

## 4.5 LITER V8

### ENGINE CODING

#### ENGINE IDENTIFICATION

Identification number is located on tag attached to engine crankcase. First six digits of code are used to identify engine, as follows:

| Application   | Chassis Type  | Engine Code |
|---------------|---------------|-------------|
| 450 SLC ..... | 107.024 ..... | 117.985     |
| 450 SL .....  | 107.044 ..... | 117.985     |
| 450 SEL ..... | 116.033 ..... | 117.986     |

### ENGINE, CYLINDER HEAD & MANIFOLD

#### ENGINE

**Removal** – 1) Remove head and drain cooling system. Note that there are both left and right engine block drains. Disconnect and remove battery and remove battery frame. Evacuate air conditioning system and remove pipe set at compressor. Disconnect and remove all water, vacuum, oil, fuel and electric lines leading to engine.

2) On 450 SEL, disconnect exhaust system and remove right drag link end from ball head. On 450 SL and 450 SLC, completely remove exhaust system. On all models, drain power steering reservoir and disconnect hoses. Unscrew TDC test socket and remove cable for TDC transmitter.

3) Remove left and right engine shock absorbers. Attach engine sling and hoist to engine and remove engine mount bolts. Remove rear engine carrier with engine mount. Loosen and disconnect driveshaft from transmission. Remove linkages connecting transmission to chassis and lift engine out (with transmission attached) at a 45° angle.

**Installation** – Ensure that oil cooler and all hoses have been flushed and are free from contamination. Renew engine mounts and components as required and reverse removal procedure. Evacuate and charge air conditioning system and check entire installation for leaks.

#### INTAKE MANIFOLD

Drain cooling system and remove air cleaner. Disconnect fuel injection linkage and fuel lines on pressure regulator. Disconnect fuel start valve. Remove ignition valves. Extract intake manifold bolts and lift manifold off in rearward direction. To install, reverse removal procedure.

#### CYLINDER HEAD

**NOTE** – Cylinder head removal should not be attempted until engine has cooled down. Several specially shaped Allen wrenches are required for cylinder head bolt removal and replacement.

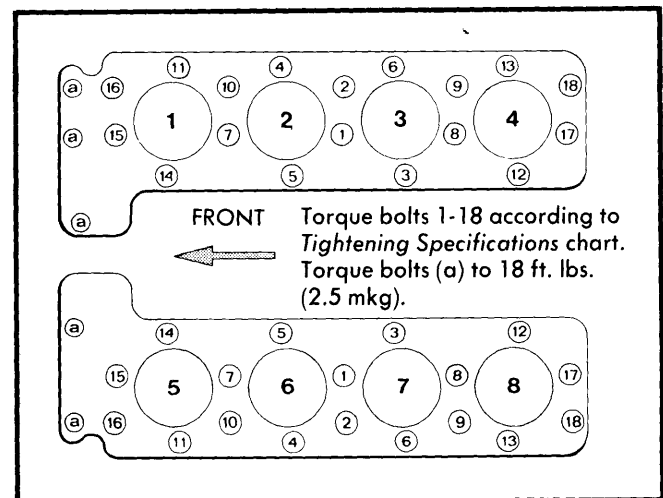
**Removal** – 1) Remove left and right drain plugs and drain cooling system. Remove air cleaner and battery. Remove fuel line and injection valves. Disconnect fuel injection linkage.

2) Disconnect and remove intake pipe (manifold). Remove A/T fluid filler pipe from attachment to cylinder head. Remove alternator and mounting bracket. Remove distributor and power steering pump with mounting bracket.

3) Disconnect exhaust pipe from manifold and exhaust gas return line at 90° fitting. Remove chain tensioner and slide rails. Mark camshaft sprocket and timing chain position for assembly reference. Remove sprocket from camshaft. Using specially shaped Allen wrenches, remove head bolts and lift off head.

**Installation** – 1) Ensure that all mating surfaces are clean and install new cylinder head gasket. Tighten cylinder head bolts in sequence shown to 22 ft. lbs. (3 mkg), and then to 43 ft. lbs. (6 mkg). Tighten 8 mm bolts to 18 ft. lbs. (2.5 mkg).

2) Complete assembly in reverse order of removal and run engine until normal operating temperature is reached. Slightly loosen head bolts individually, then retighten in sequence shown to final warm torque of 43 ft. lbs. (6 mkg).



**Fig. 1 Cylinder Head Tightening Sequence (Loosen in Reverse Order)**

#### CAMSHAFT

**Removal** – With cylinder head covers removed, set No. 1 piston at TDC firing position and remove rocker arms. Mark sprockets and timing chain for reassembly. Remove camshaft sprockets. Unbolt and remove camshaft bearings, oil tube and camshaft as an assembly.

**Installation** – 1) Assemble bearings on camshaft. Note that smooth bearing journals must fit in bearings with an oil groove, and camshaft journals with an oil groove fit only in bearings WITHOUT an oil groove.

2) Place camshaft and bearing assembly on head. Note that outer screw of left camshaft rear bearing must be inserted in bearing prior to mounting due to interference from brake unit. Oil pipe connections on bearings must be renewed to ensure proper oil pressure.

## 4.5 LITER V8 (Cont.)

3) Tighten camshaft bearing mounting screws and check that camshaft rotates freely. Mount compensating washer so that both inner and outer notches align with Woodruff key in camshaft. Assemble sprockets to camshaft so that white color faces camshaft and timing marks are aligned.

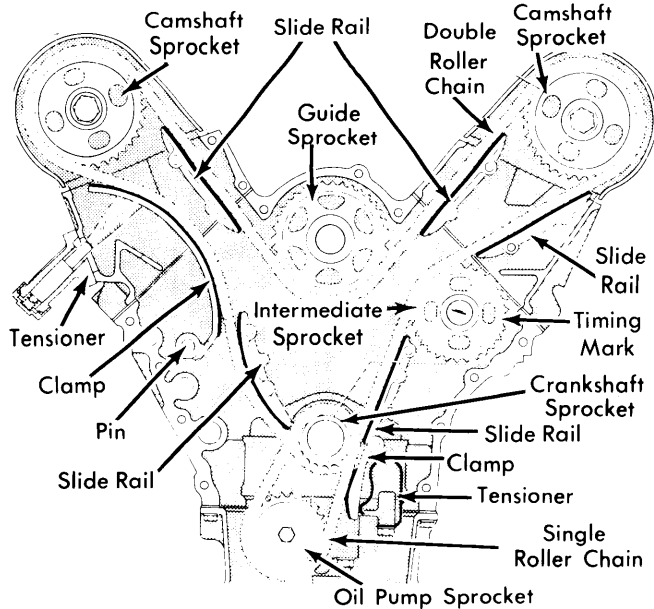


Fig. 2 Timing Chains and Sprockets

4) Install rocker arms and check basic clearance of lifters. Complete assembly in reverse order of removal.

**NOTE** — Whenever it is necessary to install either new rocker arms or camshaft, both rocker arms and camshaft must be replaced. Camshaft journals may be reground and undersize bearings installed.

## DISTRIBUTOR DRIVE GEAR

1) With timing and crankshaft chains exposed, disconnect all chain dampers (slide rails) and timing chain tensioner. Remove chain from intermediate sprocket and pull sprocket from engine.

2) Use suitable puller to extract bushing from crankcase and cover. Press new bushings in position so that lubricating groove is at bottom. Lubricate bushings and install intermediate sprocket. Note that mark on sprocket must align with mark on crankcase with engine at TDC position. Continue assembly in reverse order of removal.

## CHAIN TENSIONER

**NOTE** — In all instances chain tensioner is lubricated and connected to oiling circuit.

1) Remove air injector pipe and 3 screws fastening tensioner. Remove chain tensioner.

2) To check tensioner, place in container of oil vertically so that oil covers flange. Actuate plunger to fill tensioner with oil. After filling and venting, plunger should allow compression very slowly and evenly, and with considerable force.

3) To install, use new gasket and tighten screws evenly. Pressure pin of tensioner must press against lug of tensioning rail.

## VALVE TIMING

1) Measure timing periods on inlet valves of cylinder 1 and 6. Remove hydraulic valve lifters and replace with adjusting screws (116 050 11 20). Adjust each screw so rocker arm just touches the base circle of the cam.

2) Attach dial indicator so that pointer rests vertically on valve spring retainer. Pin should have .118" (3 mm) preload and dial should be set to zero.

3) Turn engine in direction of normal rotation until pointer moves .0787" (2 mm), leaving a preload of .039" (1 mm). Readings should be in accordance with valve timing chart. Repeat for No. 6 intake valve.

4) If timing requires correction, install an offset Woodruff Key or new chain. Keys are available in four offsets providing corrections of 4°, 6½°, 8°, and 10°.

5) After checking and adjusting valve timing, reinstall hydraulic lifters and adjust for proper base setting. See **ADJUSTING LIFTERS TO BASE SETTING**.

## VALVES

## VALVE ARRANGEMENT

Right Bank — E-I-E-I-E-I-I-E (front to rear).

Left Bank — E-I-I-E-I-E-I-E (front to rear).

## HYDRAULIC VALVE LIFTERS

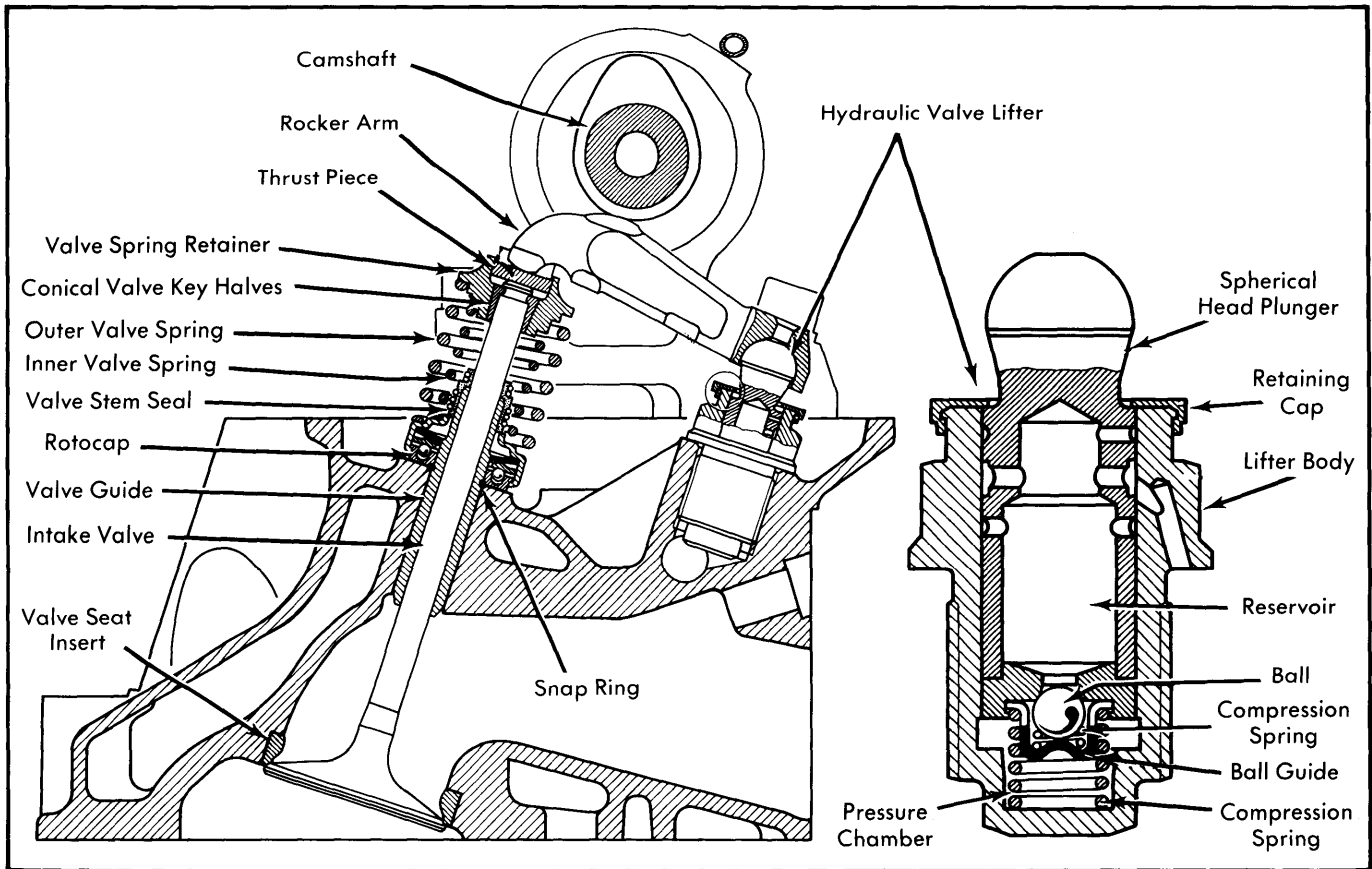
1) Hydraulic valve lifters eliminate the need to adjust valve clearance. Constant contact of rocker arms with camshaft, valves and lifters not only reduces noise, but also compensates for wear or temperature changes.

2) Oil pressure to operate the lifters is supplied by the oil pump through a lateral passage in the cylinder head (with connecting bores to each lifter) and an oil passage in the fifth camshaft bearing. The spherical head plunger contains an oil reservoir, which is separated from the pressure chamber by a ball valve.

3) When engine is stopped and cam lobe exerts pressure on the valve lifter, the plunger can be completely depressed. Oil from pressure chamber flows to reservoir. Turning cam lobe away from rocker arm releases plunger and compression spring pushes it upward until rocker arm rests against cam. Upward plunger movement causes a suction in the pressure chamber, causing oil to flow from reservoir to chamber.

4) The ball valve closes when the cam lobe exerts pressure on rocker arm. Trapped oil in pressure chamber forms a solid hydraulic connection which prevents the plunger from moving fully downward. Leak-off vents permit air and excess oil to escape.

## 4.5 LITER V8 (Cont.)



**Fig. 3** Cutaway View of Valve System and Lifter

5) To check hydraulic compensating element (lifter) performance, press on rocker arm at lifter end with valve in closed position. If pressure bleeds off too rapidly in comparison with other elements, replacement is required. If lifters are removed, they should be stored in an upright position and reinstalled in original location.

mm) outside diameter. Exhaust valve guides are available with outside diameters of .591-.608" (15.014-15.431 mm).

4) Heat cylinder head to approximately 194° F (90° C) and cool valve guides (if possible). Coat guide bore with oil and, using remover/installer mandrel, seat new guide in bore.

**NOTE** — Be sure snap ring is properly installed. Recheck valve guide clearance and that valve moves freely in guide.

### VALVE GUIDE SERVICING

1) With cylinder head removed and suitably supported, clean bores of valve guides. Hard oil carbon deposits can be eliminated with a honing needle.

2) Using a suitable plug gauge, inspect valve guides. Inner diameter of new inlet guides should be .354-.355" (9.000-9.015 mm); exhaust guides should be .433-.434" (11.000-11.018 mm). If guide is beyond this tolerance, replace with new guide.

3) With suitable reamer/installer mandrel, drive worn guide from its bore. Inspect valve guide bore in cylinder head and ream to accept next oversize guide.

**NOTE** — Replacement Inlet valve guides are available in overlapping sizes, ranging from .552-.568" (14.014-14.431



**Fig. 4** Removing Conical Valve Key Halves (Keepers)

## 4.5 LITER V8 (Cont.)

## VALVE STEM SEALS

**Removal** — Using spring compressor (116 589 00 61 00), remove rocker arms. See Fig. 3. Lift out thrust plate, and using special magnet (116 589 06 63 00), remove conical valve key halves (keepers). Remove spring retainer, inner and outer valve springs, valve stem seals and rotocaps.

**Installation** — Replacement valve stem seals are supplied in a kit which includes assembly sleeves. Place sleeve over stem and install lubricated seal with installing tool. See Fig. 4. Install remaining components in reverse order of removal.

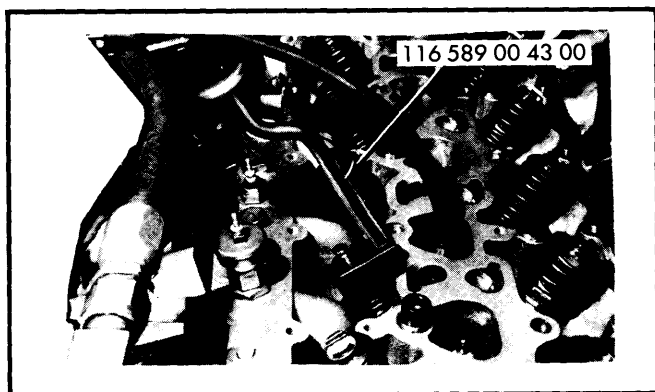


Fig. 5 Installing Valve Stem Seal

## VALVE SEAT RING

1) Check valve guide prior to removing seat ring. See *Valve Guide Servicing*. If seat ring is worn, carefully remove it by machining with a valve seat ring turning tool.

2) Thoroughly clean the receiving bore and check its diameter. If diameter is within specifications, install a new valve seat ring of the same size. If diameter is not within specification, 1.811-1.812" (46.0-46.02 mm) for intake or 1.575-1.576" (40.0-40.01 mm), machine bore to next oversize.

3) To install, heat cylinder head in water to approximately 140° F (60° C). Place pre-cooled seat ring into bore. To position seat ring, lightly tap ring, using a suitable mandrel and hammer. Machine valve seat to correct width and correct for runout. Do NOT machine rounded bead on lower part of valve seat. Valve seat runout should not exceed .0016" (.04 mm).

## ROCKER ARMS

1) Rocker arms are individually-mounted on the 16 valves, without use of a shaft. They are in constant contact with the camshaft, thrust plates above the valve stems, and hydraulic valve lifters. To remove, compress spring on each valve using compressor (123 589 03 61 00). Mark each arm for installation in original position.

2) Rocker arms have a chamfer behind ball socket (lifter end). This prevents rocker arm from striking retaining cap of lifters in extreme cases. Do not use rocker arms unless they have this chamfer.

3) Whenever camshaft is replaced, new rocker arms must also be installed. Likewise, when new rocker arms are installed, replace the camshaft, as well. When making replacements, check base setting of hydraulic valve lifters using test gauge (100 589 04 23 00). Correct, as required, using new thrust piece. Thrust pieces are available in steps of .0014" (.35 mm) from .147" (3.7 mm) to .228" (5.8 mm). See *Adjusting Lifters to Base Setting*.

## ADJUSTING LIFTERS TO BASE SETTING

**NOTE** — Always keep hydraulic valve lifters in an upright position. Rocker arms and valve lifters should always be reinstalled in original locations. When checking and adjusting lifter settings, crank engine for 30 seconds with starter contact switch.

1) When replacing compensating element (hydraulic lifters) or camshaft and rocker arms, basic position of compensating element must be checked. Rotate engine so that cam lobe of element to be checked is in the upright position and install test gauge (100 589 04 23 00).

2) Set measuring pin of gauge through rocker arm hole so that it rests on ball pin of lifter. Basic position is correct when red groove of pin is aligned with measuring edge of tool. If groove is below measuring edge, a plus (+) deviation is indicated, requiring a thinner thrust piece. Entire groove showing above measuring edge indicates a minus (-) deviation and requires a thicker thrust piece.

3) To correct setting, remove rocker arm and thrust piece. Install thinner or thicker thrust piece as required and reinstall rocker arm. Repeat measuring procedure. Position is correct when center of measuring groove aligns with edge of gauge.

## PISTONS, PINS &amp; RINGS

## OIL PAN

**450 SL and 450 SLC** — 1) Remove radiator shell and shroud. Remove front axle assembly. Remove A/C compressor and mounting bracket. Remove supporting angle bracket between pan and transmission.

2) Remove oil pan bolts and lower oil pan along with dip stick guide tube from engine. To install, apply grease to clean mating surfaces and install new gasket. Place pan in position and reverse removal procedure.

**450 SEL** — 1) Remove A/C compressor and mounting bracket from engine. Remove drive belt tensioning pulley. Unbolt and remove oil pan lower half. Remove oil pump drive sprocket and mounting bolts. Remove oil pump.

2) Remove cooling fan pulley and thermostat housing cover. Knock oil pan dip stick guide tube from pan and disconnect transmission oil lines. Remove supporting angle bracket on transmission. Remove oil pan bolts and rotate crankshaft so that oil pan can be removed in a down and forward direction.

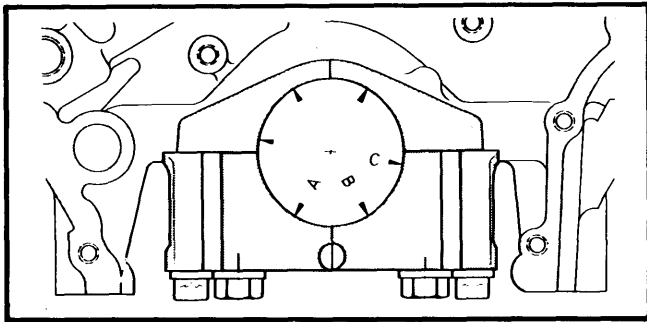
3) To install, ensure that all mating surfaces are clean and apply thin layer of grease. Use new gasket and install oil pan upper half. Continue assembly in reverse order of removal.

## 4.5 LITER V8 (Cont.)

### CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

#### MAIN & CONNECTING ROD BEARINGS

1) Mount main bearing cap to cylinder block without bearings in place. Measure inside diameter at 3 locations as illustrated. Be sure cap is properly positioned when taking reading. Offset bearing caps can be moved into center position by lightly tapping them with a plastic hammer.



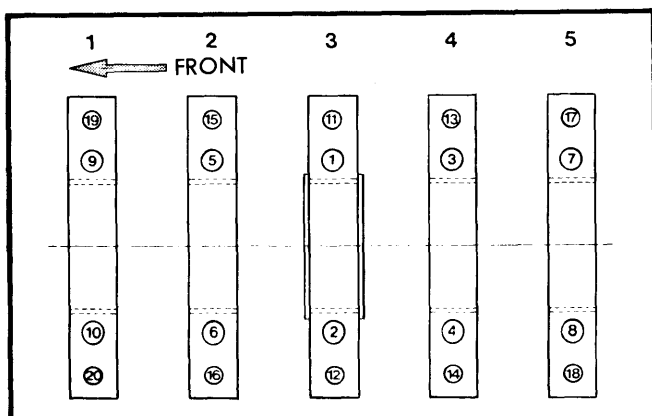
**Fig. 6 Location for Measuring Main Bearing Bore Diameter**

2) All three measurements should agree. If basic bores exceed specifications and the required overlap of bearing shell halves is not assured, remove .008" (.02 mm) from contact surfaces, using a surface plate.

3) Measure main bearing and connecting rod bearings at front and rear to check for taper. If beyond .0006" (.015 mm), remove excess material from one side of bearing cap, using surface plate.

4) Use proper bearing shells to match measurements obtained. Several overlapping bearing sizes are available. Fit bearing halves into bearing bore and tighten bolts to proper torque. Measure inner diameter of bearings and outer diameter of journals. Difference in measurements should be within bearing clearance specifications. If not, change bearing shell halves.

5) When proper clearance is calculated, clean and oil all parts and install crankshaft. Torque to specifications according to sequence.



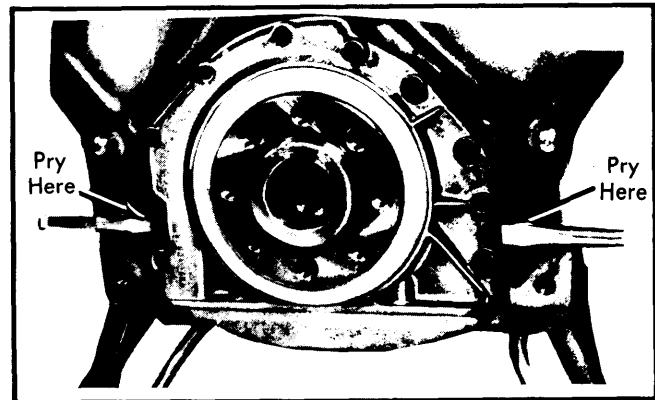
**Fig. 7 Crankshaft Main Bearing Tightening Sequence**

6) With crankshaft properly installed, check for free rotation and for proper end play. Install connecting rods.

#### REAR CRANKSHAFT SEALING RING

1) With engine removed from vehicle, unbolt and remove rear cover. Force out old sealing ring. Clean cover and sealing surfaces.

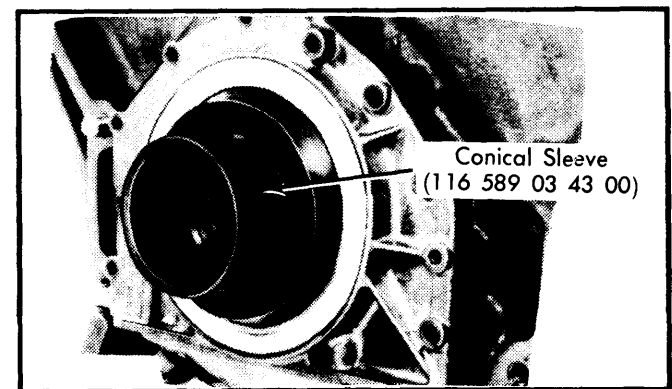
2) Check crankshaft running surface for scoring. Sealing ring with sealing lip offset inward is available in case of scored crankshaft. Press new seal into cover with suitable tool.



**Fig. 8 Removing Rear Cover and Seal**

3) Lubricate lip of seal and coat cover with sealing compound. Place conical sleeve (116 589 03 43 00) over crankshaft end and place cover in position. Use care so that pan gasket is not damaged. Tighten cover bolts evenly and install drive plate.

**NOTE** — Drive plate (flywheel) can only be mounted in one position due to offset of 1 of the 8 fastening bolts.



**Fig. 9 Installing Rear Cover and Seal**

#### FRONT CRANKSHAFT SEALING RING

**Removal** — With engine removed from vehicle. Remove all V-belts, mark hub and crankshaft with paint or chalk. Remove vibration damper, pulley and hub. Remove sealing ring, making sure that crankshaft and receiving bore are not damaged.

**Installation** — Deburr edge of receiving bore before installing new seal. Lubricate receiving bore and seal lip with oil. Install sealing ring with installation sleeve (110 589 07 61 00). Reassemble remaining components in reverse of removal procedure.

## 4.5 LITER V8 (Cont.)

### ENGINE OILING

#### ENGINE OILING SYSTEM

Lubrication is provided by a gear type oil pump directly driven by crankshaft. Oil is picked up through a strainer from lower portion of oil pan and forced to oil filter through a duct in timing casing. After passing through filter, oil flows to center main duct, to crankshaft and through rod bearings up rods to piston pin bushing. Oil galleries run to cylinder head, valve assemblies and to camshafts. Circuit also includes chain tensioner, ignition and, if applicable, air compressor.

**Oil Filter** – Disposable cartridge type. Located near front of engine.

**Normal Oil Pressure** – 7.1 psi@idle; 42.6 psi@3000 RPM.

**Over Flow Valve** – Valve is located in crankcase and enters into main oil gallery. When filter becomes severely contaminated valve will open and oil will enter in an unfiltered state.

**Crankcase Capacity** – 8.4 quarts with filter.

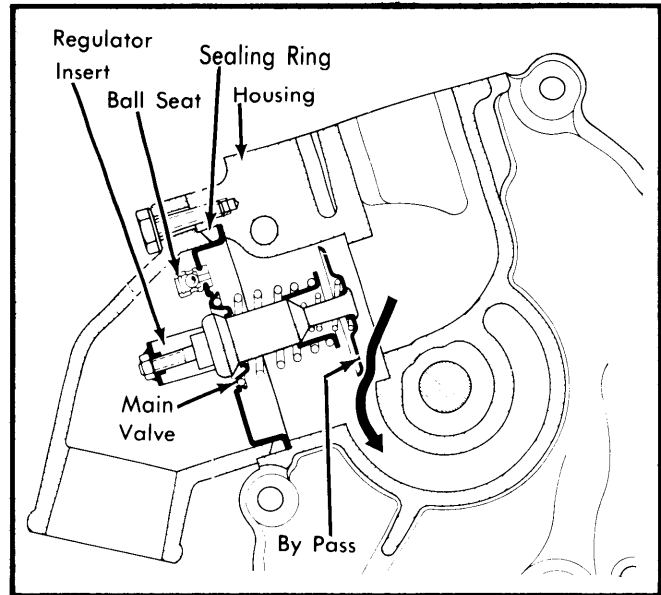


Fig. 10 Thermostat Installation

### ENGINE COOLING

#### WATER PUMP

Disconnect all necessary water hoses and any remaining components from water pump housing. Remove distributor and all mounting bolts. Remove pump from vehicle. To install, reverse removal procedure.

**Thermostat** – Located in water pump housing, as shown in illustration. To remove drain cooling system, remove air cleaner, disconnect battery and alternator. Remove housing and thermostat. When installing ensure ball valve is mounted at highest point.

**Cooling System Capacity** – 15.8 quarts.

**Thermostat** – Opens at 162-169° F (72-76° C).

**Radiator Cap** – 13-15 psi.

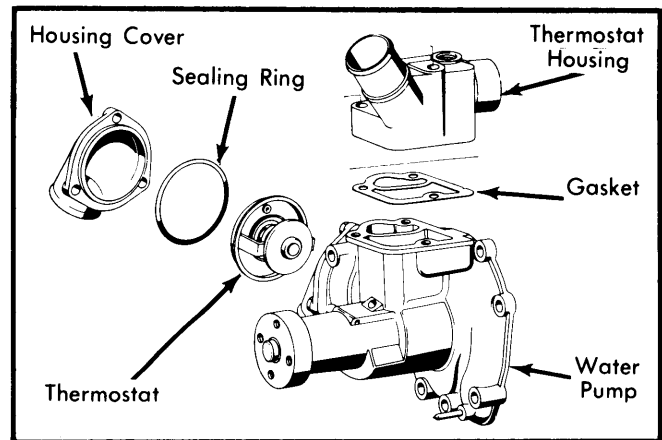


Fig. 11 Water Pump Assembly

### ENGINE SPECIFICATIONS

| GENERAL SPECIFICATIONS |          |      |            |           |                          |              |      |    |        |    |
|------------------------|----------|------|------------|-----------|--------------------------|--------------|------|----|--------|----|
| Year                   | Displ.   |      | Carburetor | HP at RPM | Torque (Ft. Lbs. at RPM) | Compr. Ratio | Bore |    | Stroke |    |
|                        | cu. ins. | cc   |            |           |                          |              | in.  | mm | in.    | mm |
| 1979                   | 275.8    | 4520 | Fuel Inj.  | 180@4750  | 220@3000                 | 8.1:1        | 3.62 | 92 | 3.35   | 85 |

| 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) |
| Int.           | 1.7362-1.7440<br>(44.10-44.30) | 45°        | 45°        | .051-.078<br>(1.3-2.0) | .3523-.3531<br>(8.95-8.97)   | Limit<br>.003           | .....               |
| Exh.           | 1.4547-1.4665<br>(36.95-37.25) | 45°        | 45°        | .059-.079<br>(1.5-2.0) | .4303-.4311<br>(10.93-10.95) | (.075)                  | .....               |

## 4.5 LITER V8 (Cont.) ENGINE SPECIFICATIONS (Cont.)

| PISTONS, PINS, RINGS |                            |                        |                            |       |                        |                            |
|----------------------|----------------------------|------------------------|----------------------------|-------|------------------------|----------------------------|
| Engine               | PISTONS                    | PINS                   |                            | RINGS |                        |                            |
|                      | Clearance<br>In. (mm)      | Piston Fit<br>In. (mm) | Rod Fit<br>In. (mm)        | Rings | End Gap<br>In. (mm)    | Side Clearance<br>In. (mm) |
| 4520 cc              | .0005-.0015<br>(.012-.037) | .....                  | .0002-.0007<br>(.005-.018) | No. 1 | .014-.022<br>(.35-.55) | .002-.0036<br>(.050-.092)  |
|                      |                            |                        |                            | No. 2 | .014-.022<br>(.35-.55) | .0016-.0030<br>(.040-.082) |
|                      |                            |                        |                            | Oil   | .010-.016<br>(.25-.40) | .0012-.0030<br>(.030-.072) |

| CRANKSHAFT MAIN & CONNECTING ROD BEARINGS |                              |                            |                   |                                    |                              |                           |                        |
|---|------------------------------|----------------------------|-------------------|------------------------------------|------------------------------|---------------------------|------------------------|
| Engine                                    | MAIN BEARINGS                |                            |                   |                                    | CONNECTING ROD BEARINGS      |                           |                        |
|   | Journal Diam.<br>In. (mm)    | Clearance<br>In. (mm)      | Thrust<br>Bearing | Crankshaft<br>End Play<br>In. (mm) | Journal Diam.<br>In. (mm)    | Clearance<br>In. (mm)     | Side Play<br>In. (mm)  |
| 4520 cc                                   | 2.517-2.519<br>(63.93-63.98) | .0018-.0033<br>(.045-.084) | .....             | .004-.009<br>(.10-.23)             | 2.044-2.047<br>(51.93-52.00) | .0008-.0027<br>(021-.068) | .009-.015<br>(.23-.39) |

| VALVE SPRINGS |                               |                                     |                        |
|---------------|-------------------------------|-------------------------------------|------------------------|
| Engine        | Free<br>Length<br>In.<br>(mm) | PRESSURE<br>Lbs. @ In.<br>(kg @ mm) |                        |
|               |                               | Valve Closed                        | Valve Open             |
| 4520 cc       | 1.77<br>(45)                  | 24.7@1.3<br>(11.2@33)               | 50.7@.846<br>(23@21.5) |
|               |                               | 67.24@1.65<br>(30.5@42)             | 194@1.2<br>(88@30.5)   |
| Outer         | 1.95<br>(49.5)                |                                     |                        |

| VALVE TIMING |              |                 |                |               |
|--------------|--------------|-----------------|----------------|---------------|
| Engine       | INTAKE       |                 | EXHAUST        |               |
|              | Open<br>ATDC | Close<br>(ABDC) | Open<br>(BBDC) | Close<br>BTDC |
| 4520 cc      | 6.5°         | 18.5°           | 23°            | 8°            |

| CAMSHAFT ① |                              |                          |                       |
|------------|------------------------------|--------------------------|-----------------------|
| Engine     | Journal Diam.<br>In. (mm)    | Clearance<br>In. (mm)    | Lobe Lift<br>In. (mm) |
| 4520 cc    |                              |                          |                       |
| No. 1      | 1.363-1.364<br>(34.96-34.98) | .0004-.0023<br>(.02-.06) | .....                 |
| No. 2 & 3  | 1.918-1.919<br>(49.20-49.22) | .011-.027<br>(.03-.07)   |                       |
| No. 4 & 5  | 1.926-1.927<br>(49.40-49.42) | .0011-.0027<br>(.03-.07) |                       |

① End play should be .003-.006" (.07-.14 mm).

| TIGHTENING SPECIFICATIONS                 |                 |
|---|-----------------|
| Application                               | Ft. Lbs. (mkg)  |
| Cylinder Head Bolts                       |                 |
| Cold, First Stage .....                   | 22 (3)          |
| Cold, Second Stage .....                  | 43 (6)          |
| Warm, Third Stage .....                   | 43 (6)          |
| Rocker Cover Bolts .....                  | 4 (.5)          |
| Camshaft Bearing Bracket Bolts .....      | 36 (5)          |
| Camshaft Sprocket Bolts .....             | 72 (10)         |
| Injection Nozzle-to-Injection Valve ..... | 7 (1)           |
| Connecting Rod Bolts .....                | ①33 (4.5)       |
| Main Bearing Caps                         |                 |
| Large Bolt .....                          | 72 (10)         |
| Small Bolt .....                          | 47 (6.5)        |
| Crankshaft Bolt .....                     | 195-239 (27-33) |
| Oil Pan .....                             | 8 (1.1)         |
| Oil Filter-to-Case .....                  | 29 (4)          |
| Oil Drain Plug .....                      | 22 (3)          |
| Oil Pressure Relief Valve .....           | 29 (4)          |
| Flywheel or Driven Plate .....            | ①25 (3.5)       |
| Hydraulic Valve Lifters .....             | 36 (5)          |
| Chain Tensioner Nut .....                 | 80 (11)         |
| Spark Plugs .....                         | 22 (3)          |

① — After torque values are achieved, torque an additional 90-100°.