4.5 LITER V8

GENERAL SPECIFICATIONS										
Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1976	275.8	4520	Fuel Inj.	180@4750	220@3000	8.1-1	3.62	92	3.35	85

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 Number
450SE	116.032	117.986
450SEL	116.033	117.986
450SL	107.044	117.985
450SLC	107.024	117.985

ENGINE REMOVAL

Removal – 1) Disconnect all necessary water hoses, electrical leads (both battery cables), fuel lines, vacuum lines and fuel injection linkage. Remove fan, radiator and air cleaner.

2) Drain power steering reservoir and disconnect hoses. Unbolt air conditioning compressor and position hoses and compressor out of way. NOTE – *It is not necessary to discharge the air conditioning system during engine removal if compressor can be moved aside enough to permit engine clearance.*

3) Disconnect fuel injection heating connections, oil pressure gauge, and ground strap. Remove left engine shock mount and loosen right side mount. Disconnect upper left side mount and right side mount from suspension. Disconnect and lower the exhaust system. Disconnect torsion bar and hand brake.

4) Remove tunnel shield and disconnect drive shaft at center bearing. Using suitable jack, support transmission. Remove engine carrier, marking it for reinstallation. Disconnect all linkage extending from transmission. On standard transmission, disconnect hydraulic lines. Attach suitable hoist, remove engine mounting bolts and lift engine from vehicle.

INTAKE MANIFOLD REMOVAL

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 REMOVAL

1) Drain cooling system and crankcase. Remove air cleaner and battery. Disconnect cable set for electronic ignition system and fuel injection linkage. Loosen ring line with injection valves and remove.

2) Disconnect and remove intake pipe (manifold). If equipped with automatic transmission, remove fluid filler pipe from its attachment to cylinder head. Remove alternator and bracket. Remove oil pump (high pressure) carrier and distributor.

3) Disconnect exhaust system. Drain power steering reservoir and disconnect both hoses. Remove chain tensioner and valve covers. Mark camshaft gear and chain for reinstallation. Remove upper chain dampers (side rails). Withdraw bolts and remove cylinder head. NOTE – *Bottom row of camshaft bearing bolts also secure cylinder head.* Care must be exercised when removing right side cylinder head as chain may not clear. To install, reverse removal procedure.

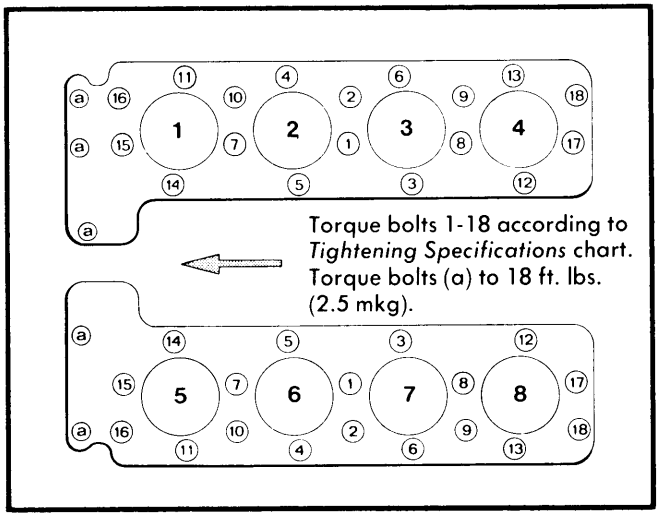

Fig. 1 Cylinder Head Tightening Sequence

VALVES							
Engine & Valve	Head Diam.	Face Angle	Seat Angle	Seat Width	Stem Diameter	Stem Clearance	Valve Lift
4520 cc							
Int.	1.7362-1.7440 (44.10-44.30)	45°	45°	.051-.078 (1.3-2.0)	.3492-.3498 (8.96-8.97)	None (Hydraulic	.....
Exh.	1.4547-1.665 (36.95-37.25)	45°	45°	.059-.079 (1.5-2.0)	.4303-.4311 (10.93-10.95)	Valve Lifters)	.....

4.5 LITER V8 (Cont.)

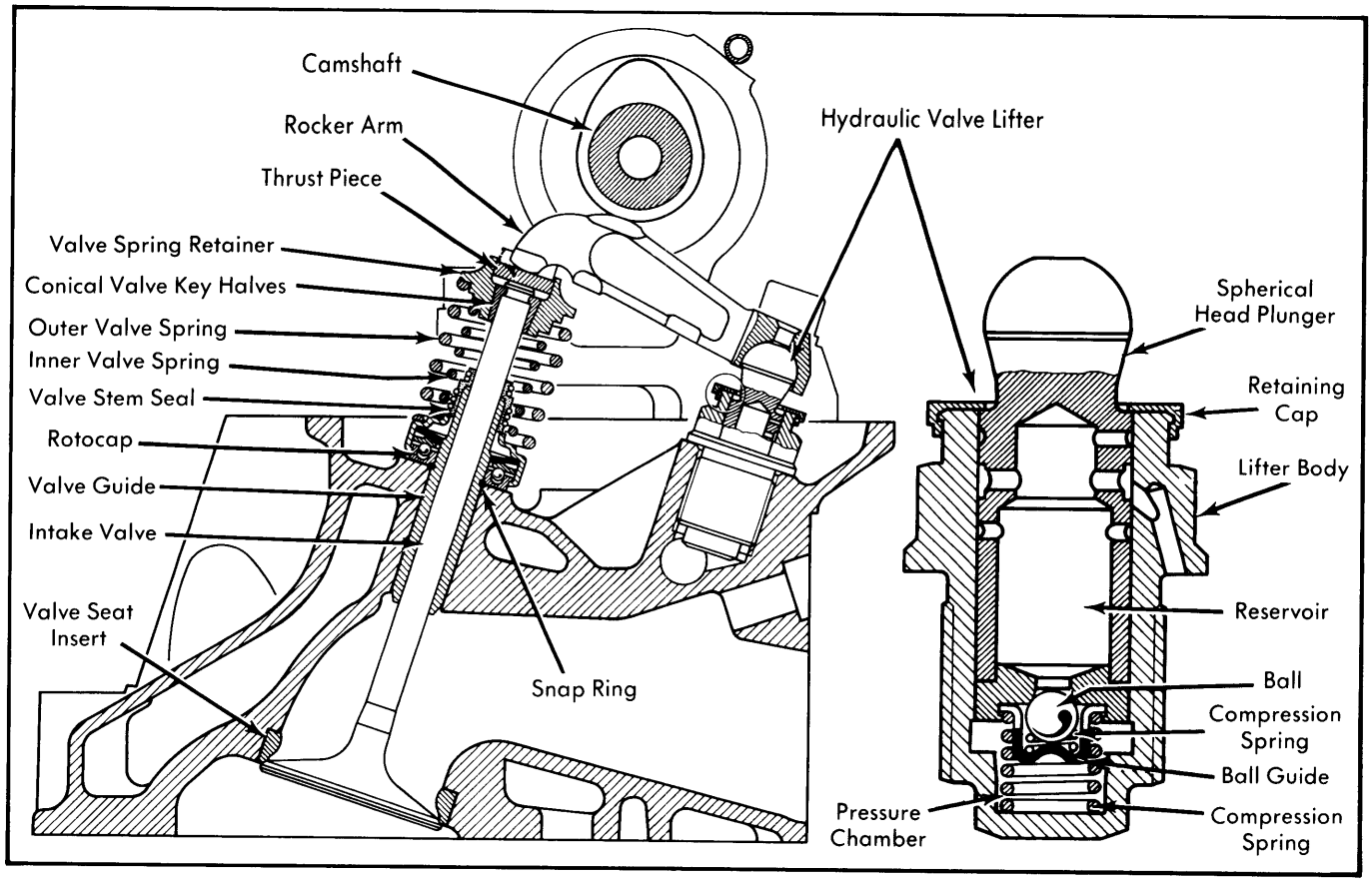

Fig. 2 Cutaway View of Valve System and Lifter

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 for valve clearance. See *Fig. 2*. 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. See *Fig. 2*.

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.

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. See *Fig. 2*.

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 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.*

4.5 LITER V8 (Cont.)

Fig. 3 Removing Conical Valve Key Halves

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. Remove spring retainer, inner and outer valve springs, valve stem seals and rotocaps.

Installation – To install, lubricate valve stem seals. Place assembly sleeve (115 589 10 59 00) on valve and slide seal into place, using assembly tool (116 589 00 43 00). See *Fig. 4*. Install remaining components in reverse order of removal.

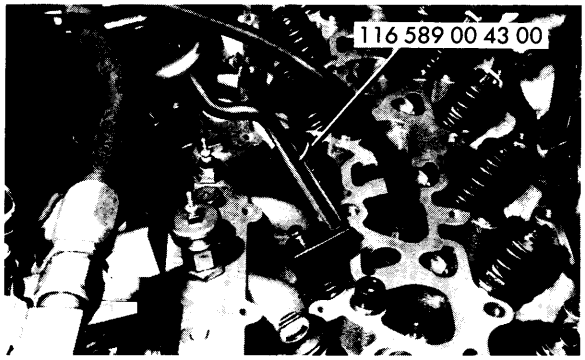

Fig. 4 Installing Valve Stem Seals

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

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. Do not machine away entire seat ring. Leave .012-.016" (.3-.4 mm) and remove this portion with a screwdriver or pointed 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), 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. After installing seat ring, peen-lock it at three points. Refinish valve seats. Valve seat runout should not exceed .0011" (.03 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 (116 589 00 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.

CHECKING NOISY VALVE LIFTERS

1) Check lifters for noise under no-load conditions (cam lobe pointing upward). On 450SE and 450SEL, turn off ignition and remove fuel pump relay (code 21) from fuse box. Connect starter contact switch to positive battery connection and to pin in contact 1 of plug. On 450SL and 450SLC models, turn off ignition switch, disconnect wire at terminal 16 (red/purple) of 4-prong plug. Connect starter contact switch at terminal 30 (red) and terminal 40 (purple).

2) Try moving rocker arms manually. If they have play, check base setting of hydraulic valve lifter. If setting is within specifications, replace valve lifter.

3) Push downward with a hammer handle on each spherical plunger head (applying pressure to rocker arm above plunger). If plunger drops too fast in comparison to other plungers, replace faulty lifter.

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. To avoid flowing while cranking engine, follow procedure outlined in step* **1)**, *CHECKING NOISY VALVE LIFTERS. Never dissasemble lifters. Replace as a complete unit.*

4.5 LITER V8 (Cont.)

1) When replacing camshaft or rocker arms or in event of noisy lifters, check and adjust base setting of lifters. To operate properly, the spherical head plunger must be adjusted to a pre-determined setting.

2) To adjust, position cam lobe in the vertical, no-load position. The clearance between the upper edge of plunger cylinder (below socket joint) and the lower edge of the retaining cap should be .028-.075" (.7-1.9 mm). This dimension can change with wear. To adjust, use thinner or thicker thrust pieces. *See Fig. 2.*

3) To measure clearance between points in step **2)**, position cam lobe in vertical, no-load position. Mount dial indicator so that its extension fits through the bore of the rocker arm and rests on spherical head plunger. Tighten dial indicator to .08" (2 mm) preload. Adjust dial indicator to zero.

4) Depress valve with spring compressor, removing the load from spherical head plunger. Compression spring will push plunger upward until it rests against retaining cap. This preload dimension should read .028-.075" (.7-1.9 mm) on dial indicator. If outside specifications, setting must be corrected.

5) To correct setting, remove dial indicator and rocker arm. Remove thrust piece and insert measuring thrust piece (100 589 16 63 00), having a thickness of .1870" (4.75 mm). Reinstall rocker arm and dial indicator and repeat measuring process in steps **3)** and **4)**. Select correct thrust piece according to measured value:

Thrust Piece Specifications

Measured Value Inches (mm)	Thrust Piece Thickness Inches (mm)
.000-.002 (0-.05)	①.2283 (5.8)
.000-.002 (0-.05)	①.2146 (5.45)
.002-.034 (.06-.87)	.2008 (5.1)
.035-.066 (.88-1.69)	.1870 (4.75)
.067-.099 (1.70-2.51)	.1732 (4.4)
.099-.131 (2.52-3.33)	.1594 (4.05)
Over .131 (3.33)	.1457 (3.7)

① – If measured value is 0-.002" (0-.05 mm), and base setting cannot be obtained with .2146" (5.45 mm) thrust piece, then install .2283" (5.8 mm) thrust piece.

6) Remove dial indicator and rocker arm, and insert selected thrust piece as indicated by measurement and chart. Install rocker arm and remeasure clearance as outlined in steps **3)** and **4)**. Remove dial indicator and install valve covers. Start engine and check for valve train noise.

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)
4520 cc	.0005-.0015 (.012-.037)	.....	.0002-.0007 (.005-.018)	No. 1	.014-.022 (.35-.55)	.002-.0036 (.050-.092)
				No. 2	.014-.022 (.35-.55)	.0016-.0030 (.040-.082)
				Oil	.010-.016 (.25-.40)	.0012-.0030 (.030-.072)

OIL PAN REMOVAL

1) Drain crankcase and disconnect transmission oil cooler (if equipped). Remove air cleaner. Disconnect front torsion bar.

2) Disconnect oil damper and place out of way. Remove oil dipstick. Raise front of vehicle and remove cover plate on intermediate flange.

3) On all models equipped with air conditioning, detach coolant compressor and place out of way. NOTE – *Do not disconnect coolant lines under pressure.* Loosen oil pan mounting bolts. For access to bolts behind damper align recess. Carefully lower oil pan.

4) When installing oil pan, center on two studs at front of cylinder block, and install remaining bolts.

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)
4520 cc	2.517-2.519 (63.93-63.98)	.0018-.0033 (.045-.084)	.....	.004-.009 (.10-.23)	2.044-2.047 (51.93-52.00)	.0008-.0027 (021-.068)	.009-.015 (.22-.39)

4.5 LITER V8 (Cont.)

MAIN & CONNECTING ROD BEARINGS

1) Mount main bearing cap to cylinder block (without bearings in place). Measure inside diameter at three locations. See *Fig. 5*. 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.

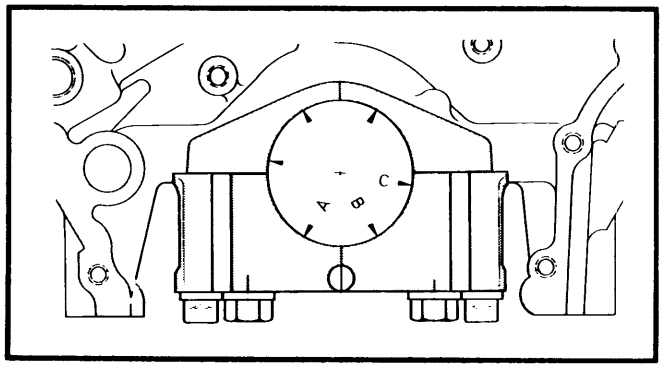

Fig. 5 Locations for Measuring Main Bearing Bore Diameter

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. See *Fig. 6*.

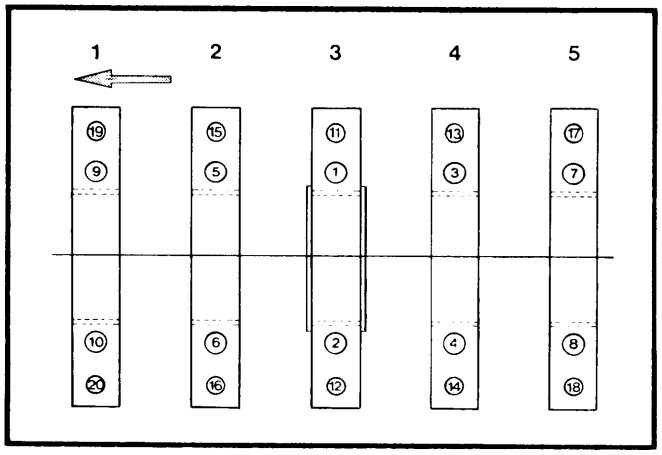

Fig. 6 Crankshaft Main Bearing Tightening Sequence

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

REAR CRANKSHAFT SEALING RING

1) Remove air cleaner on automatic transmission models only. Disconnect control pressure linkage to transmission. Drain transmission. Disconnect rear torsion bar from mount. **NOTE** – *Level control rod must be disconnected from valve.*

2) Disconnect handbrake linkage. Disconnect from transmission, linkage, vacuum line, speedometer cable and oil filler tube.

3) On manual transmission models only, disconnect hydraulic line and plug openings. Disconnect transmission bell housing and starter, placing it out of way.

4) Remove engine mounts and crossmember after suitably supporting engine. Engine must not tilt downward. Lift out transmission.

5) Remove driven plate or flywheel and intermediate flange. Using two screwdrivers, remove cover and force sealing ring out of cover. To install, use a suitable tool and insert sealing ring. Coat cover with appropriate sealing compound. Reverse removal procedure to install remaining components.

NOTE – *If the rear radial sealing ring causes wear marks on crankshaft bearing, install new sealing ring with the sealing lip offset to the outside.*

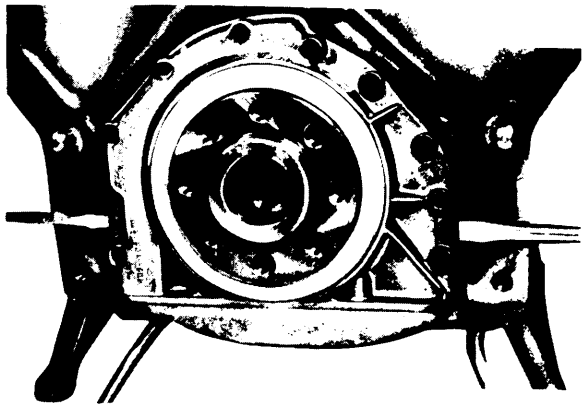

Fig. 7 Removing Rear Sealing Ring

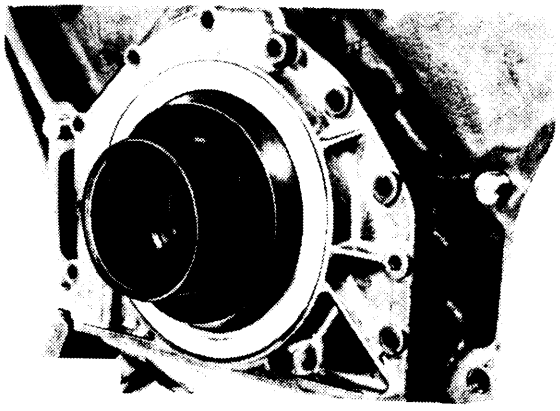

Fig. 8 Installing Rear Sealing Ring

4.5 LITER V8 (Cont.)

FRONT CRANKSHAFT SEALING RING

1) A new front crankshaft sealing ring with a full 360° shoulder (instead of 180°) is used in production beginning at the following chassis numbers:

Models with 360° Front Seal

Model	Chassis Type	Chassis No.
450SE & 450SEL	116.032 & 116.033	026691
450SL	107.044	020304
450SLC	107.024	007278

2) When installing sealing ring, use proper installation sleeve (110 589 07 61 00). Ring does not need to be filled with grease. Wet seal lip with oil.

CAMSHAFT ①

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
4520 cc	.....	.0010-.0022 (.025-.057)	.....

① – End play should be .003-.006" (.070-.143 mm).

CAMSHAFT REMOVAL

CAUTION – *Never remove both camshafts at the same time.*

1) Remove air cleaner, venturi control valve unit and disconnect vacuum hose to brake unit. Remove valve covers. Remove both camshaft sprocket bolts and spark plugs. Using suitable tool (116 589 00 61 00), remove rocker arms and mark them for reinstallation in original location.

NOTE – *Whenever rocker arms are replaced, install a new camshaft. Likewise, if a new camshaft is installed, use new rocker arms.*

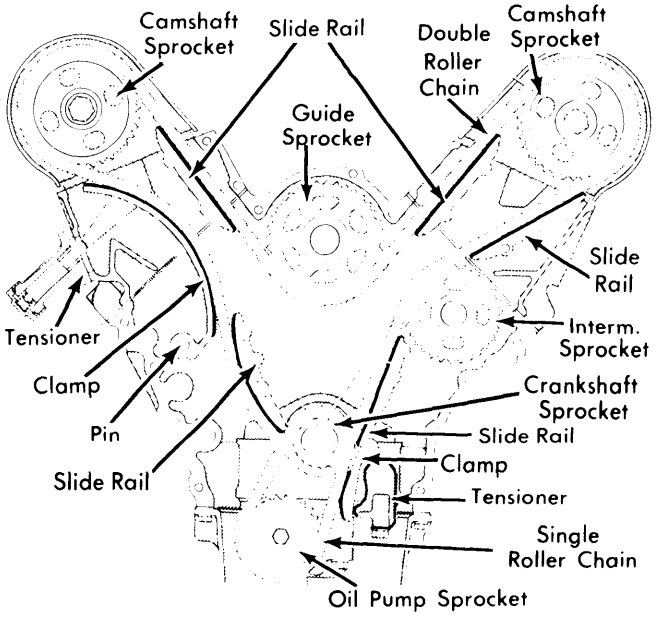

Fig. 9 Timing Chains & Sprockets

2) Place No. 1 cylinder at TDC. Ensure timing pointer is at TDC and markings on both compensating washers of camshaft are in alignment with markings on front camshaft bearings.

NOTE – *Fifth camshaft bearing has an oil passage to supply hydraulic valve lifters with oil. Second, third and fourth bearings have two oil pockets.*

3) Connect timing chain and camshaft sprocket with wire so chain does not fall or skip. Drive cam sprocket from camshaft. Remove bearing bracket bolts and lift camshaft off with brackets.

4) To install, lubricate new camshaft and insert into bearing brackets. Position assembly into cylinder head and tighten as required. NOTE – *If external lubrication pipe has been removed, replace plastic connectors.* Reverse removal procedure for remaining components.

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. Pull sprocket forward and remove from bearing in cylinder crankcase by twisting. Remove in an upward direction.

2) To install, reverse removal procedure.

NOTE – *When reinstalling chain, be sure hex bolts on camshaft sprockets are not loosened.*

CHAIN TENSIONER

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

450SL & 450SLC – Remove right side valve cover. Extract both mounting bolts and remove chain tensioner. Cable bracket must be held aside.

450SE & 450SEL – Disconnect battery, remove right side valve cover and alternator. Unbolt bracket for right side engine damper from frame. Remove chain tensioner.

VALVE TIMING

Engine	INTAKE Open ATDC	INTAKE Close ALDC	EXHAUST Open BLDC	EXHAUST Close BTDC
4520 cc	6.5°	18.5°	23°	8°

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 a dial indicator so that pointer rests on retainer of intake valve. Preload to .079" (2.007 mm). Turn indicator back to zero.

3) Turn engine in direction of rotation and read dial when gauge reaches 60. Readings should agree with Valve Timing Chart.

4.5 LITER V8 (Cont.)

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*.

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 – 8.0 quarts.

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.

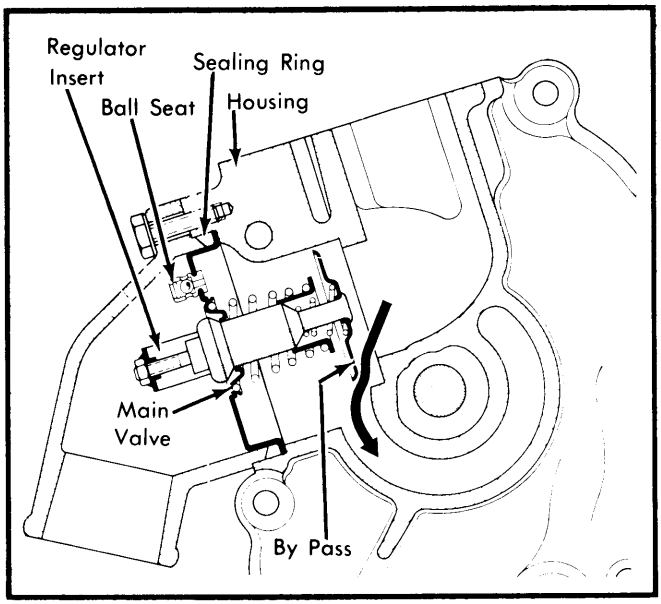

Fig. 10 Water Pump Assembly

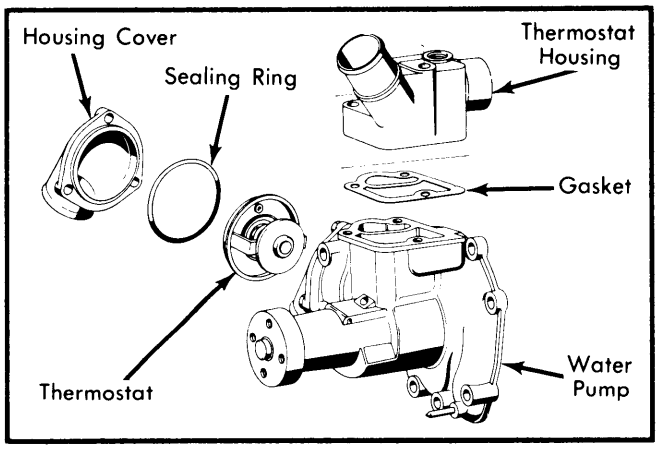

Fig. 11 Thermostat Assembly Exploded View

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head Bolts	
Cold, First Stage	22 (3)
Cold, Second Stage	36 (5)
Warm, Third Stage	43 (6)
Rocker Cover Bolts	11 (1.5)
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°.