3.8 LITER V6

IDENTIFICATION CODING

ENGINE IDENTIFICATION

Engine may be identified by the Vehicle Identification Number stamped on a metal tab attached to instrument panel near windshield on driver's side of vehicle and is visible from outside. VIN number is also stamped on both Safety Certification Decal, mounted on left front door lock face panel and on Engine Identification Label mounted on valve cover. The VIN number contains 17 digits. The 8th digit identifies engine and the 10th digit establishes model year.

Engine Code	
Engine	**Code**
3.8L (232") V6	3

ENGINE REMOVAL

See Engine Removal at end of ENGINE Section.

CYLINDER HEAD & MANIFOLDS

INTAKE MANIFOLD

Removal – **1)** Drain cooling system. Remove air cleaner assembly and heat tube. Disconnect accelerator cable and transmission linkage at carburetor. Remove accelerator mounting bracket. Disconnect cruise control unit (if equipped) and move aside. Disconnect carburetor bowl vent hose at carburetor. Disconnect thermactor air supply hose at check valve, located in back of intake manifold.

2) Disconnect fuel line at carburetor, coolant by-pass hose and heater hose at manifold and upper radiator hose at thermostat housing. Remove heater tube at manifold and tube support bracket and move assembly aside. Disconnect necessary vacuum lines at carburetor and intake manifold. Disconnect necessary electrical connectors. If equipped with air conditioning, remove support bracket at manifold. Loosen EGR tube at EGR valve adaptor and disconnect PCV line at carburetor. Remove carburetor and carburetor hold-down studs from manifold. Remove EGR spacer attaching screws from manifold.

3) With EGR adaptor and valve attached, loosen EGR spacer from manifold. Disconnect EGR tube from adaptor and slide spacer forward. Remove spacer assembly and discard old gasket. Remove PCV line, intake manifold attaching bolts, and remove intake manifold.

NOTE – *Intake manifold is sealed at each end with RTV type sealer. It may be necessary to pry on front of manifold with screwdriver blade to break seal. Use care not to damage machined surfaces.*

Installation – **1)** Clean all gasket surfaces. If intake manifold was disassembled, apply a coat of sealer to temperature sending unit, all vacuum fittings, spark knock sensor adaptor assembly and electric PVS if equipped.

2) Apply sealer to cylinder head mating surface and press new intake manifold gaskets into place. Use dowel pins as guides to position gaskets. Apply a bead of sealer at each corner where cylinder head joins cylinder block and at each end of block where manifold seats against block.

NOTE – *Assembly must occur within 15 minutes after silicone sealer is applied to prevent sealer from setting up and losing its' sealing effectiveness.*

3) Carefully lower intake manifold into position using dowel pins as a guide. Apply a thin coat of sealer (D8AZ-19558-A or equivalent) to threads of manifold bolts and underside of bolt heads. Install manifold bolts and tighten in 3 steps. See *Fig. 1*. Reverse removal procedures to complete installation.

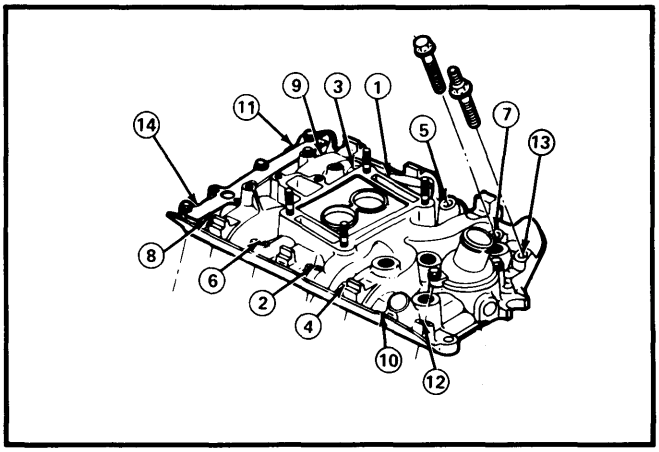

Fig. 1 Intake Manifold Tightening Sequence

CYLINDER HEAD

Removal – **1)** To remove left cylinder head, remove oil fill cap and remove power steering pump mounting bracket bolts and move pump aside. Remove air conditioning mounting bracket bolts, (if equipped) and move compressor aside.

2) To remove right cylinder head disconnect thermactor diverter valve and hose assembly at by-pass valve and downstream air tube and remove assembly. Remove accessory drive idler, alternator, and thermactor pump pulley, and remove thermactor pump. Remove alternator bracket and PCV valve.

NOTE – *If equipped with tripminder, fuel supply tube must be disconnected to gain access to upper attaching bolt of alternator bracket.*

3) Remove rocker arm cover attaching bolts, and break silicone seal by inserting a putty knife under cover flange. Remove rocker arm covers. Disconnect exhaust pipe at exhaust manifolds and remove manifold retaining bolts and remove exhaust manifolds. Remove rocker arm bolts, rocker arms, push rods and identify for proper installation in original position. Remove cylinder head bolts and discard. Remove heads.

CAUTION – *If excessive prying force is applied, plastic rocker arm covers will break.*

Installation – **1)** Clean all gasket surfaces. Using dowel pins for guides, place head gaskets on blocks. Apply a thin coat of sealer to threads of short head bolts nearest to exhaust

3.8 LITER V6 (Cont.)

manifold. Coat head bolt flat washers with oil and install bolts and washers.

CAUTION — *Torque retention can vary with used head bolts, causing coolant leaks or compression loss at cylinder head mating surface. To assure a leak-tight assembly use new head bolts.*

2) Tighten cylinder head bolts in 4 steps, then back off head bolts 2 or 3 turns. Now re-tighten head bolts using 4 steps again. After coating each push rod with oil conditioner, install push rods in their original position. Position rocker arms over push rods, install fulcrums and tighten fulcrum attaching bolts.

CAUTION — *For each valve rotate crankshaft until tappet rests on heel of camshaft lobe before tightening fulcrum attaching bolts. Fulcrums must be fully seated in cylinder head and push rods seated in rocker arm sockets prior to final tightening.*

3) Install exhaust manifolds and apply a thin bead of sealer to rocker arm cover flange. Make sure sealer fills the channel in cover flange. Install rocker arm covers and retaining bolts. Reverse removal procedure to complete installation.

NOTE — *After using 4 step method of tightening head bolts twice, it is not necessary to re-tighten head bolts after extended engine operation.*

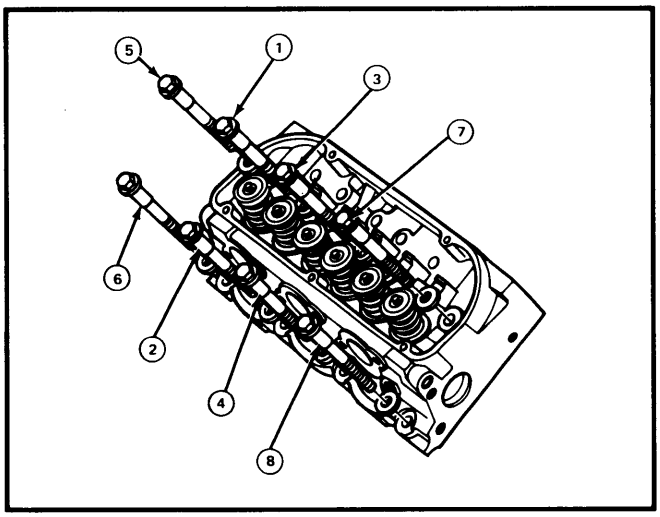

Fig. 2 Cylinder Head Tightening Sequence

VALVES

VALVE ARRANGEMENT

All Engines

E-I-E-I-E-I (Left Side)

I-E-I-E-I-E (Right Side)

VALVE GUIDE SERVICING

To ream guides for installation of valves with oversize stems, always use reamers in sequence. Reface valve seat after valve guide has been reamed. Reamers are available in .003" (.07 mm) oversize with standard diameter pilot; .015" (.38 mm) oversize with .003" (.07 mm) oversize pilot; and .030" (.76 mm) oversize pilot.

VALVE STEM OIL SEALS

Cup type seals are used on all valves. Install cupped side down, below upper spring retainer.

VALVE SPRINGS

Removal — With cylinder head removed, compress valve spring with a suitable spring compressor and remove valve keepers. Release spring compressor and remove spring retainer and spring. Remove valve stem oil seal from valves.

Installation — Check valve springs in a suitable valve spring tester and replace as necessary. Install valve stem oil seals. Reverse removal procedure to complete installation.

VALVE SPRING INSTALLED HEIGHT

Spring ends must be square within .078" (1.98 mm). Installed height of valve spring must not exceed specifications. Measure height from surface of cylinder head pad, to underside of spring retainer. See *Fig. 3*. If height is greater than specified, install .030" (.76 mm) spacer on head under spring to bring height within limits.

CAUTION — *Do not install spacers unless necessary. Spacers used in excess of recommendations will overstress springs and overload camshaft lobes, resulting in broken spring(s) and/or worn cam lobes.*

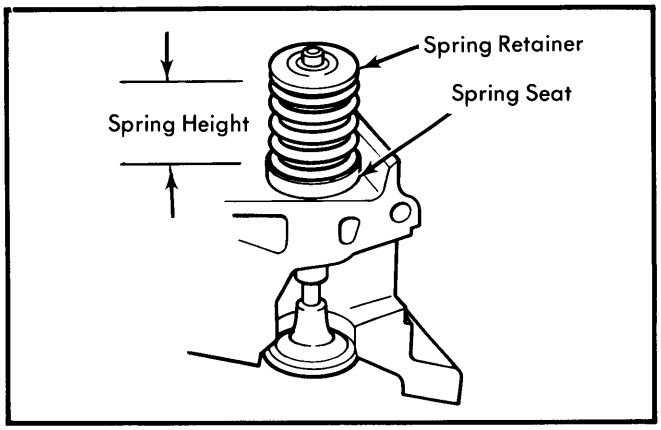

Fig. 3 Measuring Valve Spring Installed Height

Valve Spring Installed Height

Engine	Installed Height In. (mm)
3.8L (232")	1.70-1.78 (43.1-45.2)

HYDRAULIC VALVE LIFTER ASSEMBLY

Lifter parts are not interchangeable and are serviced as assemblies. Mark location of each lifter, so when engine is assembled, lifter may be installed in its original position. After cleaning and reassembling lifters, they should be tested for leakdown rate. Leakdown rate is 20-200 seconds measured at .125" (3.18 mm) plunger travel under 50 lb. (23 kg) load.

3.8 LITER V6 (Cont.)

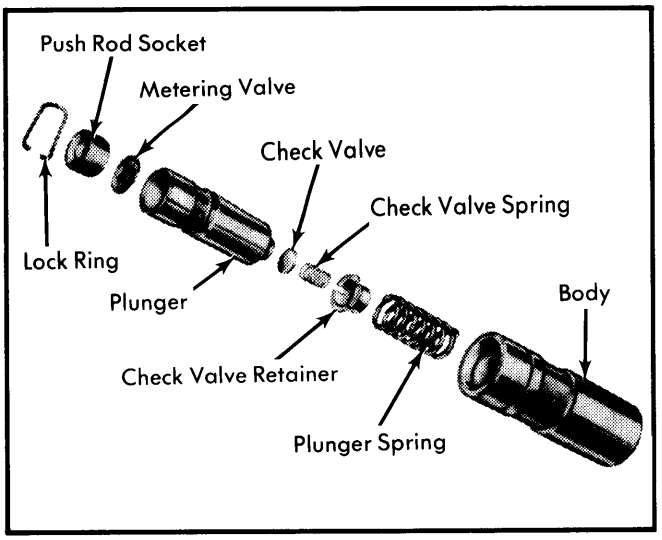

Fig. 4 Exploded View of Valve Lifter Assembly

VALVE LIFTER ADJUSTMENT

1) Turn crankshaft so that No. 1 piston is at TDC end of compression stroke and check clearance of valves listed in *Table 1*. Using suitable tool, apply pressure to push rod end of rocker arm to slowly bleed down lifter until plunger is completely bottomed.

2) Hold lifter in this position and check clearance between rocker arm and valve stem tip with a feeler gauge. If clearance is less than specification, install an undersize push rod; if greater, install an oversize push rod. After checking all valves in *Table 1*, rotate crankshaft 360° and check clearance of valves shown in *Table 2*.

Valve Lifter Adjustment Sequence Table 1

No. 1 Int.	No. 1 Exh.
No. 3 Int.	No. 2 Exh.
No. 6 Int.	No. 4 Exh.

Valve Lifter Adjustmen Sequence Table 2

No. 2 Int.	No. 3 Exh.
No. 4 Int.	No. 5 Exh.
No. 5 Int.	No. 6 Exh.

Collapsed Lifter Clearance

Application	Measurement In. (mm)
3.8L (232")	.088-.189 (2.23-4.80)

PISTONS, PINS & RINGS

OIL PAN

See Oil Pan Removal at end of ENGINE Section.

PISTON & ROD ASSEMBLY

NOTE – *Following procedure is with cylinder head, oil pan, oil pump and pickup tube removed from engine.*

Removal – 1) Remove ridge at top of cylinder bores, using suitable ridge reamer. Pistons should be at bottom of stroke and covered with a cloth to collect cuttings.

NOTE – *If oversize piston is to be installed, final honing is used to obtain proper piston clearance. Before cylinder is refinished, all main bearing caps must be in place and tightened to proper specification so crankshaft bearing bores will not become distorted from refinishing operation. Allow .0015" (.038 mm) of required oversize diameter before final step in honing is performed to allow enough stock to obtain correct surface finish.*

2) Rotate crankshaft and inspect connecting rods and rod caps for cylinder identification. Mark for identification if necessary. Remove rod cap and push each piston and rod assembly out top of cylinder block. Install rod caps on mating rods.

NOTE – *Take care not to nick crankshaft journals.*

Installation – 1) Oil piston rings and cylinder walls with a light coat of engine oil. Ensure that ring gaps are properly spaced on piston. Install ring compressor tool. Insert piston and rod assembly into correct cylinder bore, guiding rod over crankshaft journal. See *Fig. 5*.

NOTE – *Notch on piston head must be toward front of engine and connecting rod oil squirt hole should be facing to the right.* See *Fig. 6*.

2) Tap piston into cylinder bore using a wooden handle and install rod cap and tighten. Repeat procedure for each piston assembly. Check rod bearing clearance and rod side play.

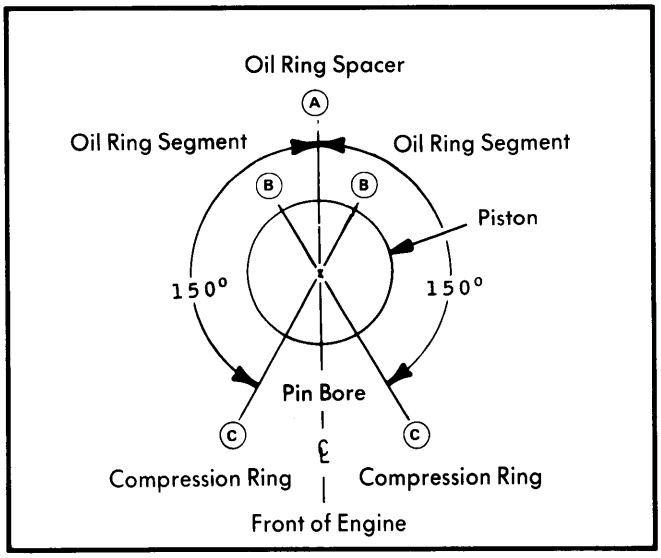

Fig. 5 Piston Ring Gap Spacing

3.8 LITER V6 (Cont.)

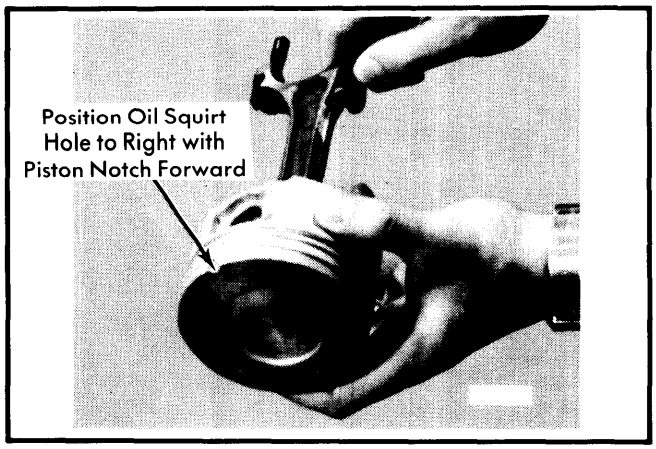

Fig. 6 Piston and Connecting Rod Assembly

FITTING PISTONS

Measure cylinder bore at right angles to crankshaft centerline, below ring travel. Piston-to-cylinder bore clearance should be within specifications. Make sure piston and cylinder block are at room temperature (70° F) when fitting.

Piston Size Code Chart

Code	Size In. (mm)
Red	3.8095-3.8101 (96.761-96.776)
Blue	3.8107-3.8113 (96.791-96.807)
.004" (.10 mm)	3.8119-3.8125 (96.822-96.837)

PISTON PINS

Removal – Using arbor press and suitable tool, press out pin.

Installation – Light tap with mallet may be needed to start pin into piston and rod assembly. Using arbor press and pilot tool, press pin into piston and rod assembly until pin centers in piston. See *Fig. 7*.

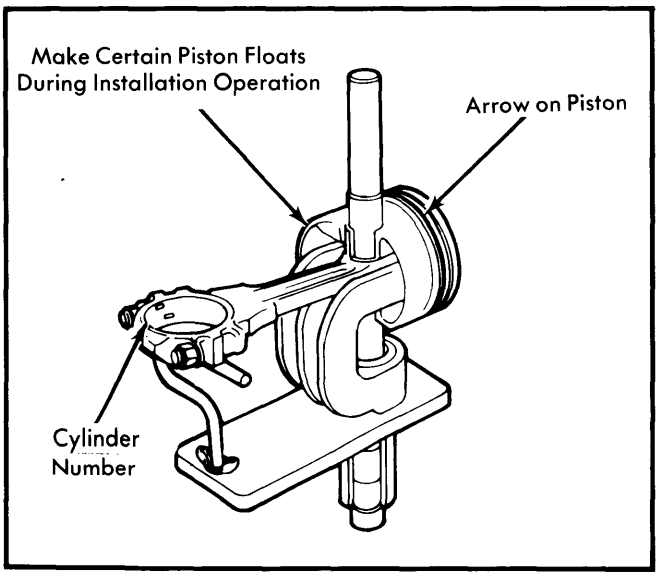

Fig. 7 Installing Piston Pin

CRANKSHAFT & ROD BEARINGS

NOTE – *To obtain access to main and connecting rod bearings, remove cylinder head and oil pan.*

MAIN BEARINGS

Removal – Before removing main bearing caps, mark caps for reassembly reference so they may be installed in original position. Remove main bearing cap bolts and remove cap. Remove upper half of bearing by inserting bearing removal tool (6331) or equivalent in oil hole of crankshaft and slowly rotate crankshaft in direction of engine rotation. This will force upper bearing half out of block.

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, providing an erroneous reading.

2) If bearing clearance is excessive, .001" (.02 mm) or .002" (.05 mm) undersize bearing half may be used in combination with a standard size bearing half. If the .002" (.05 mm) undersize bearings are used on more than 1 journal, they may be positioned in cylinder block instead of bearing cap.

3) If a standard and a .002" (.05 mm) undersize combination does not bring bearing clearance within specified limits, crankshaft will have to be refinished and undersized bearings installed.

CAUTION – *Crankshaft incorporates deep rolling main journal fillets. Refinishing is limited to .25" (6.3 mm) undersize of standard journal dimensions. Further refinishing may result in fatigue failure of crankshaft.*

4) 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 can be inserted into journal oil hole. Rotate crankshaft slowly in opposite direction of engine rotation until bearing tang is seated. Remove bearing tool. Apply a .125" (3.17 mm) bead of silicone sealer to main bearing cap and cylinder block parting line. Install bearing cap and tighten.

CONNECTING ROD BEARINGS

Removal – Position crankshaft so connecting rod to be checked or serviced is down. Inspect connecting rod caps for cylinder identification so caps can be installed in original position. Remove rod cap and bearing inserts.

Installation – Install bearing insert in connecting rod and pull rod down until it seats on crankshaft. Make sure tab on bearing engages slot in rod and that bearing is fully seated in rod. Install bearing insert in rod cap and lubricate with engine oil. Install connecting rod cap and tighten.

THRUST BEARING ALIGNMENT

Install all bearing caps except thrust bearing cap and tighten. Install thrust bearing cap with bolts finger tight. Pry crankshaft to front of engine and pry thrust bearing cap to rear of engine. While holding crankshaft forward, tighten thrust bearing cap bolts. Check crankshaft end play.

3.8 LITER V6 (Cont.)

REAR MAIN BEARING OIL SEAL

Removal – Loosen main bearing cap attaching bolts allowing crankshaft to drop slightly. Do not allow crankshaft to drop more than .031" (.78 mm). Remove main bearing cap and remove seal from cap. Remove cylinder half of seal by using proper tool or install a small sheet metal screw in one end and pull to remove seal.

Installation – 1) Clean groove in cylinder block and cap. Dip seal halves in engine oil. Carefully install upper seal half into groove with undercut side of seal toward front of engine by rotating it on seal journal of crankshaft.

NOTE – *Be sure no rubber has been shaved from outside diameter of seal by bottom edge of groove. Do not allow oil to get on sealer area.*

2) Install lower seal in bearing cap with undercut side of seal toward front of engine and tab facing rear of engine. Allow seal to protrude .375" (9.52 mm) above parting surface to mate with upper seal when cap is installed. Apply a .375" (9.52 mm) bead of silicone sealer to bearing cap and cylinder block parting line. Install bearing cap, bolts, and tighten.

CAUTION – *When using silicone sealer, assembly must take place within 15 minutes after application is made or sealer will set up partially and reduce sealing effectiveness.*

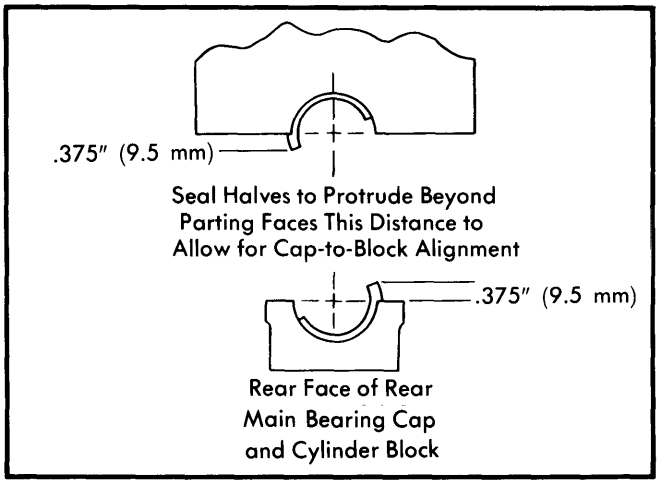

Fig. 8 Rear Main Bearing Oil Seal Installation

CAMSHAFT

ENGINE FRONT COVER

Removal – 1) Drain cooling system and disconnect negative battery cable. Remove air cleaner assembly and heat tube. Remove fan shroud and fan clutch attaching bolts and remove shroud and fan clutch assembly. Loosen accessory drive belt idler and remove drive belt and water pump pulley. If equipped, remove power steering pump mounting bracket bolts. Leaving lines connected move pump to one side.

2) If equipped, remove air compressor front support bracket. Disconnect coolant by-pass and heater hoses at water pump and upper radiator hose at thermostat housing. Disconnect coil wire from distributor cap and remove cap with wires attached. Remove distributor hold-down clamp and remove distributor. If equipped with tripminder, remove fuel flow meter support bracket. Raise vehicle.

3) Using puller (T58P-6316-D and adaptor T82L-631-B or equivalent) remove crankshaft damper. Remove fuel pump crash shield and disconnect fuel line at pump. Remove oil filter. Disconnect lower radiator hose at water pump. Remove oil pan bolts and let oil pan drop down. Remove front cover attaching bolt behind oil filter adaptor. Remove remaining front cover attaching bolts and remove front cover and water pump as an assembly.

CAUTION – *Do not attempt to remove front cover without lowering oil pan.*

Installation – Clean all gasket surfaces. Apply sealer to gasket and position on cylinder block. Install front cover, water pump and attaching bolts and tighten. Reverse removal procedures to complete installation.

FRONT COVER OIL SEAL

Removal & Installation – Remove fan shroud and fan clutch assembly bolts and remove shroud and fan clutch assembly. Loosen accessory drive belt idler. Raise vehicle. Disengage accessory drive belt. Using puller (T58P-6316-D or equivalent) remove crankshaft damper. Using screwdriver, remove front cover oil seal. Lubricate new oil seal with engine oil. Using damper seal tool (T82L-6316-A and adaptor T70P-68070-A or equivalent) install damper seal. Reverse removal procedure to complete installation.

TIMING CHAIN

Inspection – Turn crankshaft clockwise until No. 1 piston is at TDC. Remove the right valve cover and loosen No. 3 exhaust rocker arm and rotate to one side. Install a dial indicator to cylinder head and position it on push rod. Zero indicator and slowly turn crankshaft counterclockwise until slightest movement is seen on indicator. Stop and observe damper timing mark for number of degrees of travel from TDC. If reading exceeds 6°, replace timing chain and sprockets.

Removal – With No. 1 cylinder at TDC and front cover removed, remove camshaft thrust button and spring from front of camshaft sprocket, crankshaft sprocket and timing chain.

Installation – Install timing chain on sprockets with timing marks aligned as shown in *Fig.* 9. Slide both sprockets and timing chain onto engine. Tighten camshaft sprocket attaching bolts and install camshaft thrust button and spring.

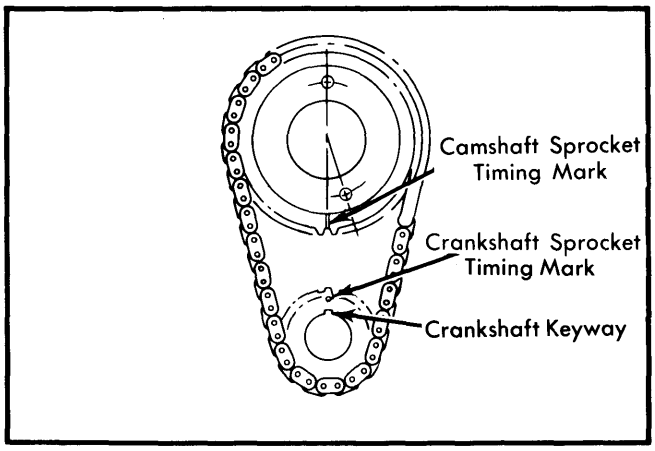

Fig. 9 Timing Chain Sprocket Alignment

3.8 LITER V6 (Cont.)

CAMSHAFT

Removal – Drain cooling system and remove radiator. If equipped with air conditioning, remove condensor. Remove grille. Remove intake manifold and valve lifters. Remove drive belt and pulley. Remove front cover and water pump as an assembly. Remove camshaft thrust button, spring and timing chain and sprocket. Remove camshaft attaching bolts and remove camshaft.

NOTE – *Front engine cover cannot be removed without lowering oil pan.*

Installation – Lubricate cam lobes and bearing surfaces with oil conditioner and install camshaft being careful not to damage bearing surfaces while sliding camshaft into position. Reverse removal procedure to complete installation.

CAMSHAFT BEARINGS

Removal & Installation – Remove engine from vehicle and remove flywheel. Remove camshaft and rear bearing bore plug. Using suitable driver-puller tool (T65L-6250-A) remove camshaft bearings. Position new bearing at bearing bores and press into place while noting the following: Oil holes in bearings must be aligned with oil holes in cylinder block. Install new bearing bore plug and reverse removal procedure to complete installation.

CAUTION – *When removing bearings, wrap a cloth around threads of puller screw to protect front bearing and journal.*

CAMSHAFT END THRUST

The 3.8L (232") V6 engine has no camshaft end play because camshaft has a spring loaded thrust button not a thrust plate.

CAM LOBE LIFT

With rocker arms removed, check lift of each lobe in consecutive order. Using a suitable dial indicator, position point on end of push rod and in same plane as push rod movement. Rotate crankshaft until lifter and push rod are at lowest position and zero indicator. Rotate crankshaft slowly until push rod is in fully raised position. Check to see that total lift recorded is within specifications. If lift on any lobe is below specifications, camshaft and valve lifters operating on worn lobe(s) must be replaced.

ENGINE OILING

Crankcase Capacity – 4 quarts. Add 1 quart with filter change.

Oil Filter – Replace at first oil change, then every second oil change after.

Normal Oil Pressure (Hot) – 54-59 psi (3.7-4.1 kg/cm^2) @2500 RPM.

Pressure Regulator Valve – In pump body. Not adjustable.

ENGINE OILING SYSTEM

Engine lubrication system is of force-feed type in which oil is supplied under full pressure to crankshaft, connecting rods, valve lifters and camshaft. From lifters, a controlled flow of oil is supplied to rocker arms by hollow push rods. All other moving parts are lubricated by gravity flow or splash oiling. Oil pump shaft is driven by distributor shaft, through an intermediate shaft.

Oil Filter – Full flow type mounted externally on front engine cover. Filter has integral by-pass valve and anti-drain back diaphragm.

OIL PUMP

Removal & Disassembly – Remove oil filter and oil pump cover attaching bolts. Remove cover and lift pump gears out of pocket in front cover. See *Fig. 10*. To remove pressure relief valve, drill a small hole in front cover and insert self-threading sheet metal screw into oil pressure relief valve chamber cap and pull or pry plug, spring and valve from valve body.

Inspection & Reassembly – Clean gasket surfaces. Measure pump gear end clearance, side clearance and check pump cover for flatness using a straightedge. Pack gears with petroleum jelly and install in cover pocket making sure petroleum jelly fills all voids between gears and pocket. Position cover and gasket and install cover attaching bolts and tighten.

CAUTION – *Failure of pump to prime when engine is started may result if pump gears are not properly packed.*

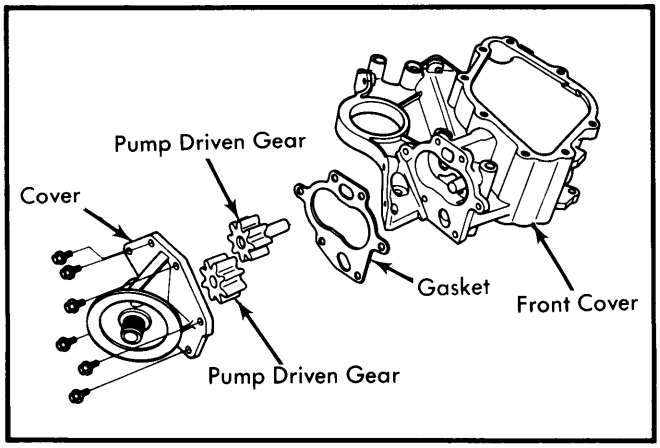

Fig. 10 Exploded View of Oil Pump

Oil Pump Specifications

Application	Specification In. (mm)
Driver Shaft-to-Housing Clearance	.0015-.0030 (.038-.076)
Idler Shaft-to-Idler Gear Clearance	.0005-.0017 (.012-.043)
Oil Pump Gear Backlash	.008-.012 (.20-.30)
Oil Pump Gear End Height	.0005-.0055 (.012-.139)
Oil Pump Gear Radial Clearance	.0020-.0055 (.050-.139)
Relief Valve-to-Bore Clearance	.0017-.0029 (.043-.073)

3.8 LITER V6 (Cont.)

ENGINE COOLING

WATER PUMP

Removal – 1) Drain cooling system. Remove air cleaner and heater tube. Remove fan shroud and fan clutch attaching bolts and remove shroud and fan clutch assembly. Loosen accessory drive belt idler, and remove drive belt and water pump pulley.

2) If equipped with power steering, remove pump mounting bracket bolts and move pump aside. If equipped with air conditioning, remove compressor front support bracket and leave compressor in place. Disconnect by-pass hose at water pump. If equipped with tripminder, remove fuel flow sensor support bracket. Remove water pump attaching bolts and remove pump.

Installation – Clean all gasket surfaces. Reverse removal procedure to complete installation.

NOTE – *For further information on cooling system capacities and other cooling system components, see appropriate article in ENGINE COOLING SYSTEMS Section.*

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N·m)
Camshaft Sprocket	15-22 (20-30)
Cylinder Head	
Step 1	47 (64)
Step 2	55 (75)
Step 3	63 (86)
Step 4	74 (101)
Step 5	Back off 2-3 turns
Step 6	Repeat steps 1-4
Connecting Rod Caps	31-36 (42-49)
Exhaust Manifold	15-22 (20-30)
Flywheel-to-Crankshaft	54-64 (73-87)
Intake Manifold	
Step 1	5 (7)
Step 2	10 (14)
Step 3	18 (24)
Main Bearing Caps	65-81 (88-110)
Pulley-to-Damper	20-28 (27-38)
Vibration Damper	93-121 (126-165)
Water Pump	15-22 (20-30)

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Engine	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
				In.	(mm)	In.	(mm)
3.8L (232")	.....	.....	.....	3.81	96.7	3.39	86.1

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)
3.8L (232")							
Int.	1.79 (45.4)	44°	45°	.06-.08 (1.5-2.0)	.3423-.3716 (8.694-8.677)	.001-.0027 (.02-.068)	.415 (10.54)
Exh.	1.47 (37.3)	44°	45°	.06-.08 (1.5-2.0)	.3418-.3411 (8.681-8.663)	.0015-.0032 (.038-.081)	.417 (10.59)

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)
3.8L (232")	2.5190-2.5198 (63.98-64.00)	.001-.0014 (.025-.035)	No. 3	.004-.008 (.10-.20)	2.3103-2.3111 (58.68-58.70)	.001-.0014 (.025-.035)	.0047-.0114 (.12-.29)

3.8 LITER V6 (Cont.)

ENGINE SPECIFICATIONS (Cont.)

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)
3.8L (232")	.0014-.0022 (.035-.055)	.0002-.0005 (.005-.012)	Press Fit	1 & 2 3	.01-.02 (.25-.50) .015-.058 (.38-1.48)	.0016-.0037 (.040-.094) .....

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
3.8L (232")	2.0505-2.0515 (52.082-52.108)	.001-.003 (.02-.07)	2.41 (61.2)

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
3.8L (232")	1.70-1.78 (43.1-45.2)	75@1.70 (34@43.1)	215@1.79 (98@45.4)