

1971-72 LAND ROVER 2.25 LITER (DIESEL) 4 CYLINDER

GENERAL SPECIFICATIONS										
Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1971-72	139.5	2286	Inj.	67@4000	105@1800	23-1	3.562	90.47	3.5	88.9

ENGINE IDENTIFICATION

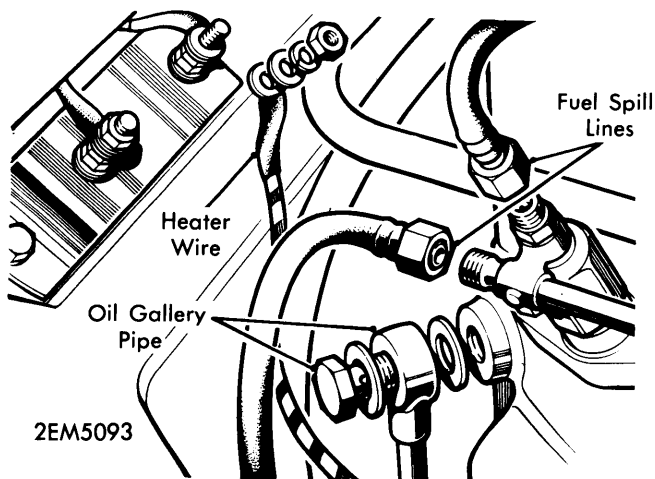
Engine serial number is stamped on left front of engine.

ENGINE REMOVAL

- 1) Remove hood and disconnect battery ground cable. Drain and remove radiator. Remove air cleaner and front floor. Disconnect exhaust pipe at manifold and heater hoses at engine.
- 2) Disconnect starter, alternator, engine ground cables and wire to heater plugs.
- 3) Disconnect fuel line at fuel pump, fuel inlet pipe from distributor pump and fuel spill lines.
- 4) Disconnect leads from oil pressure switch and water temperature transmitter. Disconnect accelerator linkage at fuel distributor pump.
- 5) If brake servo unit is fitted, disconnect vacuum pipe and butterfly control rod from induction manifold.
- 6) Remove nuts from upper rubber engine mounts. Attach suitable lifting sling to engine lifting hooks. Remove bottom nut from left hand rubber engine mount. Tension hoist sufficient to withdraw rubber engine mounts. Lower engine back to original position.
- 7) Remove nuts securing bell housing to flywheel housing. Move clutch slave cylinder aside without disconnecting hydraulic line. Support transmission with a jack or stand.
- 8) Pull engine forward enough to clear bell housing and clutch pinion. Lift engine clear of body and mount on engine stand.

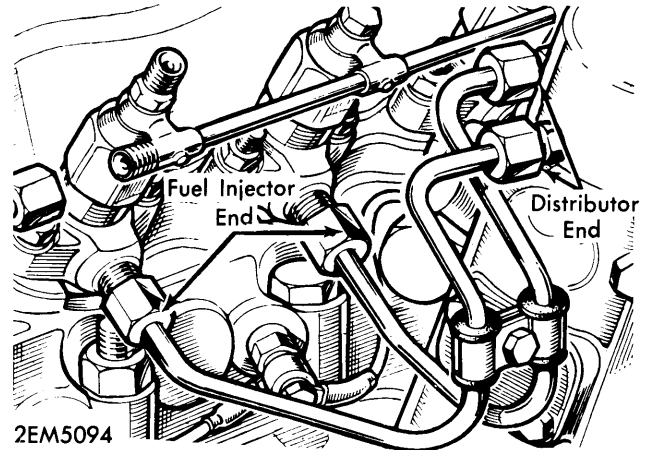
CYLINDER HEAD REMOVAL

- 1) Remove hood, air cleaner and disconnect battery ground cable. Drain cooling system. Disconnect fuel spill pipes at injector end and oil gallery pipe.



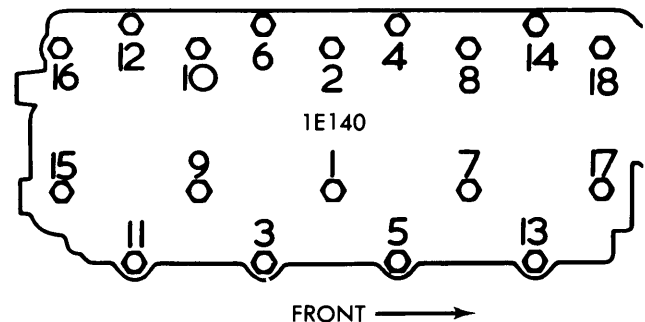
FUEL SPILL PIPES & OIL GALLERY PIPE

- 2) Disconnect lead to heater plugs and lead from water temperature transmitter. Disconnect breather hose from engine top cover.
- 3) If brake servo unit is fitted, disconnect vacuum line and control rod from intake manifold.
- 4) Disconnect the following hoses; heater hoses, hose from thermostat housing and water pump by-pass hose.
- 5) Loosen fuel injector feed pipes at distributor pump and disconnect them from injectors.



FUEL INJECTOR FEED PIPES

- 6) Remove rocker arm cover. Loosen tappet adjusting screws to remove load on rocker arms.
- 7) Remove rocker shaft support bolts. Do not remove rocker arm assembly at this point. Invert rocker arm cover and slide over studs. Secure rocker arm assembly to cover. Lift off rocker arm assembly and cover as a unit. Remove pushrods and retain them in order for reassembly.
- 8) Remove remaining head bolts and lift off head.



CYLINDER HEAD TIGHTENING SEQUENCE

NOTE — When reinstalling cylinder head, thinly coat both sides of head gasket with Hylomar PL32/M jointing compound or equivalent. Position gasket with the lettering "DIESEL" upward.

Rover Engines

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VALVES							
Engine & Valve	Head Diam.	Face Angle	Seat Angle	Seat Width	Stem Diameter	Stem Clearance	Valve Lift
2.25 Liter Int. Exh.	1.542-1.546"	45°	45°	.....	.3107-.3112"	.0013-.0019"	.388"
	1.312-1.316"	45°	45°	.....	.3410-.3415"	.0023-.0029"	.404"

VALVE ARRANGEMENT

E-I-I-E-E-I-I-E (front to rear).

VALVE GUIDES

If guides are worn, drive out of cylinder head. Lubricate new guide and drive into head using a suitable drift. Valve seats should be refaced whenever new valve guides are installed.

VALVE STEM OIL SEALS

Fit valve stem seals to valve guide with larger diameter toward valve guide. Stem seal with external projections is fitted to exhaust valve guide.

Reassembly – 1) Install an intermediate rocker bracket with locating screw through larger hole in shaft. Place remaining components on shaft (see illustration).

2) Replace rocker arm assembly on cylinder head. Torque bolts to specifications.

VALVE LIFTER SERVICE

Removal – 1) With cylinder head removed, remove tappet guide locating bolts from right side of cylinder block.

CAUTION – Do not remove tappet guides before rollers are withdrawn or rollers will fall into crankcase.

2) Using long nose pliers or wire, remove tappet slides. Keep slides and all tappet parts in order for reassembly.

VALVE SPRINGS			
Engine	Free Length	PRESSURE (LBS.)	
		Valve Closed	Valve Open
2.25 Liter Inner Outer	1.680"	17.7@1.462"	.....
	1.822"	46.0@1.587"	.....

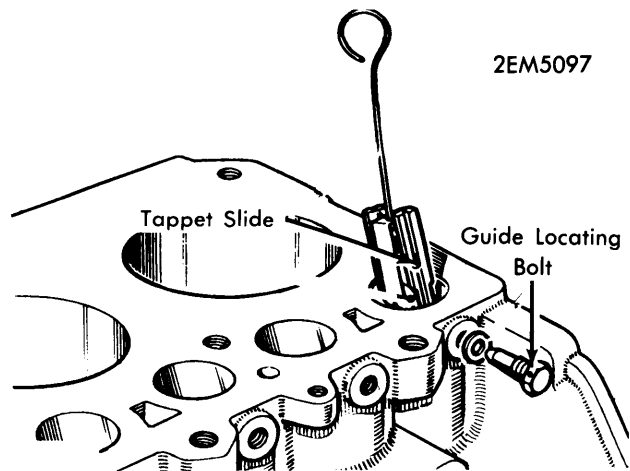
ROCKER ARM ASSEMBLY OVERHAUL

Disassembly – 1) With rocker arm cover removed, loosen tappet adjusting screws to remove load on rocker shaft.

2) Remove rocker shaft support bolts and lift off rocker arm assembly.

3) Remove locating screw and washer from intermediate rocker bracket. Withdraw all components from rocker shaft.

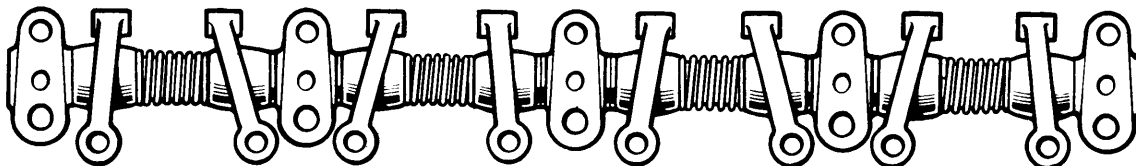
4) Inspect all components for wear. New bushings may be installed in rocker arms. Press out old bushing and press in new bushings making sure oil holes are properly aligned. Ream bushings to .530-.531". Shaft-to-rocker arm clearance is .0005-.0025".



TAPPET SLIDE REMOVAL

3) Withdraw rollers from guides.

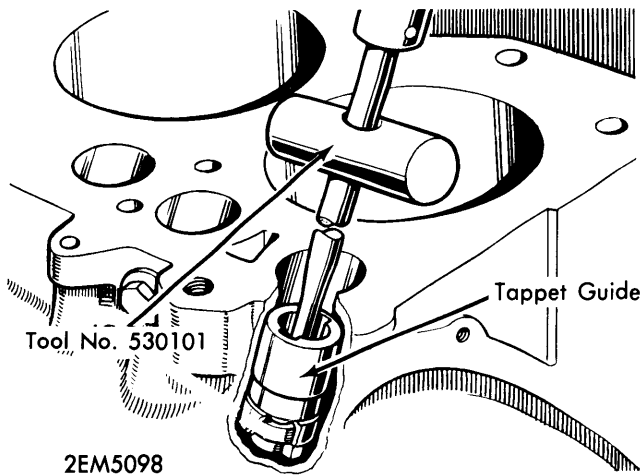
4) Withdraw tappet guides. If guides are difficult to remove use Tool No. 530101 for removal.



2EM5201

ROCKER ARM ASSEMBLY

1971-72 LAND ROVER 2.25 LITER (DIESEL) 4 CYLINDER (Cont.)



TAPPET GUIDE REMOVAL

Installation – 1) Fit tappet guides in block in proper order, aligning locating holes. Screw in locating bolts enough to hold guides in position.

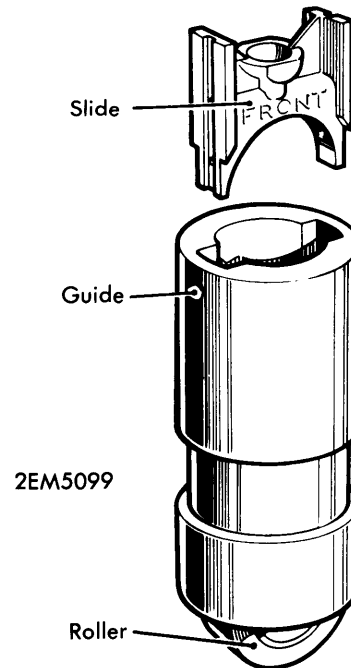
- 2) Insert rollers with larger chamfer facing forward.
- 3) Insert tappet slides with marking "FRONT" toward front of engine.
- 4) Tighten tappet guide locating bolts and lock wire in pairs.

VALVE CLEARANCE ADJUSTMENT

Valve clearance is .010" intake and exhaust. To check clearances, turn crankshaft until valves in first column are fully

open, then valves in second column may be checked and adjusted.

Valves Open	Valves to Adjust
1.....	8
3.....	6
5.....	4
2.....	7
8.....	1
6.....	3
4.....	5
7.....	2



ROLLER TAPPET ASSEMBLY

PISTONS, PINS, RINGS						
Engine	PISTONS	PINS		RINGS		
	Clearance	Piston Fit	Rod Fit	Rings	End Gap	Side Clearance
2.25 Liter	.0044-.0053"	Push Fit By Hand	.0001-.0008"	No. 1	.014-.019"	.0025-.0045"
				No.2 & 3 Oil	.010-.015" .015-.045"	.0015-.0025" .0015-.0025"

OIL PAN REMOVAL

Drain oil, remove oil pan bolts and oil pan. Upon reinstallation use new gasket, position oil pan and reinstall bolts.

PISTON & ROD INSTALLATION

Fit piston to connecting rod using new circlips. Fit rod to crankshaft with rod number matching correct rod journal. Torque rod caps to specifications and check endplay.

PISTON PIN REPLACEMENT

Remove piston circlips, push out piston pin. If rod small end bushing is worn, replace. Press in new bushing and ream to

size, making sure oil holes are properly aligned. Pin must not fall through piston, it is a push fit by hand. To check clearances (see specifications).

FITTING PISTONS

Measure pistons at bottom of skirt at 90° to piston pin bore. Measure cylinder bore approximately half way down. If a new standard size piston is fitted, make sure grade letters on block and piston are the same. Grade letters ZAB is nominal to plus .0006" and BCD is .0004 to .001" above nominal. If cylinder wear or taper exceeds specifications, fit oversize pistons. Oversize pistons are not graded and come in .010", .020", .030" and .040" oversizes.

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CRANKSHAFT MAIN & CONNECTING ROD BEARINGS							
Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam.	Clearance	Thrust Bearing	Crankshaft Endplay	Journal Diam.	Clearance	Sideplay
2.25 Liter	2.4995-2.5000"	.0008-.0017"	Center	.002-.006"	2.312-2.3127"	.0007-.0025"	.007-.012"

REPLACEMENT BEARINGS

CAUTION — Do not grind crankshaft or use undersize bearings. If standard replacement bearings will not meet specifications, replace crankshaft.

CONNECTING RODS

1) Check connecting rod alignment. Assemble cap to rod leaving out bearing halves. Torque rod nuts to 25 ft. lbs. Loosen one nut and check joint to see that there is no clearance between joint faces. If clearance exists rod must be replaced.

2) Remove rod cap and place new bearings in rod. Fit cap and torque rod nuts to 25 ft. lbs. Loosen one nut, using a .004-.008" feeler gauge, insert between rod and cap. The bearing crush may be adjusted by using slightly varying thickness of bearings to achieve proper gap.

3) Make a final check to prove bearing clearance, using a .0025" shim paper. With shim paper inserted between rod half and journal, rod should resist rotation and turn freely by hand when shim paper is removed.

4) Rods may also be checked using the Plastigage method to determine clearance.

MAIN BEARINGS

1) Fit main bearing caps, less bearing halves. Torque bolts to 100 ft. lbs. Loosen one bolt and check gap between cap and block. If any gap is present cylinder block must be replaced.

2) Remove main bearing caps, place inserts in block and caps. Torque cap bolts to 100 ft. lbs. Loosen one bolt and check gap between block and cap. It should be .004-.006". Gap may be adjusted by using slightly varying thickness of bearing inserts.

3) Make final check of main bearing clearance by inserting a .0025" shim paper between one half of bearing and crankshaft. Torque cap bolts to specifications. Crankshaft should resist rotation and with shim paper removed should be free to turn by hand. This procedure is done one bearing at a time.

4) Main bearings may also be checked using the Plastigage method to determine clearance.

THRUST BEARING ALIGNMENT

1) Place crankshaft in position in crankcase. Mount a dial indicator to read off end of crankshaft.

2) Check crankshaft endplay. If endplay is not to specifications select thrust washers of proper thickness.

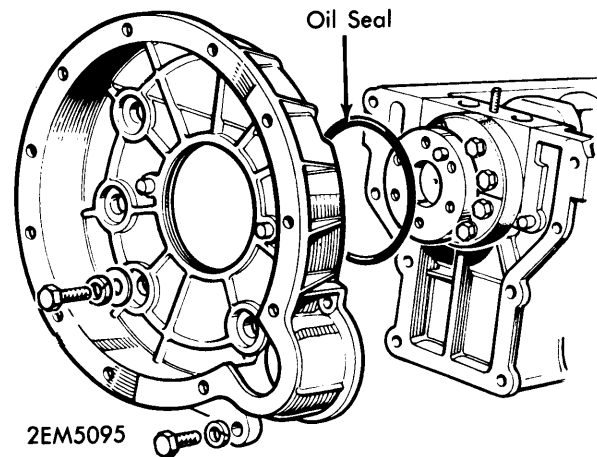
3) Place thrust washers with plated side toward crankshaft. Right and left thrust washers must be within .003" of the same thickness to maintain crankshaft centering in block. Thrust washers are available in .0025", .005", .0075" and .010" oversizes.

REAR MAIN BEARING OIL SEAL

Removal — 1) Remove hood, front floor, seat base and transmission. Place a block between flywheel housing and chassis crossmember.

2) Remove starter, oil pan, clutch assembly and flywheel.

3) Attach a lifting sling to engine, apply sufficient tension to support weight of engine. Remove block placed between flywheel housing and crossmember during transmission removal. Remove flywheel housing and oil seal.

**FLYWHEEL HOUSING SEAL**

4) Remove rear main bearing cap, upper and lower oil seal retainers and rear main bearing oil seal.

Installation — 1) Assemble seal retainer spring on crankshaft by engaging hook and eye. **CAUTION** — Do not stretch spring. Apply silicone grease to oil seal journal and ends of oil seal.

2) Open seal ends just enough to slide over crankshaft. Install seal with spring groove towards flange (see illustration). Work spring into groove with hook and eye at right angles to oil seal ends.

3) Rotate seal until seal ends are facing toward cylinder head. Apply suitable sealer to seal retainer halves.

4) Attach upper seal retainer half, leaving the two end bolts finger tight. Attach lower seal retainer half to main bearing cap in the same manner as upper retainer half.

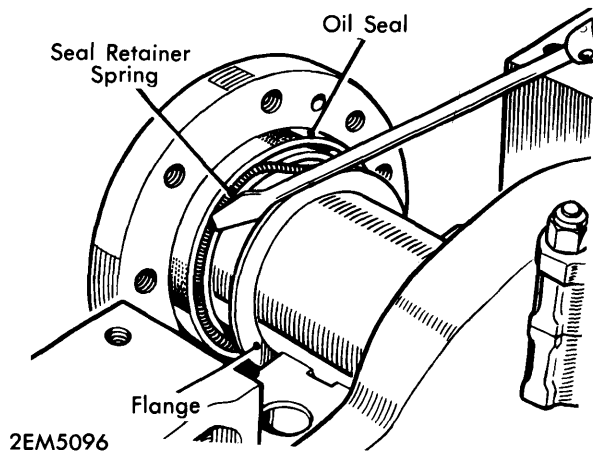
5) Using silicone grease, fit "T" seals to main bearing cap. Trim top edges of "T" seals to prevent them from fouling block when being fitted.

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6) Fit seal guides to crankcase. Install main bearing cap and "T" seals to crankcase. Leaving .030" clearance between cap and crankcase, check to see that all seals are properly positioned.

7) Torque main bearing cap to 100 ft. lbs. Fully tighten all bolts of seal retainers. **NOTE** — Turn bolt heads so they will clear flywheel housing seal.

8) Trim ends of "T" seals to leave .030" protruding from bearing cap.



REAR MAIN BEARING OIL SEAL

ENGINE FRONT COVER

Removal — Remove hood, radiator, fan belt, starter dog and crankshaft pulley. Disconnect by-pass hose from thermostat housing. Remove front cover nuts and bolts and remove cover. Drive oil seal from front cover.

Installation — Coat outside diameter of oil seal with suitable sealing compound and press into front cover. Smear grease on both sides of cover gasket and reinstall front cover.

CAMSHAFT SPROCKET REPLACEMENT

1) With front cover removed, remove chain tensioner and timing chain.

2) Remove camshaft bolt, lock and washer. Using a suitable puller, pull off camshaft sprocket.

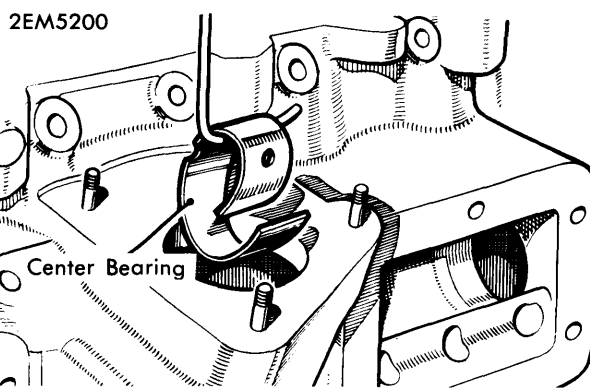
3) Reinstall camshaft sprocket. See *Valve Timing*. After sprocket is correctly on camshaft, replace washer, lock and bolt.

CAMSHAFT & BEARING REPLACEMENT

Removal — 1) With camshaft sprocket removed, remove thrust plate from camshaft. Extract camshaft using Tool No. 530101. **NOTE** — Before camshaft bearings may be removed, engine must be removed and completely disassembled.

2) Drift out front and rear bearings and remove through side cover openings.

3) Drift out two center bearings into distributor drive chamber. Collapse bearings and remove from block (see illustration).



CAMSHAFT BEARING REMOVAL

Installation — 1) Position cylinder block vertical with rear face down. Place one of bearings with single oil hole over number two bearing bore. Using suitable tools press bearing into block. Make sure oil holes are properly aligned.

2) Install front bearing, which has two oil holes. The small oil hole aligns with vertical hole in block. Press bearing into block until bearing is just below front face of cylinder block. **NOTE** — Make sure bearing is pressed in far enough so it cannot interfere with thrust plate.

3) Turn block over and install two rear bearings in a like manner.

4) Place guide plug No. 274394 in front camshaft bearing. Use two thrust plate retaining bolts to secure plug.

5) Insert reamer No. 274389 from rear of block into guide plug in front bearing.

6) Locate guide collar immediately in front of reamer cutter into rearmost bearing, tighten screws retaining guide plug.

7) Ream two center and rear bearings. Remove guide plug and ream front bearing. **NOTE** — No lubricant is used during reaming, best results are achieved when bearings are cut dry. Use compressed air to blow chips out of way while reaming.

8) Remove reamer handle and bolt. Remove reamer by turning in cutting direction.

9) Remove plugs from ends of oil gallery passages. Using compressed air blow all chips out of oil passages and reinsert plugs.

10) Screw plugs into rear of block, using new washers and sealing compound.

11) Reinstall camshaft and thrust plate. Place camshaft sprocket on shaft without using lock. Attach a dial indicator to cylinder block so endplay of camshaft may be checked (see illustration). If endplay is excessive replace thrust plate.

12) Reset valve timing and reassemble engine.

VALVE TIMING				
Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
2.25 Liter	16°	42°	51°	13°

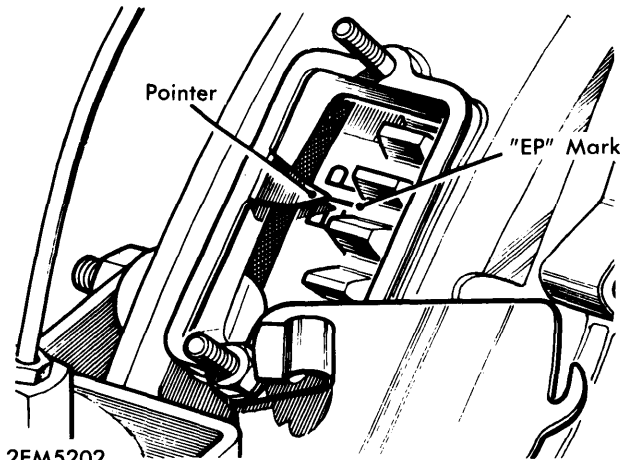
1971-72 LAND ROVER 2.25 LITER (DIESEL) 4 CYLINDER (Cont.)

TIMING CHAIN REPLACEMENT

Remove chain tensioner and lift off chain. Fit new chain and see that there is no slack on drive side of chain. See *Valve Timing for adjustment procedure*. Reinstall chain tensioner.

VALVE TIMING

1) Turn crankshaft in direction of rotation until "EP" mark on flywheel is aligned with timing pointer.

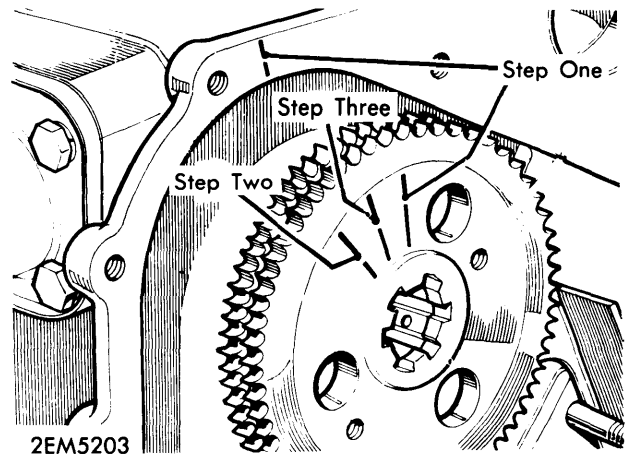
**FLYWHEEL TIMING MARK**

2) Fit camshaft sprocket to any keyway. Remove rocker arm cover.

3) Turn camshaft until No. 1 cylinder exhaust valve is fully closed and set tappet to .010".

4) Mount a dial indicator so fully open position of valve may be determined.

5) Rotate camshaft until valve approaches fully opened position, mark block and sprocket at this location. Observe dial indicator reading, rotate camshaft in reverse direction until the same dial reading is reached. Mark this position by splitting the distance between the two marks.

**VALVE TIMING MARKS**

6) Rotate camshaft until mark (midway between two marks in above procedure), is lined up with mark on block.

7) Install timing chain so there is not any slack on driving side of chain. If there is slack in chain, slide camshaft sprocket off without moving camshaft. Try alternate keyways in sprocket until one is found where there is no slack on drive side of chain.

8) Install chain tensioner and tighten camshaft sprocket bolt to specifications. **CAUTION** - When rotating crankshaft without timing chain installed, camshaft may have to be rotated to prevent pistons from interfering with valves.

ENGINE OILING**ENGINE OILING SYSTEM**

Engine lubrication is by a gear type pump. Pump feeds oil to an oil gallery from which oil feeds crankshaft main bearings. Oil from main bearings goes through passages in crankshaft to lubricate connecting rod journals. Oil passages from oil gallery goes to rocker arm shaft, where rocker arms and valve stems are oiled.

Crankcase Capacity - 7.4 qts. (with filter).

Oil Filter Type & Replacement - Paper, replace every 6,000 miles.

Normal Oil Pressure - 45-65 psi.

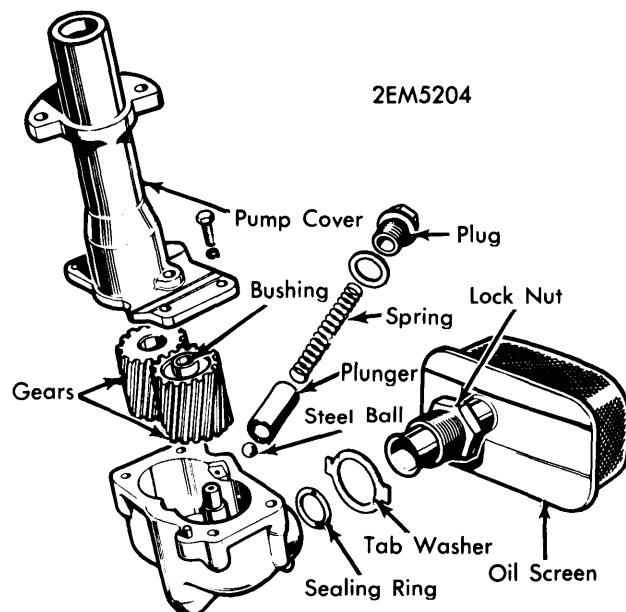
Pressure Regulator Valve - Non-adjustable.

OIL PUMP

Removal - 1) Remove oil pan and two bolts and tab washers securing oil pump. Withdraw oil pump and oil pump drive shaft.

2) Loosen oil screen locknut. Remove oil screen and sealing ring. Remove oil pump cover and pump gears.

3) Remove plug for oil pressure relief valve. Remove spring, plunger and ball.

**OIL PUMP**

