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This file was not scanned to deprive Mazda of any money - it was scanned due to the rareness of the original manuals and the overwhelming need of the RX-7 owner to have this information so that they can accurately troubleshoot problems. Perhaps if Mazda's dealerships could support the Rotary Engine it wouldn't be so necessary for the owners to do so.



Many thanks to Lenny Terris for scanning this.

Before beginning any service procedure, refer to the 1994 RX-7 Body Electrical Troubleshooting Manual; see section S for air bag system service warnings and section J1 for audio antitheft system alarm conditions.

C

ENGINE

C

INDEX	C - 2
OUTLINE	C - 3
SPECIFICATIONS	C - 3
TROUBLESHOOTING GUIDE	C - 3
ENGINE TUNE-UP PROCEDURE	C - 5
PREPARATION	C - 5
ENGINE OIL	C - 5
ENGINE COOLANT	C - 5
DRIVE BELT	C - 5
COMPRESSION	C - 9
PREPARATION	C - 9
ON-VEHICLE MAINTENANCE	C - 11
REAR OIL SEAL	C - 11
PREPARATION	C - 11
REMOVAL	C - 14
PREPARATION	C - 14
PROCEDURE	C - 14
ENGINE STAND MOUNTING	C - 21
PREPARATION	C - 21
PROCEDURE	C - 21
DISASSEMBLY	C - 23
PREPARATION	C - 23
AUXILIARY PARTS (I)	C - 24
TURBOCHARGER	C - 25
AUXILIARY PARTS (II)	C - 30
HOUSING (EXTERNAL PARTS I)	C - 36
HOUSING (EXTERNAL PARTS II)	C - 39
HOUSING (INTERNAL PARTS)	C - 41
HOUSING (ROTOR)	C - 43
CLEANING	C - 49
PREPARATION	C - 49
INSPECTION / REPAIR	C - 51
PREPARATION	C - 51
ASSEMBLY	C - 60
PREPARATION	C - 60
HOUSING (ROTOR)	C - 61
HOUSING (INTERNAL PARTS)	C - 62
HOUSING (EXTERNAL PARTS II)	C - 74
HOUSING (EXTERNAL PARTS I)	C - 78
AUXILIARY PARTS (II)	C - 87
TURBOCHARGER	C - 93
AUXILIARY PARTS (I)	C - 98
ENGINE STAND DISMOUNTING	C - 101
PROCEDURE	C - 101
INSTALLATION	C - 102
PREPARATION	C - 102
PROCEDURE	C - 103

INDEX

COMPRESSION INSPECTION, PAGE C-9
STANDARD: 830 KPa {8.5 kgf/cm², 120 psi}-250 rpm

ENGINE COOLANT INSPECTION
SERVICE, SECTION E

ENGINE OIL INSPECTION
SERVICE, SECTION D

DRIVE BELT
DEFLECTION AT 98N {10 kgf, 22 lbf}

mm {in}

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

1. Rear oil seal
Replacement page C- 11

2. Engine
Removal page C- 14
Disassembly page C- 23
Cleaning page C- 49
Inspection / Repair page C- 51
Assembly page C- 60
Installation page C-102

OUTLINE

SPECIFICATIONS

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

* TEN terminal of data link connector is grounded.

TROUBLESHOOTING GUIDE

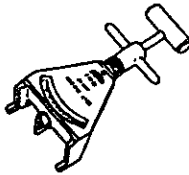
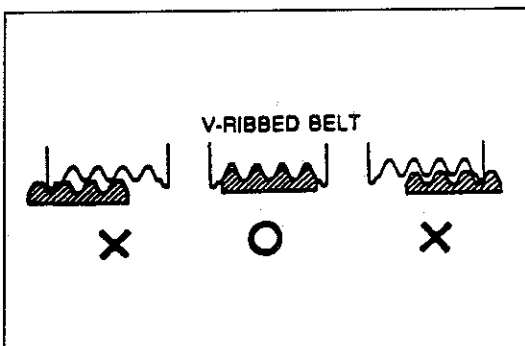
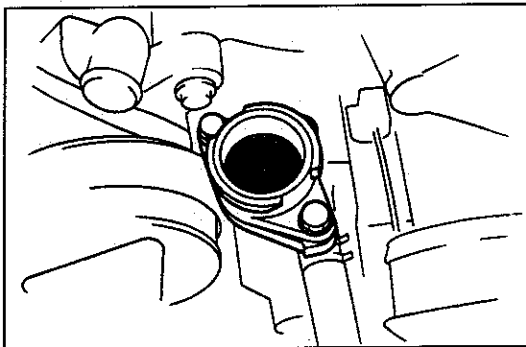
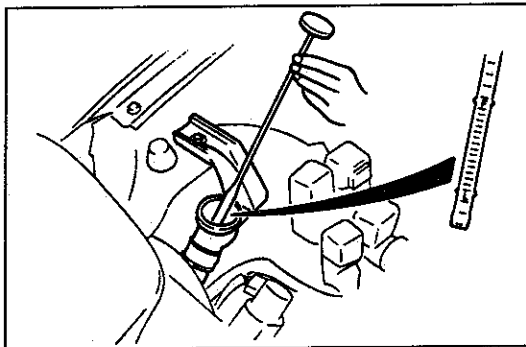
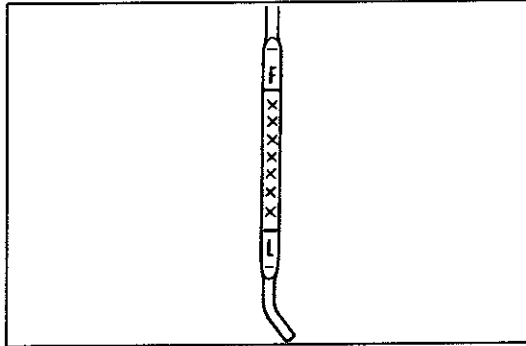
Problem	Possible cause	Action	Page
Difficult starting	Insufficient compression Deformation or abnormal wear of side housing Deformation or abnormal wear of rotor housing Wear of rotor grooves Deformation of or loose rotor seals Worn or weak rotor seal springs	Replace Replace Replace Replace Replace	C-51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

Problem	Possible cause	Action	Page
Insufficient power	Insufficient compression Deformation or abnormal wear of side housing Deformation or abnormal wear of rotor housing Wear of rotor grooves Deformation or loose rotor seals Worn or weak rotor seal springs	Replace Replace Replace Replace	C-51 C-54 C-57, 58 C-57, 58
	Malfunction of fuel system		Section F
	Malfunction of ignition system		Section G
Abnormal combustion	Malfunction of combustion chamber Carbon accumulation	Remove and clean	C-49
	Malfunction of fuel system		Section F
	Malfunction of ignition system		Section G
Excessive oil consumption	Leakage into combustion chamber Deformation or abnormal wear of side housing Malfunction of rotor (blow holes) Scratched or burred rotor land Malfunction of oil seal (incorrect angle)	Replace Replace Replace Replace	C-51 C-54 C-54 C-56
	Leakage into coolant passages Deformed rotor housing Malfunction of sealing rubber	Replace Replace	C-54 —
	Leakage to outside of engine		Section D
	Malfunction of lubrication system		Section D
Engine noise	Rotor seal noise Malfunction of rotor seals Malfunction of housing Malfunction of seal spring Malfunction of metering oil pump	Replace Replace Replace Replace	C-56, 57 C-51, 54 C-56, 57 Section D
	Knocking noise Accumulation of carbon	Remove and clean	C-49
	Hitting noise Malfunction of main bearing or rotor bearing Excessive end play Foreign matter in internal gear or stationary gear or malfunction of gear	Replace Adjust Replace	C-53, 56 C-74 C-53
	Other Malfunction of water pump bearing Loose drive belt Malfunction of alternator bearing Exhaust gas leakage Malfunction of fuel system	Adjust	Section E C-5 Section G Section F Section F

ENGINE TUNE-UP PROCEDURE

PREPARATION
SST

49 9200 020

Tension gauge,
V-ribbed beltFor
inspection of
drive belt tension

ENGINE OIL

Warning

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

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 dipstick and check the oil level and condition.
5. Add or replace oil if necessary.

Note

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

ENGINE COOLANT

Inspection

Coolant level (Engine cold)

Warning

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

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

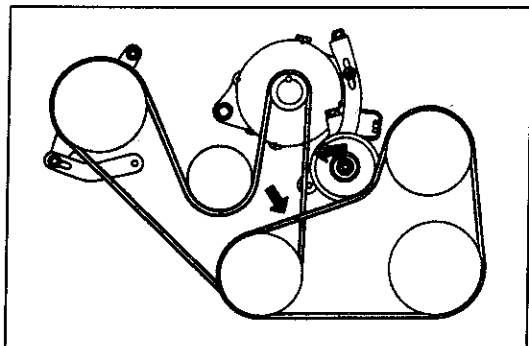
Coolant quality

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

DRIVE BELT

Inspection

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



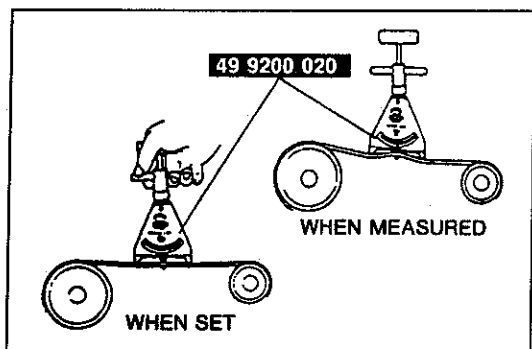
3. Check the drive belt deflection when the engine is cold, or at least 30 minutes after the engine has stopped. Apply moderate pressure **98 N {10 kgf, 22 lbf}** midway between the specified pulleys.

Deflection

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

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

4. If the deflection is not within specification, adjust it.



Drive belt tension check

Note

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

1. Using the SST, check the belt tension.

Tension

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

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

2. If the tension is not within specification, adjust it.

Adjustment

Alternator

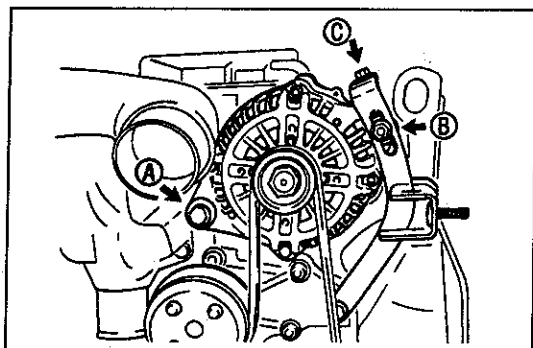
1. Loosen bolt (A) and nut (B).
2. Adjust the belt deflection by turning adjusting bolt (C).

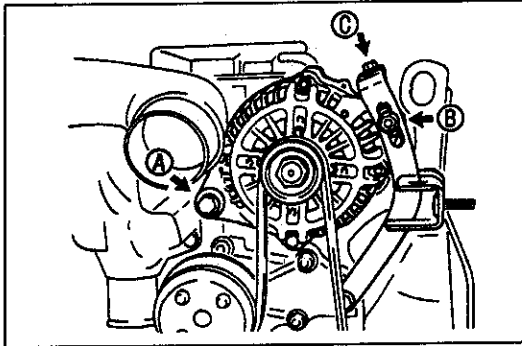
Deflection

New: 6.0-7.0 mm {0.24-0.27 in}

Used: 7.0-7.5 mm {0.28-0.29 in}

Limit: 9.0 mm {0.35 in}



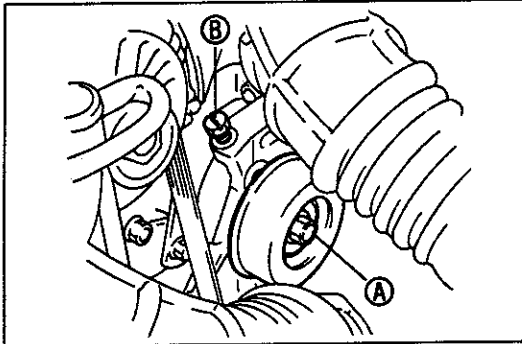


3. Tighten bolt **A** and nut **B**.

Tightening torque:

Bolt **A** 38–51 N·m {3.8–5.3 kgf·m, 28–38 ft·lbf}

Nut **B** 19–25 N·m {1.9–2.6 kgf·m, 14–18 ft·lbf}



P/S, A/C

1. Loosen idler pulley locknut **A**.

2. Adjust the belt deflection by turning adjusting bolt **B**.

Deflection

New: 3.5–4.0 mm {0.14–0.15 in}

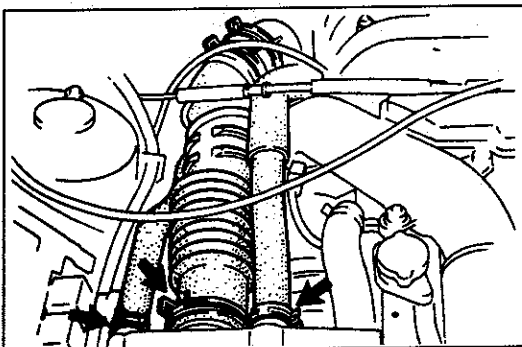
Used: 4.5–5.0 mm {0.18–0.19 in}

Limit: 6.0 mm {0.24 in}

3. Tighten nut **A**.

Tightening torque:

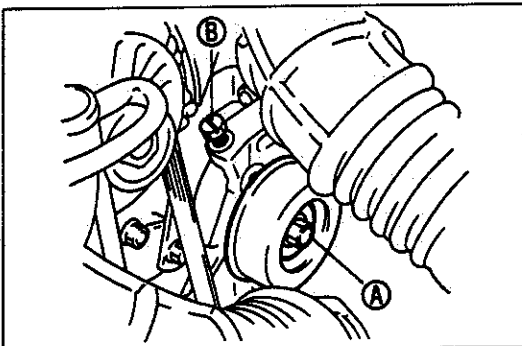
37–53 N·m {3.7–5.5 kgf·m, 27–39 ft·lbf}



Replacement

P/S, A/C

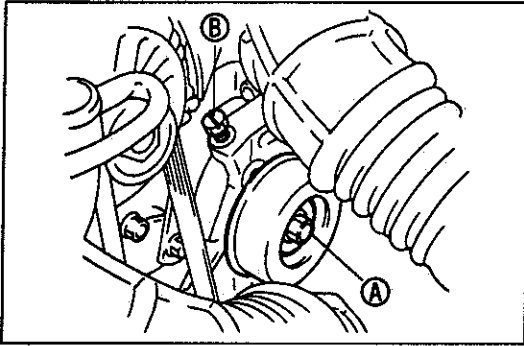
1. Disconnect the air hoses shown in the figure.



2. Loosen idler pulley locknut **A**.

3. Loosen adjusting bolt **B**.

4. Remove the belt.



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

Deflection

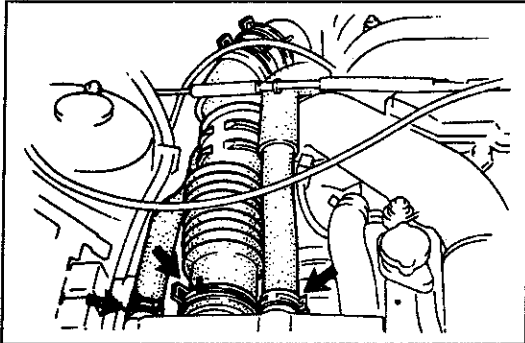
3.5–4.0mm {0.14–0.15 in}

7. Tighten idler pully locknut (A).

Tightening torque:

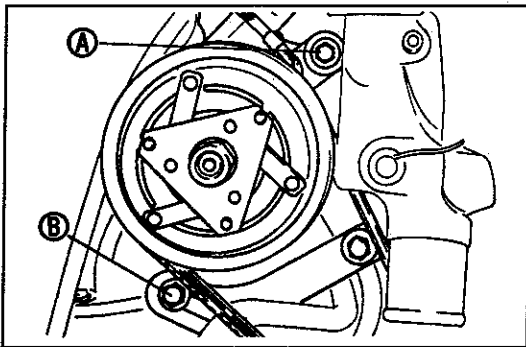
37–53 N·m {3.7–5.5 kgf·m, 27–39 ft·lbf}

8. Connect the air hoses.

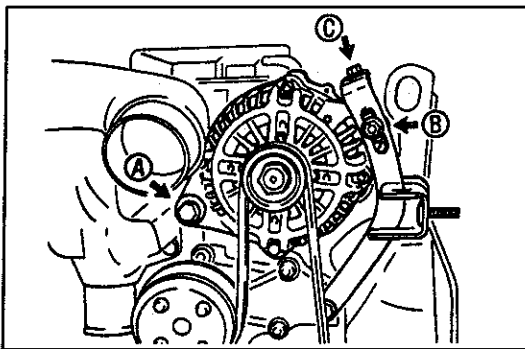


Alternator

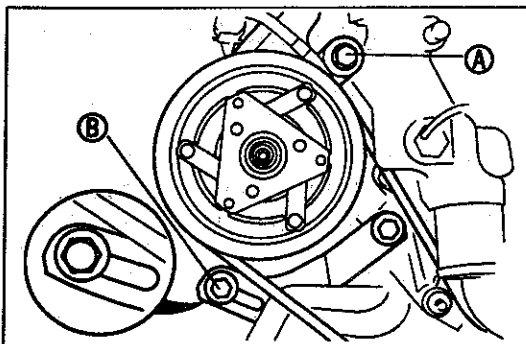
1. Disconnect the air hoses shown in the figure.



2. Loosen air pump mount bolts (A) and (B).



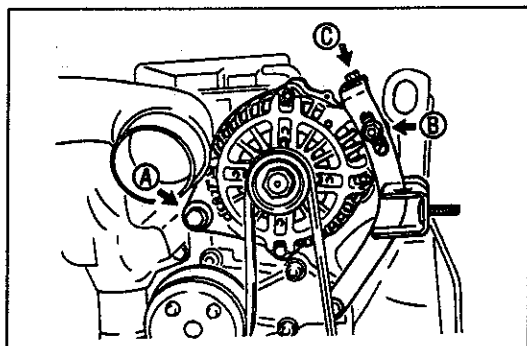
3. Loosen alternator mount bolt (A) and locknut (B).
4. Loosen adjusting bolt (C).
5. Remove the drive belt.



6. Install the new drive belt on the pulleys.
7. Tighten the air pump mount bolts (A) and (B) while applying the pressure to the drive belt.

Tightening torque:

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



8. Adjust the belt deflection by turning adjusting bolt ③.

Deflection

6.0–7.0 mm {0.24–0.27 in}

9. Tighten alternator mount bolt ① and locknut ②.

Tightening torque:

Bolt ① 38–51 N·m {3.8–5.3 kgf·m, 28–38 ft·lbf}

Nut ② 19–25 N·m {1.9–2.6 kgf·m, 14–18 ft·lbf}

10. Connect the air hoses.

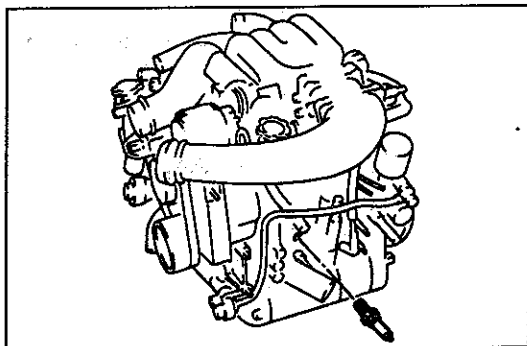
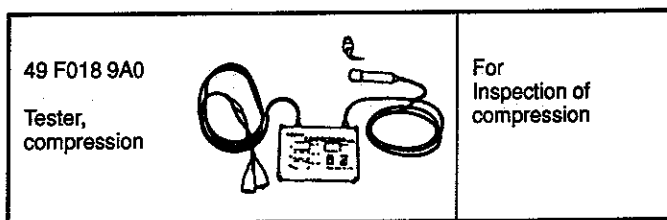
COMPRESSION

If the engine exhibits low power, poor fuel economy, or poor idle, check the following:

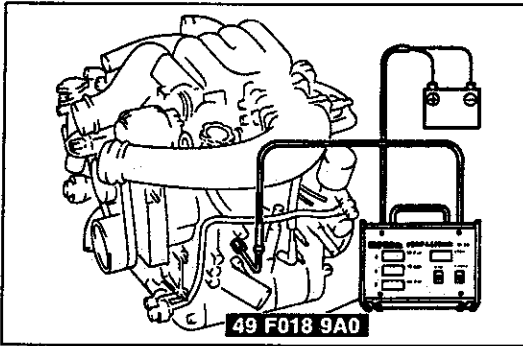
1. Ignition system (Refer to Section G.)
2. Compression
3. Fuel system (Refer to Section F.)

PREPARATION

SST



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



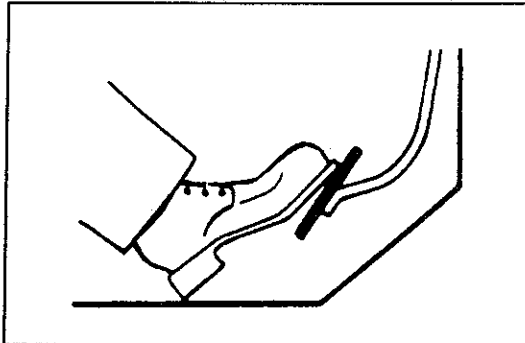
6. Connect the **SST** to the front rotor housing and the battery.
7. Fully depress the accelerator pedal and crank the engine for 5 to 10 seconds.
8. Record the compression of the three combustion chambers and cranking speed.

Compression:

690 kPa {7.0 kgf/cm², 100 psi}–250 rpm

Differential limit of chambers:

150 kPa {1.5 kgf/cm², 21 psi}–250 rpm

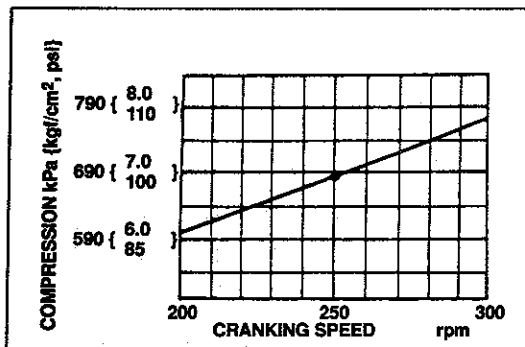


- 1) If pressure is below 290 kPa {3.0 kgf/cm², 43 psi} at one or two chambers of a rotor, the tester indicates one correct measurement and two 00.0 readings.
- 2) If pressure is below 290 kPa {3.0 kgf/cm², 43 psi} at three chambers, the tester indicates three 00.0 readings.
- 3) In the above cases,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

9. Check the rear chambers by using the same procedure.
10. Compensate the compression values if they are measured at cranking speeds other than standard or if they are measured at high altitude.

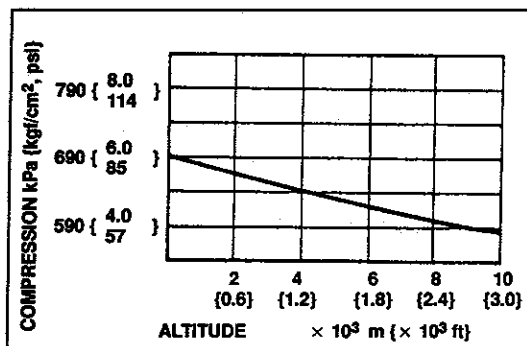
Cranking speed compensation

Compensate the compression according to the cranking speed.



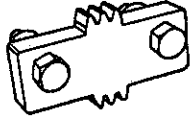
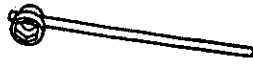

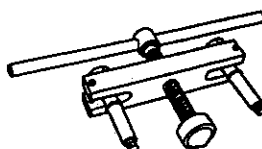
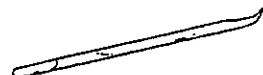
Altitude compensation

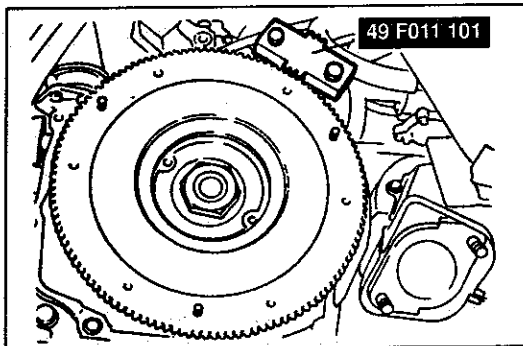
Compensate the compression according to the altitude.



ON-VEHICLE MAINTENANCE

REAR OIL SEAL
PREPARATION
SST

49 F011 101 Brake, ring gear		For prevention of eccentric shaft rotation	49 0820 035 Box wrench, flywheel		For removal of flywheel locknut
49 1881 055A Stopper, counterweight		For prevention of eccentric shaft rotation	49 0839 305A Puller, counterweight		For removal of counterweight
49 0813 225 Remover, oil seal		For Removal of oil seal			



Removal Note

1. Disconnect the negative battery cable.
2. Drain the engine oil.
3. Remove the manual transmission. (Refer to Section J.)
Remove the automatic transmission. (Refer to Section K.)

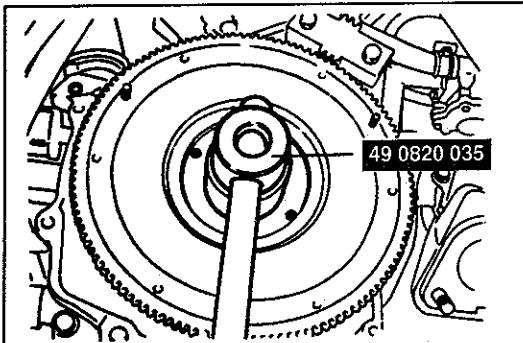
(MT)

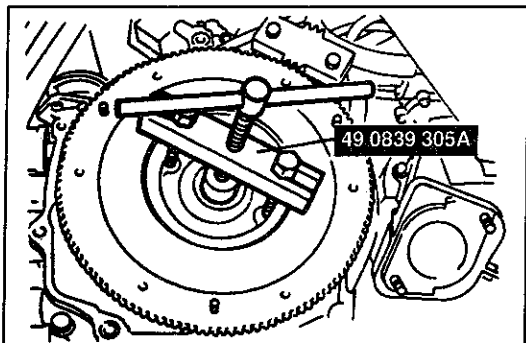
- (1) Remove the clutch cover and clutch disc. (Refer to Section H.)
- (2) Install the **SST** against the flywheel.

Caution

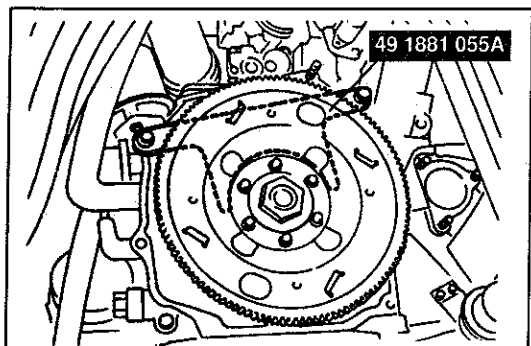
- Place a rag between the **SST** and the vacuum pipes to protect the pipes.

- (3) Remove the lock nut by using the **SST**.

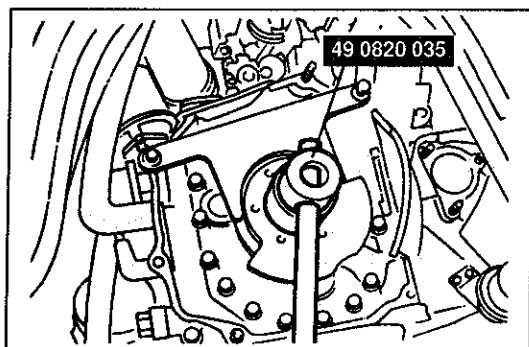




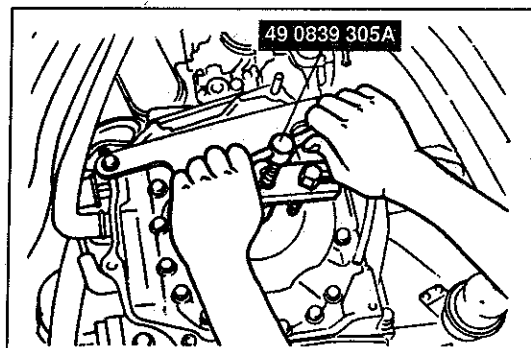
- (4) Remove the flywheel by using the SST.
- (5) Remove the key.



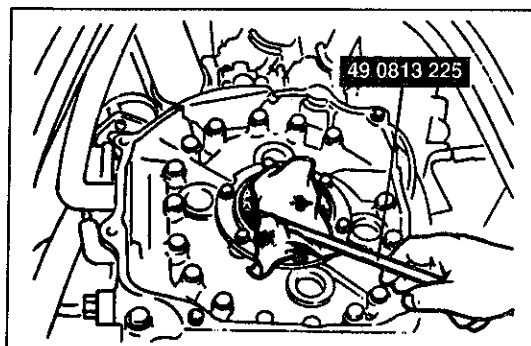
- (AT)
- (1) Install the SST against the counterweight.



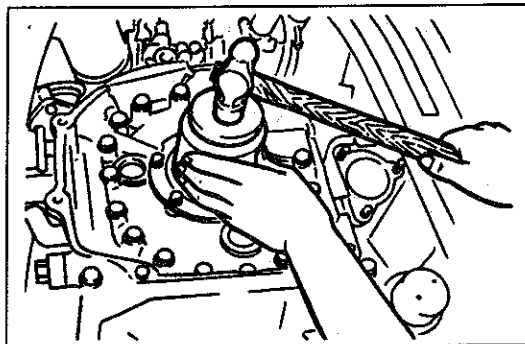
- (2) Remove the back plate and drive plate.
- (3) Remove the lock nut by using the SST.



- (4) Remove the counterweight by using the SST.

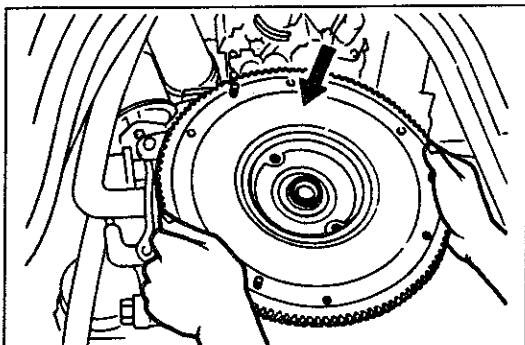


- (MT and AT)
- 4. Remove the oil seal by using the SST.

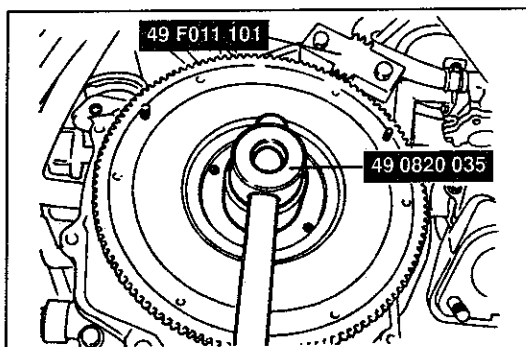
**Installation Note****Rear oil seal**

1. Apply engine oil to the seal lip.
2. Fit the oil seal onto the stationary gear.
3. Using a pipe and hammer, tap the oil seal in evenly until it is flush with the edge of the rear cover.

Oil seal outer diameter: 95.0 mm {3.74 in}

**Flywheel (MT)**

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



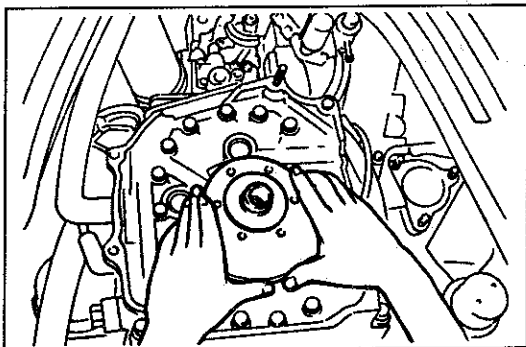
5. Install the lock nut and tighten it with the SST.

Tightening torque:

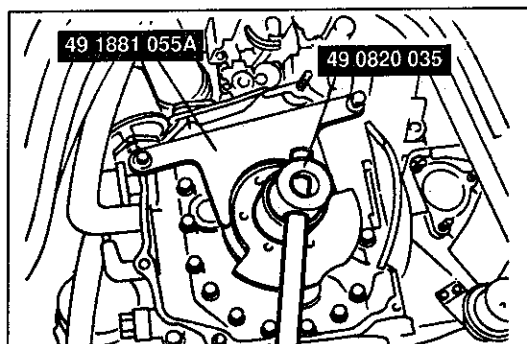
400–490 N·m {40–50 kgf·m, 290–360 ft·lbf}

Caution

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

**Drive plate (AT)**

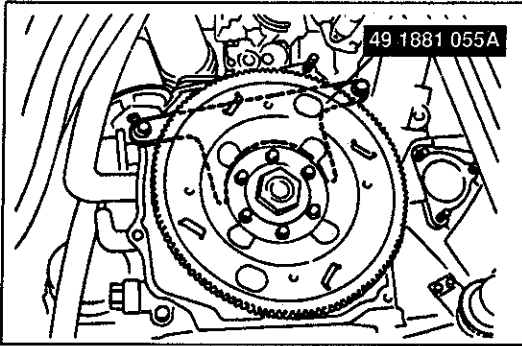
1. Fit the key to the eccentric shaft.
2. Install the counterweight to the eccentric shaft.
3. Apply thread-locking compound to the eccentric shaft threads.
4. Apply sealant to the contact surface of the lock nut.



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

Tightening torque:

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



6. Install the drive plate and the back plate.

Tightening torque:

44–60 N·m {4.4–6.2 kgf·m 32–44 ft·lbf}

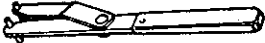
Steps After Installation

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

REMOVAL

PREPARATION

SST

<p>49 W023 585A</p> <p>Adjust wrench</p> 	<p>For prevention of P/S oil pump rotation</p>
--	--

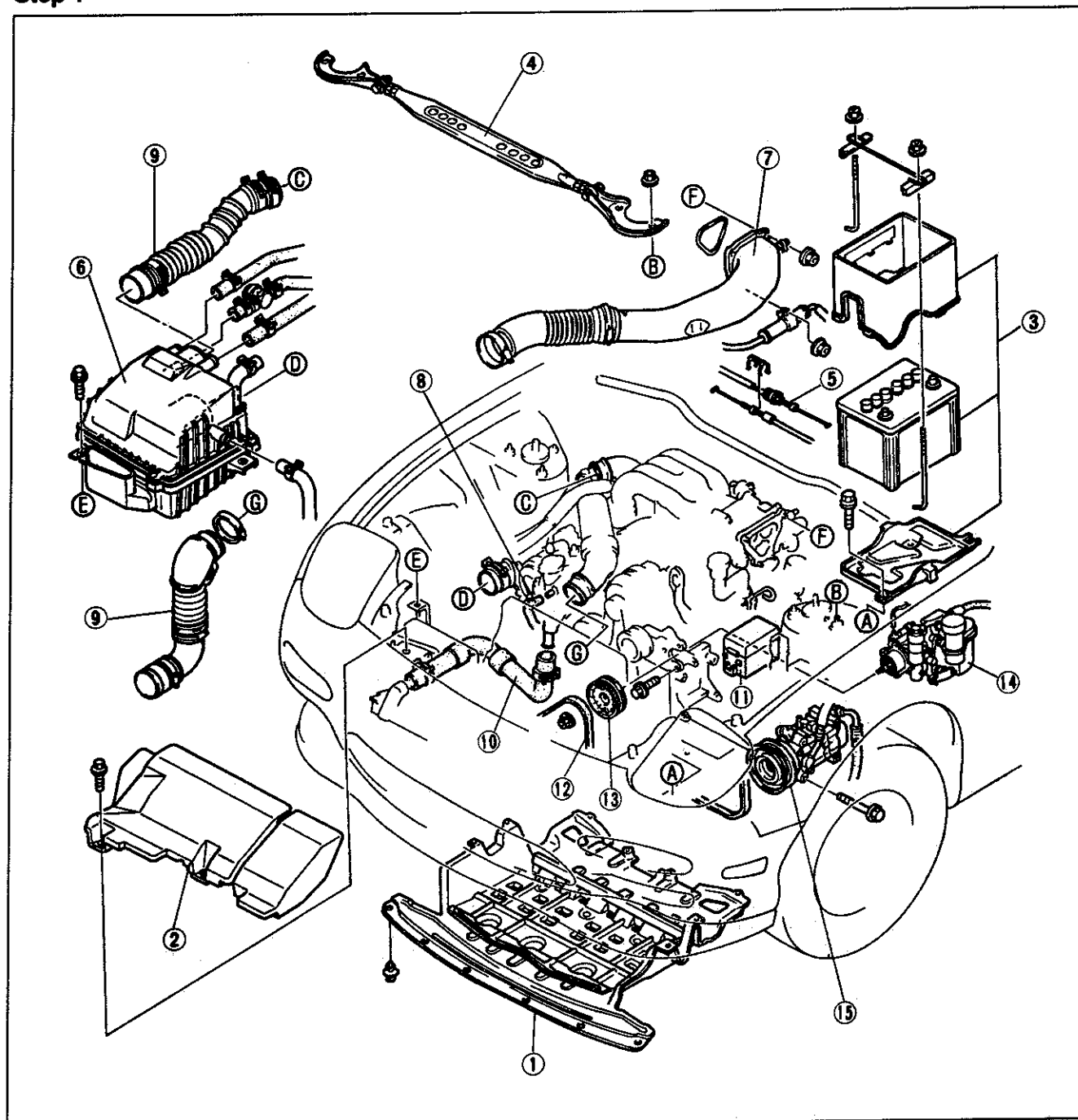
PROCEDURE

Warning

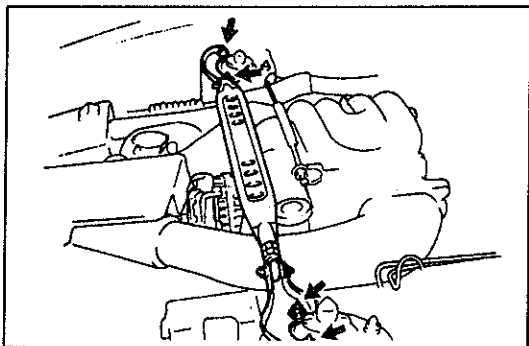
- Release the fuel pressure. (Refer to Section F)
- Keep sparks and open flames away from fuel area.

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

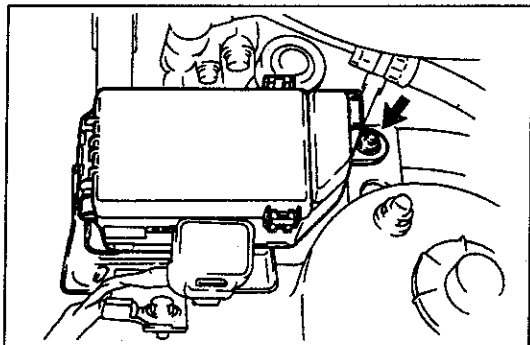
Step 1



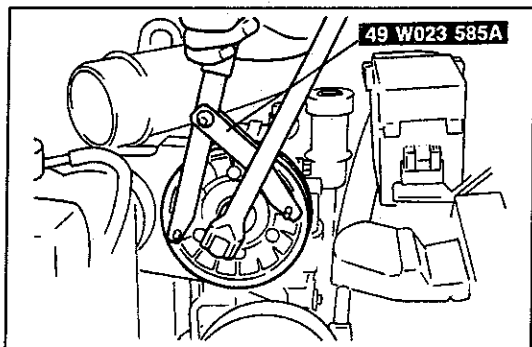
- | | |
|------------------------------|------------------------------|
| 1. Undercover | 11. Fuse box |
| 2. Fresh-air duct | Removal Note page C-16 |
| 3. Battery and box | 12. Drive belt |
| 4. Strut bar | Removal Note page C- 7 |
| Removal Note page C-16 | 13. P/S oil pump pulley |
| 5. Accelerator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

**Removal Note****Strut bar**

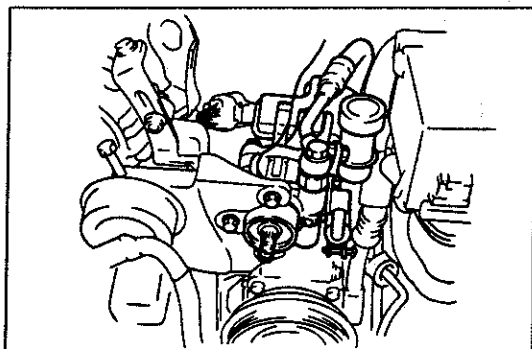
1. Remove the strut bar.
2. Temporarily tighten the lock nut to the stud bolt.

**Fuse box**

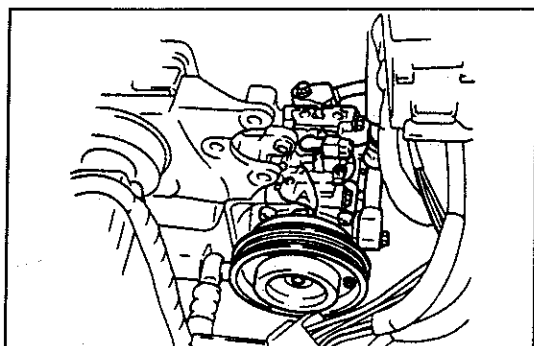
Remove the fuse box with the harness still connected.

**P/S oil pump pulley**

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

**P/S oil pump**

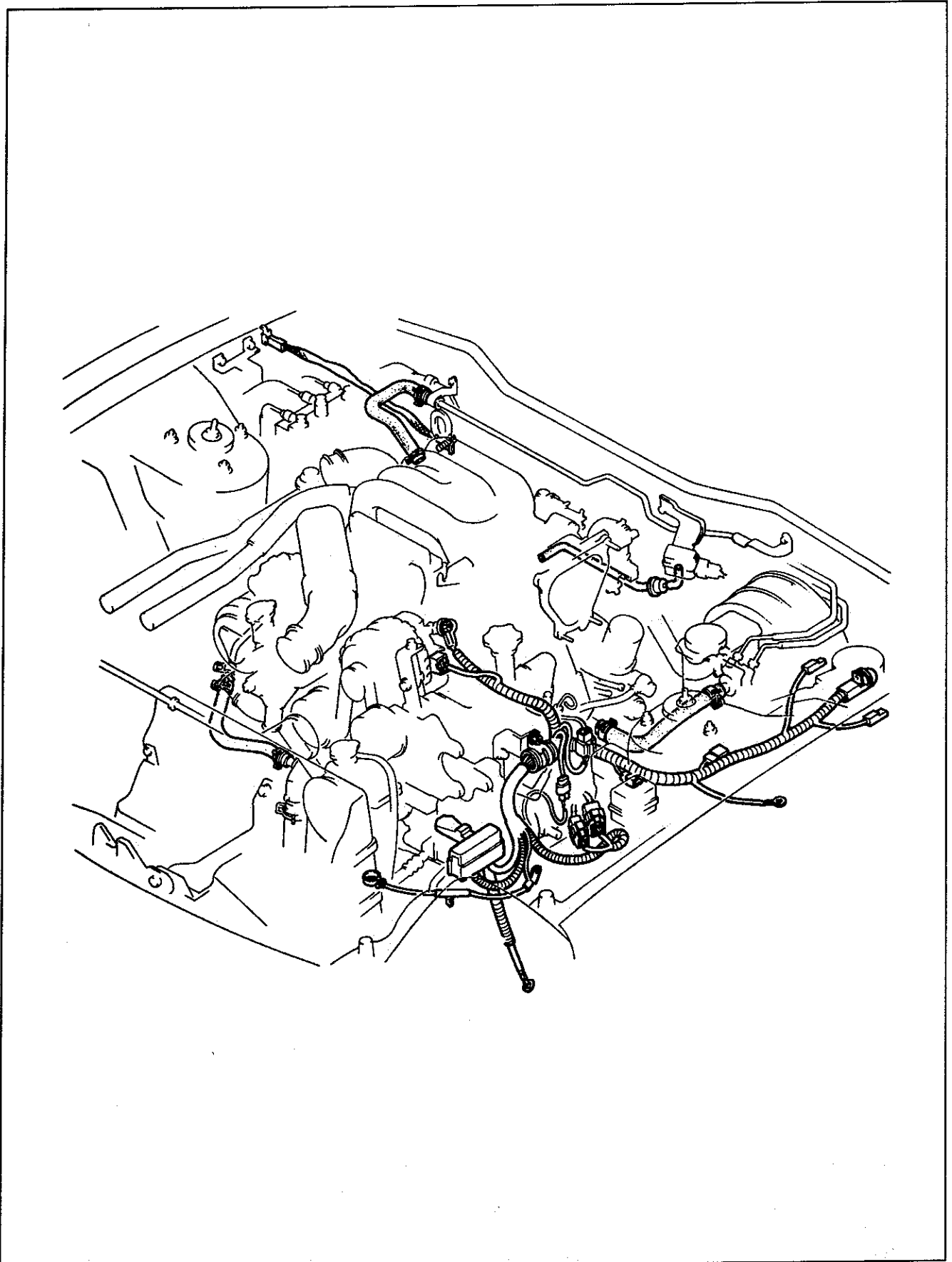
1. Remove the P/S oil pump with the hose still connected.
2. Position the pump away from the engine, and support it with wire.

**A/C Compressor**

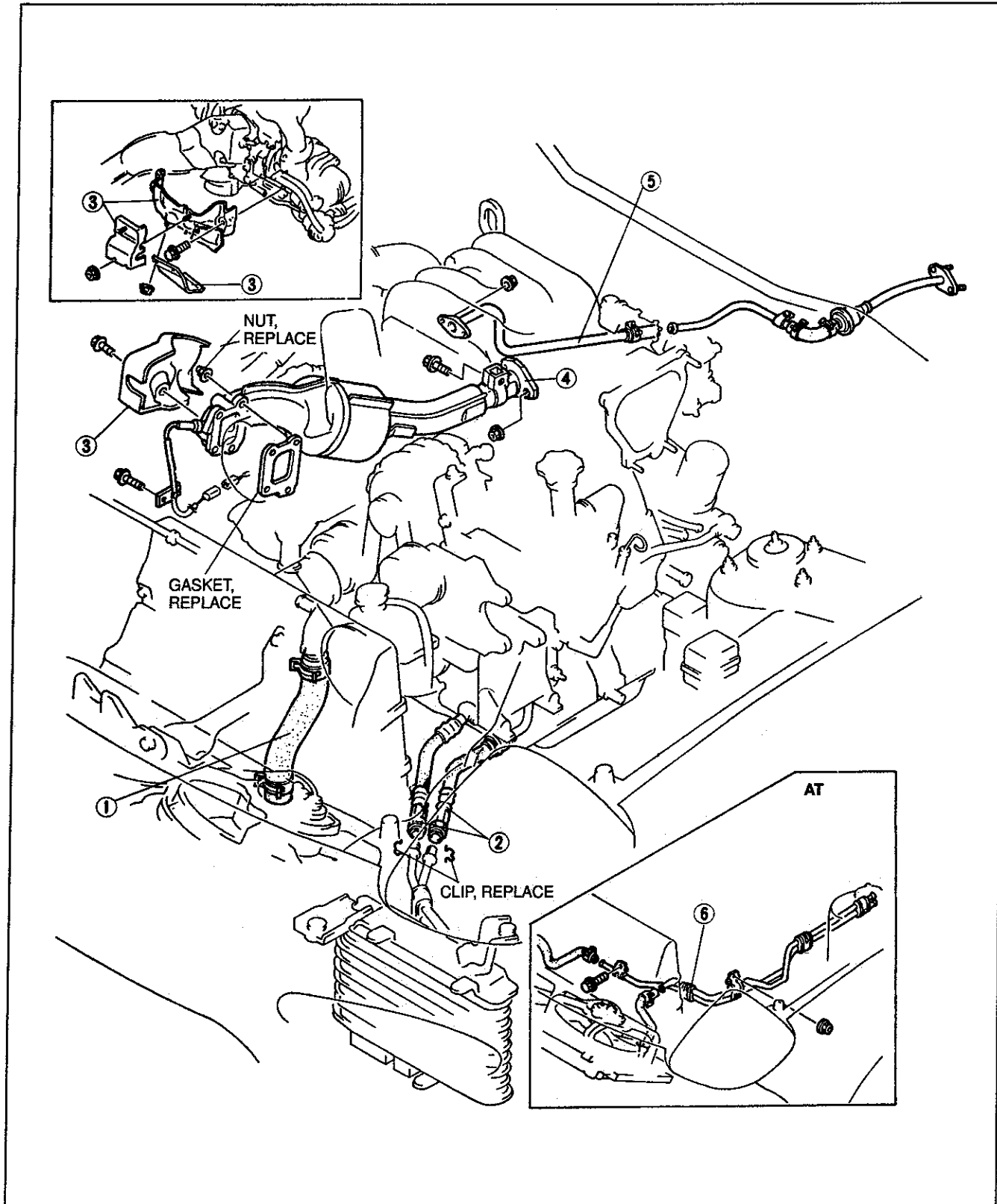
1. Remove the A/C compressor with the hoses still connected.
2. Position the compressor away from the engine, and support it with wire.

Step 2

Disconnect the harness connectors and hoses.



Step 3



1. Radiator hose (lower)

2. Oil pipe

Removal Note page C-19

3. Insulator

Removal Note page C-19

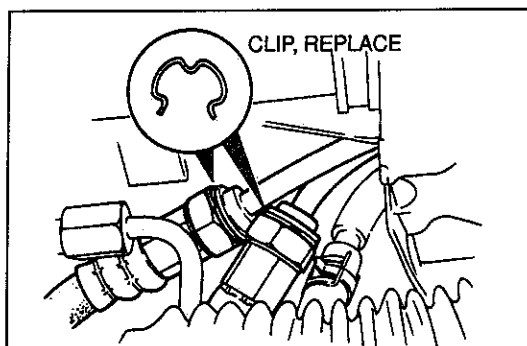
4. Front exhaust pipe

Removal Note page C-19

5. Split air pipe

6. Oil cooler pipe (AT)

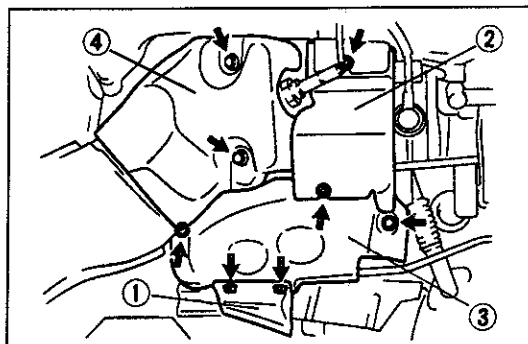
Removal Note page C-19



Removal Note

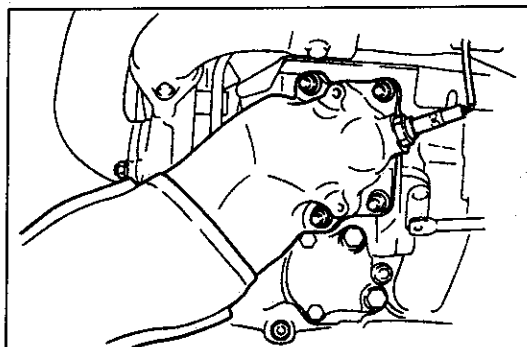
Oil pipe

Remove the clip and disconnect the oil pipe, using a drain pan to catch the oil.



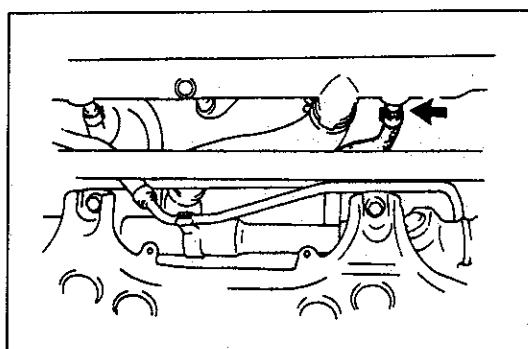
Insulator

Remove the insulators in the order shown in the figure. Keep the surface of the insulator free from oil.



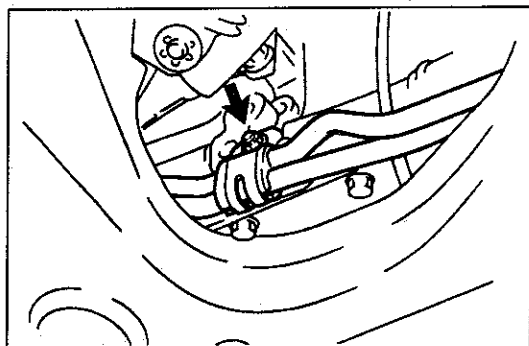
Front exhaust pipe

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



Oil cooler pipe (AT)

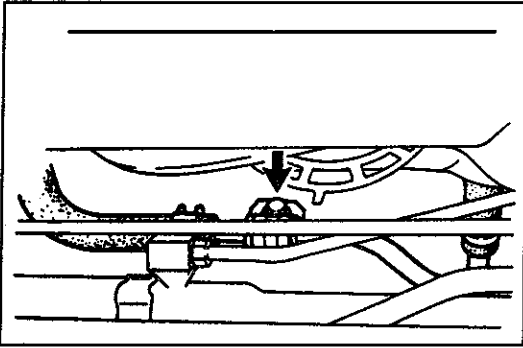
1. Disconnect the oil cooler pipe.



2. Remove the nut shown in the figure.

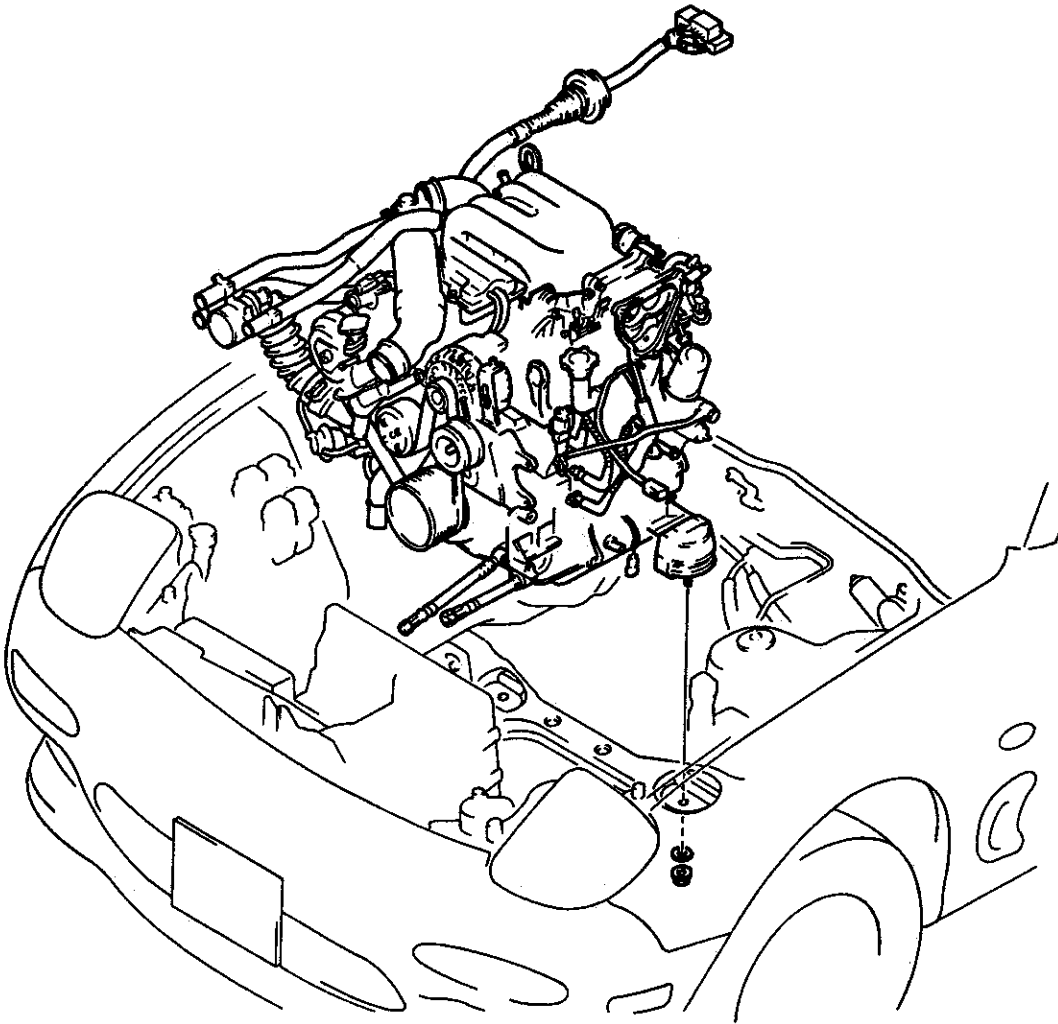
C

REMOVAL



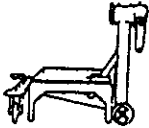

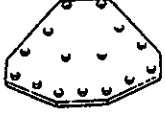
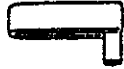




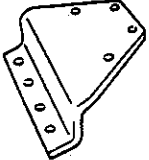
3. Remove the bolt shown in the figure and disconnect the oil cooler pipe from the engine.

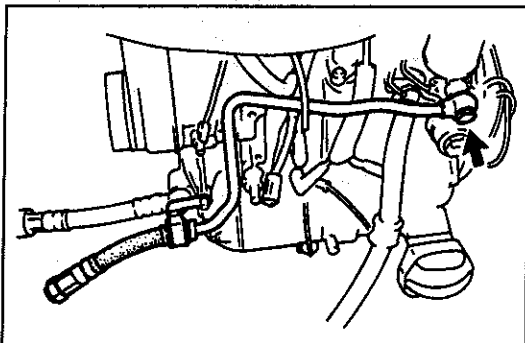
Step 4
Remove the engine assembly.



ENGINE STAND MOUNTING

PREPARATION
SST

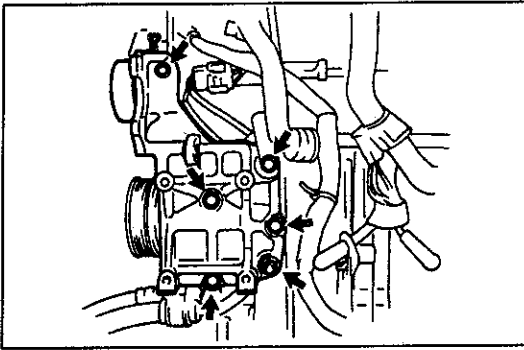
49 0107 680A Stand, engine 	For disassembly / assembly of engine	49 L010 1A0 Hanger set, engine stand 	For disassembly / assembly of engine
49 L011 101 Plate (Part of 49 L011 1A0) 	For disassembly / assembly of engine	49 L010 102 Arms (Part of 49 L010 1A0) 	For disassembly / assembly of engine
49 L010 103 Hooks (Part of 49 L011 1A0) 	For disassembly / assembly of engine	49 L010 104 Nuts (Part of 49 L010 1A0) 	For disassembly / assembly of engine
49 L010 105 Bolts (Part of 49 L010 1A0) 	For disassembly / assembly of engine	49 L010 106 Bolts (Part of 49 L010 1A0) 	For disassembly / assembly of engine
49 1114 005 Hanger, engine 	For disassembly / assembly of engine		



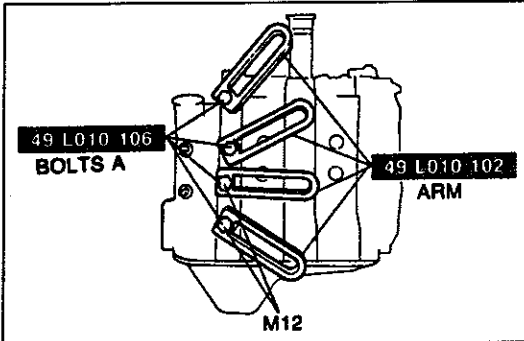
PROCEDURE

When using 49 L010 1A0

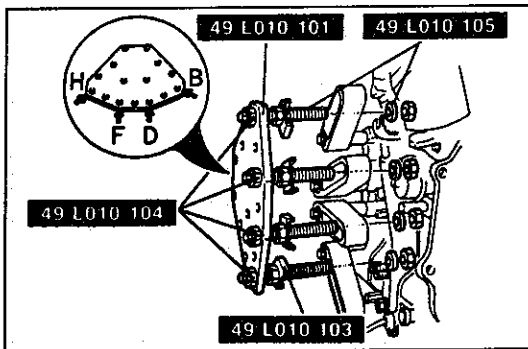
1. Remove the oil pipe.



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



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



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

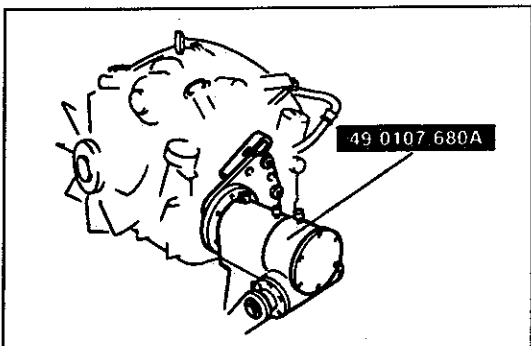
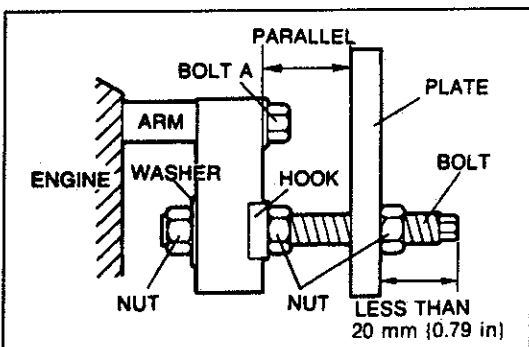
Warning

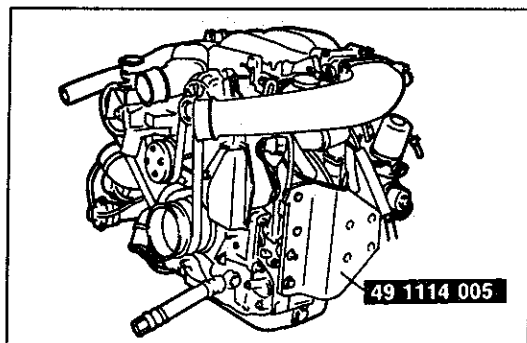
- Although the engine stand has a self-locking brake system, there is a possibility that the brake may not be effective in the following situations:

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

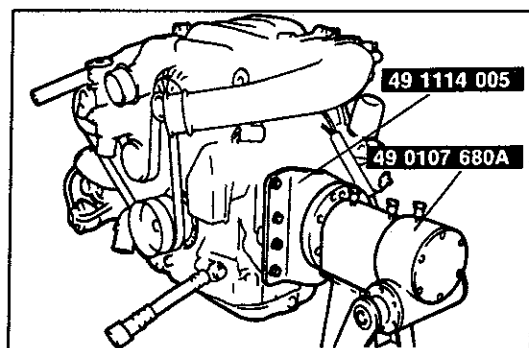
Either of these situations could lead to sudden, rapid movement of the engine and mounting stand handle and cause serious injury. Never keep the engine in an unbalanced position, and always hold the rotating handle firmly when turning the engine.

7. Tighten the bolts and nuts to affix the SST.
8. Install the engine on the SST (engine stand).



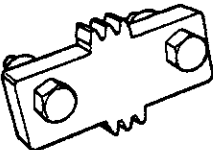
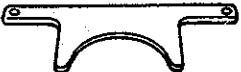
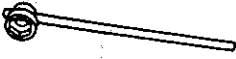
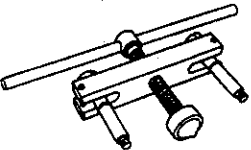
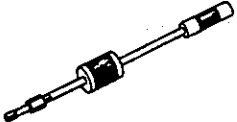


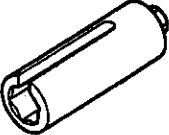
**When using 49 1114 005**

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



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

DISASSEMBLY**PREPARATION****SST**

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

Warning

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

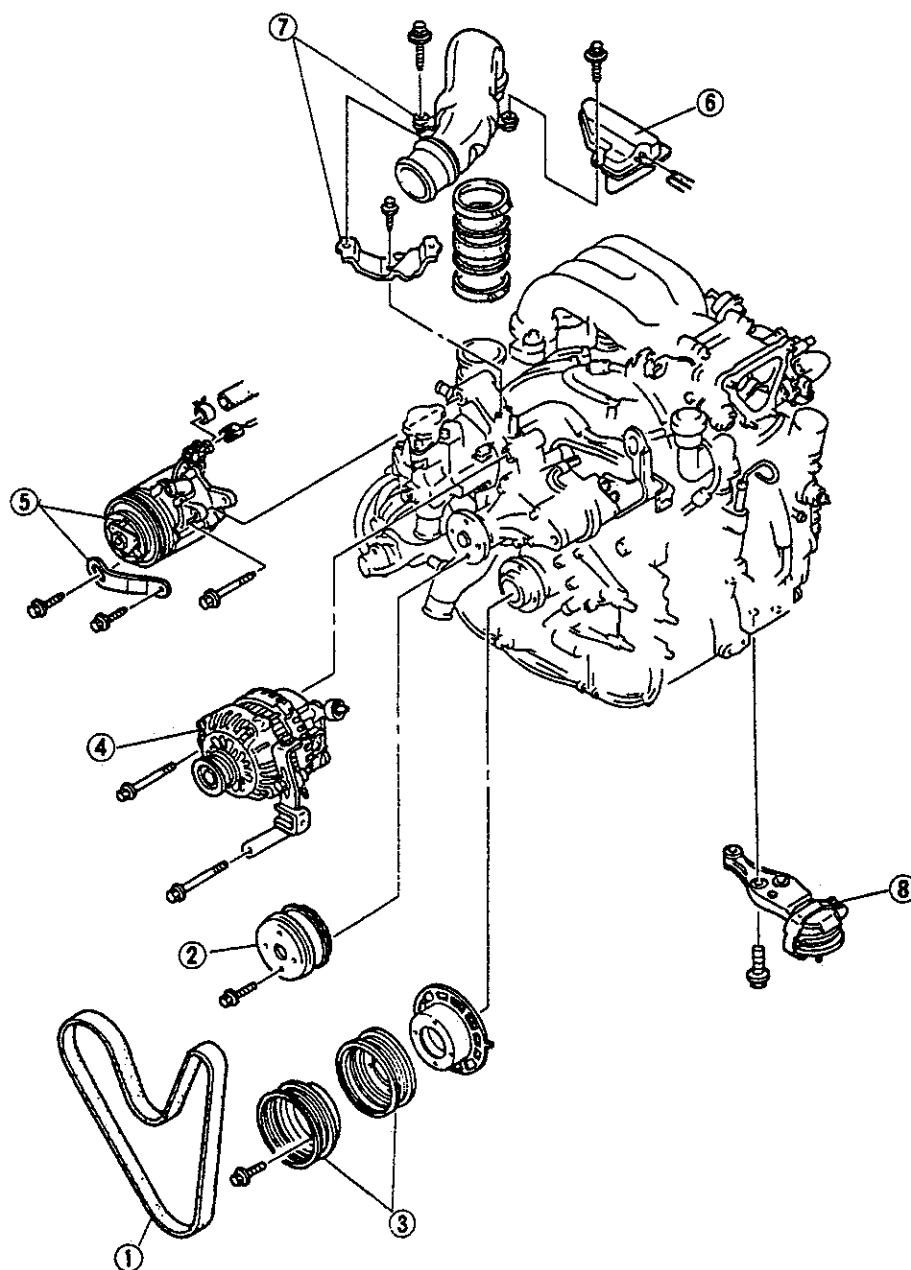
C

DISASSEMBLY

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

AUXILIARY PARTS (I)

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



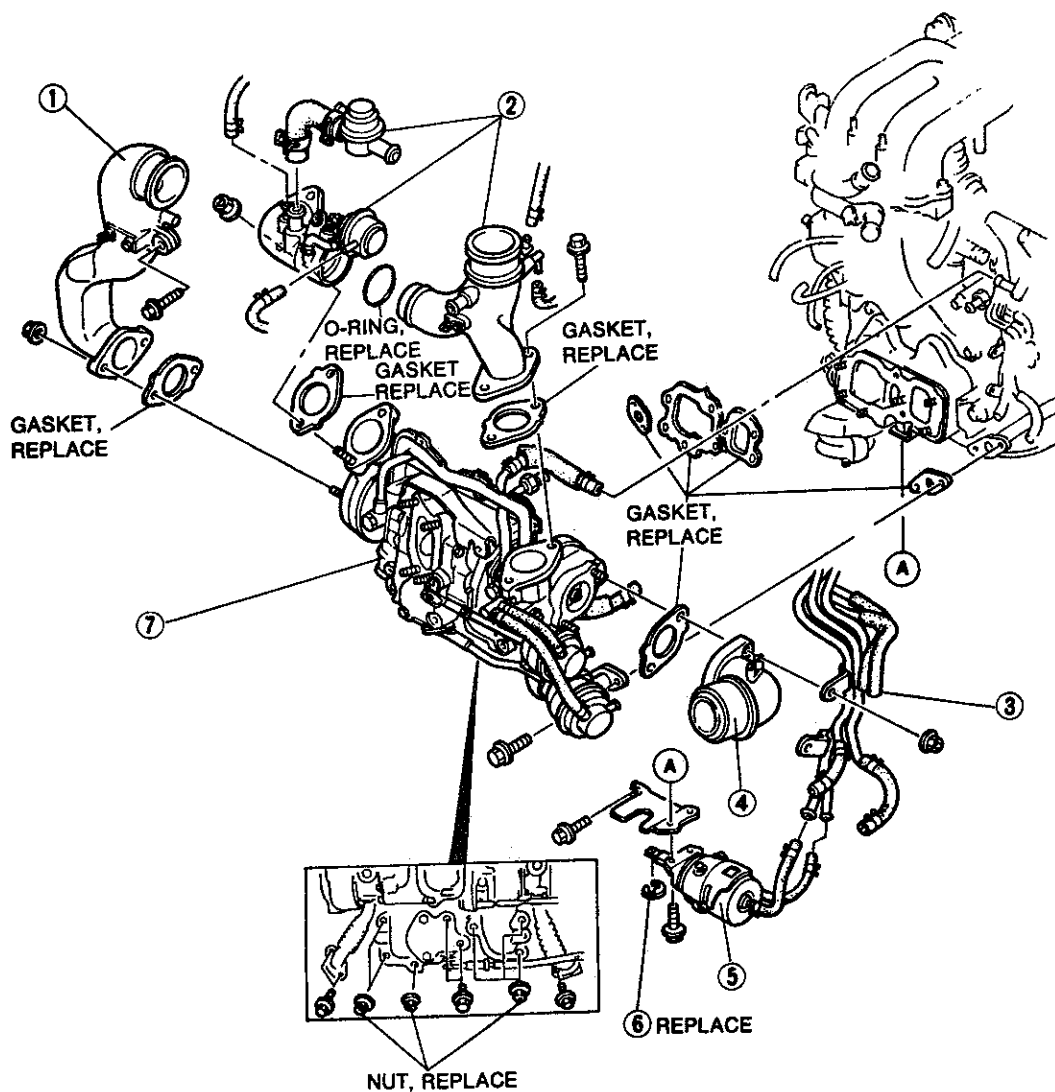
1. Drive belt
2. Water pump pulley
3. Drive belt pulley
4. Alternator and bracket

5. Air pump and bracket
6. Pressure chamber
7. Air pipe and bracket
8. Engine mount (RH and LH)

TURBOCHARGER**Turbocharger handling procedures.**

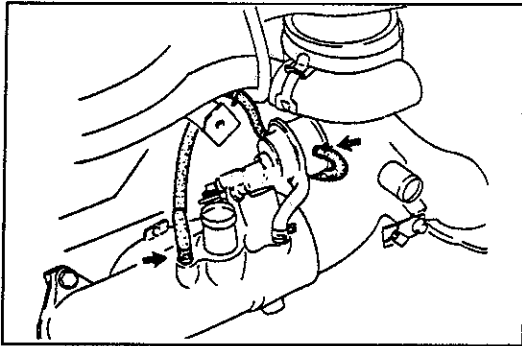
- Holding the actuator, the rod, or the actuator hose when removing and carrying the turbocharger can cause damage.
- Set the turbine down with the shaft horizontal.
- Replace damaged studs and nuts. Use only the specified studs and nuts. Using damaged or unspecified studs and nuts can cause gas leakage because of insufficient clamping.
- Protect the oil pipe from deformation. Deformation will inhibit oil flow and may damage the turbocharger due to overheating.
- Foreign material in the oil line can damage the turbocharger. Keep the oil line clean.
- Cover the turbocharger air port and exhaust port with tape to keep out foreign material. It can damage the turbocharger's internal components.
- Protect the insulators from deformation and oil. Deformed or oily insulators can lead to damage to the turbocharger due to overheating.

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



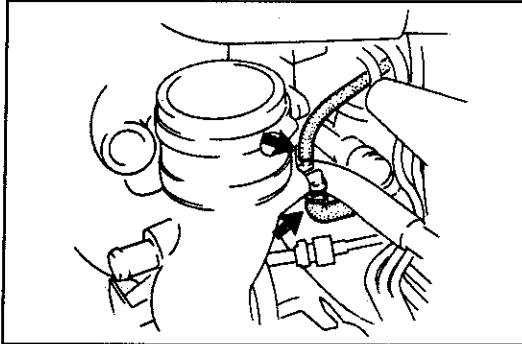
- 1. Air pipe
- 2. Air pipe and control valve
Disassembly Note page C-27
- 3. Vacuum pipe and hoses
Disassembly Note page C-27

- 4. Air intake pipe
- 5. Turbo control actuator
Disassembly Note page C-27
- 6. Clip
- 7. Turbocharger assembly
Disassembly Note page C-28

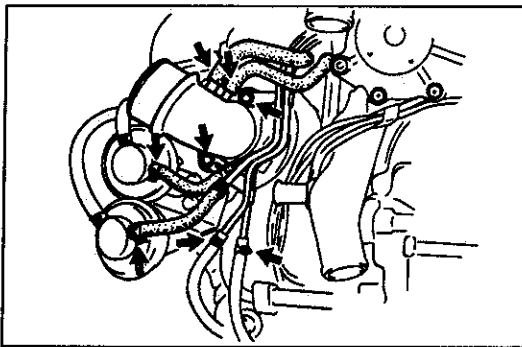


Disassembly Note
Air pipe and control valve

1. Disconnect the hoses shown in the figure.

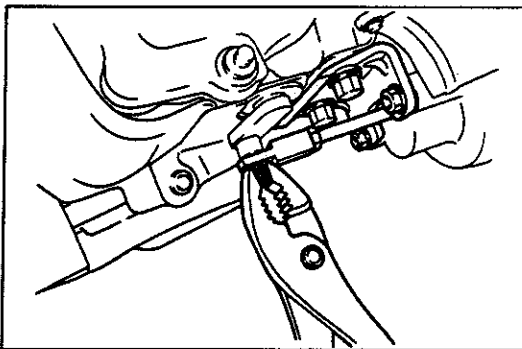


2. Disconnect the vacuum hoses shown in the figure.
3. Remove the air pipe and control valve assembly.



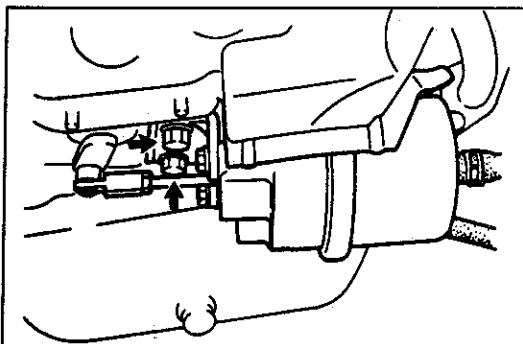
Vacuum pipe and hoses

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

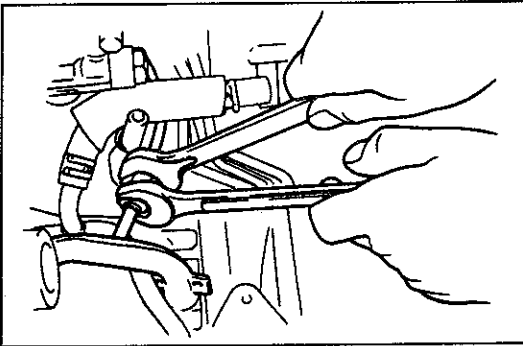


Turbo control actuator

1. Remove the clip shown in the figure.

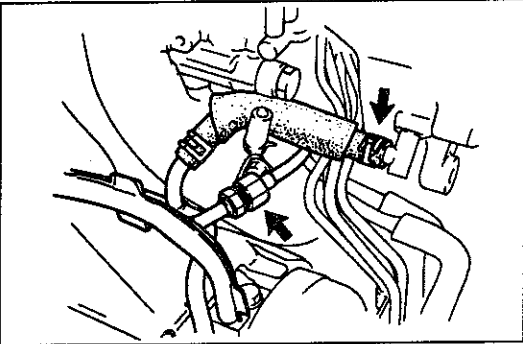


2. Remove the bolts and remove the turbo control actuator.

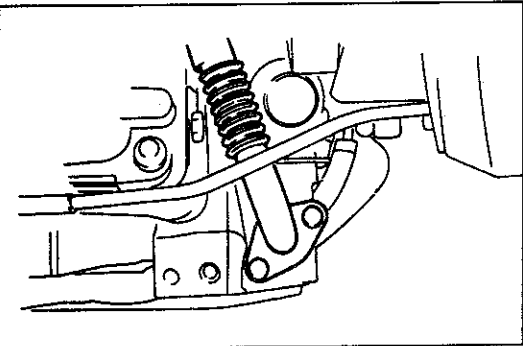
**Turbocharger assembly****Caution**

- Hold the pipe by using a wrench.

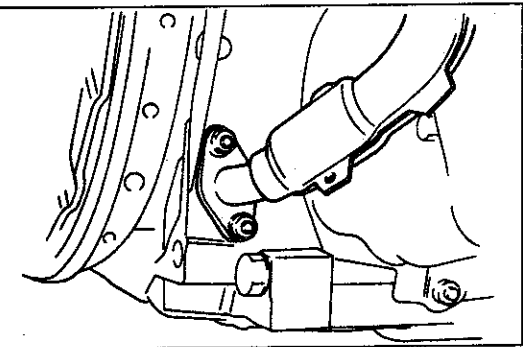
1. Use two wrenches when disconnecting the oil inlet pipe.



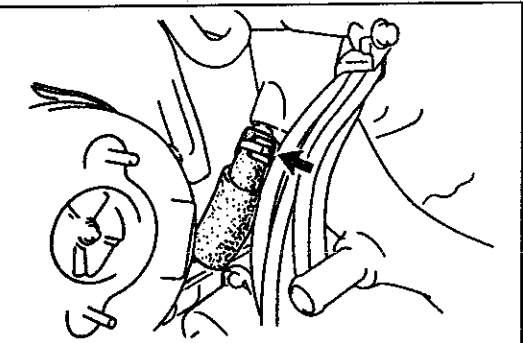
2. Disconnect the water hose and oil inlet pipe.

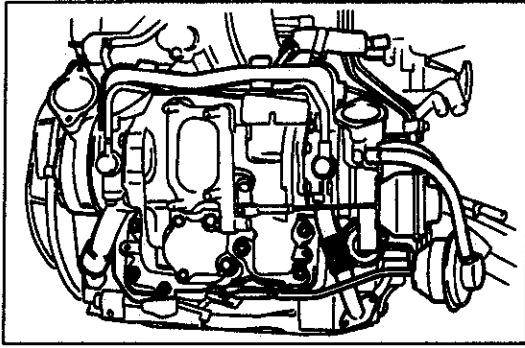


3. Disconnect the oil outlet pipes.



4. Disconnect the water hose.

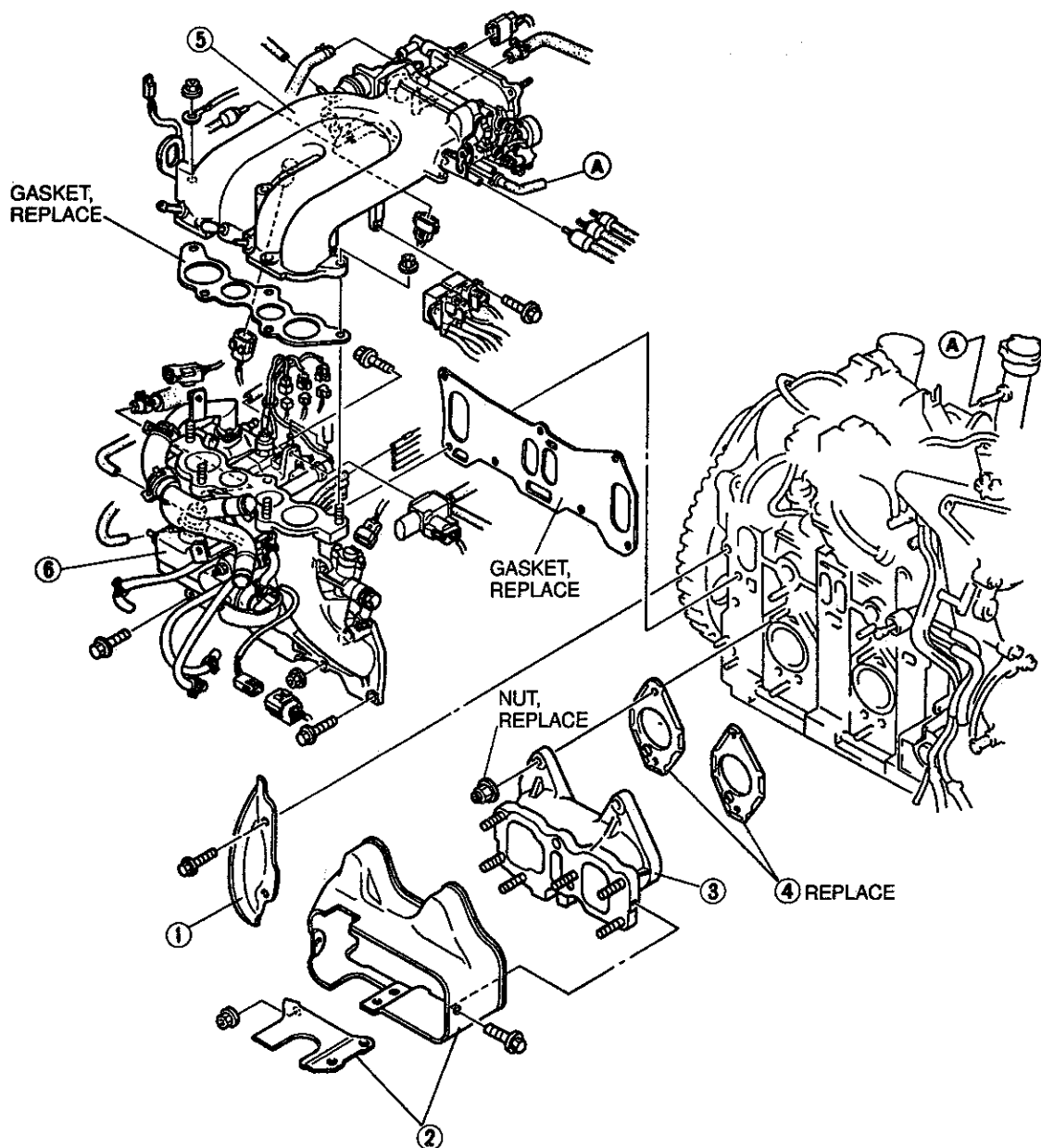




5. Remove the bolts and nuts and remove the turbocharger assembly.

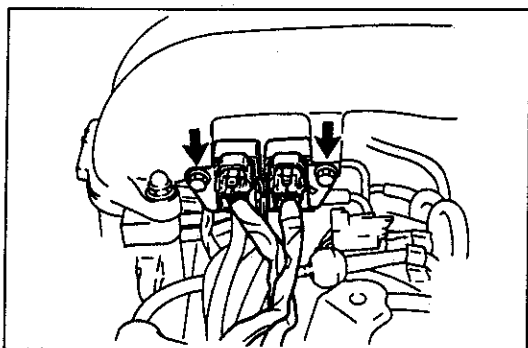
AUXILIARY PARTS (II)

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



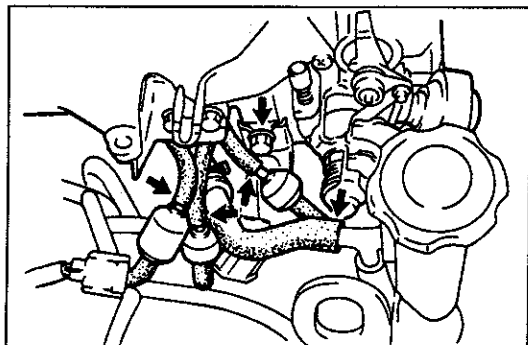
- 1. Seal plate
- 2. Exhaust manifold insulator
- 3. Exhaust manifold
- 4. Exhaust manifold gasket

- 5. Surge tank assembly
Disassembly Note page C-31
- 6. Intake manifold assembly
Disassembly Note page C-32

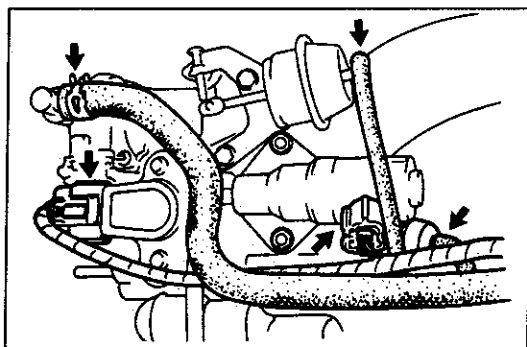


Disassembly Note
Surge tank assembly

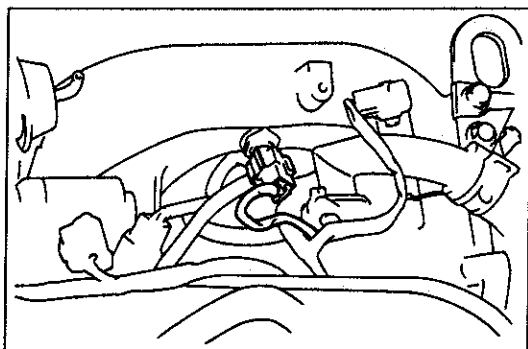
1. Remove the bolts shown in the figure.
2. Disconnect the duty solenoid valve from the surge tank.



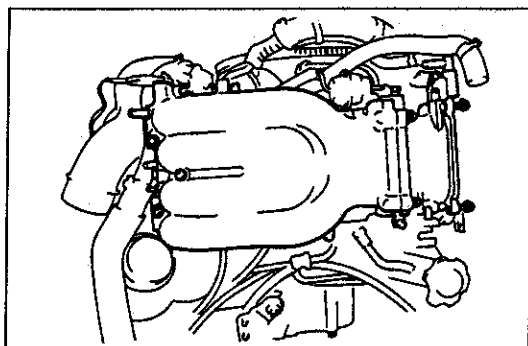
3. Disconnect the vacuum hoses and blowby hose shown in the figure.
4. Loosen the bolt shown in the figure.



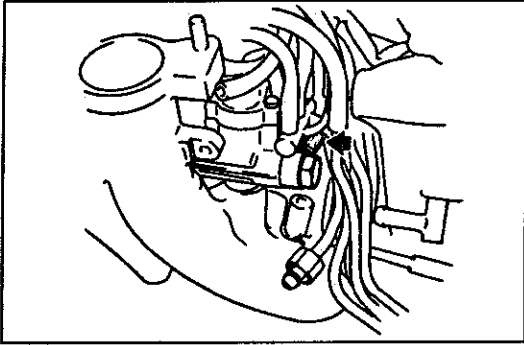
5. Disconnect the hoses and connectors shown in the figure.



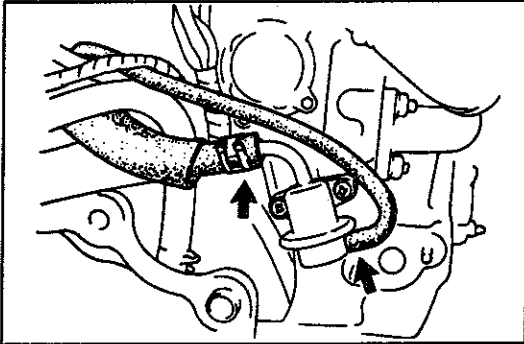
6. Disconnect the connector shown in the figure.



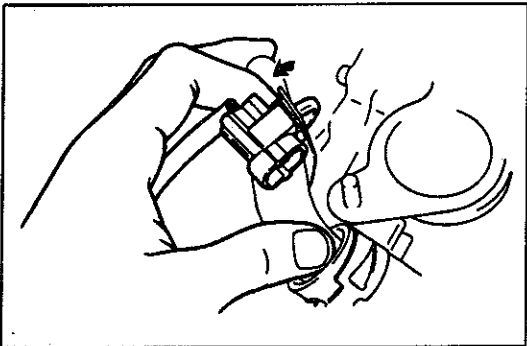
7. Remove the bolts and remove the surge tank assembly.

**Intake manifold assembly**

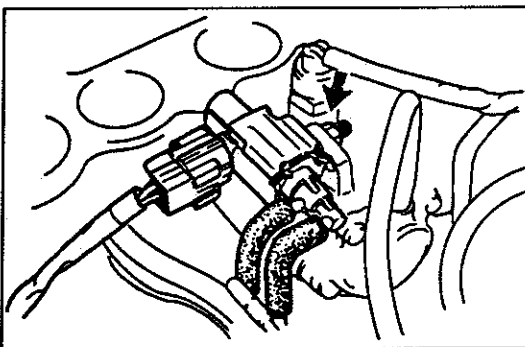
1. Disconnect the hose shown in the figure.



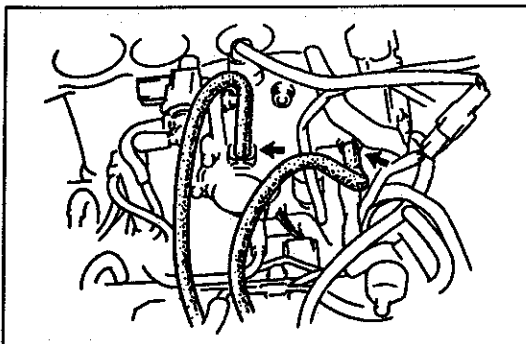
2. Disconnect the fuel hose and vacuum hose shown in the figure.



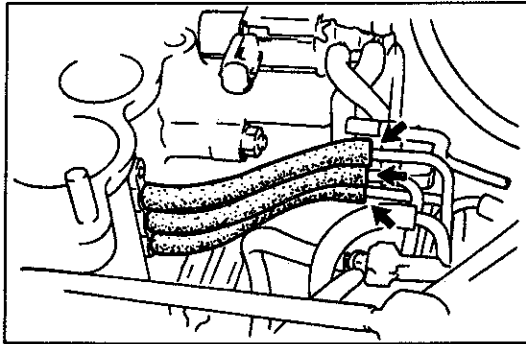
3. Remove the oxygen sensor connector.



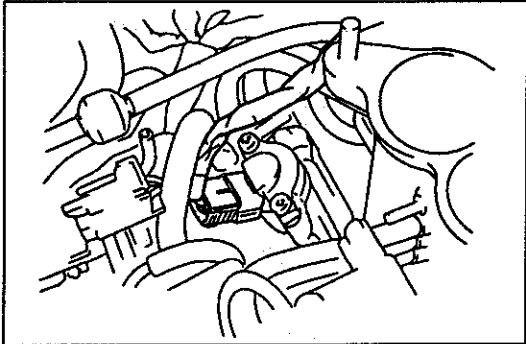
4. Remove the nut shown in the figure.
5. Remove the three-way solenoid.



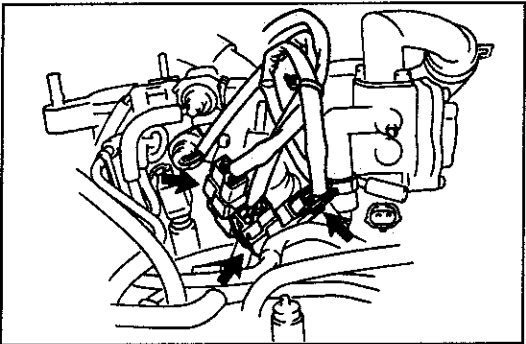
6. Disconnect the vacuum hoses shown in the figure.



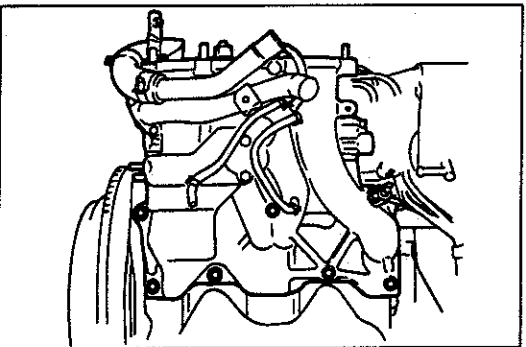
7. Disconnect the vacuum hoses shown in the figure.



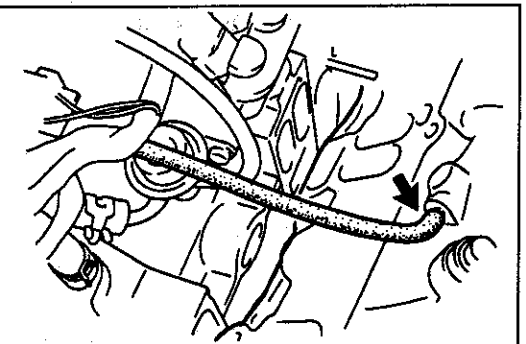
8. Disconnect the fuel injector connectors.



9. Disconnect the connectors.



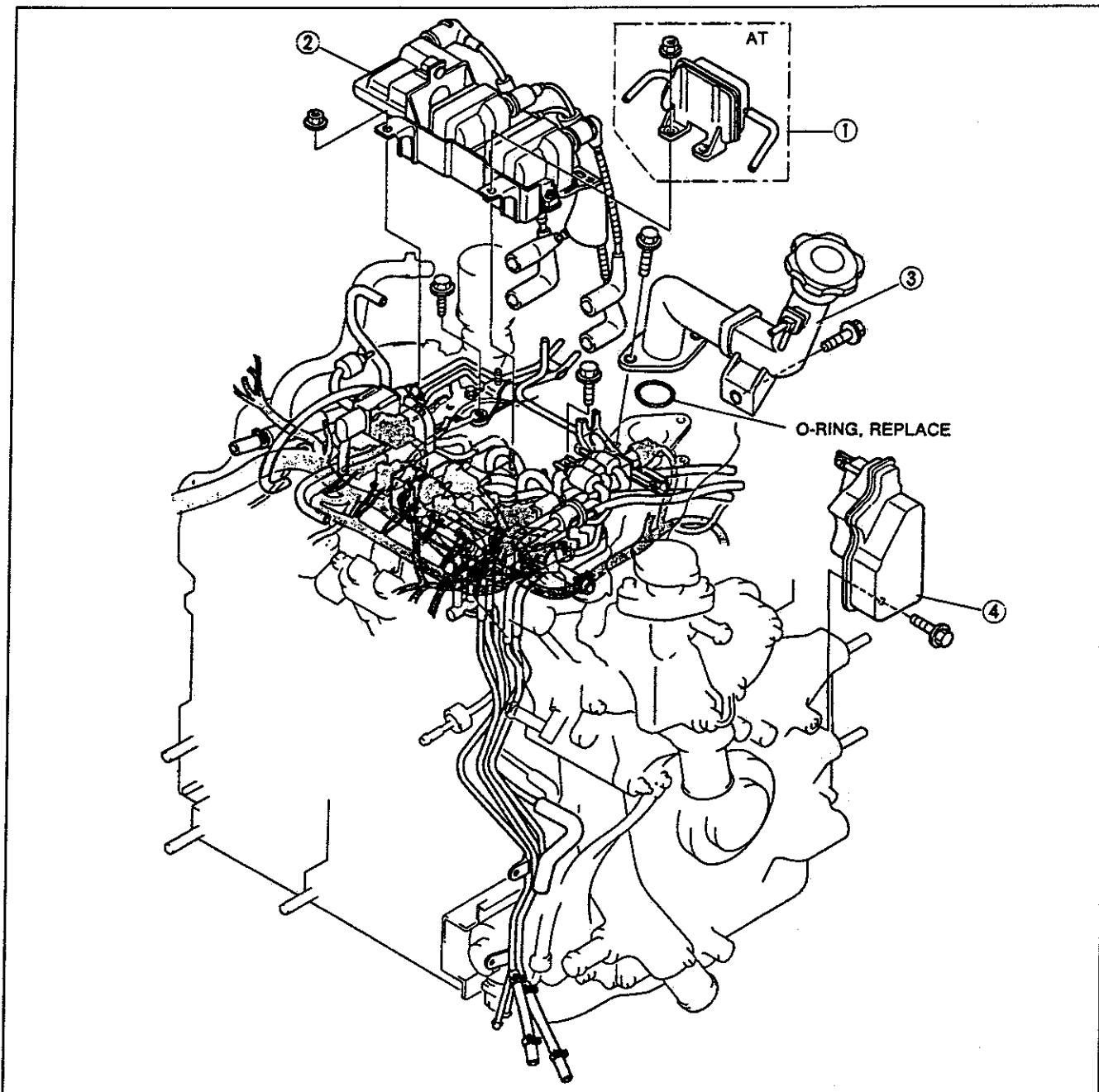
10. Remove the intake manifold assembly.



11. Disconnect the vacuum hose.

Vacuum pipe assembly

Disassemble in the order shown in the figure.

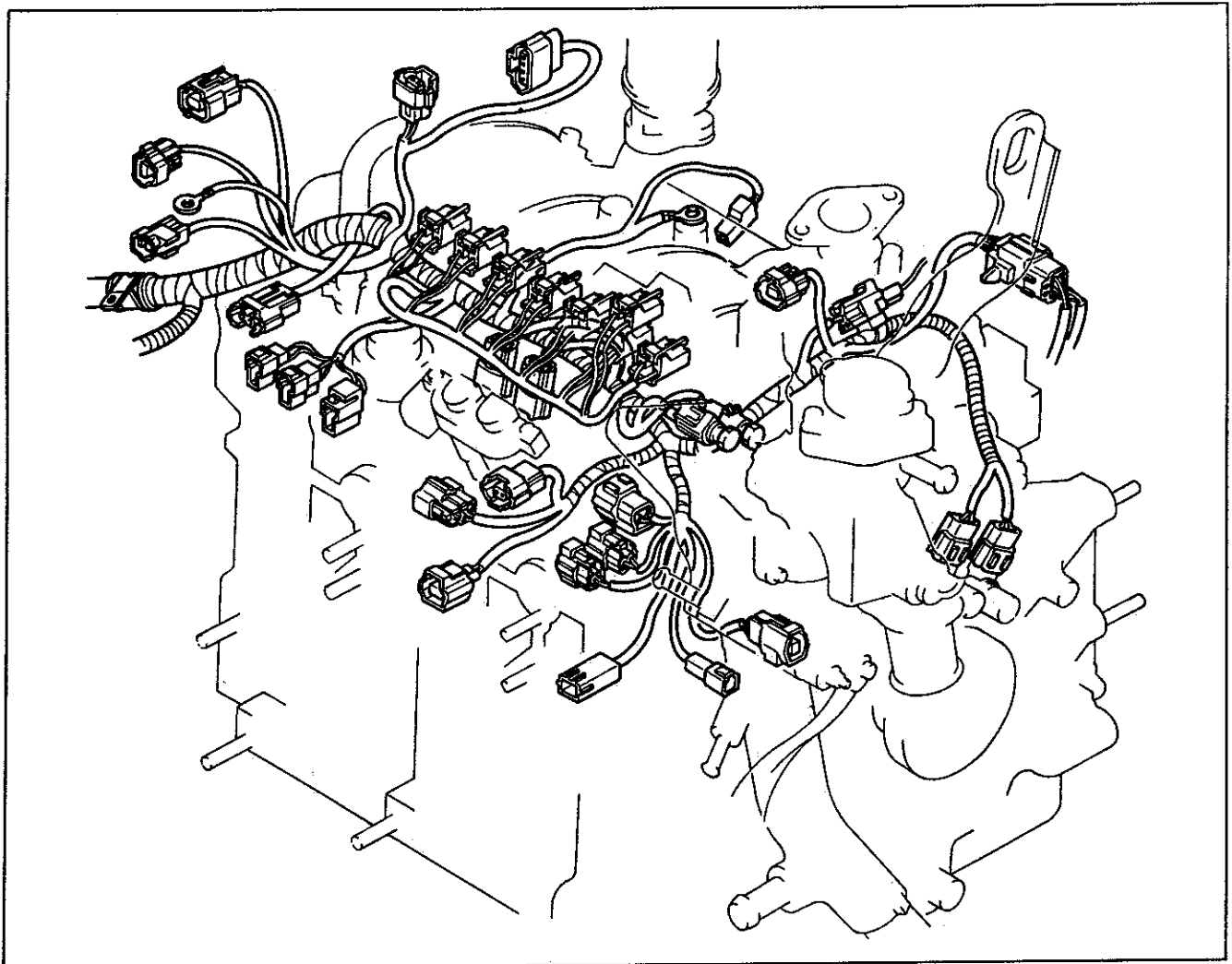


- 1. Vacuum chamber (AT)
- 2. Ignition coil assembly

- 3. Oil filler pipe
- 4. Vacuum chamber

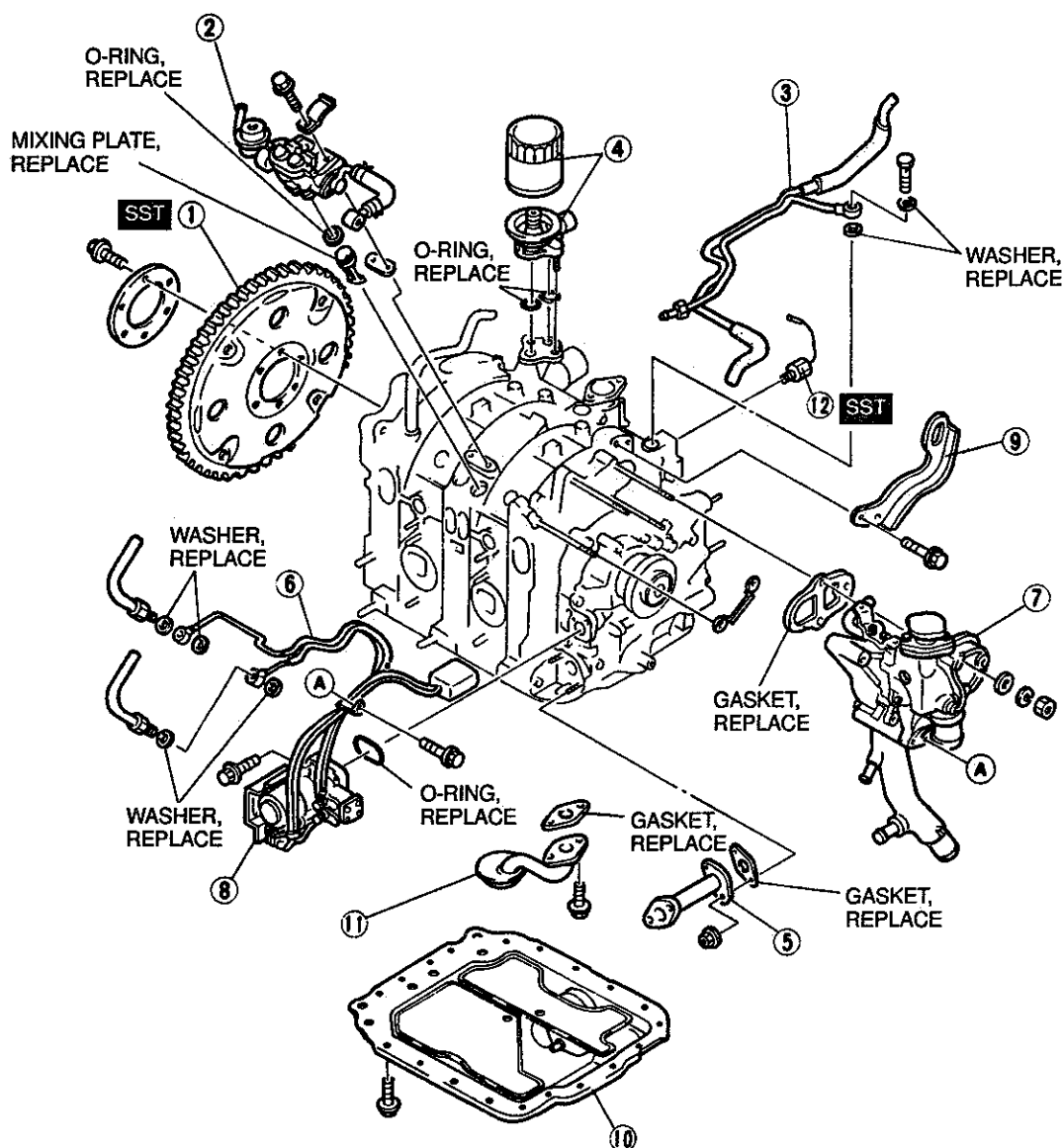
Harness

Disconnect the harness connectors shown in the figure.

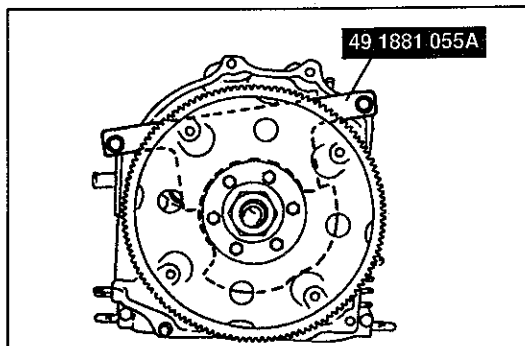


HOUSING (EXTERNAL PARTS I)

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

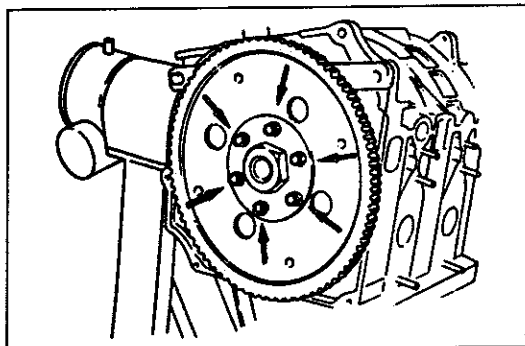


- | | |
|--|----------------------------------|
| 1. Drive plate (AT) | 7. Water pump body |
| Disassembly Note page C-37 | Service Section E |
| 2. Fuel delivery pipe and mixing plate | 8. Metering oil pump |
| Disassembly Note page C-37 | Service Section D |
| Service Section F | 9. Engine hanger |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

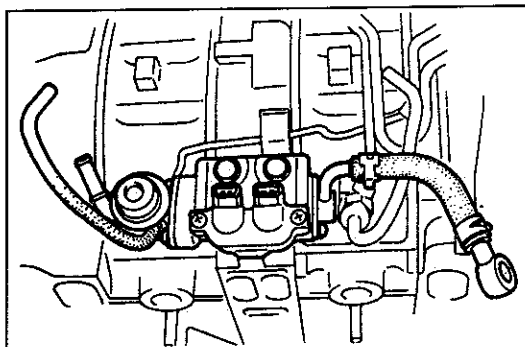


Disassembly Note
Drive plate (AT)

1. Attach the SST to the counterweight.

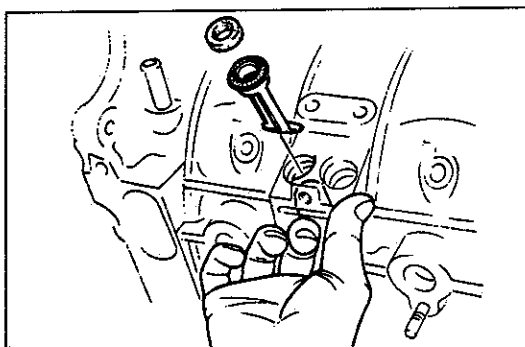


2. Remove the retainer and the drive plate.

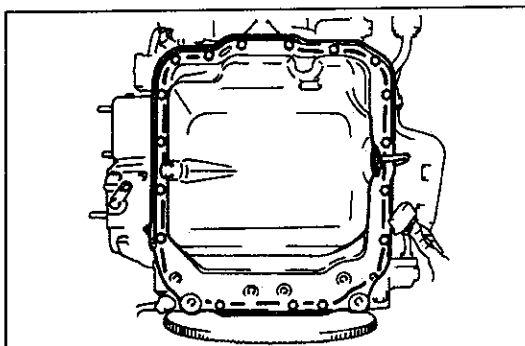


Fuel delivery pipe and mixing plate

1. Remove the fuel delivery pipe and spacer.



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



Oil pan

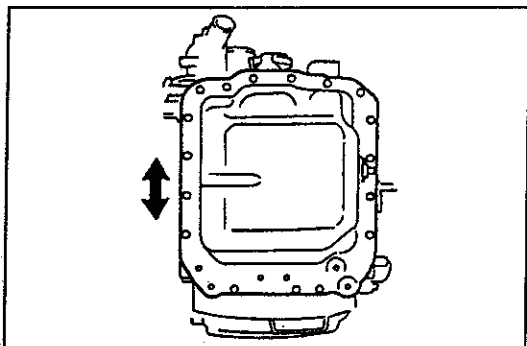
1. Remove the oil pan attaching bolts.

Caution

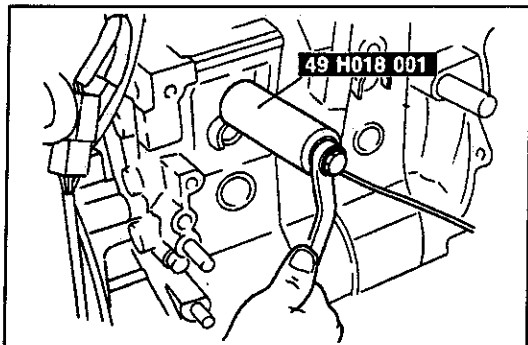
- Pry tools can easily scratch the oil pan contact surfaces. Prying off the oil pan can also easily bend the oil pan flange. Refer to the following instructions before removing the oil pan.

C

DISASSEMBLY



2. Remove the oil pan by inserting screwdriver into only the areas shown in the figure.

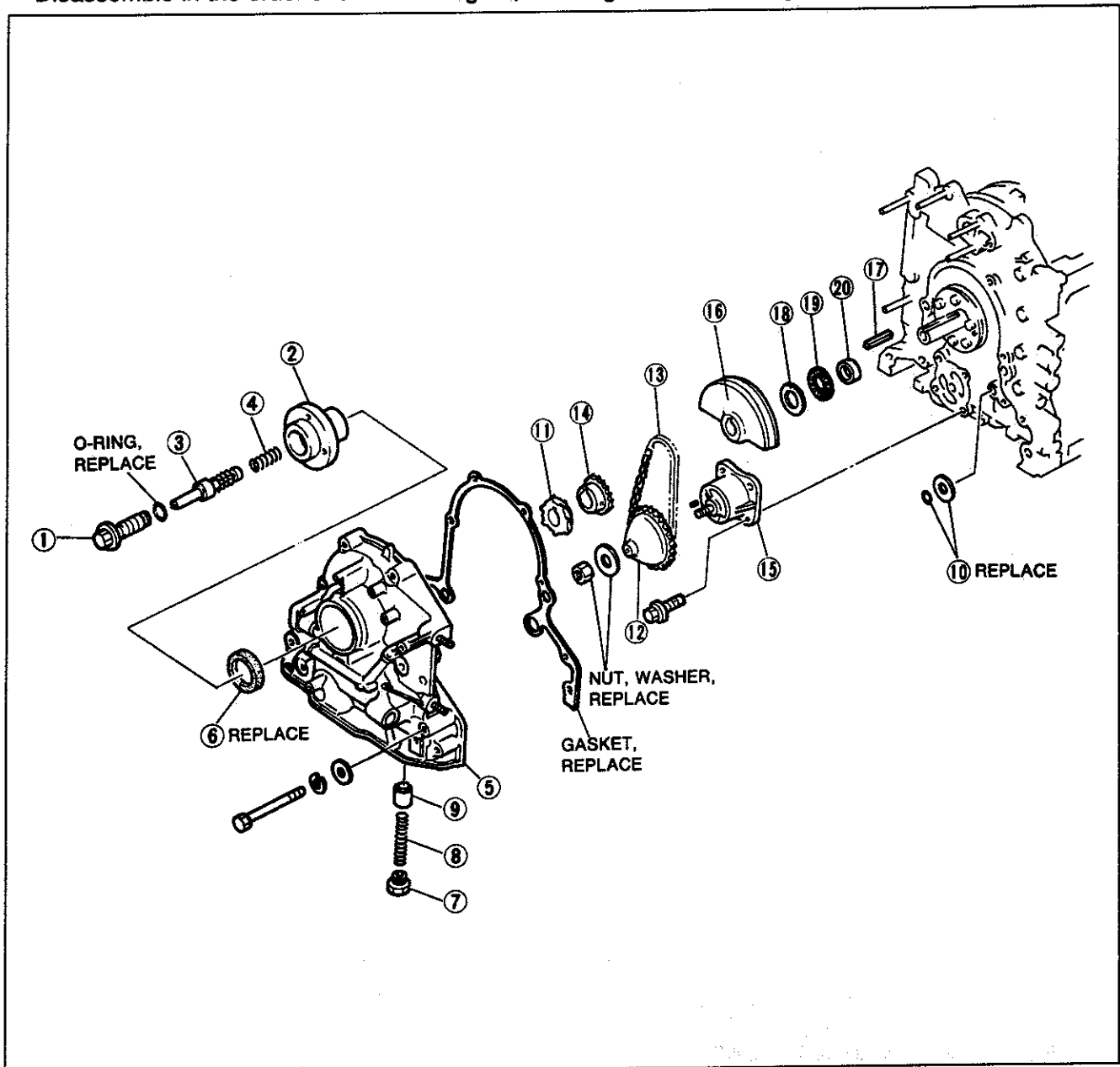


Knock sensor

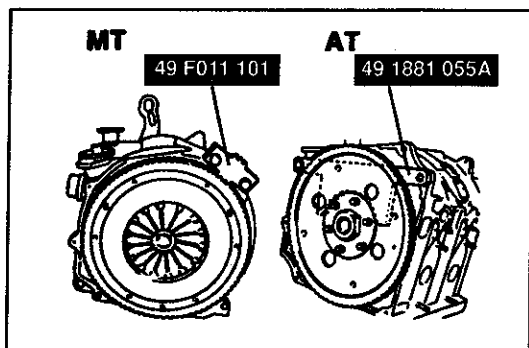
Remove the knock sensor by using the SST.

HOUSING (EXTERNAL PARTS II)

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

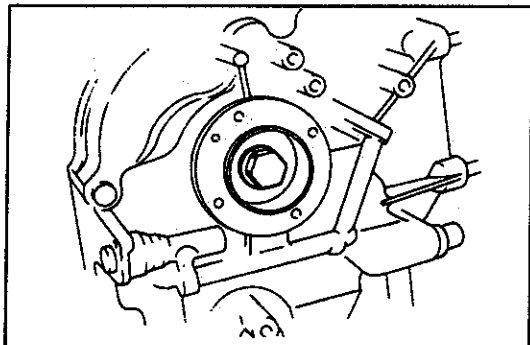


- | | |
|--|---|
| 1. Eccentric shaft lock bolt
Disassembly Note page C-40 | 12. Oil pump sprocket wheel
Disassembly Note page C-40 |
| 2. Pully boss | 13. Oil pump drive chain
Inspection page C-59 |
| 3. Eccentric shaft bypass valve
Inspection page C-59 | 14. Oil pump drive sprocket
Inspection page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

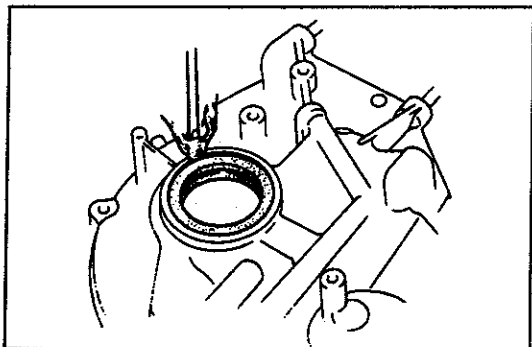
**Disassembly Note**
Eccentric shaft lock bolt

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

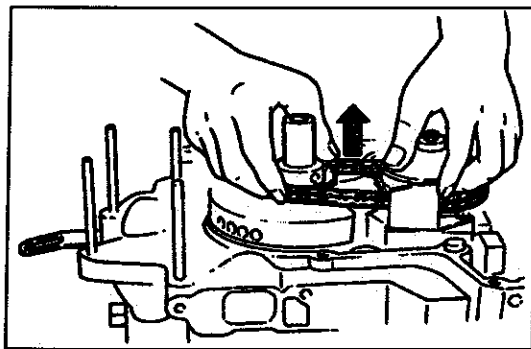
2. Remove the eccentric shaft lock bolt.

**Oil seal**

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

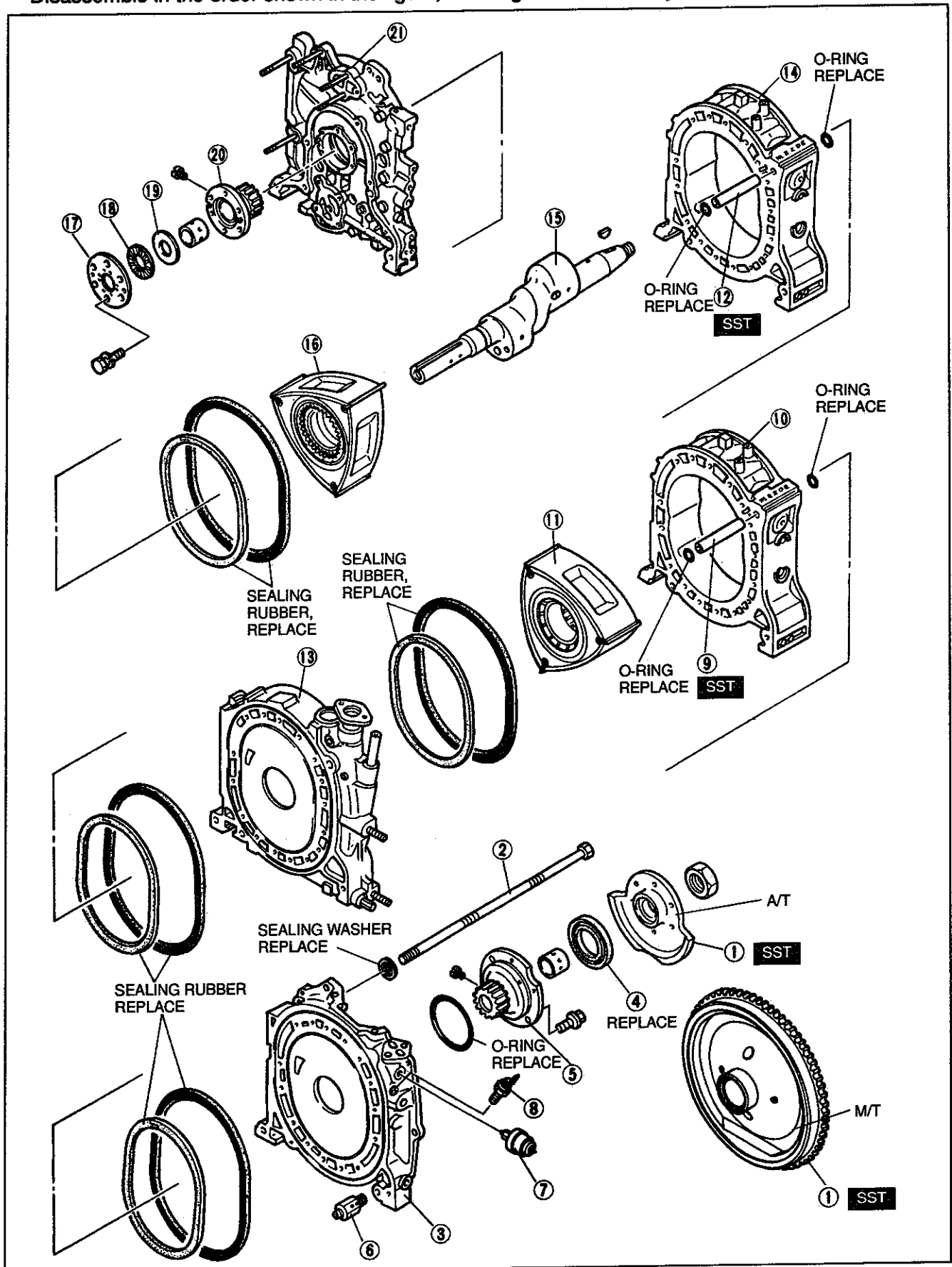
**Oil pump sprocket wheel**

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



HOUSING (INTERNAL PARTS)

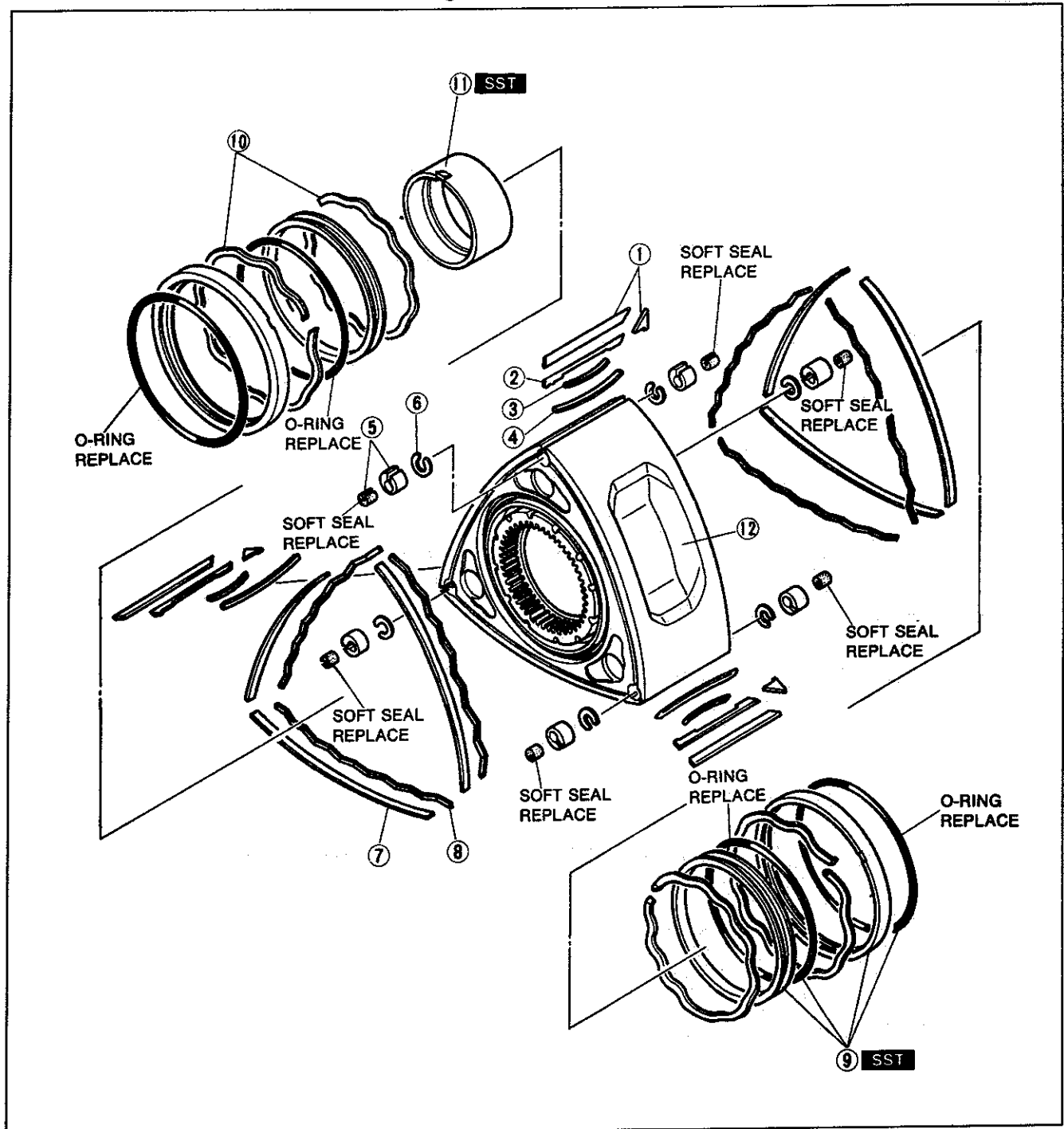
Disassemble in the order shown in the figure, referring to **Disassembly Note**.



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

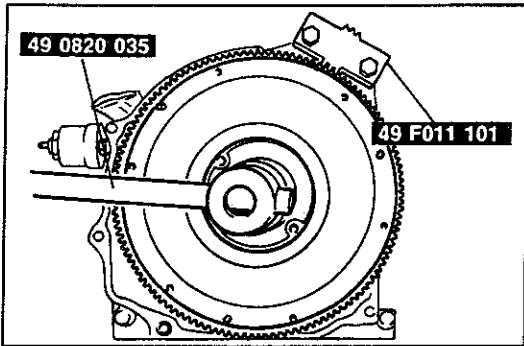
HOUSING (ROTOR)

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



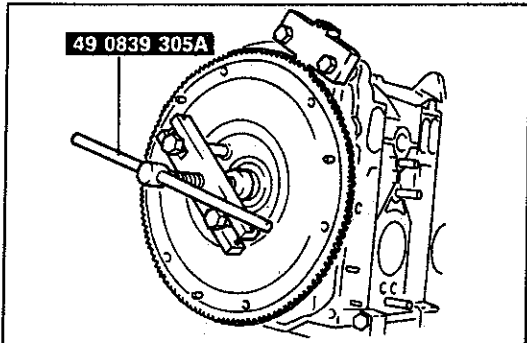
1. Apex seal and side piece
Inspection page C-57
2. Second piece
Inspection page C-57
3. Apex seal spring (short)
4. Apex seal spring (long)
5. Corner seal
Inspection page C-58
6. Corner seal spring

7. Side seal
Inspection page C-57
8. Side seal spring
9. Oil seal and O-ring
Disassembly Note page C-48
Inspection page C-56
10. Oil seal spring
11. Rotor bearing
Inspection page C-56
12. Rotor
Inspection page C-55



**Disassembly Note
Flywheel (MT)**

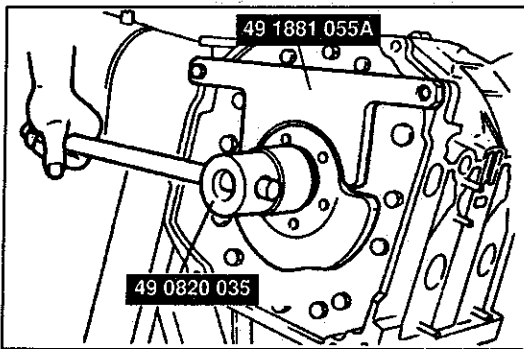
1. Remove the flywheel nut by using the SST.



2. Remove the flywheel by using the SST.

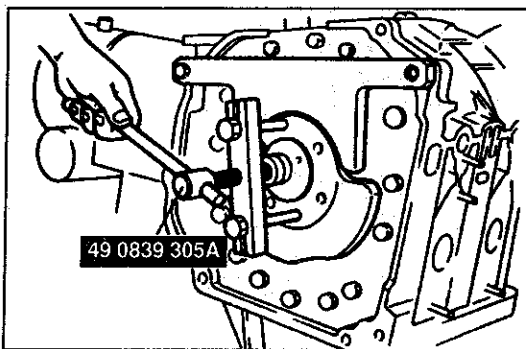
3. Remove the key.

4. Remove the SST.

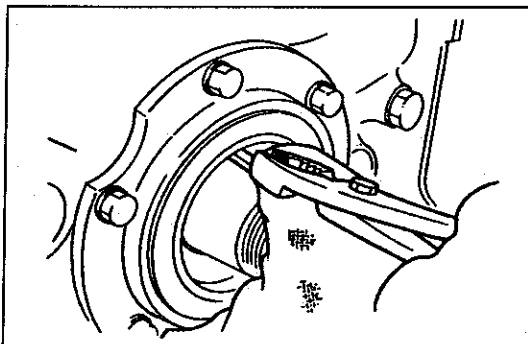


Counterweight (AT)

1. Remove the counterweight nut by using the SST.

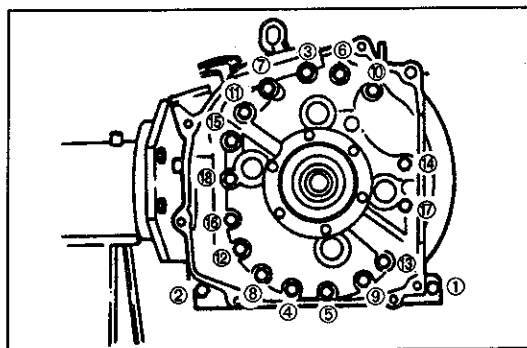


2. Remove the counterweight by using the SST.

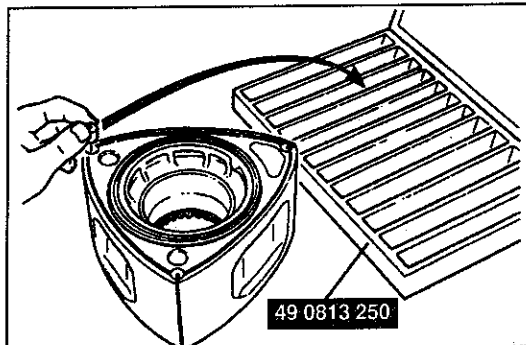


3. Remove the key by using a pryer protected with rag.

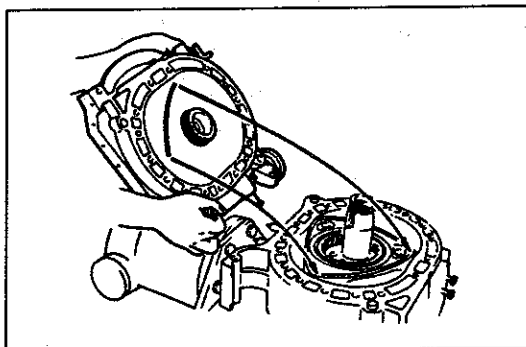
4. Remove the SST.

**Tension bolts**

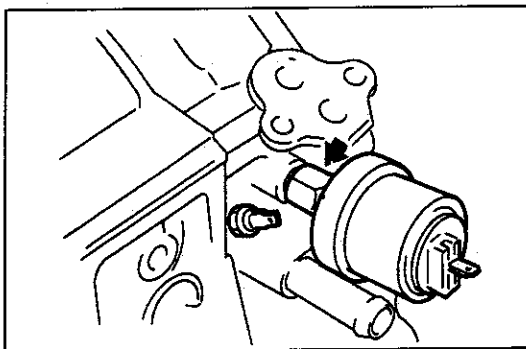
1. Loosen the tension bolts gradually and in the sequence shown in the figure; then remove them.



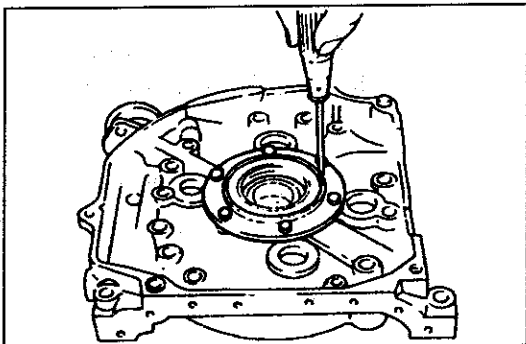
2. Rotor seals (apex, side, and corner) are identified by the numbers near each corresponding groove on the rotor face. Place them in the SST according to the numbers.

**Rear housing**

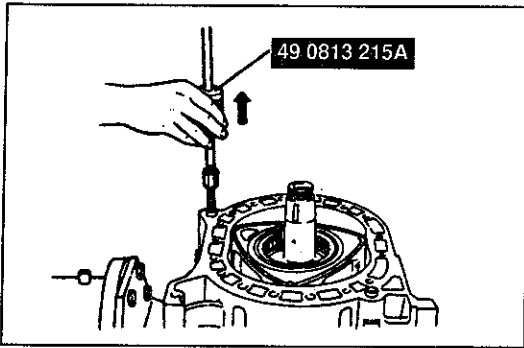
1. Remove the rear housing.
2. If the seals stick to the housing when it is removed, put them back into their original position.

**Oil pressure sensor**

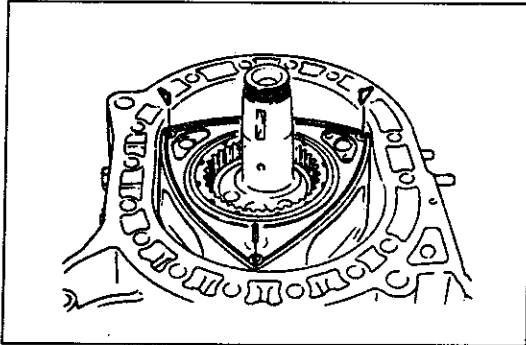
Remove the oil pressure sensor by using a wrench.

**Rear oil seal**

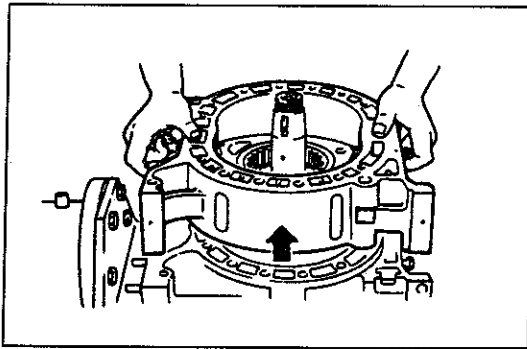
Remove the oil seal cover and the oil seal from the rear housing.

**Tubular dowel**

Remove the tubular dowels by using the SST.

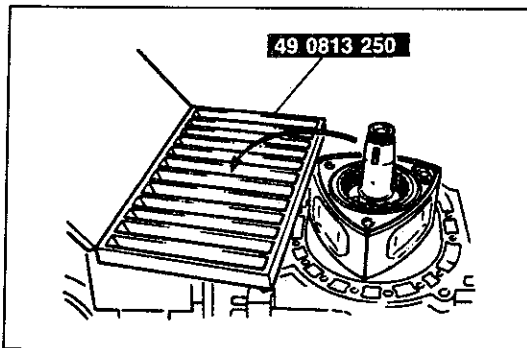
**Rear rotor housing**

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



2. Remove the rotor housing. Be careful not to drop the apex seals.

3. Remove the O-ring from the upper dowel hole.

**Rear rotor**

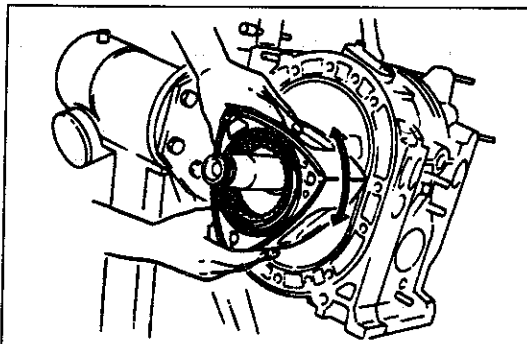
1. Remove the seals and springs, and place them in position in the SST.

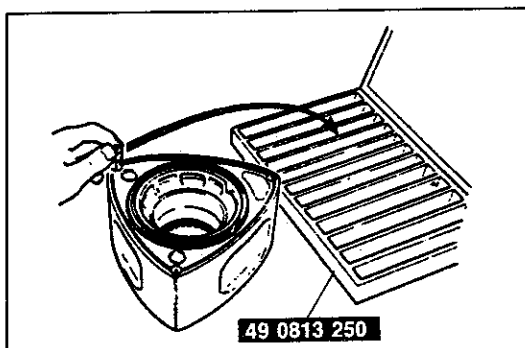
2. Remove the rotor.

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

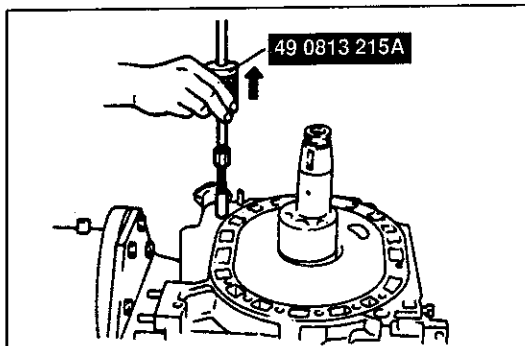
Caution

- Place the rotor on a soft surface to prevent damaging it.



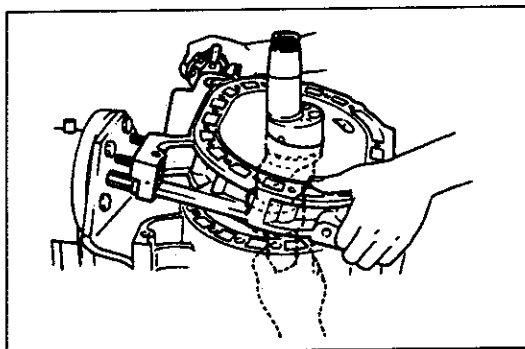


3. Remove the seals and springs, and put them in position in the SST.
4. Mark the rotor with an "R" for proper reassembly.



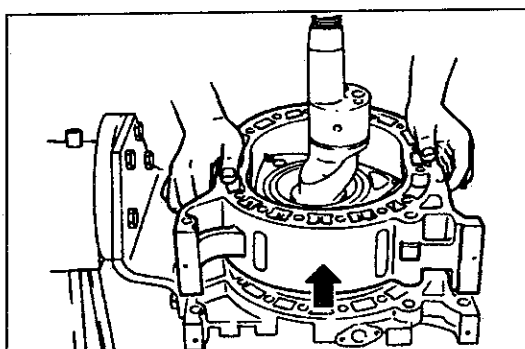
Tubular dowel

Remove the tubular dowels by using the SST.



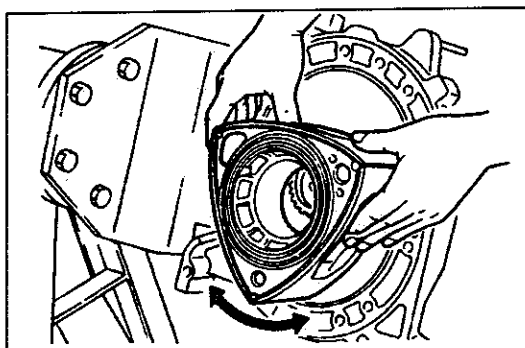
Intermediate housing

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



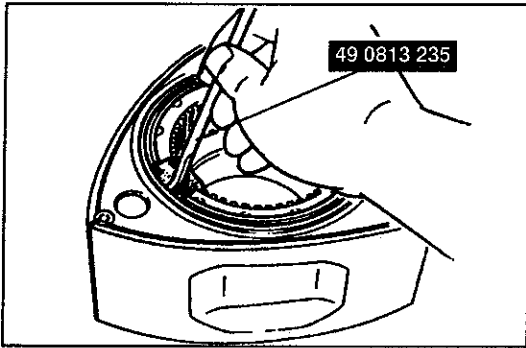
Front rotor housing

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




Front rotor

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

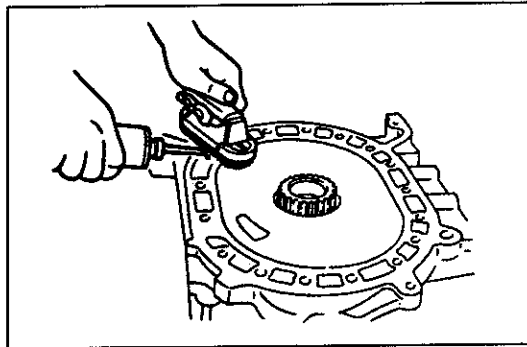
**Rotor oil seal**

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

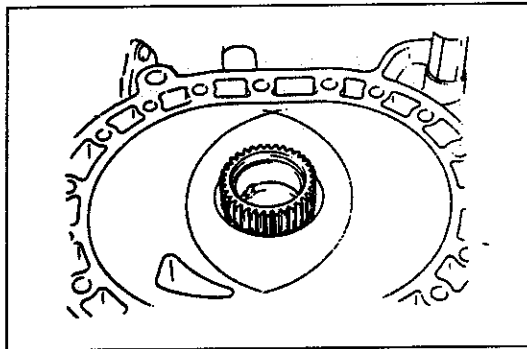
CLEANING**PREPARATION
SST**

<p>49 0813 225</p> <p>Remover, oil seal</p> 	<p>For cleaning of rotor</p>
---	--------------------------------------

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

**Side Housing (front, intermediate and rear housings)**

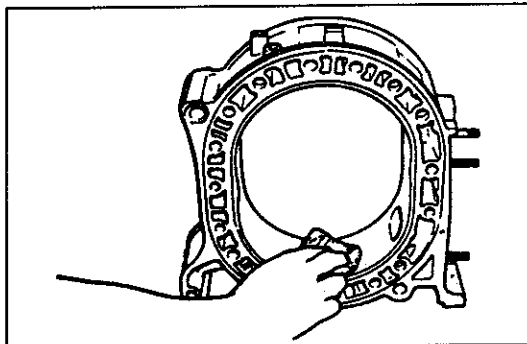
1. Remove the sealing agent from the housing surface by using a cloth or a brush soaked in solvent or thinner.



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

Caution

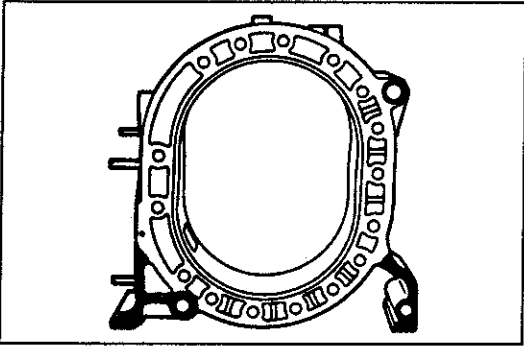
- Carbon scrapers can damage the surface.

**Rotor Housing**

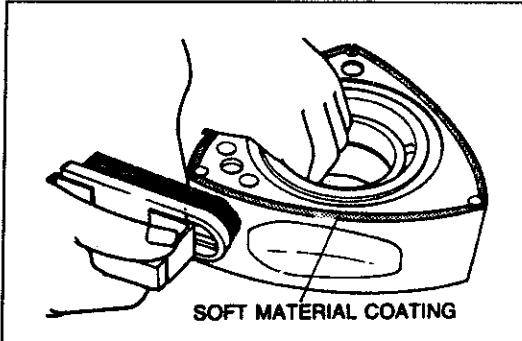
1. Inspect for traces of gas or water leakage along the inner margin of the rotor housings.
2. Remove all carbon from the inner surface of the rotor housing by wiping with a cloth soaked in solvent or thinner.

C

CLEANING



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



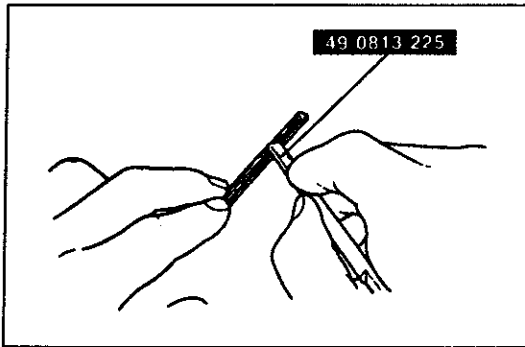
Rotor

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

Caution

- Cleaning materials can damage the soft material coating on the side surfaces.

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

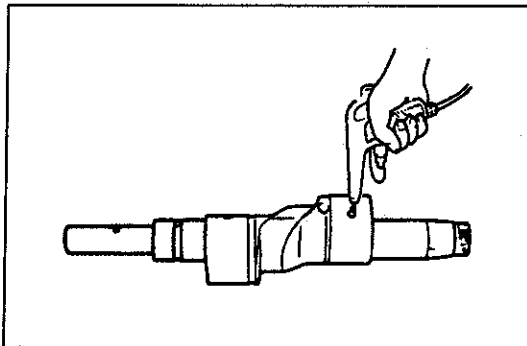


Rotor Seal (apex, side and corner seals)

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

Caution

- Emery paper will damage the seals. Don't use emery paper.

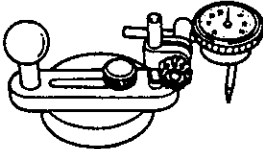
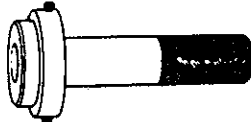
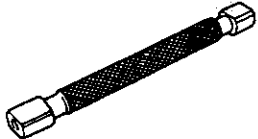
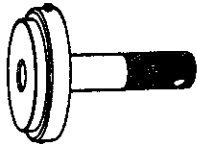


Eccentric Shaft

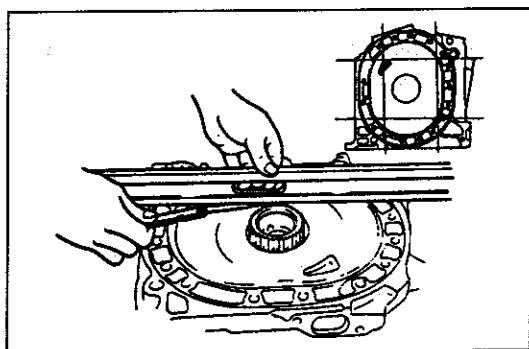
1. Wash the eccentric shaft with a cleaning solution.
2. Blow the oil passages to clean with compressed air.

INSPECTION / REPAIR

PREPARATION
SST

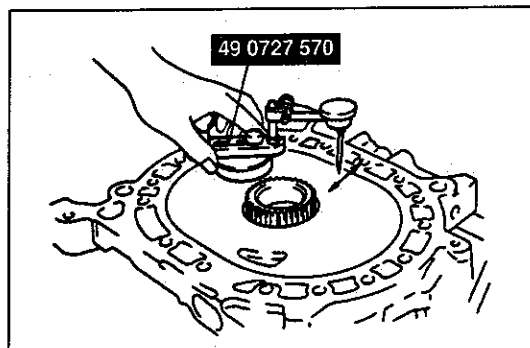
49 0727 570 Body, gauge 	For inspection of side housing	49 0813 235 Replacer main bearing 	For removal / installation of main bearing
49 0839 165 Gauge, corner seal 	For inspection of corner seal	49 0813 240 Replacer rotor bush 	For removal / installation of rotor bearing

1. Clean all parts, making sure to remove any gasket fragments, dirt, oil, grease, carbon, moisture residue, and other foreign materials. (Refer to page C-50.)
2. Inspect and repair in the specified order.

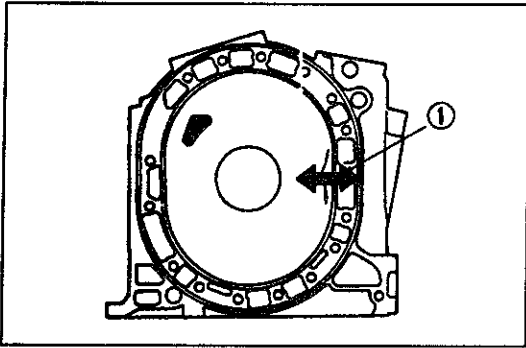
**Side Housing (front, intermediate and rear housings)**

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

Warpage: 0.04 mm {0.0016 in} max.

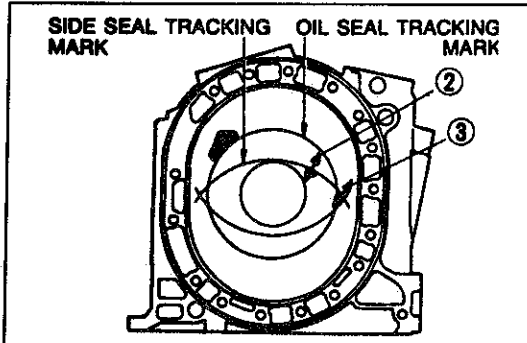


2. Check the contact surface for wear by using a dial indicator mounted on the SST. Slide the gauge across the area as indicated in the figure.



(1) Side seal wear

Wear: 0.10 mm {0.0039 in} max.

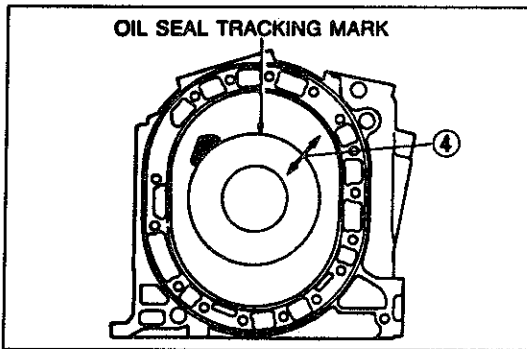


(2) Side seal wear, overlapping oil seal wear

Wear: 0.01 mm {0.0004 in} max.

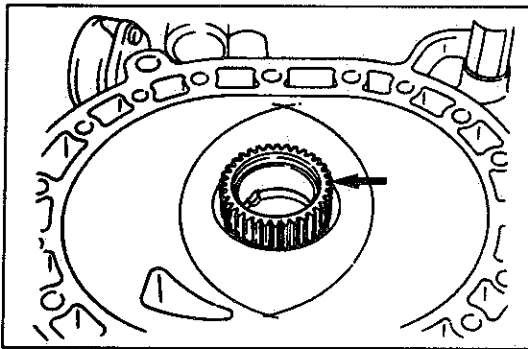
(3) Side seal wear, outside oil seal wear

Wear: 0.10 mm {0.0039 in} max.



(4) Oil seal wear

Wear: 0.02 mm {0.0008 in} max.



Stationary Gear

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

2. If necessary, replace the stationary gear.

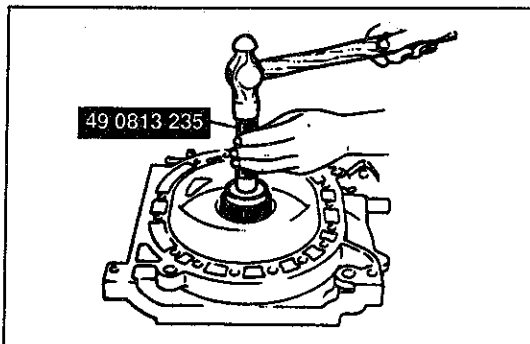
(1) (Front stationary gear)

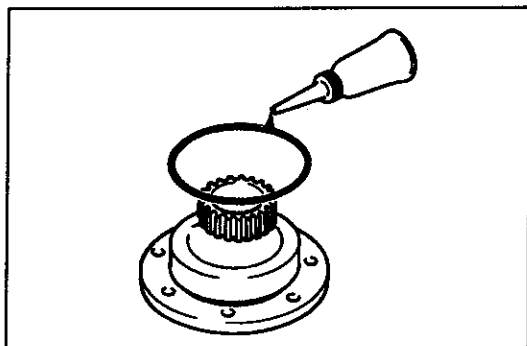
Remove the plate, needle bearing, and thrust plate.

(Rear stationary gear)

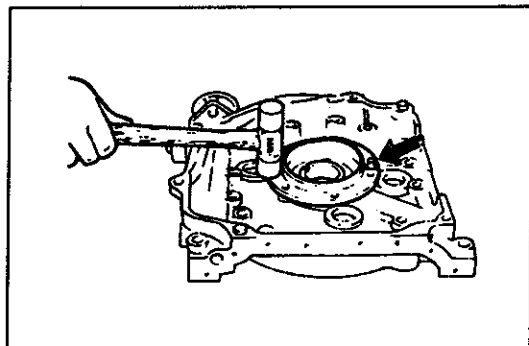
Remove the attaching bolts.

(2) Remove the stationary gear by using the SST.



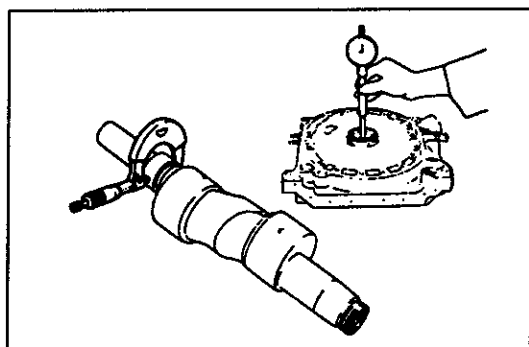


- (3) (Rear stationary gear only)
Apply petroleum jelly to a new O-ring and install it on the rear stationary gear. Apply sealant to the stationary gear flange.



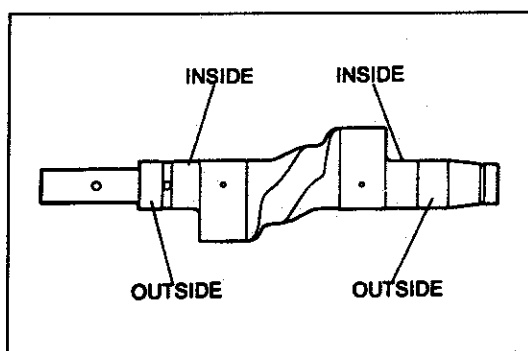
- (4) Install the stationary gear to the housing so that the slot of the stationary gear is fit over the dowel on the housing.
(5) (Front stationary gear)
Install the thrust plate, needle bearing, and plate.
(Rear stationary gear)
Tighten the attaching bolts.

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



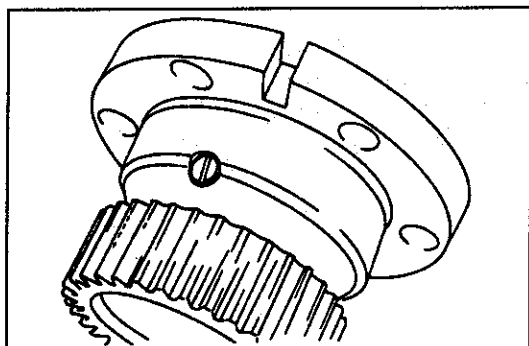
Main Bearing

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

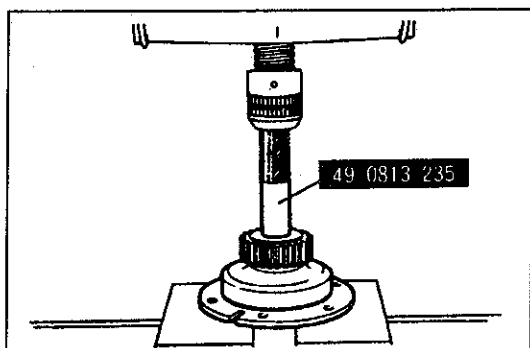


3. The inside and outside journal specifications are different.

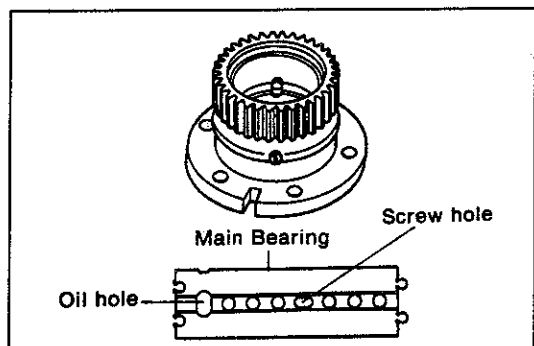
Standard clearance:
0.08–0.11 mm {0.0032–0.0043 in} outside
0.06–0.08 mm {0.0024–0.0031 in} inside
Maximum: 0.13 mm {0.0051 in} outside
0.11 mm {0.0043 in} inside



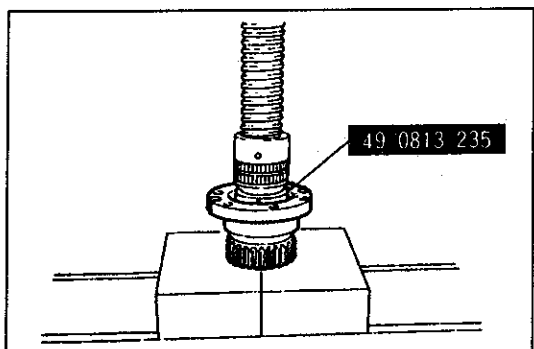
4. If necessary, replace the main bearing.
(1) Remove the stationary gear. (Refer to page C–52.)
(2) Remove the screw.



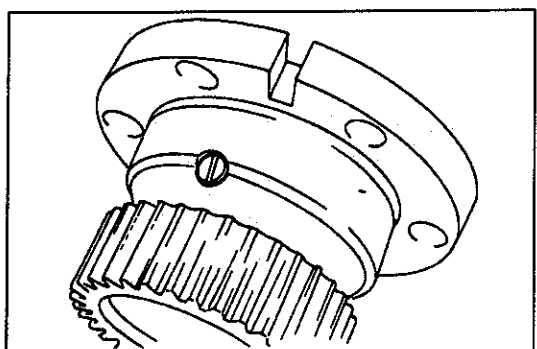
- (3) Place the stationary gear on the support with the gear facing upward.
- (4) Press out the main bearing by using the **SST** without the adapter ring. Discard the bearing.



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



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



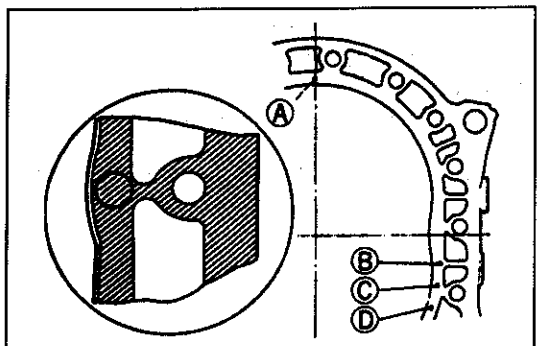
- (8) Remove the thread-locking compound from the screw and screw hole threads.
- (9) Apply new thread-locking compound to the screw threads and tighten the screw.

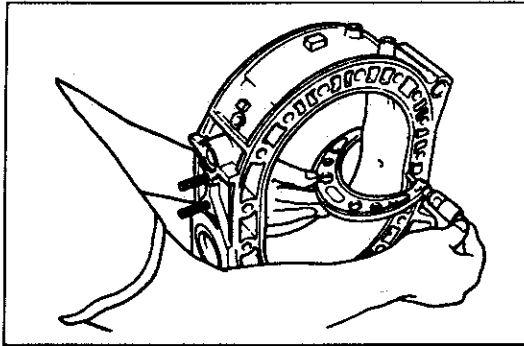
Tightening torque:

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

Rotor Housing

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

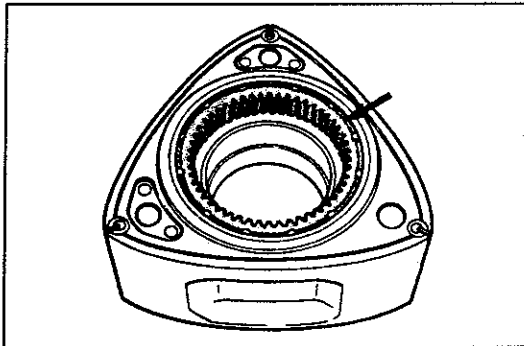




- (2) Calculate the difference between the value of point ① and the minimum value among points ②, ③, and ④.

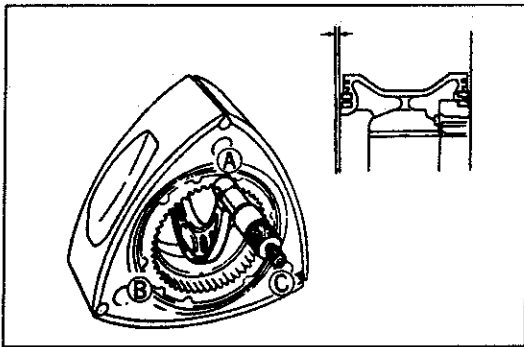
Difference: 0.06 mm {0.0024 in} max.

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



Rotor

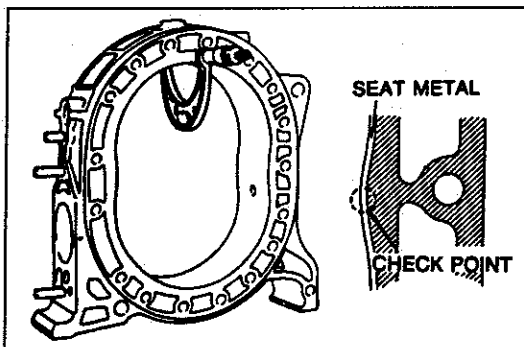
1. Carefully inspect the rotor and replace if it is severely worn or damaged.
2. Check the internal gear for cracked, scored, worn, and chipped teeth.



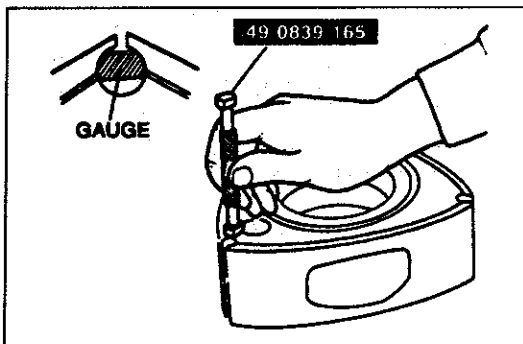
3. Check the clearance between the side housing and rotor. Measure the rotor housing width (point ①) and the maximum rotor width at the three points indicated in the figure.

Standard: 0.12–0.21 mm {0.0048–0.0082 in}

Clearance: 0.10 mm {0.0039 in} min.

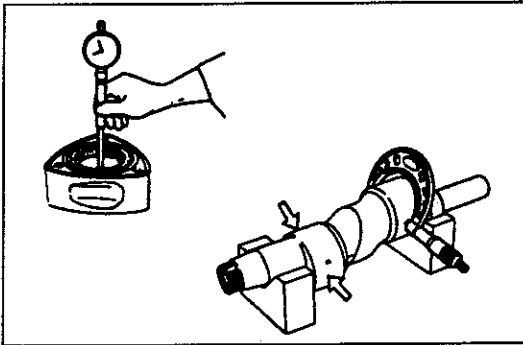


4. If the clearance is less than specified, replace the rotor assembly.



5. Check the corner seal bore for wear by using the SST.

- (1) If neither end of the gauge goes into the bore, use the original corner seal.
- (2) If only one end of the gauge goes into the bore, replace the corner seal.
- (3) If both ends of the gauge go into the bore, replace the rotor.

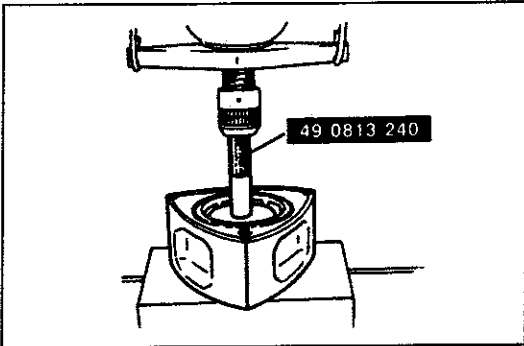
**Rotor Bearing**

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

Standard clearance:

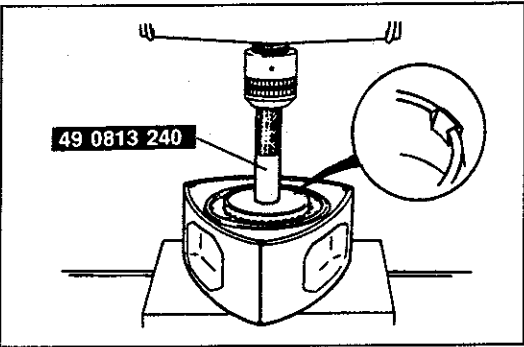
0.06–0.08 mm {0.0024–0.0031 in}

Clearance: 0.10 mm {0.0039 in} max.

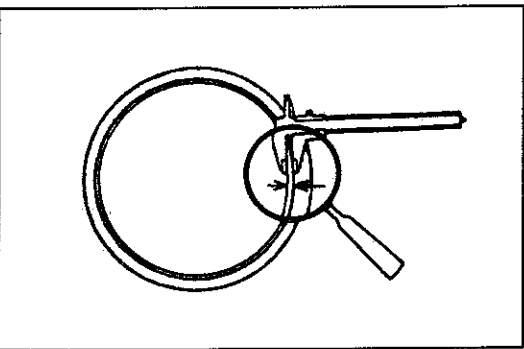


3. If not within specification, replace the rotor bearing.

- (1) Place the rotor on a support with the internal gear downward.
- (2) Press the bearing out of the rotor by using the SST without the adapter ring.

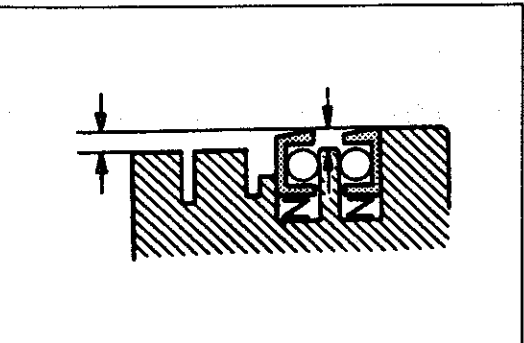


- (3) Place the rotor on the support with the internal gear facing upward.
- (4) Place the new rotor bearing on the rotor so that the bearing lug is in line with the slot of the rotor bore.
- (5) Using the SST, press the bearing in until it is flush with the rotor boss.

**Rotor Oil Seal**

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

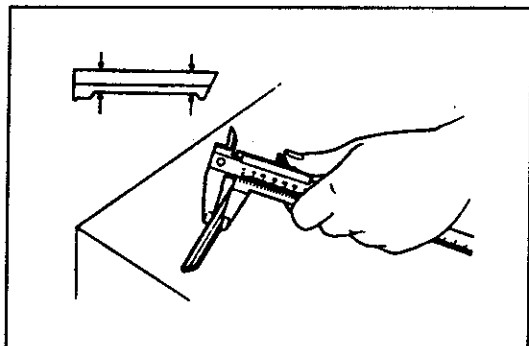
Lip width: 0.5 mm {0.020 in} max.



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

Protrusion: 0.5 mm {0.020 in} min.

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

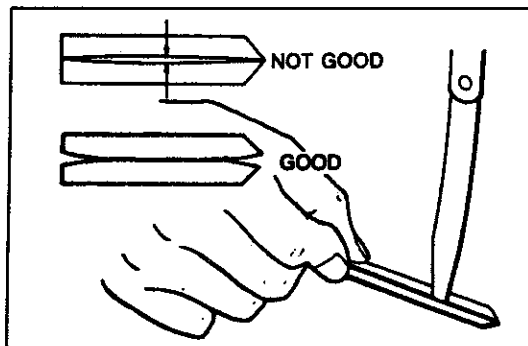
**Apex Seal**

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

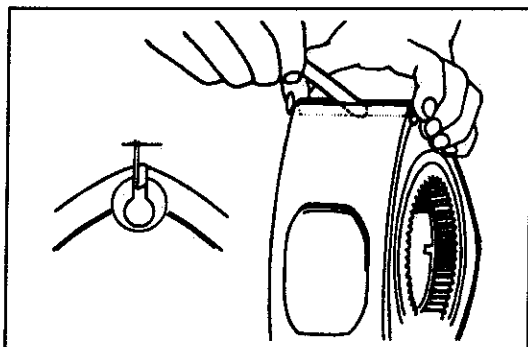
Standard height: 8.5 mm {0.33 in}

Height: 6.5 mm {0.256 in} min.

3. If the apex seal height is below 6.5 mm {0.256 in}, replace the apex seals together with apex seal springs.



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

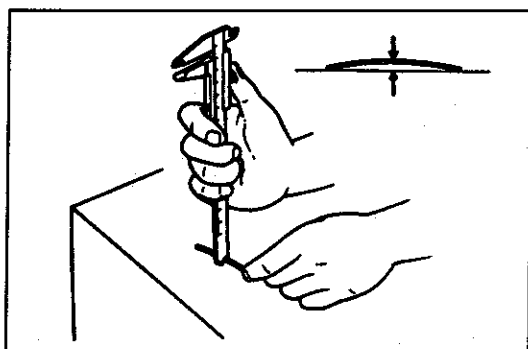


5. Check the clearance between the apex seal and the groove. Place the apex seal in its respective groove in the rotor, and measure the apex seal clearance. If necessary, replace it.

Standard clearance

0.051–0.101 mm {0.0020–0.0039 in}

Maximum: 0.15 mm {0.0059 in}

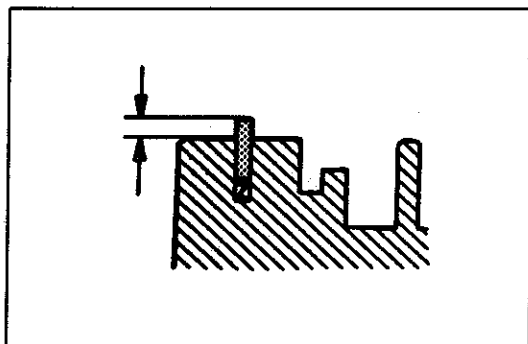


6. Check the long apex seal spring free height. If necessary, replace it.

Free height: 3.5 mm {0.138 in}

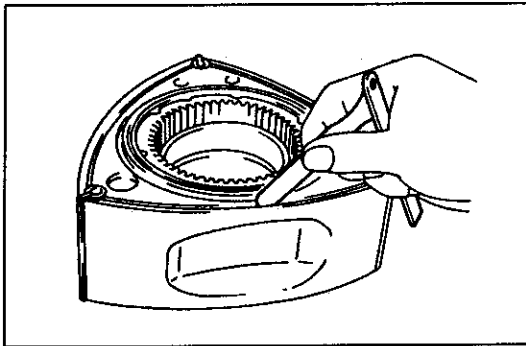
Note

- Replace the short apex seal spring only when the apex seals are replaced in step 3.

**Side Seal**

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

Protrusion: 0.5 mm {0.020 in} min.

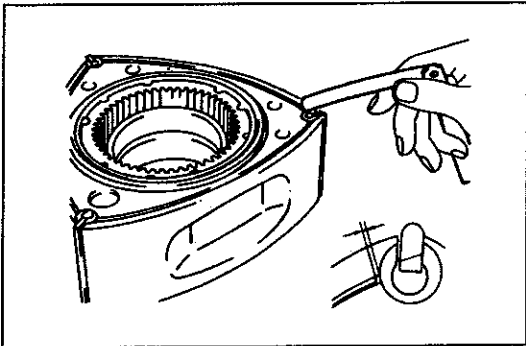


5. Check the clearance between the side seal and the groove.

Standard clearance:

0.028–0.078 mm {0.0011–0.0030 in}

Clearance: 0.10 mm {0.0039 in} max.

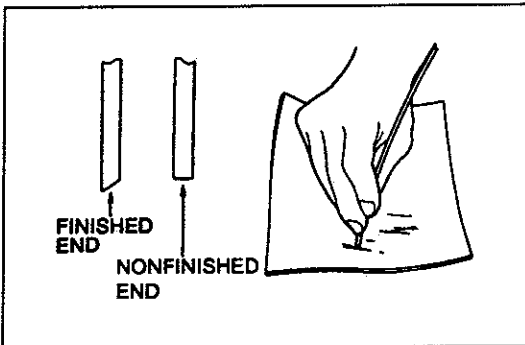


6. Check the clearance between the side seal and the corner seal.

Standard clearance:

0.05–0.15 mm {0.0020–0.0059 in}

Clearance: 0.40 mm {0.016 in} max.

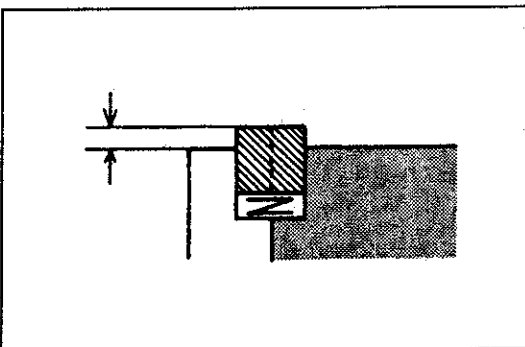


7. If necessary, replace the side seal.

Adjust the clearance between the new side seal and corner seal by carefully lapping the nonfinished end.

Adjusted clearance:

0.05–0.15 mm {0.002–0.0059 in}



Corner Seal

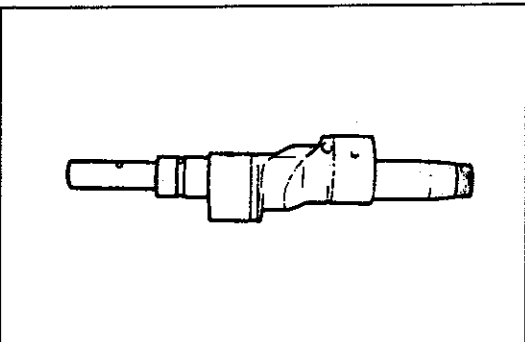
1. Inspect the corner seal and soft seal for wear, cracks, and other damage. If necessary, replace them.
2. Install the corner seal spring and corner seal into its respective groove.
3. Check the corner seal for free vertical movement.
4. Check the corner seal protrusion.

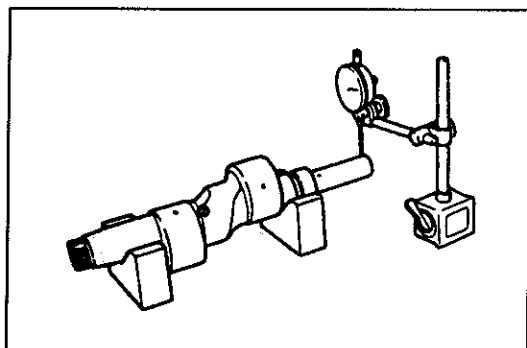
Protrusion: 0.5 mm {0.020 in} min.

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

Eccentric Shaft

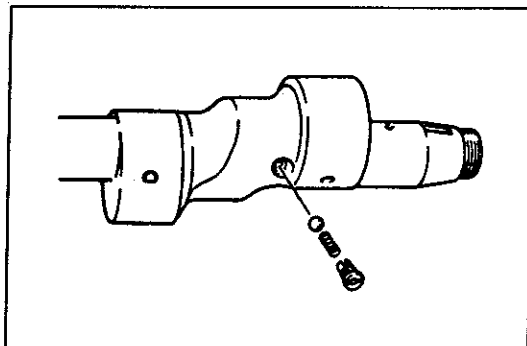
1. Check the eccentric shaft for cracks, scoring, wear, and other damage.
2. Verify that the oil passages are open.





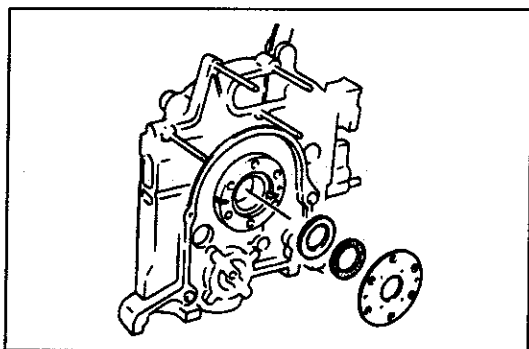
3. Check the eccentric shaft runout. Measure the runout at the end of the shaft, and replace the shaft if necessary.

Runout: 0.06 mm {0.0024 in} max.



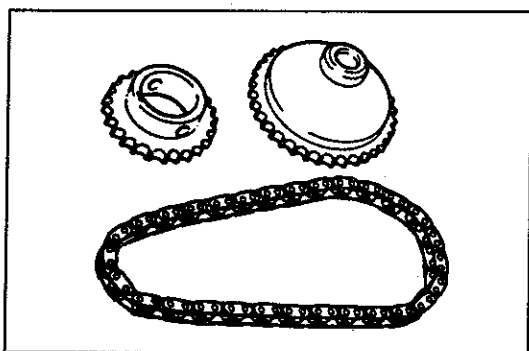
4. Check the oil jet spring for weakness, and check for sticking and damage of the steel ball.

5. Check the oil seal and pilot bearing. (Refer to section C.)



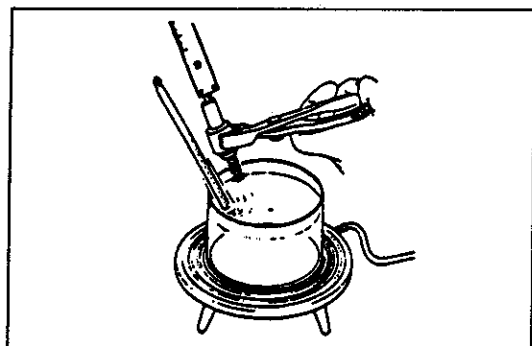
Needle Bearing and Thrust washer

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



Oil Pump Drive Chain and Sprocket Wheel

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



Eccentric Shaft Bypass Valve

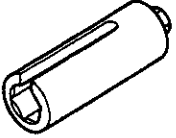
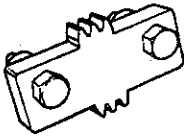
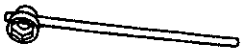

1. Place the eccentric shaft bypass valve in oil and heat up the oil gradually.
2. Check the protrusion of the valve at 60°C {140°F}.

Protrusion: 6 mm {0.24 in} min.

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

ASSEMBLY

PREPARATION
SST

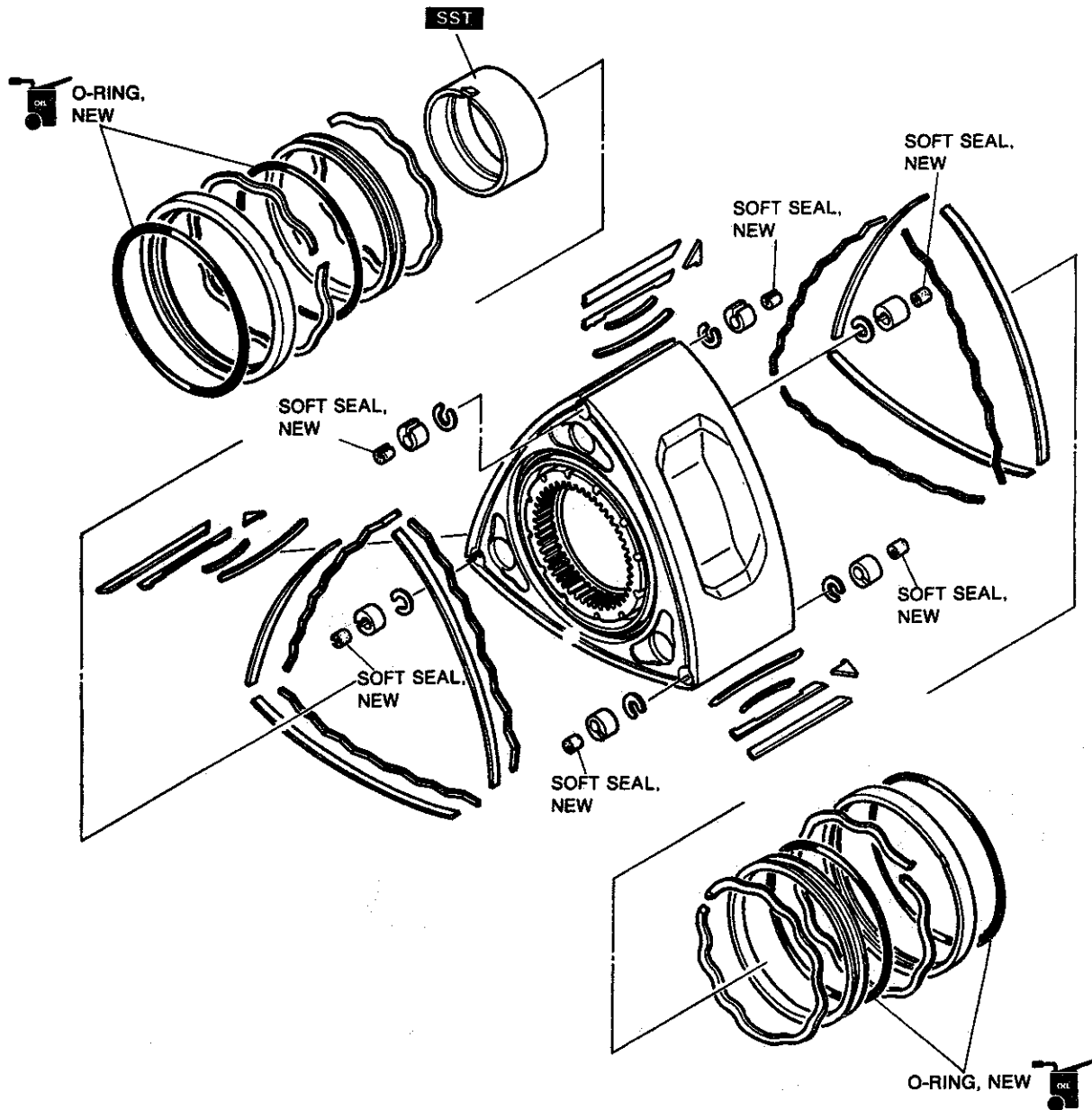
49 H018 001 Wrench, knock sensor 	For installation of knock sensor	49 F011 101 Brake, ring gear 	For prevention of engine rotation
49 0820 035 Box wrench, flywheel 	For removal / installation of locknut	49 1881 055A Stopper counter weight 	For prevention of engine rotation

1. Do not reuse gaskets or oil seals.
2. Clean all parts before reinstallation.
3. Apply clean engine oil to all sliding and rotating parts.
4. Install identical parts (such as rotor seals, seal springs, rotor oil seals, and rotor) in the exact positions from which they were removed.
5. Replace plain bearings if they are peeling, burned, or otherwise damaged.
6. Tighten all bolts and nuts to the specified torques.

Caution

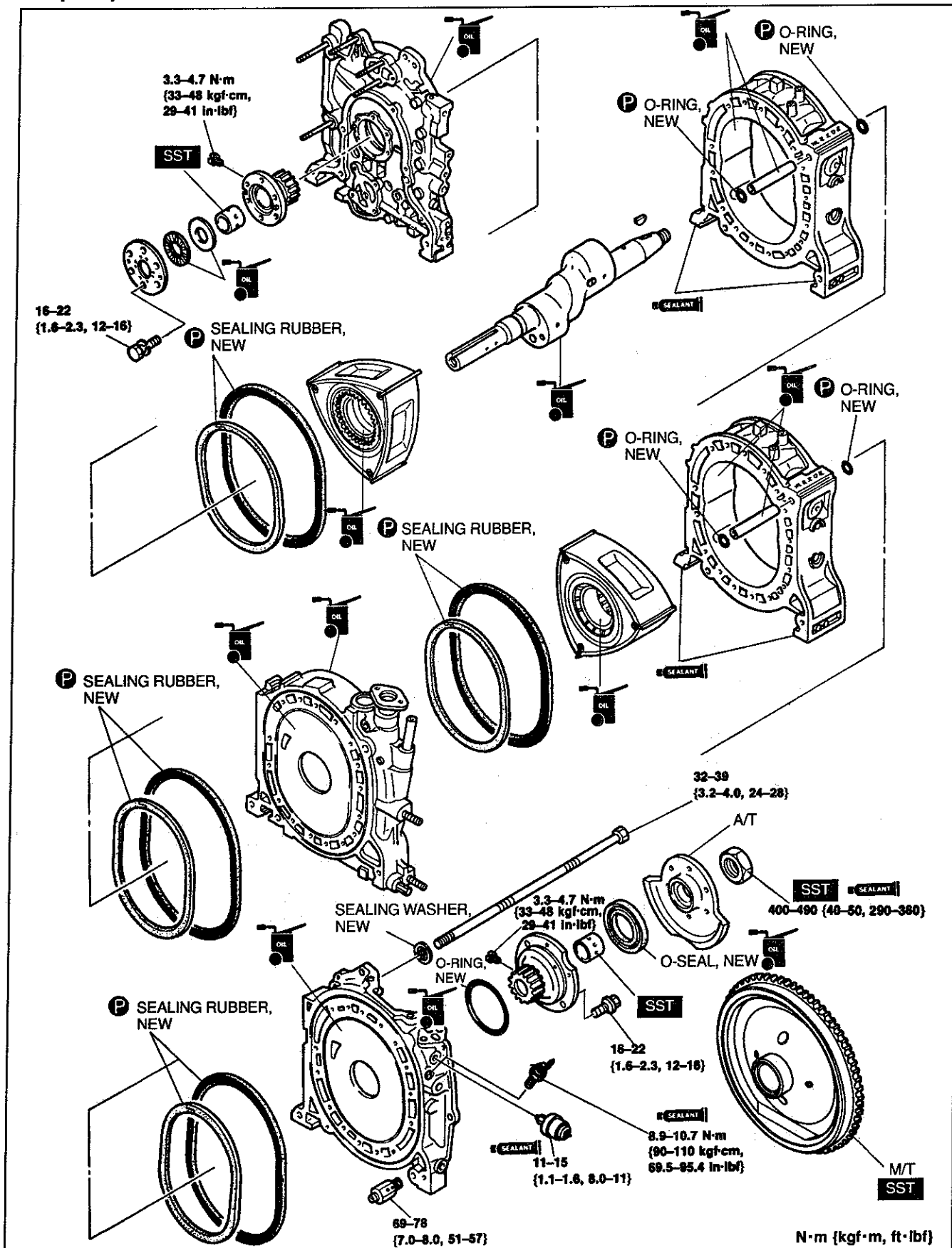
- Continuous exposure with USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after this work.

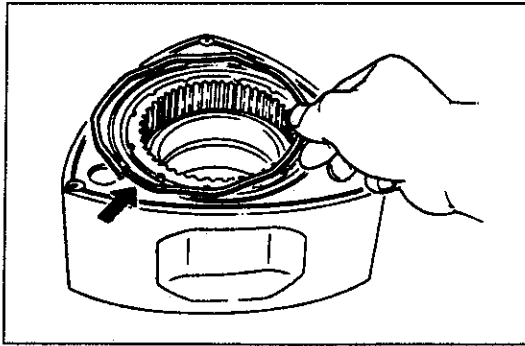
HOUSING (ROTOR)



HOUSING (INTERNAL PARTS)

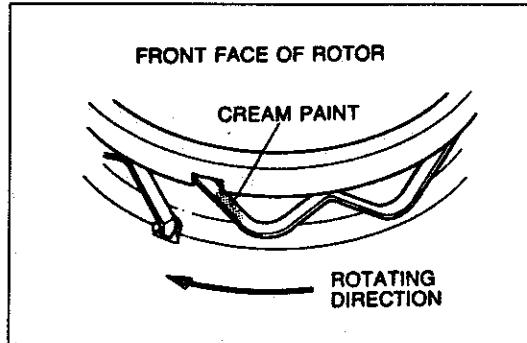
Torque Specifications



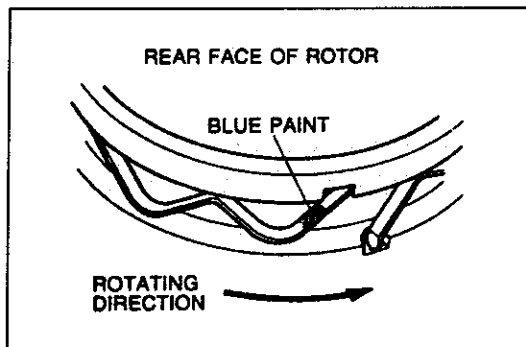


Rotor Oil Seal

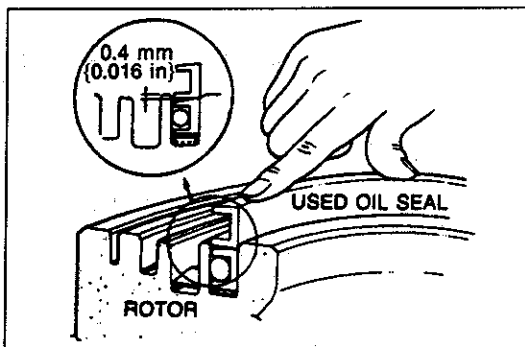
1. Verify that the oil seal moves smoothly in the groove without the O-ring in place. Do not deform the oil seal lip.
2. Install the oil seal springs in their respective grooves on the rotor with the round edge of the spring fitted in the stopper hole of the oil seal grooves.



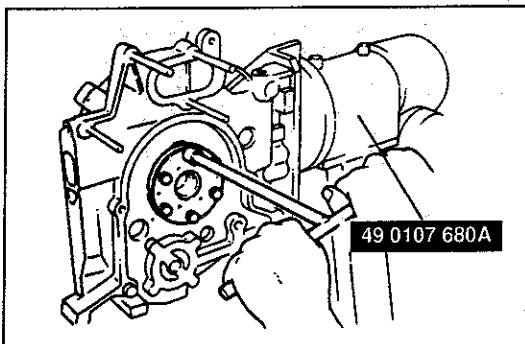
3. The oil seal springs are identified by a paint mark.
Cream ... for front faces of the front and rear rotors.
Blue for rear faces of the front and rear rotors.



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



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

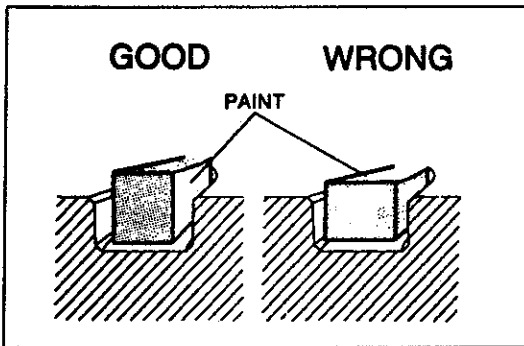


Front Housing

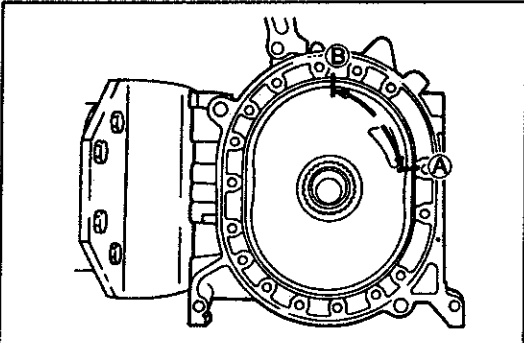
1. Mount the front housing to the SST.
2. Position the thrust plate with the chamfer facing toward the front housing. Install the needle bearing and plate.

Tightening torque:

16-22 N·m {1.6-2.3 kgf·m, 12-16 ft·lbf}



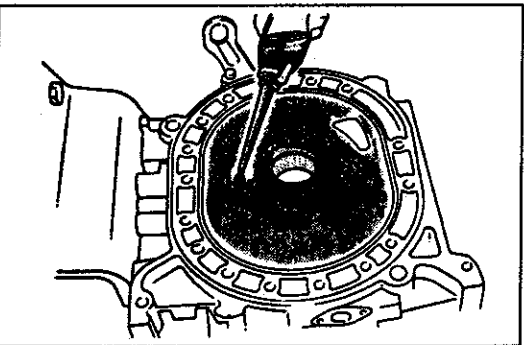
3. Apply petroleum jelly to the new outer and inner sealing rubbers.
4. Install the outer sealing rubber so that the white paint faces the side wall of the groove.



5. Install the inner sealing rubber so that the blue paint faces the outer wall of the groove and the seam is placed within the position shown in the figure.
6. Fit the sealing rubbers in the intermediate housing so that their joints are positioned between points A and B of the housing, and the painted sides face as shown in the figure.

Caution

- Twisting the sealing rubber and allowing oil or grease on it can damage the rubber.



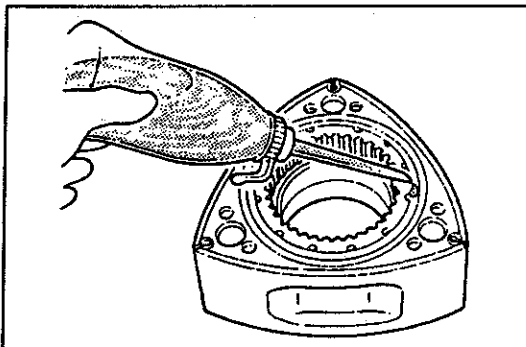
7. Apply engine oil to the contact surfaces, stationary gear, and main bearing.

Caution

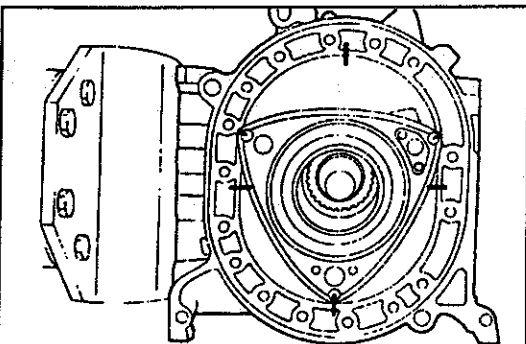
- Do not apply engine oil to the sealing rubber. It will adversely effect the petroleum jelly previously applied.

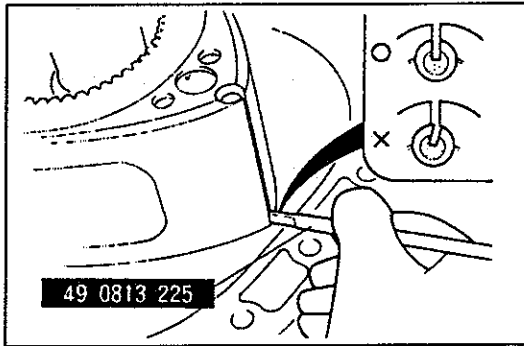
Front rotor

1. Apply engine oil to the oil seal, side seal, main bearing, and internal gear of the rotor.

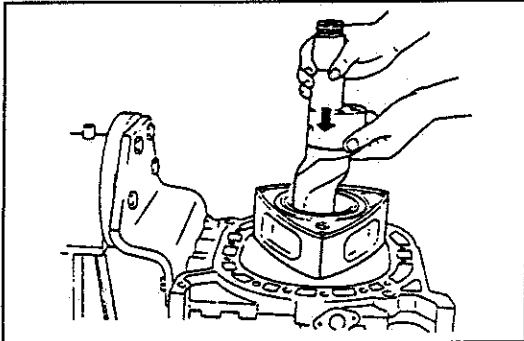


2. Place the rotor on the front housing and engage the housing stationary gear and the rotor internal gear. Position the rotor so that one of its apexes (apex seal groove) points the bottom of the engine (intake bottom dead center).





3. Insert the SST into each apex seal groove and verify that the grooves in the rotor and corner seals are aligned.



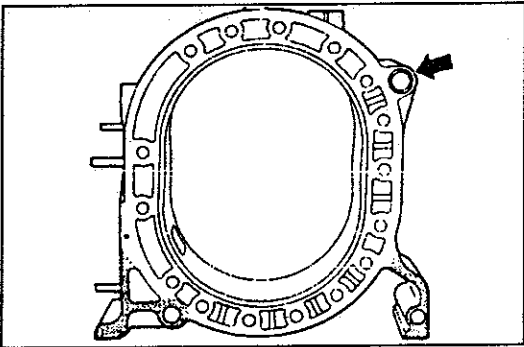
Eccentric shaft

1. Apply engine oil to the eccentric shaft journals.

Caution

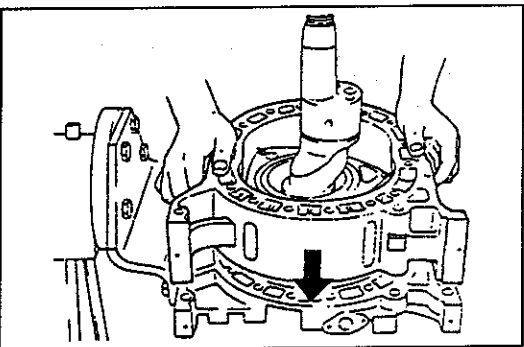
- The eccentric shaft can scratch or damage the rotor bearing and main bearing when inserted.

2. Align the eccentricity of the eccentric shaft and the rotor, and insert the eccentric shaft into the rotor and housing.

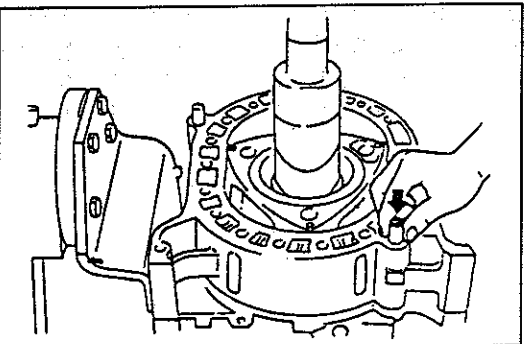


Rotor housing

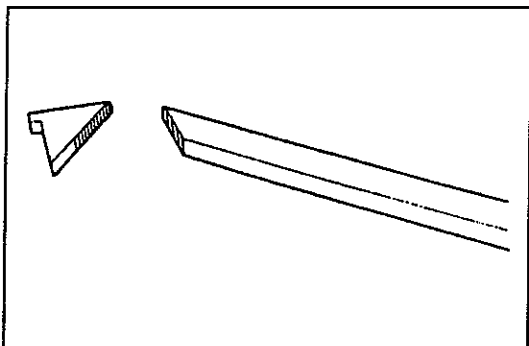
1. Coat a new O-ring with petroleum jelly and fit it in the tubular dowel hole in the rotor housing.
2. Degrease the rotor housing pedestal and apply sealant. (Shaded areas in the figure.)



3. Apply engine oil to the rotor housing inner surface and install it to the front housing.

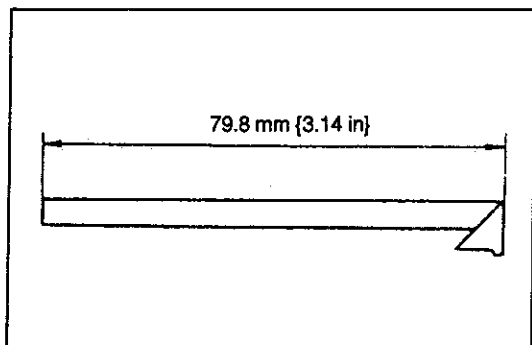


4. Coat the tubular dowel with engine oil and insert it into the tubular dowel holes in the rotor housing and front housing, making sure that the dowel is fully inserted.

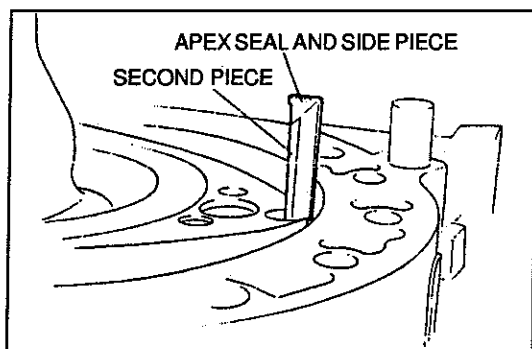
**Apex seal**

1. When apex seals are reused, assemble them in the following procedure. When new apex seals are used, go to step 2.

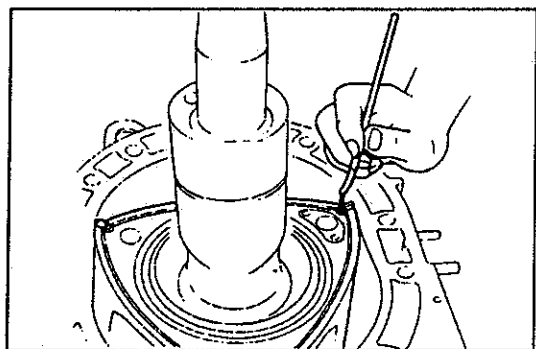
- (1) Remove any old bonding agent from the contact surfaces of the apex seal and side piece with a knife and degrease them with paint thinner.
- (2) Apply a drop of bonding agent to the contact surface of the apex seal and side seal.



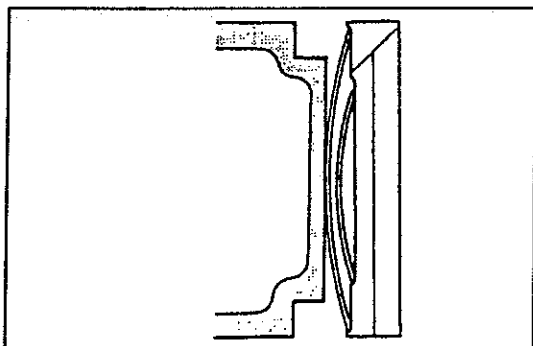
- (3) Adhere the apex seal and side piece to the specified length. The joint must be plane.
- (4) Remove excessive bonding agent with a knife.



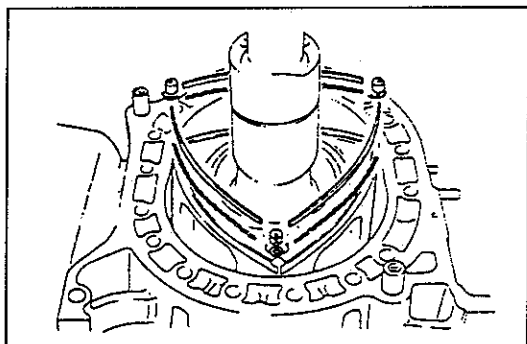
2. Install the second piece to the apex seal and side piece that is assembled in step 1. Face the side piece to the rear of the engine and insert the assembly into the apex seal groove in the rotor.



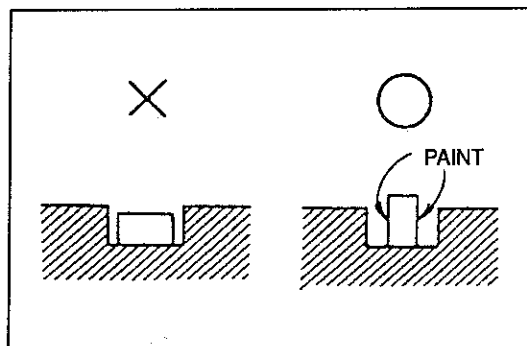
3. Install the short apex seal spring between the apex seal and apex seal groove. Face the spring toward the apex seal and press until the spring is fastened by the spring stopper on the side piece.



4. Install the long apex seal spring over the short apex seal spring. Press the spring until it is fastened by the spring stopper on the side piece.



5. Install the corner seals.
6. Install the side seals.

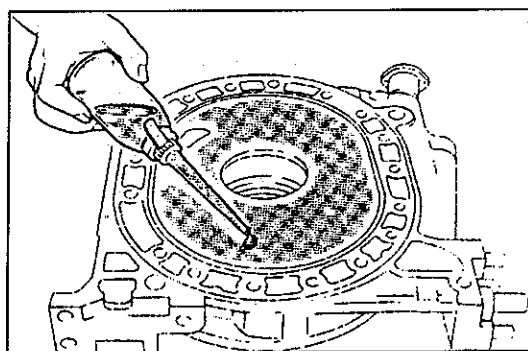
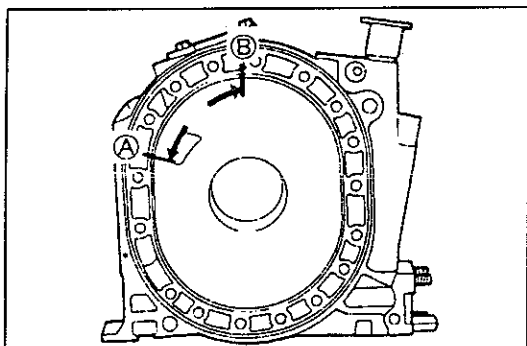


Intermediate housing

1. Apply petroleum jelly to the new sealing rubbers.
2. Fit the sealing rubbers in the intermediate housing so that their joints are positioned between points A and B of the housing, and the painted sides face as shown in the figure.

Caution

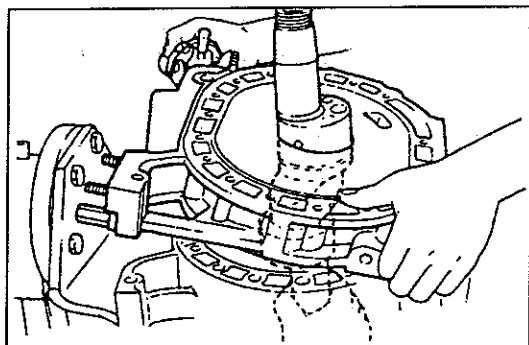
- **Twisting the sealing rubber and allowing oil or grease on it can damage the rubber.**



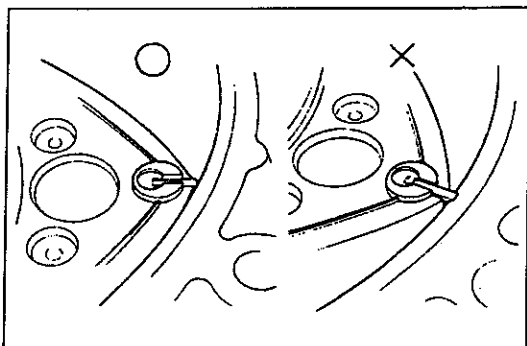
3. Apply engine oil to the seals of the front rotor.
4. Apply engine oil to the front of the contact surface of the intermediate housing.

Caution

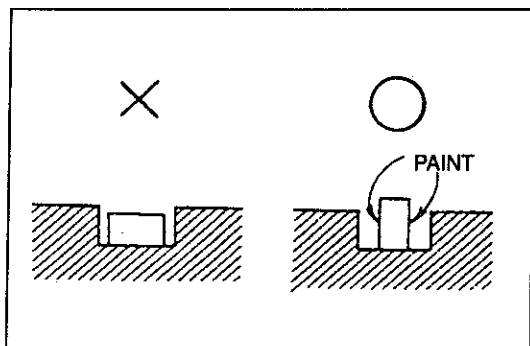
- **Do not apply engine oil to the sealing rubber. It will adversely effect the petroleum jelly previously applied.**



5. Coat new O-ring with petroleum jelly and fit it in the tubular dowel hole in the rotor housing.
6. Degrease the rotor housing pedestal and apply sealant.
7. Turn the eccentric shaft so that its rear rotor journal eccentricity is aligned with the narrower axis of the engine.

**Caution**

- The side piece on the rotor can scratch or damage the intermediate housing during assembly if it is caught between the rotor housing and intermediate housing.



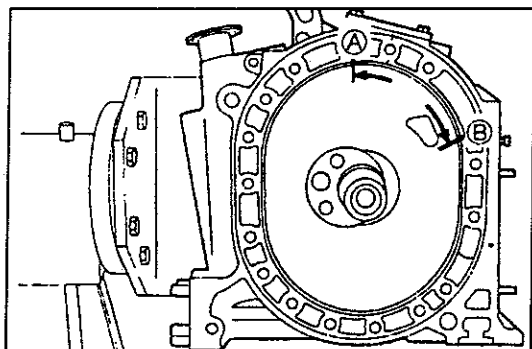
8. Working with another person, hold the eccentric shaft up approx. 3cm (1.2 in) from underside and assemble the intermediate housing over the rotor housing.

9. Apply petroleum jelly to the new sealing rubbers.

10. Fit the sealing rubbers in the intermediate housing so that their joints are positioned between points A and B of the housing, and the painted sides face as shown in the figure.

Caution

- Twisting the sealing rubber and allowing oil or grease on it can damage the rubber.

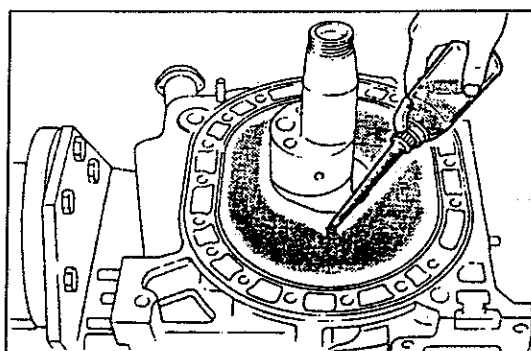


11. Apply engine oil to the seals of the front rotor.

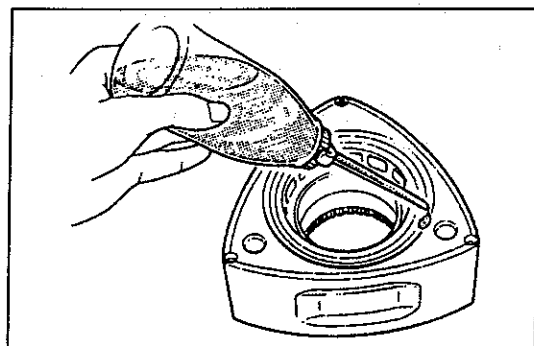
12. Apply engine oil to the front of the sliding surface of the intermediate housing.

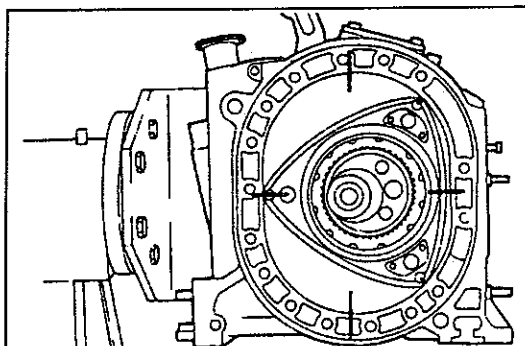
Caution

- Do not apply engine oil to the sealing rubber. It will adversely effect the petroleum jelly previously applied.

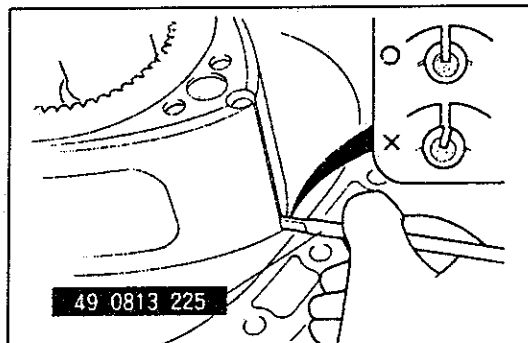
**Rear rotor**

1. Apply engine oil to the oil seal, side seal, and main bearing of the rotor.

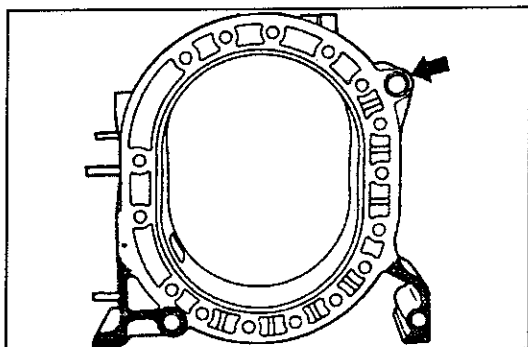




2. Install the rotor on the eccentric shaft as shown in the figure.

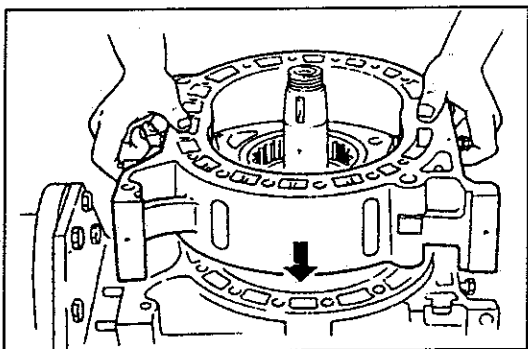


3. Insert the **SST** into each apex seal groove and verify that the grooves in the rotor and corner seals are aligned.

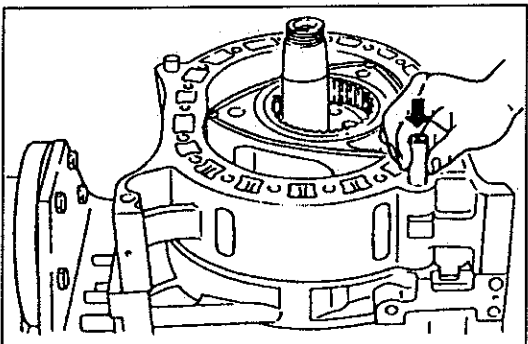


Rotor housing

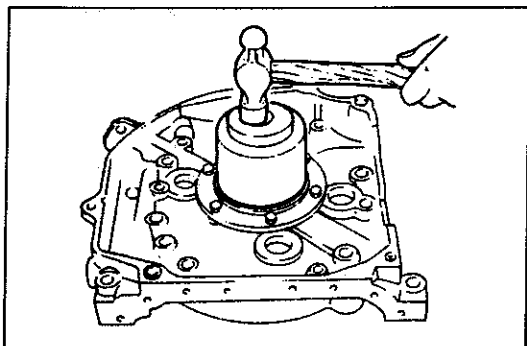
1. Coat the new O-ring with petroleum jelly and fit it in the tubular dowel hole in the rotor housing.
2. Degrease the rotor housing pedestal and apply liquid gasket. (Shaded areas in the figure.)



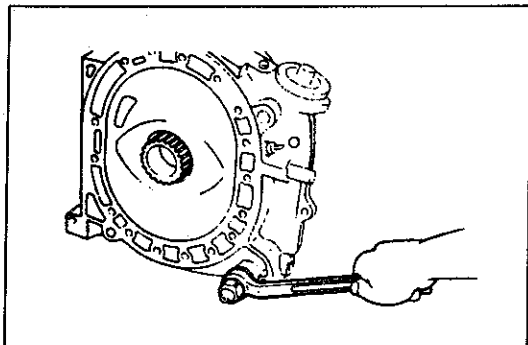
3. Apply engine oil to the rotor housing inner surface and install it to the intermediate housing.



4. Coat the tubular dowel with engine oil and insert it into the tubular dowel holes in the rotor housing and intermediate housing, making sure that the dowel is fully inserted.

**Rear Housing**

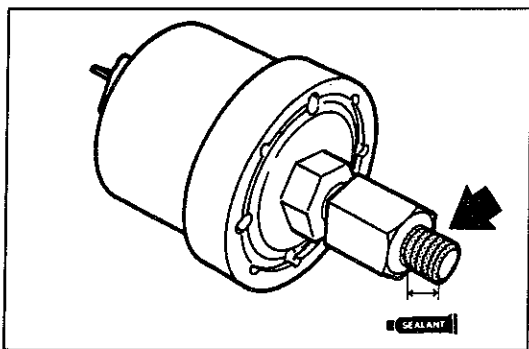
1. Apply clean engine oil to a new rear oil seal and the groove of the rear stationary gear.
2. Install the oil seal into the rear stationary gear.



3. Install the oil regulator valve.

Tightening torque:

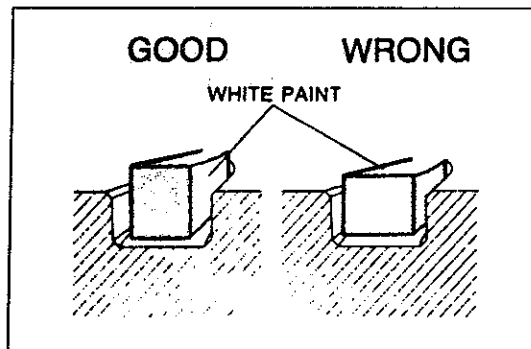
69–78 N·m {7.0–8.0 kgf·m, 51–57 ft·lbf}



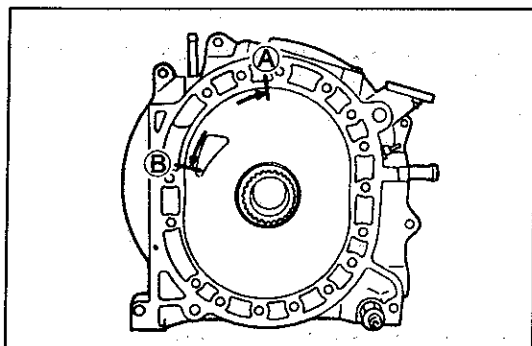
4. Apply sealant to the oil pressure switch threads. Do not allow sealant in the pressure switch hole.
5. Install the oil pressure switch.

Tightening torque:

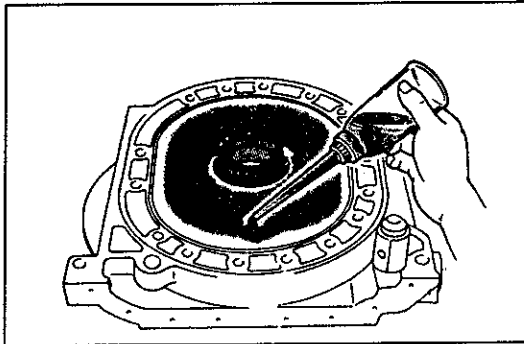
11–15 N·m {1.1–1.6 kgf·m, 8.0–11 ft·lbf}



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



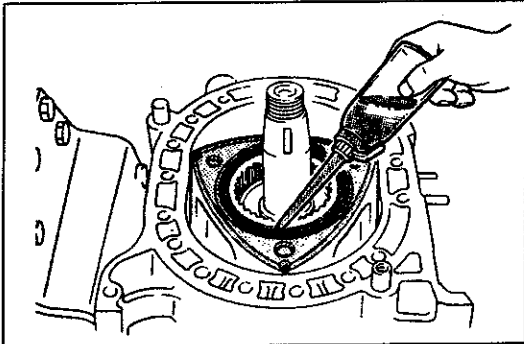
8. Install the inner sealing rubber so that the blue paint faces the outer wall of the groove and so that the seam is placed within position shown in the figure.
9. Verify that the outer and inner sealing rubbers are not twisted.



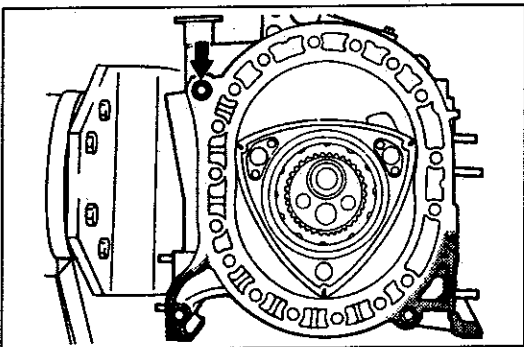
10. Apply clean engine oil to the contact surfaces, stationary gear, and main bearing.

Caution

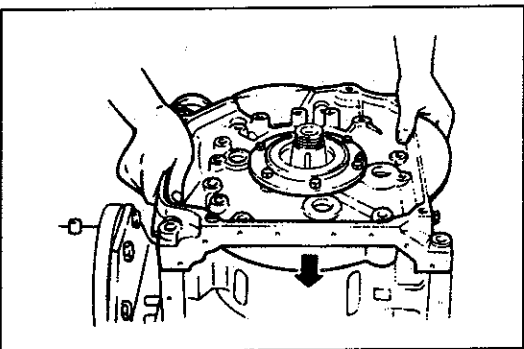
- Do not apply engine oil to the sealing rubber. It will adversely effect the petroleum jelly previously applied.



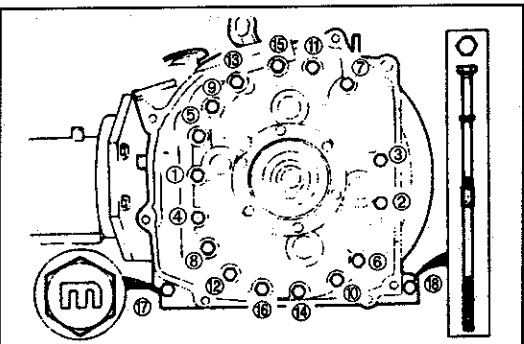
11. Apply clean engine oil to the rotor oil seal of the rear side of the rotor.



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



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



Tension Bolt

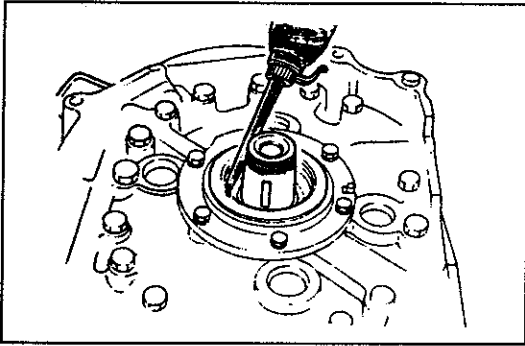
1. Apply clean engine oil to new seal washers and install them on the tension bolts.
2. Apply clean engine oil to the bolt threads.
3. Install the tension bolts and tighten them gradually in the order shown in the figure.

The bolt with the "m" mark is for the No. 17 position.

The bolt with the protector tube is for the No. 18 position.

Tightening torque:

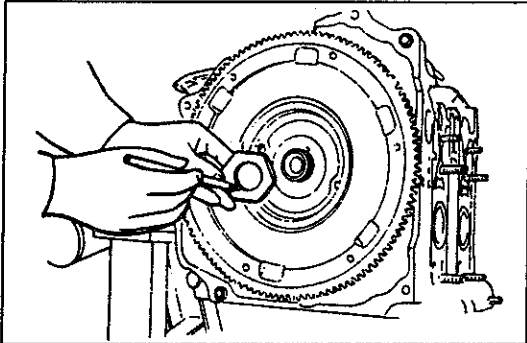
32-39 N·m {3.2-4.0 kgf·m, 24-28 ft·lbf}



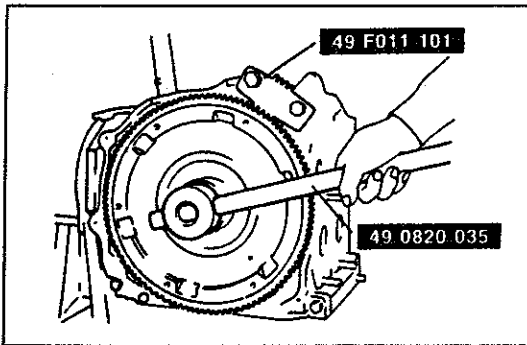
4. Turn the eccentric shaft and make sure that it rotates easily and smoothly.

Flywheel (MT)

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



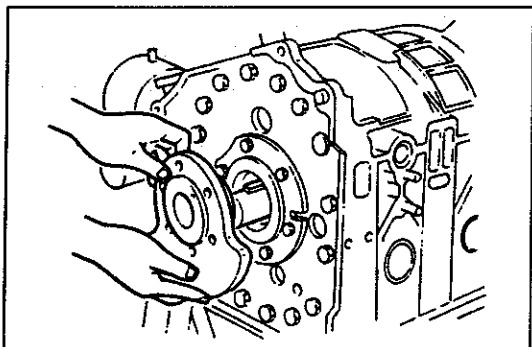
4. Apply thread-locking compound to the eccentric shaft threads.
5. Apply sealant to the contact surface of the locknut.



6. Install the lock nut and tighten it by using the SST.

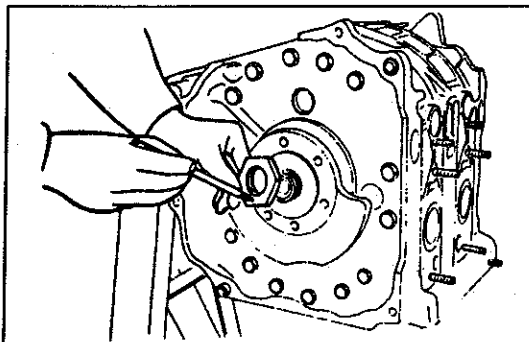
Tightening torque:

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

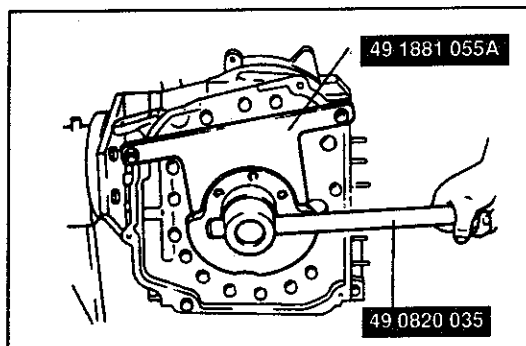


Counterweight (AT)

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



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

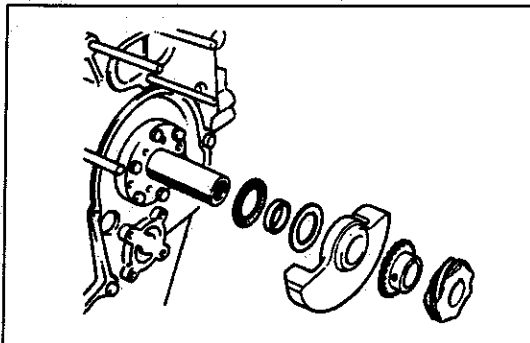
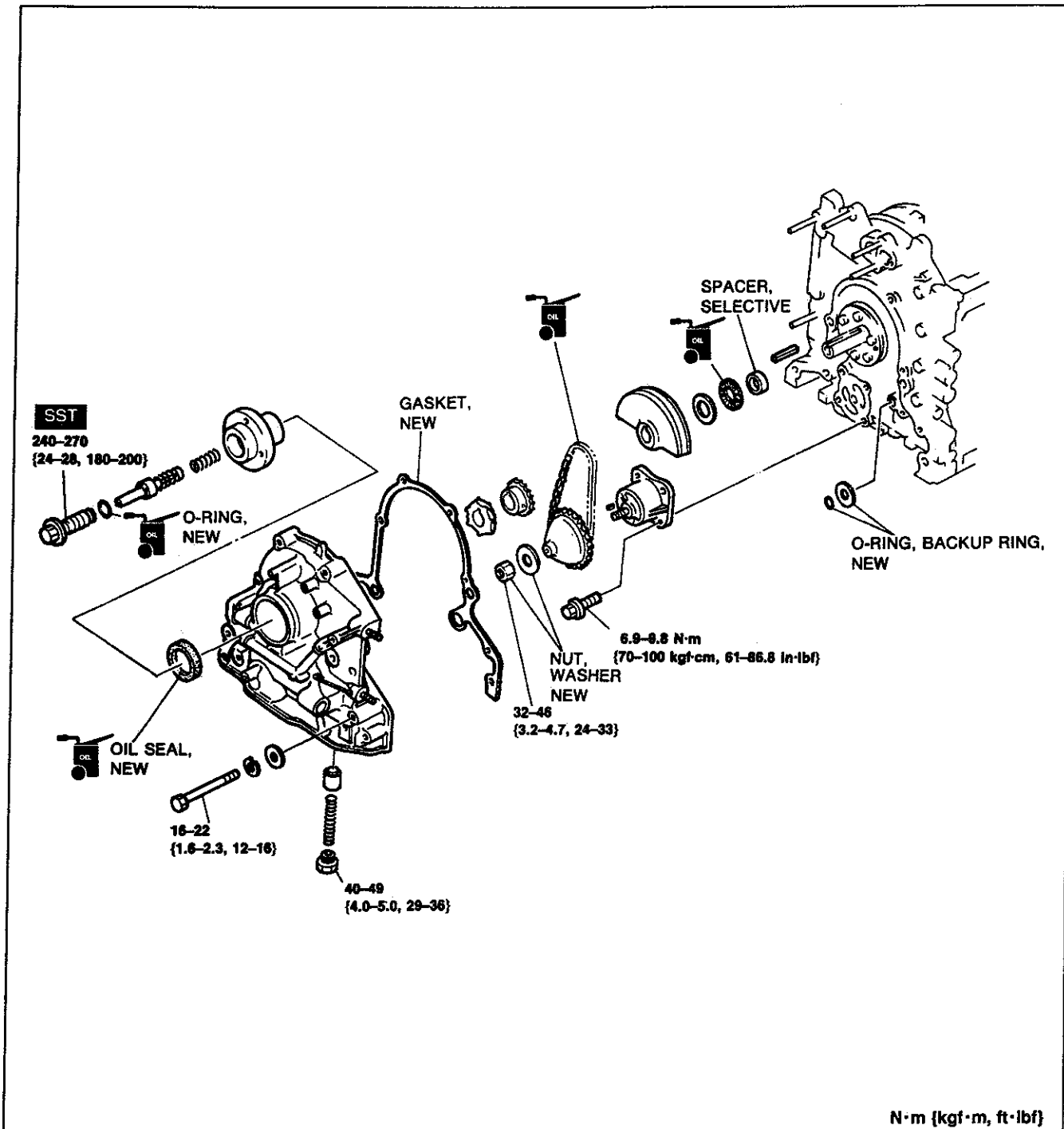


6. Install the lock nut and tighten it by using the SST.

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

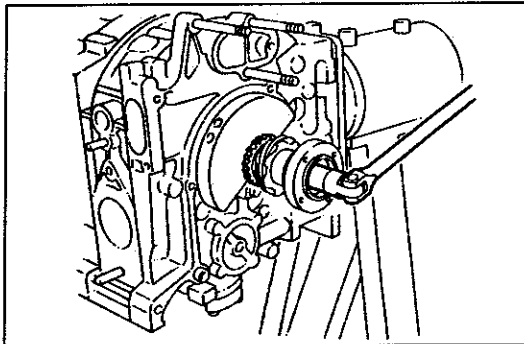
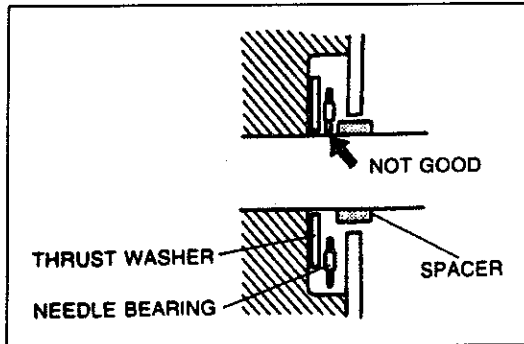
HOUSING (EXTERNAL PARTS II)

Torque Specifications

**Balance Weight, Bearing, and Spacer**

1. Install the following parts to the eccentric shaft:

- (1) Spacer
- (2) Thrust needle bearing
- (3) Thrust washer
- (4) Balance weight
- (5) Oil pump drive sprocket
- (6) Drive gear

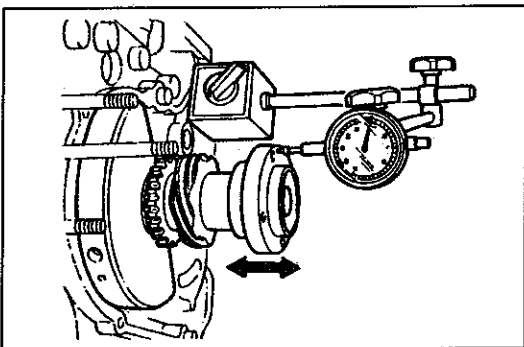


2. Verify that the needle bearing is not caught by the spacer.

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

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

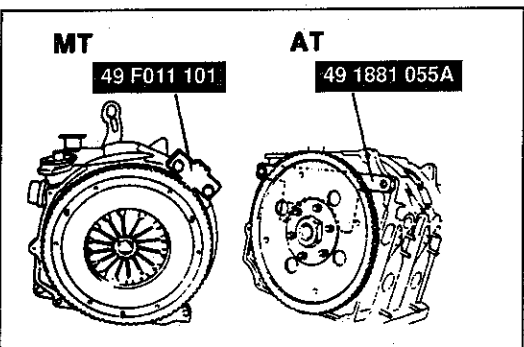
4. Remove the SST.



5. Measure the end play of the eccentric shaft.

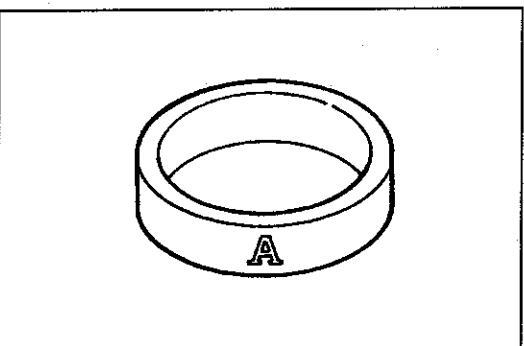
Standard:
0.040–0.070 mm {0.0016–0.0027 in}
Maximum:
0.09 mm {0.0035 in} max.

If the end play is not within specification, continue from step 6 and replace the spacer.



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

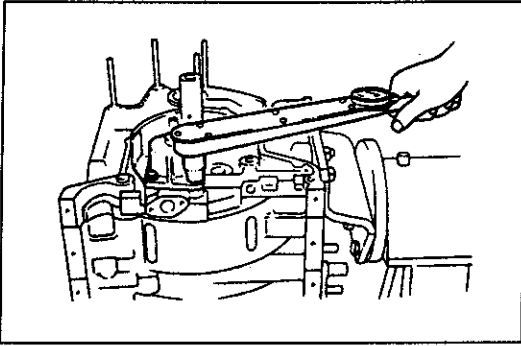
7. Remove the eccentric shaft lock bolt, drive gear, and oil pump drive sprocket.



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

Spacer stamp and thickness

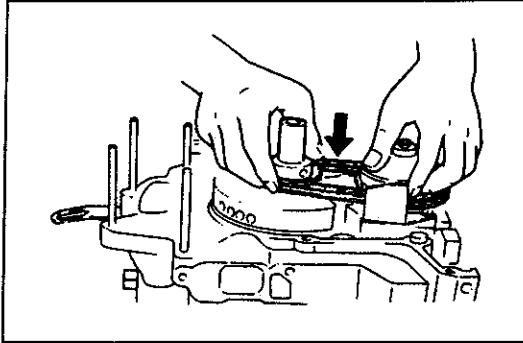
Stamp	Thickness	mm {in}	Stamp	Thickness	mm {in}
A	7.975–7.995	{0.3140–0.3147}	D	8.035–8.055	{0.3164–0.3171}
B	7.995–8.015	{0.3148–0.3155}	E	8.055–8.075	{0.3172–0.3179}
C	8.015–8.035	{0.3156–0.3163}			

**Oil pump**

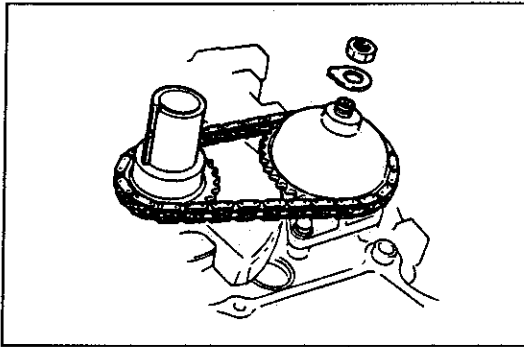
1. Apply clean engine oil to the oil pump shaft.
2. Install the oil pump to the front housing.

Tightening torque:

6.1–9.8 N·m {70–100 kgf·cm, 61–86.8 in·lbf}



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

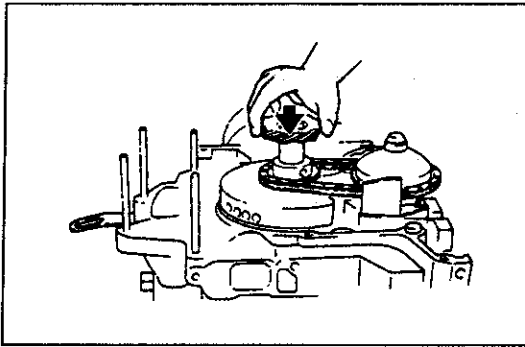


5. Install the key to the eccentric shaft.
6. Install a new washer and oil pump lock nut.

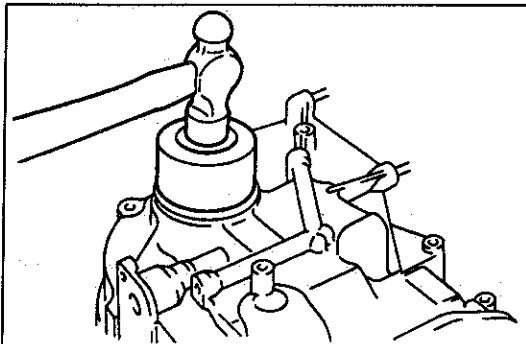
Tightening torque:

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

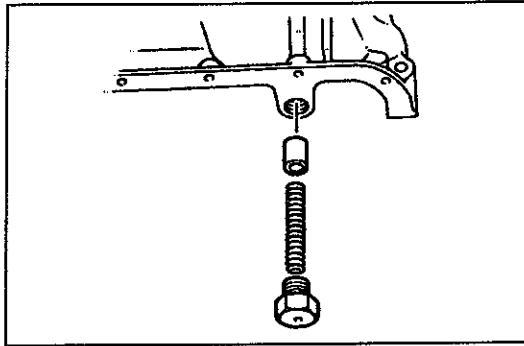
7. Bend the washer to lock the nut.



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

**Front Cover**

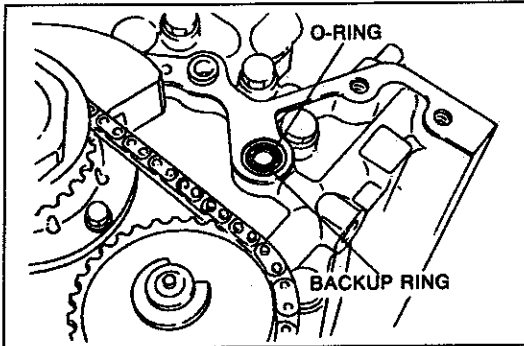
1. Apply clean engine oil to the new front oil seal and the groove of the front cover.
2. Install the oil seal in the front cover.



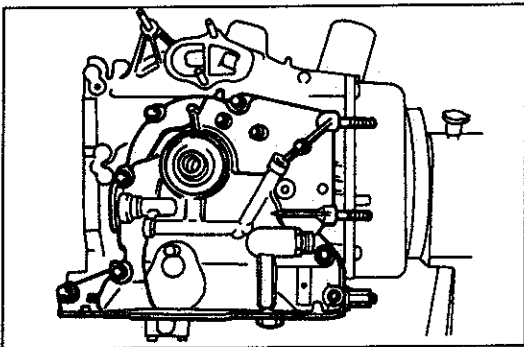
3. Install the oil pressure control valve in the front cover.

Tightening torque:

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



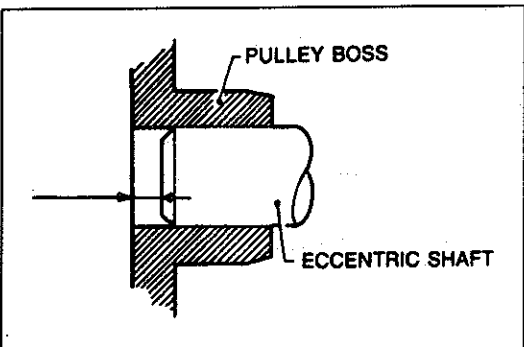
4. Apply petroleum jelly to the new O-ring and backup ring.



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

Tightening torque:

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



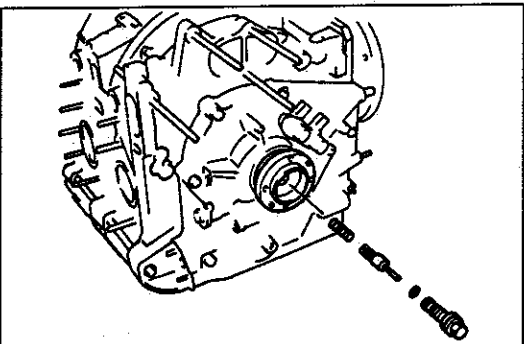
Eccentric Shaft Lock Bolt and Bypass Valve

1. Install the eccentric shaft pulley boss.

2. Temporarily install the lock bolt, and tighten it by hand.

3. Remove the lock bolt, and measure the pulley boss protrusion. If it is over the limit, the needle bearing may be caught by the spacer. Remove and reinstall the needle bearing, if necessary.

Protrusion: 2.44 mm {0.0961} max.



4. Install the bypass valve and spring into the eccentric shaft.

5. Apply clean engine oil to the new O-ring and install it on the lock bolt.

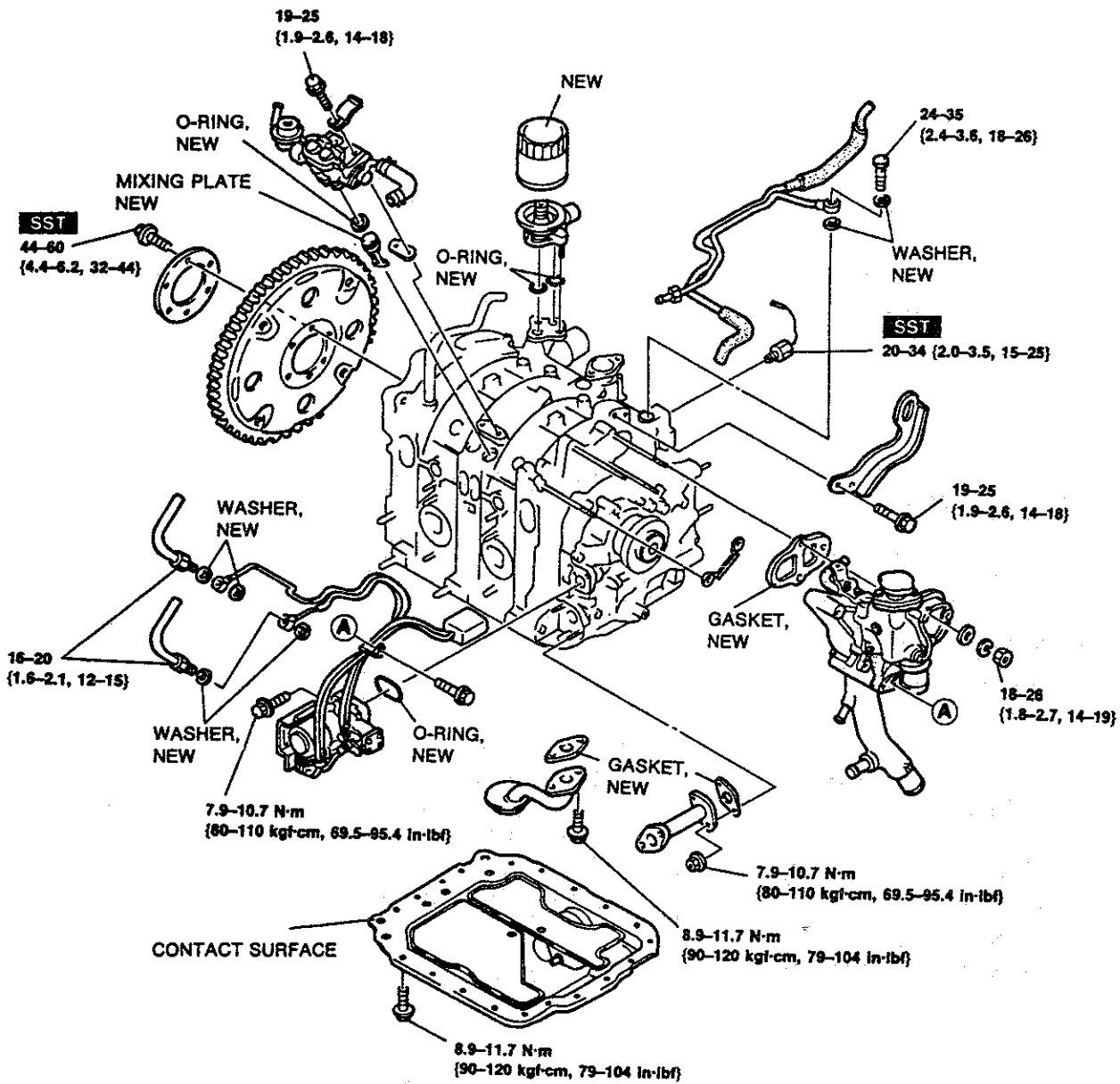
6. Apply sealant to the flange face of a new lock bolt.

7. Install the lock bolt.

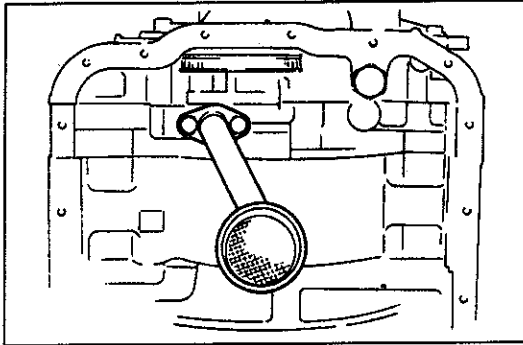
Tightening torque:

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

HOUSING (EXTERNAL PARTS I) Torque Specifications



N·m {kgf-cm, ft-lbf}

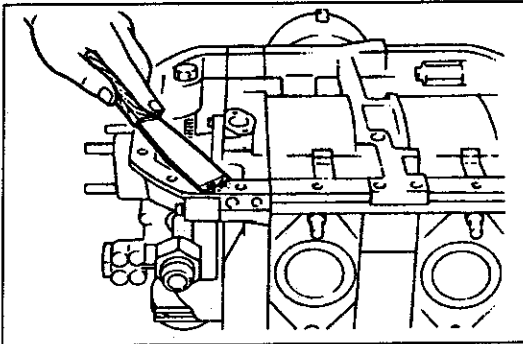


Oil Strainer

Install the oil strainer along with a new gasket.

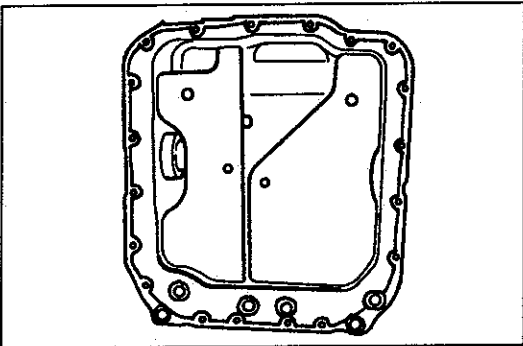
Tightening torque:

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



Oil Pan

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

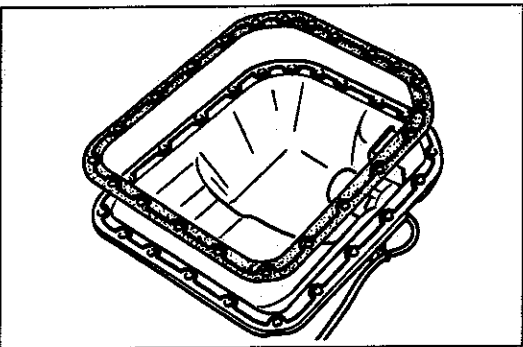


2. Clean the contact surface of the housing and oil pan with degreaser and a soft cloth.

3. Apply silicone sealant and install oil pan;

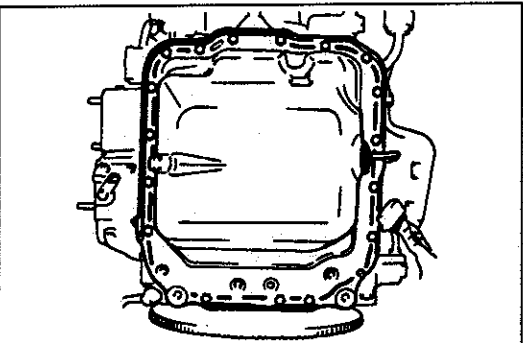
Without gasket; Apply a 4–6 mm {0.16–0.24 in} continuous bead of silicone sealant along the inside edge of the housing, inboard of the bolt holes. Overlap the ends and install the oil pan within five minutes.

With gasket; Apply a 4–6 mm {0.16–0.24 in} continuous bead of silicone sealant along the inside edge of the oil pan and the housing side of the gasket, inboard of the bolt holes. Overlap the ends and install the oil pan within five minutes.



Caution

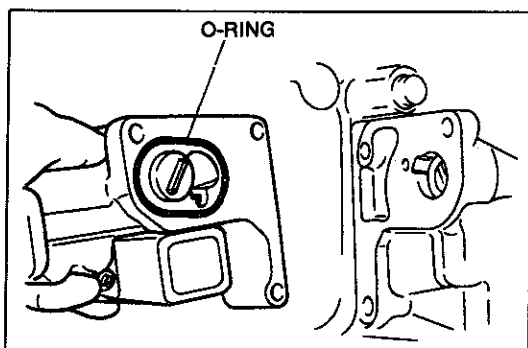
- If the bolts are reused, remove the old sealant from the bolt threads. Tightening a bolt that has old sealant on it can cause thread damage.



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

Tightening torque:

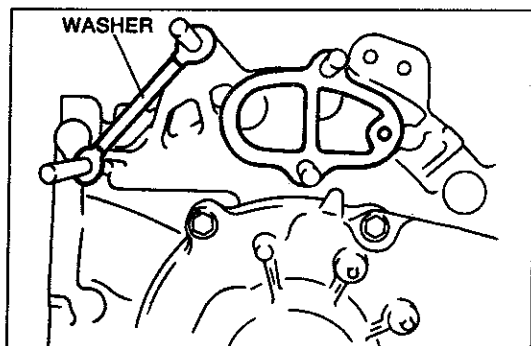
8.9–11.7 N·m {90–120 kgf·cm, 79–104 in·lbf}

**Metering oil pump**

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

Tightening torque:

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

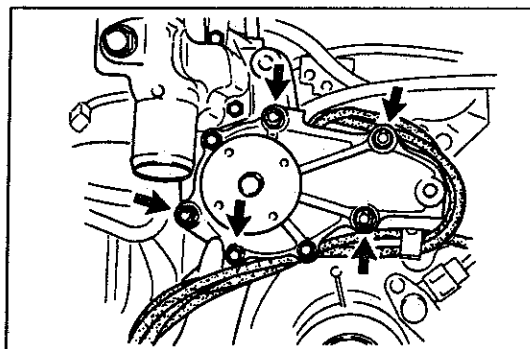
**Water pump**

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

2. Install the water pump to the front housing.

Tightening torque:

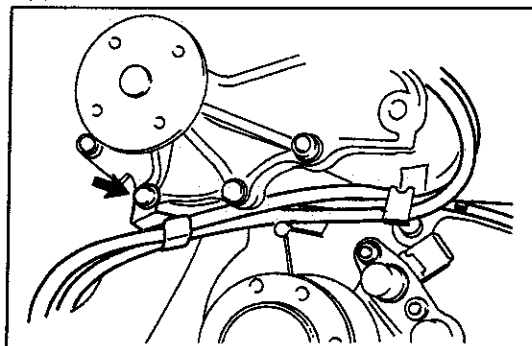
18–26 N·m {1.8–2.7 kgf·m, 14–19 ft·lbf}



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

Tightening torque:

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

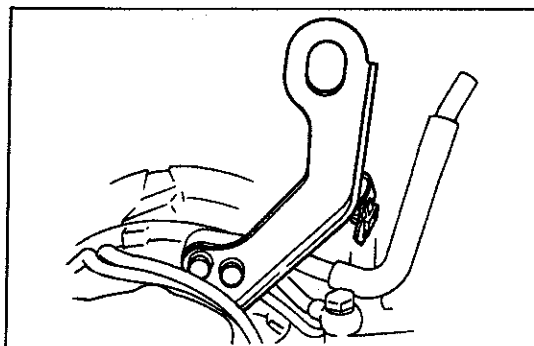
**Engine hanger**

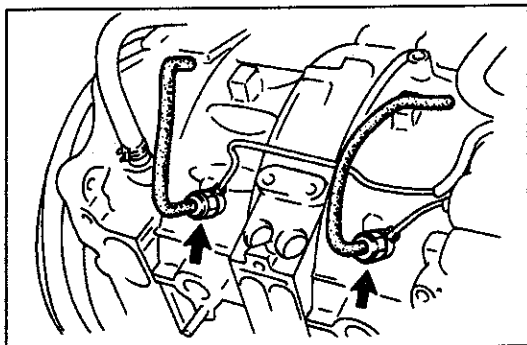
1. Install the engine hanger to the front housing.

Tightening torque:

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

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





Metering oil nozzle

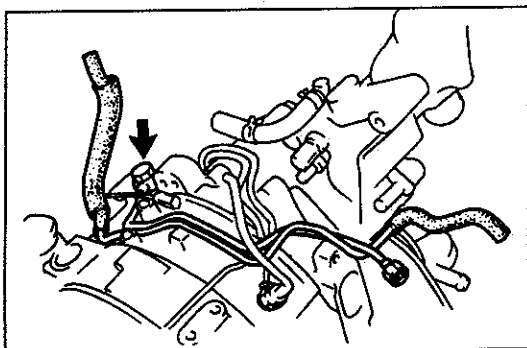
Install the oil nozzles and connect the metering oil tubes using new washers. The oil tube ends are colored.

White: Front rotor housing

Yellow: Rear rotor housing

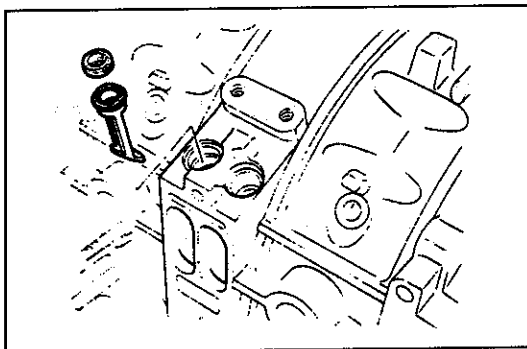
Tightening torque:

16–20 N·m {1.6–2.1 kgf·m, 12–15 ft·lbf}



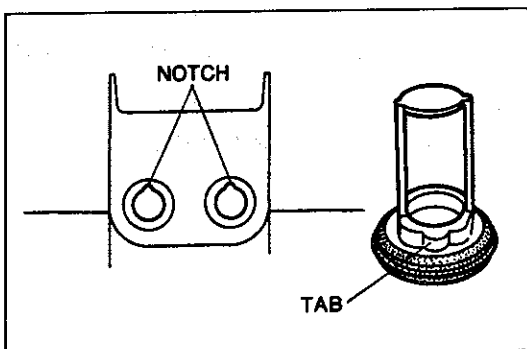
Oil inlet pipe

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



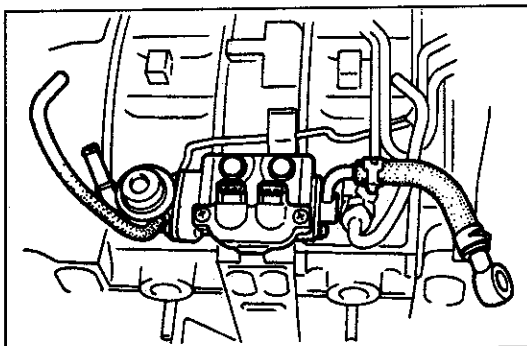
Fuel delivery pipe and mixing plate

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



3. Install the mixing plate by aligning the mixing plate tab with the housing notch.

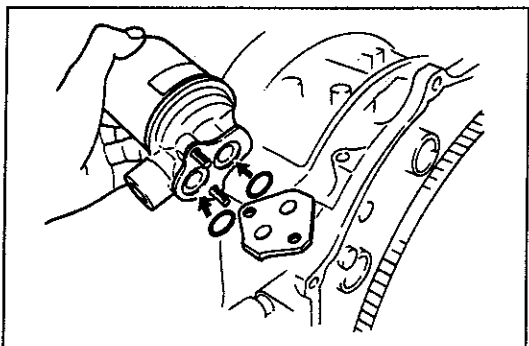
4. Install the fuel delivery pipe.



5. Install the fuel delivery pipe.

Tightening torque:

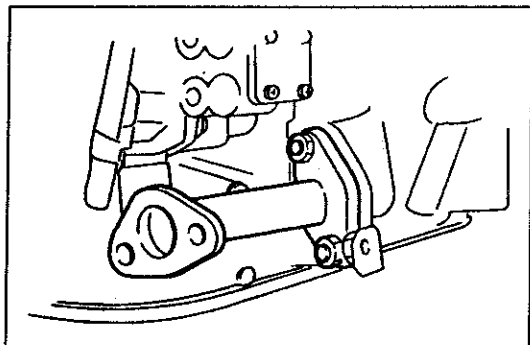
19–25 N·m {1.9–2.6 kgf·m, 14–18 ft·lbf}

**Oil filter body**

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

Tightening torque:

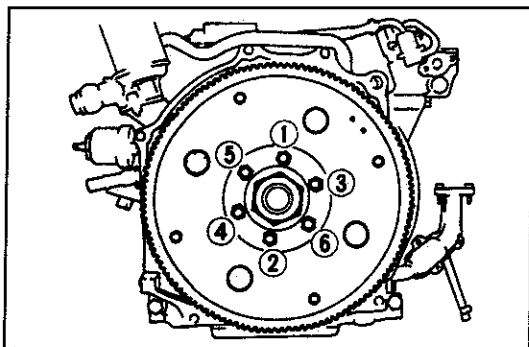
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

**Oil pipe**

Install the oil pipe along with a new gasket.

Tightening torque:

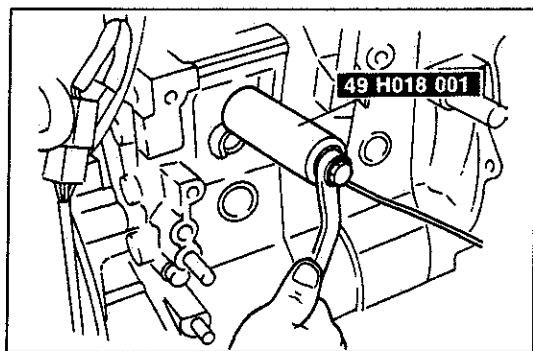
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

**Drive plate (AT)**

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

Tightening torque:

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

**Knock sensor**

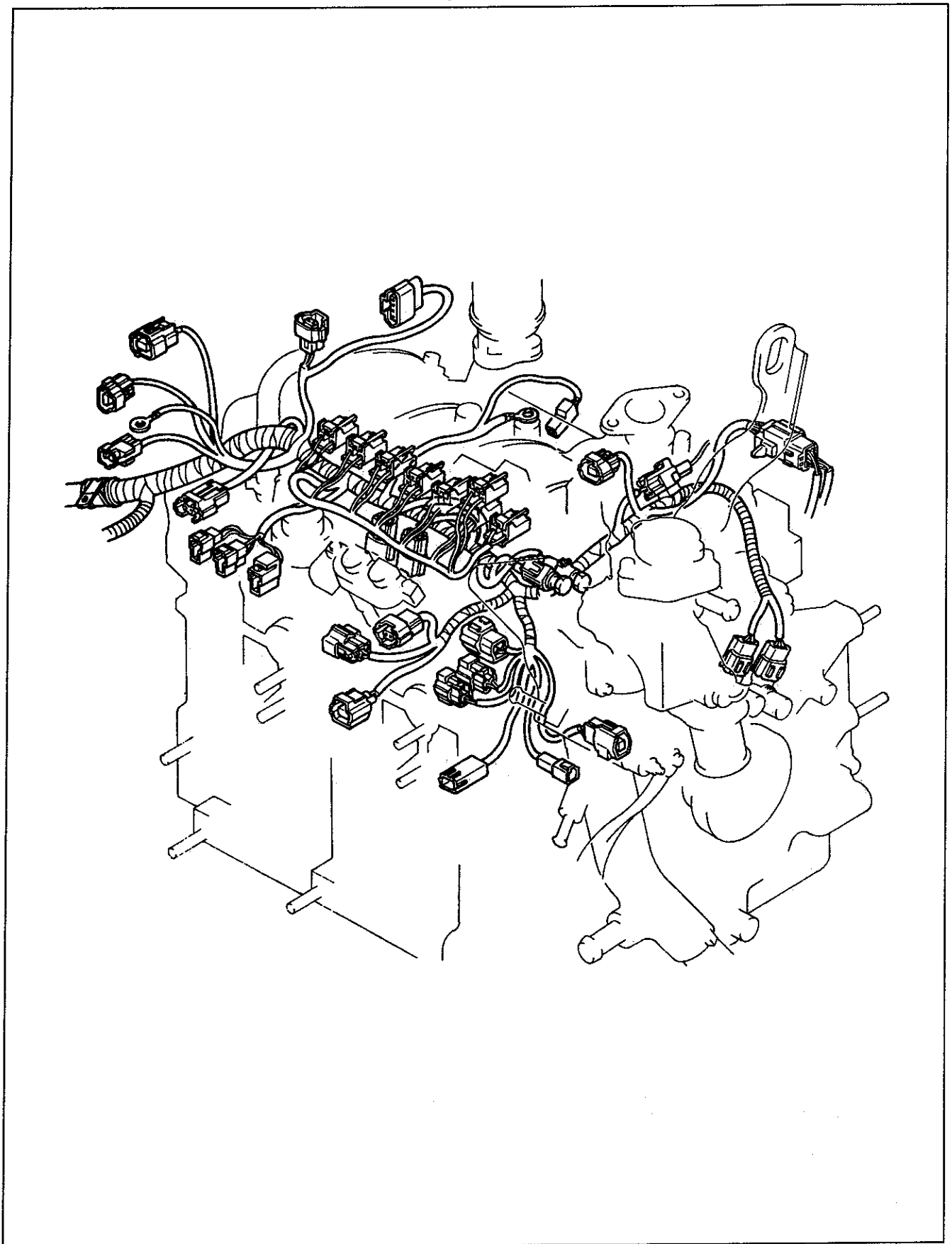
Install the knock sensor and tighten it by using the SST.

Tightening torque:

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

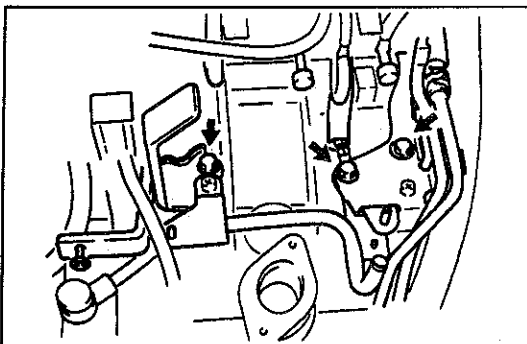
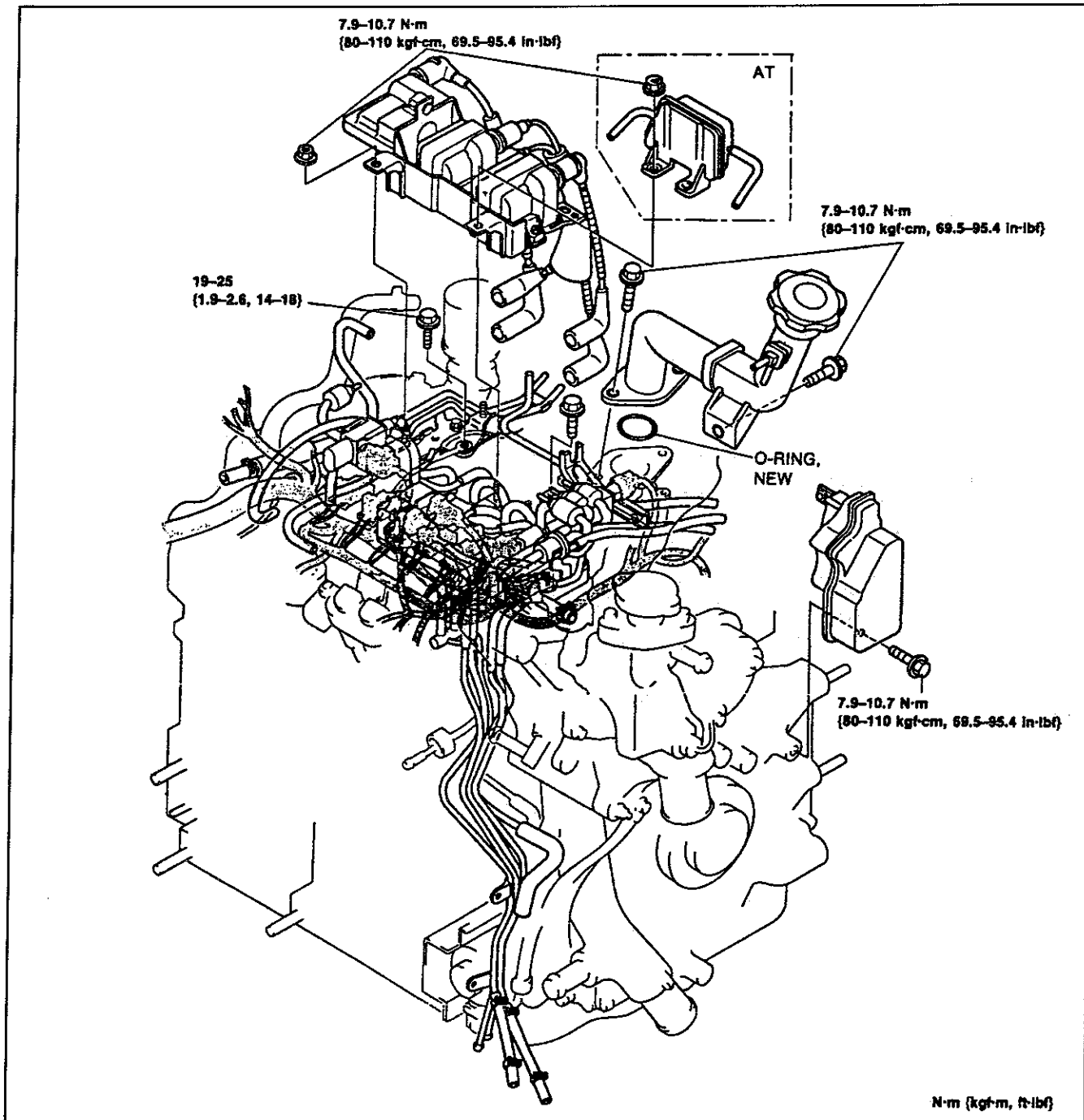
Harness

Connect the harness connectors shown in the figure.



Vacuum pipe assembly

Connect the hoses and connectors shown in the figure.

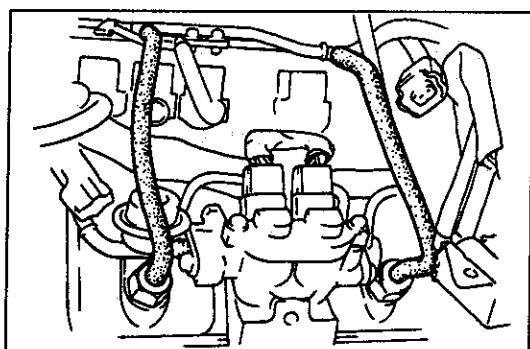
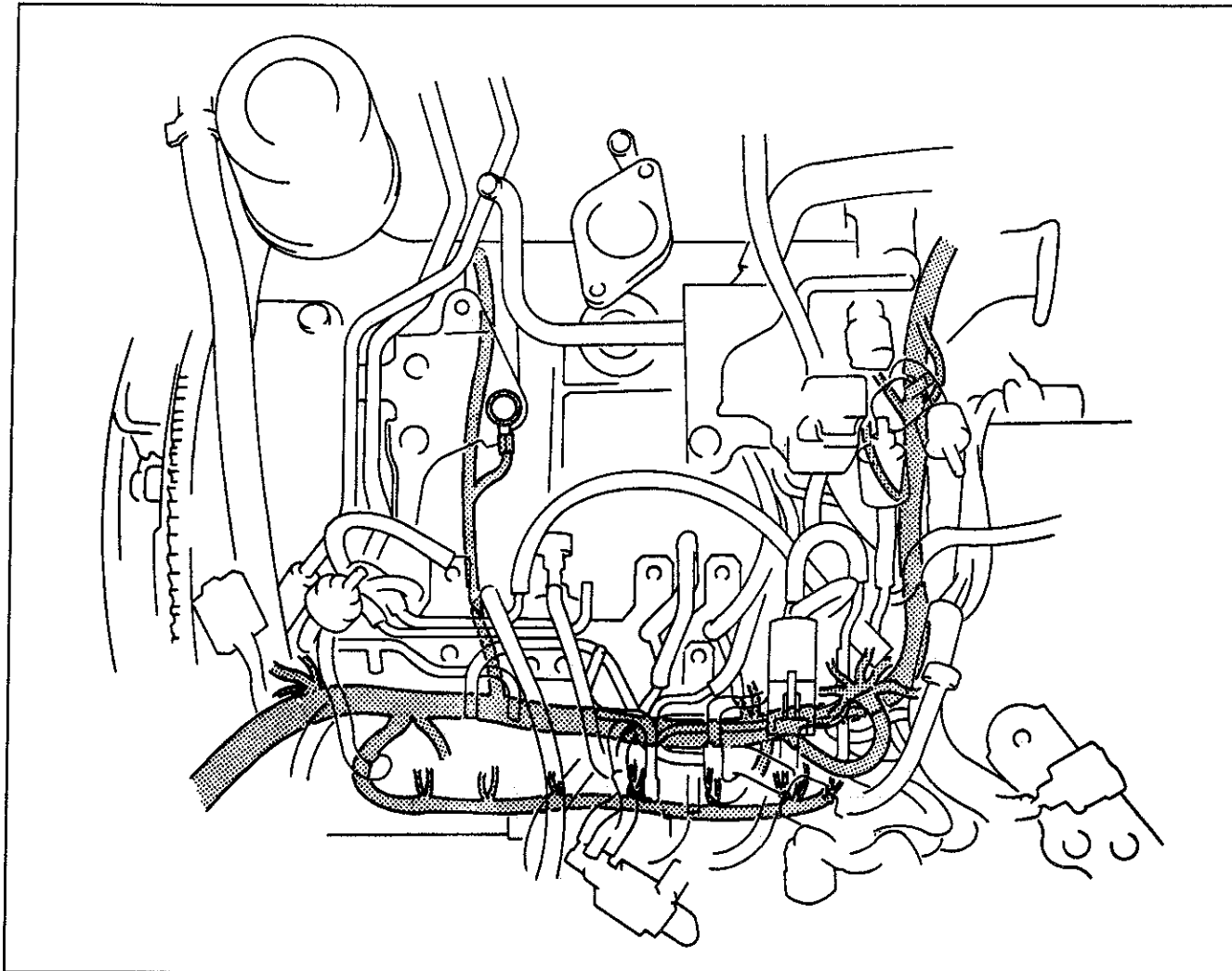
Torque Specifications**Vacuum pipe**

1. Install the vacuum pipe and ground harness.

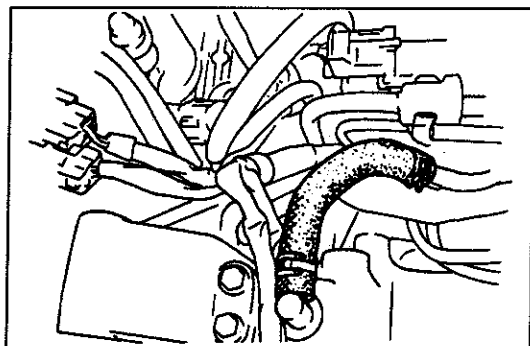
Tightening torque:

19-25 N·m {1.9-2.6 kgf·m, 14-18 ft·lbf}

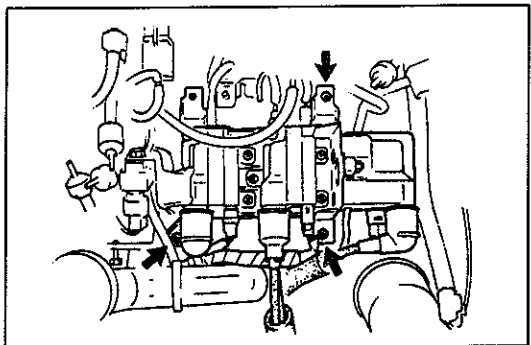
2. Install the harness and hoses as shown in the figure.



3. Connect the vacuum hoses.



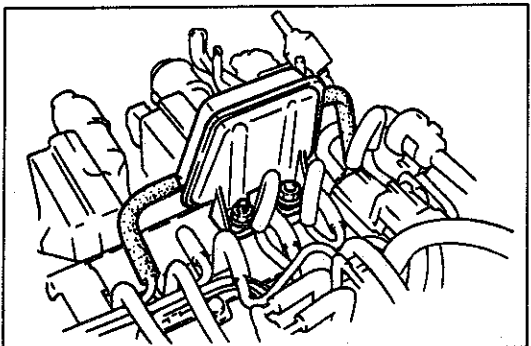
4. Connect the water hose.

**Ignition coil assembly and vacuum chamber**

1. Install the ignition coil assembly

Tightening torque:

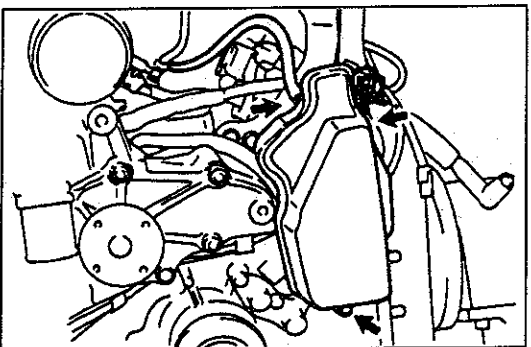
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}



2. Install the vacuum chamber. (AT)

Tightening torque:

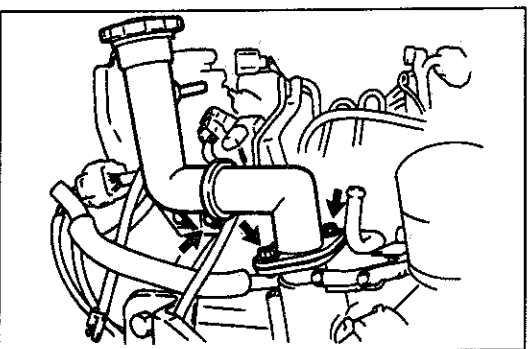
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

**Vacuum chamber**

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

Tightening torque:

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

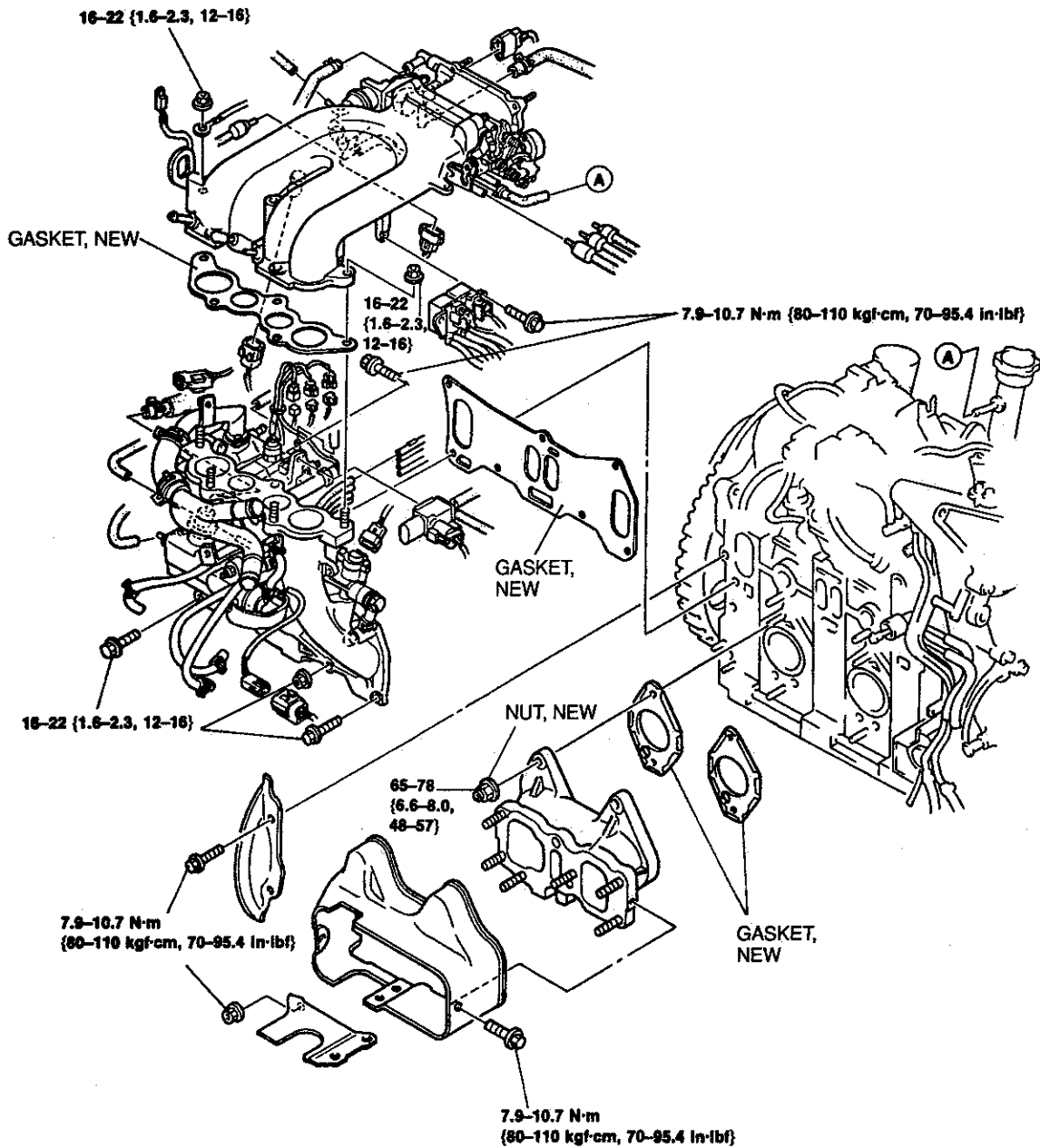
**Oil filler pipe**

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

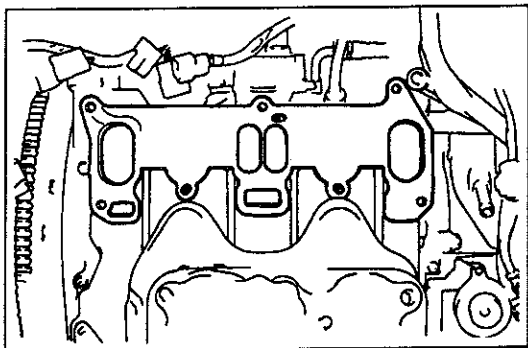
Tightening torque:

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

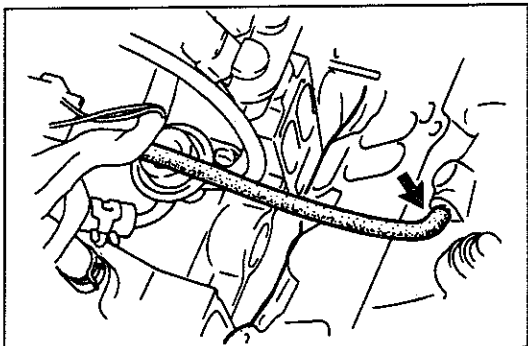
AUXILIARY PARTS (II) Torque Specifications



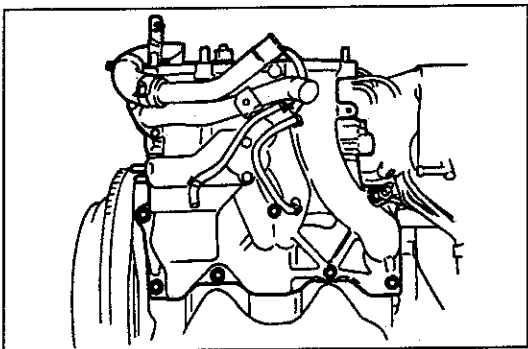
N·m {kgf·m, ft·lbf}

**Intake manifold assembly**

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



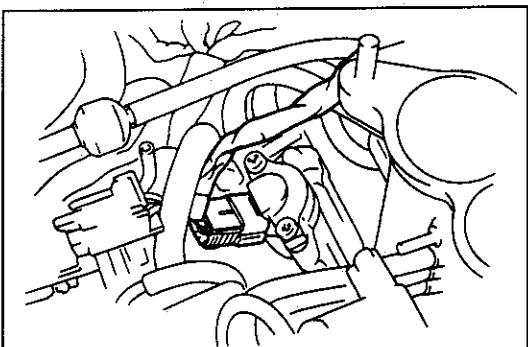
2. Connect the vacuum hose to the intake manifold.



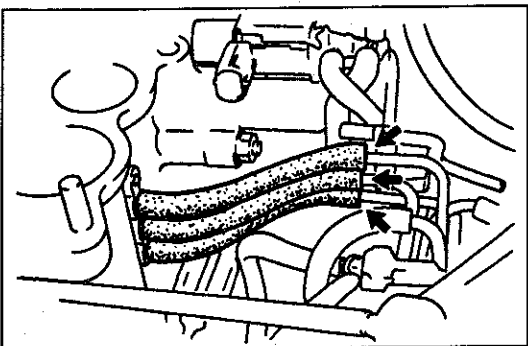
3. Install the intake manifold.

Tightening torque:

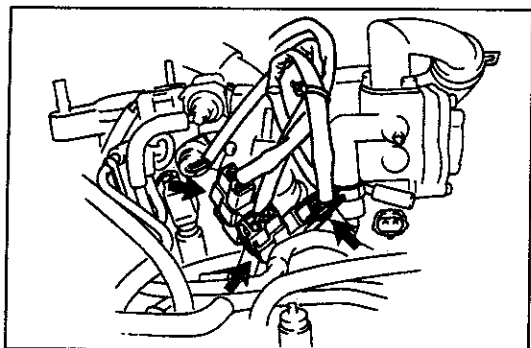
16–22 N·m {1.6–2.3 kgf·m, 12–16 ft·lbf}



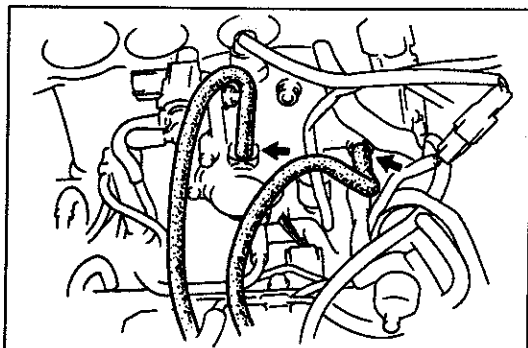
4. Connect the fuel injector connectors.



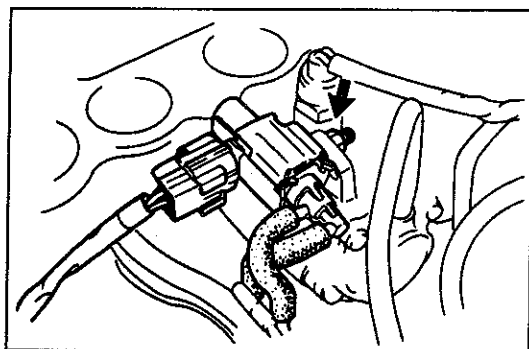
5. Connect the vacuum hoses as shown in the figure.



6. Connect the connectors shown in the figure.

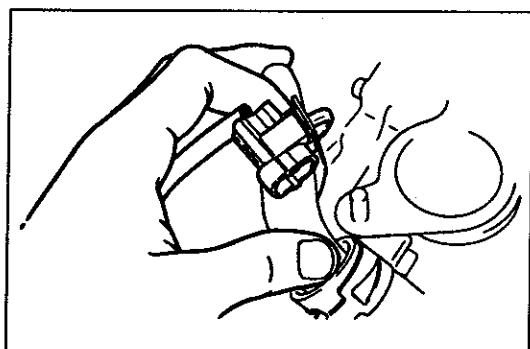


7. Connect the vacuum hoses as shown in the figure.

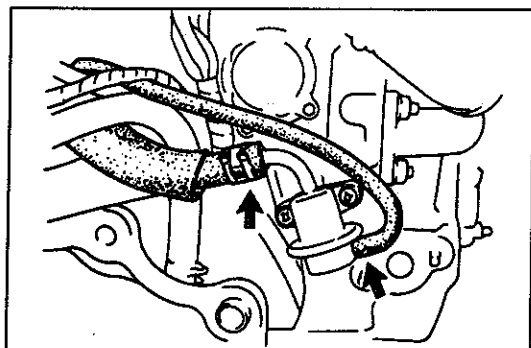


8. Install the three-way solenoid shown in the figure.

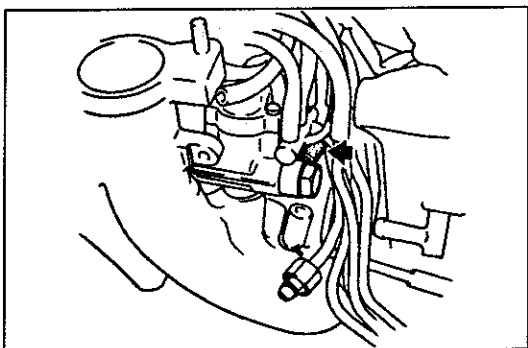
Tightening torque:
 7.9–10.7 N·m {80–110 kgf·cm, 69.5–95.4 in·lbf}



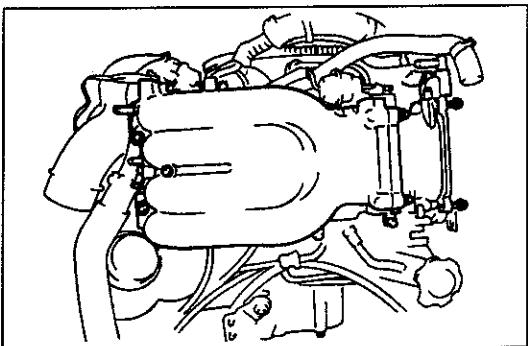
9. Mount the oxygen sensor connector.



10. Connect the fuel hose and vacuum hose.



11. Connect the fuel hose shown in the figure.

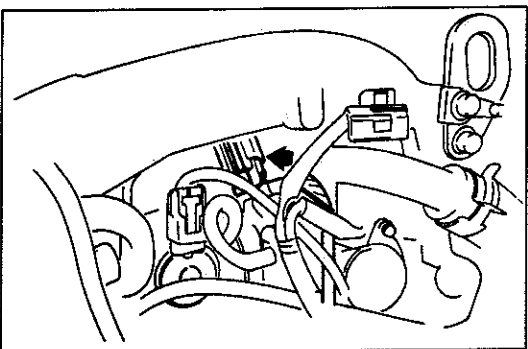


Surge tank assembly

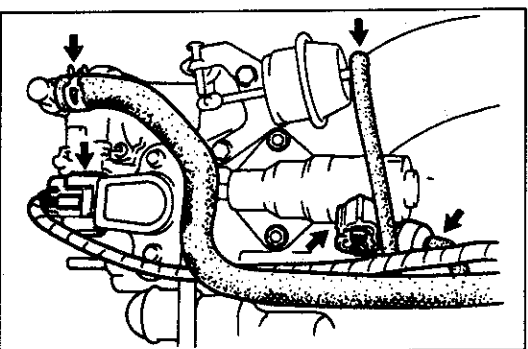
1. Install the surge tank assembly and the ground harness.

Tightening torque:

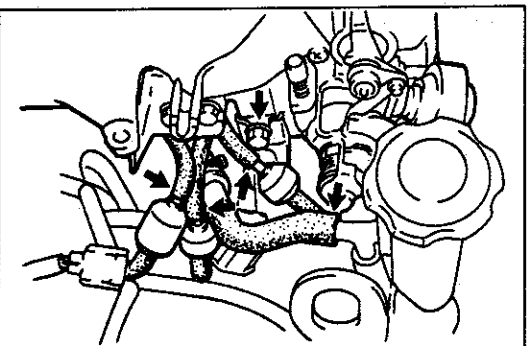
16–22 N·m {1.6–2.3 kgf·m, 12–16 ft·lbf}



2. Connect the connector shown in the figure.



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

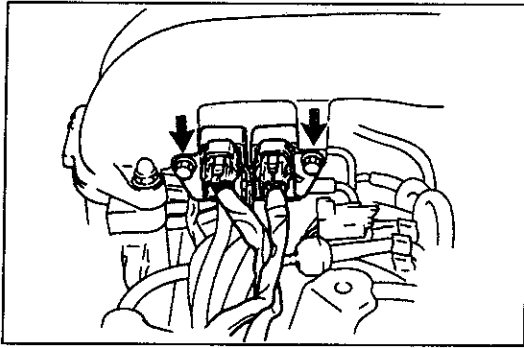


4. Tighten the bolt.

Tightening torque:

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

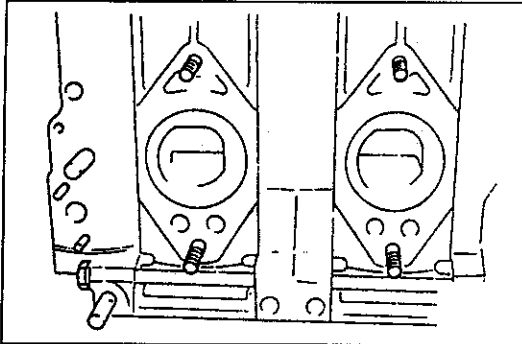
5. Connect the vacuum hoses and the blowby hose as shown in the figure.



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

Tightening torque:

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

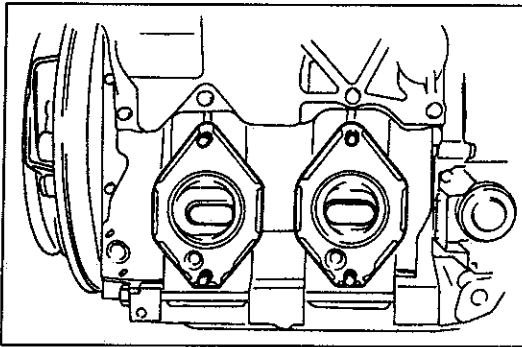


Exhaust manifold

1. Retighten the studs to the specified torque.

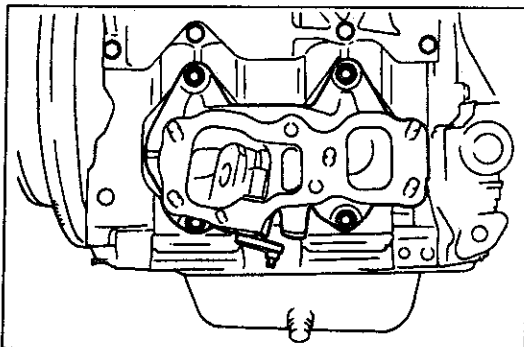
Tightening torque:

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



2. Install the gaskets with the crimped side facing the exhaust manifold.

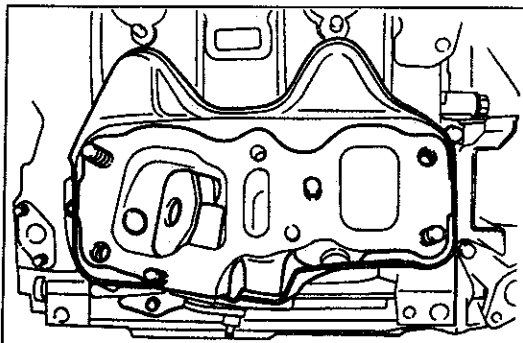
3. Install the exhaust manifold.



4. Install the exhaust manifold.

Tightening torque:

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

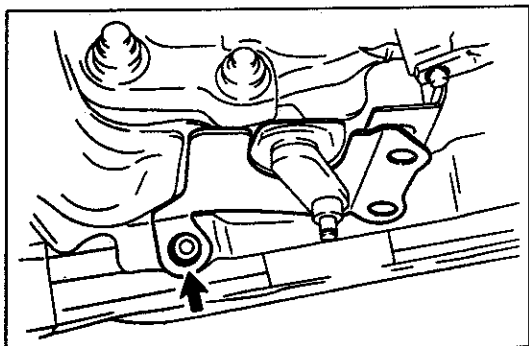


Exhaust manifold Insulator

1. Install the exhaust manifold insulator.

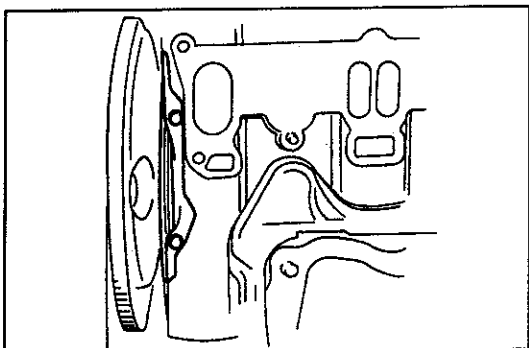
Tightening torque:

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



2. Install the exhaust manifold insulator.

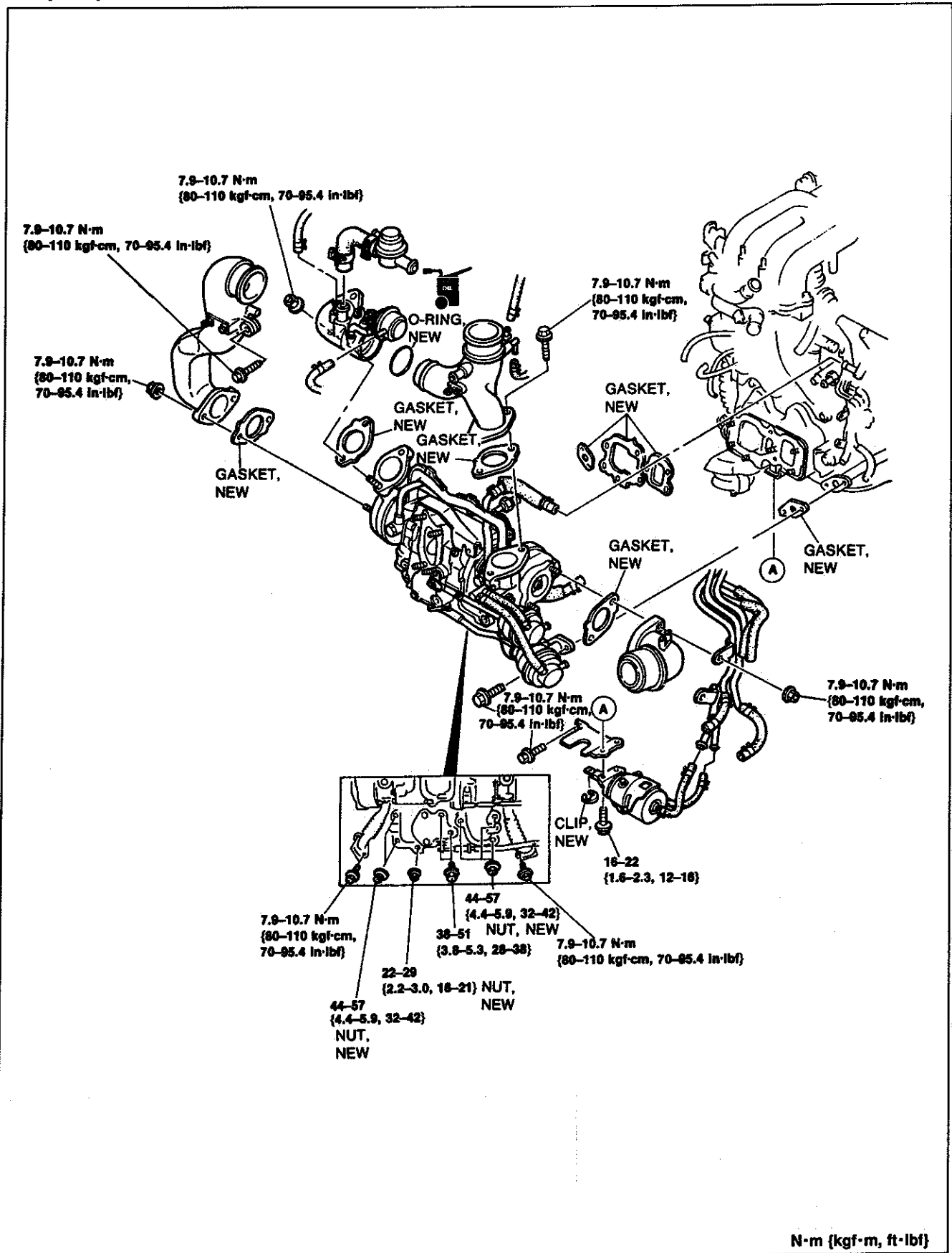
Tightening torque:
 $7.9-10.7 \text{ N}\cdot\text{m}$ {80-110 kgf·cm, 69.5-95.4 in·lbf}

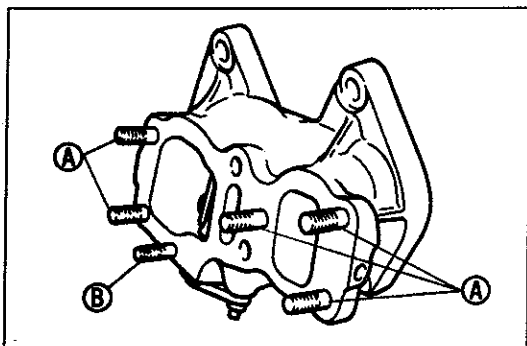


Oil seal plate
Install the oil seal plate.

Tightening torque:
 $7.9-10.7 \text{ N}\cdot\text{m}$ {80-110 kgf·cm, 69.5-95.4 in·lbf}

TURBOCHARGER Torque specifications



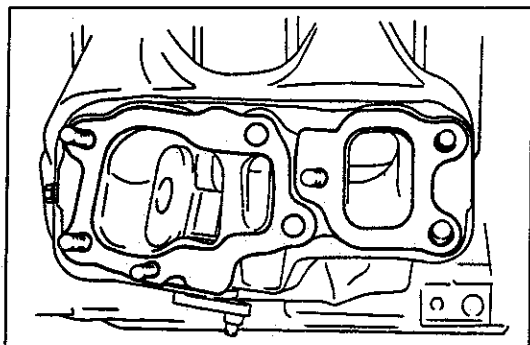
**Turbocharger**

1. Retighten the stud to the specified torque.

Tightening torque:

Ⓐ : 16–23 N·m {1.6–2.4 kgf·m, 12–17 ft·lbf}

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



2. Install the new turbocharger gaskets.

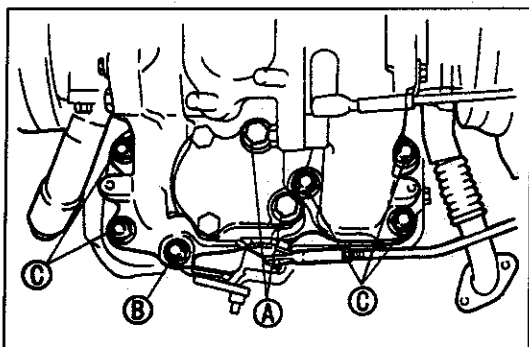
3. Install the turbocharger assembly.

Tightening torque:

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

Ⓑ : 22–29 N·m {2.2–3.0 kgf·m, 16–21 ft·lbf}

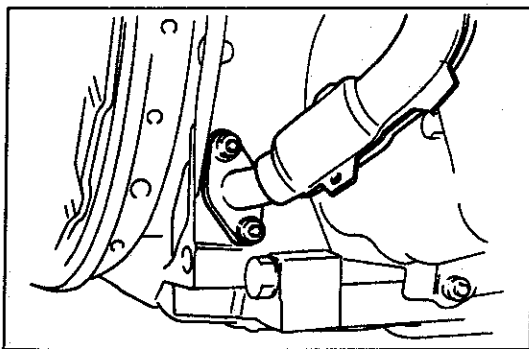
Ⓒ : 44–57 N·m {4.4–5.9 kgf·m, 32–42 ft·lbf}



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

Tightening torque:

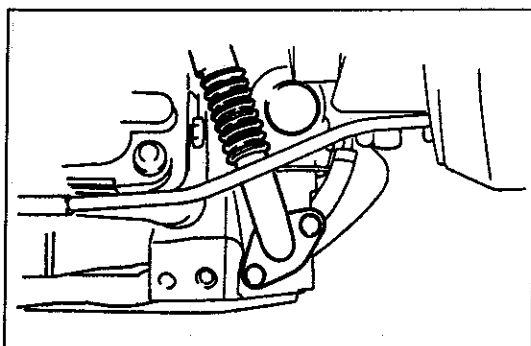
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

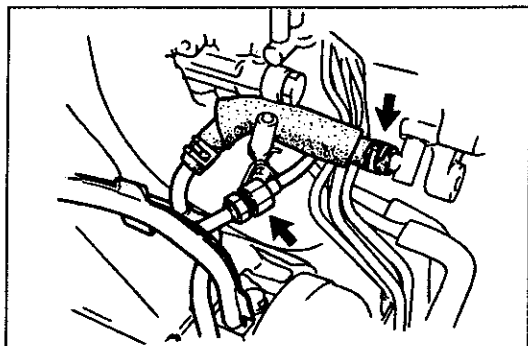


5. Connect the oil outlet pipe along with a new gasket.

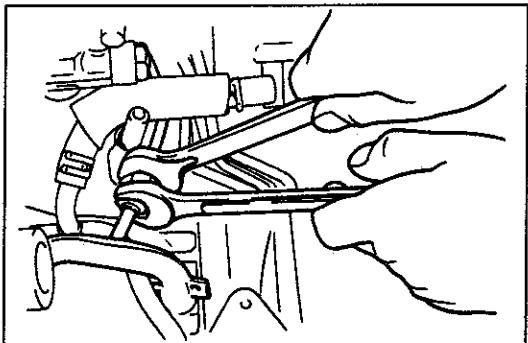
Tightening torque:

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





6. Connect the oil inlet pipe and water hose.



7. Use two wrenches to tighten the oil inlet pipe connector bolt.

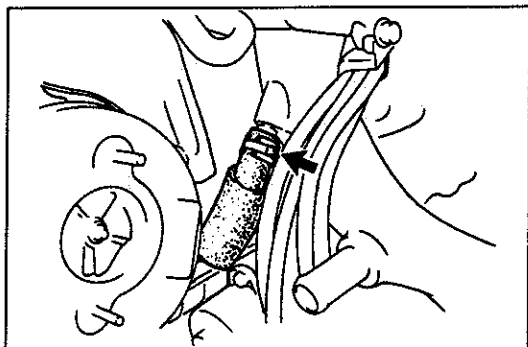
Tightening torque:

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

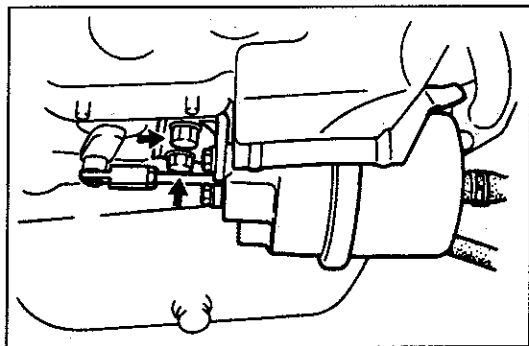
8. Tighten the oil inlet pipe connecting bolt. (Refer to page C-80)

Tightening torque:

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



9. Connect the water hose.

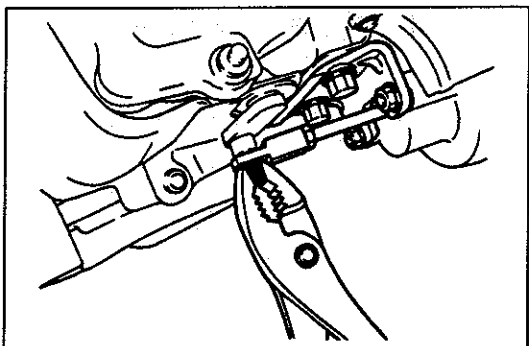


10. Install the turbo control actuator.

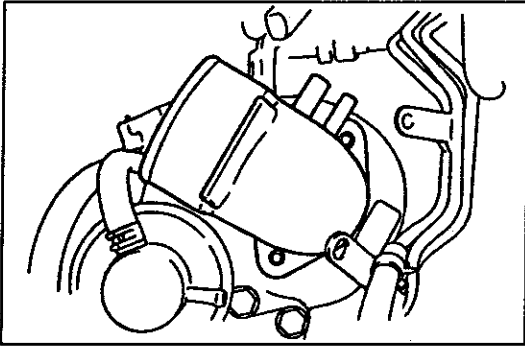
Tightening torque:

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

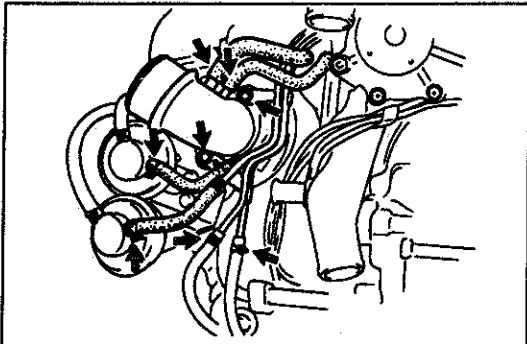
11. Connect the air hoses.



12. Install a new clip on the actuator rod.



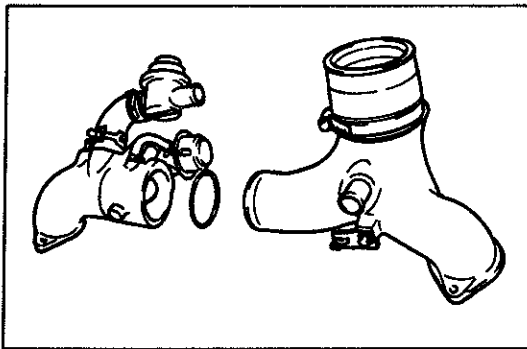
Air intake pipe
Install the air intake pipe.



Vacuum pipe
1. Install the vacuum pipe.

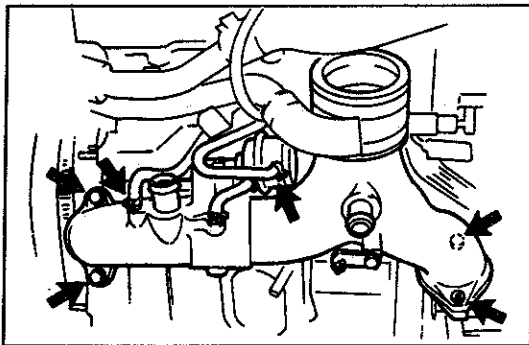
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

2. Connect the vacuum hoses.



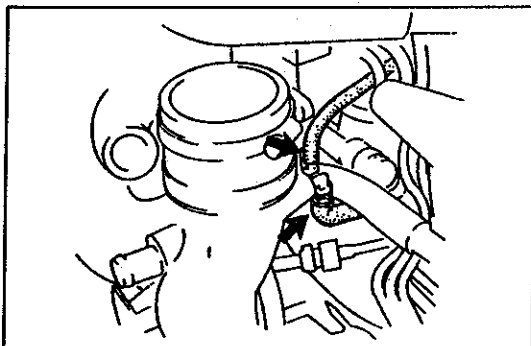
Air pipe and control valve

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

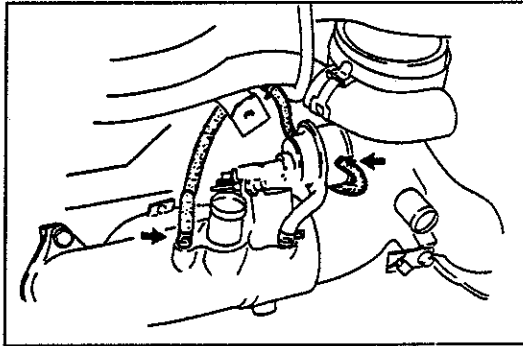


2. Install the air pipe and control valve on the turbo-charger assembly along with new gaskets.

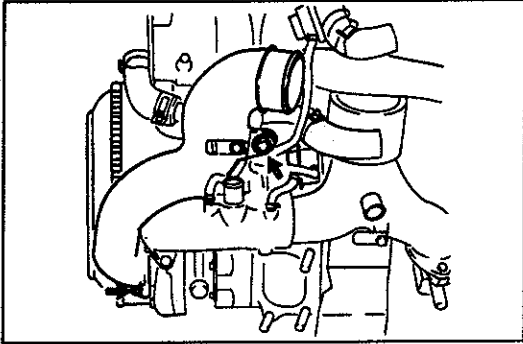
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}



3. Connect the vacuum hoses shown in the figures.



4. Connect the hoses shown in the figure.



Air pipe

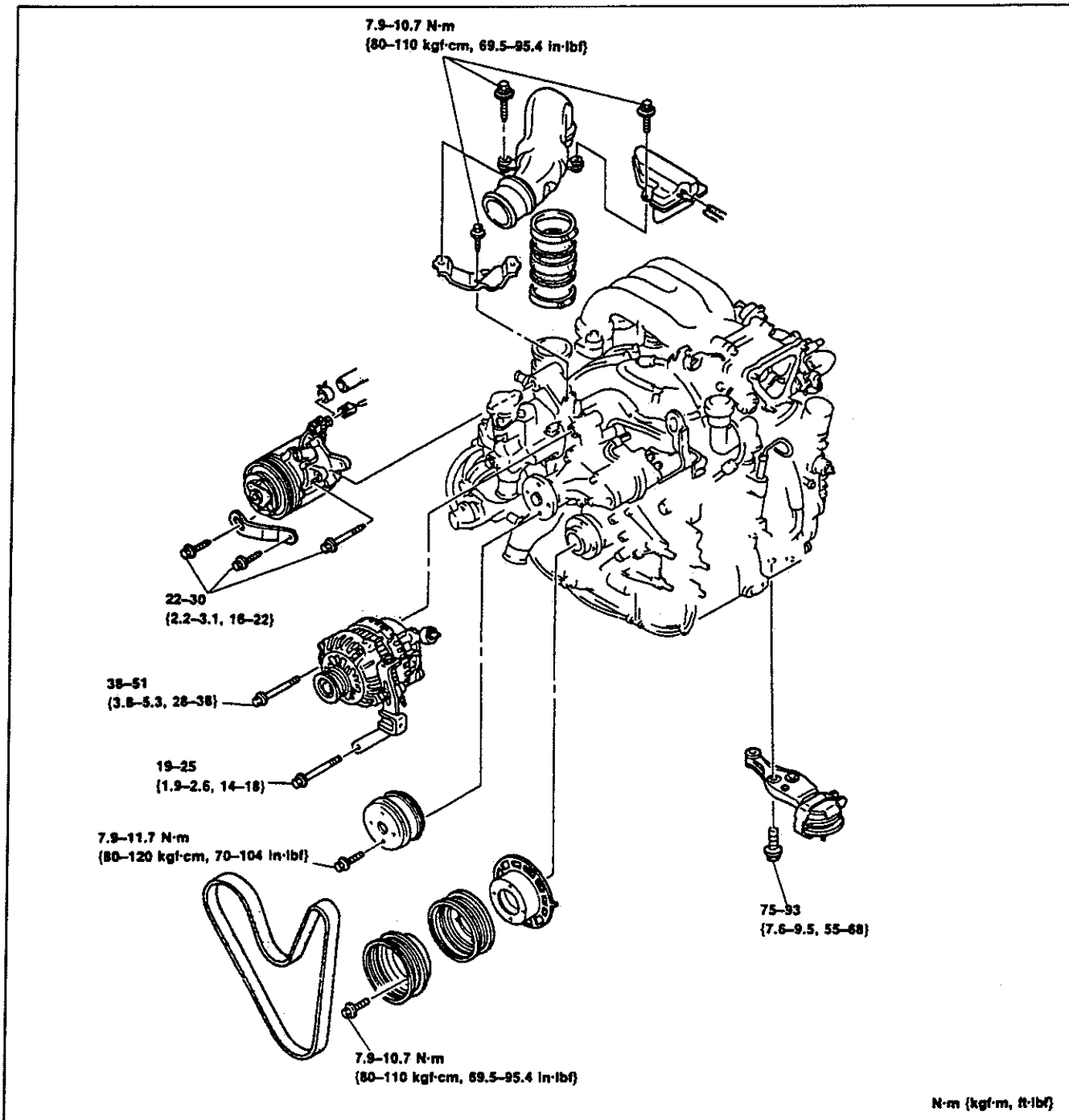
Install the air pipe along with a new gasket.

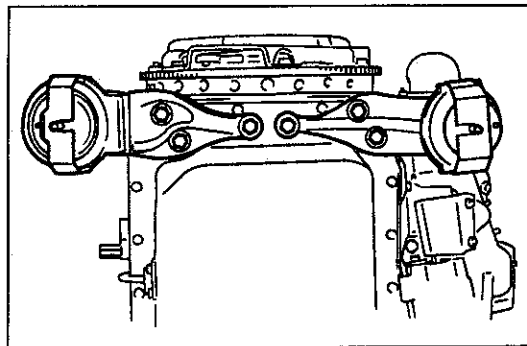
Tightening torque:

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

AUXILIARY PARTS (I)

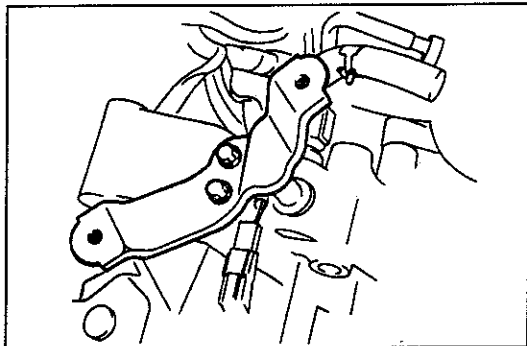
Torque specifications





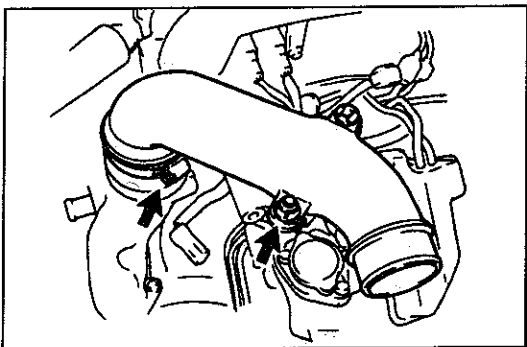
Engine mount right and left
Install the engine mount right and left.

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



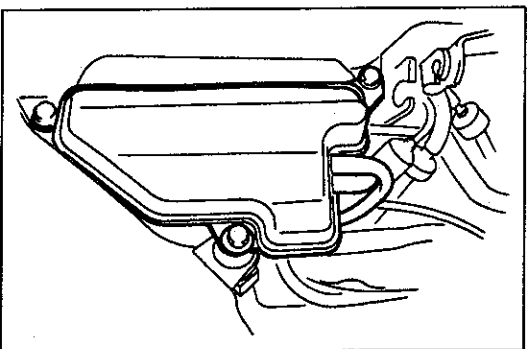
Air pipe and bracket
1. Install the air pipe bracket.

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



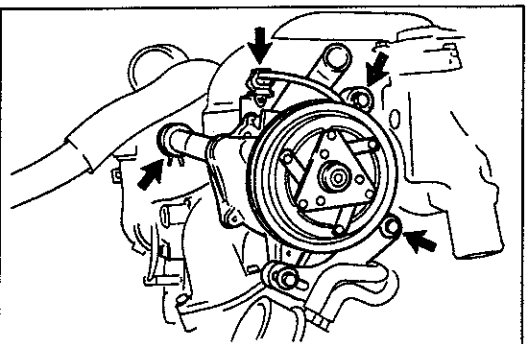
2. Install the air pipe.

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

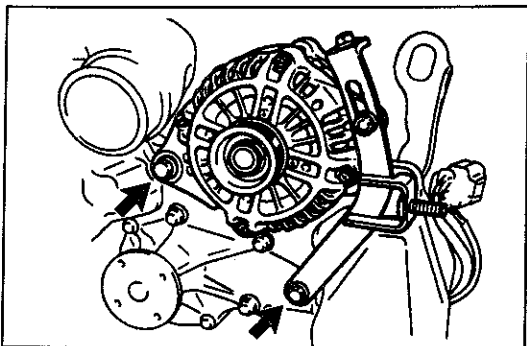


3. Install the pressure chamber.

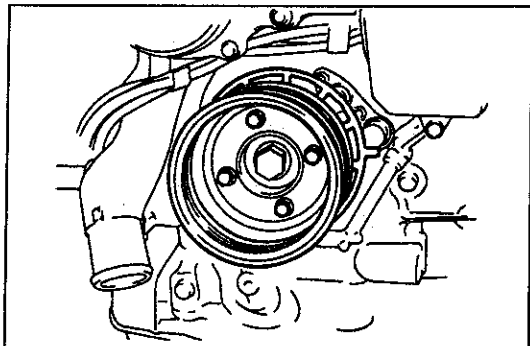
Tightening torque:
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}



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

**Alternator and bracket**

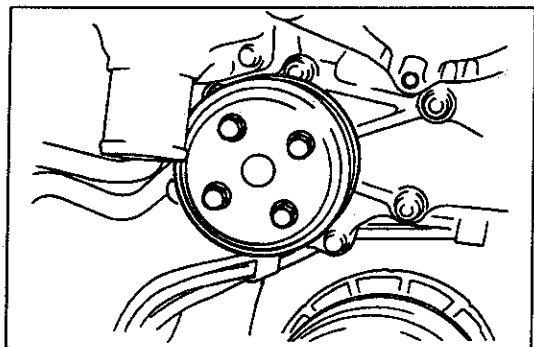
Install the alternator and bracket and hand tighten the mounting bolts.

**Drive belt pulley**

Install the drive belt pulley as shown in the figure.

Tightening torque:

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

**Water pump pulley**

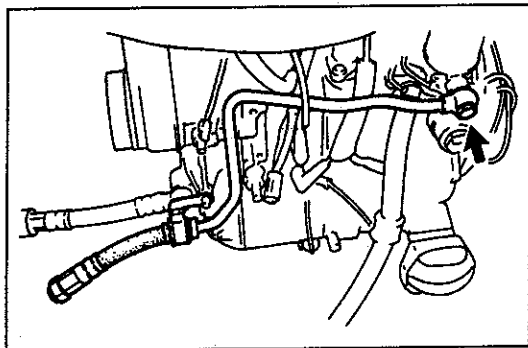
1. Install the water pump pulley and hand tighten the mounting bolts.
2. Install the drive belt. (Refer to page C-5.)
3. Tighten the water pump pulley bolts to specified torque.

Tightening torque:

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

ENGINE STAND DISMOUNTING**PROCEDURE**

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



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


Tightening torque:

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

INSTALLATION

PREPARATION

SST

<p>49 W023 585A</p> <p>Adjust wrench</p> 	<p>For removal / installation of locknut</p>
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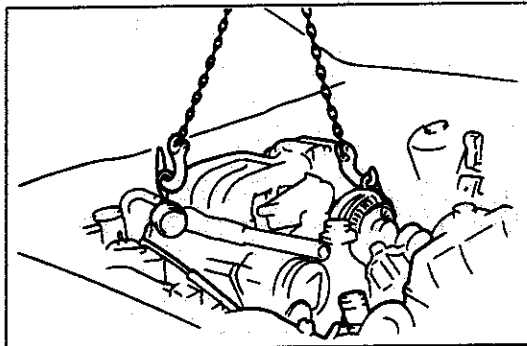
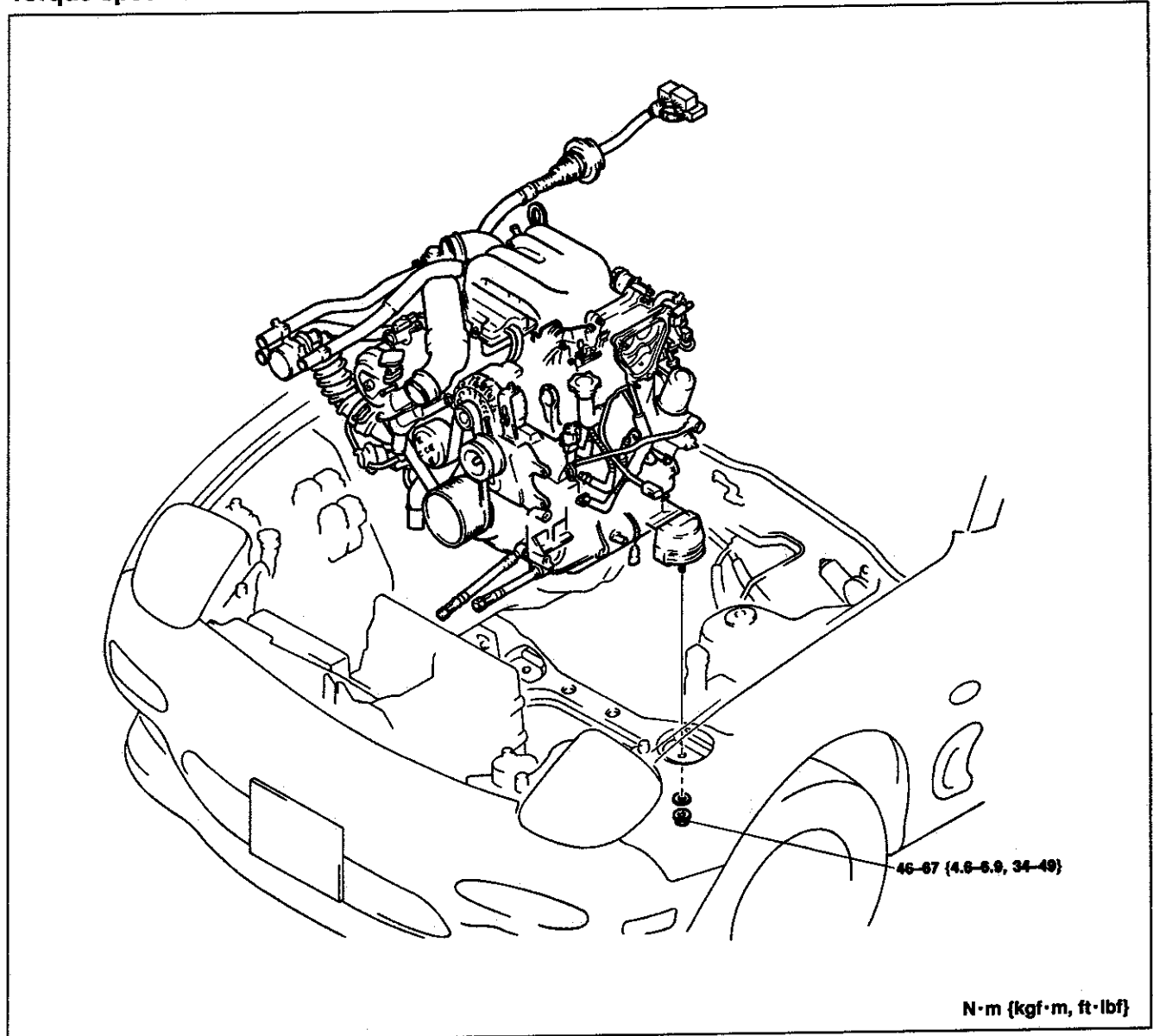
PROCEDURE

Step 1

Warning

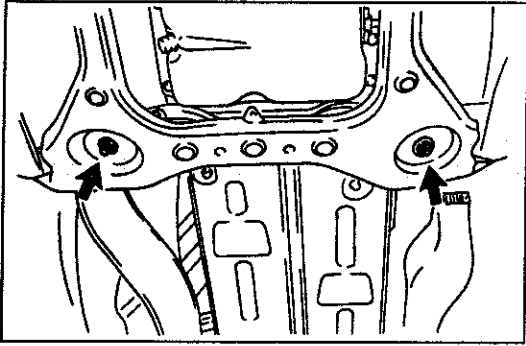
- A vehicle that is lifted but not securely supported on safety stands is dangerous. It can slip or fall, causing death or serious injury. Never work around or under a lifted vehicle if it is not securely supported on safety stands.

Torque specifications



Engine

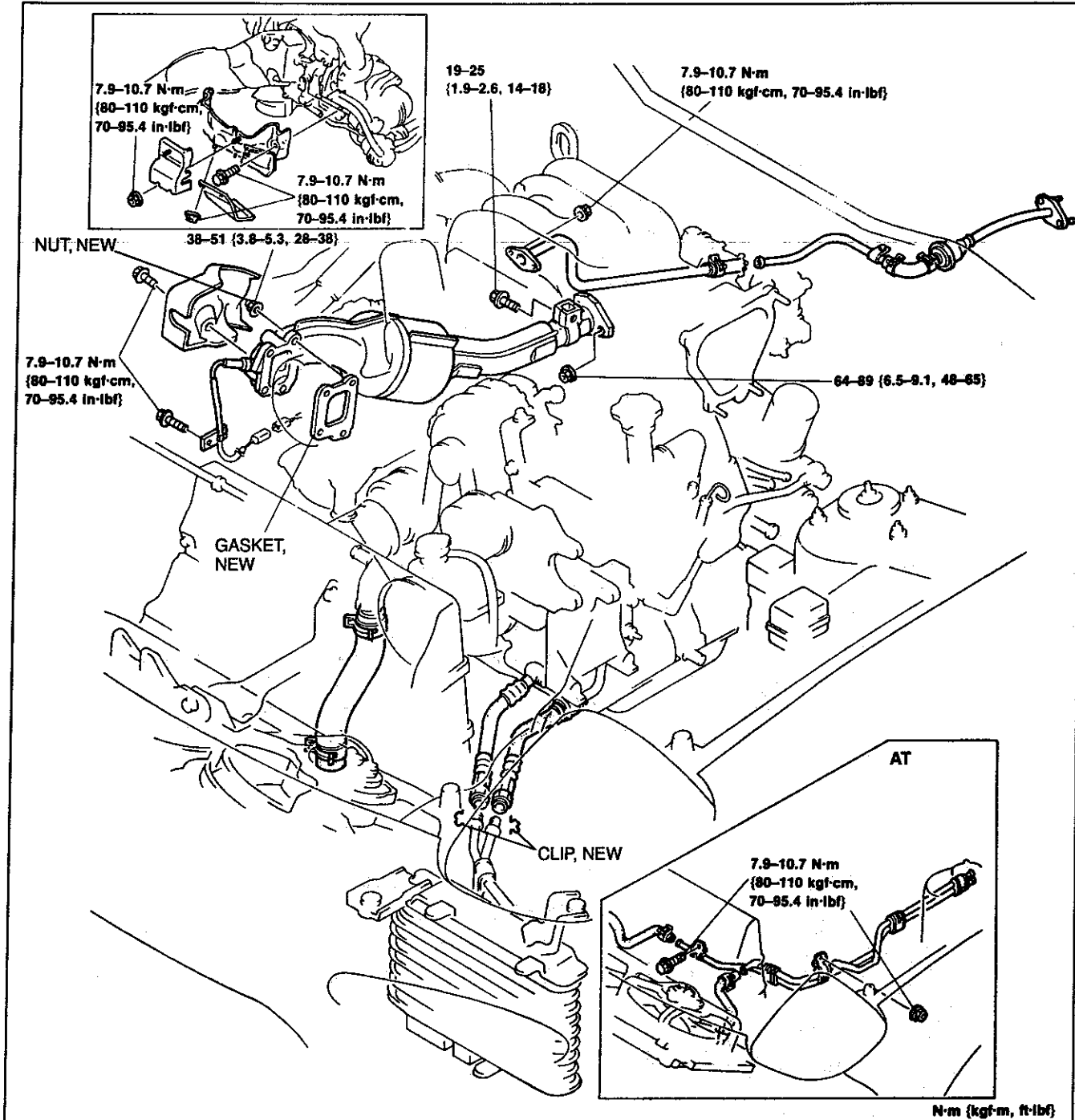
1. Suspend the engine.
2. Slowly lower the engine. Keep it from swinging or bumping into components in the engine compartment. Align the engine mounts with the cross member mounting holes.

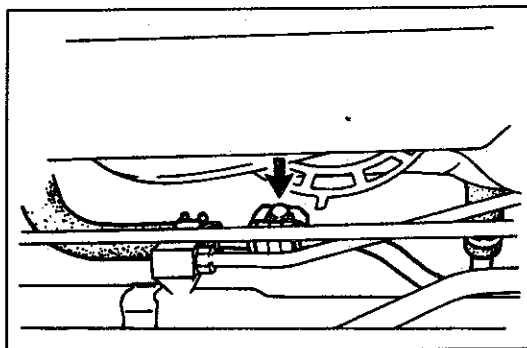
**Engine mount**

Install and tighten the engine mount nuts.

Tightening torque:

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

Step 2**Torque specifications**

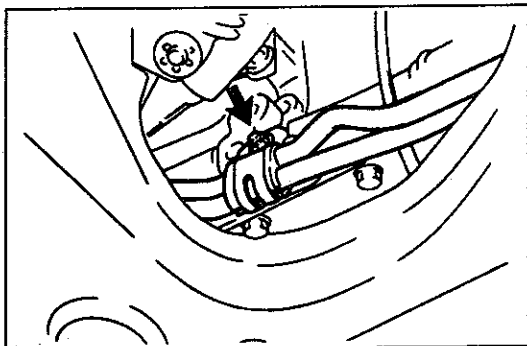


Oil Cooler Pipe (AT)

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

Tightening torque:

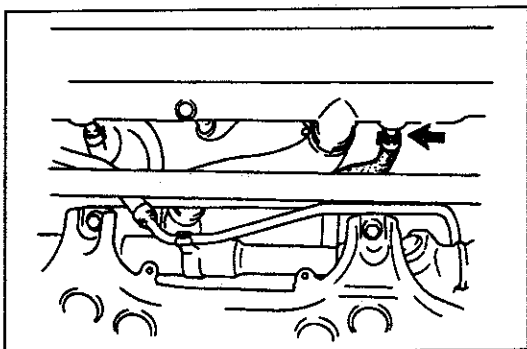
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}



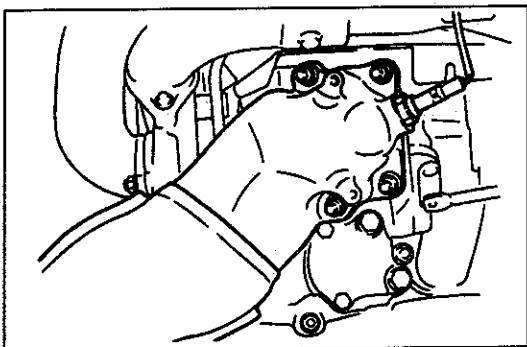
3. Tighten the nut shown in the figure.

Tightening torque:

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



4. Connect the oil cooler hose.



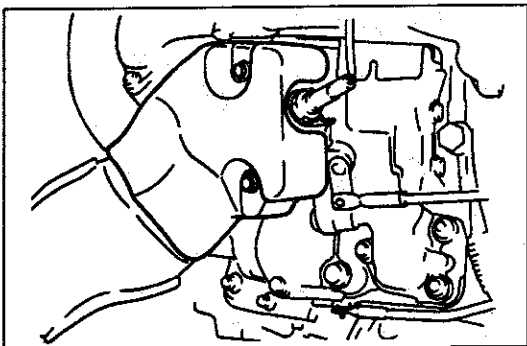
Front Exhaust Pipe

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

Tightening torque:

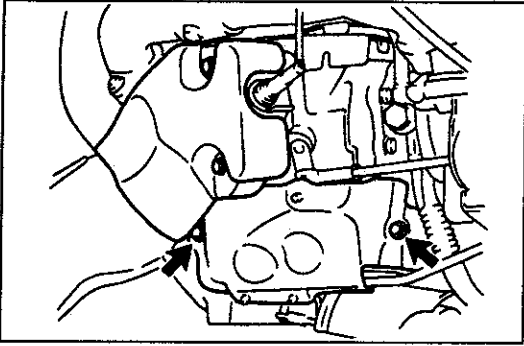
38–51 N·m {3.8–5.3 kgf·m, 28–38 ft·lbf}

2. Install the oxygen sensor harness.

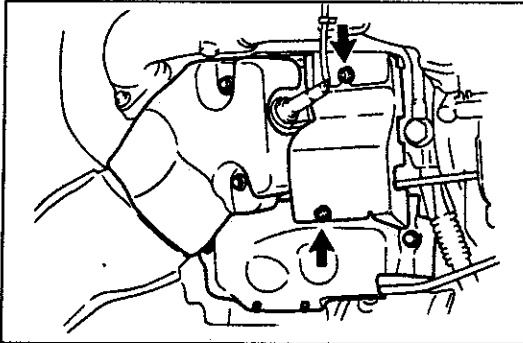


Insulator

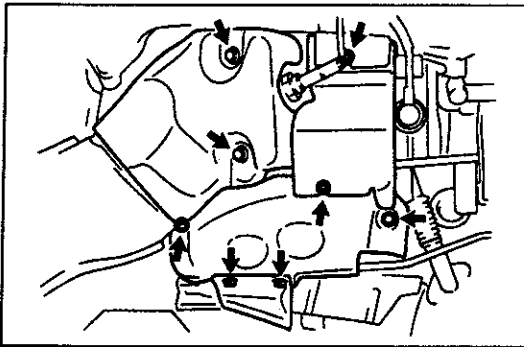
1. Install the front exhaust pipe insulator and hand tighten the bolts.



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



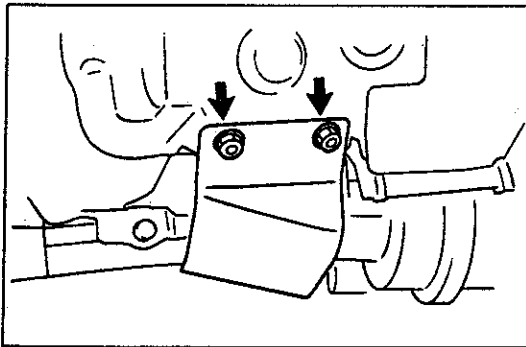
3. Install the center insulator and hand tighten the bolts.



4. Tighten the insulator bolt.

Tightening torque:

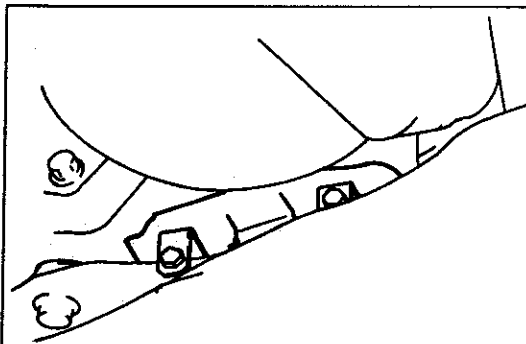
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}



5. Install the insulator.

Tightening torque:

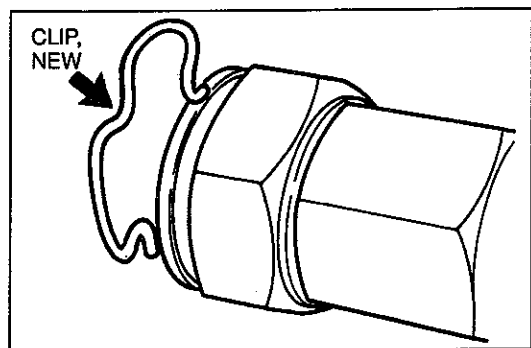
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}



6. Install the engine mount insulator.

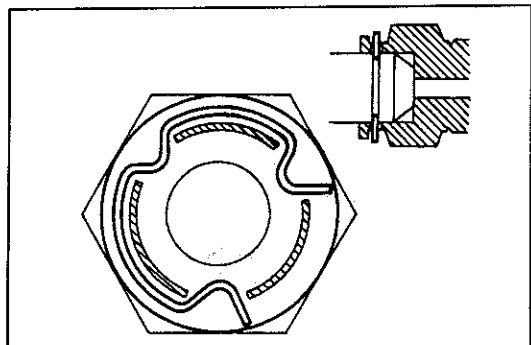
Tightening torque:

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

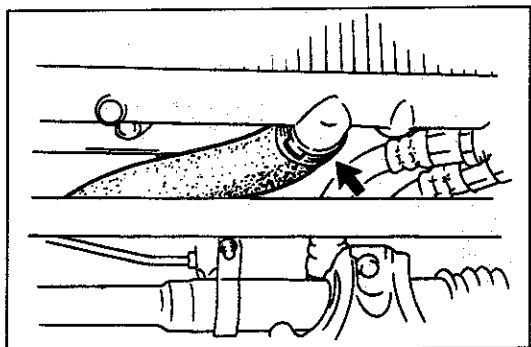


Oil Pipe

1. Connect the oil pipe and install the retaining clip.



2. Verify that the oil pipe is securely locked.



Radiator hose (lower)

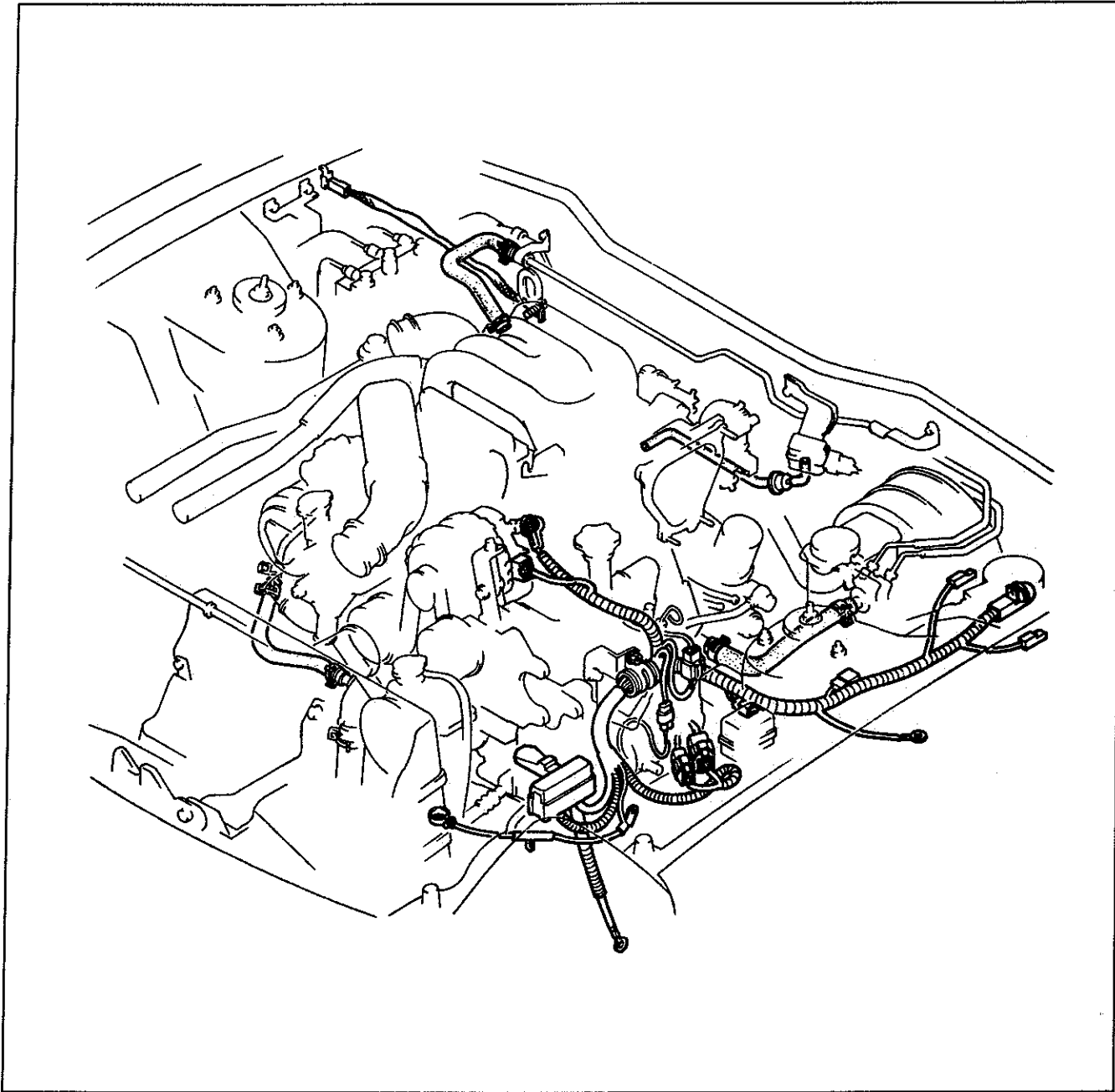
Connect the lower radiator hose.

C

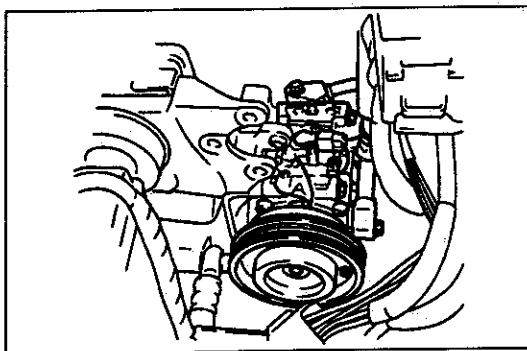
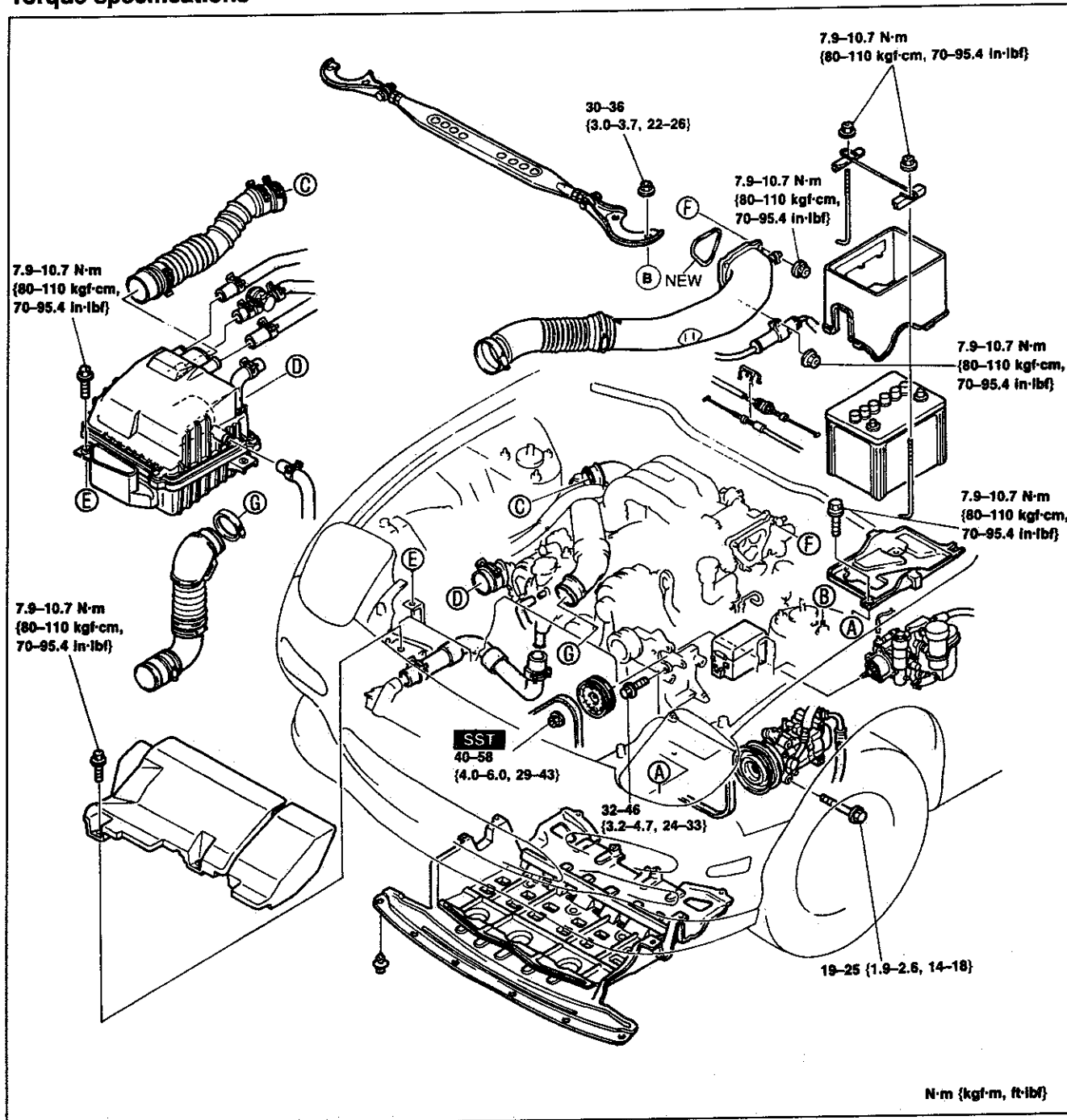
INSTALLATION

Step 3

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

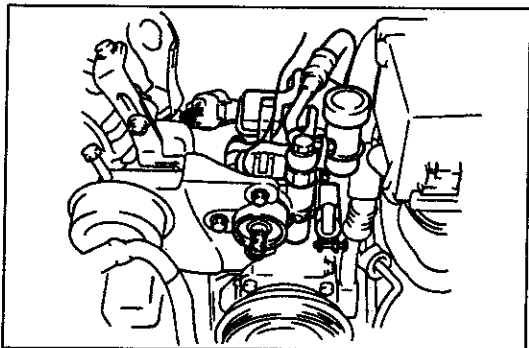


Step 4 Torque specifications



A/C compressor
Install the A/C compressor to the bracket.

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

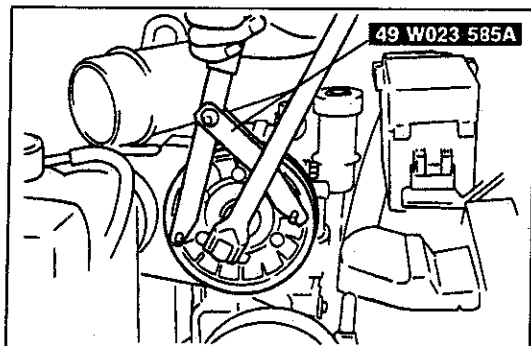
**P/S oil pump**

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

Tightening torque:

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

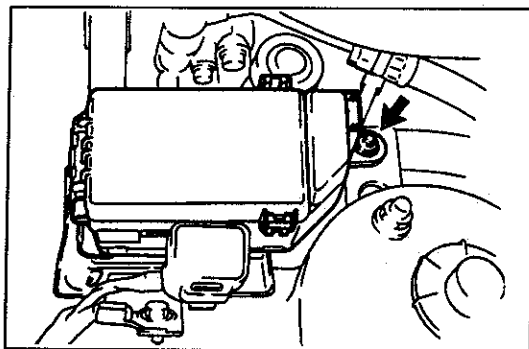
2. Connect the connector.

**P/S oil pump pulley**

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

Tightening torque:

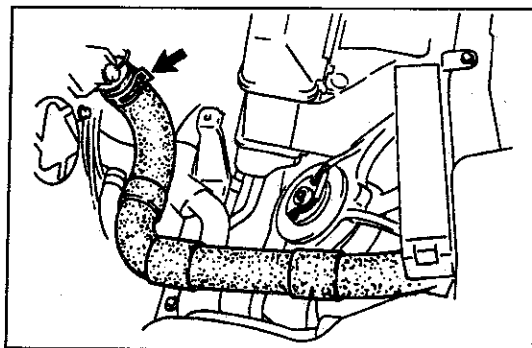
40–58 N·m {4.0–6.0 kgf·m, 29–43 ft·lbf}

**Fuse box**

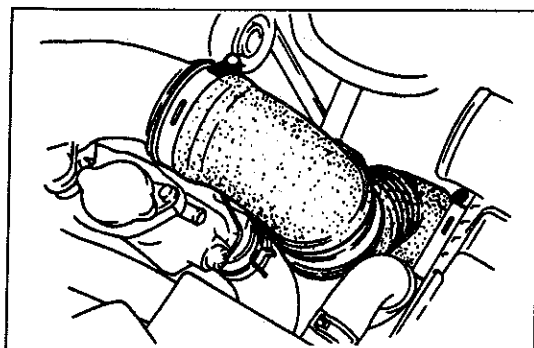
- Install the fuse box.

Tightening torque:

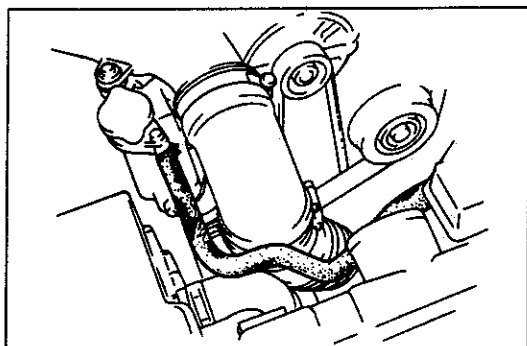
7.9–10.7 N·m {80–110 kgf·cm, 70–95.4 in·lbf}

**Radiator hose (upper)**

- Connect the upper radiator hose.

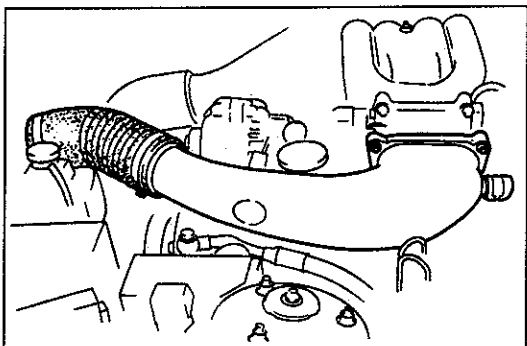
**Air hose**

- Connect the air hose.



Water hose

Connect the water hose.

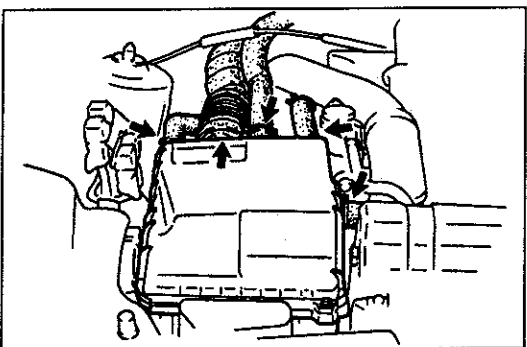


Hose

Install the hose.

Tightening torque:

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

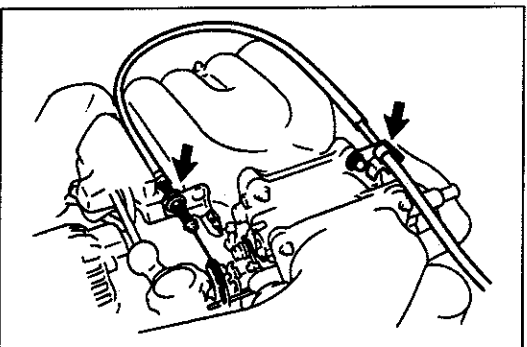


Air cleaner housing

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

Tightening torque:

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

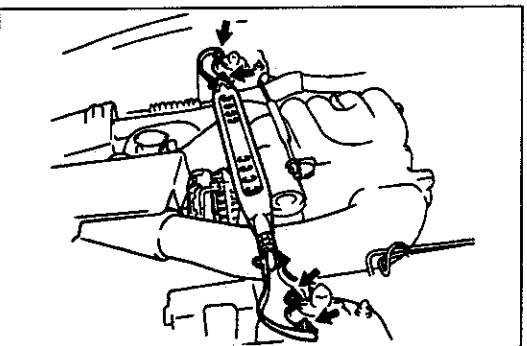


Accelerator cable

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

Deflection:

1–3 mm {0.04–0.12 in}

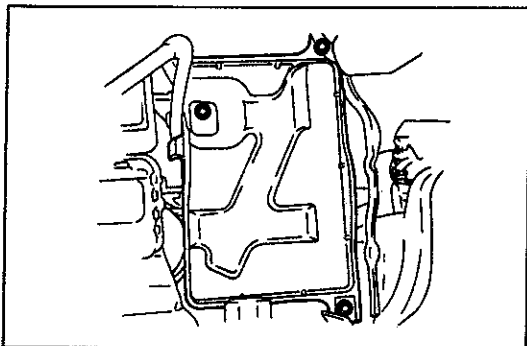


Strut bar

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

Tightening torque:

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

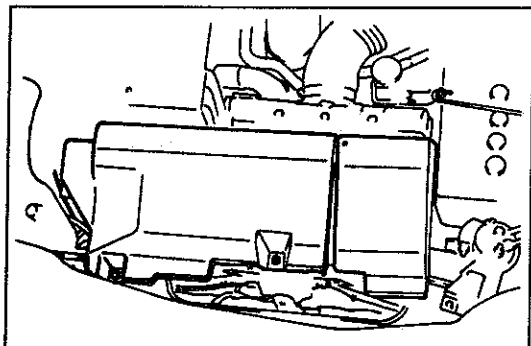
**Battery and carrier**

1. Install the battery carrier.

Tightening torque:

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

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

**Fresh-air duct**

Install the fresh-air duct.

Tightening torque:

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

Steps After Installation

1. Connect the powertrain control module. (Refer to section F.)
2. Fill the radiator with the specified amount and type of engine coolant. (Refer to section E.)
3. Fill the engine with the specified amount and type of engine oil. (Refer to section D.)
4. Fill the transmission with the specified amount and type of transmission oil.
(MT: Refer to section J, AT: Refer to section K)
5. Install the hood.
6. Start the engine and check the following.
 - (1) check for engine oil, transmission oil, and engine coolant leakage.
 - (2) check the ignition timing and idle speed. (refer to section F)
 - (3) check the operation of the emission control system.
7. Turn off the engine and check drive belt deflection. (refer to page C-6)
8. Perform a road test.
9. Recheck the oil and coolant levels.