

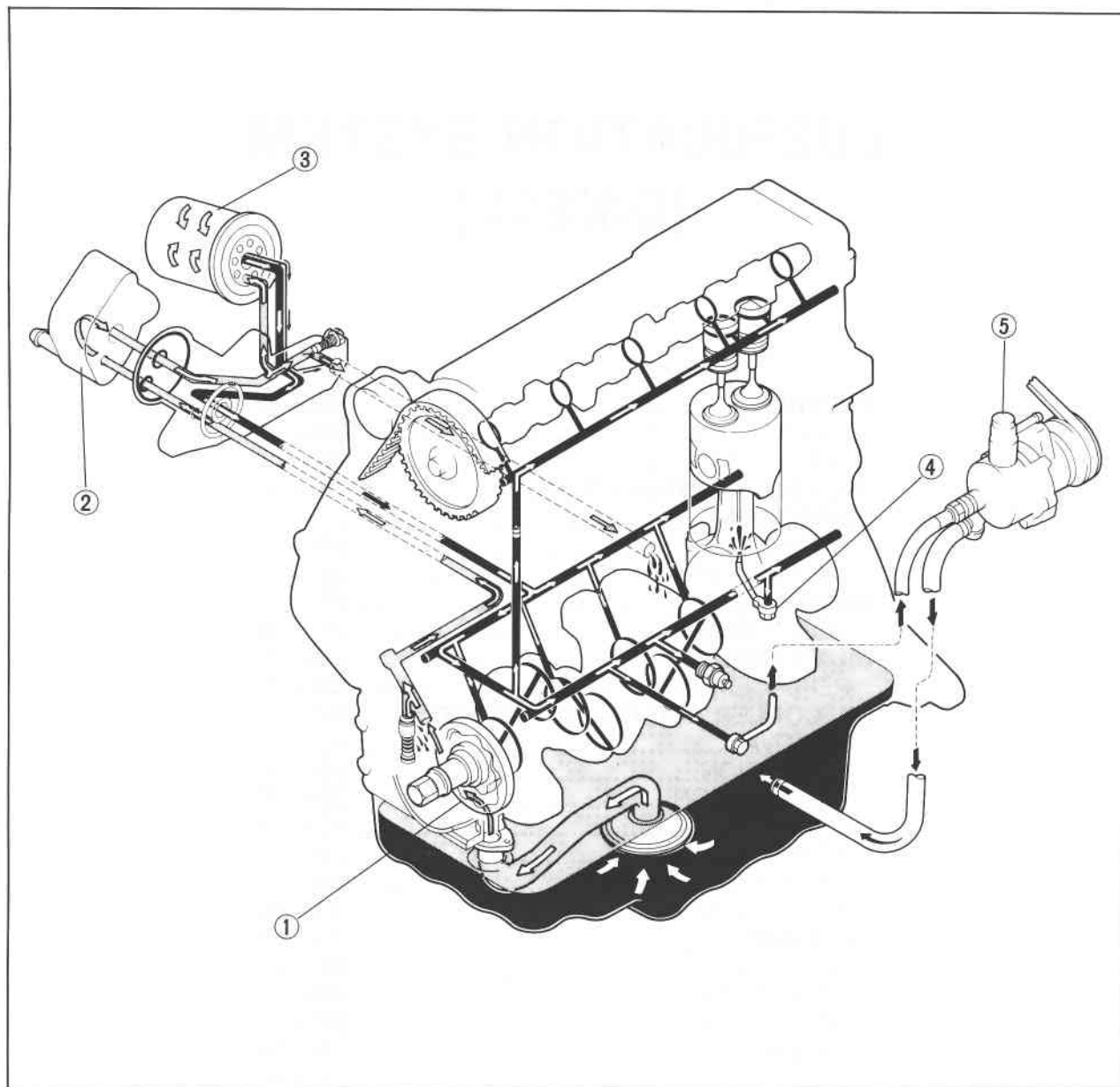
## LUBRICATION SYSTEM (DIESEL)

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## 2B OUTLINE

### OUTLINE

#### LUBRICATION CIRCUIT



76G02B-002

- 1. Oil pump
- 2. Oil cooler
- 3. Combined oil filter

- 4. Oil jet
- 5. Vacuum pump

## SPECIFICATIONS

Item		Engine model	RF-CX	RF-N
Lubrication system			Force-fed	
Oil pump	Type		Trochoid gear	
	Gear width	mm (in)	7 (0.28)	
	Regulated pressure	kPa (kg/cm <sup>2</sup> , psi)	510—618 (5.2—6.3, 74—90)	
Oil filter	Type		Combined, paper element	
	Relief pressure differential	kP (kg/cm <sup>2</sup> , psi)	78—118 (0.8—1.2, 11—17)	
Oil cooler	Type		Water cooled, 10 layer	Water cooled, 4 layer
Oil filter body	Regulated pressure	kPa (kg/cm <sup>2</sup> , psi)	402—481 (4.1—4.9, 58—70)	
	Oil cooler relief pressure differential	kPa (kg/cm <sup>2</sup> , psi)	177—216 (1.8—2.2, 26—31)	
Oil warning lamp activation pressure		kPa (kg/cm <sup>2</sup> , psi)	29 (0.3, 4.3)	
Oil capacity	Total (dry engine)	liters (US qt, Imp qt)	6.1 (6.4, 5.4)	
	Oil pan	liters (US qt, Imp qt)	5.0 (5.3, 4.4)	
	Oil filter	liters (US qt, Imp qt)	0.5 (0.52, 0.44)	
Engine oil type		API service	CD	CC, CD

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## Recommended SAE Viscosity

Temperature	(°C)	—30	—20	—10	0	10	20	30	40	50
	(°F)	—20	0	20	40	60	80	100	120	
Engine oil	5W-30									
	10W-30									
	20W-20									
	15W-40									
	30									
										40

Temperature range anticipated before next oil change, °C(°F)

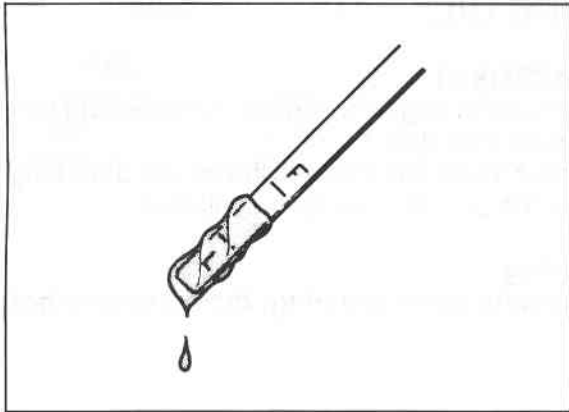
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## 2B TROUBLESHOOTING GUIDE

### TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
<b>Engine hard starting</b>	Improper engine oil	Replace	2B— 6
	Insufficient engine oil	Add oil	2B— 5
<b>Excessive oil consumption</b>	Oil working up or working down Oil leakage	Refer to Section 1C As described below	
<b>Oil leakage</b>	Loose drain plug or damaged washer	Tighten or replace	2B—10
	Faulty seal at oil pan and cylinder block	Repair	2B—10
	Damaged cylinder head cover and its seal	Replace	—
	Loose oil pump body bolt, cylinder head cover bolt, or oil pan bolt	Tighten	—
	Damaged front housing gasket, or cylinder head gasket	Replace	—
	Faulty oil seal(s)	Replace	—
	Loose oil filter	Tighten	2B— 6
	Loose or damaged oil pressure switch	Tighten or replace	—
<b>Oil pressure drop</b>	Oil leakage	As described above	
	Insufficient oil	Add oil	2B— 5
	Worn and/or damaged oil pump gear	Replace	2B—13
	Worn plunger (inside oil pump) or weak spring	Replace	2B—14
	Clogged oil strainer	Clean	—
	Excessive oil clearance between main bearing or connecting rod bearing	Refer to Section 1C	
<b>Warning lamp illuminates while engine running</b>	Oil pressure drop	As described above	—
	Malfunction of oil pressure switch	Refer to Section 15	
	Malfunction of electrical system	Refer to Section 15	

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76G02B-006

## INSPECTION

### ENGINE OIL

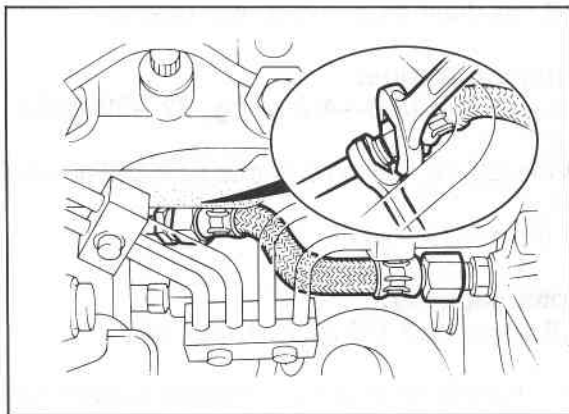
1. Be sure the vehicle is on level ground.
2. Warm up the engine to normal operating temperature and stop it.
3. Wait for five minutes.
4. Remove the oil level gauge and check the oil level and condition.
5. Add or replace oil if necessary.

#### Note

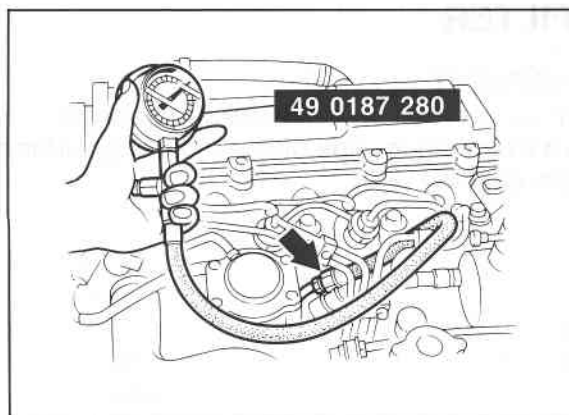
The distance between the L and F marks on the level gauge represents 1.2 liters (1.26 US qt, 1.05 Imp qt).

### OIL PRESSURE

1. Disconnect the oil hose (vacuum pump—cylinder block).

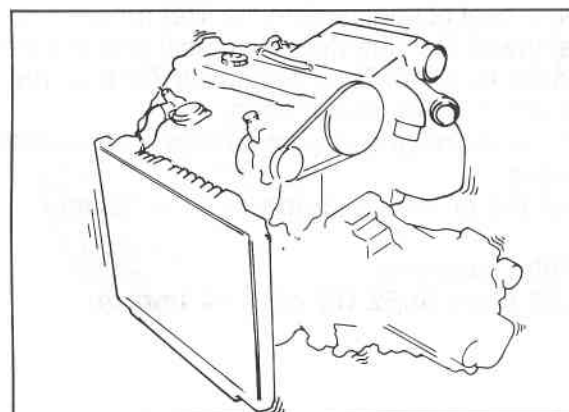


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76G02B-008

2. Set the **SST** as shown.
3. Remove the vacuum pump drive belt to prevent heat damage to bearing.
4. Warm up the engine to normal operating temperature.



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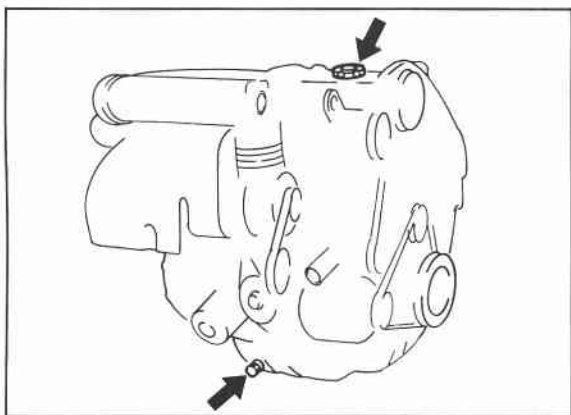
5. Run the engine first at **1,000 rpm**, then at **3,000 rpm** and note the gauge reading.

#### Standard oil pressure kPa (kg/cm<sup>2</sup>, psi)

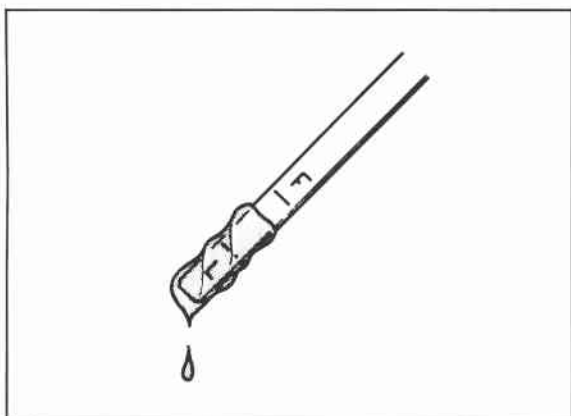
1,000 rpm	147—245 (1.5—2.5, 21—36)
3,000 rpm	343—441 (3.5—4.5, 50—64)

6. If the pressure is not as specified, check for the cause, and repair if necessary.  
(Refer to Troubleshooting Guide.)

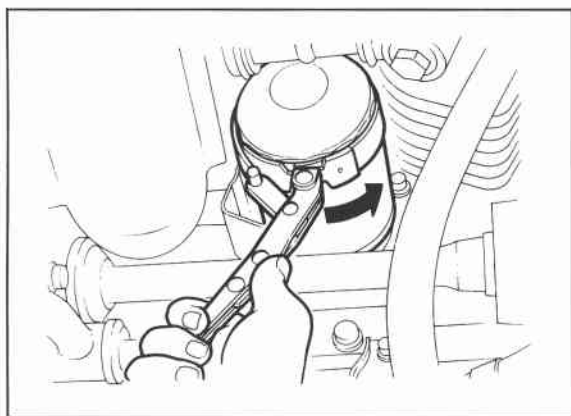
## 2B ENGINE OIL, OIL FILTER



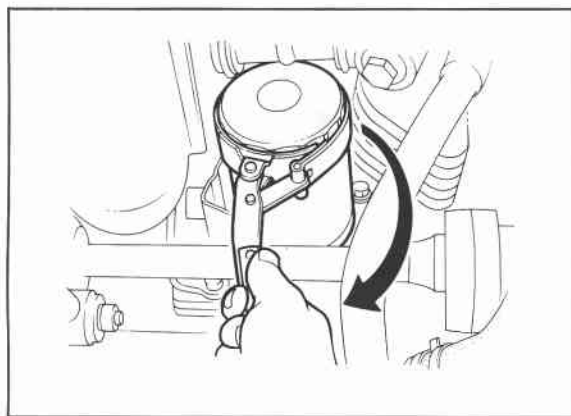
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86U02X-008



76G02B-011

### ENGINE OIL

#### REPLACEMENT

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

#### Warning

**Be careful when draining, the oil is very hot.**

4. Install the drain plug and a new gasket.

#### Tightening torque:

**29—41 N·m (3.0—4.2 m·kg, 22—30 ft·lb)**

5. Refill the engine with the specified type and amount of oil.
6. Refit the oil filler cap.

#### Oil pan capacity:

**5.0 liters (5.3 US qt, 4.4 Imp qt)**

7. Recheck the oil level after the engine has been run.

### OIL FILTER

#### REPLACEMENT

1. Remove the oil filter with a suitable wrench.
2. Use a clean rag to wipe off the mounting surface on the engine.

3. Apply a coat of engine oil to the filter rubber seal.
4. Install the oil filter until the rubber seal contacts the oil cooler by hand. Then tighten it a **7/6 turn further** with a band type wrench.
5. Start the engine and inspect around the filter seal for leaks.
6. Check the oil level and add oil if necessary.

#### Oil filter capacity:

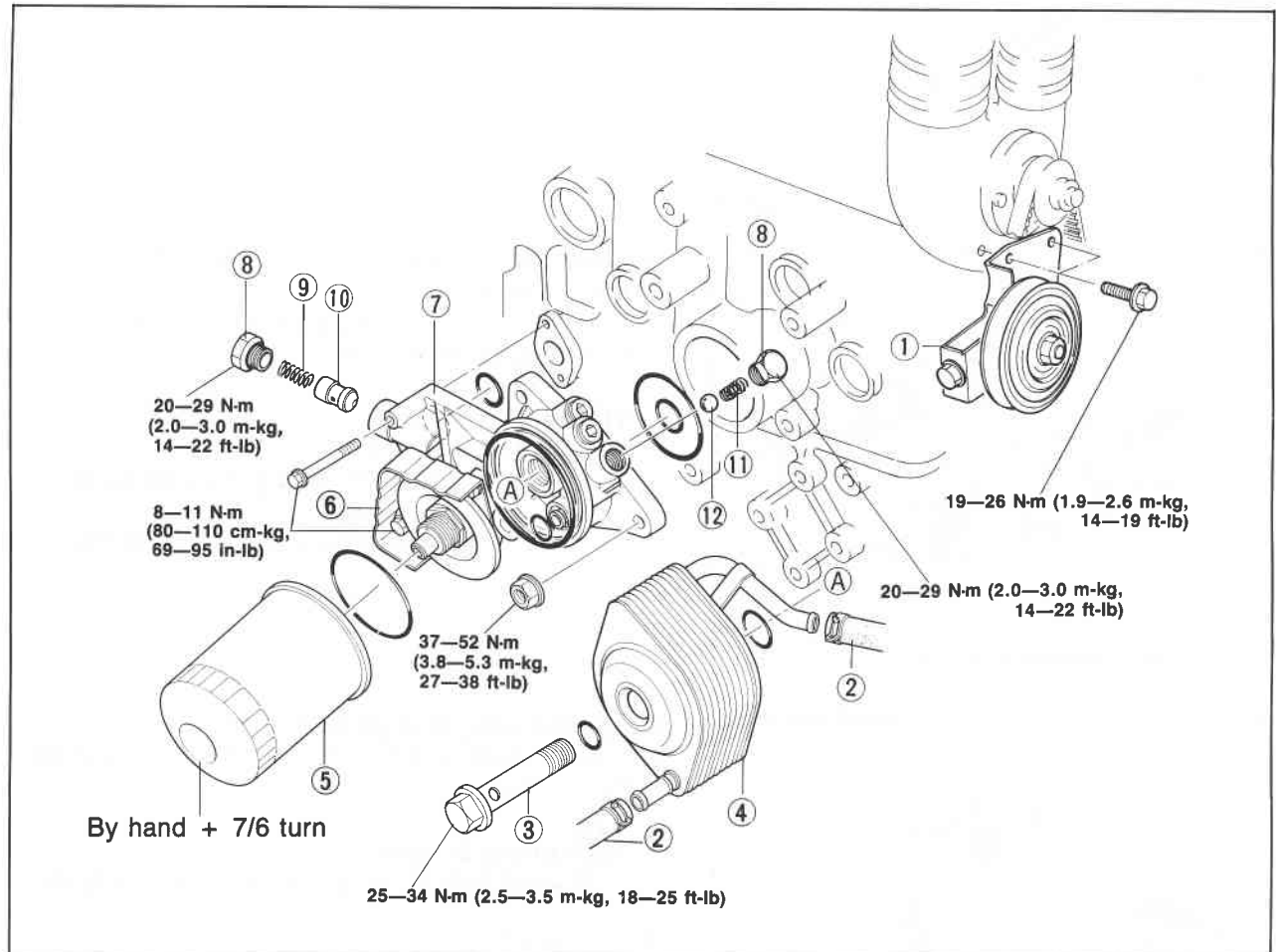
**0.50 liters (0.52 US qt, 0.44 Imp qt)**

## OIL COOLER AND OIL FILTER BODY

### REMOVAL

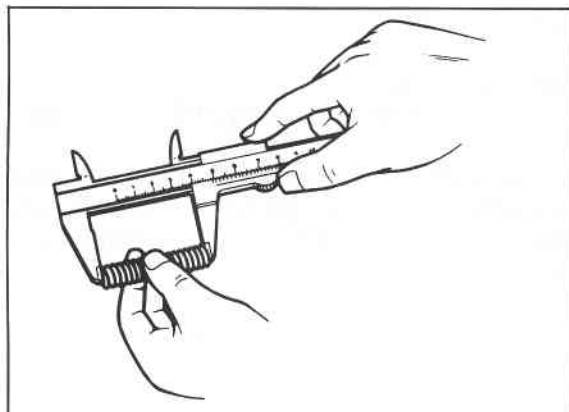
1. Disconnect the battery negative cable.
2. Drain the engine oil and coolant.
3. Remove in the sequence shown in the figure.

76G02B-012



76G02B-013

- |                   |                     |                         |
|-------------------|---------------------|-------------------------|
| 1. Idler pulley   | 5. Oil filter       | 9. Pressure spring      |
| 2. Water hose     | 6. Oil filter cover | 10. Plunger control     |
| 3. Connector bolt | 7. Oil filter body  | 11. Relief valve spring |
| 4. Oil cooler     | 8. Plug             | 12. Steel ball          |



76G02B-014

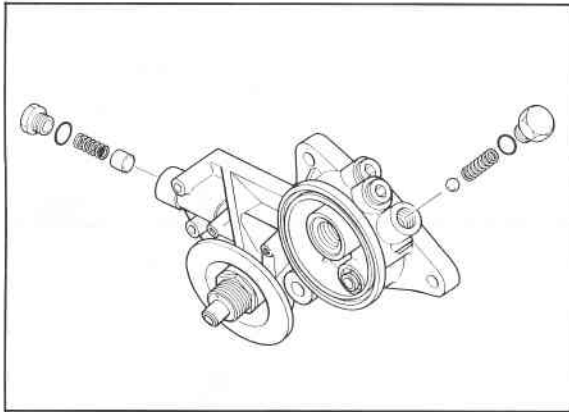
### INSPECTION

1. Inspect the oil cooler body for cracks or corroded. If necessary replace it.
2. Check the valves for damage or scoring if necessary replace it.
3. Measure free length of each valve spring. If necessary replace it.

### Free length

**Relief valve spring: 45.5 mm (1.79 in)**  
**Pressure spring : 54.6 mm (2.15 in)**

## 2B OIL COOLER AND OIL FILTER BODY



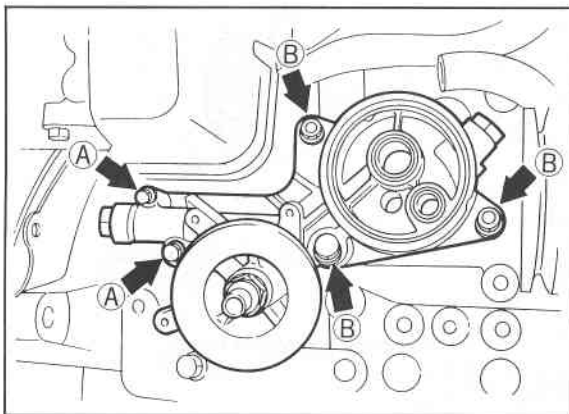
76G02B-015

### INSTALLATION

1. Apply a coat of engine oil to the valve holes.
2. Install the relief valve spring and pressure spring.

#### Tightening torque:

**20—29 N·m (2.0—3.0 m·kg, 14—22 ft·lb)**



76G02B-016

3. Clean the contact surfaces of the cylinder block and oil filter body.
4. Install new O-rings and apply a coat of engine oil.
5. Install the oil filter body.

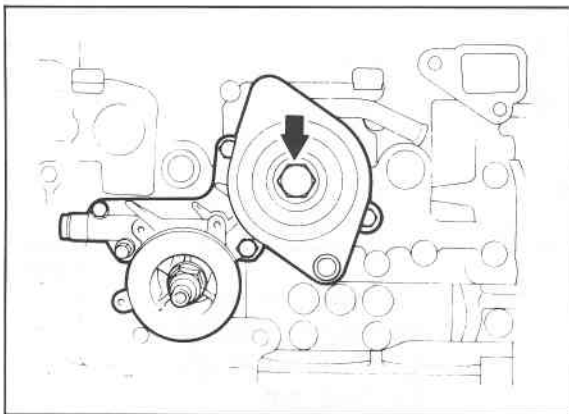
#### Tightening torque:

**Bolt A: 8—11 N·m**

**(80—110 cm·kg, 69—95 in·lb)**

**Bolt B: 37—52 N·m**

**(3.8—5.3 m·kg, 27—38 ft·lb)**



76G02B-017

6. Apply a coat of engine oil to the O-rings.
7. Install the oil cooler with new O-ring on the connector bolt.

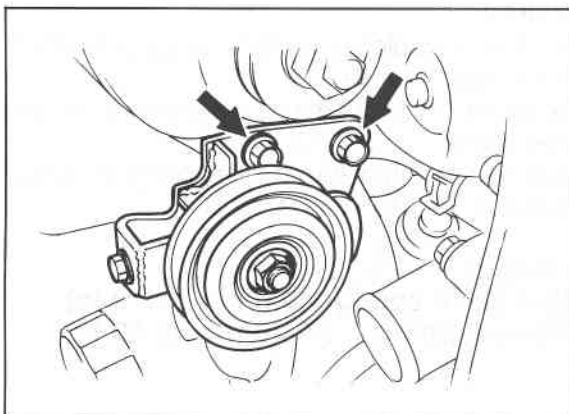
#### Tightening torque:

**25—34 N·m (2.5—3.5 m·kg, 18—25 ft·lb)**

8. Connect the water hoses.
9. Install the oil filter cover.

#### Tightening torque:

**8—11 N·m (80—110 cm·kg, 69—95 in·lb)**



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10. Install the oil filter. (Refer to page 2B—6)
11. Install the idler pulley.

#### Tightening torque:

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

12. Install the Compex supercharger drive belt and adjust the belt deflection. (Refer to page 1C—7)
13. Add specified amount of coolant and engine oil.
14. Check for leaks.

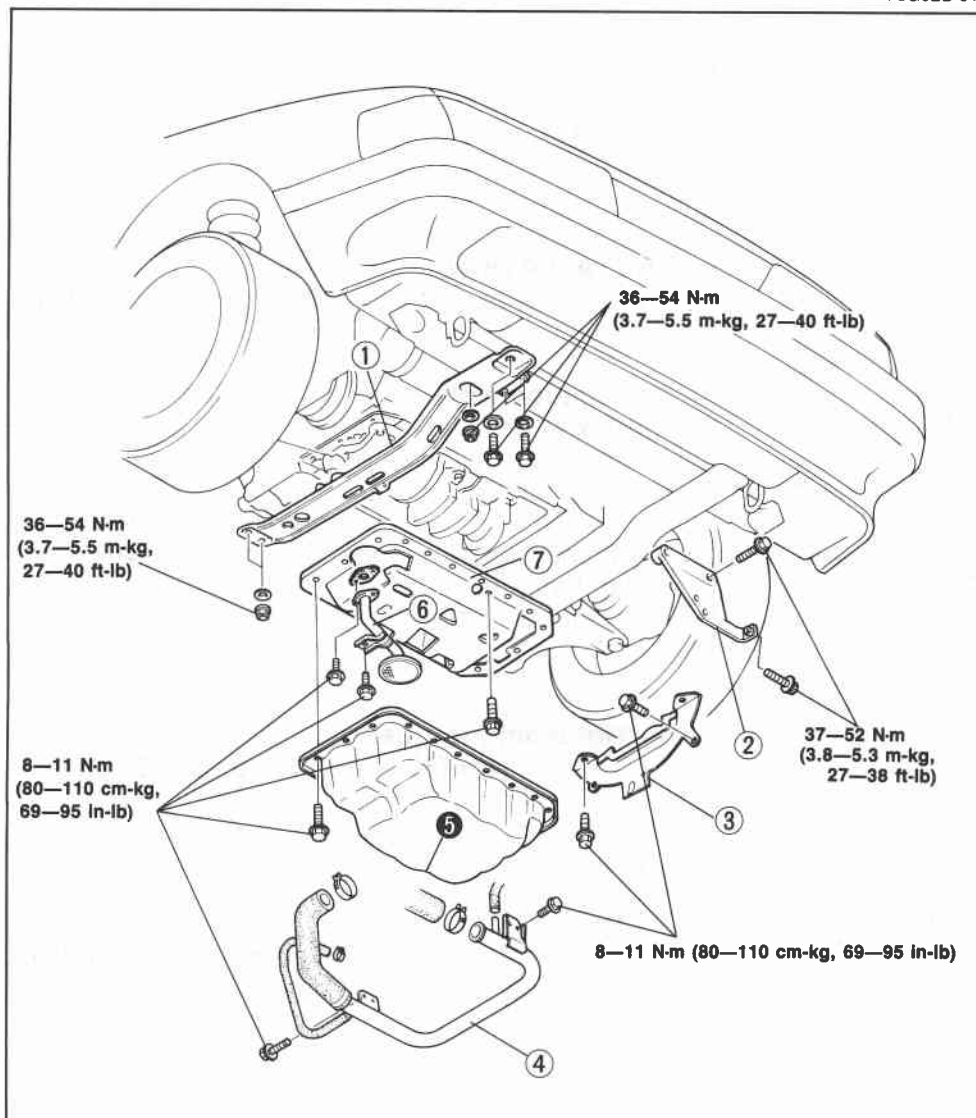


## OIL PAN

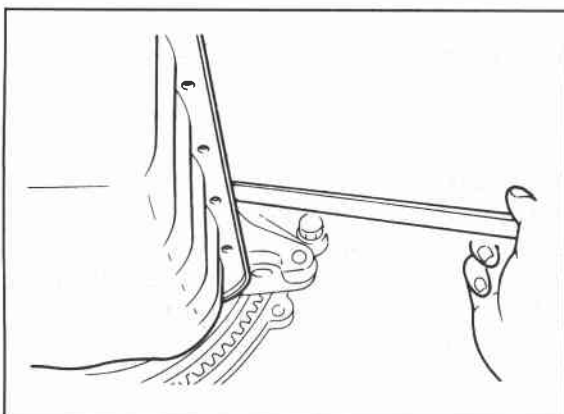
## REMOVAL

1. Disconnect the negative battery cable.
2. Drain the engine oil and coolant.
3. Remove in the sequence shown in the figure referring to the removal note for specially marked parts.

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76G02B-020



76G02B-021

### Removal Note

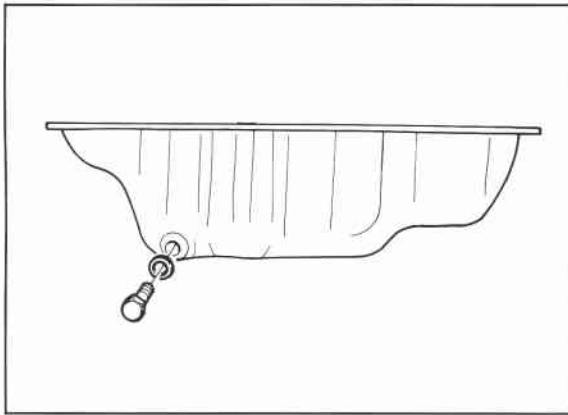
#### Oil pan

1. Remove the oil pan mounting bolts.
2. Insert a scraper or a suitable tool between the oil pan and the stiffener to separate them.
3. Remove the oil pan.
4. Remove the oil strainer and stiffener from the engine.

### Caution

**Do not bend the oil pan when prying loose.**

## 2B OIL PAN

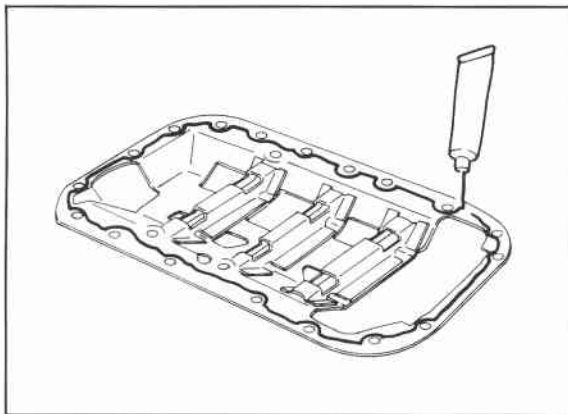


48G02X-037

### INSPECTION

Check the following points. Repair or replace if necessary.

1. Cracks, deformation, damage
2. Damaged drain plug threads



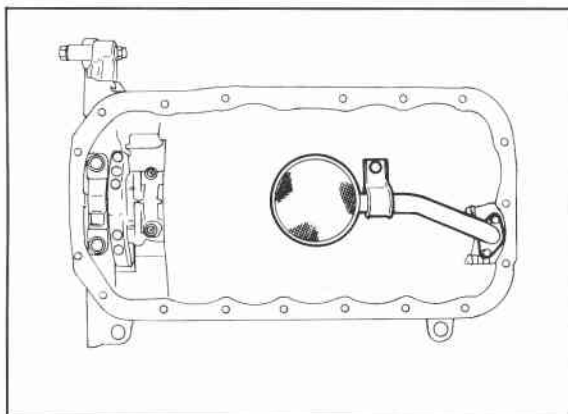
76G02B-022

### INSTALLATION

Install in the reverse order of removal referring to installation note.

#### Installation Note Stiffener (RF-CX)

1. Remove any dirt or other material from the contact surfaces.
2. Apply a continuous bead of silicone sealant to the stiffener along the inside of the bolt holes, and overlap the end.
3. Install the stiffener.



76G02B-023

#### Tightening torque:

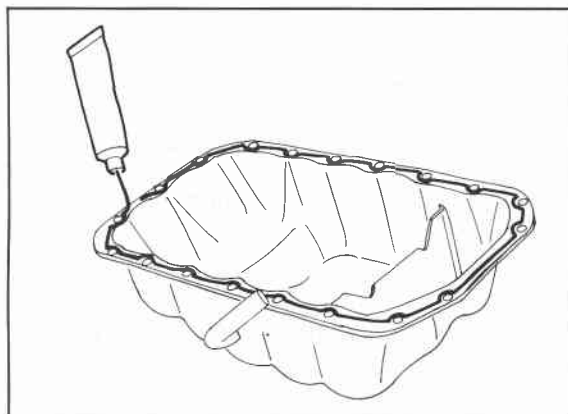
8—11 N·m (80—110 cm·kg, 69—95 in·lb)

#### Oil Strainer

Install the oil strainer and a new gasket.

#### Tightening torque:

8—11 N·m (80—110 cm·kg, 69—95 in·lb)



76G02B-024

### Oil Pan

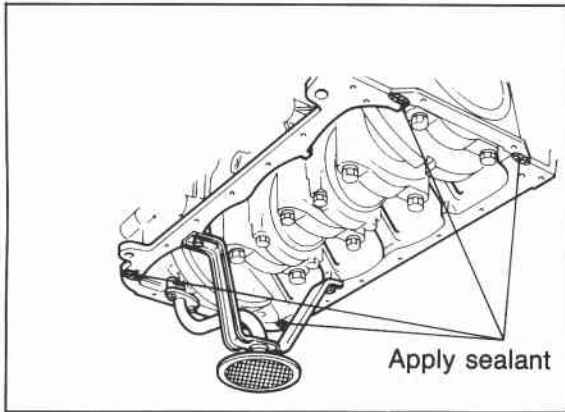
Remove any old sealant from the bolts and bolt holes. If old sealant can not be removed from the bolt, replace it.

#### Without gasket

- (1) Remove any dirt or grease from the contact surfaces with a rag.
- (2) Apply continuous bead of silicon sealant to the oil pan along the inside of the bolt holes, and overlap the ends.
- (3) Install the oil pan.

#### Tightening torque:

8—11 N·m (80—110 cm·kg, 69—95 in·lb)



76G02B-025

### With gasket

- (1) Apply sealant to the shaded areas in the figure.
- (2) Install the gasket and the oil pan.

### Tightening torque:

**8—11 N·m (80—110 cm·kg, 69—95 in·lb)**

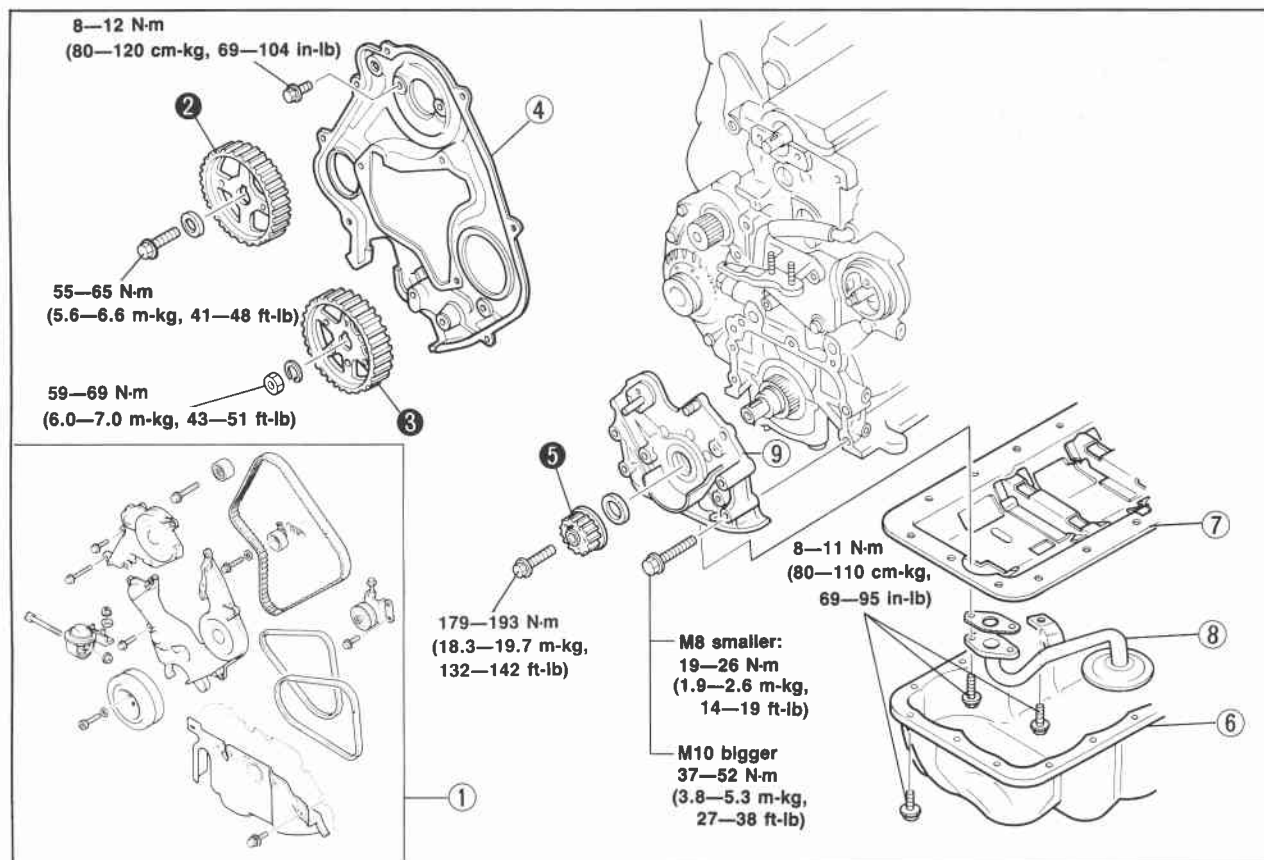
## 2B OIL PUMP

### OIL PUMP

#### REMOVAL

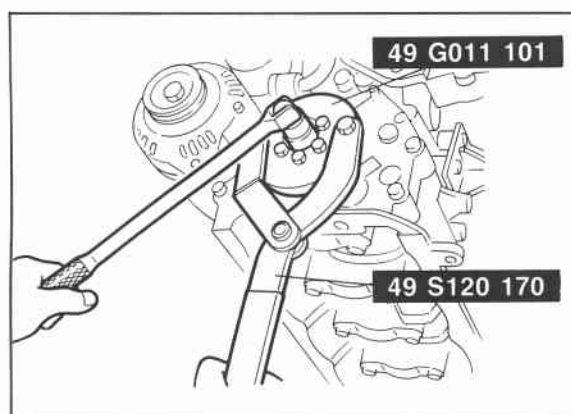
1. Disconnect the negative battery cable.
2. Drain the engine oil and coolant.
3. Remove in the sequence shown in the figure referring to the removal note for specially marked parts.

76G02B-026



76G02B-027

- |  |                                 |
|--|---------------------------------|
| 1. Timing belt (Refer to page 1C—11)           | 6. Oil pan (Refer to page 2B—9) |
| 2. Camshaft pulley (Refer to page 1C—36)       | 7. Stiffener (RF-CX)            |
| 3. Injection pump pulley (Refer to page 1C—36) | 8. Oil strainer                 |
| 4. Seal plate                                  | 9. Oil pump                     |
| 5. Timing belt pulley                          |                                 |



76G02B-028

#### Removal Note

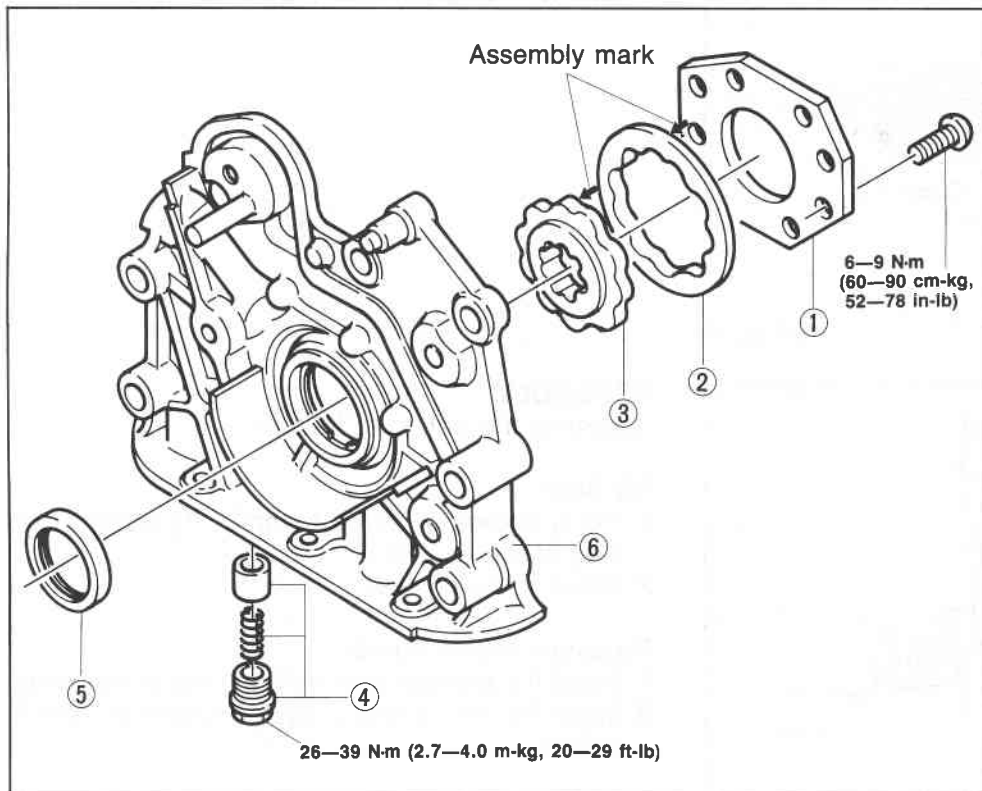
##### Timing belt pulley lock bolt

Hold the timing belt pulley with the **SST** and remove the lock bolt.

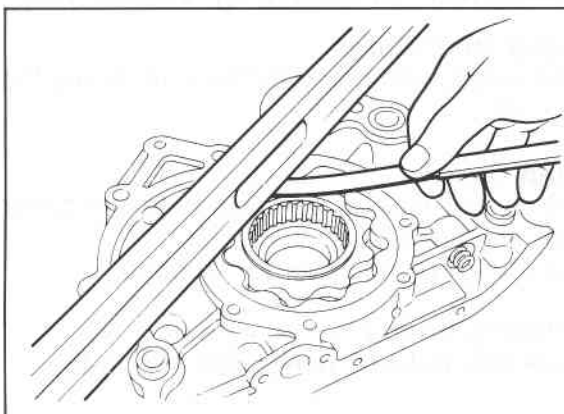
## DISASSEMBLY

Disassemble in the sequence shown in the figure.

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76G02B-036

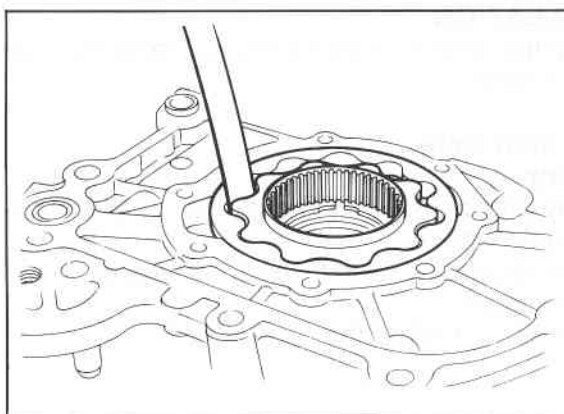


76G02B-029

## INSPECTION

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

**Clearance:**  
**0.14 mm (0.006 in) max.**

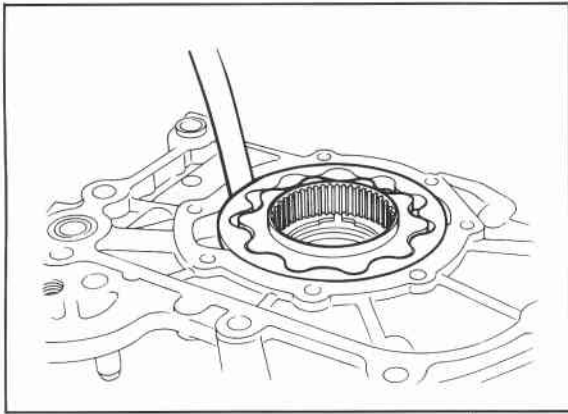


76G02B-030

3. Measure the tooth tip clearance.

**Clearance: 0.24 mm (0.009 in) max.**

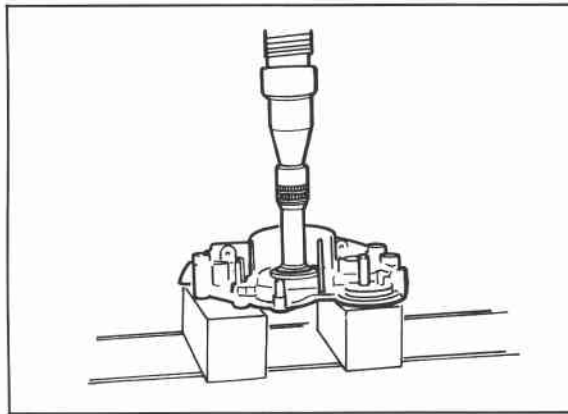
## 2B OIL PUMP



76G02B-031

4. Measure the outer rotor to pump body clearance.

**Clearance: 0.22 mm (0.009 in) max.**



76G02B-032

### ASSEMBLY

Assemble the pump as follows.

#### Oil Seal

1. Apply engine oil to the pump body and the outside of the new oil seal.
2. Press in the oil seal.

#### Pressure Relief Valve

1. Install the plunger and spring in the pump body.
2. Install the spring seat plug and tighten to specification.

#### Tightening torque:

**26—39 N·m (2.7—4.0 m·kg, 20—29 ft·lb)**

#### Outer and Inner Rotor

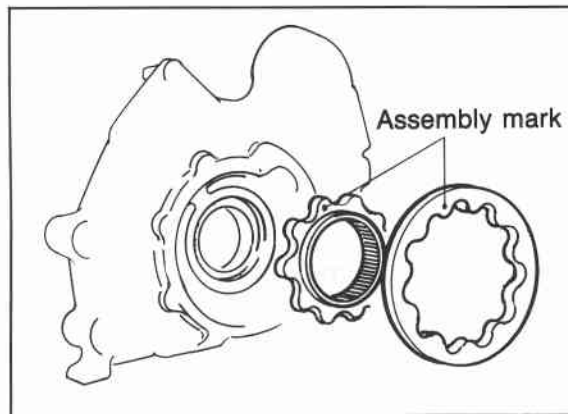
Install the rotors with the assembly mark facing the pump cover.

#### Oil Pump Cover

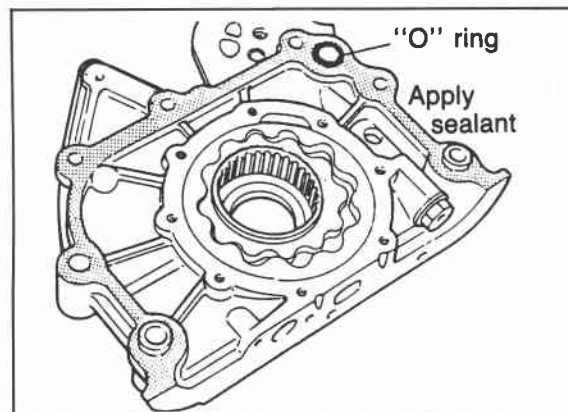
1. Apply thread locking compound to the cover mounting screws' threads.
2. Attach the oil pump cover to the body.

#### Tightening torque:

**6—9 N·m (60—90 cm·kg, 52—78 in·lb)**



76G02B-037



76G02B-033

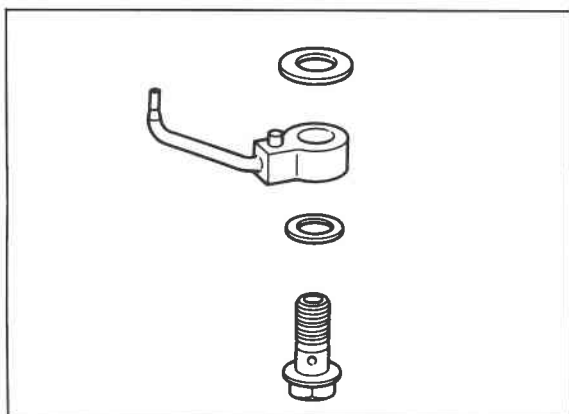
### INSTALLATION

Install in the reverse order of removal referring to installation note.

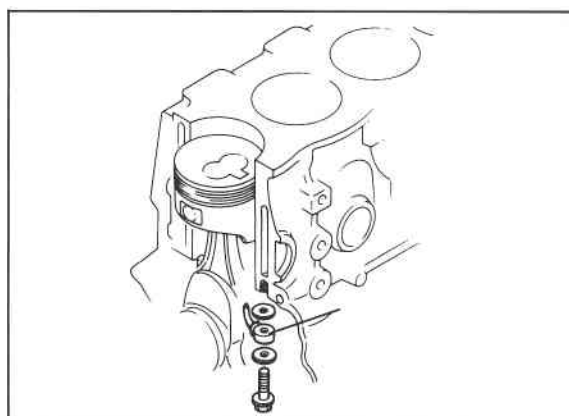
#### Installation Note

##### Oil pump

1. Apply grease to a new O-ring and install it in the oil pump body.
2. Apply silicon sealant to the shaded area as shown in the figure.
3. Apply engine oil to the oil seal lip.



76G02B-034



76G02B-035

## OIL JET

### REMOVAL

Remove each part in the following order.

1. Remove the oil pan. (Refer to page 2B—9).
2. Remove the oil jet valve.
3. Remove the oil jet.

### INSPECTION

1. Make sure that the oil passage is not clogged.
2. Check that the oil jet valve is not stuck or damaged.

### INSTALLATION

Install in the reverse order of removal.

**Tightening torque: 12—18 N·m**  
**(1.2—1.8 m·kg, 104—156 in·lb)**