

## 1600 cc 4 CYLINDER

## ENGINE CODING

## ENGINE IDENTIFICATION

Push-rod operated overhead valve, 4-cylinder in-line engine is transversely mounted at front of car. Engine identification is stamped on number plate attached to panel under hood just above right headlight. Engine code is L4.

## ENGINE, CYLINDER HEAD &amp; MANIFOLDS

## ENGINE

**NOTE** — Engine and transmission assembly are removed from vehicle as a unit. Removal and installation of assembly is accomplished with transmission in 4th gear to aid in subsequent assembly adjustment.

**Removal 1)** Disconnect and remove battery. Drain coolant by removing radiator and heater hoses. (No petcock radiator drain is provided.) Remove air cleaner and breather hose.

**2)** Disconnect and remove accelerator cable and bracket from carburetor and intake manifold. Remove fuel line from pump to carburetor. Disconnect carburetor fuel vent hoses, and remove emission and servo vacuum hoses.

**3)** Disconnect the following electrical leads: temperature sending unit, oil pressure switch, distributor and coil wires, choke wire, fan switch, air pump ground wire and engine grounding strap. Disconnect speedometer cable at drive fitting. Unhook clutch cable. Remove exhaust manifold heat stove and inlet pipe from exhaust manifold.

**4)** Raise vehicle on hoist. Loosen clamp bolt and remove gear selector rod. Unhook spring between selector rod and longitudinal member. Back off mounting nuts on stabilizer rubber insulators and engine mounts. Loosen stud locknut and remove stud from transmission with an Allen wrench. Disconnect mounting rubbers and remove complete exhaust assembly.

**5)** Remove 4 bolts holding shift tower to floor pan, then remove shift tower. Rotate gear selector rod with stabilizer halfway around and hang from wire. Disconnect alternator and starter leads. Remove 6 Allen head bolts from right and left driveshaft couplings and disconnect couplings.

**6)** Support engine and transmission assembly on suitable jack. Remove engine mountings as follows: right front upper engine mounting rubber insulator, engine-to-body bracket in engine compartment, left engine mounting bolt, and bottom engine mounting strap. Raise hoist to lift vehicle away from transmission-engine assembly, then lower jack to remove assembly from beneath vehicle.

**Installation — 1)** Reverse removal procedure, using caution that front engine insulator stud engages right apron bracket. Front engine mount rubber insulators must be parallel to front of engine. Do NOT distort when nut is tightened.

**2)** Lower and remove jack. Assure that shift shaft is in 4th gear to position and slide selector rod onto shaft. Adjust as follows: pull gear selector rod and shift lever downward, lock shift lever in 4th gear position with suitable .16" (4 mm) arbor, insert 2.76" (70 mm) spacer between floor pan and selector rod, turn shift shaft CLOCKWISE against stop using arbor, then tighten selector rod locating bolt. Remove spacer and arbor.

**3)** Complete installation noting that accelerator cable must be routed OVER air cleaner snorkel to prevent damage to cable from EGR pipe and to avoid interference with ignition system. Adjust cable so that clearance between throttle stop and pedal lever does not exceed .015" (.38 mm) with throttle fully open. Refill all fluids and check for leaks.

## INTAKE MANIFOLD

**Removal & Installation — 1)** Partially drain cooling system, remove air cleaner and thermostat housing. Disconnect accelerator cable from throttle lever, fuel and vacuum lines from carburetor, and water outlet hose and crankcase ventilation hose from intake manifold.

**2)** Disconnect decel valve-to-carburetor pipe (if equipped) and fan switch. Remove attaching bolts and nuts and lift out manifold with old gasket. To install, reverse removal procedure, noting that if installing a new manifold, decel valve must be placed over adapter and installed with special tool.

## EXHAUST MANIFOLD

**Removal & Installation —** Remove exhaust pipe flange nuts and separate the joint. (If necessary, remove air pump and mounting bracket before removing pipe.) Disconnect hot air pipe from air cleaner at exhaust manifold. Remove attaching bolts and nuts and lift off manifold. To install, reverse removal procedure using new gaskets.

## CYLINDER HEAD

**Removal — 1)** Drain engine coolant, remove air cleaner assembly and fuel line from fuel pump to carburetor. Disconnect wires from spark plugs and tie out of way.

**2)** Disconnect the following: radiator fan switch, heater and vacuum hoses at intake manifold, hoses at choke housing, temperature sending unit wire, exhaust pipe, throttle linkage, and distributor vacuum advance hose from carburetor.

**3)** Remove thermostat and housing, rocker arm cover and gasket, rocker arm shaft assembly, and push rods. Remove head bolts and lift off cylinder head.

**CAUTION** — Maintain push rods in order removed for installation in original location. Do not lay head flat as spark plugs or gasket surface may be damaged.

**Installation —** To install, reverse removal procedure and tighten head bolts in increments in sequence shown in Fig 1. Adjust valve clearance to specifications.

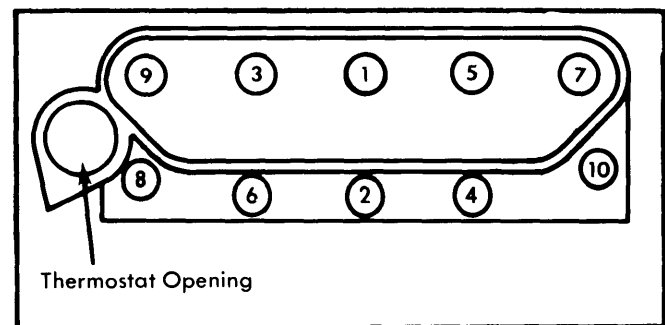


Fig. 1 Cylinder Head Bolt Tightening Sequence

## 1600 cc 4 CYLINDER (Cont.)

### VALVES

#### VALVE ARRANGEMENT

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

#### VALVE GUIDES

If valve guides become worn they may be reamed to install valves with .015" (.39 mm) oversize stems.

#### VALVE STEM OIL SEALS

Valve stem oil seals should be replaced any time cylinder head is disassembled. Install new stem seal over valve stem with open end toward head. Replace spring and retainer.

#### VALVE SPRINGS

Use suitable spring compressor tool to remove locks and retainers. Spring may be removed with head installed on engine if rocker arms and push rods are removed. It will be necessary to hold the valves closed with compressed air during the operation.

#### VALVE SPRING INSTALLED HEIGHT

Measure spring installed height from surface of spring pad to bottom of retainer. If height is greater than specified, install .030" (.76 mm) spacers between spring pad and valve spring to bring within limits. Do NOT install spacers unless necessary due to excess strain on valve train.

#### ROCKER ARM ASSEMBLY OVERHAUL

**Disassembly** — With rocker arm assembly removed from head, remove cotter pin from one end of rocker shaft and slip flat washers and crimped washer from shaft. Remove shaft supports, rocker arms and springs, keeping them in proper order for reassembly. Remove plugs from rocker arm shafts in order to clean hollow of shaft.

**Assembly** — Drive new plugs in ends of rocker shaft. Assemble rocker arm shaft so that bolt hole in rocker arm shaft support is on same side as rocker arm adjusting screw. Rocker arms are right-hand and left-hand, with pads inclined toward support. Install washers and cotter pins.

#### VALVE CLEARANCE ADJUSTMENT

**Preliminary (Cold) Adjustment** — With valve cover off, rotate crankshaft until number 1 and number 6 valves are fully open and check clearance on number 3 and 8 valve. Use feeler gauge inserted from front to rear (parallel to crankshaft centerline). Do NOT use go, no-go feeler gauge and do NOT insert perpendicular to centerline of crankshaft since an erroneous feel will result in excessively tight valves. Check remaining valves by rotating crankshaft until desired sequence shown in following table is completed:

<b>Valves Fully Open</b>	1 & 6	2 & 4	3 & 8	5 & 7
<b>Check Clearance on</b>	3 & 8	5 & 7	1 & 6	2 & 4

**Final Adjustment** — Start and warm engine to normal operating temperature. Reposition or remove components as necessary to remove rocker arm cover, then recheck torque on

cylinder head bolts and rocker arm shaft attaching bolts. Recheck valve clearance as in *Preliminary Adjustment*.

### PISTONS, PINS & RINGS

#### OIL PAN

**Removal** — Drain crankcase, remove oil dipstick and remove battery. Disconnect throttle linkage from carburetor and steering cable from rack and pinion. Disconnect rack and pinion from crossmember and move forward to provide clearance for removing pan. Remove starter motor and lower rear cover. Disassemble engine rear plate from rear plate assembly. Remove oil pan bolts, oil pan and oil pump inlet tube

**Installation** — Use new gaskets with sealer on engine block side and place on block. Place pan in position and tighten bolts evenly to specifications. Follow *Alphabetical* and then *Numerical* sequence shown in Fig. 2. Continue installation in reverse order of removal and replenish crankcase oil supply.

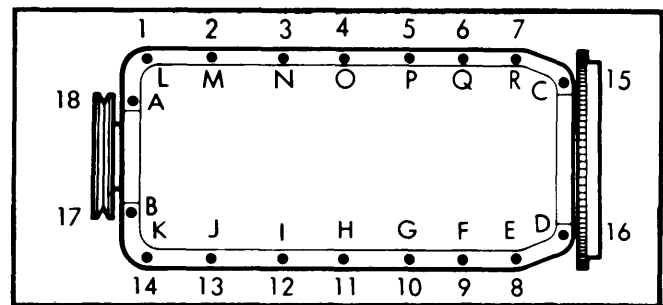


Fig. 2 Oil Pan Bolt Tightening Sequence

#### PISTON & ROD ASSEMBLY

**Removal** — With cylinder head and pan removed, partially loosen bearing cap bolts several turns, then tap them to release the cap. Completely remove bolts and bearing caps, keeping them in order so they can be installed in original positions. Push piston and connecting rod out of bore from bottom.

**Installation** — Place bearing liners in connecting rods and caps. Turn crankshaft to fit each rod to crankpin and install previously fitted bearing and cap. If bearings have not been previously fitted, use Plastigage method, then tighten caps to specified torque.

#### FITTING PISTONS

Determine piston-to-cylinder bore clearance by measuring bore at a point  $2\frac{11}{32}$ " from top, across the axis of the crankshaft, and piston diameter at a point  $2\frac{1}{4}$ " below dome at  $90^\circ$  to pin bore. If beyond service limits, oversize pistons are available in .0025" (.064 mm), .015" (.381 mm), and .030" (.762 mm).

#### PISTON PIN REPLACEMENT

Full floating wrist pins are retained by snap rings in piston pin bore. Pin may be pushed from assembly after removing retainers. Pistons are only supplied in service complete with pin to ensure correct fit and pins must not be interchanged. When assembling, make sure that FRONT marking on connecting rod is on same side of the assembly as the arrow in the piston crown. Heat piston in oil or water prior to inserting pin and retain with snap rings.

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### CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

**Connecting Rod Bearings** — Bearing inserts are fitted in rod and cap in conventional manner, using Plastigage method to determine clearance. When installing, ensure that arrow on piston points to front of engine and that number on connecting rod and cap is on camshaft side.

**Main Bearings** — Conventional replaceable inserts are used in all 5 main bearings. Number 3 (center) main bearing controls end play by means of half-circle thrust bearings inserted between thrust faces of crankshaft and block. Bearing caps are marked in order F, R2, C, R4 and R for proper installation. Use Plastigage method to determine clearance and select undersize bearings as required. Check end play with feeler gauge and install thrust bearings of correct thickness to establish specified end play.

### MAIN BEARING OIL SEALS

**Rear** — With engine out of car, remove pressure plate and clutch disc, then remove flywheel. Remove oil pan and rear oil seal carrier. Install 2 metal screws in seal above center line (do NOT let them bottom against crankshaft or block). Pry against screws and remove seal and carrier. Ensure that seal surfaces are free of burrs, then use tool (T70P-6165) to install new seal in carrier. Use oil resistant sealer at ends of new gasket positioned on carrier and install on block face using tool (T70P-6165) to align. Install remaining components in reverse order of removal.

**Front** — Front oil seal is pressed in front cover and seals against pulley hub. With cover off engine, support around oil seal and drive seal out from rear using installation/removal tool (T70P-6150). To install, turn cover over and support from rear. Use tool to drive new seal in position.

### CAMSHAFT

**Timing Chain** — With front cover off, remove crankshaft oil slinger. Remove camshaft sprocket retainer and bolts, then remove chain tensioner and bolts. Remove camshaft sprocket and timing chain. To install, place timing chain over sprockets so that timing marks on camshaft gear and crankshaft gear are aligned. Install remaining components, then bend up locking tabs after bolts have been tightened to specifications.

**Camshaft** — Proceed as in *Timing Chain*, then remove oil pump and fuel pump. Remove rocker arm cover, rocker arm assembly, distributor, and push rods. Remove camshaft thrust plate and pull out camshaft. Valve lifters may be removed if desired. To install, reverse removal procedures assuring that timing marks are aligned when installing timing chain.

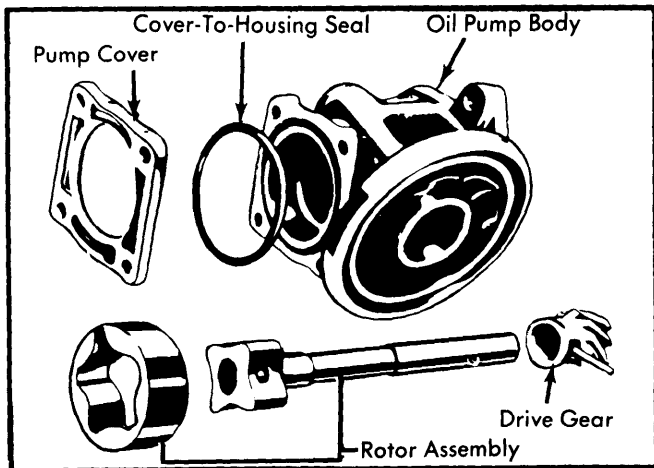


Fig. 3 Exploded View of Fiesta Oil Pump Assembly

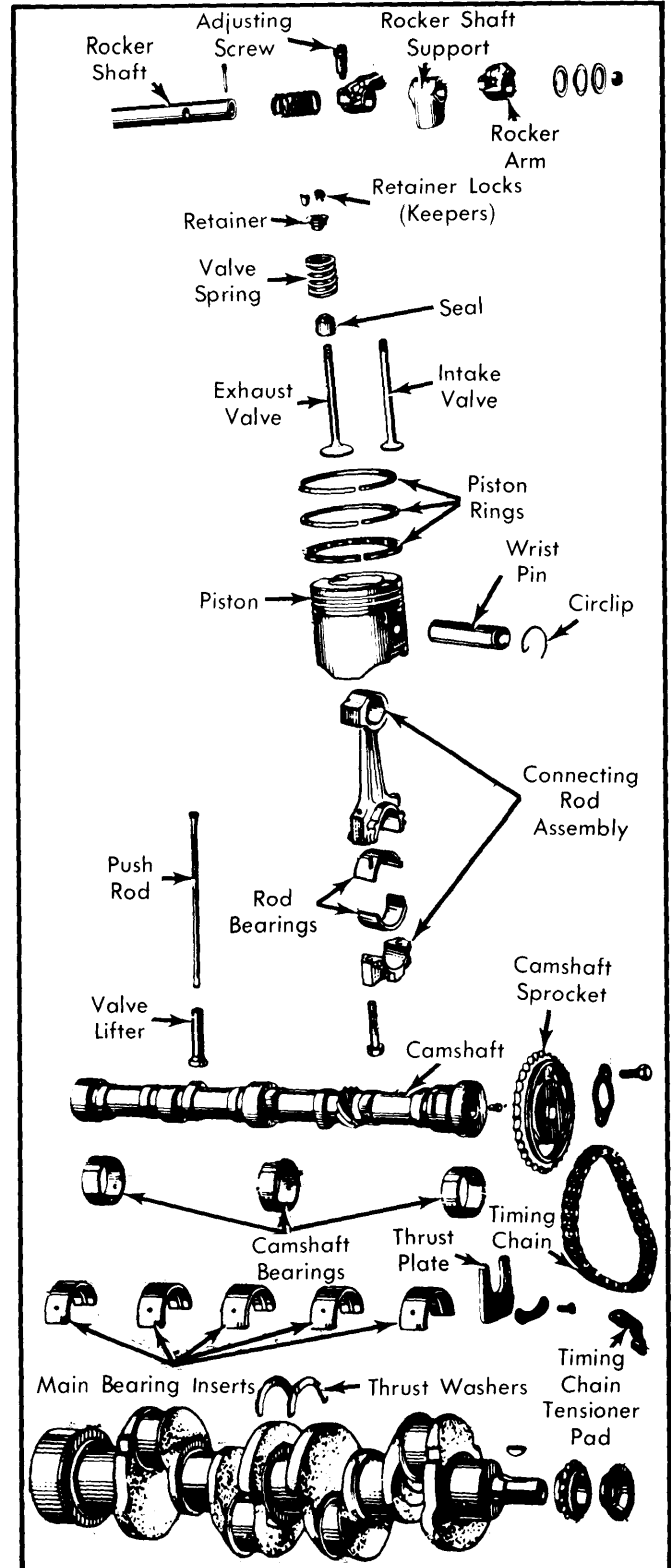


Fig. 4 Exploded View of Engine Internal Components

## 1600 cc 4 CYLINDER (Cont.)

### ENGINE OILING

#### OIL PUMP

Oil pump and filter assembly is bolted to right side of cylinder block. Assembly is removable with engine in place. Pump is driven by a gear on the engine camshaft. The full flow element type filter is bolted to a mounting flange integral with the oil pump body.

**Crankcase Capacity** – 3.5 quarts including filter.

**Oil Filter** – Disposable spin-on type.

### ENGINE COOLING

**Thermostat** – Begins to open at 185°F; fully open at 216°F.

**Cooling System Capacity** – 6.6 qts. (includes heater).

**Radiator Cap** – 14.5 psi pressure cap.

**Radiator** – Cross-flow with electric cooling fan.

### WATER PUMP

Disconnect battery and drain radiator. Loosen pump pulley bolts, then remove air pump and alternator drive belts. Remove lower radiator hose from pump. Remove pump pulley bolts and take pulley off shaft. Remove pump retaining bolts and lift pump from engine. To install, position pump on connecting hose and reverse removal procedures.

#### Engine Oiling System Specifications

Application	Specification
Oil Pressure @ 2000 RPM <sup>①</sup>	24-45 psi.
Oil Filter Type	Full Flow Element
Inner-to-Outer Rotor Clearance	.005" (.127 mm)
Outer Rotor-to-Housing Clearance	.010" (.254 mm)
Housing-to-Rotor Face Clearance	.0025" (.064 mm)
Relief Valve Spring Tension	7.5-8.5 lbs. @ 1.04"
Relief Valve Clearance	.001-.003" (.025-.076 mm)

① – Engine hot.

### 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	94	1600	2-Bbl.	.....	.....	8.6:1	3.188	80.97	3.056	77.62

#### 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)
1600 cc Intake	1.410 (35.8)	45°	45°	.050-.065 (1.27-1.65)	.3098-.3105 <sup>①</sup> (7.868-7.886)	.0008-.0027 <sup>②</sup> (.020-.069)	.3536 <sup>③</sup> (8.98)
Exhaust	1.239 (31.47)	45°	45°	.070-.085 (1.78-2.16)	.3089-.3096 <sup>①</sup> (7.846-7.863)	.0017-.0036 <sup>②</sup> (.043-.091)	.3553 <sup>③</sup> (9.02)

- ① – .015" (.381 mm) oversize limits are:  
 Intake – .3248-.3255" (8.25-8.26 mm)  
 Exhaust – .3239-.3246" (8.22-8.24 mm)
- ② – Wear limit – .0055" (.139 mm)
- ③ – At ZERO valve lash

#### VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1600 cc	1.48 (37.6)	47.5-52.5@1.263 <sup>①</sup> (3.34-3.69@32)	122.5@.953 <sup>②</sup> (8.61@24.2)

- ① – Wear Limit – 42 lbs.@1.263" (2.95 kg/cm<sup>2</sup>@32.08 mm)
- ② – Wear Limit – 104 lbs.@.953" (7.31 kg/cm<sup>2</sup>@24.2 mm)

#### CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance <sup>①</sup> In. (mm)	Lobe Lift In. (mm)
1600 cc	1.5597-1.5605 (39.62-39.64)	.0010-.0023 (.025-.058)	.2309 <sup>②</sup> (5.865) .2320 <sup>③</sup> (5.893)

- ① – End play is .0025-.0075" (.064-.191 mm).
- ② – Intake lobe
- ③ – Exhaust lobe

# Fiesta Engines

## 1600 cc 4 CYLINDER (Cont.)

### 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)
1600 cc	2.1253-2.1261 <sup>①</sup> (53.98-54.00)	.0005-.0015 (.013-.038)	No. 3 <sup>②</sup>	.003-.011 (.076-.279)	1.9368-1.9376 <sup>①</sup> (49.19-49.22)	.0004-.0015 <sup>③</sup> (.010-.038)	.004-.010 <sup>④</sup> (.102-.254)

① - Maximum out of round - .0004" (.010 mm)

③ - Allowable limit - .0004-.0024" (.010-.061 mm)

② - Thrust washers

④ - Maximum limit - .014" (.356 mm)

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)
1600 cc	.0009-.0017 (.023-.431)	.0001-.0003 <sup>①</sup> (.002-.008)	.0001-.0004 <sup>②</sup> (.002-.010)	Comp.	.009-.014 (.228-.356)	.0016-.0036 (.041-.091)
				Oil	.009-.014 (.228-.356)	.0018-.0038 (.046-.097)

① - Tight

② - Loose

### TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cam Sprocket-to-Cam Bolt	12-15 (1.7-2.1)
Cam Thrust Plate Bolts	25-35 (3.5-4.8)
Connecting Rod Bolts	30-35 (4.1-4.8)
Cylinder Head Bolts	
1st Increment	5 (.7)
2nd Increment	20-30 (2.8-4.1)
3rd Increment	50-55 (6.9-7.6)
Final Torque	65-70 (9.0-9.7)
Crankshaft Pulley Bolt	24-28 (3.3-3.9)
Cylinder Front Cover	5-7 (.7-1.0)
Clutch Pressure Plate	
To Flywheel	12-15 (1.7-2.1)
Carburetor Nuts	12-15 (1.7-2.1)
Exhaust Manifold-to-Head Studs	9-12 (1.2-1.7)
Exhaust Manifold-to-Head Nuts	15-18 (2.1-2.5)
Pulley-to-Hub	
Metal	5-7 (.7-1.0)
Plastic	7-9 (1.0-1.2)
Flywheel-to-Crankshaft Bolts	50-55 (6.9-7.6)
Intake Manifold-to-Head Bolts	12-15 (1.7-2.1)
Intake Manifold-to-Head Nuts	12-15 (1.7-2.1)
Intake Manifold-to-Head Studs	9-12 (1.2-1.7)
Main Bearing Cap Bolts	55-60 (7.6-8.3)
Oil Pump-to-Block	12-15 (1.7-2.1)
Oil Drain Plug	20-25 (2.8-3.5)
Oil Pan Bolts	
Step 1	Finger Tight Corner Bolts
Step 2	Snug All Bolts
Step 3	6.8 (.94)
Rear Oil Seal Retainer-to-Block	12-15 (1.7-2.1)
Rocker Shaft Support Bolt	25-30 (3.46-4.15)
Spark Plug	10-15 (1.38-2.1)
Water Pump-to-Block	
1/4" Bolts	5-7 (.7-1.0)
3/16" Bolt	12-15 (1.7-2.1)
Timing Pointer	8-10 (1.1-1.4)