FOX 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
1976	96.9	1588	Fuel Inj.	79@5500	89@3300	①	3.13	79.5	3.15	80

① – 8.2:1 on early models, 8.0:1 on late models.

ENGINE IDENTIFICATION

Engine number is stamped on distributor side of engine block, just above the fuel pump. Number prefix indicates engine/transmission application as follows:

Application	Engine Code
Man. Trans.	
Calif.	YG
Federal	YK
Auto. Trans.	
Federal	YH

ENGINE REMOVAL

NOTE – *The following procedure describes engine removal, without transmission, from above; however, engine and transmission assembly may be removed from below the vehicle after removing the subframe.*

1) Remove hood and disconnect battery. Remove air cleaner, preheater, and oil vent hose. Unscrew condenser and compressor mounting nuts (if equipped with air conditioning), and hang components by wire out of the way.

2) Disconnect accelerator cable from throttle valve housing. On manual transmission models, disconnect clutch cable. Relieve pressure from CIS system, disconnect fuel tank line and fuel distribution lines.

3) Disconnect all electrical wiring and mark for installation. Drain crankcase and cooling system. Disconnect radiator and heater hoses.

NOTE – *Radiator need not be removed if engine, transmission and subframe are being removed from below the vehicle.*

4) On manual transmission models, remove grille mounting screws, inner radiator trim mounting bolts and thermostat switch wire. Remove radiator trim pieces, radiator and blower motor.

5) Disconnect exhaust pipe at manifold and loosen transmission mounting bracket. Loosen upper and lower engine mounts on both sides of engine. Remove front engine mount.

NOTE – *Front engine stop shell has two slots and it must be installed so that it rests on engine mount without tension when engine is completely installed.*

6) Disconnect mounting bolts at engine block and disconnect starter leads. Remove starter, transmission and engine bolts. On manual transmission vehicle, remove flywheel guard. On automatic transmission vehicle, remove torque converter guard and disconnect hose at vacuum unit.

7) On automatic transmission vehicle, remove three torque-to-drive shell bolts through starter opening. Pull vacuum hose through eyelet on cylinder head. Using suitable engine sling (Tool No. 10-207), lift engine slightly and remove engine mounts.

8) Support transmission with floor stand or jack. Carefully separate engine and transmission. On automatic transmission vehicle, lift engine straight up and out of vehicle. On manual transmission vehicle, while lifting engine, rotate engine counterclockwise.

9) Install a suitable retaining strap (Tool No. 32-200) to prevent torque converter from falling out ot transmission. Prior to reinstallation of engine, place grease on engine block at several locations to prevent connecting plate from falling from engine during installation. To install engine, reverse removal procedures.

CYLINDER HEAD

Removal & Installation – 1) Disconnect battery ground cable. Drain coolant system and disconnect hoses which are connected to cylinder head. Disconnect exhaust pipe and electrical wires. Disengage accelerator linkage and disconnect at holder. Loosen alternator tensioner and remove camshaft drive belt and "V" belt.

2) Loosen head bolts in reverse of tightening sequence *(See Fig. 1)*. To install, place head gasket with word "top" facing cylinder head. Position cylinder head on gasket and install bolts. Tighten bolts, in steps, in sequence shown in *Fig. 1*. Reinstall remaining components and retime camshaft. Retighten head bolts after 1000 miles.

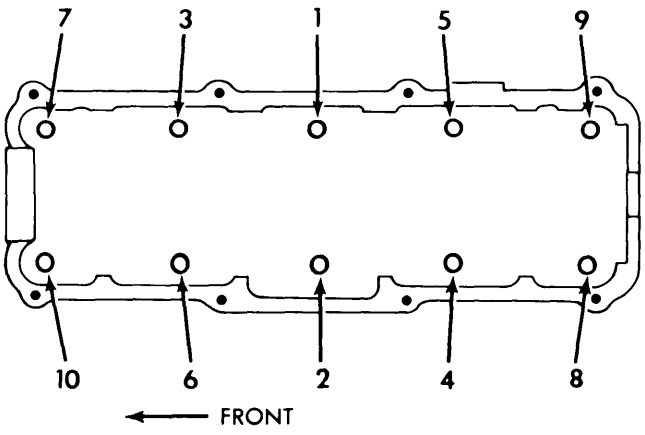

Fig. 1 Cylinder Head Tightening Sequence

FOX 4 CYLINDER (Cont.)

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)
1588 cc							
Intake	1.338 (34.0)	45°	45°	.078 (1.98)	.314 (7.98)	.001-.002 (.025-.05)	....
Exhaust	1.212 (30.8)	45°	45°	.094 (2.39)	.313 (7.95)	.001-.002 (.025-.05)	....

VALVE ARRANGEMENT

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

VALVE GUIDE SERVICING

1) Before taking measurements, clean valve guides with a cleaning broach. To measure, attach a suitable device with a dial indicator (VW 689/1) to mounting surface of cylinder head. Insert a new valve into valve guide until stem is flush with end of guide. Rock valve against dial indicator and check amount of guide-to-stem clearance. Maximum valve rock should not exceed .039" (1.0 mm) for intake valves, and .051" (1.3 mm) for exhaust valves.

2) Use a suitable press and adaptor (10-206) to remove and install valve guides. Always perform this operation from top side of head. When installing new guides, heat cylinder head to approximately 176-212°F (80-100°C). Press in new guide until it measures 2.23" (56.6 mm) from top of cylinder head to top of guide. Ream guides to proper size, reface valve seat, and rework valves.

VALVE STEM OIL SEALS

Install spring retainer using suitable tool (Tool No. 10-218). Place seal on suitable tool (Tool No. 10-204). Guide seal onto valve guide and bring it to final position by applying heavy pressure. Remove tool and check seal for correct position.

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1588 cc			
Inner	....	....	46-51@.72 (21-23@18.3)
Outer	....	....	96-106@.92 (44-48@22.3)

VALVE SPRINGS

With tappets removed, install suitable valve spring compressor (Tool No. 10-210). Compress springs and remove valve keepers and collar. Lift out valve springs. To install, reverse removal procedure.

MECHANICAL VALVE LIFTER ASSEMBLY

With camshaft and tappet discs removed, lift out tappets. Inspect for wear or damage, replace as necessary. Oil tappet lightly and replace in original position.

VALVE CLEARANCE ADJUSTMENT

1) Adjust valve clearances in firing number order (1-3-4-2). Rotate camshaft until number four cylinder valves overlap and measure number one cylinder valve clearances. Clearance is measured with engine warm. With a feeler gauge, measure clearance of each cylinder in turn and note clearance. If clearance is within .002" (.05 mm) of specifications, no adjustment is necessary.

2) Determine thickness of tappet disc installed. Using tappet clearance previously noted, calculate required thickness of disc needed to achieve proper tappet clearance. Tappet discs are available in .0019" (.05 mm) increments, from .1181" (3.0 mm) to .1673" (4.25 mm). Thickness is stamped on bottom side of tappet disc.

3) Special tools (Tool No. 10-209 and 10-208) are required to remove tappet clearance discs. Rotate camshaft so cams of one cylinder overlap and cams of cylinder to be changed no longer rest on tappets. Rotate tappet until openings are at 90° angles to camshaft. Install tool No. 10-209 to depress tappets. Using Tool No. 10-208, grasp tappet disc through opening in side of tappet and rotate out from under camshaft. Install proper disc and remove Tool No. 10-209. Repeat procedure until all tappets are adjusted.

Valve Clearances

Application	In. (mm)
Intake	
Hot	.008-.012 (.20-.30)
Cold	.006-.010 (.15-.25)
Exhaust	
Hot	.016-.020 (.41-.51)
Cold	.014-.018 (.36-.46)

NOTE – *Cold settings are given for reference as initial settings to be used during engine rework. Final adjustments are to be made with engine warm. After head repairs, recheck valve clearance adjustment after 600 miles.*

FOX 4 CYLINDER (Cont.)

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)
1588 cc	.0012 (.031)	①	.0004-.0008 (.010-.020)	Comp.	.012-.017 (.30-.43)	.0008-.002 (.02-.05)
				Oil	.010-.016 (.25-.40)	.0008-.002 (.02-.05)

① – Push fit at 140° F (60° C).

OIL PAN

Drain engine oil. Attach a suitable lifting device to engine, and apply supporting tension to engine. Remove auxiliary bolts (alternately), then remove left and right engine mounts. Unscrew oil pan bolts and remove pan. When installing, gasket is installed dry, and oil pan bolts are to be tightened in a criss-cross pattern.

PISTON & ROD ASSEMBLY

1) Before removing connecting rods, mark rod and cap for proper reinstallation. Remove rod bolts and caps and carefully push piston and rod assembly out top of cylinder.

2) On reassembly of piston and rod assemblies, cast bosses on rod and cap, as well as locating projections of bearing inserts face toward intermediate shaft. All connecting rods must be of same weight class. Weight class numbers are stamped on bottom of connecting rod caps. Using a suitable ring compresser, install piston and rod assemblies with arrow on crown of piston facing forward.

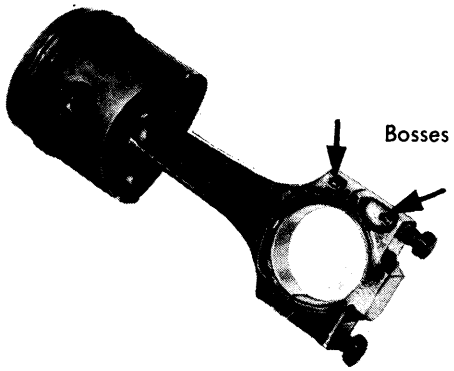

Fig. 2 Location of Connecting Rod Bosses

FITTING PISTONS

1) Measure cylinder at three points: .39" (10 mm) from top and bottom, and at center of cylinder bore. Take measurements in line with thrust face and at 90° to thrust face.

2) Measure pistons at .63" (16 mm) from bottom of piston skirt (measuring at 90° to pin bore). Combining this measurement with measurement of corresponding cylinder bore, if piston-to-cylinder clearance exceeds .003" (.08 mm), oversize pistons must be installed.

3) Place piston rings squarely in top of cylinder bore (above ring ridge) and measure end gap; replace as necessary. Measure ring side clearance; replace rings and/or pistons if clearance exceeds .005" (.13 mm). Install rings on piston with end gaps 120° offset to each other (start with oil ring gap facing directly to rear). Ensure stamped word "TOP" on rings is facing upward.

NOTE – *Engine blocks are stamp coded above water pump as to size of pistons installed.*

Standard Pistons & Cylinder Dia.
(1588 cc Engine)

Piston Dia. ①	Cyl. Dia. ①	Stamp Code
3.1291 (79.48)	3.1303 (79.51)	951
3.1295 (79.49)	3.1307 (79.52)	952
3.1299 (79.50)	3.1311 (79.53)	953

① – Measurements are given in In. (mm).

Oversize Pistons & Cylinder Dia.
(1588 cc Engine)

Piston Dia. ①	Cyl. Dia. ①	Stamp Code
3.1390 (79.73)	3.1402 (79.76)	976
3.1394 (79.74)	3.1406 (79.77)	977
3.1398 (79.75)	3.1409 (79.78)	978
3.1488 (79.98)	3.1500 (80.01)	001
3.1492 (79.99)	3.1504 (80.02)	002
3.1496 (80.00)	3.1508 (80.03)	003
3.1685 (80.48)	3.1697 (80.51)	051
3.1689 (80.49)	3.1701 (80.52)	052
3.1693 (80.50)	3.1705 (80.53)	053

① – Measurements are given in In. (mm).

PISTON PINS

Remove circlip with a pair of needle-nose pliers. Heat piston to approximately 140°F (60°C) and drive out piston pin. To install, reverse removal procedure. Always install piston on connecting rod so arrow will be facing forward when placed in cylinder.

FOX 4 CYLINDER (Cont.)

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS							
	MAIN BEARINGS				CONNECTING ROD BEARINGS		
Engine	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)
1588 cc	2.124 (53.95)	.001-.003 (.028-.088)	No. 3	.003-.007 (.07-.17)	1.809 (45.95)	.001-.003 (.028-.088)	.015 (.40)

MAIN & CONNECTING ROD BEARINGS

1) Push crankshaft toward one end and measure crankshaft end play at No. 3 (thrust) bearing. Main bearing caps are stamp-numbered "1" to "5" (front to rear) and must return to original positions upon reassembly. Measure end play of connecting rods. Remove rod and main bearing caps and check bearing clearance, using Plastigage method.

2) Measure crankshaft journals with a micrometer to determine if crankshaft is out-of-round. Maximum ovality permissible is .0012" (.03 mm). Install main inserts with bearing half having oil groove into block. Lubricate bearings and install caps.

Crankshaft Journal Diameters

Size	Main Bearing①	Connecting Rod①
Std.	2.124(53.95)	1.809(45.95)
1st US	2.114(53.70)	1.799(45.70)
2nd US	2.104(53.45)	1.789(45.45)
3rd US	2.094(53.20)	1.779(45.20)

① — Diameters given in In.(mm).

REAR MAIN BEARING OIL SEAL

Rear main bearing oil seal may be replaced with engine in vehicle, if transmission and flywheel are removed. Carefully pry oil seal from crankcase. Install suitable tool (Tool No. 10-205) on crankshaft. Slide seal over tool, by hand, as far as possible. Then remove tool. Press seal in, up to stop, with suitable tool (Tool No. 10-220), by tightening both bolts alternately.

INTERMEDIATE SHAFT OIL SEAL

Press seal out of flange. Using suitable tool (Tool No. 10-203), press new seal into flange until it is flush.

FRONT MAIN BEARING OIL SEAL

1) Front main bearing oil seal may be replaced with engine in vehicle. Remove license plate, radiator grille and camshaft belt guard. Rotate crankshaft to TDC. Use a screwdriver to lock crankshaft from turning (through opening in transmission case). Remove pulley bolt. Loosen camshaft belt tensioner and alternator adjuster. Remove both belts.

2) Pry seal out of flange using suitable tool (Tool No. 10-219). Do not place tool between seal and crankshaft, rather inner edge of support ring by cutting dust lip with sharp edge of tool. Using suitable tool (Tool No. 10-203), place seal over guide sleeve of tool. Press seal in until it is flush with flange. To install remaining components, reverse removal procedure and check valve timing.

CAMSHAFT			
Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1588 cc	1.021-1.022 (25.9-26.0)	①	②

① — Axial Play: .0018-.0046" (.048-.118 mm).
Wear Limit: .006" (.15 mm).
Radial Play: .0015-.0024" (.04-.06 mm).
② — Base-to-lobe: 1.901" (48.3 mm).

TIMING BELT

1) Remove radiator grille. Loosen alternator mounting bolts and remove "V" belt. Remove camshaft belt guard. Loosen mounting nut of camshaft belt tensioner arm and remove tension from belt. Slide belt forward off camshaft sprocket.

2) Install new belt and adjust tensioner arm until belt can be turned 90° with thumb and index finger at a point midway between camshaft sprocket and intermediate sprocket. Check valve timing.

CAMSHAFT

1) Bolt tool No. 10-200 to cylinder head. Tighten spindle until bracket of tool rests on camshaft. Remove camshaft bearing bolts and caps. Remove tension from tool spindle. Remove tool and camshaft.

2) To install camshaft, reverse removal procedure beginning with number five bearing first, as it controls end play of camshaft. Bearing caps are numbered one through five and must be installed in proper order.

VALVE TIMING				
	INTAKE		EXHAUST	
Engine	Open (BTDC)	Close (ALDC)	Open (BLDC)	Close (ATDC)
1588 cc	7°	43°	47°	3°

VALVE TIMING

Turn camshaft sprocket until punch mark on rear of camshaft sprocket is in alignment with rocker cover gasket on left side of engine. Turn crankshaft pulley and intermediate shaft sprocket until notch on pulley is aligned with punch mark on intermediate shaft sprocket. Slide camshaft belt in place and adjust tension as previously described.

FOX 4 CYLINDER (Cont.)

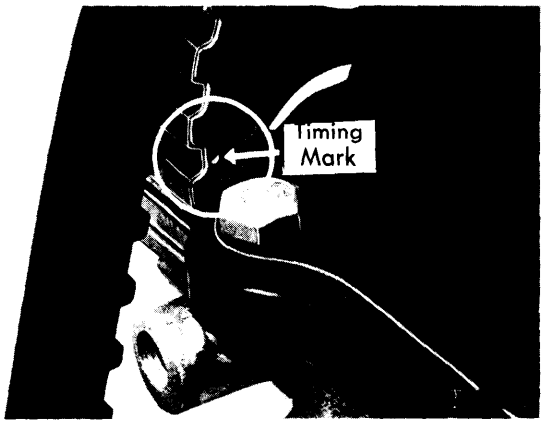

Fig. 3 Location of Camshaft Timing Marks

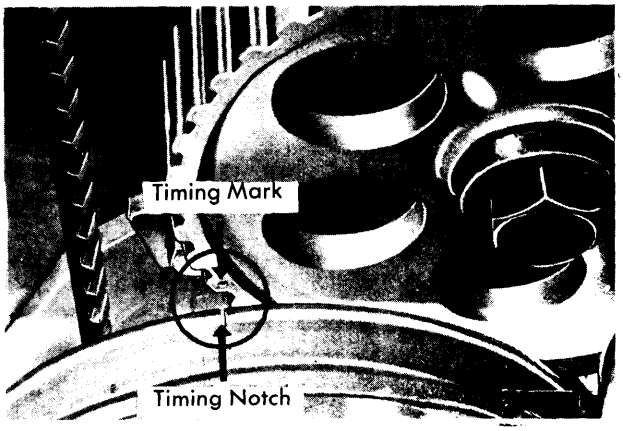

Fig. 4 Location of Crankshaft & Intermediate Shaft Timing Marks

ENGINE OILING

Crankcase Capacity – 3.15 qts. (2.98 liters).
Oil Filter – Replaceable spin-on type.
Normal Oil Pressure – 28 psi at 2000 RPM; 99.5 psi at 5000 RPM.

ENGINE OILING SYSTEM

Oiling system is a pressure feed system. A gear type oil pump lifts oil from oil pan and pressure feeds it to crankshaft journals, camshaft bearings and intermediate shaft. Other parts of system receive oil mist or splash for lubrication.

OIL PUMP

Remove oil pan and two oil pump mounting bolts. Pull pump straight down and out of engine. Remove two pump cover bolts and separate cover from pump body. Ensure that oil pump gear backlash is .002-.008" (.05-.20 mm). Check that rotor end clearance is not more than .006" (.15 mm). Remove pump drive shaft and gears. Bend up metal edges and remove filter screen. To assemble, reverse disassembly procedure.

ENGINE COOLING

Cooling System Capacity – 3.25 qts. (3.07 liters).

WATER PUMP

1) Drain coolant and remove alternator. Remove camshaft belt guard, hose clamps and pump hoses. Remove water pump mounting bolts and lift out pump by turning slightly.

2) Remove pulley and pump body mounting screws. Separate pump assembly from housing. To reassemble, reverse diassembly procedure using new gasket and pump-to-block seal.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Head Bolts (In Steps)	
Cold	54 (7.5)
Warm	62 (8.5)
Main Bearing Caps	47 (6.5)
Connecting Rod Caps	32 (4.0)
Flywheel	43-50 (6.0-7.0)
Intermediate Shaft Sprocket	58 (8.0)
Crankshaft Pulley	58 (8.0)
Oil Pan Bolts	6 (0.8)
Exhaust Manifold	17 (2.3)
Intake Manifold	18 (2.5)
Camshaft Bearing Caps	15 (2.0)
Camshaft Sprocket	58 (8.0)
Oil Pressure Switch	9 (1.3)