## 18R-C 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 |
| 1974 | 120 | 1968 | 1x2-Bbl. | 97@5500 | 106@3600 | 8.5-1 | 3.48 | 88.5 | 3.15 | 80 |

### ENGINE IDENTIFICATION

Engine number is stamped on left side of cylinder block below number one spark plug. First group of numerals and letters designates engine type.

| Application | Engine Code |
|---|---|
| 1968 cc | 18R-C |

### ENGINE REMOVAL

1) Drain coolant and engine oil, disconnect battery cables. If equipped with auto. trans., drain fluid. Unscrew hinge bolts and remove hood.

2) Remove air cleaner and disconnect heater hoses, fuel lines and all engine wiring. Disconnect flexible cable to carburetor and remove bracket holding cable to cylinder head cover. Disconnect vacuum hoses to emission control and mark them for reinstallation. Make sure to disconnect throttle retard hose connection at base of carburetor.

3) Disconnect vacuum line for brake booster at intake manifold. If equipped with air conditioning, disconnect lines at compresser. Disconnect plug-in for electric clutch.

4) Remove baffle between radiator and front suspension to gain access to lower radiator hose and auto. trans. hoses. Remove radiator and auto. trans. cooler hoses. Remove fan shrouds and grille, radiator baffle, and radiator. Remove condenser lines and condenser.

5) Remove hood lock support, disconnect clutch hose bracket (if equipped). Remove front engine mount attaching bolts. Engine will rest on mounts.

6) Disconnect exhaust pipe from exhaust manifold and disconnect support bracket from side of transmission. Remove clutch cylinder (if equipped). Remove support bracket for parking brake equalizer.

7) Disconnect speedometer drive cable, transmission linkage and driveshaft. Remove rear engine support after placing jack under engine and removing engine mounting bolts and crossmember. Engine will rest on jack. Remove engine using engine hoist. To install, reverse removal procedure.

### INTAKE & EXHAUST MANIFOLDS

**Removal** – 1) Disconnect battery and remove air cleaner. Remove fuel line, vacuum hoses, automatic choke line and PCV hose. Remove throttle rod, carburetor and heat insulator.

2) Raise and support front end of vehicle. Separate exhaust pipe at manifold. Remove manifold bolts, loosening gradually, and remove intake and exhaust manifold assembly. Manifolds may now be separated.

**Installation** – Thoroughly clean all gasket surfaces and install new gaskets. Install manifold assembly and gradually tighten bolts working from center out.

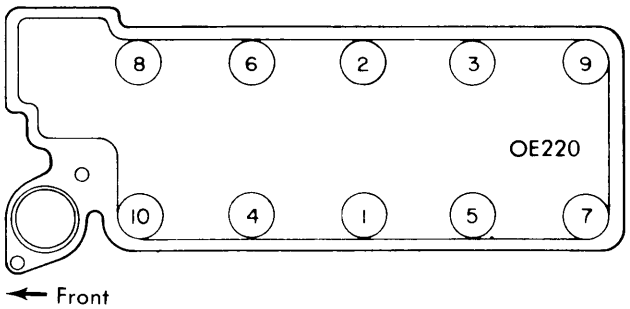
### CYLINDER HEAD

**Removal** – 1) Disconnect battery and remove air cleaner. Drain cooling system and remove radiator and heater hoses. Remove spark plug wires and vacuum lines. Remove fuel lines, throttle linkage and carburetor.

2) Remove manifolds. *See Intake & Exhaust Manifolds.* Remove cylinder head cover and rocker shaft oil delivery pipe. Remove rocker shaft assembly. *NOTE – Loosen rocker shaft bolts gradually working towards center.*

3) Remove timing chain gear from camshaft. Remove camshaft bearing caps and remove camshaft. Remove timing chain gear from timing chain. Remove cylinder head bolts, loosening in sequence gradually, in two or three steps. Lift and remove cylinder head.

**Installation** – Apply liquid sealer around oil holes in block and in areas where front cover and cylinder block meet. Install new gasket. *CAUTION – Do not slide cylinder head on block as locating dowels may cause damage to gasket surface.* Install cylinder head and tighten cylinder head bolts in sequence, taking two or three steps. Reverse removal procedure for remaining components. *See Camshaft.*




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) |
|---|---|---|---|---|---|---|---|
| 18R-C | | | | | | | |
| Intake | 1.687-1.699 (42.85-43.15) | 45° | 45° | .05-.06 (1.2-1.6) | .3138-.3146 (7.97-7.99) | .0010-.0024 (.025-.060) | ..... |
| Exhaust | 1.411-1.423 (35.85-36.15) | 45° | 45° | .05-.06 (1.2-1.6) | .3134-.3142 (7.96-7.98) | .0014-.0028 (.035-.070) | ..... |

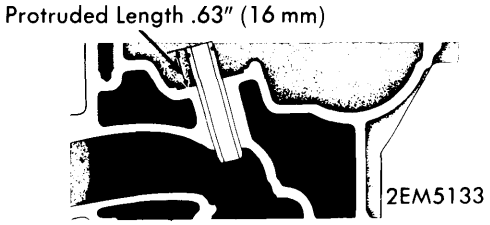
## 18R-C 4 CYLINDER (Cont.)

### VALVE ARRANGEMENT

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

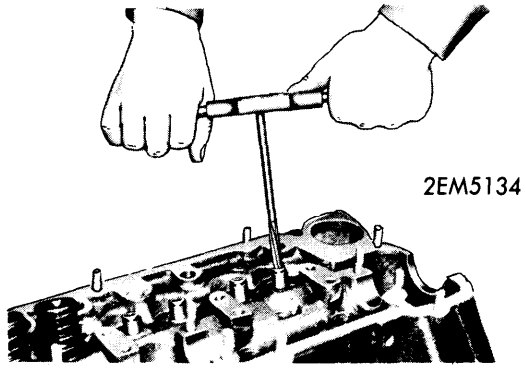
### VALVE GUIDE SERVICING

1) Measure clearance between valve stem and valve guide. If clearance exceeds .003" for intake or .004" for exhaust valve guide must be replaced. Drive valve guide down through combustion chamber using suitable tool (09201-60010).




VALVE GUIDE INSTALLATION

2) Drive in new valve guide in same direction. Valve guide should project .63" above cylinder head. New valve guide should be reamed for proper clearance.




VALVE GUIDE REAMING

### VALVE STEM OIL SEALS

1) Using a suitable spring compressor, remove valve keepers. Withdraw spring retainer and springs. Remove valve stem oil seal from end of valve guide.

2) Slide a new oil seal over valve stem, using care not to damage seal as it passes over keeper grooves. Force seal over end of valve guide. Reverse removal procedure for remaining components.

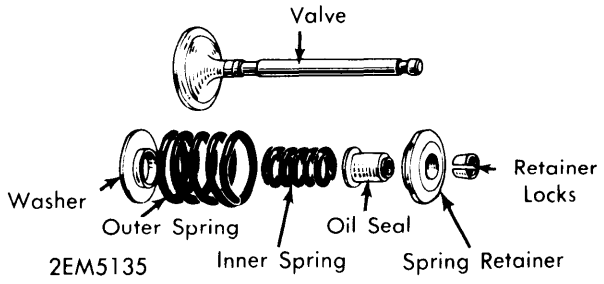
**VALVE SPRINGS**

| Engine | Free Length In. (mm) | PRESSURE (LBS.) Lbs. @ In. (kg @ mm) | |
|---|---|---|---|
| | | Valve Closed | Valve Open |
| 18R-C<br>Inner | 1.74<br>(44.1) | 16.8@1.44<br>(7.6@36.7) | ..... |
| Outer | 1.83<br>(46.5) | 57.8@1.61<br>(26.2@40.8) | |

### VALVE SPRING

**Removal** – Remove cylinder head. Using suitable valve spring compressor, compress valve spring and remove valve keepers. Release spring compressor and remove spring retainer and valve springs.

**Installation** – Install new oil seal and compress valve springs. Install remaining components in reverse of removal.

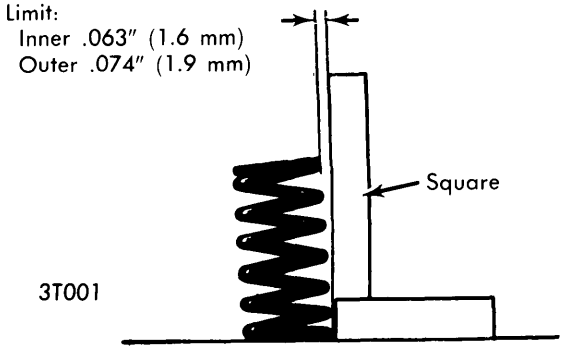



VALVE ASSEMBLY

### VALVE SPRING INSTALLED HEIGHT

1) With valve spring removed, check length under specified load in a spring tester. Check valve spring free length, if less than specified, replace spring.

2) Check valve spring squareness with a steel square. If spring is out of square more than specified, replace spring.



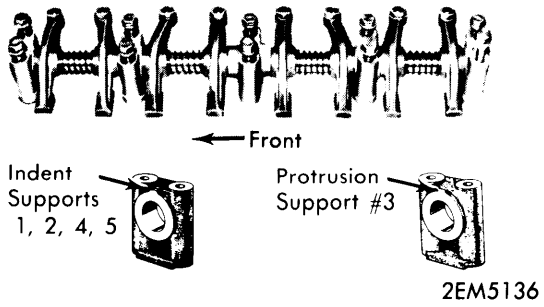

VALVE SPRING SQUARENESS LIMIT

### ROCKER ARM ASSEMBLY

1) To disassemble rocker arm assembly, remove retaining screw. *NOTE – There are three types of rocker shaft supports and three types of rocker arms. Mark in order for correct reassembly.* Remove support bolts, rocker arms, and tension springs from rocker shaft.

2) Inspect clearance between rocker shaft and rocker arm bushings. If clearance exceeds .003" bushings must be replaced. Assemble rocker arm assembly in reverse of removal and install on cylinder head. Tighten bolts gradually from center towards ends.

## 18R-C 4 CYLINDER (Cont.)




**ROCKER SHAFT ASSEMBLY**

### VALVE CLEARANCE ADJUSTMENT

Valve clearance may be set hot or cold; however, cold setting should be used as a preliminary setting value. Position No. 1 piston at TDC of compression stroke (valves 1 & 2 closed), and adjust valves 1, 2, 3 and 5. Rotate crankshaft one complete turn, align TDC mark with pointer, and adjust valves 4, 6, 7 and 8.

**Valve Clearance Adjustment**

| Valve | Hot In. (mm) | Cold In. (mm) |
|---|---|---|
| Intake | .008 (.20) | .007 (.18) |
| Exhaust | .014 (.36) | .013 (.33) |

**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) |
| 18R-C | .002-.003 (.05-.07) | Press Fit ① | .0002-.0004 (.005-.011) ② | No. 1 | .004-.012 (.10-.30) | .001-.003 (.03-.07) |
| | | | | No. 2 | .004-.12 (.10-.30) | .001-.003 (.03-.07) |
| | | | | Oil | ..... | ..... |

① — Push fit with piston heated to 176°F (80°C).
② — Push fit with piston at room temperature.

### OIL PAN REMOVAL

1) Drain engine oil. Disconnect steering relay rod, tie rods from steering idler arm, pitman arm and knuckle arm. Remove front motor mount retaining bolts.

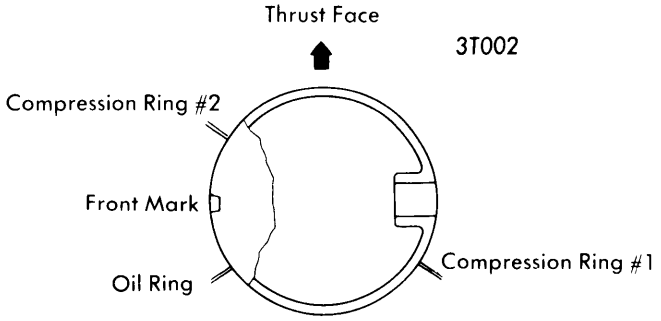
2) Using engine hoist, raise front of engine a small amount to gain access to oil pan attaching bolts. Remove oil pan bolts and remove oil pan. To install, reverse removal procedure.

*NOTE — Apply liquid sealer to four corners of oil pan gasket where front cover and rear seal retainer join cylinder block.*

### PISTON & ROD ASSEMBLY

**Removal** — Remove connecting rod caps and remove bearings. Push piston and rod assembly up through cylinder head side. Mark all components with cylinder numbers for correct reassembly.

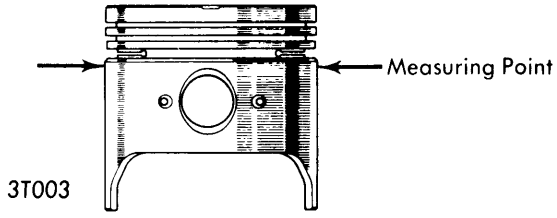
**Installation** — 1) Apply oil to piston and piston rings. Install compression rings so stamped code on side of ring faces upward. Position piston ring gaps as shown in illustration. Using suitable ring compressor, install piston and rod assembly in cylinder. Make sure indent on piston faces forward.




**PISTON RING GAP ARRANGEMENT**

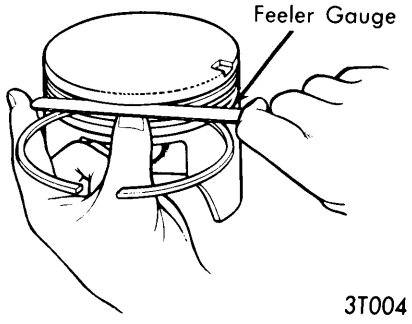
### FITTING PISTONS

1) Measure clearance of piston in cylinder. If clearance exceeds .008" cylinders must be bored for oversize pistons.




**PISTON MEASURING POINT**

2) Measure piston ring end gaps in cylinder. If cylinder has not been bored, check gap with ring in lowest part of cylinder. Check clearance of piston ring in ring groove.




**MEASURING RING CLEARANCE**

## 18R-C 4 CYLINDER (Cont.)

### PISTON PINS

**Removal** – Remove circlips, heat piston to 176°F (80°C) and push piston pin out of piston and connecting rod. Piston pin should push through connecting rod with thumb pressure when rod is at 68°F (20°C).

**Installation** – Install one circlip in piston and heat piston to 176°F (80°C). Position piston and connecting rod so mark on rod and indent on piston face same direction. Push piston pin into piston and rod assembly and replace remaining circlip. Circlips should be inserted with open end down.

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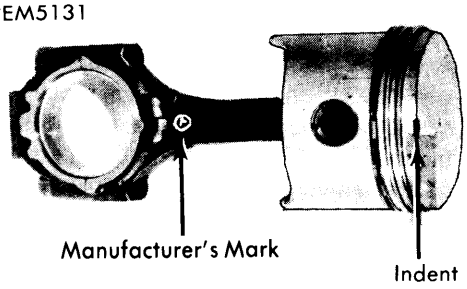



**PISTON & ROD ASSEMBLY**

**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) |
| 18R-C | 2.3613-2.3622 (59.976-60.000) | .0006-.0016 (.016-.040) | Center | .001-.008 (.02-.20) | 2.0857-2.0866 (52.976-53.000) | .0007-.0019 (.024-.048) | .006-.010 (.16-.26) |

### MAIN & CONNECTING ROD BEARINGS

1) Check crankshaft for bend. If bend exceeds .002" correct or replace crankshaft. Inspect all journals for wear or scoring. Check for out-of-round or taper, if .0004" limit is exceeded grind journals for undersize bearings.

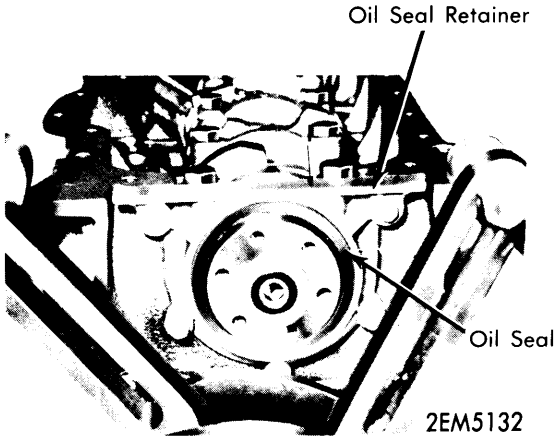
2) Measure bearing clearances using Plastigage method. If clearance exceeds limit of .003" (.08 mm), grind journals for undersize bearings. Both main and connecting rod bearings are available .010" (.25 mm), .020" (.50 mm), .030" (.75 mm), and .040" (1.00 mm) undersize.

### THRUST BEARING ALIGNMENT

Check crankshaft thrust clearance at thrust bearing using feeler gauge. If clearance exceeds limit of .012" replace all main bearings as a set.

### REAR MAIN BEARING OIL SEAL

With rear main bearing oil seal retainer removed, pry out old seal. Using suitable tool (09223-41010) drive oil seal in place. After installing new seal, coat seal lip lightly with multi-purpose grease.




**REAR OIL SEAL & RETAINER**

### ENGINE FRONT COVER OIL SEAL

With engine front cover removed, pry out old seal toward front side. Using suitable tool (09223-50010), drive seal into place. After installing new seal, coat seal lip lightly with multi-purpose grease.

**CAMSHAFT**

| Engine | Journal Diam. In. (mm) | Clearance In. (mm) | Lobe Lift In. (mm) |
|---|---|---|---|
| 18R-C | 1.3768-1.3778 (34.972-34.996) | .0005-.0014 (.012-.036) | Int. .317 (8.04) Exh. .319 (8.10) |

### TIMING CHAIN

**Removal** – 1) Remove cylinder head. See *Cylinder Head Removal*. Remove crankshaft pulley bolt and remove pulley. Remove oil pan, oil pump and timing chain cover.

2) Remove upper timing chain. Using suitable puller (09213-36010) remove camshaft drive gear. Remove both chain tensioners keeping parts separate to prevent mixing.

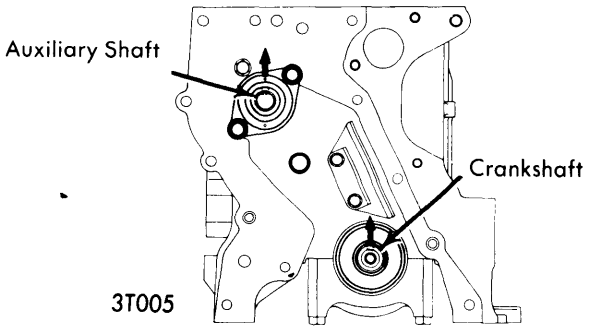
3) Using suitable puller, remove crankshaft timing gear and auxiliary shaft driven gear along with timing chain. Use puller on each gear alternately to remove uniformly. *NOTE – Both upper and lower timing chains are identical. Mark and install in original position.*

*NOTE – If upper chain tensioner is disassembled, sealer must be applied to bolt attaching chain guide to tensioner.*

**Installation** – 1) Position keyway in crankshaft upward with number one piston at TDC. Position auxiliary shaft key upward. Assemble lower timing chain on crankshaft and auxiliary shaft driven gears, aligning marks on chain with marks on gears.

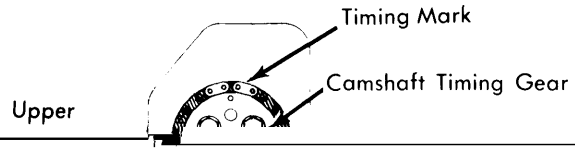
## 18R-C 4 CYLINDER (Cont.)

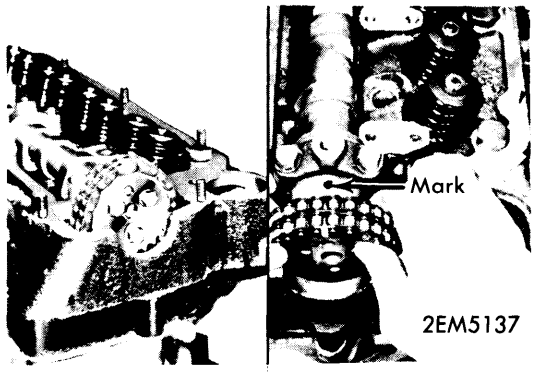
**2)** Install gears and chain assembly on shafts together. *NOTE — Do not force auxiliary shaft driven gear or plug at rear of auxiliary shaft may be loosened.*




**SHAFT ALIGNMENT**

**3)** Install engine front cover gasket. Install upper and lower chain tensioners. *NOTE — Three chain tensioner bolts have oil holes and must be installed in proper location. See illustration.*




**TIMING GEAR INSTALLATION**

### TIMING CHAIN TENSIONER & CHAIN GUIDE

**1)** Inspect surfaces of tensioner plunger and bore of tensioner body. To test clearance, lubricate plunger and insert it into plunger body. Cover oil passages with fingers and pull plunger about half way out. Vacuum strong enough to return plunger should be felt.

**2)** Measure thickness of tensioner heads and chain guide walls. Head should be minimum .453" (11.5 mm) and chain guide walls should be minimum .020" (.50 mm).

*NOTE — If upper chain tensioner is disassembled, liquid sealer*

## 18R-C 4 CYLINDER (Cont.)

### AUXILIARY SHAFT

1) With timing chains removed, remove auxiliary shaft thrust plate and pull out shaft. Inspect auxiliary shaft for straightness and replace if bent. Inspect oil pump drive gear and fuel pump cam, and replace shaft if excessively worn.

2) Measure clearance in bearings. If clearance exceeds .003" (.08 mm), replace bearings. Standard clearance is .001-.003" (.03-.07 mm). Measure thrust clearance with feeler gauge between thrust plate and first bearing. If clearance is over .012" (.30 mm), replace thrust plate. Standard clearance is .002-.005" (.06-.13 mm).

### VALVE TIMING

Valve timing is determined by the relationship between the camshaft and the crankshaft. Turn crankshaft to position No. 1 piston at TDC. (Align mark on crankshaft with pointer on chain cover.) Turn camshaft to locate dowel pin and stamped mark on camshaft at 12 o'clock position. Install timing gear and chain on camshaft. A locating pin may be needed to stretch chain and a hammer may be needed to drive on gear. Tighten timing gear bolts to 7.3-11.6 ft. lbs.

**VALVE TIMING**

| Engine | INTAKE | | EXHAUST | |
|---|---|---|---|---|
| | Open (BTDC) | Close (ABDC) | Open (BBDC) | Close (ATDC) |
| 18R-C | 20° | 48° | 56° | 12° |

## ENGINE OILING

**Crankcase Capacity** – 4.3 qts. on Corona and Pickup, 3.6 qts. on Celica. Add 1 qt. with filter on all models.

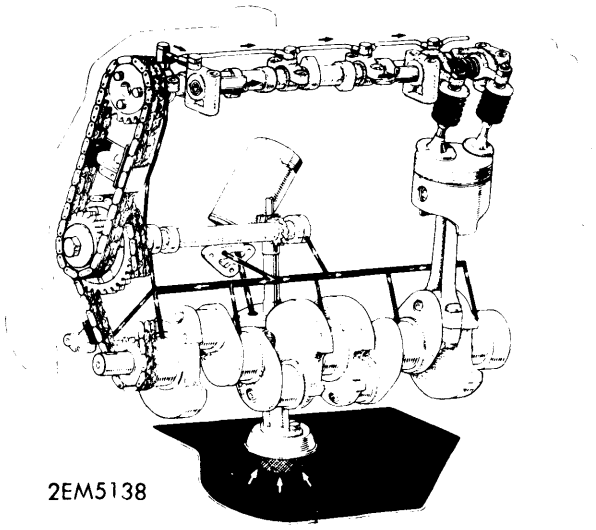
**Normal Oil Pressure** – 56.9 psi.

**Pressure Relief Valve** – 50-65 psi (3.5-4.5 kg/cm²) operating pressure.

**Oil Filter** – Full-flow type with paper elements. By-pass valve opening pressure is 11.4-17.1 psi. Located on right side of engine.

### ENGINE OILING SYSTEM

Forced feed oiling system utilizing a rotor-lobe type oil pump driven by distributor shaft. Oil from oil pan is pumped through a full flow oil filter and then to oil galleries in cylinder block. Oil is fed to crankshaft main bearings, timing chain assembly, and oil pump drive shaft. It is then channeled to camshaft and rocker arm assembly.




**ENGINE OILING SYSTEM**

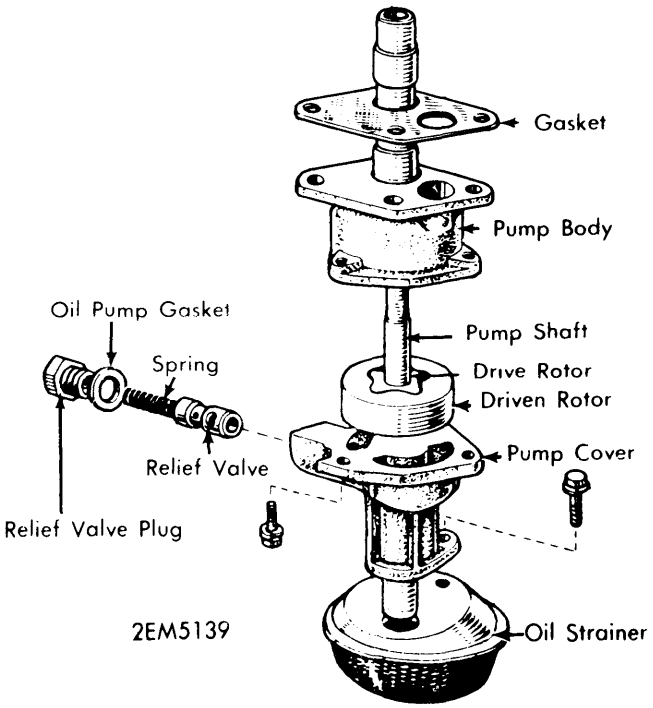
down to disengage from distributor drive shaft. Discard old gasket. To install, reverse removal procedure.

### OIL PUMP

*NOTE – Engine must be raised above front mounts and oil pan must be removed to gain access to oil pump.*

1) Remove oil drain plug and drain engine oil. Disconnect steering relay rod, tie rods from steering idler arm, pitman arm and knuckle arms (if necessary). Remove front motor mount bolts.

2) Lift engine slightly with engine hoist to gain access to oil pan bolts. Remove bolts and oil pan. Remove three screws and lockwashers that hold oil pump to block. Pull oil pump straight




**OIL PUMP**

## 18R-C 4 CYLINDER (Cont.)

### ENGINE COOLING (Cont.)

#### OIL PUMP CHECKING

1) Disassemble oil pump and check for wear or damage. Measure diameter of drive rotor. If rotor diameter is less than 1.403", replace drive rotor and driven rotor as a set.

2) Measure diameter of driven rotor. If diameter less than 1.967", replace drive rotor and driven rotor as a set. Measure tip clearance between drive rotor and driven rotor. If clearance exceeds .008", replace drive rotor and driven rotor as a set.

3) Measure side clearance between rotors and mating surface of pump cover. If clearance exceeds .006", replace rotors. Measure clearance between driven rotor and pump body. If clearance exceeds .008", replace pump body.

4) Check relief valve spring for stretch. If free length of spring is more than 1.85", replace spring. Make sure that all oil passages in pump body are clear. When replacing rotors in pump make sure that marks on each rotor are in alignment.

### ENGINE COOLING

**Thermostat** – Starts to open at 177-182°F. Fully open at 203°F.

**Cooling System Capacity** – 2.1 gals. on Corona and Celica. 2.25 gals on Pickup.

#### THERMOSTAT REMOVAL

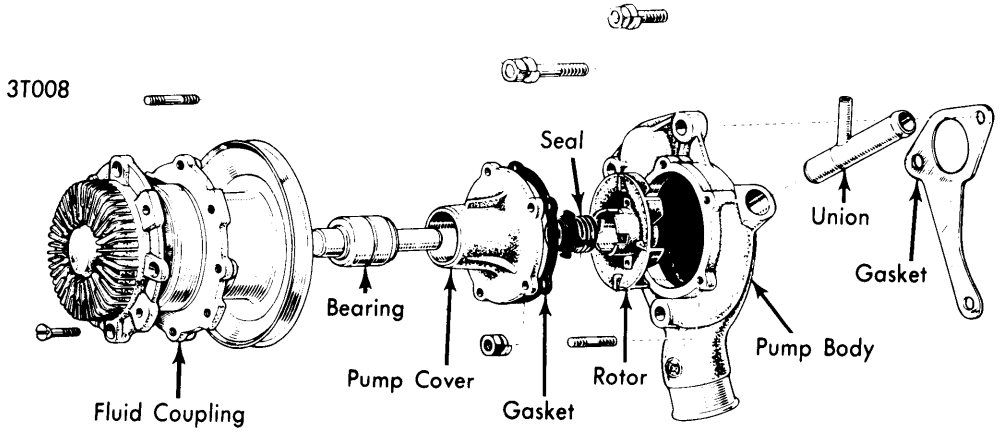
Drain cooling system and remove water outlet-to-radiator hose. Remove water outlet. Lift out thermostat from recess in cylinder head.

#### WATER PUMP REMOVAL

Drain cooling system and remove fan shroud, fan belt tensioning bar, fan belt, heater hose, and by-pass hose. Remove water pump bolts and remove water pump, fan, and fluid coupling assembly. Discard gasket. To install, reverse removal procedure using new gasket.

**TIGHTENING SPECIFICATIONS**

| Application | Ft. Lbs. (mkg) |
|---|---|
| Cylinder Head Bolts | 72-87 (10-12) |
| Main Bearing Cap Bolts | 69-83 (9.5-11.5) |
| Connecting Rod Cap Bolts | 39-48 (5.4-6.6) |
| Camshaft Bearing Cap Bolts | 12-17 (1.7-2.3) |
| Timing Chain Cover | 11-15 (1.5-2.1) |
| Axuiliary Shaft Thrust Plate | 11-15 (1.5-2.1) |
| Chain Tensioner Bolts (Upper) | 22-29 (3.0-4.0) |
| Chain Tensioner Bolts (Lower) | 14-22 (2.0-3.0) |
| Crankshaft Pulley | 72 (10) |
| Camshaft Gear | 12-17 (1.7-2.3) |
| Rocker Shaft Support | 12-17 (1.7-2.3) |
| Rocker Shaft Oil Pipe | 12-17 (1.7-2.3) |
| Manifolds | 30-35 (4.2-4.8) |
| Oil Pan | 3-5 (0.4-0.8) |
| Flywheel-to-Crankshaft | 51-58 (7.0-8.0) |
| Oil Pump Mounting Bolts | 11-15 (1.5-2.1) |




**WATER PUMP ASSEMBLY**