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
1975 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) Mark hood hinges for realignment upon installation and remove hood assembly. Drain cooling system, then remove battery and air cleaner assembly. Disconnect wiring to cold start valve, throttle switch, and temperature sensor for coolant and injectors. Disconnect cable loom from distribution pipe and position on cowl. Disconnect wiring to oil pressure sensor.

2) Remove from the inlet duct the pressure sensor hose, distributor vacuum hose, power brake hose, and crankcase ventilation hose coming from oil trap. Remove throttle cable from control arm and bracket. Remove alternator wiring and coil wires. Remove coil. Disconnect wiring to distributor and starter motor.

3) Disconnect cable loom for start inhibitor contact at joining piece at left side member (automatic transmissions only). Remove fuel line hoses at joint on left side member. Remove fuel line brackets from left engine attachment and cylinder head. Remove cold start valve hose from distribution pipe.

4) Remove fuel injectors with distribution pipe and fuel hoses as an assembly. Remove heater hoses, radiator hoses and disconnect oil cooling lines for automatic transmission from radiator. Disconnect transmission fill tube from cylinder block. Remove water return pipe.

5) Remove radiator, fan shroud, and fan. Remove power steering pump and position to one side. Raise engine using suitable engine hoist. Disconnect exhaust system at exhaust header pipe outlet. Remove front engine mount attaching nuts. Remove ground lead from engine. Remove electric leads for transmission and overdrive.

6) Remove rear engine crossmember and rear engine attachment. Remove propeller shaft. Disconnect speedometer cable from transmission. Remove control rod from selector lever on models with automatic transmission. On models with manual transmission, remove clutch wire pin from lever and clutch wire sleeve from clutch casing. Carefully lift engine and transmission from the vehicle as an assembly.

INLET DUCT

Removal – 1) Remove air cleaner, then disconnect hose to servo and hose from inlet duct to oil trap. Remove plug contacts for injectors and throttle valve switch. Disconnect cable harness from header pipe and position to one side.

2) Disconnect hoses to header pipe and hoses between header pipe and pressure regulator. Turn injector lock ring counterclockwise so it loosens from bayonet fitting and pull the injector up and out of inlet duct. Remove sealing ring, washers, and bayonet fitting. Remove inlet duct.

Installation – To install, reverse removal procedure while noting the following: Always use new sealing ring when installing injectors. Ensure all electrical leads are connected.

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)

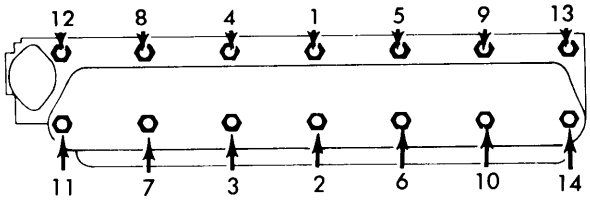

Fig. 1 Cylinder Head Tightening Sequence

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 (7.92-7.94)	.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.

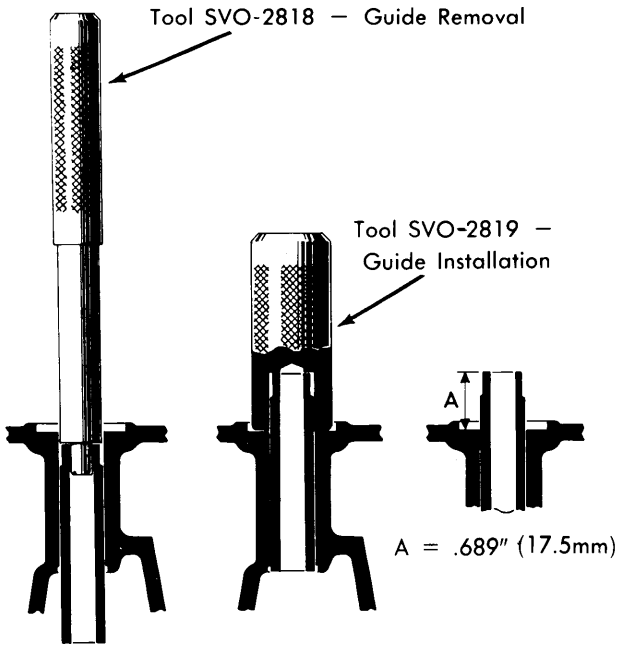

Fig. 2 Valve Guide Removal, Installation & Height

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 "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 "O". No. 6 rocker arms should be in "balance". *NOTE – When in "balance", the intake rocker arm has just closed and exhaust rocker arm just starts* to open. Adjust No. 1 valve clearance. Rotate crankshaft and adjust valves in sequence indicated in the following table.

Valve Adjusting Sequence

Balance	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

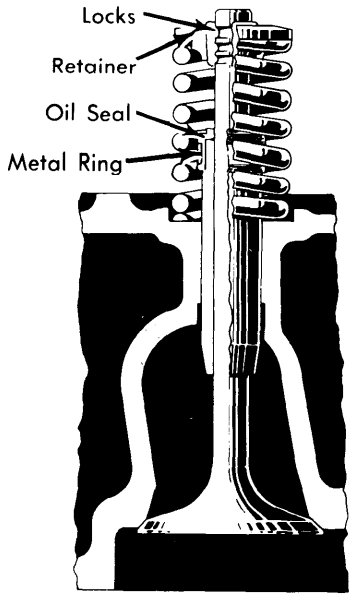

Fig. 3 Valve Guide & Valve Assembly

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) Remove cylinder head and oil pan. 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 rod cap attaching bolts and rod cap. Remove connecting rod and piston assembly through top of cylinder block.

2) To reinstall, lubricate all internal surfaces with engine oil before installation. Make sure that notch in piston crown is facing front of engine. Use a ring compressor (SVO-2823) to compress rings (without changing their position) and install piston and connecting rod assembly to cylinder block in their original position.

3) Tap lightly on piston dome with wooden handle tool while guiding connecting rod onto crankshaft. Install rod cap onto proper piston and connecting rod assembly. Tighten attaching bolts. Install cylinder head and oil pan.

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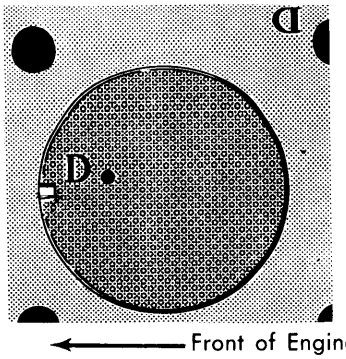

Fig. 4 Installation Marks for Piston & Engine Block

FITTING PISTONS

Pistons should be fitted into respective cylinders without rings. 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.

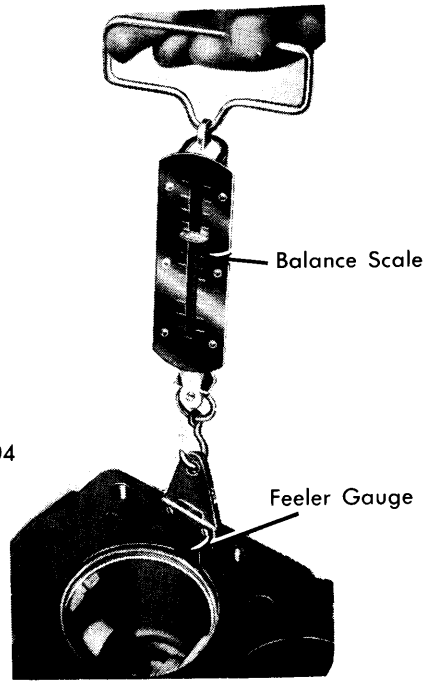

Fig. 5 Measuring Piston Clearance with a Spring Scale

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. Identify and mark connecting rod caps and main bearing caps to ensure correct replacement. Remove connecting rod caps and push pistons toward top of cylinder. Remove main bearing caps (one at a time) and thoroughly clean all bearing surfaces.

2) Measure all journals using a micrometer. Out-of-round on connecting rod journals should not exceed .003" (.07 mm) and on 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.

3) 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.

Fig. 6 Installing Rear Oil Seal Flange to Engine Block

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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 remove 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.

Installation — 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)	①.0008-.0030 (.020-.075)	...

① — End play should be .0008-.0024" (.02-.06 mm).

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.* When gears are in alignment, No. 6 cylinder should be at TDC on compression stroke. Replace remaining components in reverse of removal procedure.

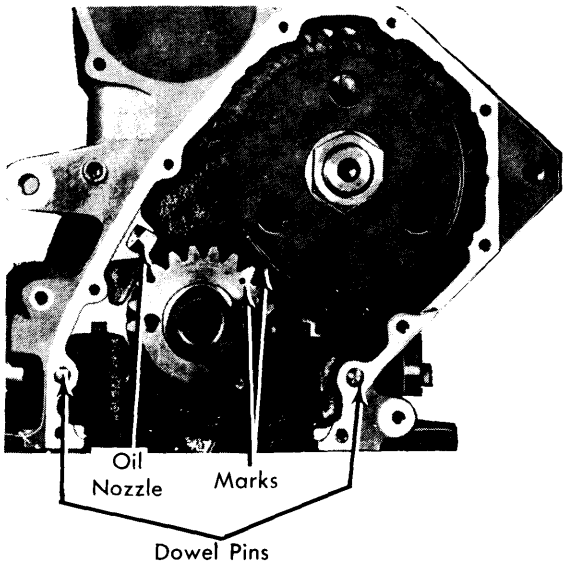

Fig. 7 Aligning Timing Marks

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.)

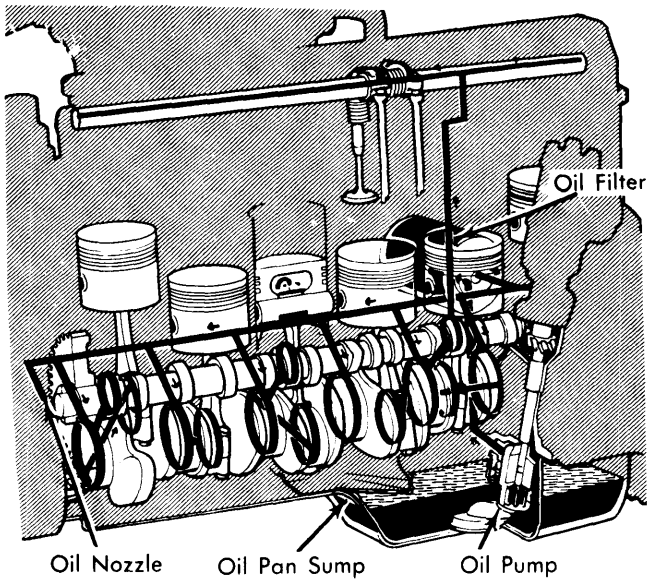

Fig. 8 Cutaway View of Engine Oiling System

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.

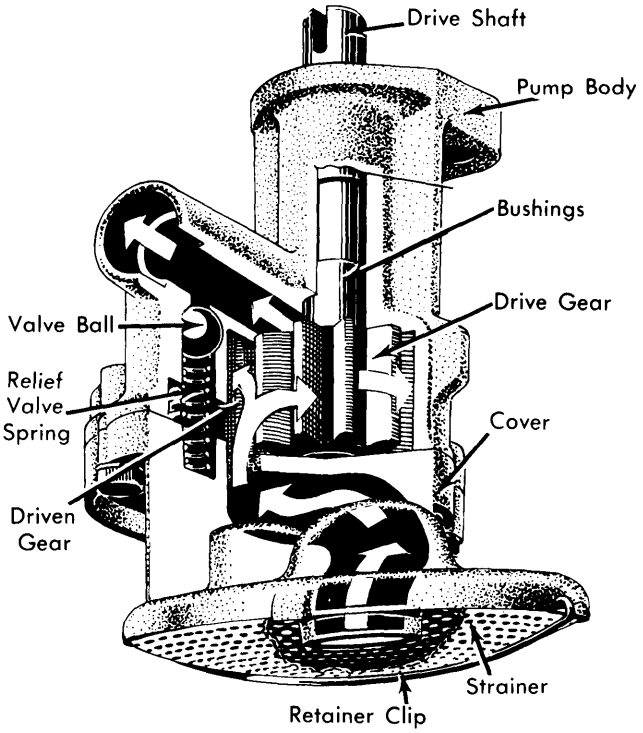

Fig. 9 Cutaway & Operational View of Oil Pump Assembly

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)