SPITFIRE MK IV 4 CYLINDER

GENERAL SPECIFICATIONS										
Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1974	91	1493	1x1-Bbl.	57@5000	73@3000	7.5-1	2.90	73.7	3.44	87.5

ENGINE IDENTIFICATION

Engine number is stamped on left side of block beneath No. 4 spark plug.

FM1234LUE

1st & 2nd Digits – Prefix used to designate USA market. Two codes may be used: "FM" or "FK".
3rd, 4th, 5th & 6th Digits – Series build number.
7th Digit – Denotes compression: "L" indicates low compression; "H" indicates high compression.
8th Digit – Denotes USA market for 1972 & later.
9th Digit – Denotes engine unit (no explanation).

ENGINE REMOVAL

1) Remove hood and battery. Drain coolant and engine oil. Disconnect top, bottom and expansion hoses from engine. Remove radiator and disconnect heater hoses at engine.

2) Disconnect throttle cable at linkage and choke cable from rocker cover and carburetor. Separate exhaust pipe from manifold. Disconnect high and low tension leads at distributor.

3) Disconnect starter cable, alternator harness connector, temperature sensing wire, oil pressure wire and ground strap at alternator bracket. Disconnect fuel line at pump and plug line.

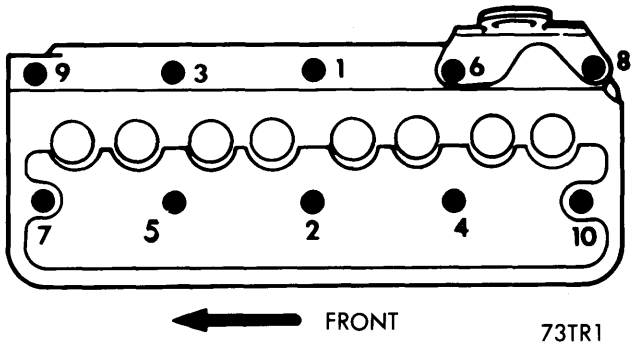
4) Remove transmission tunnel cover and disconnect propeller shaft at transmission. Remove top cover. Disconnect rear mount-to-transmission bracket. Remove nut and bolt attaching exhaust pipe clamp to transmission.

5) Disconnect speedometer cable. Unbolt clutch slave cylinder from transmission and hang to one side. Remove front engine mount bolts. Raise engine to clear oil pan, pull forward and raise engine/transmission assembly clear of vehicle. To install, reverse removal procedures.

INTAKE MANIFOLD

1) Remove air cleaner and disconnect fuel line. Disconnect hose to rocker cover. Unhook throttle return spring. Disconnect and remove throttle cable. Disconnect choke cable, ignition vacuum line and water hoses.

2) Unscrew manifold bolts connecting intake to exhaust manifold. Remove manifold-to-engine bolts and lift out manifold assembly.



CYLINDER HEAD TIGHTENING SEQUENCE

CYLINDER HEAD

1) Disconnect battery and drain cooling system. Remove intake and exhaust manifold assemblies. Disconnect spark plug wires.

2) Remove rocker shaft assembly. Remove push rods and suitably mark them for reinstallation. Remove water pump housing and alternator. Remove cylinder head nuts, loosening them in progressive sequence. To install, reverse removal procedure.

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)
1493 cc							
Intake	1.437-1.443 (36.50-36.65)	45°	45°	....	.3107-.3112 (7.87-7.90)	.0008-.0023 (.02-.06)	....
Exhaust	1.168-1.172 (29.66-29.76)	45°	45°	....	.3100-.3105 (7.874-7.887)	.0015-.0030 (.03-.07)	....

VALVE ARRANGEMENT

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

VALVE GUIDE SERVICING

1) Inspect valve guide wear by inserting a new valve, lifting it slightly off its seat, and rocking sideways. Movement of valve head across seat should not exceed .020" (.51 mm).

SPITFIRE MK IV 4 CYLINDER (Cont.)

2) If replacement is required, use suitable tool (S.60A-6) to remove and replace valve guide. Guide protrusion above top face of cylinder head must lie between .749-.751" (19.02-19.08 mm).

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1493 cc	1.52 (38.6)	20 @ .875 (2.8 @ 22.2)	....

VALVE SPRINGS

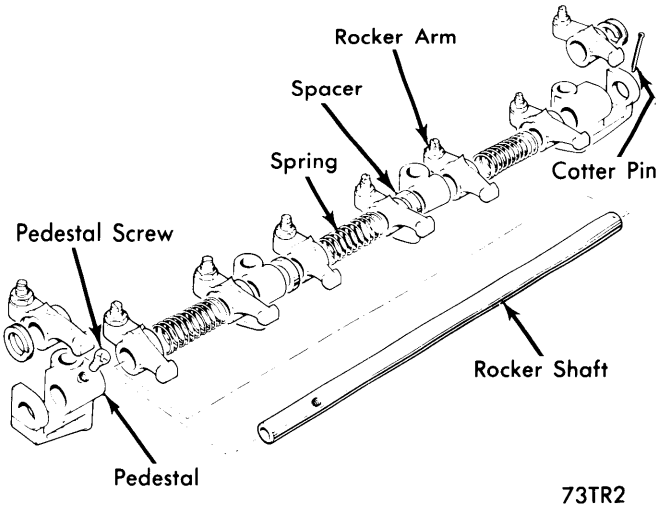
Using suitable valve spring compressor, remove valve retainers. Withdraw collars and valves. Check valve springs for cracks, distortion and load length. When any one spring is defective, it is advisable to replace all springs.

ROCKER ARM ASSEMBLY

Remove rocker arm cover. Progressively and evenly remove rocker arm pedestal nuts. Lift off rocker arm assembly. Pull cotter pin from front end of rocker shaft. Slide rockers, pedestals, springs and spacers from shaft, noting order for reassembly. Remove screw locating rear pedestal to shaft. Inspect and replace excessively worn parts. To install, reverse removal procedure making sure rear pedestal screw correctly engages rocker shaft.

VALVE TAPPETS

Check valve tappets for chips, score marks, ridges or excessive wear. Replace as necessary and ensure tappets are free to slide and rotate in their positions.



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ROCKER ARM ASSEMBLY

VALVE CLEARANCE ADJUSTMENT

Disconnect battery, then remove rocker cover and spark plugs. Make necessary adjustment in sequence as indicated in chart below. Turning adjustment screw clockwise will decrease clearance, and turning screw counterclockwise will increase clearance. Proper clearance for intake and exhaust valves is .010" (.25 mm).

Valves Open①	Valves to Adjust
No. 8 & 6	No. 1 & 3
No. 4 & 7	No. 5 & 2
No. 1 & 3	No. 8 & 6
No. 5 & 2	No. 4 & 7

① — Counting from front.

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)
1493 cc	.0023 ① (.06)	Push Fit	Push Fit	No. 1 & 2	....	.002-.0025 (.051-.063)
				Oil	....	.0038-.0048 (.097-.122)

① — Specification is for FK engines. For FM engines, specification is .0015" (.038 mm).

OIL PAN REMOVAL

Drain crankcase. Remove bolts attaching pan to crankcase. Raise engine sufficiently to lower pan. Turn pan sideways and withdraw. To install, reverse removal procedure with long bolts at rear of oil pan.

PISTON & ROD ASSEMBLY

1) Disconnect battery ground cable and drain engine oil. Remove oil pan and cylinder head as previously described.

2) Remove pickup strainer and bring No. 1 & No. 4 connecting rods to accessible position. Index bearing caps and connecting rods.

3) Remove connecting rod bolts and withdraw bearing caps. Push pistons and connecting rods upward, withdrawing them out top of cylinder. Attach bearing cap to respective connecting rod.

4) To install, position No. 1 and No. 4 connecting rods at BDC and lubricate journals with engine oil. Coat piston and connecting rod assemblies with engine oil. Carefully insert connecting rod and piston into cylinder ensuring arrow is pointing toward front of engine and piston rings are staggered.

5) Fit upper bearing and pull connecting rod over crankshaft. Install lower bearing cap and torque bolts to specifications.

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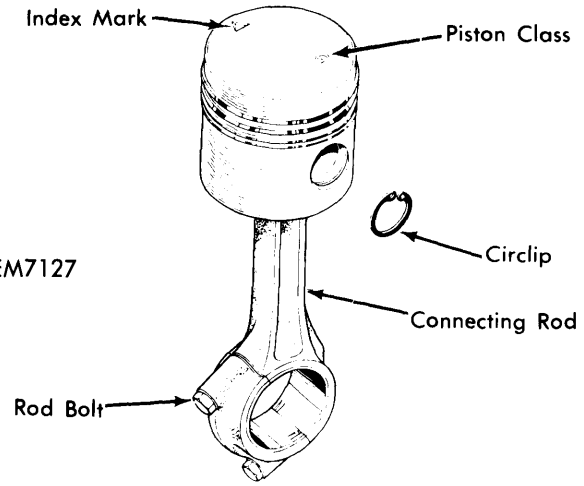
PISTON PIN REPLACEMENT

1) Remove circlips from pistons and extract piston pin. Separate piston from connecting rod. Inspect connecting rod bushing for wear and replace if necessary.

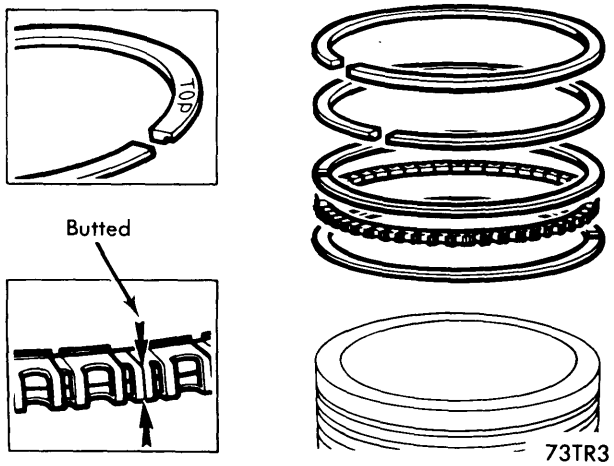


PISTON & ROD ASSEMBLY

2) Using suitable press, remove worn bushing and install replacement. Ensure oil hole in new bushing is aligned with hole in connecting rod. Ream bushing to fit piston pin. Piston pin diameter is .8123-.8125" (20.63-20.64 mm) and is a thumb push fit at 68°F (20°C).

FITTING PISTONS

Inspect and measure cylinder for wear or taper. Measure piston diameter and determine if clearance is correct. Install expanding ring in bottom groove of piston with ends butting but not overlapping. From bottom of piston install bottom rail and from top upper rail. Install middle ring with word "TOP" facing upward (see illustration). Install upper compression ring and stagger ring gaps on non-thrust sides of piston.



PISTON RING INSTALLATION

Cylinder & Piston Diameters

Application	In. (mm)
Bore Size (All)	2.9004-2.9079 (73.67-73.86)
Piston Top Diam.	
Eng. FK	2.871-2.874 (72.93-73.01)
Eng. FM	2.870-2.873 (72.90-72.98)
Piston Bottom Diam.	
Eng. FK	2.8983-2.8984 (73.617-73.620)
Eng. FM	2.8990-2.8995 (73.635-73.647)

NOTE — Pistons are available in .020" (.51 mm) oversize.

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)
1493 cc	2.3115-2.3120 (58.713-58.725)	...	Rear	.004-.008 (.10-.20)	1.8750-1.8755 (47.625-47.638)	....	....

MAIN & CONNECTING ROD BEARINGS

1) Remove engine, cylinder head and oil pan. Remove main and rod bearing caps. Slightly push up connecting rod assembly but do not dislodge it from cylinder. Remove upper connecting rod bearings.

2) Remove crankshaft and upper main bearings. Remove thrust washers from rear main bearing. Examine all bearing journals and determine if regrinding is necessary.

3) Examine each bearing and replace as required. Bearings are available in .010", .020", and .030" (.25, .51, and .76 mm) undersizes. Any undersize crankshaft which is installed or has been installed in service should have a size marking stamped in which corresponds to similar marking on bearings.

4) To install main and connecting rod bearings, reverse removal procedure, noting the following: bend over locking tabs, if equipped.

CRANKSHAFT END PLAY

Using a dial gauge as shown in illustration, measure crankshaft end play. Value obtained should be within specifications. If not, use a suitable oversize thrust washer. Thrust washers are available in .005" (.13 mm) oversizes.

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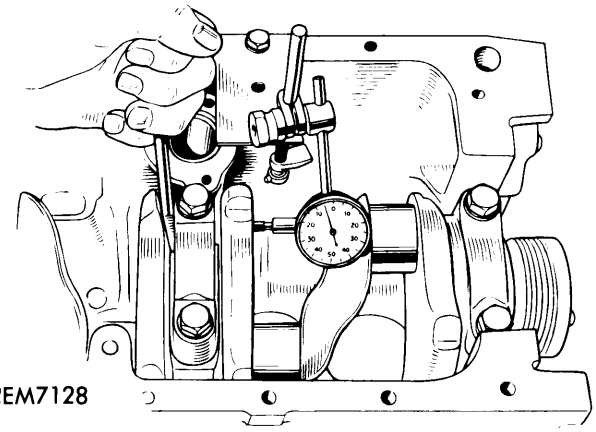
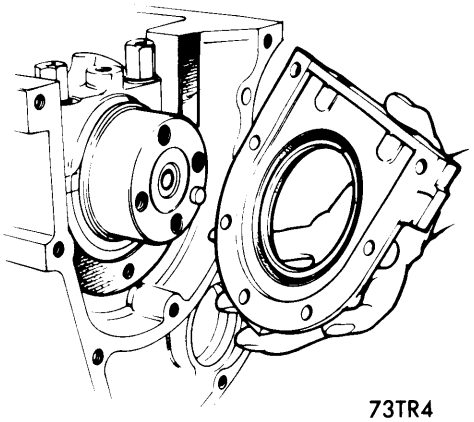


CHECKING CRANKSHAFT END PLAY

REAR MAIN BEARING OIL SEAL

1) Remove rear transmission adaptor plate. Remove two bolts attaching oil pan to seal housing and seven bolts attaching seal housing to crankcase. Remove seal housing and press out old seal.

2) Coat O.D. of seal with grease and press seal into housing with lip facing crankshaft. Install a new gasket coated with sealing compound. Carefully install seal housing with a plain copper washer on top bolt.



REAR MAIN BEARING SEAL HOUSING

ENGINE FRONT COVER & OIL SEAL

1) Remove fan belt, fan and crankshaft pulley. Remove attaching bolts and timing cover. Press out old seal and install new seal with open side facing toward engine.

2) Using a bent piece of steel rod to hold chain tensioner clear of chain, place timing cover in position and then carefully remove bent wire. Install attaching bolts and tighten.

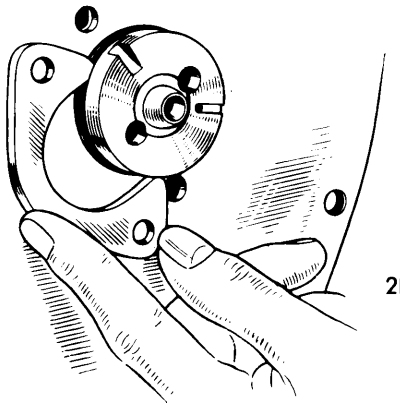
CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1493 cc	1.8402-1.8407	....	....

CAMSHAFT REMOVAL

Disconnect battery, remove cylinder head and timing cover. Withdraw camshaft sprocket and timing chain. Lift out valve tappets. Remove distributor, drive gear and fuel pump. Remove camshaft thrust plate. Carefully extract camshaft taking care to avoid damage to cams and bearings. To install, reverse removal procedure.

CAMSHAFT END THRUST

End play is compensated for by a thrust plate installed on front end of camshaft (see illustration). Specified end play is .004-.008" (.11-.22 mm). Oversize thrust plates may be installed to bring end play within specification.



CAMSHAFT THRUST PLATE

VALVE TIMING				
	INTAKE		EXHAUST	
Engine	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
1493cc	18°	58°	58°	18°

TIMING CHAIN REPLACEMENT

1) Remove timing cover and straighten locking tabs on camshaft sprocket bolts. Bring No. 1 cylinder to TDC and loosen camshaft sprocket bolts. Withdraw camshaft sprocket, timing chain and crankshaft sprocket.

2) To install, fit crankshaft sprocket, ensuring it is properly aligned and shimmed. Position timing chain and camshaft sprocket by rotating sprocket and chain as necessary to obtain alignment of camshaft mounting holes. *NOTE – Do not disturb position of camshaft.* Fit lock plate to camshaft sprocket.

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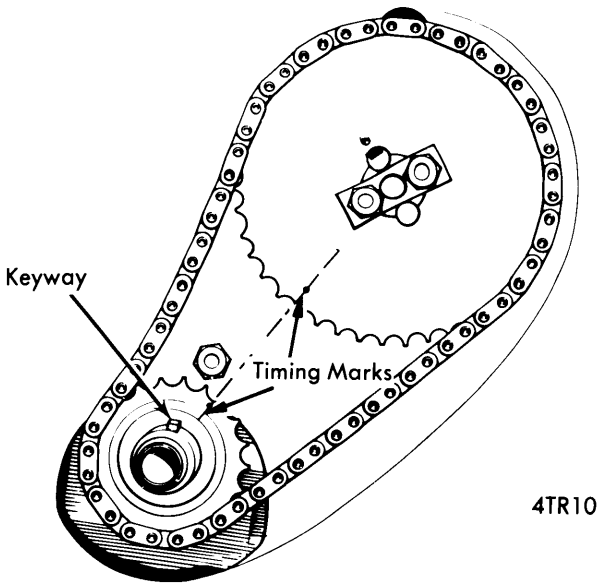
3) Install timing cover, crankshaft pulley, fan belt, and radiator assembly. Connect battery and refill cooling system.

VALVE TIMING

Remove valve cover and adjust No. 7 and No. 8 valves to .050" (1.27 mm) clearance. Turn crankshaft until No. 1 piston is at TDC of compression stroke (pulley mark aligned with pointer). Check that No. 1 and No. 2 valves are fully closed by inserting a feeler gauge between valve tip and rocker pad. Ensure No. 7 and No. 8 valve clearances remain equal (use two feeler gauges); oscillate crankshaft as required to maintain equality. Adjust valve timing as necessary to obtain the described settings. Readjust No. 7 and No. 8 valves to proper valve clearance specifications. Replace rocker cover. *NOTE – If chain or sprockets are removed, ensure timing marks are aligned when sprockets are reinstalled. Crankshaft sprocket keyway should be straight up when sprocket marks come into line.*



ALIGNING TIMING MARKS

ENGINE OILING

ENGINE OILING SYSTEM

Oil is drawn from engine by a rotor type pump which discharges via a nonadjustable relief valve to a full-flow filter. Cylinder bores, pistons and piston pins are splash lubricated all other components are oiled through drilled passages.

Crankcase Capacity – 4.8 qts. (incl. filter).

Oil Filter – Disposable canister type.

Oil Pressure Relief Valve – Located in cylinder block beneath oil filter. Check relief valve spring free length; it should be 1.53" (38.8 mm).

OIL PUMP

1) Remove oil pan previously described. Remove three bolts securing oil pump to crankcase. Lift from vehicle and place in a vise.

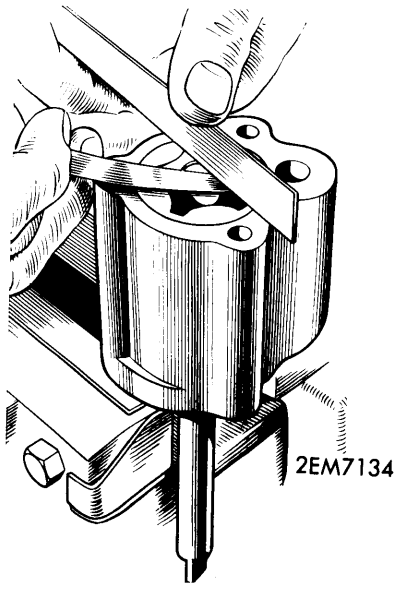
2) Place a straightedge across pump body, then use a feeler gauge to check clearance between rotor face and straight edge; it should be .004" (.10 mm).

3) Check clearance between inner rotor and outer rotor. Clearance must not exceed .010" (.25 mm).

4) Check clearance between outer rotor and body; it must not exceed .008" (.20 mm).

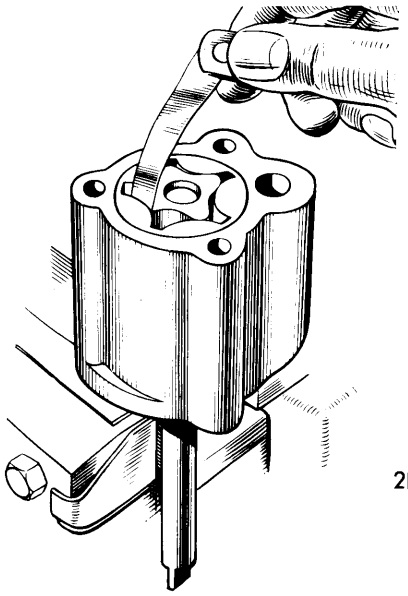
5) Check cover plate for scoring, and test on a surface plate for distortion. Examine pump spindle bearing surface in body for excessive wear.

6) Reassembly oil pump installing any new parts as necessary to satisfy specifications. To install oil pump, reverse removal procedure.



ROTOR-TO-PUMP BODY CLEARANCE

SPITFIRE MK IV 4 CYLINDER (Cont.)



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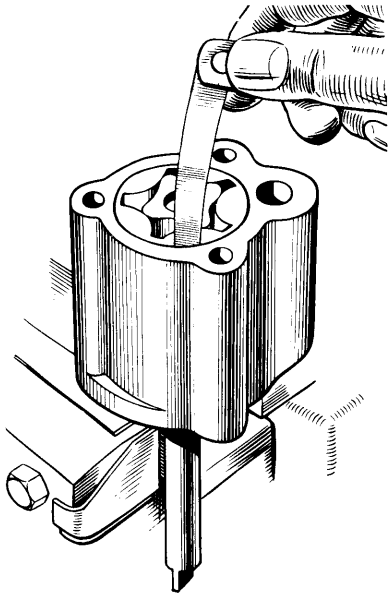
INNER AND OUTER ROTOR CLEARANCE



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OUTER ROTOR AND BODY CLEARANCE

ENGINE COOLING

Thermostat – Std. Type - Opens at 180°F (82°C).
Cold Weather Type (from FK 33745UE) Opens at 190°F (88°C).

Cooling System Capacity – 4.8 qts.

Radiator Cap – 13 psi.

WATER PUMP

Drain cooling system. Remove radiator hoses, then unbolt and remove radiator. Detach fan belt. Unscrew three nuts securing water pump flange to thermostat and pump housing. Withdraw water pump. Remove fan. To install, reverse procedure.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Connecting Rod Bolts	
Color Dyed	50 (6.9)
Phosphated	46 (6.4)
Sprocket-to-Camshaft	24 (3.3)
Crankshaft Pulley Nut	150 (20.7)
Cylinder Head Bolts	46 (6.4)
Flywheel-to-Crankshaft	
Cadmium Plated Bolt	40 (5.5)
Parkarised Bolt	45 (6.2)
Intake-to-Exhaust Manifold	14 (1.9)
Manifold-to-Head	25 (3.5)
Main Bearing Cap Bolts	65 (9.0)
Oil Pan Bolts	20 (2.8)
Oil Seal Block Screw	14 (1.9)
Rocker Cover-to-Head	2 (0.3)
Rocker Shaft-to-Head	34 (4.7)
Rear Crankshaft Seal	20 (2.8)
Spark Plugs	20 (2.8)
Timing Cover-to-Front Plate	
3/8" Screw	10 (1.4)
7/8" Screw	20 (2.8)
Stud	16 (2.2)
Bolt	20 (2.8)
Water Pump-to-Head	20 (2.8)