

LUBRICATION SYSTEM DIAGRAM ..... 5-2

SERVICE INFORMATION ..... 5-3

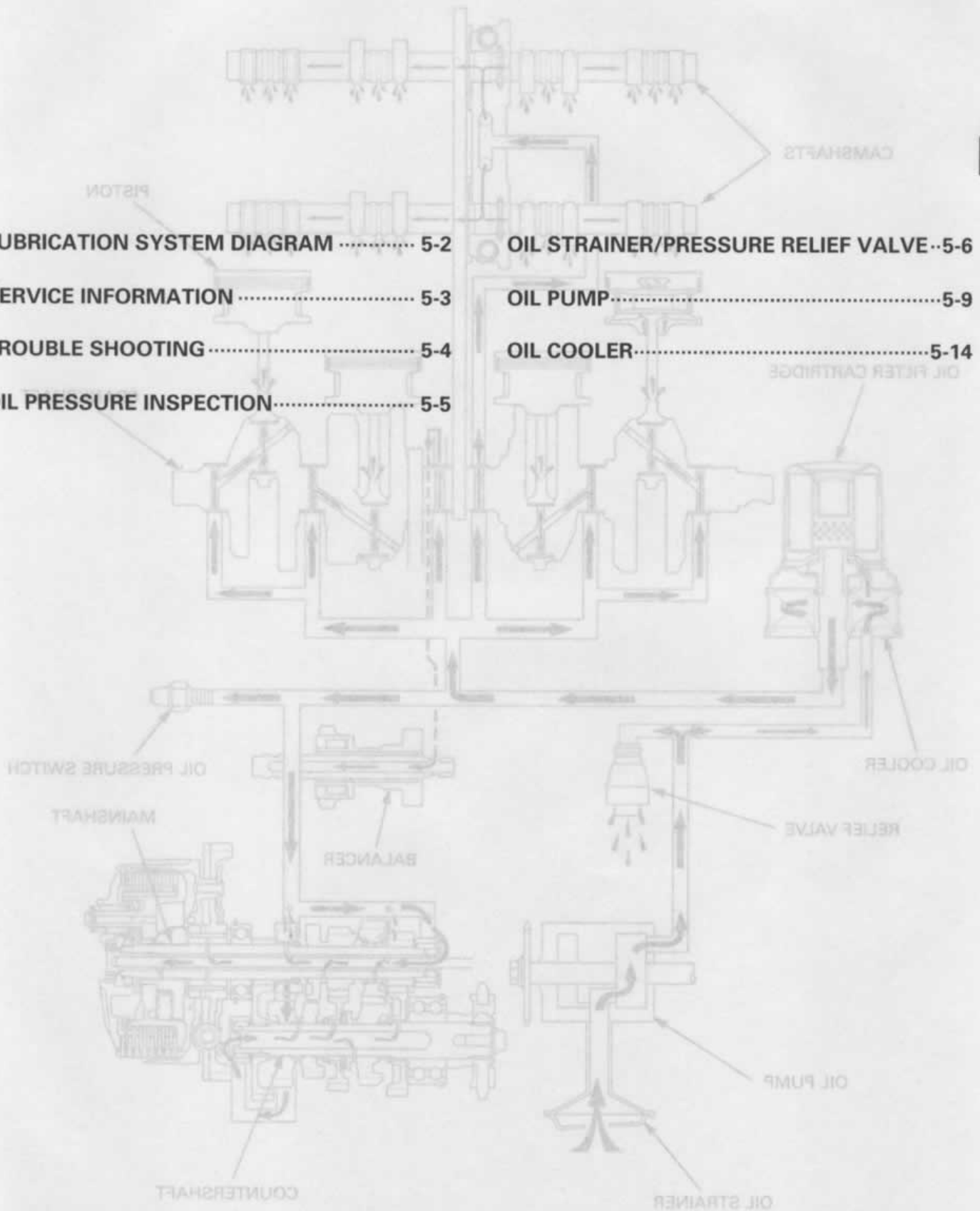
TROUBLE SHOOTING ..... 5-4

OIL PRESSURE INSPECTION ..... 5-5

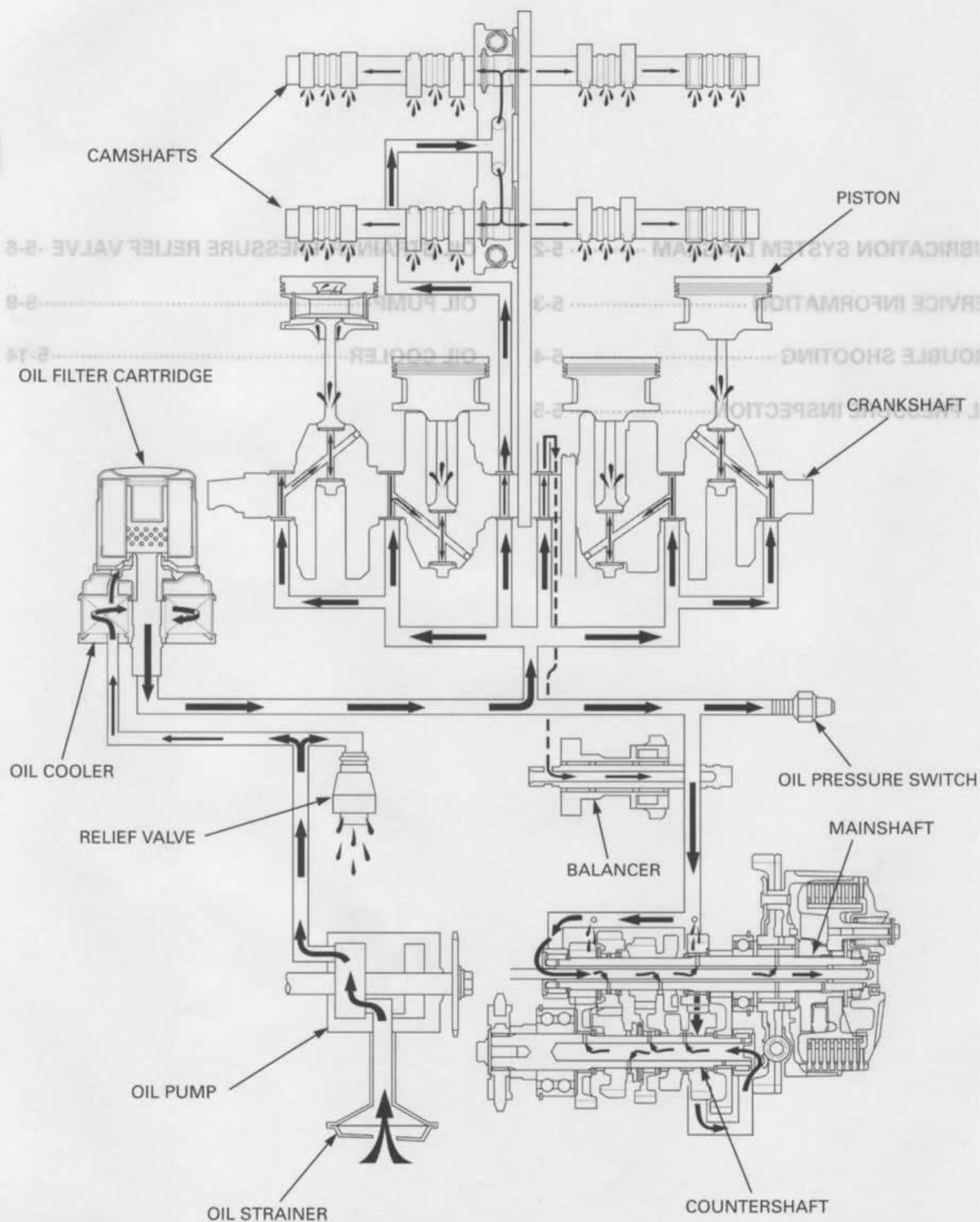
OIL STRAINER/PRESSURE RELIEF VALVE .. 5-6

OIL PUMP ..... 5-9

OIL COOLER ..... 5-14



## LUBRICATION SYSTEM DIAGRAM



## SERVICE INFORMATION

## GENERAL

**⚠ CAUTION**

Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.

- The oil pump can be serviced with the engine installed in the frame.
- The service procedures in this section must be performed with the engine oil drained.
- When removing and installing the oil pump, use care not to allow dust or dirt to enter the engine.
- If any portion of the oil pump is worn beyond the specified service limits, replace the oil pump as an assembly.
- After the oil pump has been installed, check that there are no oil leaks and that oil pressure is correct.

## SPECIFICATIONS

| ITEM                                |                              | STANDARD   | SERVICE LIMIT |
|-------------------------------------|------------------------------|--|---------------|
| Engine oil capacity                 | After draining               | 3.7 liter (3.9 US qt, 3.3 Imp qt)  | —             |
|                                     | After draining/filter change | 3.9 liter (4.1 US qt, 3.4 Imp qt)  | —             |
|                                     | After disassembly            | 4.8 liter (5.1 US qt, 4.2 Imp qt)  | —             |
| Recommended engine oil              |                              | HONDA 4-stroke oil or equivalent motor oil<br>API service classification SE, SF or SG<br>Viscosity: SAE 10W-40 | —             |
| Oil pressure at oil pressure switch |                              | 490 - 588 kPa (5.0 - 6.0 kgf/cm <sup>2</sup> , 71 - 85 psi) at 5,000 min <sup>-1</sup> (rpm)/(80°C/176°F)      | —             |
| Oil pump rotor                      | Tip clearance                | 0.15 (0.006)   | 0.20 (0.008)  |
|                                     | Body clearance               | 0.15 - 0.22 (0.006 - 0.009)  | 0.35 (0.014)  |
|                                     | Side clearance               | 0.02 - 0.07 (0.001 - 0.003)  | 0.10 (0.004)  |

## TORQUE VALUES

|   |                                |                                      |
|---|--------------------------------|--------------------------------------|
| Oil pump assembly bolt                        | 13 N·m (1.3 kgf·m, 9 lbf·ft)   | CT bolt                              |
| Oil pump driven sprocket bolt/washer          | 15 N·m (1.5 kgf·m, 11 lbf·ft)  | Apply a locking agent to the threads |
| Oil cooler bolt (filter boss)                 | 74 N·m (7.5 kgf·m, 54 lbf·ft)  |                                      |
| Oil pressure switch                           | 12 N·m (1.2 kgf·m, 9 lbf·ft)   | Apply sealant to the threads         |
| Oil pressure switch wire terminal bolt/washer | 2 N·m (0.22 kgf·m, 1.6 lbf·ft) |                                      |
| Engine oil filter cartridge                   | 26 N·m (2.7 kgf·m, 20 lbf·ft)  | Apply clean engine oil to the O-ring |
| Engine oil drain plug                         | 29 N·m (3.0 kgf·m, 22 lbf·ft)  |                                      |

## TOOLS

|  |   |   |
|--|---|---|
| Oil pressure gauge set<br>07506-3000001<br><br>or equivalent commercially available | Oil pressure gauge attachment<br>07406-0030000<br> | Oil filter wrench<br>07HAA-PJ70101<br> |
|--|---|---|

TROUBLE SHOOTING

GENERAL

Oil level too low

- Oil consumption
- External oil leak
- Worn piston rings
- Improperly installed piston rings
- Worn cylinders
- Worn stem seals
- Worn valve guide

Low oil pressure

- Oil level low
- Clogged oil strainer
- Internal oil leak
- Incorrect oil being used

No oil pressure

- Oil level too low
- Oil pressure relief valve stuck open
- Broken oil pump drive chain
- Broken oil pump drive or driven sprocket
- Damaged oil pump
- Internal oil leak

High oil pressure

- Oil pressure relief valve stuck closed
- Clogged oil filter, gallery or metering orifice
- Incorrect oil being used

Oil contamination

- Oil or filter not changed often enough
- Worn piston rings

Oil emulsification

- Blown cylinder head gasket
- Leaky coolant passage
- Entry of water

CAUTION

Lead engine oil may cause skin cancer if repeatedly left in contact with the skin for an extended period. It is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.

- The oil pump can be serviced with the engine installed in the frame.
- The service procedures in this section must be performed with the engine oil drained.
- When removing and installing the oil pump, use care not to allow dust or dirt to enter the engine.
- If any portion of the oil pump is worn beyond the specified service limits, replace the oil pump as an assembly.
- After the oil pump has been installed, check that there are no oil leaks and that oil pressure is correct.

SPECIFICATIONS

| ITEM                                |                             | STANDARD  |
|-------------------------------------|-----------------------------|---|
| Engine oil capacity                 | After draining              | 3.7 liter (3.9 US qt. 4.1 imp. qt.)   |
|                                     | After draining/after change | 3.8 liter (4.1 US qt. 4.3 imp. qt.)   |
|                                     | After disassembly           | 4.8 liter (5.1 US qt. 5.3 imp. qt.)   |
| Recommended engine oil              |                             | HONDA 4-stroke oil or equivalent<br>motor oil<br>API service classification SE, SF or SG<br>Viscosity: SAE 10W-40 |
| Oil pressure at oil pressure switch |                             | 450 - 588 kPa (6.5 - 8.5 psi)<br>at 6,000 min. <sup>-1</sup> (rpm) (800 C/176 F)                                  |
| Oil pump rotor                      | Tip clearance               | 0.15 (0.006)  |
|                                     | Body clearance              | 0.15 - 0.22 (0.006 - 0.009)   |
|                                     | Side clearance              | 0.02 - 0.07 (0.001 - 0.003)   |

TORQUE VALUES

|   |                                |                                      |
|---|--------------------------------|--------------------------------------|
| Oil pump assembly bolt                        | 13 N·m (1.3 kgf-m, 9 lbf-ft)   | CT bolt                              |
| Oil pump driven sprocket bolt/washer          | 15 N·m (1.5 kgf-m, 11 lbf-ft)  | Apply a locking agent to the threads |
| Oil cooler bolt (filter base)                 | 24 N·m (2.5 kgf-m, 18 lbf-ft)  |                                      |
| Oil pressure switch                           | 12 N·m (1.2 kgf-m, 9 lbf-ft)   | Apply sealant to the threads         |
| Oil pressure switch wire terminal bolt/washer | 2 N·m (0.22 kgf-m, 1.6 lbf-ft) |                                      |
| Engine oil filter cartridge                   | 28 N·m (2.7 kgf-m, 20 lbf-ft)  | Apply clean engine oil to the O-ring |
| Engine oil drain plug                         | 28 N·m (3.0 kgf-m, 22 lbf-ft)  |                                      |

TOOLS

|   |   |   |
|---|---|---|
| Oil pressure gauge set<br>07508-3000007   | Oil pressure gauge attachment<br>07408-0030000                                      | Oil filter wrench<br>073AA-P170707  |
|  |  |  |
| or equivalent commercially available  |   |   |

## OIL PRESSURE INSPECTION

If the oil pressure indicator light remains on a few seconds, check the indicator system before checking the oil pressure.

Check the oil level (page 4-14).

Warm up the engine to normal operating temperature (approximately 80°C/176°F).

Stop the engine and remove the oil pressure switch terminal screw.

Remove the oil pressure switch.

Connect an oil pressure gauge and attachment to the pressure switch hole.

### TOOLS:

**Oil pressure gauge set** 07506-3000001  
(Equivalent commercially available)

**Oil pressure gauge attachment** 07406-0030000

Start the engine and increase the rpm to 5,000 min<sup>-1</sup> (rpm) and read the oil pressure.

### OIL PRESSURE:

490 - 588 kPa (5.0 - 6.0 kgf/cm<sup>2</sup>, 71 - 85 psi) at 5,000 min<sup>-1</sup> (rpm)/(80°C/176°F)

Stop the engine and remove the tools.

Apply sealant to the threads of the oil pressure switch threads.

Install and tighten the oil pressure switch to the specified torque.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

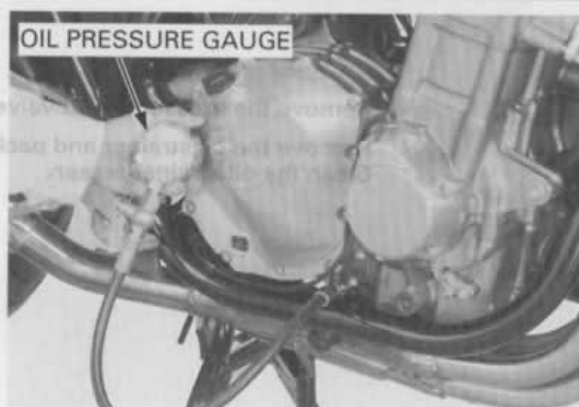
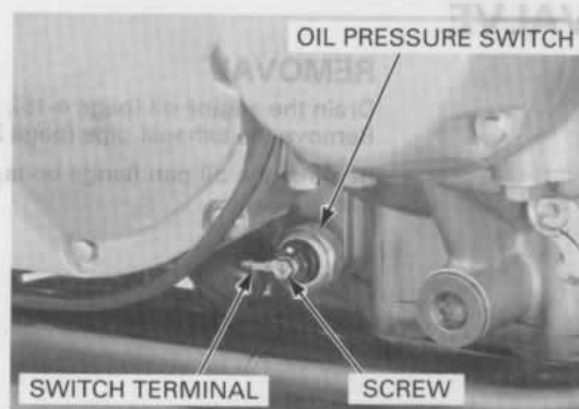
Route the oil pressure switch wire properly (page 1-23).

Connect the switch wire to the terminal and tighten the screw to the specified torque.

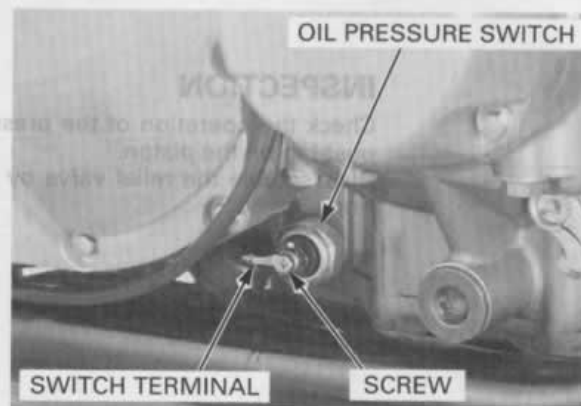
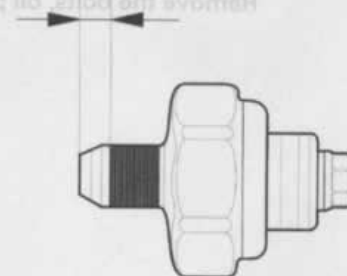
**TORQUE: 2 N·m (0.22 kgf·m, 1.6 lbf·ft)**

Start the engine and check that the oil pressure warning indicator goes off after few seconds.

If the warning indicator incorrect, check the oil pressure switch (page 19-20).



Do not apply sealant to the thread head 3 - 4 mm (0.1 - 0.2 in).



## OIL STRAINER/PRESSURE RELIEF VALVE

### REMOVAL

Drain the engine oil (page 4-15).

Remove the exhaust pipe (page 3-12).

Remove the oil pan flange bolts, wire clamp and oil pan.

Remove the pressure relief valve and O-ring.

Remove the oil strainer and packing.

Clean the oil strainer screen.

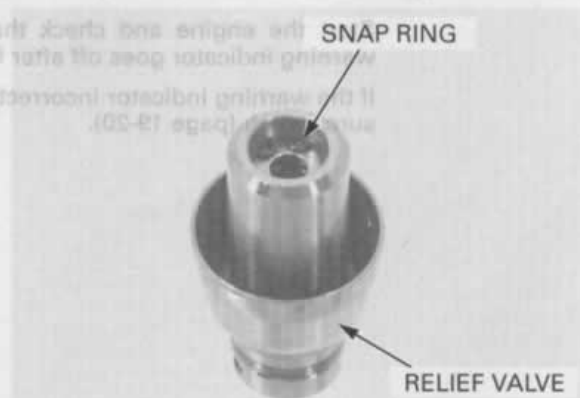
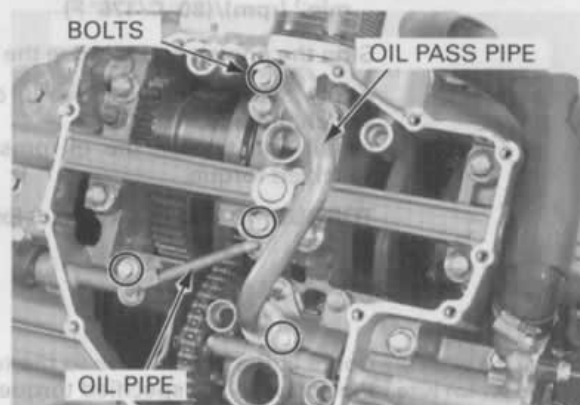
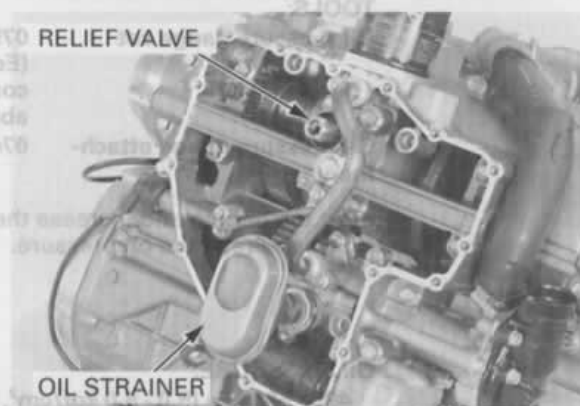
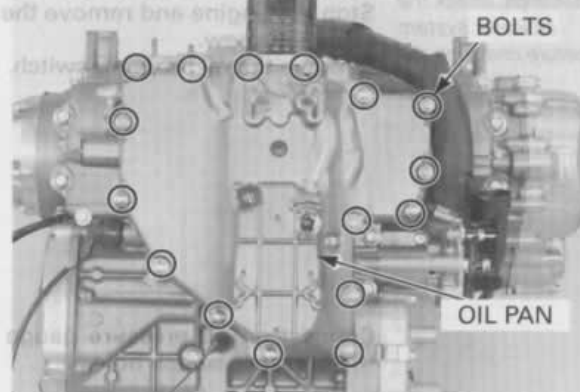
Remove the bolts, oil pass pipe and O-rings.

Remove the bolts, oil pipe and O-rings.

### INSPECTION

Check the operation of the pressure relief valve by pushing on the piston.

Disassemble the relief valve by removing the snap ring.





Inspect the piston for wear, sticking or damage.  
Inspect the spring for weakness or damage.

Assemble the relief valve in the reverse order of disassembly.

RELIEF VALVE BODY

PISTON

SPRING

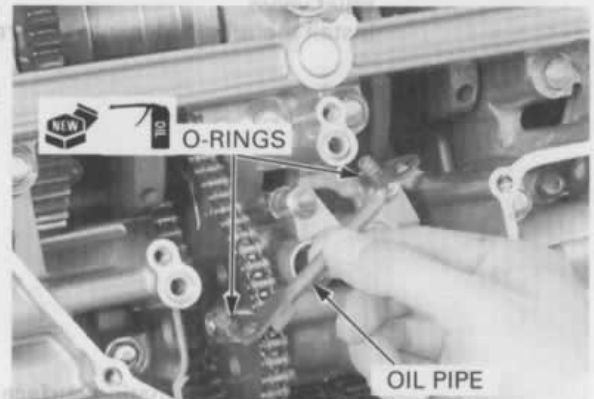
WASHER

## INSTALLATION

Apply oil to the new O-rings and install it onto the oil pipe.

Install the oil pipe into the crankcase.

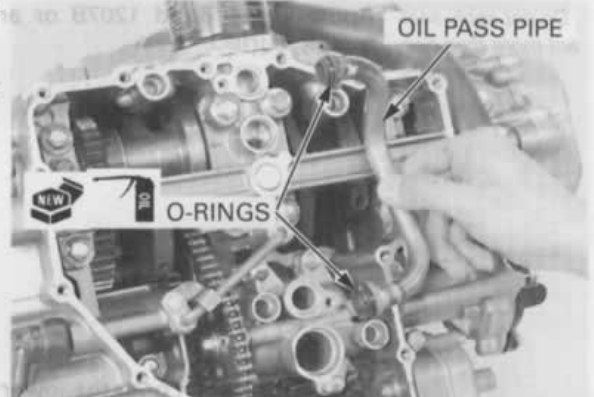
Apply a locking agent to the oil pipe bolt threads and install them.



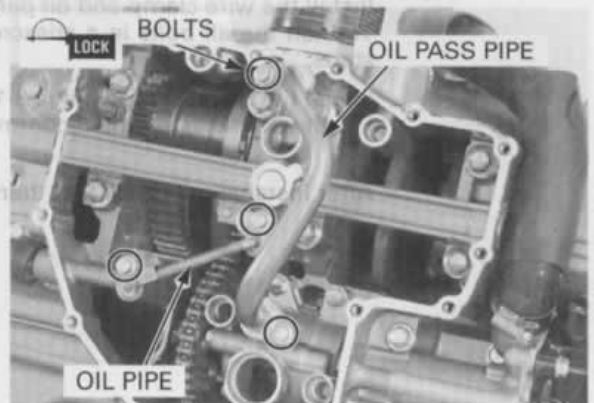
Apply oil to the new O-rings and install it onto the oil pipe.

Install the oil pipe into the crankcase.

Apply a locking agent to the oil pipe bolt threads and install them.

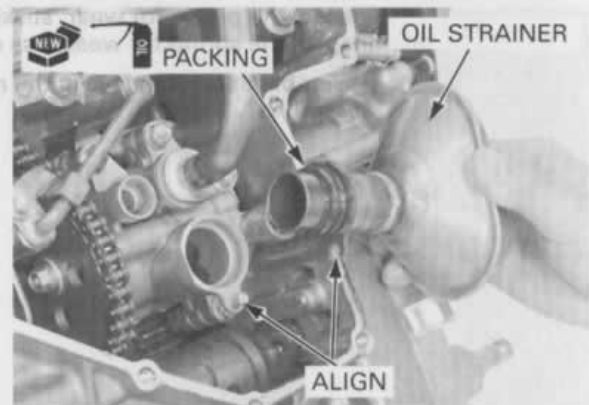


Tighten the oil pipe bolts and oil pass pipe bolts securely.

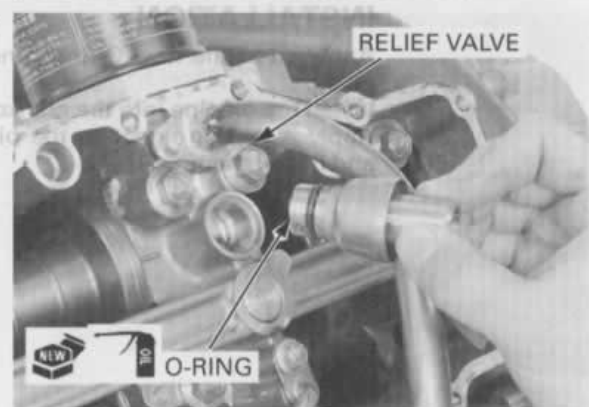


## LUBRICATION SYSTEM

Apply oil to the new packing and install it onto the oil strainer.  
Install the oil strainer into the oil pump while aligning strainer groove with the boss on the oil pump body.

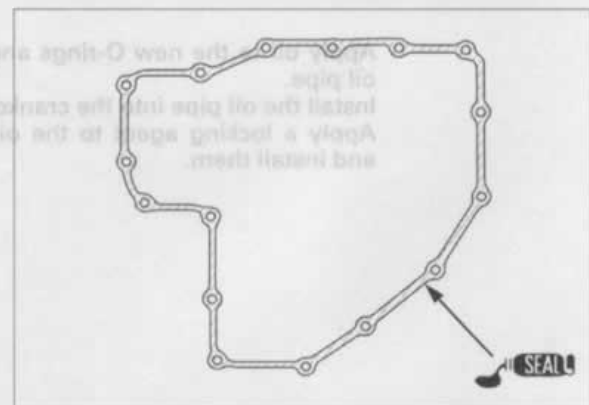


Apply oil to the new O-ring and install it onto the relief valve.  
Install the relief valve into the crankcase.



Clean the oil pan mating surface thoroughly.

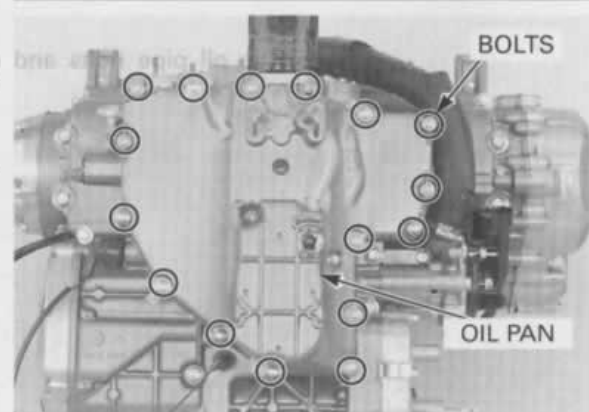
Apply Three Bond 1207B or an equivalent to the mating surface.



Install the oil pan onto the lower crankcase.  
Install the wire clamp and oil pan mounting bolts.  
Tighten the all bolts in a crisscross pattern in 2 - 3 steps.

Install the exhaust pipe (page 3-14).  
Fill the crankcase with recommended oil (page 4-15).

After installation, check that there are no oil leaks.





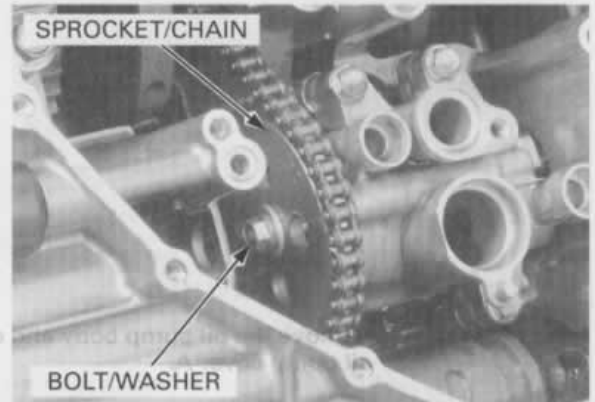
## OIL PUMP

## REMOVAL

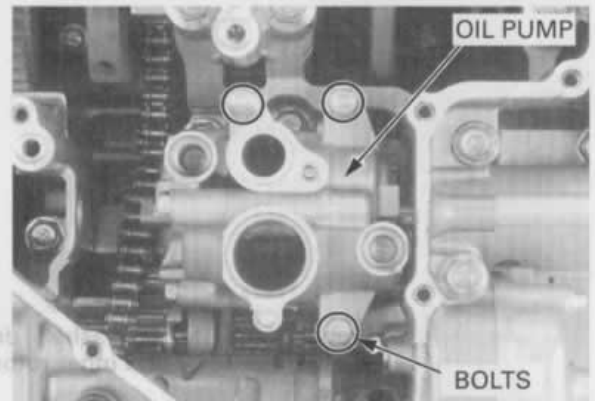
Remove the following:

- Clutch (page 10-16)
- Water pump (page 7-15)
- Oil pan (page 5-6)

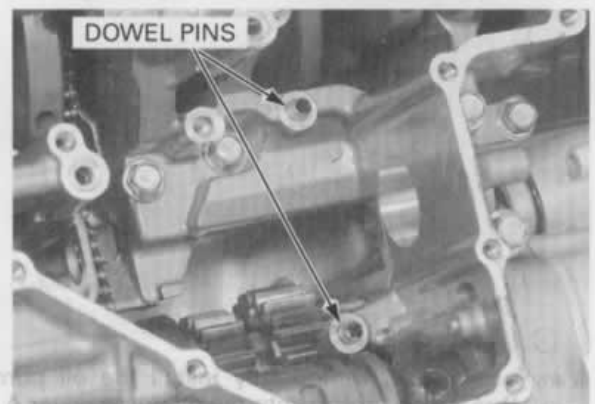
Remove the bolt/washer, then remove the oil pump driven sprocket and drive chain from the oil pump shaft.



Remove the three flange bolts and oil pump assembly.

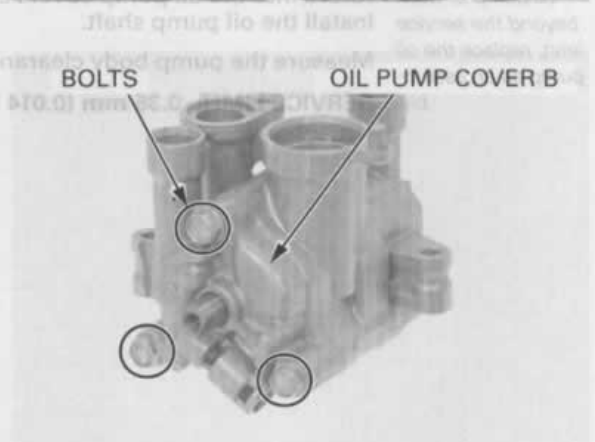


Remove the dowel pins.



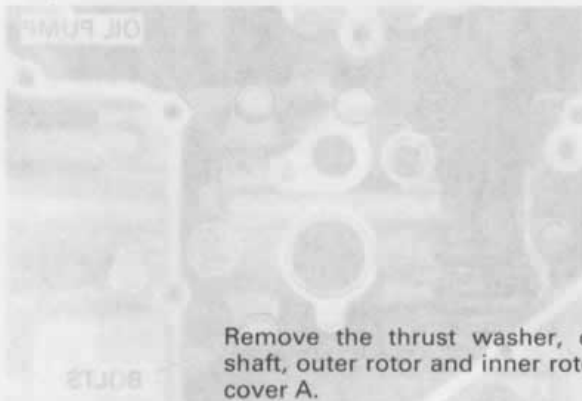
## DISASSEMBLY

Remove the bolts and oil pump cover B.



## LUBRICATION SYSTEM

Remove the dowel pins.



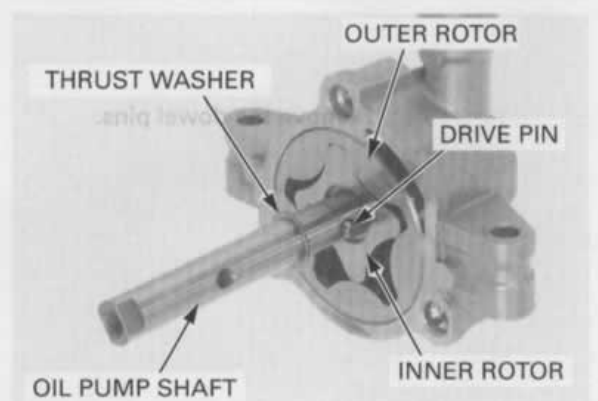
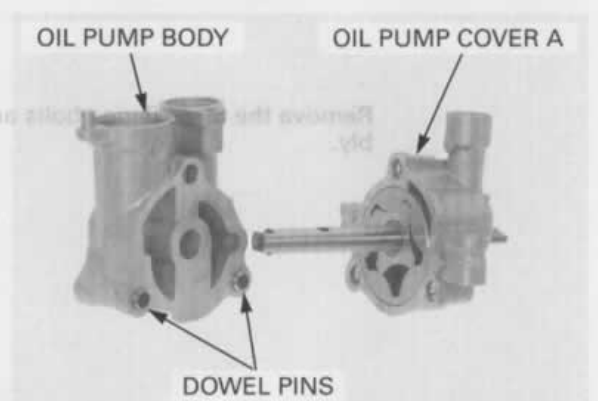
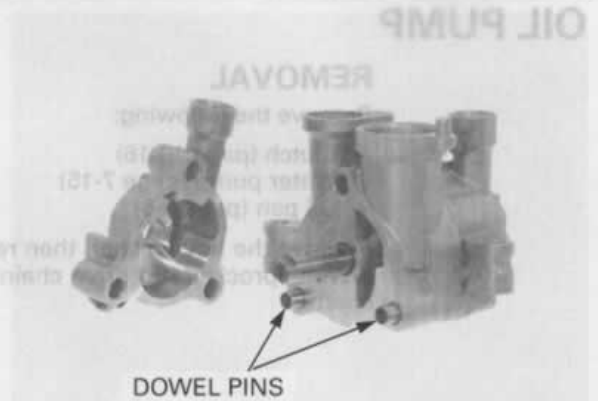
### INSPECTION

If any portion of the oil pump is worn beyond the service limit, replace the oil pump as an assembly.

Temporarily install the oil pump inner and outer rotors into the oil pump cover A. Install the oil pump shaft.

Measure the pump body clearance.

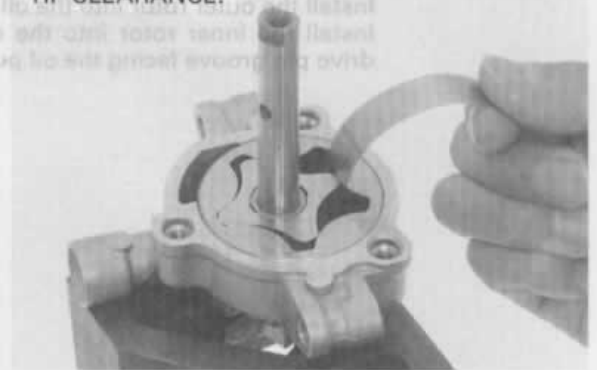
**SERVICE LIMIT: 0.35 mm (0.014 in)**



Measure the rotor tip clearance.

**SERVICE LIMIT: 0.20 mm (0.008 in)**

**TIP CLEARANCE:**



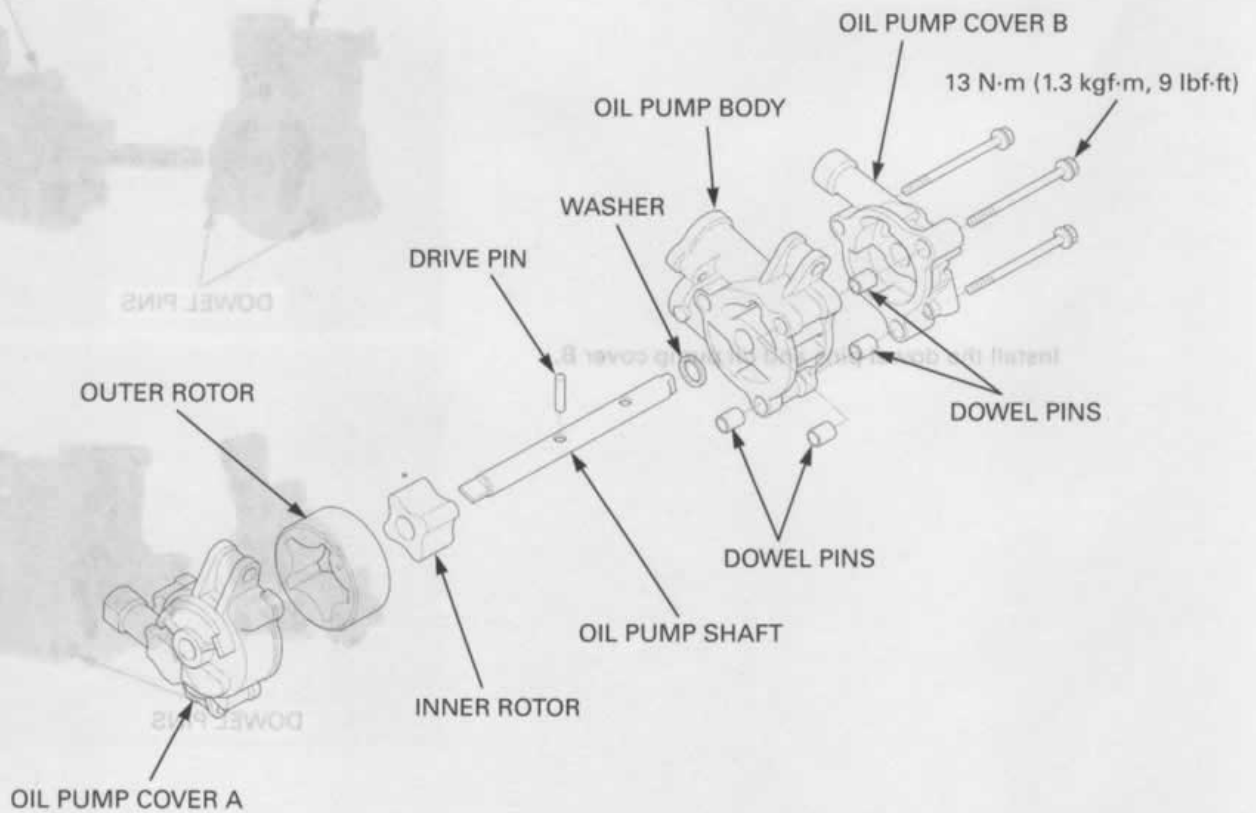
Measure the side clearance using a straight edge and feeler gauge.

**SERVICE LIMIT: 0.10 mm (0.004 in)**

**SIDE CLEARANCE:**

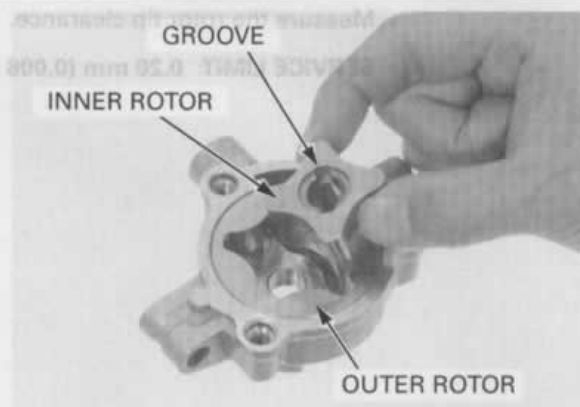


## ASSEMBLY

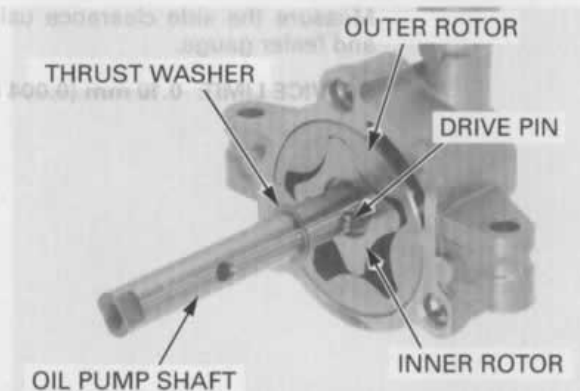
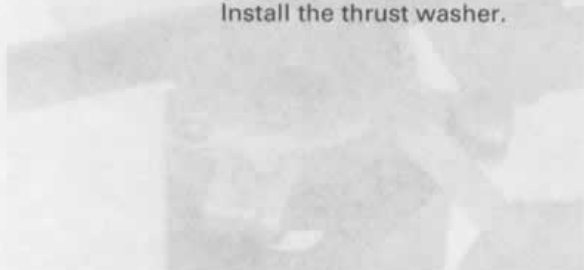


## LUBRICATION SYSTEM

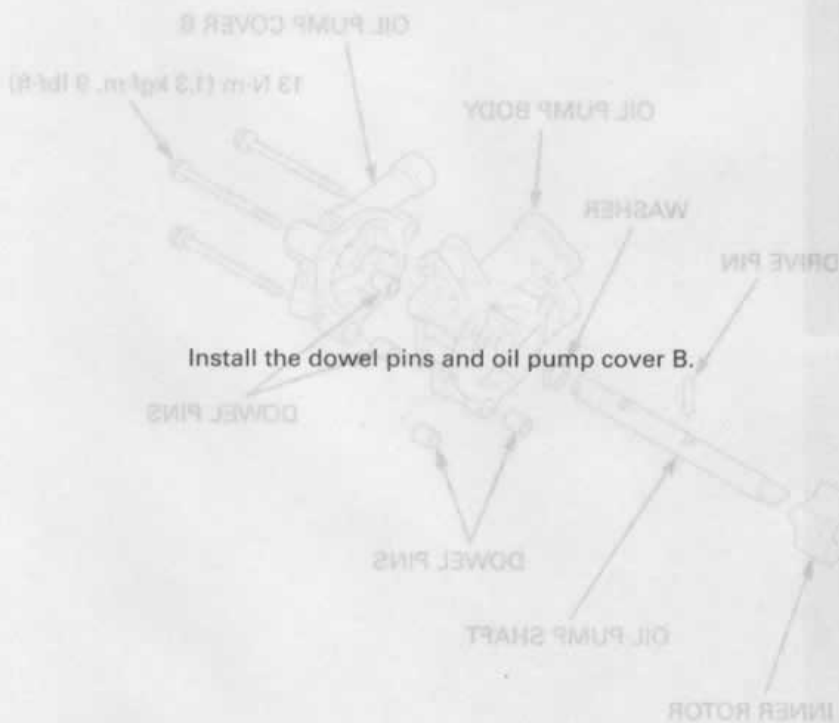
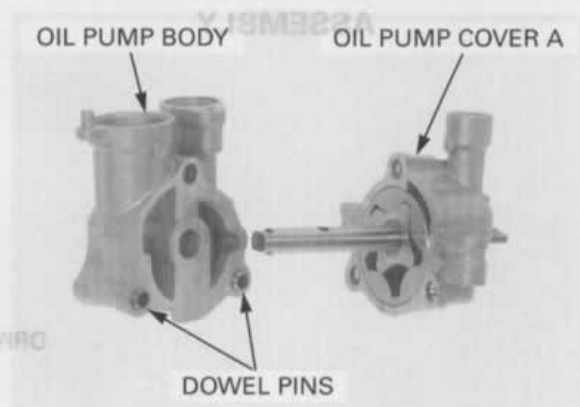
Apply clean engine oil to each parts.  
Install the outer rotor into the oil pump cover A.  
Install the inner rotor into the outer rotor with its drive pin groove facing the oil pump body.



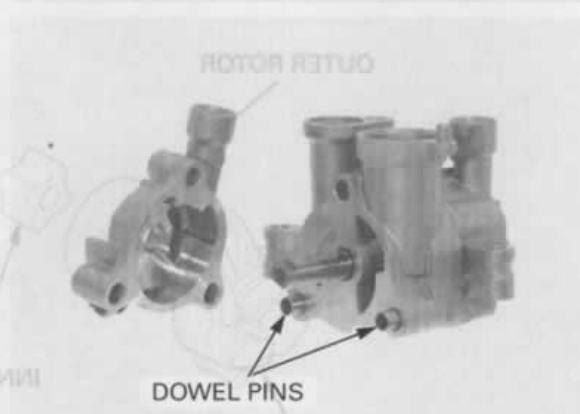
Install the oil pump shaft through the inner rotor and oil pump cover A.  
Install the drive pin into the hole in the pump shaft and align the pin with the groove in the inner rotor groove as shown.  
Install the thrust washer.



Install the dowel pins to the oil pump body.  
Install the oil pump body to the oil pump cover A.



Install the dowel pins and oil pump cover B.

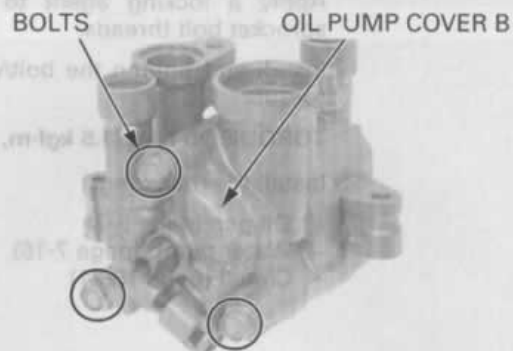


Install the oil pump assembly bolts and tighten the bolts to the specified torque.

**TORQUE: 13 N·m (1.3 kgf-m, 9 lbf-ft)**

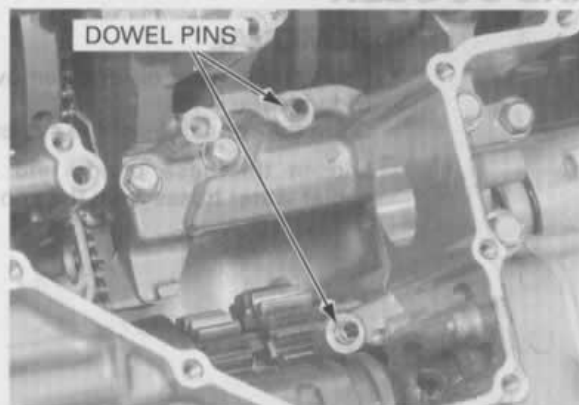
Check the oil pump operation by turning the pump shaft.

If necessary, reassemble the oil pump.

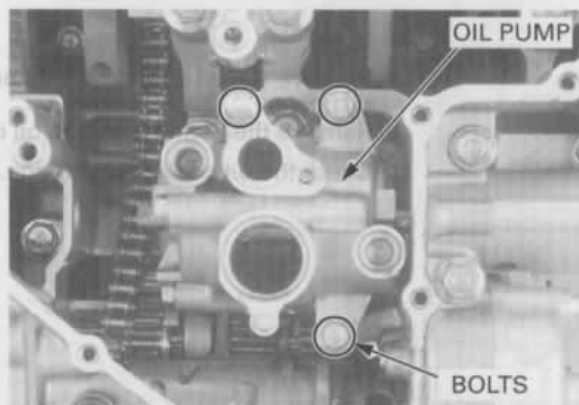


## INSTALLATION

Install the dowel pins to the crankcase.

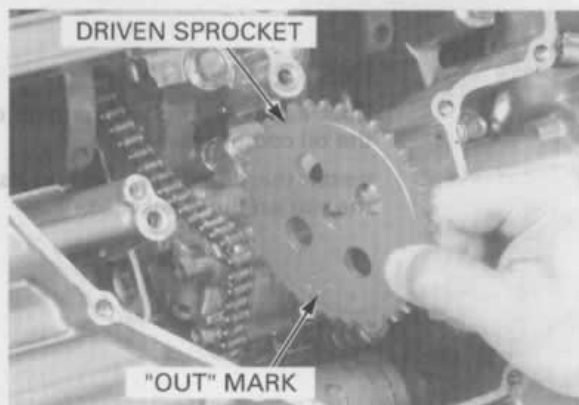


Install the oil pump and tighten the mounting bolts securely.



Install the oil pump driven sprocket with its "OUT" mark facing the clutch and install it into the drive chain.

Install the driven sprocket onto the oil pump shaft while aligning the cut-outs.



## LUBRICATION SYSTEM

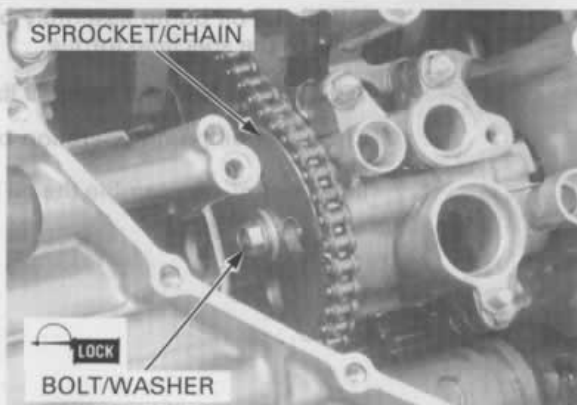
Apply a locking agent to the oil pump driven sprocket bolt threads.

Install and tighten the bolt/washer to the specified torque.

**TORQUE: 15 N·m (1.5 kgf·m, 11 lbf·ft)**

Install the following:

- Oil pan (page 5-7)
- Water pump (page 7-16)
- Clutch (page 10-21)



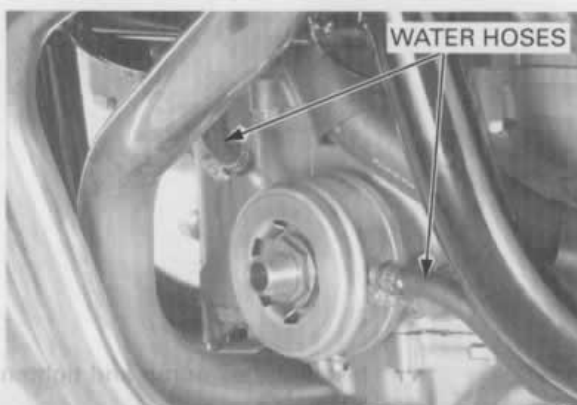
## OIL COOLER

### REMOVAL

Drain the engine oil and remove the oil filter cartridge (page 4-15).

Drain the coolant from the system (page 7-6).

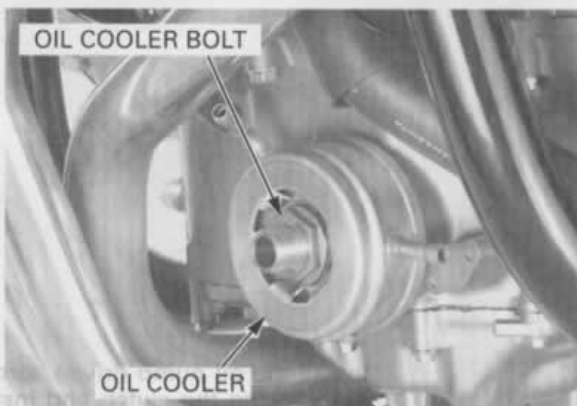
Loosen the hose bands and disconnect the oil cooler water hoses from the cooler.



Remove the oil cooler bolt (filter boss), washer and oil cooler.

Remove the O-ring from the oil cooler.

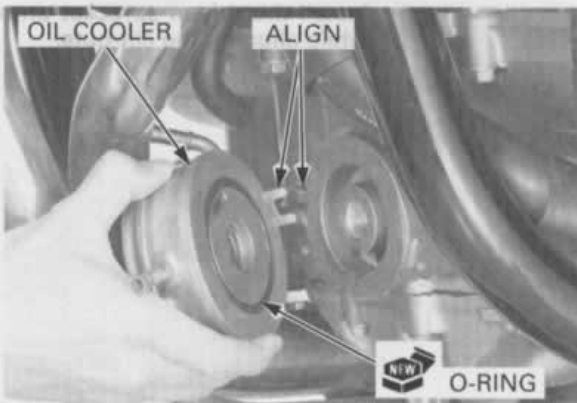
Check the oil cooler for damage.



### INSTALLATION

Coat a new O-ring with engine oil and install it into the oil cooler groove.

Install the oil cooler aligning its guide groove with the rug on the crankcase.

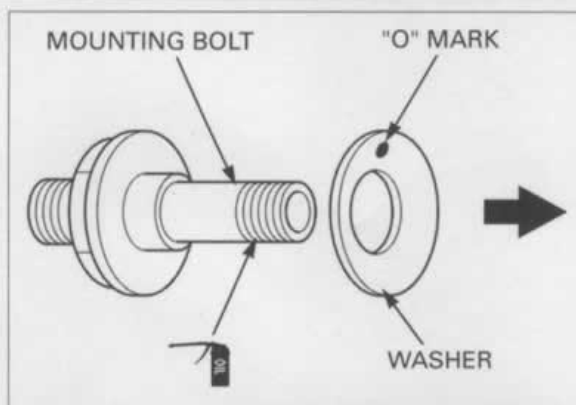




Apply oil to the oil cooler bolt threads and seating surface.

*Install the lock washer with its concave side ("o" mark) facing the oil cooler.*

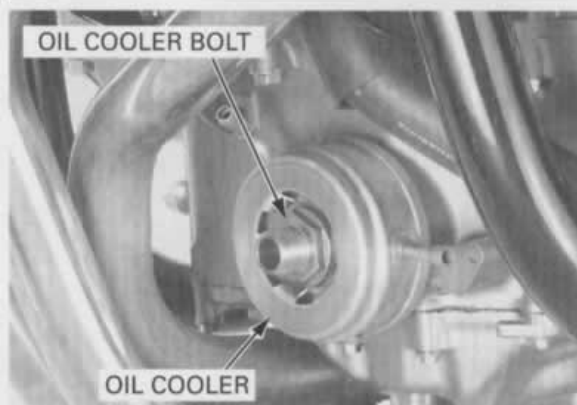
Install the lock washer and oil cooler bolt.



*Be sure the cooler bolt collar slides inside the oil cooler.*

Tighten the oil cooler bolt to the specified torque.

**TORQUE: 74 N·m (7.5 kgf·m, 51 lbf·ft)**



Connect the oil cooler water hoses, tighten the hose band securely.

Install the oil filter cartridge and fill the crankcase with recommended oil (page 4-14).  
Fill the cooling system and bleed air (page 7-6).

