3TC 4-CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Engine can be identified by first group of numbers and letters in engine serial number. Engine serial number is located on left side of cylinder block behind dipstick.

Engine Identification

Application	Code
Corolla (1770 cc)	3TC

ENGINE, CYLINDER HEAD & MANIFOLD

ENGINE

NOTE – *Following general procedures may not apply to all vehicles equipped with 3TC engine.*

Removal – 1) Disconnect and remove battery. Drain cooling system and disconnect hoses and tubes at radiator. Hood may be removed to provide greater access to engine and increased clearance when removing engine. Remove radiator. Remove air cleaner and disconnect accelerator torque rod, bond cable and clutch hose bracket.

2) Disconnect heater hoses and coolant temperature gauge wiring from engine. Disconnect all engine-to-chassis electrical connections at engine. Disconnect fuel line at pump and exhaust pipe at manifold flange. Remove starter. If equipped with automatic transmission, remove 6 torque converter mounting bolts through service holes at front side of drive plate and ring gear.

3) Attach suitable sling to engine and take up slack. Remove engine-to-transmission mounting bolts and left and right engine mount nuts. Lift engine from vehicle. Use caution to avoid damage to clutch and brake fluid reservoirs.

Installation – Screw alignment dowel in rear of engine to ease alignment. If equipped with automatic transmission, screw alignment dowel in one of the lower torque converter mounting holes. Lower engine into position, replace mounting bolts and nuts, and reverse removal procedure.

INTAKE MANIFOLD

Removal – Remove air cleaner and brackets. Disconnect fuel line and throttle controls at carburetor. Disconnect all remaining tubes and lines from carburetor and manifold. Beginning at ends and working toward center, loosen manifold bolts and nuts in several steps. Remove intake manifold assembly with carburetor attached.

Installation – Install new gasket on clean mating surfaces and install manifold. Tighten bolts and nuts in several steps, beginning at lower center and working toward ends in a criss-cross pattern.

EXHAUST MANIFOLD

Removal – Remove air cleaner and intake heat tube. Disconnect exhaust pipe at manifold flange. Loosen bolts and nuts in several steps, beginning at ends of manifold. Remove manifold.

Installation – Install manifold with new gasket to clean mating surfaces. Beginning in center and working outward, tighten nuts and bolts in several steps to specified torque.

CYLINDER HEAD

Removal – Drain cooling system and remove manifolds as previously described. Set No. 1 cylinder at TDC on compression stroke. Remove spark plug wires by pulling on rubber boots. Remove rocker arm cover and loosen cylinder head bolts in several steps in reverse of tightening sequence. Lift off rocker arm assembly and take out push rods, keeping them in order for installation. Remove head.

Installation – Ensure that mating surfaces are clean and install new head gasket. Place push rods in proper positions. Loosen rocker arm adjusting screw lock nuts and install rocker arm assembly. Tighten head bolts in several steps in the sequence shown and continue installation in reverse order of removal.

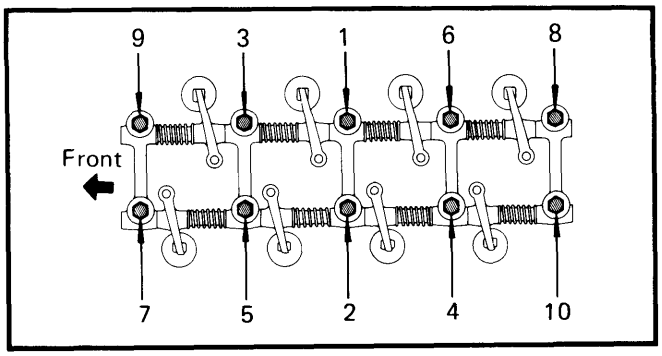

Fig. 1 Cylinder Head Tightening Sequence (Loosen in Reverse Order)

VALVES

VALVE ARRANGEMENT

Right Side – All intake.
Left Side – All exhaust.

VALVE GUIDE SERVICING

NOTE – *Manufacturer recommends using new valve guides whenever valves are replaced.*

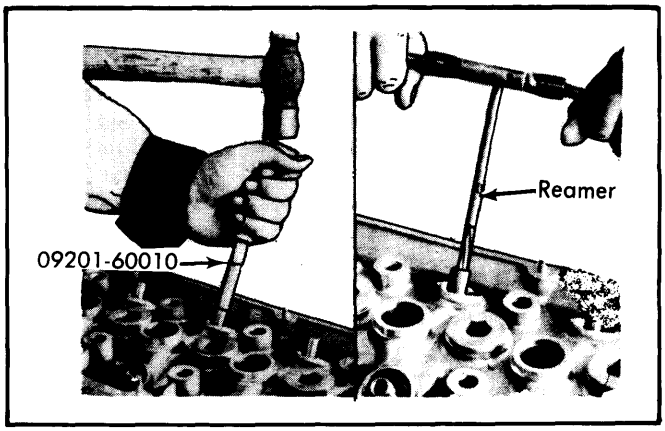

Fig. 2 Removing Valve Guide Bushing and Reaming to Proper Clearance

3TC 4-CYLINDER (Cont.)

1) Measure clearance between valve stem and valve guide bushing. If clearance is greater than .003" (.08 mm) for intake or .004" (.10 mm) for exhaust, replace valve and/or guide bushing.

2) Break off upper half of valve guide and heat cylinder head to 176-212°F (80-100°C). Using guide replacement tool (09201-60011), drive out guide bushing toward combustion chamber.

3) Apply thin coat of oil to guide and guide hole. Drive guide in until snap ring contacts head. Ream guide to achieve proper clearance.

VALVE STEM OIL SEALS

Cup type oil seals are used on all valves. Do not use old seals when valves have been removed. To install, lubricate valve stem and insert in cylinder head. Again lubricate valve stem and carefully push oil seal over valve guide.

NOTE – *Do not push down on top of seal; use pressure on seal sides only.*

VALVE SPRING FREE LENGTH & INSTALLED HEIGHT

Check all valve springs for correct free length, load length and squareness. Spring squareness should be within 075" (1.9 mm). When installed valve spring height should be 1.484" (37.7 mm). Spring free length should be 1.657" (42.08 mm).

ROCKER ARM ASSEMBLY

1) Remove cylinder head. Remove rocker arm assembly. To disassemble, remove 4 retainer springs at each corner, both end supports, compression springs and 2 end rocker arms.

2) Remove remaining middle 3 supports, 4 rocker arms and springs off rocker support shafts. Clearance between rocker arms and shaft should be .0024" (.060 mm) maximum.

NOTE – *Mark all parts to reassemble in order. Place washer between rocker arm and support number three (center).*

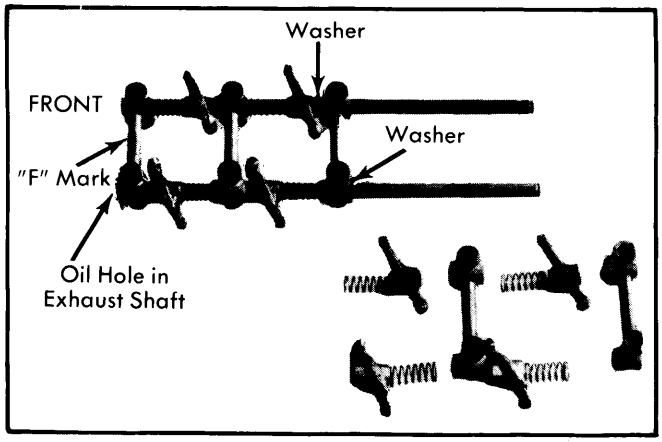

Fig. 3 Partially Disassembled View of Rocker Arm Assembly

VALVE LIFTERS

Inspect lifters and check clearance in bore. If clearance exceeds .004" (.10 mm), select oversize lifter and ream lifter bore to obtain clearance of .001-.002" (.02-.05 mm).

VALVE CLEARANCE ADJUSTMENT

NOTE – *Check with engine at normal operating temperature.*

Set number 1 cylinder to TDC on compression stroke. Adjust intake valves on number 1 and 2 cylinders, exhaust valves on number 1 and 3 cylinders. Turn crankshaft one revolution (360°) and adjust intake valves on number 3 and 4, exhaust valves on number 2 and 4 cylinders.

Valve Clearance Adjustment

Valve	In. (mm)
Intake	.008 (.20)
Exhaust	.013 (.33)

PISTONS, PINS & RINGS

OIL PAN

Removal – 1) Disconnect left and right engine front mounts. Raise vehicle and support on stands. Remove engine undercover and right side stiffener plate. Remove stabilizer bar and oil pan bolts.

2) Place jack under clutch housing and raise slightly, taking care not to pull lower radiator hose. Lower oil pan and remove oil pump bolts. Pull oil pan and pump forward and outward.

Installation – Apply liquid sealer to 4 corners of oil pan gasket. To complete installation, reverse remove procedure.

PISTON & ROD ASSEMBLY

Removal – With oil pan and cylinder head removed, mark connecting rod and cap for correct assembly and take off bearing cap nuts. Tap studs lightly to loosen caps and remove bearing caps. Push piston/rod assembly out through top of cylinder block.

NOTE – *Cover rod bolts with short pieces of hose to prevent damage to crankshaft.*

Installation – Install piston rings on piston with ring gaps spaced as shown in *Fig. 4*. Code letter and number on ring should face UP. Lubricate piston, crankshaft and cylinder walls. Using suitable ring compressor, insert pistons in cylinders, making sure that notch in piston top is toward front of engine. Use hose pieces on studs to protect crankshaft. Install rod caps and tighten to specifications.

NOTE – *After tightening each cap, check rotation condition of crankshaft.*

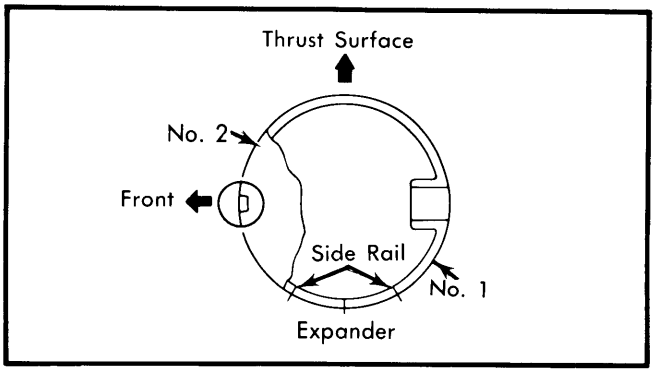

Fig. 4 Installed Position of Piston Rings

3TC 4-CYLINDER (Cont.)

FITTING PISTONS

1) Measure piston at right angle to pin center line, .40" (11 mm) below bottom ring. Standard piston diameter is 3.3437-3.3457" (84.92-84.98 mm). Oversize pistons are available .50" (13.0 mm), .75" (19.0 mm) and 1.00" (25.4 mm).

2) Measure cylinders at top, center and bottom of bore in two directions. If wear exceeds .008" (.20 mm) on any one cylinder, rebore all cylinders for oversize pistons.

3) Insert piston rings into cylinders and measure end gap at lower part of cylinder where wear is smallest. Measure clearance between ring and ring groove.

PISTON PIN REPLACEMENT

Check pin fit by trying to rock piston at right angle to pin. If any movement is felt, piston and pin must be replaced. Use suitable press and adapter (09221-25013) to press out piston pin. Install piston and pin to connecting rod so that notch in piston top is on same side of rod as trademark on rod center.

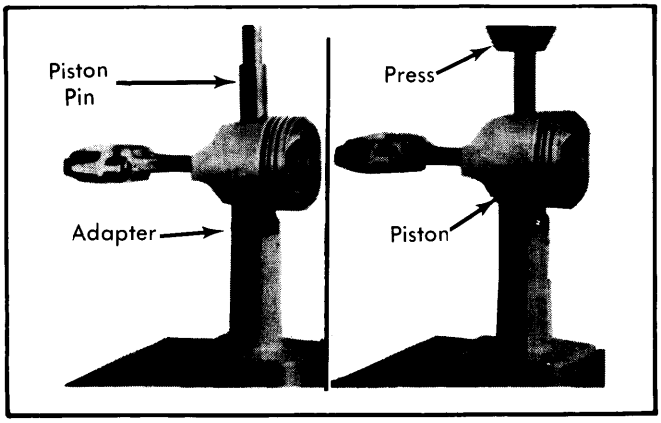

Fig. 5 Piston Pin Removal and Installation with Press and Adapter

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

Use Plastigage method to measure bearing clearance. Clearance limit is .003" (.08 mm). Taper and out-of-round limit is .0004" (.01 mm). If limits are exceeded, crankshaft must be ground for undersize bearings. Bearings are available .002" (.05 mm), .010" (.25 mm) and .020" (.50 mm) undersizes.

THRUST BEARING ALIGNMENT

Measure crankshaft end play at center bearing. If end play exceeds limit of .012" (.30 mm), install replacement thrust bearings. Bearings are available in standard and oversizes of .005" and .010" (.125 and .250 mm).

NOTE – *Oil groove on bearing faces toward center.*

REAR MAIN BEARING OIL SEAL

Remove oil seal retainer and drive out old oil seal. Apply grease to seal inner lip and take care not to damage this surface. Using suitable tool (09250-10011), drive new seal into place. Replace oil seal retainer with new gasket.

ENGINE FRONT COVER

Removal – Remove water pump and fan assembly. Remove air pump. Set No. 1 cylinder at TDC on compression stroke, so key in crankshaft is facing straight upward. Remove crankshaft pulley with suitable puller (09213-31021). Remove bolts from pan into cover and cover into block, then carefully remove cover from engine.

Installation – Ensure that mating surfaces are clean and install new gasket between cover and block. Use new section of pan gasket if old gasket at bottom has been damaged. Apply suitable sealer at corners and place cover in position. Install cover bolts and drive pulley into position with suitable tool (09214-60010). Complete assembly in reverse of removal procedure.

FRONT COVER OIL SEAL

With front cover removed from engine, pry out old oil seal. With suitable driver (09223-22010), drive new seal in position until it is about even with timing gear cover. Before installing on engine, coat seal lip with multi-purpose grease.

CAMSHAFT

TIMING CHAIN & GEAR

Removal – With front cover off, remove camshaft gear retaining bolt. Remove camshaft gear, timing chain and crankshaft gear by pulling out evenly. Maximum elongation of chain is 11.47" (291.4 mm) with 11 lbs. (5 kg) tension.

Installation – Chain tensioner and plunger should be removed before installing timing chain and gears. Ensure that crankshaft and camshaft keys are pointing UP. Assemble chain and gears with marks aligned as illustrated and install as an assembly. Tighten camshaft timing gear bolt and install chain tensioner. Install remaining components in reverse order of removal.

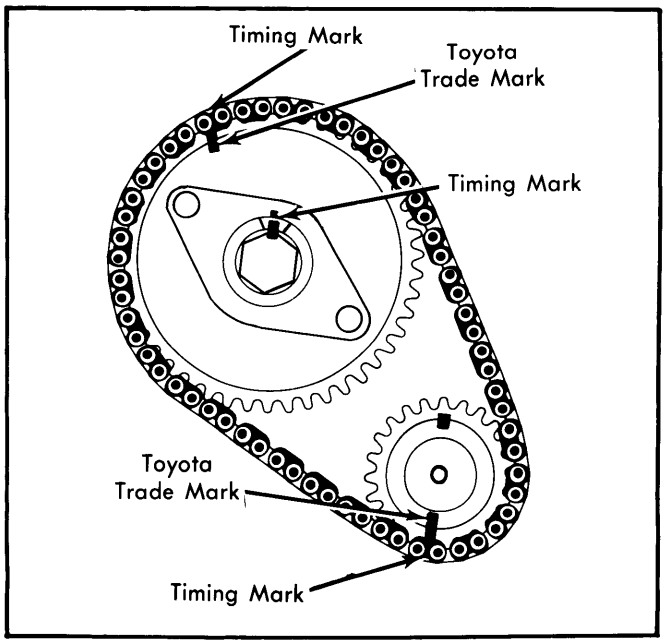

Fig. 6 Timing Chain and Sprocket Alignment Marks

3TC 4-CYLINDER (Cont.)

TIMING CHAIN TENSIONER & DAMPER

1) Inspect surfaces of tensioner plunger and bore of tensioner body. To test clearance, lubricate plunger and insert it into plunger body. Cover two oil passages with fingers and pull plunger. Vacuum strong enough to return plunger should be felt.

2) Measure thickness of tensioner head and chain damper wall. Head should be minimum .492" (12.5 mm) and chain damper should be minimum .20" (5.0 mm).

3) Install chain tensioner, then install damper. Clearance between chain and damper should be .020" (.5 mm) when properly installed.

NOTE – *Chain tensioner must be filled with oil after replacing tensioner or timing chain.*

CAMSHAFT

Removal – With cylinder head, timing chain cover and timing chain assembly removed, remove distributor and fuel pump. Lift out tappets and mark position for installation. Remove camshaft thrust plate. Insert timing gear retaining bolt and pull out camshaft slowly while turning.

Installation – Lubricate all bearing journals and insert camshaft. Place camshaft thrust plate in position with marked side outward. Install thrust plate retaining bolts. Install remaining components in reverse order of removal, ensuring that all timing marks are aligned.

CAMSHAFT BEARINGS

1) Using suitable bearing remover tool (09215-25010), pull out bearings 1, 2 and 5 toward front and bearings 3 and 4 toward rear. Using same tool, install new bearings in the following order: No. 4 using No. 1 as a guide, No. 2 using No. 1 as a guide and No. 3 using No. 5 as a guide.

2) Install No. 1 bearing using No. 2 as a guide and No. 5 bearing using No.1 and No. 4 as guides. Ensure that oil holes in bearings are aligned with oil holes in block. Bearings are available .005" and .010" (.125 and .250 mm) undersize.

NOTE – *Apply liquid sealer to plug at rear of block.*

CAMSHAFT END THRUST

To measure end thrust, install thrust plate and timing gear. Tighten timing gear bolt and check clearance with feeler gauge. Standard clearance is .0028-.0059" (.071-.149 mm) If maximum of .012" (.30 mm) is exceeded, replace thrust plate.

ENGINE OILING

Crankcase Capacity – 3.5 quarts without filter; 4.0 quarts with filter.

Oil Filter – Full flow type with integral relief valve.

Normal Oil Pressure – 28 psi (2 kg/cm²) at idle; 43 psi (3 kg/cm²) running (minimum values).

Oil Pressure Regulator Valve – Begins to open at 51-63 psi (3.6-4.4 kg/cm²).

OIL PUMP

Oil pump is driven by bottom of distributor shaft. With oil pan off, remove mounting bolt and pull pump from engine. Remove cover and strainer, and check clearances. Inspect relief valve for scoring or wear and replace as necessary. Drive rotor and driven rotor have punch marks on cover side for assembly identification. Assemble pump and check operation by submerging suction end in clean engine oil and turning shaft clockwise with a screwdriver. Oil should come out discharge hole. Close hole with thumb and turn shaft as before. Shaft should be difficult to turn.

Oil Pump Specifications

Application	In. (mm)
Rotor Tip Clearance	.0016-.0063 (.040-.160)
Limit	.0098 (.248)
Rotor Side Clearance	.0012-.0035 (.030-.088)
Limit	.0059 (.149)
Rotor-to-Body Clearance	.0039-.0063 (.099-.160)
Limit	.0098 (.248)

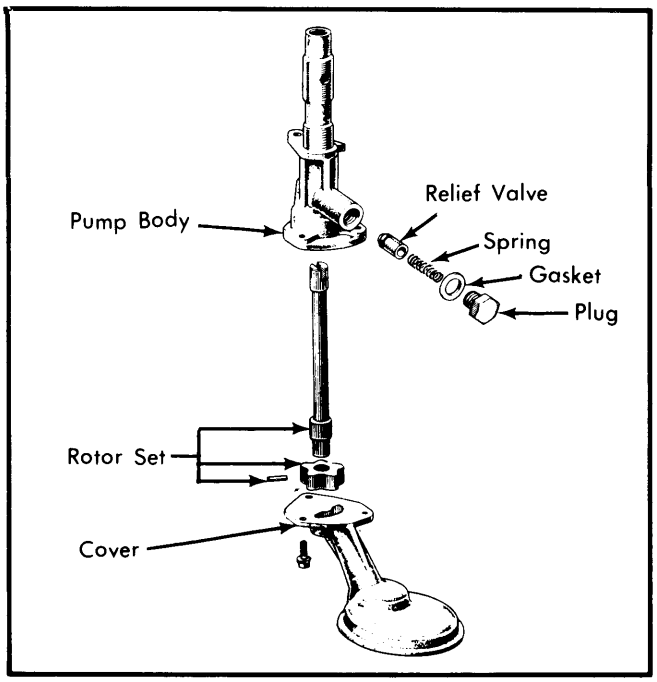

Fig. 7 Exploded View of Oil Pump and Pressure Relief Valve Assembly

ENGINE COOLING

Thermostat – Wax pellet type thermostat with opening temperature of 187-194°F (86-90°C). Fully opened at 212°F (100°C).

COOLANT DRAINING

Engine must be cool, then remove radiator cap. Loosen drain plugs at bottom of radiator and left side of engine block and drain coolant. To refill, make sure both drains are closed and

3TC 4-CYLINDER (Cont.)

fill radiator wth coolant. Start and run engine until warm, then top off radiator with coolant. Fill reservoir half full, then install radiator and reservoir caps.

Coolant Capacity – 8.4 quarts with manual transmission; 8.5 quarts with automatic transmission.

WATER PUMP

Removal & Installation – Drain cooling system and remove fan belt. Remove fan and drive pulley. Remove radiator hose, by-pass hose and heater hose from pump. Remove mounting bolts and lift pump from engine. To install, ensure that mating surfaces are clean and use new gasket. Reverse removal procedures to complete installation.

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displ.		Carburetor	HP at RPM①	Torque (Ft. Lbs. at RPM)②	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1981	108	1770	1x2-Bbl.	70 @ 2400	93 @ 2400	9.0:1	3.35	85	3.08	78

① – California: 73@5000.
② – California: 90@2600.

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)
1770 cc							
Intake	.....	44.5°	45°	.047-.063 (1.2-1.6)	.3136-.3142 (7.97-7.98)	.0010-.0024 (.025-.061)	.....
Exhaust	.....	44.5°	45°	.047-.063 (1.2-1.6)	.3136-.3142 (7.97-7.98)	.0012-.0026 (.030-.066)	.....

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)
1770 cc	.002-.003 (.05-.07)	Press Fit	Press Fit	No. 1	.004-.010 (.10-.25)	.0008-.0024 (.02-.06)
				No. 2	.006-.012 (.15-.30)	.0006-.0022 (.015-.055)
				Oil	.008-.028 (.20-.70)	.....

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)
1770 cc	2.282-2.284 (57.976-58.000)	.0009-.0019 (.024-.048)	Center	.0008-.009 (.02-.22)	1.8888-1.8898 (47.976-48.000)	.0009-.0019 (.024-.048)	.006-.010 (.16-.26)

3TC 4-CYLINDER (Cont.)

ENGINE SPECIFICATIONS (Cont.)

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1770 cc			
No. 1	1.829-1.830 (46.46-46.48)	.0010-.0026 (.025-.066)	.....
No. 2	1.819-1.820 (46.21-46.23)		
No. 3	1.809-1.810 (45.96-45.98)		
No. 4	1.800-1.801 (45.71-45.73)		
No. 5	1.790-1.791 (45.46-45.48)		

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N·m)
Camshaft Sprocket	51-79 (69-107)
Camshaft Thrust Plate	8-11 (11-15)
Connecting Rod Caps	29-36 (39-49)
Crankshaft Pulley	47-61 (64-83)
Cylinder Head Bolts	62-68 (84-92)
Exhaust Manifold	22-32 (30-44)
Flywheel	42-47 (57-64)
Intake Manifold	14-18 (19-24)
Main Bearing Caps	53-63 (72-86)

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE (LBS.) Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1770 cc	1.657 (42.1)	57.9@1.484 (26.3@37.7)	.....