

Opel Engines

1900 cc 4 CYLINDER (Cont.)

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	115.8	1900	2-Bbl.	75@4800	92@2800	7.6-1	3.66	92.96	2.75	69.85

ENGINE IDENTIFICATION

Engine number is stamped on a machined pad on left side of engine. First two digits designate engine size.

Application	Engine Code
1900 cc Engine.....	1.9US

ENGINE REMOVAL

- Removal** - 1) Remove hood, disconnect battery and drain radiator. Remove radiator hoses, radiator and shroud. Disconnect heater and choke hoses.
- 2) Disconnect brake booster vacuum hose and remove air cleaner. Disconnect all electrical connections and accelerator linkage. Remove console, shift lever boot, plate and shift lever.
- 3) Disconnect fuel pump and remove splash shield. Disconnect speedometer cable, back-up light switch and clutch cable. Disconnect propeller shaft, exhaust pipe, clutch housing support, and transmission support. Remove engine mounts.
- 4) Attach hoist to engine and lift engine and transmission from vehicle.

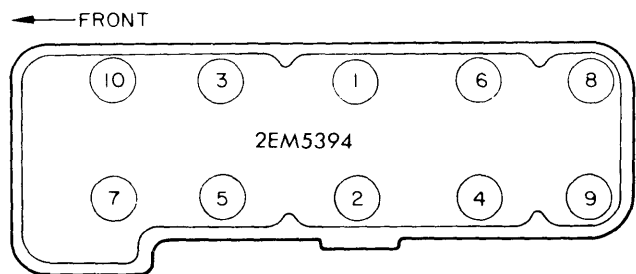
INTAKE & EXHAUST MANIFOLD REMOVAL

- 1) Disconnect battery and remove air cleaner. Disconnect throttle linkage and vacuum advance at carburetor. Remove fuel inlet line from carburetor.
- 2) Remove PCV valve hose from rocker arm cover. Disconnect EGR lines from carburetor and intake manifold.
- 3) Disconnect exhaust pipe. Remove six bolts mounting manifold assembly to cylinder head. Lift off manifold assembly.
- 4) If necessary, intake and exhaust manifolds can be separated by removing carburetor and four bolts attaching manifolds.

- 5) To install, reverse removal procedure and tighten all nuts and bolts to specifications.

CYLINDER HEAD REMOVAL

- 1) Drain radiator and block. Remove hoses from thermostat housing.
- 2) Remove manifold assembly as outlined above. *NOTE* - If cylinder head is being removed to change gasket, it is not necessary to remove manifold assembly.
- 3) Remove spark plug wires, and bolt holding wires away from cylinder head.
- 4) Remove rocker arm cover. Using suitable tool (J-22915) extract cylinder head bolts. Remove two bolts securing cylinder head to front cover. Remove three bolts attaching plate to front of cylinder head.
- 5) Remove plastic screw from end of camshaft. Remove three bolts attaching camshaft sprocket to cylinder head. Slide sprocket off camshaft and remove head.
- 6) To install, reverse removal procedure and tighten all bolts to specification. See *Illustration*.



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)
1900 cc Int.	1.574 (39.98)	44°	45°	.049-.059 (1.25-1.50)	.3538-.3543 (8.99-9.00)	.0010-.0029 (.025-.074)
Exh.	1.340 (34.04)	44°	45°	.063-.073 (1.60-1.85)	.3524-.3528 (8.95-8.96)	.0020-.0039 (.051-.099)

VALVE ARRANGEMENT

E-I-I-E-E-I-I-E

VALVE GUIDE SERVICING

- 1) Remove cylinder head as previously described. *NOTE* - Never place removed cylinder head with installed camshaft and valves, contact face down.

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- 2) Using suitable spring compressor (J-8062) compress valve spring and remove cap retainers. Release tool and remove spring and cap.
- 3) Remove valves and place them in numerical order for reinstallation in original position.
- 4) Remove carbon from combustion chambers, pistons and valves. Clean carbon and gum deposits from valve guide bores.
- 5) Visually inspect valve faces and seats for pits, burned areas or any evidence of poor seating.
- 6) New intake valves must not be refaced or lapped with grinding compound. For correct valve head angle, see specification chart.
- 7) Inspect valve guides for wear or pits. Valve guides can be reamed to fit oversize stems. *NOTE - Oversize valves are sometimes fitted during production. Oversize valve and guides are available in following diameters:*
- 8) Reseat valve seats in cylinder head, using suitable tool.
- 9) Lube valves with engine oil and reinstall valves, valve springs, caps and cap retainers. Install valve spring with closely wound coils toward cylinder head.
- 10) Install cylinder head and adjust valve clearances.

Valve & Valve Guide Oversizes

Oversizes	Valve Guide Dia.	Valve Stem Dia.
.0030" ①		
Intake.....	.3582-.3592"	.3567-.3572"
Exhaust.....	.3582-.3592"	.3553-.3559"
.0059" ②		
Intake.....	.3615-.3622"	.3597-.3602"
Exhaust.....	.3615-.3622"	.3583-.3588"
.0118" ③		
Intake.....	.3671-.3681"	.3656-.3661"
Exhaust.....	.3671-.3681"	.3642-.3647"

- ① - Oversize identification mark is No. 1.
- ② - Oversize identification mark is No. 2.
- ③ - Oversize identification mark is letter A.

ROCKER ARM STUD REPLACING

- 1) Remove air cleaner, rocker arm cover and rocker arm. *NOTE - Rocker arm studs are screwed into cylinder head. The tapered part of the stem serves to prevent stud from loosening.*
- 2) Attach vise-grip pliers to stud and remove stud from cylinder head.

- 3) Screw in new stud. Seat tapered part of stud by striking stud end with a rubber mallet.
- 4) Put two turned down rocker arm nuts on threaded part of stud and torque stud into cylinder head. Torque value is 29 ft. lbs. *NOTE - After a short period of operation, valve clearance generally increases. Check stud tightness and retorquing to specification.*

VALVE LIFTER SERVICING

- 1) Valve lifters can be removed after extracting rocker arm cover and rocker arms.
- 2) No oversize lifters are available. Valve lifter guide pit marks can generally be eliminated or smoothed with fine emery cloth. At this time lifters should be replaced.
- 3) To install, reverse removal procedure and adjust valve clearance.

VALVE CLEARANCE ADJUSTMENT

- 1) Hydraulic lifter adjustment must be done with engine off. Engine may be cold or hot.
- 2) Set piston of respective cylinders to TDC. Manufacturer recommends adjusting lifters in the firing order.
- 3) Back off adjusting nut at the rocker arm until clearance is achieved. Tighten adjusting nut until any clearance between valve, rocker arm and lifter is eliminated. Tighten adjusting nut one revolution further. No readjustment will be necessary.

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1900 cc Int.	93 @ 1.57 (42.2 @ 39.9)	182 @ 1.18 (82.6 @ 30.0)
Exh.	97 @ 1.36 (44.0 @ 34.5)	180 @ .96 (81.7 @ 24.4)

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)
1900 cc	.0014 (.036)	.0004-.0007 (.010-.018)	Press Fit	1	.014-.022 (.36-.56)	.0024-.0034 (.061-.086)
				2	.014-.022 (.36-.56)	.0013-.0024 (.033-.061)
				3	.015-.055 (.38-1.40)	.0013-.0024 (.033-.061)

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OIL PAN REMOVAL

- 1) Suitably support engine from top of engine compartment. Ensure that device will not allow engine to move once engine mounts have been removed.
- 2) Remove two motor mount bracket nuts. Remove two front suspension-to-frame rail bolt retaining nuts. Disconnect steering shaft U-joint.
- 3) Using a floor jack placed under center of front suspension crossmember, raise vehicle high enough for suspension to be removed.
- 4) Place jack stands under front of vehicle to support it in position.
- 5) Remove front crossmember support-to-frame mounting bolts.
- 6) Disconnect brake hoses.
- 7) Lower front suspension from vehicle.
- 8) Drain oil and remove oil pan.

PISTON & ROD ASSEMBLY

- 1) Remove oil pan as previously described.
- 2) Remove cylinder head as previously described.
- 3) Inspect cylinder bore above ring travel and eliminate ridges, if any exist.
- 4) Mark cylinder number on all pistons, rods and caps. *NOTE* — Cylinders are numbered 1-2-3-4 (Front to Rear).
- 5) Remove cap bearing shell from No. 1 connecting rod.
- 6) Remove piston and rod assembly through top of cylinder. Remove remaining piston assemblies in similar manner.
- 7) To install, compress piston rings and install piston and rod assembly from top of engine.

PISTON PIN REPLACEMENT

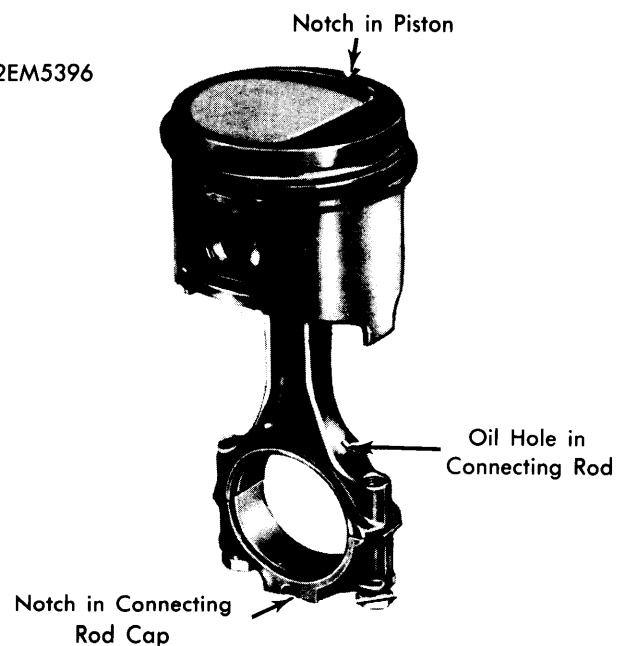
- 1) Inspect bearing surfaces of piston pins. Check for wear by measuring surfaces with a micrometer. Check fit of piston in piston boss. If pins fit too tight due to gum and varnish, use a suitable solvent to remove sludge.
- 2) If piston bosses are worn out-of-round or are oversize, the piston and pin assembly must be replaced. Oversize pins are not used.
- 3) Piston pin must be pressed from piston and connecting rod assembly. Opel recommends a specific tool layout for this procedure, however most any press can be adapted to complete the operation.

- 4) Pin must, on reassembly, fit with .0004-.0007" clearance.

FITTING PISTONS & RINGS

- 1) Pistons are cam ground. For fitting purposes piston must be measured 2½" below top of piston at right angles to piston pin.
- 2) Oversize pistons are available. If cylinder is to be bored, first select piston.
- 3) Piston must be assembled with notch in piston head facing toward front of engine, oil hole in connecting rod pointing toward right (manifold) side and notch in connecting rod cap facing rearward.

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PISTON & ROD ASSEMBLY

- Rings All Models —
- 1) Top ring is chrome plated and can be installed either way.
 - 2) No. 2 ring is stamped "Top" and must be installed with index word facing up.
 - 3) Oil ring can be installed either direction.
 - 4) Install rings with gaps 90° offset and check clearance.

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)
1900 cc	2.2829-2.2835 (57.99-58.00)	.0009-.0025 (.023-.064)	No. 5	.0017-.0061 (.043-.155)0006-.0025 (.015-.064)	.0043-.0095 (.109-.241)

MAIN BEARING & CONNECTING
ROD BEARING SERVICE

Connecting Rod Bearings — 1) Remove oil pan as previously described.

- 2) Disconnect two connecting rods at a time from crankshaft. Inspect bearing and crankpin journals. While rotating crankshaft to bring rod journals to bottom, it is necessary to temporarily reconnect rods to crankshaft.

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3) If rod bearings are chipped or scored, they must be replaced. If bearings appear satisfactory, use Plastigage method to check clearance.

4) If crankpin journals are scored or ridged, crankshaft must be reground or replaced. Minor imperfections may be eliminated by honing.

5) Bearings are available in standard sizes and several oversizes. Select correct bearing and reinstall cap with bearing. Tighten nuts to specification.

Main Bearings - 1) Crankshaft bearings consist of two halves which are identical (Exc. rear main) and interchangeable in cap and crankcase.

2) Crankshaft bearings are precision type which do not require reaming to size. Shims are not available. Bearings are available in standard and undersize. **NOTE** - Do not file crankshaft bearing caps to adjust wear.

3) Crankshaft main bearings can be inspected in same manner as connecting rod bearings (Plastigage method).

THRUST BEARING ALIGNMENT

If thrust bearing has been disturbed or replaced, it is necessary to line up thrust surfaces of the bearing before cap bolts are tightened. Move crankshaft forward and backward (fore and aft) the maximum travel limit. After having moved the crankshaft several times, finger tighten thrust cap bearing bolts and move crankshaft forward one more time. Thrust bearing should now be aligned.

REAR MAIN BEARING OIL SEAL SERVICE

- 1) Remove transmission, bell housing and clutch.
- 2) Remove flywheel.
- 3) Using a punch, make a small hole in oil seal and insert a metal screw. With a pair of pliers, pull out oil seal.
- 4) Fit new seal to installer J-22928 (or equivalent). Place installer, with seal, over crankshaft flange and carefully seat seal.
- 5) Reverse removal procedure for remaining components. **NOTE** - Replace flywheel bolts and torque to specification.



REMOVING REAR MAIN OIL SEAL

TIMING CHAIN COVER

1) Using suitable tool, support weight of engine. Remove radiator and shroud assembly. Remove cylinder head and remove generator (alternator) bracket.

2) Remove fuel pump and distributor. Remove chain tensioner from timing cover. Remove crankshaft pulley bolt and pulley. Remove water pump, oil pan and timing chain cover. **NOTE** - There is one bolt hidden by water pump.

3) To install, reverse removal procedure using new gaskets.

TIMING CHAIN COVER OIL SEAL

NOTE - It is possible to replace oil seal without removing timing chain cover.

1) Remove fan belt, crankshaft pulley bolt and pulley.

2) Insert suitable tool (screwdriver) behind seal and rest tool on crankshaft pin. Pry out oil seal.

3) Oil a new seal and place it on tool J-22924 (or equivalent). Place seal and installer on crankshaft. Using crankshaft washer and bolt, seat seal into cover.

TIMING CHAIN REPLACEMENT

1) Using suitable tool, support weight of engine. Remove radiator and shroud assembly.

2) Remove cylinder head as previously described.

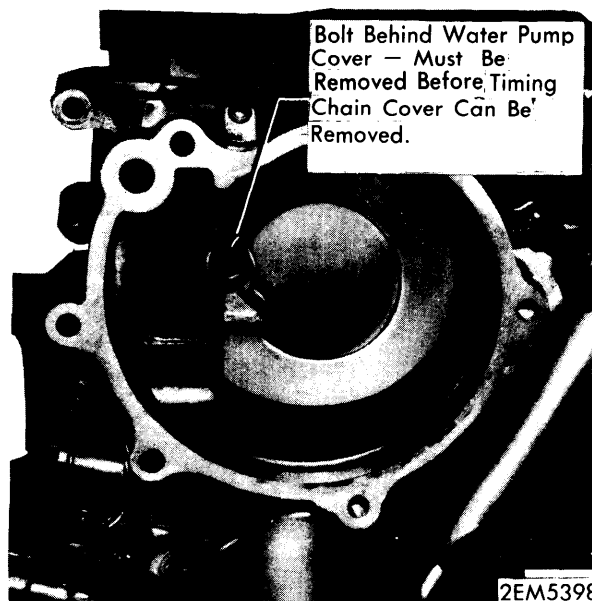
3) Remove generator (alternator) and mounting bracket.

4) Remove fuel pump and distributor. Remove chain tensioner from timing cover.

5) Remove crankshaft pulley bolt and pulley. Remove water pump, oil pan and timing chain cover bolts. **NOTE** - There is one bolt hidden by water pump.

6) Remove timing sprockets and timing chain.

7) To install, reverse removal procedure, aligning mark on camshaft sprocket with mark on camshaft sprocket support.



BOLT BEHIND WATER PUMP

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CAMSHAFT REMOVAL

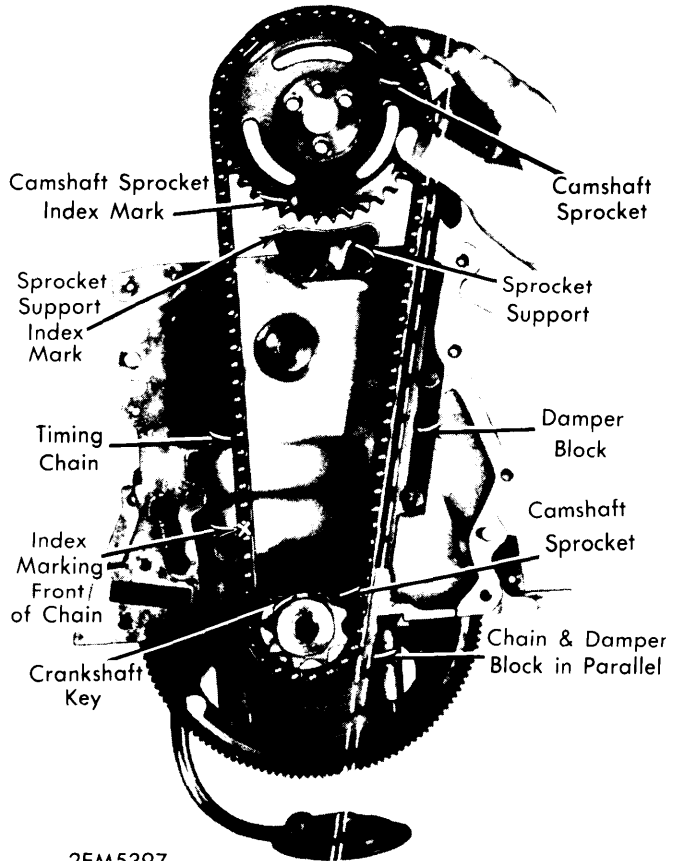
- 1) Remove cylinder head as previously described.
- 2) Loosen rocker arm nuts and swing rocker arms off lifters.
- 3) Remove valve lifters and place them in a suitable holder. Lifters must be replaced in original position.
- 4) Remove cover from access hole on left rear of cylinder head. Remove camshaft toward front, support camshaft with one hand inserted through access hole.
- 5) To install, reverse removal procedure. Check camshaft end clearance between cover and nylon screw with feeler gauge. Clearance must be .004-.008". Excess clearance may be eliminated by readjusting cover carefully with a suitable drift. *NOTE - Maximum permissible radial runout of camshaft center bearing with camshaft supported in outer bearings is .001".*

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1900 cc Front	1.926 (48.92)	.001-.003 (.025-.076)
1	1.916 (48.67)		
2	1.911 (48.54)		
3	1.906 (48.41)		

VALVE TIMING

After sprocket has been installed to camshaft, recheck alignment of chain. When marks on camshaft sprocket are aligned with marks on camshaft sprocket support, No. 1 and No. 4 pistons will be at TDC. No. 4 piston will be in firing position

and No. 1 piston will be on exhaust stroke. To time engine to fire on No. 1 cylinder, rotate crankshaft 360°.



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VALVE TIMING MARKS

ENGINE OILING

Crankcase Capacity - All models, 3½ qts.. Add ½ qt. with filter change.

Pressure Regulator Valve - Located in oil pump cover and is nonadjustable.

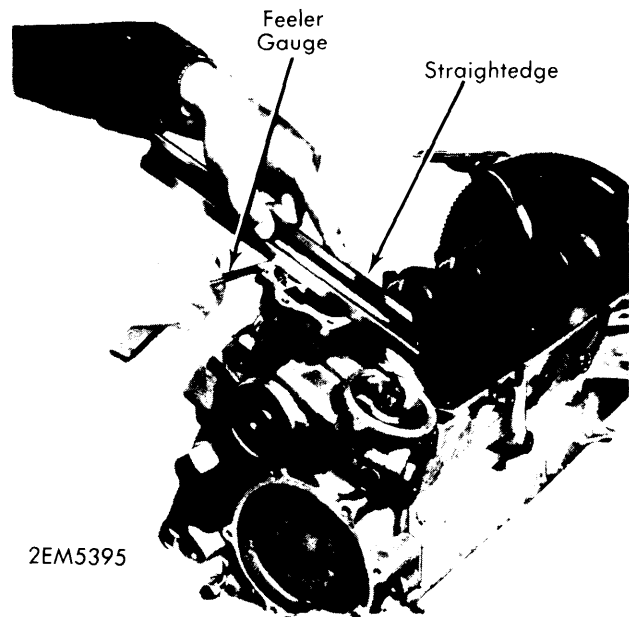
Oil Filter - Full-flow type with disposable cartridge.

ENGINE OILING SYSTEM

Pressure lubrication of engine is achieved by a gear type oil pump. Pump sucks oil through a screen into pump housing and forces it through a full flow type oil filter into main oil galley. Part of oil is fed to the crankshaft and camshaft bearings. The bearings of crankshaft journals are connected with main bearings by bores so main bearings can effectively be oiled. Oil thrown off crankshaft serves as lubrication for cylinder walls.

OIL PUMP

- 1) Remove screws mounting oil pump cover assembly to timing cover and remove cover. Slide out oil pump gears. Clean gears in a suitable solvent and inspect for wear and scoring.



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MEASURING OIL PUMP END GEAR CLEARANCE

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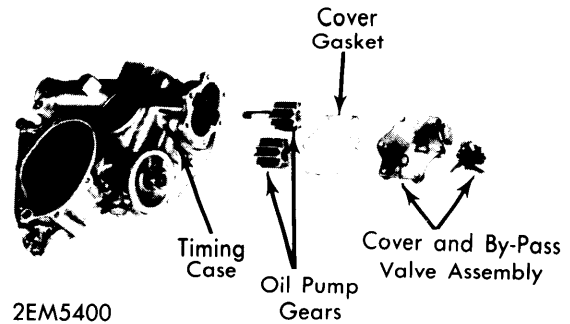
ENGINE OILING (Cont.)

2) If pump cover is scored by gear action, it must be replaced. If distributor shaft bushing is worn, assembly must be replaced. In some cases a .008" oversize bore for pump gears and shafts may have been installed during manufacturing. These cases can be distinguished by the number 0.2" stamped into pump flange. Oversize replacement gears are available.

3) If new gears are installed, end clearance should be measured with a straight edge and feeler gauge. Gears must not protrude over pump housing more than .004".

4) Inspect oil pump gear backlash. Backlash should not exceed .004-.008".

5) Inspect spring, ball and seat for dirt and foreign material that might impair operation.



OIL PUMP ASSEMBLY

ENGINE COOLING

Thermostat – Standard thermostats are 190°. Thermostat should begin to open at 189°F and be fully open at approximately 212°F. If thermostat does not operate properly, it must be replaced.

Cooling System Capacity – All models 6 quarts.

WATER PUMP

Removal – Drain coolant, remove radiator and shroud. Remove fan belt, fan blade and pulley on pump shaft. Disconnect water pump inlet and heater hose from water pump. Remove bolts, pump assembly and gasket from timing chain cover.

Installation – To install, thoroughly clean all gasket surfaces and reverse removal procedure using new gaskets.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Connecting Rod Bolts	36 (4.98)
Crankshaft Main Bearing Bolts	72 (9.95)
Flywheel-to-Crankshaft Bolts.....	43 (5.95)
Cylinder Head Bolts	
Warm	58 (5.95)
Cold	72 (9.95)
Camshaft Sprocket Bolts	18 (2.49)
Crankshaft Pulley Bolts	72 (9.95)
Rocker Arm Stud	29 (4.01)
Timing Chain Cover	14 (1.94)
Water Pump to Timing Chain Cover	11 (1.52)
Engine Supports.....	40 (5.53)
Manifold to Cylinder Head	33 (4.56)