2.3 LITER 4-CYLINDER

IDENTIFICATION CODING

ENGINE IDENTIFICATION

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

Engine Code

Engine	Code
2.3L (140") 2-Bbl.	A

ENGINE REMOVAL

See Engine Removal at end of ENGINE Section.

CYLINDER HEAD & MANIFOLDS

INTAKE MANIFOLD

Removal – 1) Drain cooling system. Remove air cleaner and disconnect accelerator cable from carburetor. Disconnect vacuum lines. Remove dipstick. Disconnect heat tube at EGR valve. Disconnect fuel line at carburetor.

2) Remove bolt holding dipstick tube to intake manifold. Remove PCV valve and hoses at intake manifold and engine block. Remove distributor cap hold down screws and position distributor cap out of way. Remove intake manifold bolts and remove intake manifold.

Installation – Reverse removal procedure and note the following: Clean gasket material from cylinder head and intake manifold. Install new gasket on cylinder head. Install manifold and tighten bolts in 2 steps, following sequence shown in *Fig. 1*.

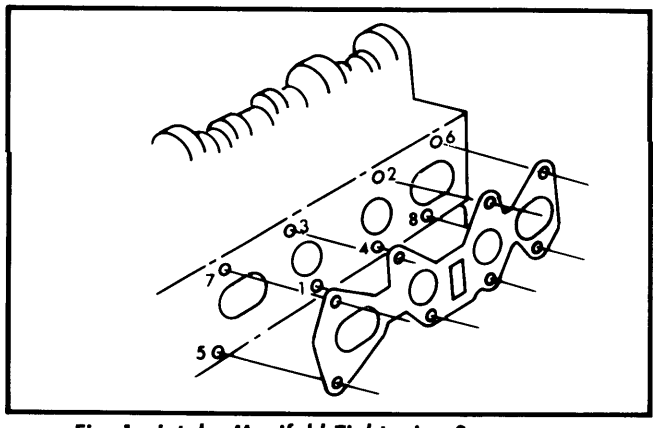

Fig. 1 Intake Manifold Tightening Sequence

EXHAUST MANIFOLD

Removal – Remove air cleaner (if required) and 3 attaching nuts and 2 bolts from exhaust manifold shroud. Remove nuts attaching muffler inlet pipe and lower out of way. Remove 8 bolts attaching exhaust manifold-to-cylinder head and remove exhaust manifold.

Installation – Reverse removal procedure and note the following: Apply light film of graphite grease on exhaust manifold gasket surface and install manifold. Install and tighten bolts in 2 steps, following sequence shown in *Fig. 2*.

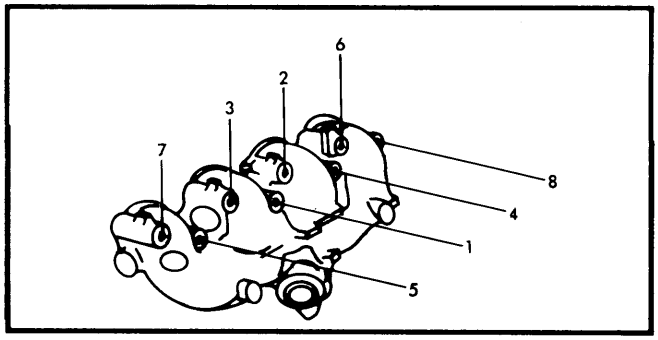

Fig. 2 Exhaust Manifold Tightening Sequence

CYLINDER HEAD

Removal – 1) Perform intake and exhaust manifold removal procedures, then remove spark plugs and rocker arm cover. Remove alternator mounting bracket from cylinder head. Remove upper radiator hose. Remove 4 camshaft belt cover bolts and remove cover.

2) Loosen camshaft belt tensioner bolts, unload tensioner and remove belt, tensioner assembly and tensioner spring stop from cylinder head. Disconnect oil sending unit wire. Remove cylinder head bolts and remove cylinder head and camshaft assembly from engine.

Installation – Clean gasket material from cylinder head and block. Install new gasket on block. Position camshaft with pin between 5 o'clock and 6 o'clock position to avoid damage to protruding valves. Place cylinder head assembly on block and install head bolts and tighten bolts in 2 steps, following sequence shown in *Fig. 3*.

NOTE – *Before installing head on block, blow oil out of cylinder head bolt block holes.*

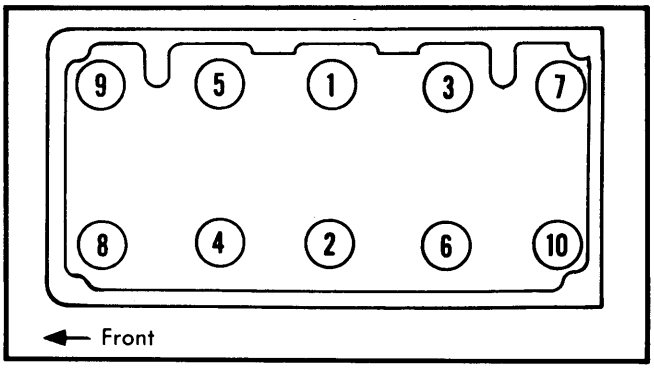

Fig. 3 Cylinder Head Tightening Sequence

VALVES

VALVE ARRANGEMENT

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

2.3 LITER 4-CYLINDER (Cont.)

VALVE GUIDES

If valve guides become worn, they may be reamed to install a new valve with oversize stem. When going from a standard size stem to oversize, always use reamers in sequence to obtain final desired bore. Valve seat must be refaced after guide has been reamed, and a suitable tool used to break sharp corner (ID) of guide.

VALVE STEM OIL SEALS

With valve in head, install plastic seal protector cap over end of valve stem. Oil protector cap and start stem seal carefully over cap using seal installer tool (T73P-6571-A). Push seal down until seal jacket touches top of valve guide. Remove plastic seal protector cap. Using seal installer tool, bottom seal on valve guide.

VALVE SPRINGS

Removal – 1) Remove exhaust manifold shroud and valve rocker arm cover. Remove both rocker arms (cam followers) from cylinder being serviced. Remove spark plug from cylinder and install air line and adaptor to cylinder. Apply a minimum of 140 psi (9.8 kg/cm^2) line pressure.

NOTE – *If air pressure does not hold valve shut, remove cylinder head for inspection.*

2) Use suitable tool (T74P-6565-A) to compress valve spring and remove retainer locks, spring retainer and valve spring. Remove and discard valve stem seal.

CAUTION – *Do not remove air pressure.*

Installation – 1) Install new valve stem oil seal, valve spring and retainer. Compress spring and install valve spring retainer locks.

CAUTION – *Do not compress valve spring beyond 1.06" (27 mm) during installation.*

2) Remove compressor tool, turn off air and remove adapter. Apply Lubriplate or equivalent to all rocker arm contact surfaces. Dip rocker arms in engine oil before installing in position. Install spark plug and rocker arm cover.

NOTE – *Make sure that the hydraulic lifters have been collapsed and released before rotating camshaft.*

VALVE SPRING INSTALLED HEIGHT

Measure assembled height of valve spring from surface of spring pad to underside of spring retainer. If height is not within specifications, install .030" (.76 mm) spacer(s) between spring and pad to obtain recommended height. Do not install spacers unless necessary, as excess use of spacers will result in overstressing valve springs and over-loading camshaft lobe.

Spring Height Specifications

Engine	Installed Height In. (mm)
2.3L	1.531-1.594 (38.89-40.49)

HYDRAULIC LIFTER ASSEMBLY

Hydraulic lifter assemblies must be installed in original locations. Clean and inspect parts. Replace entire assembly if plunger is not free in body. Assemble lifters and check free operation by pressing down on cap. Place lifter upright in leakdown tester tool (6500-E) and check for leakdown rate of .125" (3.17 mm) in 2-8 seconds with a 50 lb. (222 N) load. If not within specifications, replace lifter assembly.

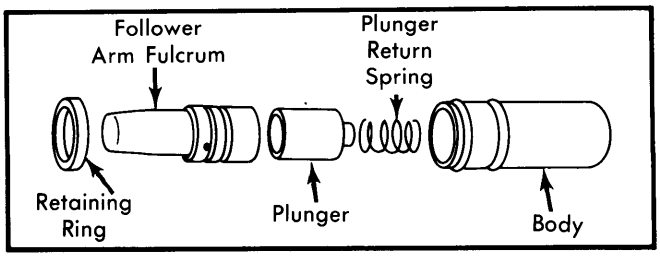

Fig. 4 Exploded View of Hydraulic Lifter Assembly

HYDRAULIC LIFTER ADJUSTMENT

Position camshaft so high point of cam lobe is facing away from valve (valve closed) to be checked. Remove coil spring holding cam follower arm to lash adjuster (if equipped). Use suitable tool (T74P-6565-A) to slowly apply pressure to cam follower until lash adjuster is completely collapsed. Hold in this position and check clearance between follower and cam. If not within specifications .035-055" (.88-1.39 mm) inspect cam follower, valve spring installed height and cam.

PISTONS, PINS & RINGS

OIL PAN

See Oil Pan Removal at end of ENGINE Section.

PISTON & ROD ASSEMBLY

Removal – 1) Remove ridge at top of cylinder bores (using suitable ridge reamer) before removing pistons from block.

NOTE – *Keep tops of pistons covered with cloth to catch cuttings during this procedure.*

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

NOTE – *Be careful not to nick crankshaft journals.*

Installation – 1) Oil piston rings and cylinder walls with a light coat of engine oil. Make sure ring gaps are properly spaced on piston and install ring compressor tool on piston. *See Fig. 5.*

2) Insert rod and piston assembly into cylinder bore and guide rod over crankshaft journal.

NOTE – *Notch or arrow on piston head should be toward front of engine.*

3) Tap piston into cylinder bore using a wooden handle, install rod cap, and tighten. Repeat procedure for each piston assembly.

2.3 LITER 4-CYLINDER (Cont.)

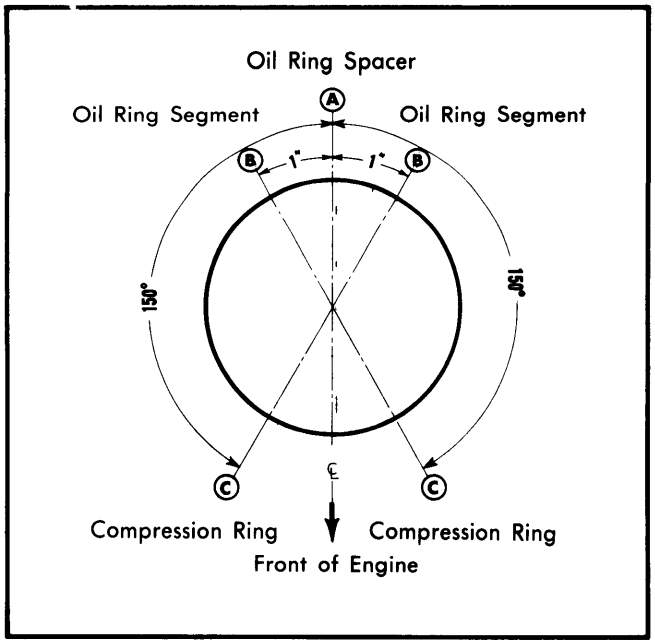

Fig. 5 Piston Ring Gap Spacing

FITTING PISTONS

Check piston to cylinder bore clearance by measuring the piston and bore diameters. Measure outer diameter of piston at centerline of piston pin bore and at 90° to pin bore axis. 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 normal room temperature (70° F) when fitting.

Piston Size Code Chart

Code	Size In. (mm)
Red	3.7780-3.7786 (95.961-95.976)
Blue	3.7792-3.7798 (95.991-96.006)
.003" Oversize	3.7084-3.7810 (96.022-96.037)

PISTON PINS

Removal – Remove bearing inserts from connecting rod and cap. Mark pistons and pins to assure assembly with same rod. Press piston pin from piston and connecting rod.

Installation — Apply a light coat of engine oil to all parts. Assemble piston to connecting rod with oil squirt hole in connecting rod and arrow or notch on top of piston positioned as shown in *Fig.* 6. Start piston pin in piston and connecting rod. Press pin through both piston and rod until pin is centered in piston. Pins are available in .001" (.02 mm) and .002" (.05 mm) oversize.

CRANKSHAFT & ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

NOTE – *Following procedures are with oil pan and oil pump removed.*

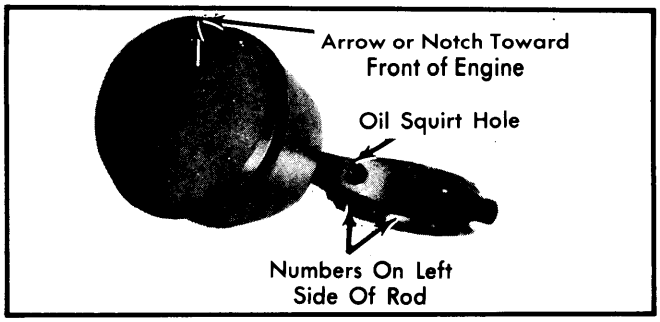

Fig. 6 Installing Piston and Rod Assembly

Connecting Rod Bearings – After ensuring rod caps are marked for cylinder identification, remove rod caps. Use Plastigage method to check for proper bearing clearances. If not within specifications, new bearings must be installed. New bearings are available in .001" (.02 mm) and .002" (.05 mm) undersize. Selective fitting is required on each connecting rod. A standard bearing may be used in combination with a .001" (.02 mm) or .002" (.05 mm) undersize bearing. Coat bearing surfaces with oil, install rod cap and tighten nuts.

NOTE – *Always replace bearings in pairs. Never use a new bearing in combination with a used bearing.*

Main Bearings – 1) Position jack under counterweight adjoining bearing being checked so weight of crankshaft will not compress Plastigage and provide an erroneous reading. With all bearing caps (other than one being checked) tight, check clearances using Plastigage method.

2) If clearances are excessive, a .001" (.02 mm) or .002" (.05 mm) undersize bearing may be used in combination with a standard bearing. If .002" (.05 mm) undersize bearings are used on more than one journal, they must be positioned in cylinder block rather than bearing cap.

NOTE – *Always replace bearings in pairs. Never use a new bearing in combination with a used bearing.*

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

4) Remove all upper main bearings by inserting suitable tool in oil hole of crankshaft journal and rotating crankshaft clockwise to roll bearing from engine. Oil new upper bearing and insert plain (unnotched) end between crankshaft and indented (or notched) side of block. Rotate bearing into place. Install all main bearing caps with arrows pointing to front of engine.

REAR MAIN BEARING OIL SEAL

Removal — Split lip type oil seal is used for service replacement. Loosen all main bearing cap bolts, allowing crankshaft to drop not more than .063" (1.60 mm) and remove main bearing cap. Remove oil seal from cap and clean oil seal groove. Remove upper seal half from block using seal removal tool or metal screw in end of seal.

CAUTION – *Extreme care should be taken not to scratch or mar crankshaft seal surfaces.*

2.3 LITER 4-CYLINDER (Cont.)

Installation – 1) Apply Lubriplate (or equivalent) to new split lip type seal halves. Carefully install upper seal into its groove, with undercut side of seal toward front of engine making sure seal ends are flush with block.

2) Make sure no rubber has been shaved from outside diameter of seal. Tighten remaining bearing caps. Install lower seal in rear main bearing cap with undercut side of seal toward front of engine making sure seal ends are flush with bearing cap ends

NOTE – *Locating tab must face rear of engine.*

3) Apply silicone sealer to rear main bearing cap mating surfaces, making sure not to allow sealer to contact oil seal. Install main bearing cap and tighten bolts.

FRONT CRANKSHAFT OIL SEAL

Removal & Installation – Remove alternator belt and crankshaft pulley. Remove camshaft drive belt. See *CAMSHAFT TIMING*. Remove drive belt sprocket and belt guide from crankshaft, if so equipped. Use suitable tool (T74P-6150-A or T74P-6700-B) to remove and replace oil seal.

CAMSHAFT

CAMSHAFT DRIVE BELT

Removal & Installation – See *CAMSHAFT TIMING*.

CAMSHAFT

Removal – 1) With cylinder head removed from engine, remove rocker arms.

NOTE – *Keep rocker arms in order for reinstallation in original location.*

2) Remove camshaft sprocket attaching bolt. Slide sprocket and belt guide plate from camshaft. Remove camshaft thrust plate from rear of cylinder head and carefully slide camshaft out.

Installation – Oil camshaft with engine oil and apply Lubriplate to valve stem tips. Oil rocker arms and carefully install camshaft in cylinder head. Install thrust plate, bolts and tighten. Check camshaft end play and replace thrust plate if end play is not within specifications.

NOTE – *Use new camshaft attaching bolt or use new Teflon tape on threads of old bolt.*

CAMSHAFT BEARINGS

Removal & Installation – Use suitable tool (T71P-6250-A) to remove and install bearings.

NOTE – *Lubrication hole in bearing must be aligned with hole in journal.*

CAMSHAFT END THRUST

With camshaft drive belt cover removed, push camshaft toward rear of engine. Install dial indicator so indicator point is on camshaft sprocket attaching screw or gear hub and zero dial indicator. Using a large screwdriver between camshaft sprocket or gear and cylinder head, pull the camshaft forward and release it. Read dial indicator and if end play is not within specifications, replace thrust plate at rear of cylinder head.

CAM LOBE LIFT

Measure distance between major and minor diameters of each cam lobe with a micrometer. Difference in readings is lobe lift. If readings vary or do not meet specifications, replace camshaft and all rocker arms (cam followers).

CAMSHAFT TIMING

Checking Timing – 1) Remove access plug from timing belt cover and position crankshaft at TDC by aligning pointer on cover with "O" mark on crankshaft damper. See *Fig. 7*.

CAUTION – *Turn engine in direction of normal rotation only.*

2) Look through access hole and check that timing mark on camshaft drive sprocket is aligned with pointer on inner belt cover. Remove distributor cap and check that rotor is facing No. 1 position on cap.

Adjusting Timing – 1) If timing is incorrect or it is necessary to remove belt, remove timing belt outer cover, and loosen belt tensioner adjustment screw. Position tension adjusting tool (T74P-6254-A) on tension spring roll pin and release belt tensioner. Tighten adjustment screw to hold tensioner in released position. Remove crankshaft damper, belt guide and drive belt.

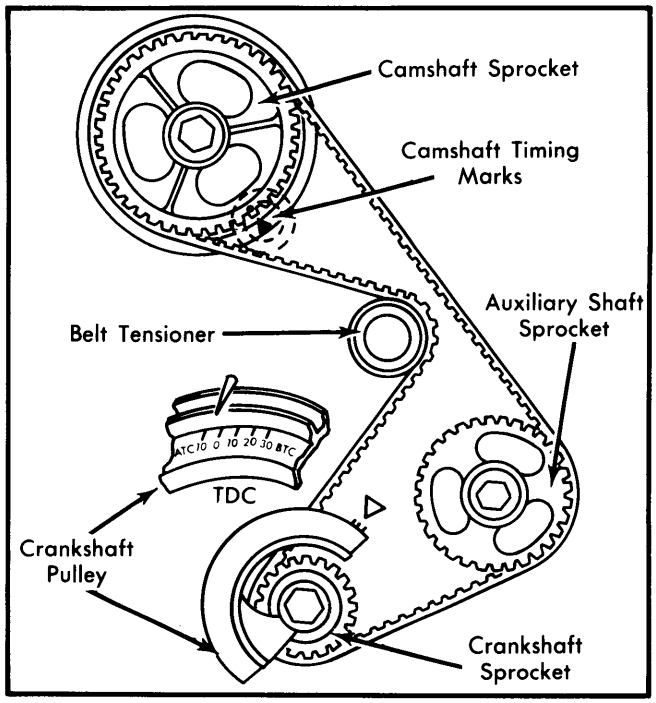

Fig. 7 Camshaft Belt Sprocket Alignment

2) Position crankshaft sprocket and camshaft sprocket as shown in *Fig. 7*. Remove distributor cap and set rotor to No. 1 firing position by turning auxiliary shaft. Install drive belt over crankshaft sprocket and then counterclockwise over auxiliary and camshaft sprockets. Align belt in middle of sprockets.

3) Loosen tensioner adjustment screw and allow tensioner to move against drive belt. Remove spark plugs and rotate crankshaft 2 complete turns in normal direction of rotation to

2.3 LITER 4-CYLINDER (Cont.)

remove slack from belt. Tighten tensioner adjustment and pivot bolts. Recheck timing alignment. Install parts previously removed.

AUXILIARY SHAFT

Removal – Remove drive belt cover, drive belt and auxiliary sprocket retaining bolt and washer. Slide sprocket from auxiliary shaft. Remove distributor, fuel pump and auxiliary shaft cover. Remove thrust plate and carefully remove shaft from cylinder block. Using bearing removal tool (T58L-101-A), remove bearing from block.

Installation – 1) Align oil holes in bearing with those in block and drive bearing into place, using suitable tool (T57T-7003-A). Oil shaft with engine oil and slide into cylinder block.

CAUTION – *Do not allow gear and fuel pump eccentric to touch bearing surfaces during installation.*

2) Install thrust plate, gasket, shaft cover, fuel pump, distributor and sprocket. Install and adjust drive belt. Install drive belt cover.

ENGINE OILING

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

Oil Filter – Replace at 1st oil change and every 2nd oil change after that.

Normal Oil Pressure (Hot) – 40-60 psi (2.8-4.2 kg/cm²) at 2000 RPM.

Pressure Regulator Valve – In pump body. Not adjustable.

ENGINE OILING SYSTEM

Oiling system is force feed type using a full flow oil filter. Oil enters main oil gallery from the oil filter and flows to main bearings and camshaft bearings. Connecting rod bearings are supplied from front and rear main bearings via inclined passages. A squirt hole in each rod bearing end supplies oil to piston thrust side of cylinder. The auxiliary shaft is connected with the main oil gallery. See *Fig. 8*.

The distributor shaft receives oil from a passage drilled in the auxiliary shaft. Cam and cam follower arms are supplied from camshaft bearings and valve lash adjusters are oiled from drilled oil passages in cylinder head.

OIL PUMP

Removal – Remove oil pan and separate pick-up tube and screen from body of pump. Remove oil pump attaching screws and remove pump.

Disassembly – Remove pick-up tube gasket and cover attaching bolts. Remove cover, inner rotor, shaft assembly and outer race. Drill a small hole and insert sheet metal screw into oil pressure relief valve chamber cap. Pull out cap and remove spring and plunger.

Reassembly – Oil parts thoroughly and install oil pressure relief valve plunger, spring and a new cap. Install outer race and inner rotor and shaft assembly. Install cover and tighten attaching screws.

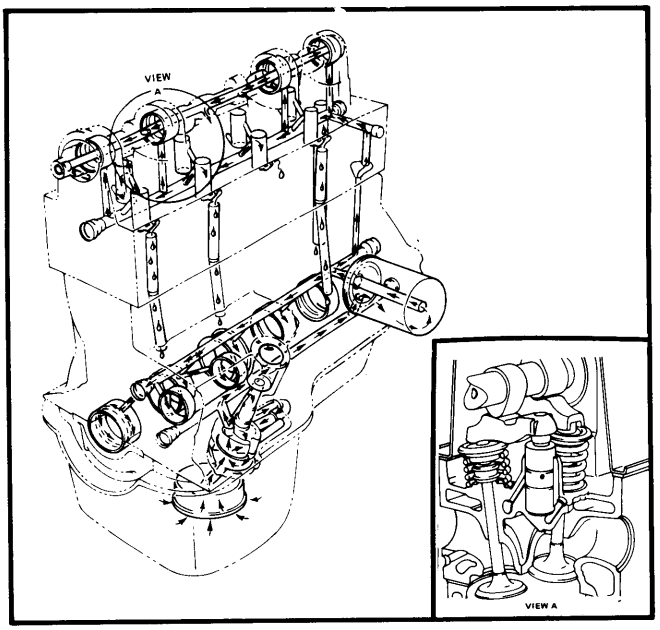

Fig. 8 Engine Oiling System

NOTE – *Make sure identification mark (dimple) on outer race is facing outward and on same side as mark on rotor. Rotor assembly and race are serviced as an assembly only.*

Installation – To install, reverse removal procedure and use a new pick-up tube gasket.

Oil Pump Specifications

Application	Specification In. (mm)
Rotor Shaft-to-Hsg. Bearing	.0015-.0030 (.038-.076)
Rotor Assembly End Clearance	.004 (.10)
Outer Race-to-Housing	.001-.013 (.02-.33)
Relief Valve Spring	
Tension	15.2-17.2 lbs. (6-7 kg) @1.20 (30.4)
Clearance	.0015-.0030 (.038-.076)

ENGINE COOLING

WATER PUMP

Installation — 1) After all gasket surfaces are clean, coat both sides of gasket with sealer and position gasket on cylinder block. Position water pump on block, install retaining bolts and tighten. Connect lower radiator hose and heater hose to water pump.

2) Install water pump pulley, fan and alternator belt. Install thermactor pump, power steering and air conditioning fan belts. Fill and bleed system and check for leaks.

Removal – Drain cooling system. Remove thermactor pump, power steering and air conditioning belts if equipped. Disconnect lower radiator hose from water pump. Remove alternator fan belt, fan, and water pump pulley. Disconnect heater hose from water pump. Remove water pump attaching bolts and remove water pump.

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

2.3 LITER 4-CYLINDER (Cont.)

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Engine	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke		Displ.	
				in.	mm	in.	mm	cu. ins.	cc
2.3L(140")	88 @ 4800	118 @ 2800	9.0:1	3.78	96.0	3.126	79.40	140	2300

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)
2.3L (140")							
Int.	1.723-1.747 (43.76-44.37)	44°	45°	.060-.080 (1.52-2.03)	.3416-.3423 (8.68-8.69)	.0010-.0027 (.025-.068)	.3997 (10.152)
Exh.	1.49-1.51 (37.8-38.3)	44°	45°	.070-.090 (1.77-2.28)	.3411-.3418 (8.66-8.68)	.0015-.0032 (.038-.081)	.3997 (10.152)

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)
2.3L (140")	.0014-.0022 (.035-.055)	.0002-.0004 (.005-.010)	Press Fit	1 & 2	.010-.020 (.25-.50)	.002-.004 (.05-.10)
				3	.015-.055 (.38-1.39)	Snug

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)
2.3L (140")	3.3982-2.3990 (60.914-60.934)	.0008-.0015 (.020-.038)	No. 3	.004-.008 (.10-.20)	2.0462-2.0472 (51.973-51.998)	.0008-.0015 (.020-.038)	.0035-.0105 (.088-.266)

2.3 LITER 4-CYLINDER (Cont.)

ENGINE SPECIFICATIONS (Cont.)

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
2.3L (140")	1.89 (48.0)	71-79@1.56 (32-35@3.6)	159-175@1.16 (72-79@29.4)

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
2.3L (140")	1.7713-1.7720 (44.991-45.008)	.001-.003 (.02-.07)	.2437 (6.189)

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N•m)
Auxiliary Shaft Sprocket	28-40 (38-54)
Belt Tensioner Pivot Bolt	28-40 (38-54)
Belt Tensioner Adjustment Bolt	14-21 (19-29)
Camshaft Sprocket	89-90 (109-122)
Connecting Rod	
Step 1	25-30 (34-41)
Step 2	30-36 (41-49)
Crankshaft Pulley	100-120 (136-163)
Cylinder Head	
Step 1	50-60 (68-82)
Step 2	80-90 (109-122)
Exhaust Manifold	①16-23 (22-31)
Flywheel	54-64 (73-87)
Fuel Pump	14-21 (19-29)
Intake Manifold	①14-21 (19-29)
Main Bearing Caps	
Step 1	50-60 (68-82)
Step 2	80-90 (109-122)

Application	INCH Lbs. (N•m)
Auxiliary Shaft Thrust Plate	72-108 (8-12)
Camshaft Thrust Plate	72-108 (8-12)
Oil Pan	
6 mm Bolt	72-96 (8-11)
8 mm Bolt	96-120 (11-14)

①— Tighten in 2 steps, step 1 is 60-84 Inch Lbs. (7-10 N•m).