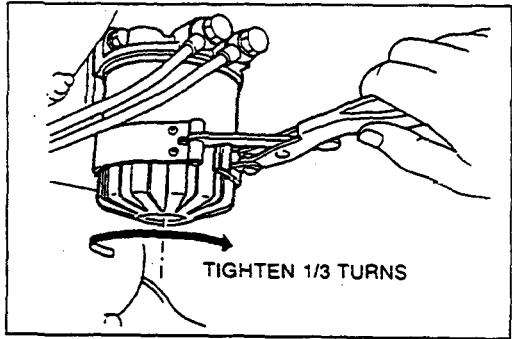
Without heater core:

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.

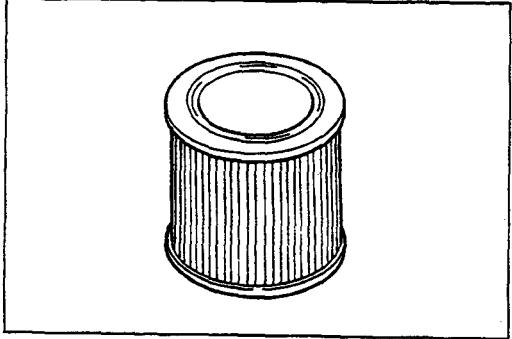


9TA0AX-022



TIGHTEN 1/3 TURNS

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.

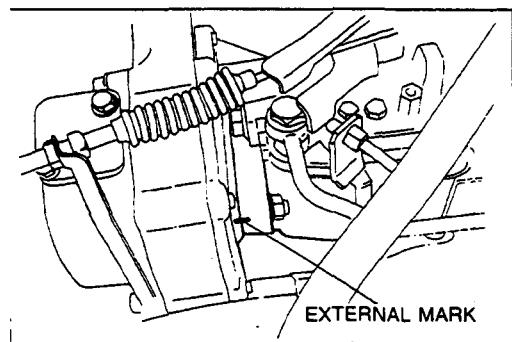
6. Start the engine and check for fuel leakage.

INSPECTION OF AIR CLEANER ELEMENT

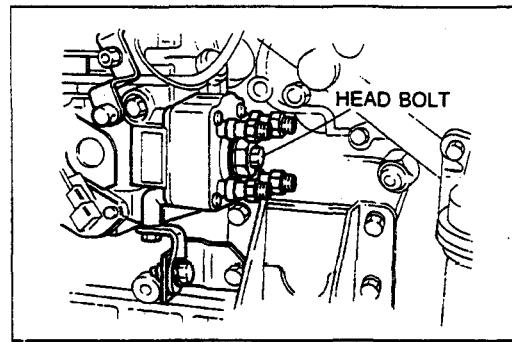
Visually check that the element for excessive dirt, damage or oil. Clean or replace it if necessary.

Note

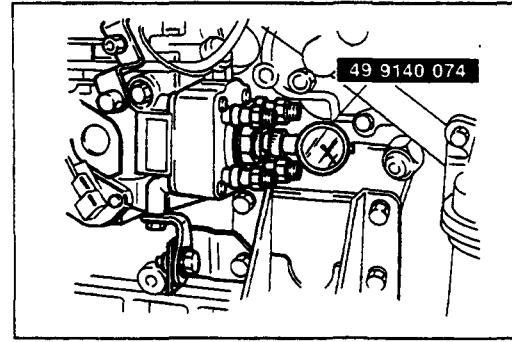
- When cleaning, first blow dust from inside then blow the dust off the outside of air cleaner element.



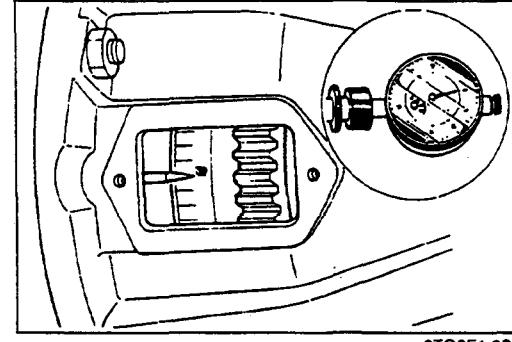
9TG0AX-030



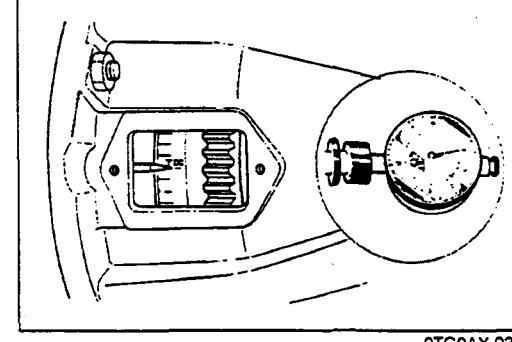
9TG0F1-018



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.

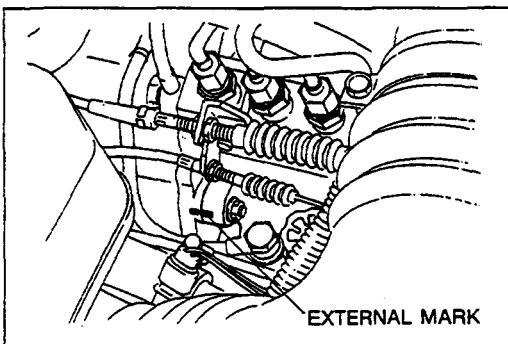
5. When the dial gauge needle does not deflect, set the needle to "0" on the scale.

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.



SL, TF Engine Inspection

Note

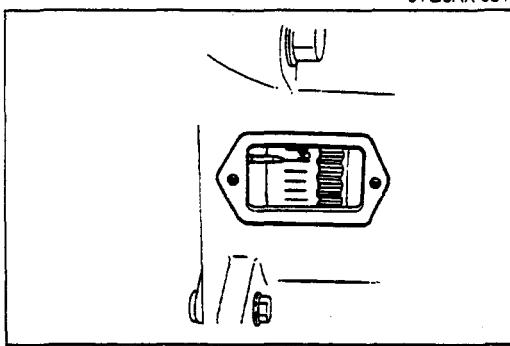
- Usually it is enough to confirm that the external marks are aligned.

Caution

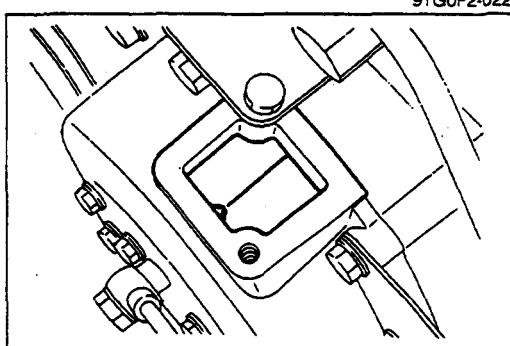
- Direct injection engines are sensitive to injection timing. Incorrect timing will cause engine knocking or low power output.

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.

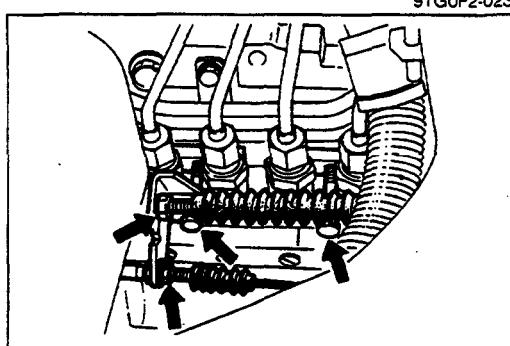


3. Verify that the pointer of the timing gear case and the mark on the timer are aligned.
4. If not as specified, adjust the injection timing.

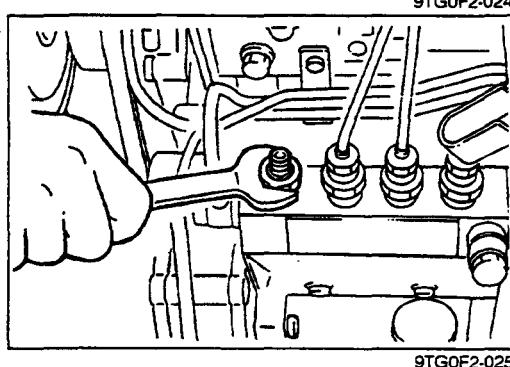


Adjustment

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.

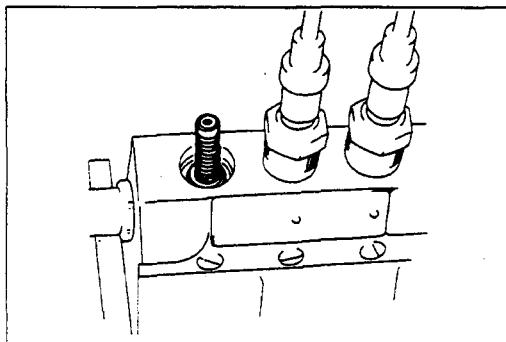


5. Remove No.1 injection pipe and the delivery valve holder.



SCHEDULED MAINTENANCE SERVICES

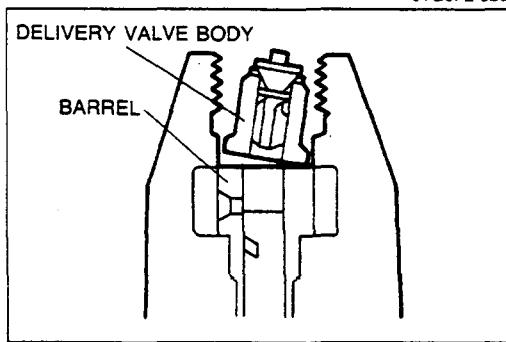
A



6. Remove the delivery valve spring seat and spring.

Caution

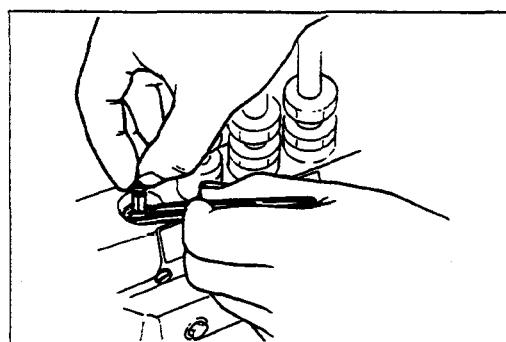
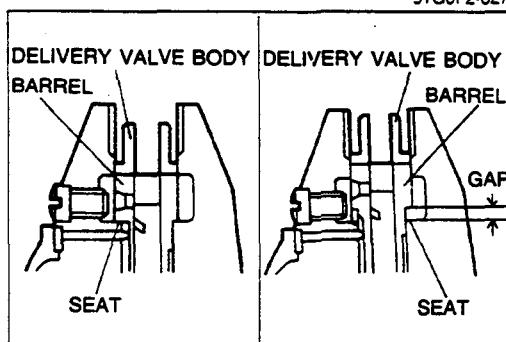
- Do not remove the delivery valve body.



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.

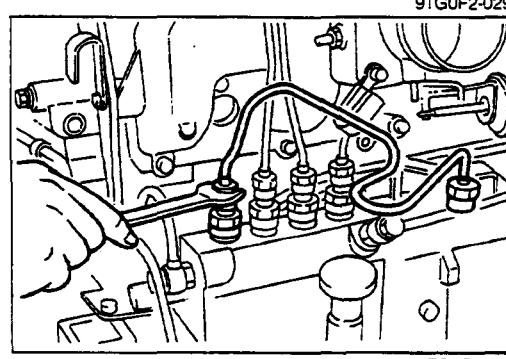


8. Remove the delivery valve, holding the flat washer with tweezers.

Caution

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

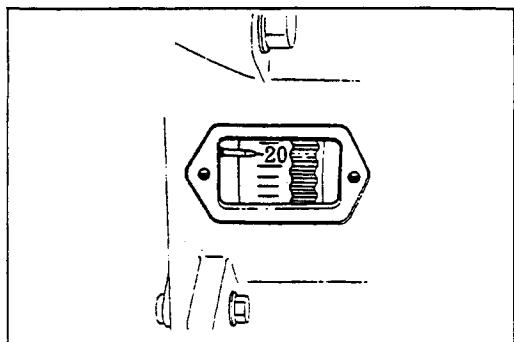
9. Reinstall the delivery valve holder.



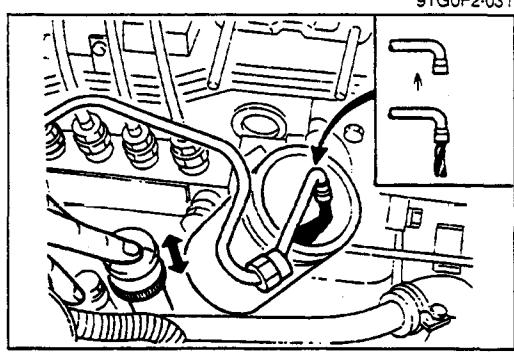
10. Tighten No. 1 injection pipe so that it points away from the pump.

9TG0F2-030

A SCHEDULED MAINTENANCE SERVICES



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



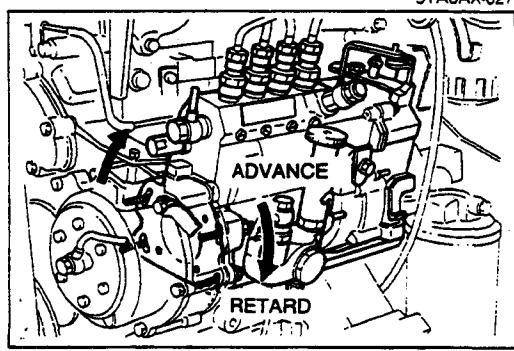
12. Place a container under No.1 injector pipe and verify that fuel is expelled when pumping the primer pump.
13. While pumping the priming pump, turn the flywheel in the normal direction of rotation and verify that fuel flow stops as specified.

Fuel stops:

SL Non-turbo: 12° BTDC

SL Turbo : 13° BTDC

TF : 11° BTDC



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)

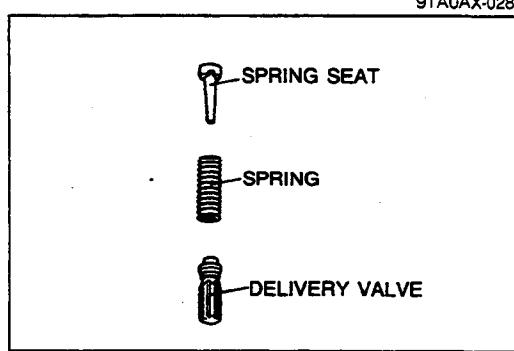
16. Mark the pump flange and pump body for future reference.

17. Install the delivery valve, spring, and spring seat.

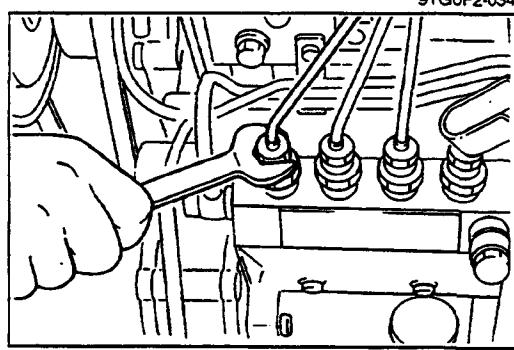
18. Tighten the delivery valve holder.

Tightening torque:

39—44 N·m (4.0—4.5 m·kg, 29—33 ft-lb)

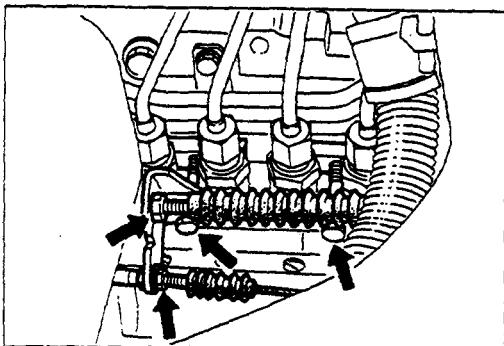


19. Install No.1 injection pipe.

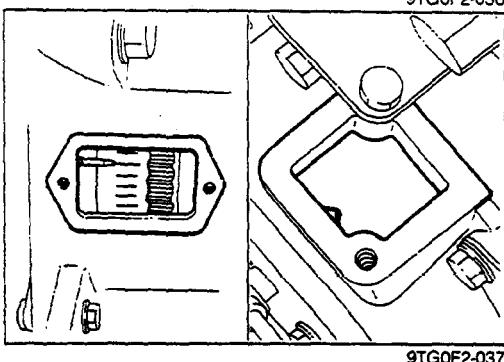


SCHEDULED MAINTENANCE SERVICES

A



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.



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

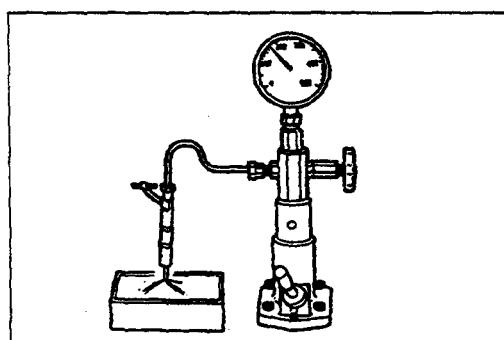
Warning

- 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.

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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

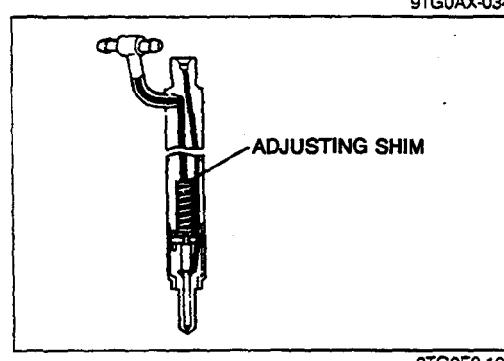
13,244—13,734 kPa
(135—140 kg/cm², 1,920—1,991 psi)

SL engine

New nozzle : 17,168 kPa (175 kg/cm², 2,489 psi)
Used nozzle: 16,677 kPa (170 kg/cm², 2,417 psi)

TF engine

New nozzle : 20,580 kPa (210 kg/cm², 2,986 psi)
Used nozzle: 19,620 kPa (200 kg/cm², 2,844 psi)

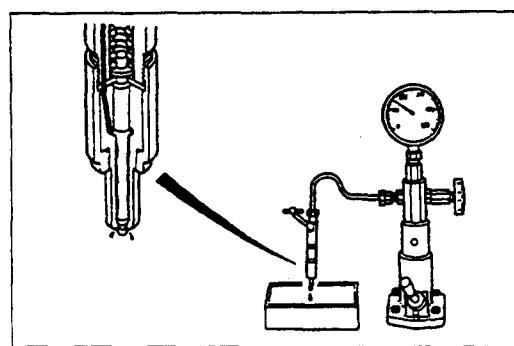


3. If not within the specified pressure, adjust the starting pressure by adding or removing shims.

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.

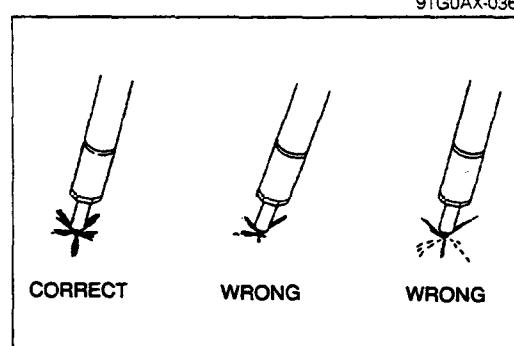
A SCHEDULED MAINTENANCE SERVICES



Leakage of Injector

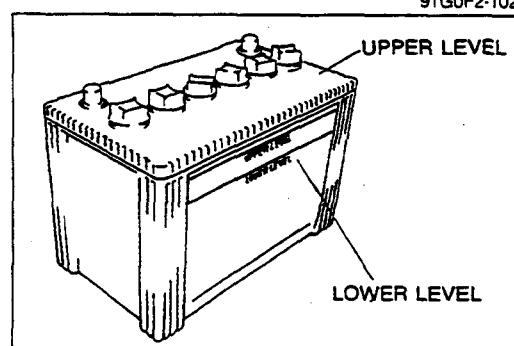
Apply pressure SL engine: 14,715 kPa (150 kg/cm², 2,133 psi), HA and TF engines: 1,962 kPa (20 kg/cm², 284 psi) lower than the specified injection pressure and see if the fuel leaks from the nozzle injection hole.

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



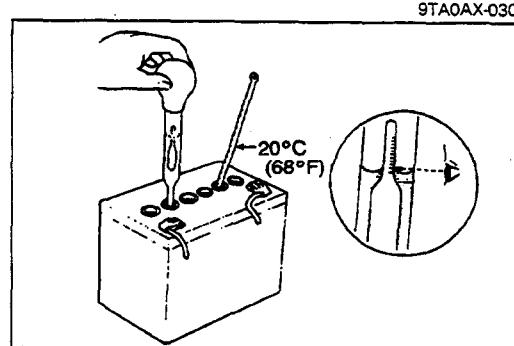
Atomizing Condition

1. Connect the nozzle on the nozzle tester.
2. 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.



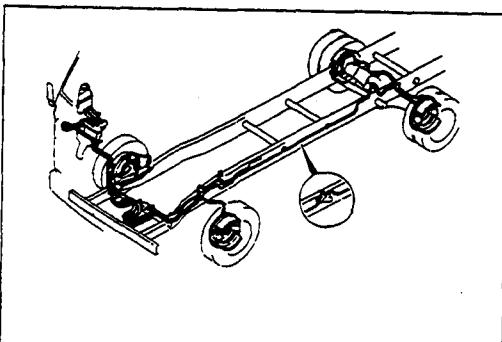
INSPECTION OF BATTERY

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.
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.)



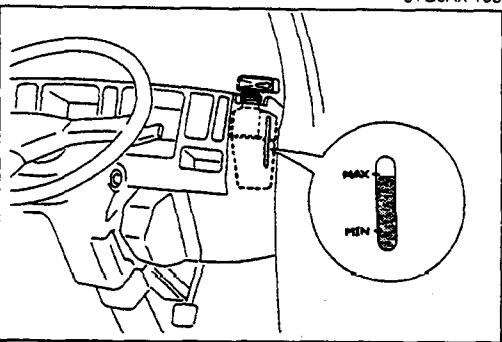
SCHEDULED MAINTENANCE SERVICES

A



INSPECTION OF BRAKE AND CLUTCH LINES, HOSES AND CONNECTIONS

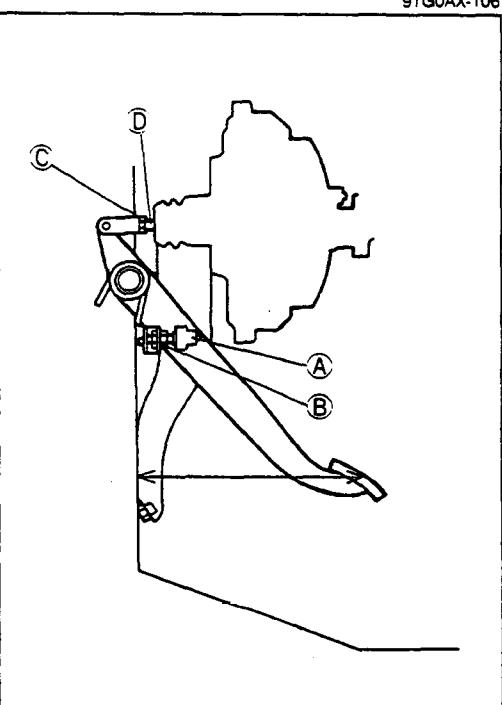
Check the brake and clutch lines and hoses for proper attachment and connections. There should not be any leaks, cracks, chafing, abrasion, deterioration, etc. on the lines or connections.



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



INSPECTION OF BRAKE PEDAL

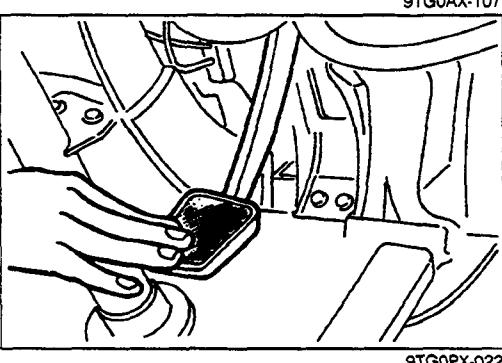
Pedal Height Inspection

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



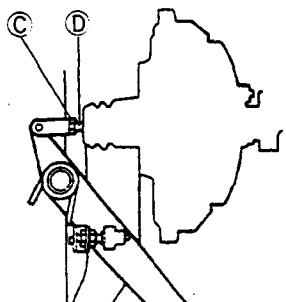
Pedal Play Inspection

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)

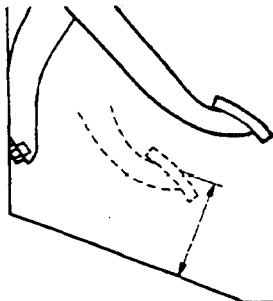
- Do not inspect the pedal play with the ignition switch ON. The brake vacuum warning buzzer will operate when the ignition switch is ON.



9TG0PX-023

Adjustment

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



9TG0PX-024

Pedal-to-floor Clearance**Inspection**

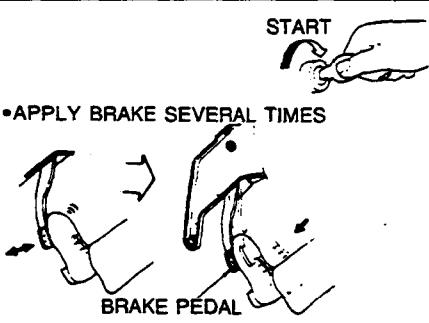
1. Start the engine and depress the pedal with a force of 5.9 N (60 kg, 52 lb). Check that the distance from the floor panel to the center of the upper surface of the pedal pad is as specified.

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

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-108

INSPECTION OF DRUM BRAKE

Check the following 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

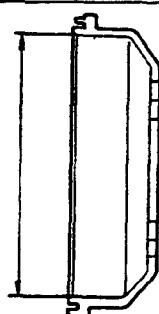
Min: 1.0mm (0.04 in)

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

Standard drum inner diameter:

Refer to Section TD

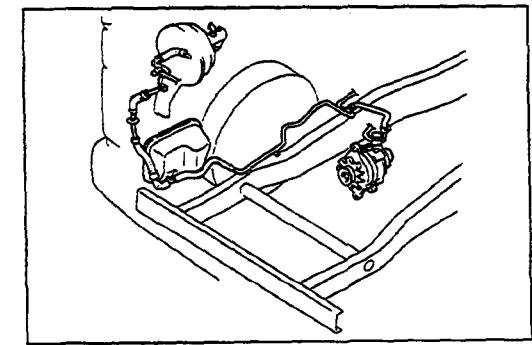
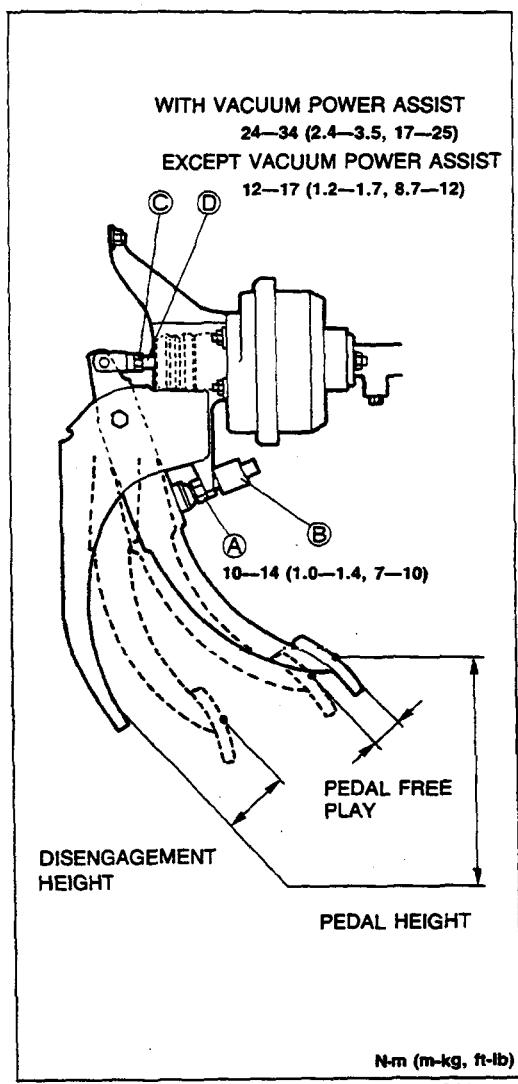
Max: Refer to Section TD



9TG0AX-110

SCHEDULED MAINTENANCE SERVICES

A



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)

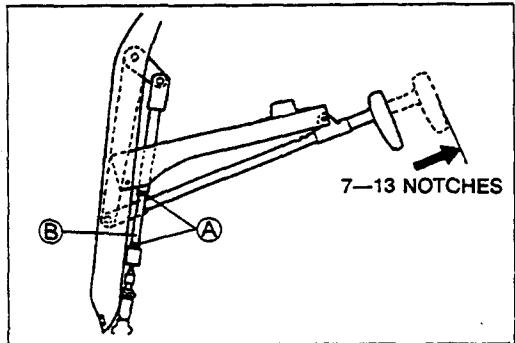
Except vacuum power assist

12–17 N·m (1.2–1.7 m·kg, 8.7–12 ft·lb)

4. After adjustment, inspect the pedal height.

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.



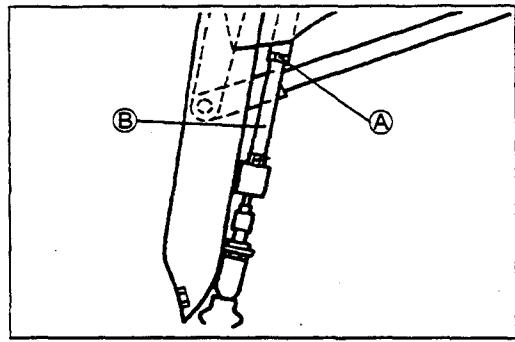
INSPECTION OF PARKING BRAKE LEVER

Inspection

Lever stroke

- 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

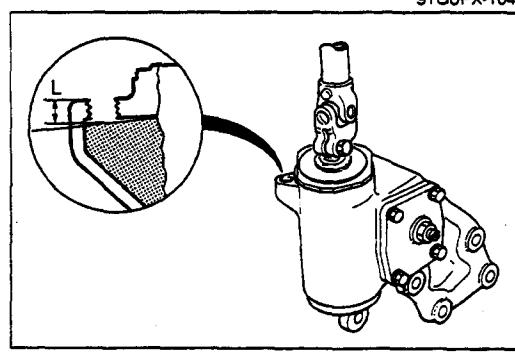


Adjustment

- Loosen locknut **A** and turn the adjusting bolt **B** 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.**

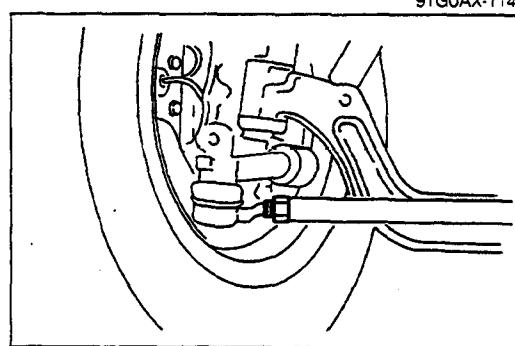


INSPECTION OF MANUAL STEERING GEAR OIL LEVEL

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

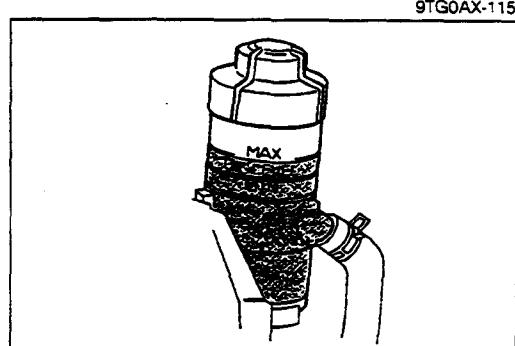
Standard "L" dimension: 10mm (0.39 in)

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



INSPECTION OF STEERING LINKAGE, TIE ROD ENDS AND ARMS

- Check the steering linkage for looseness and damage.
- Check the tie rod ends for excessive play.
- Check the dust boots for damage.
- Check the tie rod ends for looseness or grease leakage.



INSPECTION OF POWER STEERING FLUID AND LINES (If equipped)

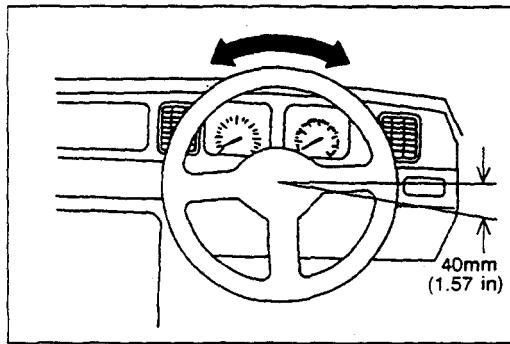
- Check the fluid hoses, lines and connections for cracks, chafing, deterioration, etc..
- Check the fluid level on the reservoir.
The level should be between the "MAX" and "MIN" level.
Add fluid if necessary.

Fluid specification:

ATF M2C33-F or DEXRON-II

SCHEDULED MAINTENANCE SERVICES

A



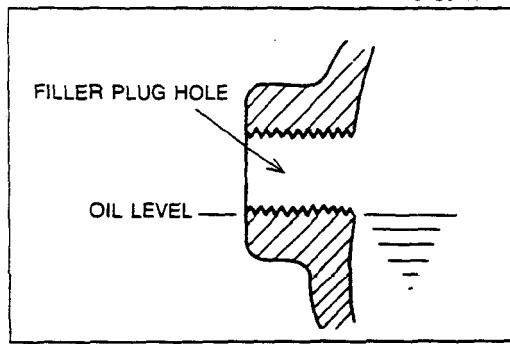
9TG0AX-117

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.



9TG0AX-118

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)

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

Specified oil:

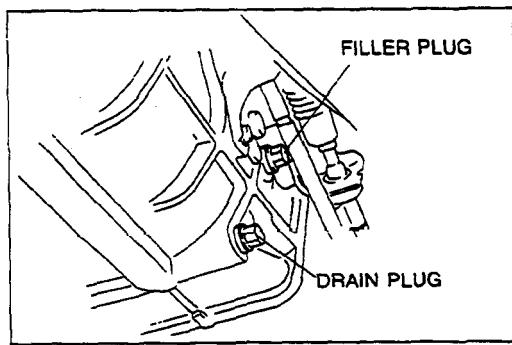
**Type: API Service GL-4 or GL-5
SAE 75W-90**

**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)**

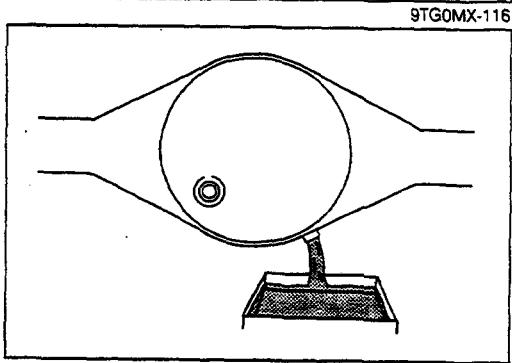
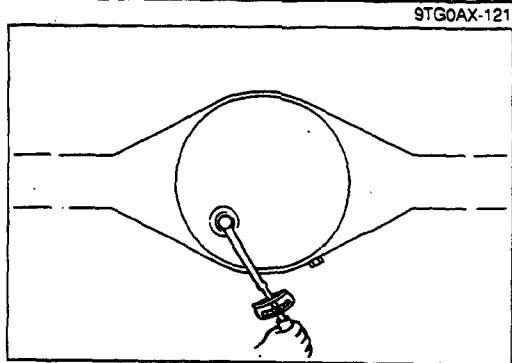
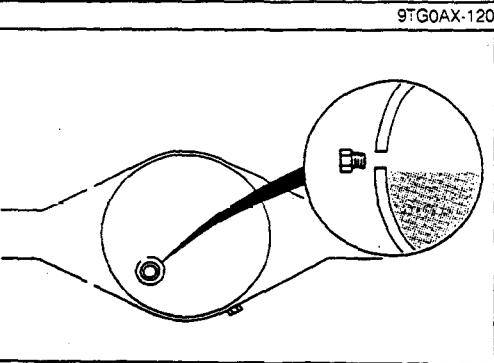
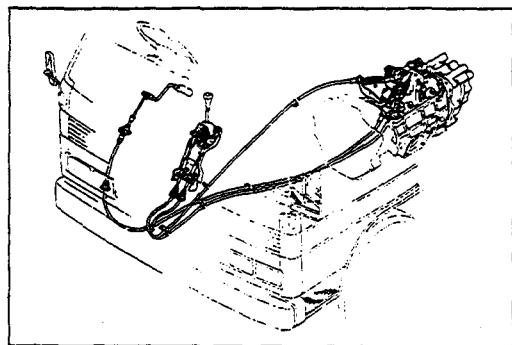
5. Apply sealant to the filler plug threads.
6. Install the filler plug.

Tightening torque:

33—51 N·m (3.4—5.2 m·kg, 25—38 ft-lb)



9TG0AX-119



INSPECTION OF TRANSMISSION LINKAGE AND CABLES

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

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

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.

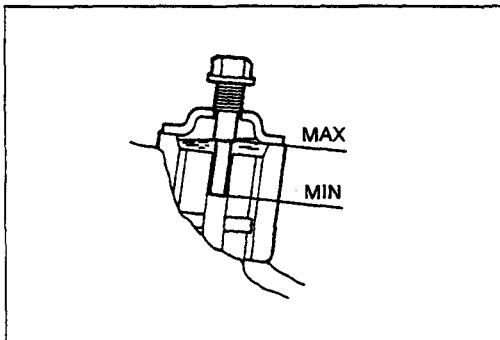
Tightening torque:

39—54 N·m (4.0—5.5 m-kg, 29—40 ft-lb)

9TG0MX-118

SCHEDULED MAINTENANCE SERVICES

A

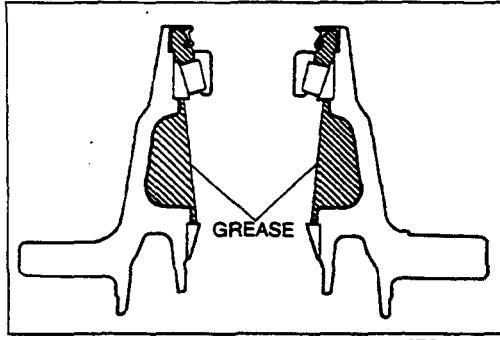


9TG0AX-124

INSPECTION OF KINGPIN OIL

Check the kingpin oil level on the gauge.

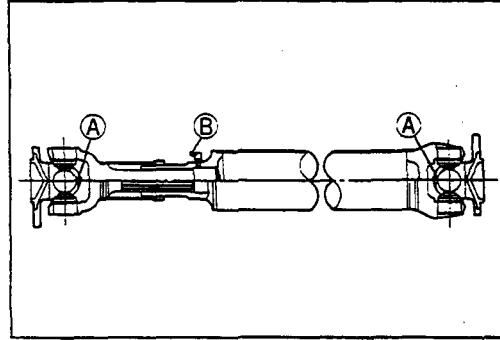
The level should be between the "MAX" and "MIN" level.



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).



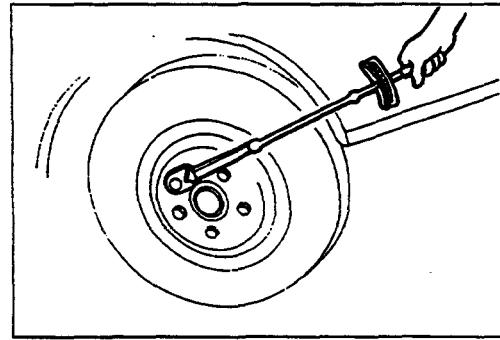
9TG0AX-128

LUBRICATION OF PROPELLER SHAFT JOINTS

Lubricate each part with the specified grease through the nipples.

Nipples....Grease

- | | |
|---|-----------------------------------|
| Ⓐ |NLGI No.2 |
| Ⓑ |Disulphide molybdenum grease |



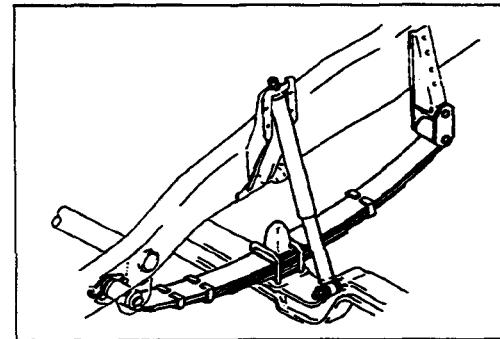
9TF0AX-017

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		491—735 (50—75, 362—542)	
Rear	167—215 (17—22, 123—159)	Inside 540—784 (55—80, 398—578)	Outside 491—735 (50—75, 362—542)



9TG0AX-130

TIGHTENING BOLTS AND NUTS ON CHASSIS AND BODY

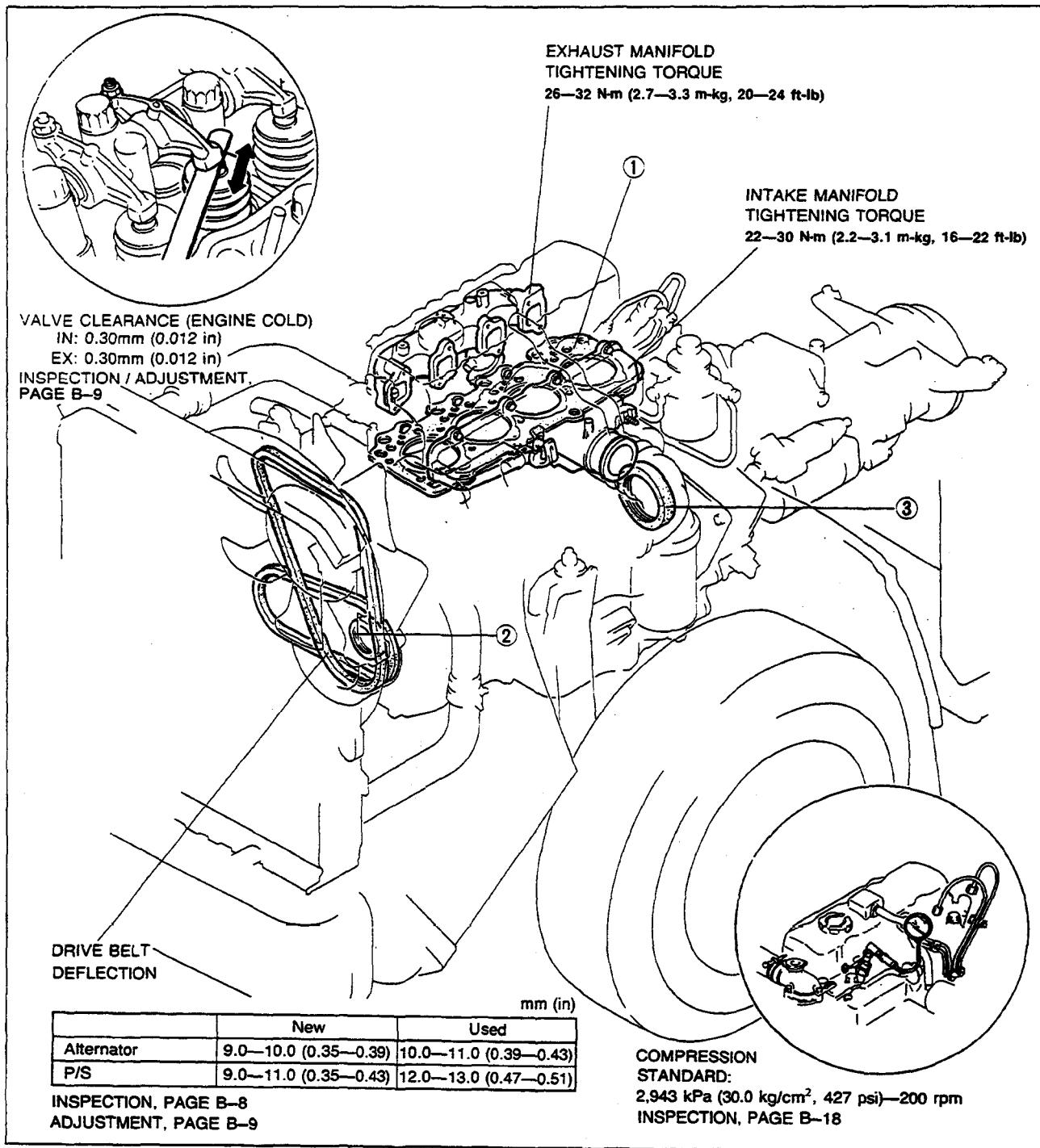
Retighten any loose nuts and bolts on chassis and body to the specified torque.

ENGINE

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HA ENGINE



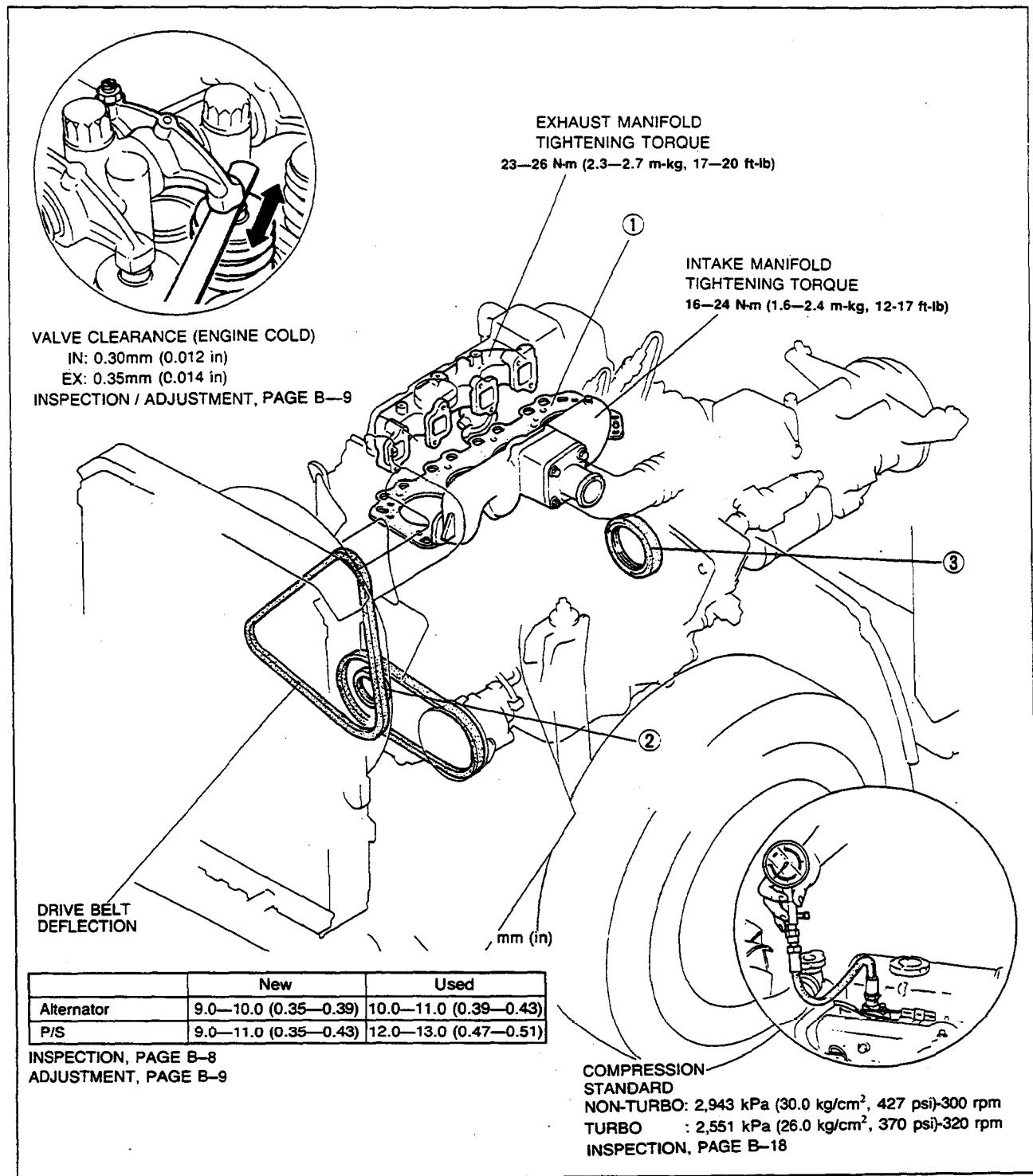
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9TF0BX-002

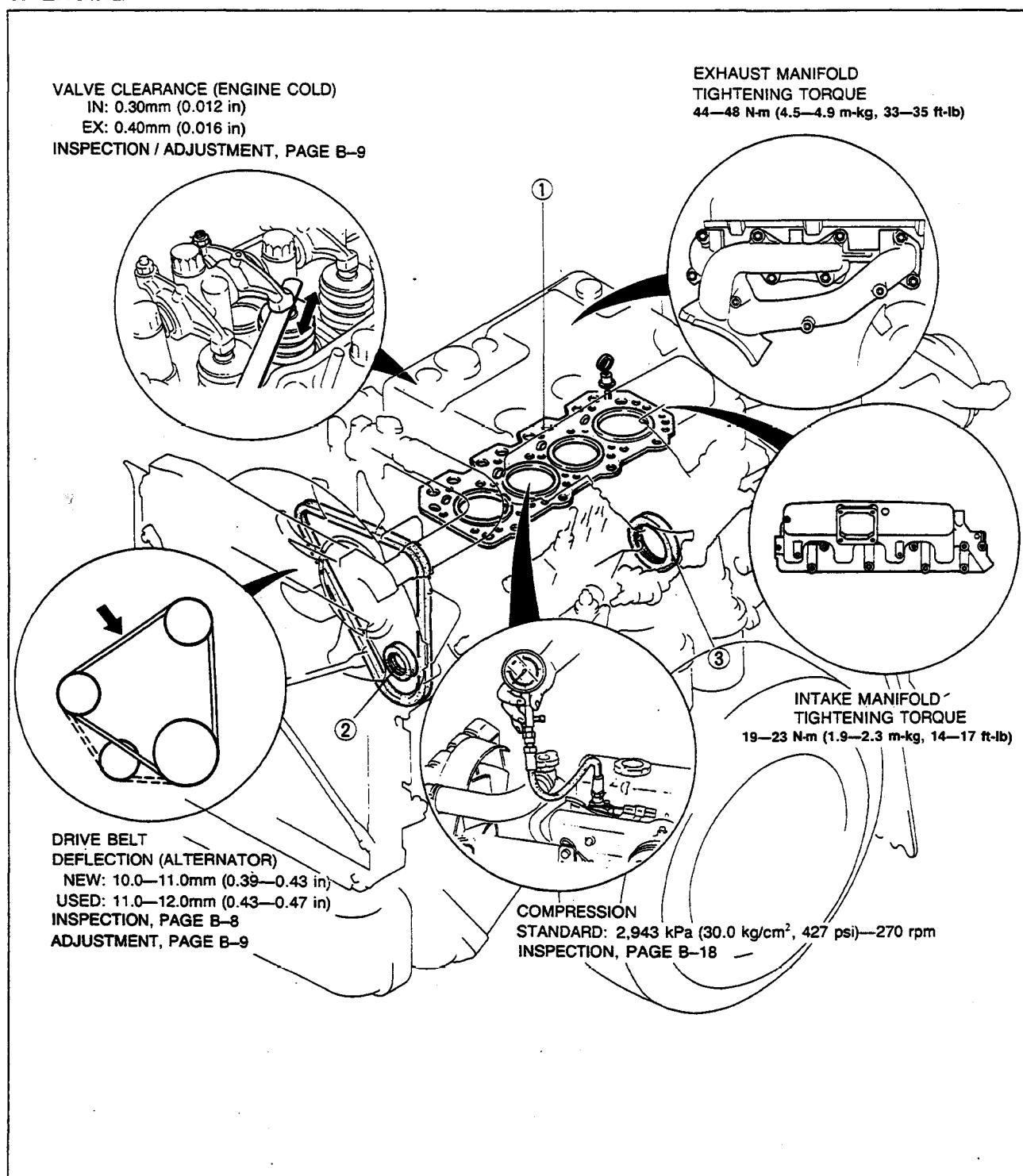
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SL ENGINE



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TF ENGINE



9TF0BX-004

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OUTLINE, TROUBLESHOOTING GUIDE

B

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 Worn piston, piston rings, or cylinder Failed cylinder head gasket	Replace Repair or replace Replace	B-76 B-80,81 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 Poor valve to valve seat contact Failed cylinder head gasket	Adjust Repair or replace Replace	B- 9 B-77 B-21
	Malfunction of fuel system	Refer to Section F	
	Oil working up Worn piston ring groove or stuck piston ring Worn piston or cylinder	Replace Repair or replace	B-82 B-80,81
Excessive oil consumption	Oil working down Worn valve seal Worn valve stem or guide	Replace Replace	B-114,120 B-76
	Oil leakage	Refer to Section D	

B TROUBLESHOOTING GUIDE

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

9TF0BX-005

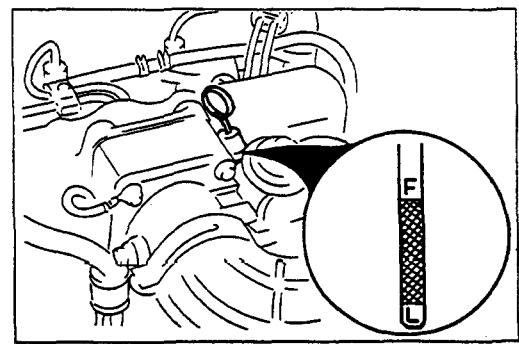
ENGINE TUNE-UP PROCEDURE

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
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9TG0B2-007



9TG0B2-008

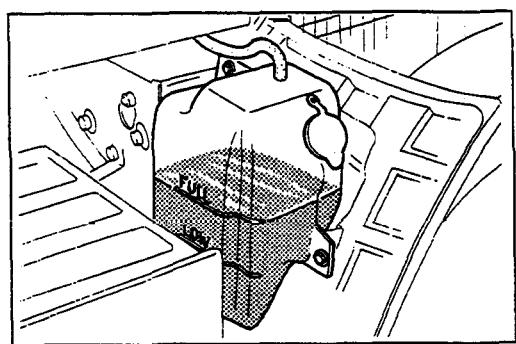
ENGINE OIL

Inspection

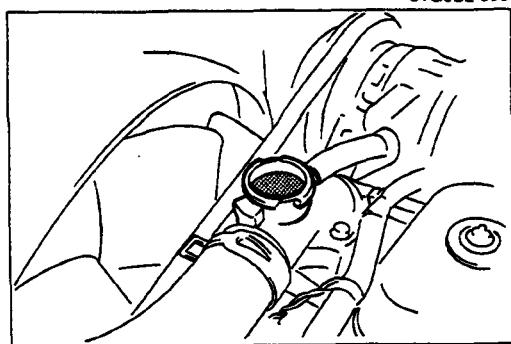
1. Be sure the vehicle is on level ground.
2. Warm up the engine to normal operating temperature and stop it.
3. Wait for five minutes.
4. Remove the oil level gauge and check the oil level and condition.
5. Add or replace oil as necessary.

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).



9TG0B2-009



9TG0B2-010

ENGINE COOLANT

Inspection

Coolant level (engine cold)

Warning

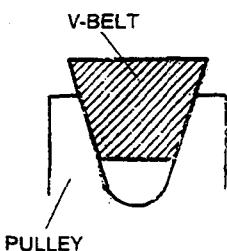
- Never remove the radiator cap while the engine is hot.
- Wrap a thick cloth around the cap before removing it.

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.

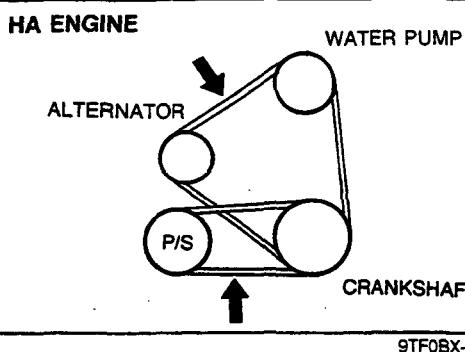
Coolant quality

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.

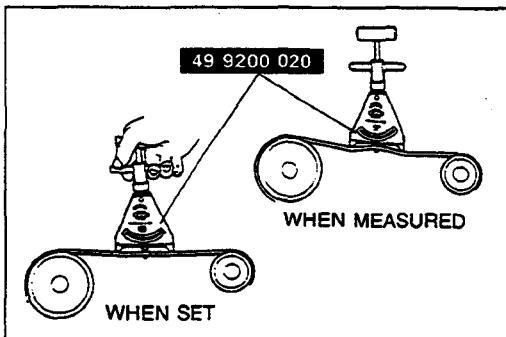
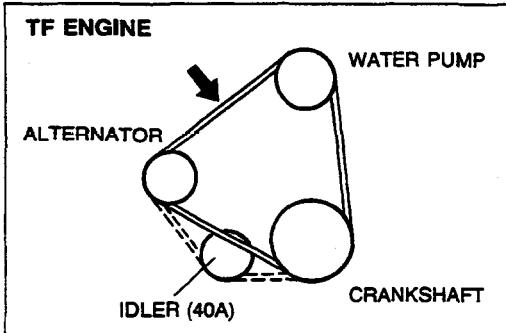
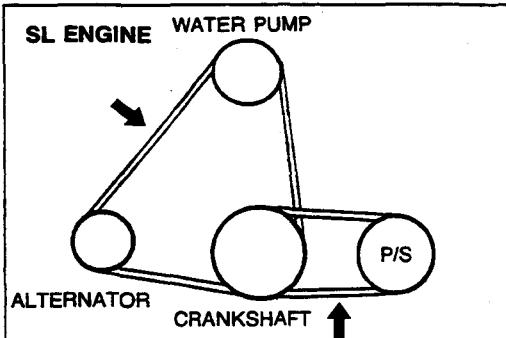
B ENGINE TUNE-UP PROCEDURE



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)

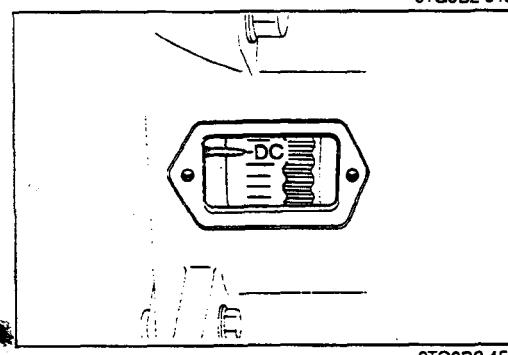
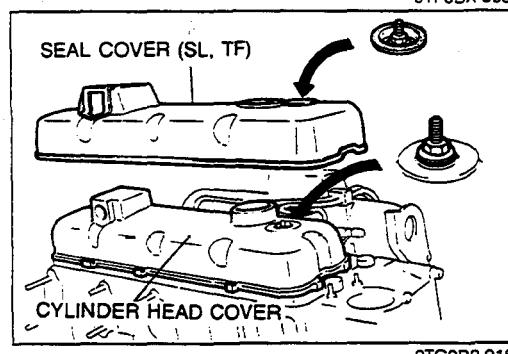
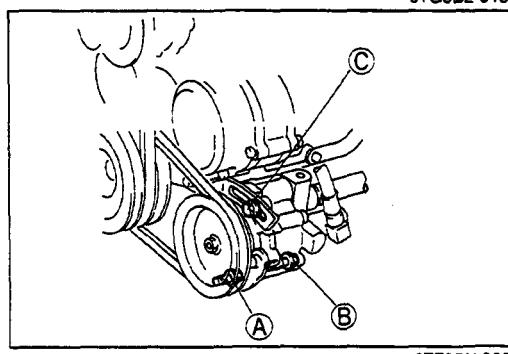
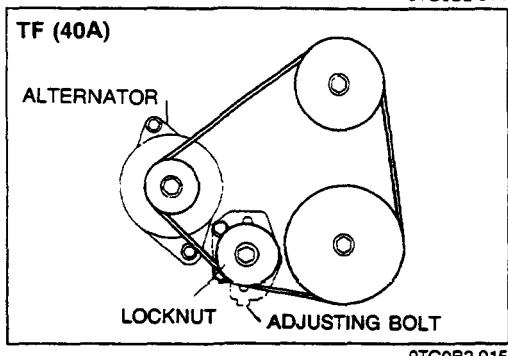
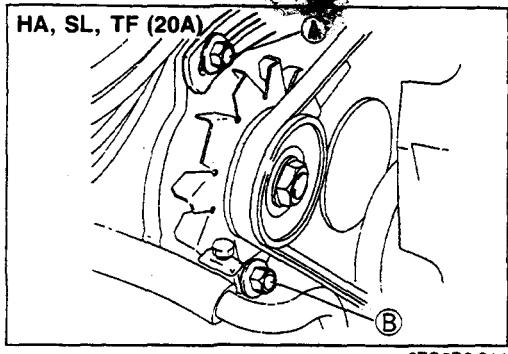
		New	Used
HA	Alternator	9.0–10.0 (0.35–0.39)	10.0–11.0 (0.39–0.43)
	P/S	9.0–11.0 (0.35–0.43)	12.0–13.0 (0.47–0.51)
SL	Alternator	9.0–10.0 (0.35–0.39)	10.0–11.0 (0.39–0.43)
	P/S	9.0–11.0 (0.35–0.43)	12.0–13.0 (0.47–0.51)
TF	Alternator	10.0–11.0 (0.39–0.43)	11.0–12.0 (0.43–0.47)

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)



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)

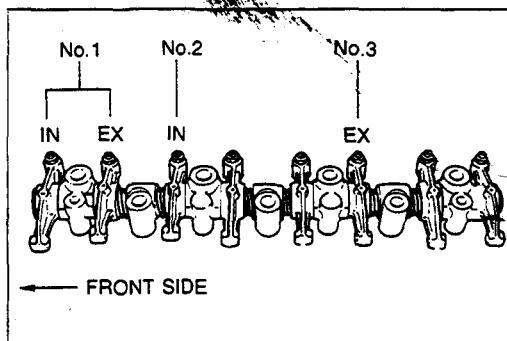
VALVE CLEARANCE

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.

ENGINE TUNE-UP PROCEDURE

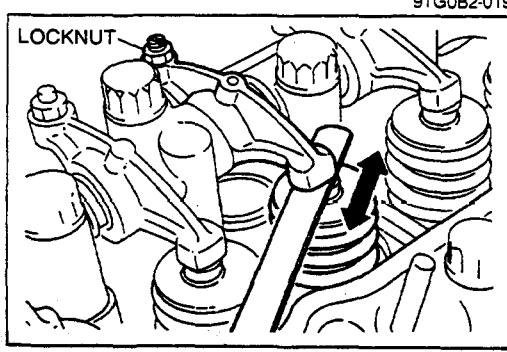


5. Measure the valve clearance as shown in the figure.

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)

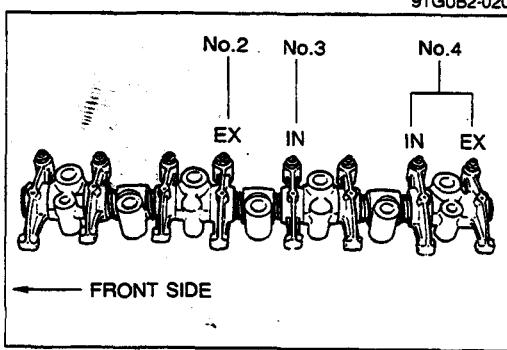


6. If necessary, loosen the locknut and adjust the valve clearance by turning the adjusting screw.

7. Tighten the locknut.

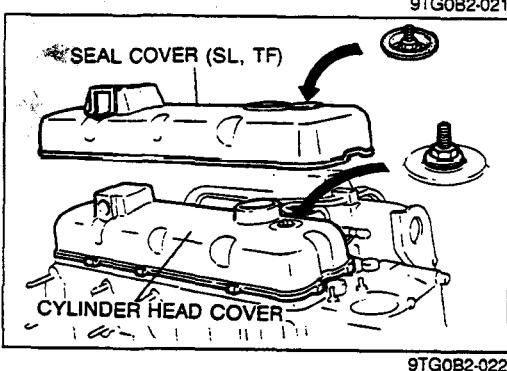
Tightening torque:

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



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)

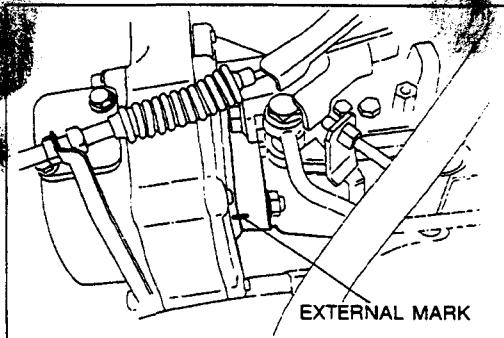
13. Install the air intake pipe (SL Turbo).

Tightening torque:

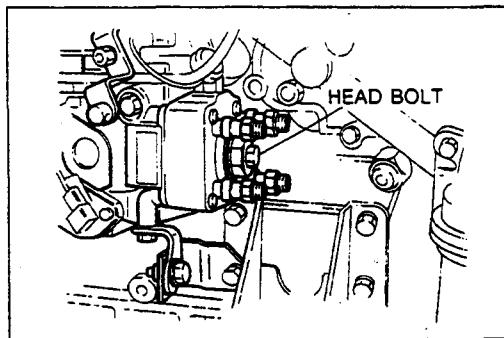
7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

ENGINE TUNE-UP PROCEDURE

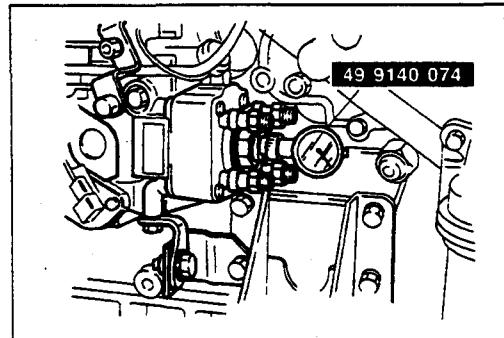
B



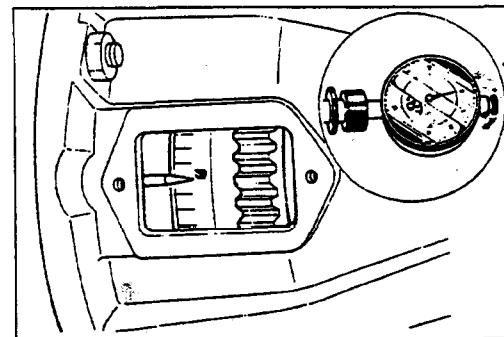
9TG0B2-023



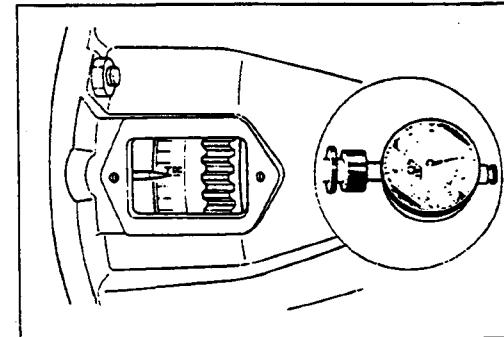
9TG0B2-024



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.

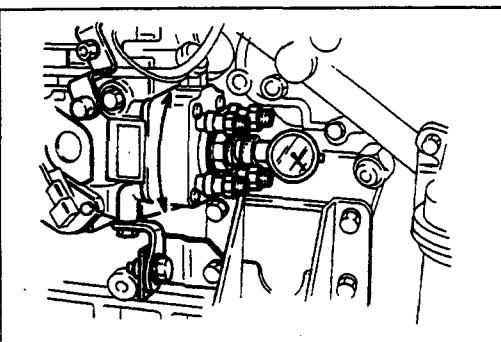
8. Turn the flywheel until 3° BTDC is indicated.

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)

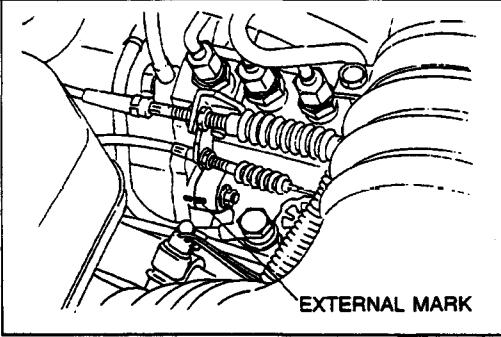
10. If the change is not as specified, adjust the injection timing.



9TG0B2-028

Adjustment

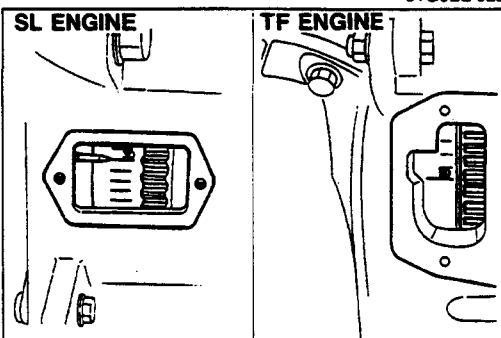
1. If the injection timing is faulty, turn the injection pump to a position in which the dial gauge needle indicates 1.00mm (0.0394 in).
 - (1) When the cam lift is larger than 1.00mm (0.0394 in), turn the injection pump all the way in the engine revolving direction once, and then turn it in the reverse 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.



9TG0B2-029

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.

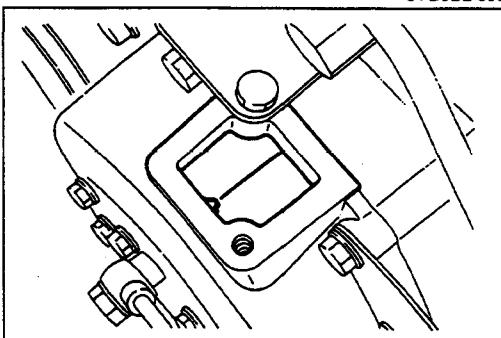


9TG0B2-030

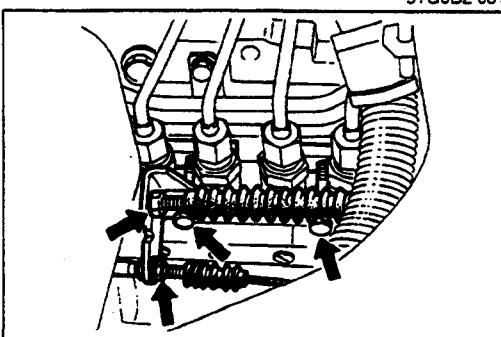
Note

- 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.



9TG0B2-031



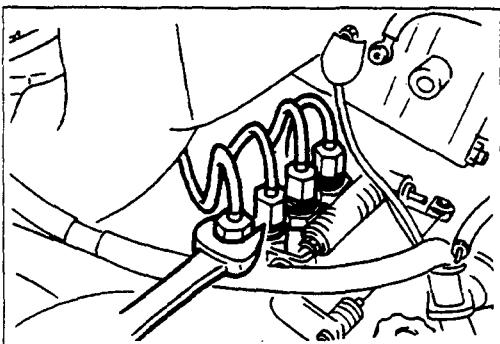
9TG0B2-032

Adjustment

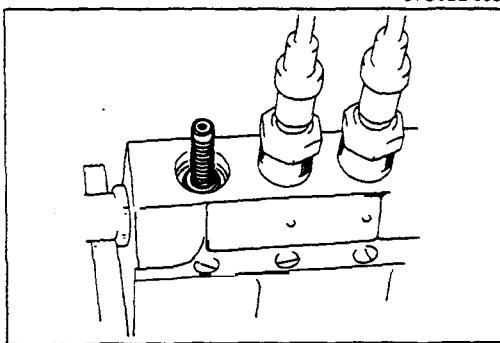
1. Remove the fuel stop cable from the cut lever.
2. Remove the accelerator cable from the control lever.
3. Remove bracket.
4. Loosen injection pipes No.2—4 at the pump.

ENGINE TUNE-UP PROCEDURE

B



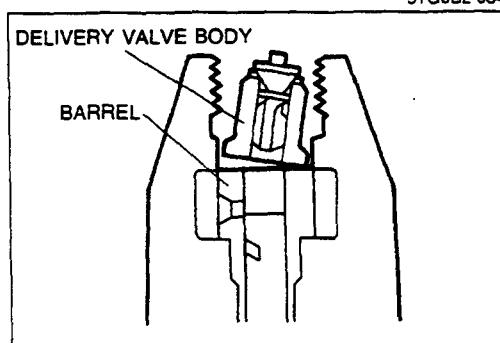
5. Remove No.1 injection pipe and the delivery valve holder.



6. Remove the delivery valve spring seat and spring.

Caution

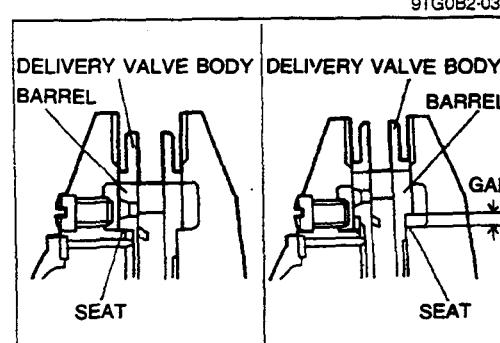
- Do not remove the delivery valve body.



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.

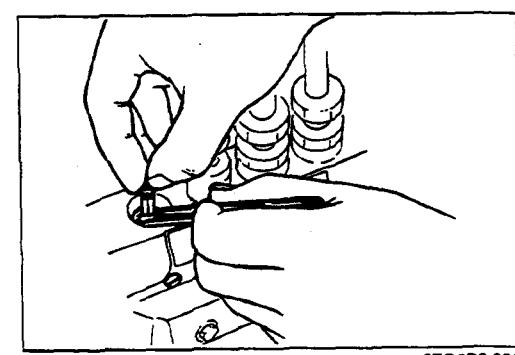


8. Remove the delivery valve, holding the flat washer with tweezers.

Caution

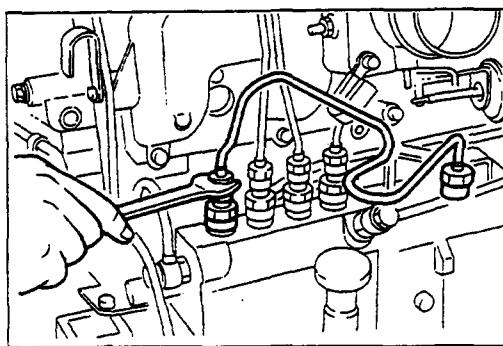
- Do not pinch the sliding surface of the delivery valve.

9. Install the delivery valve holder.

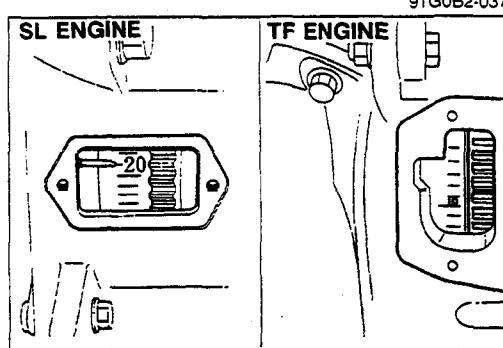


9TG0B2-036

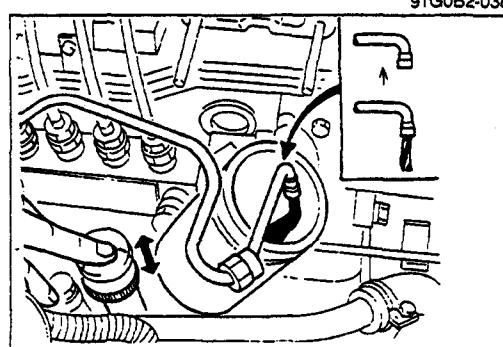
ENGINE TUNE-UP PROCEDURE



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



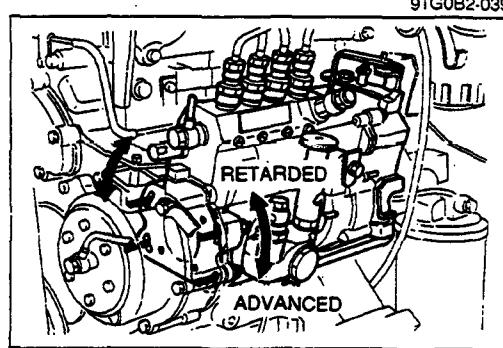
11. Turn the flywheel in the direction of rotation and set it at **20° BTDC**.



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



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.

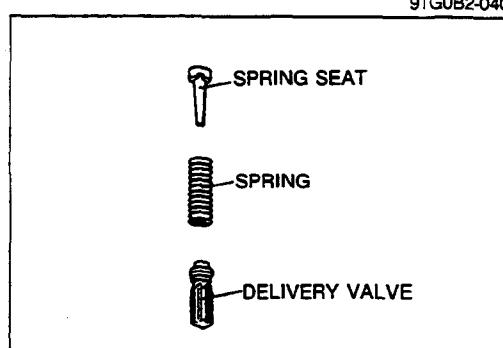
Tightening torque:

34—39 N·m (3.5—4.0 m·kg, 25—29 ft-lb)

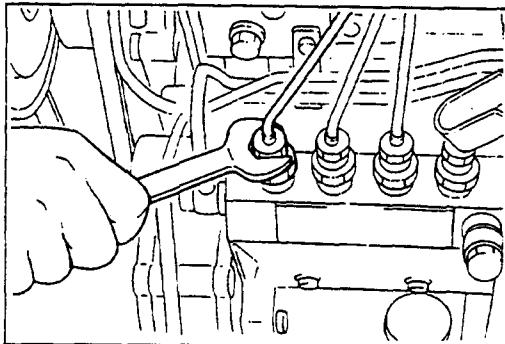
16. Mark the pump flange and the pump body for future reference.
17. Install the delivery valve, spring, and spring seat.
18. Tighten the delivery valve holder.

Tightening torque:

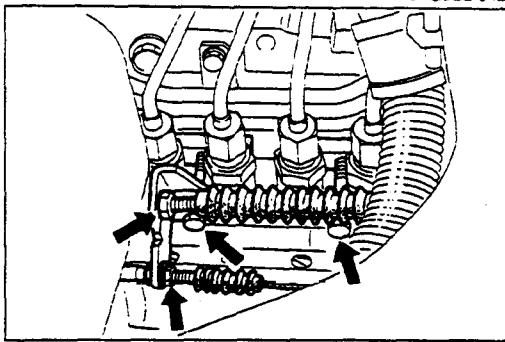
39—44 N·m (4.0—4.5 m·kg, 29—33 ft-lb)



ENGINE TUNE-UP PROCEDURE



19. Install No.1 injection pipe.

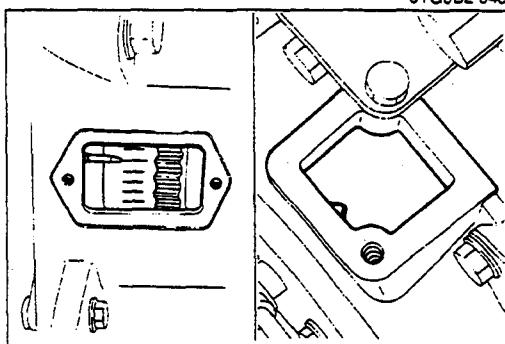


20. Tighten injection pipes No.2—4.

21. Install the bracket.

22. Install the accelerator cable to the control lever.

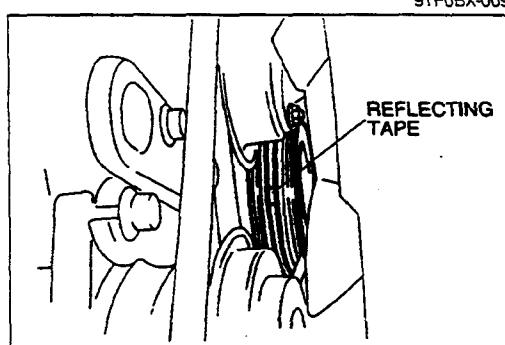
23. Install the fuel stop cable to the cut lever.



24. Install blind covers onto the clutch housing and the timing gear case.

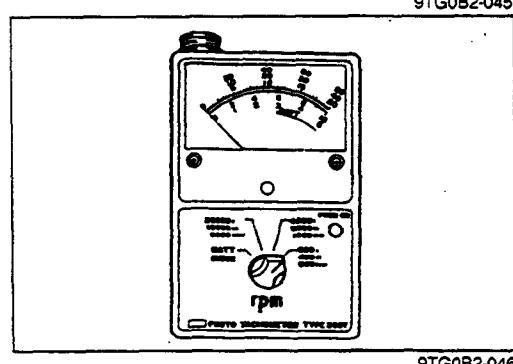
25. Bleed air from the system. (Refer to page B-16.)

26. Start the engine, and check for fuel leaks.



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.

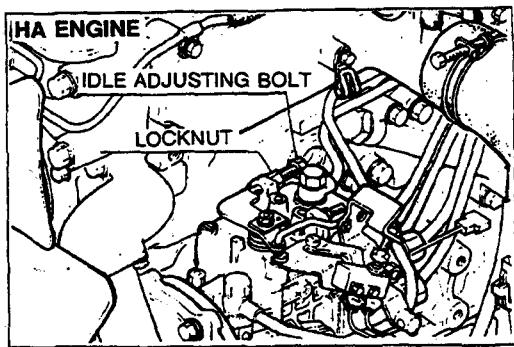


4. Confirm the free play of the accelerator cable.

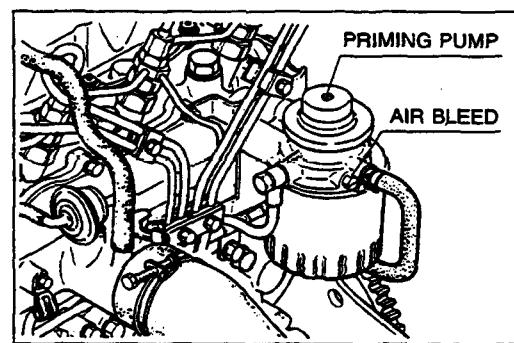
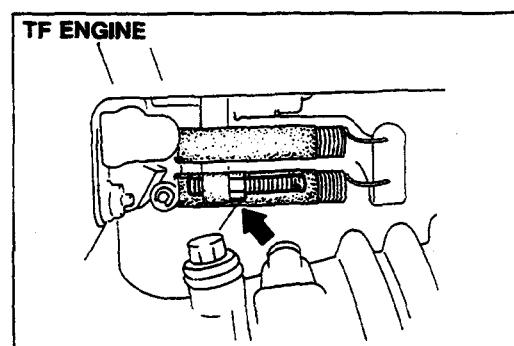
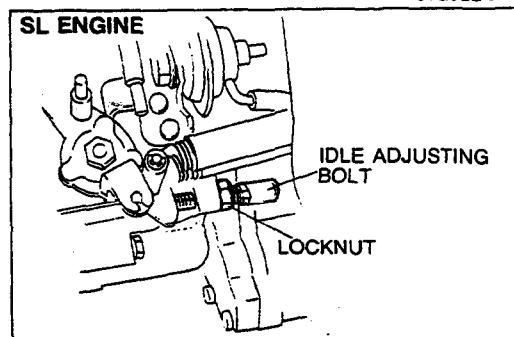
Free play: 1—3mm (0.04—0.12 in)

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

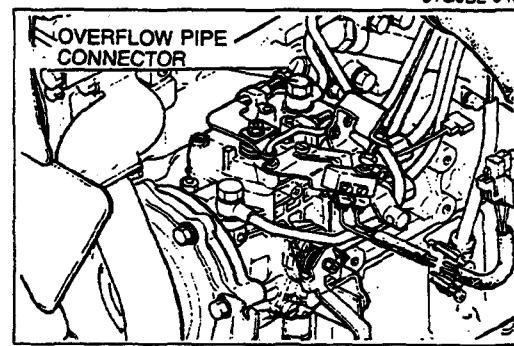
Idle speed	HA	: 600—650 rpm
	SL Non-Turbo	: 620—670 rpm
	SL Turbo	: 660—710 rpm
	TF	: 620—700 rpm



9TG0B2-047



9TG0B2-048



9TG0B2-049

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)

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.

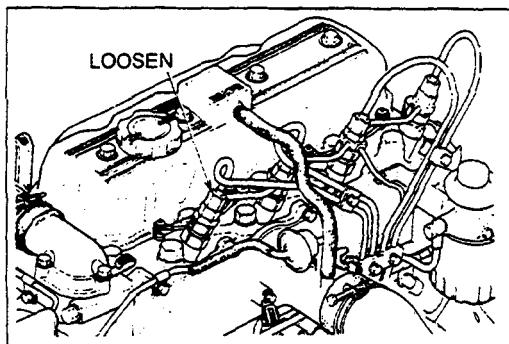
Tightening torque:

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.

ENGINE TUNE-UP PROCEDURE

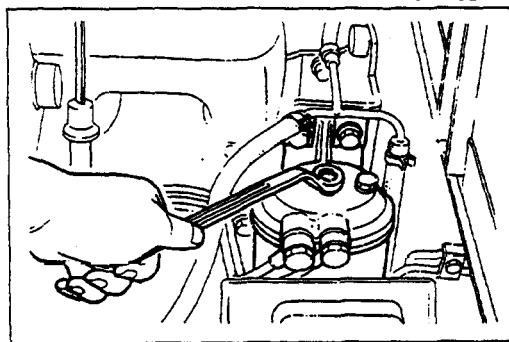
B



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)



SL, TF Engine

Warning

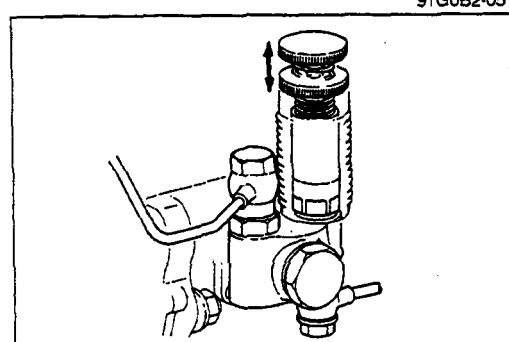
- Keep sparks, cigarettes, and open flames away from the fuel area.

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)

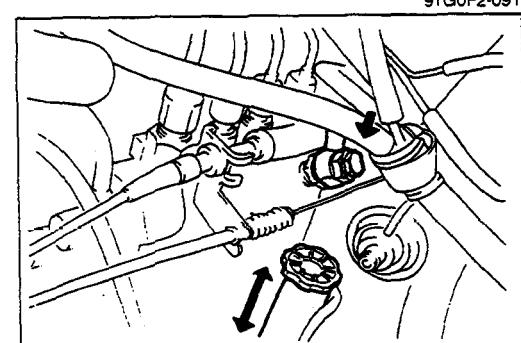


4. Loosen the return pipe at the injection pump, and pump the priming pump until no air is expelled.
5. Tighten the bolt.

Tightening torque:

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

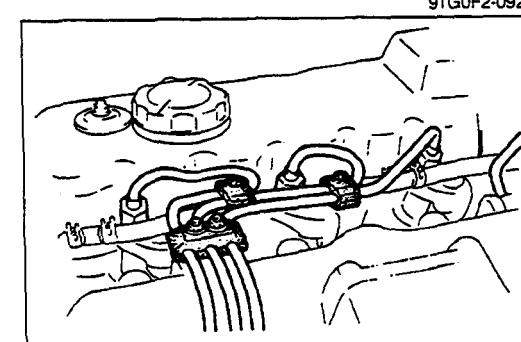
6. Push the priming pump down and tighten it.



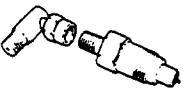
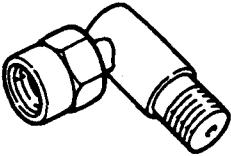
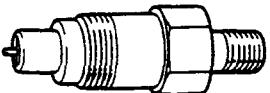
7. Loosen the injection pipes at the injection nozzles.
8. Crank the engine, and verify that fuel is expelled from each injection pipe.
9. Tighten the injection pipes.

Tightening torque:

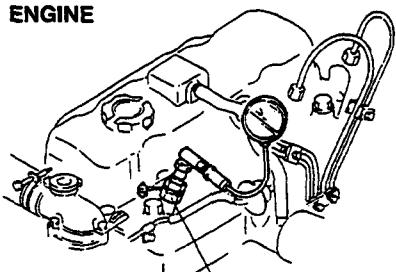
20—25 N·m (2.0—2.5 m·kg, 14—18 ft·lb)



B**COMPRESSION****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

HA ENGINE

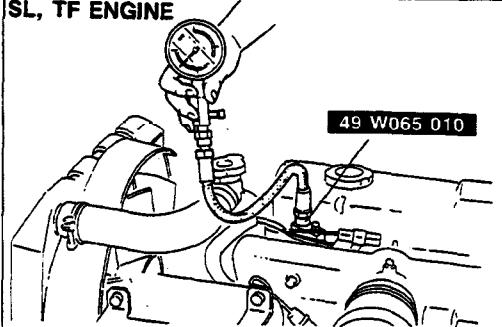
9TG0B2-056

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.

SL, TF ENGINE

9TG0B2-057

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

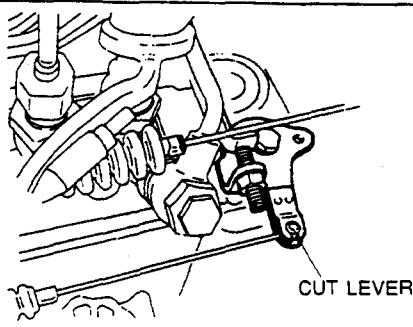
Disconnect the fuel cut solenoid connector.

FUEL CUT SOLENOID CONNECTOR

9TG0B2-057

COMPRESSION

B



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
SL	HA	2,943 (30.0, 427)-200	2,649 (27.0, 384)-200
	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:

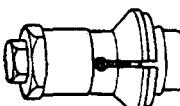
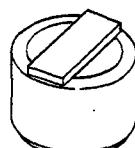
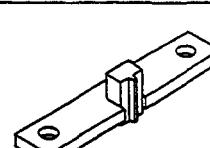
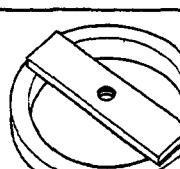
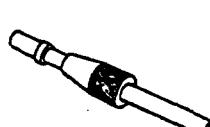
294 kPa (3.0 kg/cm², 43 psi) max.

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

B**ON-VEHICLE MAINTENANCE****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.

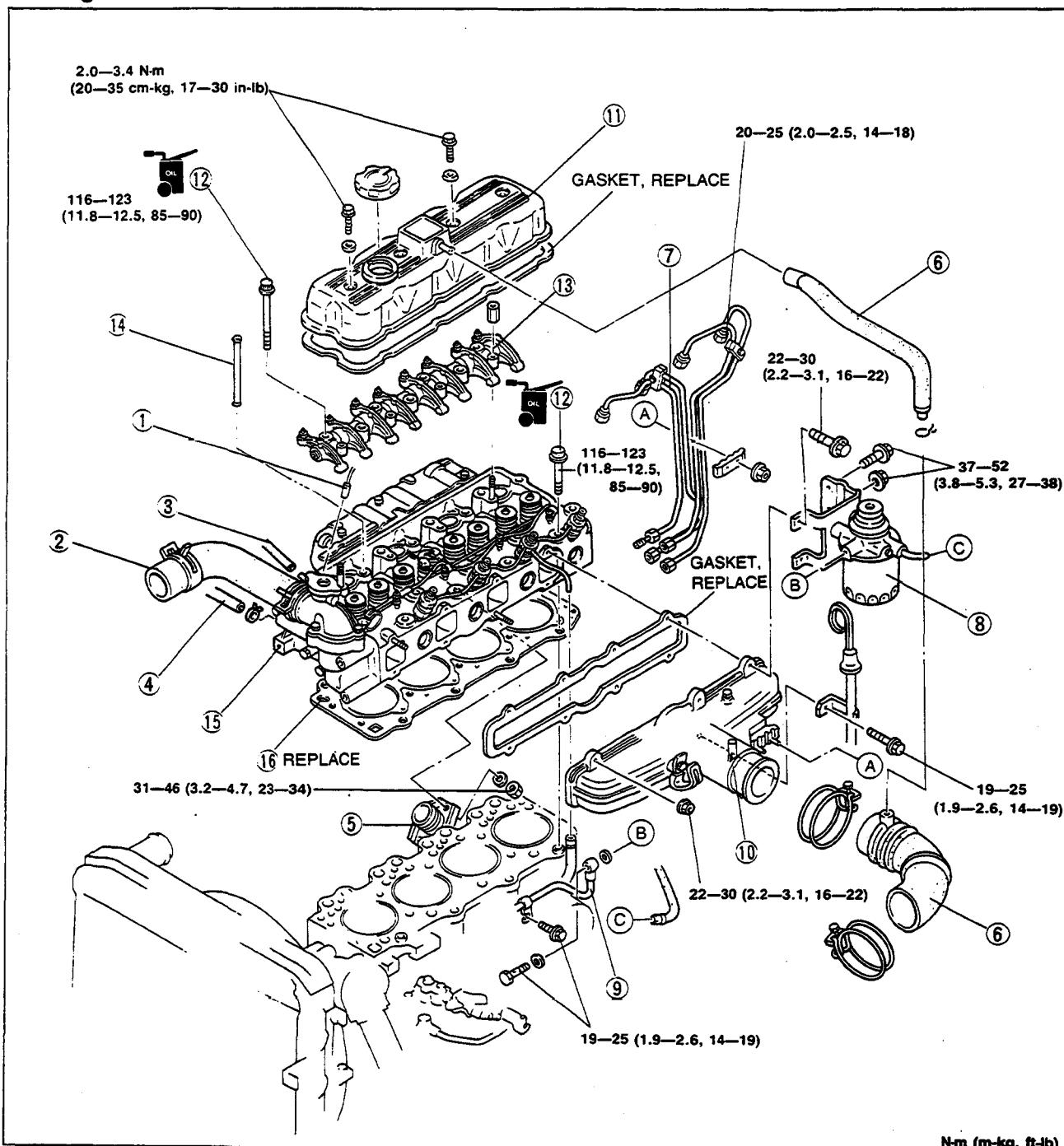
1. Disconnect the negative battery cable.
2. Drain the engine coolant.
3. Remove in the order shown in the figure, referring to **Removal Note**.
4. Install in the reverse order of removal, referring to **Installation Note**.

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

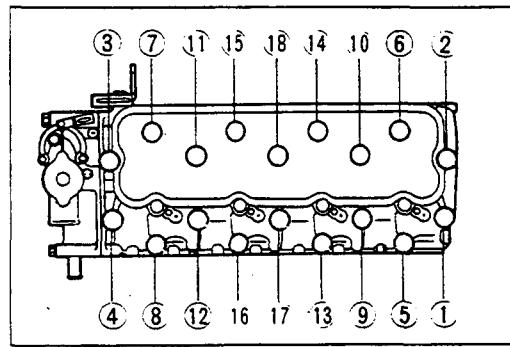
HA Engine



N·m (m·kg, ft·lb)

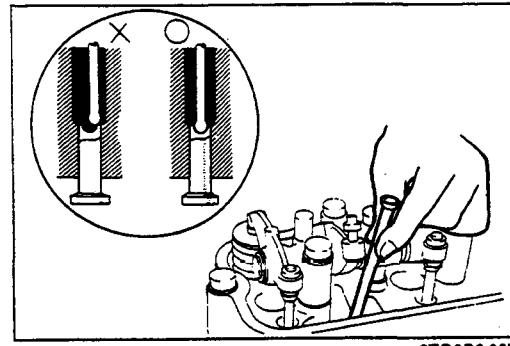
9TF0BX-012

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



Removal note
Cylinder head bolt

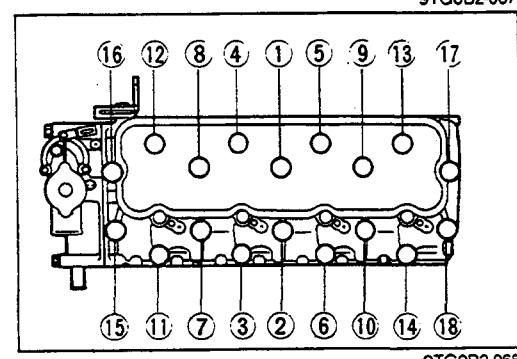
1. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.
2. Remove the cylinder head bolts.

**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.

**Cylinder head bolt****Caution**

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

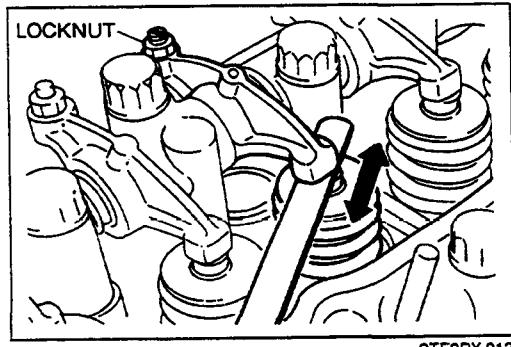
1. Apply clean engine oil to the bolt threads and seat faces.
2. Install the cylinder head bolts.
3. Tighten the cylinder head bolts in two or three steps in the order shown in the figure.

Tightening torque:

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

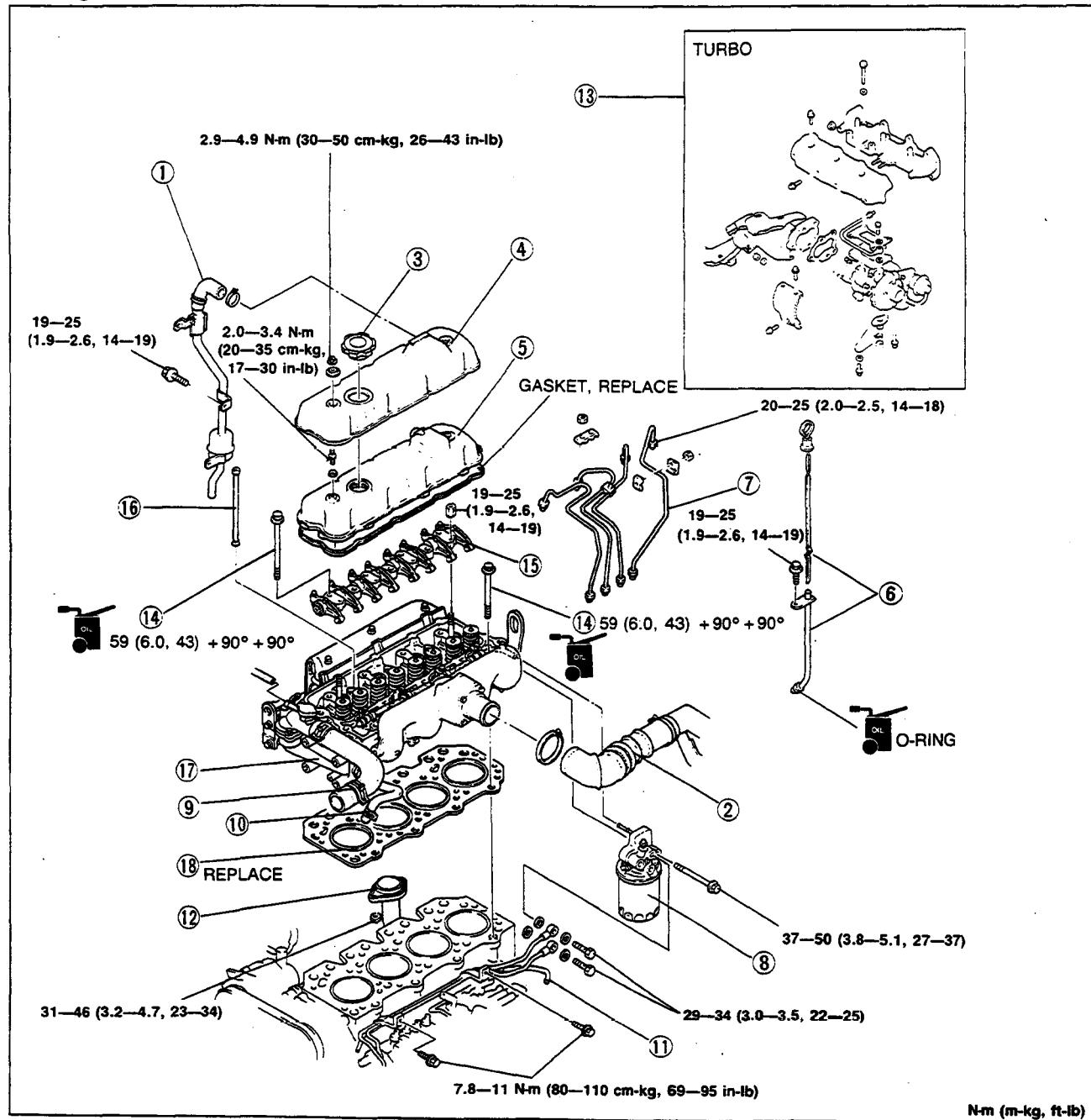
Caution

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



B ON-VEHICLE MAINTENANCE

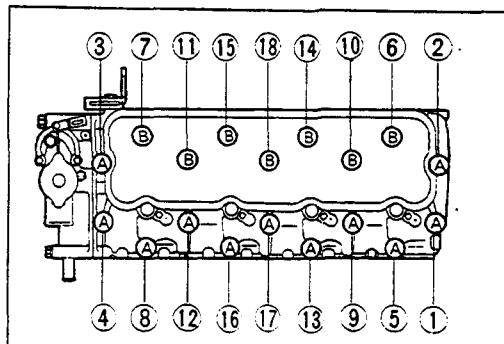
SL Engine



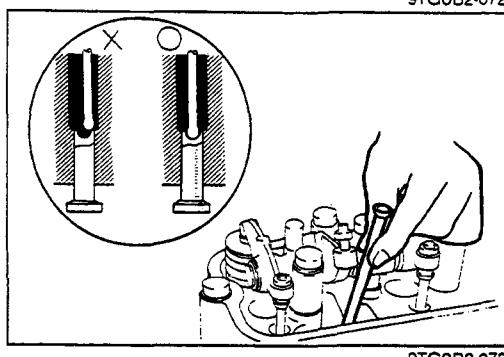
N·m (m·kg, ft·lb)

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

**Removal note****Cylinder head bolt**

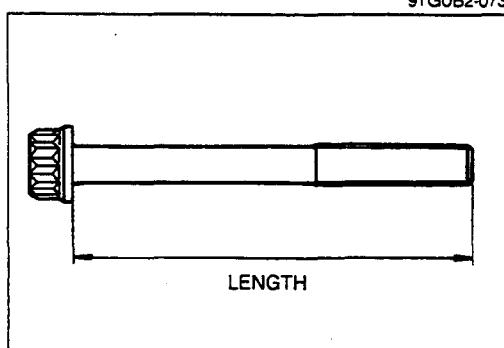
1. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.
2. Remove the cylinder head bolts.

**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.

**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 **A:** 121.7—122.3mm (4.791—4.815 in)
B: 150.7—151.3mm (5.933—5.957 in)

Maximum **A:** 123.0mm (4.843 in)
B: 152.0mm (5.984 in)

Caution

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

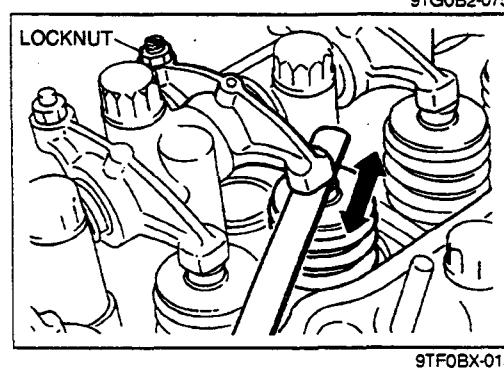
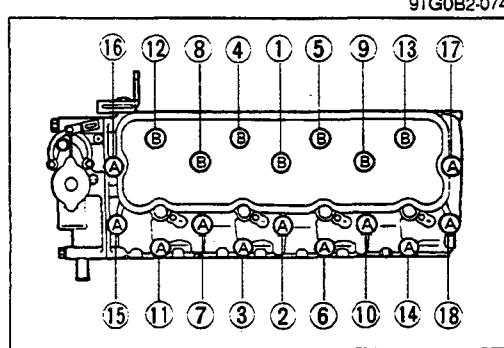
2. Apply clean engine oil to the bolt threads and seat faces.
3. Install the cylinder head bolts.
4. Tighten the cylinder head bolts in two or three steps in the order shown in the figure.

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

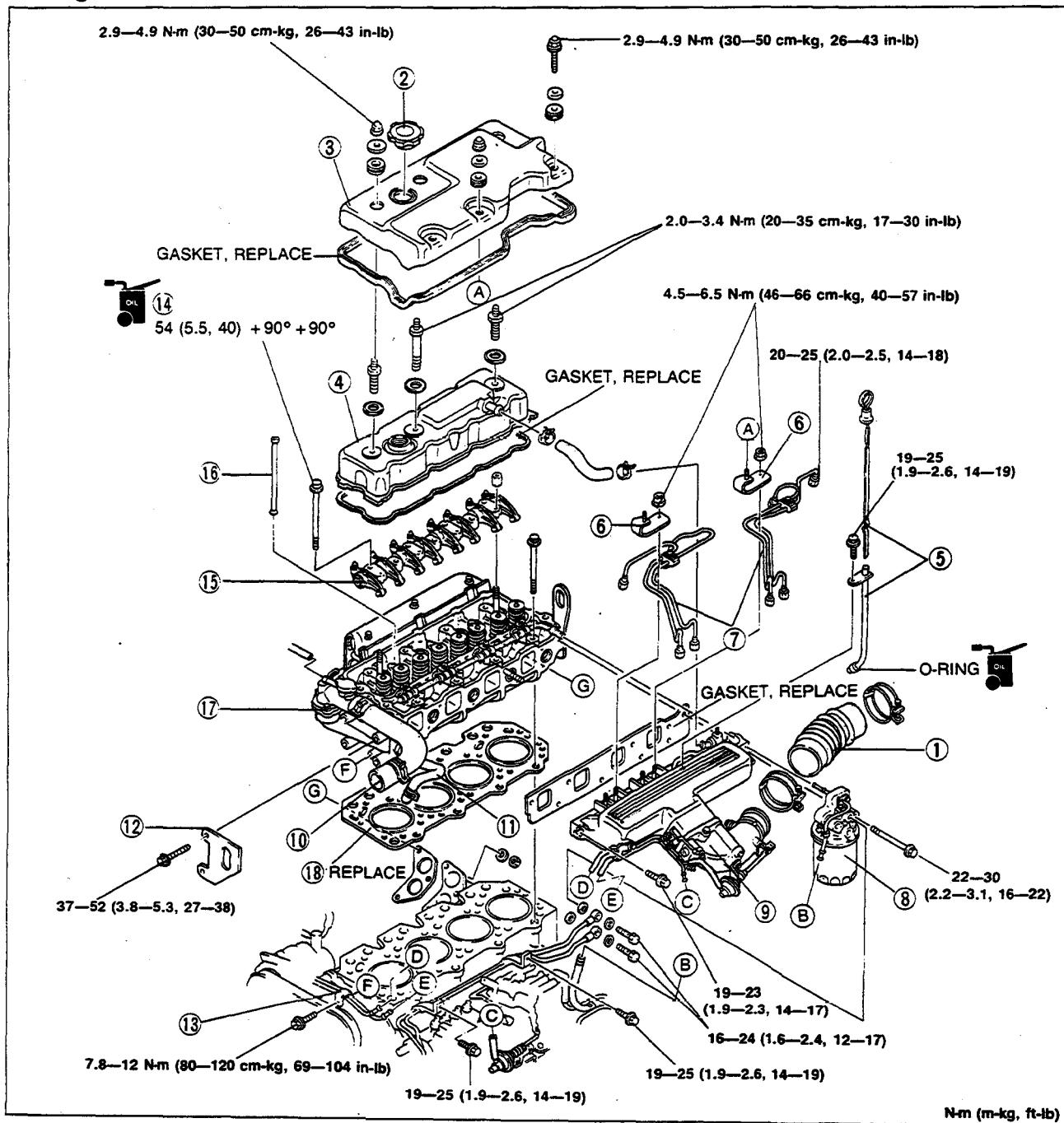
5. Make paint marks on the bolt heads as shown in the figure.
6. With the paint marks as a reference point, tighten the cylinder head bolts **another $90^\circ \pm 15^\circ$** in the tightening order.
7. Tighten the bolts **once again $90^\circ \pm 15^\circ$** in the tightening order.

Caution

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

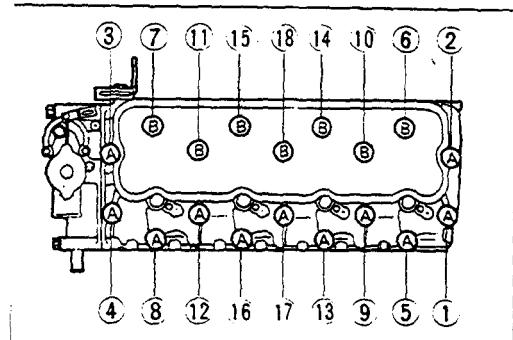


TF Engine

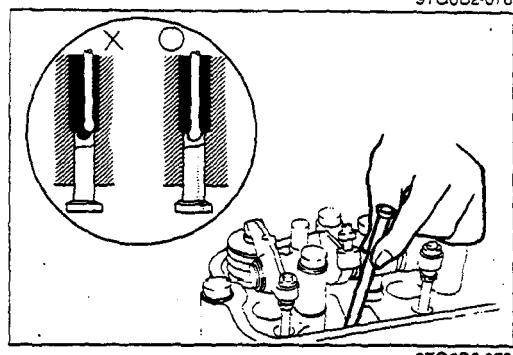


1. Air hose
2. Oil filler cap
3. Seal cover
4. Cylinder head cover
5. Oil level gauge and guide pipe
6. Injection pipe clip
7. Injection pipe
8. Fuel filter body
9. Intake manifold
10. Upper radiator hose
11. Heater hose
12. Front engine hanger

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

**Removal note****Cylinder head bolt**

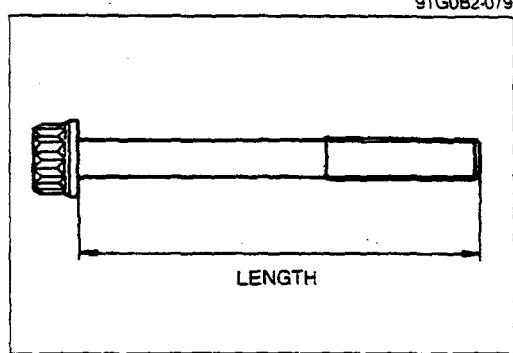
1. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.
2. Remove the cylinder head bolts.

**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.

**Cylinder head bolt**

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

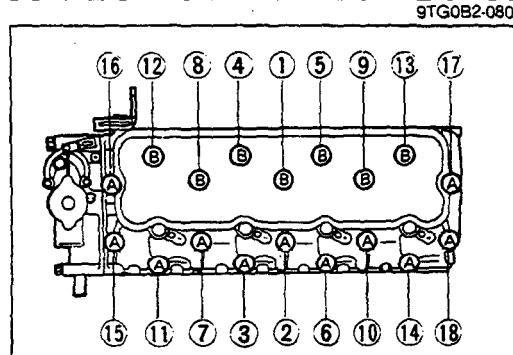
Length

Standard (A): 130.2—130.8mm (5.126—5.150 in)

(B): 158.2—158.8mm (6.228—6.252 in)

Maximum (A): 131.5mm (5.177 in)

(B): 159.5mm (6.280 in)

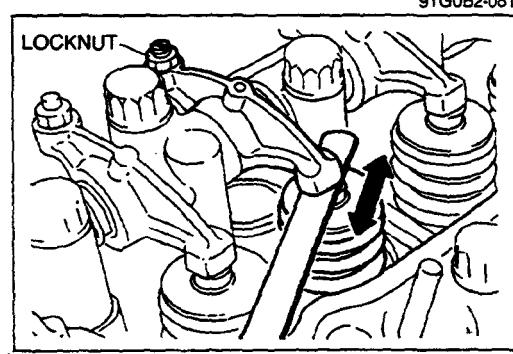
**Caution**

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

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 $90^\circ \pm 15^\circ$** in the tightening order.
7. Tighten the bolts **once again $90^\circ \pm 15^\circ$** in the tightening order.

**Caution**

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

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.

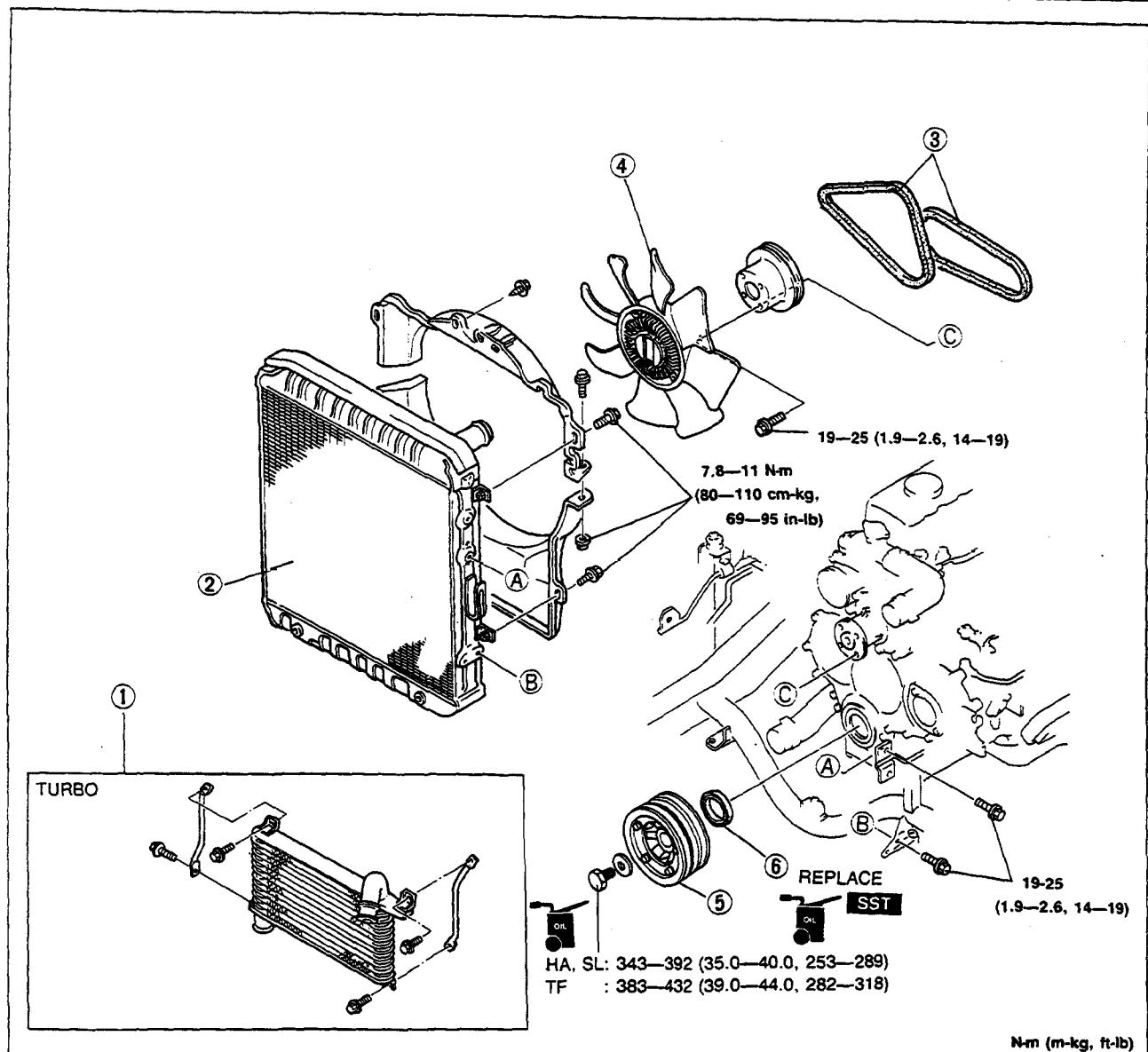
1. Disconnect the negative battery cable.
2. Remove the undercover.
3. Drain the engine coolant.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Install in the reverse order of removal, referring to **Installation Note**.

9TG0B2-083

Steps After Installation

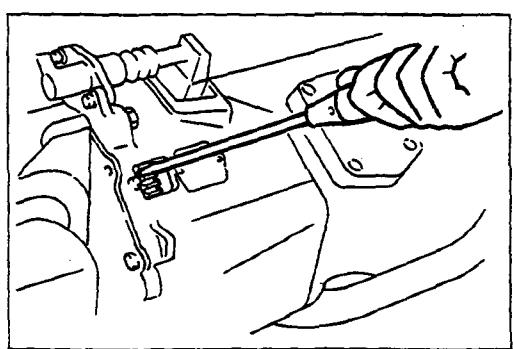
1. Fill the radiator with the specified amount and type of engine coolant. (Refer to Section E.)
2. Install the undercover.
3. Connect the negative battery cable.
4. Start the engine and check as follows:
 - (1) Engine oil and engine coolant leakage.
 - (2) Drive belt deflection. (Refer to page B-8.)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

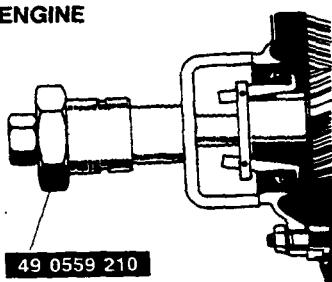
Removal note Crankshaft pulley

Caution

- Perform this operation with the aid of a helper.

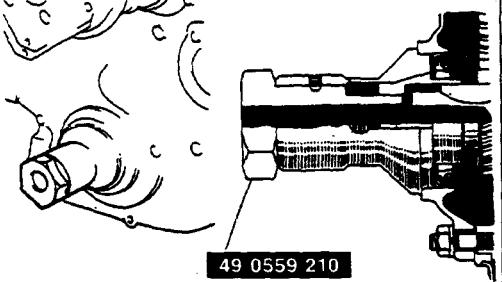
1. Remove the cover from the clutch housing (HA, SL) or from the end plate (TF).
2. Set a suitable tool against the flywheel ring gear for prevention of engine rotation.
3. Remove the pulley bolt (HA, SL) or nut (TF).
4. Remove the crankshaft pulley.

HA ENGINE



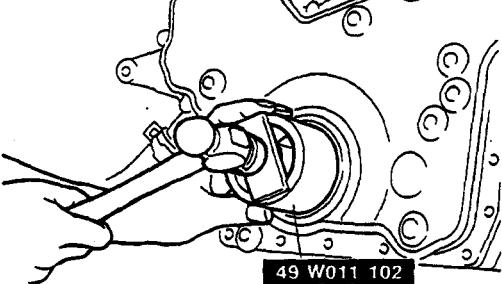
9TG0B2-088

HA ENGINE

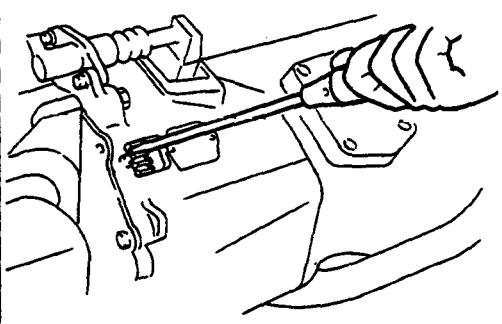


9TG0B2-089

TF ENGINE



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)

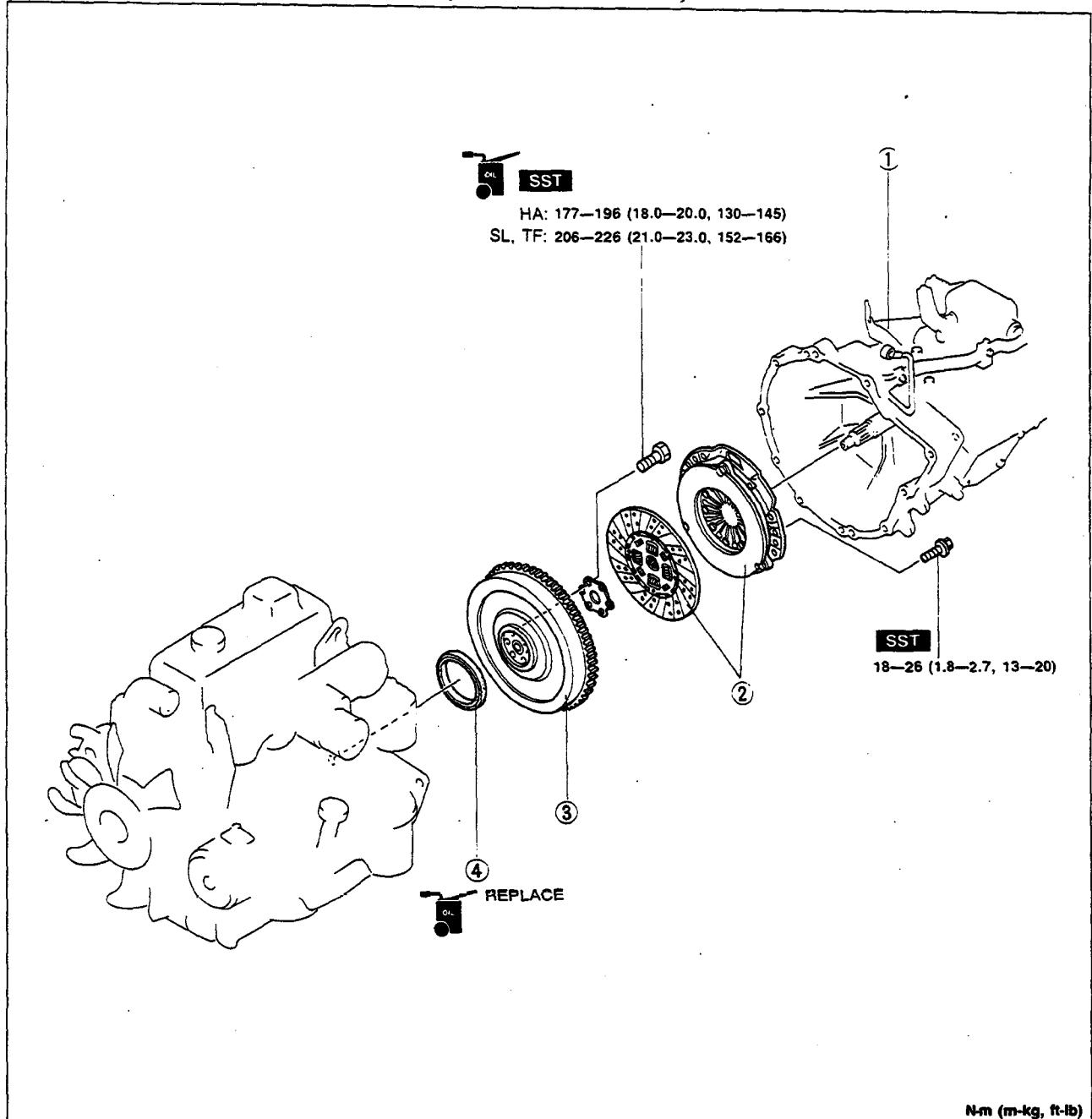
5. Install the cover to the clutch housing or to the end plate.

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**.

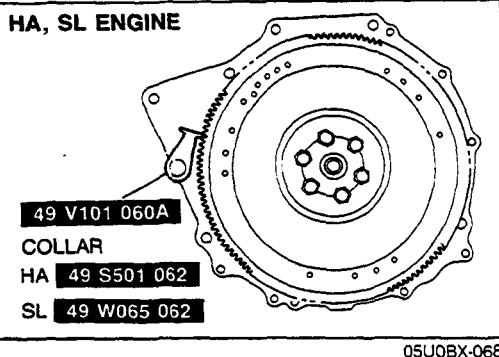
Steps After Installation

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



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

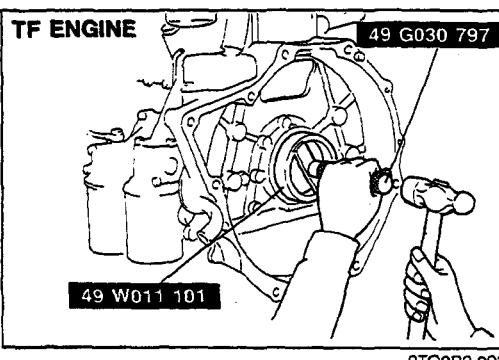
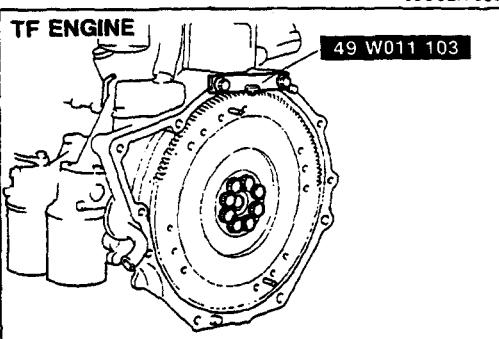
B ON-VEHICLE MAINTENANCE



Removal note

Flywheel

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



Installation note

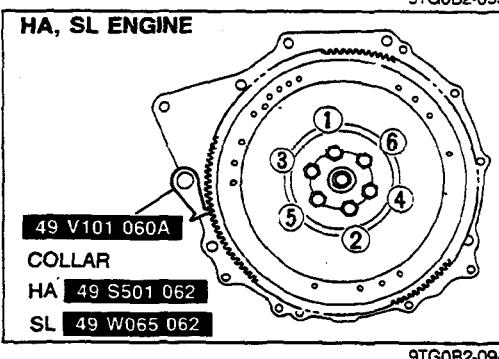
Oil seal

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.

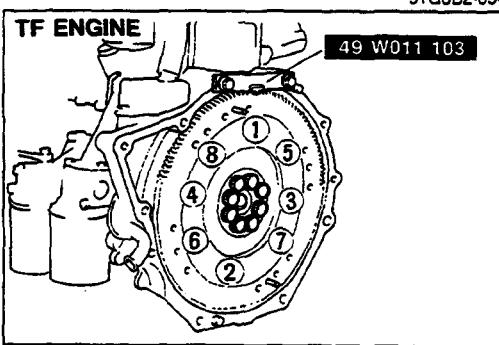
Tightening torque

HA:

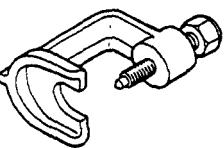
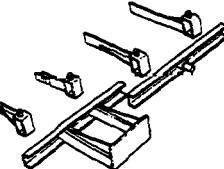
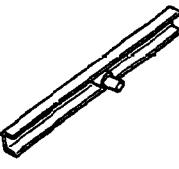
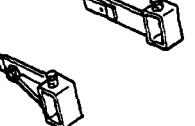
177—196 N·m (18.0—20.0 m·kg, 130—145 ft·lb)

SL, TF:

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



REMOVAL**PREPARATION
SST**

49 0727 575 Pulier, 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			

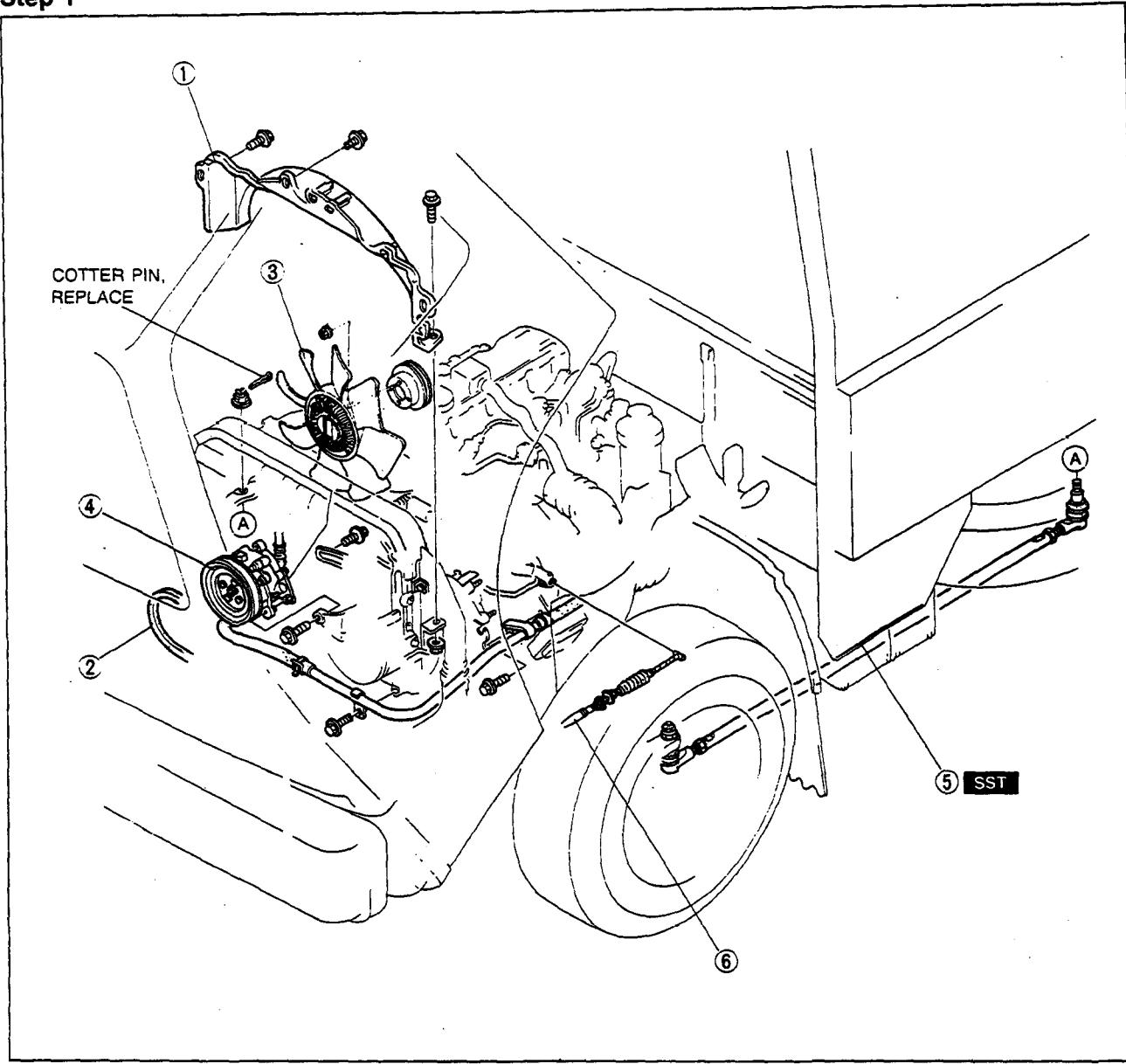
9TG0B2-095

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



9TFOBX-021

1. Radiator cowling, upper
2. Drive belt
3. Cooling fan
4. P/S oil pump

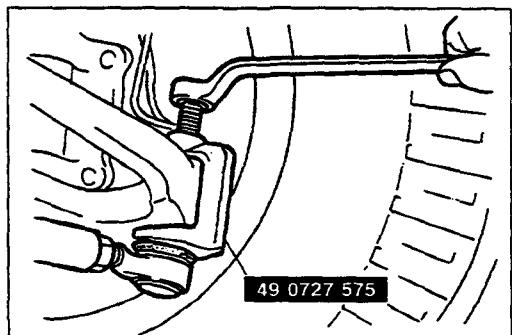
5. Tie-rod
Removal Note..... page B-34
6. Accelerator cable

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.



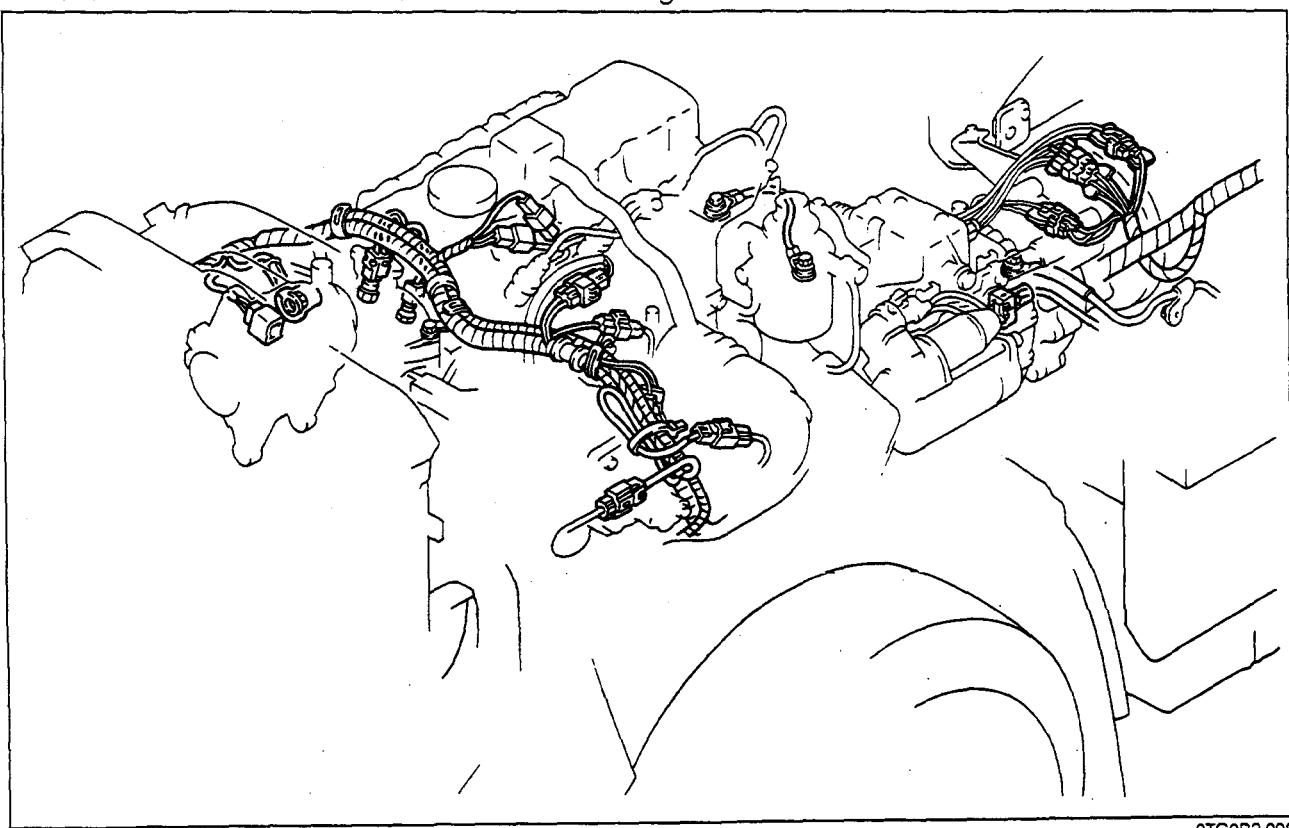
9TG0B2-102

REMOVAL

B

Step 2

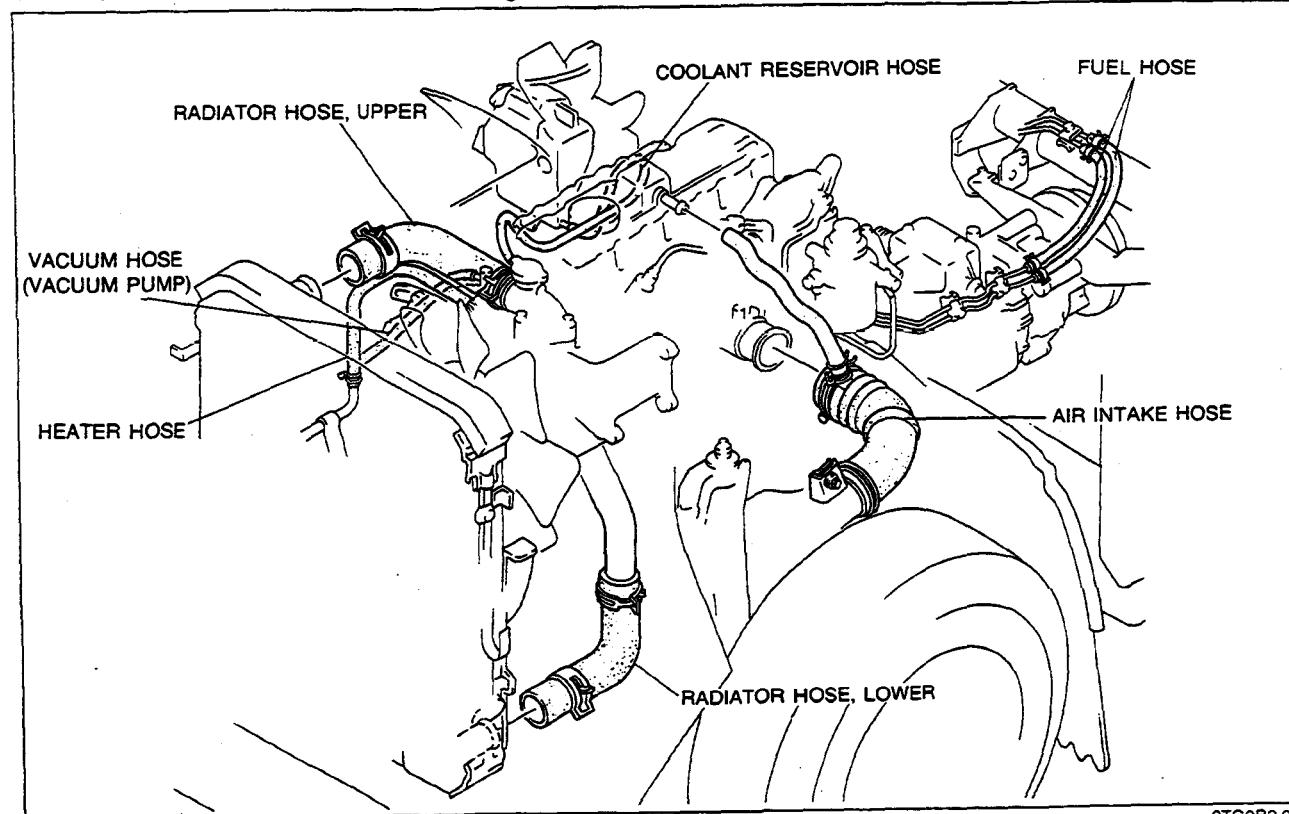
1. Disconnect the harness connectors shown in the figure.



9TG0B2-098

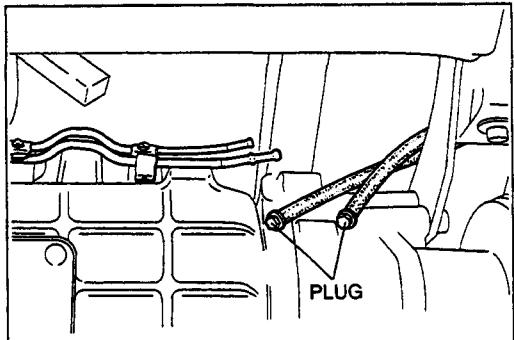
Step 3

1. Disconnect the hoses shown in the figure.



9TG0B2-099

B-35

B**REMOVAL**

05U0BX-078

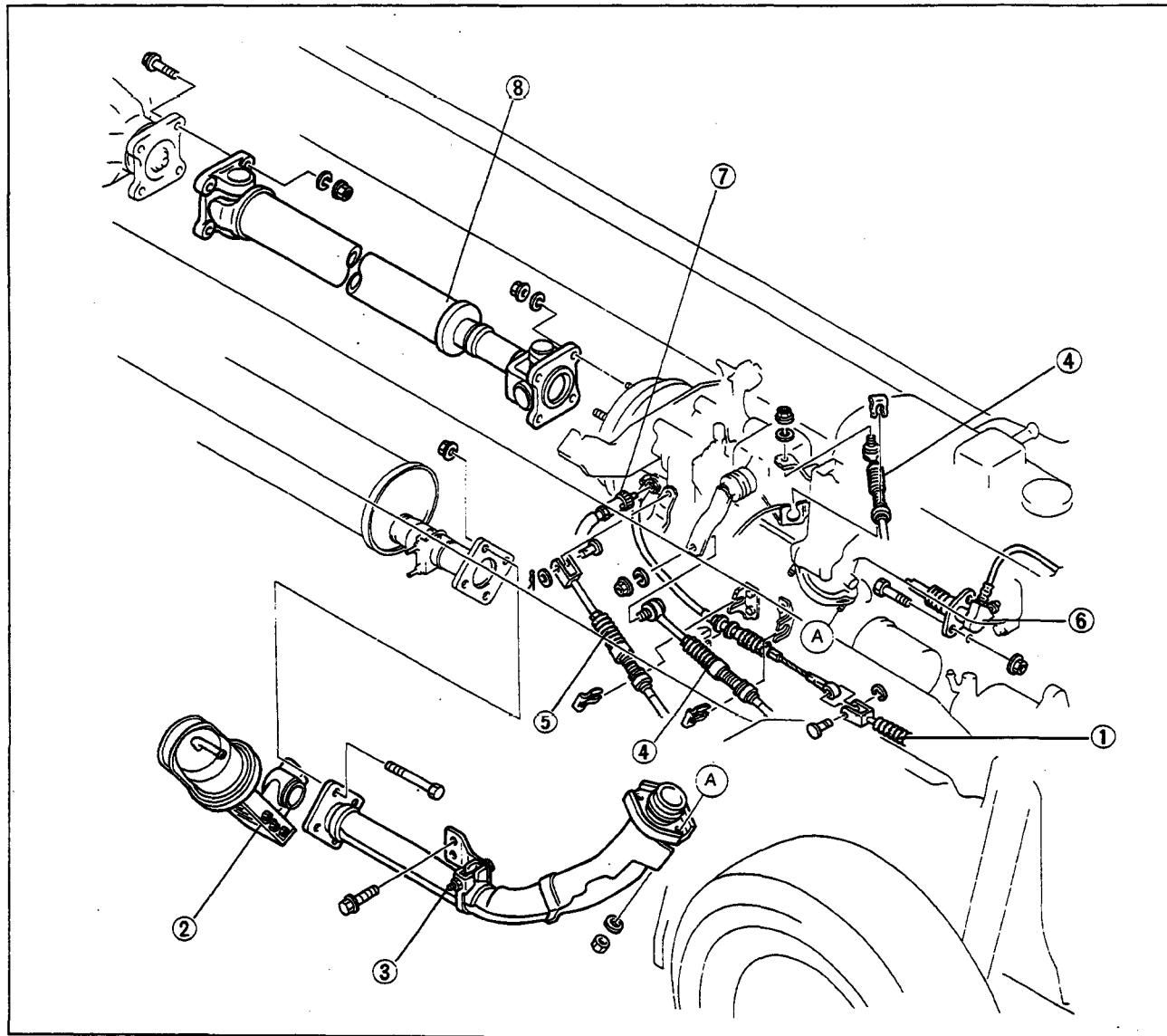
Removal note
Fuel hose
Warning

- 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

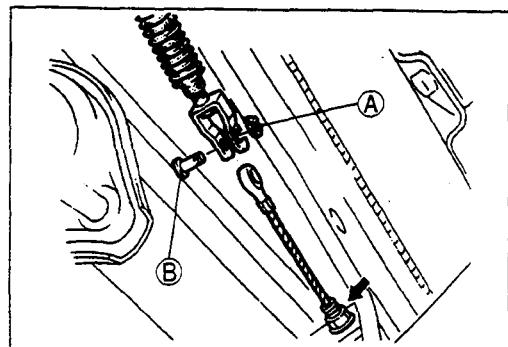
9TF0BX-022

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

REMOVAL

B

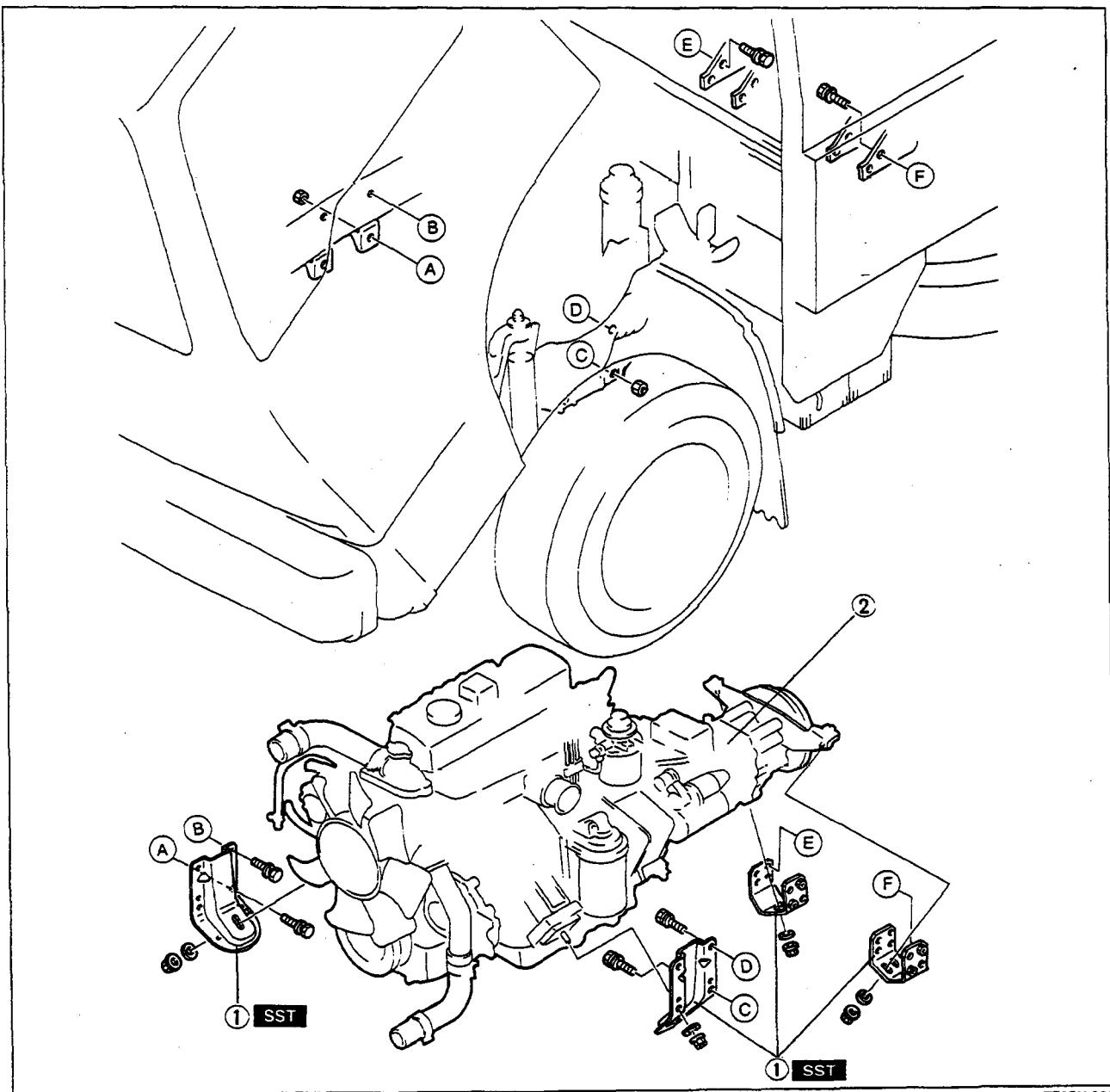


9TG0B2-101

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

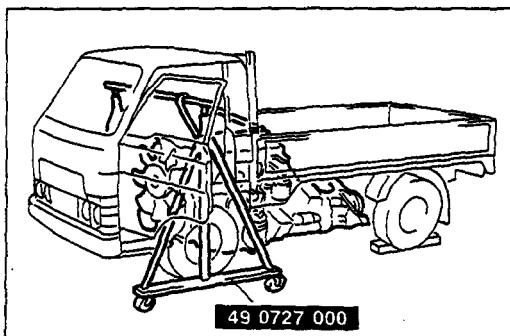


9TF0BX-023

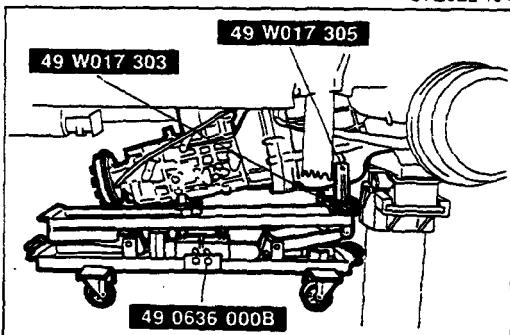
1. Engine support bracket
Removal Note..... page B-38

2. Engine and transmission assembly

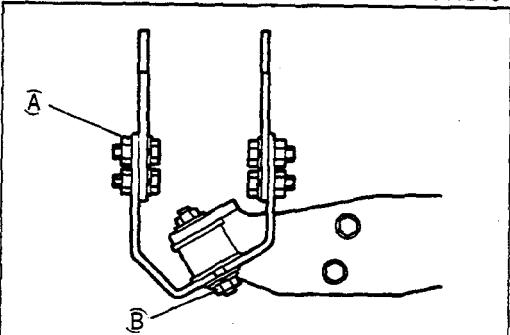
REMOVAL



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.

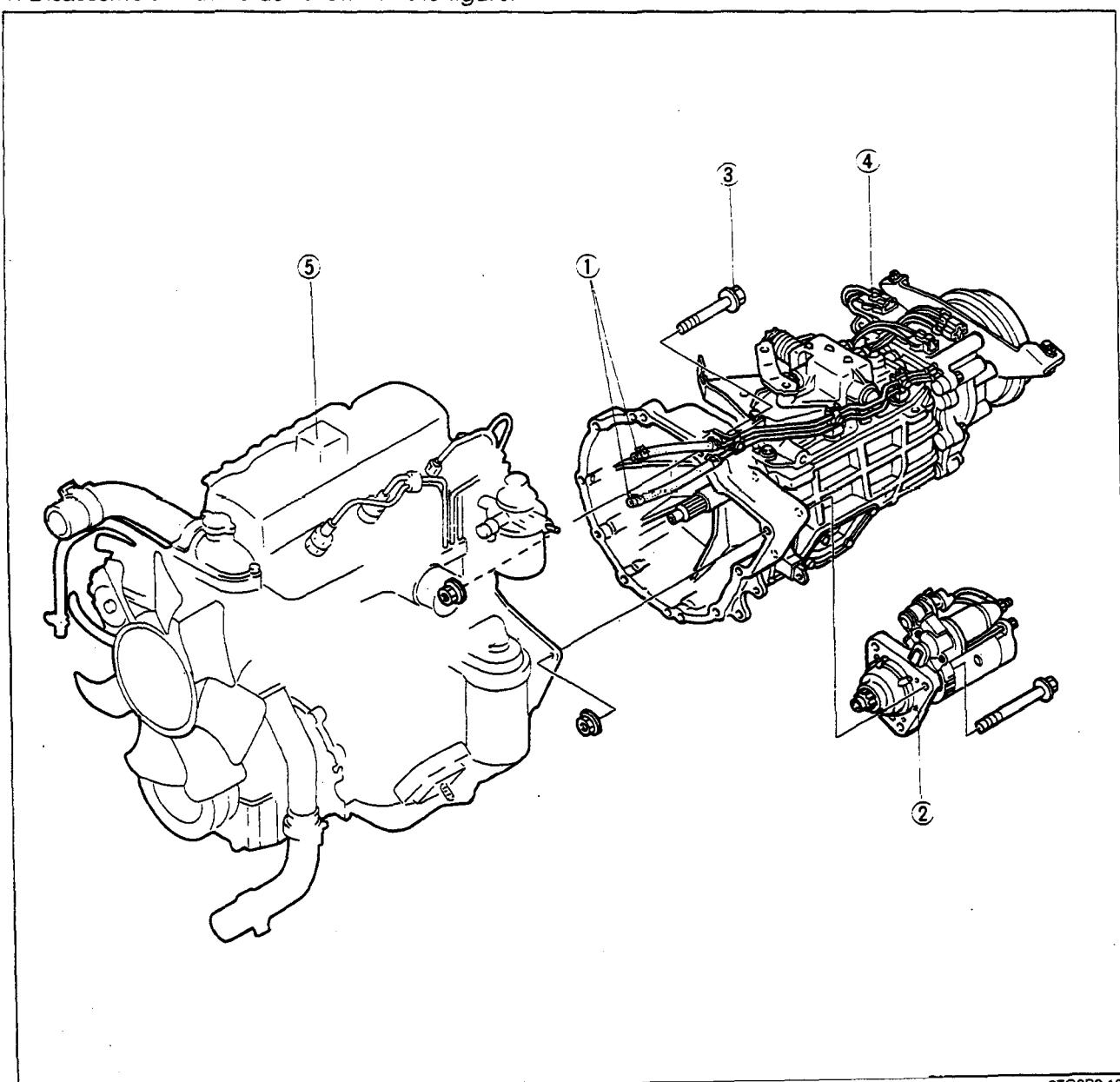
8. Remove the engine and transmission assembly.

REMOVAL

B

Step 6

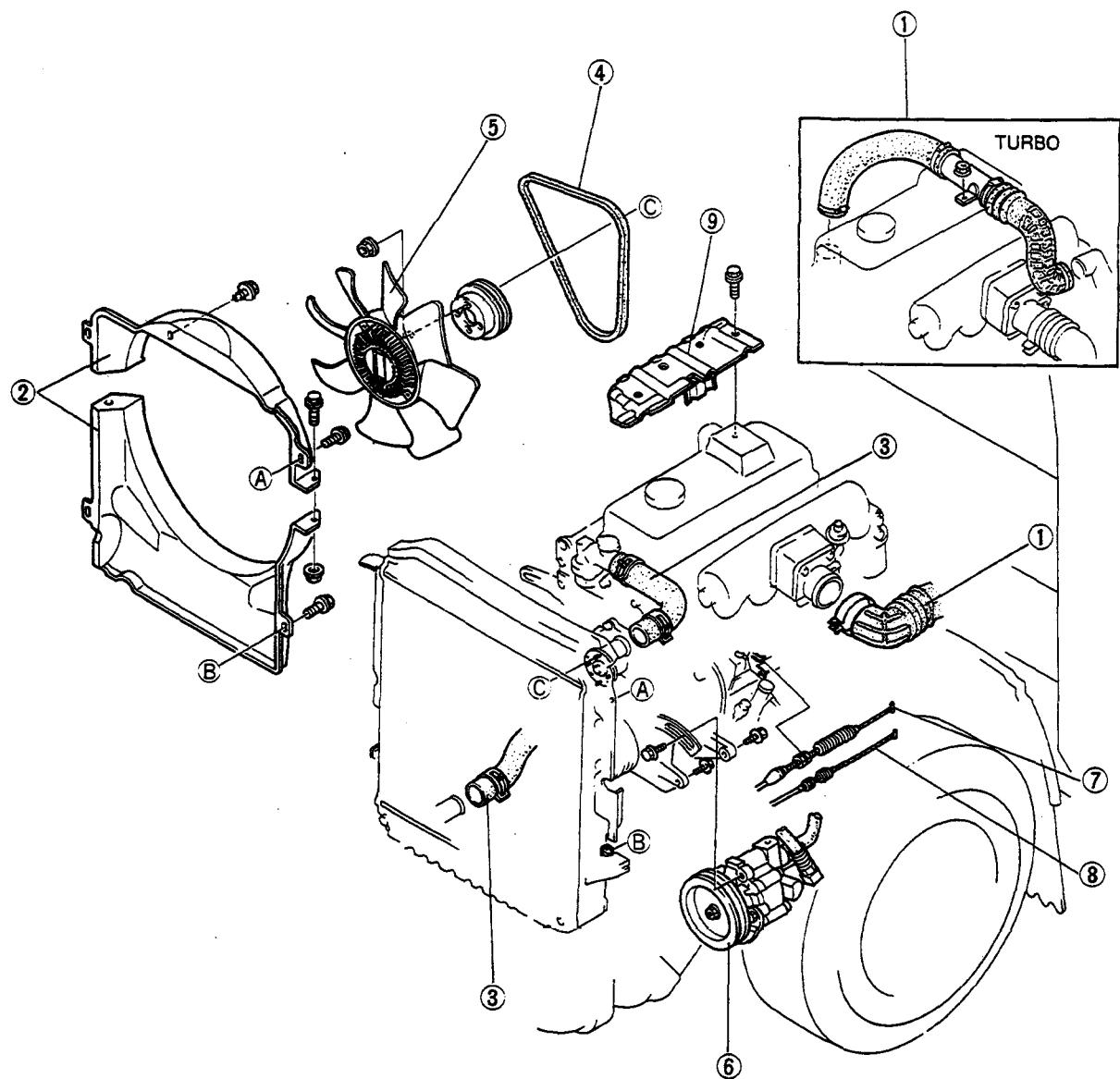
1. Disassemble in the order shown in the figure.



9TG0B2-109

1. Fuel hose
2. Starter
3. Transmission mounting bolt

4. Transmission
5. Engine

B**REMOVAL****SL Engine****Step 1**

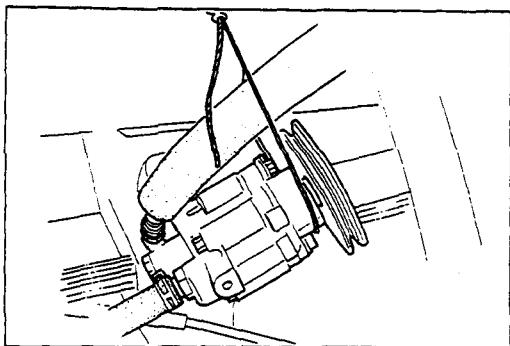
1. Air intake hose
2. Radiator cowling
3. Radiator hose
4. Drive belt
5. Cooling fan

6. P/S oil pump
Removal Note..... page B-41
7. Accelerator cable
8. Fuel stop cable
9. Exhaust manifold insulator

9TFOBX-024

REMOVAL

B



05U0BX-074

Removal note P/S oil pump

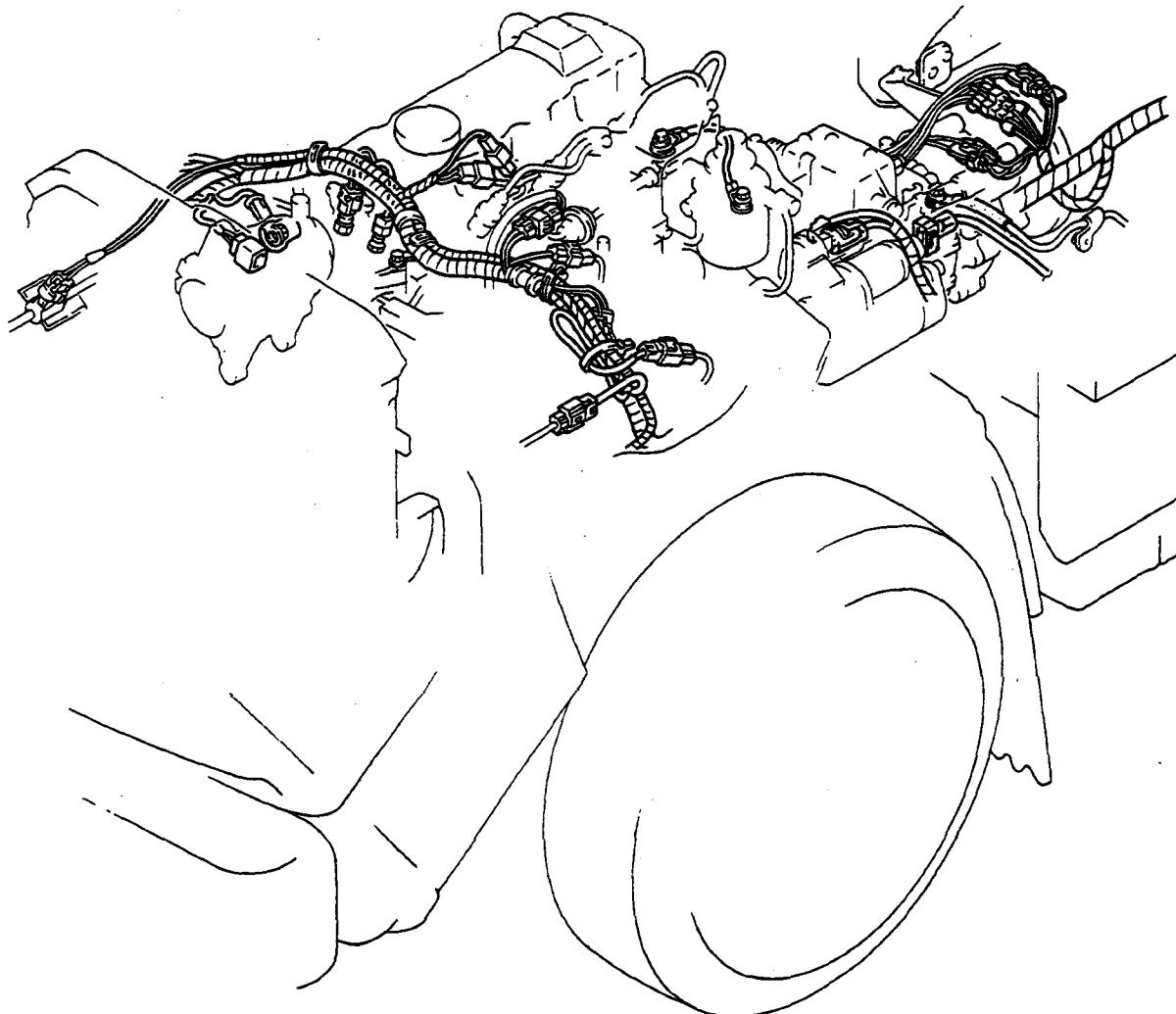
Caution

- 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.

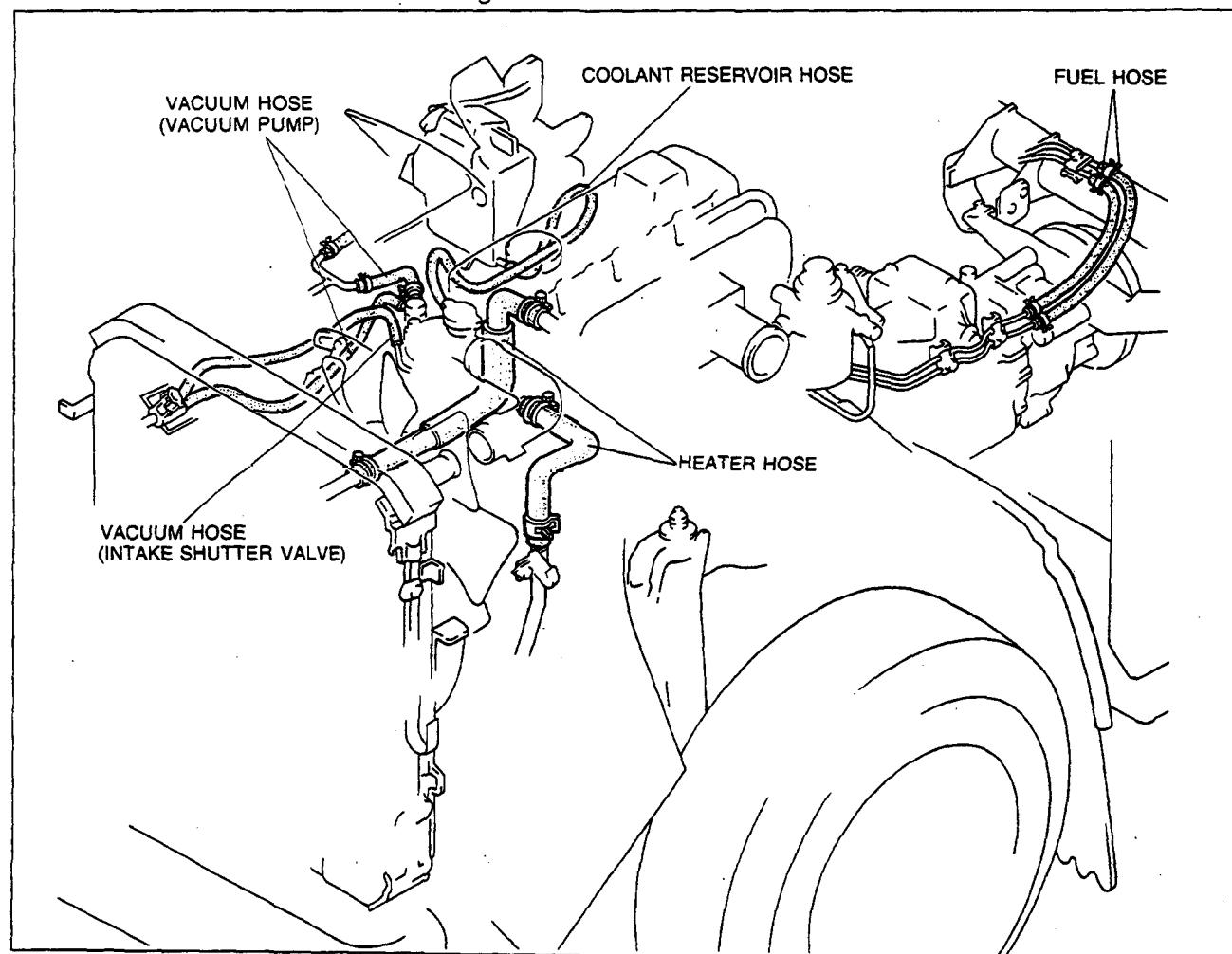
Step 2

1. Disconnect the harness connectors shown in the figure.

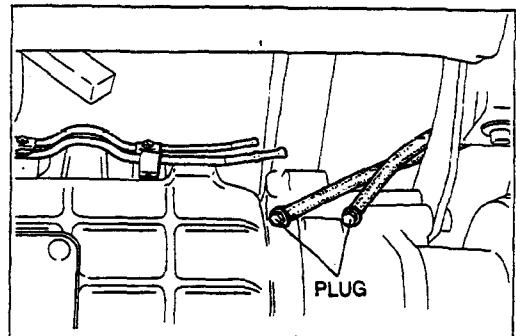


B**REMOVAL****Step 3**

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

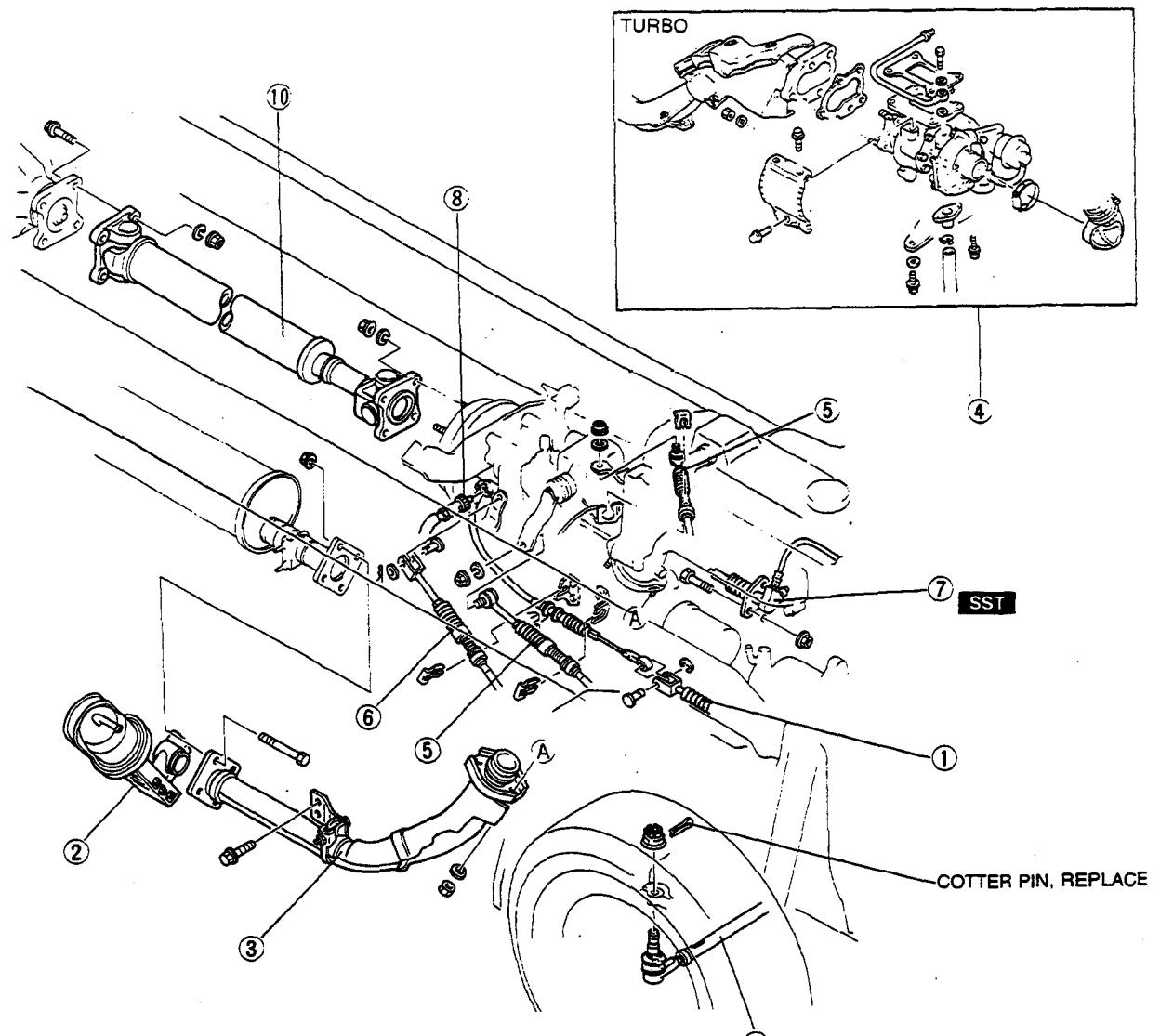
- Cover the hose with a rag because fuel will spray out when disconnecting.
- Plug the disconnected hoses to avoid fuel leakage.

1. Disconnect the fuel hoses.

REMOVAL

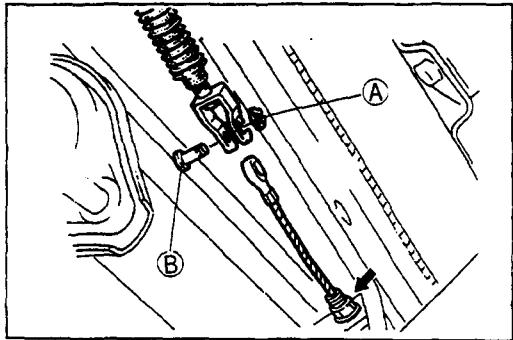
B

Step 4



9TF0BX-025

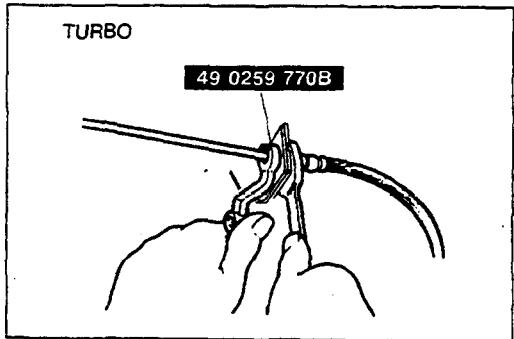
- | | | | |
|---|-----------|---|-----------|
| 1. Parking brake cable
Removal Note..... | page B-44 | 7. Clutch release cylinder
Removal Note..... | page B-44 |
| 2. Exhaust shutter valve | | 8. Speedometer cable | |
| 3. Front exhaust pipe | | 9. Tie-rod
Removal Note..... | page B-44 |
| 4. Turbocharger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

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.



TURBO

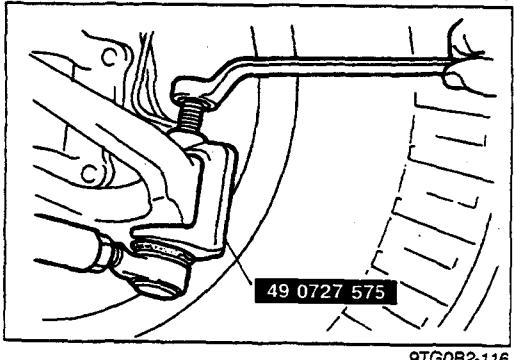
49 0259 770B

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.

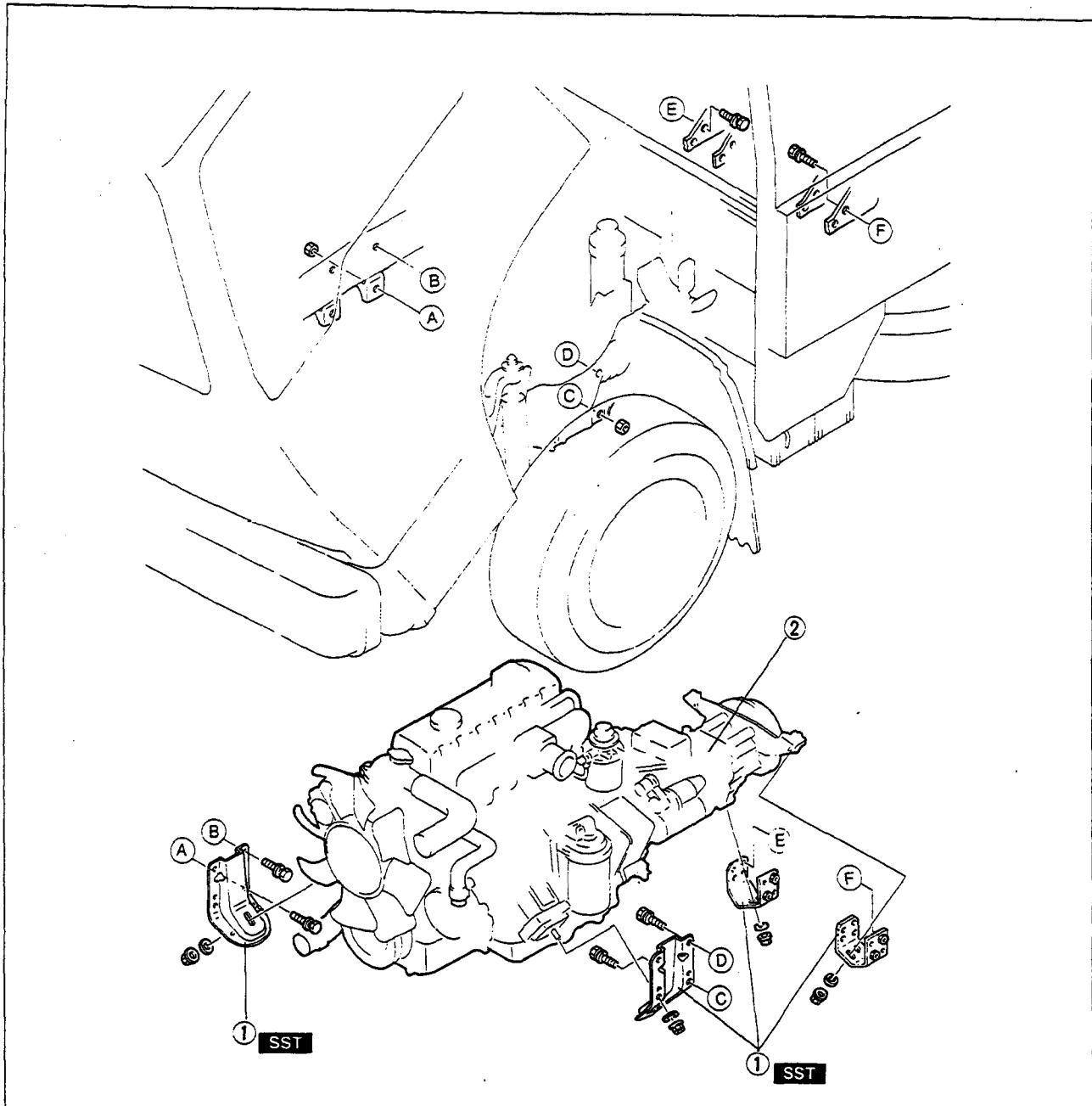
Caution

- Do not reuse the cotter pin.

REMOVAL

B

Step 5

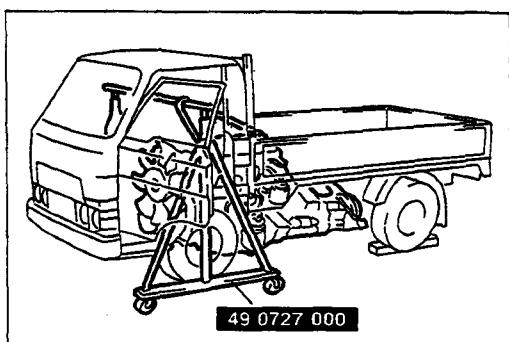


9TF0BX-026

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).

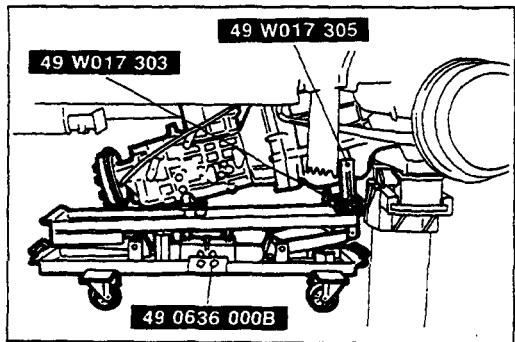
2. (Tilt cabin)

Support the engine with a hoist.

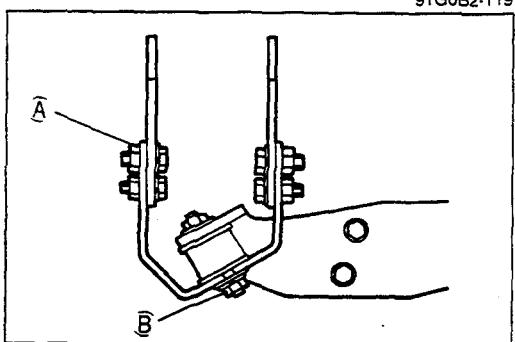
(Non-tilt cabin)

Support the engine with the SST.

REMOVAL



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.

9TG0B2-119

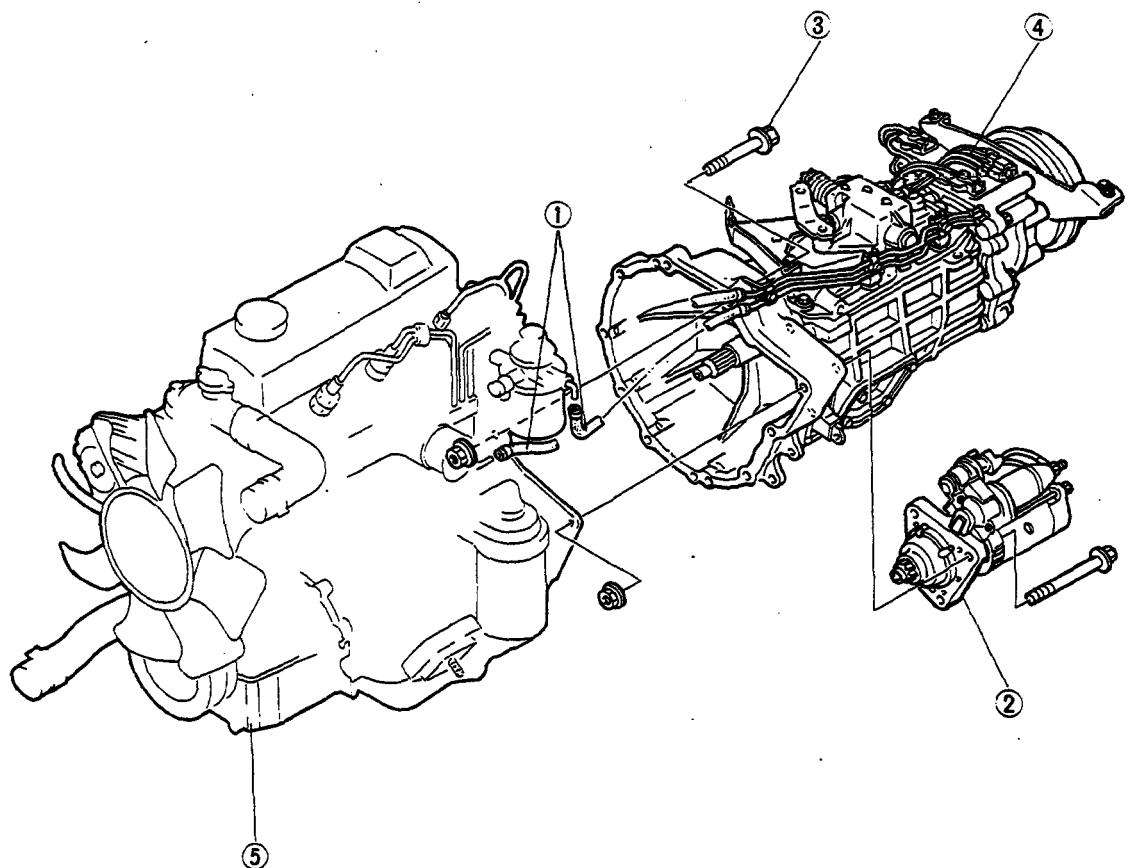
9TF0BX-027

REMOVAL

B

Step 6

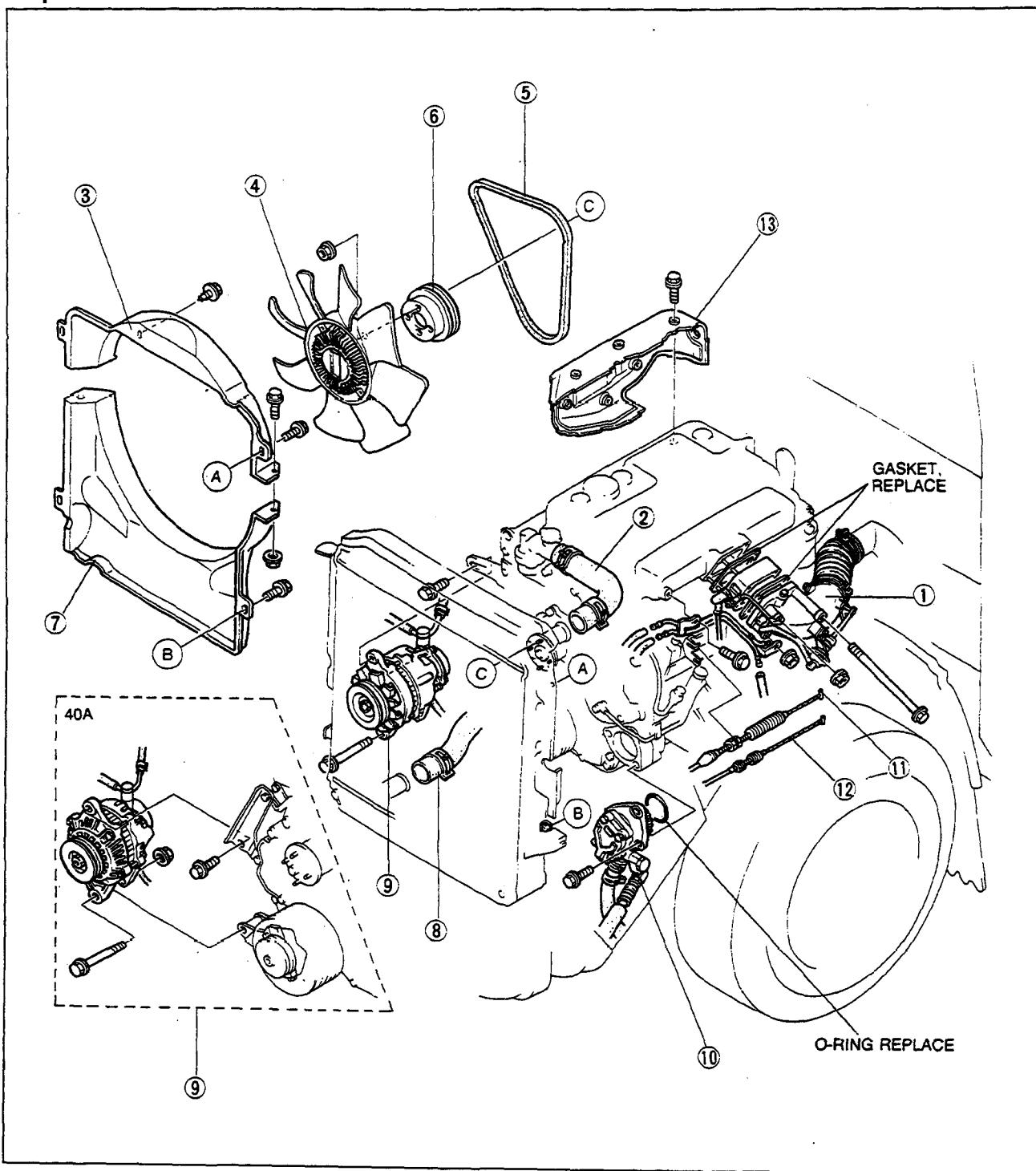
1. Disassemble in the order shown in the figure.



- 1. Fuel hose
- 2. Starter
- 3. Transmission mounting bolt

- 4. Transmission
- 5. Engine

9TF0BX-028

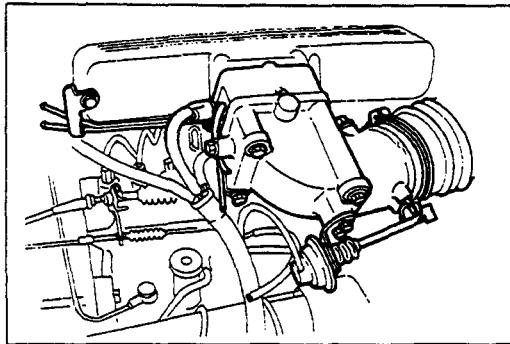
TF Engine
Step 1


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

REMOVAL

B

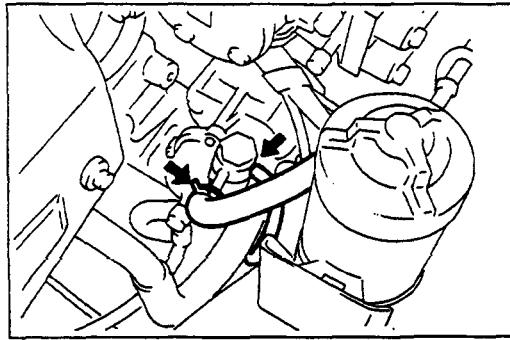


9TG0B2-125

Removal note

Air hose, intake manifold elbow

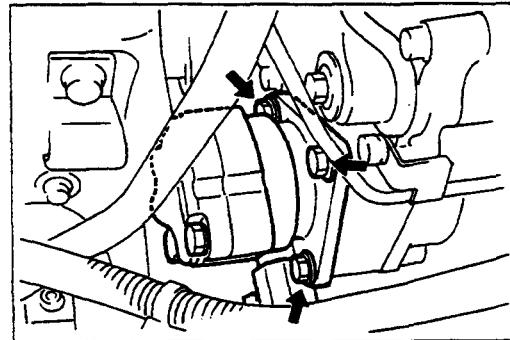
1. Disconnect the exhaust shutter valve vacuum hose.
2. Remove the vacuum pipe.
3. Disconnect the intake manifold elbow.



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

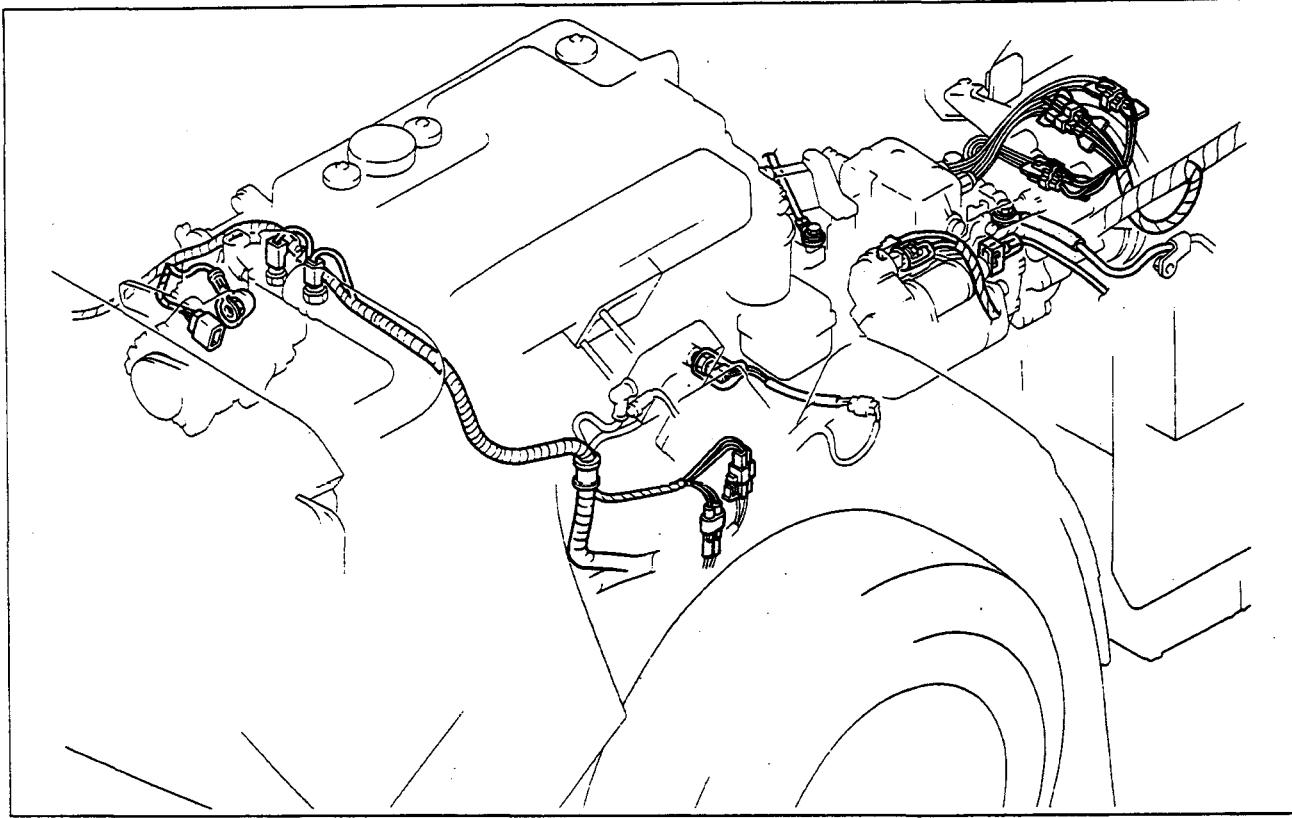
Caution

- 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.

B**REMOVAL****Step 2**

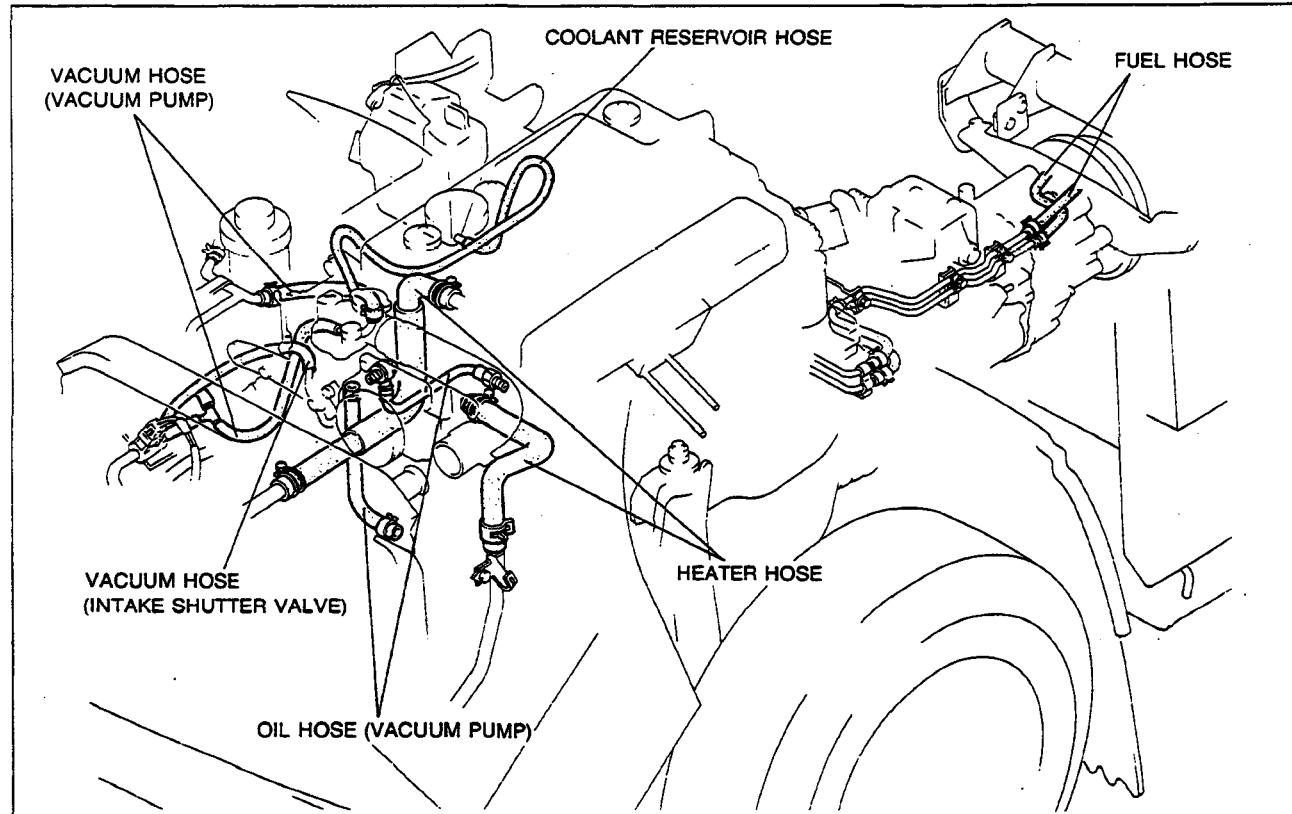
1. Disconnect the harness connectors shown in the figure.



9TG0B2-129

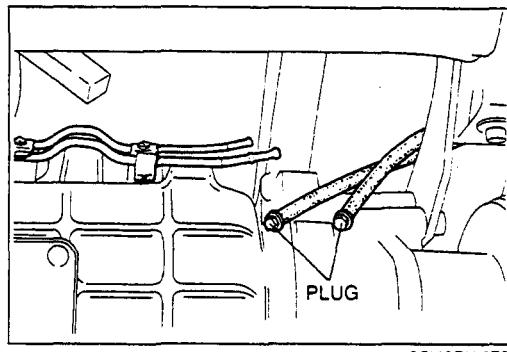
Step 3

1. Disconnect the hoses shown in the figure.



9TG0B2-130

REMOVAL

Removal note
Fuel hose

Warning

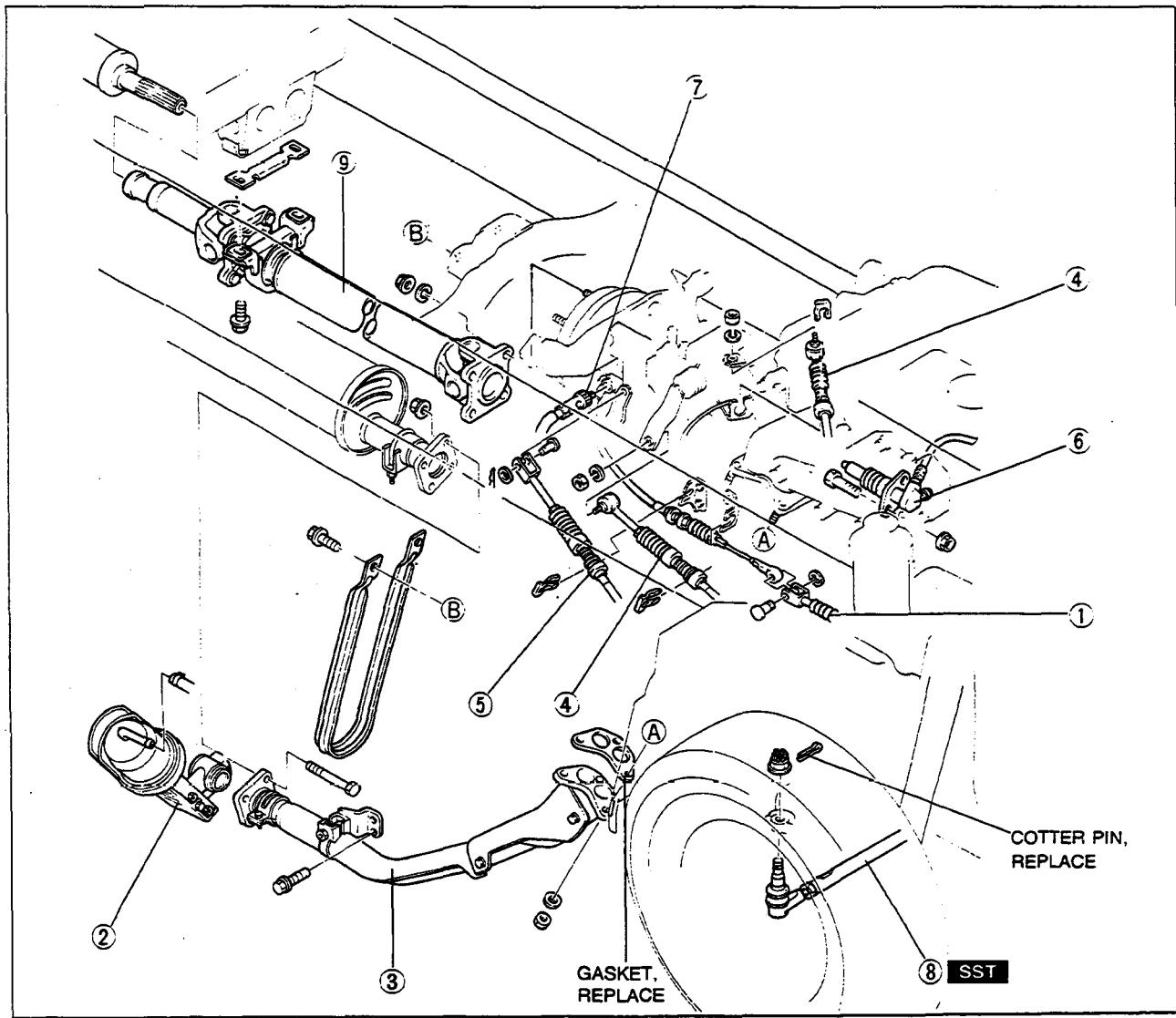
- Keep sparks and open flame away from the fuel area.

Caution

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

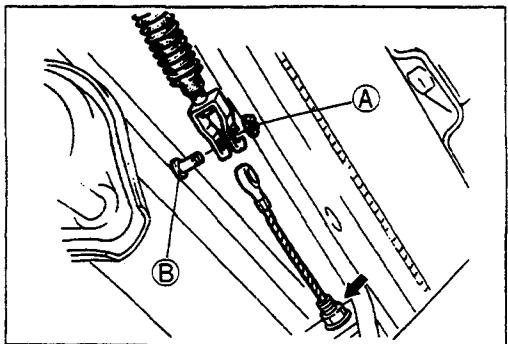
1. Disconnect the fuel hoses.

Step 4



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

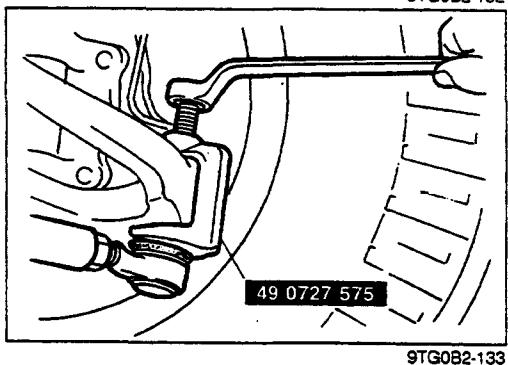
REMOVAL



Removal note

Parking brake cable

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



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.

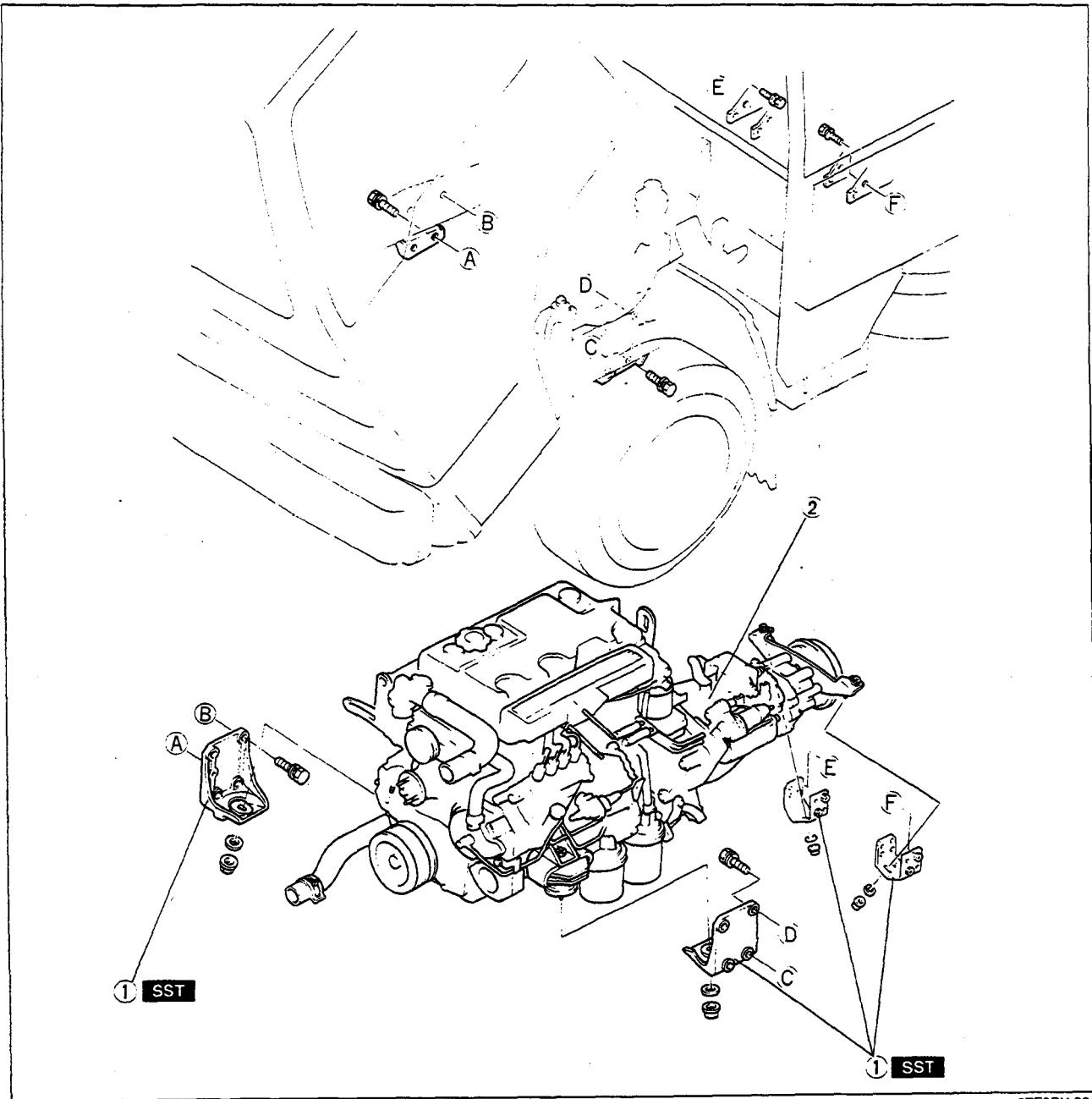
Caution

- Do not reuse the cotter pin.

REMOVAL

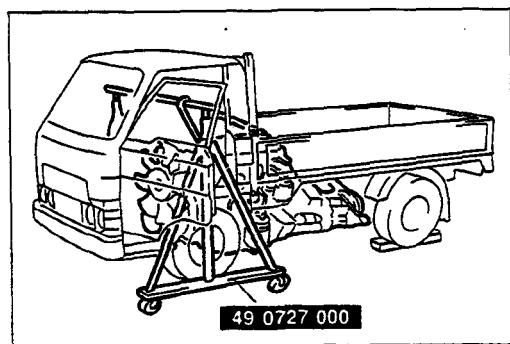
B

Step 5



1. Engine support bracket

Removal Note..... page B-53



2. Engine and transmission assembly

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)

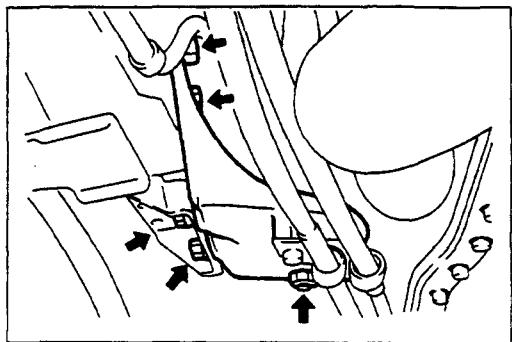
Support the engine with a hoist.
(Non-tilt cabin)

Support the engine with the **SST**.

B

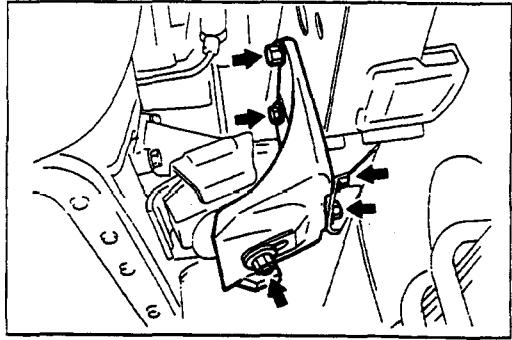
REMOVAL

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



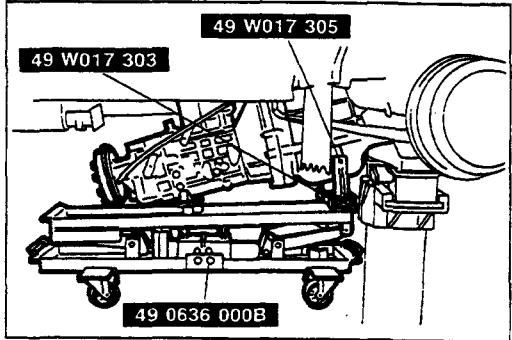
9TG0B2-136

5. Remove the left engine mount.



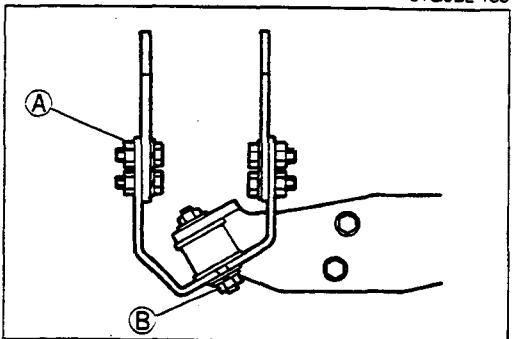
9TG0B2-137

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



9TG0B2-138

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



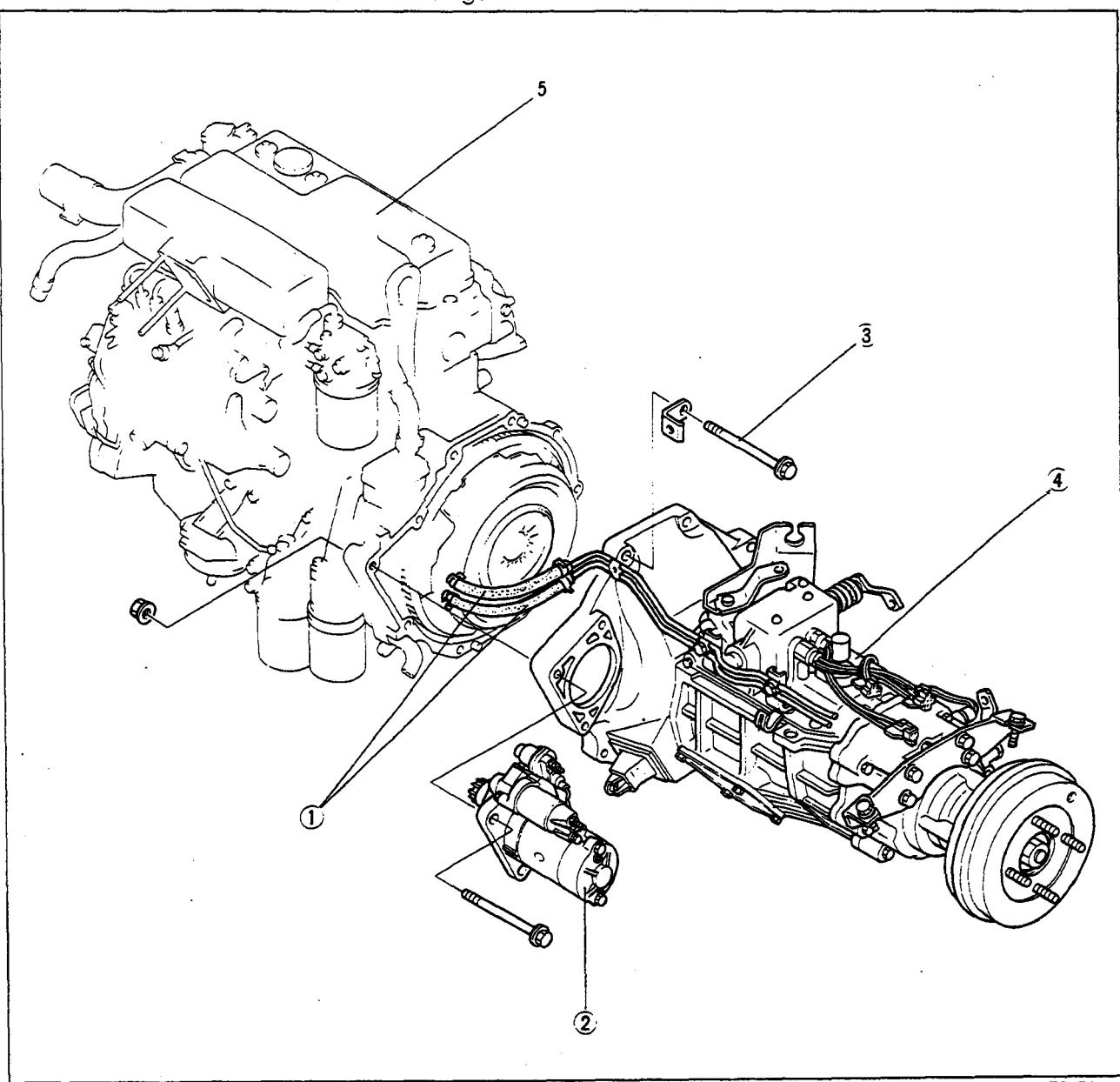
9TG0B2-139

REMOVAL

B

Step 6

1. Disassemble in the order shown in the figure.



9TG0B2-140

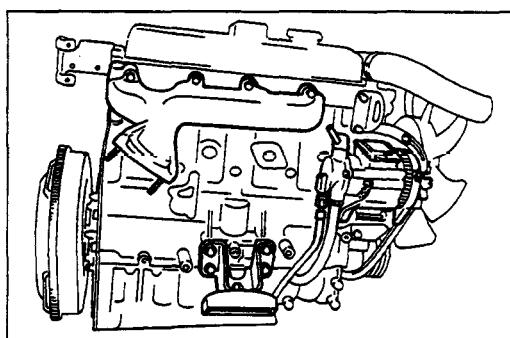
1. Fuel hose
2. Starter
3. Transmission mounting bolt

4. Transmission
5. Engine

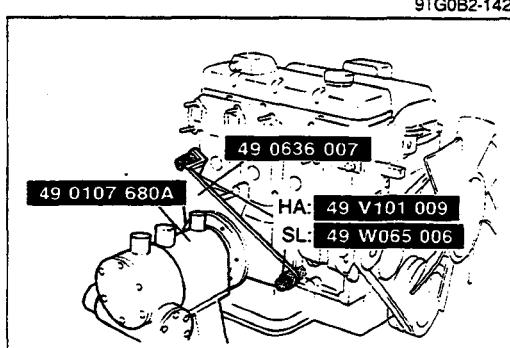
B**ENGINE STAND MOUNTING****ENGINE STAND MOUNTING****PREPARATION
SST**

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

**PROCEDURE****HA, SL Engine**

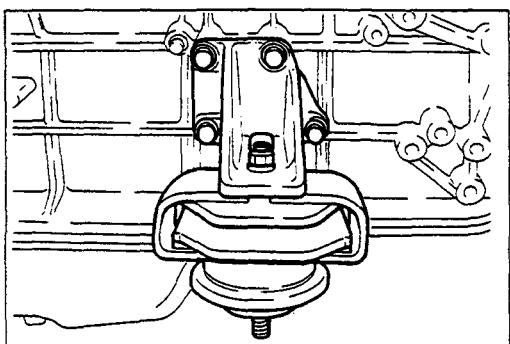
1. Remove the breather pipe (SL).
2. Remove the exhaust manifold and gasket.
3. Remove the alternator and alternator bracket.
4. Remove the right engine mount.
5. Remove the oil bypass filter and oil pipe.



6. Install the **SST (engine hanger)** to the holes shown in the figure.
7. Mount the engine on the **SST (engine stand)**.

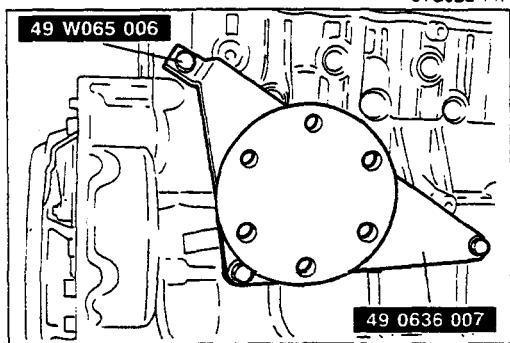
ENGINE STAND MOUNTING

B

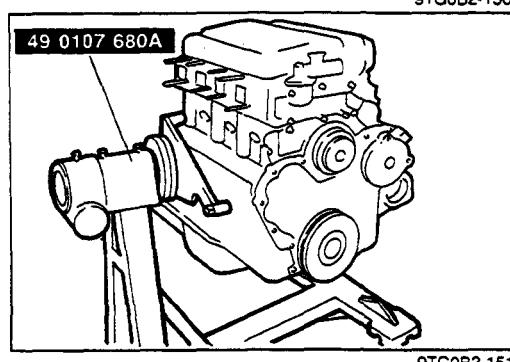


TF Engine

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

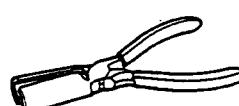
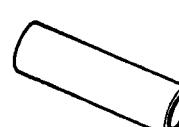
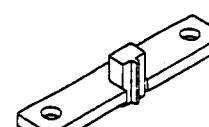
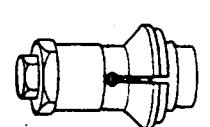
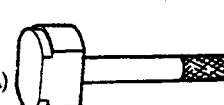
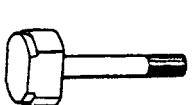


4. Install the **SST (engine hanger)** to the holes shown in the figure.



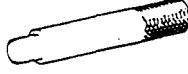
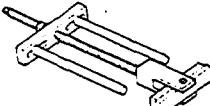
5. Mount the engine on the **SST (engine stand)**.

B**DISASSEMBLY****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

DISASSEMBLY

B

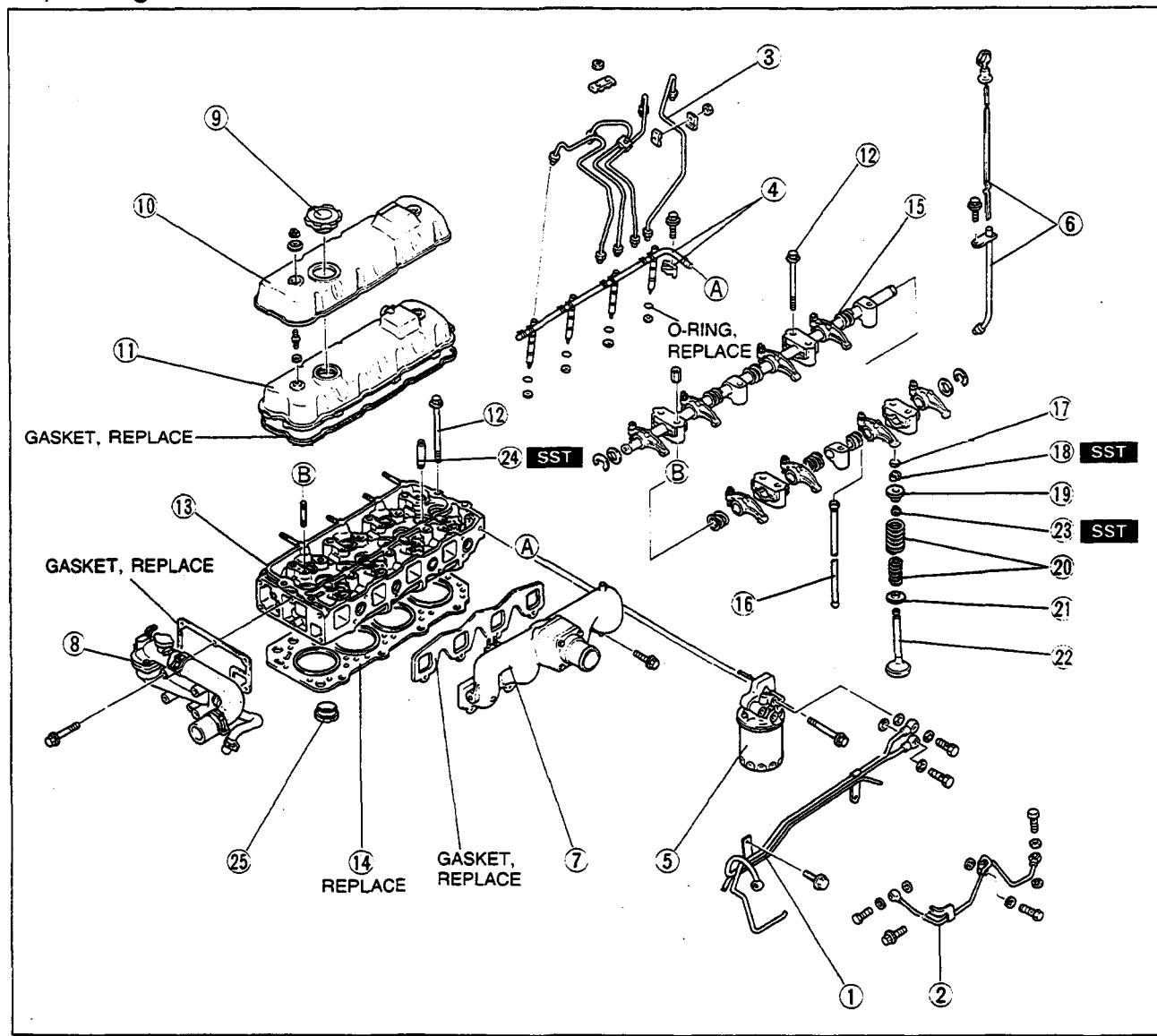
49 W065 016 Body (Part of 49 W065 015)		For removal of cylinder liners	49 W065 017 Handle (Part of 49 W065 015)		For removal of cylinder liners
49 W010 1A0 Remover set. cylinder liner (TF)		For removal of cylinder liners			9TG0B2-152

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

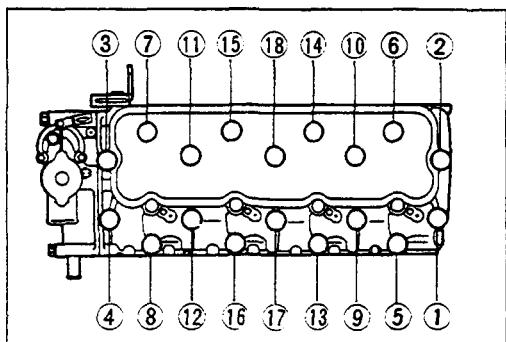
B**DISASSEMBLY****CYLINDER HEAD
HA, SL Engine**

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

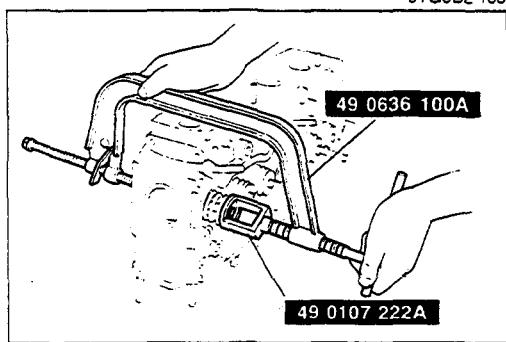
DISASSEMBLY

B



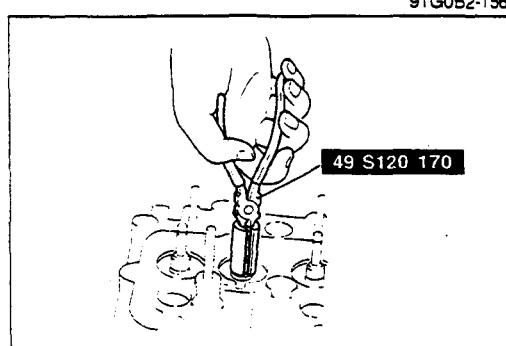
Disassembly Note Cylinder head bolt

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



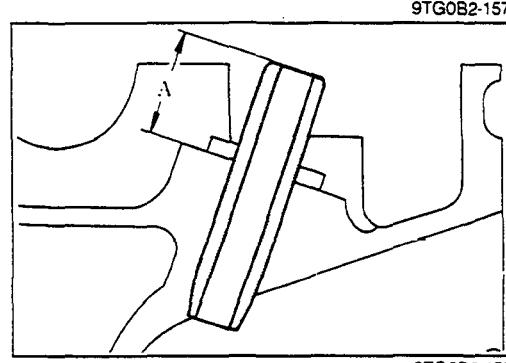
Valve keeper

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



Valve seal

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



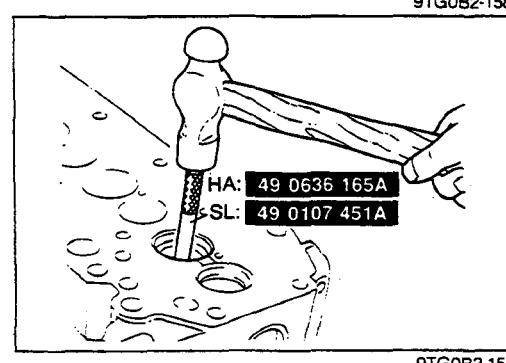
Valve guide

Caution

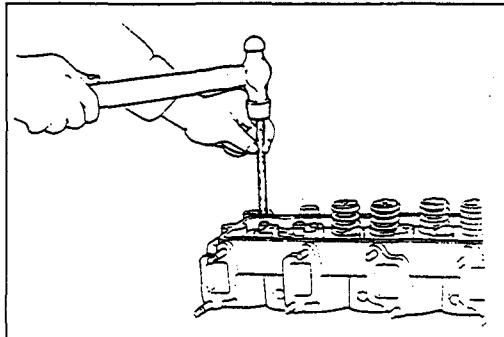
- If the valve guide is removed, it must be replaced with a new one.

1. Measure height A of each valve guide.

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



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

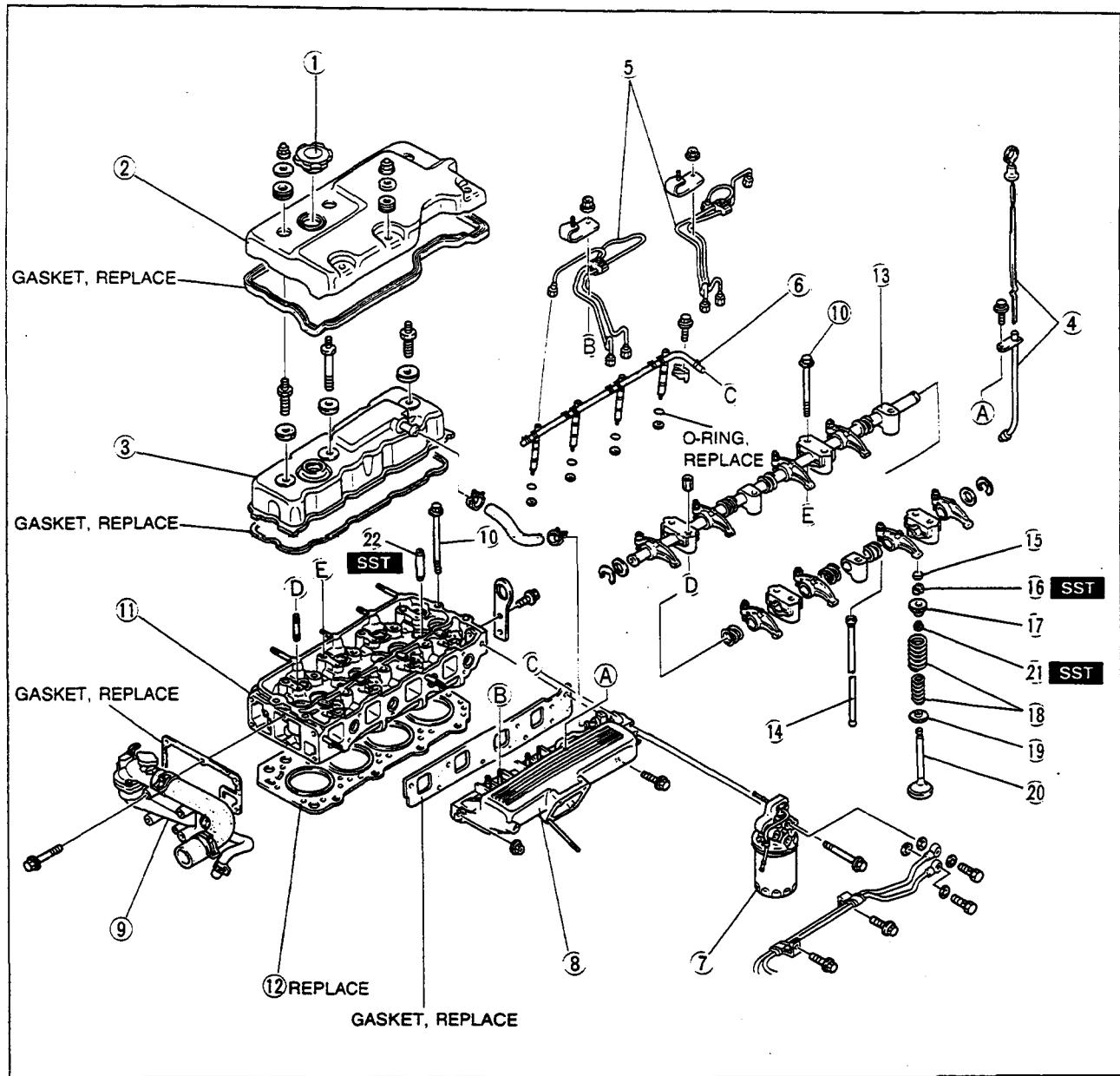
Combustion chamber insert

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.

DISASSEMBLY

B

TF Engine



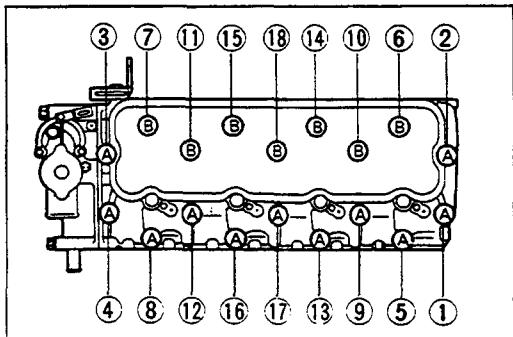
Disassembly Note page B-64

Inspection page B-79

Inspect for wear or damage

Disassembly Note page B-64

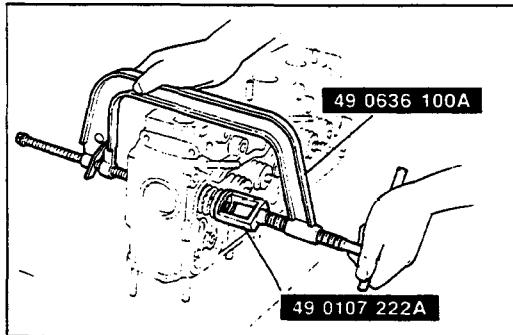
B DISASSEMBLY



9TG0B2-163

Disassembly Note Cylinder head bolt

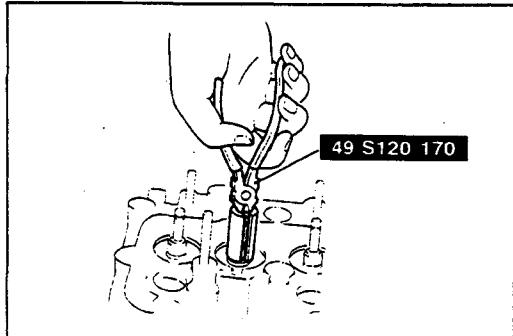
1. Loosen the cylinder head bolts in two or three steps in the order shown in the figure.
2. Remove the cylinder head bolts.



9TG0B2-164

Valve keeper

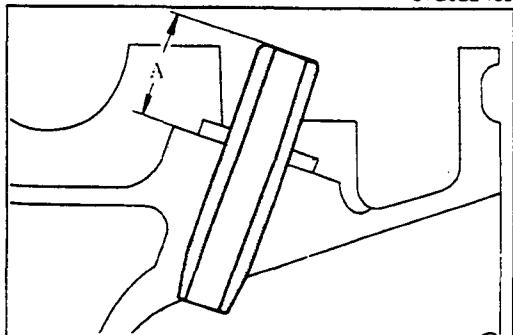
1. Set the **SST** against the upper valve spring seat as shown in the figure.
2. Remove the valve keepers.



9TG0B2-165

Valve seal

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



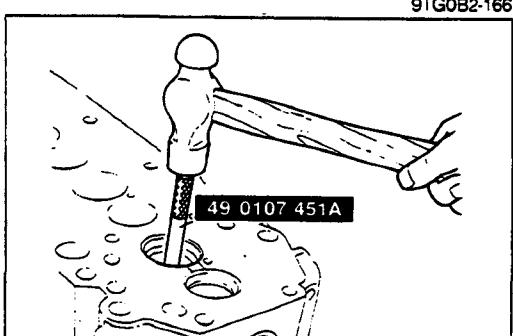
9TG0B2-166

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)



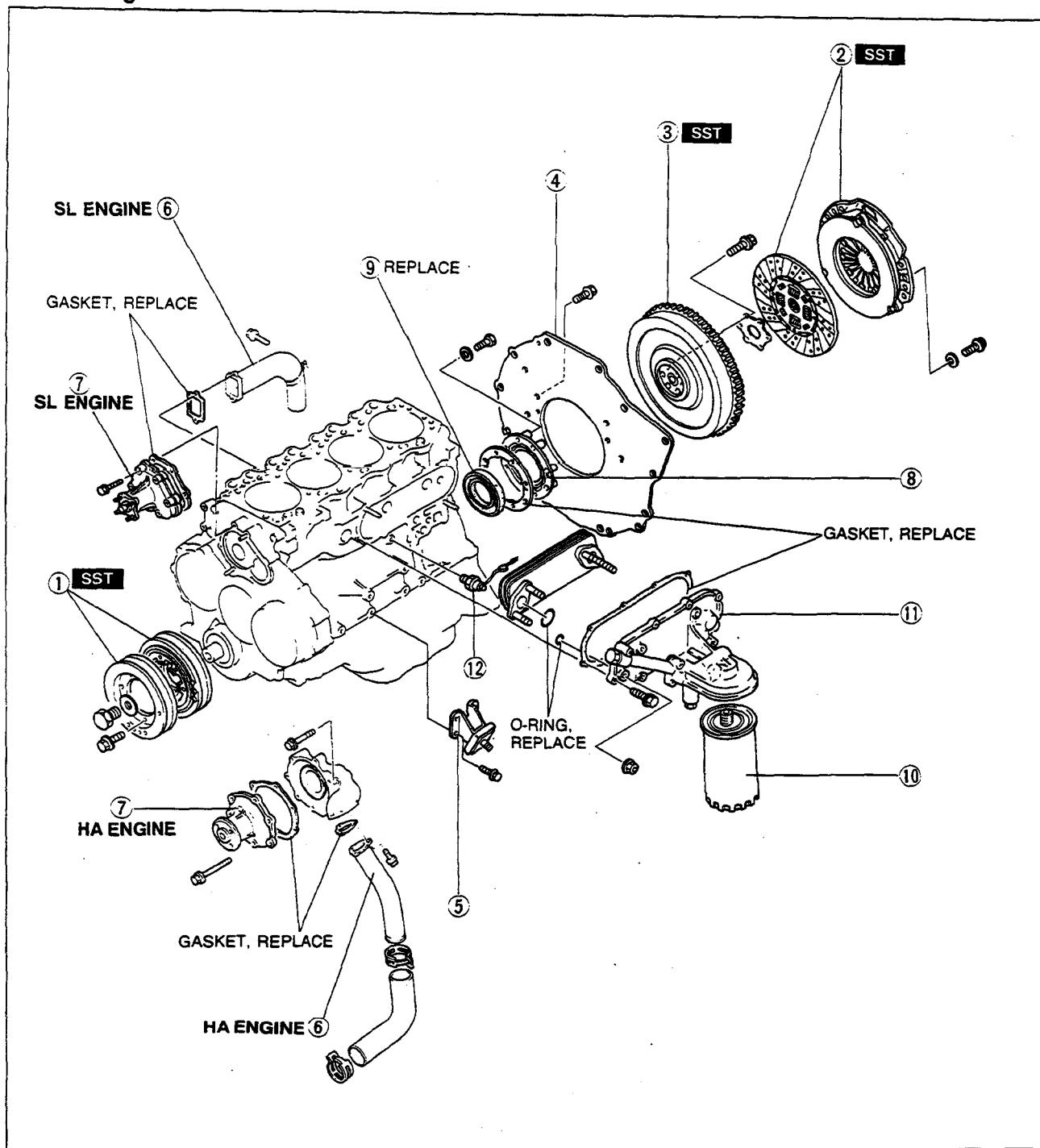
9TG0B2-167

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**.

DISASSEMBLY

B

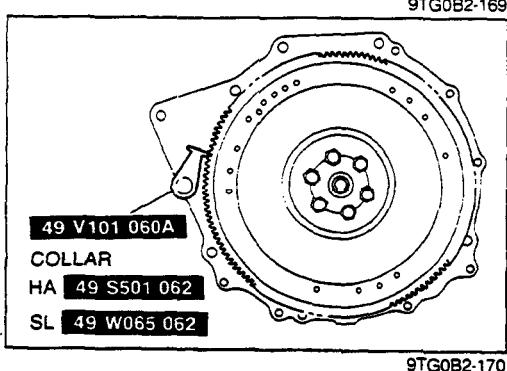
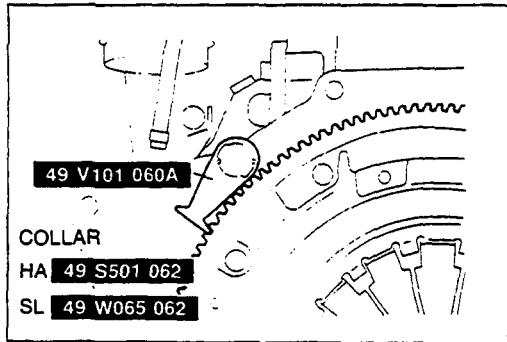
CYLINDER BLOCK (EXTERNAL PARTS I) HA, SL Engine



9TF0BX-034

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

DISASSEMBLY



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.

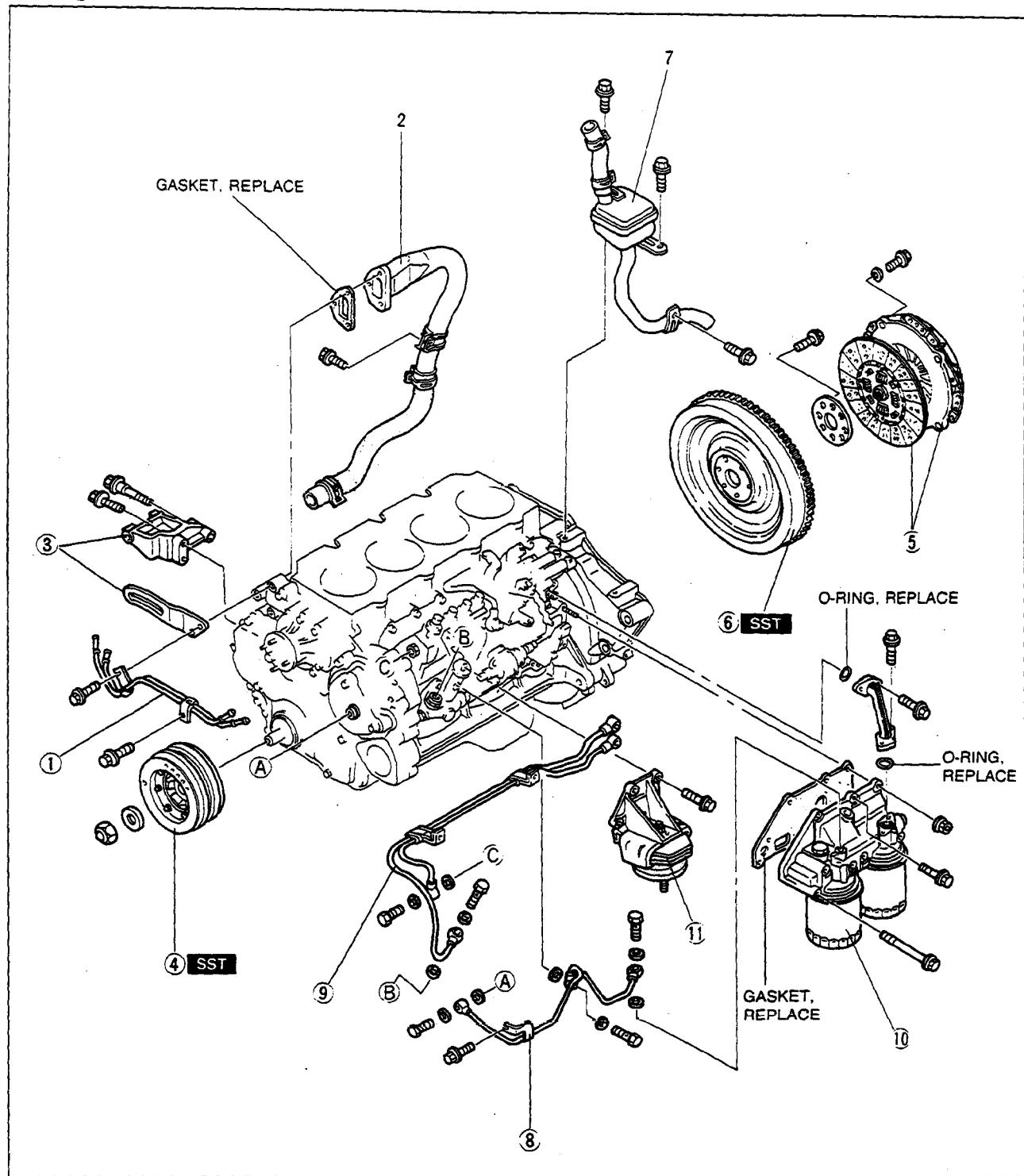
Flywheel

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

DISASSEMBLY

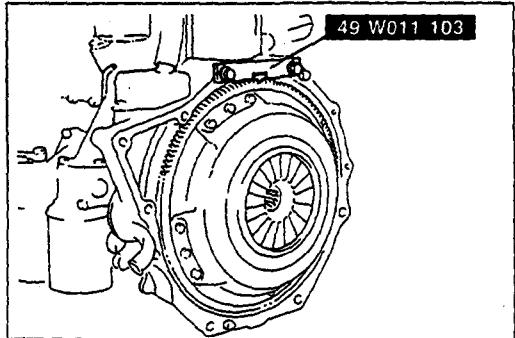
B

TF Engine

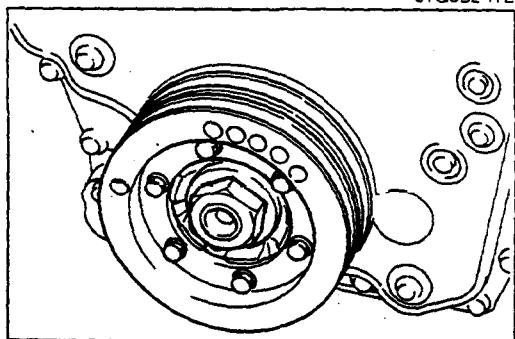


- | | |
|----------------------------------|----------------------------------|
| 1. Vacuum pipe | 6. Flywheel |
| 2. Water pipe | Disassembly Note page B-68 |
| 3. Alternator bracket | Inspect for wear or damage |
| 4. Crankshaft pulley | 7. PCV chamber |
| Disassembly Note page B-68 | 8. Oil pipe |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

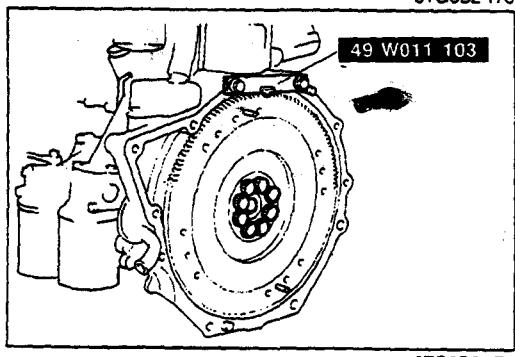
9TF0BX-035

**Disassembly Note****Crankshaft pulley**

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



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

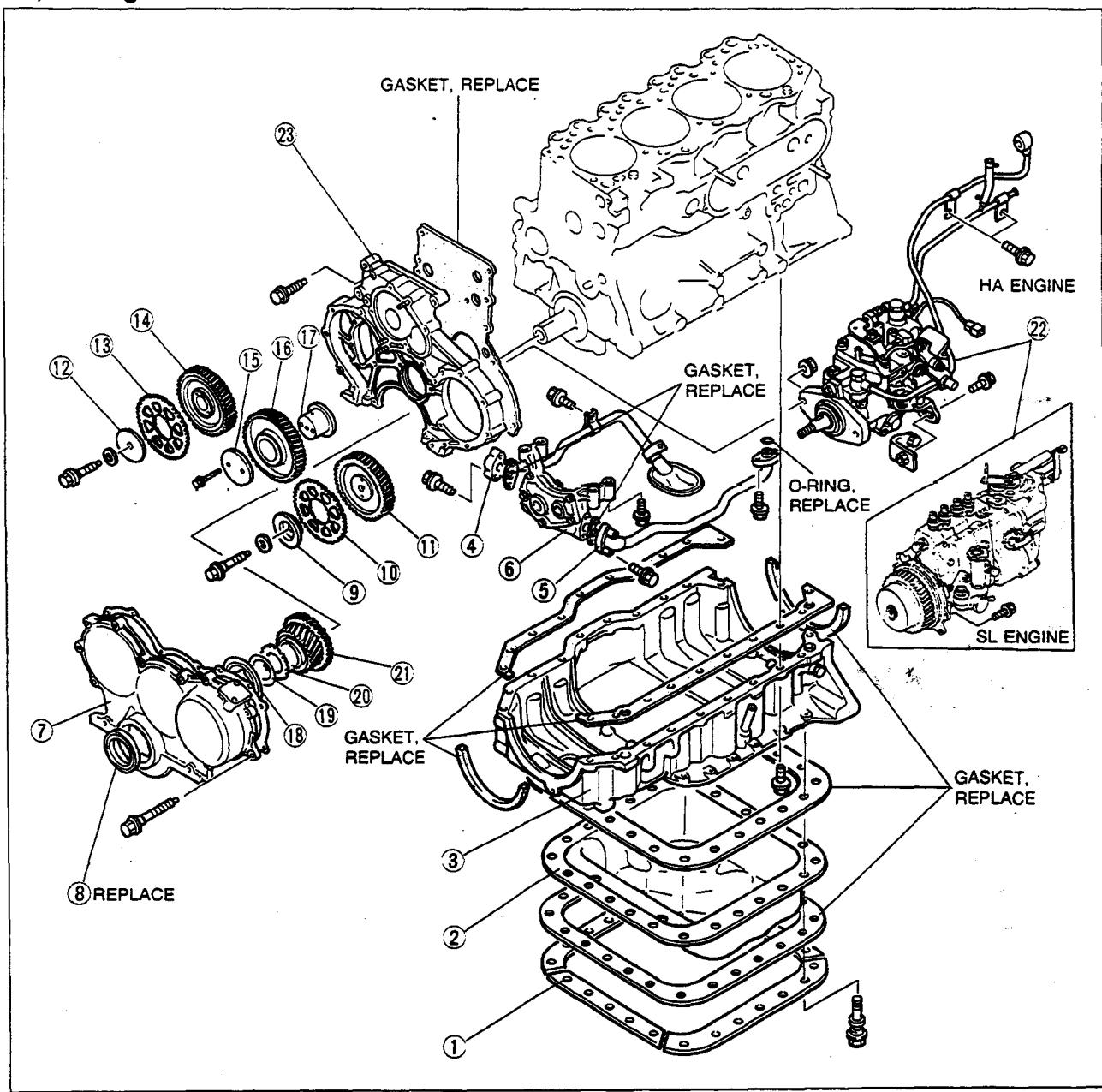
**Flywheel**

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

DISASSEMBLY

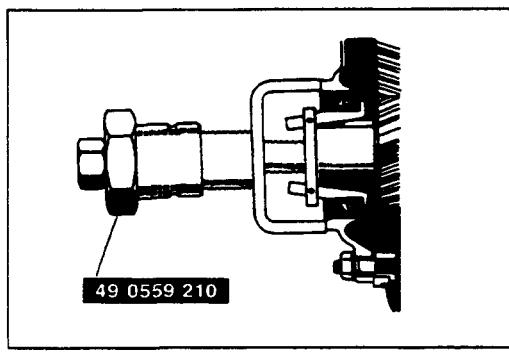
B

CYLINDER BLOCK (EXTERNAL PARTS II) HA, SL Engine



9TF0BX-036

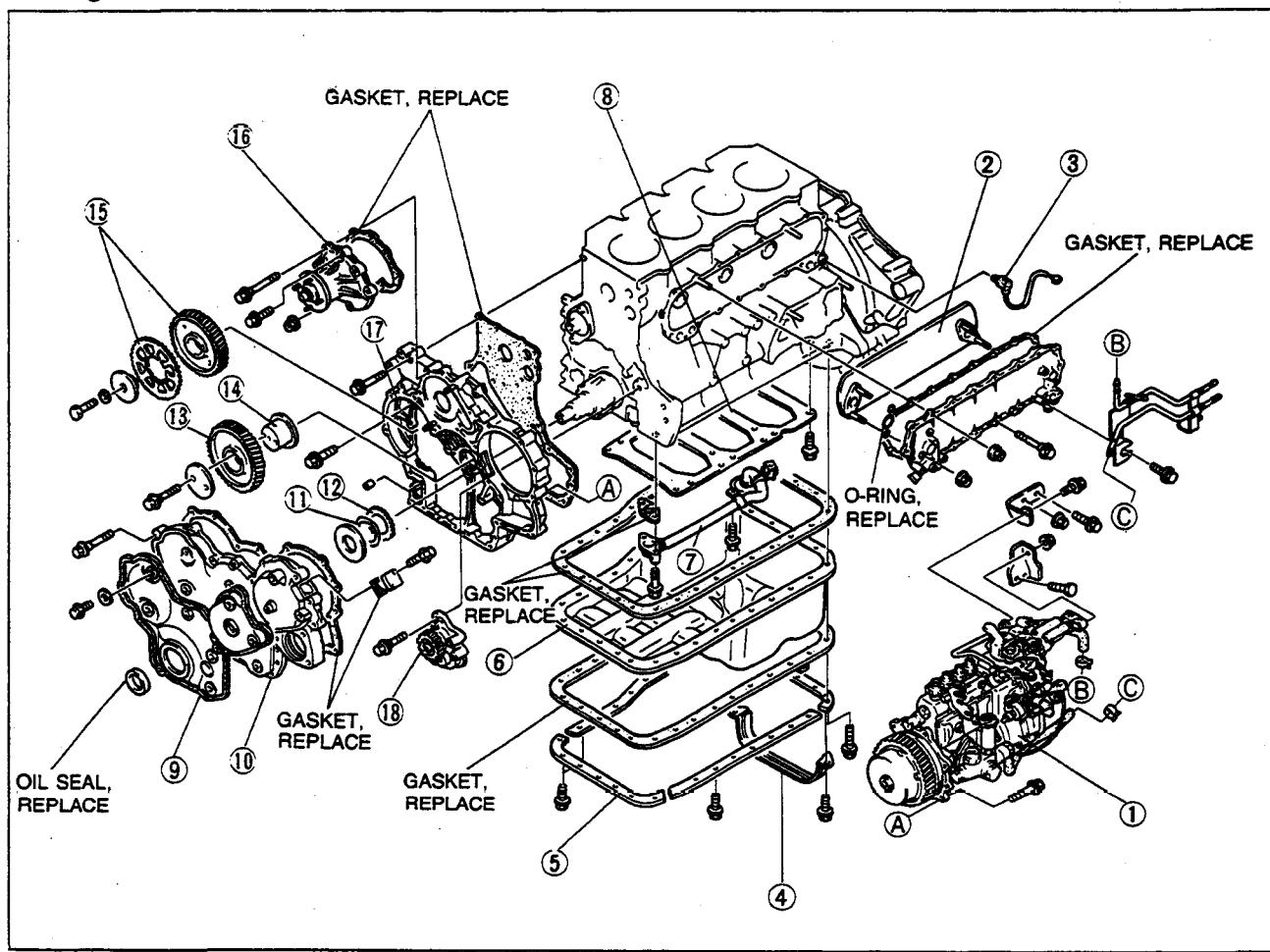
- | | |
|---|------------------------------|
| 1. Stiffener | 11. Injection pump gear (HA) |
| 2. Oil pan | 12. Lock plate |
| Inspect for cracks, deformation, and damage | 13. Friction gear |
| 3. Oil pan upper block | 14. Camshaft gear |
| 4. Oil strainer | 15. Thrust plate |
| 5. Oil pipe | 16. Idler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



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.

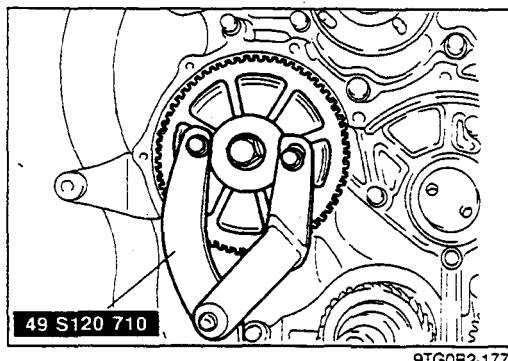
TF Engine

9TF0BX-037

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

DISASSEMBLY

B



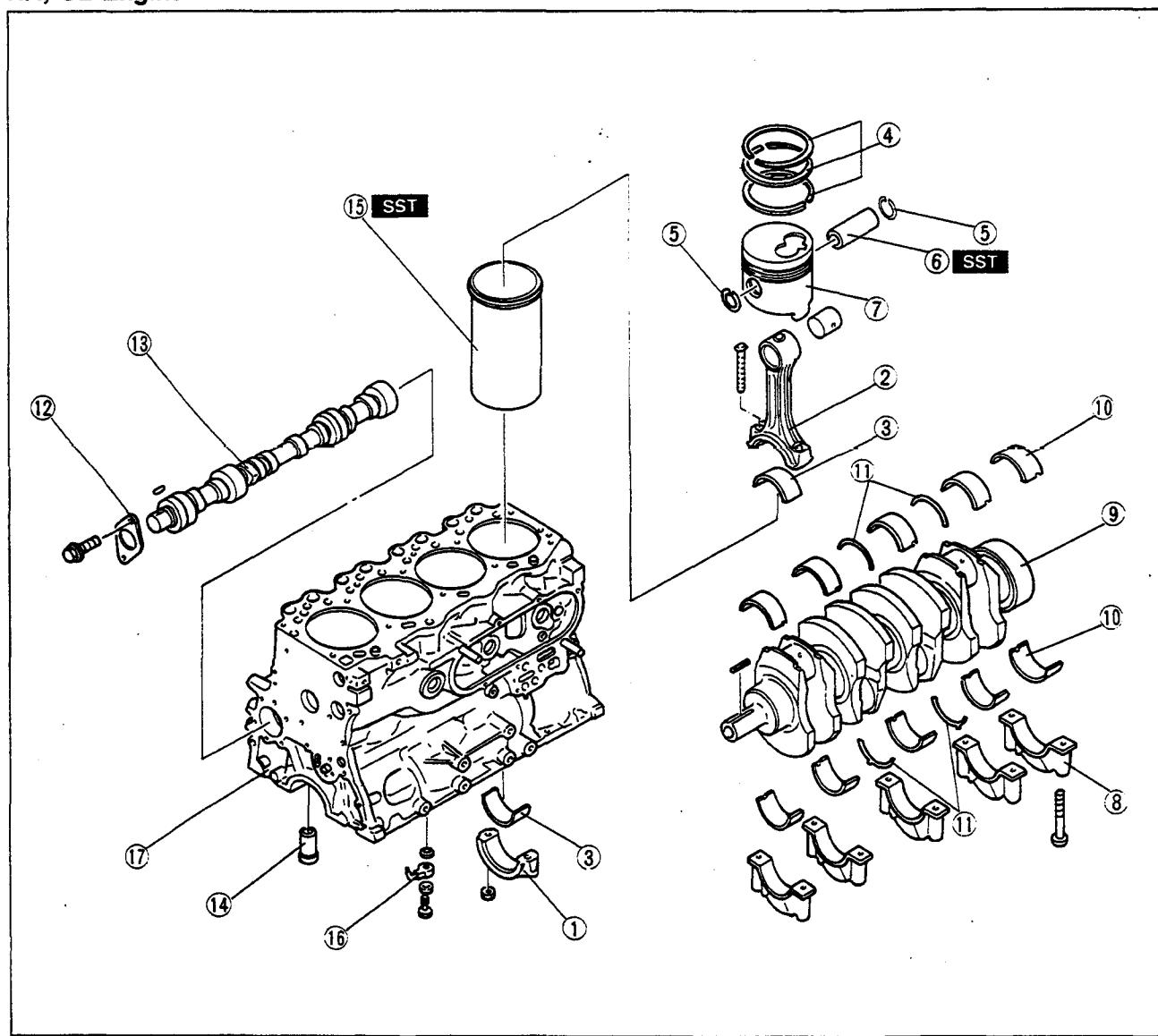
Disassembly Note

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



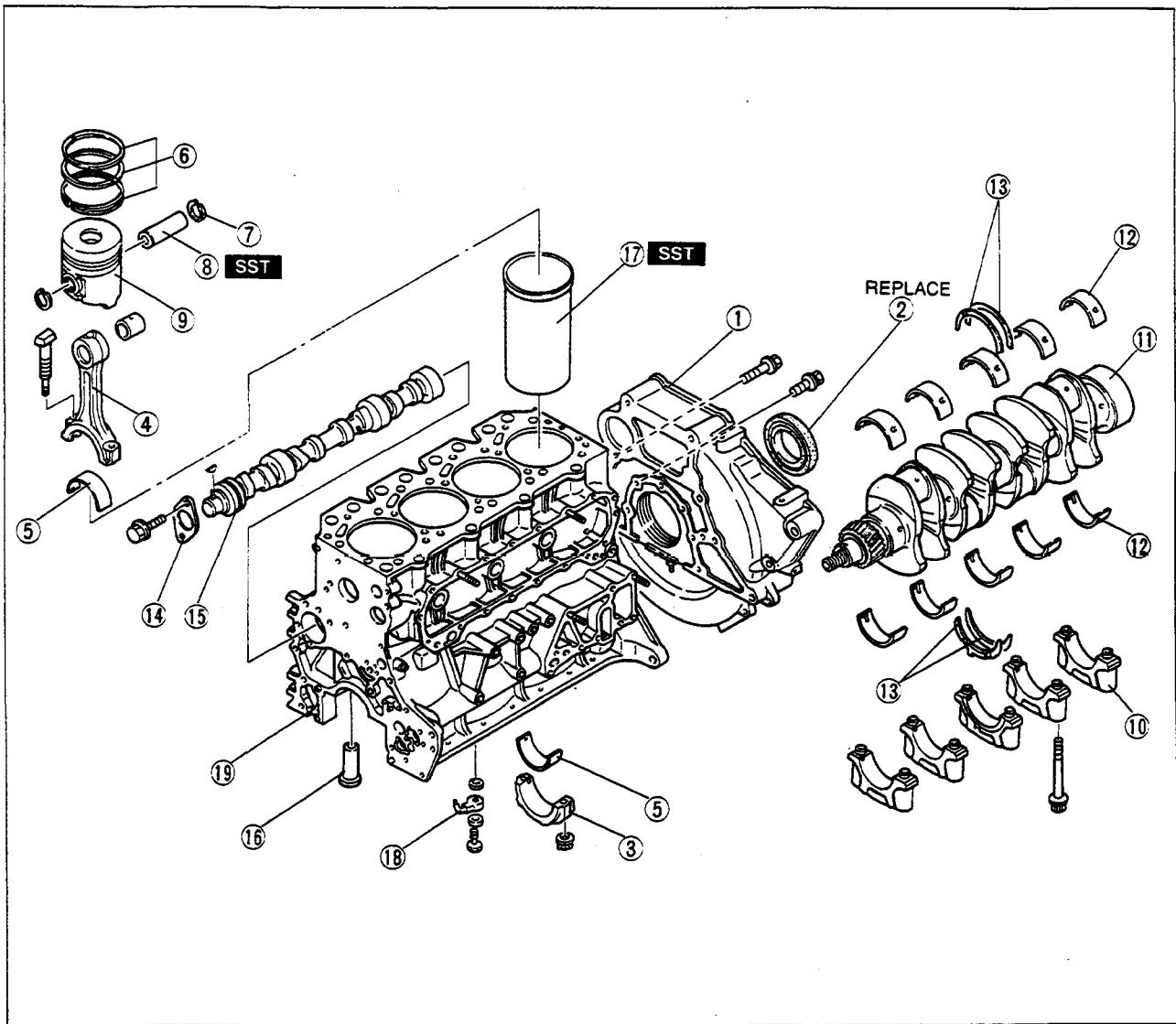
9TF0BX-038

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
14. Tappet
Inspection page B-85
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

DISASSEMBLY

B

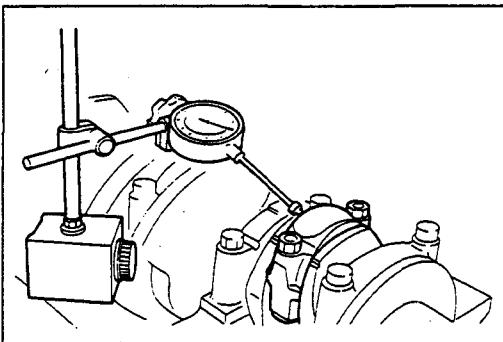
TF Engine



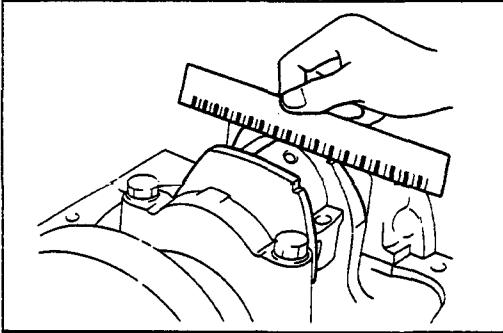
9TF0BX-039

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

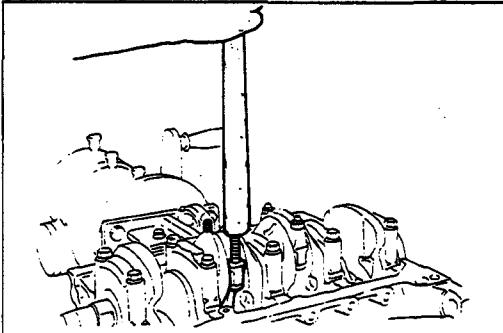
DISASSEMBLY



9TF0BX-040



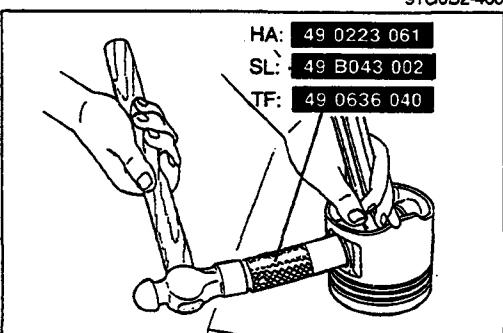
9TF0BX-041



9TG0B2-459



9TG0B2-460



05U0BX-114

Disassembly Note

Connecting rod cap

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

Connecting rod

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

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.

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).

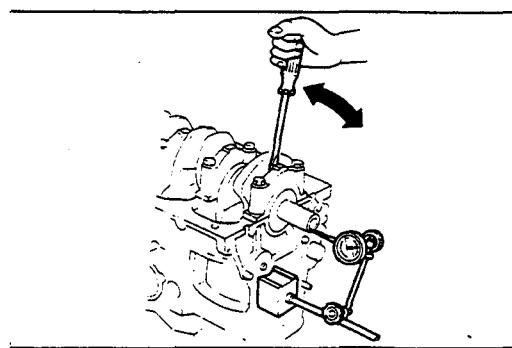
Piston pin

Caution

- Mark the connecting rod direction for proper reassembly.

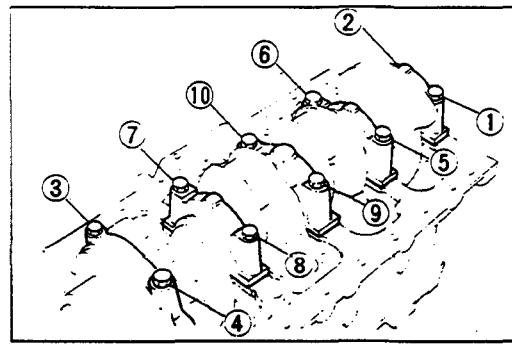
1. Remove the piston pin with the SST.

DISASSEMBLY

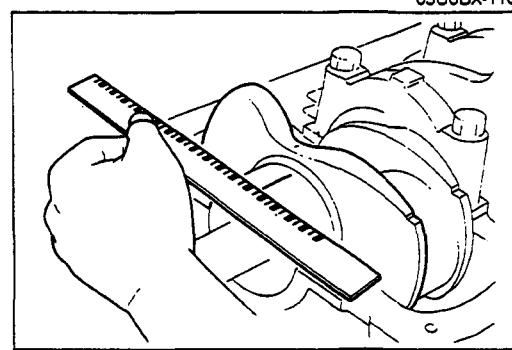


Main bearing cap

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

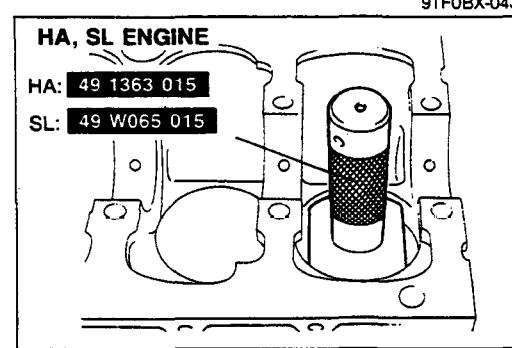


2. Loosen the main bearing cap bolts in two or three steps in the order shown in the figure.
3. Remove the main bearing caps.



Crankshaft

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



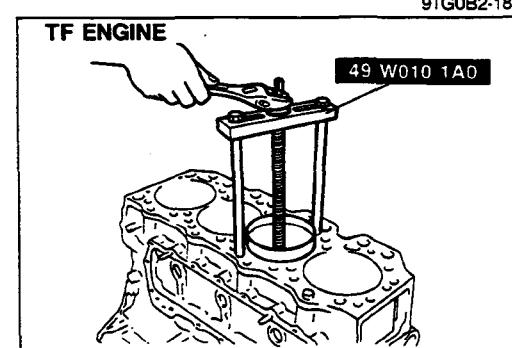
Cylinder liner

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.



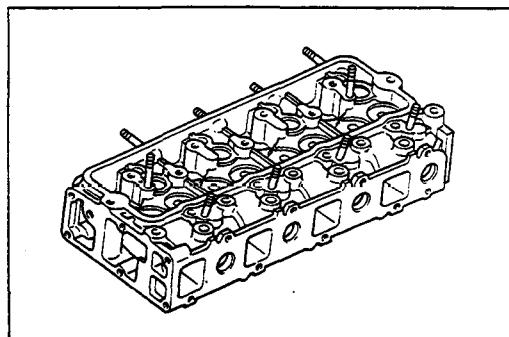
INSPECTION / REPAIR

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).**

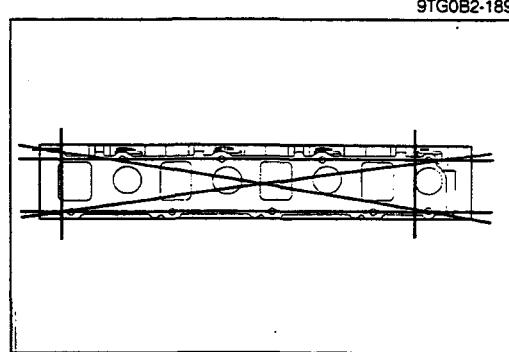
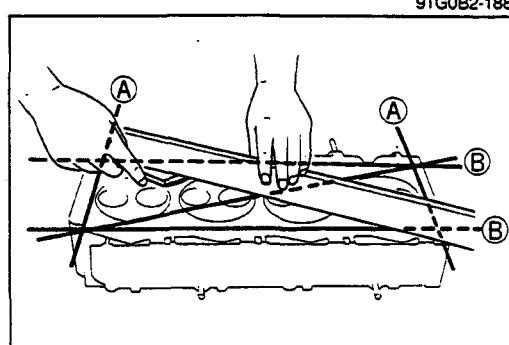
9TG0B2-187

**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 **(A)** : 0.10mm (0.004 in) max.
(B) : 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.

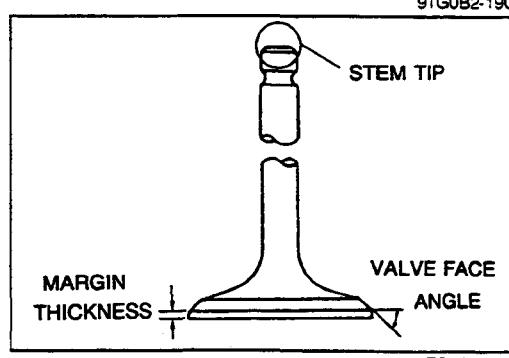
VALVE MECHANISM**Valve and Valve Guide**

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

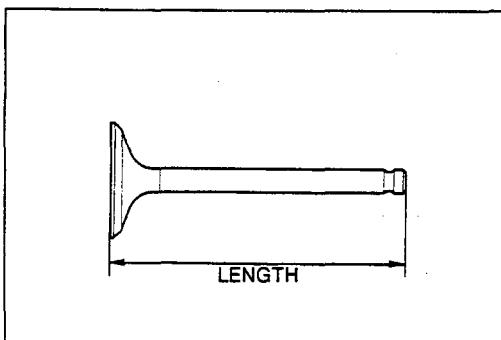
mm (in) min.

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

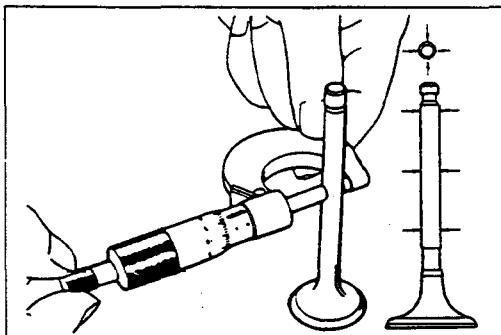


INSPECTION / REPAIR

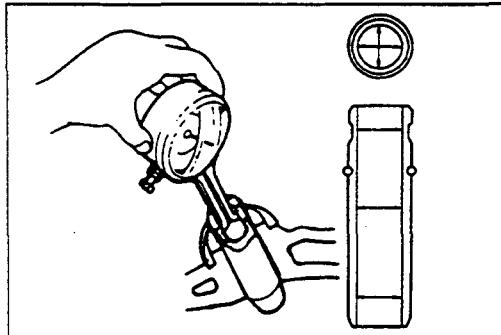
B



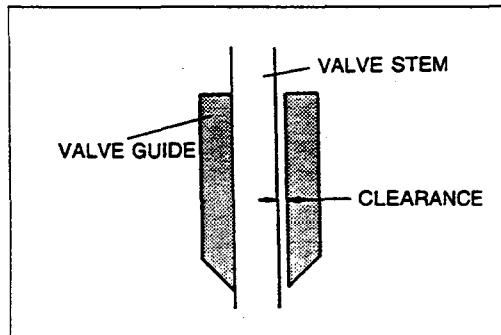
9TG0B2-192



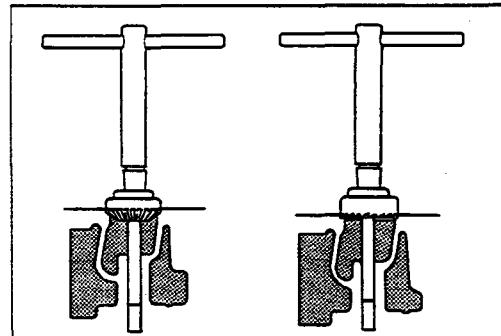
9TG0B2-193



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)

		Standard	Minimum
HA	IN	8.955—8.980 (0.3526—0.3535)	
	EX	8.935—8.960 (0.3518—0.3528)	
SL	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	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

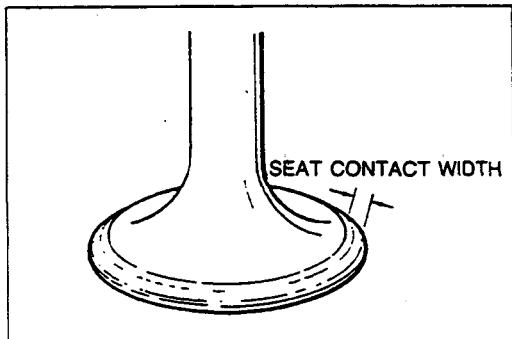
1. Inspect the contact surface of each valve seat and valve face for the following.

- (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.

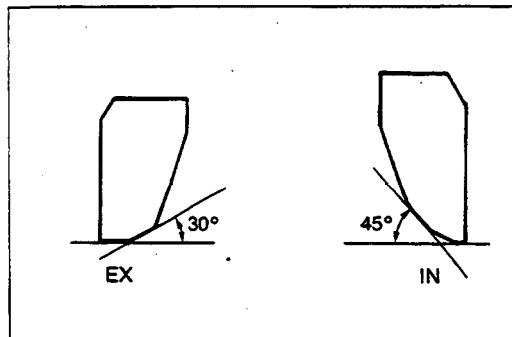
3. Apply a thin coat of Prussian blue to the valve face.

4. Inspect the valve seating by pressing the valve against the seat.

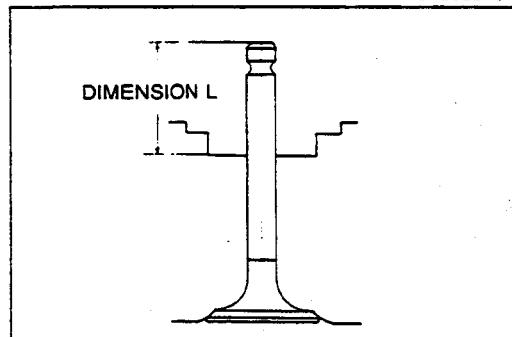
- (1) If blue does not appear 360° around the valve face, replace the valve.
- (2) If blue does not appear 360° around the valve seat, resurface the seat.



9TG0B2-196



9TG0B2-197



9TG0B2-198

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)

9TG0B2-199

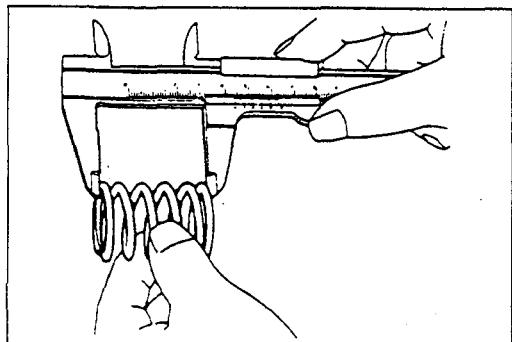
- (2) If **dimension L** is as below, adjust with washer on spring seat area of cylinder head.

	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

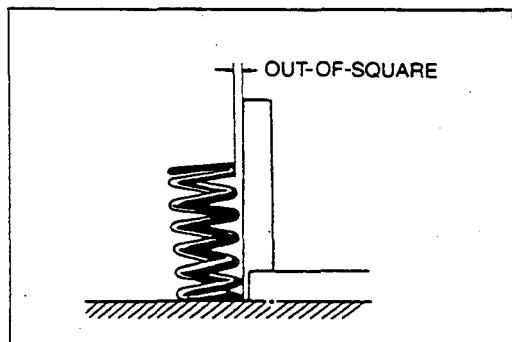
Valve Spring

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
	IN	Inner	44.1 (1.736)
		Outer	55.7 (2.193)
HA	EX	Inner	44.1 (1.736)
		Outer	55.7 (2.193)
SL (Non-Turbo)	IN	Inner	46.6 (1.835)
		Outer	53.1 (2.091)
	EX	Inner	46.6 (1.835)
		Outer	53.1 (2.091)
SL (Turbo)	IN	Inner	46.6 (1.835)
		Outer	53.1 (2.091)
	EX	Inner	49.4 (1.945)
		Outer	56.1 (2.209)
TF	IN	Inner	51.4 (2.024)
		Outer	59.5 (2.343)
	EX	Inner	51.4 (2.024)
		Outer	59.5 (2.343)

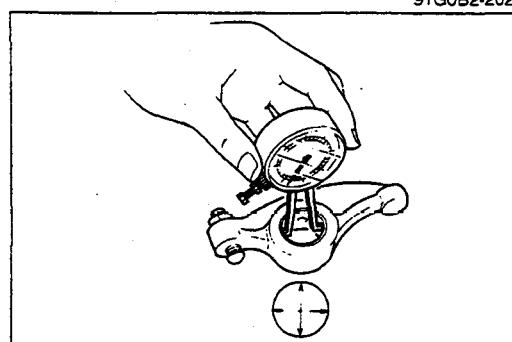


9TG0B2-202

Out-of-square

mm (in) max.

		Outer	Inner
	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

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)

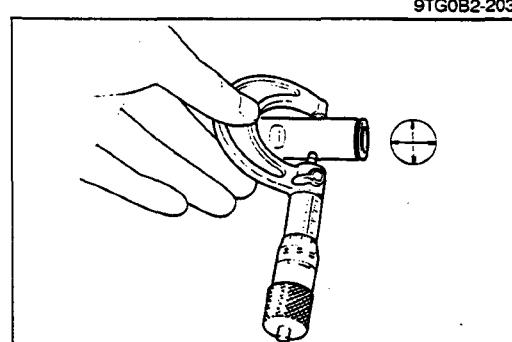
HA	15.876—15.896 (0.6250—0.6258)
SL (Non-Turbo)	19.000—19.021 (0.7480—0.7489)
SL (Turbo)	23.000—23.021 (0.9055—0.9063)
TF	21.000—21.021 (0.8268—0.8276)

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)



9TG0B2-204

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

CYLINDER BLOCK

1. Inspect the cylinder block for the following. Repair or replace the cylinder block as necessary.

(1) Leakage damage.

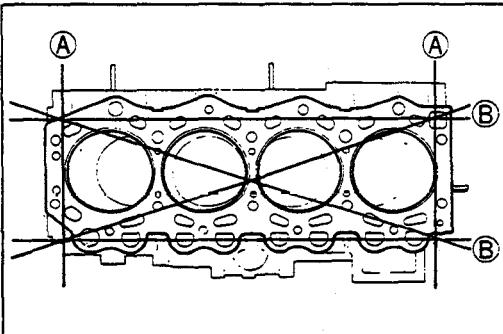
(2) Cracks.

(3) Scoring of cylinder liner.

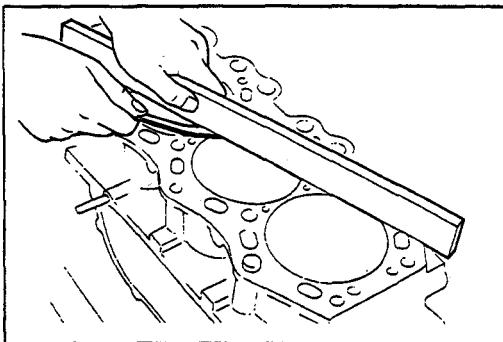
2. Measure the distortion of the deck of the cylinder block in the six directions shown in the figure.

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

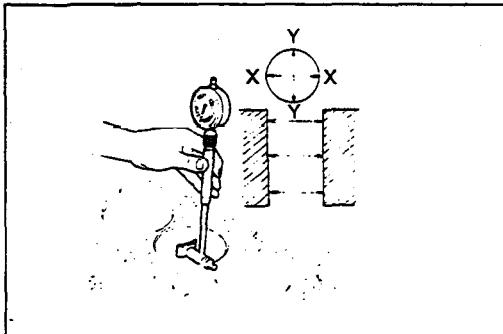
3. If the distortion exceeds specification, replace the cylinder block.



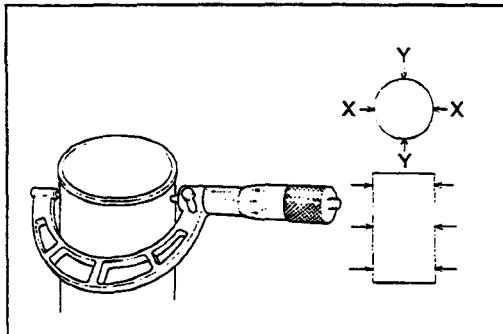
9TG0B2-206



9TG0B2-207



9TG0B2-208



9TG0B2-209

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)

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.

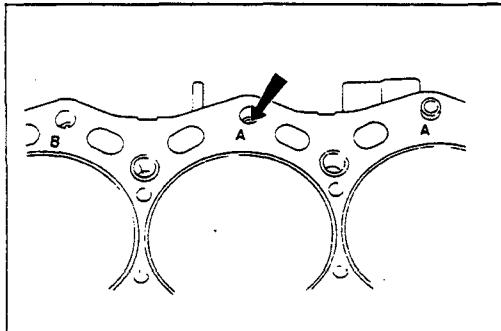
Clearance

mm (in)

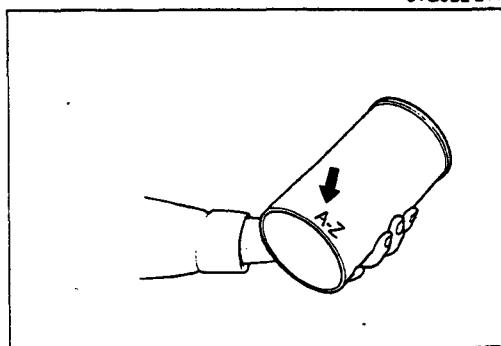
HA	-0.004--0.080 (-0.0002--0.0031)
SL, TF	0.013-0.039 (0.0005-0.0015)

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

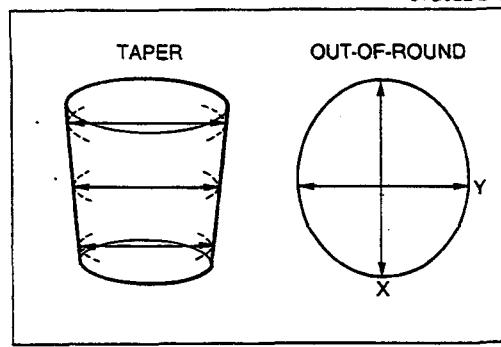
9TG0B2-210



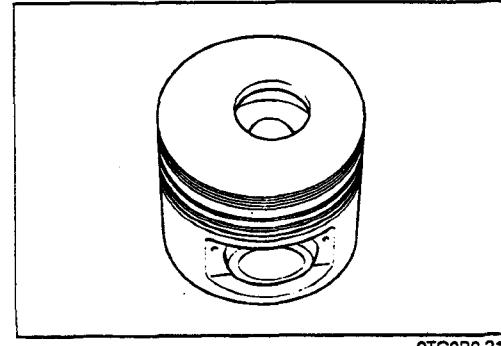
9TG0B2-211



9TG0B2-212



9TG0B2-213



9TG0B2-213

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.

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.

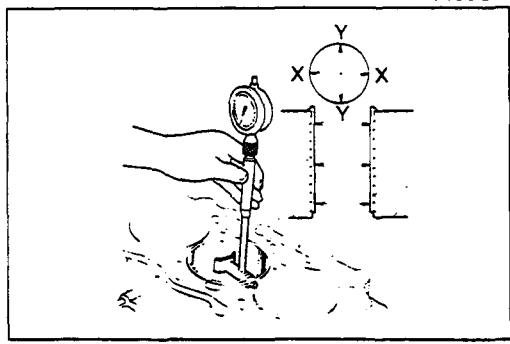
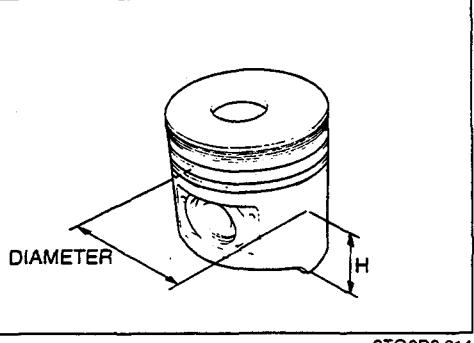
9. If the difference between measurements X and Y of the cylinder liner exceeds the maximum out-of-round, replace the cylinder liner.

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

INSPECTION / REPAIR



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.

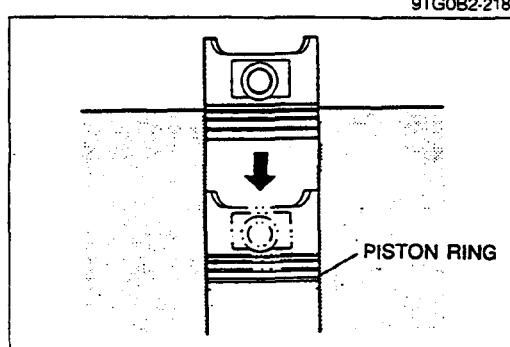
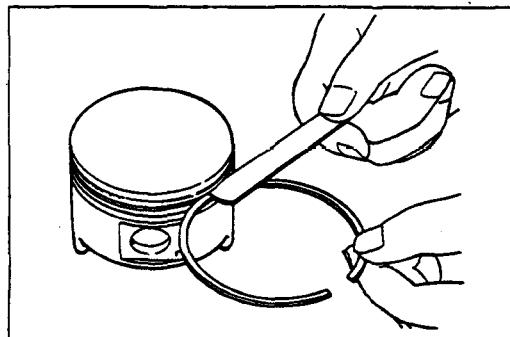
Clearance

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

**Piston and Piston Rings**

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

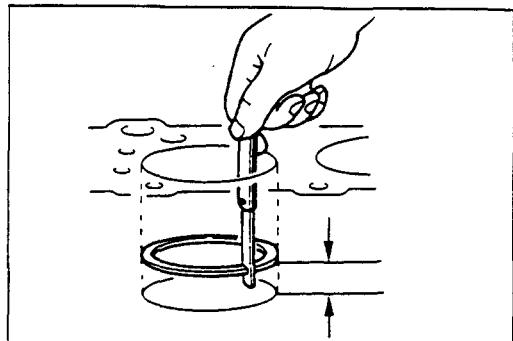
Clearance

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.



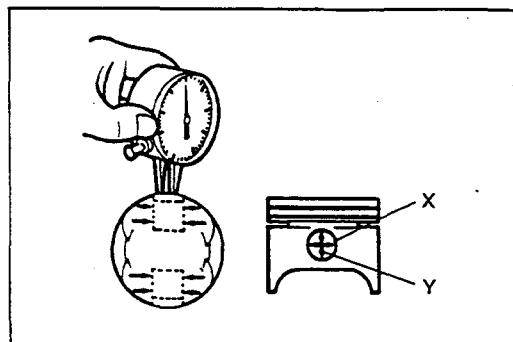
9TG0B2-220

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

End gap

	Top	Second	Oil	mm (in)
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

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)

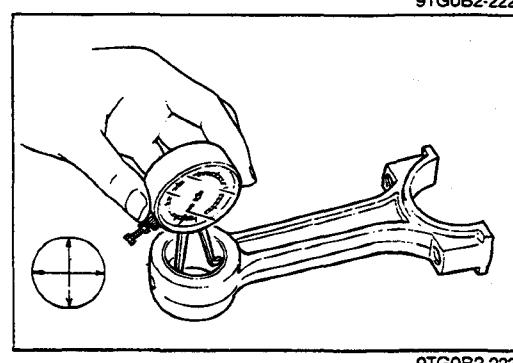
4. If the clearance exceeds specification, replace the piston and/or piston pin.

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)



9TG0B2-223

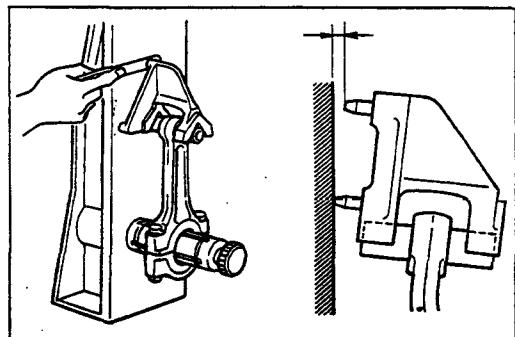
2. Calculate the clearance between the connecting rod bushing and piston pin.

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



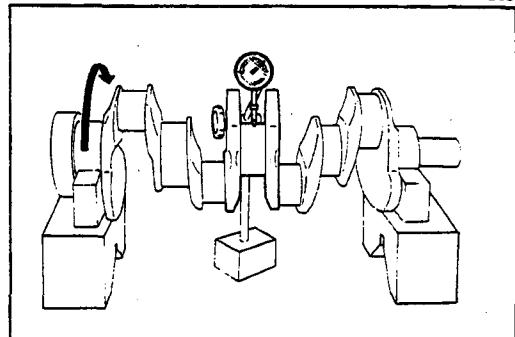
9TG0B2-225

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)

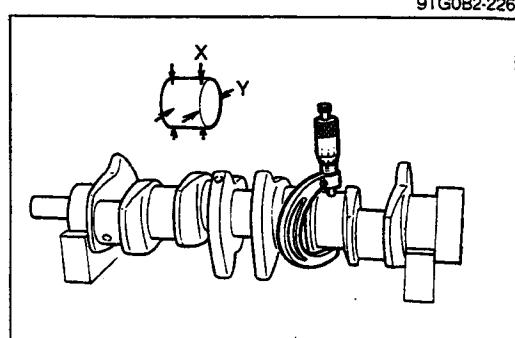


9TG0B2-226

CRANKSHAFT

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

Runout: 0.05mm (0.0020 in) max.



9TG0B2-227

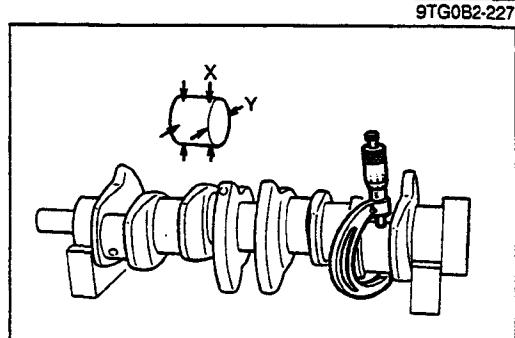
4. Measure each journal diameter in X and Y directions at two points.

Main journal diameter

mm (in)

HA, SL	75.805—75.825 (2.9844—2.9852)
TF	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

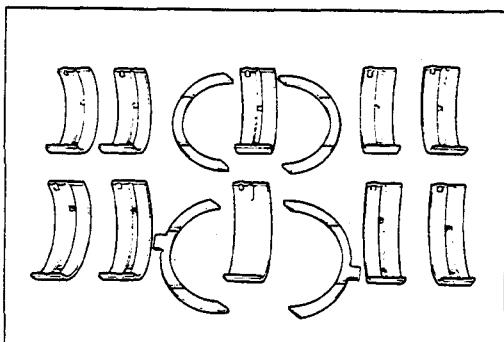
mm (in)

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.

INSPECTION / REPAIR

B



9TG0B2-229

- 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)

9TG0B2-230

Crankpin journal diameter undersize

mm (in)

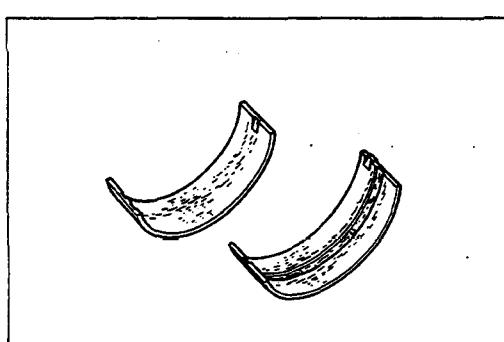
	Bearing size	Journal diameter
HA, SL	0.254 (0.0100) undersize	60.858—60.871 (2.3960—2.3965)
	0.508 (0.0200) undersize	60.604—60.617 (2.3860—2.3865)
	0.762 (0.0300) undersize	60.350—60.363 (2.3760—2.3765)
TF	0.254 (0.0100) undersize	63.733—63.746 (2.5092—2.5097)
	0.508 (0.0200) undersize	63.479—63.492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

9TG0B2-231

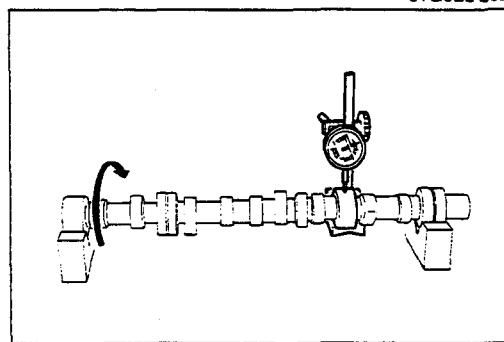
BEARING

Main Bearing and Connecting Rod Bearing

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



9TG0B2-232

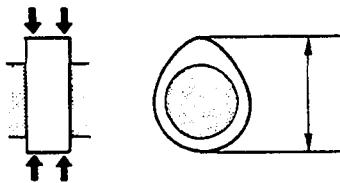


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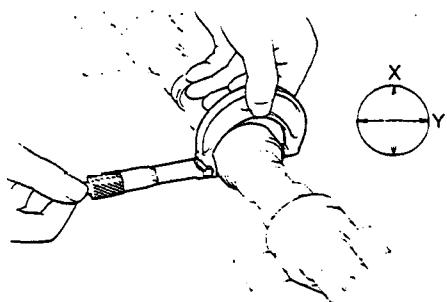
CAMSHAFT

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

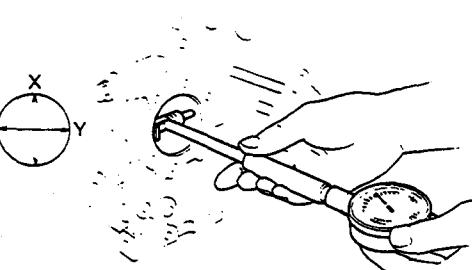
Runout: 0.08mm (0.0031 in) max.



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	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)
SL	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)
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)

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

Diameter

mm (in)

HA	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)
SL	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)
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)

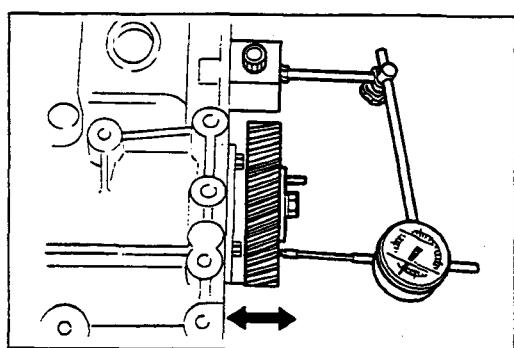
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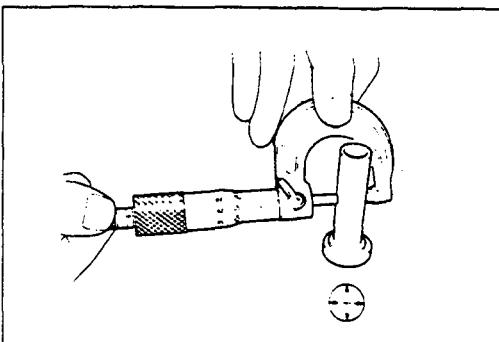
8. If the clearance exceeds the maximum, replace the camshaft and/or cylinder block.
9. Measure the camshaft end play. If the end play exceeds the maximum, replace the camshaft and/or the cylinder head.

End play

Standard : 0.02–0.18mm (0.0008–0.0071 in)
Maximum: 0.30mm (0.012 in)

9TG0B2-238





9TG0B2-239

TAPPET

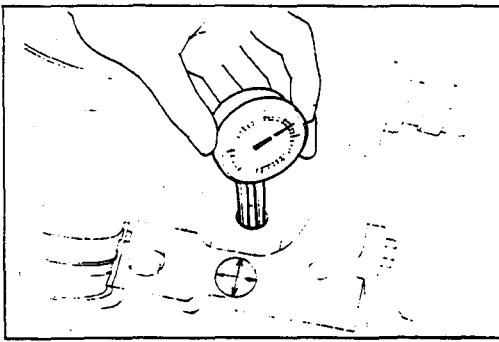
1. Inspect the tappets for wear or damage. Replace the tappet if necessary.
2. Measure the tappet outer diameter.

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.



9TG0B2-240

Diameter

mm (in)

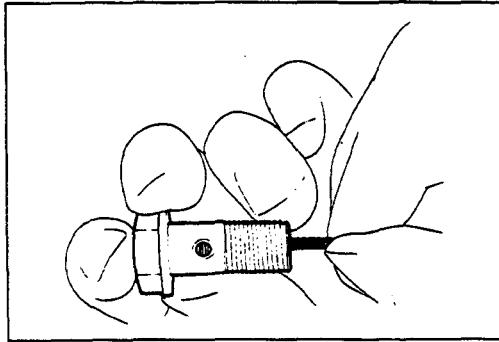
HA, SL	14.288—14.319 (0.5625—0.5637)
TF	15.588—15.619 (0.6137—0.6149)

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)

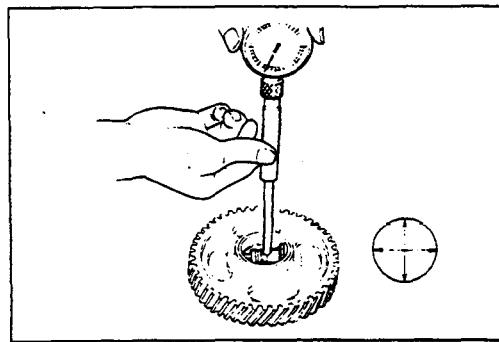
5. If the clearance exceeds the maximum, replace the tappet and/or cylinder block.



9TG0B2-241

OIL JET

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



9TG0B2-461

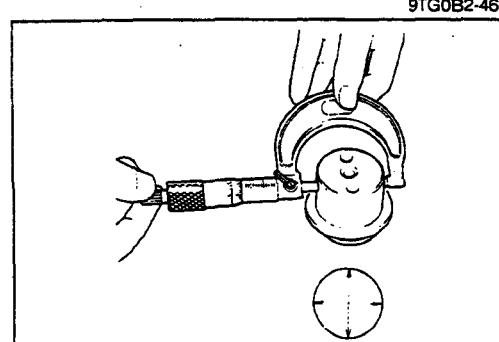
IDLER GEAR

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)



9TG0B2-462

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

Clearance

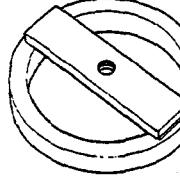
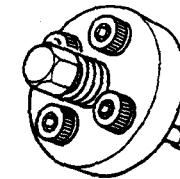
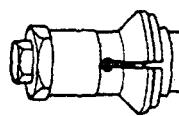
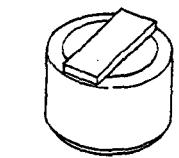
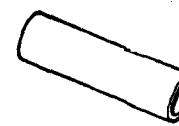
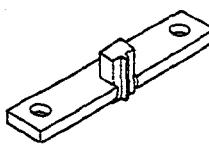
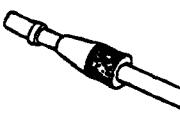
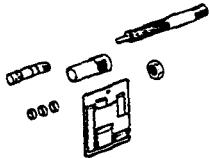
Standard : 0.034—0.084mm (0.0013—0.0033 in)
Maximum: 0.15mm (0.006 in)

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

B ASSEMBLY

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

ASSEMBLY

B

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

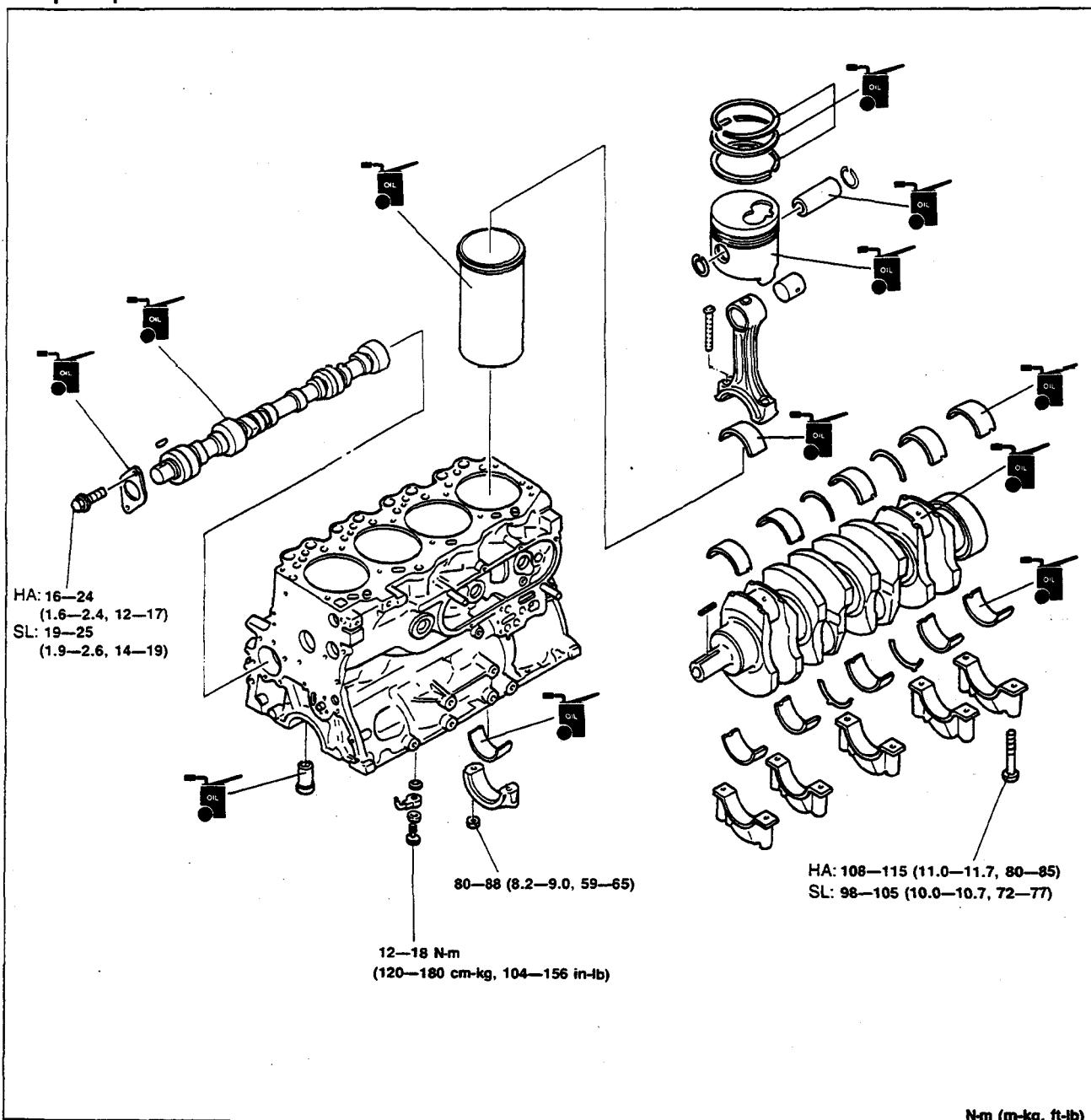
9TG0B2-241

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

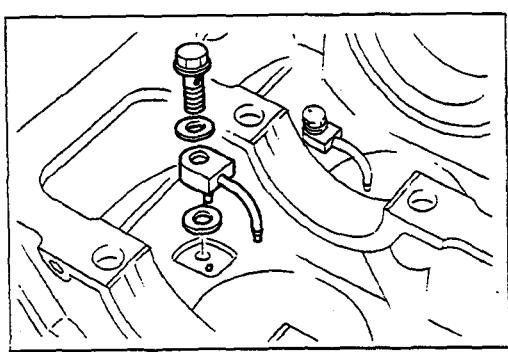
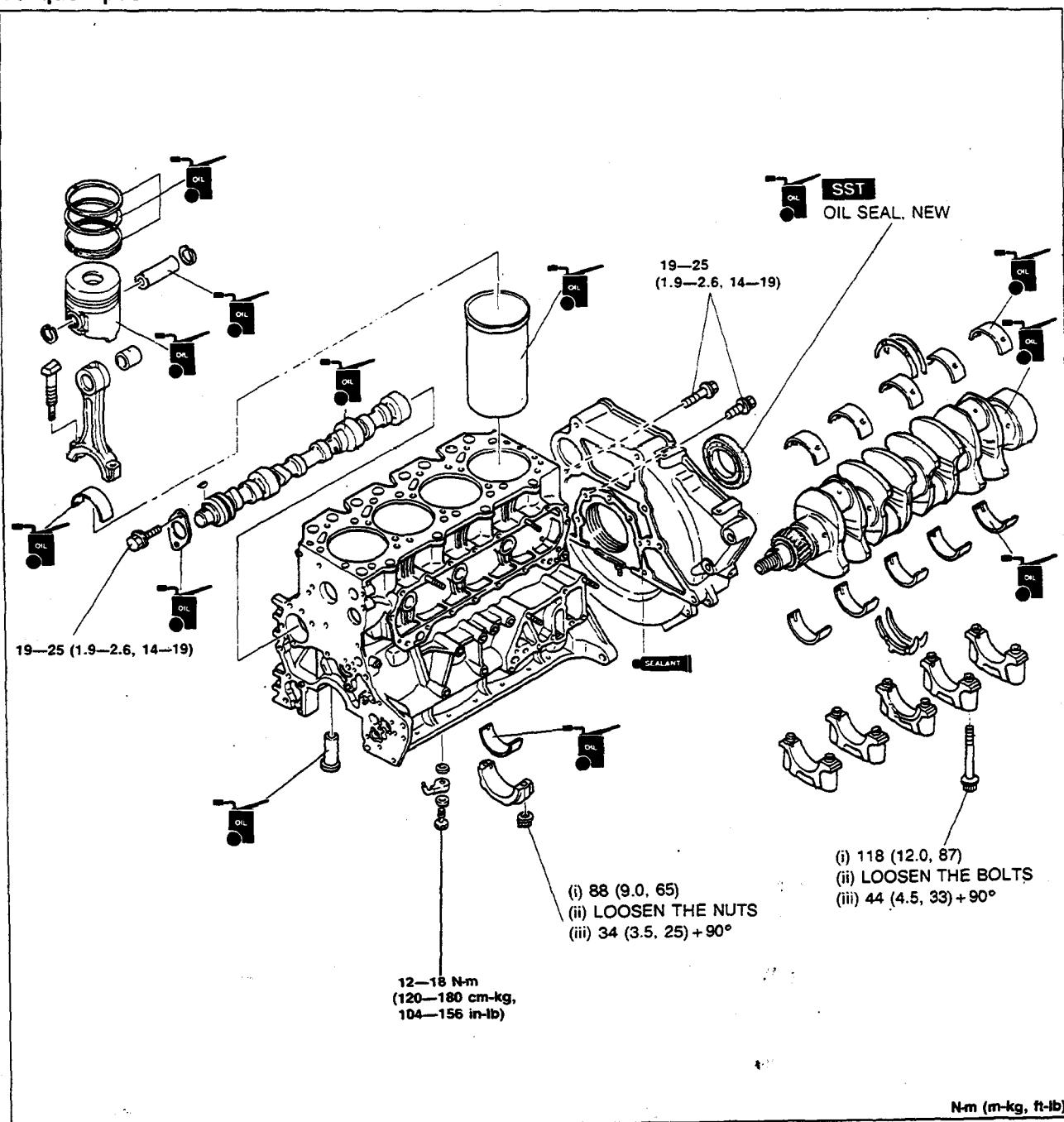
- Do not reuse gaskets or oil seals.

9TG0B2-242

CYLINDER BLOCK (INTERNAL PARTS)**HA, SL Engine****Torque Specifications****N·m (m·kg, ft·lb)**

9TG0B2-243

TF Engine
Torque Specifications



9TG0B2-245

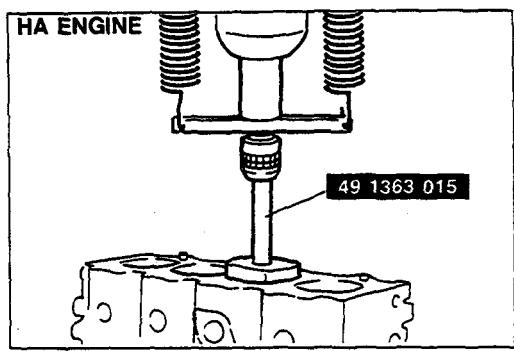
Oil Jet

1. Install the oil jets.

Tightening torque:

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

ASSEMBLY

**Cylinder Liner**

1. Apply engine oil to the cylinder liner.

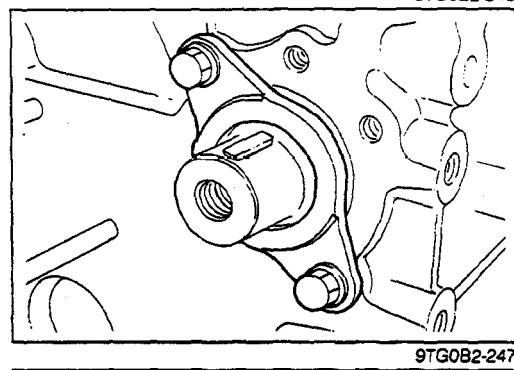
Caution

- 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**

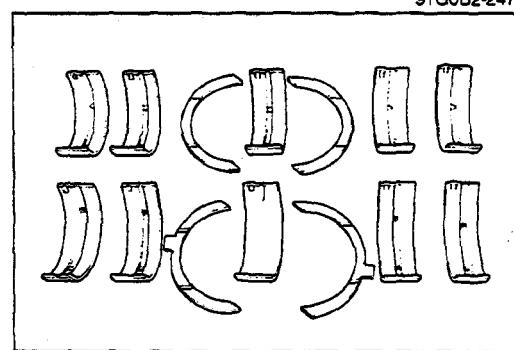
1. Apply clean engine oil to the tappet.
2. Install the tappet in the cylinder block.

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.

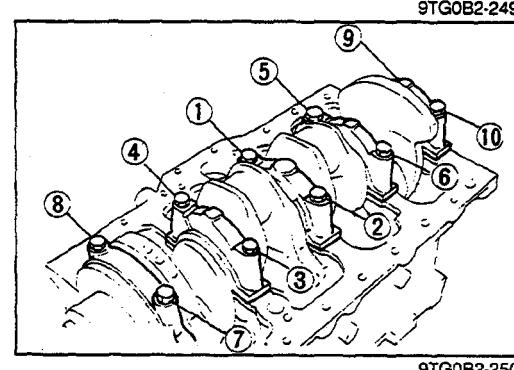
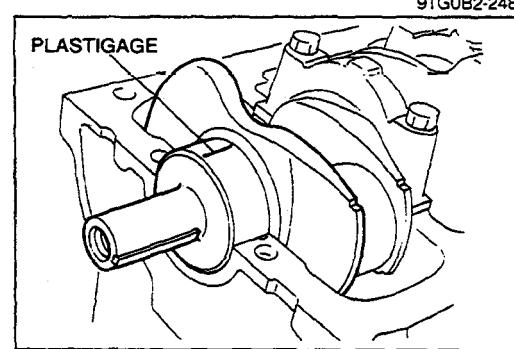
- (4) Position Plastigage atop the journals in the axial direction.
- (5) Install the lower main bearings and the main bearing caps according to the cap number and ⇄ mark.
- (6) Tighten the main bearing cap bolts in two or three steps in the order shown in the figure.

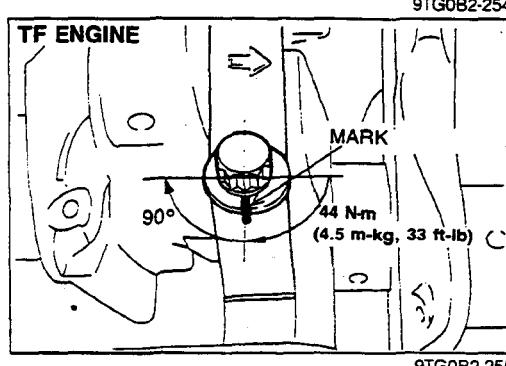
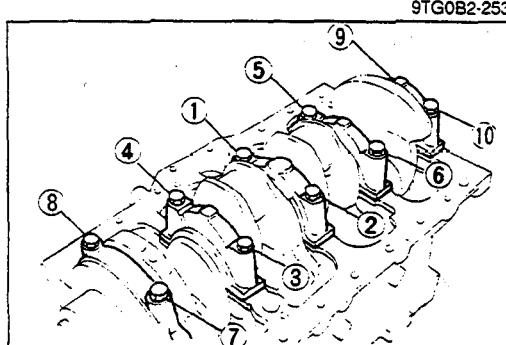
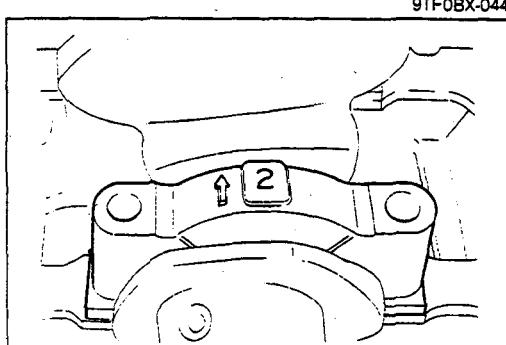
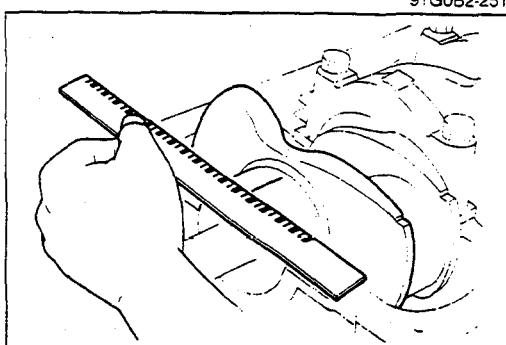
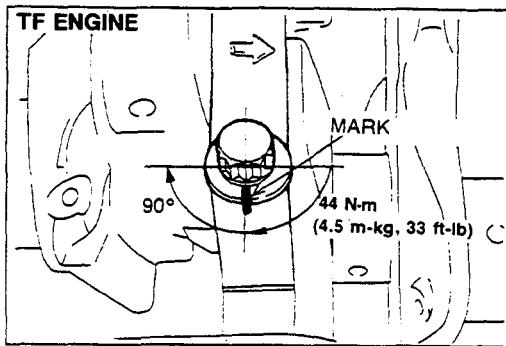
Tightening torque

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)





(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.

- (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 No.3	0.058—0.092 (0.0023—0.0036) 0.084—0.118 (0.0033—0.0046)
		0.12 (0.005) 0.15 (0.006)

- 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.
- 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)

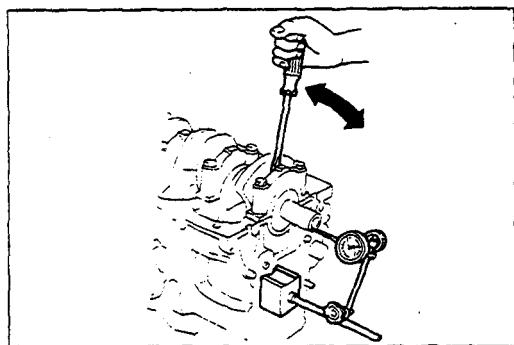
TF: 118 N·m (12.0 m-kg, 87 ft-lb)

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.

ASSEMBLY

- Measure the crankshaft end play.

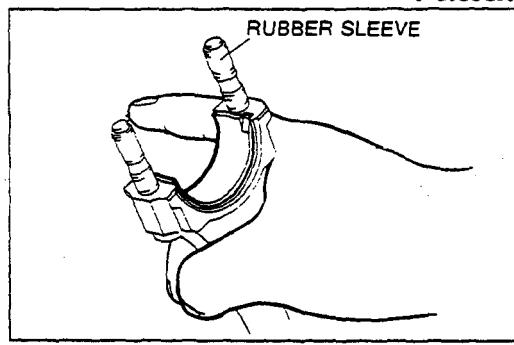
End play

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

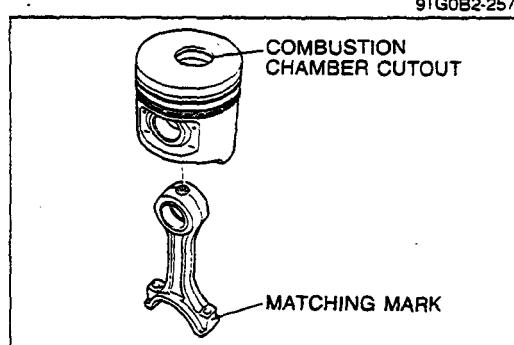
- If the end play exceeds the maximum, grind the crankshaft and install an oversize thrust bearing or replace the crankshaft and thrust bearing.

Thrust bearing width**Standard:**

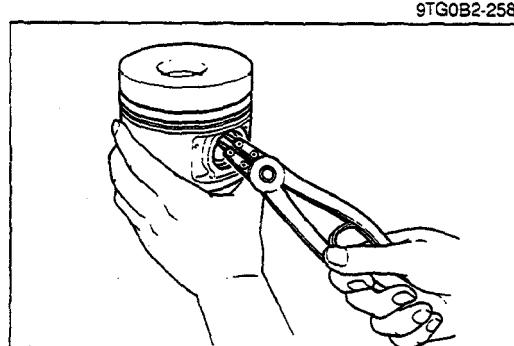
2.275—2.325mm (0.0896—0.0915 in)
0.178mm (0.0070 in) oversize:
2.453—2.503mm (0.0966—0.0985 in)

**Piston and Connecting Rod****Caution**

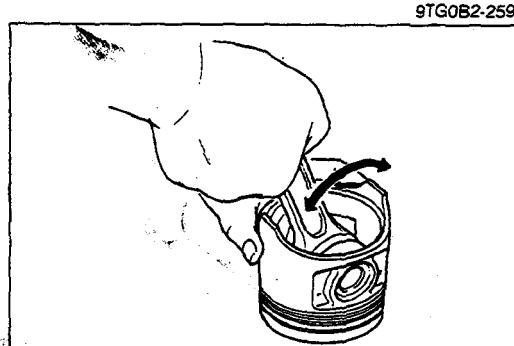
- Protect the connecting rod bolts with rubber sleeves to prevent damage to the crankpin journal.**



- Install one piston pin clip into the clip groove in the piston.
- 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.
- Heat the piston to 50—60°C (122—140°F).
- Apply clean engine oil to the piston pin.
- Install the piston pin from the side opposite the clip.
If the pin cannot be installed smoothly, replace the piston and/or connecting rod.

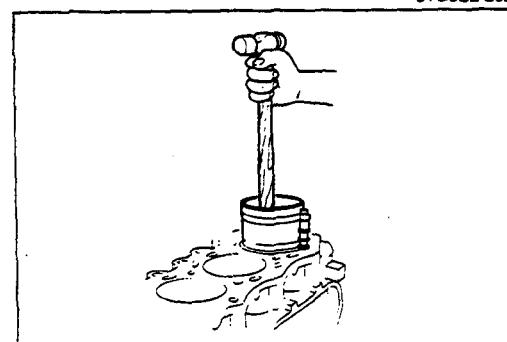
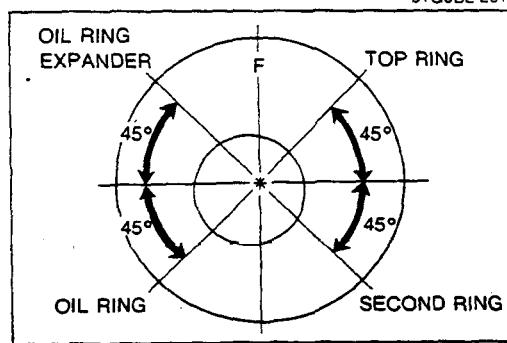
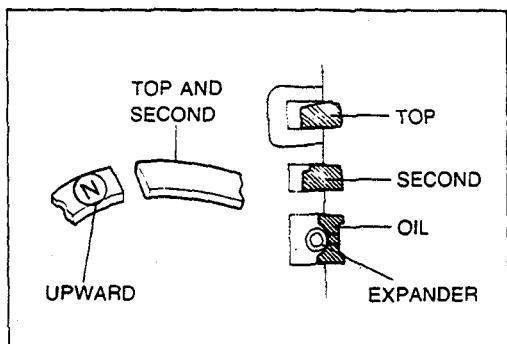


- Install the second clip into the clip groove in the piston.



- 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.

ASSEMBLY



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.

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.**

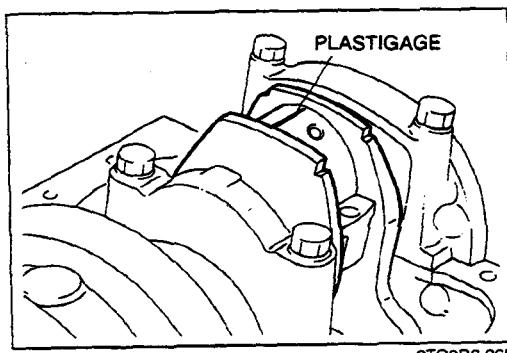
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- (2) Position Plastigage atop the journals in the axial direction.
- (3) Install the connecting rod bearing and cap with the marks aligned.
- (4) Tighten the nuts in two or three steps.

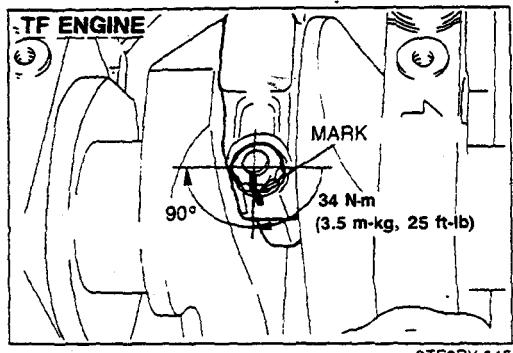
Tightening torque

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)



ASSEMBLY



(5) TF Engine

- Loosen the connecting rod nuts.
- Retighten the nuts in two or three steps.

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

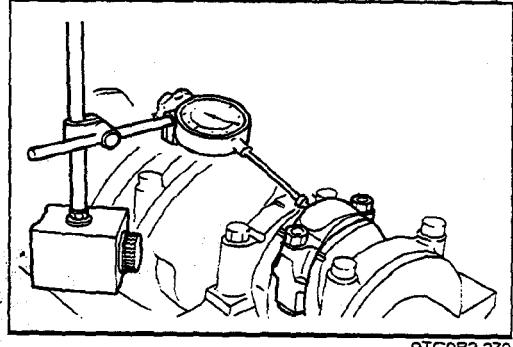
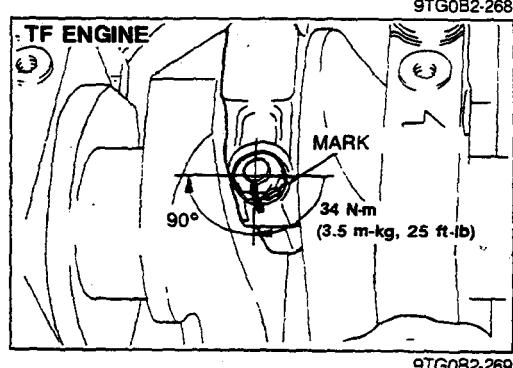
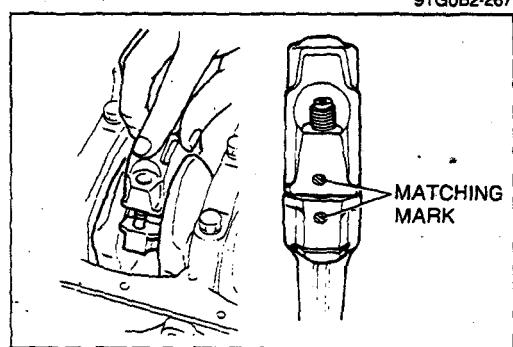
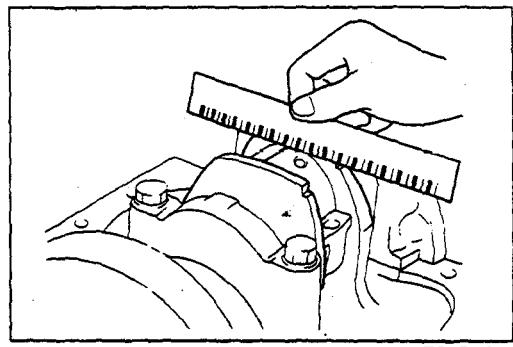
- Tighten the nuts approx. 90°.
- Remove the connecting rod caps, and measure the Plastigage at each journal at the widest point for the smallest clearance, and at the narrowest point for the largest clearance.
- If oil clearance exceeds specification, grind the crankshaft and install undersize main 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

- Loosen the connecting rod nuts.
- Retighten the nuts in two or three steps.

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

- Tighten the nuts approx. 90° further.

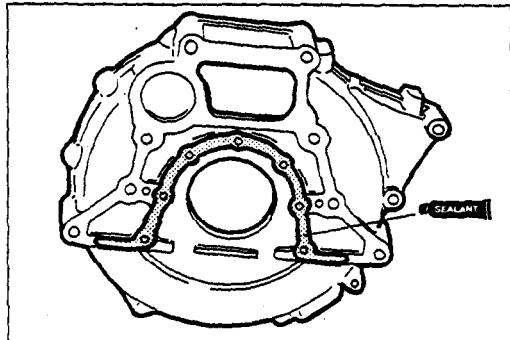
22. Measure the connecting rod side clearance.

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.

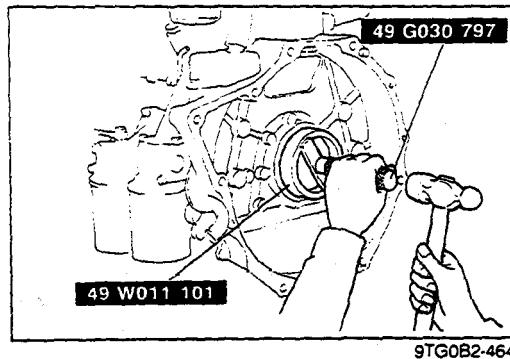


End Plate (TF)

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)



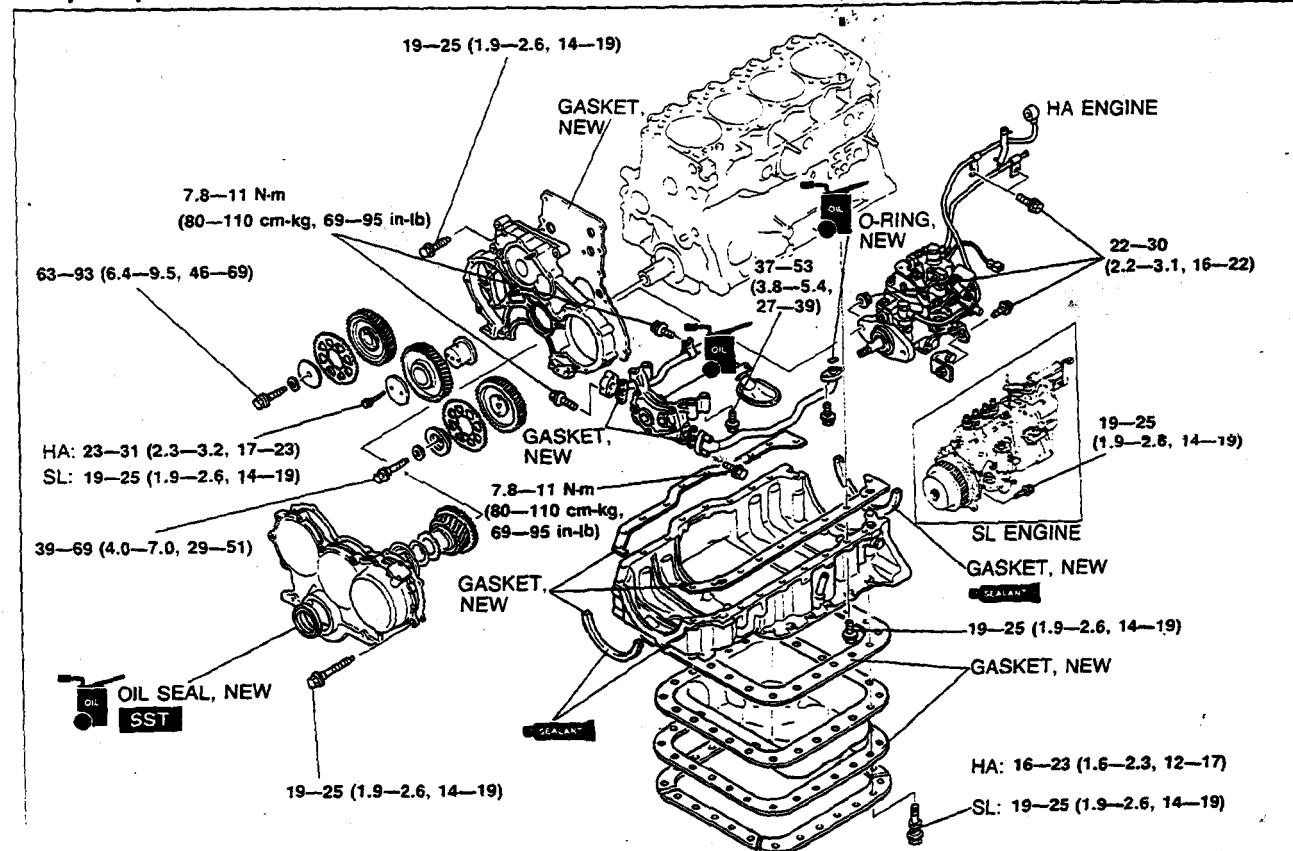
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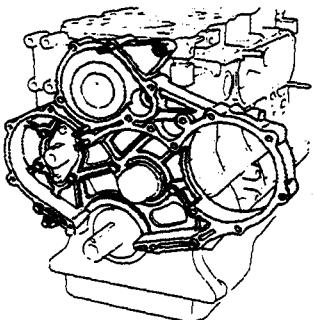
2. Apply a small amount of clean engine oil to the lip of the new oil seal.
 3. Install the oil seal with the **SST** and a hammer.

CYLINDER BLOCK (EXTERNAL PARTS II)

HA, SL Engine

Torque Specifications





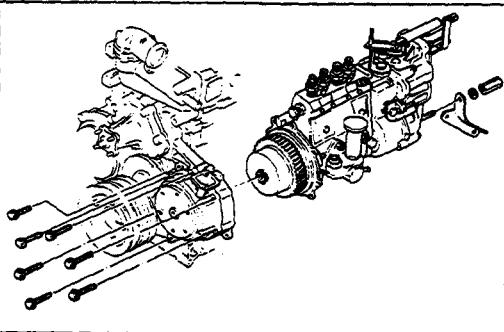
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Timing Gear Case

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.

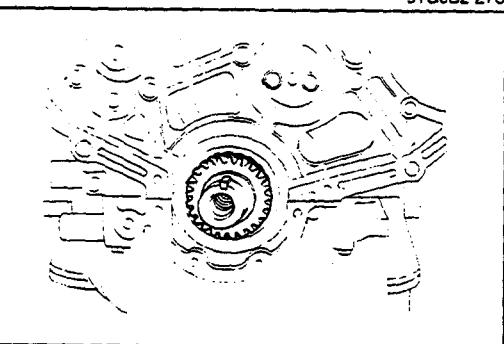
Tightening torque

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)

Crankshaft Timing Gear

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



9TG0B2-273

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)

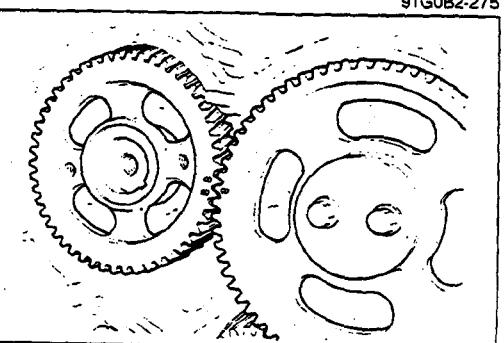
SL: 19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

Camshaft Gear and Injection Pump Gear

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

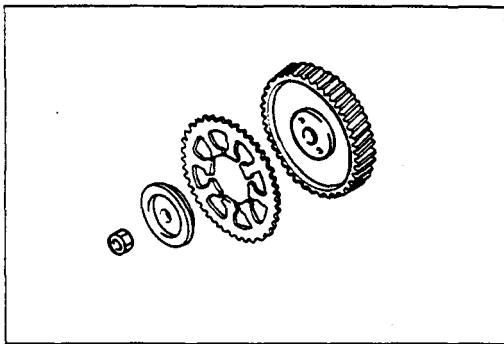
Tightening torque:

63—93 N·m (6.4—9.5 m·kg, 46—69 ft·lb)



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ASSEMBLY

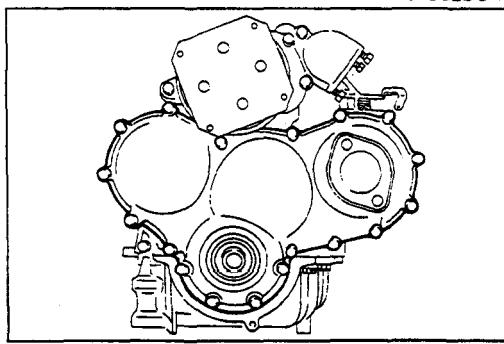


2. HA Engine

- (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)

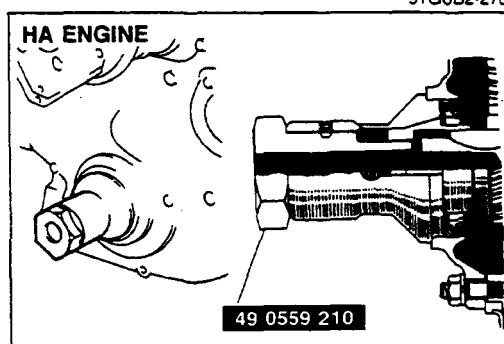


Timing Gear Cover

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)



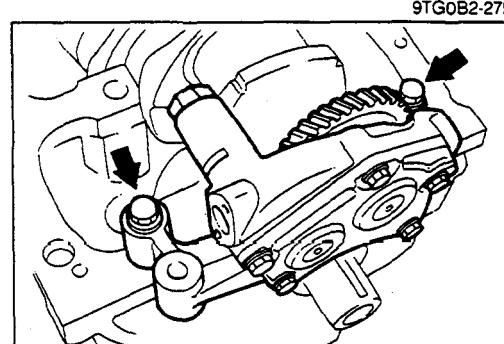
2. Apply a small amount of clean engine oil to the lip of the new oil seal.

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.

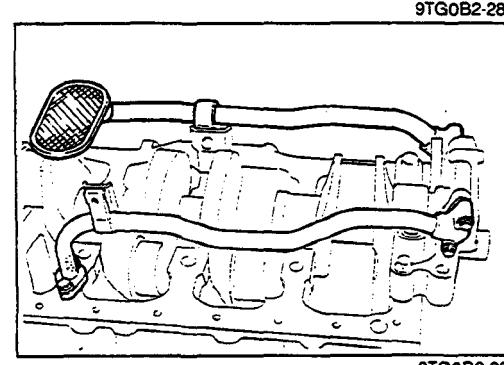


Oil Pump

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)



Oil Strainer and Oil Pipe

1. Install the oil strainer and a new gasket.

Tightening torque:

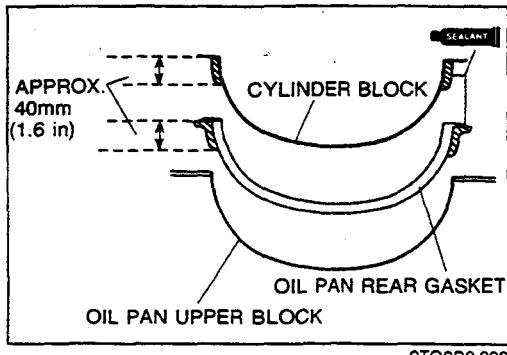
7.8—11 N·m (80—110 cm·kg, 69—95 in-lb)

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

Tightening torque

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

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



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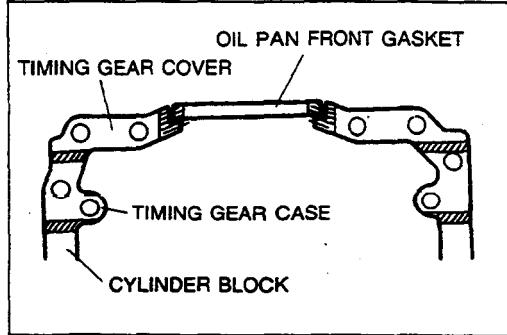
Oil Pan Upper Block**Caution**

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

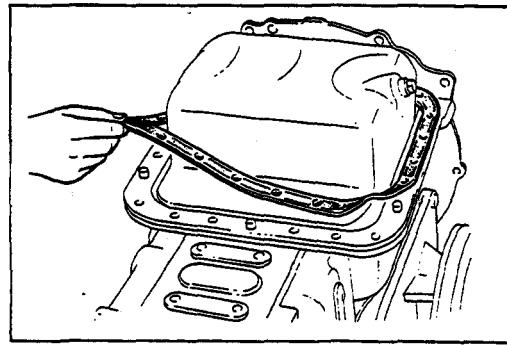
1. Apply silicone sealant as shown to the shaded areas of a new oil pan gasket (front and rear).
2. Install the gaskets onto the cylinder block.
3. Apply silicone sealant to the shaded areas of the cylinder block.
4. Install the oil pan upper block and a new gasket.

Tightening torque:

19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



9TG0B2-283



9TG0B2-285

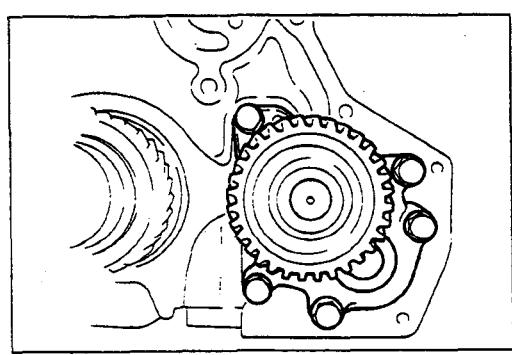
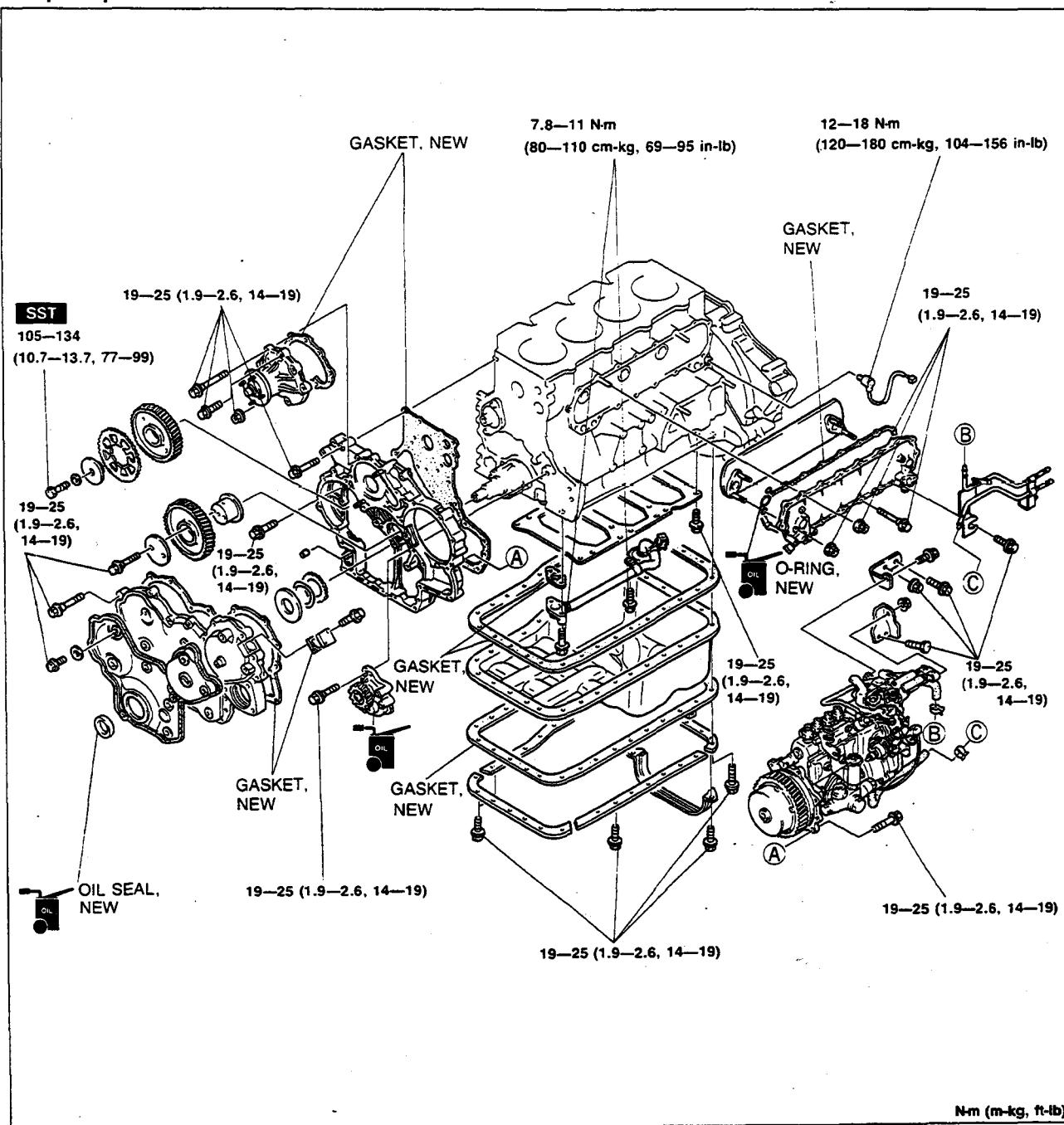
Oil Pan

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)

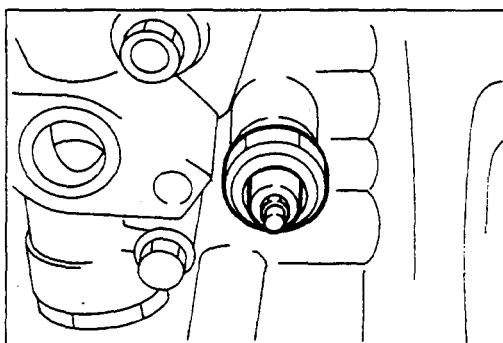
SL: 19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

**TF Engine
Torque Specifications**

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)

ASSEMBLY

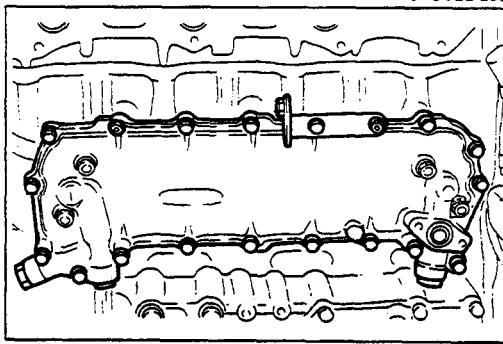
9TG0B2-288

Oil Pressure Switch

1. Install the oil pressure switch.

Tightening torque:

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



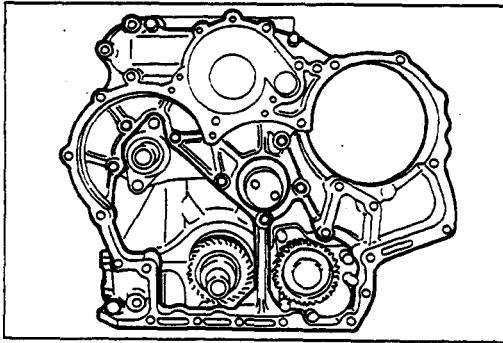
9TG0B2-289

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)



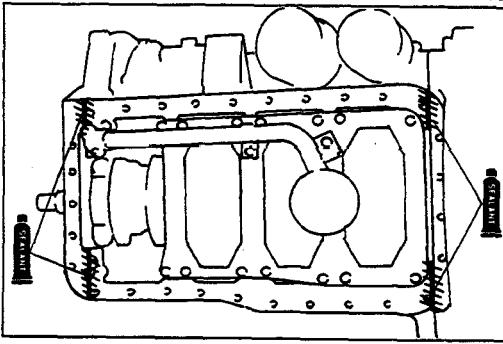
9TG0B2-290

Timing Gear Case

1. Install the timing gear case.

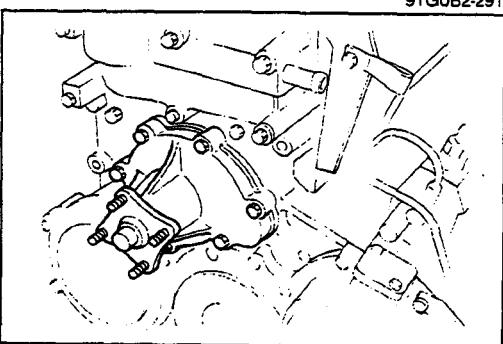
Tightening torque:

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

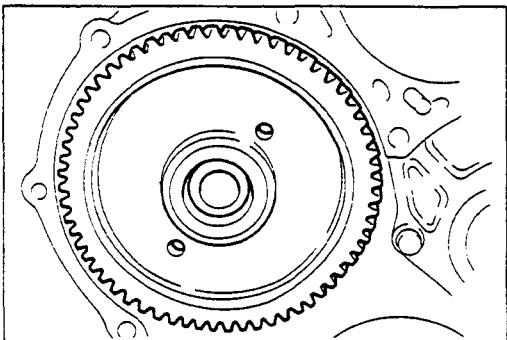
Water Pump

1. Install the water pump and a new gasket.

Tightening torque:

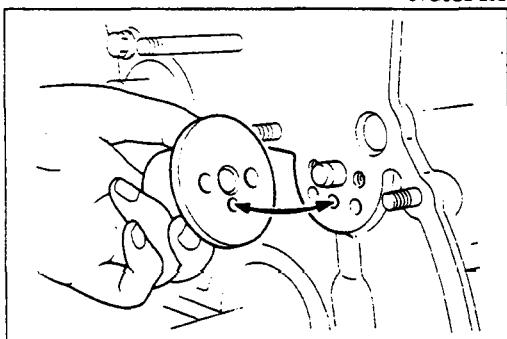
19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

ASSEMBLY

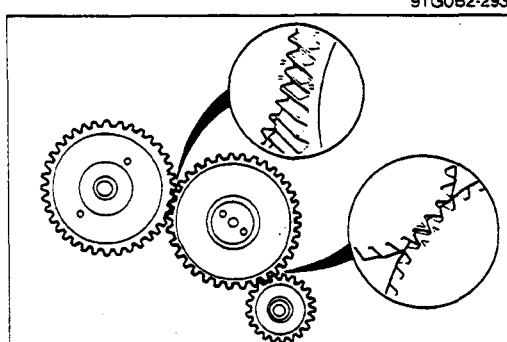


Timing Gear Train

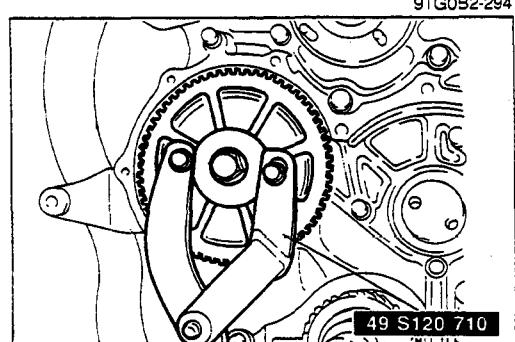
1. Align the Woodruff key, and install the cam gear.



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



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

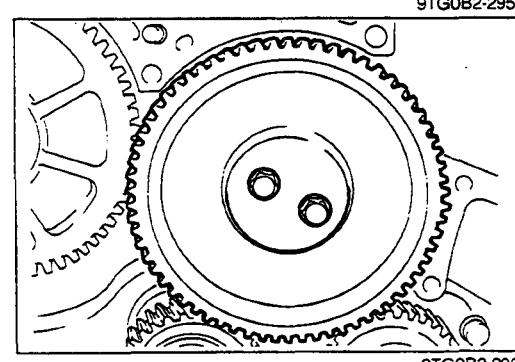


4. Install the friction plate and washer to the cam gear, and affix them with the SST.

5. Install and tighten the lock bolt.

Tightening torque:

63—93 N·m (6.4—9.5 m-kg, 46—69 ft-lb)

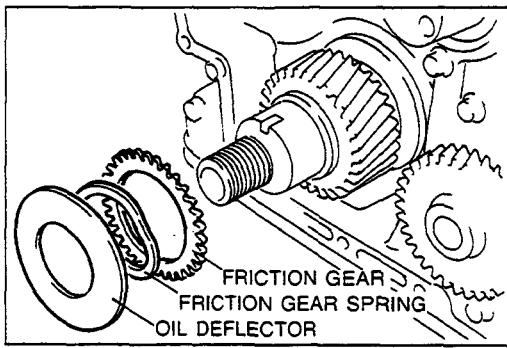


6. Install the idler gear and thrust plate.

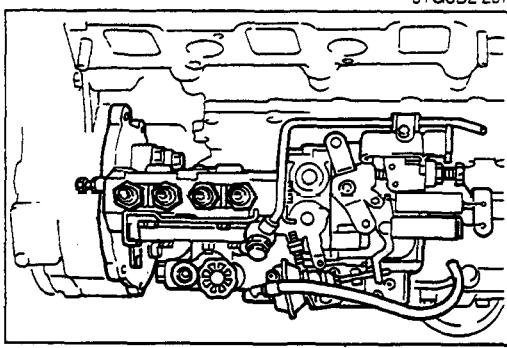
Tightening torque:

19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

B ASSEMBLY



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

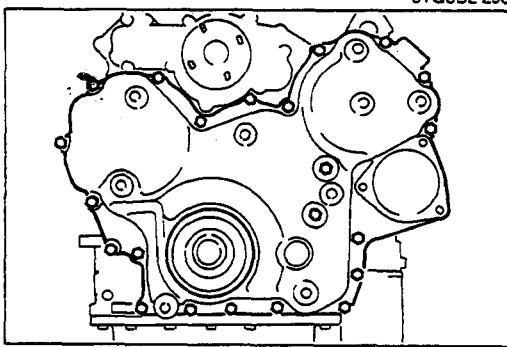


Fuel Injection Pump

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)

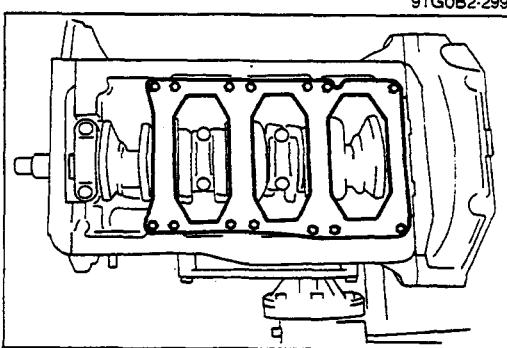


Timing Gear Cover

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)

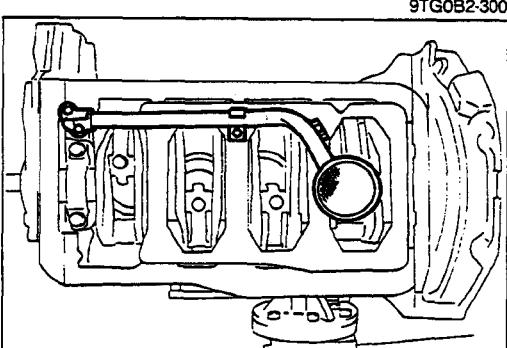


Stiffening Plate

1. Install the stiffening plate.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft-lb)

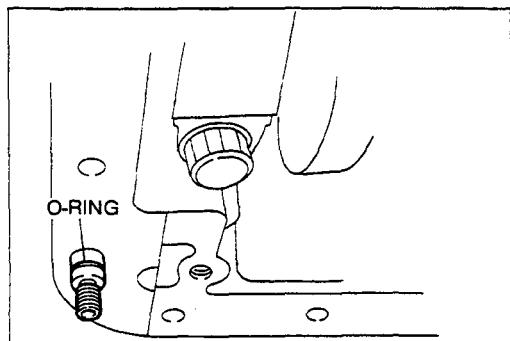


Oil Strainer

1. Install the oil strainer and a new gasket.

Tightening torque:

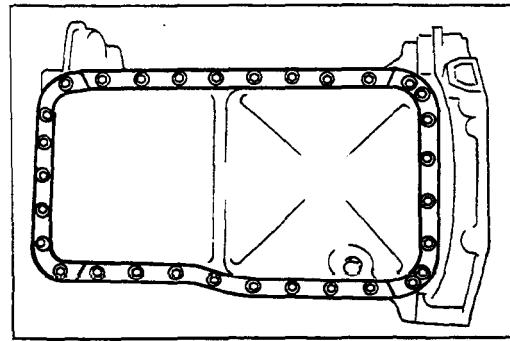
7.8—11 N·m (80—110 cm·kg, 69—95 in-lb)



9TG0B2-302

Oil Pan

1. Install new O-rings on the bolts.



9TG0B2-303

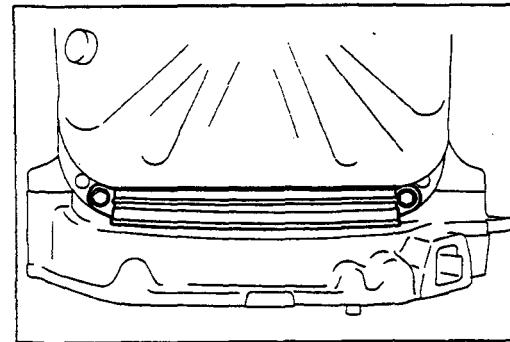
2. Install a new gasket.

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)

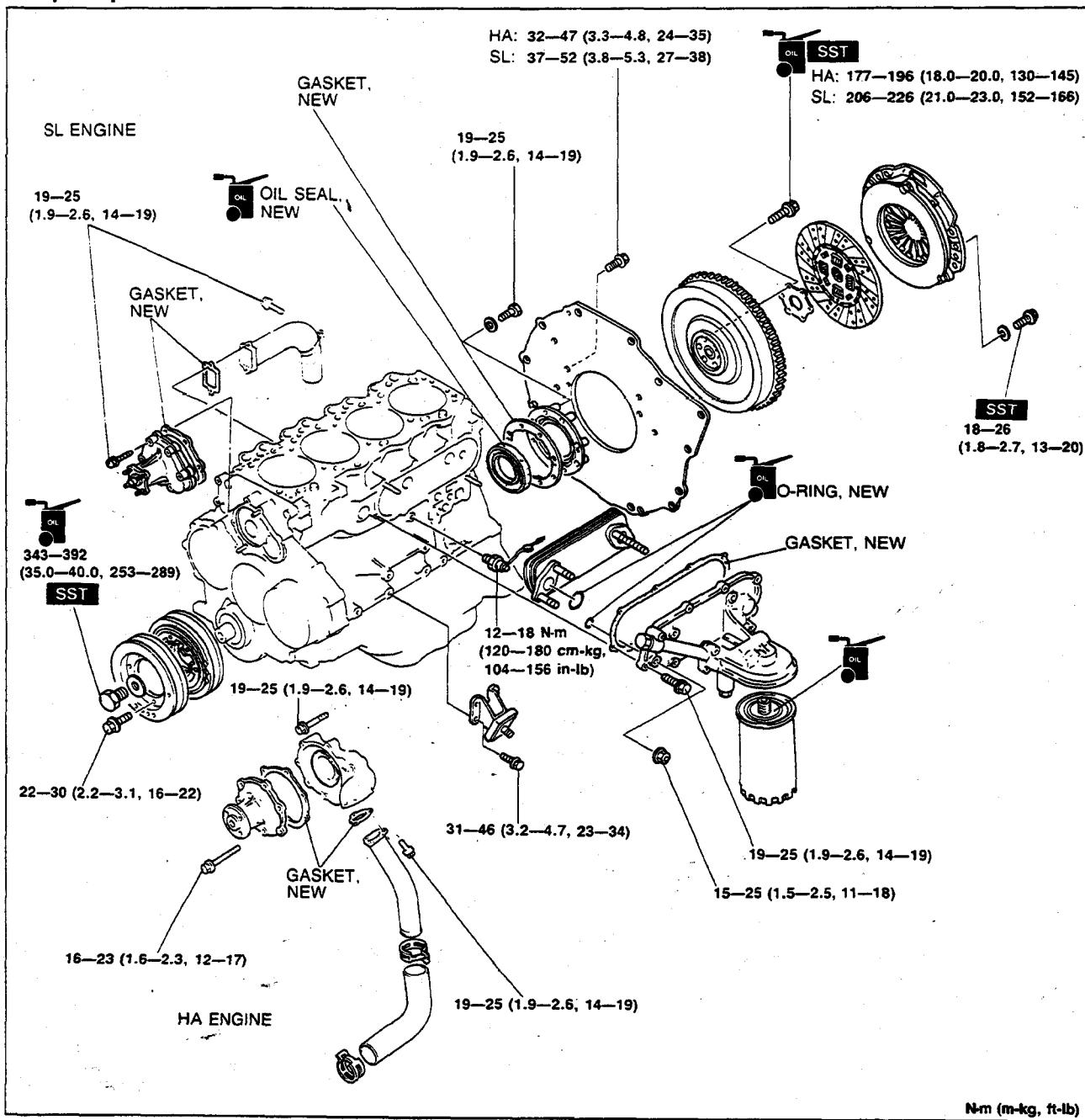
B

ASSEMBLY

CYLINDER BLOCK (EXTERNAL PARTS I)

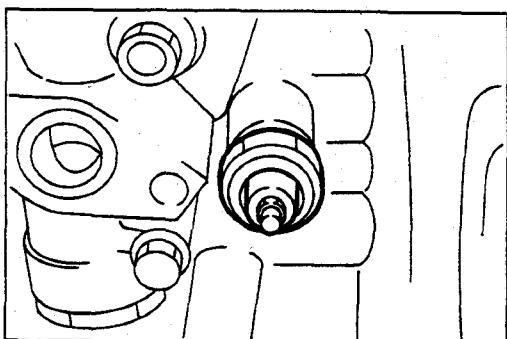
HA, SL Engine

Torque Specifications



N·m (m-kg, ft-lb)

9TG0B2-307



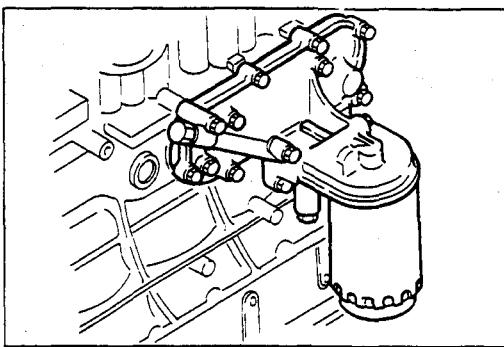
Oil Pressure Switch

- ## 1. Install the pressure switch.

Tightening torque:

12–18 N·m (120–180 cm-kg, 104–156 in-lb)

ASSEMBLY



9TG0B2-309

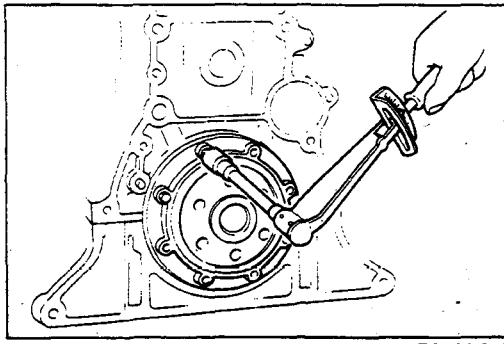
Oil Cooler, Oil Filter

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.



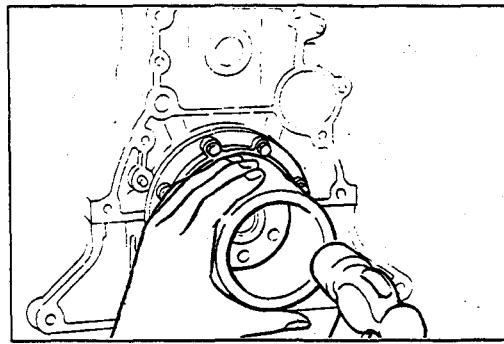
9TG0B2-310

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)



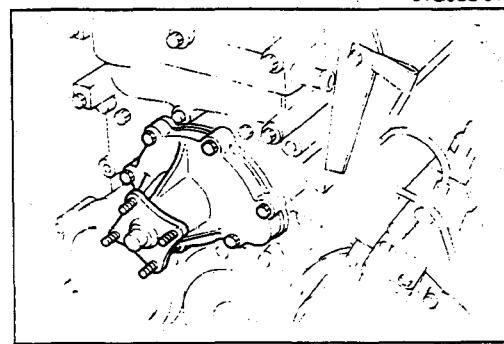
9TG0B2-311

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.



9TG0B2-312

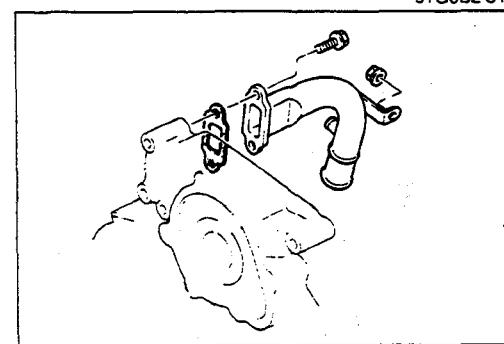
Water Pump

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)



9TG0B2-313

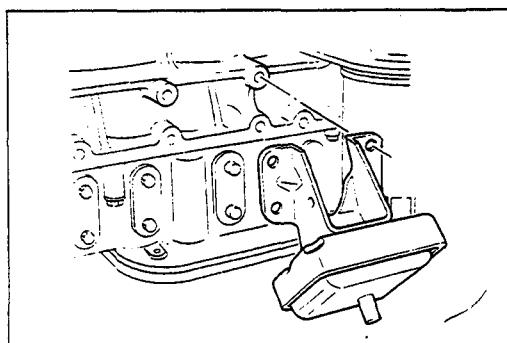
Water Inlet Pipe

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)

ASSEMBLY

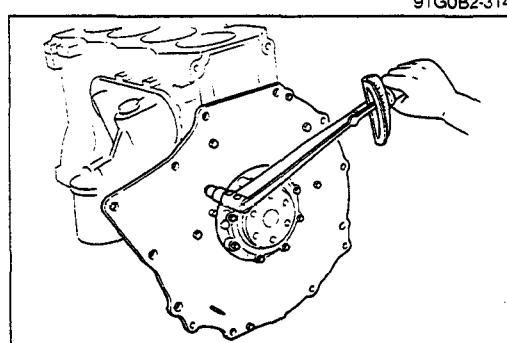


Left Engine Mount

1. Install the left engine mount.

Tightening torque:

31—46 N·m (3.2—4.7 m·kg, 23—34 ft·lb)



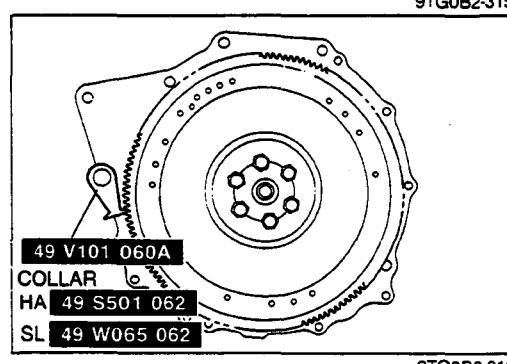
End Plate

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)



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.

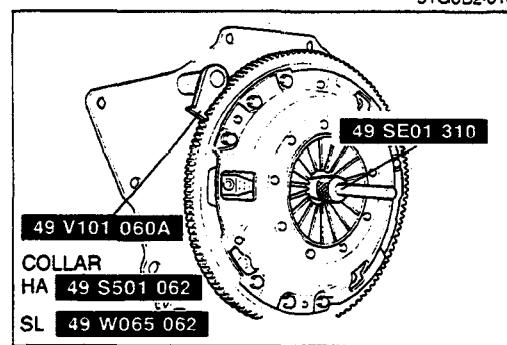
Tightening torque

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)

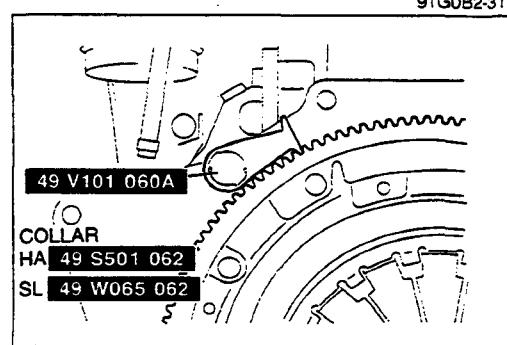


Clutch Disc and Clutch Cover

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)



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.

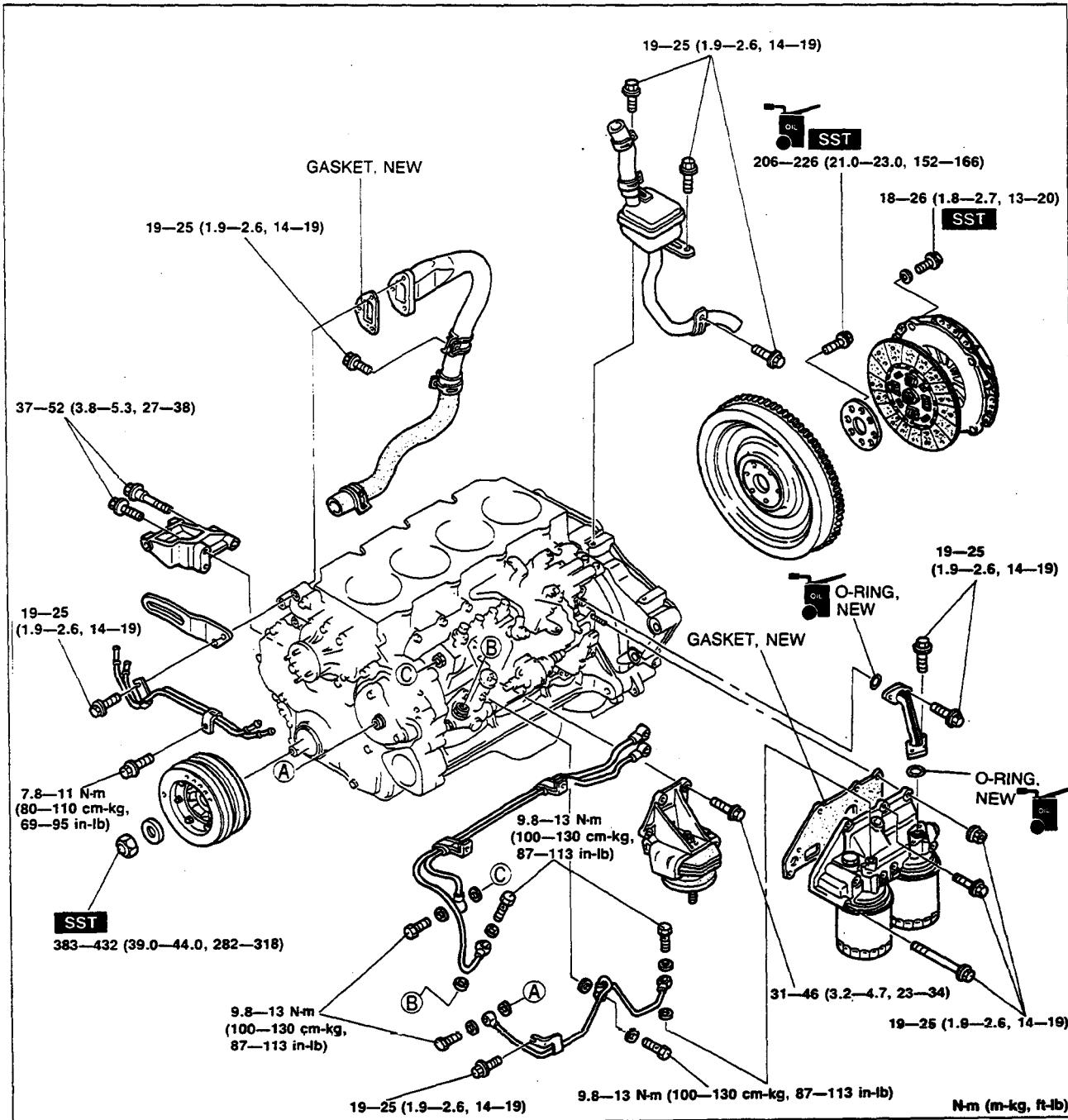
Tightening torque:

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

ASSEMBLY

B

TF Engine Torque Specifications



N·m (m·kg, ft-lb)

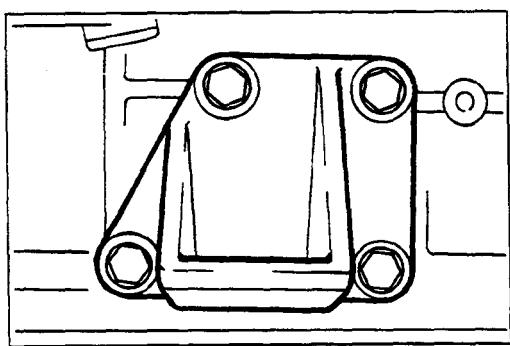
9TG0B2-319

Engine Mount

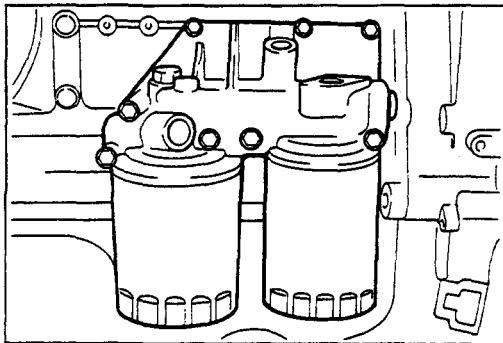
1. Install the left engine mount.

Tightening torque:

31-46 N·m (3.2-4.7 m·kg, 23-34 ft-lb)



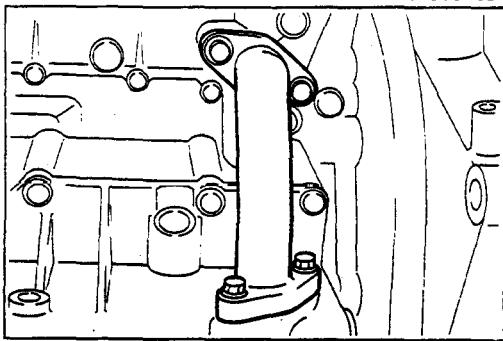
9TG0B2-320

B**ASSEMBLY****Oil Filter Assembly**

1. Install the oil filter and a new gasket.

Tightening torque:

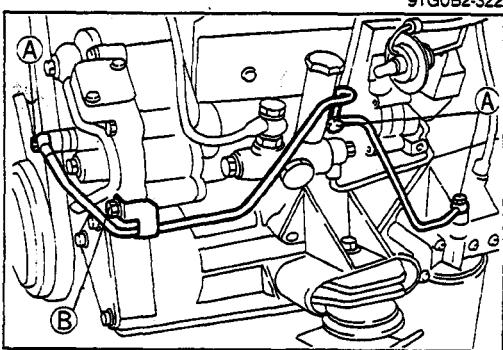
19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



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

Tightening torque:

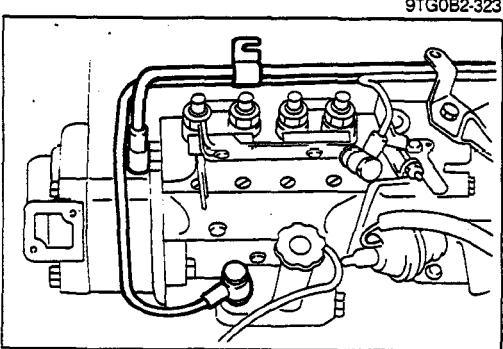
19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

**Injection Pump Oil Pipe**

1. Install the injection pump oil pipe.

Tightening torque

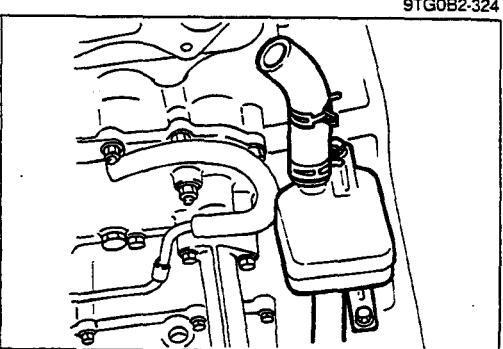
(A): 9.8—13 N·m (100—130 cm·kg, 87—113 in·lb)
(B): 19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

**Fuel Pipe**

1. Install the fuel pipe.

Tightening torque:

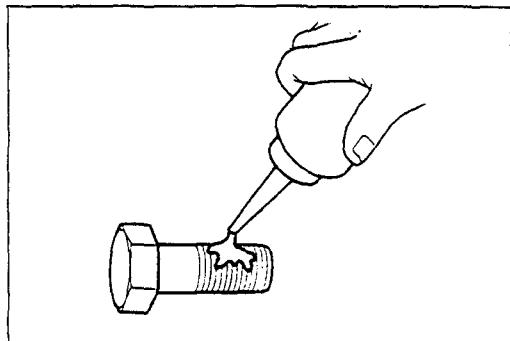
9.8—13 N·m (100—130 cm·kg, 87—113 in·lb)

**PCV Chamber**

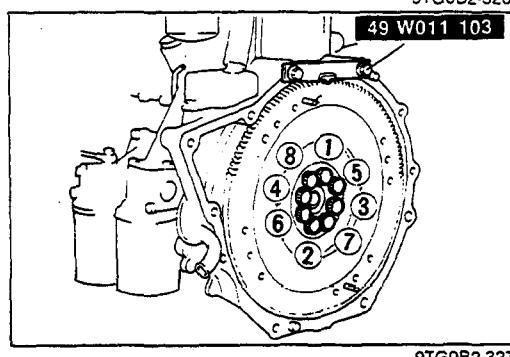
1. Install the PCV chamber.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

**Flywheel**

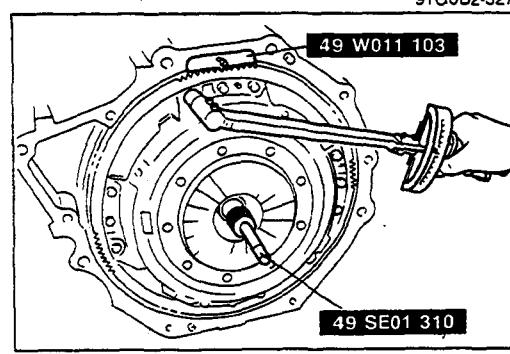
1. Apply clean engine oil to the bolt threads and seat faces.



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:

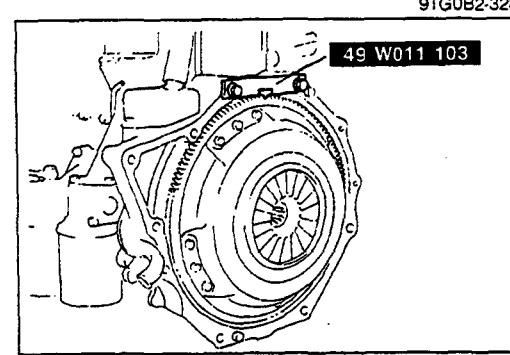
206—226 N·m (21.0—23.0 m-kg, 152—166 ft-lb)

**Clutch Disc and Clutch Cover**

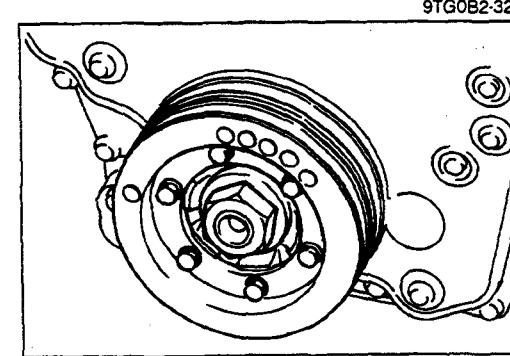
1. Install the clutch disc and the clutch cover with the **SST**. (Refer to Section H.)

Tightening torque:

18—26 N·m (1.8—2.7 m-kg, 13—20 ft-lb)

**Crankshaft Pulley**

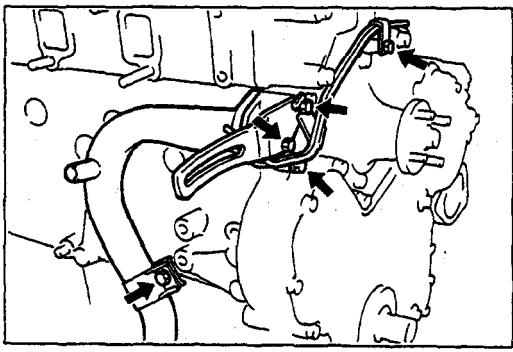
1. Install the crankshaft pulley.
2. Hold the flywheel with the **SST**.



3. Install the washer and locknut.

Tightening torque:

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



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.

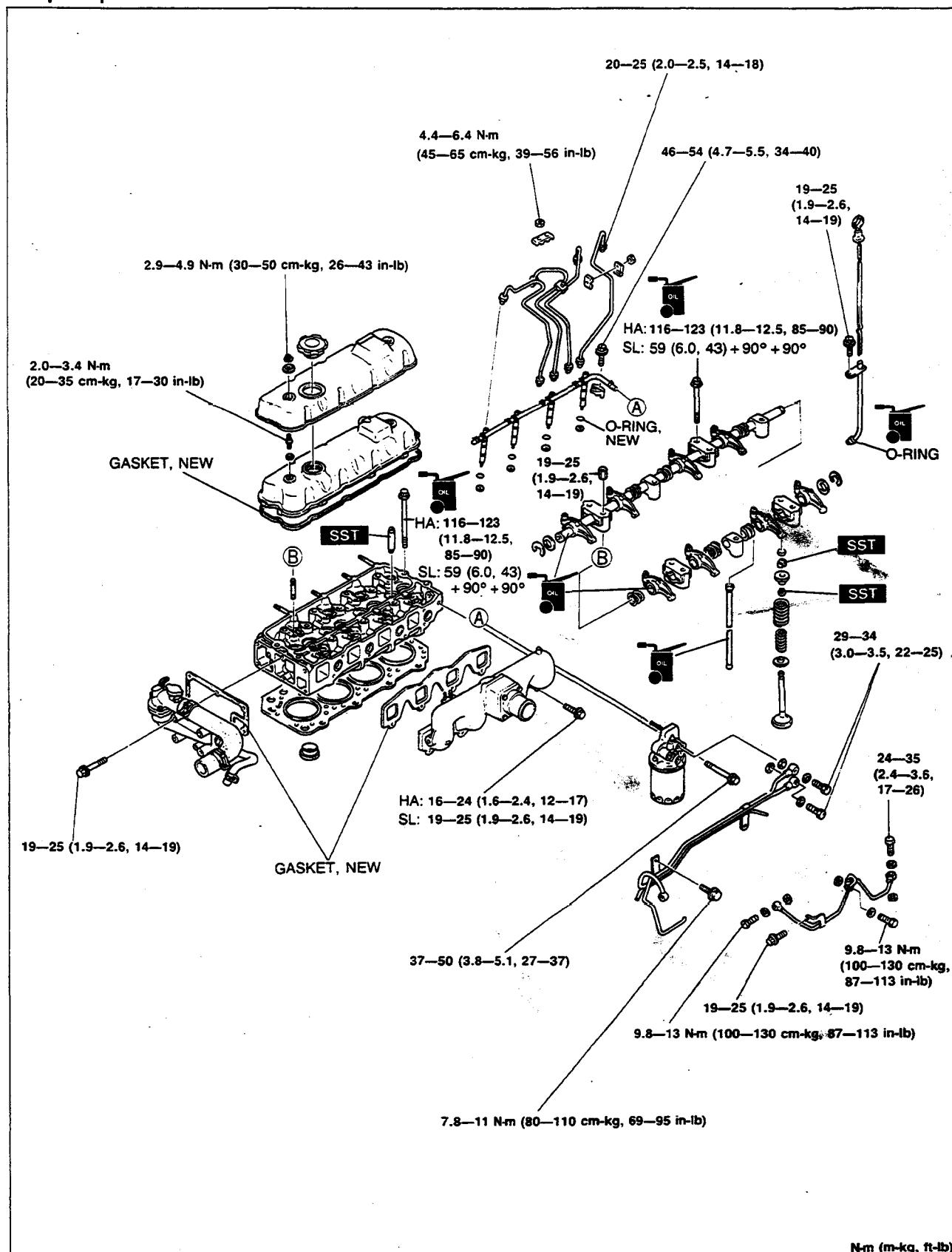
Tightening torque:

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

ASSEMBLY

B

CYLINDER HEAD HA, SL Engine Torque Specifications

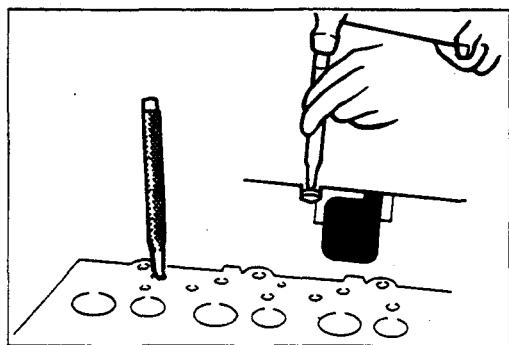


N·m (m·kg, ft·lb)

9TG0B2-333

B-113

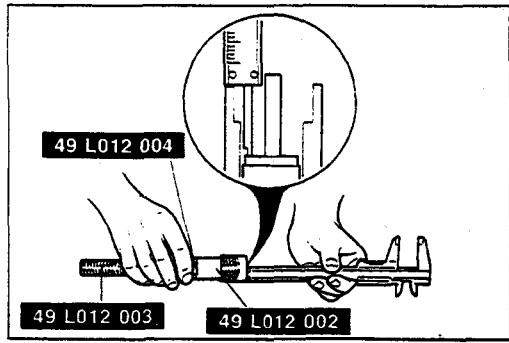
ASSEMBLY



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.



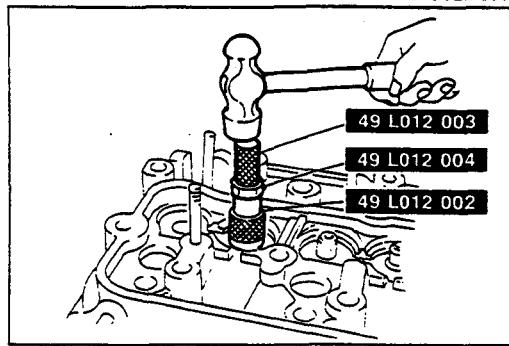
9TG0B2-336

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.

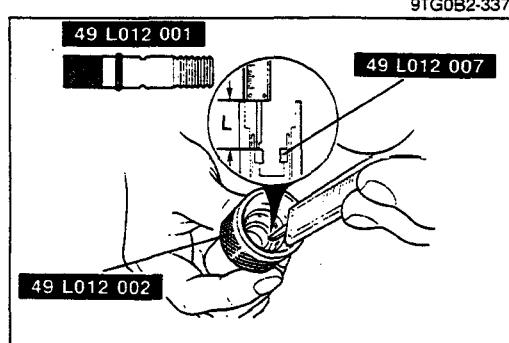


9TG0B2-337

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.

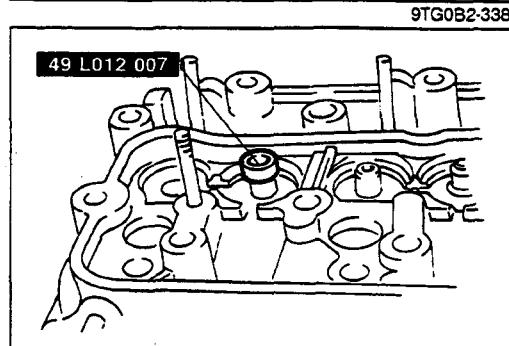


9TG0B2-338

Valve Seal

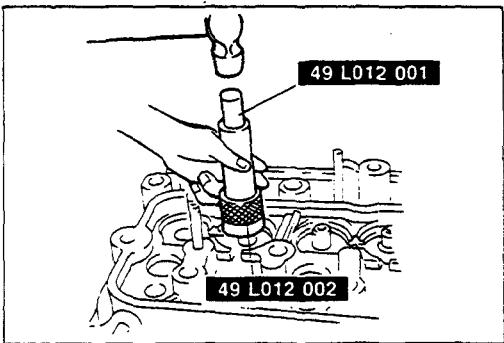
1. Assemble the **SST** so that depth **L** is as specified.

Depth L: 16.5—16.9mm (0.650—0.665 in)



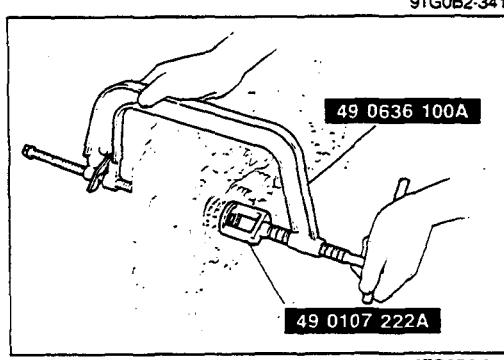
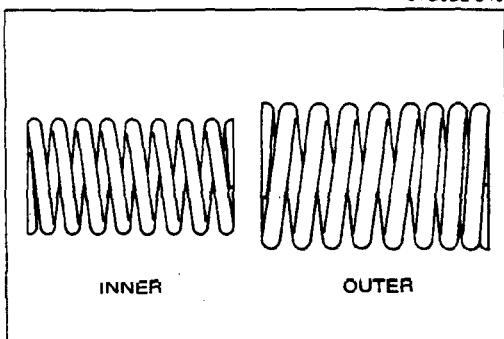
9TG0B2-339

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

**Caution**

- Do not use a hammer.

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



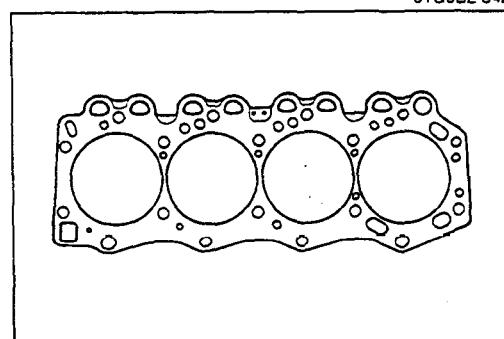
4. Compress the valve spring with the **SST**.

5. Install the valve keepers.

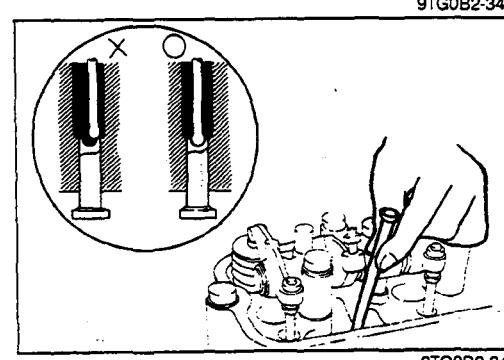
6. Remove the **SST**.

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.

**Cylinder Head Gasket**

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

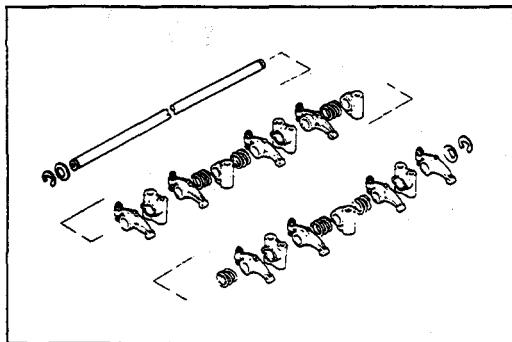
**Cylinder Head**

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

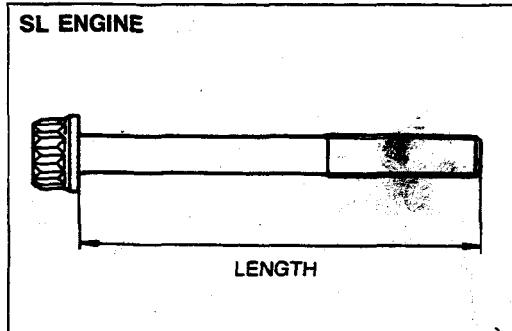
Caution

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

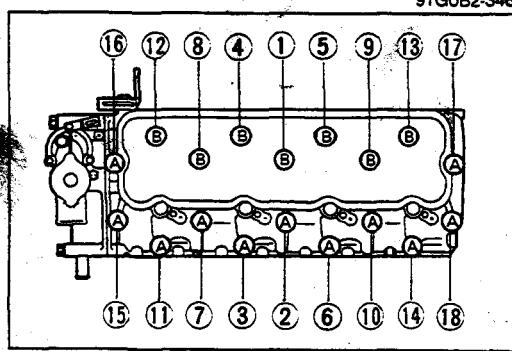
ASSEMBLY



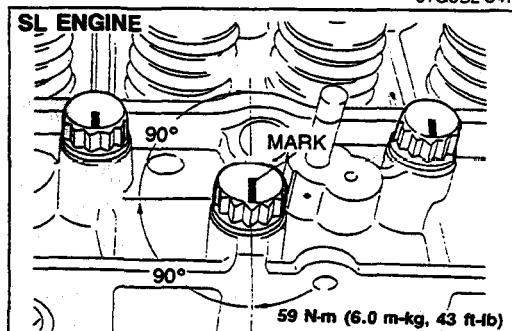
9TG0B2-345



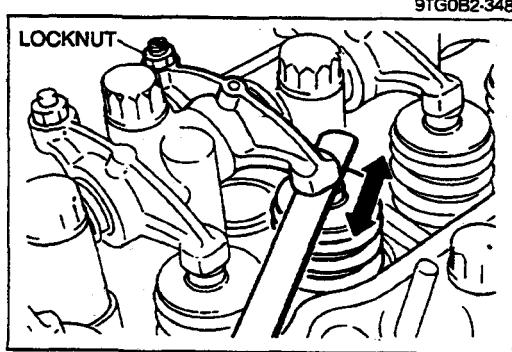
9TG0B2-346



9TG0B2-347



9TG0B2-348



9TF0BX-046

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.

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 (A): 121.7—122.3mm (4.791—4.815 in)
(B): 150.7—151.3mm (5.933—5.957 in)

Maximum (A): 123.0mm (4.843 in)
(B): 152.0mm (5.984 in)

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)

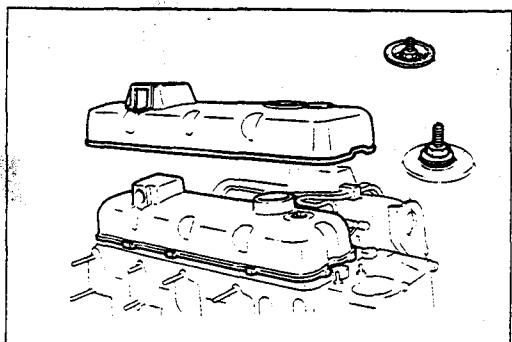
SL: 59 N·m (6.0 m·kg, 43 ft-lb)

11. SL Engine

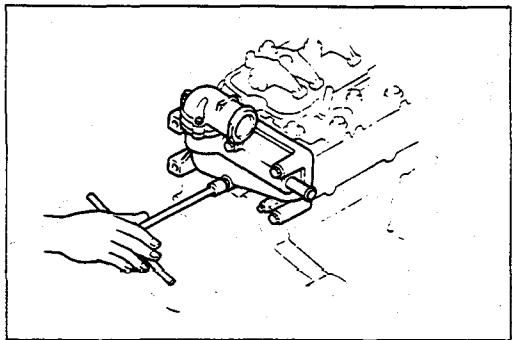
- (1) Make paint marks on the bolt heads as shown in the figure.
- (2) With the paint marks as a reference point, tighten the cylinder head bolts **another 90° ± 15°** in the tightening order.
- (3) Tighten the bolts **once again 90° ± 15°** in the tightening order.

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

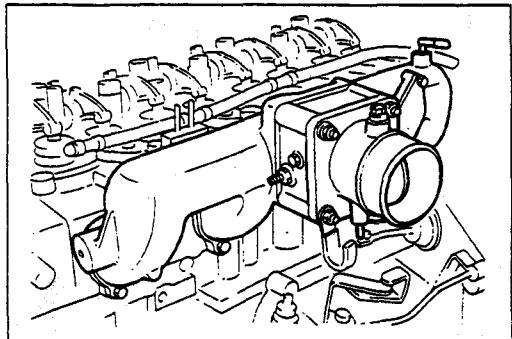
ASSEMBLY



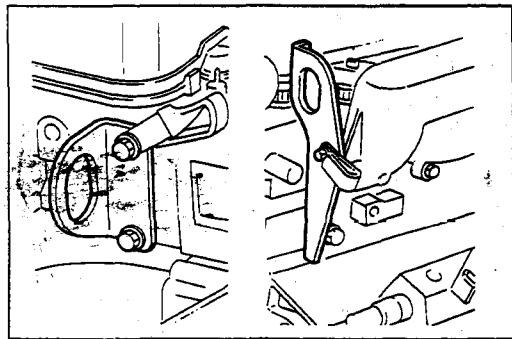
9TG0B2-350



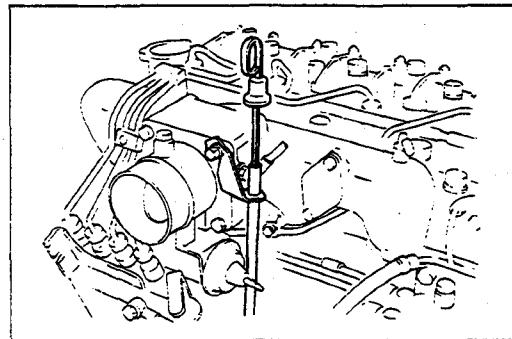
9TG0B2-351



9TG0B2-352



9TG0B2-353



9TG0B2-354

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.

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)

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)

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)

Oil Level Gauge and Guide Pipe

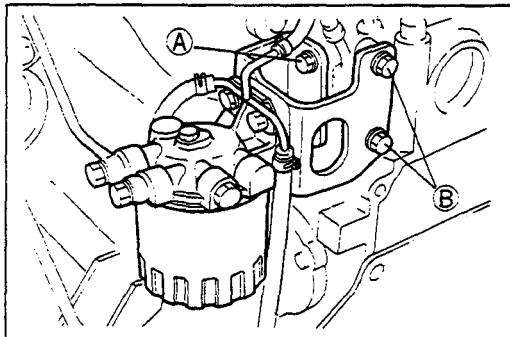
1. Apply clean engine oil to a new O-ring and install the oil level gauge guide pipe.

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

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

2. Install the fuel filter body.

Tightening torque:

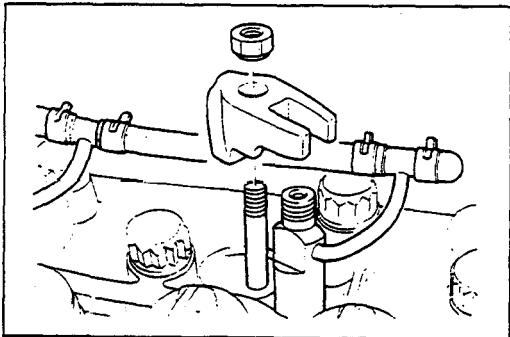
37—50 N·m (3.8—5.1 m·kg, 27—37 ft·lb)

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)



9TG0B2-356

Injection Pipe

1. Install the injection pipe.

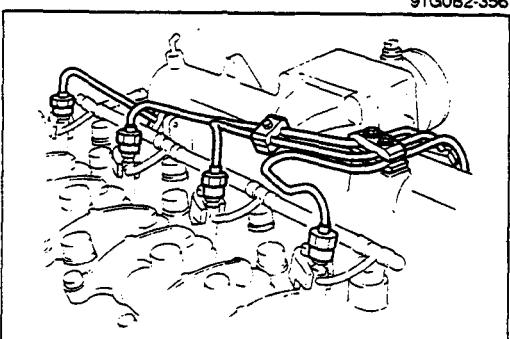
Tightening torque:

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)



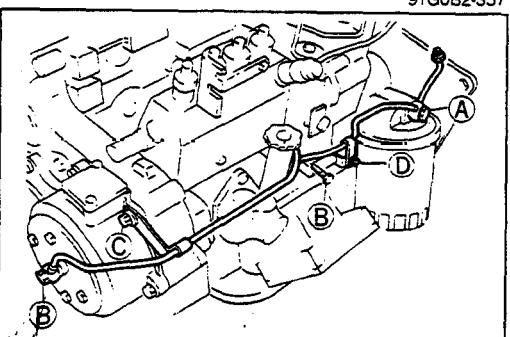
9TG0B2-357

Injection Pump Oil Pipe (SL)

1. Install the injection pump oil pipe.

Tightening torque

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



9TG0B2-358

Fuel Pipe

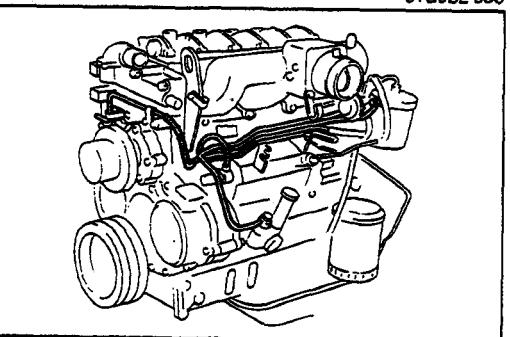
1. Install the fuel pipe.

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)

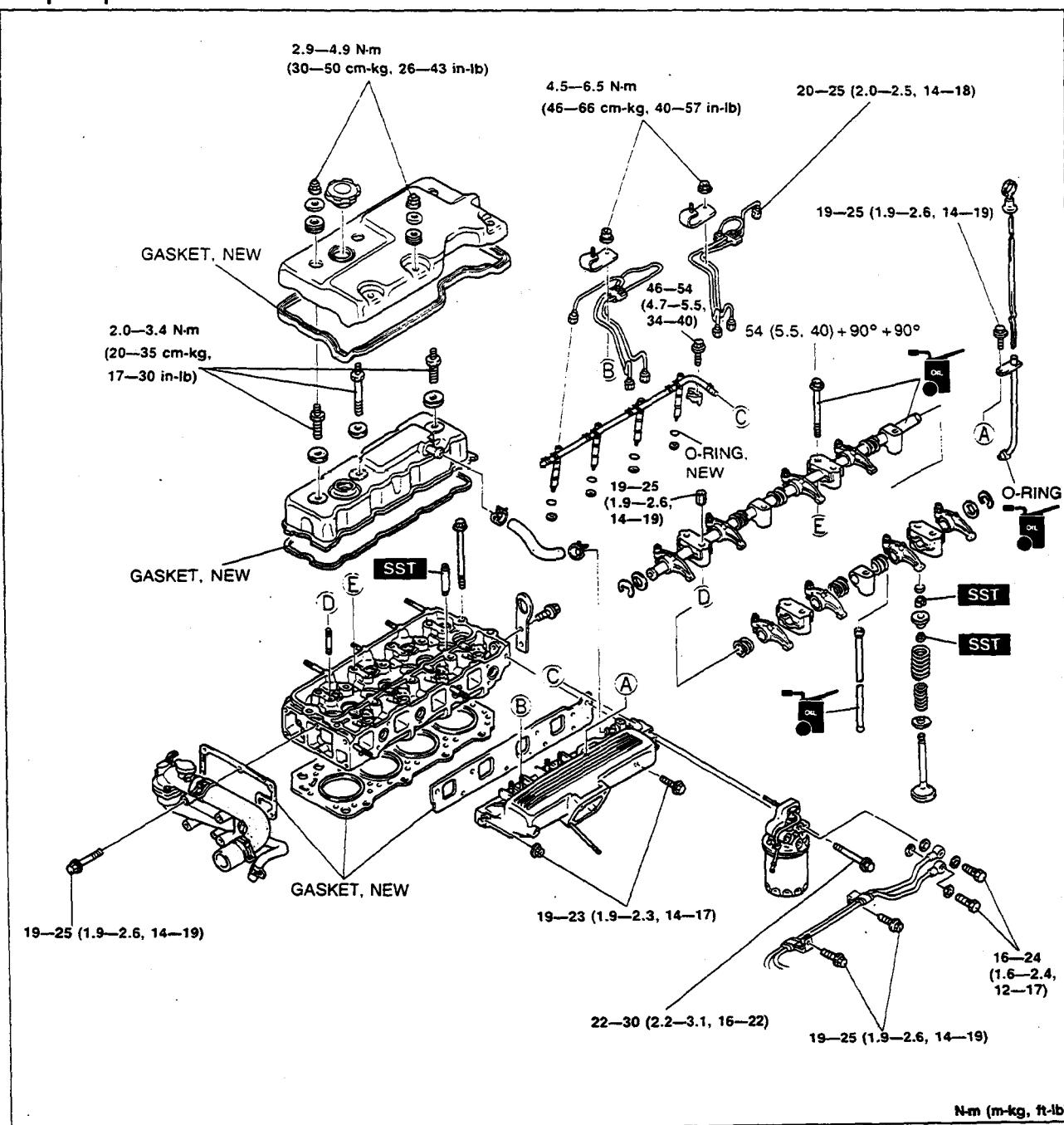


9TG0B2-359

ASSEMBLY

B

TF Engine Torque Specifications

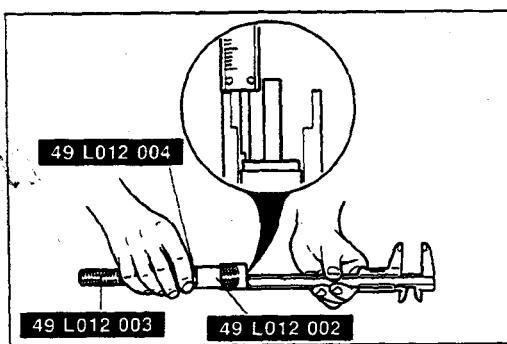


Valve Guide

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

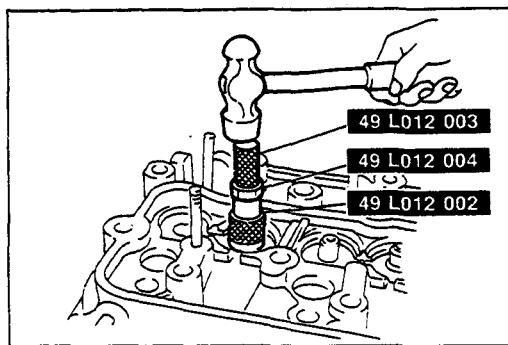
Depth L: 14.2—14.4mm (0.559—0.567 in)

2. Tighten the locknut.



9TG0B2-361

ASSEMBLY

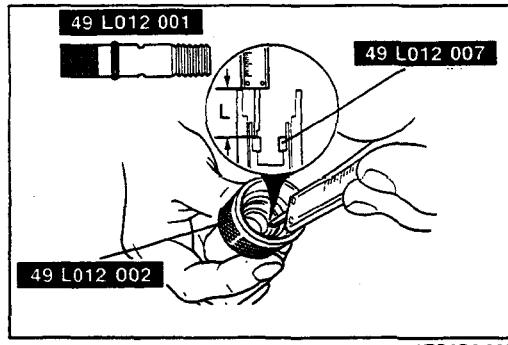


9TG0B2-362

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.

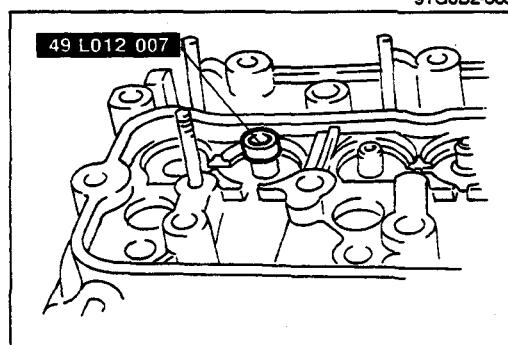


9TG0B2-363

Valve Seal

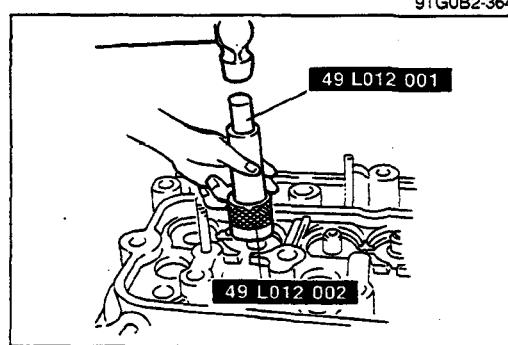
1. Assemble the **SST** so that depth **L** is as specified.

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.

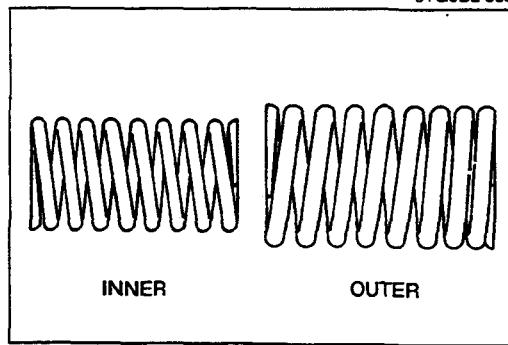


9TG0B2-365

Caution

- **Do not use a hammer.**

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

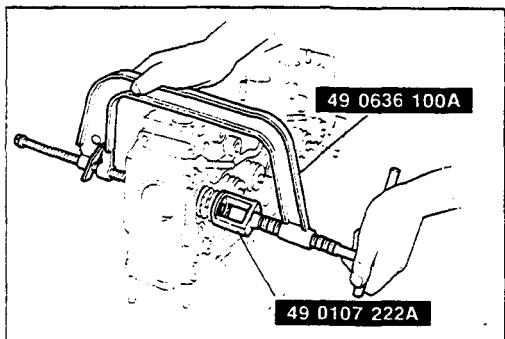


9TG0B2-366

Valve, Valve Spring and Valve Spring Seat

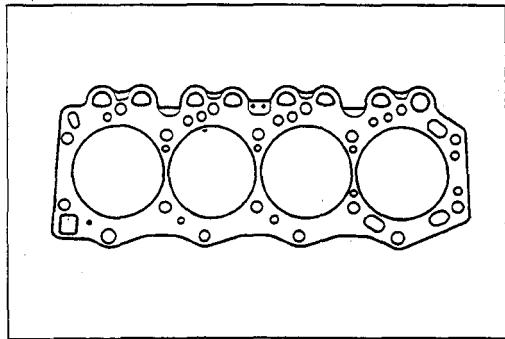
1. Install the lower spring seat.
2. Install the valve.
3. Install the valve springs (outer and inner) and the upper spring seat.

ASSEMBLY

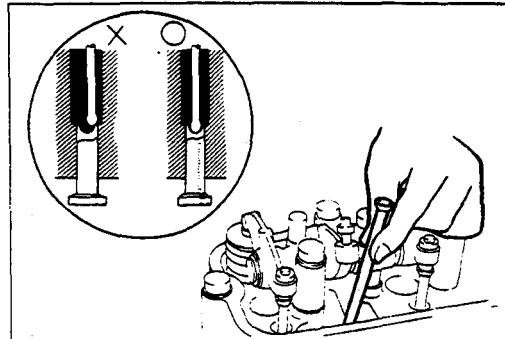


9TG0B2-367

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.



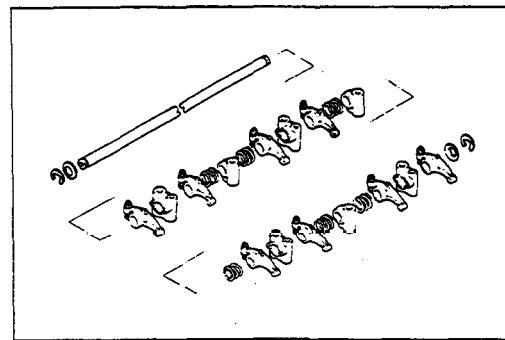
9TG0B2-368



9TG0B2-369

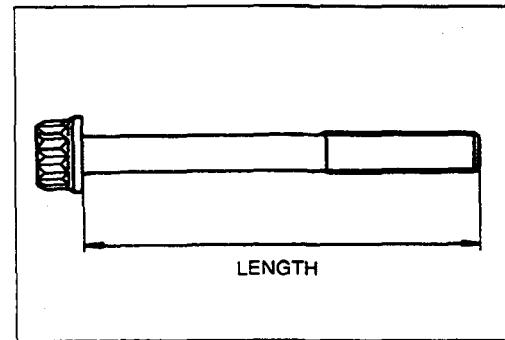
Cylinder Head Gasket

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



9TG0B2-370

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.



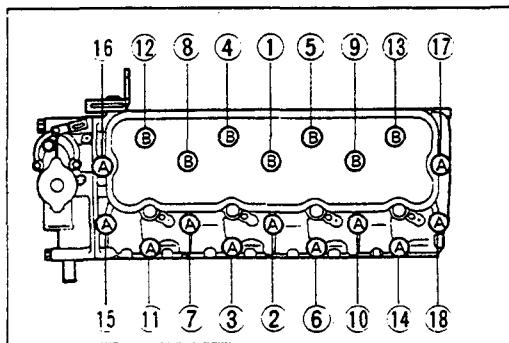
9TG0B2-371

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

Length

Standard **A:** 130.2—130.8mm (5.126—5.150 in)
B: 158.2—158.8mm (6.228—6.252 in)

Maximum **A:** 131.5mm (5.177 in)
B: 159.5mm (6.280 in)



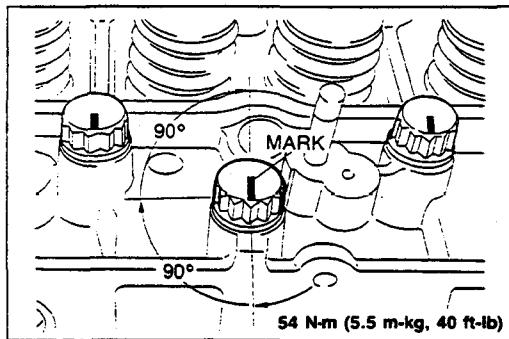
9TG0B2-372

Caution

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

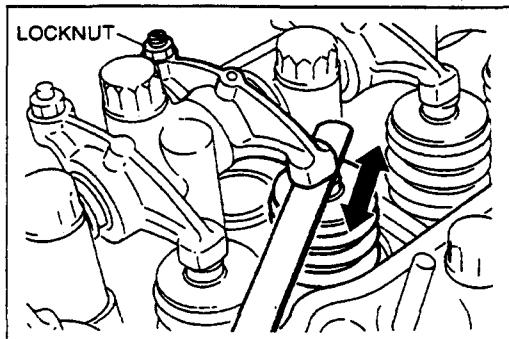
8. Apply clean engine oil to the bolt threads and seat faces.
9. Install the cylinder head bolts.
10. Tighten the bolts in two or three steps in the order shown in the figure.

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



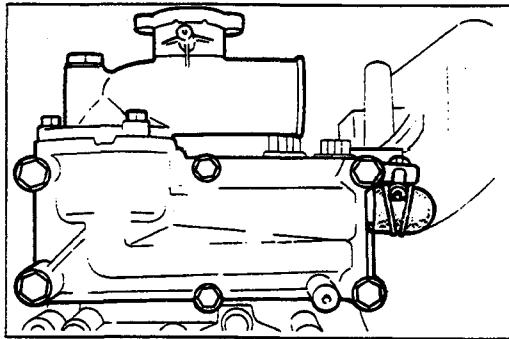
9TG0B2-373

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.)



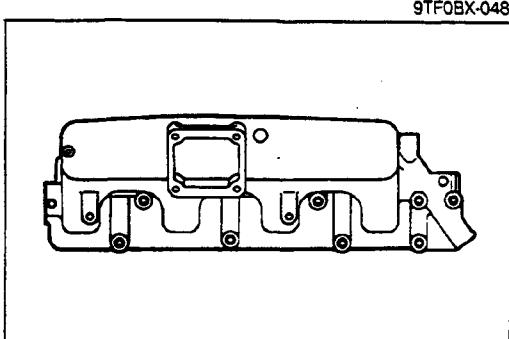
9TF0BX-048

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

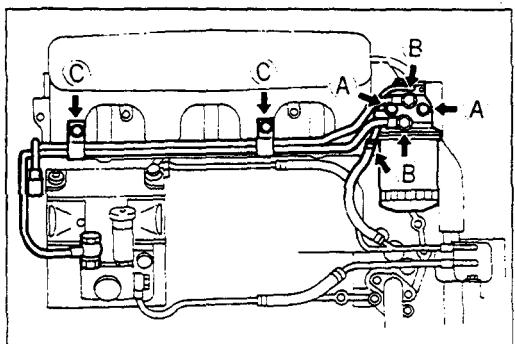
Intake Manifold Assembly

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)

ASSEMBLY

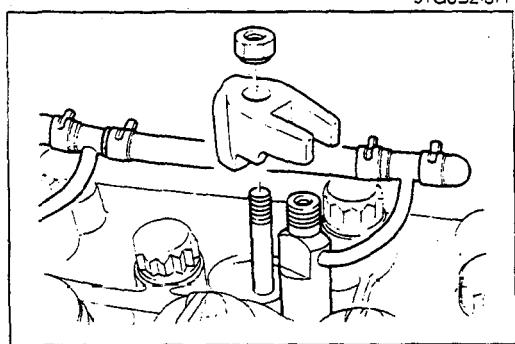


Fuel Filter Body

1. Install the fuel filter body.

Tightening torque

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

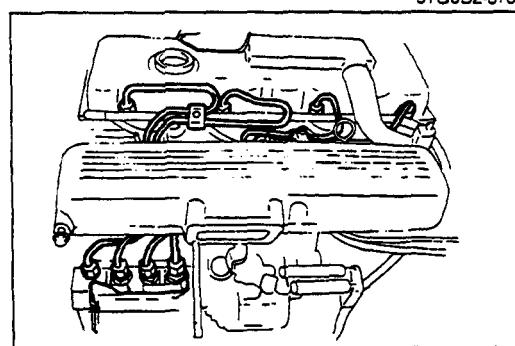


Injection Nozzle and Nozzle Holder

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)



Injection Pipe

1. Install the injection pipe.

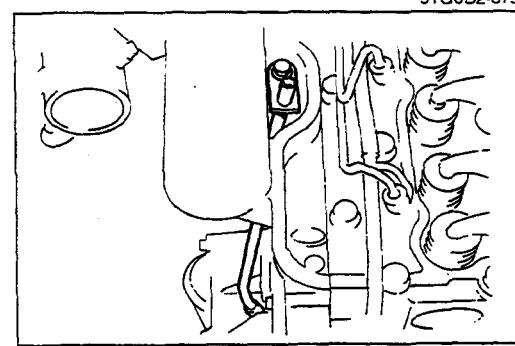
Tightening torque:

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)



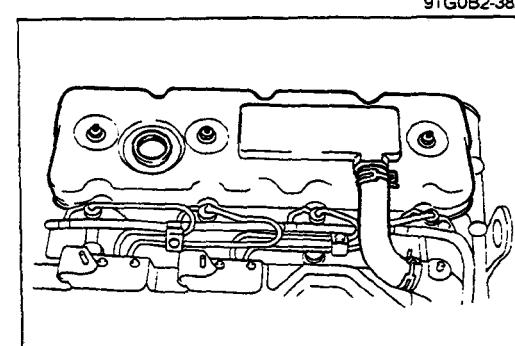
Oil Level Gauge and Guide Pipe

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.

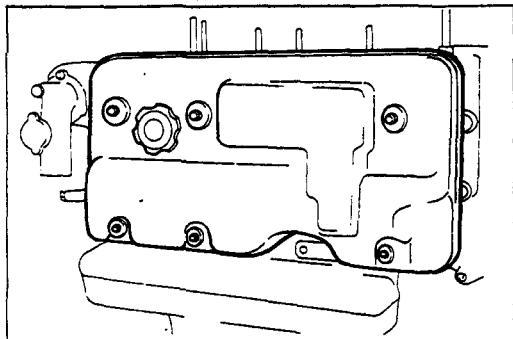


Cylinder Head Cover

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

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**(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)**

4. Install the right engine mount.

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

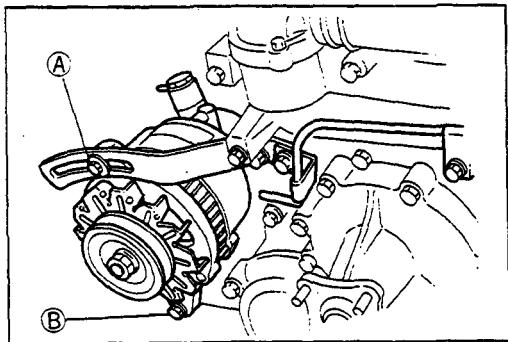
5. Install the exhaust manifold and a new gasket.

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)**

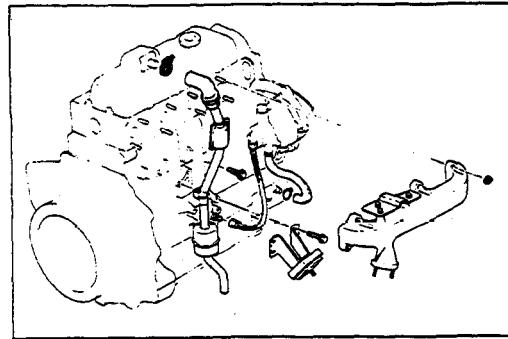
6. Install the breather pipe (SL).

Tightening torque**(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)****TF Engine**

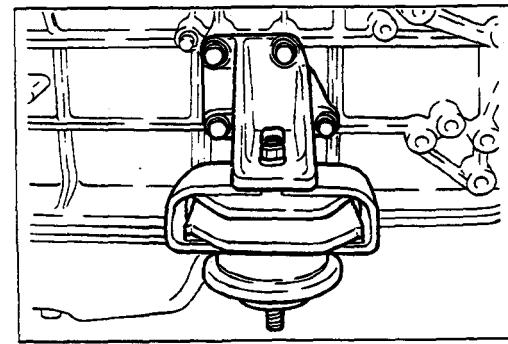
1. Install the right engine mount.

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

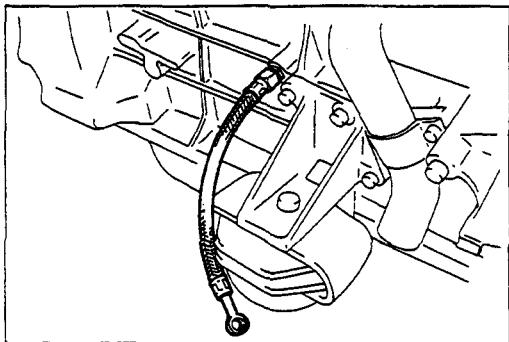
9TG0B2-387



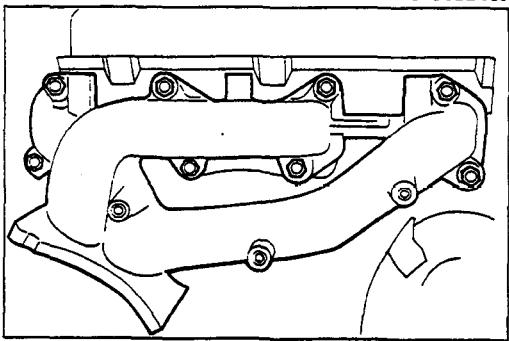
9TG0B2-388



9TG0B2-389

B**ENGINE STAND DISMOUNTING**

2. Connect the oil hose.

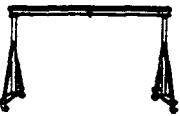
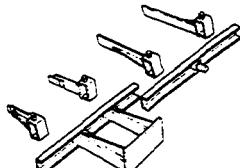
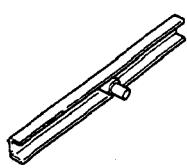
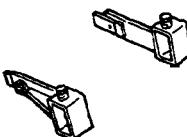
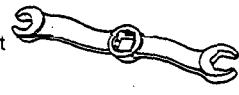


3. Install the exhaust manifold and a new gasket.

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

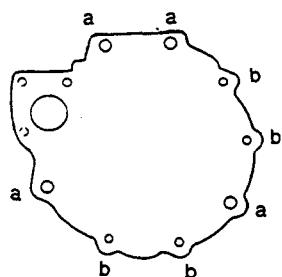
PROCEDURE

1. Tighten all bolts and nuts to the specified torques.

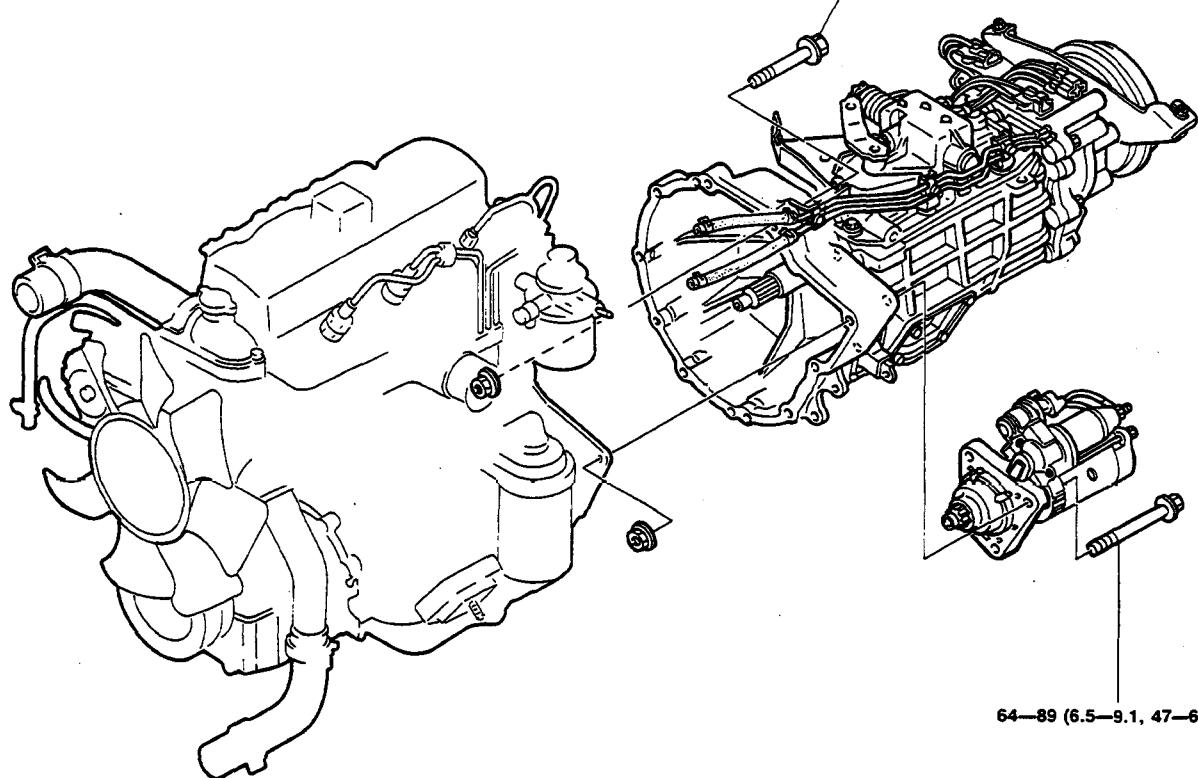
9TG0B2-392

B**INSTALLATION****HA Engine****Step 1**

1. Assemble the engine and transmission.

Torque Specifications

a: 89—117 (9.1—11.9, 66—86)
b: 37—52 (3.8—5.3, 27—38)



N·m (m·kg, ft-lb)

9TG0B2-393

INSTALLATION

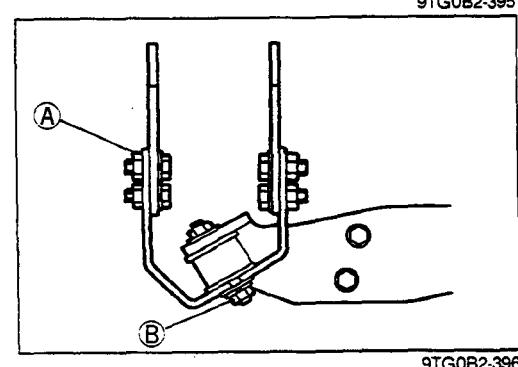
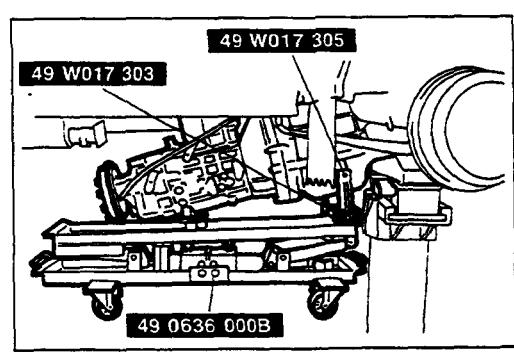
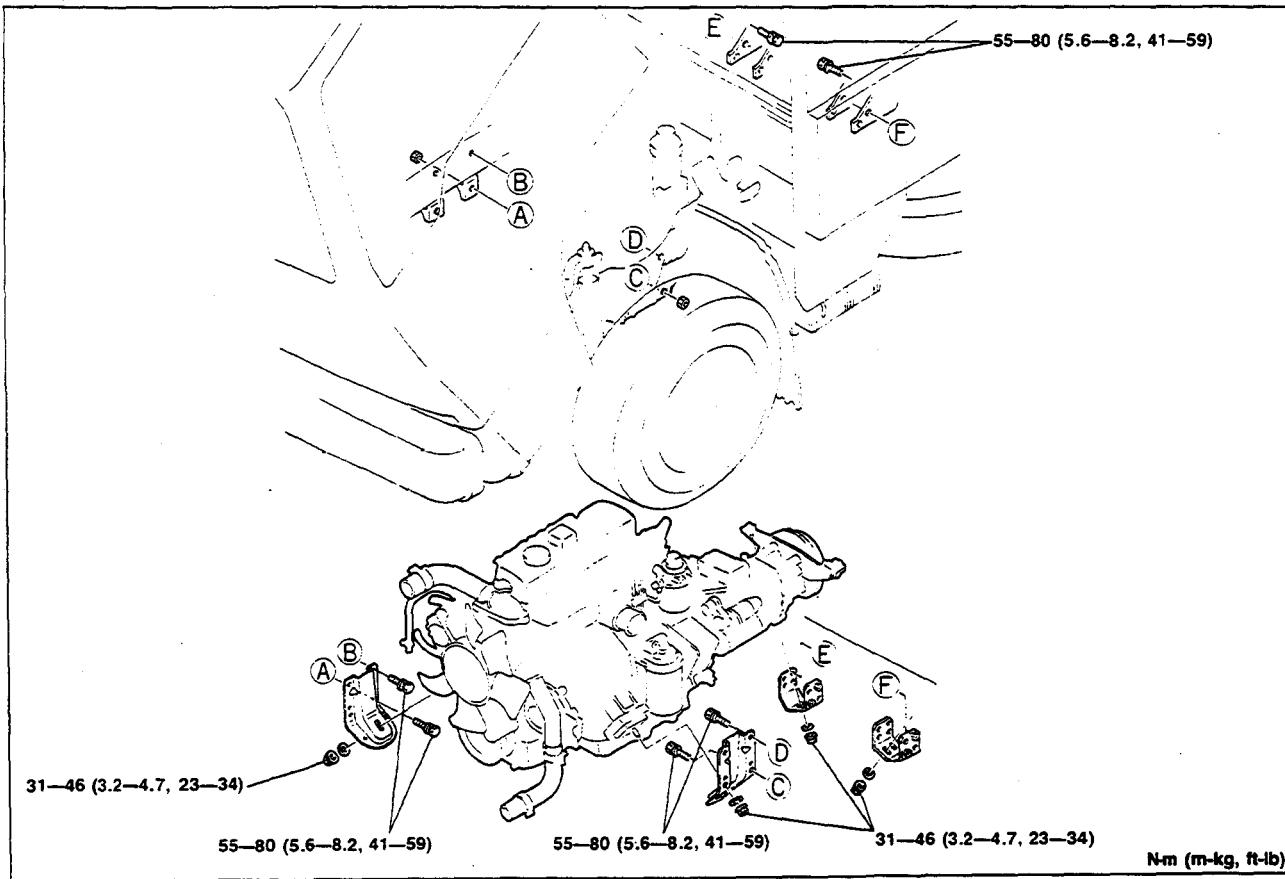
B

Step 2

Warning

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

Torque Specifications



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

(A): 55—80 N·m (5.6—8.2 m·kg, 41—59 ft·lb)
(B): 31—46 N·m (3.2—4.7 m·kg, 23—34 ft·lb)

7. Tighten the engine mount nuts.

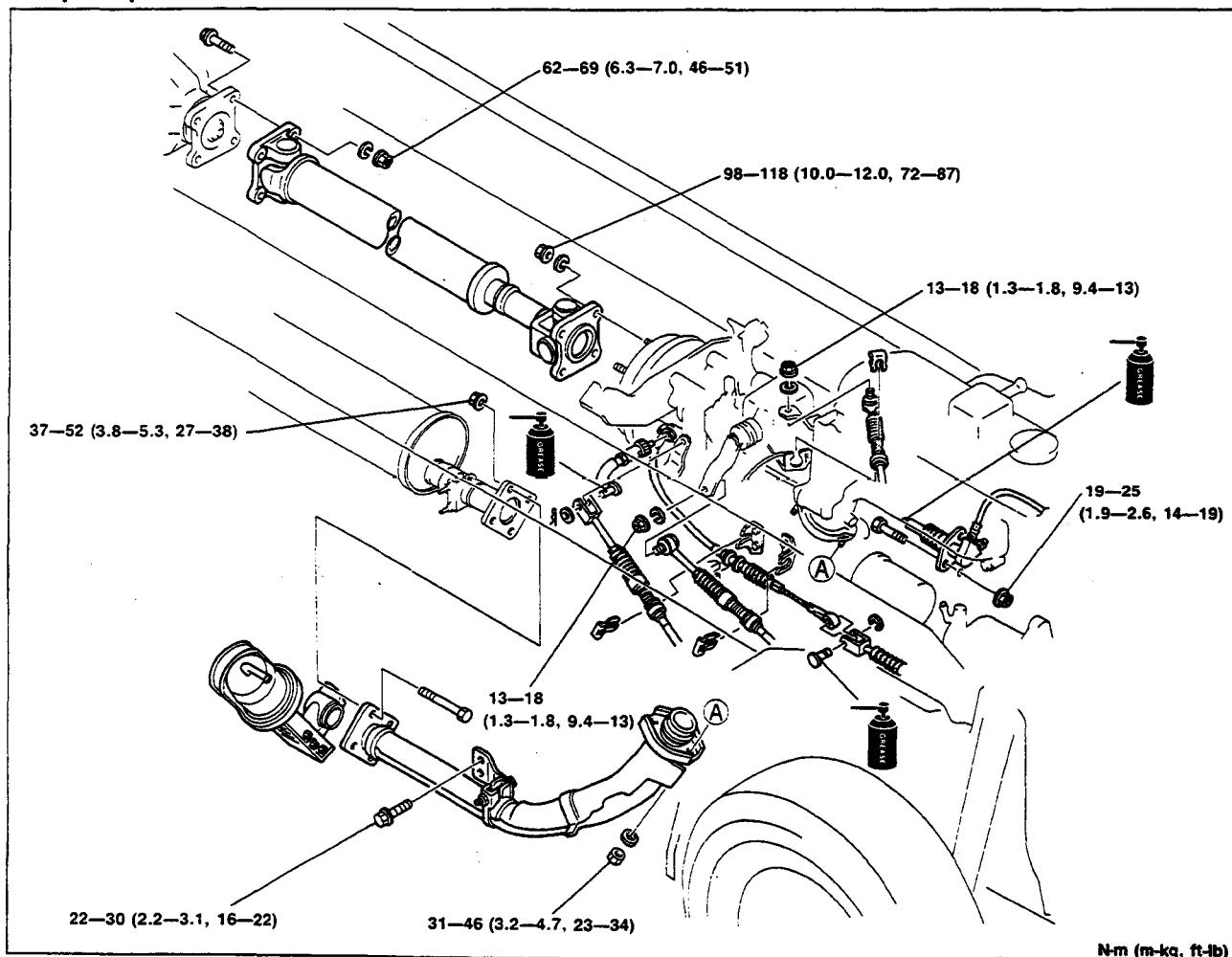
Tightening torque:

31—46 N·m (3.2—4.7 m·kg, 23—34 ft·lb)

B

INSTALLATION

Step 3 Torque Specifications

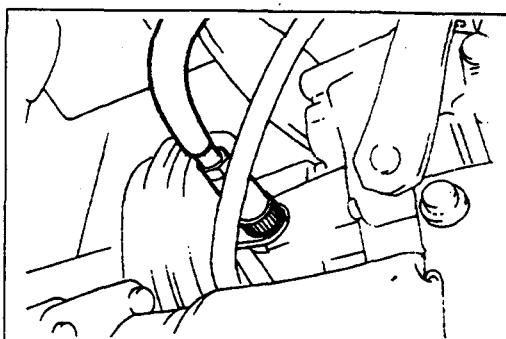


Propeller shaft

1. Install the propeller shaft. (Refer to Section L.)

Speedometer cable

1. Install the speedometer cable.

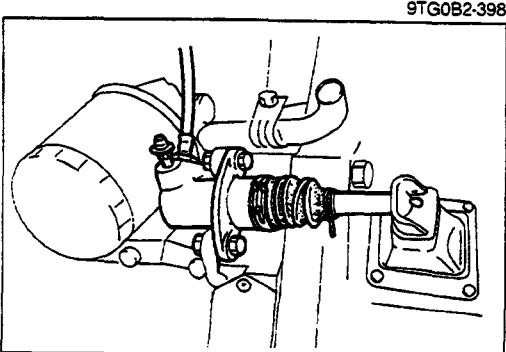


Clutch release cylinder

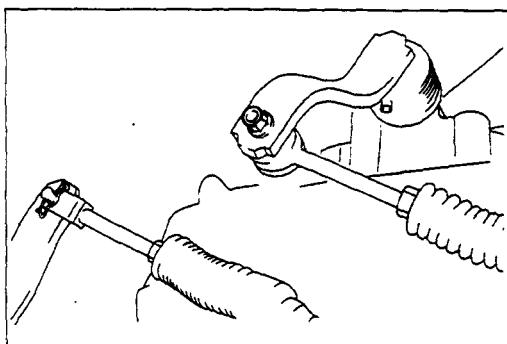
1. Install the clutch release cylinder.

Tightening torque:

19-25 N·m (1.9-2.6 m·kg, 14-19 ft-lb)



INSTALLATION



9TG0B2-401

Sub-select cable

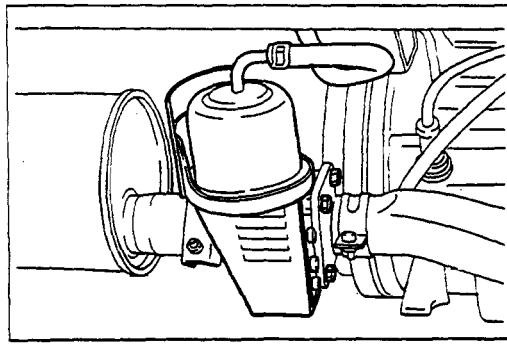
1. Install the sub-select cable. (Refer to Section J.)

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)



9TG0B2-402

Front exhaust pipe

1. Install the front exhaust pipe.

Tightening torque:

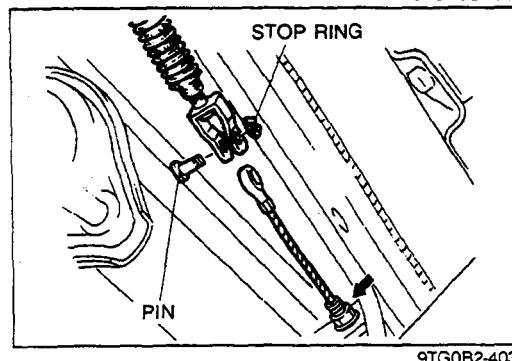
**31—46 N·m (3.2—4.7 m·kg, 23—34 ft-lb)....Pipe
22—30 N·m (2.2—3.1 m·kg, 16—22 ft-lb)....Bracket**

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)



9TG0B2-403

Parking brake cable

1. Mount the parking brake rear cable to the vehicle frame.

Tightening torque:

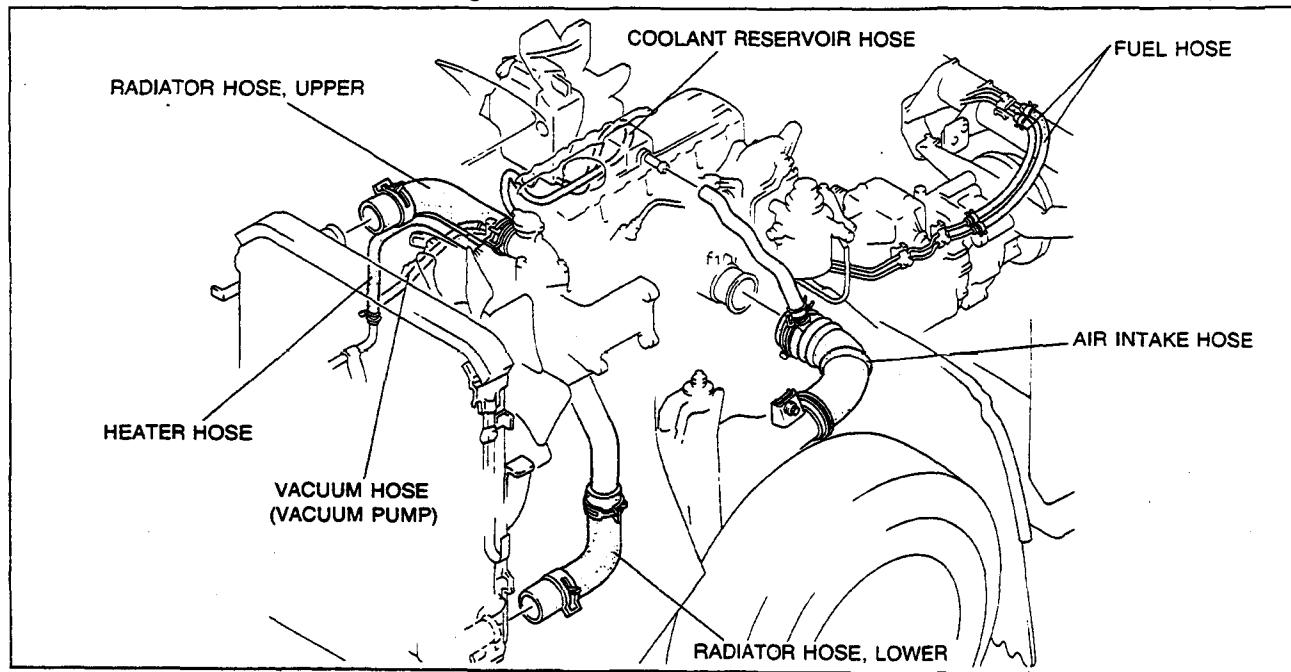
31—46 N·m (3.2—4.7 m·kg, 23—34 ft-lb)

2. Connect the front and rear cable with the pin and install the stop ring.

B**INSTALLATION****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.

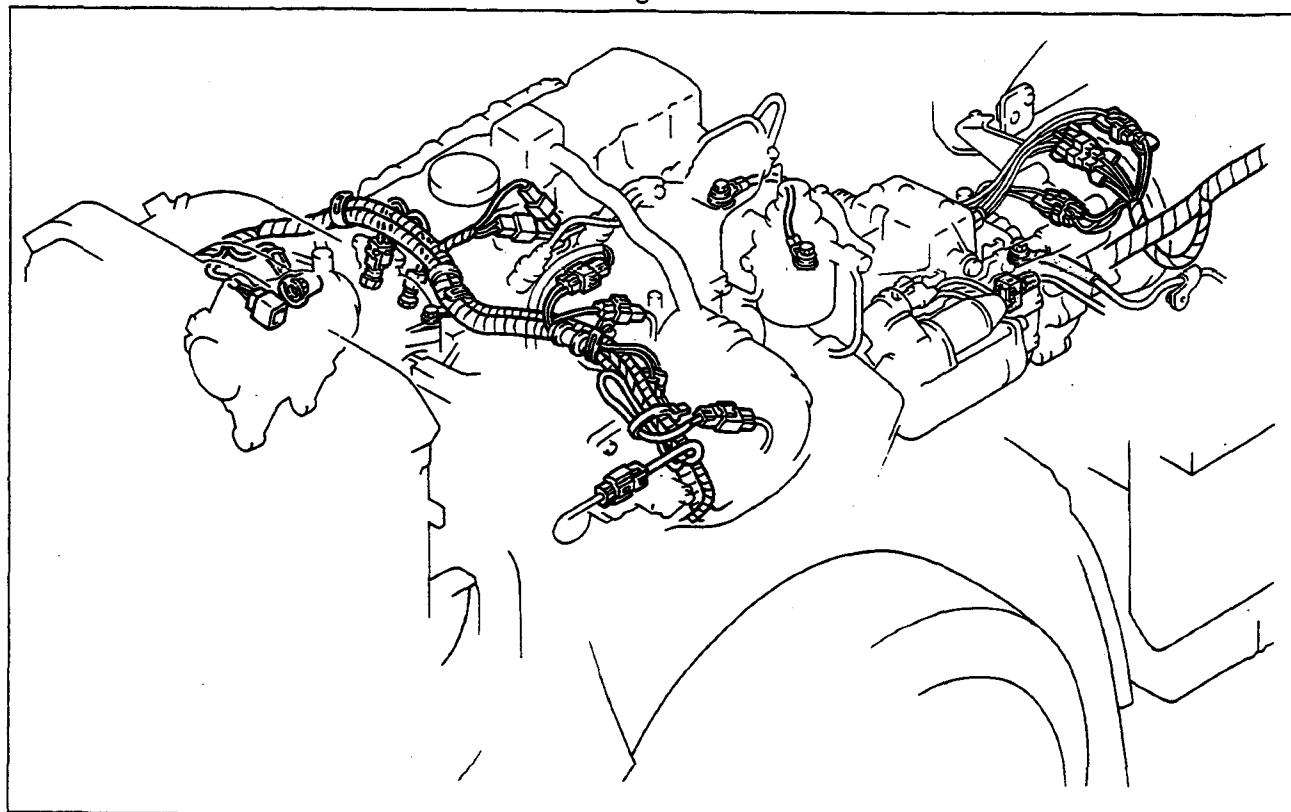
1. Connect the hoses shown in the figure.



9TG0B2-404

Step 5

1. Connect the harness connectors shown in the figure.



9TG0B2-405

INSTALLATION

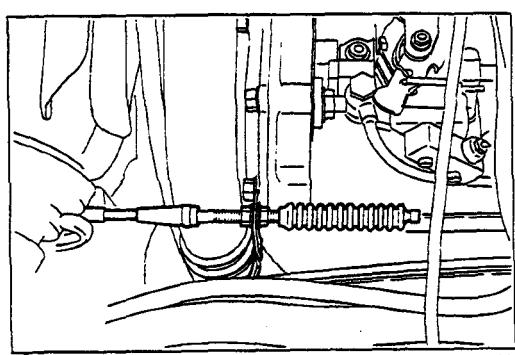
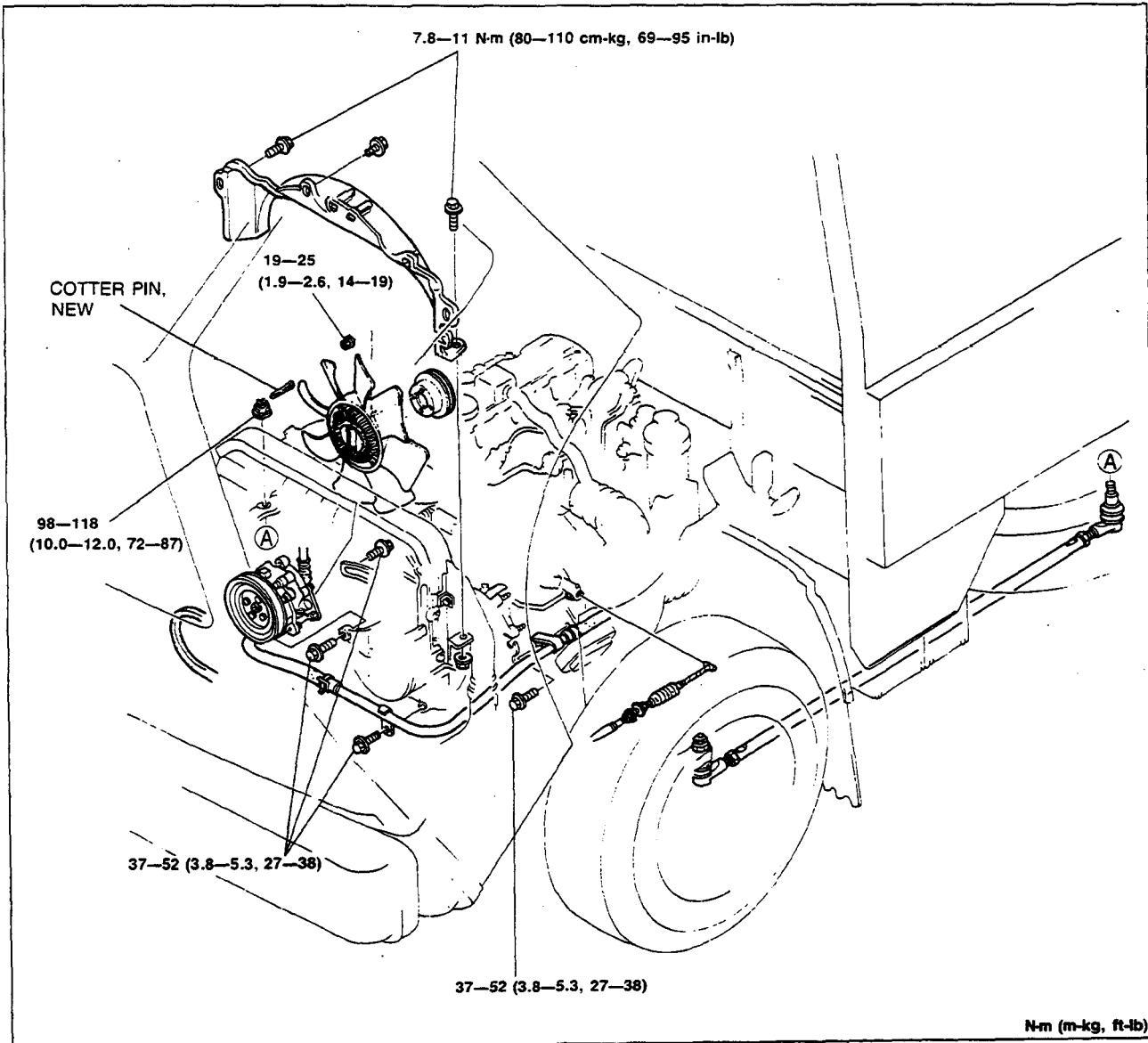
B

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.

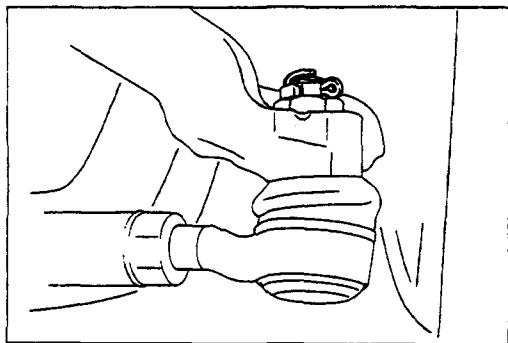
Torque Specifications



Accelerator cable

1. Install the accelerator cable.
2. Adjust the cable deflection by turning the adjusting nut.

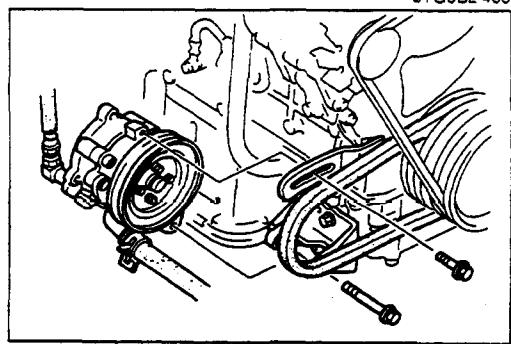
Deflection: 1—3mm (0.04—0.12 in)

**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

INSTALLATION

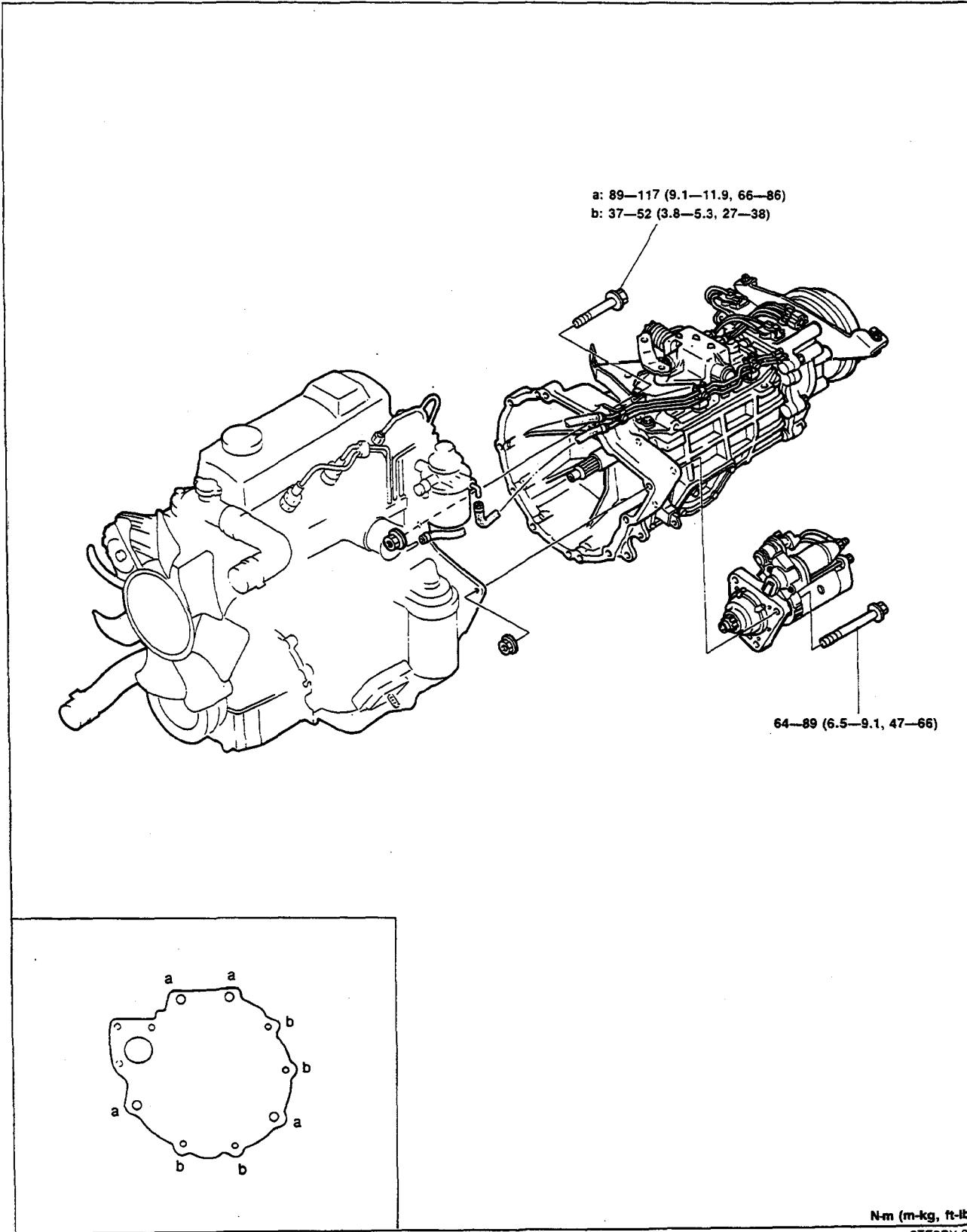
B

SL Engine

Step 1

1. Assemble the engine and transmission.

Torque Specifications



B

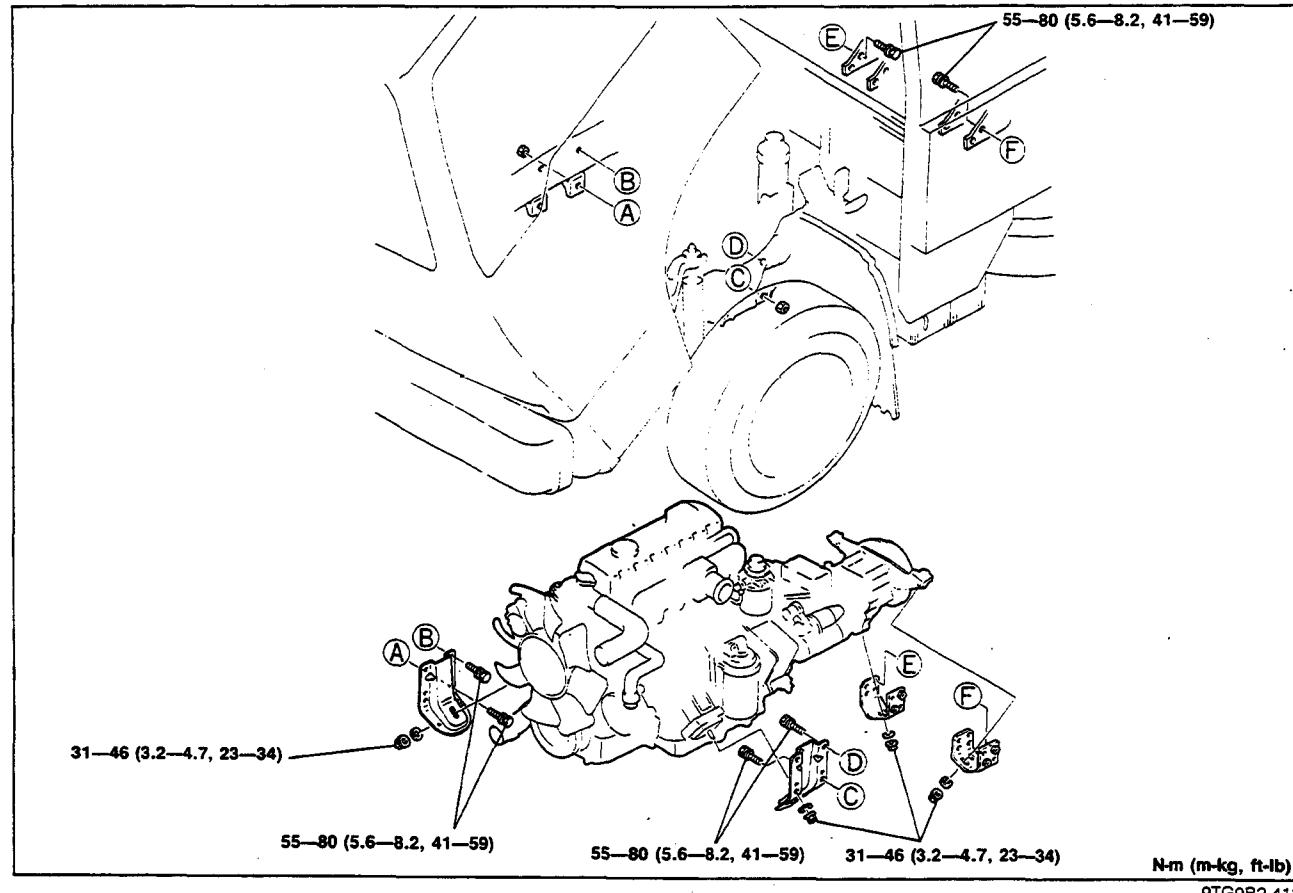
INSTALLATION

Step 2

Warning

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

Torque Specifications



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

A: 55—80 N·m (5.6—8.2 m·kg, 41—59 ft·lb)
B: 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)

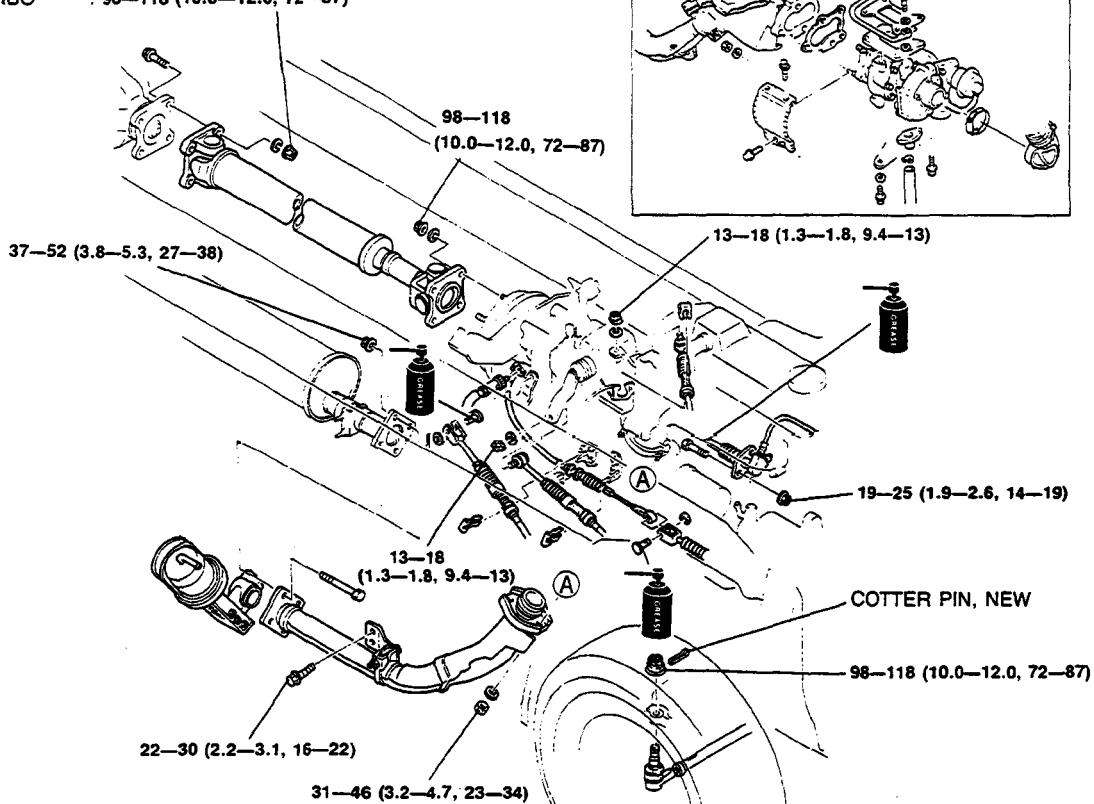
Step 3
Torque Specifications

TWO-JOINT TYPE: 62—69 (6.3—7.0, 46—51)

THREE-JOINT TYPE

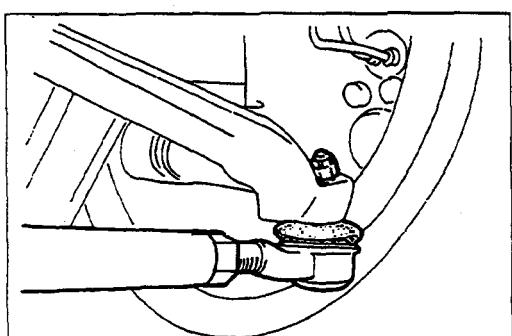
NON-TURBO: 62—69 (6.3—7.0, 46—51)

TURBO : 98—118 (10.0—12.0, 72—87)



N·m (m·kg, ft·lb)

9TF0BX-051



9TG0B2-416

Propeller shaft

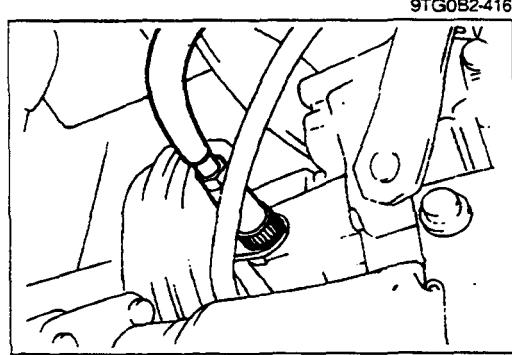
1. Install the propeller shaft. (Refer to Section L.)

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)



9TG0B2-417

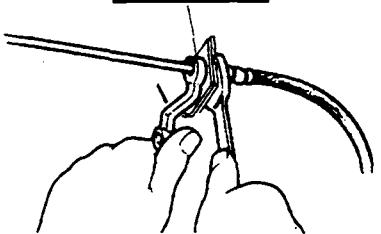
Speedometer cable

1. Install the speedometer cable.

B**INSTALLATION**

TURBO

49 0259 770B



9TG0B2-418

**Clutch release cylinder
(Non-Turbo)**

1. Install the clutch release cylinder.

Tightening torque: $19\text{--}25 \text{ N}\cdot\text{m (1.9\text{--}2.6 m}\cdot\text{kg, 14\text{--}19 ft}\cdot\text{lb)}$ **(Turbo)**

1. Connect the clutch hose with the SST.

Tightening torque: $22\text{--}26 \text{ N}\cdot\text{m (2.2\text{--}2.7 m}\cdot\text{kg, 16\text{--}20 ft}\cdot\text{lb)}$ **Sub-select cable**

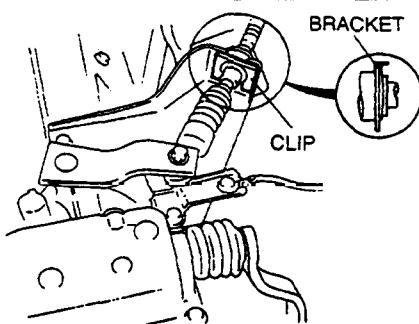
1. Install the sub-select cable. (Refer to Section J.)

Shift/select cable

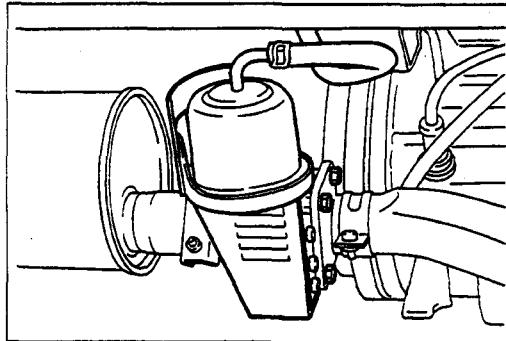
1. Install the shift/select cable.

Turbocharger (Turbo)

1. Install the turbocharger. (Refer to Section F.)



9TG0B2-418



9TG0B2-420

Front exhaust pipe

1. Install the front exhaust pipe.

Tightening torque: $31\text{--}46 \text{ N}\cdot\text{m (3.2\text{--}4.7 m}\cdot\text{kg, 23\text{--}34 ft}\cdot\text{lb})\dots\text{Pipe}$
 $22\text{--}30 \text{ N}\cdot\text{m (2.2\text{--}3.1 m}\cdot\text{kg, 16\text{--}22 ft}\cdot\text{lb})\dots\text{Bracket}$ **Exhaust shutter valve**

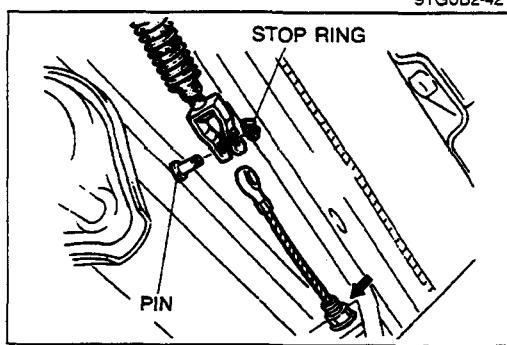
1. Install the exhaust shutter valve.

Tightening torque: $37\text{--}52 \text{ N}\cdot\text{m (3.8\text{--}5.3 m}\cdot\text{kg, 27\text{--}38 ft}\cdot\text{lb)}$ **Parking brake cable**

1. Mount the parking brake rear cable to the vehicle frame.

Tightening torque: $31\text{--}46 \text{ N}\cdot\text{m (3.2\text{--}4.7 m}\cdot\text{kg, 23\text{--}34 ft}\cdot\text{lb)}$

2. Connect the front and rear cable with the pin and install the stop ring.



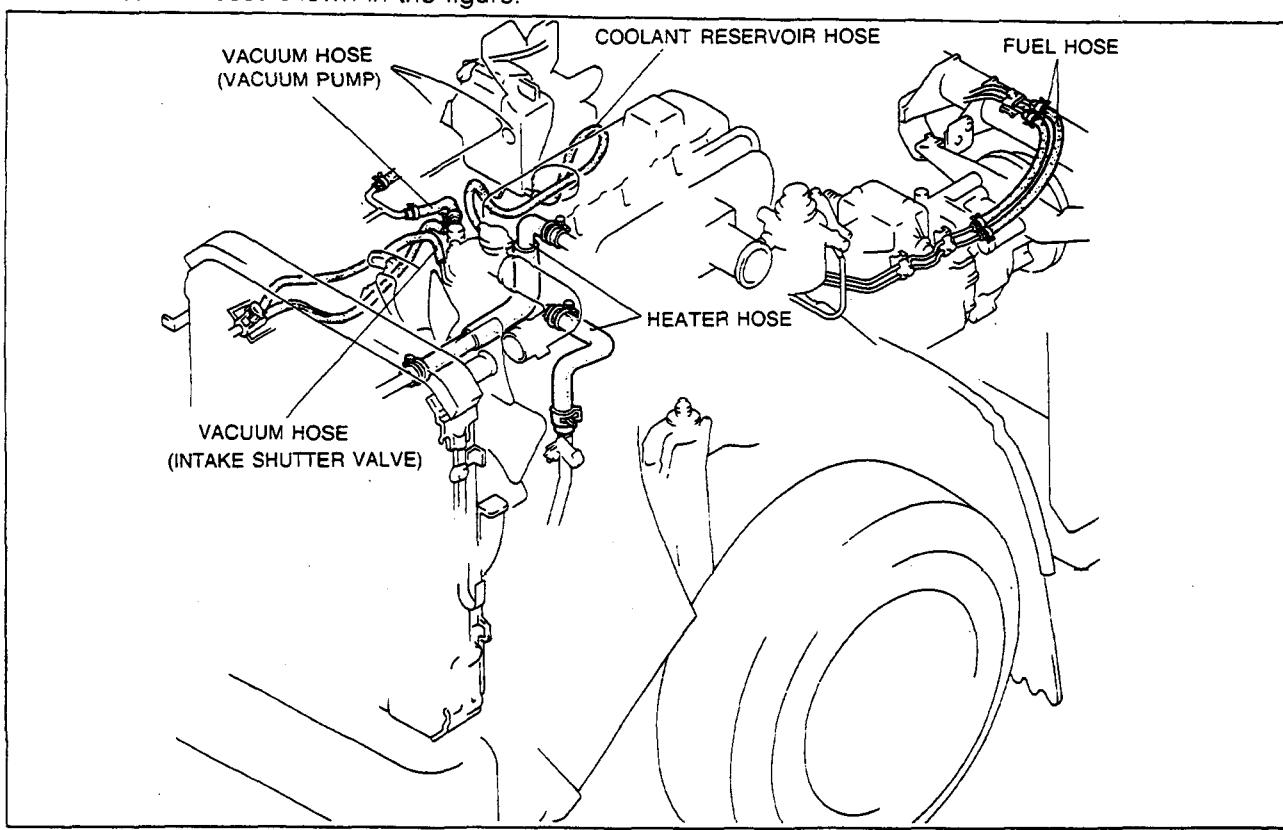
9TG0B2-422

INSTALLATION

B

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

B-139

B

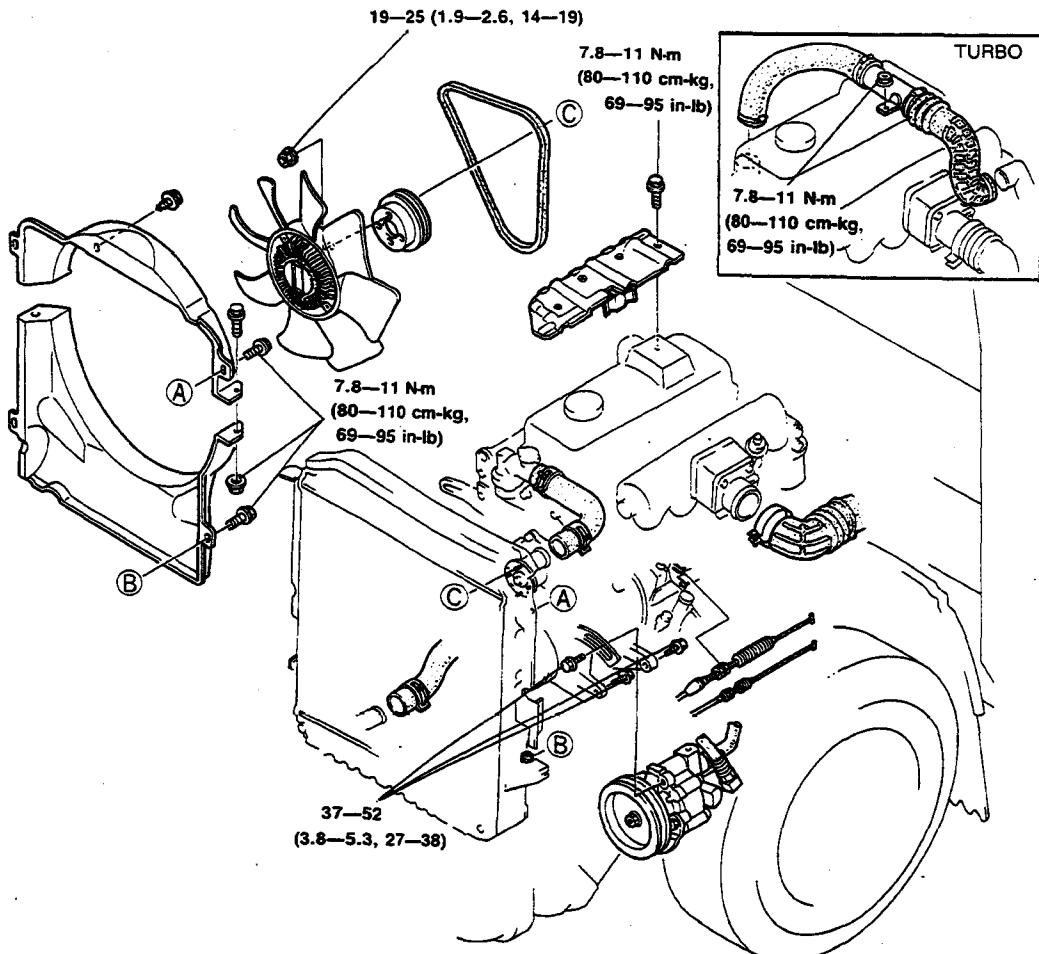
INSTALLATION

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

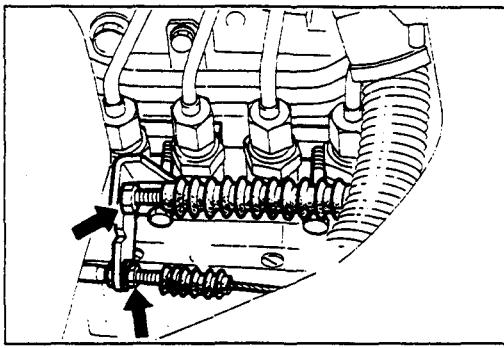


N·m (m·kg, ft·lb)

9TG0B2-425

INSTALLATION

B



9TG0B2-427

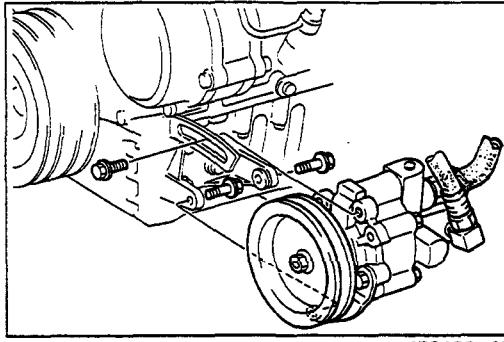
Fuel stop cable

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)



9TG0B2-429

P/S oil pump

1. Install the P/S oil pump and loosely tighten the mounting bolts.

Drive belt

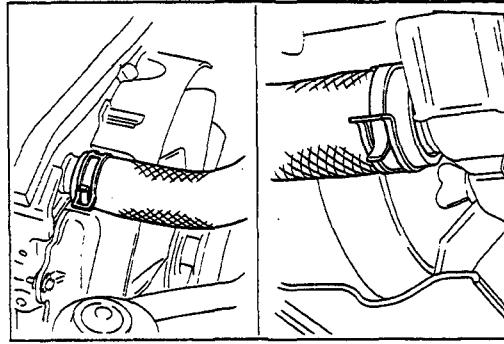
1. Install the drive belts.

Cooling fan

1. Install the cooling fan.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft-lb)



9TG0B2-430

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:

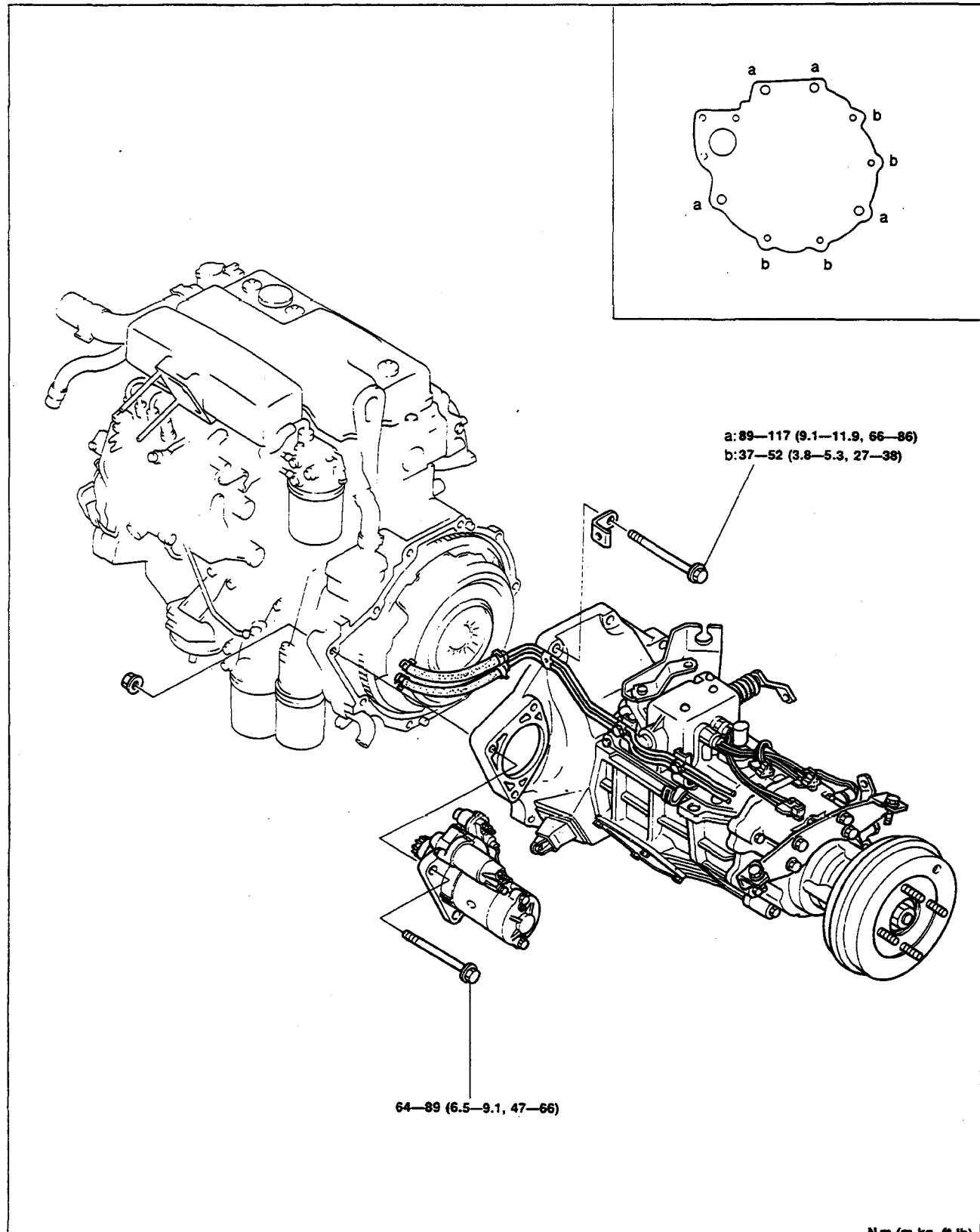
7.8—11 N·m (80—110 cm·kg, 69—95 in-lb)

Air intake hose

1. Install the air intake pipe and hose.

B**INSTALLATION****TF Engine****Step 1**

1. Assemble the engine and transmission.

Torque Specifications

N·m (m·kg, ft·lb)

9TG0B2-431

INSTALLATION

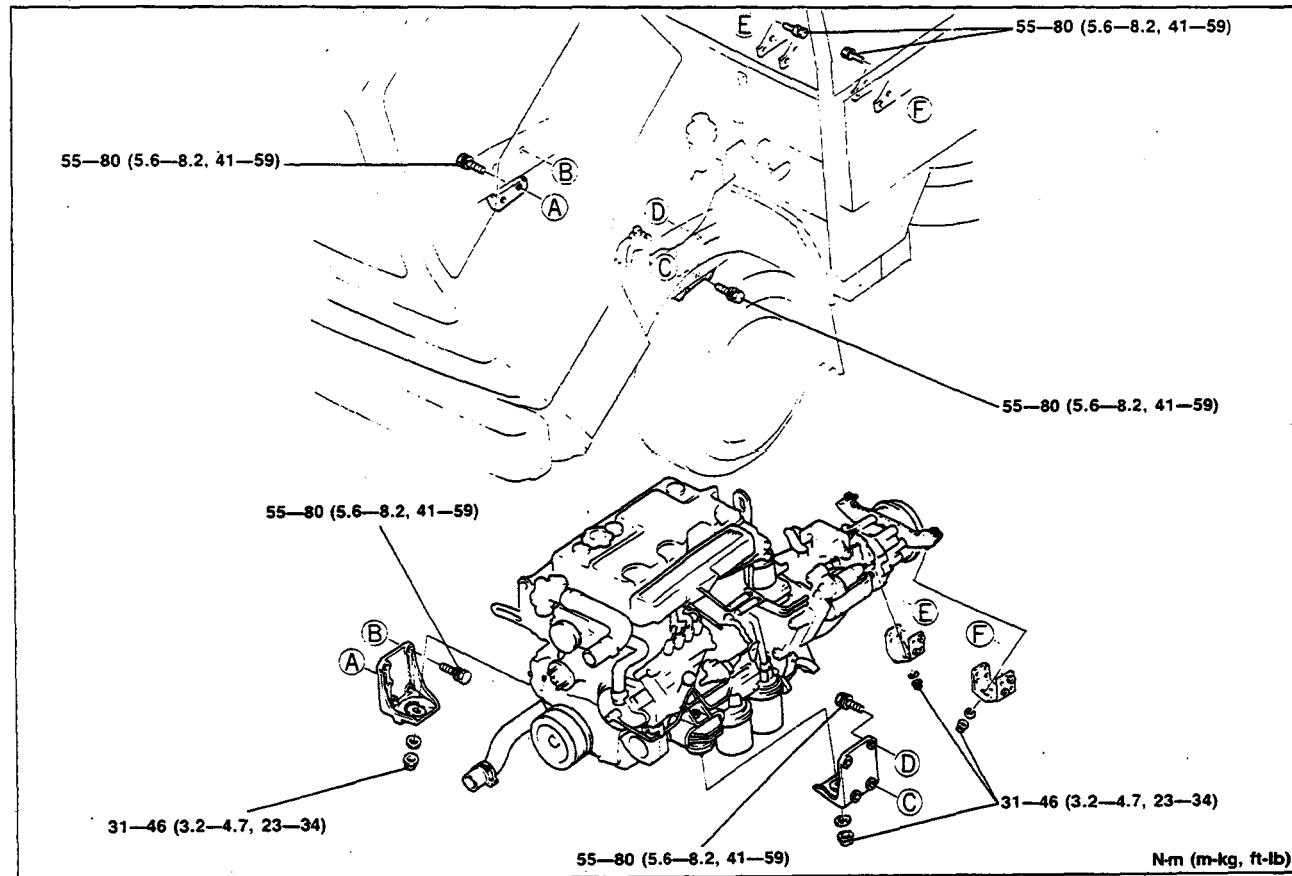
B

Step 2

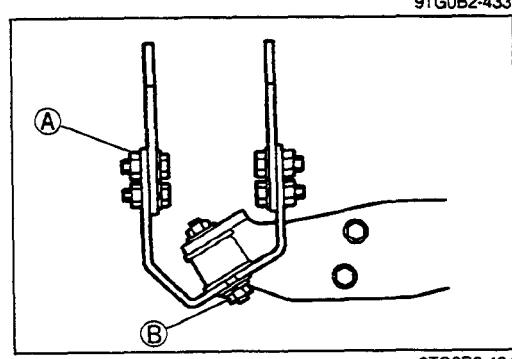
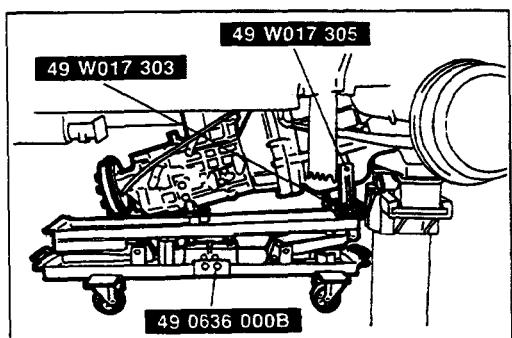
Warning

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

Torque Specifications



9TG0B2-432



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.

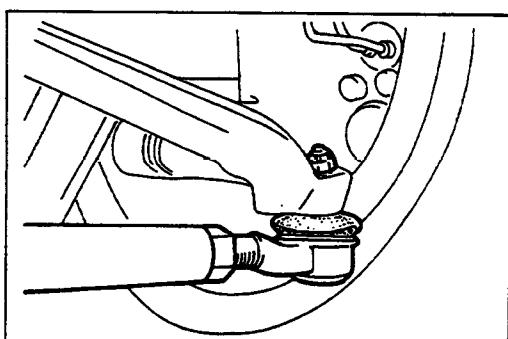
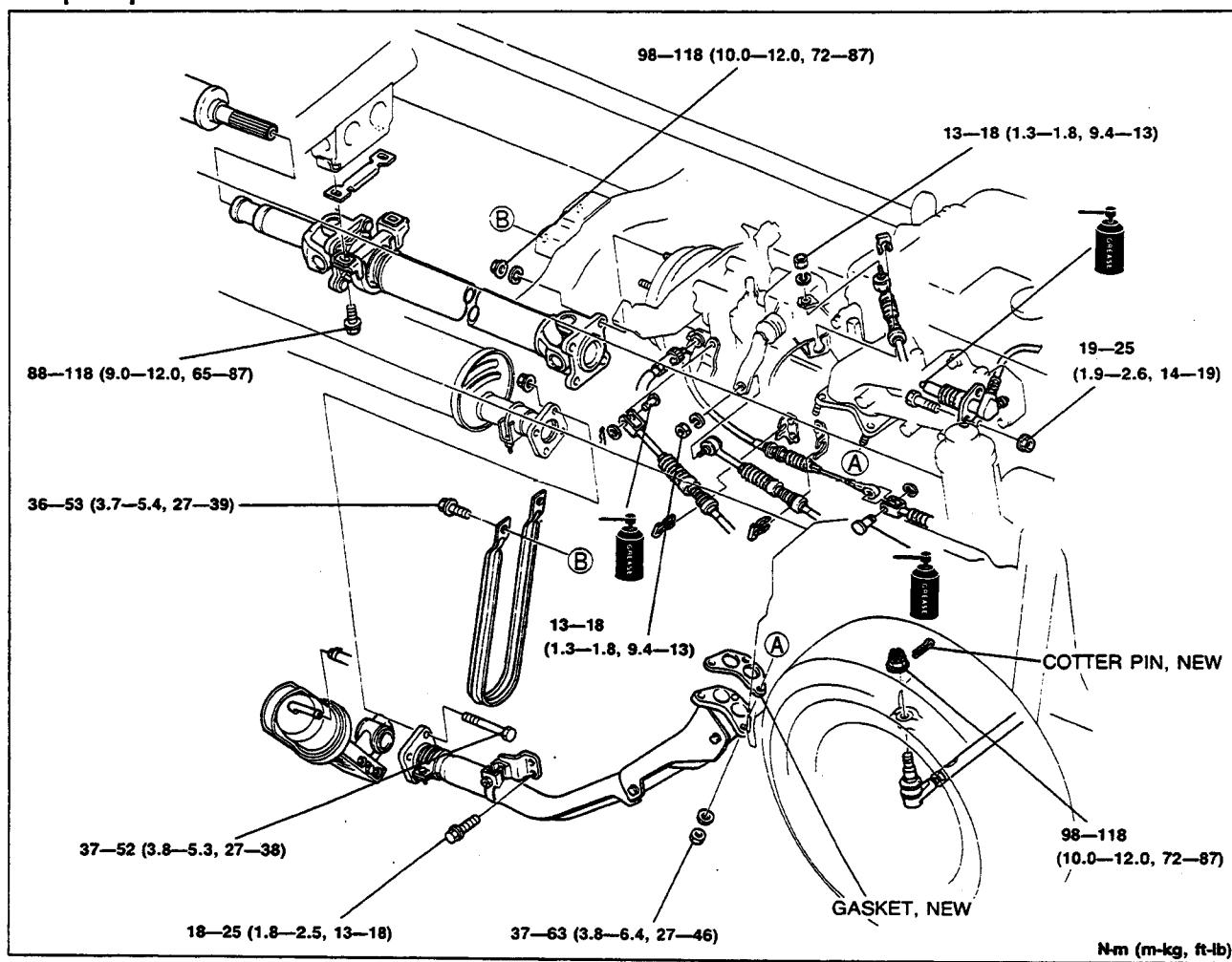
Tightening torque

(A): 55-80 N·m (5.6-8.2 m-kg, 41-59 ft-lb)
(B): 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)

B**INSTALLATION**
Step 3
Torque Specifications
**Propeller shaft**

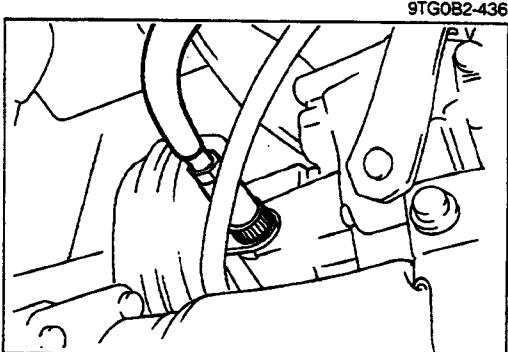
1. Install the propeller shaft. (Refer to Section L.)

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:

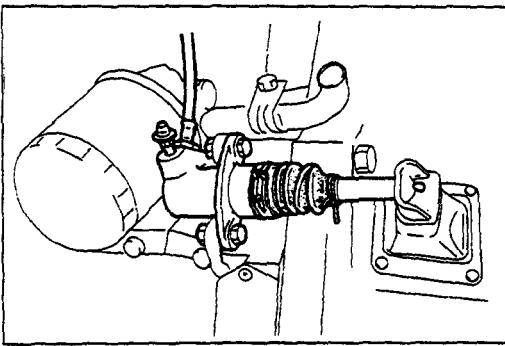
98–118 N·m (10.0–12.0 m·kg, 72–87 ft·lb)

**Speedometer cable**

1. Install the speedometer cable.

INSTALLATION

B

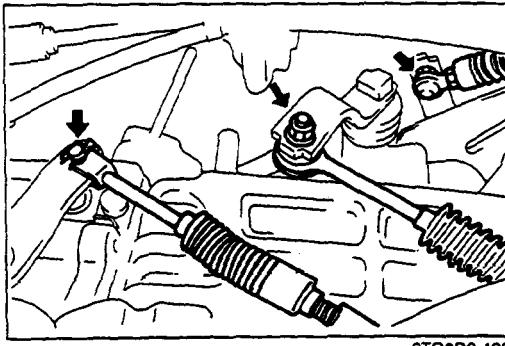


Clutch release cylinder

1. Install the clutch release cylinder.

Tightening torque:

19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



Sub-select cable

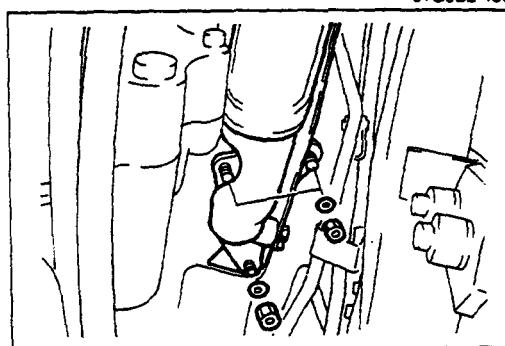
1. Install the sub-select cable. (Refer to Section J.)

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.

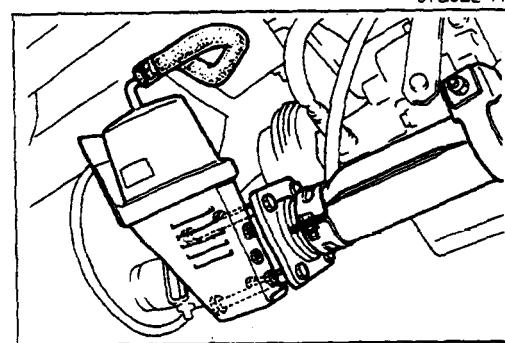
Tightening torque:

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)

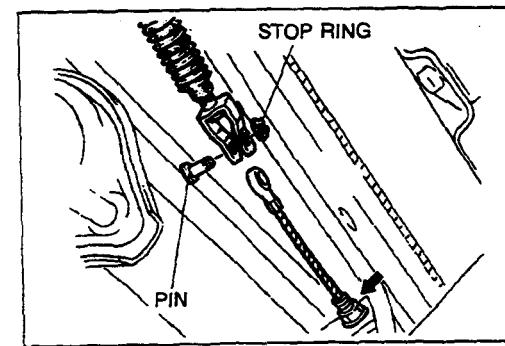


Exhaust shutter valve

1. Install the exhaust shutter valve.

Tightening torque:

37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)



Parking brake cable

1. Mount the parking brake rear cable to the vehicle frame.

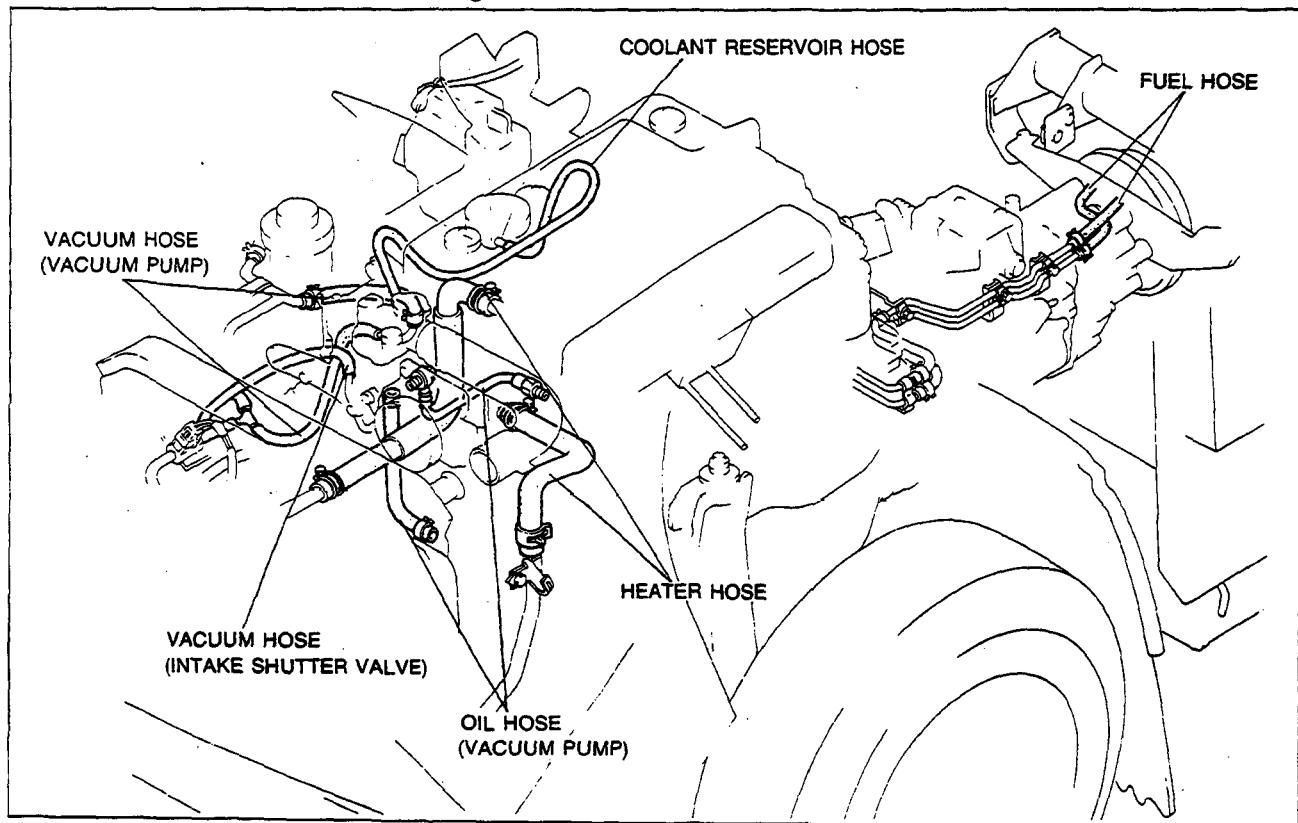
Tightening torque:

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.

B**INSTALLATION****Step 4**

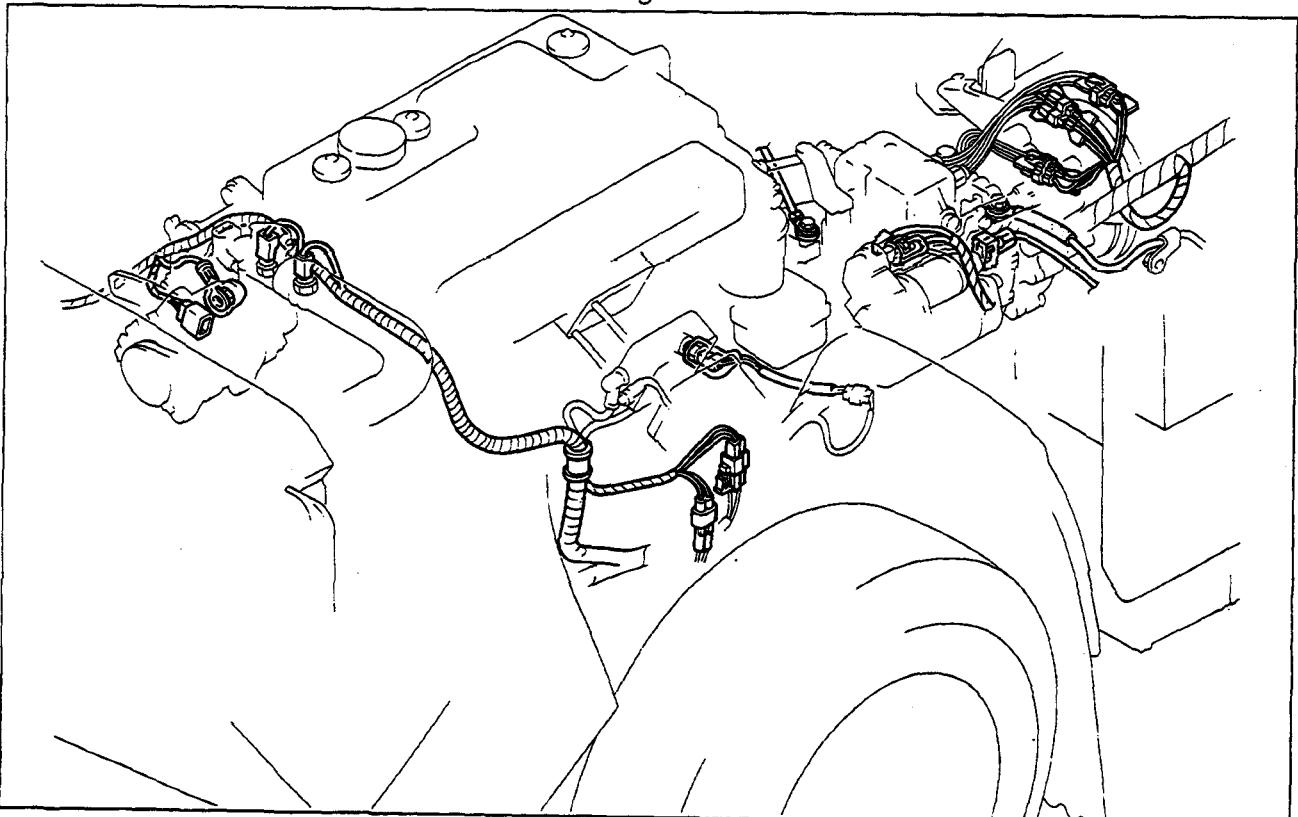
1. Connect the hoses shown in the figure.



9TG0B2-442

Step 5

1. Connect the harness connectors shown in the figure.



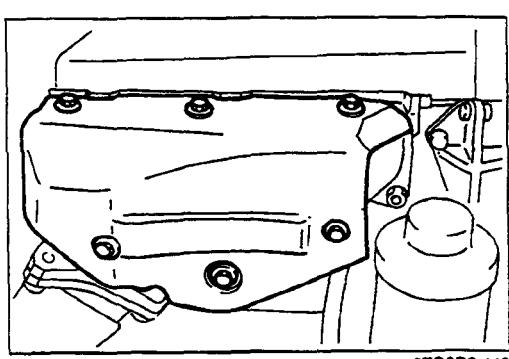
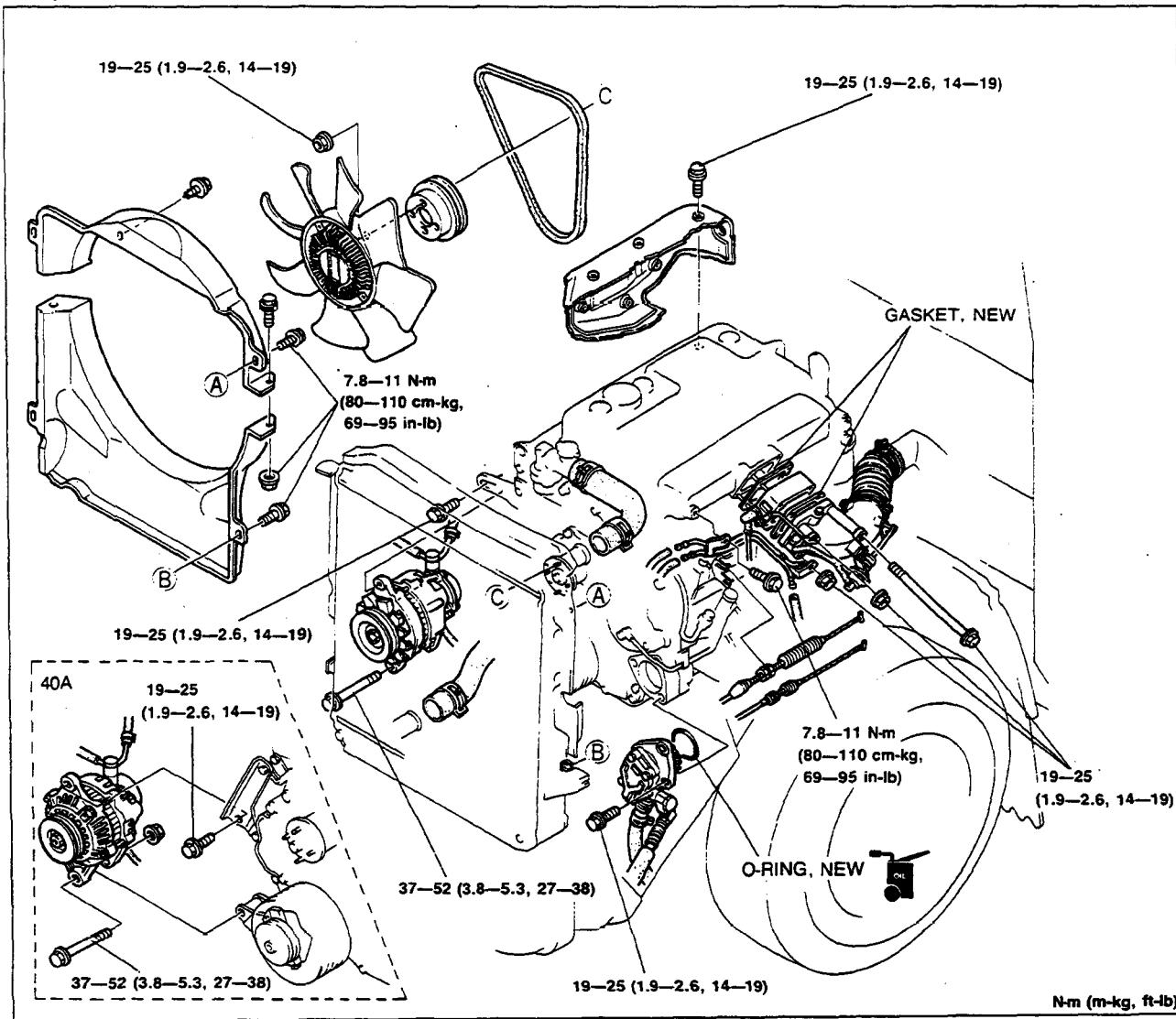
9TG0B2-443

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

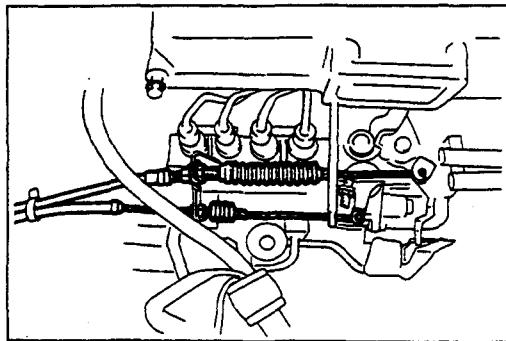
**Exhaust manifold insulator**

1. Install the exhaust manifold insulator.

Tightening torque:

19-25 N·m (1.9-2.6 m·kg, 14-19 ft·lb)

B INSTALLATION



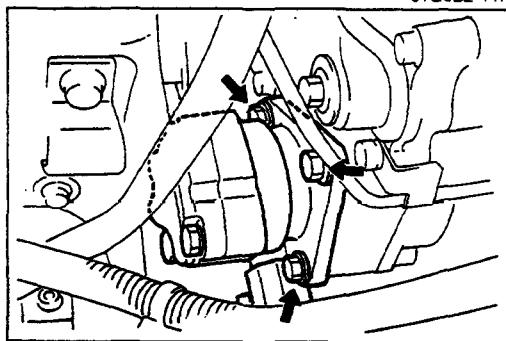
Fuel stop cable

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)

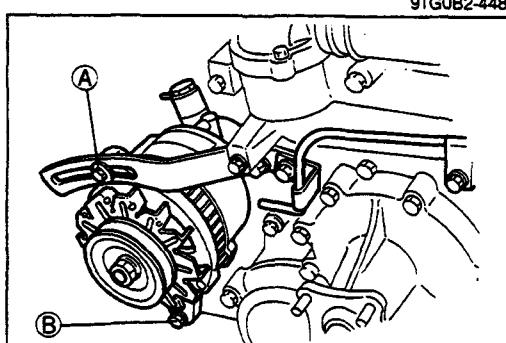


P/S oil pump

1. Install the P/S oil pump and new O-ring.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft-lb)



Alternator

1. Install the alternator strap.

Tightening torque:

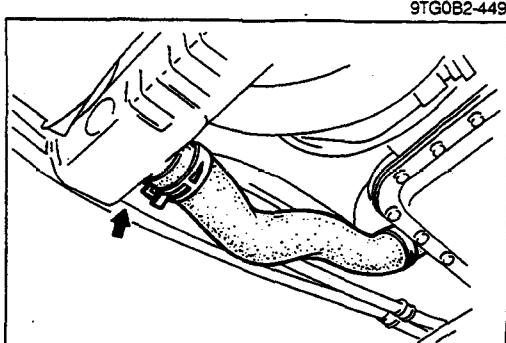
19—25 N·m (1.9—2.6 m·kg, 14—19 ft-lb)

2. Install the alternator.

Tightening torque

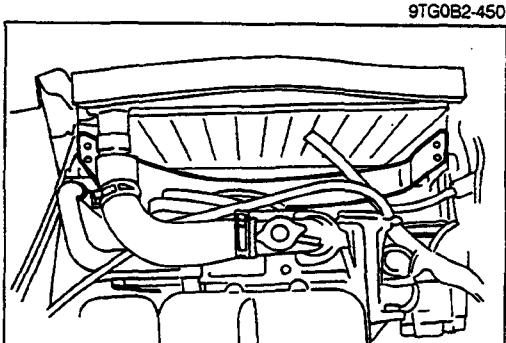
(A): 19—25 N·m (1.9—2.6 m·kg, 14—19 ft-lb)

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



Radiator hose, lower

1. Connect the lower radiator hose.



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.

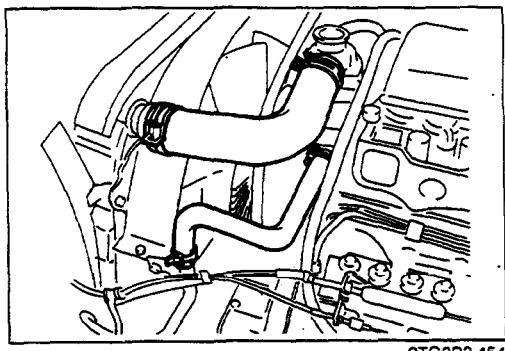
Cooling fan

1. Install the cooling fan.

Tightening torque:

19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)

9TG0B2-452

**Radiator cowling, upper**

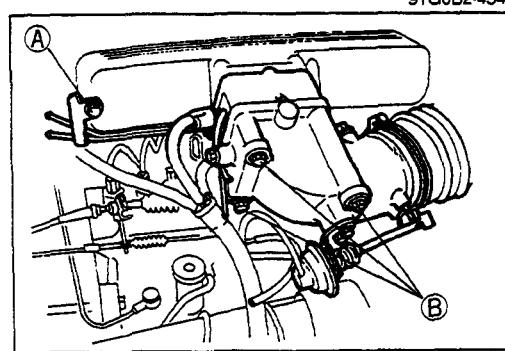
1. Install the upper radiator cowling.

Tightening torque:

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

Radiator hose, upper

1. Connect the upper radiator hose.

**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

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

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

3. Connect the vacuum hose.

B INSTALLATION

Steps After Installation

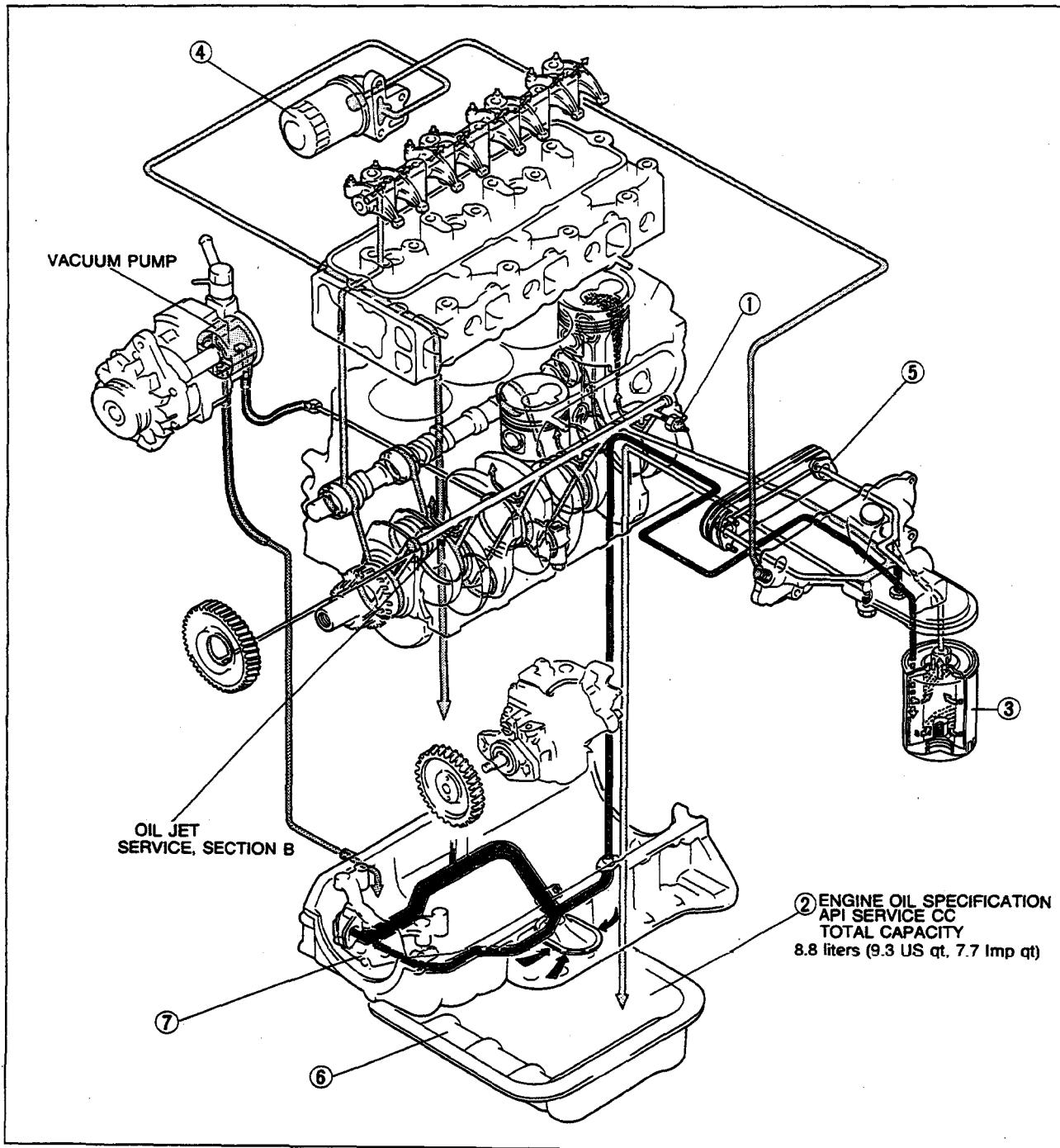
1. Install the undercover.
2. If the engine oil was drained, fill with the specified amount and type of engine oil. (Refer to Section D.)
3. Fill the radiator with the specified amount and type of engine coolant. (Refer to Section E.)
4. If the transmission oil was drained, fill with the specified amount 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.

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LUBRICATION SYSTEM

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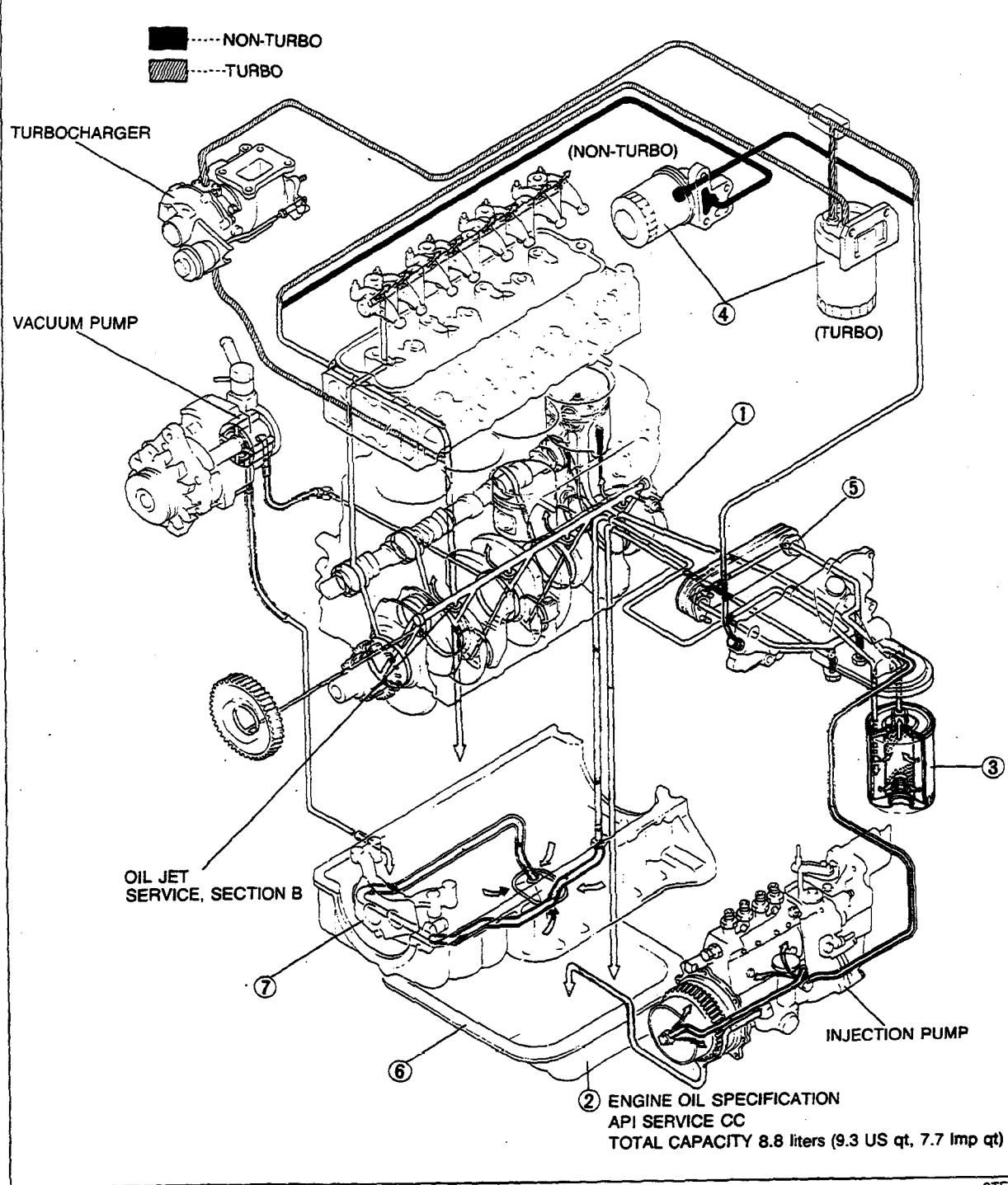
9TF0DX-001

INDEX**HA ENGINE**

9TF0DX-002

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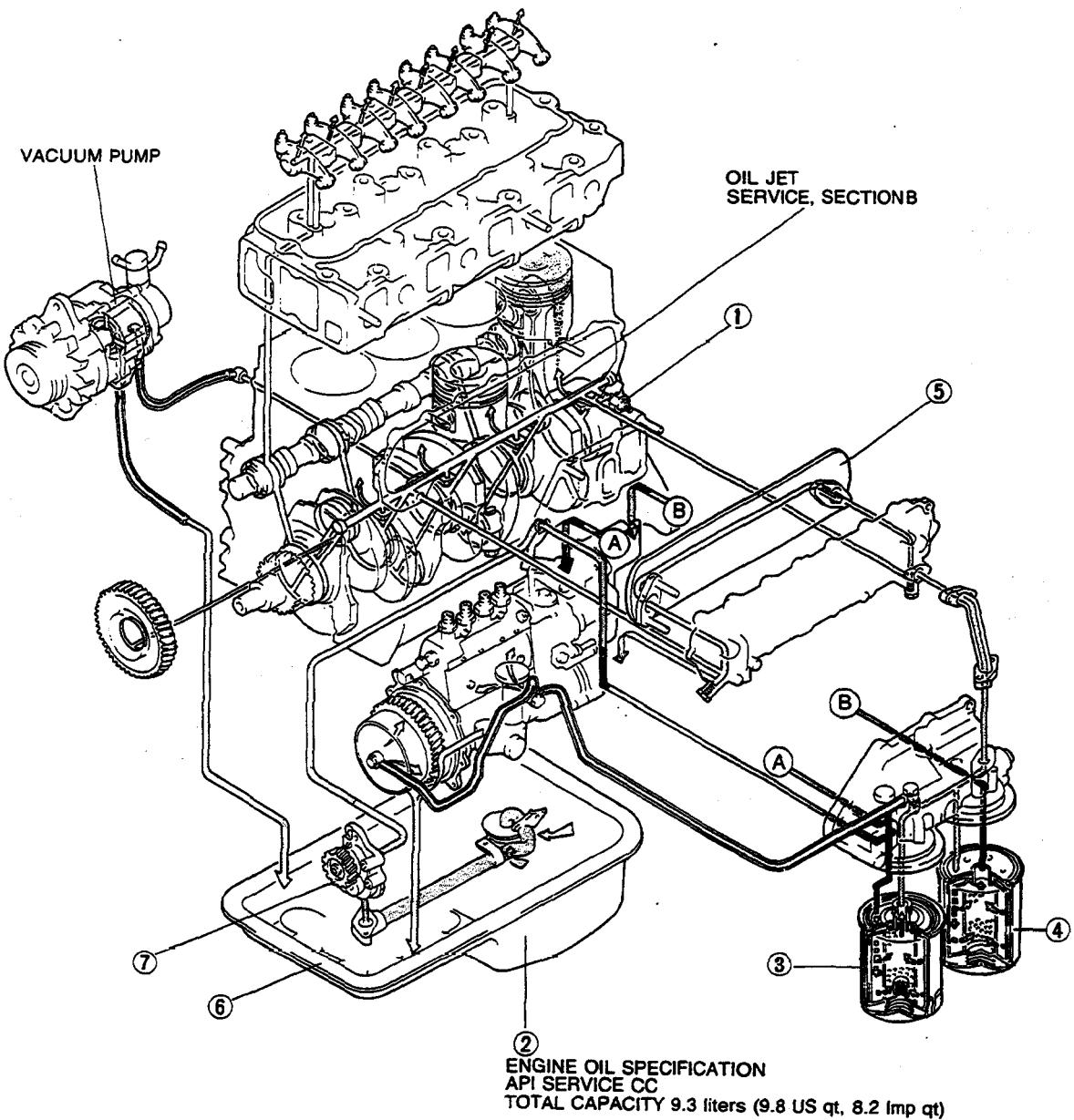
SL ENGINE



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TF ENGINE



9TF0DX-004

- | | | | |
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OUTLINE, TROUBLESHOOTING GUIDE

D

OUTLINE

SPECIFICATIONS

Item	Engine	HA	SL	TF	
Lubrication system	Force-fed type				
Oil pump	Type	Positive displacement gear			
	Regulating pressure kPa (kg/cm ² , psi)	608—667 (6.2—6.8, 88—97)	—	—	
Oil filter	Type	Full-flow, paper element			
	Relief pressure differential kPa (kg/cm ² , psi)	78—118 (0.8—1.2, 11—17)			
	Regulating pressure kPa (kg/cm ² , 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)			
	Oil pan liters (US qt, Imp qt)	6.5 (6.9, 5.7)			
	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

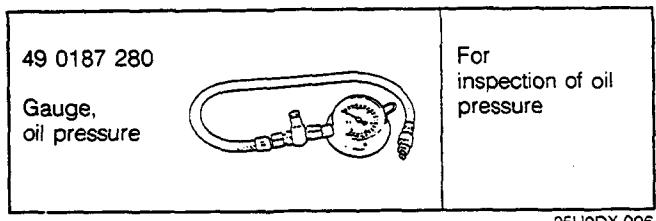
9TF0DX-005

D

OIL PRESSURE

OIL PRESSURE

PREPARATION SST



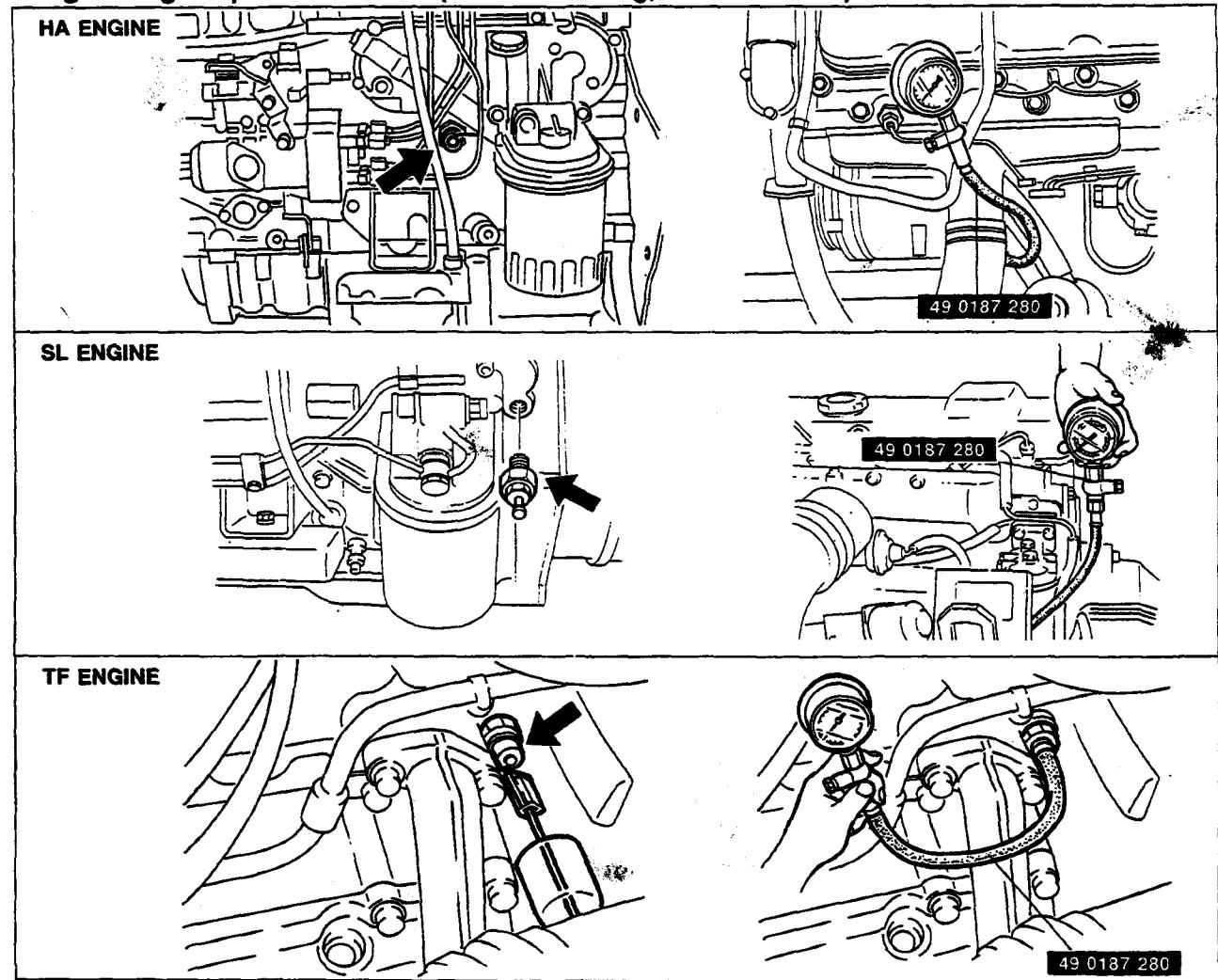
INSPECTION

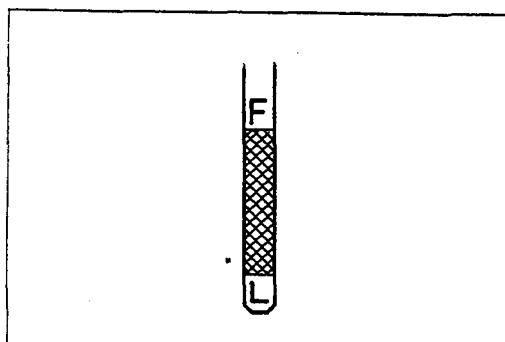
1. Remove the oil pressure switch.
2. Screw the **SST** into the oil pressure switch installation hole.
3. Warm up the engine to normal operating temperature.
4. Run the engine at **3,600 rpm**, and note the gauge reading.

Oil pressure: 373 kPa (3.8 kg/cm², 54 psi) min.

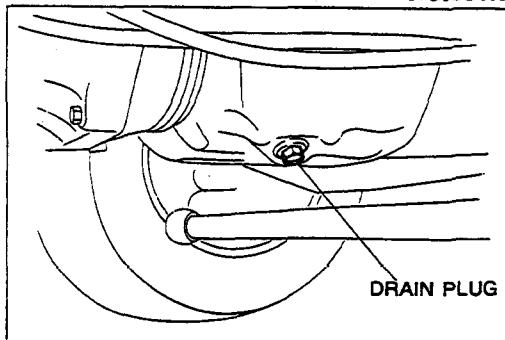
5. If the pressure is not as specified, check for the cause and repair. (Refer to Troubleshooting Guide.)
6. Remove the **SST** and install the oil pressure switch.

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

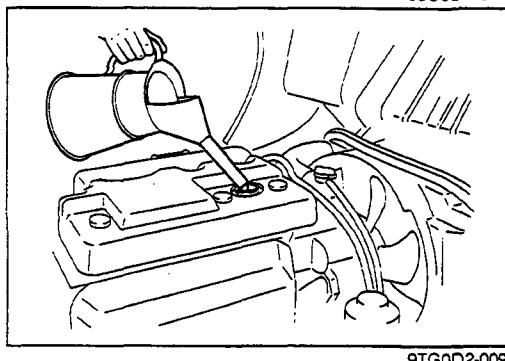




9TG0D2-008



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9TGOD2-009

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)

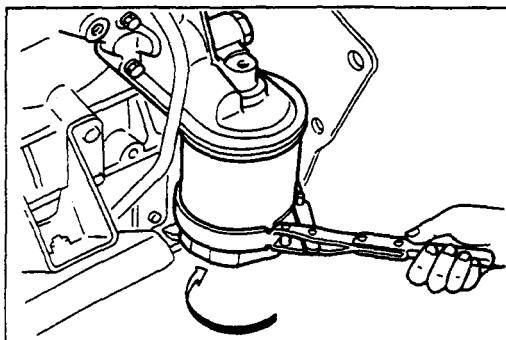
TF: 7.0 liters (7.4 US qt, 6.2 Imp qt)

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

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

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

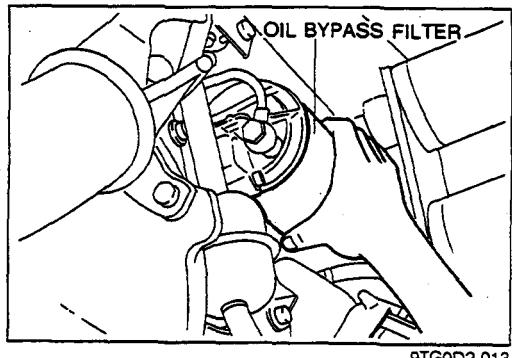


OIL FILTER

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)



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

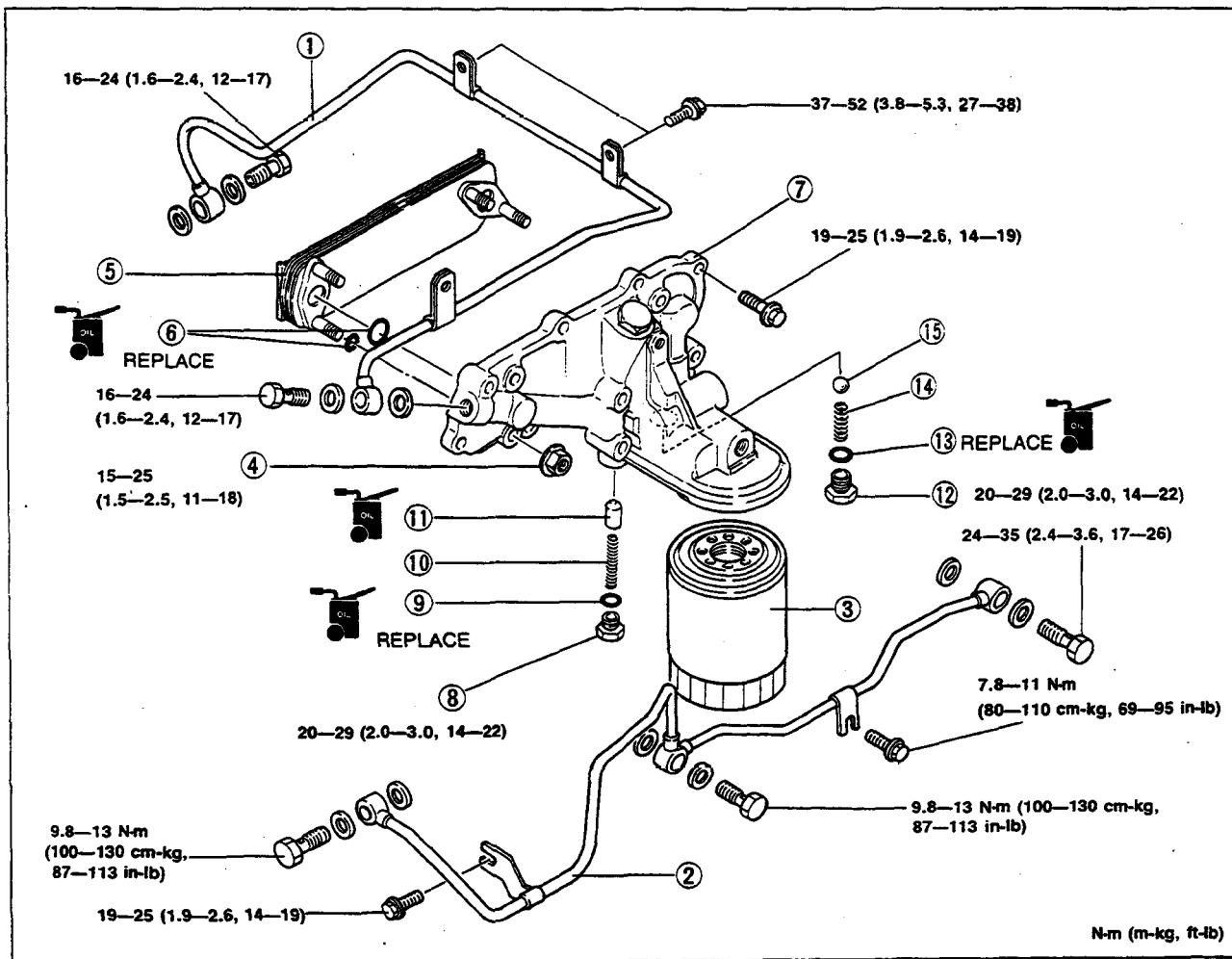
1. Disconnect the negative battery cable.
2. Drain the engine oil.
3. Drain the engine coolant.
4. Remove in the order shown in the figure.
5. Install in the reverse order of removal.

Steps After Installation

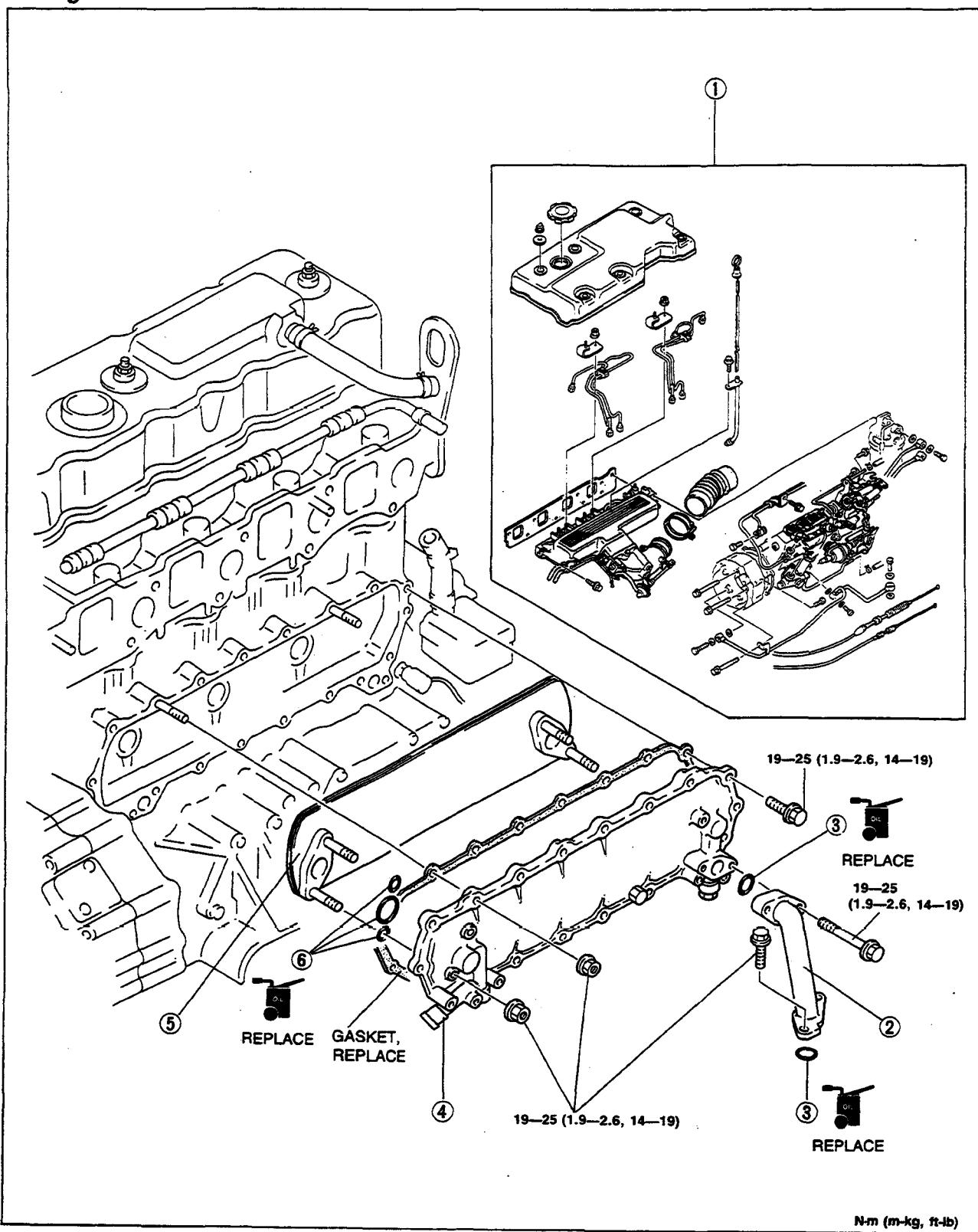
1. Fill the radiator with the specified amount and type of engine coolant. (Refer to Section E.)
2. Fill with the specified amount and type of engine oil. (Refer to page D-7.)
3. Connect the negative battery cable.
4. Start the engine and check for leaks.
5. Check the engine oil and engine coolant levels.

9TF0DX-007

HA, SL Engine



1. Oil pipe (Oil bypass filter)
2. Oil pipe (Fuel injection pump)
3. Oil filter
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

D**OIL COOLER****TF Engine**

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

N·m (m·kg, ft·lb)

9TG0D2-017

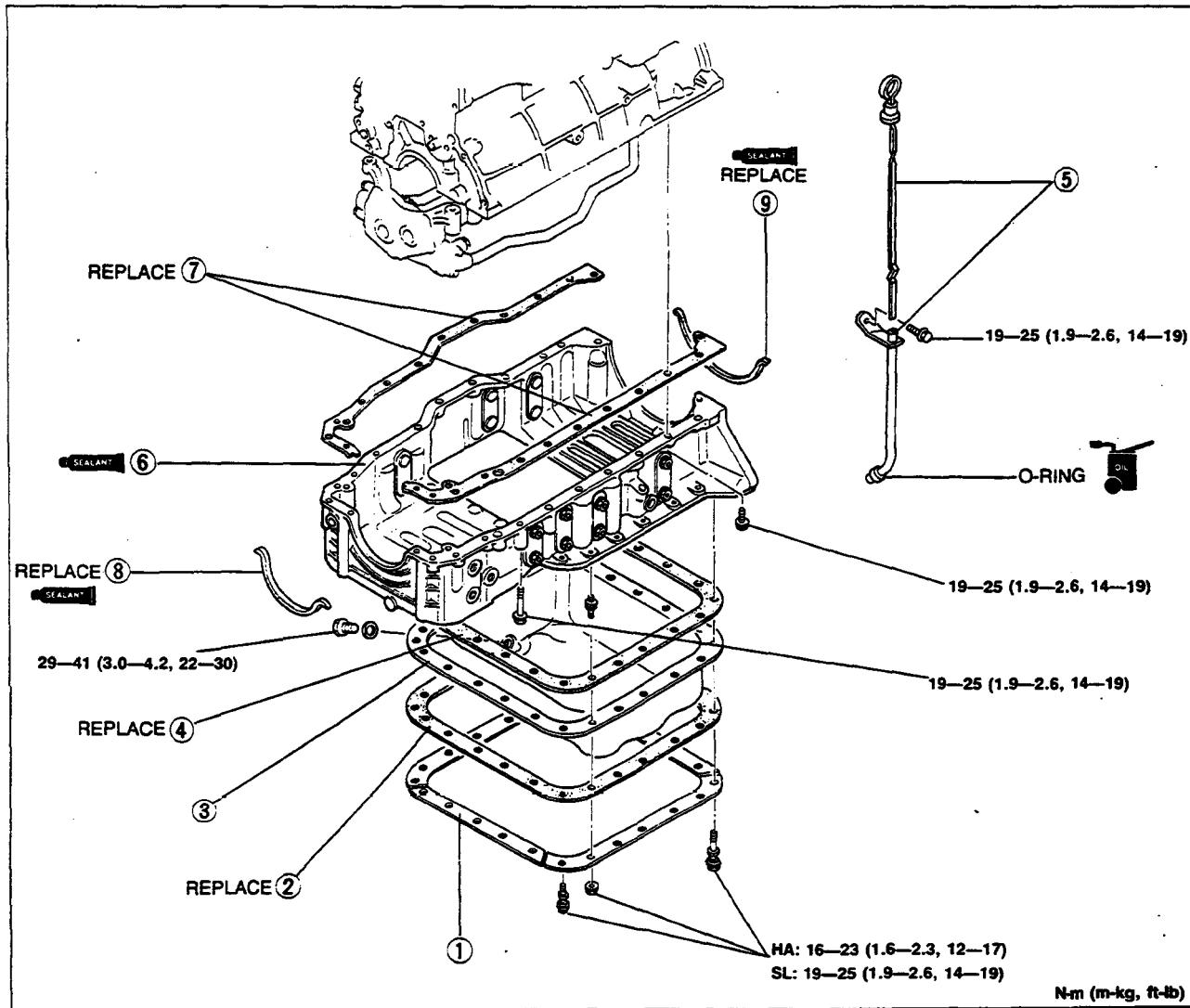
OIL PAN**REMOVAL / INSTALLATION**

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-005

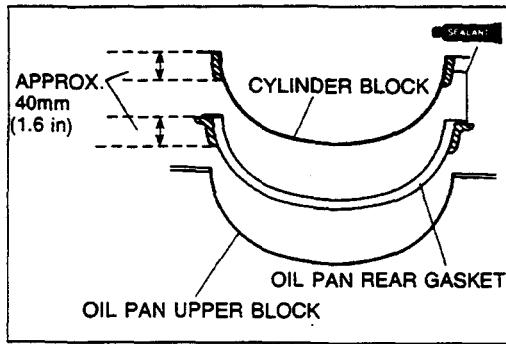
HA, SL Engine

N·m (m·kg, ft·lb)

9TF0DX-010

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

OIL PAN



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.

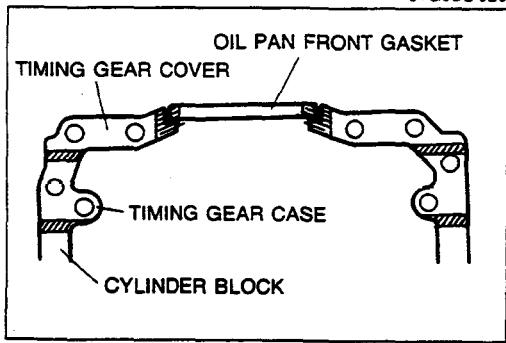
1. Apply silicone sealant to the shaded areas of the new oil pan rear gasket.
2. Install the oil pan rear gasket to the oil pan upper block.

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:

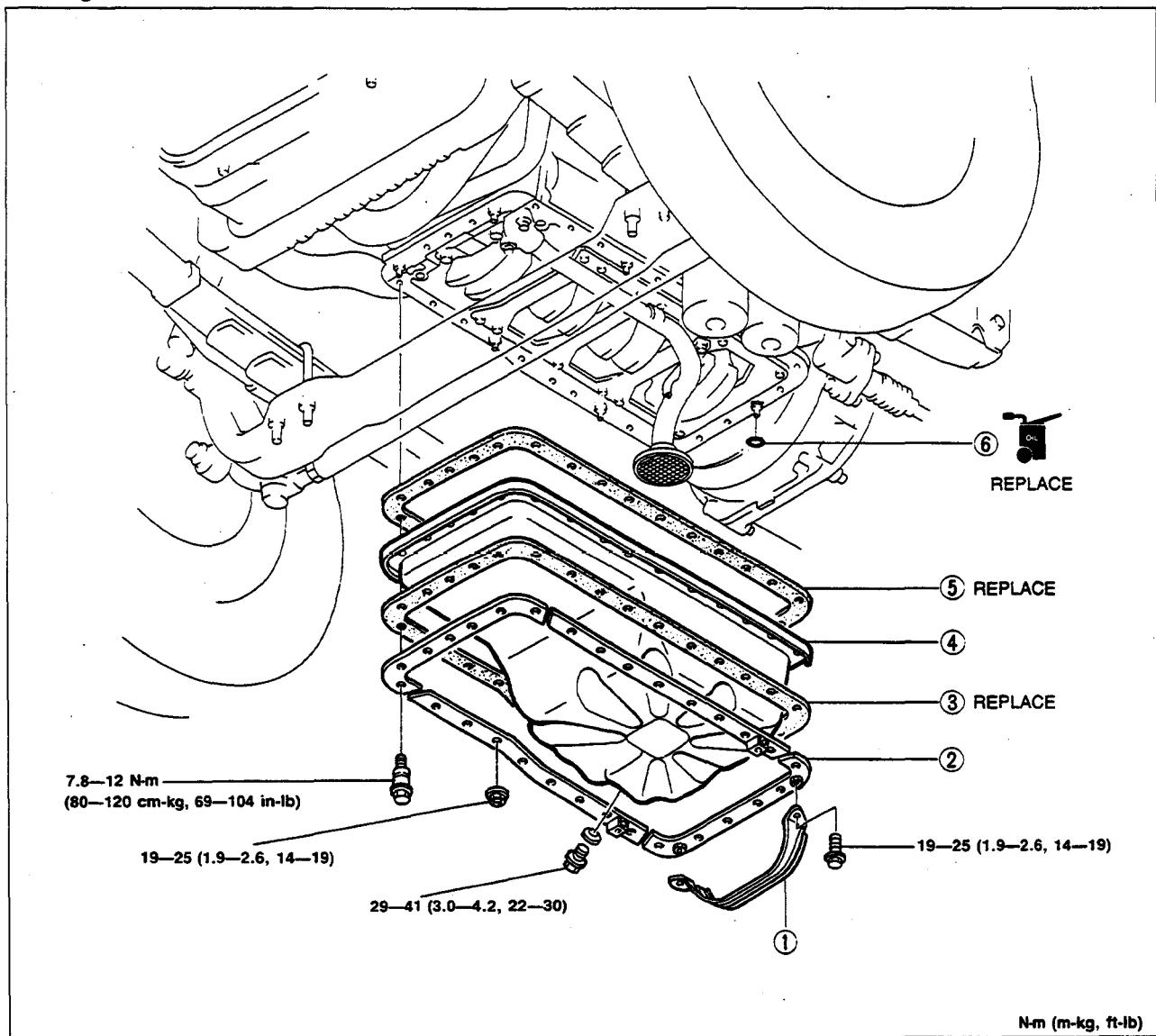
19—25 N·m (1.9—2.6 m-kg, 14—19 ft-lb)



OIL PAN

D

TF Engine



N·m (m·kg, ft·lb)

9TF0DX-011

1. Seal plate

2. Stiffener

3. Rubber gasket

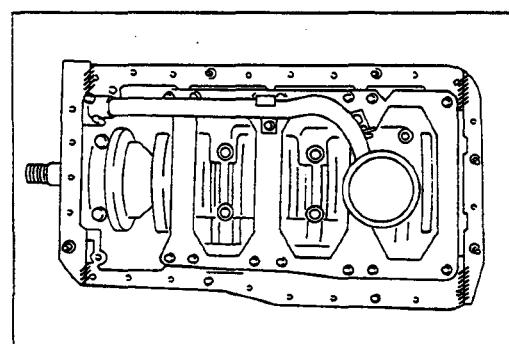
4. Oil pan

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.

- Apply silicone sealant to the shaded areas of the cylinder block.
- 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.
- If the fan touches the cowling, adjust the radiator cowling mounting position.

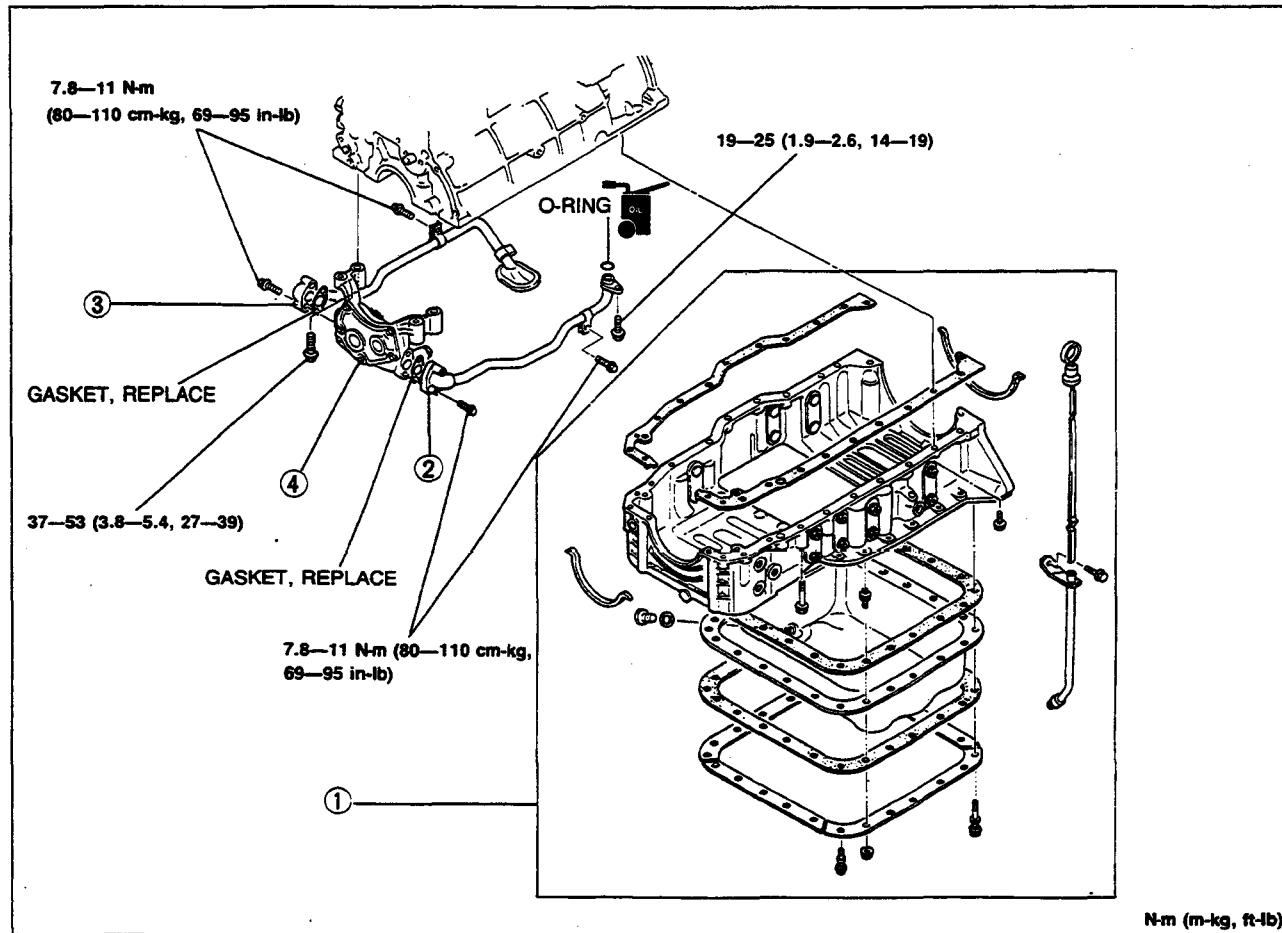
1. Disconnect the negative battery cable.
2. Drain the engine oil.
3. Remove in the order shown in the figure, referring to **Removal Note**.
4. Install in the reverse order of removal, referring to **Installation Note**.

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

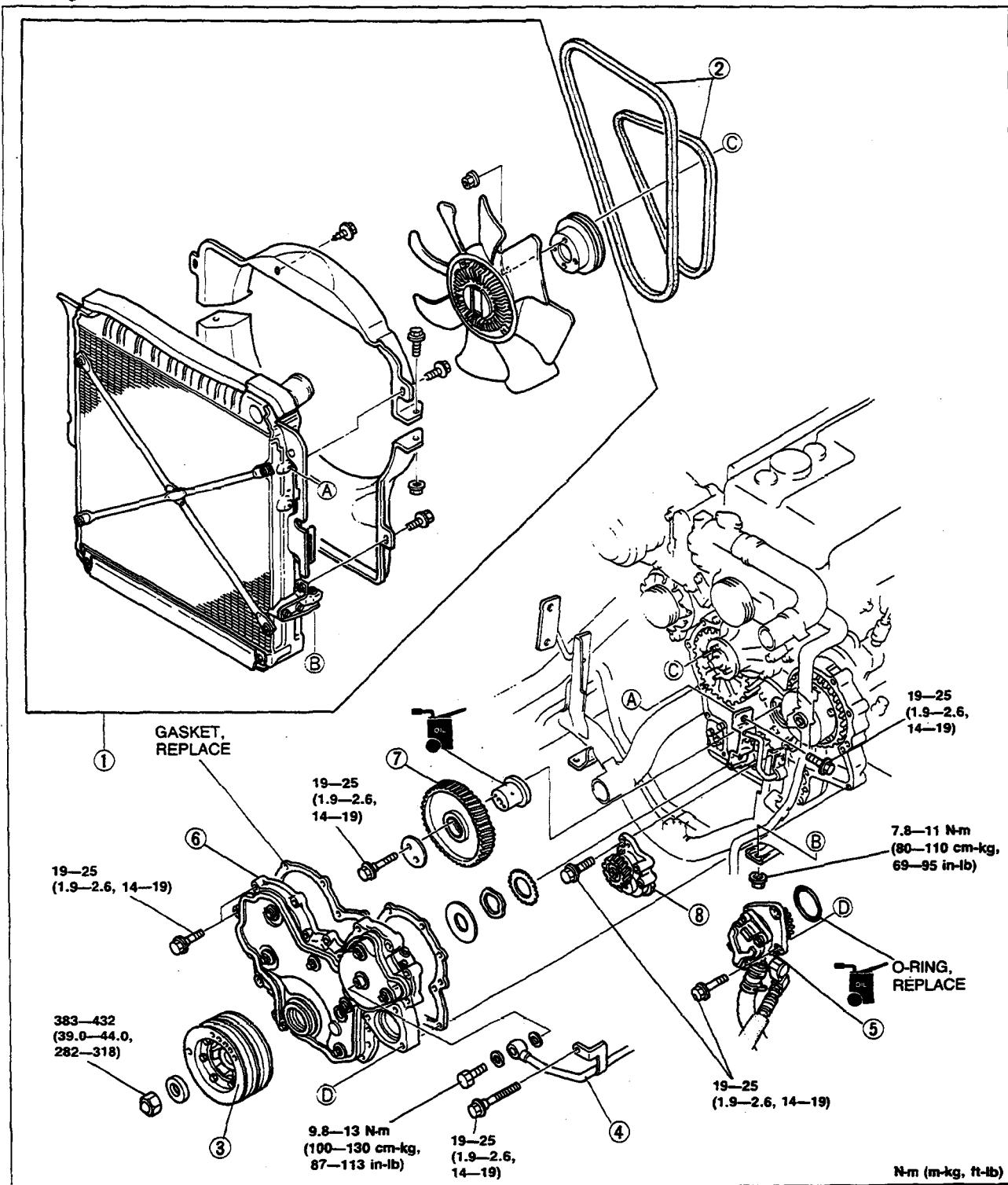


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Removal / Installation..... page D-11
2. Oil pipe
3. Oil strainer
4. Oil pump
Disassembly / Inspection / Assembly..... page D-17

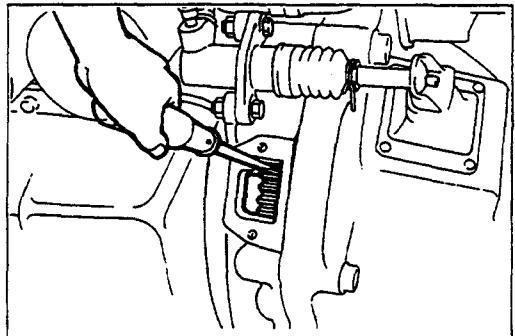
OIL PUMP

D

TF Engine



- | | | |
|--|-----------|---|
| 1. Radiator
Service | Section E | 4. Oil pipe (Fuel injection pump) |
| 2. Drive belt
Adjustment | Section B | 5. P/S oil pump |
| 3. Crankshaft pulley
Removal Note | page D-16 | 6. Timing gear cover |
| Installation Note..... | page D-16 | 7. Idler gear |
| | | 8. Oil pump |
| | | Disassembly / Inspection /
Assembly..... |
| | | page D-17 |

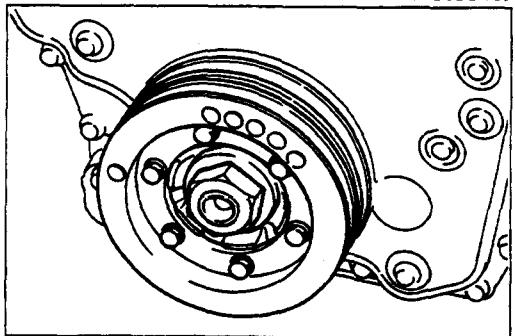


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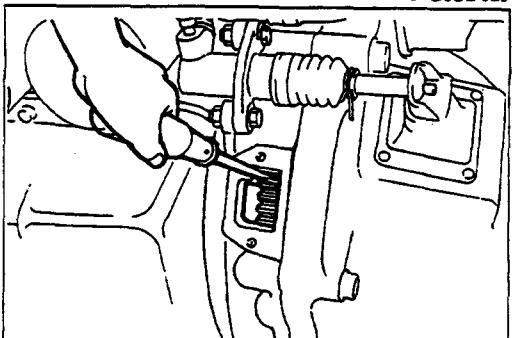
**Removal Note
Crankshaft pulley****Caution**

- 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.



9TG0D2-029



9TG0D2-030

**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.

OIL PUMP

D

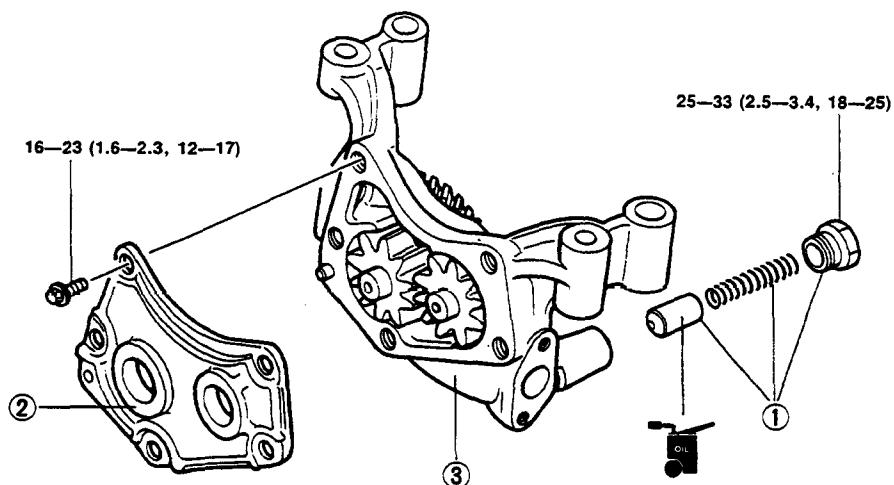
DISASSEMBLY / INSPECTION / ASSEMBLY

Caution

- If a problem is found, replace the pump as a unit.

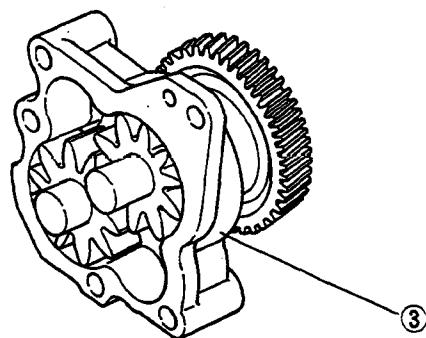
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Assemble in the reverse order of disassembly, referring to **Assembly Note**.

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

OIL PUMP

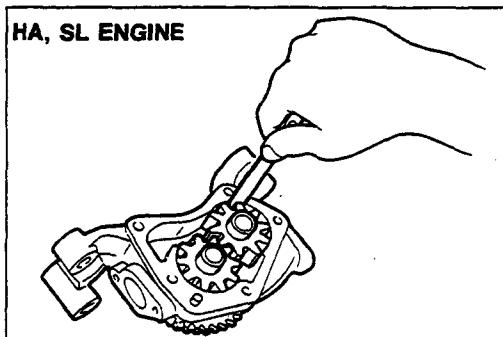
INSPECTION
Rotor Clearance

- Measure the rotor to pump body clearance.

Clearance

Standard : 0.10—0.19mm (0.0039—0.0075 in)

Maximum: 0.20mm (0.0079 in)



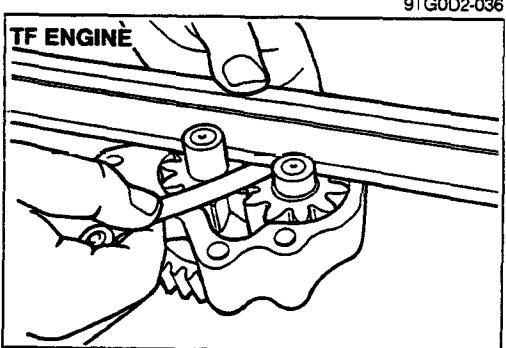
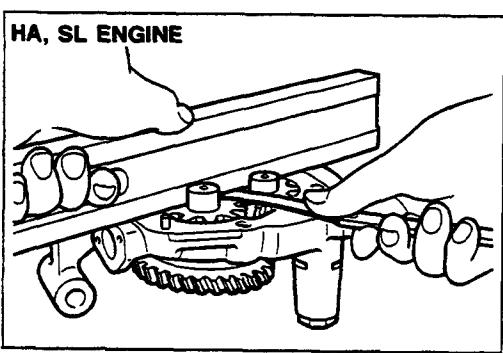
- Measure the side clearance (between the rotor and the edge of the pump body).

Clearance

Standard : 0.04—0.09mm (0.0016—0.0035 in)

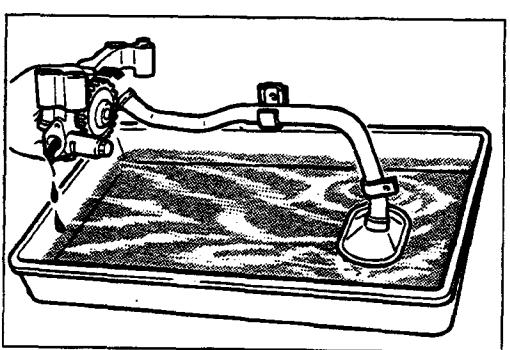
Maximum: 0.15mm (0.0059 in)

- If the clearance exceeds the maximum, replace the oil pump assembly.



Operation Check (HA, SL)

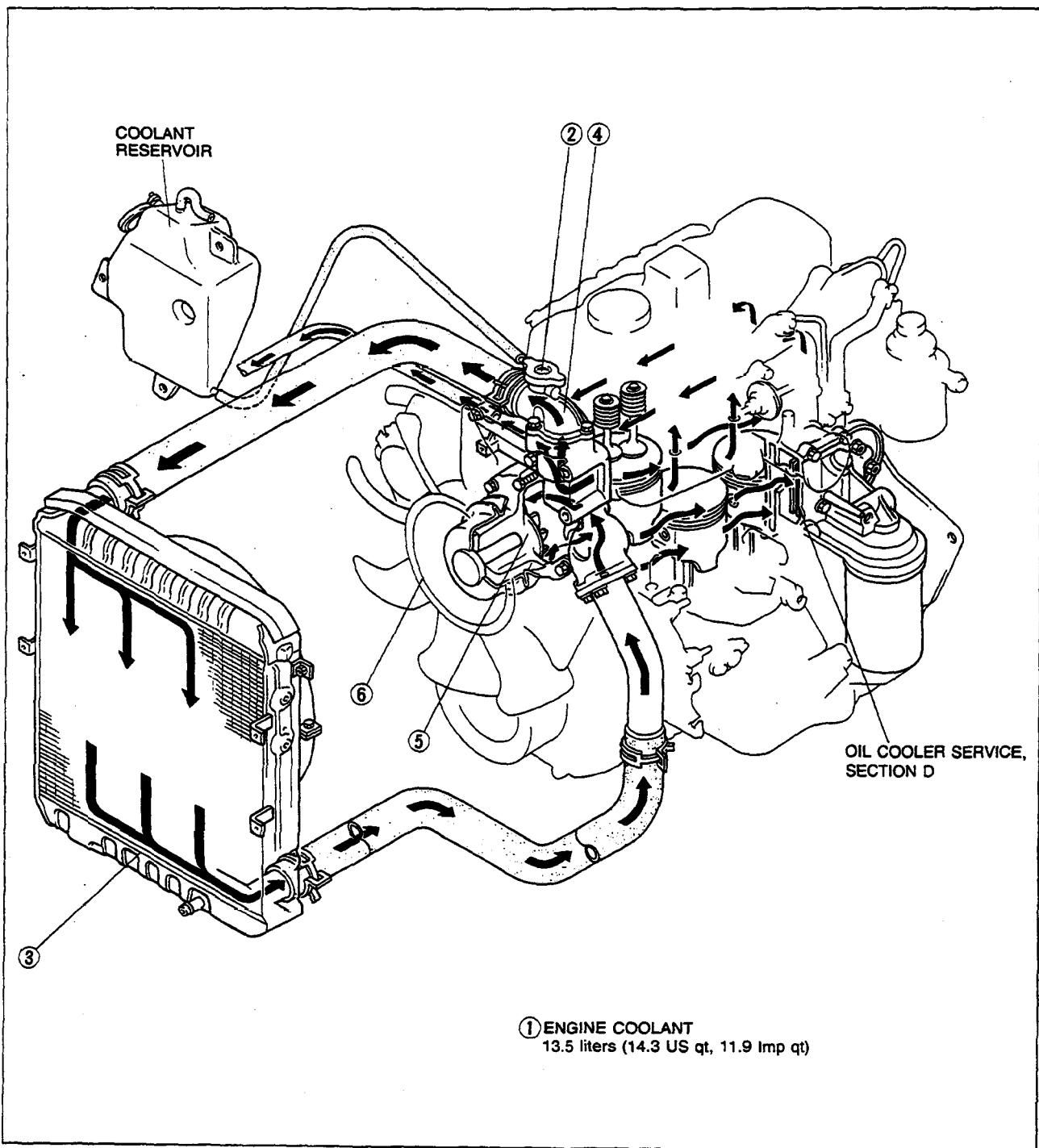
- Install the relief valve to the pump body.
- Install the oil strainer to the pump body.
- Submerge the oil strainer in engine oil as shown in the figure.
- Rotate the oil pump driven gear counterclockwise by hand and verify that engine oil flows.



COOLING SYSTEM

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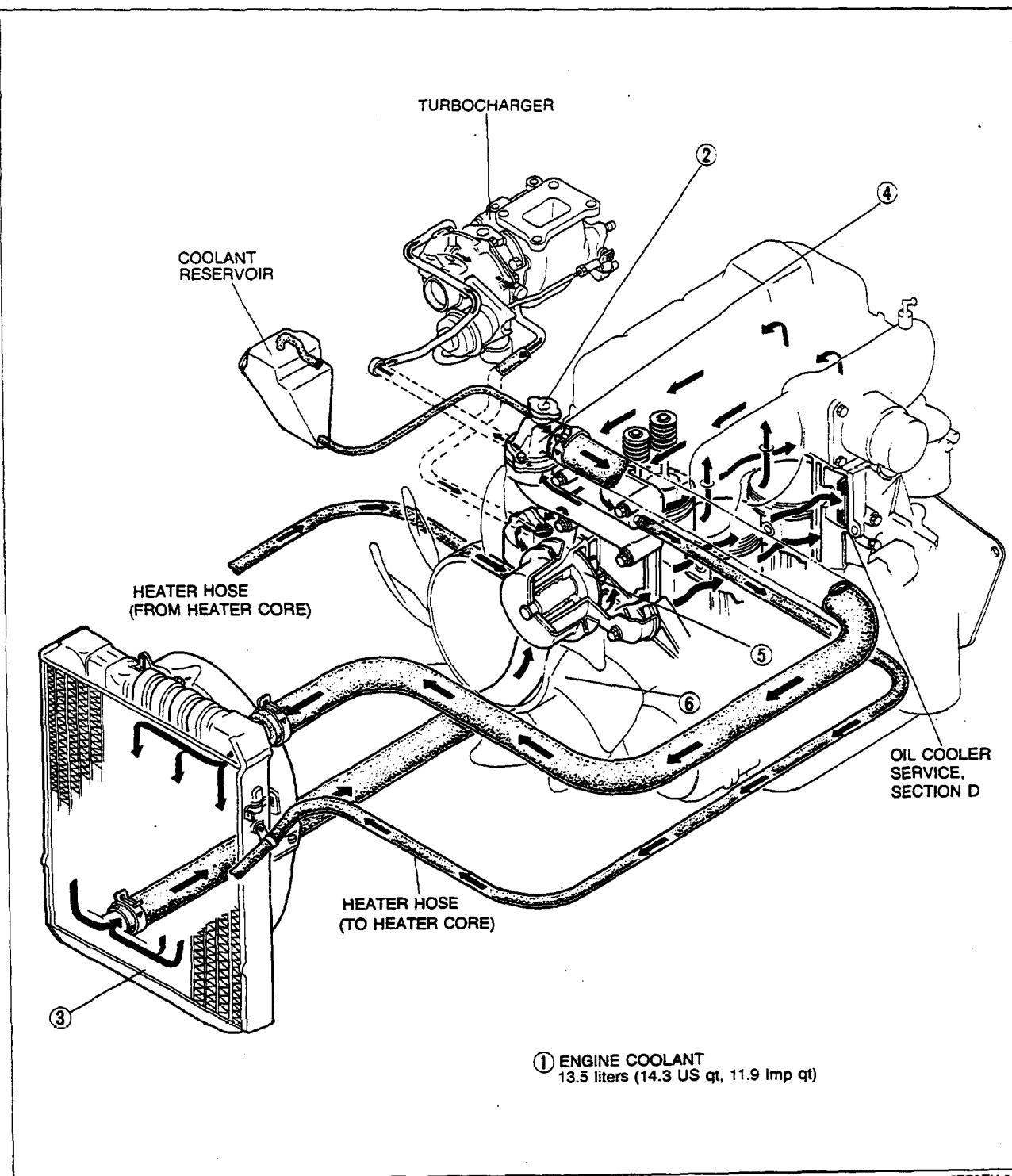
9TFOEX-001

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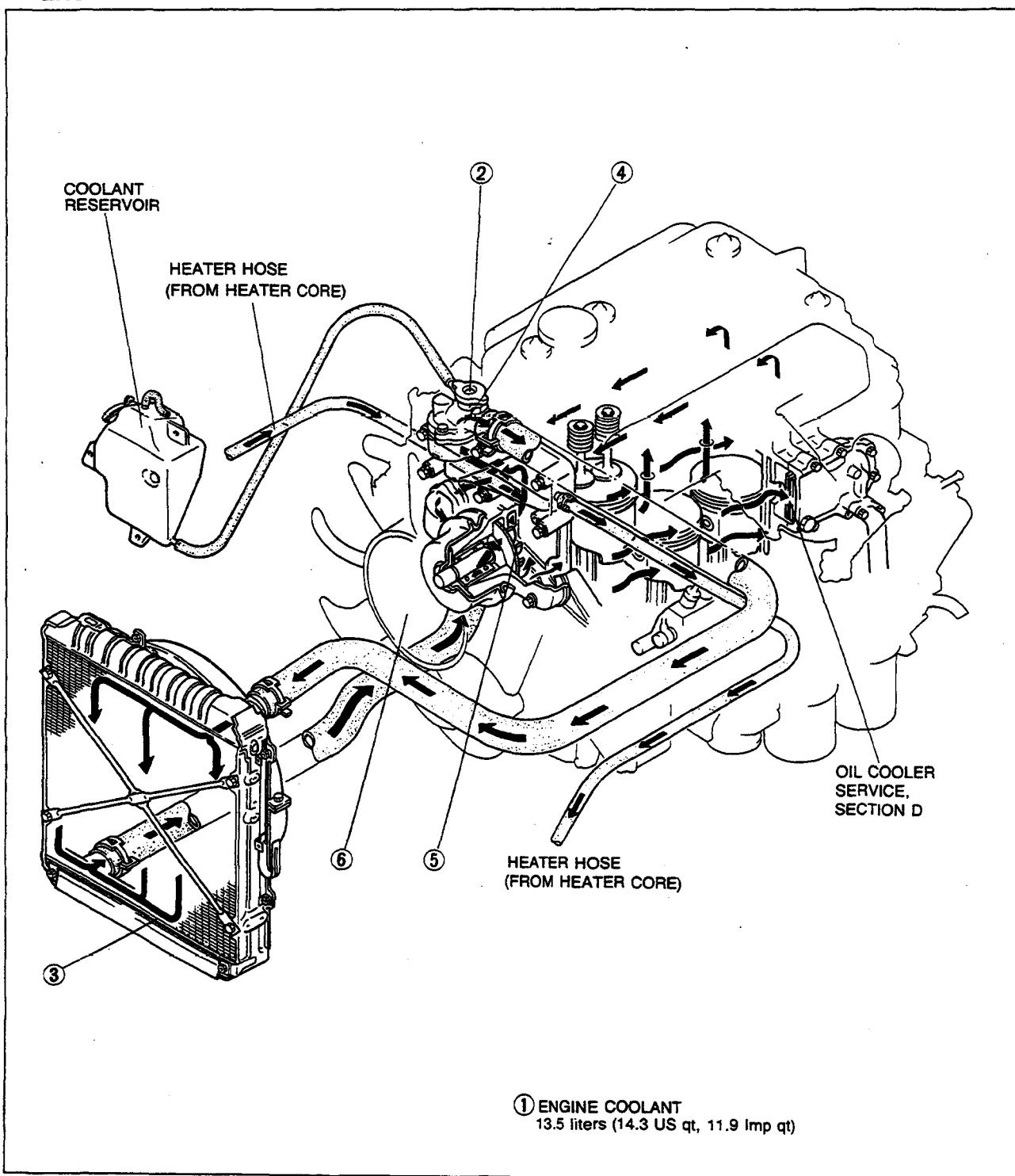
SL ENGINE



9TF0EX-003

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 - Removal / Inspection / Installation..... page E-10
5. Water pump
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TF ENGINE



9TFOEX-004

- | | |
|------------------------------|------------------------------|
| 1. Engine coolant | 4. Thermostat |
| Inspection | Removal / Inspection / |
| Replacement..... | Installation..... |
| 2. Radiator cap | 5. Water pump |
| Inspection | Removal / Installation..... |
| 3. Radiator | 6. Cooling fan |
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OUTLINE, TROUBLESHOOTING GUIDE

E

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)

9TFOEX-005

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Overheating	Coolant level insufficient Coolant leakage Radiator fins clogged Radiator cap malfunction Cooling fan malfunction Thermostat malfunction Water passage clogged Water pump malfunction	Add coolant Repair Clean Replace Replace Replace Clean Replace	E- 7 — E- 9 E- 8 E-12 E-10 E- 7 E-11
Corrosion	Impurities in coolant	Replace	E- 7
Warning buzzer sounds while engine running	Coolant level insufficient Malfunction of coolant level sensor Malfunction of electrical system	Add coolant Refer to Section T Refer to Section T	E- 7

9TFOEX-006

E-5

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
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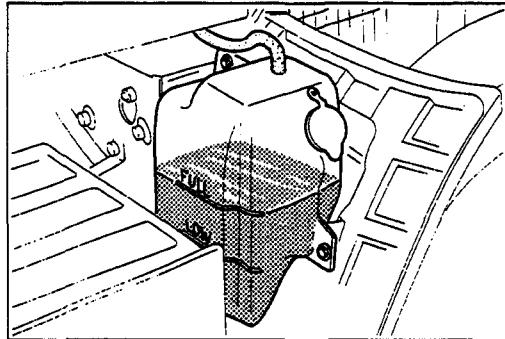
05U0EX-005

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.

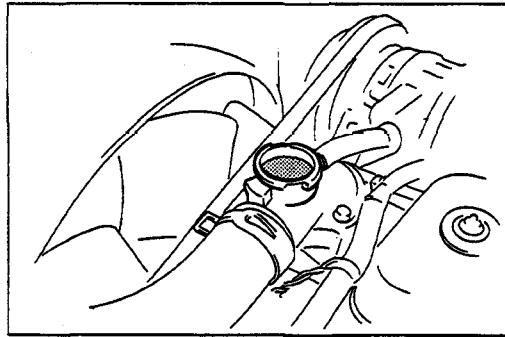
9TG0E2-007



9TG0E2-008

Coolant Level (Engine Cold)

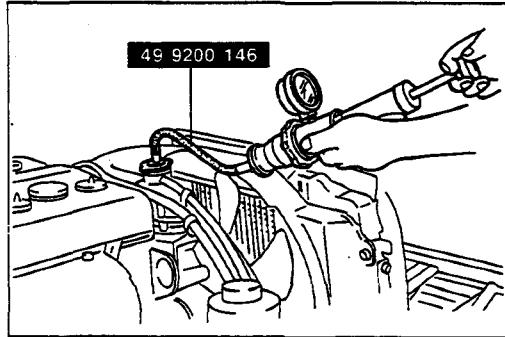
1. Verify that the coolant level is near the coolant inlet port.
2. Verify that the coolant level in the coolant reservoir is between the FULL and LOW marks. Add coolant if necessary.



9TG0E2-009

Coolant Quality

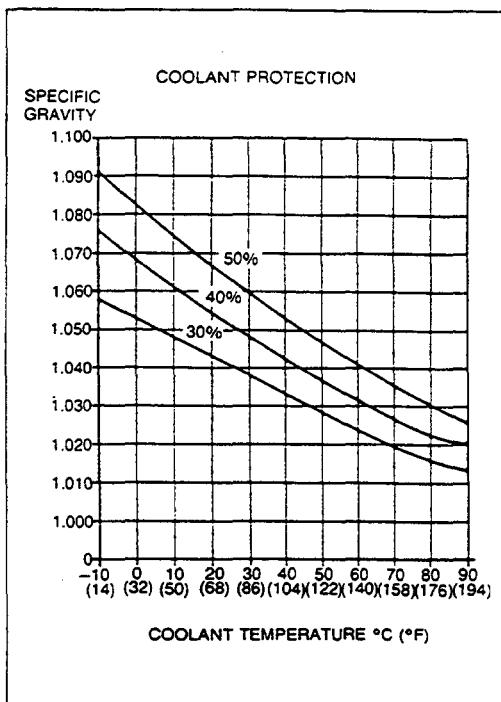
1. Verify that there is no buildup of rust or scale around the radiator cap or coolant inlet port.
2. Verify that coolant is free of oil.
Replace the coolant if necessary.



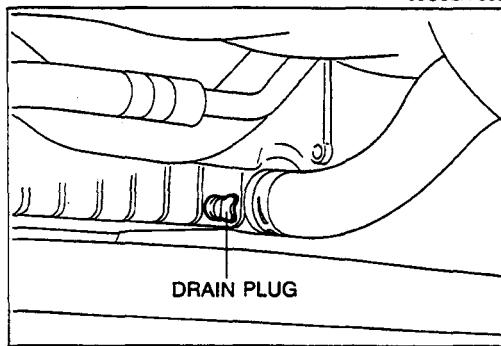
9TG0E2-010

Coolant Leakage

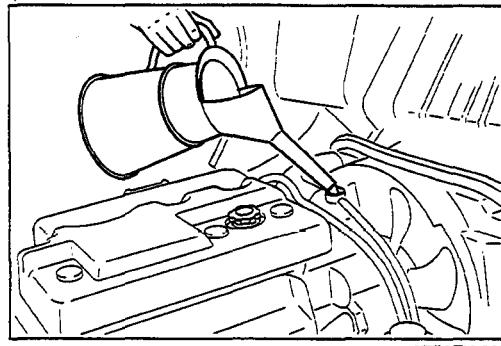
1. Connect a radiator tester (commercially available) and the SST to the coolant inlet port.
2. Apply **88 kPa (0.9 kg/cm², 13 psi)** pressure to the system.
3. Verify that the pressure is held.
If not, check for coolant leakage.



05U0EX-009



9TG0E2-011



9TF0EX-007

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

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.

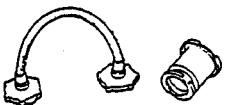
1. Remove the radiator cap and loosen the drain plug.
2. Drain the coolant into a suitable container.
3. Flush the cooling system with water until all traces of color are gone, then let the system drain completely.
4. Install the drain plug.
5. Fill with the proper amount and mixture of ethylene glycol-based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

Coolant capacity:

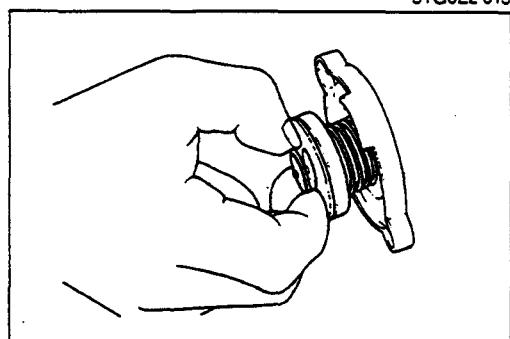
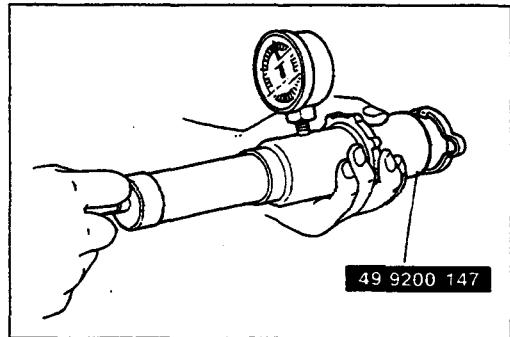
13.5 liters (14.3 US qt, 11.9 Imp qt)

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
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05U0EX-014

**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/cm², 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.

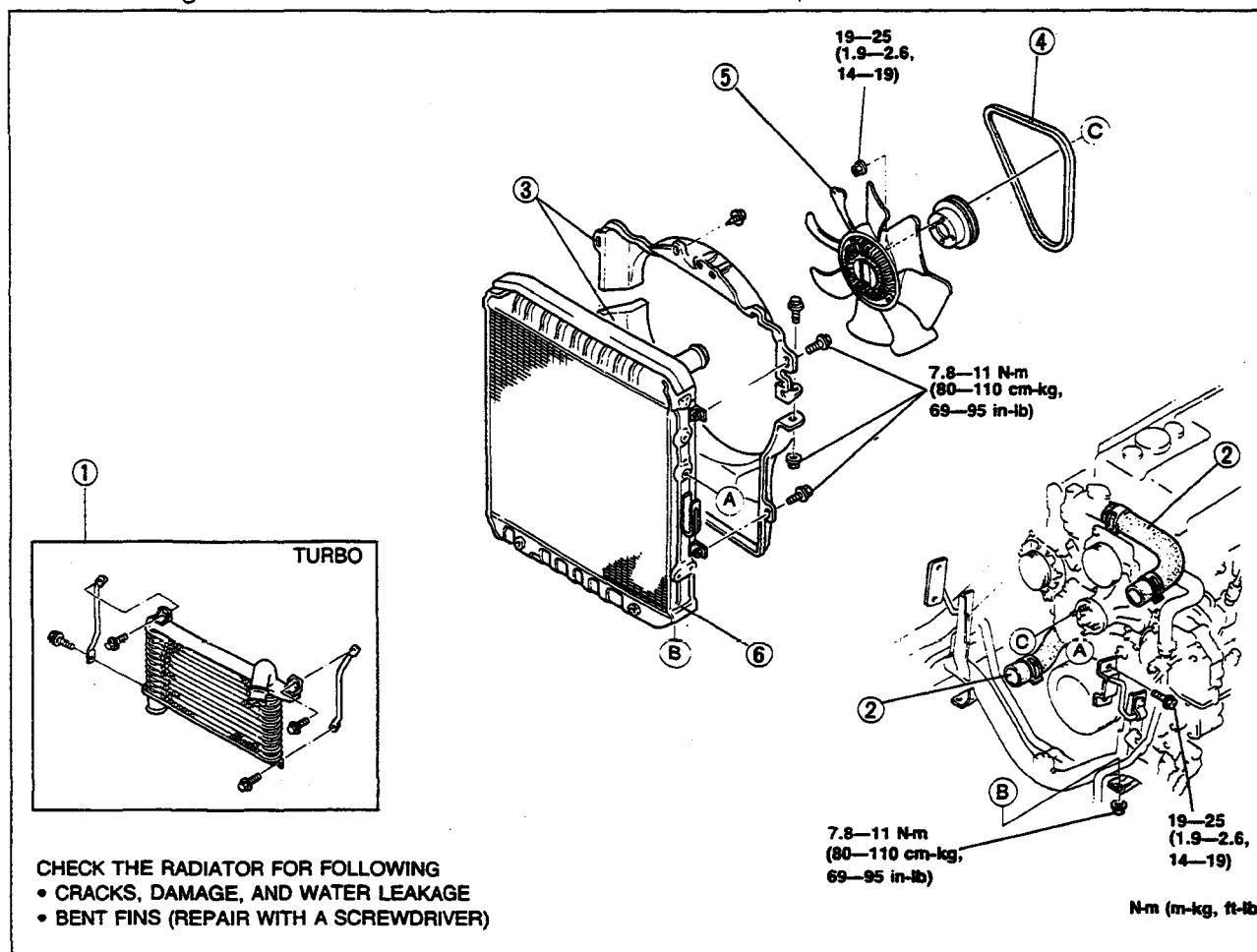
RADIATOR**REMOVAL / INSTALLATION****Caution**

- 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.
- 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 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.



1. Intercooler Service..... Section F2
2. Radiator hose
3. Radiator cowling

4. Cooling fan drive belt Adjustment Section B
5. Cooling fan
6. Radiator

9TF0EX-008

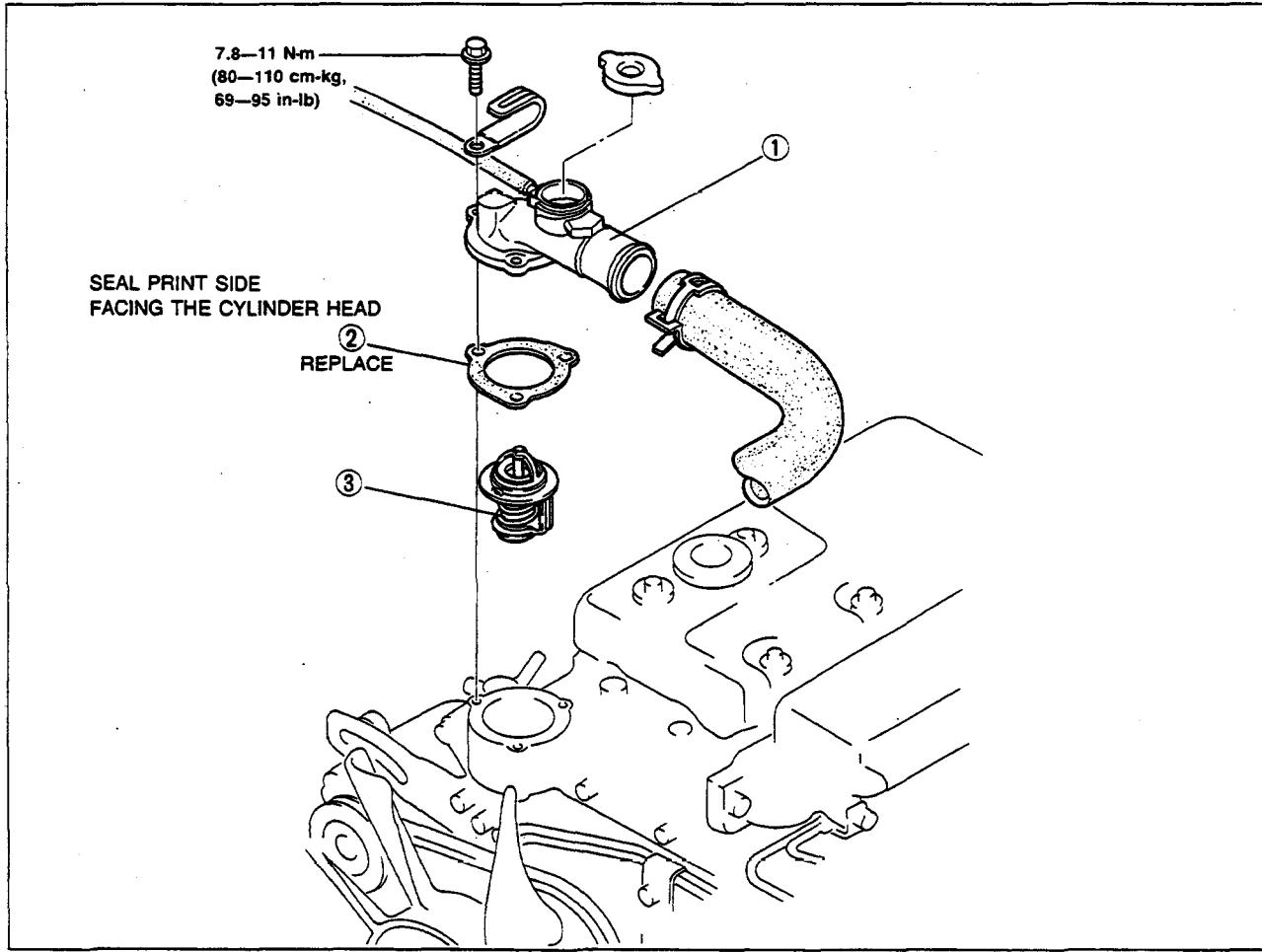
THERMOSTAT

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

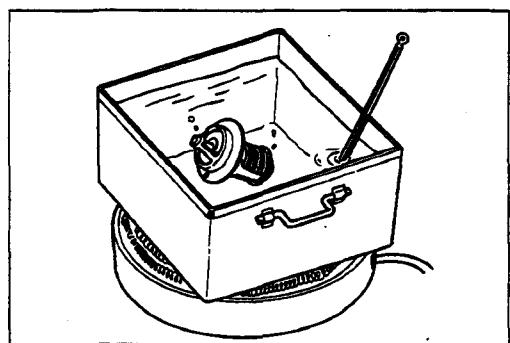
1. Fill the radiator with the specified amount and type of engine coolant. (Refer to page E-7.)
2. Connect the negative battery cable.
3. Start the engine and check for leaks.



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.

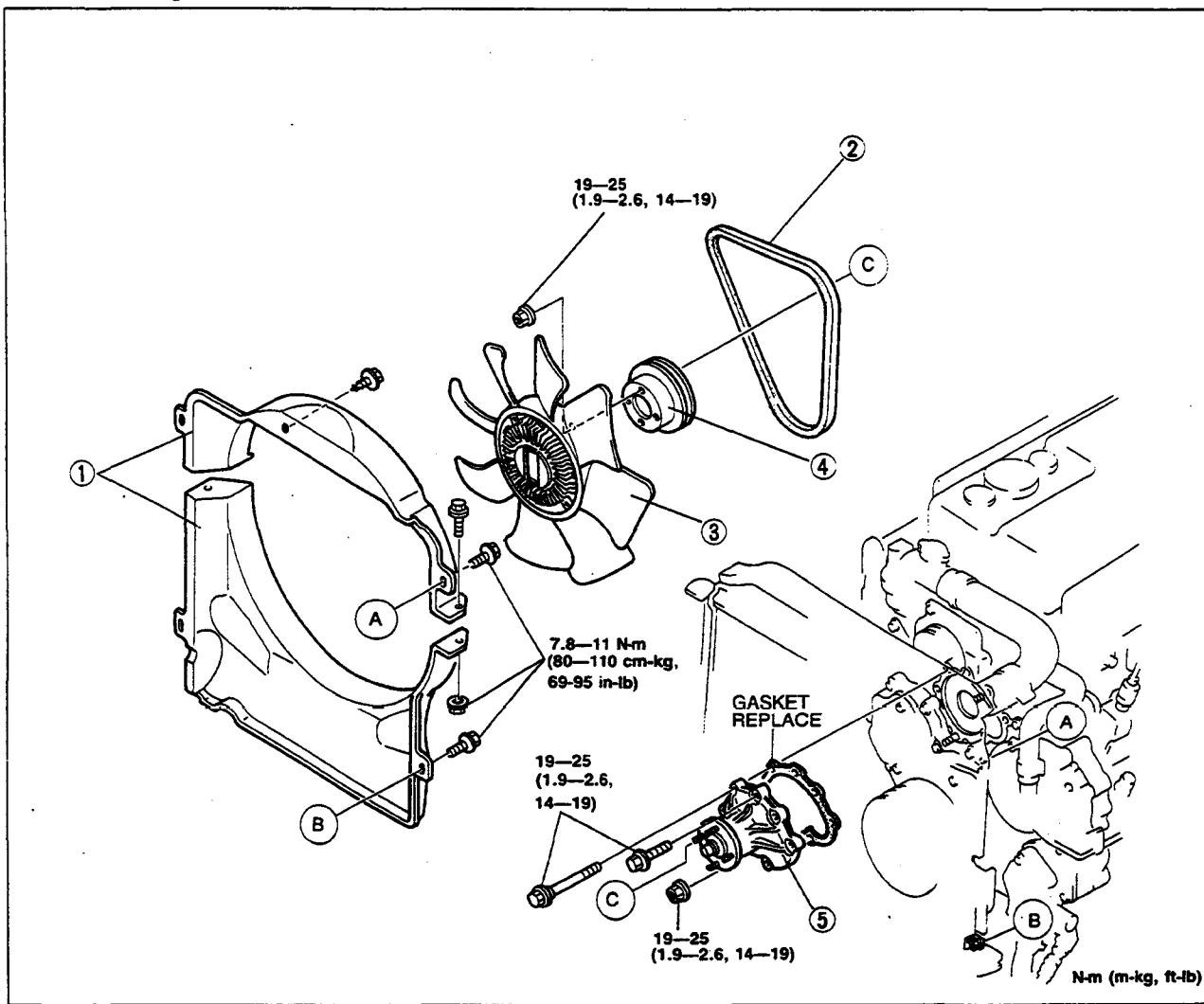
WATER PUMP**REMOVAL / INSTALLATION****Caution**

- 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

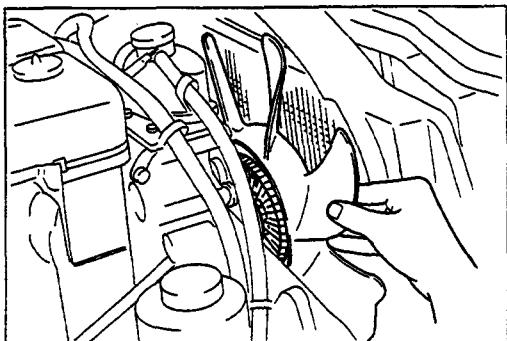
1. Fill the radiator with the specified amount and type of engine coolant. (Refer to page E-7.)
2. Connect the negative battery cable.
3. Start the engine and check for leaks.



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

9TF0EX-010



9TG0E2-018

COOLING FAN

INSPECTION

1. Inspect for the following. 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

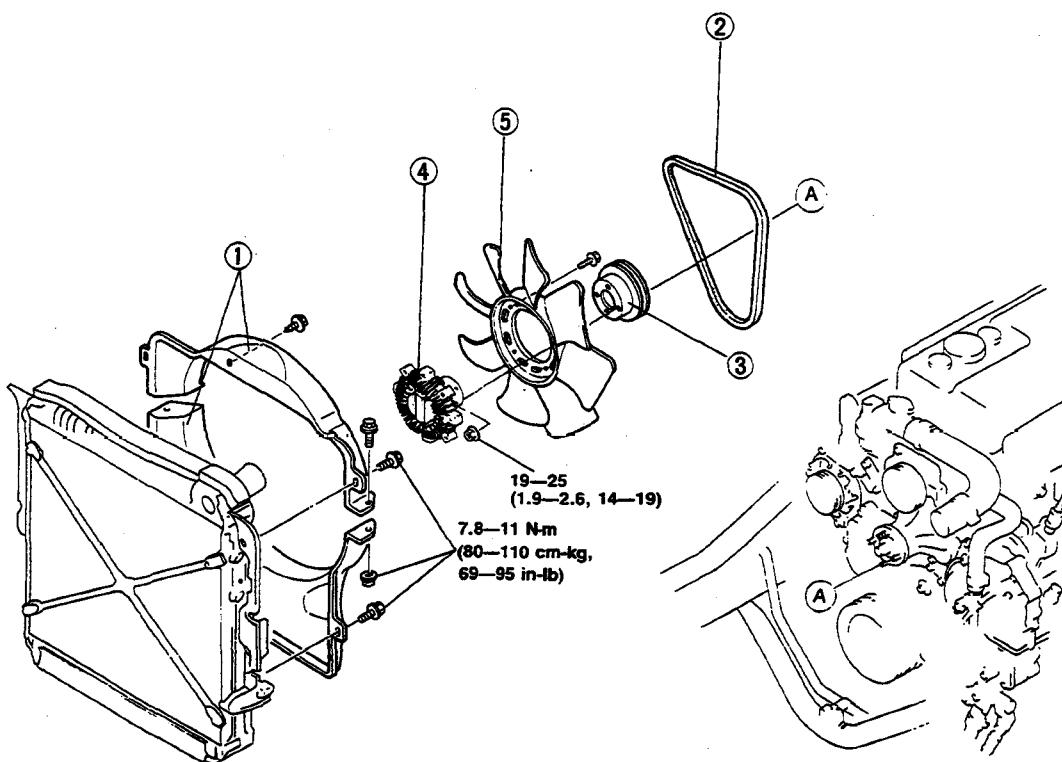
Caution

- 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

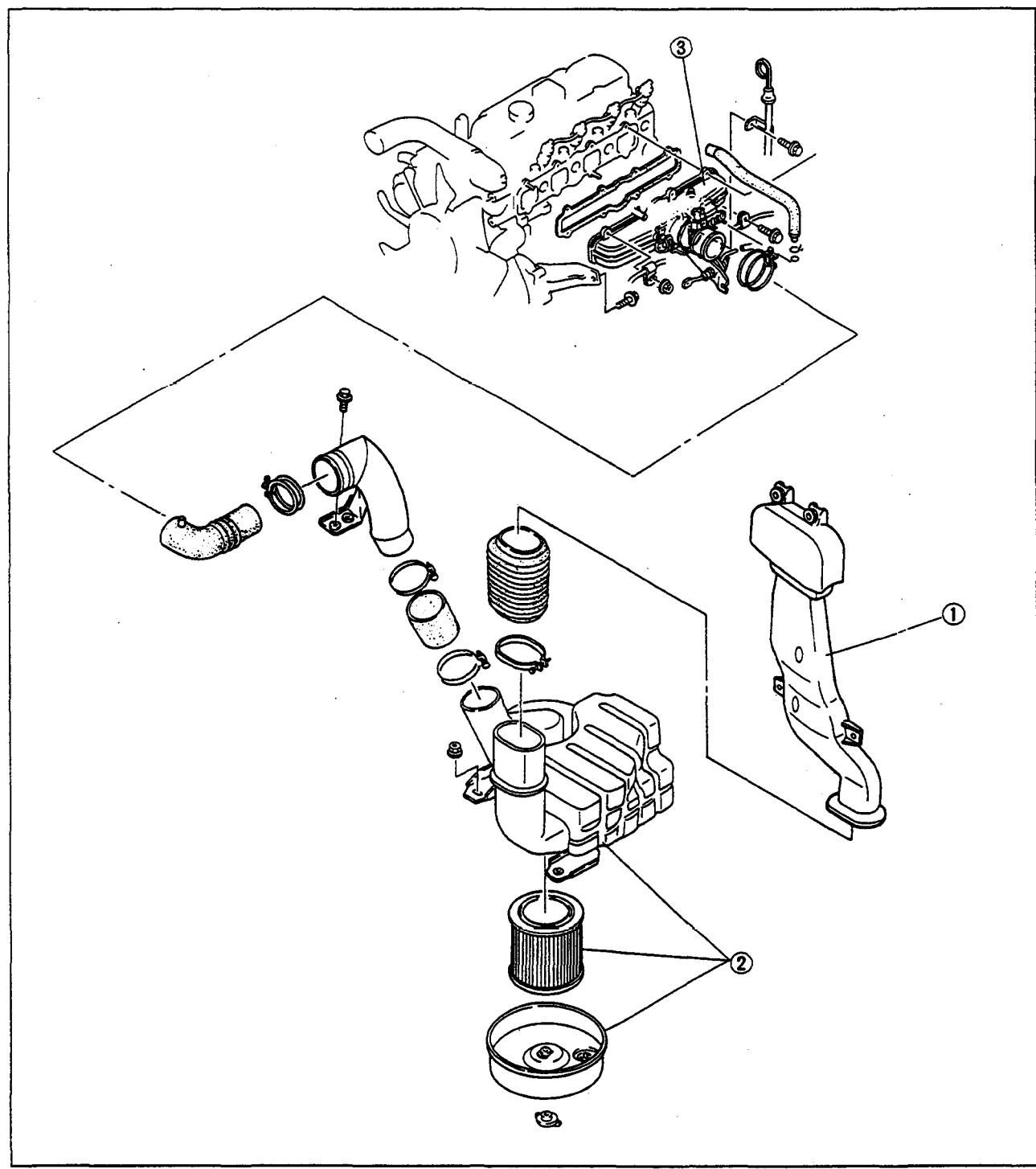
3. Water pump pulley
4. Fan drive
5. Fan blade

FUEL AND EMISSION CONTROL SYSTEMS (HA ENGINE)

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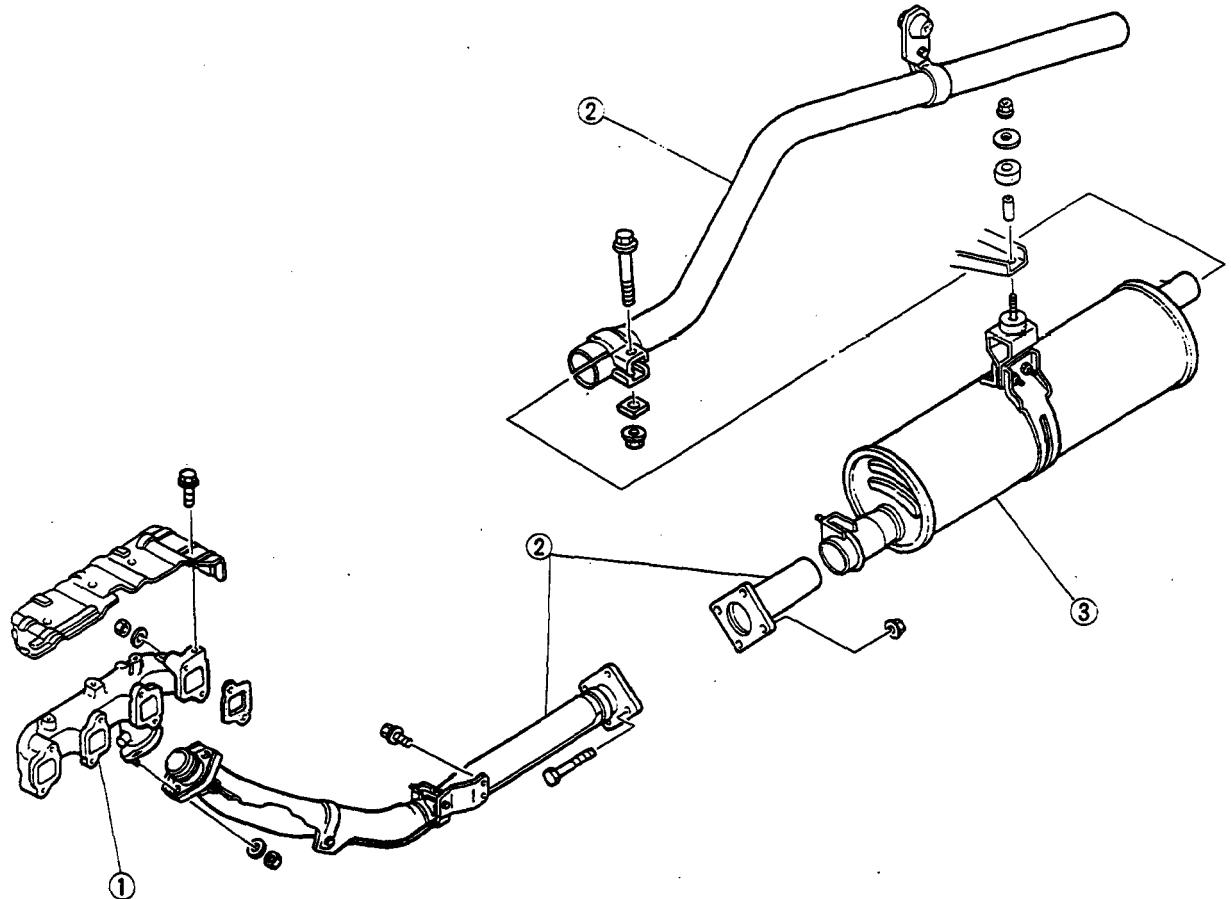
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INTAKE DEVICES



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| 2. Air cleaner
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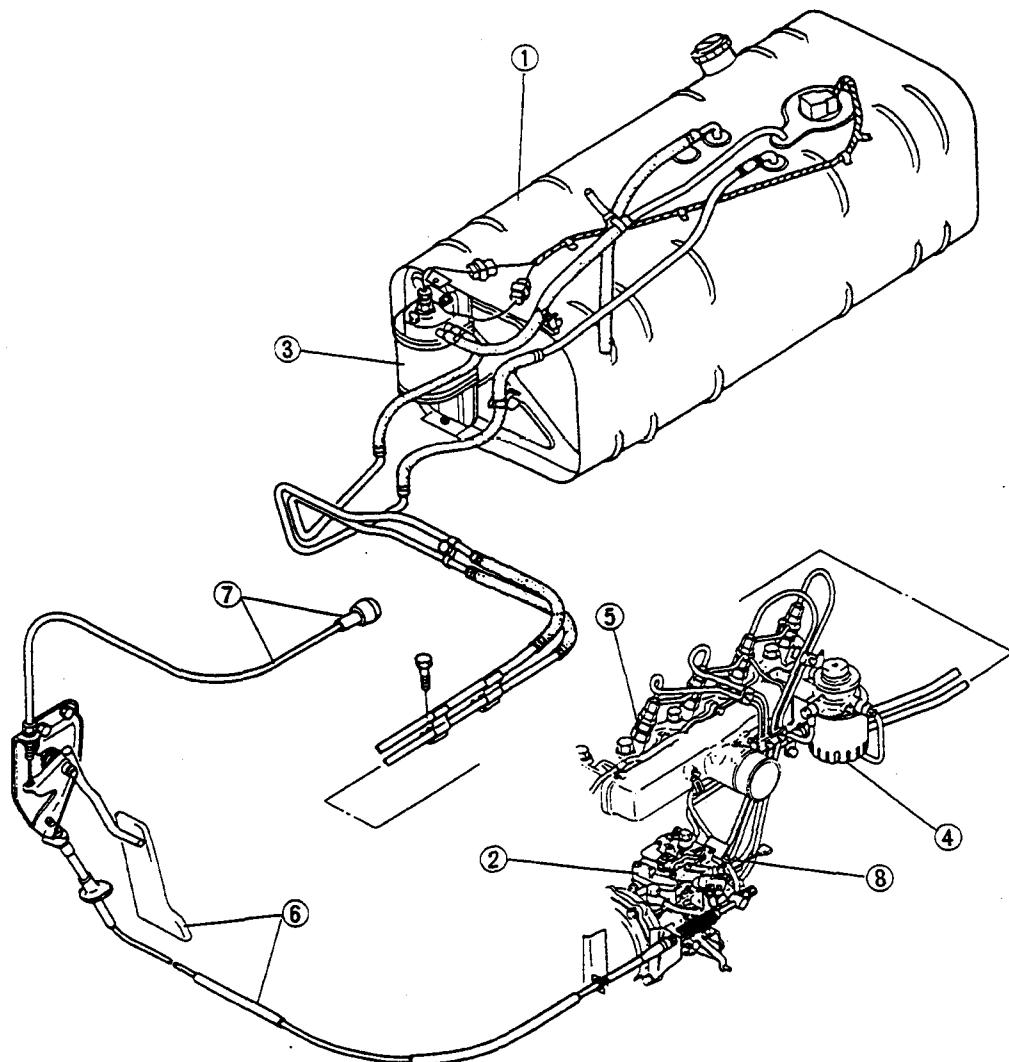
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2. Exhaust pipe
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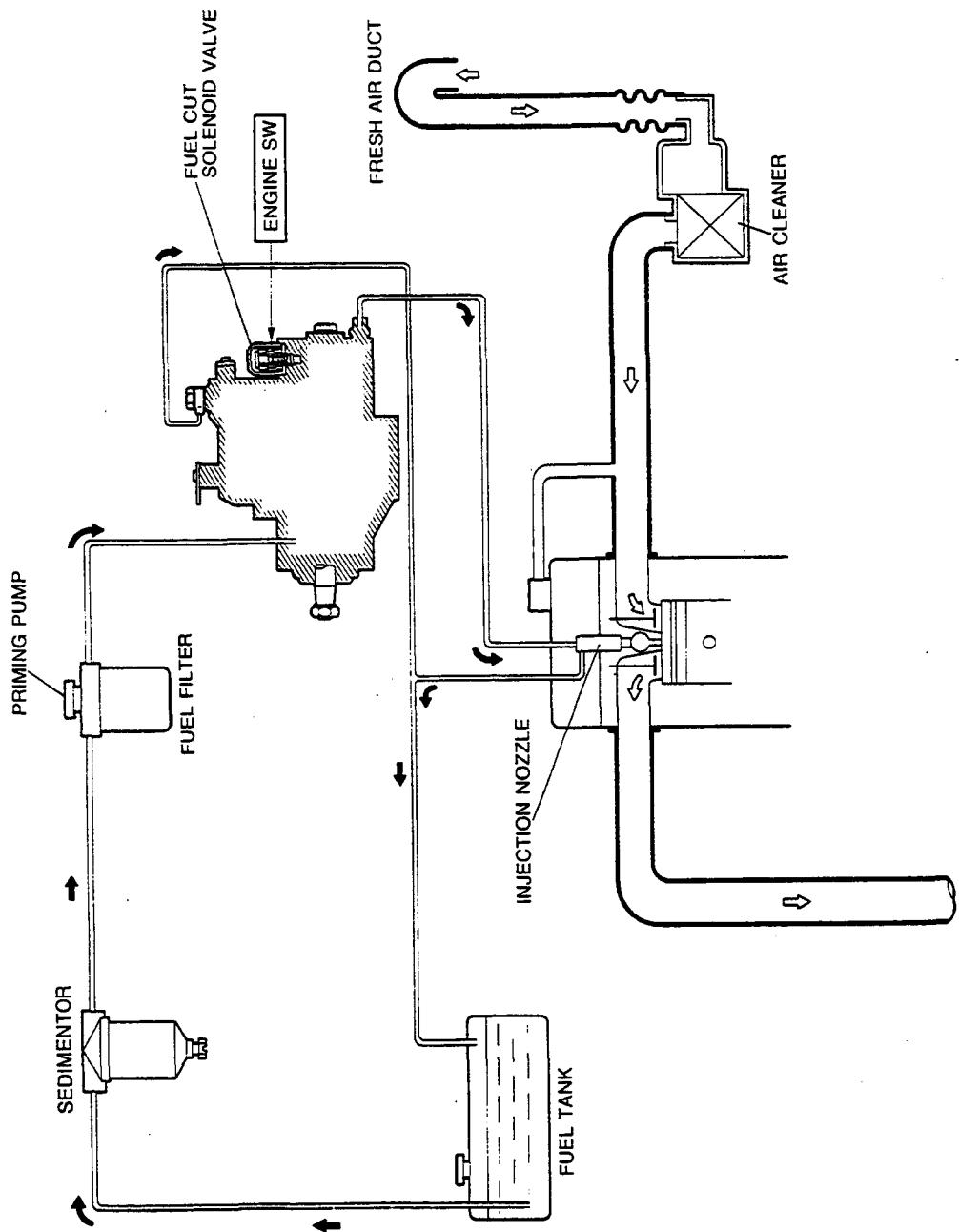
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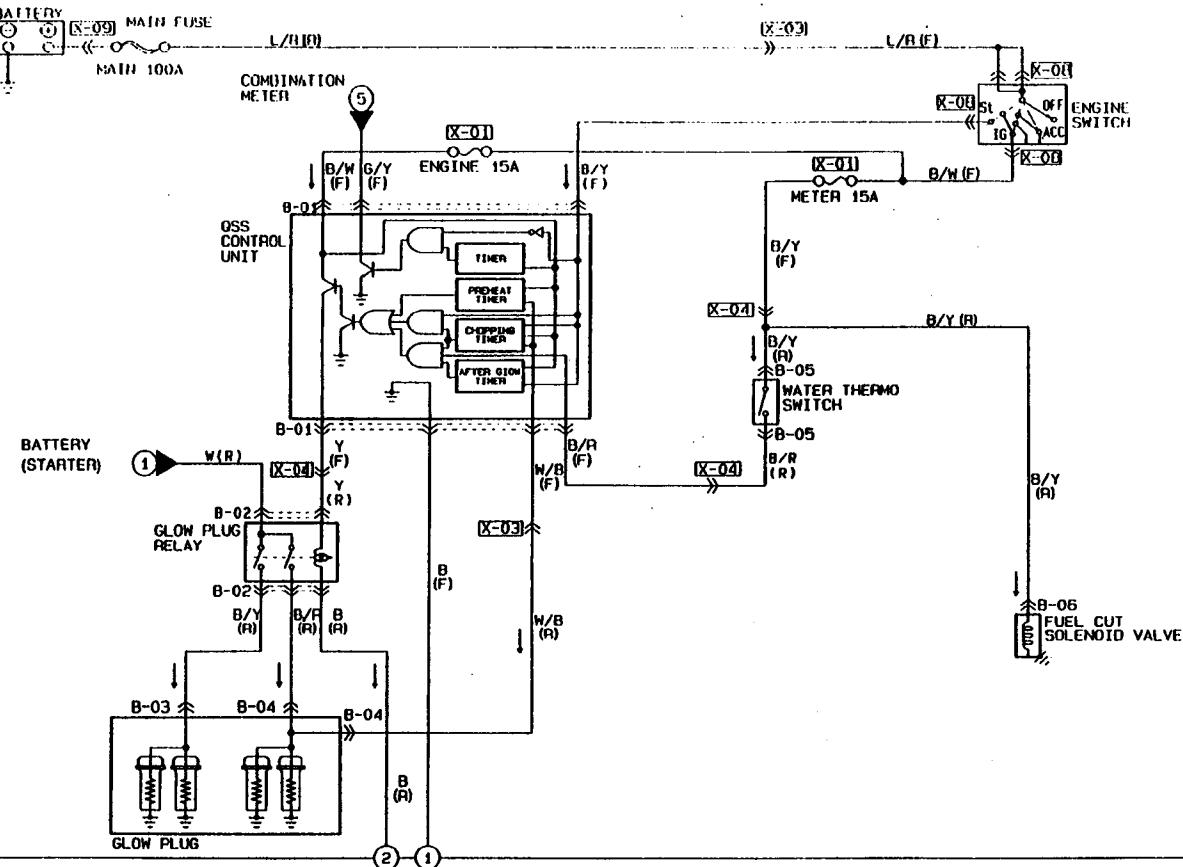
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OUTLINE**SYSTEM DIAGRAM**



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<table border="1"> <tr> <td>G/Y *</td> <td>B/W *</td> <td>B/R</td> </tr> <tr> <td>Y *</td> <td>B</td> <td>B/Y * B/R</td> </tr> </table>	G/Y *	B/W *	B/R	Y *	B	B/Y * B/R	<table border="1"> <tr> <td>W</td> <td>B</td> </tr> <tr> <td>B/Y B/R</td> <td>Y</td> </tr> </table>	W	B	B/Y B/R	Y	<table border="1"> <tr> <td>B/Y</td> </tr> <tr> <td></td> </tr> </table>	B/Y		<table border="1"> <tr> <td>B/R</td> <td>W/B</td> </tr> </table>	B/R	W/B	<table border="1"> <tr> <td>B/Y</td> </tr> <tr> <td>B/R</td> </tr> </table>	B/Y	B/R	<table border="1"> <tr> <td>B/Y</td> </tr> </table>	B/Y	
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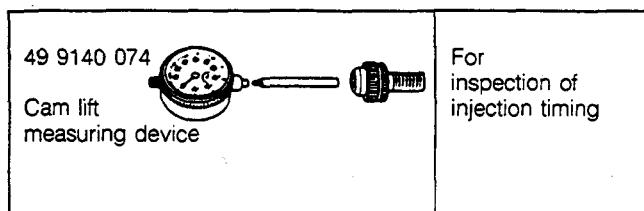
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TROUBLESHOOTING GUIDE

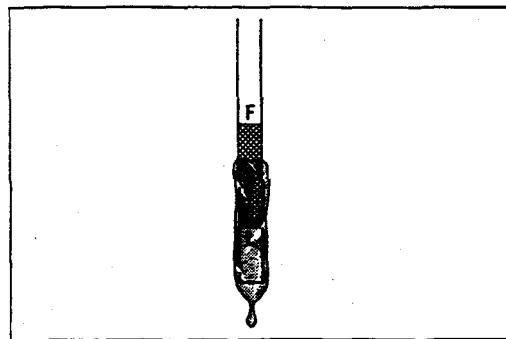
TROUBLESHOOTING GUIDE

Trouble	Possible Cause	Action
Hard starting	Fuel filter Clogged Water or air in fuel filter	Replace Repair
	Fuel injection pump Faulty fuel cut solenoid Faulty injection timing Air in injection pump Faulty stop lever position Trouble inside pump	Replace Adjust Repair Adjust Replace
	Fuel injection nozzle Seized needle valve Fuel dripping from nozzle Faulty valve opening pressure Faulty glow plug	Replace Replace Adjust Replace
Rough idling	Fuel filter Clogged Water or air in fuel filter	Replace Repair
	Fuel injection pump Refer to "Hard starting"	
	Fuel injection nozzle Seized needle valve Faulty valve opening pressure Improper mounting to nozzle holder Leakage of nozzle holder copper washer	Replace Adjust Repair Replace
	Fuel injection pipe Cracks Leaking from joint Improper idle speed adjustment	Replace Repair Adjust
Engine knocking	Faulty injection timing Low quality fuel Faulty injection nozzle opening pressure Seized needle valve of injection nozzle Fuel dripping from injection nozzle	Adjust Replace Adjust Replace Replace
High fuel consumption	Fuel injection pump Faulty full load adjust screw Faulty injection timing High idling speed	Adjust Adjust Adjust
	Fuel injection nozzle Faulty valve opening pressure Fuel dripping from nozzle Leakage of nozzle holder copper washer Fuel leaking from joint Clogged fuel filter Clogged air cleaner	Repair Replace Replace Repair Replace Replace
Poor acceleration	Fuel injection nozzle Clogged air cleaner Seized needle valve Fuel dripping from nozzle	Adjust Replace Replace
	Fuel injection pump Refer to "Hard starting"	
	Fuel injection pipe Refer to "Rough idling"	
	Fuel filter Water, air, etc., in the fuel filter Clogged	Adjust Replace

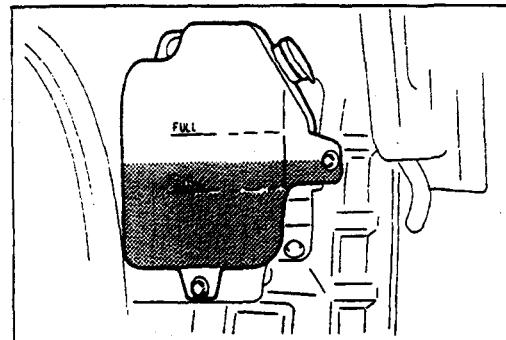
ENGINE TUNE-UP

PREPARATION
SST

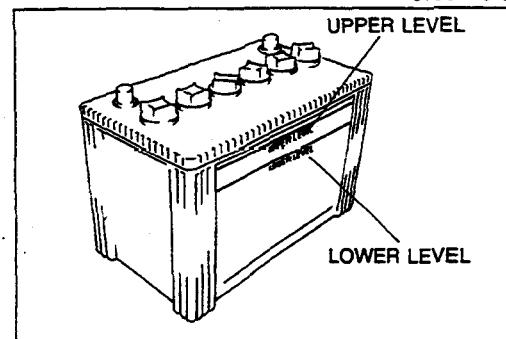
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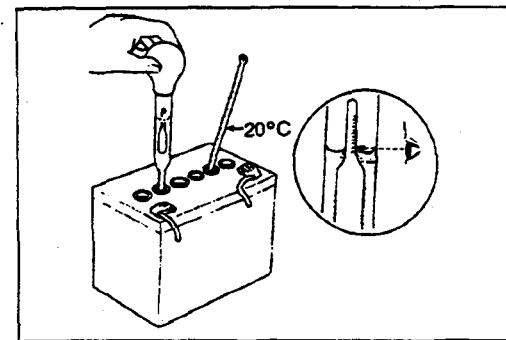
9TG0F1-009



9TG0F1-010



9TG0F1-011



9TG0F1-012

BASIC INSPECTION**Engine Oil**

Check the engine oil level and condition with the level gauge.
Add or change oil, if necessary.

Coolant**Warning**

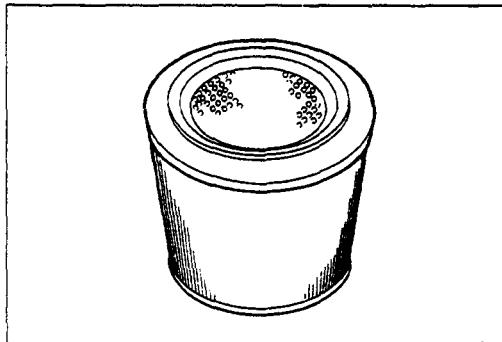
- Never remove the radiator cap while the engine is hot.
- Wrap a thick cloth around the cap while carefully removing it.

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.

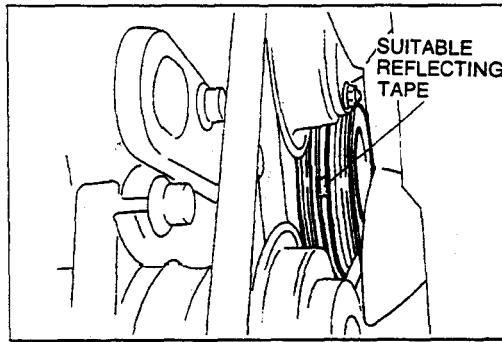
Battery

1. Check for corrosion on the terminals and for loose cable connections.
2. Check the electrolyte level.
If the level is too 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.)

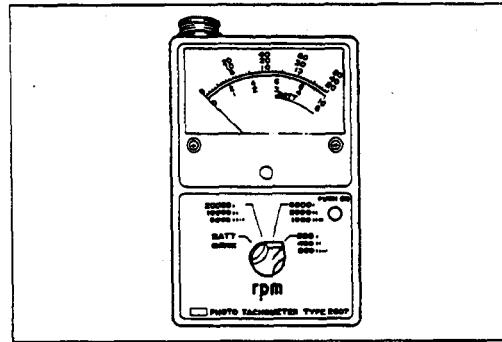
ENGINE TUNE-UP



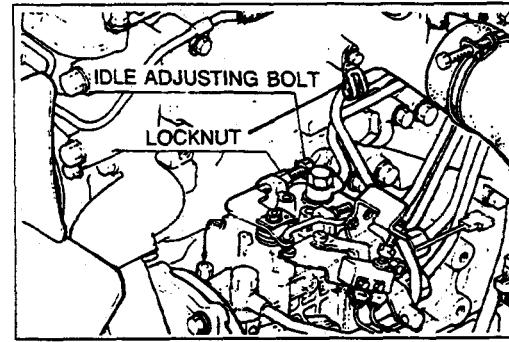
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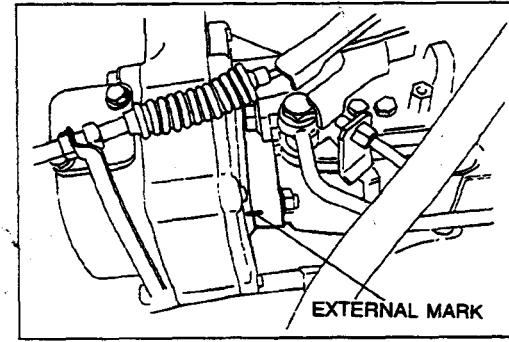
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9TG0F1-015



9TG0F1-016



9TG0F1-017

Air Cleaner Element

Visually check the air cleaner element for excessive dirt, damage or oil. Clean with compressed air if necessary.

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.

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

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.

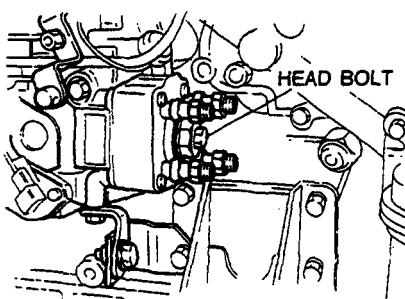
Tightening torque:

5.9—8.8 N·m (0.6—0.9 m·kg, 4.3—7.2 ft-lb)

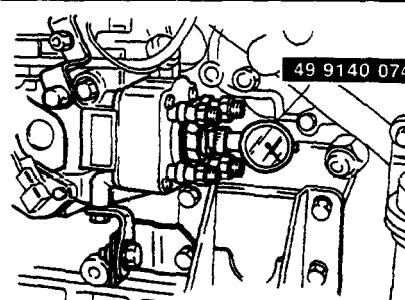
Injection Timing Inspection

Note

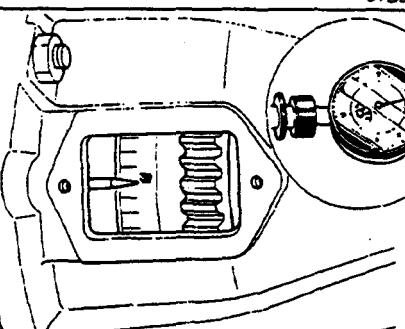
- Usually it is enough to confirm that the external marks are aligned.
- Set the injection timing after installment of the injection pump.



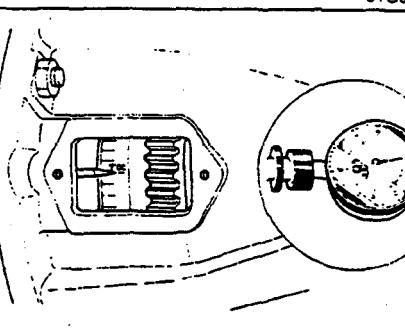
9TG0F1-018



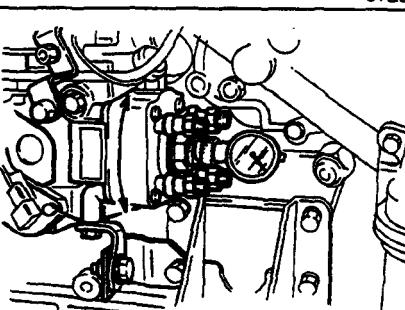
9TG0F1-019



9TG0F1-020



9TG0F1-021



9TG0F1-022

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.

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.

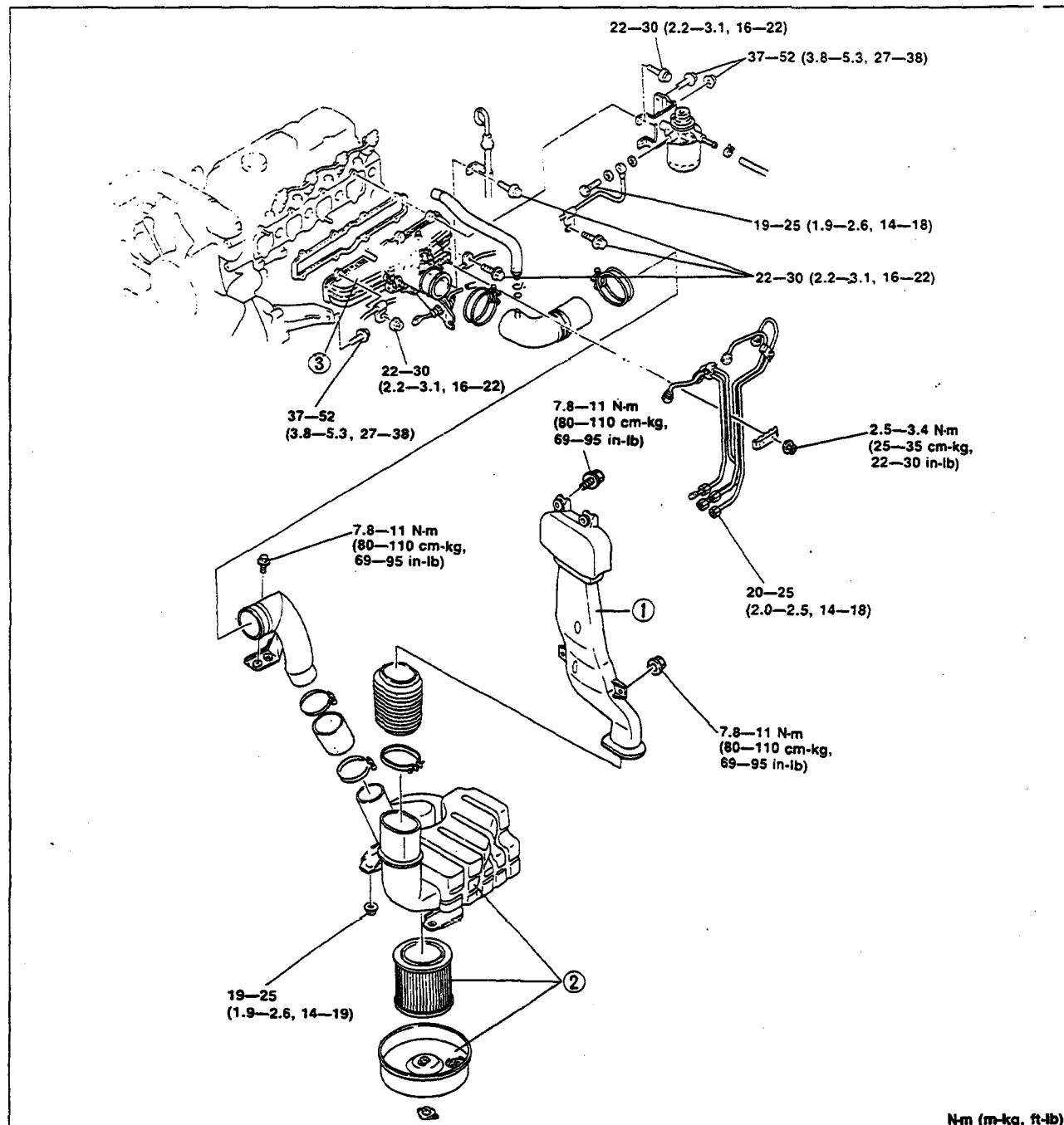
INTAKE AIR SYSTEM

INTAKE AIR SYSTEM

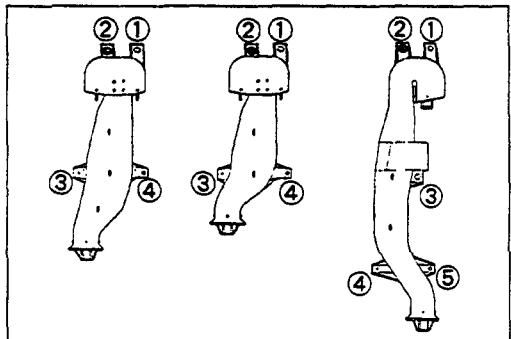
COMPONENTS

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.



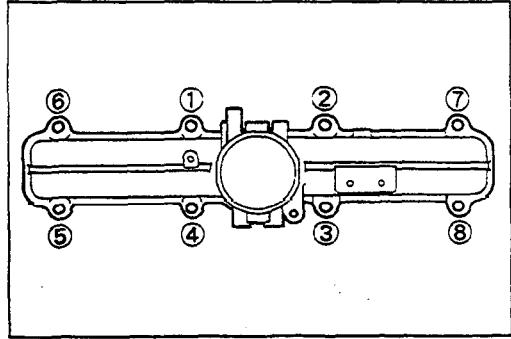
1. Fresh air duct
Check for contamination, cracks and other damage
Installation Note page F1-12
2. Air cleaner
Inspection of element page F1- 9
3. Intake manifold
Check for contamination, cracks and other damage
Installation Note page F1-12



9TG0F1-024

Installation Note**Fresh air duct**

Install in the order shown in the figure.



9TG0F1-025

Intake manifold

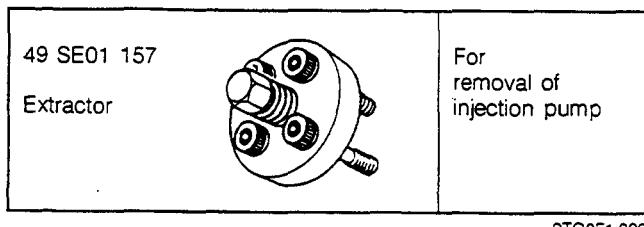
1. Use a new gasket.
2. Tighten in the order shown in the figure.

Tightening torque:

22—31 N·m (2.2—3.1 m·kg, 15—22 ft-lb)

FUEL SYSTEM

PREPARATION SST



9TG0F1-026

FUEL TANK

Removal / Inspection / Installation

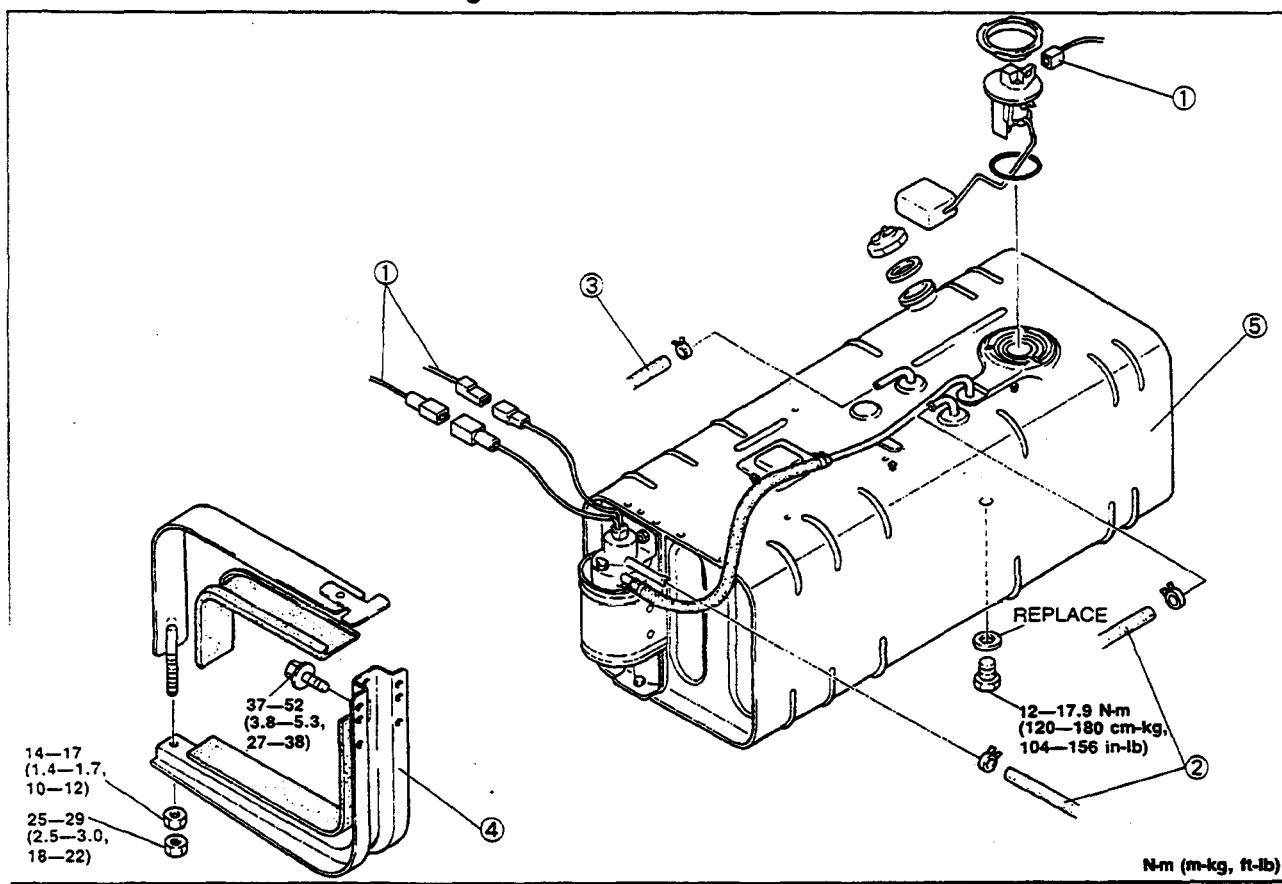
1. Remove in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal.

Warning

- Keep sparks, cigarettes, and open flames away from the fuel tank.

Note

- Drain the fuel before removing the fuel tank.



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

F1

FUEL SYSTEM

INJECTION PUMP

Note

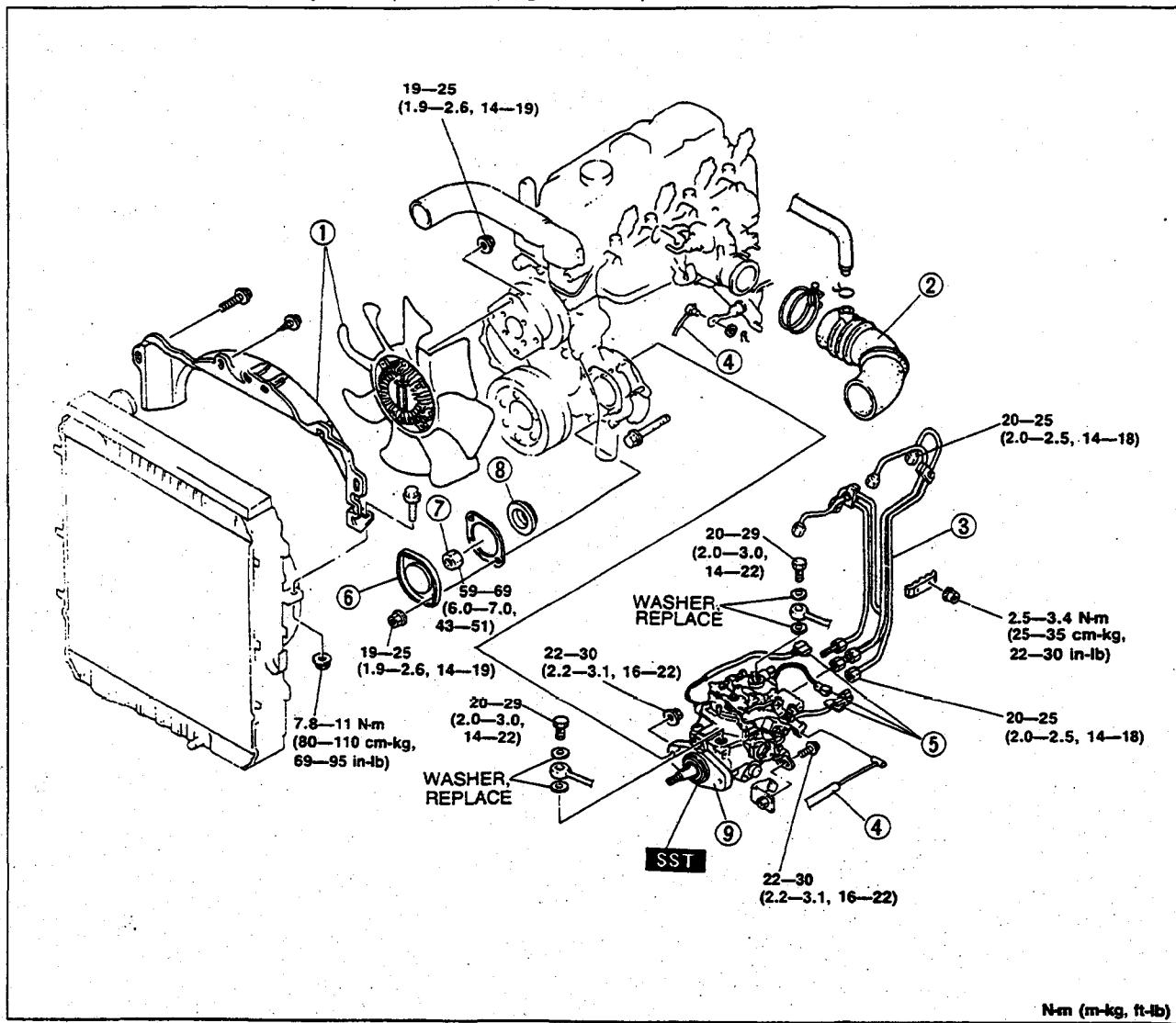
- Special tools and testers are required for service of the injection pump. The pump should be serviced only by an authorized Diesel Kiki distributor.

Removal / Installation

Warning

- Keep sparks cigarettes, and open flames away from the injection pump.

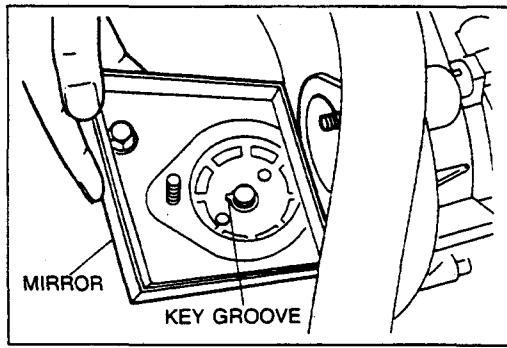
1. Remove the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.
4. Adjust the injection timing. (Refer to page F1-9.)
5. Bleed air from the fuel system. (Refer to page F1-17.)



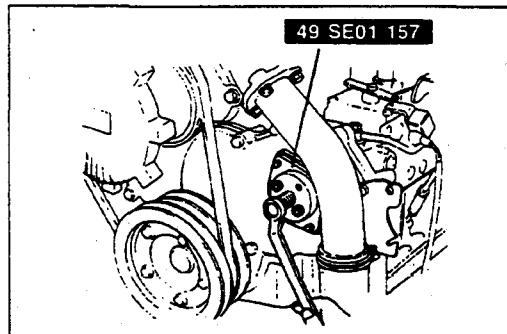
1. Fan and upper cooling fan shroud
2. Air hose
3. Injection pipe
4. Accelerator pipe, Idle-up cable
5. Harness

6. Pump cover
7. Locknut
8. Washer
9. Injection pump

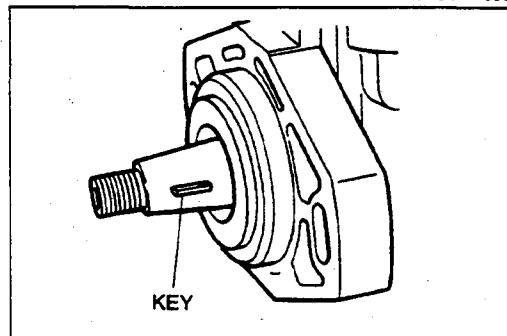
FUEL SYSTEM



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.)

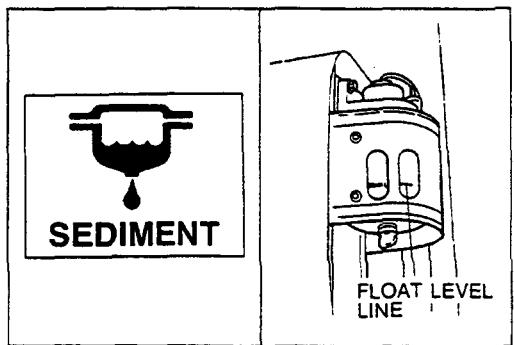
3. Turn the **SST** bolt to push the pump free of the drive gear.

Caution

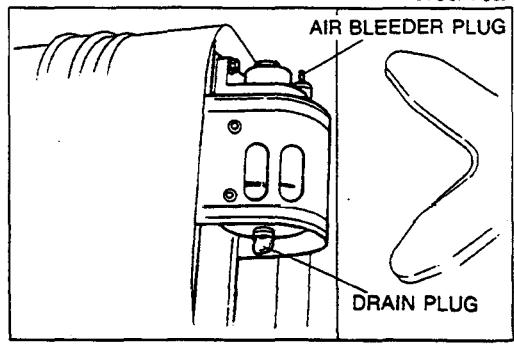
- Do not drop the key into the gear case.

Installation Note

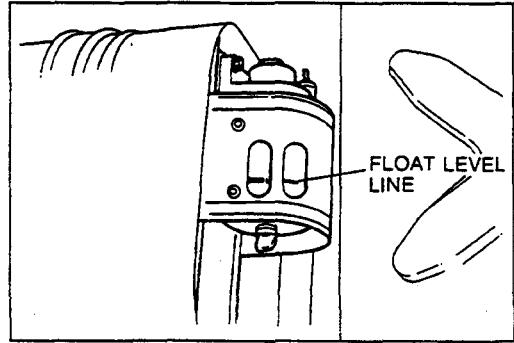
Before installing the key into the driveshaft of the injection pump, lightly tap the key groove of the shaft with a hammer to assure that the key is tightly held in the key groove.



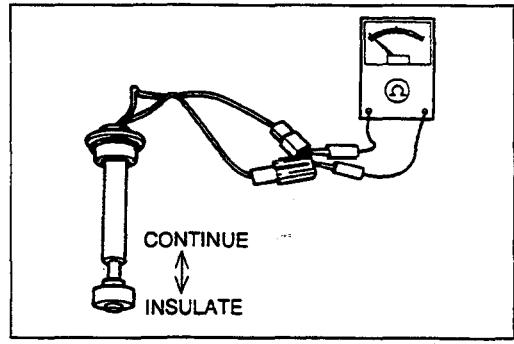
9TG0F1-032



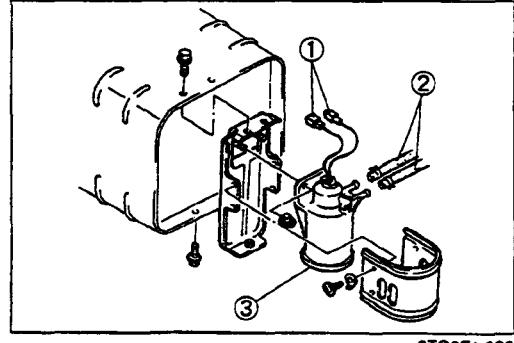
9TG0F1-033



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

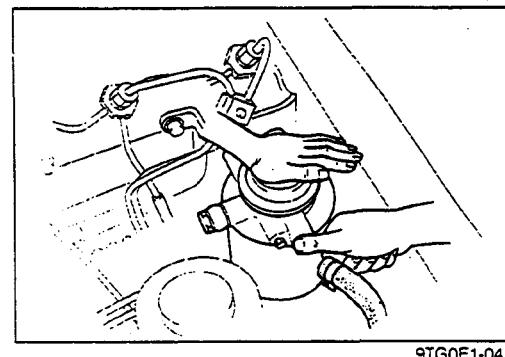
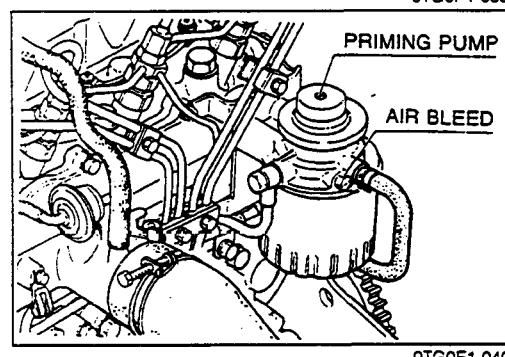
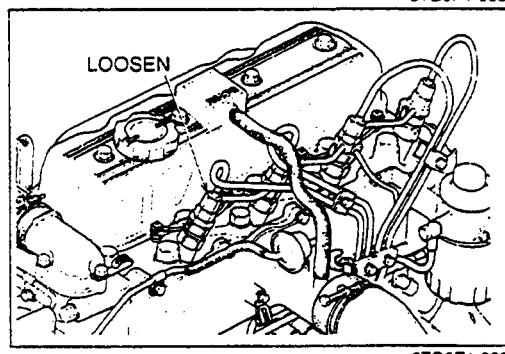
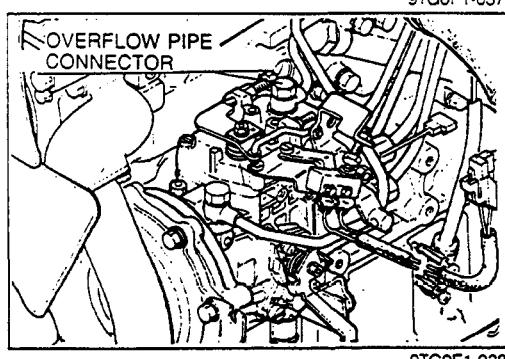
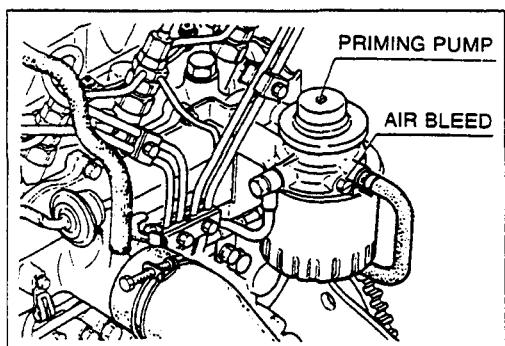
Replacement

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.

FUEL SYSTEM



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**

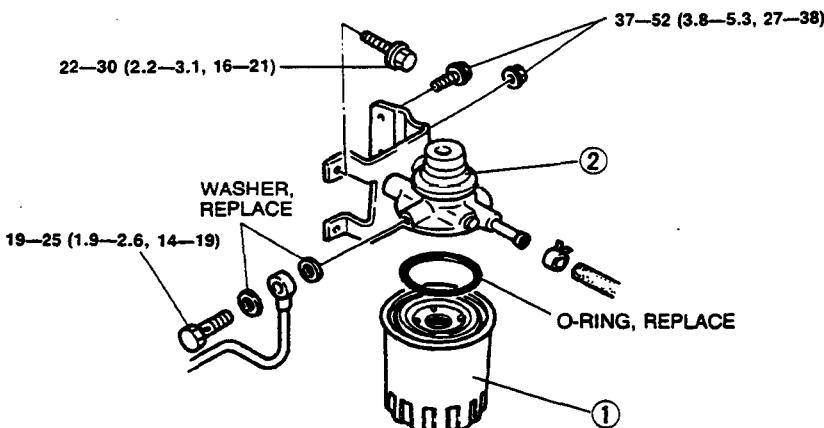
- Keep sparks, cigarettes, and open flames away from the fuel filter.

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 is 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.



N·m (m·kg, ft·lb)

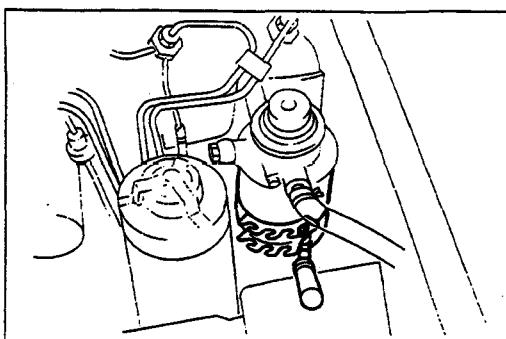
9TG0F1-042

1. Filter element

Removal Note page F1-18
 Installation Note page F1-18

2. Fuel filter body**Removal Note**

1. Remove the filter element with an oil filter wrench.



9TG0F1-043

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.



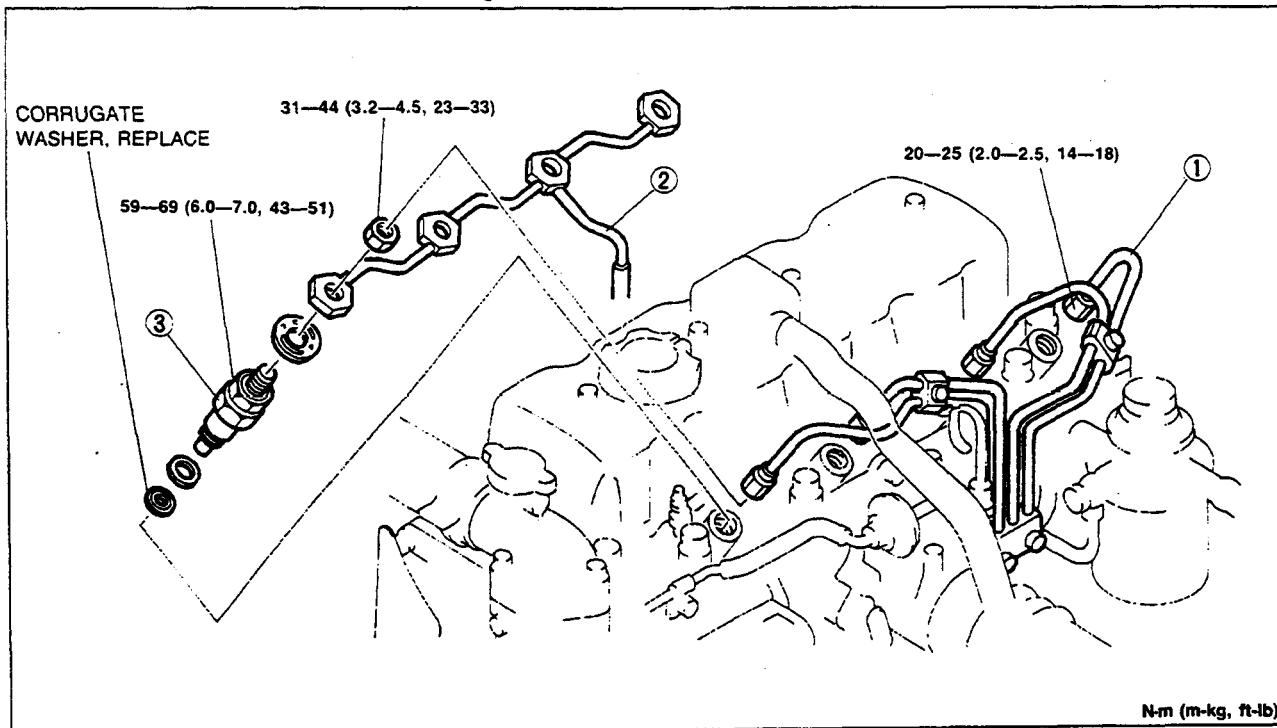
9TG0F1-044

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.



1. Injection pipe
2. Return pipe

3. Injection nozzle

Inspection

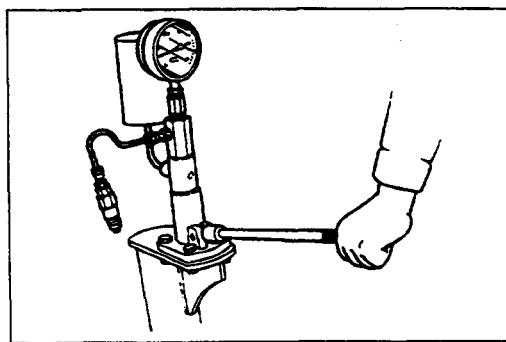
Warning

- 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



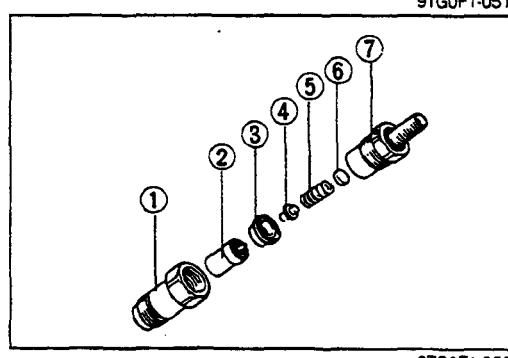
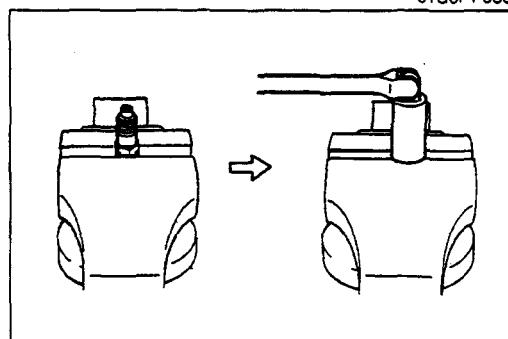
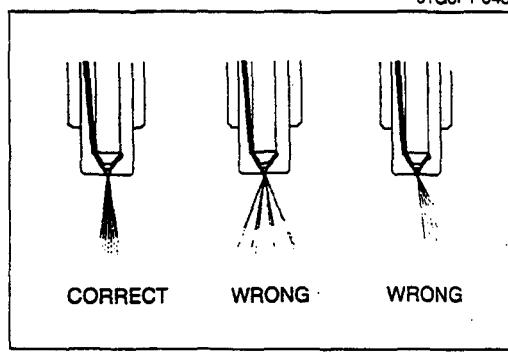
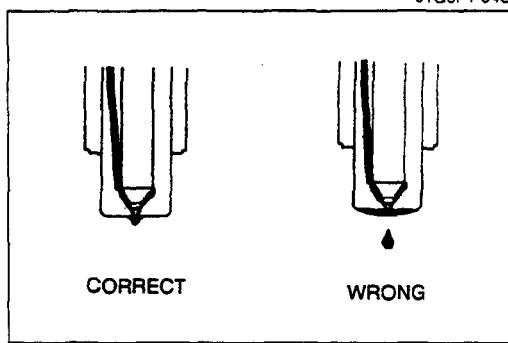
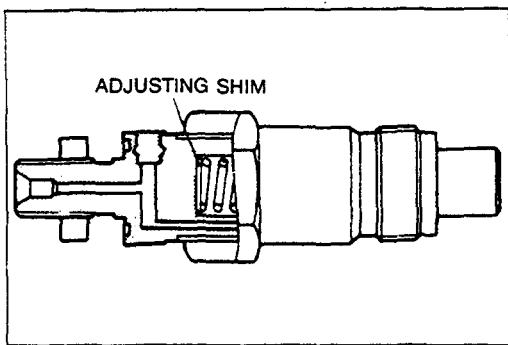
9TG0F1-047

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/cm², 1,920—1,991 psi)



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/cm², 68 psi).

Leakage of injector

1. Connect the nozzle to a nozzle tester.
2. Apply pressure 1,962 kPa (20 kg/cm², 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.

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.

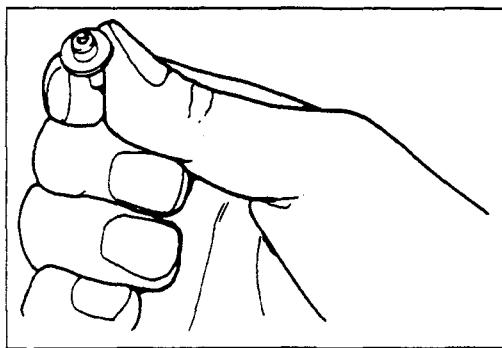
Disassembly

1. Clamp the nozzle in a vise as shown in the figure.

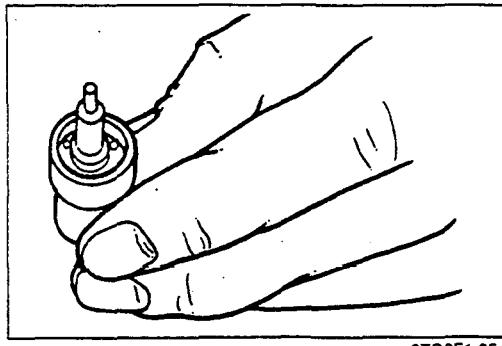
2. Disassemble as shown in the figure.

- ① Retaining nut
- ② Nozzle body
- ③ Distance piece
- ④ Pressure pin
- ⑤ Pressure spring
- ⑥ Shim
- ⑦ Nozzle holder

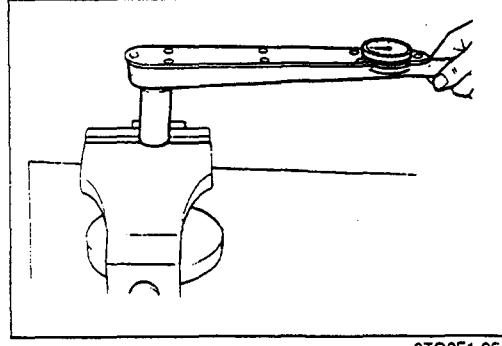
FUEL SYSTEM



9TG0F1-053



9TG0F1-054



9TG0F1-055

Checking Injection Nozzle

- Verify that the seat of the pressure pin and other parts are free of damage.

- 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

- Assemble in the reverse order of disassembly.

Tightening torque:

78—98 N·m (8.0—10.0 m-kg, 58—72 ft-lb)

- Retest the nozzle after assembly.

Installation**Caution**

- Do not reuse the copper washers.
- Tighten the nozzle into the cylinder head to the specified torque.

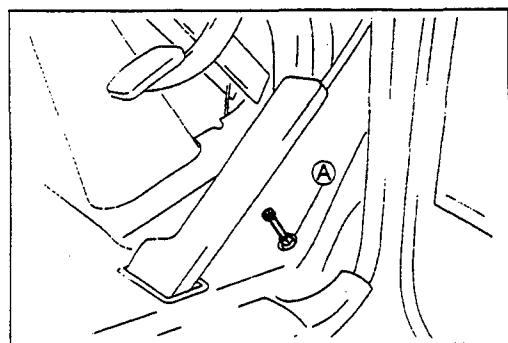
- Install in the reverse order of removal.

Tightening torque:

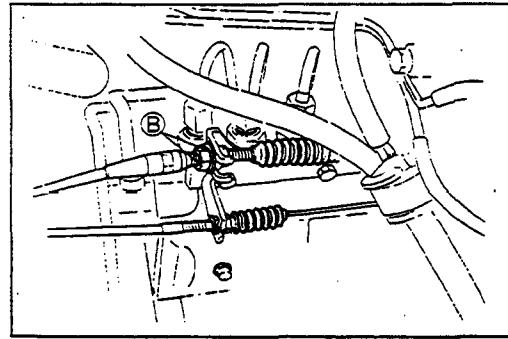
59—69 N·m (6.0—7.0 m-kg, 43—51 ft-lb)

- 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)**

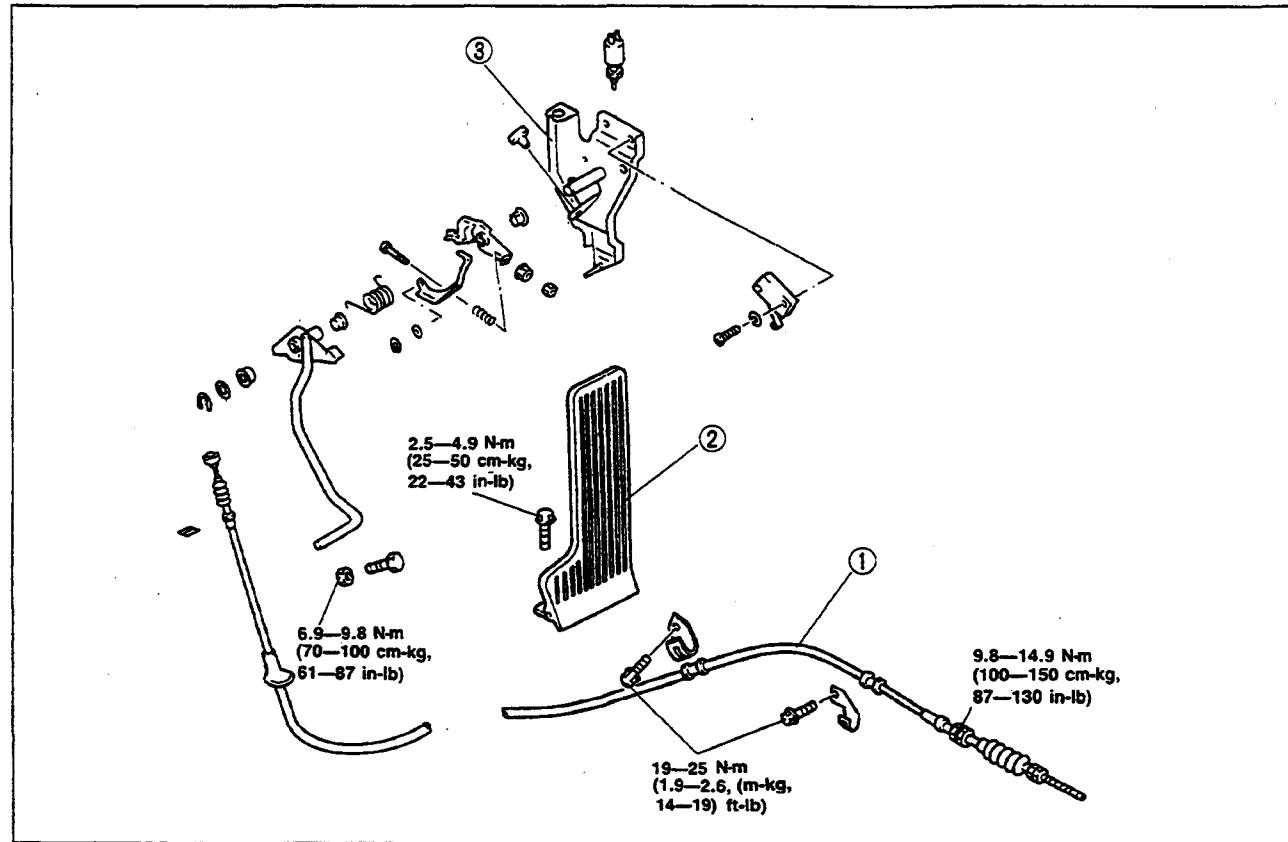
3. Check the free play of the accelerator cable.

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**

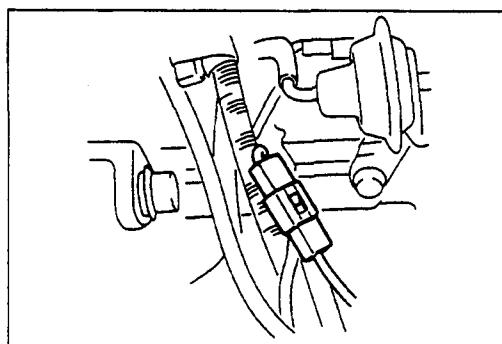
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



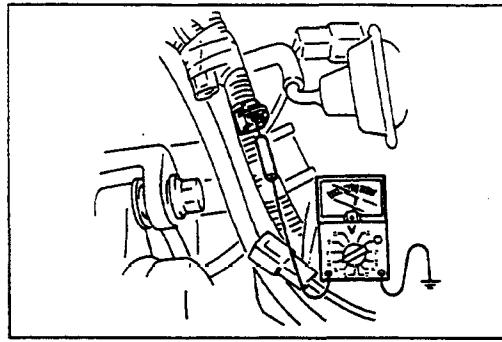
9TG0F1-059

1. Accelerator cable
2. Accelerator pedal

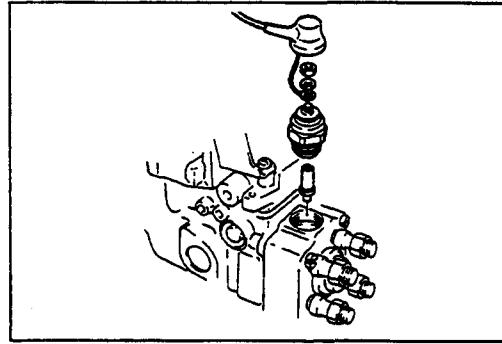
3. Bracket



9TG0F1-060



9TG0F1-061



9TG0F1-062

FUEL CUT CONTROL SYSTEM

SYSTEM OPERATION

- Verify that the engine stops when the fuel cut solenoid valve connector is disconnected.

FUEL CUT SOLENOID VALVE

Inspection

- Verify that the fuel cut solenoid valve clicks when the engine switch is turned ON and OFF.
- If it does not, disconnect the fuel cut solenoid valve and check the voltage to the valve.

Engine switch	Voltage
ON	12V
OFF	0V

- If as specified, replace the fuel cut solenoid valve.

Replacement

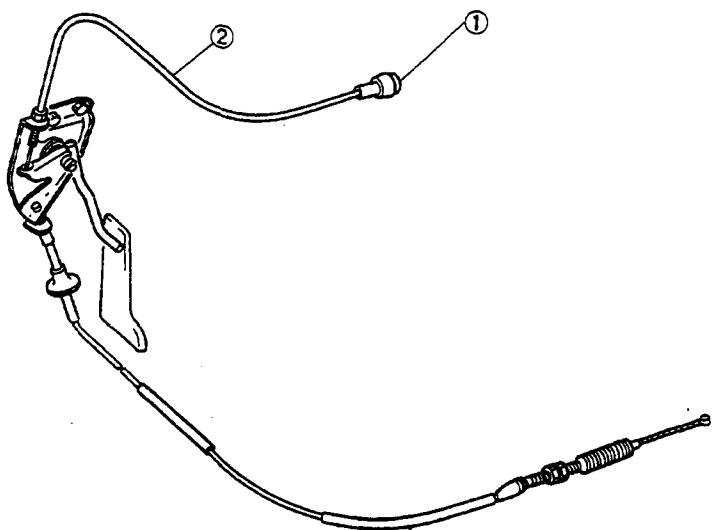
- Disconnect the fuel cut solenoid valve connector.
- Remove the fuel cut solenoid valve from the injection pump.
- Install in the reverse order of removal.

Tightening torque:

39—44 N·m (4.0—4.5 m·kg, 29—33 ft·lb)

IDLE SPEED CONTROL SYSTEM

STRUCTURAL VIEW



9TG0F1-063

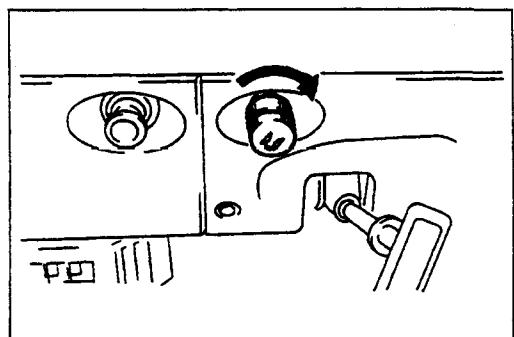
1. Idling knob

Removal / Installation page F1-25

2. Idling cable

Inspection / Adjustment page F1-24

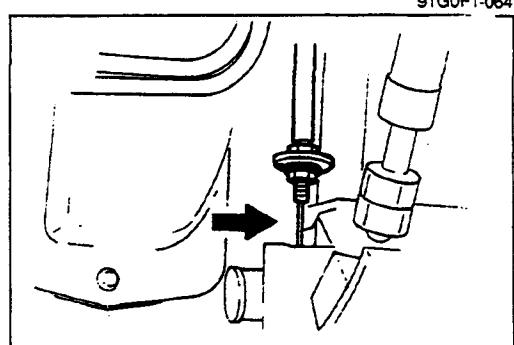
Removal / Installation page F1-25



9TG0F1-064

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.



9TG0F1-065

3. Check the free play of the cable when the idling knob is not turned.

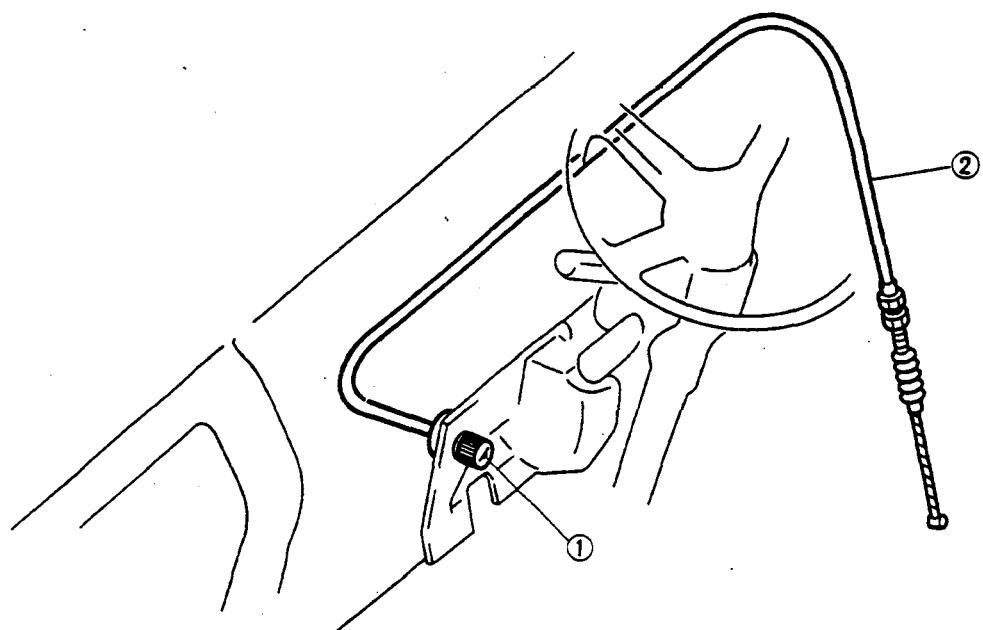
Free play: 0—5mm (0—0.2 in)

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.



1. Idling knob

2. Idling cable

EXHAUST SYSTEM

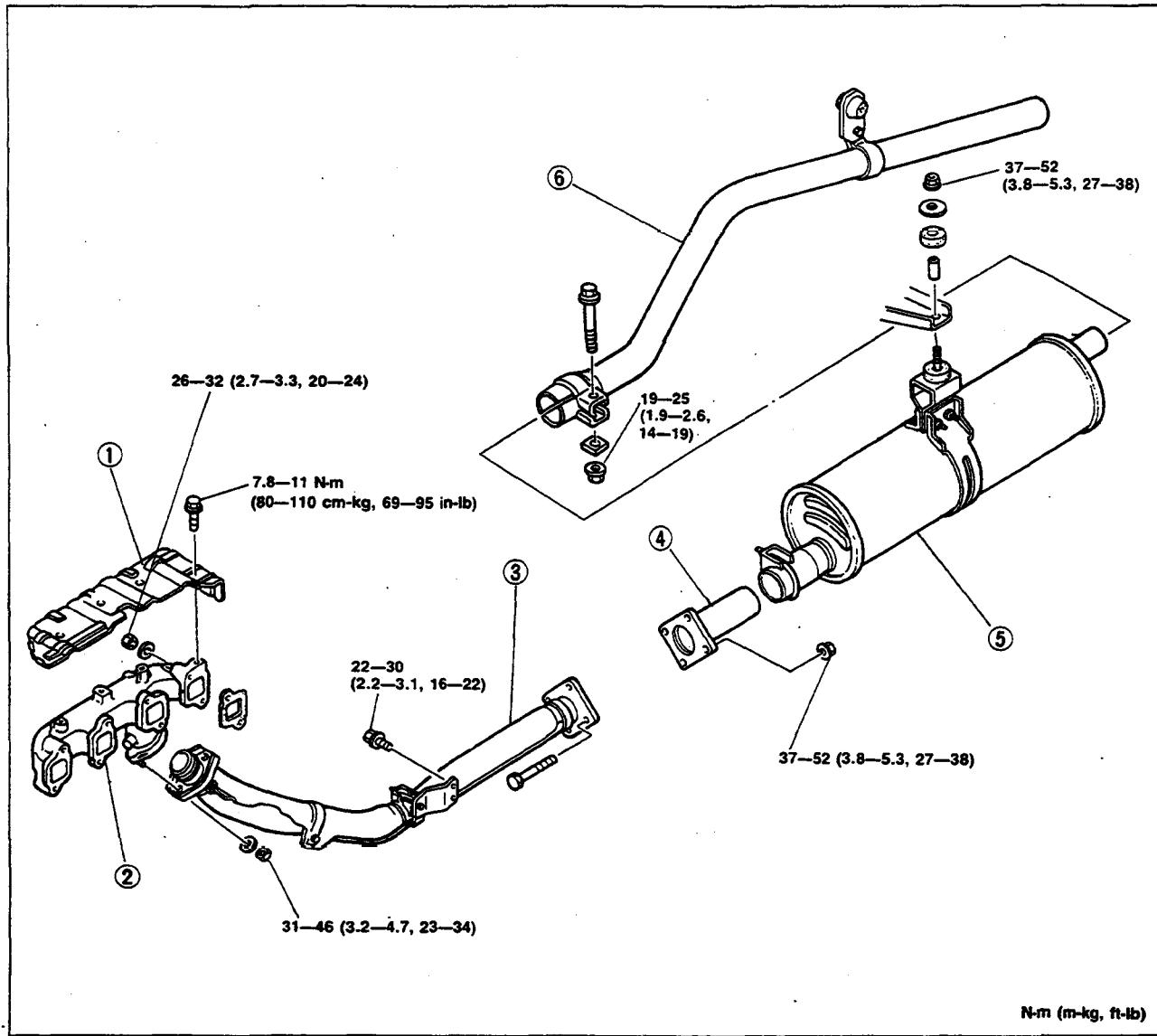
COMPONENTS

Vehicle Inspection

- Run the engine and verify that there is no exhaust leakage.

Removal / Inspection / Installation

- Remove in the order shown in the figure.
- Inspect all parts and repair or replace as necessary.
- Install in the reverse order of removal.



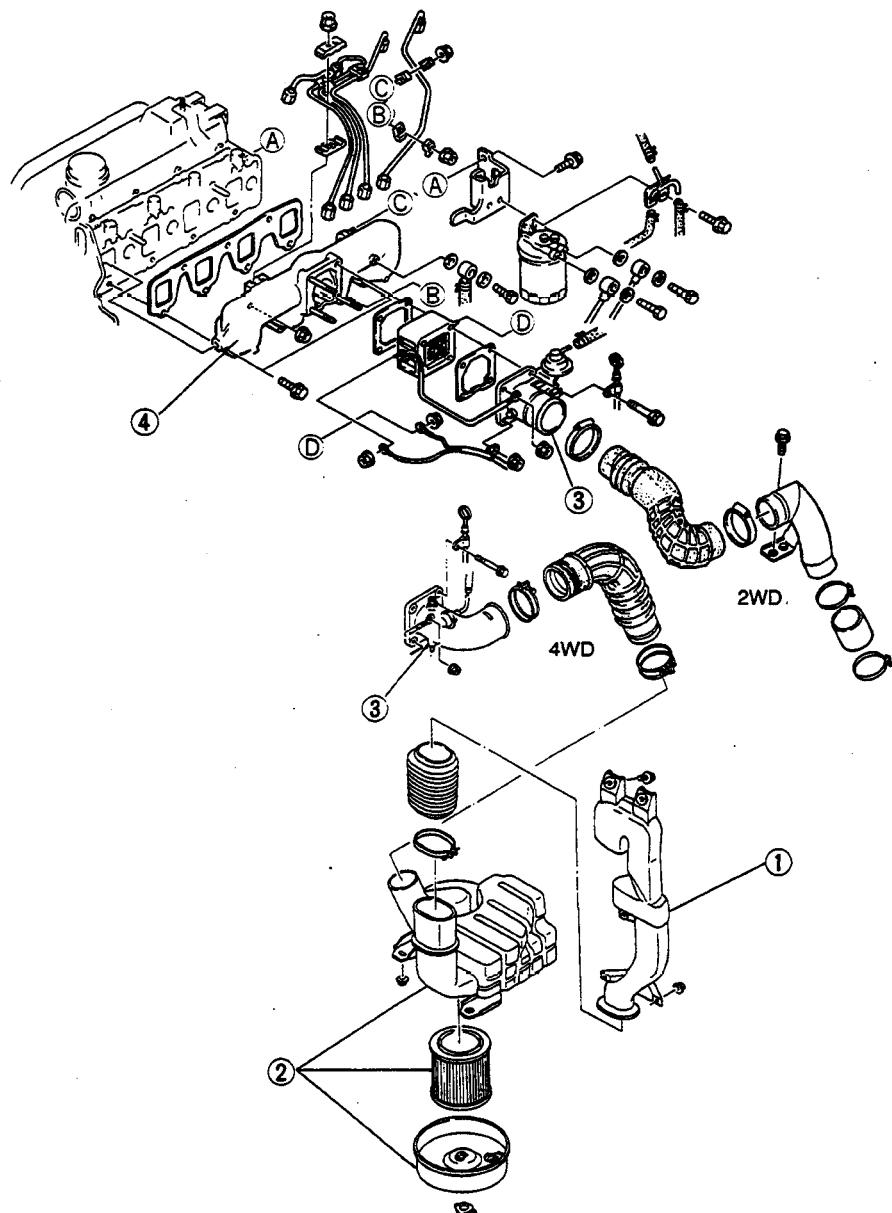
- Exhaust manifold insulator
- Exhaust manifold
Check for contamination, cracks and other damage
- Front pipe assembly
Check for contamination, cracks and other damage
- Middle pipe assembly
Check for contamination, cracks and other damage
- Main silencer
Check for contamination, cracks and other damage
- Tail pipe assembly
Check for contamination, cracks and other damage

FUEL AND EMISSION CONTROL SYSTEMS

(SL, SL TURBOCHARGED ENGINE)

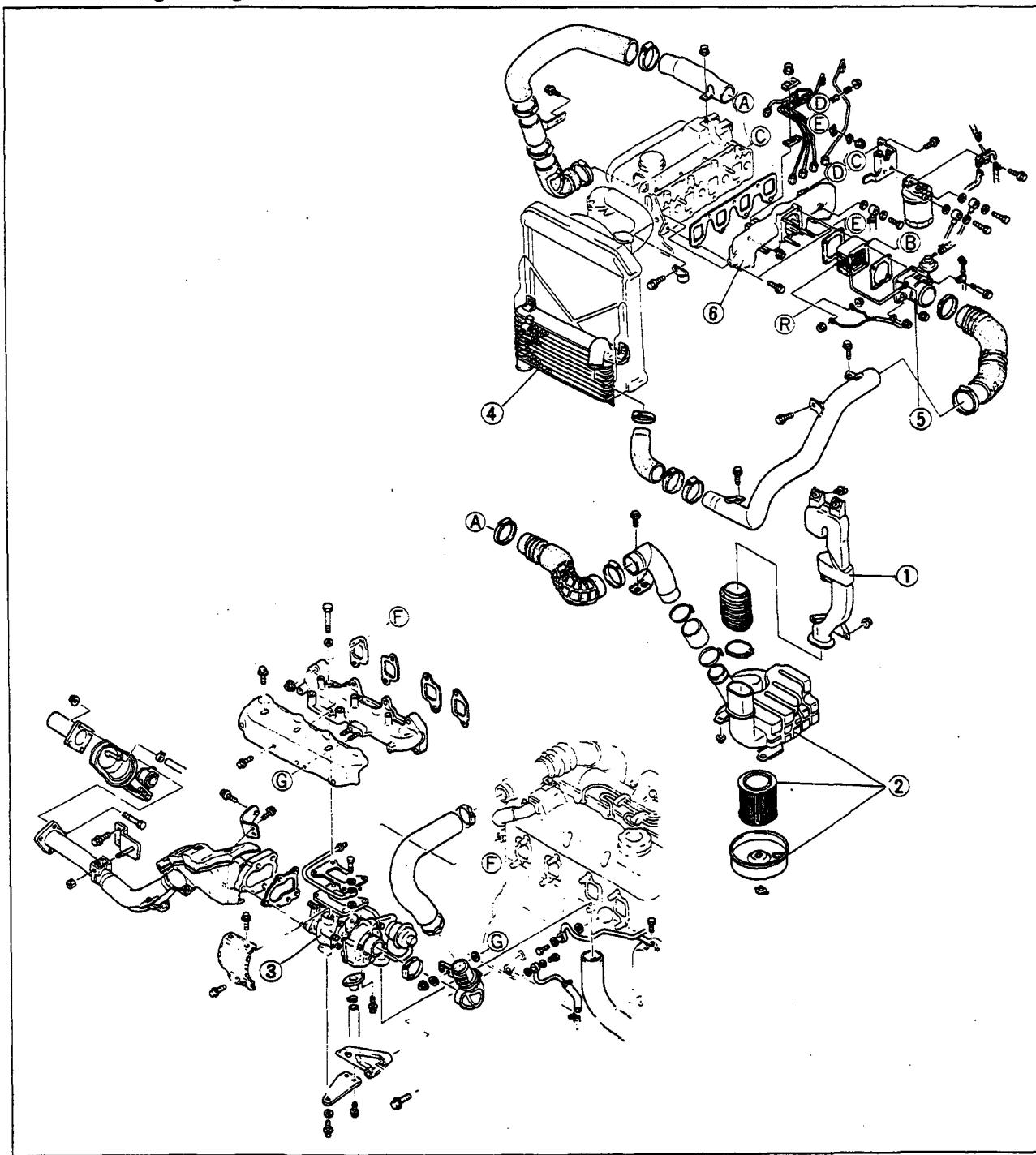
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FUEL DEVICES	F2- 4	FUEL STOP CABLE	F2-41
EXHAUST CONTROLLED HEATING DEVICES	F2- 5	IDLE SPEED CONTROL SYSTEM	F2-43
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OUTLINE	F2- 8	IDLING KNOB, IDLING CABLE	F2-43
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FUEL TANK	F2-29	NEUTRAL SWITCH	F2-54
INJECTION PUMP	F2-30	EXHAUST BRAKE SWITCH.....	F2-55
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SEDIMENTOR SENSOR (DETECTOR)	F2-34		
FUEL FILTER	F2-35		
INJECTION NOZZLE	F2-37		
ACCELERATOR PEDAL, ACCELERATOR CABLE	F2-40		

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INTAKE DEVICES
SL Engine

9TGOF2-002

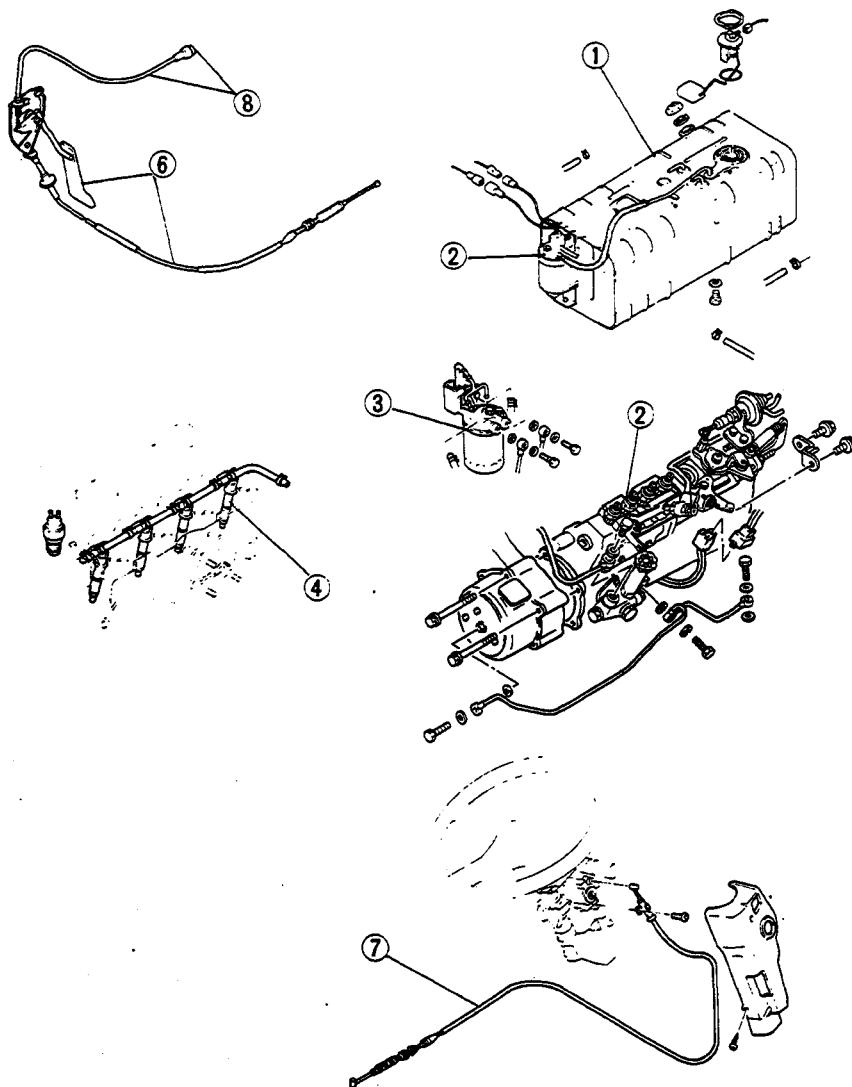
1. Fresh air duct
 Removal / Inspection /
 Installation page F2-18
2. Air cleaner
 Inspection page F2-13
3. Intake shutter valve
 Removal / Installation page F2-18
 Inspection page F2-49
4. Intake manifold
 Installation Note page F2-20

SL Turbocharged Engine

9TG0F2-003

- | | |
|---|---|
| 1. Fresh air duct
Removal / Inspection /
Installation page F2-18 | 4. Intercooler
Inspection page F2-28
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| 2. Air cleaner
Removal / Inspection /
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Inspection page F2-13 | 5. Intake shutter valve
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| 3. Turbocharger
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Installation page F2-23 | 6. Intake manifold
Removal / Inspection /
Installation page F2-22 |

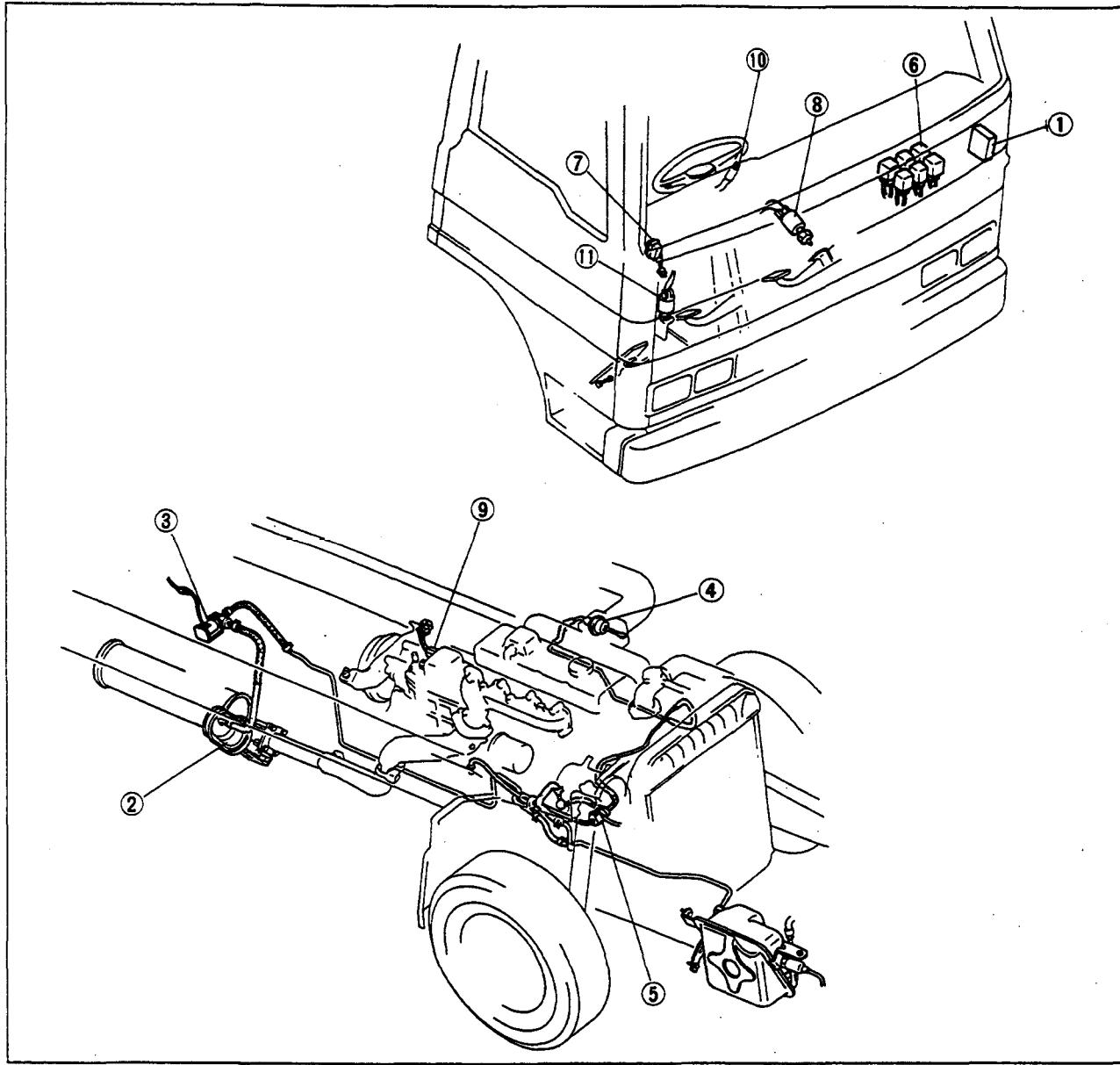
FUEL DEVICES



9TG0F2-004

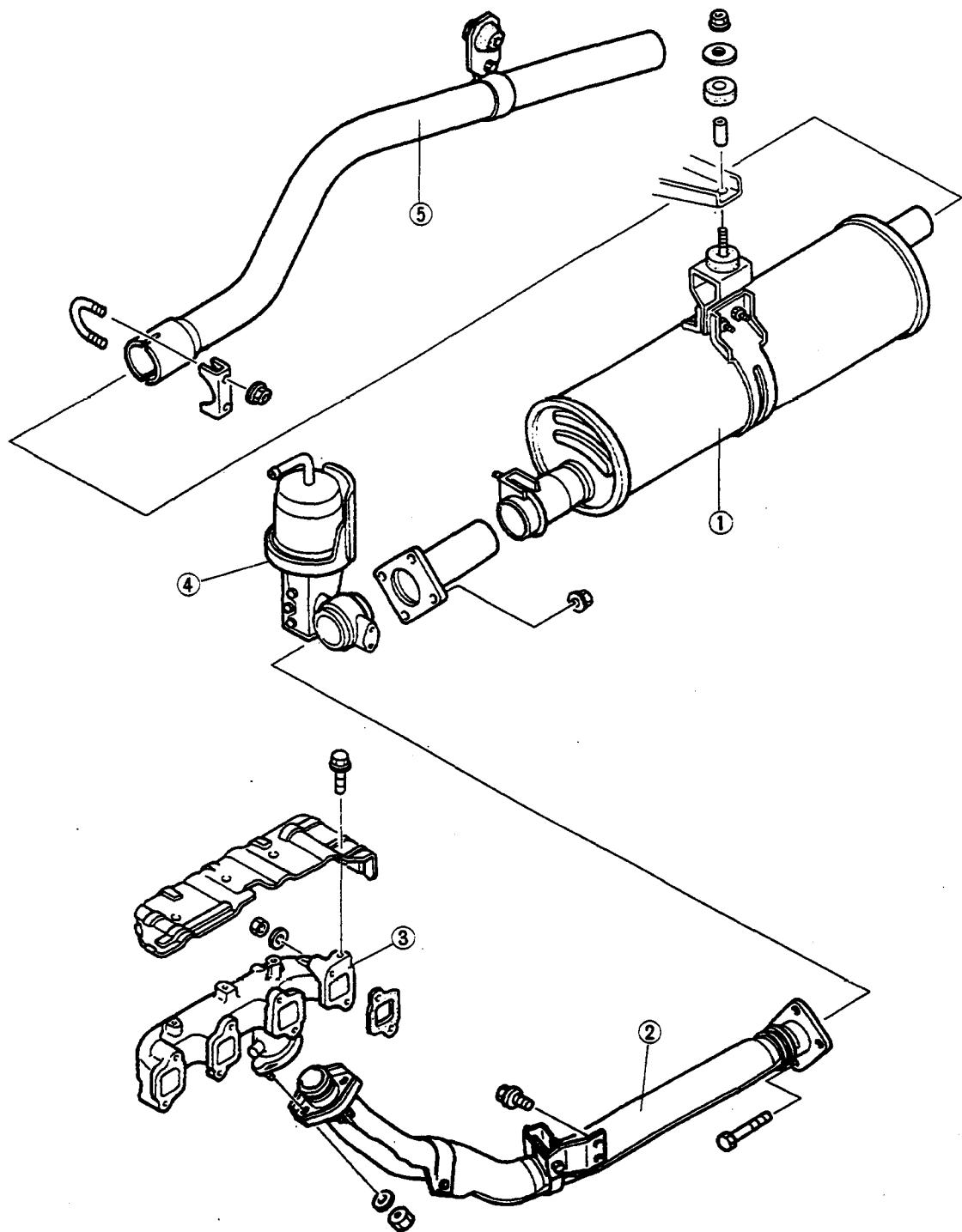
1. Fuel tank
 Removal / Inspection /
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2. Injection pump
 Removal page F2-30
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3. Sedimentor
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4. Fuel filter
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6. Accelerator pedal, Accelerator cable
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7. Fuel stop cable
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EXHAUST CONTROLLED HEATING DEVICES



9TG0F2-005

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Installation	page F2-52	
2. Exhaust brake unit	Removal.....	page F2-49
Inspection	page F2-49	
Installation	page F2-50	
3. Magnetic valve (Exhaust shutter valve)	Removal.....	page F2-50
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4. Actuator (Intake shutter valve)	Inspection	page F2-51
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5. Solenoid valve (Intake shutter valve)	Inspection	page F2-52
6. Cancel relay (Pay load above 3.5t only)	Removal.....	page F2-52
7. Exhaust heating switch	Inspection	page F2-53
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8. Clutch switch	Inspection	page F2-54
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9. Neutral switch	Inspection	page F2-54
Replacement.....	page F2-55	
10. Exhaust brake switch	Inspection	page F2-55
11. Accelerator switch	Inspection	page F2-53
Replacement.....	page F2-54	

EXHAUST DEVICES

1. Main silencer
2. Exhaust pipe
3. Exhaust manifold

4. Exhaust brake unit
5. Tail pipe

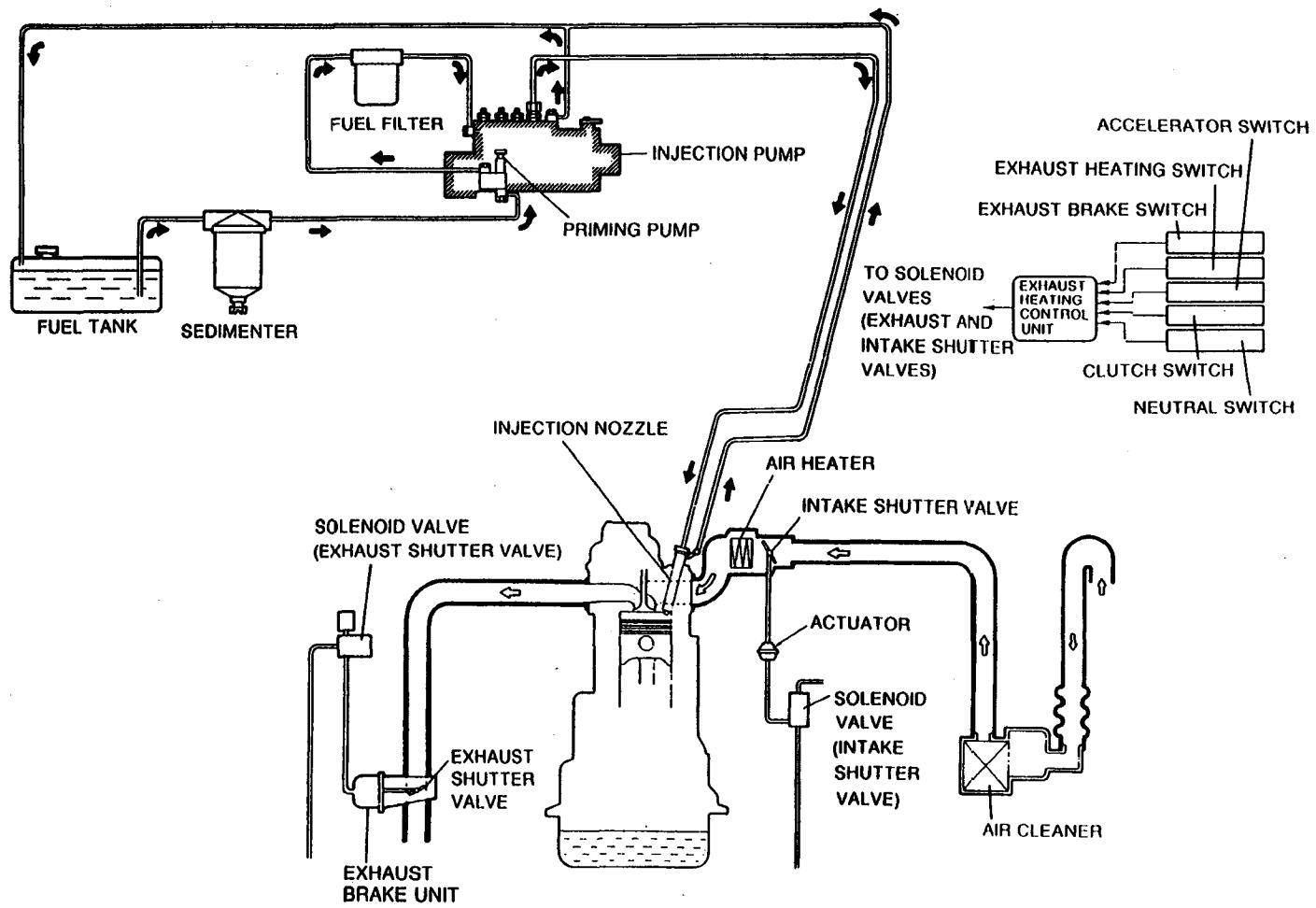
9TG0F2-006

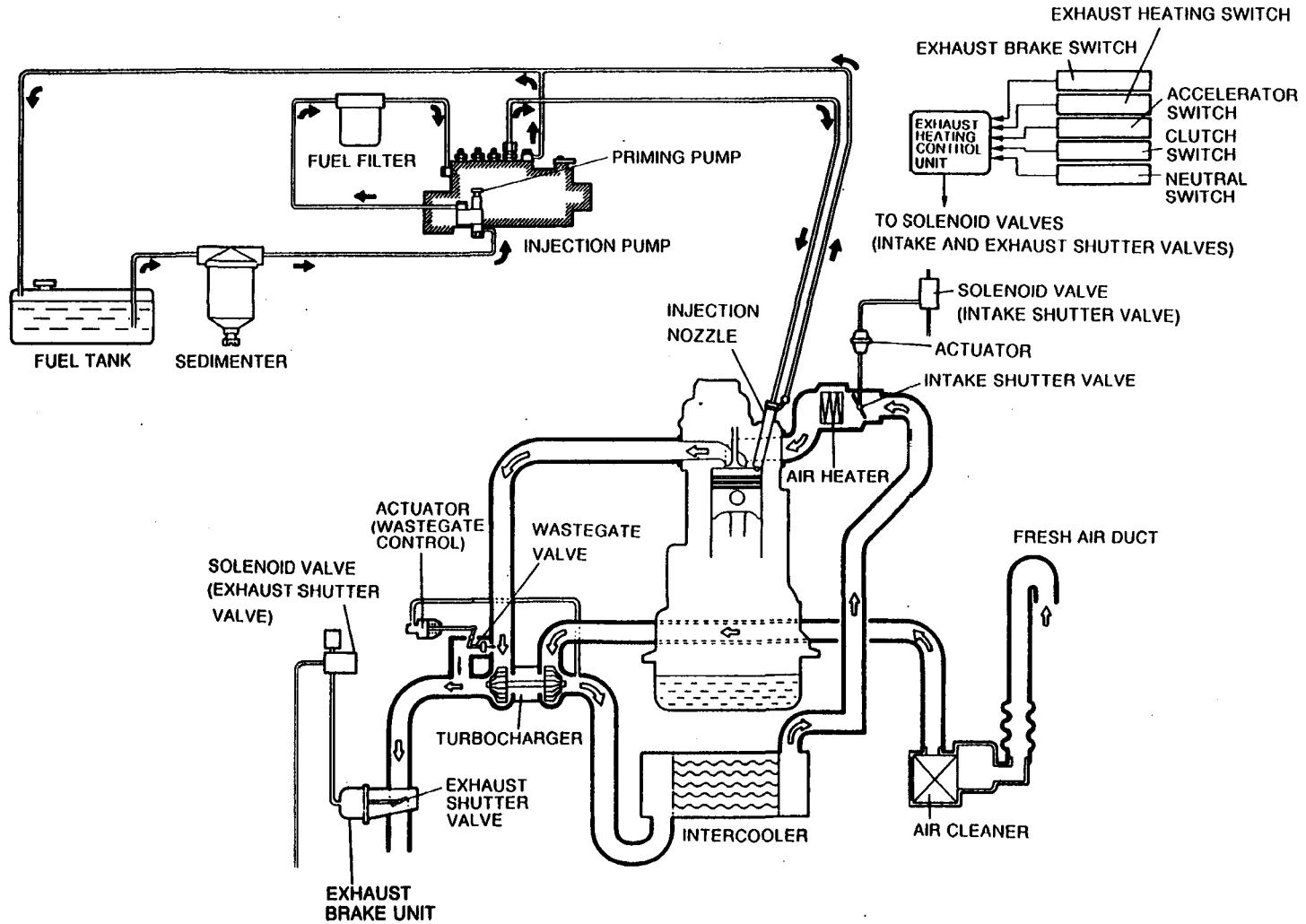
OUTLINE

F2

MEMO

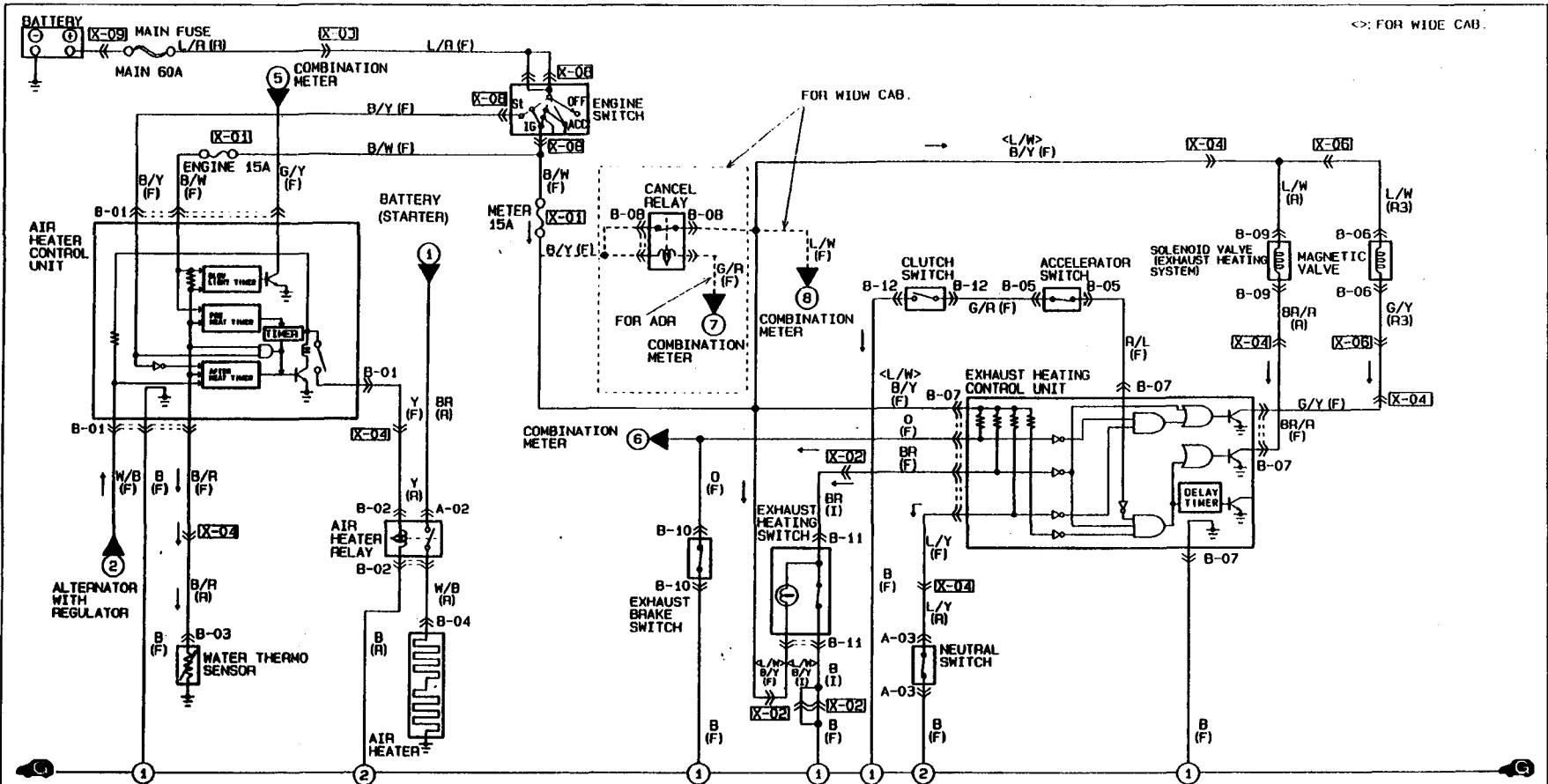
OUTLINE
SYSTEM DIAGRAM
SL Engine





WIRING DIAGRAM

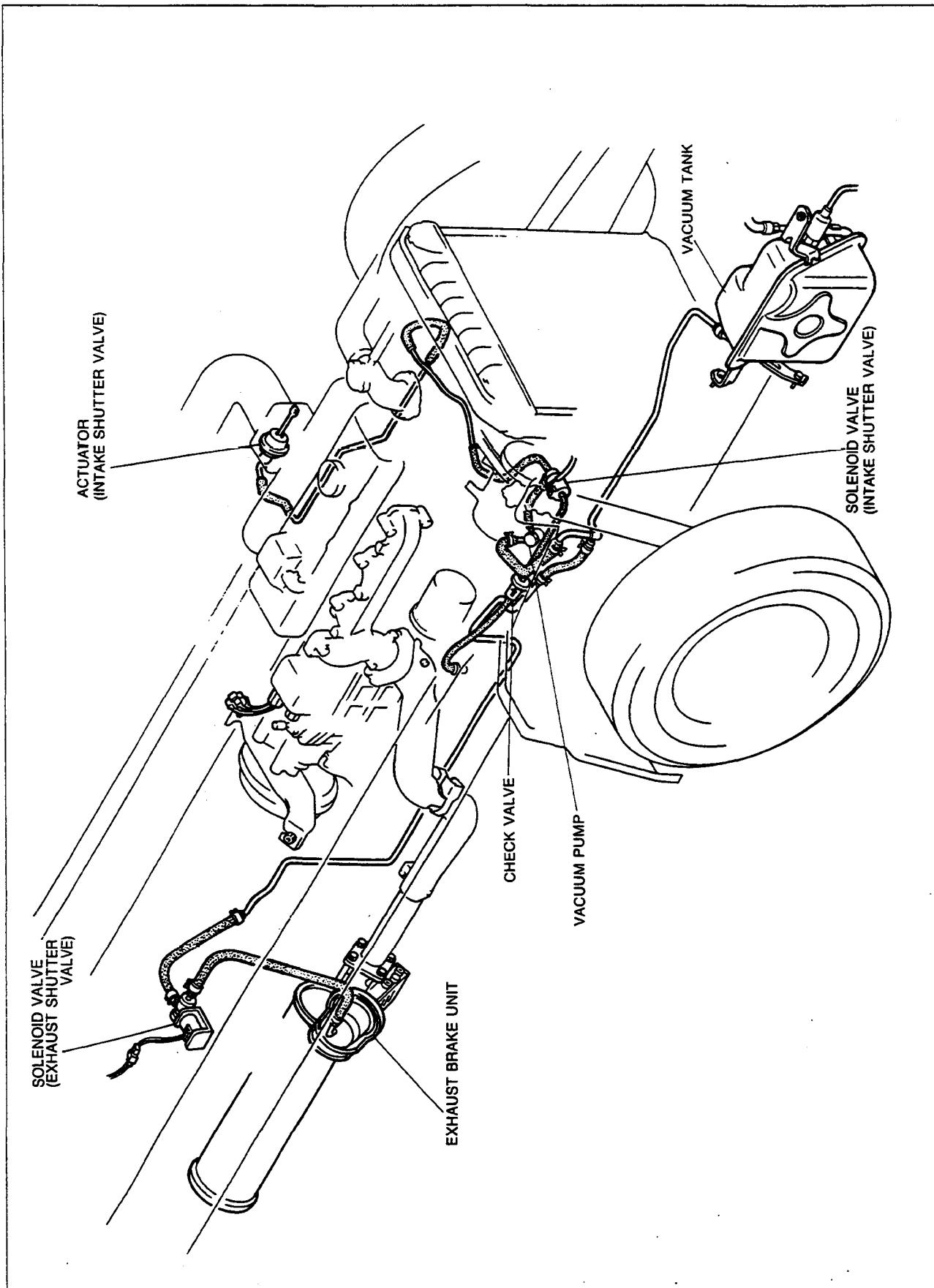
F2-10



B-01 AIR HEATER CONTROL UNIT (F)	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)
G/Y X B/W B/R *Y X B/B/Y W/B *B/Y	Y B	W/B	W/B	R/L G/R	L/W G/Y	BR/R G/Y O X 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-03 NEUTRAL SWITCH (R)
L/W X G/R B/Y B/Y	BR/R L/W	O B	X B L/M B/Y BR	B G/R		B/W (R) B/L L/Y
A-02 STARTING MOTOR (B) & FUSIBLE LINK (R)	FUSIBLE LINK 5.0sq					(): FOR CREW CAB.

NOTE: *...NOT USED

VACUUM HOSE ROUTING DIAGRAM

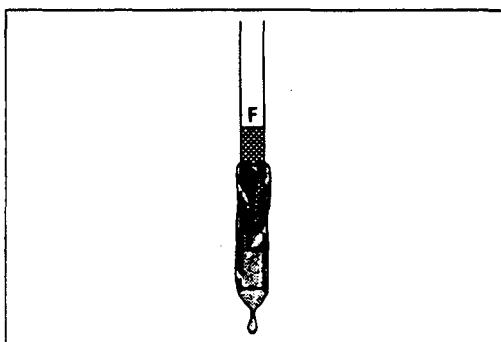


TROUBLESHOOTING GUIDE

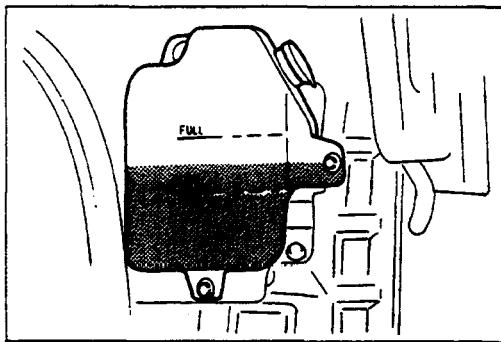
Trouble	Possible Cause	Action
Hard starting	Malfunction of stop system Air in injection pipe, injection pump, fuel filter or sedimentor Clogged fuel line or fuel filter Incorrect injection timing Seized or leaking delivery valve. Incorrect injection starting pressure Malfunction of injection nozzle Malfunction of feed pump Malfunction of governor Malfunction of injection pump	Adjust or replace Bleed air Replace Adjust Replace or clean Adjust Clean or replace Clean or replace Replace Replace
Rough idling	Incorrect idling speed Incorrect injection timing Clogged fuel line or fuel filter Leak in fuel line or fuel filter Air in injection pipe, injection pump, fuel filter or sedimentor Seized or leaking delivery valve Incorrect injection starting pressure Malfunction of injection nozzle Malfunction of feed pump Malfunction of timer Malfunction of injection pump	Adjust Adjust Clean or replace Repair or replace Bleed air Replace or clean Adjust Clean or replace Clean or replace Replace Replace
Engine knocking	Incorrect injection timing Incorrect injection starting pressure Malfunction of injection nozzle Low quality of fuel	Adjust Adjust Clean or adjust Drain and replace
Excessive exhaust smoke	Incorrect injection timing Water in injection pump, fuel filter or sedimentor Incorrect injection starting pressure Clogged air cleaner Malfunction of delivery valve Malfunction of injection pump	Adjust Drain Adjust Clean or replace Clean or replace Replace
Poor acceleration	Low quality of fuel Incorrect injection timing Clogged fuel line or fuel filter Air in injection pump or fuel filter Clogged air cleaner Malfunction of delivery valve Incorrect injection starting pressure Malfunction of injection nozzle Malfunction of feed pump Malfunction of injection pump Malfunction of governor	Drain and replace Adjust Clean or replace Air bleed Clean or replace Clean or replace Adjust Clean or replace Clean or replace Replace Replace
High fuel consumption	Incorrect injection timing High idling speed Incorrect injection starting pressure Clogged air cleaner Clogged fuel filter Malfunction of injection nozzle	Adjust Adjust Adjust Clean or replace Replace Clean or replace
Engine does not stop	Malfunction of fuel stop system	Adjust or repair

9TG0F2-012

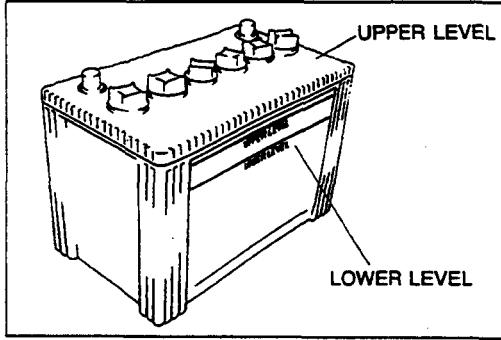
ENGINE TUNE-UP



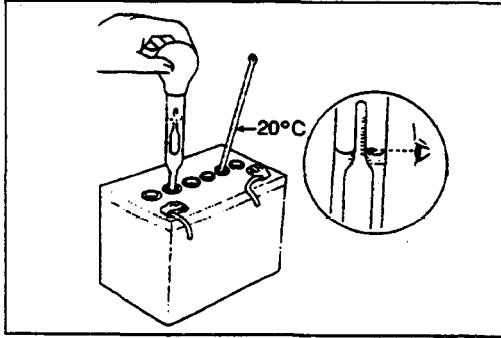
9TG0F2-013



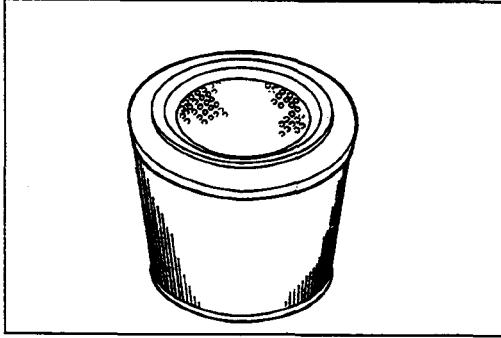
9TG0F2-014



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.

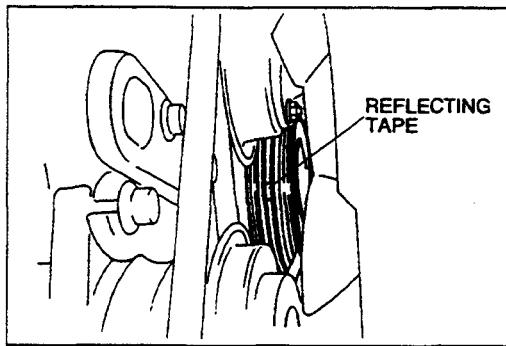
Verify that the coolant level is near the radiator inlet port, and that the level in the reservoir is between the FULL and LOW marks. Add coolant as necessary.

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

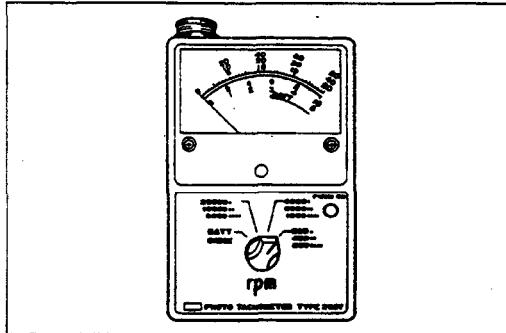
Visually check the air cleaner element for excessive dirt, damage or oil. Clean with compressed air if necessary.



9TG0F2-018

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.



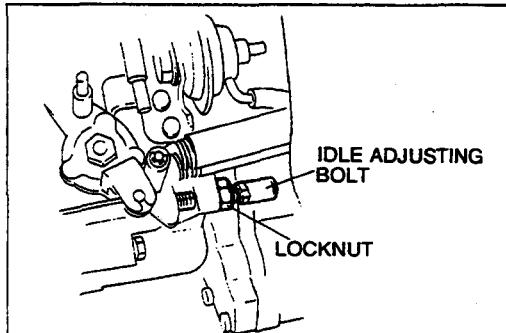
9TG0F2-019

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)**



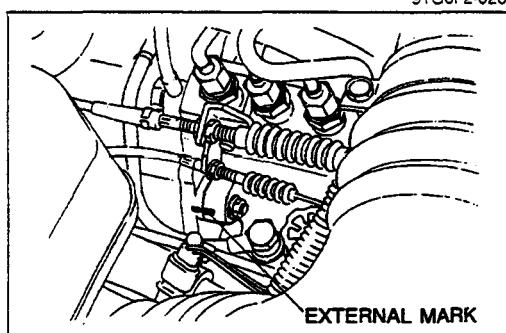
9TG0F2-020

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)



9TG0F2-021

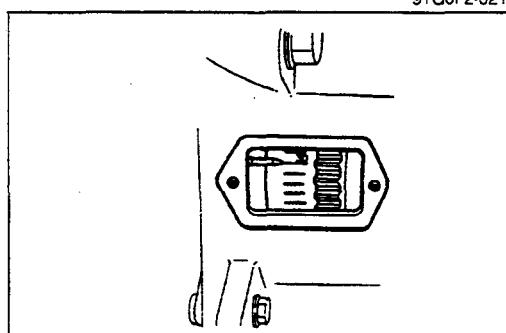
**Injection Timing
Inspection****Note**

- 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.

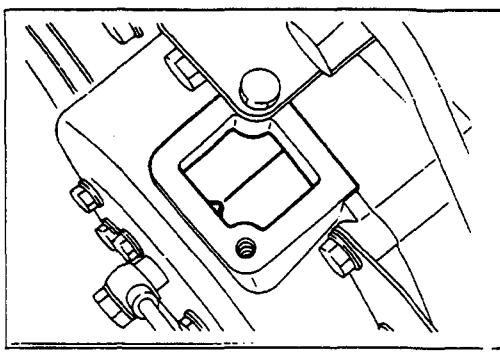
Set the injection timing after installing the injection pump.



9TG0F2-022

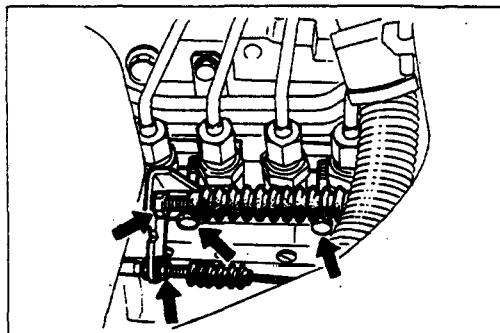
1. Remove the service hole covers from the clutch housing and the timing gear case.
2. Turn the flywheel in the direction of rotation until the indicator pin is at 30° BTDC.

ENGINE TUNE-UP



9TG0F2-023

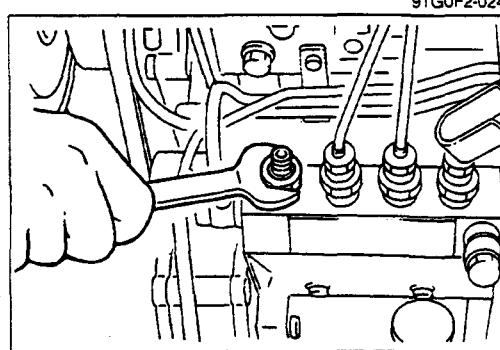
3. Verify that the pointer of the timing gear case and the mark on the timer are aligned.
4. If not as specified, adjust the injection timing.



9TG0F2-024

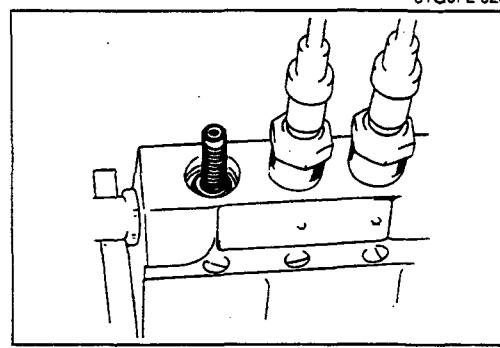
Adjustment

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.

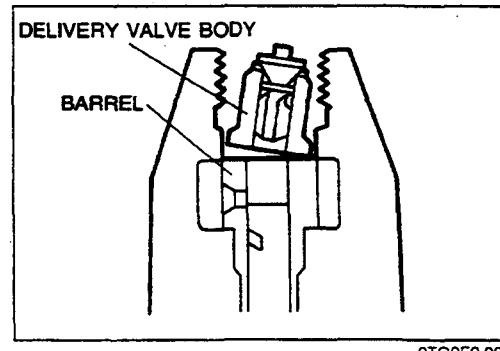


9TG0F2-026

6. Remove the delivery valve spring seat and spring.

Caution

- Do not remove the delivery valve body.

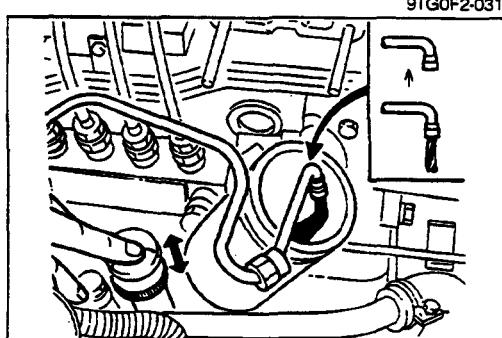
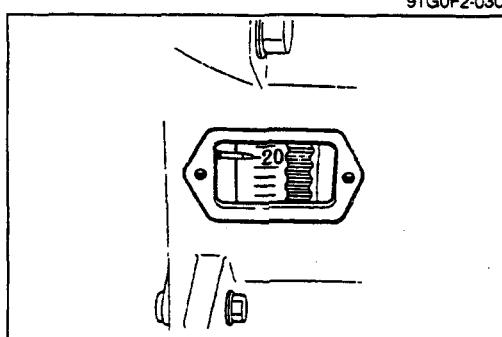
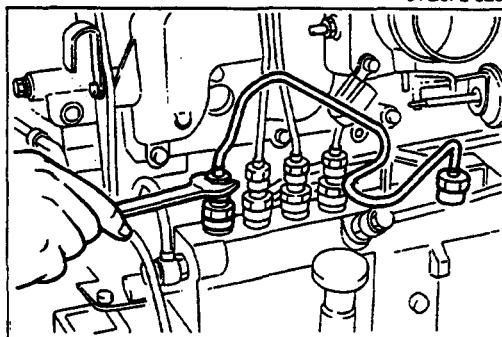
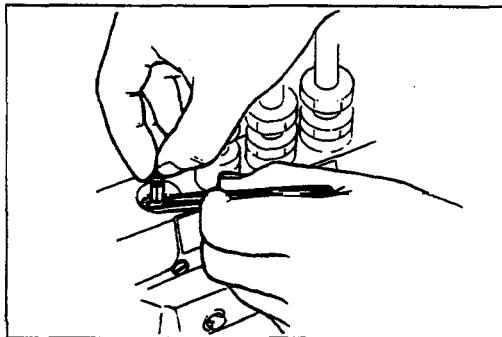
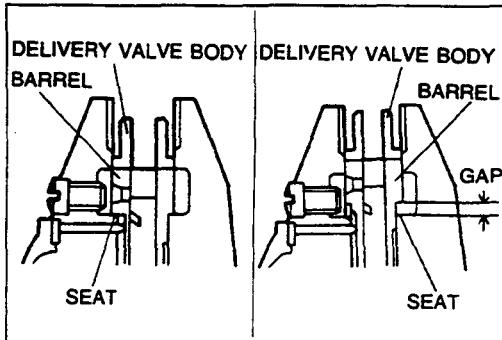


9TG0F2-027

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.



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.

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

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

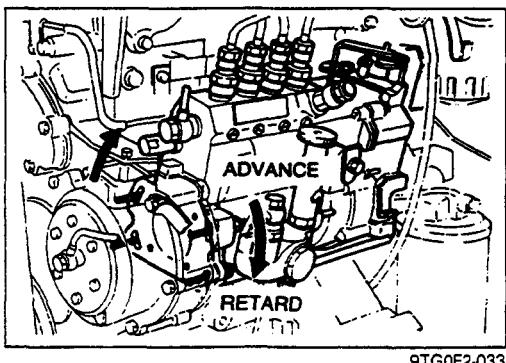
12. Place a container under No.1 injector pipe and verify that fuel is expelled when pumping the primer pump.

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)

ENGINE TUNE-UP

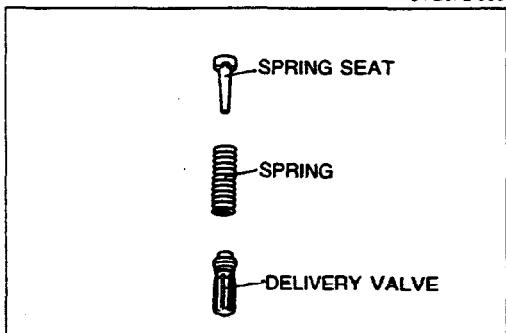


9TG0F2-033

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)

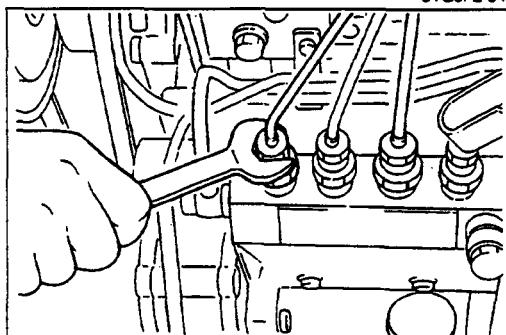


9TG0F2-034

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.

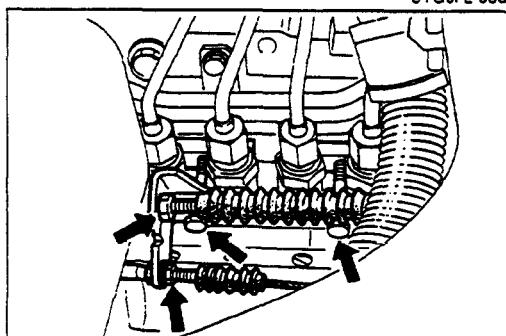
Tightening torque:

39—44 N·m (4.0—4.5 m-kg, 29—33 ft-lb)



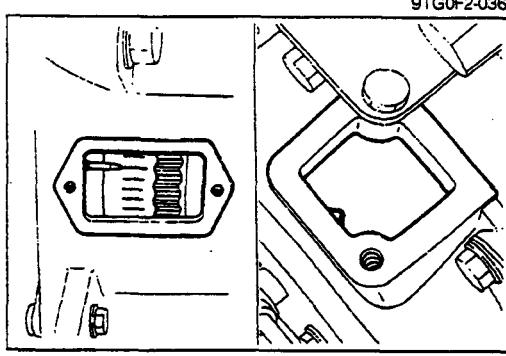
9TG0F2-035

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. (Refer to page F2-35.)
26. Start the engine, and check for fuel leaks.

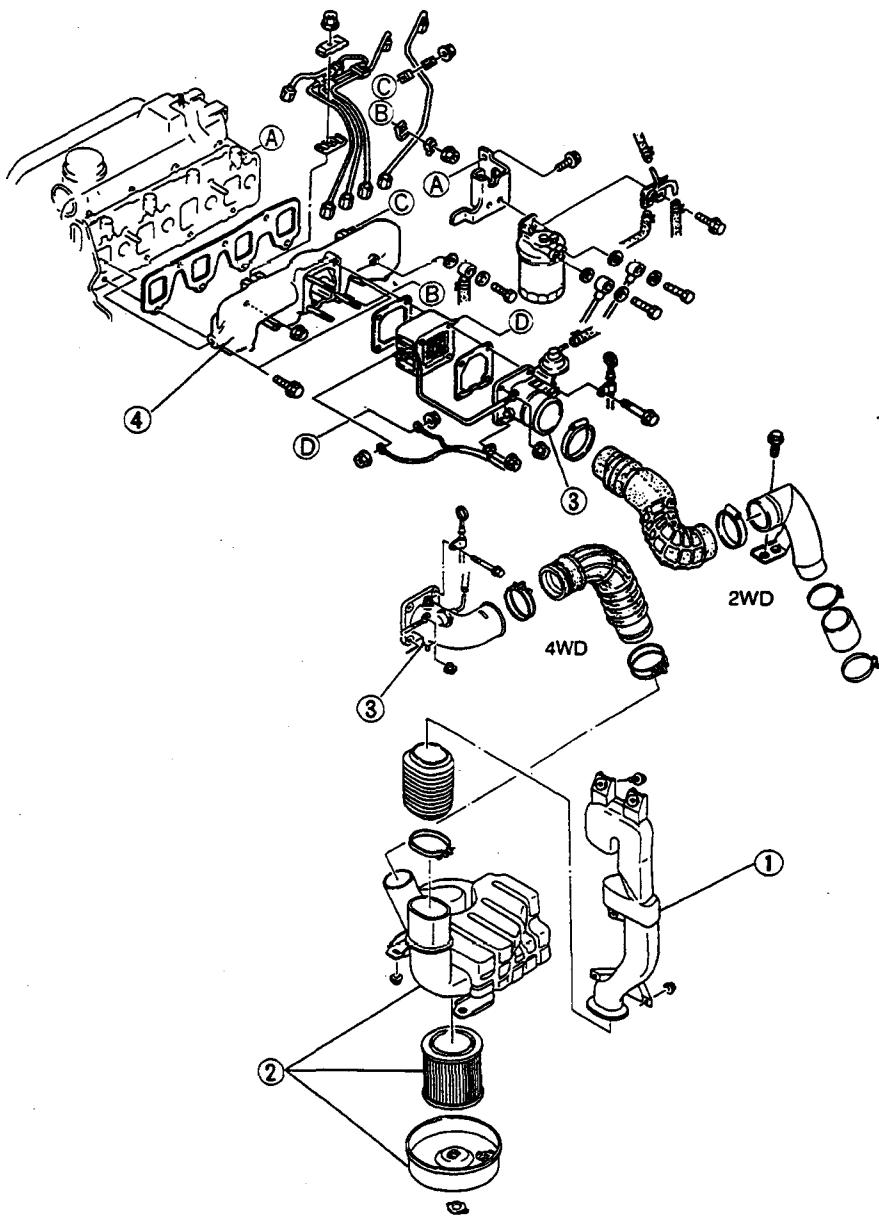
INTAKE AIR SYSTEM

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**.

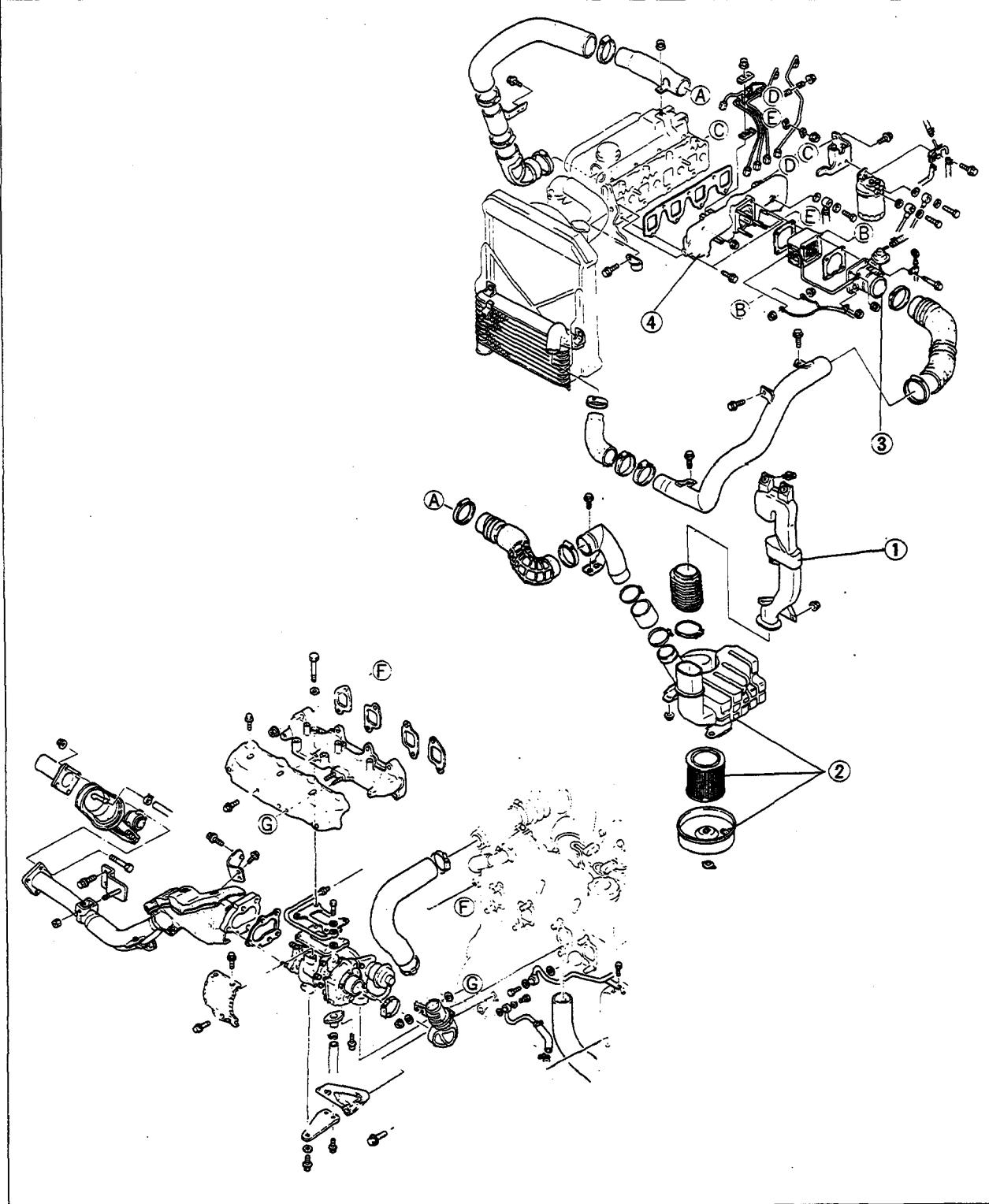
SL Engine



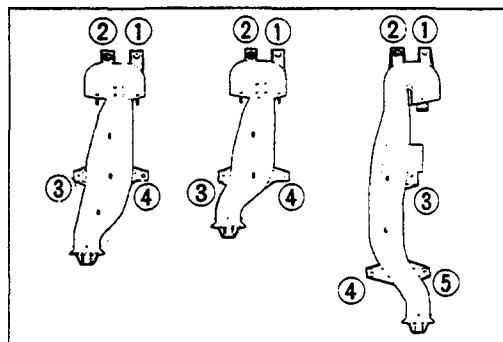
9TG0F2-038

- | | |
|--|---|
| 1. Fresh air duct
Check for contamination, cracks and other damage page F2-18
Installation Note page F2-20 | 3. Intake shutter valve
Inspection page F2-49 |
| 2. Air cleaner
Inspection page F2-13 | 4. Intake manifold
Check for contamination, cracks and other damage page F2-18
Installation Note page F2-20 |

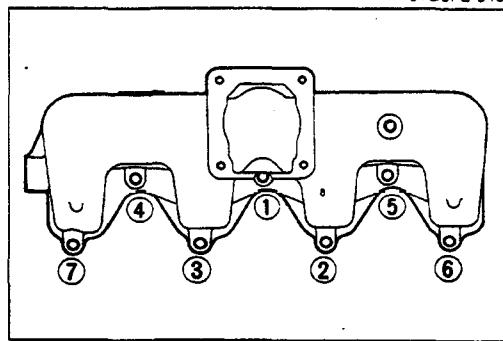
SL Turbocharged Engine



- 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

**Installation note****Fresh air duct**

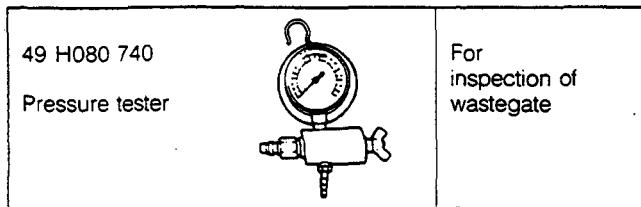
Install in the order shown in the figure.

**Intake manifold**

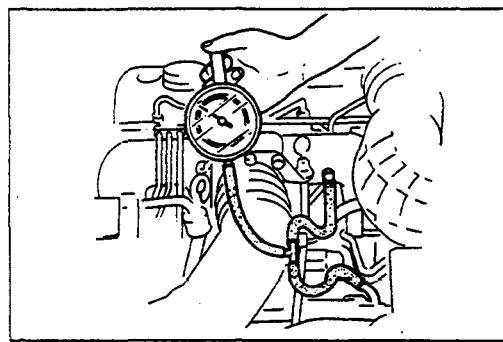
1. Use a new gasket.
2. Tighten in the order shown in the figure.

Tightening torque:

22—31 N·m (2.2—3.1 m·kg, 15—22 ft-lb)

TURBOCHARGER**TURBOCHARGER****PREPARATION
SST**

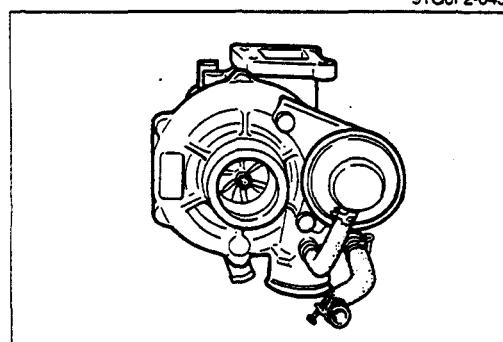
9TG0F2-042



9TG0F2-043

TURBOCHARGER**On-vehicle Inspection****Turbocharger boost pressure**

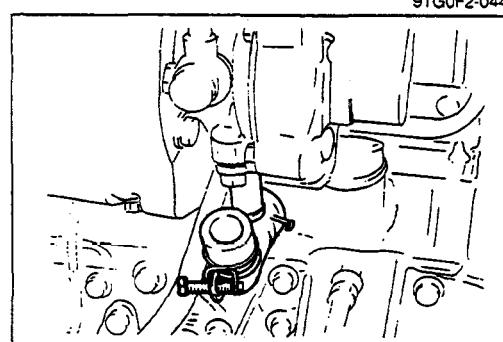
1. Disconnect the air hose from the wastegate.
2. Connect a pressure gauge as shown.
3. Connect a tachometer to the engine.
4. Warm up the engine to operating temperature.
5. Increase the engine speed to **4,000 rpm** and verify that the boost pressure is within specification.

Boost pressure:**41.2—49.1 kPa (0.42—0.5 kg/cm², 6.0—7.1 psi)**

9TG0F2-044

Turbine wheel

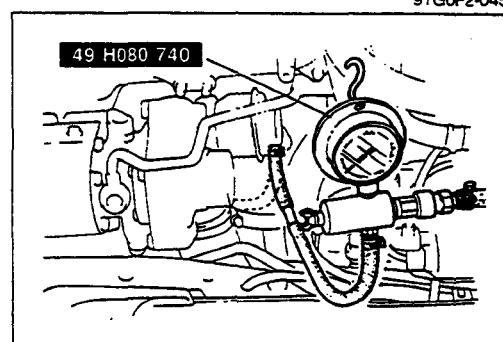
1. Allow the engine to cool.
2. Remove the air hose.
3. Verify that the rotor assembly turns smoothly.
4. If there is excessive load or noise, replace the turbocharger.



9TG0F2-045

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.



9TG0F2-046

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/cm², 19.6 psi)**.
4. Verify that the rod moves when disconnecting and reconnecting the air supply hose.

Caution

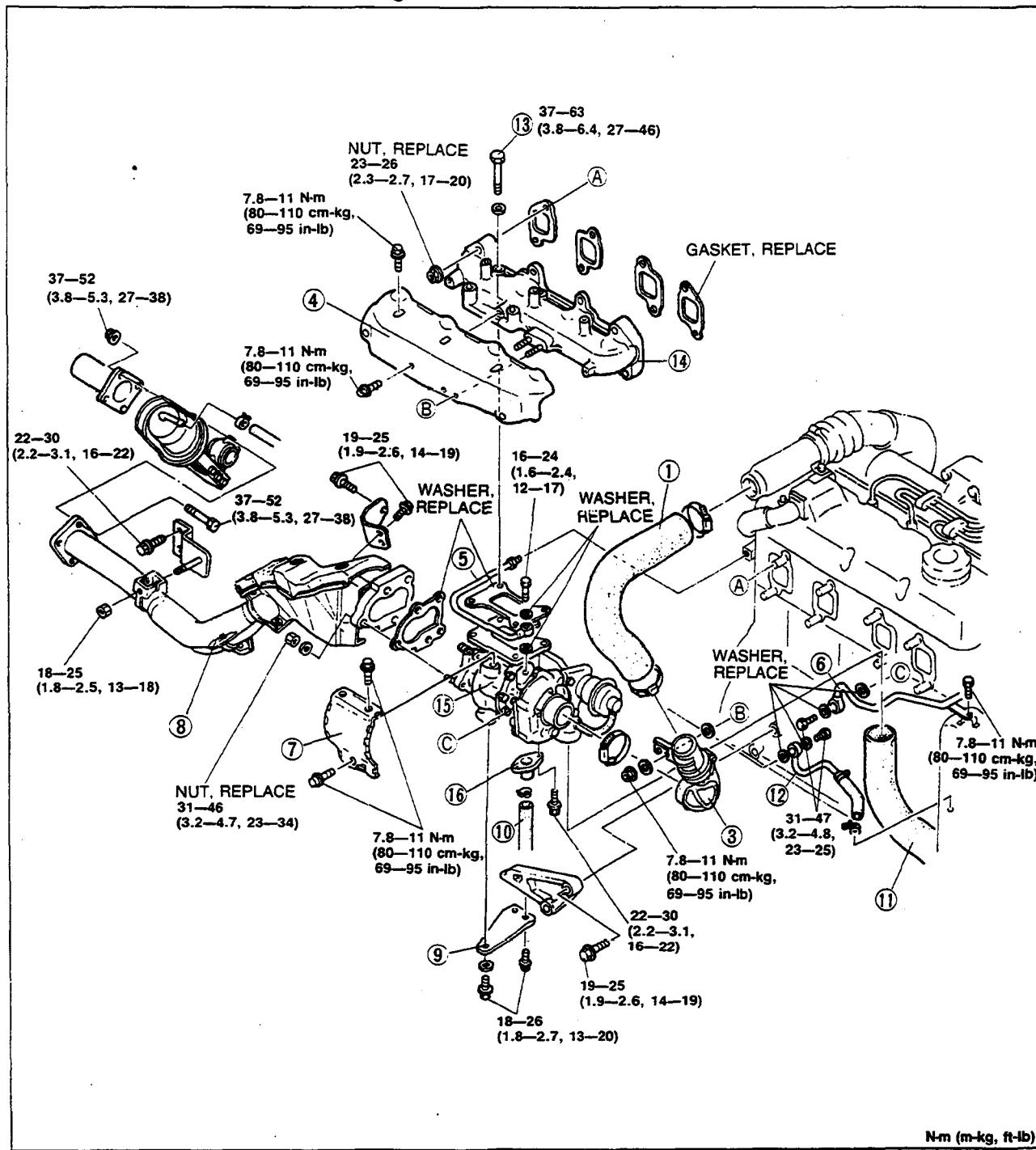
- **Do not apply more than 196 kPa (2.0 kg/cm², 28 psi) of air pressure.**

F2

TURBOCHARGER

Removal

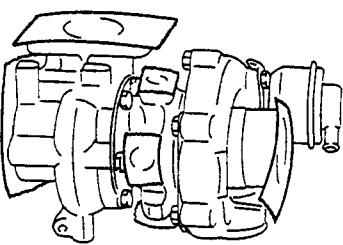
1. Drain the engine oil and coolant.
2. Remove in the order shown in the figure.



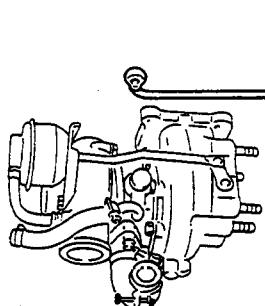
N·m (m·kg, ft·lb)

9TG0F2-047

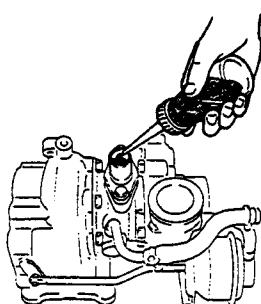
1. Air intake hose
2. Change rod bracket
3. Joint rubber
4. Heat insulator
5. Oil pipe
6. Water pipe
7. Insulator
8. Front pipe
9. Turbo bracket spring
10. Oil hose
11. Joint hose
12. Water hose
13. Stud bolt
14. Exhaust manifold
15. Turbocharger
16. Oil pipe



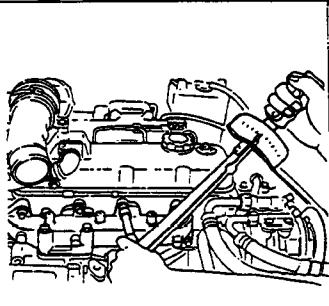
9TG0F2-048



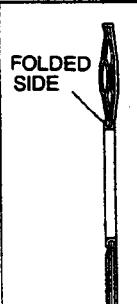
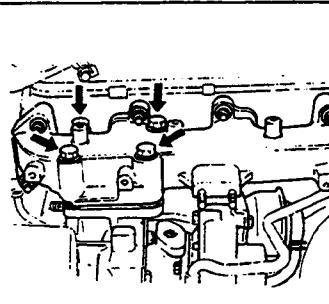
9TG0F2-049



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:

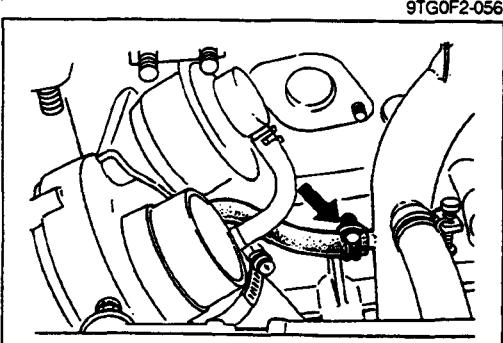
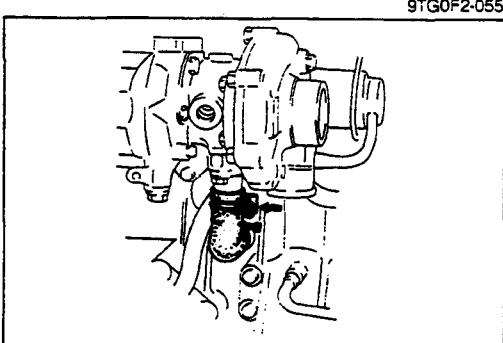
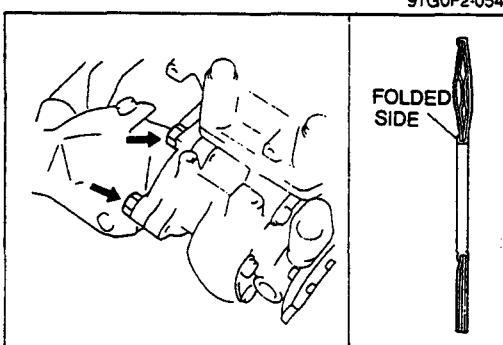
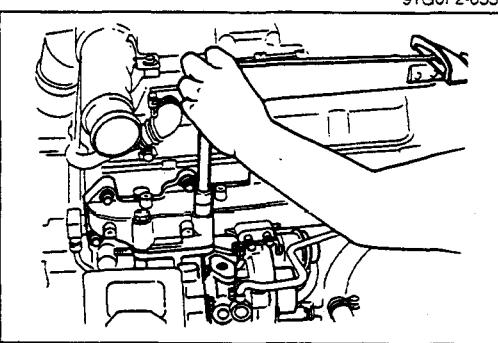
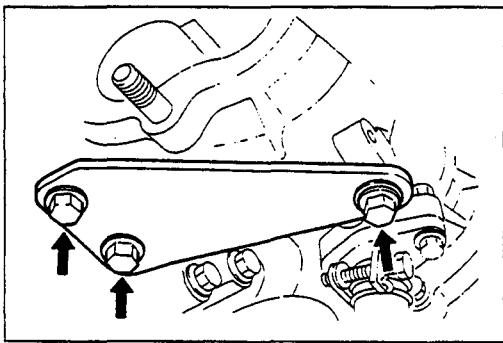
22.6—26.5 N·m (2.3—2.7 m-kg, 17—19 ft-lb)

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.



5. Install the turbocharger flex bracket.

Tightening torque:
17.7—26.5 N·m (1.8—2.7 m-kg, 13—19 ft-lb)

6. Tightening the turbocharger mounting bolts.

Tightening torque:
37.3—62.8 N·m (3.8—6.4 m-kg, 28—46 ft-lb)

7. Install the front exhaust pipe using a new gasket and nuts.

Note

- **Install the gasket with the folded side facing the turbocharger.**

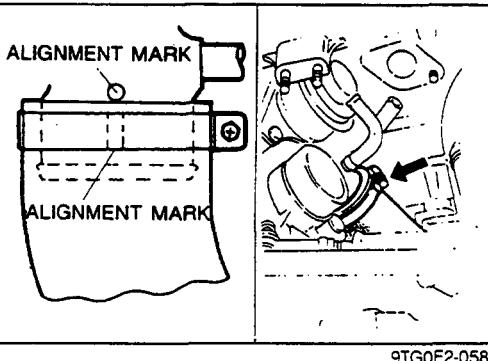
Tightening torque:

37.3—62.8 N·m (3.8—6.4 m-kg, 28—46 ft-lb)

8. Connect the oil hose.

9. Connect the water hose.

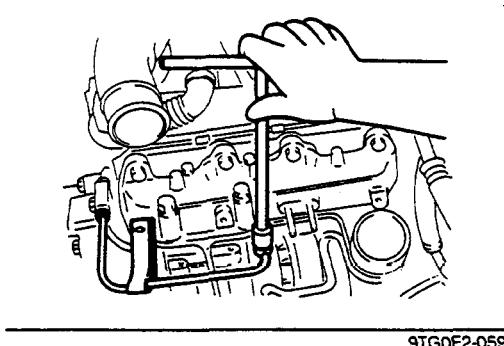
TURBOCHARGER



10. Connect the joint hose with the alignment mark matched, and tighten the hose clamp.

Tightening torque:

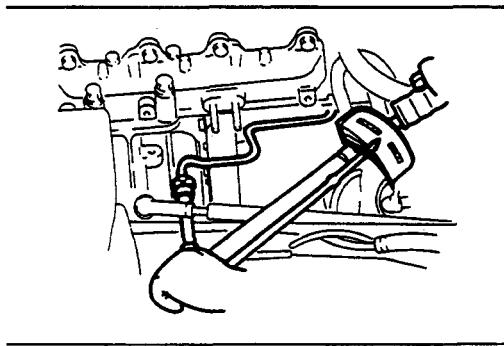
3.9—4.9 N·m (40—50 cm·kg, 35—43 in·lb)



11. Install the oil pipe and a new washer.

Tightening torque:

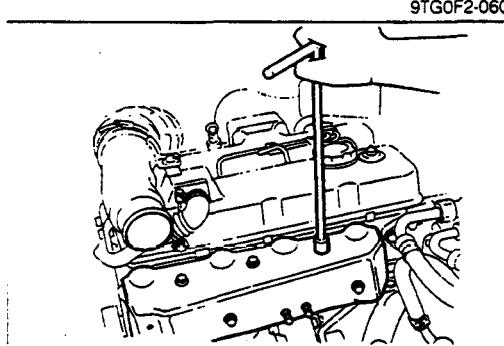
15.7—23.5 N·m (1.6—2.4 m·kg, 12—17 ft·lb)



12. Install the water pipe and a new washer.

Tightening torque:

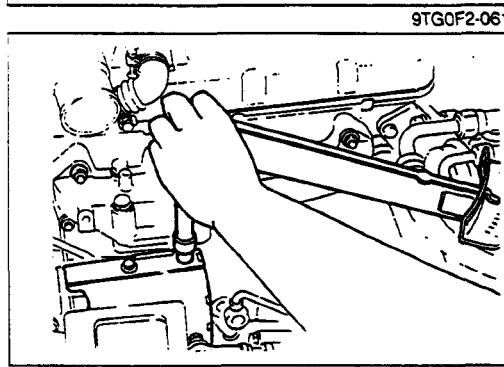
15.7—23.5 N·m (1.6—2.4 m·kg, 12—17 ft·lb)



13. Install the exhaust manifold heat insulator.

Tightening torque:

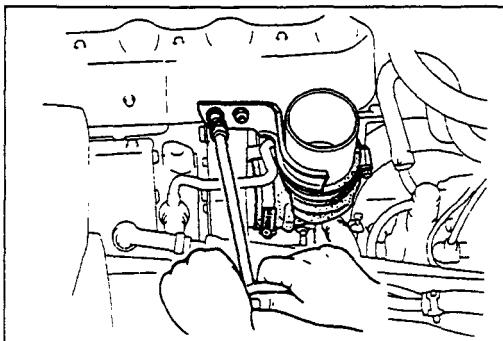
7.8—10.8 N·m (0.8—1.1 m·kg, 5.8—8.0 ft·lb)



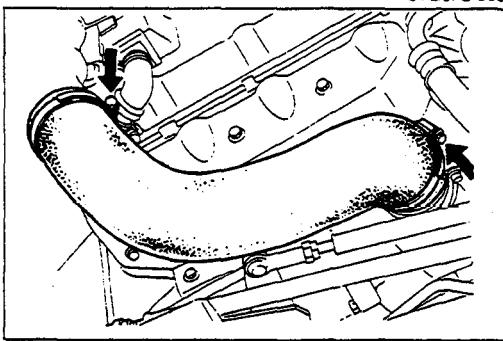
14. Install the turbocharger heat insulator.

Tightening torque:

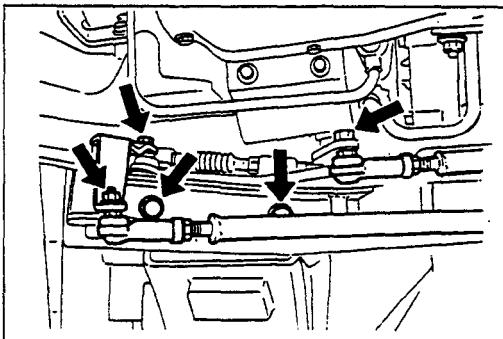
7.8—10.8 N·m (0.8—1.1 m·kg, 5.8—8.0 ft·lb)



15. Connect the joint rubber.



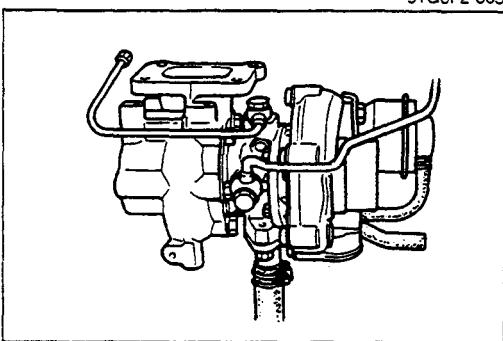
16. Connect the air intake hose.



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

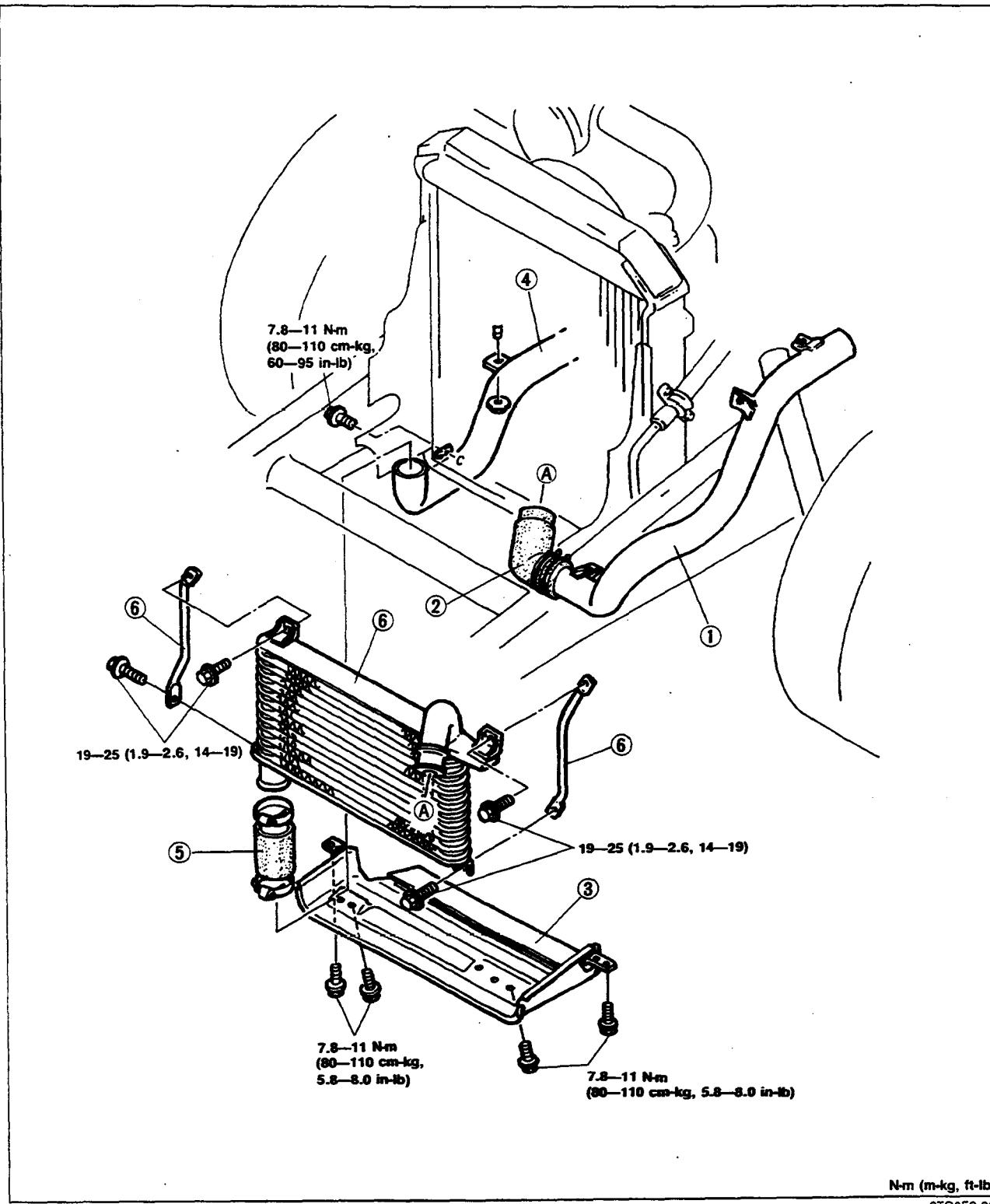
- Let the engine idle for a few minutes to lubricate the turbocharger.

TURBOCHARGER

INTERCOOLER

Removal / Installation

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



1. Air intake pipe
2. Joint rubber (Outlet side)
3. Under cover

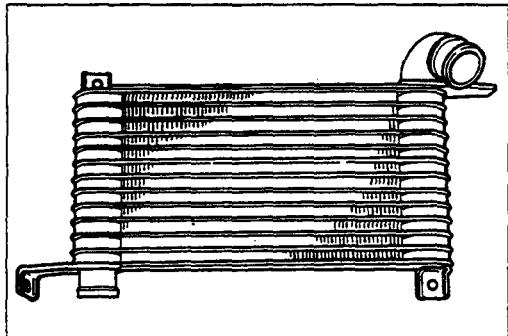
4. Air intake pipe
5. Joint rubber (Inlet side)
6. Intercooler, Intercooler stay

N·m (m·kg, ft·lb)

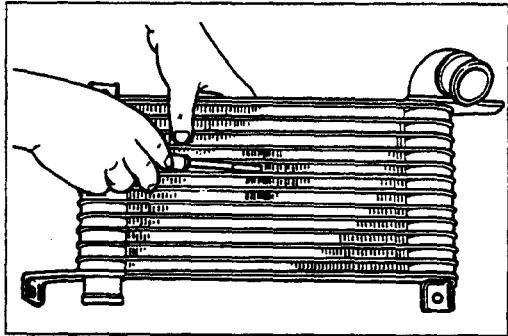
9TG0F2-067

Inspection and Repair

1. Inspect the intercooler for cracks, restriction, or damage.



9TG0F2-068



9TG0F2-069

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

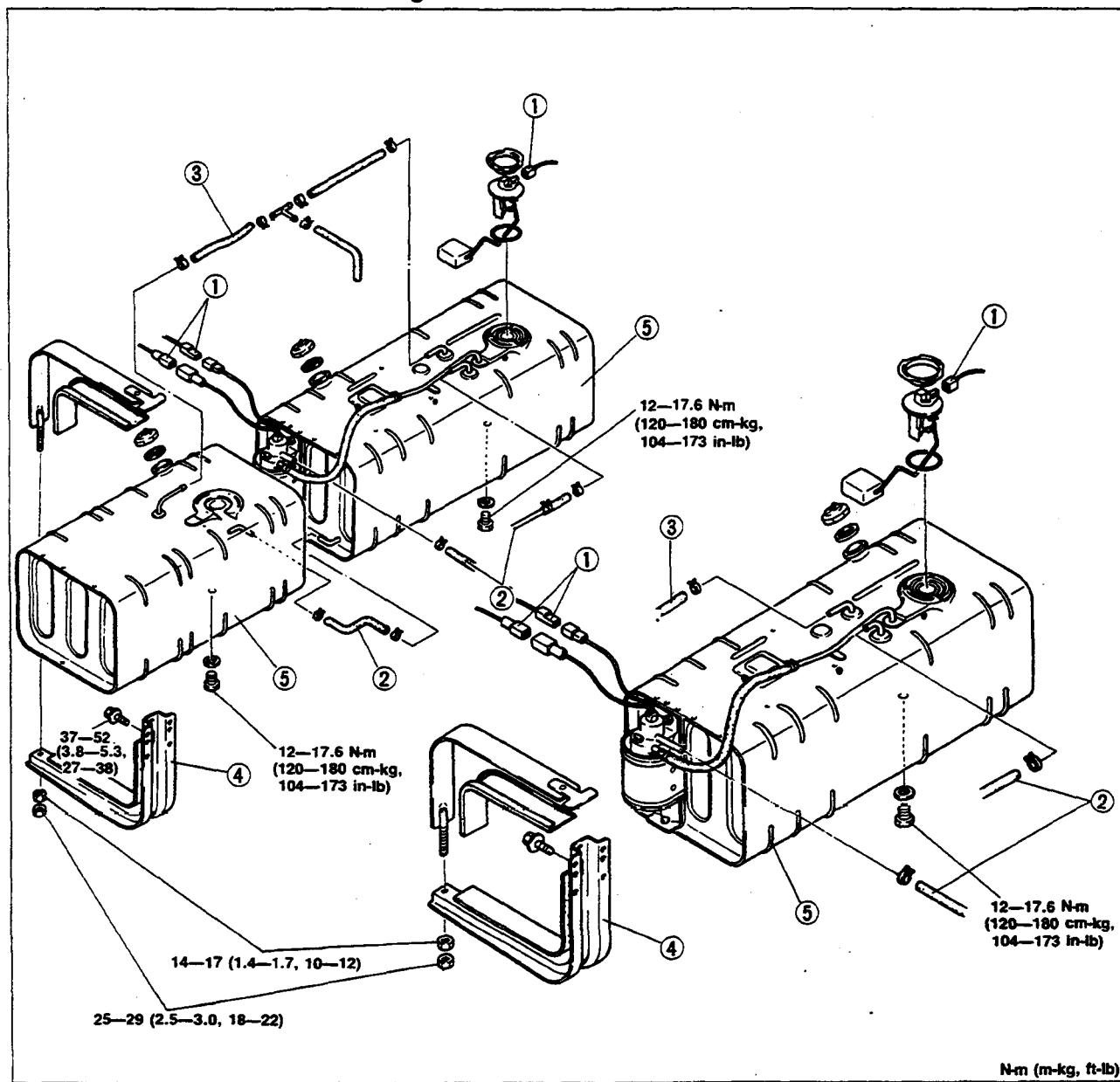
1. Remove in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal.

Warning

- Keep sparks, cigarettes, and open flames away from the fuel tank.

Note

- Drain the fuel before removing the fuel tank.



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

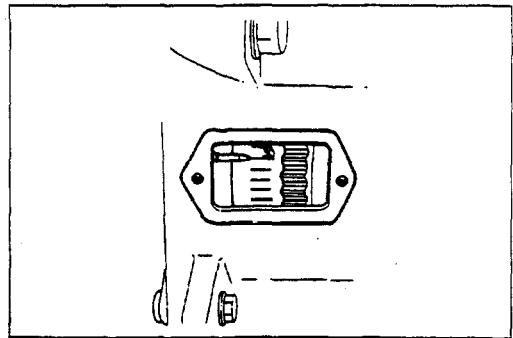
INJECTION PUMP

Removal

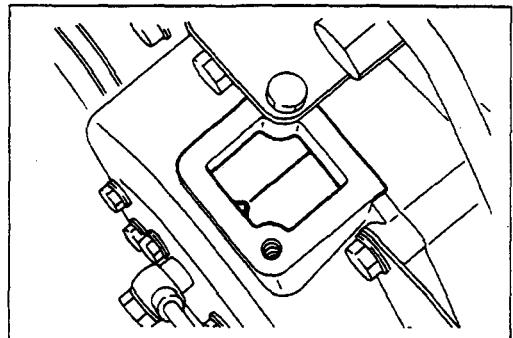
Note

- 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.

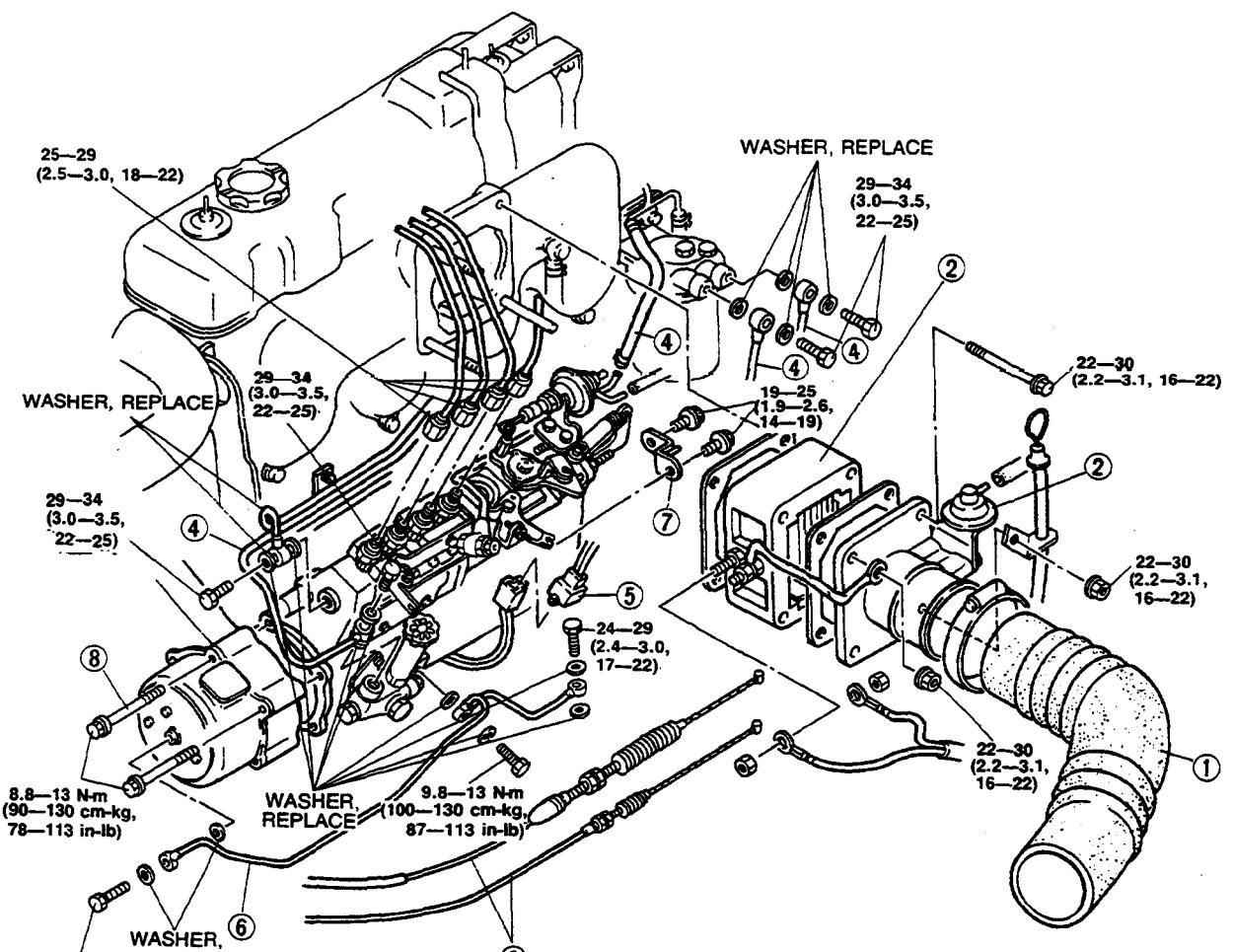
Note

- 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.



N·m (m·kg, ft·lb)

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

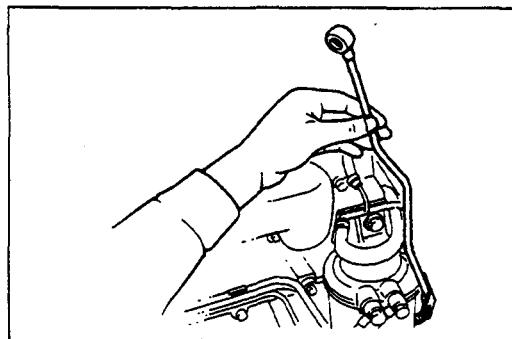
5. Harness

6. Oil pipe

7. Bracket

8. Bolts

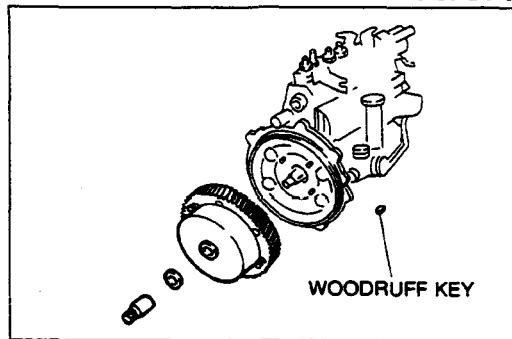
9. Fuel injection pump



9TG0F2-075

Removal note**Note**

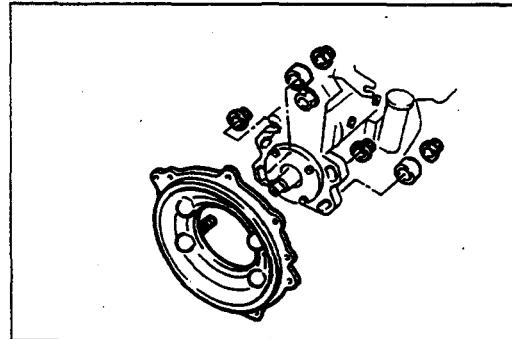
- When removing the fuel pipe from the bottom of the feed pump, remove it at the feed pump side and quickly hold the pipe up to prevent fuel leakage.



9TG0F2-076

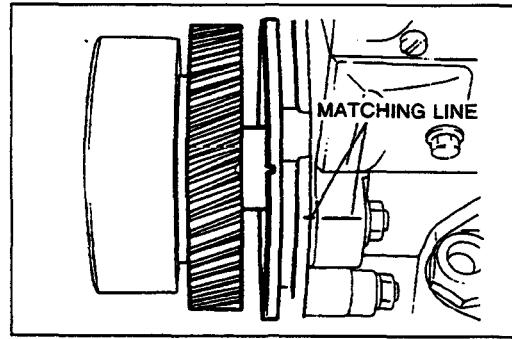
Disassembly / Assembly

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.

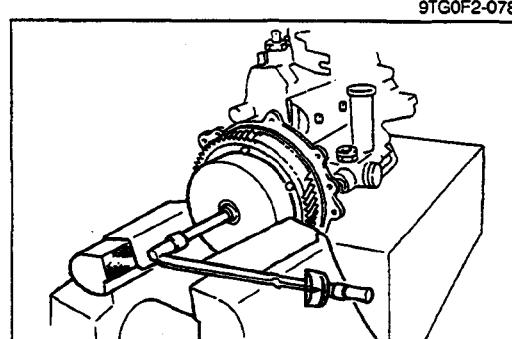


9TG0F2-078

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)



9TG0F2-079

7. Install the woodruff key, and install the timer and gear assembly onto the pump shaft.
8. Affix the timer in a vise, and tighten the nut.

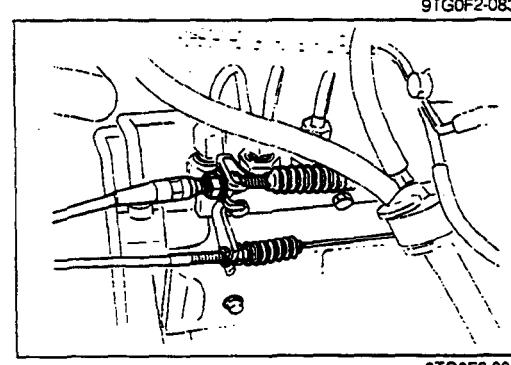
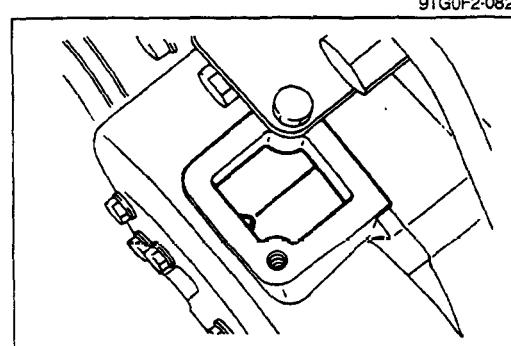
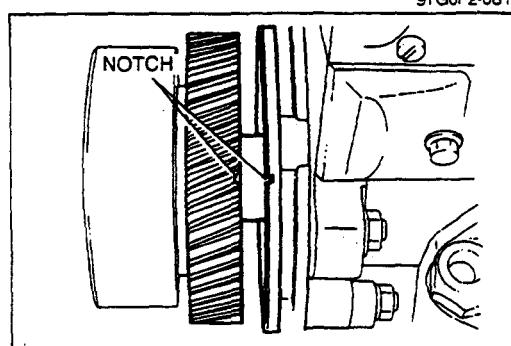
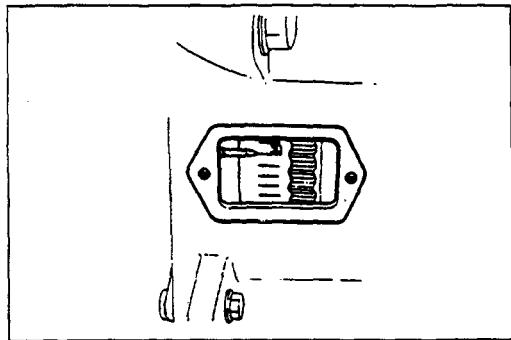
Tightening torque:

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.)

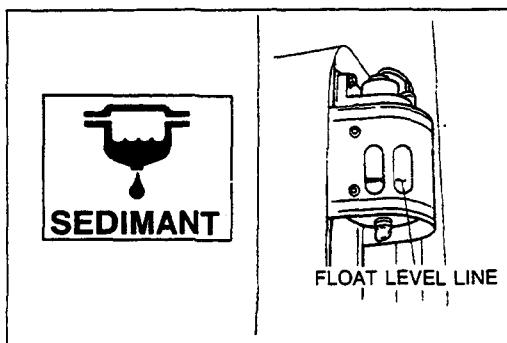
9TG0F2-080

**Installation note****Injection pump**

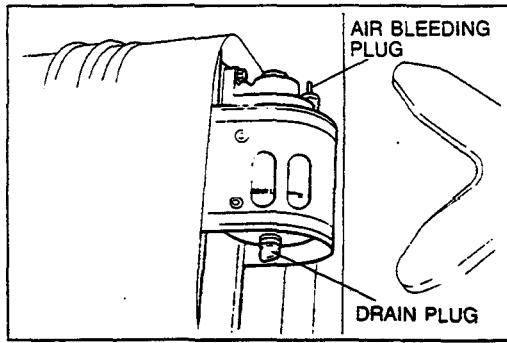
1. Before installing the injection pump, verify that No.1 cylinder is at 30° BTDC.
2. Align the notches of the flange plate and the injection pump gear.
3. Install the injection pump.
4. Verify that the mark on the timer and the tab of the timing gear case are aligned.

Accelerator cable, fuel stop cable

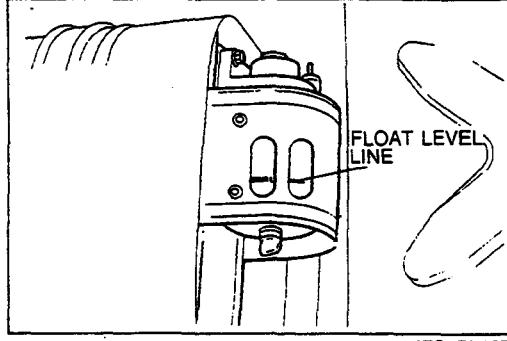
1. After installing the accelerator cable, adjust the free play of the cable. (Refer to page F2-40.)
2. After installing the fuel stop cable, adjust the free play of the cable. (Refer to page F2-41.)



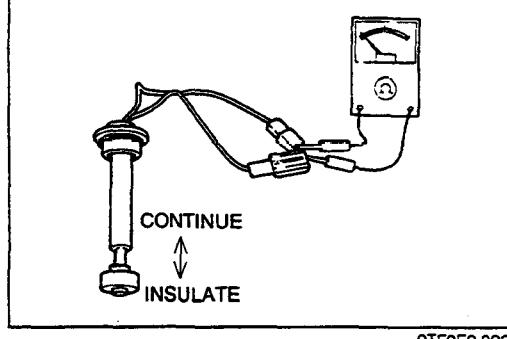
9TG0F2-085



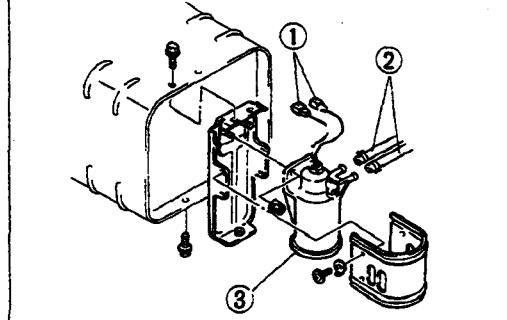
9TG0F2-086



9TG0F2-087



9TG0F2-002



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.

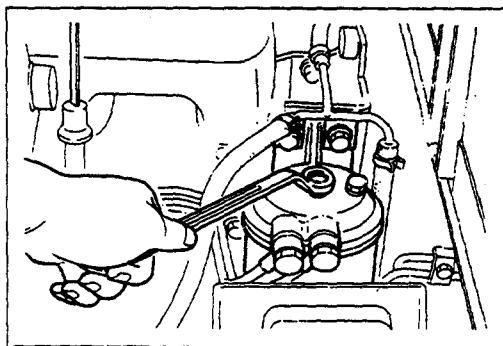
Float	Continuity
Up	Yes
Down	No

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.



FUEL FILTER Air Bleeding

Warning

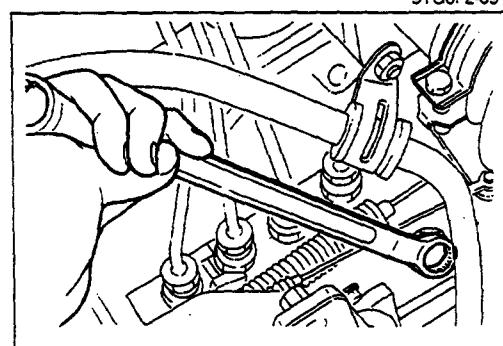
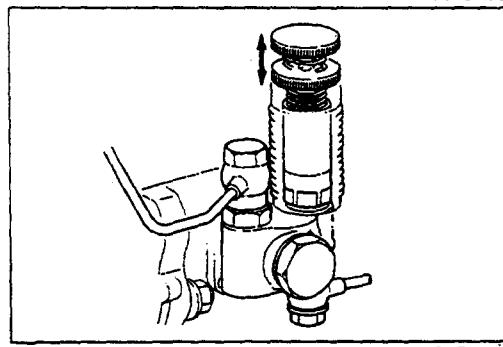
- Keep sparks, cigarettes, and open flames away from the fuel filter.

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)

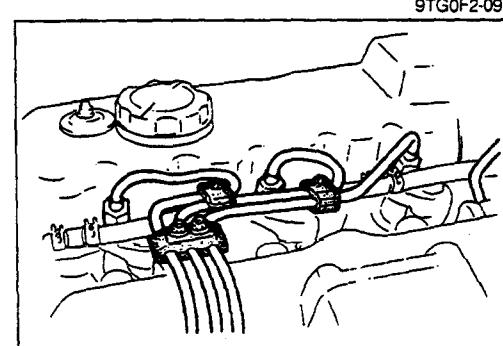


4. Loosen the return pipe at the injection pump, and pump the priming pump until no air is expelled.
5. Tighten the bolt.

Tightening torque:

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

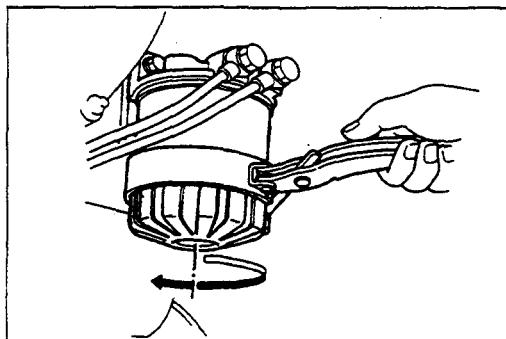
6. Push the priming pump down and tighten it.



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

Tightening torque:

20—25 N·m (2.0—2.5 m·kg, 14—18 ft·lb)



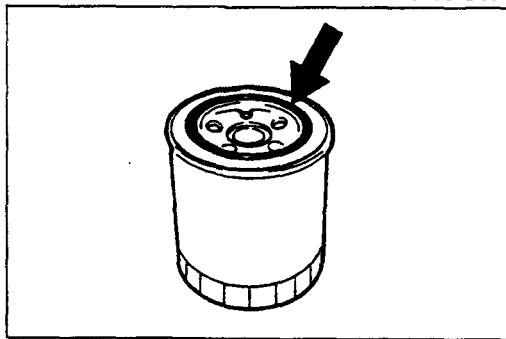
9TG0F2-094

Replacement

Warning

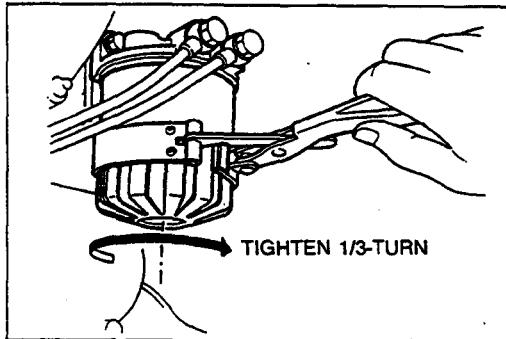
- Keep sparks, cigarettes and open flames away from the fuel filter.

1. Remove the filter with a filter wrench.



9TG0F2-095

2. Apply fuel to the O-ring.



9TG0F2-096

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.)

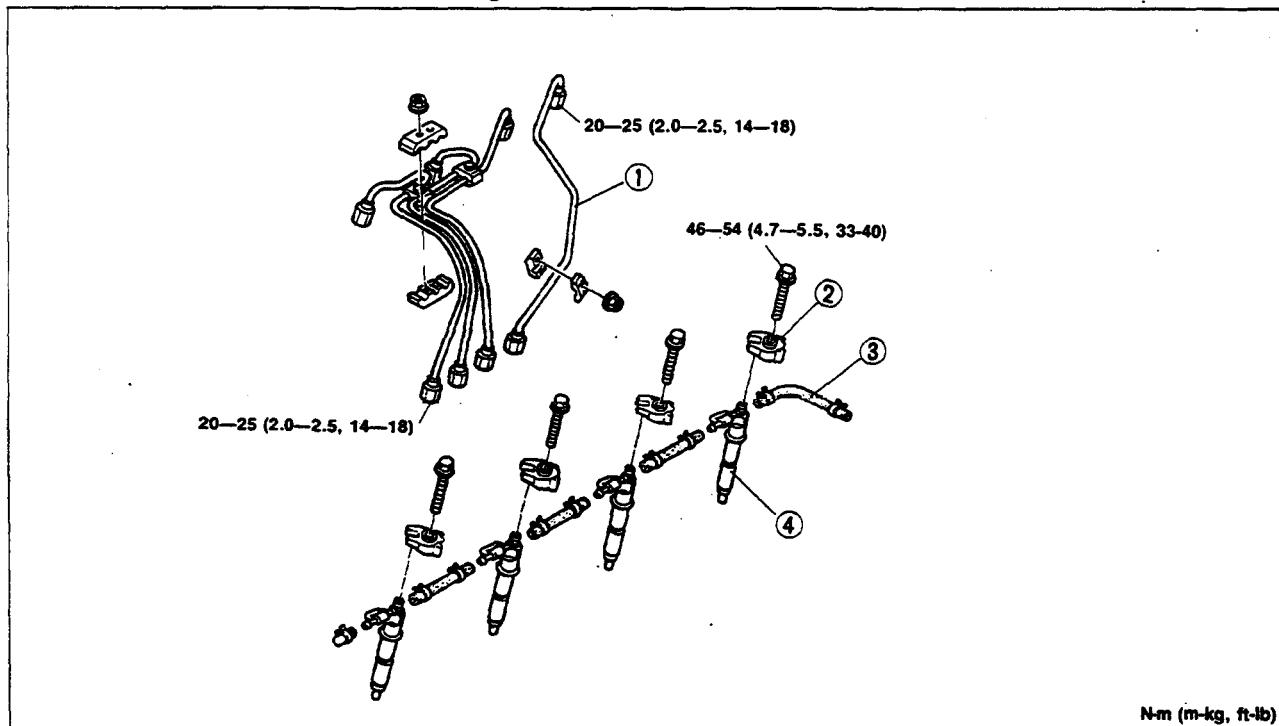
5. Start the engine, and verify that there is no fuel leakage around the filter.

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.



N·m (m·kg, ft·lb)

9TG0F2-097

1. Injection pipe
2. Nozzle holder bracket

3. Fuel return hose
4. Injection nozzle

Inspection

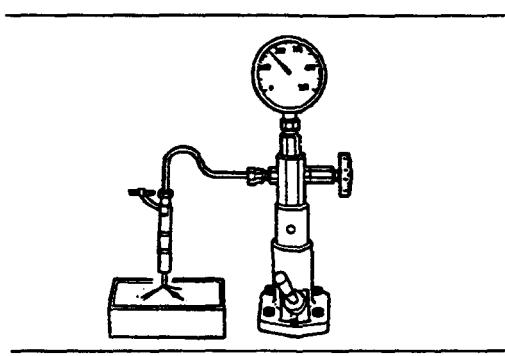
Warning

- 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



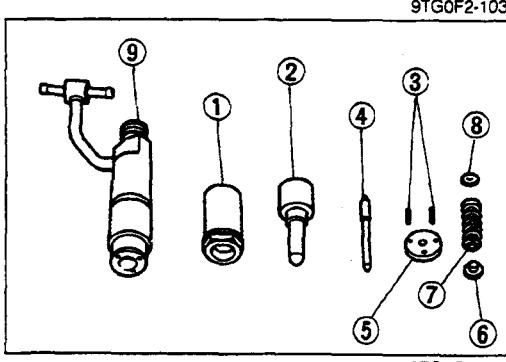
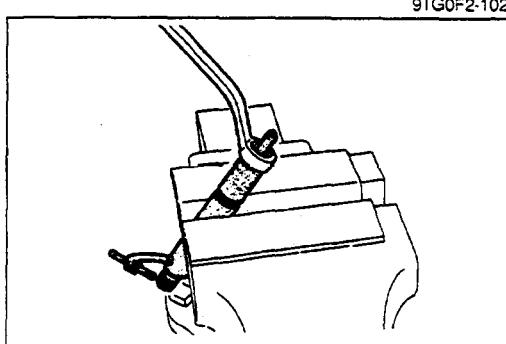
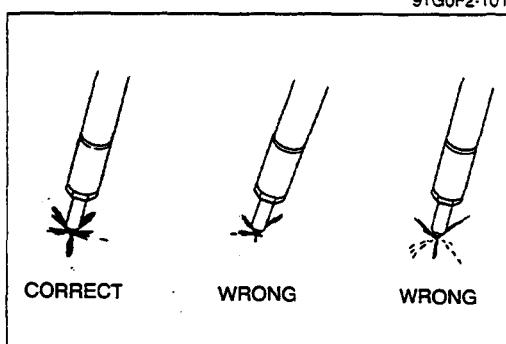
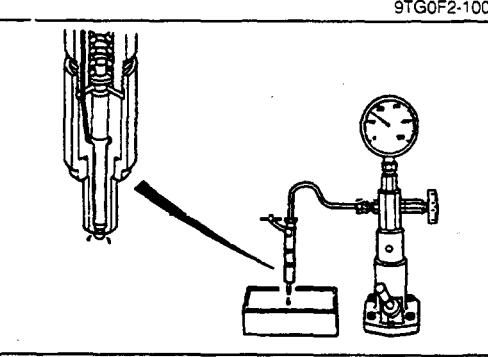
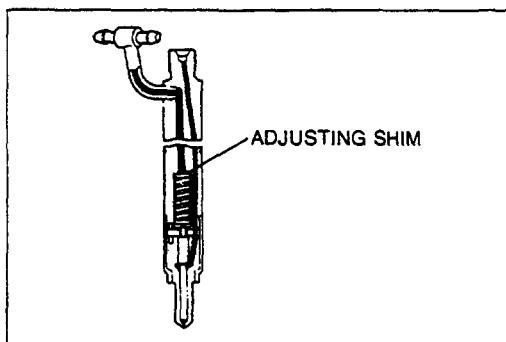
9TG0F2-099

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/cm², 2,489 psi)
 Used nozzle: 16,677 kPa (170 kg/cm², 2,417 psi)



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/cm², 71 psi).

Leakage of injector

Apply pressure 4,715 kPa (150 kg/cm², 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.

Atomizing condition

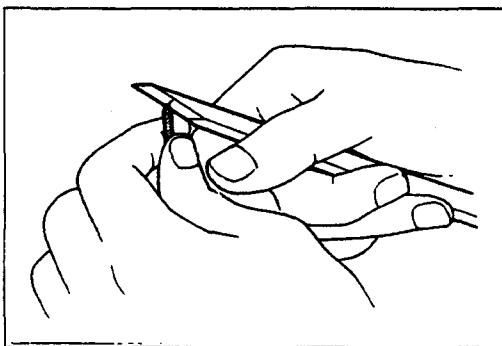
1. Connect the nozzle on the nozzle tester.
2. Air bleed by operating the nozzle tester handle several times.
3. Keeping the pressure gauge of the nozzle tester in the non-functioning condition, quickly lower the handle (lower the handle as quickly as possible so that a pulsating whistling sound can 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.

Disassembly

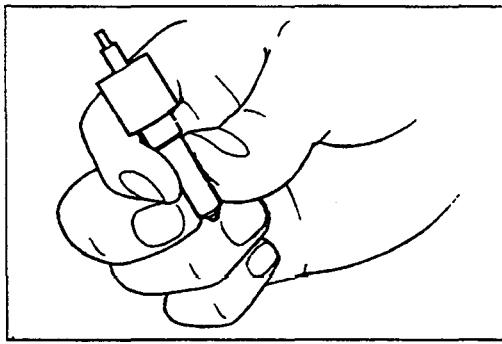
1. Clamp the nozzle in a vise as shown in the figure.

2. Disassemble as shown in the figure.

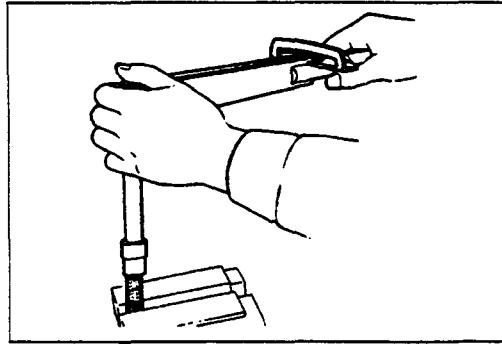
- ① Retaining ring
- ② Nozzle body
- ③ Guide pin
- ④ Needle valve
- ⑤ Distance piece
- ⑥ Pressure pin
- ⑦ Pressure spring
- ⑧ Shim
- ⑨ Nozzle holder



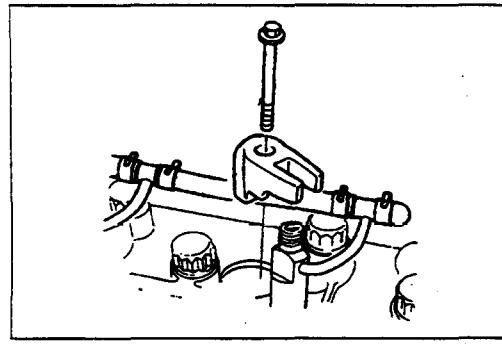
9TG0F2-105



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 its 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.

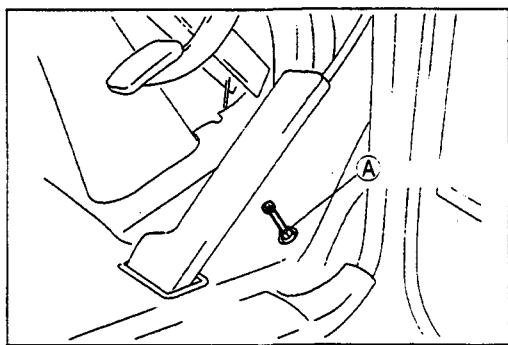
Tightening torque**Retainer bolt:**

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.

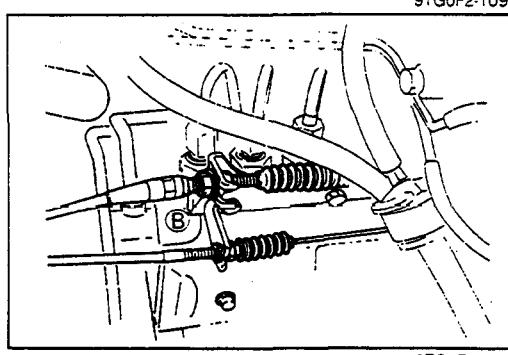


ACCELERATOR PEDAL, ACCELERATOR CABLE Inspection / Adjustment

- Verify that the control lever of the injection pump is in the full-open position when the accelerator pedal is fully depressed.
- 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)



- Check the free play of the accelerator cable.

Free play: 1.0—3.0mm (0.039—0.12 in)

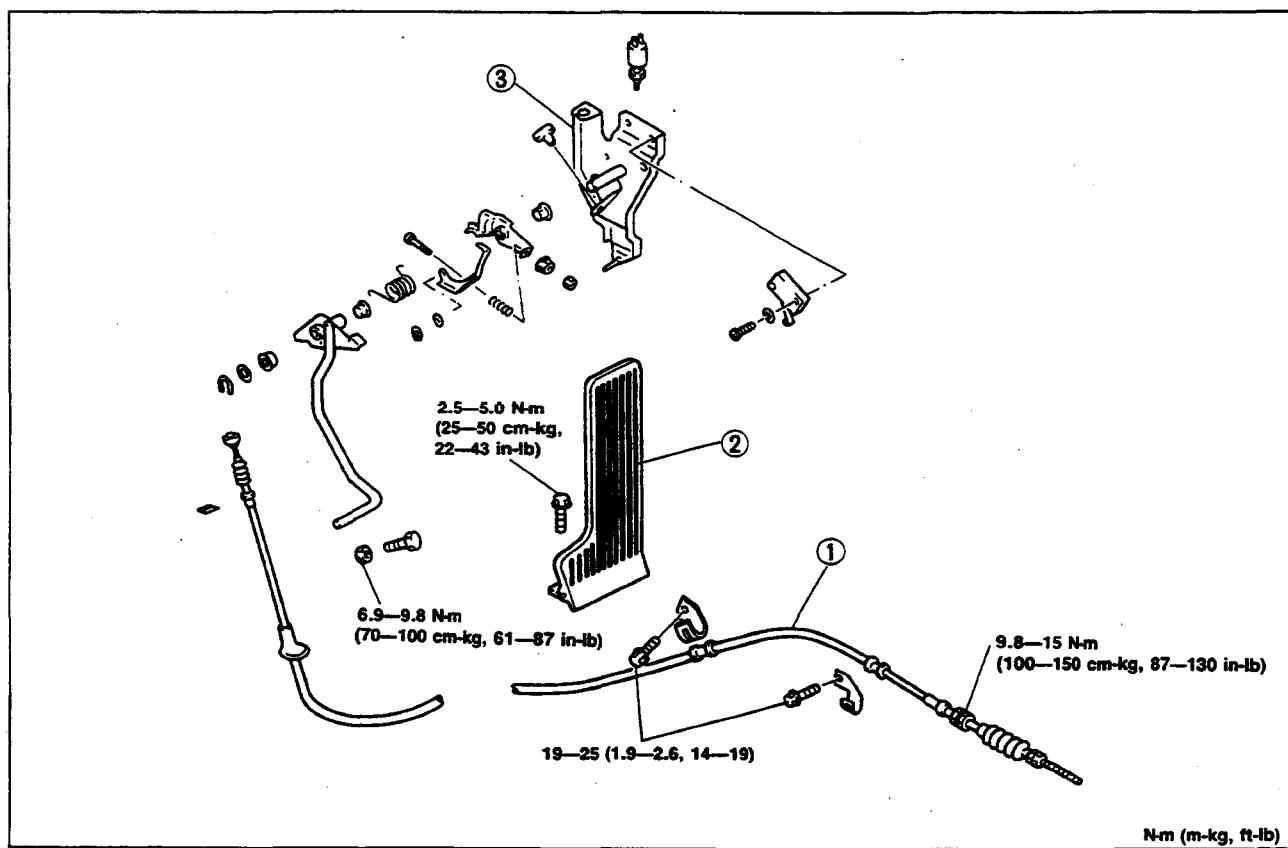
- Adjust nuts B if necessary.

Tightening torque:

9.8—15 N·m (100—150 cm·kg, 87—130 in·lb)

Removal / Installation

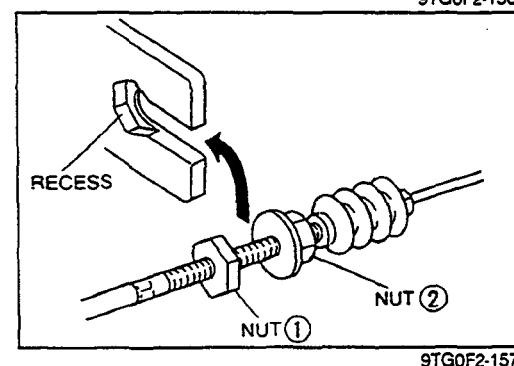
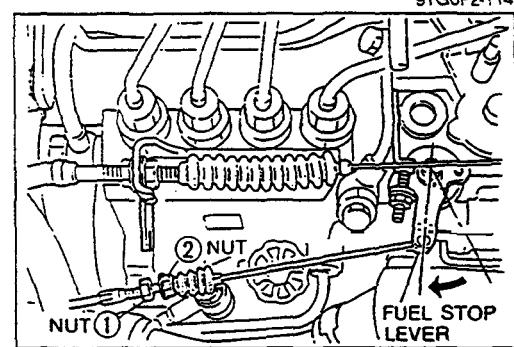
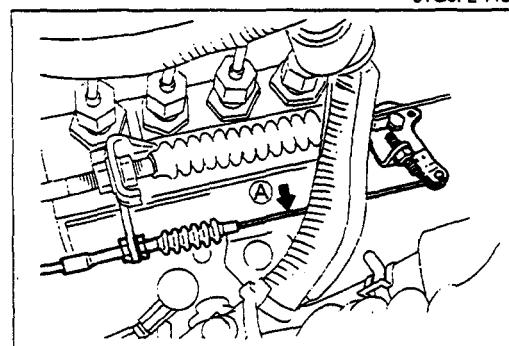
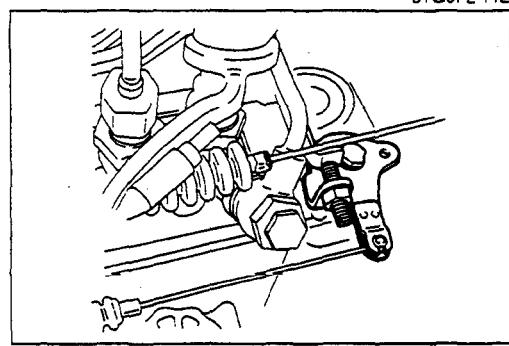
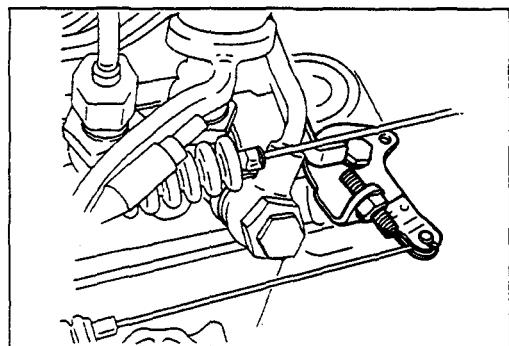
- Remove in the order shown in the figure.
- Install in the reverse order of removal.



- Accelerator cable
- Accelerator pedal

- Bracket

FUEL CUT CONTROL SYSTEM



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

Inspection

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 **(A)** position of the fuel stop cable.

Free play: 0—2mm (0—0.078 in)

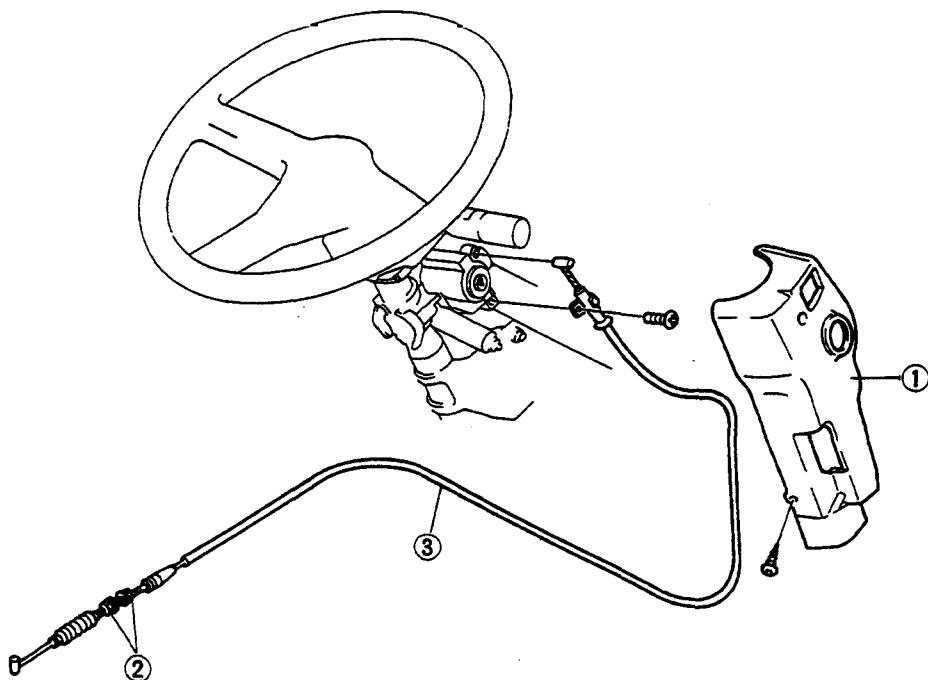
5. Verify that the engine stops when turn the engine switch OFF.
6. If not as specified, adjust the cable as follows.

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.

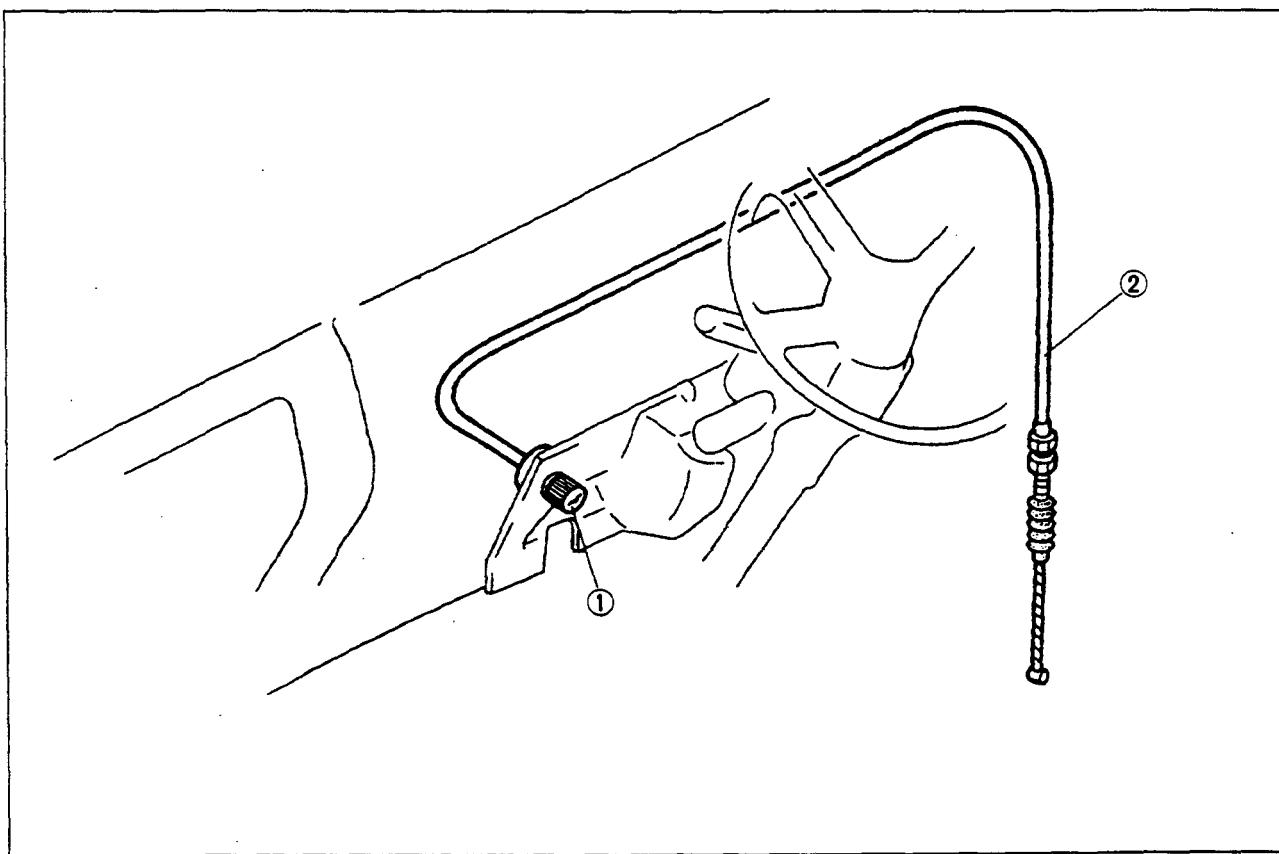
Removal / Installation

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.



1. Steering column cover
2. Locknuts

3. Fuel stop cable

IDLE SPEED CONTROL SYSTEM**STRUCTURAL VIEW**

9TG0F2-116

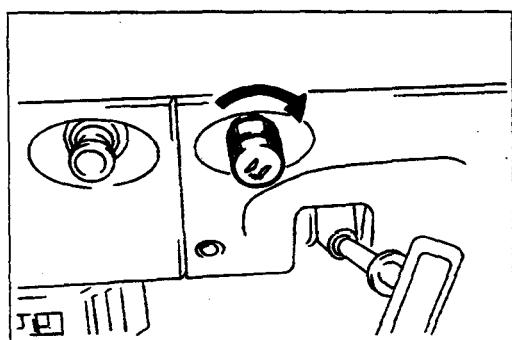
1. Idling knob

Removal / Installation page F2-44

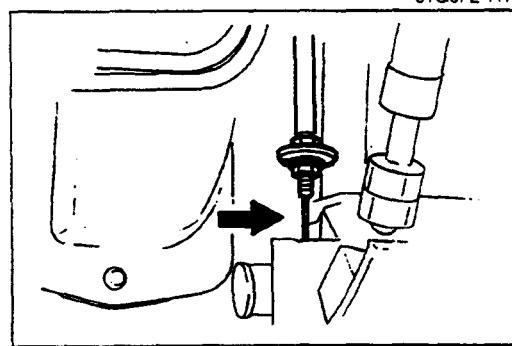
2. Idling cable

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.

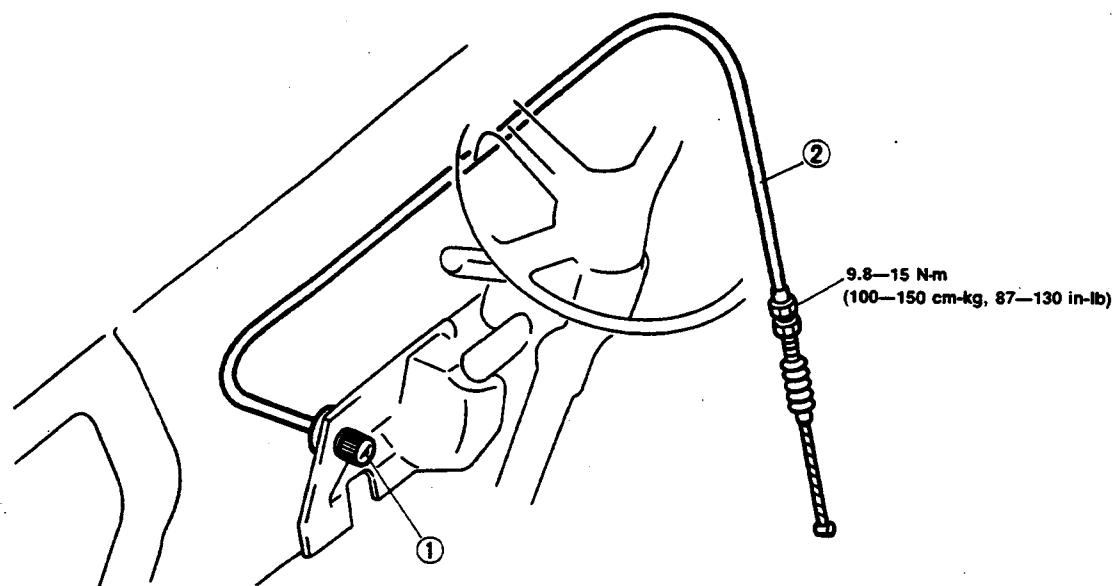
Free play: 0—5mm (0—0.2 in)

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.



1. Idling knob

2. Idling cable

EXHAUST SYSTEM

EXHAUST SYSTEM

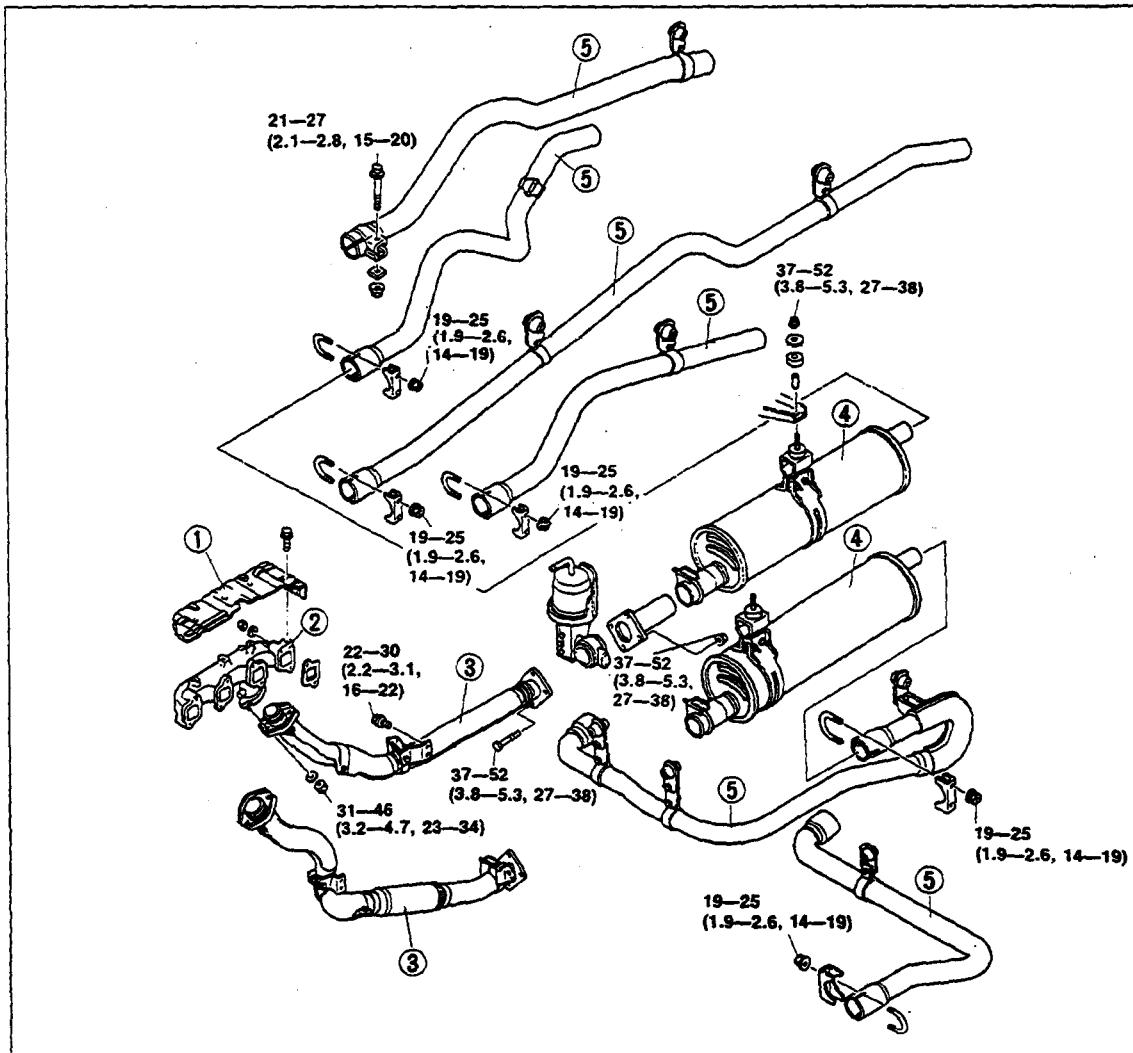
COMPONENTS

Vehicle Inspection

- Run the engine and verify that there is no exhaust leakage.

Removal / Inspection / Installation

- Removal in the order shown in the figure.
- Inspect all parts and repair or replace as necessary.
- Install in the reverse order of removal.

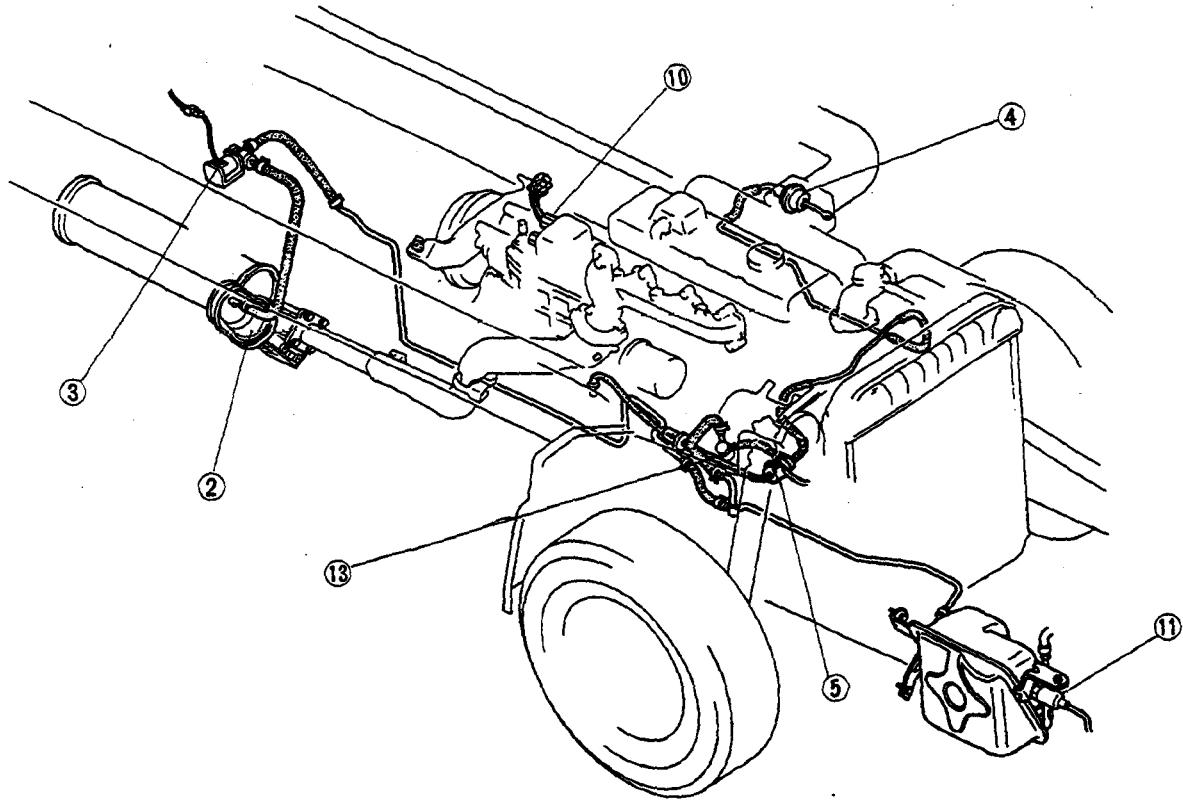
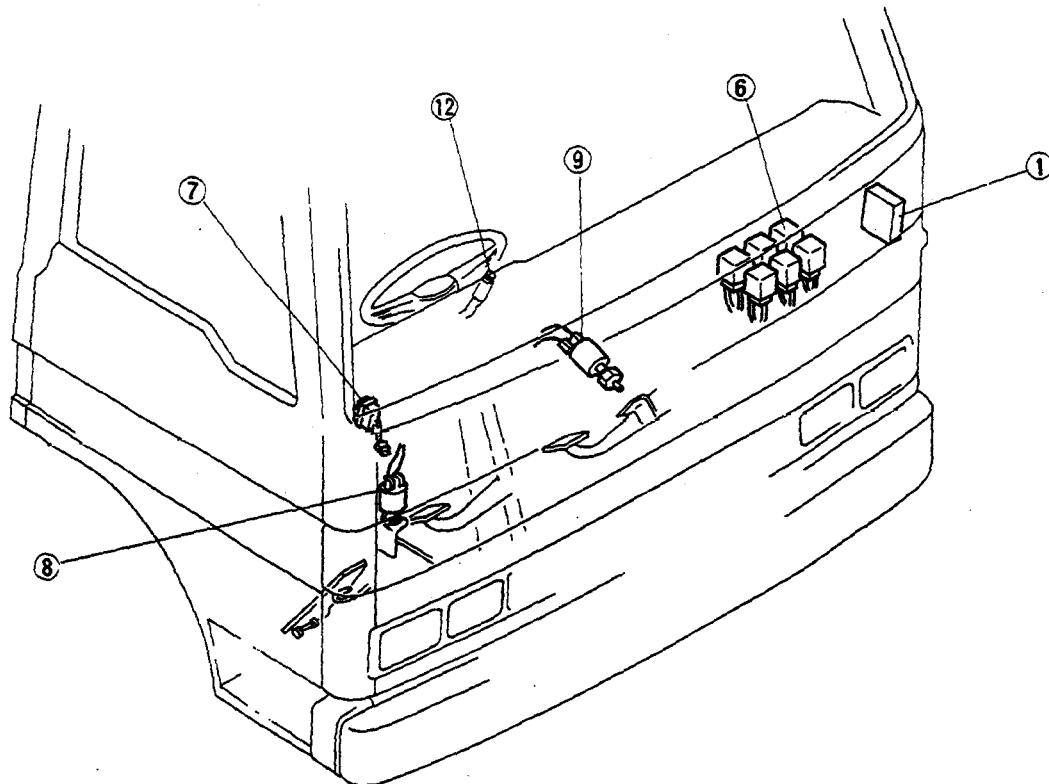


N·m (m·kg, ft·lb)

9TG0F2-12

- Exhaust manifold insulator (SL engine only)
SL turbocharged engine,
refer to page F2-22
- Exhaust manifold (SL engine only)
Check for contamination, cracks and other
damage
SL turbocharged engine,
refer to page F2-22
- Front pipe assembly (SL engine only)
Check for contamination, cracks and other
damage
SL turbocharged engine,
refer to page F2-22

- Main silencer
Check for contamination, cracks and other
damage
- Tail pipe assembly
Check for contamination, cracks and other
damage

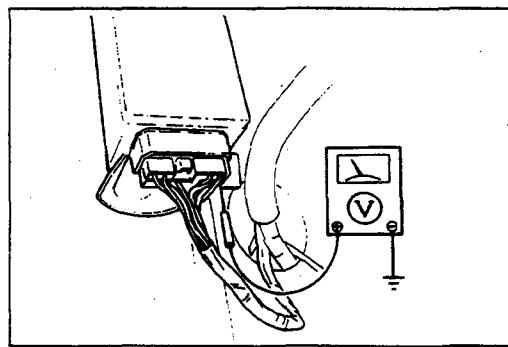
EXHAUST CONTROLLED HEATING SYSTEM**STRUCTURAL VIEW**

EXHAUST CONTROLLED HEATING SYSTEM

F2

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 F2-53
Inspection	page F2-53
Installation.....	page F2-53
8. Accelerator switch	
Inspection	page F2-53
Replacement.....	page F2-53
9. Clutch switch	
Inspection	page F2-54
Replacement.....	page F2-54
10. Neutral switch	
Inspection	page F2-54
Replacement.....	page F2-54
11. Vacuum switch (pay load above 3.5t only)	
Inspection	Section 1
12. Exhaust brake switch	
Inspection	page F2-55
13. Vacuum pump	
Removal	Section F
Inspection	Section F
Installation.....	Section F

9TG0F2-122



9TG0F2-123

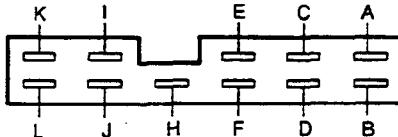
EXHAUST HEATING CONTROL UNIT

Inspection

- Measure the terminal voltage of the exhaust heating control unit when the vacuum switch connector disconnected.
- If not as specified repair the wire harness or replace the control unit.

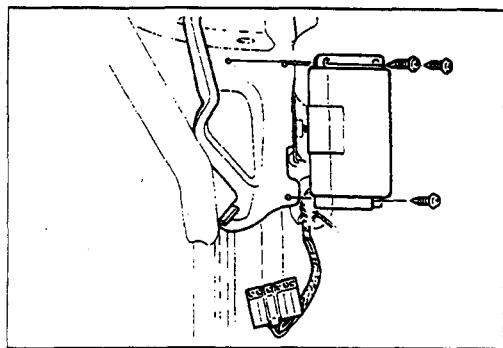
Terminal	Colour of wire	Connected to	Conditions of measuring (engine switch ON)	Voltage	Possible cause
A	BR	Exhaust heating switch	Exhaust heating switch OFF	Approx. 12V	Exhaust heating switch (Refer to page F2-53) Wire harness
			Exhaust heating switch ON	Approx. 0V	
B	R/L	Clutch switch	Accelerator 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

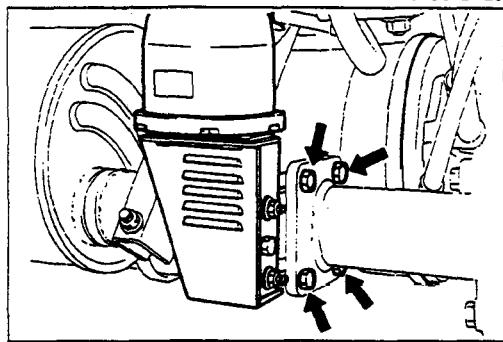


*.... Pay load above 3.5t only

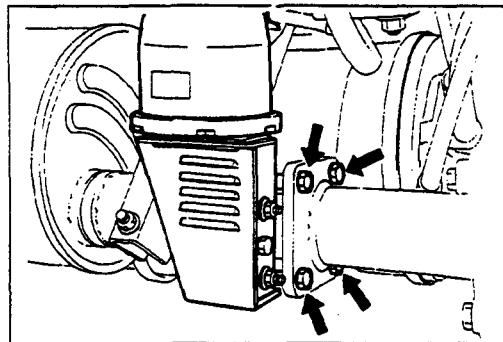
9TG0F2-124



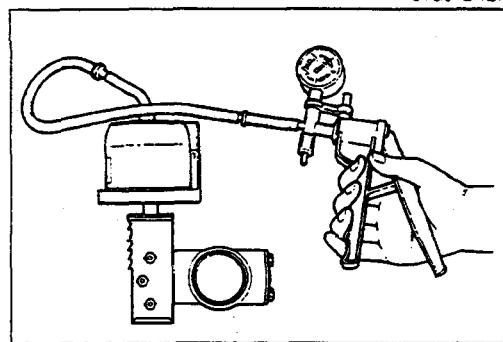
9TG0F2-125



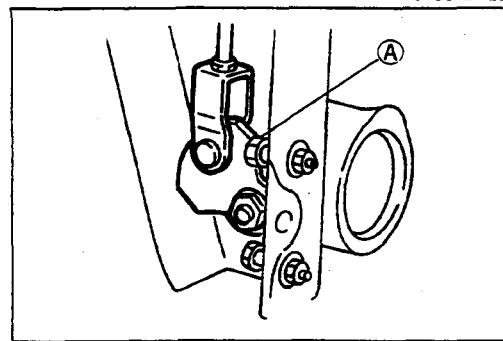
9TG0F2-126



9TG0F2-127



9TG0F2-128



9TG0F2-129

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.

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.

Inspection

1. Remove the exhaust brake unit assembly.
2. Remove the service hole cover.

3. Connect a vacuum pump and check the following.

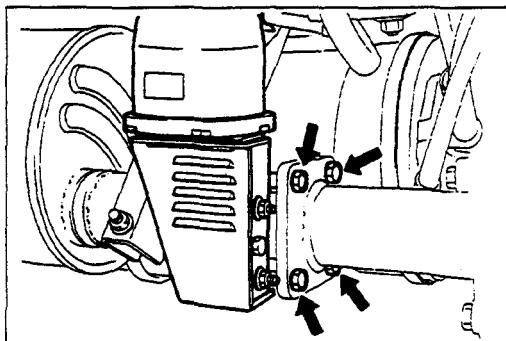
**Starts closing: 100 mmHg (3.9 inHg)
Fully closed : 350 mmHg (13.8 inHg)**

4. When fully closed, adjust the gap of the valve by turning bolt A.

Gap: 0.2—0.4mm (0.007—0.015 in)

F2

EXHAUST CONTROLLED HEATING SYSTEM



Installation

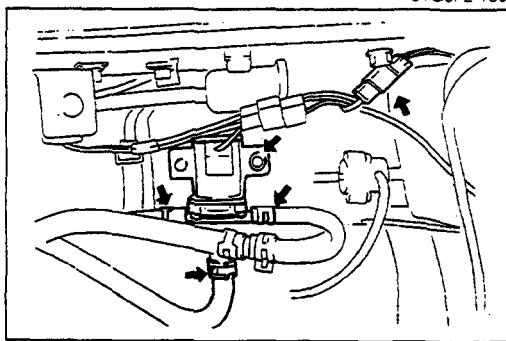
Note

- After installing the exhaust brake unit, the vacuum warning buzzer may ring until vacuum is built up.

Install in the reverse order of removal.

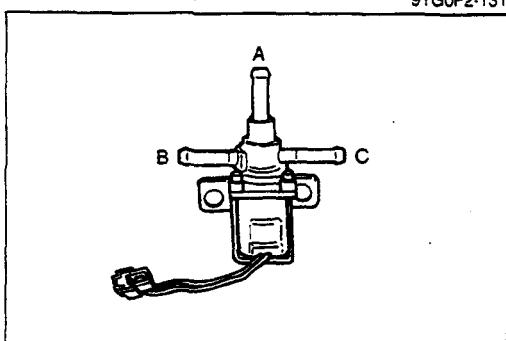
Tightening torque:

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.



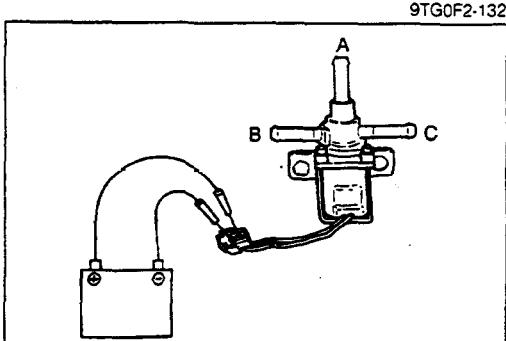
Inspection

1. Verify air flow through the valve.

A—B: Flow

A—C: No flow

B—C: No flow

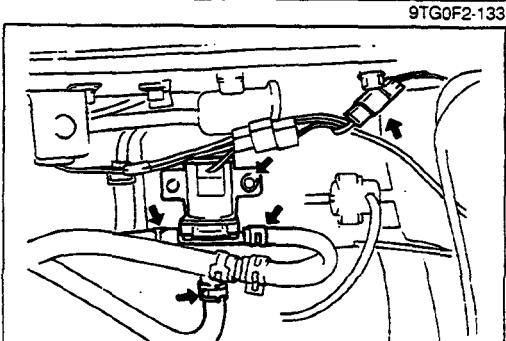


2. Connect 12V to the valve and verify air flow.

A—B: No flow

A—C: Flow

B—C: No flow



Installation

Note

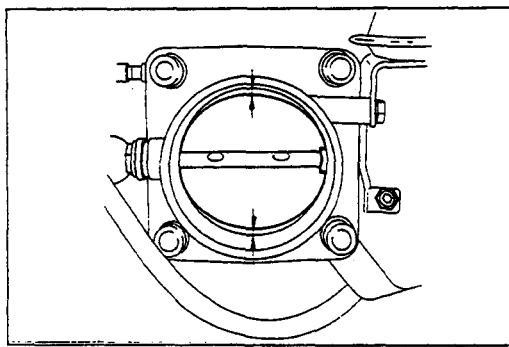
- After installing the magnetic valve, the vacuum warning buzzer may ring until vacuum is built up.

Install in the reverse order of removal.

Tightening torque:

43—61 N·m (4.4—6.2 m·kg, 32—45 ft·lb)

EXHAUST CONTROLLED HEATING SYSTEM



9TG0F2-135

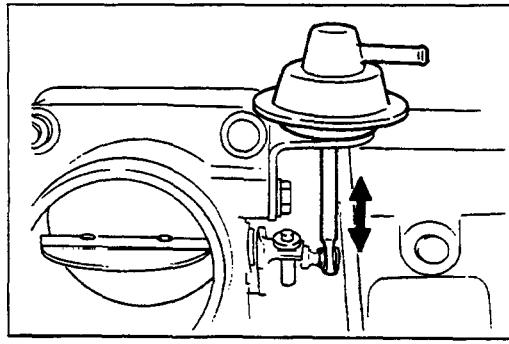
INTAKE SHUTTER VALVE

Inspection

1. Verify that the clearance at both sides of the valve is as specified when the valve is fully closed.

Clearance: $5.7 \pm 0.2\text{mm}$ (0.224 ± 0.007 in)

2. If not as specified, adjust by turning the adjusting screw.

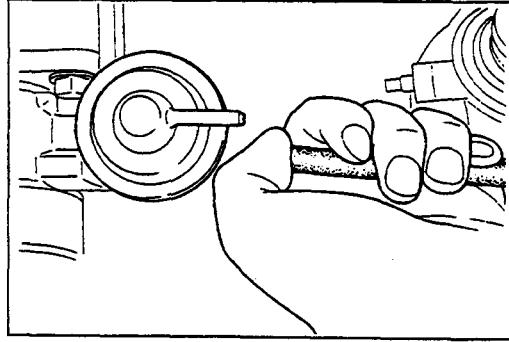


9TG0F2-136

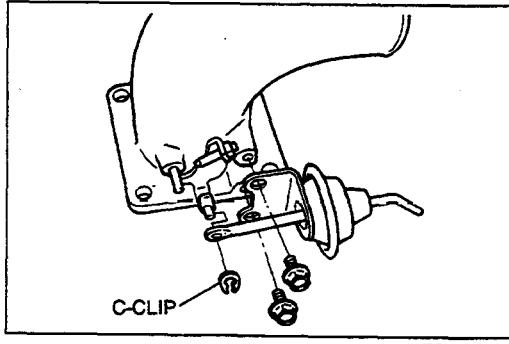
INTAKE SHUTTER VALVE ACTUATOR

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.



9TG0F2-137



9TG0F2-138

Replacement

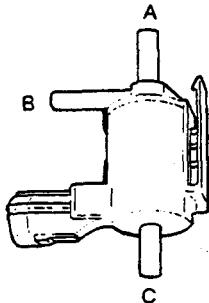
Note

- 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)



9TG0F2-139

SOLENOID VALVE (INTAKE SHUTTER VALVE) Inspection

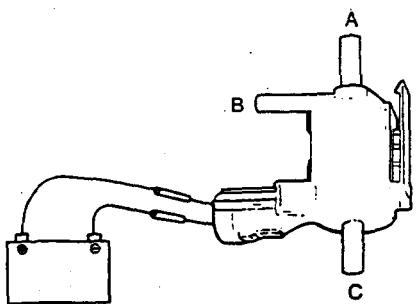
Note

- 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**

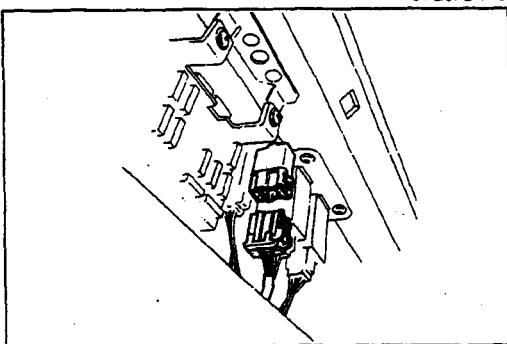
3. Connect 12V to the valve and verify air flow.

A—B: Flow**A—C: No flow****B—C: No flow**

9TG0F2-140

CANCEL RELAY**Removal**

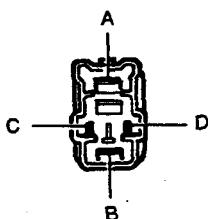
Remove as shown in the figure.



9TG0F2-141

Inspection

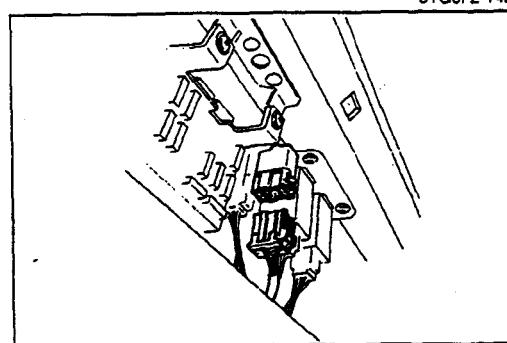
1. Disconnect the cancel relay.
2. Check for continuity between terminals A and D of the relay.
3. Connect 12V between terminals B and C, and verify that there is no continuity between terminals A and D.
4. If not as specified, replace the cancel relay.



9TG0F2-142

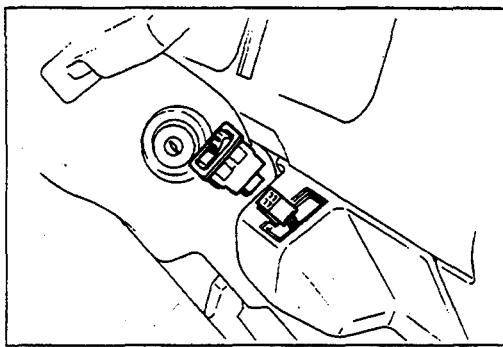
Installation

Install in the reverse order of removal.



9TG0F2-143

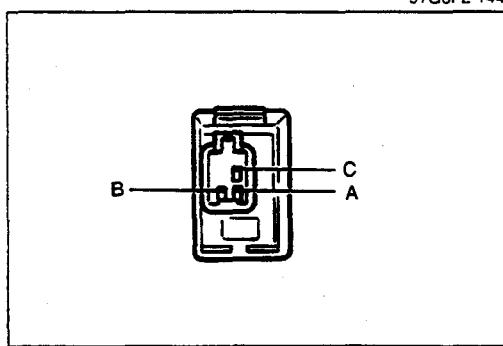
EXHAUST CONTROLLED HEATING SYSTEM



EXHAUST HEATING SWITCH

Removal

Remove as shown in the figure.



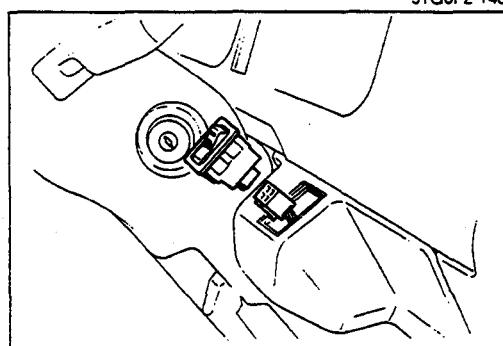
Inspection

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

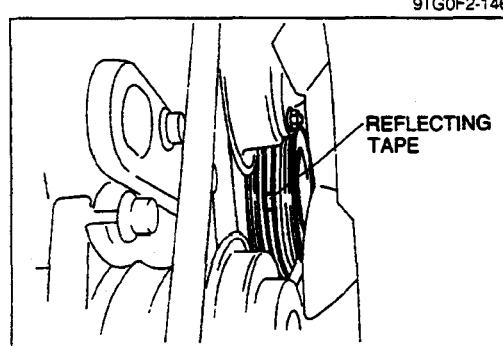
Note

- When checking continuity between A and B, and B and C, connect the negative (-) tester lead to terminal B.



Installation

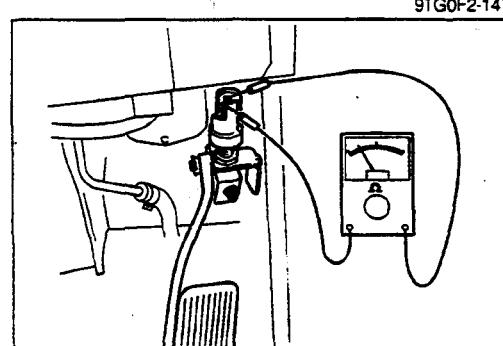
Install in the reverse order of removal.



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.



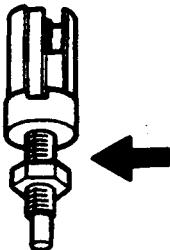
3. Start the engine.
4. Disconnect the accelerator switch connector.
5. Connect a photo tachometer.
6. Verify that there is no continuity of the switch when the accelerator is not depressed.
7. Depressed the accelerator, and verify that there is continuity at the specified speed.

Specified speed: 800—1,000 rpm

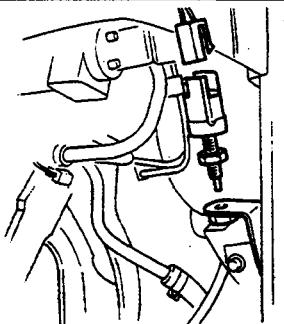
8. If not as specified, loosen the locknut and adjust the switch.
9. After adjusting, tighten the locknut.

Tightening torque:

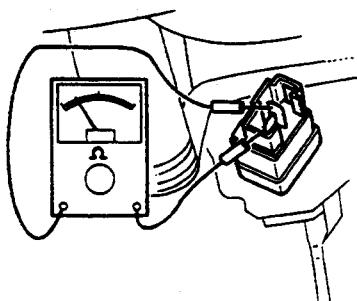
14—18 N·m (1.4—1.8 m·kg, 10—13 ft·lb)



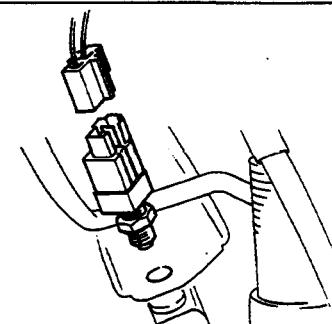
9TG0F2-149



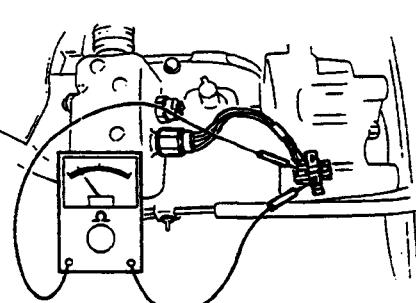
9TG0F2-150



9TG0F2-151



9TG0F2-152



9TG0F2-153

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.

CLUTCH SWITCH

Inspection

1. Disconnect the clutch switch connector.
2. Check continuity of the switch.

Clutch pedal	Continuity
Depressed	No
Released	Yes

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)

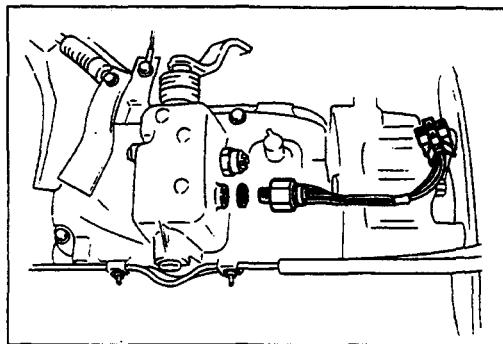
NEUTRAL SWITCH

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.



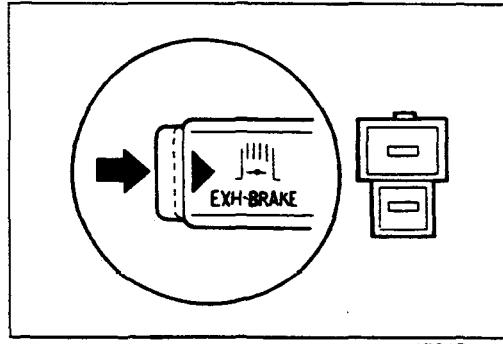
9TG0F2-154

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)



9TG0F2-155

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.)

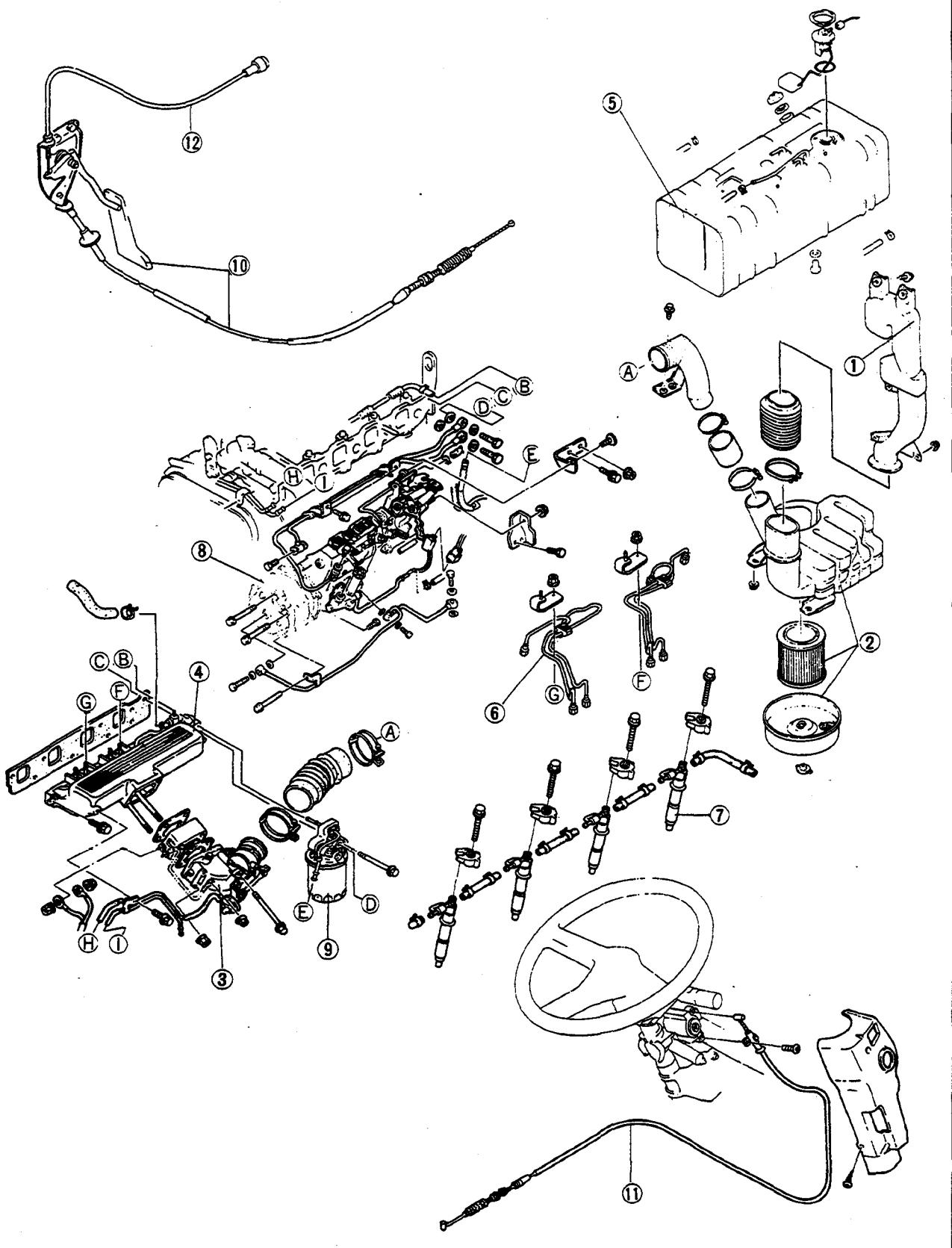
FUEL AND EMISSION CONTROL SYSTEMS

(TF ENGINE)

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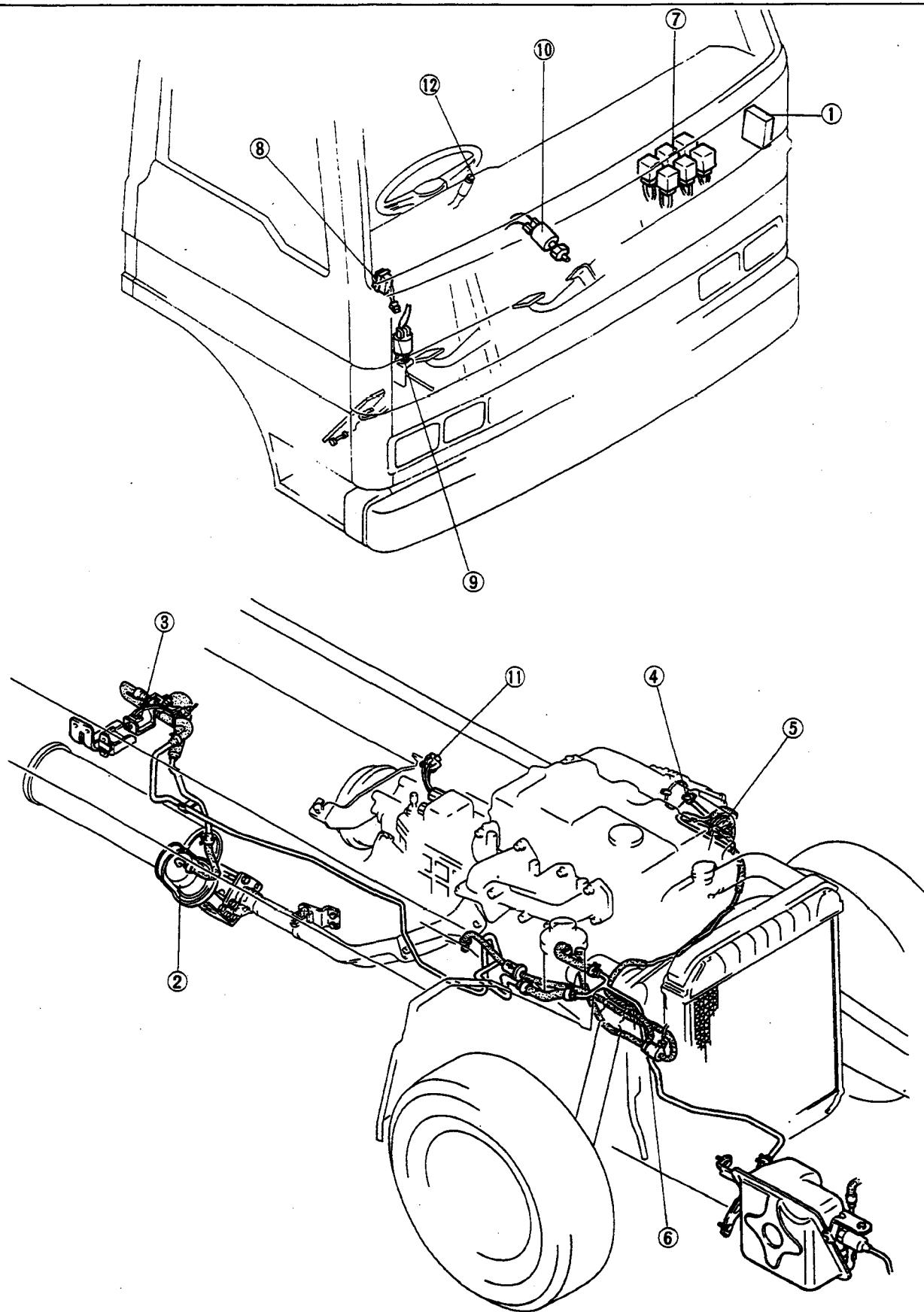
INDEX

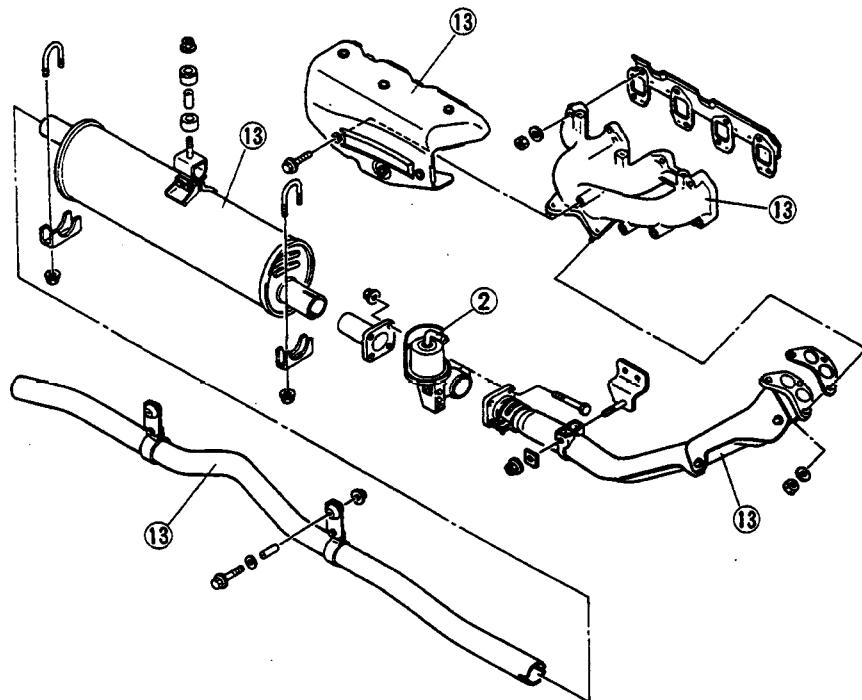
INTAKE AND FUEL DEVICES



-
- 1. Fresh air duct
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 - Installation page F3-15
 - 2. Air cleaner
 - Removal / Installation page F3-15
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 - 3. Intake shutter valve
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 - 4. Intake manifold
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 - 5. Fuel tank
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 - 10. Accelerator pedal, Accelerator cable
 - Inspection / Adjustment page F3-28
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 - 11. Fuel stop cable
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EXHAUST AND EXHAUST CONTROLLED HEATING DEVICES



9TG0F3-005

1. Exhaust heating control unit

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2. Exhaust brake unit

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3. Magnetic valve (Exhaust shutter valve)

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4. Intake shutter valve

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5. Intake shutter valve actuator

Inspection / Replacement.....	page F3-40
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6. Solenoid valve (Intake shutter valve)

Inspection	page F3-41
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7. Cancel relay

Removal / Inspection /	
Installation	page F3-41
8. Exhaust heating switch

Removal / Inspection /	
Installation	page F3-42
9. Accelerator switch

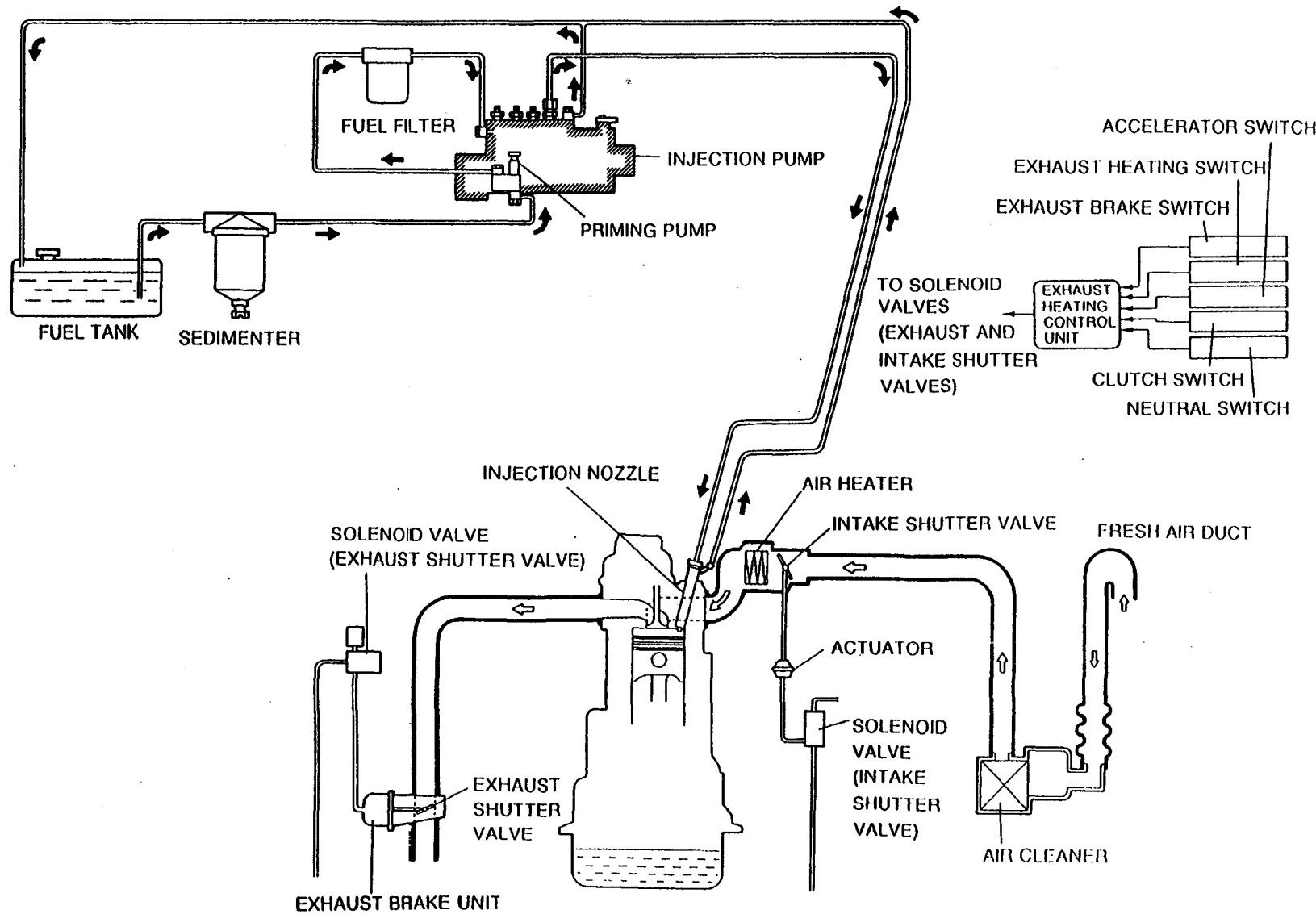
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10. Clutch switch

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-------------------------------	------------
11. Neutral switch

Inspection	page F3-43
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12. Exhaust brake switch

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13. Exhaust system

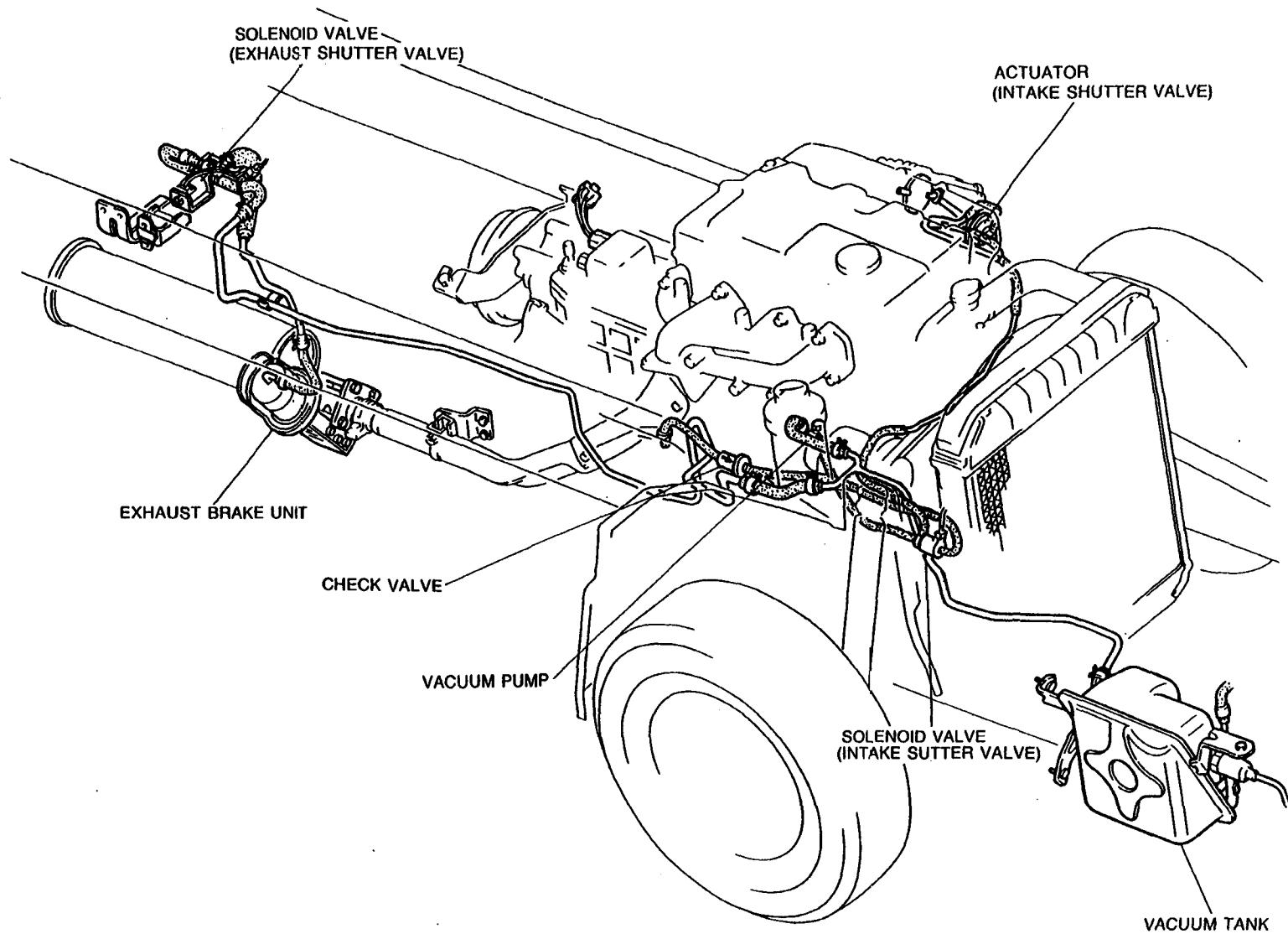
Removal / Inspection /	
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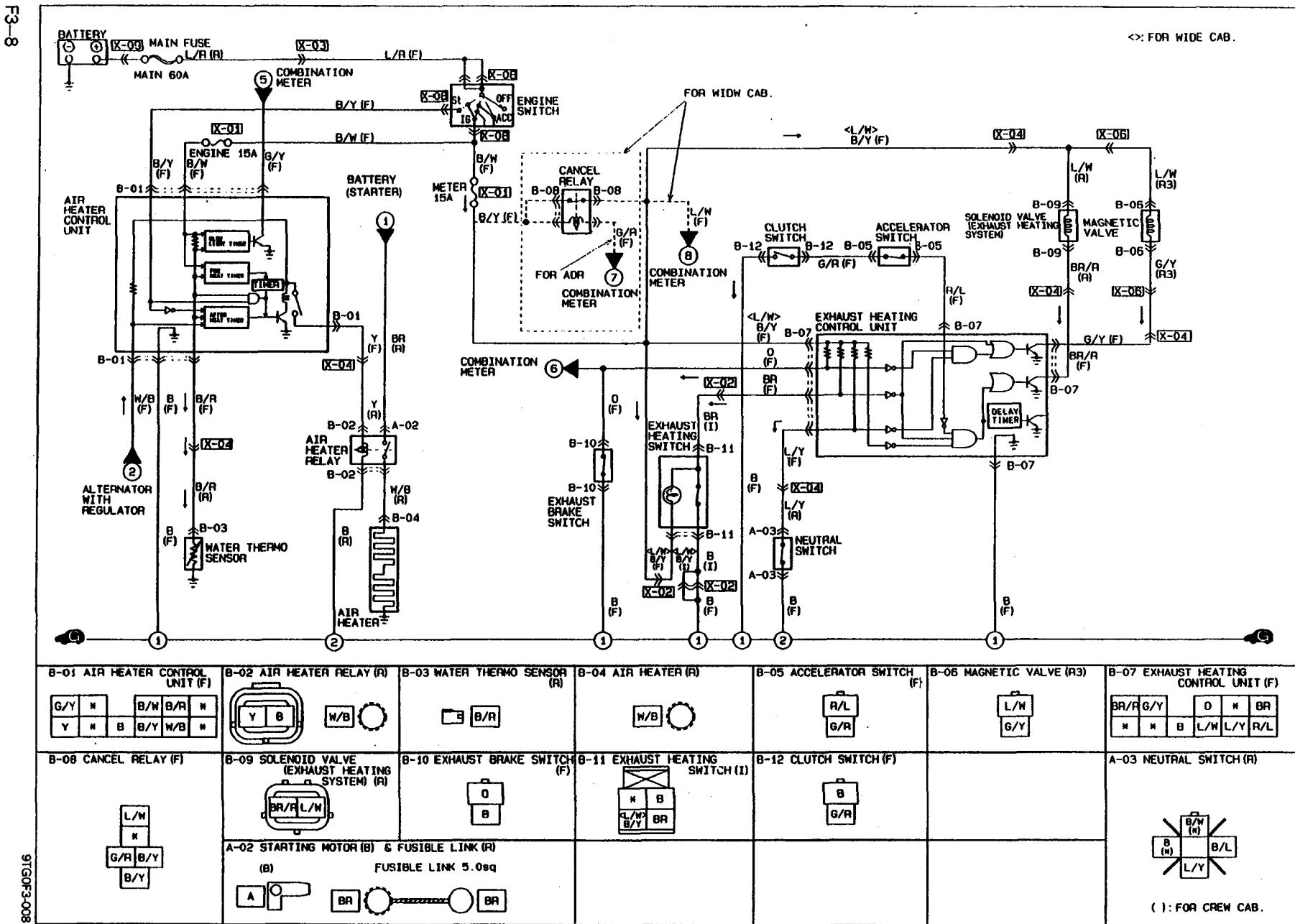


VACUUM HOSE ROUTING DIAGRAM

OUTLINE

F3





TROUBLESHOOTING GUIDE

TROUBLESHOOTING GUIDE

Trouble	Possible Cause	Action
Hard starting	Malfunction of stop system Air in injection pipe, injection pump, fuel filter or sedimentor Clogged fuel line or fuel filter Incorrect injection timing Seized or leaking delivery valve Incorrect injection starting pressure Malfunction of injection nozzle Malfunction of feed pump Malfunction of governor Malfunction of injection pump	Adjust or replace Bleed air Replace Adjust Replace or clean Adjust Clean or replace Clean or replace Replace Replace
Rough idling	Incorrect idling speed Incorrect injection timing Clogged fuel line or fuel filter Leak in fuel line or fuel filter Air in injection pipe, injection pump, fuel filter or sedimentor Seized or leaking delivery valve Incorrect starting pressure Malfunction of injection nozzle Malfunction of feed pump Malfunction of timer Malfunction injection pump	Adjust Adjust Clean or replace Repair or replace Bleed air Replace or clean Adjust Clean or replace Clean or replace Replace Replace
Engine knocking	Incorrect injection timing Incorrect injection starting pressure Malfunction of injection nozzle Low quality of fuel	Adjust Adjust Clean or adjust Drain and replace
Excessive exhaust smoke	Incorrect injection timing Water in injection pump, fuel filter or sedimentor Incorrect injection starting pressure Clogged air cleaner Malfunction of delivery valve Malfunction injection pump	Adjust Drain Adjust Clean or replace Clean or replace Replace
Poor acceleration	Low quality of fuel Incorrect injection timing Clogged fuel line or fuel filter Air in injection pump or fuel filter Clogged air cleaner Malfunction of delivery valve Incorrect injection starting pressure Malfunction of injection nozzle Malfunction of feed pump Malfunction of injection pump Malfunction of governor	Drain and replace Adjust Clean or replace Air bleed Clean or replace Clean or replace Adjust Clean or replace Clean or replace Replace Replace
High fuel consumption	Incorrect injection timing High idling speed Incorrect injection starting pressure Clogged air cleaner Clogged fuel filter Malfunction of injection nozzle	Adjust Adjust Adjust Clean or replace Replace Clean or replace
Engine does not stop	Malfunction of	Adjust or repair

9TG0F3-009



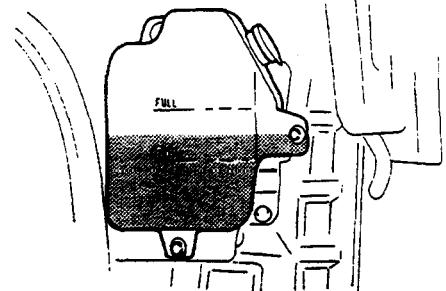
9TG0F3-010

ENGINE TUNE-UP

BASIC INSPECTION

Engine Oil

Check the engine oil level and condition with the level gauge. Add or change oil if necessary.



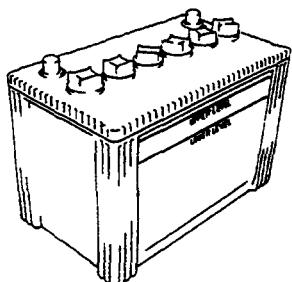
9TG0F3-011

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.



9TG0F3-012

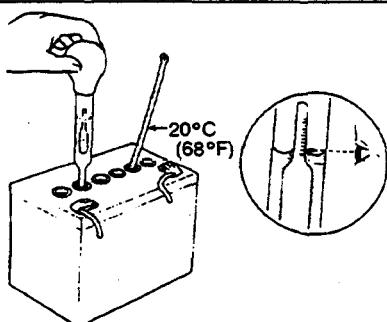
Battery

1. Check for corrosion on the terminals and for loose cable connections.

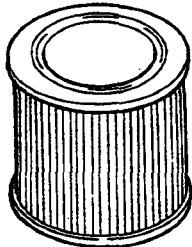
2. Check the electrolyte level.

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.)



9TG0F3-013

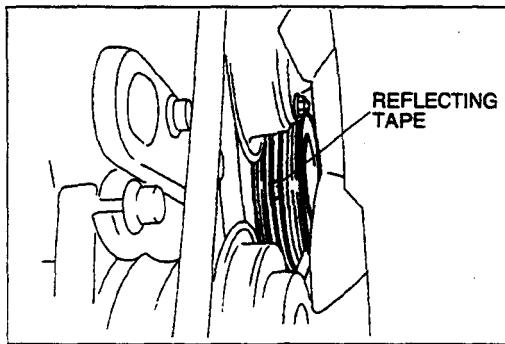


9TG0F3-014

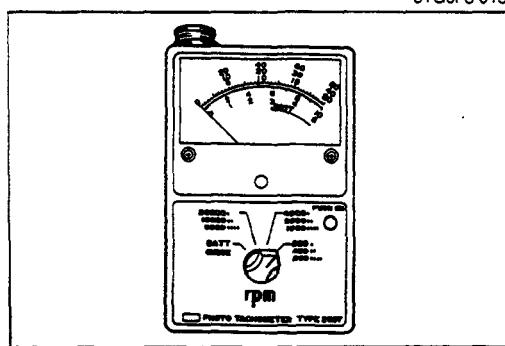
Air Cleaner

Visually check the air cleaner element for excessive dirt, damage or oil. Clean with compressed air if necessary.

ENGINE TUNE-UP

**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.

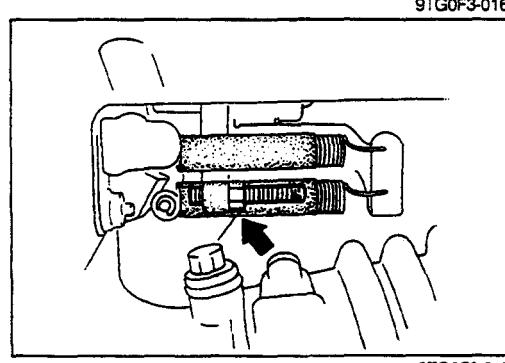


3. Verify the free play of the accelerator cable.

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

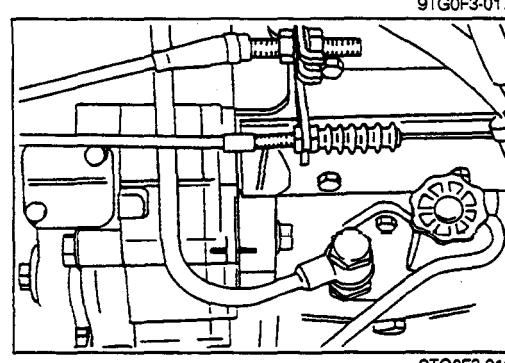


5. If not as specified, loosen the locknut of idle adjust bolt and then adjust turning the bolt.

6. Tighten the locknut.

Tightening torque:

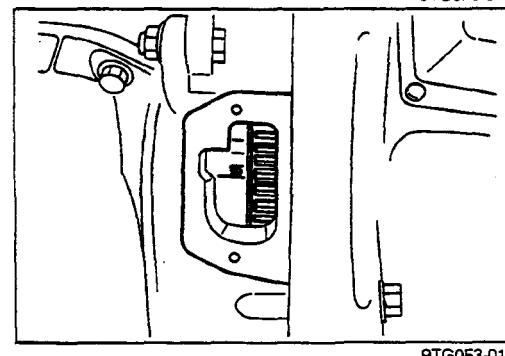
9.8—14 N·m (100—140 cm·kg, 87—121 in·lb)

**Injection Timing Inspection****Note**

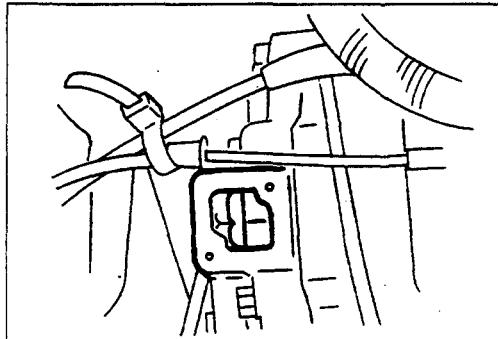
- Usually it is enough to confirm that the external marks are aligned.

Caution

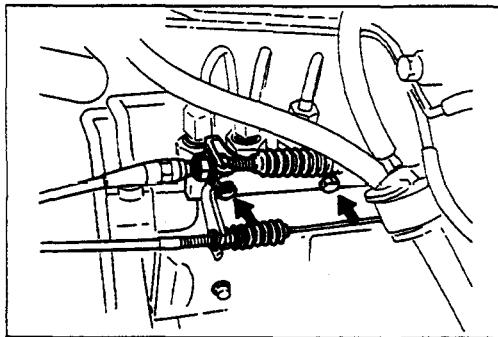
- Direct injection engine is sensitive to injection timing. Incorrect timing will cause engine knocking or low power output. Set the injection timing after installing the injection pump.



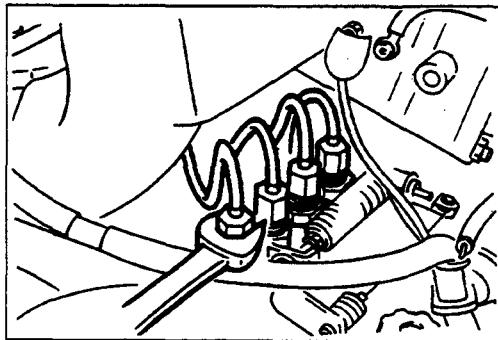
1. Remove the service hole covers from the clutch housing and the timing gear case.
2. Turn the flywheel in the direction of rotation until the indicator pin is at 30° BTDC.



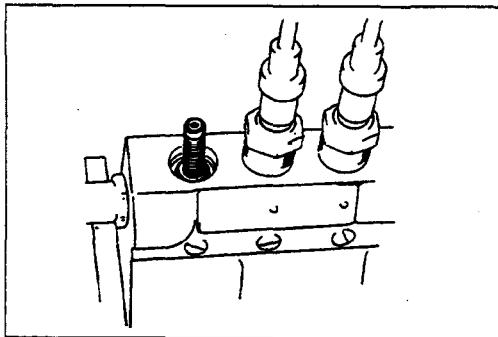
9TG0F3-020



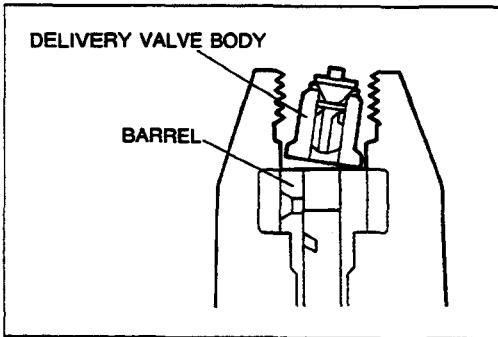
9TG0F3-021



9TG0F3-022



9TG0F3-023



9TG0F3-024

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.

6. Remove the delivery value spring seat and spring.

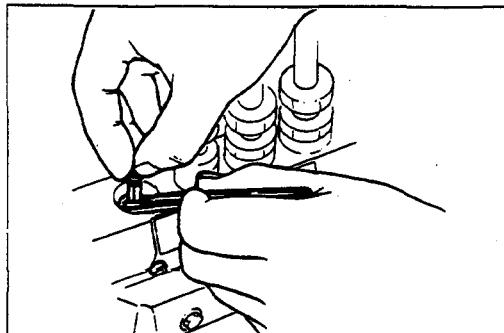
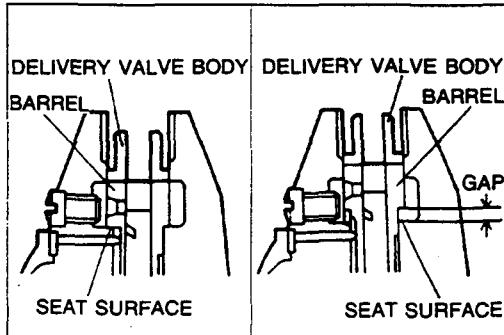
Caution

- Do not remove the delivery valve body.

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.

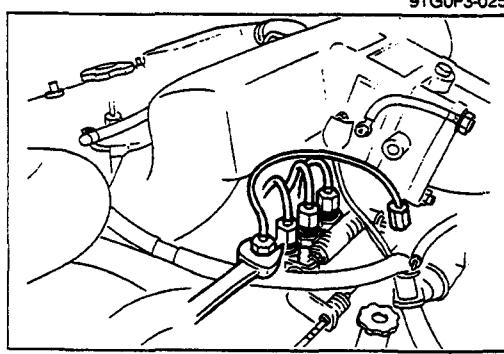


8. Remove the delivery valve, holding the flat washer with tweezers.

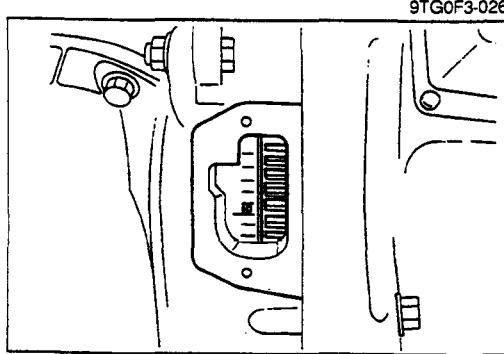
Caution

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

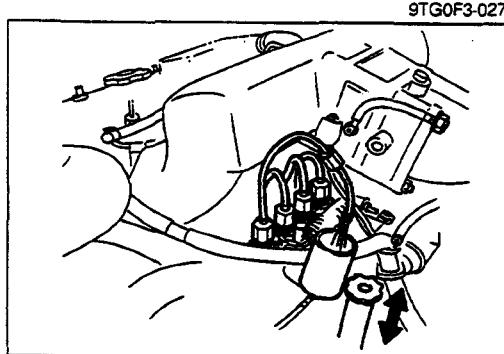
9. Reinstall the delivery valve holder.



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



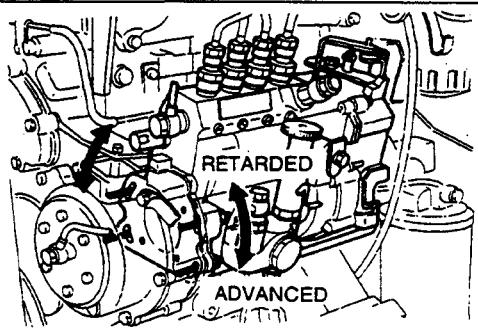
11. Turn the flywheel in the direction of rotation and set it at 20° BTDC.



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)

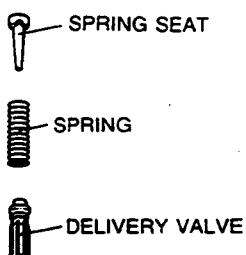


9TG0F3-029

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)



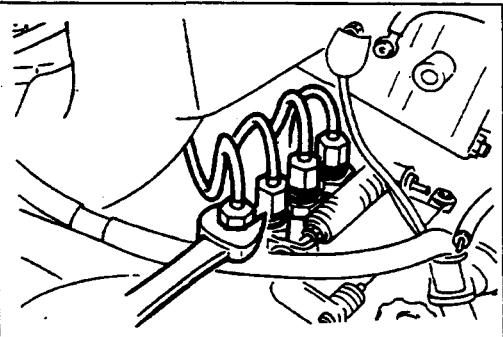
9TG0F3-030

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

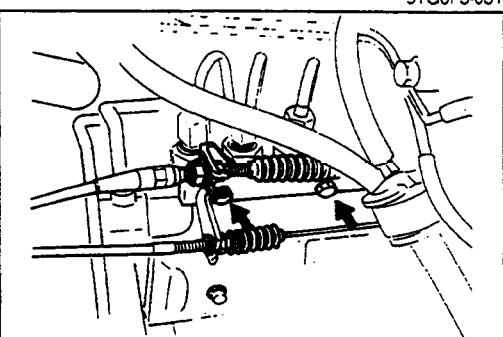
39—44 N·m (4.0—4.5 m·kg, 29—33 ft-lb)

19. Install No.1 injection pipe.



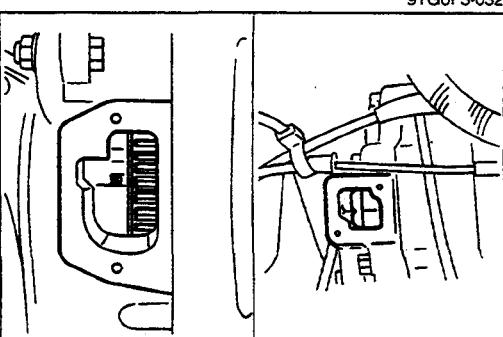
9TG0F3-031

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.



9TG0F3-032

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.



9TG0F3-033

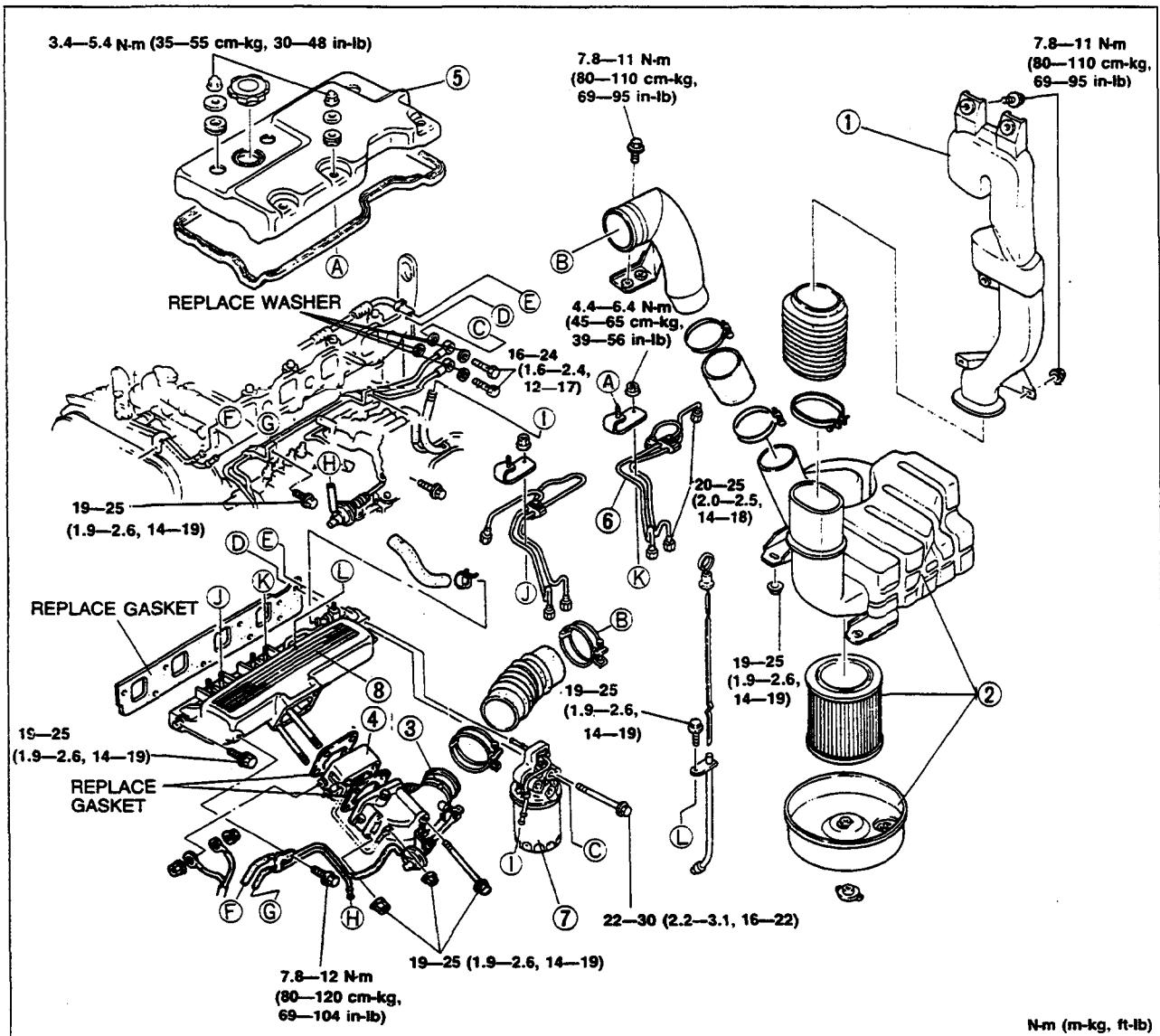
INTAKE AIR SYSTEM

INTAKE AIR SYSTEM

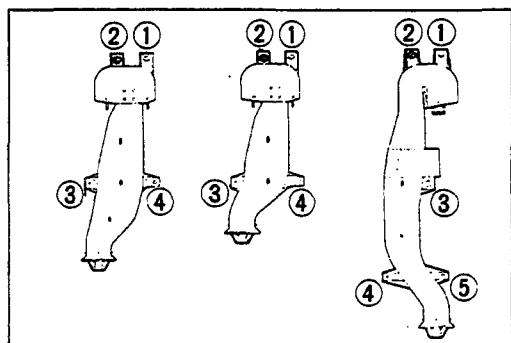
COMPONENTS

Removal / Inspection / Installation

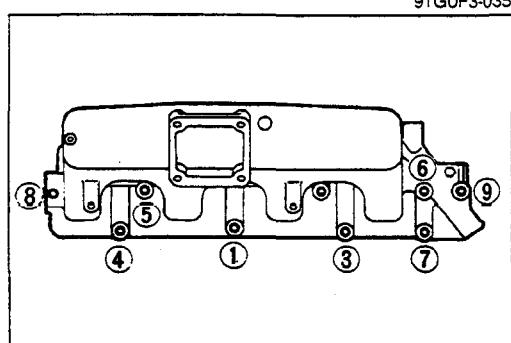
1. Remove in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal.



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

**Installation note****Fresh air duct**

Install in the order shown in the figure.

**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

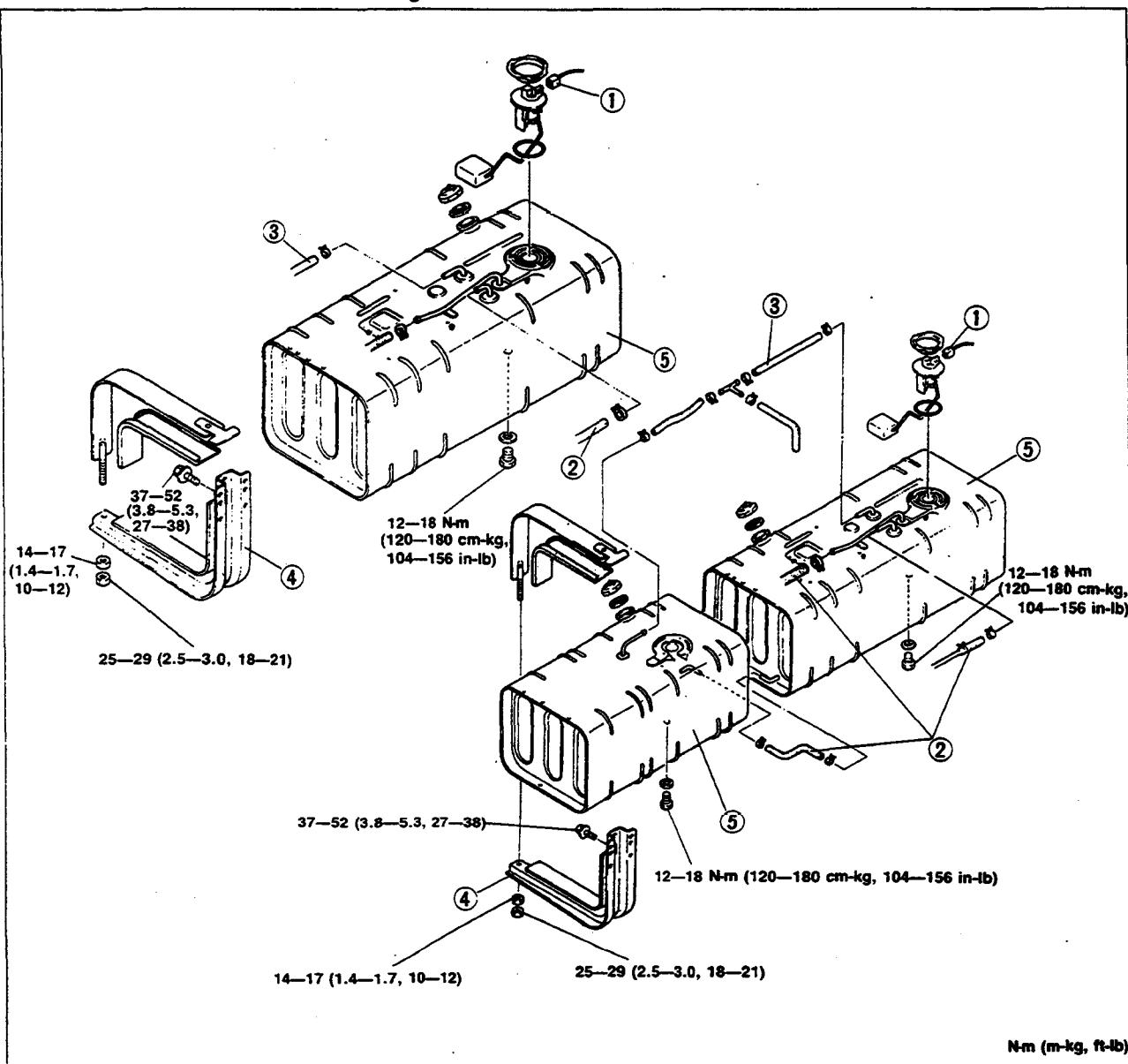
1. Remove in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal.

Warning

- Keep sparks cigarettes, and open flames away from the fuel tank.

Note

- Drain the fuel before removing the fuel tank.



N·m (m·kg, ft-lb)

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

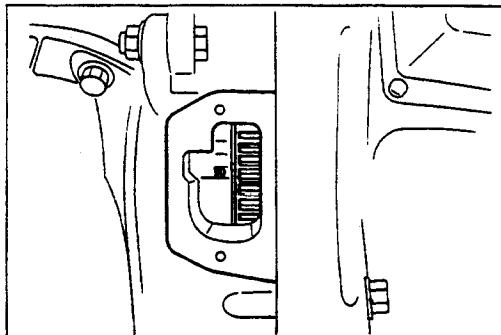
INJECTION PUMP

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

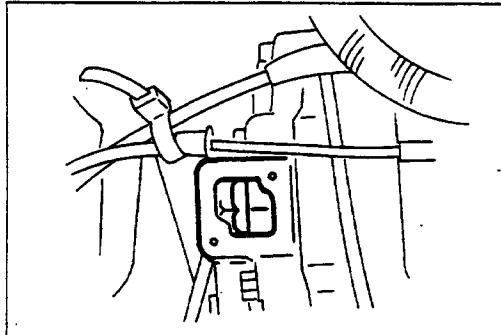


9TG0F3-039

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.



9TG0F3-002

3. Remove the cover from the gear case, and verify that the mark on the timer and the pointer are aligned.

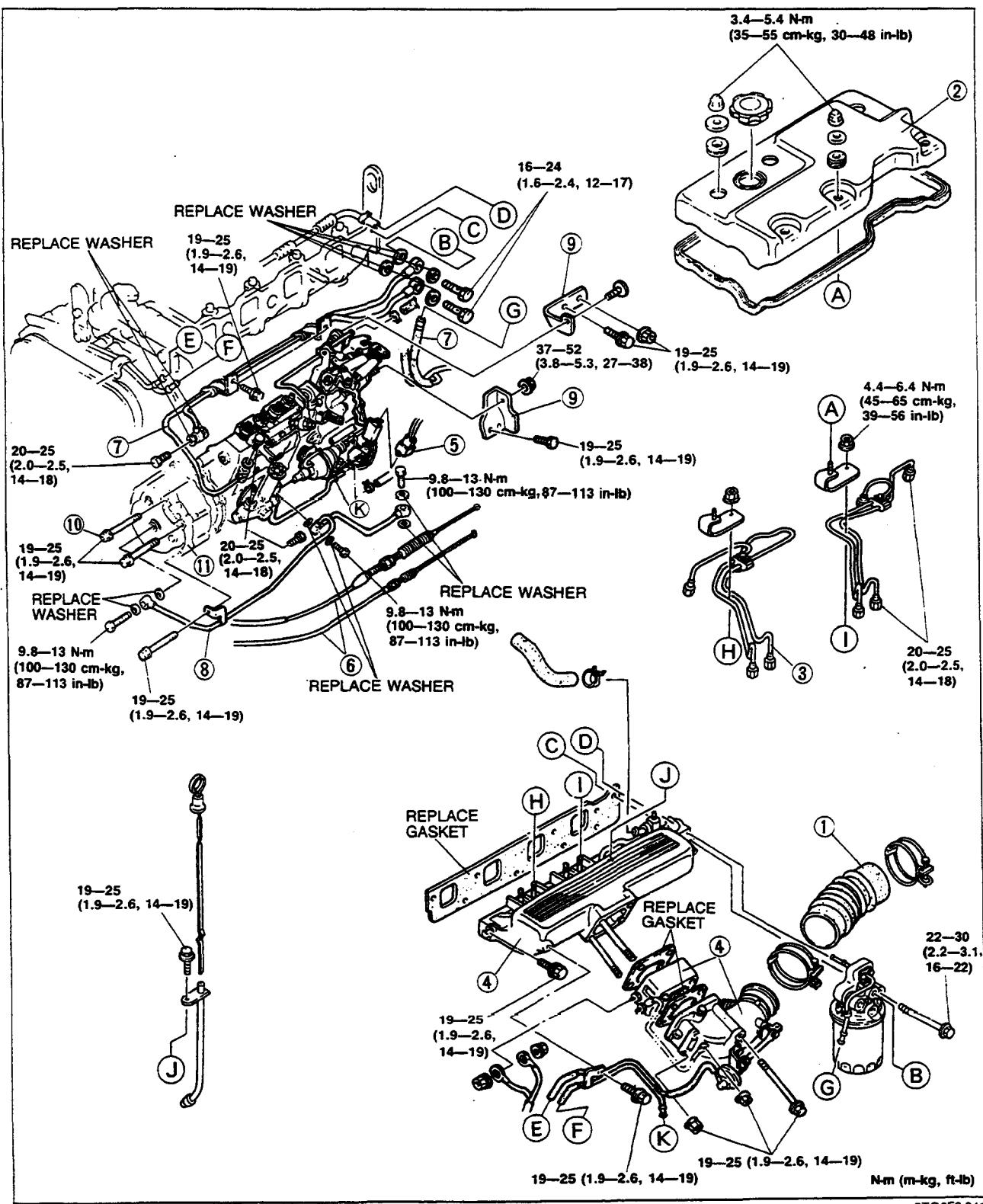
Note

- If they are not aligned, No.4 cylinder is at 30° BTDC.

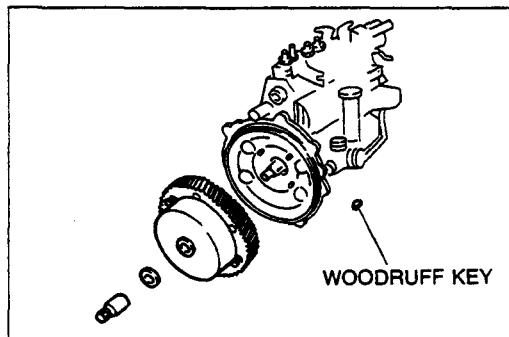
4. Remove in the order shown in the figure.
(Refer to page F3-19.)

Caution

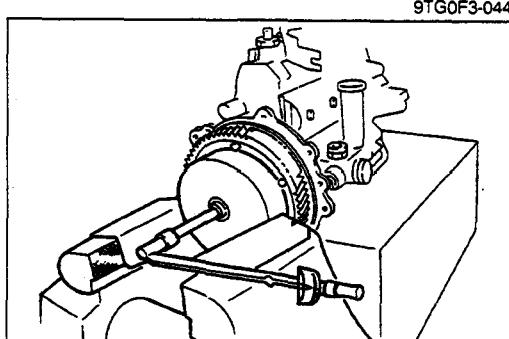
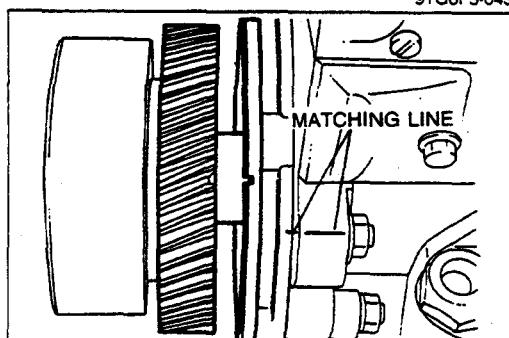
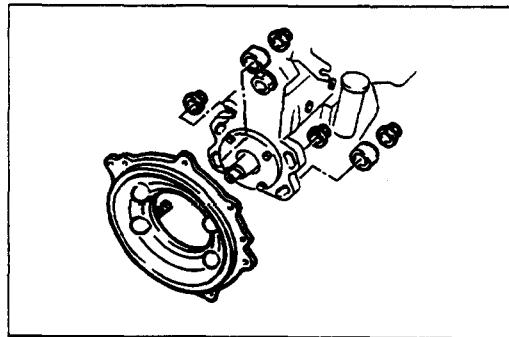
- Cover the intake manifold and injection pipes after removed.
- After removing the pump, do not turn the engine.



- | | |
|---|---|
| 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.

4. Remove the flange plate.

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.

8. Affix the timer in a vise, and tighten the nut.

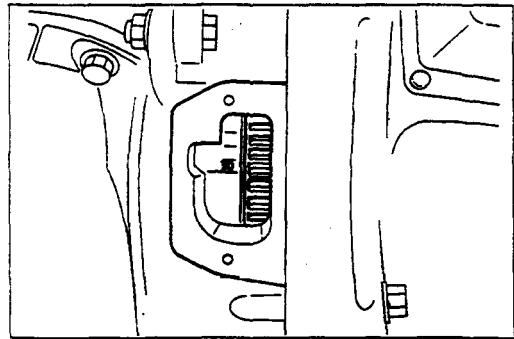
Tightening torque:

59—69 N·m (6.0—7.0 m-kg, 43—51 ft-lb)

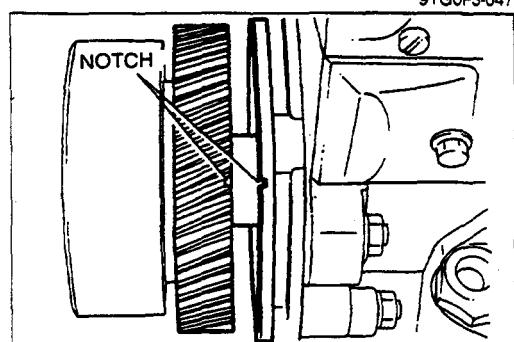
Installation

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

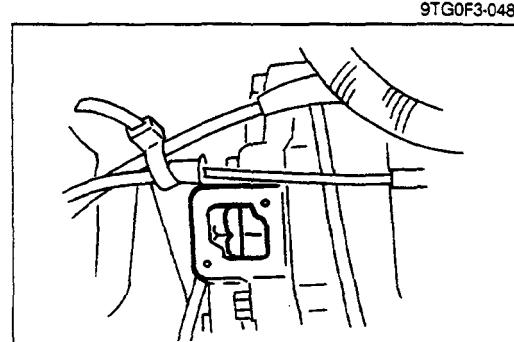
**Installation note****Injection pump**

1. Before installing the injection pump, verify that No.1 cylinder is at 30° BTDC.

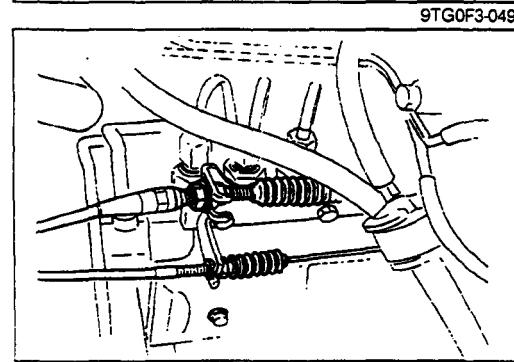


2. Align the notches of the flange plate and the injection pump gear.

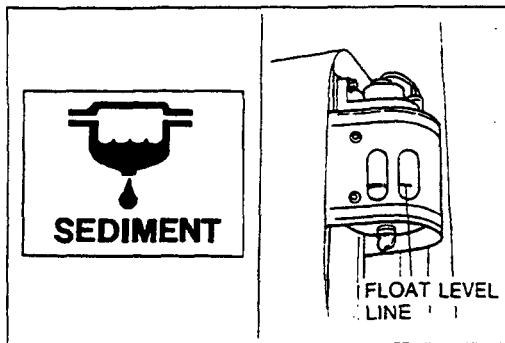
3. Install the injection pump.



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.)

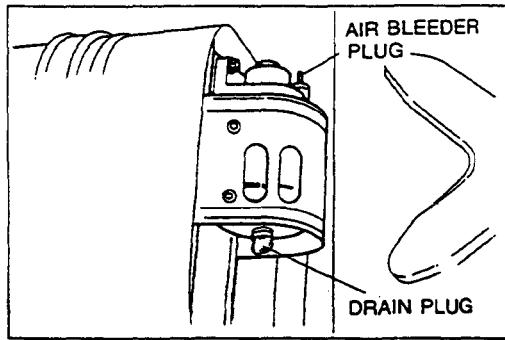


9TG0F3-051

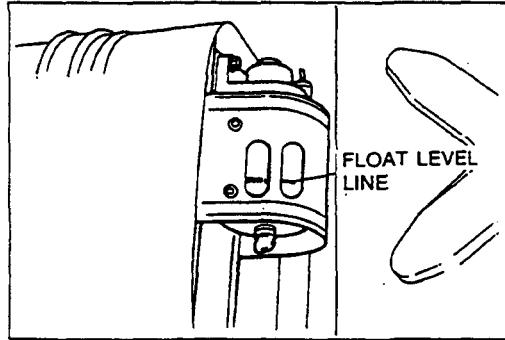
SEDIMENTATOR Draining Water

Note

- Drain the water when the sedimentator warning light is illuminated or the float ring has risen near the float level line.



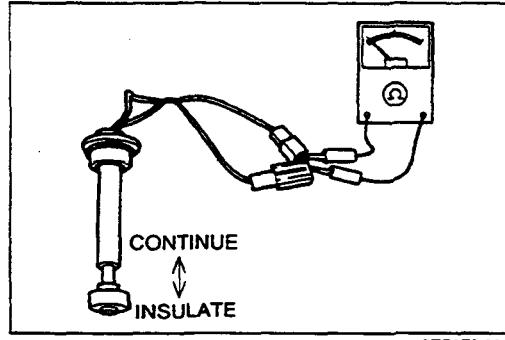
9TG0F3-052



9TG0F3-053

Inspection

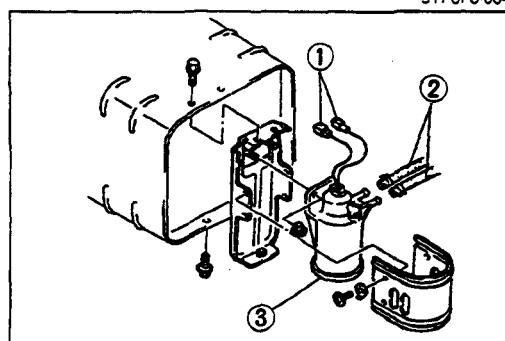
1. Visually check the sedimentator for damage and fuel leakage. Repair or replace, if necessary.
2. Check the position of the float ring and if the ring is near the float level line, drain the water.



9TF0F3-004

SEDIMENTATOR SENSOR (DETECTOR) Inspection

1. Remove the sedimentor sensor from the sedimentator.
2. Verify that there is continuity with ohmmeter, when the float up.



9TG0F3-055

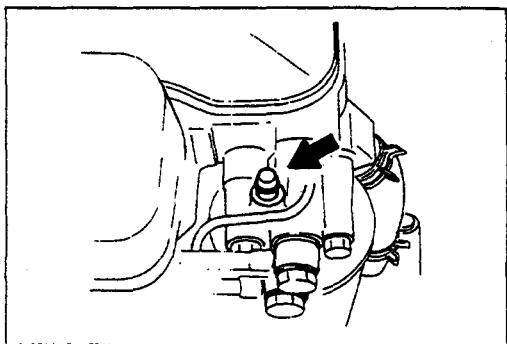
Replacement

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.

FUEL SYSTEM


FUEL FILTER
Air Breeding
Warning

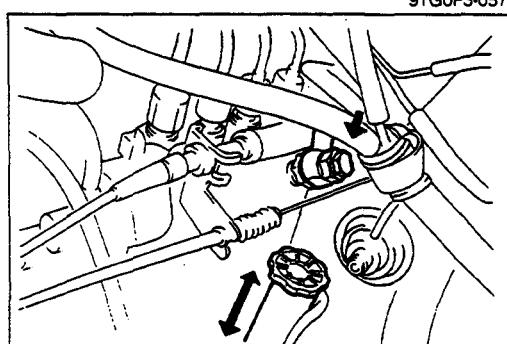
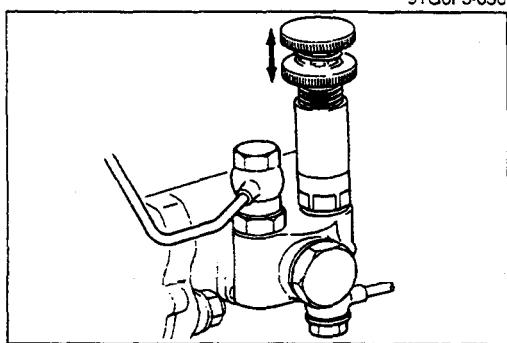
- Keep sparks, cigarettes and open flames away from the fuel filter.

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)

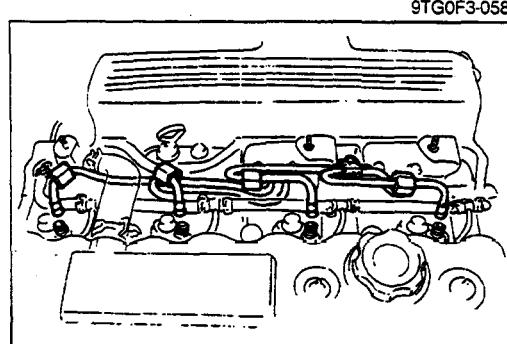


4. Loosen the return pipe at the injection pump, and pump the priming pump until no air is expelled.
 5. Tighten bolt.

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.

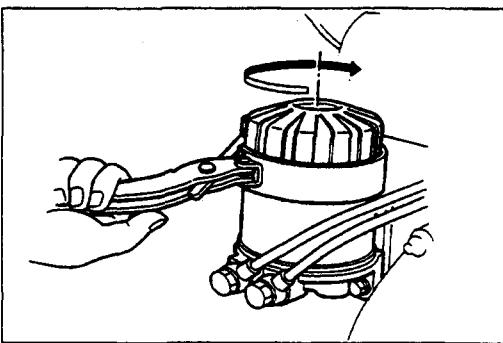
Tightening torque:

20—25 N·m (2.0—2.5 m·kg, 14—18 ft·lb)

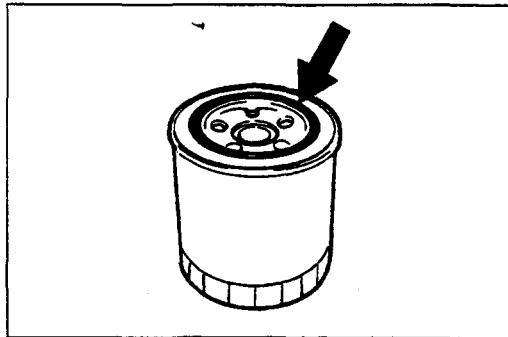
Replacement**Warning**

- Keep sparks, cigarettes and open flames away.

1. Remove the filter with a filter wrench.



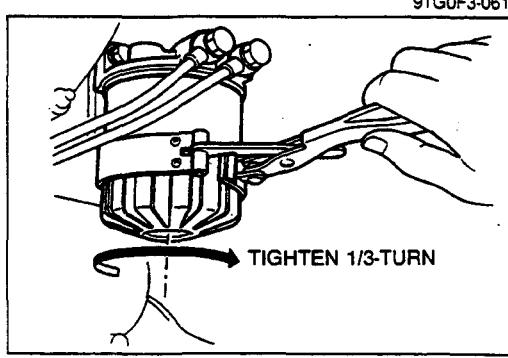
2. Apply to the O-ring.



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.



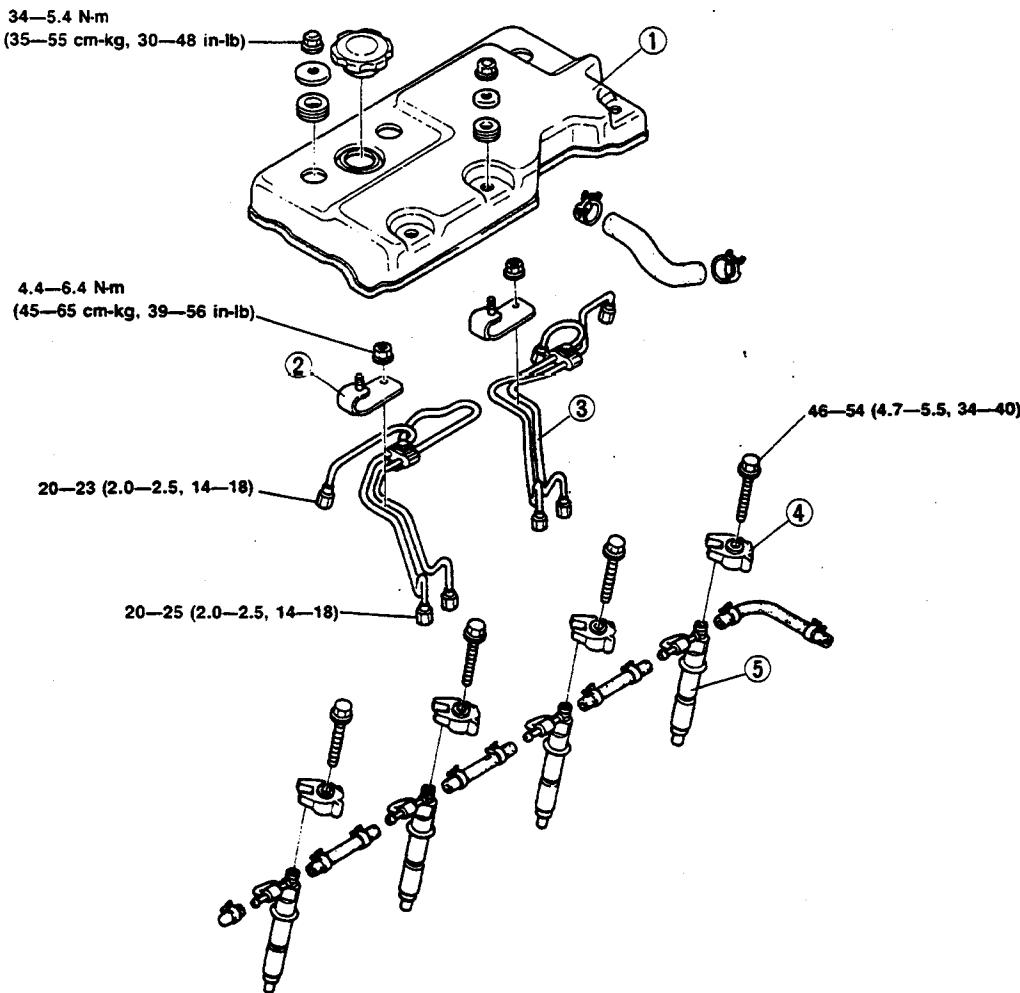
INJECTION NOZZLE

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.



1. Seal cover

2. Injection pipe holder

3. Injection pipe

4. Holder bracket

5. Injection nozzle

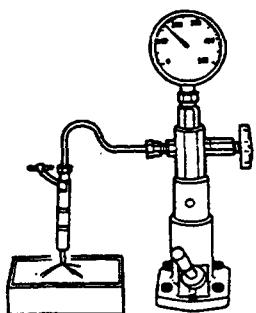
Inspection

Warning

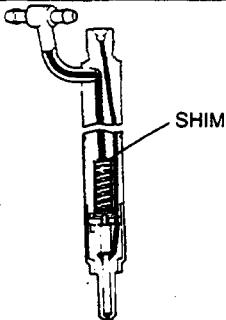
- Do not allow your hands or any other part of the body to come into the direct path of the spray when using the nozzle tester because the spray has enough force to break the skin and possibly cause blood poisoning.

Caution

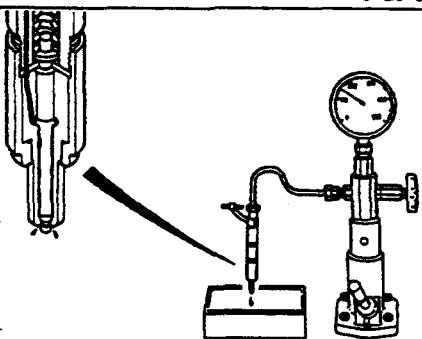
- The nozzle tester should be set up in a clean work place.



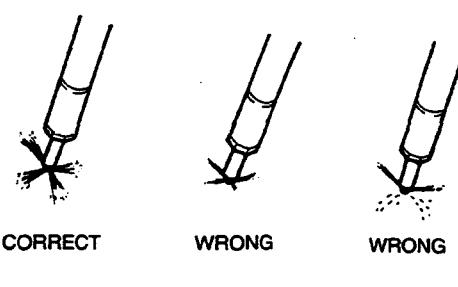
9TG0F3-064



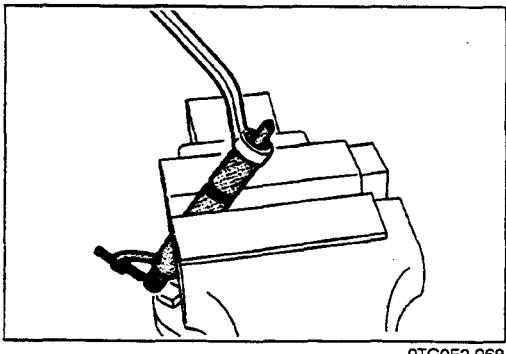
9TG0F3-065



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/cm², 2,986 psi)
Used nozzle 19,620 kPa (200 kg/cm², 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/cm², 71 psi).

Leakage of injector

Apply pressure 1,962 kPa (20 kg/cm², 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.

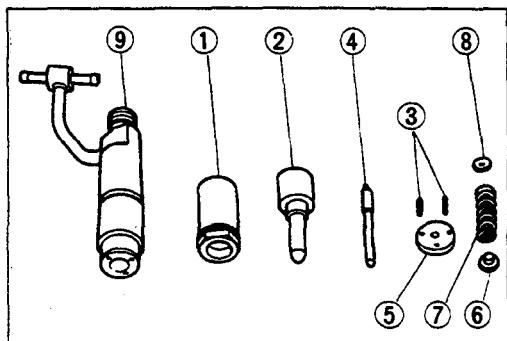
Atomizing condition

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 heard). Repeat this operation several times and check the atomizing condition.
4. Verify that the fuel is atomized uniformly and properly.

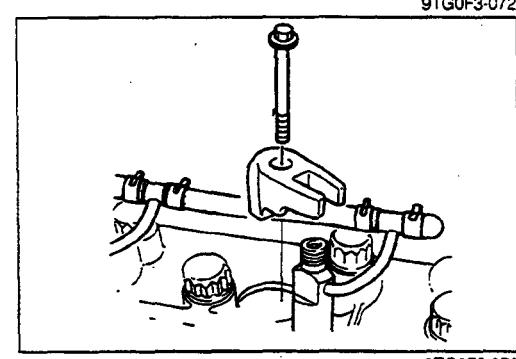
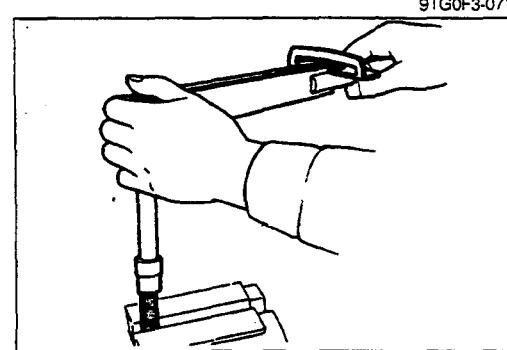
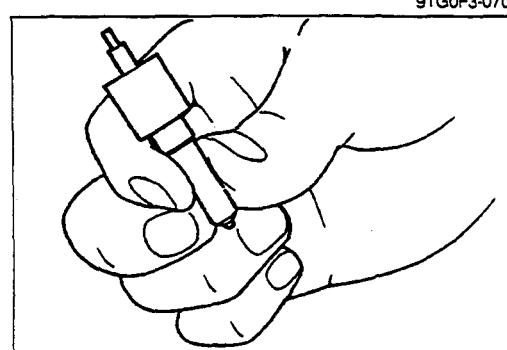
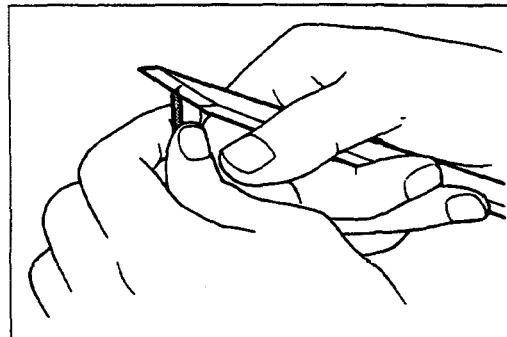
5. Verify that the injection angle and direction are normal.
6. If the atomizing condition is incorrect, it is necessary to disassemble, wash and recheck the nozzle, or to replace it.

Disassembly

1. Clamp the nozzle in a vise as shown in the figure.



9TG0F3-069



2. Disassemble as shown in the figure.

- ① Retaining ring
- ② Nozzle body
- ③ Guide pin
- ④ Needle valve
- ⑤ Distance piece
- ⑥ Pressure pin
- ⑦ Pressure spring
- ⑧ Shim
- ⑨ Nozzle holder

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 its 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 F3—26.)

Installation

Caution

- Use new gaskets and O-rings.

1. Install in the reverse order of removal.

Tightening torque:

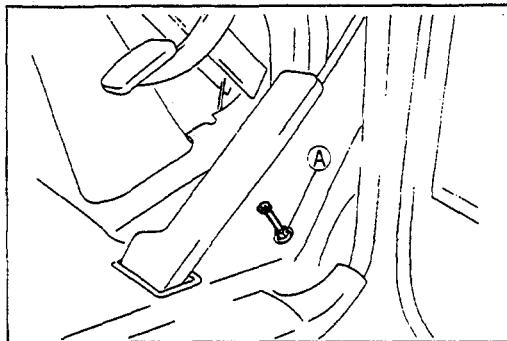
Retainer bolt:

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

ACCELERATOR PEDAL, ACCELERATOR CABLE Inspection / Adjustment

- Verify that the control lever of the injection pump is in the fully-open position when the accelerator pedal is fully depressed.
- 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)

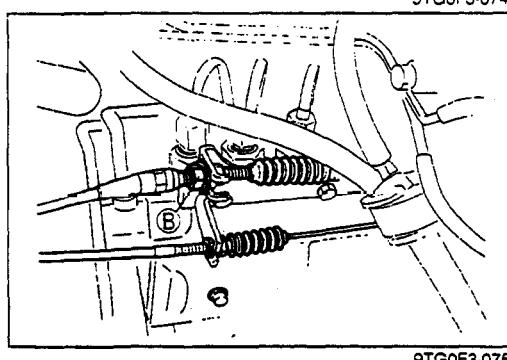
- Check the free play of the accelerator cable.

Free play 1.0—3.0mm (0.039—0.12 in)

- Adjust the nuts **B**, if necessary.

Tightening torque:

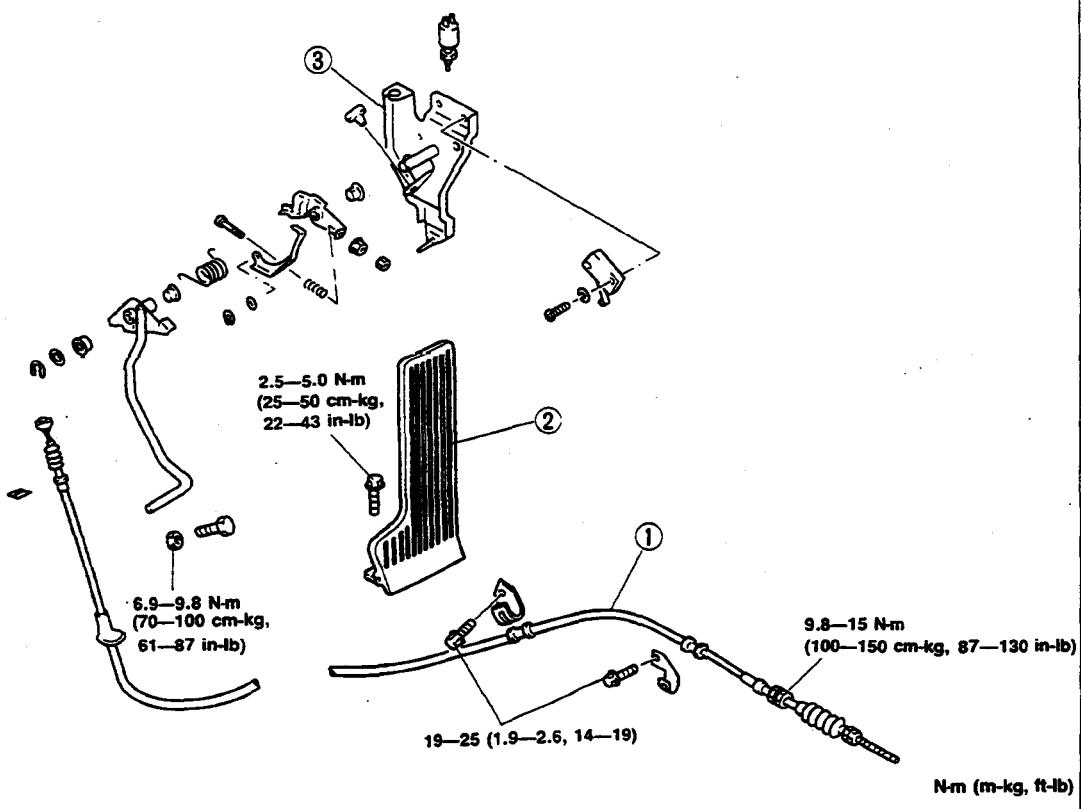
9.8—15 N·m (100—150 cm·kg, 87—130 in·lb)



9TG0F3-075

Removal / Installation

- Remove in the order shown in the figure.
- Install in the reverse order of removal.

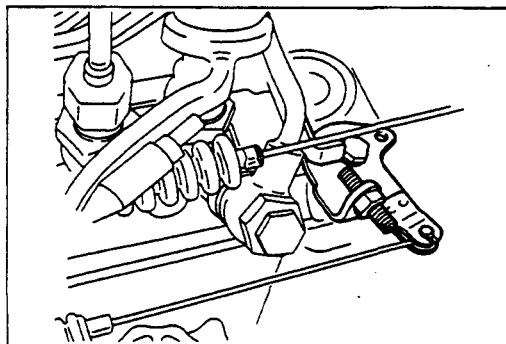


9TG0F3-076

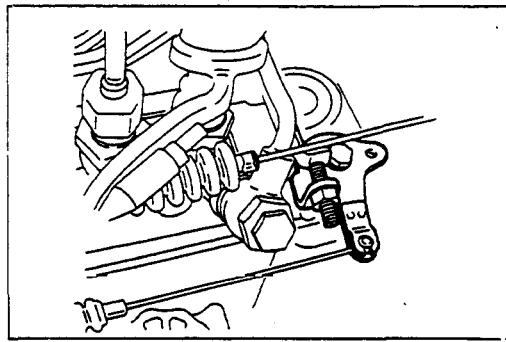
- Accelerator cable
- Accelerator pedal

- Bracket

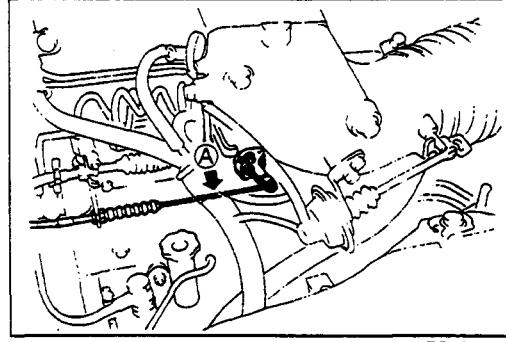
FUEL CUT CONTROL SYSTEM



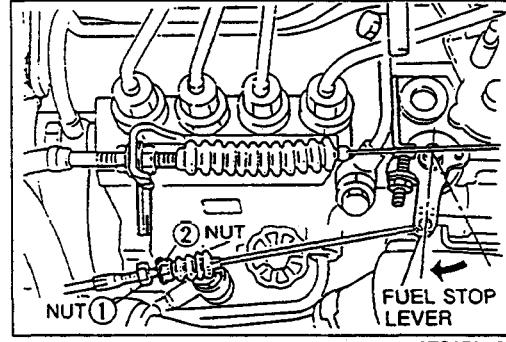
9TG0F3-077



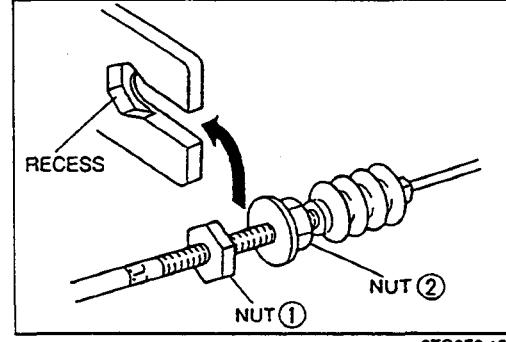
9TG0F3-078



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

Inspection

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 **(A)** 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

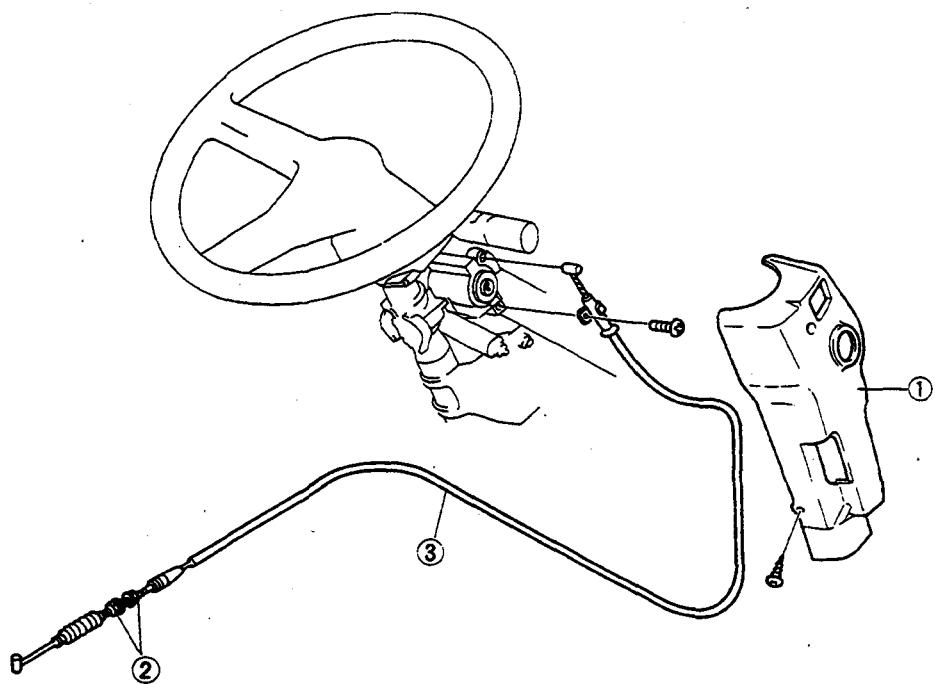
1. Turn the engine switch OFF.
2. Loosen nut **②** and remove the fuel stop cable from the bracket.
3. Pull the fuel stop cable and verify that the fuel stop lever is at the fuel stop position.
4. Adjust nut **①** so that there is no clearance between it and the outside of the bracket.
5. Install the 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.

F3

FUEL CUT CONTROL SYSTEM

Removal / Installation

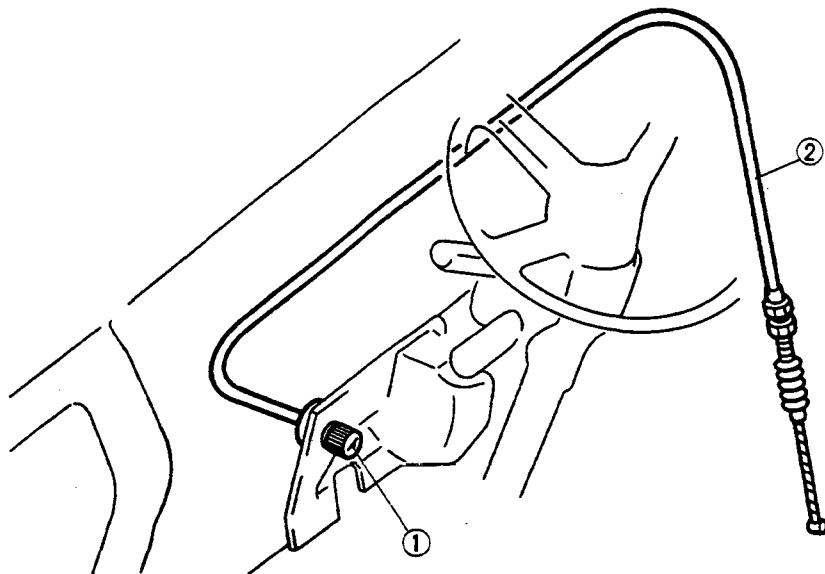
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Adjust the free play of the fuel stop cable.



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

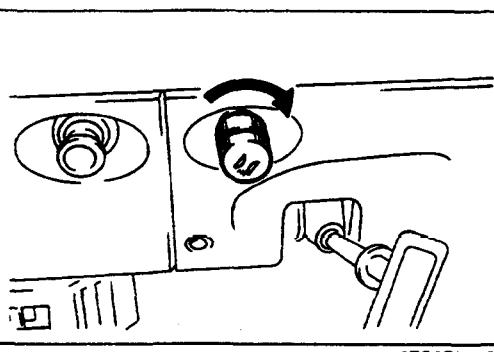
2. Idling cable

Inspection / Adjustment page F3-31

Removal / Installation page F3-32

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.

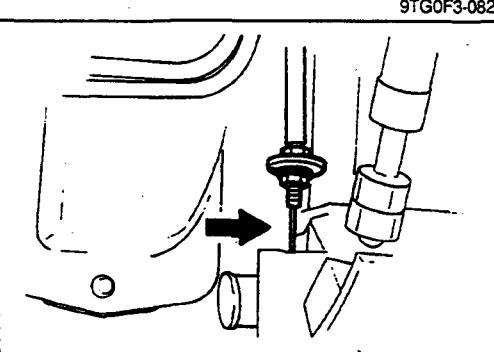


9TG0F3-082

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)**

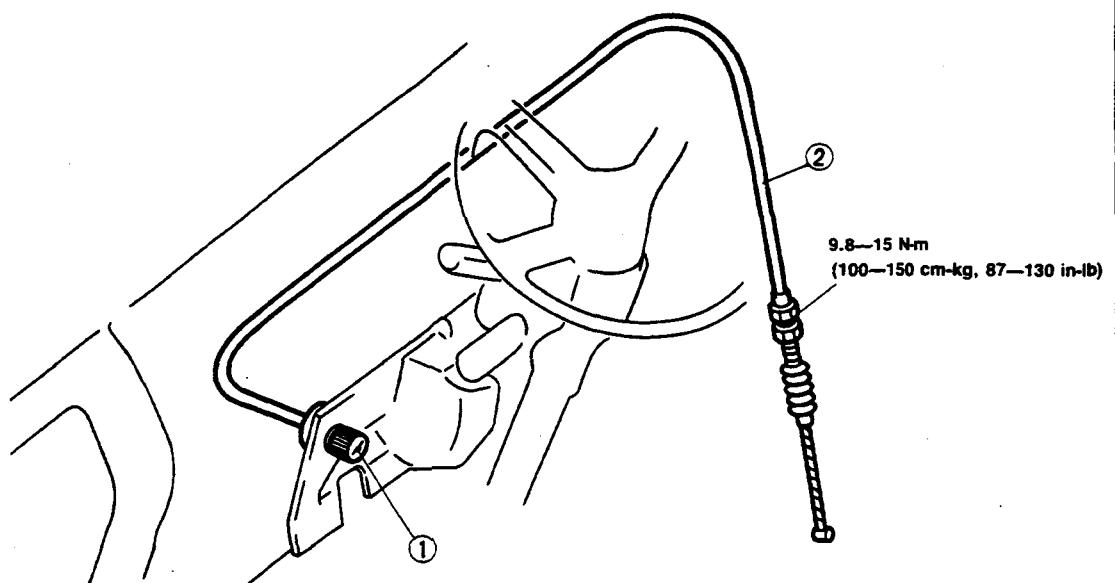
9TG0F3-083

F3

IDLE SPEED CONTROL SYSTEM

Removal / Installation

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



1. Idling knob

2. Idling cable

9TG0F3-084

EXHAUST SYSTEM

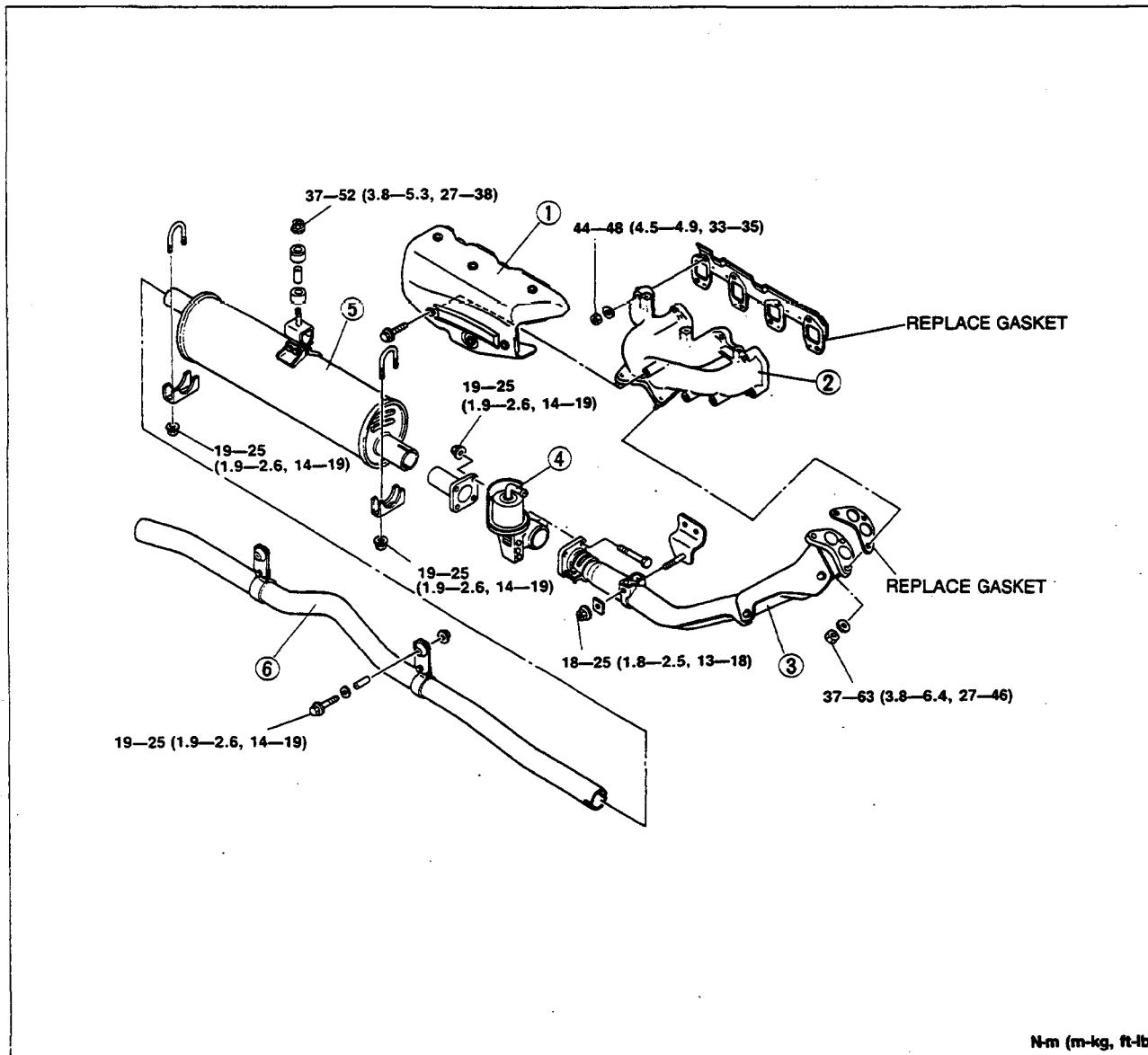
COMPONENTS

Vehicle Inspection

- Run the engine and verify that there is no exhaust leakage.

Removal / Inspection / Installation

- Remove in the order shown in the figure.
- Inspect all parts and repair or replace as necessary.
- Install in the reverse order of removal.



N·m (m·kg, ft·lb)

9TG0F3-085

- Exhaust manifold insulator
- Exhaust manifold
Check for contamination, cracks and other damage
- Front pipe assembly
Check for contamination cracks and other damage
- Exhaust brake unit
Inspection page F3-38
- Main silencer assembly
Check for contamination, cracks and other corrosion
- Tail pipe assembly
Check for contamination, cracks and other damage

F3

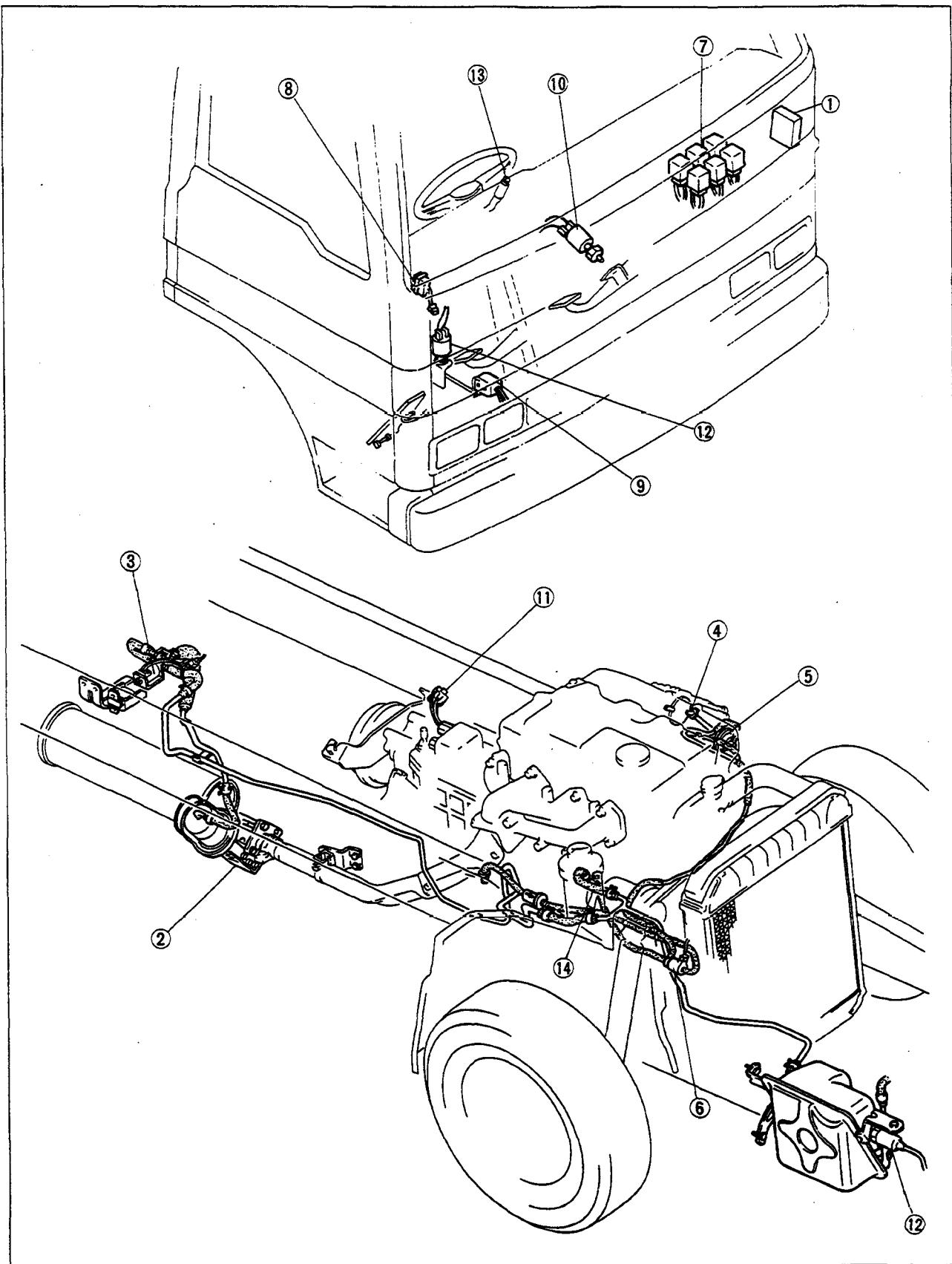
EXHAUST SYSTEM

MEMO

EXHAUST CONTROLLED HEATING SYSTEM

EXHAUST CONTROLLED HEATING SYSTEM

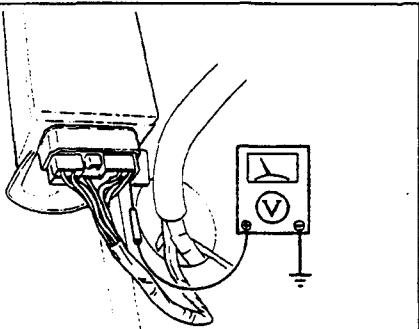
STRUCTURAL VIEW



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

EXHAUST CONTROLLED HEATING SYSTEM



9TG0F3-088

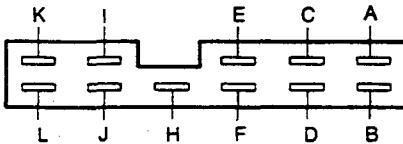
EXHAUST HEATING CONTROL UNIT

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.

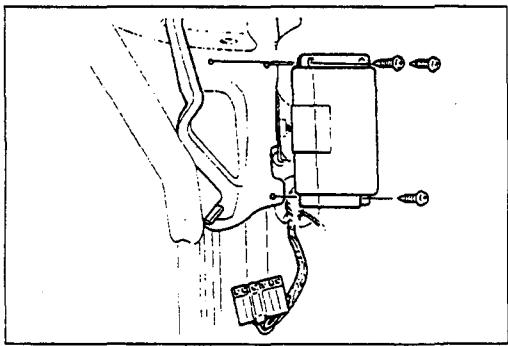
Terminal	Color of wire	Connected to	Conditions of measuring (engine sw ON)	Voltage	Possible cause
A	BR	Exhaust heating switch	Exhaust heating switch OFF	Approx. 12V	Exhaust heating switch (Refer to page F3-42) Wire harness
			Exhaust heating switch ON	Approx. 0V	
B	R/L	Clutch switch	Accelerator and clutch 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

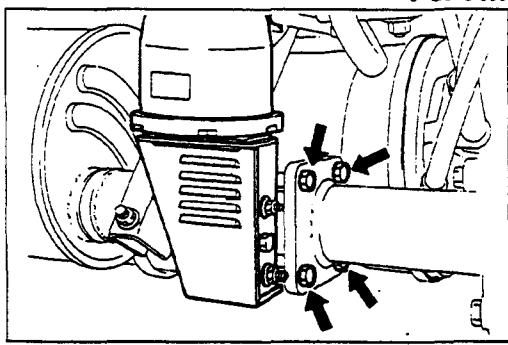


*.... Pay load above 3.5t only

9TG0F3-089

**Replacement**

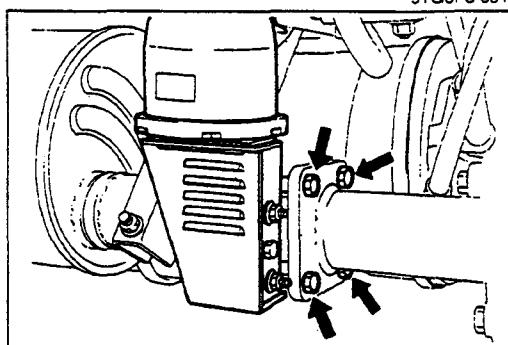
1. Disconnect the connector from the exhaust heating control unit.
2. Remove the exhaust heating control unit.
3. Install in the reverse order of removal.

**EXHAUST BRAKE UNIT (POWER CHAMBER)****Removal**

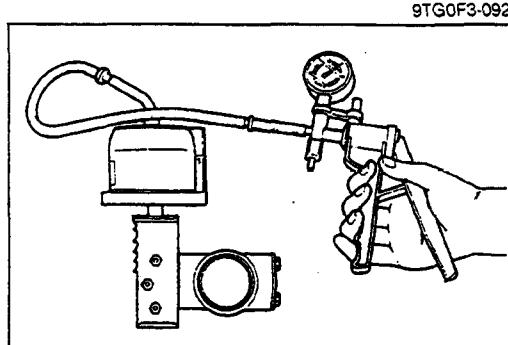
1. Disconnect the vacuum hose from the exhaust brake unit.
2. Remove the exhaust brake unit assembly.

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.

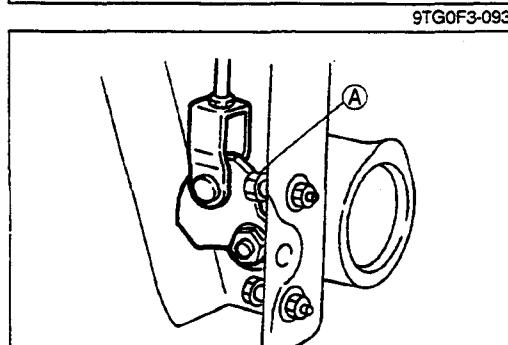
**Inspection**

1. Remove the exhaust brake unit assembly.
2. Remove the service hole cover.



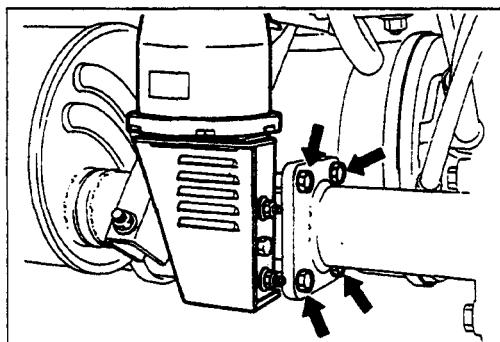
3. Connect a vacuum pump and check the following.

**Starts closing 100mmHg (3.9 inHg)
Fully closing 350mmHg (13.8 inHg)**



4. When fully closed adjust the gap of the valve by turning bolt **(A)**.

Gap 0.2—0.4mm (0.007—0.015 in)



9TG0F3-095

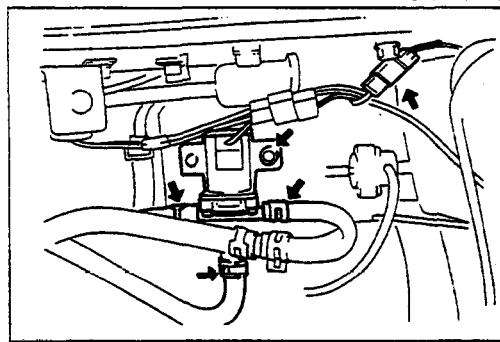
Installation**Note**

- 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:

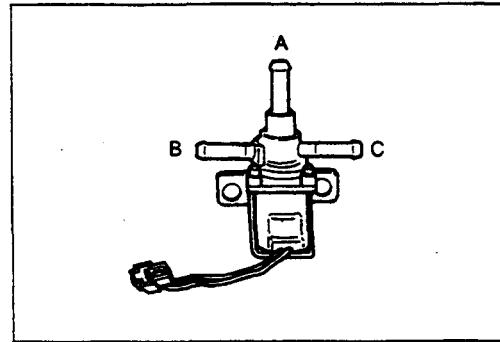
19—25 N·m (1.9—2.6 m·kg, 14—19 ft-lb)



9TG0F3-096

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.



9TG0F3-097

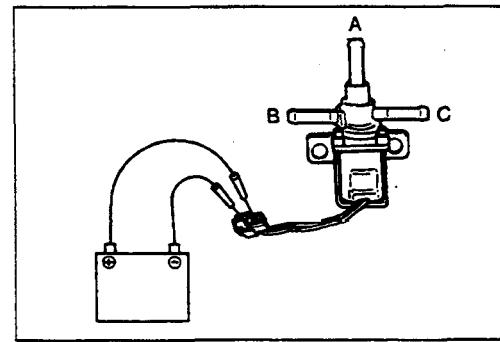
Inspection

1. Verify air flow through the valve.

A—B: Flow

A—C: No flow

B—C: No flow



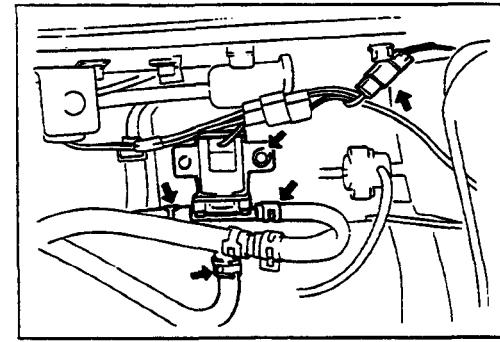
9TG0F3-098

2. Connect 12V to the valve and verify air flow.

A—B: No flow

A—C: Flow

B—C: No flow



9TG0F3-099

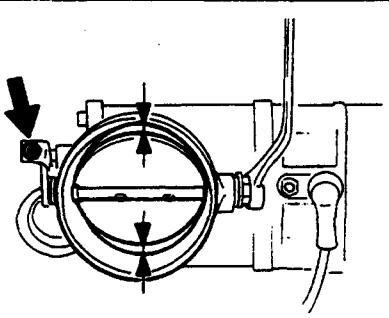
Installation**Note**

- 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)



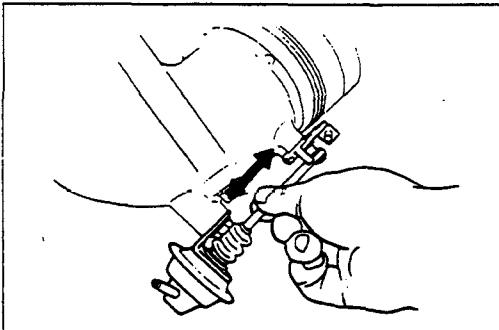
9TG0F1-100

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: $5.7 \pm 0.2\text{mm}$ (0.224 ± 0.007 in)

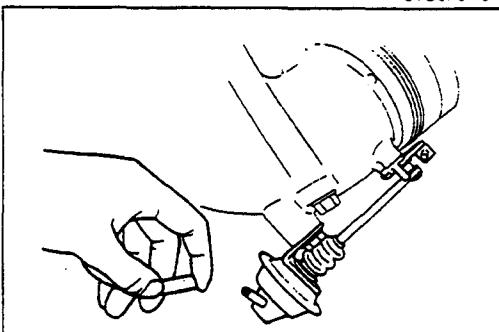
2. If not as specified, adjust by turning the adjusting screw.



9TG0F3-101

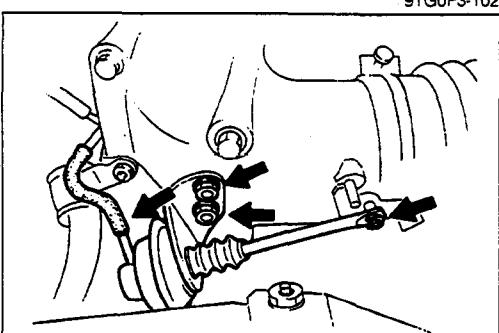
INTAKE SHUTTER VALVE ACTUATOR**Inspection**

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

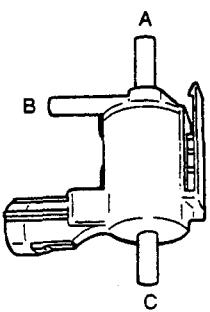
Replacement**Note**

- 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)

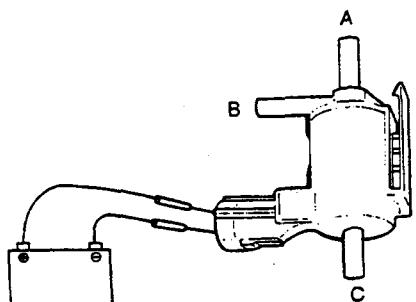


9TG0F3-104

SOLENOID VALVE (INTAKE SHUTTER VALVE) Inspection

Note

- After installing the solenoid valve, the vacuum warning buzzer may ring until vacuum is built up.



9TG0F3-105

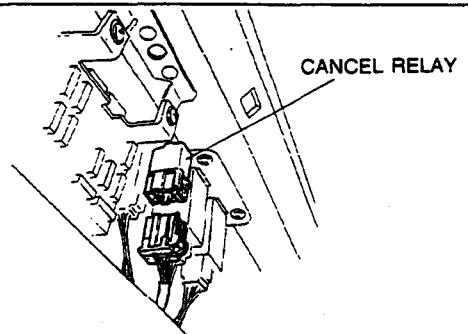
1. Remove the solenoid valve.

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**



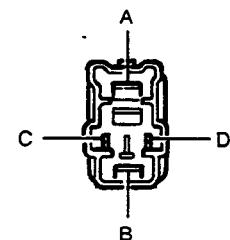
9TG0F3-106

CANCEL RELAY**Removal**

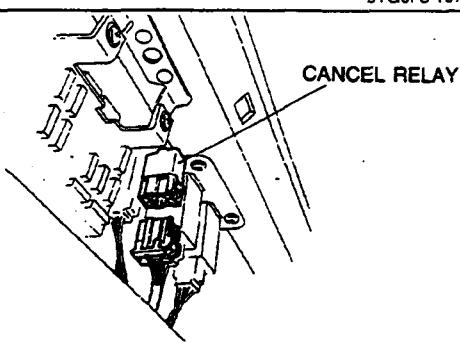
Remove as shown in the figure.

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.



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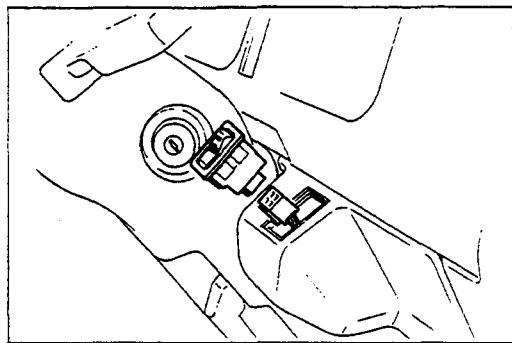
9TG0F3-108

Installation

Install in the reverse order of removal.

F3

EXHAUST CONTROLLED HEATING SYSTEM

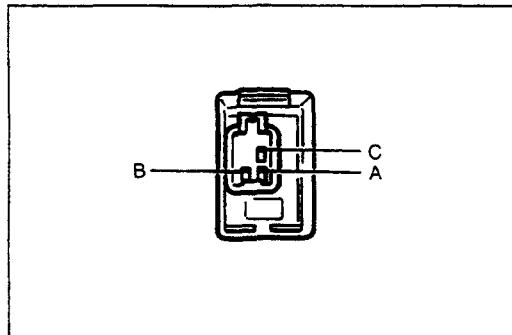


9TG0F3-109

EXHAUST HEATING SWITCH

Removal

Remove in the order shown in the figure.

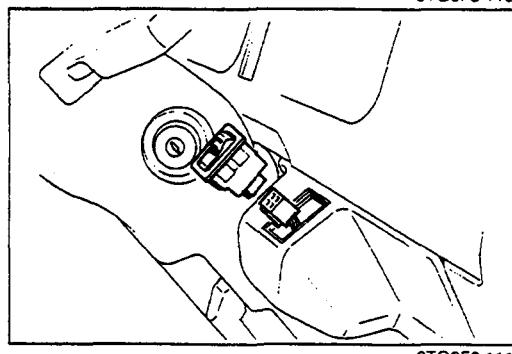


9TG0F3-110

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



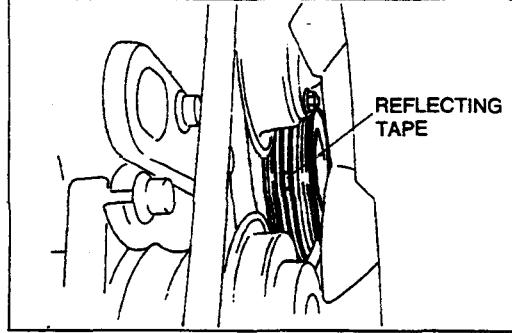
9TG0F3-111

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.

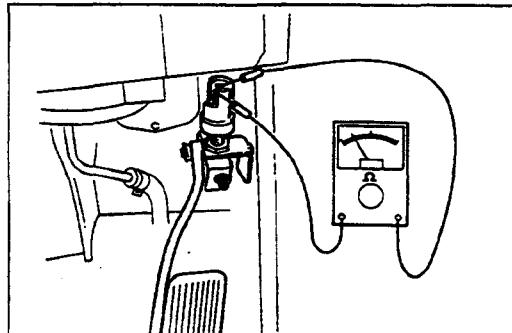


9TG0F3-112

ACCELERATOR SWITCH

Inspection

1. Run the engine to normal operating temperature.
2. Stop the engine and affix reflecting tape to the crankshaft pulley.

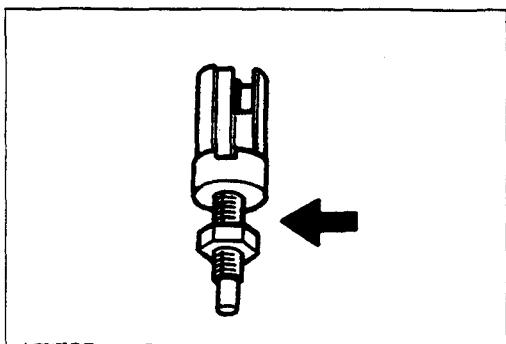


9TG0F3-113

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

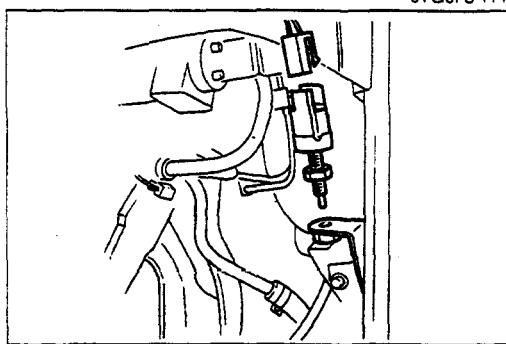
EXHAUST CONTROLLED HEATING SYSTEM



8. If not as specified, loosen the locknut and adjust the switch.
9. After adjusting, tighten the locknut.

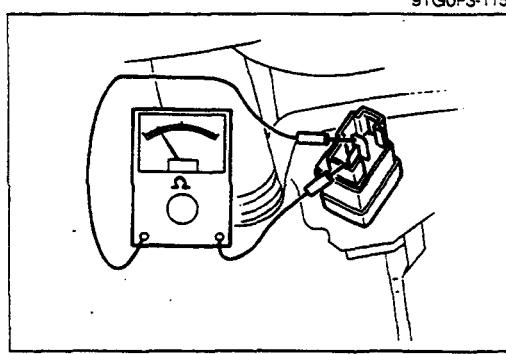
Tightening torque:

14—18 N·m (1.4—1.8 m-kg, 10—13 ft-lb)



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.

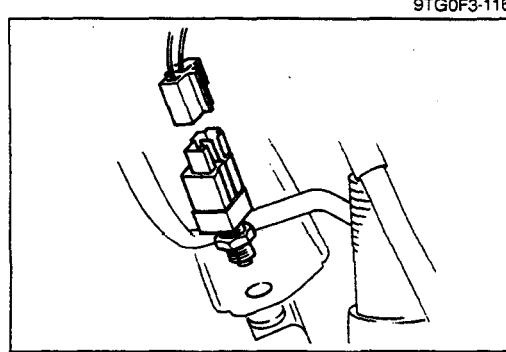


CLUTCH SWITCH

Inspection

1. Disconnect the clutch switch connector.
2. Check continuity of the switch.

Clutch pedal	Continuity
Depressed	No
Released	Yes

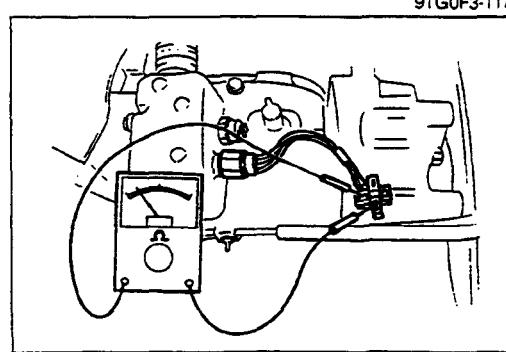


Replacement

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)



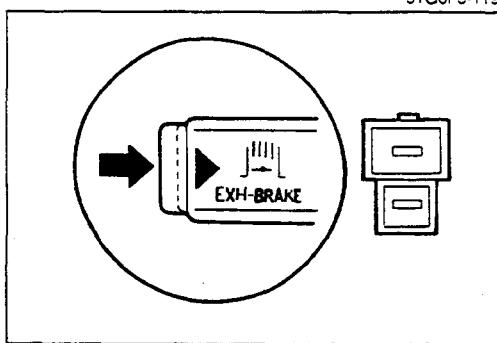
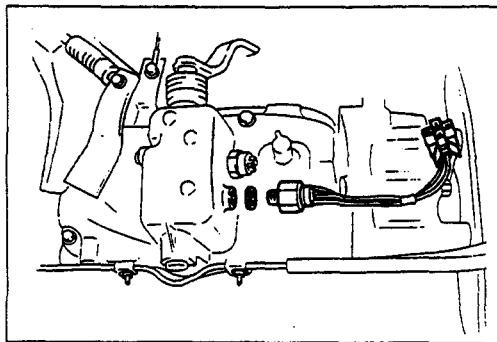
NEUTRAL SWITCH

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.

**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.

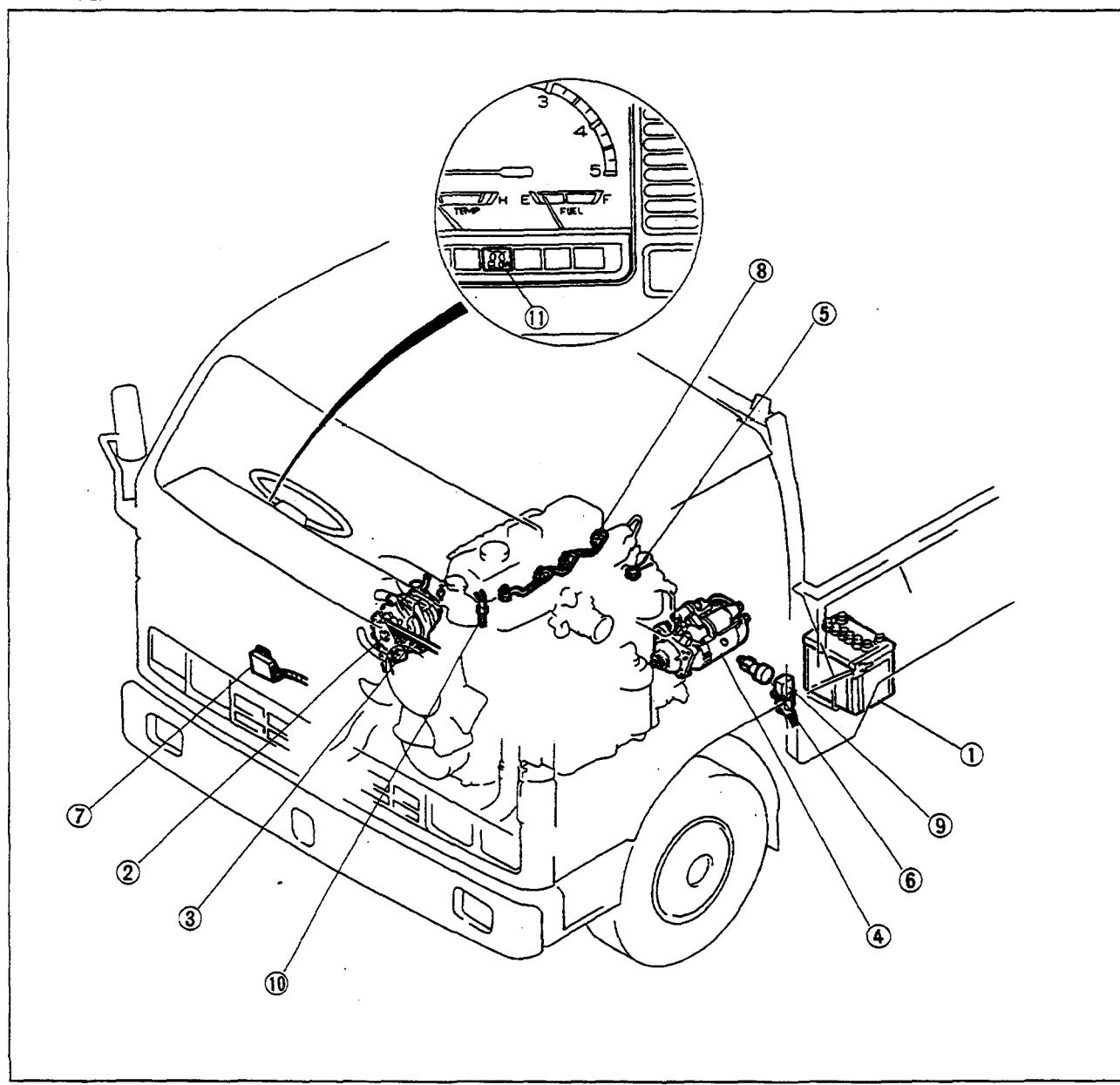
Exhaust brake switch	Continuity
OFF	No
ON	Yes

4. If not as specified, replace the switch. (Refer to Section T.)

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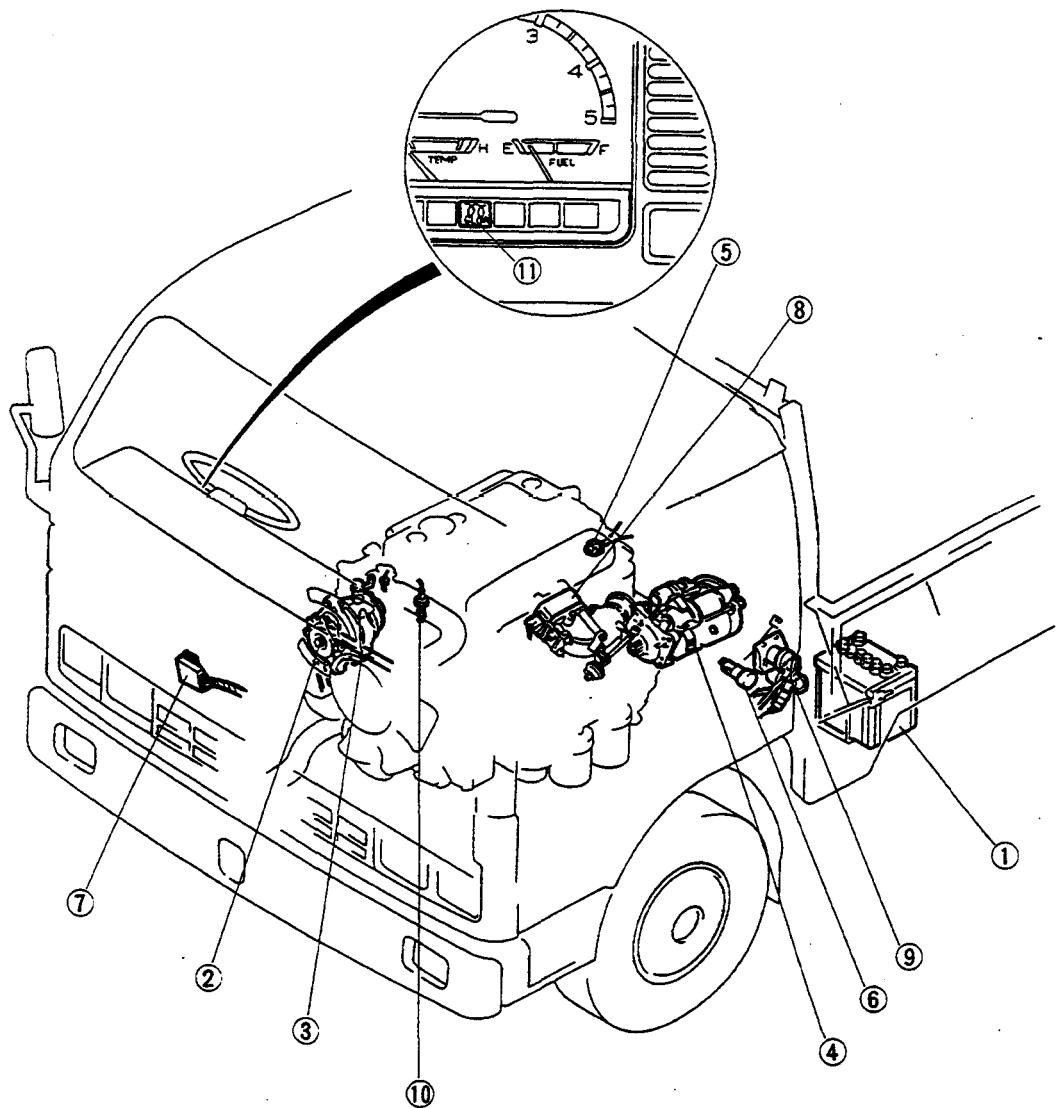
9TF0GX-001

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9TF0GX-002

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| 10. Water thermosensor | 10. Water thermosensor |
| Inspection..... | Inspection..... |
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SL, TF ENGINES



9TF0GX-003

- | | |
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| | Inspection..... |
| | 11. Glow indicator lamp |
| | Inspection..... |

G

TROUBLESHOOTING

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 <ul style="list-style-type: none"> Faulty contact of battery terminal Faulty grounding of negative cable Voltage drop caused by discharging Insufficient voltage caused by faulty battery Engine switch <ul style="list-style-type: none"> Faulty contact on engine switch Loose engine switch wiring and connectors Broken wire between engine switch and magnetic switch Magnetic switch and related parts <ul style="list-style-type: none"> Loose wiring and connectors Broken wire of magnetic switch pull-in coil Faulty contact of magnetic switch contact plate Broken wire of magnetic switch holding coil Starting motor and related parts <ul style="list-style-type: none"> Faulty contact of brushes Fatigued brush spring Faulty grounding of field coil Faulty soldering of field coil Faulty commutator Faulty grounding of armature Wear on parts 	Clean and tighten Clean and repair Charge Replace Replace Repair or Replace Repair Replace Replace Replace Repair or replace Replace Replace Repair Repair or replace Replace Replace
Starting motor turns, but the engine does not start	Insufficient battery capacity Air heater system and related parts (in cold) <ul style="list-style-type: none"> Faulty air heater control unit Faulty air heater relay Faulty air heater Faulty water thermosensor Broken or grounded of harness in air heater system and related parts Quick start system and related parts <ul style="list-style-type: none"> Faulty QSS control unit Faulty glow plug relay Faulty glow plug Faulty water thermosensor Broken or grounded of harness in QSS and related parts 	Charge Replace Replace Replace Replace Replace or replace Replace Replace Replace Replace Repair or replace
Starting motor turns, but pinion gear does not mesh with ring gear	<ul style="list-style-type: none"> Tip of overrunning clutch pinion is worn Raced overrunning clutch drive spring Raced overrunning clutch Faulty sliding surface of spline Worn bushing Worn ring gear 	Replace Replace Replace Repair or replace Replace Replace
Starting motor turns continuously and does not stop	<ul style="list-style-type: none"> Sticking contact plate of magnetic switch Layer short of magnetic switch coil Engine (ignition) switch does not return properly 	Replace Replace Replace
Battery discharge	<ul style="list-style-type: none"> Loose drive belt Grounded or broken stator coil Faulty contact between brush and slip ring Faulty rectifier Faulty IC regulator Insufficient or unsuitable battery electrolyte Faulty battery electrode (internal short circuit) Faulty contact of battery terminal Excessive electric load 	Adjust Replace Clean and replace Replace Replace Adjust Replace Clean and tighten Check power consumption
Overcharged battery	<ul style="list-style-type: none"> Faulty IC regulator 	Replace

9TG0G1-004

CHARGING SYSTEM

CHARGING SYSTEM

BATTERY

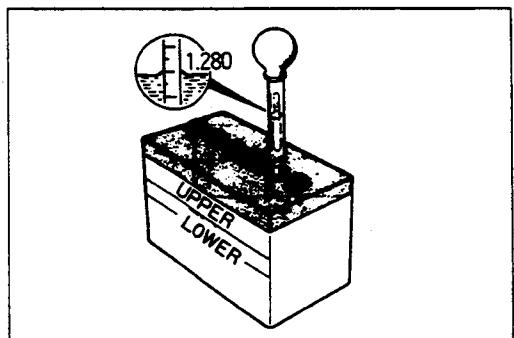
Inspection

Terminal and Cable

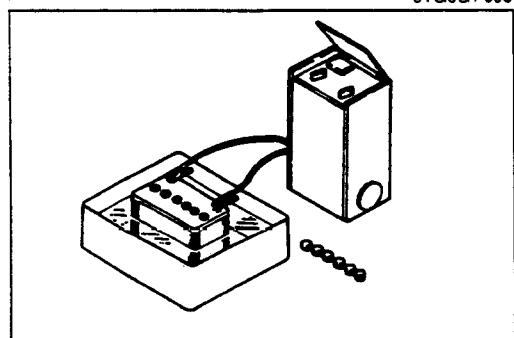
1. Check the tightness of the terminals to ensure good electrical connections. Clean the terminals and coat them with grease after tightening the terminal.
2. Inspect for corroded or frayed battery cables.
3. Check the rubber protector on the positive terminal for proper coverage.

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 electrolyte 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 tire away from the battery.
- When charging on vehicle, disconnect the battery cable.

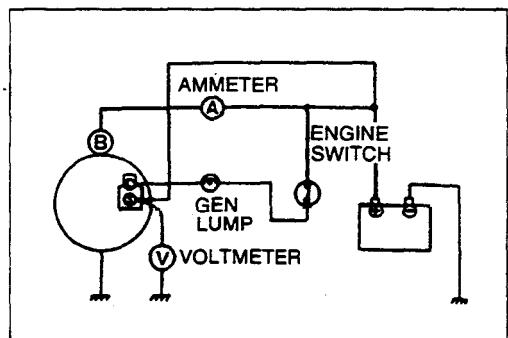
9TG0G1-008

ALTERNATOR

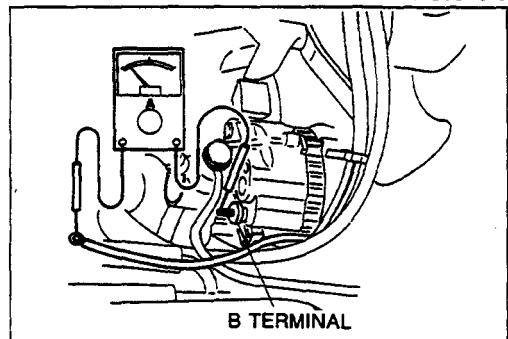
Caution

- 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

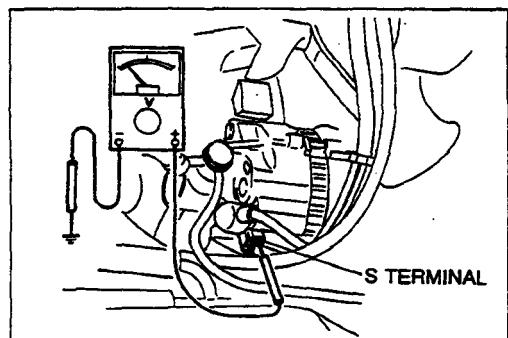
Inspection (On-vehicle)**Checking no-load adjustment voltage**

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.

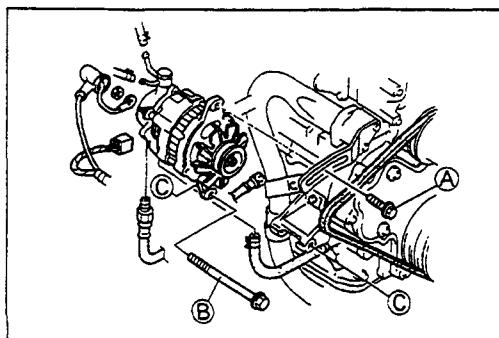
Ammeter: 5A or less**Voltmeter (adjustment voltage):** **$14.4 \pm 0.3V$ (at 20°C (68°F))**

9TG0G1-013

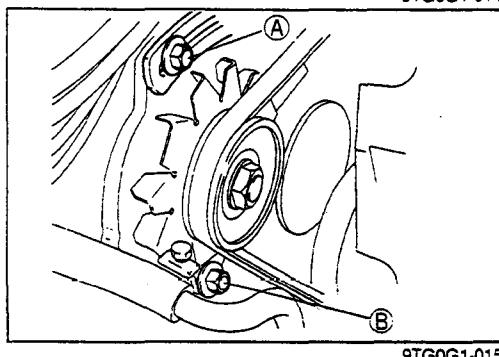
CHECKING OUTPUT

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.

CHARGING SYSTEM



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 A.
4. Remove the drive belt.
5. Disconnect the vacuum hose and oil hose.
6. Remove the bolt B.
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 A and bolt B.

Tightening torque:

Bolt A

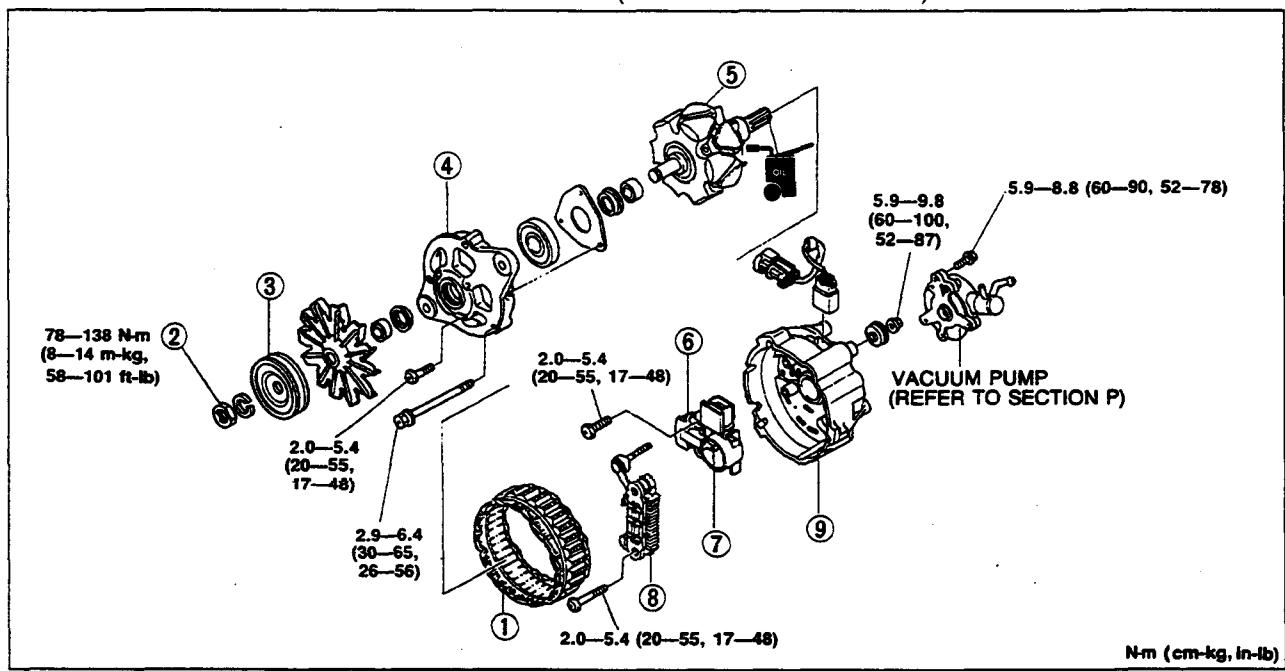
19—25 N·m (1.9—2.6 m·kg, 14—19 ft-lb)

Bolt B

37—52 N·m (3.8—5.3 m·kg, 27—38 ft-lb)

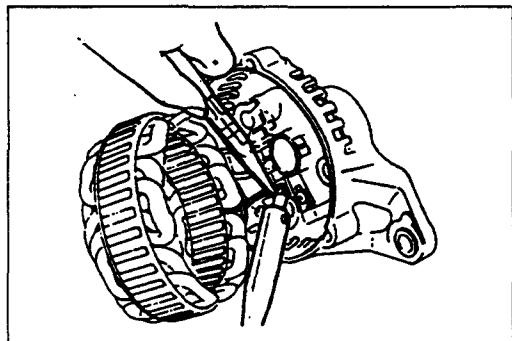
Disassembly / Assembly

1. Disassemble in the numbered order shown in the figure. (Refer to disassemble Note.)
2. Assemble in the reverse order of disassembly. (Refer to assemble Note.)

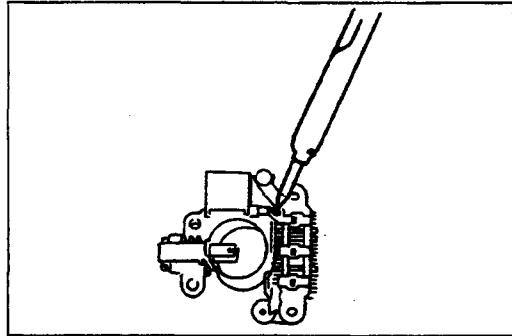


9TF0GX-004

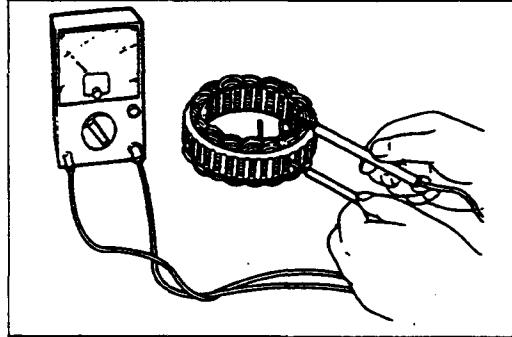
1. Stator
Inspection..... page G- 8
2. Nut set
3. Pulley
4. Front bracket
5. Rotor
Inspection..... page G- 8
6. Regulator
Disassemble Note page G- 8
Assemble Note page G- 8
7. Brushes
Inspection..... page G- 9
8. Rectifier
Inspection..... page G- 9
9. Rear bracket



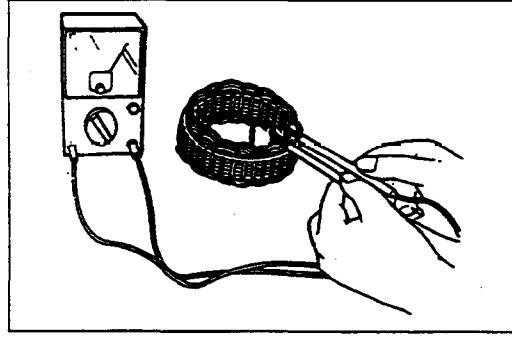
9TG0G1-017



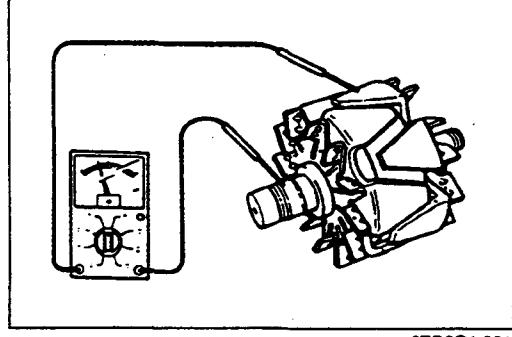
9TG0G1-018



9TG0G1-019



9TG0G1-020



9TG0G1-021

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.

Brush Holder and IC Regulator Assembly

1. Use a soldering iron to disconnect the brush holder and IC regulator assembly from the rectifier.

Inspection

Inspect the following parts, and repair or replace if a problem is found.

Stator

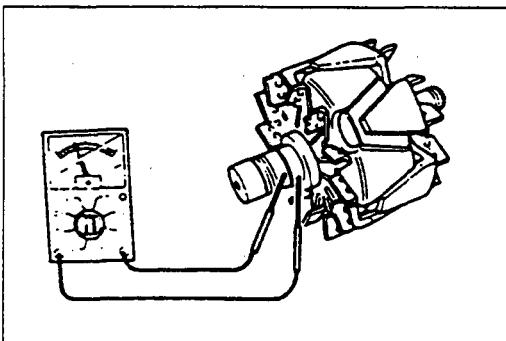
1. Use a circuit tester to check for continuity between the core and each lead wire.
No-continuity is the normal condition.

2. Use a circuit tester to check for continuity between lead wires.
Continuity is the normal condition.

Rotor

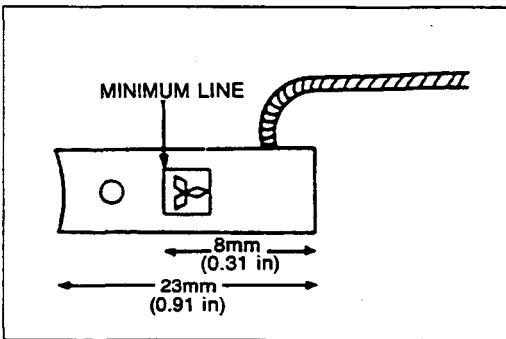
1. Use a circuit tester to check for continuity between the core and each slip ring.
No-continuity is the normal condition.

CHARGING SYSTEM



2. Use an ohmmeter to check the resistance between each slip rings.

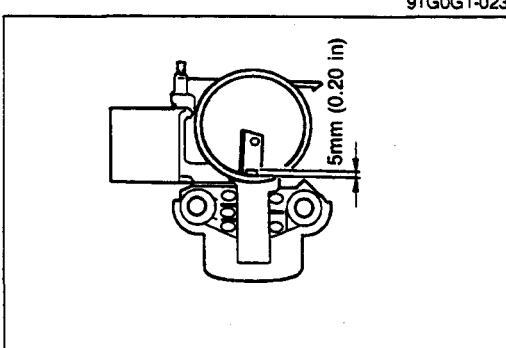
Resistance: 2.5—3.5Ω (20°C (68°F))



Brushes

1. If the brushes are worn almost to or beyond the limit, replace them.

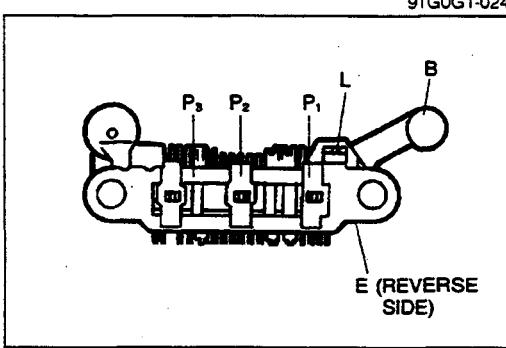
Minimum: 8mm (0.31 in)



2. When install new brush, pull lead wire to put brush into approx. 5mm (0.2 in) holder and install with soldering iron.

Caution

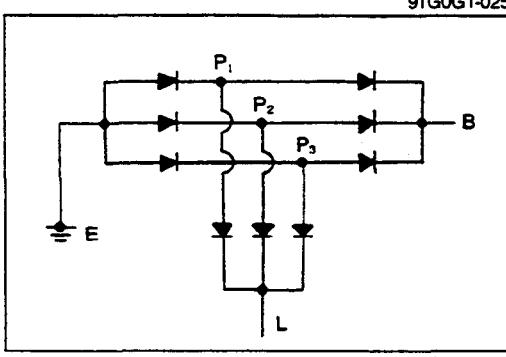
- Replace both brushes in the same time.



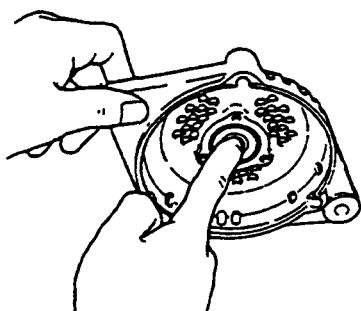
Rectifier

1. Check for continuity of the diodes by using an ohmmeter.

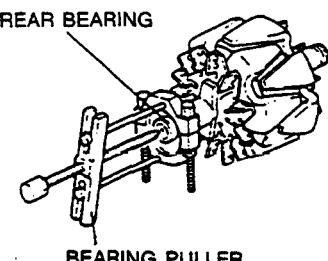
Negative terminal	Positive terminal	Continuity
E	P1, P2, P3	Yes
B		No
L		No
P1, P2, P3	E	No
	B	Yes
	L	Yes



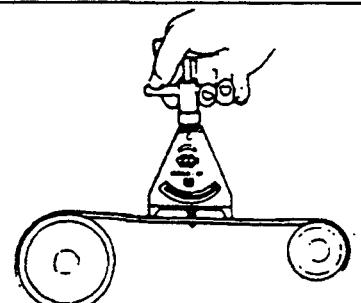
2. Replace the rectifier.



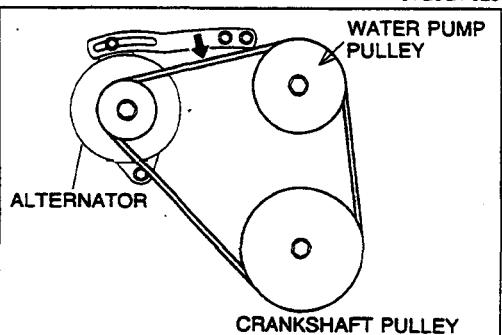
9TG0G1-027



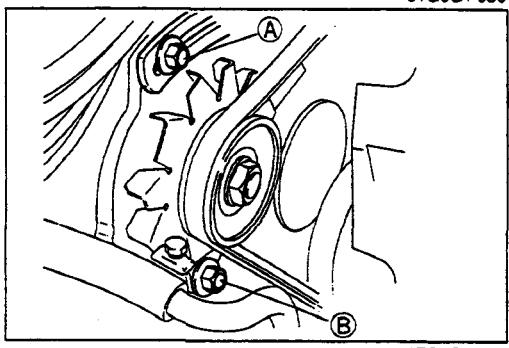
9TG0G1-028



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

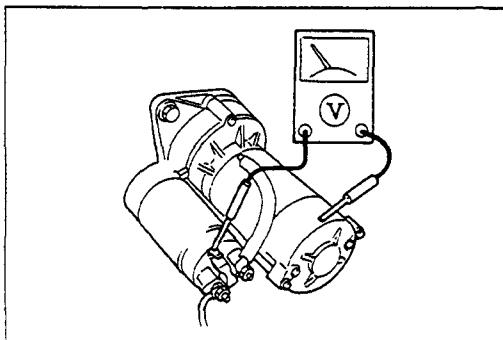
- Used one:** 10–11mm (0.39–0.43 in)
14–16mm (0.55–0.63 in) (SL 4WD)
11–12mm (0.43–0.49 in) (TF engine)
- New One:** 9–10mm (0.35–0.39 in)
12–14mm (0.47–0.55 in) (SL 4WD)
10–11mm (0.39–0.43 in) (TF engine)

Adjustment

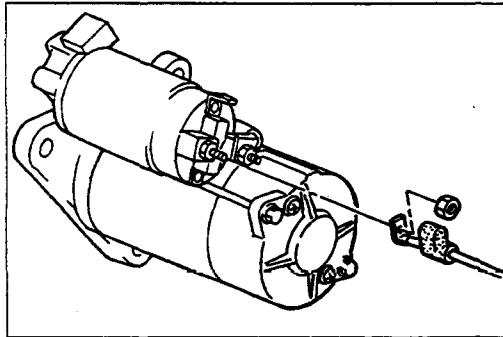
1. Loosen bolts A and B.
2. Move the alternator in or out to adjust the belt deflection.
(Refer to inspection part.)
3. Tighten bolts A and B to the specified torque.

Torque: **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)

STARTER



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

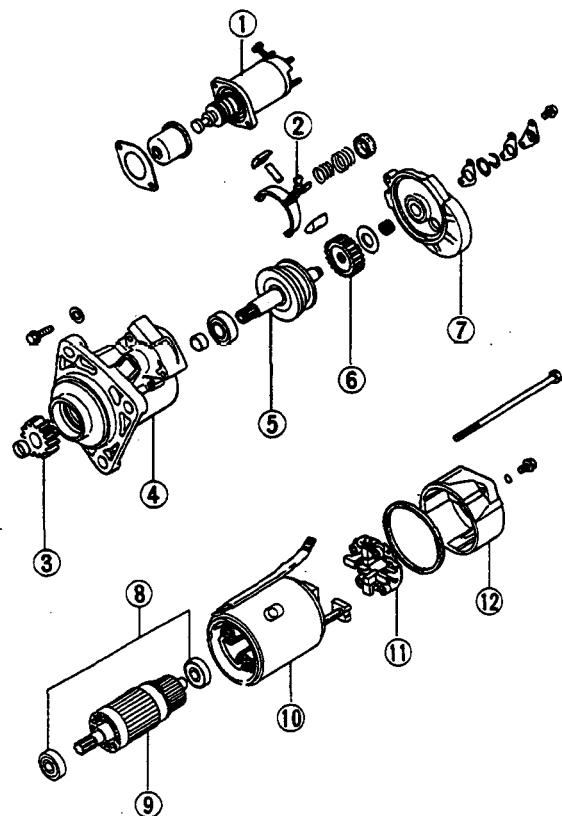
1. Disconnect the negative battery cable.
2. Disconnect the wiring from the starter.
3. Remove the starter bolts.
4. Draw out the starter from lower side of the vehicle.
5. Install in the reverse order of removal.

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.

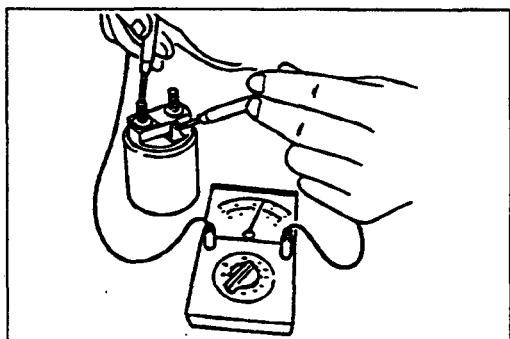


9TG0GX-005

- | | | |
|--|---|--|
| 1. Magnetic switch
Inspection page G-12 | 7. Center bracket | 11. Brushes and brush holder
Inspection page G-16
Replacing
(brush) page G-17 |
| 2. Lever | 8. Bearing | 12. Rear bracket |
| 3. Pinion gear | 9. Armature
Inspection page G-13 | |
| 4. Front bracket | 10. Yoke (field coil)
Inspection page G-16
Replacing
(brush) page G-17 | |
| 5. Overrunning clutch | | |
| 6. Driving gear | | |

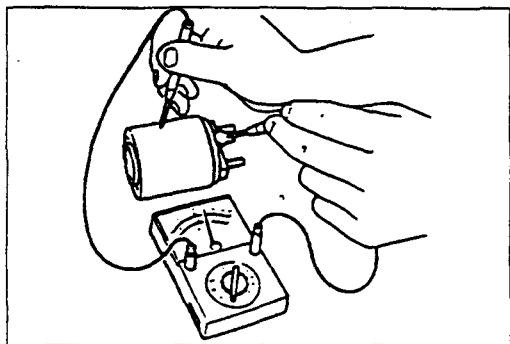
Magnetic Switch

1. Verify that there is continuity between ⑤ and ⑩ terminal by using a circuit tester.
Replace if necessary.

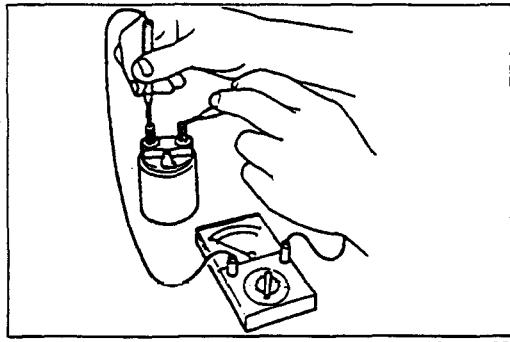


9TG0G1-035

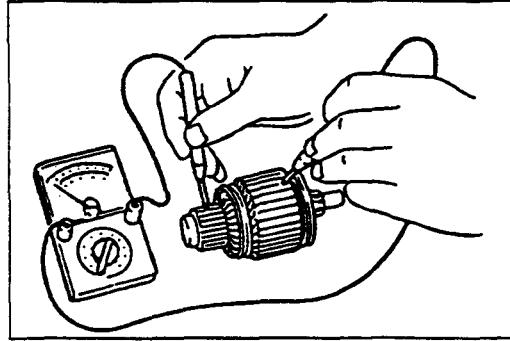
STARTER



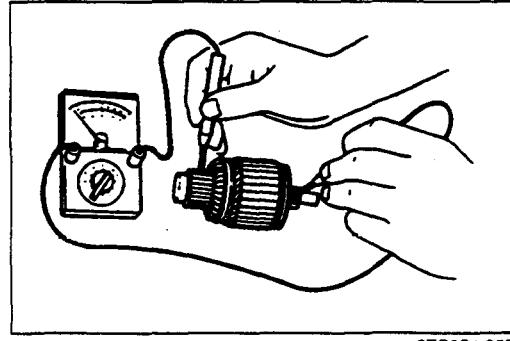
9TG0G1-036



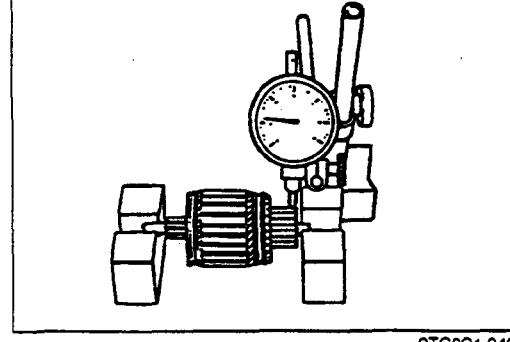
9TG0G1-037



9TG0G1-038



9TG0G1-039



9TG0G1-040

2. Check for continuity between the **S** terminal and the body with a circuit tester.
Replace the magnetic switch if there is no continuity.

3. Check for continuity between the **M** and **B** terminal. Replace the magnetic switch if there is continuity.

Armature

1. Ground of armature coil

Check for continuity between the commutator and the core with a circuit tester. Replace the armature if there is continuity.

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.

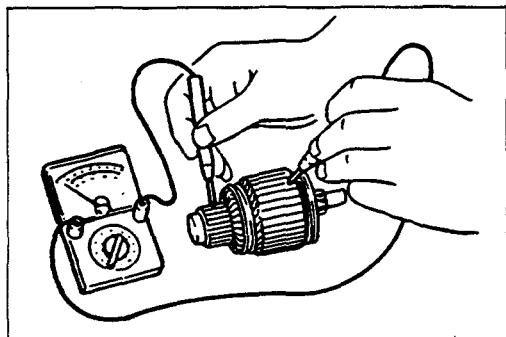
3. Vibration of the commutator

- (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.

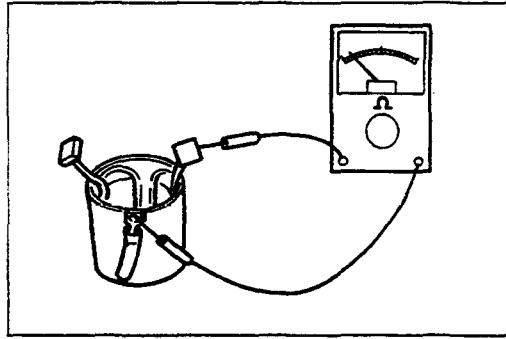
Standard vibration	mm (in)	0.05 (0.002)
Limit	mm (in)	0.1 (0.004)

Note

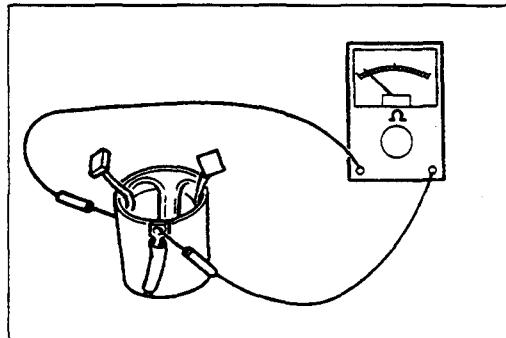
- Before checking, be sure that there is no play in the bearings.

STARTER

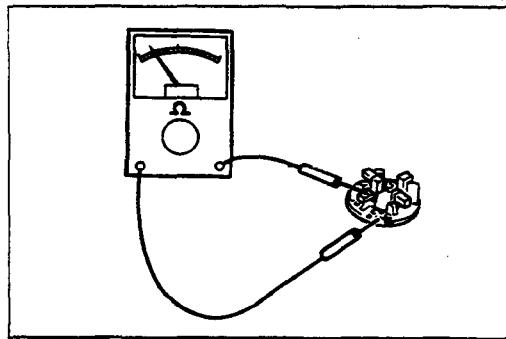
9TG0G1-041



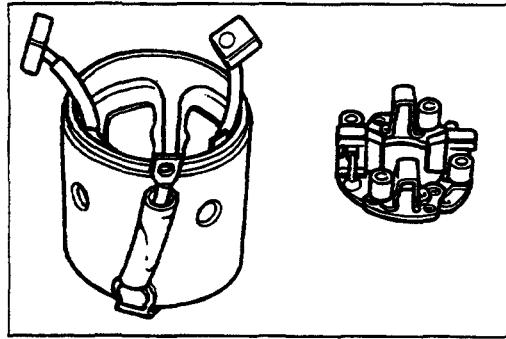
9TG0G1-042



9TG0G1-043



9TG0G1-044



9TG0G1-045

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)

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.

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.

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.

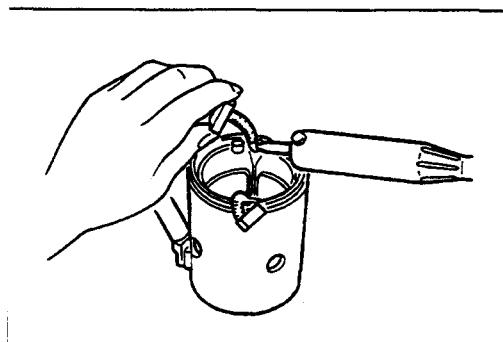
2. If the brushes are worn beyond the wear limit or if the wear is near the limit, replace the brushes.

Limit of brush: 11mm (0.43 in)

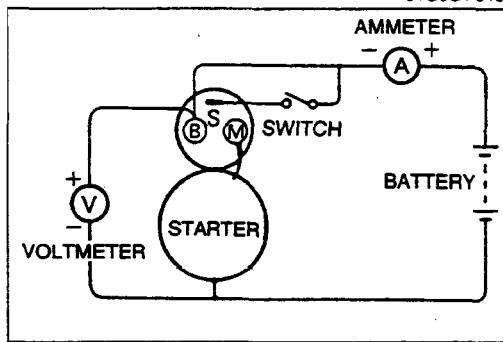
Note

- **New one: 18mm (0.71 in)**

STARTER



9TG0G1-046



9TG0G1-047

Replacing Brush

Brush holder

- When replacing the brush, replace the whole holder assembly.

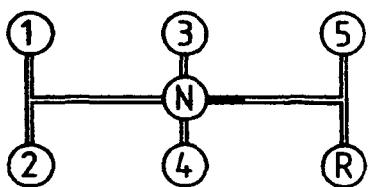
Yoke

- Cut off the root of brush wire on yoke.
- Solder a new brush around the cut part of the wire.

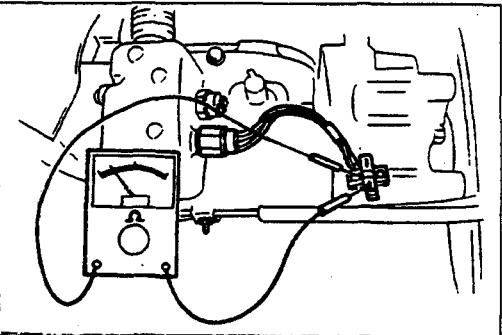
No-load Test

- Connect the starter and the battery as shown in the figure.
- If the conditions below are met when the starter is operated, the starter is functioning properly.

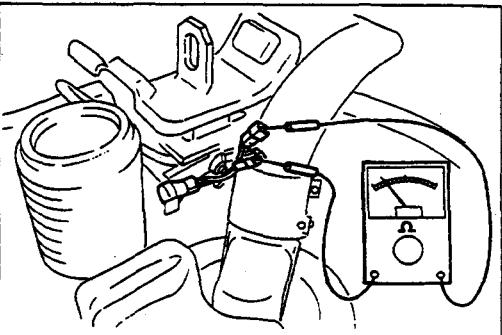
Output (kW)	2.7
Terminal voltage (V)	11
Electric current (A)	Less than 120
Rotating speed (rpm)	More than 4,000

STARTER

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

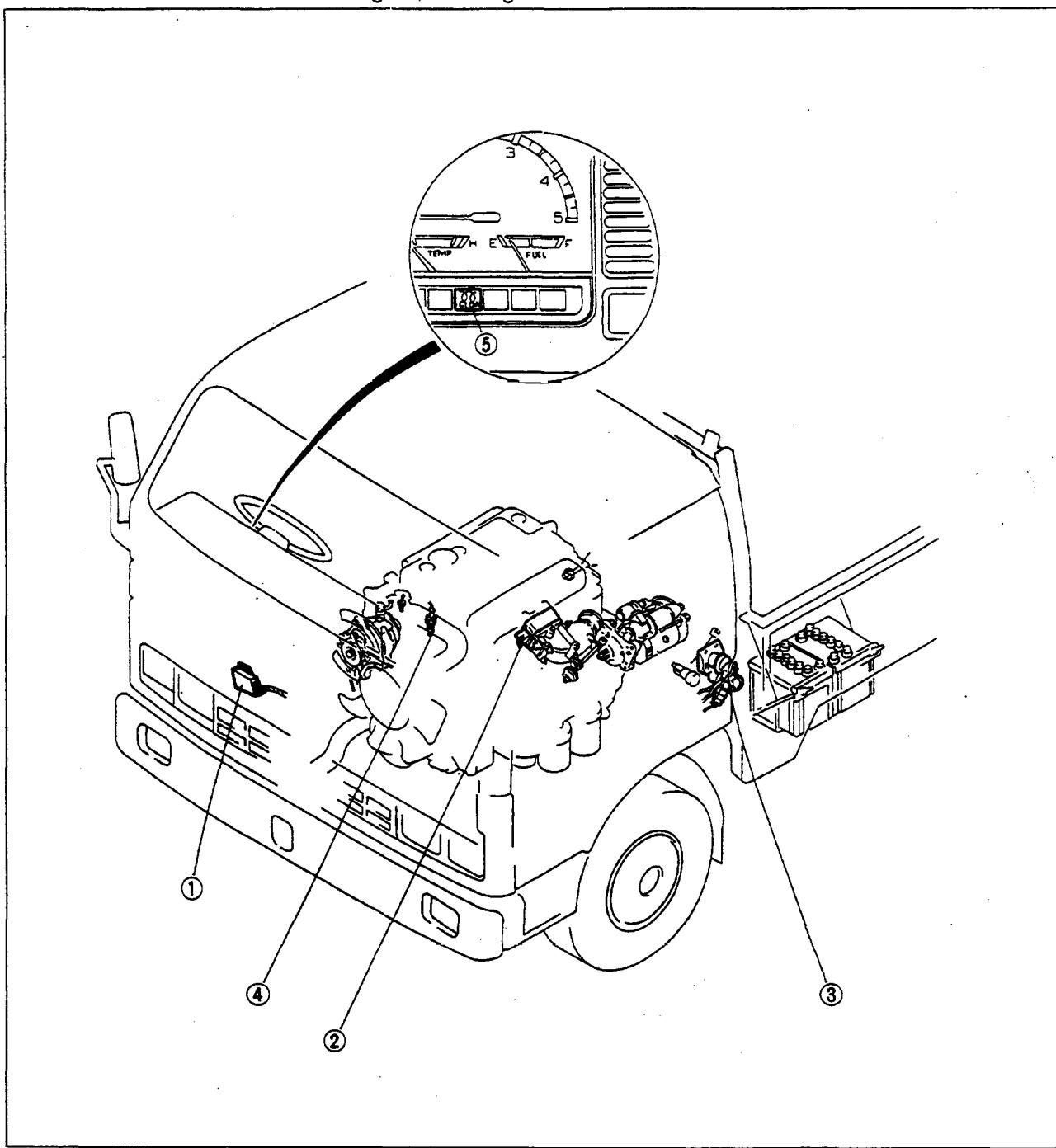
AIR HEATER SYSTEM

STRUCTURAL VIEW

Removal / Installation

1. Remove in the order shown in the figure.

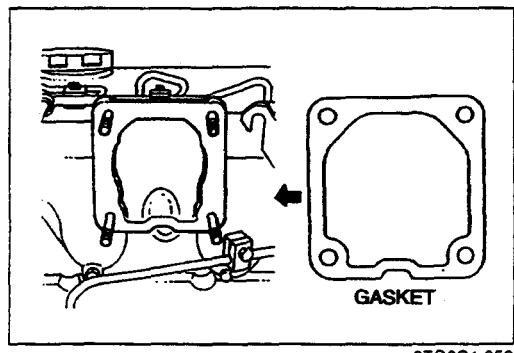
Install in the order shown in the figure, referring to **Installation Note**.



9TF0GX-006

- | | | | |
|---|-----------|--|-----------|
| 1. Air heater control unit
Inspection..... | page G-21 | 3. Air heater relay
Inspection..... | page G-22 |
| 2. Air heater
Inspection..... | page G-22 | 4. Water thermosensor
Inspection..... | page G-23 |
| Installation Note | page G-20 | 5. Glow indicator
Inspection..... | page G-23 |

AIR HEATER SYSTEM



9TG0G1-052

Installation note

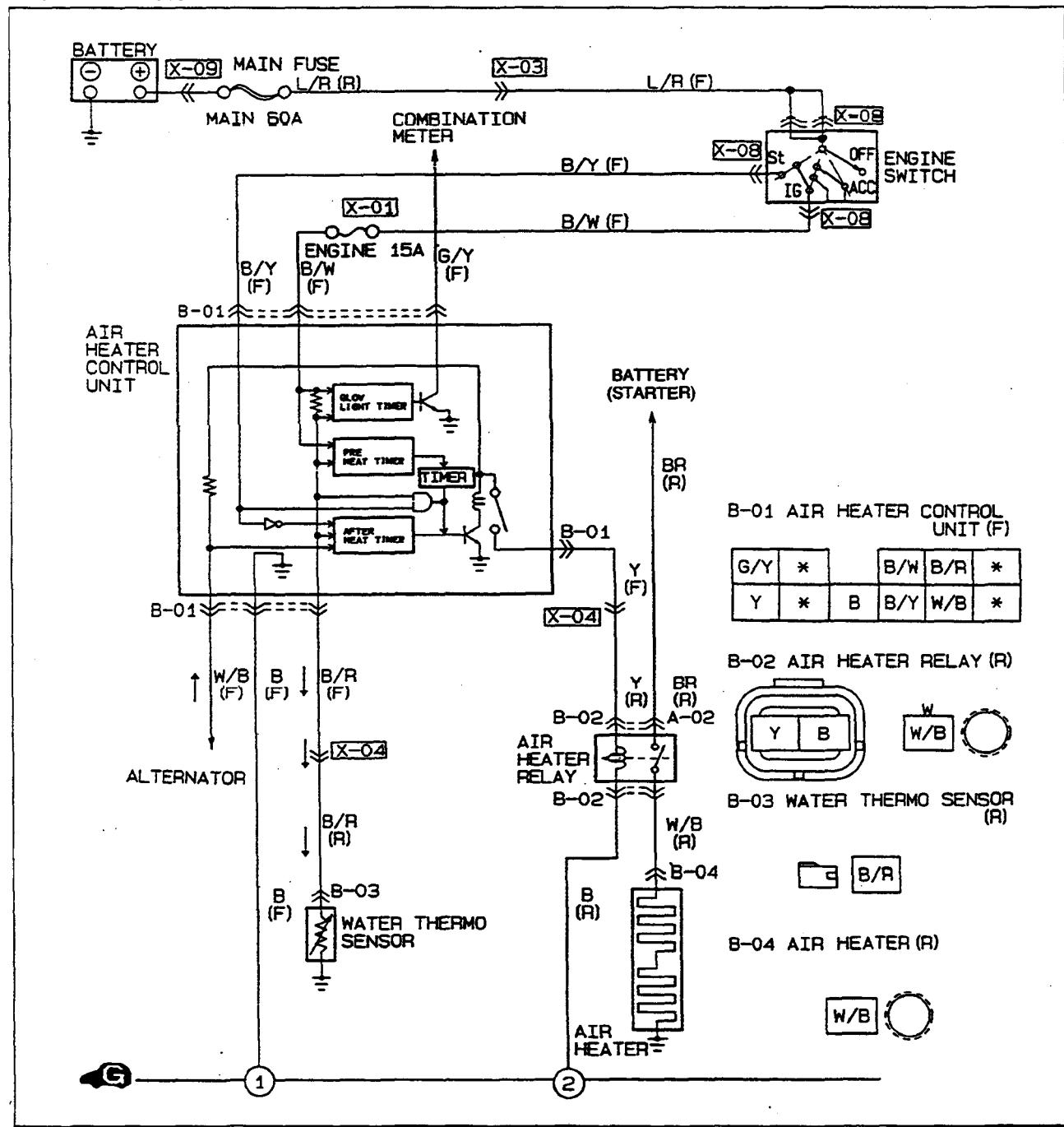
Air heater

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.

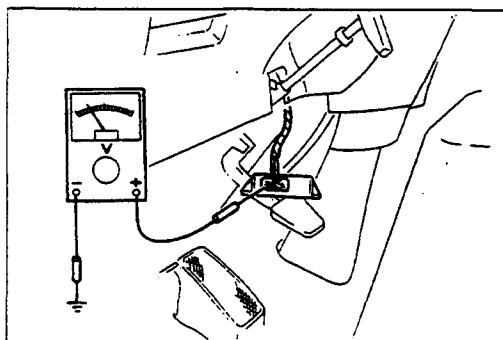
CIRCUIT DIAGRAM



9TG0G1-053

AIR HEATER SYSTEM

G

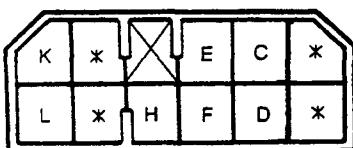


9TG0G1-054

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.



* : EMPTY

9TG0G1-055

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

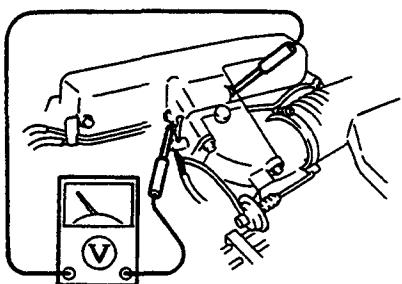
9TG0G1-056

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).

AIR HEATER SYSTEM



9TG0G1-057

AIR HEATER Inspection

1. Disconnect the air heater connector.
2. Measure the resistance between the terminals.

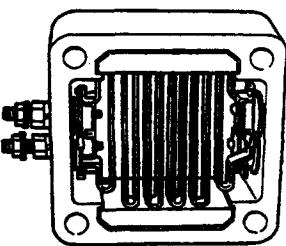
Resistance

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.



9TG0G1-058

AIR HEATER RELAY

Inspection

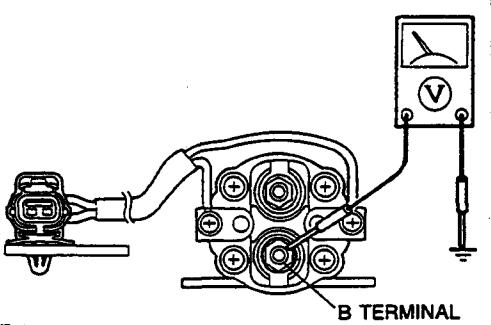
Voltage inspection

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 (600 Ω) 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 approx.12V for 7 seconds after engine switch is ON.

5. If not as specified, be sure the voltage of the relay C terminal is approx.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.



9TG0G1-059

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 (600 Ω) to the wiring harness.
3. Check the voltage of the relay B terminal with circuit tester.

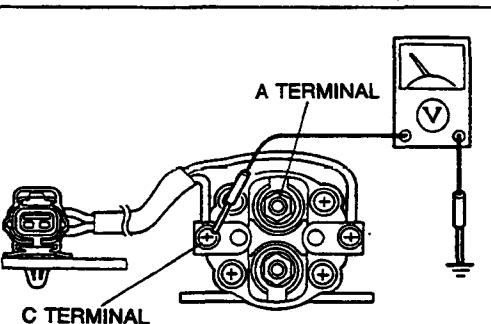
Standard voltage: Approx. 12V

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

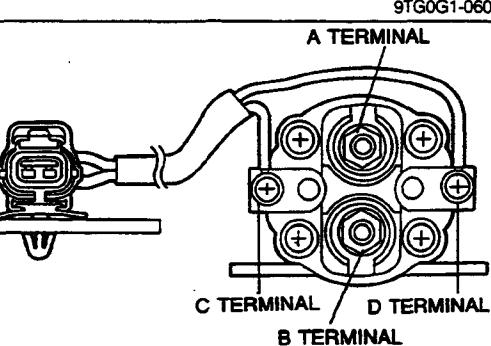
1. Disconnect the negative battery terminal.
2. Remove the air heater relay.
3. Verify that there is continuity between the C (wiring color is white) and D (wiring color is black) terminal.
4. Verify that there is continuity between A and B terminal, when apply the battery voltage between C and D terminal.
5. If not as specified, replace the relay.



9TG0G1-060

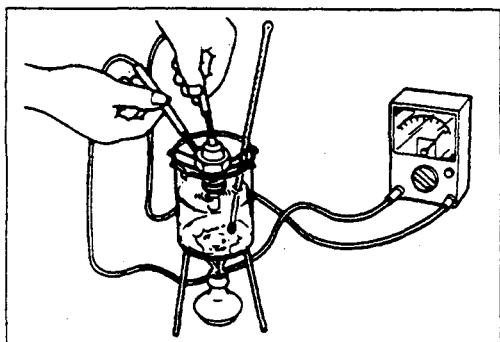
Resistance inspection

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 between C and D terminal.
5. If not as specified, replace the relay.



9TG0G1-061

AIR HEATER SYSTEM



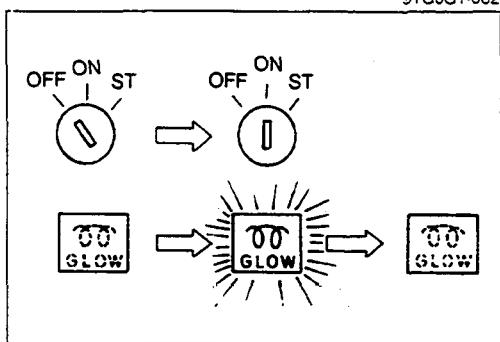
9TG0G1-062

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



9TG0G1-063

GLOW INDICATOR LAMP Inspection

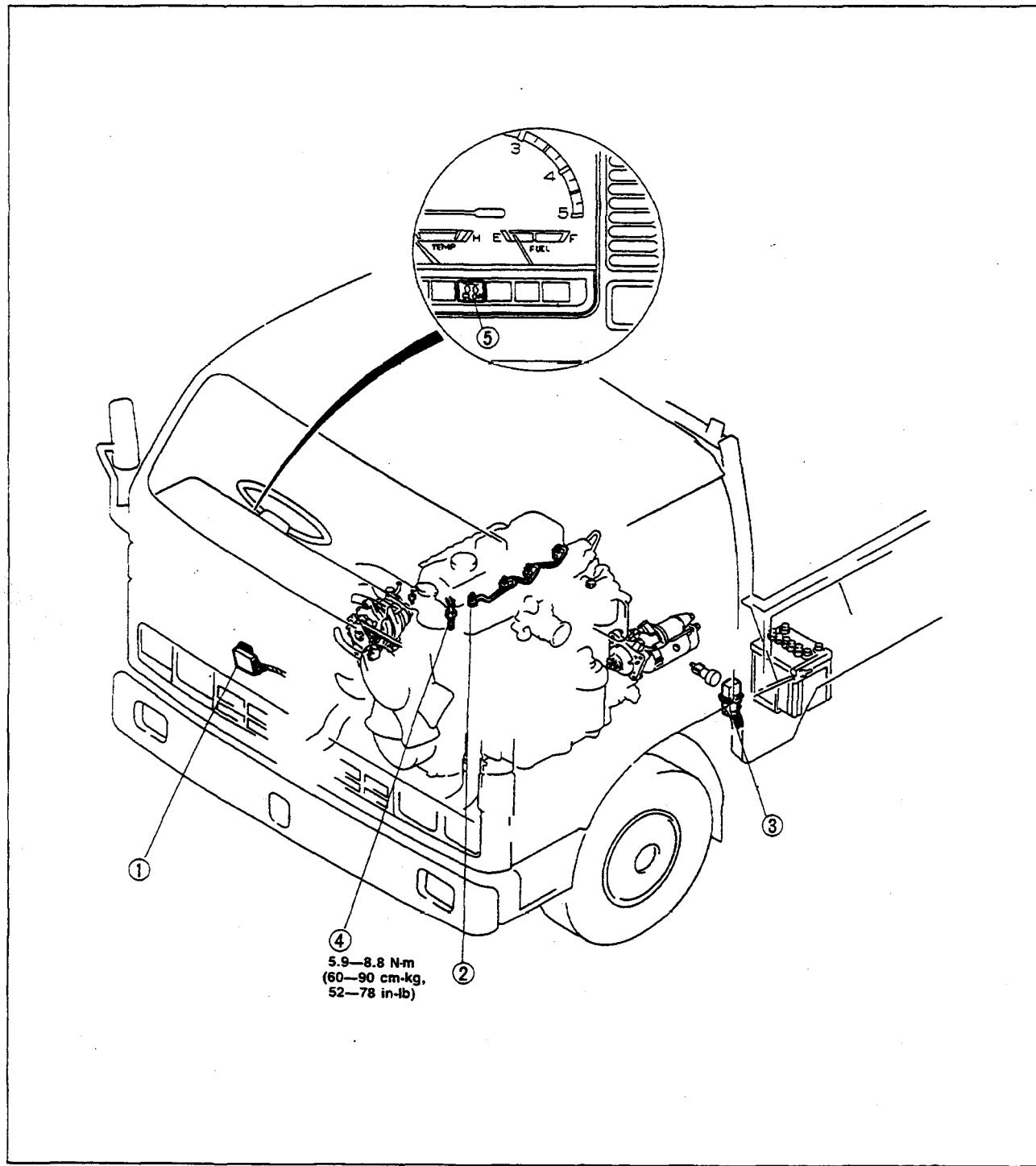
1. Turn the engine switch ON and verify that the GLOW indicator flashes for a few seconds.

G

QUICK START SYSTEM (QSS)

QUICK START SYSTEM (QSS)

STRUCTURAL VIEW Removal / Installation



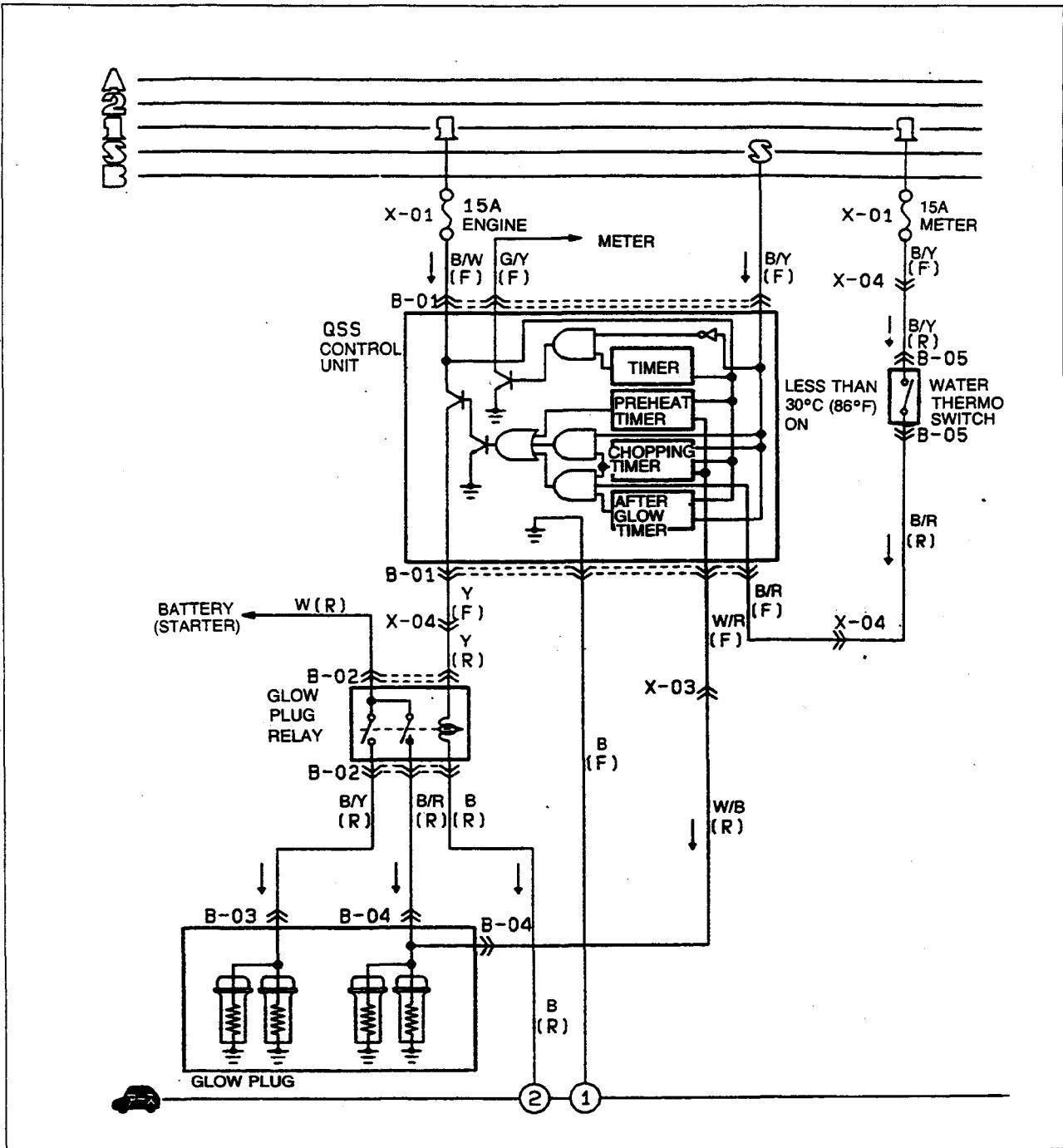
9TF0GX-007

- | | |
|---|-----------|
| 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 |

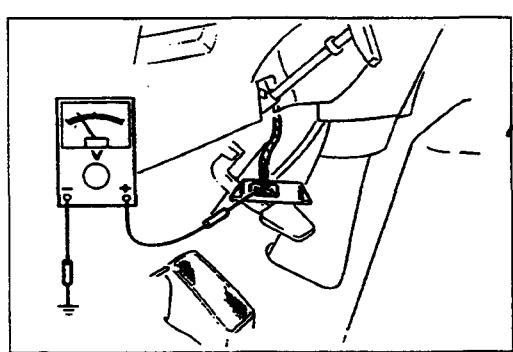
QUICK START SYSTEM (QSS)

G

CIRCUIT DIAGRAM



9TG0G1-065

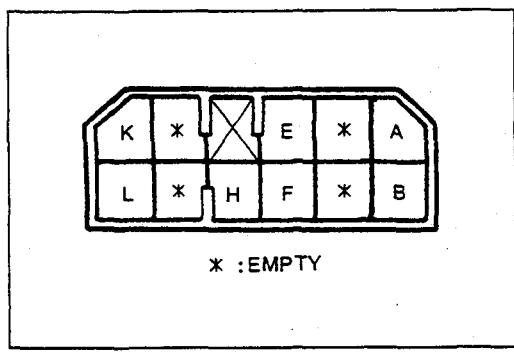


9TG0G1-066

QSS CONTROL UNIT Inspection

1. Remove the QSS control unit.
2. Measure the voltage at each terminal of the control unit.

QUICK START SYSTEM (QSS)



9TG0G1-067

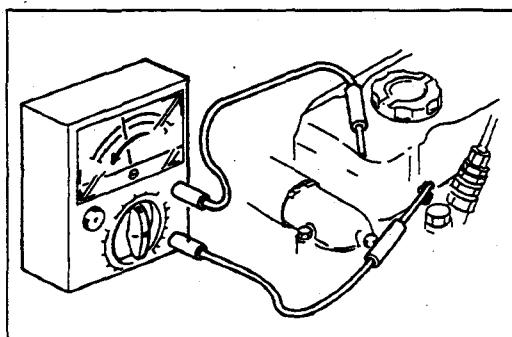
3. If there is a problem, check and repair or replace the device connected to the terminal. If there is no problem on the devices replace the control unit.

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

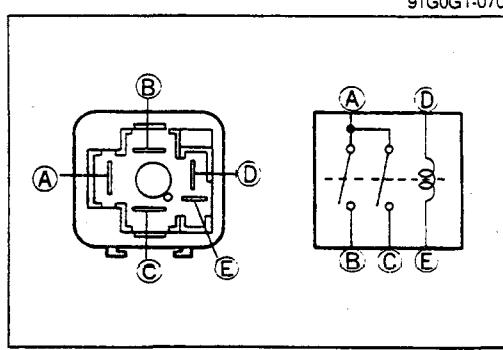
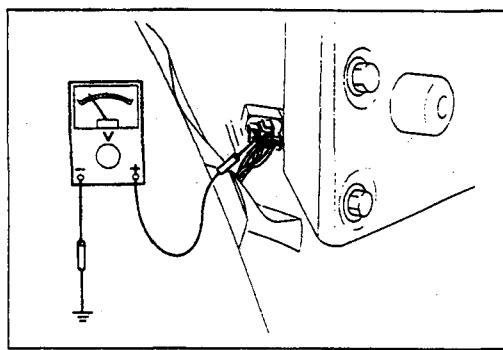
GLOW PLUG Inspection

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.

QUICK START SYSTEM (QSS)



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
C		More than approx. 6 sec. after engine switch ON 0
D	Cranking	Approx. 12↔0
E	For approx. 15 sec. after cranking when the coolant temperature is less than 30°C (86°F).	Approx. 12↔0
	Always	0

Note

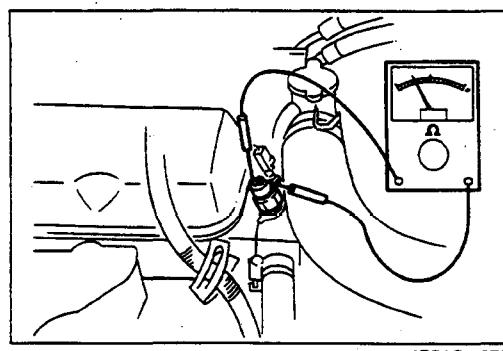
- 12↔0V: Indicates voltage fluctuates between 12V and 0V.

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 between terminals A and B, and A and C.

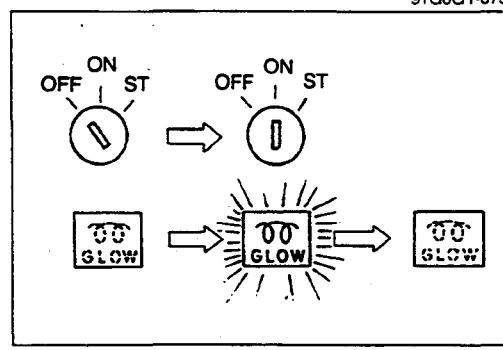


WATER THERMOSENSOR

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



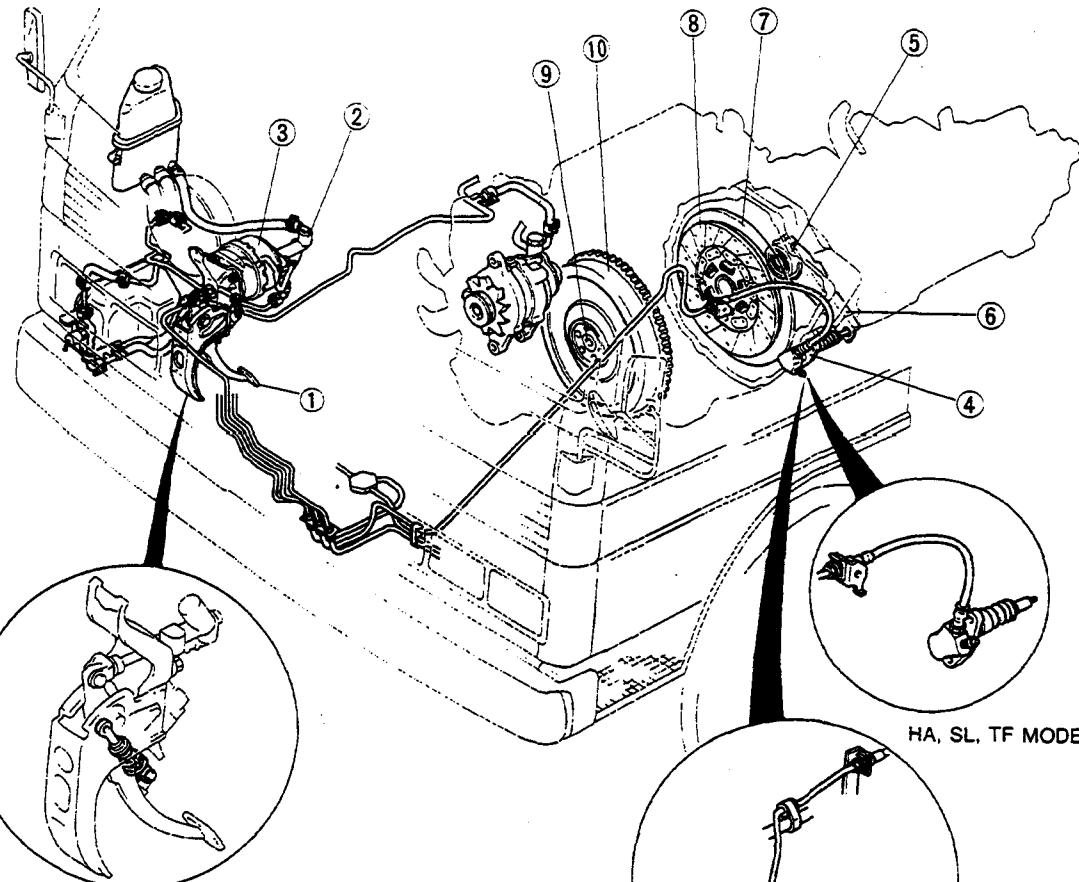
GLOW INDICATOR LAMP

Inspection

1. When the engine switch ON, verify that the GLOW indicator lamp flashes for a few seconds.

CLUTCH

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HA, SL, TF MODEL

SL TURBO MODEL

9TFOHX-001

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5. Release bearing
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6. Clutch release fork
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7. Clutch cover
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8. Clutch disc
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9. Pilot bearing
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10. Flywheel
 Removal / Installation page H-18
 Inspection page H-22

OUTLINE, TROUBLESHOOTING GUIDE

H

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)					
	Outer diameter mm (in)	260 (10.24)								
	Inner diameter mm (in)	170 (6.69)								
Clutch disc	Thickness	Type 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									

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TROUBLESHOOTING GUIDE

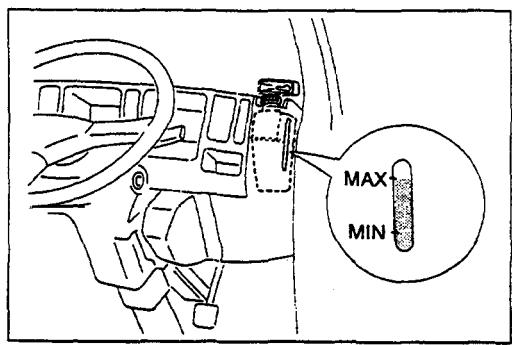
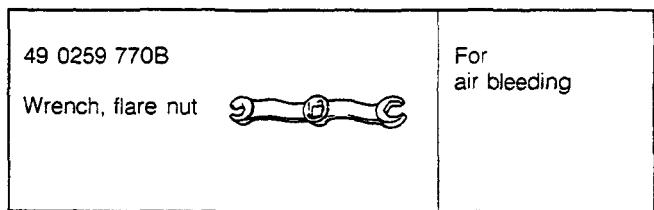
Problem	Possible Cause	Remedy	Page
Slipping	Clutch disc facing worn excessively Clutch disc facing surface hardened or oil on surface Pressure plate damaged Diaphragm spring damaged or weakened Insufficient clutch pedal play Clutch pedal sticking Flywheel damaged	Replace Repair or replace Repair or replace Replace Adjust Repair or replace Repair or replace	H-18, 21 H-18 H-18 H-18 H-18 H- 5 H- 6 H-18, 22
Faulty disengagement	Excessive runout or damaged clutch disc Clutch disc splines rusted or worn Oil on facing Diaphragm spring weakened Excessive clutch pedal play Insufficient clutch fluid Leakage of clutch fluid	Replace Remove rust or replace Repair or replace Replace Adjust Add fluid Locate and repair or replace	H-18, 21 H-18 H-18 H-18 H-18 H- 5 H- 3 —
Clutch vibrates when accelerating	Oil on facing Torsion springs weakened Clutch disc facing hardened or damaged Clutch disc facing rivets loose Pressure plate damaged or excessive runout Flywheel surface hardened or damaged Loose or worn engine mount	Repair or replace Replace Repair or replace Replace Replace Repair or replace Tighten or replace	H-18 H-18 H-18 H-18 H-18 H-18 —
Clutch pedal sticking	Pedal shaft not properly lubricated	Lubricate or replace	H- 6
Abnormal noise	Clutch release bearing damaged Poor lubrication of release bearing sleeve Torsion springs weakened Excessive crankshaft end play Pilot bearing worn or damaged Worn pivot points of release fork	Replace Lubricate or replace Replace Repair Replace Repair or replace	H-18, 21 H-18 H-18 Refer to Section B H-18, 22 H-18

9TG0HX-004

H CLUTCH FLUID

CLUTCH FLUID

PREPARATION SST



REPLACEMENT

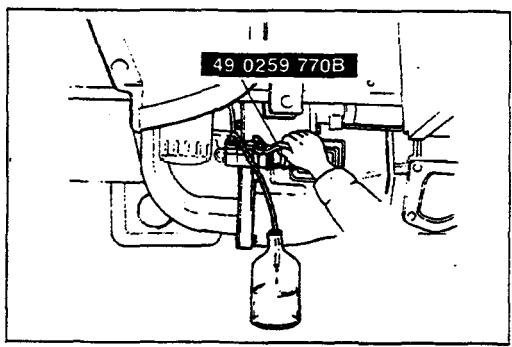
Note

- 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.



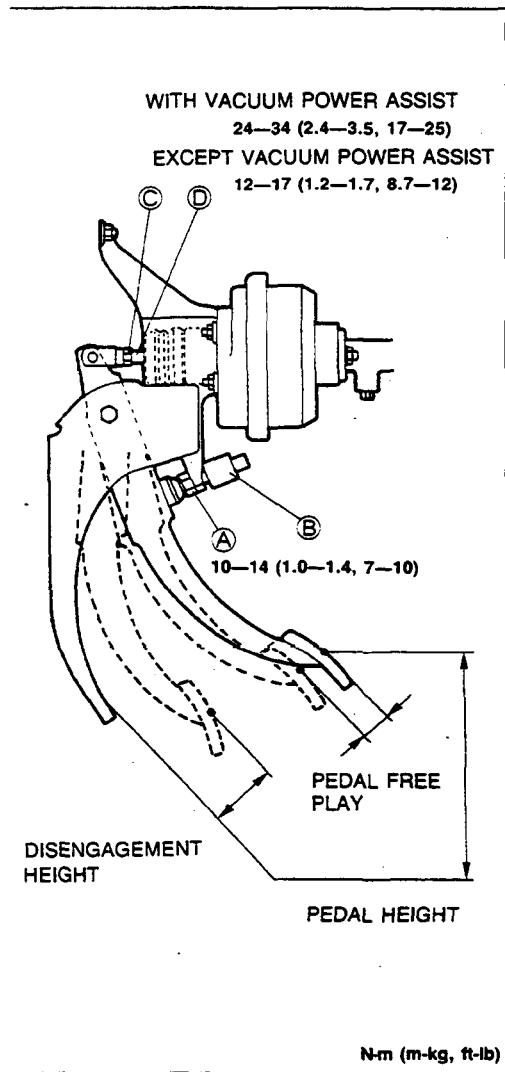
3. Place the other end of the vinyl hose in a clear container.
4. Slowly pump the clutch pedal several times.
5. With the clutch pedal depressed, loosen the bleeder screw with the SST to let the fluid escape. Close the bleeder screw with the SST.
6. Repeat Steps 4 and 5 until only clean fluid is seen.
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.

CLUTCH PEDAL



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.

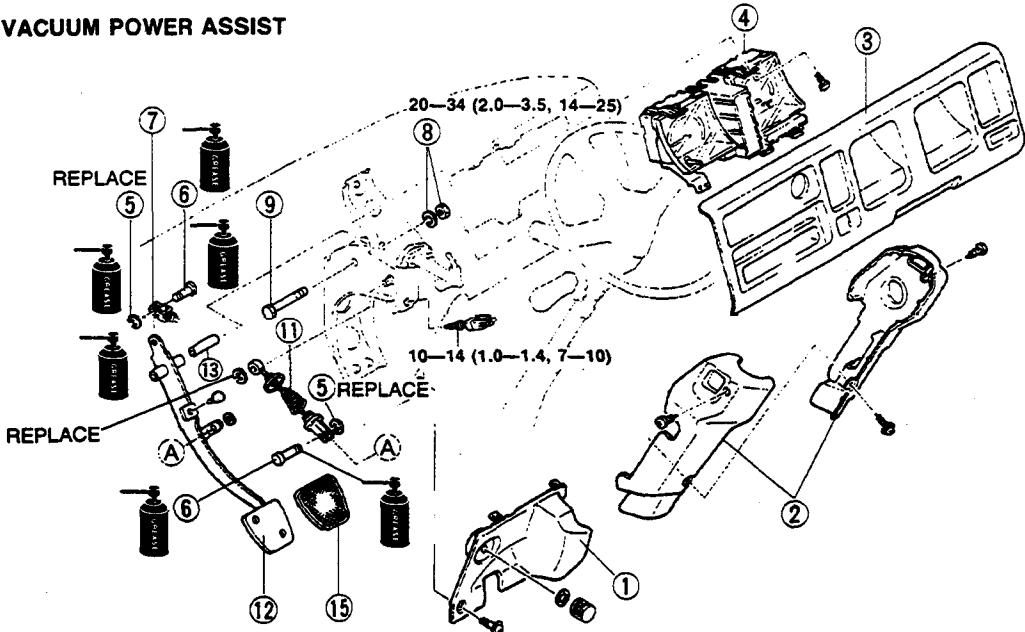
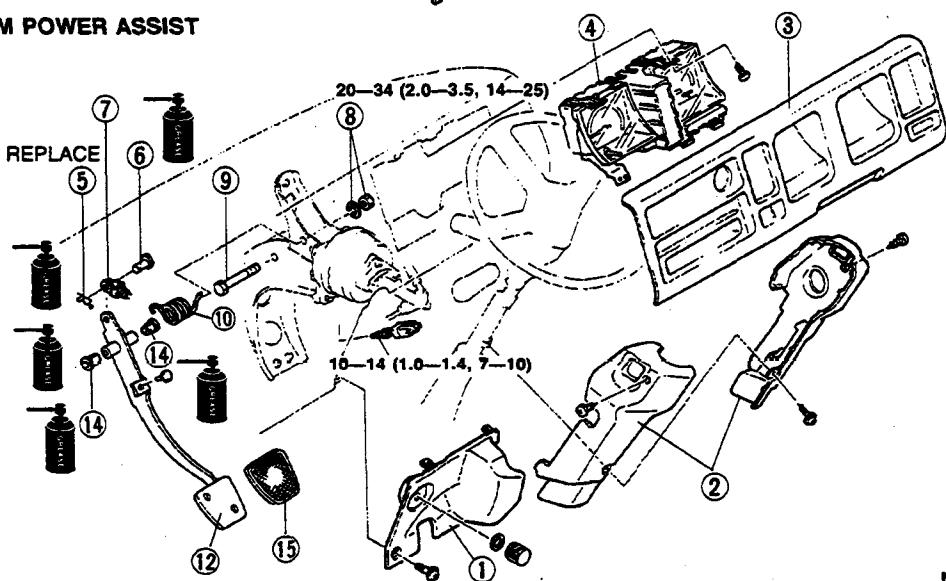
REMOVAL / INSPECTION / INSTALLATION

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**.

EXCEPT VACUUM POWER ASSIST**WITH VACUUM POWER ASSIST**

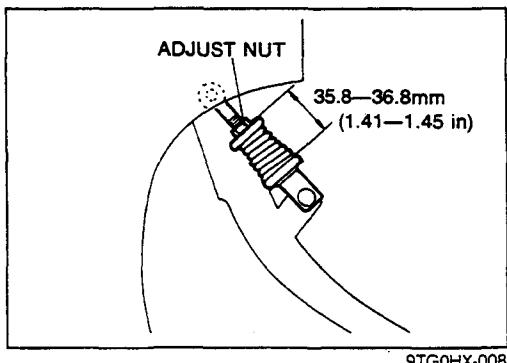
N·m (m·kg, ft-lb)

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

CLUTCH PEDAL

H



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)

H

CLUTCH MASTER CYLINDER

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
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9TG0HX-009

REMOVAL / INSPECTION / INSTALLATION

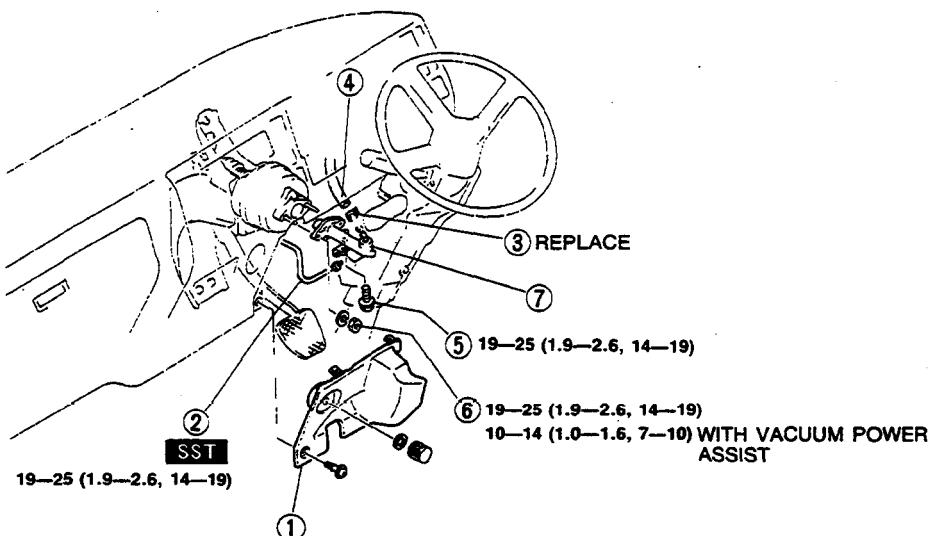
Caution

- 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**.

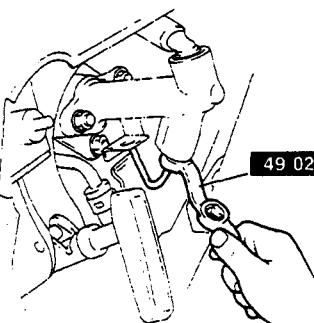


N·m (m·kg, ft·lb)

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

CLUTCH MASTER CYLINDER

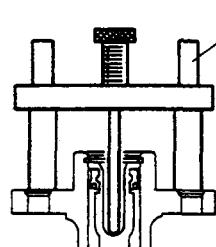


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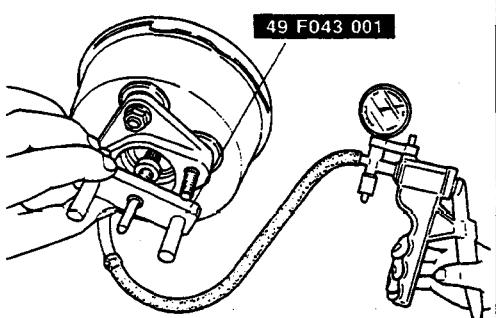
Removal Note

Clutch pipe

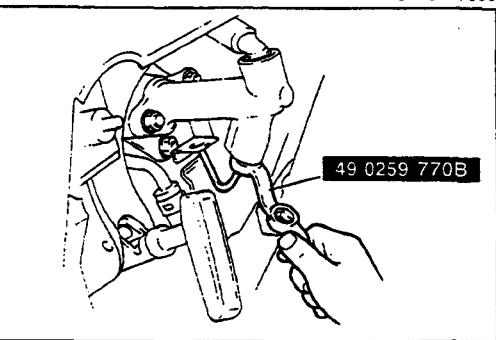
1. Disconnect the clutch pipe with the **SST**.



9TG0HX-012



9TF0HX-006



9TG0HX-014

Clutch hose

1. Disconnect the clutch hose from the master cylinder.
2. Plug the outlet of the clutch hose.

9TG0HX-011

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.

3. Apply a vacuum of 500 mmHg (19.7 inHg) to the vacuum power assist using a vacuum pump.

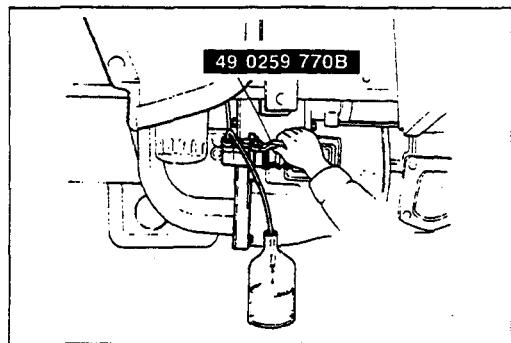
4. Turn over the **SST** and set it on the vacuum power assist.
5. Verify that the clearance between the **SST** and the push rod is 0.1—0.3mm (0.004—0.012 in). Adjust the push rod if necessary.

Clutch pipe

1. Tighten the clutch pipe with the **SST**.

Tightening torque:

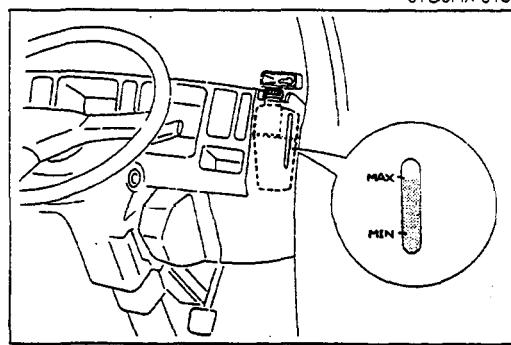
19—26 N·m (1.9—2.6 m·kg, 14—19 ft-lb)

**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**

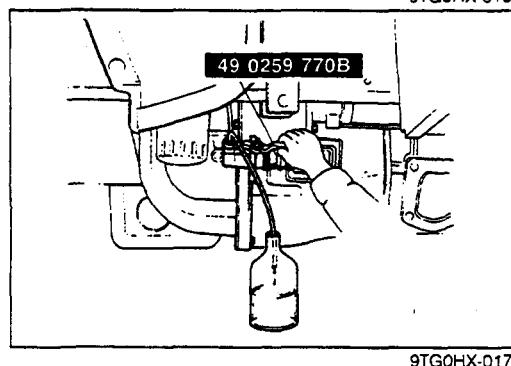
The clutch hydraulic system must be bled to remove air introduced whenever a hydraulic line is disconnected.

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.

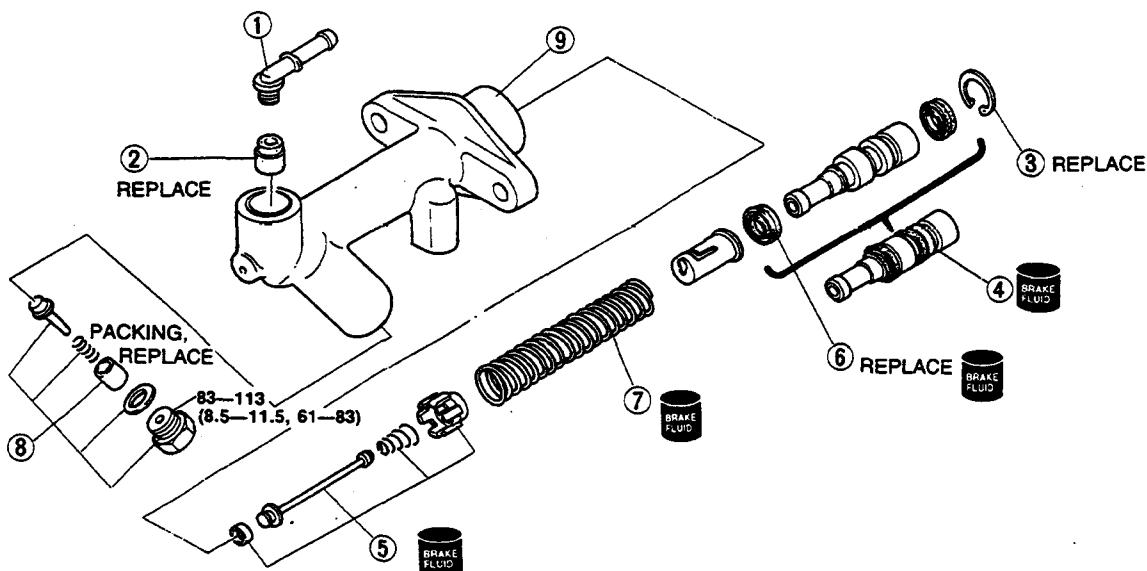
Tightening torque:

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**

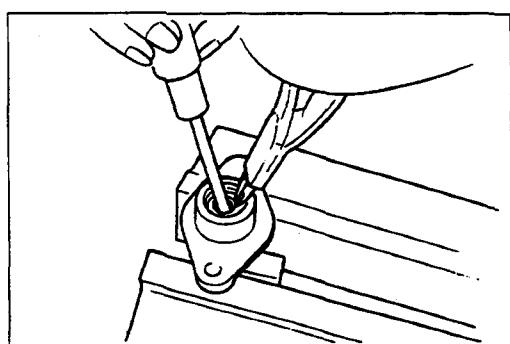
- Clean the disassembled parts in solvent and blow through all ports and passages with compressed air.
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
 2. Inspect all parts and repair or replace as necessary.
 3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



N·m (m·kg, ft·lb)

9TFOHX-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

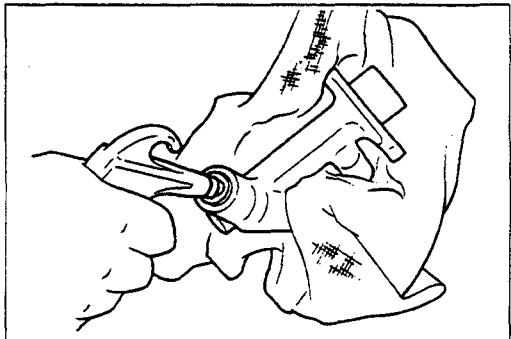


03U0HX-018

**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.

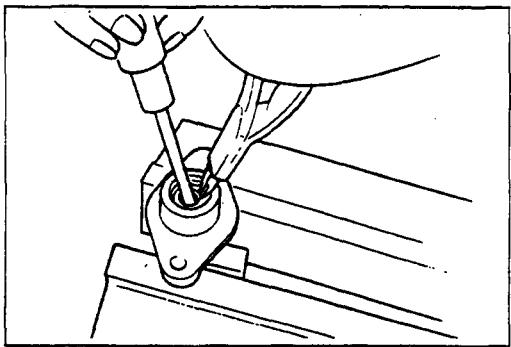
03U0HX-019

Snap ring

Caution

- Do not damage the push rod contact surface of the piston.

1. While pressing the piston, install the snap ring.

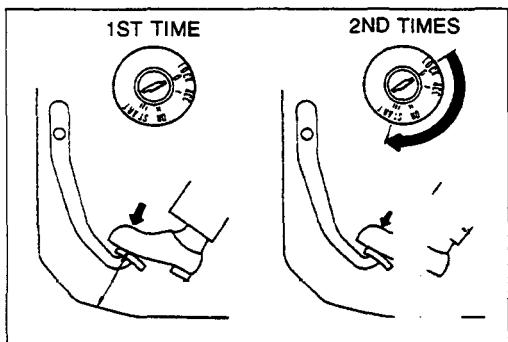


03U0HX-021

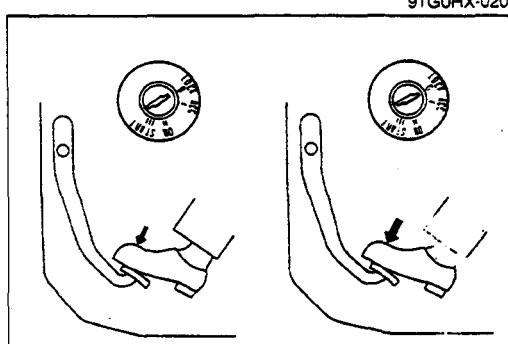
VACUUM POWER ASSIST**INSPECTION****Note**

- This inspection is performed to determine if the vacuum power assist is functioning.
- If a problem is found, replace the vacuum power assist assembly.

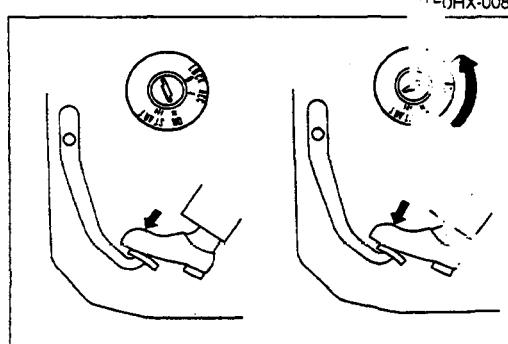
9TG0HX-019

**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.

**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.

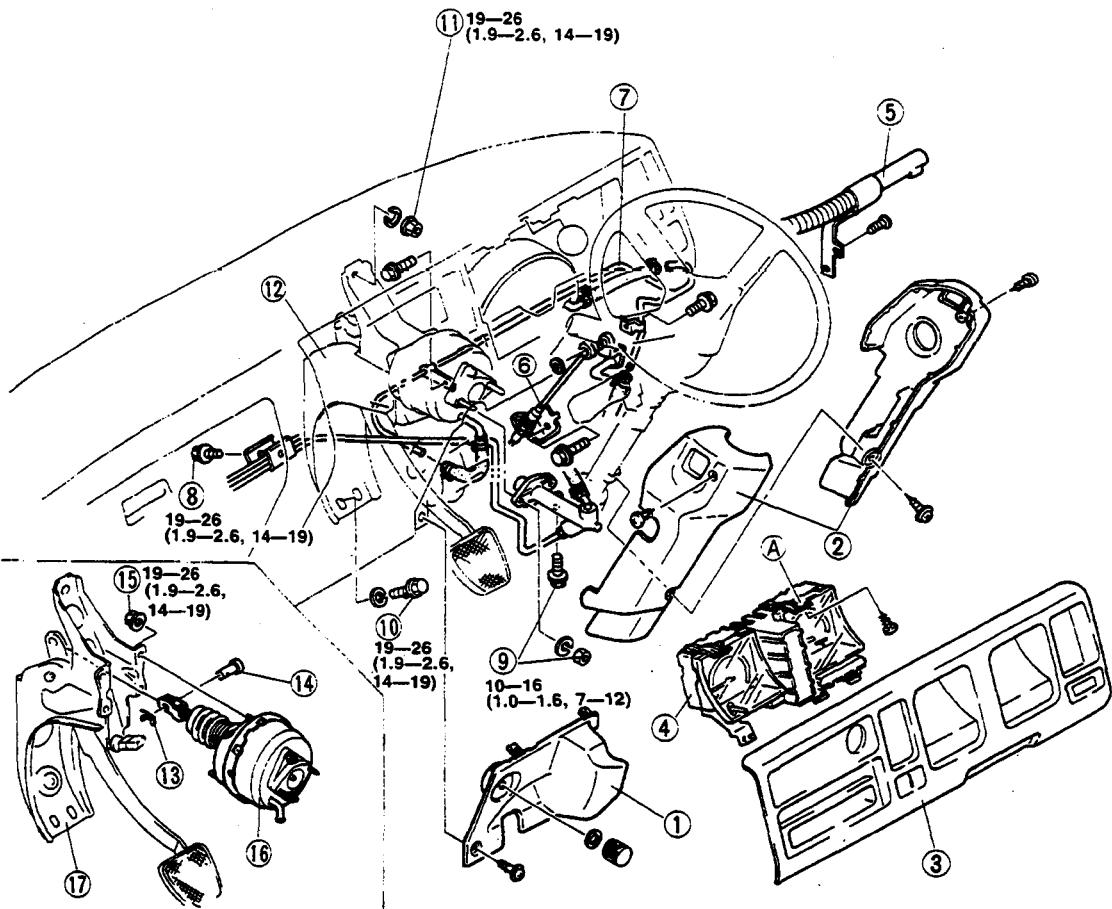
**Vacuum Loss Check (Loaded Condition)**

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.

H VACUUM POWER ASSIST

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 | 7. Vacuum pipe | 13. Retaining ring |
| 2. Column cover | 8. Bolt | 14. Pin |
| 3. Meter cover | 9. Bolt/Nut | 15. Nut |
| 4. Instrument cluster | 10. Bolt | 16. Vacuum power assist
Installation note.. page H-9 |
| 5. Duct | 11. Nut | |
| 6. Sub-select cable | 12. Vacuum power assist/
clutch pedal assembly | 17. Clutch pedal assembly |

CLUTCH RELEASE CYLINDER

CLUTCH RELEASE CYLINDER

PREPARATION SST

49 0259 770B	For disconnecting and connecting clutch pipe
Wrench, flare nut	

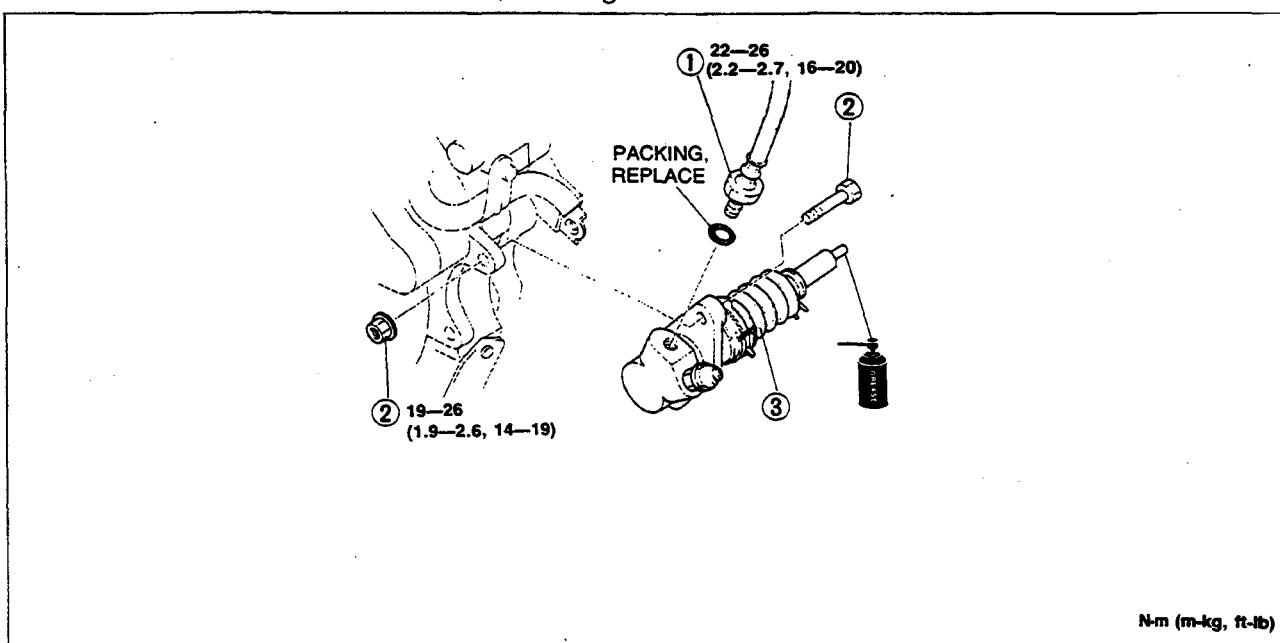
03U0HX-022

REMOVAL / INSTALLATION

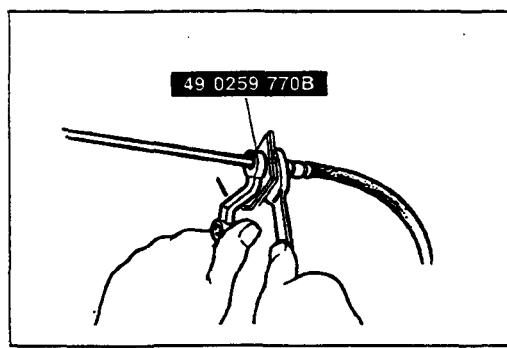
Caution

- 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**.



- | | |
|-----------------------------------|---|
| 1. Flexible hose | 3. Clutch release cylinder |
| Removal Note page H-15 | Remove boot and check for fluid leakage |
| Installation Note page H-16 | Overhaul page H-16 |
| 2. Bolt/Nut | |



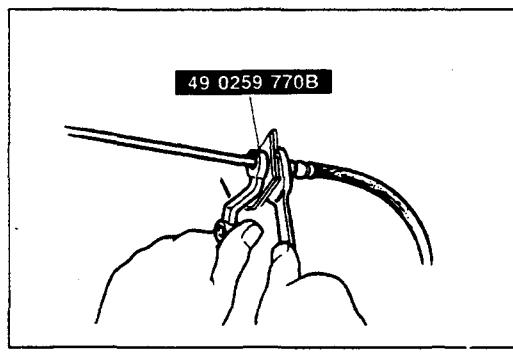
Removal Note Flexible hose

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**.

H CLUTCH RELEASE CYLINDER



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

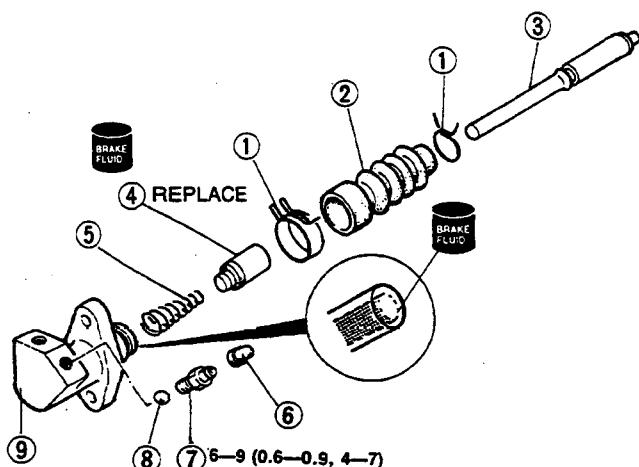
1. After installation, bleed the clutch system.
(Refer to page H-10.)

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**.



N·m (m-kg, ft-lb)

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

H

CLUTCH UNIT

PREPARATION SST

49 E301 060 Brake, ring gear (HA, SL engine)	A photograph of a long, thin metal bolt or screw with a square head and a slot for a screwdriver.	For prevention of engine rotation	49 W011 103 Brake, ring gear (TF engine)	A photograph of a rectangular metal plate with two holes and a slot for a screwdriver.	For prevention of engine rotation
49 S501 062 Collar (HA engine)	A photograph of a cylindrical metal collar with a ribbed or flared end.	For prevention of engine rotation	49 W065 062 Collar (SL engine)	A photograph of a cylindrical metal collar with a ribbed or flared end.	For prevention of engine rotation
49 SE01 310 Clutch disc centering tool	A photograph of a long, thin metal tool with a ribbed handle and a pointed tip.	For alignment of clutch disc	49 1285 071 Puller, bearing	A photograph of a long, thin metal tool with a ribbed handle and a pointed tip, designed for pulling bearings.	For removal of pilot bearing
49 B011 103 Chuck (Part of 49 1285 071)	A photograph of a cylindrical metal chuck with a ribbed handle and a pointed tip.	For removal of pilot bearing			9TF0HX-011

H

CLUTCH UNIT

REMOVAL / INSTALLATION

Note

- Remove the clutch release cylinder with the flexible hose connected.
- Do not remove the pilot bearing if not necessary.

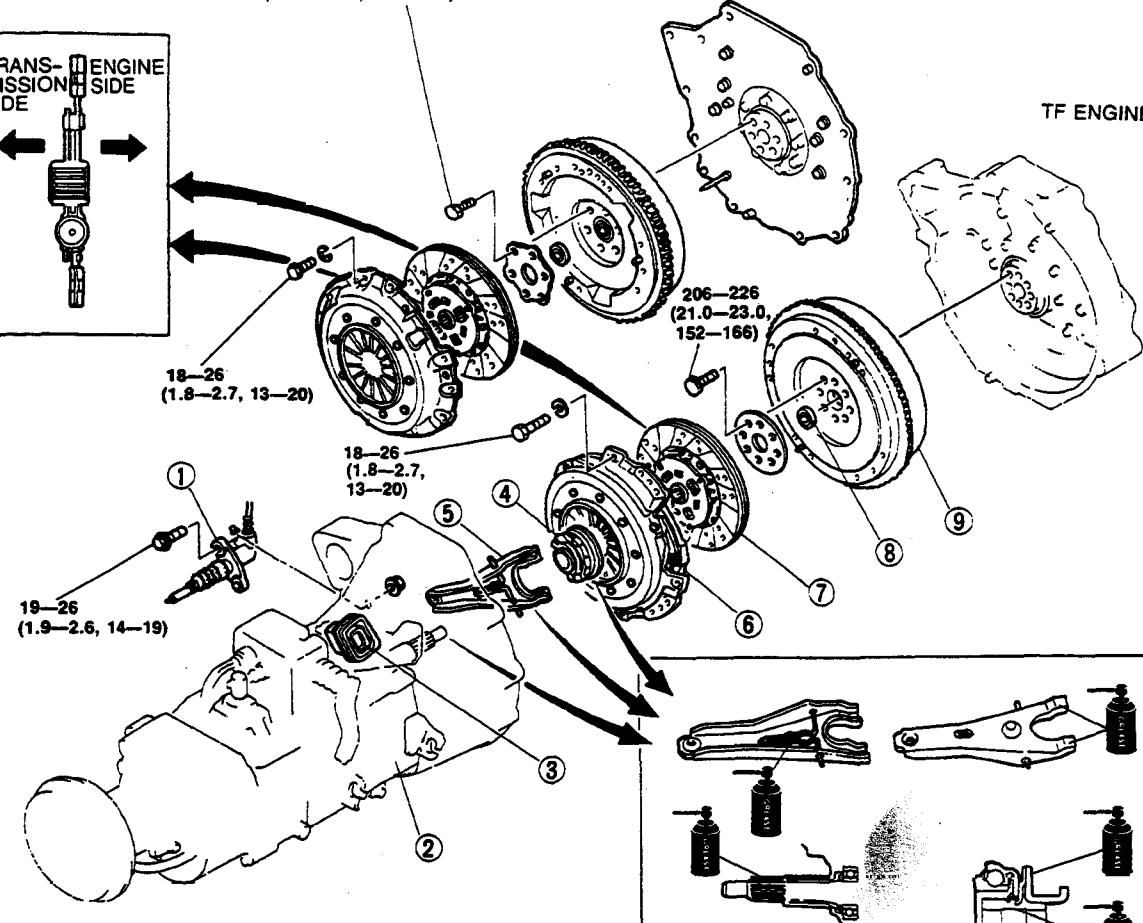
1. Remove in the order shown in the figure, referring to Removal Note.

2. Install in the reverse order of removal, referring to Installation Note.

152—160 (15.5—16.3, 112—118) HA ENGINE
177—196 (18.0—20.0, 130—145) SL ENGINE
206—226 (21.0—23.0, 152—166) SL TURBO ENGINE

EXCEPT TF ENGINE

TF ENGINE

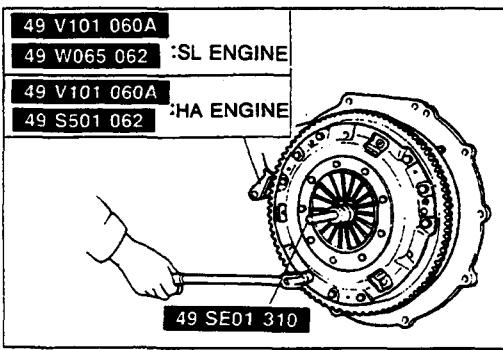


9TF0HX-012

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

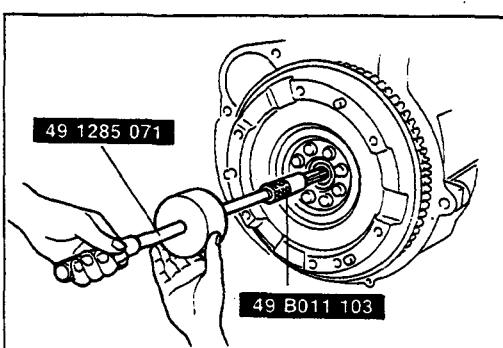
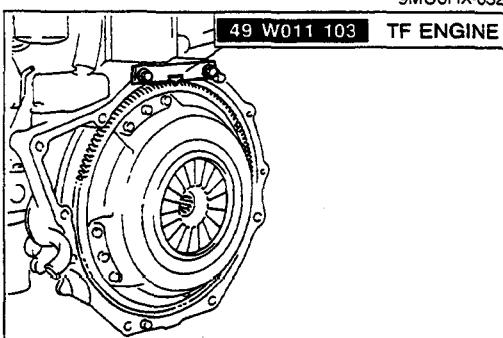
7. Clutch disc Removal Note page H-19
Inspection page H-21
Installation Note page H-20
8. Pilot bearing Inspection page H-19
Removal Note page H-22
Installation Note page H-20
9. Flywheel Removal Note page H-19
Inspection page H-22
Installation Note page H-20

CLUTCH UNIT



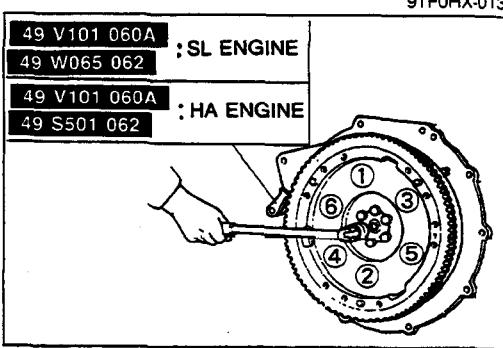
Removal Note Clutch cover and disc

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**.

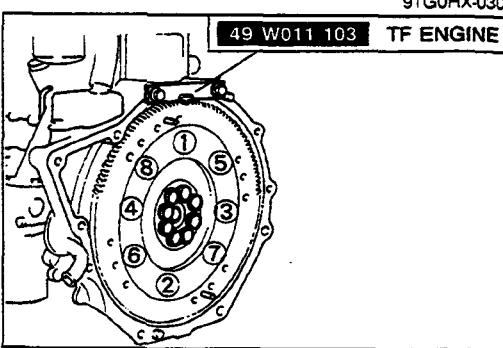


Flywheel

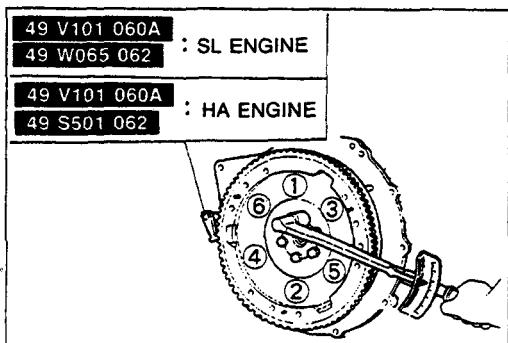
Note

- 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.



H CLUTCH UNIT



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)

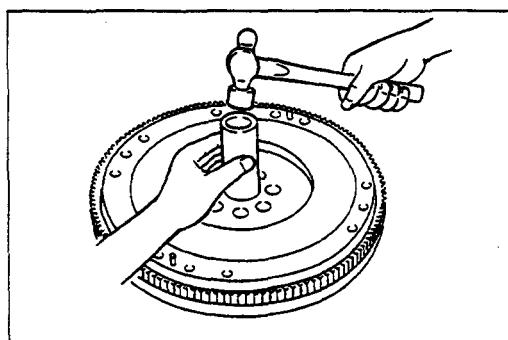
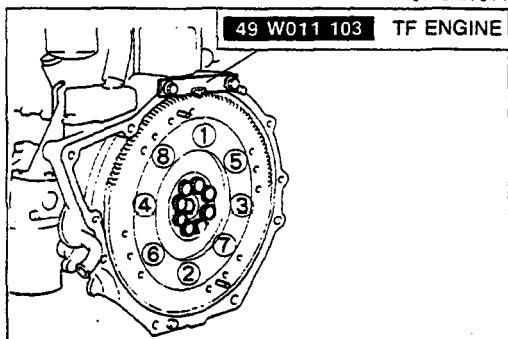
HA engine

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

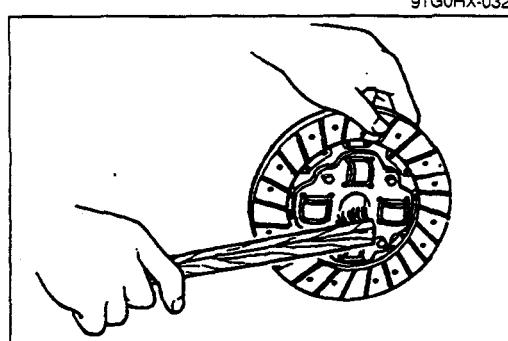


Pilot bearing

Note

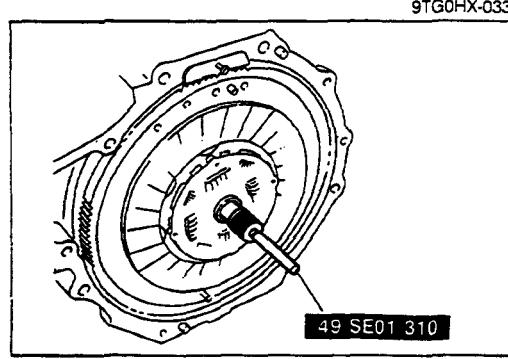
- Install the pilot bearing flush with the flywheel.

1. Install the new bearing with the suitable pipe.



Clutch disc

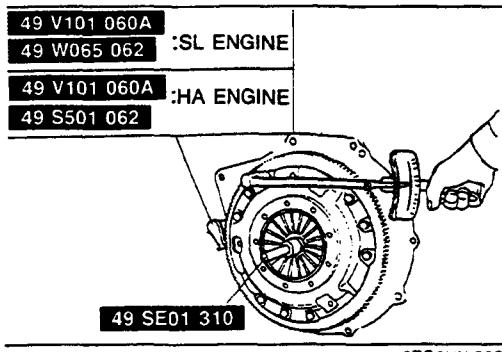
1. Clean the clutch disc splines and main drive gear splines; then apply organic molybdenum grease.



2. Hold the clutch disc in position with the **SST**.

CLUTCH UNIT, RELEASE BEARING, CLUTCH COVER, CLUTCH DISC

H

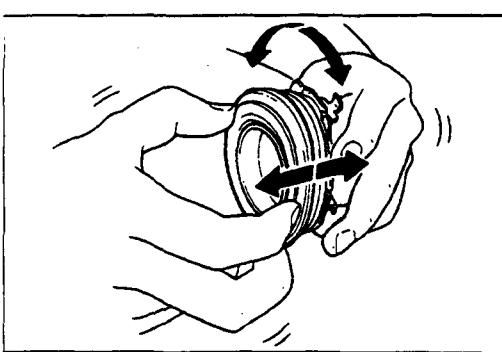
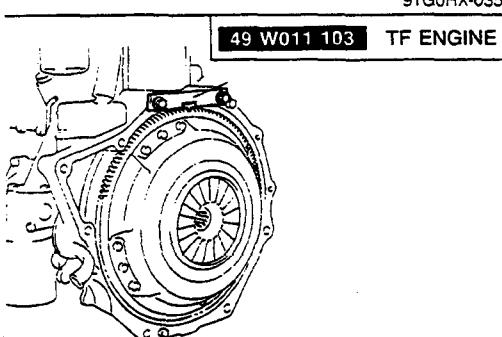


Clutch cover

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)



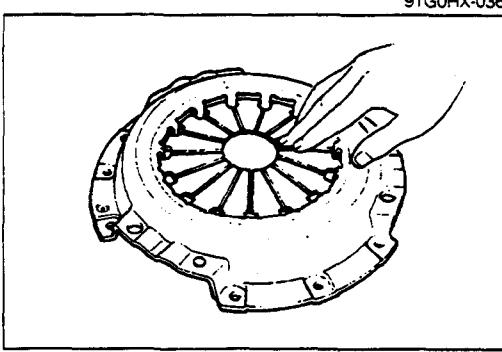
RELEASE BEARING

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

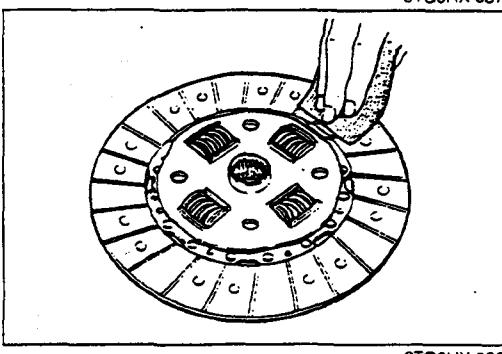
Note

- 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

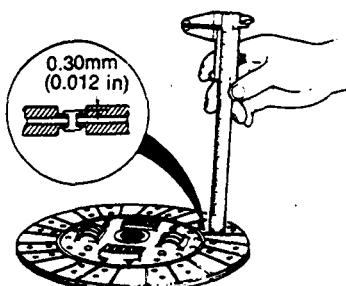
- Use sandpaper if the trouble is minor.

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.

If either is loose, replace the clutch disc.

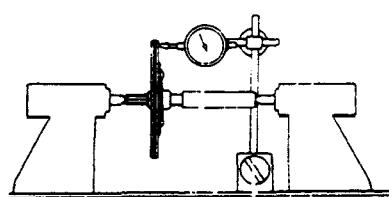
CLUTCH DISC, PILOT BEARING, FLYWHEEL



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

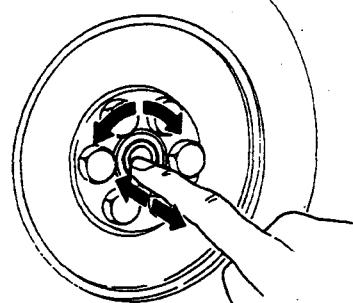
4. Measure the clutch disc runout with a dial indicator.
Replace the clutch disc if runout is excessive.

Maximum runout: 0.7mm (0.027 in)

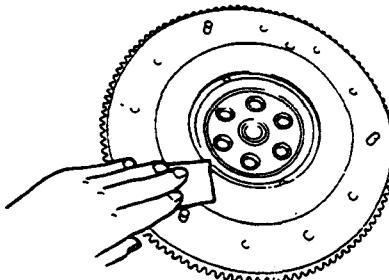
PILOT BEARING

INSPECTION

1. Turn the bearing while applying force in the axial direction.
If the bearing sticks or has excessive resistance, replace it.



03U0HX-036



9TG0HX-040

FLYWHEEL

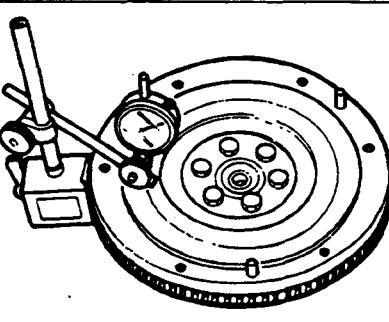
INSPECTION

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.
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)

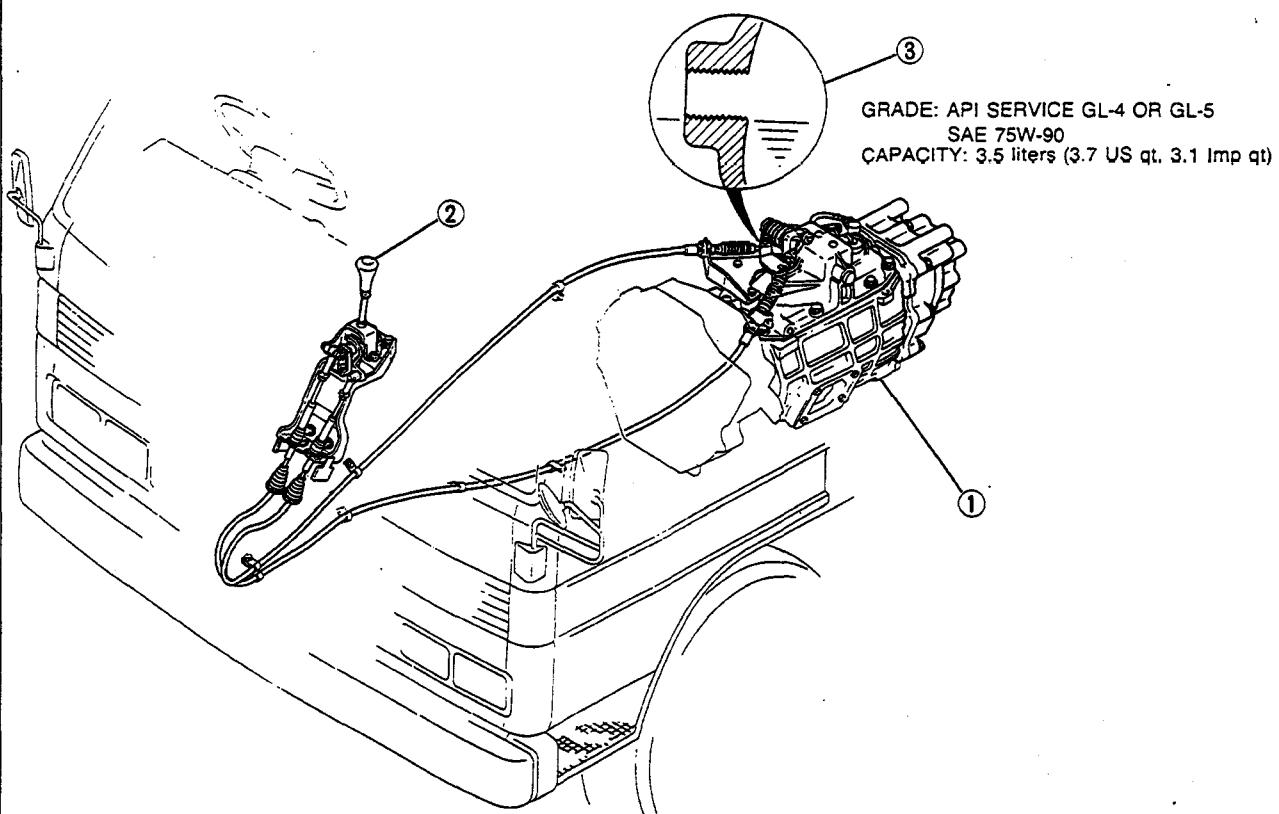


03U0HX-038

MANUAL TRANSMISSION (W5M-R)

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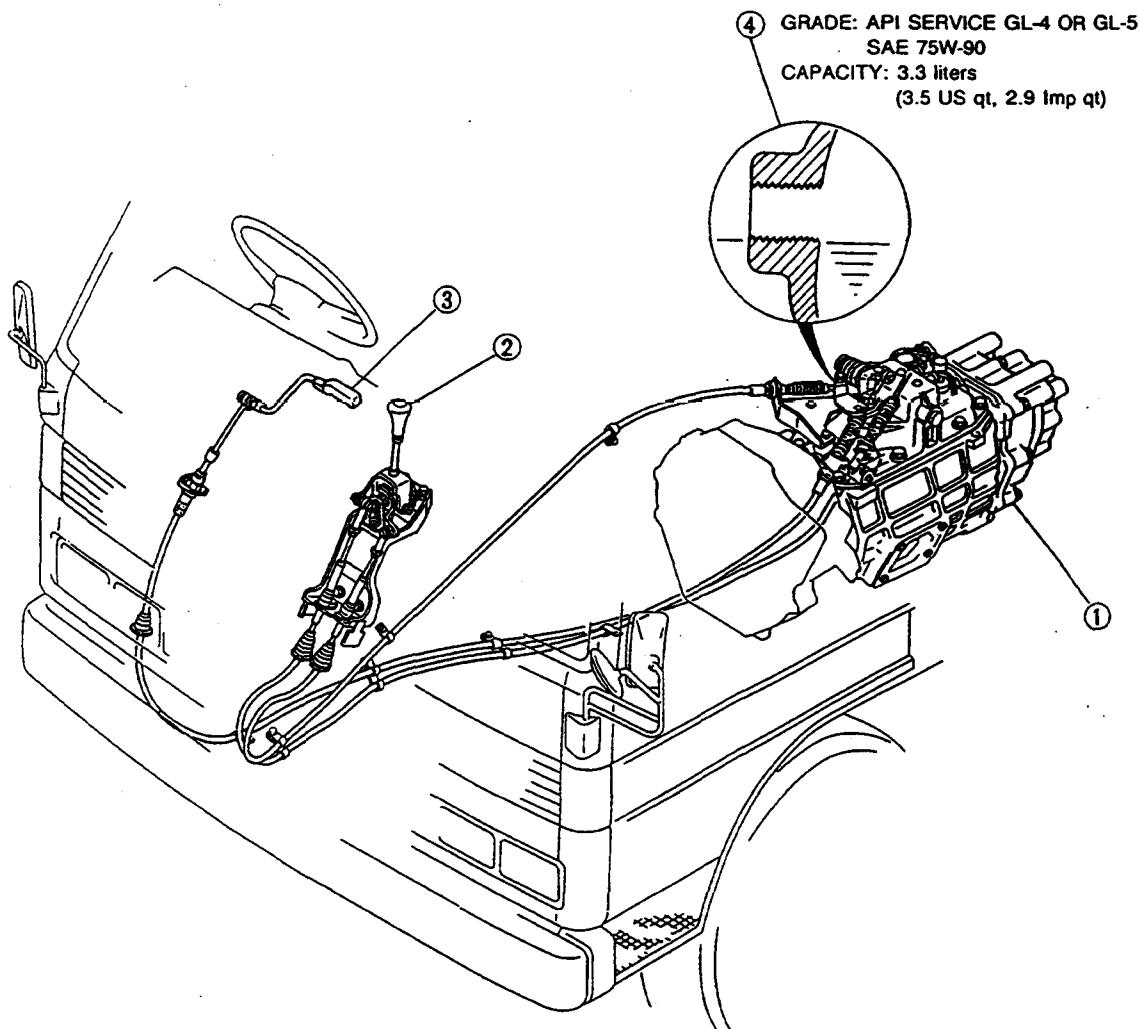
9TF0J1-001

INDEX**WITHOUT SUB-TRANSMISSION**

9TF0J1-002

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
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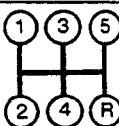
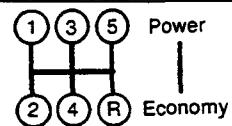
WITH SUB-TRANSMISSION



- 9TFQJ1-003
- | | |
|---|---|
| 1. Transmission | 3. Shift mechanism (Sub-transmission) |
| Removal / Installation page J1-14 | Removal / Installation page J1-29 |
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| Assembly page J1-31 | |
| 2. Shift mechanism (Transmission) | 4. Transmission oil |
| Removal / Installation page J1-47 | Inspection page J1-13 |
| | Replacement page J1-13 |

OUTLINE

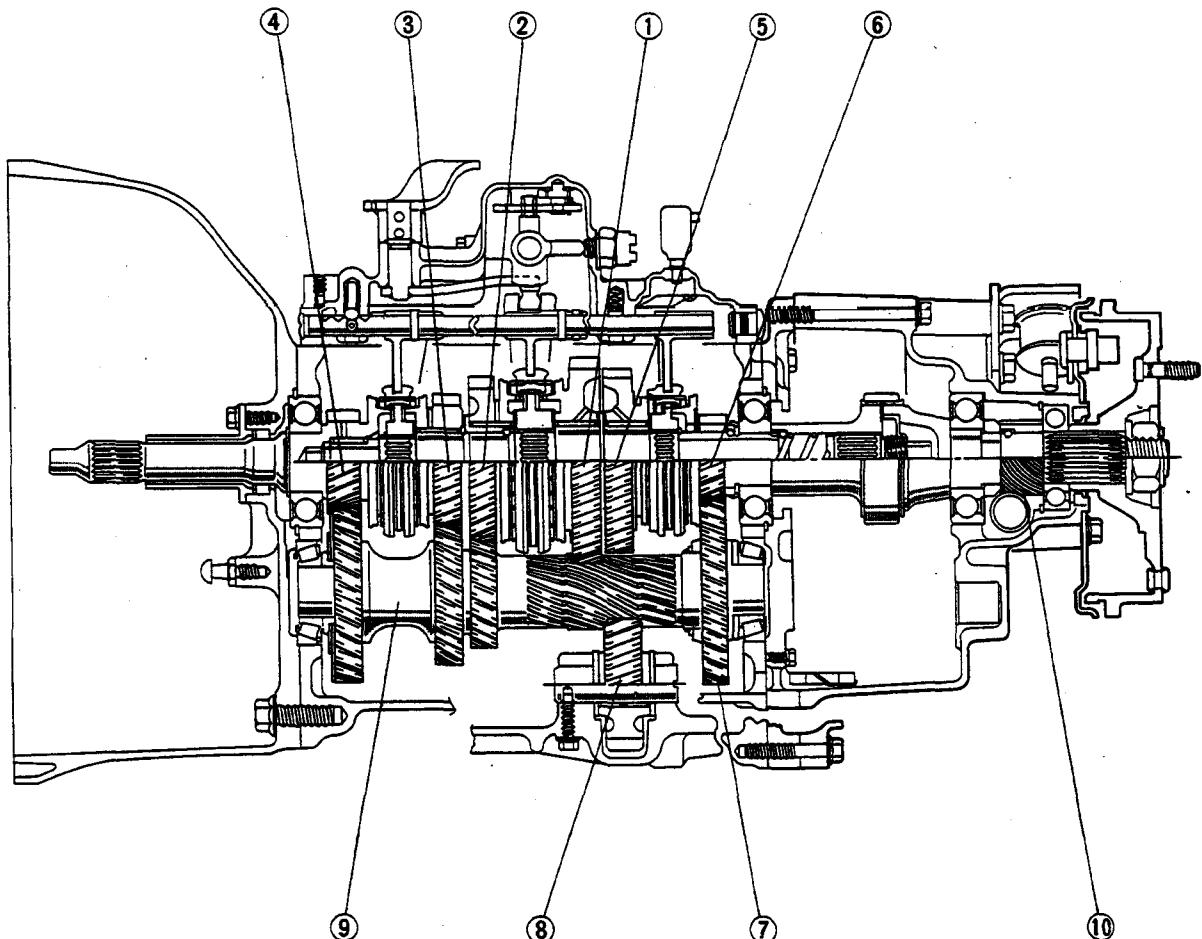
SPECIFICATIONS

Transmission models		W5M-R Without sub-transmission			W5M-R With sub-transmission		
Engine		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

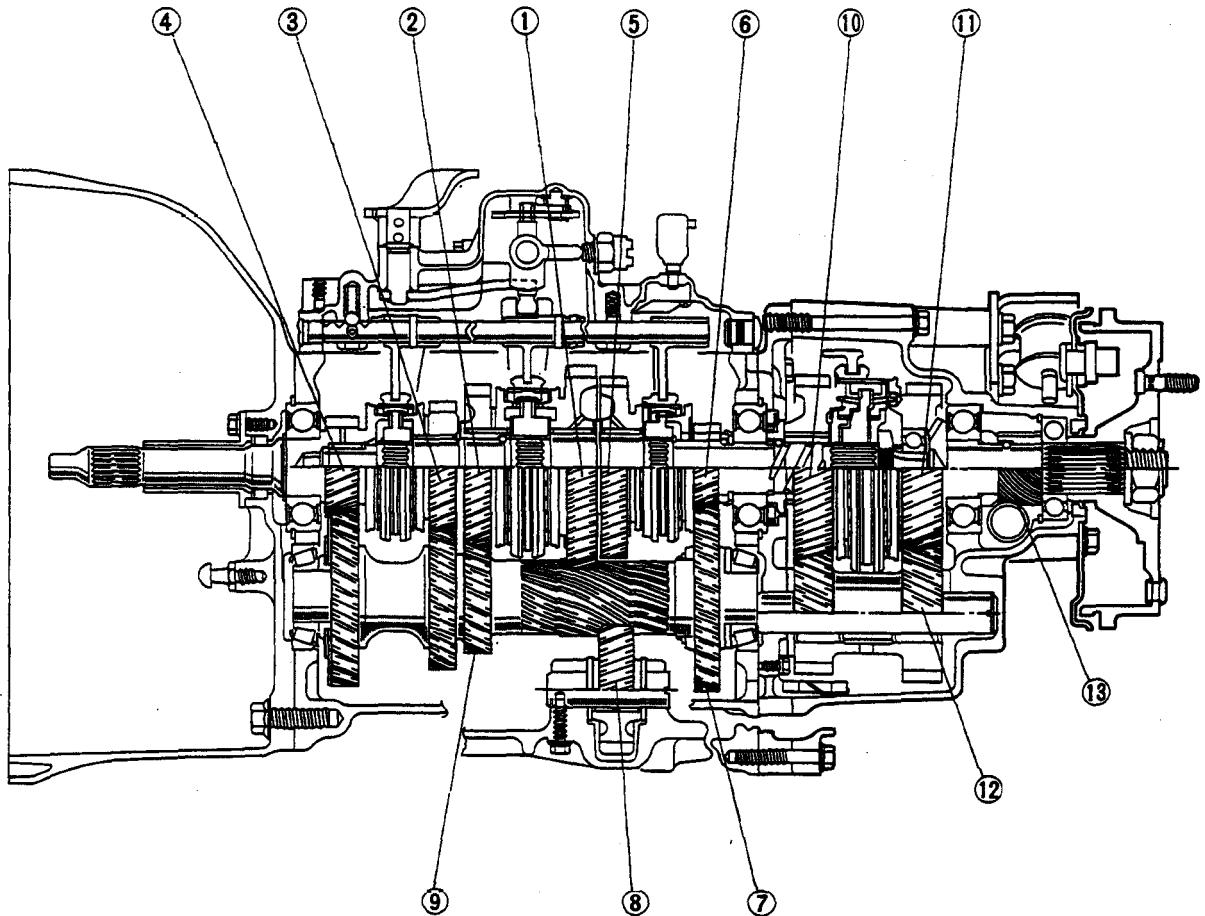
W5M-R
WITHOUT SUB-TRANSMISSION



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

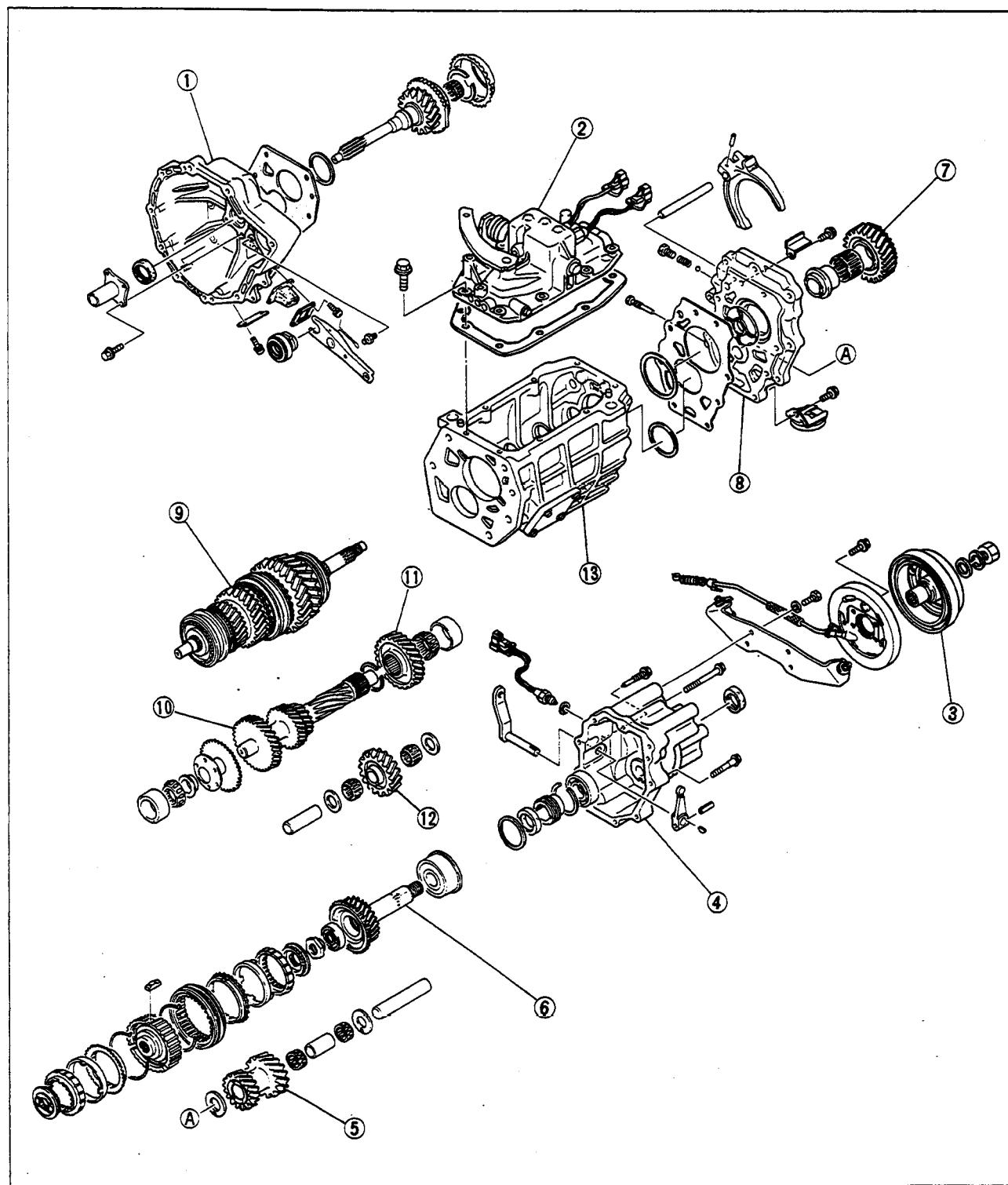
W5M-R
WITH SUB-TRANSMISSION



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

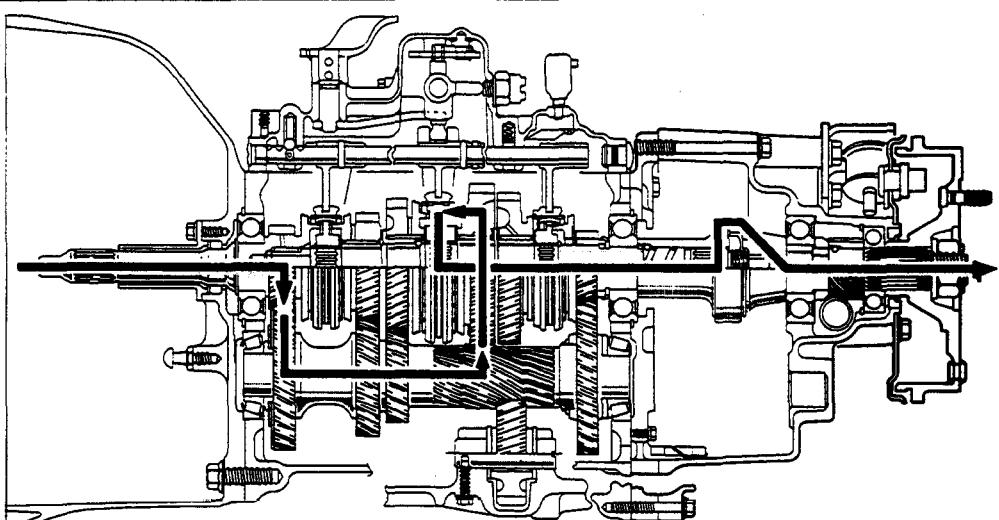


9TG0J1-009

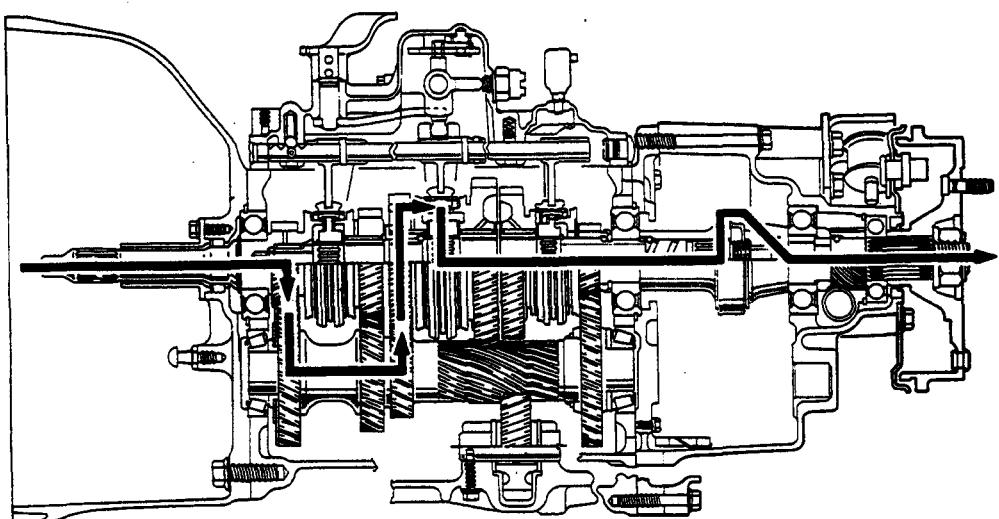
- 1. Clutch housing
- 2. Top cover
- 3. Center brake drum
- 4. Rear housing
- 5. Counter high gear
- 6. Output shaft
- 7. High gear
- 8. Case adapter
- 9. Main shaft assembly
- 10. Countershaft gear
- 11. Counter 5th gear
- 12. Reverse idler gear
- 13. Transmission case

**POWERFLOW
(Without Sub-transmission)**

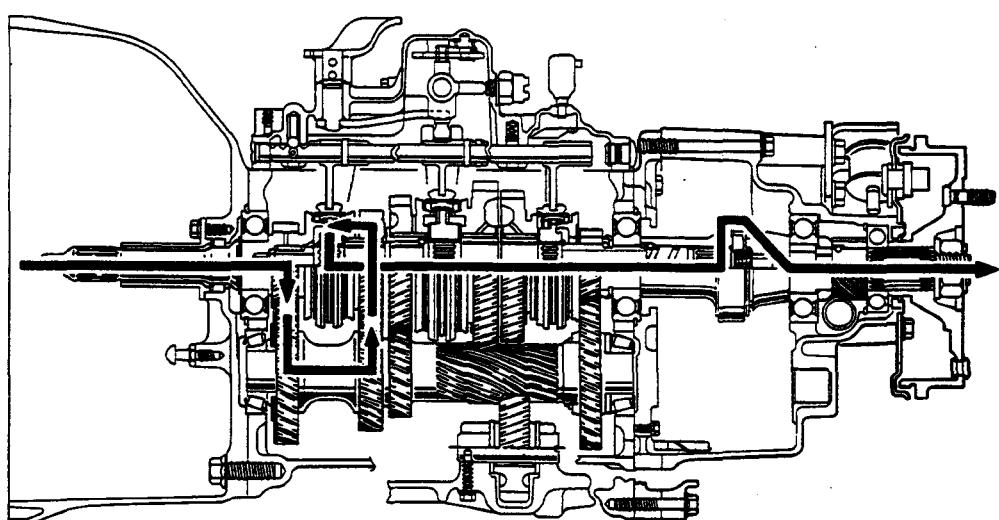
1ST



2ND



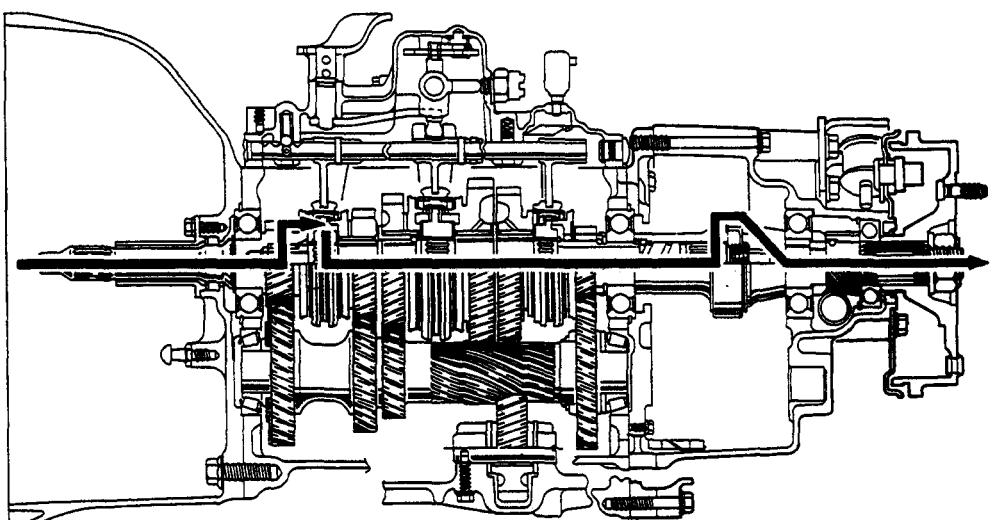
3RD



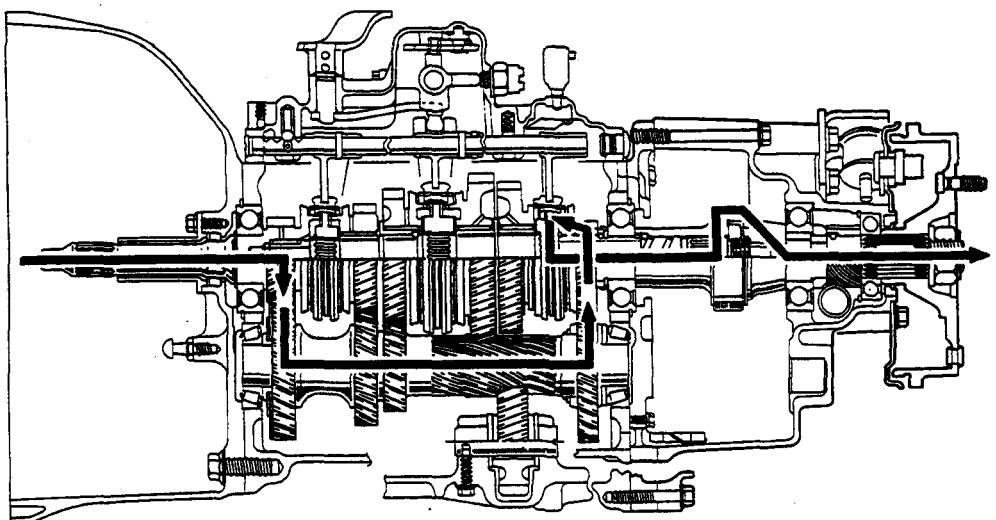
OUTLINE

J1

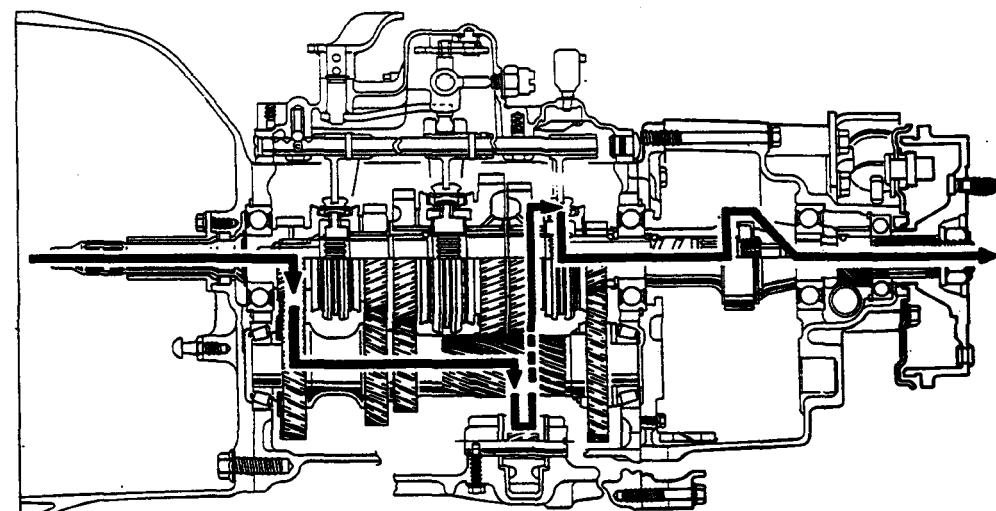
4TH

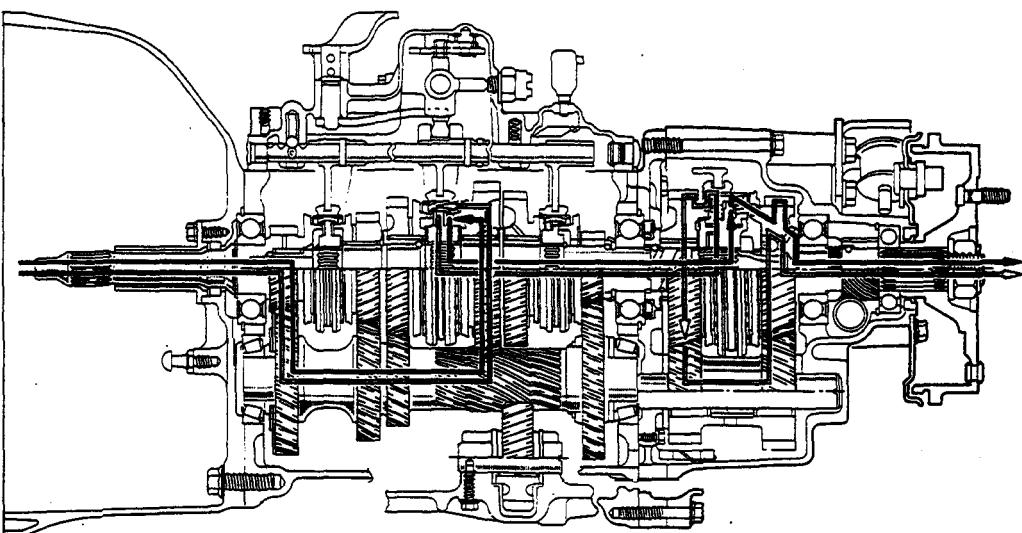
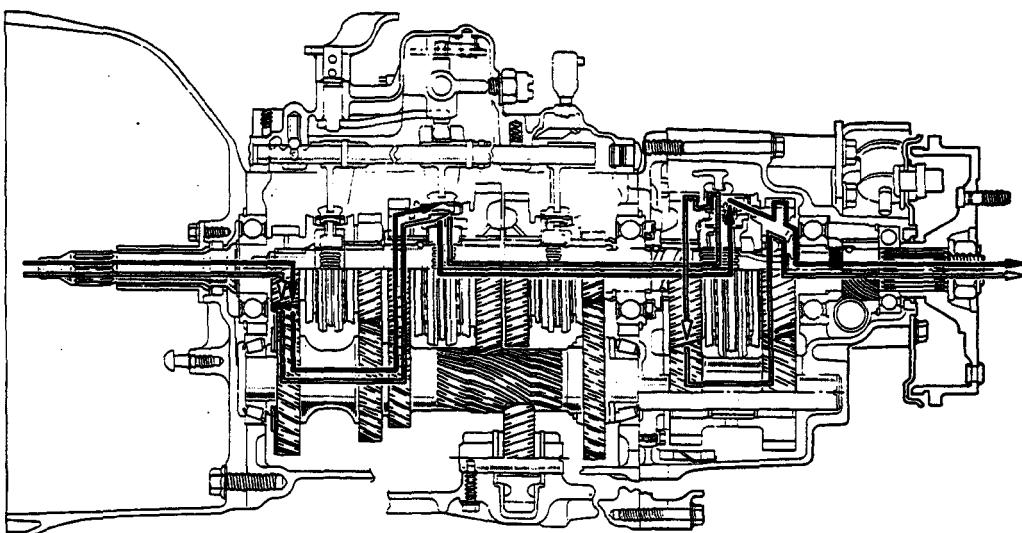
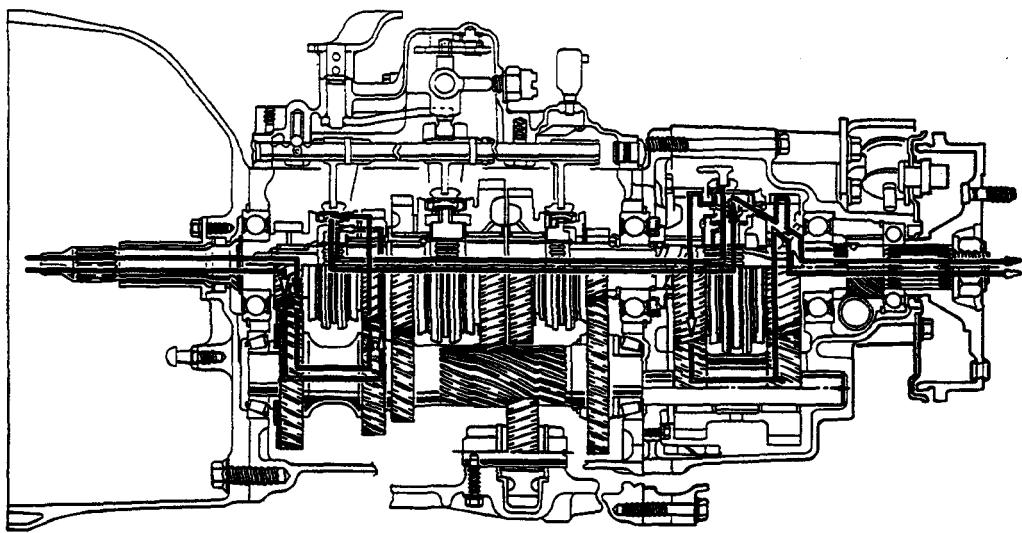


5TH



REVERSE

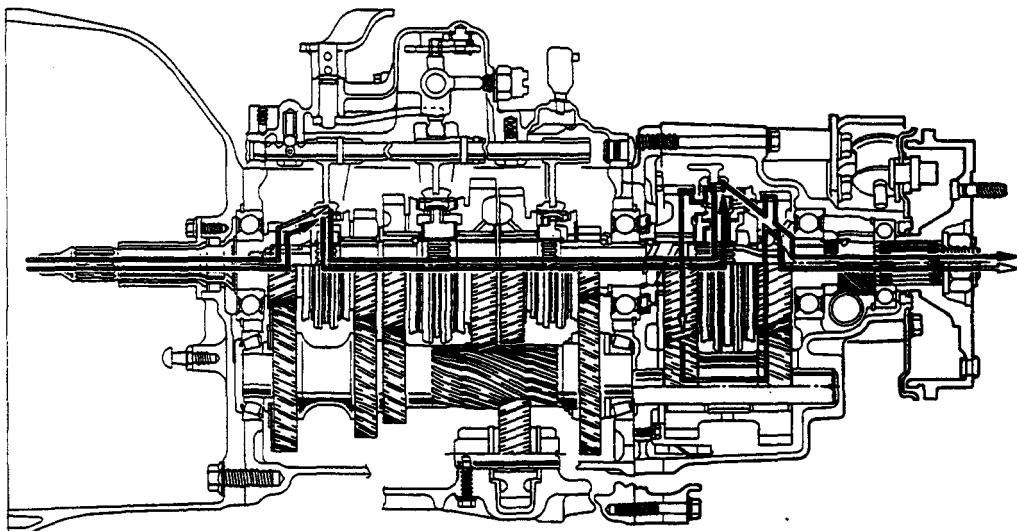


J1**OUTLINE****POWERFLOW
(With Sub-transmission)**Power →
Economy: ⇛**1ST****2ND****3RD**

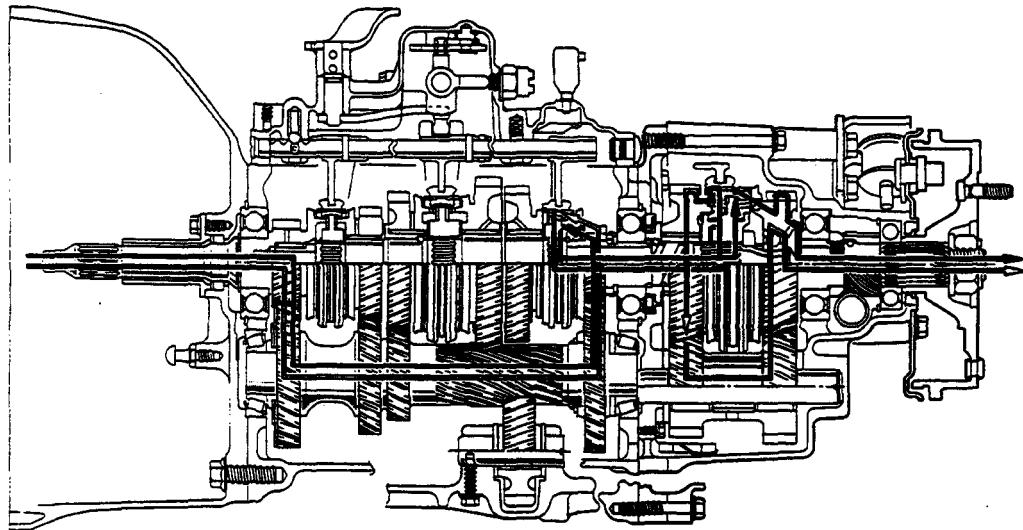
OUTLINE

Power →
Economy: ↘

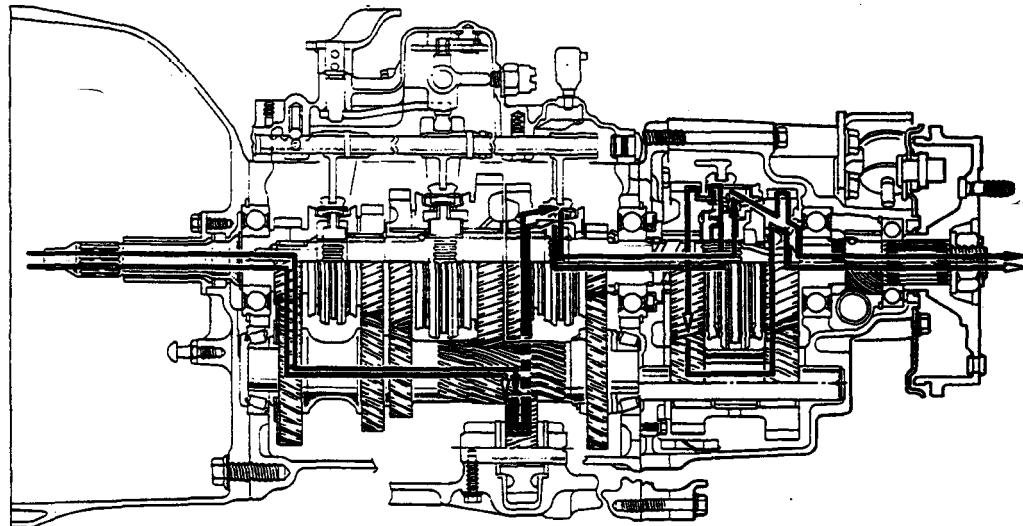
4TH



5TH



REVERSE

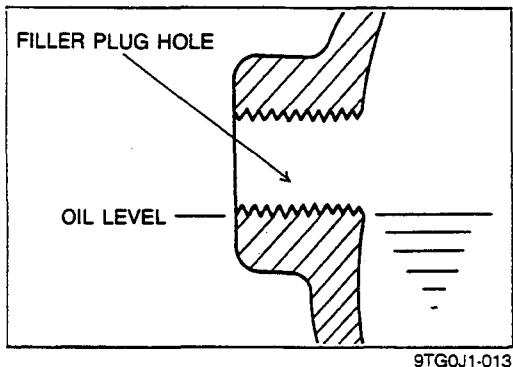


TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Abnormal noise	Insufficient oil Deterioration of oil quality Worn bearing Worn contact surface of countershaft gear Worn contact surface of gear Excessive gear backlash Damaged gear teeth Foreign matter in transmission	Add oil Replace with specified oil Replace Replace Replace Replace Replace Repair or replace	J1-13 J1-13 J1-31 J1-29 J1-28 — J1-28 —
Difficult to shift	Bent shift rod Insufficient oil Deterioration of oil quality Worn or loose shift fork and shift rod Worn synchronizer ring Worn synchronizer cone of gear Poor contact of synchronizer ring and gear cone Excessive longitudinal play of gears Worn bearing Fatigued synchronizer key spring	Replace Add oil Replace with specified oil Replace Replace Replace Replace Replace Replace	— J1-13 J1-13 J1-30 J1-30 J1-30 — J1-31 —
Jumps out of gear	Weak detent ball spring Worn shift fork Worn clutch hub sleeve Excessive gear backlash Worn bearing	Replace Replace Replace Replace Replace	— J1-30 J1-29 — J1-31
Shift lever does not function smoothly or is difficult to operate	Sticking control cable Malfunction of control cable ball joint	Replace Replace	J1-47 J1-47
Selector lever does not function smoothly or is difficult to operate	Sticking control cable Malfunction of control cable ball joint	Replace Replace	J1-49 J1-49

9TF0J1-005

TRANSMISSION OIL



TRANSMISSION OIL

INSPECTION

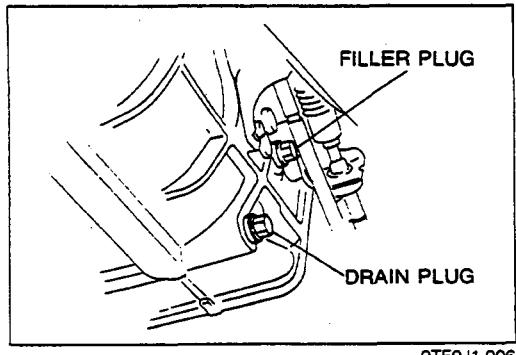
Caution

- 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)

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

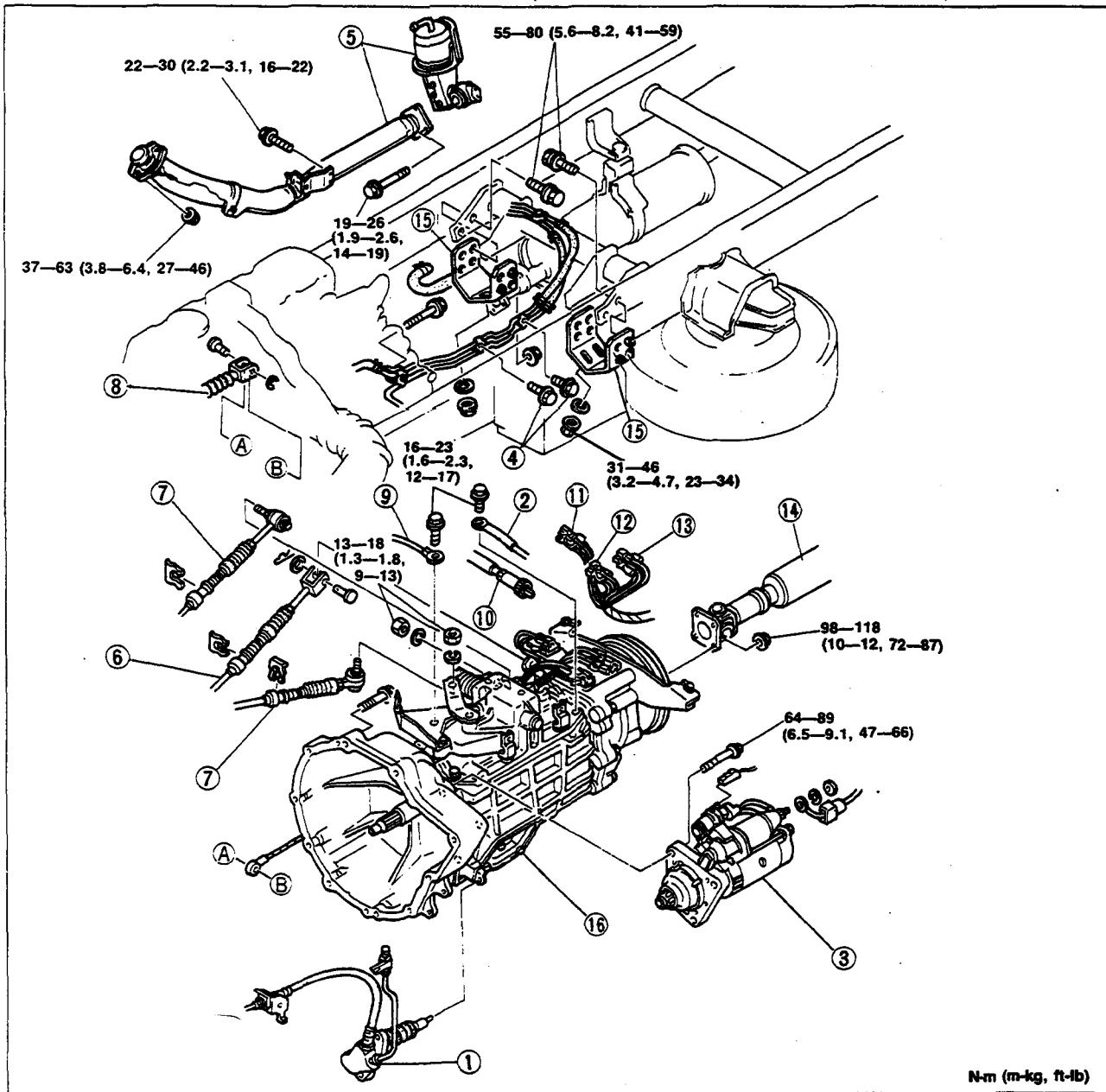
9TF0J1-007

REMOVAL / INSTALLATION

1. Disconnect the negative battery cable.
2. Raise the vehicle and support it with safety stands.

9TG0J1-016

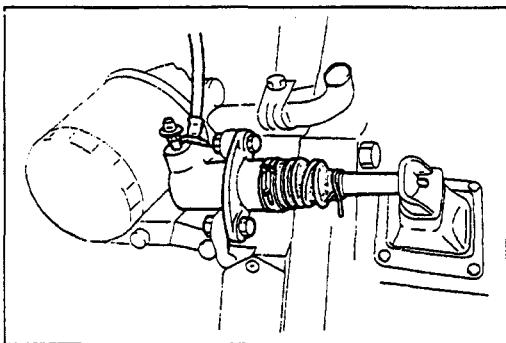
3. Drain the transmission oil into a suitable container.
4. Remove in the order shown in the figure, referring to **Removal Note**.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. Add the specified amount of the specified transmission oil. (Refer to page J1-13.)
7. Warm up the engine and transmission, and inspect for oil leakage and transmission operation.



N·m (m·kg, ft·lb)

9TFQJ1-008

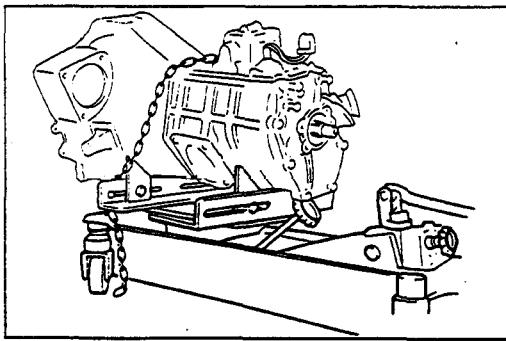
1. Clutch release cylinder
Removal Note page J1-16
2. Ground wire
Installation Note page J1-16
3. Starter page J1-16
4. Fuel pipe clip bolt
5. Exhaust pipe and power chamber
6. Sub-selector cable
7. Shift/selector cable
8. Parking brake cable
9. Ground wire
Installation Note page J1-16
10. Speedometer 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**

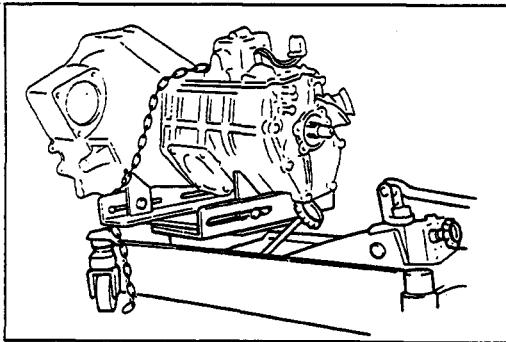
1. Remove the bolt and nut shown in the figure.
2. Move the clutch release cylinder out of the way to remove the transmission.



9TG0J1-019

Transmission

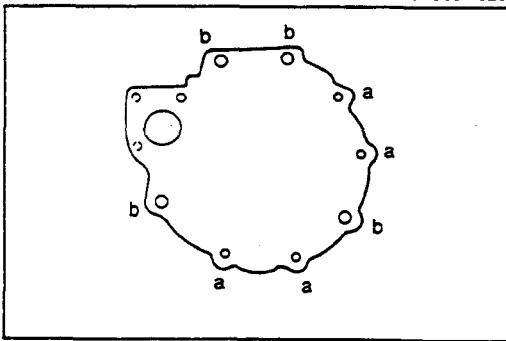
1. Support the engine with a jack under the oil pan.
2. Support the transmission with a transmission jack.
3. Remove the transmission mount bolts.
4. Remove the transmission from under the vehicle.



9TG0J1-020

Installation Note**Transmission**

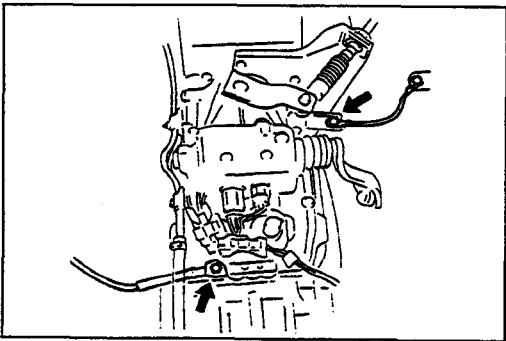
1. Install the transmission with the transmission jack.



9TG0J1-021

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)

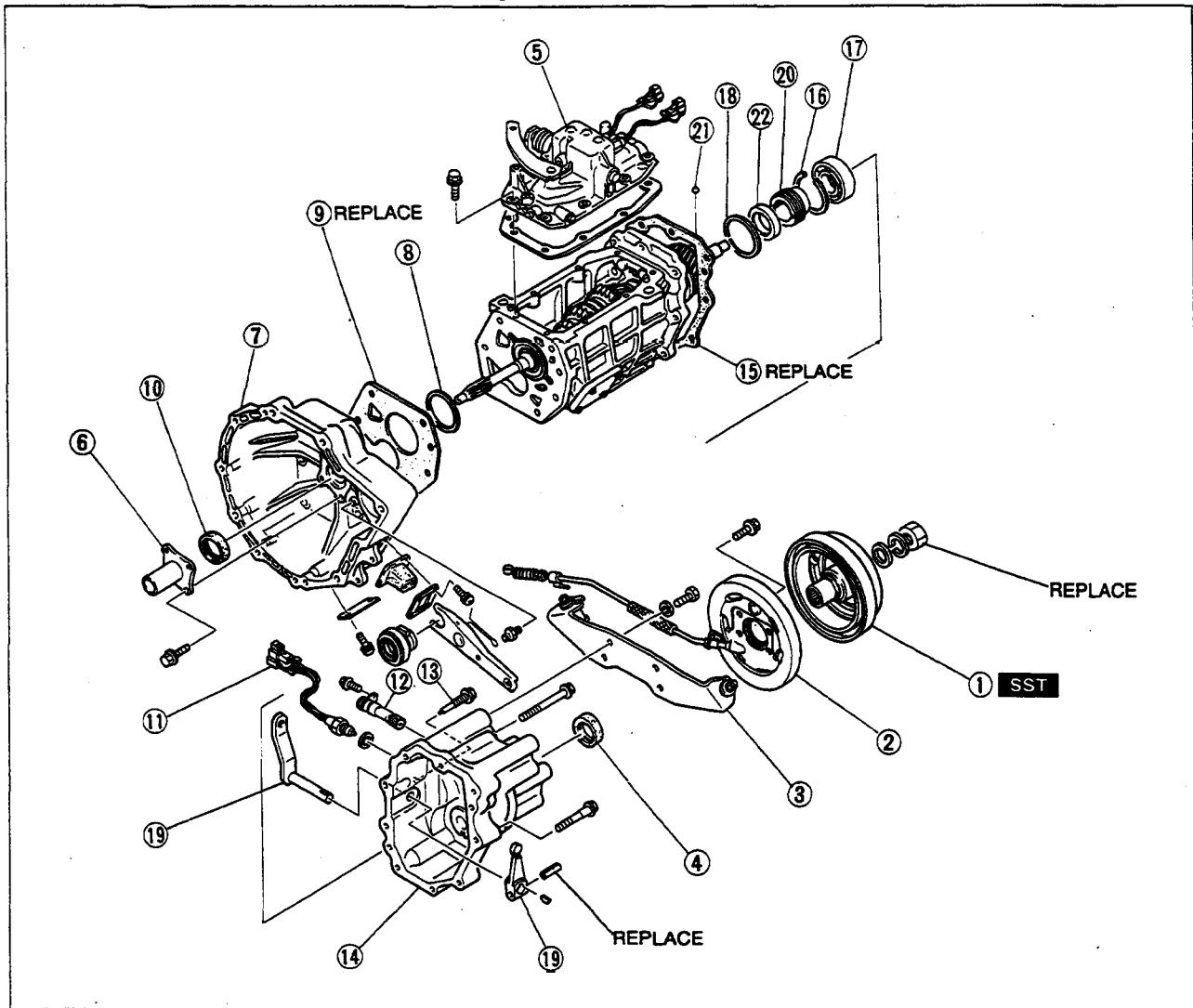
TRANSMISSION

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.

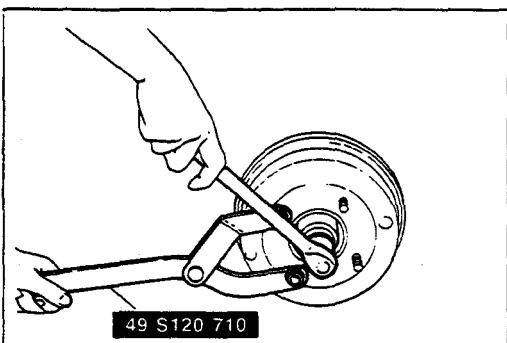
Housing Components

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



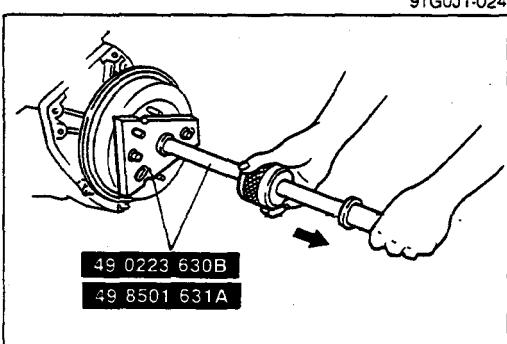
9TF0J1-009

- | | | |
|---|--|----------------------------|
| 1. Center brake drum
Disassembly Note | 6. Front cover | 15. Gasket |
| page J1-18 | 7. Clutch housing | 16. Snap ring |
| 2. Center brake assembly | 8. Adjustment shim | 17. Ball bearing |
| 3. Transmission mount | 9. Gasket | Disassembly Note |
| 4. Oil seal
Inspect for damage
Replace if necessary
On-vehicle replacement | 10. Oil seal
Inspect for damage
Replace if necessary | page J1-18 |
| page J1-18 | 11. Sub-transmission switch | 18. Adjustment shim |
| 5. Top cover
Disassembly ... page J1-27 | 12. Speedometer driven gear | 19. Shift lever |
| Assembly page J1-33 | 13. Bolt | 20. Speedometer drive gear |
| | 14. Rear housing
Disassembly Note | 21. Ball |
| | page J1-18 | 22. Spacer |

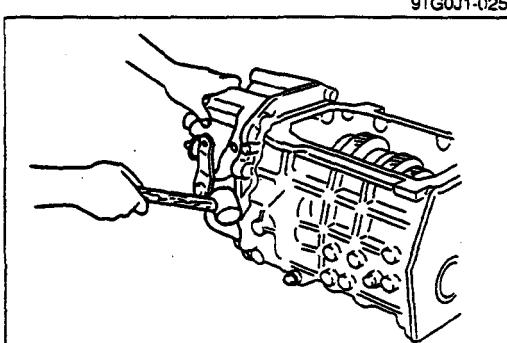


Disassembly Note Center brake drum

1. Hold the center brake drum with the **SST**, and remove the locknut.

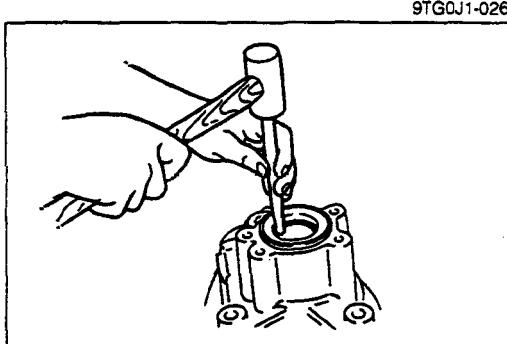


2. Remove the center brake drum with the **SST**.



Rear housing

1. Remove the rear housing. If necessary, tap the housing with a plastic hammer.

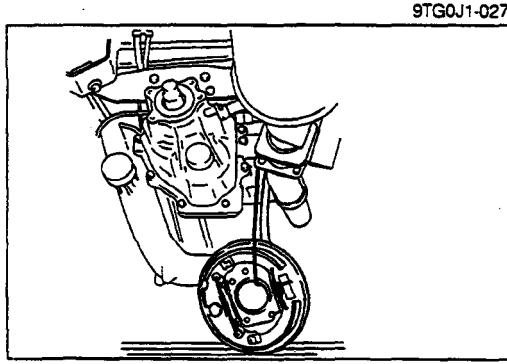


Ball bearing

Caution

- Do not damage the oil seal.

1. Remove the ball bearing with a brass bar and a hammer.

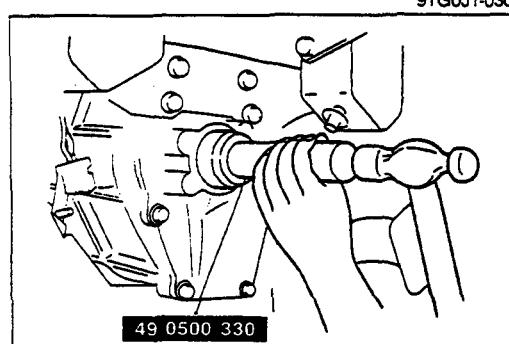
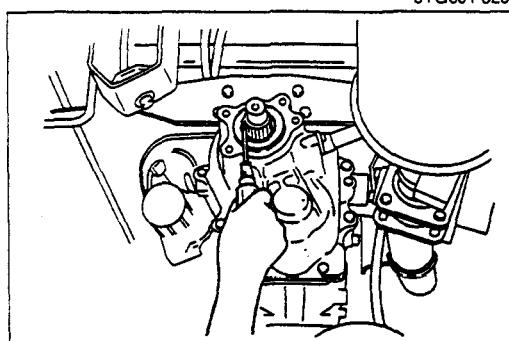
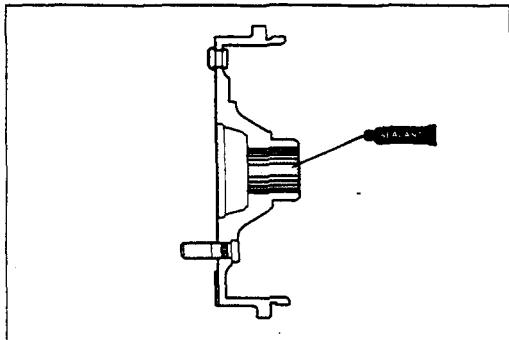


On-vehicle replacement

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.

TRANSMISSION

**Caution**

- Do not damage the mainshaft splines.

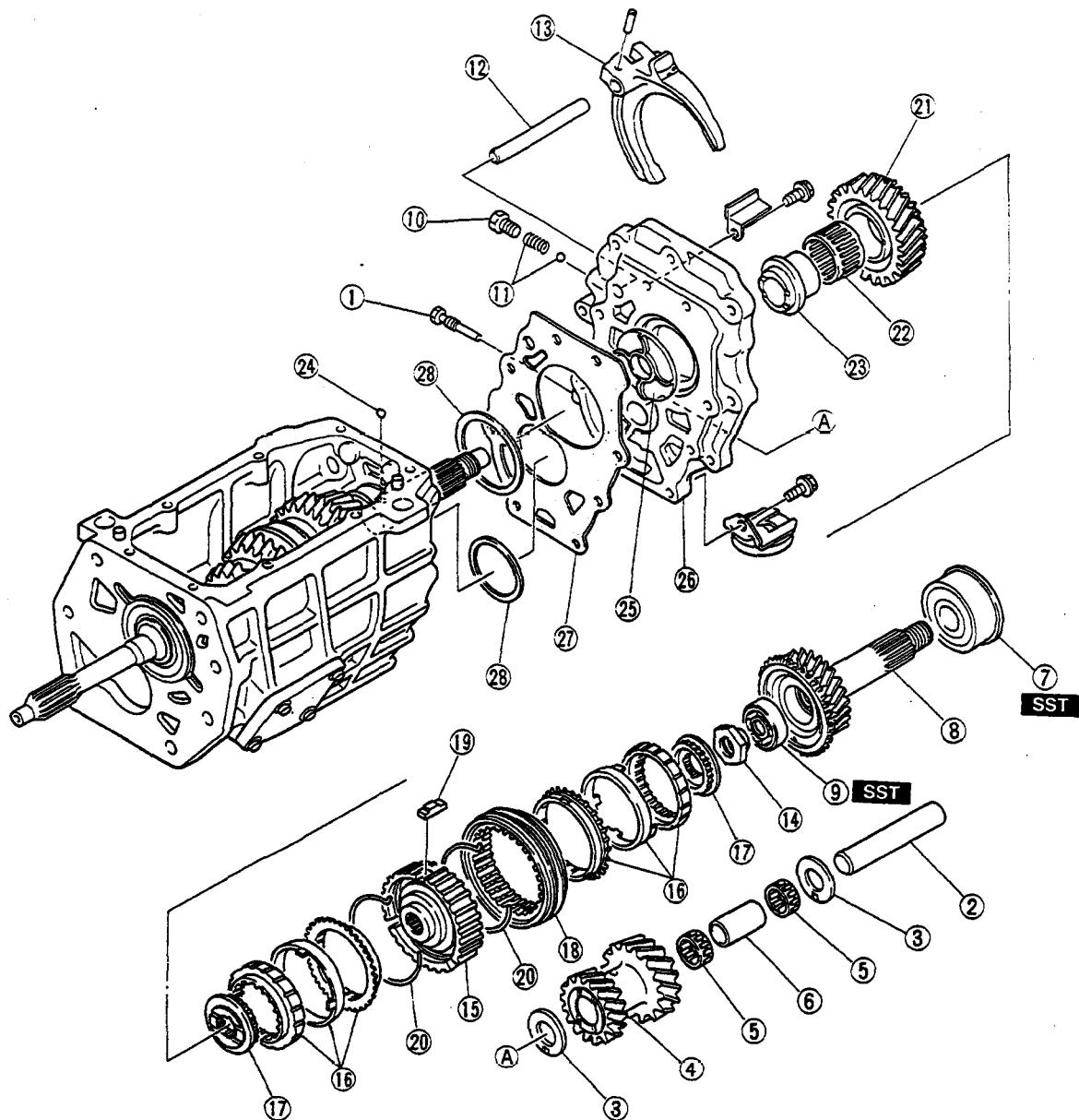
4. Remove the oil seal.
5. Apply transmission oil to outer periphery and lip of the new oil seal.

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

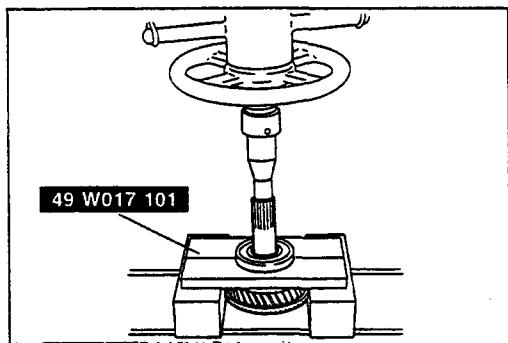
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.



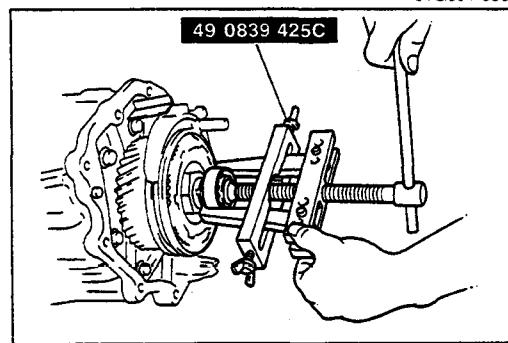
9TF0J1-011

- | | | |
|-----------------------------|-----------------------------|-----------------------------|
| 1. Mounting bolt | 9. Bearing | 17. Inner cone hub |
| 2. Counter gear shaft | Disassembly Note | 18. Clutch hub sleeve |
| 3. Thrust washer | | 19. Synchronizer key |
| 4. Counter high gear | Inspection page J1-31 | 20. Synchronizer key spring |
| Inspection page J1-28 | 10. Cap plug | 21. High gear |
| 5. Needle bearing | 11. Steel ball and spring | Inspection page J1-28 |
| Inspection page J1-31 | 12. Shift rod | 22. Needle bearing |
| 6. Spacer | 13. Shift fork | Inspection page J1-31 |
| 7. Output shaft bearing | 14. Locknut | 23. Gear sleeve |
| Disassembly Note | Disassembly Note | 24. Steel ball |
| page J1-21 | page J1-21 | 25. Scoop ring |
| Inspection page J1-31 | 15. Clutch hub assembly | 26. Case adapter |
| 8. Output shaft | 16. Double cone assembly | 27. Gasket |
| Inspection page J1-28 | Inspection page J1-30 | 28. Adjustment shim |

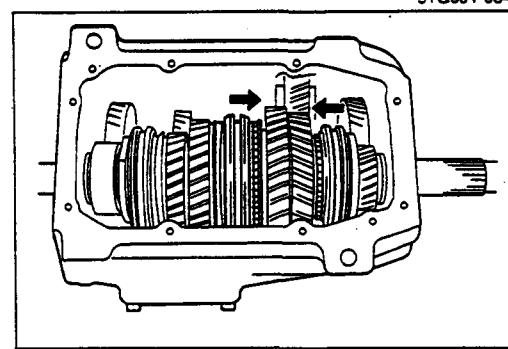
TRANSMISSION

**Disassembly Note
Output shaft bearing**

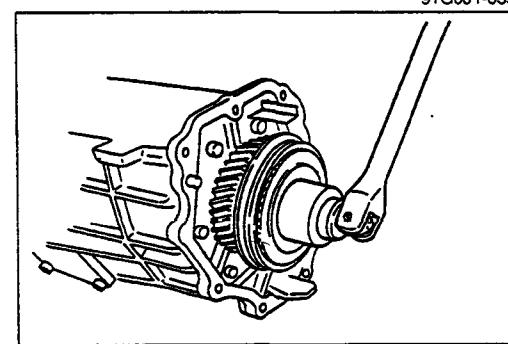
1. Remove the bearing from the output shaft with the **SST**.

**Bearing**

1. Remove the bearing with the **SST**.

**Locknut**

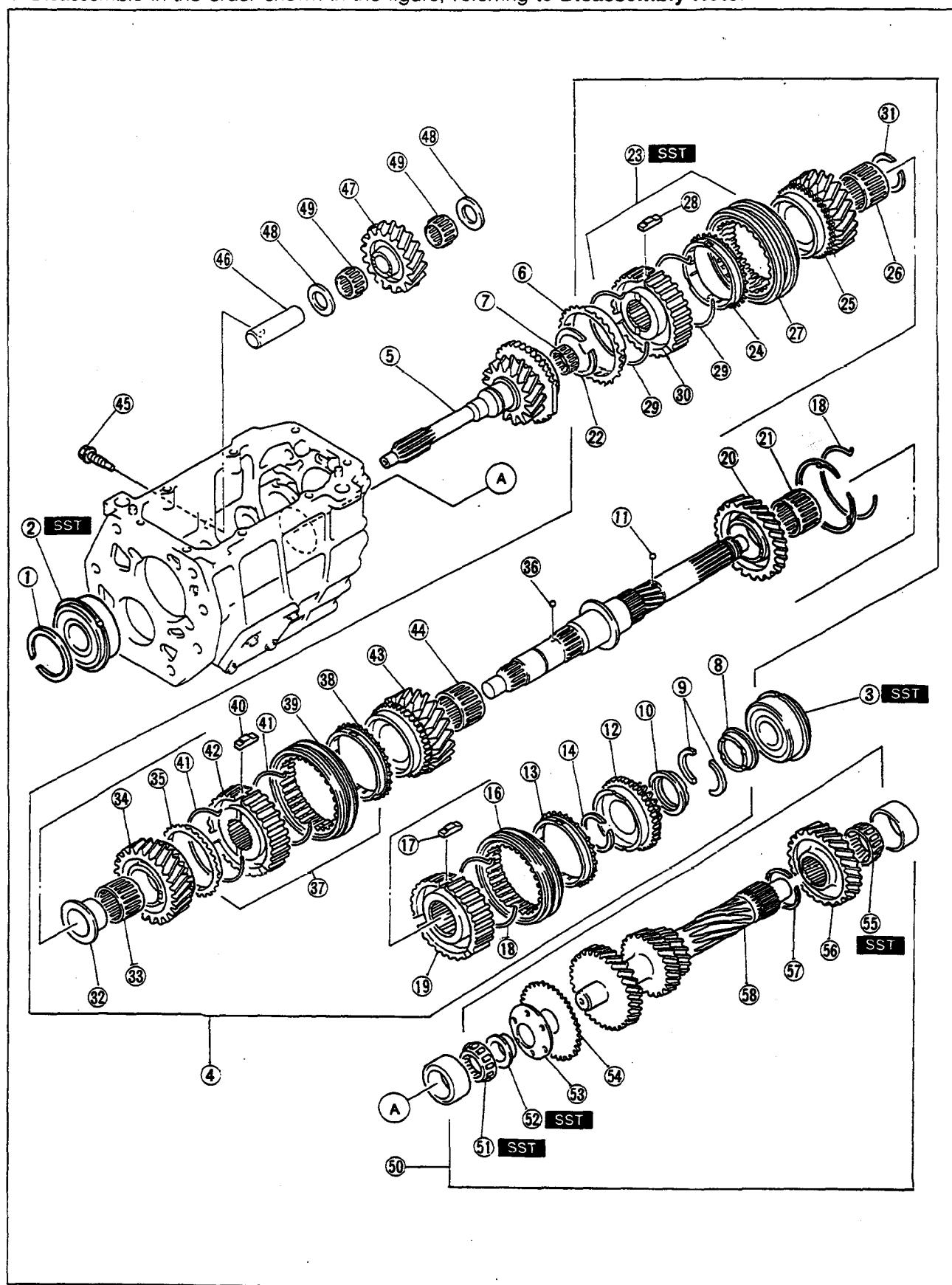
1. Uncrimp the tab of the locknut.
2. Shift the clutch hub sleeves to 1st gear and reverse gear to put the gears in a double-engaged condition.



3. Remove the locknut.

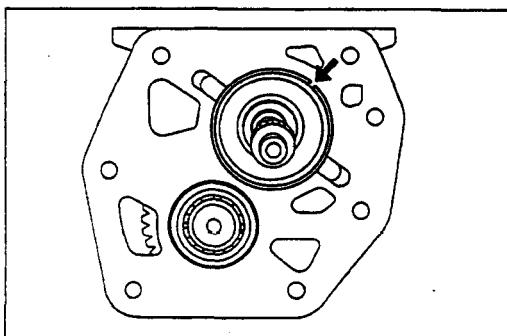
Main shaft

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

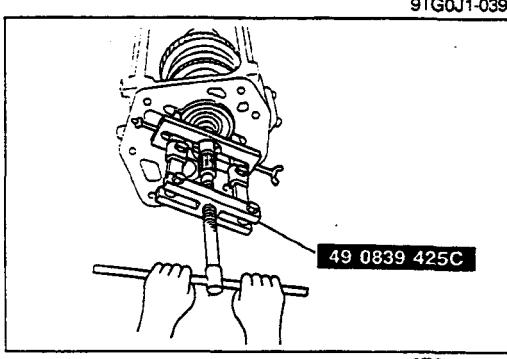


TRANSMISSION

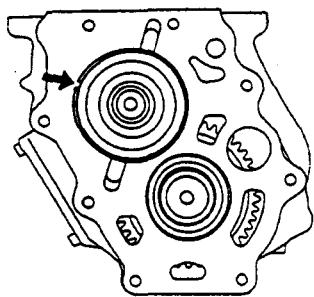
1. Snap ring	20. Reverse gear	42. Clutch hub
2. Main drive gear bearing	Inspection..... page J1-28	43. 1st gear
Disassembly Note	Inspection..... page J1-31	Inspection..... page J1-28
..... page J1-23	21. Needle bearing	44. Needle bearing
Inspection..... page J1-31	Inspection..... page J1-31	Inspection..... page J1-31
3. Mainshaft bearing	22. Snap ring	45. Mounting bolt
Disassembly Note	23. Clutch hub assembly	46. Reverse idler gear shaft
..... page J1-24	(3rd/4th)	47. Reverse idler gear
Inspection..... page J1-31	Disassembly Note	Inspection..... page J1-28
4. Mainshaft assembly page J1-24	48. Thrust washer
Disassembly Note	24. Synchronizer ring (3rd)	49. Needle bearing
..... page J1-24	Inspection..... page J1-30	Inspection..... page J1-31
5. Main drive gear	25. 3rd gear	50. Countershaft assembly
Disassembly Note	Inspection..... page J1-28	Disassembly Note
..... page J1-24	26. Needle bearing page J1-25
Inspection..... page J1-28	Inspection..... page J1-31	51. Countershaft front bearing
6. Synchronizer ring (4th)	27. Clutch hub sleeve	Disassembly Note
Inspection..... page J1-30	28. Synchronizer key page J1-25
7. Needle bearing	29. Synchronizer key spring	Inspection..... page J1-31
Inspection..... page J1-31	30. Clutch hub	52. Spacer
8. Retaining ring	31. Snap ring	Disassembly Note
9. C-washer	32. Gear sleeve page J1-26
10. Thrust lock washer	33. Needle bearing	53. Diaphragm spring
11. Steel ball	Inspection..... page J1-31	54. Friction gear
12. 5th gear	34. 2nd gear	55. Countershaft rear bearing
Inspection..... page J1-28	Inspection..... page J1-28	Disassembly Note
13. Synchronizer ring (5th)	35. Synchronizer ring (2nd) page J1-26
Inspection..... page J1-30	Inspection..... page J1-30	Inspection..... page J1-31
14. Snap ring	36. Steel ball	56. Counter 5th gear
15. Clutch hub assembly	37. Clutch hub assembly	Inspection..... page J1-28
(5th/reverse)	(1st/2nd)	57. Snap ring
16. Clutch hub sleeve	38. Synchronizer ring (1st)	58. Countershaft
17. Synchronizer key	Inspection..... page J1-30	Inspection..... page J1-29
18. Synchronizer key spring	39. Clutch hub sleeve	9TG0J1-012
19. Clutch hub	40. Synchronizer key	
	41. Synchronizer key spring	

**Disassembly Note****Main drive gear bearing**

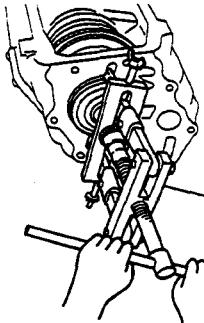
1. Turn the bearing snap ring so that the ends are 90° to the case grooves.



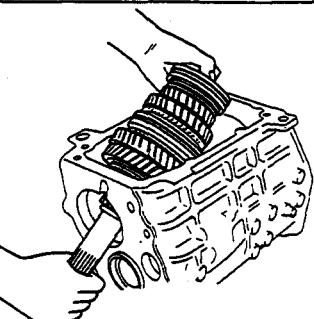
2. Remove the main drive gear bearing with the SST.

**Mainshaft bearing**

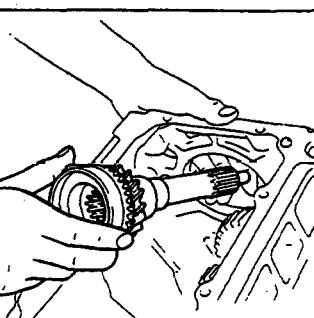
1. Turn the bearing snap ring so that the ends are **90°** to the case grooves.



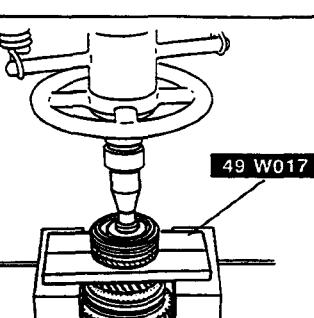
2. Remove the mainshaft bearing with the **SST**.

**Mainshaft assembly**

1. Remove the mainshaft assembly from the transmission case.

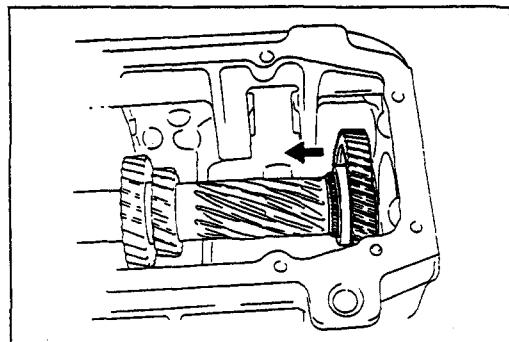
**Main drive gear**

1. Remove the main drive gear from the transmission case.

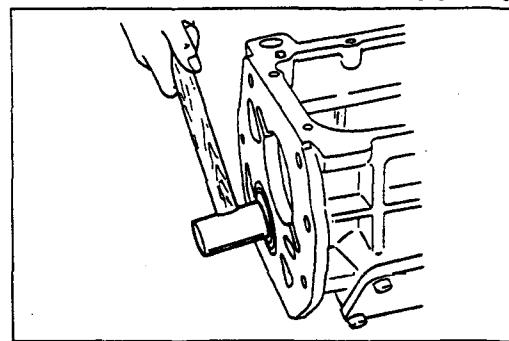
**Clutch hub assembly (3rd/4th)**

1. Remove the clutch hub assembly with the **SST**.

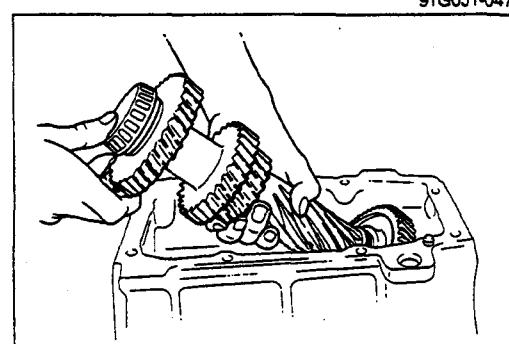
TRANSMISSION

**Countershaft assembly**

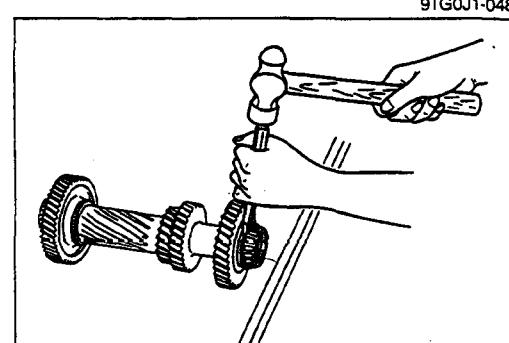
1. Remove the snap ring from the counter 5th gear and move the counter 5th gear toward the front of the transmission.

**Caution**

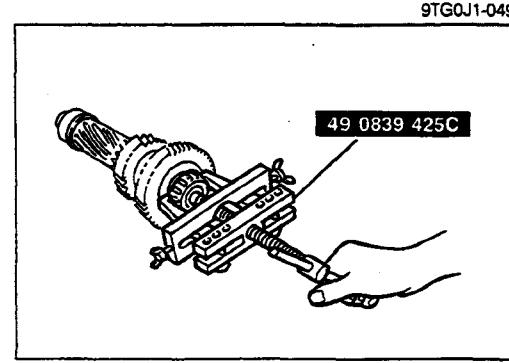
- Do not tap the bearing inner race.
2. Gently strike the front of the countershaft with a brass hammer and remove the bearing outer race from the rear.



3. Remove the countershaft assembly from the transmission case.

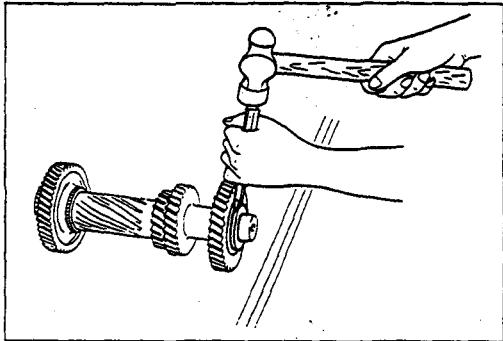
**Countershaft front bearing**

1. Move the bearing away from the spacer with a chisel and a hammer.

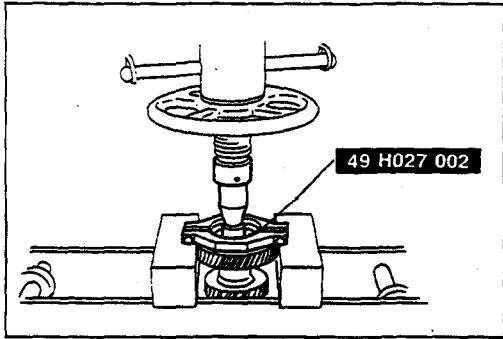


2. Remove the bearing with the SST.

9TG0J1-050



9TG0J1-051



9TG0J1-052



9TG0J1-053

Spacer

1. Move the spacer away from the diaphragm spring with a chisel and a hammer.

Note

- Do not reuse the diaphragm spring.

2. Remove the spacer, diaphragm spring and friction gear with the SST.

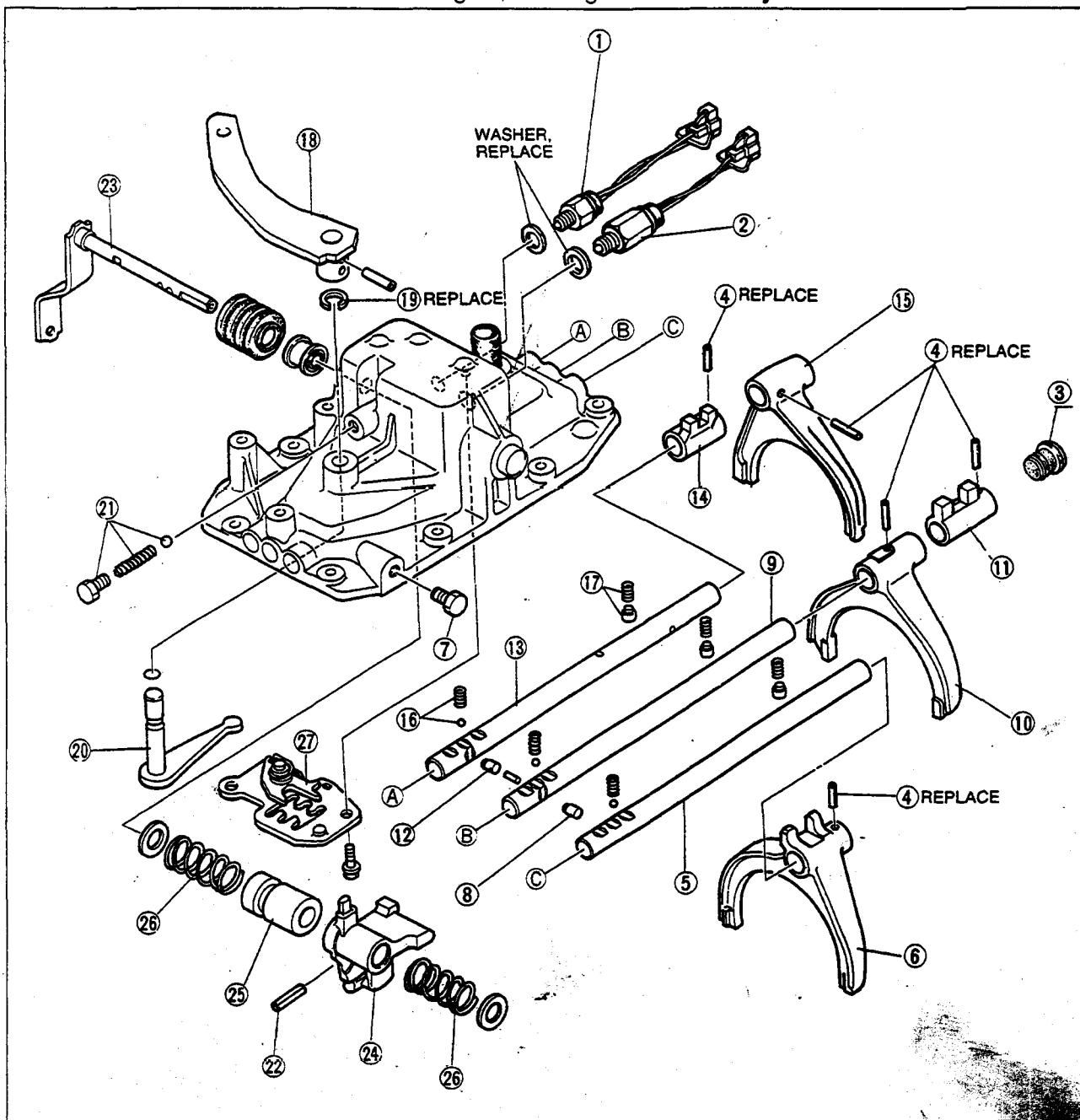
Countershaft rear bearing

1. Remove the bearing and thrust washer with the SST.

TRANSMISSION

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

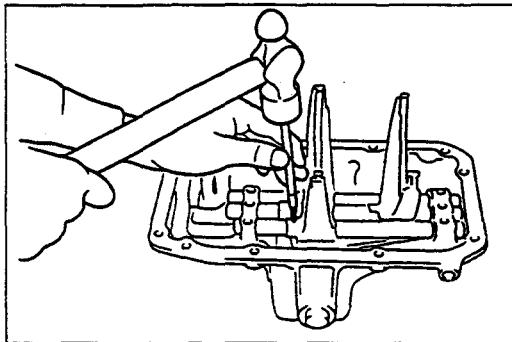
13. Shift rod
14. Shift rod end
15. Shift fork (5th/reverse)
16. Steel ball and spring
17. Spring seat and spring
18. Selector lever

19. Snap ring
20. Selector arm
21. Cap plug ball and spring
22. Roll pin

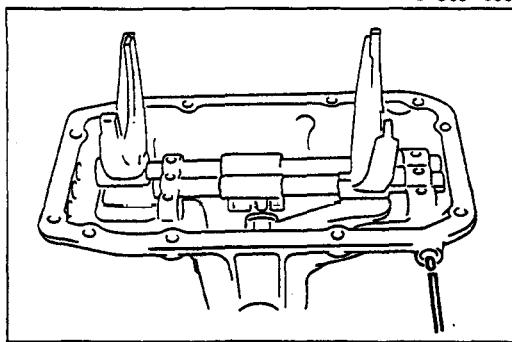
Disassembly Note

..... page J1-28

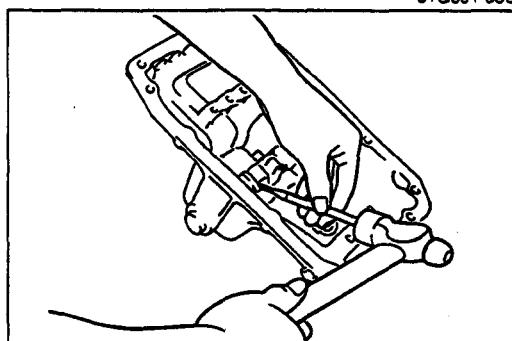
23. Shift lever
24. Change lever
25. Reverse lock stopper
26. Spring(s)
27. Change guide plate

**Disassembly Note****Roll pin**

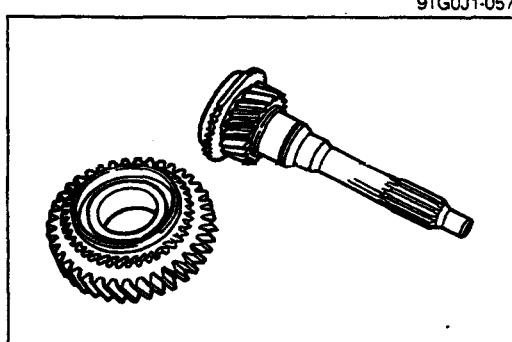
1. Remove the roll pins with a pin punch.

**Interlock pin**

1. Remove the interlock pin with a magnet.

**Roll pin**

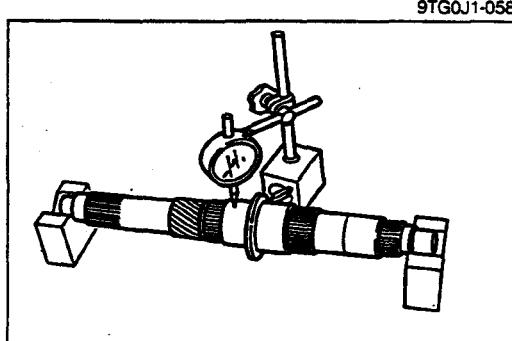
1. Align the groove, then remove the roll pin with a pin punch.

**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.

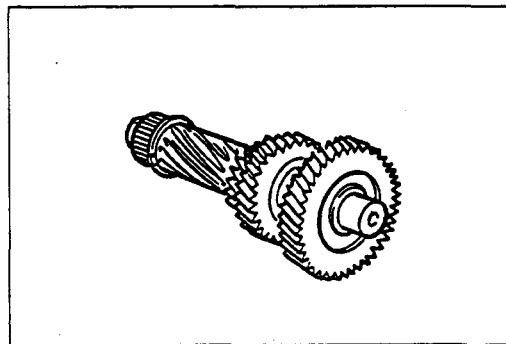
**Mainshaft**

1. Measure the mainshaft runout.

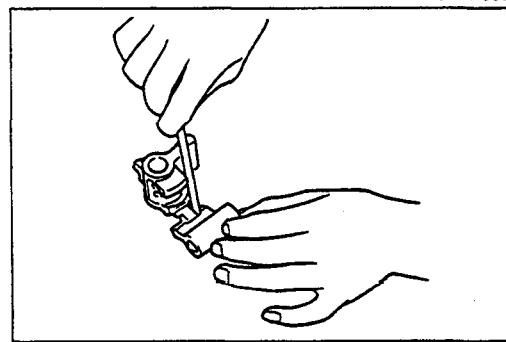
Runout: 0.035mm (0.0014 in) max.

2. Inspect splines for damage and wear.

TRANSMISSION

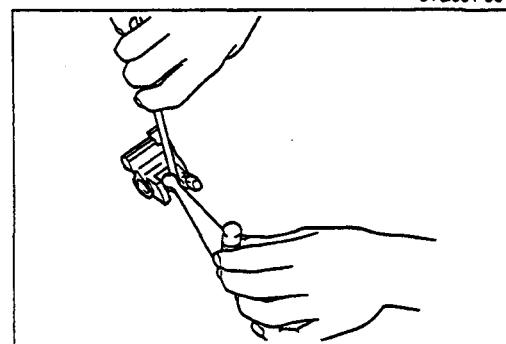
**Countershaft**

1. Inspect gear teeth for damage, wear, and cracks.
2. Inspect splines for damage and wear.

**Shift rod end and change lever**

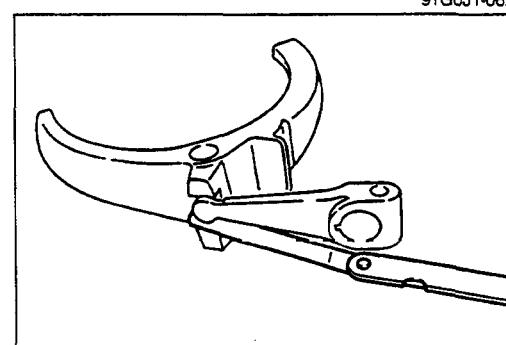
1. Measure the clearance between the shift rod ends and change lever.

Clearance: 0.8mm (0.031 in) max.

**Selector lever and change lever**

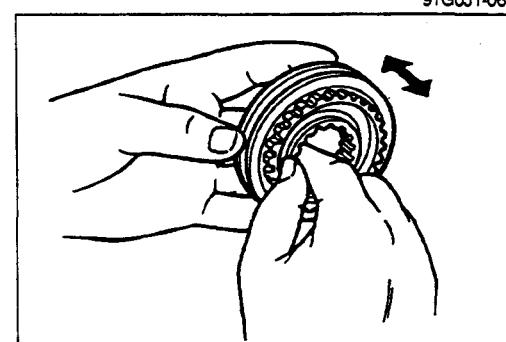
1. Measure the clearance between the selector lever and change lever.

Clearance: 0.8mm (0.031 in) max.

**Inner shift lever and shift fork**

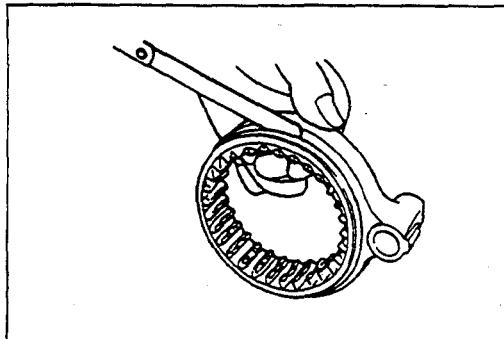
1. Measure the clearance between the inner shift lever and shift fork.

Clearance: 0.8mm (0.031 in) max.

**Clutch hub assembly**

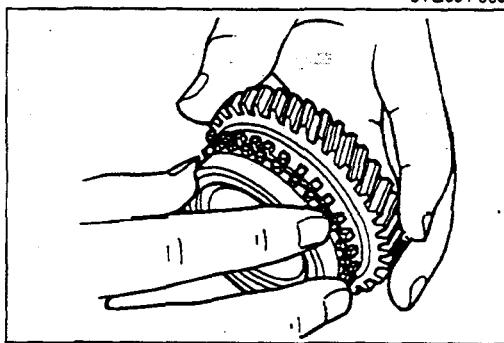
1. Inspect for clutch hub sleeve and hub operation.
2. Inspect individual gear teeth for damage, wear, and cracks.
3. Inspect synchronizer key for damage, wear, and cracks.

9TG0J1-064



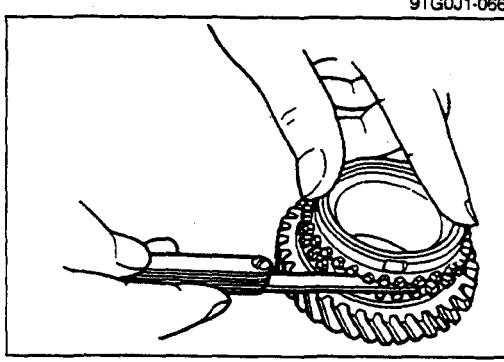
- Measure the clearance between the hub sleeve and release fork.

Clearance: 0.8mm (0.031 in) max.



Synchronizer ring

- Inspect individual synchronizer ring teeth for damage, wear, and cracks.
- Inspect taper surface for wear and cracks.

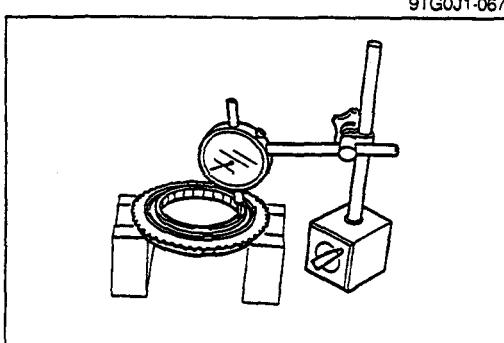


Note

- Set the synchronizer ring squarely in the gear; then measure around the circumference.

- Measure the clearance between the synchronizer ring and flank surface of gear.

Clearance: 1.0mm (0.039 in) min.

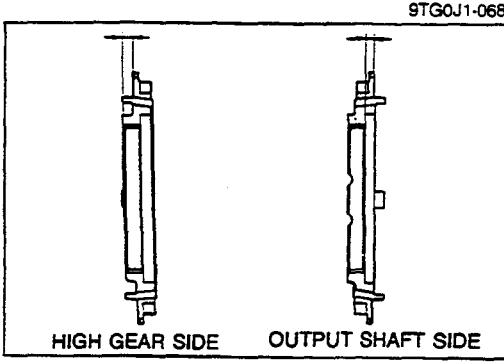


Double cone

Note

- If a problem exists, replace the assembly.

- Inspect individual teeth for damage, wear, and cracks.
- Inspect taper surface for wear and cracks.



Note

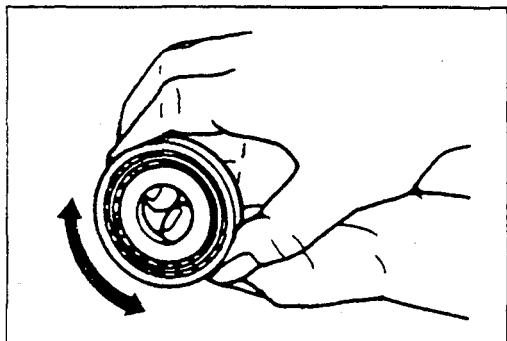
- Measure around the circumference.

- 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.

TRANSMISSION



9TG0J1-070

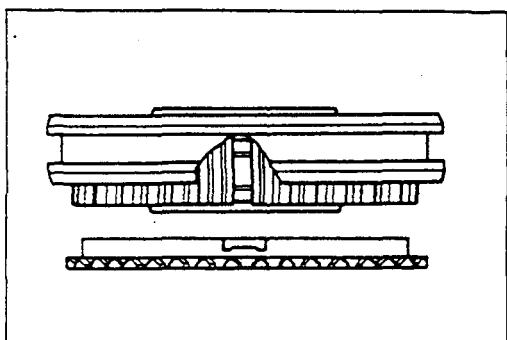
Bearing

Inspect for damage and rough rotation.

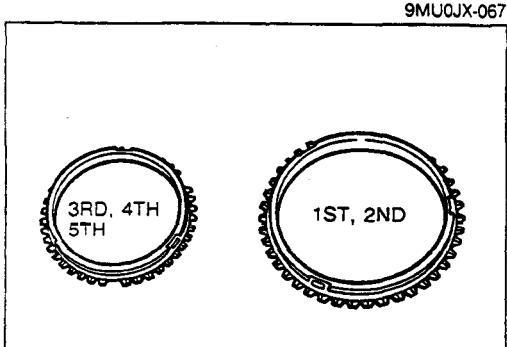
ASSEMBLY**Precaution**

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.

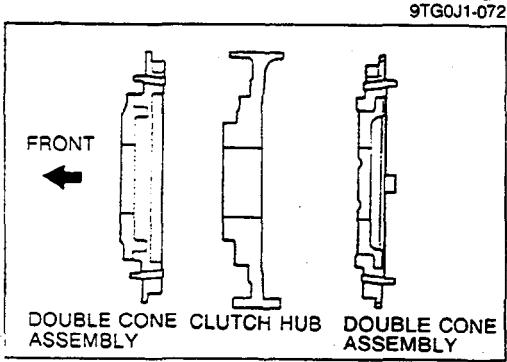
9TG0J1-071

**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) 3rd, 4th and 5th synchronizer rings are the same.
b) 1st and 2nd synchronizer rings are the same.

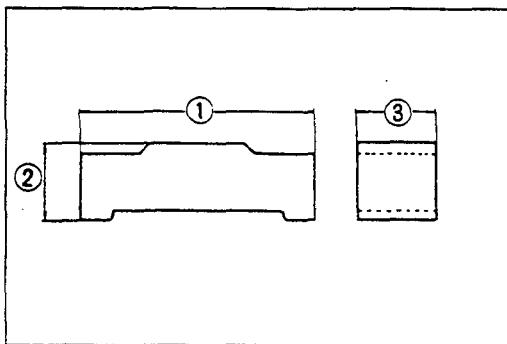


9TG0J1-073

- Install the double cones as shown in the figure.

J1

TRANSMISSION

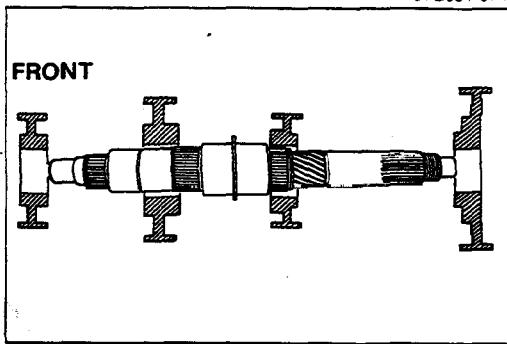


9TG0J1-074

- There are three types of synchronizer keys.

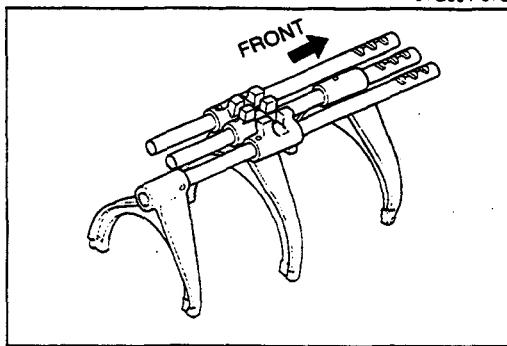
Standard dimensions are as follows:

	①	②	③	mm (in)
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.

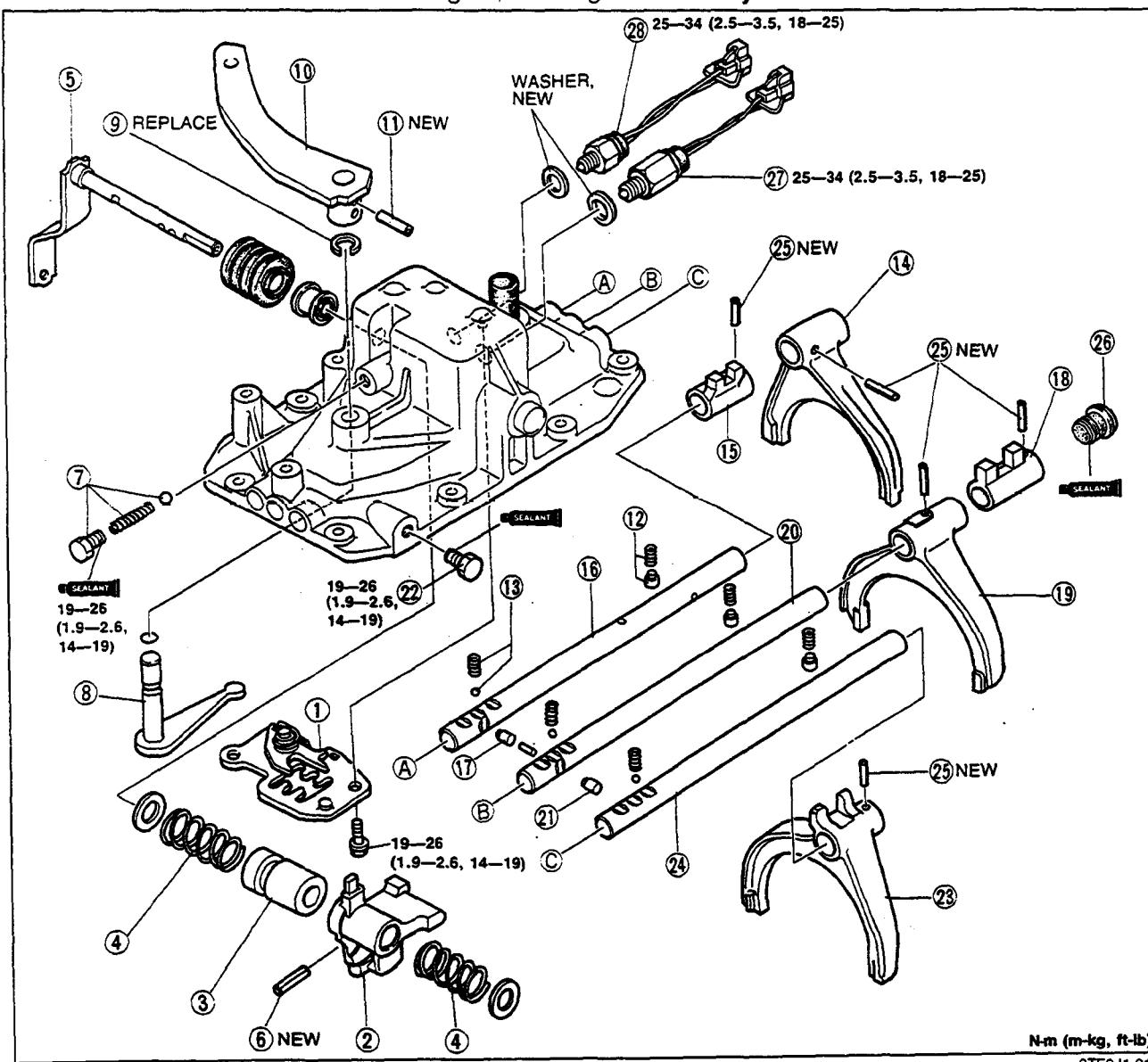


9TG0J1-076

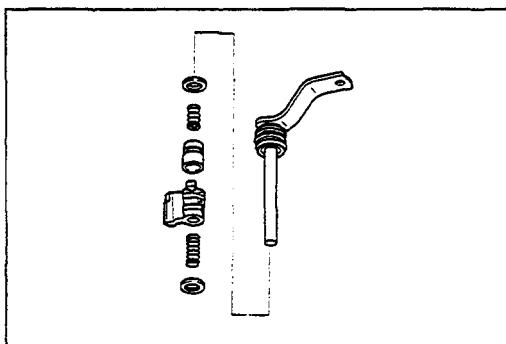
Shift fork, shift rod and shift rod end.

Note

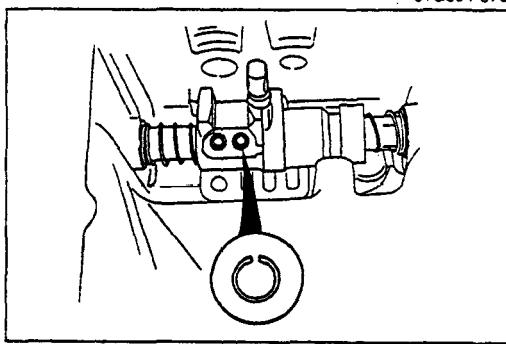
- Install the shift forks, shift rods and shift rod ends as shown in the figure.

Top Cover1. Assemble in the order shown in the figure, referring to **Assembly Note**.

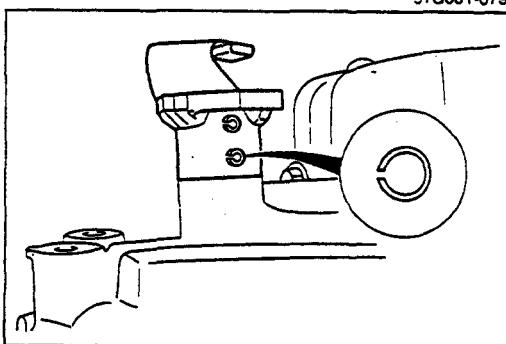
- | | | |
|------------------------------|-------------------------------|--------------------------|
| 1. Change guide plate | 10. Selector lever | 20. Shift rod |
| 2. Change lever | 11. Roll pin (selector lever) | Assembly Note |
| Assembly Note | Assembly Note | page J1-34 |
| page J1-34 | page J1-34 | |
| 3. Reverse lock stopper | 12. Spring seat and spring | 21. Interlock pin |
| Assembly Note | 13. Steel ball and spring | Assembly Note |
| page J1-34 | 14. Shift fork (5th/reverse) | page J1-34 |
| 4. Spring(s) | 15. Shift rod end | 22. Cap plug. |
| Assembly Note | 16. Shift rod | 23. Shift fork (1st/2nd) |
| page J1-34 | Assembly Note | 24. Shift rod |
| 5. Shift lever | page J1-34 | Assembly Note |
| 6. Roll pin (change lever) | 17. Interlock pin | page J1-34 |
| Assembly Note | Assembly Note | |
| page J1-34 | page J1-34 | |
| 7. Cap plug, ball and spring | 18. Shift rod end | 25. Roll pin |
| 8. Selector arm | 19. Shift fork (3rd/4th) | Assembly Note |
| 9. Snap ring | | page J1-35 |
| | | 26. Rubber plug |
| | | 27. Neutral switch |
| | | 28. Backup light switch |

**Assembly Note****Change lever, reverse lock stopper and spring**

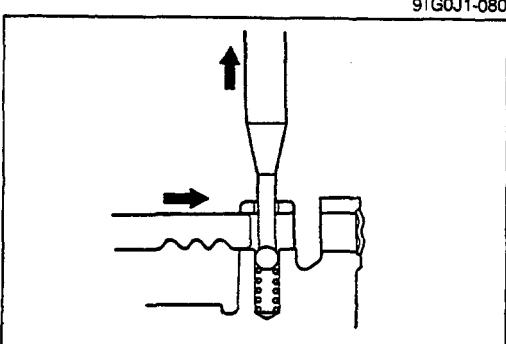
1. Install the change lever, reverse lock stopper and springs in the proper direction.

**Roll pin (change lever)**

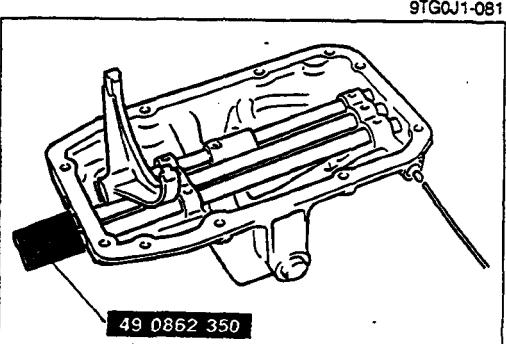
1. Install the roll pins as shown in the figure.

**Roll pin (Selector lever)**

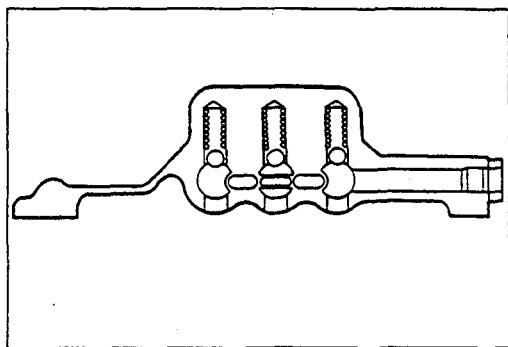
1. Install the roll pins as shown in the figure.

**Shift rod**

1. Slide the shift rod into the top cover while pushing the ball downward as shown in the figure.

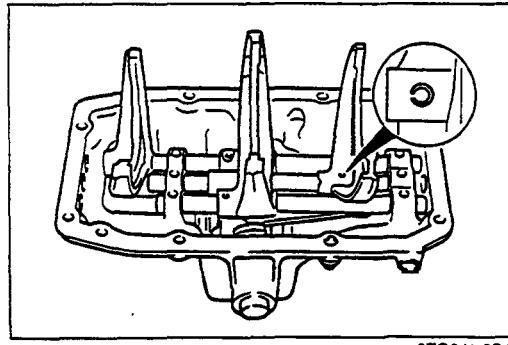
**Interlock pin**

1. Slide the SST into the top cover to guide the interlock pin, and insert the pin.

TRANSMISSION**Note**

- The interlock pins must be installed as shown.

9TG0J1-083



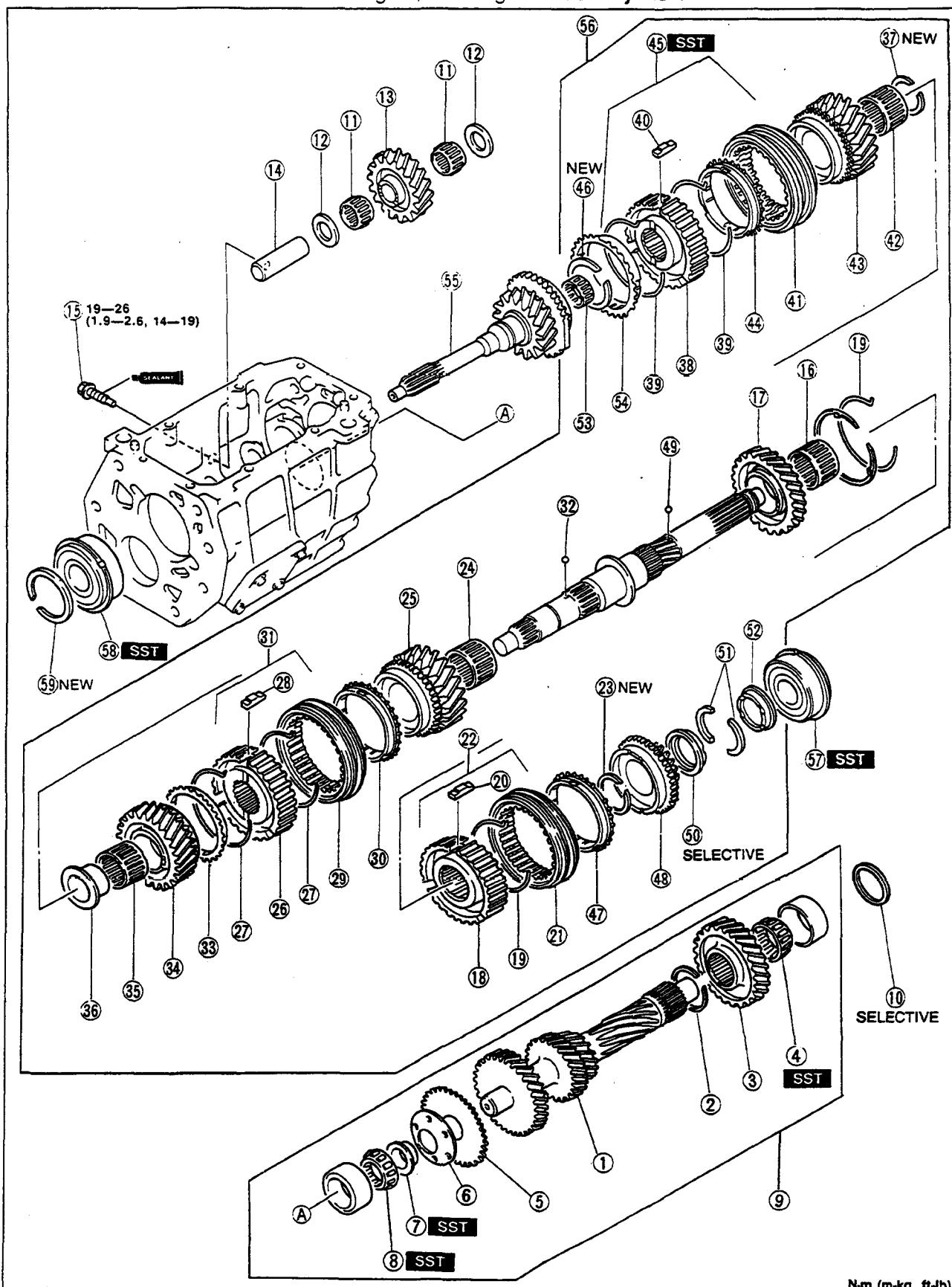
9TG0J1-084

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**.



N·m (m·kg, ft·lb)

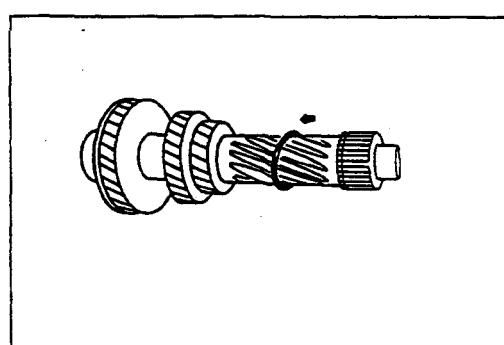
9TG0J1-085

TRANSMISSION

J1

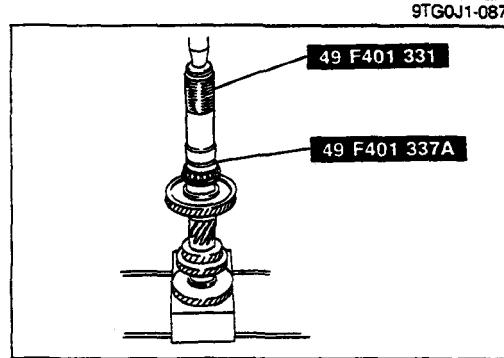
- | | | |
|-------------------------------|-----------------------------|-----------------------------|
| 1. Countershaft | 16. Needle bearing | 41. Clutch hub sleeve |
| 2. Snap ring | 17. Reverse gear | 42. Needle bearing |
| Assembly Note | 18. Clutch hub | 43. 3rd gear |
| page J1-37 | 19. Synchronizer key spring | 44. Synchronizer ring (3rd) |
| 3. Counter 5th gear | 20. Synchronizer key | 45. Clutch hub assembly |
| 4. Countershaft rear bearing | 21. Clutch hub sleeve | (3rd/4th) |
| Assembly Note | 22. Clutch hub assembly | Assembly Note |
| page J1-37 | (5th/reverse) | page J1-39 |
| 5. Friction gear | 23. Snap ring | 46. Snap ring |
| 6. Diaphragm spring | 24. Needle bearing | 47. Synchronizer ring (5th) |
| 7. Spacer | 25. 1st gear | 48. 5th gear |
| Assembly Note | 26. Clutch hub | 49. Steel ball |
| page J1-38 | 27. Synchronizer key spring | 50. Thrust lock washer |
| 8. Countershaft front bearing | 28. Synchronizer key | Assembly Note |
| Assembly Note | 29. Clutch hub sleeve | page J1-39 |
| page J1-38 | 30. Synchronizer ring (1st) | 51. C-washer |
| 9. Countershaft assembly | 31. Clutch hub assembly | 52. Retaining ring |
| Assembly Note | (1st/2nd) | 53. Needle bearing |
| page J1-38 | 32. Steel ball | 54. Synchronizer ring (4th) |
| 10. Adjustment shim | 33. Synchronizer ring (2nd) | 55. Main drive gear |
| Assembly Note | 34. 2nd gear | 56. Mainshaft assembly |
| page J1-38 | 35. Needle bearing | 57. Mainshaft bearing |
| 11. Needle bearing | 36. Gear sleeve. | Assembly Note |
| 12. Thrust washer | 37. Snap ring | page J1-39 |
| 13. Reverse idler gear | 38. Clutch hub | 58. Main drive gear bearing |
| 14. Reverse idler gear shaft | 39. Synchronizer key spring | Assembly Note |
| 15. Mounting bolt | 40. Synchronizer key | page J1-40 |
| Assembly Note | | |
| page J1-39 | | |

9TF0J1-015



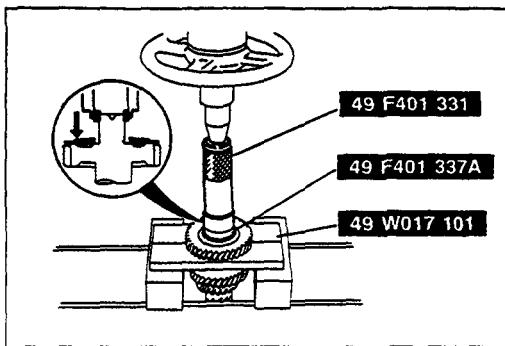
**Assembly Note
Snap ring**

1. Install a new snap ring as shown in the figure.

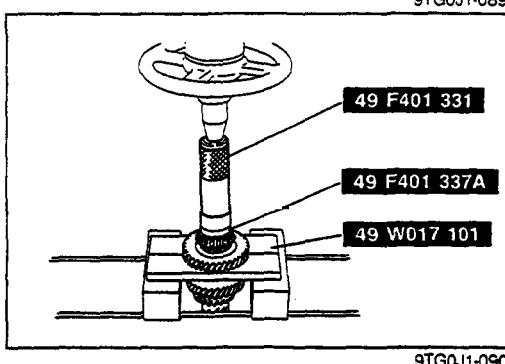


Countershaft rear bearing

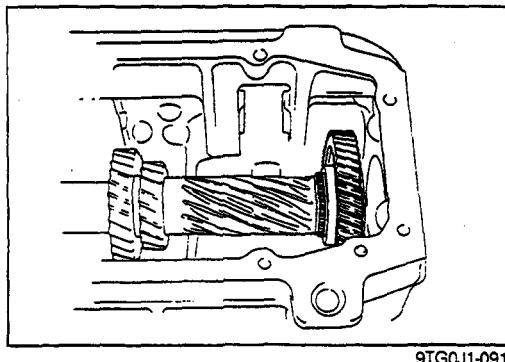
1. Press the bearing inner race onto the countershaft with the SST.

**Spacer**

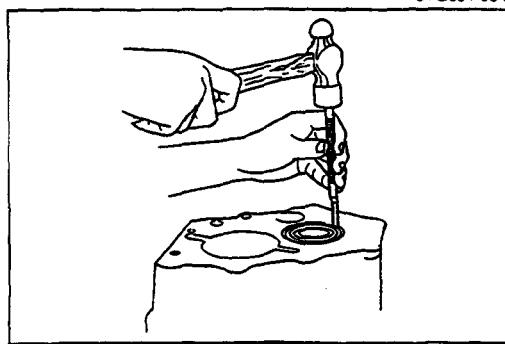
1. Install the new spacer with the **SST**.

**Countershaft front bearing**

1. Press the bearing inner race onto the countershaft with the **SST**.

**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.

**Adjustment shim**

1. Install the clutch housing.

Tightening torque:

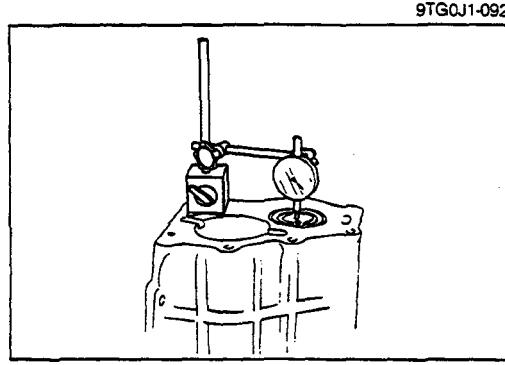
120—155 N·m (12.2—15.8 m·kg, 88—114 ft·lb)

2. Drive in the rear bearing outer race with a punch or similar tool.

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)**



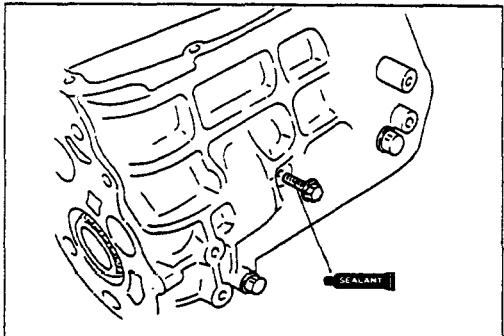
Adjustment shim thickness

mm (in)

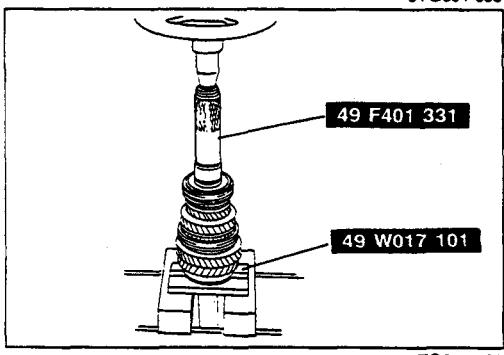
0.50 (0.020)	0.55 (0.022)	0.60 (0.024)
0.65 (0.026)	0.70 (0.028)	0.75 (0.030)
0.80 (0.031)	0.85 (0.033)	0.90 (0.035)
0.95 (0.037)	1.00 (0.039)	1.05 (0.041)
1.10 (0.043)	1.15 (0.045)	1.20 (0.047)
1.25 (0.049)	1.30 (0.051)	1.35 (0.053)
1.40 (0.055)	1.45 (0.057)	1.50 (0.059)

4. Remove the clutch housing.

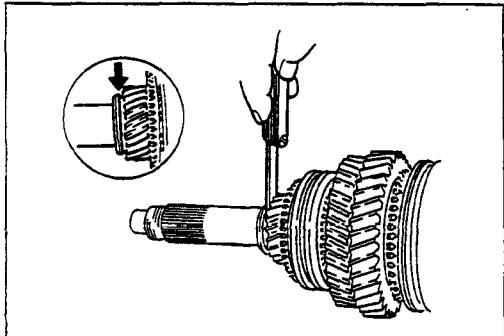
9TG0J1-094



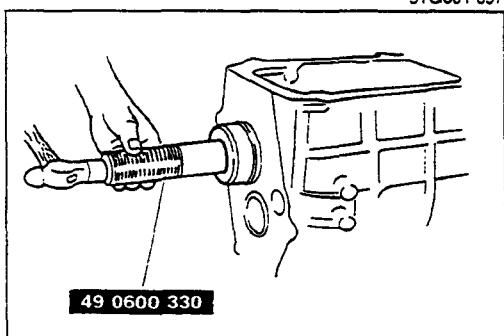
9TG0J1-095



9TG0J1-096



9TG0J1-097



9TG0J1-098

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)****Clutch hub assembly (3rd/4th)**

1. Set the mainshaft with a press.
2. Install the clutch hub assembly with the **SST**.

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.

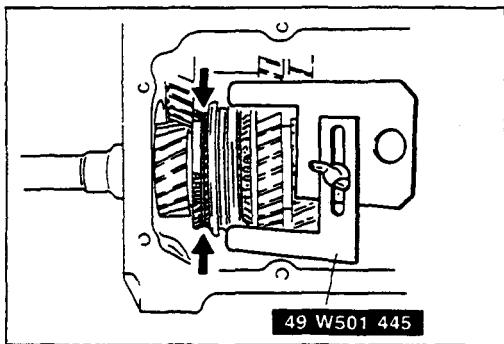
Standard: 0.35—0.45mm (0.014—0.018 in)**Thrust lock washer thickness**

mm (in)

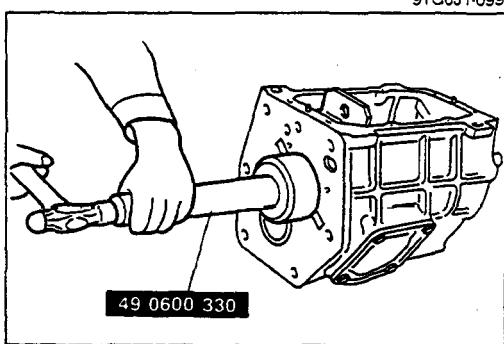
5.0 (0.197)	5.1 (0.201)	5.2 (0.205)
5.3 (0.209)	5.4 (0.213)	5.5 (0.217)

Mainshaft bearing

1. Install the mainshaft bearing with the **SST**.

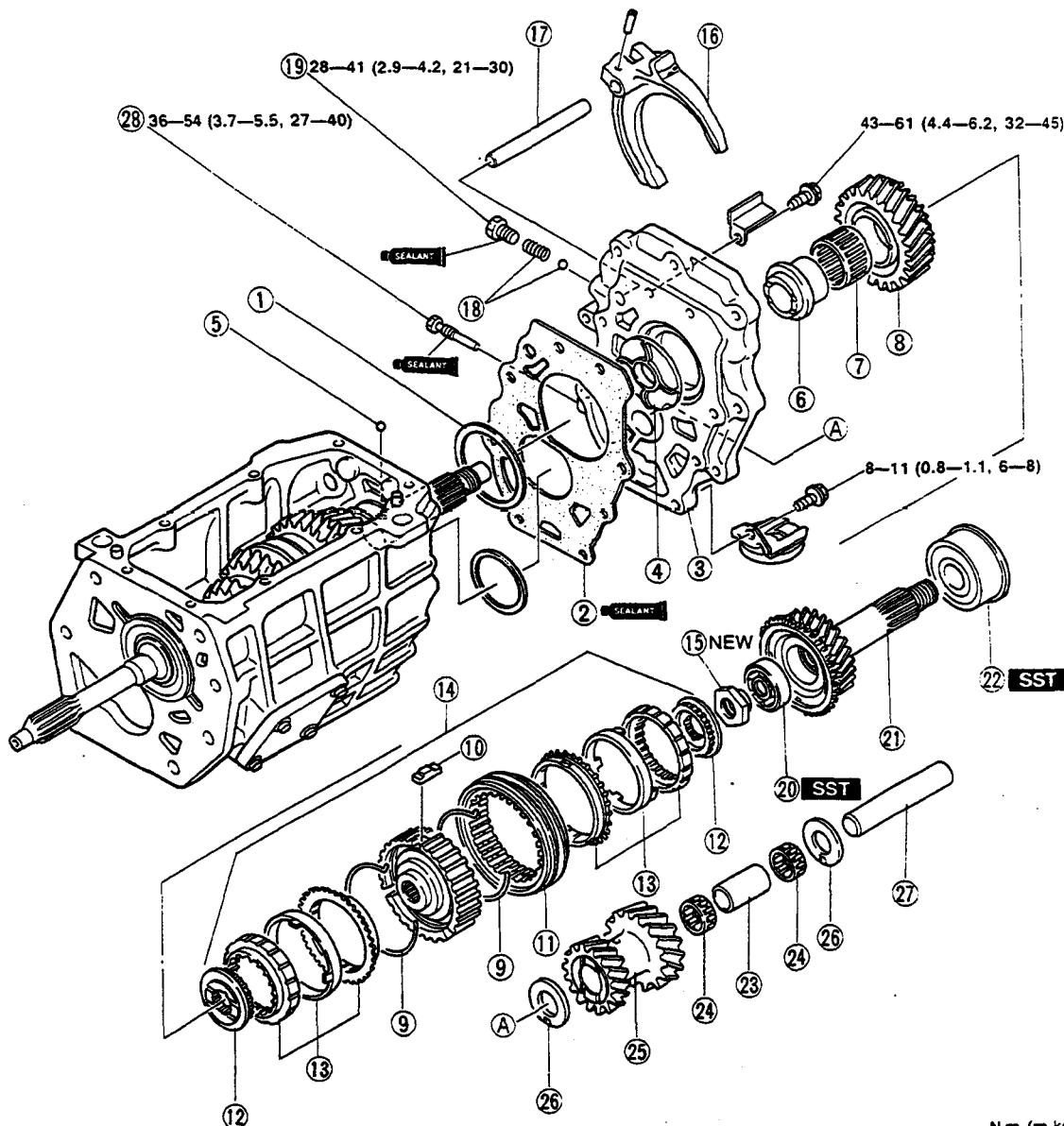
**Main drive gear bearing**

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**.

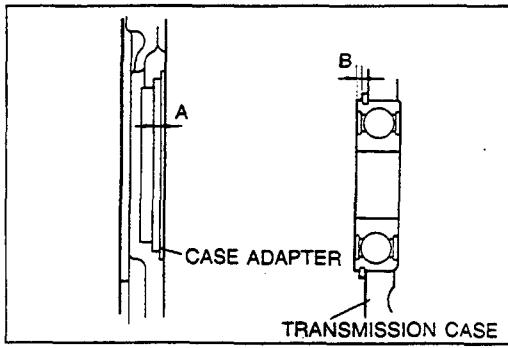
9TG0J1-100

Sub-transmission Parts1. Assemble in the order shown in the figure, referring to **Assembly Note**.

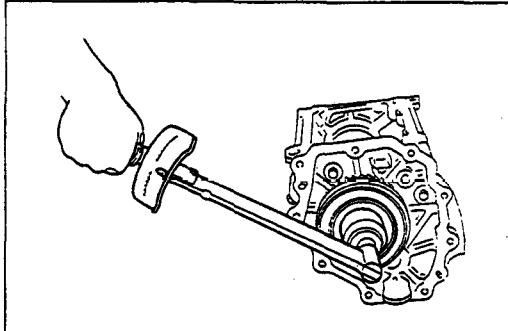
N·m (m·kg, ft·lb)

9TF0J1-016

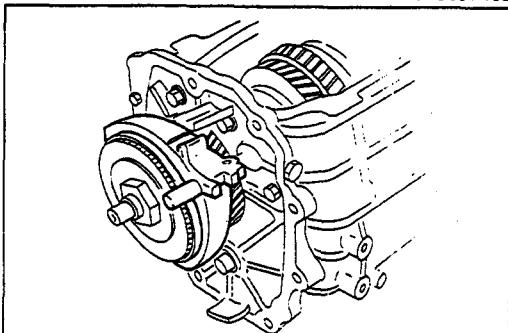
1. Adjustment shim
Assembly Note page J1-42
2. Gasket page J1-42
3. Case adapter page J1-42
4. Scoop ring page J1-42
5. Steel ball page J1-42
6. Gear sleeve page J1-42
7. Needle bearing page J1-42
8. High gear page J1-42
9. Synchronizer key spring page J1-42
10. Synchronizer key page J1-42
11. Clutch hub sleeve page J1-42
12. Inner cone hub page J1-42
13. Double cone assembly page J1-42
14. Clutch hub assembly page J1-42
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 page J1-42
19. Cap plug page J1-42
20. Bearing
Assembly Note page J1-42
21. Output shaft page J1-42
22. Output shaft bearing
Assembly Note page J1-42
23. Spacer page J1-42
24. Needle bearing page J1-42
25. Counter high gear page J1-42
26. Thrust washer page J1-42
27. Counter gear shaft page J1-42
28. Mounting bolt
Assembly Note page J1-43



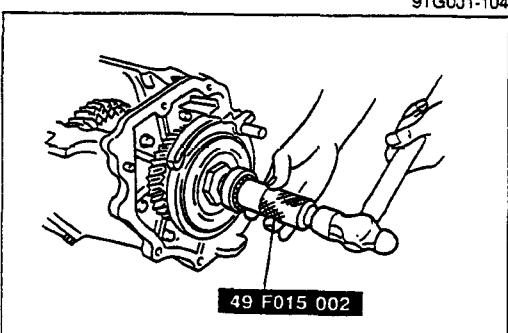
9TG0J1-102



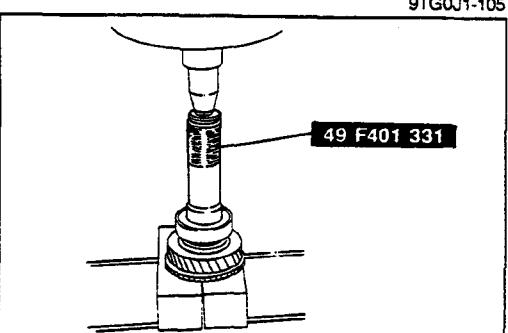
9TG0J1-103



9TG0J1-104



9TG0J1-105



9TG0J1-106

Assembly Note

Adjustment shim

- 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

- Slide the clutch hub sleeves onto 1st and reverse gears to lock the mainshaft.
- Tighten the new locknut.

Tightening torque:

157—235 N·m (16—24 m·kg, 116—174 ft·lb)

- Use a chisel to stake the locknut.

Shift fork and shift rod

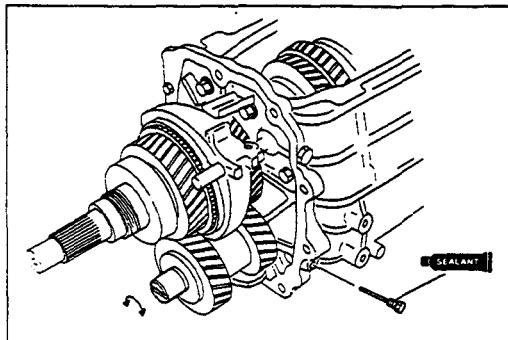
- Install the shift fork and shift rod into the case adapter.

Bearing

- Install the bearing with the **SST**.

Output shaft bearing

- Install the bearing with the **SST**.



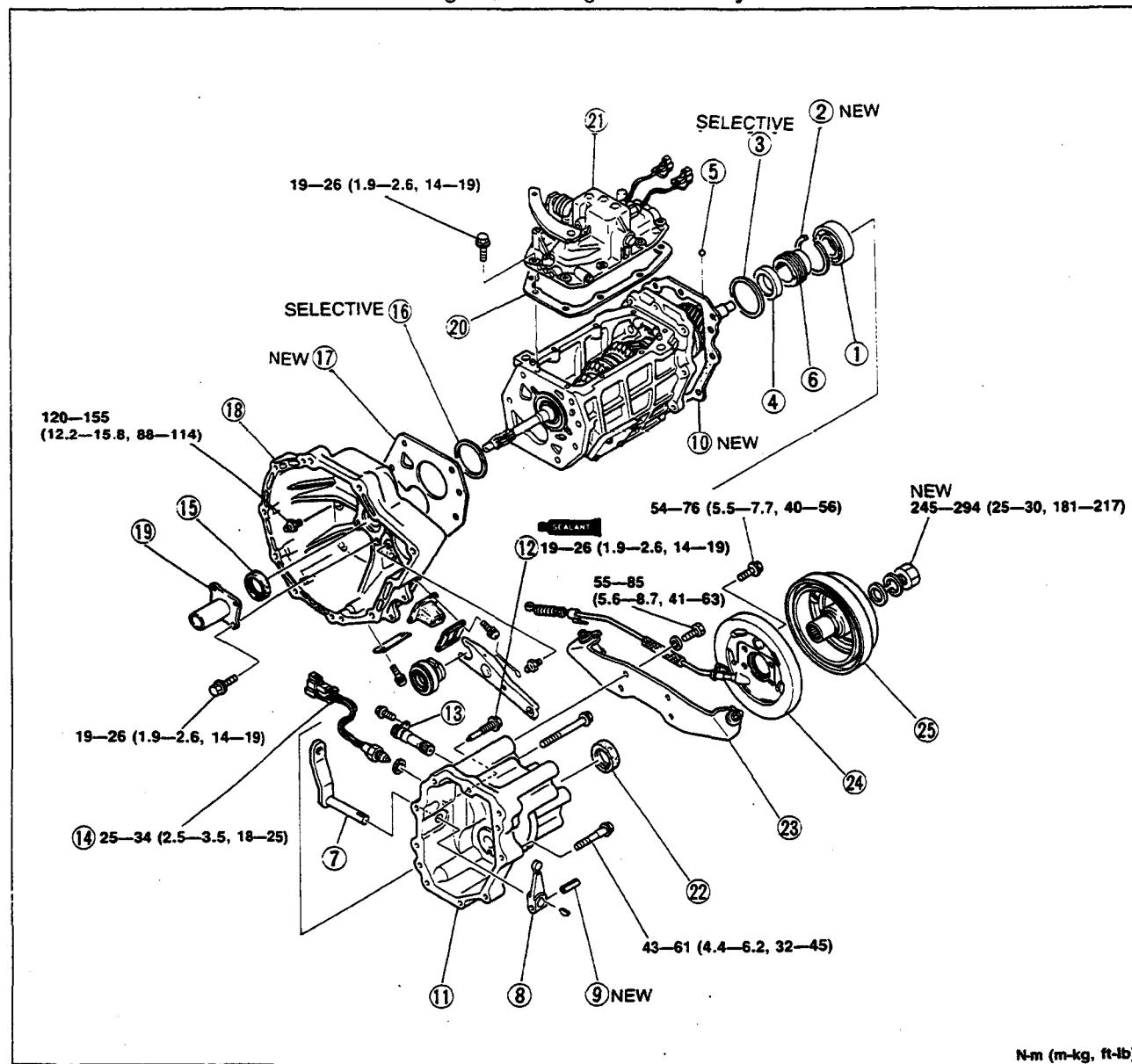
9TG0J1-107

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:

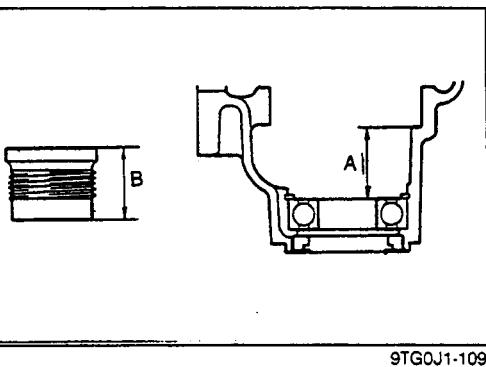
36—54 N·m (3.7—5.5 m·kg, 27—40 ft-lb)

Housing Components1. Assemble in the order shown in the figure, referring to **Assembly Note**.

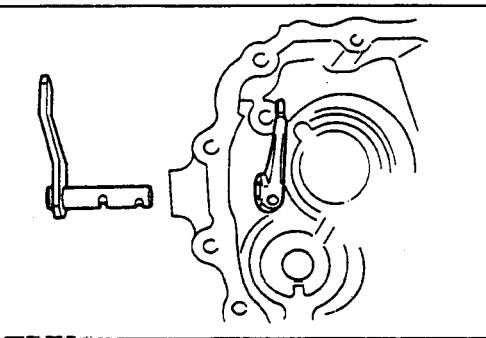
N·m (m·kg, ft·lb)

9TF0J1-017

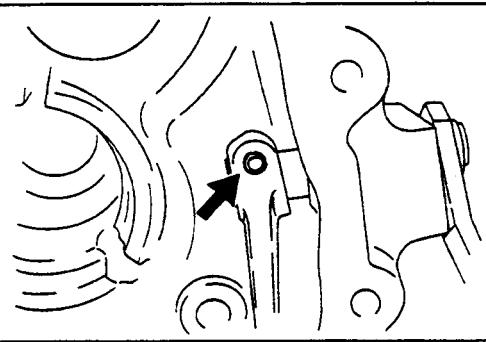
- | | | |
|---------------------------|-----------------------------|---------------------------|
| 1. Bearing | 9. Roll pin | 17. Gasket |
| 2. Snap ring | Assembly Note | 18. Clutch housing |
| 3. Adjustment shim | page J1-45 | 19. Front cover |
| Assembly Note | page J1-45 | 20. Gasket |
| 4. Spacer | 10. Gasket | 21. Top cover |
| 5. Steel ball | 11. Rear housing | 22. Oil seal |
| 6. Speedometer drive gear | Assembly Note | Assembly Note |
| 7. Outer shift lever | page J1-45 | page J1-46 |
| Assembly Note | 12. Lock bolt | 23. Transmission mount |
| 8. Inner shift lever | Assembly Note | 24. Center brake assembly |
| Assembly Note | page J1-45 | 25. Center brake drum |
| page J1-45 | 13. Speedometer driven gear | Assembly Note |
| page J1-45 | 14. Sub-transmission switch | page J1-46 |
| page J1-45 | 15. Oil seal | |
| page J1-45 | 16. Adjustment shim | |
| | Assembly Note | |
| | page J1-46 | |



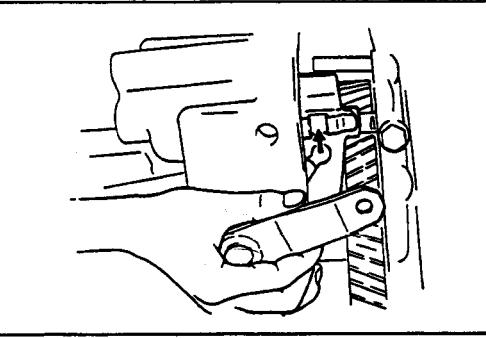
9TG0J1-109



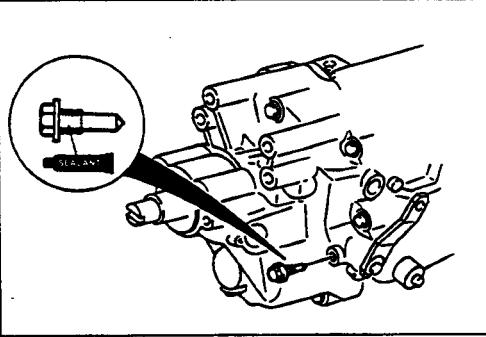
9TG0J1-110



9TG0J1-111



9TG0J1-112



9TG0J1-113

Assembly Note Adjustment shim

- 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)	

Outer and inner shift lever

- Install the shift lever as shown in the figure.

Roll pin

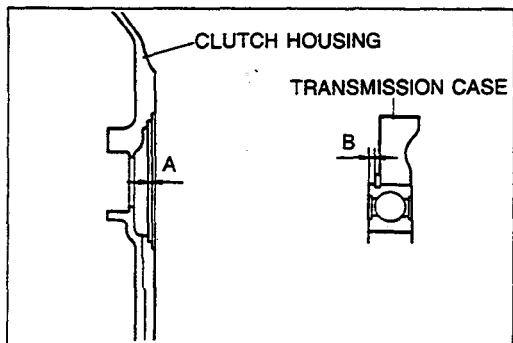
- Install the roll pin as shown in the figure.

Rear housing

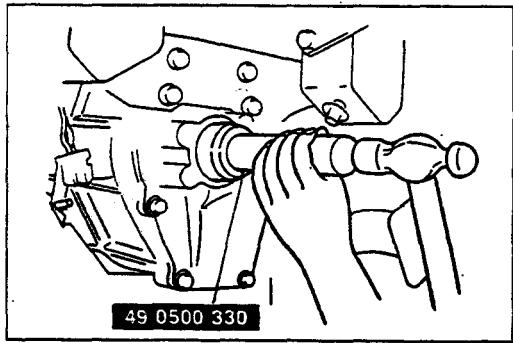
- Align the thrust washer silent of the counter gear and the rear housing groove.
- Align the inner shift lever and shift fork groove, and install the rear housing.

Lock bolt

- Align the shift lever groove with the lock bolt hole, and install the lock bolt.

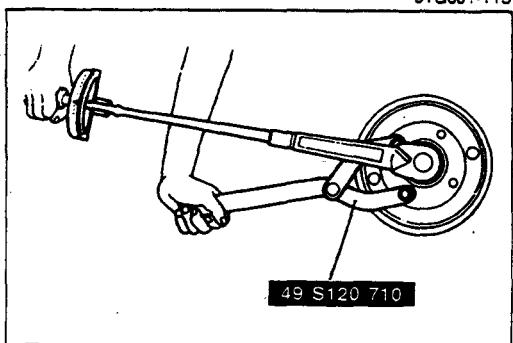


9TG0J1-114



49 0500 330

9TG0J1-115



49 S120 710

9TG0J1-116

Adjustment shim

- 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

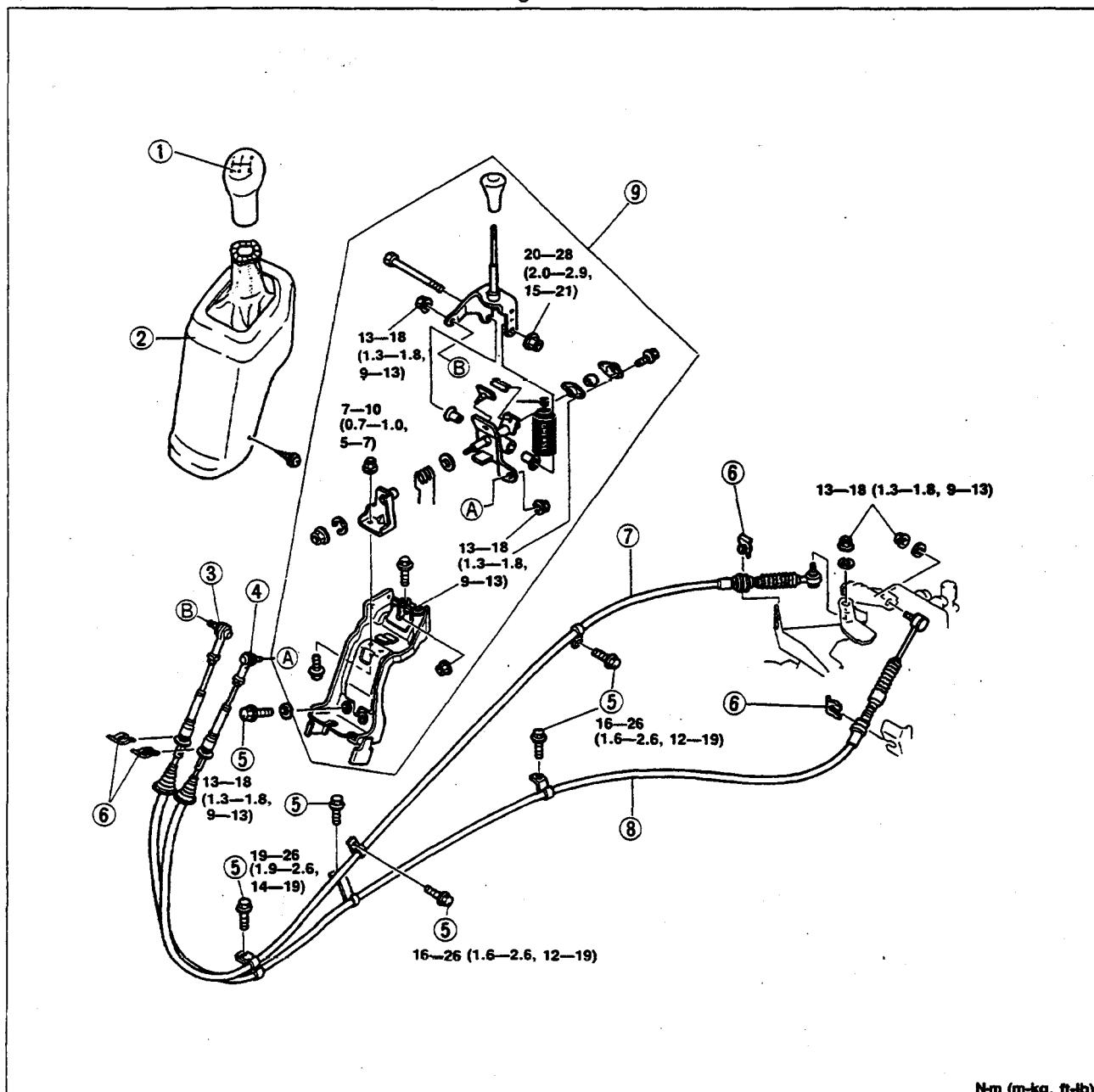
1. Install the center brake drum.
2. Hold the drum with the **SST**, and tighten the locknut.

SHIFT MECHANISM (TRANSMISSION)

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**.

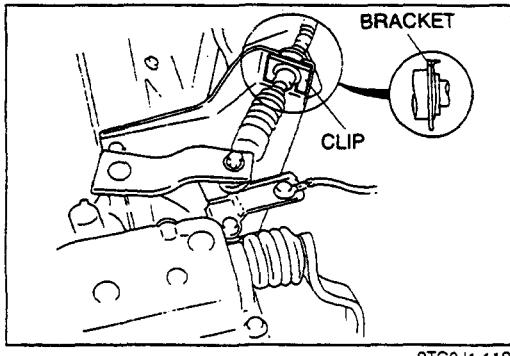


1. Shift knob
Installation Note page J1-48
2. Console
3. Shift cable ball joint
Installation Note page J1-48
4. Selector cable ball joint
Installation Note page J1-48
5. Bolt

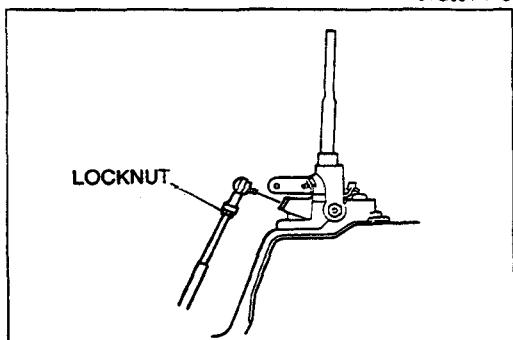
6. Clip
Installation Note page J1-48
7. Selector cable
Inspect boots for damage
Inspect cable for damage and function
8. Shift cable
Inspect boots for damage
Inspect cable for damage and function
9. Shift lever assembly

N·m (m·kg, ft·lb)

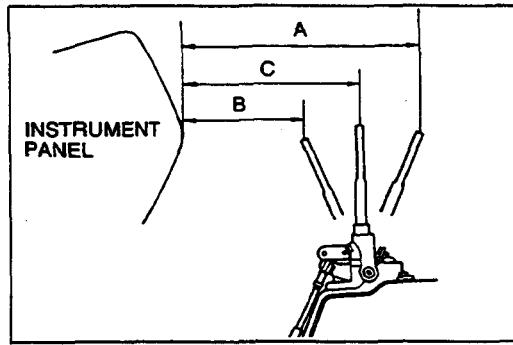
9TF0J1-018

**Installation Note****Clips**

1. Install the clips as shown in the figure.



9TG0J1-122



9TG0J1-123

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)

Shift cable ball joint

1. Measure A and B shown in the figure.
2. Calculate the neutral position of the shift lever as follows:

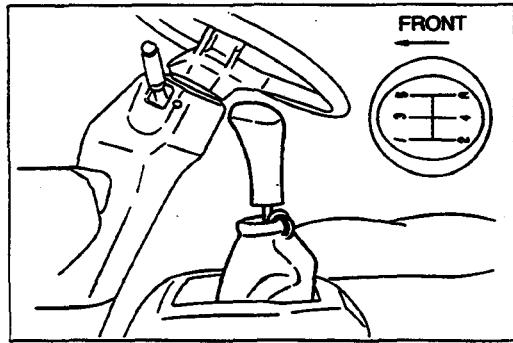
$$\text{Neutral position C} = \text{B} + \frac{\text{A} - \text{B}}{2}$$

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)

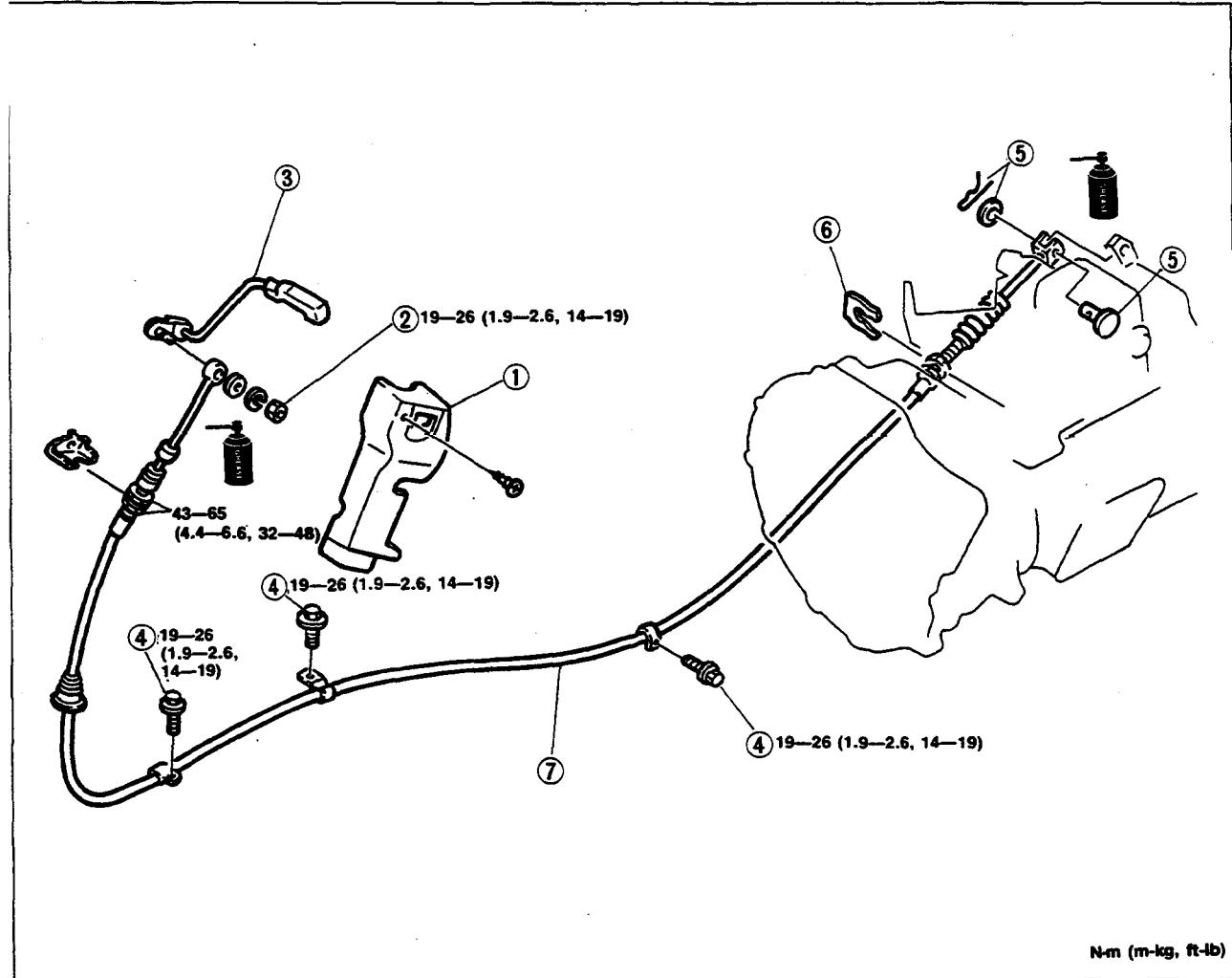
7. After installation, verify that the shift lever operates smoothly.

**Shift knob**

1. Install the shift knob as shown in the figure.

SHIFT MECHANISM (SUB-TRANSMISSION)**REMOVAL / INSTALLATION**

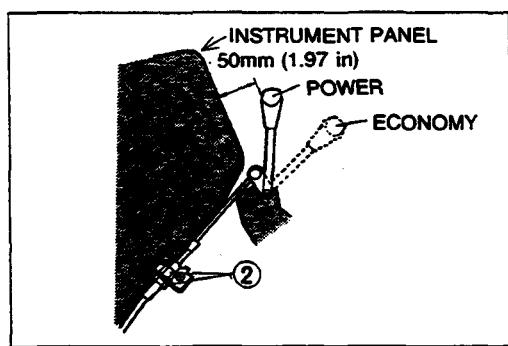
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal, referring to **Installation Note**.



N·m (m·kg, ft-lb)

9TG0J1-019

- | | |
|--|---|
| 1. Steering column cover | 6. Clip
Installation Note page J1-48 |
| 2. Nut
Installation Note page J1-49 | 7. Sub-selector cable
Inspect boot for damage
Inspect cable for damage and function |
| 3. Selector lever | |
| 4. Bolt | |
| 5. Spring pin and pin | |



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)

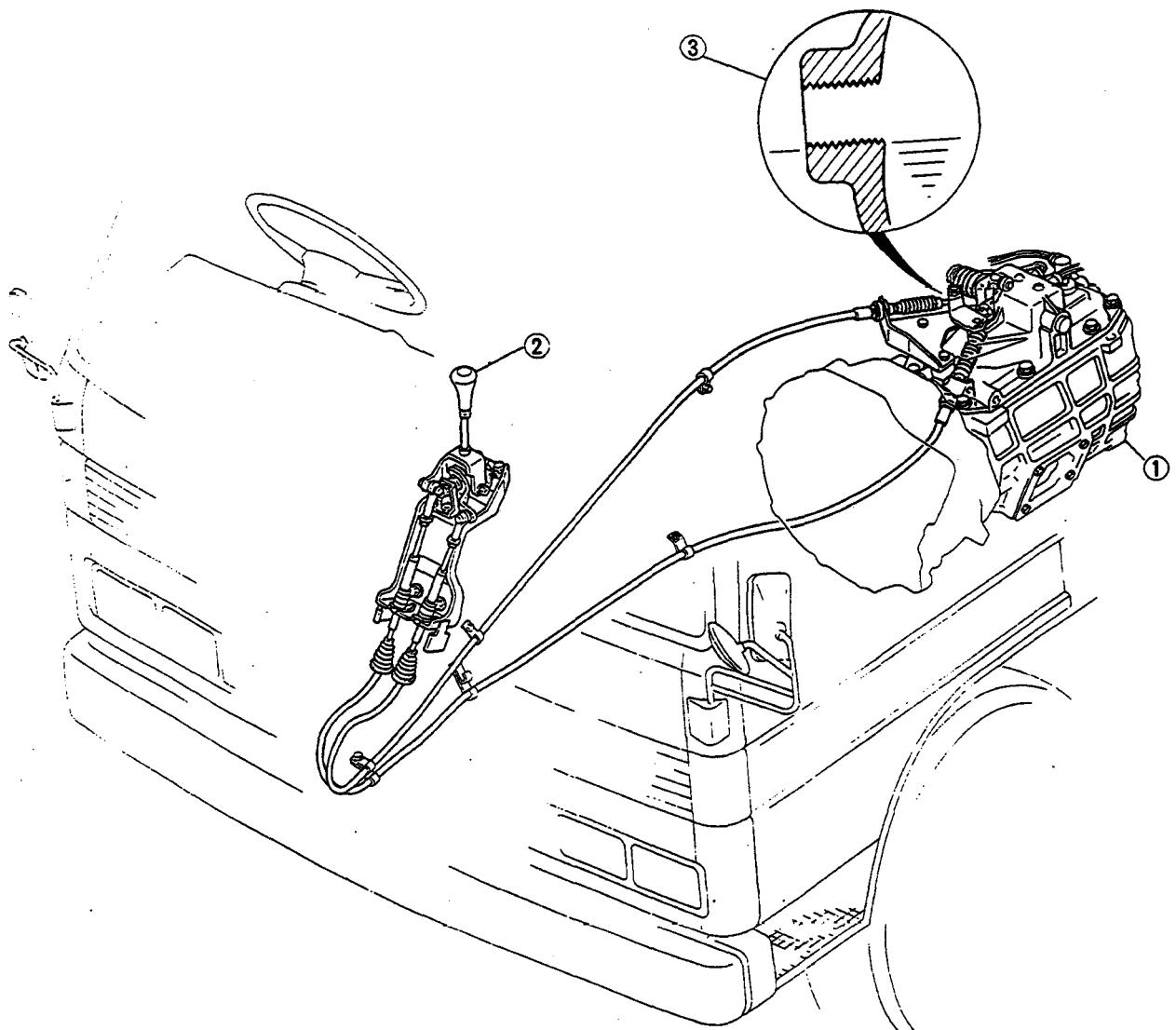
MANUAL TRANSMISSION (Z5M-R)

INDEX.....	J2- 2
OUTLINE	J2- 4
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
REMOVAL / INSTALLATION.....	J2-14
DISASSEMBLY	J2-18
INSPECTION	J2-30
ASSEMBLY	J2-33
SHIFT MECHANISM (TRANSMISSION)	J2-47
REMOVAL / INSTALLATION	J2-47
SHIFT MECHANISM (SUB-TRANSMISSION) J2-49	
REMOVAL / INSTALLATION	J2-49

9TG0J2-001

INDEX**WITHOUT SUB-TRANSMISSION**GRADE: API SERVICE GL-4 OR GL-5
SAE 75W-90

CAPACITY: 4.5 liters (4.8 US qt, 4.0 Imp qt)



9TG0J2-002

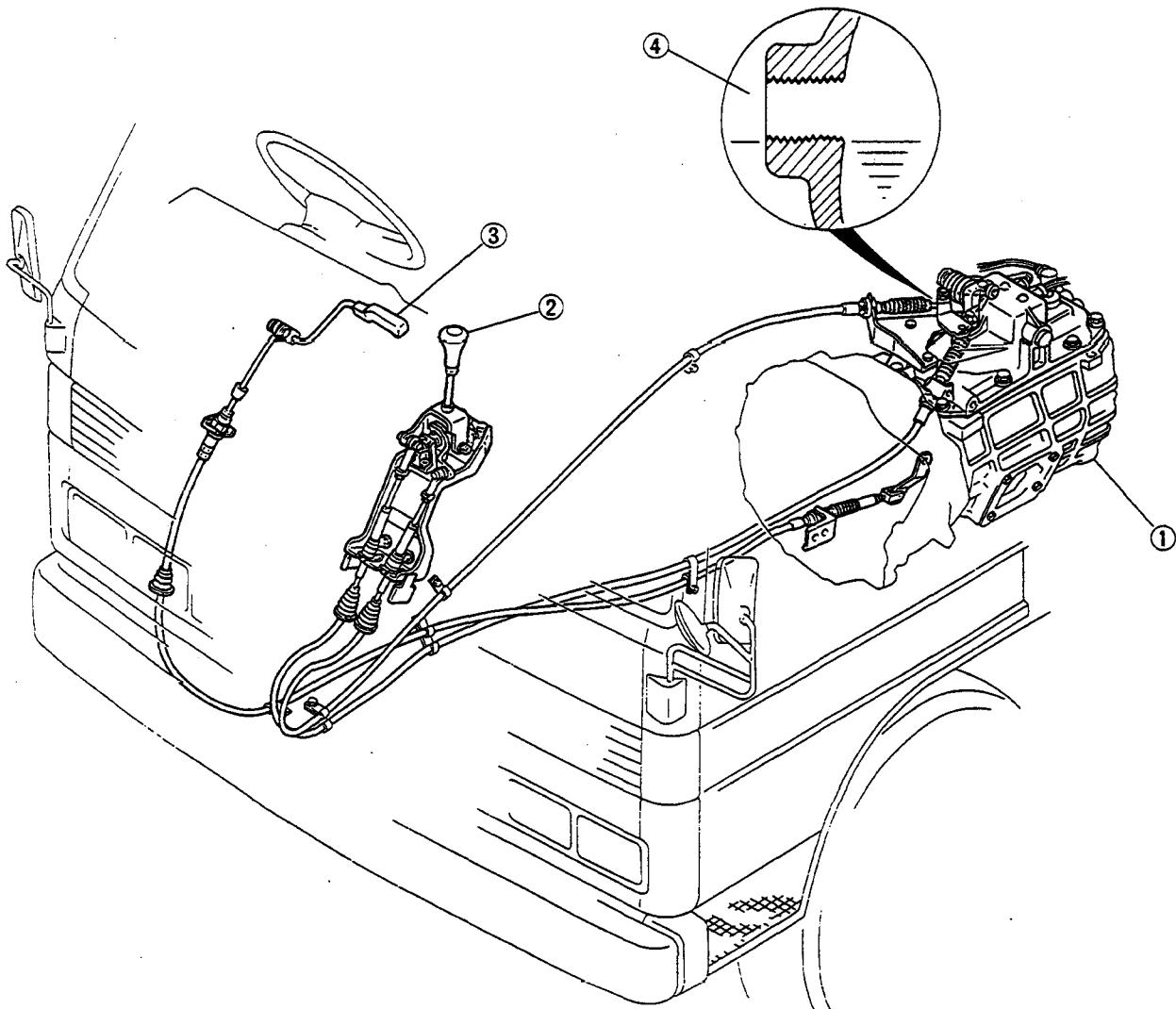
- | | |
|---|---|
| 1. Transmission | 2. Shift mechanism (Transmission) |
| Removal / Installation page J2-14 | Removal / Installation page J2-47 |
| Disassembly page J2-18 | 3. Transmission oil |
| Inspection page J2-30 | Inspection page J2-13 |
| Assembly page J2-33 | Replacement page J2-13 |

INDEX**WITH SUB-TRANSMISSION**

GRADE: API SERVICE GL-4 OR GL-5

SAE 75W-90

CAPACITY: 4.2 liters (4.4 US qt, 3.7 Imp qt)



9TG0J2-003

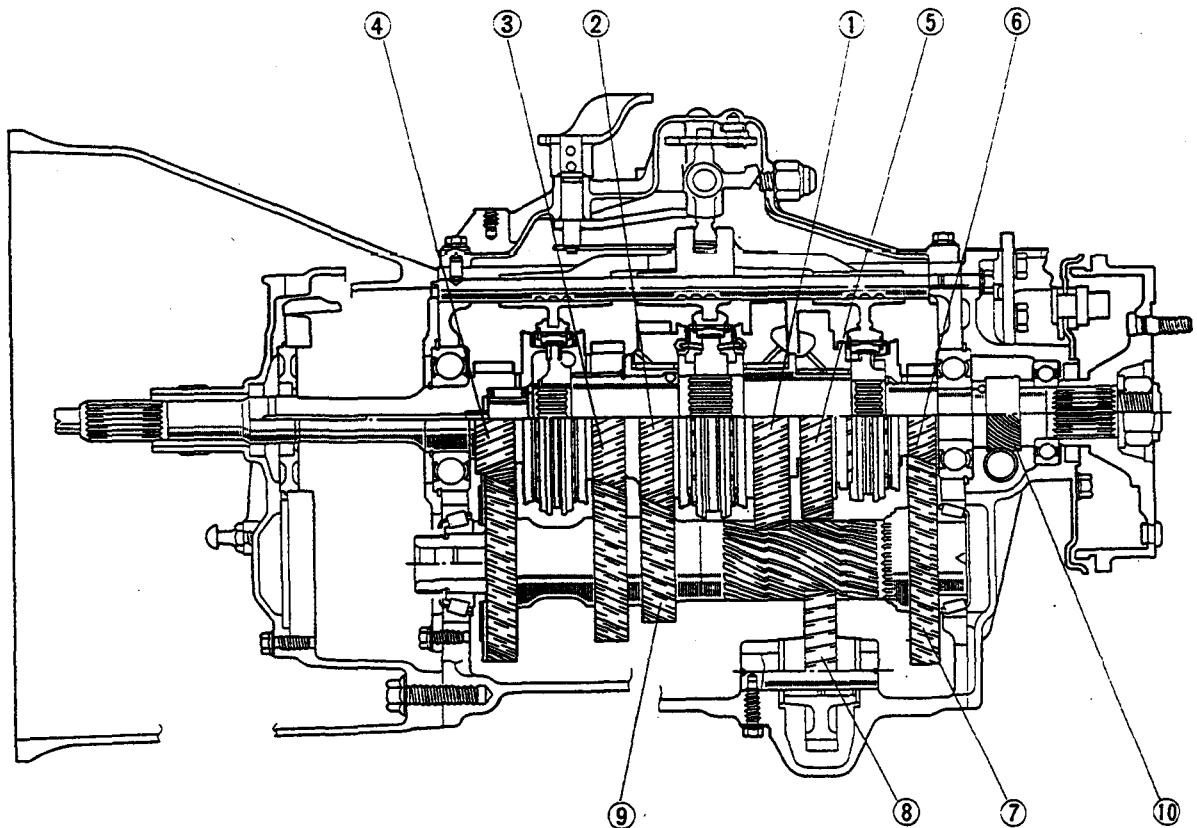
1. Transmission
 - Removal / Installation page J2-14
 - Disassembly page J2-18
 - Inspection page J2-30
 - Assembly page J2-33
2. Shift mechanism (Transmission)
Removal / Installation page J2-47
3. Shift mechanism (Sub-transmission)
Removal / Installation page J2-49
4. Transmission oil
 - Inspection page J2-13
 - Replacement page J2-13

OUTLINE

SPECIFICATIONS

Item	Engine	Transmission model		
		Z5M-R		
		Without Sub-Transmission	With Sub-Transmission	
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	—	
		Power	—	
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**

- 1. 1st gear
- 2. 2nd gear
- 3. 3rd gear
- 4. Main drive gear (4th gear)

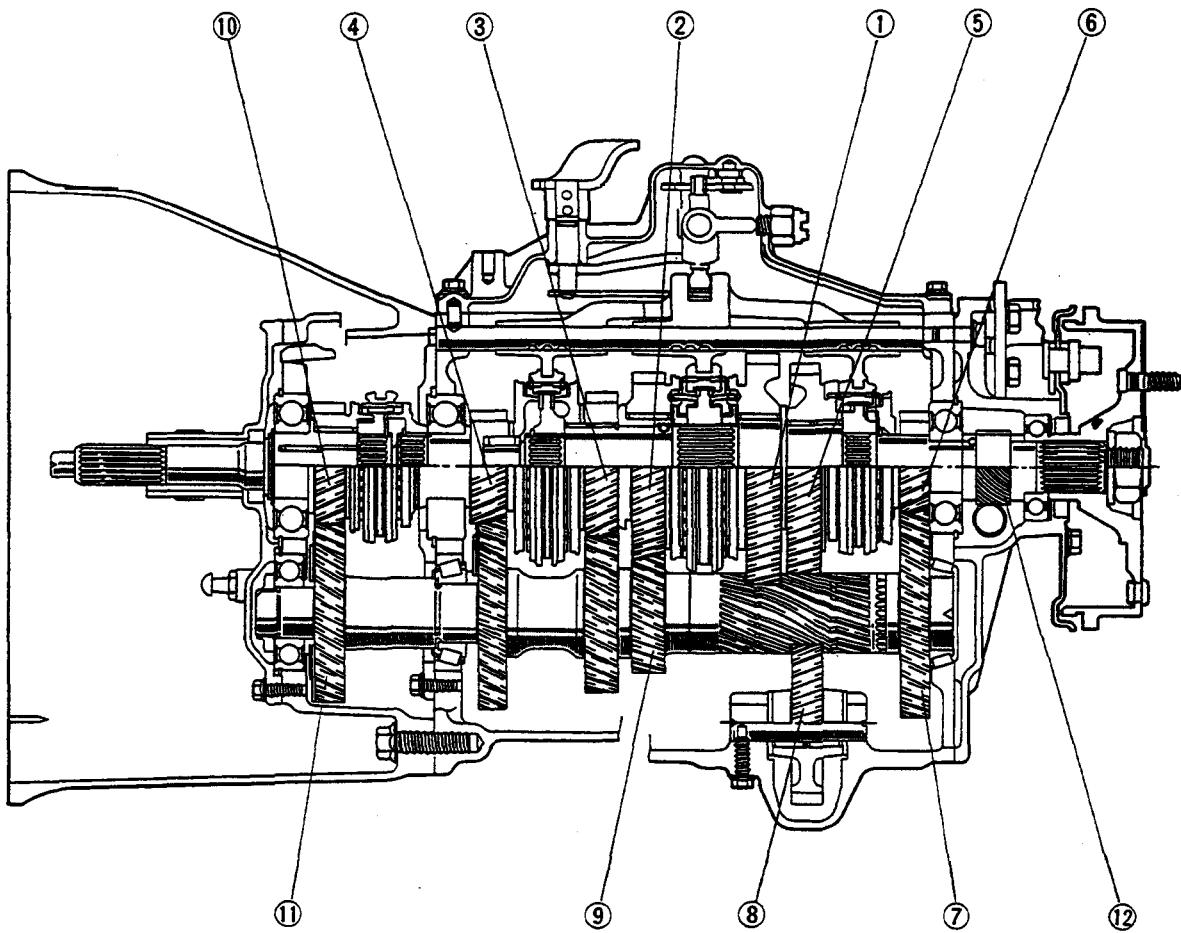
- 5. Reverse gear
- 6. 5th gear
- 7. Counter 5th gear

- 8. Reverse idler gear
- 9. Countershaft gear
- 10. Speedometer drive gear

9TG0J2-005

STRUCTURAL VIEW

WITH SUB-TRANSMISSION



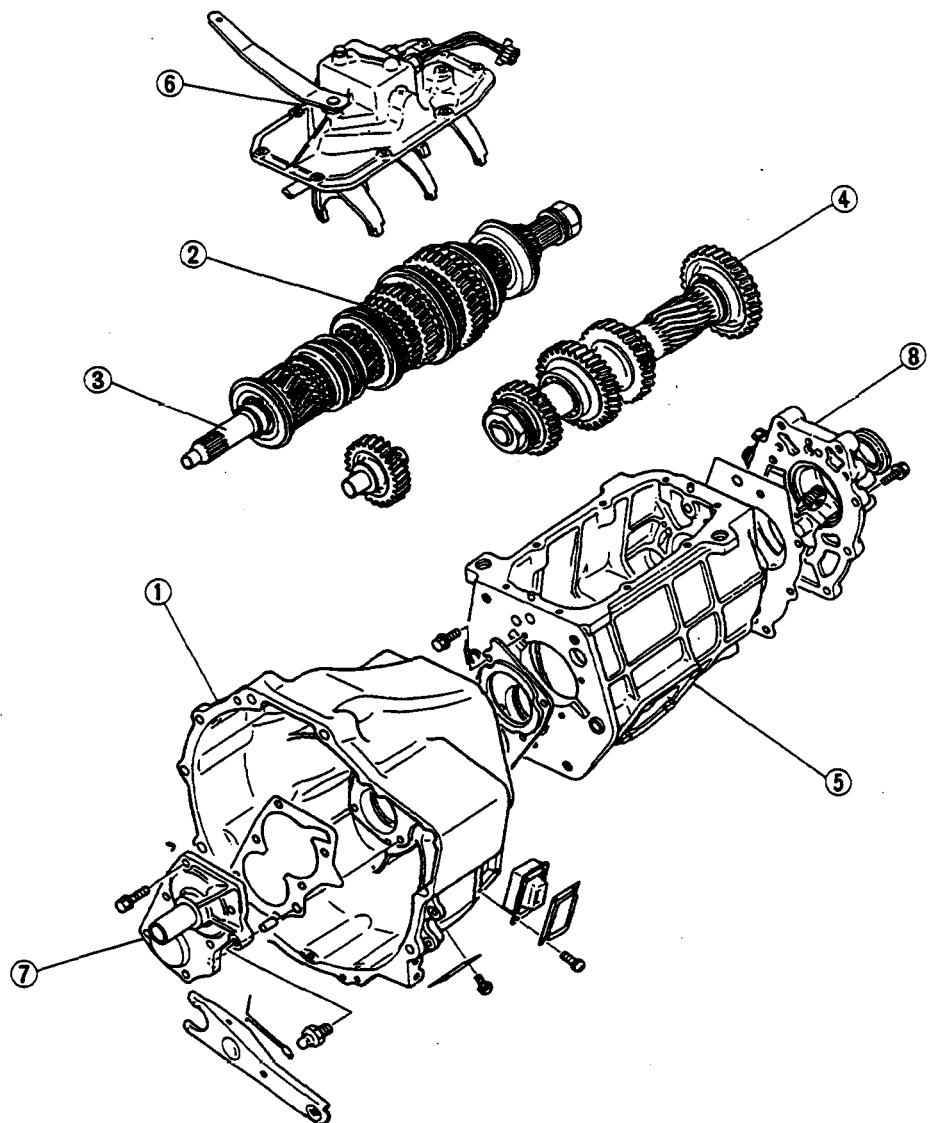
1. 1st gear
2. 2nd gear
3. 3rd gear
4. Main drive gear (4th gear)

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

9TG0J2-006

COMPONENTS



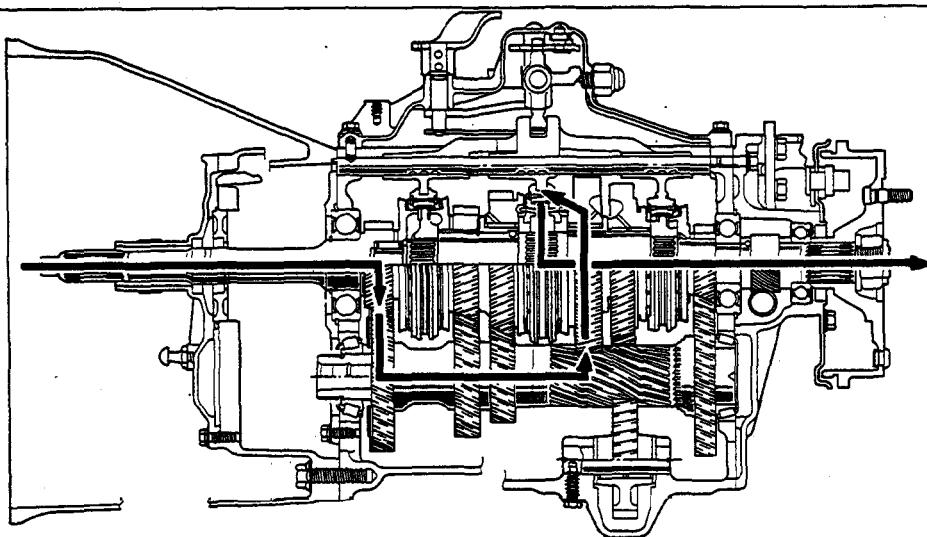
1. Clutch housing
2. Mainshaft assembly
3. High gear
4. Countershaft assembly

5. Transmission case
6. Top cover assembly
7. Front cover
8. Rear cover

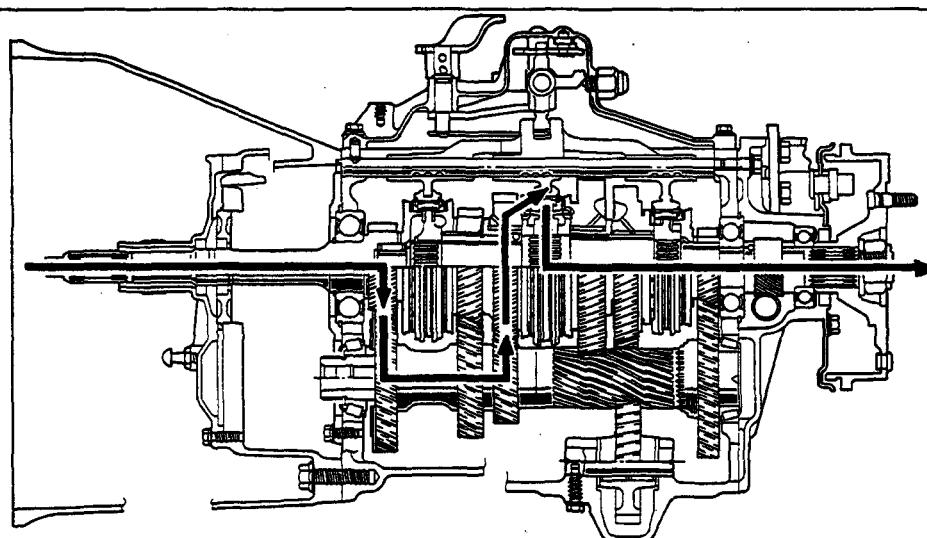
9TG0J2-007

**POWERFLOW
Without Sub-Transmission**

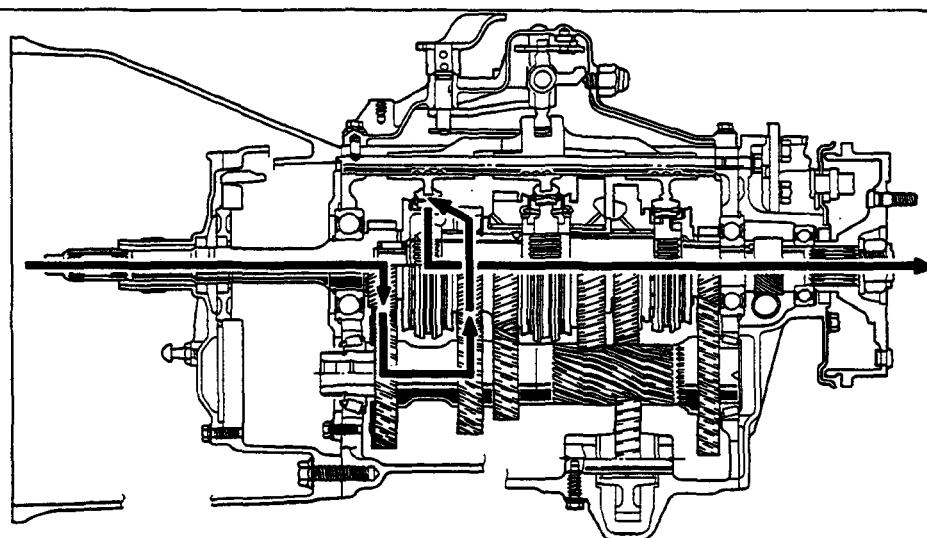
1ST



2ND



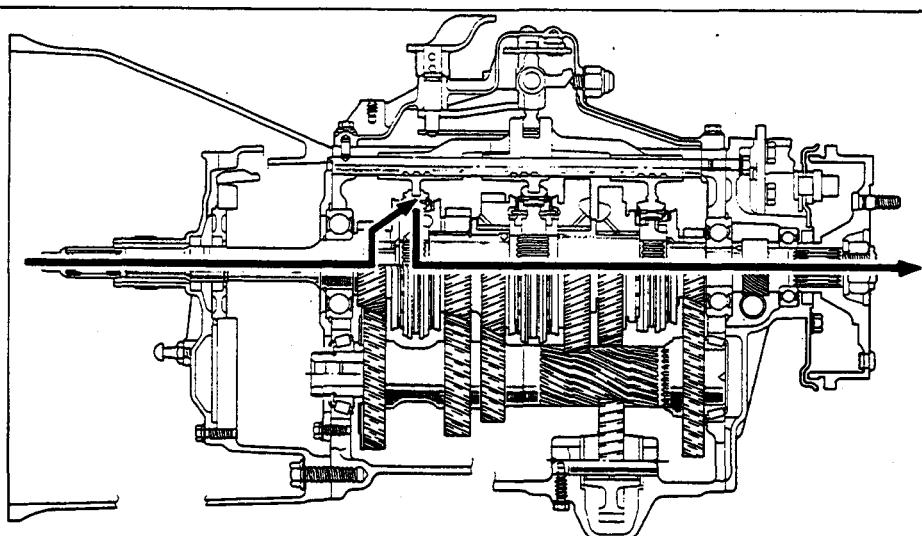
3RD



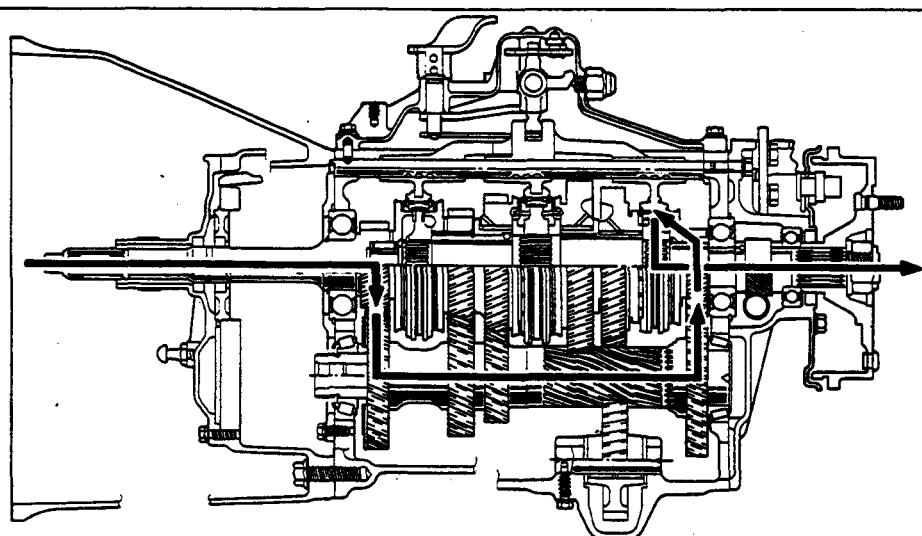
OUTLINE

J2

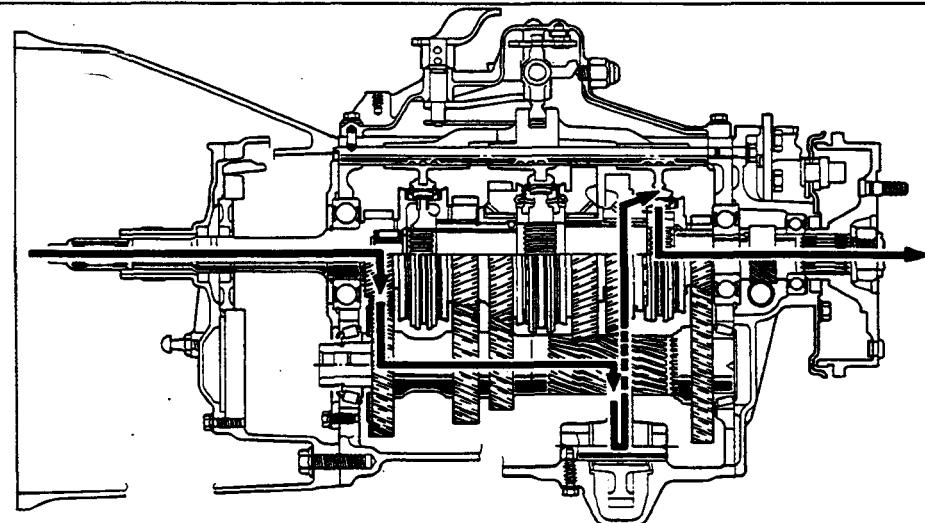
4TH

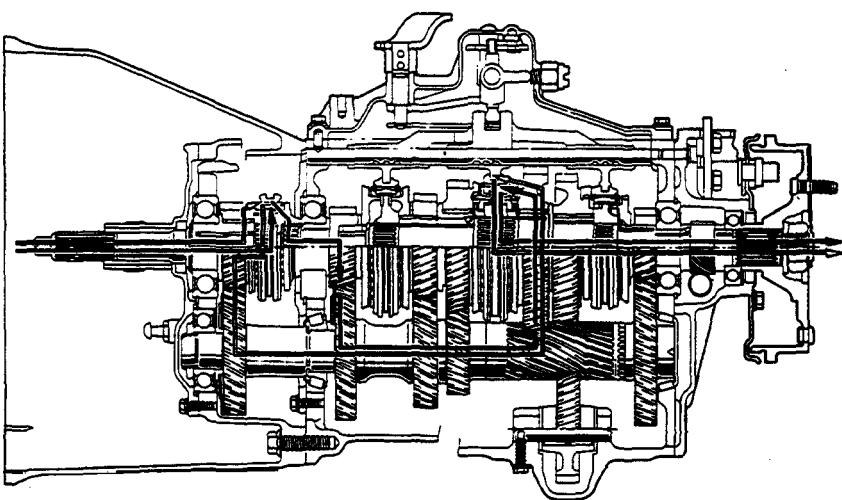
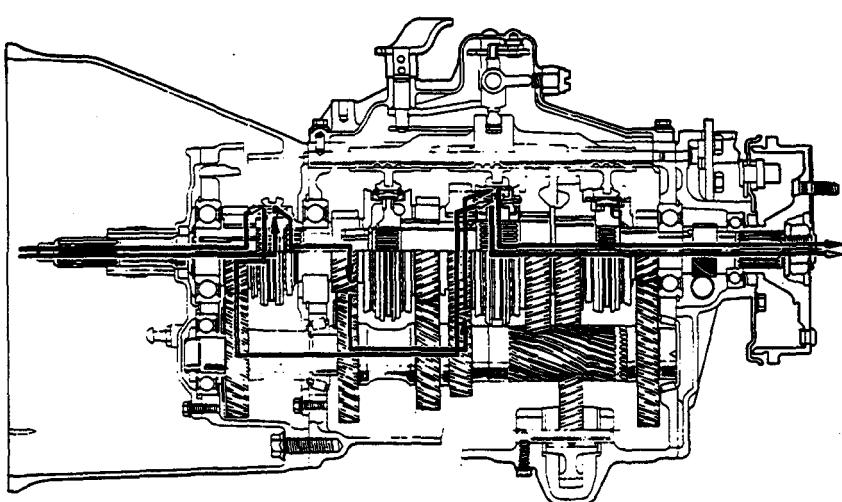
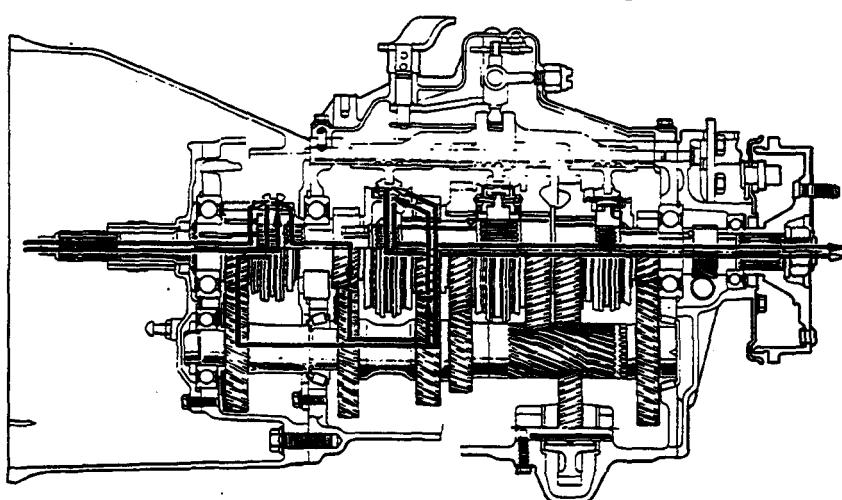


5TH



REVERSE



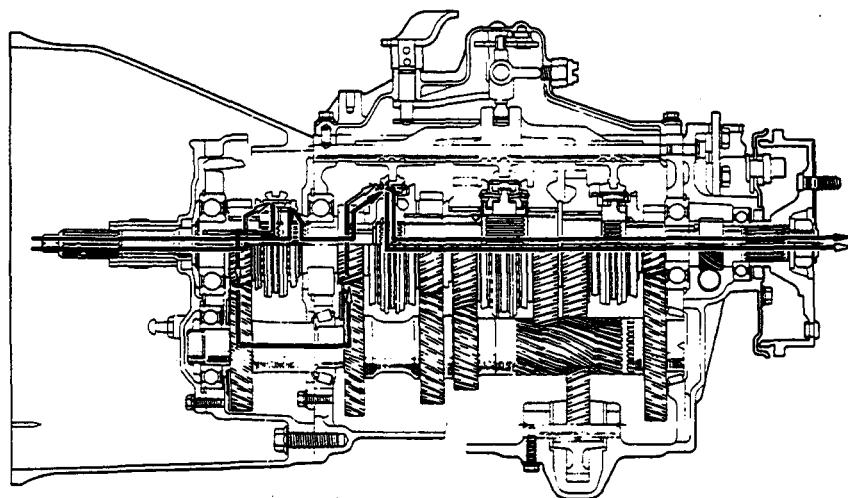
With Sub-TransmissionPower : →
Economy: ⇒**1ST****2ND****3RD**

OUTLINE

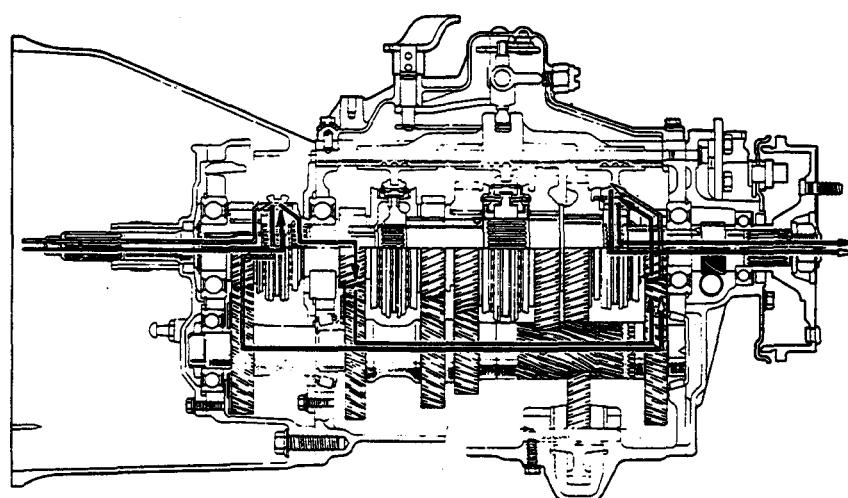
J2

Power →
Economy ⇒

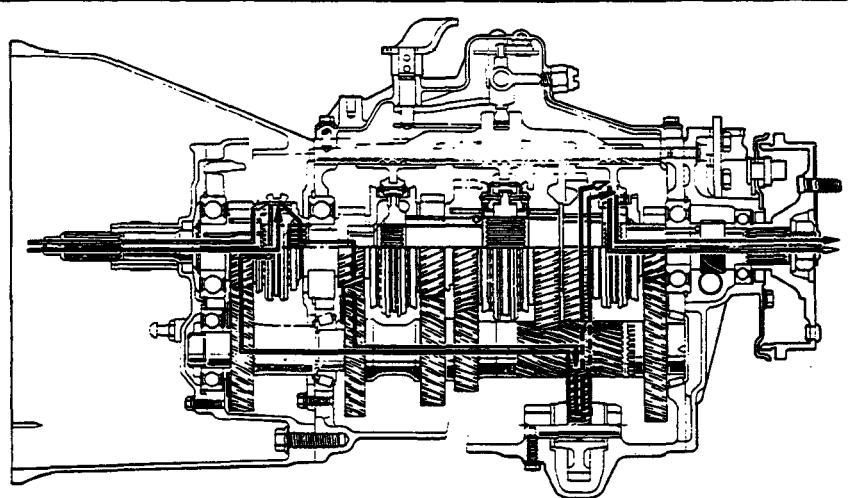
4TH



5TH



REVERSE

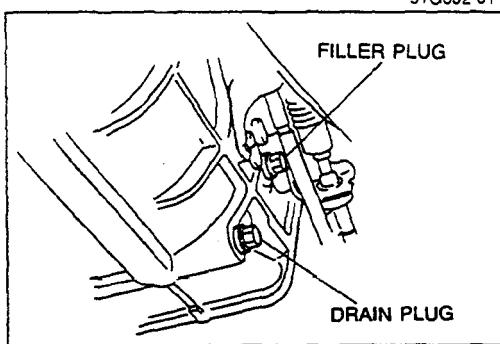
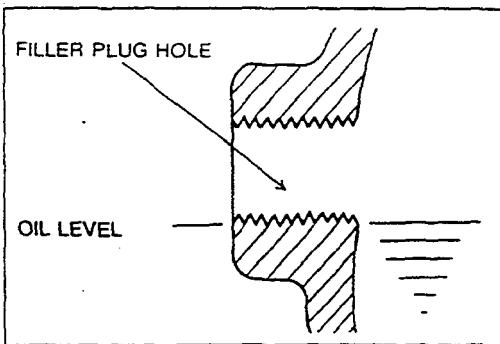


TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Abnormal noise	Insufficient oil Deterioration of oil quality Worn bearing Worn contact surface of countershaft gear Worn contact surface of gear Excessive gear backlash Damaged gear teeth Foreign matter in transmission	Add oil Replace with specified oil Replace Replace Replace Replace Replace Repair or replace	J2-13 J2-13 J2-32 J2-30 J2-30 — J2-30
Difficult to shift	Bent shift rod Insufficient oil Deterioration of oil quality Worn or loose shift fork and shift rod Worn synchronizer ring Worn synchronizer cone of gear Poor contact of synchronizer ring and gear cone Excessive longitudinal play of gears Worn bearing Fatigued synchronizer key spring	Replace Add oil Replace with specified oil Replace Replace Replace Replace Replace Replace Replace	— J2-13 J2-13 — J2-31 J2-31 J2-31 — J2-32 —
Jumps out of gear	Weak detent ball spring Worn shift fork Worn clutch hub sleeve Excessive gear backlash Worn bearing	Replace Replace Replace Replace Replace	— J2-31 J2-31 — J2-32
Shift lever does not function smoothly or is difficult to operate	Stuck control cable Malfunction of control cable ball joint	Replace Replace	J2-47 J2-47
Selector lever does not function smoothly or is difficult to operate	Stuck control cable Malfunction of control cable ball joint	Replace Replace	J2-49 J2-49

9TG0J2-010

TRANSMISSION OIL



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

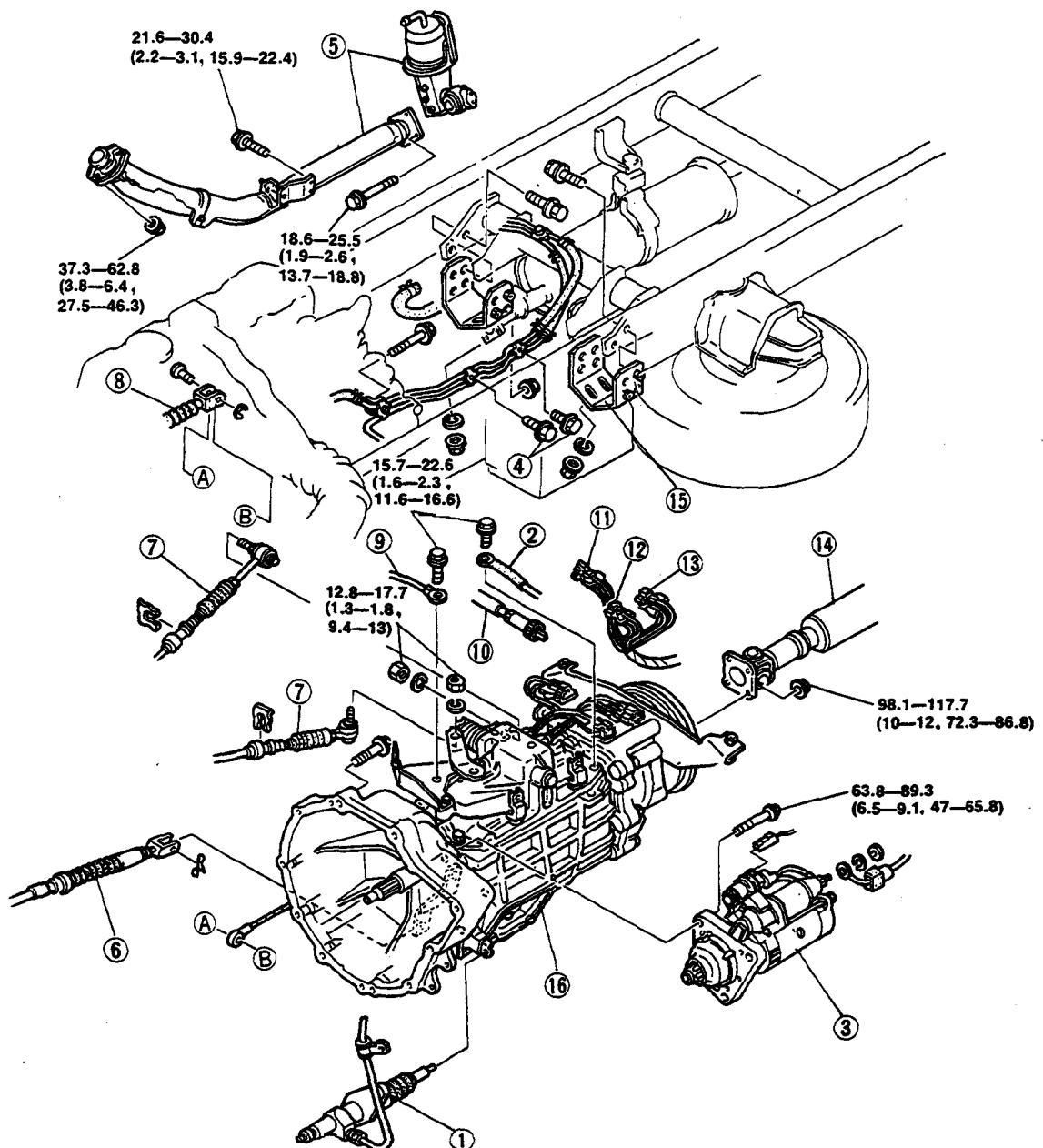
49 S120 710 Holder, coupling flange	For removal of center brake drum locknut	49 8501 631A Attachment, rear axle shaft puller	For removal of center brake drum
49 0223 630B Puller, rear axle shaft	For removal of center brake drum locknut	49 F026 103 Puller, wheel hub	For removal of clutch hub
49 0839 425C 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.

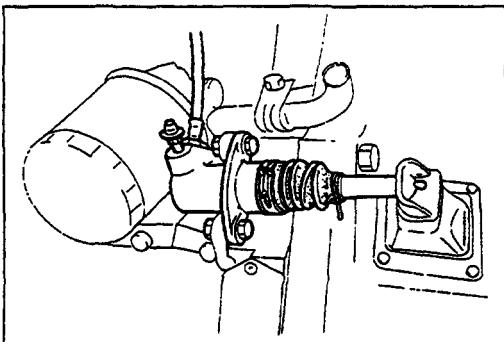
9TG0J2-015



N·m (m·kg, ft·lb)

9TG0J2-016

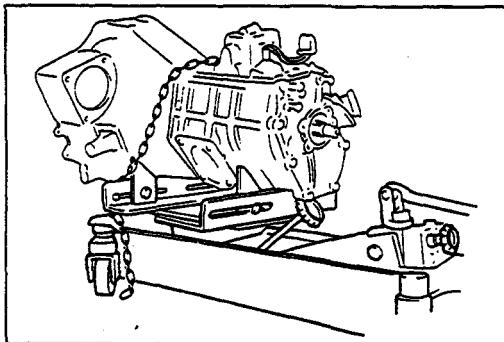
1. Clutch release cylinder
Removal Note page J2-16
2. Ground wire
Installation Note page J2-17
3. Starter
4. Fuel pipe clip bolt
5. Exhaust pipe and power chamber.
6. Sub-selector cable
7. Shift/selector cable
8. Parking brake cable
9. Ground wire
Installation Note page J2-17
10. Speedometer cable
11. 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.



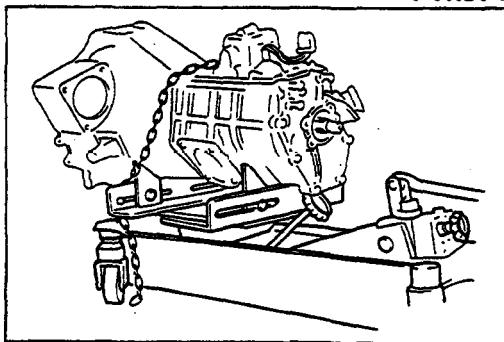
9TG0J2-019

Transmission

1. Support the engine with a jack under the oil pan.
2. Support the transmission with a transmission jack.
3. Remove the transmission mounting bolts.
4. Remove the transmission from under the vehicle.

9TG0J2-018

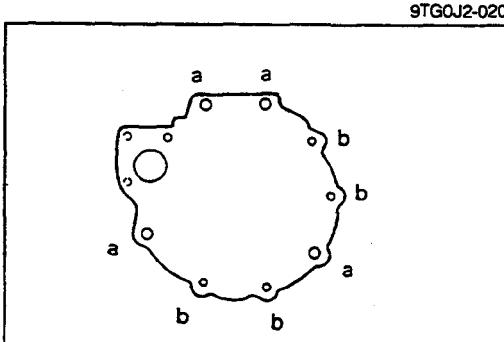
4. Remove the transmission from under the vehicle.



9TG0J2-020

Installation Note**Transmission**

1. Install the transmission with the transmission jack.

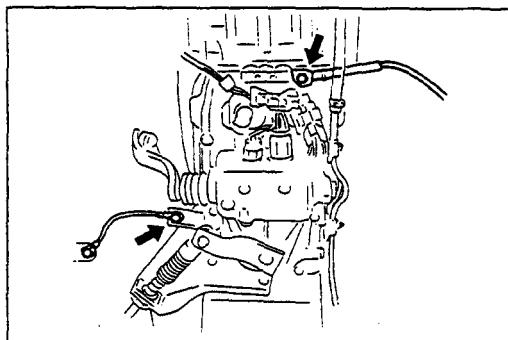


9TG0J2-021

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)

TRANSMISSION



9TG0J2-022

Ground wire

1. Install the ground wires.

Tightening torque:

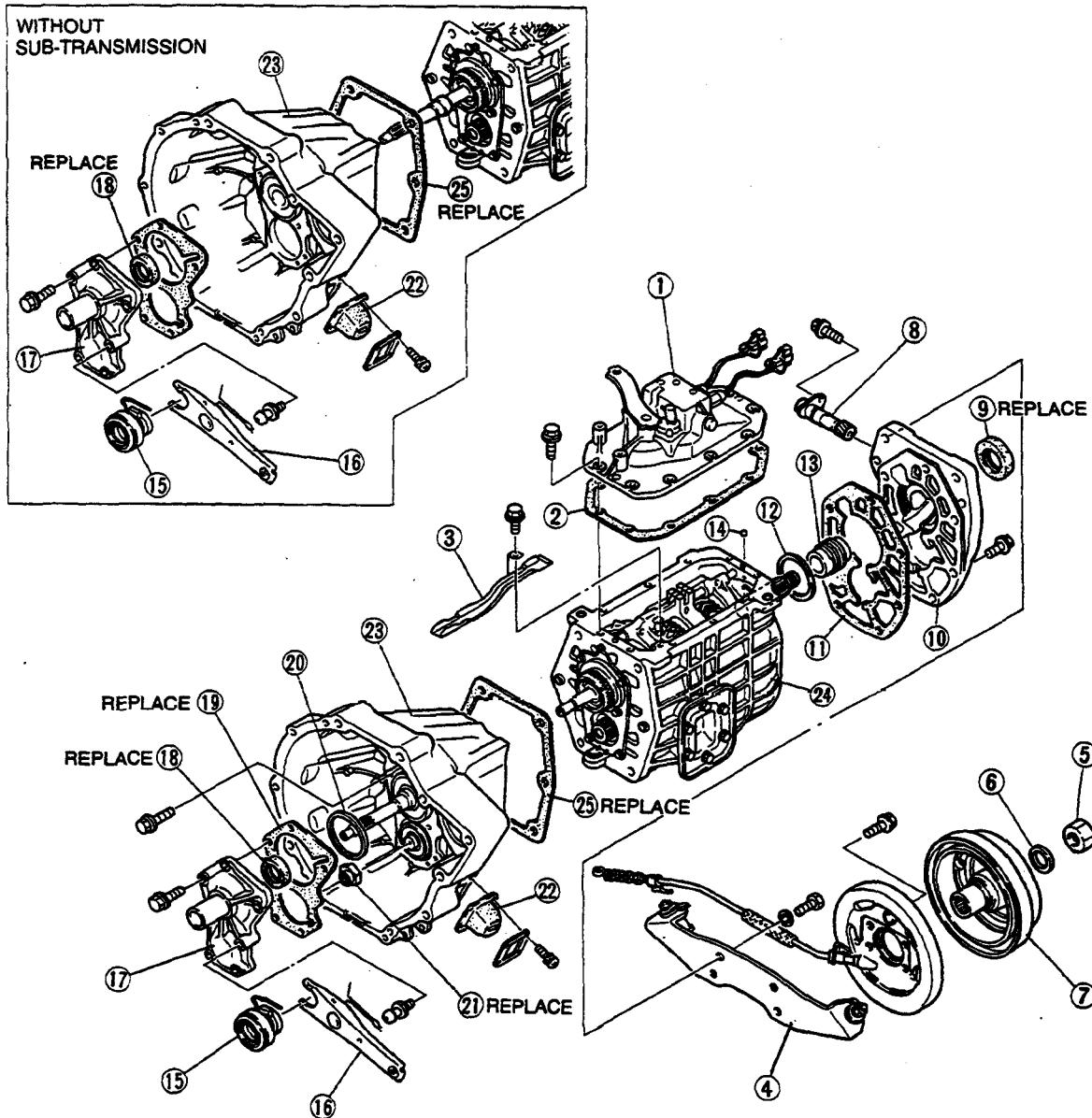
16—23 N·m (1.6—2.3 m·kg, 12—17 ft·lb)

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.

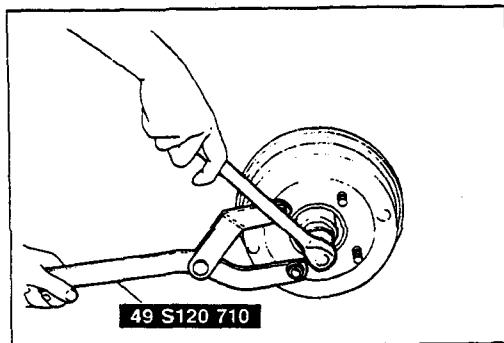
Housing Components

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

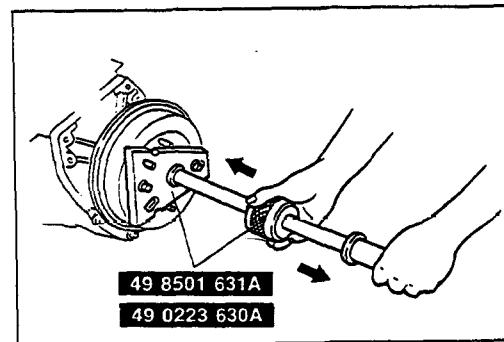


- | | | |
|---|------------|--|
| 1. Top cover assembly
Disassembly..... | page J2-21 | 14. Steel ball |
| 2. Gasket | | 15. Release bearing
Inspection..... |
| 3. Oil guide | | 16. Release fork |
| 4. Transmission mount | | 17. Front cover |
| 5. Locknut (Rear) | | 18. Oil seal (Front)
Inspect for damage |
| 6. Washer | | 19. Gasket |
| 7. Center brake drum
Disassembly Note..... | page J2-19 | 20. Adjustment shim |
| 8. Speedometer driven gear | | 21. Locknut (Front)
Disassembly Note..... |
| 9. Oil seal (Rear)
Inspect for damage
On-vehicle replacement..... | page J2-20 | 22. Dust boot |
| 10. Rear cover | | 23. Clutch housing assembly
Disassembly..... |
| 11. Gasket | | 24. Transmission case assembly
Disassembly..... |
| 12. Adjustment shim | | 25. Gasket |
| 13. Speedometer drive gear | | |

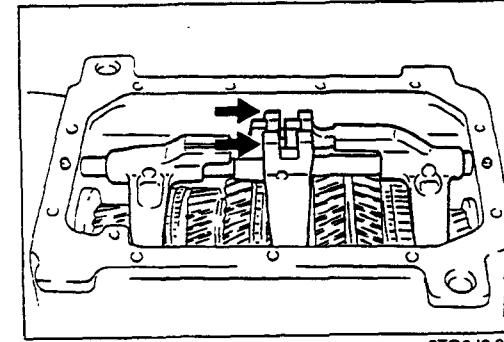
9TG0J2-024



9TG0J2-025



9TG0J2-026



9TG0J2-027

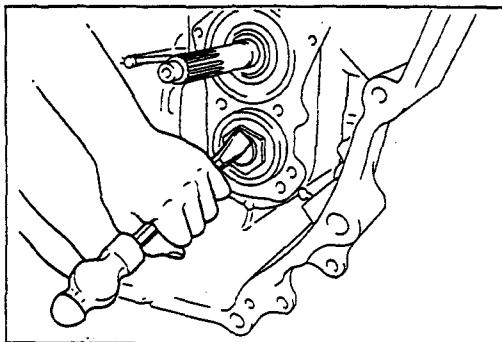
Disassembly Note Center brake drum

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

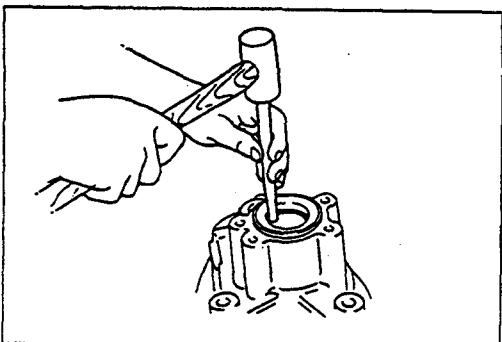
- Do not reuse the locknut.

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

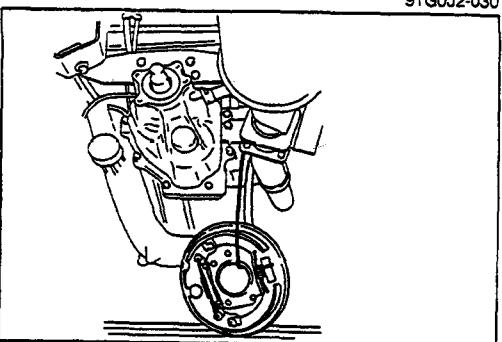


9TG0J2-030

Caution

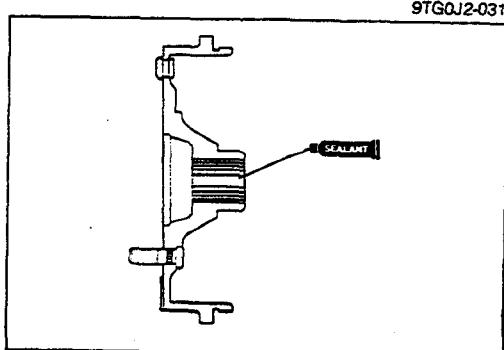
- Do not damage the mainshaft splines.

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.

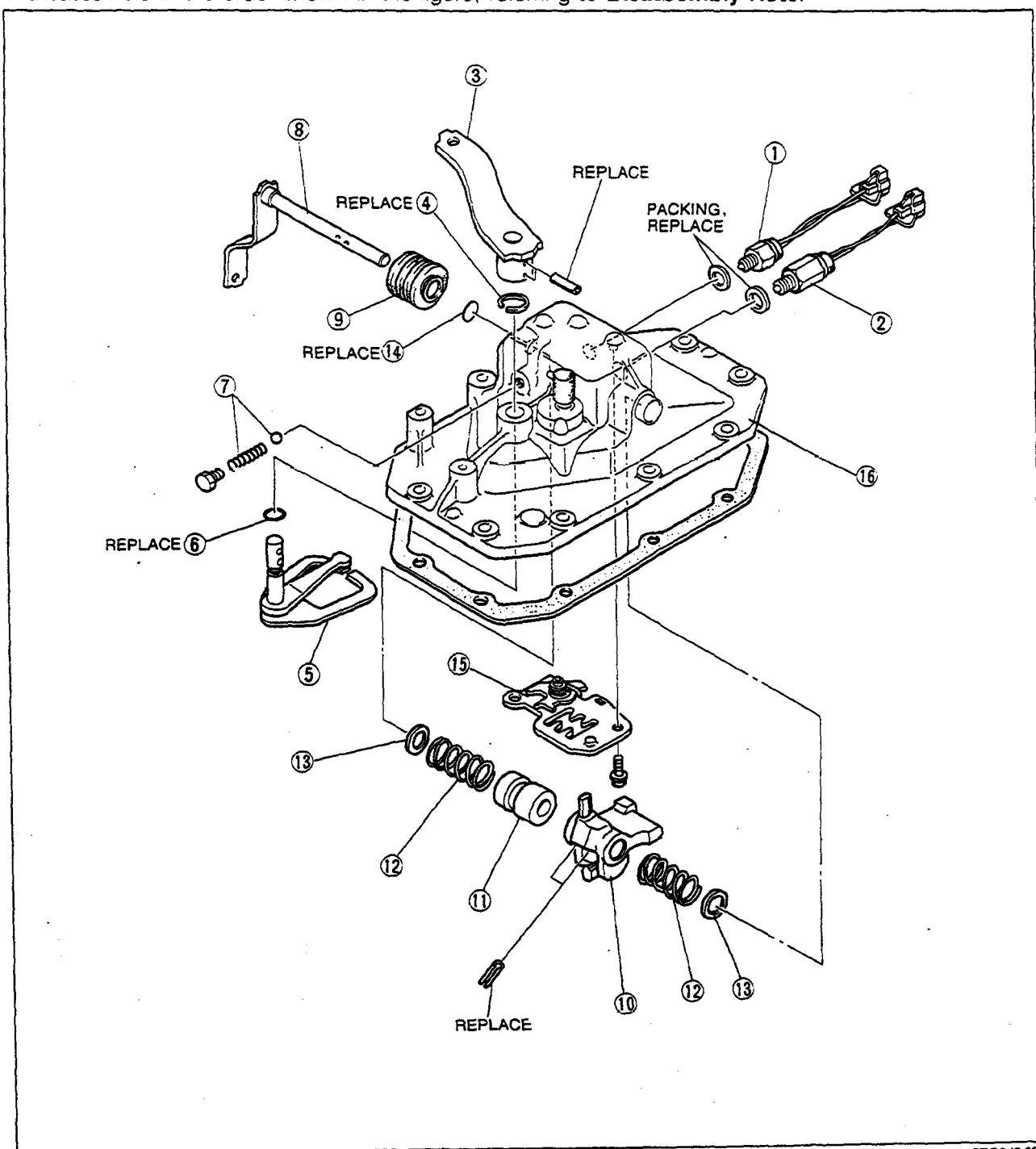


9TG0J2-032

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**.



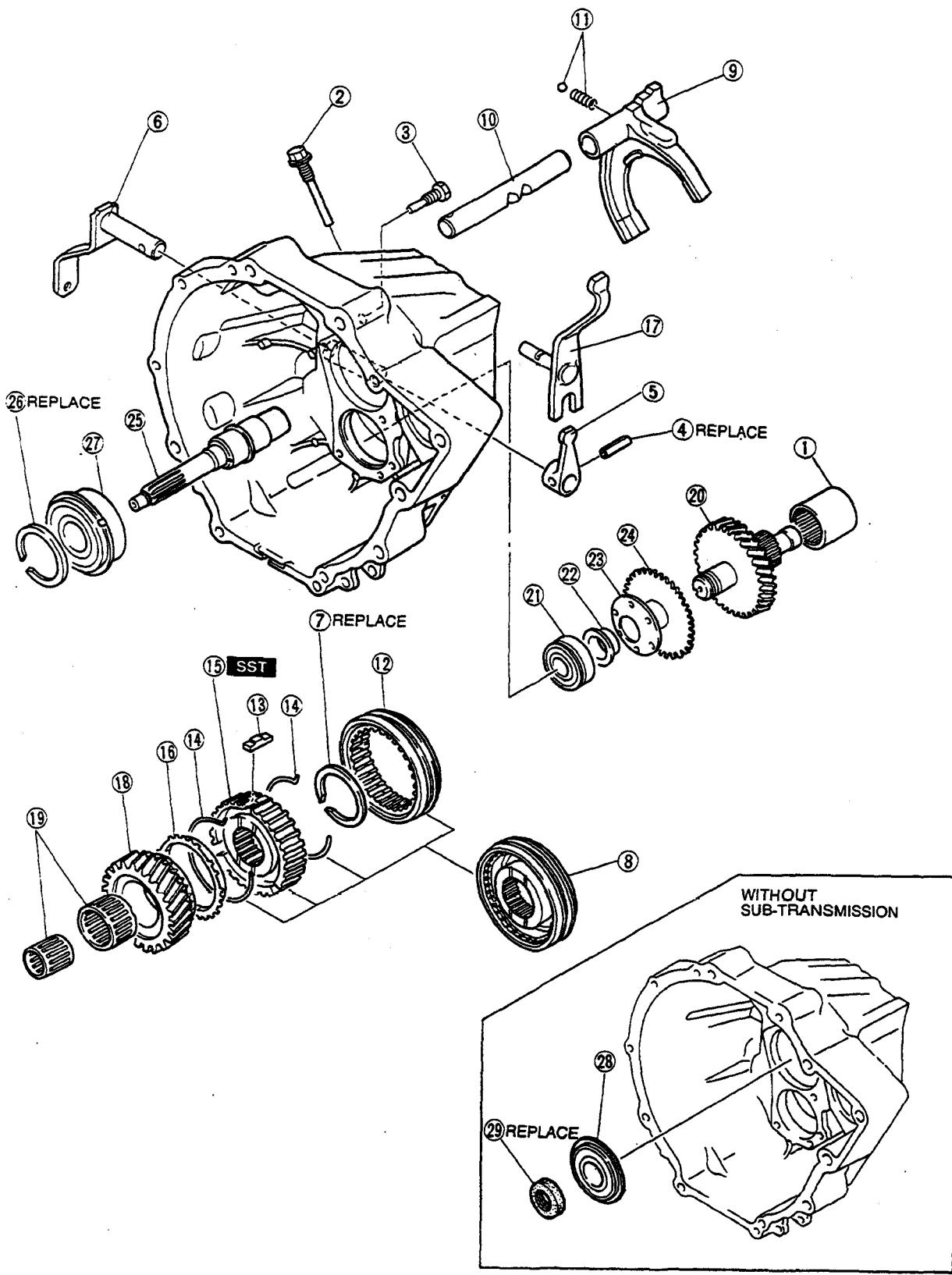
9TG0J2-033

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

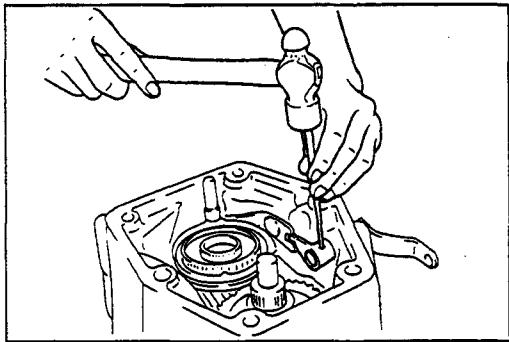
Sub-transmission Components

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



- | | |
|-----------------------------------|----------------------------------|
| 1. Sleeve joint | 17. Counter lever |
| 2. Shift rod set bolt | 18. High gear |
| 3. Counter lever set bolt | Inspection..... page J2-30 |
| 4. Roll pin | |
| 5. Inner shift lever | 19. Needle bearing |
| Disassembly Note..... page J2-23 | Inspection..... page J2-32 |
| 6. Outer shift lever | 20. Counter high gear |
| 7. Snap ring | Disassembly Note..... page J2-23 |
| 8. Clutch hub assembly | Inspection..... page J2-30 |
| Disassembly Note..... page J2-23 | 21. Ball bearing |
| Inspection..... page J2-31 | Inspection..... page J2-32 |
| 9. Shift fork | 22. Spacer |
| Inspection..... page J2-31 | Disassembly Note..... page J2-24 |
| 10. Shift fork rod | 23. Diaphragm spring |
| 11. Steel ball and spring | 24. Friction gear |
| 12. Hub sleeve | 25. Input shaft |
| 13. Synchronizer key | Disassembly Note..... page J2-24 |
| 14. Synchronizer key spring | 26. Snap ring |
| 15. Clutch hub | 27. Ball bearing |
| 16. Synchronizer ring (High gear) | Inspection..... page J2-32 |
| Inspection..... page J2-31 | 28. Guide cover |
| | 29. Oil seal |

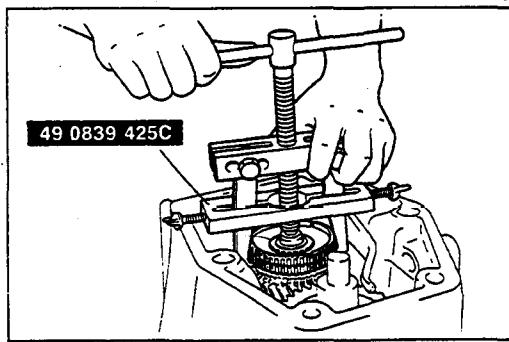
9TG0J2-035



9TG0J2-036

Disassembly Note**Inner shift lever (Roll pin)**

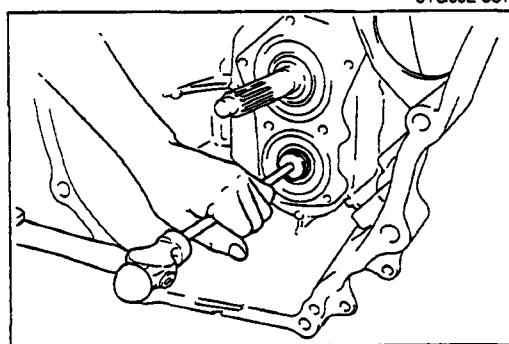
1. Remove the roll pin and remove the inner shift lever from the outer shift lever.



9TG0J2-037

Clutch hub assembly

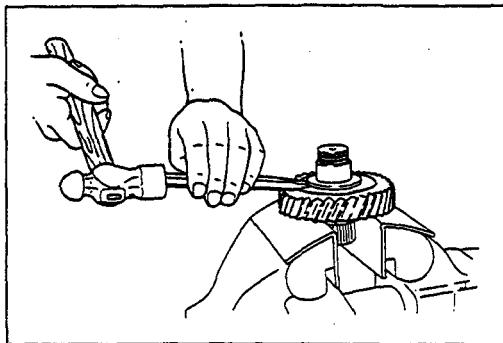
1. Use the SST to remove the clutch hub if it is tight.



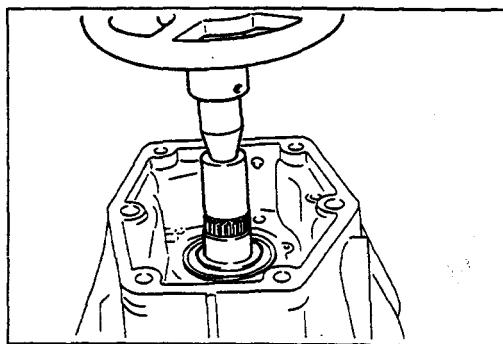
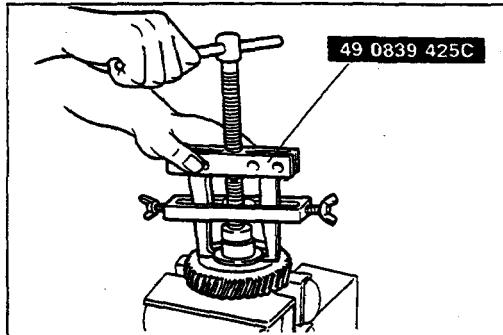
9TG0J2-038

Counter high gear

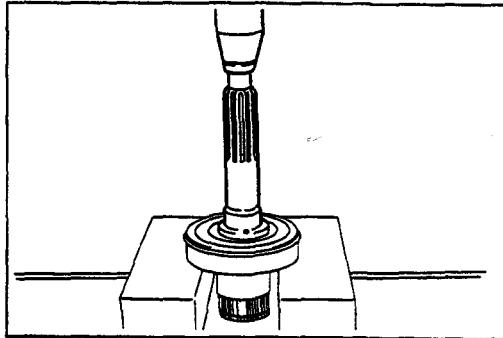
1. Remove the counter high gear assembly by driving it out the front.



9TG0J2-039



9TG0J2-040



9TG0J2-041

Spacer

1. Remove the spacer from the counter high gear with the chisel and the **SST**.

Input shaft

1. Remove the input shaft assembly with a press.

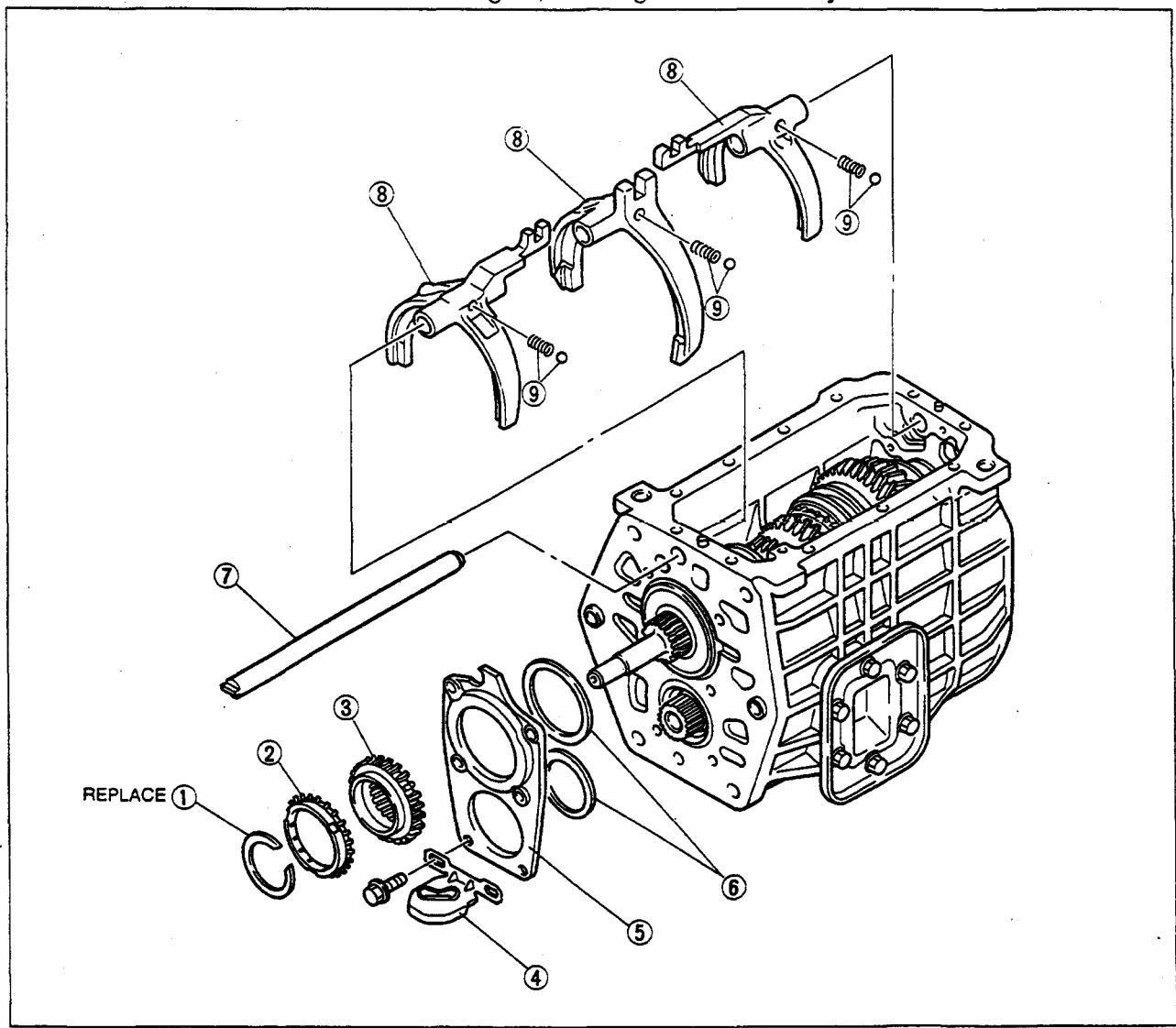
2. Remove the snap ring.

3. Remove the input shaft with a press.

TRANSMISSION

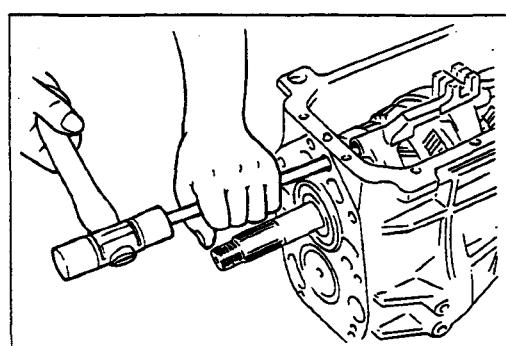
Shift Components

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



9TG0J2-042

- | | |
|---|---|
| 1. Snap ring | 6. Adjustment shim |
| 2. Synchronizer ring
(Input clutch)
Inspection..... | 7. Shift rod
Disassembly Note page J2-25 |
| 3. Input clutch | 8. Shift fork
Inspection..... page J2-31 |
| 4. Magnet | 9. Steel ball and spring |
| 5. Bearing cover | |



9TG0J2-043

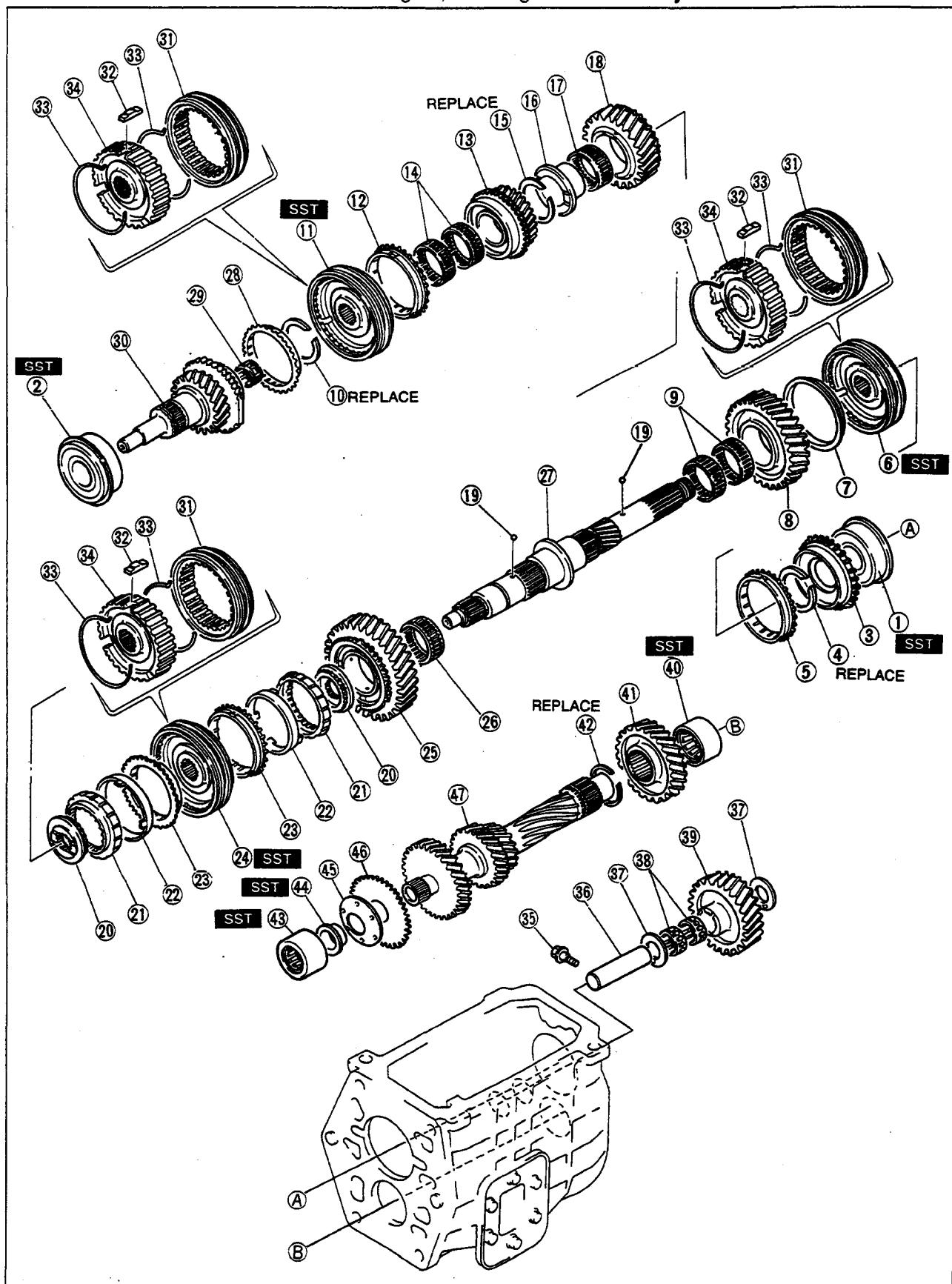
Disassembly Note
Shift rod
Note

- **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**.

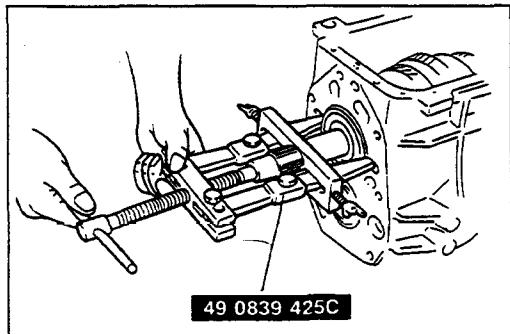


TRANSMISSION

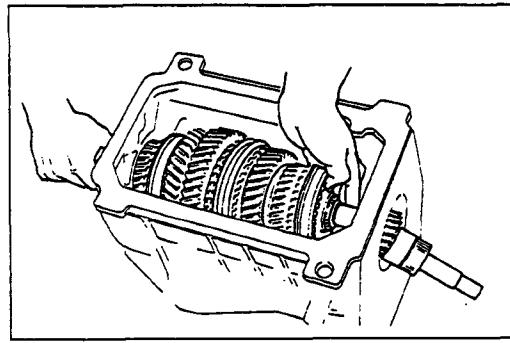
J2

- | | | |
|---|--|---|
| 1. Mainshaft bearing
Disassembly Note | 14. Needle bearing
Inspection page J2-32 | 32. Synchronizer key |
| page J2-27 | 15. Snap ring | 33. Synchronizer key spring |
| Inspection page J2-32 | 16. Gear sleeve | 34. Clutch hub |
| 2. Main drive gear bearing
Disassembly Note | 17. Needle bearing
Inspection page J2-32 | 35. Bolt |
| page J2-27 | 18. 2nd gear
Inspection page J2-30 | 36. Reverse idler gear shaft |
| 3. 5th gear
Inspection page J2-30 | 19. Steel ball | 37. Thrust washer |
| 4. Snap ring | 20. Inner cone hub | 38. Needle bearing
Inspection page J2-32 |
| 5. Synchronizer ring (5th)
Inspection page J2-31 | 21. Inner cone | 39. Reverse idler gear
Inspection page J2-30 |
| 6. Clutch hub assembly
(5th/reverse)
Disassembly Note | 22. Double cone
Inspection page J2-32 | 40. Countershaft bearing (Rear)
Disassembly Note |
| page J2-28
Inspection page J2-31 | 23. Outer cone | page J2-29
Inspection page J2-32 |
| 7. Retaining ring | 24. Clutch hub assembly (1st/2nd)
Disassembly Note | 41. Counter 5th gear
Inspection page J2-30 |
| 8. Reverse gear
Inspection page J2-30 | page J2-28
Inspection page J2-31 | 42. Snap ring |
| 9. Needle bearing
Inspection page J2-32 | 25. 1st gear
Inspection page J2-30 | 43. Countershaft bearing (Front)
Disassembly Note |
| 10. Snap ring | 26. Needle bearing
Inspection page J2-32 | page J2-29
Inspection page J2-32 |
| 11. Clutch hub assembly (3rd/4th)
Disassembly Note | 27. Mainshaft
Inspection page J2-30 | 44. Spacer
Disassembly Note |
| page J2-28
Inspection page J2-31 | 28. Synchronizer ring (4th)
Inspection page J2-31 | page J2-29
45. Diaphragm spring |
| 12. Synchronizer ring (3rd)
Inspection page J2-31 | 29. Needle bearing
Inspection page J2-32 | 46. Friction gear |
| 13. 3rd gear
Inspection page J2-30 | 30. Main drive gear
Inspection page J2-30 | 47. Countershaft gear
Inspection page J2-30 |
| | 31. Hub sleeve | |

9TG0J2-045



9TG0J2-046



9TG0J2-047

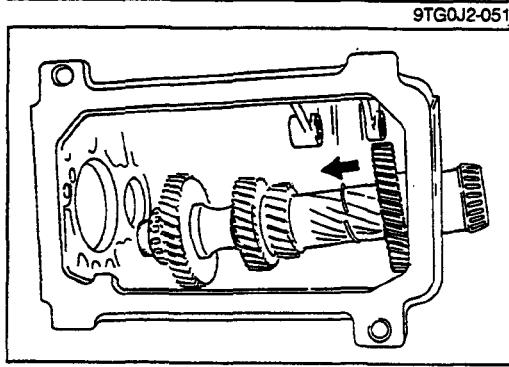
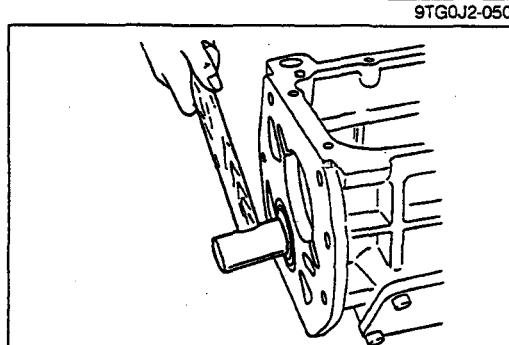
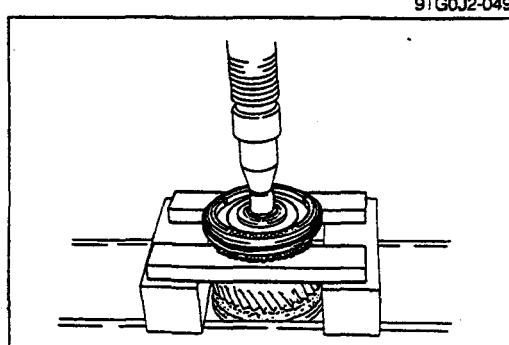
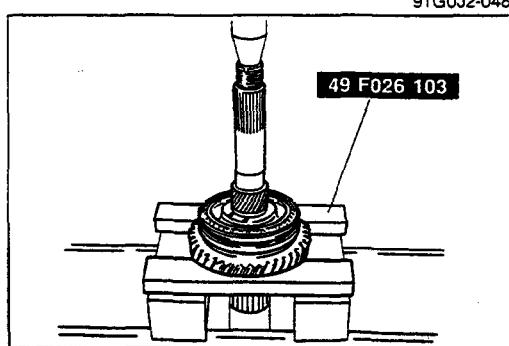
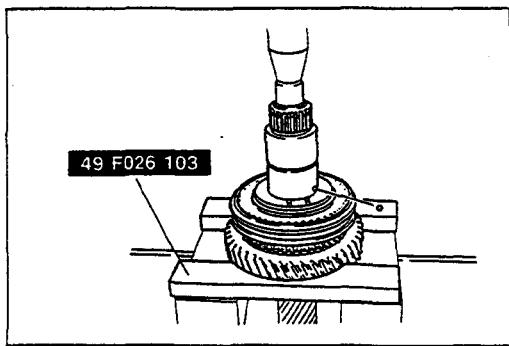
Disassembly Note

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.



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.

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.

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.

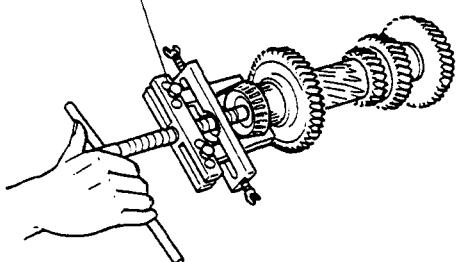
Countershaft assembly

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.

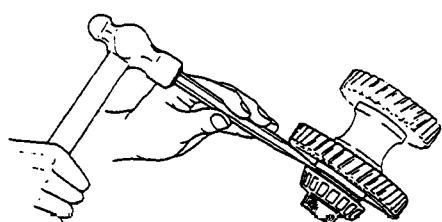
3. Remove the countershaft assembly from the transmission case.

TRANSMISSION

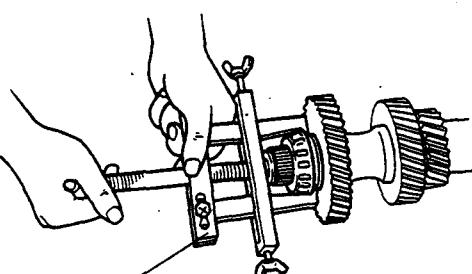
49 0839 425C



9TG0J2-053



9TG0J2-054



49 0839 425C

Countershaft bearing

1. Remove the rear bearing inner race with the **SST**.

2. Move the front bearing away from the spacer with a chisel.
3. Remove the front bearing with the **SST**.

Spacer

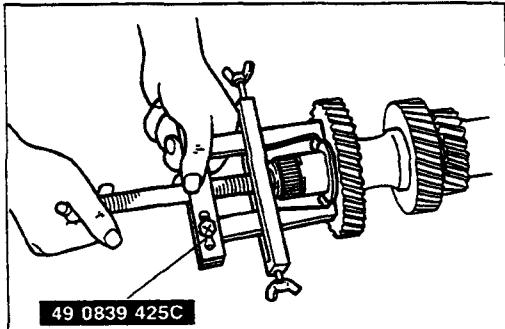
1. Move the spacer away from the diaphragm spring with a chisel.

Note

- **Do not reuse the diaphragm spring.**

2. Remove the spacer with the **SST**.

9TG0J2-055

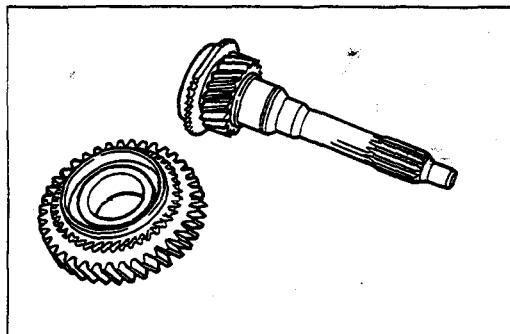


49 0839 425C

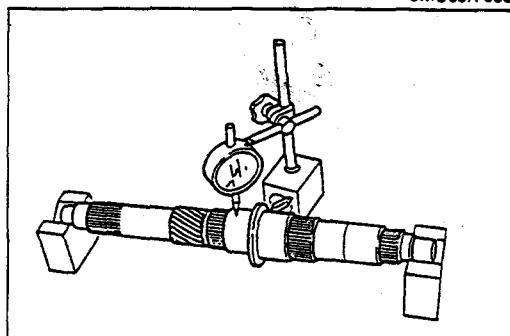
INSPECTION

Inspect all parts, and repair or replace as necessary.

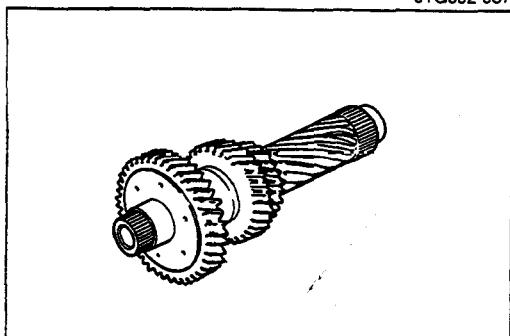
9TG0J2-056



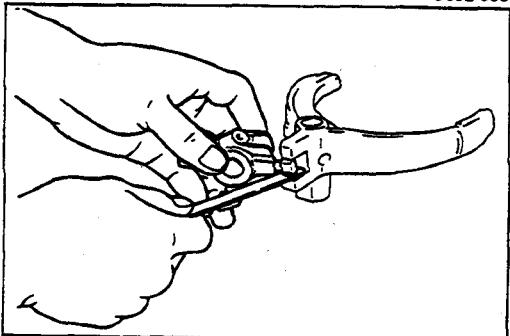
9MU0JX-055



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.

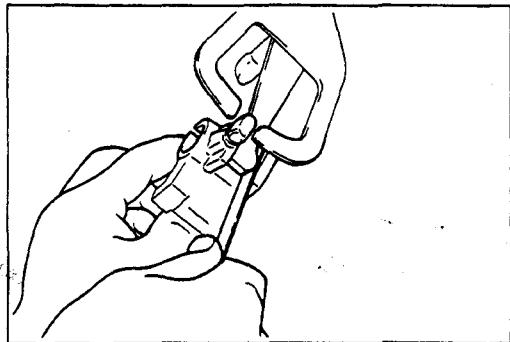
Countershaft

1. Inspect gear teeth for damage, wear and cracks.
2. Inspect the splines for damage and wear.

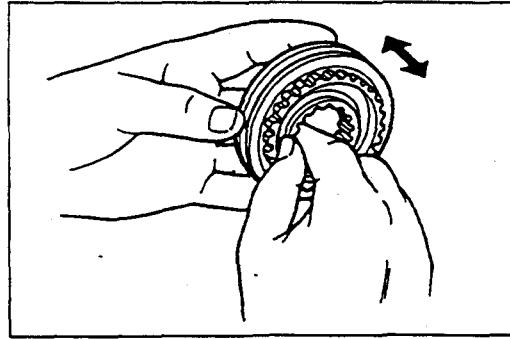
Shift fork and change lever

1. Measure the clearance between the shift fork and the change lever.

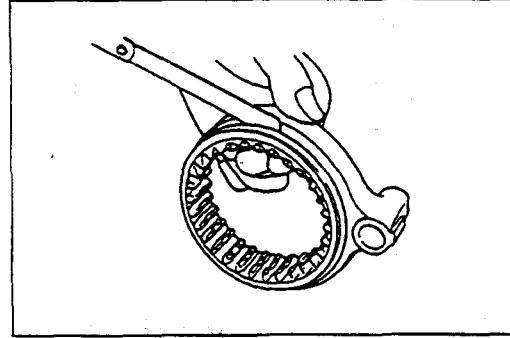
Clearance: 0.8mm (0.032 in) max.



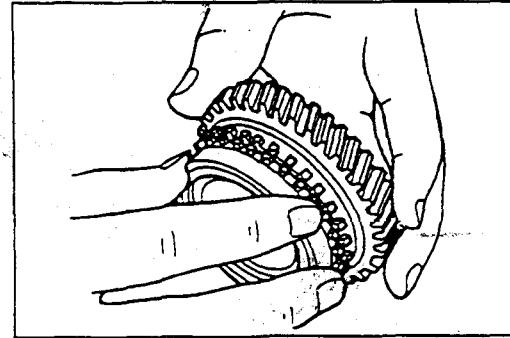
9TG0J2-060



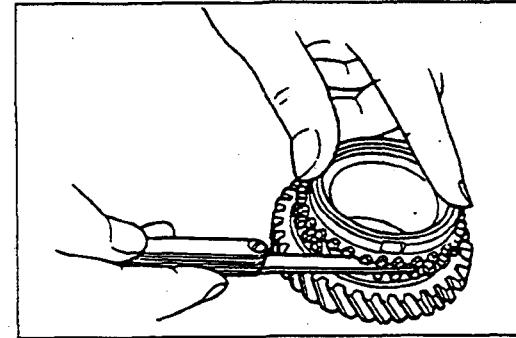
9TG0J2-061



9TG0J2-062



9TG0J2-063



9TG0J2-064

Selection arm and change lever

1. Measure the clearance between the selection arm and the change lever.

Clearance: 0.8mm (0.032 in) max.

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.

4. Measure the clearance between the hub sleeve and the release fork.

Clearance: 0.8mm (0.031) max.

Synchronizer ring

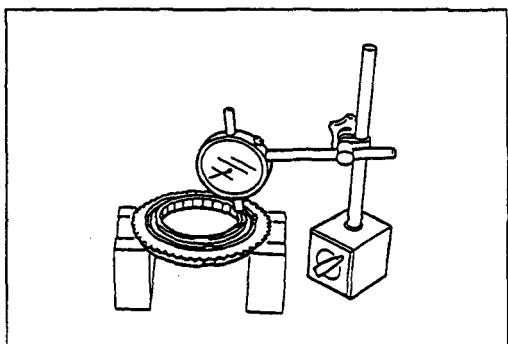
1. Inspect individual synchronizer ring teeth for damage, wear and cracks.
2. Inspect the taper surface for wear and cracks.

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.

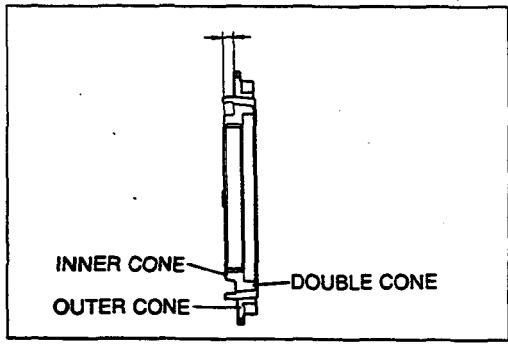


9TG0J2-065

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.

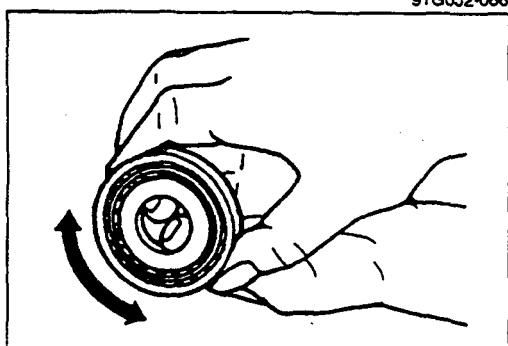


9TG0J2-066

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.

9TG0J2-067

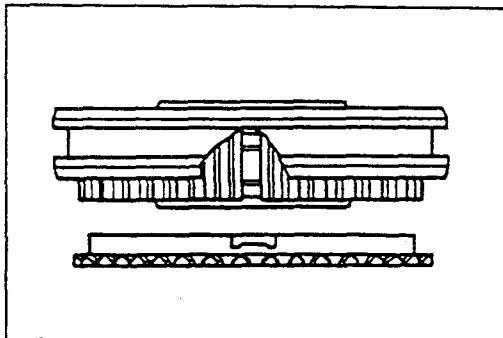
Bearing

1. Inspect for damage or rough rotation.

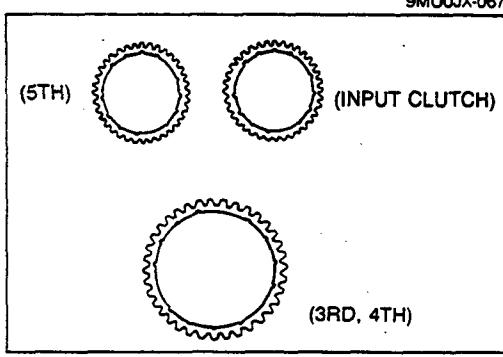
ASSEMBLY**Precaution**

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

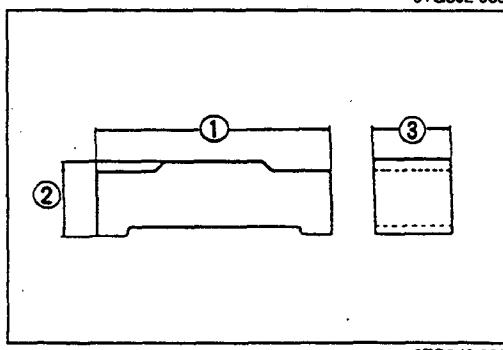
**Clutch hub****Caution**

- Align the synchronizer ring grooves with the clutch hub keys during installation.



9MU0JX-067

9TG0J2-068



9TG0J2-069

Note

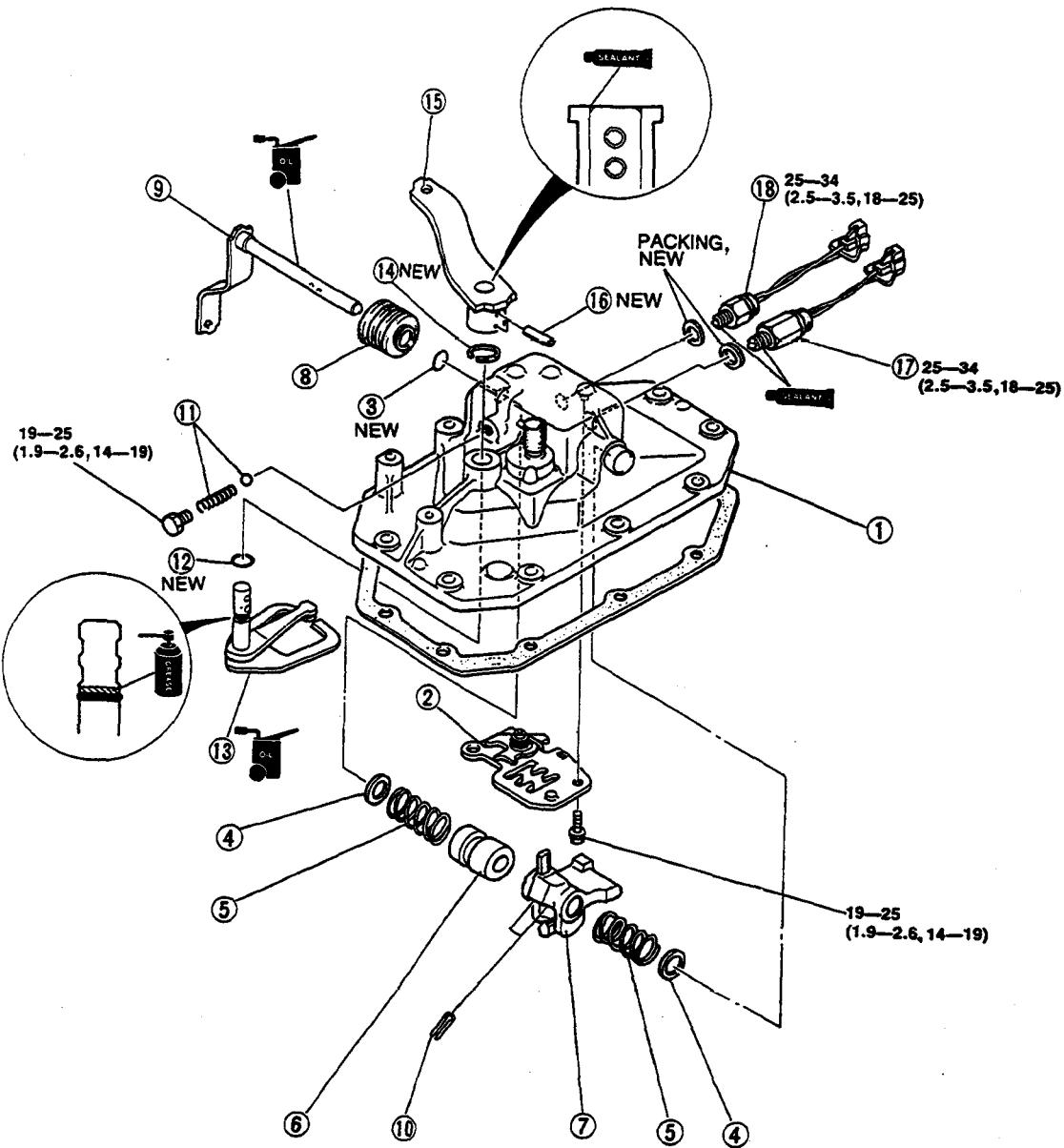
- The synchronizer rings have the same basic shape. Carefully note these distinguishing features.
 - a) Sub-transmission synchronizer rings are the smallest.
 - b) 5th synchronizer ring is next larger.
 - c) 3rd and 4th are the biggest and are exactly the same.
- There are two types of synchronizer keys. 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

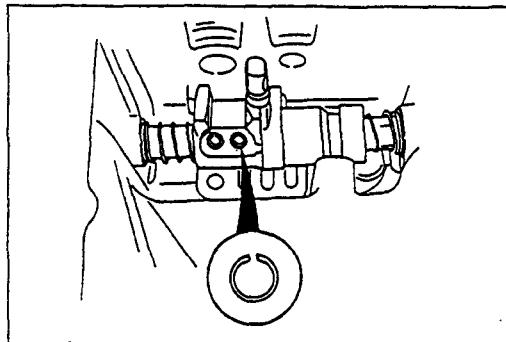
1. Assemble in the order shown in the figure, referring to **Assembly Note**.



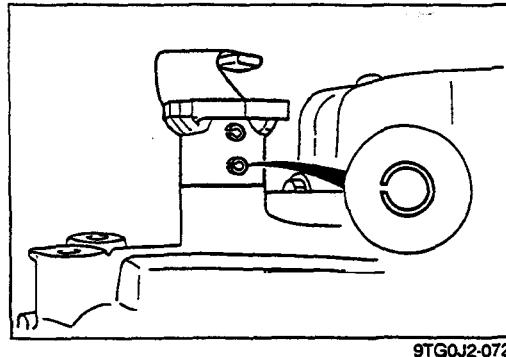
Nm (m·kg, ft·lb)

9TG0J2-070

- | | | |
|-------------------------|--|--|
| 1. Top cover | 9. Control lever | 15. Select lever |
| 2. Guide plate | 10. Roll pin (Change lever)
Assembly Note | 16. Roll pin (Select lever)
Assembly Note |
| 3. Oil seal | page J2-35 | page J2-35 |
| 4. Washer | 11. Steel ball and spring | 17. Neutral switch |
| 5. Spring | 12. O-ring | 18. Backup light switch |
| 6. Reverse lock stopper | 13. Selection arm | |
| 7. Change lever | 14. Snap ring | |
| 8. Dust boot | | |

**Assembly Note****Roll pin (Change lever)**

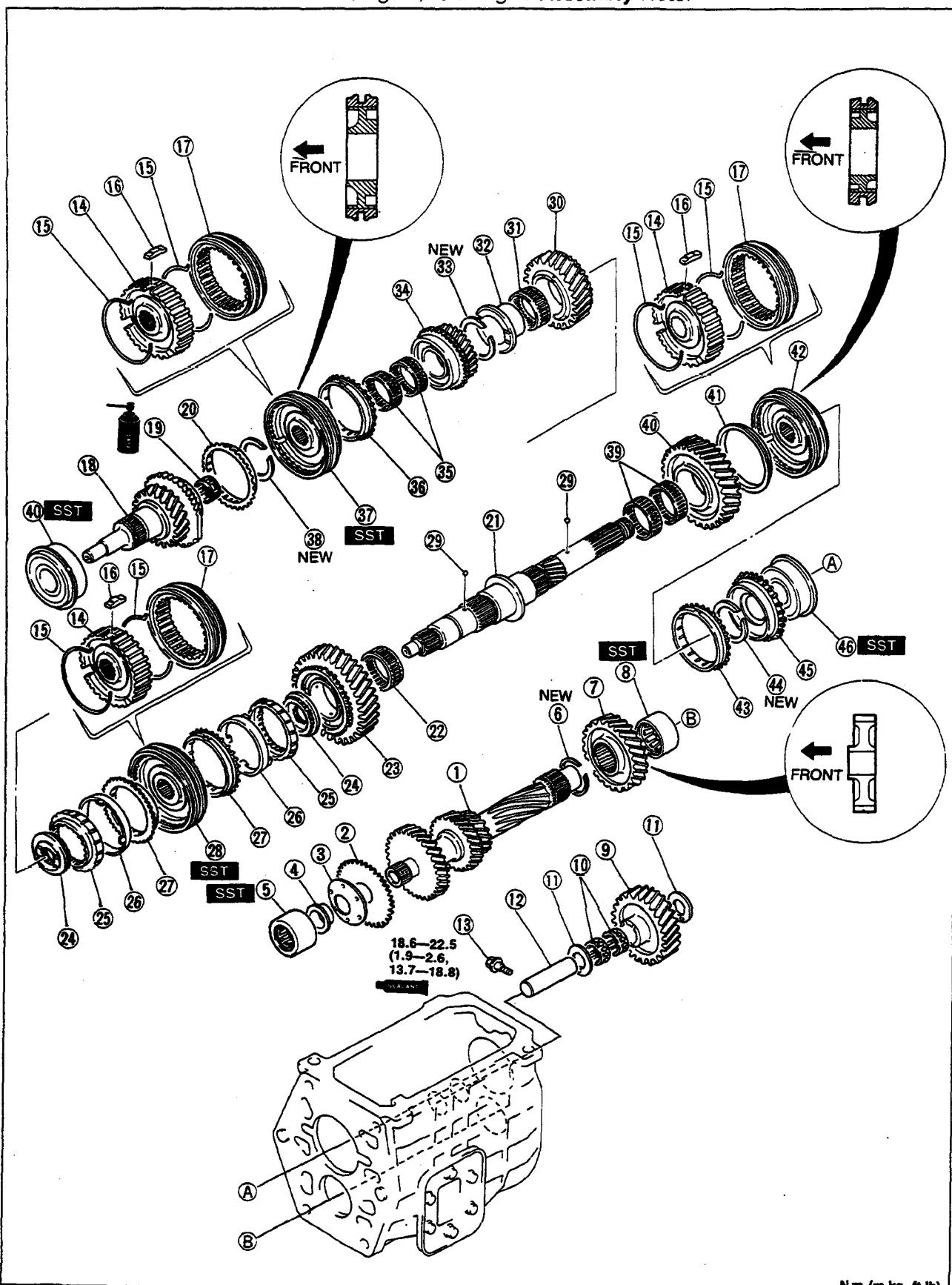
1. Install the roll pins as shown in the figure.

**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**.

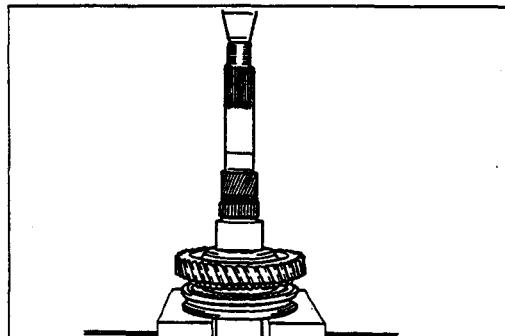


N·m (m-kg, ft-lb)

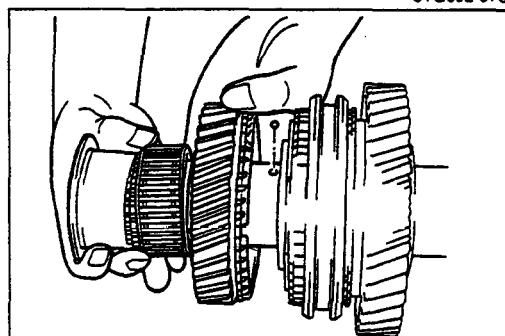
TRANSMISSION

- | | | |
|---------------------------------|-----------------------------|-----------------------------|
| 1. Countershaft gear | 17. Hub sleeve | 34. 3rd gear |
| 2. Friction gear | 18. Main drive gear | 35. Needle bearing |
| 3. Diaphragm spring | 19. Needle bearing | 36. Synchronizer ring (3rd) |
| 4. Spacer | 20. Synchronizer ring (4th) | 37. Clutch hub assembly |
| Assembly Note | 21. Mainshaft | (3rd/4th) |
| page J2-38 | 22. Needle bearing | Assembly Note |
| 5. Countershaft bearing (Front) | 23. 1st gear | page J2-37 |
| Assembly Note | 24. Inner cone hub | |
| page J2-38 | 25. Inner cone | |
| 6. Snap ring | 26. Double cone | |
| 7. Counter 5th gear | 27. Outer cone | |
| 8. Countershaft bearing (Rear) | 28. Clutch hub assembly | |
| Assembly Note | (1st/2nd) | |
| page J2-38 | Assembly Note | |
| 9. Reverse idler gear | page J2-37 | |
| 10. Needle bearing | 29. Steel ball | |
| 11. Thrust washer | 30. 2nd gear | |
| 12. Reverse idle gear shaft | Assembly Note | |
| 13. Bolt | page J2-37 | 47. Main drive gear bearing |
| 14. Clutch hub | 31. Needle bearing | Assembly Note |
| 15. Synchronizer key spring | 32. Gear sleeve | page J2-39 |
| 16. Synchronizer key | 33. Snap ring | |

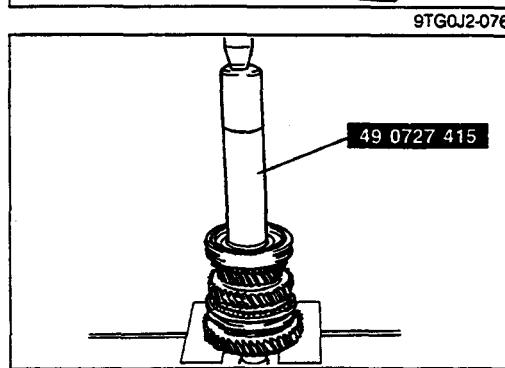
9TG0J2-074



9TG0J2-075

**2nd gear**

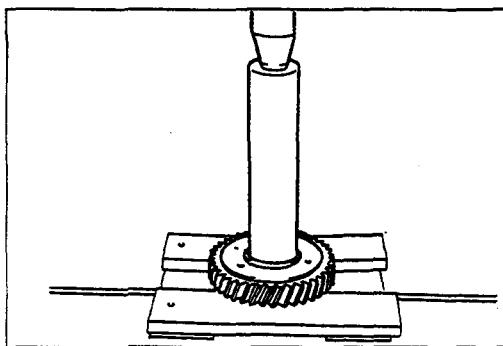
1. Install the steel ball, and then install the gear sleeve, needle bearing, and 2nd gear.



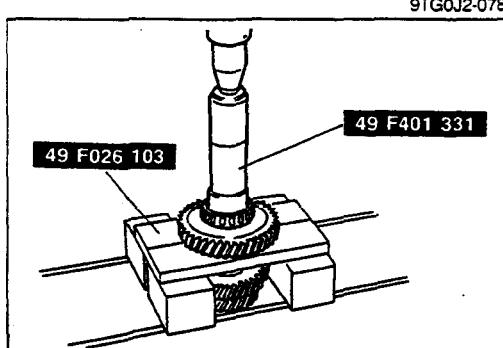
9TG0J2-077

Clutch hub assembly (3rd/4th)

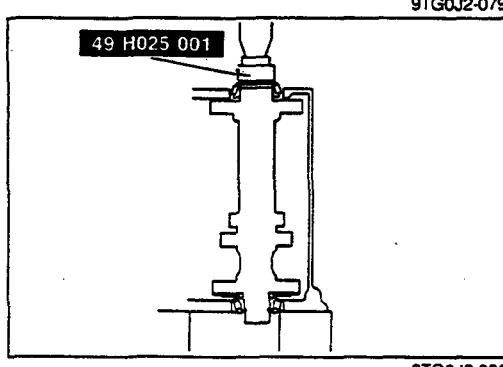
1. Set the 3rd gear and 3rd/4th clutch hub assembly on the mainshaft, then press on the 3rd/4th clutch hub assembly on with the SST.

**Spacer**

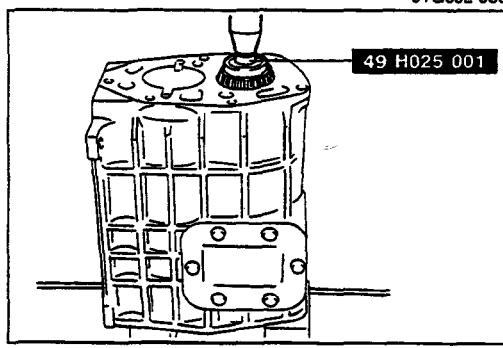
1. Install the new spacer with a suitable pipe.

**Countershaft bearing (Front)**

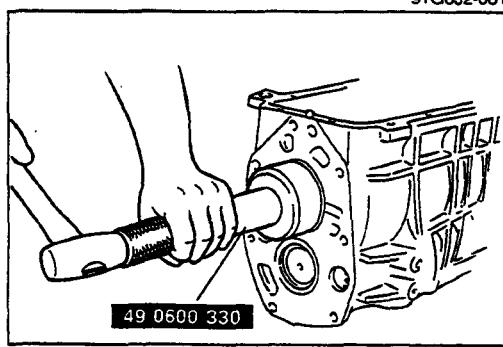
1. Install the countershaft bearing with the **SST**.

**Countershaft bearing (Rear)**

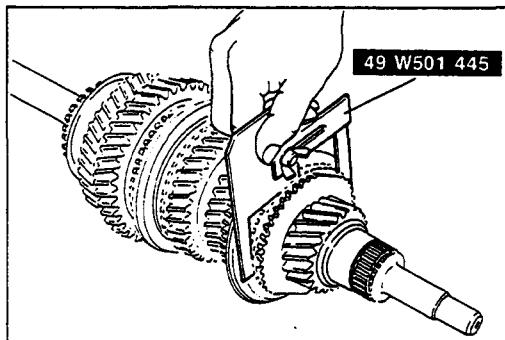
1. Install the new snap ring and counter 5th gear.
2. Set the countershaft gear in the transmission case.
3. Set the counter 5th gear into position and fit the snap ring.



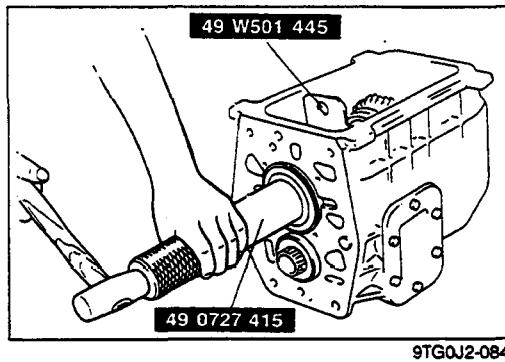
3. Install the countershaft bearing with the **SST**.

**Mainshaft bearing**

1. Install the mainshaft bearing with the **SST**.

**Main drive gear bearing**

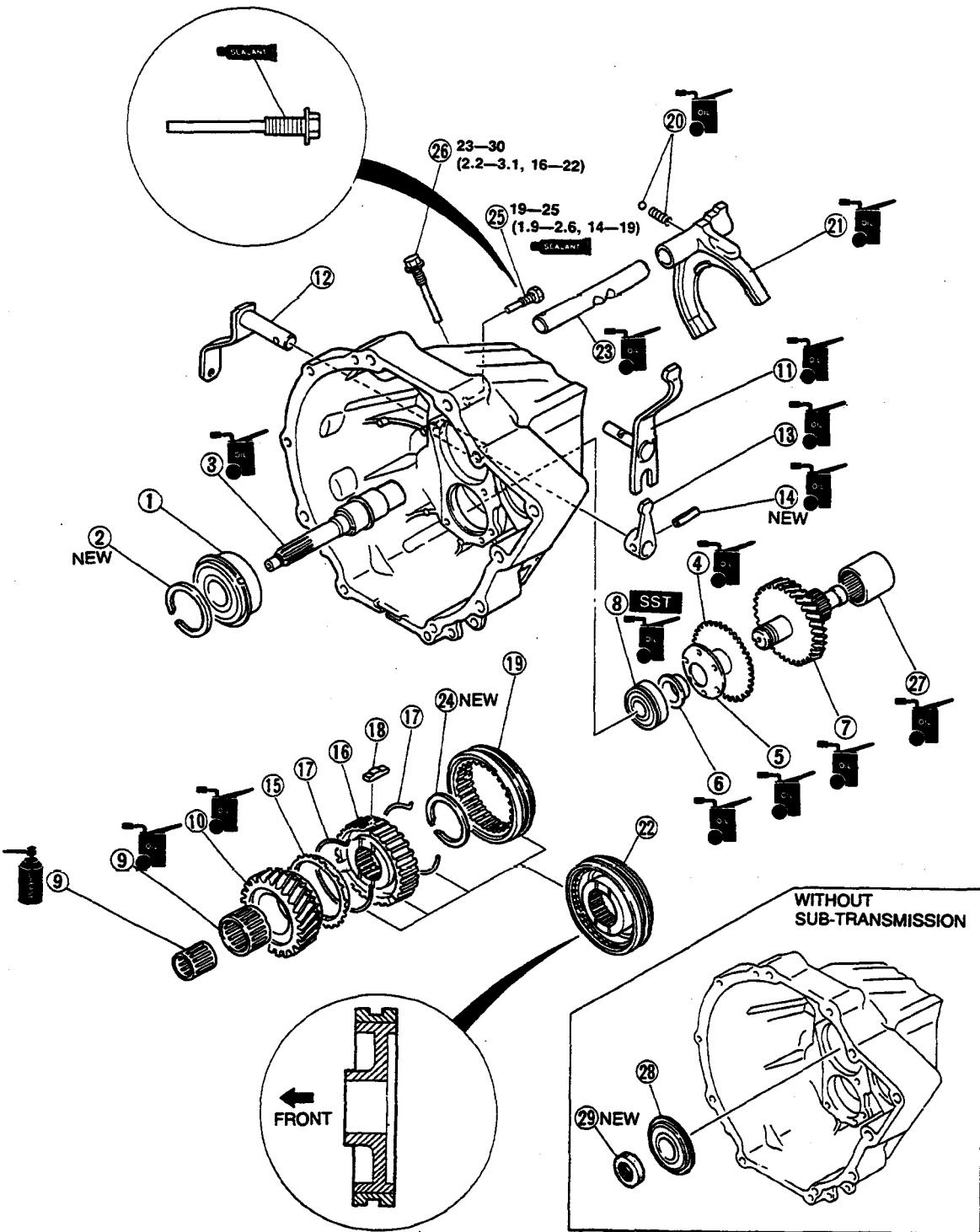
1. Set the **SST** between the 4th synchronizer ring and the synchromesh gear on the main drive gear.



2. Install the main drive gear bearing with the **SST**.

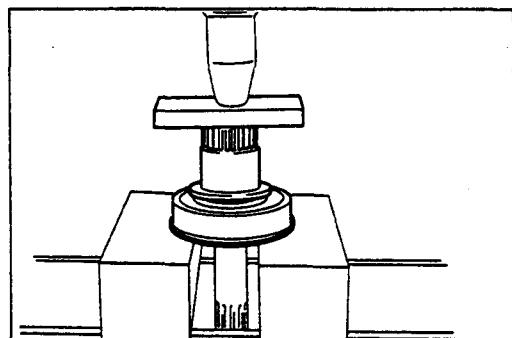
Sub-Transmission Components

1. Assemble in the order shown in the figure, referring to **Assembly Note**.



- | | | |
|--|------------|---|
| 1. Input shaft bearing
Assembly Note..... | page J2-41 | 15. Synchronizer ring |
| 2. Snap ring | | 16. Clutch hub |
| 3. Input shaft
Assembly Note..... | page J2-41 | 17. Synchronizer key spring |
| 4. Friction gear | | 18. Synchronizer key |
| 5. Diaphragm spring | | 19. Hub |
| 6. Spacer
Assembly Note..... | page J2-41 | 20. Steel ball and spring |
| 7. Counter high gear | | 21. Shift fork |
| 8. Bearing (Counter high gear)
Assembly Note..... | page J2-42 | 22. Clutch hub assembly
Assembly Note..... |
| 9. Needle bearing | | page J2-42 |
| 10. High bear | | 23. Shift rod |
| 11. Counter lever | | 24. Snap ring |
| 12. Outer shift lever | | 25. Counter lever set bolt |
| 13. Inner shift lever | | 26. Shift rod set bolt |
| 14. Roll pin
Assembly Note..... | page J2-42 | 27. Sleeve joint |
| | | 28. Guide cover |
| | | 29. Oil seal |

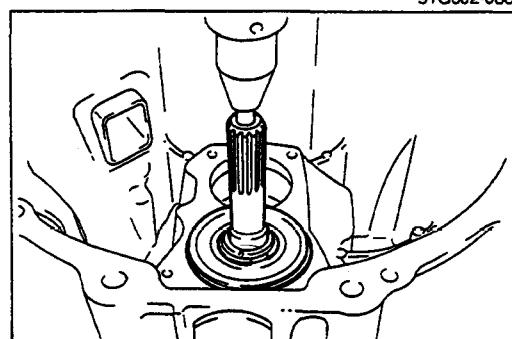
9TG0J2-087



9TG0J2-088

Assembly Note
Input shaft bearing

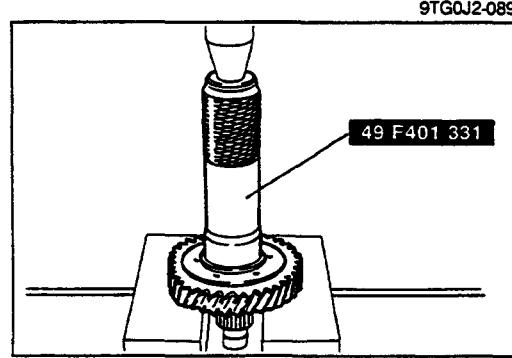
1. Press the ball bearing onto the input shaft with a press.
2. Install the snap ring.



9TG0J2-089

Input shaft

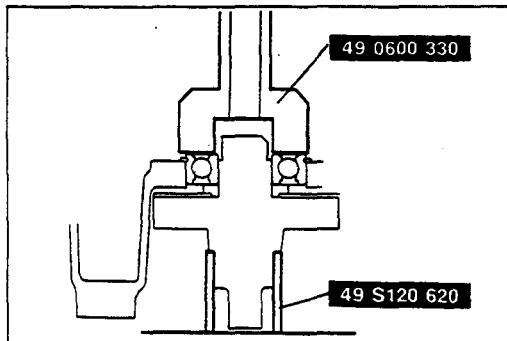
1. Press the input shaft into the clutch housing with a press.



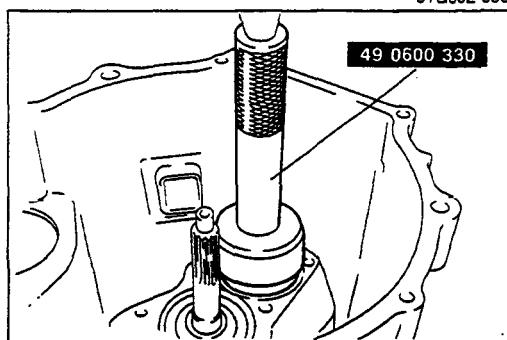
9TG0J2-090

Spacer

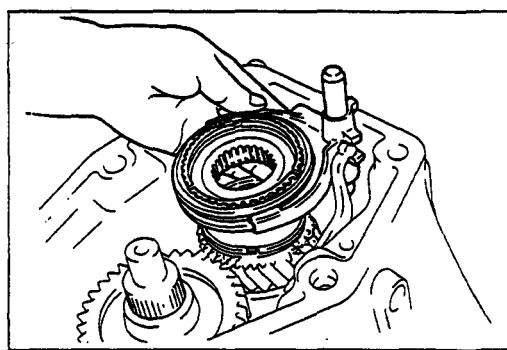
1. Press the friction gear, diaphragm spring and spacer onto the counter high gear with the **SST** and a press.

**Bearing (Counter high gear)**

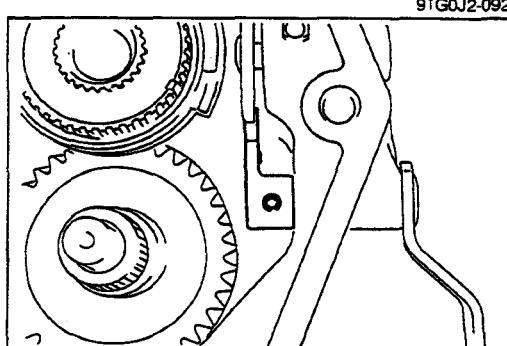
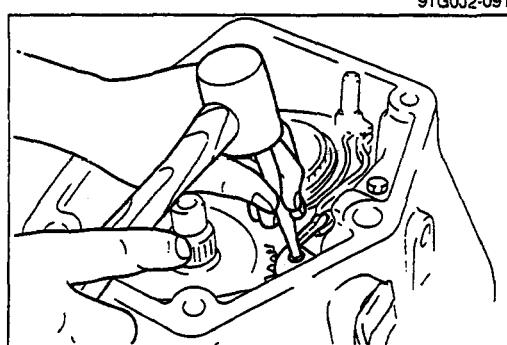
1. Slide the counter high gear assembly into position from the rear side of the clutch housing.
2. Press the bearing onto the counter high gear with the **SST** and a press.

**Clutch hub assembly**

1. With the shift fork on the hub sleeve, install it to the high gear.

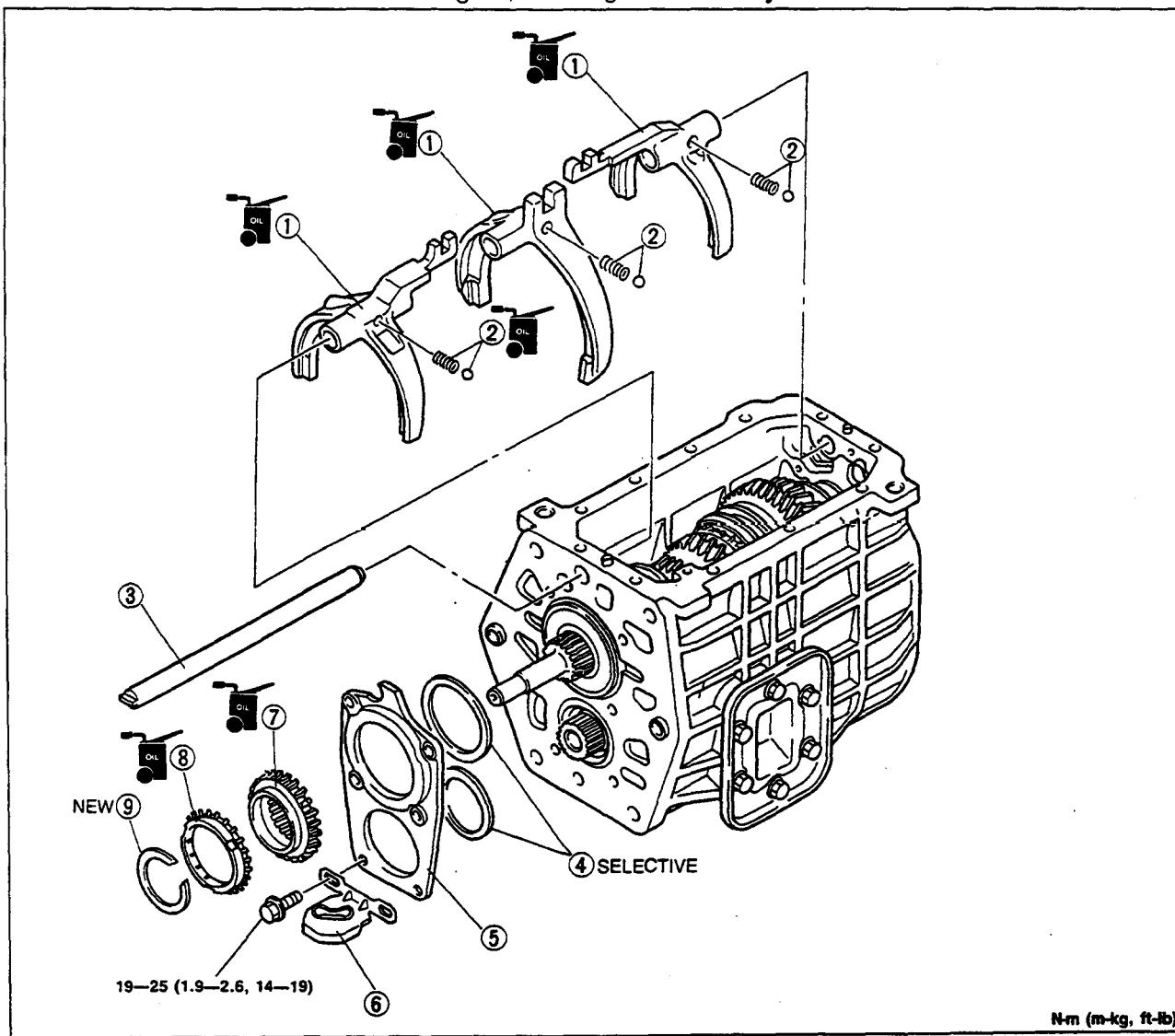
**Roll pin**

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**.

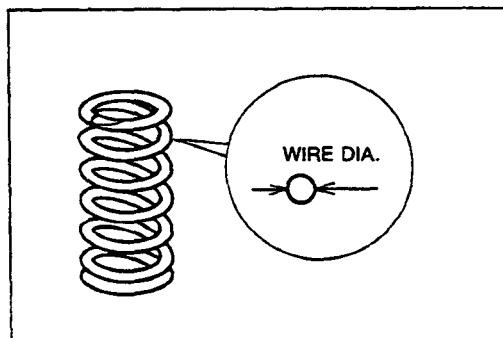


- | | |
|--------------------------|--|
| 1. Shift fork | 5. Bearing cover |
| 2. Steel ball and spring | 6. Magnet |
| Assembly Note..... | page J2-43 |
| 3. Shift fork rod | 7. Input clutch |
| Assembly Note..... | page J2-44 |
| 4. Adjustment shim | 8. Synchronizer ring
(Input clutch) |
| Assembly Note..... | 9. Snap ring |

Assembly Note **Spring**

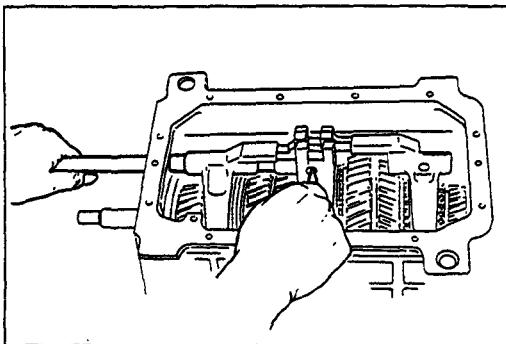
Note

- There are two types of springs; be sure to install them correctly.

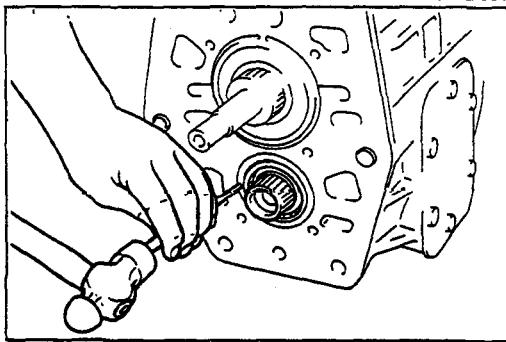


9TG0J2-094

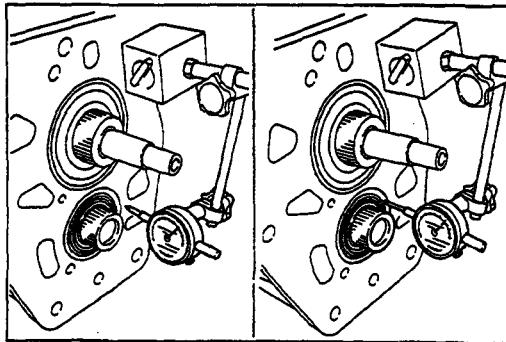
Wire dia.	Shift fork
φ1.4mm (0.055 in)	3RD, 4TH and 5TH, Rev.
φ1.8mm (0.070 in)	1ST, 2ND



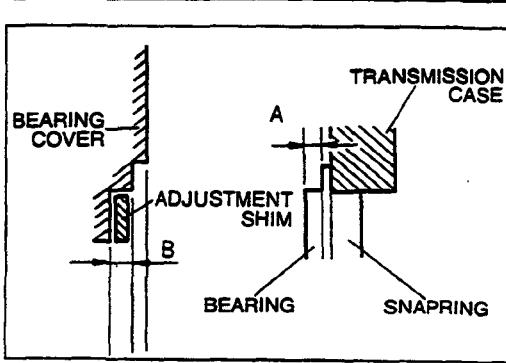
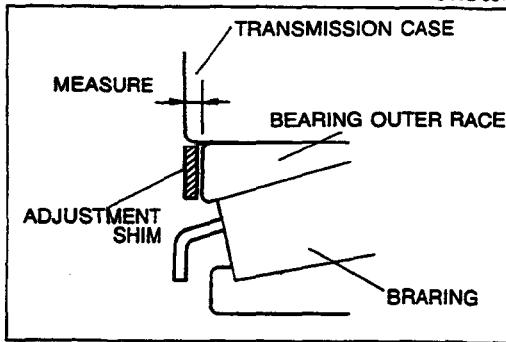
9TG0J2-095



9TG0J2-096



9TG0J2-097



9TG0J2-098

Shift rod

- 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.

Adjustment shim (Countershaft)

- Temporarily tighten the rear cover and tap in the bearing outer race with a copper hammer.

- 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)

Adjustment shim (Mainshaft)

- 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)

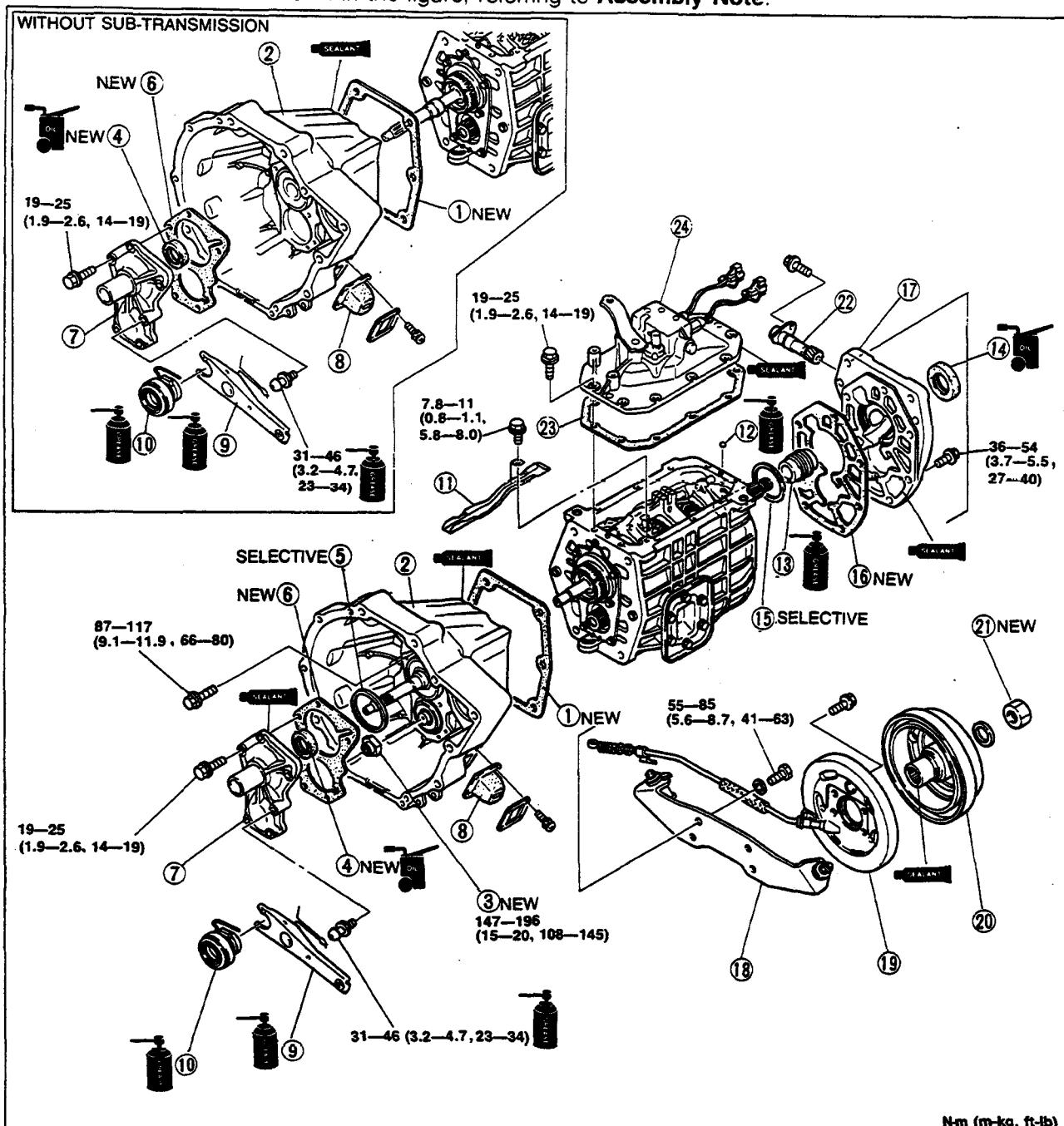
0.1 (0.004)	0.3 (0.012)
-------------	-------------

TRANSMISSION

J2

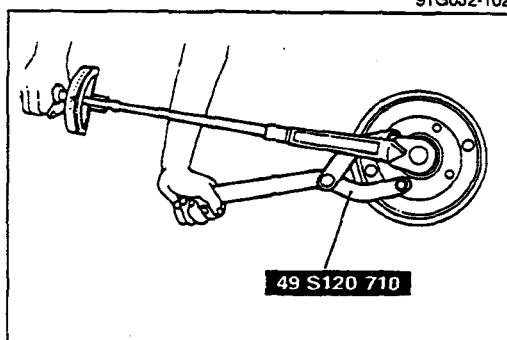
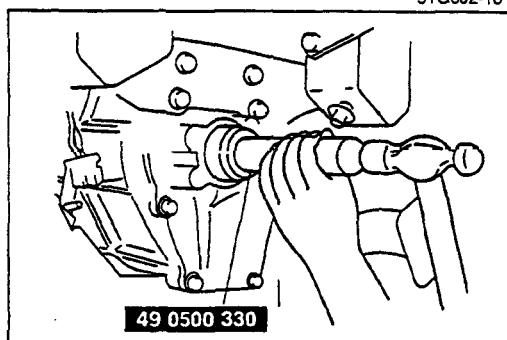
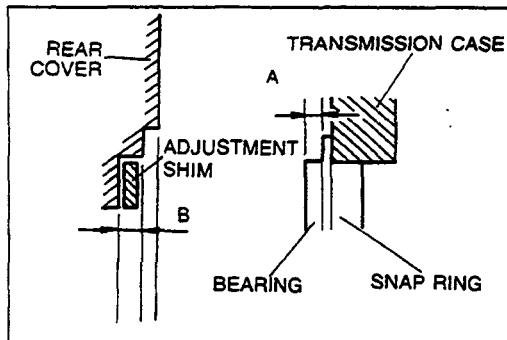
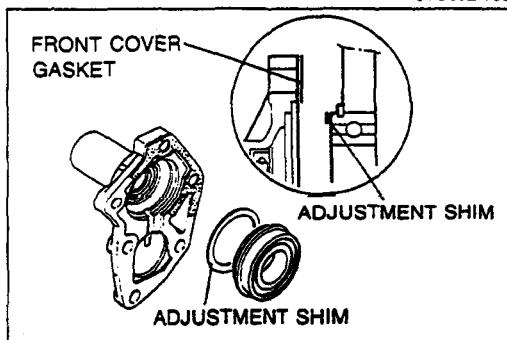
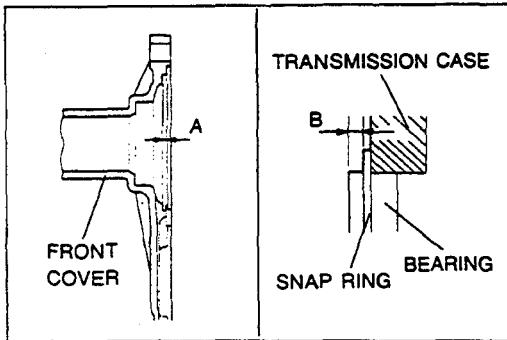
Housing Components

1. Assemble in the order shown in the figure, referring to **Assembly Note**.



N·m (m-kg, ft-lb) 9TG0J2-099

- | | | |
|---|-------------------------------|--------------------------------|
| 1. Gasket | 10. Release bearing | 17. Rear cover |
| 2. Clutch housing assembly | 11. Oil guide | 18. Transmission mount |
| 3. Locknut | 12. Steel ball | 19. Center brake assembly |
| 4. Oil seal | 13. Speedometer drive gear | 20. Center brake drum |
| 5. Adjustment shim (Front)
Assembly Note | 14. Oil seal
Assembly Note | Assembly Note page J2-46 |
| page J2-46 | page J2-46 | |
| 6. Gasket | 15. Adjustment shim (Rear) | 21. Locknut |
| 7. Front cover | Assembly Note | 22. Speedometer driven gear |
| 8. Dust boot | page J2-46 | 23. Gasket |
| 9. Release fork | 16. Gasket | 24. Top cover assembly |



Assembly Note

Adjustment shim (Front)

- 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)

- 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.

- Install the oil seal with the SST.

Center brake drum

- Install the center brake drum.
- Hold the drum with the SST, and tighten the locknut.

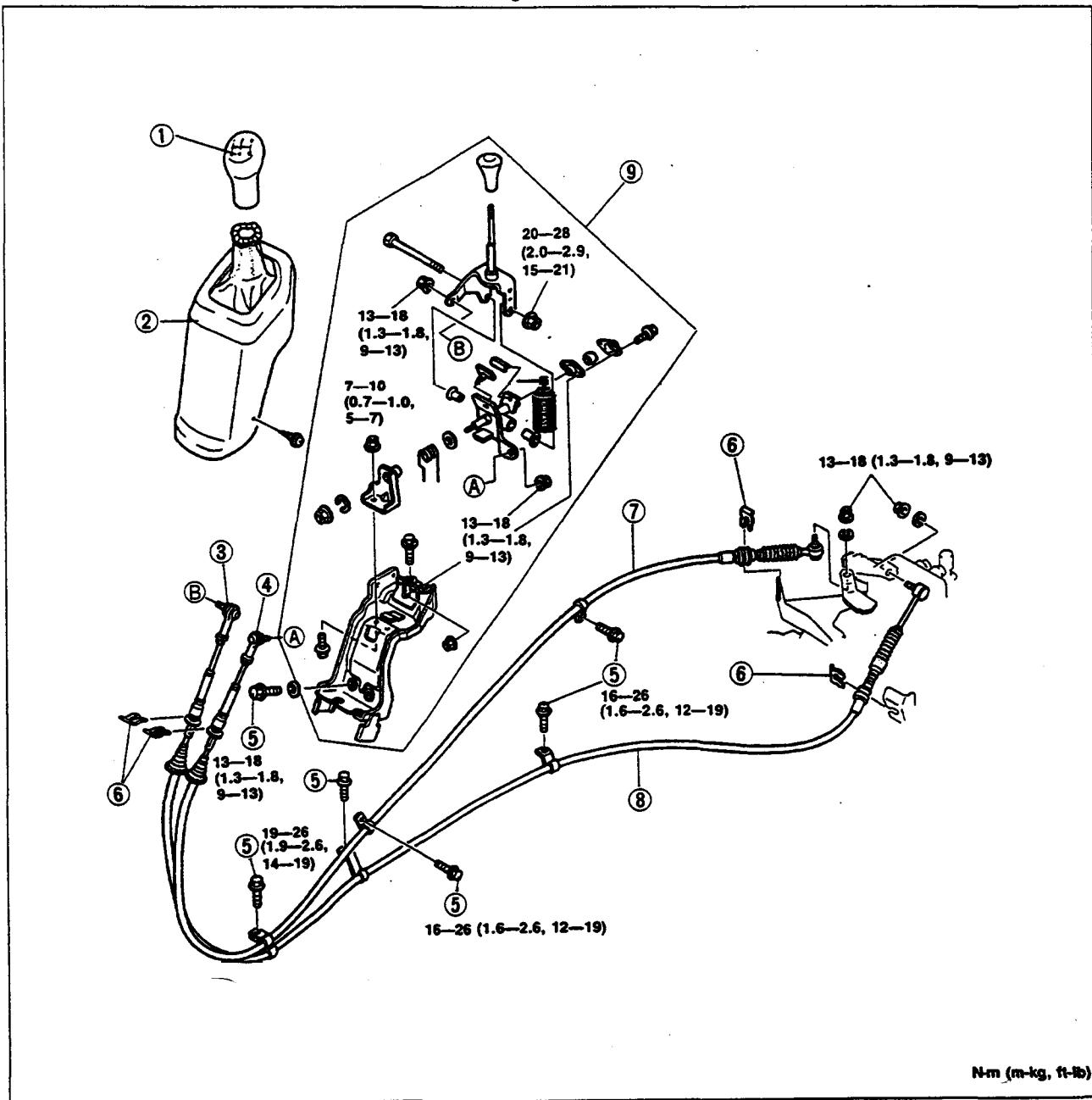
Tightening torque:

245—294 N·m (25—30 m-kg, 180—216 ft-lb)

SHIFT MECHANISM (TRANSMISSION)

REMOVAL / INSTALLATION

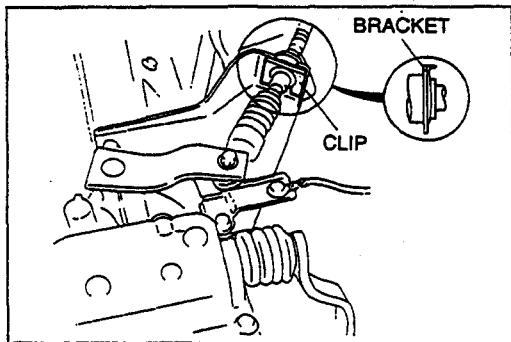
1. Remove in the order shown in the figure.
2. Inspect all parts and repair or replace as necessary.
3. Install in the reverse order of removal, referring to **Installation Note**.



Nm (m·kg, ft·lb)

9TG0J2-104

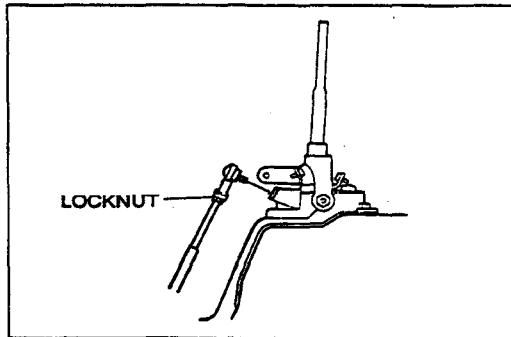
1. Shift knob
Installation Note page J2-48
2. Console
3. Shift cable ball joint
Installation Note page J2-48
4. Selector cable ball joint
Installation Note page J2-48
5. Bolt
6. Clip
Installation Note page J2-48
7. Selector cable
Inspect boots for damage
Inspect cable for damage and function
8. Shift cable
Inspect boots for damage
Inspect cable for damage and function
9. Shift lever assembly



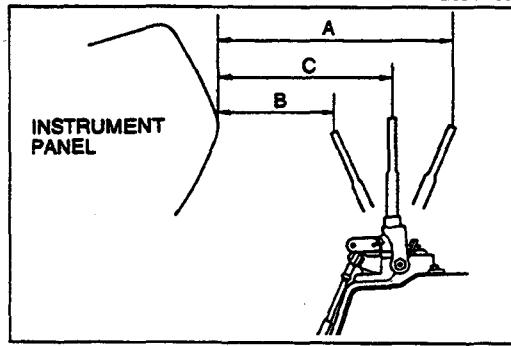
9TG0J2-105

Installation Note**Clip**

1. Install the clips as shown in the figure.



9TG0J2-106



9TG0J2-110

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)

Shift cable ball joint

1. Measure A and B shown in the figure.
2. Calculate the neutral position of the shift lever as follows:

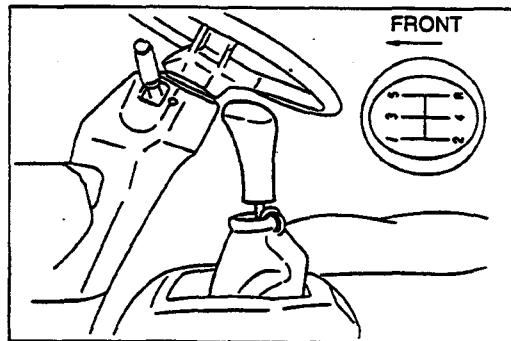
$$\text{Neutral position } C = B + \frac{A - B}{2}$$

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.



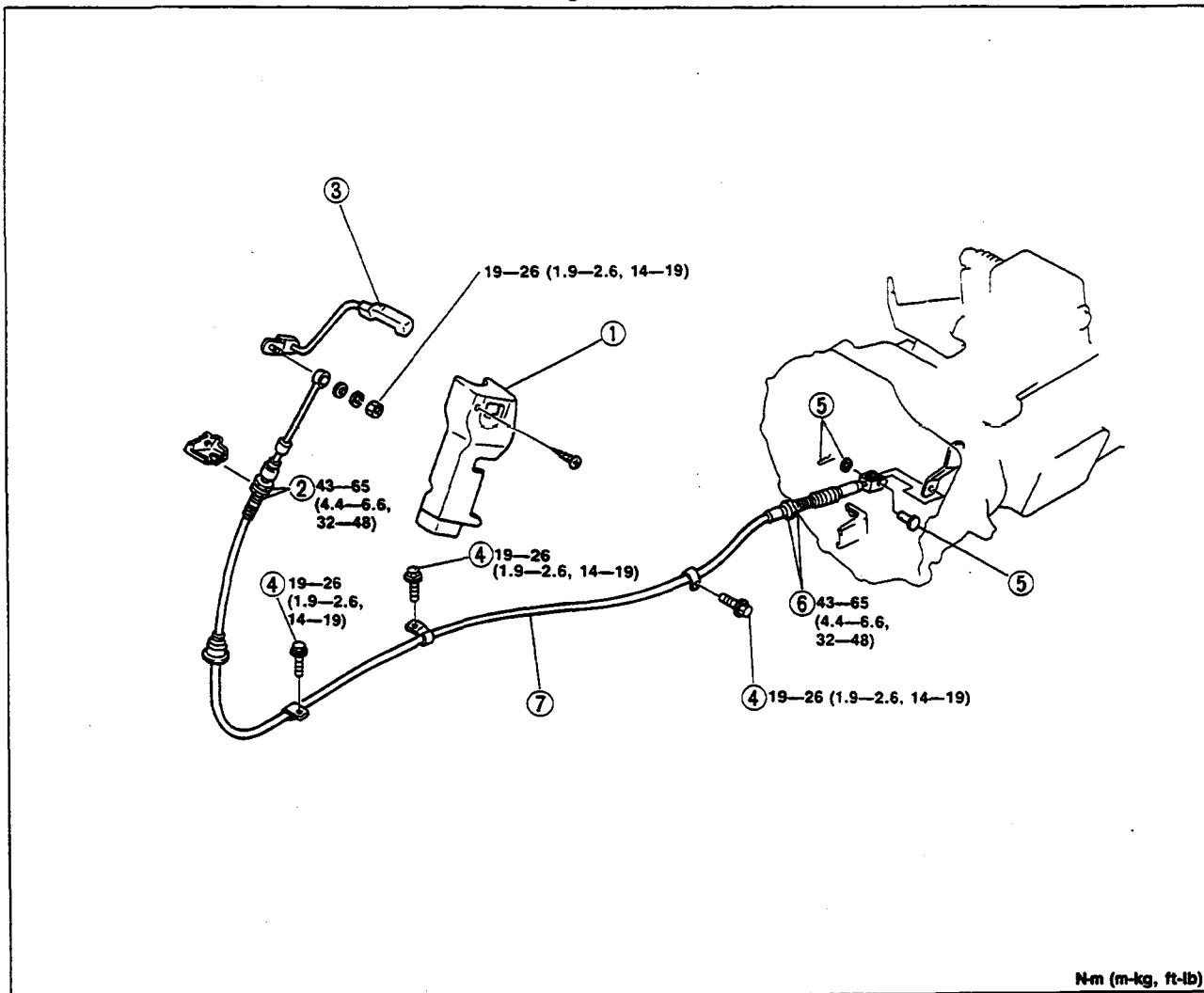
9TG0J2-106

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**.



1. Steering column cover

2. Nut

Installation Note page J2-49

3. Selector lever

4. Bolt

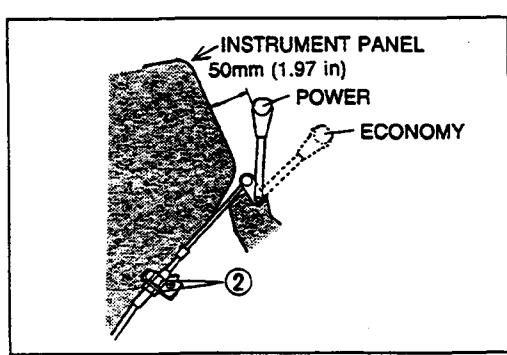
5. Spring pin and pin

6. Nut

7. Sub-selector cable

Inspect boot for damage

Inspect cable for damage and function

**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

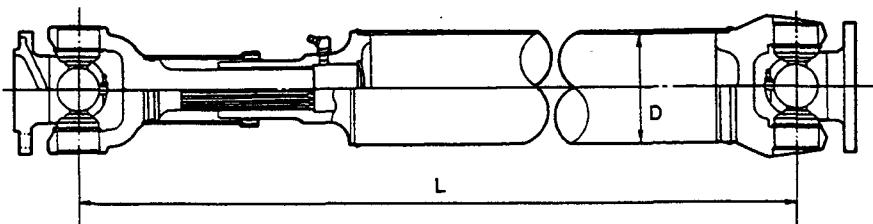
9TFOLX-001

L OUTLINE

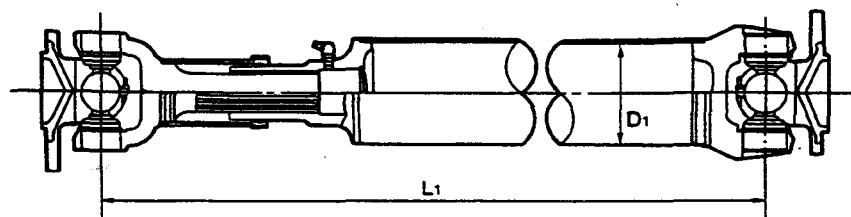
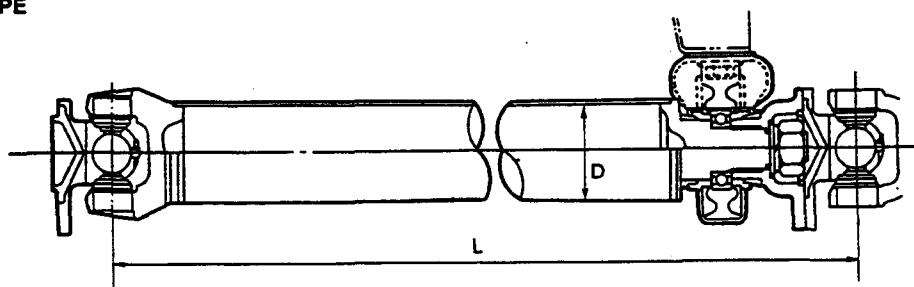
OUTLINE

SPECIFICATIONS

TWO-JOINT TYPE



THREE-JOINT TYPE



9TG0LX-002

Engine type		HA, SL		SL Turbo		TF	
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)
		L1	—	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)
Outer diameter		D	82.6 (3.25)		90.0 (3.54)		958 (37.72)
		D1	—		90.0 (3.54)		1,281–1,288 (50.43–50.71)

9TF0LX-002

TROUBLESHOOTING GUIDE, PROPELLER SHAFT

L

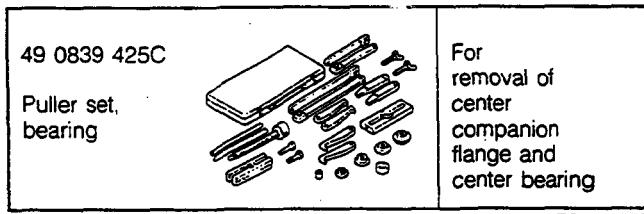
TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Vibration	Faulty assembly of sliding joint Bent propeller shaft Improperly installed universal joint snap ring Worn or damaged center bearing Loose center bearing mounting bolts Loose yoke mounting bolts Worn sliding joint splines Improperly assembled center bearing yoke	Repair Replace Repair Replace Tighten Tighten Replace Repair	L- 6 L- 6 L- 6 L- 6 L- 6 L- 6 L- 4 L- 6 L- 6
Abnormal noise	Worn or damaged bearing cup Improperly installed universal joint snap ring Worn or damaged center bearing Loose yoke mounting bolts Worn or damaged sliding joint splines Insufficient grease	Replace Repair Replace Tighten Replace Greace	L- 6 L- 6 L- 6 L- 4 L- 6 L-11

9TFOLX-003

PROPELLER SHAFT

PREPARATION SST

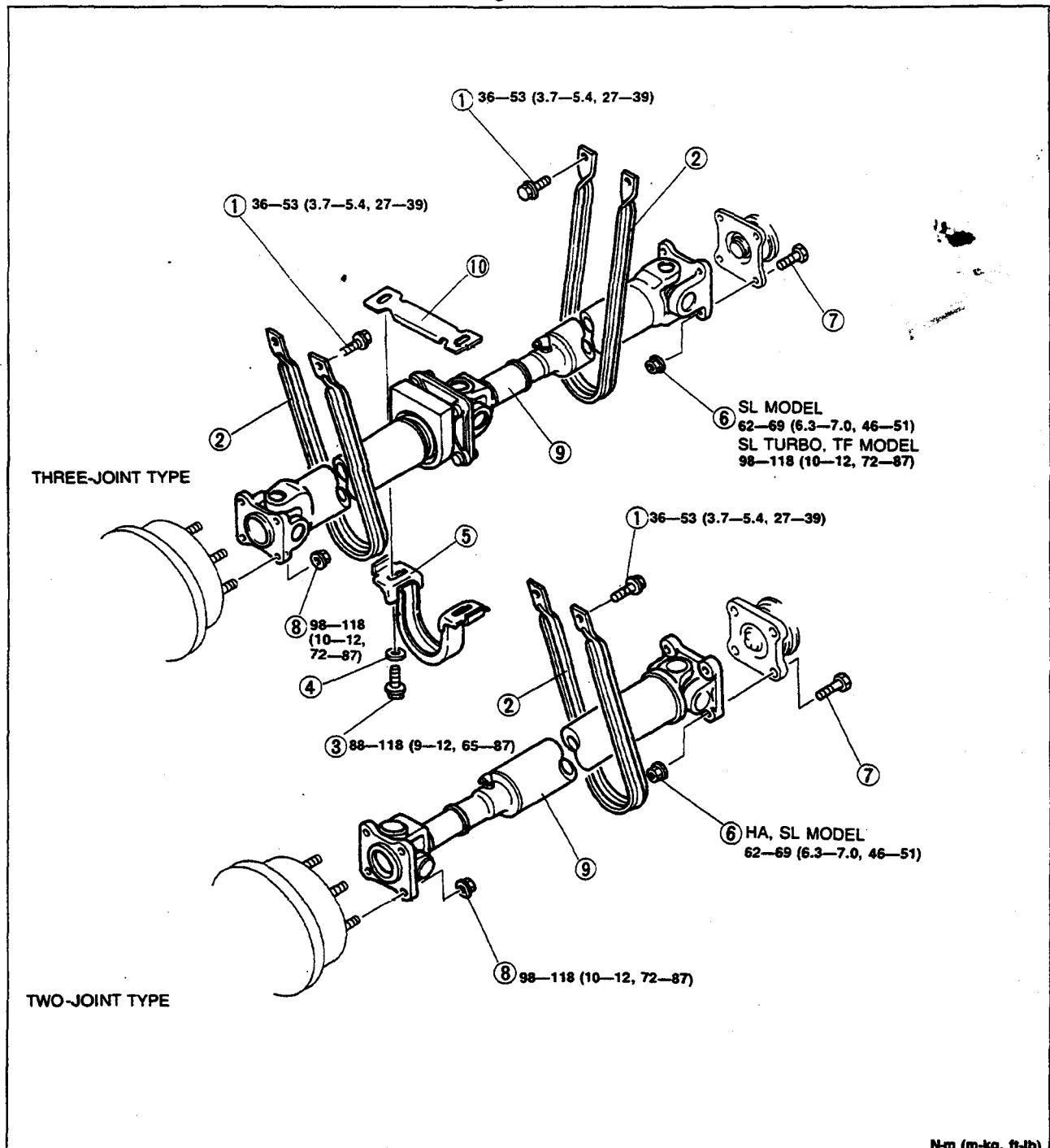


9TG0LX-005

L PROPELLER SHAFT

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.

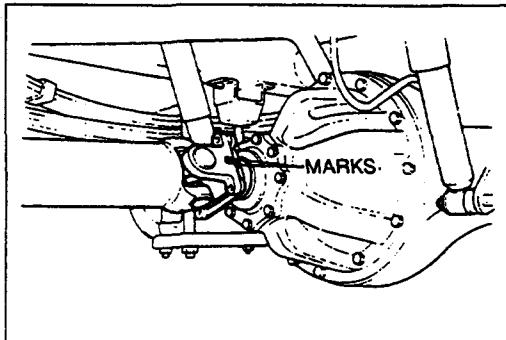


N·m (m·kg, ft·lb)
9TF0LX-004

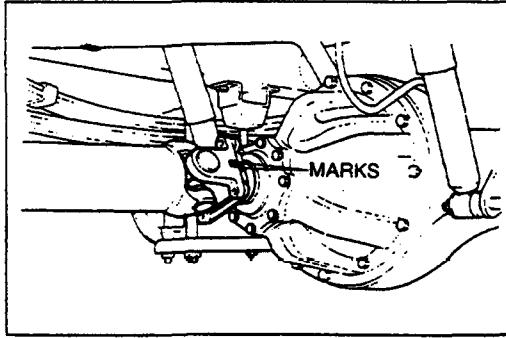
- | | |
|---------------------------|----------------------------------|
| 1. Bolt | 8. Nut |
| 2. Safety loop | 9. Propeller shaft |
| 3. Bolt | Removal Note..... page L-5 |
| 4. Washer | Overhaul page L-5 |
| 5. Center bearing bracket | Installation Note page L-5 |
| 6. Nut | |
| 7. Bolt | 10. Plate |

PROPELLER SHAFT

L



9TG0LX-007



9TG0LX-008

Removal Note

Propeller shaft

1. Mark the yoke, parking brake drum, and companion flange for correct reassembly.

Installation Note

Propeller shaft

1. Align the marks and install the propeller shaft.

OVERHAUL

Caution

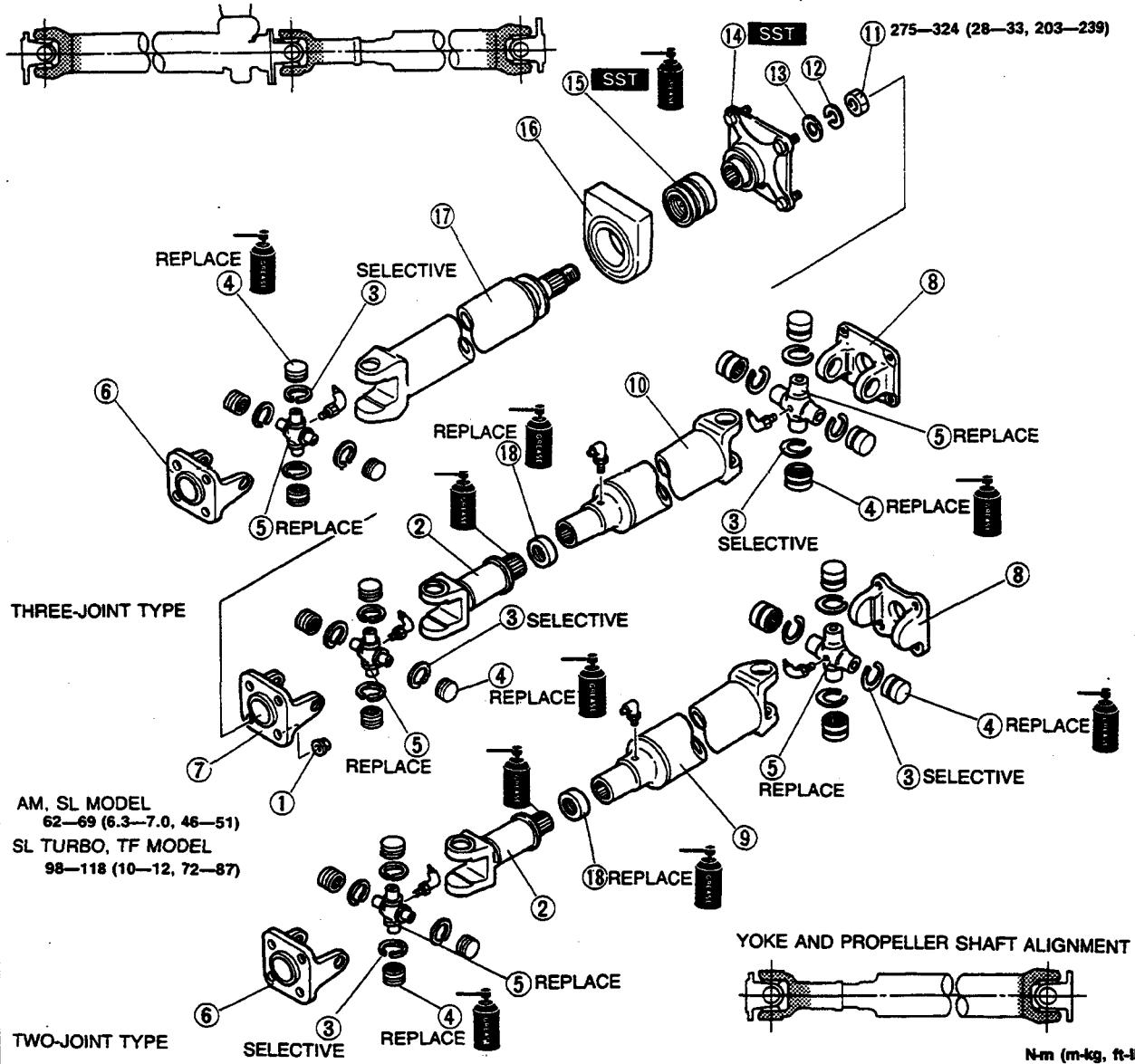
- Use pads in the vise to prevent damaging the part.
- Do not remove the oil seal if not necessary.

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

PROPELLER SHAFT

YOKE AND PROPELLER SHAFT ALIGNMENT

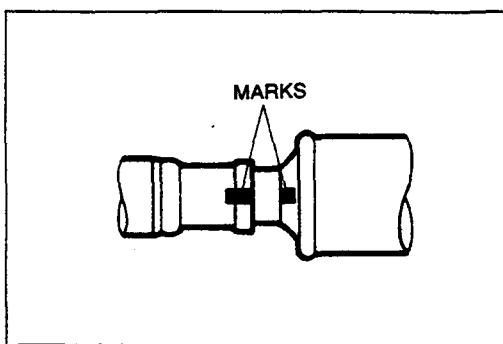


1. Nut (Yoke)
2. Sliding joint
Disassembly Note page L-7
Inspect splines for wear and damage
3. Snap ring
Disassembly Note page L-7
Assembly Note page L-9
4. Bearing cup
Disassembly Note page L-7
Inspect for wear, damage and rotation
Assembly Note page L-9
5. Spider
Inspect for wear and damage
6. Front 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

PROPELLER SHAFT

L



Disassembly Note

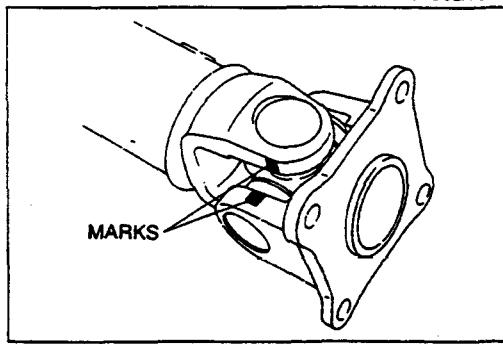
Sliding joint

1. Mark the sliding joint and propeller shaft for proper reassembly.

Caution

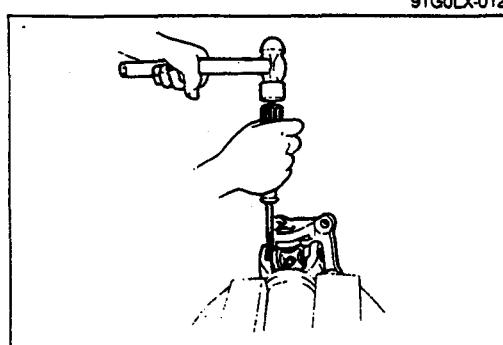
- Replace the sliding joint and propeller shaft as a set if necessary.

2. Remove the sliding joint.

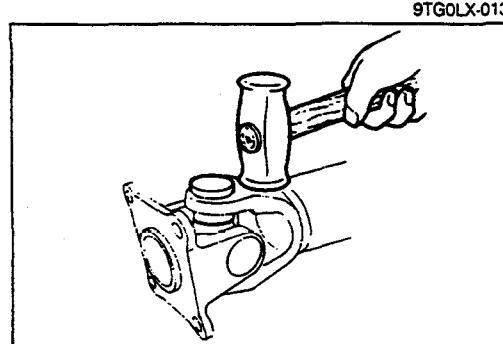


Snap ring

1. Mark the yoke and propeller shaft for proper reassembly.

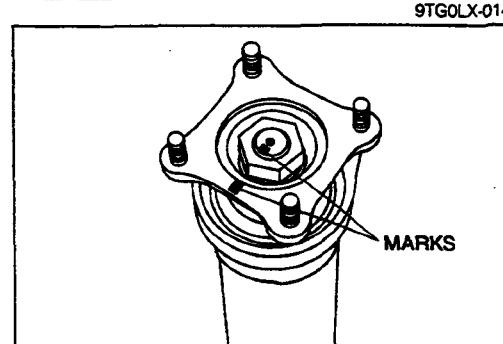


2. Clamp the propeller shaft in a vise.
3. Remove the snap ring.



Bearing cup

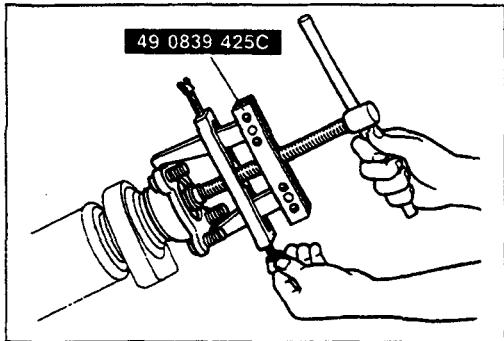
1. Push one bearing cup out of the propeller shaft by tapping the propeller shaft yoke.
2. Remove the opposite bearing cup in the same manner.
3. Separate the propeller shaft and yoke.
4. Clamp the yoke in a vise.
5. Remove the bearing cups and the spider from the yoke as in Steps 1 and 2.



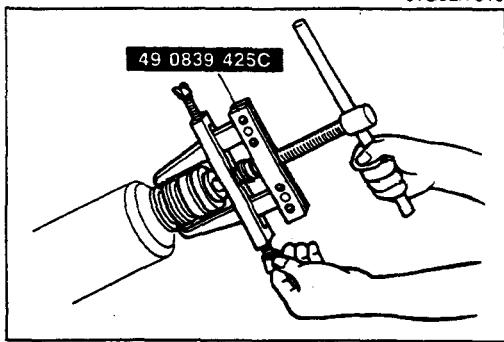
Center companion flange

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.

L PROPELLER SHAFT



4. Remove the companion flange with the **SST**.

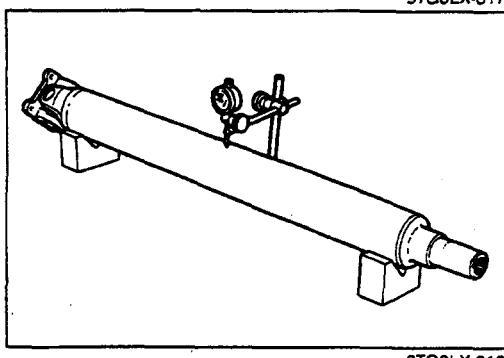


Center bearing

Caution

- Do not damage the oil seal.

1. Remove the center bearing with the **SST**.



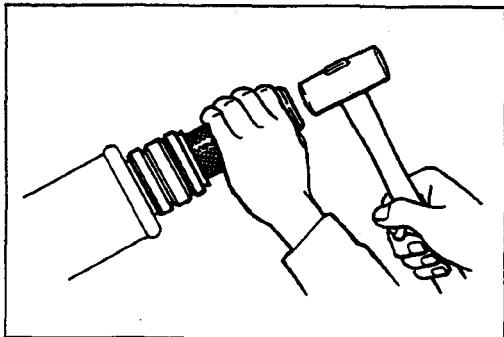
**Inspection
Propeller shaft**

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.



**Assembly Note
Center bearing**

Caution

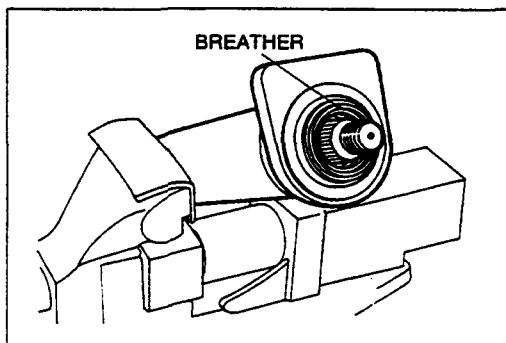
- Face the oil seal breather rearward.

1. Install the center bearing onto the propeller shaft with a suitable pipe and a hammer.

Pipe diameter: 45mm (1.77 in)

PROPELLER SHAFT

L

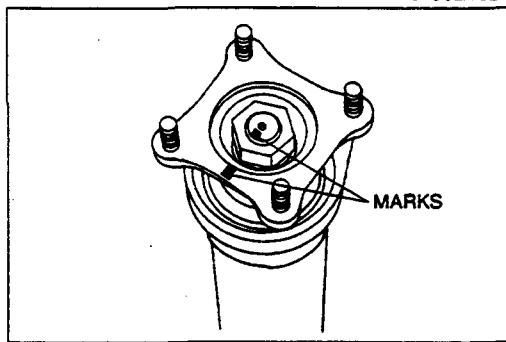


Center bearing rubber

Caution

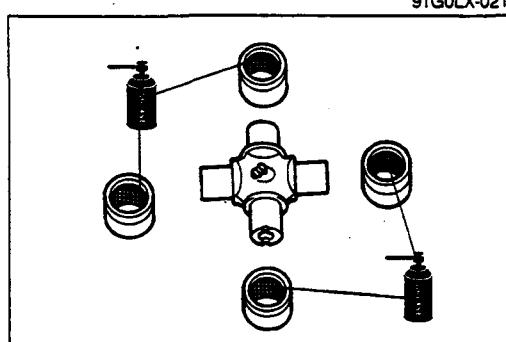
- Face the oil seal breather upward.

1. Install the center bearing rubber.



Center companion flange

1. Align the marks on the flange and shaft, and install the center companion flange.

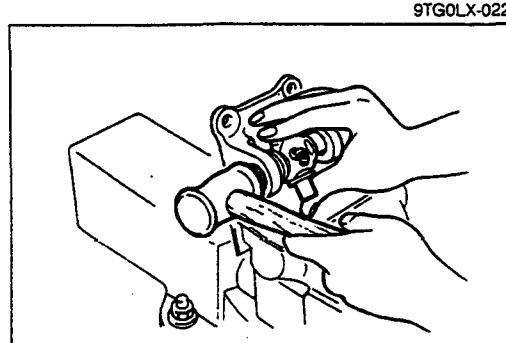


Bearing cup

Caution

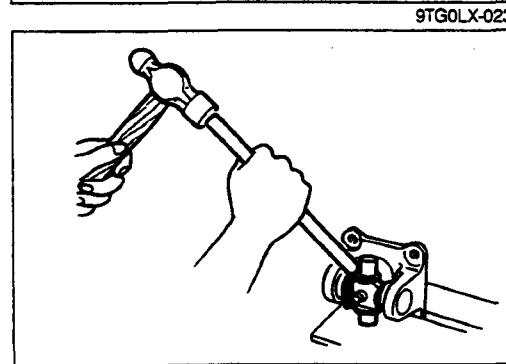
- Do not reuse the snap ring, bearing cup, or spider.

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.



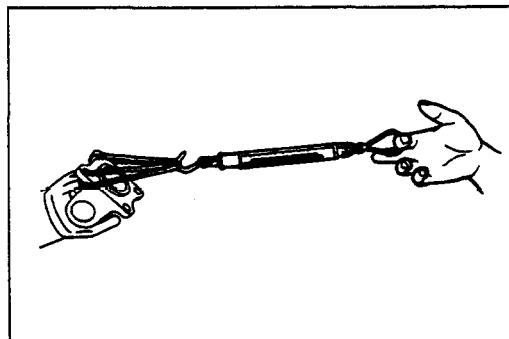
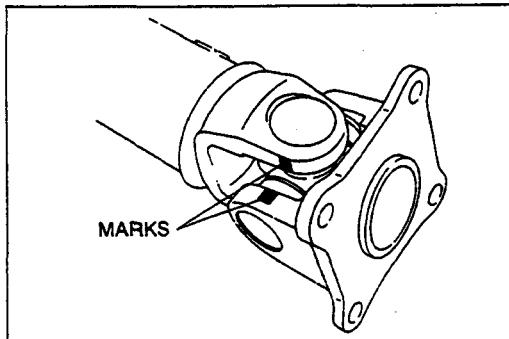
Snap ring

Caution

- Use only new snap rings and ones of the same thickness.

1. Install the thinnest snap rings.

PROPELLER SHAFT


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)

PROPELLER SHAFT

L

LUBRICATION

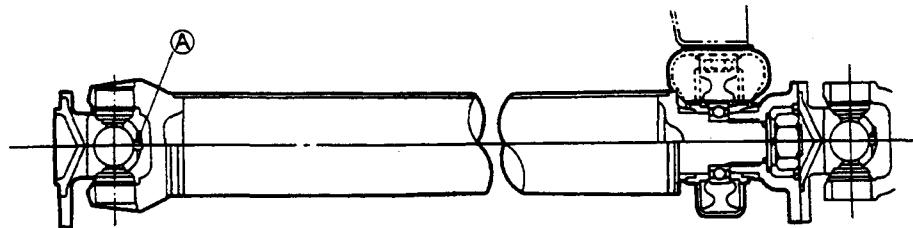
1. Lubrication fittings are installed to make possible regular lubrication. The type of grease used for the universal joints and slip yoke is different.

Lubricant

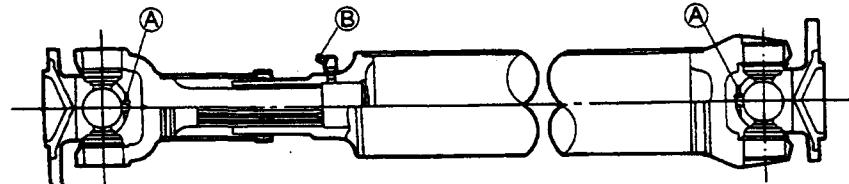
- | | |
|-----------------------|------------------------------|
| For fitting (A) | Lithium based grease |
| For fitting (B) | Disulphide molybdenum grease |

THREE-JOINT TYPE

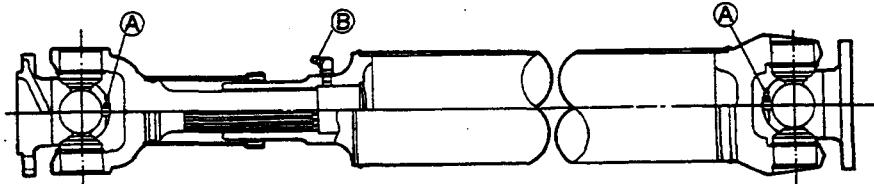
PROPELLER
SHAFT NO.1



PROPELLER
SHAFT NO.2



TWO-JOINT TYPE



FRONT AND REAR AXLES

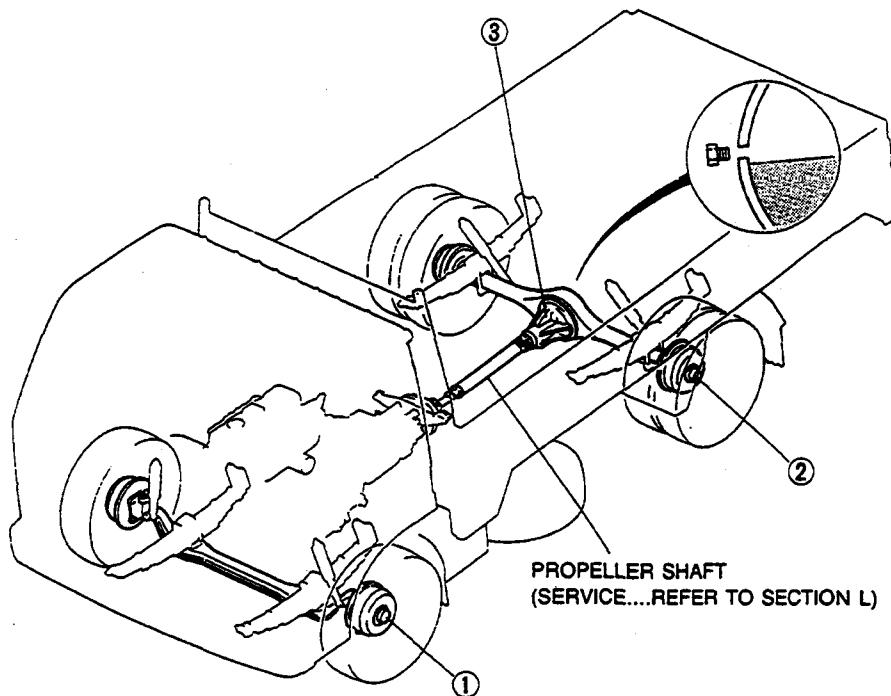
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PREPARATION.....	M- 4
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PREPARATION.....	M-15
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OIL SEAL	M-24
DIFFERENTIAL.....	M-26

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INDEX

OIL SPECIFICATION
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)



9TF0MX-002

1. Front axle
 - Preinspection page M- 5
 - Preload adjustment page M- 5
 - Wheel hub
 - Removal / Inspection /
 - Installation page M- 6
 - Disassembly / Inspection /
 - Assembly page M- 8
 - Steering knuckle
 - Removal / Inspection /
 - Installation page M-10
 - Disassembly / Inspection /
 - Installation page M-13
2. Rear axle
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 - Preload adjustment page M-15
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 - Installation page M-16
 - Disassembly / Inspection /
 - Assembly page M-18
3. Differential
 - Differential oil page M-23
 - Oil seal page M-24
 - Removal / Installation page M-26
 - Overhaul page M-28

OUTLINE

OUTLINE

SPECIFICATIONS

Model	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
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	Engine type	SL Turbo	TF	
	Cargo box length	ft	17	
	Cabin style		Wide cabin	
	Body style		Truck	Crew cabin
Item	Pay load	t	4	3.5
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)	

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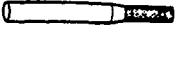
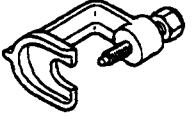
TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Abnormal noise	Worn or damaged pinion and side gear Excessive side gear backlash Worn or damaged side bearing Worn or damaged drive pinion bearing Worn or damaged ring gear Excessive ring gear backlash Insufficient oil Defective oil Poor contact of ring gear teeth Worn side gear spline Worn companion flange spline Worn drive pinion spline Worn pinion shaft Worn or damaged wheel bearing	Replace Replace Adjust or replace Replace Replace Replace Adjust Add Replace Adjust Replace Replace Replace Replace Replace Replace	M-28 M-28 M-28 M-28 M-28 M-28 M-39 M-23 M-23 M-40 M-28 M-28 M-28
Oil leakage	Insufficient sealant on differential carrier Damaged oil seal Loose drain plug	Correct Replace Tighten	M-26 M-24 M-23
Steering heavy	Binding kingpin Insufficient kingpin oil Steering unit related problem	Replace Add	M-10 M-10 Section N
Steering wheel pulls	Improperly adjusted front wheel bearing preload Steering unit related problem	Adjust	M- 5 Section N
Steering wheel vibration	Worn or improperly adjusted front wheel bearing Worn kingpin Steering unit related problem	Replace or adjust Replace	M- 5 M-10 Section N
Excessive steering wheel play	Improperly adjusted front wheel bearing preload Worn kingpin Steering unit related problem	Adjust Replace	M- 5 M-10 Section N

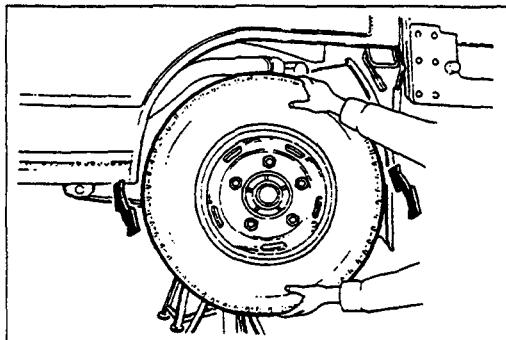
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FRONT AXLE

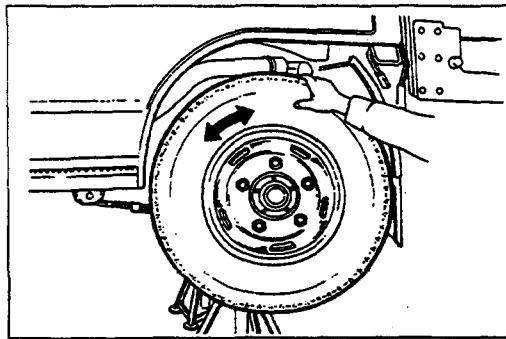
PREPARATION
SST

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

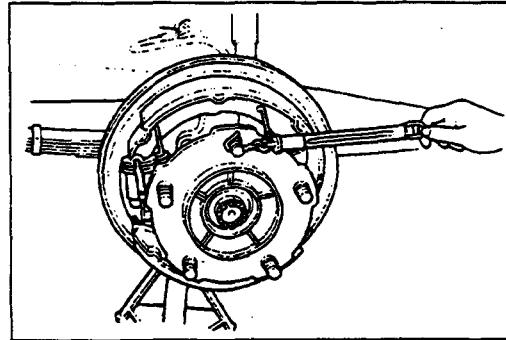
FRONT AXLE



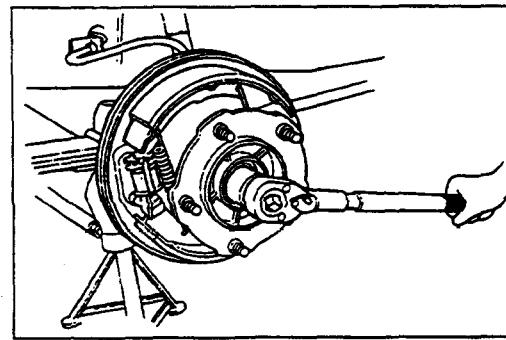
9TG0MX-010



9TG0MX-011



9TG0MX-012



9TF0MX-006

WHEEL HUB, STEERING KNUCKLE**Preinspection****Wheel bearing play**

- 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.**

- Verify that there is no abnormal noise and that the tire rotates smoothly when rotated by hand.
- Adjust the wheel bearing preload as necessary.

Preload Adjustment

- Remove the wheel and tire.
- 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.**

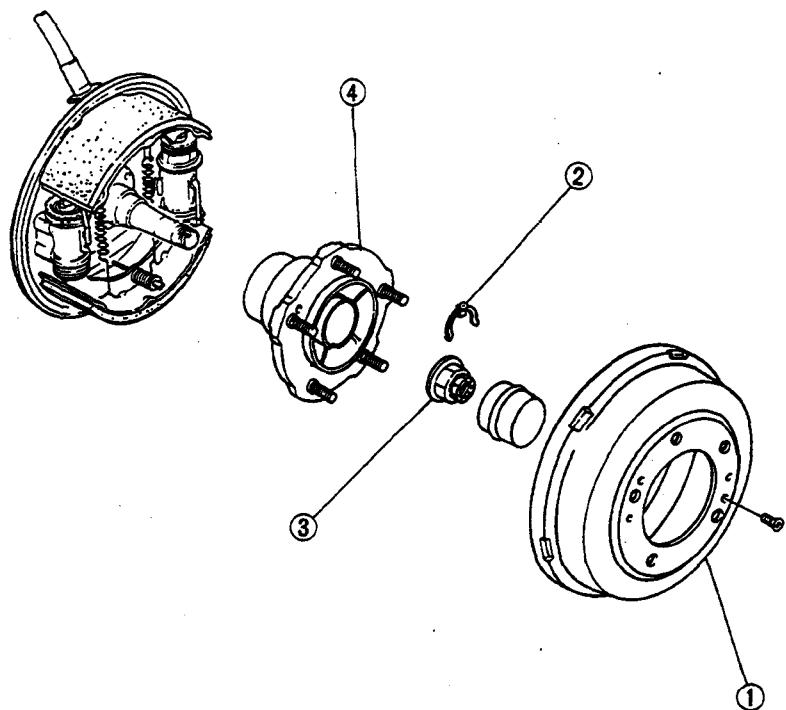
- Remove the brake drum. (Refer to page M-6.)
- Remove the stop retainer.
- Loosen the hub nut until it can be turned by hand.
- Attach a pull scale to a wheel lug bolt, and measure the frictional force while turning.
Then tighten the hub nut until the preload is as specified.

**Preload: Frictional force plus
11—30 N (1.1—3.0 kg, 2.4—6.6 lb)**

- Install in the reverse order of removal.

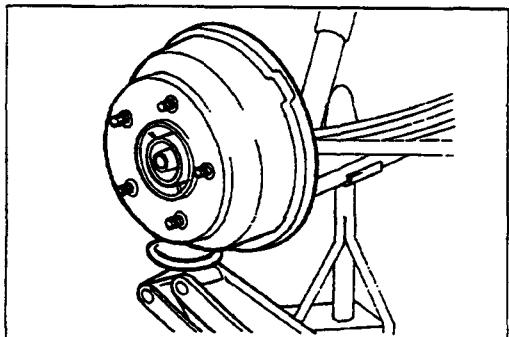
WHEEL HUB**Removal / Inspection / Installation**

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 | 4. Wheel hub
Removal Note page M-7
Disassembly / Inspection / Assembly page M-7 |
| 2. Stop retainer | |
| 3. Hub nut
Installation Note page M-7 | |

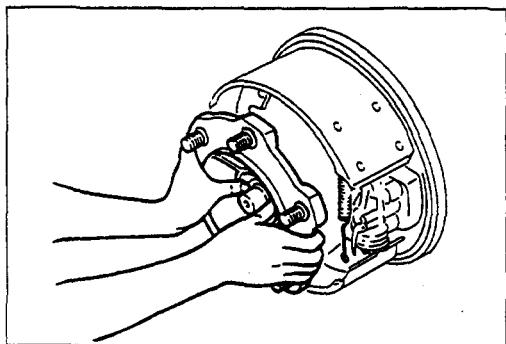
**Removal Note
Brake drum**

1. Support the brake drum with a jack and remove it.

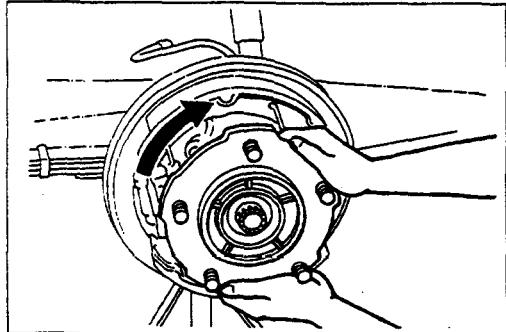
Caution

- Do not damage the oil seal.

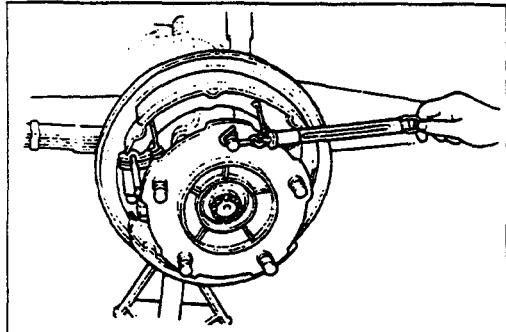
FRONT AXLE



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.

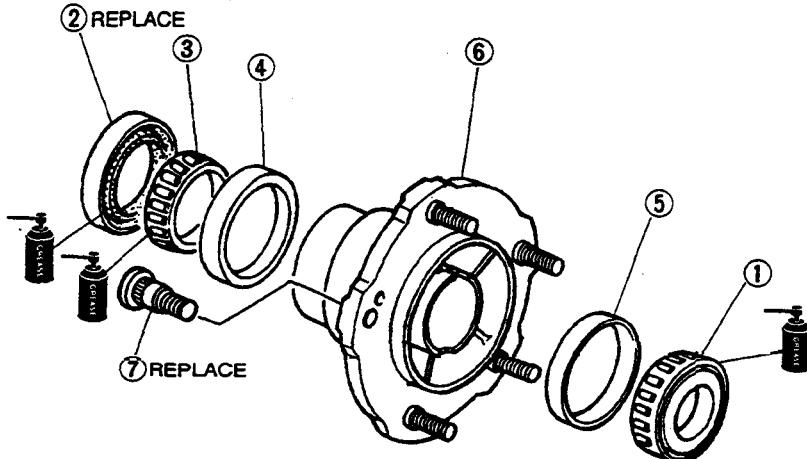
4. Attach a pull scale to a wheel hub bolt, and measure the frictional force while turning. Tighten the locknut until the preload is as specified.

Preload: Frictional force plus

11—30 N (1.1—3.0 kg, 2.4—6.6 lb)

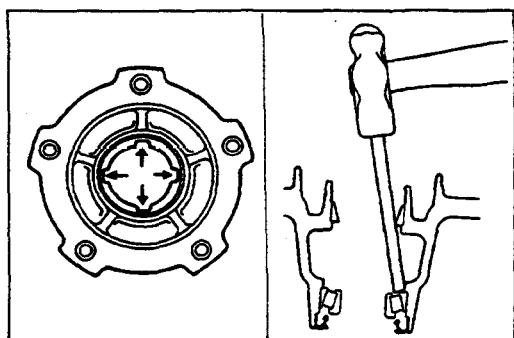
Disassembly / Inspection / Assembly

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 | 5. Bearing outer race (Outer)
Disassembly Note page M-8
Assembly Note page M-9 |
| 2. Oil seal
Assembly Note page M-9 | 6. Wheel hub |
| 3. Bearing inner race (Inner)
Inspect for damage and rotation | 7. Hub bolt
Disassembly Note page M-9
Assembly Note page M-9 |
| 4. Bearing outer race (Inner)
Disassembly Note page M-8
Assembly Note page M-9 | |



STG0MX-020

**Disassembly Note
Bearing outer race****Caution**

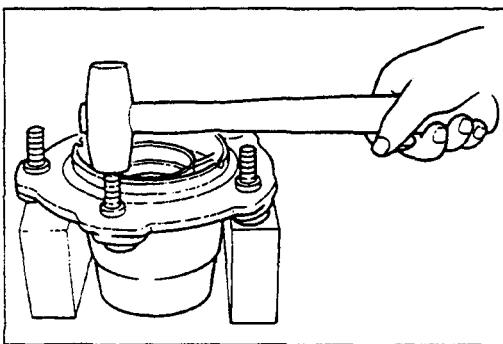
- Replace the inner and outer race as a set.
- Do not reuse the removed oil seal.

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.

FRONT AXLE

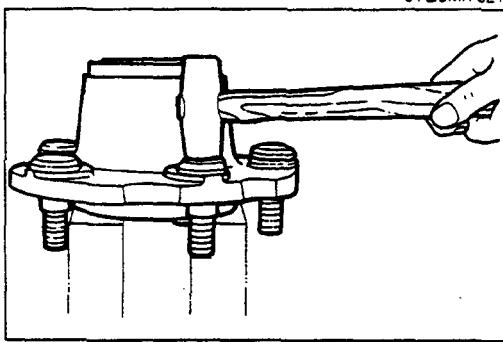


Hub bolt

Caution

- Do not remove the hub bolt if not necessary.
- Do not reuse a removed hub bolt.

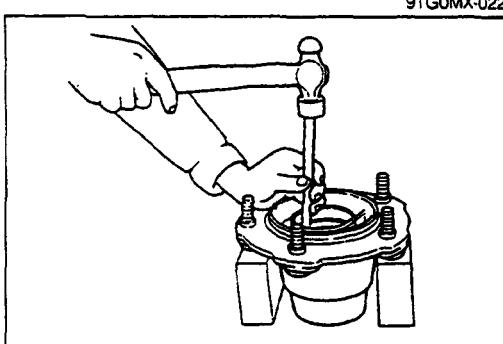
1. Remove the hub bolts with a brass hammer.



Assembly Note

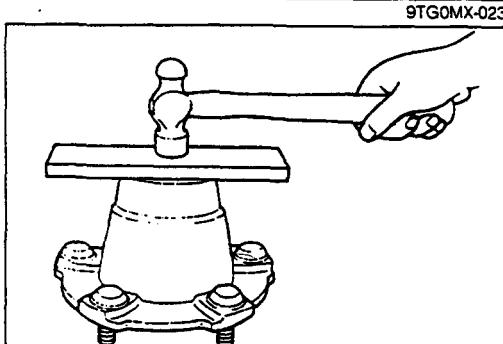
Hub bolt

1. Install the hub bolts with a brass hammer.



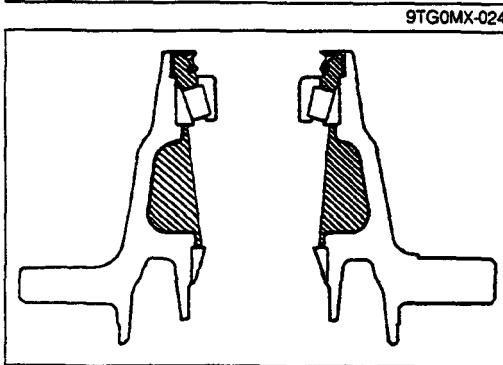
Bearing outer race

1. Install the bearing outer race with a brass bar and a hammer.



Oil seal

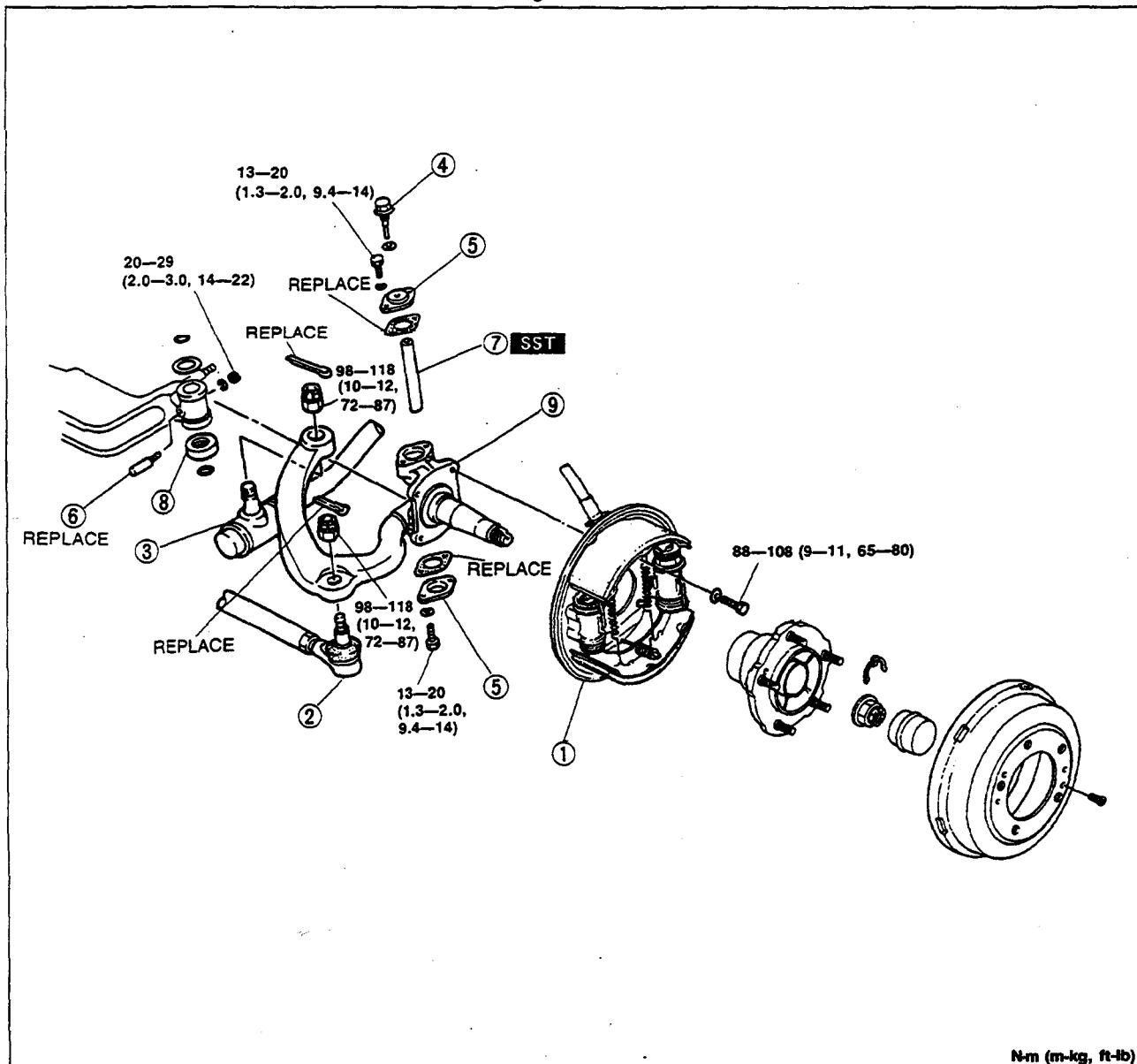
1. Apply grease around the new oil seal lip.
2. Drive the oil seal into the wheel hub with a suitable plate and a hammer.



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**.

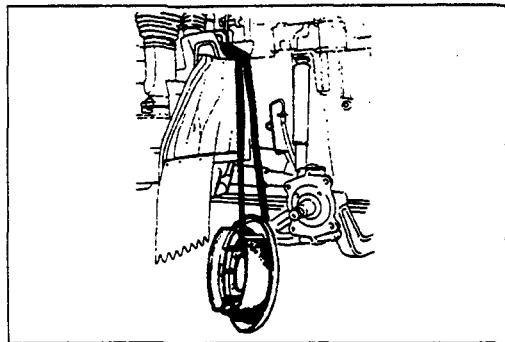


N·m (kg·m, ft·lb)

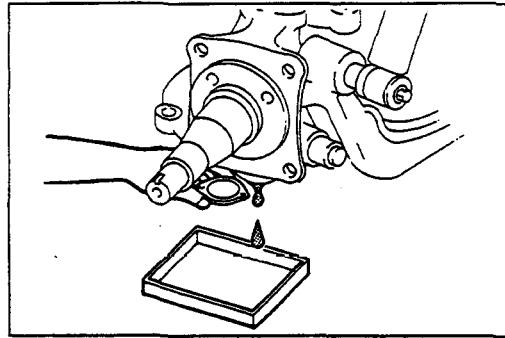
9TF0MX-009

- | | | | |
|---|-----------|---|-----------|
| 1. Brake backing plate
Removal Note..... | page M-11 | 6. Lock pin
Removal Note..... | page M-11 |
| Service | Section P | | |
| 2. Tie-rod ball joint
Service | Section N | 7. Kingpin
Removal Note..... | page M-11 |
| 3. Drag link ball joint
Service | Section N | Inspection | page M-11 |
| 4. Kingpin oil level gauge
Installation Note | page M-13 | Installation Note | page M-12 |
| 5. Kingpin cap
Removal Note..... | page M-11 | 8. Kingpin bearing
Inspect for damage and rotation | |
| | | 9. Steering knuckle
Disassembly / Inspection /
Assembly | page M-13 |
| | | Installation Note | page M-12 |

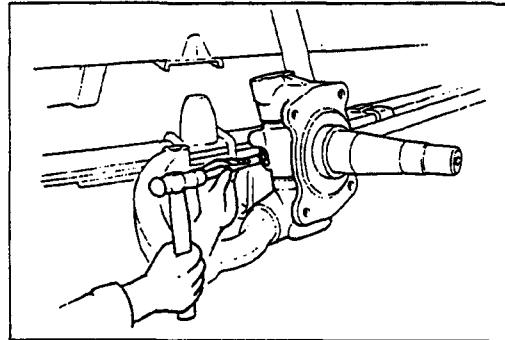
FRONT AXLE



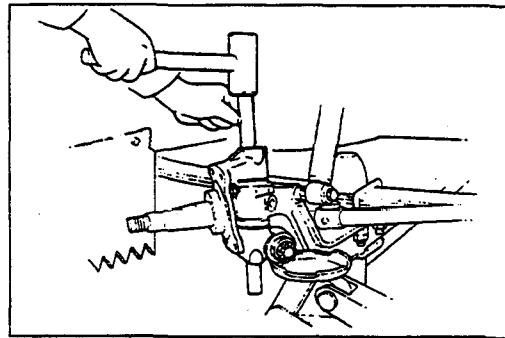
9TG0MX-027



9TG0MX-028



9TG0MX-029



9TG0MX-030

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.

Kingpin cap

Note

- Prepare a suitable drip pan.

1. Remove the upper and lower kingpin caps.

Lock pin

Caution

- Do not reuse the removed lock pin.

1. Remove the lock pin with a hammer.

Kingpin

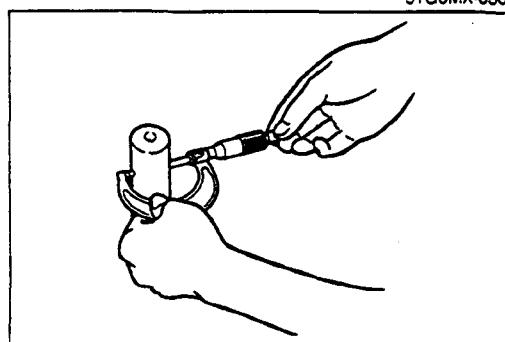
1. Remove the kingpin with a brass bar and a hammer.

Inspection

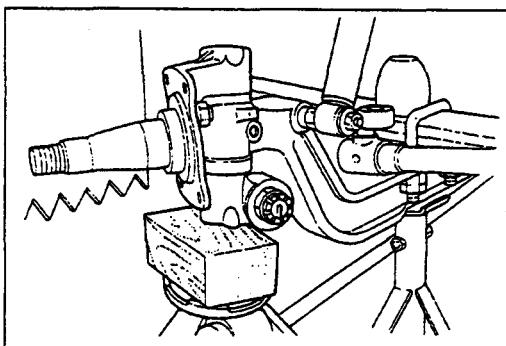
Kingpin bushing and kingpin clearance

1. Measure the kingpin bushing inner diameter and kingpin outer diameter with a micrometer, then figure out the clearance between them.

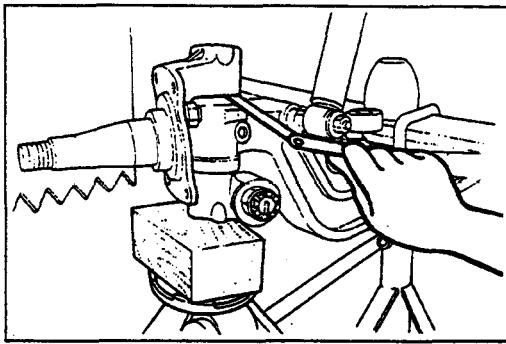
Clearance: 0.01—0.04mm (0.0004—0.0016 in)



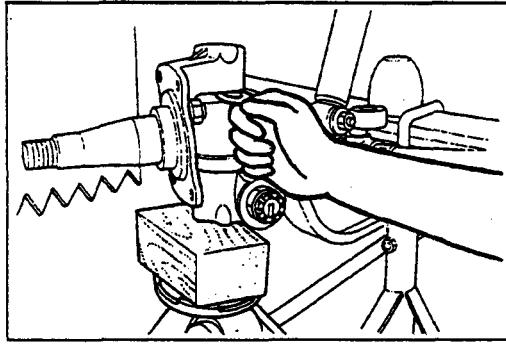
9TG0MX-031



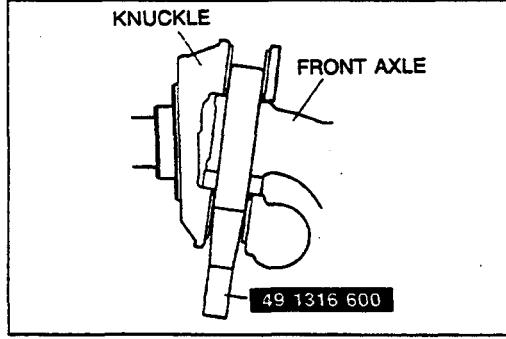
9TG0MX-032



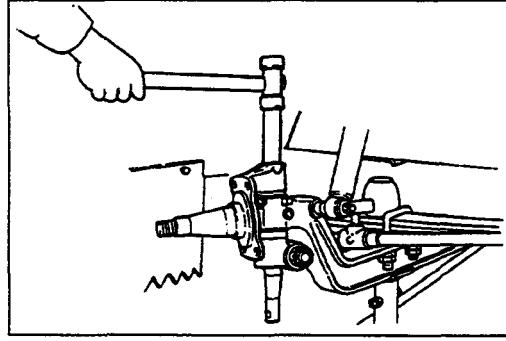
9TG0MX-033



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:

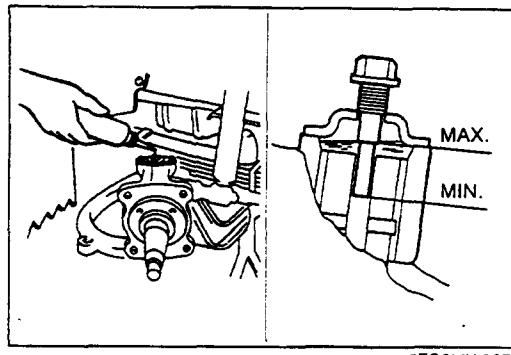
mm (in)

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

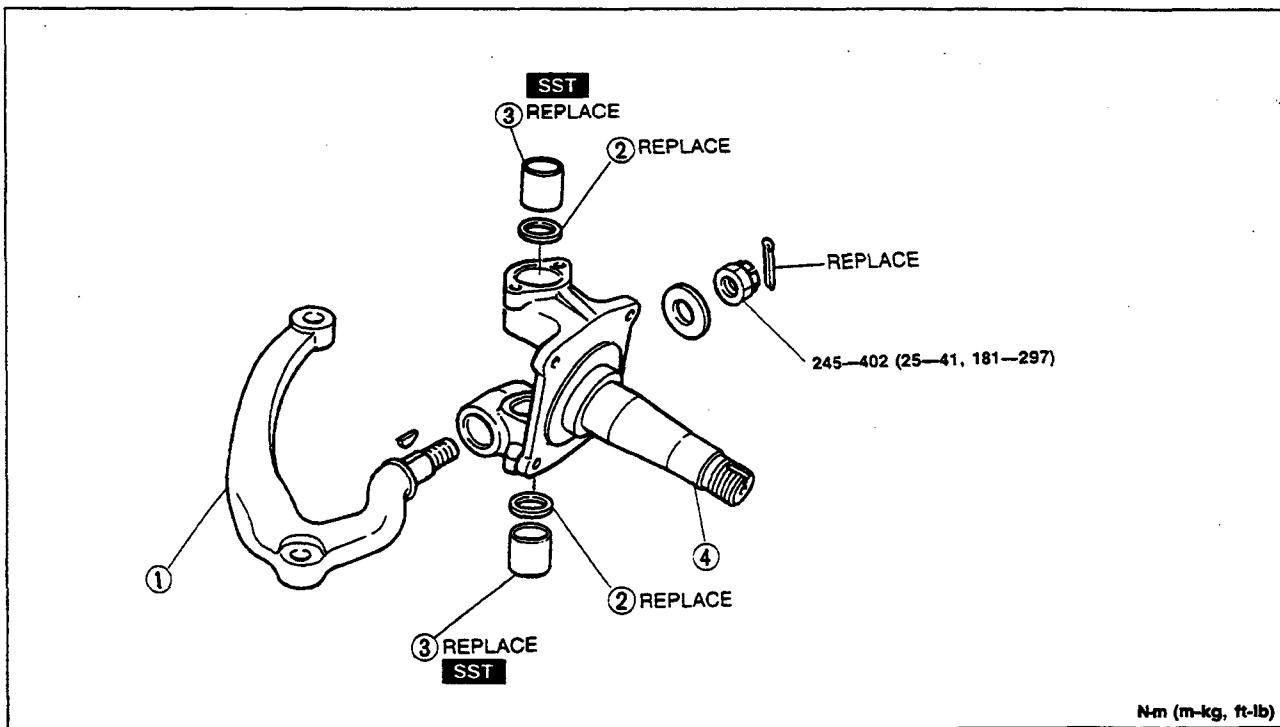
Kingpin oil level gauge**Caution**

- 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**.

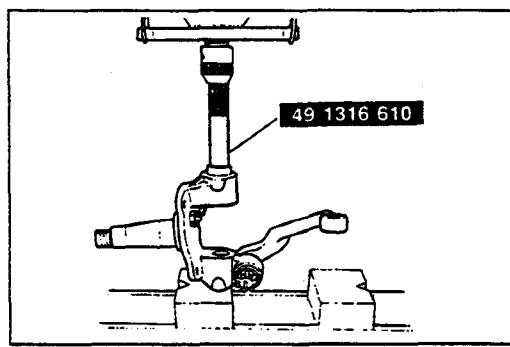


N·m (m-kg, ft-lb)

9TF0MX-010

1. Knuckle arm
Inspect for damage and cracking
2. O-ring

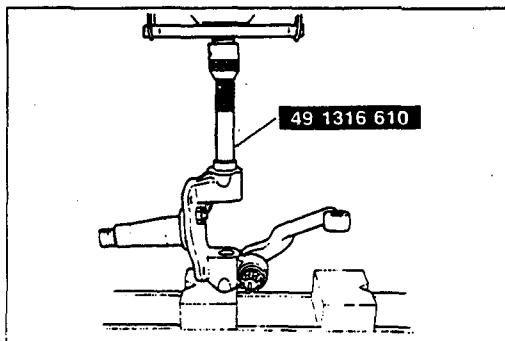
3. Kingpin bushing
Disassembly Note page M-13
Assembly Note page M-14
4. Steering knuckle
Inspect for damage and cracking



9TG0MX-039

**Disassembly Note
Kingpin bushing**

1. Remove the kingpin bushing with the **SST** and a press.



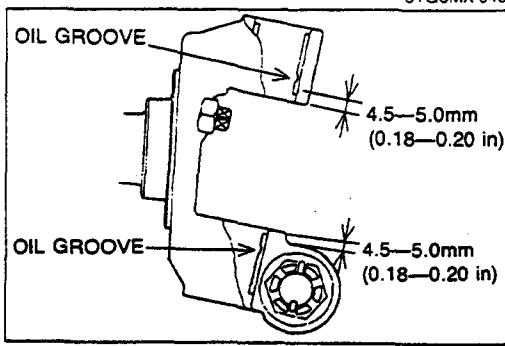
9TG0MX-040

**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.

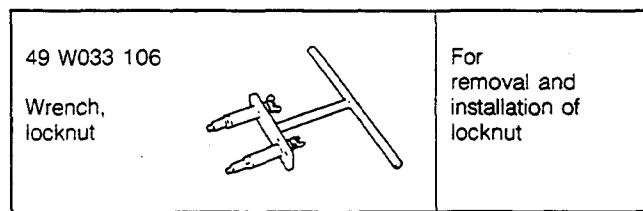
2. When installing, allow **4.5—5.0mm (0.18—0.20 in)** clearance between the end of the bushing and the matching surface of the knuckle.



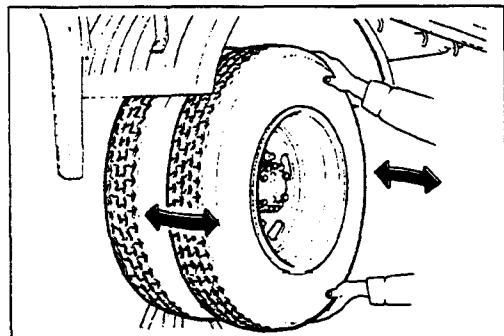
9TG0MX-041

REAR AXLE

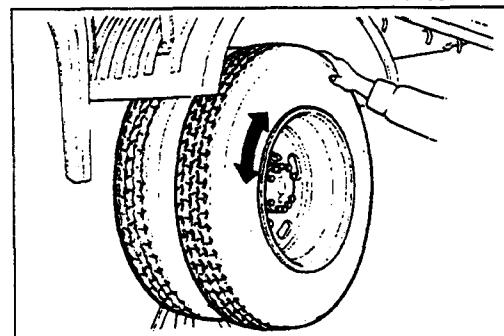
REAR AXLE

PREPARATION
SST

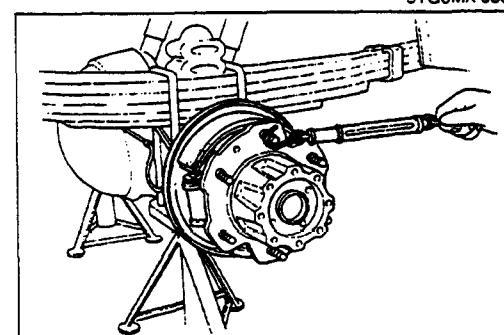
9TG0MX-086



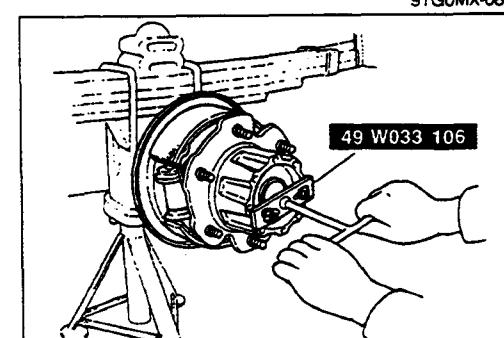
9TG0MX-087



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.

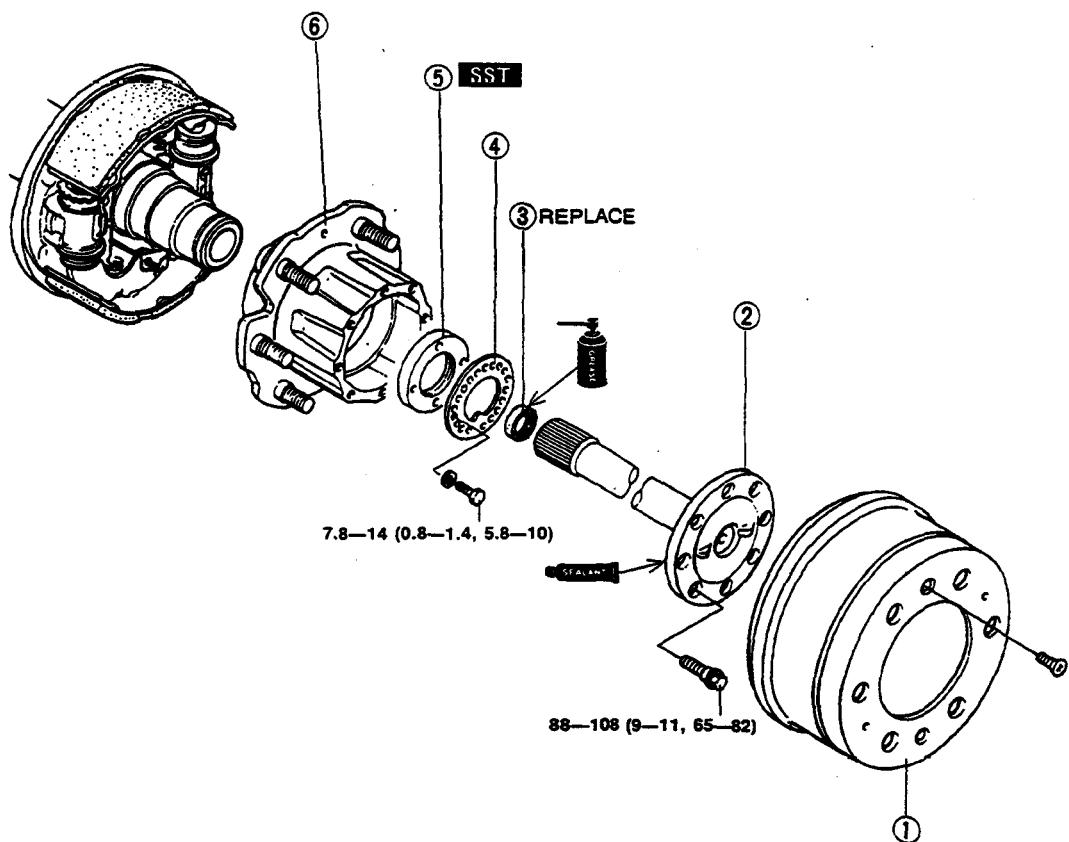
Preload: Frictional force plus**11–30 N (1.1–3.0 kg, 2.4–6.6 lb)**

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.

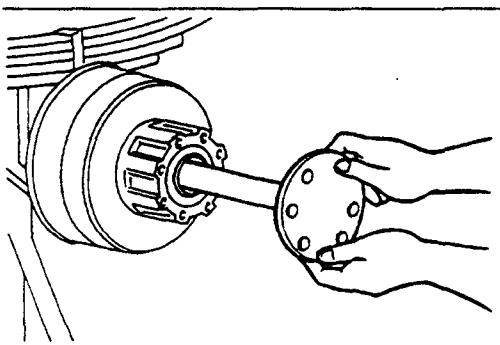


N·m (m·kg, ft·lb)

9TF0MX-011

- | | | |
|--|-----------|--|
| 1. Brake drum
Removal Note..... | page M-17 | 5. Locknut |
| 2. Axle shaft
Removal Note..... | page M-17 | 6. Wheel hub
Removal Note..... |
| 3. Oil seal
Installation Note | page M-18 | Inspect for damage and cracks
Disassembly / Inspection /
Assembly
Installation Note |
| 4. Set plate | | page M-17
page M-18
page M-17 |

REAR AXLE



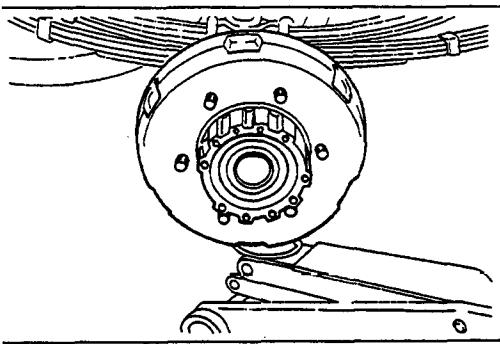
9TG0MX-092

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

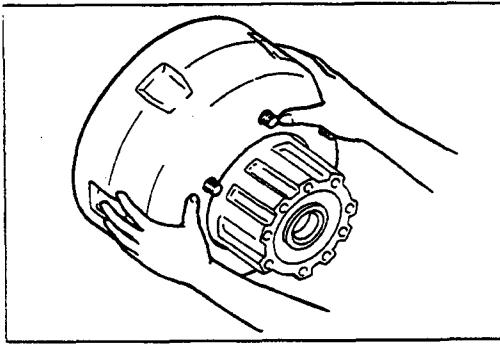
Brake drum

1. Support the brake drum with a jack.

Caution

- Do not damage the oil seal.

2. Remove the brake drum.



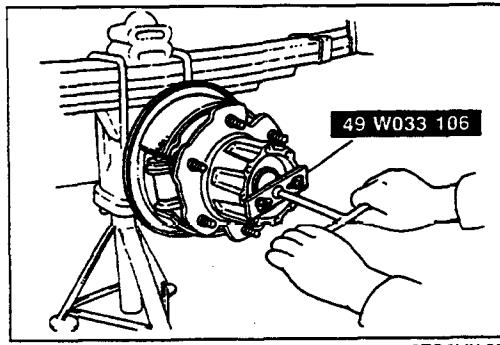
9TG0MX-094

Wheel hub

Caution

- Do not drop the bearing inner race.

1. Remove the wheel hub from the axle housing.

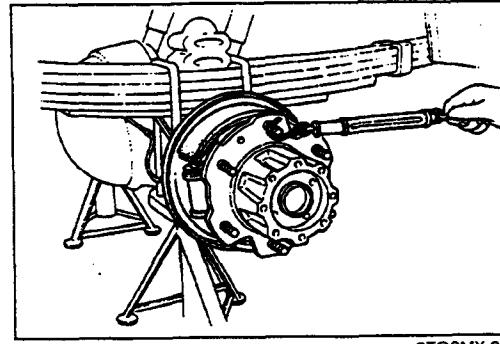


9TG0MX-095

Installation Note

Wheel hub

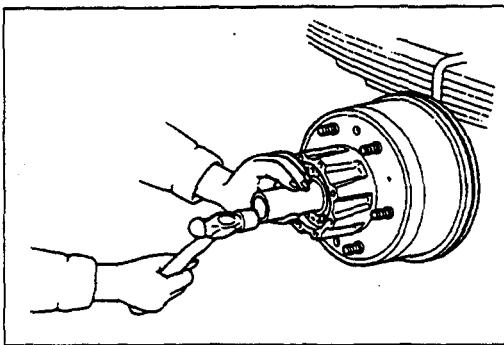
1. Tighten the locknut with the SST.
2. Turn the wheel hub several times to seat the bearings.
3. Loosen the locknut until it can be turned by hand.



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)**



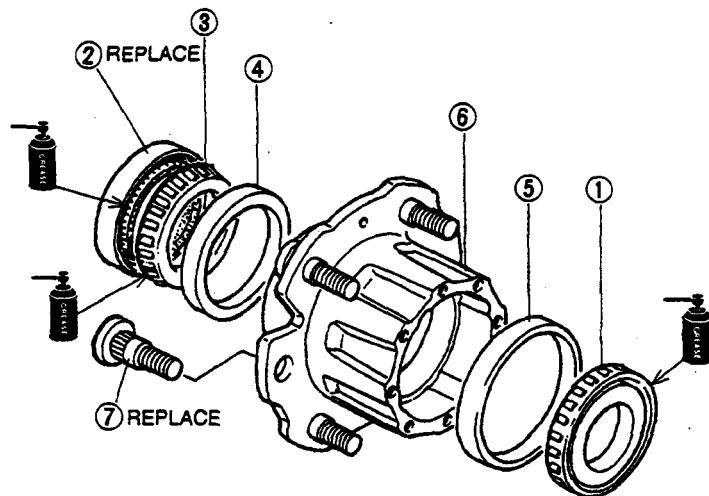
9TG0MX-097

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.

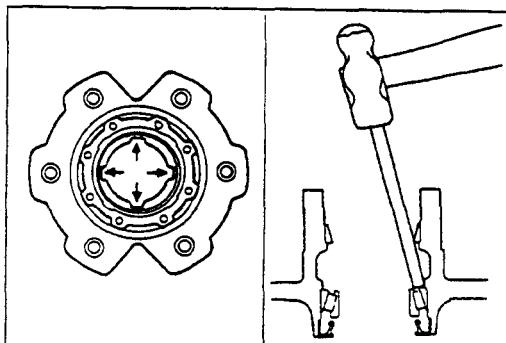
Disassembly / Inspection / Assembly

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 | 5. Bearing outer race (Outer)
Inspect for damage or wear
Assembly Note page M-19 |
| 2. Oil seal
Assembly Note page M-19 | 6. Wheel hub
7. Hub bolt
Disassembly 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 |



9TGOMX-099

Disassembly Note

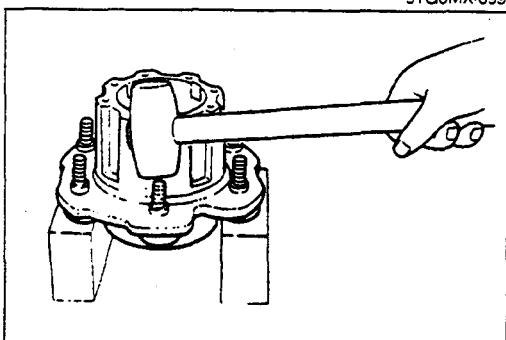
Bearing outer race (Inner)

Caution

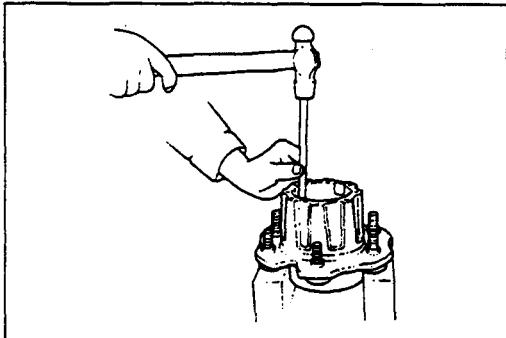
- Replace the inner and outer race as a set.
 - Do not reuse the removed oil seal.

Note

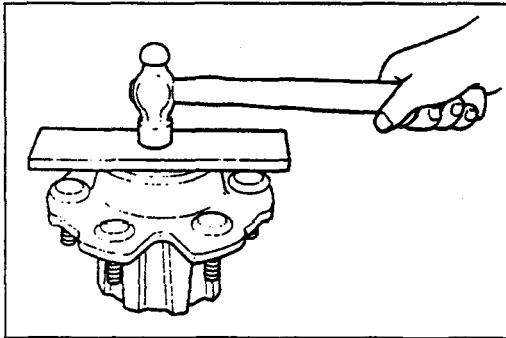
- When removing the bearing outer race (inner), the inner race and oil seal will also come out.



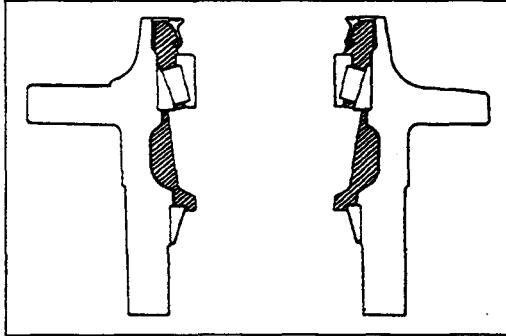
9TGOMX-100



9TGOMX-101



9TG0MX-102



9TGOMX-103

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.

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.

3. Pack grease into the shaded areas shown in the figure.

M

DIFFERENTIAL

DIFFERENTIAL

PREPARATION SST

For W and Y type

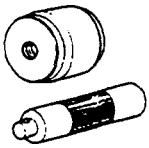
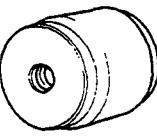
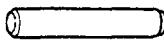
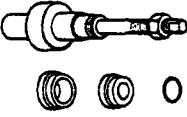
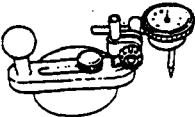
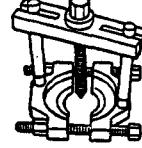
49 0107 680A Engine stand		For installation of differential carrier	49 M005 561 Hanger, diff. carrier		For support of differential carrier
49 S120 710 Holder, coupling flange		For removal and installation of locknut	49 0839 425C Puller set, bearing		For removal of companion flange and bearing
49 0259 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 ø72 (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

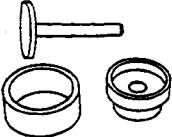
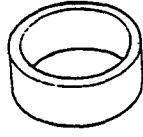
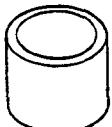
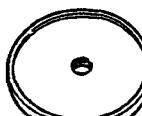
DIFFERENTIAL

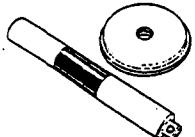
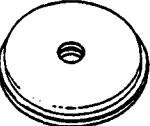
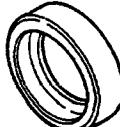
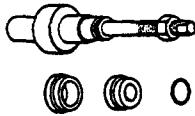
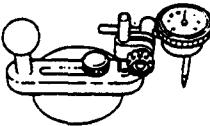
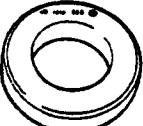
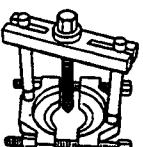
M

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

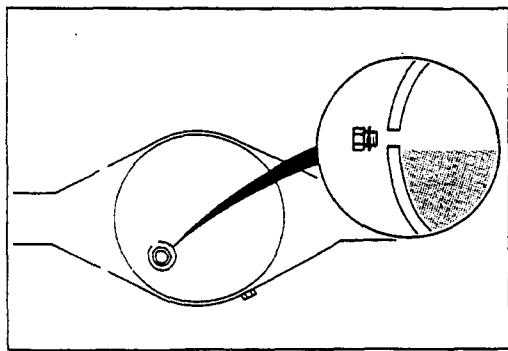
9TG0MX-113

For Y type

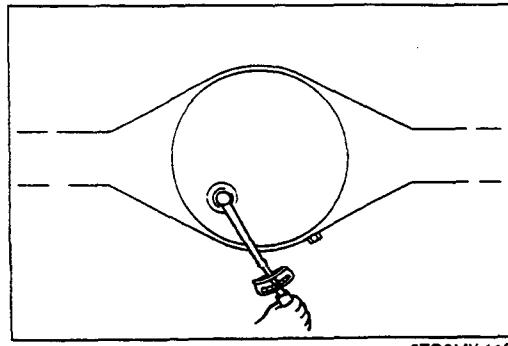
49 S231 625 Puller & Installer set, lower arm bushing		For installation of side bearing inner race	49 S231 626 Support block (Part of 49 S231 625)		For installation of side bearing inner race
49 W027 003 Installer, bearing		For installation of rear bearing inner race	49 W033 105 Installer, oil seal		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			

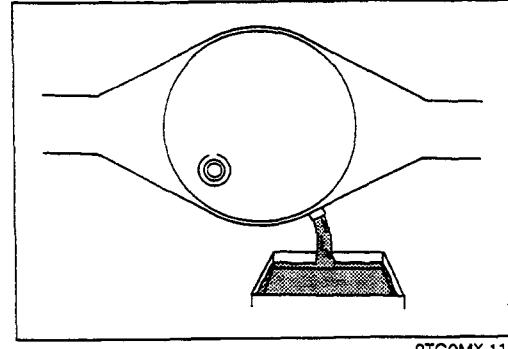
9TG0MX-114



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:

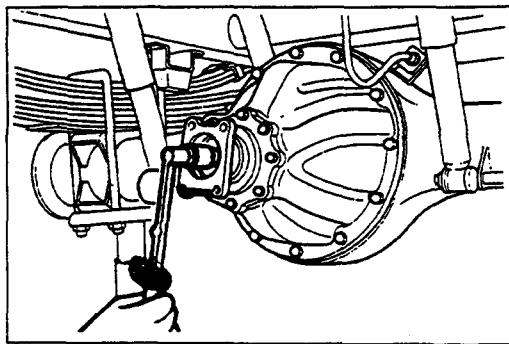
**W type: 2.6 liters (2.7 US qt, 2.3 Imp qt)
Y type: 3.6 liters (3.8 US qt, 3.2 Imp qt)**

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

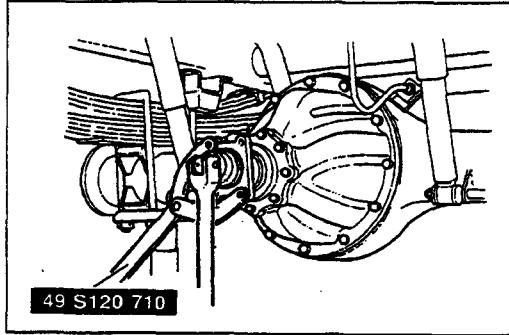
Tightening torque:

39—54 N·m (4.0—5.5 m-kg, 29—40 ft-lb)

9TF0MX-013

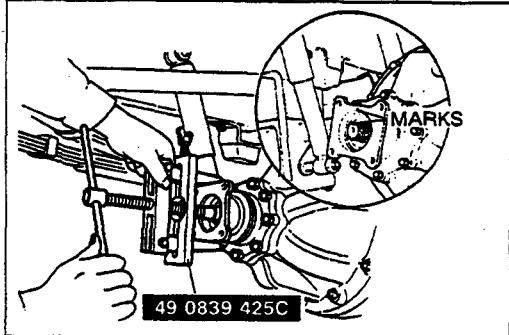


9TG0MX-119



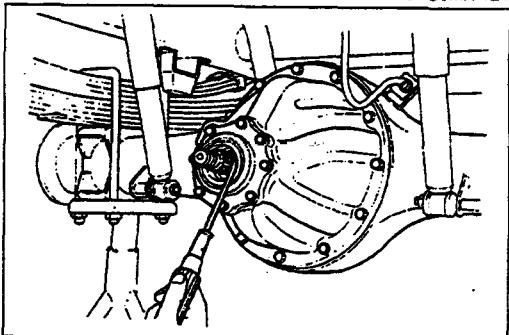
49 S120 710

9TG0MX-120

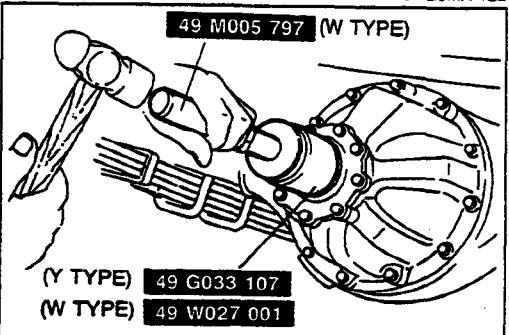


49 0839 425C

9TG0MX-121



9TG0MX-122



9TG0MX-123

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.

3. Hold the companion flange with the **SST** and remove the locknut.

Note

- Mark the companion flange and the drive pinion for proper reassembly.

4. Remove the companion flange with the **SST**.

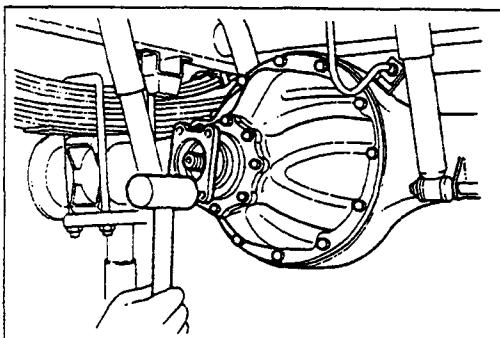
5. Pry out the oil seal.

Note

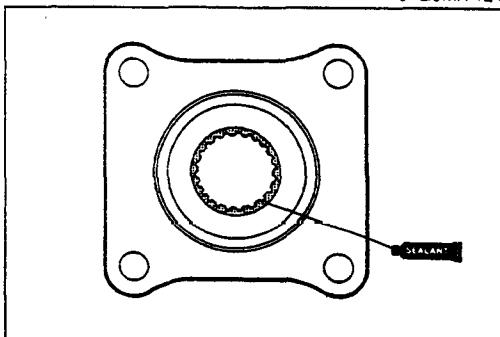
- Apply a thin coat of differential oil to the lip of the oil seal.

6. Install the new oil seal with the **SST**.

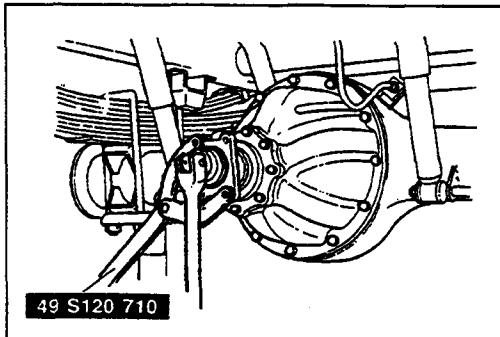
DIFFERENTIAL



9TG0MX-124



9TG0MX-125



49 S120 710

9TG0MX-126

7. Install the companion flange with a brass hammer.

8. Apply 0.5cc of sealant around the companion flange splines.

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.

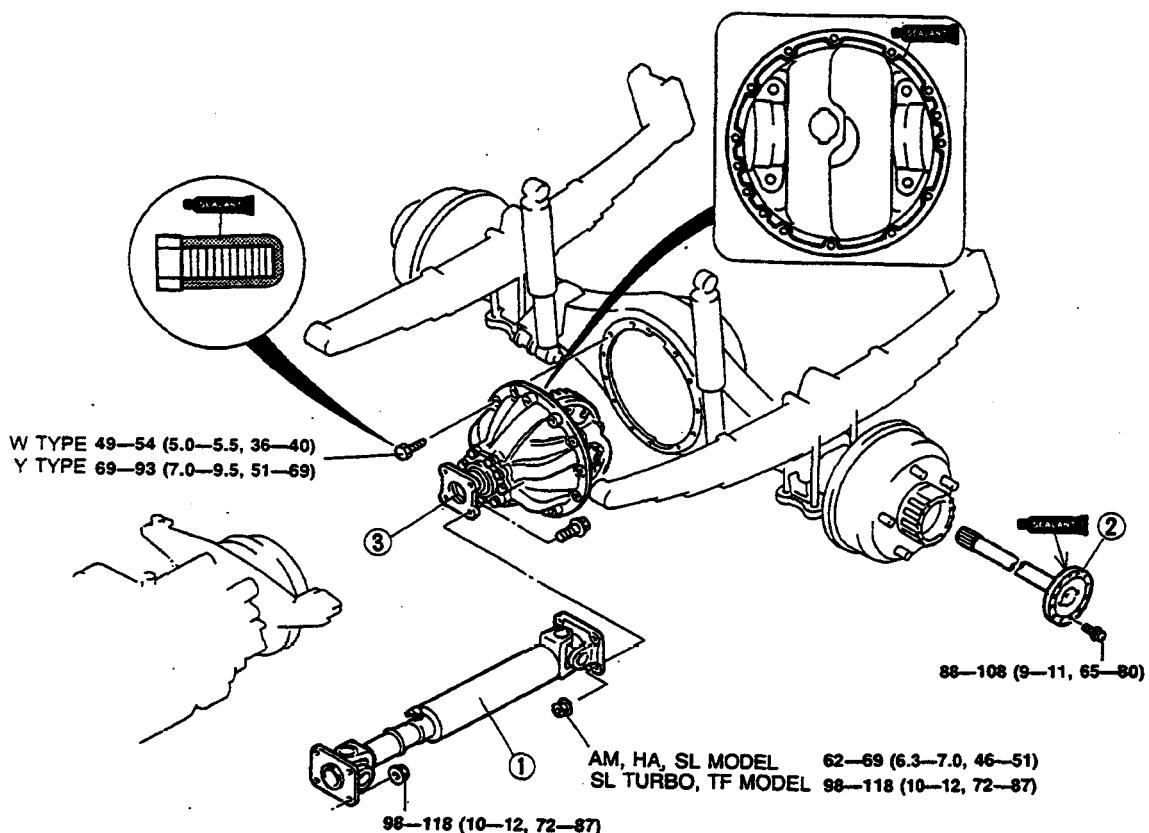
9. Hold the companion flange with the SST, and tighten lock-nut and new washer until the specified drive pinion preload is obtained.

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.)

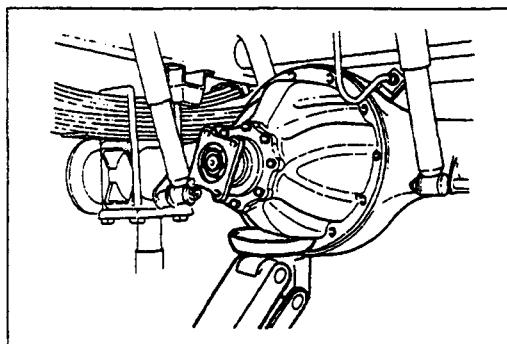


Nm (m·kg, ft·lb)

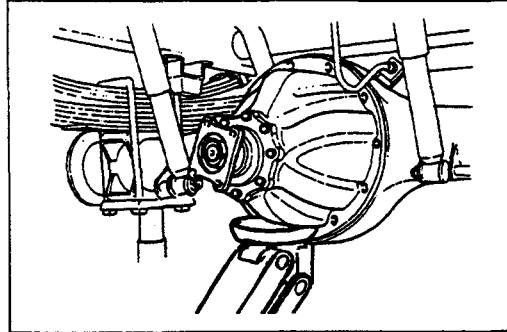
9TF0MX-014

- | | | | |
|---|-----------|--------------------------------------|-----------|
| 1. Propeller shaft
Service..... | Section L | 3. Differential
Removal Note..... | page M-27 |
| 2. Rear axle shaft
Removal Note..... | page M-17 | Overhaul | page M-28 |
| | | Installation Note | page M-27 |

DIFFERENTIAL



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)

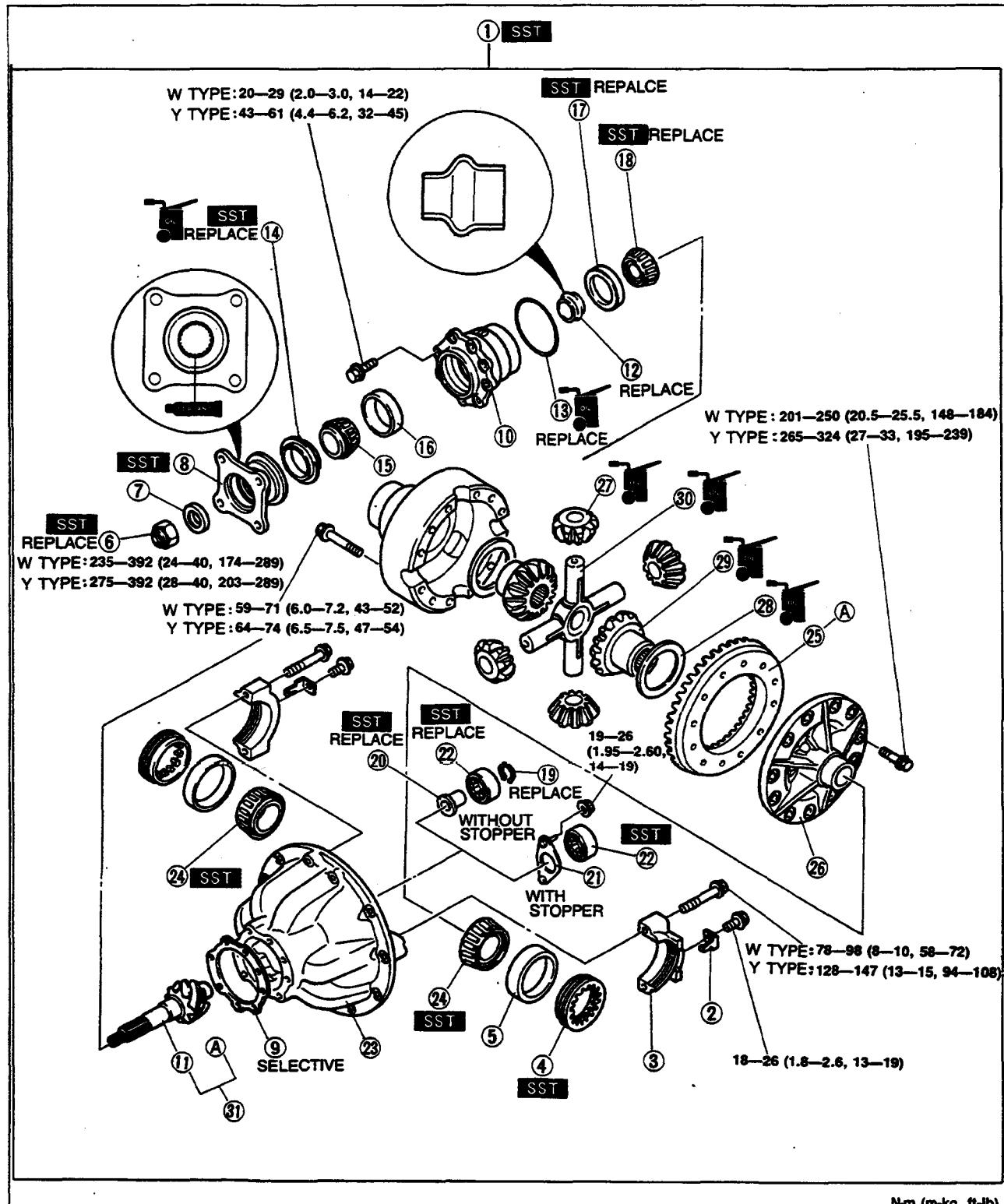
Y type: 69—93 N·m (7.0—9.5 m·kg, 51—69 ft-lb)

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**.

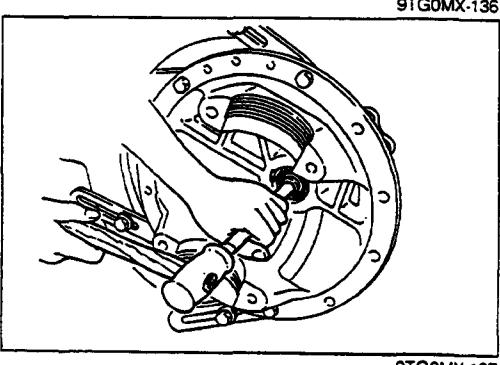
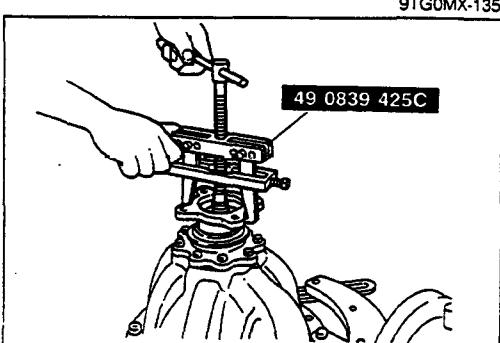
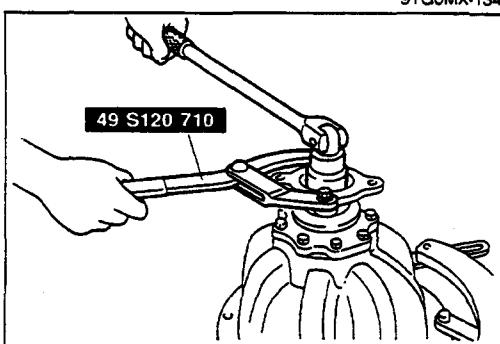
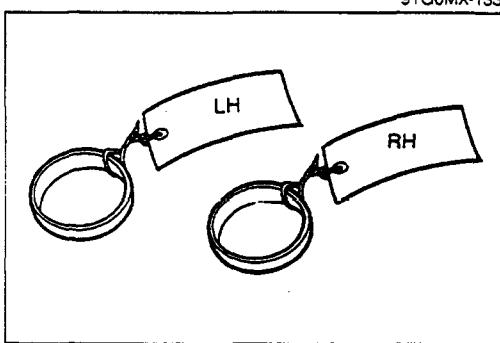
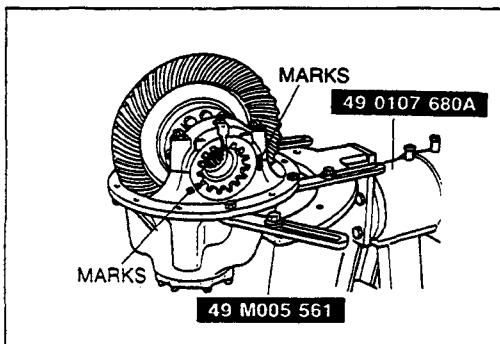


DIFFERENTIAL

M

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



Disassembly Note

Differential gear assembly

- Mount the differential gear assembly on the SST.

Bearing cap

- Mark the bearing cap and the carrier for proper reassembly.

Adjusting screw

- Mark the adjusting screw and the carrier for proper reassembly.

Side bearing outer race

Note

- Identify the left and right side bearing outer races for proper reassembly.

- Remove the side bearing outer races.

Locknut

- Hold the companion flange with the SST, and remove the locknut.

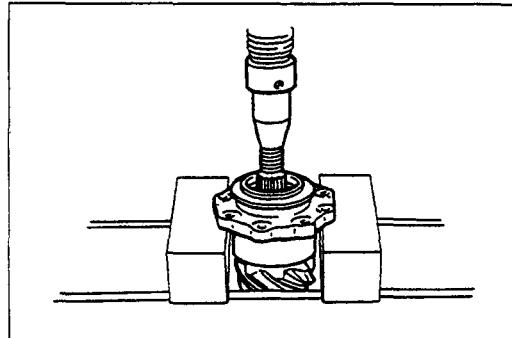
Companion flange

- Pull the companion flange off with the SST.

Bearing housing

- Drive the bearing housing from the carrier by tapping the drive pinion with a brass bar and a hammer.

DIFFERENTIAL

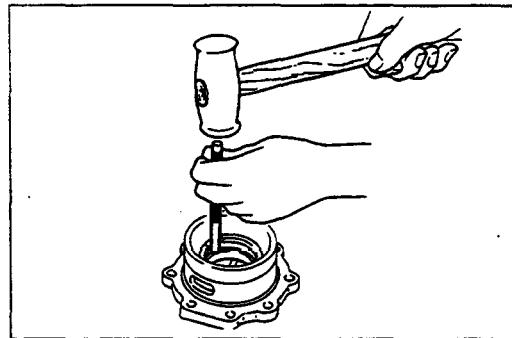


Drive pinion

Note

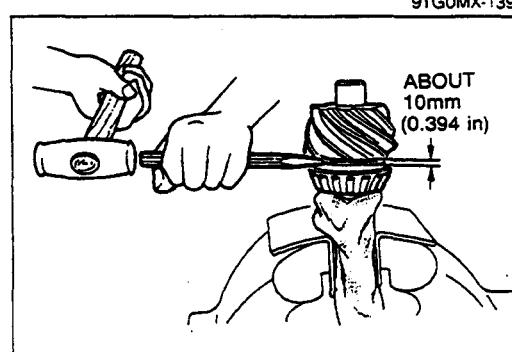
- Hold the drive pinion with a hand so that it does not fall.

1. Push the drive pinion out of the bearing housing with the SST and press.



Bearing outer race

1. Remove the front and rear bearing outer races with a brass bar and a hammer.



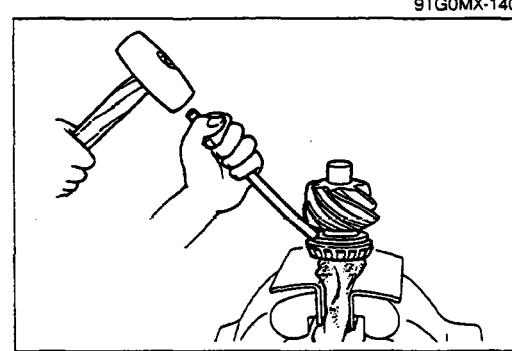
Rear bearing inner race

1. Protect the drive pinion with a rag and place it in a vise.

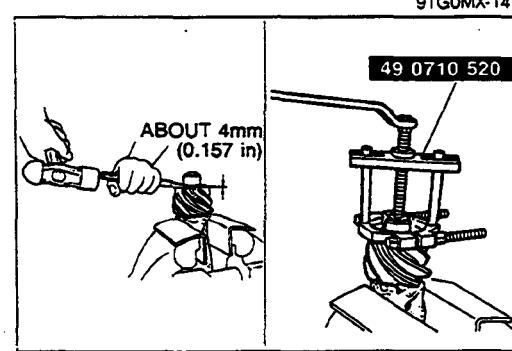
Caution

- 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)



3. Remove the bearing inner race with a brass bar and a hammer.



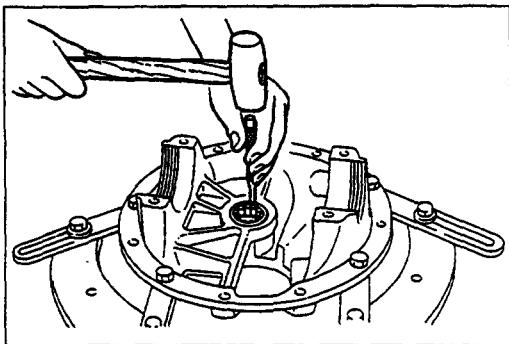
Pilot bearing inner race (W type, no stopper)

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.

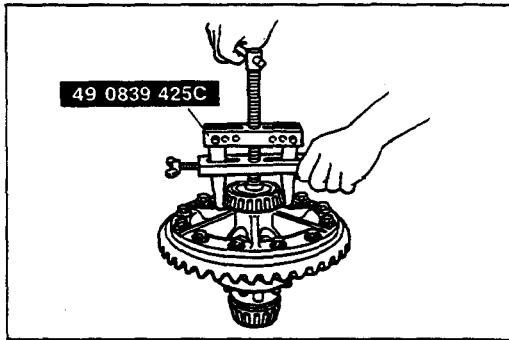
2. Make approx. 4mm (0.16 in) of clearance between the drive pinion and the pilot bearing inner race.
3. Remove the pilot bearing inner race from the drive pinion with the SST.



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Pilot bearing outer race

1. Remove the pilot bearing outer race from the carrier with a brass bar and a hammer.

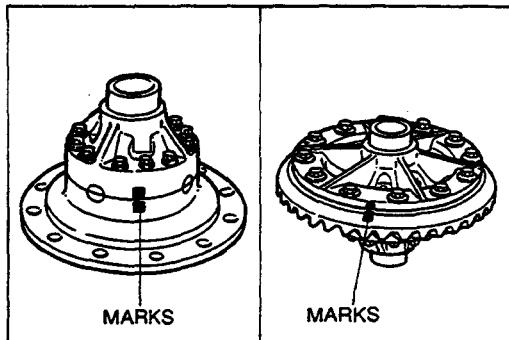


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Side bearing inner race**Note**

- 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

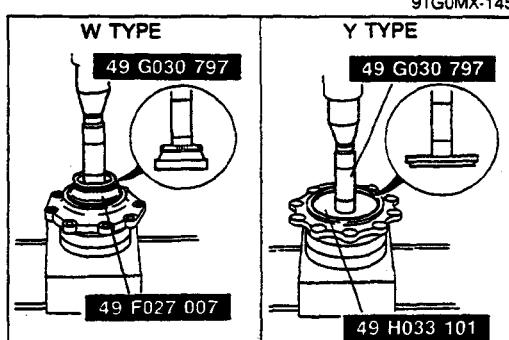
1. Mark the ring gear and the gear case for proper reassembly.

Gear case

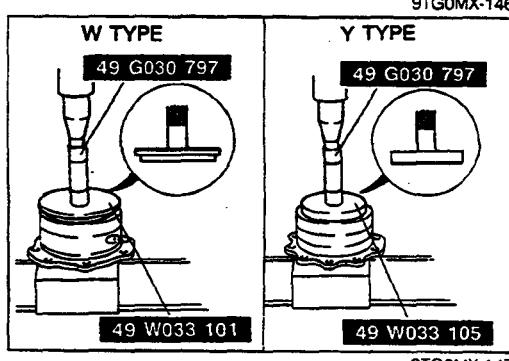
1. Mark the gear case for proper reassembly.

Assembly Note**Front bearing outer race**

1. Press the front bearing outer race into the bearing housing with the **SST** and a press.



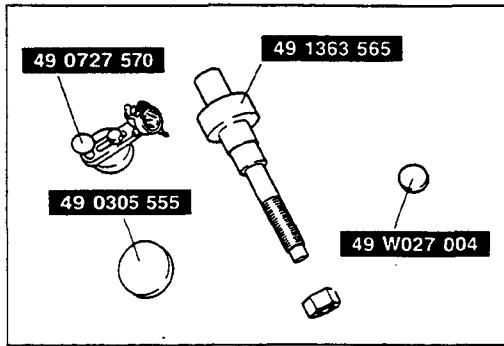
9TG0MX-146



9TG0MX-147

Rear bearing outer race

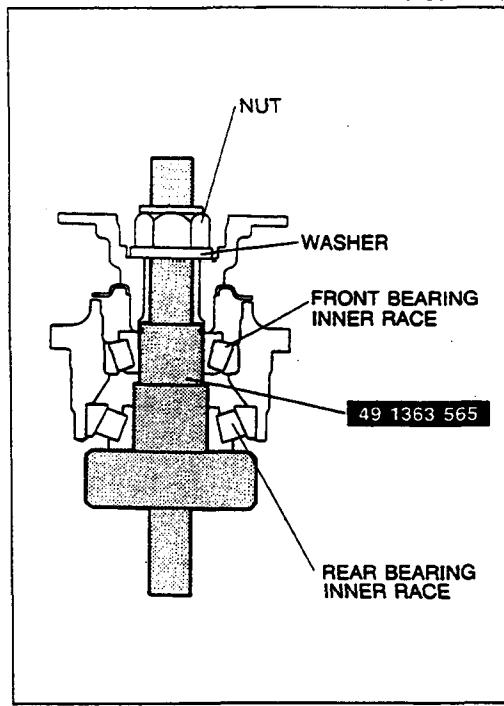
1. Press the new rear bearing outer race into the bearing housing with the **SST** and a press.



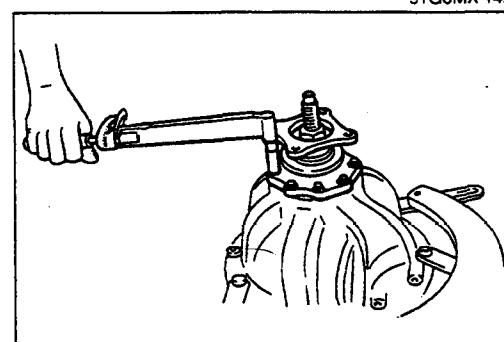
[W type]

Adjustment of pinion height

1. Adjust the pinion height as follows with the **SST**.



- (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.



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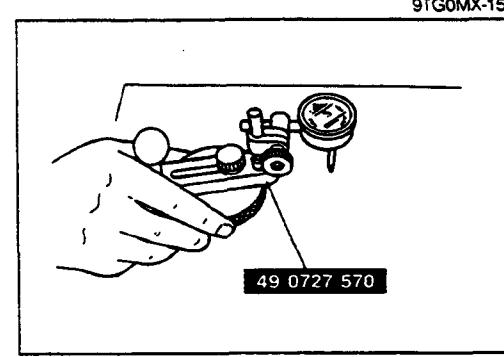
Caution

- Do not install the adjustment shim.

- (3) Install the bearing housing assembly into the carrier.

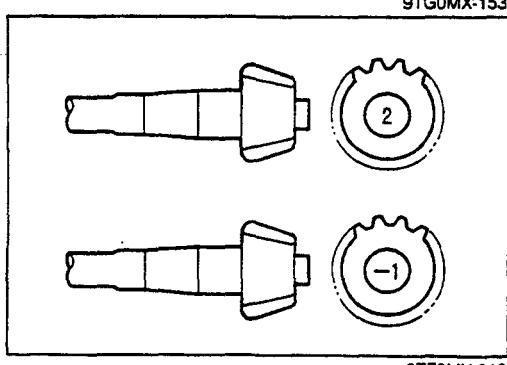
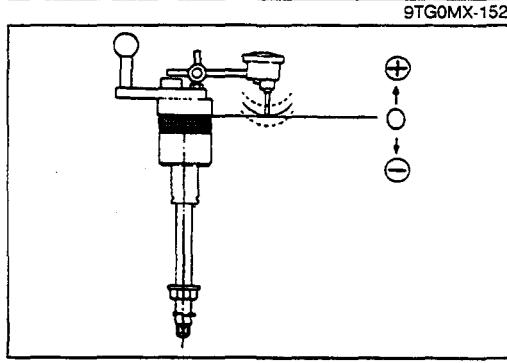
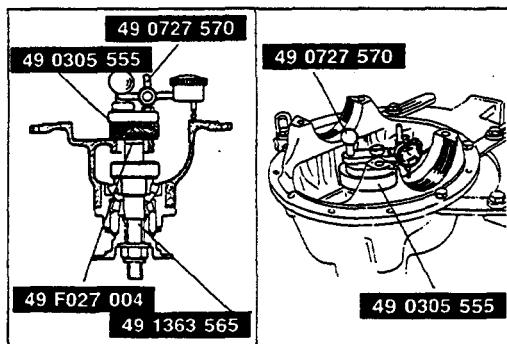
Tightening torque:

20—29 N·m (2.0—3.0 m·kg, 15—22 ft·lb)



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- (4) Place the **SST** on the surface plate and set the dial indicator to zero.



- (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.

- (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.)

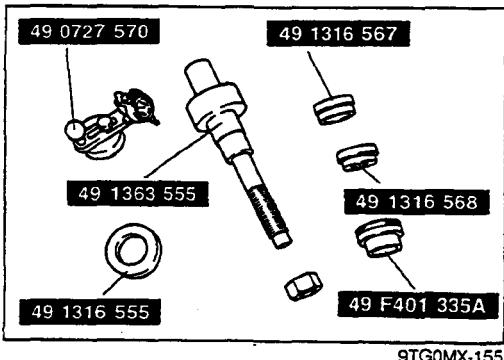
Note

- Select adjustment shims within $0 \pm 0.03\text{mm}$ ($0 \pm 0.001\text{ in}$) of the specified thickness.
- Use a maximum of five shims.

Adjustment shim thickness:

mm (in)

0.1 (0.004)	0.15 (0.006)
-------------	--------------



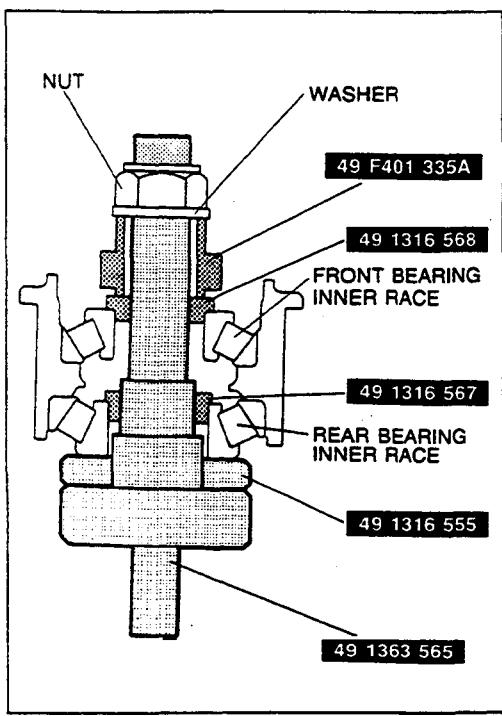
[Y type]

Adjustment of pinion height

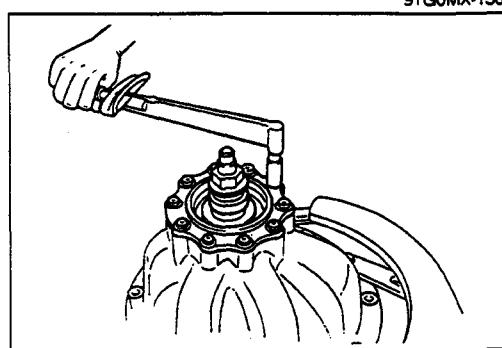
1. Adjust the pinion height as follows with the **SST**.

DIFFERENTIAL

M



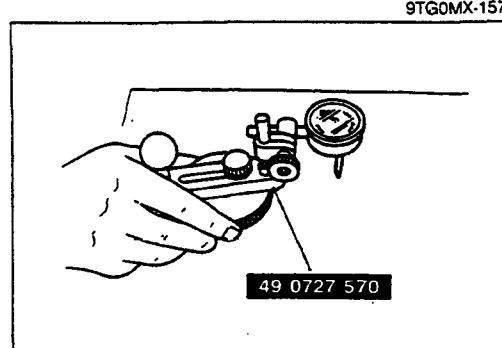
- (1) Slide the **SST** (49 1316 555), new rear bearing inner race, and the **SST** (49 1316 567) onto the **SST** (49 1363 565). Install the assembly into the carrier.
- (2) Install the front bearing inner race, **SST** (49 1316 568), **SST** (49 F401 335A), and the washer onto the **SST** (49 1363 565). Tighten the nut so that the **SST** (49 1363 565) can still be turned by hand.



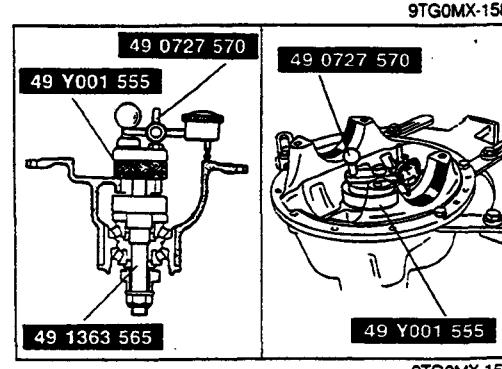
- Caution**
- Do not install the adjustment shim.

- (3) Install the bearing housing assembly into the carrier.

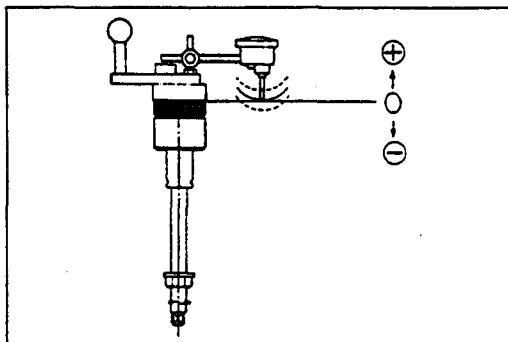
Tightening torque:
43—61 N·m (4.4—6.2 m·kg, 32—45 ft-lb)



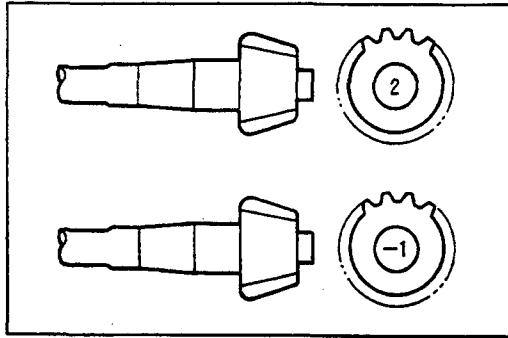
- (4) Place the **SST** on the surface plate and set the dial indicator to zero.



- (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.



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9TFOMX-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

$$\begin{aligned} 2: +0.02\text{mm (0.0008 in)} \\ -1: -0.01\text{mm (-0.0004 in)} \end{aligned}$$

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.)

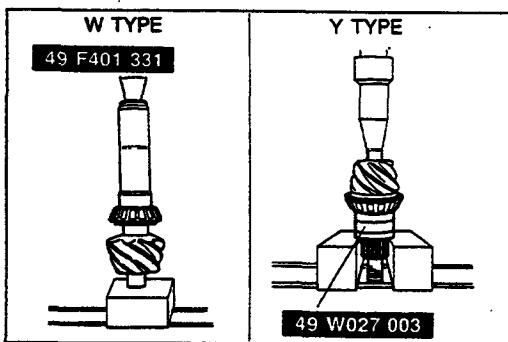
Note

- Select adjustment shims within $0 \pm 0.03\text{mm (0 \pm 0.001 in)}$ of the specified thickness.
- Use a maximum of five shims.

Adjustment shim thickness:

mm (in)

0.1 (0.004)	0.15 (0.006)
-------------	--------------

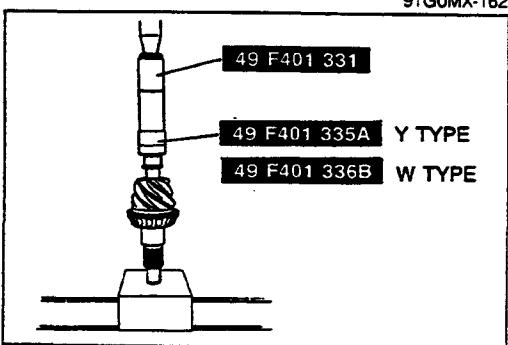


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[W and Y type]

Rear bearing inner race

- Install the rear bearing inner race with the SST and a press.

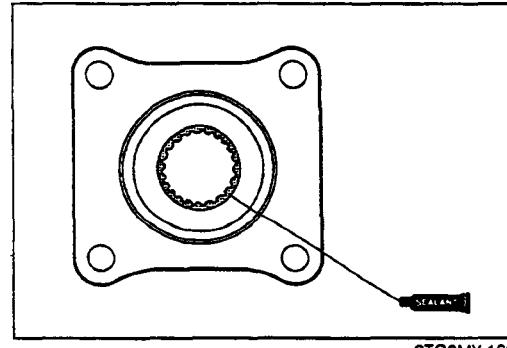
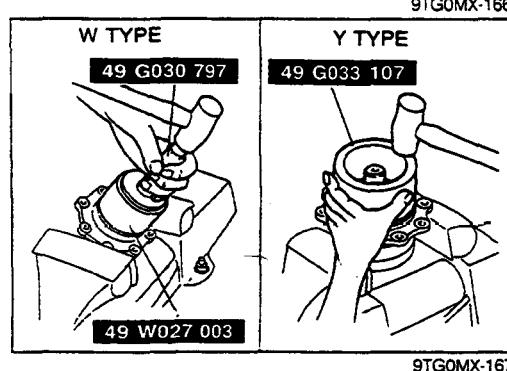
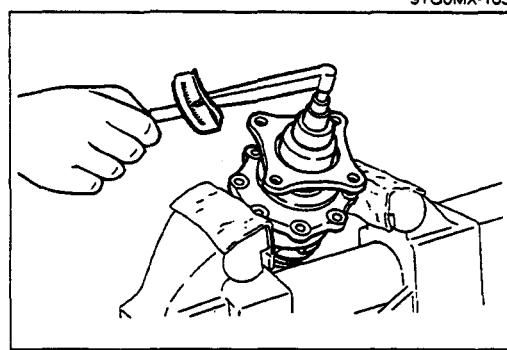
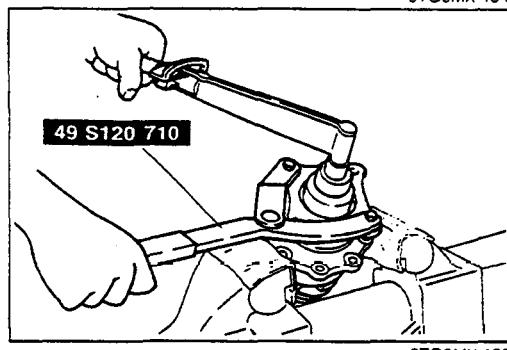
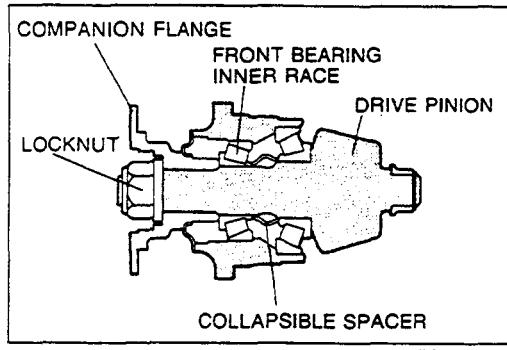


9TGOMX-163

[Y type and W type (no stopper)]

Pilot bearing inner race

- Install the pilot bearing inner race with the SST and a press.



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

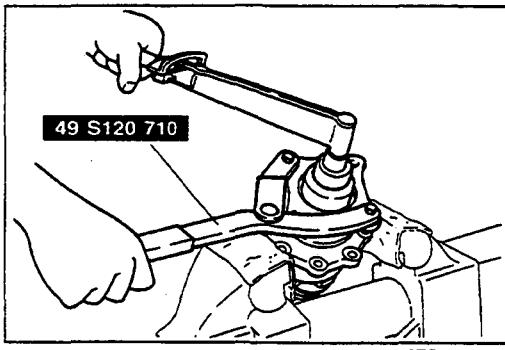
Note

- Apply gear oil to the lip of the new oil seal.
- Push the oil seal fully into the carrier.

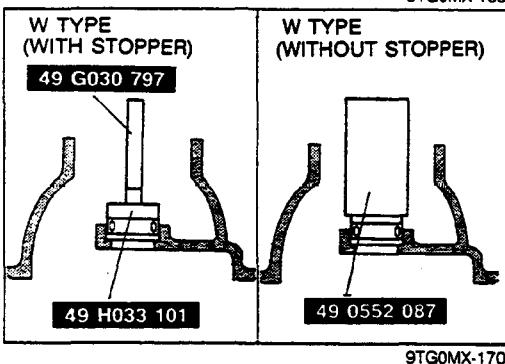
1. Install the new oil seal into the carrier with the SST.

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.



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.

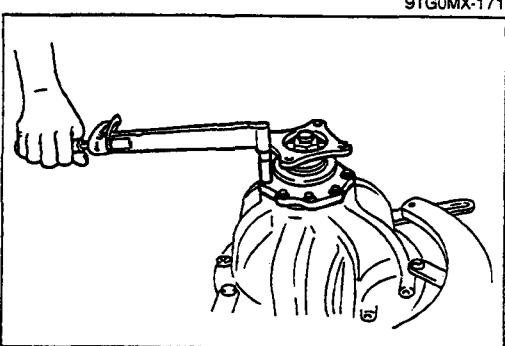
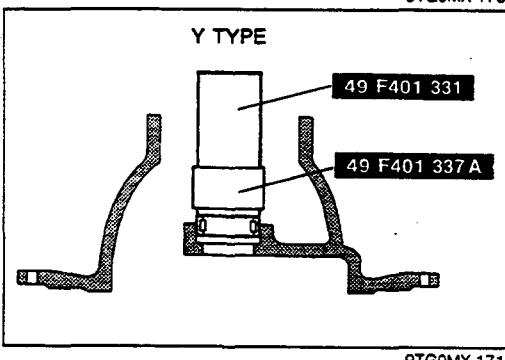


Pilot bearing outer race

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)



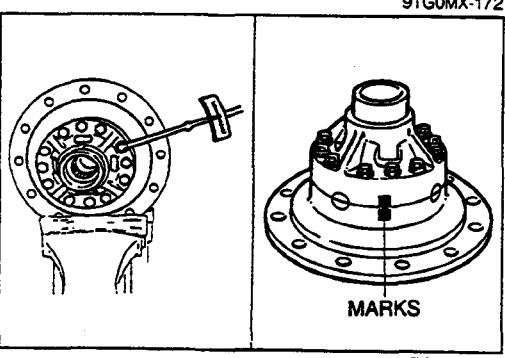
Bearing housing

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)



Gear case

1. Align the marks and assemble the gear case.

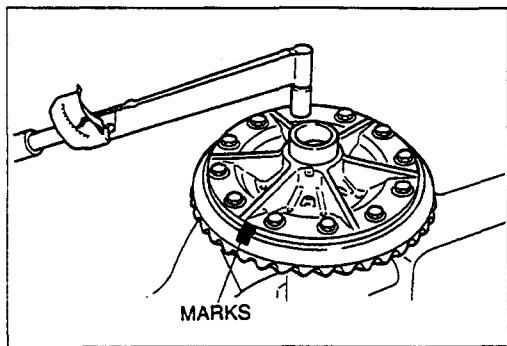
Tightening torque:

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)

DIFFERENTIAL

M



9TG0MX-174

Ring gear

1. Align the marks on the ring gear and the gear case and assemble them.

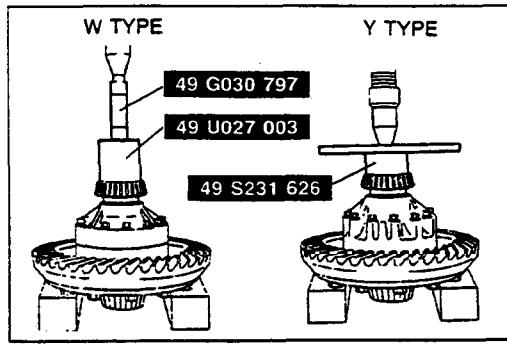
Tightening torque:

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)



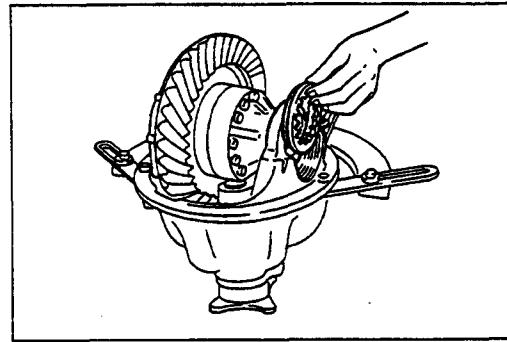
9TG0MX-175

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.



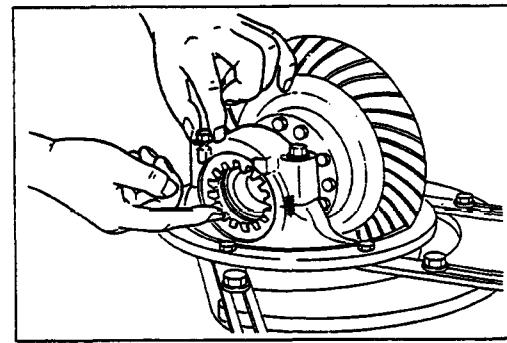
9TG0MX-176

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.



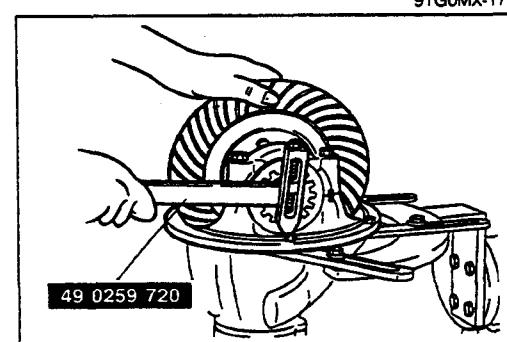
9TG0MX-177

Bearing cap

Note

- Align the bearing cap and the adjusting screw threads.

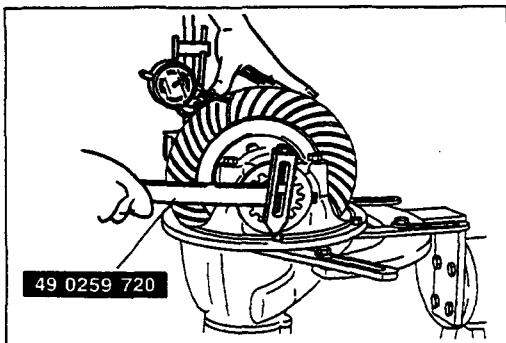
1. Install the bearing cap, and apply a small amount of thread-locking compound (W type), then temporarily tighten the bolts.



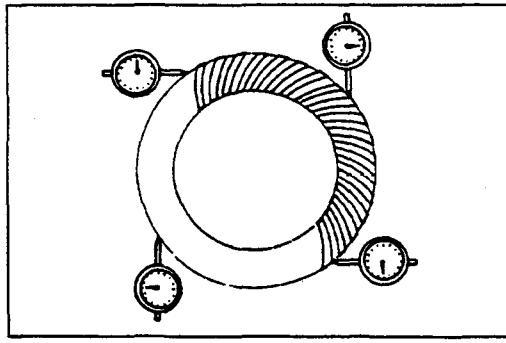
9TG0MX-178

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).



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**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.

- 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.

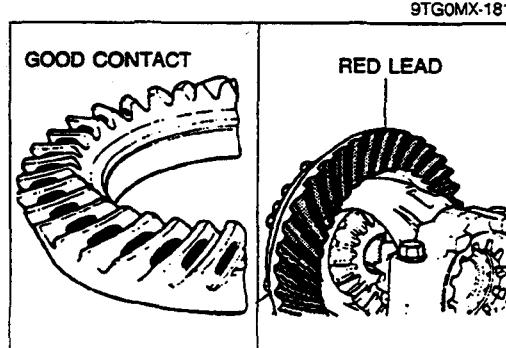
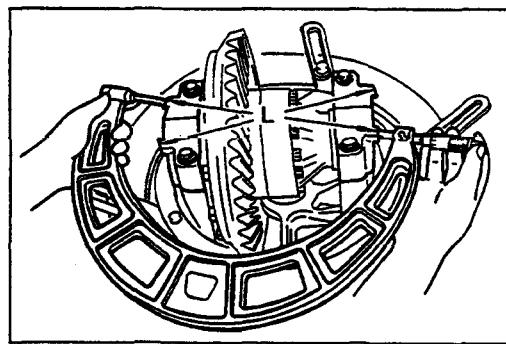
- Measure the distance between the pilot sections on the bearing caps (L) with a micrometer.

Distance (L)

W type: $279.5^{+0}_{-0.08}$ mm (11.00 $\pm^{0}_{0.003}$ in)

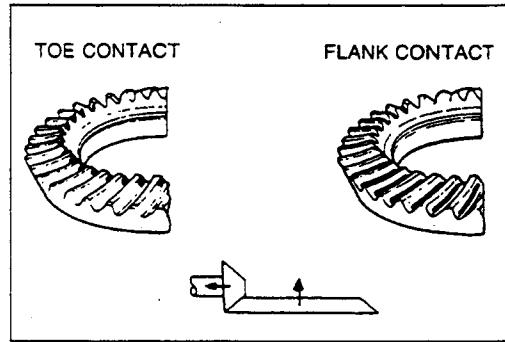
Y type: $289.5^{+0.10}_{-0.05}$ mm (11.40 $\pm^{0.004}_{0.002}$ in)

- After adjustment of distance (L), recheck that the backlash is as specified.

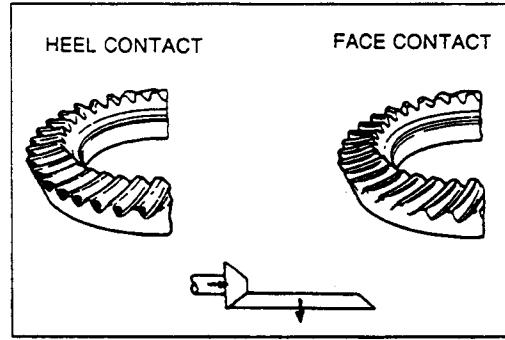
**Inspection and adjustment of teeth contact**

- Coat both surfaces of 6—8 teeth of the ring gear with a thin coat of red lead.
- While moving the ring gear back and forth by hand, rotate the drive pinion several times and check the tooth contact.
- If the tooth contact is good, wipe off the red lead.
- If it is not good, adjust the pinion height, and then adjust the backlash.

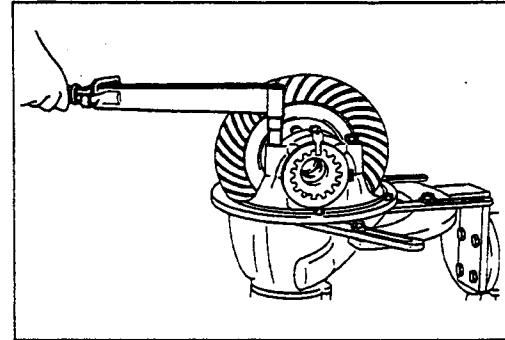
DIFFERENTIAL



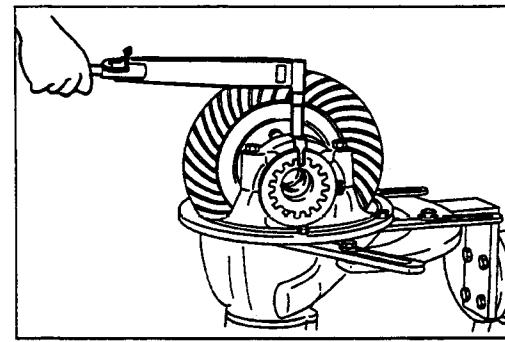
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9TG0MX-184



9TG0MX-185



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(1) Toe and flank contact

Replace the adjustment shim with a thinner one to move the drive pinion outward.

(2) Heel and face contact

Replace the adjustment shim with a thicker one to bring the drive pinion in.

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)

2. Install the lock plates on the bearing caps.

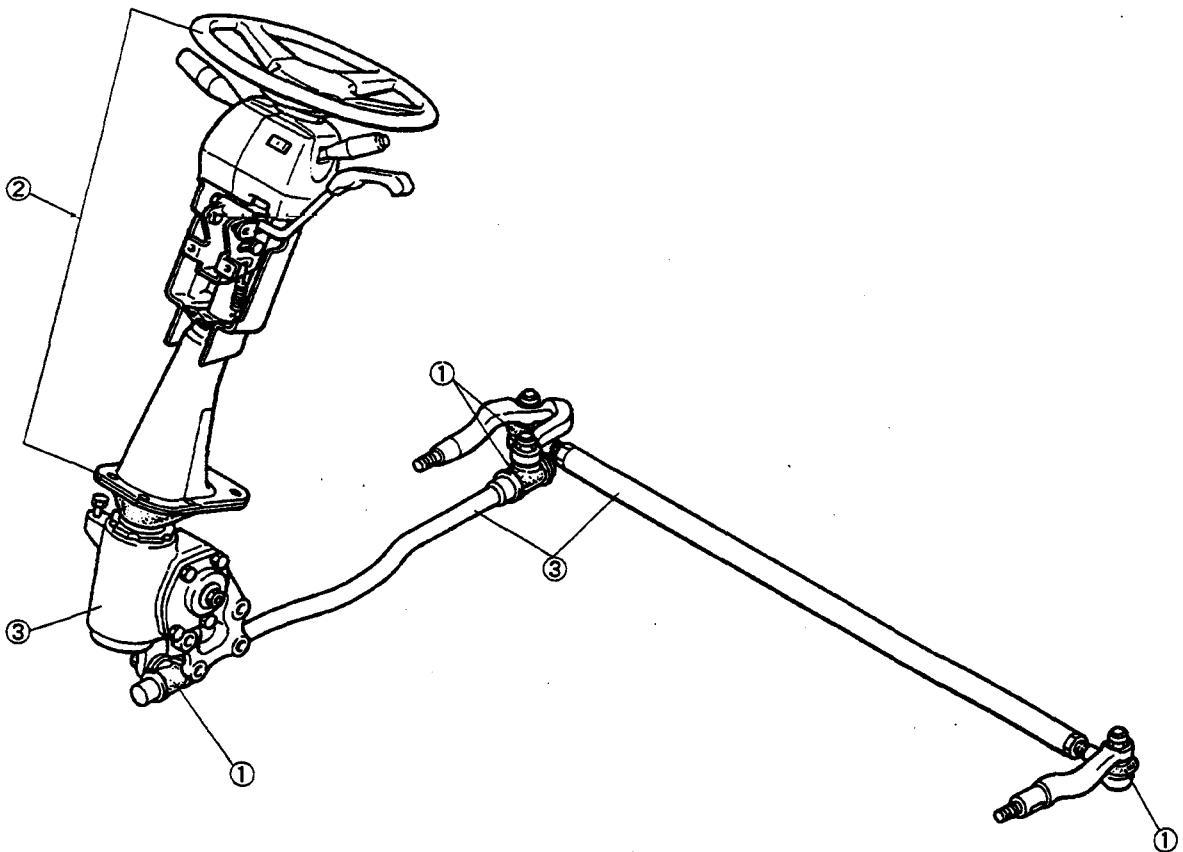
Tightening torque:

18—25 N·m (1.8—2.6 m-kg, 13—19 ft-lb)

STEERING SYSTEM

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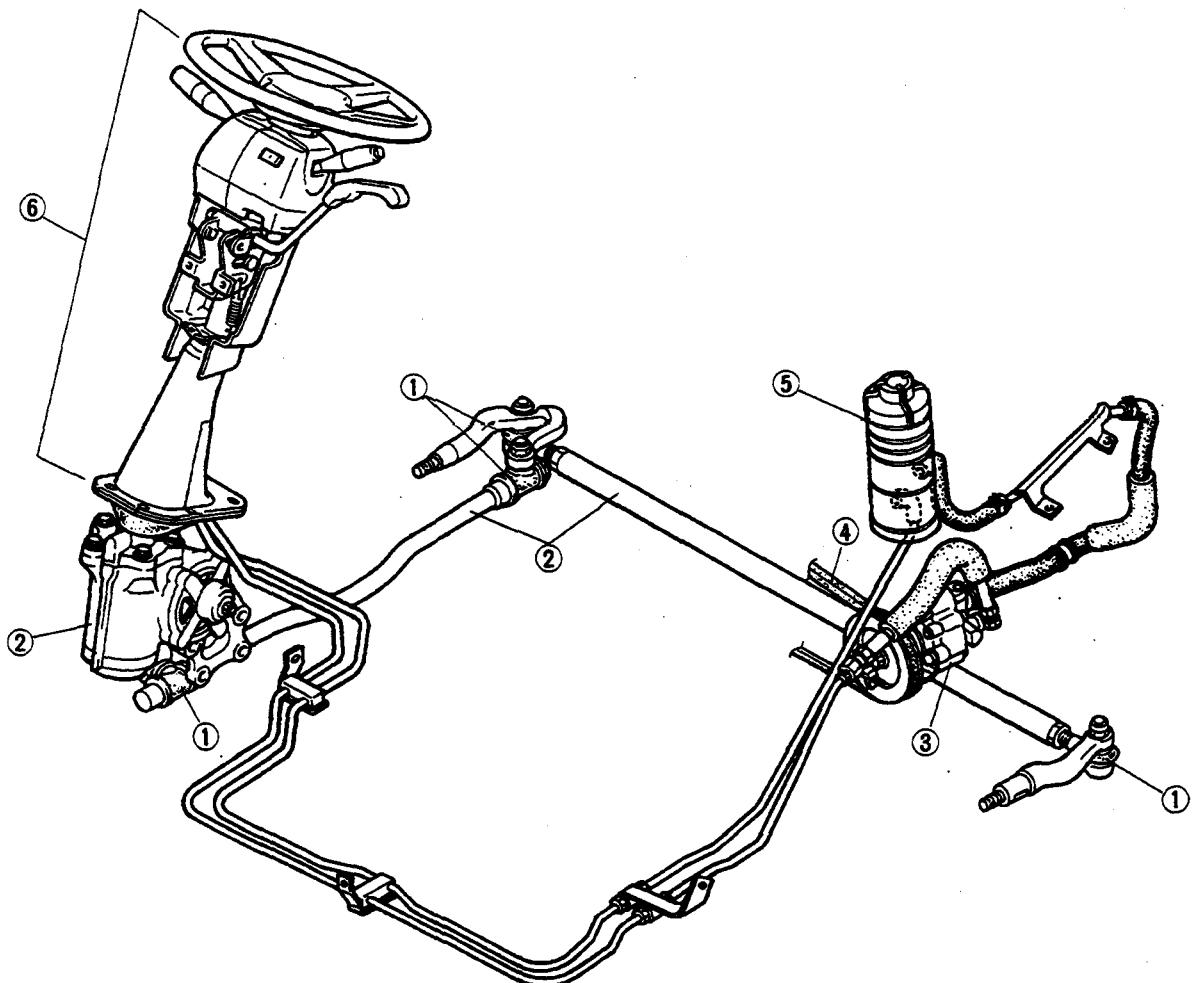
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9TF0NX-002

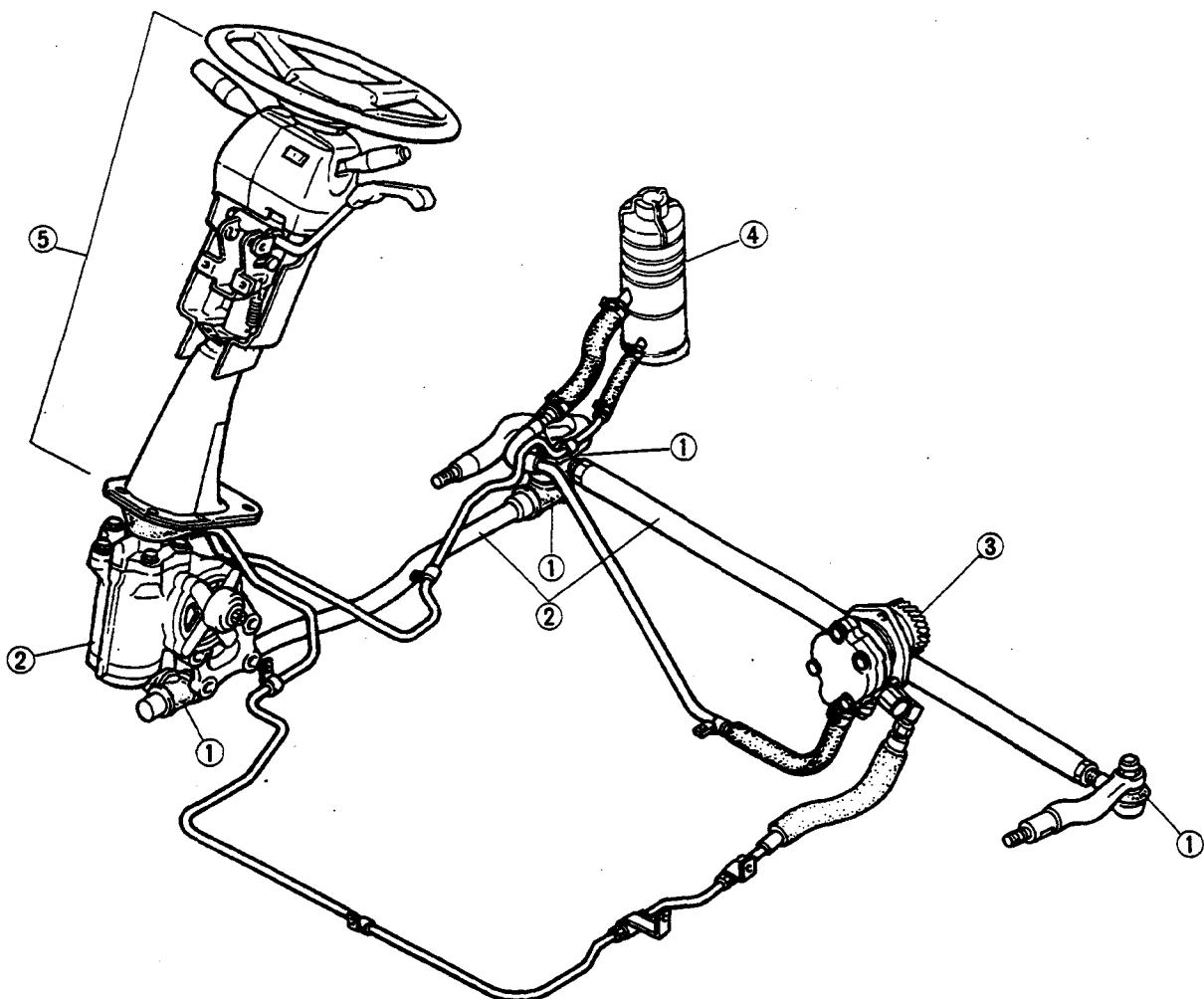
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POWER STEERING (3.5 L TURBO ENGINE MODEL)



9TF0NX-003

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5. Power steering fluid
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POWER STEERING (4.0 L ENGINE MODEL)

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OUTLINE, MANUAL STEERING

N

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)	
Steering gear	Amount of tilt mm (in)	*50 (1.97)	
	Type	Ball nut	
Oil	Gear ratio	28–33	22.6
	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)

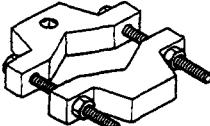
* if equipped

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 $\phi 62$ (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
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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 Irregular tire wear Heavy (Jacked-up) Faulty lubrication, abnormal wear, presence of foreign matters and stuck or damaged ball joints of steering system Improper adjustment of steering worm shaft preload Malfunctioning or damaged steering gear Insufficient oil in gear box Worn or damaged kingpin bushing Stuck kingpin Insufficient kingpin oil	Adjust Replace Lubricate or replace Adjust Replace Lubricate Replace Replace Lubricate	Section Q Section Q N- 8 N-20 N-15 N-20 Section R Section R Section R
Steering wheel pulls to one side	Deformed steering linkage Improper adjustment of front wheel bearing preload Twisted front axle Fatigued front springs Faulty wheel alignment (toe-in) Incorrect tire pressure Irregular tire wear Dragging brakes	Replace Adjust Replace Replace Adjust Adjust Replace Adjust	N-15 Section R Section M Section R Section R Section Q Section Q Section P
General instability while driving	Deformed steering linkage Worn or damaged joints of steering system Improper adjustment of steering worm shaft preload Improper adjustment of front wheel bearing preload Fatigued front spring Loose U-bolts Malfunctioning of shock absorber Faulty wheel alignment (toe-in) Incorrect tire pressure Deformed or unbalanced wheels	Replace Replace Adjust Adjust Replace Tighten Replace Adjust Adjust Repair or replace	N-15 N- 8 N-20 Section M Section R Section R Section R Section R Section Q Section Q
Steering wheel effort uneven	Malfunctioning steering gear Malfunctioning joints of steering system Steering linkage does not operate smoothly	Replace Replace Replace	N-15 N- 8 N-15
Excessive steering wheel play	Improper adjustment of gear box backlash Worn steering gear Worn or damaged joints of steering system Loose steering gear mounting bolts Worn kingpin Improper adjustment of front wheel bearing preload	Adjust Replace Replace Tighten Replace Adjust	N-20 N-15 N- 8 N-15 Section R Section R
Poor steering wheel return	Stuck or damaged steering joints Improper adjustment of steering worm shaft preload Incorrect tire pressure Malfunctioning suspension system	Repair or replace Adjust Adjust Repair or replace	N- 8 N-20 Section Q Section R

MANUAL STEERING

N

TROUBLESHOOTING GUIDE (Cont'd)

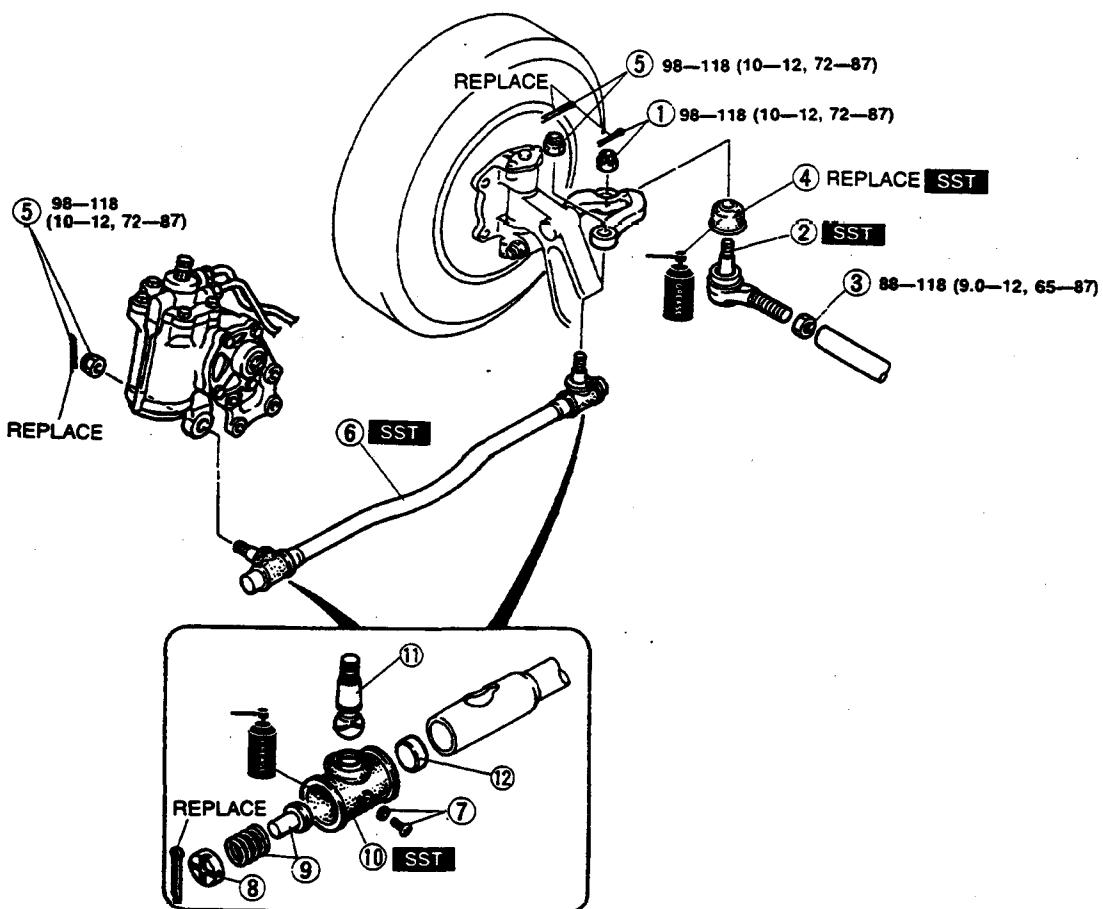
Problem	Possible Cause	Action	Page/Section
"Shimmy" occurs (Steering wheel vibrates left/right)	Deformed steering linkage Loose steering gear mounting bolts Worn or damaged steering joints Improper adjustment of steering worm shaft preload Worn or improper adjustment of front wheel bearing preload Worn kingpin bushing Worn kingpin Incorrect tire pressure Irregular tire wear Depth of tire tread is different between left and right tires Deformed or unbalanced wheels Malfunctioning or loose shock absorbers Loose U-bolts Faulty wheel alignment (toe-in)	Replace Tighten Replace Adjust Adjust or replace Replace Replace Adjust Replace Replace Repair or replace Replace or tighten Tighten Adjust	N-15 N-15 N- 8 N-20 Section M Section M Section M Section Q Section Q Section Q Section Q Section R Section R Section R
Abnormal noise from steering system	Loose or worn steering linkage Worn steering joints Loose steering gear mounting bolts Obstruction near steering column Malfunctioning steering gear Improper adjustment of gear box backlash	Tighten or replace Replace Tighten Repair Replace Adjust	N-15 N- 8 N-15 N-12 N-15 N-20

9TF0NX-006

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**.

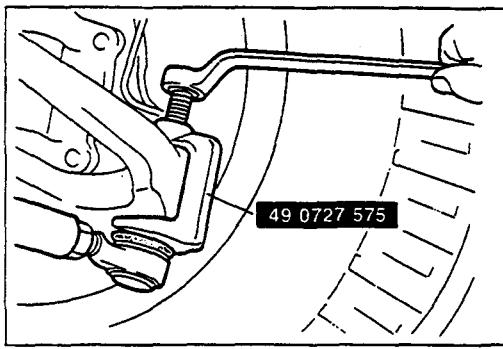


N·m (m-kg, ft-lb)

9TF0NX-007

- | | |
|--|--|
| 1. Cotter pin, nut | 6. Drag link |
| 2. Tie-rod end
Removal note..... | Removal note..... page N- 9 |
| 3. Locknut
Removal note..... | 7. Plug |
| 4. Tie-rod end boot
Removal note..... | 8. End plug
Installation note |
| 5. Cotter pin, nut | 9. Spring, ball seat |
| | 10. Dust seal
Removal note..... page N- 9 |
| | 11. Ball stud |
| | 12. Ball seat |

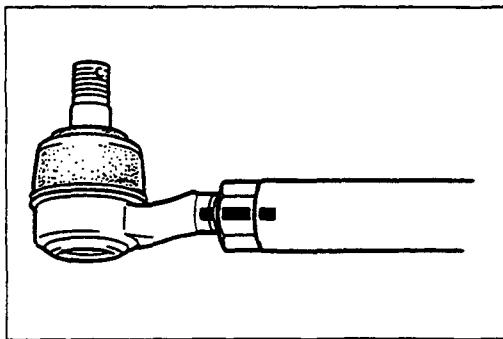
MANUAL STEERING



Removal note

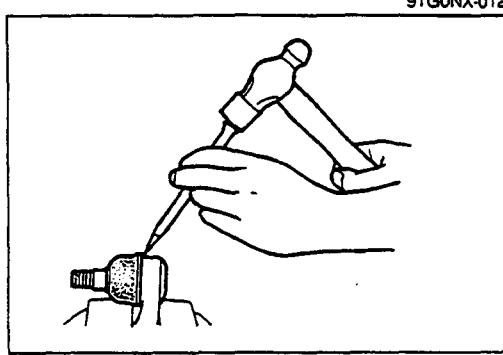
Tie-rod end

1. Separate the tie-rod end from the knuckle arm with the **SST**.



Locknut

1. Mark the tie-rod end locknut for reference during installation before loosening.

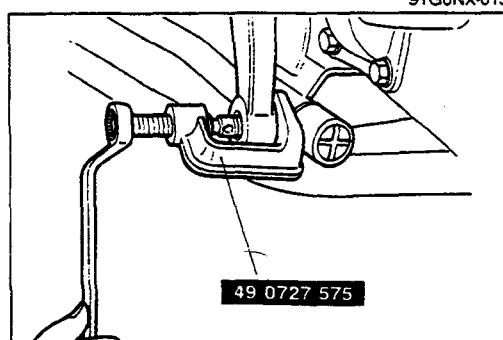


Tie-rod end boot

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.

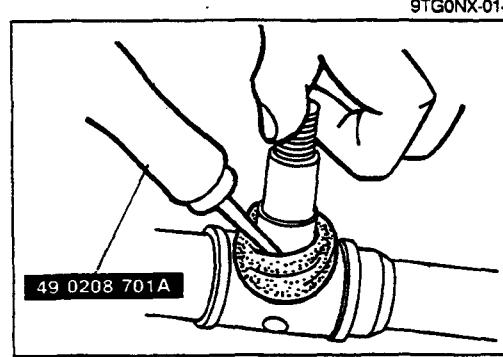
Caution

- Do not scar the part where the boot attaches to the tie-rod end.



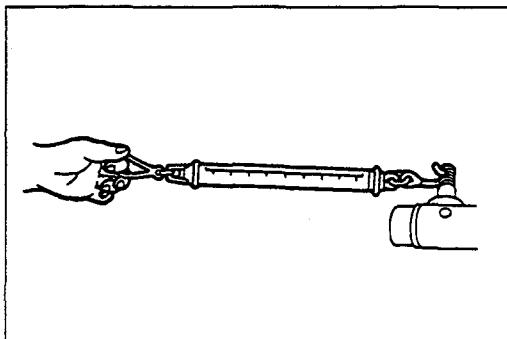
Drag link

1. Separate the drag link with the **SST**.

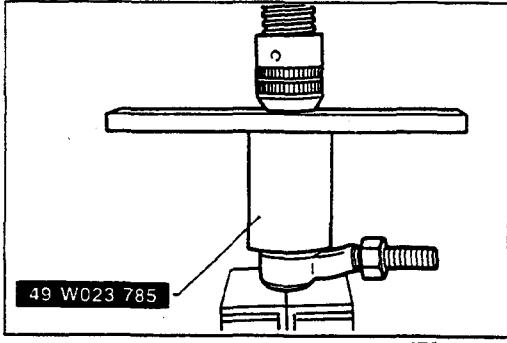


Dust seal

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.**

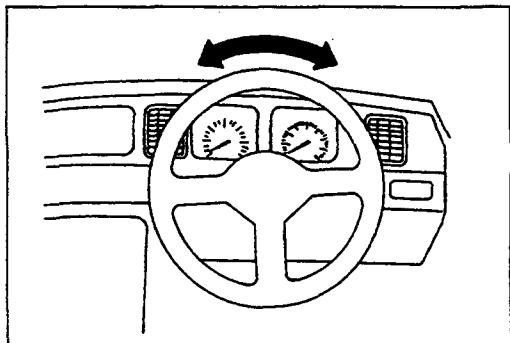
2. Adjust the starting torque of the ball stud by turning the end plug.

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.

MANUAL STEERING



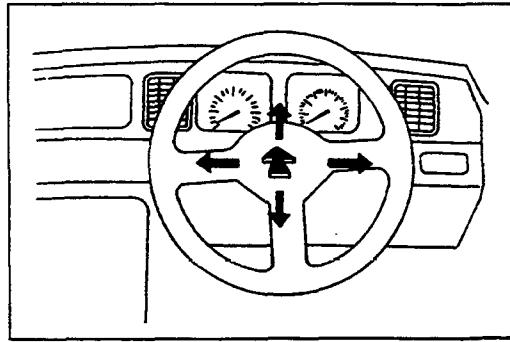
9TG0NX-018

STEERING WHEEL AND COLUMN ON-VEHICLE INSPECTION

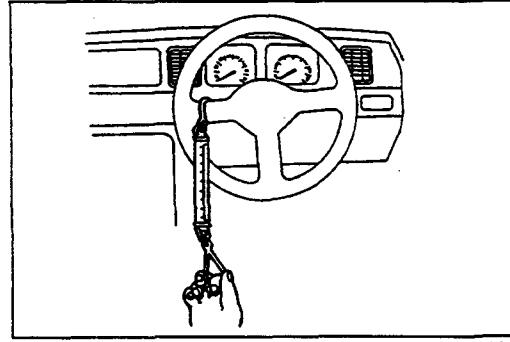
Steering wheel play

- 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)



9TG0NX-019



9TG0NX-020

Steering wheel effort

- With the vehicle on a hard level surface, move the steering wheel to put the wheels in the straight-ahead position.

Note

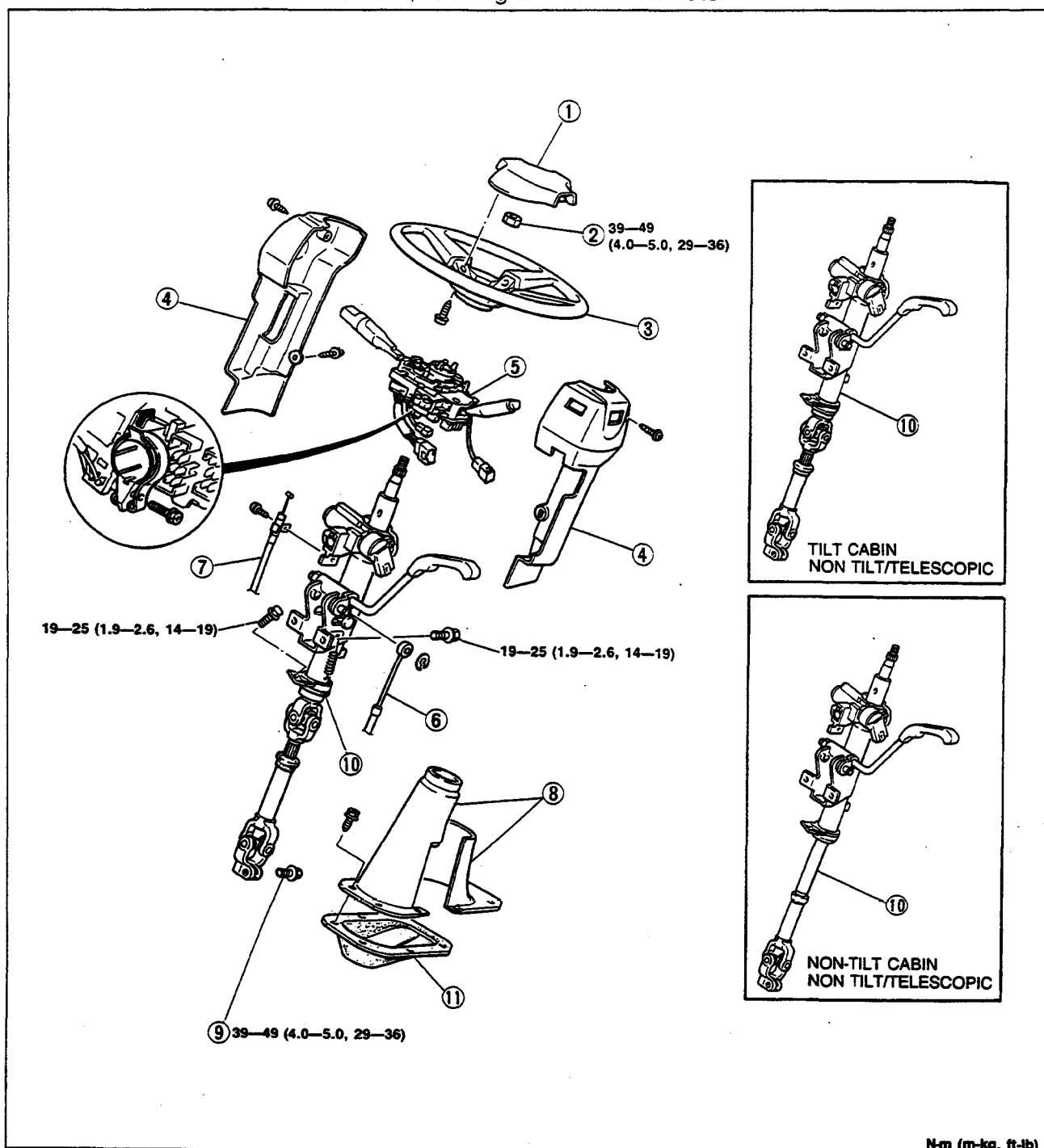
- Measure after turning the steering wheel to the left and right 5 times or more.

- 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**.

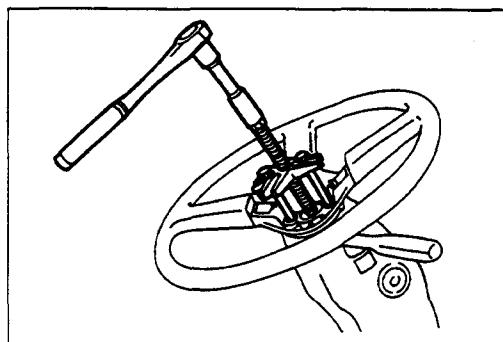


N·m (m·kg, ft·lb)

9TF0NX-008

- | | |
|---|---|
| 1. Horn cover | 7. Fuel stop cable (4.0 L, 3.5 L Turbo engine) |
| 2. Locknut | 8. Joint cover |
| 3. Steering wheel
Removal note page N-13 | 9. Fixing bolt |
| 4. Column cover | 10. Steering shaft
Installation note page N-13 |
| 5. Combination switch | 11. Dust boot |
| 6. Sub-transmission selection cable | |

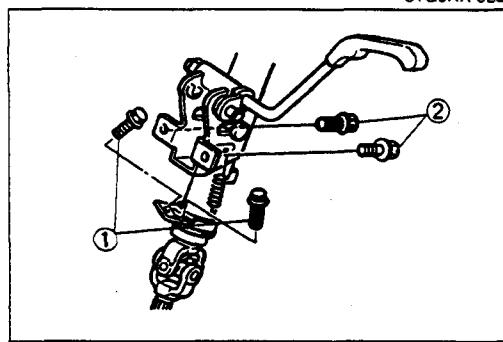
MANUAL STEERING


Removal note
Steering wheel

1. Remove the steering wheel with a suitable puller.

Caution

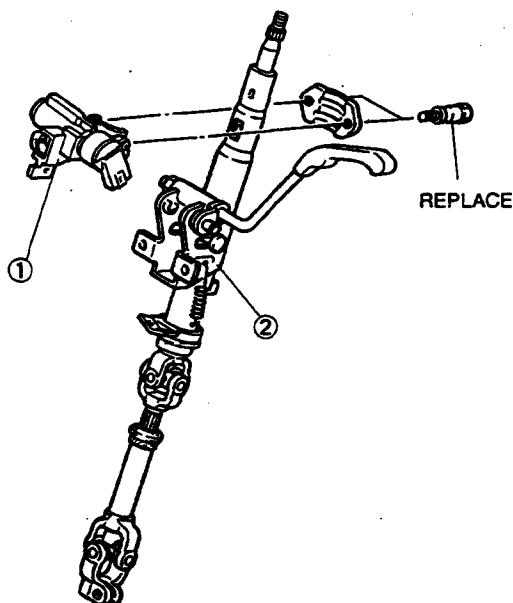
- Do not try to remove the steering wheel by hitting the shaft with a hammer. The column will collapse.


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**.



9TFONX-009

1. Steering lock assembly

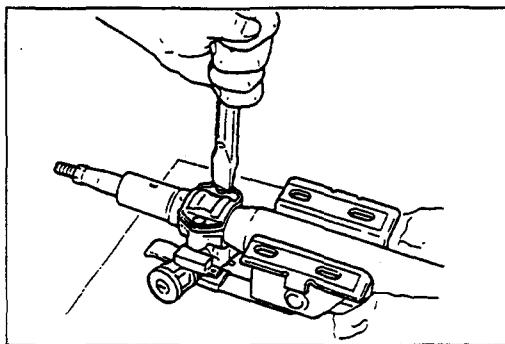
Disassembly note page N-14

Inspection page N-14

Assembly note page N-14

2. Steering shaft

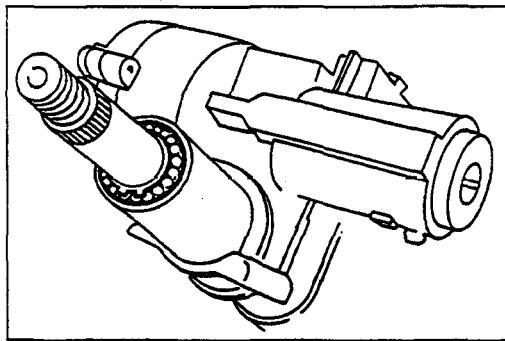
Inspection page N-14



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.

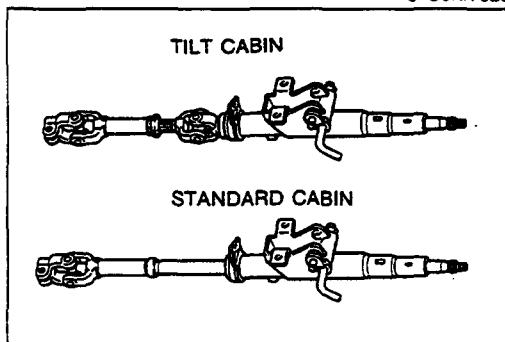


9TG0NX-026

Inspection
Steering shaft

1. Column bearing damage.

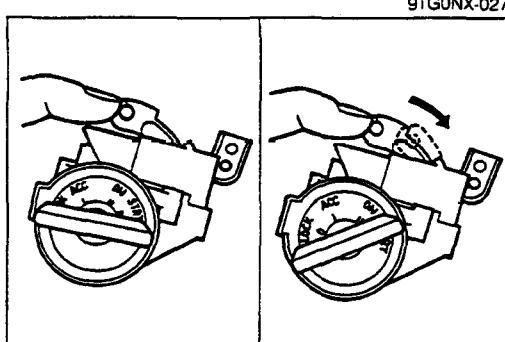
2. Operation and damage of steering shaft and joint.



9TG0NX-027

Steering lock assembly (3.5 L TURBO and 4.0 L Engine type)

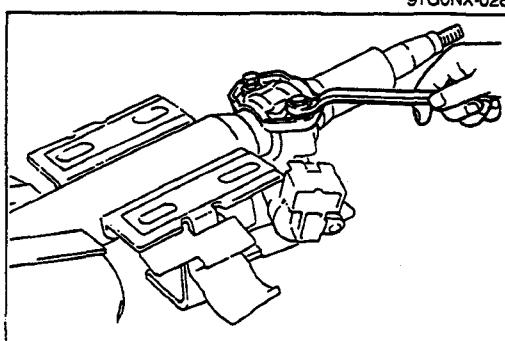
1. Verify that the cable connector moves only as shown in the figure when the key is in the **LOCK** and **ACC** position.



9TG0NX-028

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.

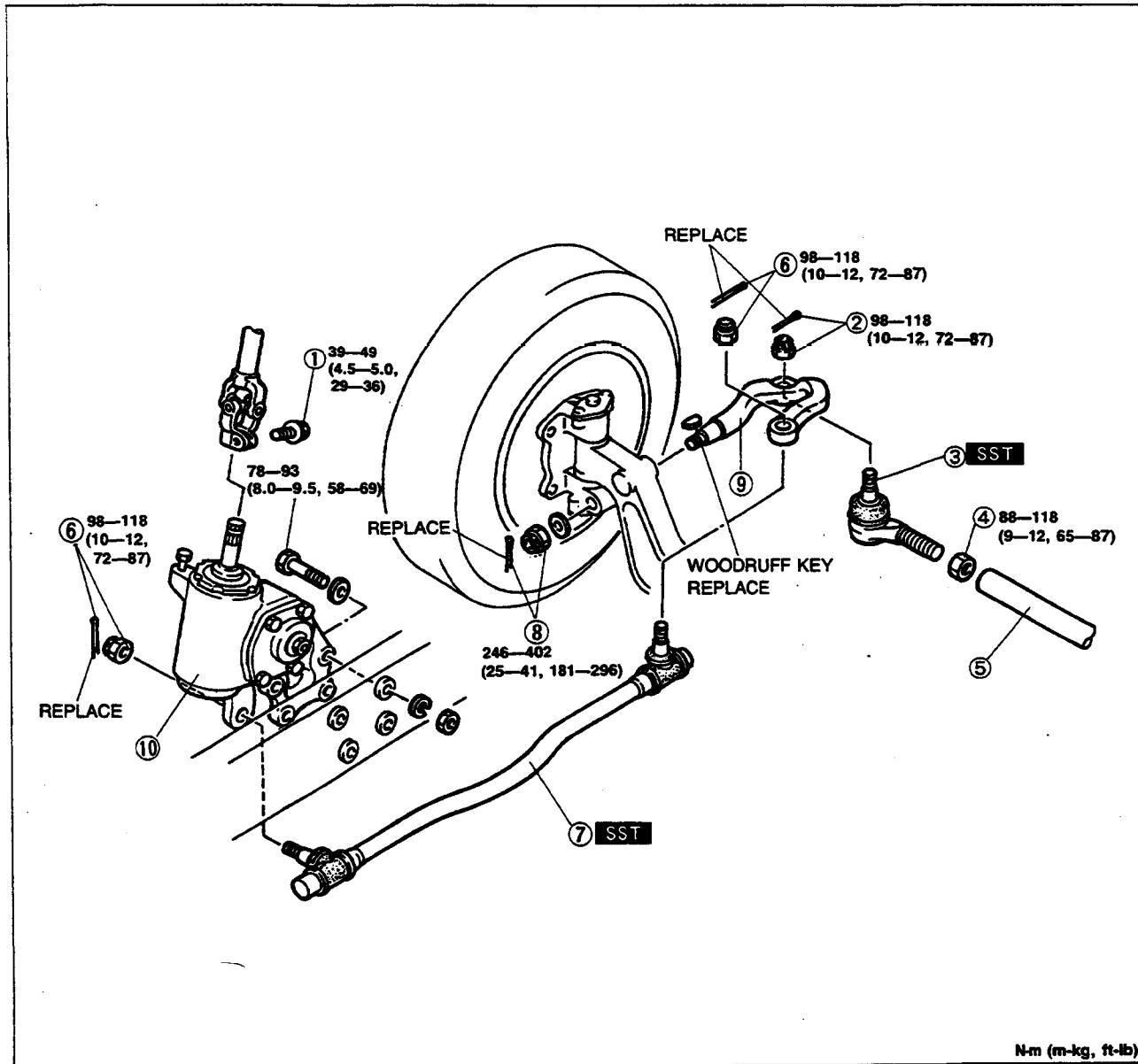


9TG0NX-029

MANUAL STEERING

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.



N·m (m·kg, ft·lb)

9TF0NX-010

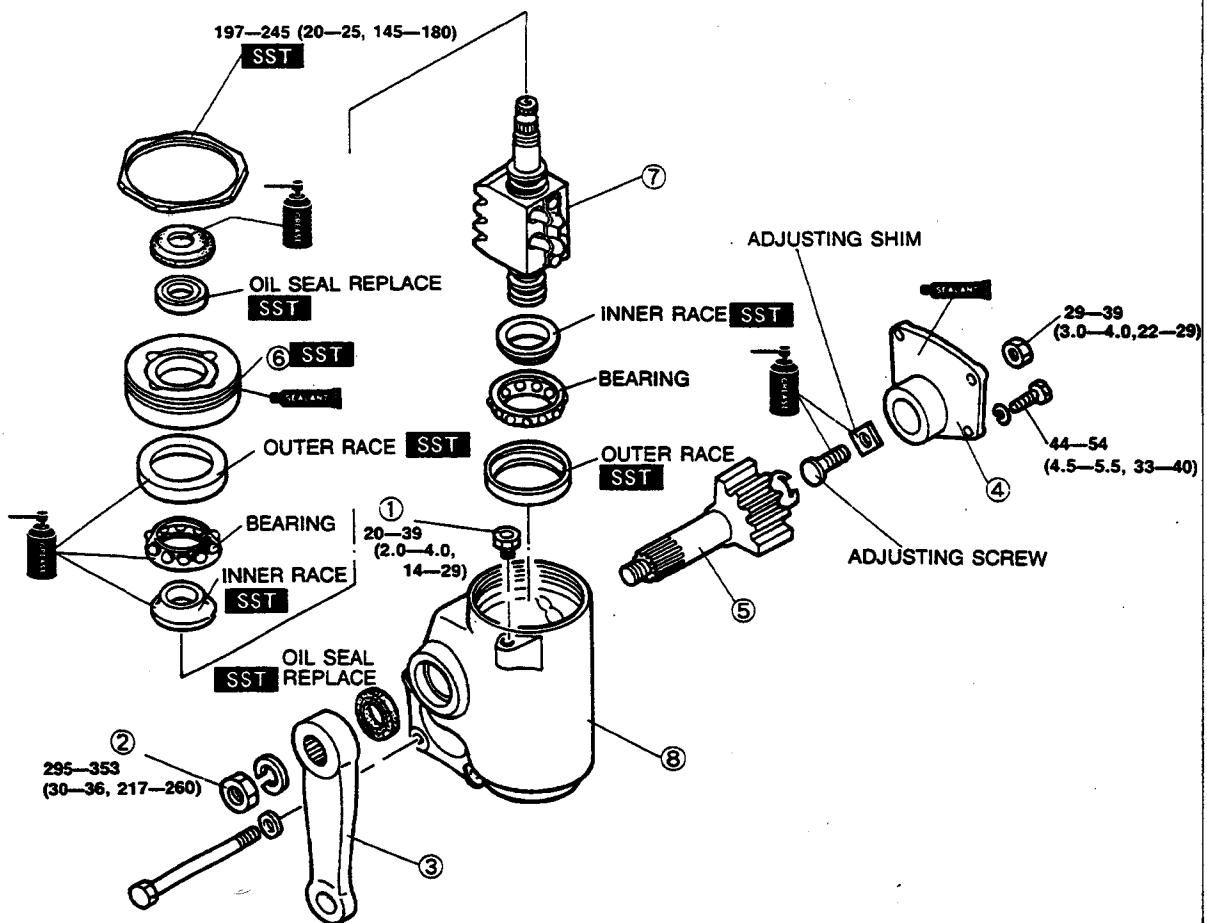
- | | |
|---------------------------------|--|
| 1. Fixing bolt | 6. Cotter pin, nut |
| 2. Cotter pin, nut | 7. Drag link |
| 3. Tie-rod end | Removal note..... page N- 9 |
| Removal note..... page N- 9 | Inspect for bending |
| Inspect for damage | Inspect operation of ball stud |
| Inspect operation of ball joint | |
| 4. Locknut | 8. Cotter pin, nut |
| Removal note..... page N- 9 | 9. Knuckle arm |
| 5. Tie-rod | 10. Steering gear |
| Inspect for bending | 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 thoroughly and drain the gear oil through the filler port.

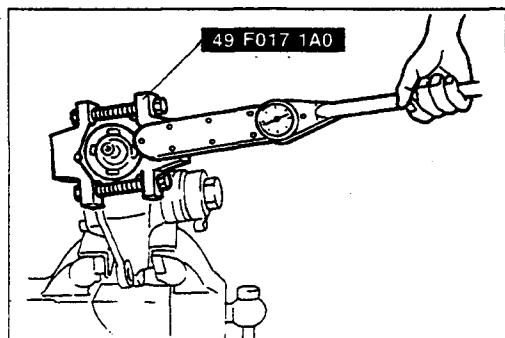


N·m (m·kg, ft·lb)

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

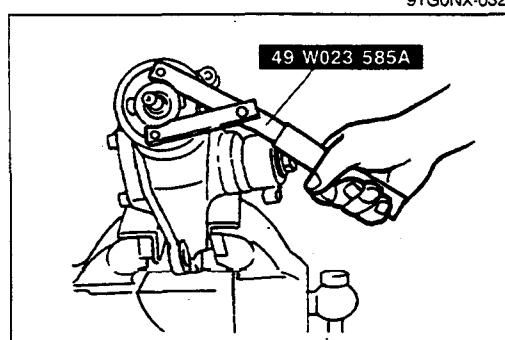
MANUAL STEERING



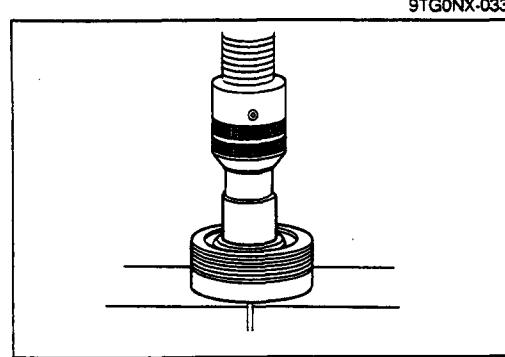
Disassembly note

Adjusting plug

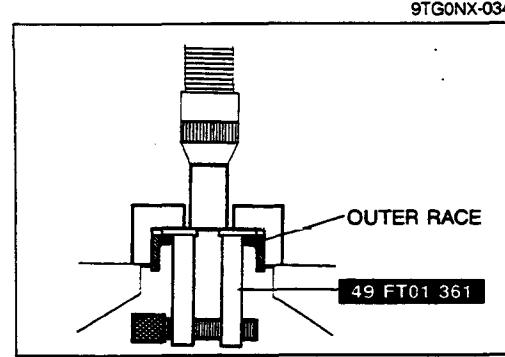
1. Remove the locknut with the **SST**.



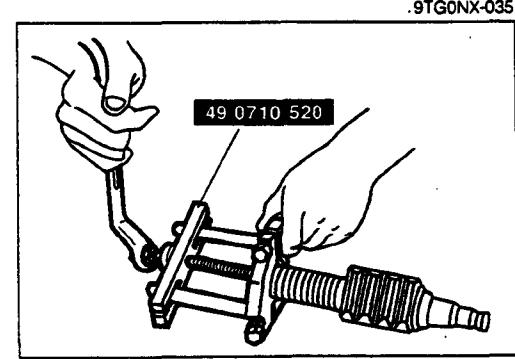
2. Remove the adjusting plug with the **SST**.



3. Press the oil seal out with a **23mm (15/16 in)** socket from the front side as shown.

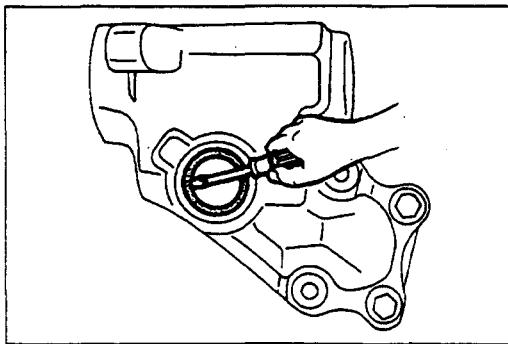


4. Press the outer race out with a socket and the **SST** as shown.



Worm ball nut assembly

1. Remove the two inner races with the **SST**.



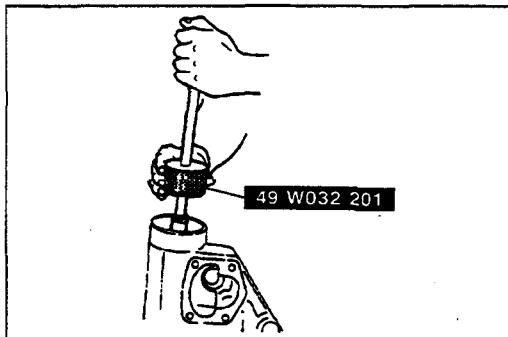
9TG0NX-037

Gear housing

1. Remove the oil seal with a screwdriver.

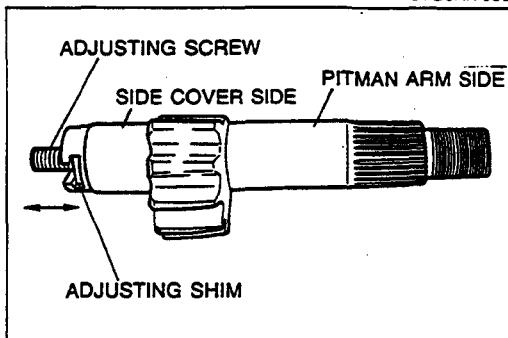
Caution

- Do not damage the bushing or the inside of the gear housing.



49 W032 201

9TG0NX-038



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)

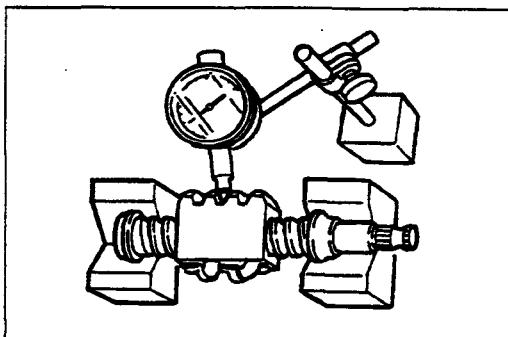
Available adjustment shims:

**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

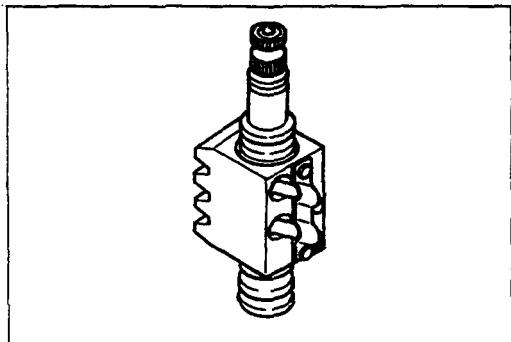
1. Measure the play in the vertical direction as shown.

Limit: 0.05mm (0.002 in)

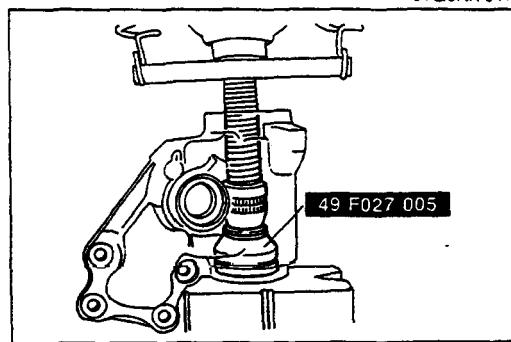
2. Check for damage and wear of the teeth.

MANUAL STEERING

N

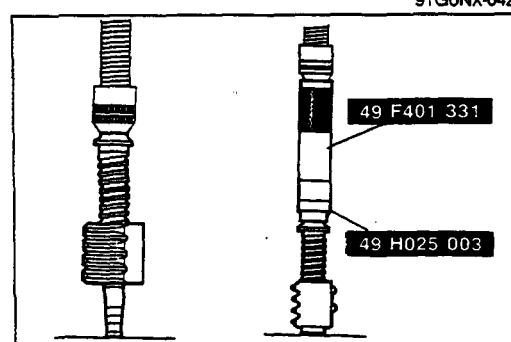


3. Verify that the worm ball nut turns and moves down by its own weight when holding the shaft as shown.



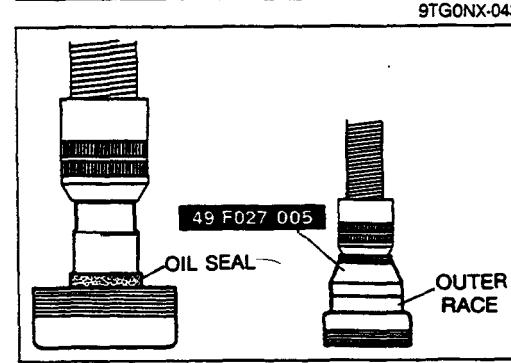
Assembly note Gear housing

1. Press the outer race in with the **SST** as shown.



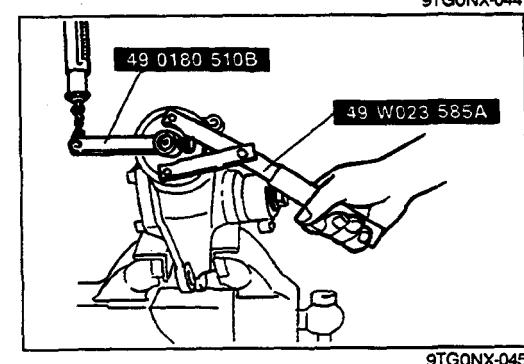
Worm ball nut assembly

1. Press the two inner races on with the **SST** as shown.



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.

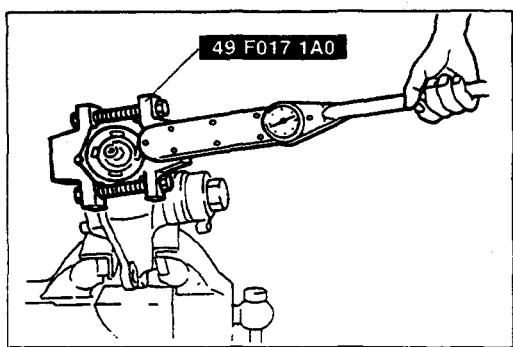


5. Turn the adjusting plug with the **SST**.
6. Measure the worm shaft preload with the **SST** and a pull scale.
7. Turn the adjusting plug to obtain the specified preload.

Worm shaft preload (without sector shaft):

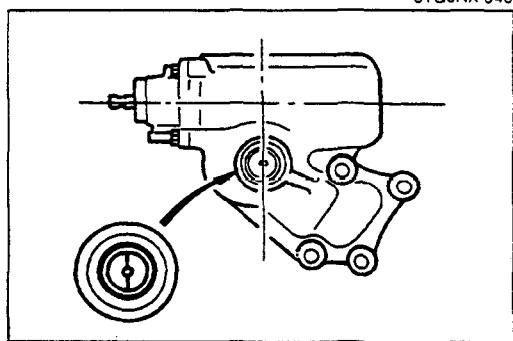
Pull scale reading:

2.9—6.9 N (0.3—0.7 kg, 0.7—1.5 lb)



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

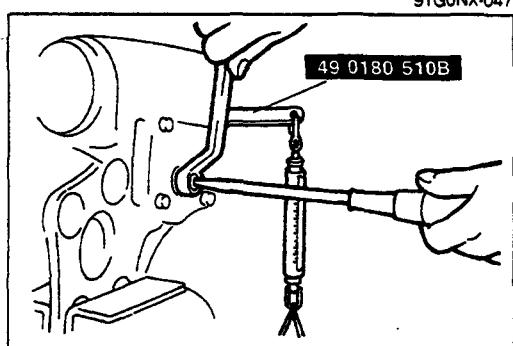
Note

- 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.

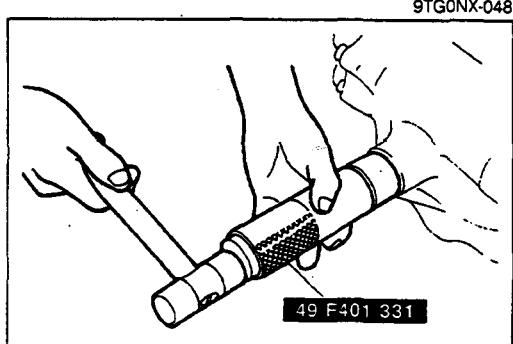


4. Turn the adjusting bolt.
5. Measure the worm shaft preload in the straight-ahead position with the **SST** and a pull scale.
6. Turn the adjusting bolt to obtain the specified preload.

Worm shaft preload (after sector shaft installed)

Pull scale reading

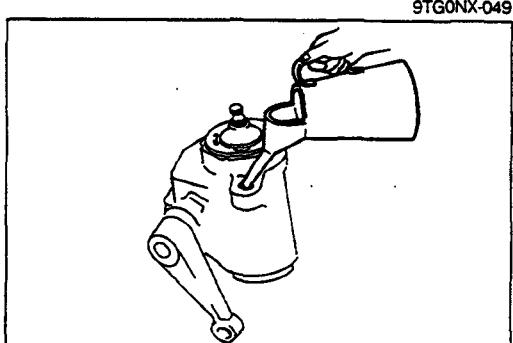
6.9—11 N (0.7—1.1 kg, 1.5—2.4 lb)



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.

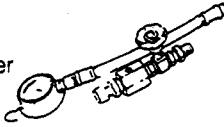
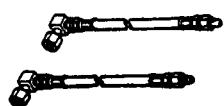
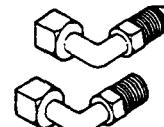
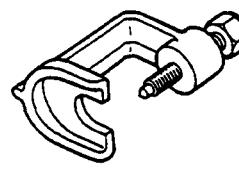
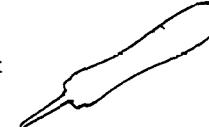
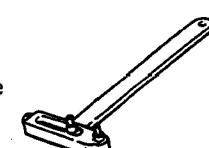
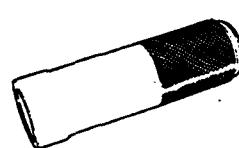
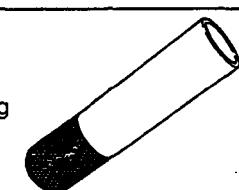
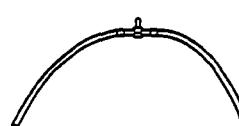
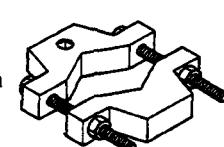


- 2: Fill the gear housing with gear oil.

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

9TGONX-051

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page/Section
Steering feels heavy	Poor lubrication, foreign material, or abnormal wear of steering ball joint Improper worm shaft preload Malfunctioning or damaged steering gear Leakage of fluid Low fluid level or air in fluid Insufficient oil pump pressure Clogged fluid pipe Loose or damaged oil pump drive belt Damaged oil pump drive gear (4.0 L Engine) Incorrect tire pressure Improperly adjusted wheel alignment	Lubricate or replace Adjust Replace Repair or replace Add fluid or bleed air Replace Repair or replace Adjust or replace Replace Adjust Adjust Adjust	N- 8 N-35 N-28 N-24 N-23 N-37 — N-46 N-43 Section Q Section R
Steering wheel pulls to one side	Dragging brake Incorrect tire pressure Unevenly worn tires Weak front spring Improperly adjusted wheel alignment	Repair Adjust Replace Replace Adjust	Section P Section Q Section Q Section R Section R
General instability while driving	Damaged steering linkage Worn or damaged steering ball joints Improper worm shaft preload Incorrect tire pressure Damaged or unbalanced wheel Weak front spring Malfunctioning shock absorber Improperly adjusted wheel alignment	Replace Replace Adjust Adjust Adjust or replace Replace Replace Adjust	N-28 N- 8 N-35 Section Q Section Q Section R Section R Section R
Steering effort not uniform	Loose oil pump drive belt Malfunctioning steering gear Malfunctioning steering joint Malfunctioning steering linkage	Adjust or replace Replace Replace Replace	N-46 N-28 N- 8 N-28
Excessive steering wheel play	Worn steering gear Worn or damaged steering joint Loose steering gear mounting bolts Improperly adjusted steering gear backlash Weak kingpin Improperly adjusted front wheel bearing preload	Replace Replace Tighten Adjust Replace Adjust	N-28 N- 8 N-28 N-35 Section M Section M
Poor steering wheel return	Stuck or damaged steering joint Improperly adjusted worm shaft preload Steering shaft contacting something Incorrect tire pressure Improperly adjusted front wheel alignment	Replace Adjust Repair or replace Adjust Adjust	N- 8 N-35 N-12 Section Q Section R
Shimmy (Steering wheel vibrates left/right)	Damaged steering linkage Loose steering gear mounting bolts Worn or damaged steering joint Improperly adjusted worm shaft preload Damaged or worn front wheel bearing Excessive tire or wheel runout Loose lug nuts Unbalanced wheel Incorrect tire pressure Unevenly worn tires Malfunctioning shock absorber Loose shock absorber mounting bolts Cracked or worn suspension bushings Improperly adjusted front wheel alignment	Replace Tighten Replace Adjust Replace Replace Tighten Adjust or replace Adjust Replace Replace Tighten Replace Adjust	N-28 N-28 N- 8 N-35 Section M Section Q Section Q Section Q Section Q Section Q Section Q Section R Section R Section R Section R Section R Section R

ENGINE SPEED SENSING POWER STEERING

TROUBLESHOOTING GUIDE (Cont'd)

Problem	Possible Cause	Action	Page/Section
Abnormal noise from steering system	Loose steering gear mounting bolts Malfunctioning steering gear Loose or damaged steering linkage Worn steering joint Obstruction near steering column Improperly adjusted steering gear backlash Loose oil pump Loose oil pump bracket Loose oil pump pulley Loose or over tight oil pump drive belt Worn or damaged oil pump drive gear (4.0 L Engine) Air in system Malfunctioning oil pump Obstruction near steering column or pressure hose	Tighten Replace Tighten or replace Replace Repair or replace Adjust Tighten Tighten Tighten Adjust Replace Bleed air Replace Adjust or replace	N-28 N-28 N-28 N- 8 N-12 N-35 N-37 N-37 N-37 N-46 N-43 N-23 N-37 —

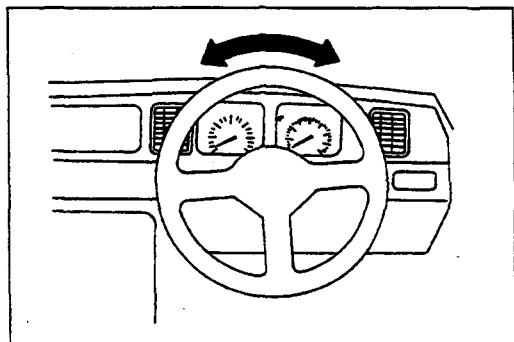
9TF0NX-012

AIR BLEEDING

Caution

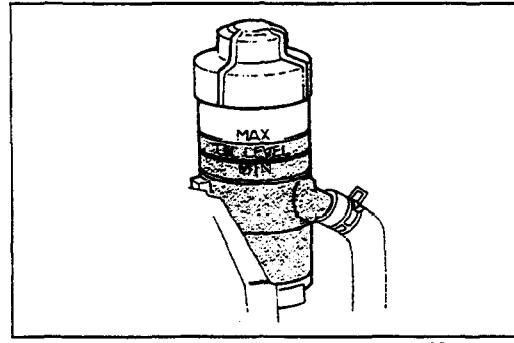
- While air bleeding, add fluid to ensure the proper fluid level, thus preventing air from getting into fluid.

9TG0NX-053



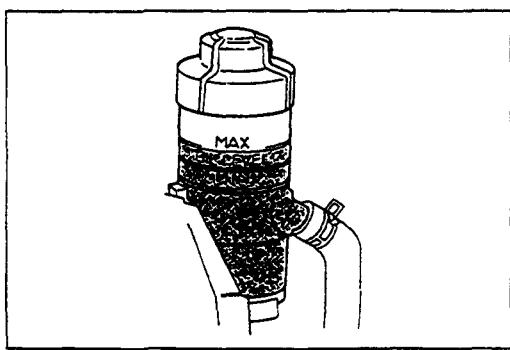
9TF0NX-013

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-055

ENGINE SPEED SENSING POWER STEERING



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.

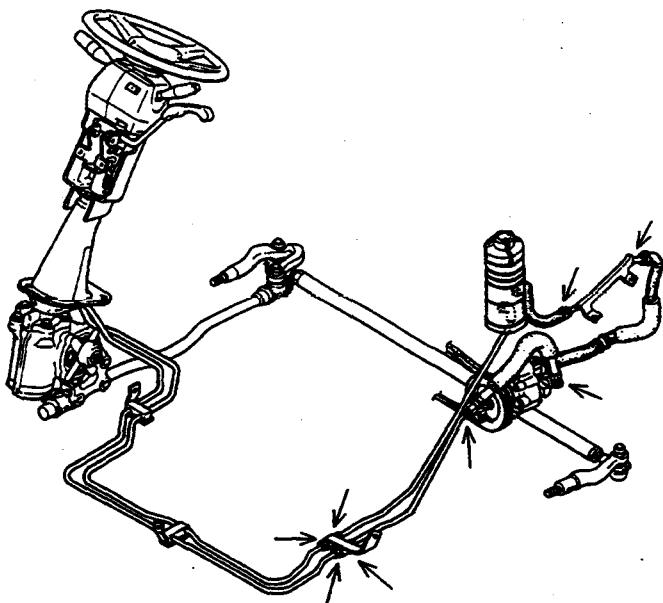
Caution

- 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.

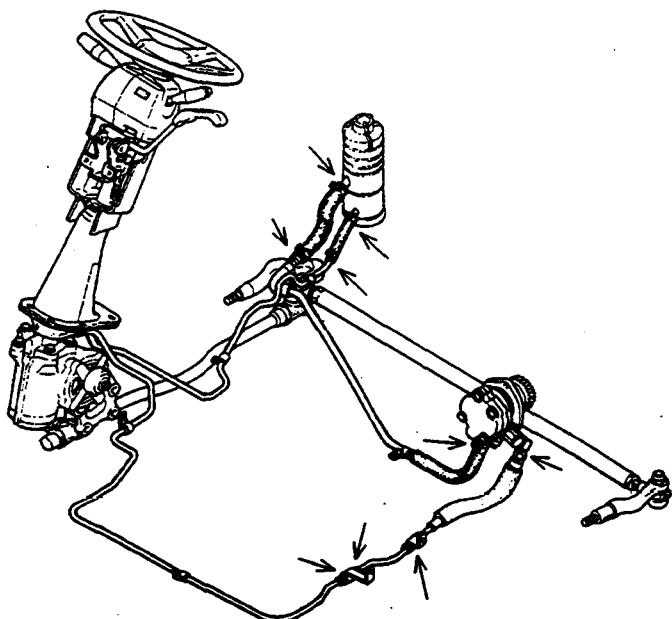
3.5 L TURBO MODEL



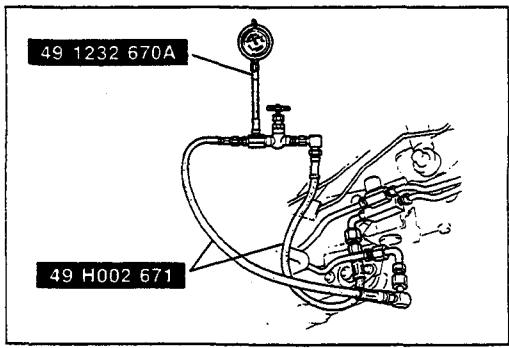
ENGINE SPEED SENSING POWER STEERING

N

4.0 L ENGINE MODEL



9TFONX-015



9TGONX-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.)

9TFONX-016

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/cm², 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.

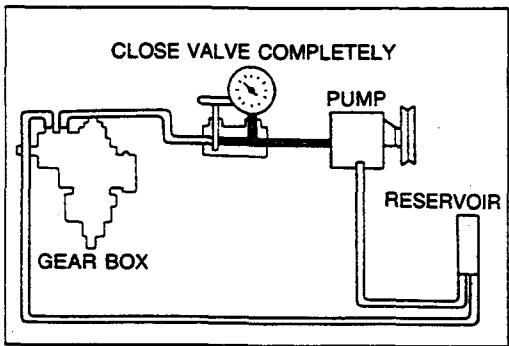
6. Open the gauge valve fully again and increase the engine speed to **1,000—1,500 rpm**.
7. Turn the steering wheel fully to the left and right and measure the fluid pressure generated by the gear housing. If the pressure is below specification, replace the gear housing assembly.

Gear housing fluid pressure:

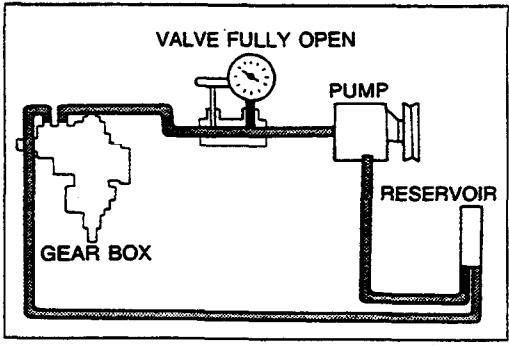
10,301 kPa (105 kg/cm², 1,493 psi)

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.



9TGONX-062



9TGONX-063

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.

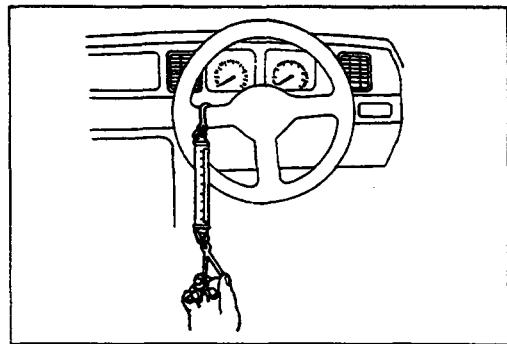
Steering wheel effort

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



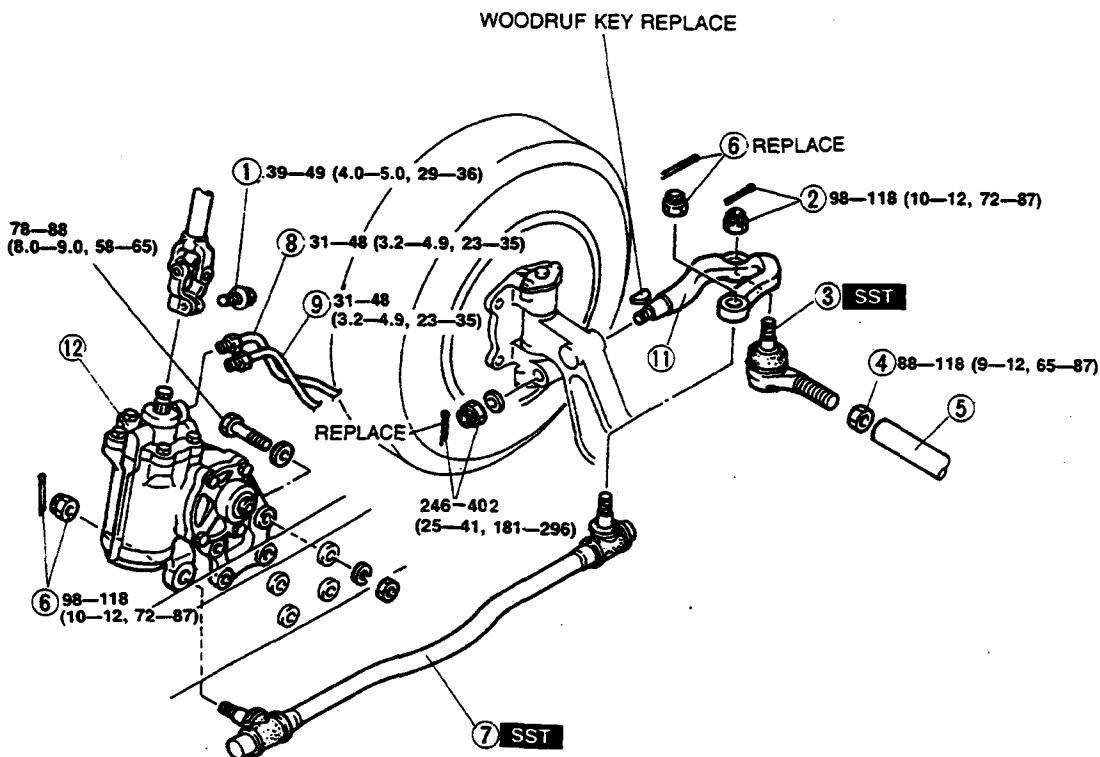
9TG0NX-066

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.



N·m (m·kg, ft·lb)

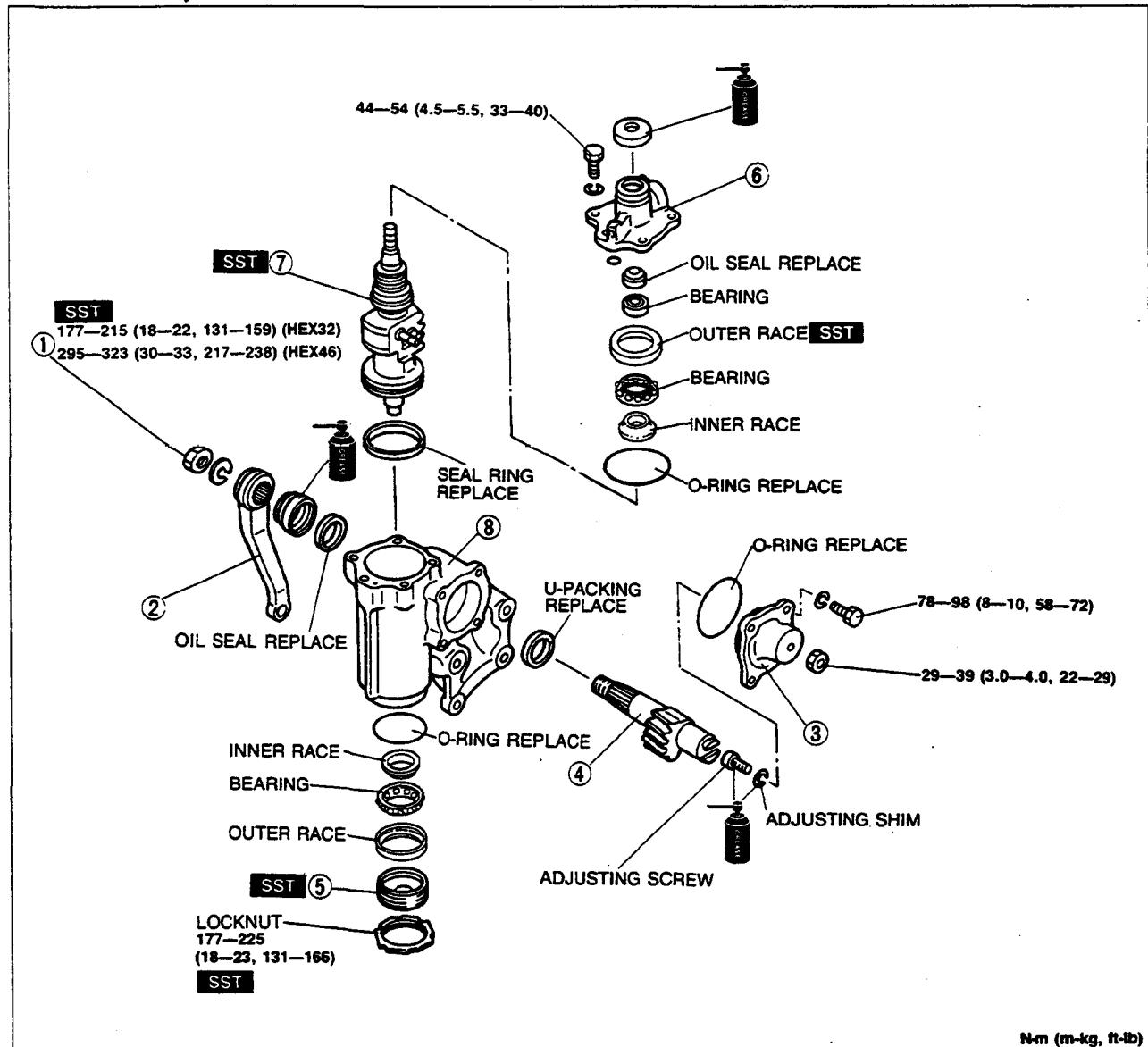
9TF0NX-019

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

ENGINE SPEED SENSING POWER STEERING

Disassembly / Inspection / Assembly

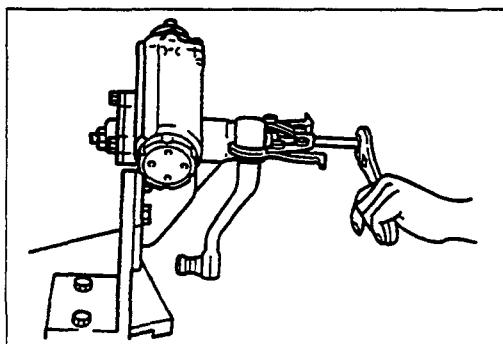
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Inspect for all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



N·m (m·kg, ft·lb)

91F0N0X-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



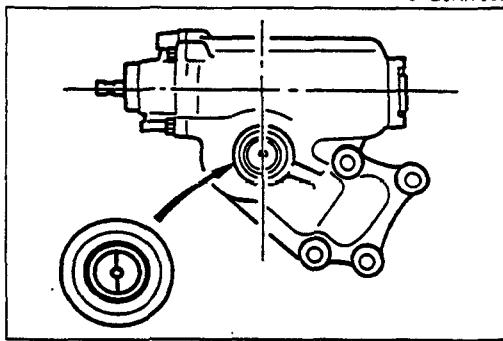
9TGONX-069

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.



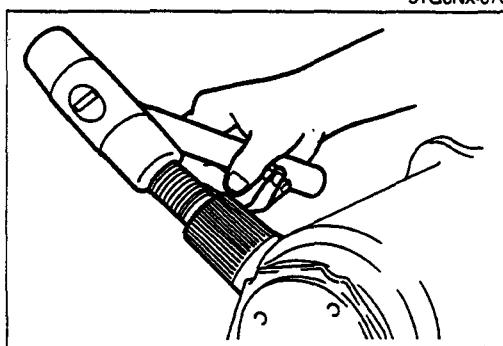
9TGONX-070

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.

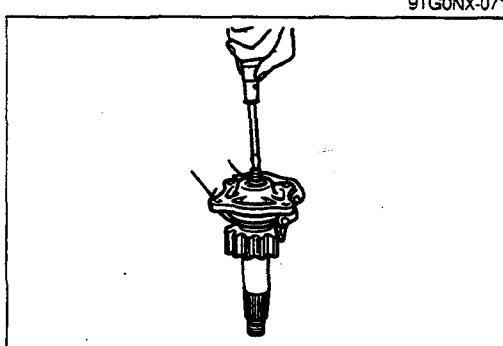


9TGONX-071

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.

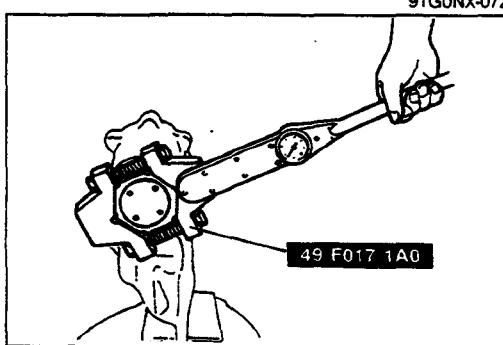


9TGONX-072

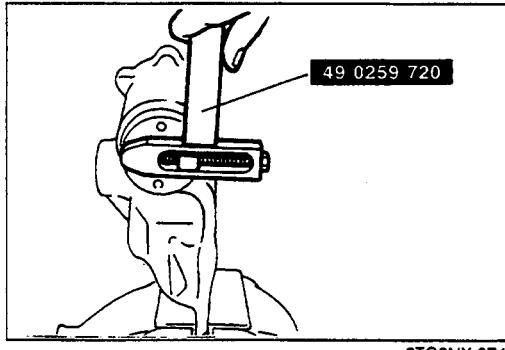
5. Remove the side cover from the sector shaft by turning the adjusting screw clockwise as shown.

Adjusting plug

1. Remove the locknut with the SST.

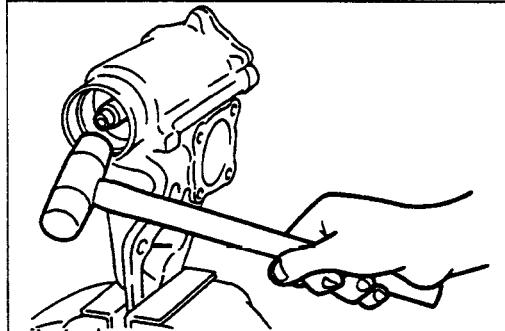


9TGONX-073



2. Remove the adjusting plug with the **SST**.

9TG0NX-074



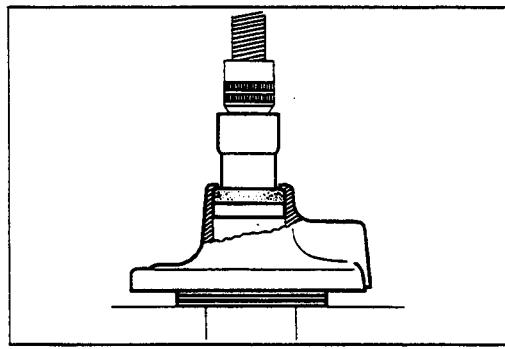
Valve housing, Worm ball nut assembly

Caution

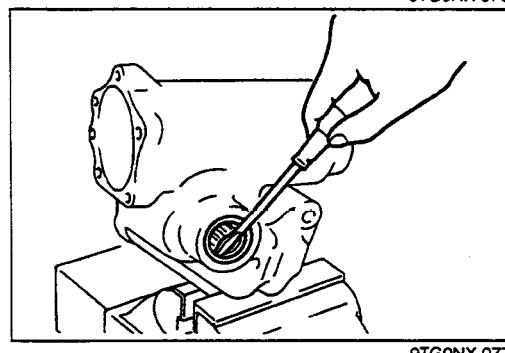
- Do not damage the inside of the gear housing and the worm ball nut assembly.

1. Remove the valve housing and the worm ball nut assembly together by hitting the worm shaft end with a plastic hammer.
2. Press the ball bearing and the oil seal out with the a socket.
3. Remove the outer race with a screwdriver.

9TG0NX-075



9TG0NX-076



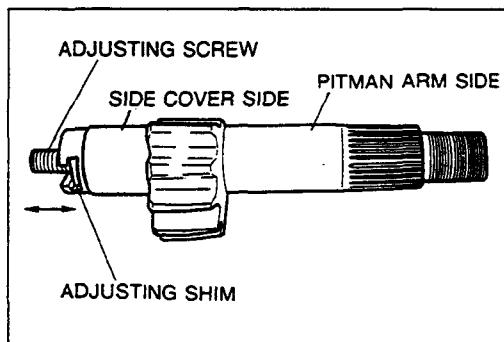
9TG0NX-077

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

- Set the adjusting screw and the adjustment shim in the T-groove.
- Measure the clearance with a feeler gauge in the axial direction.
- 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),

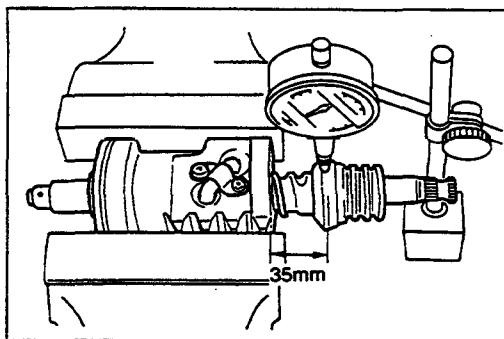
2.05mm (0.081 in)

- 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)

- Check for damage and wear of the teeth and the shaft.

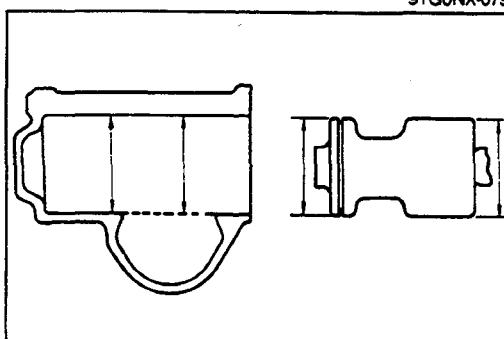


9TG0NX-079

Worm ball nut assembly

- Measure the play in the vertical direction as shown.

Limit: 0.4mm (0.016 in)

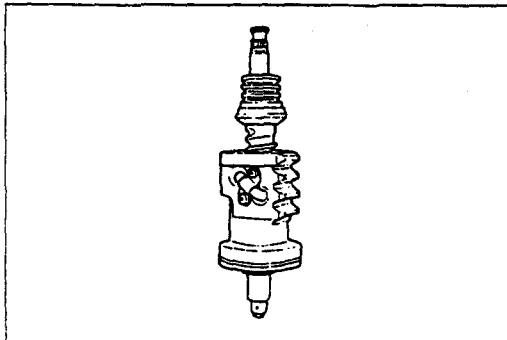


9TG0NX-080

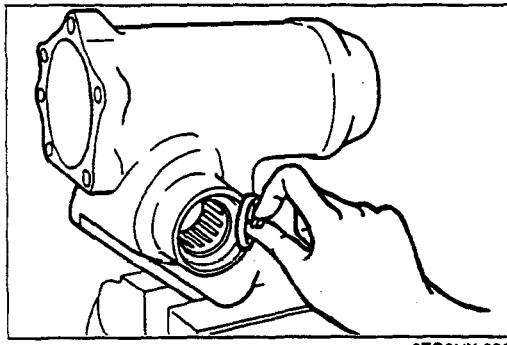
- Measure the clearance of gear housing inner diameter and worm ball nut assembly outer diameter.

Limit: 0.15mm (0.006 in)

ENGINE SPEED SENSING POWER STEERING



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.



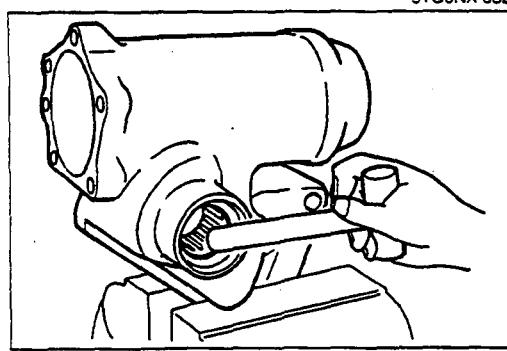
Assembly note

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.

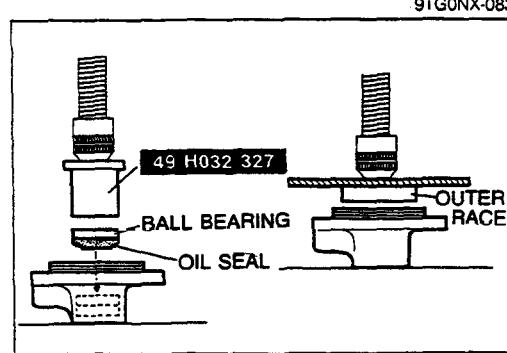
Note

- 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.



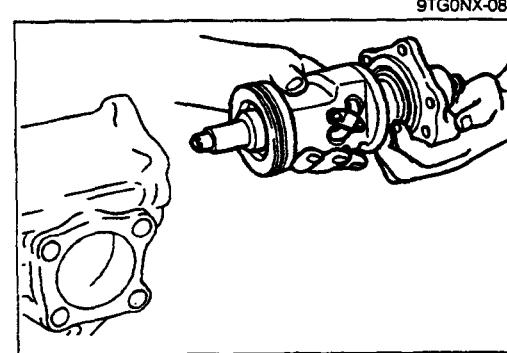
Caution

- Do not damage the inside of the gear housing or the needle bearing.



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.

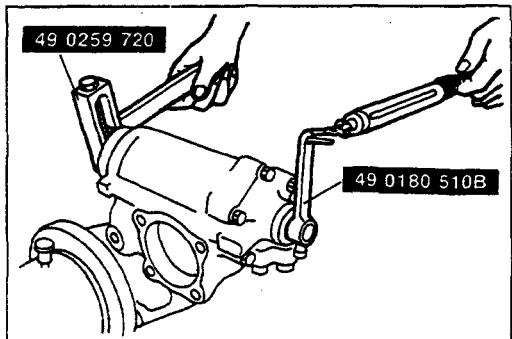


Worm ball nut assembly

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.

**Adjusting plug**

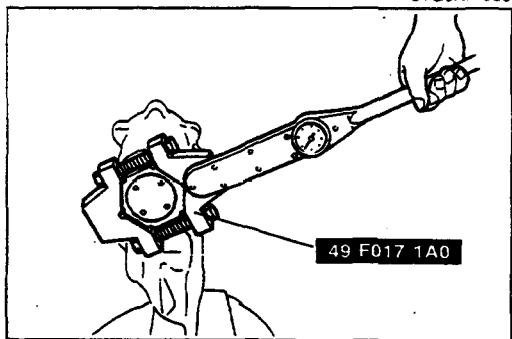
1. Install the inner race on the worm shaft.
2. Apply ATF to the O-ring.
3. Install the adjusting plug and the outer race by hand.
4. Verify that the worm shaft turns smoothly.
5. Turn the adjusting plug with the **SST**.
6. Measure the worm shaft preload with the **SST** and a pull scale.
7. Turn the 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.

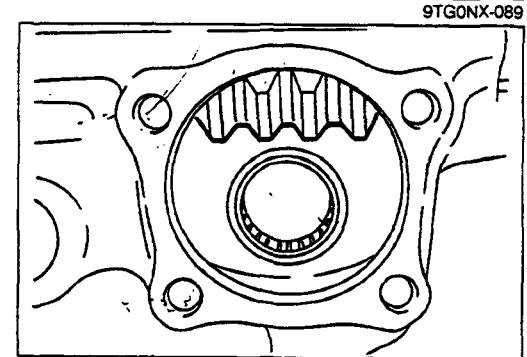
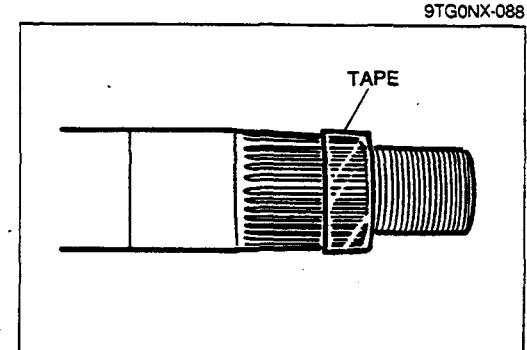
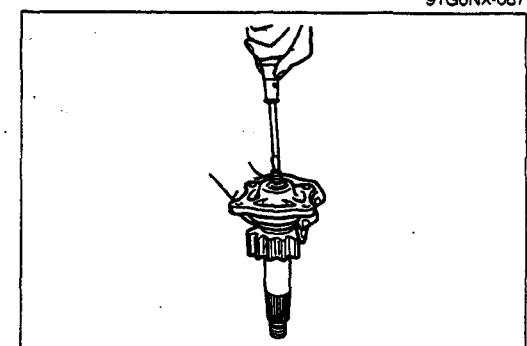
**Sector shaft, side cover**

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.

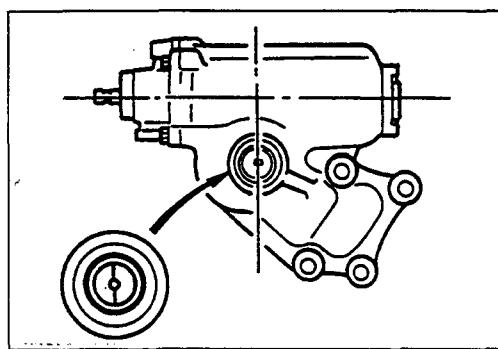
Caution

- Not to damage the needle bearing, use tape on the sector shaft as shown.

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.



ENGINE SPEED SENSING POWER STEERING

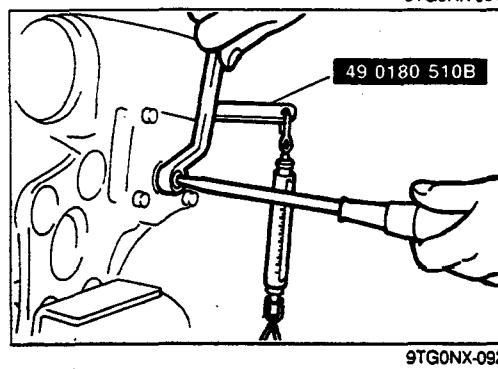


Adjustment of preload

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.

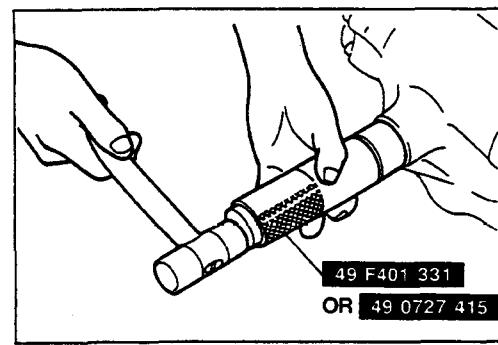
4. Turn the adjusting bolt.
5. Measure the worm shaft preload in the straight-ahead position with the **SST** and a pull scale.
6. Turn the adjusting bolt to obtain the specified preload.

Worm shaft preload (after sector shaft installed)

Pull scale reading

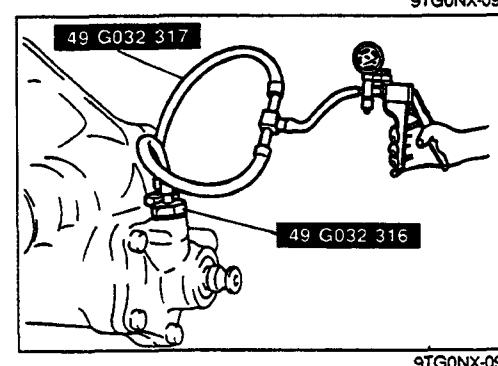
5.9—7.8 N (0.6—0.8 kg, 1.3—1.8 lb)

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.



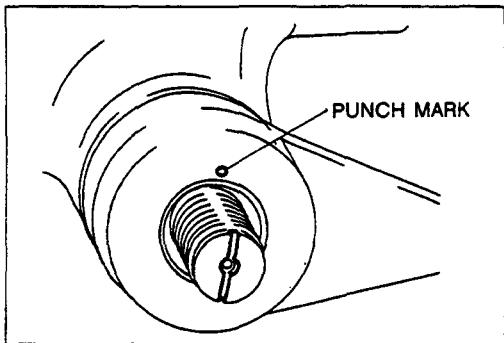
Gear housing

1. Tap the oil seal in with the **SST** and a plastic hammer.



Hermetic inspection

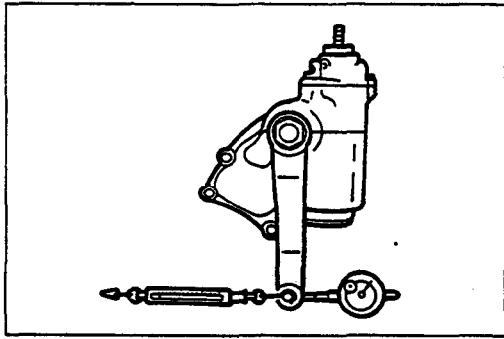
1. Connect the **SST** to the cylinder housing.
2. Connect a vacuum pump to the **SST**.
3. Apply **400 mmHg (15.7 inHg)** vacuum.
4. Verify that vacuum is held for at least **30 sec**.



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.

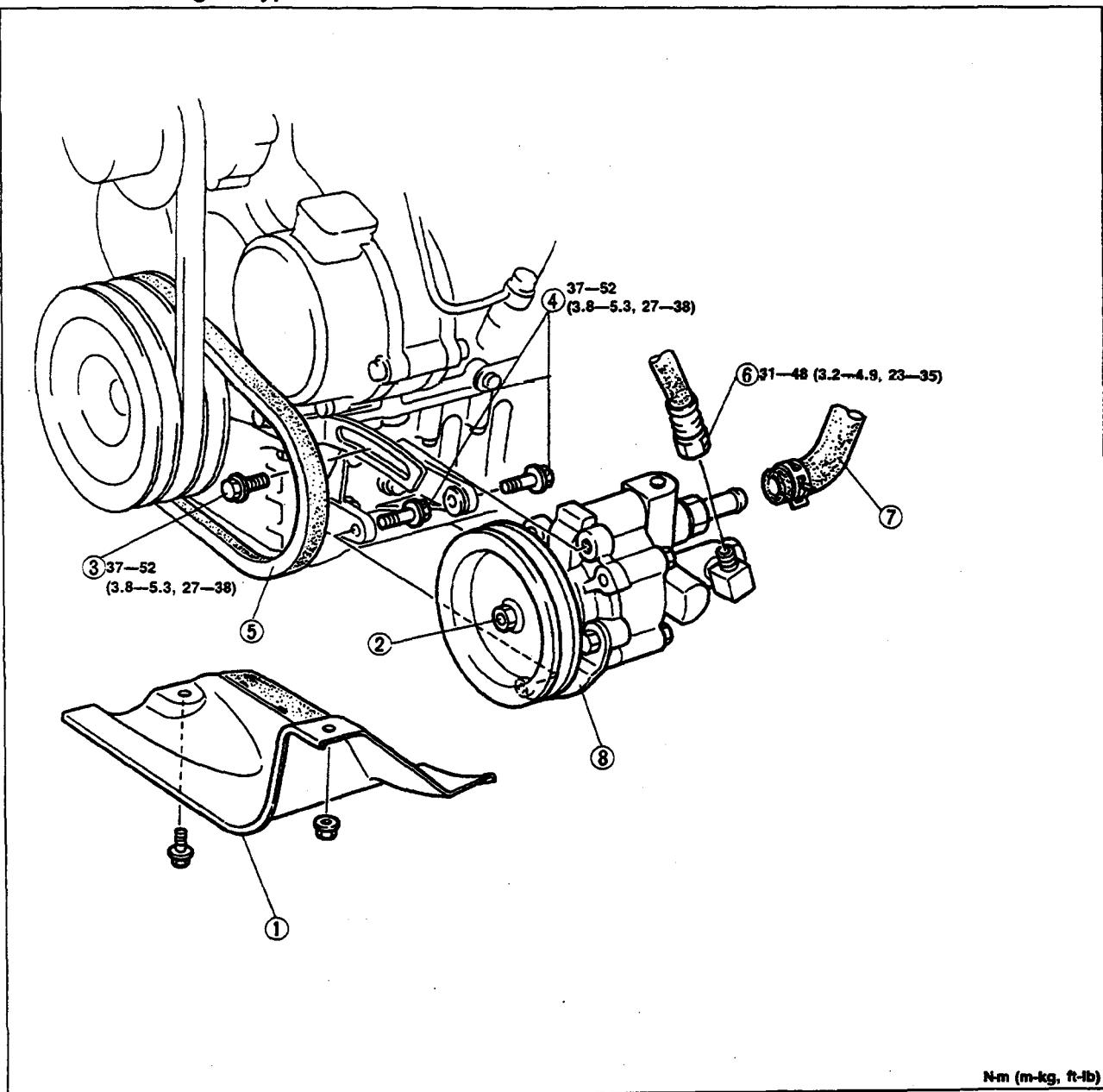
ENGINE SPEED SENSING POWER STEERING

POWER STEERING OIL PUMP

Removal / Installation

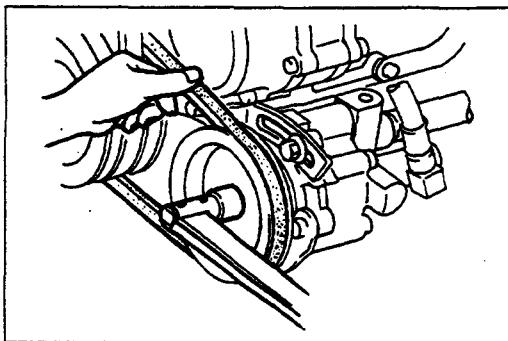
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.

3.5 L TURBO Engine type

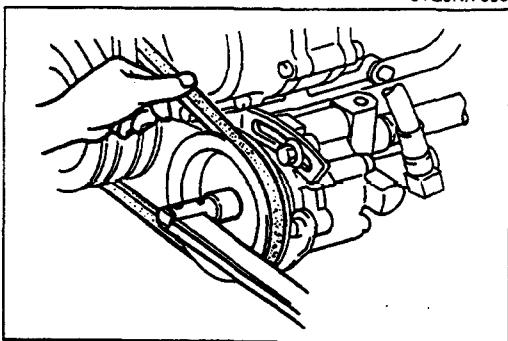


N·m (m·kg, ft·lb)
9TF0NX-021

- | | |
|---|----------------------------|
| 1. Pump protector | 6. Pressure pipe |
| 2. Locknut (Do not remove if not necessary) | 7. Return hose |
| Removal note page N-38 | 8. Oil pump assembly |
| Installation note page N-38 | Disassembly / Inspection / |
| 3. Strap bolt | Assembly page N-39 |
| 4. Bolt | |
| 5. Drive belt | |
| Inspection page N-46 | |
| Adjustment page N-46 | |
| Replacement page N-47 | |

**Removal note****Locknut**

1. Push the drive belt as shown and loosen the locknut.

**Installation note****Locknut**

1. Push the drive belt as shown and tighten the locknut to the specified torque.

Tightening torque:

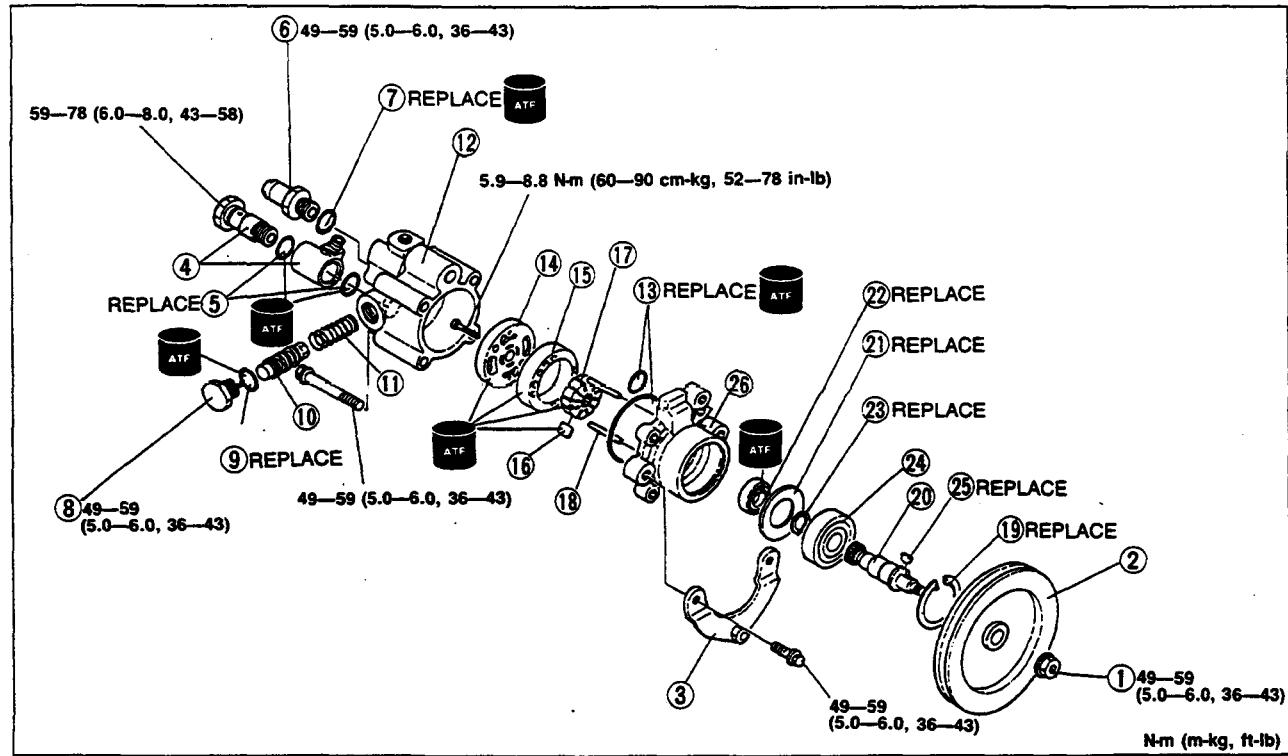
49—59 N·m (5.0—6.0 m·kg, 36—43 ft-lb)

ENGINE SPEED SENSING POWER STEERING

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**.

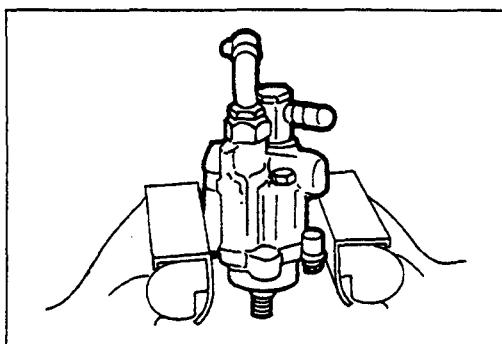
3.5 L TURBO Engine type



N·m (m·kg, ft·lb)

9TFONX-022

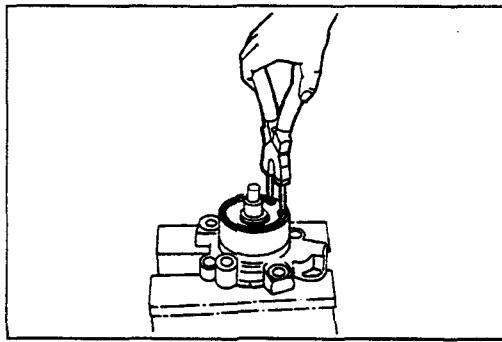
1. Locknut
2. Pulley
3. Bracket
4. Connector (Return)
5. O-ring
6. Connector (Pressure)
7. O-ring
8. Plug
9. O-ring
10. Control valve assembly
Inspect for damage and wear
11. Spring
Inspect for damage
12. Rear body
Inspect for damage and wear
13. O-ring
14. Pressure plate
Inspect for damage and wear
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



9TGONX-103

Disassembly note**Caution**

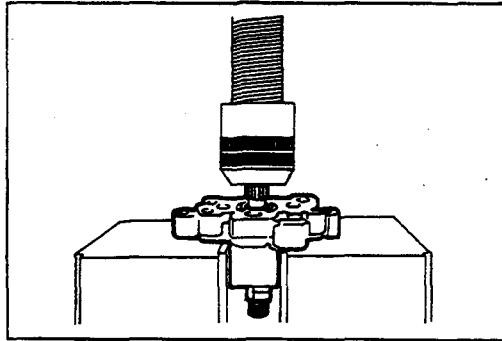
- When securing the oil pump in a vise, use protective plates as shown in the figure.



9TGONX-104

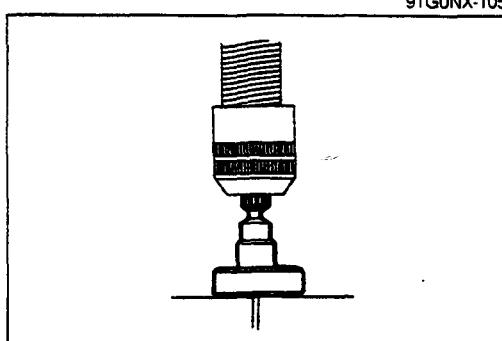
Driveshaft

1. Press the driveshaft and bearing out as shown.
2. Remove the snap ring.



9TGONX-105

3. Press the bearing out as shown.



9TGONX-106

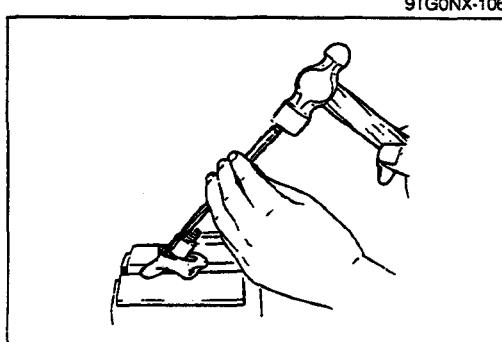
Woodruff key (If necessary)

1. Secure the driveshaft in a vise with rag as shown.

Caution

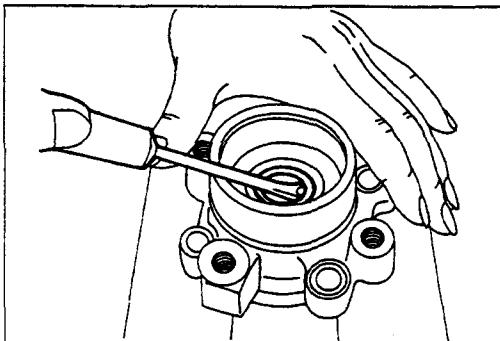
- Do not damage the shaft.
- Do not remove the woodruff key if it is not defective.

2. Remove the Woodruff key with a chisel and a hammer.



9TGONX-107

ENGINE SPEED SENSING POWER STEERING

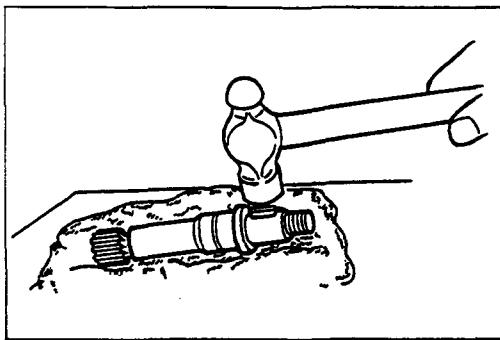


Oil seal

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.



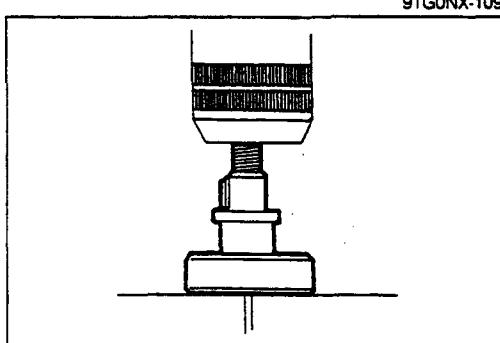
Assembly note

Woodruff key

1. Tap the Woodruff key into the shaft.

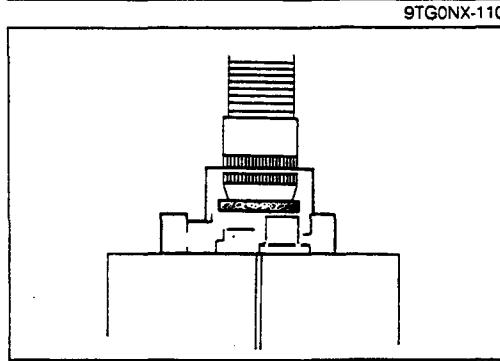
Caution

- Not to damage the shaft, use a rag under the shaft for protection.



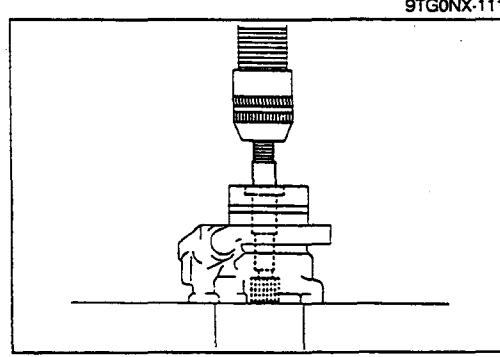
Driveshaft

1. Press the bearing on as shown.
2. Install the snap ring.



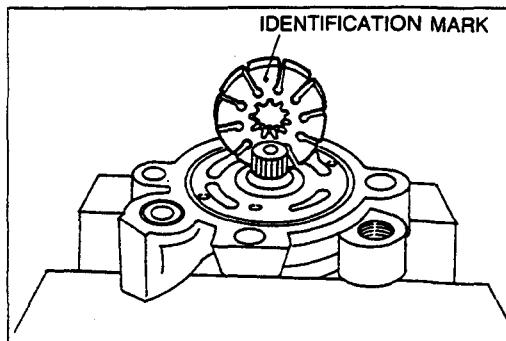
Front body

1. Press the oil seal in as shown.

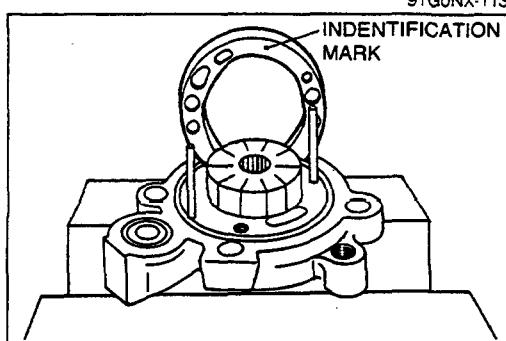


2. Press the driveshaft and the bearing in as shown.
3. Install the snap ring.

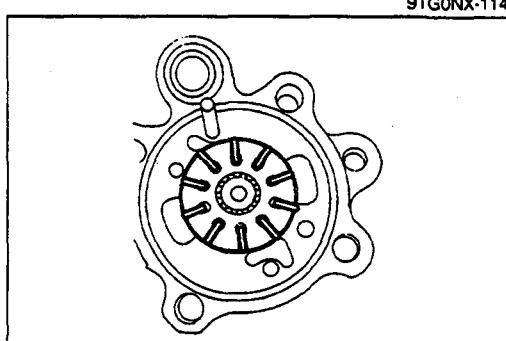
9TG0NX-112

**Rotor**

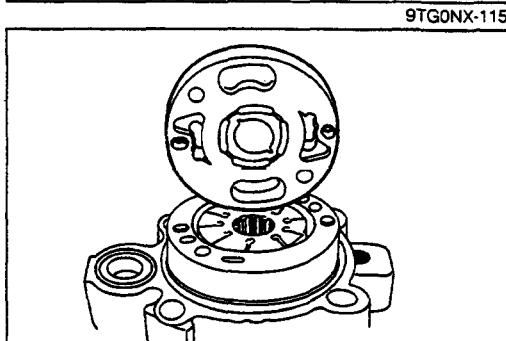
1. Apply ATF to the rotor and install it with the identification mark facing the front body as shown.

**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.

**Vane**

1. Apply ATF to the vanes and place them in the rotor with the rounded edges against the cam ring.

**Pressure plate**

1. Apply ATF to the pressure plate and install it.

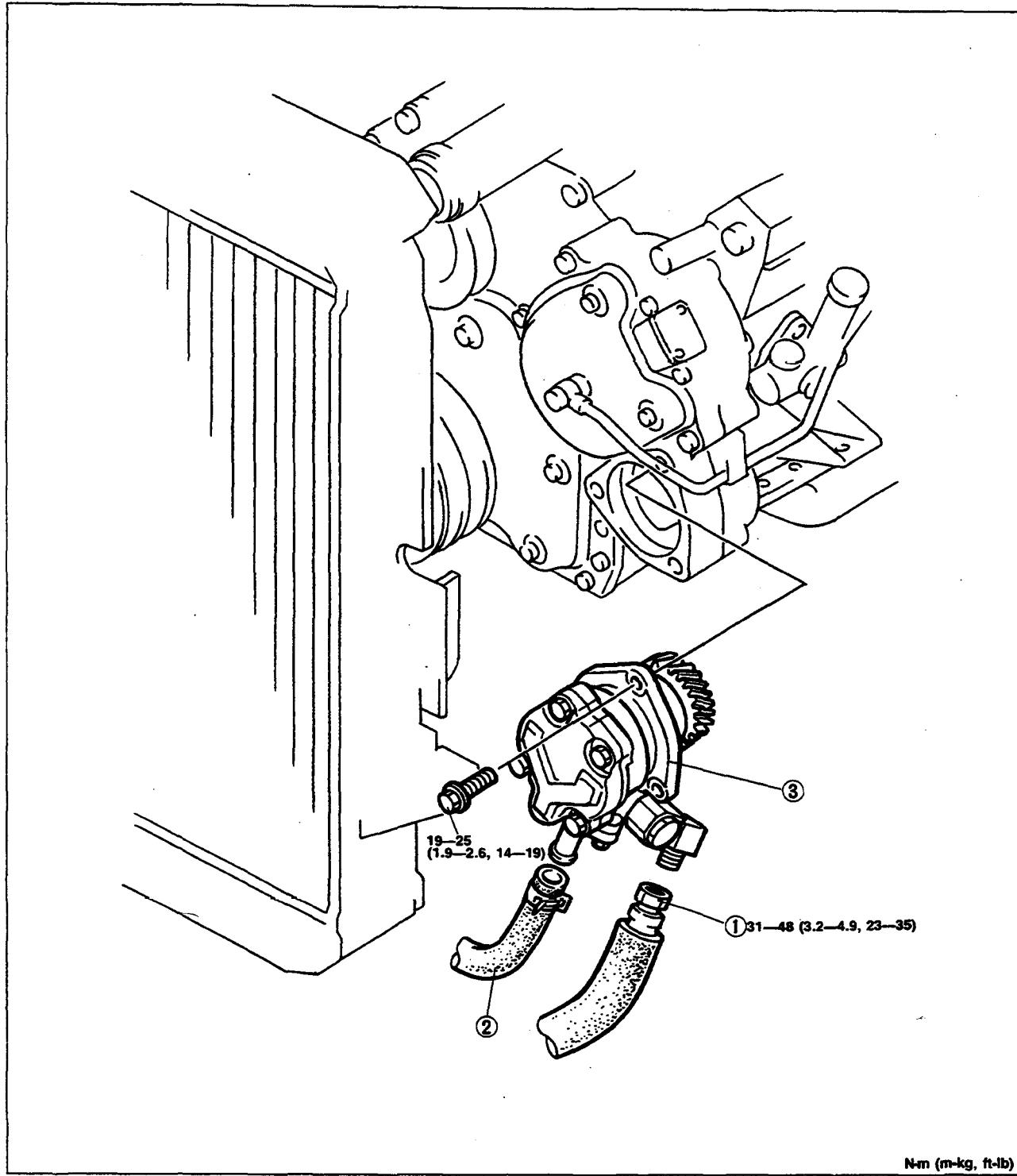
ENGINE SPEED SENSING POWER STEERING

N

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



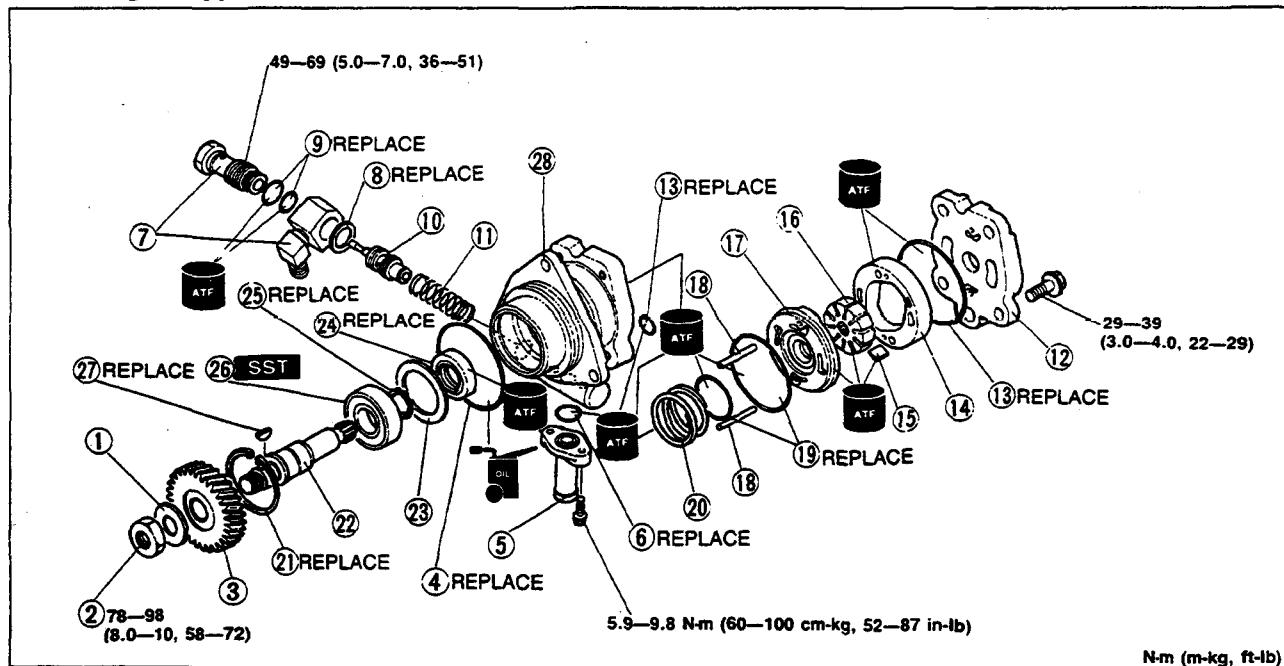
1. Pressure pipe
2. Return hose

3. Oil pump assembly
Disassembly / Inspection /
Assembly page N-44

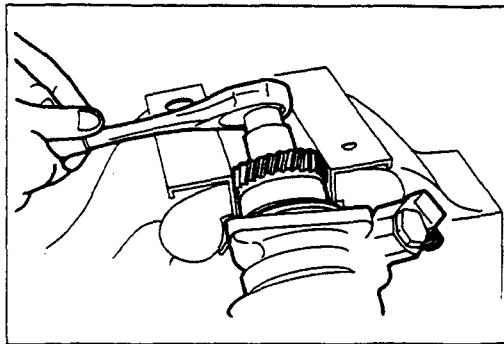
N·m (m·kg, ft·lb)
9TF0NX-023

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

**Disassembly note****Locknut**

- Secure the oil pump use in a vise.

Caution

- Not to damage the pump, use protective plates.**

- Remove the washer with a chisel and a hammer.

Caution

- Do not damage the driveshaft or the drive gear.**

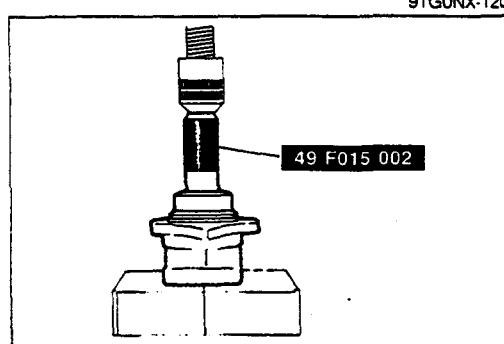
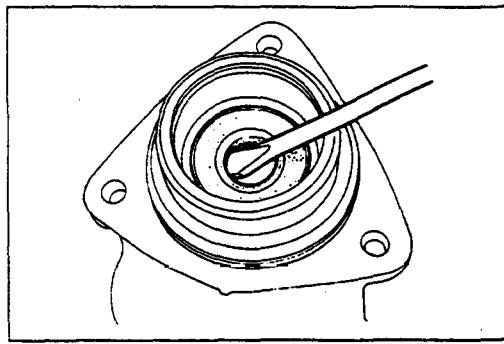
- Remove the locknut.

Oil seal

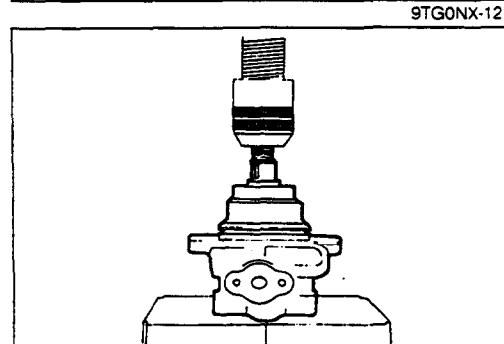
- Remove the oil seal with a screwdriver as shown.

Caution

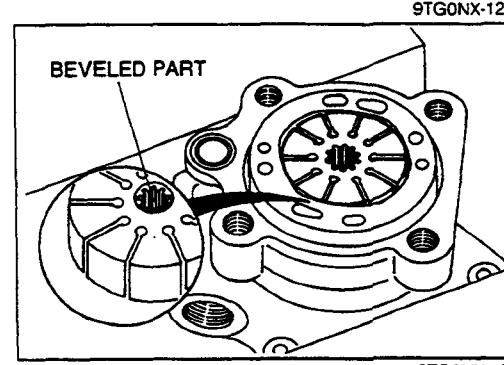
- Do not damage the front body or the bushing.**

**Assembly note****Front body**

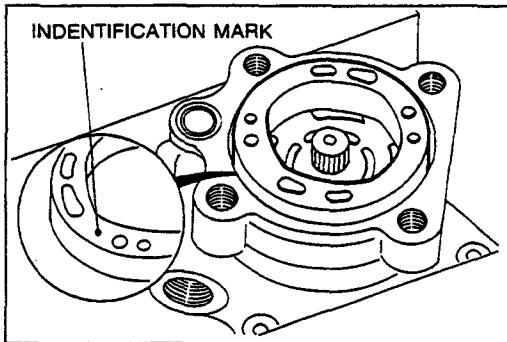
- Press the oil seal in with the **SST**.



- Press the driveshaft and the bearing in together as shown.
- Install the snap ring.

**Rotor**

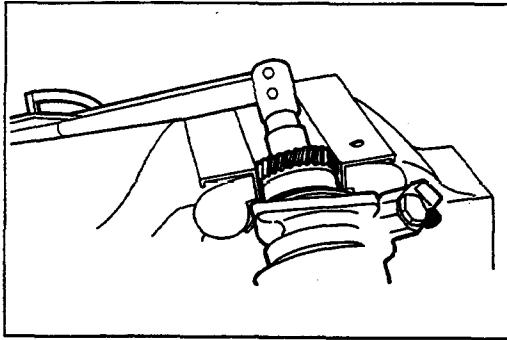
- Apply ATF to the rotor and install it with the beveled side facing the front body as shown.



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.

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)

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):

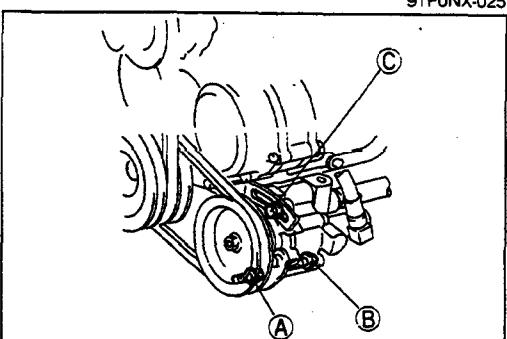
37—52 N·m (3.8—5.3 m-kg, 27—38 ft-lb)

Replacement**3.5 L Turbo Engine type**

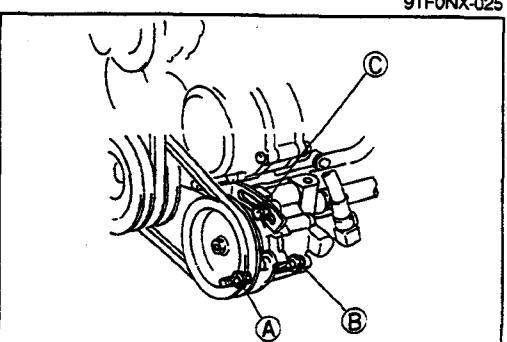
1. Loosen bolts A and B and strap bolt C.

2. Remove and replace the drive belt.

3. Adjust the deflection. (Refer to above.)



9TF0NX-025



9TF0NX-026

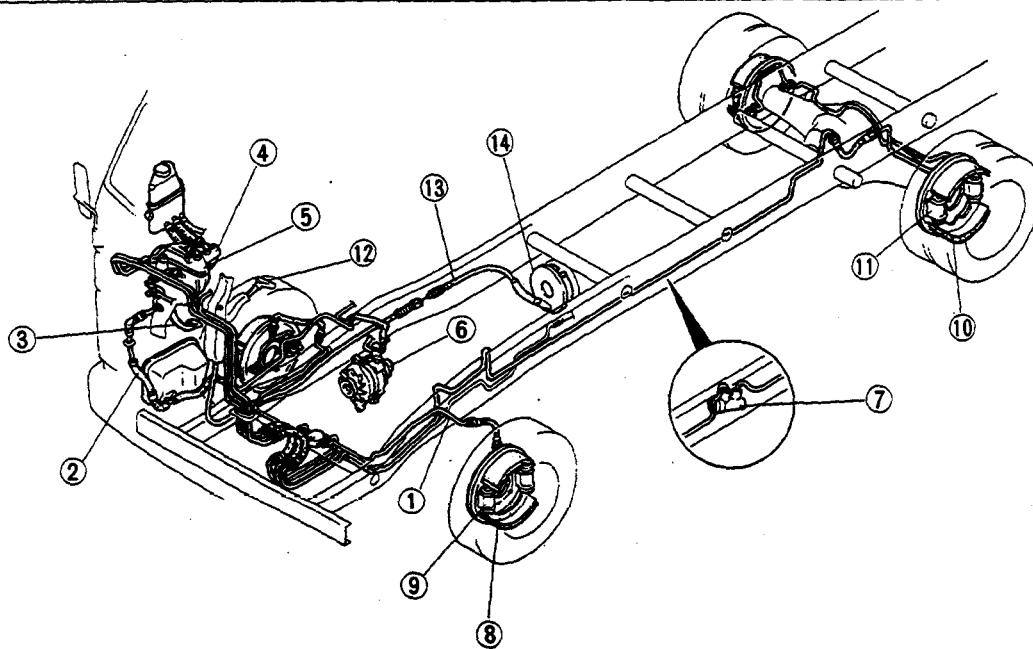
BRAKING SYSTEM

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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				
Rear brake (Drum)	Shoe clearance adjustment	Manual adjustment				
	Type	Dual 2-leading				
	Wheel cylinder inner diameter mm (in)	25.4 (1.00)				
	Lining dimensions	Refer to next page				
Power brake unit	Drum inner diameter	Refer to next page				
	Shoe clearance adjustment	Manual adjustment				
Parking brake	Type	Tandem diaphragm				
	Diameter mm (in)	(a) 188 + 215 (7.4 + 8.5) (b) 213 + 240 (8.4 + 9.4)				
Auxiliary brake system	Type	Center brake				
	Operating type	Stick type				
	Lever ratio	5.125				
	Maximum notch number	20				
	Lining dimensions mm (in) (Length x width x thickness)	190.6x35.0x3.6 (7.5x1.38x0.13)				
Rear braking force control device	Drum inner diameter mm (in)	190 (7.48)				
	Auxiliary brake system	—	Exhaust brake system			
Brake fluid		Load-sensing G-valve				
		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

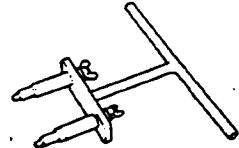
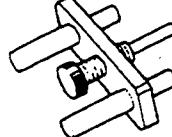
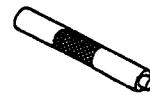
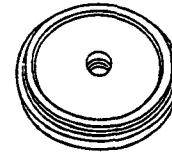
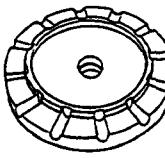
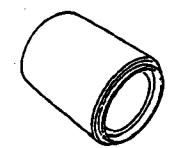
9TG0PX-003

P**OUTLINE, BRAKE SYSTEM****Lining and Drum Dimensions**

Engine	Body type	Rear wheel	Item	Front brake		Rear brake	
			Lining dimensions mm (in) (Length x width x thickness)	Drum inner diameter mm (in)	Lining dimensions mm (in) (Length x width x thickness)	Drum inner diameter mm (in)	
HA		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)	
	14 feet cargo deck		307.0x90.0x8.0 (12.09x3.54x0.31)		307.0x90.0x8.0 (12.09x3.54x0.31)		
SL TURBO	14 and 17 feet cargo deck		334.9x110.0x10.5 (13.18x4.33x0.41)		334.9x110.0x10.5 (13.18x4.33x0.41)		
TF							

9TF0PX-004

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

9TG0PX-005

BRAKE SYSTEM

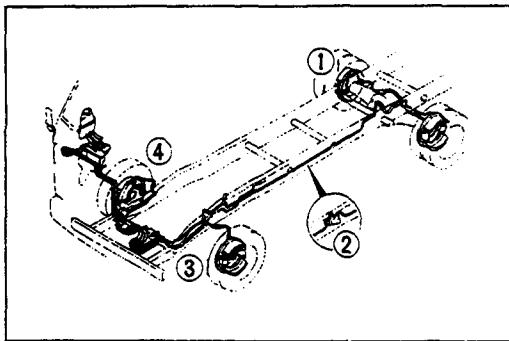
P

TROUBLESHOOTING GUIDE

Problem	Possible cause	Remedy	Page
Poor braking	Leakage of brake fluid Air in system Worn lining Brake fluid, grease, oil, or water on lining Hardening of lining surface or poor contact Malfunction of master cylinder or wheel cylinder Malfunction of power brake unit Malfunction of check valve (vacuum hose) Damaged vacuum hose Deterioration of flexible hose Malfunction of LSGV Worn drum Malfunction of vacuum pump Overloaded Wheel and tire related problem	Repair Air bleed Replace Clean or replace Grind or replace Repair or replace Repair or replace Repair or replace Replace Replace Replace Replace Inspect Correct	— P- 6 P-27,32 P-27,32 P-27,32 P-12,28,33 P-18 P-17,24 P- 9 P- 7 P-26 P-28,33 P-22 — Section Q
Brakes pull to one side	Worn lining Brake fluid, grease, oil, or water on lining Hardening of lining surface or poor contact Abnormal wear or distortion of drum, or lining Looseness of backing plate mounting bolts Malfunction of wheel cylinder Malfunction of master cylinder Wheel and tire related problem Looseness of wheel bearing or improper adjustment of preload	Replace Clean or replace Grind or replace Repair or replace Tighten Repair or replace Repair or replace — Replace or adjust	P-27,32 P-27,32 P-27,32 P-28,33 P-28,33 P-28,33 P-12 Section Q Section M
Brakes do not release	No brake pedal play Improperly adjusted push rod clearance Clogged master cylinder return port Weak shoe return spring Wheel cylinder not returning properly Improperly adjusted pedal height Improperly adjusted wheel bearing preload	Adjust Adjust Clean Replace Clean or replace Adjust Adjust	P-10 P-12 — P-28,33 P-28,33 P-10 Section M
Pedal goes too far (too much pedal stroke)	Improperly adjusted pedal play Worn pad or lining Air in system	Adjust Replace Air bleed	P-10 P-27,32 P- 6
Excessive steering wheel play	Brake drag Steering related problem Wheel and tire related problem Suspension related problem	Repair — — —	— Section N Section Q Section R
Vacuum warning buzzer is operating (Australia payload 3,500 kg and 4,000 kg)	Malfunction of vacuum pump Damaged vacuum hose Malfunction of check valve (vacuum hose) Faulty vacuum switch	Inspect Repair or replace Repair or replace Inspect	P-22 P- 9 P-17,24 Section T
Abnormal noise or vibration during braking	Worn lining Deteriorated lining Brakes do not release Foreign material or scratches on drum contact surface Looseness of backing plate mounting bolts Damaged drum contact surface Poor contact of lining Insufficient grease on sliding parts Looseness of wheel bearing or improper adjustment of preload	Replace Grind or replace Repair Clean Tighten Replace Repair or replace Apply grease Replace or adjust	P-27,32 P-27,32 — — P-28,33 P-28,33 P-27,32 — Section M

9TFOPX-005

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.

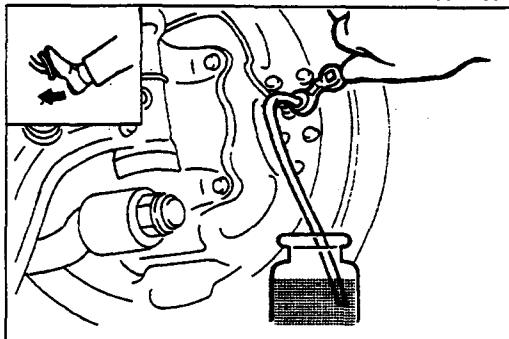
2. After removing the bleeder cap, connect one end of a transparent vinyl tube to the bleeder screw and place the other end in a receptacle.
3. One person should depress the brake pedal a few times, and then hold it in the depressed position.
4. A second person should loosen the bleeder screw, drain out the fluid, and retighten the screw.

Tightening torque:

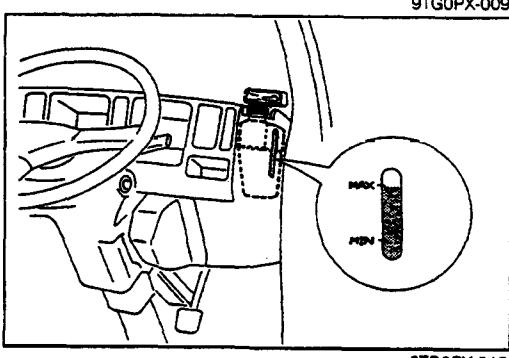
5.9—8.8 N·m (0.6—0.9 m·kg, 4.3—6.5 ft-lb)

Note

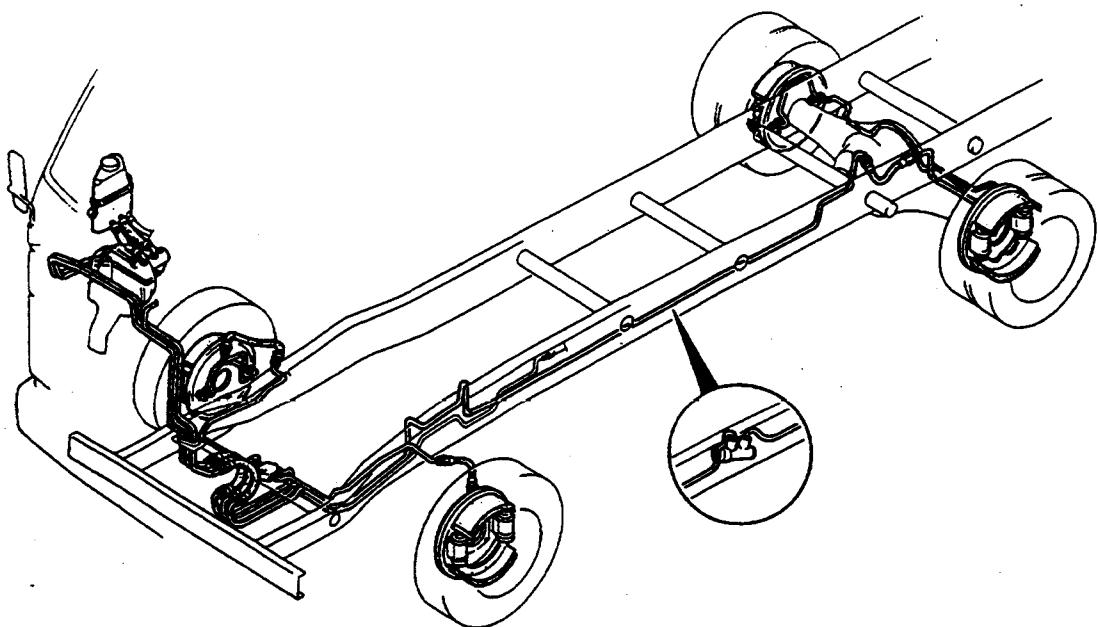
- The two people should stay in voice contact with each other.



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.



9TG0PX-010

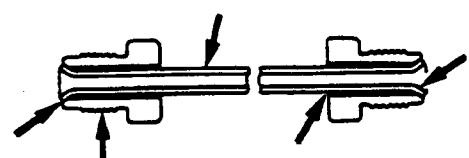
BRAKE SYSTEM**BRAKE HYDRAULIC LINE**

9TG0PX-011

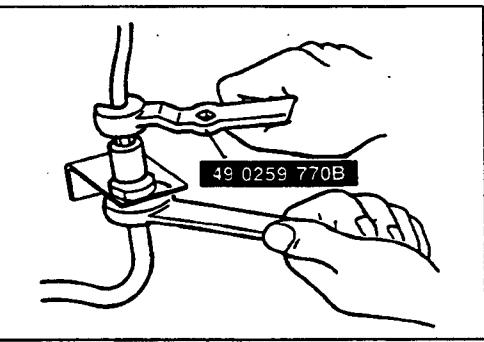
On-vehicle Inspection

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



9TG0PX-012

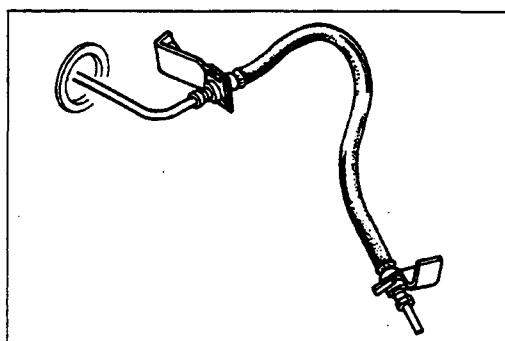


9TG0PX-013

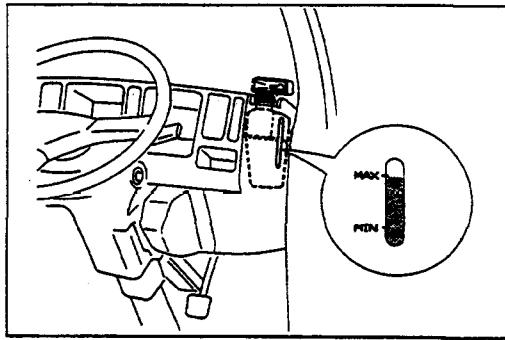
Removal / Installation**Removal / Installation note**

1. Remove or install the brake pipe with the **SST**.
2. Tighten the flare nut to the specified torque.

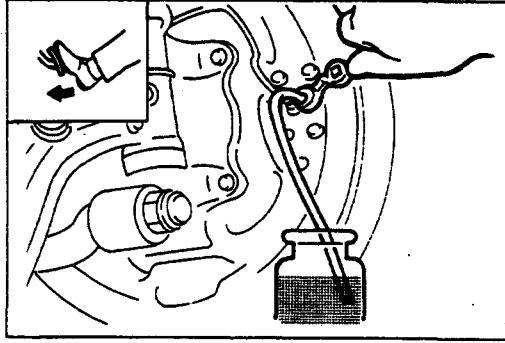
Flare nut tightening torque:**13—22 N·m (1.3—2.2 m·kg, 9.4—16 ft-lb)**



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.

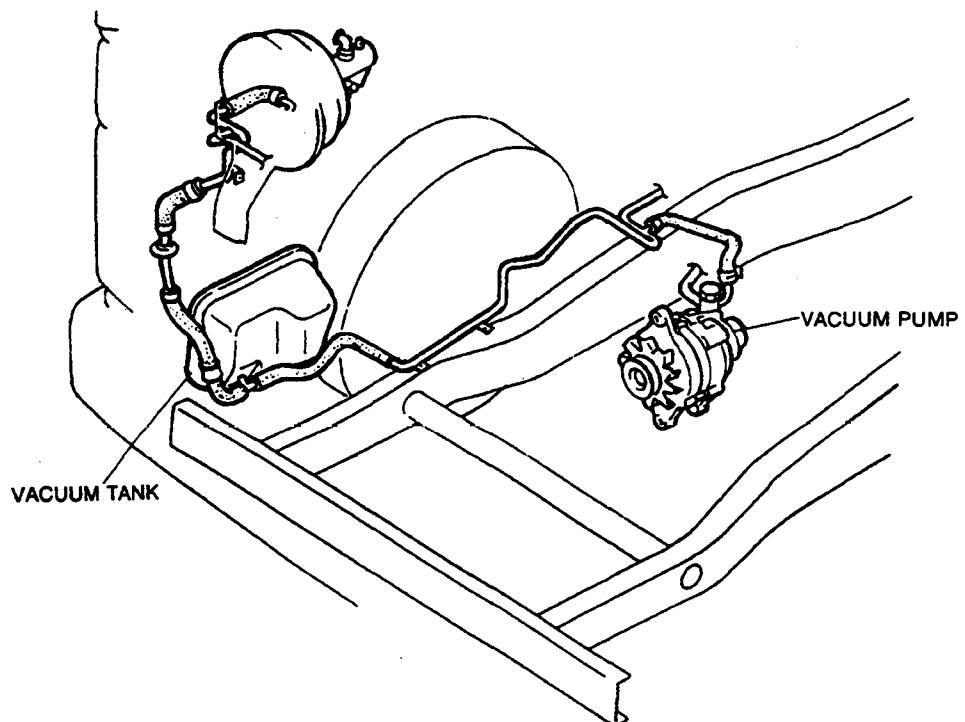
BRAKE FLUID**On-vehicle Inspection**

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.

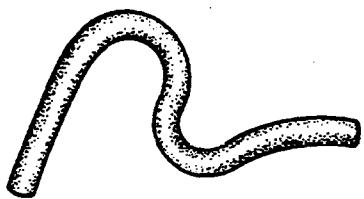
Replacement

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

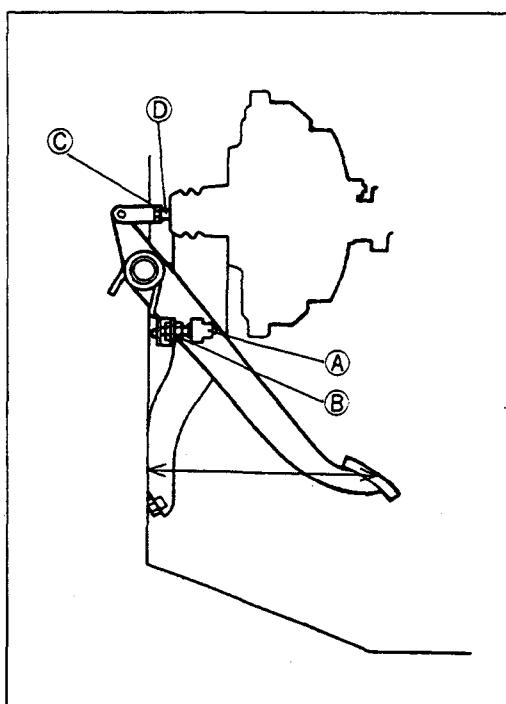
Check for the following and replace parts as necessary.

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

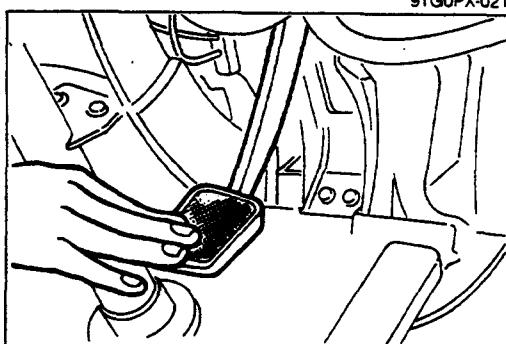
BRAKE PEDAL On-vehicle Inspection Pedal height Inspection

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



9TG0PX-021

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).

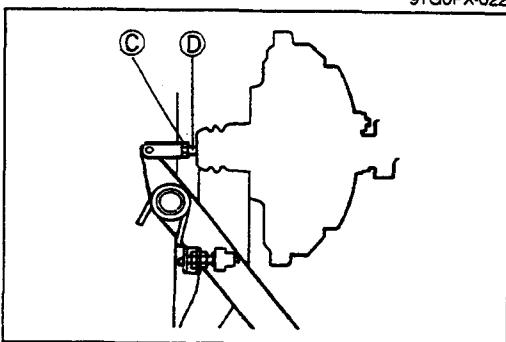
Pedal play: 9—11mm (0.35—0.43 in)

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



9TG0PX-022

Pedal-to-floor clearance Inspection

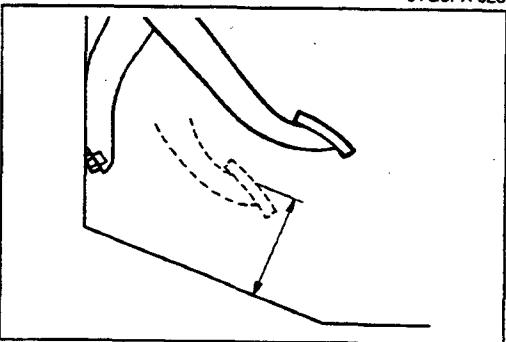
1. Start the engine and depress the pedal with a force of 5.9 N (60 kg, 52 lb).

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:

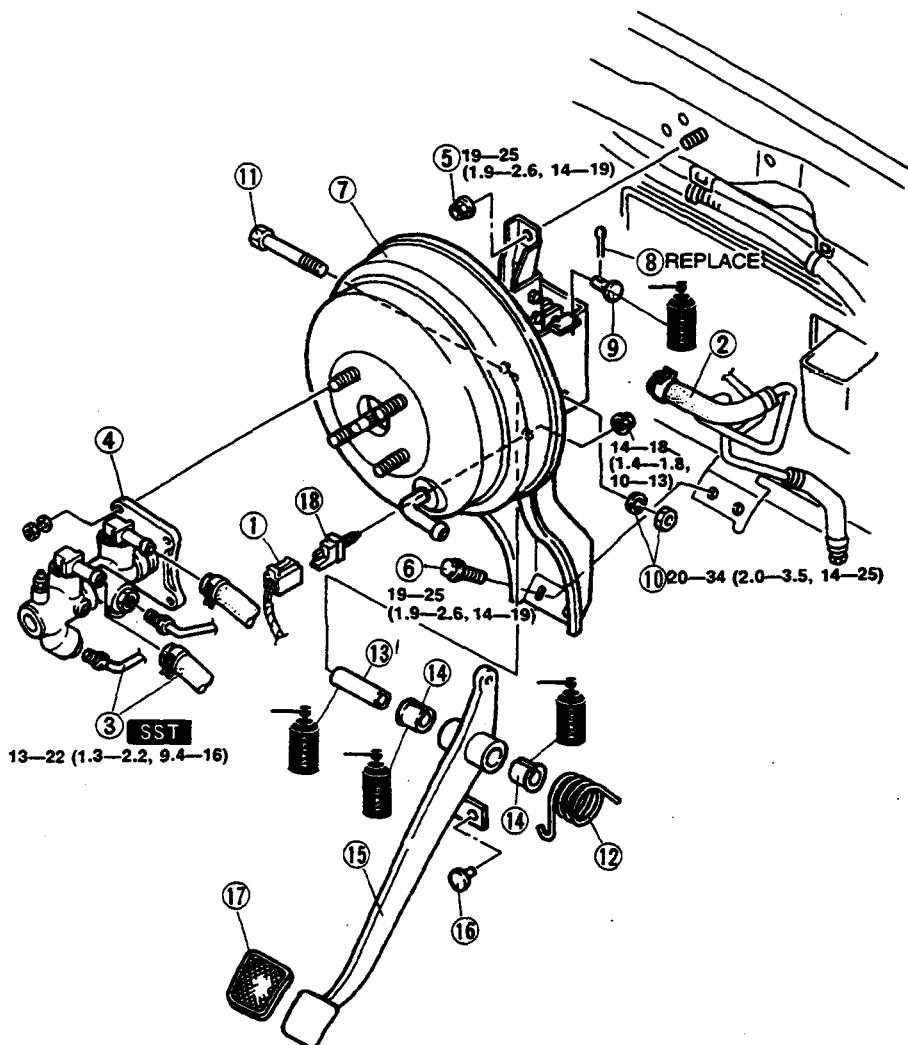
- Air in brake system
- Too much shoe clearance



9TG0PX-024

BRAKE SYSTEM**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.)



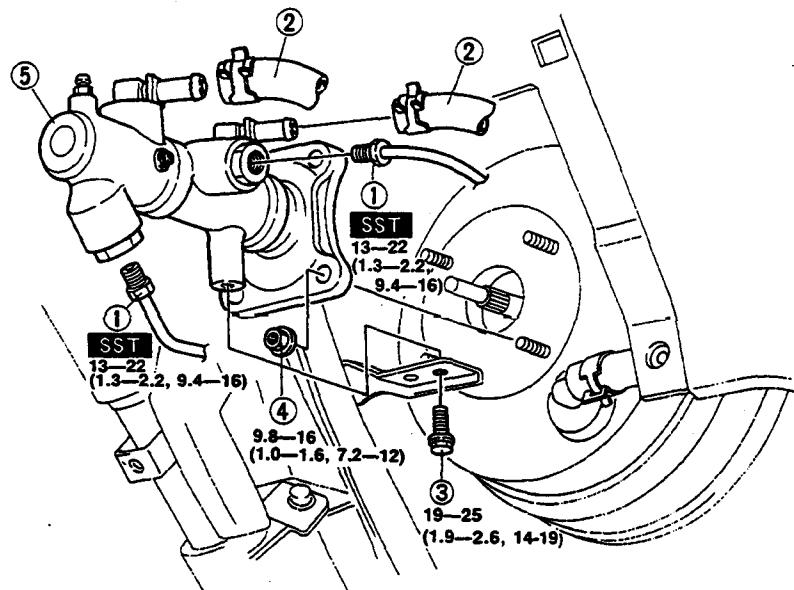
N·m (m-kg, ft-lb)

9TG0PX-025

- | | |
|--|---|
| 1. Coupler (Stoplight switch) | 12. Return spring
Inspect for weakness or damage |
| 2. Vacuum hose | 13. Spacer |
| 3. Brake pipe and hose | 14. Bushing
Inspect for weakness or damage |
| 4. Master cylinder
Removal / Installation page P-12 | 15. Brake pedal
Inspect for bending or damage |
| 5. Nut | 16. Stop rubber
Inspect for wear |
| 6. Bolt | 17. Pedal pad
Inspect for wear |
| 7. Power brake unit and pedal assembly | 18. Stoplight switch |
| 8. Snap pin | |
| 9. Clevis pin | |
| 10. Nut and washer | |
| 11. Bolt | |

MASTER CYLINDER**Removal / Installation**

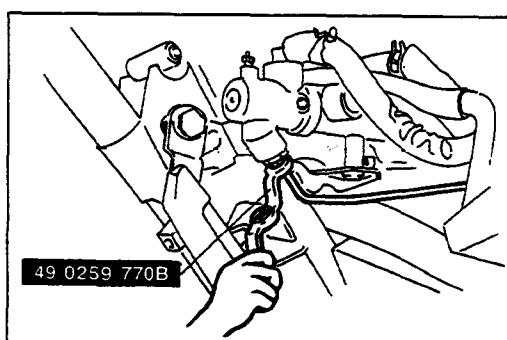
1. Remove the lower panel.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.
4. After installation, add brake fluid, bleed air, and check for fluid leakage. (Refer to page P-6.)



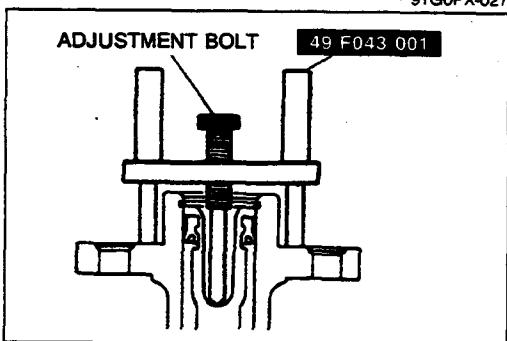
N·m (m·kg, ft·lb)

9TG0PX-026

- | | | | |
|------------------------------------|-------|---|-----------|
| 1. Brake pipe
Removal note..... | below | 5. Master cylinder
Installation note | below |
| 2. Brake hose | | Disassembly / Inspection / | |
| 3. Bolt | | Assembly | page P-14 |
| 4. Nut | | | |



9TG0PX-027



9TG0PX-028

Removal note**Brake pipe**

1. Disconnect the brake pipe from the master cylinder with the **SST**.

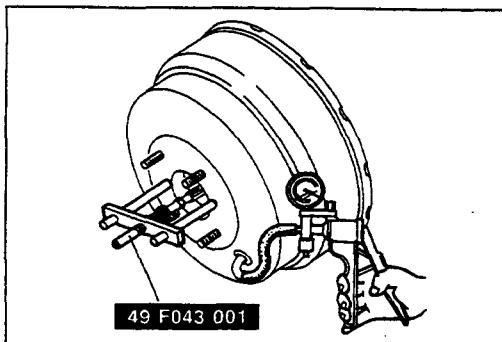
Caution

- **Brake fluid will damage painted surfaces.**
If it does get on a painted surface, wipe it off immediately.

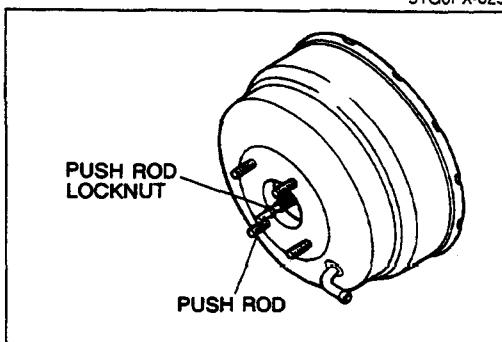
Installation note**Master cylinder****Push rod clearance****Inspection**

1. Place the **SST** atop the master cylinder. Turn the adjustment bolt until it bottoms in the piston.

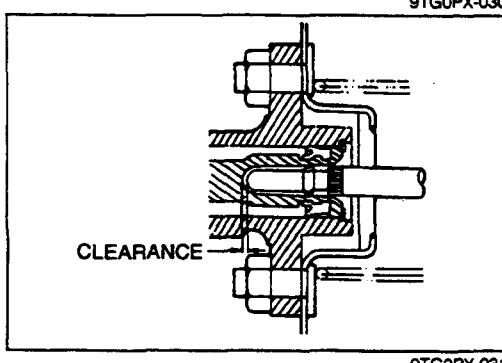
BRAKE SYSTEM



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.

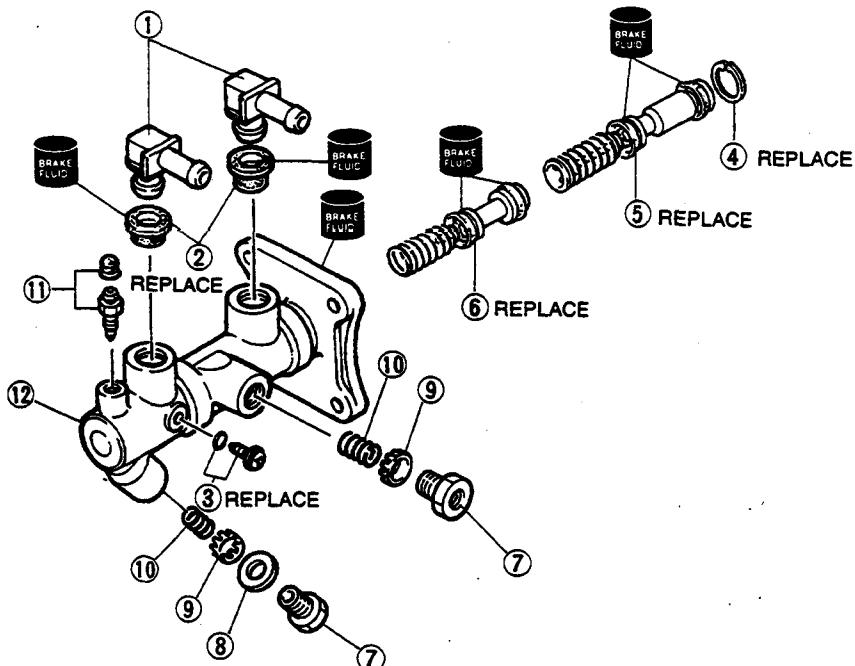
	Push rod-to-piston clearance
When no vacuum applied to unit	0.4—0.6mm (0.016—0.024 in)
When vacuum applied to unit is approx. 500 mmHg (19.7 inHg)	0.1—0.3mm (0.004—0.012 in)

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.

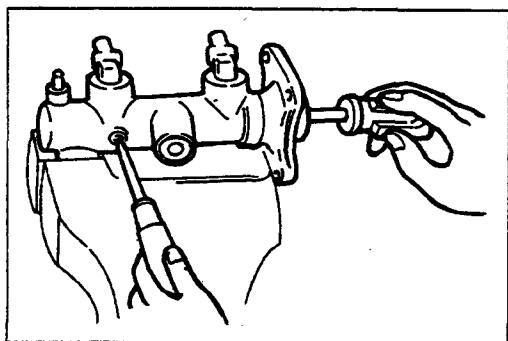
Caution

- Do not let foreign material enter the cylinder.
- Do not scratch the inside of the cylinder or piston cups.



9TG0PX-032

- | | |
|--|--|
| 1. Hose connector | 7. Joint bolt |
| 2. Bushing
Inspect for wear or damage | 8. O-ring |
| 3. Stopper screw and O-ring
Disassembly note..... below | 9. Oil seal |
| Assembly note..... page P-15 | 10. Spring
Inspect for wear |
| 4. Snap ring | 11. Bleeder cap and screw |
| 5. Primary piston assembly
Inspect piston cups for damage | 12. Cylinder body
Inspect for crack or damage |
| 6. Secondary piston assembly
Inspect piston cups for damage | |
| Disassembly note page P-15 | |

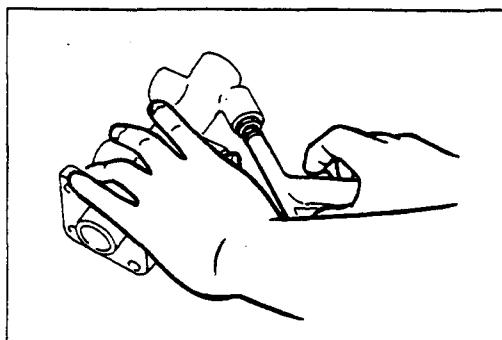


9TG0PX-033

**Disassembly note
Stopper screw**

1. Push the primary piston assembly in fully, then remove the stopper screw.

BRAKE SYSTEM



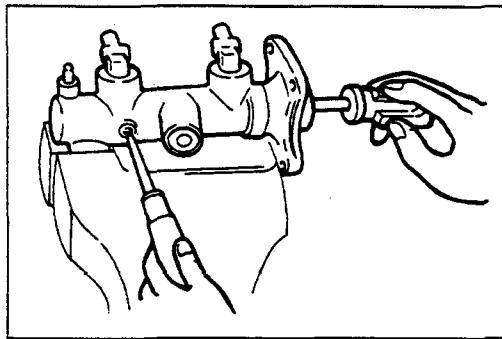
9TG0PX-034

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.



9TG0PX-035

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.

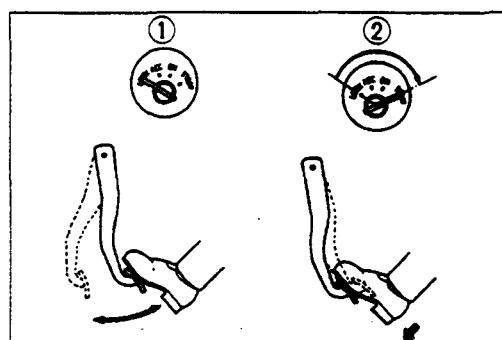
POWER BRAKE UNIT

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

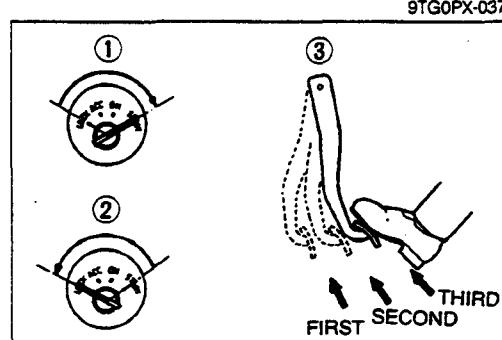


9TG0PX-037

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.



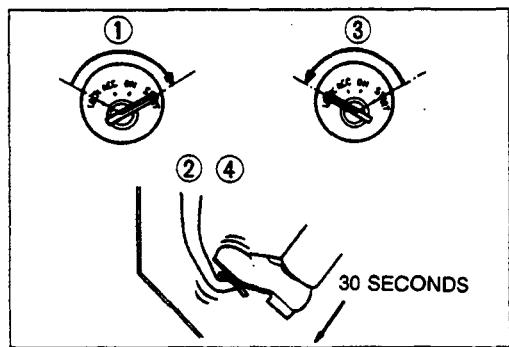
9TG0PX-038

Step 2

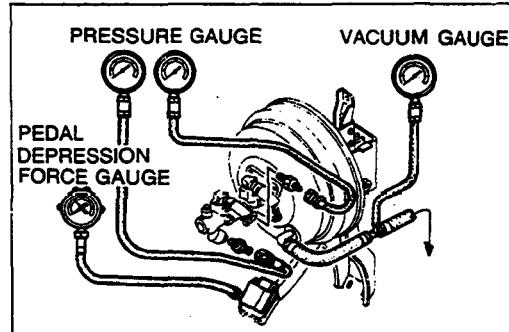
1. Start the engine.
2. Stop the engine after it has run for 1 or 2 minutes.
3. Depress the pedal with the usual force.
4. If the first pedal stroke is long and becomes shorter with subsequent strokes, the unit is operating.

Note

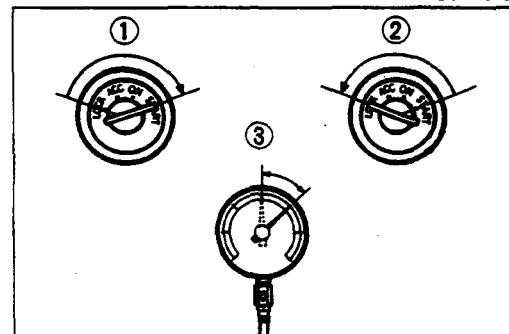
- If a problem is found, inspect for damage of the check valve or vacuum hose, and examine the installation. Repair if necessary, and inspect it once again.



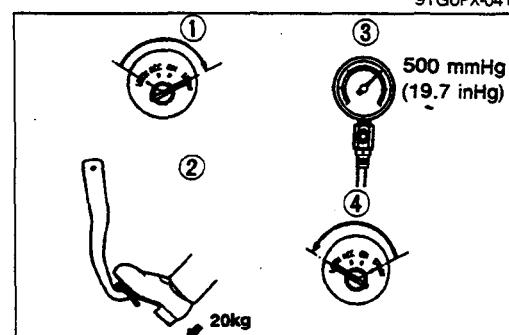
9TG0PX-039



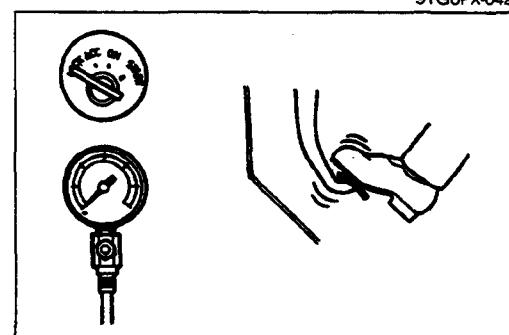
9TG0PX-040



9TG0PX-041



9TG0PX-042



9TG0PX-043

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.

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.

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.

Loaded condition

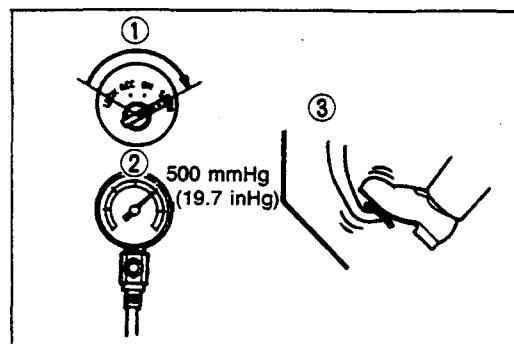
1. Start the engine.
2. Depress the brake pedal with a force of **196 N (20 kg, 44 lb)**.
3. With the brake pedal depressed, stop the engine when the vacuum gauge reading reaches **500 mmHg (19.7 inHg)**.
4. Observe the vacuum gauge for **15 seconds**. If the gauge shows **475—500 mmHg (18.7—19.7 inHg)**, the unit is operating.

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)

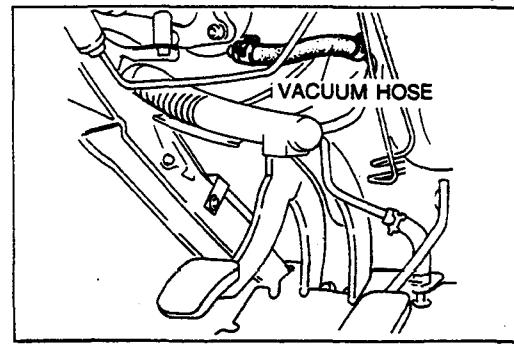
BRAKE SYSTEM



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.

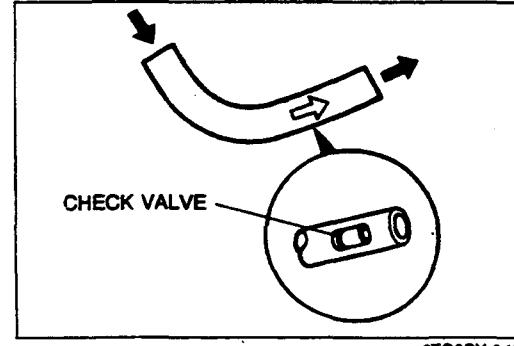
Pedal force	Fluid pressure	Diameter of unit
196 N (20 kg, 44 lb)	6,180 kPa (63.0 kg/cm ² , 896 psi)	188 + 215mm (7.4 + 8.5 in)
196 N (20 kg, 44 lb)	6,278 kPa (64.0 kg/cm ² , 910 psi)	213 + 240mm (8.4 + 9.4 in)



9TG0PX-045

Inspection of check valve

1. Disconnect the vacuum hose from the power brake unit.



9TG0PX-046

2. Apply suction and pressure to the hose from the power brake unit side.

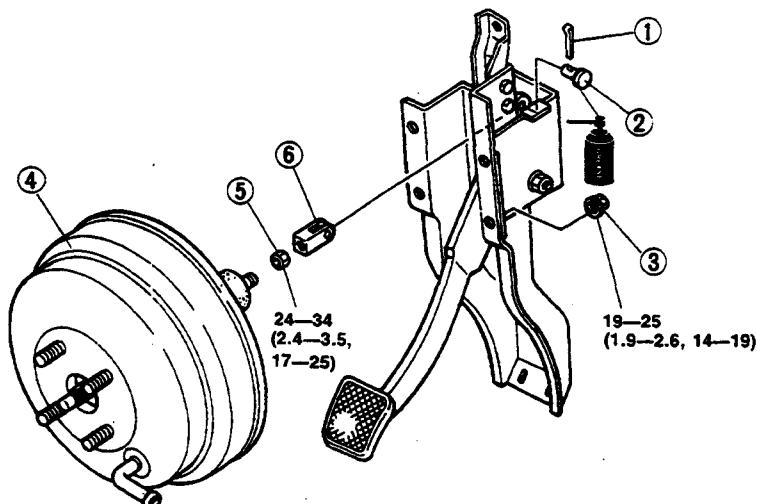
Check that air flows only toward the vacuum pump.

Note

- If the air passes in both directions or not at all, replace the check valve along with the hose.

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 | 4. Power break unit
Disassembly / Inspection /
Assembly page P-19 | 5. Nut |
| 2. Clevis pin | | 6. Operating lever |
| 3. Nut | | |

Disassembly / Inspection / Assembly

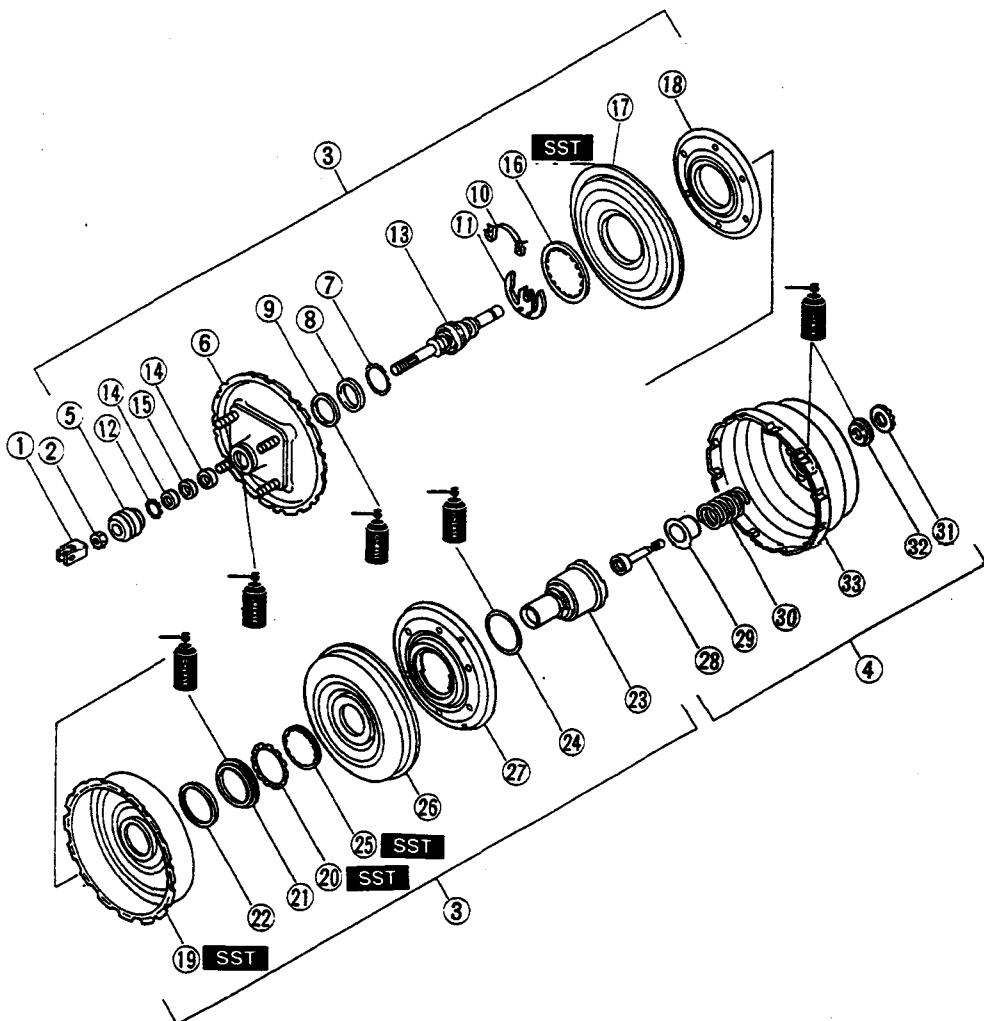
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.

Caution

- Remove all the retainers with a screwdriver. When removing them, do not damage the valve body or diaphragm.

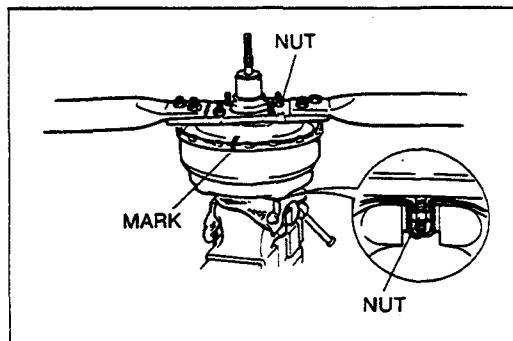
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of removal, referring to **Assembly Note**.

9TG0PX-048



9TGOPX-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

**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.

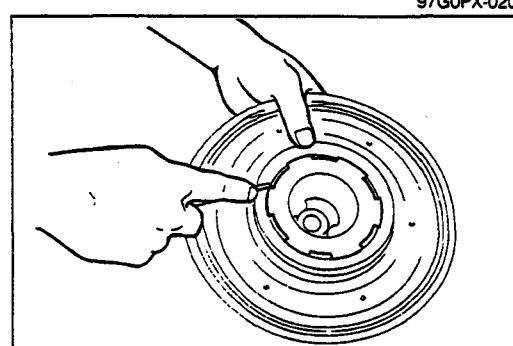
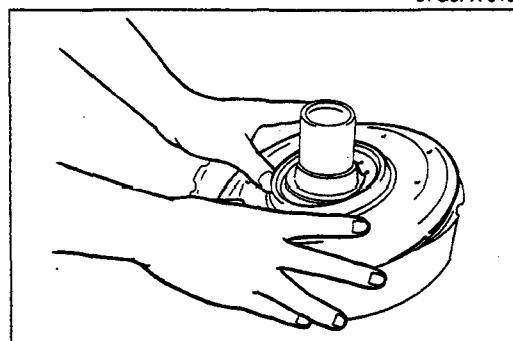
Caution

- The rear shell is spring loaded; loosen it carefully.

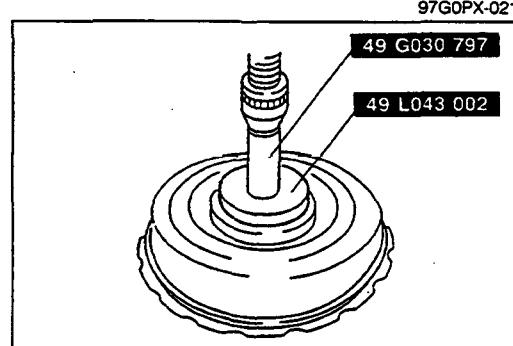
4. Rotate the rear shell counterclockwise to unlock.

Rear diaphragm plate

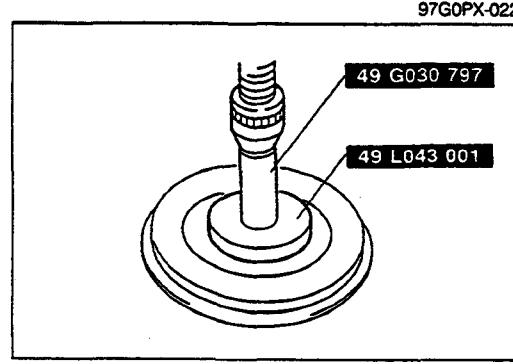
Remove the diaphragm plate while holding it at an angle.

**Valve body**

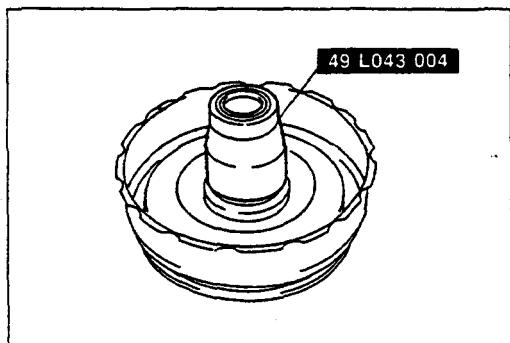
1. Pry up the diaphragm plate.
2. Remove the valve body.

**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.

**Retainer (front diaphragm)**

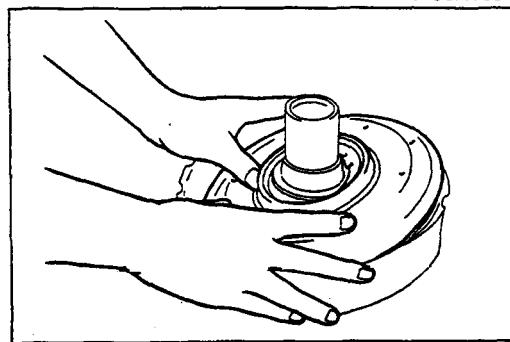
Press in the retainer with the SST.

BRAKE SYSTEM

97GOPX-024

Center plate

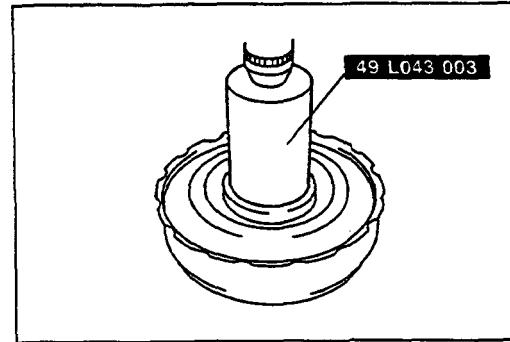
1. Apply grease to the outer surface of the **SST**.
2. Install the **SST** to the valve body to protect the seal from damage.
3. Install the center plate.



97GOPX-025

Rear diaphragm plate

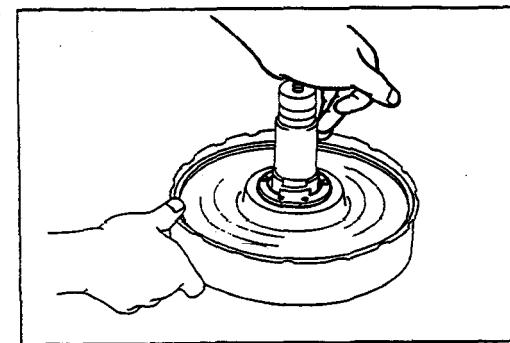
Install the diaphragm plate while holding it at an angle.



97GOPX-026

Retainer (rear diaphragm)

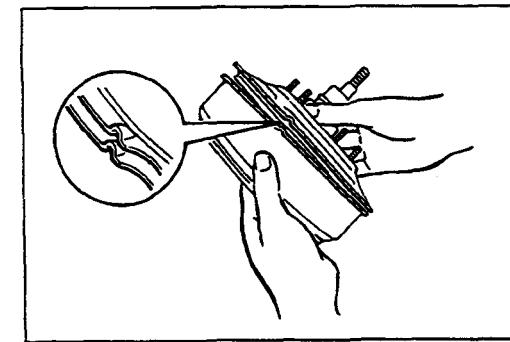
Press in the retainer with the **SST**.



97GOPX-027

Stop key

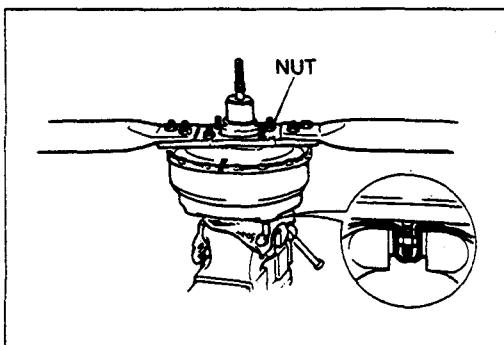
Install the stop key while pushing the valve rod.



97GOPX-028

Rear shell assembly and center plate

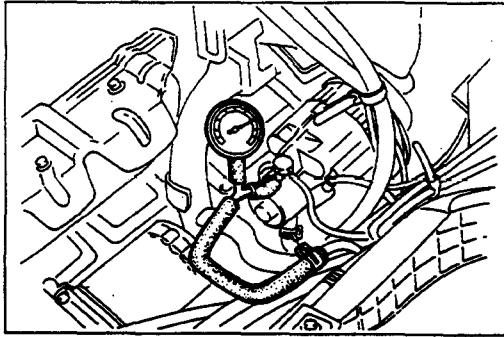
Align the notches of the rear shell and the center plate.



97G0PX-029

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.



9TG0PX-050

VACUUM PUMP**On-vehicle Inspection****Function check**

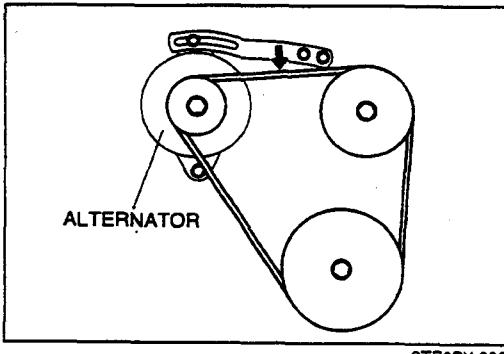
1. Warm up the engine.
2. Disconnect the vacuum hose from the vacuum pump and connect a vacuum gauge as shown in the figure, then check the vacuum.

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.)

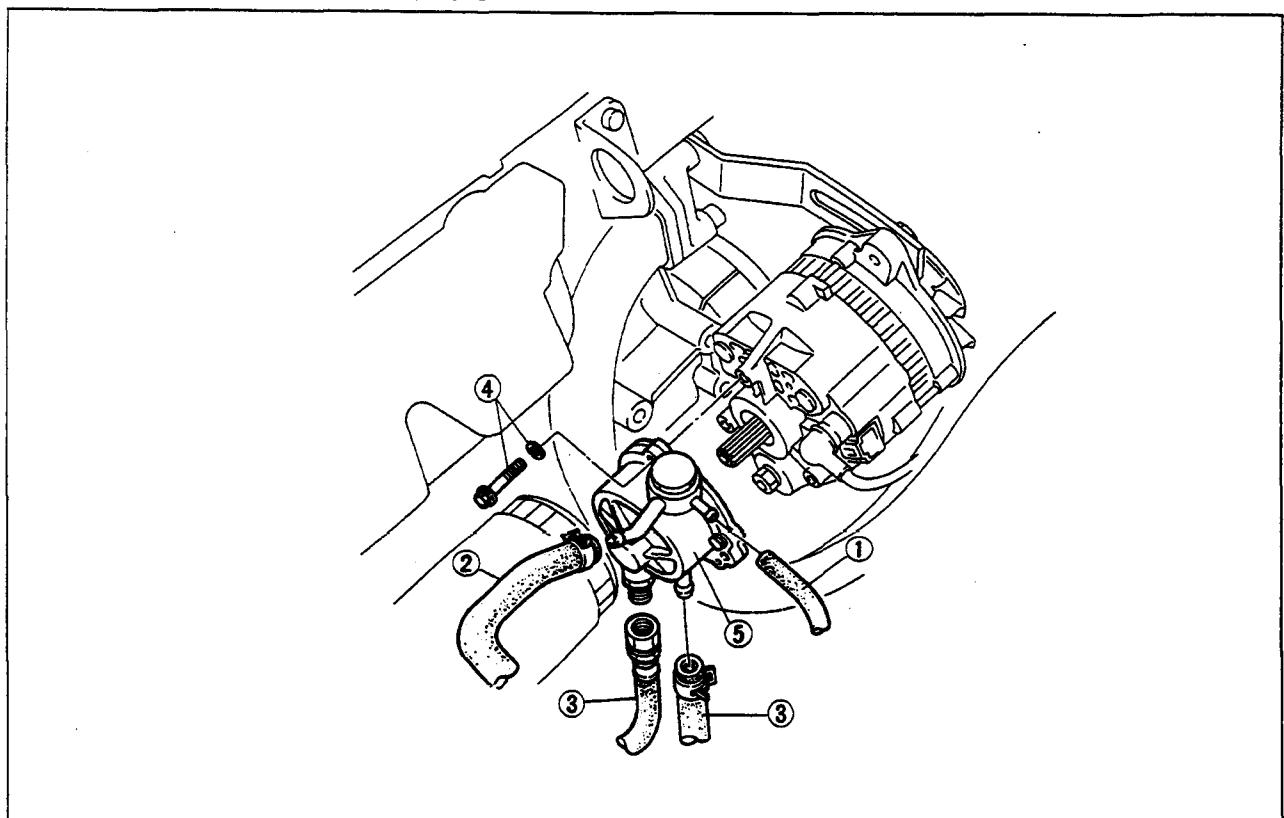
(2) Shortage of the lubrication oil pressure
(Refer to Section B.)



9TF0PX-006

Removal / Installation

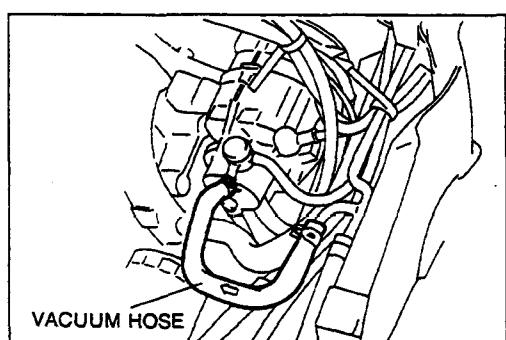
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



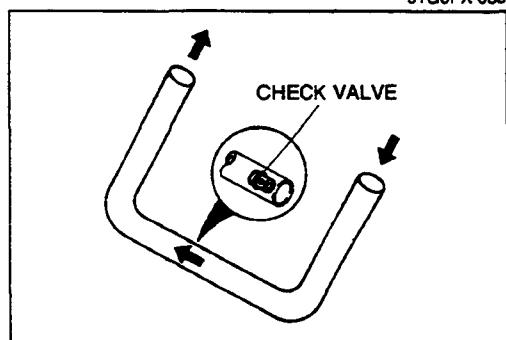
9TG0PX-052

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.

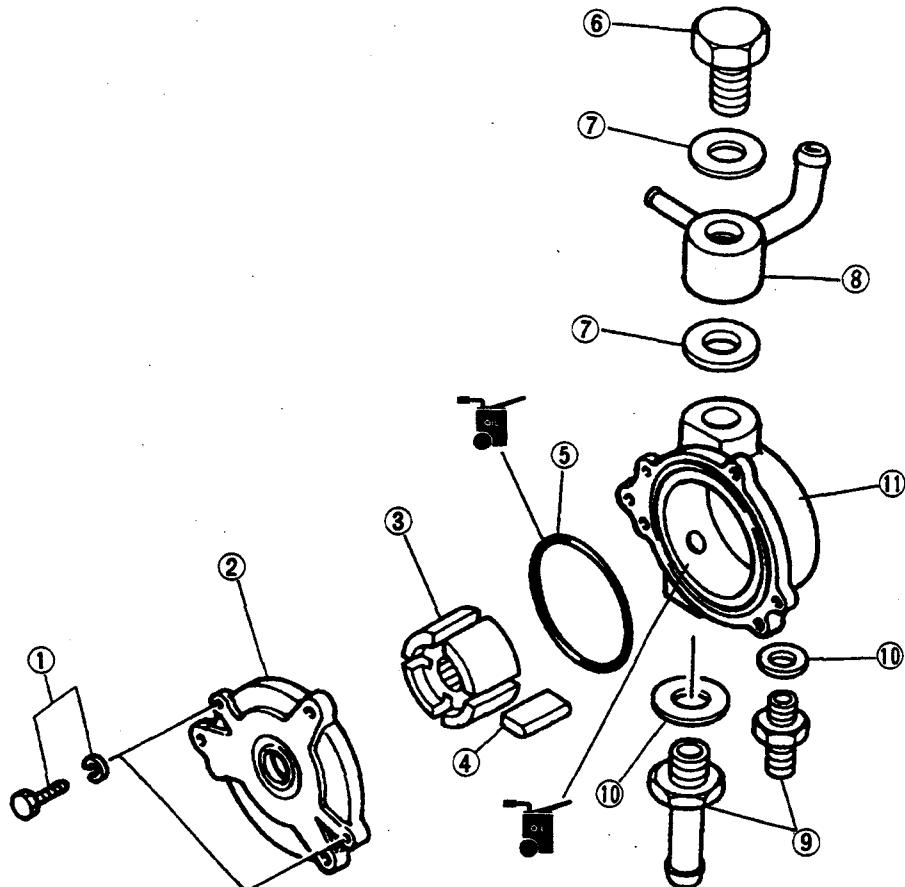
2. Apply suction and pressure to the hose from the vacuum tank side.
Check that air flows only toward the vacuum pump.

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.....

5. O-ring

6. Set bolt

7. Washer

8. Connector

9. Joint

10. O-ring

11. Pump housing

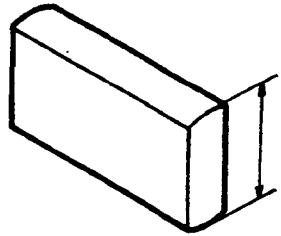
Inspection

Check the following and replace if necessary.

1. Worn or damaged rotor
2. Worn or damaged vane

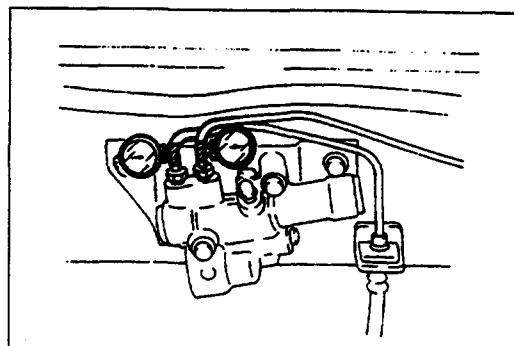
Limit: Vane height 7.6mm (0.299 in)
 Vane width 4.9mm (0.193 in)

3. Worn or damaged housing

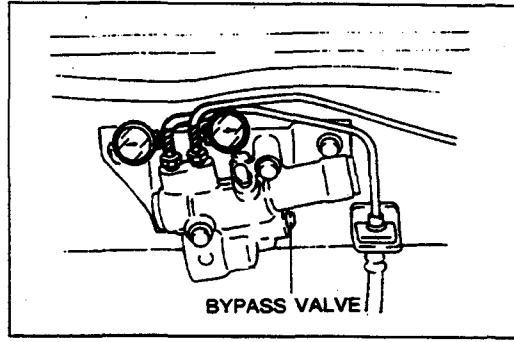


9TG0PX-056

BRAKE SYSTEM

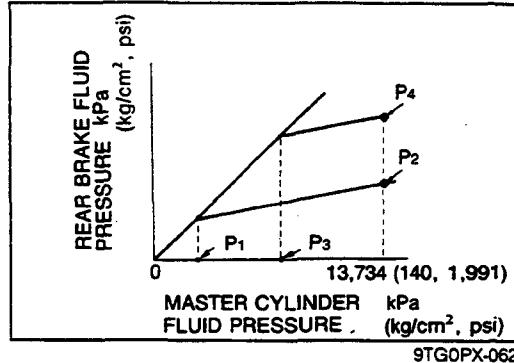


9TGOPX-058



BYPASS VALVE

9TGOPX-061



9TGOPX-062

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

9TFOPX-007

Type 1: 10 feet cargo deck (rear single tire)

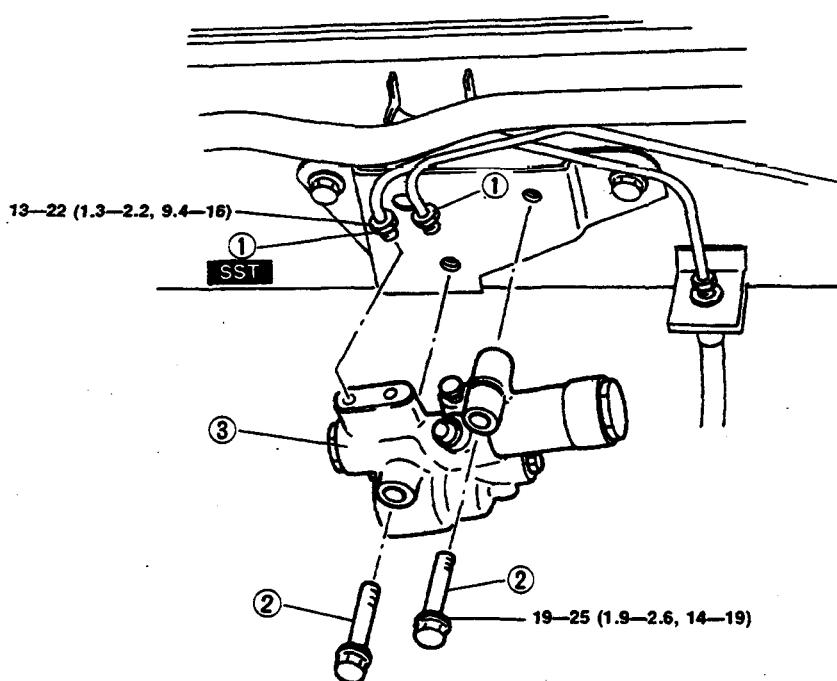
Type 2: 10 feet cargo deck (rear double tire)

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.)



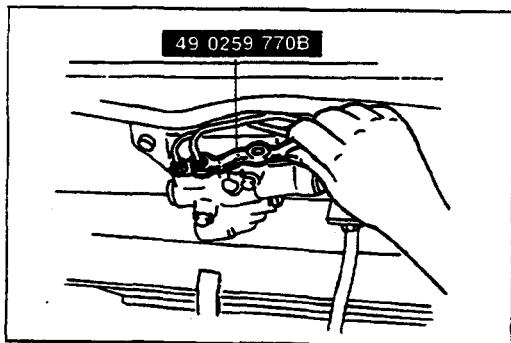
N·m (m·kg, ft·lb)

9TG0PX-064

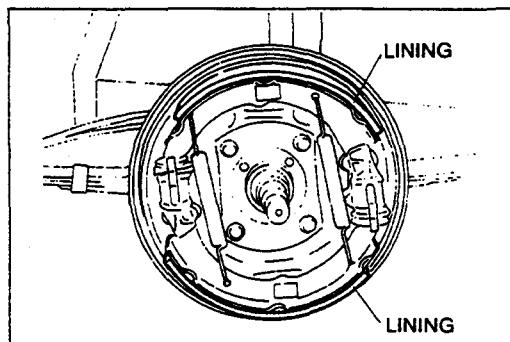
1. Brake pipe
Removal note.....
2. Bolt
below
3. Load-sensing G-valve (LSGV)

Removal note
Brake pipe

1. Remove the break pipe with the **SST**.



9TG0PX-065

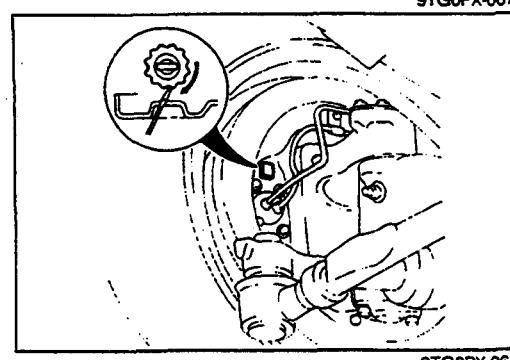
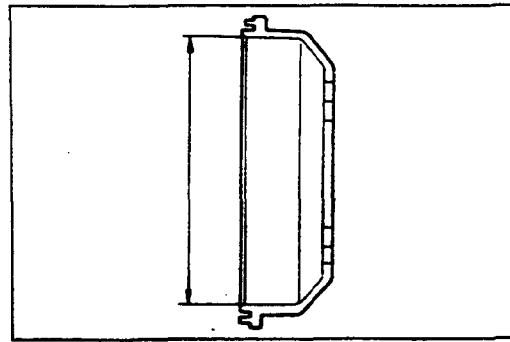
**FRONT BRAKE (DRUM)****On-vehicle Inspection****Lining thickness and drum inner diameter**

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.

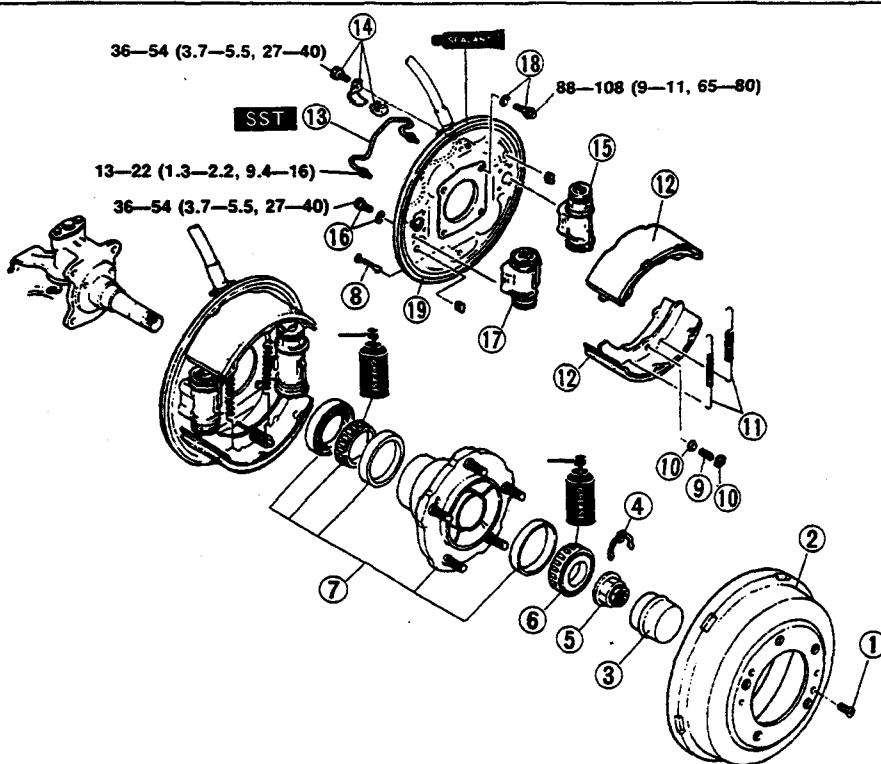
9TF0PX-009

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.

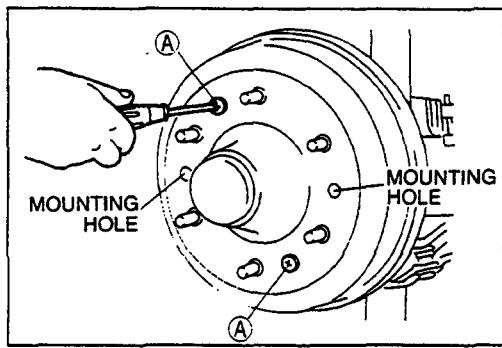


N·m (m·kg, ft·lb)

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

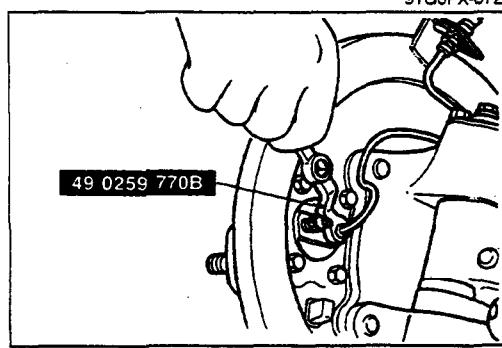
BRAKE SYSTEM



Removal note

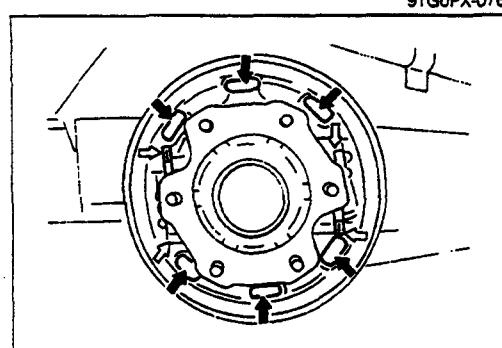
Brake drum

1. Remove the brake drum with the set screw tightened into the hole (A), if the drum is hard to remove.



Brake pipe

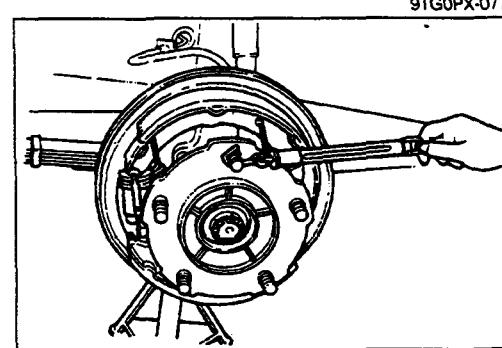
1. Remove the brake pipe with the SST.



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.



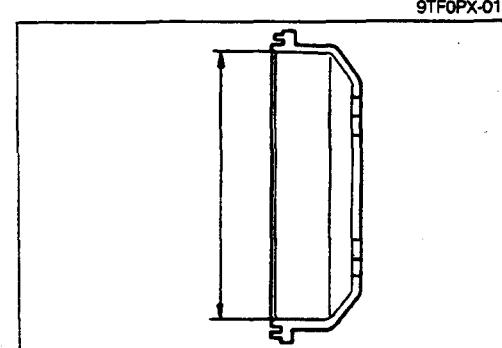
Locknut

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.



Inspection

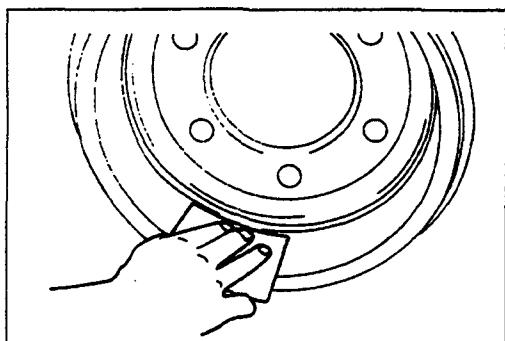
Brake drum

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.



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.

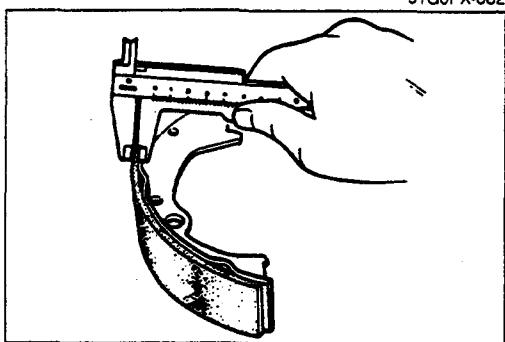
Caution

- 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.

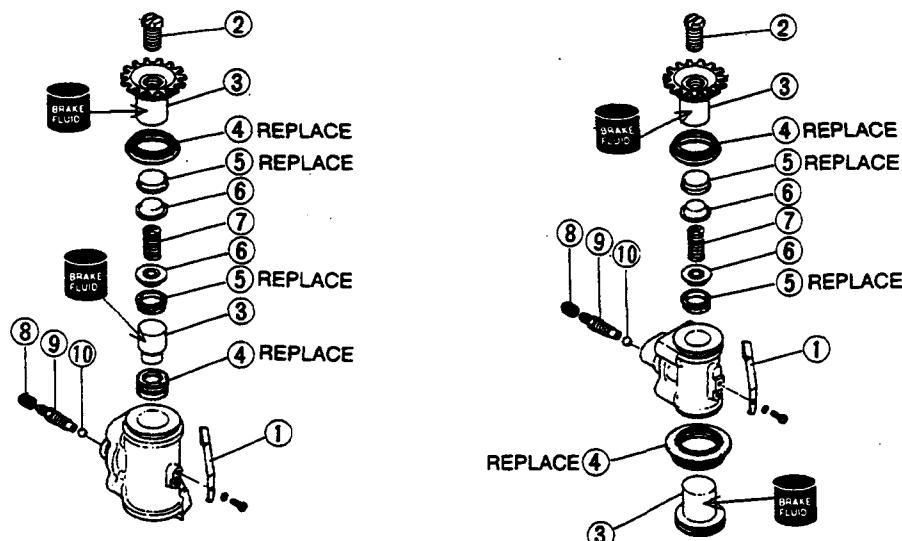


WHEEL CYLINDER**Disassembly / Inspection / Assembly**

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.

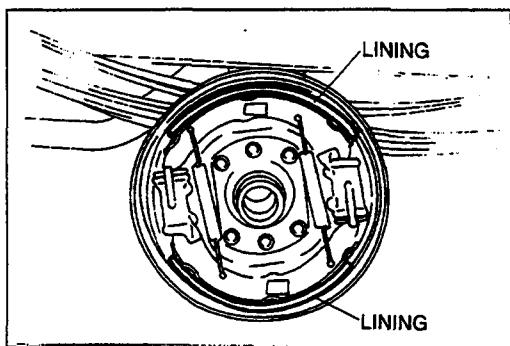


1. Spring
Inspect for deformation or weakness
2. Adjusting screw
3. Pistons
Inspect for damage
4. Dust boots
5. Piston rubber cups

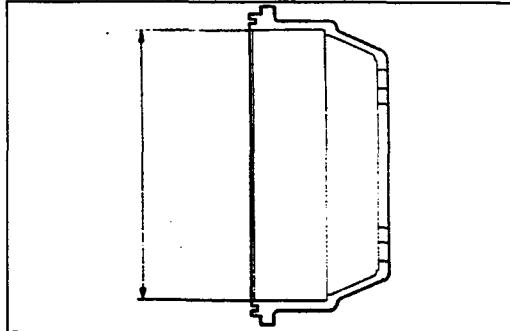
6. Bleeder cap
7. Spring
Inspect for deformation or weakness
8. Bleeder cap
9. Bleeder screw
10. Steel ball

9TG0PX-084

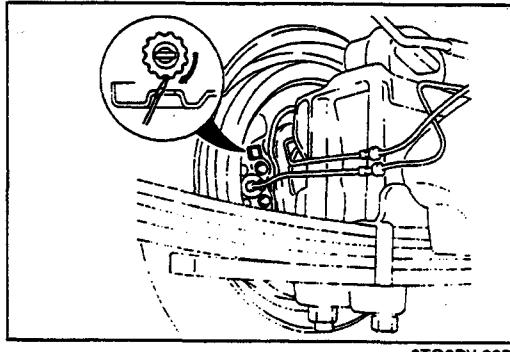
BRAKE SYSTEM



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.

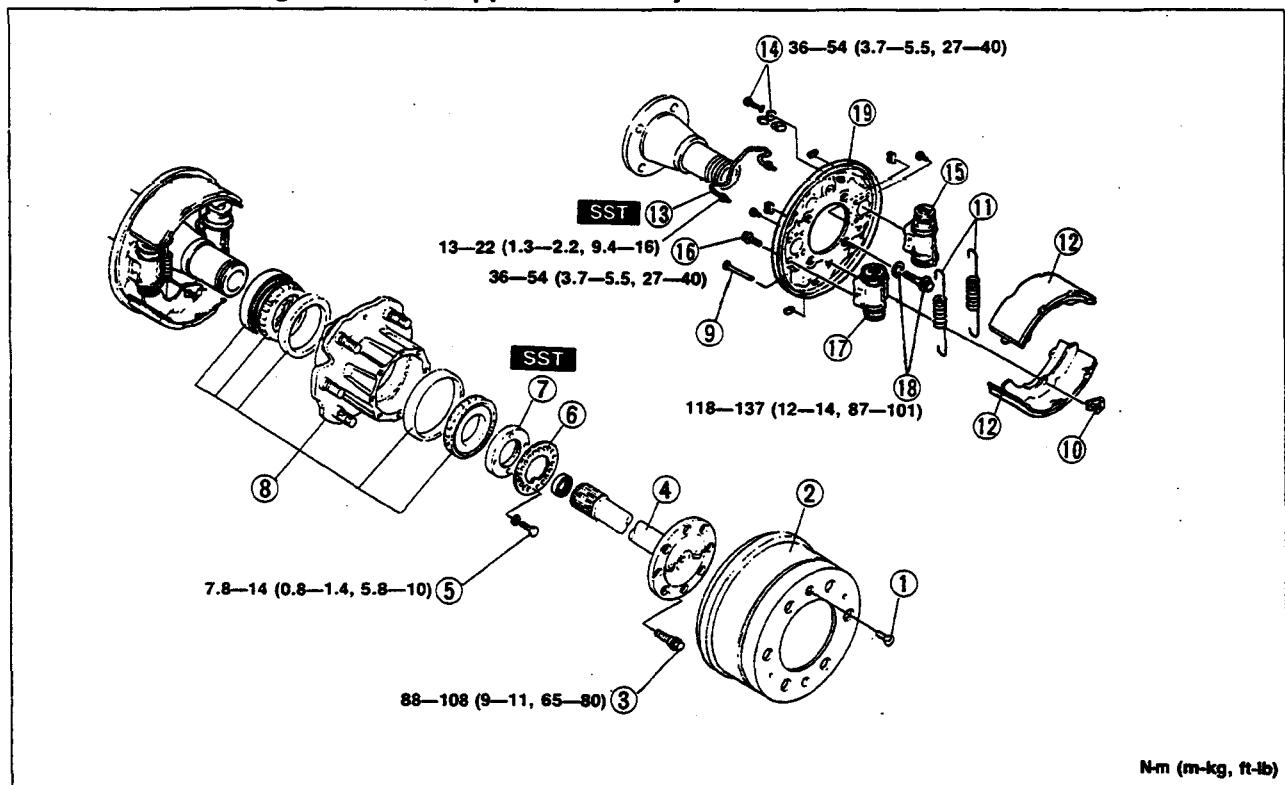
9TF0PX-013

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

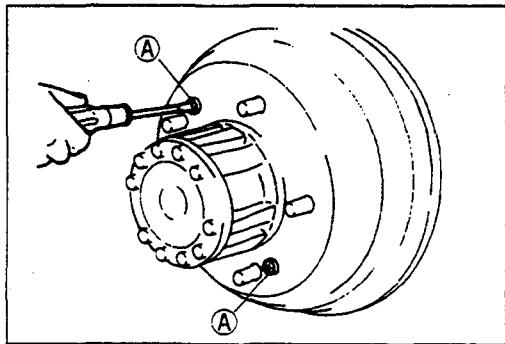
- Use a specially designed vacuum cleaner or equivalent to clean the brake assembly.
- When removing the drum, support it with a jack.



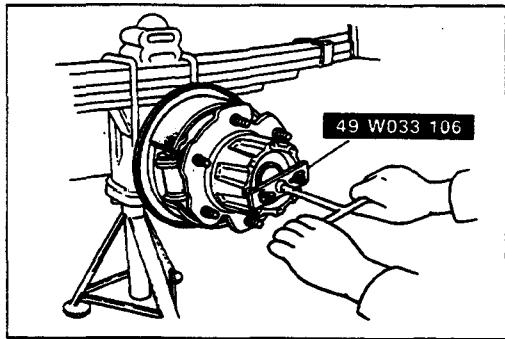
N·m (m·kg, ft·lb)

9TF0PX-014

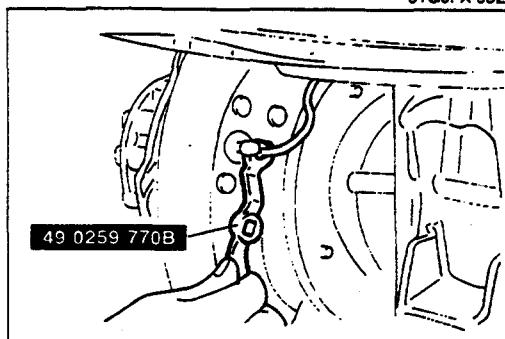
1. Set screw	12. Brake shoe
2. Brake drum	Installation note page P-34
Removal note page P-34	Inspection page P-35
Inspection page P-35	
3. Bolt	13. Brake pipe
4. Rear axle shaft	Removal note page P-34
5. Bolt	14. Bolt, pipe clip
6. Set plate	15. Wheel cylinder
7. Locknut	Disassembly / Inspection /
Removal note page P-34	Assembly page P-36
Installation note page P-34	
8. Rear hub	16. Bolt and washer
9. Hold pin	17. Wheel cylinder
10. Set spring	Disassembly / Inspection /
Inspect for deformation or weakness	Assembly page P-36
11. Return spring	18. Bolt and washer
Inspect for deformation or weakness	19. Backing plate
	Inspect for deformation or damage

**Removal note****Brake drum**

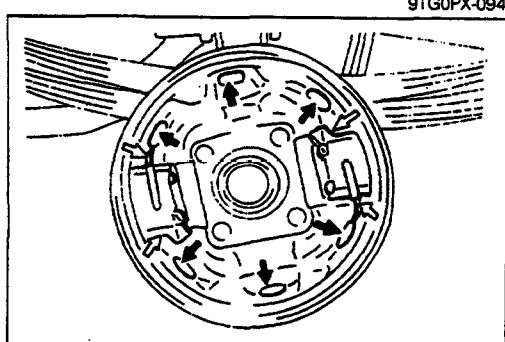
1. Remove the brake drum with the set screw tightened into the hole **A**, if the drum is hard to remove.

**Locknut**

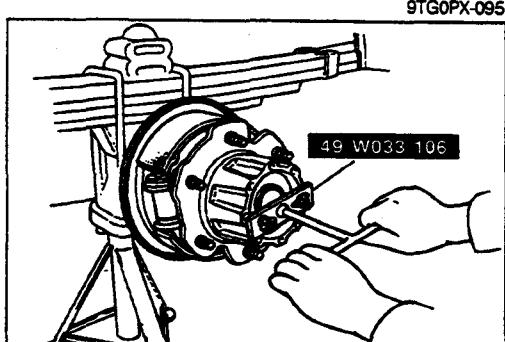
1. Remove the locknut with the **SST**.

**Brake pipe**

1. Remove the brake pipe with the **SST**.

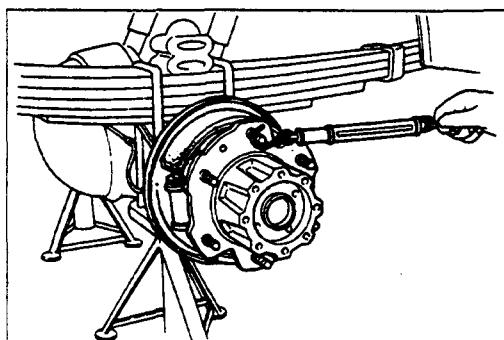
**Installation note****Brake shoe**

1. Before installation, apply grease to the wheel cylinder and anchor sliding parts (↔), the projections of the backing plate (↔).

**Locknut**

1. Tighten the locknut with the **SST**.

BRAKE SYSTEM

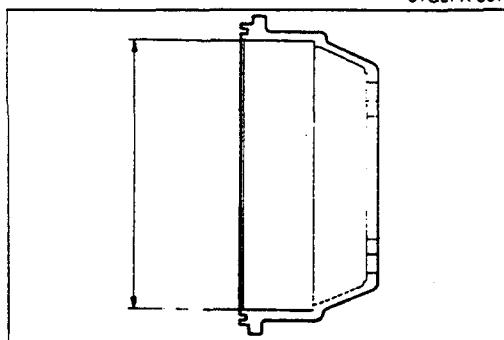


9TG0PX-097

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.



9TG0PX-098

Inspection

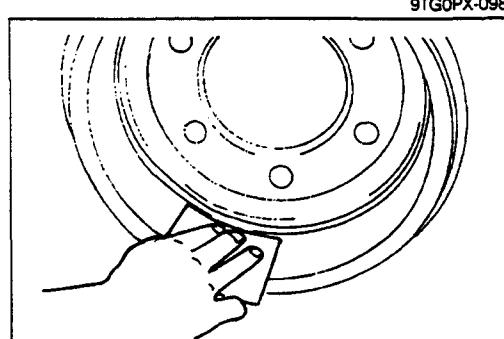
Brake drum

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-099

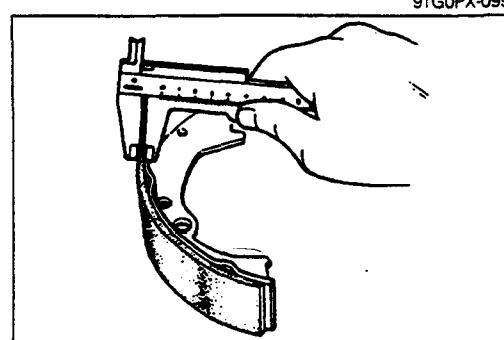
2. Check the contact of drum and lining. Apply chalk to the inside of the drum and rub the shoe against the drum.

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.

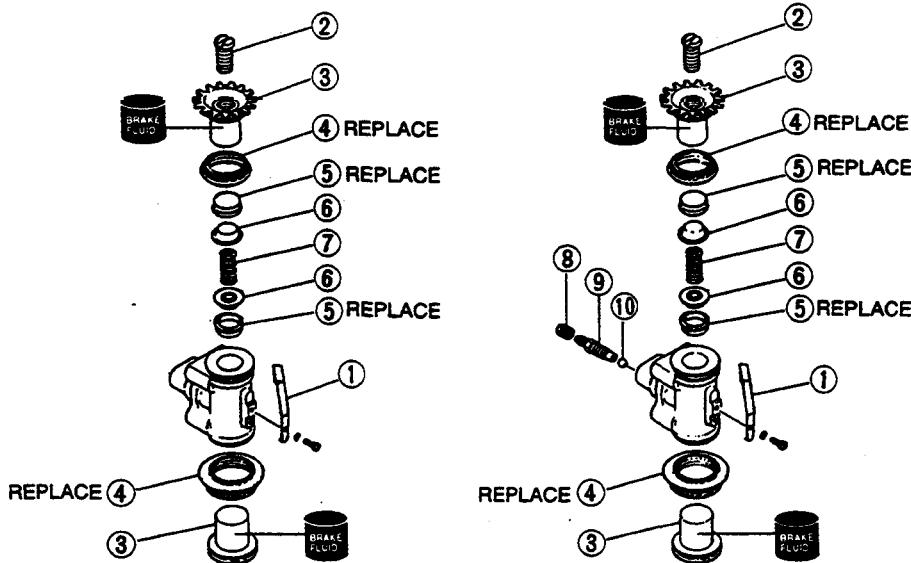
Lining thickness: 1.0mm (0.04 in) min.

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 | 6. Feeling block |
| 2. Adjusting screw | 7. Spring
Inspect for deformation or weakness |
| 3. Pistons
Inspect for damage | 8. Bleeder cap |
| 4. Dust boots | 9. Bleeder screw |
| 5. Piston rubber cups | 10. Steel ball |

PARKING BRAKE SYSTEM

PARKING BRAKE SYSTEM

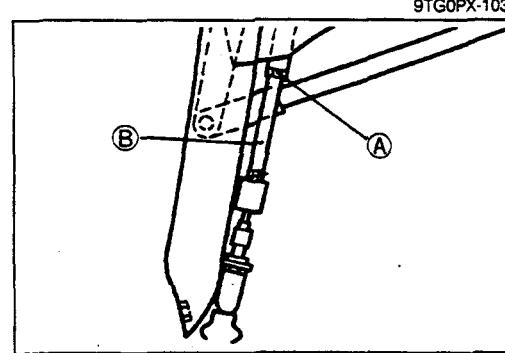
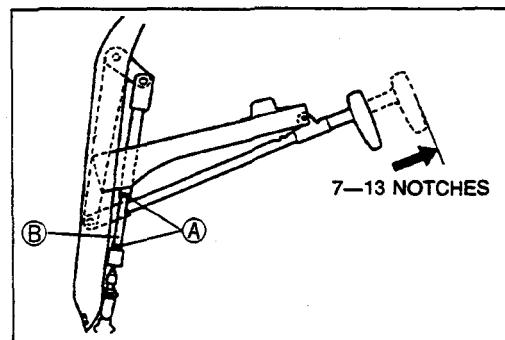
PREPARATION SST

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 Hardened or damaged brake cable Surface hardening or poor contact of center brake shoe Worn center brake drum	Adjust Repair or replace Clean or replace Grind or replace	Below P-39 P-40 P-41

9TF0PX-015



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

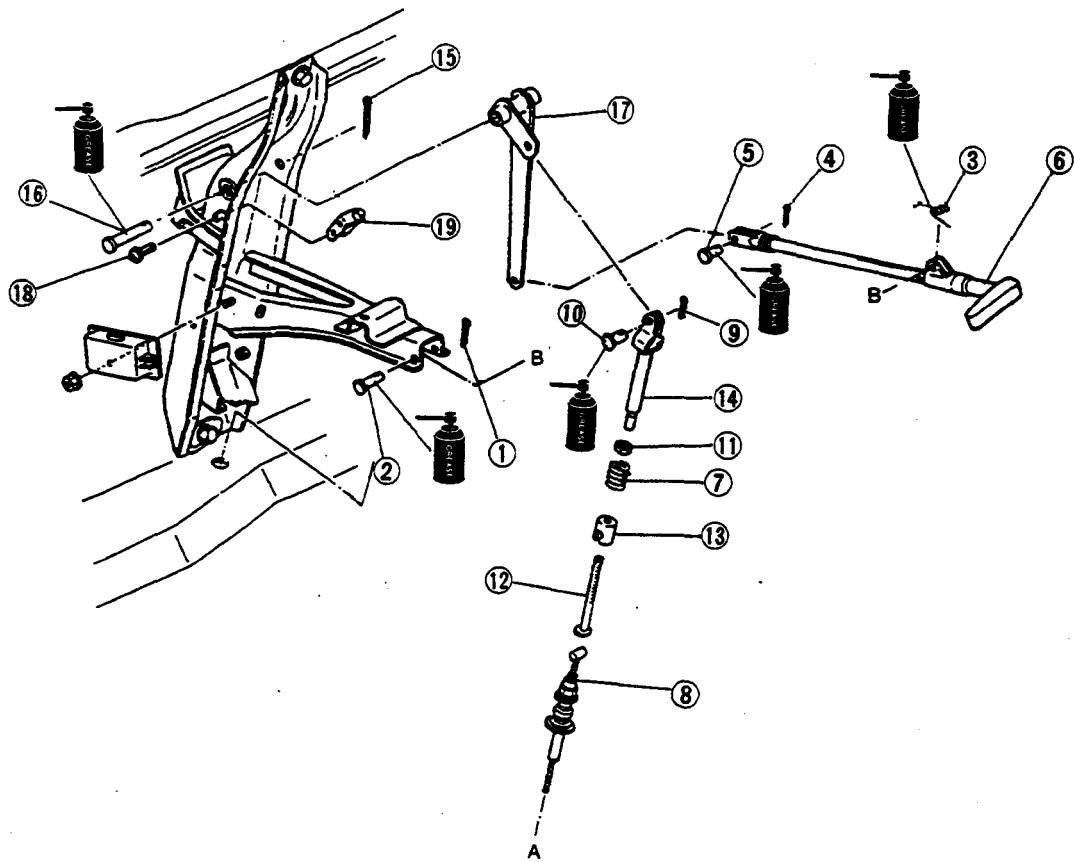
1. Loosen locknut **(A)** and turn the adjusting bolt **(B)** so that the stroke is within the above range.

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.

P**PARKING BRAKE SYSTEM****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

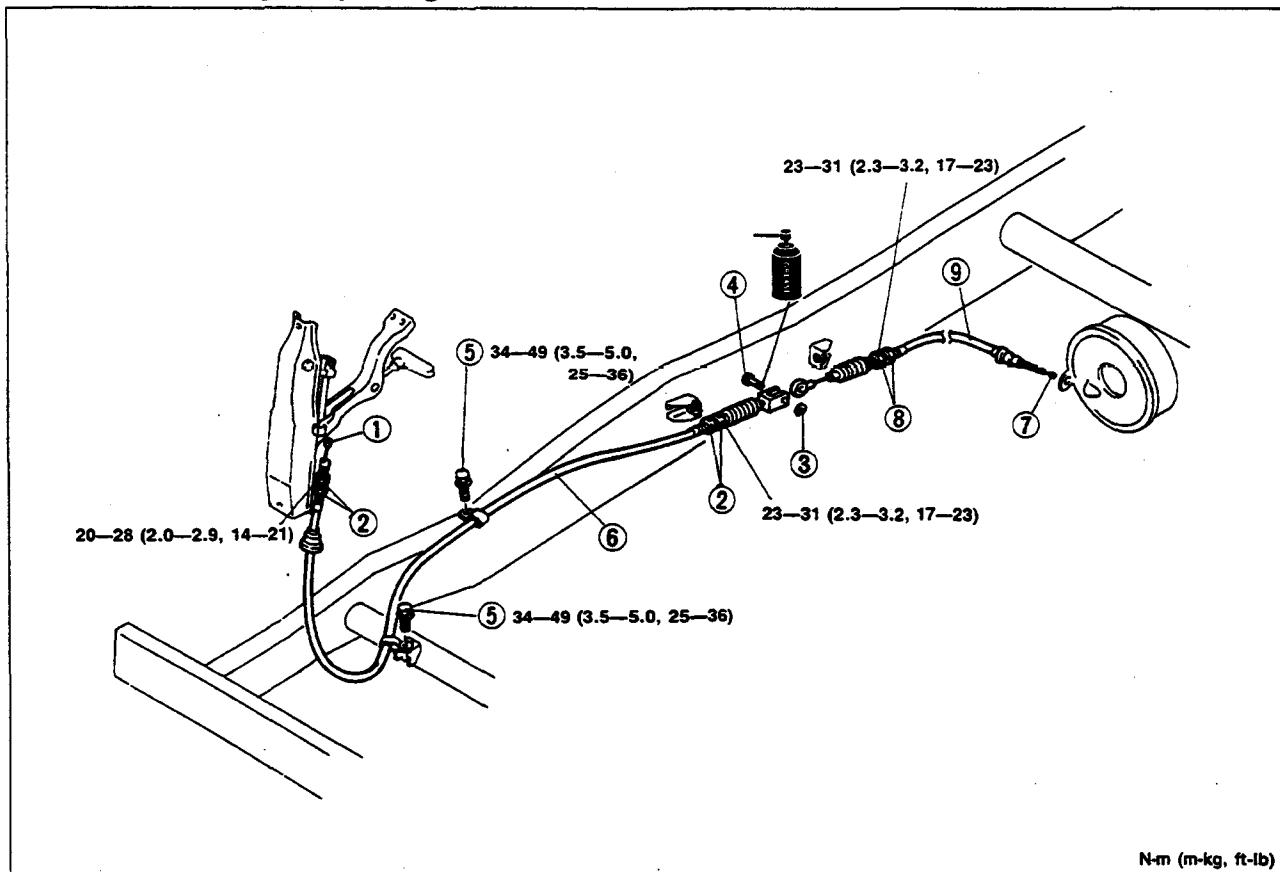
- | | |
|---|--|
| 1. Split pin | 10. Clevis pin |
| 2. Clevis pin | 11. Nut |
| 3. Return spring
Inspect for deformation or weakness | 12. Adjusting bolt |
| 4. Split pin | 13. Joint |
| 5. Clevis pin | 14. Tension rod
Inspect for damage or deformation |
| 6. Parking brake rod
Inspect for wear or damage of ratchet pawl | 15. Split pin |
| 7. Spring
Inspect for deformation or weakness | 16. Clevis pin |
| 8. Front cable
Removal / Inspection /
Installation..... page P-39 | 17. Parking brake lever
Inspect for damage or deformation |
| 9. Split pin | 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.

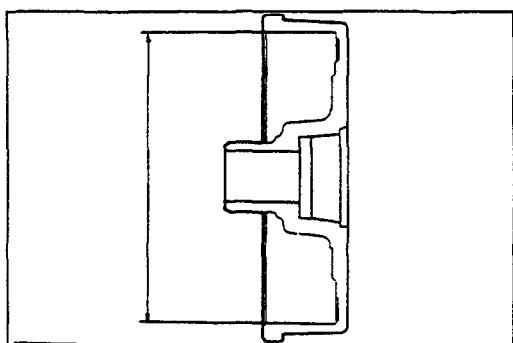


N·m (m·kg, ft·lb)

9TF0PX-017

1. Front cable end
2. Nuts
3. Stop ring
4. Clevis pin
5. Bolt
6. Front cable
Inspect for damage

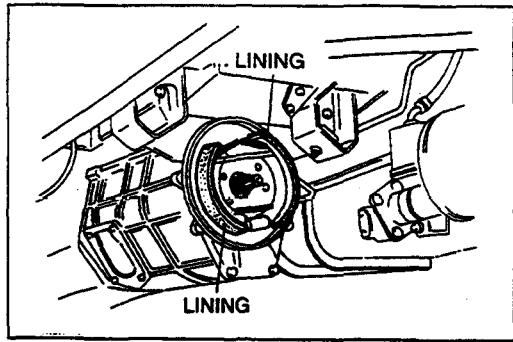
7. Rear cable end
8. Nuts
9. Rear cable
Inspect for damage



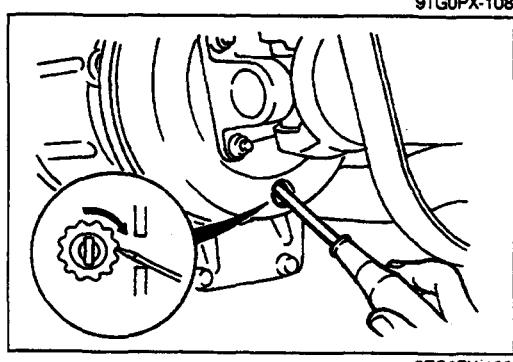
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CENTER BRAKE**On-vehicle Inspection****Lining thickness and drum inner diameter**

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)**

9TG0PX-109

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**

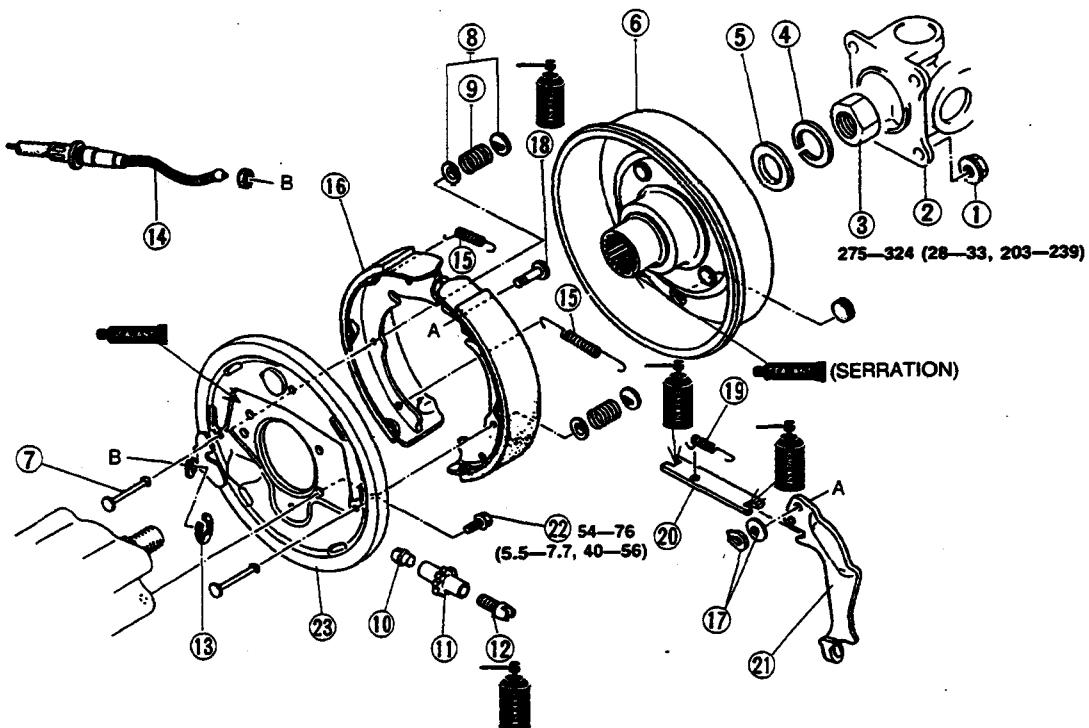
Refer to page P-41.

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PARKING BRAKE SYSTEM

Removal / Inspection / Installation

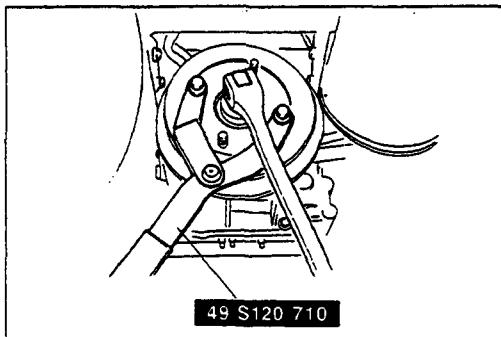
1. Jack up the vehicle and support it with safety stands.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal.
4. Inspect all parts and repair or replace as necessary.
5. After installation, take the following steps:
 - (1) Adjustment 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



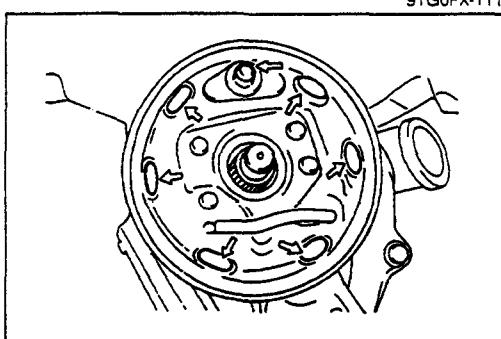
N·m (m·kg, ft-lb)

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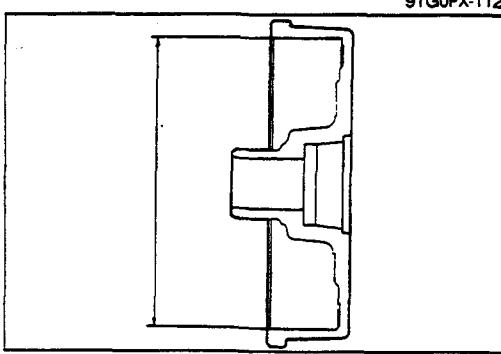
- | | |
|-------------------------------------|-------------------------------------|
| 1. Nut | 14. Parking cable |
| 2. Propellershaft | 15. Return spring |
| 3. Locknut | Inspect for weakness or deformation |
| Removal note page P-42 | 16. Center brake shoe |
| 4. Washer | Installation note page P-42 |
| 5. Oil seal | Inspection page P-42 |
| 6. Center brake drum | 17. Retainer |
| Inspection page P-43 | 18. Pin |
| 7. Hold pin | 19. Return spring |
| 8. Stop plate | Inspect for weakness or deformation |
| 9. Spring | 20. Strut |
| Inspect for weakness or deformation | 21. Lever |
| 10. Sleeve | 22. Bolt |
| 11. Adjusting nut | 23. Backing plate |
| 12. Adjusting screw | Inspect for damage |
| 13. Stop retainer | |

**Removal note****Locknut**

1. Remove the locknut with the drum locked with the **SST**.

**Installation note****Center brake shoe**

1. Before installation, apply grease to all sliding parts (⇒).

**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.

2. Check the contact of drum and lining.

Apply chalk to the inside of the drum and rub the shoe against the drum.

Note

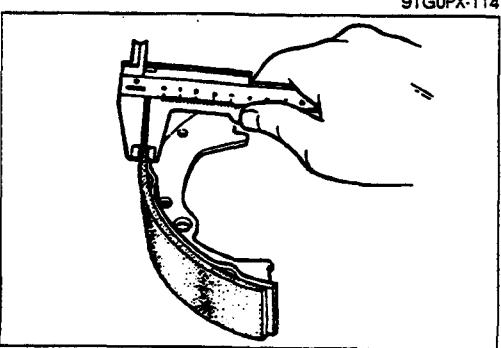
- Check for extremely bad contact.

Caution

- If there are extremely uneven wear, grind (within the limit) or replace the drum.
- After the check, wipe off the chalk.

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
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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

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Q**OUTLINE****OUTLINE****SPECIFICATION**
Single tire

Specifications		Wheel			Tire	
		Size	Offset mm (in)	Diameter of pitch circle mm (in)	Size	Tire pressure kPa (kg/cm ² , 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)

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Dual tires

Specifications		Wheel			Tire						
		Size	Offset mm (in)	Diameter of pitch circle mm (in)	Size	Tire pressure kPa (kg/cm ² , 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)				
			5.50Fx16	115 (4.528)		6.50—16—10	441 (4.50, 64)				
	3.5L	Front	5.50Fx16	115 (4.528)		6.50R16—10	491 (5.00, 71)				
						7.00—16—10	466 (4.75, 68)				
		Rear				7.00—16—12	466 (4.75, 68)				
						7.00R16—10	441 (4.50, 64)				
3,000 kg	3.5L	Front	5.50Fx16	115 (4.528)	203.2 (8)	7.00—16—10	491 (5.00, 71)				
						7.00—16—12	515 (5.25, 75)				
		Rear				7.00R16—10	540 (5.50, 78)				
						7.00—16—10	515 (5.25, 75)				
	4.0L	Front	6.00GSx16	127 (5)	222.25 (8.75)	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)				
4,000 kg	3.5L	14 feet body	Front	6.00GSx16	127 (5)	222.25 (8.75)	7.00—16—12	564 (5.75, 82)			
		Rear	17 feet body	6.00GSx16	127 (5)	222.25 (8.75)	7.00R16—12	638 (6.50, 93)			
		Front					7.50—16—10	515 (5.25, 75)			
		Rear					7.50—16—12	564 (5.75, 82)			
	4.0L	14 feet body	Rear				7.50R16—12	638 (6.50, 93)			
		Front	17 feet body	6.00GSx16	127 (5)	222.25 (8.75)	7.50—16—10	515 (5.25, 75)			
		Rear					7.50—16—12	564 (5.75, 82)			
		Front					7.50R16—12	638 (6.50, 93)			

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TROUBLESHOOTING GUIDE

Q

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 Stuck or damaged lower arm ball joint Cracked or worn suspension bushings Damaged or worn front wheel bearing Improperly adjusted front wheel alignment	Replace Tighten Replace Replace Tighten Adjust or replace Adjust Replace Replace Tighten Replace Replace Replace Replace Replace Adjust	Section N Section N Section N — Q-5 Q-8 Q-2 — Section R 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

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WHEELS AND TIRES

SPECIAL NOTES ABOUT WHEELS AND TIRES

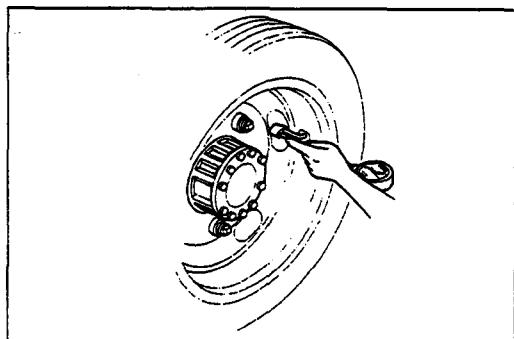
1. Do not use wheels or tires other than the specified types.

NOTES REGARDING TIRE REPLACEMENT

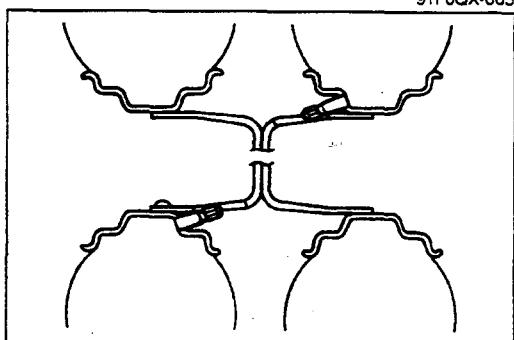
Note the following points when tires are to be removed from or mounted onto the wheels.

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.

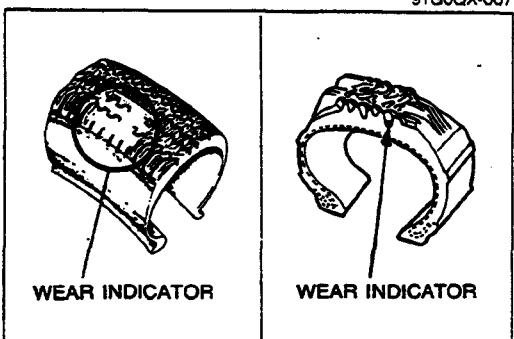
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9TG0QX-007



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.

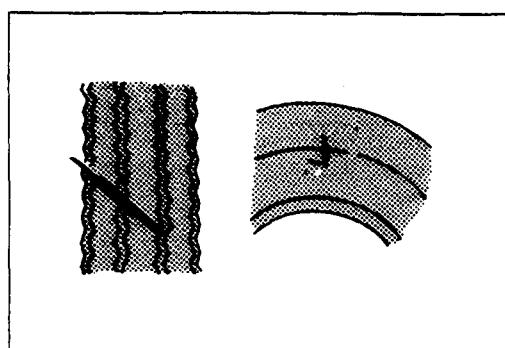
Remaining tread limit

Ordinary tires: 1.6mm (0.063 in)

Snow tires: 50% of tread

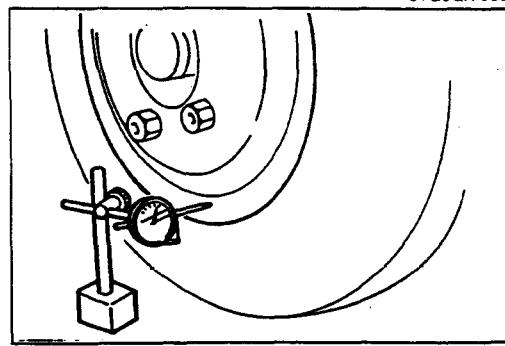
(Tire should be replace if wear indicators are exposed.)

WHEELS AND TIRES



Visual inspection

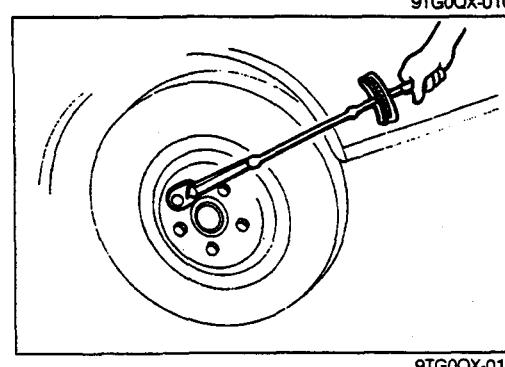
1. Check for cracks, damage, and foreign matter (such as metal pieces, nails, and stones) in tire and cracks, deformation, and damage to the wheel.
2. Replace the tire or wheel if necessary.



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.



Wheel lug nut

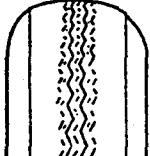
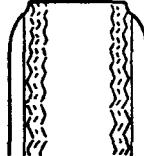
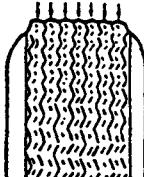
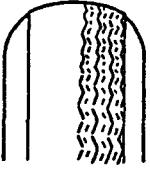
1. Check the tightening torque.

Tightening torque:

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

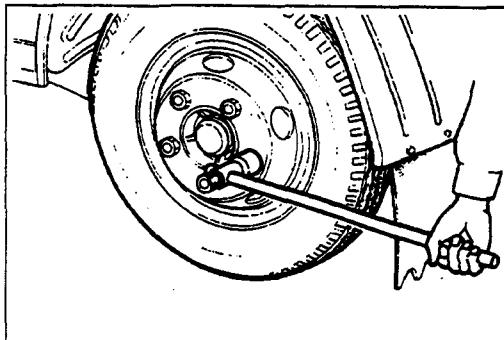
Abnormal tire wear

1. Refer to the chart below for the possible causes and actions.

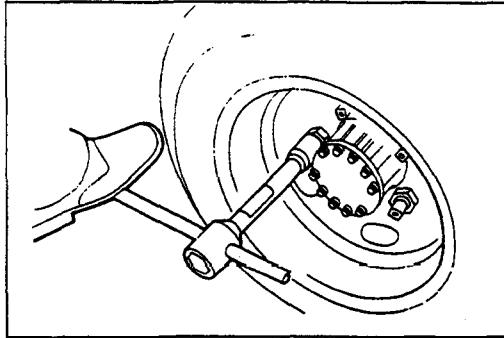
Wear pattern	Possible cause	Action
SHOULDER WEAR 	Underinflation (both sides worn) Incorrect camber (one side worn) Hard cornering Lack of rotation	Adjust tire pressure Repair or replace axle and suspension parts Reduce speed Rotate tires
CENTER WEAR 	Overinflation Lack of rotation	Adjust tire pressure 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

9TG00X-012

WHEELS AND TIRES



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.

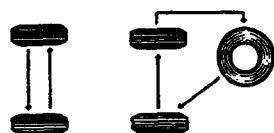
Tightening torque: Refer to page Q-5.

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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SINGLE TIRE



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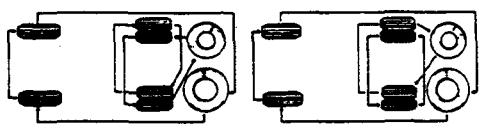
Tire Rotation

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.)

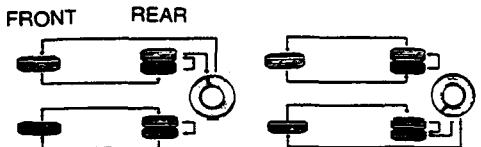
DUAL TIRE



1ST TIME, 3RD TIME,
5TH TIME... 2ND TIME, 4TH TIME,
6TH TIME...

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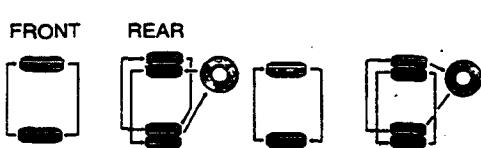
DUAL TIRE



1ST TIME, 3RD TIME,
5TH TIME... 2ND TIME, 4TH TIME,
6TH TIME...

9TG0QX-018

DUAL TIRE



1ST TIME, 3RD TIME,
5TH TIME... 2ND TIME, 4TH TIME,
6TH TIME...

9TG0QX-019

When the front wheels are different from rear wheels in size.

When the front and rear wheels are the same in size and number of plies.

When the front tires are different from rear tires in number of plies.

Wheel Balance Adjustment

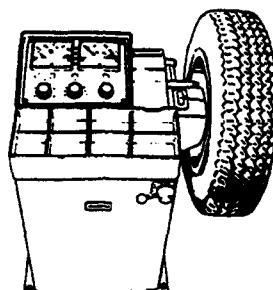
1. If a wheel becomes unbalanced or if a tire is replaced or repaired, the wheel must be rebalanced to within specification.

Maximum unbalance (at rim edge): 30 g (1.06 oz)

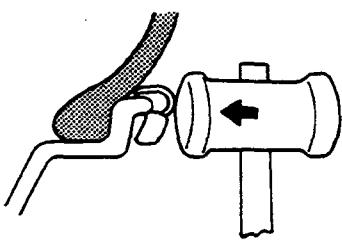
Balance weight: 100 g (3.5 oz) max.

Caution

- **Do not use more than two balance weights on each side.**
- **Attach the balance weights tightly.**



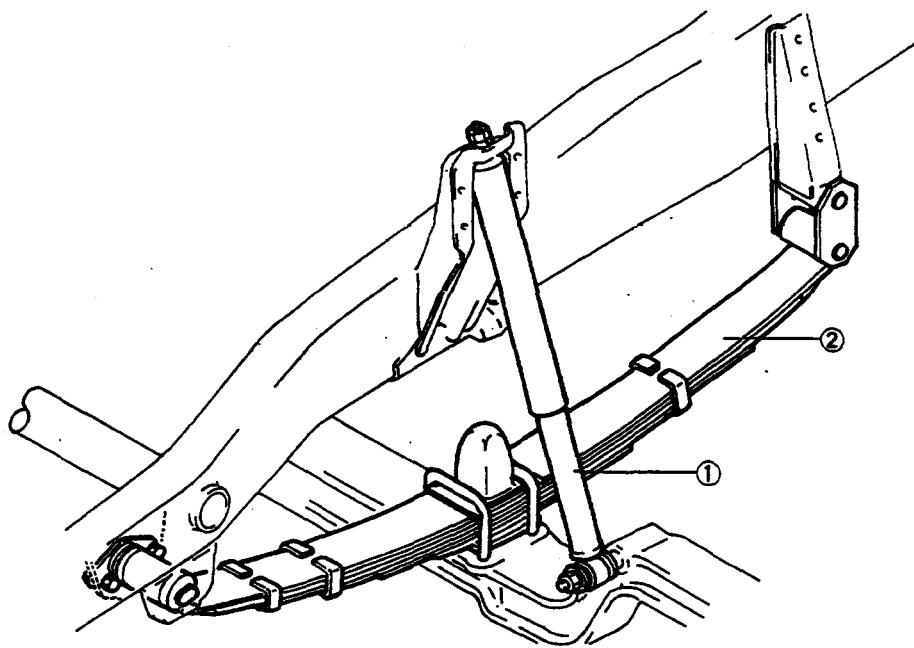
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SUSPENSION

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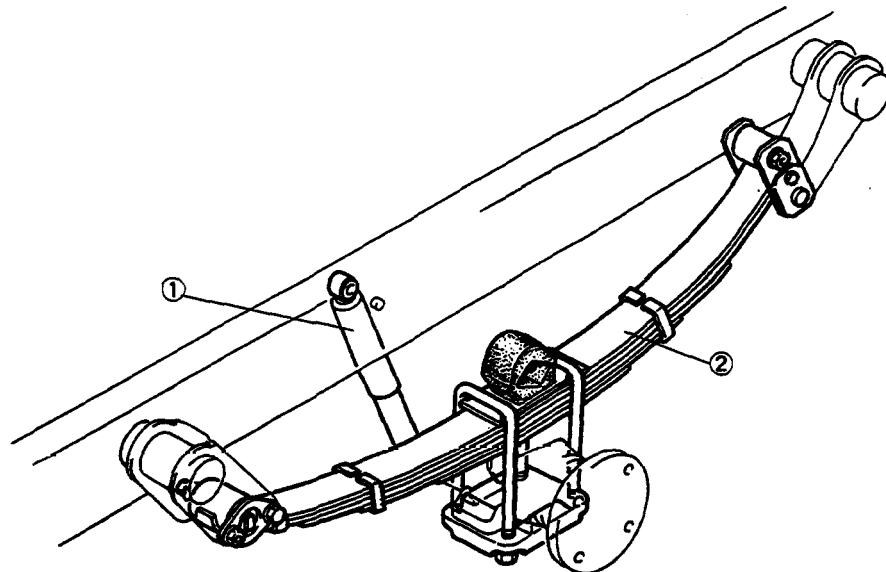
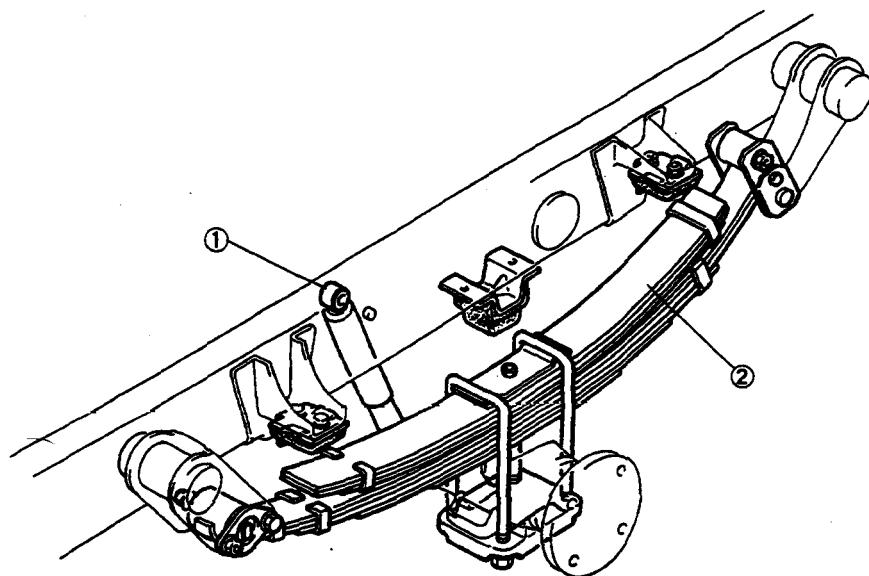
9TFORX-001

INDEX**FRONT SUSPENSION**

9TF0RX-002

1. Front shock absorber
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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**

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

9TFORX-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'	←

9TFORX-005

*¹ Fuel tank full; radiator coolant and engine oil at specified level, and spare tire, jack and tools in designated position

OUTLINE

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)

9TFORX-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)		
F	260 x 70 x 11 (10.2 x 2.8 x 0.43)		
	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)
G	380 x 70 x 11 (15.0 x 2.8 x 0.43)		
	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)		
H	380 x 70 x 11 (15.0 x 2.8 x 0.43)		
	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)
I	380 x 70 x 11 (15.0 x 2.8 x 0.43)		
	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)		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)		

9TFORX-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	Crew cab				2.0	B	G
SL TURBO	Truck	Wide	14		2.75	B	H
			17		3.0	C	F
TF	Crew cab		14	High/Double	D	I	
	Truck		17		4.0	D	I
					D	I	
					3.5	D	I
					4.0	D	I
					D	I	

9TFORX-008

TROUBLESHOOTING GUIDE

R

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

9TFORX-009

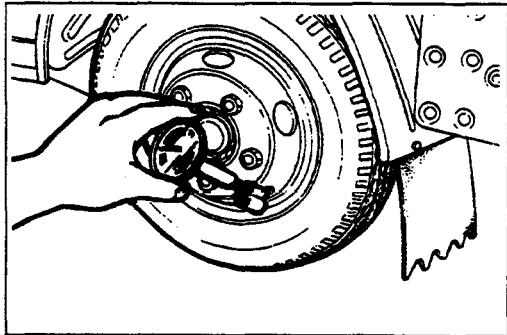
WHEEL ALIGNMENT

PREPARATION SST

49 0559 605A

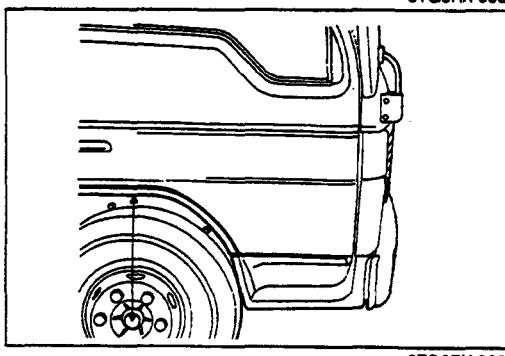
Adapter, caster/
camber gaugeFor
adjustment of
wheel alignment

9TFORX-010



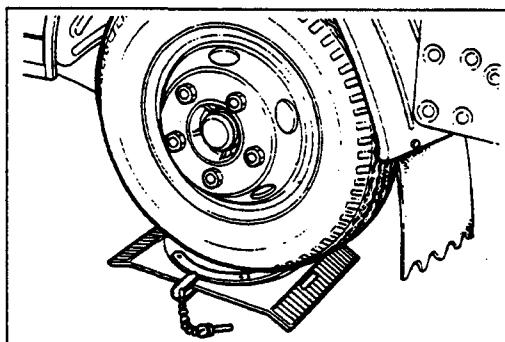
PREINSPECTION

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).

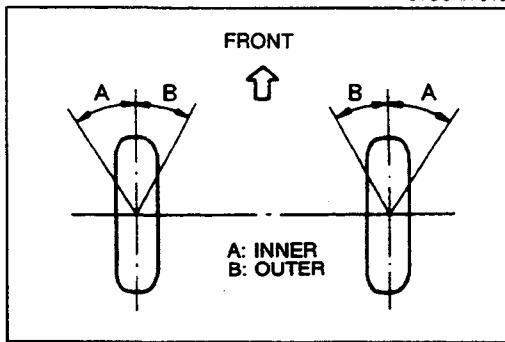


9TG0RX-009

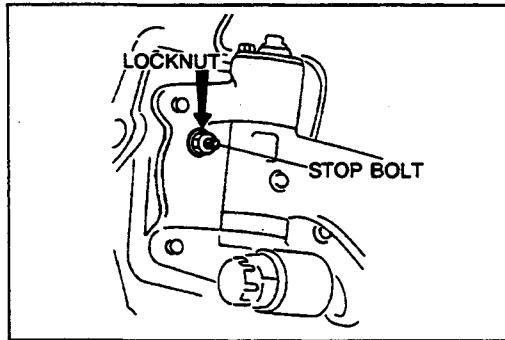
WHEEL ALIGNMENT



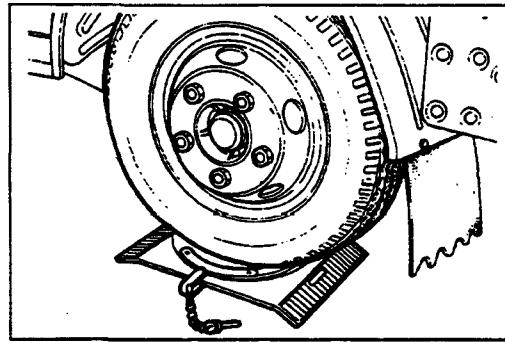
9TG0RX-010



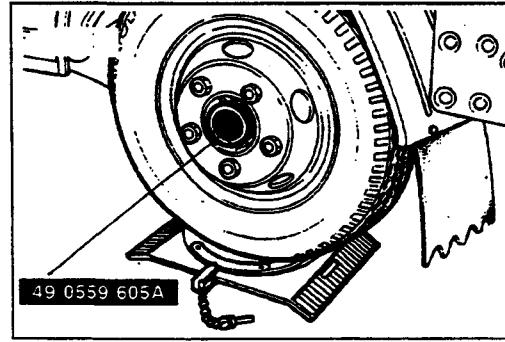
9TF0RX-011



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	$38^\circ \pm 2^\circ$	$42^\circ \pm 2^\circ$
Outer	$29^\circ \pm 2^\circ$	$31^\circ \pm 2^\circ$

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:

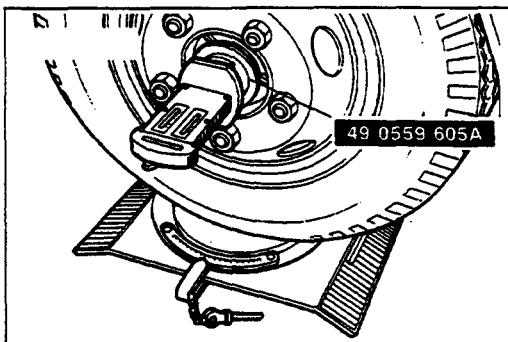
59—88 N·m (6—9 m·kg, 43—65 ft-lb)

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.



9TFORX-013

4. Attach the caster/camber gauge to the **SST** and measure the camber, caster, and king-pin angle.

Standard angle

Camber angle : $0^\circ 40' \pm 30'$
Caster angle : $2^\circ 30' \pm 20'$
King-pin angle: $7^\circ 00'$

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.

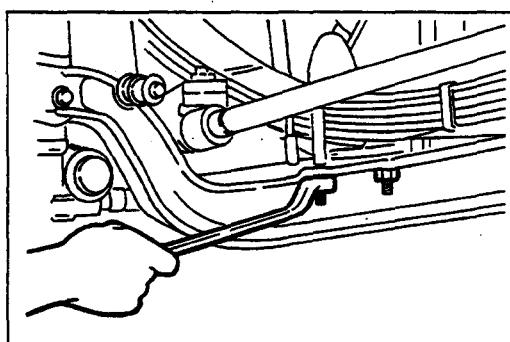
Warning

- Support the front axle with the jack.

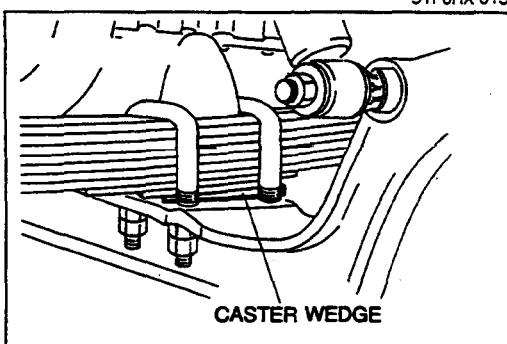
2. Remove the leaf spring U-bolts.

9TFORX-014

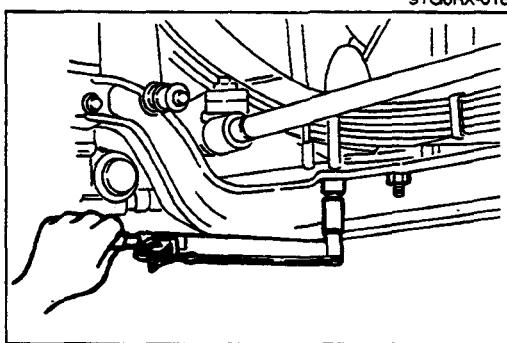
3. Lower the front axle and replace the caster wedge.



9TFORX-015



9TFORX-016



9TFORX-018

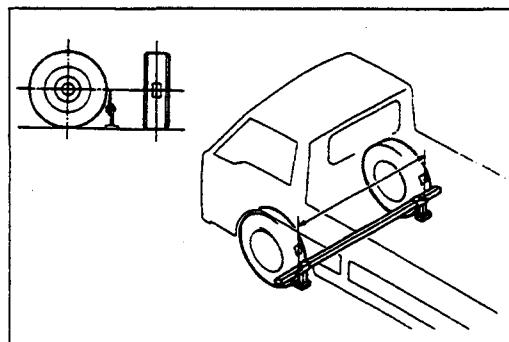
4. Install the U bolt.

5. Lower the vehicle and tighten the U-bolt to the specified torque.

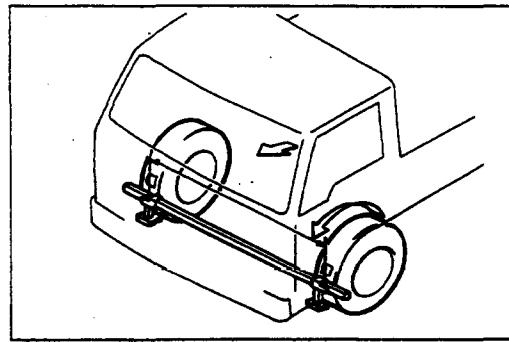
Tightening torque:

118—147 N·m (12—15 m·kg, 87—108 ft·lb)

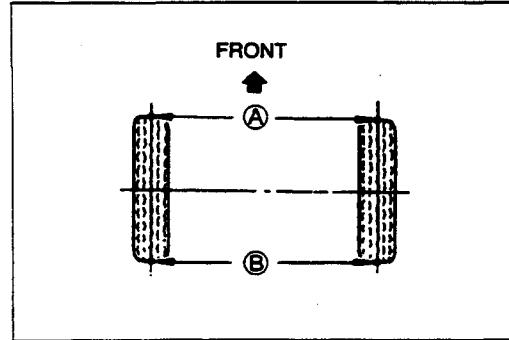
WHEEL ALIGNMENT



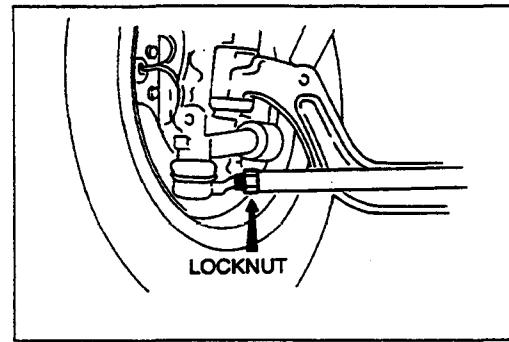
9TG0RX-020



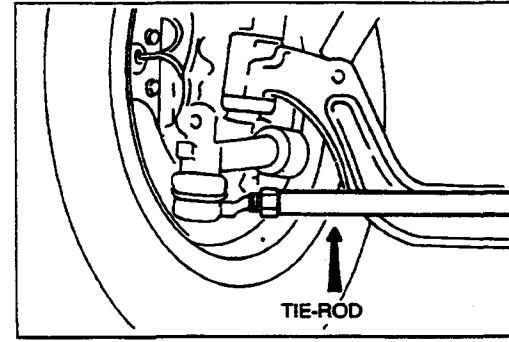
9TG0RX-021



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: $3 \pm 3\text{mm}$ ($0.12 \pm 0.12\text{ in}$)

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

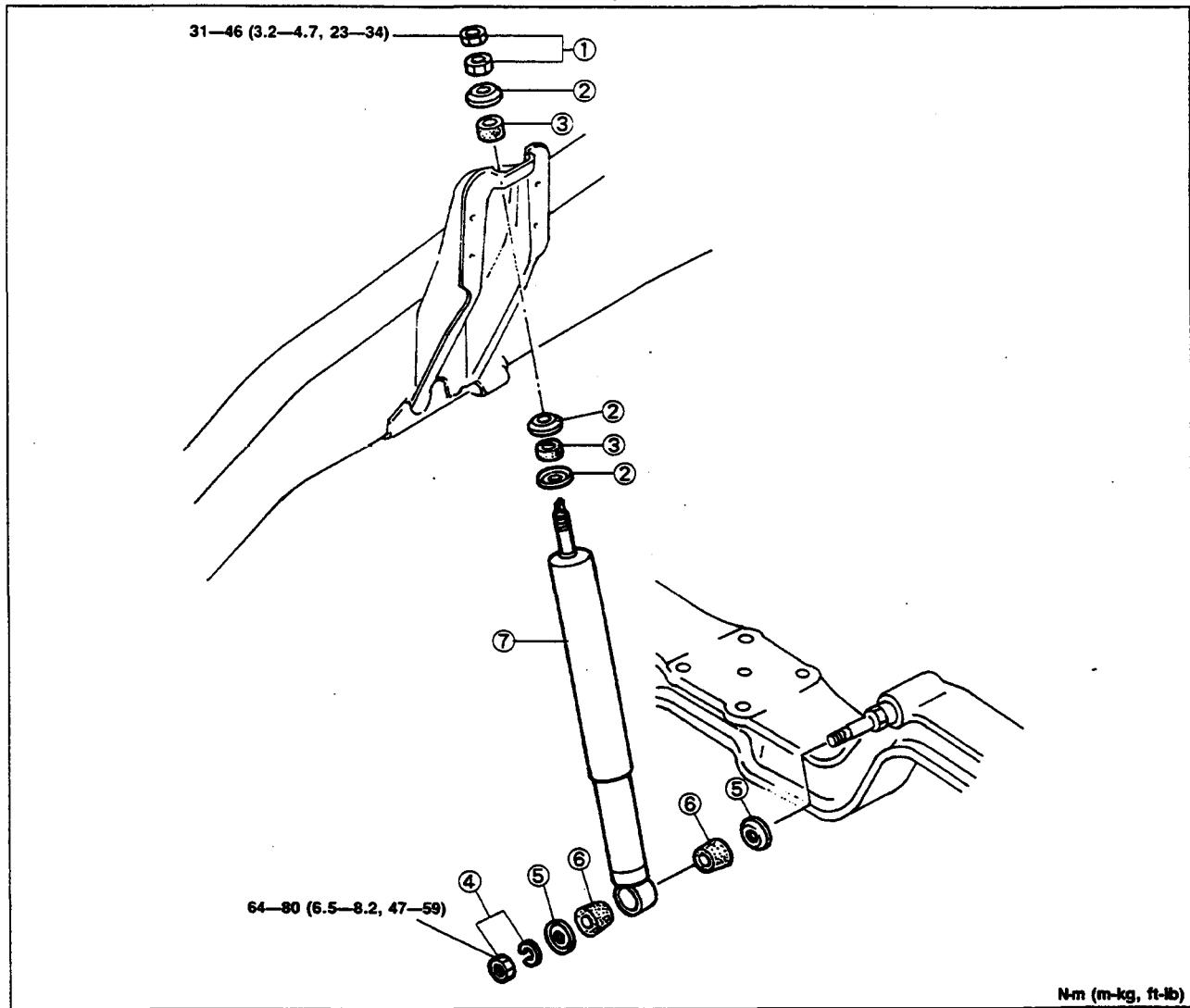
FRONT SUSPENSION (LEAF SPRING)

R

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.



N·m (m-kg, ft-lb)

9TG0RX-027

1. Nut
2. Retainer
3. Bushing

Inspect for damage and deterioration

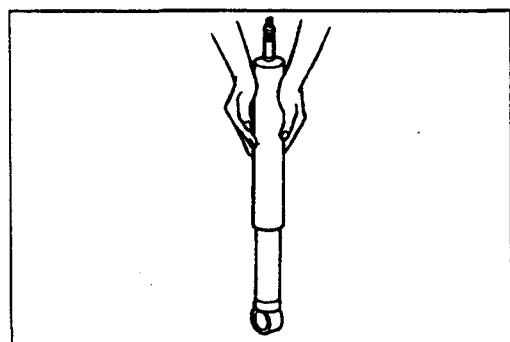
4. Nut and washer

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

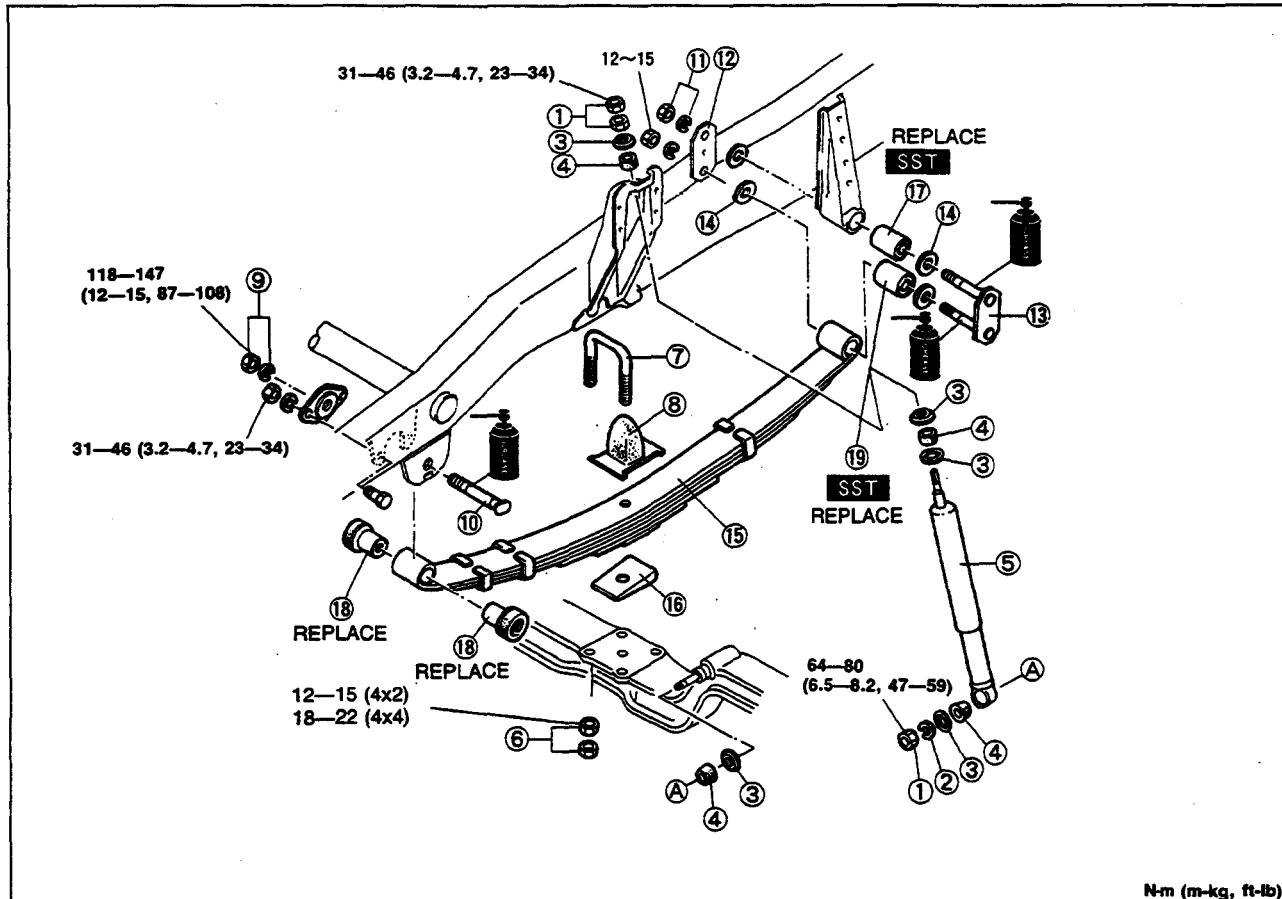
- (1) Depress the shock absorbers several times to check for no binding or noise.

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

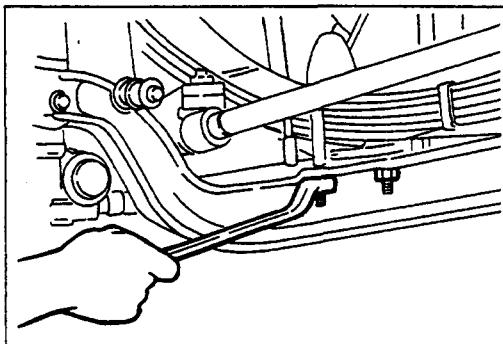
- **Tighten the mounting nuts of the shackle pin and spring pin to the specified torque with the vehicle lowered and in an unladen condition.**



- | | | |
|---|--|-----------|
| 1. Nut | 13. Shackle pin
Removal note | page R-15 |
| 2. Washer | 14. Thrust washer | |
| 3. Retainer | 15. Leaf spring assembly
Inspect for weakness of spring | |
| 4. Bushing
Inspect for damage and deterioration | 16. Caster wedge
Installation note | page R-16 |
| 5. Shock absorber | 17. Shackle pin bushing
Removal note | page R-15 |
| 6. Nut | Installation note | page R-16 |
| 7. U-bolt
Removal note | 18. Spring bushing (Front)
Removal note | page R-15 |
| 8. Bound stop
Inspect for damage and deterioration | Installation note | page R-16 |
| 9. Nut and washer | 19. Spring bushing (Rear)
Removal note | page R-15 |
| 10. Spring pin
Removal note | Installation note | page R-16 |
| 11. Nut and washer | | |
| 12. Shackle plate | | |

FRONT SUSPENSION (LEAF SPRING)

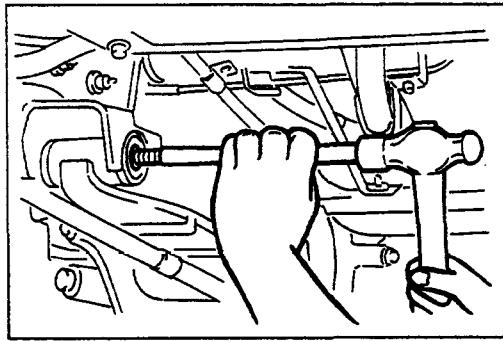
R



Removal note

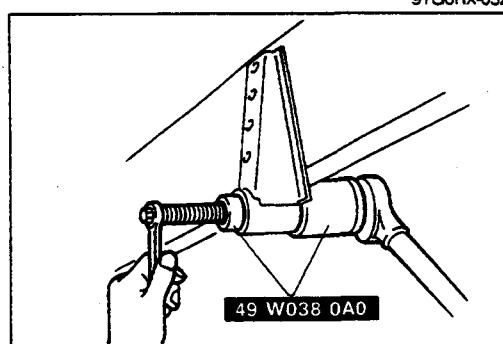
U-bolt

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.



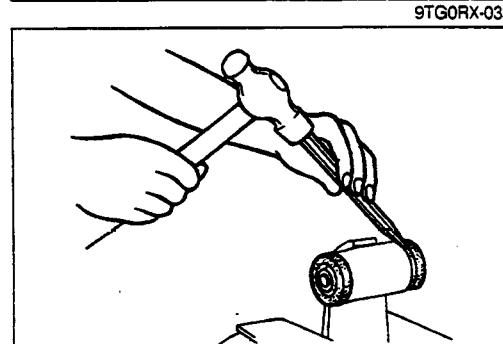
Spring pin and shackle pin

1. Remove the spring pin and shackle pin with a brass bar.



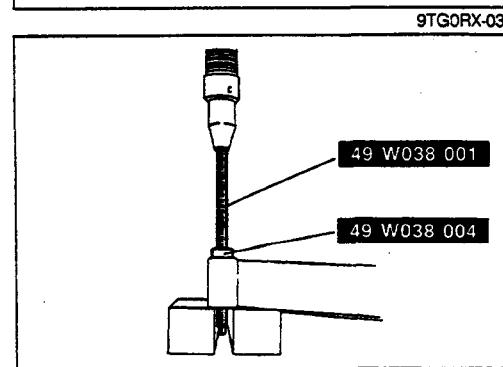
Shackle pin bushing

1. Remove the shackle pin bushing from the frame with the SST.



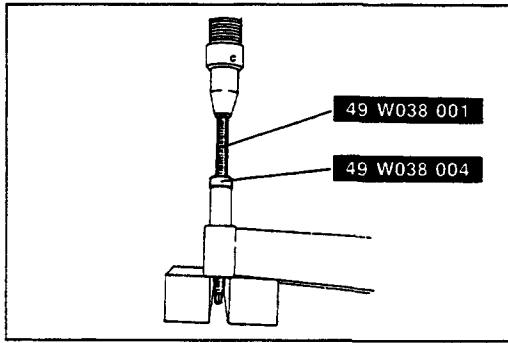
Spring bushings (Front side)

1. Remove one side of the bushing with a chisel.
2. Remove the remaining bushing with a suitable pipe.

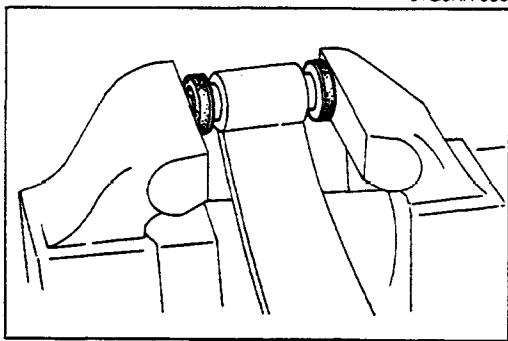


Spring bushing (Rear side)

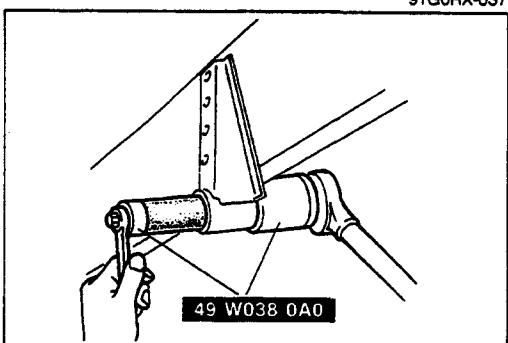
1. Remove the bushing with the SST and a press.

**Installation note****Spring bushing (Rear side)**

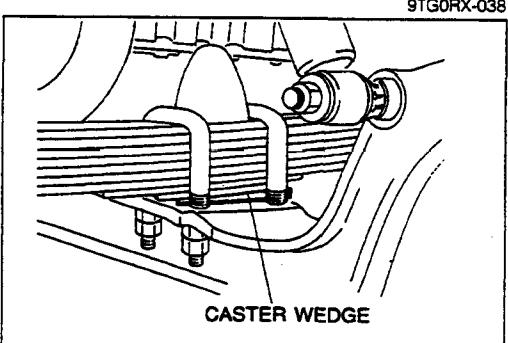
1. Install the bushing with the **SST** and a press.

**Spring bushings (Front side)**

1. Install the bushings with a vise.

**Shackle pin bushing**

1. Install the new bushing into the frame with the **SST**.

**Caster wedge**

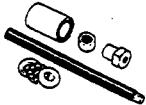
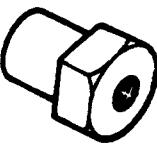
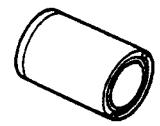
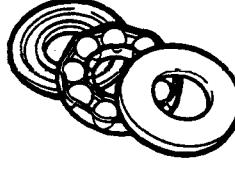
1. Install the caster wedge with the thicker side facing toward rear.

REAR SUSPENSION (LEAF SPRING)

R

REAR SUSPENSION (LEAF SPRING)

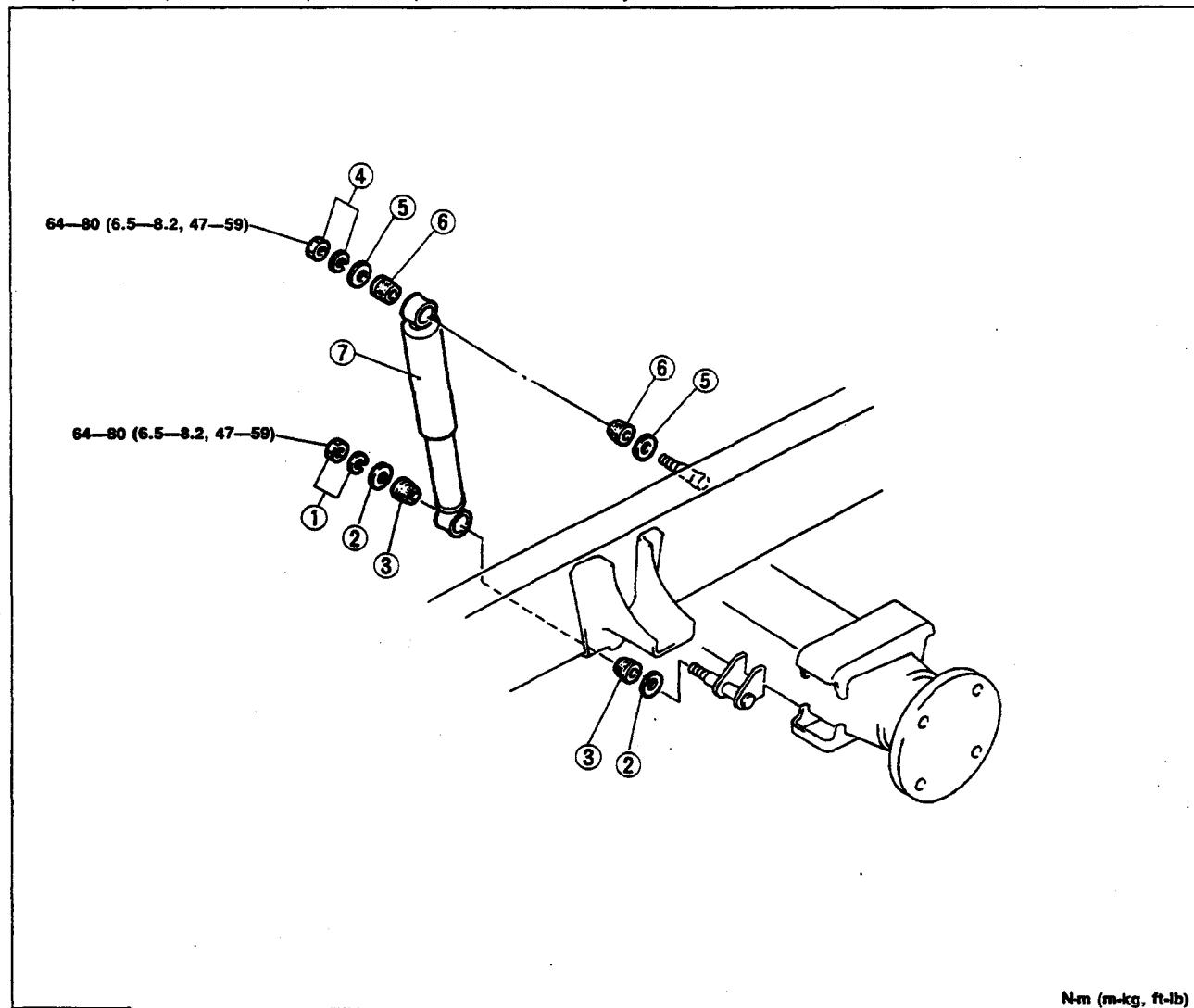
PREPARATION SST

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

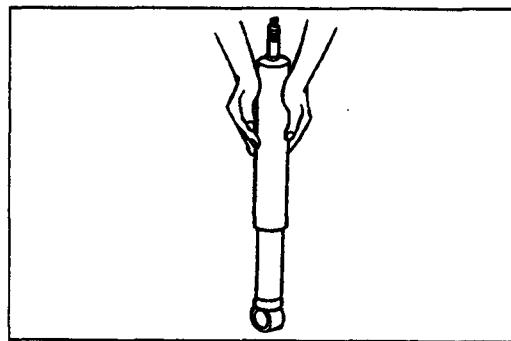
REAR SHOCK ABSORBER**Removal / Inspection / Installation**

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.



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 SUSPENSION (LEAF SPRING)

R

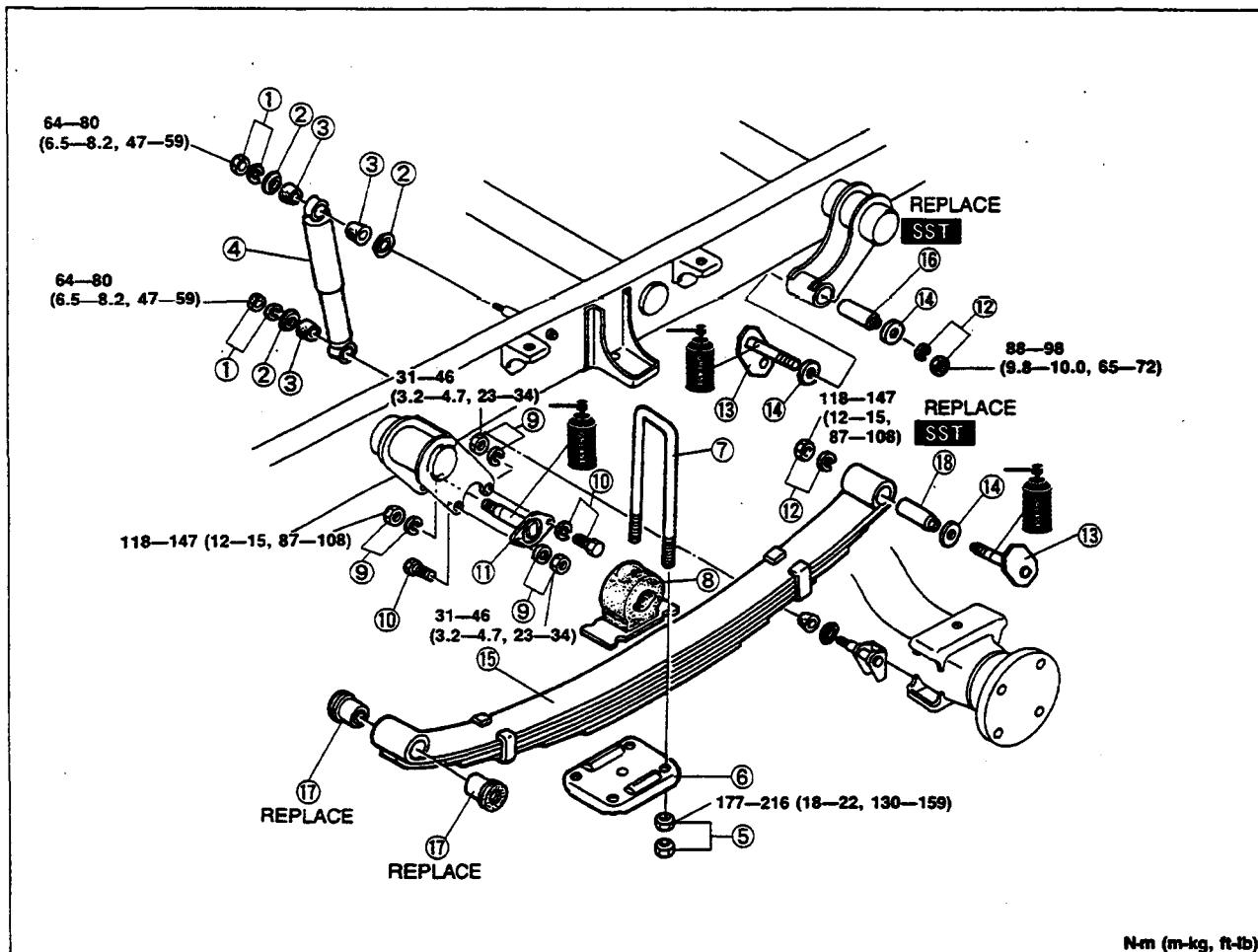
REAR LEAF SPRING

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

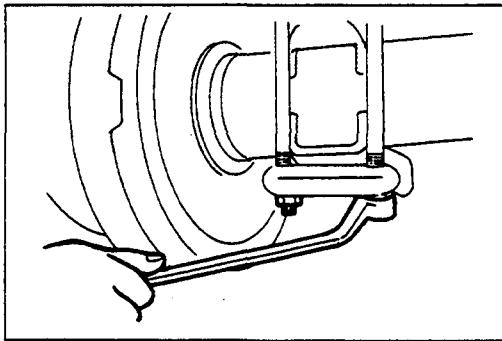
- **Tighten the mounting nuts of the shackle pin and spring pin to the specified torque with the vehicle lowered and in an unladen condition.**



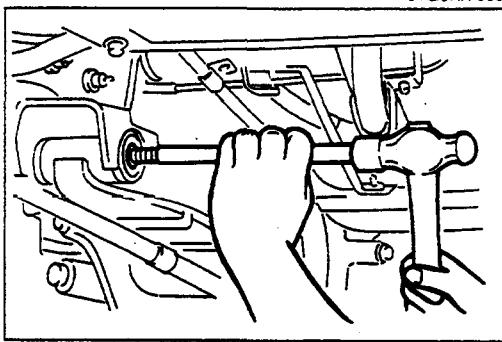
N·m (m·kg, ft·lb)

9TF0RX-020

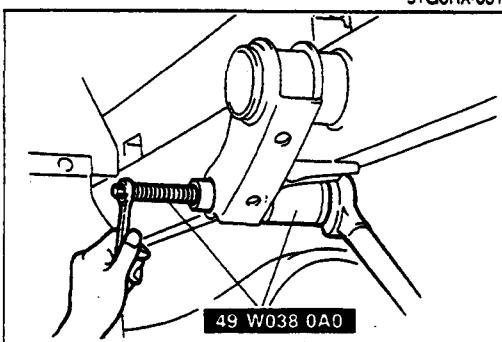
1. Nut and washer
2. Retainer
3. Bushing
Inspect for damage and deterioration
4. Shock absorber
5. Nut
6. Spring clamp
7. U-bolt
Removal note page R-20
8. Bound stop
Inspect for damage and deterioration
9. Nut and washer
10. Bolt and washer
11. Spring pin
Removal note page R-20
12. Nut and washer
13. 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

**Removal note****U-bolt**

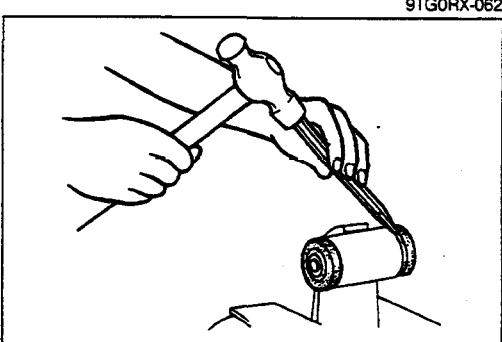
1. Jack up the rear axle.
2. Remove the U-bolt mounting nuts.
3. Remove the U-bolts and bound stops.
4. Lower the rear axle.

**Spring pin and shackle pin**

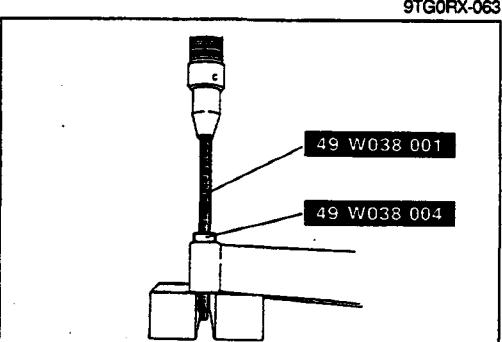
1. Remove the spring pin and shackle pin with a brass bar.

**Shackle pin bushing**

1. Remove the shackle pin bushing from the frame with the SST.

**Spring bushings (Front side)**

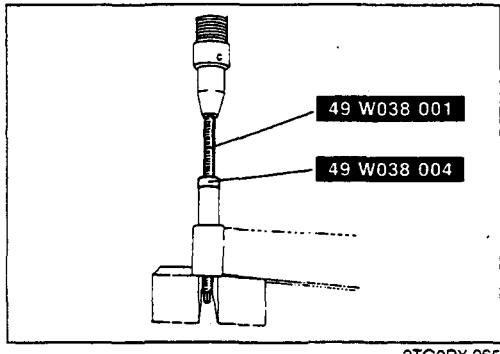
1. Remove one side of the bushing with a chisel.
2. Remove the remaining bushing with a suitable pipe.

**Spring bushing (Rear side)**

1. Remove the bushing with the SST and a press.

REAR SUSPENSION (LEAF SPRING)

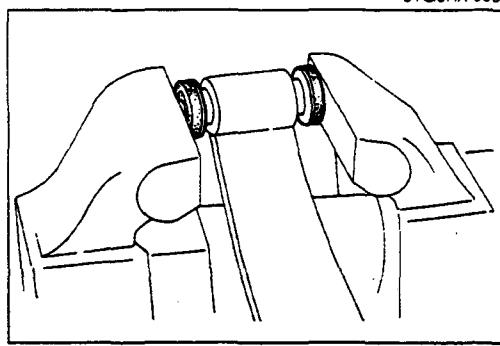
R



Installation note

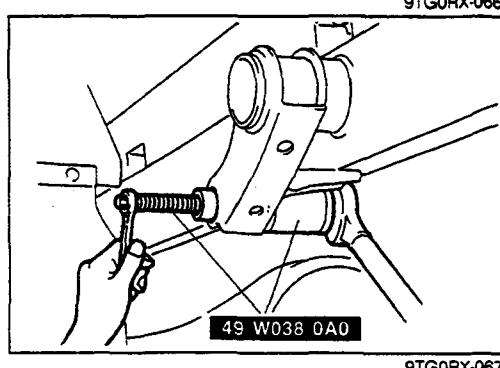
Spring bushing (Rear side)

1. Install the new bushing with the **SST** and a press.



Spring bushing (Front side)

1. Install the new rubber bushing with a vise.



Shackle pin bushing

1. Install the new bushing into the frame with the **SST**.

9TG0RX-067

BODY

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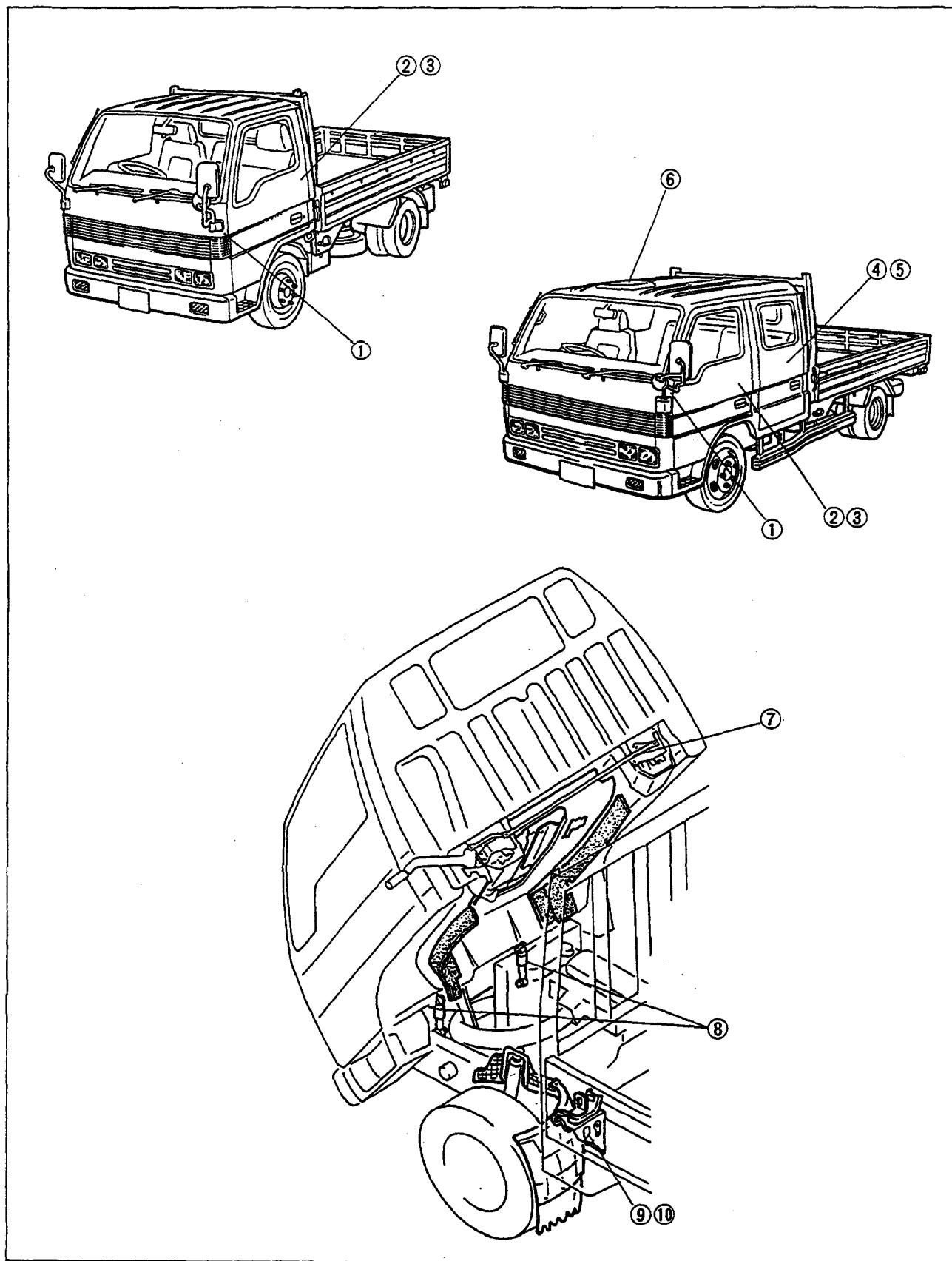
9TG0SX-001

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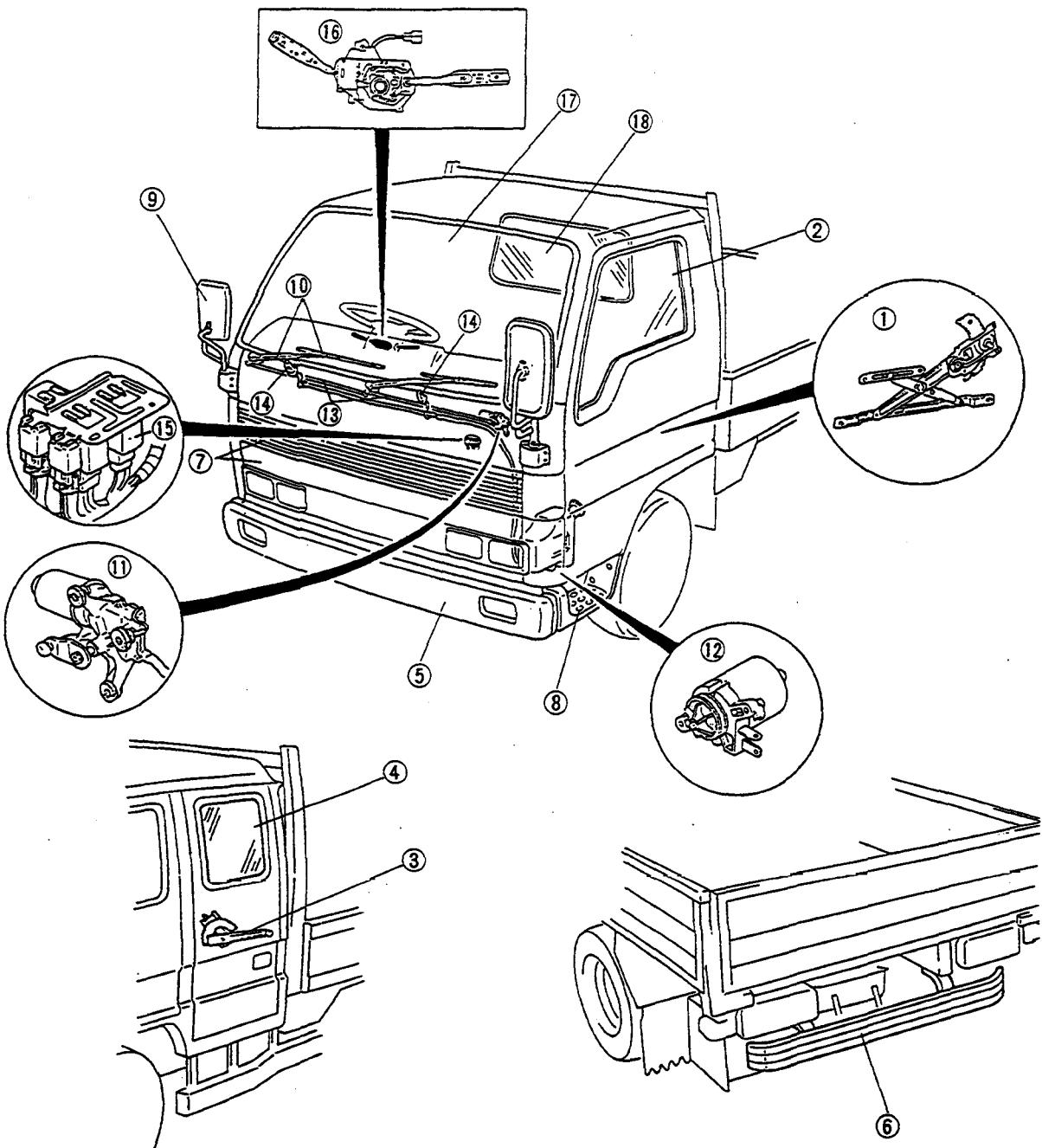
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EXTERIOR



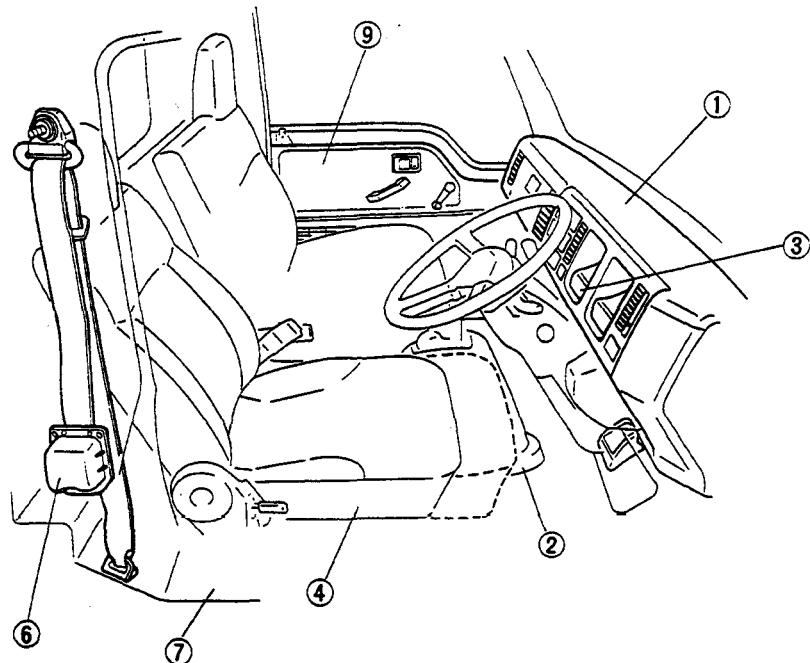
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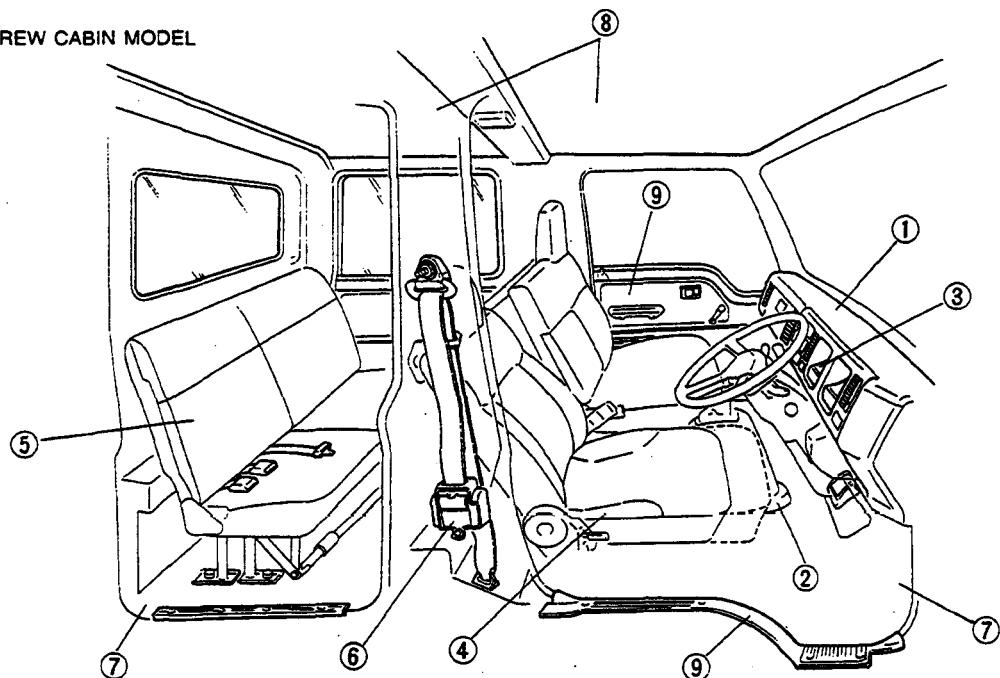
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INTERIOR



CREW CABIN MODEL



9TG0SX-006

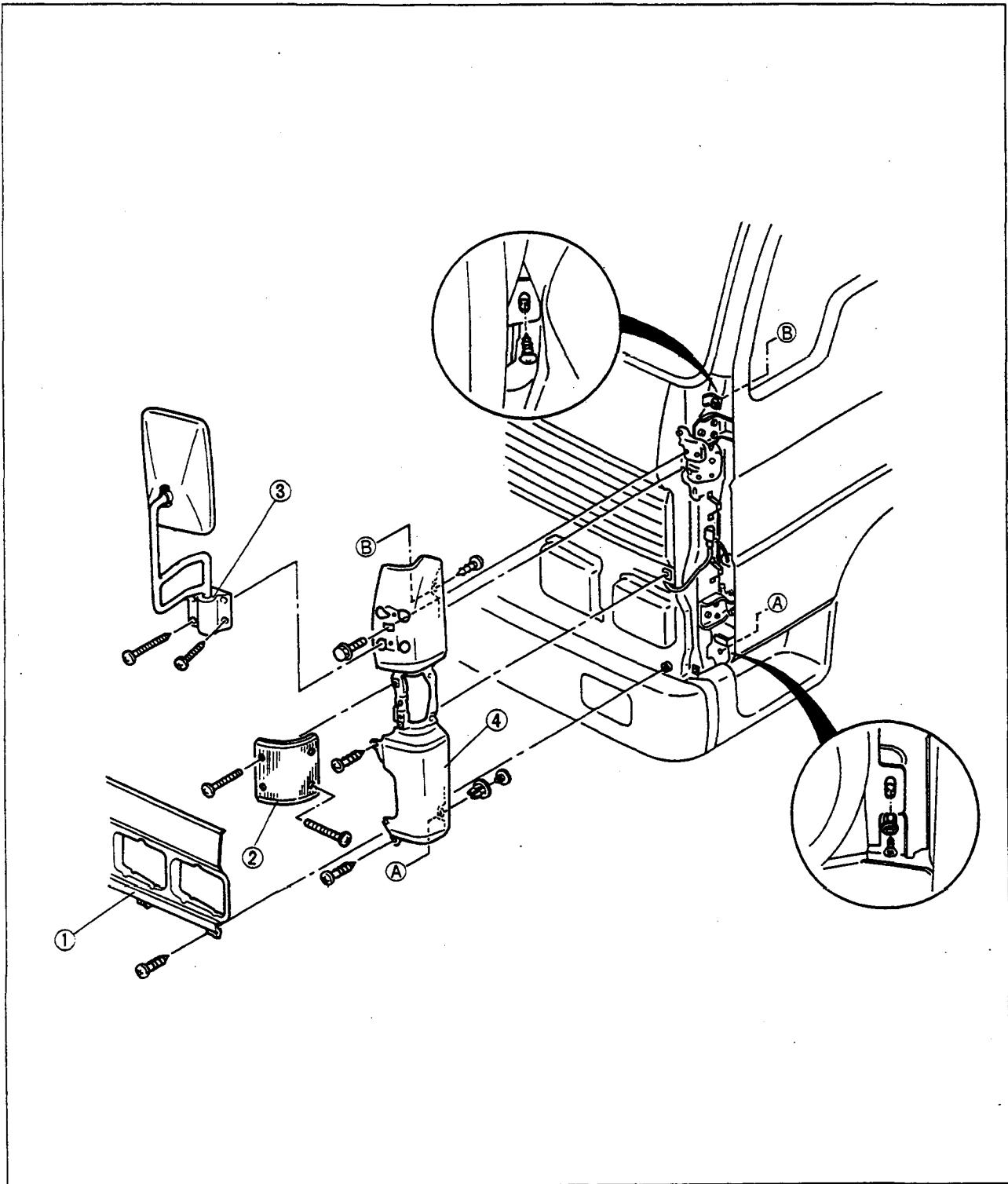
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2. Console
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3. Clock
 Removal / Installation page S-61
4. Front seat
 Removal / Installation page S-53
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8. Headliner
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9. 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.



1. Radiator grille
2. Front combination light

3. Mirror
4. Front fender panel

FRONT DOOR

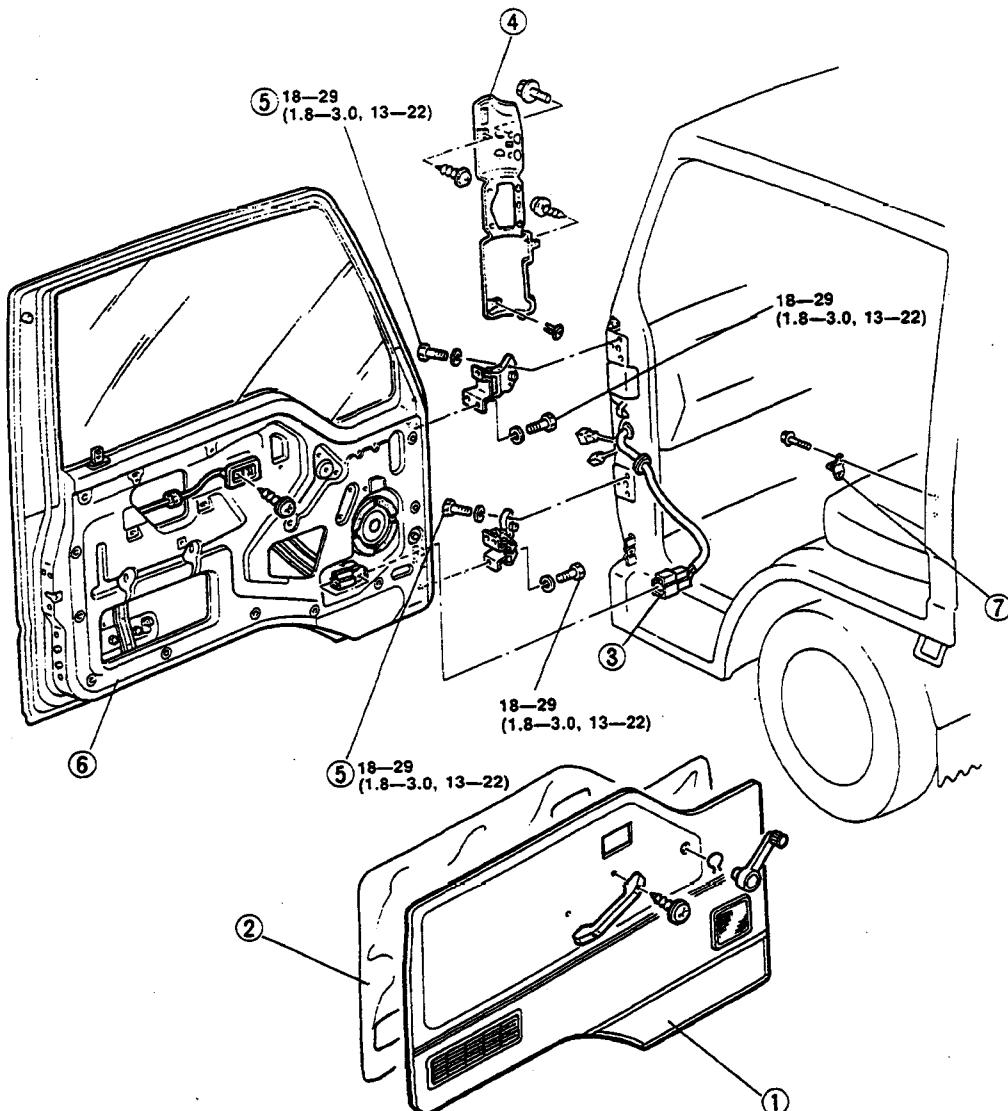
COMPONENTS

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.



N·m (m·kg, ft·lb)

9TG0SX-008

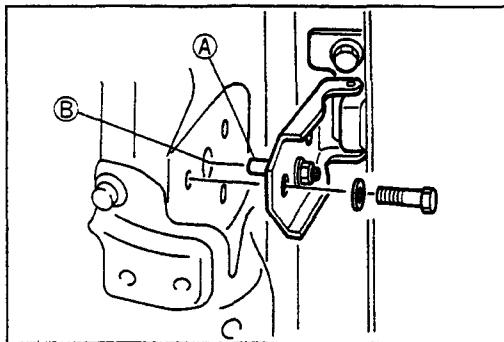
1. Trim (with door speaker model)
2. Door screen (with door speaker model)
3. Connector (door speaker)
4. Front fender panel
5. Bolt

6. Front door

Installation Note	page S-9
Adjustment.....	page S-9
7. Door lock striker

Adjustment.....	page S-9
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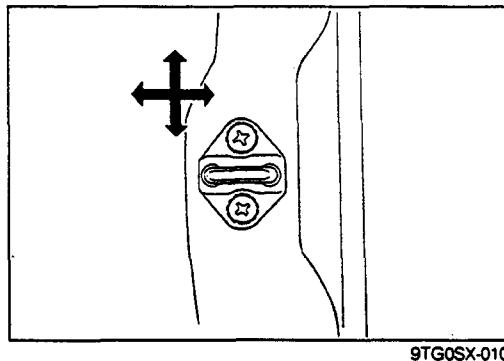
FRONT DOOR



Installation note

Front door

1. Align the pin and install the front door.



9TG0SX-009

9TG0SX-010

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.

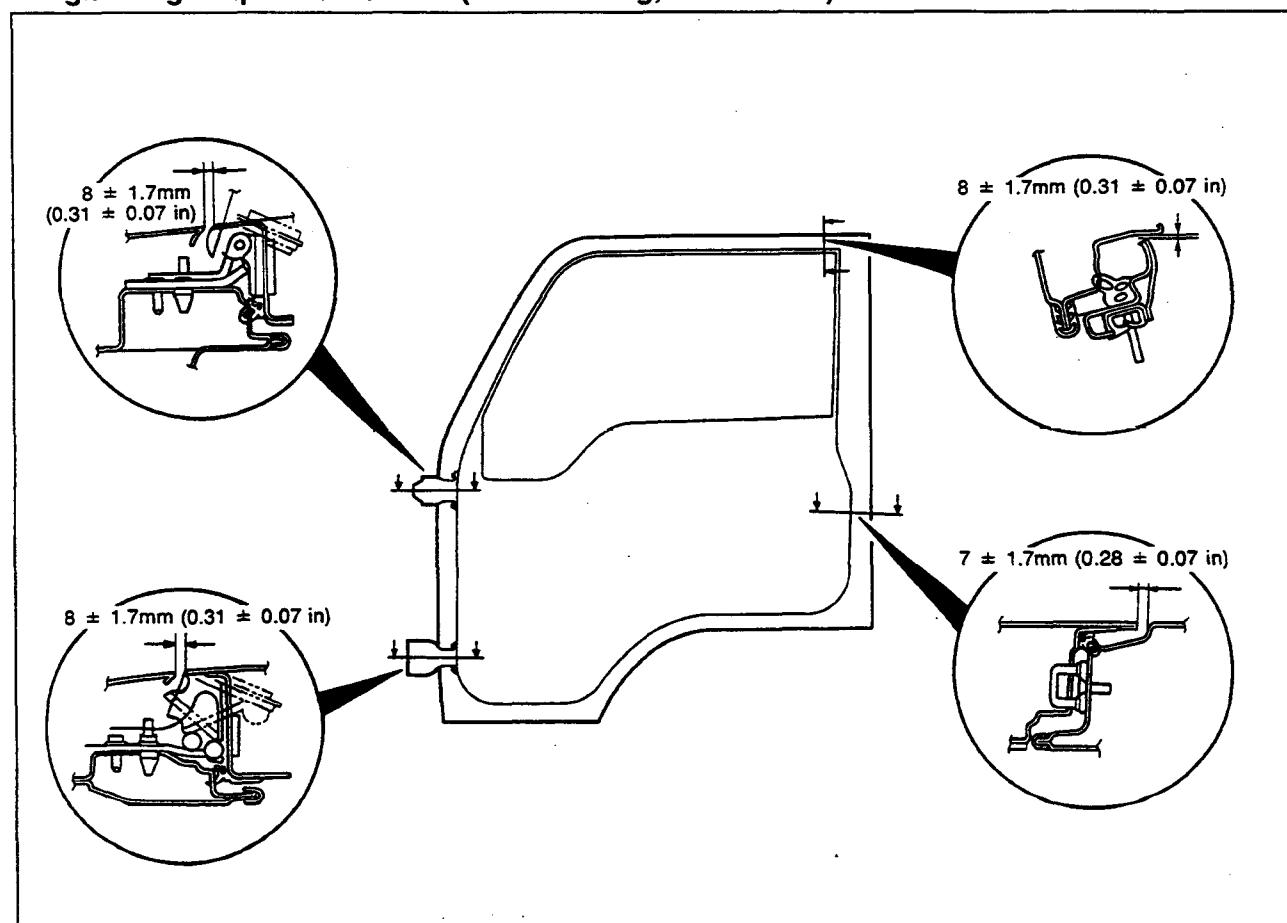
Tightening torque:

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

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S

FRONT WINDOW REGULATOR AND GLASS

FRONT WINDOW REGULATOR AND GLASS

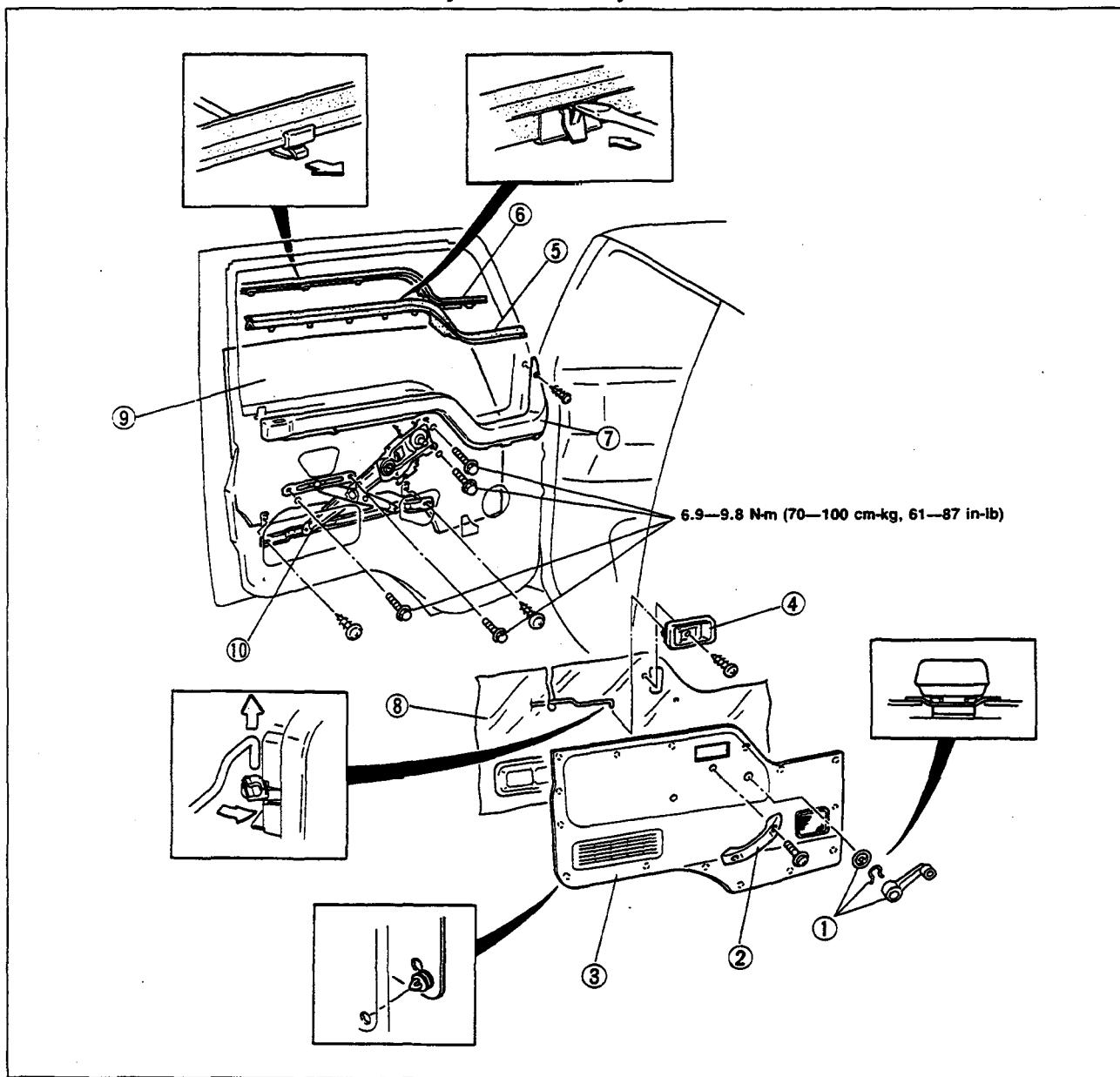
COMPONENTS

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

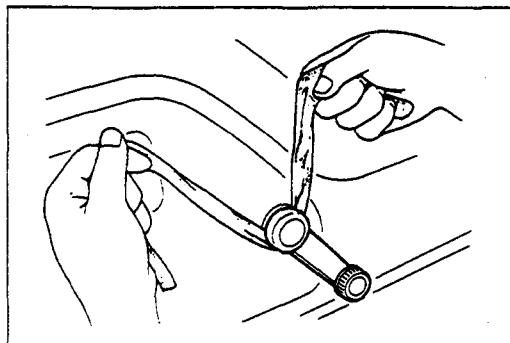
- Remove the door screen carefully so that it may be reused.



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

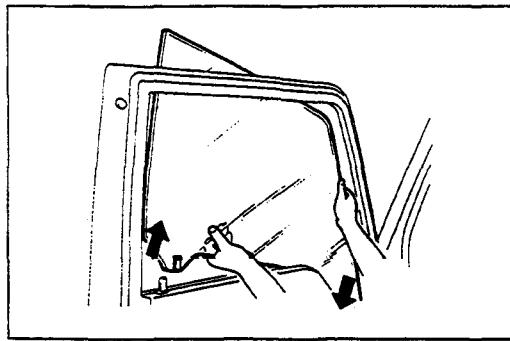
FRONT WINDOW REGULATOR AND GLASS



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.

S

FRONT DOOR LOCK AND OPENER

FRONT DOOR LOCK AND OPENER

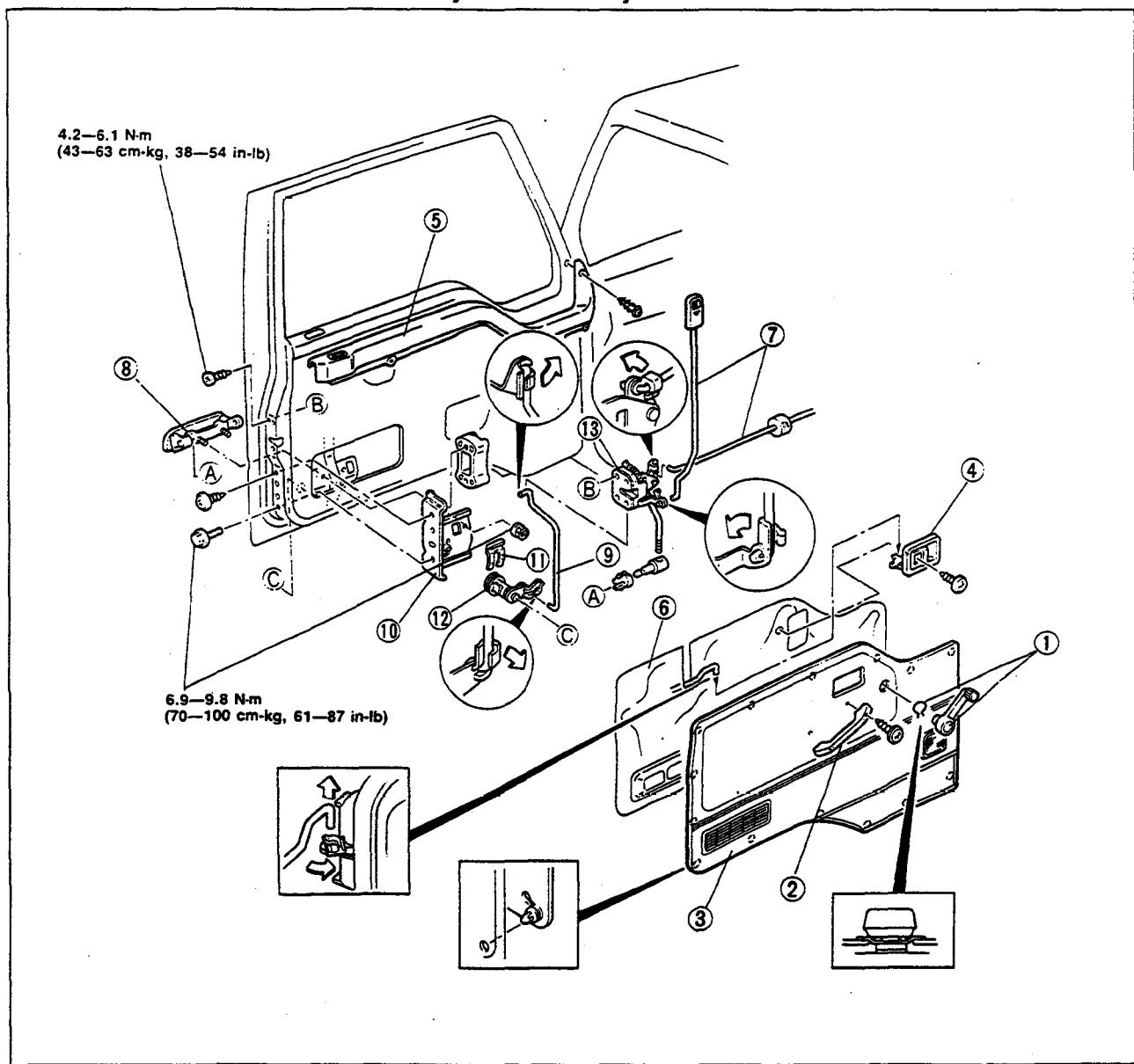
COMPONENTS

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

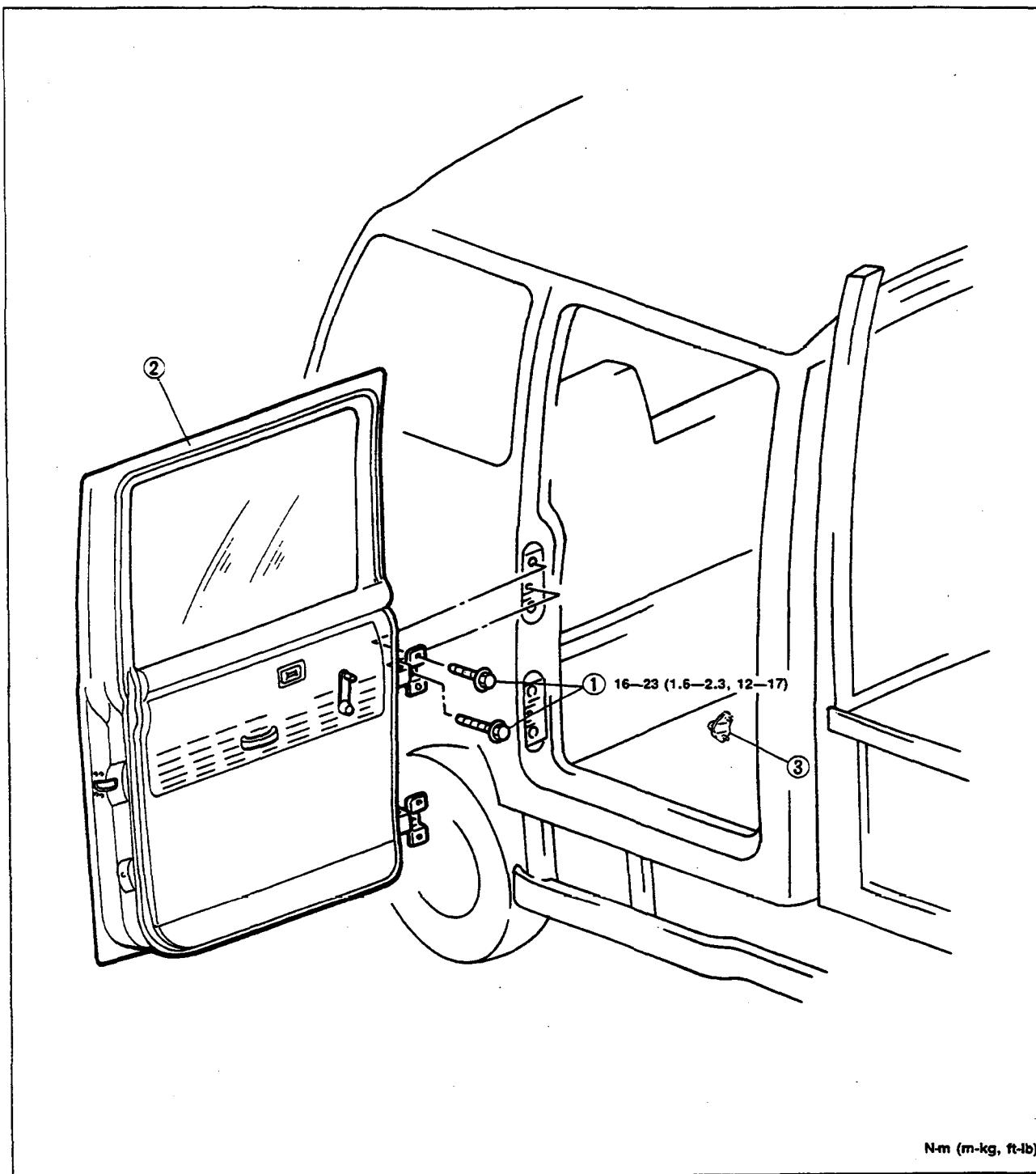
1. Regulator handle
Removal Note..... page S-11
2. Armrest
3. Door trim
4. Inner handle
5. Cover
6. Door screen
7. Opener link
8. Outer door handle
9. Door lock link
10. Bracket
11. Lock cylinder retainer
12. Lock cylinder
13. Door lock assembly

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.

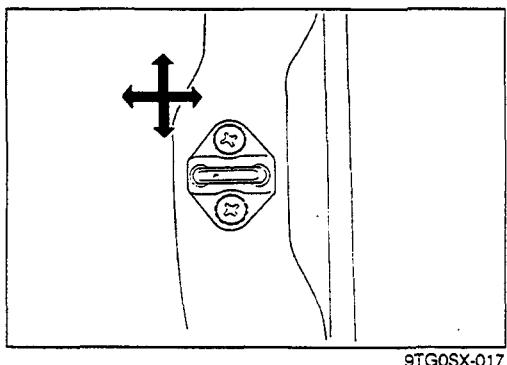


1. Bolt
2. Rear door
Adjustment..... page S-14

3. Door lock striker
Adjustment..... page S-14

S

REAR 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 front door (crew cabin). If there is a problem, adjust by moving the door lock striker laterally.

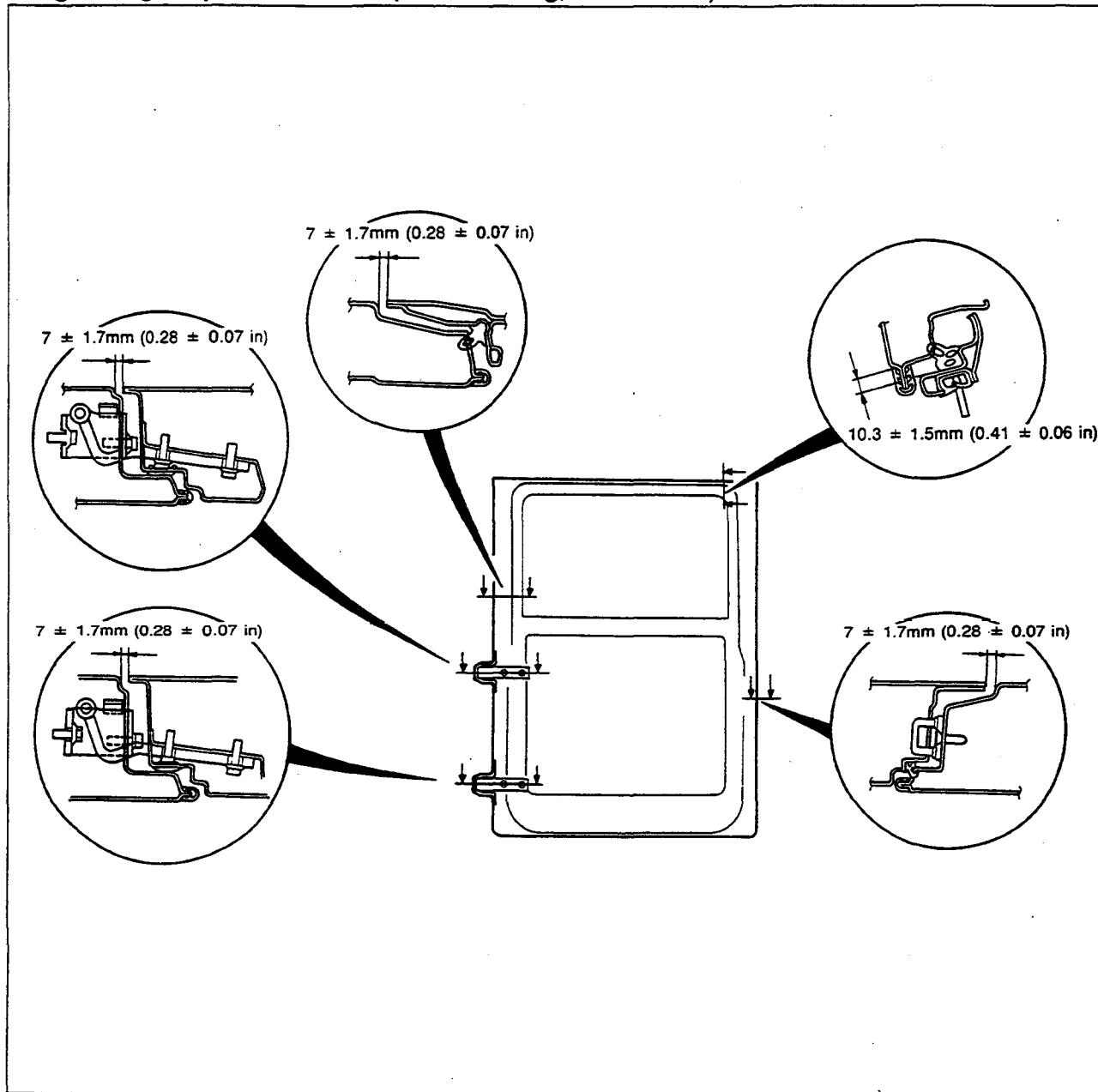
Tightening torque:

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)



REAR WINDOW REGULATOR AND GLASS

REAR WINDOW REGULATOR AND GLASS

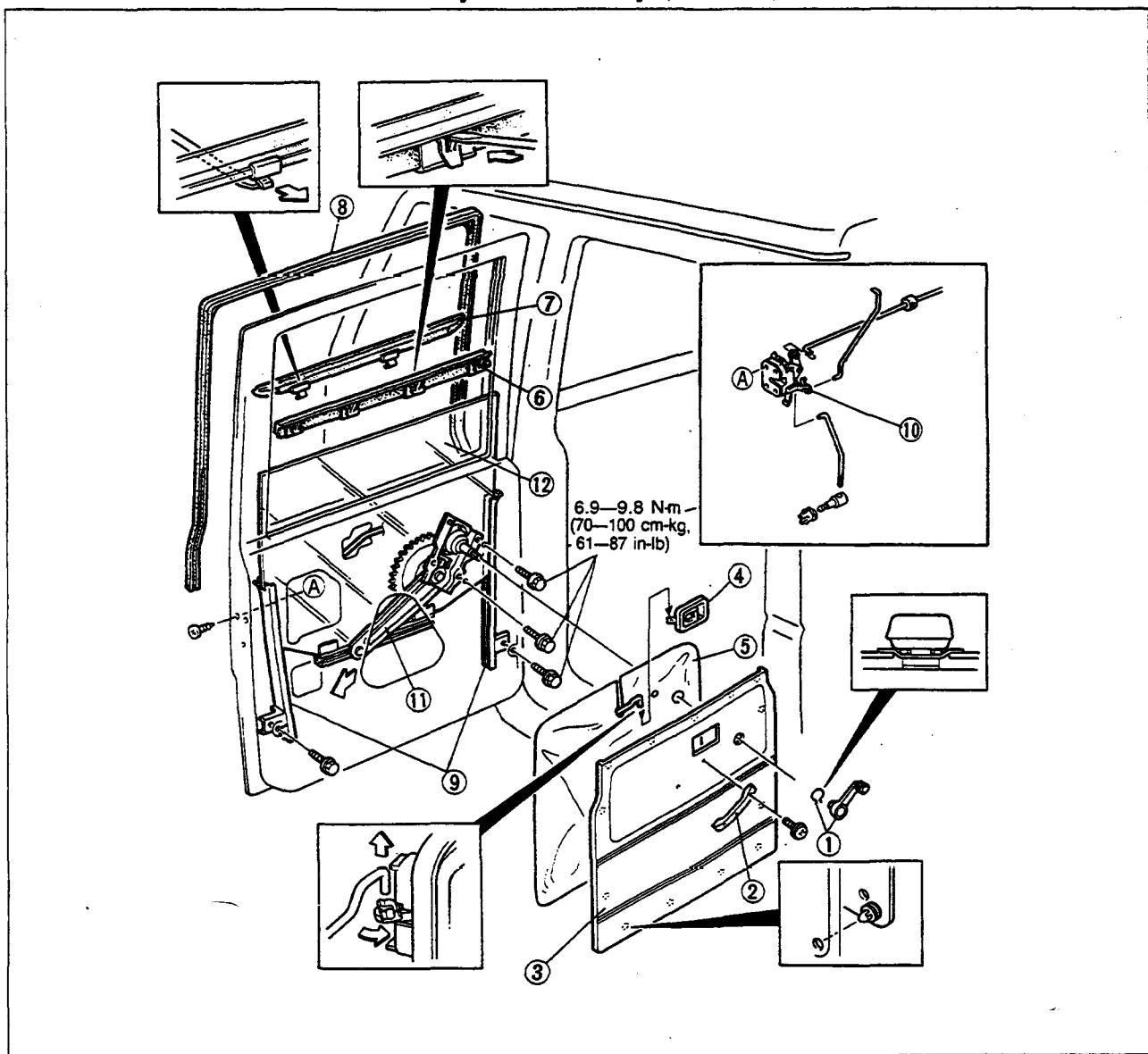
COMPONENTS

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.

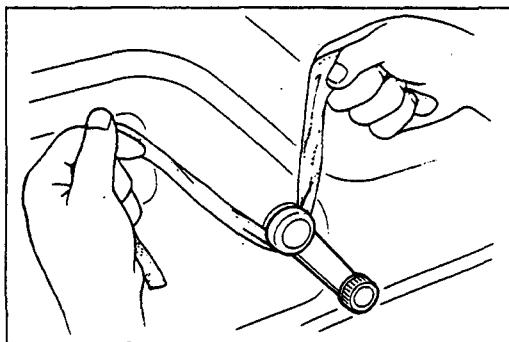
Caution

- Remove the door screen carefully so that it may be reused.

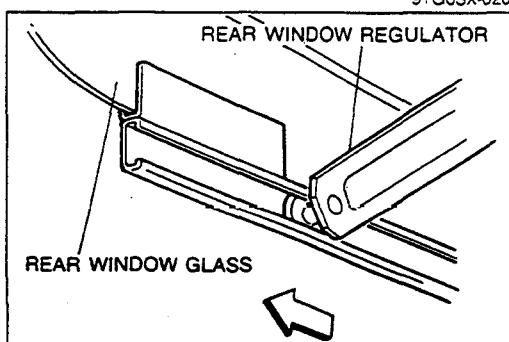


9TG0SX-019

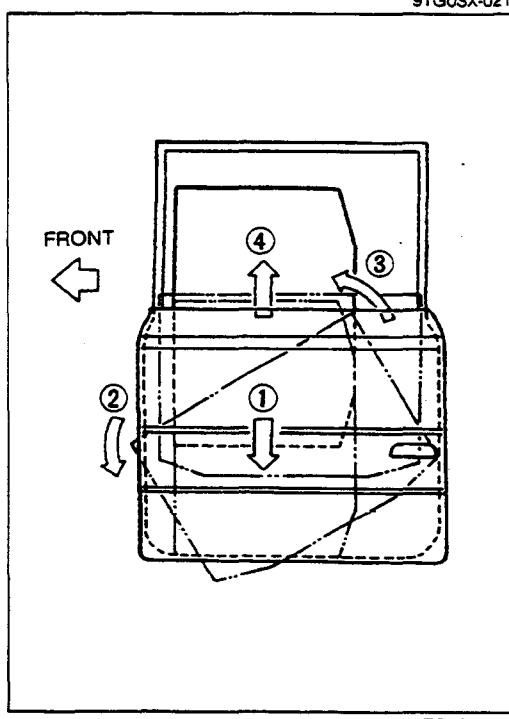
- | | | |
|--|-----------|--|
| 1. Regulator handle
Removal Note..... | page S-16 | 8. Run channel |
| 2. Armrest | | 9. Glass guide |
| 3. Door trim | | 10. Rear door lock assembly |
| 4. Inner handle | | 11. Rear window regulator
Removal Note..... |
| 5. Door screen | | page S-16 |
| 6. Inner weatherstrip | | 12. Rear window glass
Removal Note..... |
| 7. Outer weatherstrip | | page S-16 |

**Removal note****Regulator handle**

1. Remove the regulator handle with a rag as shown in the figure.

**Rear window regulator**

1. Remove the regulator as shown in the figure.

**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

REAR DOOR LOCK AND OPENER

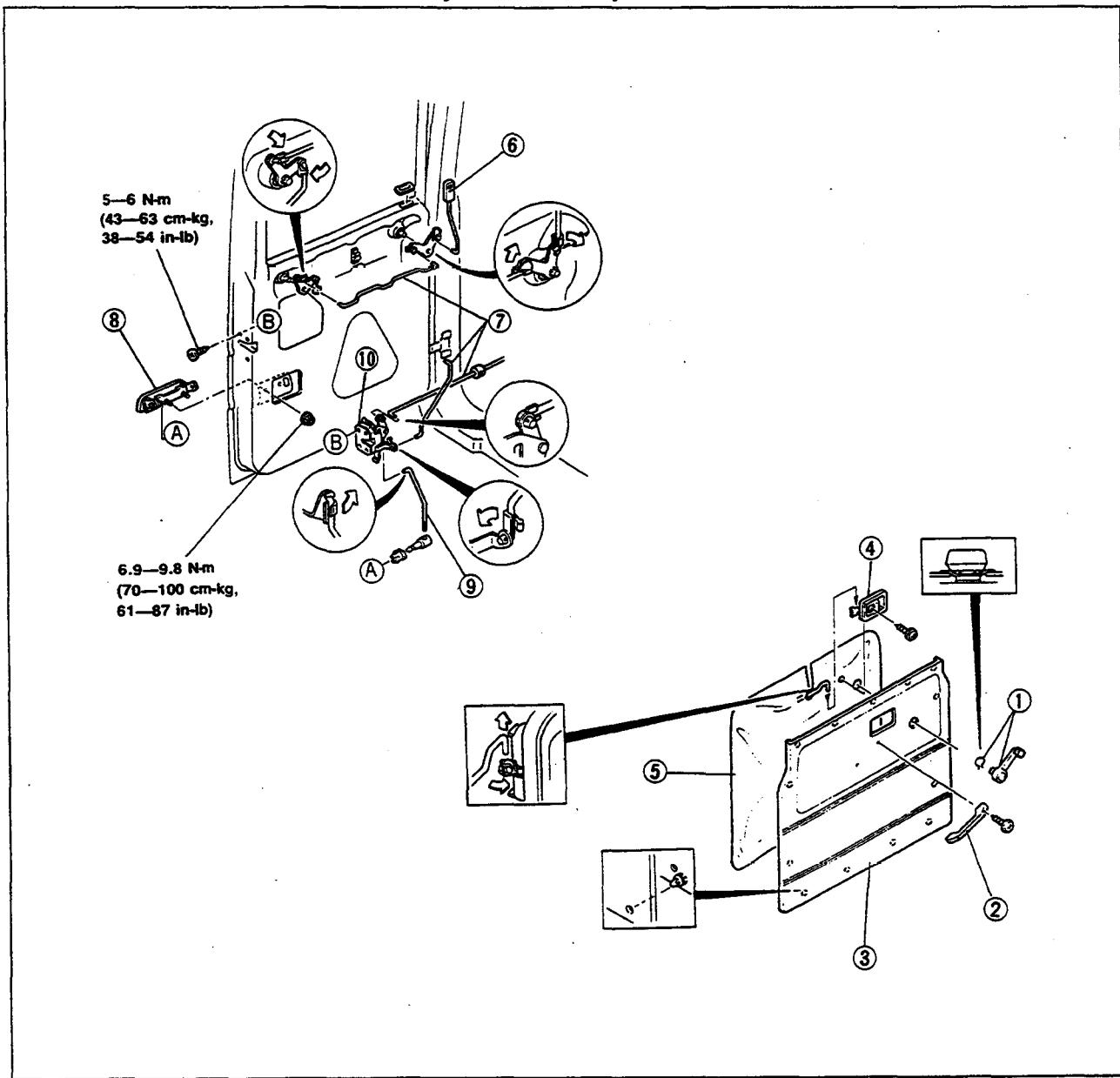
COMPONENTS

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 | 6. Opener link |
| 2. Armrest | | 7. Door lock link 1 |
| 3. Door trim | | 8. Outer door handle |
| 4. Inner handle | | 9. Door lock link 2 |
| 5. Door screen | | 10. Door lock assembly |

S

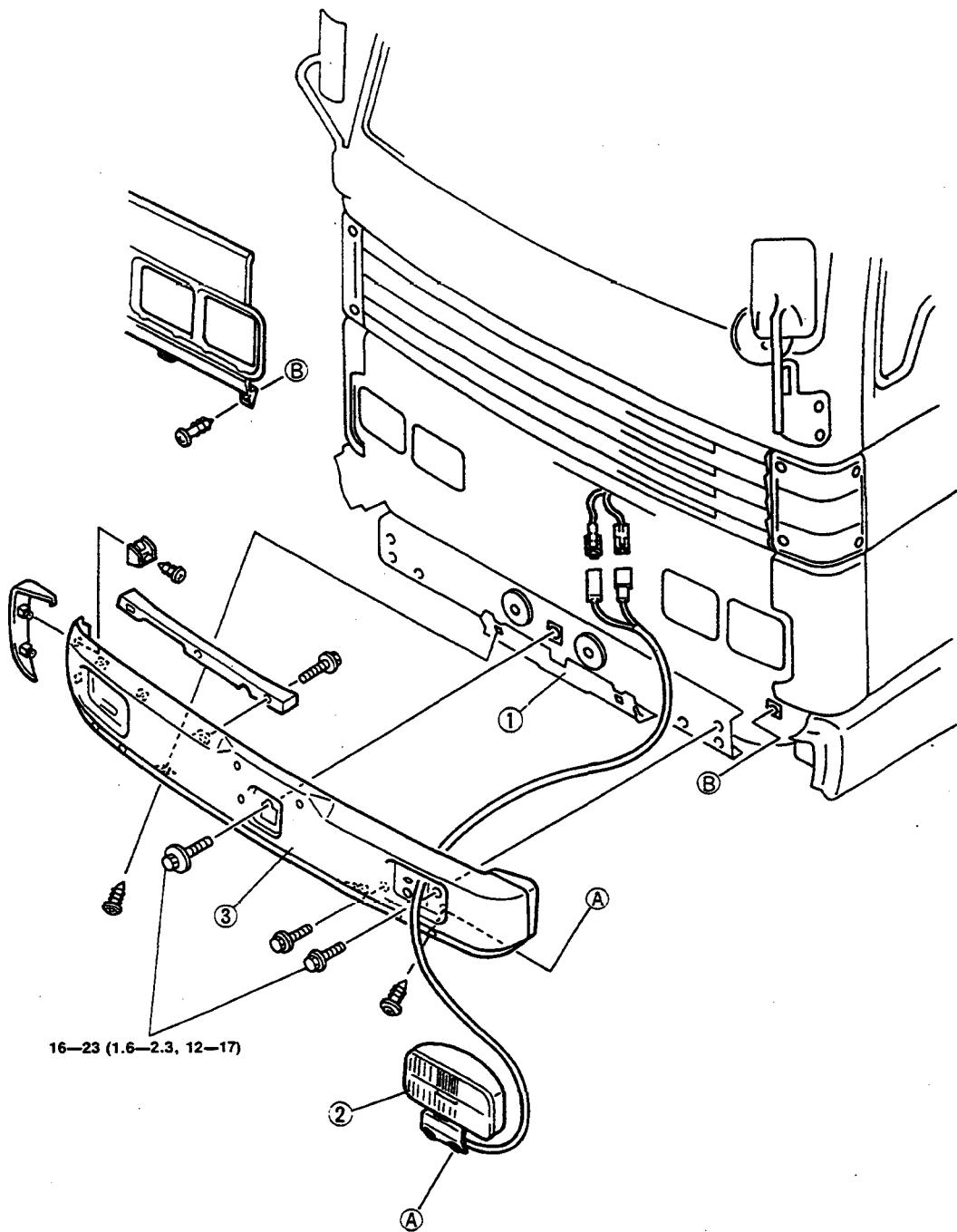
FRONT BUMPER

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

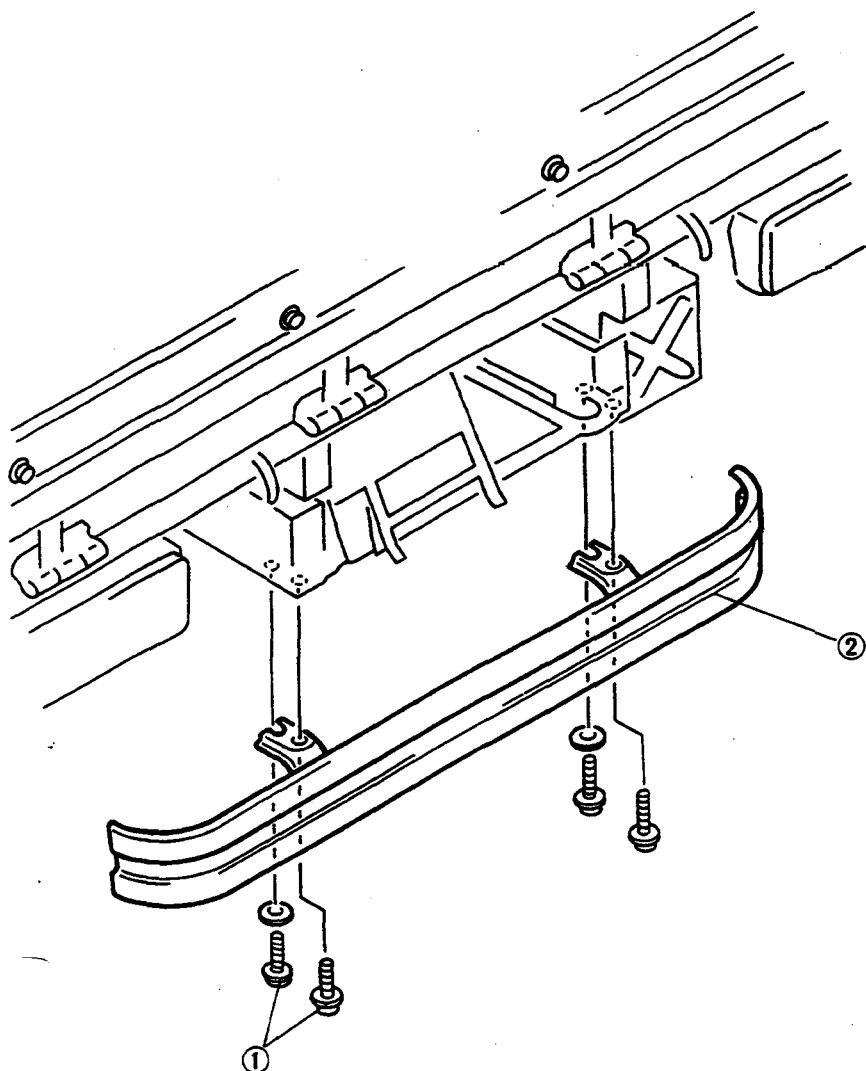
3. Front bumper assembly

N·m (m·kg, ft·lb)

9TG0SX-024

REAR BUMPER**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.



1. Bolt

2. Rear bumper

S

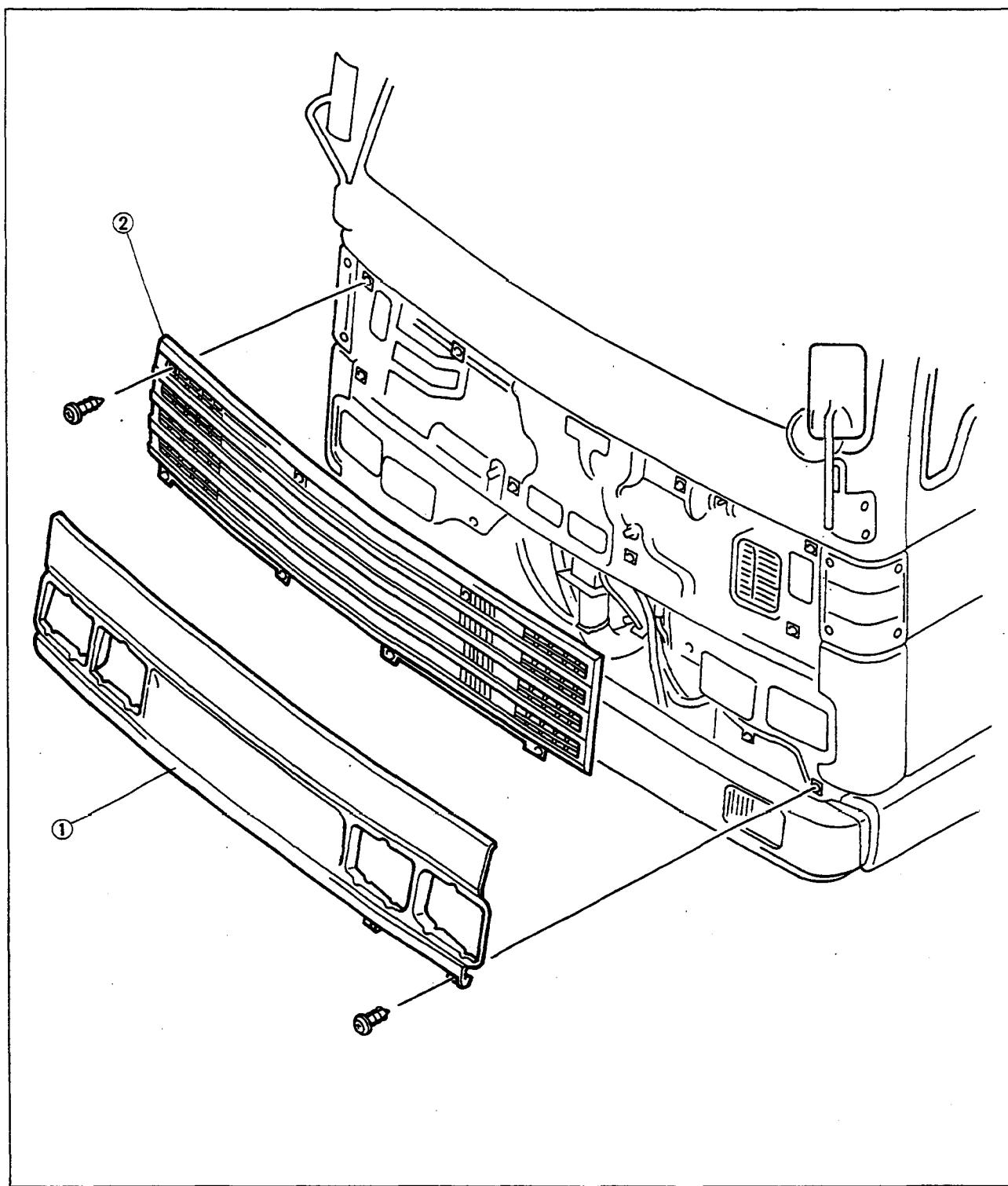
RADIATOR GRILLE/FRONT GRILLE

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.



1. Radiator grille

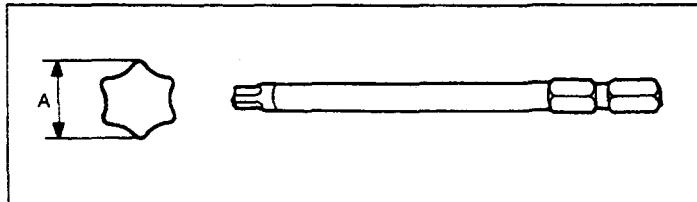
2. Front grille

9TG0SX-026

STEP**STEP****PREPARATION**

*1 Torx wrench	For removal and installation of step
-------------------	--------------------------------------

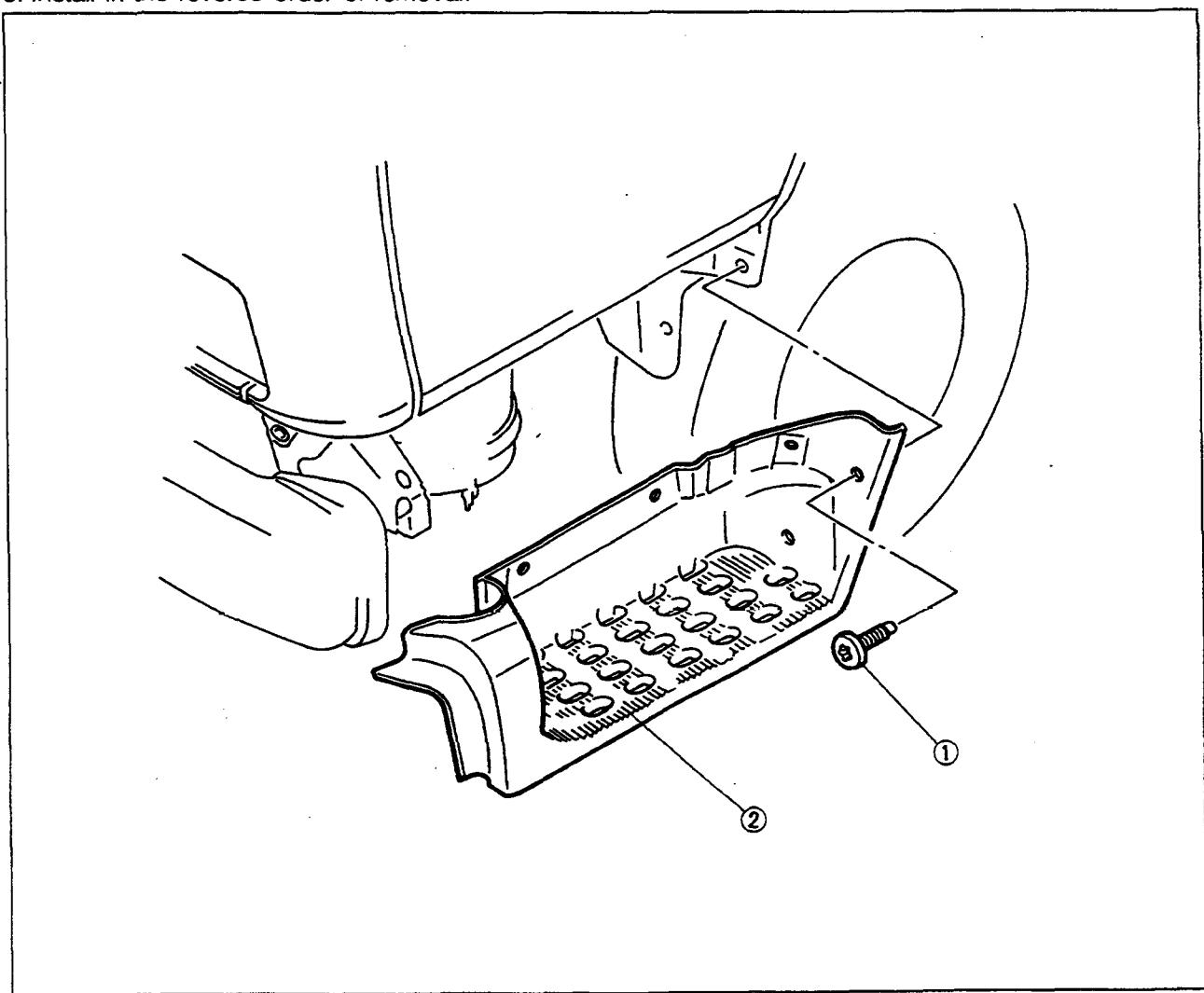
*1
Torx wrench
specification



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.



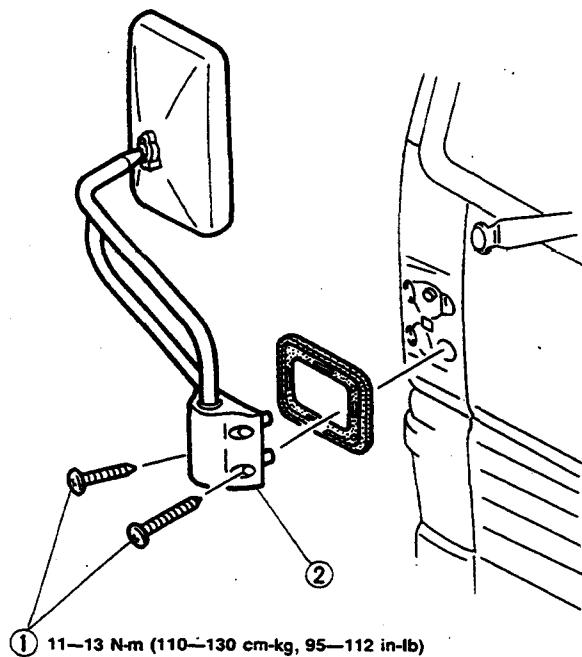
1. Torx screw

2. Step

MIRROR**MIRROR****Removal / Installation**

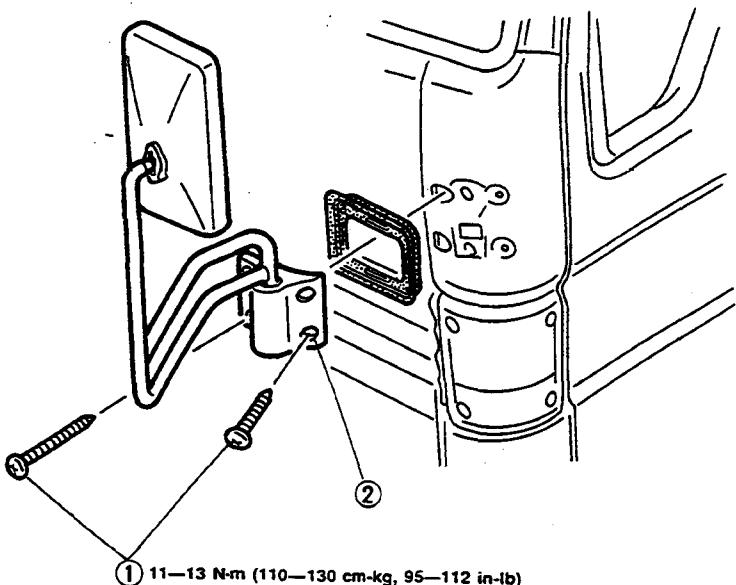
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.

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)

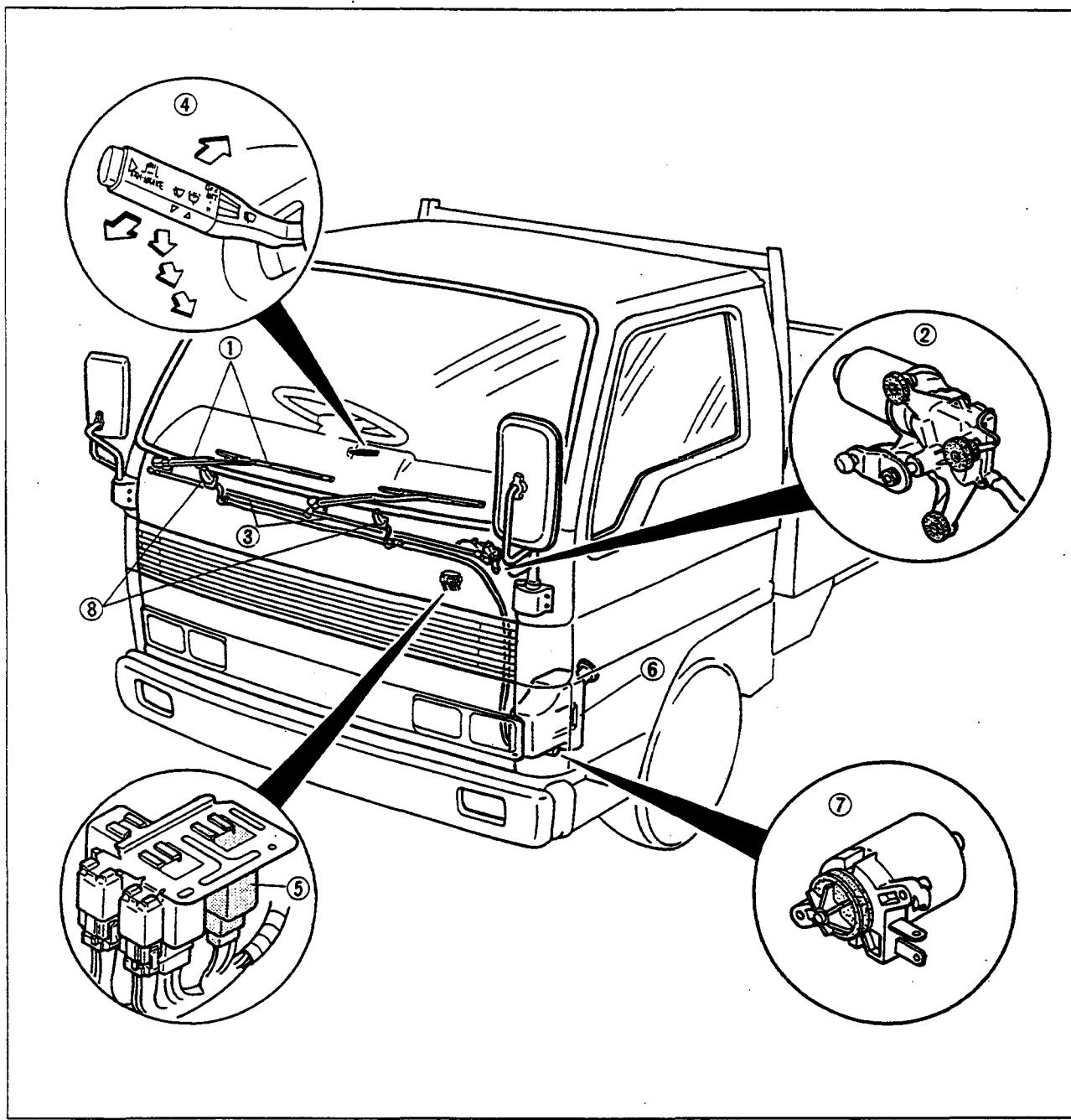
1. Bolt

2. Mirror

9TG0SX-028

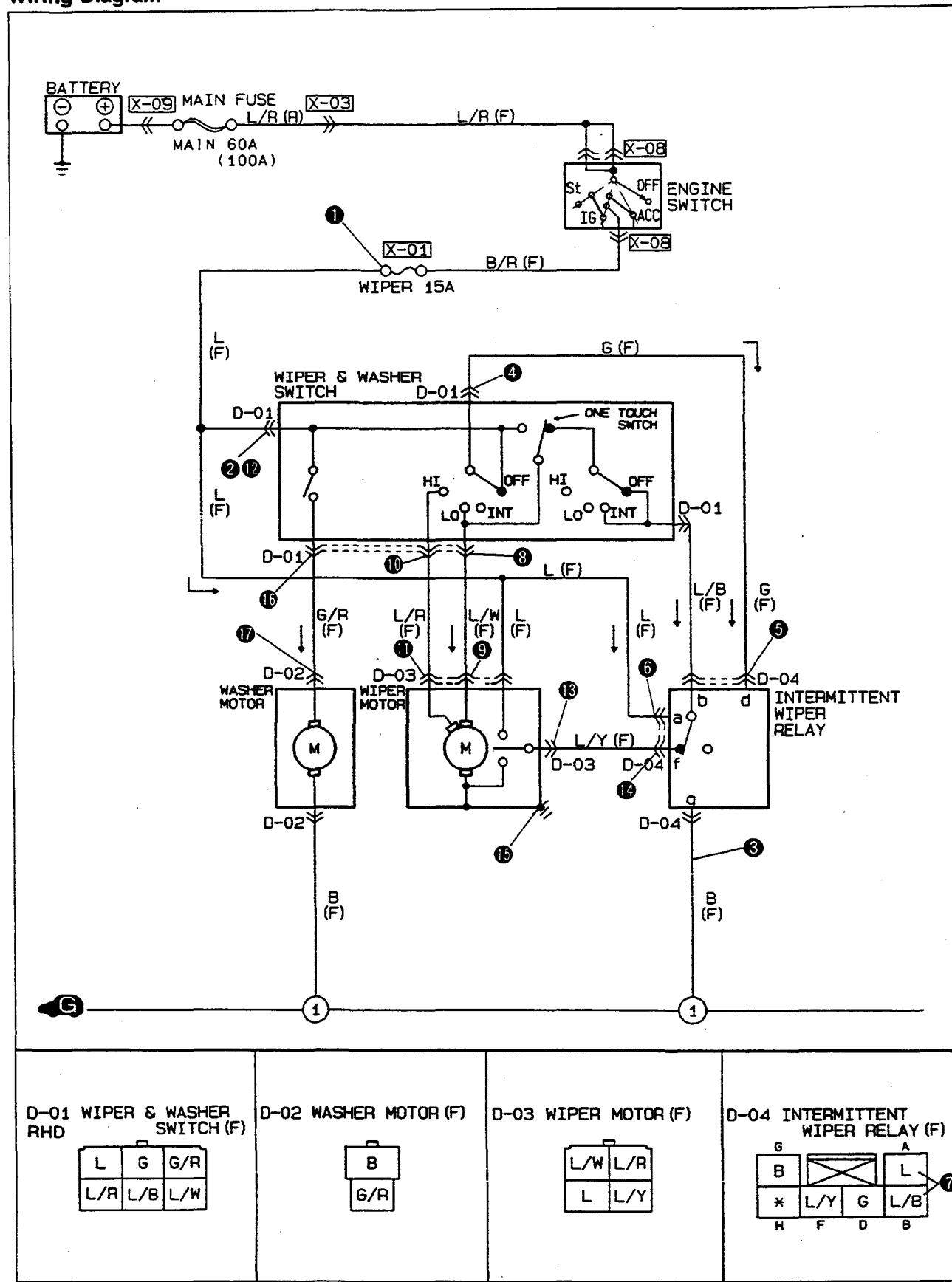
WINDSHIELD WIPER AND WASHER

STRUCTURAL VIEW



9TG0SX-029

- | | |
|--|--|
| 1. Wiper arm and blade
Removal / Installation page S-29
Adjustment page S-32 | 5. Intermittent wiper relay
Inspection page S-34 |
| 2. Wiper motor and bracket
Removal / Installation page S-29
Disassembly / Assembly page S-33
Inspection page S-33 | 6. Washer tank assembly
Removal / Installation page S-29 |
| 3. Wiper link assembly
Removal / Installation page S-30 | 7. Washer motor
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Inspection page S-34 |
| 4. Wiper and washer switch
Inspection page S-34 | 8. Washer nozzle
Removal / Installation page S-31
Adjustment page S-32 |

S**WINDSHIELD WIPER AND WASHER****TROUBLESHOOTING GUIDE****Wiring Diagram**D-01 WIPER & WASHER
RHD SWITCH (F)

L	G	G/R
L/R	L/B	L/W

D-02 WASHER MOTOR (F)

B
G/R

D-03 WIPER MOTOR (F)

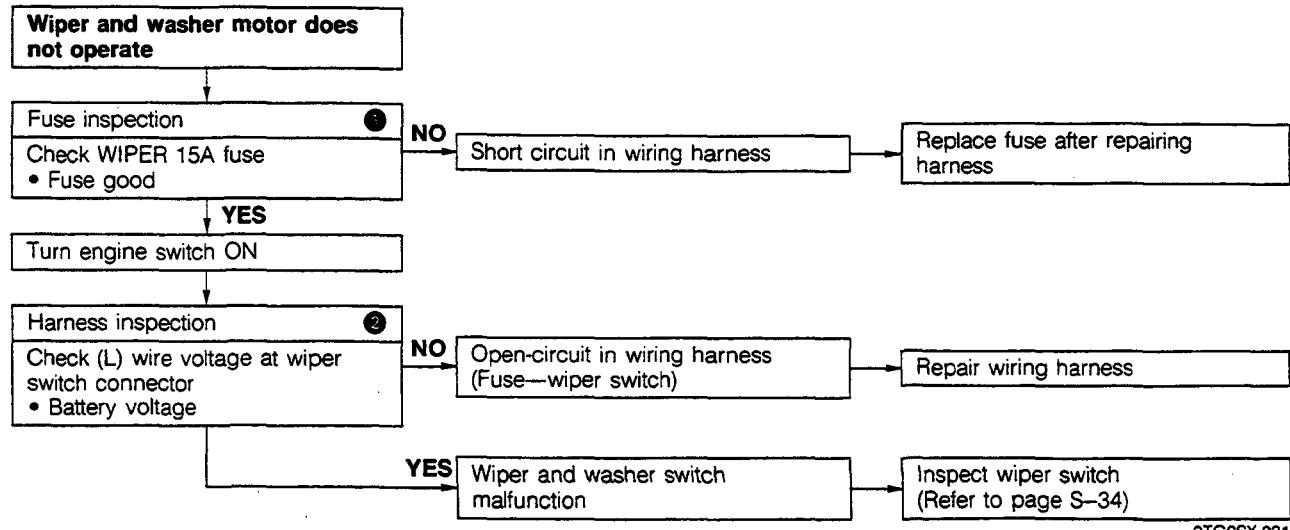
L/W	L/R
L	L/Y

D-04 INTERMITTENT
WIPER RELAY (F)

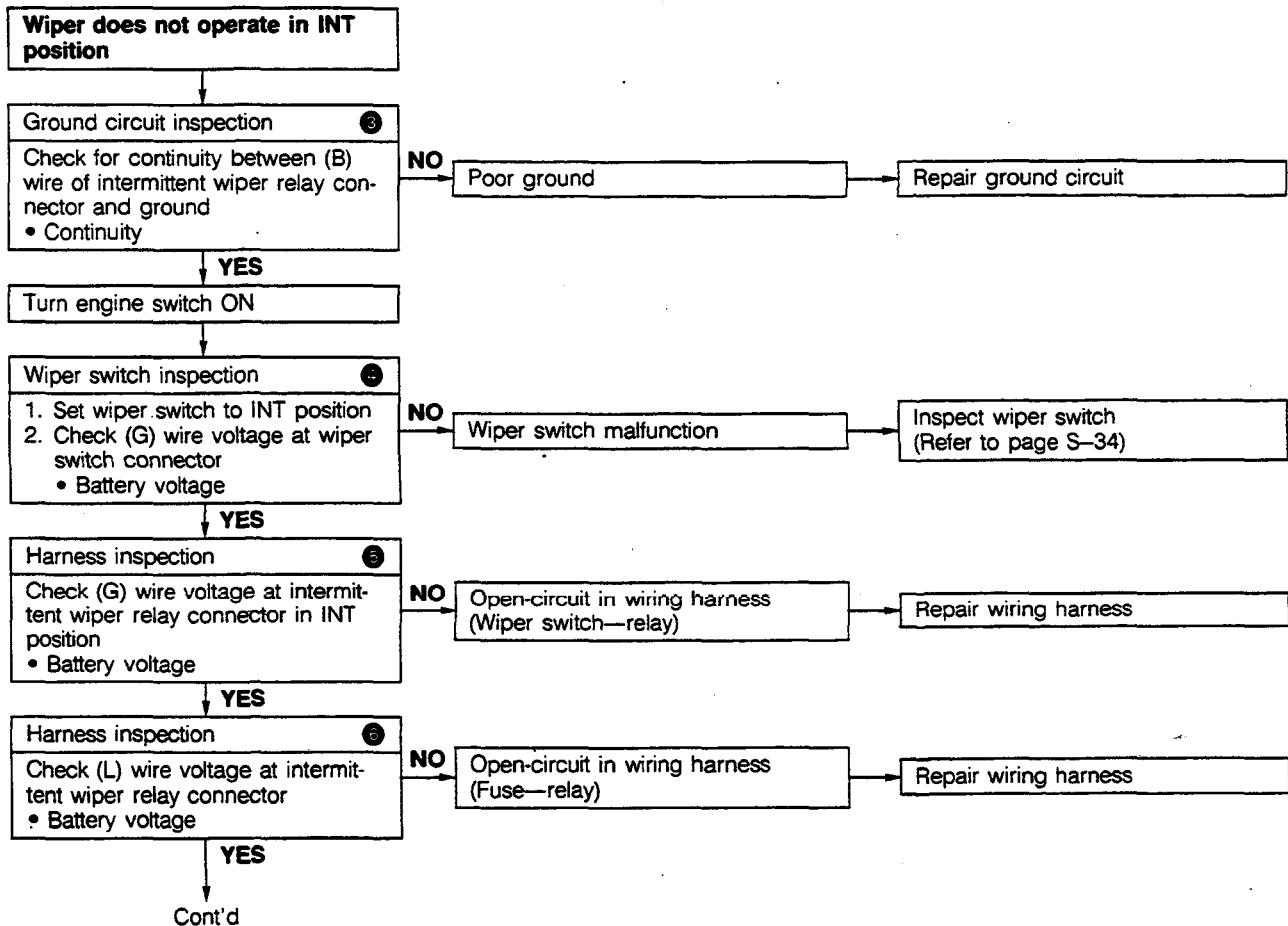
G		A
B		L
*	L/Y	G
H	F	D
		B

WINDSHIELD WIPER AND WASHER

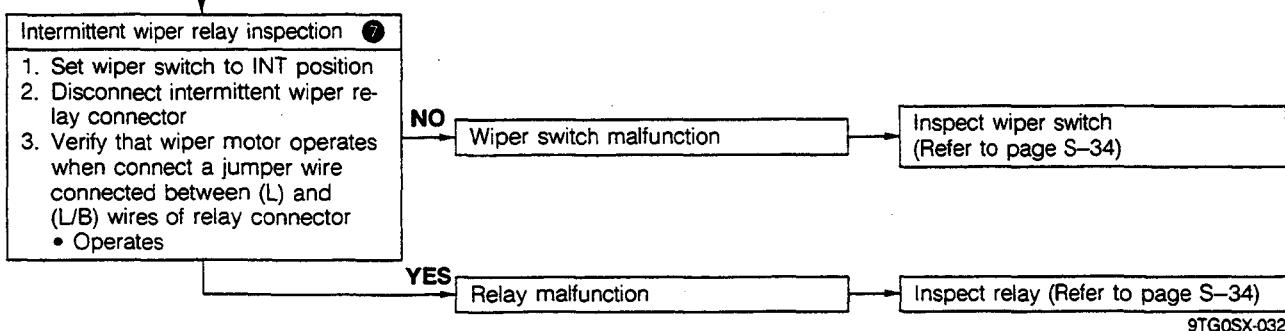
S



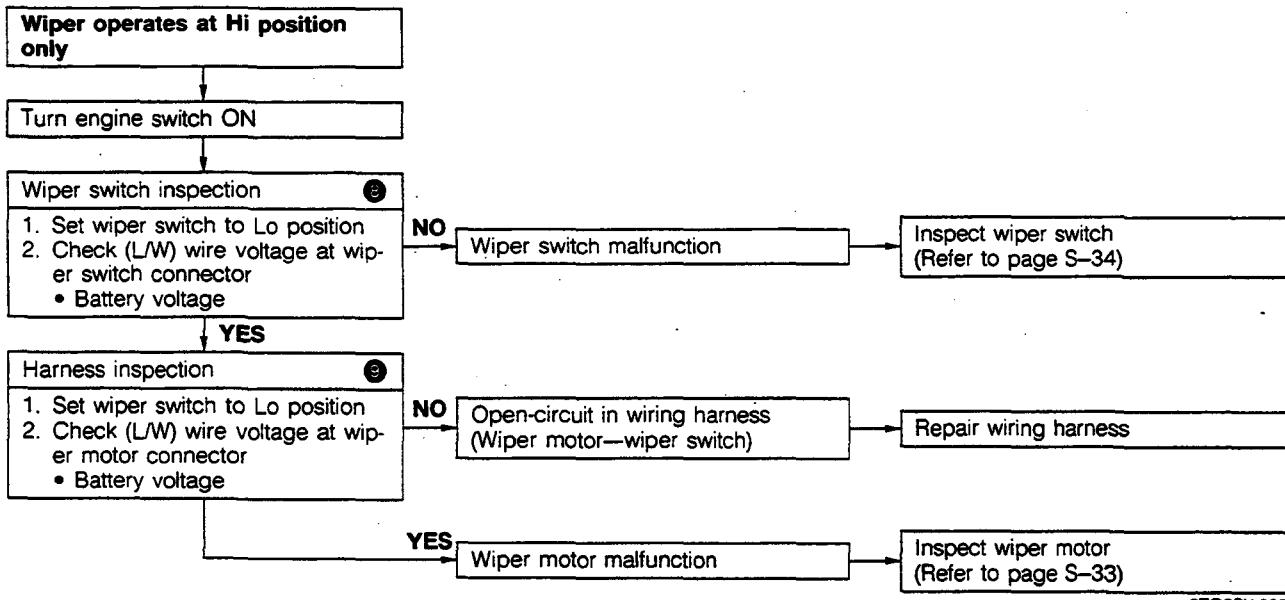
9TG0SX-031



Cont'd



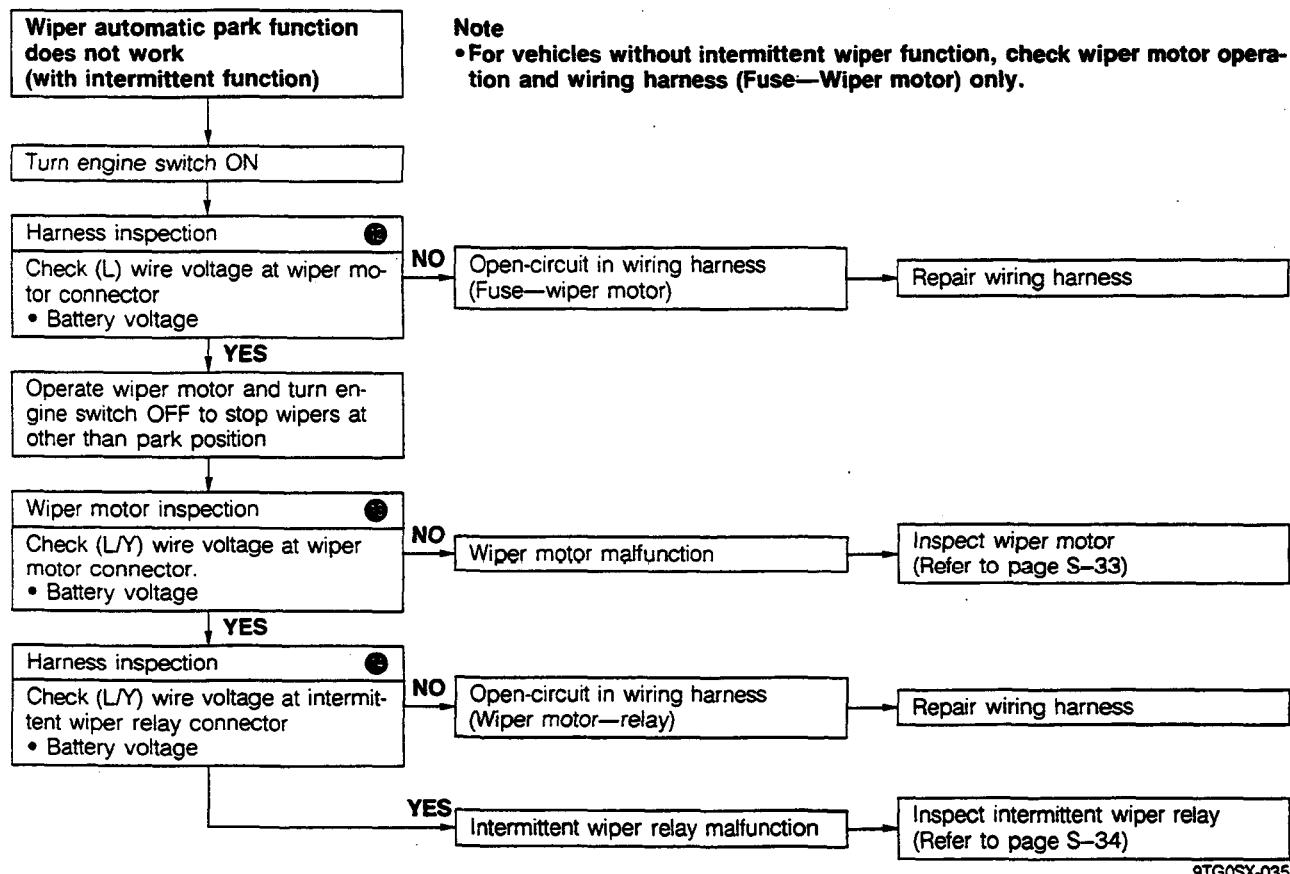
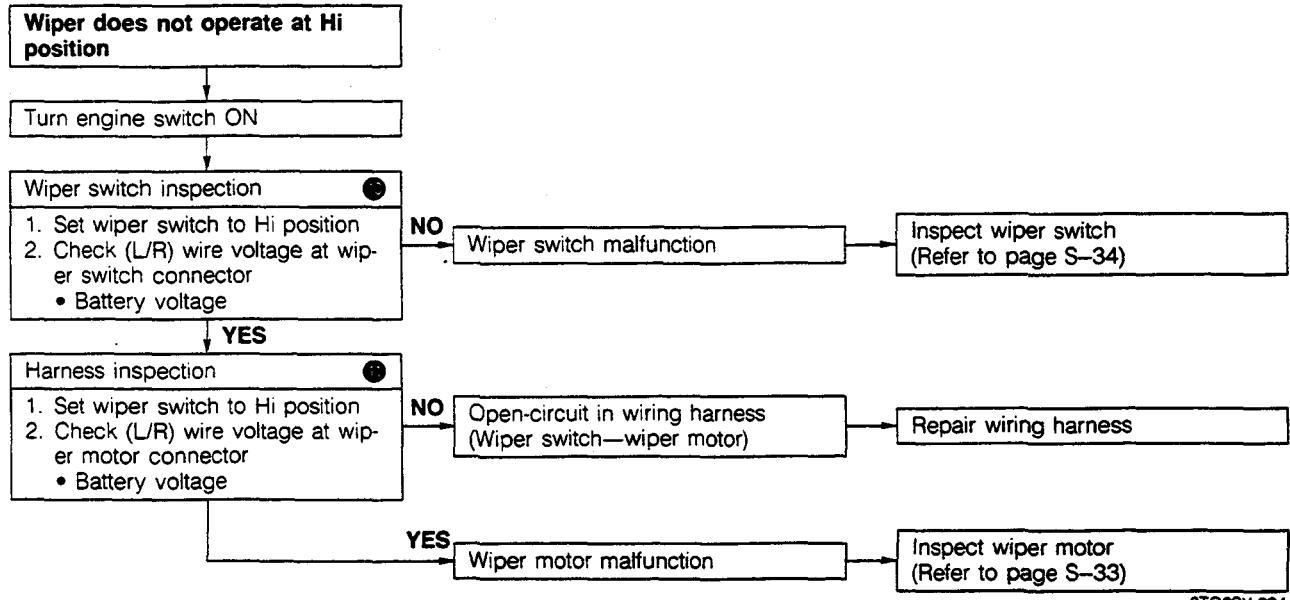
9TG0SX-032



9TG0SX-033

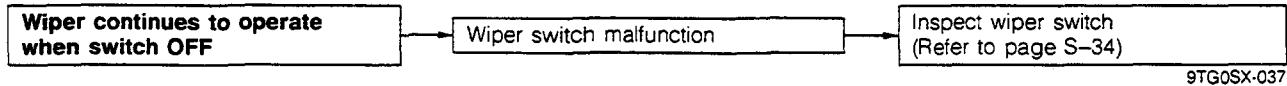
WINDSHIELD WIPER AND WASHER

S

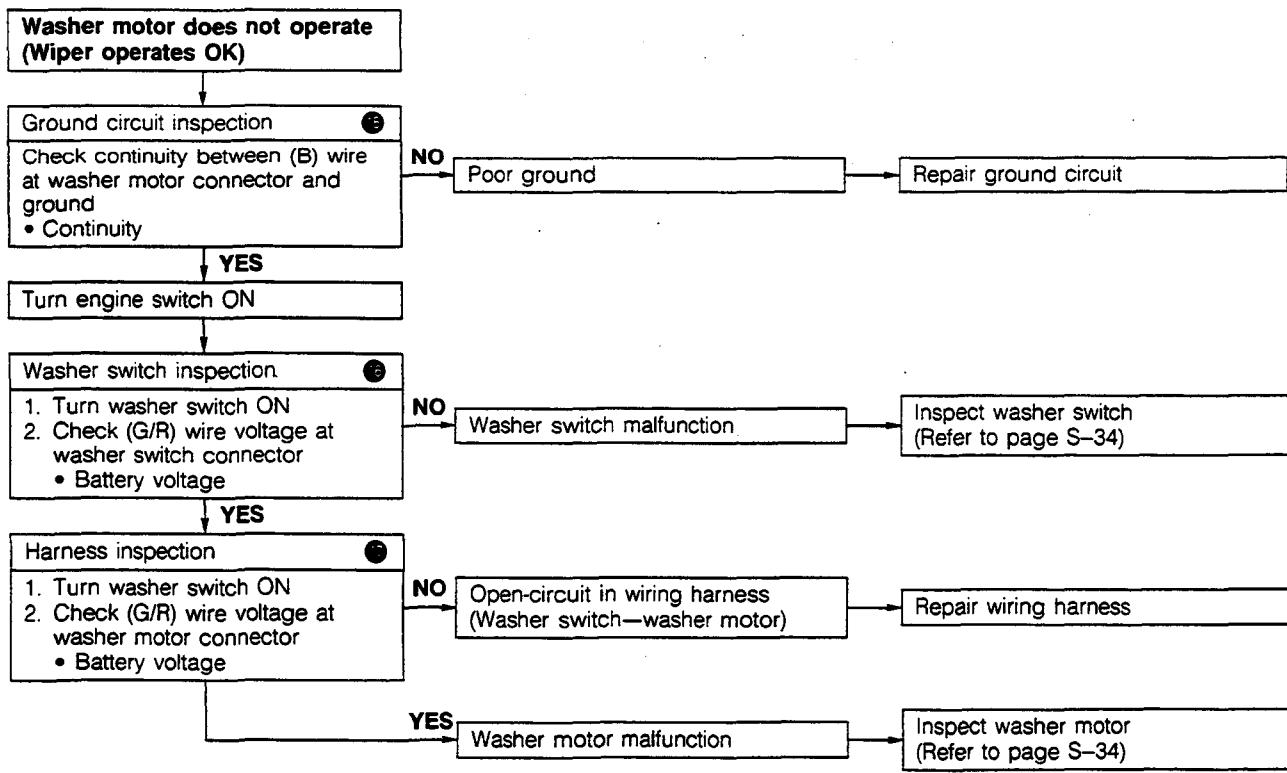


S**WINDSHIELD WIPER AND WASHER**

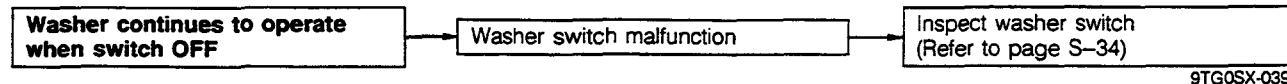
9TG0SX-036



9TG0SX-037



9TG0SX-038



9TG0SX-039

WINDSHIELD WIPER AND WASHER

COMPONENTS

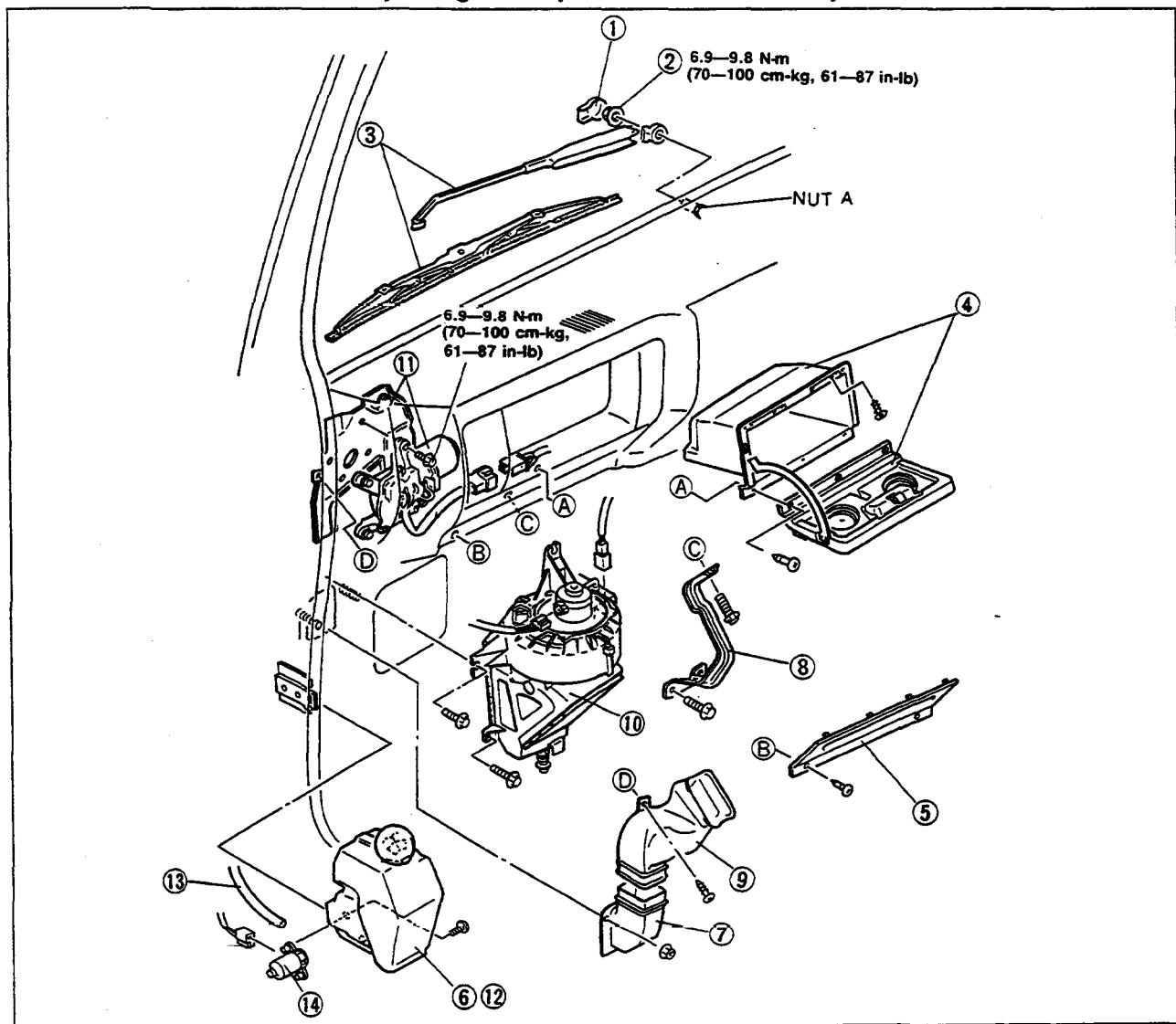
Removal / Installation

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

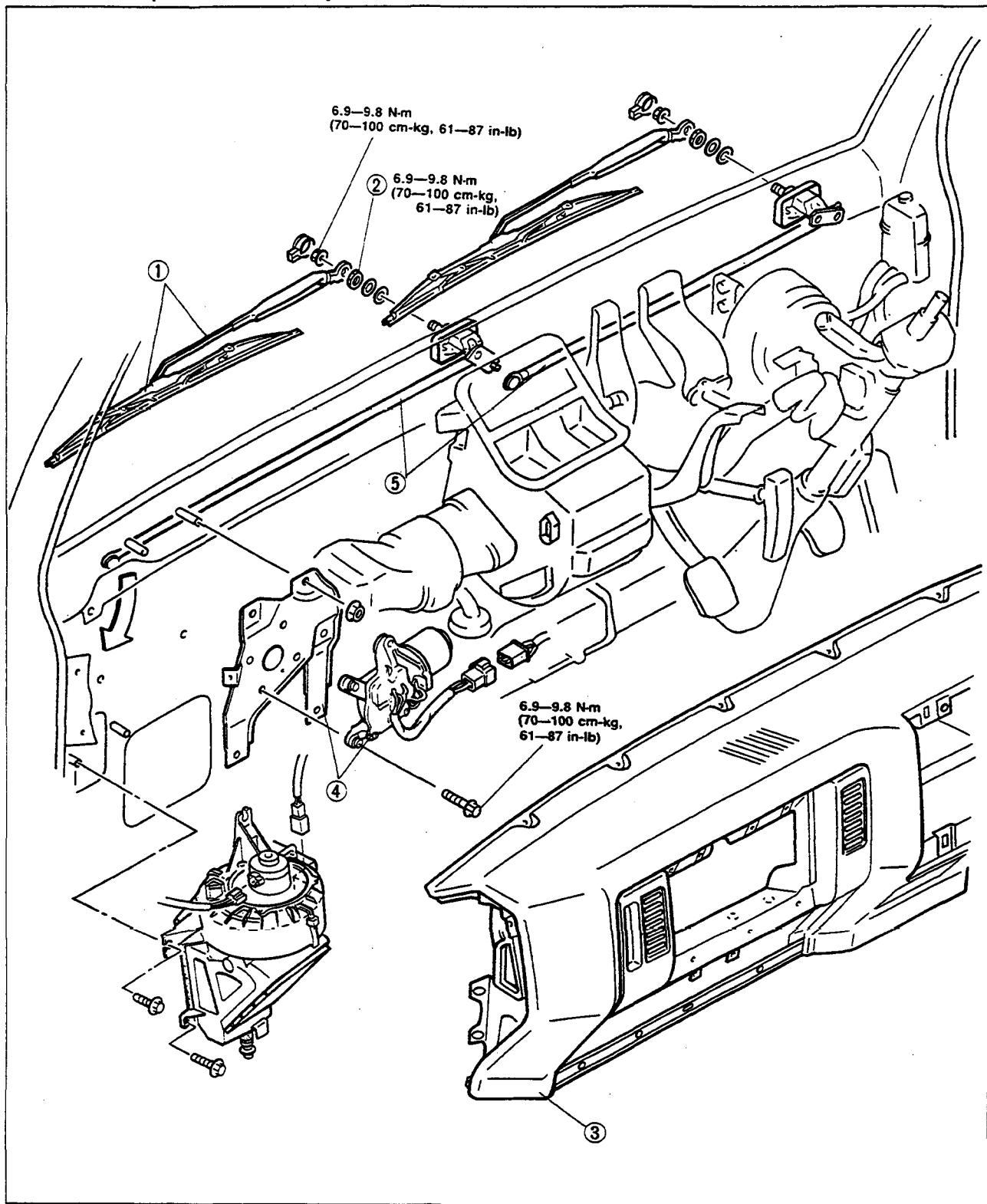
4. Glove box
5. Lower panel
6. Washer tank assembly
7. Fresh air duct
8. Bracket

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

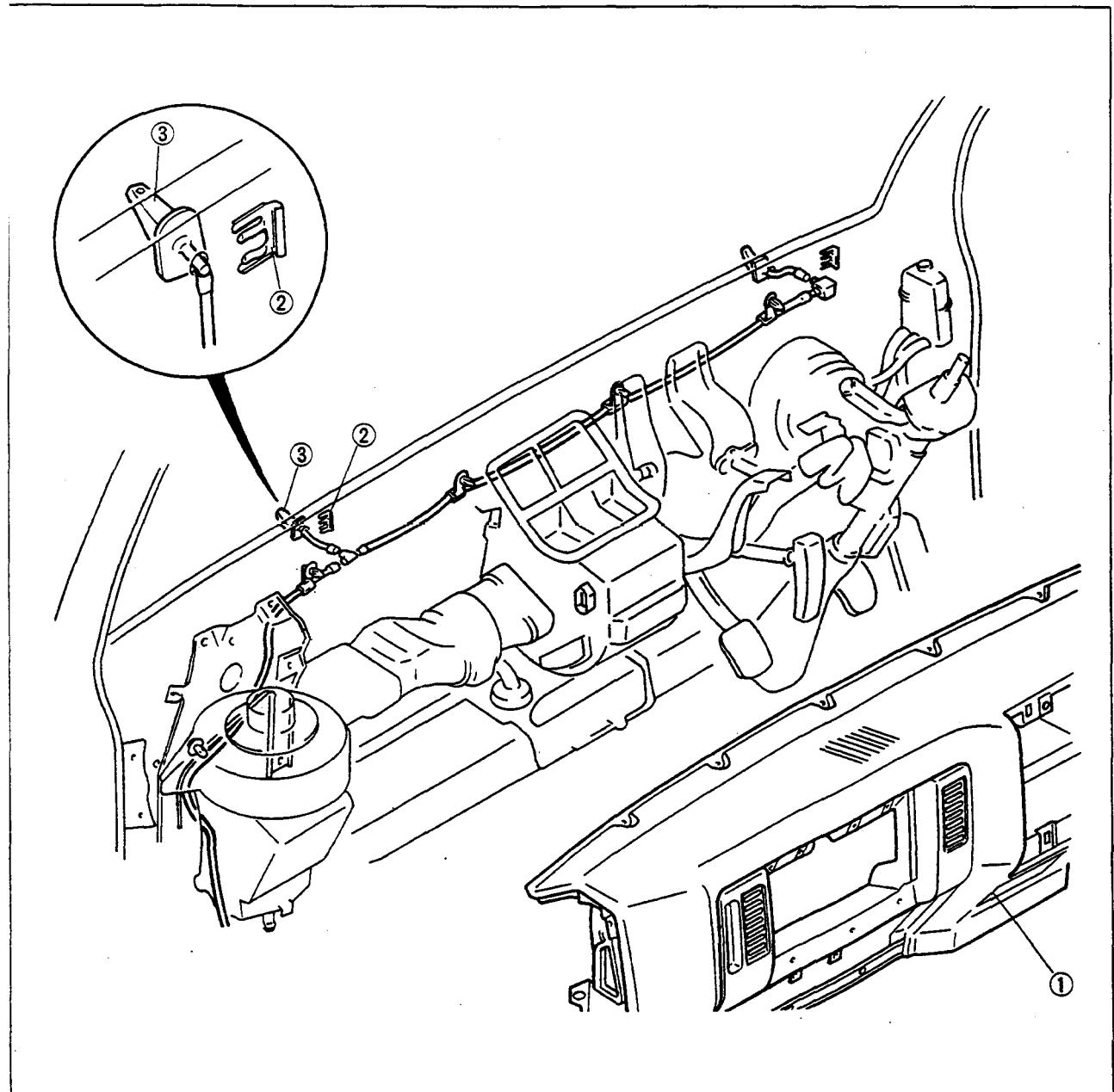
12. Washer tank assembly
13. Washer pipe
14. Washer motor
Inspection page S-34

S**WINDSHIELD WIPER AND WASHER****Windshield wiper link assembly**

9TG0SX-041

- | | | | |
|---|-----------|---|-----------|
| 1. Wiper arm and blade
Adjustment..... | page S-32 | 4. Wiper motor and bracket
Installation Note | page S-31 |
| 2. Nut | | Disassembly / Assembly | page S-33 |
| 3. Instrument panel
Removal / Installation | page S-50 | Inspection | page S-33 |
| | | 5. Windshield wiper link assembly | |

Washer nozzle

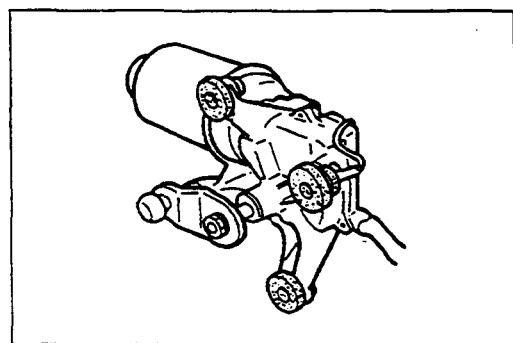


9TG0SX-042

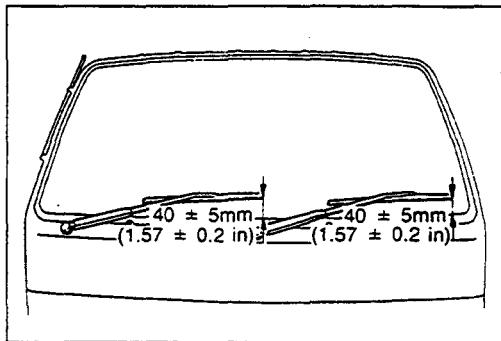
- | | |
|---|--|
| 1. Instrument panel
Removal / Installation page S-50 | 3. Washer nozzle
Adjustment page S-32 |
| 2. Clip | |

Installation note
Wiper motor and bracket

1. Align the wiper motor arm as shown in the figure.



9TG0SX-043

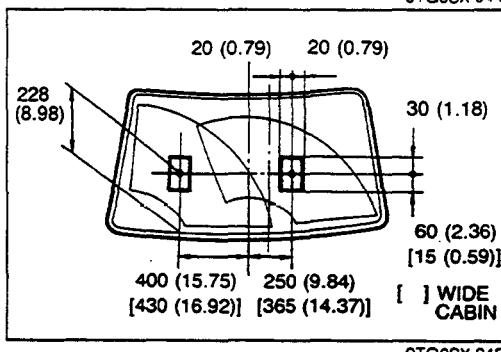
**Adjustment****Wiper arm height**

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: $40 \pm 5\text{mm}$ ($1.57 \pm 0.2\text{ in}$)

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.

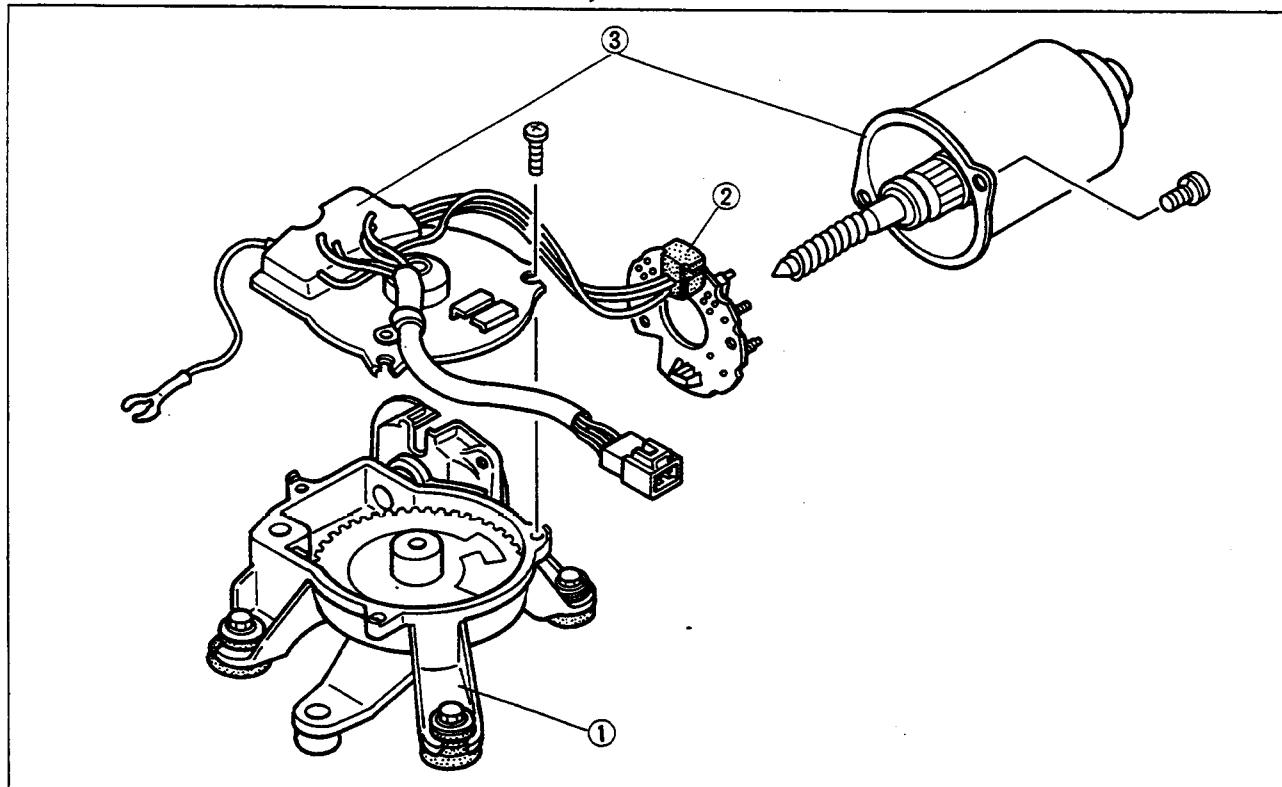
WINDSHIELD WIPER AND WASHER

S

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

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

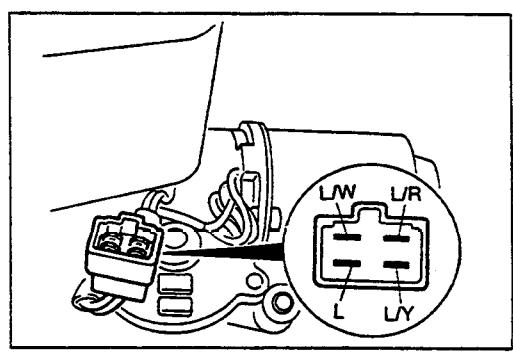
Note

- **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 applying 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.

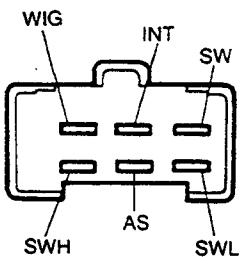


9TG0SX-050

9TG0SX-048

S-33

WINDSHIELD WIPER AND WASHER



9TG0SX-052

WIPER AND WASHER SWITCH

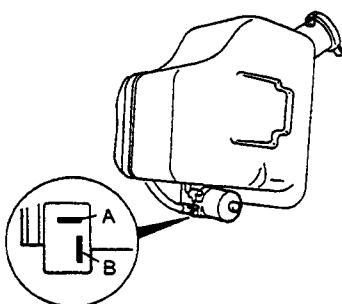
Inspection

1. Check continuity between terminals.

Wiper	AS	SWL	SWH	WIG	INT	SW
OFF	○	○				
One touch: ON		○		○		
INT	○	○		○	○	
Lo		○		○		
Hi			○	○		
Washer: ON				○		○

○—○: 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.

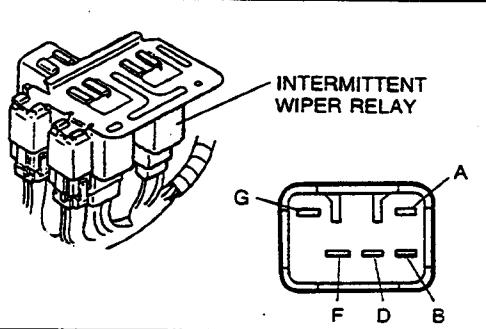
Operation

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	
B	12V	Operates

3. If not as specified, replace the washer motor.

9TG0SX-047



9TG0SX-048

INTERMITTENT WIPER RELAY

Inspection

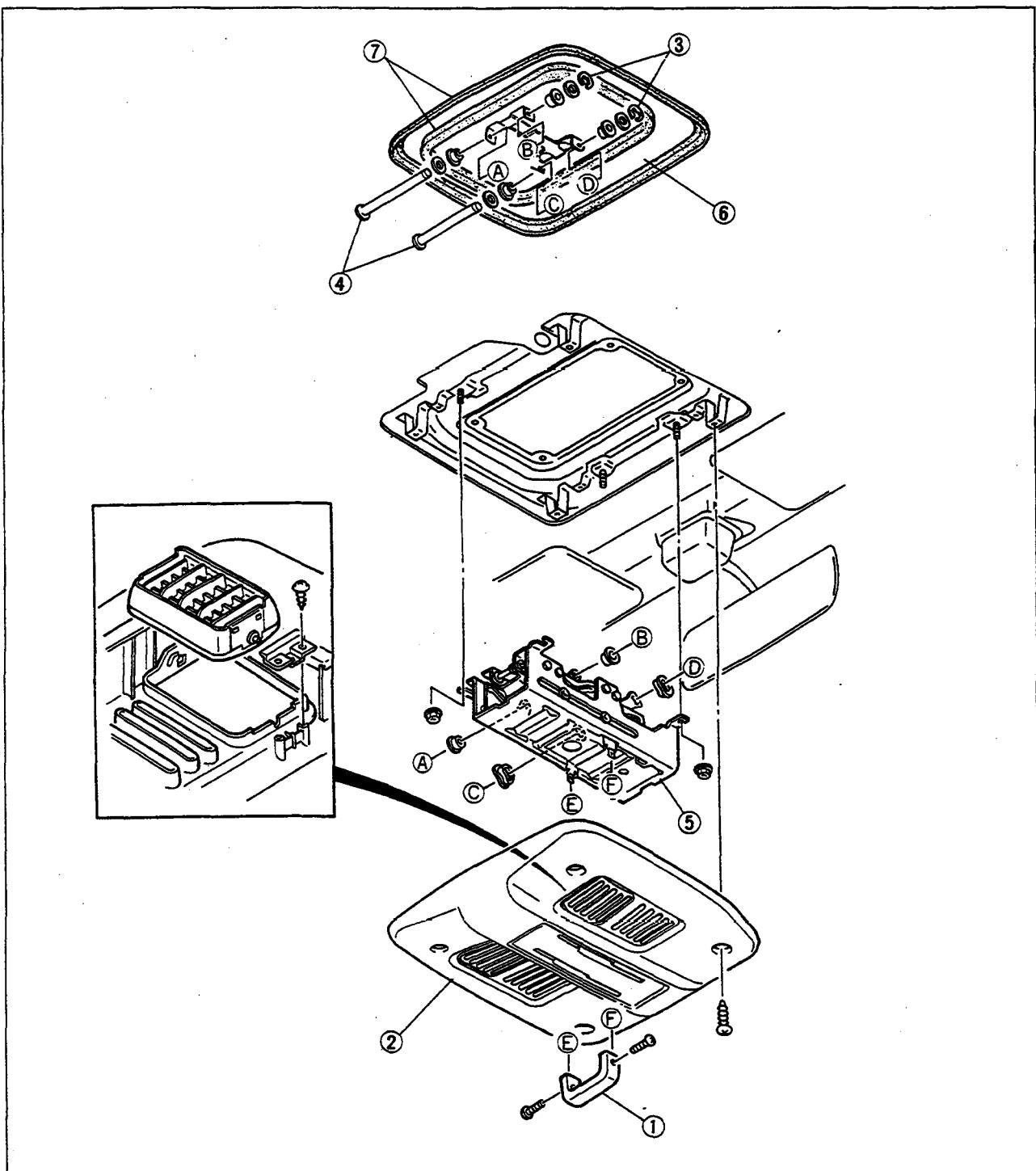
1. Connect a jumper wire between A and D terminals of the relay connector, and connect a voltmeter to B terminal of the relay connector.
2. Turn the engine switch ON and measure the voltage.

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.



1. Lever
2. Ventilator grille
3. Retaining ring
4. Shaft

5. Lever assembly
6. Roof lid assembly
7. Seal rubber

9TG0SX-053

WINDSHIELD

PREPARATION SST

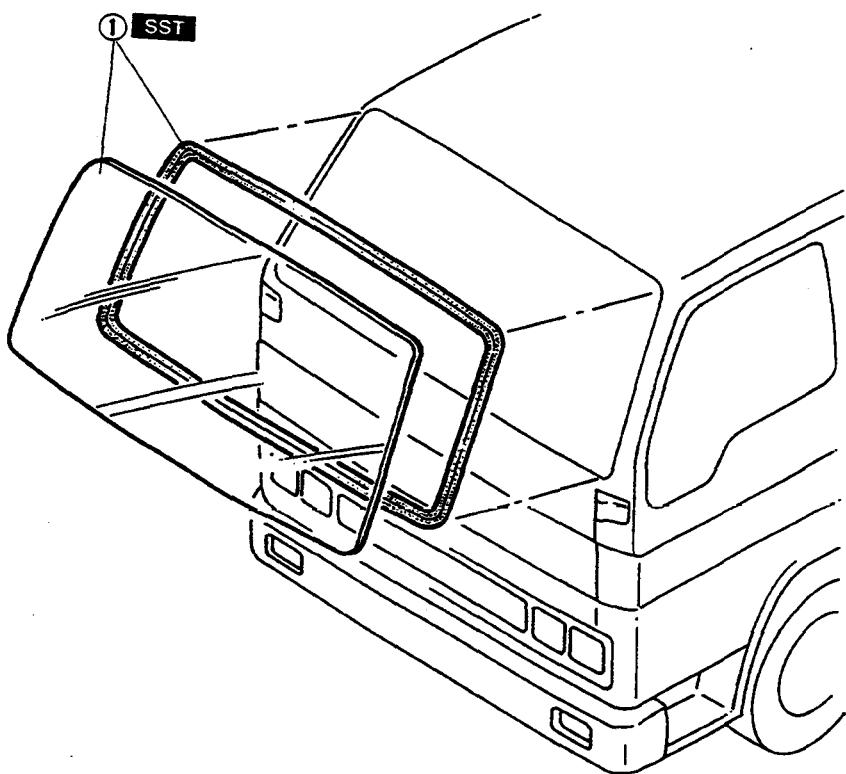
49 0259 866		For removal and installation of windshield
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9TG0SX-054

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**.



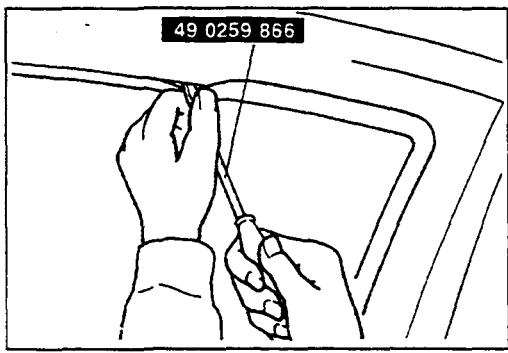
9TG0SX-055

1. Windshield and weatherstrip

Removal Note page S-37

Installation Note page S-37

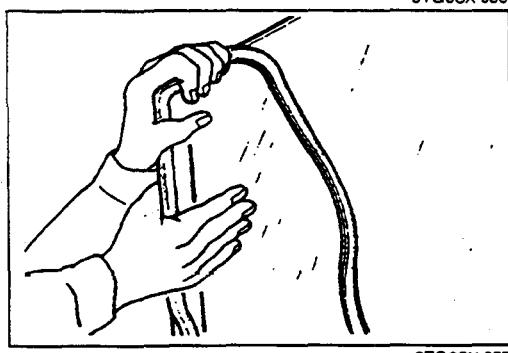
WINDSHIELD



Removal note

Windshield and weatherstrip

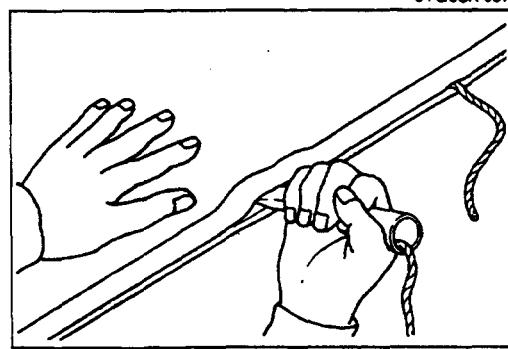
- Pry the weatherstrip outward from within the cabin with **SST**.
- Remove the windshield together with the weatherstrip.



Installation note

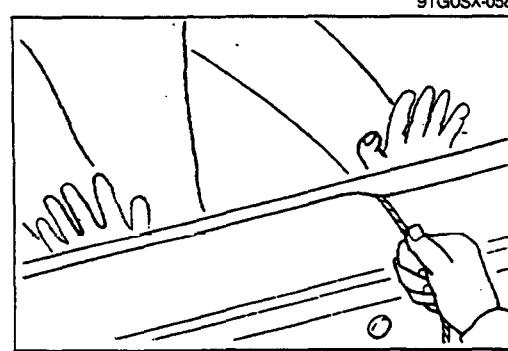
Windshield and weatherstrip

- Remove the sealant from the body surface.
- Fit the weatherstrip onto the windshield.



- Insert heavy string around the weatherstrip.

- Apply soapy water to ensure smooth installation between the weatherstrip and the body.
- Locate the glass and weatherstrip squarely in the windshield frame.



Note

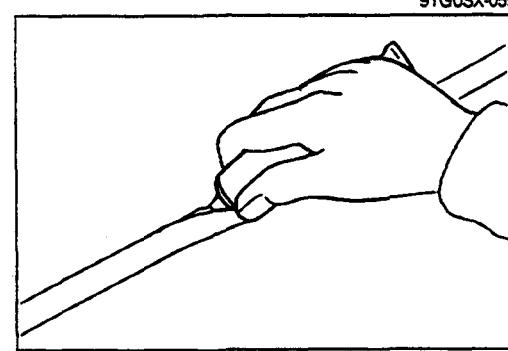
- The following operation must be done with a partner.

- Tap lightly on the outside of the windshield while pulling the string to install the weatherstrip around the entire circumference.

- Move the glass by hands on the inside and outside of the glass if it is not properly seated.

- Protect the body around the window frame with masking tape.

- Fill with sealant between the weatherstrip and body and between the weatherstrip and glass around the entire circumference.

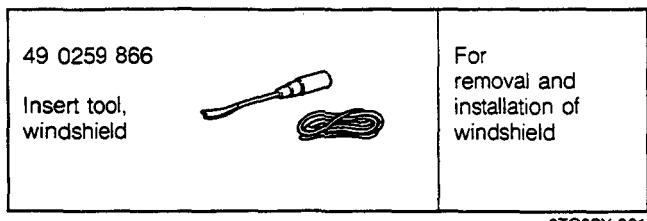


S

BACK WINDOW

BACK WINDOW

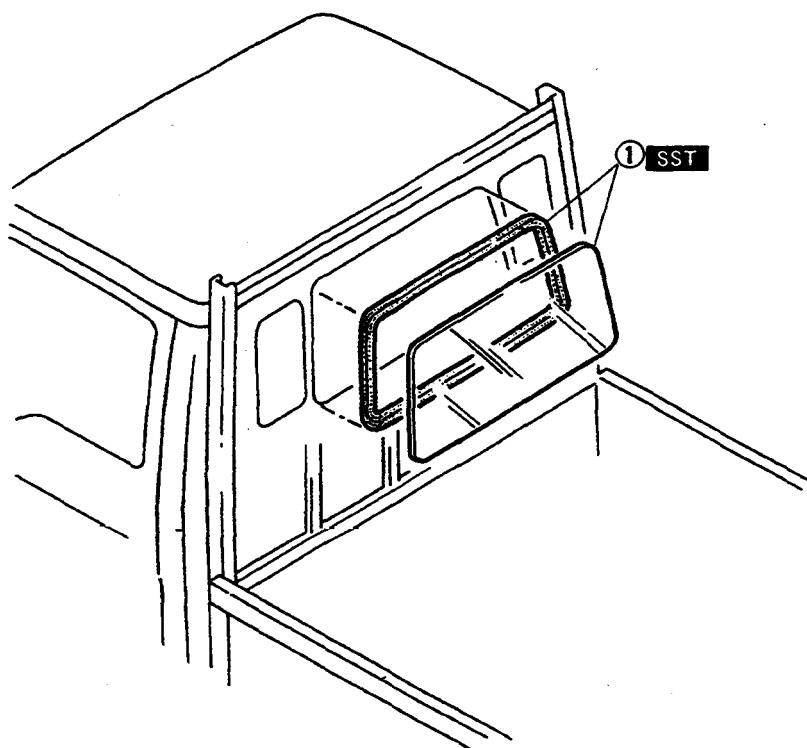
PREPARATION SST



COMPONENTS

Removal / Installation

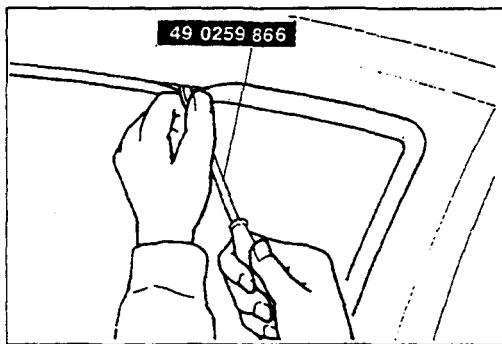
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.



9TG0SX-062

1. Back window and weatherstrip
- Removal Note page S-39
Installation Note page S-39

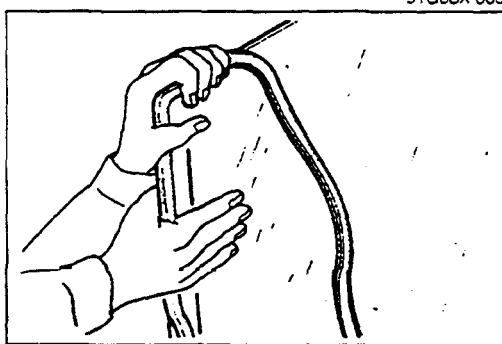
BACK WINDOW



Removal note

Back window and weatherstrip

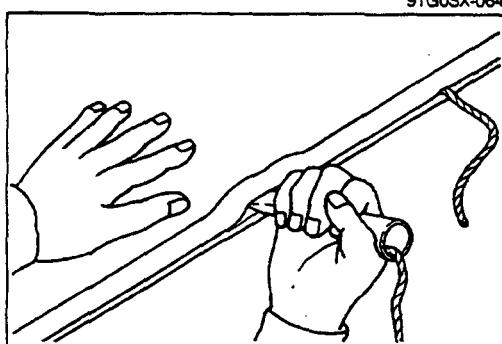
1. Pry the weatherstrip outward from within the cabin with **SST**.
2. Remove the back window together with the weatherstrip.



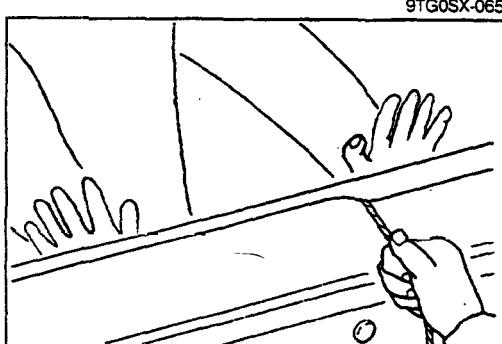
Installation note

Back window and weatherstrip

1. Remove the sealant from the body surface.
2. Fit the weatherstrip onto the back window.



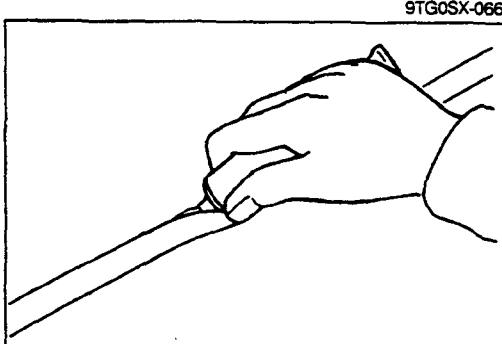
3. Insert heavy string around the weatherstrip.
4. Apply soapy water to ensure smooth installation between the weatherstrip and the body.
5. Locate the glass and weatherstrip squarely in the window frame.



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.
8. Protect the body around the window frame with masking tape.
9. Fill with sealant between the weatherstrip and body and between the weatherstrip and glass around the entire circumference.



9TG0SX-067

S

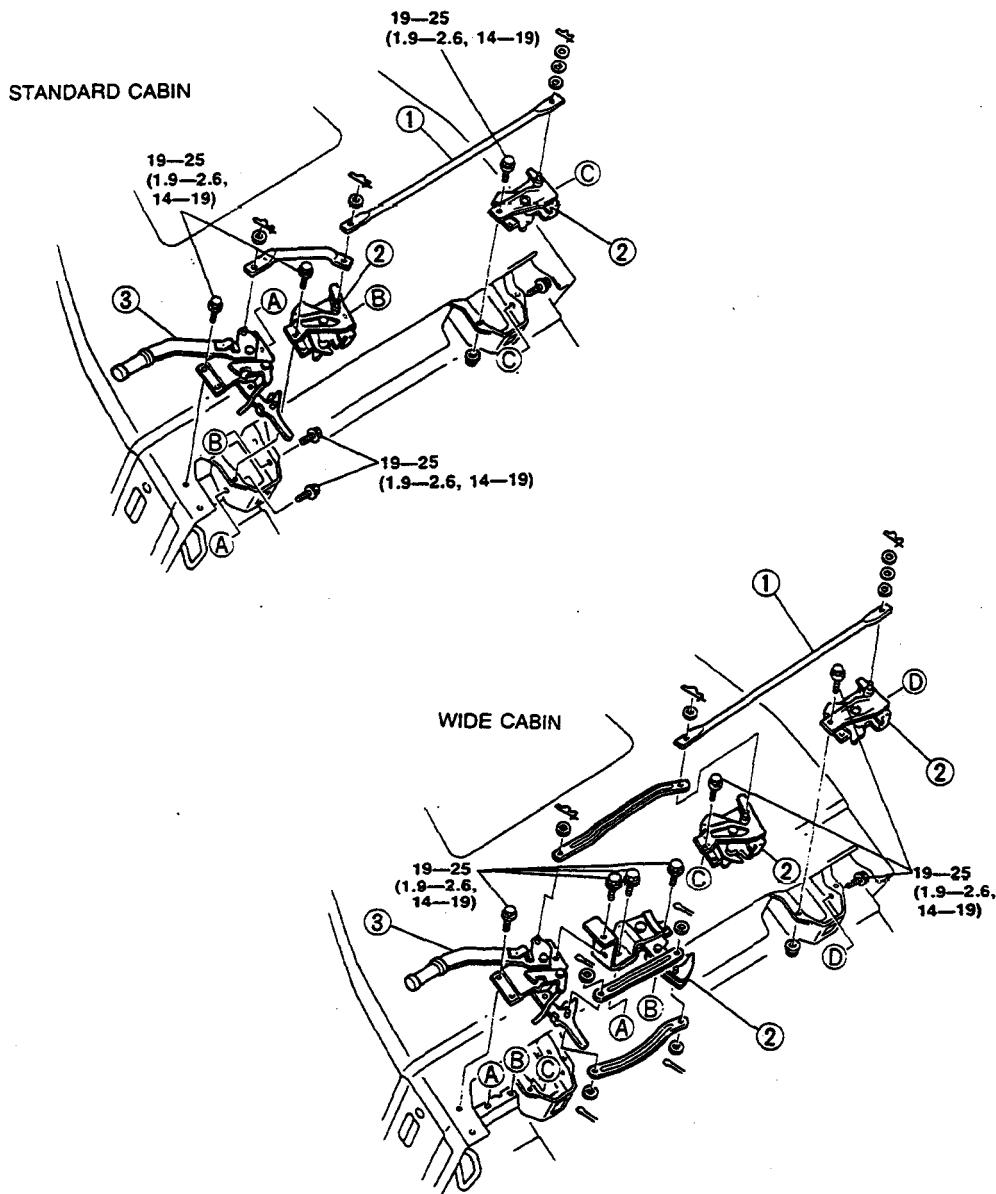
TILT LOCK SYSTEM

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.



N·m (m·kg, ft·lb)

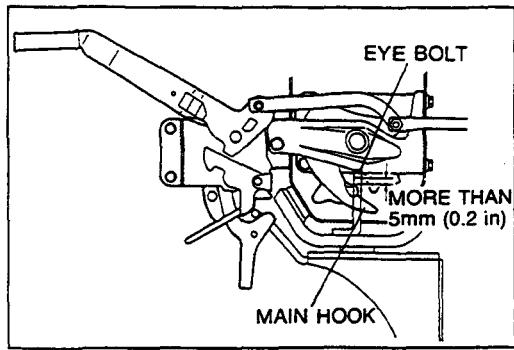
9TF0SX-001

1. Rod
2. Hook assembly

3. Lock lever assembly

TILT LOCK SYSTEM

S



9TG0SX-069

Inspection

1. Lower the cabin and measure the clearance between the main hook and eye bolt.

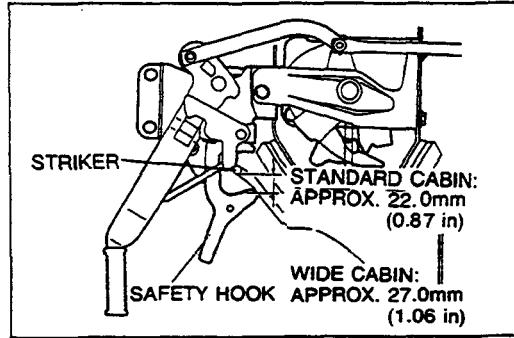
Clearance: 5mm (0.2 in) min.

2. Verify that when the main hook is completely locked, the clearance between safety hook and striker is as specified.

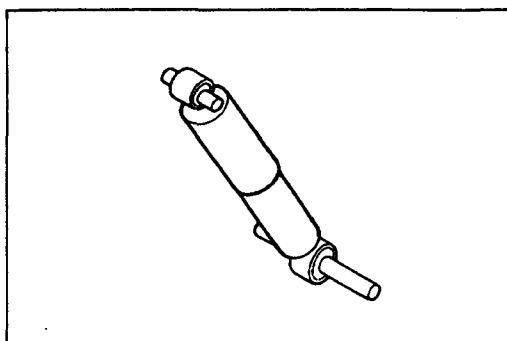
Clearance:

**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.



9TF0SX-002

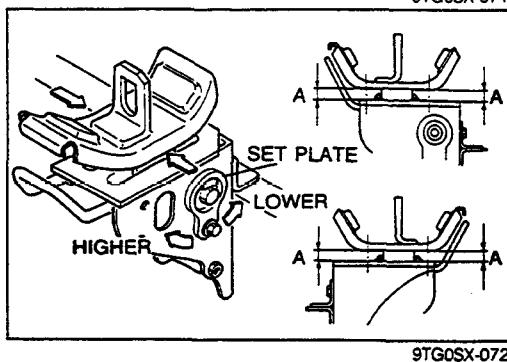


CABIN MOUNT

DAMPER

Inspection (On-vehicle)

- 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)

- Check for heights A as shown in the figure.

Height:

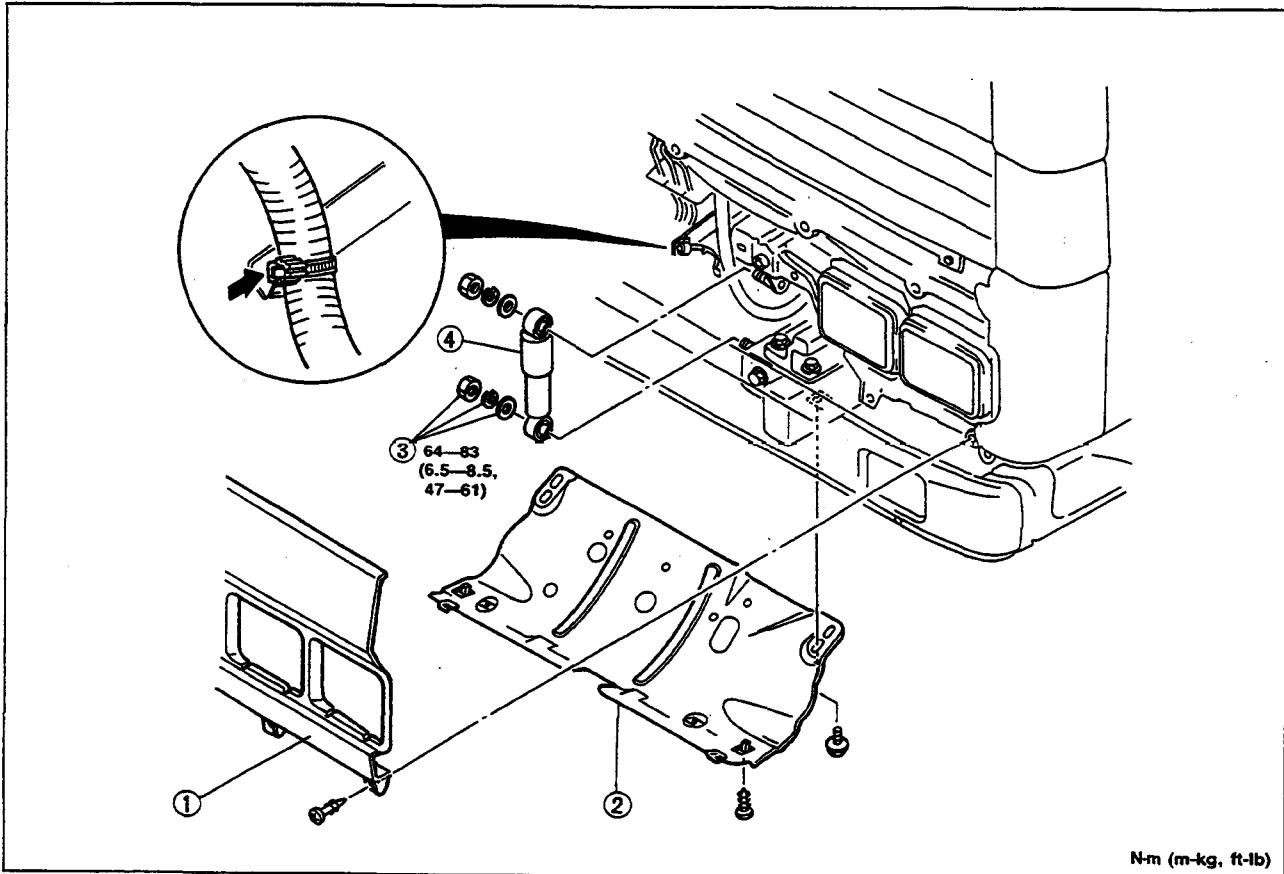
Wide cabin $43.0 \pm 1.0\text{mm}$ ($1.69 \pm 0.04\text{ in}$)
Standard cabin $26.4 \pm 1.0\text{mm}$ ($1.04 \pm 0.04\text{ in}$)

Caution

- Loosen the damper mounting bolts when adjusting

- Adjust the height by moving the set plate if not as specified.

FRONT CABIN DAMPER



- Radiator grille
- Undercover

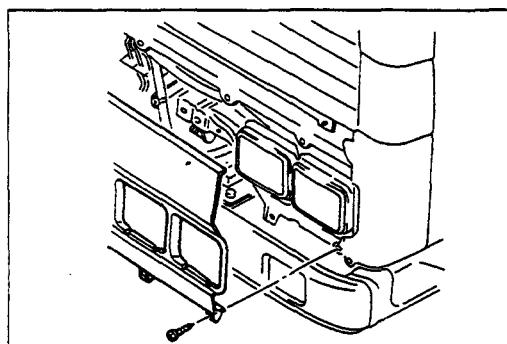
- Nut, lock washer, washer
- Front cabin damper

Inspection (On-vehicle) page S-42

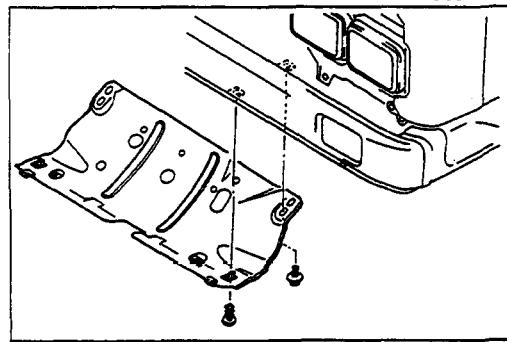
CABIN MOUNT

Removal

1. Remove the radiator grille.

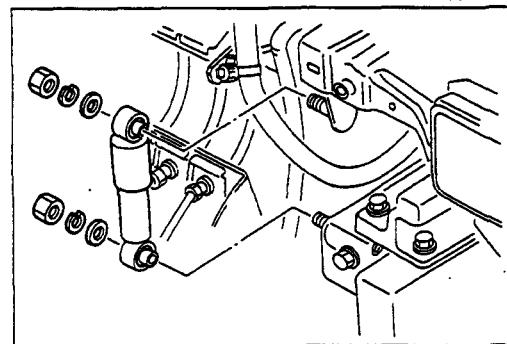


9TG0SX-074



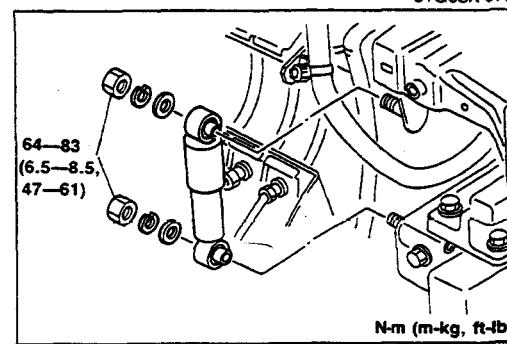
9TG0SX-075

2. Remove the undercover.



9TG0SX-076

3. Remove the nuts and front cabin damper.



N·m (m·kg, ft·lb)

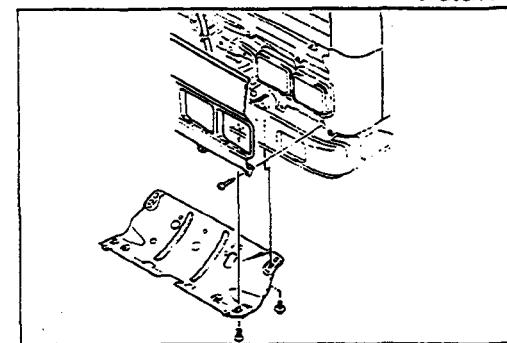
9TG0SX-077

Installation

1. Install the damper between the frame and cabin.
2. Install nuts and tighten to the specified torque.

Tightening torque:

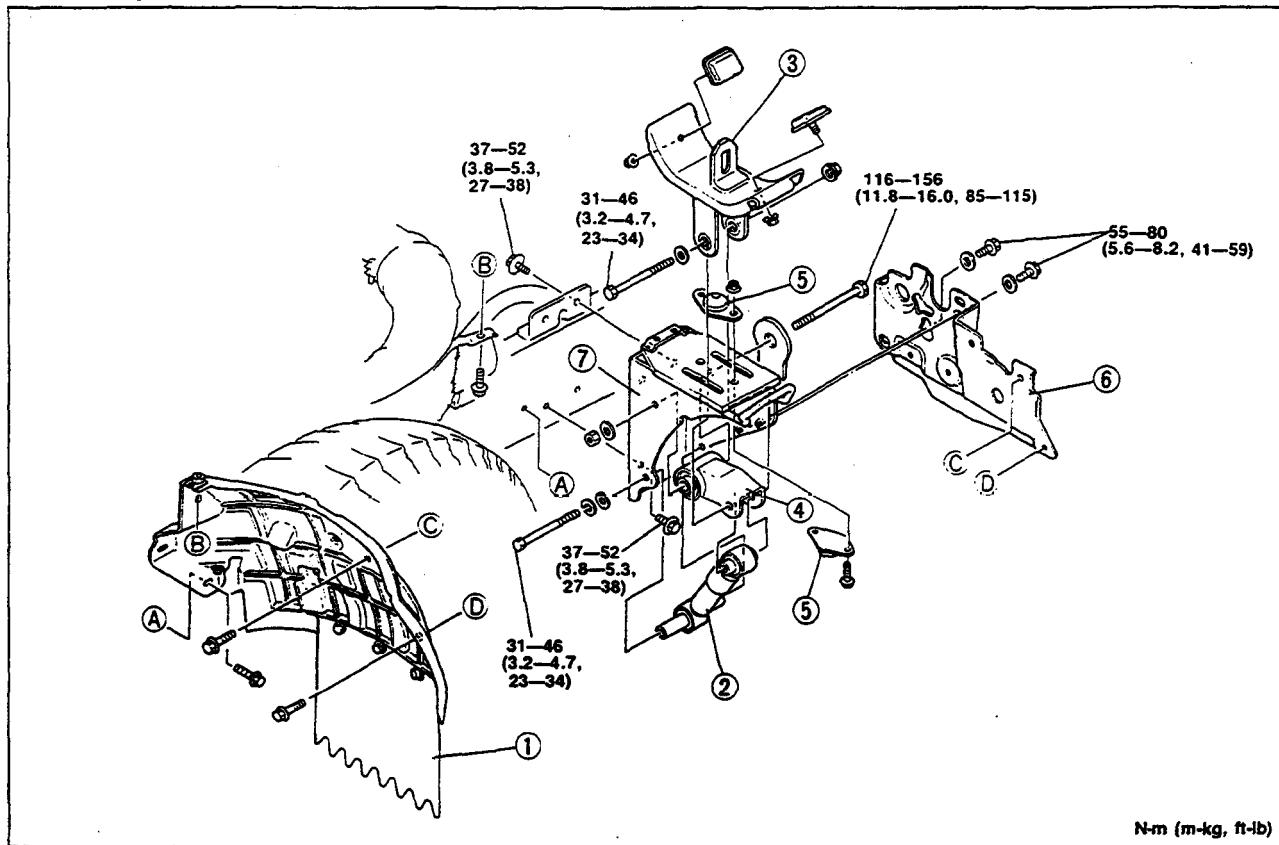
64—83 N·m (6.5—8.5 m·kg, 47—61 ft·lb)



9TG0SX-078

3. Install the undercover and radiator grille.

REAR CABIN MOUNT With damper



N·m (m·kg, ft·lb)

9TG0SX-079

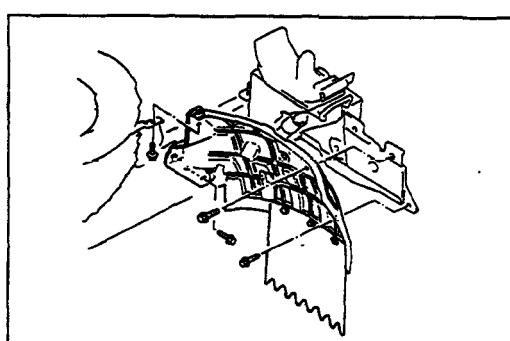
1. Mud guard and flap
2. Rear cabin damper
Inspection (On-vehicle) page S-42
3. Wedge
4. Arm assembly
5. Stopper rubber
6. Front flap bracket
7. Cabin mount bracket

Removal

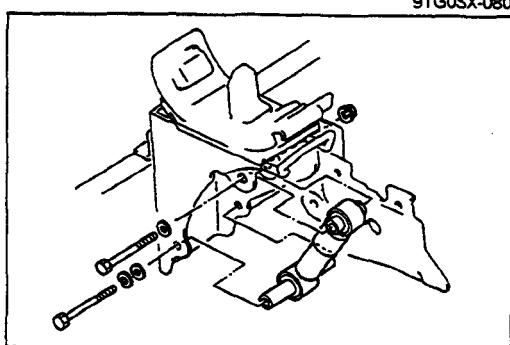
Caution

- Securely lock the cabin when raised.
- Disconnect the negative battery cable.

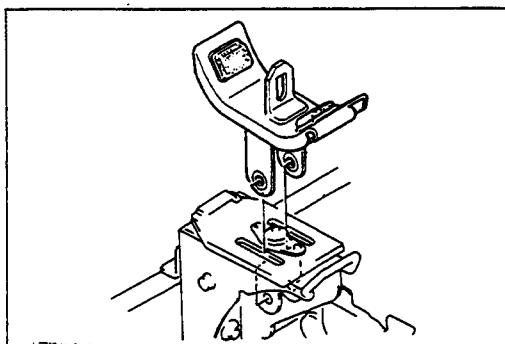
1. Remove the mud guard flap.
2. Remove the damper mounting bolts and damper.



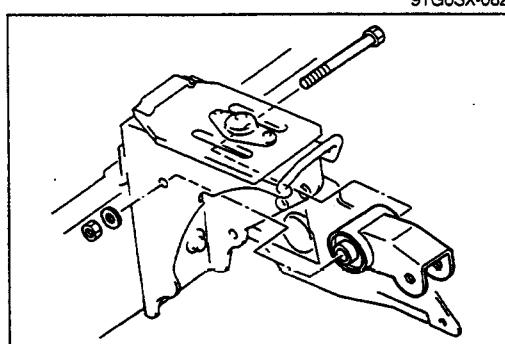
9TG0SX-080



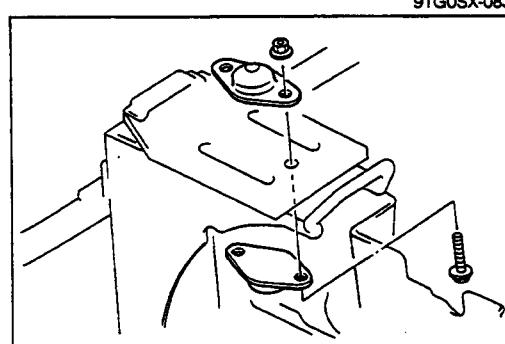
9TG0SX-081

CABIN MOUNT

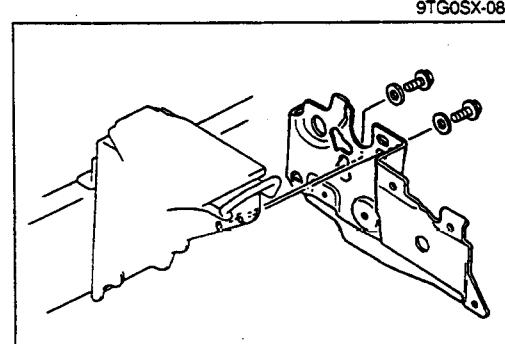
3. Remove the wedge.



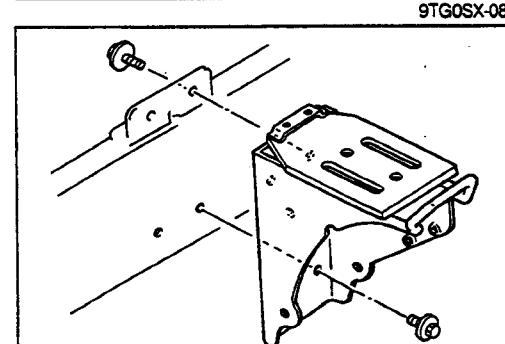
4. Remove the arm mounting bolts and arm.



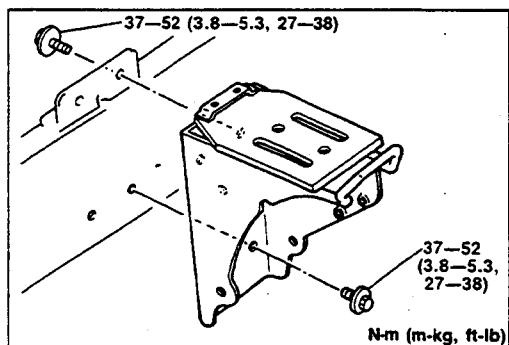
5. Remove the nuts and stopper rubber.



6. Remove the front flap bracket.



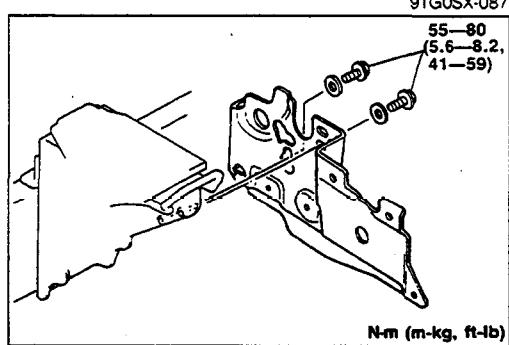
7. Remove the cabin mount bracket.

**Installation**

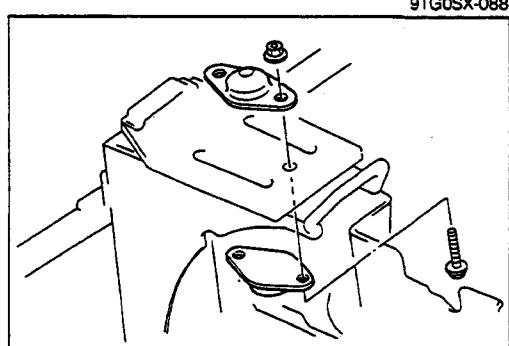
1. Install the cabin mount bracket.

Tightening torque:

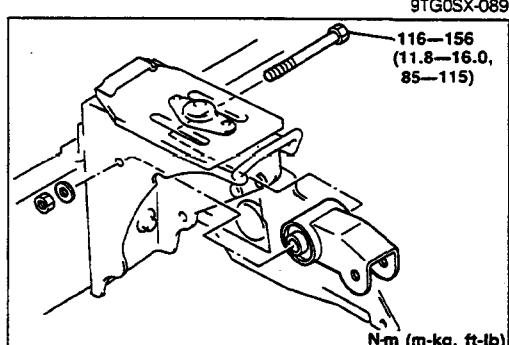
37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)



2. Install the front flap bracket.



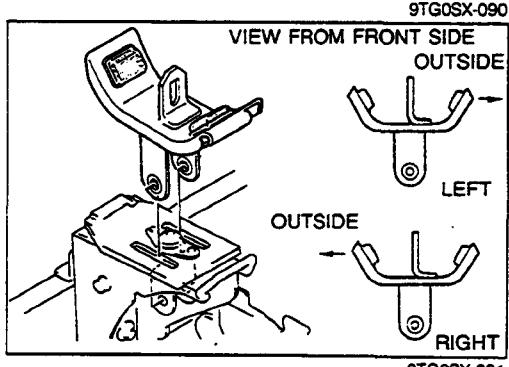
3. Install the stopper rubber.



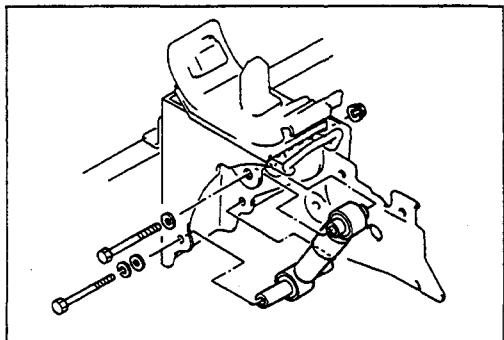
4. Install the arm and bolt.

Tightening torque:

116—156 N·m (11.8—16.0 m·kg, 85—115 ft·lb)



5. Install the wedge as shown in the figure.

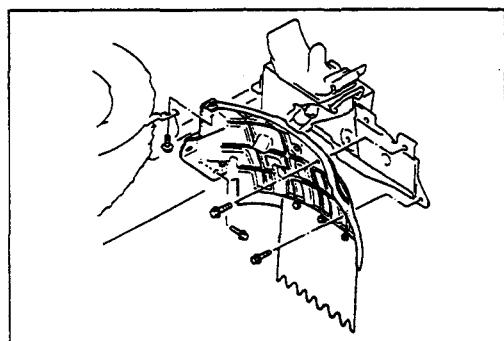
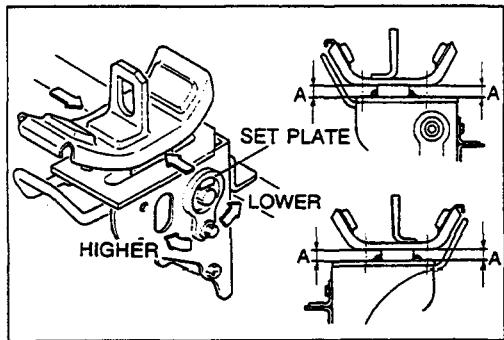
CABIN MOUNT

9TG0SX-092

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.

9TG0SX-094

S

CABIN MOUNT

REAR CABIN MOUNT

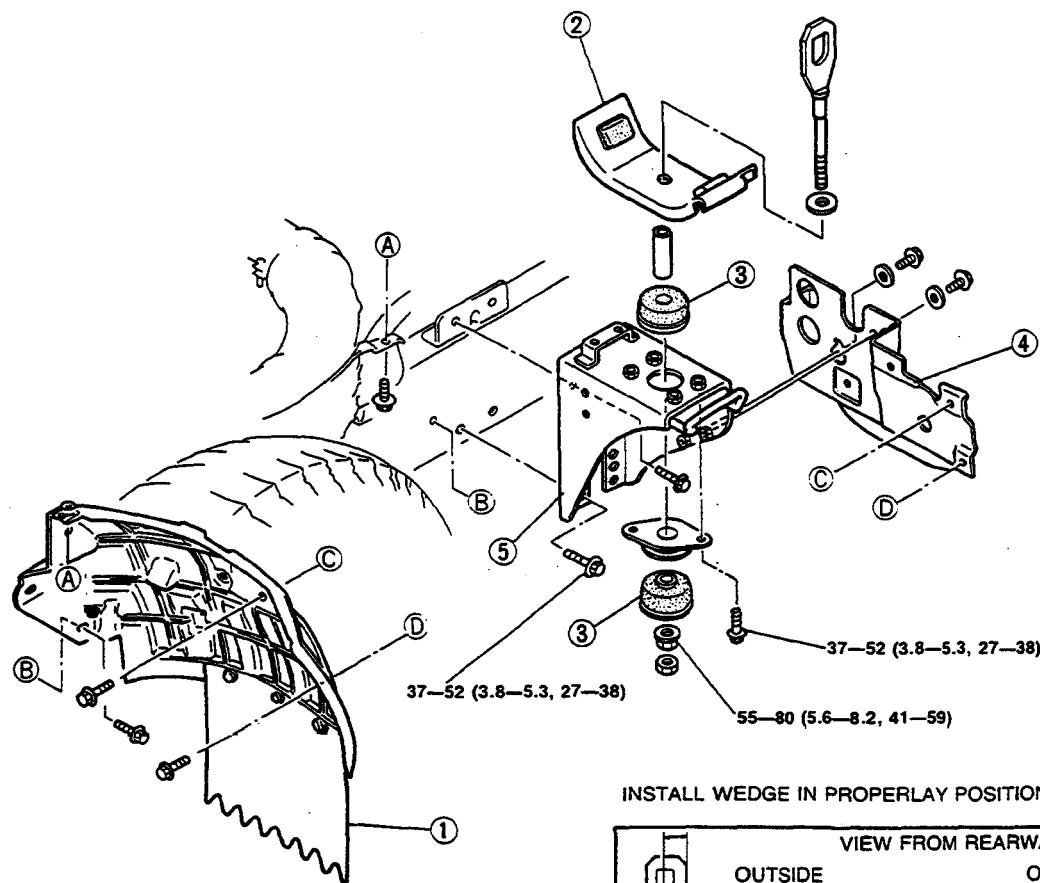
Without Damper

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.



N·m (m·kg, ft·lb)

9TG0SX-095

1. Mud guard and flap
2. Wedge
3. Bushing

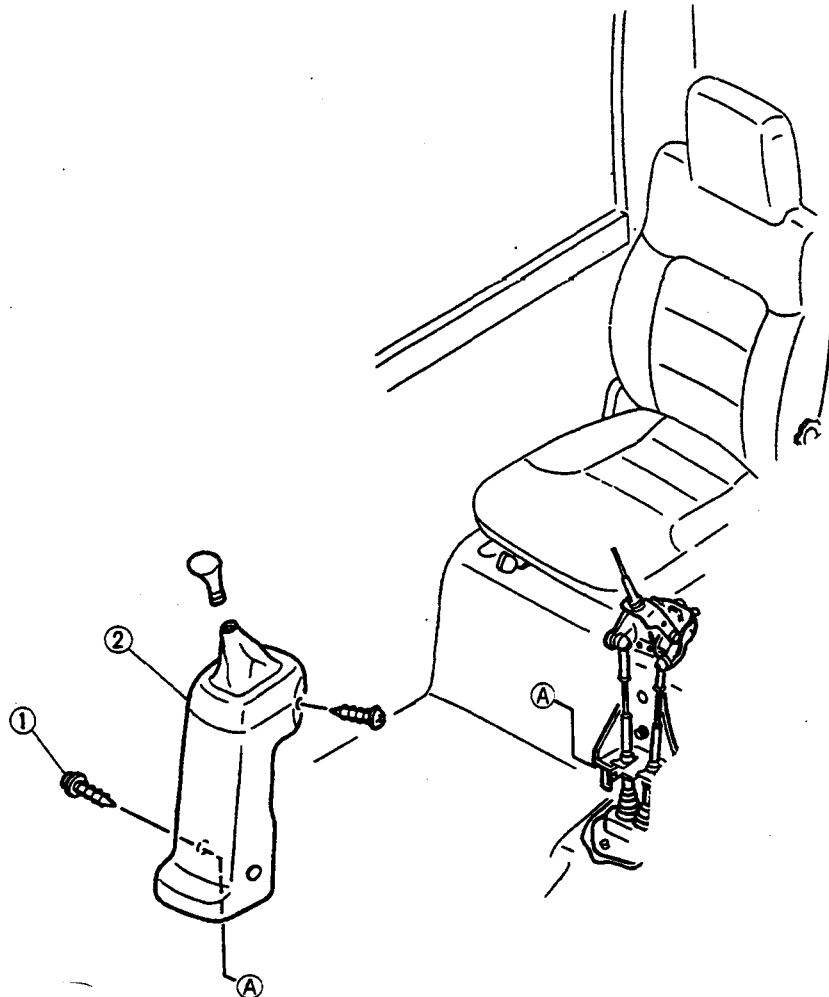
4. Front flap bracket
5. Rear cabin bracket

CONSOLE

COMPONENTS

Removal / Installation

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



9TF0SX-003

Console

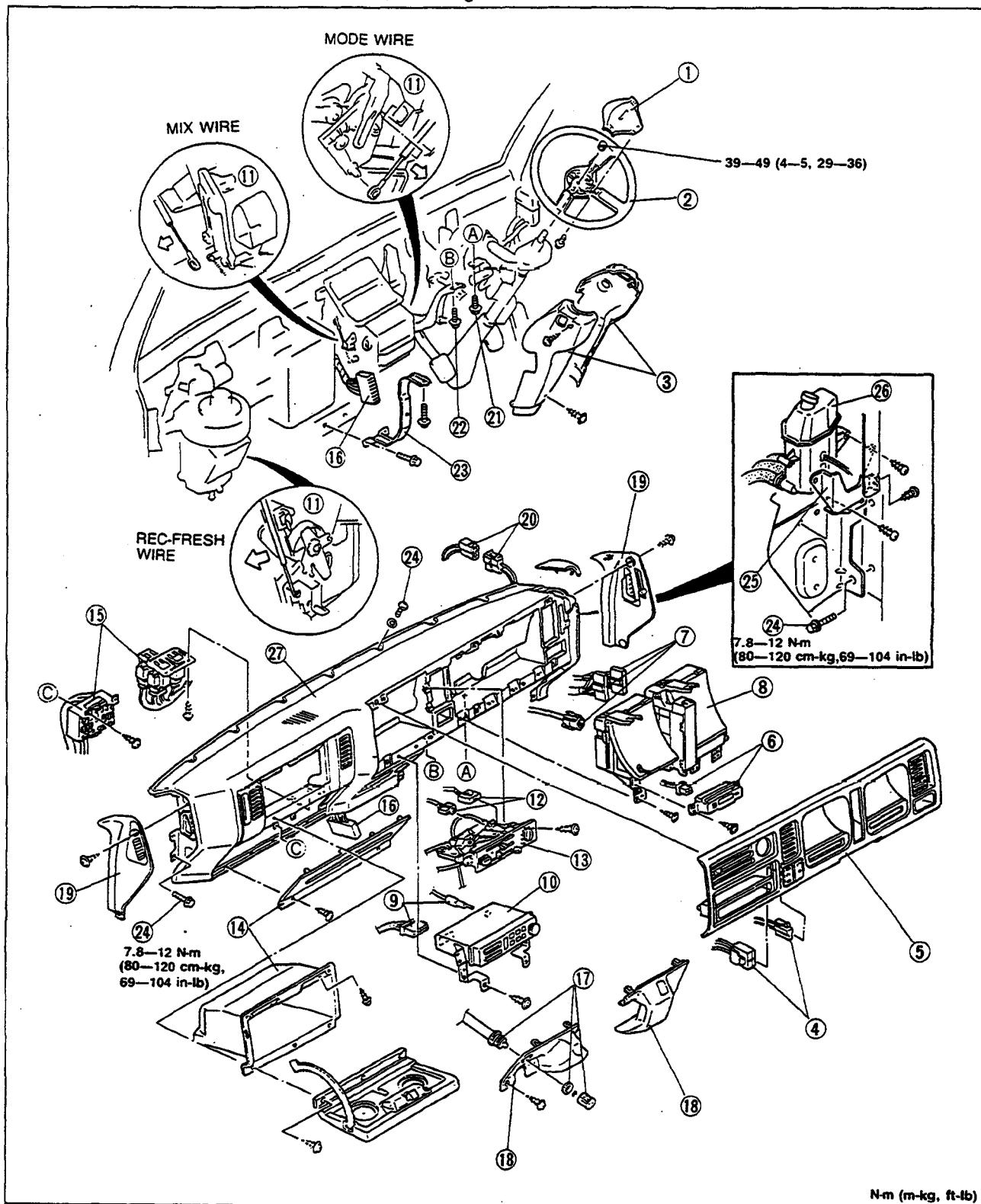
1. Screws
2. Console

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.



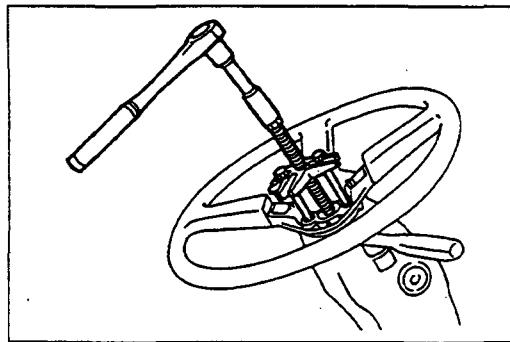
N·m (m·kg, ft·lb)

9TG0SX-097

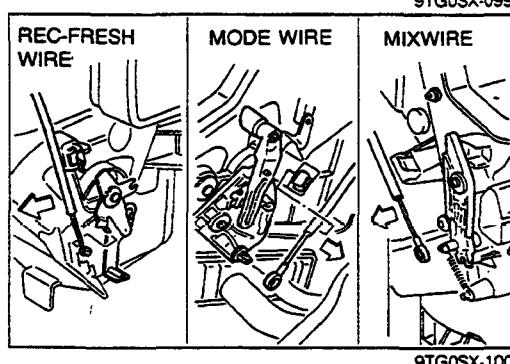
INSTRUMENT PANEL

- | | |
|---|--|
| 1. Horn cover | 13. Heater control unit |
| 2. Steering wheel | 14. Lower panel, glove box |
| Removal Note..... | 15. Fuse box, relay assembly |
| Installation Note..... | 16. Connector
(for instrument panel harness: 21-pin) |
| 3. Steering column cover | 17. Idling knob, cable |
| 4. Connectors
(fog light switch, exhaust heating switch) | 18. Lower panel |
| 5. Instrument cluster panel | 19. Side panel |
| 6. Clock | 20. Connector (brake fluid level sensor) |
| 7. Connector (meter), speedometer cable | 21. Steering bracket mounting bolt |
| 8. Instrument cluster (meter) | 22. Parking brake bracket mounting bolt |
| 9. Connector (audio), antenna feeder | 23. Bracket |
| 10. Audio | 24. Instrument panel mounting bolt
Installation Note..... page S-51 |
| 11. Heater control wire | 25. Brake reserve tank bracket |
| Removal Note..... | 26. Brake reserve tank |
| Installation Note..... | 27. Instrument panel |
| 12. Connector (heater control unit) | |

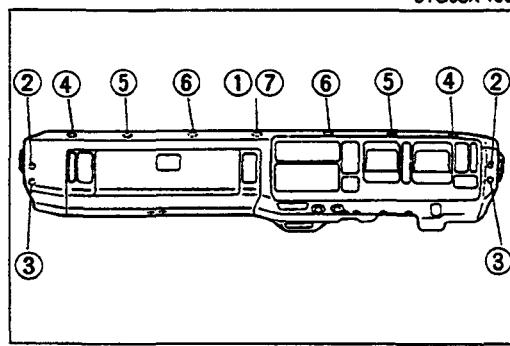
9TG0SX-098


**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.

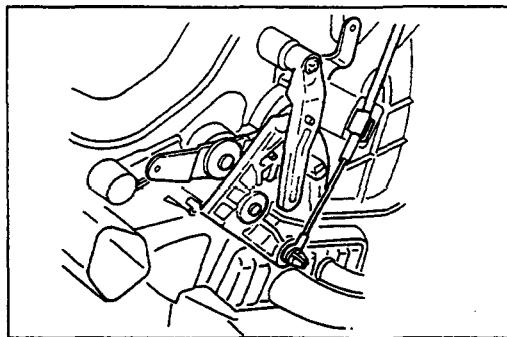

Installation note
Instrument panel mounting bolt

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



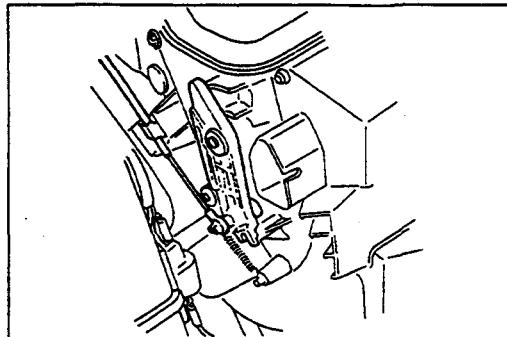
9TG0SX-103

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.



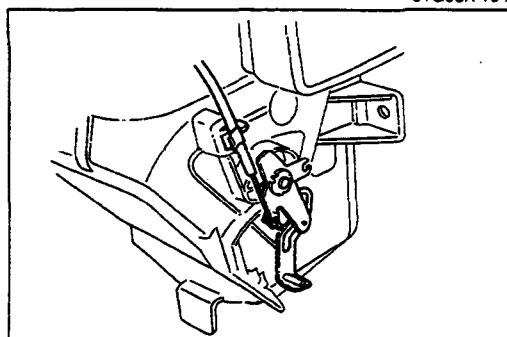
9TG0SX-104

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**

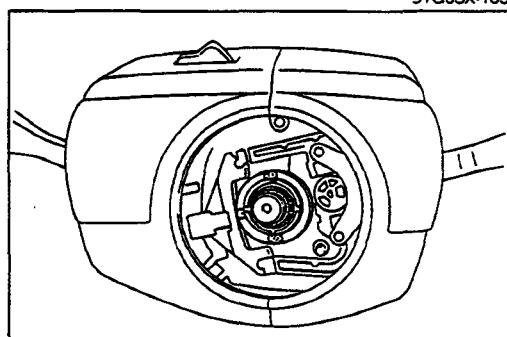
1. Set the REC-FRESH lever to REC position.
2. Set the REC-FRESH door link to REC position as shown in the figure, and connect the wire.
3. Clamp the wire.

Caution

- After installation, move the REC-FRESH lever to verify that it moves the full stroke from REC to FRESH.

Steering wheel

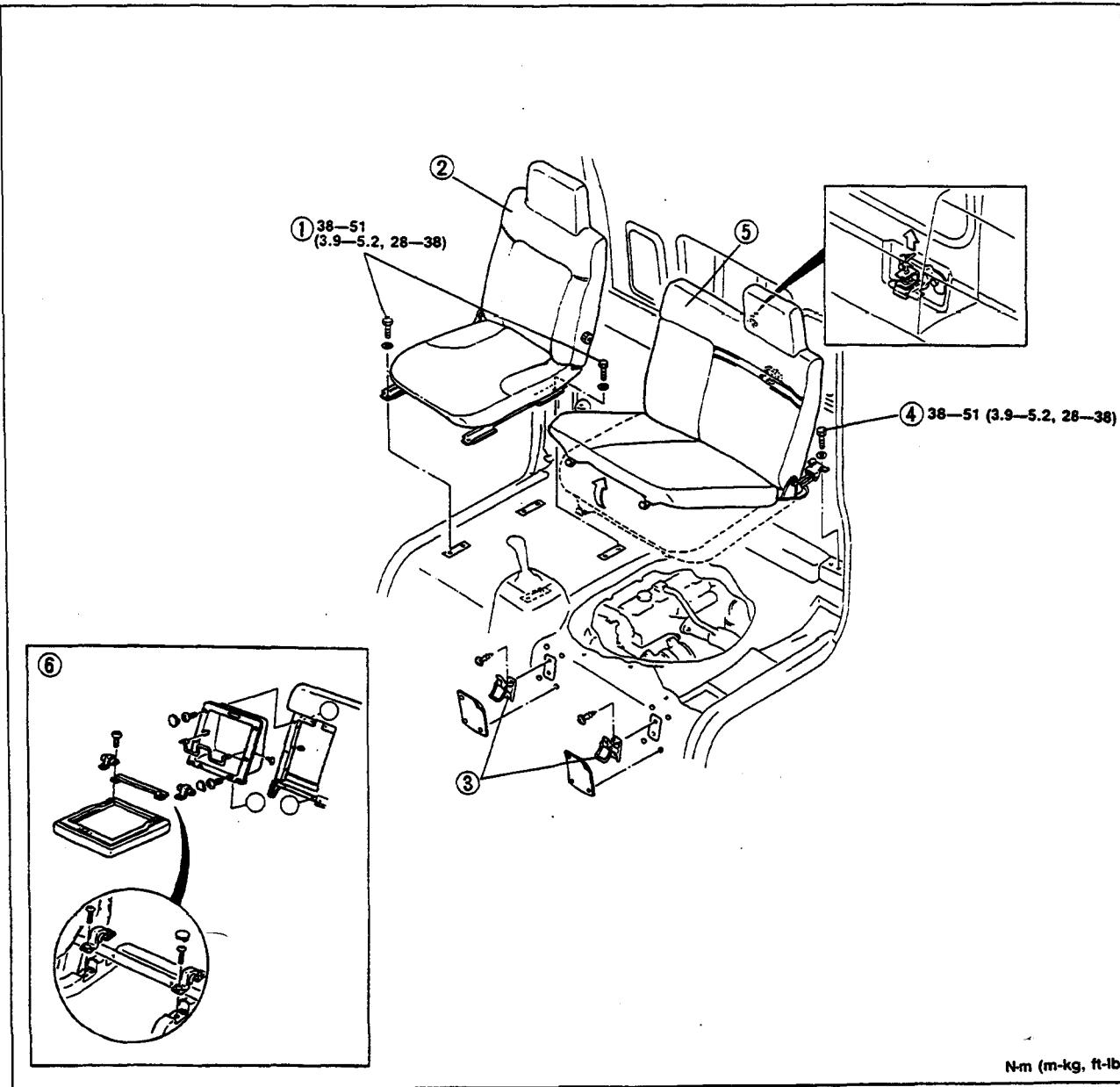
1. Set the cancel cam as shown in the figure.



9TG0SX-106

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

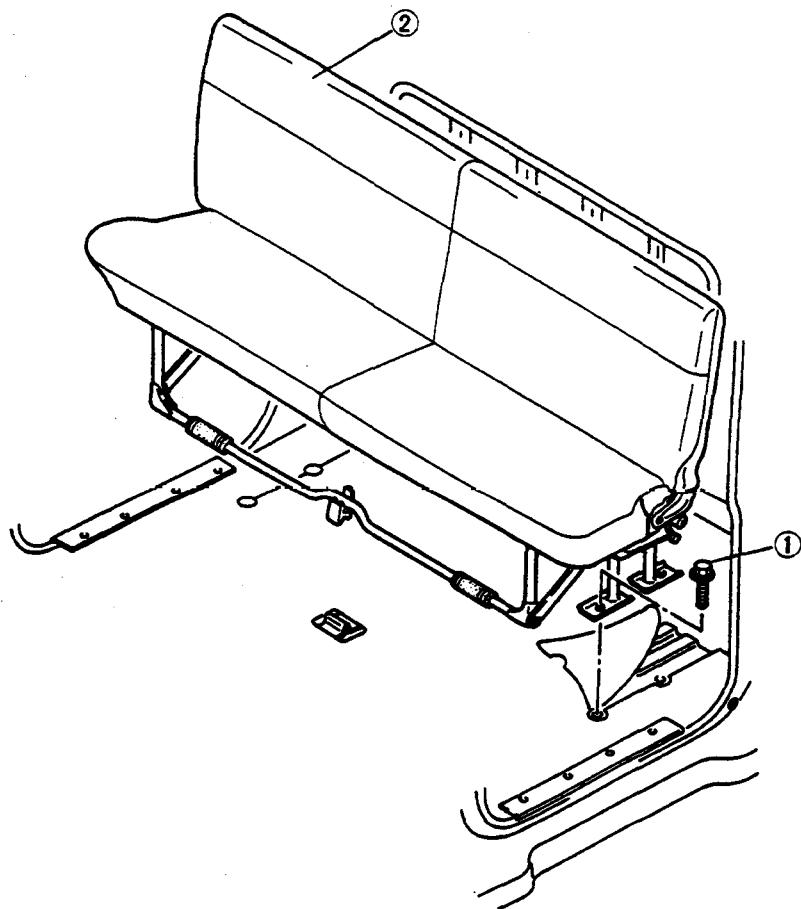
Seatback tray

6. Seatback tray

S

SEAT

Rear seat (Crew cabin)



9TG0SX-108

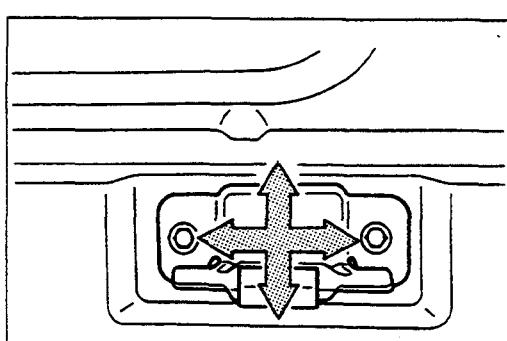
1. Mounting bolt

2. Rear seat

Installation note

Passenger seat

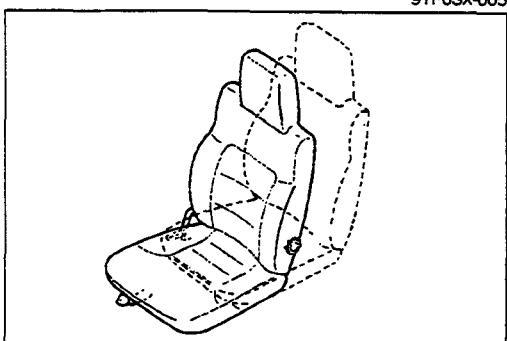
1. Verify that the seatback lock is securely locked after installation.
2. Adjust the seatback striker if necessary.



9TF0SX-005

Driver seat

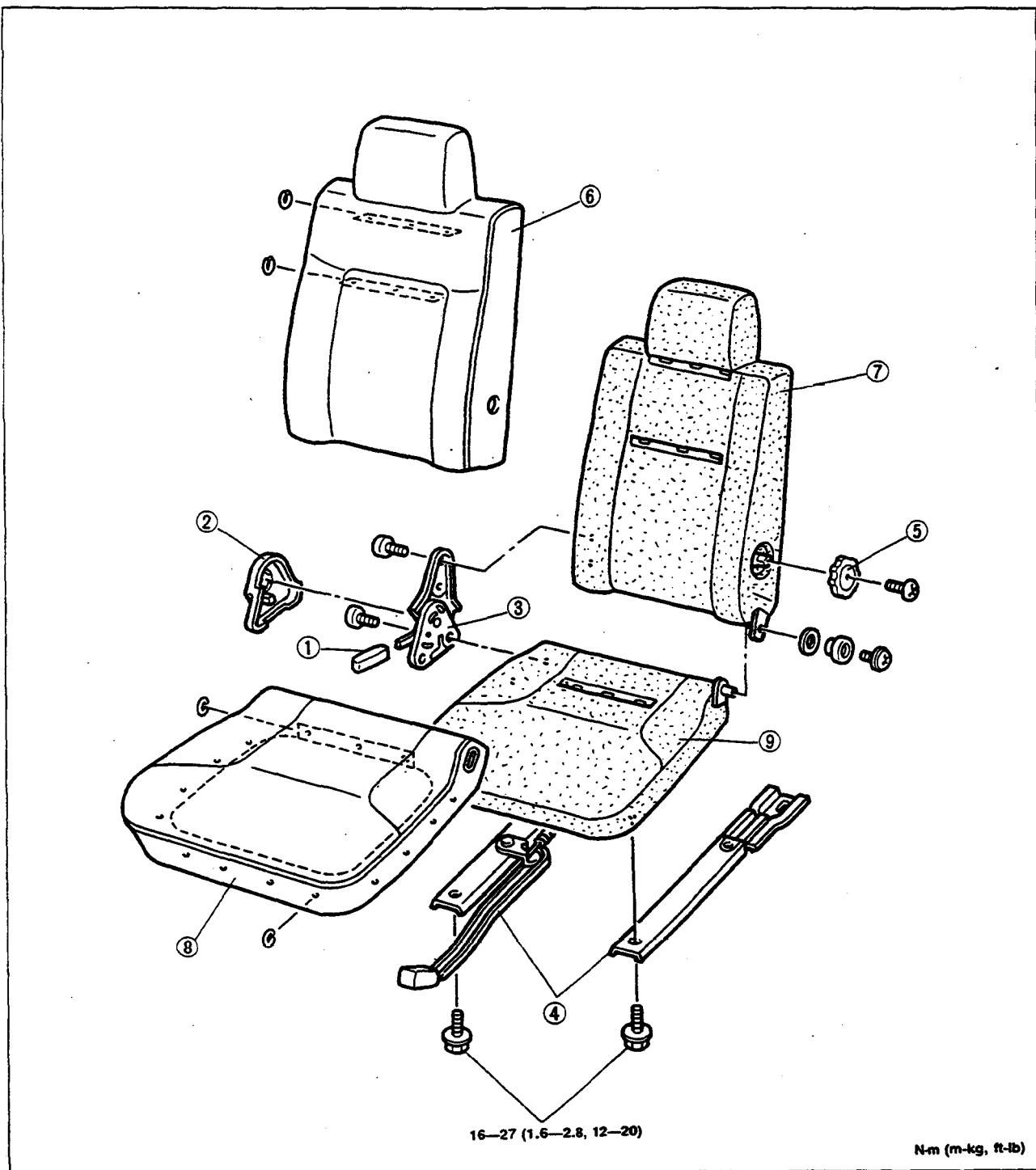
1. Verify that the seat slides smoothly.



9TG0SX-110

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

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

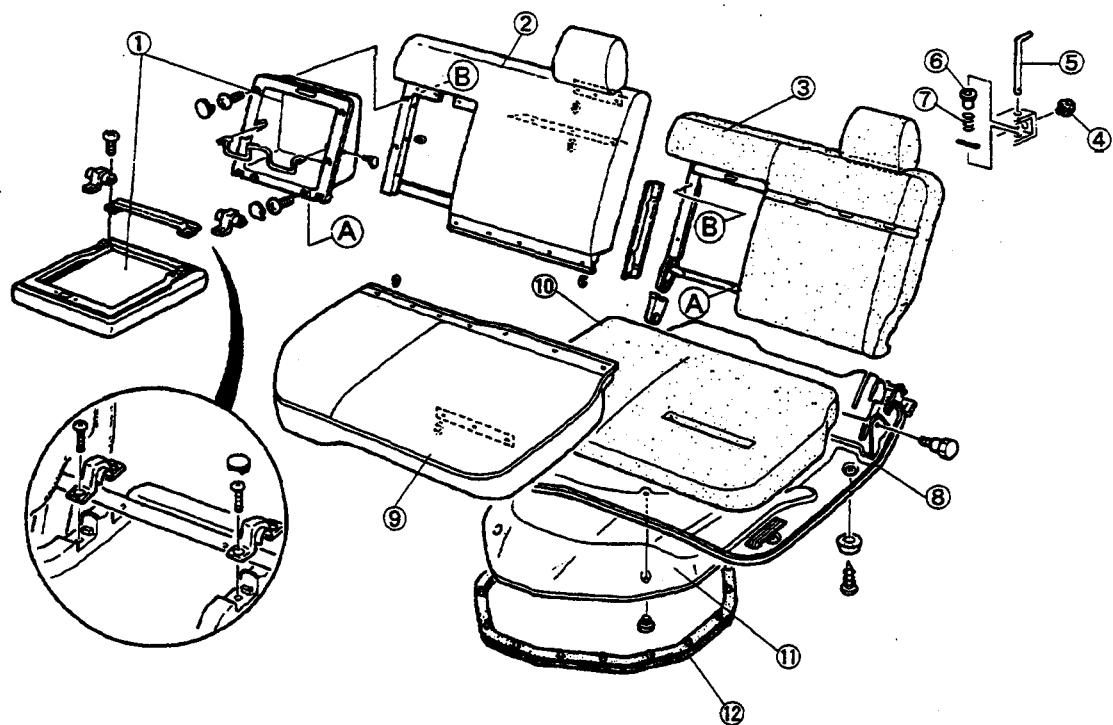
N·m (m·kg, ft·lb)

9TG0SX-111

S

SEAT

Passenger seat (with seatback tray)

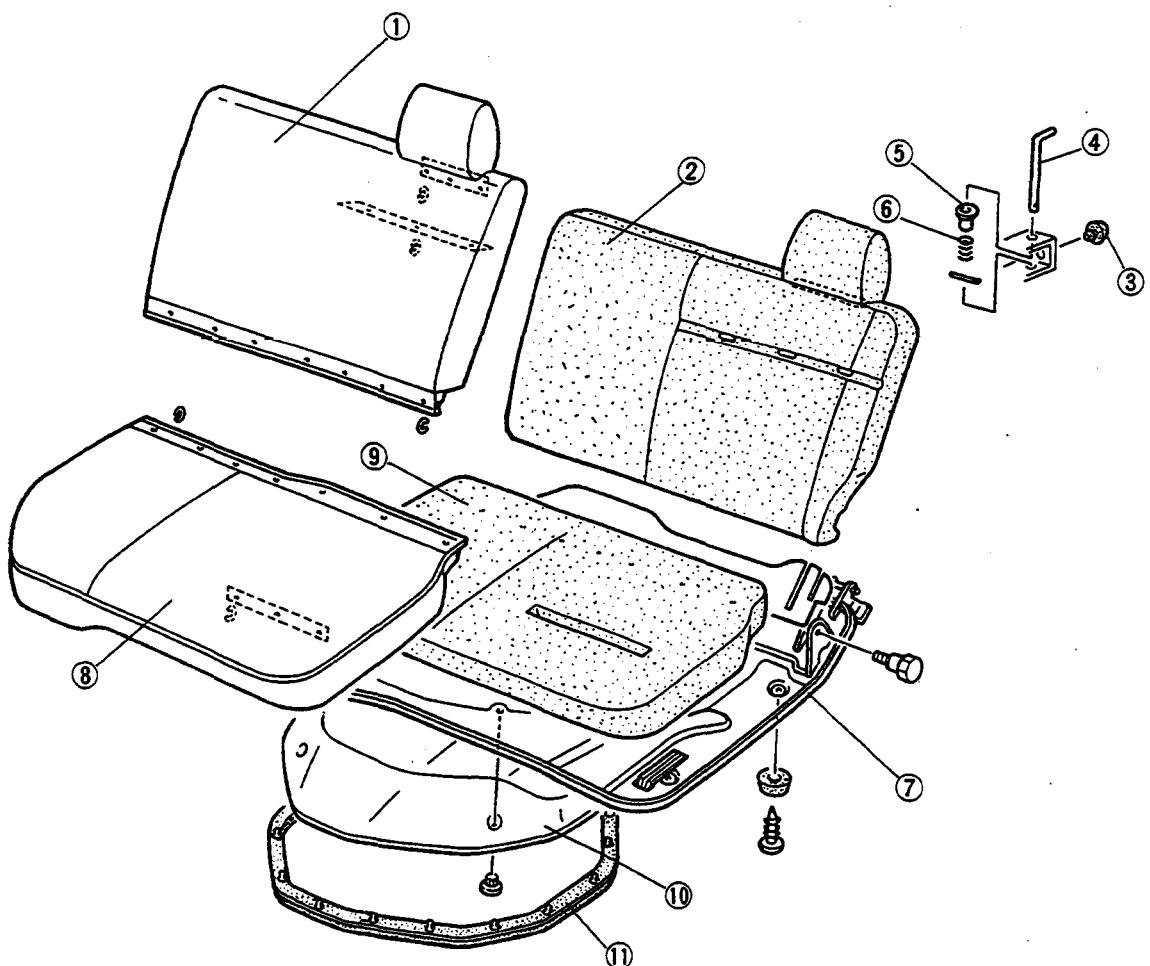


9TF0SX-006

- 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
 - 12. Rubber seal
- Disassembly Note..... page S-58
- Disassembly Note..... page S-58

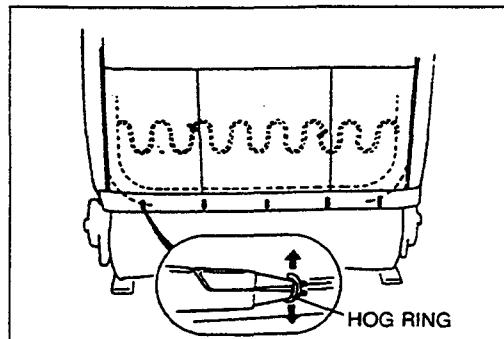
Passenger seat



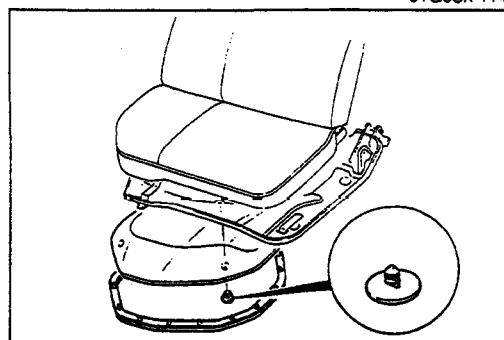
9TF0SX-007

1. Front seatback trim
2. Front seatback cushion
3. Rubber
4. Lock pin
5. Bushing
6. Spring
7. Plate

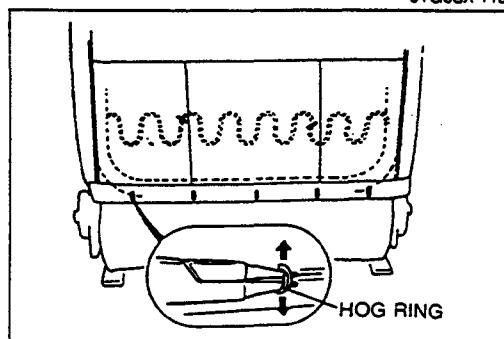
8. Front seat trim
9. Front seat cushion
10. Insulator
Disassembly Note..... page S-58
11. Rubber seal
Disassembly Note..... page S-58

**Disassembly note****Insulator**

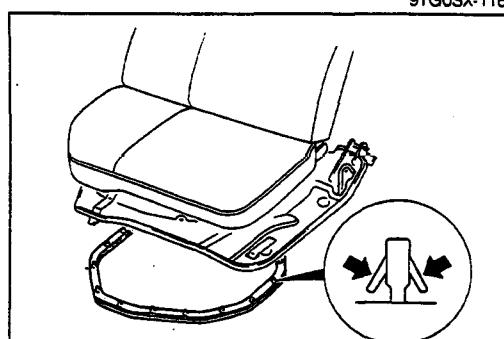
1. Remove the hog rings from the seatback and seat cushion.
2. Remove the seat cushion cover.



3. Remove the fasteners and insulator.

**Rubber seal**

1. Remove the hog rings from the seatback and seat cushion.
2. Remove the seat cushion cover.



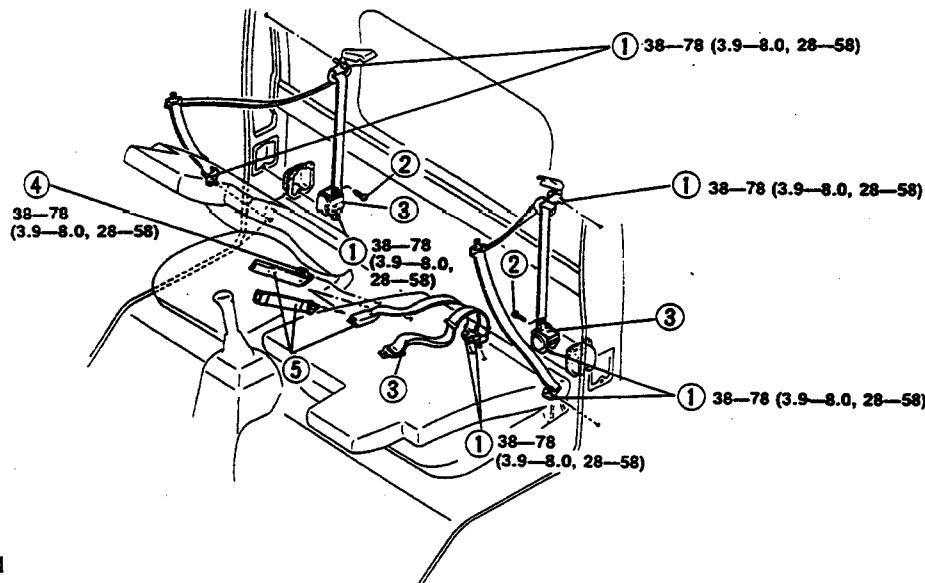
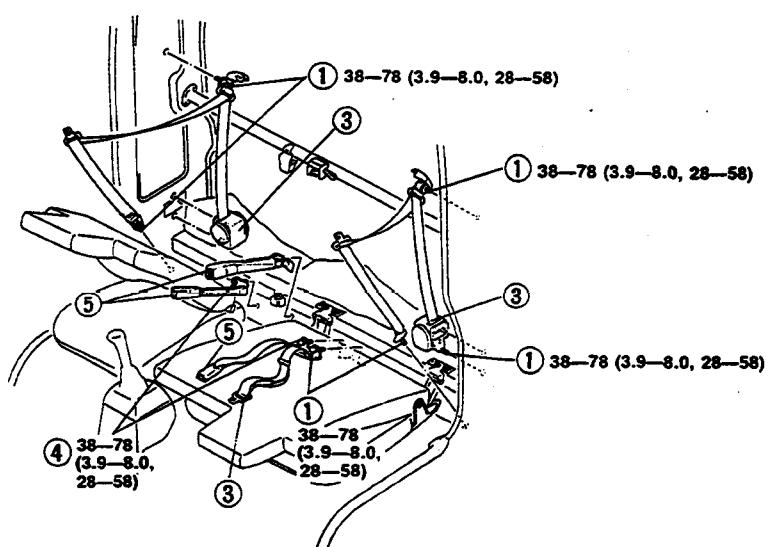
3. Remove the rubber seal fasteners as shown in the figure.

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**EXCEPT CREW CABIN****CREW CABIN**

N·m (m·kg, ft·lb)

9TG0SX-118

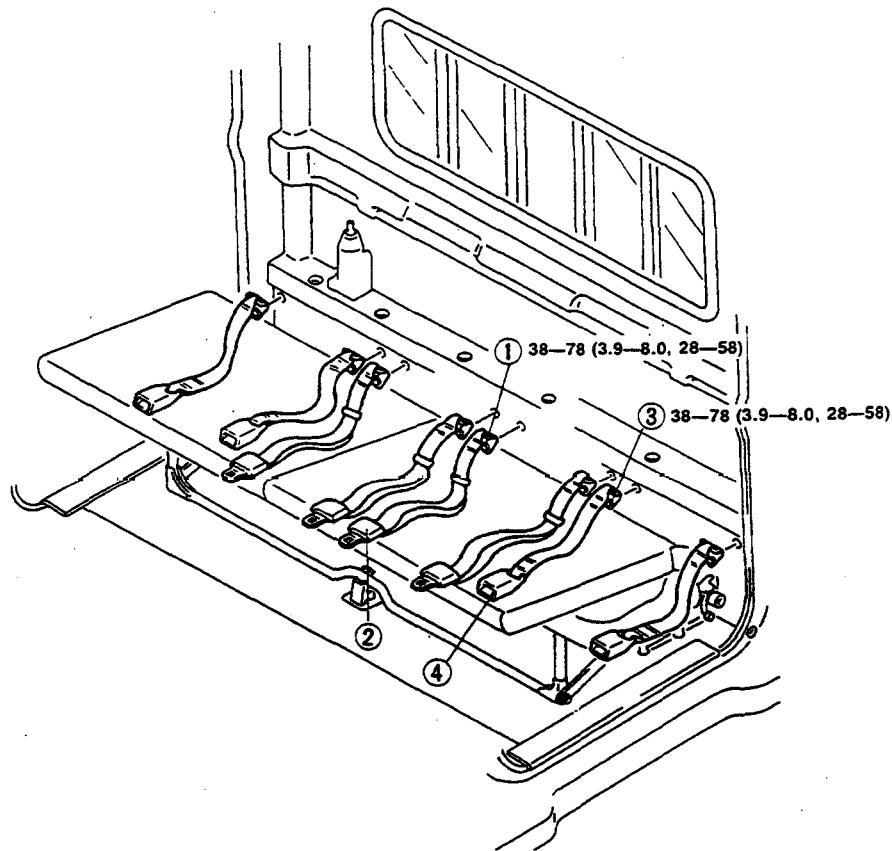
Front seat belt

1. Bolt
2. Screw
3. Front seat belt

Inspection page S-60

Buckle

4. Bolt
5. Buckle

Rear seat belt

N·m (m-kg, ft-lb)

9TG0SX-119

Rear seat belt

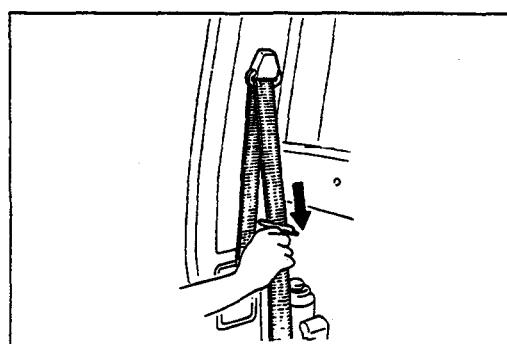
1. Bolt
2. Rear seat belt

Buckle

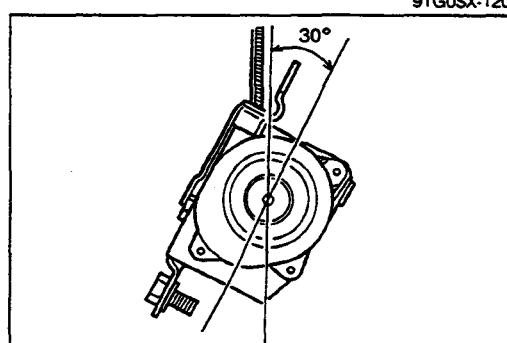
3. Bolt
4. Buckle

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.



9TG0SX-120

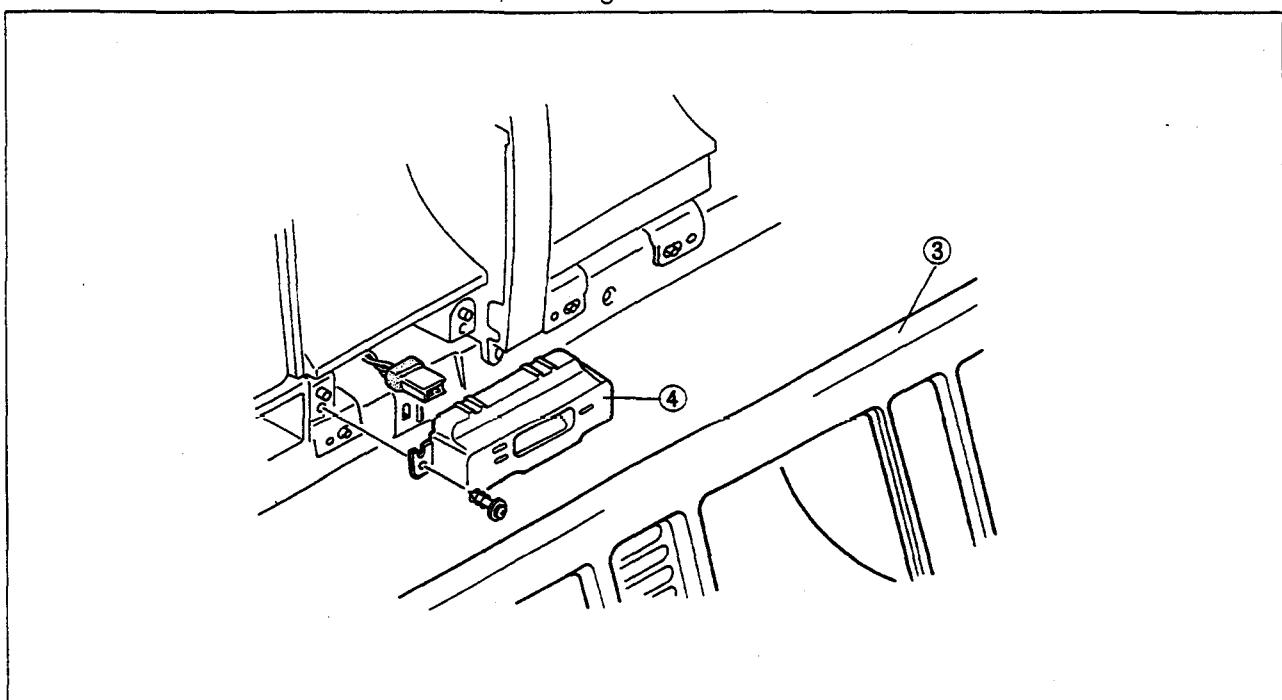


9TG0SX-121

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****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**.

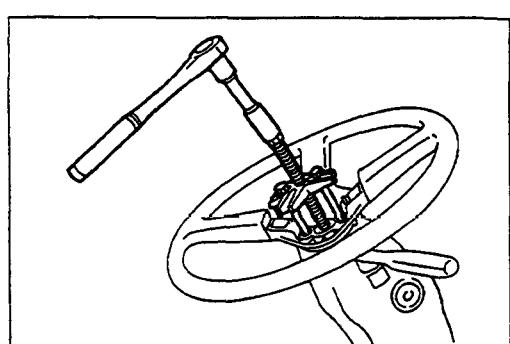


9TG0SX-122

1. Steering column
2. Steering wheel

Removal Note page S-61
Installation Note page S-61

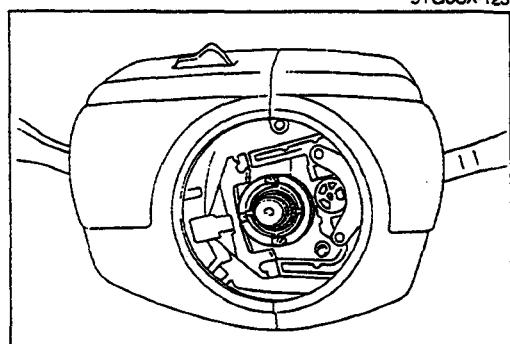
3. Instrument cluster panel
4. Clock



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.

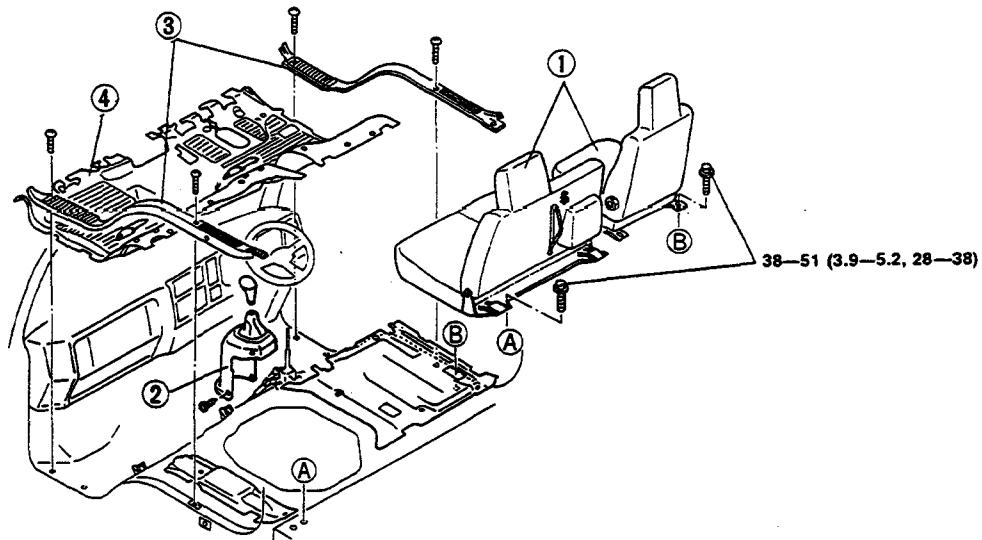
FLOORMAT

COMPONENTS

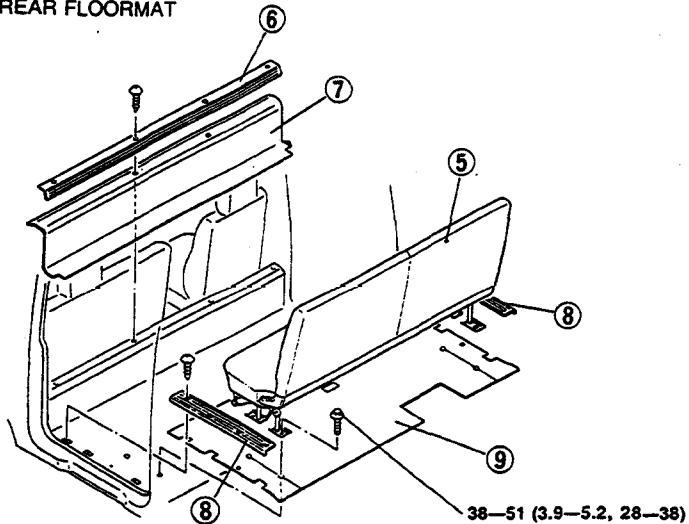
Removal / Installation

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



REAR FLOORMAT



N·m (m·kg, ft·lb)

9TF0SX-008

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

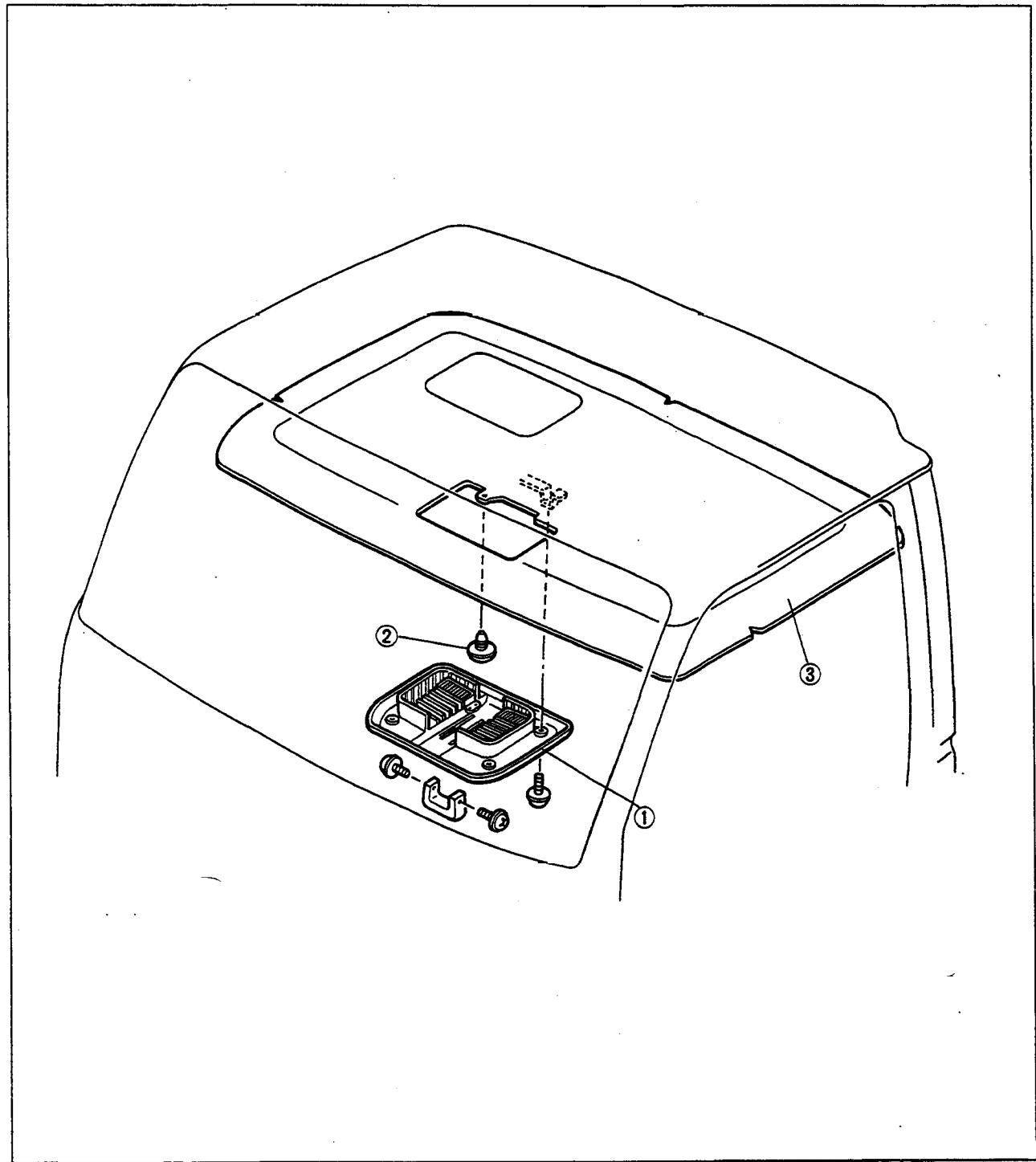
5. Rear seat
Removal / Installation page S-54
6. Brim plate
7. Back plate mat
8. Mat side plate
9. Rear floormat

HEADLINER

HEADLINER Removal

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure.

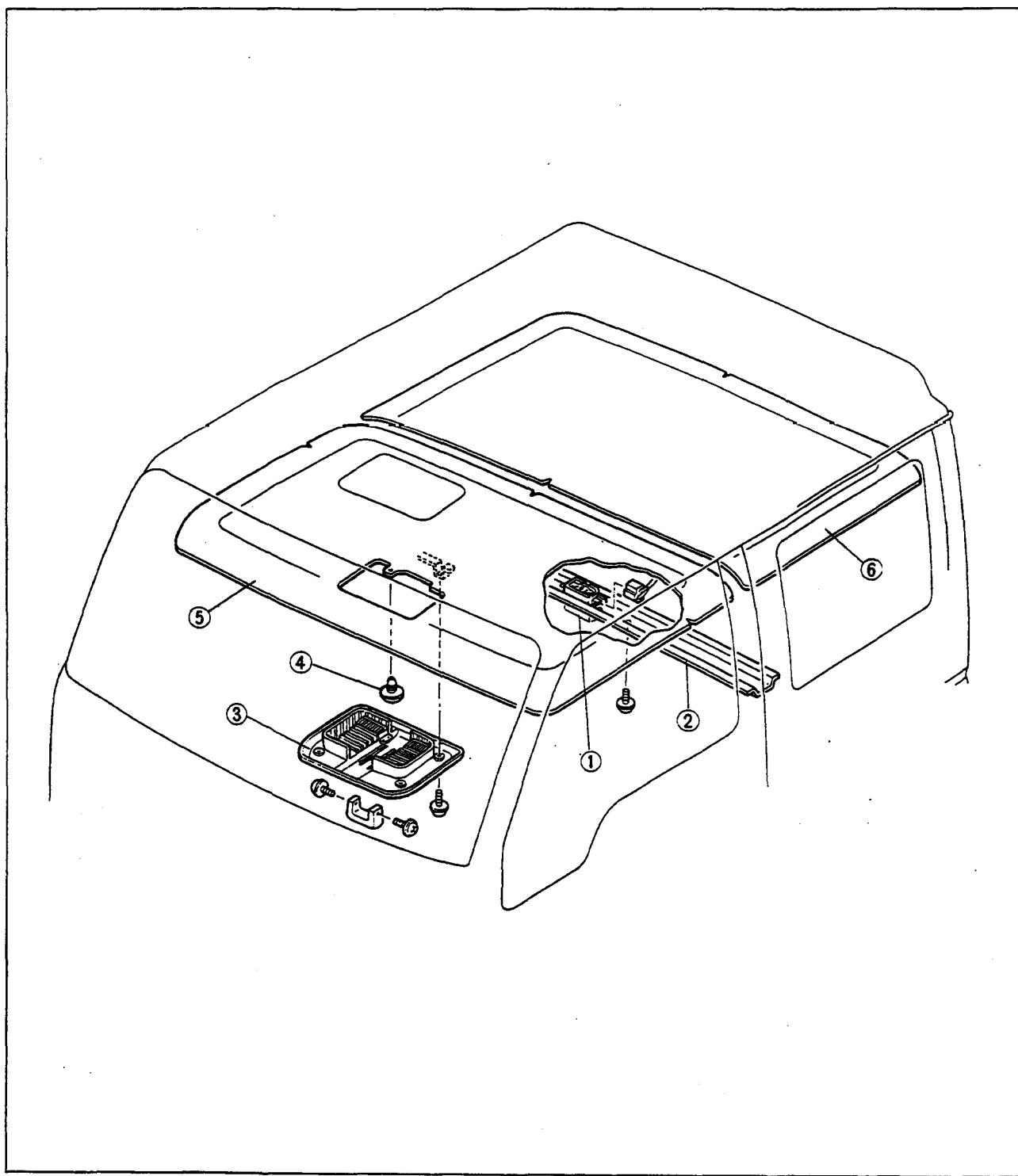
Except crew cabin



9TG0SX-126

1. Roof ventilator grille
2. Fastener

3. Headliner
Installation page S-65

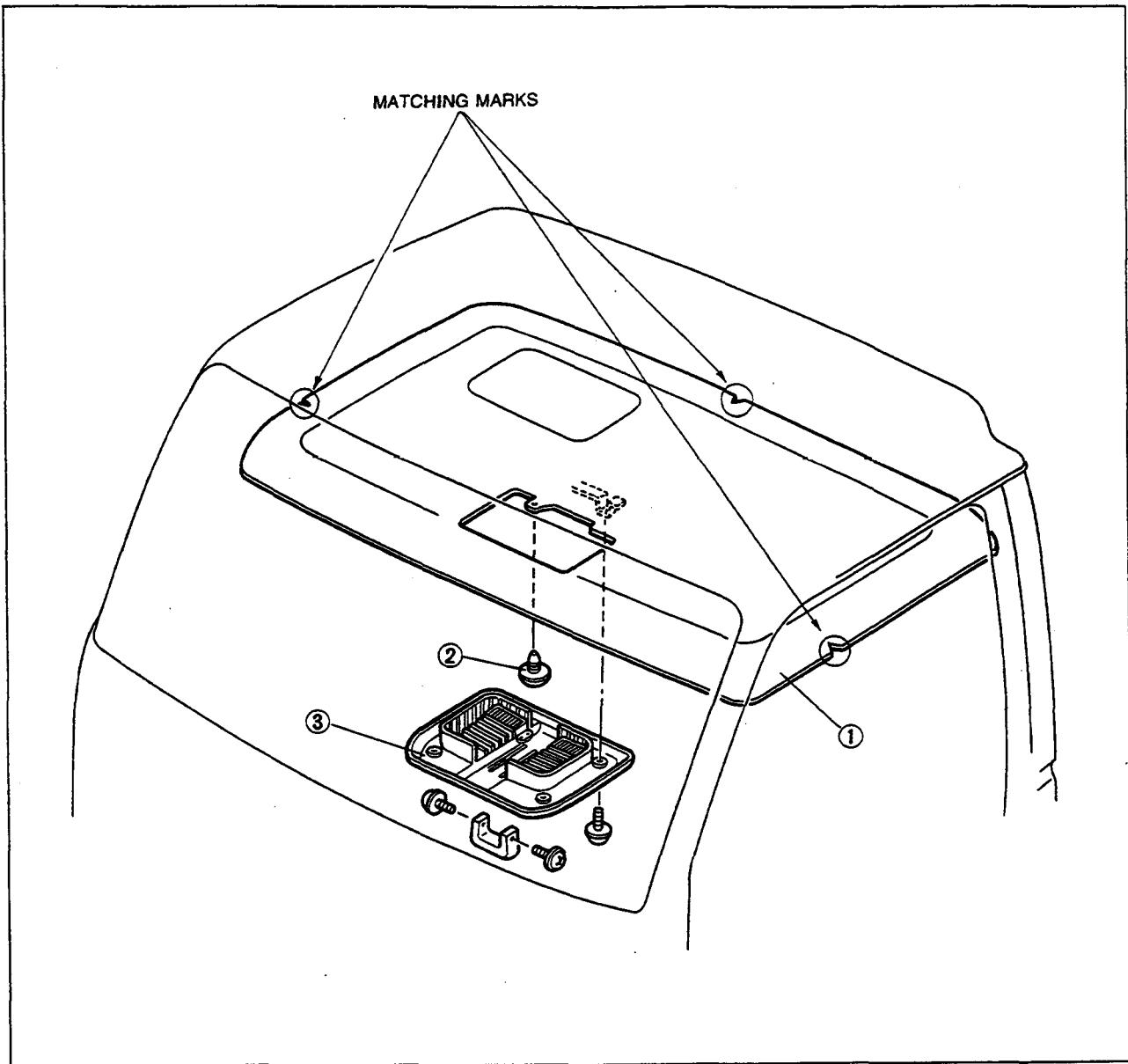
Crew cabin

9TG0SX-127

- | | | |
|---|-----------|--|
| 1. Rear interior lamp
Service..... | Section T | Rear headliner |
| 2. Roof reinforcement
Front headliner | | 6. Rear headliner
Installation..... page S-66 |
| 3. Roof ventilator grille | | |
| 4. Fastener | | |
| 5. Front headliner
Installation..... | page S-66 | |

Installation

1. Install in the reverse order of removal, referring to **Installation Note**.

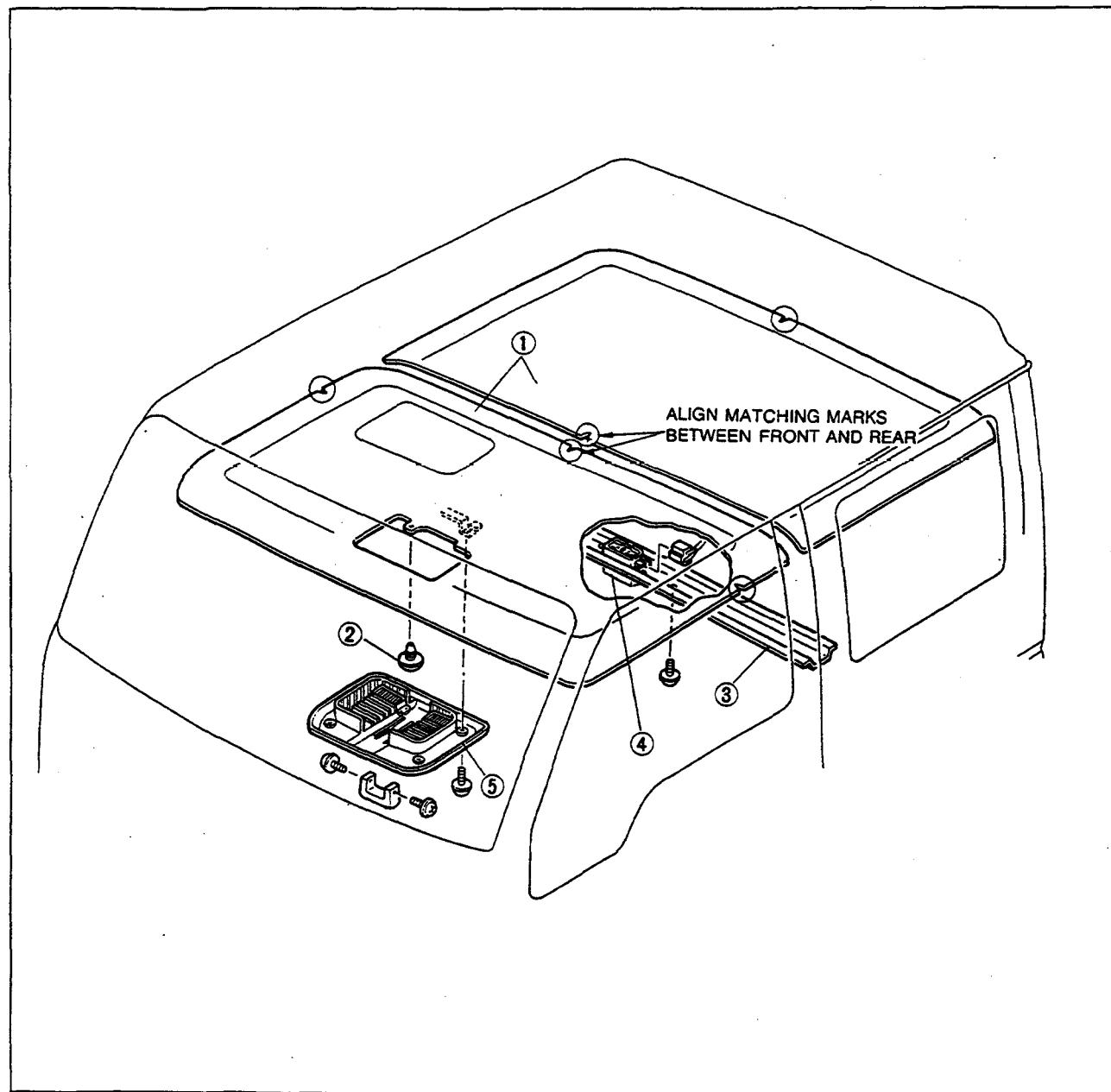
Except crew cabin

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

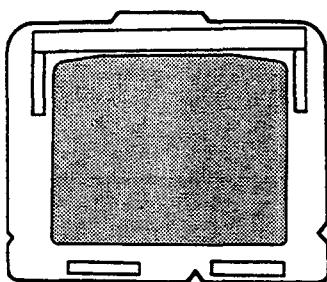
3. Roof reinforcement

4. Rear interior lamp

5. Roof ventilator grille

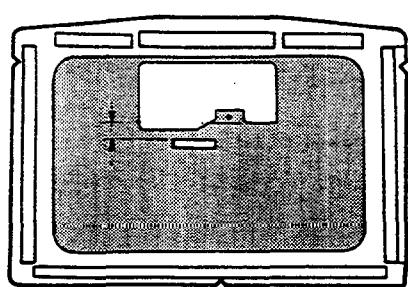
HEADLINER

STANDARD CABIN

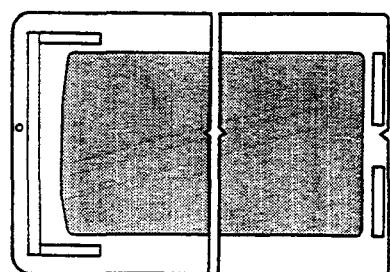


9TG0SX-130

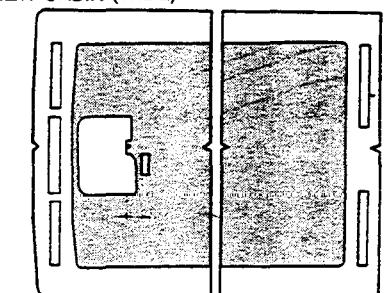
WIDE CABIN



CREW CABIN (STANDARD)



CREW CABIN (WIDE)

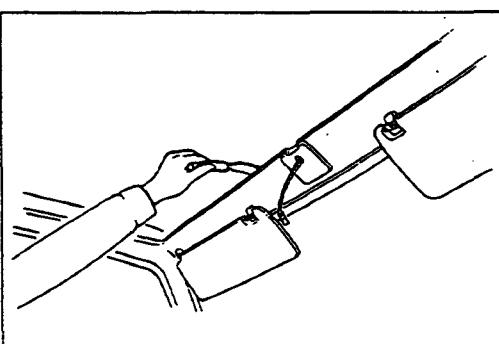


Installation note

Headliner

1. Remove the protective sheet (shaded area) from the headliner.

2. Push the headliner into place with a flat tool.



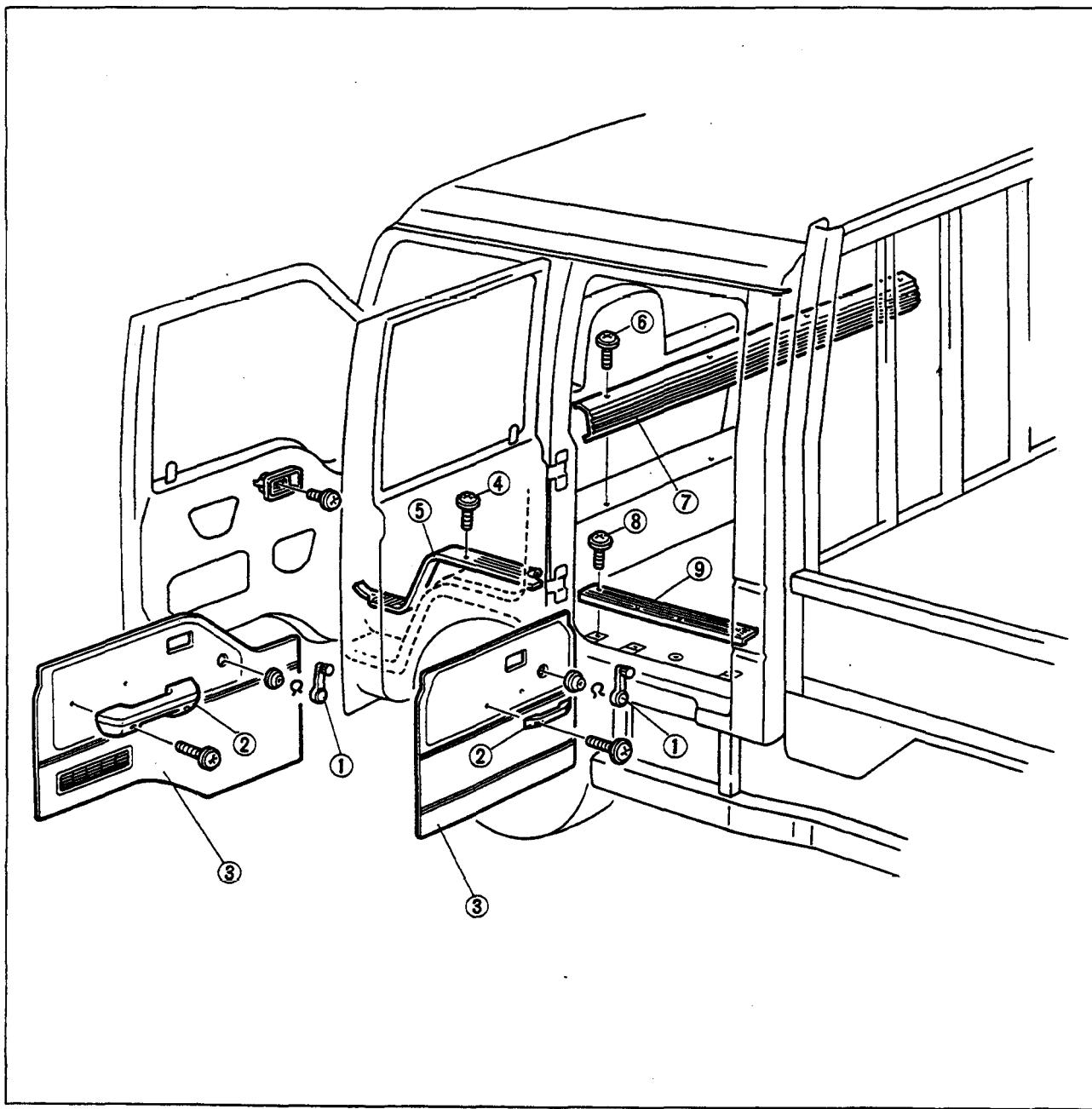
9TG0SX-131

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

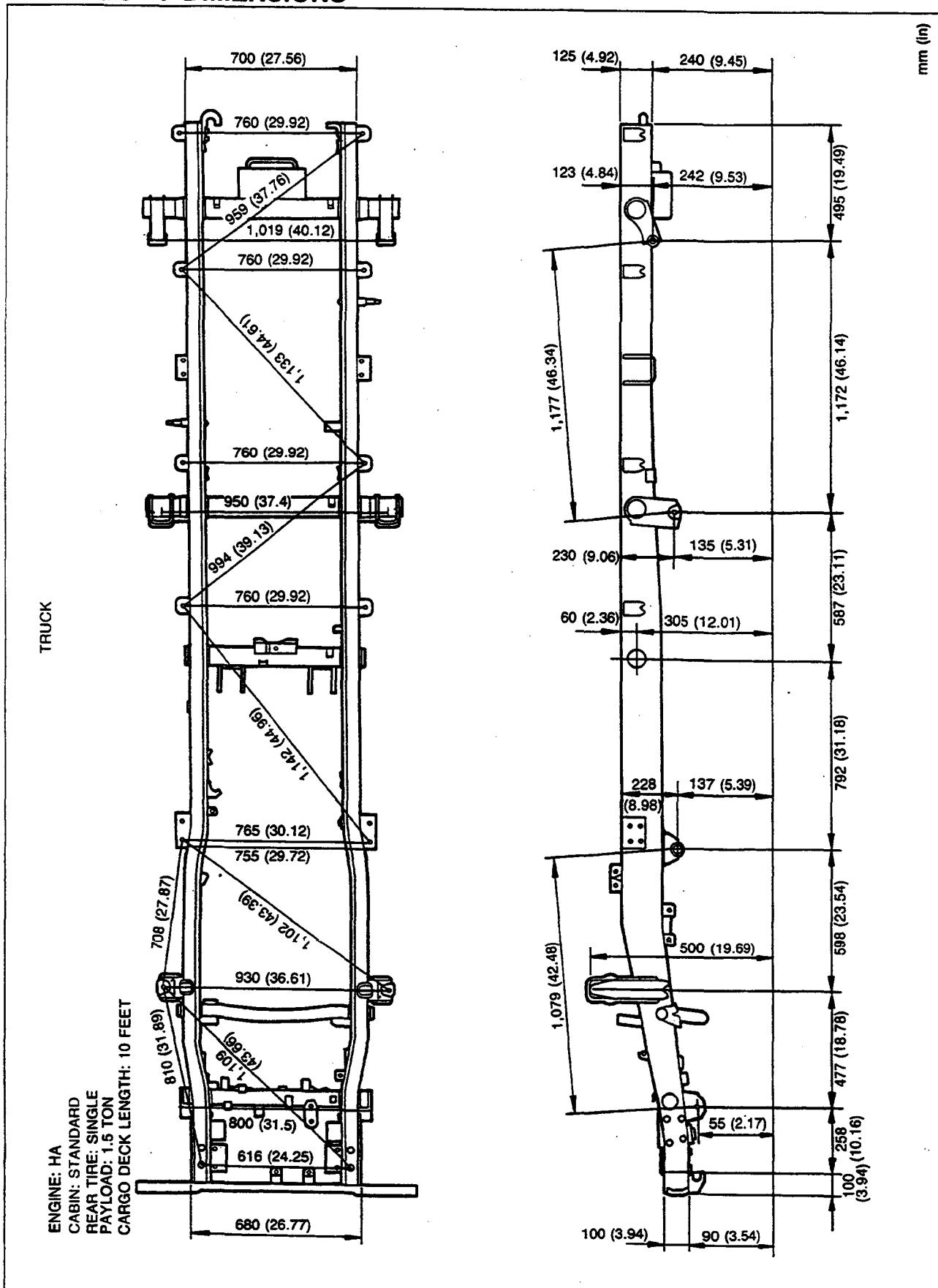
Mat side plate (crew cabin)

8. Screw
9. Mat side plate

UNDERBODY DIMENSIONS

S

UNDERBODY DIMENSIONS

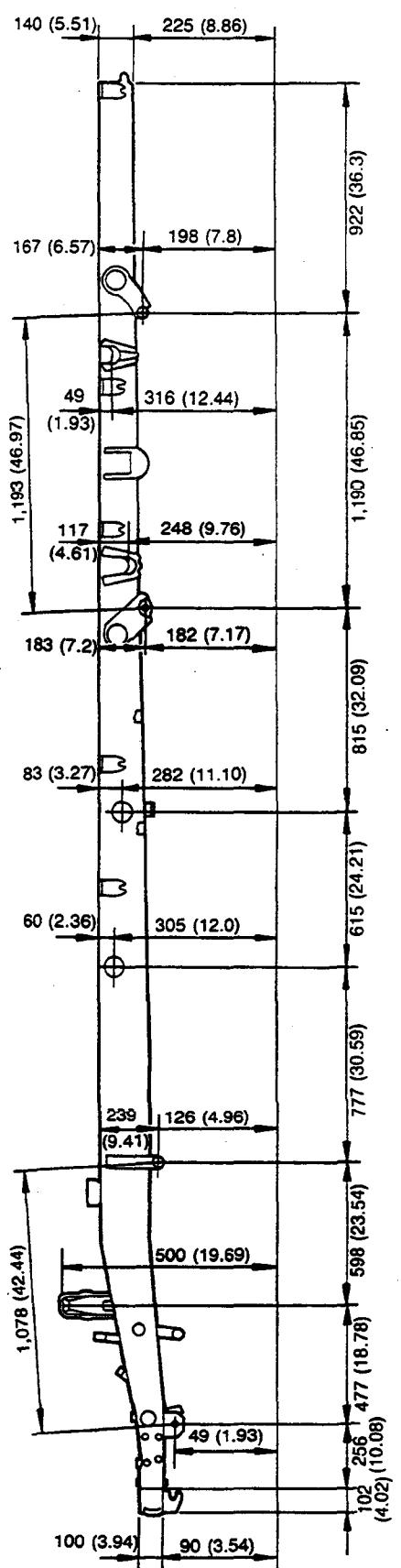
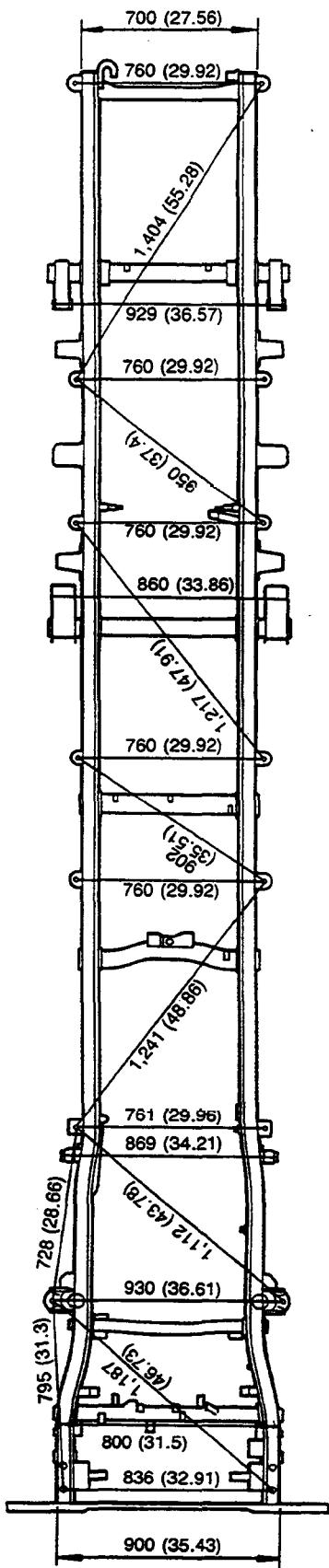


ENGINE: HA
CABIN: STANDARD
REAR TIRE: SINGLE
PAYOUT: 1.5 TON
CARGO DECK LENGTH: 10 FEET

S**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

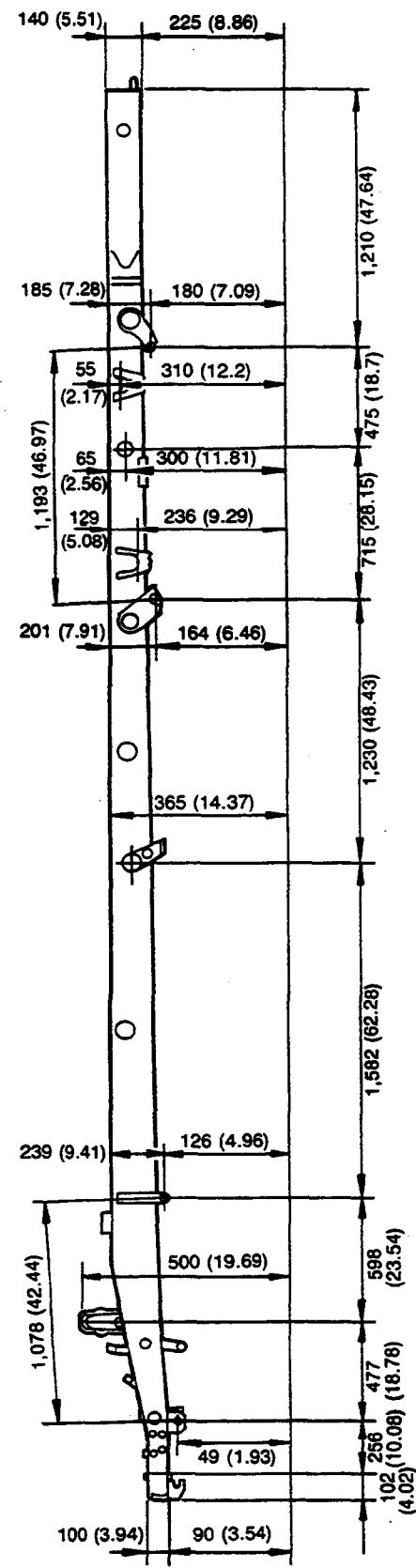
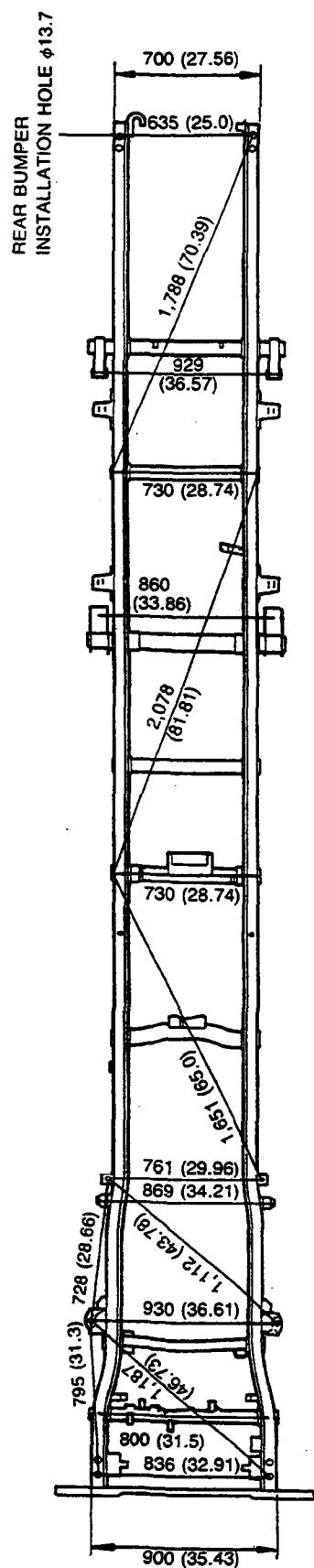


mm (in)

UNDERBODY DIMENSIONS

S

TRUCK
ENGINE: SL
CABIN: WIDE
REAR TIRE: DOUBLE
PAYOUT: 4 TON
CARGO DECK LENGTH: 17 FEET

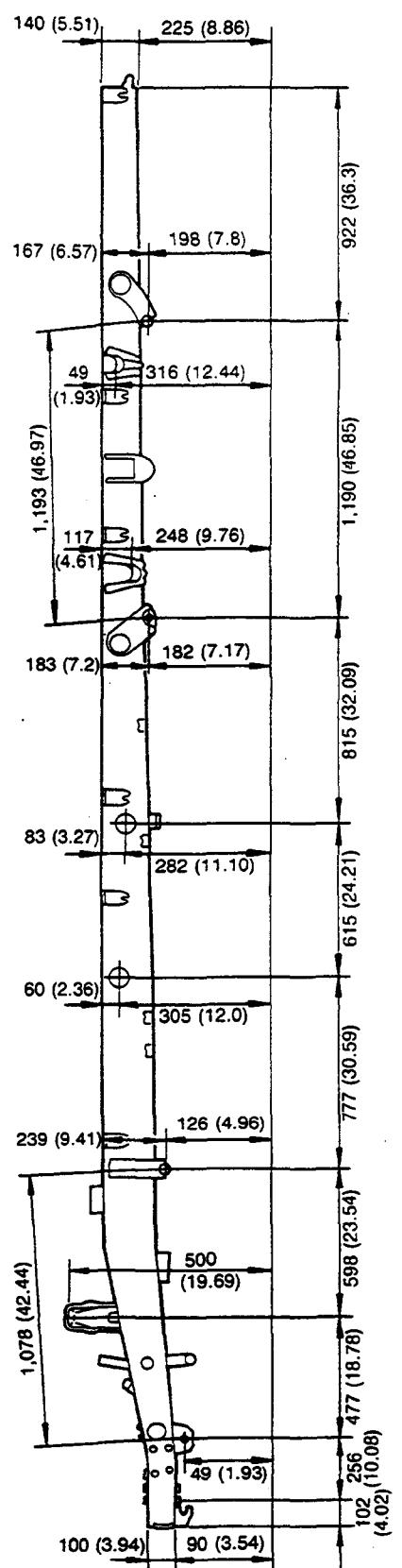
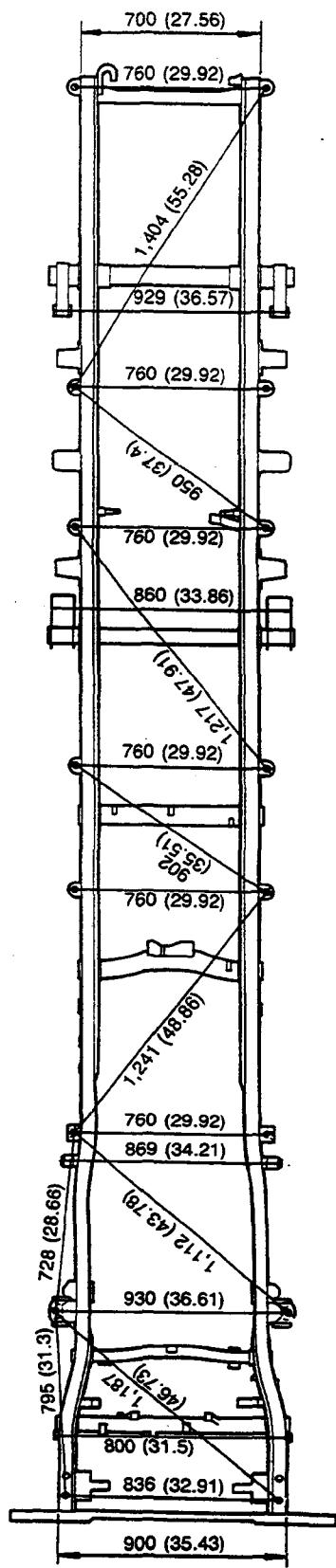


mm (in)

UNDERBODY DIMENSIONS

**ENGINE: TF
CABIN: WIDE, CREW WIDE
REAR TIRE: DOUBLE
PAYLOAD: 3.6 TON OR 4 TON
CARGO DECK LENGTH: 14 FEET**

TRUCK OR CREW CABIN



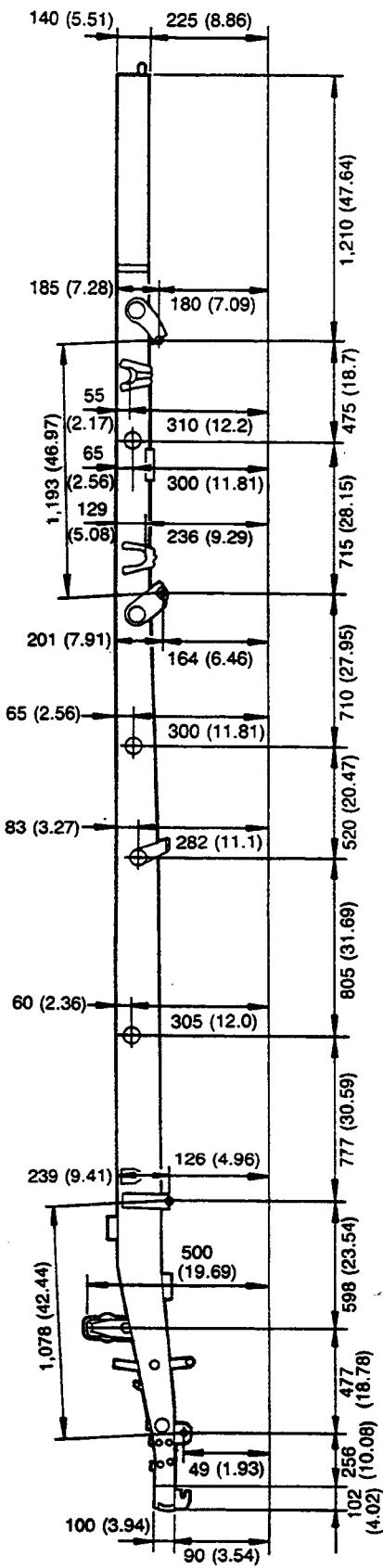
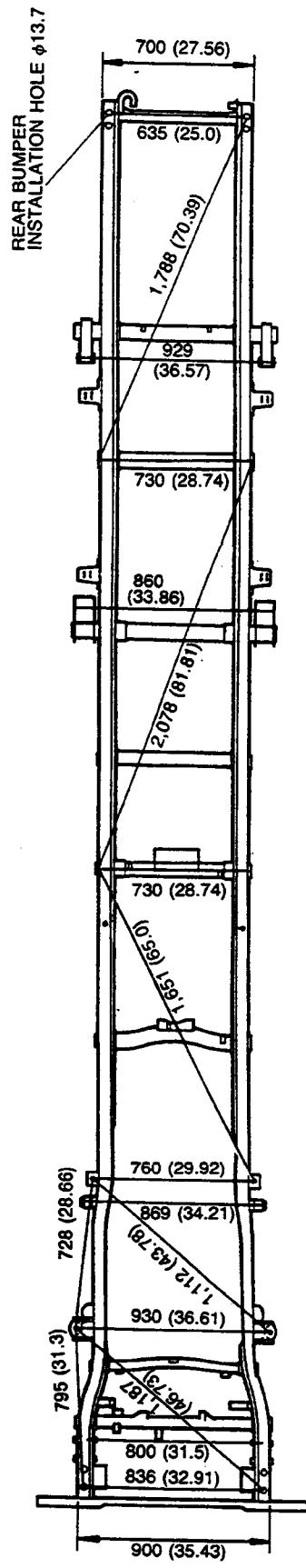
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UNDERBODY DIMENSIONS

S

TRUCK

ENGINE: TF
 CABIN: WIDE
 REAR TIRE: DOUBLE
 PAYLOAD: 4 TON
 CARGO DECK LENGTH: 17 FEET



mm (in)

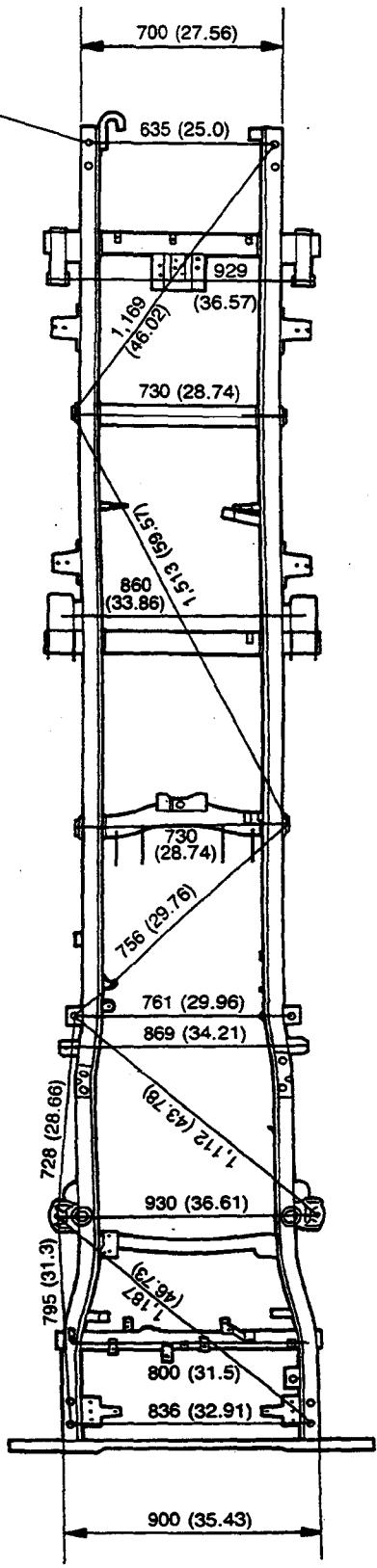
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UNDERBODY DIMENSIONS

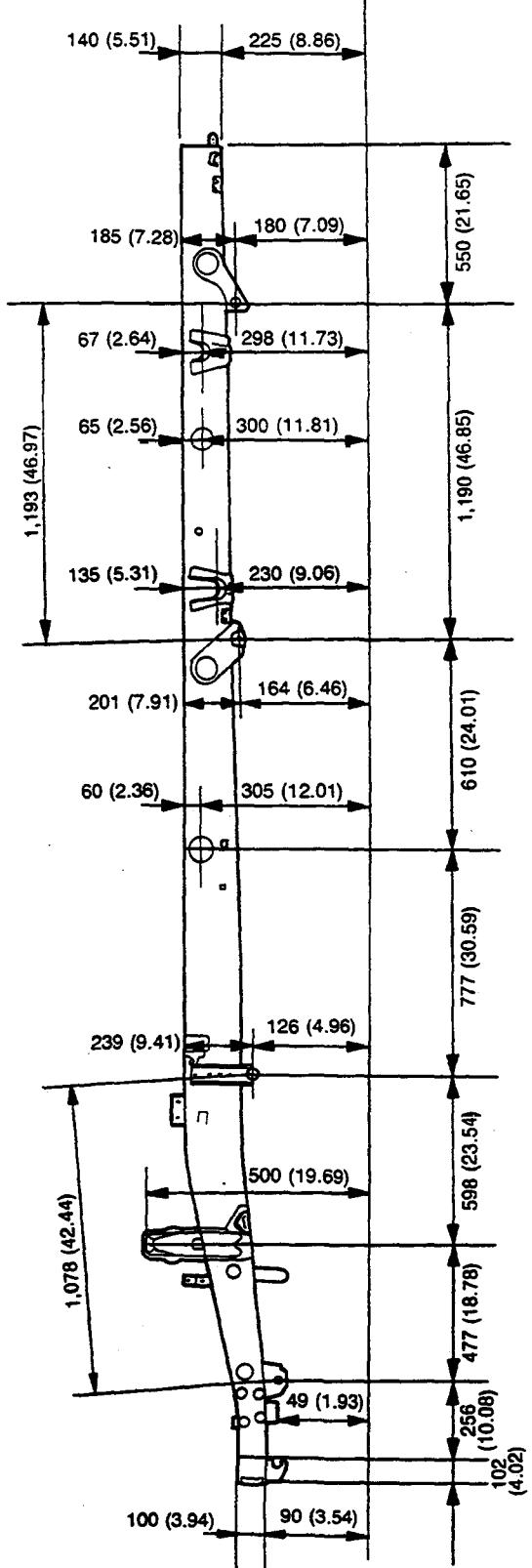
TRUCK

ENGINE: SL
 CABIN: WIDE
 REAR TIRE: DOUBLE
 PAYLOAD: 2 TON
 CARGO DECK LENGTH: 10 FEET

REAR BUMPER
INSTALLATION HOLE $\phi 13.7$

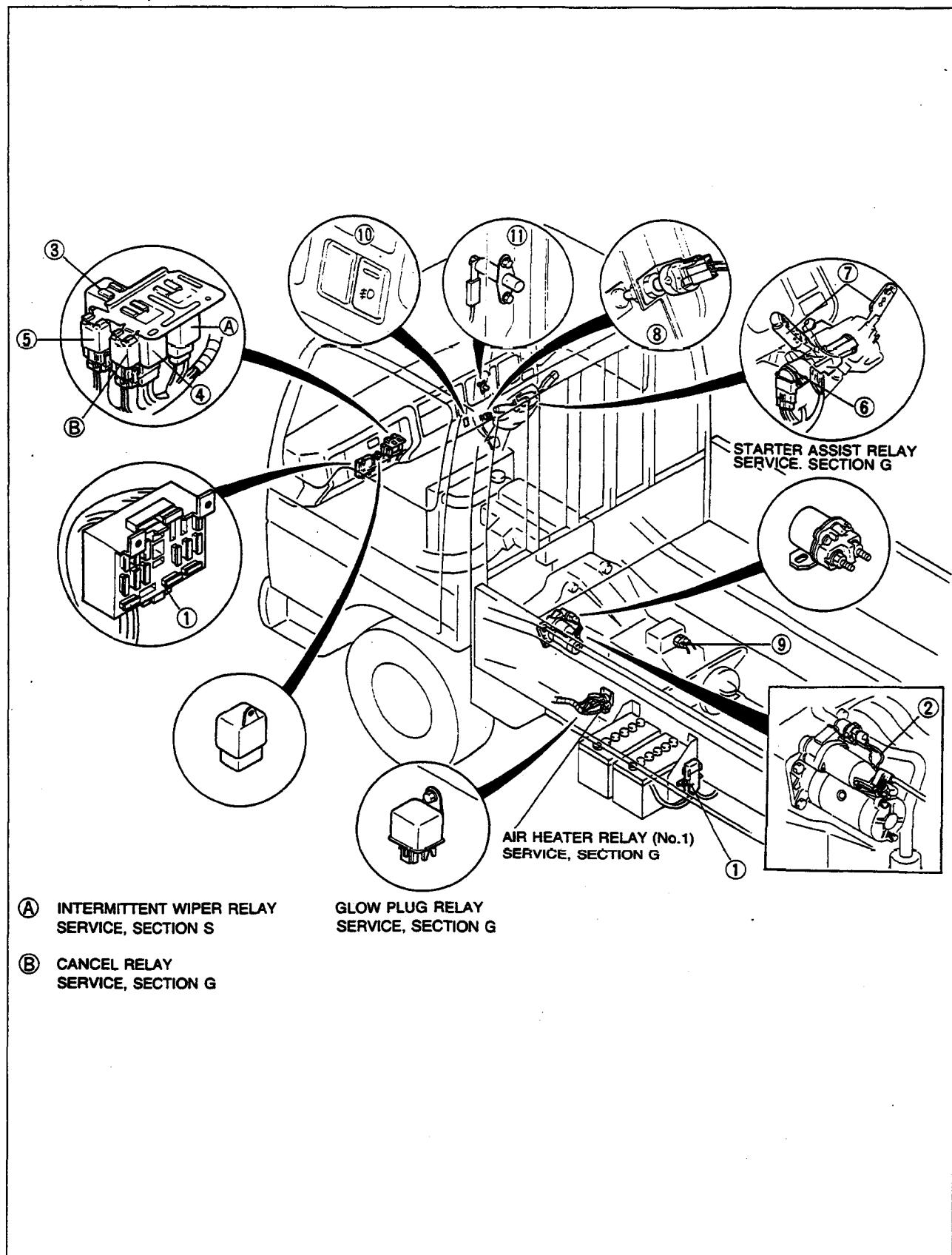


mm (in)



BODY ELECTRICAL SYSTEM

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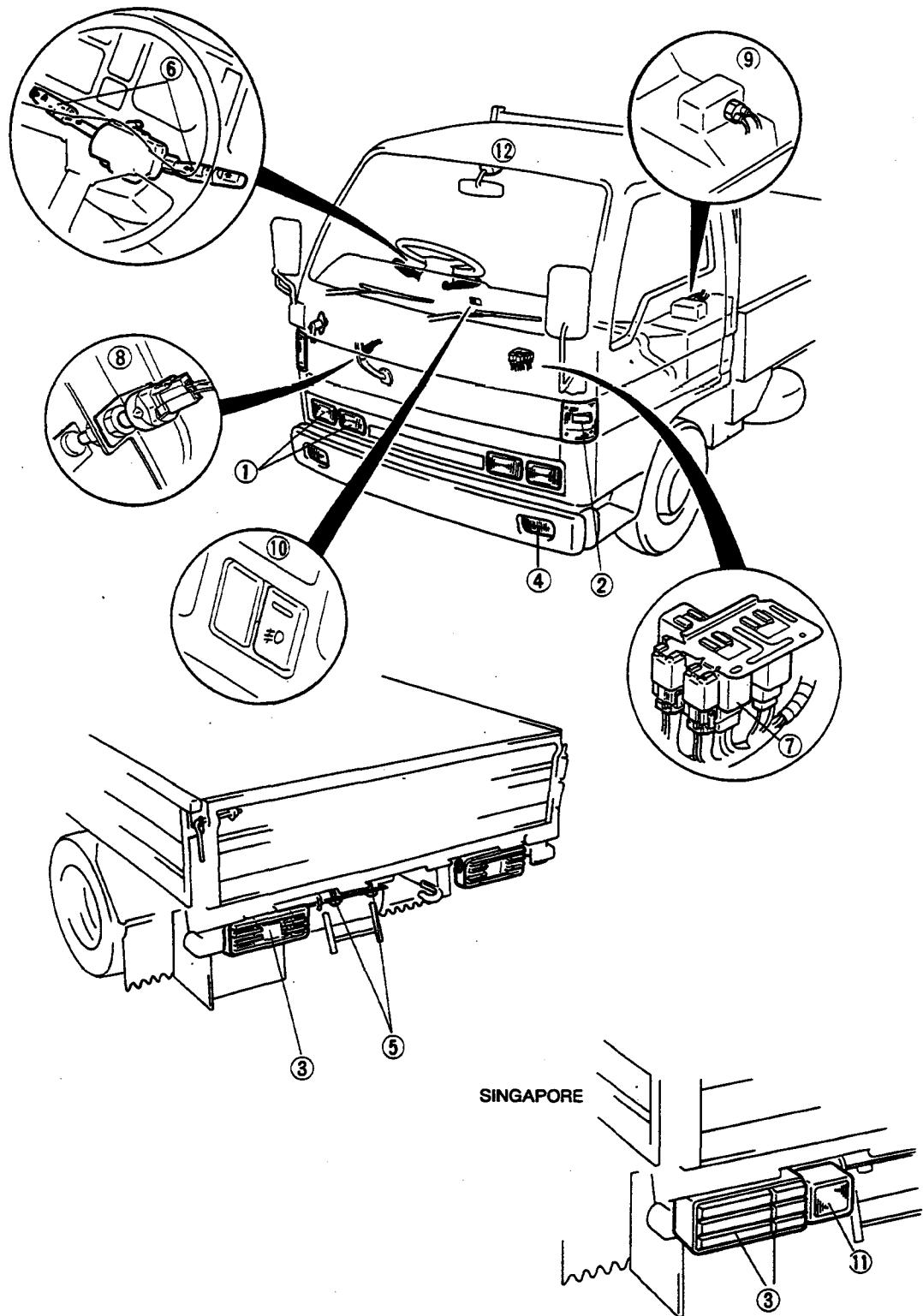
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EXTERIOR LIGHT, INTERIOR LAMP

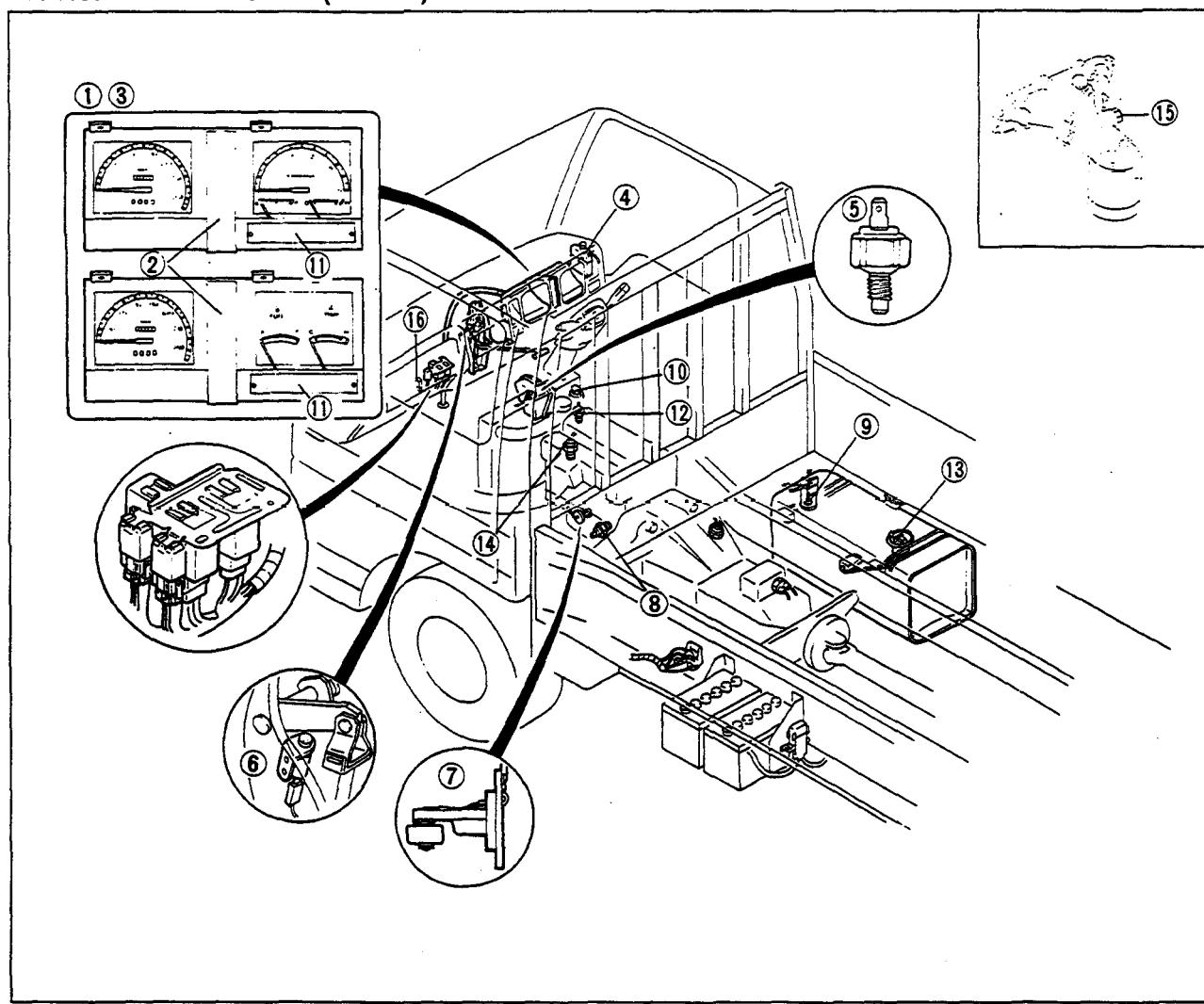


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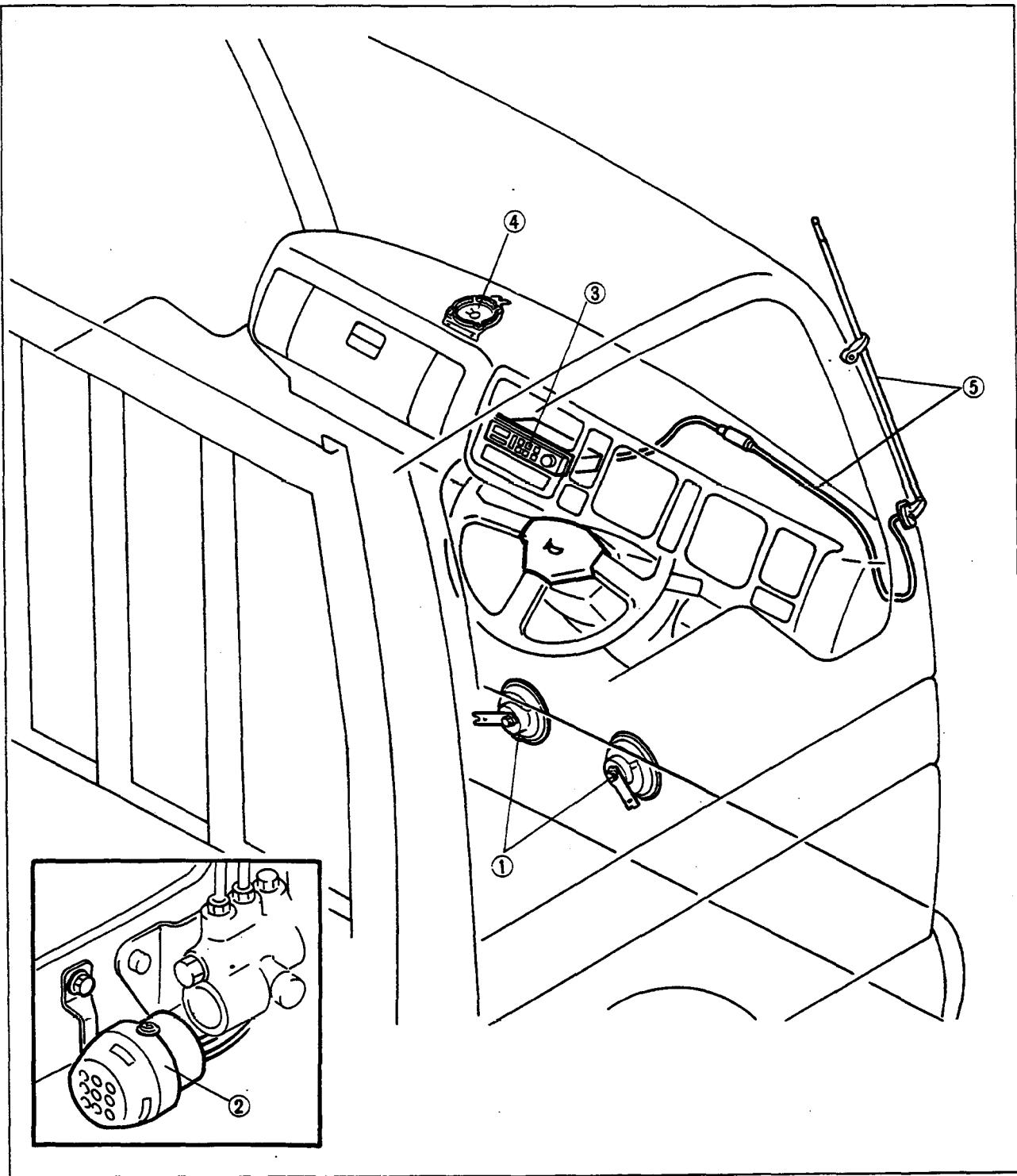
9TGOTX-005

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TROUBLESHOOTING GUIDE

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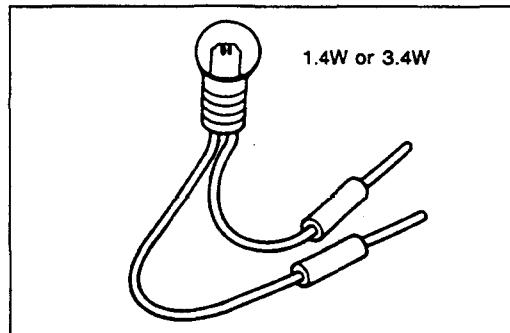
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OUTLINE

HOW TO USE THIS SECTION

Understanding will be easier if this section is used in conjunction with the **WIRING DIAGRAMS**.

9MU0TX-008



69G15X-002

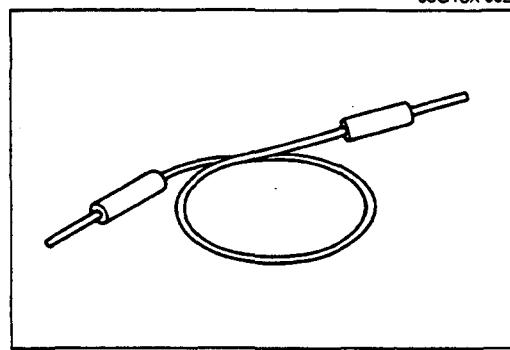
ELECTRICAL TROUBLESHOOTING TOOLS

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.



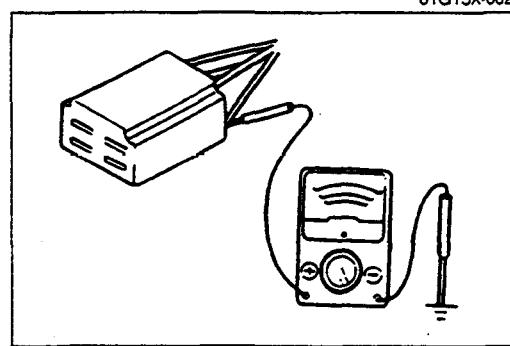
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Jumper Wire

The jumper wire is used for testing by short-circuiting switch terminals and for verifying the condition of ground connections.

Caution

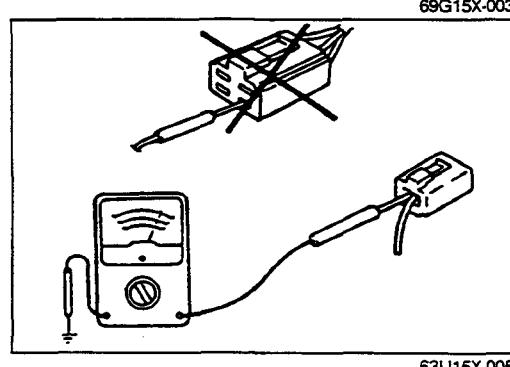
- Do not connect the jumper wire between a power source line and body ground because this may cause burning or other damage to harnesses or electronic components.



69G15X-003

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.



63U15X-005

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.

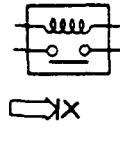
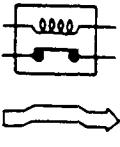
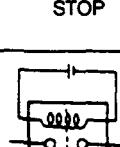
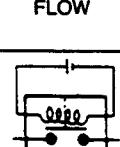
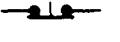
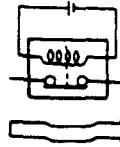
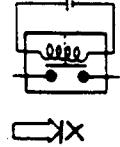
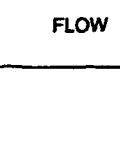
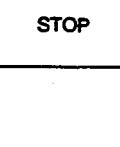
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OUTLINE

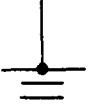
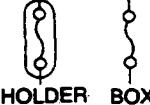
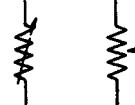
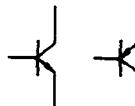
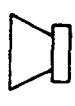
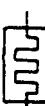
ELECTRICAL SYMBOLS

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)	 	 	 	 
In operation (Power supply)	 	 	 	 

Other Electrical Symbols

			
BATTERY	BODY GROUND	FUSE	FUSIBLE LINK
			
MOTOR	COIL, SOLENOID	RESISTOR	VARIABLE RESISTOR
			
THERMISTER	DIODE	CONDENSER	LIGHT
			
TRANSISTOR	SPEAKER	CIGARETTE LIGHTER	HEATER

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.

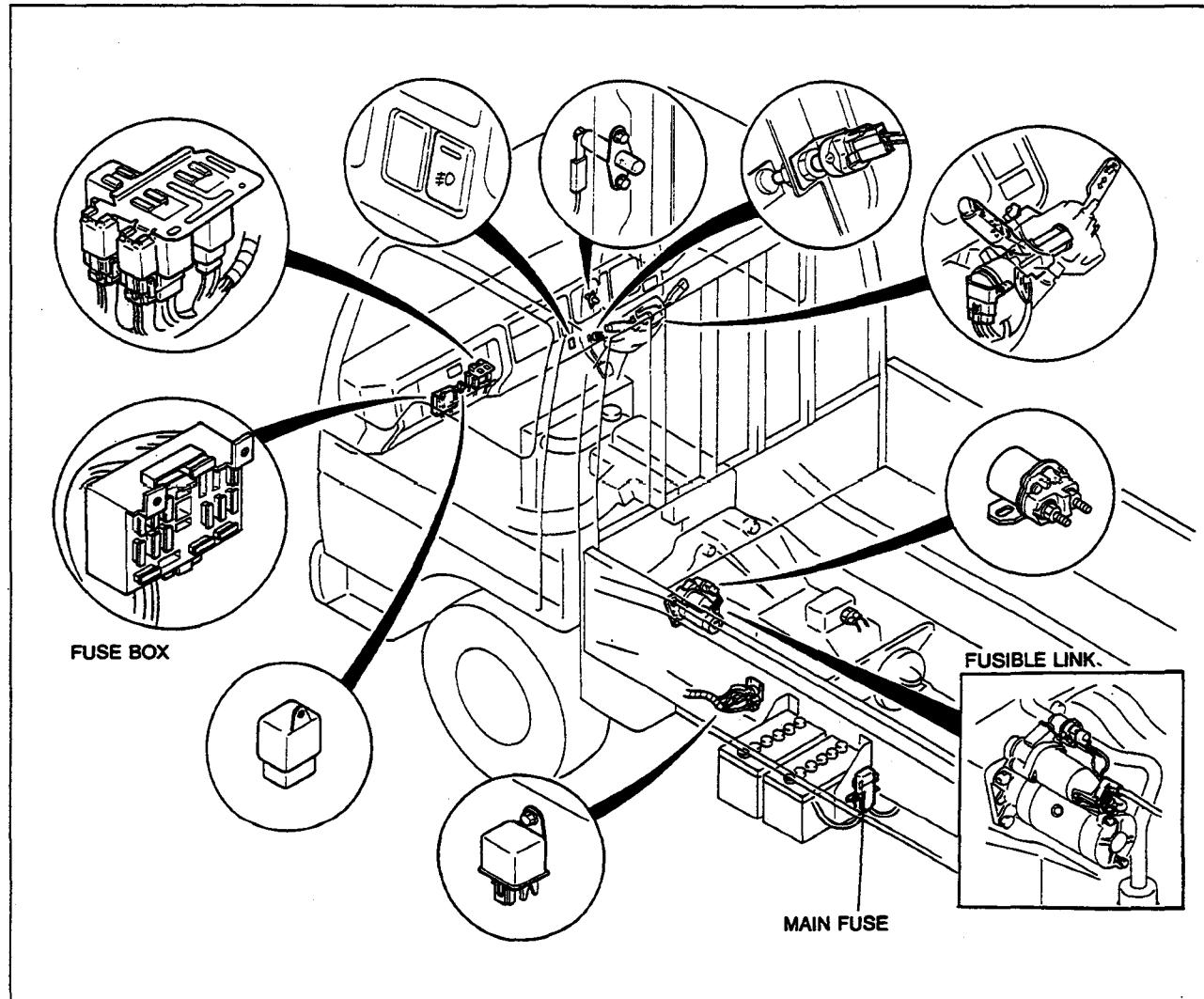
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FUSES

Specifications

Main fuse block

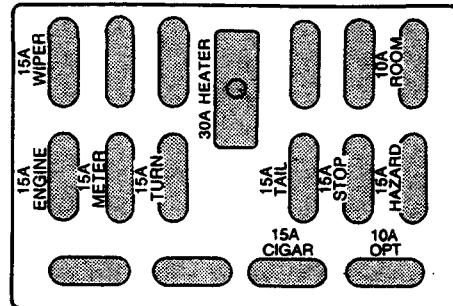
Fuse	Housing color	Protected circuit
MAIN 100A	Blue	Glow plug, Engine switch, Alternator. Circuits protected in fuse box
MAIN 60A	Yellow	Engine switch, Alternator, Air heater, Circuits protected in fuse box
HEAD 30A	Pink	Alternator, Headlight
WORKING LAMP 30A	Pink	Working lamp



FUSE

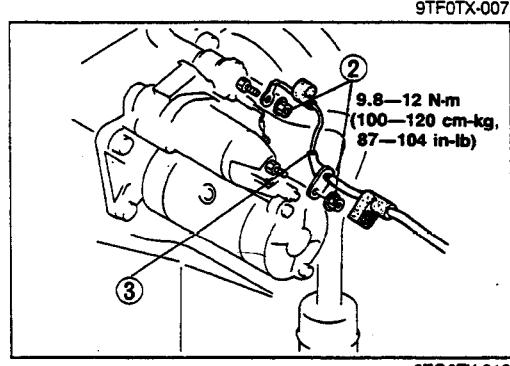
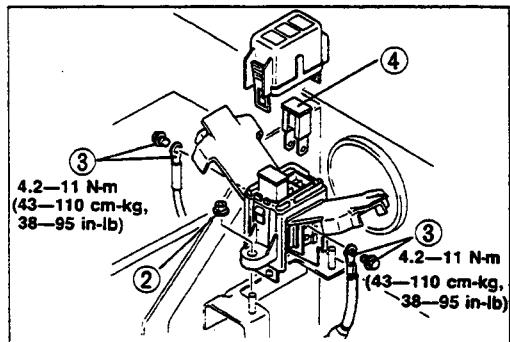
Fuse box

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	—



Fusible link: Circuit protected QSS or air heater system.

9TG0TX-011



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

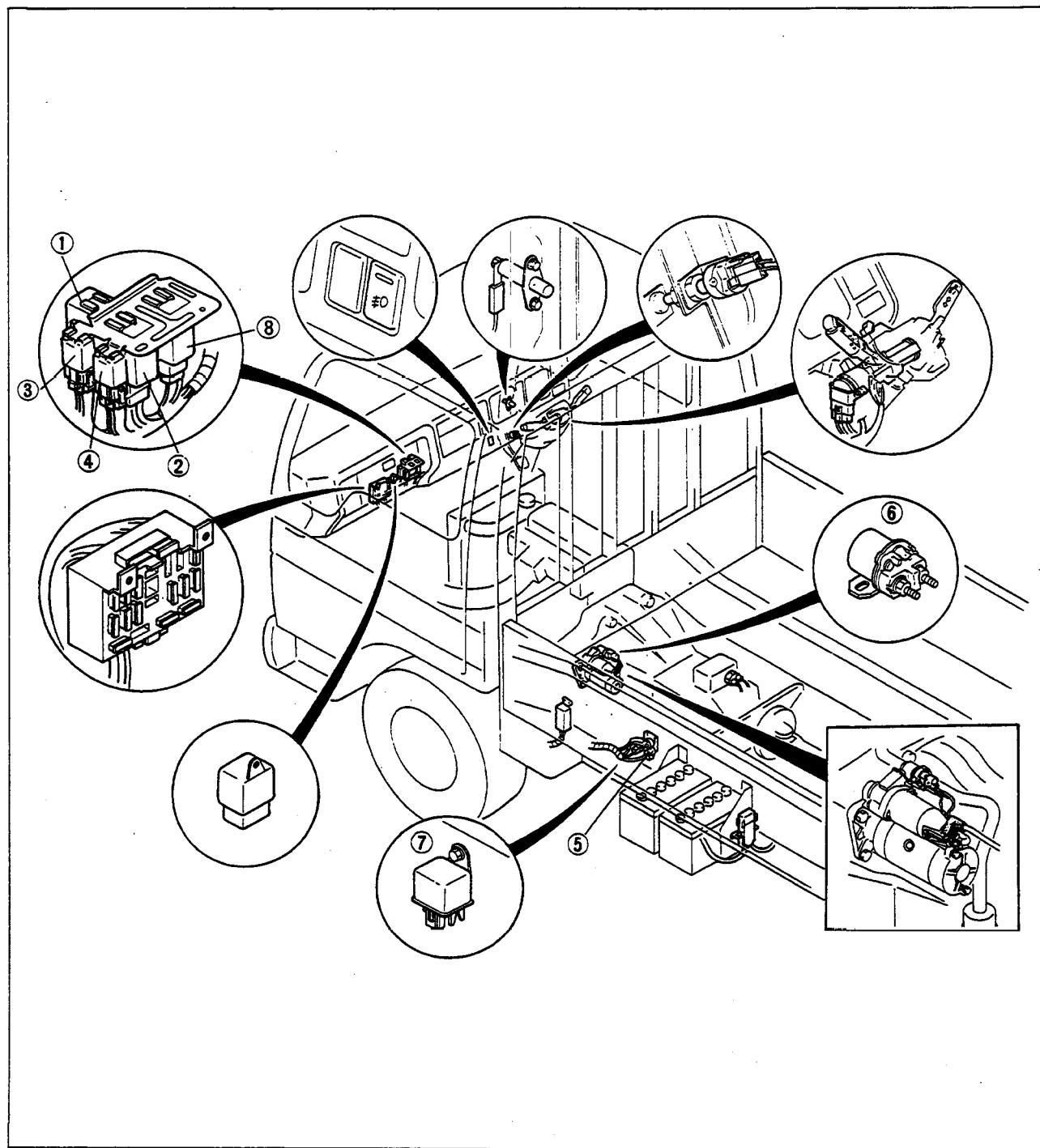
1. Disconnect the negative battery cable.
2. Remove the nuts.
3. Remove the fusible link from the stator.
4. Install in the reverse order of removal.

Tightening torque:

9.8–12 N·m (100–120 cm·kg, 87–104 in·lb)

RELAY

STRUCTURAL VIEW

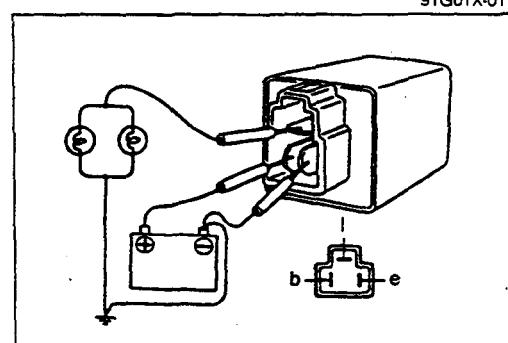
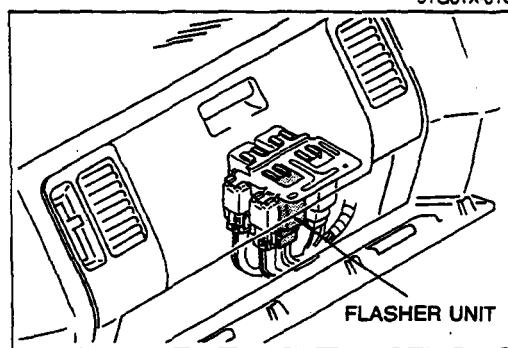
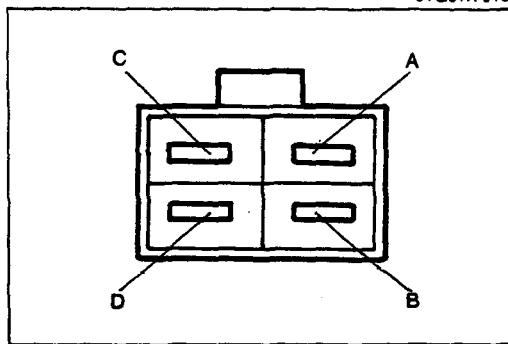
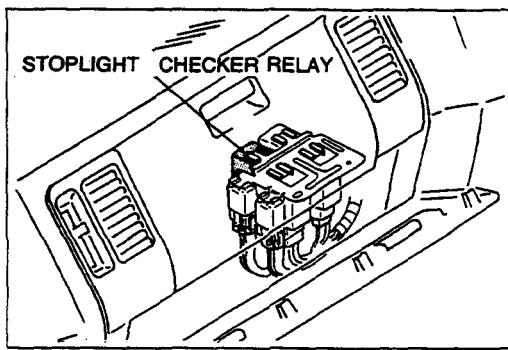


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- | | |
|--|--|
| 1. Stoplight checker relay
Inspection page T-15, 60 | 5. Air heater relay
Service Section G |
| 2. Flasher unit
Inspection page T-15 | 6. Assist relay
Service Section G |
| 3. Horn relay
Inspection page T-73 | 7. Glow plug relay
Service Section G |
| 4. Cancel relay
Service Section G | 8. Intermittent wiper relay
Service Section S |

RELAY

T



STOPLIGHT CHECKER RELAY

Inspection

1. Check continuity between terminals of the stoplight checker relay.

Note

- Set the tester to $\times 1,000\Omega$ 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 I and a ground, and verify that the test lamp glows.

Caution

- Apply the battery voltage to terminals properly.

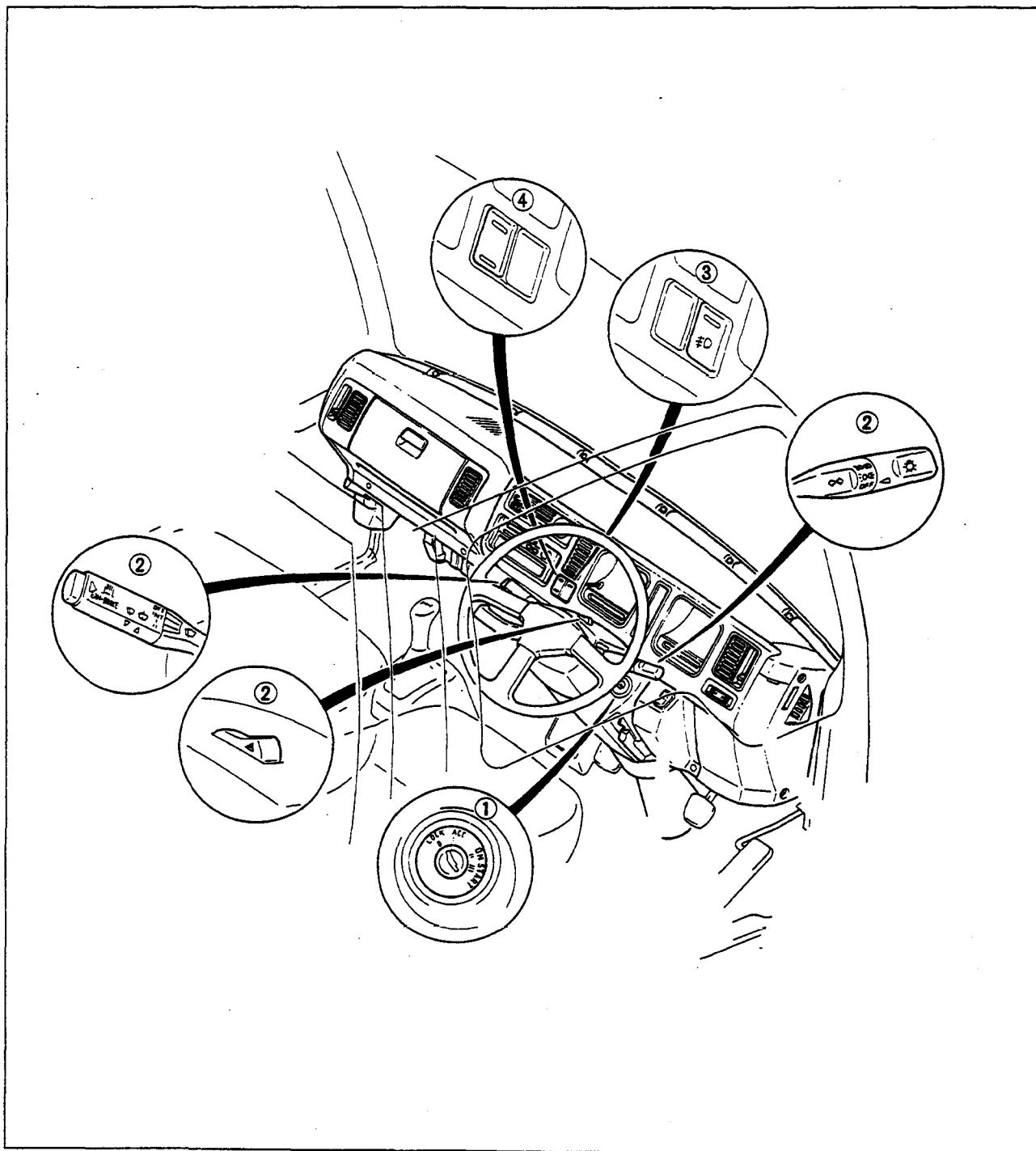
3. Replace the flasher unit if not as specified.

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SWITCHES

SWITCHES

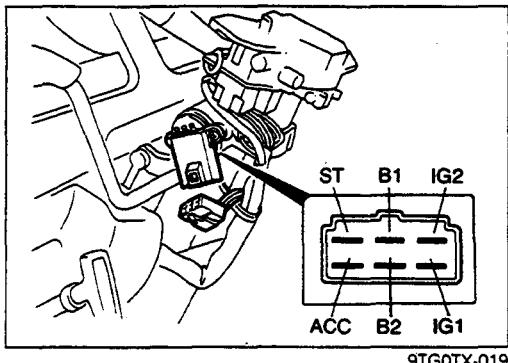
STRUCTURAL VIEW



9TGOTX-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

SWITCHES



9TG0TX-019

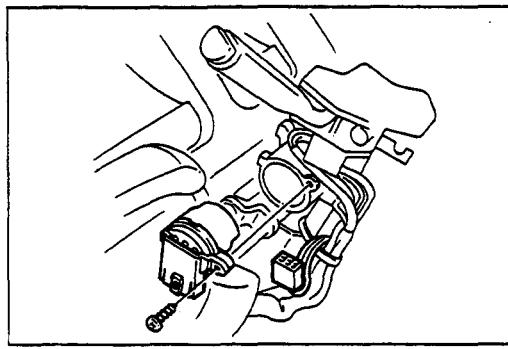
ENGINE SWITCH

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.



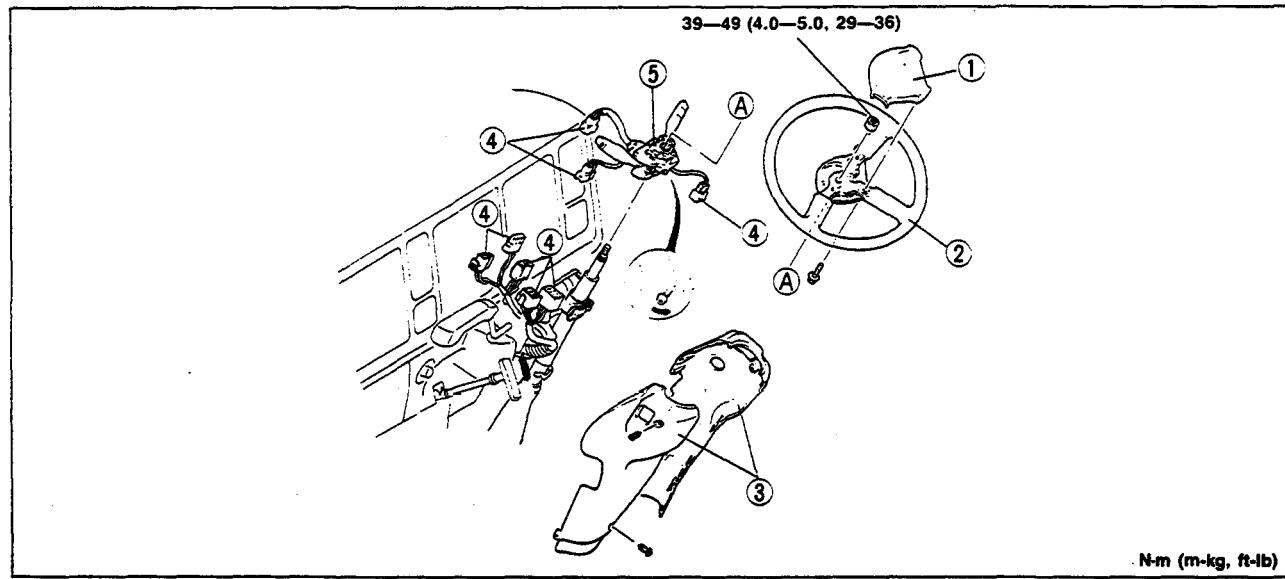
9TG0TX-020

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.



N·m (m·kg, ft·lb)

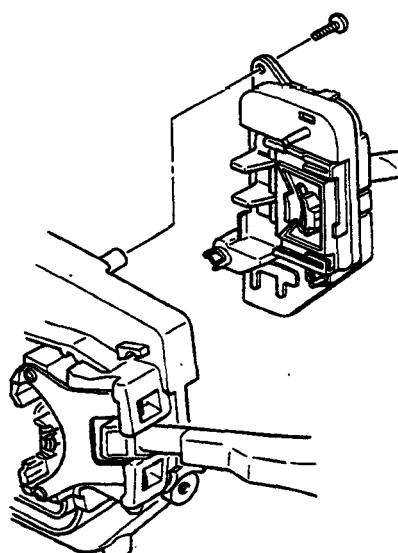
9TG0TX-021

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.



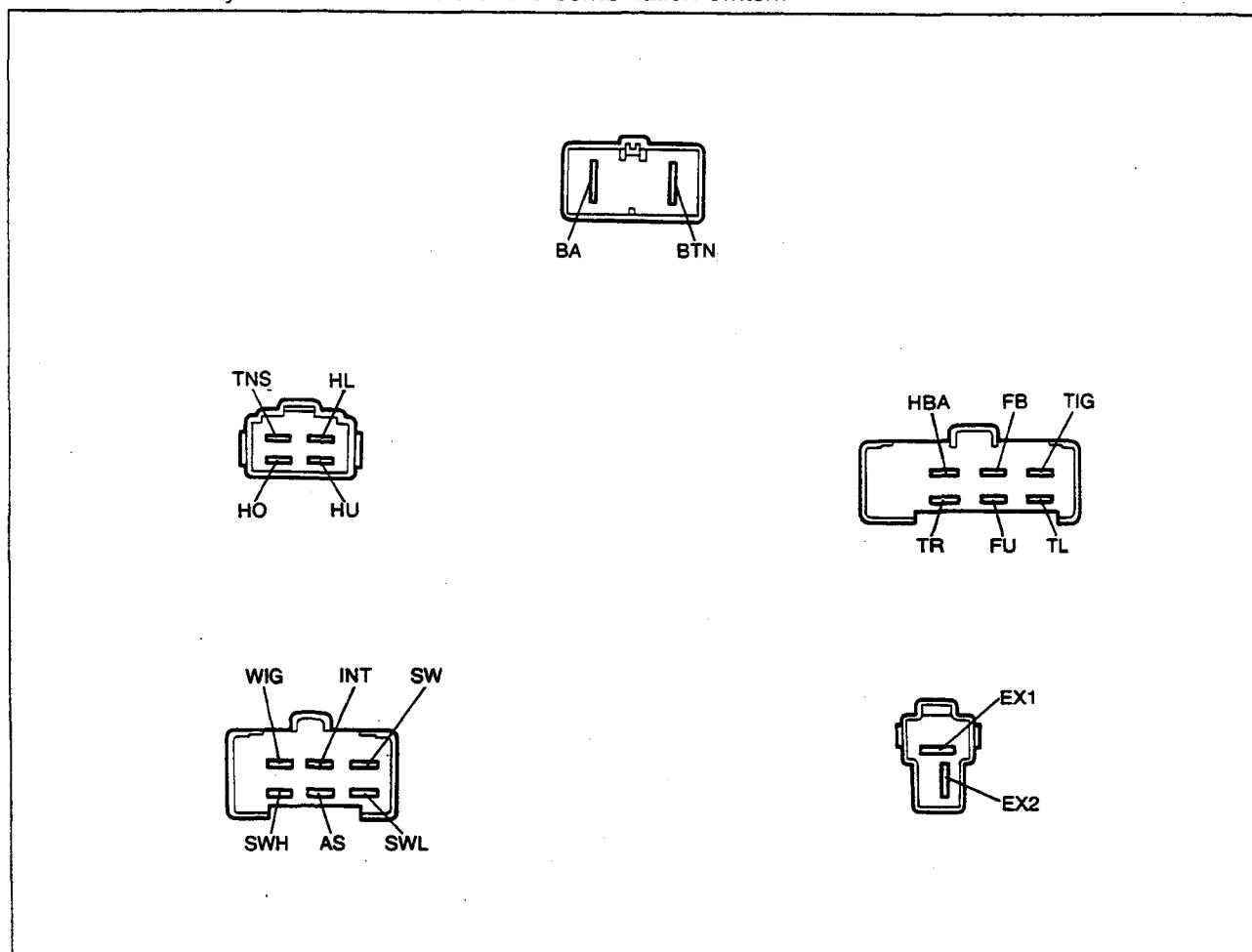
9TG0TX-022

T

SWITCHES

Inspection

- 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			○	○		

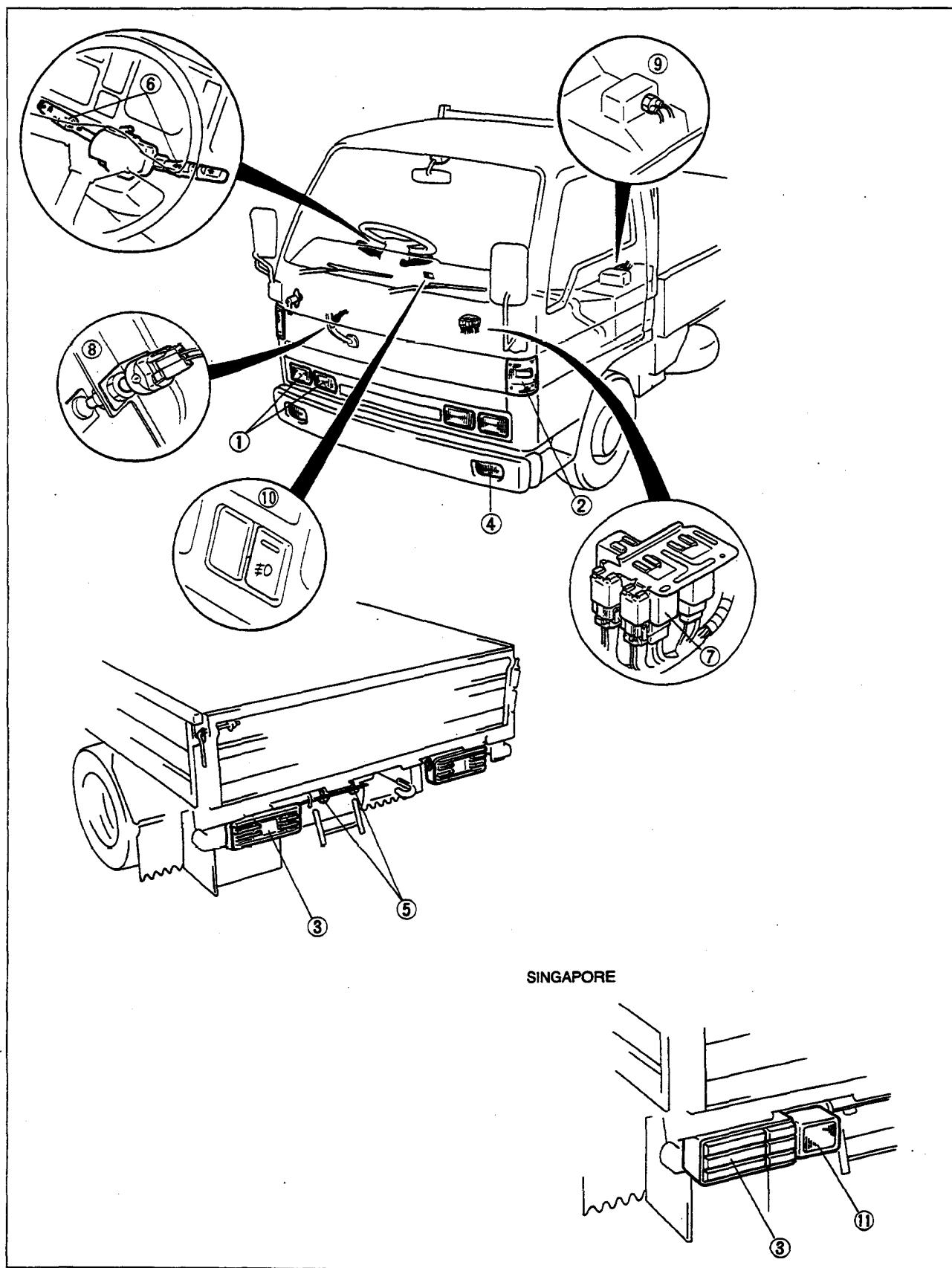
Exhaust brake switch

Exhaust brake switch	EX1	EX2
OFF		
ON	○	○

○—○: Indicates continuity

EXTERIOR LIGHTING SYSTEM

STRUCTURAL VIEW



EXTERIOR LIGHTING SYSTEM

T

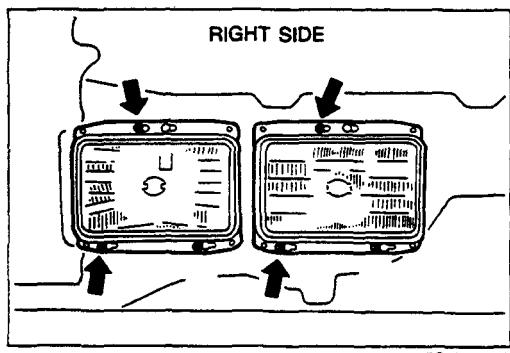
1. Headlight	4. Fog light
Aiming.....	Troubleshooting
Troubleshooting	page T-34
Removal / Installation	Removal / Inspection /
	Installation
2. Front combination light	page T-38
Removal / Inspection /	
Installation	page T-37
1) Turn and hazard warning light	5. License plate light
Troubleshooting	Troubleshooting
Removal / Inspection /	page T-28
Installation	Removal / Inspection /
2) Small light control system	Installation
Troubleshooting	page T-41
Removal / Inspection /	6. Combination switch
Installation	Removal / Installation
3. Rear combination light	Disassembly / Assembly
Removal / Inspection /	page T-18
Installation	Inspection
1) Turn and hazard warning light	page T-19
Troubleshooting	7. Flasher unit
Removal / Inspection /	Inspection
Installation	page T-15
2) Small light control system	8. Stoplight switch
Troubleshooting	Inspection
Removal / Inspection /	page T-41
Installation	9. Back-up light switch
3) Back-up light	Inspection
Troubleshooting	page T-41
Removal / Inspection /	10. Fog light switch
Installation	Inspection
4) Stoplight	page T-42
Troubleshooting	11. Back-up light
Removal / Inspection /	Troubleshooting
Installation	Removal / Inspection /
	Installation
	page T-30
	page T-40
	9TGOTX-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

EXTERIOR LIGHTING SYSTEM



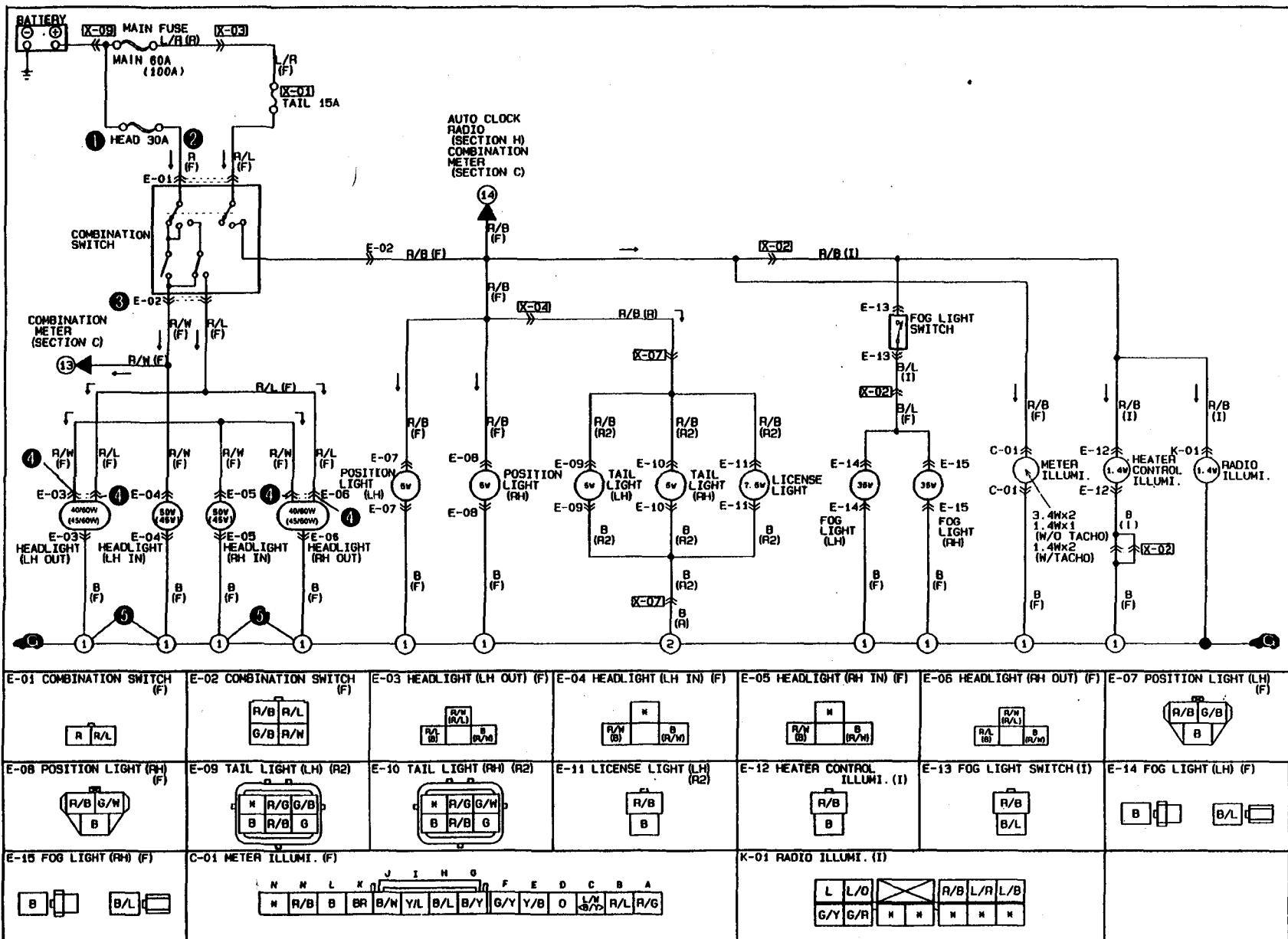
OTGOTX-027

AIMING

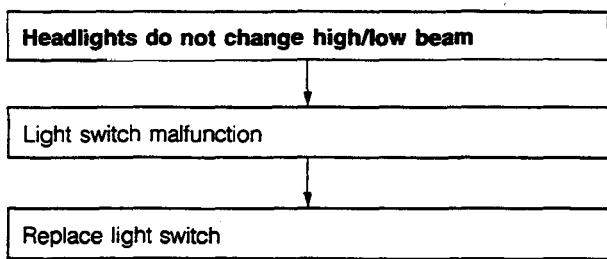
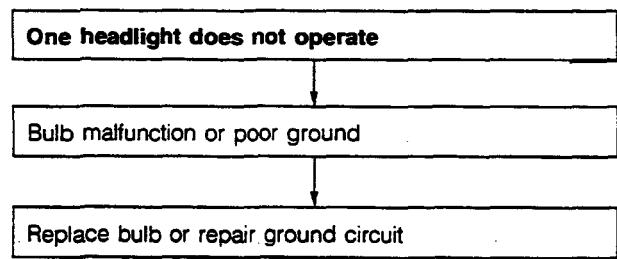
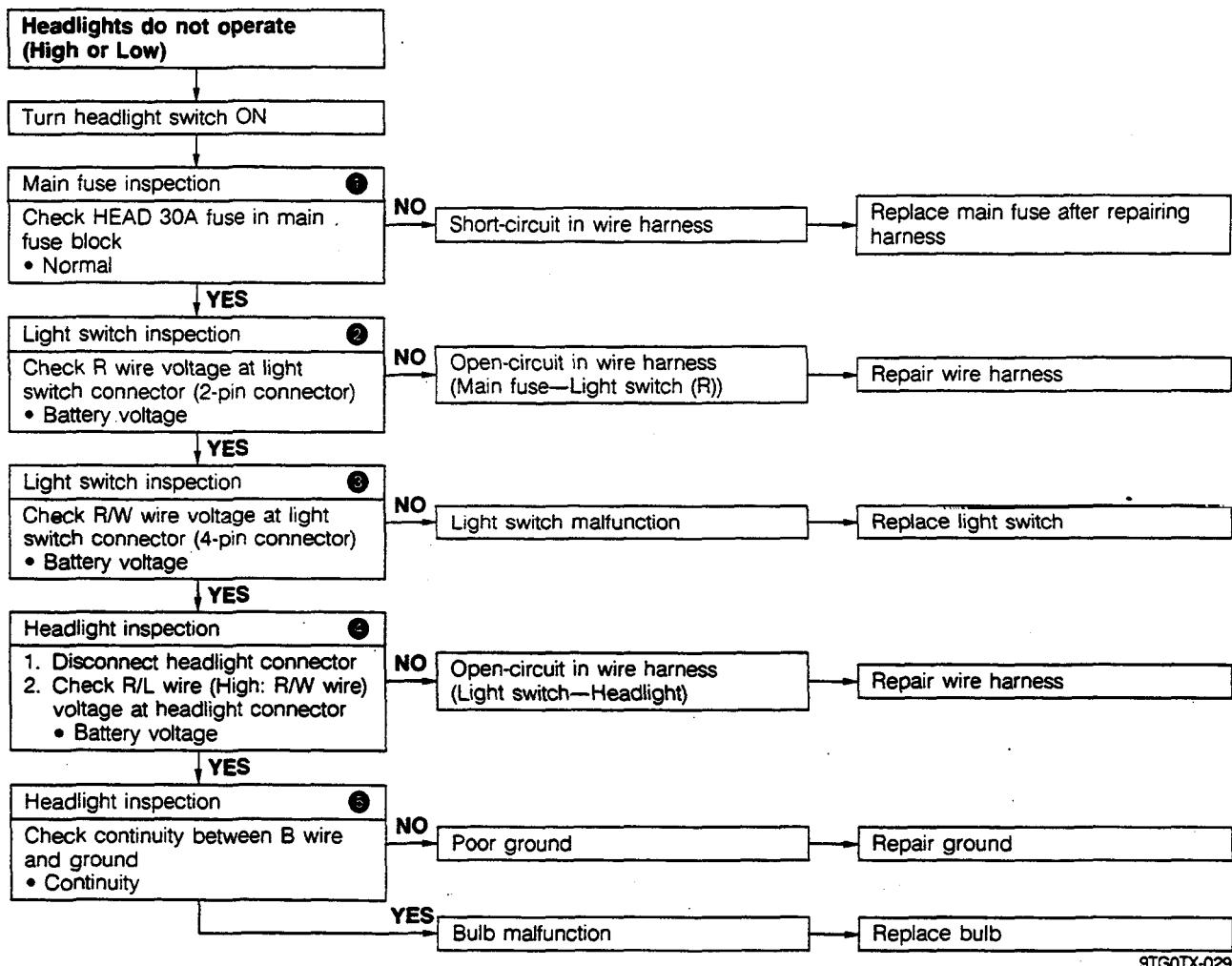
1. Adjust the tire air pressures to specification.
2. Position the unloaded vehicle on a flat, level surface.
3. Adjust the headlights to meet local vehicle regulations.
To adjust, turn the adjusting screws.

EXTERIOR LIGHTING SYSTEM

TROUBLESHOOTING Headlights Wiring diagram

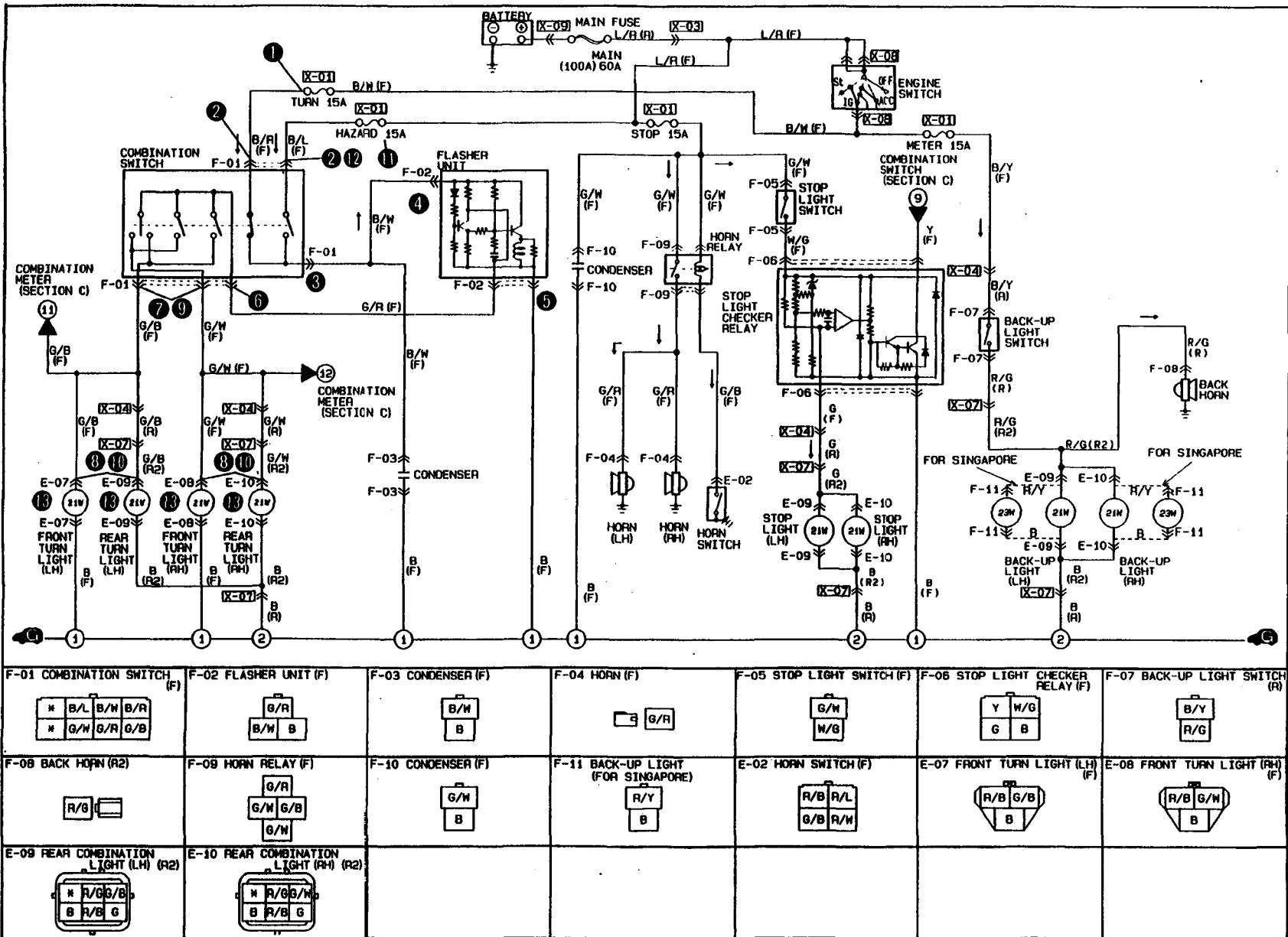


EXTERIOR LIGHTING SYSTEM



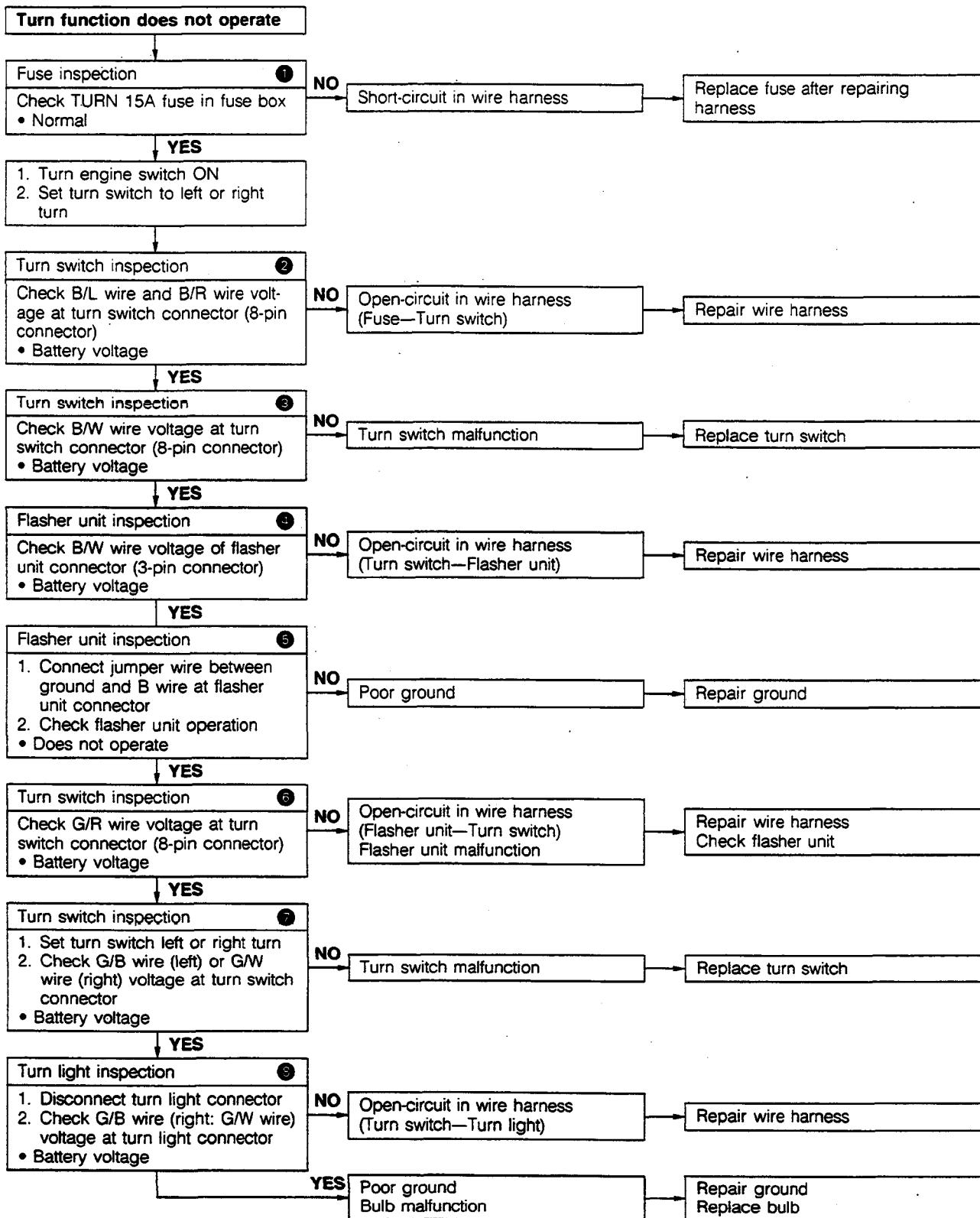
EXTERIOR LIGHTING SYSTEM

Turn and Hazard Warning Light Wiring diagram



T

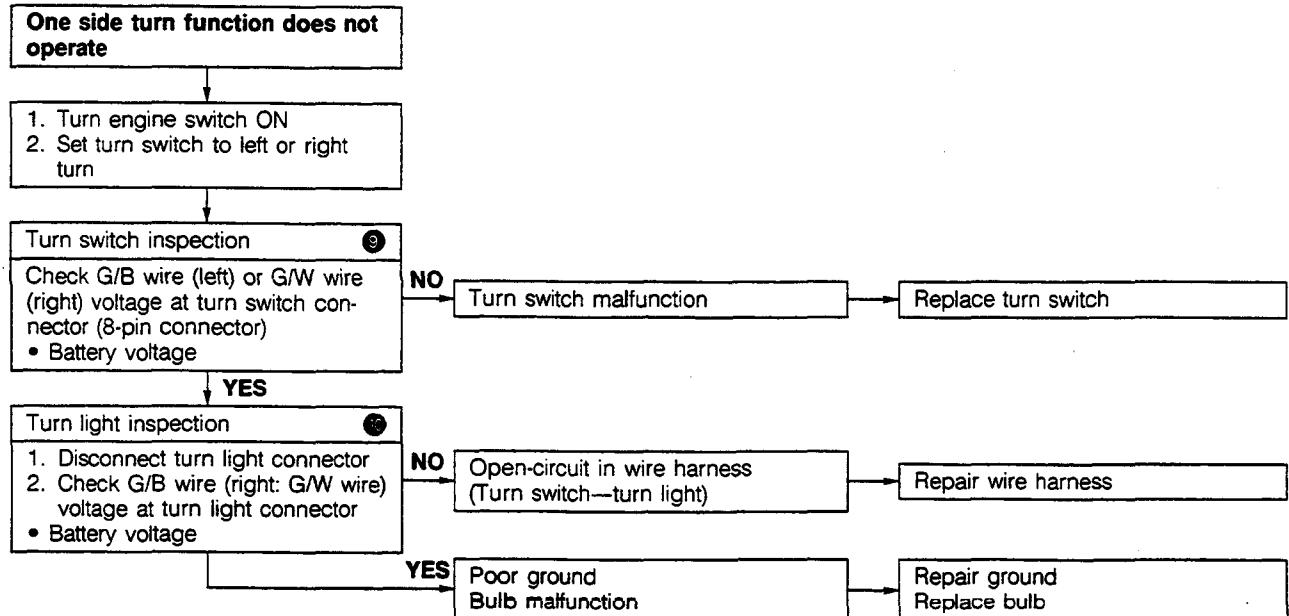
EXTERIOR LIGHTING SYSTEM



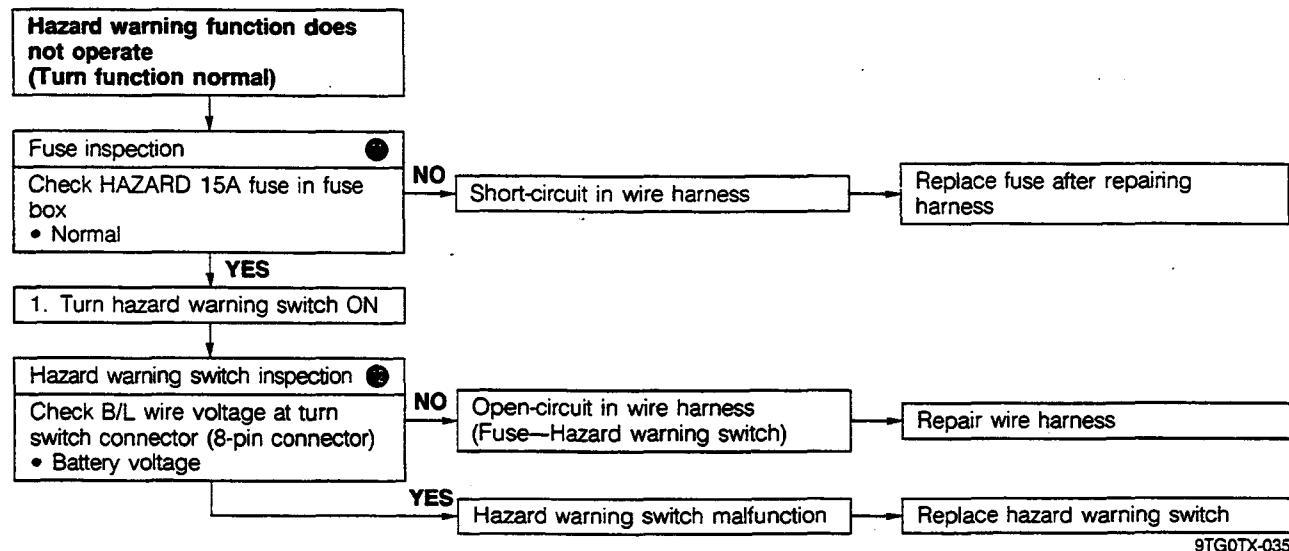
9TGOTX-033

EXTERIOR LIGHTING SYSTEM

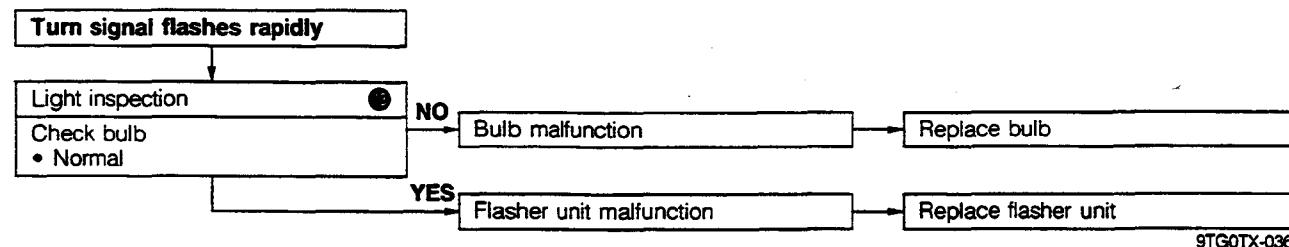
T



9TGOTX-034



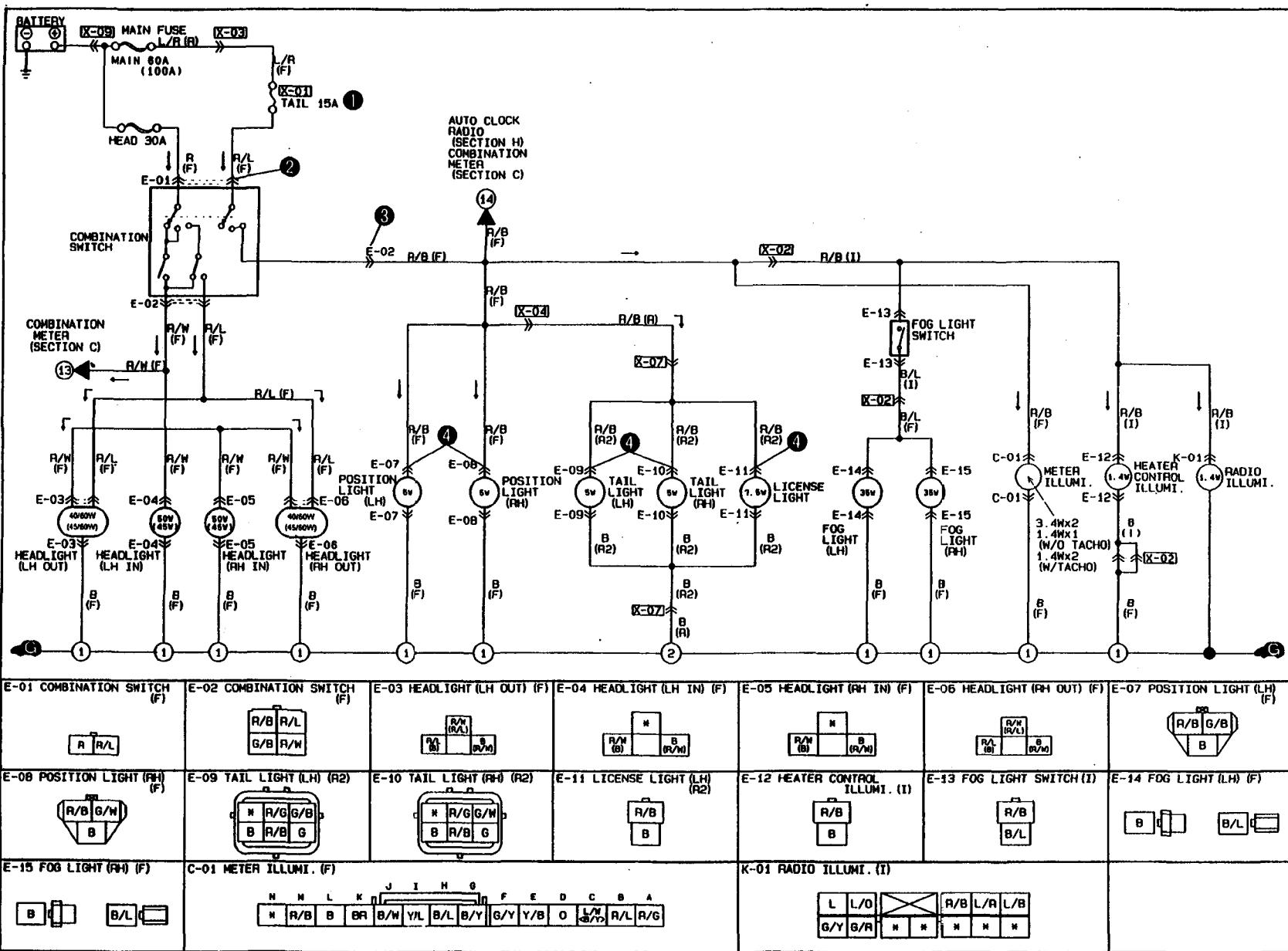
9TGOTX-035



9TGOTX-036

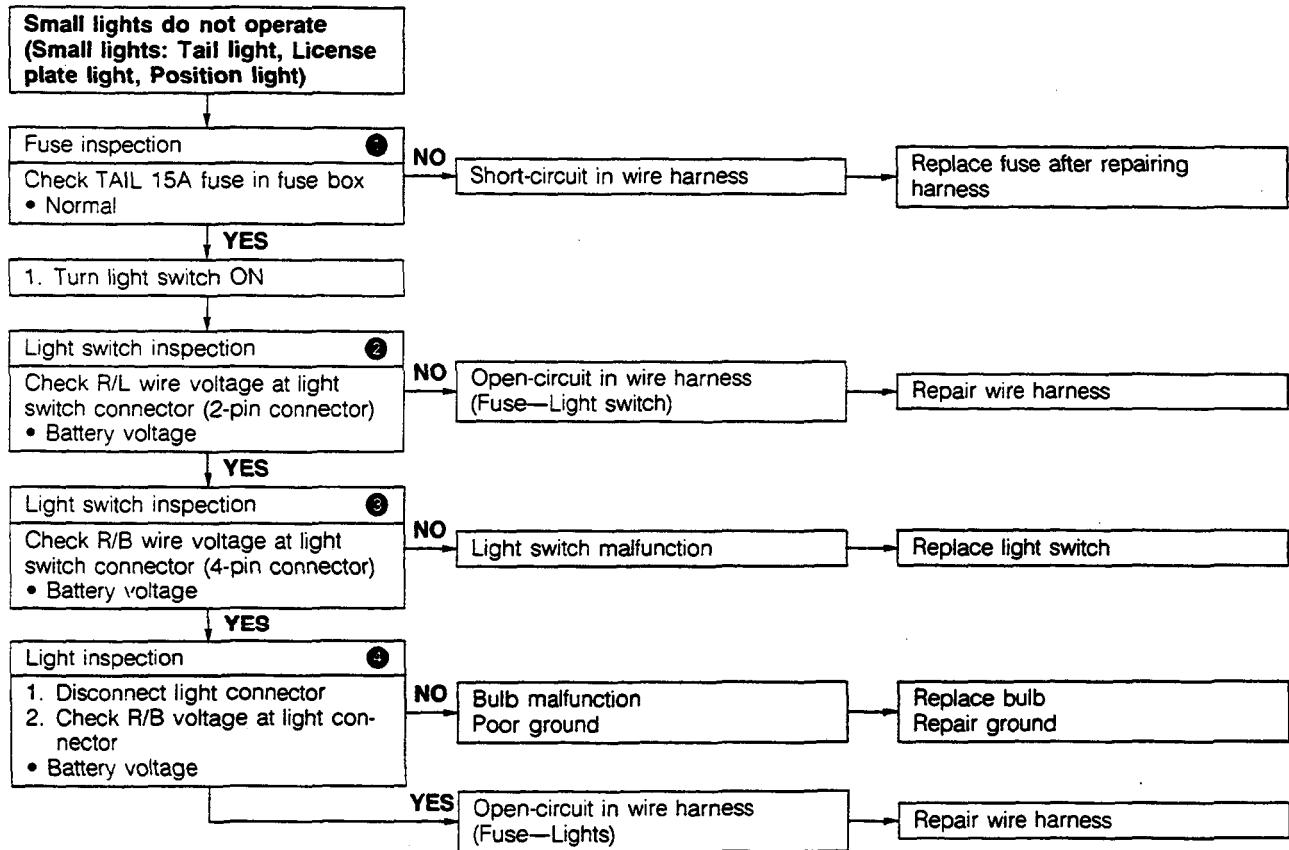
Small Light Control System Wiring diagram

EXTERIOR LIGHTING SYSTEM



EXTERIOR LIGHTING SYSTEM

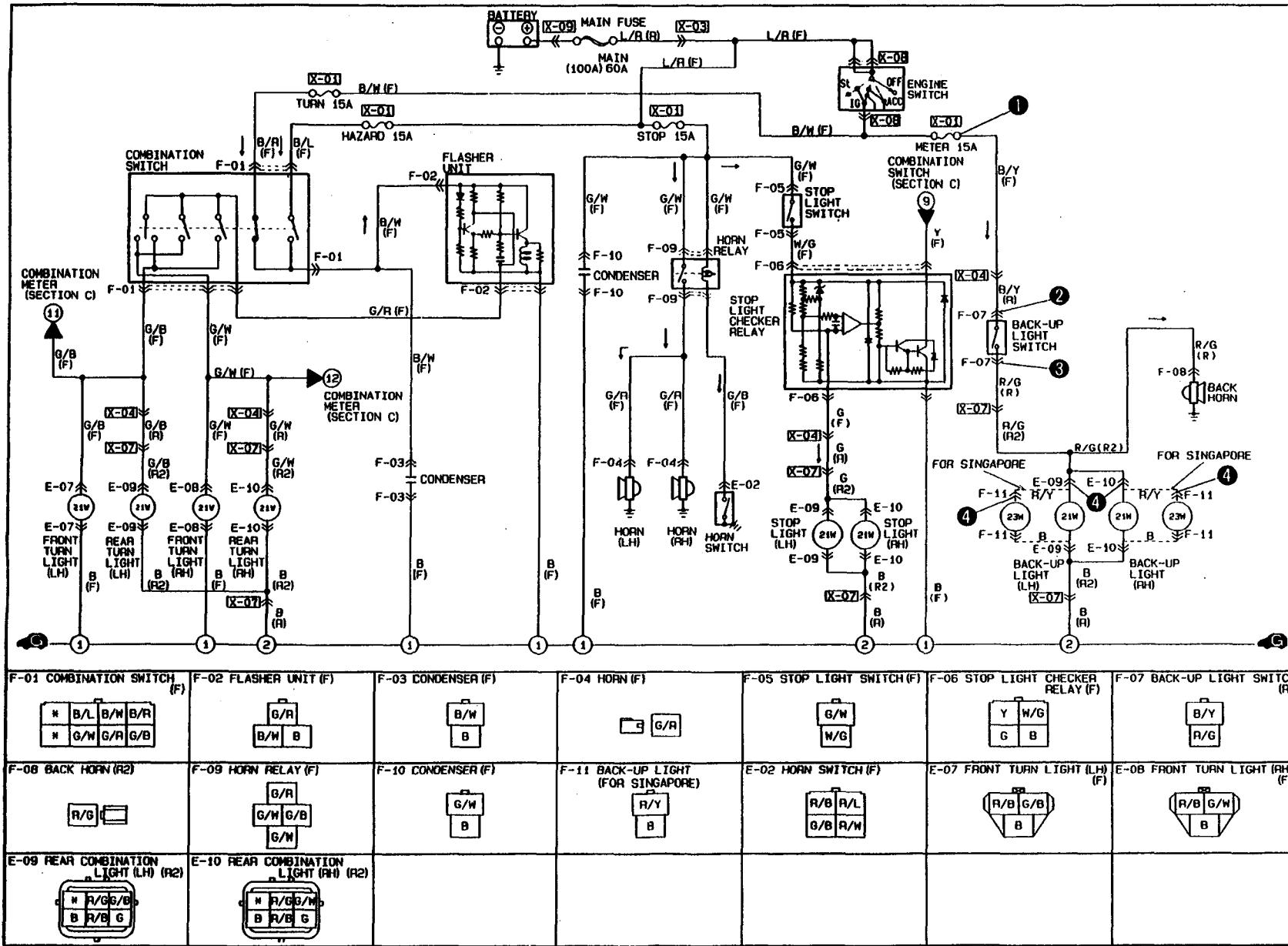
T



9TG0TX-038

EXTERIOR LIGHTING SYSTEM

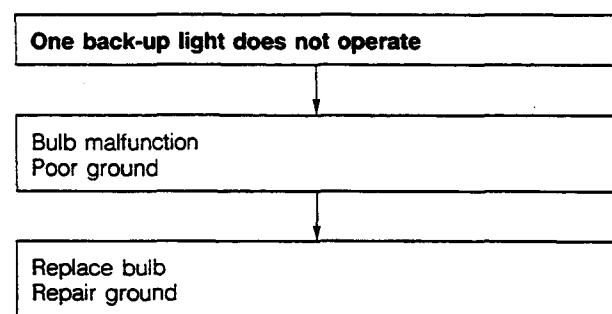
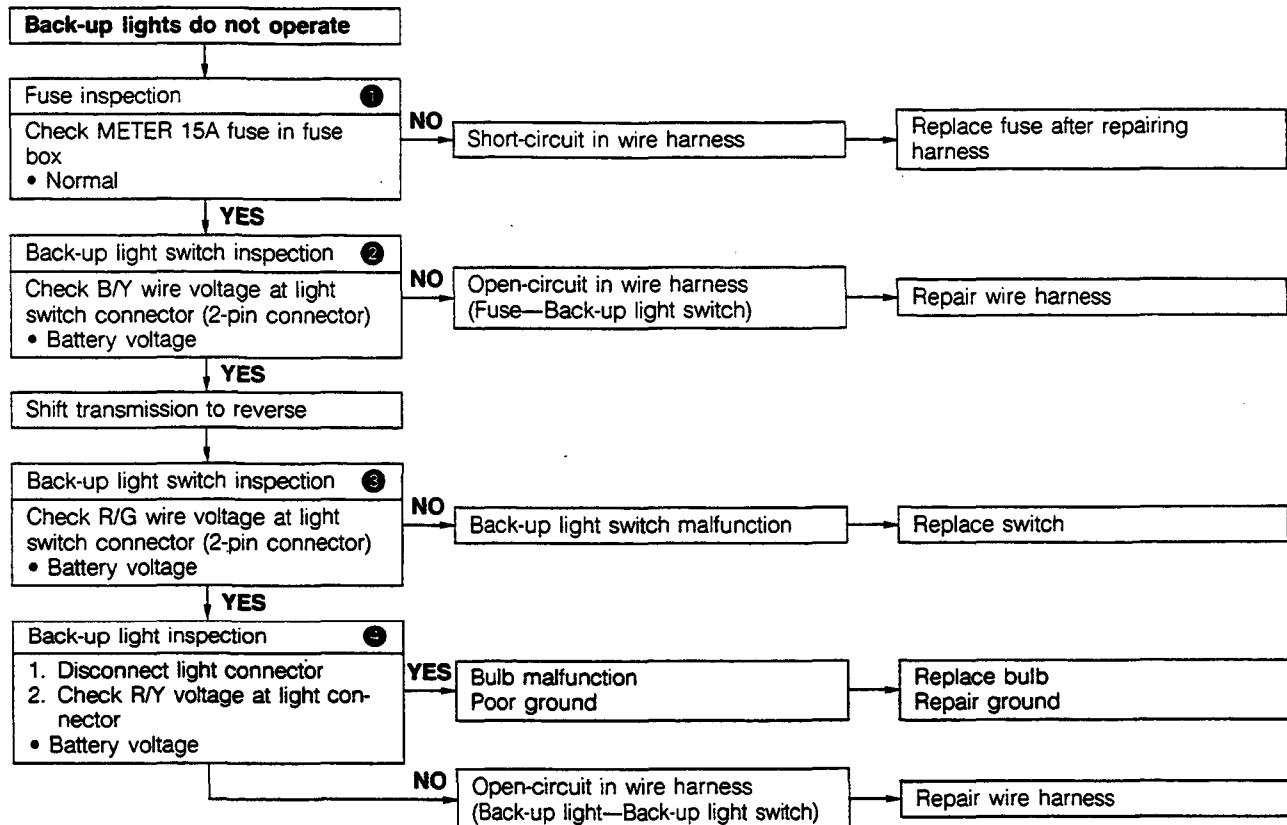
Back-up Light Wiring diagram



9TGOTX-039

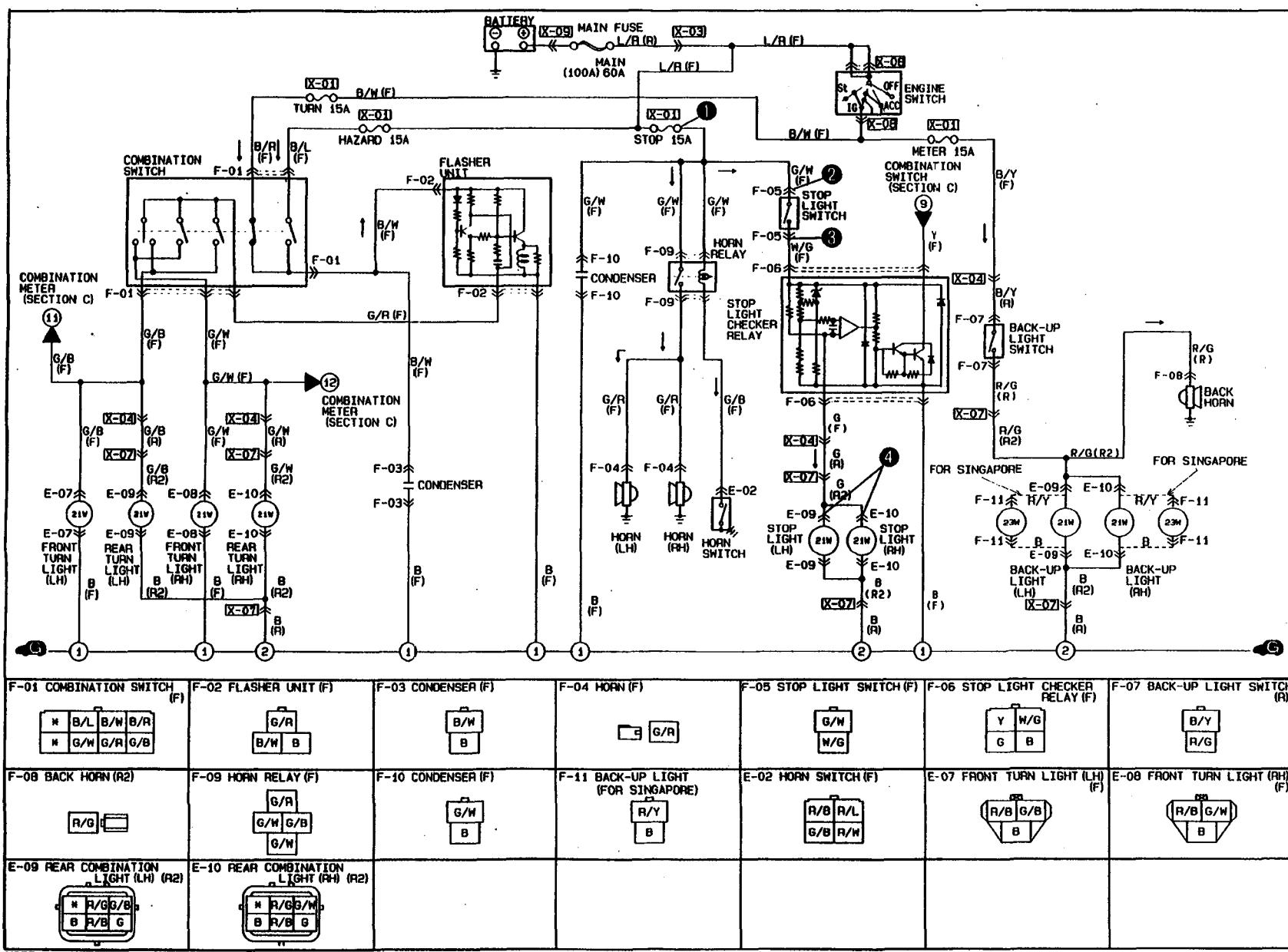
EXTERIOR LIGHTING SYSTEM

T



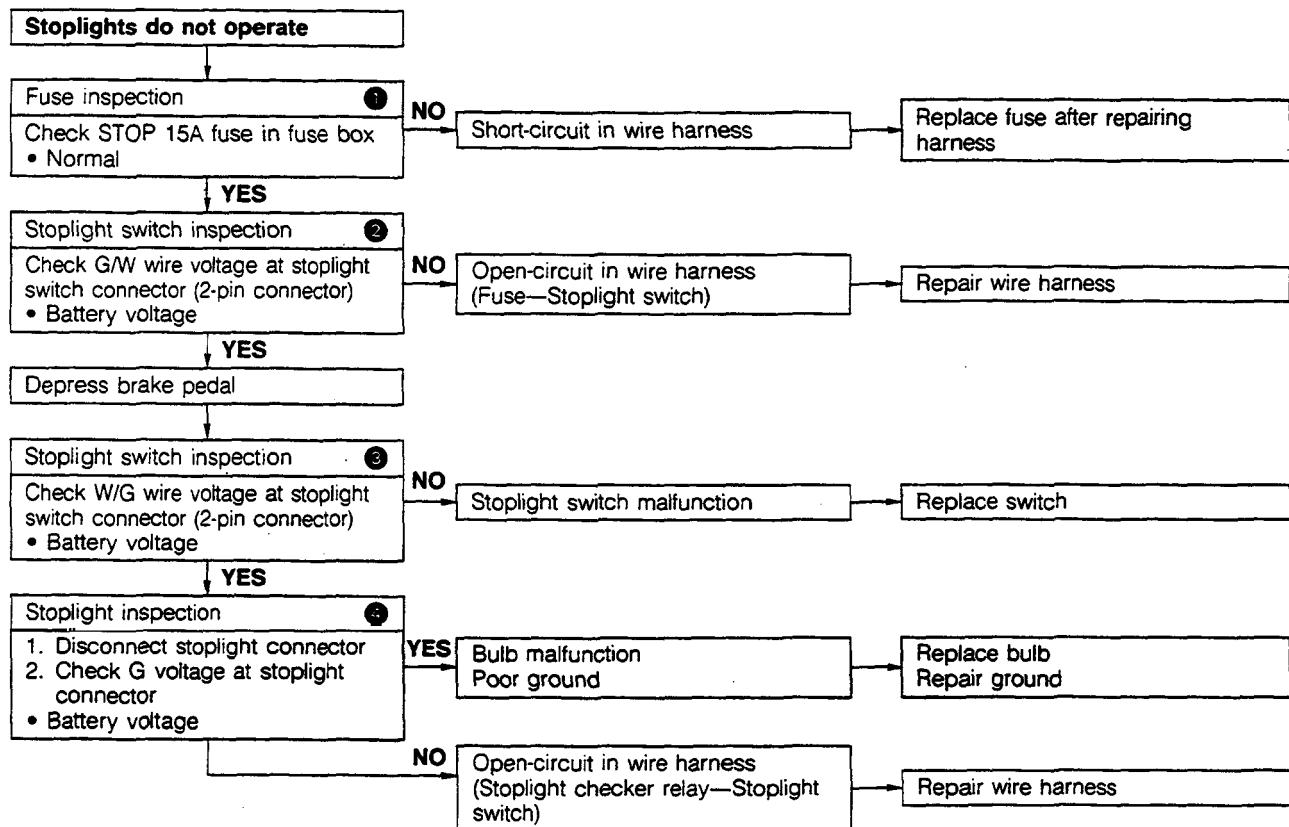
Stoplight Wiring diagram

EXTERIOR LIGHTING SYSTEM

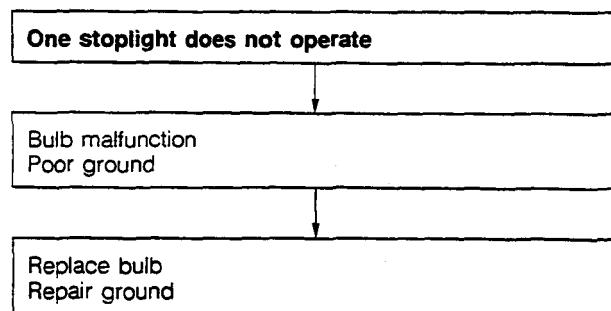


EXTERIOR LIGHTING SYSTEM

T



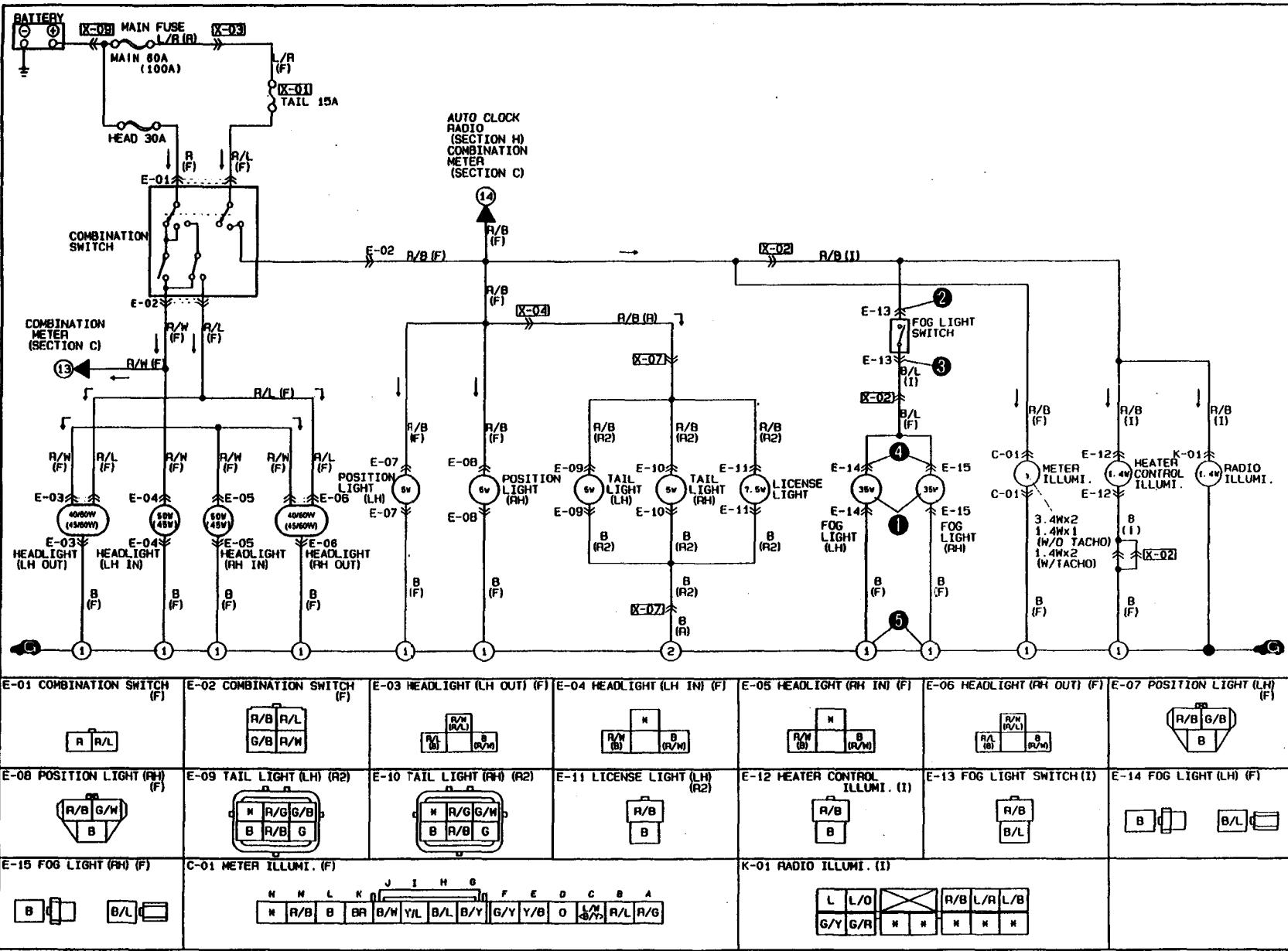
9TG0TX-043



9TG0TX-044

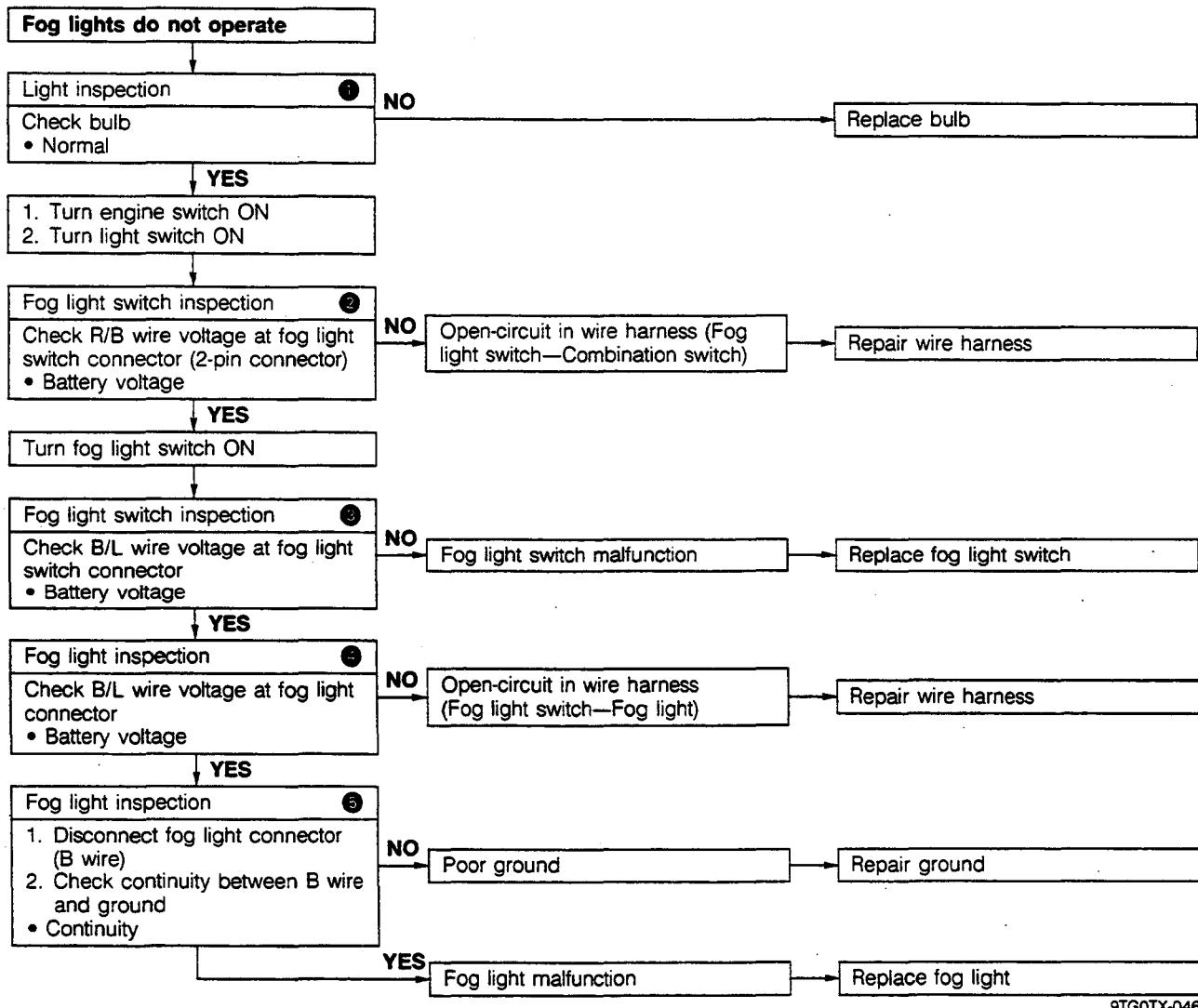
Fog Light Wiring diagram

EXTERIOR LIGHTING SYSTEM

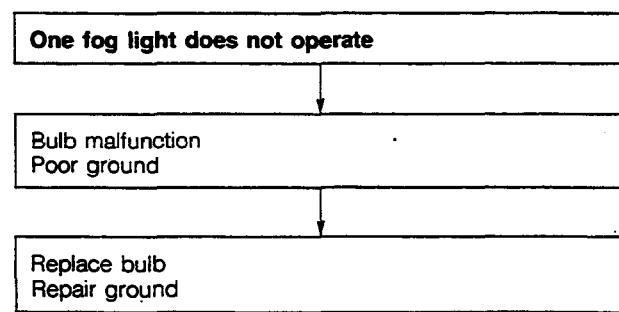


EXTERIOR LIGHTING SYSTEM

T



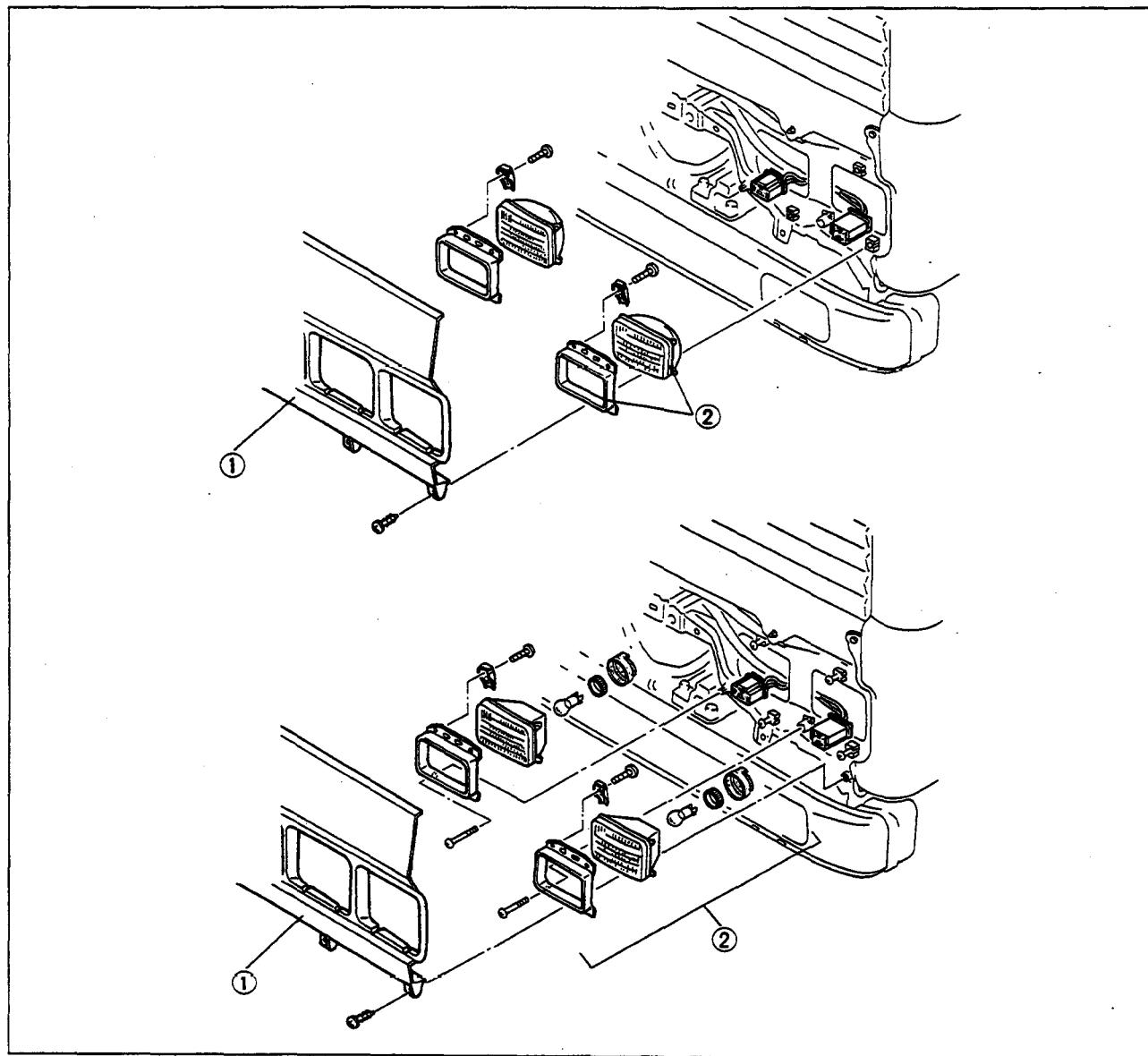
9TG0TX-046



9TG0TX-047

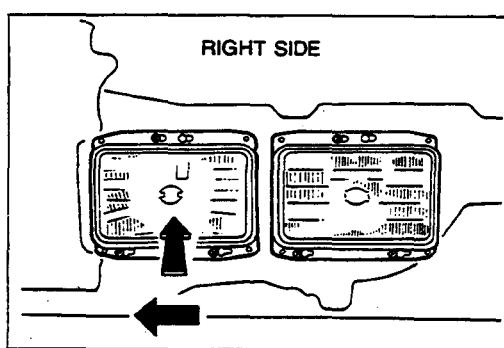
HEADLIGHT**Removal / Installation**

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

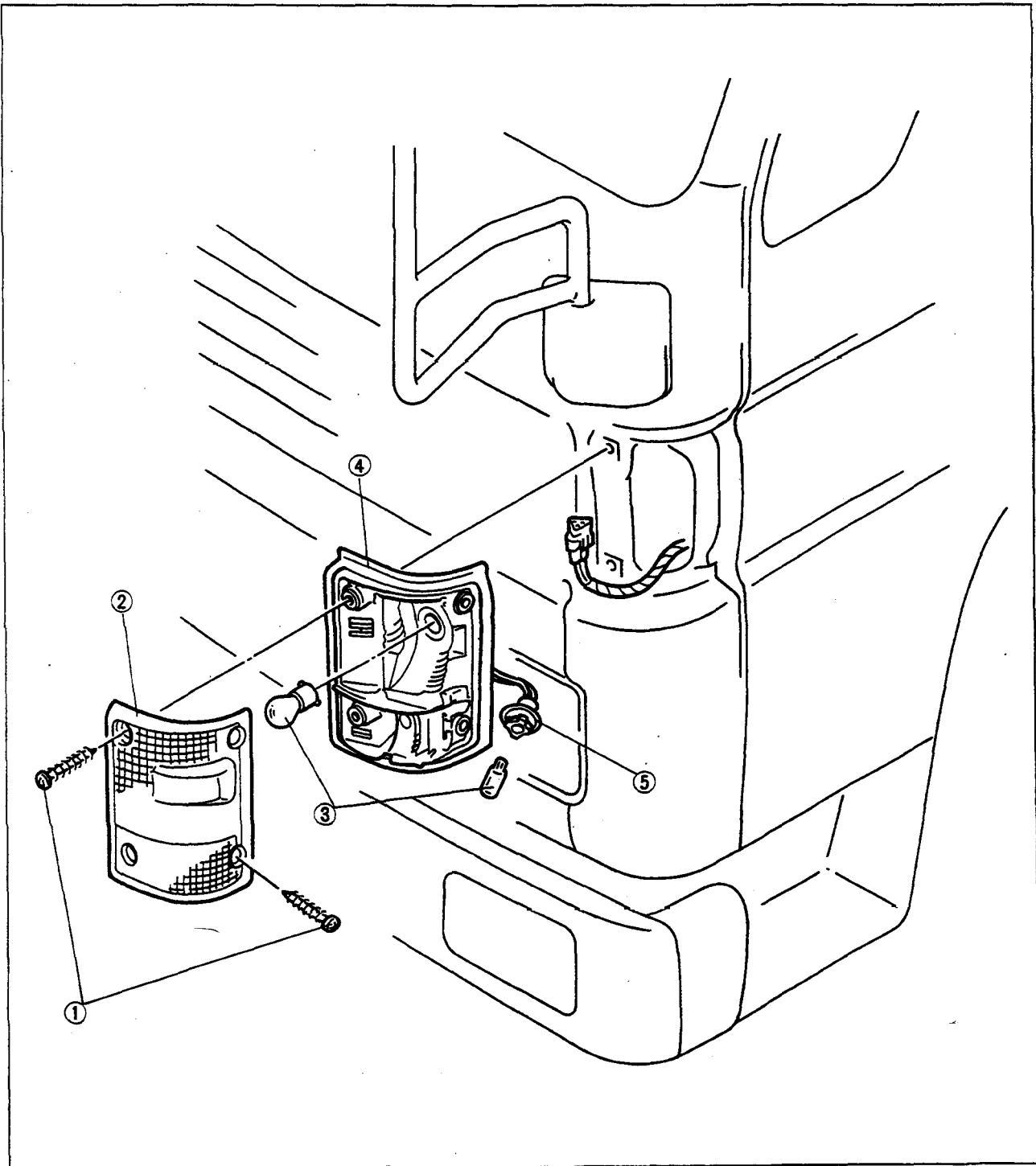
Removal note
Headlight

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.



1. Screws
2. Lens
3. Bulb

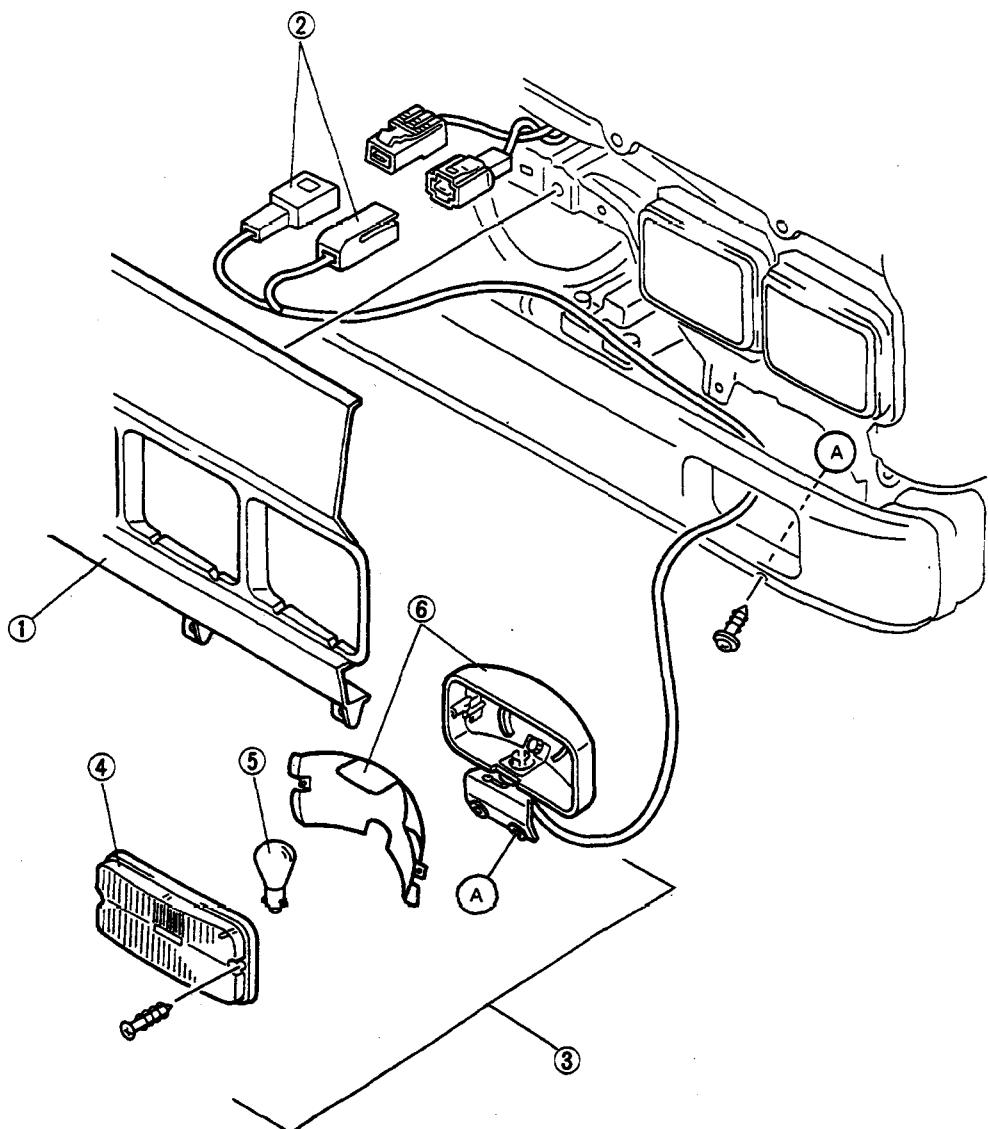
Inspect for failure and poor contact

4. Housing
5. Socket

9TG0TX-050

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.

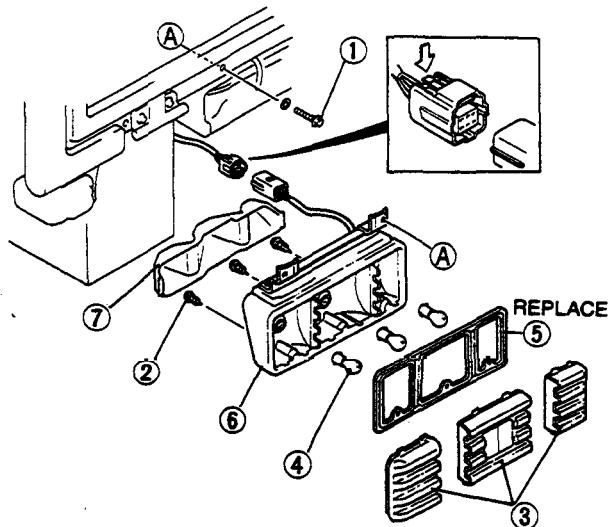
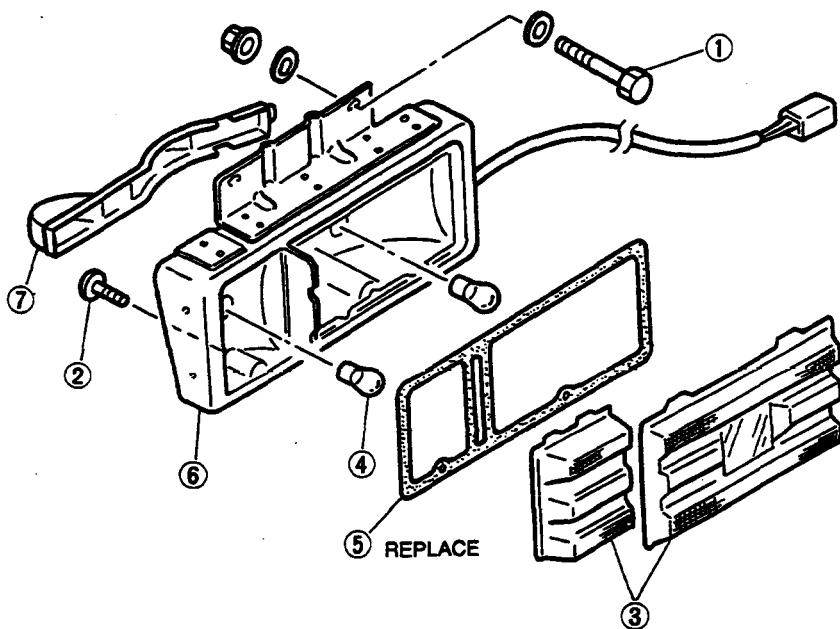


9TG0TX-051

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**

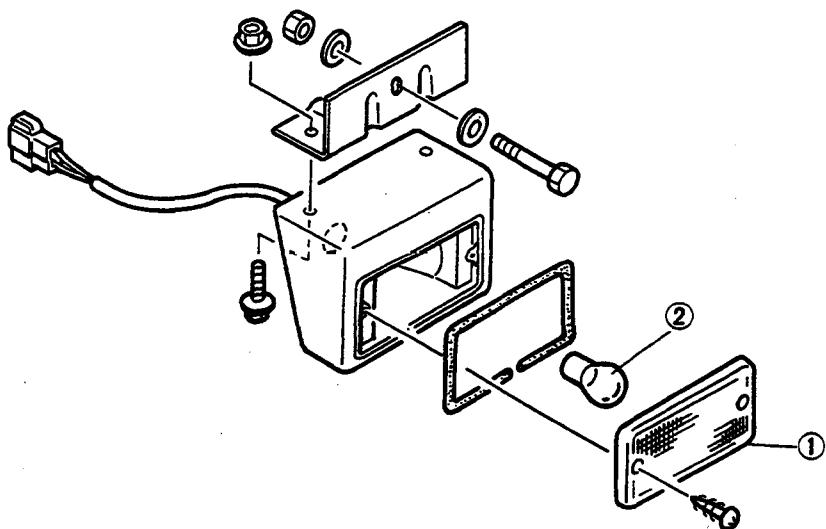
9TF0TX-010

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

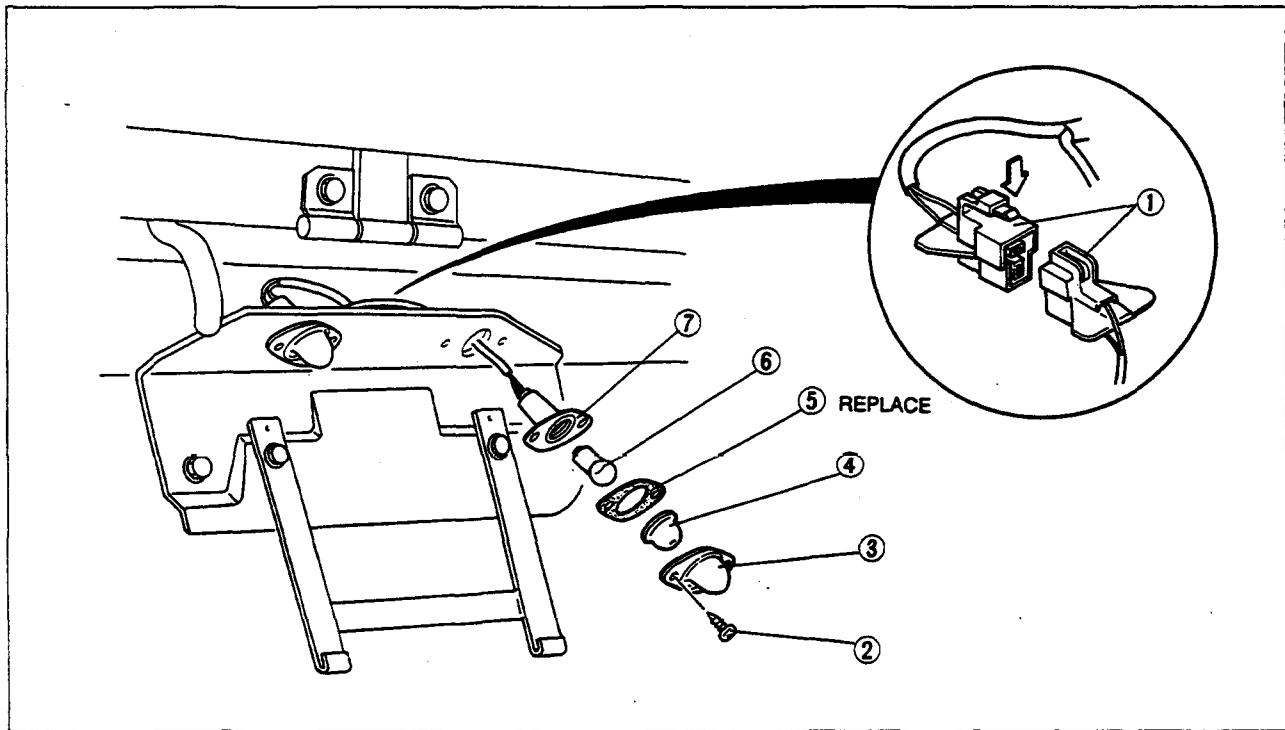
1. Lens

2. Bulb

Inspect for failure and poor contact

LICENSE PLATE LIGHT**Removal / Inspection / Installation**

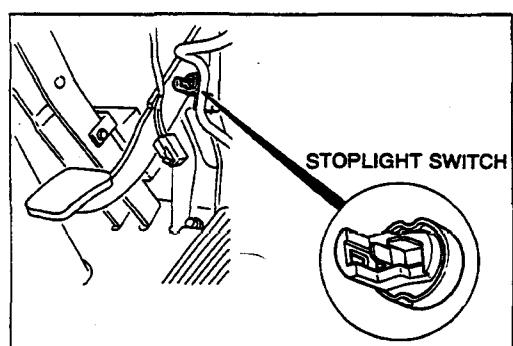
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure.
3. Inspect all parts and repair or replace as necessary.
4. Install in the reverse order of removal.



9TGOTX-054

1. Connector
2. Screws
3. Cover
4. Lens

5. Gasket
6. Bulb
Inspect for failure and poor contact
7. Socket



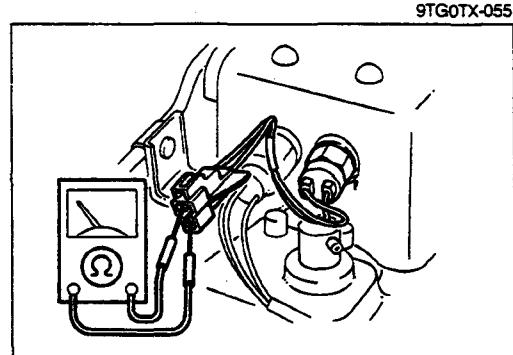
9TGOTX-055

**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 specified.



9TGOTX-056

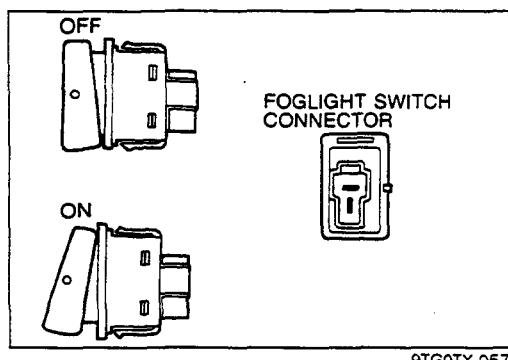
**BACK-UP LIGHT SWITCH
Inspection**

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.

T EXTERIOR LIGHTING SYSTEM/INTERIOR LIGHTING SYSTEM



FOG LIGHT SWITCH

Inspection

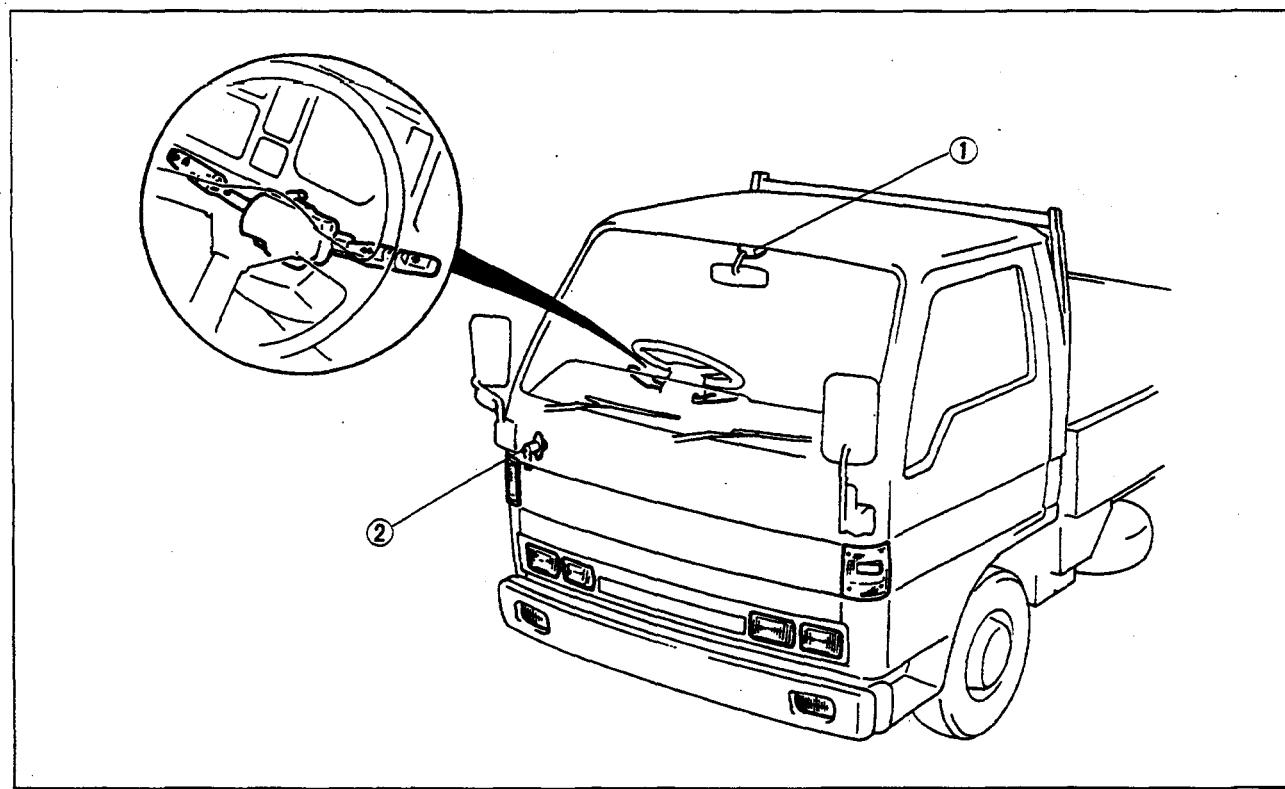
1. Remove the fog light switch.
2. Disconnect the fog light switch connector.
3. Check continuity of the fog light switch.

Switch	Continuity
ON	Yes
OFF	No

4. Replace the fog light switch if not as specified.

INTERIOR LIGHTING SYSTEM

STRUCTURAL VIEW



1. Interior lamp

Troubleshooting page T-43
 Removal / Inspection /
 Installation page T-46

2. Door switch

Inspection page T-46

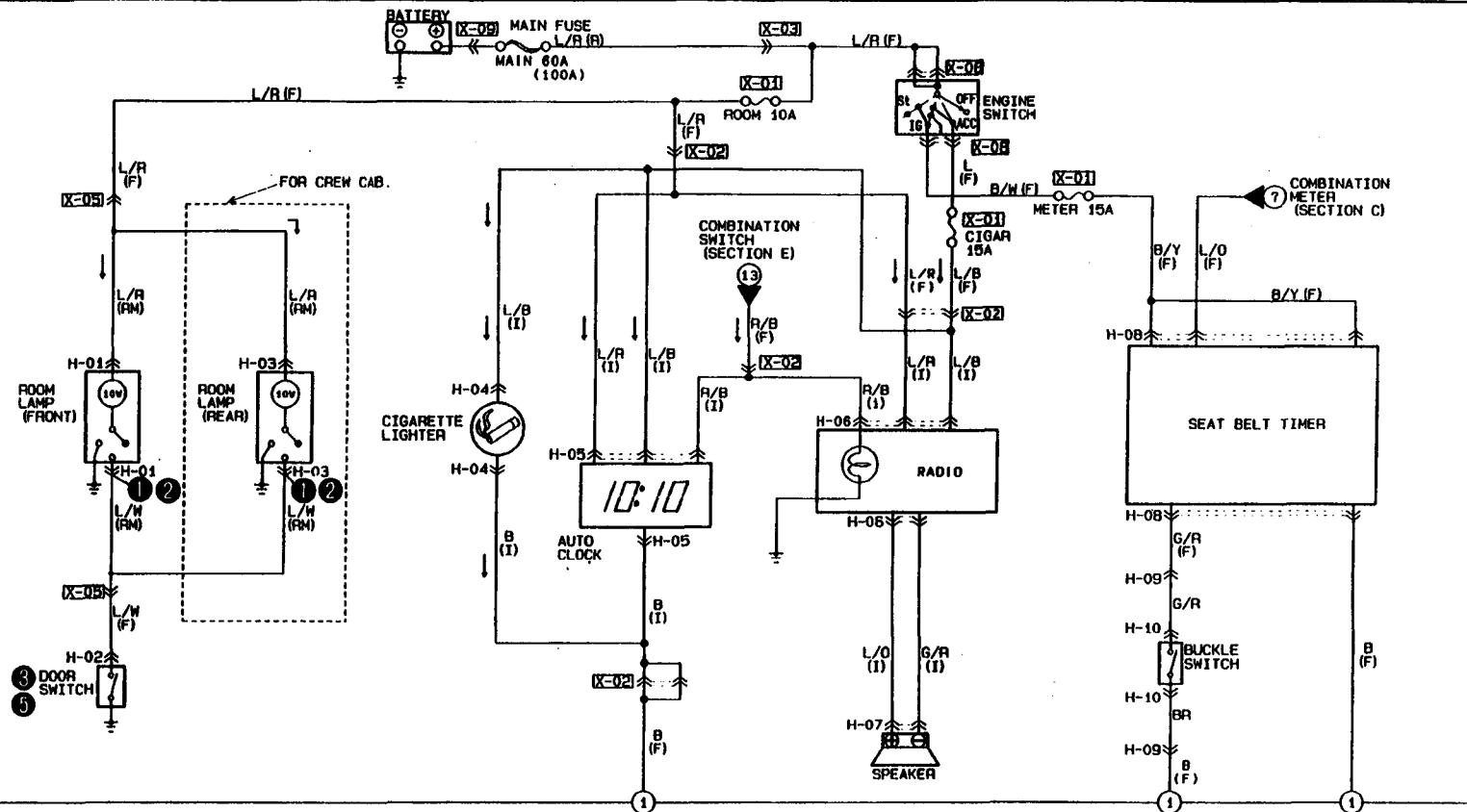
SPECIFICATIONS

Lamp	Bulb (W)	Remark
Interior lamp	10	Front interior lamp
	10	Rear interior lamp (Crew cab.)

9TG0TX-059

INTERIOR LIGHTING SYSTEM

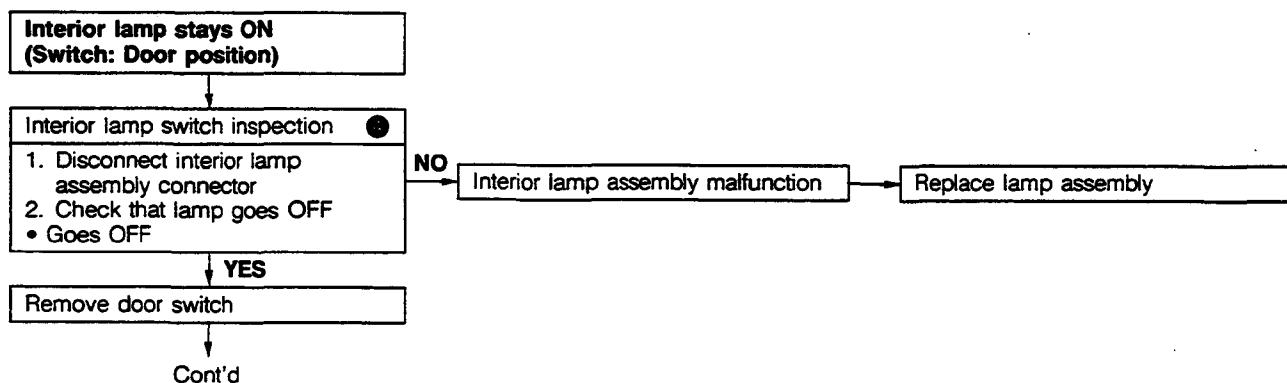
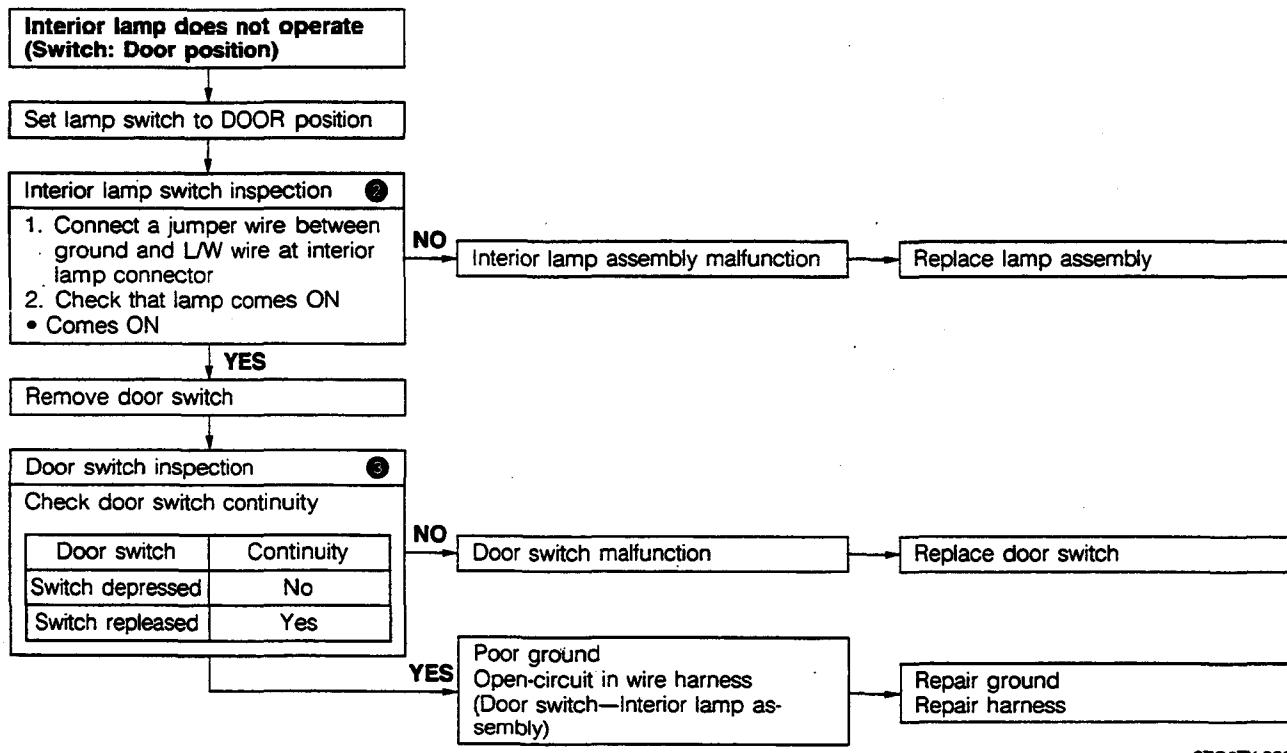
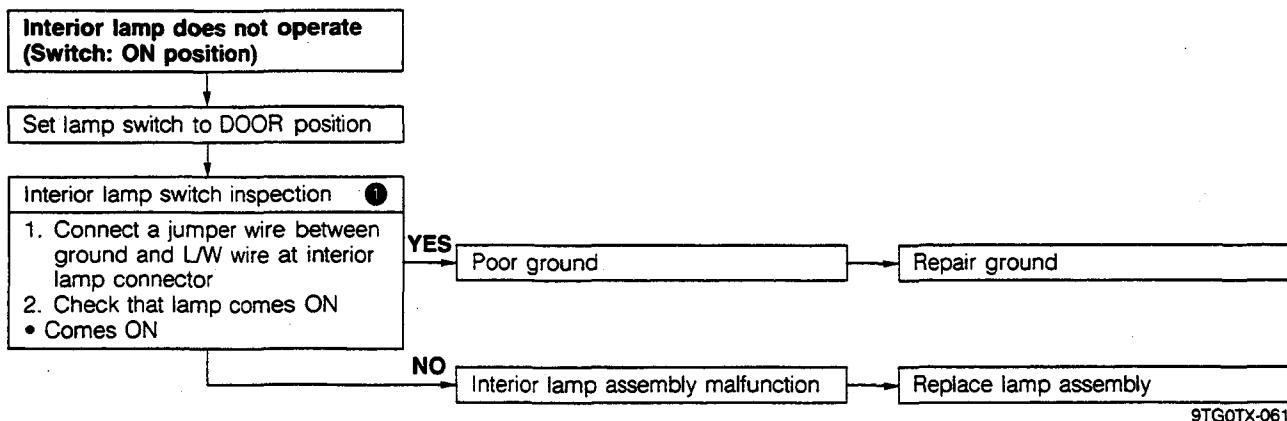
TROUBLESHOOTING
Interior Lamp
Wiring diagram



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)
(4) L/R L/W	(4) L/N	(4) L/W L/R	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)	H-08 SEAT BELT TIMER (F)	H-09 BUCKLE SWITCH CORD (F)	H-10 BUCKLE SWITCH		
G/R L/O	B/Y B/Y B * G/R L/O	G/R B	G/R BR		

NOTE: *---NOT USED.

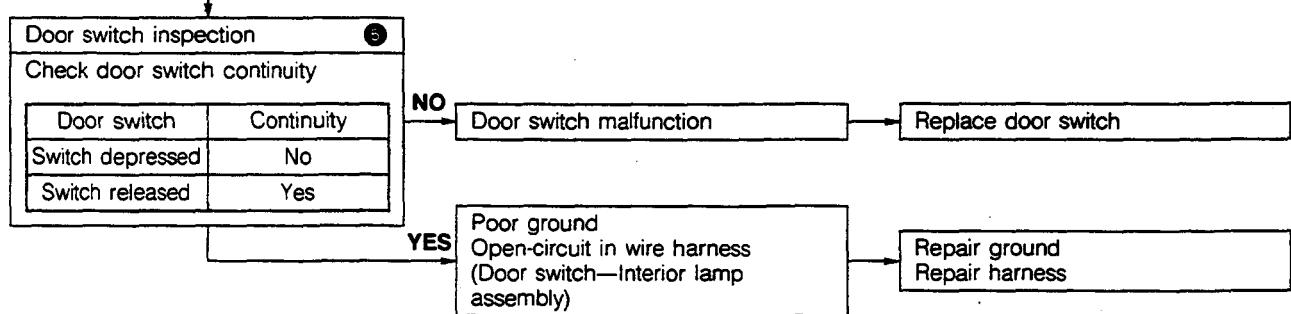
INTERIOR LIGHTING SYSTEM



INTERIOR LIGHTING SYSTEM

T

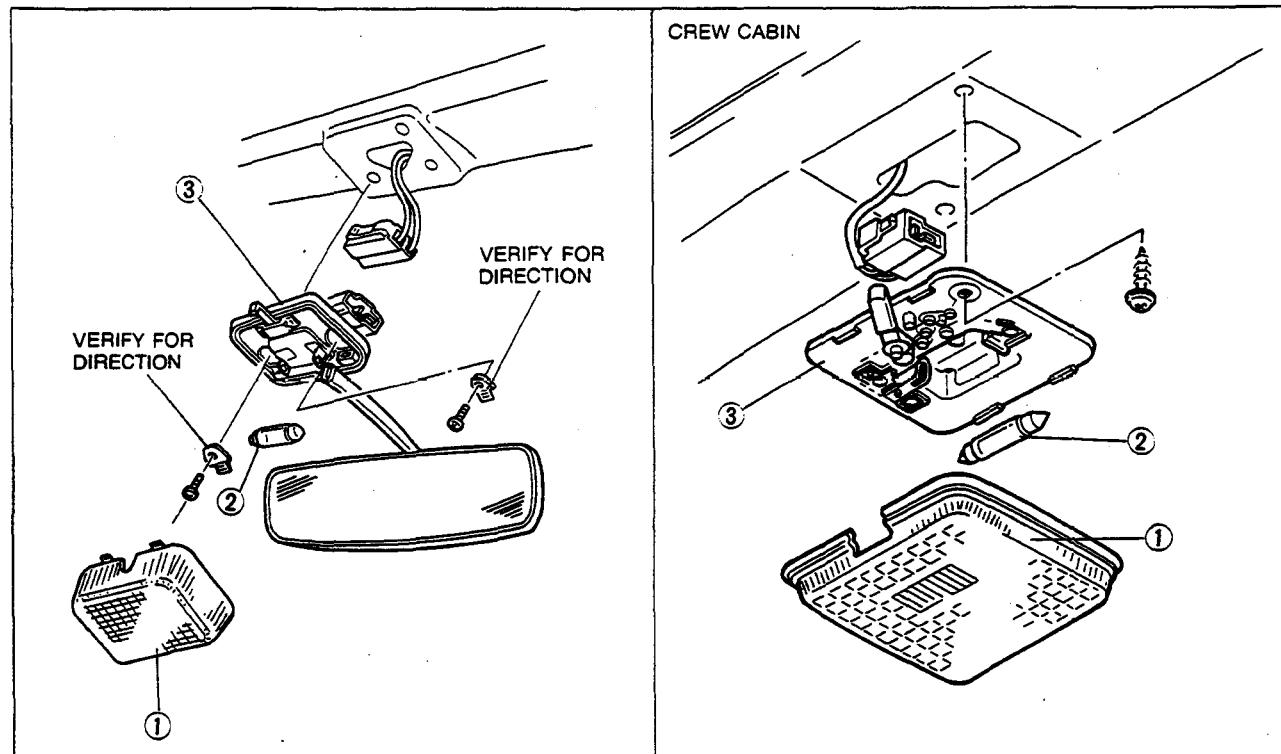
Cont'd



9TGOTX-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

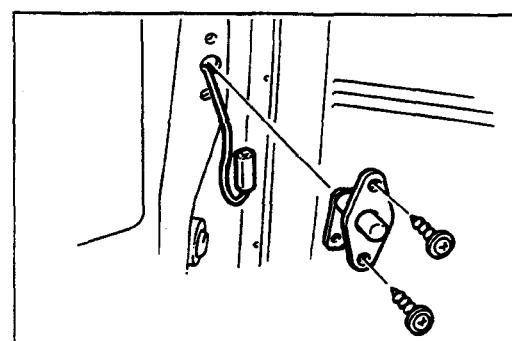
1. Lens
2. Bulb

Inspect for failure and poor contact

3. Interior lamp assembly

DOOR SWITCH**Inspection**

1. Remove the door switch.

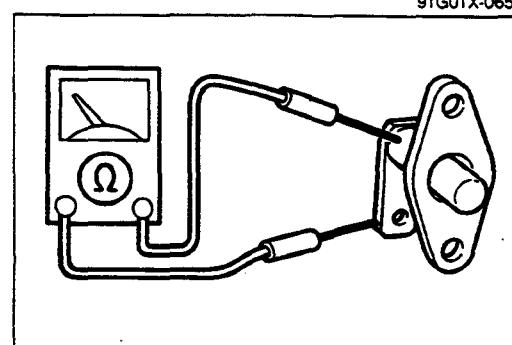


9TG0TX-065

2. Check continuity of the door switch.

Switch	Continuity
Switch depressed	No
Switch released	Yes

3. Replace the door switch if not as specified.

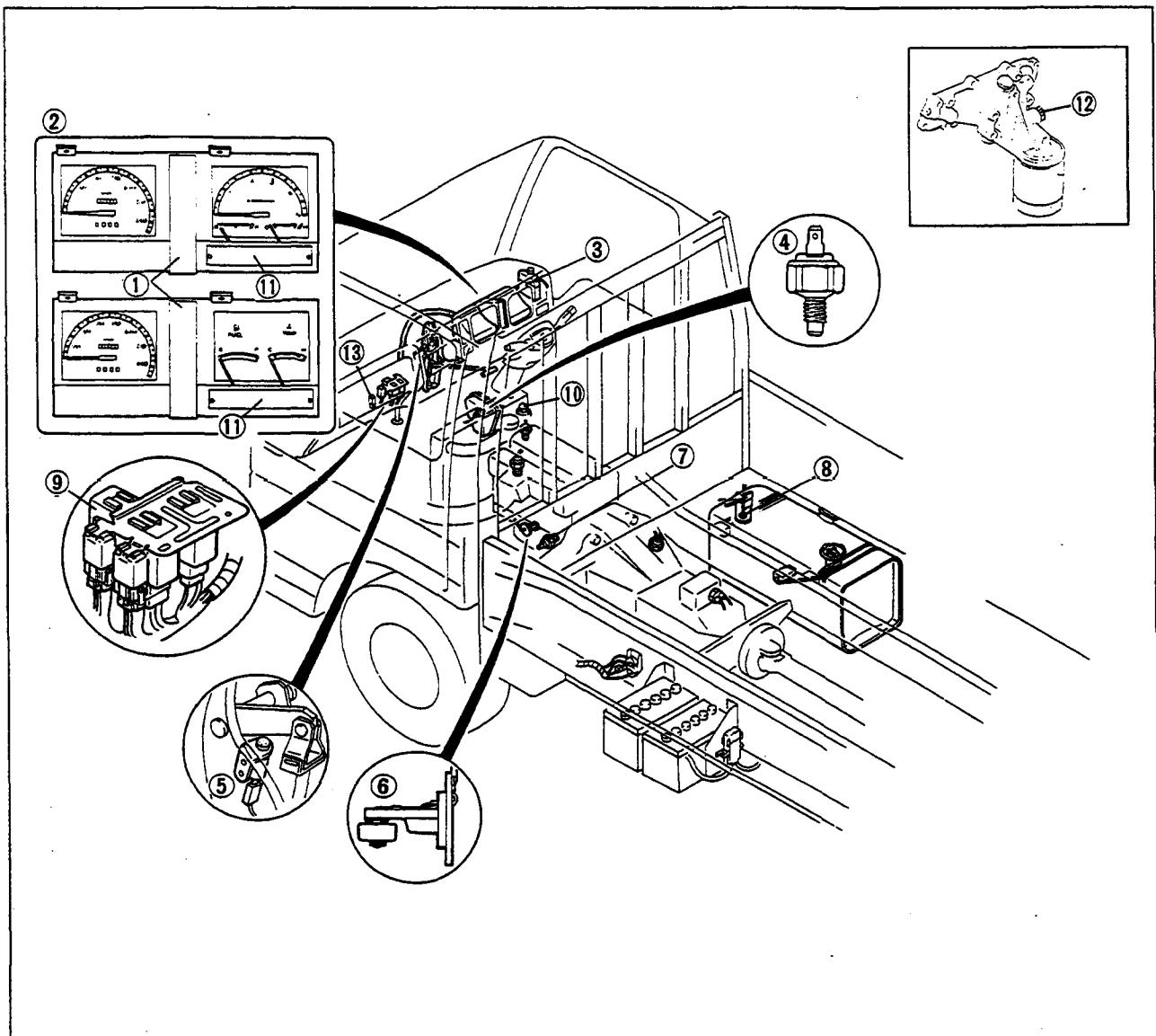


9TG0TX-066

WARNING SYSTEM

WARNING SYSTEM

STRUCTURAL VIEW



9TF0TX-011

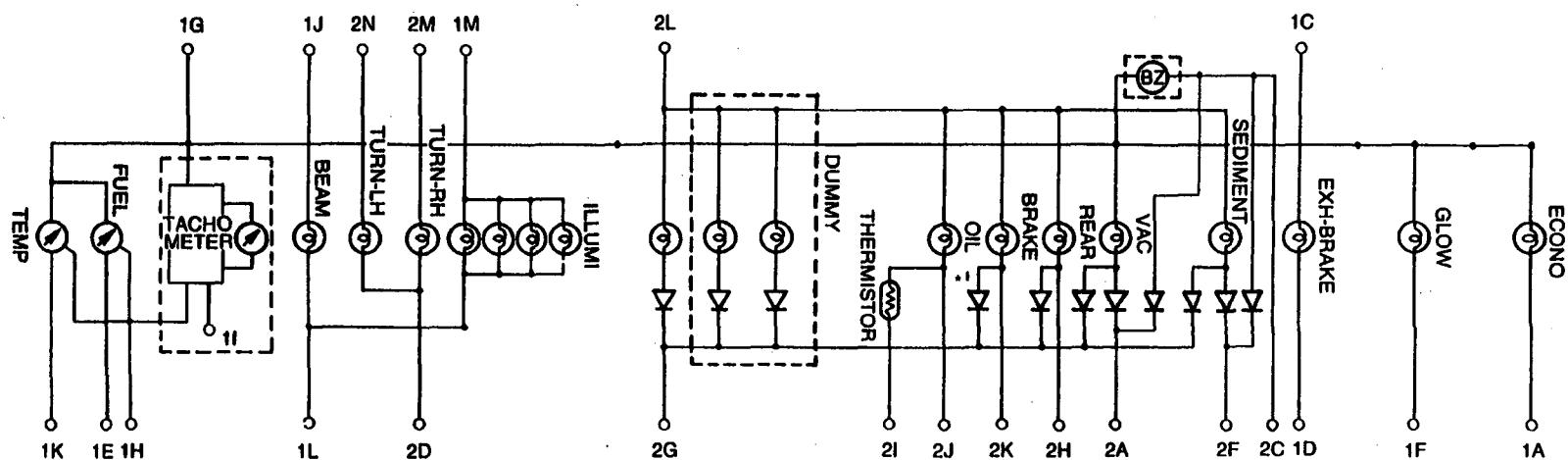
- | | | | |
|---|-----------|---|-----------|
| 1. Warning lamp
Troubleshooting | page T-48 | 7. Oil pressure switch
Inspection | page T-58 |
| Inspection | page T-58 | 8. Sedimentor sensor
Inspection | page T-62 |
| 2. Warning buzzer
Troubleshooting | page T-57 | 9. Stoplight checker relay
Inspection | page T-60 |
| Removal / Installation | page T-69 | 10. Coolant level sensor
Inspection | page T-62 |
| Inspection | page T-61 | 11. Indicator lamp
Inspection | page T-58 |
| 3. Brake fluid level sensor
Inspection | page T-60 | Inspection | page T-62 |
| Removal / Installation | page T-60 | 12. Oil bypass alarm switch
Inspection | page T-59 |
| 4. Vacuum switch
Troubleshooting | page T-56 | 13. Coolant warning unit
Inspection | page T-59 |
| 5. Parking brake switch
Inspection | page T-60 | | |
| 6. Oil level sensor
Removal / Installation | page T-61 | | |
| Inspection | page T-61 | | |

TROUBLESHOOTING

Warning Lamp

Wiring diagram

WARNING SYSTEM

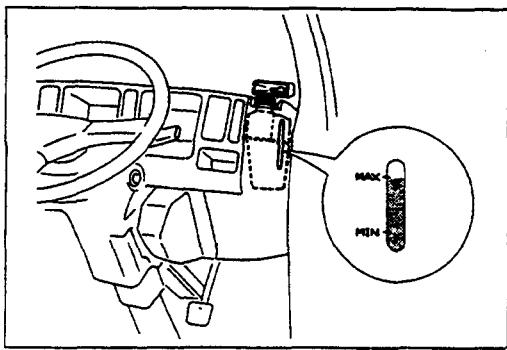


TERMINAL	CONNECTION TO	TERMINAL	CONNECTION TO
1A	SUB-MISSION SWITCH	2A	VACUUM SWITCH
1B	—	2B	—
1C	FUSE	2C	COOLANT WARNING UNIT
1D	EXHAUST BRAKE SWITCH	2D	GROUND
1E	FUEL GAUGE SENDER UNIT	2E	—
1F	QSS CONTROL UNIT AIR HEATER CONTROL UNIT	2F	ALTERNATOR
1G	FUSE	2G	ALTERNATOR
1H	GROUND	2H	STOPLIGHT CHECKER 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

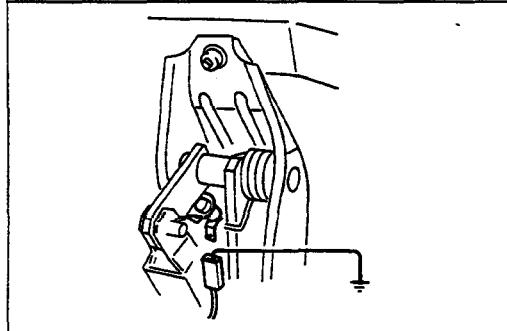
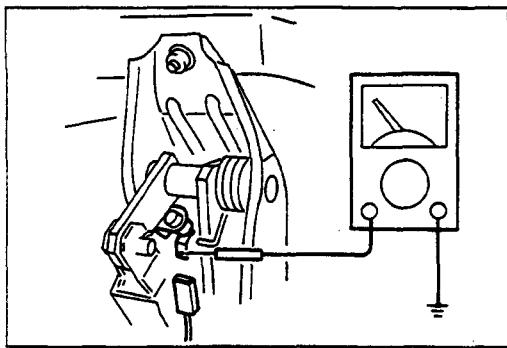
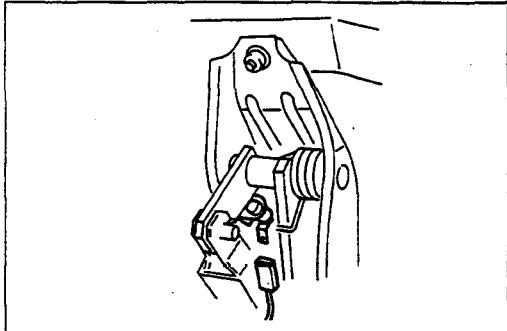
*1 AUSTRALIA

WARNING SYSTEM

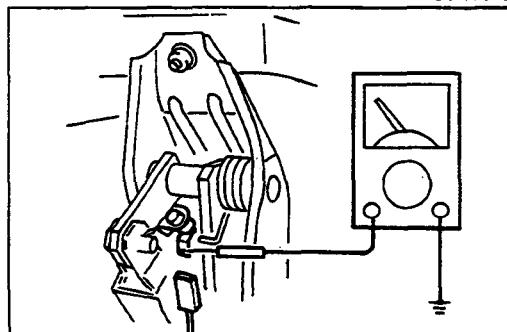
T



9TGOTX-069

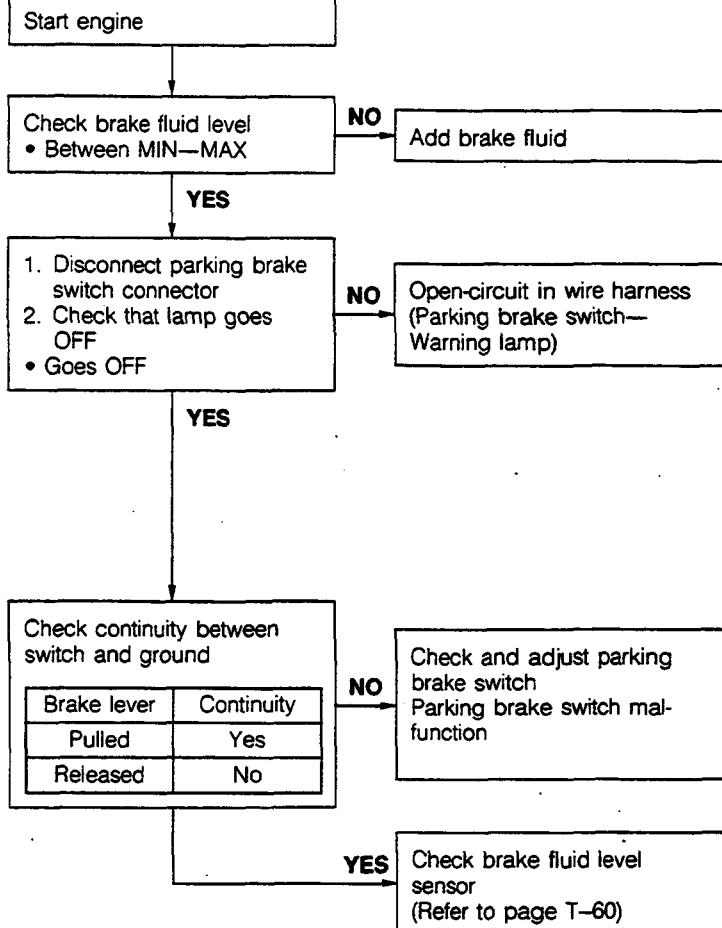


9TGOTX-070

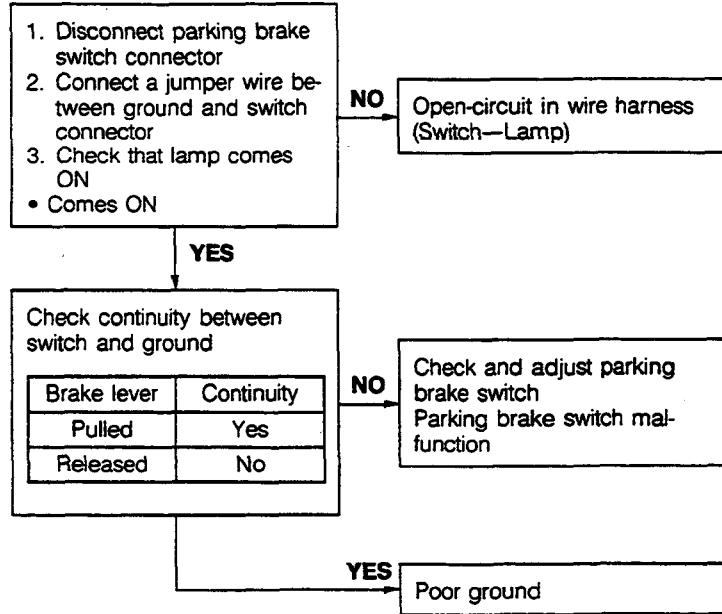


Brake warning lamp

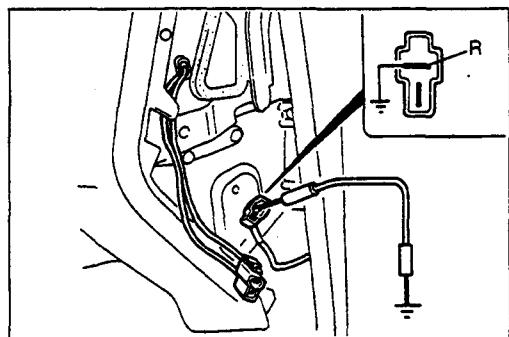
Brake warning lamp comes ON after engine started



Brake warning lamp does not operate parking brake set



WARNING SYSTEM

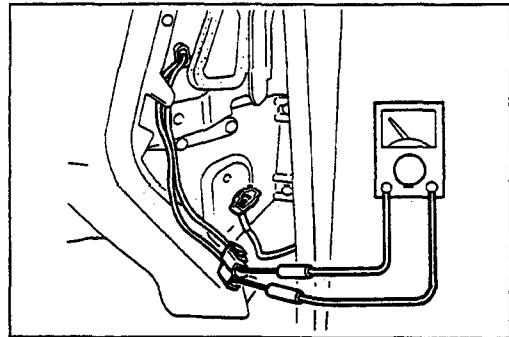


9TGOTX-071

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

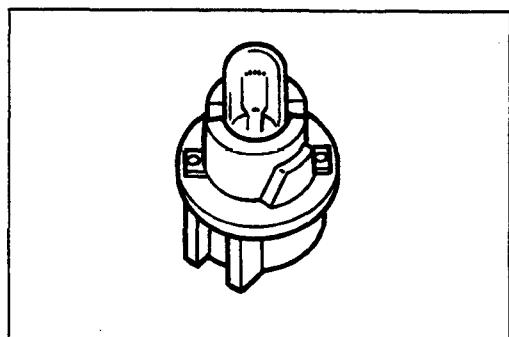
Alternator warning lamp

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

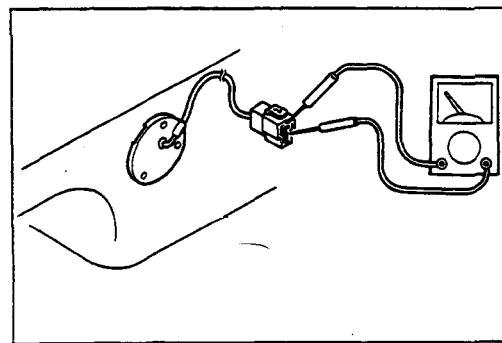
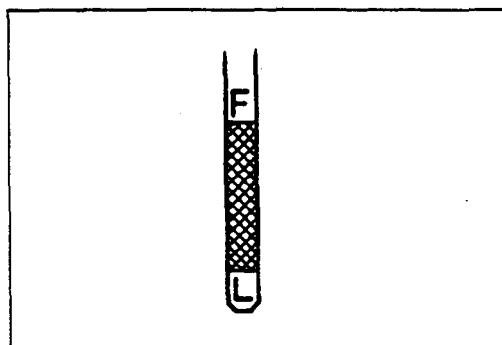
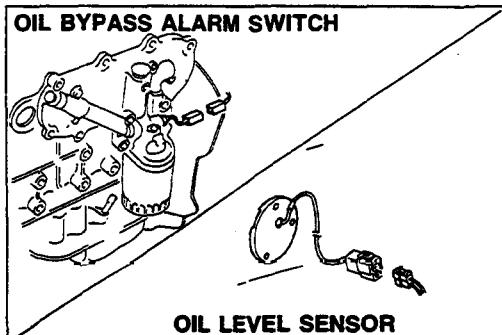
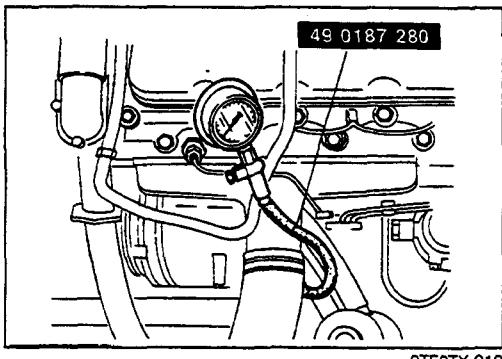
NO Replace bulb

YES Open-circuit in wire harness (Alternator—Lamp)

9TGOTX-072

WARNING SYSTEM

T



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

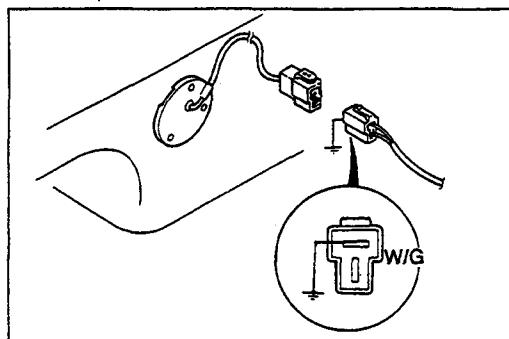
Check oil pressure
(Refer to Section D)

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)



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

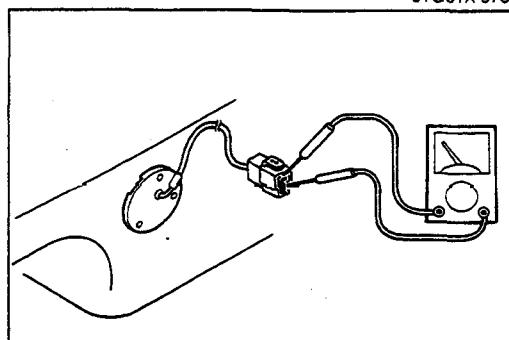
Oil level	Continuity
Below L	Yes
Above L	No

NO

Oil level sensor malfunction

YES

Poor ground



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

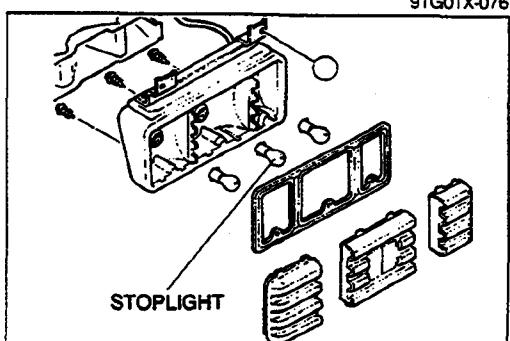
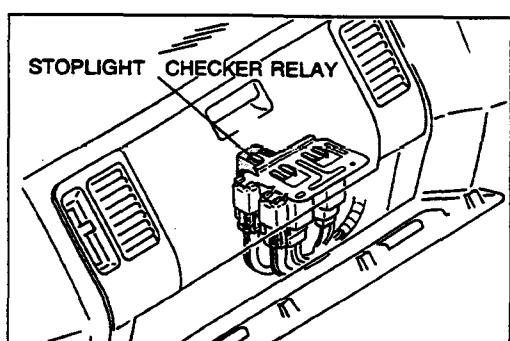
- Normal

NO

Replace stoplight

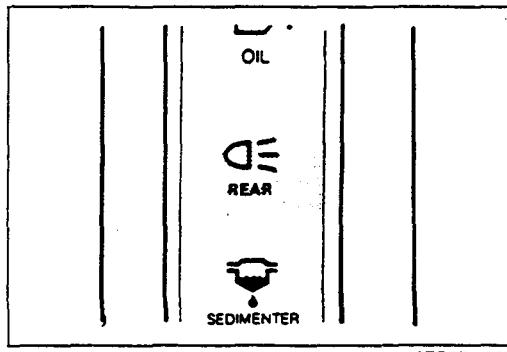
YES

Check stoplight checker relay
(Refer to page T-60)

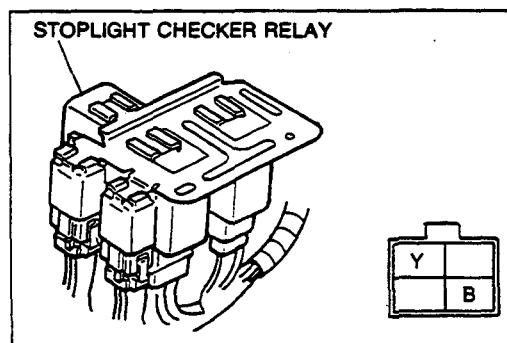
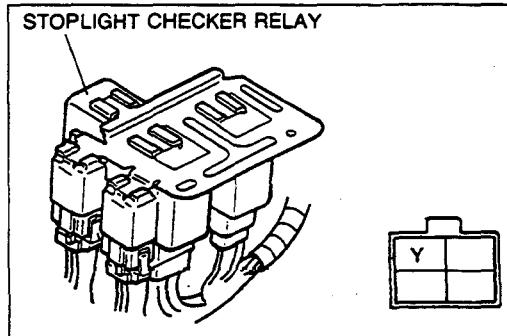


WARNING SYSTEM

T



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

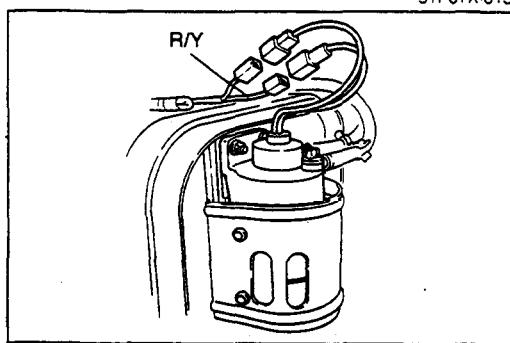
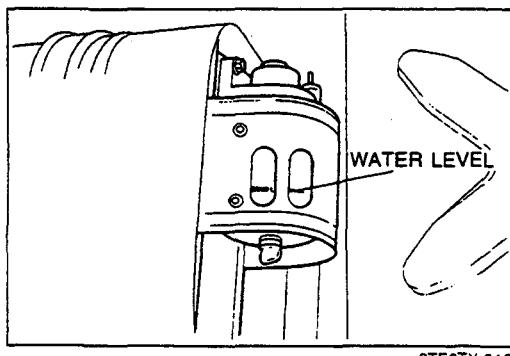
NO

Poor ground

YES

Check stoplight checker relay (Refer to page T-60)

WARNING SYSTEM



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

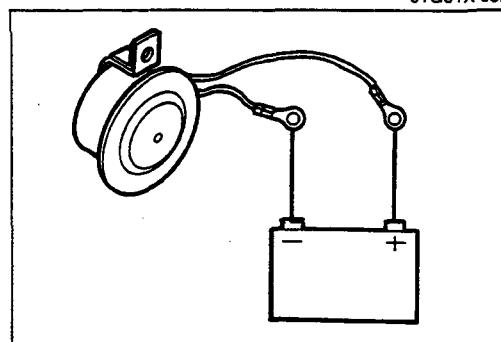
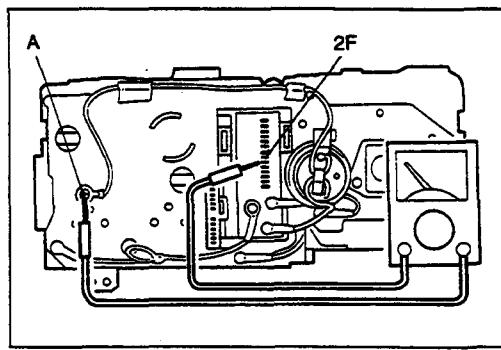
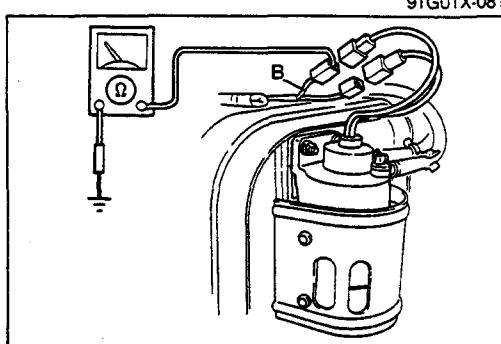
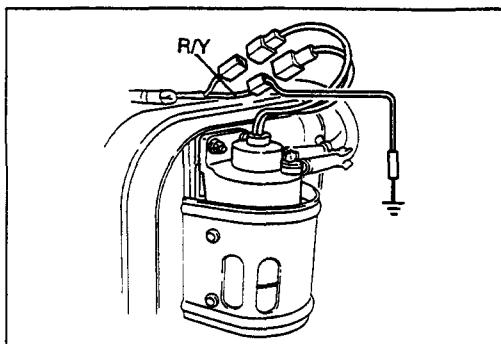
NO

Short-circuit in wire harness
(R/Y wire—Instrument cluster)

YES

Check sedimentor sensor
(Refer to page T-62)

WARNING SYSTEM



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 continuity between B wire at sensor connector and ground
- Continuity

NO Poor ground

YES Check sedimentor sensor (Refer to page T-62)

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

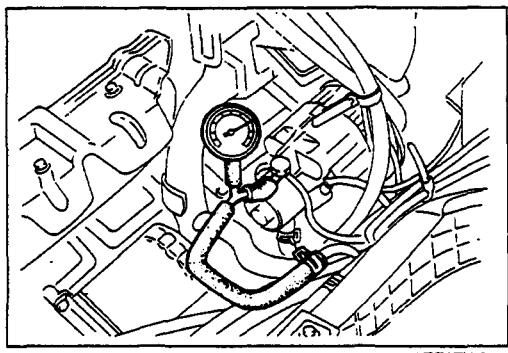
NO Instrument cluster malfunction

YES

- Check buzzer operation (Refer to page T-61)
- Normal

NO Buzzer malfunction

YES Short-circuit in instrument cluster

**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

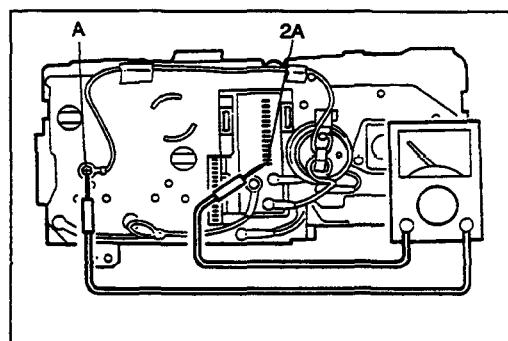
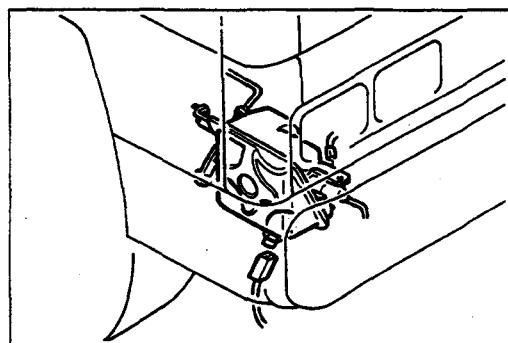
1. Disconnect vacuum switch connector
2. Check that lamp goes OFF and buzzer stops
 - Goes OFF and buzzer stops

YES

Vacuum switch malfunction

NO

Short-circuit in wire harness
(Vacuum switch—Instrument
cluster)



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)

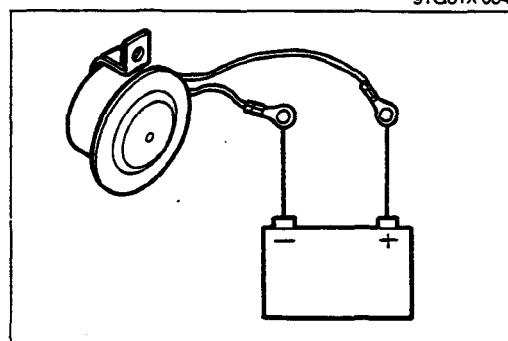
- Normal

NO

Buzzer malfunction

YES

Short-circuit in instrument
cluster



WARNING SYSTEM

T

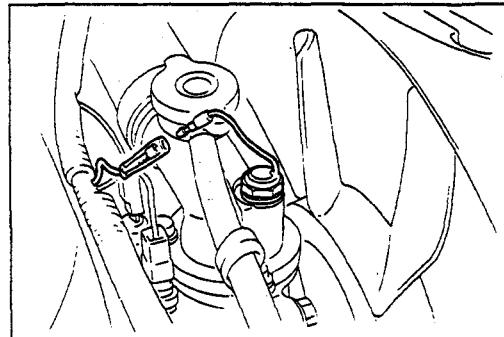
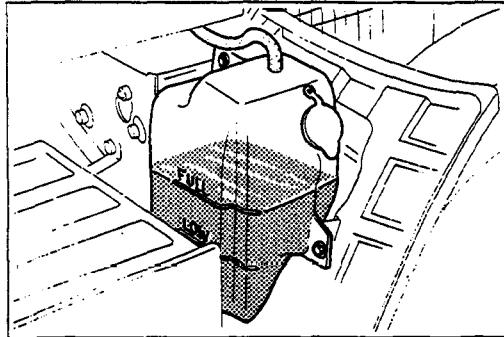
Warning buzzer

Warning buzzer sounds

Note

- If vacuum warning lamp comes ON with buzzer operation, refer to page T-56 for troubleshooting.
- If sedimentator warning lamp comes ON with buzzer operation, refer to page T-54 for troubleshooting.

9TG0TX-065



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 warn-
ing unit connector
2. Check that buzzer stops
• Stops

YES

Coolant warning unit
malfunction

NO

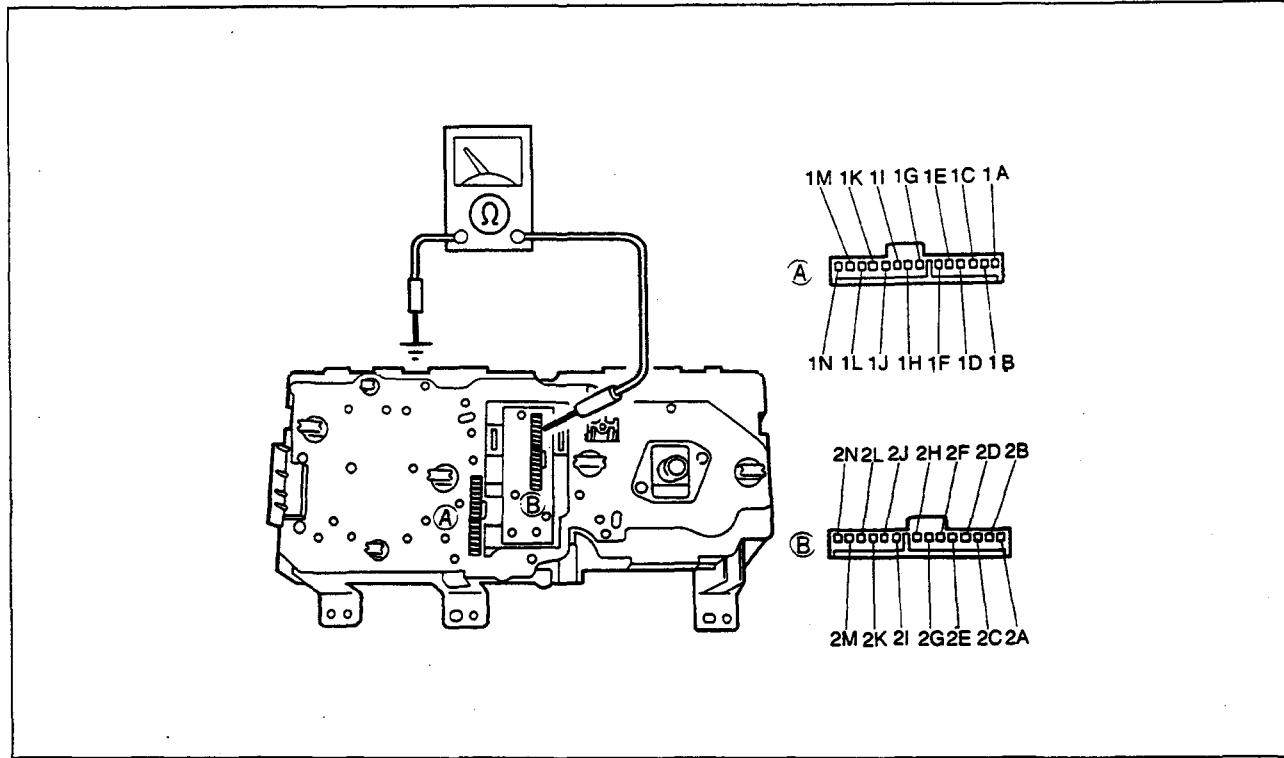
Short-circuit in wire harness
(Sensor—Unit)
Short-circuit in instrument
cluster

WARNING AND INDICATOR LAMP**Inspection**

1. Check continuity with an ohmmeter.

Caution

- Connect the probes to the correct terminals.



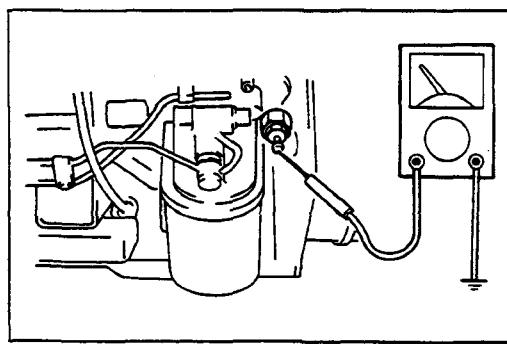
9TF0TX-015

Warning lamp

Lamp	Ohmmeter connection to	
	+ probe	- probe
Sedimentor warning	2F	
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
	Right	2M
		2D



9TGOTX-088

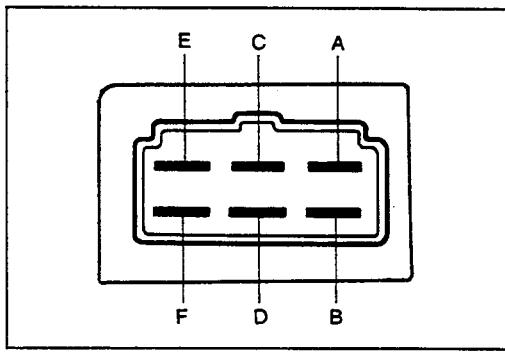
OIL PRESSURE SWITCH**Inspection**

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.

WARNING SYSTEM



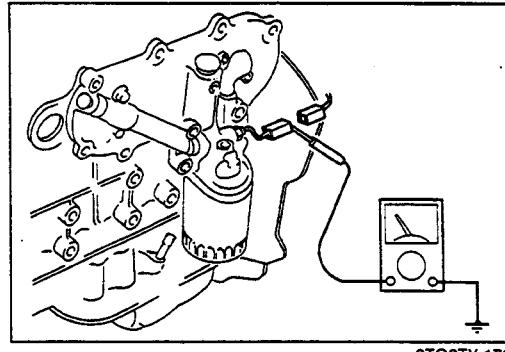
9TG0TX-171

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

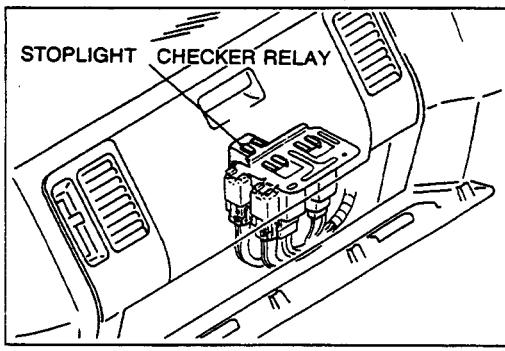
Inspection

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 is normal.

WARNING SYSTEM



STOPLIGHT CHECKER RELAY

Inspection

1. Check continuity between terminal of the stoplight checker relay.

Note

- Set the tester to $\times 1,000\Omega$ 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

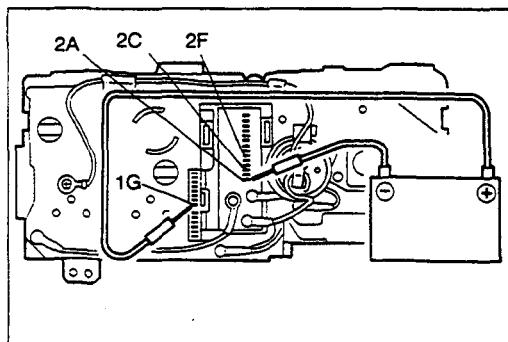
1. Disconnect the parking brake switch connector.
2. Check continuity between the parking brake switch and ground.

Parking brake switch	Continuity
Pulled	Yes
Released	No

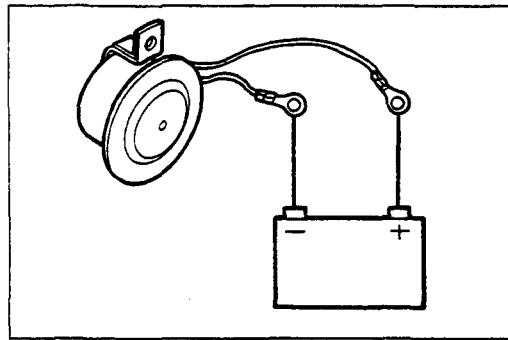
3. Replace the parking brake switch if not as specified.

WARNING SYSTEM

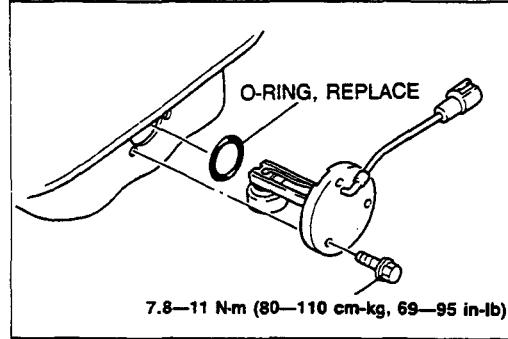
T



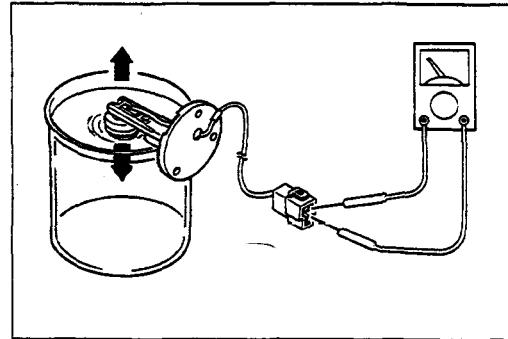
9TGOTX-094



9TGOTX-095



9TGOTX-097



9TGOTX-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:

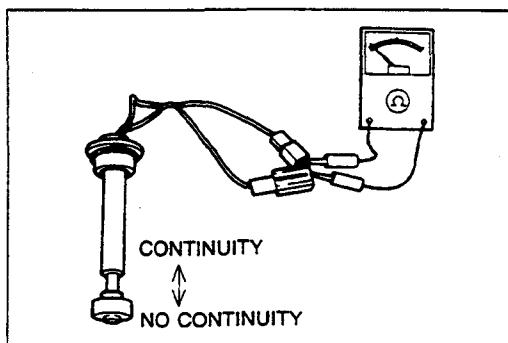
7.8–11 N·m (80–110 cm·kg, 69–95 in·lb)

Inspection

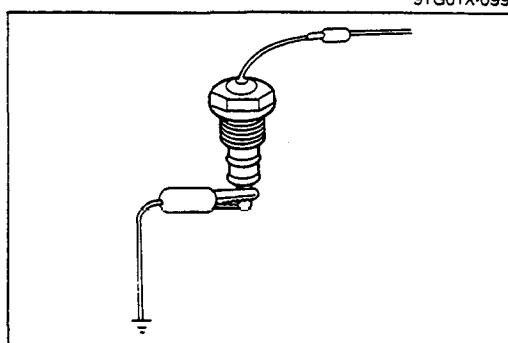
1. Place the oil level sensor and a thermometer in a container of water.
2. Gradually heat the water.
3. Check for continuity of the sensor.

Float	Continuity
Up	No
Down	Yes

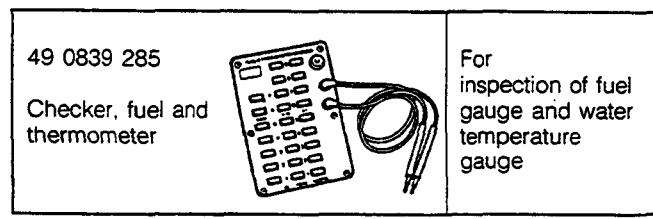
4. Replace the oil level sensor, if not as specified.

**SEDIMENTOR SENSOR****Inspection**

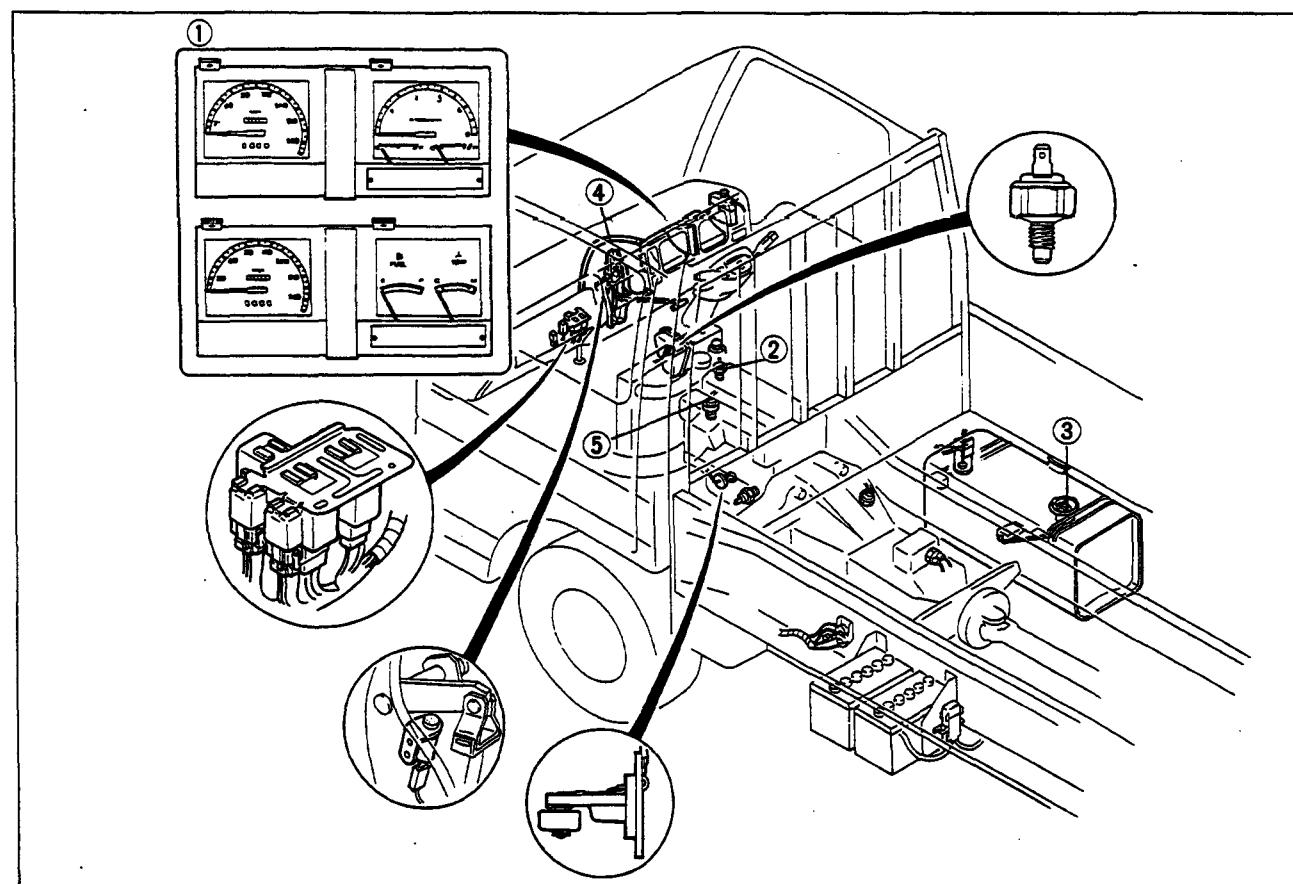
1. Remove the sedimentor sensor from the sedimentor.
2. Connect an ohmmeter to the sedimentor sensor.
3. Verify that there is continuity when the float is up.
4. Replace the sedimentor sensor if not as specified.

**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**

9TGOTX-103

STRUCTURAL VIEW

9TGOTX-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

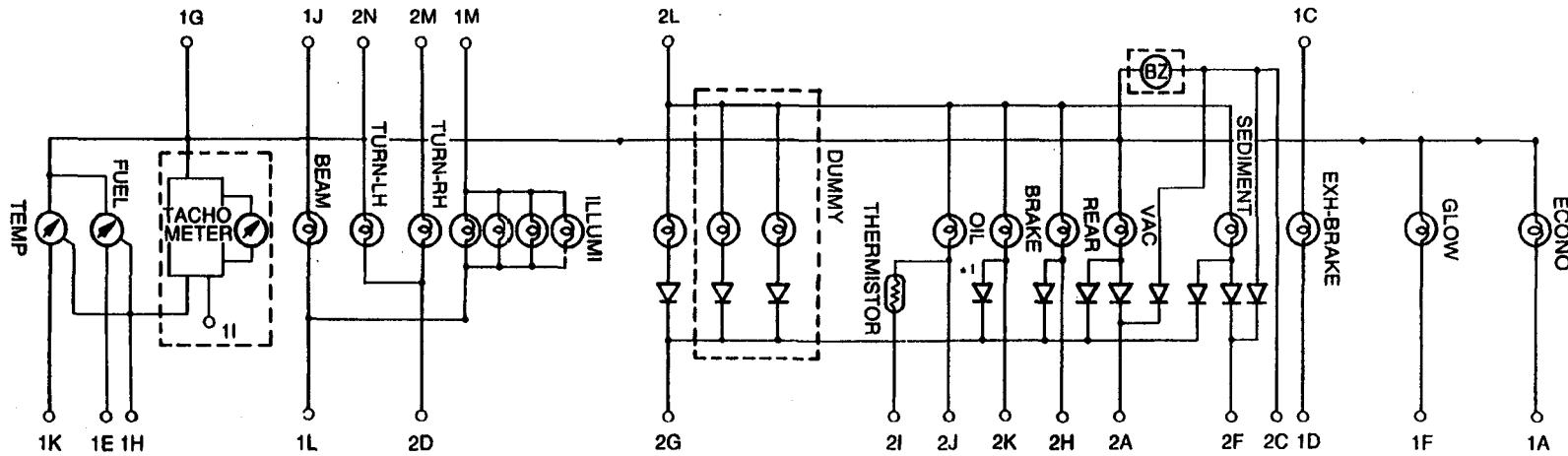
Removal / Installation	page T-71
Inspection	page T-71
4. Speedometer cable

Removal / Installation	page T-68
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5. Pickup sensor

Inspection	page T-72
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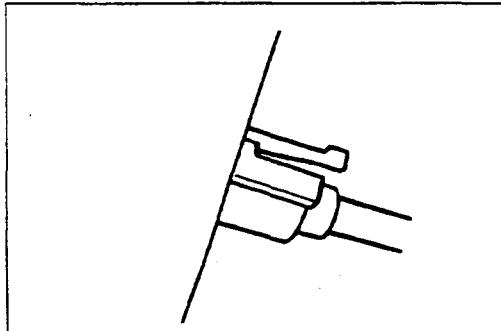
TROUBLESHOOTING
Wiring Diagram
INSTRUMENT CLUSTER (METER)

T-64

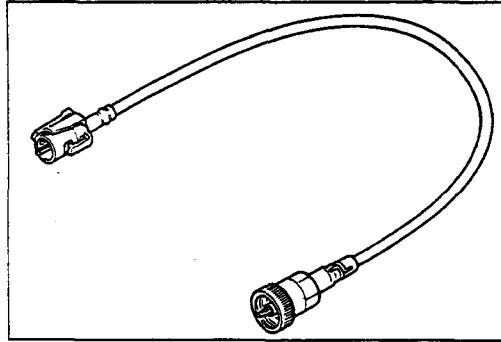


Speedometer does not operate or indication incorrect

9TG0TX-106



9TG0TX-107



9TG0TX-108

Step 1

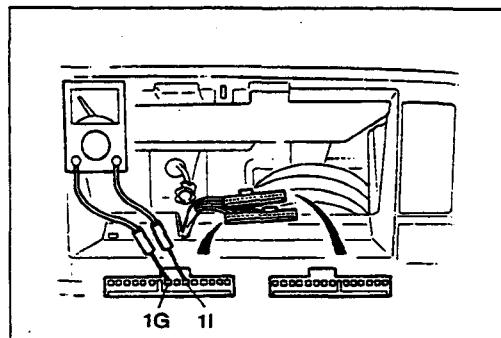
1. Verify that the speedometer cable is properly connected.

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



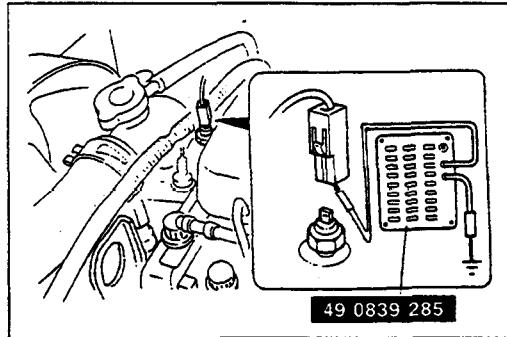
9TG0TX-110

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

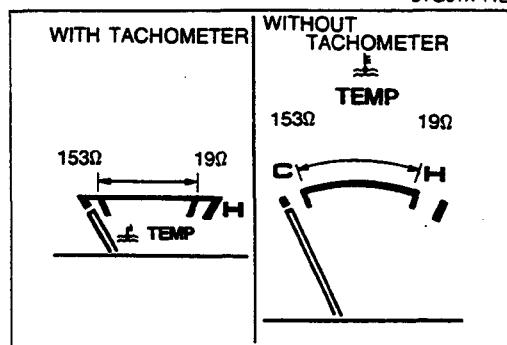
Step 1

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.

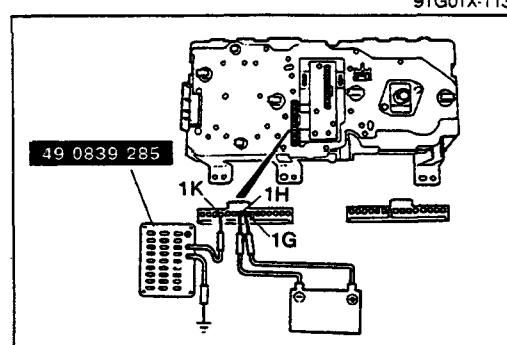


9TG0TX-113

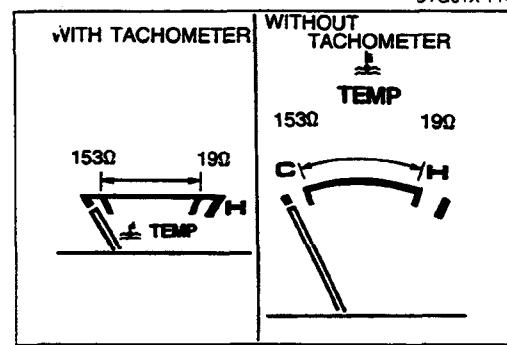
Step 2

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



9TG0TX-114



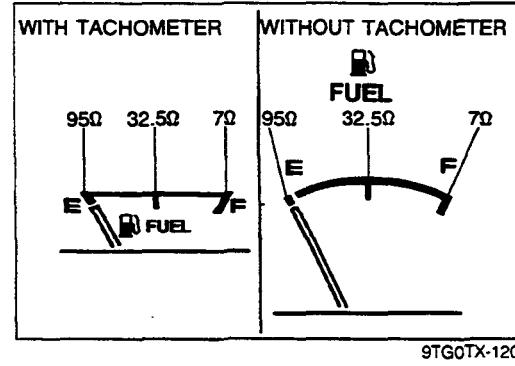
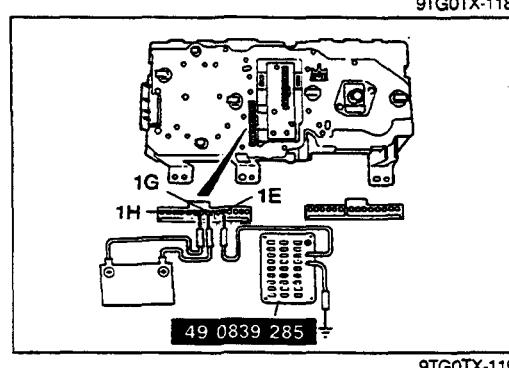
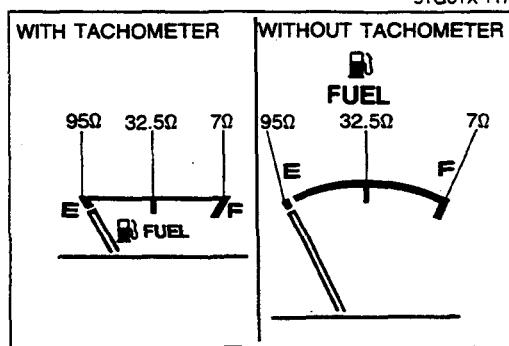
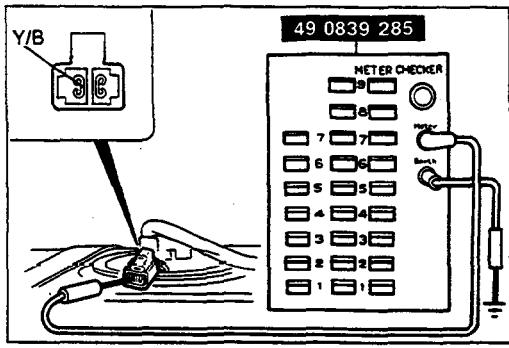
9TG0TX-115

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

9TGOTX-116



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.

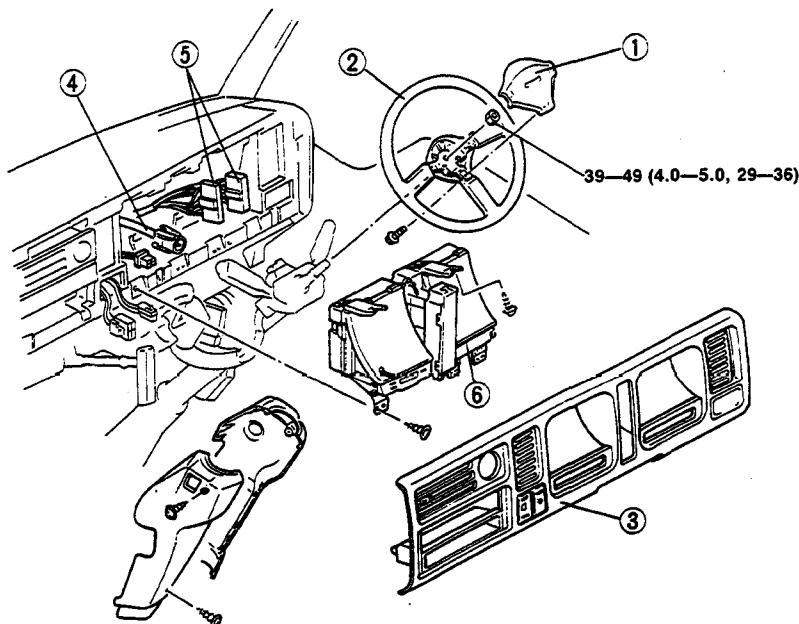
T

INSTRUMENT CLUSTER (METER)

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**.



N·m (m-kg, ft-lb)

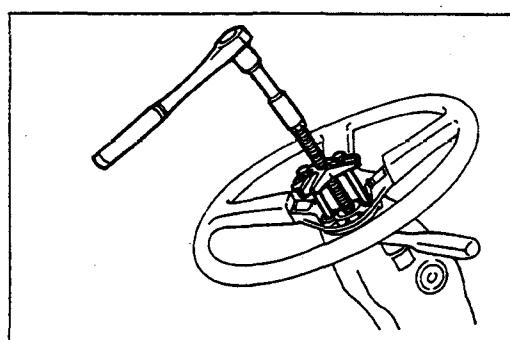
9TGOTX-121

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

Removal note Steering wheel

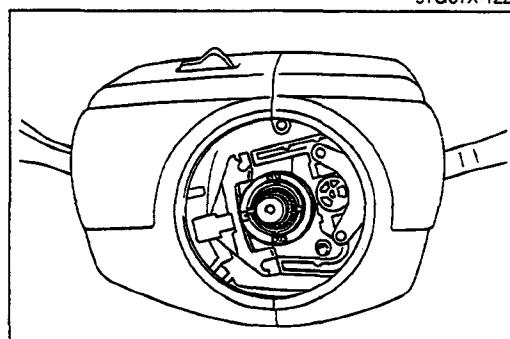
1. Remove the steering wheel with a steering wheel puller.



9TGOTX-122

Installation note Steering wheel

1. Set the cancel cam as shown in the figure.

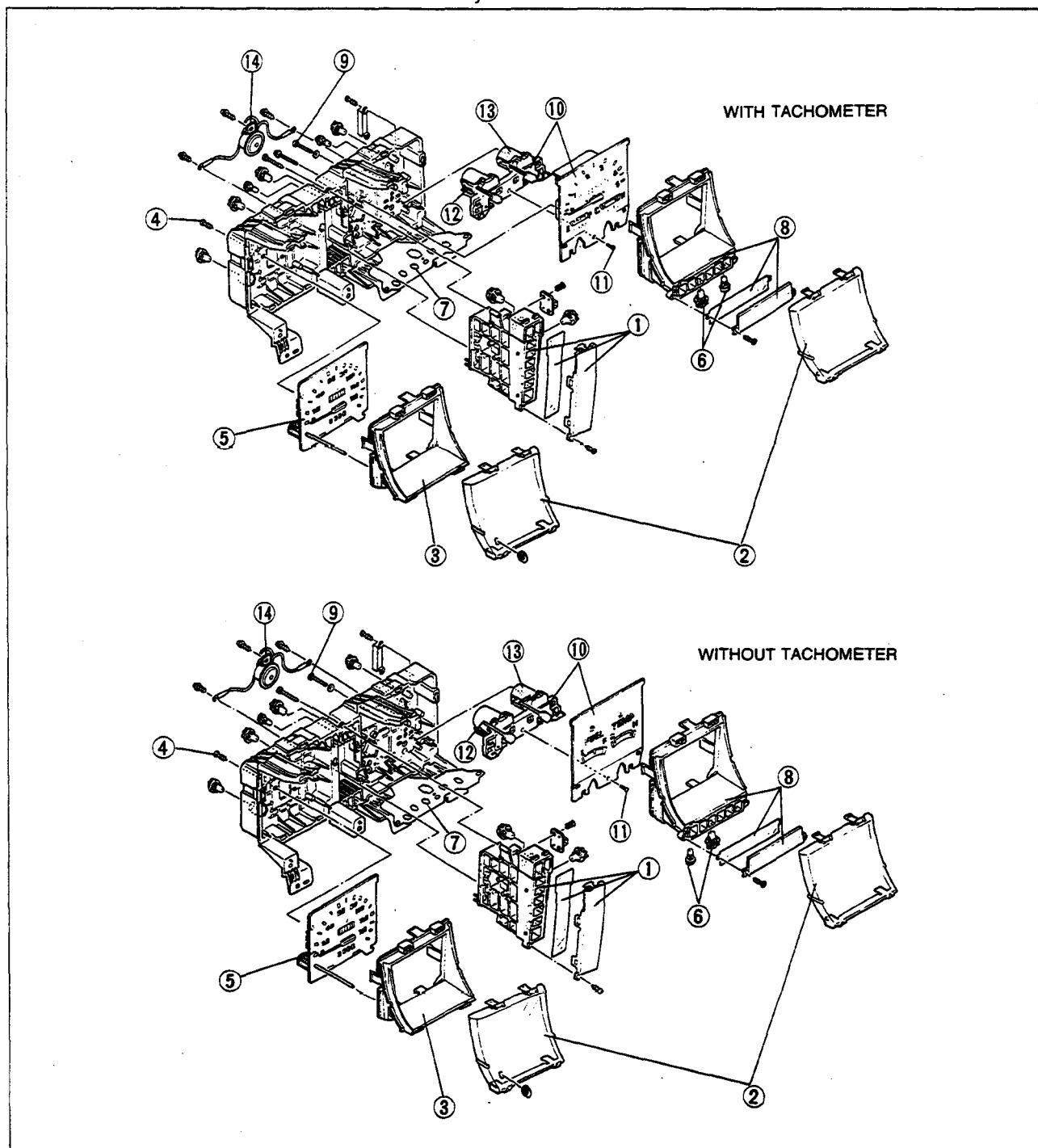


9TGOTX-123

INSTRUMENT CLUSTER (METER)

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



9TG0TX-124

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

INSTRUMENT CLUSTER (METER)

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

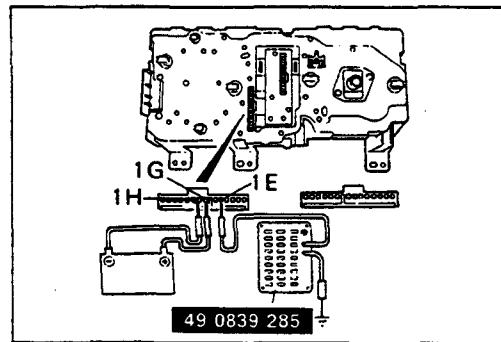
km/h

Standard indication	Allowable range
40	40—43
80	80—84

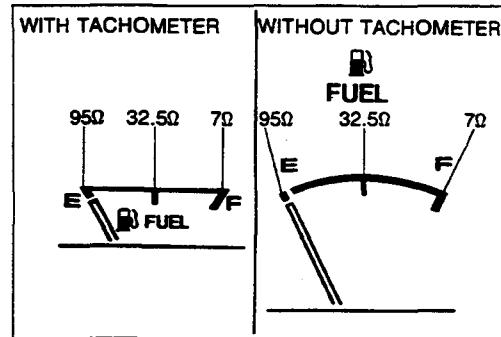
mph

Standard indication	Allowable range
20	20—22
50	50—53
80	80—84

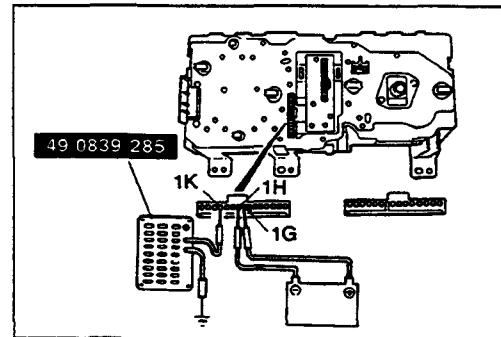
9TG0TX-126



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.

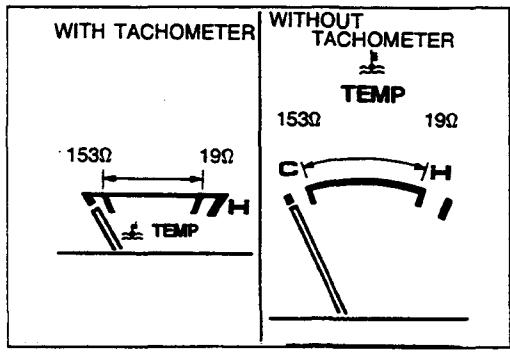
Caution

- 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.

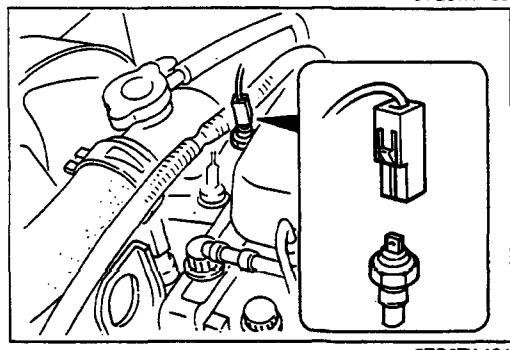
INSTRUMENT CLUSTER (METER)



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

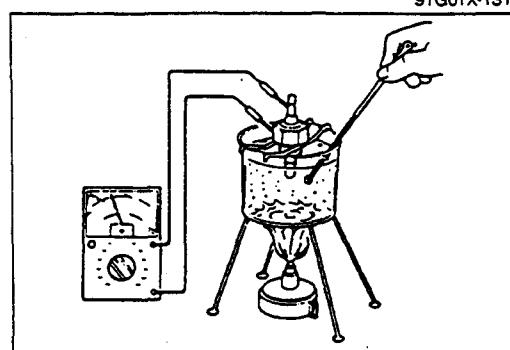
- Continue the above checks for at least two minutes each to correctly judge the condition.
- The allowable indication error is twice the width of the needle.



WATER THERMOSENSOR

Removal / Installation

1. Disconnect the connector from the water thermosensor.
2. Remove the sensor.
3. Install in the reverse order of removal.

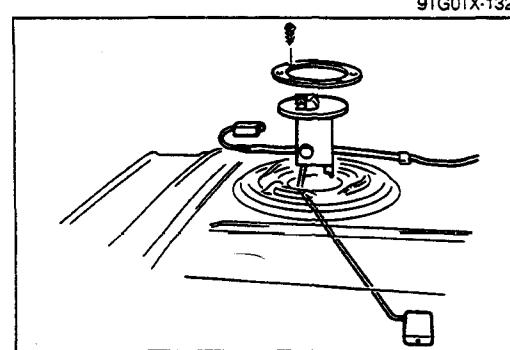


Inspection

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)

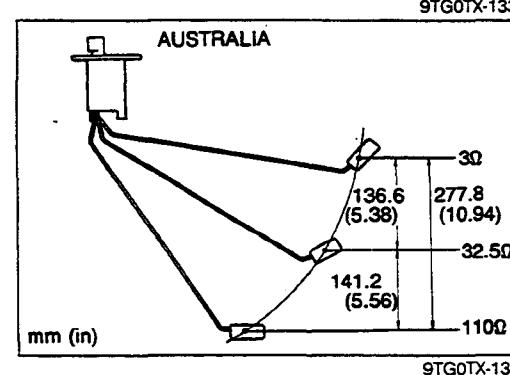
3. Replace the water thermosensor if not as specified.



FUEL GAUGE SENDER UNIT

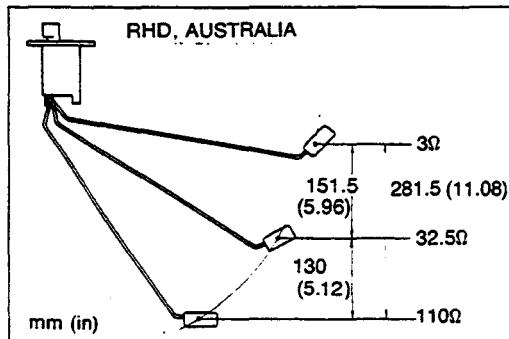
Removal / Installation

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.

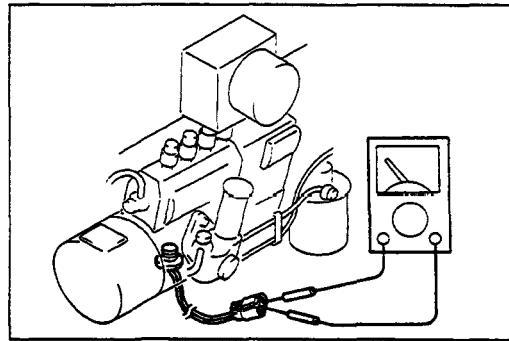


Inspection

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**

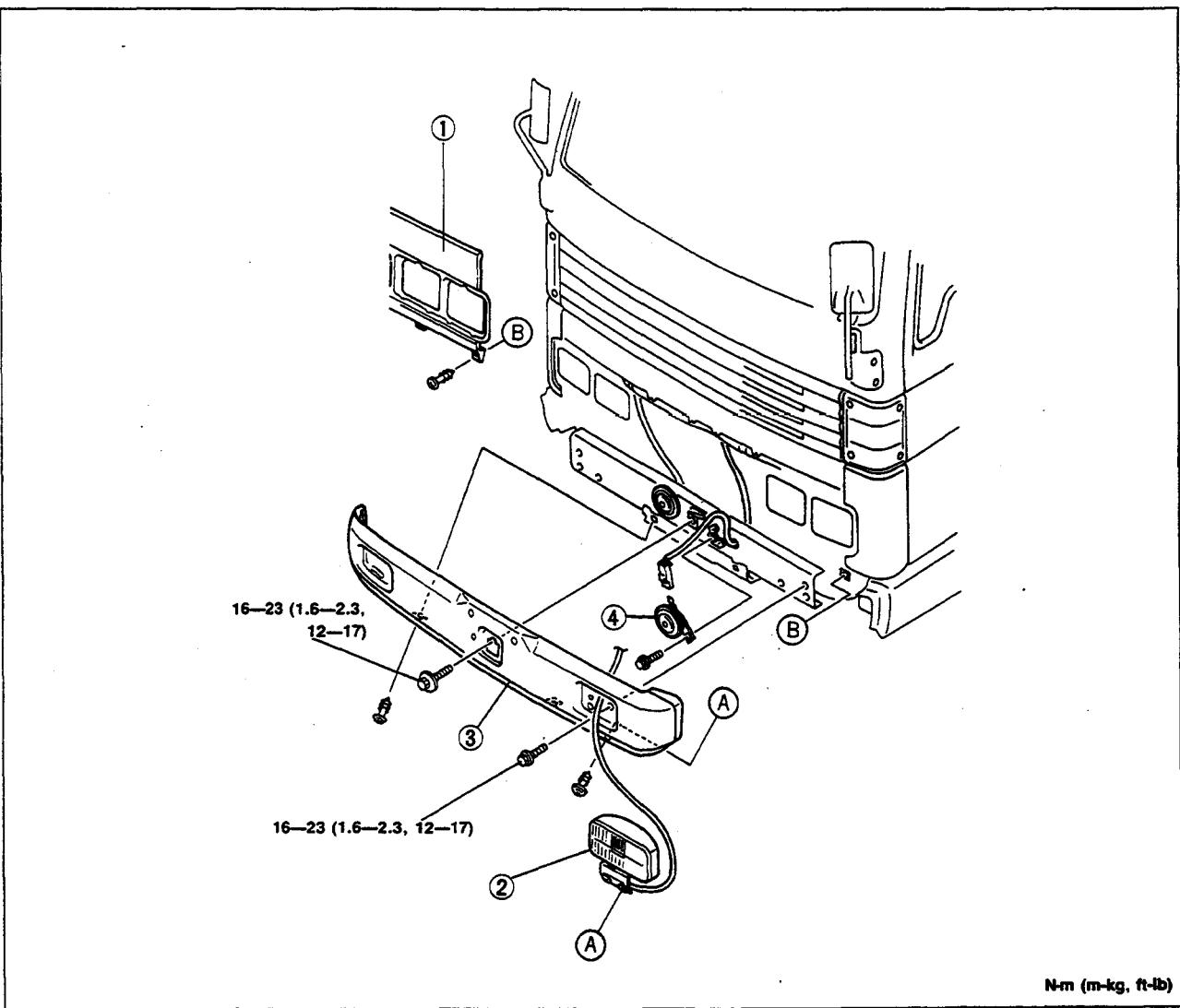
1. Disconnect the pickup sensor connector.
2. Check for continuity with an ohmmeter.
3. Replace the pickup sensor if there is no continuity.



9TGOTX-135

HORN**HORN****Removal / Installation**

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



1. Radiator grille
2. Fog light

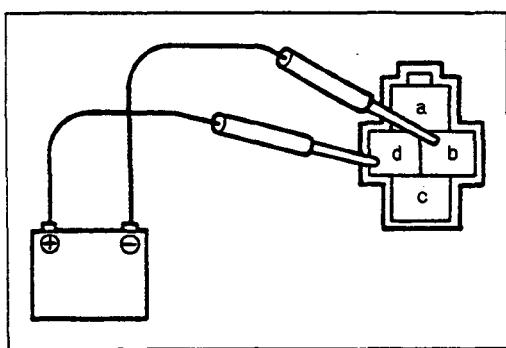
Removal / Inspection /

Installation page T-38

3. Front bumper
4. Horn

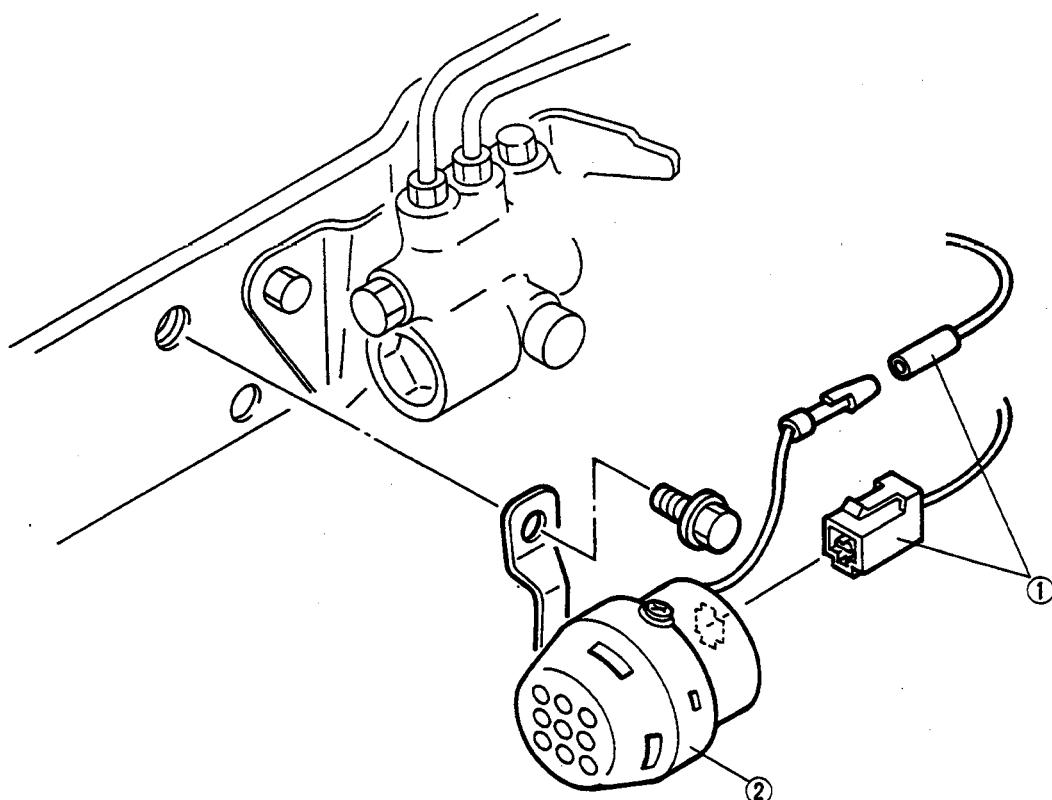
**HORN RELAY
Inspection**

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.

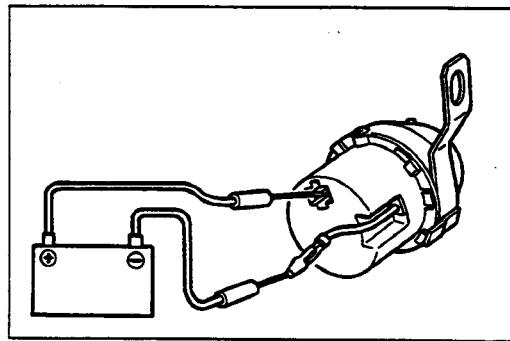


9TGOTX-138

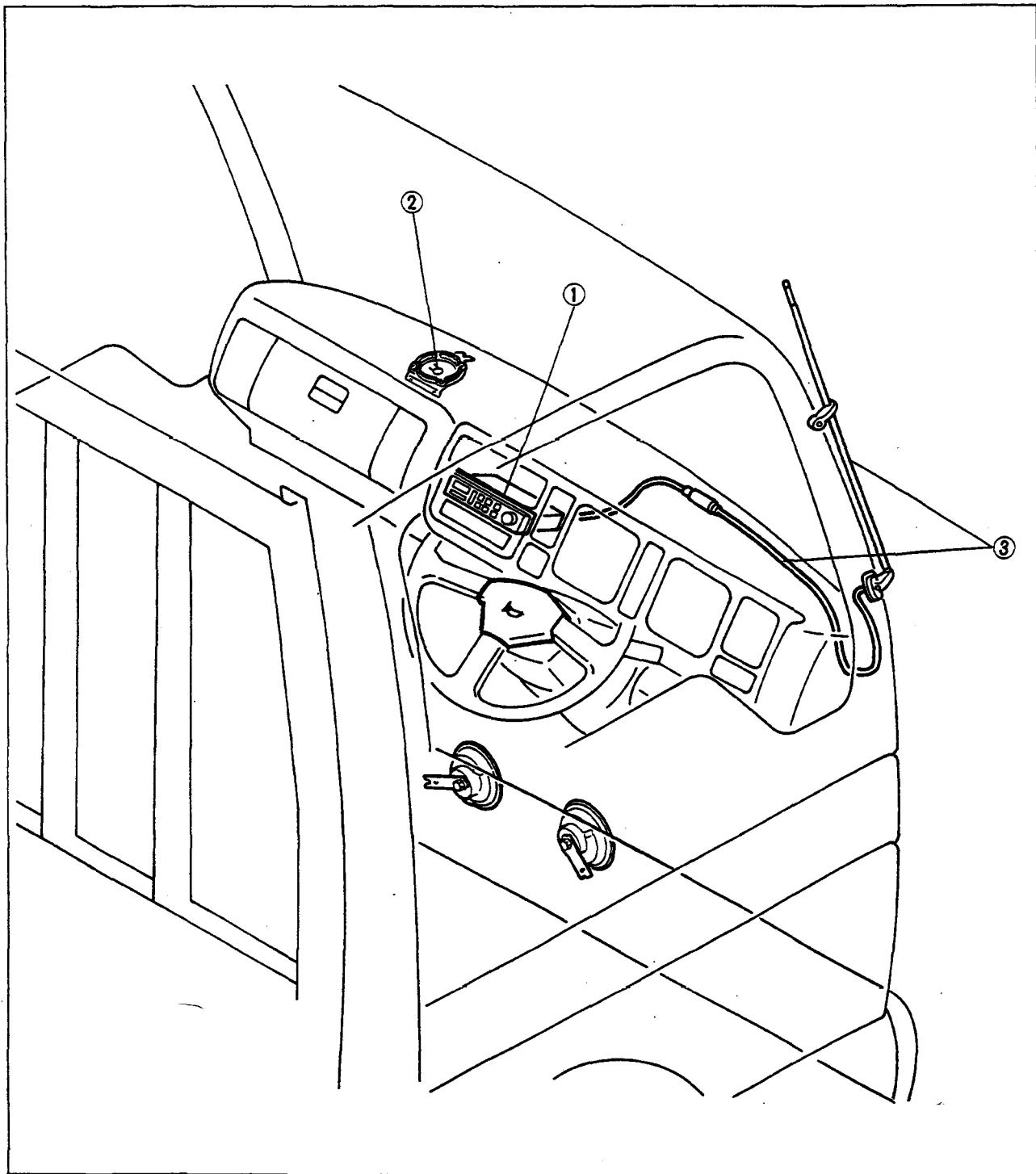
1. Connector

2. Backing warning horn
Inspection page T-74**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.



9TGOTX-139

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

AUDIO

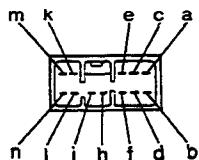
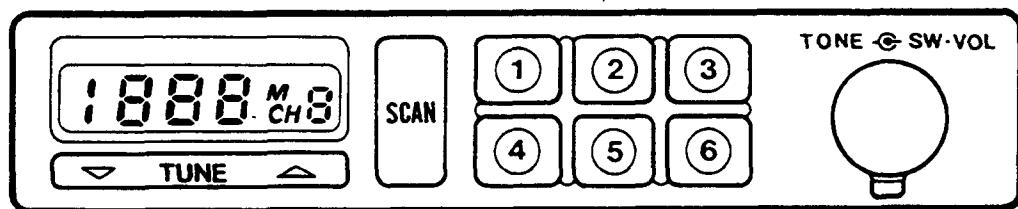
SPECIFICATIONS

		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	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

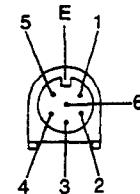
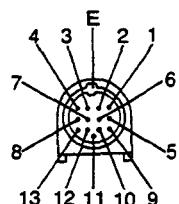
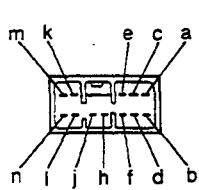
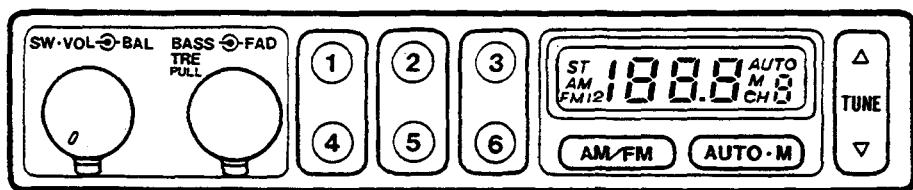
DESCRIPTIONS

AM Radio



a	(+) 13.2V (ACC)
b	
c	
d	
e	
f	
h	
j	
k	SPEAKER (+)
l	SPEAKER (-)
m	SPEAKER (+)
n	SPEAKER (-)

9TG0TX-142

AUDIO**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 (-)

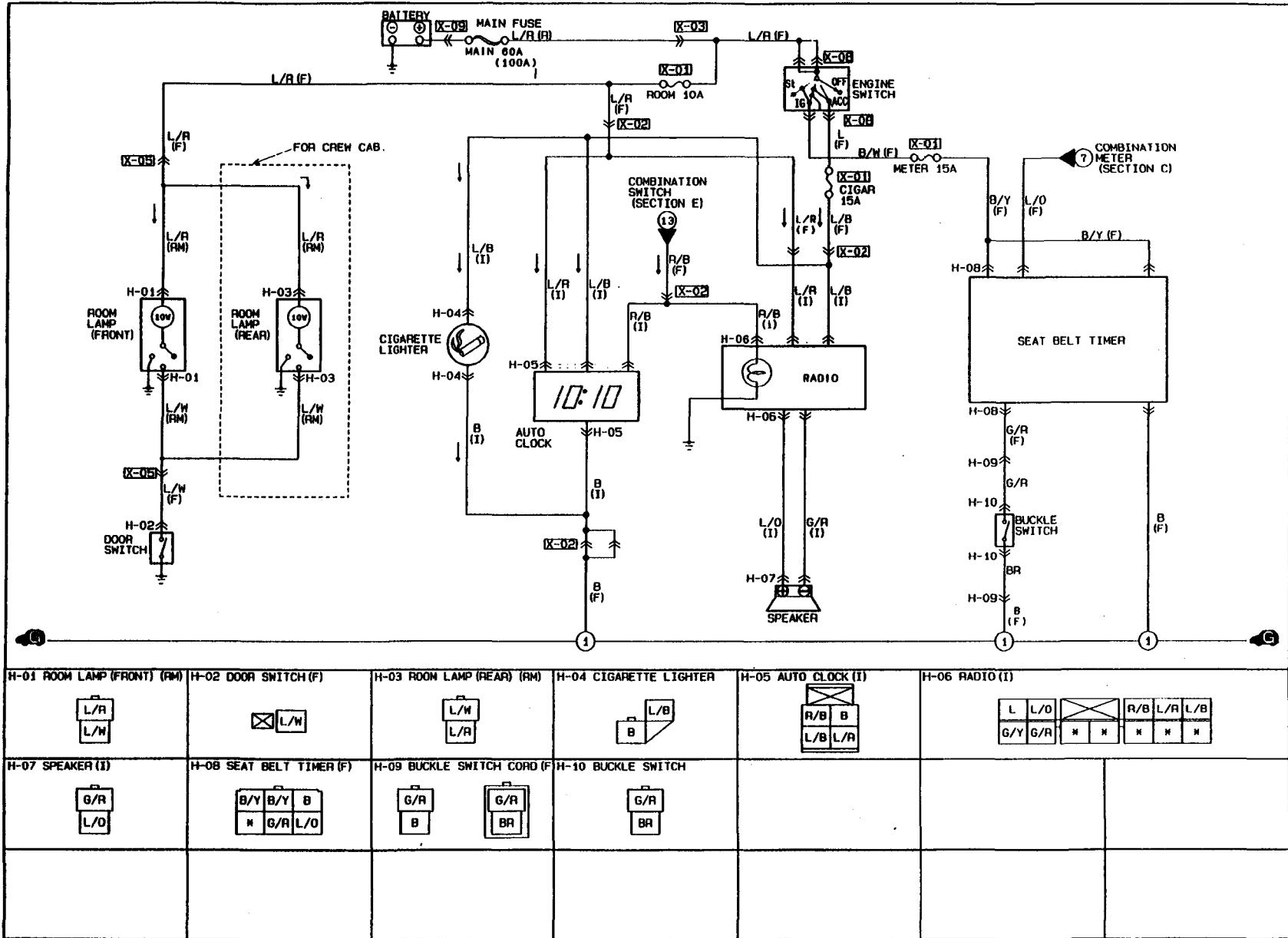
1	OUTPUT (+)
2	INPUT (+)
3	OUTPUT (+)
4	INPUT (+)
5	SIGNAL GROUND
6	ILLUMINATION
7	(+) 13.2V (ACC)
8	BATTERY
9	SYSTEM ON
10	SYSTEM OFF (DECK)
11	SYSTEM OFF (AUX)
12	
13	SYSTEM MUTE
E	GROUND

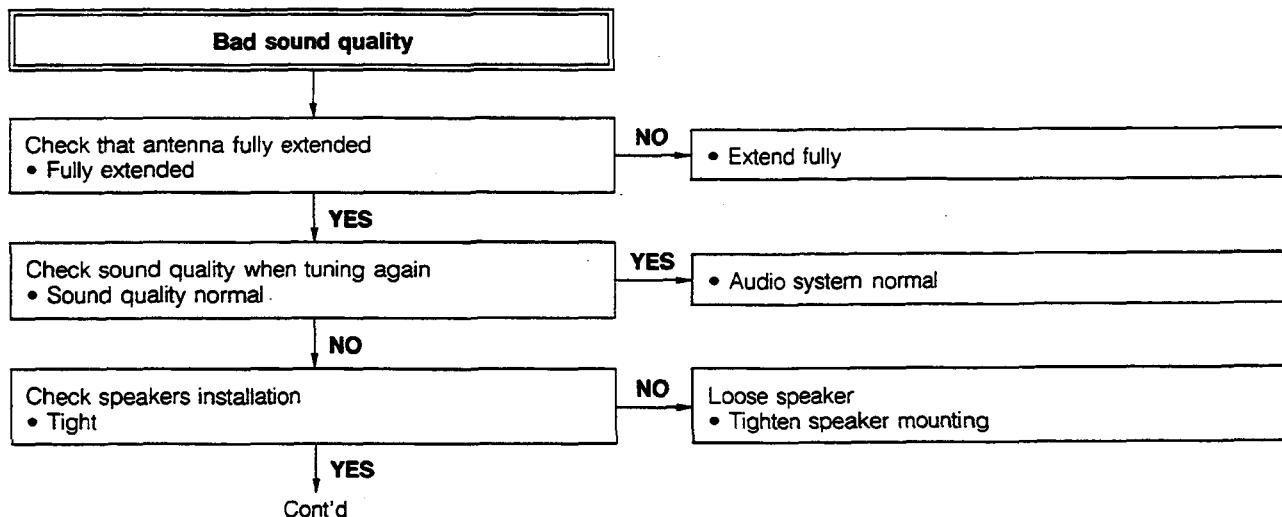
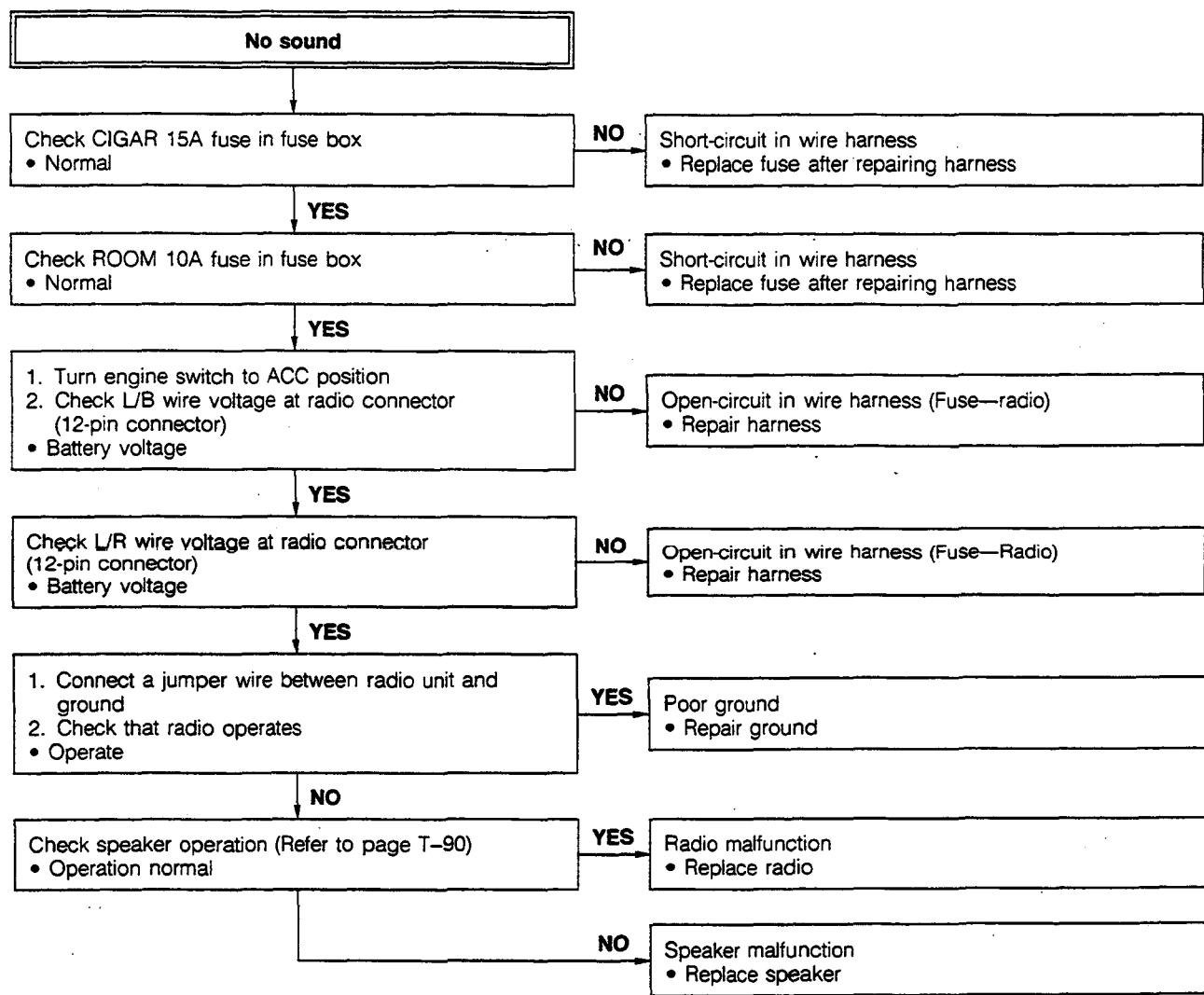
1	OUTPUT (+)
2	(+) 13.2V CONTROL POWER
3	OUTPUT (+)
4	OUTPUT (-)
5	OUTPUT (-)
6	GROUND
E	SHIELD GROUND

TROUBLESHOOTING

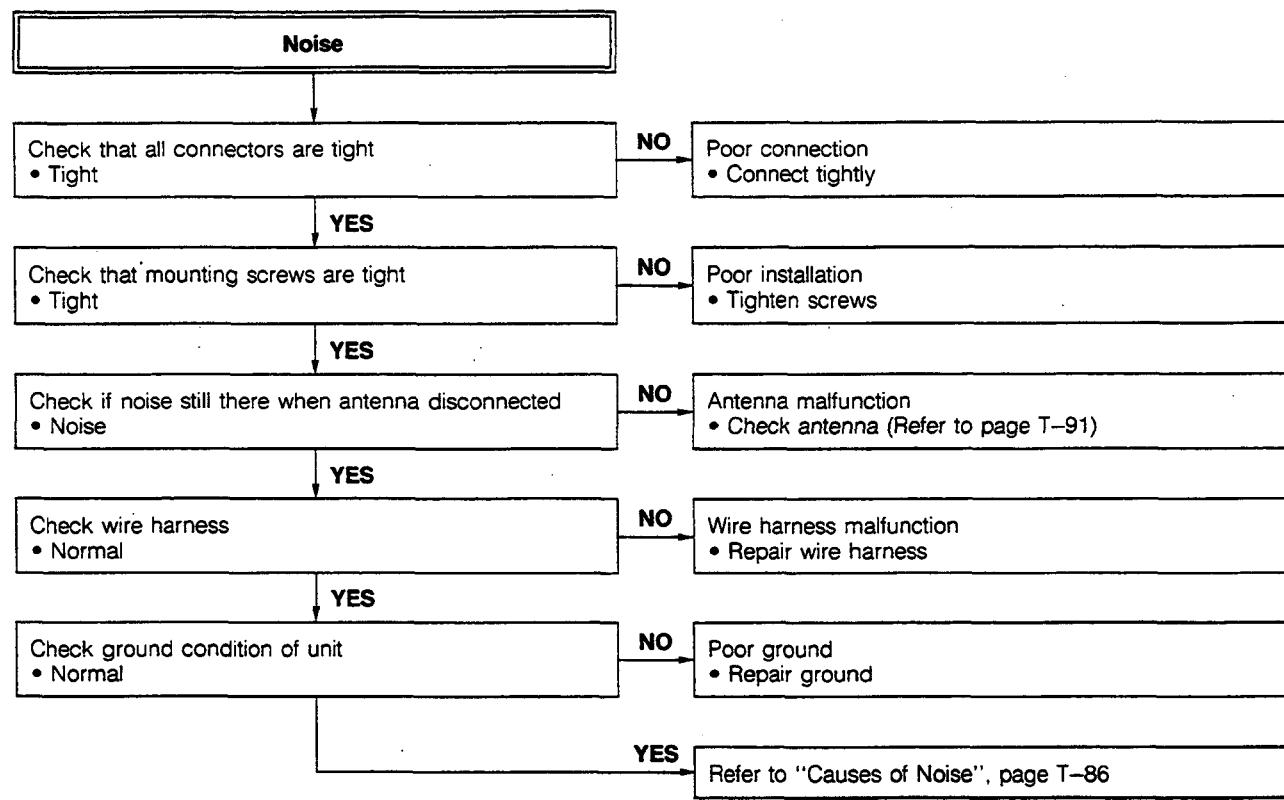
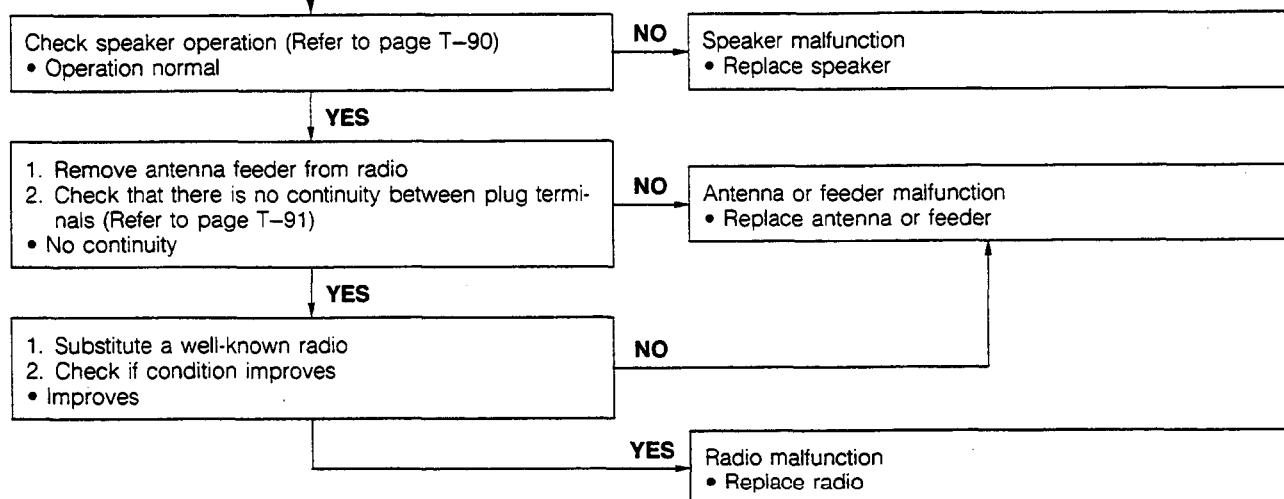
Wiring Diagram

AUDIO



AM Radio

Cont'd



AUDIO

T

No display of frequency, Preset memory canceled

Note

- When battery is dead or radio is disconnected from battery for repair, all memory is cancelled. The stations must be preset again.

1. Turn engine switch OFF
2. Check back-up terminal voltage
 - Higher than approx. 8V

NO

- Open circuit in wire harness
 - Repair back-up circuit

YES

- Check that connectors are tight
 - Tight

NO

- Poor connection
 - Connect tightly

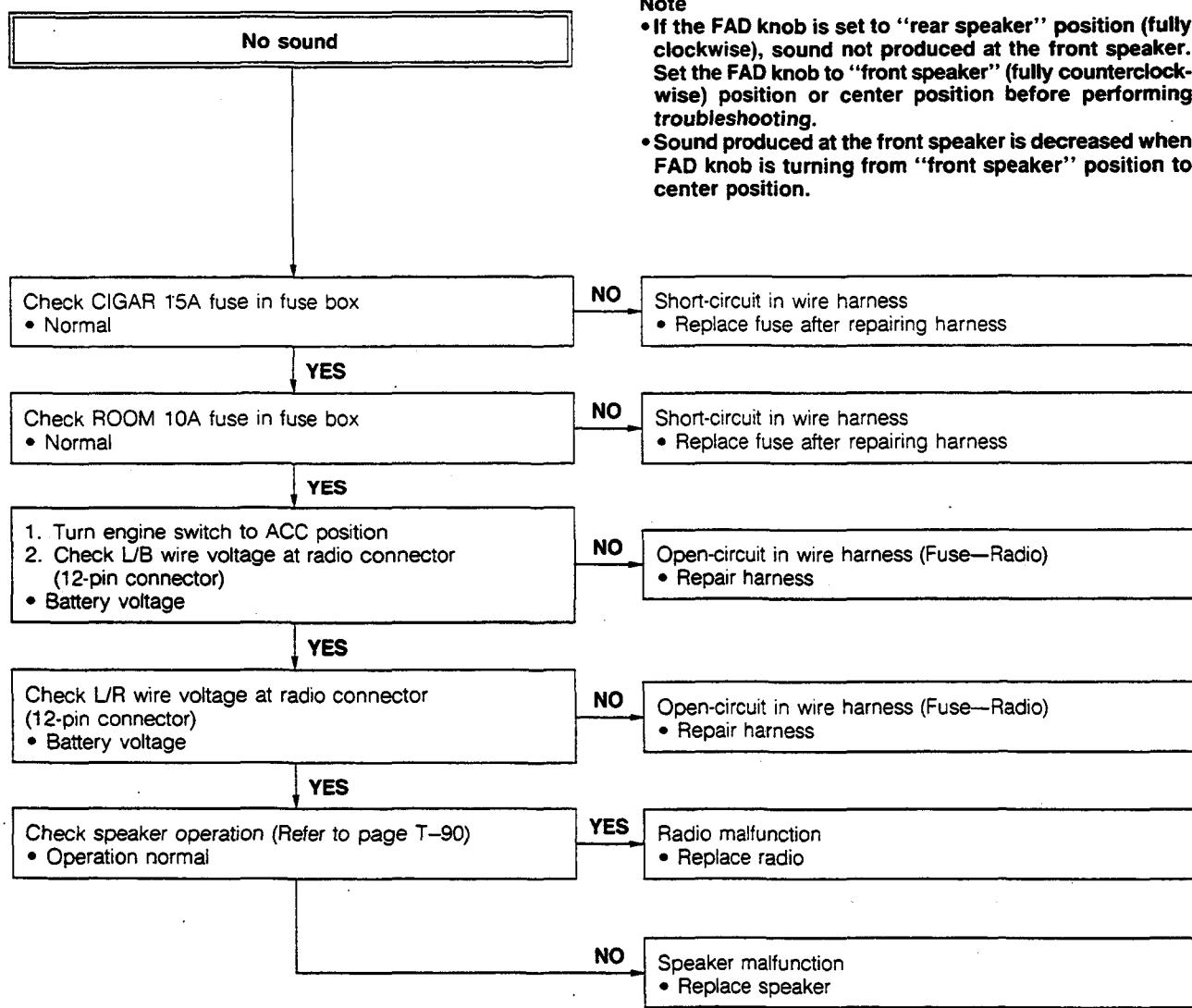
YES

- Radio malfunction
 - Replace radio

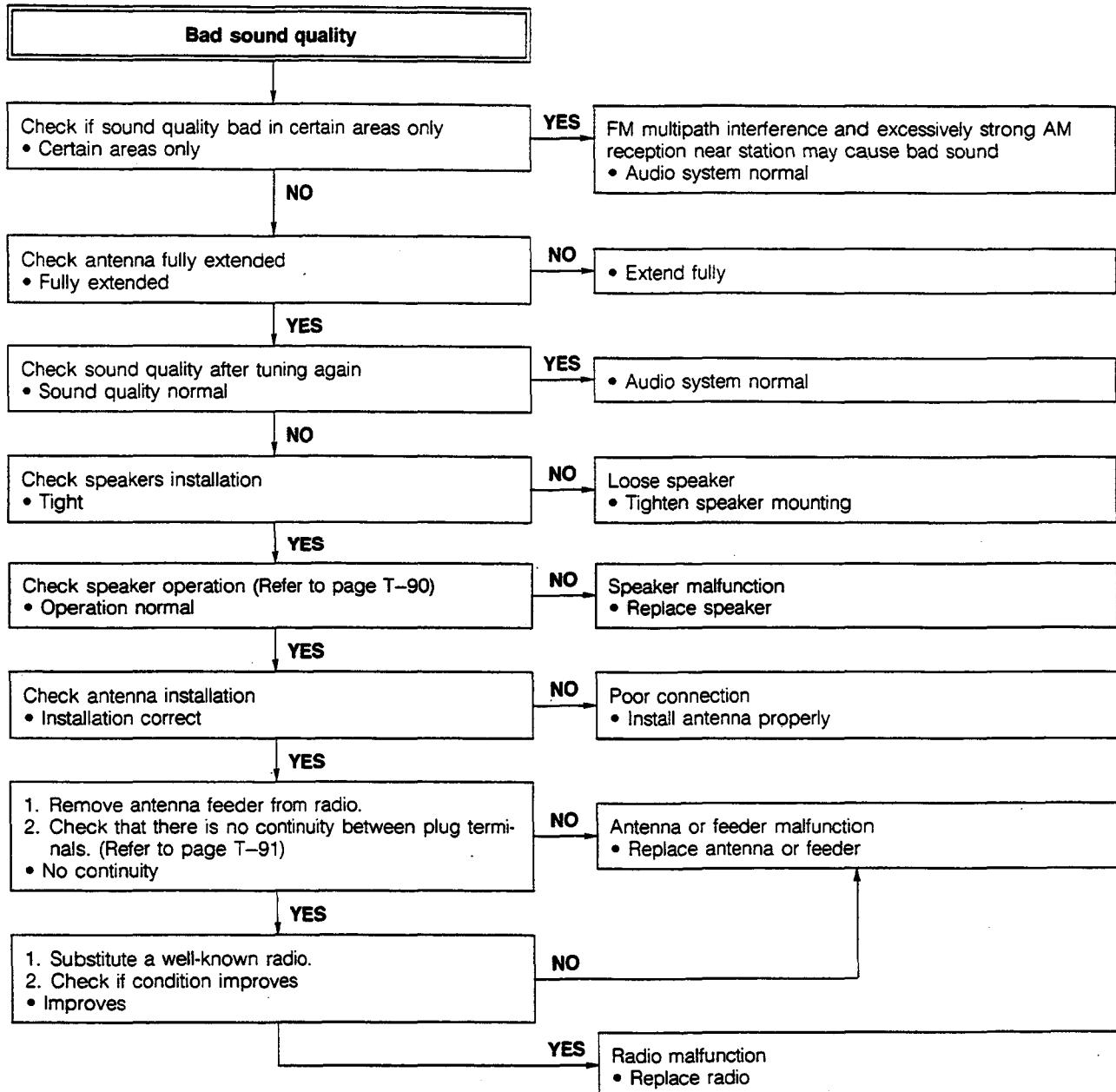
9TG0TX-149

AUDIO

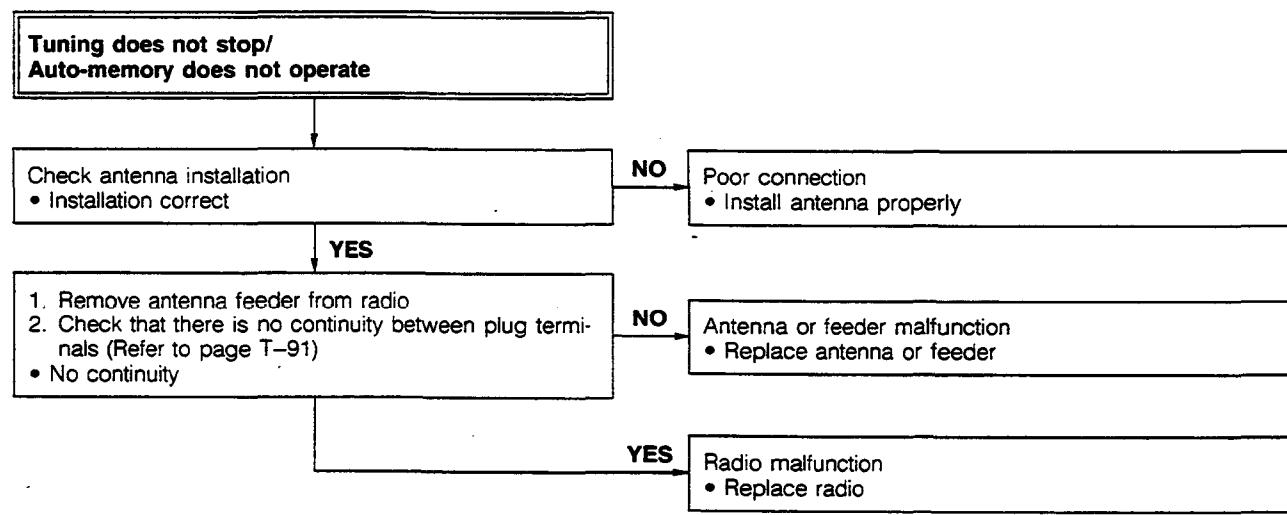
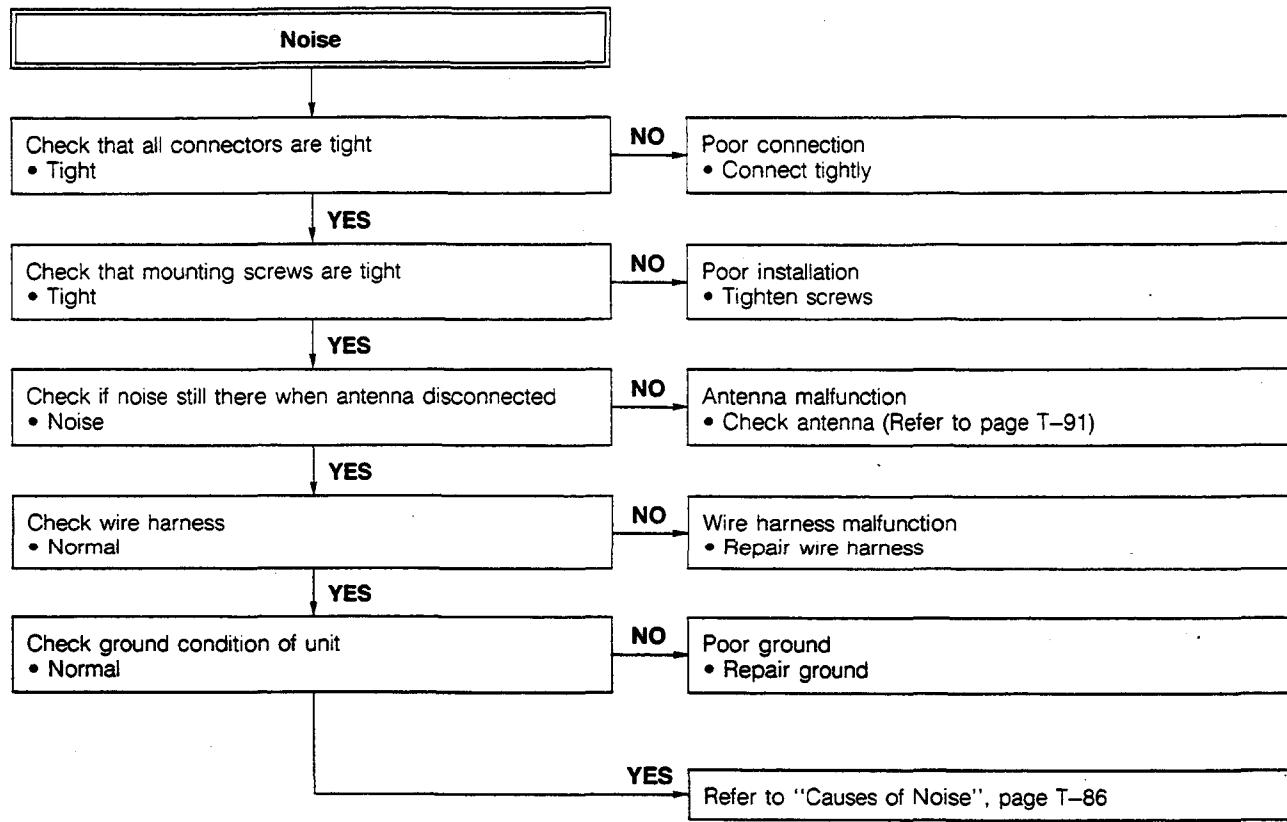
AM/FM Radio



9TF0TX-021



9TF0TX-022



AUDIO

T

No display of frequency, Preset memory canceled

1. Turn engine switch OFF
2. Check back-up terminal voltage
 - Higher than approx. 8V.

YES

- Check that connectors are tight
- Tight

NO

- Open circuit in wire harness
- Repair back-up circuit

NO

- Poor connection
- Connect tightly

YES

- Radio malfunction
- Replace radio

9TG0TX-154

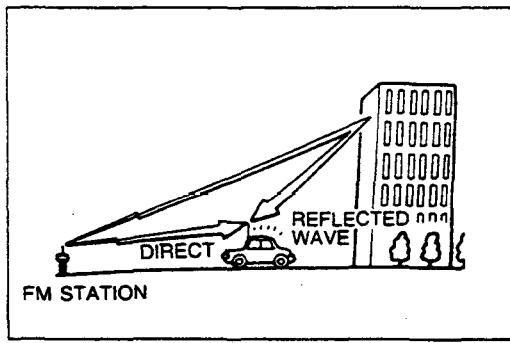
Causes of Noise

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 induces noise. (called outside noise.)
3. Noise from other cars or neon signs, for example. (ambience noise.)

Since ambience noise is a temporary occurrence, 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.

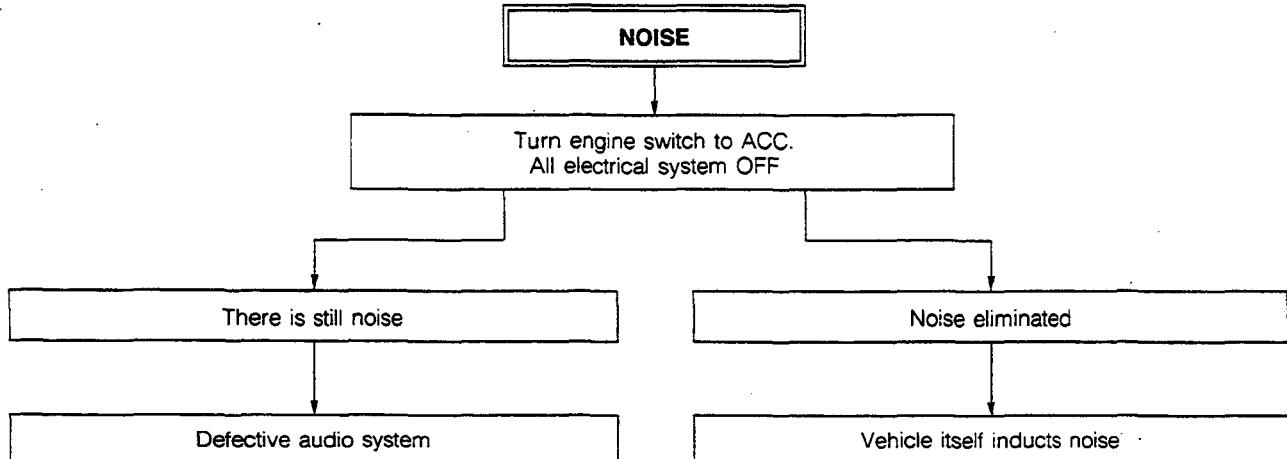
9TGOTX-162



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

9TGOTX-163

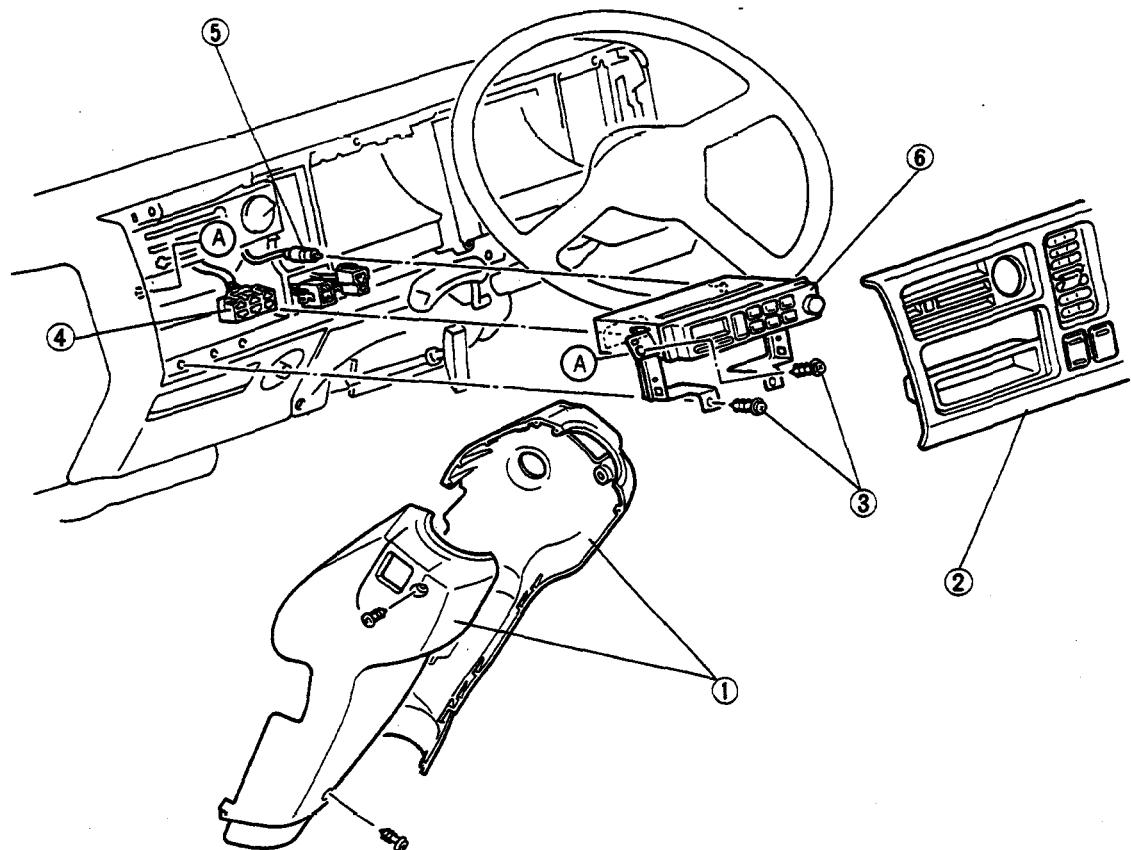
Noise Suppression Chart

Cause	Remedy
Motor noise (Wiper, washer, for example.)	<p>1. Check grounding. 2. Install condensers to motor circuit.</p>
Turn signal noise	<p>Connect condenser to power line of flasher unit.</p>
Alternator noise	<p>Connect condenser near alternator.</p>

9TG0TX-164

AUDIO UNIT**Removal / Installation**

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



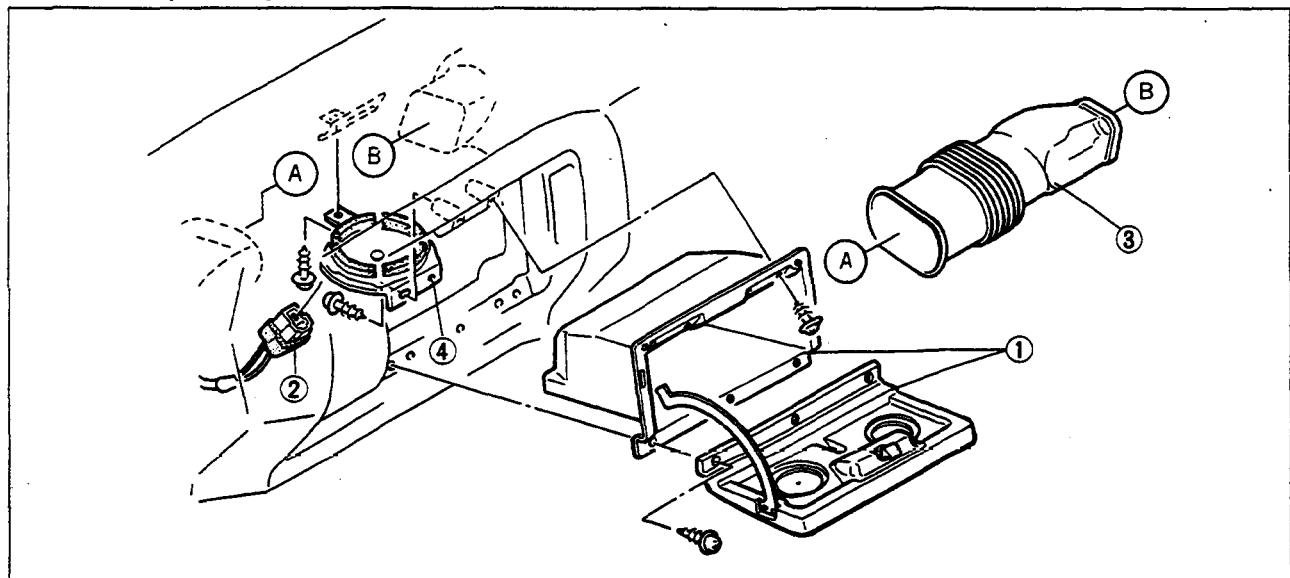
9TF0TX-025

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**

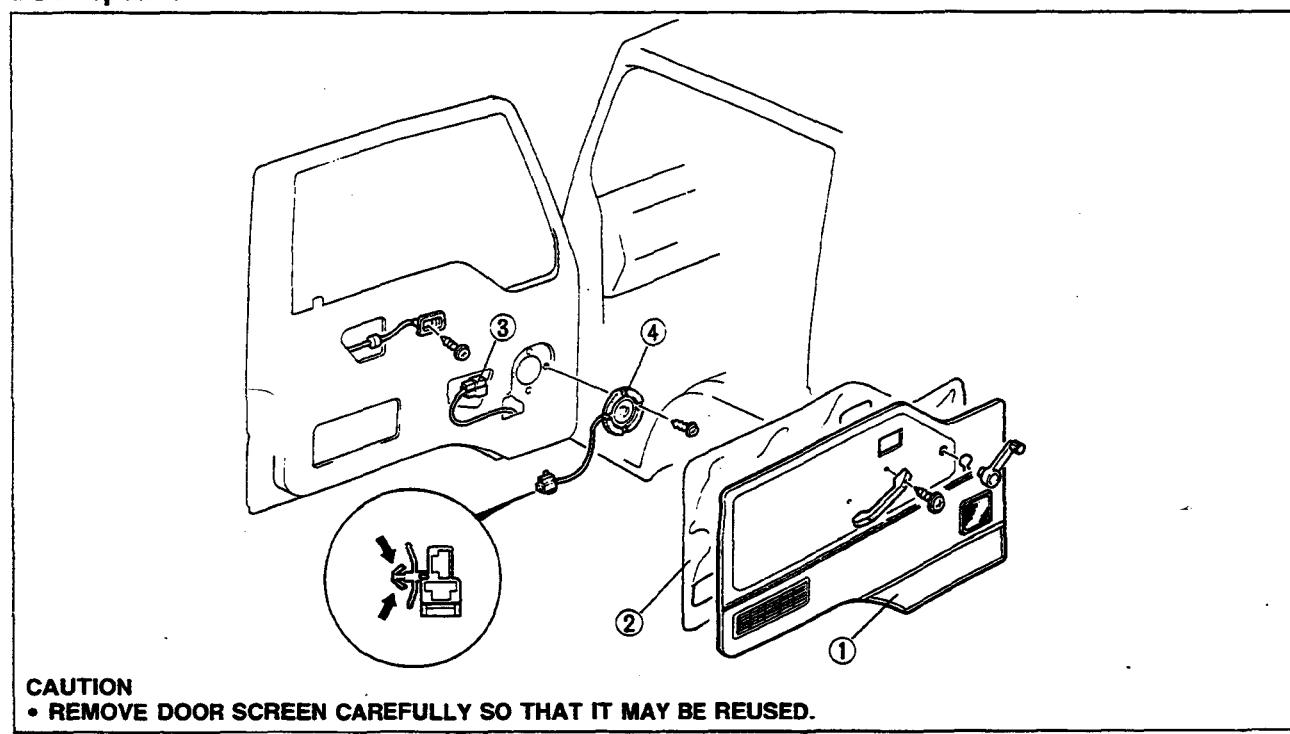
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.

Instrument panel speaker

9TF0TX-026

1. Glove box
2. Connectors
3. Duct

4. Speaker
Inspection page T-90

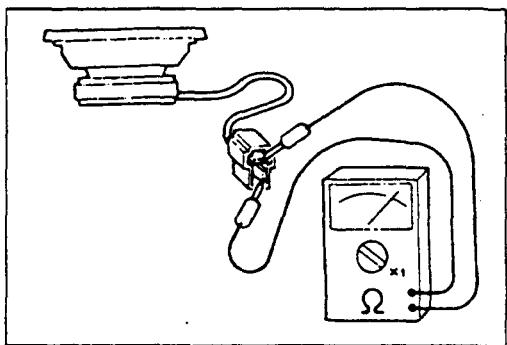
Door speaker**CAUTION**

- REMOVE DOOR SCREEN CAREFULLY SO THAT IT MAY BE REUSED.

1. Door trim
2. Door screen
3. Connectors

4. Speaker
Inspection page T-90

9TF0TX-027



Inspection

Caution

- Use an ohmmeter at $x1\Omega$ range.

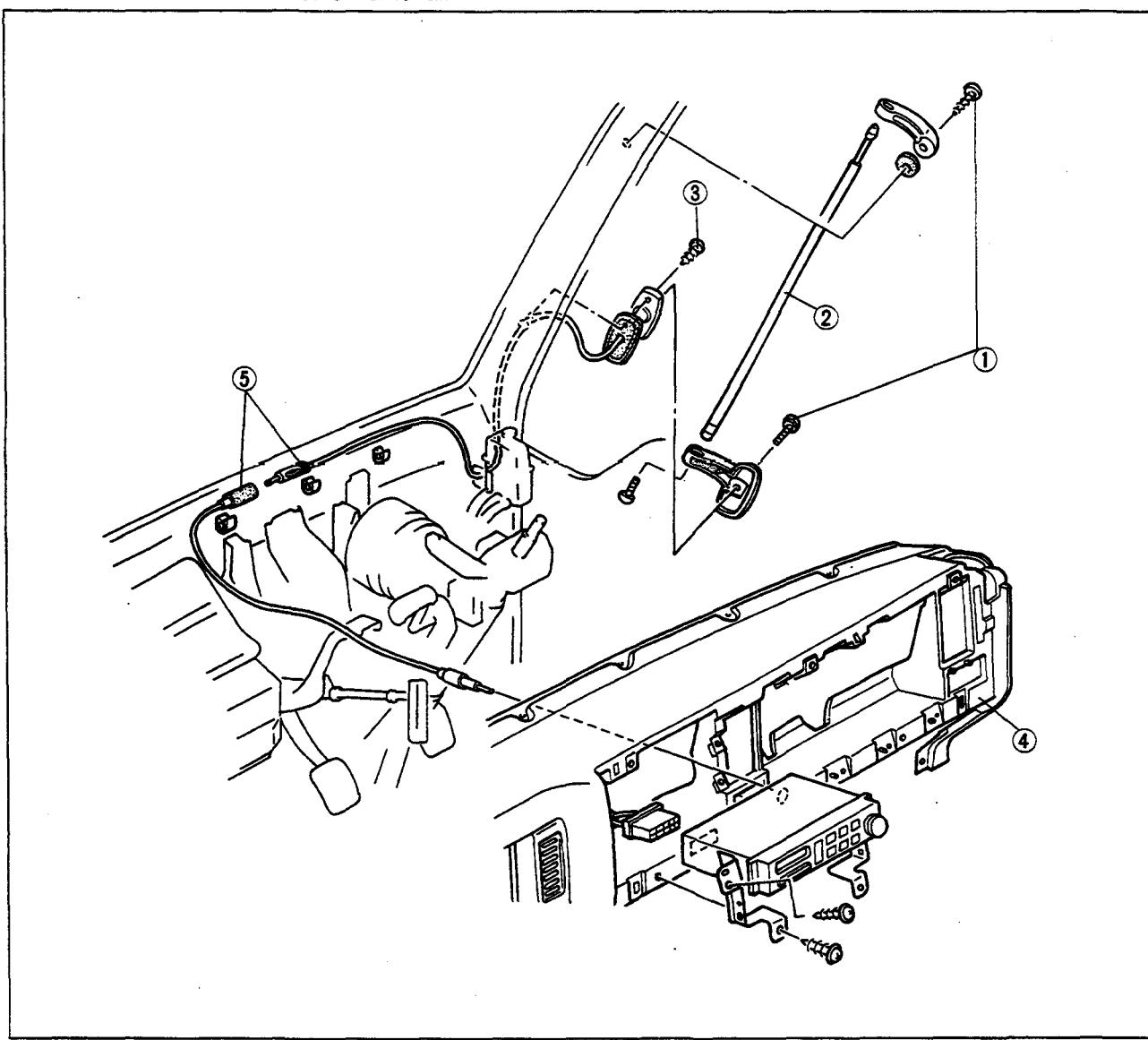
1. Check for resistance of the speaker.

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**

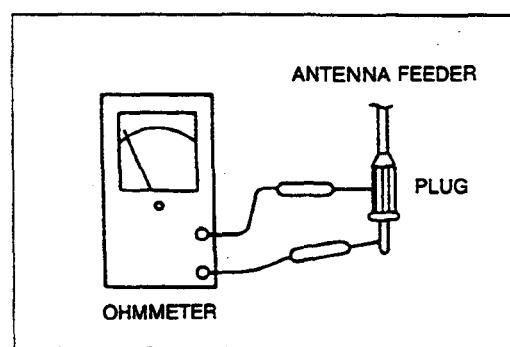
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



9TF0TX-028

1. Screws
2. Antenna
3. Screws

4. Instrument panel Service Section S
5. Antenna feeder Inspection page T-91



9TG0TX-170

Inspection

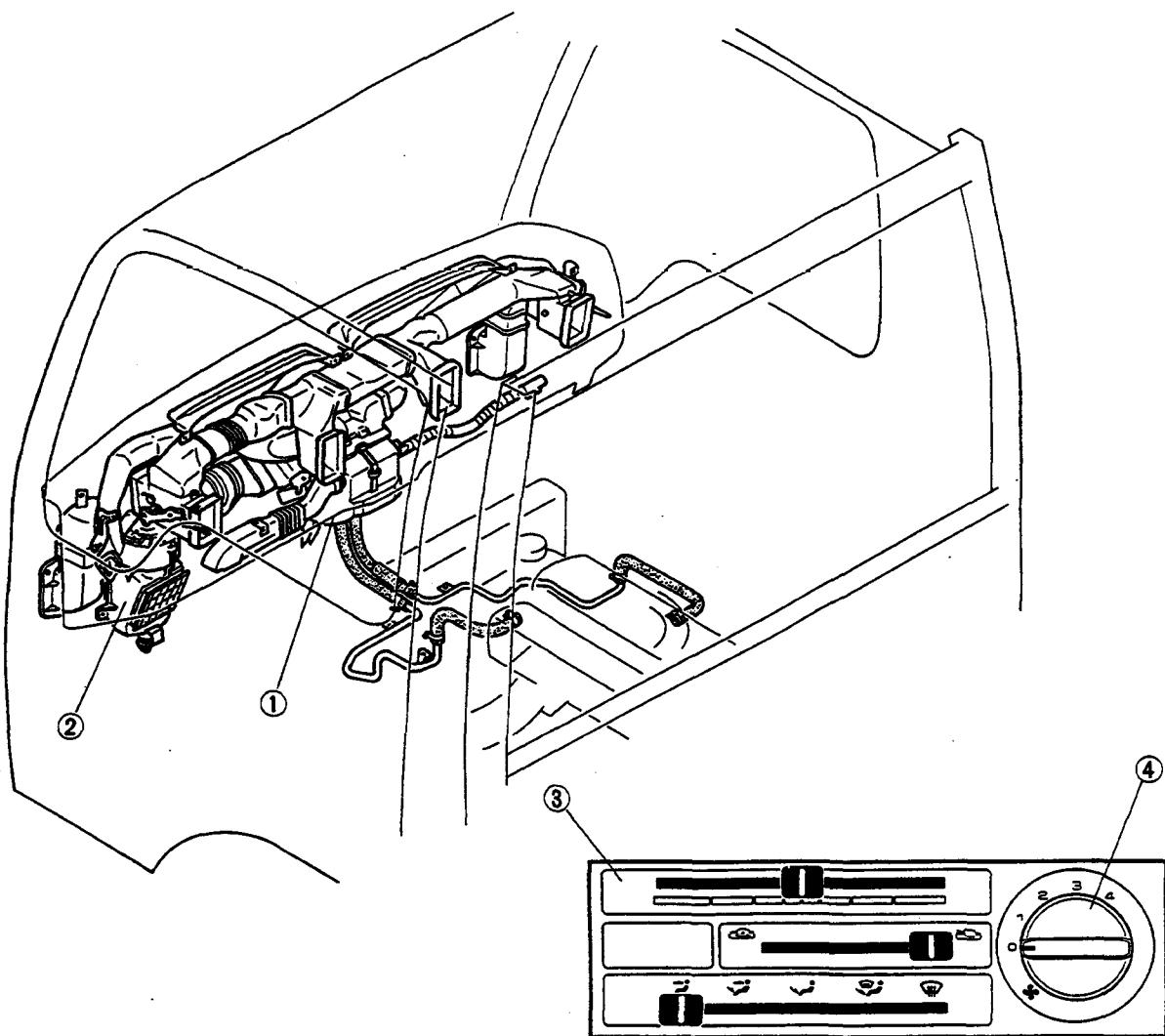
1. Check that there is no continuity between the plug terminals.
2. Replace the antenna feeder if not as specified.

HEATER AND AIR CONDITIONER SYSTEM

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TROUBLESHOOTING	U- 3
TROUBLESHOOTING GUIDE	U- 3
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FRONT HEATER	U- 7
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FRONT BLOWER UNIT	U-10
HEATER CONTROL UNIT.....	U-13

9TGOUX-001

INDEX



9TGOUX-002

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2. Front blower unit
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3. Heater control unit
 - Removal / Installation..... page U-13
 - Disassembly / Assembly page U-16
4. Fan switch
 - Inspection..... page U-16

TROUBLESHOOTING

U

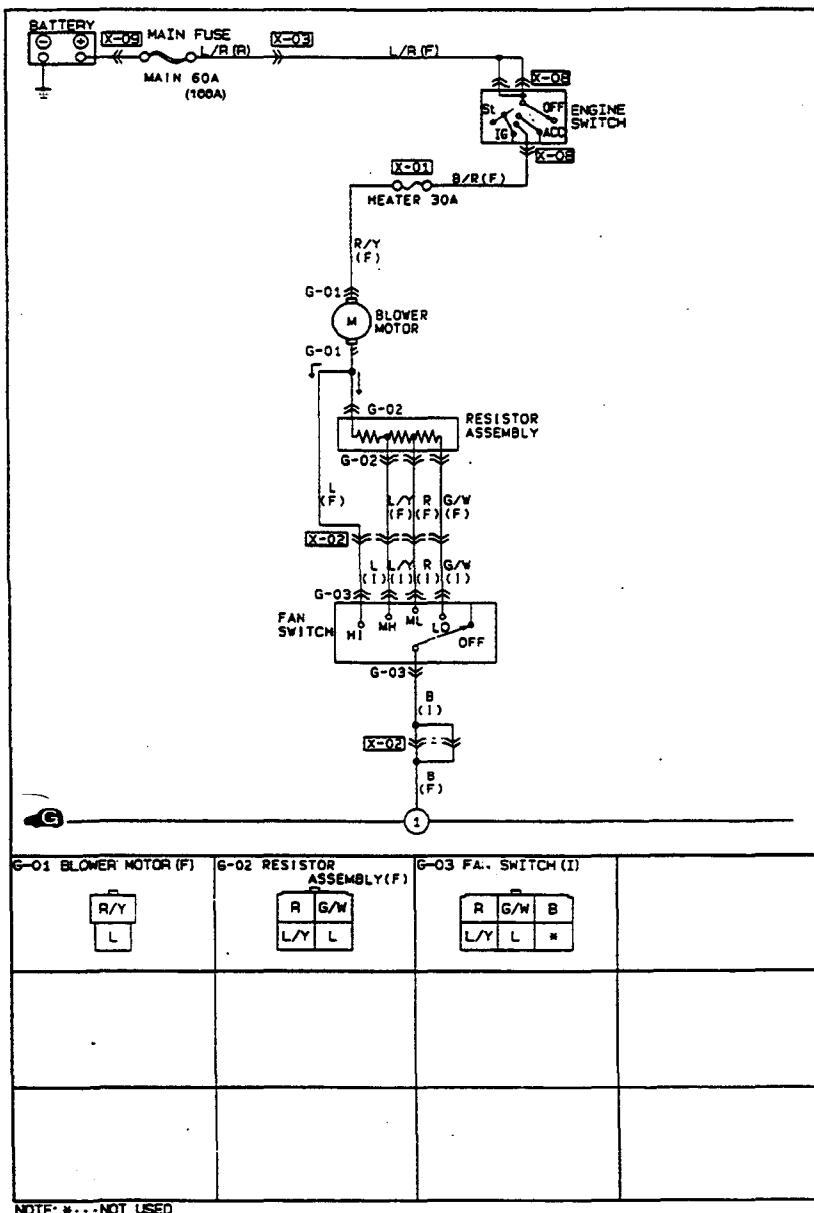
TROUBLESHOOTING

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

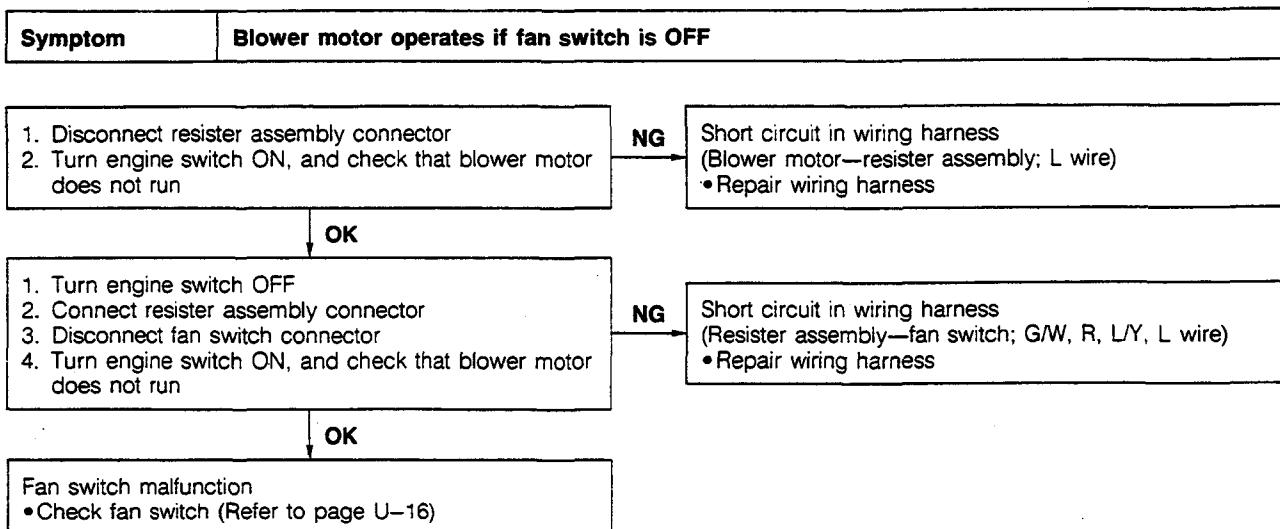
9TFOUX-001

WIRING DIAGRAM

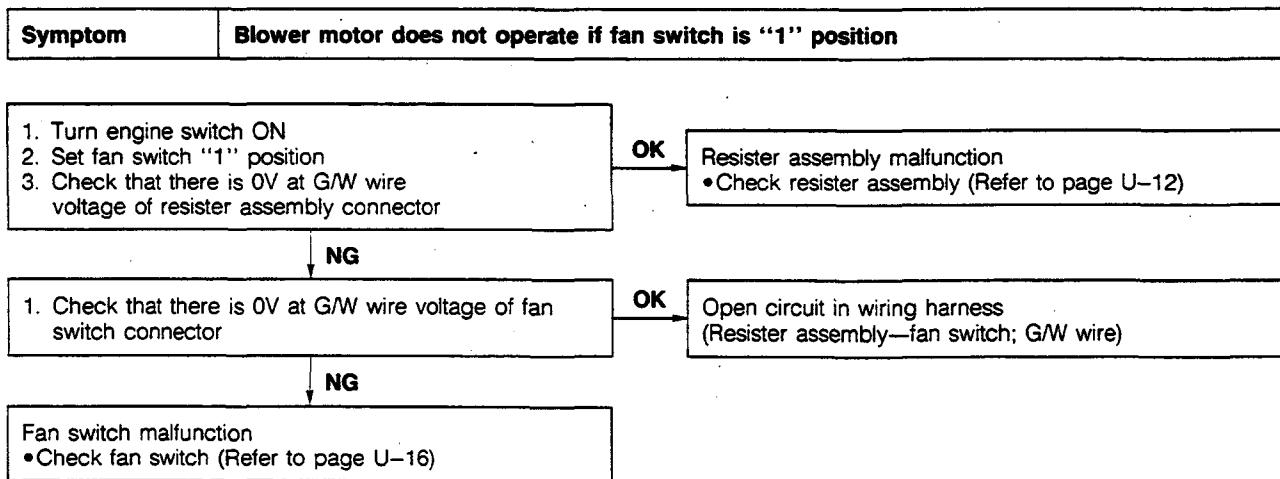


9TGOUX-004

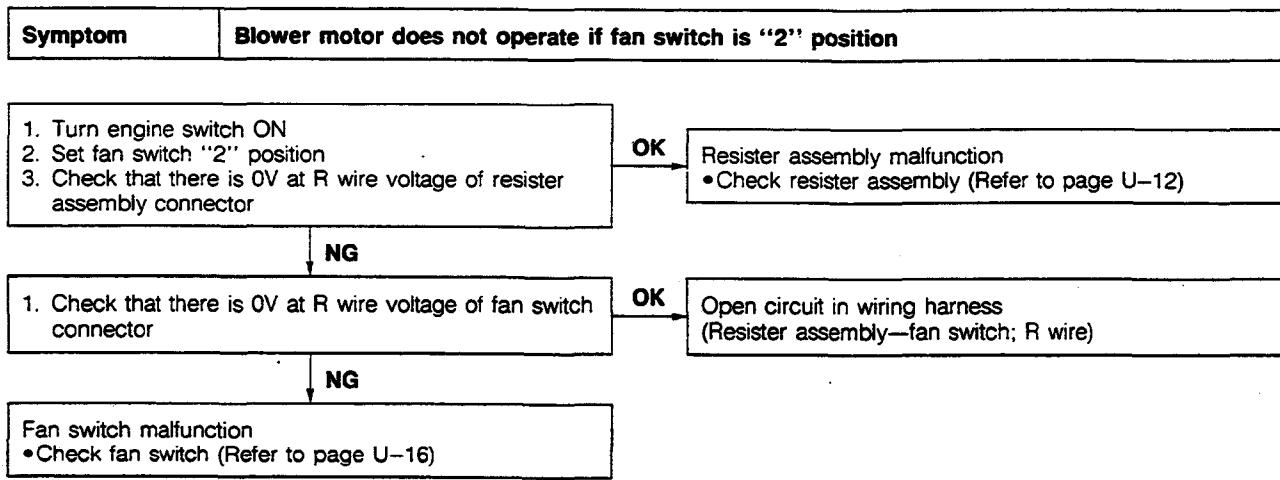
U-3



9TG0UX-005



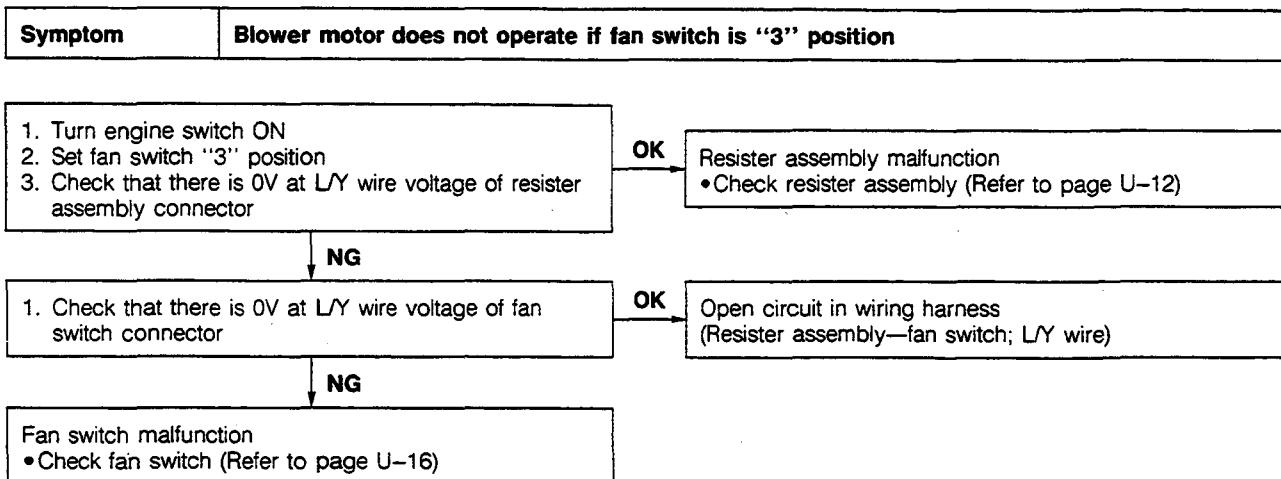
9TG0UX-006



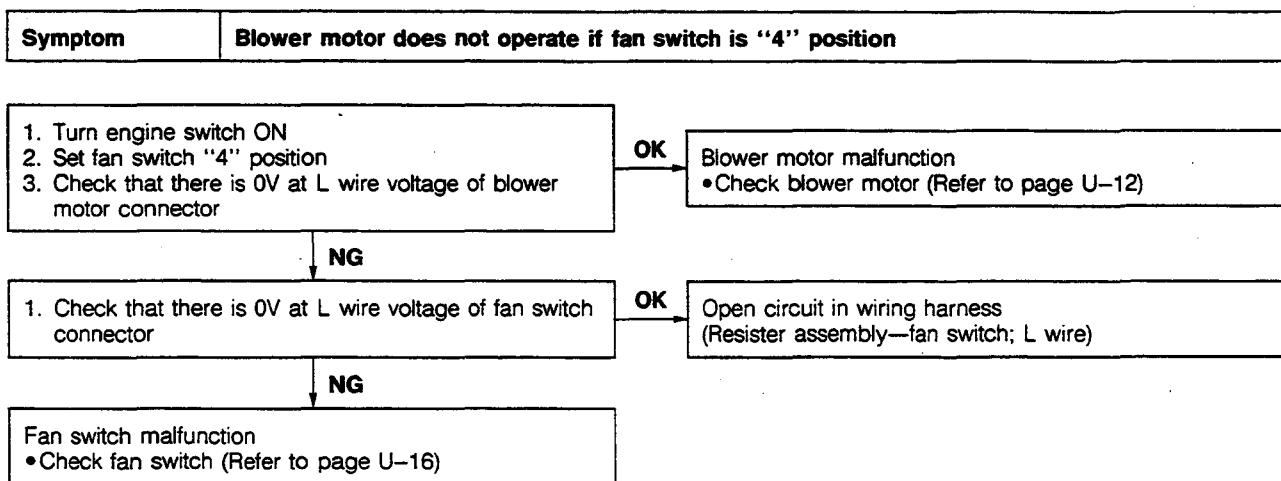
9TG0UX-007

TROUBLESHOOTING

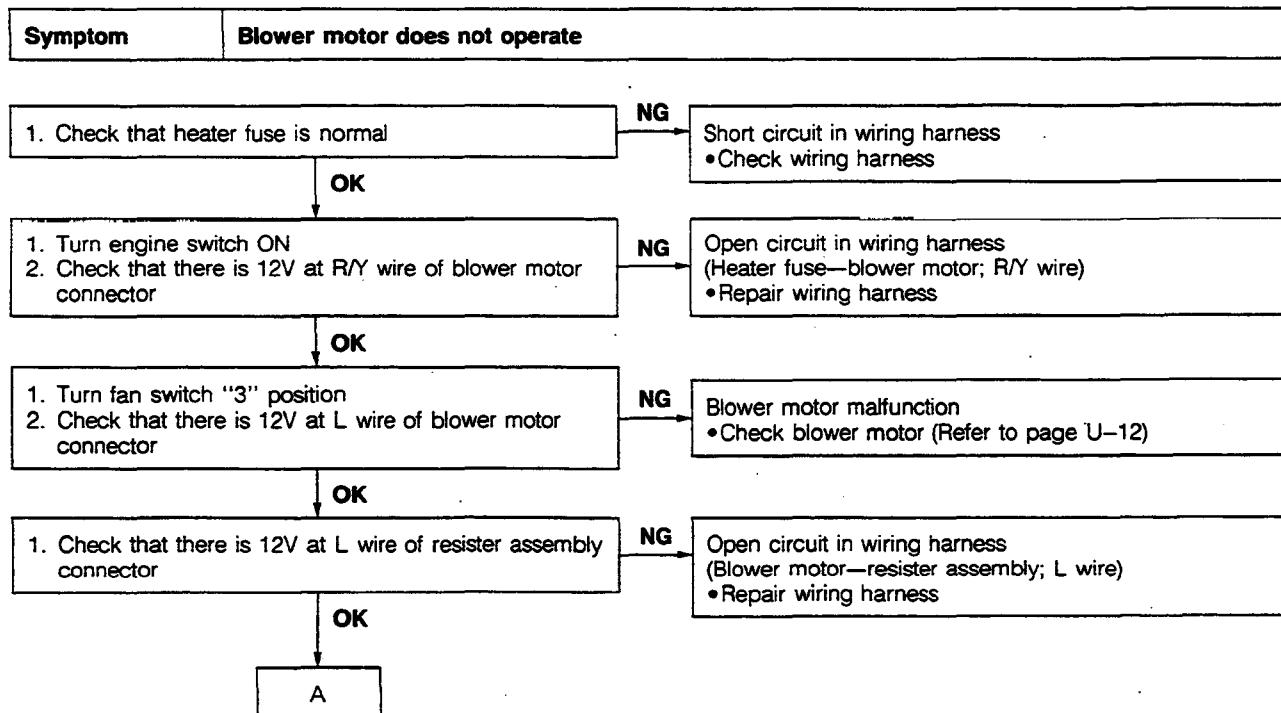
U

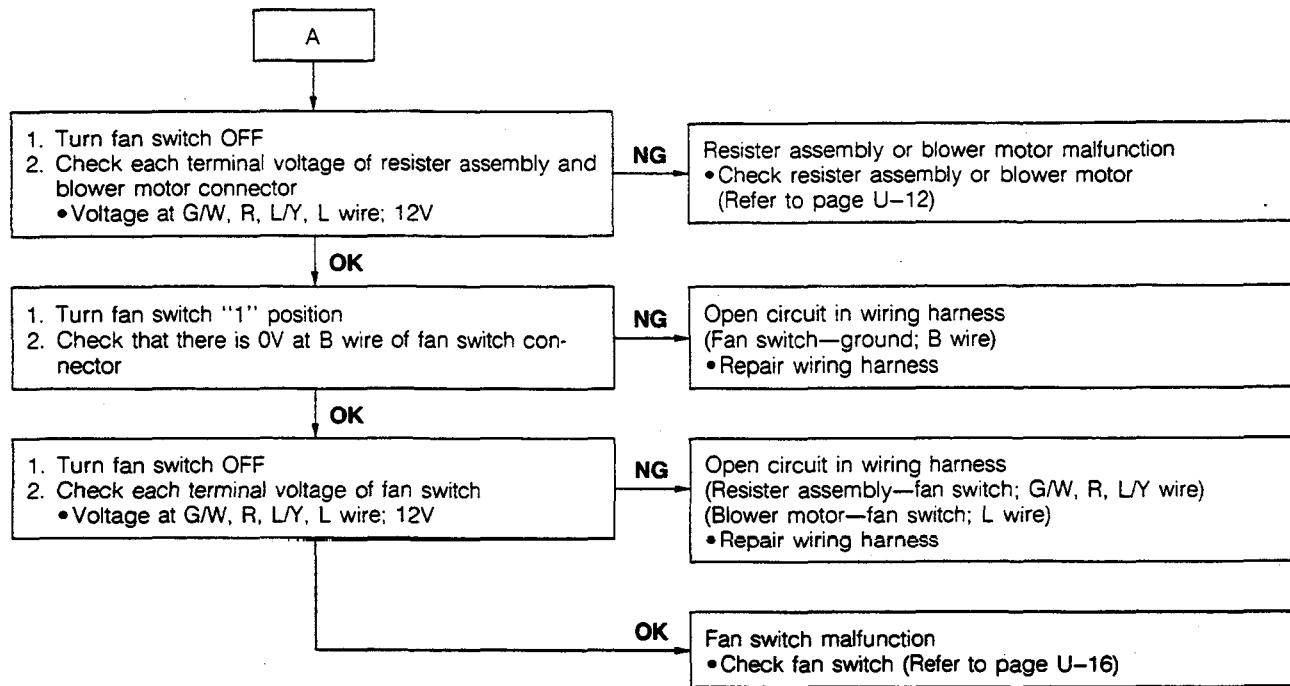


9TG0UX-008

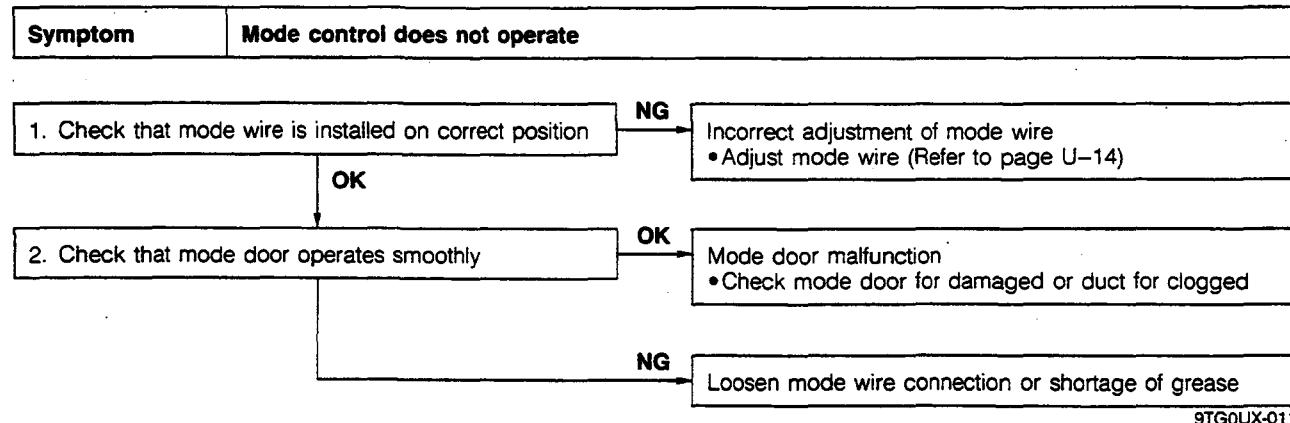


9TG0UX-009

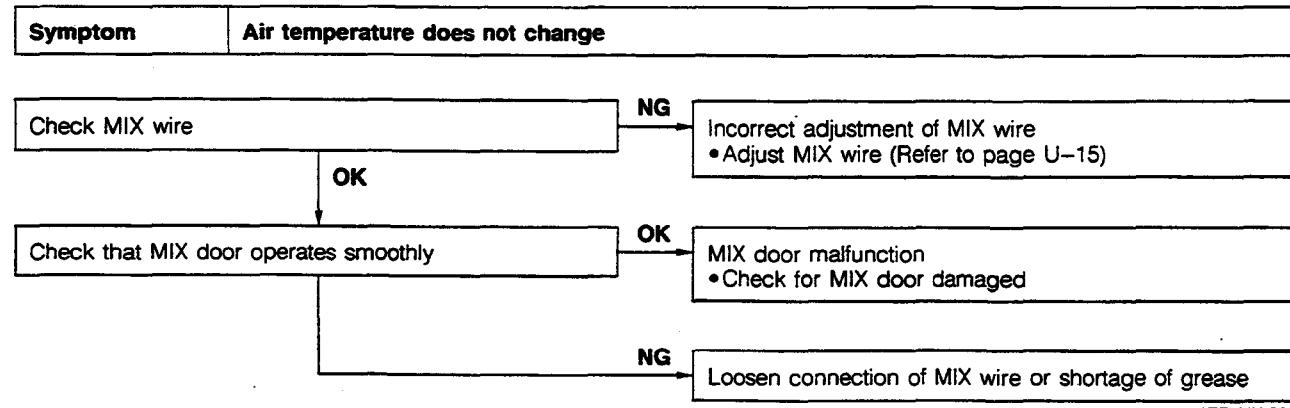




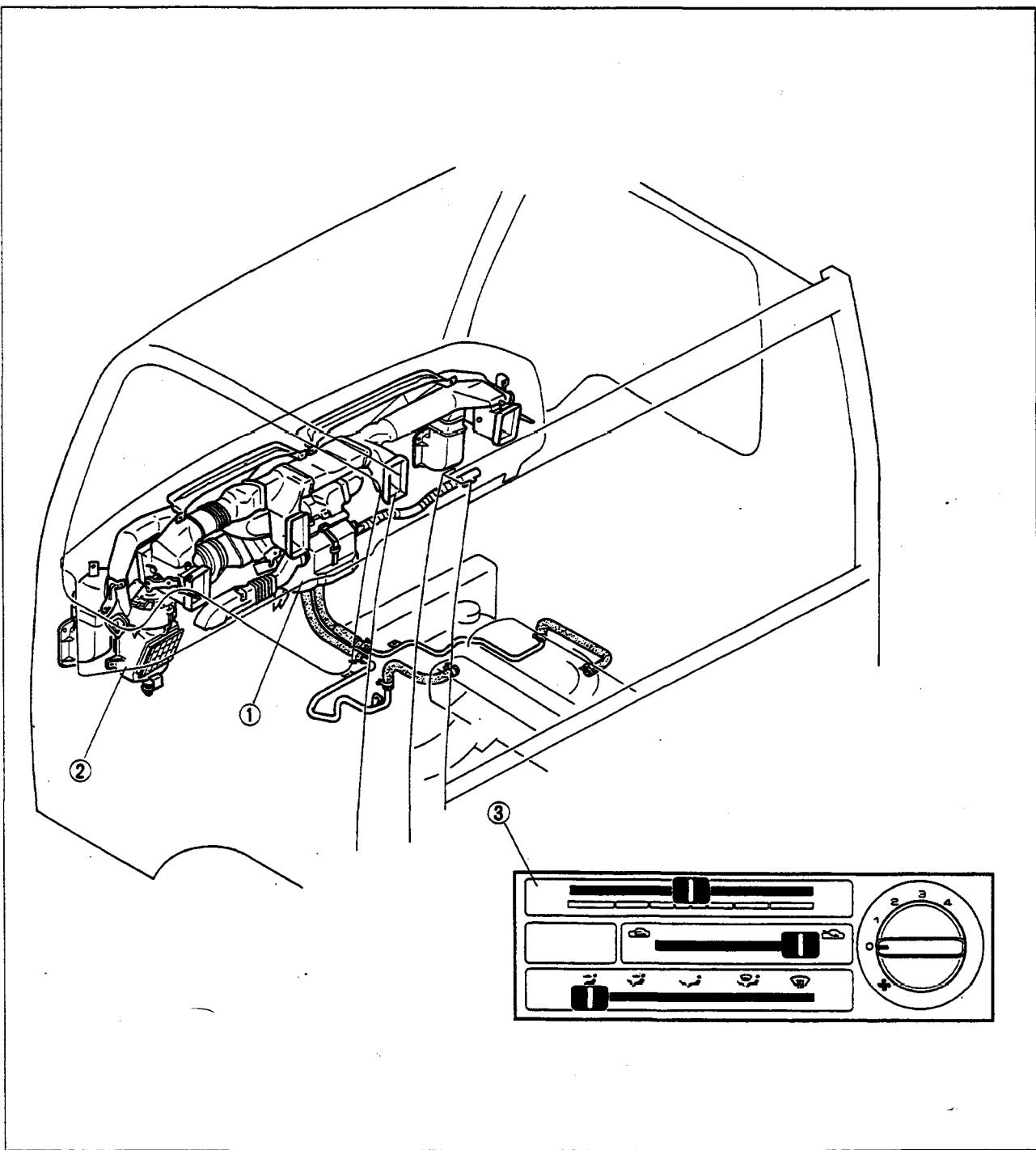
9TG0UX-010



9TG0UX-011



9TF0UX-002

FRONT HEATER**STRUCTURAL VIEW**

9TG0UX-013

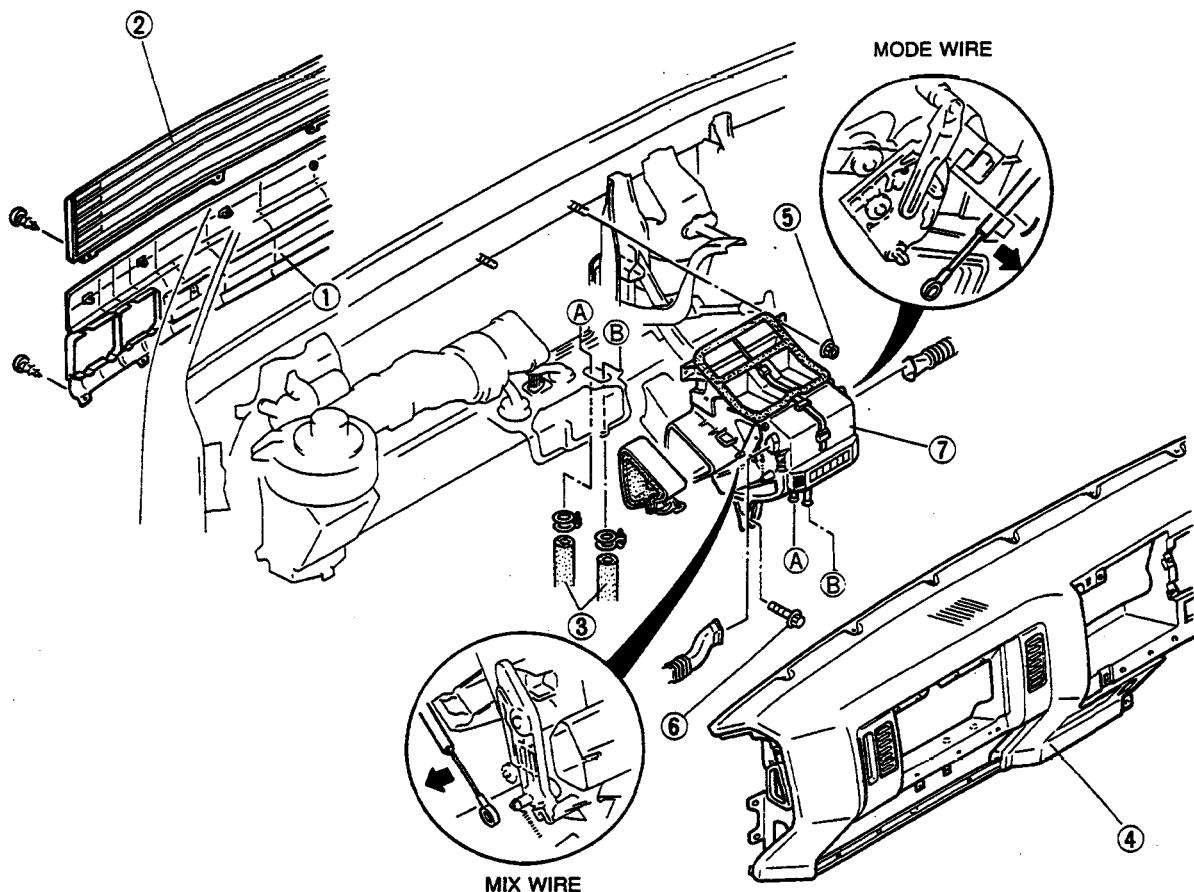
- | | |
|-----------------------------|------------------------|
| 1. Front heater unit | 3. Heater control unit |
| Removal / Installation..... | page U- 8 |
| Disassembly / Assembly..... | page U- 9 |
| Inspection..... | page U- 9 |
| 2. Front blower unit | |
| Removal / Installation..... | page U-10 |
| 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

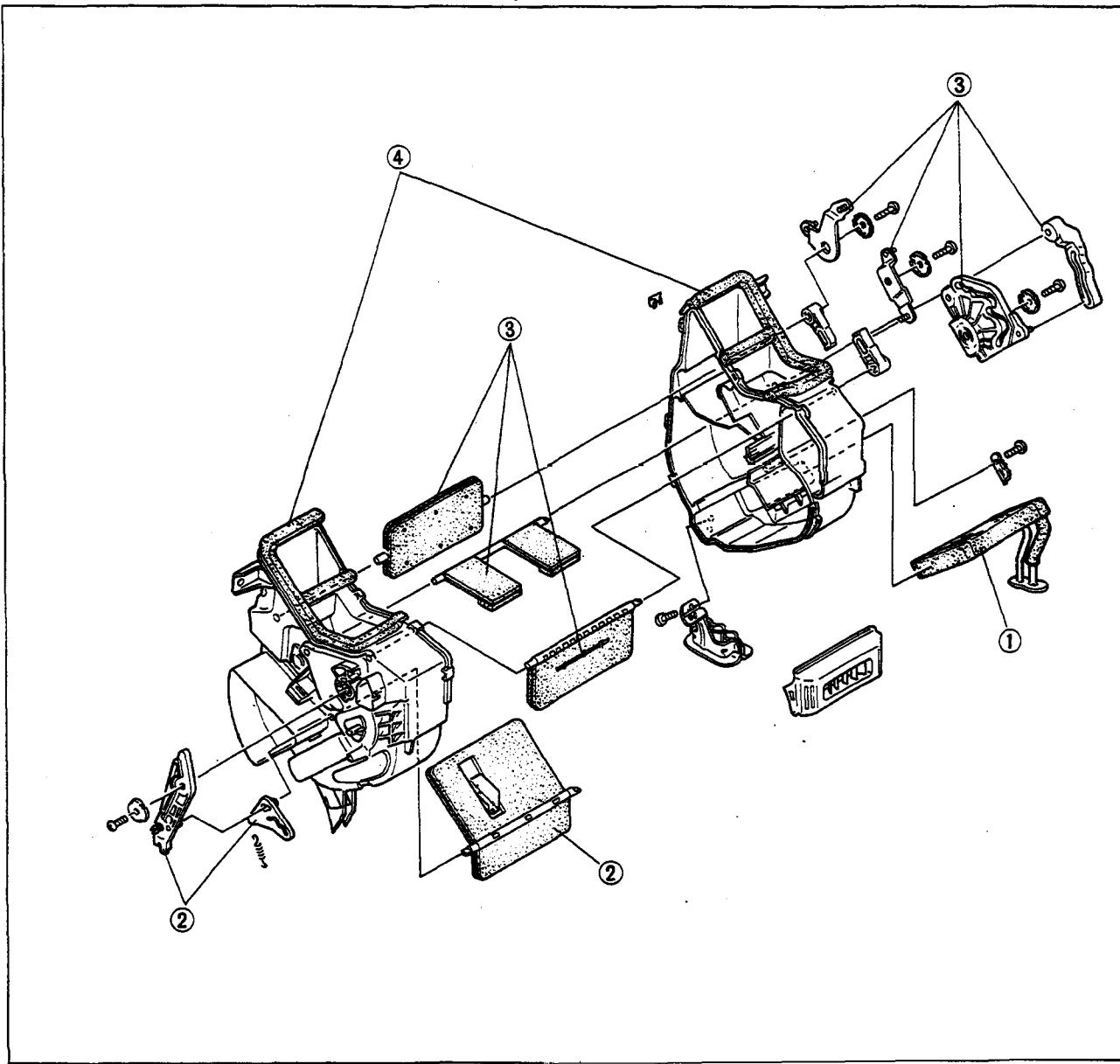
5. Nuts
 6. Bolts
 7. Front heater unit
- Disassembly / Assembly..... page U- 9
Inspection..... page U- 9

FRONT HEATER

U

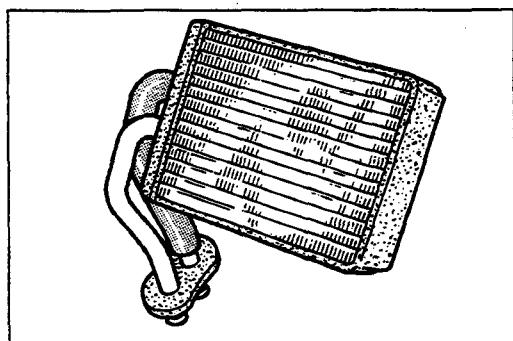
Disassembly / Assembly

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



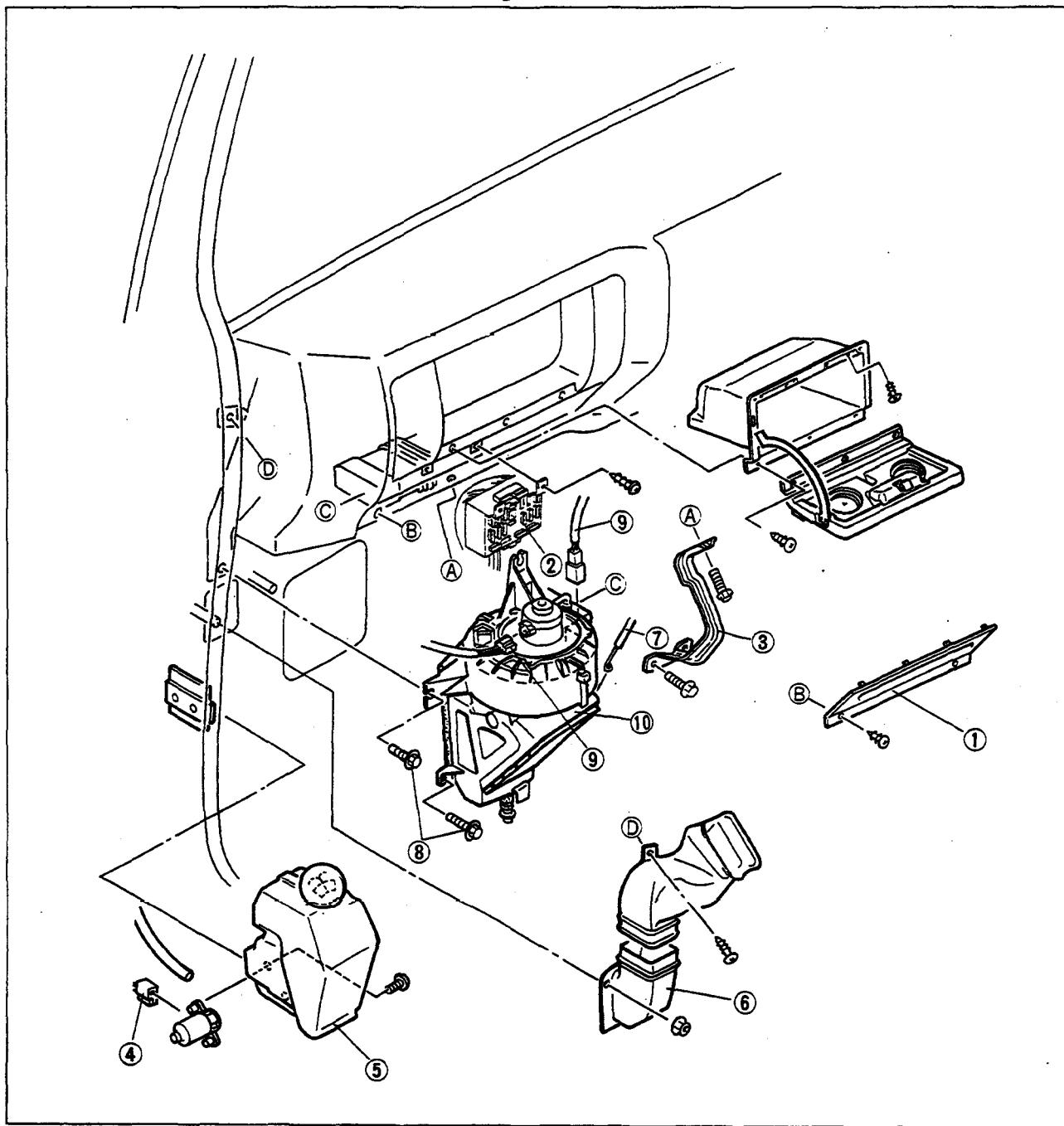
9TG0UX-016

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**

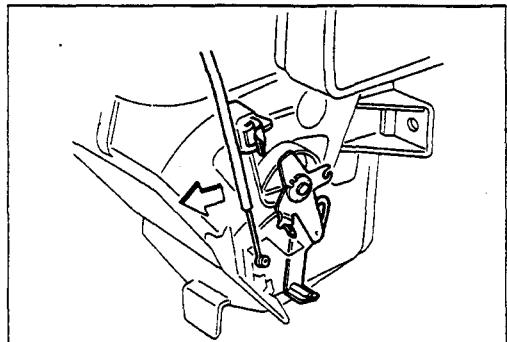
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.



9TG0UX-017

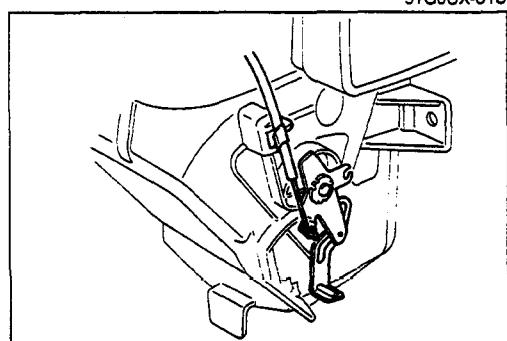
- | | |
|---------------------------|--|
| 1. Lower panel | 7. REC-FRESH wire |
| 2. Fuse box | Removal Note page U-11 |
| 3. Bracket | Installation Note page U-11 |
| 4. Washer motor connector | 8. Bolts |
| 5. Washer tank | 9. Connector |
| 6. Natural duct | 10. Front blower unit |
| | Disassembly / Assembly page U-12 |
| | Inspection page U-12 |

FRONT HEATER



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

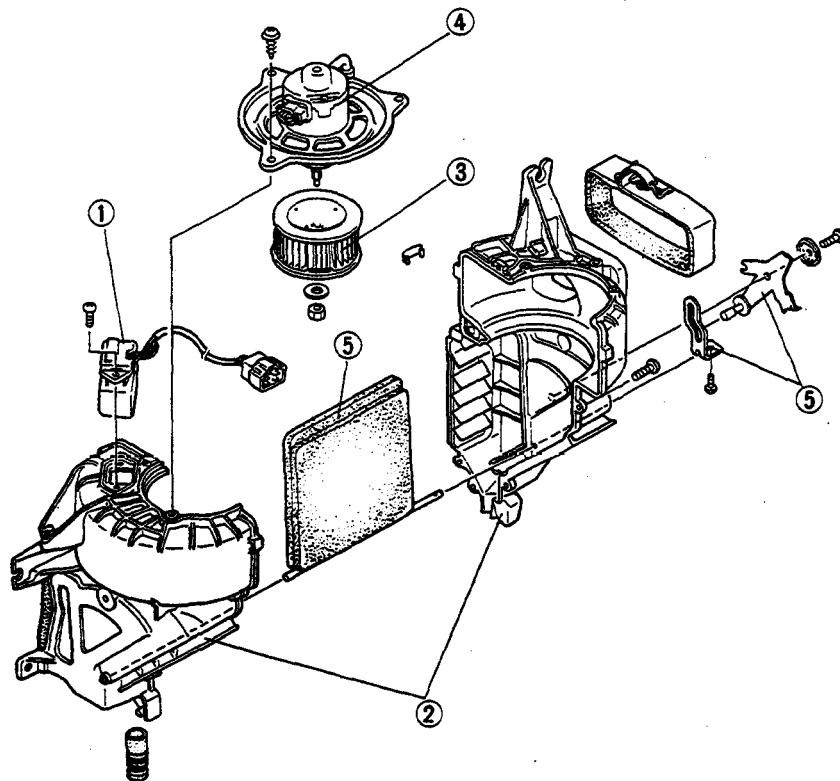
- After installation, move the REC-FRESH lever to be sure the wire is securely attached, and that it moves the full stroke from REC to FRESH.

9TG0UX-018

9TG0UX-019

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



9TGOUX-020

1. Resister assembly
Inspection page U-12
2. Blower unit case

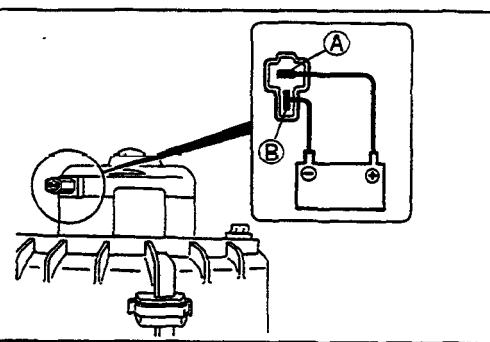
3. Blower fan
4. Blower motor
Inspection page U-12

5. REC-FRESH door assembly

Inspection
Blower motor

1. Remove the glove 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	



9TGOUX-021

Resister assembly

1. Remove the glove box.
2. Disconnect the resister assembly connector.
3. Check for continuity between terminals.

A	B	C	D
○	○		
○		○	
○			○

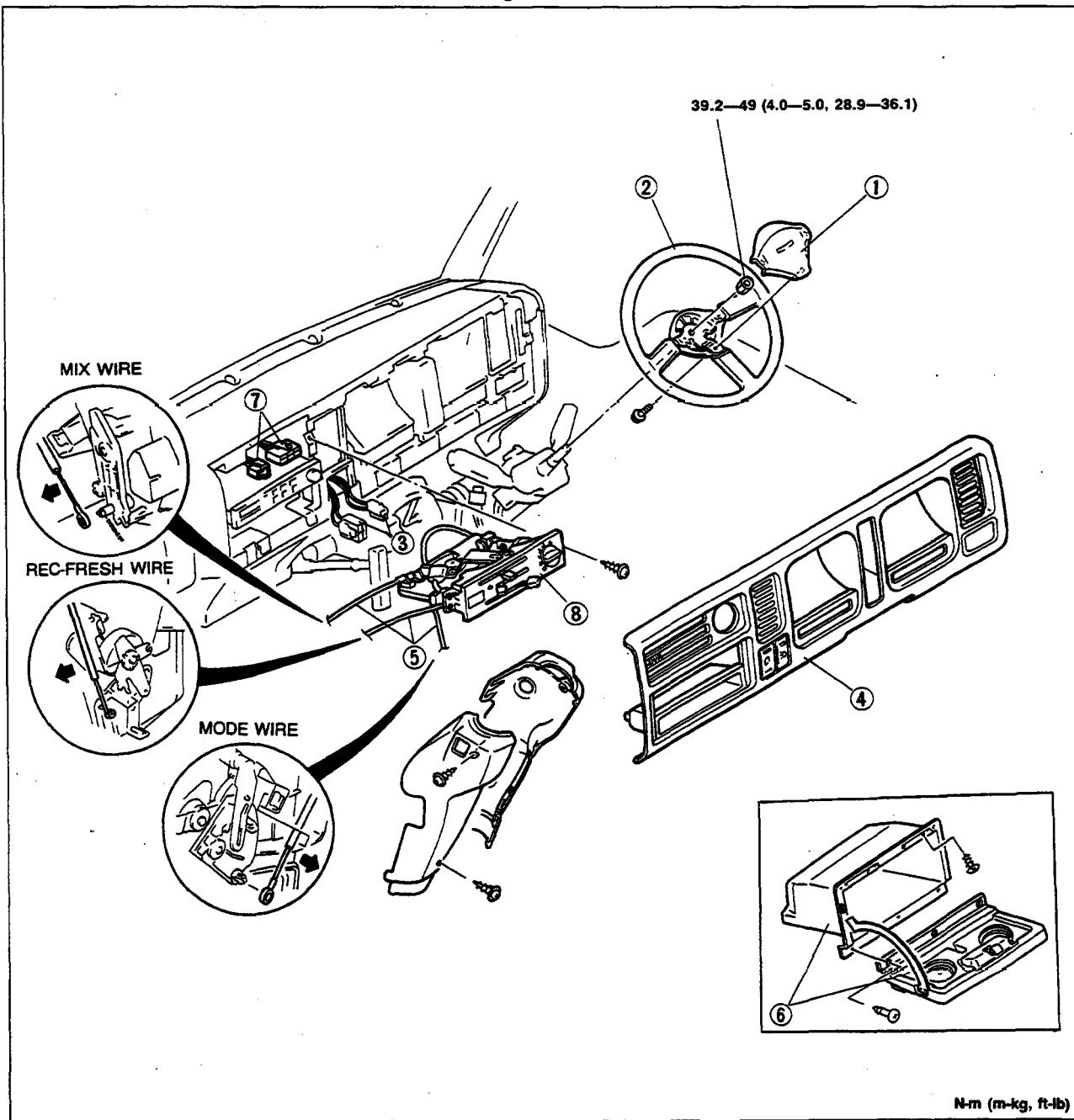
○—○: Indicates continuity

4. If not as specified, replace the resister assembly.

9TGOUX-022

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**.

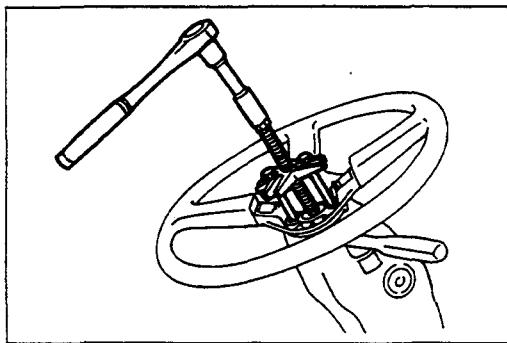


N·m (m·kg, ft·lb)

9TG0UX-023

- | | |
|------------------------|--|
| 1. Steering column | 6. Grove box |
| 2. Steering wheel | 7. Connector (for heater control unit) |
| Removal Note | 8. Heater control unit |
| Installation Note..... | Disassembly / Assembly..... page U-16 |
| 3. Connector | Inspection..... page U-16 |
| 4. Meter panel | |
| 5. Heater control wire | |
| Removal Note | page U-14 |
| Installation Note..... | page U-14 |

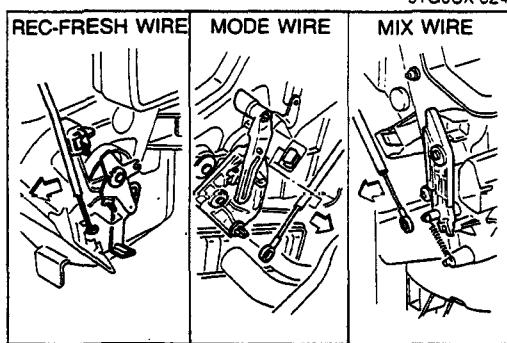
FRONT HEATER



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

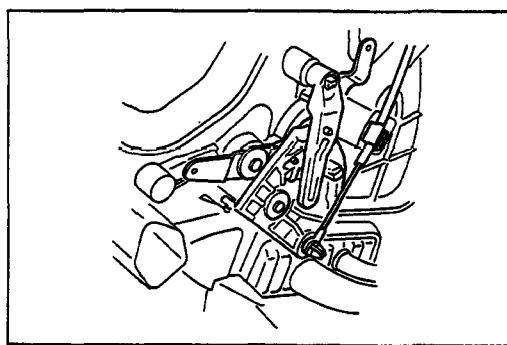
MODE wire

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.

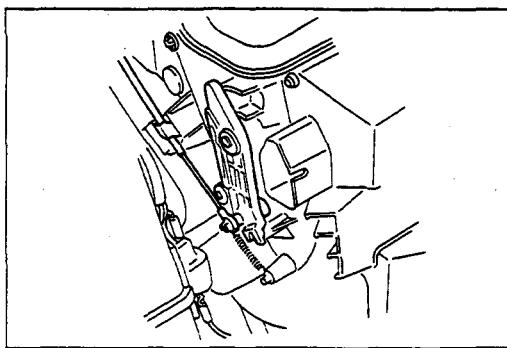
Caution

- After installation, move the MODE lever to be sure that it moves the full stroke from DEF to VENT.



9TG0UX-027

FRONT HEATER



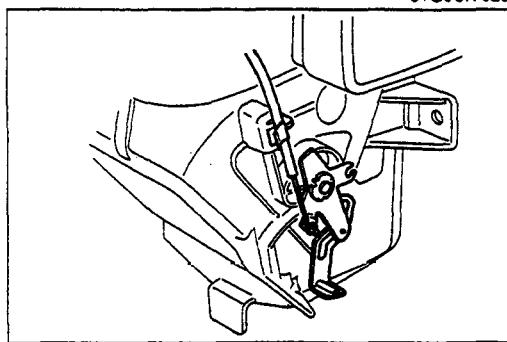
MIX wire

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.



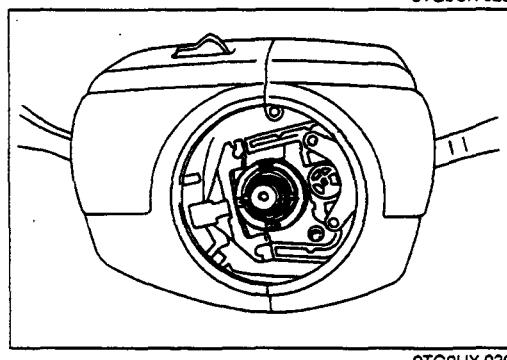
REC-FRESH wire

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.

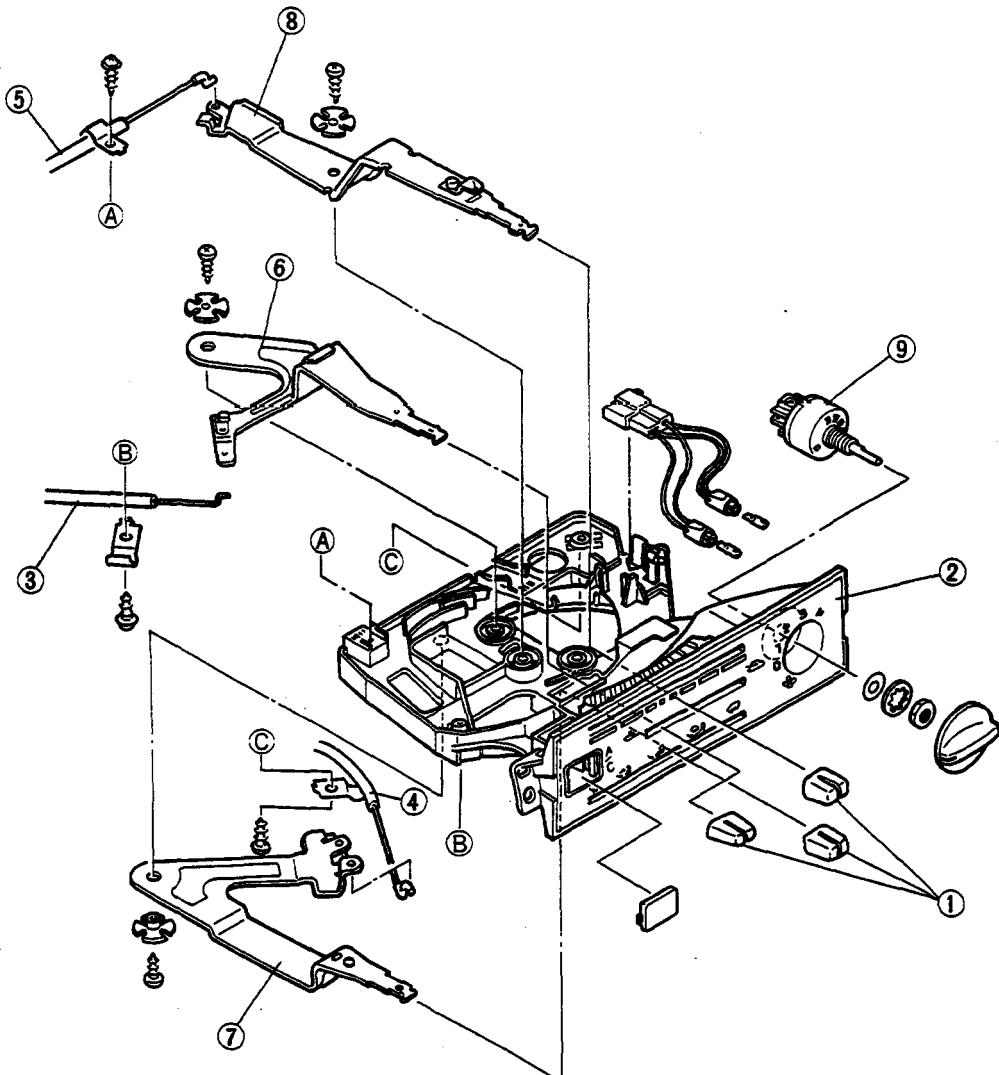


Steering wheel

1. Set the 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.

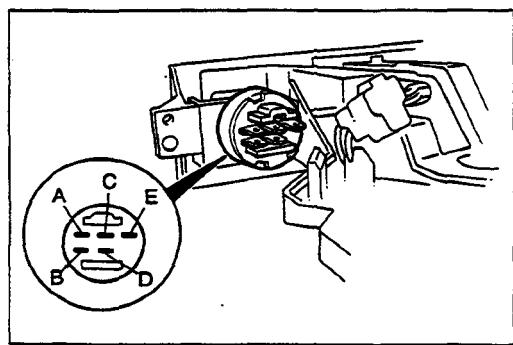


9TG0UX-031

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

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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	
Body		Truck				Crew cab
Cabin		Standard		Wide		
Cargo deck length (feet)		10		14		17
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	
Body		Truck		Crew cab		Truck	
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)
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)
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)
Wheelbase	mm (in)	2,510 (98.82)	3,335 (131.30)	3,335 (131.30)	3,490 (137.40)	3,335 (131.30)	3,940 (155.12)
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)
	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)

TECHNICAL DATA

TD

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/cm ² , psi)-rpm	Standard		2,943 (30.0, 427)—200	2,943 (30.0, 427)—300	2,551 (26.0, 370)—320		
	Minimum		2,649 (27.0, 384)—200	2,649 (27.0, 384)—300	2,256 (23.0, 327)—320		
	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)		
		IN	Minimum	114.1 (4.492)	119.2 (4.693)		
	EX	Standard	114.6 (4.512)	114.5 (4.508)	119.3 (4.697)		
		EX	Minimum	114.1 (4.492)	114.0 (4.488)		
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)				
		IN	15.2—15.4 (0.598—0.606)				
Guide projection (Height "A")	mm (in)	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		TF
			Non-Turbo	Turbo	
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	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	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	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	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)
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.	2.07 (0.0815) max.
		Inner	1.25 (0.0492) max.	1.63 (0.0642) 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)
		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)
	EX	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)
		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)
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)

TECHNICAL DATA

TD

Item	Engine	HA	SL		TF
			Non-Turbo	Turbo	
Camshaft bearing oil clearance	Standard mm (in)		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)	Y	94.967—94.993 (3.7389—3.7399)	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)
[Measured at 90° to pin bore axis at point H from the bottom of the piston]		Z	H = 22.0 (0.866)	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)	
Piston pin bore diameter	mm (in)	29.996—30.008 (1.1809—1.1814)		34.996—35.008 (1.3384—1.3389)	
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)
		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)
		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)
		Maximum		1.5 (0.059)	0.20—0.40 (0.008—0.016)
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)	

TECHNICAL DATA

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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								
Regulating pressure	kPa (kg/cm ² , psi)	608—667 (6.2—6.8, 88—97)		—				
Oil pressure	kPa (kg/cm ² , 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/cm ² , psi)	78—118 (0.8—1.2, 11—17)						
Regulating pressure	kPa (kg/cm ² , 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/cm ² , 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)					
		Oil pan	6.5 (6.9, 5.7)					
		Oil filter	1.0 (1.06, 0.88)					
		Oil bypass filter	0.6 (0.63, 0.53)					
Grade								
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						

TECHNICAL DATA

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/cm ² , psi)		74–103 (0.75–1.05, 11–15)							
Cooling system checking pressure	kPa (kg/cm ² , 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)							
Antifreeze solution	Protection	Mixture percentage (volume) %			Specific gravity of mixture at 20°C (68°F)					
		Water	Solution							
		65	35		1.054					
		55	45		1.066					
		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/cm ² , 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	

TECHNICAL DATA

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)			
Clutch cover	Disengagement height	mm (in)	65 (2.56)			
	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)			
Master cylinder	Wear limit	mm (in)	0.3 (0.01)			
	Inner diameter	mm (in)	15.87 (0.62)			
	Release cylinder	Inner diameter	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	Standard		1.5 (0.059)		
	mm (in)	Limit	1.0 (0.039)		
Shift fork					
Clearance between fork and sleeve	Standard		0.380–0.528 (0.0150–0.0208)		
	mm (in)	Limit	0.8 (0.0315)		
Clearance between fork and change lever	Standard		0.2–0.4 (0.0079–0.0157)		
	mm (in)	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)	

TECHNICAL DATA

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	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
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)
Oil	Worm bearing preload	kg (lb)	0.7—1.1 (1.5—2.4)
	Type	API Service GL-4, SAE 90	
	Capacity	liters (US qt, Imp qt)	0.94 (0.99, 0.83)
			2.0 (2.11, 1.76)

TECHNICAL DATA

TD

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	Vacuum 0 mmHg	(a): 687 (7.0, 100)/196 (20, 44) (b): 589 (6.0, 85)/196 (20, 44)						
	kPa (kg/cm ² , psi)/N (kg, lb)	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-value (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		Rear brake	
			Lining dimensions mm (in) (Length x width x thickness)		Drum inner diameter mm (in)	Drum inner diameter mm (in)
Std.	Limit	Std.	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)
SL			307.0x75.0x8.0 (12.09x2.95x0.31)	320 (12.60)	321 (12.64)	304.0x75.0x8.0 (12.09x2.95x0.31)
SL TURBO	14 feet cargo deck	Dual	307.0x90.0x8.0 (12.09x3.54x0.31)			307.0x90.0x8.0 (12.09x3.54x0.31)
TF			334.9x110.0x10.5 (13.18x4.33x0.41)			334.9x110.0x10.5 (13.18x4.33x0.41)

Q. WHEELS AND TIRES**Single tire**

Specifications	Wheel			Tire	
	Size	Offset mm (in)	Diameter of pitch circle mm (in)	Size	Tire pressure kPa (kg/cm ² , psi)
3.0L	Front Rear	5.50Fx15	30 (1.181)	184.15 (7.25)	7.00—15—10 392 (4.00, 55) 417 (4.25, 60)

Dual tires

Specifications	Wheel			Tire	
	Size	Offset mm (in)	Diameter of pitch circle mm (in)	Size	Tire pressure kPa (kg/cm ² , 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)
		4.50Ex16	108 (4.252)		6.50—16—8 417 (4.25, 60)
		5.50Fx16	115 (4.528)		6.50—16—10 441 (4.50, 64)
	Rear	4.50Ex16	108 (4.252)		6.50R16—10 491 (5.00, 71)
		5.50Fx16	115 (4.528)		7.00—16—10 466 (4.75, 68)
		4.50Ex16	108 (4.252)		7.00—16—12 466 (4.75, 68)
		5.50Fx16	115 (4.528)		7.00R16—10 441 (4.50, 64)
2,750 kg 3.5L	Front	4.50Ex16	108 (4.252)	203.2 (8)	7.00—16—10 491 (5.00, 71)
		5.50Fx16	115 (4.528)		7.00—16—12 515 (5.25, 75)
		4.50Ex16	108 (4.252)		7.00R16—10 540 (5.50, 78)
		5.50Fx16	115 (4.528)		7.00—16—10 515 (5.25, 75)
	Rear	4.50Ex16	108 (4.252)		7.00—16—12 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00R16—10 515 (5.25, 75)
		4.50Ex16	108 (4.252)		7.00—16—10 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00R16—10 515 (5.25, 75)
3,000 kg 3.5L	Front	4.50Ex16	108 (4.252)	203.2 (8)	7.00—16—10 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00—16—12 540 (5.50, 78)
		4.50Ex16	108 (4.252)		7.00R16—10 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00—16—10 491 (5.00, 71)
	Rear	4.50Ex16	108 (4.252)		7.00—16—12 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00R16—10 515 (5.25, 75)
		4.50Ex16	108 (4.252)		7.00—16—10 491 (5.00, 71)
		5.50Fx16	115 (4.528)		7.00R16—10 515 (5.25, 75)
3,500 kg 4.0L	Front	4.50Ex16	108 (4.252)	203.2 (8)	7.00—16—10 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00—16—12 540 (5.50, 78)
		4.50Ex16	108 (4.252)		7.00R16—10 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00—16—10 491 (5.00, 71)
	Rear	4.50Ex16	108 (4.252)		7.00—16—12 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00R16—10 515 (5.25, 75)
		4.50Ex16	108 (4.252)		7.00—16—10 491 (5.00, 71)
		5.50Fx16	115 (4.528)		7.00R16—10 515 (5.25, 75)
4,000 kg 3.5L 4.0L	Front	4.50Ex16	108 (4.252)	203.2 (8)	7.00—16—10 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00—16—12 540 (5.50, 78)
		4.50Ex16	108 (4.252)		7.00R16—10 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00—16—10 491 (5.00, 71)
	Rear	4.50Ex16	108 (4.252)		7.00—16—12 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00R16—10 515 (5.25, 75)
		4.50Ex16	108 (4.252)		7.00—16—10 491 (5.00, 71)
		5.50Fx16	115 (4.528)		7.00R16—10 515 (5.25, 75)
4,000 kg 3.5L 4.0L	Front	4.50Ex16	108 (4.252)	203.2 (8)	7.00—16—10 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00—16—12 540 (5.50, 78)
		4.50Ex16	108 (4.252)		7.00R16—10 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00—16—10 491 (5.00, 71)
	Rear	4.50Ex16	108 (4.252)		7.00—16—12 515 (5.25, 75)
		5.50Fx16	115 (4.528)		7.00R16—10 515 (5.25, 75)
		4.50Ex16	108 (4.252)		7.00—16—10 491 (5.00, 71)
		5.50Fx16	115 (4.528)		7.00R16—10 515 (5.25, 75)

TECHNICAL DATA

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 (*¹Unladen 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)		
F	260 x 70 x 11 (10.2 x 2.8 x 0.43)		
	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)		
	880 x 70 x 10 (34.6 x 2.8 x 0.39)		
	660 x 70 x 11 (26.0 x 2.8 x 0.43)		
G	380 x 70 x 11 (15.0 x 2.8 x 0.43)		
	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)		
	880 x 70 x 10 (34.6 x 2.8 x 0.39)		
	660 x 70 x 11 (26.0 x 2.8 x 0.43)		
H	380 x 70 x 11 (15.0 x 2.8 x 0.43)		
	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)		
	880 x 70 x 10 (34.6 x 2.8 x 0.39)		
	660 x 70 x 11 (26.0 x 2.8 x 0.43)		
I	380 x 70 x 11 (15.0 x 2.8 x 0.43)		
	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)		
	940 x 70 x 10 (37.0 x 2.8 x 0.39)		
	760 x 70 x 11 (30.0 x 2.8 x 0.43)		

TECHNICAL DATA

TD

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
	Inside	50	45
Turn signal lights	Front	21	
	Rear	21	21
Tail lights		5	5
License plate lights			7.5
Stoplights		21	21
Back-up lights		21	21
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
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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.

Note

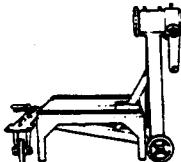
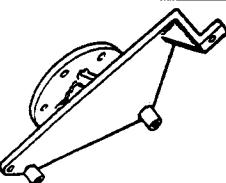
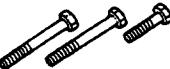
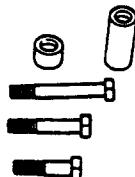
- When ordering tool sets that consist of several tools, check the List in the Parts Catalogue to make sure that some tools are not duplicated in other sets you may already have. If they are, instead of ordering the set, order only those new tools that are needed.

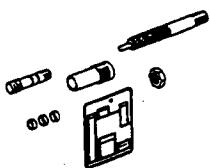
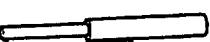
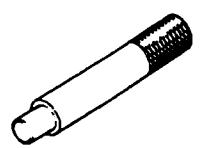
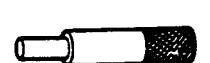
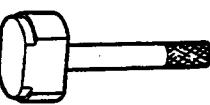
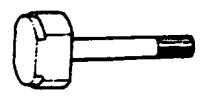
9MUSTX-002

SPECIAL TOOLS

ST

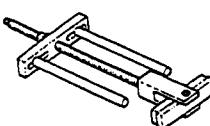
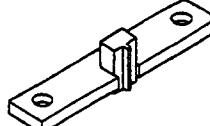
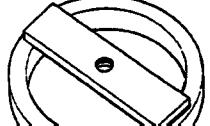
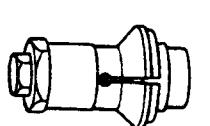
ENGINE (HA, SL, TF, AM)

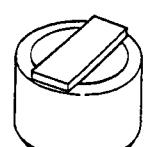
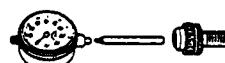
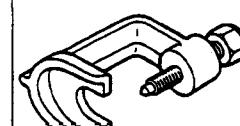
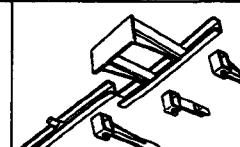
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0727 000 Engine crane	B	
49 0636 000B Transmission lifter	B	
49 0107 680A Engine stand	A	
49 0636 007 Body	A	
49 V101 009 Bolt (HA)	A	
49 W065 006 Attachment set (SL, TF)	A	
49 0636 100A Arm, valve spring lifter	A	
49 0107 222A Pivot	A	

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 L012 0AO 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	

ST

SPECIAL TOOLS

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W010 1AO 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	

SPECIAL TOOLS

ST

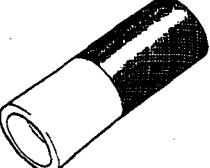
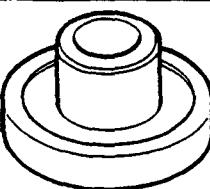
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 SE01 310 Centering tool, clutch disc	A	
49 G030 797 Handle (TF)	A	

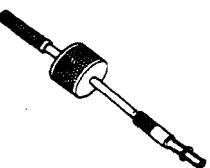
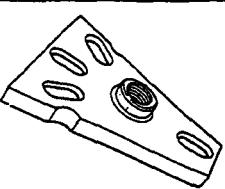
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 S120 710 Holder, coupling frange	A	
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CLUTCH AND TRANSMISSION

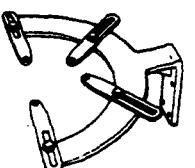
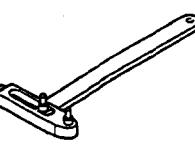
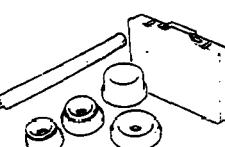
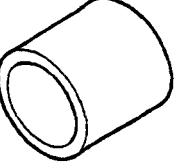
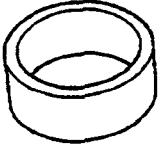
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0600 330 Installer, bearing	A	
49 0727 415 Installer, main shaft front & rear bearing	A	
49 0223 630B Puller, rear axle shaft	B	
49 0862 350 Guide, shift fork assy	A	
49 F026 103 Puller, wheel hub	A	

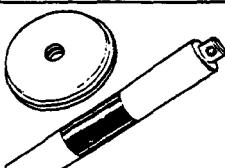
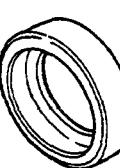
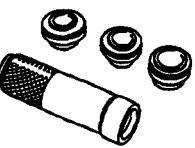
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W017 101 Remover, clutch hub	A	
49 0839 425C Puller set, bearing	A	
49 W501 445 Holder, synchronizer ring	B	
49 0600 620B Puller, main drive shaft bearing	A	
49 0500 330 Installer, transmis- sion bearing	A	

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 Support 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 $\phi 72$ (W type)	A	
49 F401 330B Installer set, bearing	A	

SPECIAL TOOLS

ST

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	

ST

SPECIAL TOOLS

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	
—	—	—

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	

SPECIAL TOOLS

ST

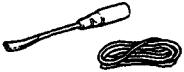
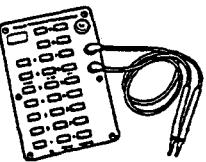
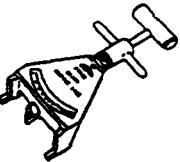
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W038 0A0 Replacer set, rubber bush	A	
49 W023 785 Installer, dust boot	A	
49 0208 701A Boot air out tool	B	
49 0559 605A Adapter, caster camber gauge	A	
49 H032 327 Installer, bearing and oil seal	A	
49 F401 331 Body	A	

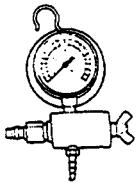
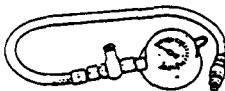
TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 W023 585A Adjust wrench	A	
49 FT01 361 Remover bearing	A	
49 H025 003 Bearing installer	A	
49 G032 3A1 Joint hose	A	
49 G032 316 Adapter	A	
49 F027 005 Attachment for bearing φ62	A	

ST

SPECIAL TOOLS

TESTER AND OTHERS

TOOL NUMBER & DESCRIPTION	PRIORITY	ILLUSTRATION
49 0259 866 Inserting tool, window glass	B	
49 0839 285 Checker, fuel and thermometer	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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WIPER ARM AND BLADE	S-29, 32
WIPER MOTOR	S-29, 33

WIRING DIAGRAM

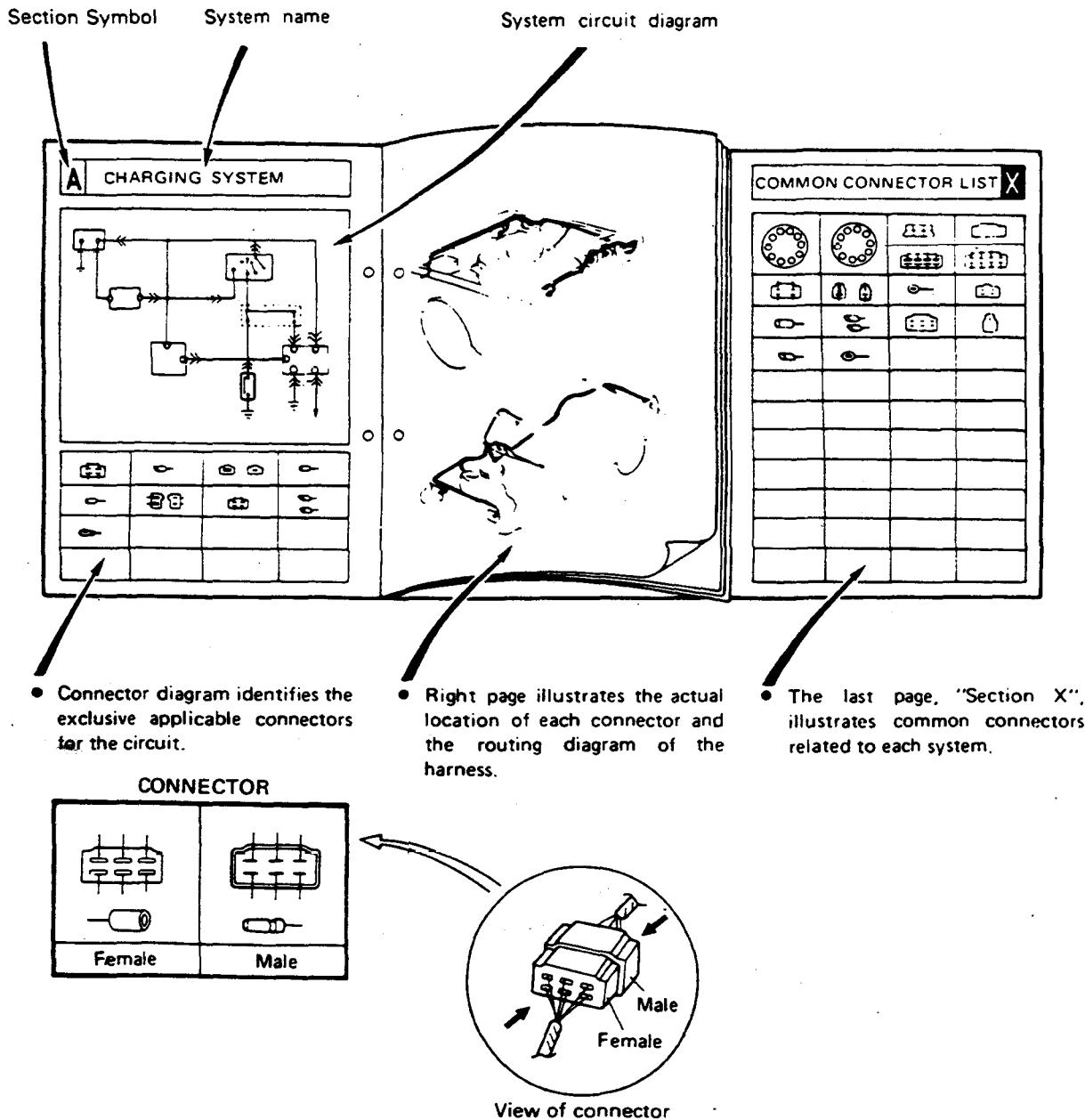
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■ SYMBOLS IN THIS WIRING DIAGRAM.....	Z-5
■ PARTS INDEX.....	Z-7(PI)
■ GROUND CIRCUIT	Z-8(JC)
■ ELECTRICAL WIRING SCHEMATIC	Z-9(W)
■ STARTING SYSTEM	Z-10(A)
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■ CHARGING SYSTEM	Z-10(A)
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■ LICENSE LIGHTS.....	Z-20(E)
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■ ILLUMINATION LAMPS.....	Z-20(E)
■ TURN & HAZARD FLASHER LIGHTS.....	Z-22(F)
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■ HEATER.....	Z-24(G)
■ ROOM LAMPS.....	Z-26(H)
■ CIGARETTE LIGHTER.....	Z-26(H)
■ AUTO CLOCK	Z-26(H)
■ COMMON CONNECTOR LIST.....	Z-28(X)
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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:



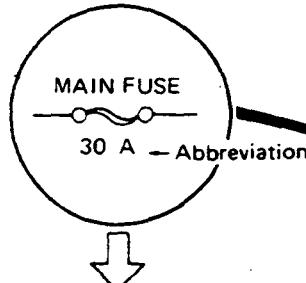
HOW TO USE THIS WIRING DIAGRAM

WIRING COLOR CODE

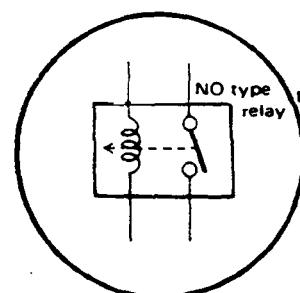
Wiring color code is indicated with alphabetical letter(s). The first letter indicates the basic color of the wire, and second letter (if any) indicates the color of the stripe.

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

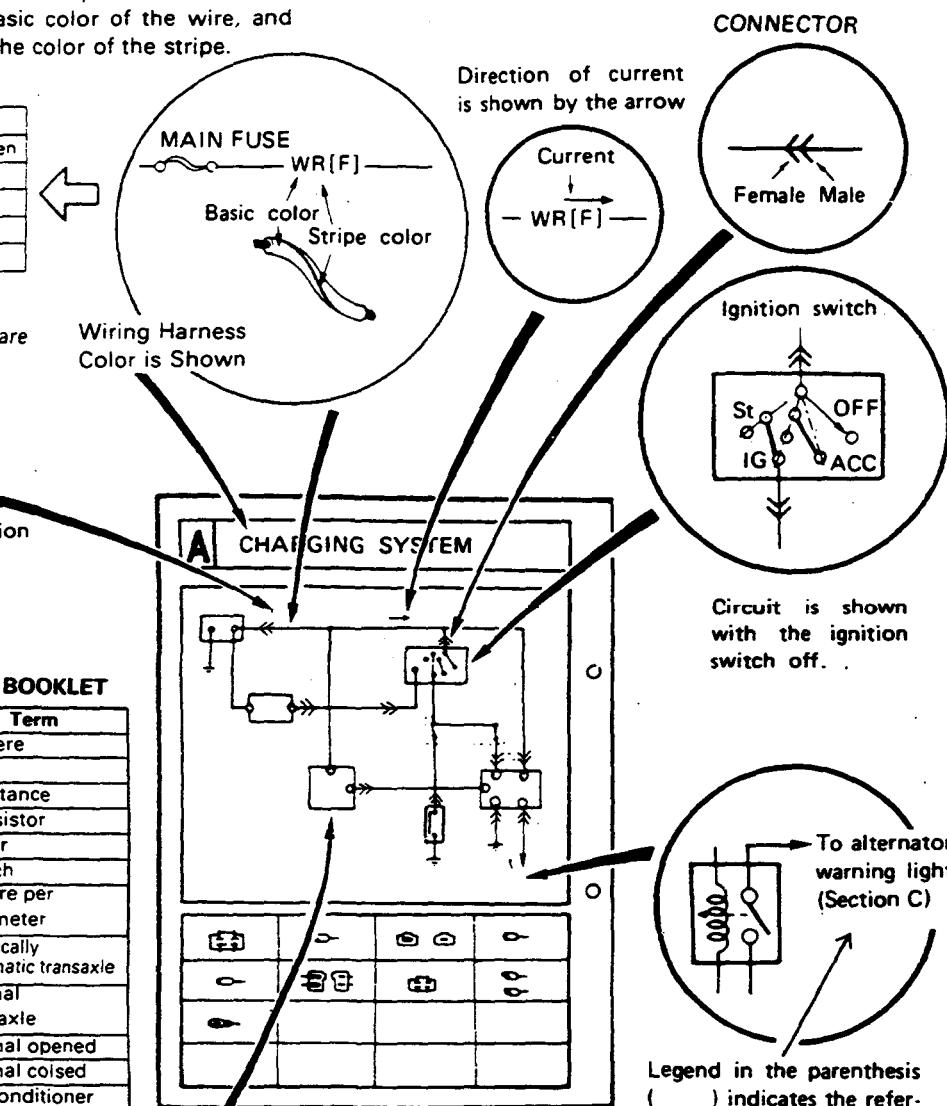
The same main fuse and fuses are indicated on each page.


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	EC-AT	Electrically Automatic transaxle
RH	Right hand		
LH	Left hand		
FR	Front right	MT	Manual transaxle
FL	Front left	NO	Normal opened
RR	Rear right	NC	Normal closed
RL	Rear left	A/C	Air Conditioner
V	Volt	AT	Automatic Transaxle
P/S	Power Steering		



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.

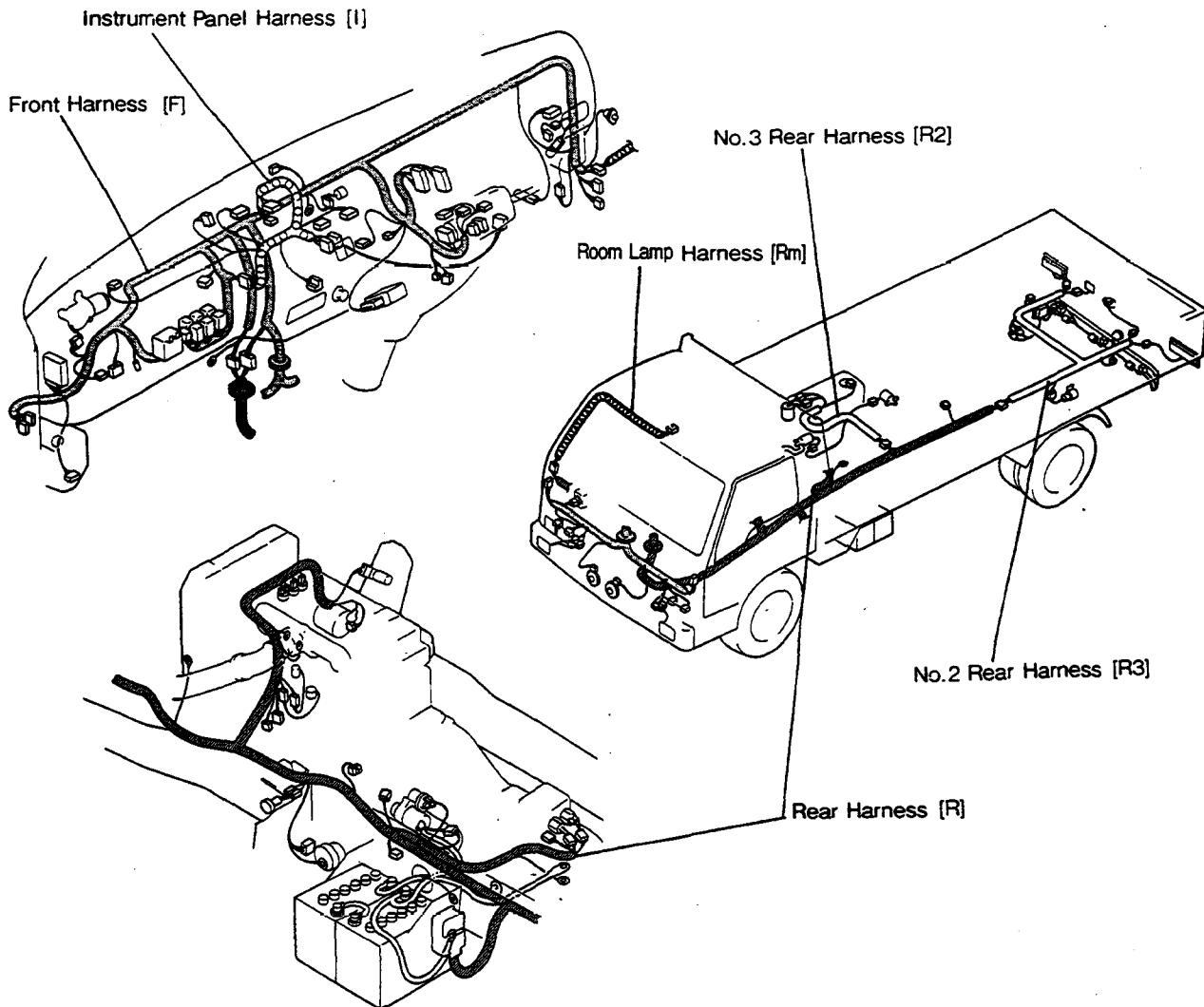
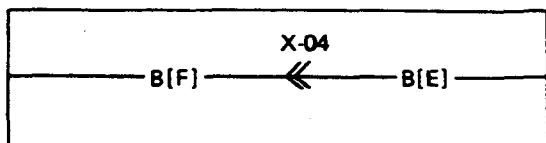


Relay		Switch	
NO type relay	NC type relay	NO switch	NC switch
 Not in operation	 Flow	 Stop	 Flow
 In operation	 Flow	 Stop	 Flow

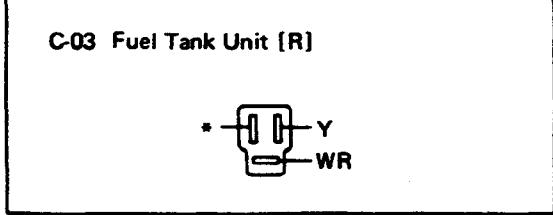
HARNESS SYMBOLS

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

- This sign(*) means "empty" - Not used.
- It is seen from the above that this connector (C-03) is in the rear harness.

HOW TO USE THIS WIRING DIAGRAM

Z-O

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.	<p style="margin-left: 20px;"> Signal converter ———— Coil signal converted to ———— ON-OFF signal </p>

GRAPHIC SYMBOLS

Battery	Ground	Holder	Box	Main Fuse	Motor
Coil solenoid	Resistance	Variable resistance	Thermister	Diode	
Condenser	Transistor	Pump	Lamp	Horn	
Speaker	Cigarette lighter	Heater	Illuminated Diode	Zener Diode	

WIRING DIAGRAM

Z

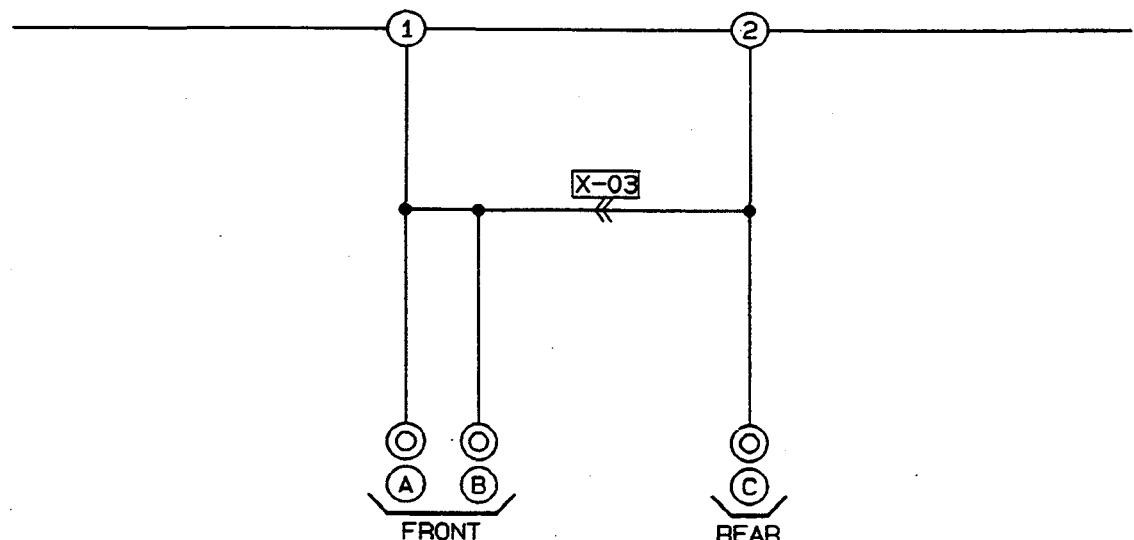
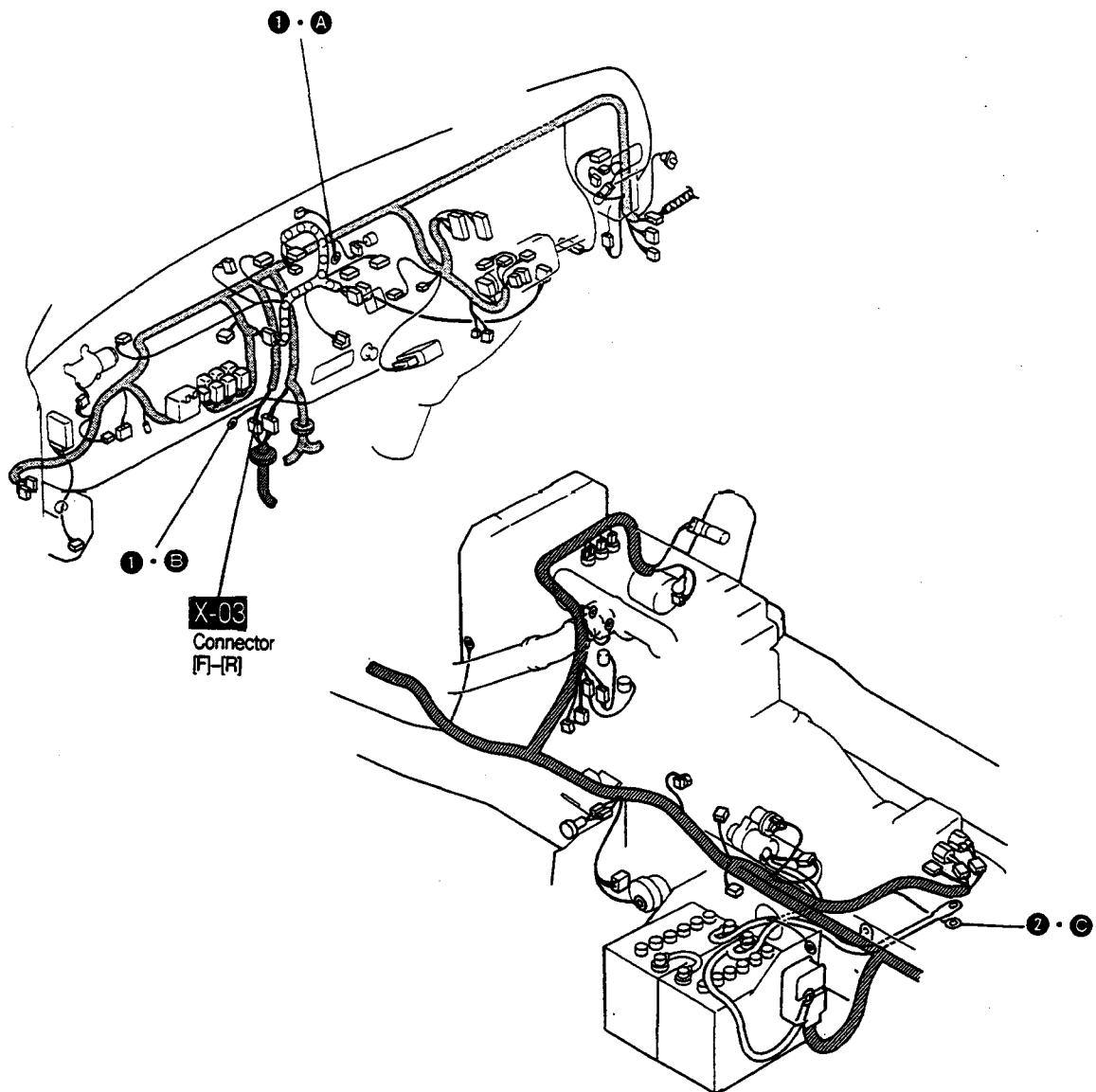
PARTS INDEX

PI

PARTS NAME	SECTION	PARTS NAME	SECTION
Ⓐ Accelerator Switch.....	B-2	Ⓝ Neutral Switch.....	A, B-2
Air Heater Control Unit.....	B-2	Ⓞ Oil Bypass Switch.....	C
Air Heater	B-2	Oil Level Sensor.....	C
Air Heater Relay.....	B-2	Oil Pressure Switch.....	C
Alternator With Regulator.....	A	Ⓟ P/E Select Switch.....	C
Auto Clock.....	H	PTO Switch.....	C
Ⓑ Back Horn.....	F	Parking Brake Switch.....	C
Back-up Light Switch.....	F	Pick Up Sensor.....	C
Back-up Light.....	F	Position Light.....	E
Battery.....	A-H	ⓧ QSS Control Unit.....	B-1
Blower motor.....	G	Ⓡ Radio.....	H
Brake Fluid Level Switch.....	C	Rear Turn Light.....	F
Ⓒ Cancel Relay.....	B-2	Resister Assembly.....	G
Cigarette Lighter.....	H	Room Lamp.....	H
Clutch Switch.....	B-2	Ⓓ Sedimentor Level Sensor.....	C
Condenser.....	F	Solenoid Valve.....	B-2
Combination Meter.....	C	Speaker.....	H
Combination Switch.....	E, F	Starting Motor.....	A
Coolant Level Sensor.....	C	Stop Light Checker Relay.....	F
Coolant Level Unit.....	C	Stop Light Switch.....	F
Ⓓ Door Switch.....	H	Stop Light.....	F
Ⓔ Engine Switch.....	A-H	Sub Mission Switch.....	C
Exhaust Brake Switch.....	B-2	Sub Starting Switch.....	A
Exhaust Heating Switch.....	B-2	Ⓔ Tail Light.....	E
Exhaust Heating Control Unit.....	B-2	⓫ Vacuum Switch.....	C
Ⓕ Fan Switch.....	G	⓪ Washer Motor.....	D
Flasher Unit.....	F	Water Thermo switch.....	B-1
Fog Light Switch.....	E	Water Thermo Sensor.....	B-2, C
Front Turn Light.....	F	Wiper & Washer Switch.....	D
Fuel Cut Solnoid Valve.....	B-1	Wiper Motor.....	D
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		

JC

■ GROUND CIRCUIT



WIRING DIAGRAM

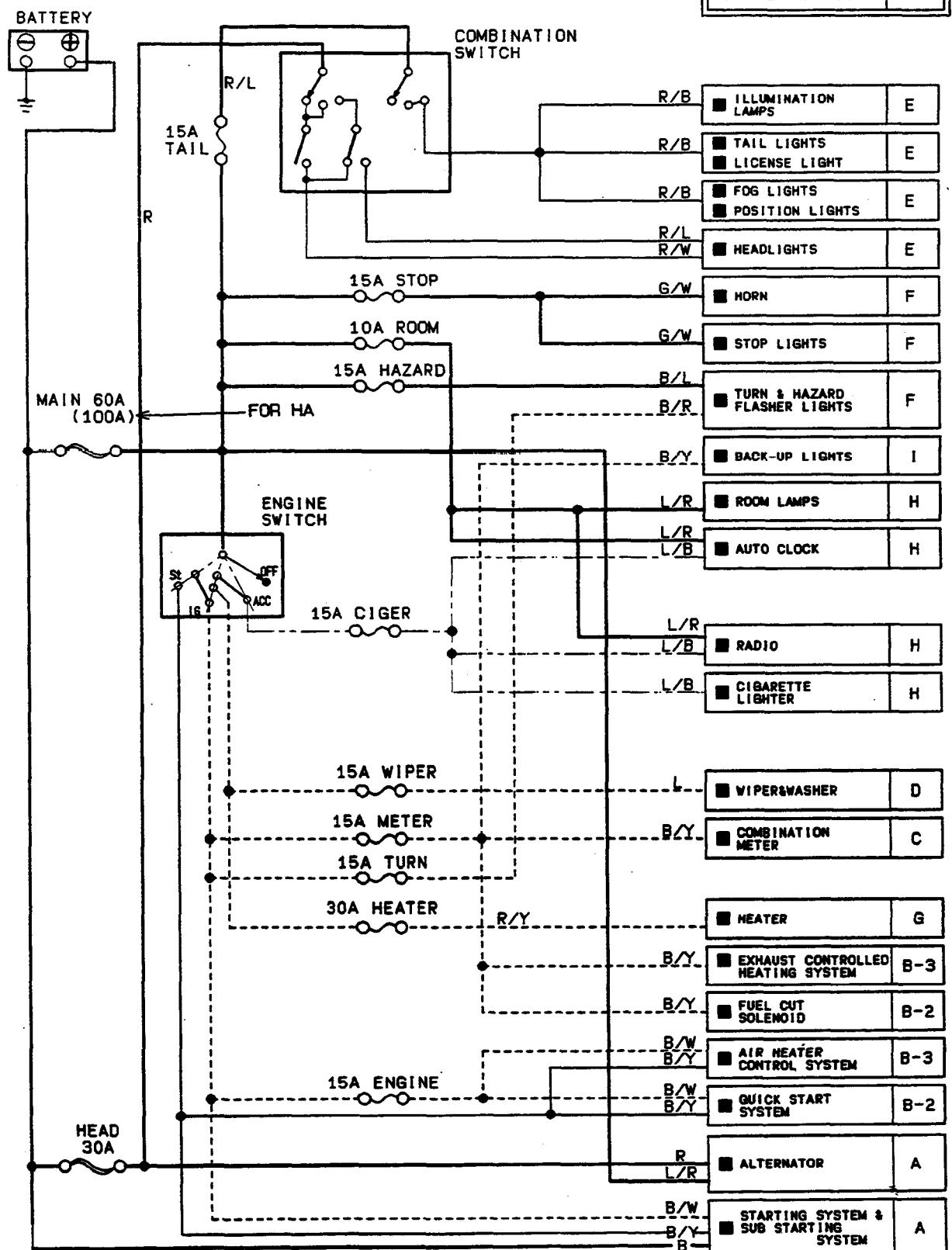
Z

W

■ ELECTRICAL WIRING SCHEMATIC

Note: Current from Battery
Current from IG Terminal of Ignition Switch
Current from ACC Terminal of Ignition Switch
Others

SYSTEM CIRCUIT	SECTION
----------------	---------

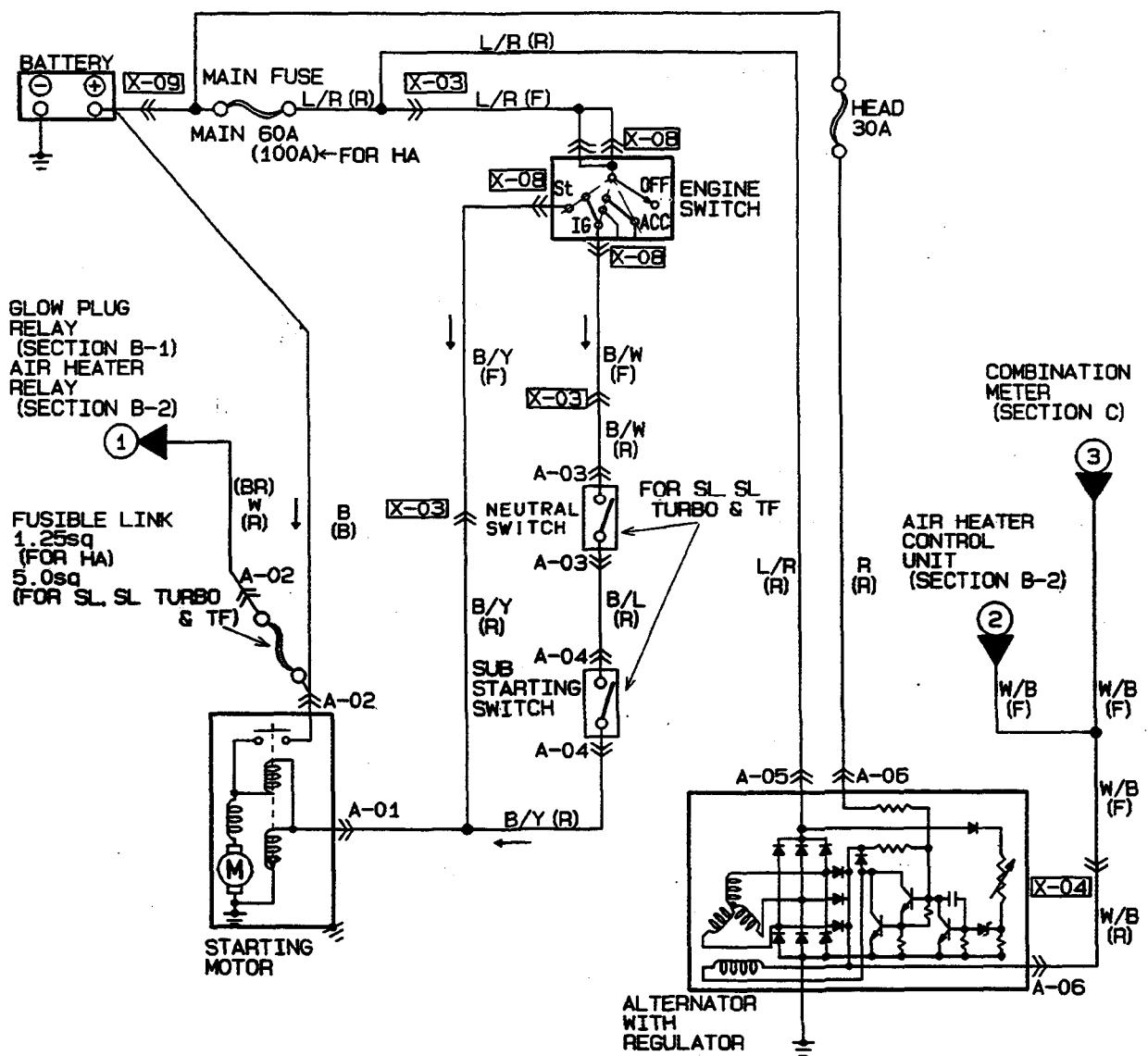


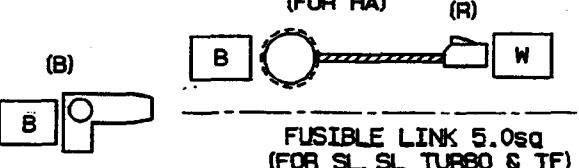
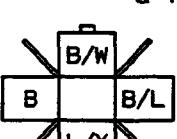
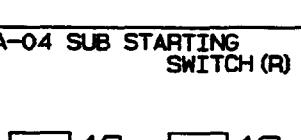
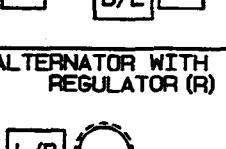
WIRING DIAGRAM

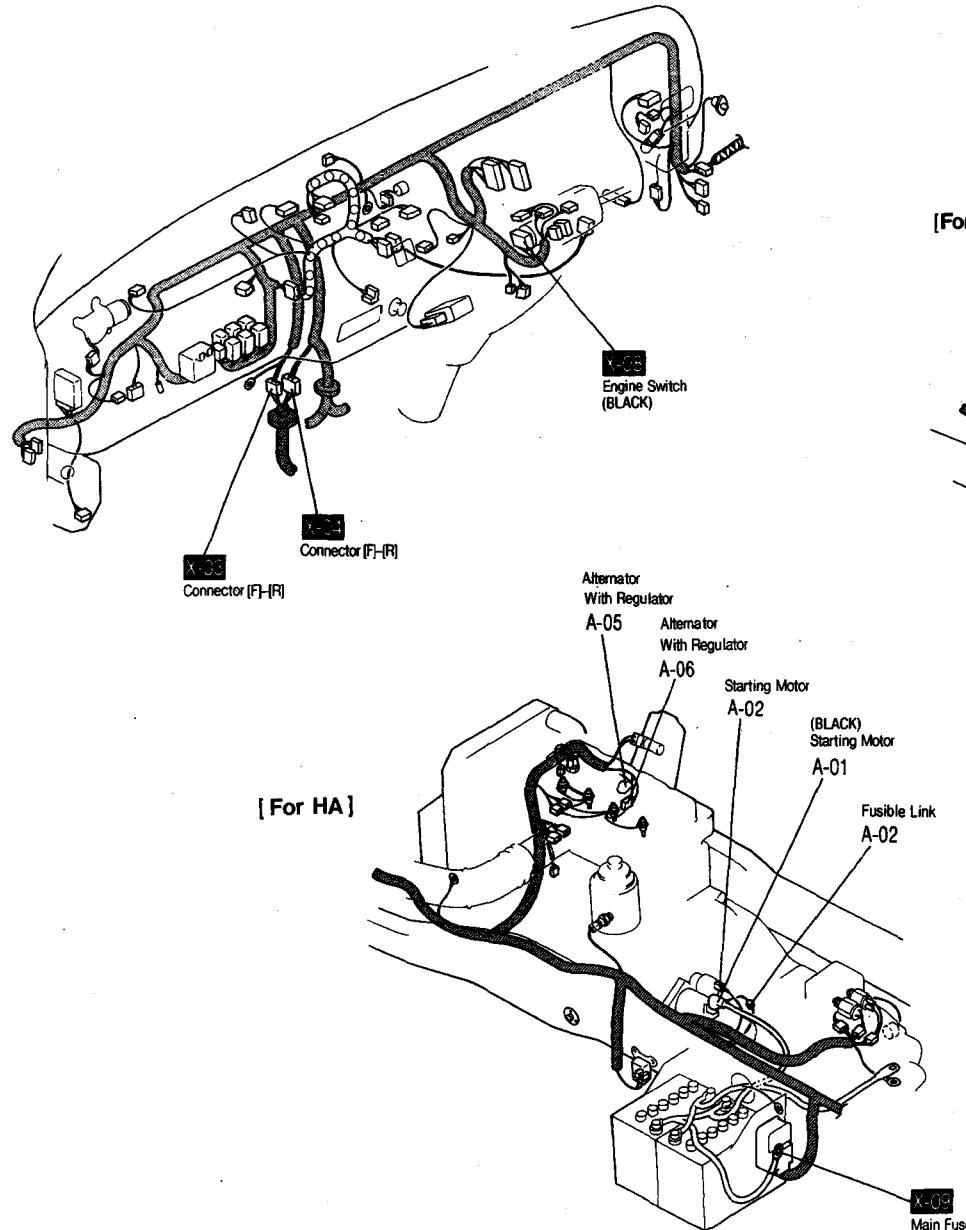
A

- STARTING SYSTEM ■ SUB STARTING SYSTEM
- CHARGING SYSTEM

(): FOR SL, SL
TURBO & TF

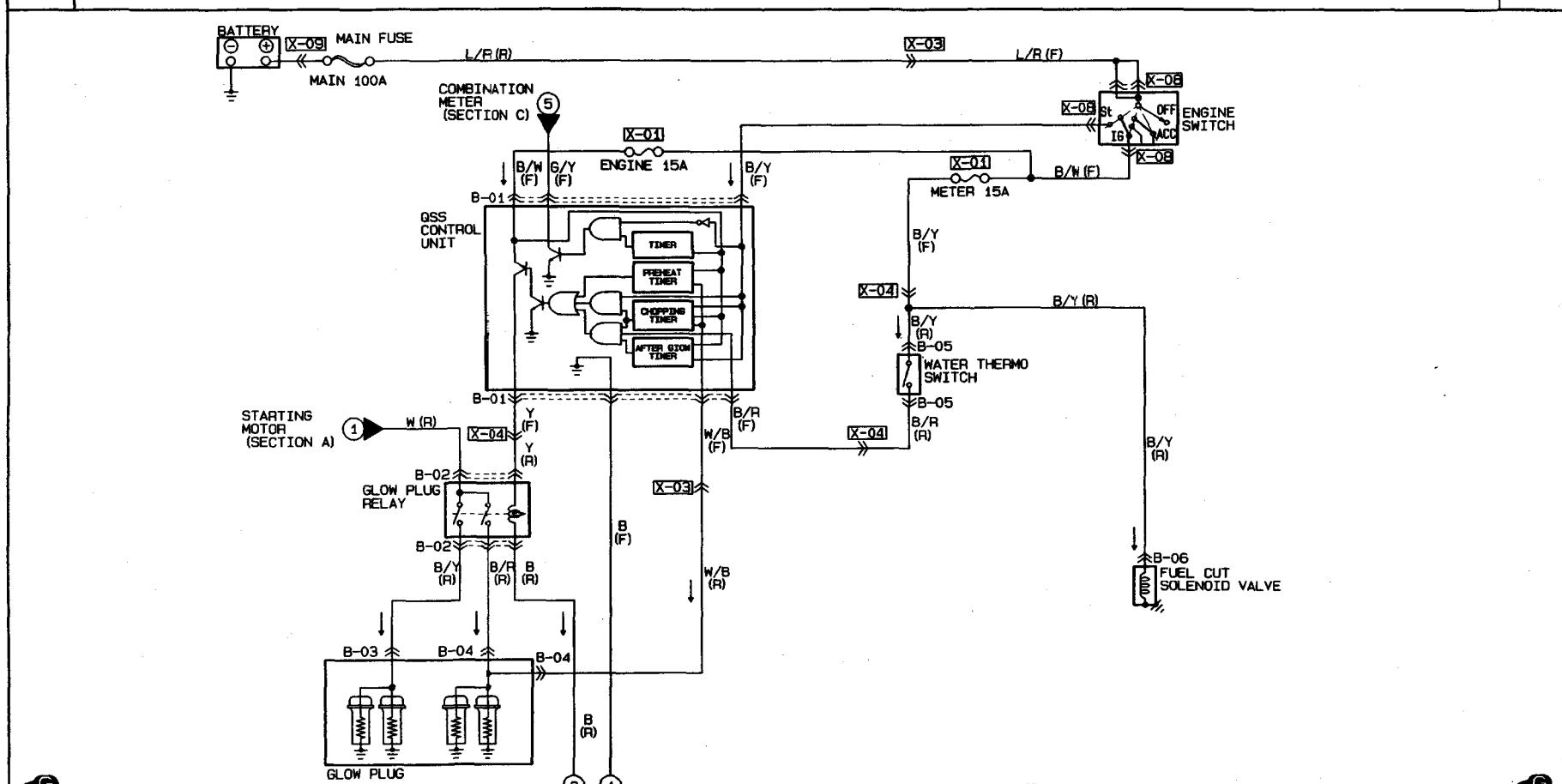


A-01 STARTING MOTOR (R)	A-02 STARTING MOTOR (B) & FUSIBLE LINK (R) FUSIBLE LINK 1.25sq (FOR HA) (R)	A-03 NEUTRAL SWITCH (A) (FOR SL, SL TURBO & TF)
		
A-04 SUB STARTING SWITCH (R)		
		
A-05 ALTERNATOR WITH REGULATOR (R)	A-06 ALTERNATOR WITH REGULATOR (R)	
		

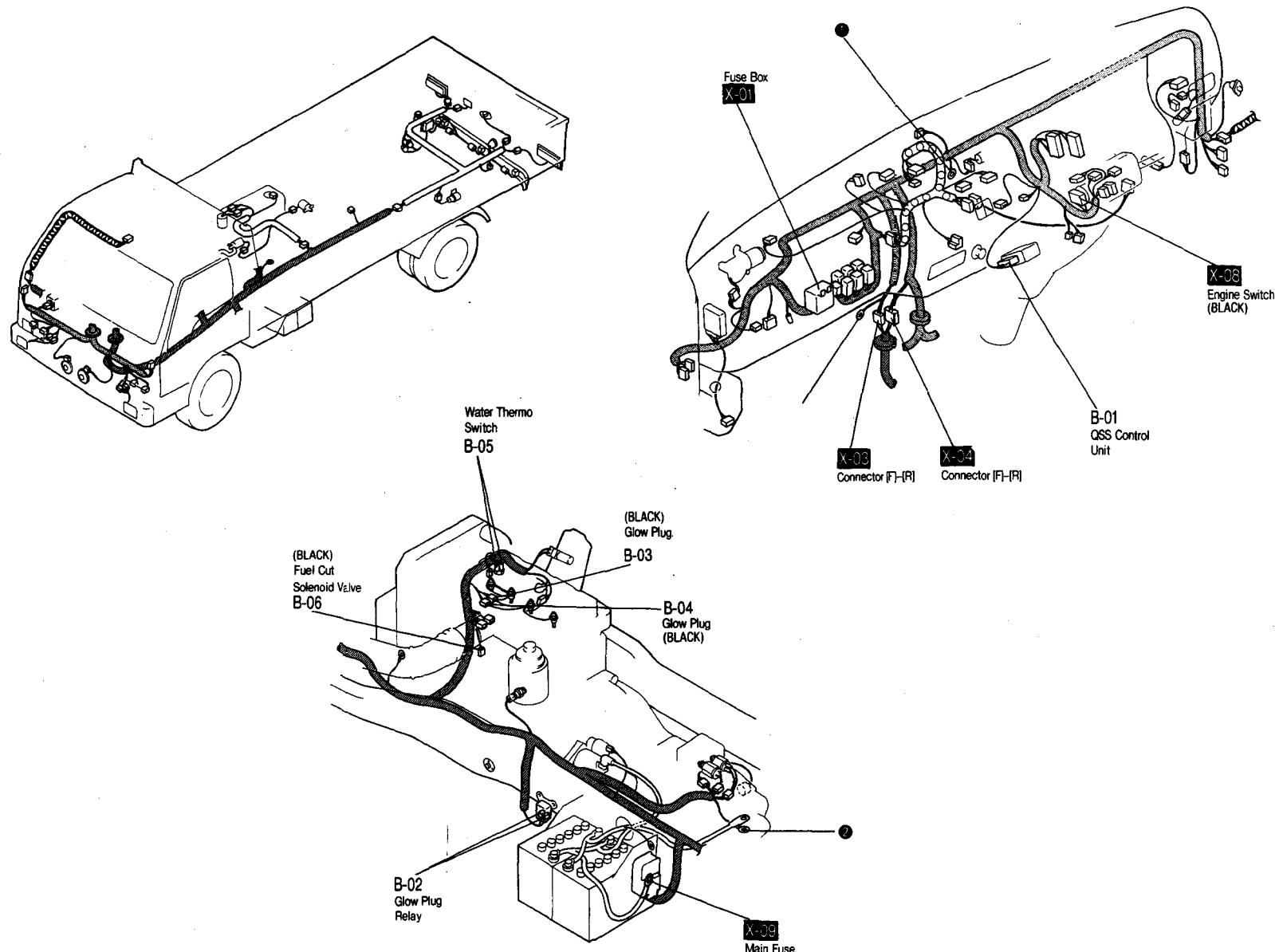


B-1 FOR HA ■ QUICK START SYSTEM (QSS) ■ FUEL CUT SOLENOID

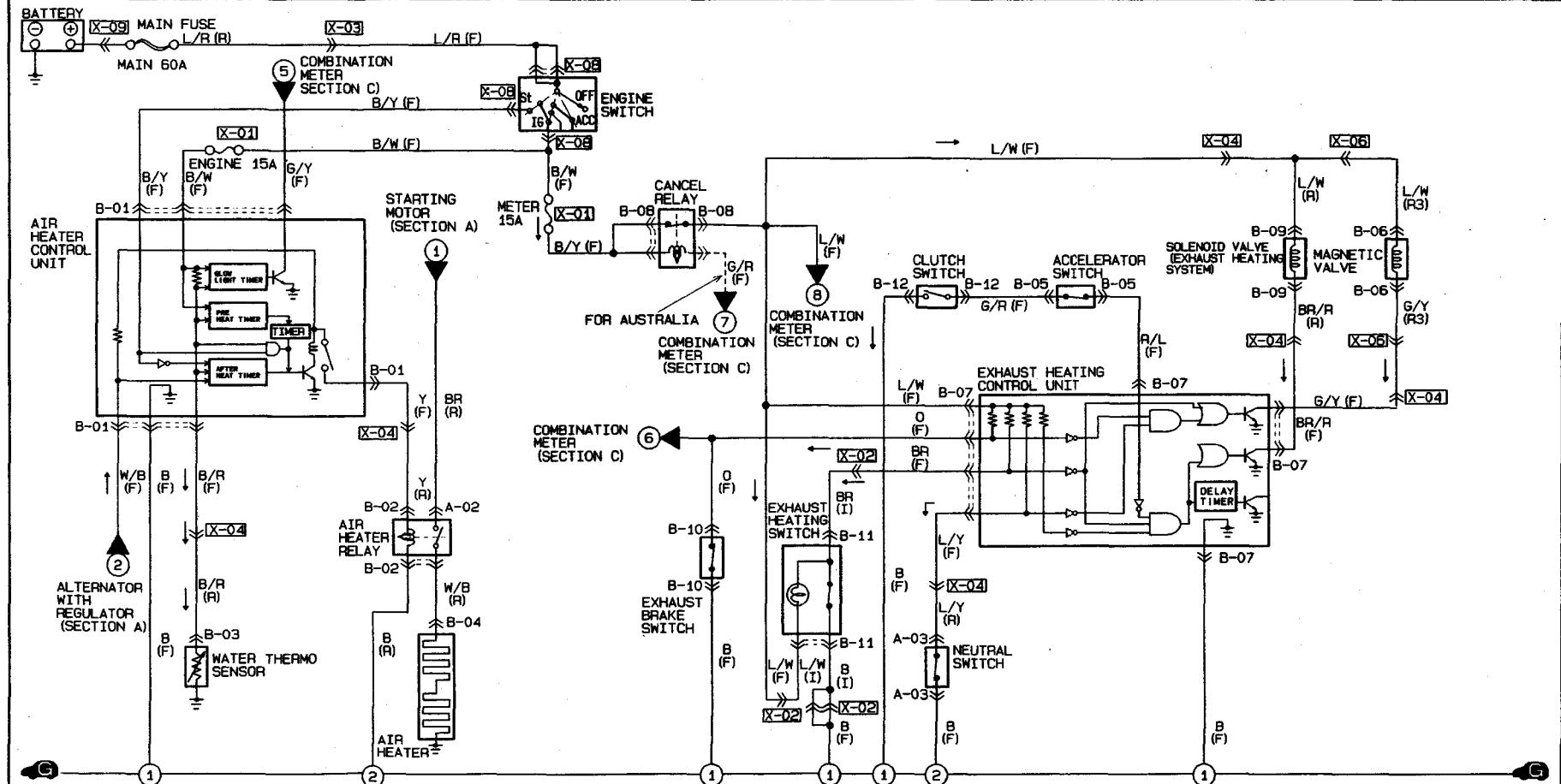
B-1



B-01 GSS 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)																																																																																					
<table border="1"> <tr> <td>G/Y</td><td>*</td><td>B/W</td><td>*</td><td>B/R</td><td></td><td></td></tr> <tr> <td>Y</td><td>*</td><td>B</td><td>B/Y</td><td>*</td><td>W/B</td><td></td></tr> </table>	G/Y	*	B/W	*	B/R			Y	*	B	B/Y	*	W/B		<table border="1"> <tr> <td>W</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>B/Y</td><td>B/R</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	W							B/Y	B/R						<table border="1"> <tr> <td>B</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>Y</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	B							Y							<table border="1"> <tr> <td>B/Y</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	B/Y														<table border="1"> <tr> <td>B/R</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	B/R														<table border="1"> <tr> <td>B/Y</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>B/R</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	B/Y							B/R							
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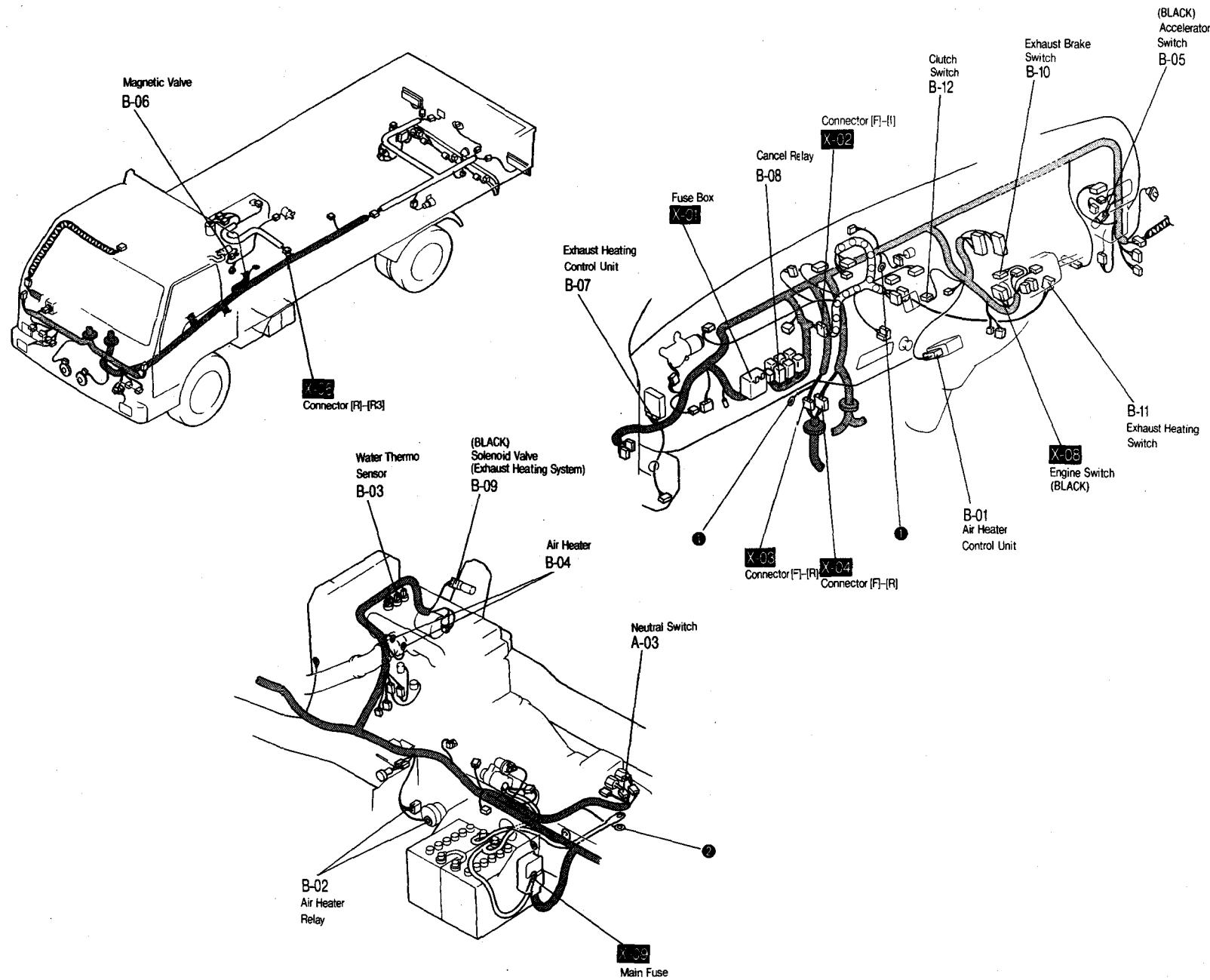


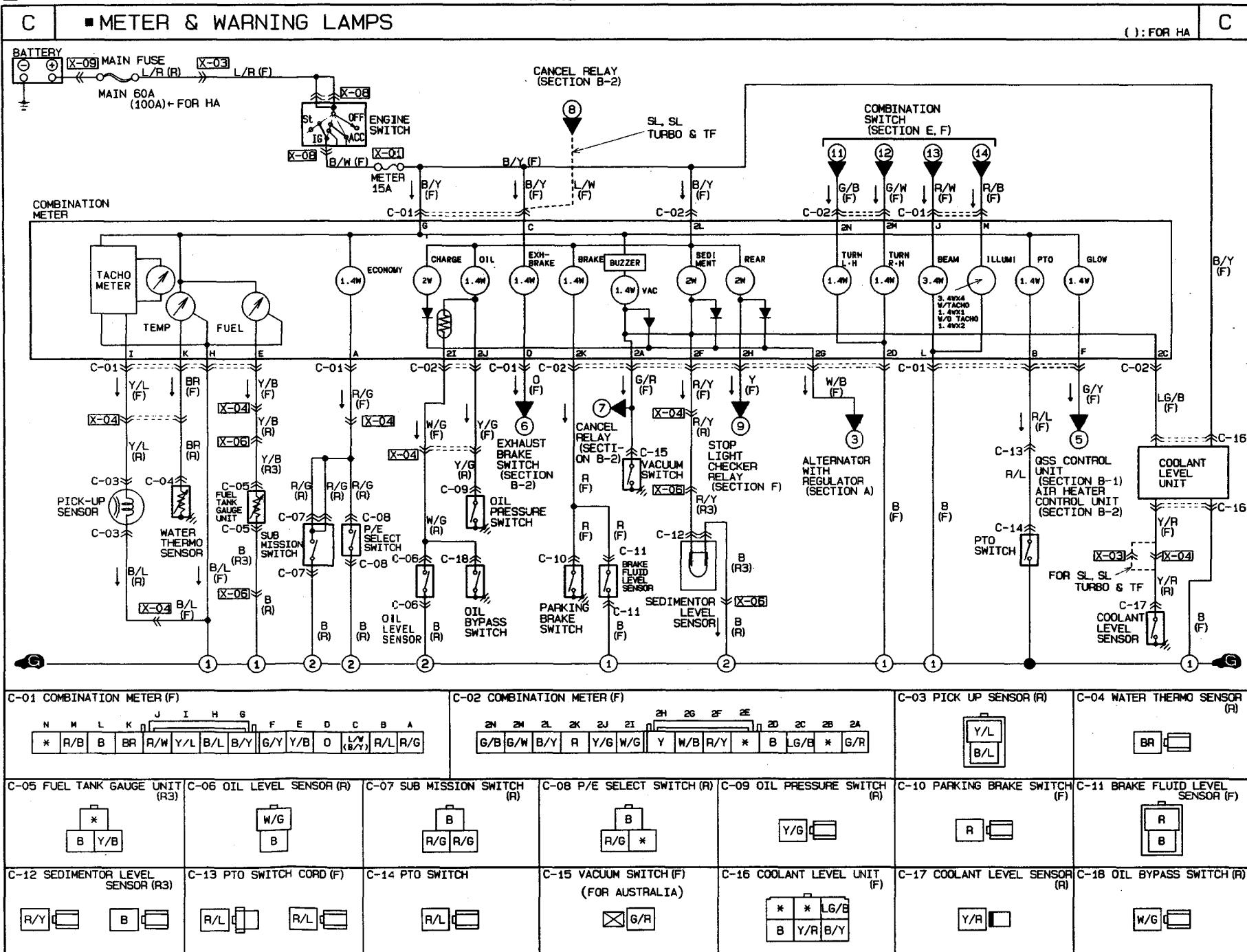
B-2 FOR SL, SL TURBO & TF ■ AIR HEATER CONTROL SYSTEM ■ EXHAUST CONTROLLED HEATING SYSTEM B-2

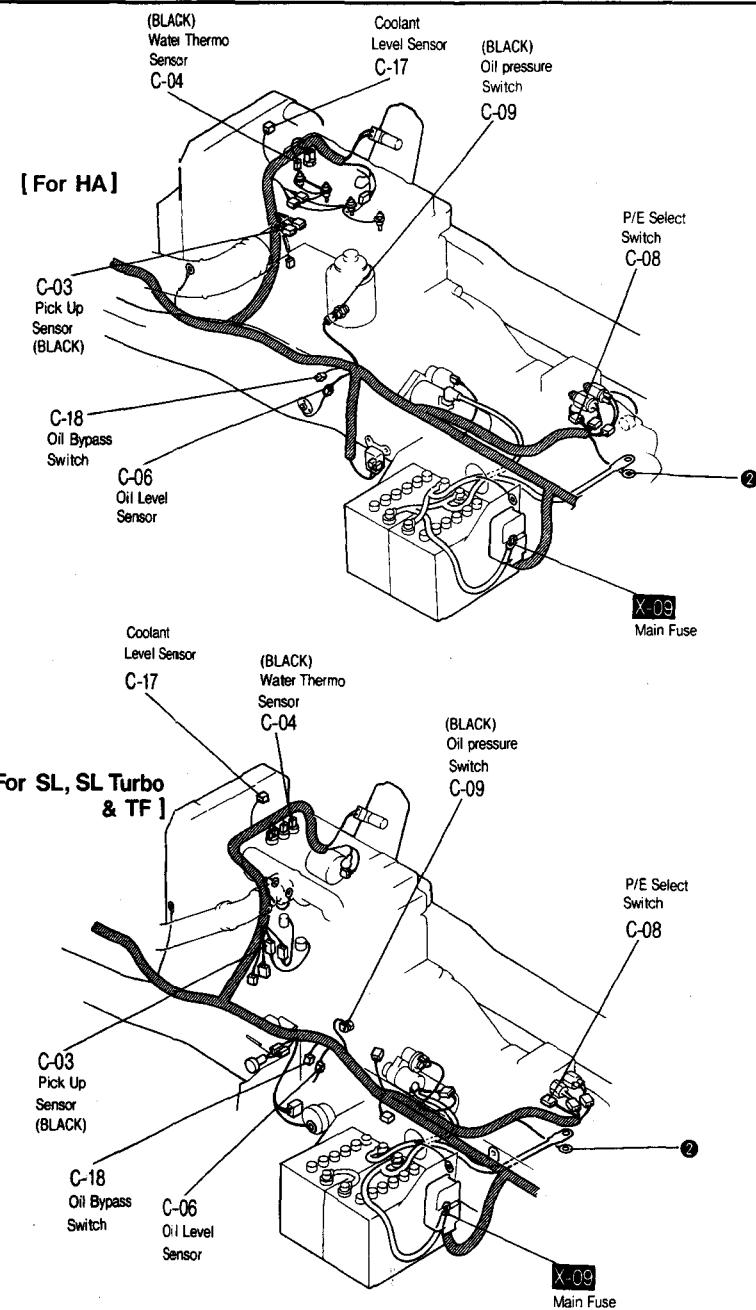
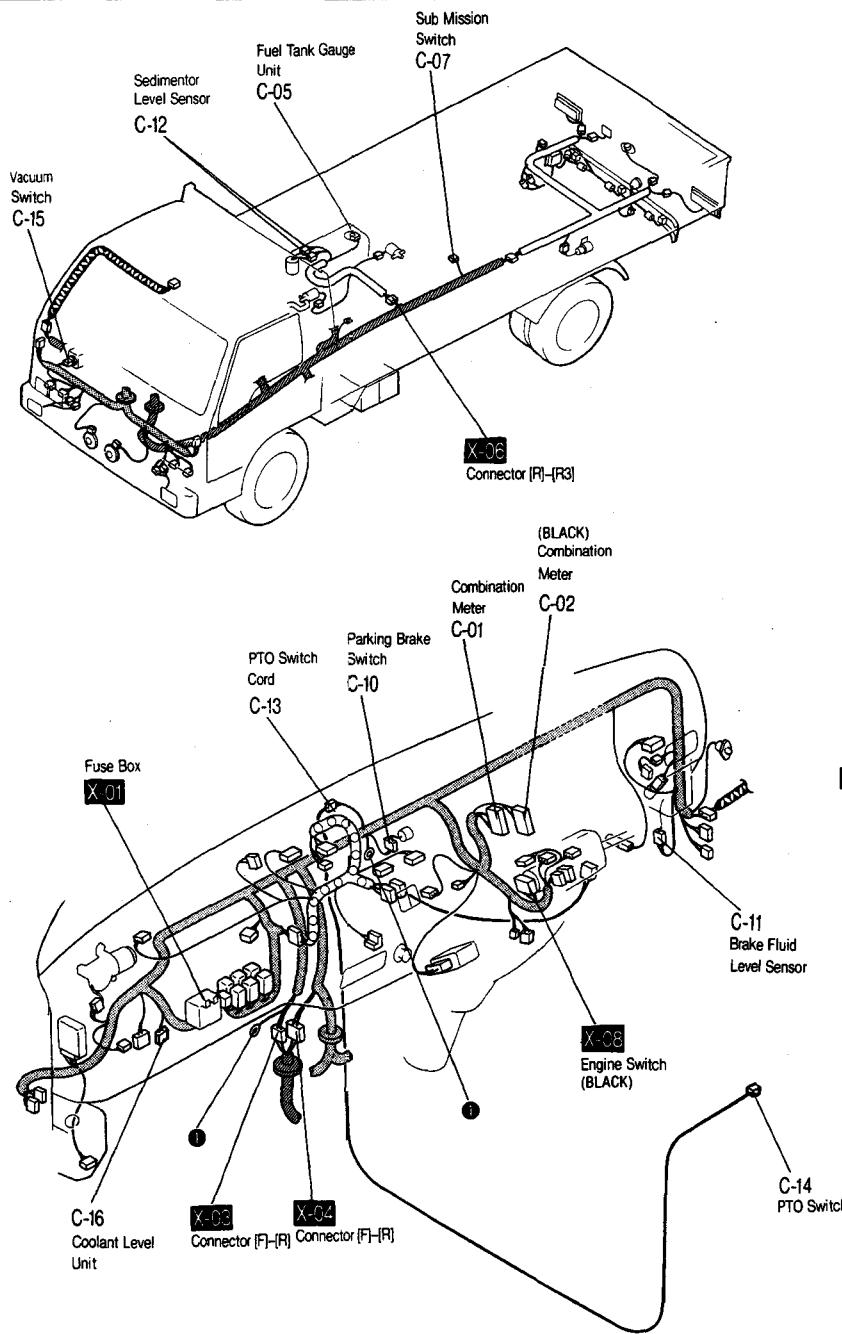


B-01 AIR HEATER CONTROL UNIT (F)	B-02 AIR HEATER RELAY (R)	B-03 WATER THERMO SENSOR (R)	B-04 AIR HEATER (R)	B-05 ACCELERATOR SWITCH (F)	B-06 MAGNETIC VALVE (R3)	B-07 EXHAUST HEATING CONTROL UNIT (F)																								
<table border="1"> <tr> <td>G/Y</td><td>*</td> <td>B/W</td><td>B/R</td><td>*</td> <td></td><td></td></tr> <tr> <td>Y</td><td>*</td> <td>B</td><td>B/Y</td><td>W/B</td><td>*</td><td></td></tr> </table>	G/Y	*	B/W	B/R	*			Y	*	B	B/Y	W/B	*							<table border="1"> <tr> <td>BR/G/Y</td><td></td> <td>O</td><td>*</td><td>BR</td></tr> <tr> <td>*</td><td>*</td> <td>B</td><td>L/W</td><td>L/Y</td></tr> </table>	BR/G/Y		O	*	BR	*	*	B	L/W	L/Y
G/Y	*	B/W	B/R	*																										
Y	*	B	B/Y	W/B	*																									
BR/G/Y		O	*	BR																										
*	*	B	L/W	L/Y																										
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-03 NEUTRAL SWITCH (R)																								
	A-02 STARTING MOTOR (B) & FUSIBLE LINK (R) (B)	FUSIBLE LINK 5.0sq				() : FOR CREW CAB.																								

NOTE: *...NOT USED





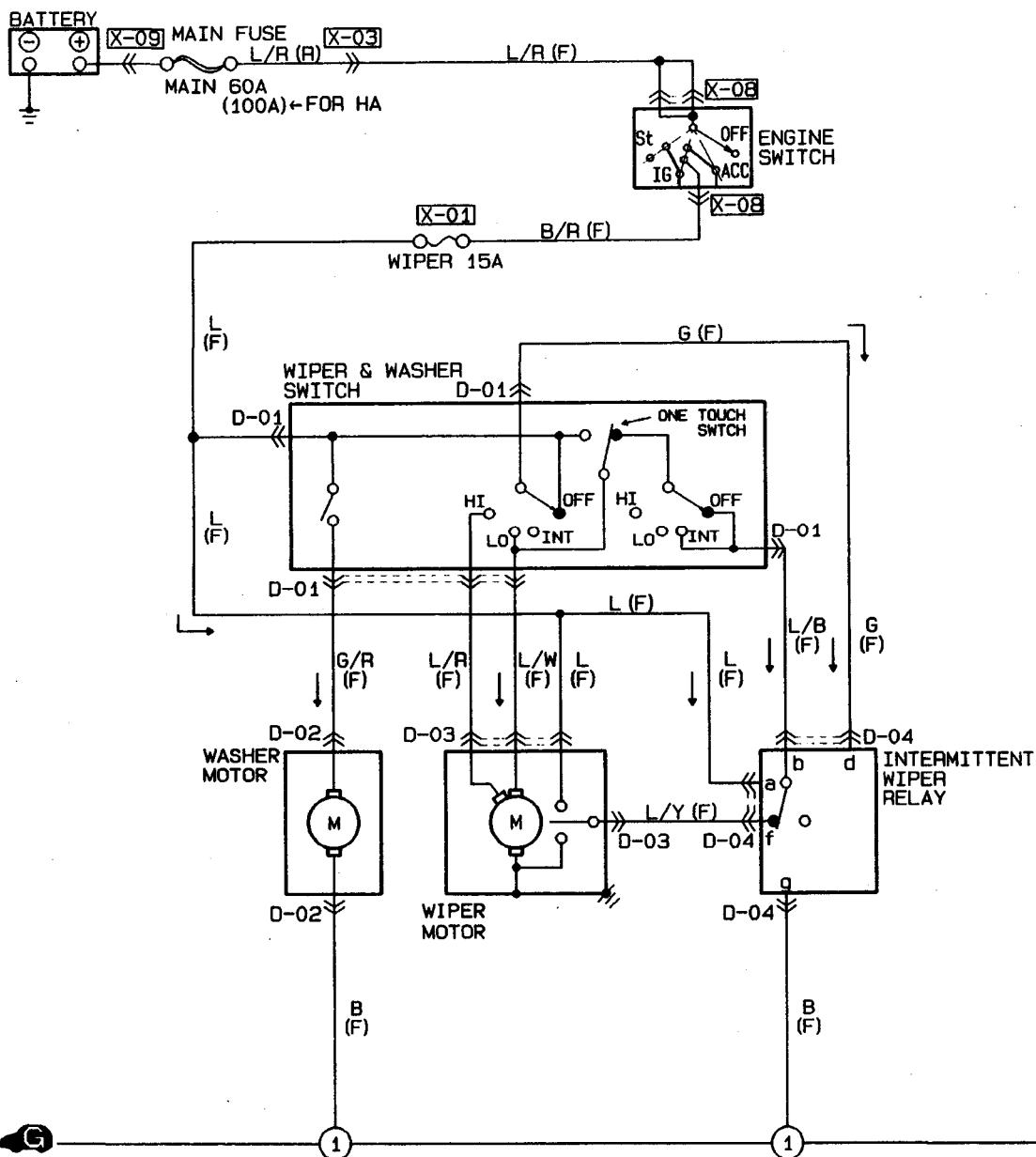


Z

WIRING DIAGRAM

D

■ WIPER & WASHER



D-01 WIPER & WASHER SWITCH (F)

L	G	G/R
L/R	L/B	L/W

D-02 WASHER MOTOR (F)

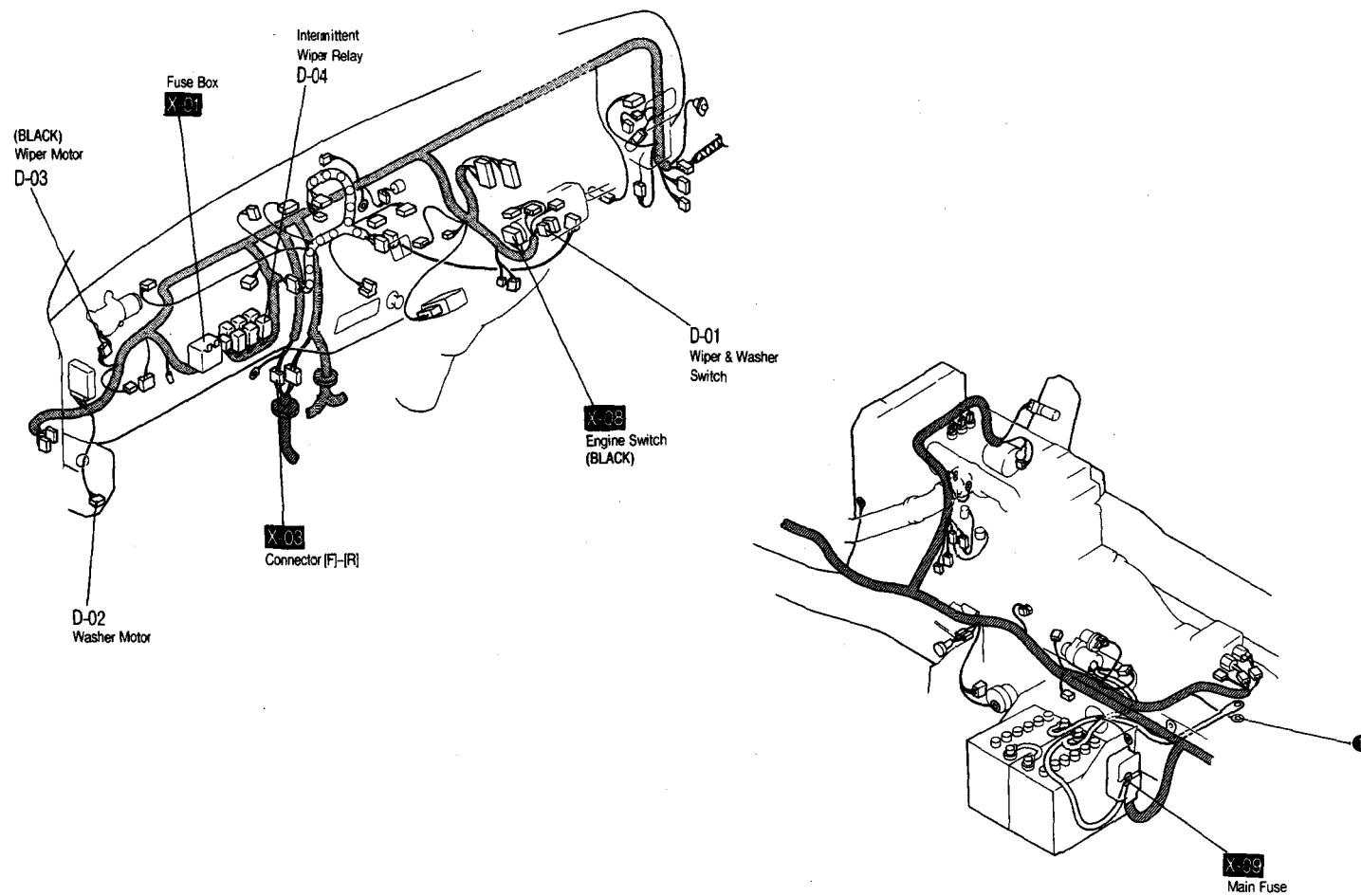
B
G/R

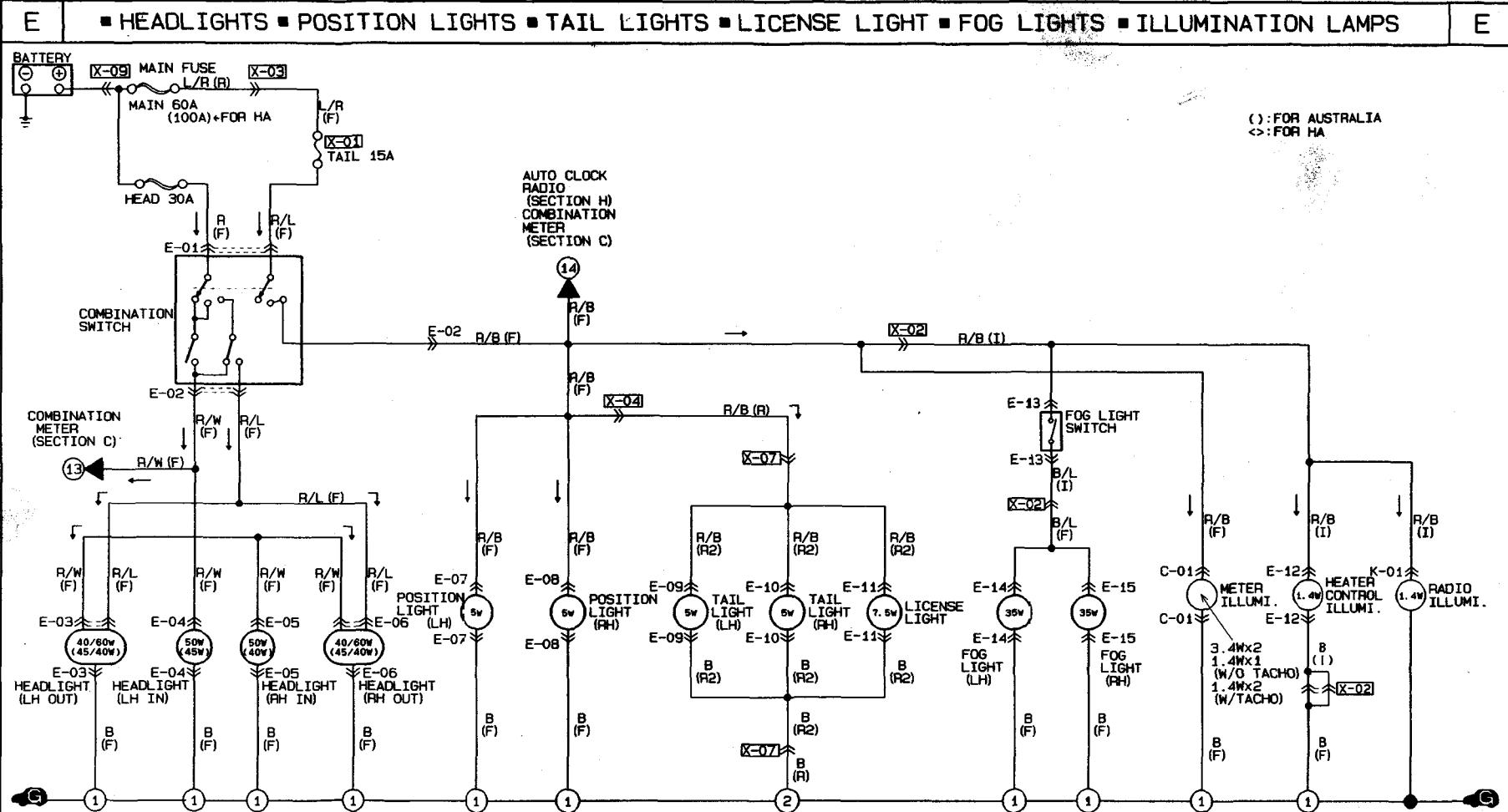
D-03 WIPER MOTOR (F)

L/W	L/R
L	L/Y

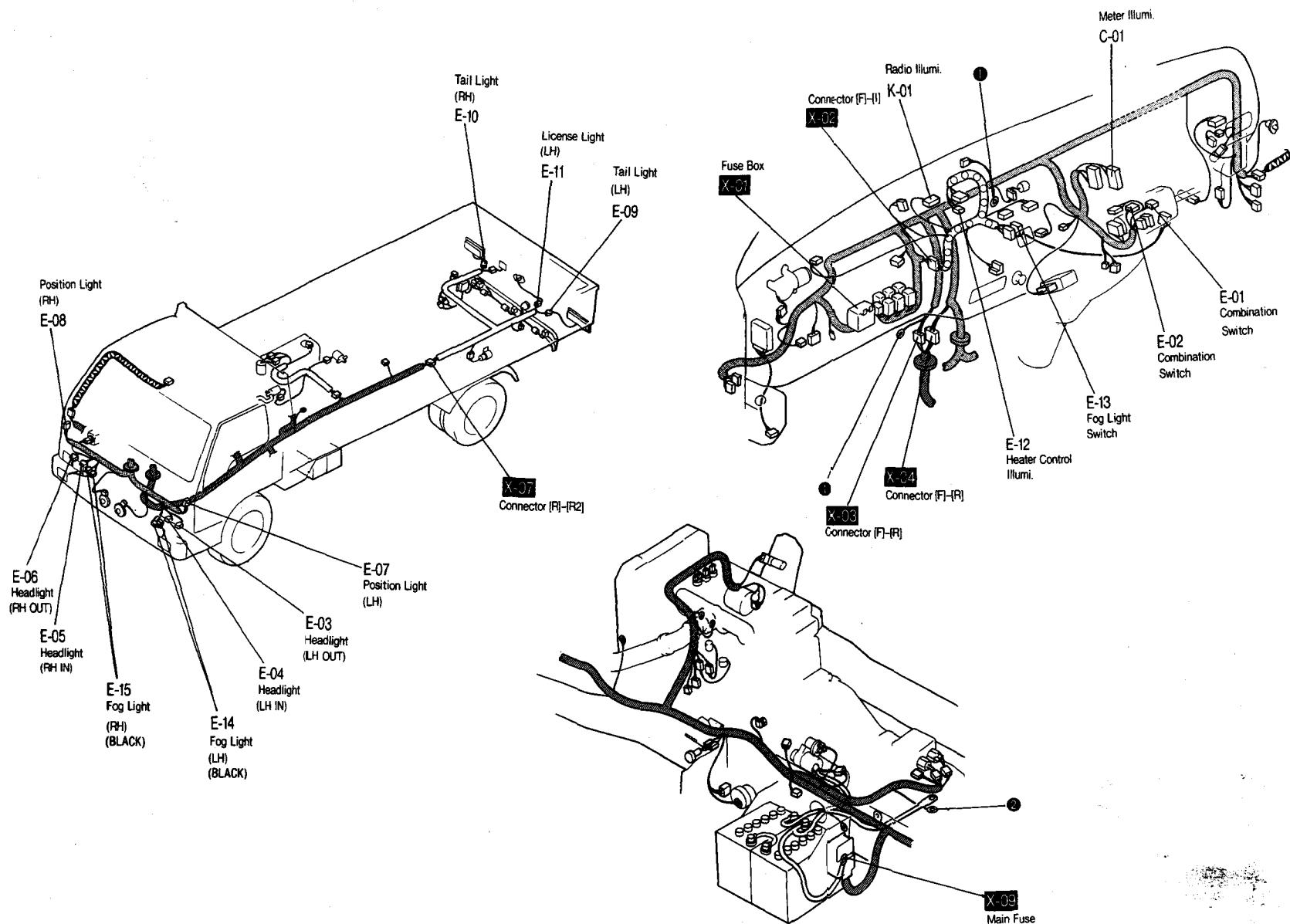
D-04 INTERMITTENT WIPER RELAY (F)

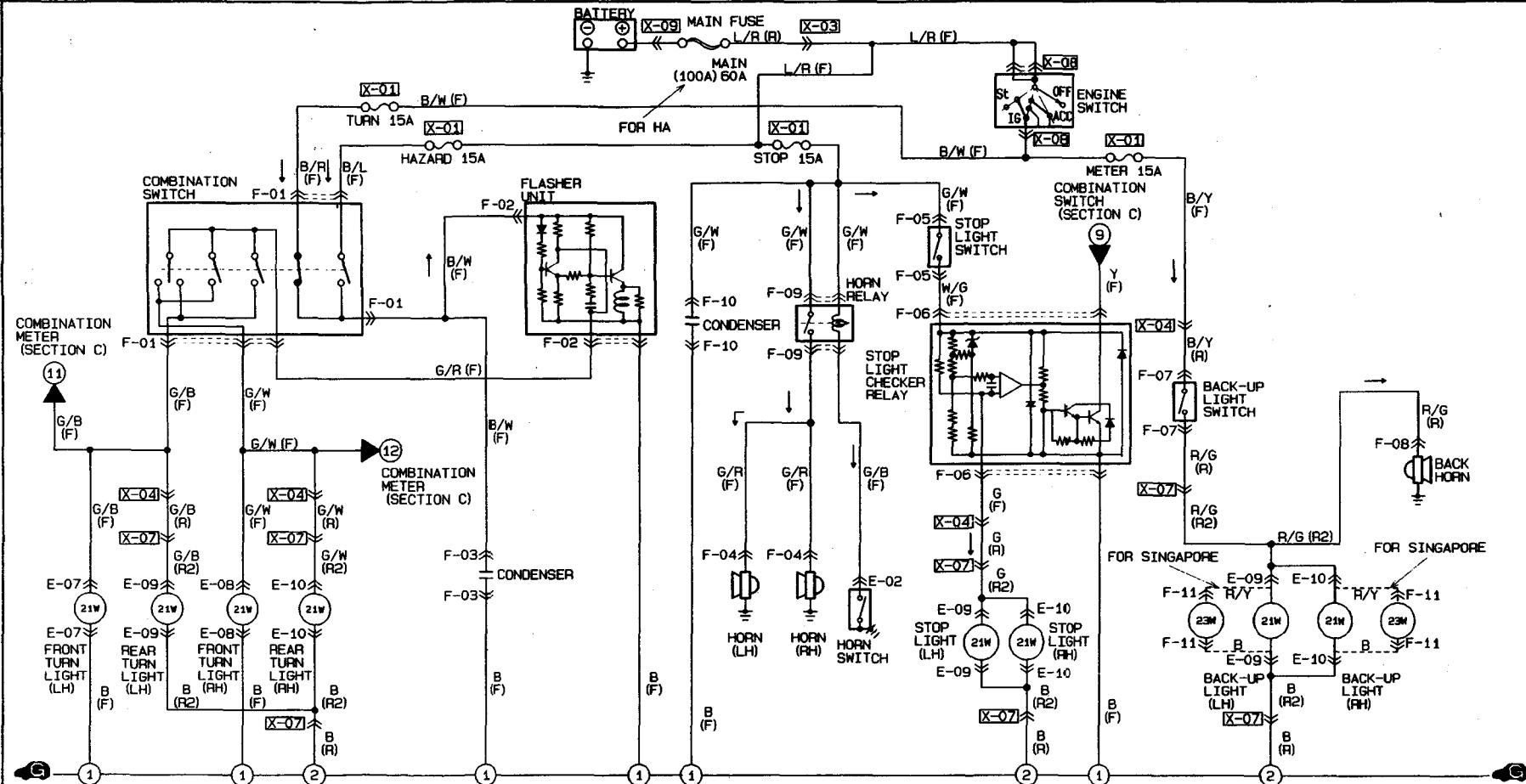
G		A
B		L
*	L/Y	G
H	F	D
		B





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)																																											
	<table border="1"> <tr> <td>N</td><td>H</td><td>L</td><td>K</td><td>J</td><td>I</td><td>H</td><td>G</td> </tr> <tr> <td>*</td><td>R/B</td><td>B</td><td>BR</td><td>B/W</td><td>Y/L</td><td>B/L</td><td>B/Y</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>G/Y</td><td>Y/B</td><td>O</td><td>L/W</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>R/L</td><td>R/G</td> </tr> </table>				N	H	L	K	J	I	H	G	*	R/B	B	BR	B/W	Y/L	B/L	B/Y					G/Y	Y/B	O	L/W							R/L	R/G	<table border="1"> <tr> <td>L</td><td>L/O</td><td>X</td><td>R/B</td><td>L/R</td><td>L/B</td> </tr> <tr> <td>G/Y</td><td>G/R</td><td>*</td><td>*</td><td>*</td><td>*</td> </tr> </table>	L	L/O	X	R/B	L/R	L/B	G/Y	G/R	*	*	*	*
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				G/Y	Y/B	O	L/W																																										
						R/L	R/G																																										
L	L/O	X	R/B	L/R	L/B																																												
G/Y	G/R	*	*	*	*																																												





F-01 COMBINATION SWITCH F-02

(F)

FLASHER UNIT (F) F-03 CONDENSER

G/R
B/W

(F) F-04

1

DRN (F)

G/R

F-05 STOP LIGHT SWITCH (F) F-06 S

TOP LIGHT CHECKER F-07 BACK-UP LIG

RELAY (F)	
Y	W/G
G	B

F-08 BACK HORN (B2) F-09

R/G

HORN RELAY (F) F-10 CONDENSEE

G/W G/B

(F) F-11

1

ACK-UP LIGHT

FOR SINGAPORE)
R/Y
B

E-02 HORN SWITCH (F) E-07 E

R/B R/L
G/B R/W

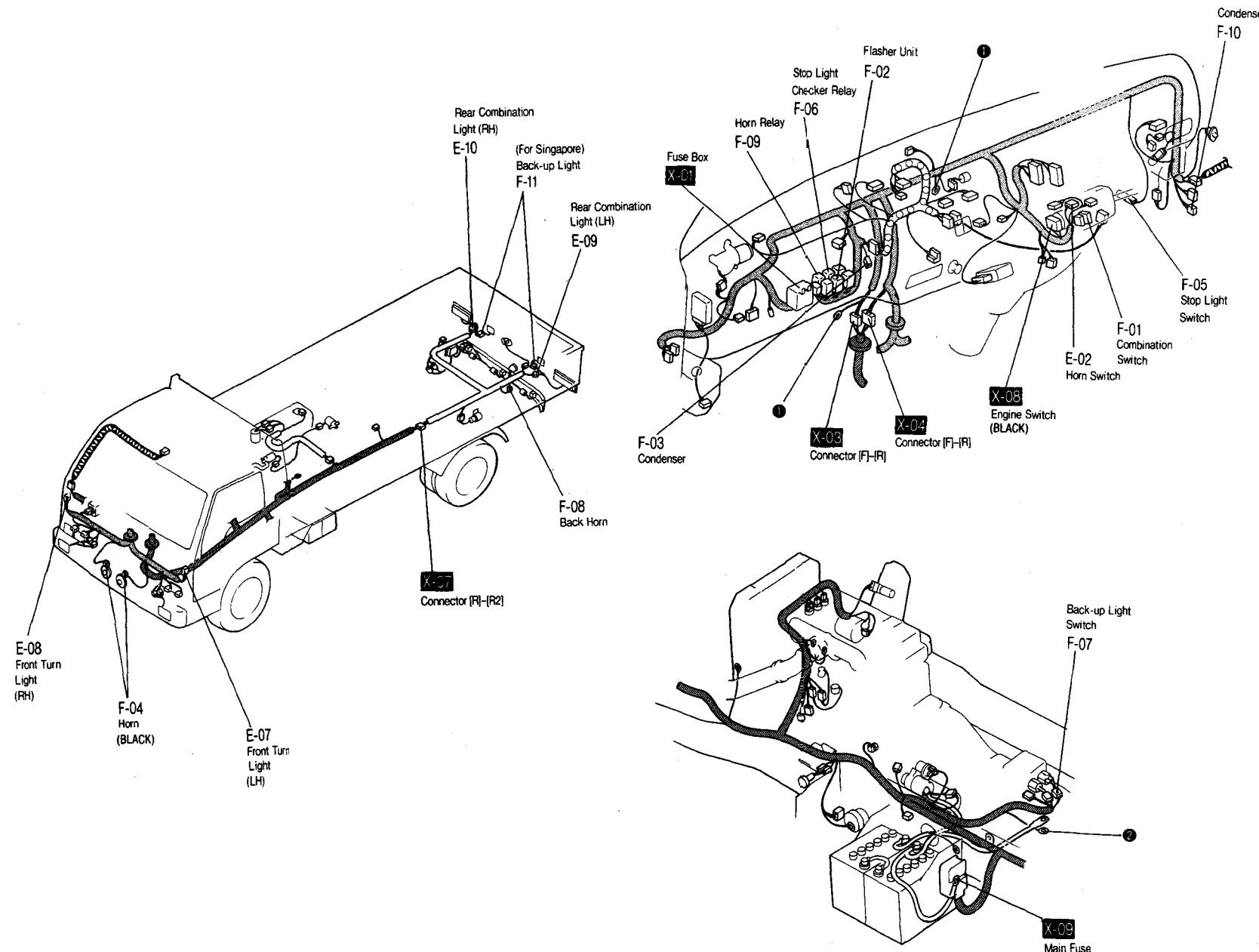
ONT TURN I TIGHT (L H) E-08 FRONT TURN

E-09 REAR COMBINATION E-10

LIGHT

READ COMBINATION

HEAT COMBINATION
LIGHT (RH) (R2)

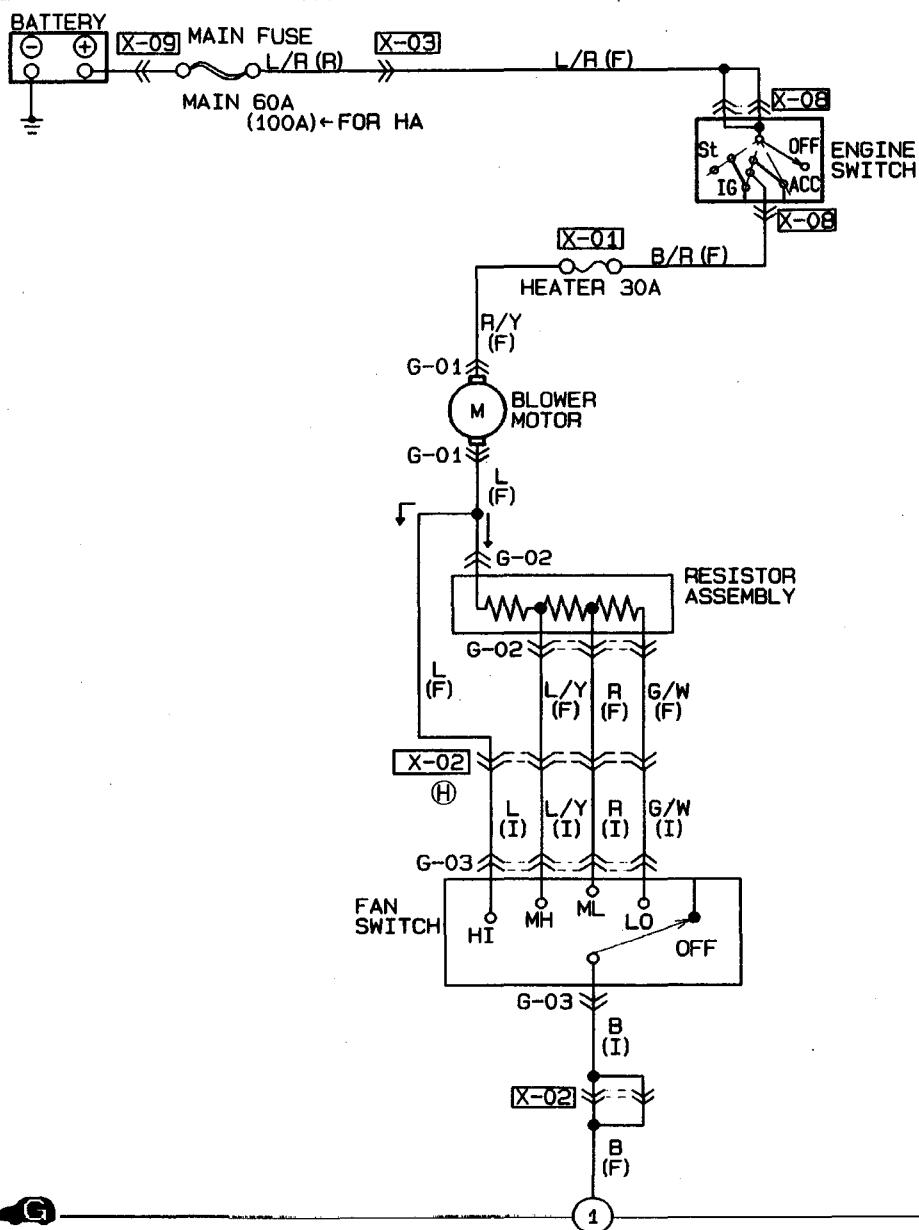


Z

WIRING DIAGRAM

G

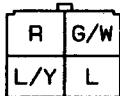
■ HEATER



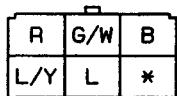
G-01 BLOWER MOTOR (F)



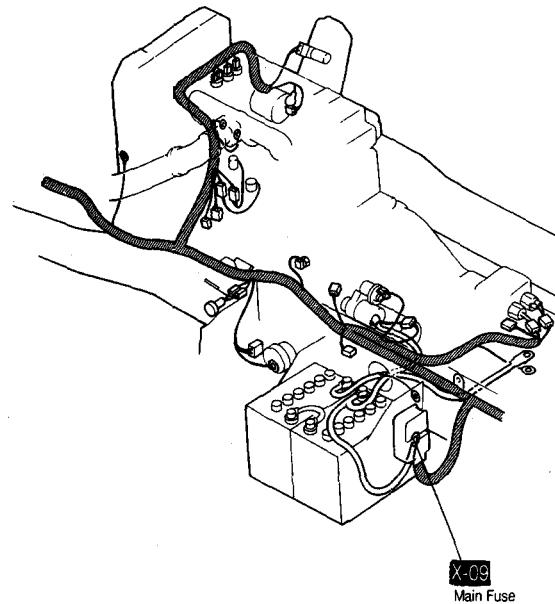
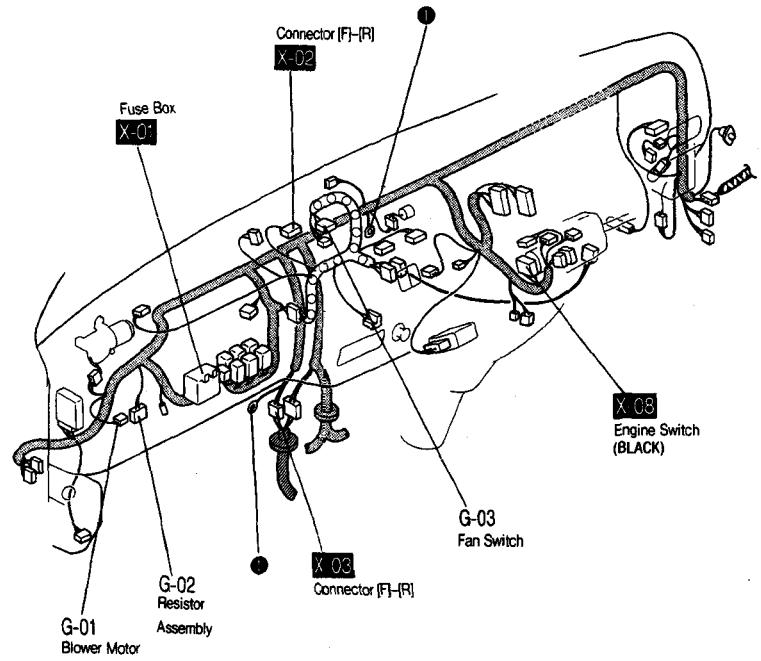
G-02 RESISTOR ASSEMBLY (F)



G-03 FAN SWITCH (I)

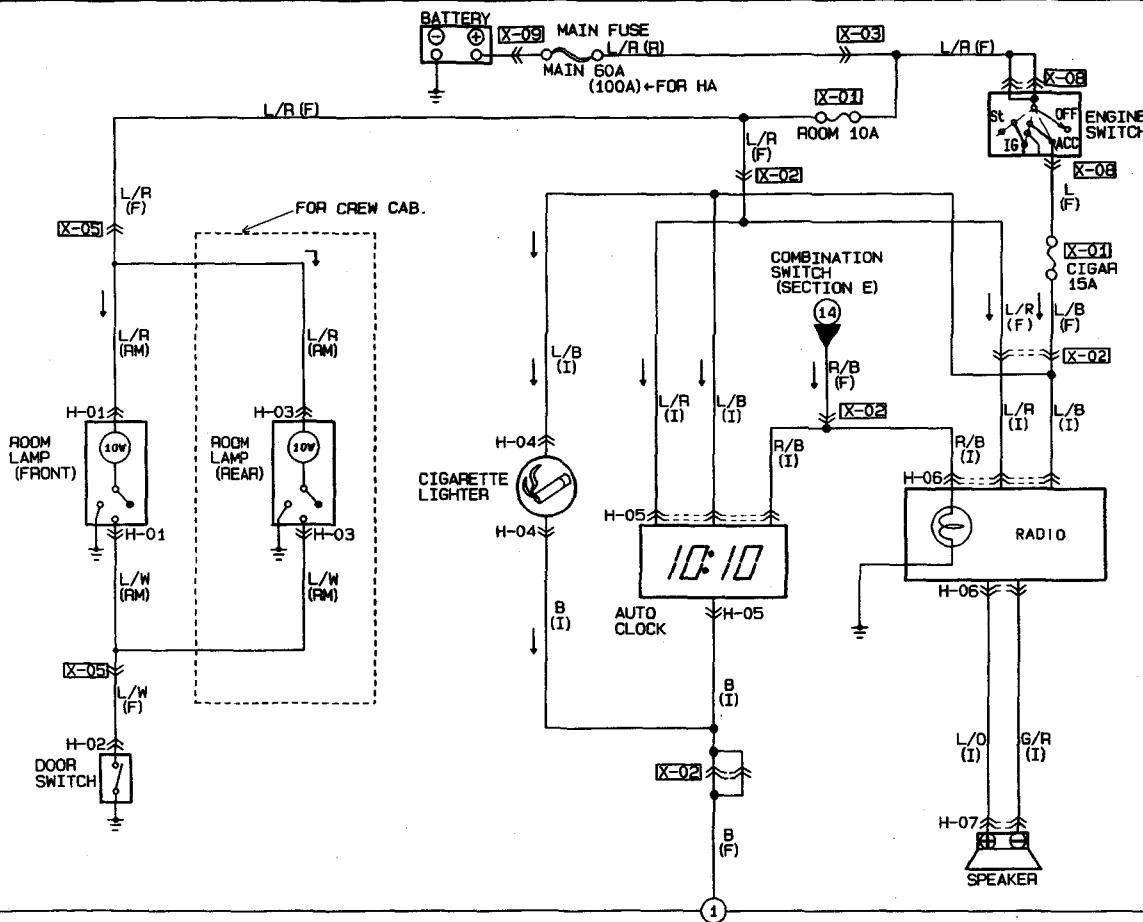


NOTE: *...NOT USED



H ■ ROOM LAMPS ■ CIGARETTE LIGHTER ■ AUTO CLOCK ■ RADIO

H



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)							

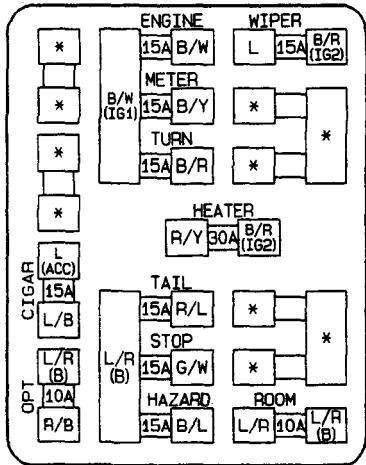
NOTE: *...NOT USED

Z

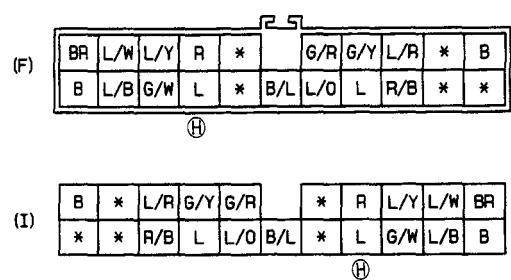
WIRING DIAGRAM

■ COMMON CONNECTOR LIST (): FOR SL SL
TURBO & TF

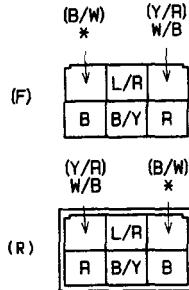
X-01 FUSE BOX (F)



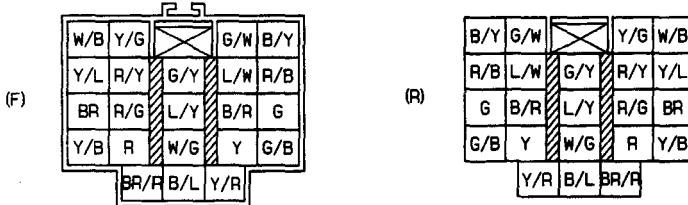
X-02 CONNECTOR BETWEEN FRONT (F) AND INSTRUMENT PANEL HARNESS (I)



X-03 CONNECTOR BETWEEN FRONT (F) AND REAR HARNESS (R)



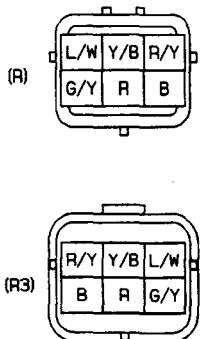
X-04 CONNECTOR BETWEEN FRONT (F) AND REAR HARNESS (R)



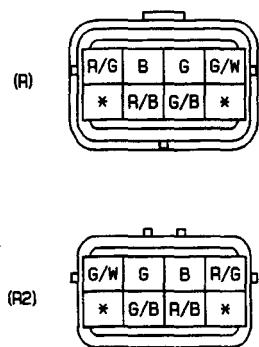
X-05 CONNECTOR BETWEEN FRONT (F) AND ROOM HARNESS (RM)



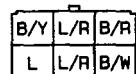
X-06 CONNECTOR BETWEEN REAR HARNESS (R) AND NO.3 REAR HARNESS (R3)



X-07 CONNECTOR BETWEEN REAR HARNESS (R) AND NO.2 REAR HARNESS (R2)



X-08 ENGINE SWITCH (F)



X-09 MAIN FUSE (B) (+SIDE)



