## 1900 CC 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 |
| 1975 | 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

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 wires at cold start injector, fuel injectors, throttle valve switch, temperature sensor, thermo time switch, auxiliary air valve, and air flow meter. Remove air cleaner and air flow meter. Disconnect inlet hose for throttle body housing and position to one side.

2) Disconnect accelerator linkage cable. Disconnect hoses at auxiliary air valve, throttle body housing to EGR, air conditioning thermo vacuum switch at vacuum "T", and distributor vacuum retard hose at vacuum "T". Disconnect electronic fuel injection wiring harness ground located at rear of manifold.

3) Disconnect vacuum brake booster hose and remove accelerator linkage springs. Disconnect fuel return hose and fuel pressure regulator hose. Disconnect exhaust pipe. Remove intake manifold attaching bolts and remove manifold assembly. Separate exhaust manifold from intake manifold if necessary.

**Installation** – To install, reverse removal procedure while noting the following: Install new gaskets and apply suitable sealer (Loctite) on all attaching bolts for intake and exhaust manifolds.

### CYLINDER HEAD

**Removal** – 1) Remove air flow meter and air cleaner assembly. Remove EGR valve attaching bolt to thermostat housing. Disconnect hoses and connections to auxiliary air valve and thermostat housing. Drain radiator and block. Remove intake and exhaust manifold as previously described.

2) Remove spark plug wires from plugs and bracket bolt holding wires away from cylinder head. Remove rocker arm cover. Using special tool (J-22915), remove cylinder head bolts. Remove two bolts attaching cylinder head to front cover, and three bolts attaching plate to front of cylinder head.

3) Remove plastic screw from end of camshaft. Remove three bolts attaching camshaft sprocket to cylinder head, slide sprocket off camshaft and remove cylinder head.

**Installation** – 1) To install, reverse removal procedure while noting the following: Ensure all gasket surfaces, piston tops, and bores are clean. Lubricate cylinder bores with engine oil. Cylinder head gasket must be coated with sealer at points where gasket mates with timing chain cover, and rubber gasket ring must be in place on timing case.

2) With cylinder head in position, rotate camshaft so recesses are in vertical position which will allow installation of the left row of bolts. Install cylinder head attaching bolts and tighten in sequence as shown in illustration. After sliding camshaft sprocket onto camshaft, install nylon adjusting screw, and check that chain has not slipped. Ensure that clearance exists between cover and nylon adjusting screw.

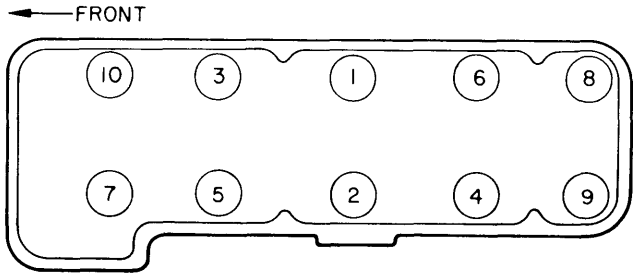


*Fig. 1 Tightening Sequence for Cylinder Head*

| 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 (1.24-1.50) | .3538-.3543 (8.99-9.00 | .0010-.0029 (.025-.074) | ..... |
| Exh. | 1.340 (34.04) | 44° | 45° | .063-.073 (1.60-1.85) | .3524-.3523 (8.95-8.96 | .0020-.0039 (.051-.099) | ..... |

## 1900 CC 4 CYLINDER (Cont.)

### VALVE ARRANGEMENT

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

### VALVE GUIDE SERVICING

1) Remove cylinder head as previously described. *NOTE — Never place cylinder head, with camshaft and valves installed, face down on work bench. Use a spring compressor (J-8062) to compress valve spring, then remove cap retainers. Release tool and remove spring and cap.*

2) Remove valves and place them in order for reinstallation into original position. Remove carbon from combustion chambers, pistons, and valves. Clean carbon and gum deposits from valve guide bores. Visually inspect valve faces and seats for pits, burned areas or any evidence of poor seating.

3) New intake valves must not be refaced or lapped with grinding compound. For correct valve head angle, see specification chart. Inspect valve guides for wear or pitting. Valve guides can be reamed to fit oversize stems. *NOTE — Oversize valves are sometimes fitted during production.* Oversize valves and guides are available in three sizes as shown in following table.

4) After reseating valve seats in cylinder head, lube valves with engine oil. Reinstall valves, valve springs, caps, and cap retainers. Valve spring must be installed with closely wound coils toward cylinder head. Install cylinder head and adjust valve clearance.

**Valve & Valve Guide Oversizes**

| Oversizes | Valve Guide Dia. | Valve Stem Dia. |
|---|---|---|
| .0030"(.076 mm)① | | |
| Intake | .3582-.3592" (98-24 mm) | .3567-.3572" (9.060-9.073 mm) |
| Exhaust | .3582-.35 (9.08-9.124 mm) | .3553-.3559" (9.025-9.040 mm) |
| .0059"(.150 mm)② | | |
| Intake | .3615-.3622" (9.182-9.200 mm) | .3597-.3602" (9.136-9.149 mm) |
| Exhaust | .3615-.3622" (9.182-9.200 mm) | .3583-.3588" (9.101-9.114 mm) |
| .0118"(.300 mm)③ | | |
| Intake | .3671-.3681" (9.324-9.350 mm) | .3656-.3661" (9.286-9.299 mm) |
| Exhaust | .3671-.3681" (9.324-9.350 mm) | .3642-.3647" (9.251-9.263 mm) |

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 tappered 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 tappered part of stud by striking stud end with a rubber mallet. Put two turned down rocker arm nuts on threaded part of stud and torque stud into cylinder head.

### VALVE LIFTER SERVICING

Valve lifters can be removed after extracting rocker arm cover and rocker arms. No oversize lifters are available. Valve lifter pit marks can generally be eliminated or smoothed with fine emery cloth, or lifters must be replaced if necessary. To install, reverse removal procedure after amply oiling valve lifters. 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) |

## 1900 CC 4 CYLINDER (Cont.)

### OIL PAN

**Removal** – 1) Support engine from top of engine compartment ensuring that engine will not move when engine mounts are removed. Remove two motor mount bracket nuts. Remove two front suspension-to-frame rail bolt retaining nuts. Disconnect steering shaft "U" joint.

2) Position safety stands under front of vehicle. Remove front crossmember support-to-frame mounting bolts. Disconnect brake hoses and lower front suspension from vehicle. Drain oil and remove oil pan.

**Installation** – To install, reverse the removal procedure while noting the following: Apply sealer to gasket surfaces of oil pan. Bleed brake system after connecting brake hoses. Tighten all nuts and bolts to specifications.

### PISTON & ROD ASSEMBLY

**Removal** – Remove cylinder head and oil pan as previously described. Isnpect cylinder bore above ring travel and eliminate ridges, if any exist. Remove rod bearing cap and bearing from No. 1 piston rod assembly. Remove piston and rod assembly through top of cylinder. *NOTE – Mark cylinder number on all pistons, rods, and caps. Cylinders are numbered 1-2-3-4 going from the front to rear.* Remove remaining piston assemblies in similar manner.

**Installation** – Ensure all cylinder bores, pistons, rod bearings, and crankshaft journals are clean. Coat all bearing surfaces and cylinder bores with engine oil. Position crankshaft journal for No. 1 cylinder in straight down position. With ring gaps properly positioned, and ring compressor tool installed, install piston and rod assembly into No. 1 cylinder. Notch in piston head must point toward front and oil hole in connecting rod must face to the right. Install rod bearing cap and tighten. Install remaining piston assemblies in similar manner while turning crankshaft journal to straight down position when installing. Install cylinder head and oil pan as previously described.

### PISTON PINS

Using a press and suitable tools (J-23436), press piston pin out of piston and connecting rod. Install new pin by placing pilot through piston and connecting rod. Lightly oil piston pin and place piston, rod, pin and ram on the base. Press in pin until it is centered in connecting rod. Piston must be assembled so when installed in engine the notch in piston head will face toward front of engine, oil hole in connecting rod will point toward right (manifold) side, and notch in connecting rod cap will face towards the rear.

### FITTING PISTONS

1) Measure cylinder bore for wear and taper. Measure piston diameter 2½" below top of piston and at right angles to piston pin. If piston-to-cylinder clearance is not within specifications, pistons are available in .020" (.51 mm) oversize.

2) Install piston rings on piston as follows: Top ring is chrome plated and can be installed either way. No. 2 ring is stamped "TOP" and must be installed with "TOP" facing up. Oil ring can be installed either direction. Install rings with gaps 90° offset and check clearance.

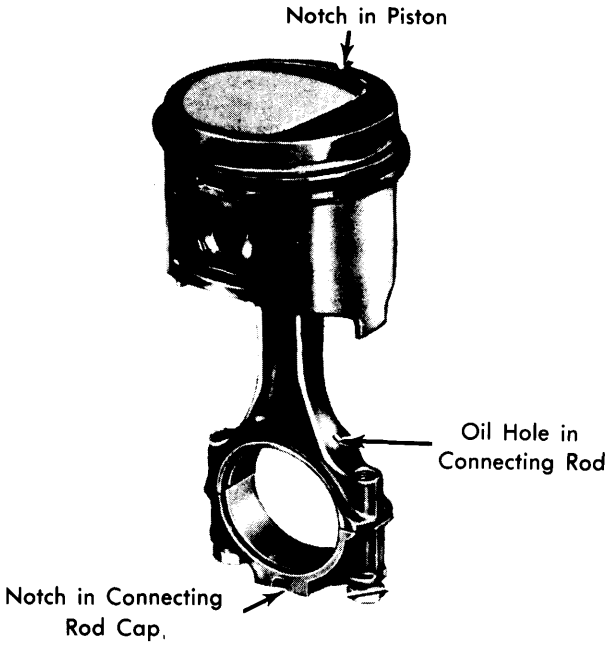


*Fig. 2 Piston and Connecting Rod Assembly*

**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 (57.986-58.001) | .0009-.0025 (.023-.064) | No. 5 | .0017-.0061 (.043-.155) | ... | .0006-.0025 (.015-.064) | .0043-.0095 (.109-.241) |

### MAIN & CONNECTING ROD BEARINGS

**Removal** – Remove oil pan to obtain access to main and connecting rod bearings and then proceed as follows:

1) To change connecting rod bearings, remove rod caps. Inspect connecting rod caps for cylinder identification so caps are installed in same position upon assembly. With crankshaft

## 1900 CC 4 CYLINDER (Cont.)

lined up in center of cylinder bore, push piston towards top of cylinder block a small amount and remove upper half of bearing.

**2)** Before removing main bearing caps, mark for identification so installation position is correct. Remove nuts on main bearing cap and remove cap. NOTE – Check main bearings one journal at a time. Remove upper half of bearing by inserting suitable tool (J-8080) into oil hole of crankshaft and slowly rotating crankshaft in direction of engine rotation, forcing out upper half of bearing.

**Installation** – **1)** Determine crankshaft journal clearance in bearing by Plastigage method. Place a jack under counterweight adjoining bearing being checked so weight of crankshaft will not compress Plastigage and provide an erroneous reading. If bearing clearance is excessive, undersize bearings are available. Use Plastigage method to determine connecting rod bearing clearance. If clearance is not within specifications, oversize bearings are available.

**2)** After bearings have been fitted, apply a light coat of engine oil to journals and bearings. With crankshaft throw to bottom of stroke and upper half of bearing installed, push piston down until connecting rod bearing seats on journal. Install connecting rod cap and tighten. Check connecting rod side clearance.

**3)** To install upper main bearing, lubricate bearing with engine oil and place plain end of bearing over shaft on locking tang side of block. Partially install bearing so suitable tool (J-8080) can be inserted in journal oil hole. Rotate crankshaft slowly in opposite direction of engine rotation until bearing tang is seated. Install bearing cap and tighten.

### 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

**Removal & Installation** – Remove transmission, bell housing, and clutch. Remove flywheel. Using a punch, make a small hole in oil seal and insert a metal screw. Pull out oil seal using a pair of pliers. Fit new seal to installer (J-22928), then position installer, with seal, over crankshaft flange and carefully seat seal. Install flywheel, clutch, bell housing, and transmission.

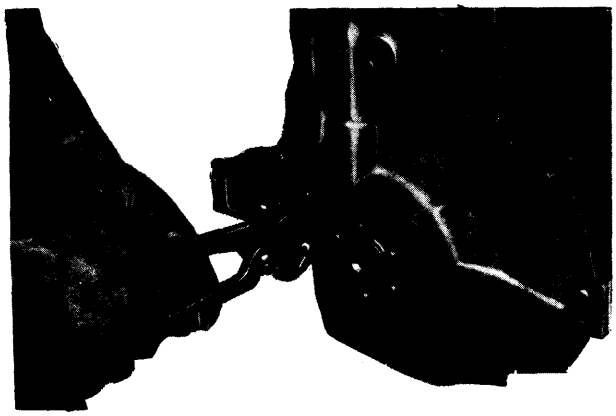

*Fig. 3 Removing the Rear Main Oil Seal*

### TIMING CHAIN COVER

**Removal & Installation** – Support engine from top of engine compartment ensuring that engine will not move when engine mounts are removed. Remove radiator and shroud assembly. Remove cylinder head and alternator bracket. 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.* To install, reverse removal procedure and use new gaskets.

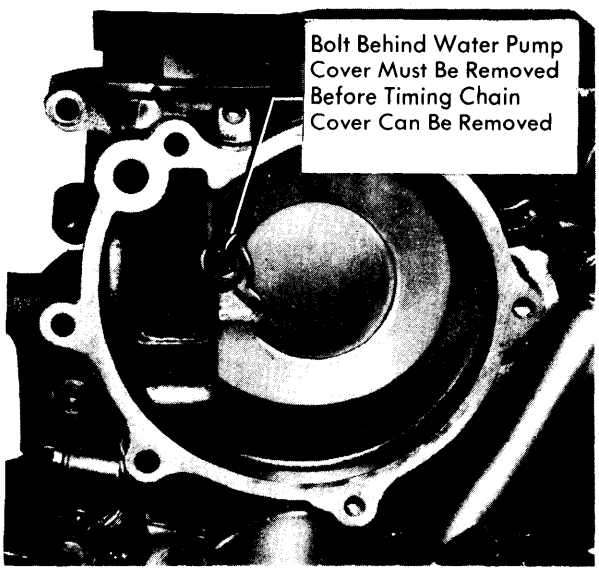


*Fig. 4 Location of Hidden Bolt Behind Water Pump*

### TIMING CHAIN COVER OIL SEAL

**Removal & Installation** – Remove fan belt, crankshaft pulley bolt and pulley. Insert a screwdriver behind seal, rest it on crankshaft and pry out oil seal. Oil the new seal and position on an installer tool. Position seal and tool on crankshaft, then using crankshaft washer and bolt, seat seal into cover. Install pulley, pulley bolt, and fan belt.

### TIMING CHAIN

**Removal & Installation** – Remove timing chain cover as previously described. Remove timing sprockets and timing chain. To install, reverse removal procedure while aligning mark on camshaft sprocket with mark on camshaft sprocket support.

### CAMSHAFT

**Removal** – Remove cylinder head as previously described. Loosen rocker arm nuts and swing rocker arms off lifters. Remove valve lifters and place them in a holder so lifters may be reinstalled in their original position. Remove cover from access hole on left rear of cylinder head. Remove camshaft toward front, while supporting camshaft with one hand inserted through access hole.

## 1900 CC 4 CYLINDER (Cont.)

**Installation** – To install, reverse removal procedure while noting the following: Check camshaft end clearance between cover and nylon screw with feeler gauge. Clearance must be .004-.008" (.10-.20 mm). Excess clearance may be eliminated by readjusing cover carefully with a drift. *NOTE – Maximum radial runout of camshaft center bearing, with camshaft supported in outer bearings, is .001" (.025 mm).*

| 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 tc fire on No. 1 cylinder, rotate crankshaft 360°.

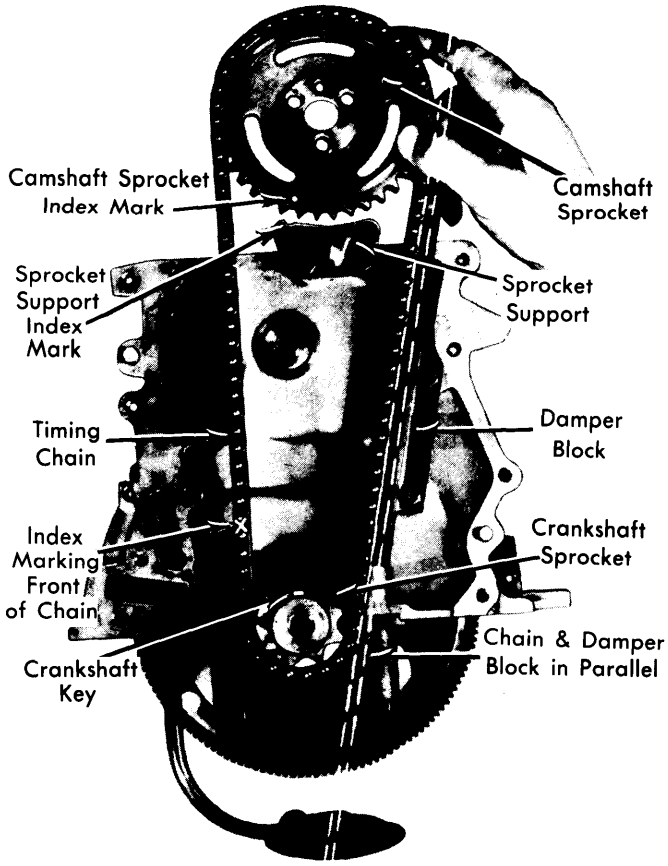


*Fig. 5 Aligning Timing Chain and Sprocket Marks*

## ENGINE OILING

**Crankcase Capacity** – All models use 3½ quarts. Add ½ quart 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.

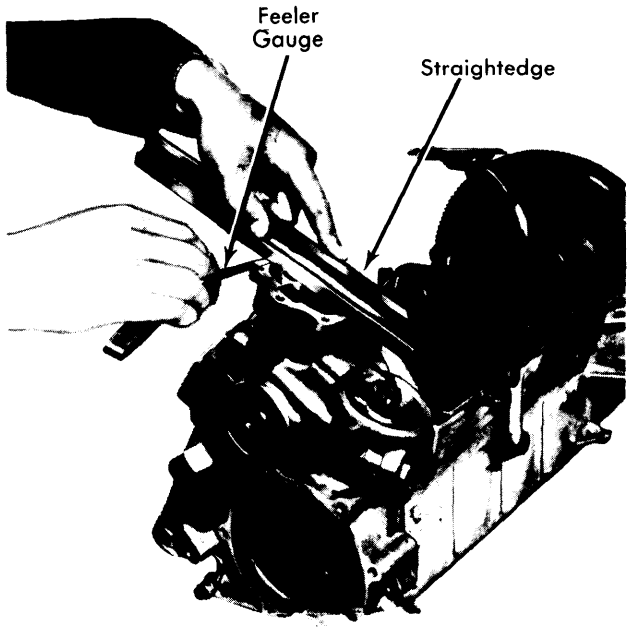


*Fig. 6 Measuring Oil Pump Gear End Clearance*

## 1900 CC 4 CYLINDER (Cont.)

### 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 cre 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.

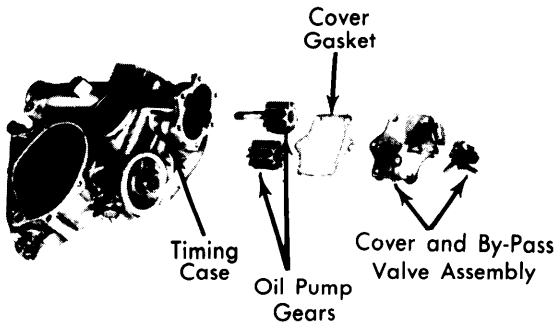


*Fig. 7 Disassembled View of Oil Pump*

## 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 | 33(4.6) |
| Crankshaft Main Bearing Bolts | 73(10.1) |
| Flywheel-to-Crankshaft Bolts | 43(5.9) |
| Cylinder Head Bolts | 72(10.0) |
| Camshaft Sprocket Bolts | 18(2.5) |
| Crankshaft Pulley Bolts | 72(10.0) |
| Rocker Arm Stud | 25(3.5) |
| Timing Chain Cover | 11(1.5) |
| Water Pump-to-Timing Chain Cover | 11(1.5) |
| Engine Supports | 33(4.6) |
| Manifold-to-Cylinder Head | 29(4.0) |