

SERVICE MANUAL

**MODEL
A10 & A12
ENGINE**



SECTION EL

ENGINE LUBRICATION SYSTEM

EL

ENGINE LUBRICATION SYSTEM	EL- 2
SERVICE DATA AND SPECIFICATIONS	EL- 5
TROUBLE DIAGNOSES AND CORRECTIONS	EL- 5
SPECIAL SERVICE TOOLS	EL- 6

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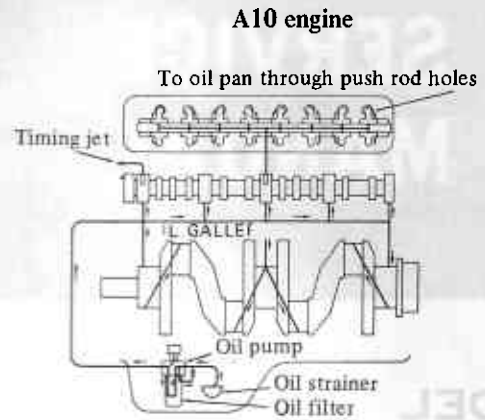
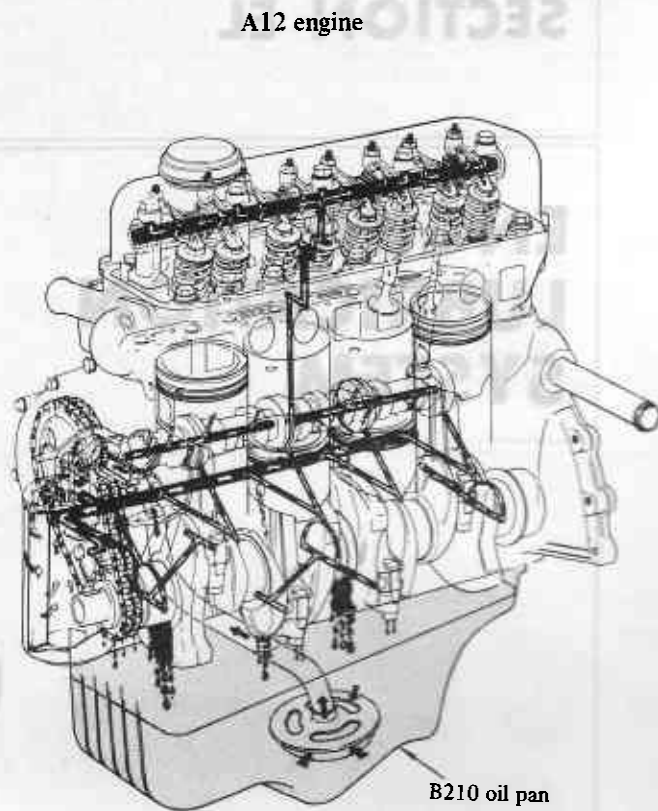


Fig. EL-1 Lubrication system

ENGINE LUBRICATION SYSTEM

CONTENTS

DESCRIPTION	EL-2	INSPECTION	EL-3
LUBRICATION CIRCUIT	EL-3	OIL PRESSURE REGULATOR VALVE	EL-4
OIL PUMP	EL-3	OIL PRESSURE RELIEF VALVE	EL-4
DESCRIPTION	EL-3	OIL FILTER	EL-4
REMOVAL	EL-3	REMOVAL	EL-4
INSTALLATION	EL-3	INSTALLATION	EL-4
DISASSEMBLY AND ASSEMBLY	EL-3	OIL PRESSURE WARNING SWITCH	EL-4

DESCRIPTION

The lubricating system is of a pres-

sure-feed type and consists of highly efficient components suited for high

speed running and output.

LUBRICATION CIRCUIT

Oil drawn from the oil pan through the inlet screen and tube to the inlet side of the oil pump is delivered by the oil pump through the outlet portion of the oil pump and the oil gallery to the inlet side of the full flow oil filter and to the main oil gallery.

The main oil gallery supplies oil to the crankshaft main bearings and drilled passages in the crankshaft, and thus, oil is fed directly from the main bearings to the connecting rod bearings.

Oil injected from jet holes on connecting rods lubricates the cylinder walls and piston pins.

The oil distributed from the main gallery enters the chain tensioner, and the pad is held against the chain by oil pressure and spring. The oil also lubricates the timing chain through the jet hole located near the chain.

Furthermore, lubricant is supplied to each camshaft bearing through each crankshaft main bearing and finally to the oil gallery in the rocker shaft through the center camshaft bearing.

The rocker arm and valve are lubricated by the oil through the oil gallery in the rockershaft.

To this oil gallery, lubricant is supplied through the center camshaft bearing as shown in Figure EL-1.

OIL PUMP

DESCRIPTION

The oil pump and filter assembly is bolted to the right side of the cylinder block. The oil pump is driven by a gear on the camshaft.

REMOVAL

1. Place a suitable container under oil pump.
2. Remove three bolts attaching oil pump and filter assembly and withdraw assembly.
3. Separate oil filter from oil pump.

4. Clean off old gasket from mating surfaces.

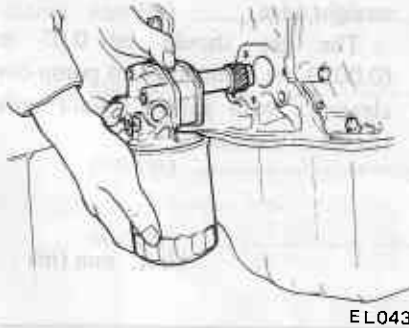


Fig. EL-2 Removing oil pump assembly

- b. Do not pull out drive shaft pin securing drive shaft and inner rotor. Shaft is press fitted to rotor with the pin caulked.

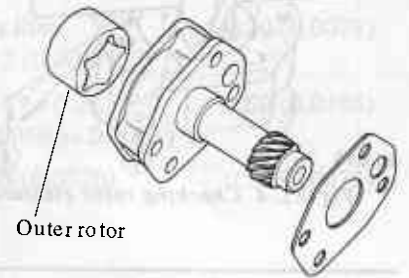


Fig. EL-3 Oil pump

INSTALLATION

1. Install oil filter to oil pump.
2. Locate oil pump and filter assembly or cylinder block, using a spacer and new gasket. Secure with three bolts.

Tightening torque:

0.9 to 1.4 kg-m
(6.5 to 10 ft-lb)

3. Check oil level and add oil if necessary.
4. Start engine and check for oil leaks.
5. Remove the container.

Tightening torque:

Oil pump cover bolt:
0.33 to 0.45 kg-m
(2 to 3 ft-lb)

Regulator valve plug:
4.0 to 5.0 kg-m
(29 to 36 ft-lb)

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 camber.

Be sure all dirt and metal particles are removed.

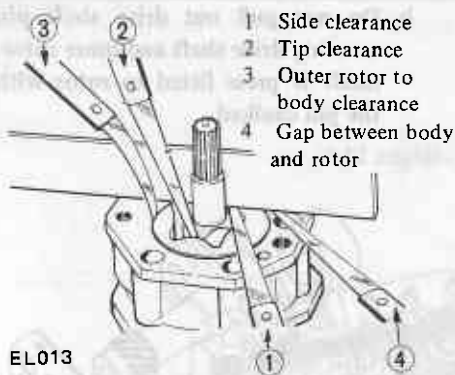
1. Inspect pump body and cover for cracks or excessive wear.
2. Inspect pump rotors for damage or excessive wear.
3. Check inner rotor shaft for looseness in pump body.
4. Inspect regulator valve for wear scoring.
5. Check regulator spring to see that it is not worn on its side or collapsed.
6. Check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

DISASSEMBLY AND ASSEMBLY

1. Remove bolt securing pump cover to pump body. Separate pump cover from pump body.
2. Slide out outer rotor from pump body.
3. Remove oil pressure regulator plug, washer, shim, spring and valve.
4. Assemble oil pump in reverse order of disassembly.

Notes:

- a. When placing oil pump in a vice, use extreme care not to distort pump body and cover in the jaws.



EL013

Fig. EL-4 Checking rotor clearance

8. Place a straight edge across the face of pump as shown in Figure EL-4. Check side clearance (outer to inner rotor) and gap between body and straight edge.

The gap should be 0.05 mm (0.0020 in), then rotor to pump cover clearance with gasket should satisfy the specifications.

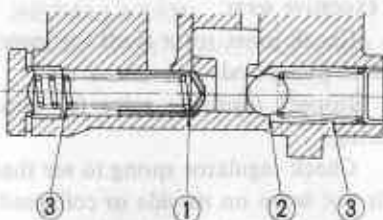
Unit: mm (in)

	Standard	Wear limit
Rotor side clearance (Outer to inner rotor)	0.05 to 0.12 (0.0020 to 0.0047)	0.20 (0.0079)
Rotor tip clearance	Less than 0.12 (0.0047)	0.20 (0.0079)
Outer rotor to body clearance	0.15 to 0.21 (0.0059 to 0.0083)	0.50 (0.0197)
Gap between body and rotor	0.05 (0.0020)	0.20 (0.0079)

Note: The outer and inner rotor are not serviced separately. If the oil pump is damaged or worn, replace the entire oil pump assembly.

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.



- 1 Regulator valve
- 2 Relief valve
- 3 Valve spring

EL045

Fig. EL-5 Regulator and relief valve

OIL PRESSURE RELIEF VALVE

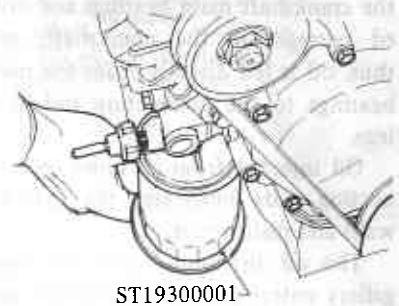
The relief valve, located in the oil pump cover, by-passes the oil into the main oil gallery when the oil filter element is excessively clogged. With regulator valve removed check valve for operation. See Figure EL-5.

OIL FILTER

REMOVAL

Place a suitable container under the filter.

Unscrew filter from oil pump cover flange, using Oil Filter Wrench ST19300001.



EL052

Fig. EL-6 Removing oil filter

INSTALLATION

1. Coat the packing on the new filter with oil. Position the filter on the oil pump cover flange. Hand tighten the filter until the packing contacts the cover flange, then advance it 2/3 turn.

Note: Do not overtighten the filter, or oil leak may occur.

2. Operate the engine at fast idle, and check for oil leaks. Check the oil level and add oil if necessary.

OIL PRESSURE WARNING SWITCH

The oil pressure warning switch is located on the oil pump cover and wired to an instrument cluster. See Figure EL-6.

The warning light glows whenever the oil pressure drops below 0.2 to 0.4 kg/cm² (2.8 to 5.7 psi).

Prior to installing a switch to cover, be sure to apply a conductive sealer to threads of switch.

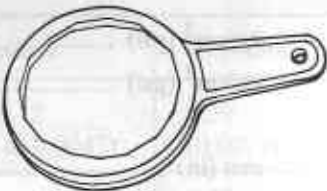
SERVICE DATA AND SPECIFICATIONS

Oil pump		Standard	Wear limit
Rotor side clearance (Outer to inner rotor)	mm (in)	0.05 to 0.12 (0.0020 to 0.0047)	0.20 (0.0078)
Rotor tip clearance	mm (in)	less than 0.12 (0.0047)	0.20 (0.0078)
Outer rotor to body clearance	mm (in)	0.15 to 0.21 (0.0059 to 0.0083)	0.50 (0.0196)
Gap between body and rotor	mm (in)	0.05 (0.0020)	0.20 (0.0078)
Oil pressure regulator valve			
Oil pressure at idling	kg/cm ² (psi)	more than 0.8 (11)	
Oil pressure at 3,000 rpm	kg/cm ² (psi)	3.8 to 5.2 (54 to 74)	
Regulator valve spring:			
Free length	mm (in)	43.49 (1.7122)	
Installed length/load	mm/kg (in/lb)	30.3/3.67 (1.193/8.09)	
Tightening torque			
Oil pump securing bolts	kg-m (ft-lb)	0.9 to 1.4 (6.5 to 10)	
Oil pump cover bolt	kg-m (ft-lb)	0.33 to 0.45 (2 to 3)	
Regulator valve cap nut	kg-m (ft-lb)	4.0 to 5.0 (29 to 36)	

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. Faulty regulator. Used of poor quality engine oil.	Correct. Clean or replace. Replace. Adjust or replace. Replace.
Noise	Excessive backlash in pump rotors.	Replace.

SPECIAL SERVICE TOOL

No.	Tool number & tool name	Description	For use on	Reference page or figure No.
1.	ST19300001 Oil filter wrench	This tool is used to take oil filter out of place. In tightening the filter, do not use this tool, to prevent excess tightening. 	A10 A12	Fig. EL-6

SE339