6.9 LITER V8

ENGINE CODING

ENGINE IDENTIFICATION

Engine identification number is located on tag attached to engine crankcase. First six digits of code are used to identify engine.

Application	Chassis Type	Engine Code
6.9 Liter	116.036	100.985

ENGINE & CYLINDER HEAD

ENGINE

NOTE – *Engine and transmission must be removed as a unit.*

Removal – 1) Remove hood, fan, fan shroud and radiator. Remove air cleaner, battery and battery frame. Remove hydraulic lines from hydropneumatic suspension pump. Discharge air-conditioning system.

2) Drain power steering reservoir and remove hoses. Remove all water, vacuum, oil, fuel and electrical lines leading to engine. Remove throttle control shaft.

3) Remove shield between oil pan and reservoir. Remove oil feed and return lines. Remove exhaust pipes and exhaust heat shield. Loosen locknut on drive shaft. Unbolt drive shaft at transmission and push toward the rear. Loosen all connections on transmission. Remove both engine shock absorbers, at frame crossmember.

4) Attach a engine hoist to lifting eyes on engine. Remove rear engine carrier with engine mount. Remove front engine mount. Remove engine and transmission.

Installation – To install reverse removal procedure.

CYLINDER HEAD

NOTE – *Cylinder head can only be removed when engine is cold.*

Removal – 1) Drain cooling system and crankcase. Remove battery, fan and fan shroud. Disconnect hydraulic oil pump lines. Remove alternator and bracket. Remove windshield washer reservoir and bracket. Disconnect injection lines at injector nozzles, and warm-up compensator.

2) Disconnect fuel supply and return from fuel distributor. Disconnect control linkage, remove mixture regulator assembly with lower housing. Remove throttle control shaft. Remove injection nozzles. Remove bracket for oil lines. Disconnect all electrical lines and vacuum lines. Remove intake manifold.

3) Unbolt exhaust pipe at manifold. Remove timing chain tensioner. Remove timing chain guide rails. Mark camshaft sprocket and timing chain. Carefully remove camshaft sprocket, letting timing chain fall down. Remove cylinder head bolts in reverse of tightening sequence. (*Fig. 1*).

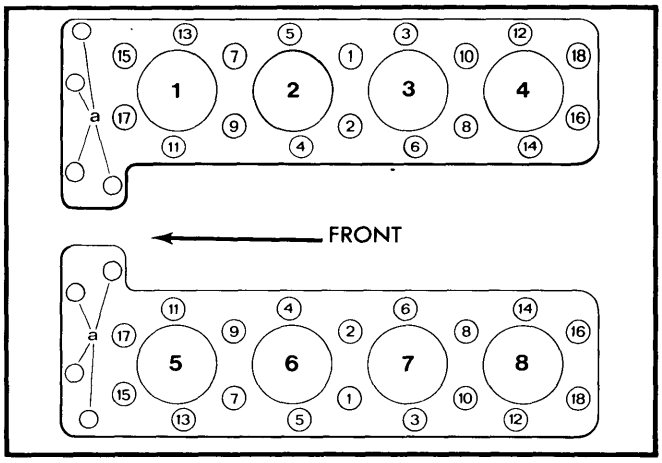

Fig. 1 Cylinder Head Tightening Sequence (Loosen in Reverse Order)

NOTE – *To remove cylinder head bolts at rear of left cylinder bank, raise engine at transmission mount. Level adjusting switch must be pulled out to first notch.*

Installation – To install, reverse removal procedure.

NOTE – *Place cylinder head on crankcase and lift, insert new cylinder head gasket.*

CAMSHAFT

NOTE – *If camshaft is replaced, install new rocker arms. Camshaft code is located at rear of shaft.*

CAMSHAFT

Removal – 1) Place No. 1 piston at TDC of compression stroke. Remove rocker arms. Remove compression spring of the timing chain tensioner by unscrewing plug.

Fig. 2 Timing Chain Tensioner Spring Plug

2) Mark both camshaft sprockets and timing chain. Remove camshaft sprockets and mounting bolts for camshaft bearings. Remove camshafts.

6.9 LITER V8 (Cont.)

NOTE – *Camshaft bearing bolts for 4th and 5th bearing can only be removed by raising left side of engine. If not replacing these bearings, they may be left installed and camshaft pulled out from front of engine.*

Installation – 1) Oil camshaft bearings, mount bearings with camshaft. Tighten mounting bolts (in steps) from the inside to the outside. Camshaft should turn freely.

2) Install compensating washer (V-notch in washer on top of woodruff key). Install camshaft sprockets and timing chain checking alignment of marks. Turn crankshaft one full revolution and place the piston of No. 1 cylinder at TDC of compression stroke.

3) With piston No. 1 at TDC, the marks on both camshafts must be in alignment. Install oil pipe. Reverse removal procedure to install remaining components.

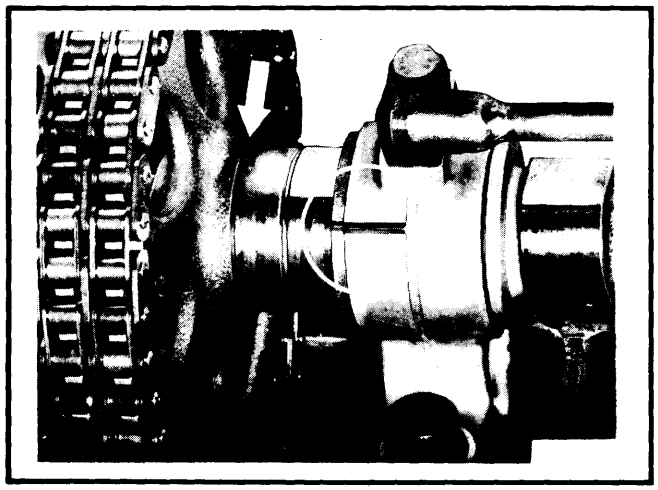

Fig. 3 Camshaft Aligning Marks

TIMING CHAIN

1) Remove spark plugs and right hand cylinder head cover. Remove rocker arms on righthand side, marking them for installation in same spot as they were originally. Remove chain tensioner.

2) Cover chain box with rag and break chain with separating tool or grind pin ends off one link. Attach new chain to original with master link and rotate crankshaft in normal direction with socket and ratchet applied to front hub. Keep chain engaged with sprocket while turning, and pull old chain until master link is in position at top of righthand camshaft sprocket.

3) Fasten ends of new chain with master link. Insert from front so that "E" locks are on rear side of chain. Set engine to TDC position and check that camshaft/bearing marks are properly aligned. See *Valve Timing*. Complete assembly in reverse order of removal.

VALVE TIMING

NOTE – *For routine assembly jobs, ensuring that camshaft marks and crankshaft TDC marks align is sufficient.*

1) Camshafts should have code "36" stamped on rear end of left camshaft and "37" stamped on rear of right camshaft. To check valve timing, remove rocker arm and hydraulic valve lifter of intake valves on No. 1 and No. 6 cylinders. Install solid adjusting bolts (116 050 11 20) where valve lifters were removed.

2) Install rocker arms and adjust bolts for zero clearance when cam lobes point up. Mount dial indicator on head so that gauge pin rests on spring retainer with .118" (3 mm) preload. Zero indicator dial and rotate crankshaft until dial indicator needle moves .078"(2 mm). Value on vibration damper must agree with *Intake Open* value on *Valve Timing* chart.

3) Offset Woodruff keys are available for corrections of approximately 4°, 6½°, 8°, and 10°. Each tooth on the camshaft sprocket will change timing by about 18°. After checking and correcting valve timing, install original lifters and rocker arms in correct position.

VALVES

VALVE GUIDE SERVICING

1) Clean valve guide and remove all hard carbon. Using suitable go no-go plug gauges, check valve guide clearance. Drift out old guide using a suitable drift. Check bore in cylinder head and ream to oversize if necessary.

2) Heat cylinder head to 176-194°F (80-90°C) and chill valve guide. Drive valve guide in until lock ring is seated against cylinder head. Allow cylinder head to cool and check guide fit in head.

VALVE STEM OIL SEALS

Removal – 1) Remove camshaft cover. Remove rocker arm. Rotate engine until both valves are closed and supply compressed air to spark plug hole to hold valves closed.

2) Compress valve springs, using suitable valve spring compressor. Remove valve keepers, collar, springs and valve stem oil seal.

Installation – 1) Install valve stem oil seal. On intake guide, position coil spring at top and clamping strap at bottom. On exhaust, place installation bead on bottom next to valve guide.

2) Install springs, collars and keepers, using a suitable valve spring compressor. Install rocker arm and check tappet clearance. Replace camshaft cover and tighten nuts.

VALVE SPRING

With cylinder head and rocker arms removed, compress valve springs with a suitable valve spring compressor. Remove valve keepers, collar and springs.

6.9 LITER V8 (Cont.)

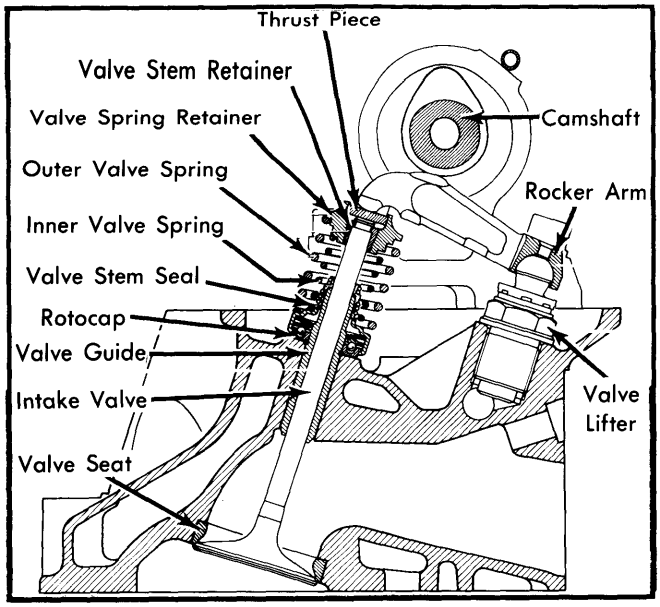

Fig. 4 Valve Assembly

HYDRAULIC VALVE LIFTERS

Removal – Remove camshaft cover and rocker arms. Unscrew hydraulic valve lifters.

Installation – Moisten threads of valve lifter with engine oil and screw into cylinder head. Install rocker arms and camshaft cover. When installing new valve lifters the base setting must be adjusted.

BASE SETTING ADJUSTMENT

NOTE – *With new hydraulic valve lifters installed; crank engine for 30 seconds with remote starter switch, before making adjustment.*

1) Remove tension from rocker arm by cranking engine until cam lobe points up. Set test gauge (100 58 04 23 00) over lifter so that measuring pin rests on ball pin of lifter. Basic position is correct when red groove of pin is aligned with measuring edge of tool.

2) If groove of pin is below measuring edge, a plus (+) deviation is indicated, requiring a thinner thrust piece (pressure pad). Entire groove showing above measuring edge indicates a minus (−) deviation and requires a thicker thrust piece.

3) To correct base setting, remove rocker arm. Remove thrust piece and measure thickness. Thrust pieces are available in steps of .0014 (.25 mm) from .147" (3.7 mm) to .228" (5.8 mm). Install thinner or thicker thrust piece as required and reinstall rocker arm. Repeat measuring procedure.

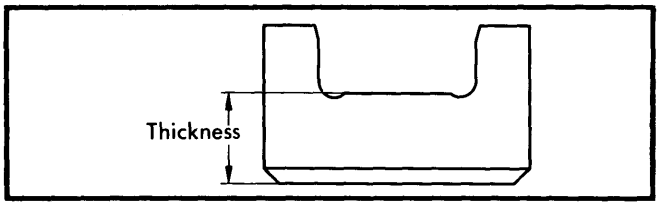

Fig. 5 Thrust Piece (Pressure Pad)

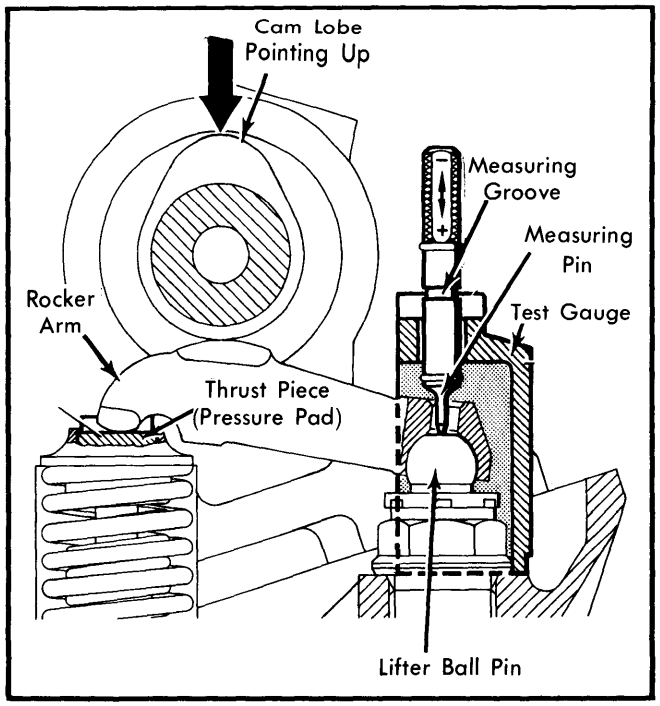

Fig. 6 Checking Hydraulic Lifter Base Setting

ROCKER ARM ASSEMBLY

Removal – Remove battery and camshaft cover. Rotate camshaft (by remote starter switch) until camshaft lobe is pointed up. Using a suitable valve spring compressor (100 589 06 61 00), position compressor between camshaft and valve spring collar, lever valve downward until rocker arm can be removed.

Installation – Reverse removal procedure.

NOTE – *When installing new rocker arms, replace camshaft and check base setting of hydraulic valve lifters.*

PISTONS, PINS & RINGS

OIL PAN

Removal – 1) Remove hood, drain cooling system and engine oil. Remove upper radiator hose and air filter. Remove throttle control shaft. Loosen lines on oil cooler and loosen cooler frame.

2) Remove guard plate between oil pan and reservoir. Unscrew hoses from fittings on pan and remove upper 2 fittings from pan by removing mounting bolts. Remove A/C compressor with hoses, and gear oil pump with holder.

3) Loosen front engine mounting bolts and engine damper on cross member. Remove oil pan attaching bolts. Lift engine at front eye until oil pan can be removed.

Installation – Clean mating surfaces and coat with suitable sealer. Install new gasket on pan. Install new "O" rings and gaskets on connecting flanges and install in original position. Continue in reverse order of removal.

6.9 LITER V8 (Cont.)

FITTING PISTONS

Measure pistons and cylinder diameters to determine if pistons or cylinders are worn. Oversize pistons are available.

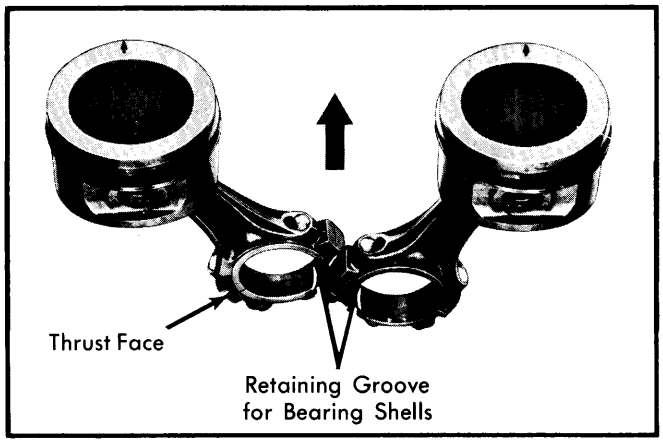

Fig. 7 Piston and Connecting Rod Alignment

PISTON PINS

Piston pins are retained by circlips in grooves of piston. To remove, take out circlips and force pin from assembly. When installing, ensure that arrow on piston crown faces forward and lock grooves for bearing tabs face center of engine.

NOTE – *Do NOT heat piston when removing or replacing piston pin.*

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

Inspect main and connecting rod journal for wear or damage. Maximum wear or out of round is .0004" (.01 mm). Crankshaft may be reground for up to 4 repair stages, and hardness checked prior to reassembly.

REAR MAIN BEARING OIL SEAL

With engine out of car and crankshaft removed, pull old seal and rubber strip from crankcase and end cover. Place rubber strip in crankcase, then radial seal half. Preload in position with piece of 2¾" (70 mm) pipe, then cut seal and strip off so that .004" (.1 mm) extends from ends of seal. Repeat in end cover. Lubricate seal and install crankshaft. Install end cover with new sealing pins and continue in reverse of removal procedure.

FRONT MAIN BEARING OIL SEAL

Removal – Using suitable hub extractor (100 589 12 33 00), remove hub, vibration damper and pulley. Pry seal from end cover with screwdriver, using care not to damage seal bore or crankshaft.

Installation – Lubricate seal and press into position with installer (100 589 07 61 00). If hub shows wear from old seal, hub must be replaced. Install hub, vibration damper and pulley.

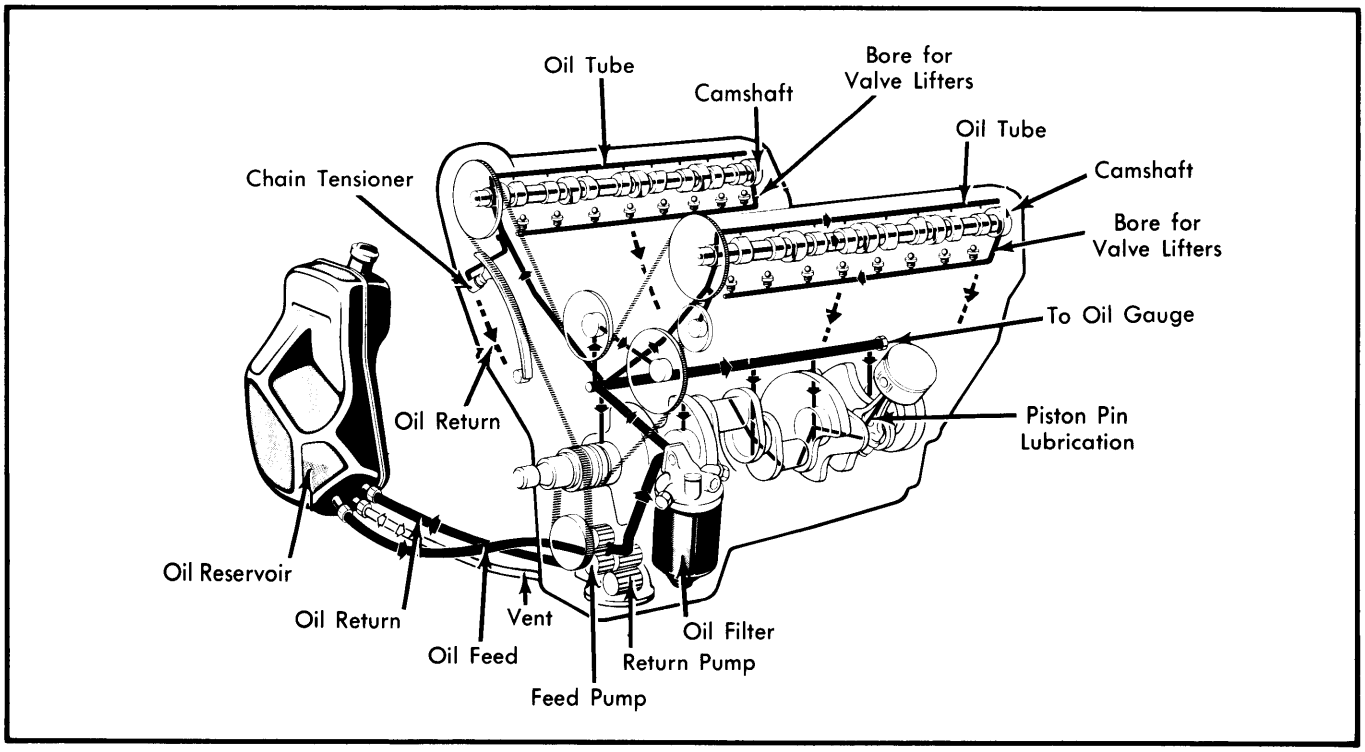

Fig. 8 Engine Oiling System

6.9 LITER V8 (Cont.)

ENGINE OILING

Crankcase Capacity – 12 quarts with filter.

Oil Filter – Full-flow paper cartridge with 50 psi (3.5 kg/cm²) relief valve built in.

Pressure Regulator Valve – Non-adjustable relief valve opens at 115 psi (8 kg/cm²).

Normal Oil Pressure – At least 7 psi at idle and 50 psi (3.5 kg/cm²) at 3000 RPM.

OIL PUMP

A gear type oil pump consisting of a oil feed and oil return pump. The pump is attached to the crankcase and is driven by a duplex roller chain. The oil return pump is larger than the oil feed pump, to limit oil foaming.

ENGINE COOLING SYSTEM

Thermostat – Opens at 189°F (87°C)

Cooling System Capacity – 17 qts.

Radiator Cap – 14 psi

WATER PUMP

Removal – **1)** Drain coolant and detach upper radiator hose. Loosen "V" drive belts. Remove radiator shroud and visco fan clutch. Take off water pump pulley.

2) Remove heater hose and lower hose from pump. Remove thermostat housing from water pump. Unscrew mounting bolts and remove water pump.

Installation – Replace gaskets and seals and reverse removal sequence.

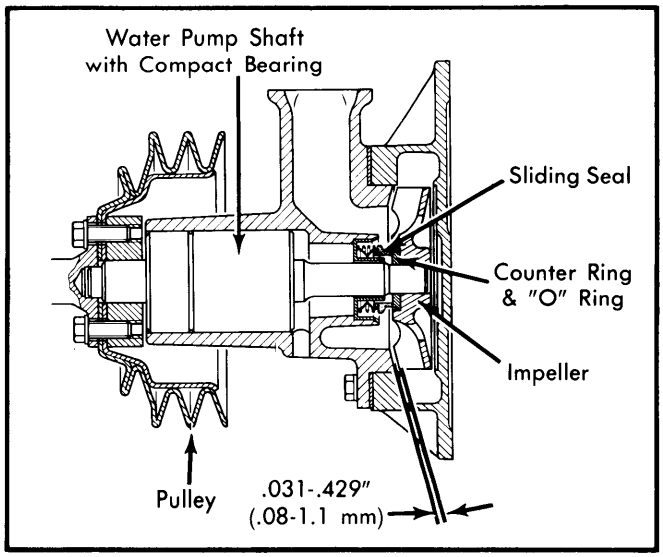

Fig. 9 Water Pump Assembly

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
1979	417.1	6834	Fuel Inj.	250@4000	360@2500	8.0:1	4.21	107	3.74	95

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)
6834							
Intake	1.985-1.989 (50.9-51.0)	45°	45°	.05-.08 (1.3-2.0)	.3525-.3531 (8.955-8.970)	.....	.....
Exhaust	1.673-1.681 (42.9-43.1)	45°	45°	.06-.08 (1.5-2.0)	.4303-.4311 (10.93-10.95)	.....	.....

6.9 LITER V8 (Cont.)

ENGINE SPECIFICATIONS (Cont.)

VALVE TIMING

Engine	INTAKE Open (ATDC)	INTAKE Close (ABDC)	EXHAUST Open (BBDC)	EXHAUST Close (ATDC)
6384 cc				
New①				
Left (36)	12°	25°	32°	19°
Right (37)	10°	23°	34°	21°
In Service②				
Left & Right	14°	27°	30°	17°

① — New engine or timing chain.
② — More than 12,500 miles.

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
6384 cc			
No. 1	1.363-1.364 (34.95-34.97)	.0008-.0023 (.02-.06)	.....
No. 2 & 3	1.967-1.968 (50.45-50.47)	.0012-.0027 (.03-.07)	
No. 4 & 5	1.987-1.988 (50.95-50.97)	.0012-.0027 (.03-.07)	

PISTONS, PINS, RINGS

Engine	PISTONS Clearance In. (mm)	PINS Piston Fit In. (mm)	PINS Rod Fit In. (mm)	RINGS Rings	RINGS End Gap In. (mm)	RINGS Side Clearance In. (mm)
6384 cc	.0006-.0010 (.015-.025)	.0001-.0004 (.003-.011)	.0002-.0006 (.007-.017)	No. 1	.016-.023 (.40-.60)	.0078-.0023 (.04-.06)
				No. 2	.016-.023 (.40-.60)	.0008-.0016 (.02-.04)
				No. 3	.012-.018 (.30-.45)	.0008-.0016 (.02-.04)

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS Journal Diam. In. (mm)	MAIN BEARINGS Clearance In. (mm)	MAIN BEARINGS Thrust Bearing	MAIN BEARINGS Crankshaft End Play In. (mm)	CONNECTING ROD BEARINGS Journal Diam. In. (mm)	CONNECTING ROD BEARINGS Clearance In. (mm)	CONNECTING ROD BEARINGS Side Play In. (mm)
6834 cc	2.728 (69.96)	.0011-.0031 (.03-.08)	No. 3	.004-.009 (.10-.24)	2.143 (54.96)	.0008-.0027 (.03-.08)	.009-.015 (.22-.39)

TIGHTENING SPECIFICATIONS

Application	Ft.Lbs (mkg)
Cylinder Head Bolts	
Stage 1	29 (4.0)
Stage 2	①65 (9.0)
Main Bearing Caps	58 (8.0)
Connecting Rod Caps②	36 (5.0)
Flywheel	36 (5.0)
Crankshaft Pulley	290 (30)
Camshaft Bearing	36 (5.0)
Camshaft Sprocket	72 (10)
Chain Tensioner Plug	36 (5.0)
Hydraulic Valve Lifters	36 (5.0)

① — Retorque with warm engine to 65 ft. lbs. (9mkg)
② — Turn 90° after reaching final torque.