



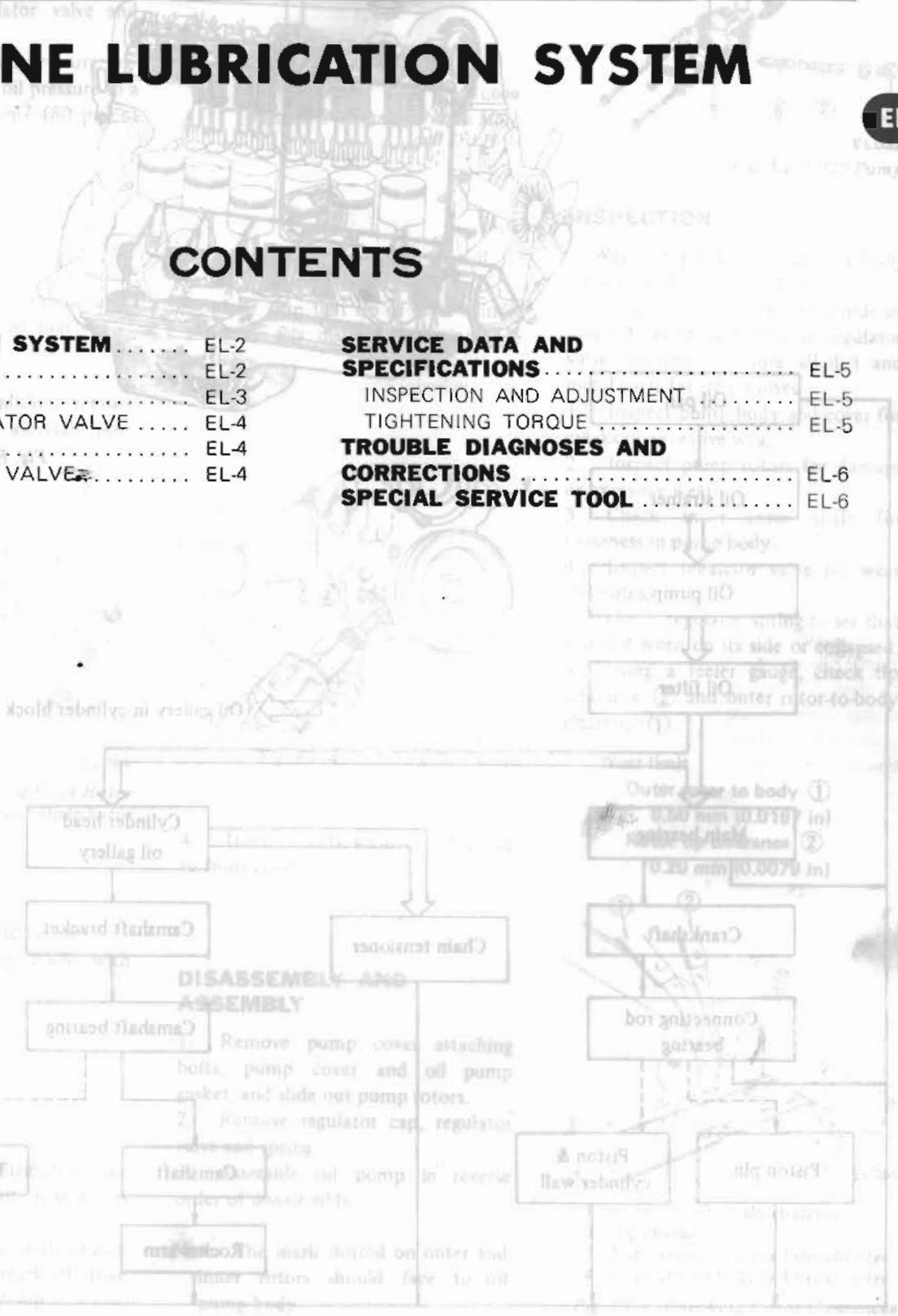
# SECTION EL

## ENGINE LUBRICATION SYSTEM

EL

### CONTENTS

<b>ENGINE LUBRICATION SYSTEM</b> .....	EL-2	<b>SERVICE DATA AND SPECIFICATIONS</b> .....	EL-5
LUBRICATION CIRCUIT .....	EL-2	INSPECTION AND ADJUSTMENT .....	EL-5
OIL PUMP .....	EL-3	TIGHTENING TORQUE .....	EL-5
OIL PRESSURE REGULATOR VALVE .....	EL-4	<b>TROUBLE DIAGNOSES AND CORRECTIONS</b> .....	EL-6
OIL FILTER .....	EL-4	<b>SPECIAL SERVICE TOOL</b> .....	EL-6
OIL PRESSURE RELIEF VALVE .....	EL-4		



### INSTALLATION

Timing chain  
1. Timing chain  
2. Timing chain  
3. Timing chain  
4. Timing chain  
5. Timing chain  
6. Timing chain  
7. Timing chain  
8. Timing chain  
9. Timing chain  
10. Timing chain

# ENGINE LUBRICATION SYSTEM

## LUBRICATION CIRCUIT

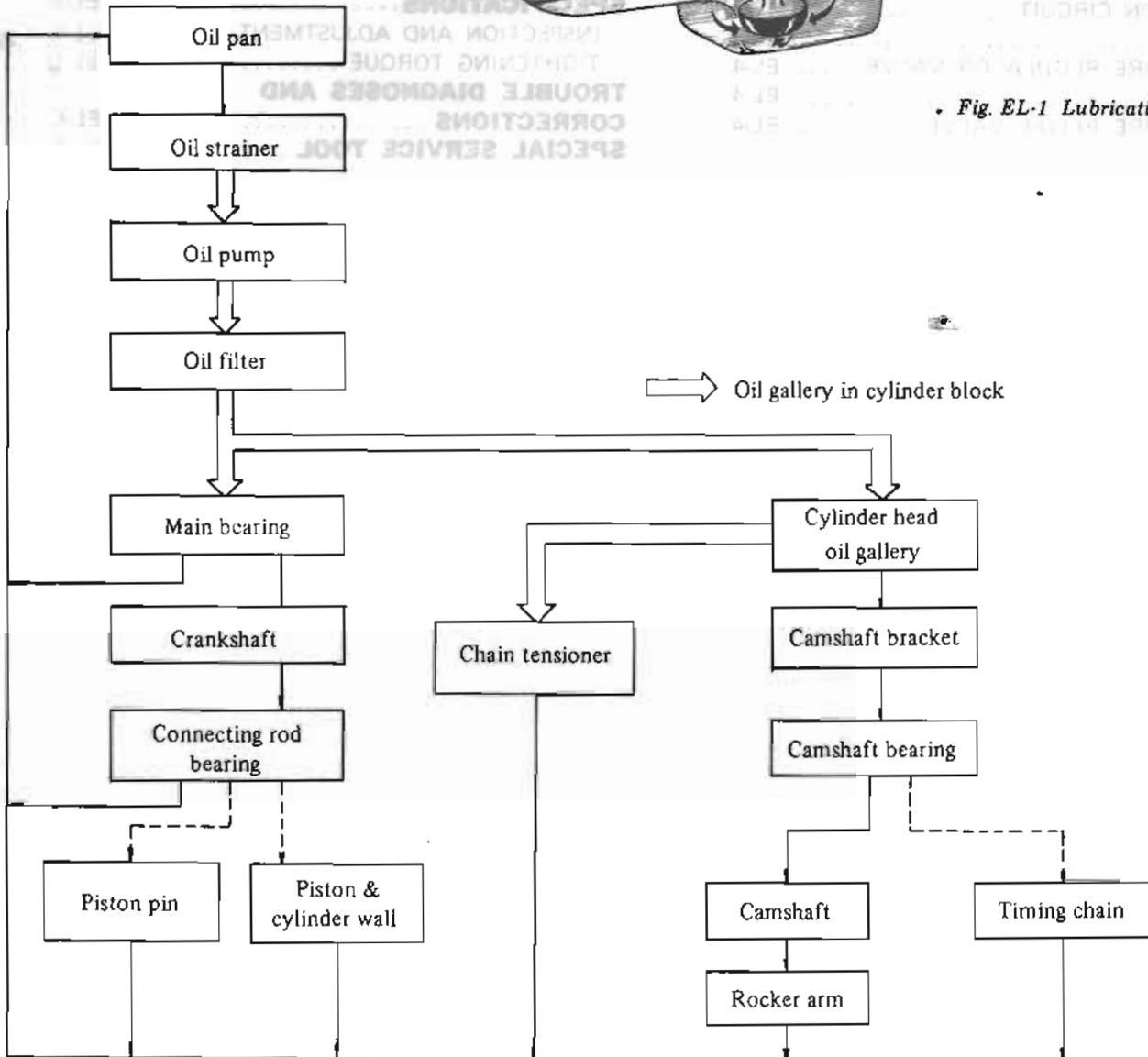
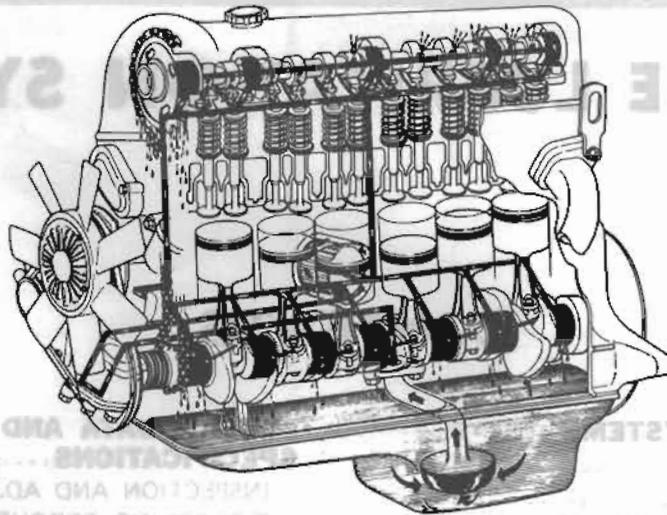


Fig. EL-1 Lubricating Circuit

EL072

## OIL PUMP

The oil pump is secured on the bottom of the front cover with bolts and driven by the oil pump drive spindle assembly which is driven by the helical gear on the crankshaft.

The oil pump assembly consists of an oil pressure regulator valve and outer and inner rotors.

The spring-loaded oil pressure regulator valve limits the oil pressure to a maximum of 5.6 kg/cm<sup>2</sup> (80 psi) at 3,000 rpm.

## REMOVAL

1. Before removing oil pump in engine, turn crankshaft so that No. 1 piston is at T.D.C.

**Note:** Under this condition, remove distributor cap and ascertain position of head rotor.

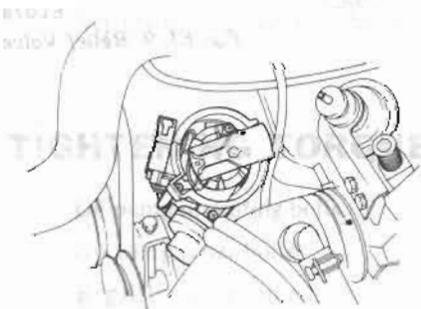


Fig. EL-2 Setting Head Rotor Position at Distributor

2. Remove splash shield board.
3. Remove oil pump body with drive spindle assembly.

## INSTALLATION

1. Make sure that distributor head rotor is in the same position as it was before removal.
2. Fill pump housing with engine oil, then align punch mark of drive spindle with hole in oil pump.

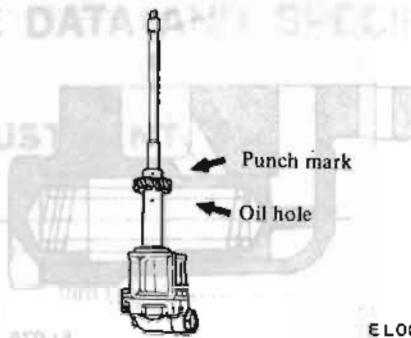


Fig. EL-3 Aligning Punch Mark and Oil Hole

3. Using a new gasket, install oil pump and drive spindle assembly.

Make sure that tip of drive spindle assembly fits distributor fitting hole securely.

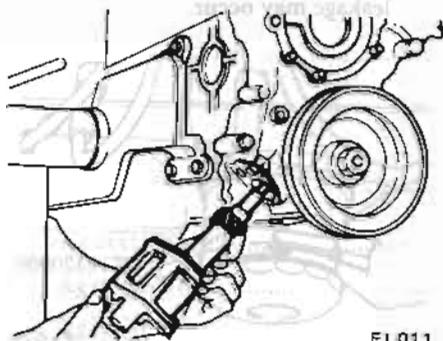


Fig. EL-4 Installing Oil Pump

4. Tighten bolts securing oil pump to front cover.

## DISASSEMBLY AND ASSEMBLY

1. Remove pump cover attaching bolts, pump cover and oil pump gasket, and slide out pump rotors.
2. Remove regulator cap, regulator valve and spring.
3. Assemble oil pump in reverse order of disassembly.

**Note:** The mark dotted on outer and inner rotors should face to oil pump body.

- |                         |                    |
|-------------------------|--------------------|
| 1 Oil pump body         | 6 Regulator valve  |
| 2 Outer rotor           | 7 Regulator spring |
| 3 Inner rotor and shaft | 8 Regulator cap    |
| 4 Gasket                |                    |
| 5 Oil pump cover        |                    |

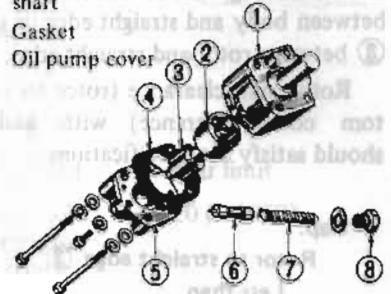


Fig. EL-5 Oil Pump

## INSPECTION

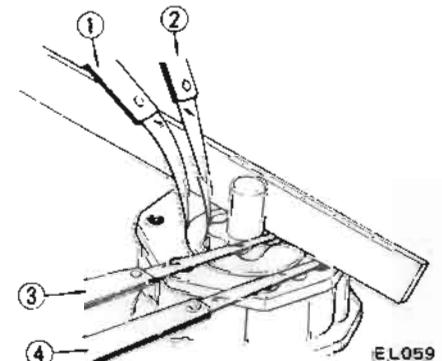
Wash all parts in cleaning solvent and dry with compressed air.

Use a brush to clean the inside of pump housing and pressure regulator valve chamber. Be sure all dirt and metal particles are removed.

1. Inspect pump body and cover for cracks or excessive wear.
2. Inspect pump rotors for damage or excessive wear.
3. Check inner rotor shaft for looseness in pump body.
4. Inspect regulator valve for wear or scoring.
5. Check regulator spring to see that it is not worn on its side or collapsed.
6. Using a feeler gauge, check tip clearance ② and outer rotor-to-body clearance ①.

### Wear limit

- |                       |                     |
|-----------------------|---------------------|
| Outer rotor to body ① | 0.50 mm (0.0197 in) |
| Rotor tip clearance ② | 0.20 mm (0.0079 in) |



- 1 Outer rotor to body clearance
- 2 Tip clearance
- 3 Gap between rotor and straight edge
- 4 Gap between body and straight edge

Fig. EL-6 Checking Rotor Clearances

7. Place a straight edge across the face of pump and depress it slightly as shown in Fig. EL-6. Check gap ④ between body and straight edge or gap ③ between rotor and straight edge.

Rotor side clearance (rotor to bottom cover clearance) with gasket should satisfy the specifications.

**Gap:**

Rotor to straight edge ③

Less than  
0.06 mm (0.0024 in)

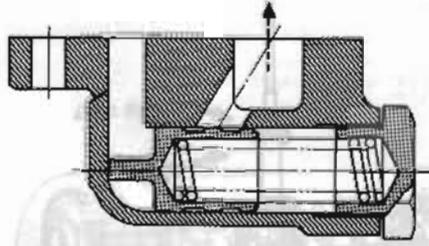
Oil pump body to straight edge ④

Less than  
0.03 mm (0.0012 in)

**Note:** Pump rotors and body are not serviced separately. If pump rotors or body are damaged or worn, replacement of the entire oil pump assembly is necessary.

## OIL PRESSURE REGULATOR VALVE

The oil pressure regulator valve is not adjustable. At the released position, the valve permits the oil to by-pass through the passage in the pump cover to the inlet side of the pump. Check regulator valve spring to ensure that spring tension is correct.



EL076

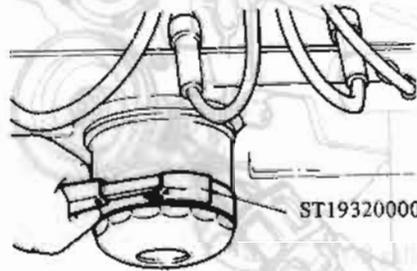
Fig. EL-7 Regulator Valve

## OIL FILTER

The oil filter is a cartridge type. The oil filter element should be replaced periodically, with the use of Oil Filter Wrench ST19320000.

When installing an oil filter, fasten it to cylinder block by hand.

**Note:** Do not overtighten filter, or oil leakage may occur.



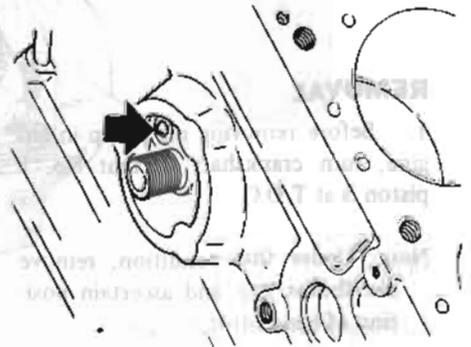
EL016

Fig. EL-8 Removing Oil Filter

## OIL PRESSURE RELIEF VALVE

The relief valve located at the center portion securing oil filter in the cylinder block by-passes the oil into the main gallery when the oil filter element is excessively clogged.

With oil filter removed, check valve unit for operation. Inspect for a cracked or broken valve. If replacement is necessary, remove valve by prying it out with a screwdriver. Install a new valve in place by tapping it.



EL078

Fig. EL-9 Relief Valve

**SERVICE DATA AND SPECIFICATIONS**

**INSPECTION AND ADJUSTMENT**

**OIL PUMP**

		Standard	Wear limit
Rotor side clearance (rotor to bottom cover)	mm (in) .....	0.04 to 0.08 (0.0016 to 0.0031)	0.20 (0.0079)
Rotor tip clearance	mm (in) .....	Less than 0.12 (0.0047)	0.20 (0.0079)
Outer rotor to body clearance	mm (in) .....	0.15 to 0.21 (0.0059 to 0.0083)	0.50 (0.0197)

**OIL PRESSURE REGULATOR VALVE**

Regulator valve spring:		
Free length	mm (in) .....	52.5 (2.067)
Installed length/load	mm/kg (in/lb) .....	34.8/7.9 to 8.7 (1.370/17.4 to 19.2)
Regulator valve opening pressure	kg/cm <sup>2</sup> (psi)/rpm .....	3.5 to 4.2 (50 to 60)/3,000

**TIGHTENING TORQUE**

Oil pump mounting bolts	kg-m (ft-lb) .....	1.1 to 1.5 (8 to 11)
Oil pump cover bolts	kg-m (ft-lb) .....	0.7 to 1.0 (5.1 to 7.2)
Regulator valve cap nut	kg-m (ft-lb) .....	4 to 5 (29 to 36)

**SPECIAL SERVICE TOOL**

Tool number & description	Reference page & Fig. No.	Kent-Moore part
Oil filter wrench	Fig. 11-8	U-2204



## TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Oil leakage	Damaged or cracked body cover. Oil leakage from gasket. Oil leakage from regulator valve. Oil leakage from blind plug.	Replace. Replace. Tighten or replace. Replace.
Decreased oil pressure	Leak of oil in engine oil pan. Dirty oil strainer. Damaged or worn pump rotors. Malfunctioning regulator. Use of poor quality engine oil.	Correct. Clean or replace. Replace. Replace. Replace.
Warning light remains "on" - engine running	Decreased oil pressure. Oil pressure switch unserviceable. Electrical fault.	Previously mentioned. Replace. Check circuit.
Noise	Excessive backlash in pump rotors.	Replace.

## SPECIAL SERVICE TOOL

Tool number & tool name	Kent-Moore No.	Tool number & tool name	Kent-Moore No.
	Reference page or Fig. No.		Reference page or Fig. No.
ST19320000 Oil filter wrench	J 25664 Fig. EL-8		

