LE CAR 4-CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Type of vehicle and engine number is marked on a number plate riveted to the left rear side of the engine block. Plate is located just below cylinder head mating surface. First 5 digits indicate engine type.

ENGINE IDENTIFICATION

Application	Code
Le Car (1397 cc)	847-25

ENGINE MANIFOLDS & CYLINDER HEAD

ENGINE

NOTE: Engine and transaxle are removed as an assembly.

Removal

1) Remove battery. Drain coolant from engine and radiator. Drain engine oil. Take out grille. Remove hood and inner fender support. Remove air cleaner.

2) Disconnect all electrical leads, control cables, vacuum lines and coolant hoses that might interfere with engine removal. Mark each item as it is disconnected. Remove transaxle cover.

3) Remove exhaust pipe flange. Remove radiator mounting nuts. Lift out radiator, cooling fan, and expansion tank. Disconnect steering shaft at flexible coupling. Do not lose rubber bushing.

4) Remove front wheels. Remove brake calipers without disconnecting hoses and support out of way. Disconnect tie rods at rack. Use tool and separate upper ball joints. Remove steering gear box. Be sure to index steering box shims.

5) Remove air pump complete with bracket. Remove top transaxle bolts on bell housing. Attach hydraulic hoist to engine. Remove nuts from engine mounts. Remove shift rod support bolts.

6) Disconnect clutch cable. Remove front transaxle mounting bracket. Slide transaxle to left, then to right to free axle drive shafts. Remove engine assembly from vehicle.

Installation

To install, reverse removal procedure. Grease transaxle input shaft and axle drive shafts. Do not damage oil seals on axle drive shafts. Make sure axle drive shafts fully seat. Adjust clutch. Refit steering rubber bushing. Bleed cooling system.

INTAKE & EXHAUST MANIFOLD

Removal

1) Disconnect battery ground. Remove air filter hose. Disconnect and plug carburetor heating hose. Disconnect choke, accelerator, fuel lines and vacuum lines. Take off carburetor. Separate exhaust pipe.

2) Remove manifold nuts and starter heat shield. Pull manifold from engine. It may be necessary to remove nut on left engine mount and tilt engine to right to gain enough clearance for removal.

Installation

To install, reverse removal procedure, replacing all gaskets.

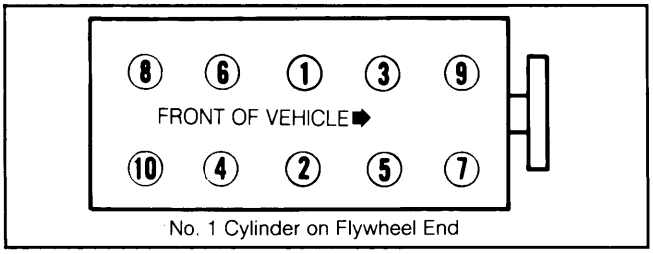
CYLINDER HEAD

Removal

1) Disconnect battery ground. Drain cooling system. Remove air cleaner. Disconnect all hoses, vacuum lines, wires, and cables from cylinder head. Loosen air pump and take off belt. Disconnect exhaust pipe at the manifold.

2) Disconnect hood lock control cable and place out of way. Take off valve cover. Remove cylinder head bolts, only loosening bolt next to distributor 1/2 turn. Tap head until free. Remove bolt and head.

Fig. 1: Cylinder Head Tightening Sequence



Loosen in reverse order.

Installation

To install cylinder head, reverse removal procedure. Make sure new head gasket is installed with "HAUT-TOP" marking facing up.

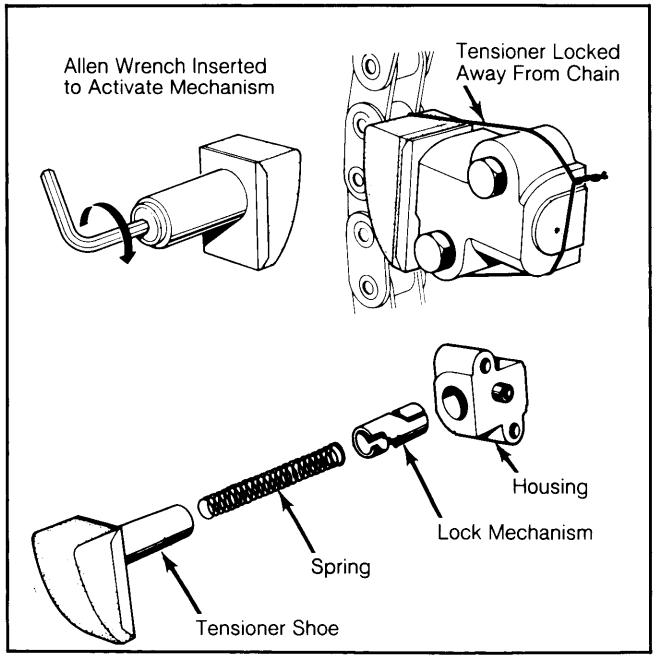
CAMSHAFT

TIMING CHAIN

Removal

With engine removed and supported, remove timing cover. Wire tensioner shoe away from chain. *See Fig. 2.* Remove camshaft sprocket lock bolt. Use a puller to remove camshaft sprocket with timing chain. Chain will come off without disturbing crankshaft sprocket.

Fig. 2: Views of Timing Chain Tensioner



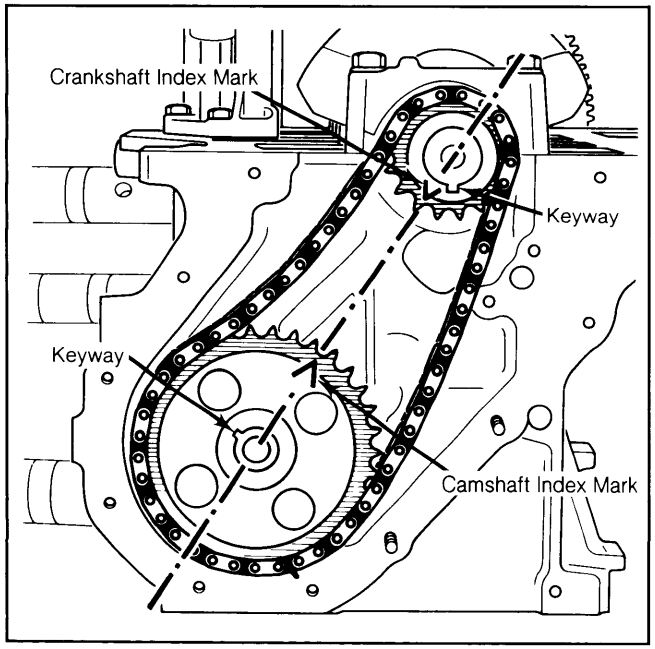
Wire tensioner shoe away from chain during removal.

LE CAR 4-CYLINDER (Cont.)

Installation

1) Position chain on camshaft sprocket. Align camshaft reference mark with mark on crankshaft. Note position of camshaft and crankshaft keyway shown in *Fig. 3.* Using a small hex wrench, activate the tensioner mechanism.

Fig. 3: Index Mark and Keyway Positions for Timing Chain Installation (Engine Inverted)



Align reference marks to install chain.

2) Refit chain tensioner with thrust plate. Tighten mounting bolts and release load on automatic wear compensator tensioner. Release load by pressing down on bottom of tensioner body. Install new timing chain tensioner.

CAMSHAFT

Removal

Remove engine and support on stand. Remove cylinder head, distributor drive gear, oil pan, timing chain cover, and timing chain. Work through access slots in camshaft sprocket and remove 2 flange bolts. Carefully slide camshaft from engine.

Installation

1) Check clearance between camshaft sprocket and flange. Clearance must not exceed .002-.005" (.05-.12 mm). Lubricate camshaft journals and lobes, then refit the camshaft.

2) Install flange and tighten. Refit sprocket and tighten mounting bolt. Make sure all camshaft and crankshaft alignment marks are matched. *See Fig. 3.* Reverse removal procedure for remaining components.

CAMSHAFT OIL SEAL

Removal

1) Remove engine air cleaner, air pump, pump support and drive belt. Remove the serrated pulley from the camshaft. Remove camshaft bearing using puller (Mot. 876). Install a spacer of 1.0" (25 mm) diameter and 1.75" (45 mm) length between the camshaft and the bolt of tool Mot. 500.02.

2) Install tool with spacer and push past the seal. Expand the tool ends by moving ring expander as far in as possible. Screw in bolt and remove seal.

Installation

Place the new seal on tool Mot. 500.02. Install the seal on the camshaft and tap gently into place all the way to the centering spacer. Install the bearing using tool Mot. 876 with the tool grip facing outward. Install the remaining components in reverse order of removal.

VALVES

VALVE ARRANGEMENT

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

VALVE GUIDE SERVICING

1) Measure O.D. of worn guide and replace with nearest oversize. Standard valve guide O.D. is .433" (11 mm). First oversize is .437" (11.10 mm) and is identified by 1 groove mark. Second oversize is .443" (11.25 mm) and is identified by 2 groove marks.

2) Ream valve guide hole in head to accept new guide. Size of reamer must be equal to outside diameter of new valve guide. To install new guide, lightly lubricate with oil. Fit guide to press with chamfer facing out. Seat guide completely in head. Finish ream valve guide bore to accept valve.

VALVE SPRINGS

Removal (Cylinder Head Installed)

Remove valve cover. Remove spark plug of cylinder requiring work. Loosen rocker arm as far as possible and remove push rod. Fit valve retaining tool in spark plug hole. Compress valve spring. Remove keepers, top cup, spring, and base washer. Check spring at free length and under a load.

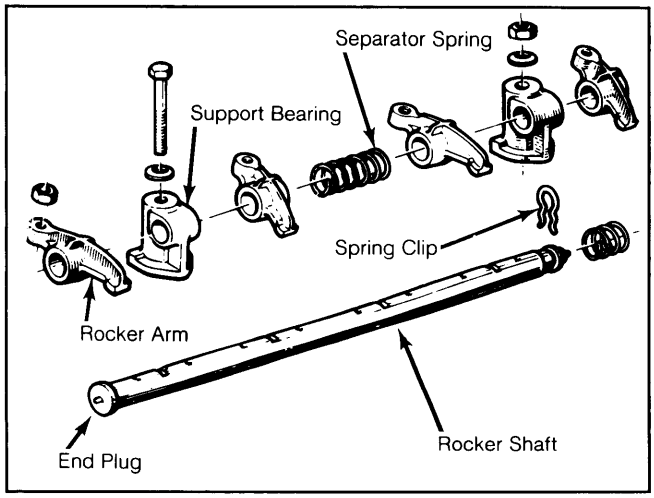
Installation

To install, reverse removal procedure. Make sure valve spring is installed with closest coil spacing toward cylinder head.

ROCKER SHAFT

After cleaning rocker shaft components, remove clips and take off springs, rocker arms, and support

Fig. 4: Exploded View of Rocker Arm and Shaft Assembly



LE CAR 4-CYLINDER (Cont.)

bearings. End plugs are press fit and cannot be removed. For correct reassembly sequence refer to *Fig. 4.*

VALVE CLEARANCE

Set intake valve clearance to .006" (.15 mm) cold or .007" (.18 mm) hot. Set exhaust valve clearance to .008" (.20 mm) cold or .010" (.25 mm) hot. Hot refers to an engine that has been operated at normal engine temperature and allowed to cool for 50 minutes.

VALVE ADJUSTING SEQUENCE

Valve Open	Valve to Adjust
No. 1 Exhaust	No. 3 Int. & No. 4 Exh.
No. 3 Exhaust	No. 4 Int. & No. 2 Exh.
No. 4 Exhaust	No. 2 Int. & No. 2 Exh.
No. 2 Exhaust	No. 1 Int. & No. 3 Exh.

PISTONS, PINS & RINGS

OIL PAN

Removal

1) Drain oil. Remove sway bar "U" brackets and pull bar down. Remove lower transaxle metal cover. Remove transaxle bolts that mount through gear shift bracket. Clutch protective cover must be removed.

2) Place a jack under front of transaxle to support it. Remove front pad. Raise transaxle front. Remove mounting bolts and tilt pan toward back of vehicle. Rotate crankshaft to provide clearance. Clean gasket surfaces.

Installation

To install, reverse removal procedure. Apply gasket sealer to rubber gaskets. Make sure pan side gaskets overlap bearing gaskets.

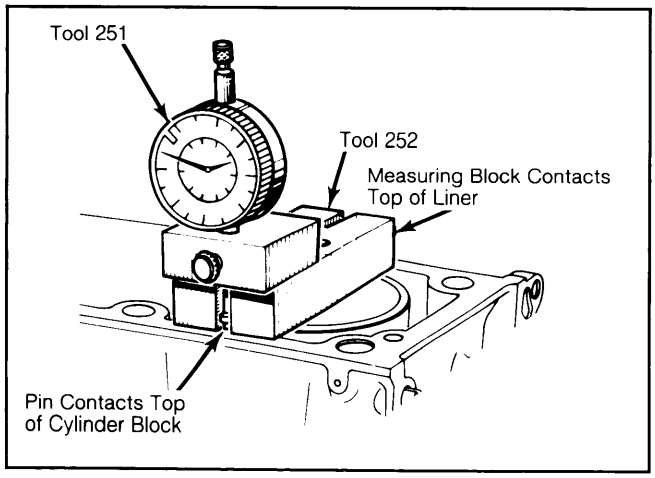
CYLINDER LINERS

Removal

1) Disconnect battery ground. Drain cooling system and oil pan. Remove air cleaner, cylinder head, oil pan, and oil pump. Fit liner clamp on head.

2) Index connecting rods and bearing caps. Remove connecting rod caps and bearings. Remove liner clamp and liner-piston-rod assembly.

Fig. 5: Checking Cylinder Liner Protrusion



Measure protrusion without "O" ring installed.

Installation

1) Check cylinder liner protrusion WITHOUT sealing "O" ring installed on liner base. Install dial indicator (Mot. 251) and measuring block (Mot. 252) as shown in *Fig. 5.* Protrusion must be .001-.004" (.02-.09 mm). If protrusion is incorrect, substitute a new set of liners to determine if defect is in liners or cylinder block.

2) Remove liners from cylinder block and install "O" rings on base of liners. Install the piston assemblies in liners.

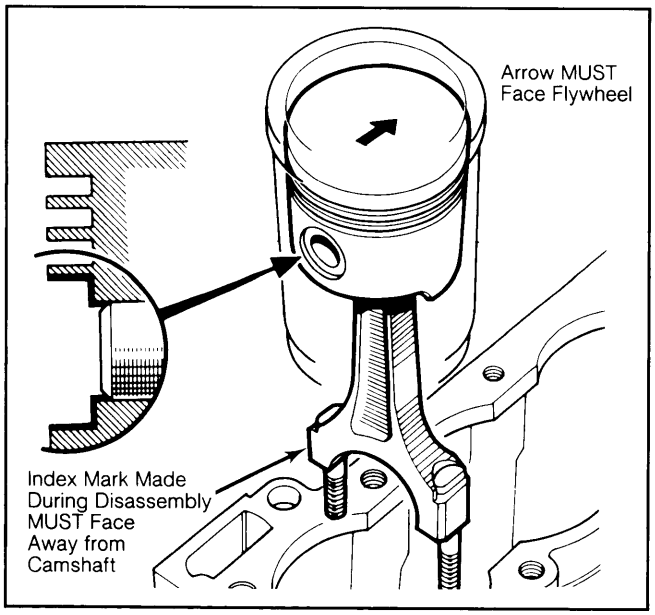
3) Lubricate rod bearings and install liner-piston-connecting rod assemblies into block. Make sure No. 1 is at clutch end. Number on connecting rod bearing end is on opposite side of camshaft. Arrow on piston must face flywheel. Install connecting rod caps. Reverse removal procedure for remaining components.

PISTON & ROD ASSEMBLY

Removal

Remove piston and rod assembly from block with cylinder liners. See Cylinder Liners. Remove piston out bottom of liner. Take off rings, piston pin, and connecting rod. See Piston Pins.

Fig. 6: Piston Mounting and Identification Marks



Reassemble piston and connecting rod as shown.

Installation

Fit piston pin. Fit rings. Piston rings are pregapped. Assemble with "O" mark or "TOP" facing up. Lubricate connecting rod assemblies with oil and fit to liner. Make sure machined side of connecting rod bearing is parallel with flat edge on liner top.

PISTON PIN

Removal

Remove piston assembly from liner. Remove rings. Using pin tool (Mot. 574), extract piston pin.

Installation

1) Position piston with arrow facing flywheel. Index mark made during removal on connecting rod must face away from camshaft. Heat connecting rod to 482°F (250°C). Slide new piston over installing mandrel and screw in locating plug (part of tool kit Mot. 574).

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LE CAR 4-CYLINDER (Cont.)

2) Lightly oil piston pin. Push mandrel, pin guide, and pin assembly through piston by hand, until piston pin makes contact with rod. This procedure will automatically center and correctly space the pin.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

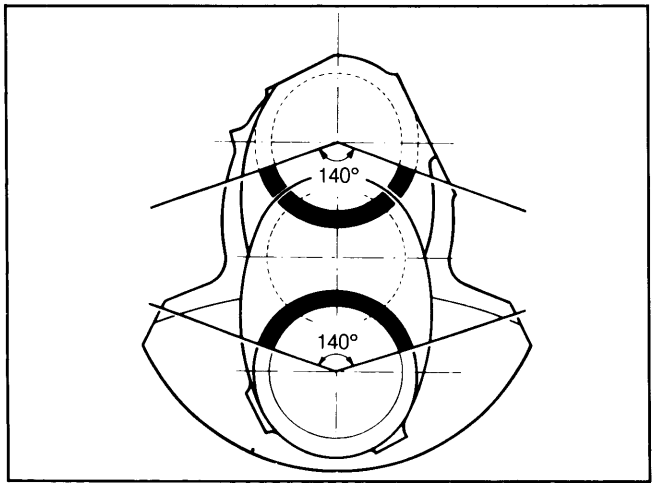
MAIN BEARING SERVICE

1) Remove cylinder head and oil pan. Invert engine. Remove connecting rod bearing caps. Mark position of main bearing to block. Remove main bearing caps. Remove crankshaft, upper main bearings, and thrust washers.

2) Use a micrometer and measure crankshaft journals. If any main bearing journal is worn beyond 2.147" (54.55 mm) or any connecting rod journal is worn beyond 1.722" (43.73 mm), crankshaft must be reground and fitted with new bearings.

NOTE: Connecting rod journals are roll hardened. Make sure roll hardening remains intact over a 140° section facing rotational centerline of crankshaft.

Fig. 7: Crankshaft MUST Maintain Roll Hardened Surfaces as Shown in Illustration



Hardening must cover a 140° segment.

3) Fit upper main bearings. Nos. 1 and 3 are identical. Nos. 2, 4, and 5 have 2 oil holes. Lubricate main bearing journals and fit crankshaft into position. Fit thrust washers with White metal toward crankshaft. Fit bearing to main bearing caps (those with no oil holes). Fit caps being sure to align with previously made reference marks.

4) Fit upper connecting rod bearings and slide over crankshaft. Fit lower half of bearing in cap, then tighten cap. Make sure crankshaft is free to turn.

5) Use a dial indicator to check crankshaft end play. Crankshaft should not have more than .002-.009" (.05-.23 mm) end play. Replace thrust washers if end play is beyond specification.

REAR MAIN BEARING OIL SEAL

With New Crankshaft

Fit new seal to installation tool Mot. 259-01 (or equivalent). Lubricate outer seal lip. Install seal in original position, seating it until the tool lip just contacts the cylinder block.

With Original Crankshaft

Offset new seal approximately 1/8" to position seal so it does not rest in same place as original. Drive seal into place with tool Mot 259-01 (or equivalent). Seal is seated when tool edge just touches block. Remove tool, insert 1/8" thick spacer, and repeat seating process to correctly seat seal into position.

ENGINE OILING

CRANKCASE CAPACITY

Capacity is 3.4 qts. (3.2L) with filter change.

OIL FILTER

Filter is the disposable canister type.

NORMAL OIL PRESSURE

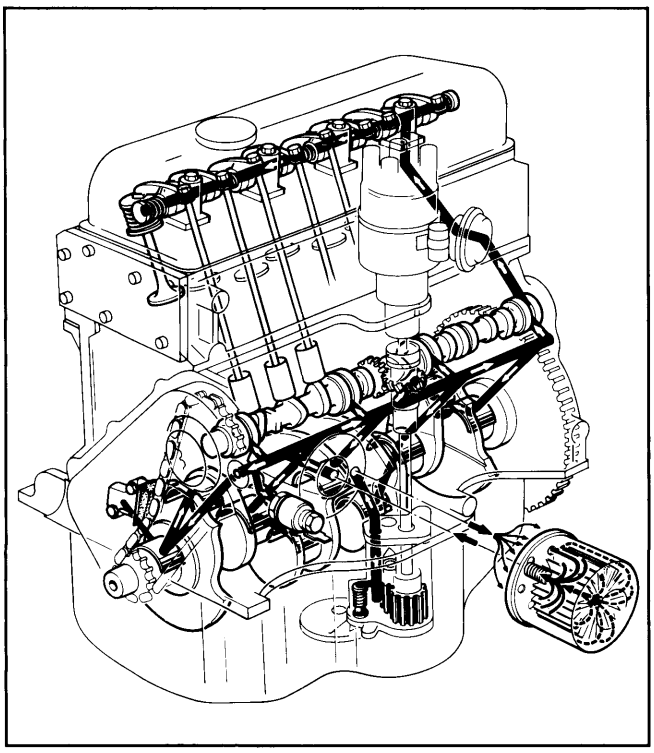
Oil pressure should be 10 psi (.7 kg/cm²) at idle speed, and 50 psi (3.5 kg/cm²) at 4000 RPM.

ENGINE OILING SYSTEM

Oil is picked up in the pan and pumped through the oil pump and filter to a gallery with passages leading to main, connecting rod and camshaft bearings.

Oil from the front main bearing supplies the chain tensioner and returns to the pan. At the back of the main gallery, oil travels up a passage to the rocker arms and valve train.

Fig. 8: Engine Oiling System



OIL PUMP

Removal

Drain oil and remove oil pan. Take out 3 bolts mounting oil pump and remove pump.

LE CAR 4-CYLINDER (Cont.)

Disassembly

Remove 4 pump cover bolts. Remove cover slowly, as relief valve is under spring tension. Remove driven gear, drive gear, and drive gear shaft.

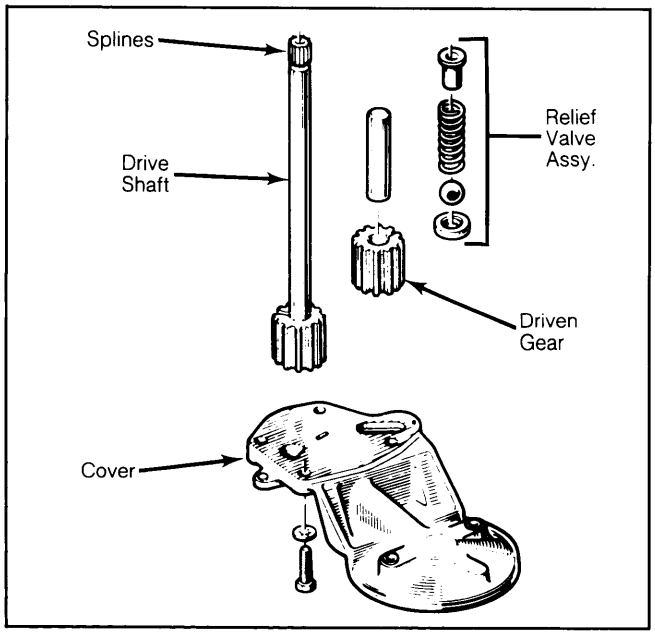
Inspection

Examine splines on drive shaft. Check ball seat for damage. Check pressure relief spring for fatigue. Check clearance between gears and body. Replace gears if clearance exceeds .008" (.20 mm).

Reassembly

To reassemble oil pump, reverse disassembly procedure.

Fig. 9: Exploded View of Oil Pump Assembly



Installation

Install pump and mounting bolts. Do not use gasket between oil pump and block. Tighten the mounting bolts. To complete installation, reverse the removal procedure.

ENGINE COOLING

WATER PUMP

Removal

Disconnect battery. Disconnect hoses. Drain block at plug near timing cover. Loosen alternator. Remove water pump drive belt. Remove A.I.R. pump, water pump pulley, grooved belt, and temperature sending unit. Remove mounting bolts and tap pump free.

Installation

To install, reverse removal procedure. Be sure to bleed air from cooling system.

COOLING SYSTEM CAPACITY

Capacity is approximately 6.5 quarts (6.2L), including heater.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Cylinder Head Bolts	
Cold	40 (54)
Hot	45 (61)
Connecting Rod Nuts	35 (48)
Main Bearings	40-50 (54-68)
Manifolds	10 (14)
Rocker Arm Shaft	10-15 (14-20)
Timing Sprocket-to-Camshaft	20 (27)

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displacement		Fuel System	HP@RPM	Torque Ft. Lbs.@RPM	Compr. Ratio	Bore		Stroke	
	Cu. In.	cc					In.	mm	In.	mm
1982	85.4	1397	1x2-Bbl.	....	....	8.8:1	2.99	76.0	3.03	77.0

VALVES

Engine Size & 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)
1397 cc							
Intake	1.346 (34.2)	60°	60°	.043-.055 (1.1-1.4)	.276 (7)	....	....
Exhaust	1.141 (29.0)	45°	45°	.055-.067 (1.4-1.7)	.267 (7)	....	....

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ENGINE SPECIFICATIONS (Cont.)

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)
1397 cc	2.157 (54.80)	....	No. 3	.002-.009 (.05-.23)	1.731 (43.97)	....	.012-.022 (.30-56)

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Ring No.	End Gap In. (mm)	Side Clearance In. (mm)
1397 cc	....	Free Fit	Press Fit	....	[1]	....

[1] — Pre-set gap. Do not alter.

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1397 cc	....	[1]	....

[1] — End play .002-.005" (.05-.12 mm).

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (Kg @ mm)	
		Valve Closed	Valve Open
1397 cc	1.65 (42.0)	....	80@1.0 (36@25)

VALVE TIMING

Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
1397 cc	22°	62°	65°	25°