

## LUBRICATING SYSTEM

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## DESCRIPTION

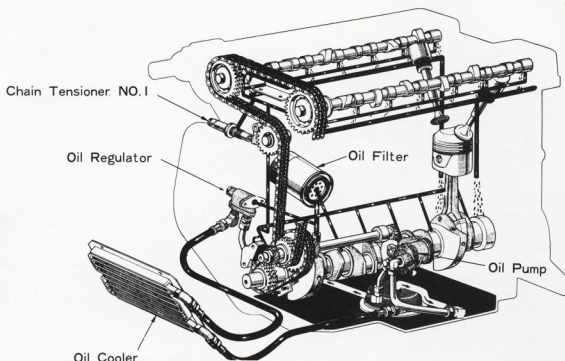


Fig.5-1 Engine Lubricating System

Y5040-A

The lubricating system is an all forced-feed, full-flow filtering type, and an oil cooler is provided.

The oil pump is of a gear type mounted on the left side of the cylinder block exterior, and is driven by the oil pump drive shaft.

The oil filter is of a full-flow, and an easy replaceable unit construction type. The discharged oil travels into the oil passages within the cylinder block to lubricate the engine internal components, and the valve mechanism.

When the oil pressure varies within the oil filter due to clogged element, the relief valve in the oil filter will open, and by-passes the oil flow directly without passing through the element. When the oil pressure becomes higher due to the increase of the oil pump revolution, the oil regulator will open, and other oil flows through the oil cooler where it is cooled, and returns to the oil pan. To lubricate the valve mechanism, the oil lubricating the camshaft bearings flows up through the oil passage in the cylinder block, and passes the cylinder head passage, and other oil flows and lubricates the camshaft timing gears, chains, and other related gears through the passages in the camshafts, and gear retaining bolts.

## Specification:

## Oil Pump

Type

Delivery capacity (SAE-30)

Gear type

Over 3.5 liters (3.7 US qts., 3.1 imp. qts) per minute at 270 ~ 330 rpm of pump at 100°C (212°F) at 2 kg/cm<sup>2</sup> (28.4 psi)

## 5-2 LUBRICATING SYSTEM - Description, Oil Pump

Delivery capacity (SAE-30)	Over 71 liters (18.8 US gals., 15.6 Imp. gals) per minute to 3,950 to 4,050 rpm of pump at 100°C (212°F) at 2 kg/cm <sup>2</sup> (28.4 psi)
Relief valve opening pressure	5.0 ~ 6.0 kg/cm <sup>2</sup> (71.1 ~ 85.3 psi)
Number of gear teeth	
Oil pump idler gear No.1	35 teeth
Oil pump idler gear No.2	32 teeth
Oil pump drive shaft gear	24 teeth
Oil pump drive gear	7 teeth
Oil pump driven gear	7 teeth
Oil Regulator	
By-pass valve opening pressure	3.0 ~ 4.0 kg/cm <sup>2</sup> (42.7 ~ 56.9 psi)
Oil Filter	
Type	Replaceable unit construction type
Filtration area	3,000 cm <sup>2</sup> (465 sq. in)
Oil capacity	0.8 liter (0.9 US qt., 0.7 Imp.qt)
Relief valve opening pressure	0.8 ~ 1.2 kg/cm <sup>2</sup> (11.4 ~ 17.1 psi)
Oil Cooler	
Type	Fin and tube radiator type
Radiation area	1.74 m <sup>2</sup> (18.7 sq. ft)
Durable maximum pressure	10 kg/cm <sup>2</sup> (142.2 psi)
Oil capacity	215 cc (0.23 US qt., 0.19 Imp. qt)
Weight	1.8 kg (4 lb)

### OIL PUMP

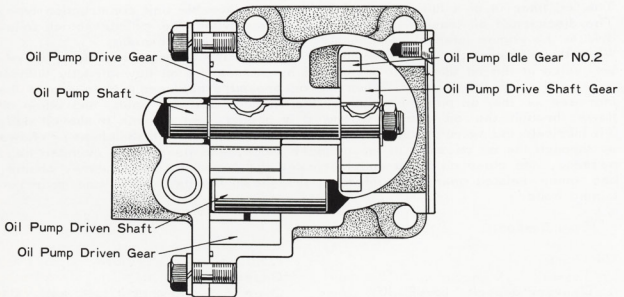


Fig.5-2 Cross Sectional View of Oil Pump

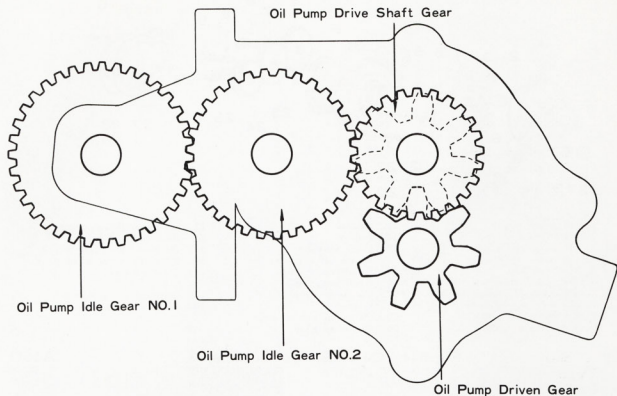


Fig.5-3 Oil Pump Gear Train

G1151

### Removal

1. Disconnect the air cleaner hose from the air intake connector No.1 and then remove the air intake connector No.1 and the gasket.
2. Remove all air horns, and the air intake connector No.2.
3. Disconnect the choke wire, accelerator connecting rod and the fuel hose from the carburetor No.1.
4. Remove the carburetor No.1 with the carburetor vibration insulator from the intake manifold.  
DO NOT TOUCH the carburetor adjusting screws.
5. Loosen the union nuts and disconnect the oil pump outlet pipe No.1 and the inlet pipe No.1 from the oil pump.

6. Remove the oil pump retaining nuts and then remove the oil pump assembly and the "O" ring upward from the engine cylinder block.

### Disassembly

1. Remove the oil pump cover assembly and the "O" ring, and take out the oil pump driven gear. Remove the shaft snap ring on the oil pump shaft, then take out the oil pump drive gear, and the woodruff key.
2. Remove the oil pump gear cover and the gasket. Pull out the oil pump shaft gear together with the oil pump shaft.
3. Loosen and remove the oil pump relief valve plug, and disassemble the valve spring and the relief valve.

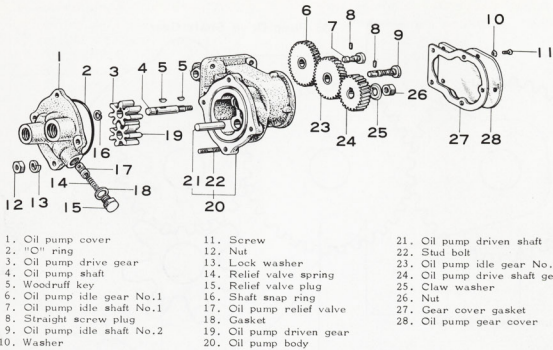


Fig.5-4 Oil Pump Components

A1511

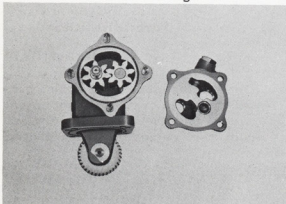


Fig.5-5 Oil Pump Cover V3538 Removal

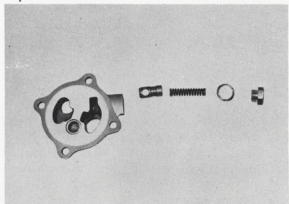


Fig.5-7 Relief Valve V3540 Disassembly

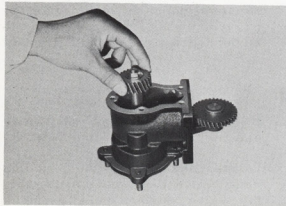


Fig.5-6 Oil Pump Drive Shaft Gear & Oil Pump Shaft V3539

4. If necessary, remove the oil pump drive shaft gear from the oil pump shaft.  
To remove, straighten the claw washer, and remove the gear retaining nut, then remove the gear from the shaft.

Inspection & Repair

Clean the disassembled parts thoroughly in clean gasoline.

1. Inspect the oil pump body and the

oil pump cover for scores and cracks. Replace as necessary.

- Inspect the oil pump shaft, and driven shaft for excessive wear, and scores.

If defective, replace the shaft.

The oil pump shaft and driven shaft diameter is 13.964 - 13.982 mm (0.5498 - 0.5505").

- Inspect the clearance between the oil pump shaft, and the oil pump body bushing, and the oil pump cover bushing.

The specified clearance is 0.018 to 0.054 mm (0.0007 - 0.0021"), and the limit is 0.08 mm (0.0031"). If it exceeds this limit, replace the oil pump shaft, oil pump body or the oil pump cover.

- Check the oil pump drive gear and the oil pump driven gear for wear, and scores. If defective, replace the gears as a set.

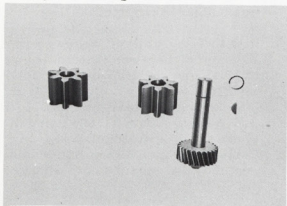


Fig.5-8 Gears Inspection V3541

- Inspect the clearance between the oil pump driven gear and the oil pump driven shaft.

The specified clearance is 0.014 - 0.042 mm (0.0005 - 0.0016"), The limit is 0.060 mm (0.0024"). If it exceeds this limit, replace the driven gear or the shaft.

- Assemble the oil pump shaft, oil pump drive gear and the oil pump driven gear into the oil pump body, and check the following conditions.

a. Check the tip clearance of the gears with the oil pump body. This clearance should be 0.025 to 0.105 mm (0.001 - 0.004"), and if the clearance exceeds 0.15 mm (0.006"), replace the shaft or the gears as a set.

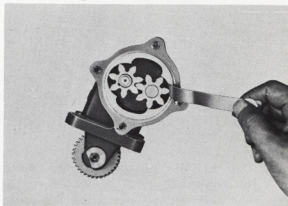


Fig.5-9 Checking Gear Tip Clearance V3542

b. Check the gear backlash between the drive and driven gears. The backlash should be 0.50 to 0.60 mm (0.020 - 0.024"). If the backlash exceeds 0.7 mm (0.028"), replace the gears as a set.

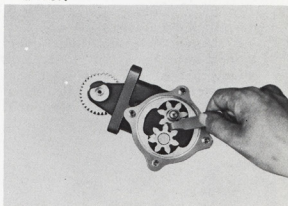


Fig.5-10 Checking Gears Backlash V3543

c. Check the gear side clearance. Measure the space between the gear, and the straight-edge with a feeler gauge.

This clearance should be 0.03 to 0.09 mm (0.001 - 0.004"), and if the clearance exceeds 0.15 mm (0.006"), replace the oil pump



body or the gears as a set.

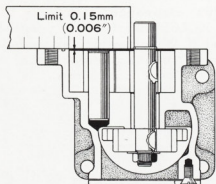


Fig.5-11 Gear Side Clearance G1152

7. Check the oil pump relief valve for fitness, and inspect the spring and the sliding surfaces for wear or damage.

If defective, replace the relief valve and the spring.

8. Inspect the gear backlash between the oil pump idler gear No.1 and the oil pump idler gear No.2. The backlash should be 0.1 ~ 0.3 mm (0.004 ~ 0.012").

If the backlash exceeds 0.5 mm (0.02"), replace the gear/s or the oil pump idler shaft/s.

To disassemble the idler gear, loosen and remove the two straight screw plugs (oil pump idler shaft set screws) with a Hex Head Wrench (hollow screw wrench).

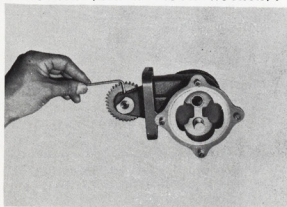


Fig.5-12 Removing Straight Screw Plug V3544

Next, press out the oil pump idler

shaft, and remove the oil pump idler gear.

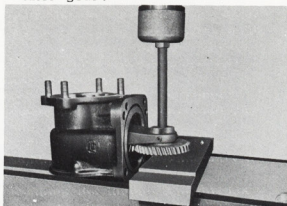


Fig.5-13 Removing Oil Pump Idler Shaft No.1 V3545

9. Inspect the gear backlash between the oil pump idler gear No.2 and the oil pump drive shaft gear. The backlash should be 0.1 ~ 0.3 mm (0.004 ~ 0.012"). If the backlash exceeds 0.5 mm (0.02"), replace the idler gear No.2, oil pump drive shaft gear or the oil pump idler shaft No.2.

10. Inspect the idler gears thrust clearance between the oil pump idler gears and the oil pump idler shaft flanges.

The specified clearance is 0.1 to 0.4 mm (0.004 ~ 0.016"), and the limit is 0.6 mm (0.024").

If the clearance exceeds this limit, replace the gear/s or shaft/s.

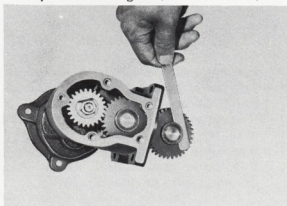


Fig.5-14 Checking Idler Gear Thrust Clearance V3546



Assembly

Before assembly, all rotating or sliding parts should be lubricated with engine oil.

1. Install the oil pump idler gear No. 2 onto the oil pump idler shaft No. 2, and assemble the shaft into the oil pump body with a press. Tighten the straight screw plugs securely with a Hex. Head Wrench. Lock the straight screw plugs in place by punching at three places.
2. Assemble the oil pump idler gear No. 1 and the idler shaft No. 1 onto the oil pump body in the same manner as described above.
3. Install the oil pump drive shaft gear and the oil pump shaft into the oil pump body. Next, position the woodruff key on the oil pump shaft, and then slide in the oil pump drive gear onto the shaft. Install the shaft snap ring onto the oil pump shaft.
4. Install the oil pump driven gear.
5. Assemble the oil pump relief valve and the spring into the oil pump cover. Install the new gasket, and tighten the relief valve plug.
6. Place a new "O" ring into the groove of the oil pump body, and install the oil pump cover. Tighten the nuts to 1.0 ~ 1.5 m-kg (7 ~ 11 ft-lb) torque.
7. Apply the liquid sealer onto the oil pump body and the oil pump gear cover, and then install the oil pump gear cover and new gasket. Tighten the screws securely.
8. After assembly, check the gears for free movement.

9. After the assembly is complete, connect the oil pump inlet pipe No. 1 to the oil pump inlet elbow, and submerge the oil pump inlet pipe No. 1 into a container filled with a clean engine oil, then rotate the oil pump idler gear No. 1, and check if the oil flows out from the outlet port.

Installation

Follow the removal procedures in the reverse order.

1. The "O" ring should be replaced when installing the oil pump onto the cylinder block.
2. When connecting the oil pump inlet and the outlet pipes to the oil pump and the oil pan, apply the liquid sealer onto the threads of the elbows and union to prevent oil leak.
3. After installation, operate the engine, and check the oil pressure and for oil leaks.
4. If necessary, adjust the carburetors.  
For detail adjustment, refer to Adjustment & Installation in FUEL SYSTEM.

## OIL REGULATOR

Removal

1. Remove the oil filter with the Oil Cleaner Band Wrench 09228-41010.
2. Disconnect the oil cooler flexible hose No. 2, and the oil pump outlet pipe No. 2 from the oil regulator.
3. Remove the oil regulator from the cylinder block.

Inspection

1. Loosen the oil regulator valve plug, and pull out the spring, and the oil regulator valve.

## 5-8 LUBRICATING SYSTEM - Oil Regulator, Oil Filter, Oil Cooler

2. Check the oil regulator valve for fitness, and inspect the oil passage, spring, and the sliding surfaces for wear or damage. If defective, replace the valve on the spring.
3. After assembly, check the oil regulator valve for smooth operation.

### Installation

Follow the removal procedures in the reverse order.

### OIL FILTER

#### Removal & Installation

1. To remove the oil filter, use the Oil Cleaner Band Wrench 09228-41010.

### OIL COOLER

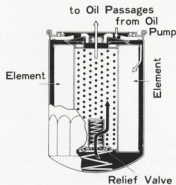


Fig.5-15 Cross Sectional X4098 of Oil Filter View

2. For installation, tighten firmly with the hand. Never use the Oil Cleaner Band Wrench 09228-41010 to tighten.

Oil Cooler Flexible Hose NO.2

Oil Regulator

Oil Cooler

Oil Cooler Flexible Hose NO.1

Fig.5-16 Oil Cooler & Flexible Hoses

Y5043

Removal

1. Remove the radiator lower shroud.
2. Remove the radiator lower grille.
3. Drain the engine lubricant.
4. Disconnect the oil cooler flexible hoses No.1, and No.2 from the oil cooler.
5. Remove the oil cooler securing bolts, and withdraw the oil cooler.

Inspection

1. Check the oil cooler for leaks from the core, and the union/s.  
Repair if necessary.
2. Check the oil cooler core fins for being clogged in the air passages.
3. If the claggage of the oil cooler core is more than 20 percent of the oil cooler area, replace the oil cooler.

Installation

Follow the removal procedures in the reverse order.

\* \* \* \* \*