164 6 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
1974 B 30 F	181.8	2980	F.I.	138 @ 5500	154 @ 3500	8.7:1	3.50	88.9	3.15	80

ENGINE IDENTIFICATION

Engine type designation, part number, and manufacturing serial number are located on machined surface on left forward side of cylinder block.

ENGINE REMOVAL

1) Drain coolant, disconnect battery ground cable. Remove gear shift lever on manual transmission vehicle. Remove air cleaner and all electrical contacts to engine, starter, and alternator.

2) Disconnect following parts from inlet duct; pressure sensor hose, distributor vacuum hose, power brake hose, and crankcase ventilation hose from oil trap. Remove throttle cable, automatic transmission starter inhibitor (if equipped), and all fuel line connections to engine.

3) Disconnect fuel injection accessories and remove fuel injectors from engine, fit masking caps and protective plugs to injector openings in engine. On vehicles equipped with automatic transmission, remove all cooling lines and oil filler tube.

4) Remove radiator hoses and heater hoses from engine. Take out radiator, fan shroud, and fan. Lift out water return pipe. Remove power steering pump and place on left wheel housing.

5) Raise engine slightly using suitable engine hoist. Disconnect exhaust system at exhaust header pipe outlet. Remove ground lead for automatic starter inhibitor, or electrical cables for manual transmission overdrive. Remove front engine mount bolts.

6) Remove rear engine crossmember and rear engine attachment. Take out propeller shaft. Disconnect speedometer cable at transmission. On manual transmission vehicle, disconnect clutch linkage, if automatic transmission, remove control rod for selector lever.

7) Carefully lift engine and transmission out of vehicle. Reinstall engine and transmission, and all related parts in reverse of removal procedure.

INLET DUCT

Removal – 1) Disconnect hose for pressure sensor from inlet duct, fuel hose for cold start valve (from distributor line), and fuel hoses from lines on firewall. Remove plug contacts for temperature sensor, cold start valve, and throttle valve switch.

2) Disconnect hose for induction air, remove electric lead for temperature sensor and grounding lead from inlet duct. Remove bolts for pressure regulator bracket. Remove injectors and fit with masking caps, use protective plugs in holes. Remove inlet duct.

Installation – 1) Remove protective plugs and masking caps. Install inlet duct. Place new rubber seals on injectors. Fit injectors and distributor line, install pressure regulator.

2) Connect electric leads for temperature sensor and grounding lead to inlet duct. Clip on plug contacts for temperature sensor, cold start valve, and throttle valve switch. Connect hose for inducted air. Fit fuel hoses and pressure sensor hose.

CYLINDER HEAD

Removal – 1) Remove lower radiator hose and drain cooling system. Disconnect battery lead from battery and cylinder head attachment. Remove air cleaner. From the inlet duct, remove the following: pressure sensor hoses for power brake and crankcase ventilation, and vacuum hose for distributor.

2) Remove contacts for throttle valve switch, cold start valve, thermal timer contact, temperature sensor, and injectors. Remove ignition cable harness. Remove temperature sensor from engine. Detach throttle cable from control shaft. Separate link rod and control bracket from inlet duct.

3) Unscrew flange bolts for exhaust manifold. Remove fuel hoses from distribution pipe. Detach upper radiator hose. Remove alternator adjuster bracket from head. Pull off spark plug wires. Remove heater hose from heat control valve.

4) Remove rocker arm cover and take out rocker arm assembly and withdraw push rods. Unscrew cylinder head bolts and lift off head. Remove head gasket, exhaust flange gaskets, and sealing rings for water pump.

Installation – 1) Position and attach intake and exhaust pipes to cylinder head. Place head gasket on mounting surface, ensuring "TOP" mark is upward. Install new sealing rings for water pump. Insert head installation guide dowels (SVO 2435).

2) Check that oil hole in cylinder head for rocker arm mechanism is not blocked. Place head in position, install bolts, and remove guide dowels. Tighten head bolts in three stages, as indicated in table, and according to illustrated sequence. Adjust valves to .022-.024" (.55-.60 mm).

3) Reverse remainder of removal procedures to complete reassembly of cylinder head, then start engine and run for approximately ten minutes (under load, if possible) while carrying out functional checks of items disconnected. Remove air cleaner and rocker arm covers. Recheck head bolts to ensure they are at final specified torque setting. Check and, if

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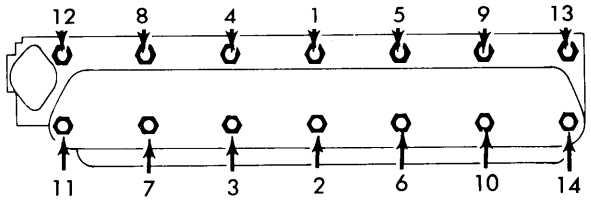
necessary, readjust valve clearance to .020-.022" (.50-.55 mm). Replace rocker arm cover and air cleaner.

Cylinder Head Tightening Specifications

Sequence	Ft. Lbs. (mkg)
Step One	29 (4.0)
Step Two	58 (8.0)
Step Three	65 (9.0)



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CYLINDER HEAD TIGHTENING SEQUENCE

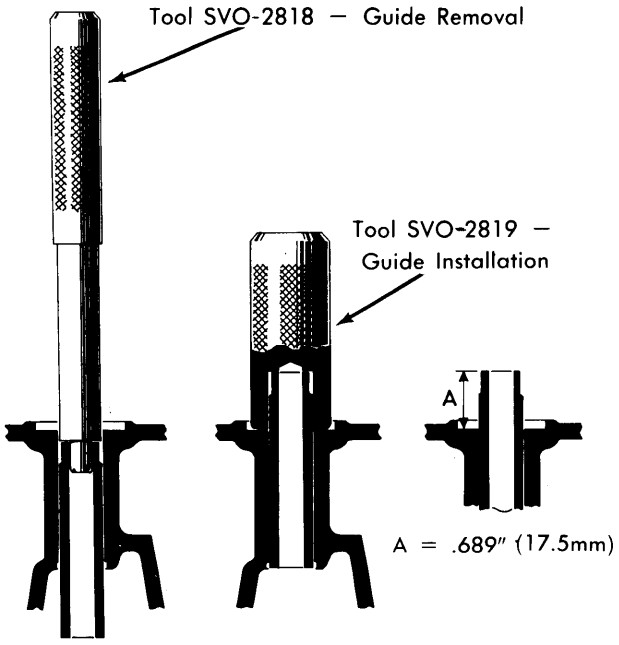
VALVES							
Engine & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
B 30 F							
Intake	1.732 (44)	44.5°	45°	.08 (2)	.3132-.3138 (7.95-7.97)	.0012-.0026 (.030-.067)	.264 (6.7)
Exhaust	1.378 (35)	44.5°	45°	.08 (2)	.3120-.3126 (7.93-7.94)	.0024-.0038 (.060-.097)	.264 (6.7)

VALVE ARRANGEMENT

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

ROCKER ARM ASSEMBLY

Remove all related parts. See *Cylinder Head Removal*. Check rocker arm shaft and push rods for excessive or undue wear, replace where necessary. Rocker arms can be rebushed if wear exceeds .004" (.1 mm). Press out old bushing using a suitable tool (SVO 1867), and install new bushing. Ream bushing to accurate fit on rocker arm shaft. Bushing oil hole should be aligned with oil hole in rocker arm. Grind rocker arm tips, if necessary, to ensure correct angle or surface.



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VALVE GUIDE REPLACEMENT

VALVE GUIDE SERVICING

Removal & Installation – Press out old guides using suitable tool (SVO-2818 or equivalent). Clean guide area thoroughly and press in new guides using drift tool (SVO-2819 or equivalent) which will give correct press-in depth of .689" (17.5 mm). Ensure that guides are free of burrs; check for free movement of valves in guides.

VALVE STEM OIL SEALS

Seals are rubber umbrella (or cup-type) which fit over valve guides. Metal ring secures seal against guide.

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
B 30 F	1.81 (46)	60-70@1.57 (26-32@40)	172-191@1.18 (78-87@30)

VALVE SPRINGS

Removal & Installation – With cylinder head removed, compress valve springs using suitable valve spring compressing tool, remove valve locks. Disassemble valve spring components

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and place valves in order in suitable valve rack. To install, place valve in position, fit valve guide seal, valve spring, retainer and locks.

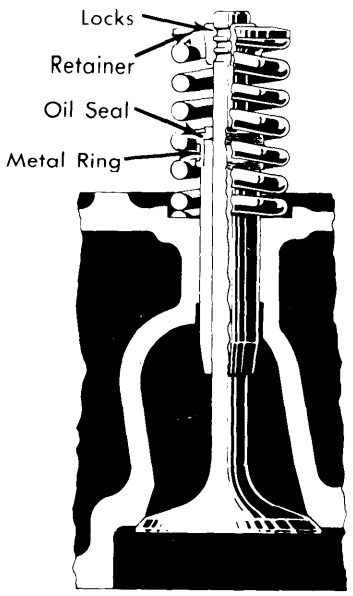
VALVE CLEARANCE ADJUSTMENT

Valve clearance is to be adjusted with engine off. This procedure may be done with engine warm or cold. Valve clearance adjustment setting of .020" (.50 mm) is the same for both intake and exhaust valves. Use two gauges: a "go" gauge of .020" (.50 mm) thickness, and a "no go" gauge of .022" (.55 mm) thickness. Clearance is adjusted so that the "go" gauge can be inserted easily, while the "no go" gauge may not be inserted. Turn crankshaft until No. 1 piston is in firing position and pulley mark is at "0". Adjust valves in order shown:

Valve Adjusting Sequence

Balance ①	Adjust
No. 6	No. 1
No. 2	No. 5
No. 4	No. 3
No. 1	No. 6
No. 5	No. 2
No. 3	No. 4

① — Balance = Intake rocker arm has just closed and exhaust rocker arm just starts to open.



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VALVE & GUIDE ASSEMBLY

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Rings	End Gap In. (mm)	Side Clearance In. (mm)
B 30 F	.0004-.0012 (.01-.03)	Push Fit	Push Fit	All	.016-.022 (.40-.55)	.0016-.0028 (.040-.072)

OIL PAN

Removal & Installation – 1) Using suitable lifting device, raise front of engine. Place jack stands under vehicle front jacking points. Drain crankcase. Remove lower engine mounting nuts. Remove rear bolts of front axle member and replace with two ½-13x9" auxiliary bolts.

2) Remove front bolts from front axle member. Lower and remove jacking device so that front axle member hangs on auxiliary bolts. Remove reinforcing bracket on clutch housing, remove pan bolts and lower pan from engine. To reinstall, reverse removal procedure, replace auxiliary bolts with regular bolts. Reinstall all related parts.

PISTON & ROD ASSEMBLIES

Removal & Installation – 1) Disassemble related parts. *See Oil Pan Removal.* Check to ensure that connecting rods and rod caps are marked correctly to reinstall in original location. Remove carbon ridge from cylinder bores. Remove connecting rods with pistons. Replace connecting rod caps on respective connecting rods.

2) To reinstall, lubricate all internal surfaces with engine oil before assembly. Make sure that notch in piston crown is facing front of engine, connecting rod marking should face away from camshaft side.

3) Use suitable installing ring (SVO-2823 or equivalent) to fit piston and connecting rod assembly into block. Tap lightly on piston dome with wooden handle tool while guiding connecting rod onto crankshaft. Secure and tighten all nuts and bolts. Reassemble in reverse of removal procedure.

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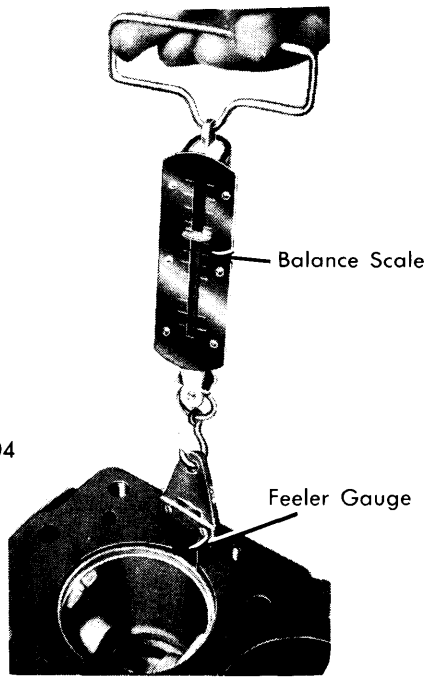


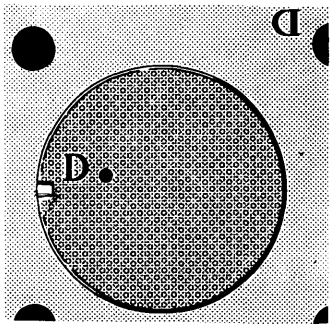
MEASURING PISTON CLEARANCE

FITTING PISTONS

Pistons should be fitted into respective cylinders without rings. Piston is to be inserted dome end down into cylinder. Clearance is measured at right angles to piston pin hole, using a feeler gauge of .002" (.05 mm) thickness attached to a spring balance (see illustration). Force applied should be 2.2 lbs. (1 kg) to give an average value for piston clearance. Test piston at several different depths in cylinder. Standard bore cylinders will be stamped with letter denoting cylinder dimension. Piston in that cylinder should be stamped with the same letter.

PISTON PINS

Piston pins are available in .002" (.05 mm) oversize from standard diameter. If replacement oversize pins are needed, piston pin hole should be reamed out to correct measurement using suitable reaming tool. Use reamer fitted with pilot guide, and take only small cuts at a time. Pin fit is correct when pin can be pushed through connecting rod hole by hand, with only light resistance.



CYLINDER BLOCK & PISTON MARKING

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
B 30 F	2.4981-2.4986 (63.451-63.464)	.0011-.0033 (.028-.083)	...	.0019-.0054 (.047-.137)	2.1255-2.1260 (53.987-54.00)	.0012-.0028 (.029-.071)	.006-.014 (.15-.35)

MAIN & CONNECTING ROD BEARINGS

Removal & Installation – 1) Remove oil pan and related parts. See *Oil Pan Removal*. Identify and mark connecting rod caps and main bearing caps to ensure correct replacement.

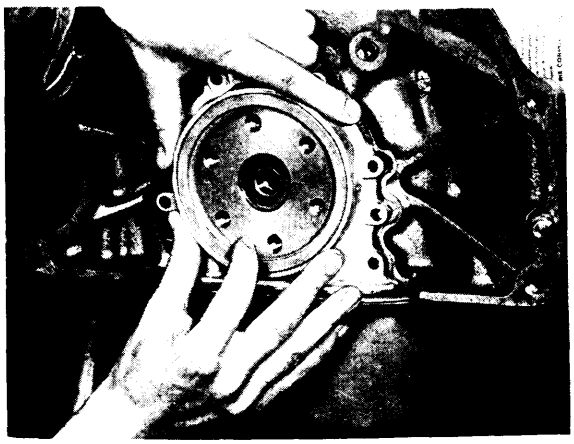
2) Remove connecting rod caps and push pistons to top of cylinders. Remove main bearing caps and thoroughly clean all bearing surfaces.

3) Measure all journals, using a micrometer. Out-of-round on connecting journals should not exceed .003" (.07 mm) and main bearing journals, it should not exceed .002" (.05 mm). If values measured are close to, or in excess of wear limits, crankshaft must be removed and reground to suitable undersize.

4) If all journals check out to standard size, refit with replacement bearings. Reinstall main bearing caps, refit connecting rods to crankshaft and tighten all nuts and bolts to specifications. Reassemble engine in reverse order of removal.

REAR MAIN BEARING OIL SEAL

Removal & Installation – 1) Remove transmission, clutch assembly, and flywheel from engine. Take out two bolts holding oil pan to sealing flange. Loosen two rear oil pan bolts to take pressure off rear seal. Remove sealing flange.



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INSTALLING REAR OIL SEAL FLANGE

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2) Remove oil seal using suitable drift tool (SVO-2817 or equivalent). *CAUTION — Avoid damaging oil seal flange when pressing out old seal.* Carefully clean surface of crankshaft and inspect for wear.

3) *NOTE — Oil seal ring can be installed in three positions in sealing flange depending on wear surface on crankshaft. Determine which area to position seal before installing seal in flange.* Fit oil seal to sealing flange, lubricate seal and press into flange using suitable installing tool. Position sealing flange on engine with new gasket and carefully reinstall flange bolts and pan bolts. Replace all related parts in reverse of removal procedure.

FRONT COVER REMOVAL

1) Drain cooling system, and remove radiator and grille. Detach fan and fan belt. Unscrew pulley bolts and damper bolts. Remove center bolt and withdraw polygon hub using a suitable puller (SVO 2814), or move hub using hand pressure only, if possible.

2) Remove front cover bolts, remove front pan bolts in bottom of cover. Loosen several extra bolts on each side of oil pan to ease removal and installation of cover, do not damage gasket on oil pan.

3) Clean all gasket surfaces thoroughly. Replace front cover gasket and reinstall front cover onto guide dowel pins. Install bolts and tighten cover and oil pan. Reassemble all related parts in reverse order of removal procedure.

FRONT COVER OIL SEAL

Removal & Installation — 1) Remove all related parts. See *Front Cover Removal*. After polygon hub is removed, use suitable puller tool to remove oil seal.

2) Clean seal area carefully. Lubricate sealing lip on new seal and install using suitable tool (SVO-2816 or equivalent). *NOTE — Seal can be installed in three positions depending on wear on polygon hub. Position new seal in area of least wear.* Refit polygon hub on crankshaft, line up center punch marks on crankshaft end with marks on hub.

3) Reassemble all related parts in reverse of removal procedure. Damper pulley will only line up in one position as bolt holes are asymmetrically placed.

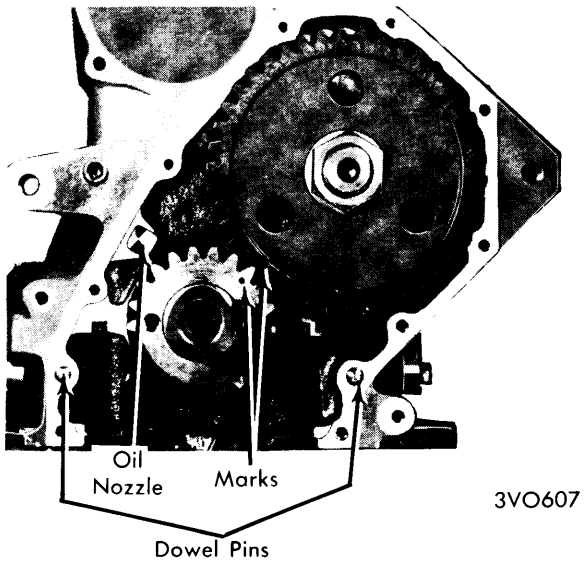
CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
B 30 F	1.8494-1.8504 (46.975-47.00)	.0008-.0030 (.020-.075)	...

TIMING GEAR

Removal & Installation — 1) Remove all related parts. See *Front Cover Removal*. Remove camshaft nut and pull off camshaft gear using suitable puller tool (SV0-2250 or equivalent). Pull off crankshaft gear using suitable tool (SV0-2822 or equivalent). Screw out oil nozzle and clean thoroughly, then re-fit (nozzle is used to lubricate timing gears).

2) Position crankshaft gear in place using suitable tool (SVO-2815 or equivalent), then place camshaft gear in alignment with marks on crankshaft gear (see illustration). *CAUTION — Do not push back on camshaft as sealing washer at camshaft end can be loosened.* Replace all related parts in reverse order of removal procedure.



TIMING GEAR ALIGNMENT

VALVE TIMING

Align index marks (pin punch) on camshaft gear and on crankshaft gear. When timing marks are opposite each other, number six piston will be at TDC on compression stroke. Fit camshaft nut and tighten.

ENGINE OILING

Crankcase Capacity — 6.3 quarts including filter.

Oil Filter — Full-flow type, disposable spin-on element.

Oil Pressure — 36-85 psi @ 2000 RPM with engine warm and new oil filter.

ENGINE OILING SYSTEM

Engine utilizes a force-feed lubrication system. Oil is moved from oil pan through oil pump to full-flow oil filter mounted on outside of engine block assembly. Oil is pressure-fed from filter to drilled galleries in center of block. Lubricant moves under pressure to main bearings which are drilled to pass oil on to connecting rod bearings and to camshaft bearings. Lubrication is forced from camshaft bearings upwards in block to rocker arm shaft where flow is directed to rocker arms and moves down push rods to valve lifters. Excess or run-off oil drains back down into pan via drain holes in cylinder head. Oil nozzle in timing gear recess sprays front gears with oil. Cylinder walls and piston rings are lubricated by splash from connecting rods.

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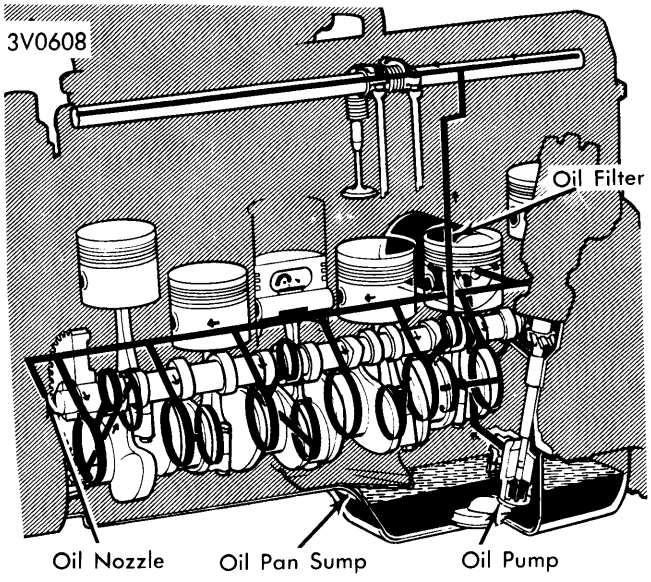
ENGINE OILING (Cont.)



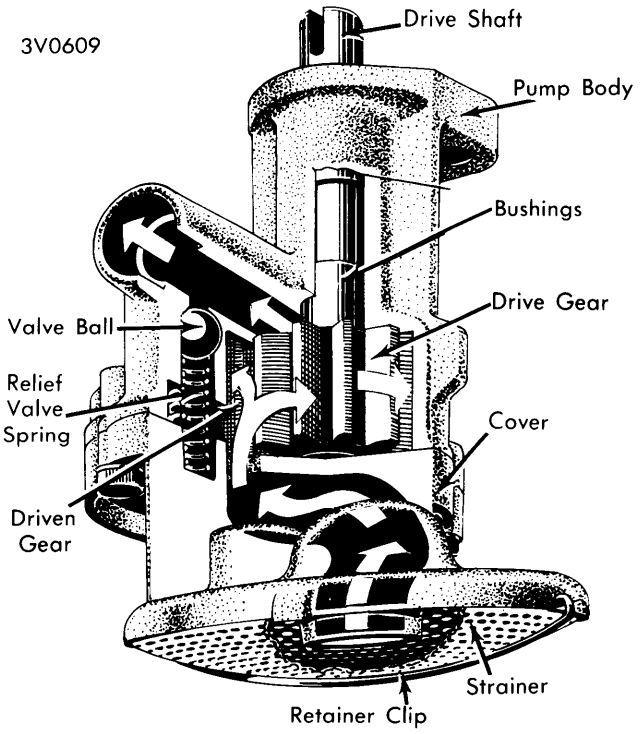
ENGINE LUBRICATING SYSTEM

OIL PUMP

Removal & Installation – 1) *See Oil Pan Removal.* Pull oil pump out of engine assembly. Disassemble and clean all parts thoroughly. Check all parts for undue wear or fatigue, replace if necessary.

2) Backlash clearance should be .006-.014" (.15-.35 mm), end play allowable is .0008-.0040" (.02-.10 mm), replace bushings or shaft if worn beyond tolerances. Drive shaft and gear are matched set and must be replaced as an assembly.

3) Reinstall oil pump, making sure that sealing rings on oil delivery pipe are securely in place. Be certain oil pump goes into groove in pump shaft. Reinstall all related parts in reverse of removal procedure.



OIL PUMP ASSEMBLY

ENGINE COOLING

Thermostat – Wax type, begins to open at 177-182°F (81-83°C). Fully open at 194°F (90°C).

Cooling System Capacity – 13.0 qts.

WATER PUMP

1) Drain cooling system by disconnecting the lower radiator hose. Remove expansion tank with hose. Detach upper radiator hose. Unscrew retaining bolts and lift out fan shroud and radiator. Remove mounting bolts for water pump, then withdraw pump.

2) Clean gasket surface thoroughly and position new pump and gasket. Make sure sealing rings on upper side of pump locate correctly. Press pump upward against cylinder head extension, so that sealing between pump and cylinder head will be complete. Ensure sealing rings at water pipes are not damaged, and press in pipes completely when attaching.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head Bolts	
Step One	29 (4.0)
Step Two	58 (8.0)
Step Three	65 (9.0)
Main Bearing Cap Bolts	87-94 (12-13)
Connecting Rod Cap Bolts	51-57 (7-8)
Flywheel Bolts	47-51 (6.5-7.0)
Camshaft Nut	94-108 (13-14)
Crankshaft Pulley Bolt	51-58 (7-8)
Oil Pan Bolts	6-8 (.8-1.1)
Int. & Exh. Manifold Bolts	13-16 (1.8-2.2)