

## 2300 cc 4 CYLINDER

### ENGINE CODING

#### ENGINE IDENTIFICATION

Vehicle identification plate is riveted to top right fender apron (Capri) or is located on body at right rear corner of engine compartment (Courier). Code is located in block labeled engine or engine model. Use table to identify code.

#### Engine Codes

Application	Code
Capri 2300 cc .....	YA
Courier 2300 cc .....	WB

### ENGINE, CYLINDER HEAD & MANIFOLDS

#### ENGINE

**Capri** - 1) Disconnect battery cables. Disconnect all hoses and connections to air cleaner assembly while noting positions to aid in reassembly, then remove air cleaner assembly. Mark hood hinge locations, then remove hood. Raise vehicle on a hoist and remove engine shield. Drain cooling system and crankcase.

2) Remove starter. Remove converter bolt access plug and three converter-to-flywheel bolts. Remove flywheel or converter housing cover and lower housing attaching bolts. Disconnect exhaust pipe from exhaust manifold. Disconnect transmission cooler lines from radiator on models with automatic transmission.

3) Remove engine mount nuts. Disconnect and plug fuel lines at fuel pump. Remove power steering pump pulley and lower power steering-to-bracket bolt. Lower vehicle. Remove fan shroud, radiator hoses, and radiator. Disconnect heater and vacuum hoses at engine. Disconnect power brake hose and oil pressure line.

4) Disconnect kickdown cable. Disconnect accelerator cable retaining clip at ball stud, then pull lightly on cable while depressing tangs one at a time on bracket clip and remove throttle cable. Disconnect idle solenoid. Disconnect water temperature wire, vacuum amplifier, alternator wires, and ground wire.

5) Disconnect vacuum hose and coil wire from distributor. Remove alternator adjusting arm bolt, power steering pump-to-bracket bolts and remove pump. Disconnect choke wire. Support transmission and housing with a floor jack, then remove housing-to-engine attaching bolts. Attach lifting hoist to engine, and carefully lift engine from vehicle.

**Courier** - 1) Remove hood, marking location of hinges. Disconnect battery, drain cooling system. Remove air cleaner and heat stove assembly. Disconnect radiator hoses at radiator. Remove radiator and shroud. Disconnect thermactor hoses at pump. Disconnect heater hoses, choke cable and accelerator linkage. Disconnect brake vacuum booster hose and vacuum amplifier.

2) Remove alternator and bracket, and move out of the way. Disconnect fuel line at carburetor. Raise vehicle and drain crankcase. Disconnect exhaust pipe from manifold and remove exhaust pipe hanger. Remove right engine mount bracket. Remove lower transmission-to-engine attaching bolts. Lower vehicle, support transmission with a jack and remove remaining transmission-to-engine attaching bolts.

3) Install a suitable engine lifting sling, to engine lifting hooks. Remove clutch slave cylinder from transmission. Pull engine forward until it clears transmission shaft. Lift engine from vehicle.

#### INTAKE MANIFOLD

**Removal & Installation** - Remove air cleaner and disconnect fuel line from carburetor. Disconnect distributor and crankcase ventilation hoses at intake manifold. Disconnect carburetor linkage from carburetor. Remove nuts and bolts, then remove intake manifold and carburetor as an assembly from engine. To install, reverse removal procedure while noting the following: Use a new gasket upon installation. Tighten manifold nuts and bolts, in two steps, using sequence as shown in illustration.

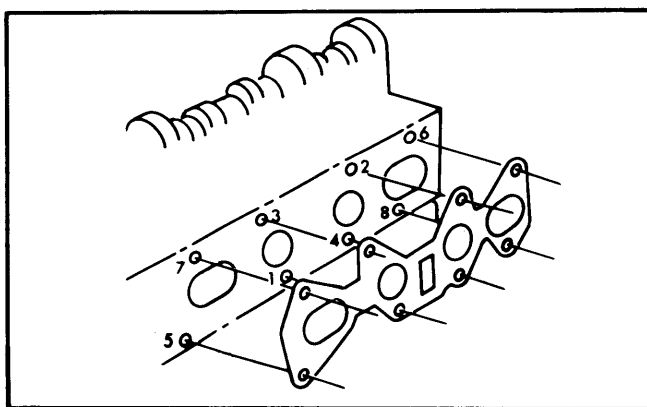


Fig. 1 Intake Manifold Tightening Sequence

#### EXHAUST MANIFOLD

**Removal & Installation** - Remove air cleaner and two attaching nuts from top of exhaust manifold shroud. Remove attaching nuts from muffler inlet pipe and manifold, then remove exhaust manifold. To install, apply a light film of graphite grease on exhaust manifold and install manifold. Tighten nuts to specification in sequence shown in illustration.

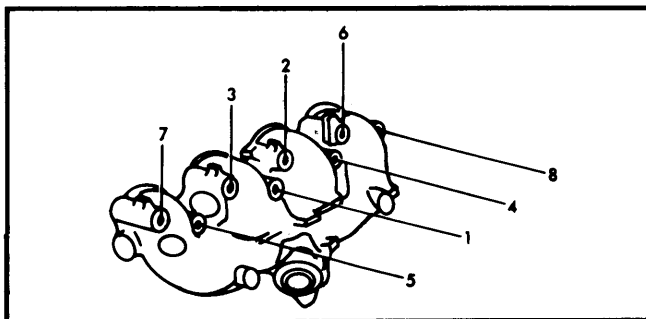


Fig. 2 Exhaust Manifold Tightening Sequence

#### CYLINDER HEAD

**Removal** - Drain cooling system, remove air cleaner and rocker arm cover. Remove exhaust manifold. Remove intake manifold and carburetor as an assembly. Disconnect spark plug wires from plugs. Remove all drive belts, fan, and pulley. Remove crankshaft pulley attaching bolt and crankshaft pulley. Remove camshaft drive belt cover, loosen drive belt

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tensioner and remove belt. Remove water outlet elbow from cylinder head. Remove timing belt inner cover-to-cylinder head attaching bolt. Remove cylinder head bolts, then remove cylinder head and camshaft as an assembly.

**Installation** — Clean gasket material from cylinder head and block. Install new gasket on block. Place cylinder head assembly on block and install head bolts. Tighten bolts, in two steps, using sequence shown in illustration. Reverse removal procedure for remaining components and adjust timing belt tension.

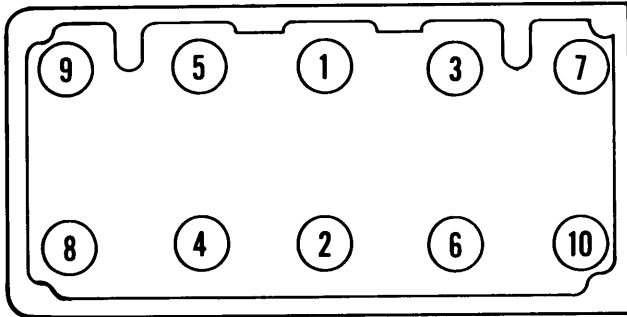


Fig. 3 Cylinder Head Tightening Sequence

### VALVES

#### VALVE ARRANGEMENT

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

#### 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. The valve seat must be refaced after a guide has been reamed, and a suitable tool used to break sharp corner (ID) of guide.

#### VALVE STEM OIL SEALS

With valve in head, place plastic installation cap over end of valve stem. Start stem seal carefully over cap and push seal down until jacket touches top of valve guide. Remove plastic cap and bottom seal on valve guide.

#### VALVE SPRINGS

**Removal** — Remove valve rocker arm cover. Remove both rocker arms (cam followers) from cylinder being serviced. Remove spark plug from cylinder and install air line and adapter to cylinder with a minimum of 140 psi line pressure.

**NOTE** — If air pressure does not hold valve shut, remove cylinder head for inspection. Use a suitable tool to compress valve spring, then remove retainer locks. Remove tool, spring retainer, spring, and valve stem seal. **CAUTION** — DO NOT remove air pressure.

**Installation** — Install NEW valve stem oil seal, valve spring and retainer. Compress spring and install retainer locks. **CAUTION** — Do not compress spring more than necessary to install locks. Remove compressor tool, turn off air and remove adapter. Apply Lubriplate to all contact surfaces of rocker arms and install in position. **CAUTION** — Make sure that the

affected lash adjuster has been collapsed and released before rotating camshaft.

#### VALVE SPRING INSTALLED HEIGHT

Measure assembled height of valve spring from surface of the 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 overloading camshaft lobe.

#### Spring Height Specifications

Engine	Installed Height
2300 cc .....	1.531-1.594

#### HYDRAULIC LASH ADJUSTER ASSEMBLY

Two types of hydraulic lash adjusters are used in 2300 cc engines. Clean and inspect all parts of assembly. Replace the entire assembly if plunger is not free in body. Assemble lifter assembly and check for freeness of operation by pressing down on the cap. Lifters may also be checked with a hydraulic tester to check leakdown rate.

#### HYDRAULIC LASH ADJUSTMENT

Position camshaft so high point of cam lobe is facing away from valve to be checked (valve closed). Remove coil spring holding cam follower arm to lash adjuster. Use special tool (T74P-6565-B) 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, inspect cam follower, valve spring installed height, and cam.

#### Hydraulic Lash Adjustment

Application	① Clearance
Base of Lobe-to-Rocker Arm	
Desired .....	.040-.050" (1.0-1.3 mm)
Allowable .....	.035-.055" (.9-1.4 mm)

① — Leak down rate is 2-8 seconds.

### PISTONS, PINS & RINGS

#### OIL PAN

**Removal** — Remove dipstick and flywheel housing cover, then drain crankcase. Disconnect steering coupling from rack and pinion and unbolt rack and pinion from crossmember; move assembly forward for clearance. Withdraw oil pan mounting bolts and maneuver pan from vehicle.

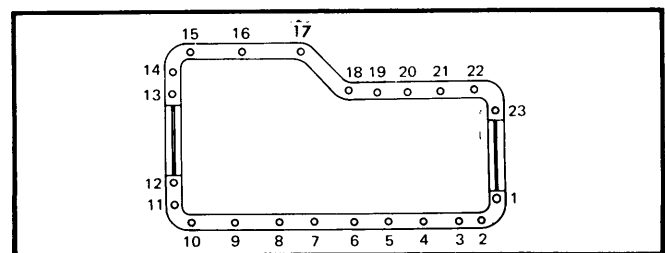


Fig. 4 Oil Pan Tightening Sequence

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**Installation** — To install oil pan, reverse removal procedure referring to tightening sequence illustration.

### PISTON & ROD ASSEMBLY

**Removal** — Remove cylinder head, oil pan, and oil pump. Remove ridge at top of cylinder bores using a ridge reamer before removing pistons from block. **NOTE** — Keep tops of pistons covered during this procedure. Rotate crankshaft and inspect connecting rods and rod caps for cylinder identification. Identify them if necessary. Remove rod cap and push each piston and rod assembly out top of cylinder bore. **NOTE** — Be careful not to nick crankshaft journals. Install rod caps on mating rods.

**Installation** — Oil piston rings and cylinder walls with light engine oil. Install ring compressor on piston, then insert rod and piston assembly into cylinder bore and guide rod over crankshaft journal. **NOTE** — Notch on piston head should point towards front of engine. Tap piston into cylinder bore using a wooden handle, install rod cap and tighten nuts in two steps. Repeat procedure for each piston assembly.

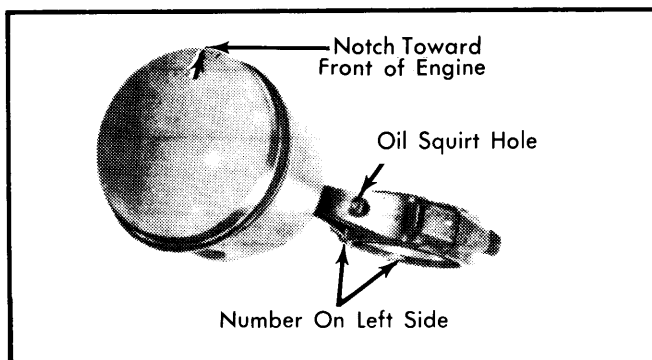


Fig. 5 Piston & Rod Assembly Installation Features

### FITTING PISTONS

1) Check piston to cylinder bore clearance by measuring the piston and cylinder bore diameters. Measure outer diameter of piston at centerline of piston pin bore and at 90° to pin bore axis. Measure the diameter of each cylinder bore at the top, middle and bottom, with the gauge placed at right angles and parallel to the centerline of the engine.

2) Standard size pistons are color coded; red, blue or have .003" OS stamped on the dome. Select the piston to assure the proper clearance. When the bore diameter is in the lower one third of specified range, a red piston should be used. When the bore diameter is in the middle one third a blue piston should be used. When the bore diameter is in the upper one third, the .003" OS piston should be used.

3) If no piston can be fitted, refinish the cylinder to provide proper clearance. When a piston has been fitted, mark it for assembly in the cylinder to which it has been fitted.

Piston Code	Diameter In. (mm)
Red .....	3.7780-3.7786 (95.961-95.976)
Blue .....	3.7792-3.7798 (95.991-96.006)
.003" O.S. ....	3.7804-3.7810 (96.022-96.037)

**Cylinder Bore Range** . 3.7795-3.7831" (95.999-96.090mm)  
**Piston-to-Bore Clearance** .. .0014-.0022" (.0355-.0558mm)

### 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 light coat of engine oil to all parts. Assemble piston to connecting rod with oil squirt hole (in connecting rod) and notch (on piston head) positioned as shown in illustration. Start piston pin in piston and connecting rod, then press pin through piston and connecting rod until pin is centered in piston.

## CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

### MAIN & CONNECTING ROD BEARINGS

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

**Connecting Rod Bearings** — After ensuring rod caps are marked for cylinder identification, remove rod caps. Use Plastigage method to check for proper bearing clearance. If not within specifications, new bearings must be installed. New bearings are available in .001" (.025 mm) and .002" (.051 mm) undersizes. Selective fitting is required on each connecting rod. A standard bearing may be used in combination with either undersize bearing. **NOTE** — Always replace bearings in pairs. Never use a new bearing in combination with a used bearing. Coat bearing surfaces with oil, install rod cap and tighten nuts.

**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" (.025 mm) or .002" (.051 mm) undersize bearing may be used in combination with a standard bearing. If .002" (.051 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. If standard and .002" (.051 mm) undersize combination do not bring bearing clearance within specified limits, crankshaft will have to be refinished and undersized bearings installed.

3) 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 & Installation** — 1) Split lip type seal is provided for service replacement. Remove oil pan and oil pump. Loosen

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all main bearing cap bolts, allowing crankshaft to drop (not more than  $\frac{1}{32}$ " ) and remove rear main bearing cap. Remove oil seal from cap and clean oil seal groove. Remove upper seal half from block using seal removal tool or small metal screw in end of seal. **CAUTION** — Extreme care should be taken not to scratch or mar crankshaft seal surface.

2) Dip new split lip type seal halves in clean engine oil. Carefully install upper seal into its groove with undercut side of seal toward front of engine, by rotating it on seal journal of crankshaft until approximately  $\frac{3}{8}$ " protrudes below parting surface. **CAUTION** — Be 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.

3) Allow seal to protrude approximately  $\frac{3}{8}$ " above parting surface to mate with upper seal. **NOTE** — Locating tab must face rear of engine. Apply suitable sealer to rear main bearing cap mating surfaces, taking care not to permit sealer on seal, install main bearing cap and tighten bolts.

### FRONT CRANKSHAFT OIL SEAL REPLACEMENT

**Removal & Installation** — Remove alternator drive belt and crankshaft pulley. Remove camshaft drive belt. See *Camshaft Drive Belt Replacement*. Slide camshaft drive belt sprocket and belt off crankshaft. **NOTE** — It may be necessary to utilize a puller to withdraw sprocket. Fit a suitable tool (T71P-6150-A) over end of crankshaft and remove seal. To install new seal, reverse removal procedure.

**NOTE** — Cylinder front cover and auxiliary shaft seals are replaced using procedure outlined above.

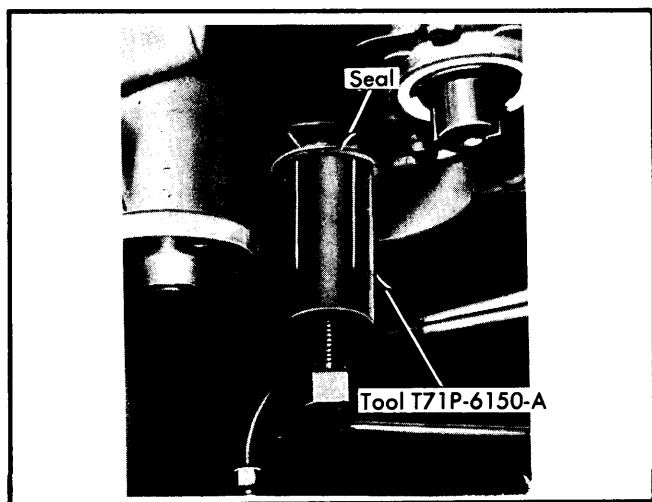


Fig. 6 Removing Front Crankshaft Oil Seal

### CAMSHAFT

#### CAMSHAFT DRIVE BELT

**Removal & Installation** — See *Camshaft Timing*.

#### CAMSHAFT

**Removal** — With cylinder head removed from engine, remove rocker arms. **NOTE** — Keep rocker arms in order for

reinstallation in original position. 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 rear of cylinder block.

**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 endplay and replace thrust plate if endplay 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 (71P-6250A) to remove and install bearings. **NOTE** — Lube hole in bearing must be aligned with oil hole in journal.

#### CAMSHAFT 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.

#### CAMSHAFT END PLAY

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 endplay is not within specifications, replace thrust plate at rear of cylinder head.

#### CAMSHAFT TIMING

**Checking Timing** — Remove access plug from belt cover and position crankshaft to TDC by aligning pointer on cover with "O" mark on crankshaft damper. **CAUTION** — Turn engine in direction of normal rotation only. 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 number one 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 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.

2) Position crankshaft sprocket and camshaft sprocket as shown in illustration. 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 fore and aft on sprockets.

3) Loosen tensioner adjustment screw and allow tensioner to move against drive belt. Remove spark plugs and rotate crankshaft two complete turns in direction of normal rotation to remove slack from belt. Tighten tensioner adjustment and pivot bolts. Recheck timing mark alignment.

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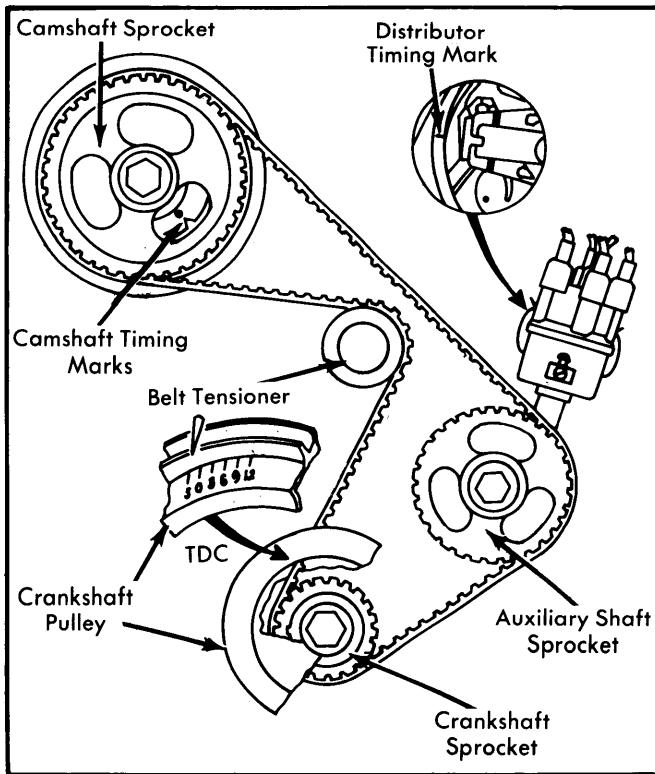


Fig. 7 Location of Timing Marks

### 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. Remove bearing from block, if worn or damaged, using suitable tool.

**Installation** — Align oil holes in bearing with those in block and drive bearing into place using a suitable tool. 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. Install thrust plate, gasket and shaft cover, fuel pump, distributor and sprocket. Install and adjust drive belt. Install drive belt cover.

### ENGINE OILING

#### ENGINE OILING SYSTEM

Oiling system is force feed type using a full flow oil filter. Oil enters main oil gallery from oil filter and flows to main bearings and camshaft bearings. Connecting rod bearings are supplied from front and rear main bearings via inclined main oil gallery. Distributor shaft receives oil from passage drilled in auxiliary shaft. Cams and cam follower arms are passages. A squirt hole in each rod bearing end supplies oil to piston thrust side of cylinder. Auxiliary shaft is connected with supplied from camshaft bearings and valve lash adjusters are oiled from drilled oil passages in cylinder head.

**Crankcase Capacity** — 4 qts. with filter change

**Oil Filter Type** — Full flow.

**Normal Oil Pressure (Hot)** — 40-60 psi at 2000 RPM.

**Pressure Regulator Valve** — In pump body. Not adjustable.

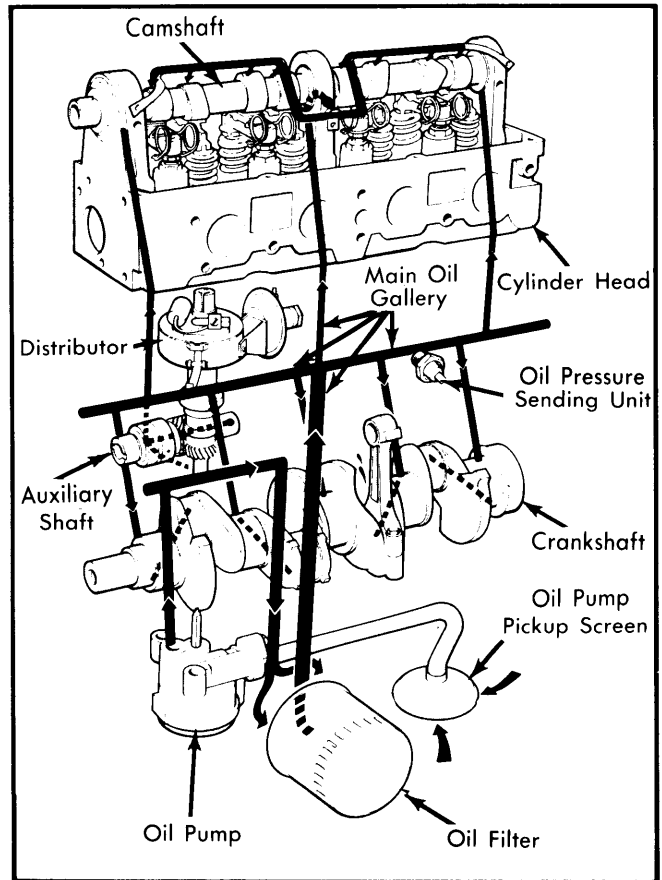


Fig. 8 Engine Oiling System

### OIL PUMP

**NOTE** — Remove oil pump and cover. Check clearances and if not within specifications, replace oil pump. Do not disassemble oil pump.

**Removal** — Remove oil pan and separate pick-up tube and screen from body of pump. Remove oil pump attaching bolts. Remove three cover attaching screws and remove cover.

#### Oil Pump Specifications

Application	Clearance In.(mm)
Drive Shaft-to-Housing .....	.0015-.0029(.038-.074)
Rotor Assembly End Clearance .....	.001-.004(.025-.101)
Outer Rotor-to-Housing	
Capri .....	.001-.007 (.025-.178)
Courier .....	.001-.013 (.025-.330)
Relief Valve Spring	
Tension .....	15.2-17.2 lbs.@1.20" (6.9-7.8 kg@30.4 mm)

# Capri & Courier Engines

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**Installation** — Clean and check pump clearances. Install pump cover and attaching screws. Position a new gasket and oil inlet tube on pump and install attaching bolts.

### Cooling System Capacity

Capri — 7½ qts.  
Courier — 8½ qts.

### ENGINE COOLING

**Thermostat** — Opens at 185-192°F (85-89°C). Full Open at 210-216°F (99-102°C).

**Radiator Cap** — 13 psi.

## 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
1978	140	2300	2-Bbl.	.....	.....	8.4:1	3.78	96.01	3.126	79.40

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)
2300 cc Intake	1.728-1.744 (43.89-44.30)	44°	45°	.060-.080 (1.52-2.03)	.3416-.3423 (8.68-8.69)	.0010-.0027 (.025-.069)	.3997 (10.15)
Exhaust	1.492-1.508 (37.90-38.30)	44°	45°	.070-.090 (1.78-2.29)	.3411-.3418 (8.66-8.68)	.0015-.0032 (.038-.081)	.3997 (10.15)

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)
2300 cc	.0014-.0022 (.035-.056)	.0002-.0004 (.005-.010)	Ⓛ	Comp. Oil	.010-.020 (.25-.51) .015-.055 (.38-1.40)	.002-.004 (.051-.102) Snug

Ⓛ — Interference Fit.

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)
2300 cc	2.3982-2.3990 (60.91-60.93)	.0008-.0015 (.020-.038)	No. 3	.004-.008 (.10-.20)	2.0464-2.0472 (51.979-51.999)	.0008-.0015 (.020-.038)	.0035-.0105 (.089-.267)

## 2300 cc 4 CYLINDER (Cont.) ENGINE SPECIFICATIONS (Cont.)

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
2300 cc	1.824 (46.3)	71-79@1.56 (32-36@39.6)	180-198@1.16 (82-90@29.5)

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
2300 cc	1.7713-1.7720 (44.991-45.009)	.001-.003 (.025-.076)	.2437 (6.19)

① — Endplay is .001-.007" (.025-.178 mm).

TIGHTENING SPECIFICATIONS	
Application	Ft. Lbs.(mkg)
Auxiliary Shaft Gear .....	28-40(3.9-5.5)
Auxiliary Shaft Thrust Plate .....	6-9(.8-1.2)
Belt Tensioner Pivot .....	28-40(3.9-5.5)
Belt Tensioner Adjuster .....	14-21(1.9-2.9)
Camshaft Sprocket .....	80-90 (11.1-12.4)
Camshaft Thrust Plate .....	6-9(.8-1.2)
Connecting Rod	
Step 1 .....	25-30(3.5-4.1)
Step 2 .....	30-36(4.1-5.0)
Crankshaft Pulley .....	100-120 (13.8-16.6)
Cylinder Head	
Step 1 .....	60(8.3)
Step 2 .....	80-90(11.1-12.4)
Exhaust Manifold-to-Cylinder Head .....	16-23(2.2-3.2)
Flywheel-to-Crankshaft .....	54-64(7.5-8.8)
Front Cover .....	6-9(.8-1.2)
Intake Manifold-to-Cylinder Head .....	14-21(1.9-2.9)
Main Bearing Cap	
Step 1 .....	60(8.3)
Step 2 .....	80-90(11.1-12.4)
Oil Pan-to-Block	
M6 Bolts .....	7-9(1.0-1.2)
M8 Bolts .....	11-13(1.5-1.8)
Rocker Arm Cover .....	4-7(.6-1.0)
Timing Belt Cover .....	6-9(.8-1.2)
Water Pump-to-Cylinder Block .....	14-21(1.9-2.9)