Ford 6 Engines

4.9 LITER 6-CYLINDER

IDENTIFICATION CODING

ENGINE IDENTIFICATION

Engine is identified by a letter code in eighth position of Vehicle Identification Number (VIN). The VIN is visible through windshield on left upper side of instrument panel. The VIN is also located on the Safety Compliance Certification Label, attached to left door lock pillar.

ENGINE IDENTIFICATION CODE

Engine	Code
4.9L (300") 1-Bbl.	E

ENGINE REMOVAL

See Engine Removal at end of ENGINE Section.

CYLINDER HEAD & MANIFOLD

INTAKE MANIFOLD

Removal

1) Remove air cleaner. Disconnect accelerator cable or rod at carburetor. Remove accelerator retracting spring. Remove kickdown rod retracting spring (vehicles with automatic transmission). Remove accelerator rod bellcrank assembly.

2) Label and disconnect all vacuum lines at carburetor. Disconnect fuel inlet line at carburetor. Disconnect muffler inlet pipe from exhaust manifold. Disconnect power brake vacuum line (if equipped). Remove crankcase vent hose from intake manifold.

3) Remove manifolds from cylinder head. Separate manifolds by removing nuts securing manifolds together. Discard all gaskets.

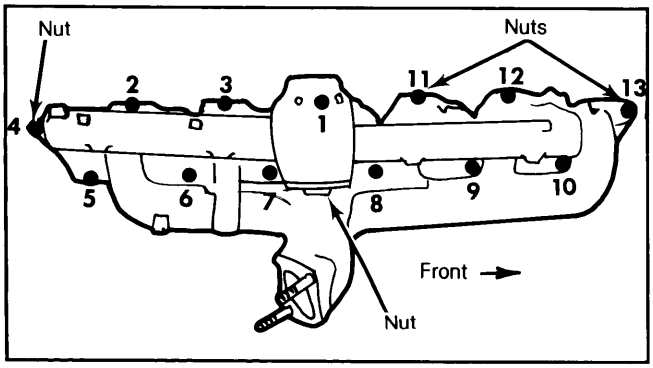
Installation

1) Clean mating surfaces of cylinder head and manifolds. If one of the manifolds is to be replaced, transfer tube fittings and install new studs in new manifold.

2) Lightly coat intake and exhaust manifold mating surfaces with graphite grease. Using new gasket, position exhaust manifold over studs of intake manifold. Install lock washers, and tighten nuts finger tight.

3) Coat manifold assembly and cylinder head mating surfaces lightly with graphite grease. Using new gasket, install and tighten intake manifold. Ensure gaskets have not become dislodged. Tighten nuts securing manifolds together. *See Fig. 1.*

Fig. 1: Intake & Exhaust Manifold Tightening Sequence



Tighten to 22-32 ft. lbs. (30-43 N.m).

4) Using new gaskets as required, install remaining components in reverse order of removal. Adjust transmission linkage, engine idle speed and air/fuel mixture as necessary.

CYLINDER HEAD

Removal

1) Drain cooling system and remove air cleaner. Remove PCV valve and carburetor fuel inlet line. Disconnect vent hose at intake manifold. Label and remove all vacuum lines at carburetor.

2) Remove accelerator cable retracting spring and disconnect accelerator cable from carburetor. On vehicles with automatic transmission, disconnect kickdown rod at carburetor. Disconnect upper radiator hose and heater hose at coolant outlet elbow. Remove coil bracket retaining bolt, and position coil to one side.

3) Disconnect muffler inlet pipe from exhaust manifold. Remove rocker arm cover. Loosen rocker arm stud nuts, and rotate rocker arms to one side. Identify push rods for reinstallation in original locations, and remove. Disconnect spark plug wires at spark plugs.

4) Remove cylinder head bolts and attach lifting eyes to cylinder head. Position a floor crane or other lifting device, and attach lifting sling to eyes. Raise cylinder head and manifold assembly from engine.

CAUTION: Do not pry between cylinder head and block when detaching head assembly, as gasket surface may be damaged.

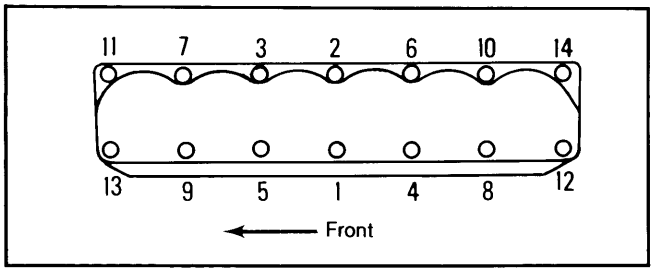
Installation

1) Clean all gasket mating surfaces. Check flatness of block and head gasket surfaces. Position new gasket over dowel pins on cylinder block.

2) Install lifting eyes on cylinder head (in previous locations used to detach head assembly). Use suitable hoist to position cylinder head over block. Carefully lower head assembly onto block, ensuring dowel pins properly engage in head. Remove hoist and lifting eyes.

3) Coat threads of head bolts with engine oil, and install. Tighten cylinder head bolts in 3 steps. *See Fig. 2.* Lubricate push rod ends, rocker arm fulcrum seats, and sockets with polyethelene grease or equivalent, and install. Reverse removal procedure to install remaining components.

Fig. 2: Cylinder Head Tightening Sequence



Tighten to specification in 3 steps.

VALVES

VALVE ARRANGEMENT

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

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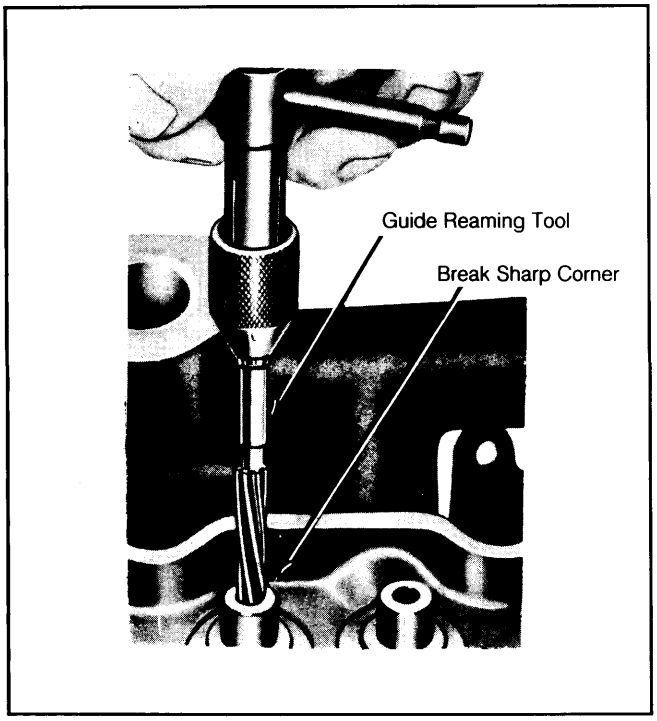
4.9 LITER 6-CYLINDER (Cont.)

VALVE GUIDE SERVICING

When reaming valve guides, always use reamers in proper sequence. Reface valve seats after reaming operation. Use a scraper to break sharp corner at top of valve guide bore, after reaming. Replacement valves are available in .003" (.08 mm), .015" (.38 mm) and .030" (.76 mm) oversize. *See Fig. 3.*

Fig. 3: Reaming Valve Guides



Always use reamers in proper sequence.

VALVE STEM OIL SEALS

Cup-type Teflon oil seals are used on valves. Install cupped side down over valve stem.

VALVE SPRINGS

Removal

1) Remove air cleaner. Remove accelerator cable retracting spring and disconnect accelerator cable at carburetor. Remove PCV valve from rocker arm cover, and remove rocker arm cover.

2) Remove spark plug from cylinder to be serviced. Crank engine to position piston at TDC after compression stroke. Install an air line and adapter to spark plug hole and apply air pressure.

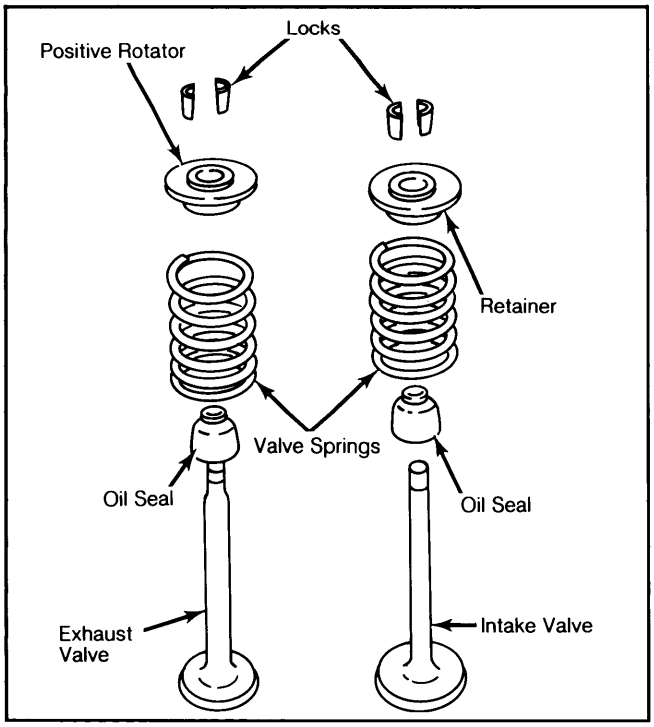
3) Remove rocker arm stud nut, fulcrum seat, rocker arm, and push rod. Reinstall stud nut. Using spring compressor tool, compress spring and remove retainer locks. Remove spring retainer, spring and oil seal.

CAUTION: Do not remove air pressure, until all components are reinstalled.

Inspection

1) Inspect valve stem for wear and binding in valve guide. Check valve spring for proper pressure using valve spring tester. Replace springs that fail to meet specifications. *See Valve Springs table.*

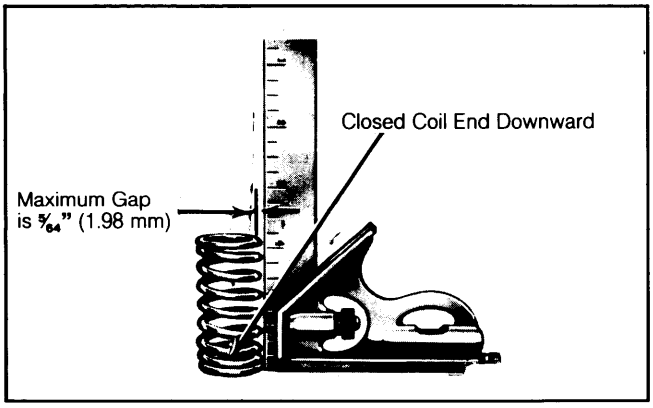
Fig. 4: Valve Assembly for 4.9L Engine



Install springs with closed coil end down.

2) Inspect each spring for squareness, using a steel square and flat surface. Observe gap between top coil of spring and square, while slowly rotating spring. Replace spring if more than 5/64" (1.98 mm) out-of-square. *See Fig. 5.*

Fig. 5: Checking Valve Spring Squareness



Measure gap, while slowly rotating spring.

Installation

1) Lubricate valve stem with heavy engine oil, and install new valve stem oil seal. Place valve spring over valve, with closed coil end downward. Install spring retainer, and compress spring to install retainer locks.

2) Apply polyethelene grease or equivalent to both ends of push rod, top of valve stem, and fulcrum seat and socket. Install push rod, rocker arm, fulcrum seat and stud nut. Adjust valve clearance. *See VALVE CLEARANCE ADJUSTMENT in this article.* Remove air line and adapter and install spark plug. Reverse removal procedure to install remaining components.

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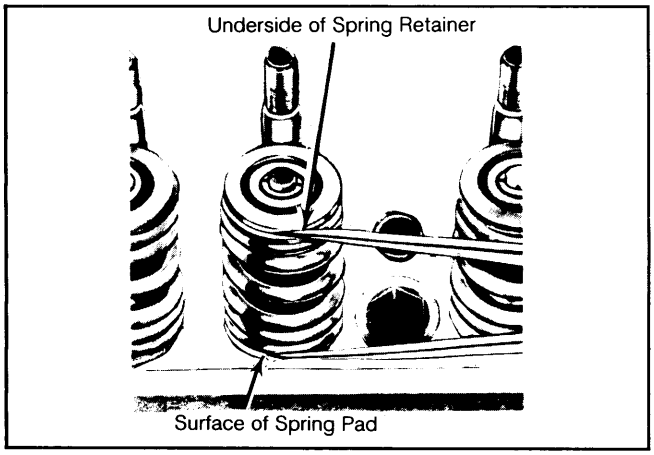
Ford 6 Engines

4.9 LITER 6-CYLINDER (Cont.)

VALVE SPRING INSTALLED HEIGHT

1) Using dividers and a scale, measure assembled height of valve spring from surface of cylinder head spring pad to underside of spring retainer. *See Fig. 6.*

Fig. 6: Checking Valve Spring Height



Do not install spacers unless necessary.

2) Installed height for intake valves is $1^{11}/_{16}$-$1^{23}/_{32}$" (42.85-43.66 mm). Installed height for exhaust valves is $1^{9}/_{16}$-$1^{19}/_{32}$" (39.70-40.49 mm). If height of spring is greater than specified, install necessary .030" (.762 mm) spacer(s) between cylinder head spring pad and valve spring to correct the height.

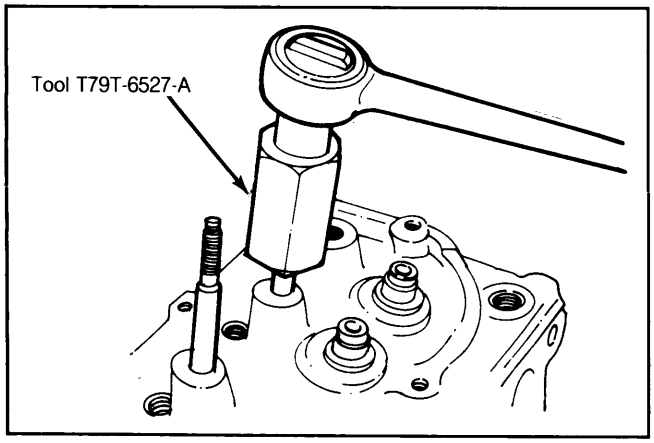
CAUTION: Do not install spacers, unless necessary to meet specifications. Excessive use of spacers will overstress the valve train, causing unnecessary damage.

ROCKER ARM STUDS

Removal

Use stud removing tool (T79T-6527-A) to remove defective studs. Follow manufacturer's instructions. Use a screw extractor to remove any rocker arm stud that is broken off flush with stud boss. *See Fig. 7.*

Fig. 7: Removing Rocker Arm Stud



Follow tool manufacturer's instructions.

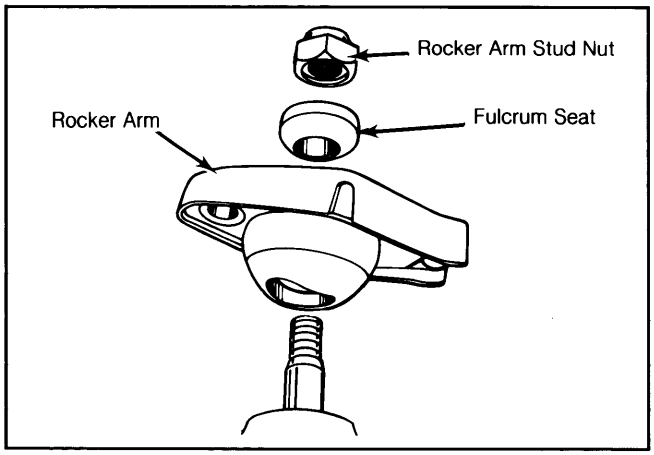
Installation

1) Replacement studs may be pressed into head, using stud replacement tool (T79T-6527-B). Apply polyethelene grease or equivalent to end of stud. Align stud and replacement tool over stud bore. Tap sliding driver until it bottoms. When driver contacts stud boss, stud is installed at proper height.

2) Rocker arm stud bore diameter is .3685-.3695" (9.360-9.385 mm). If not within limits, ream stud bore to correct oversize, using reamers in proper sequence. Studs are available in oversizes of .006" (.152 mm), .010" (.254 mm), and .015" (.381 mm).

CAUTION: Make sure metal particles from reaming process do not enter valve area.

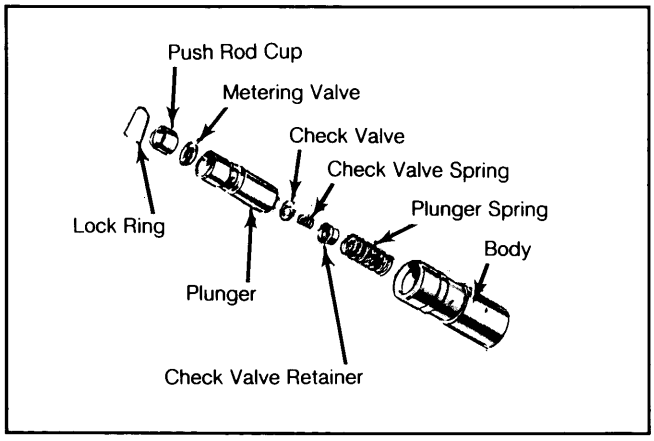
Fig. 8: Rocker Arm Assembly



HYDRAULIC VALVE LIFTER ASSEMBLY

1) Lifters should be serviced as an assembly only. Lifters must be disassembled and cleaned prior to testing, and must be tested using hydraulic lifter test fluid. Parts are not interchangeable. *See Fig. 9.*

Fig. 9: Hydraulic Lifter Assembly



Parts are not interchangeable between lifters.

2) Leak down rate on all lifters is 10-50 seconds at $^{1}/_{16}$" (1.6 mm) plunger travel, using lifter leak down testing device. Replace lifter assembly if any sign of malfunction is apparent.

VALVE CLEARANCE ADJUSTMENT

A positive stop rocker arm stud eliminates the necessity of adjusting valve clearance. To obtain correct

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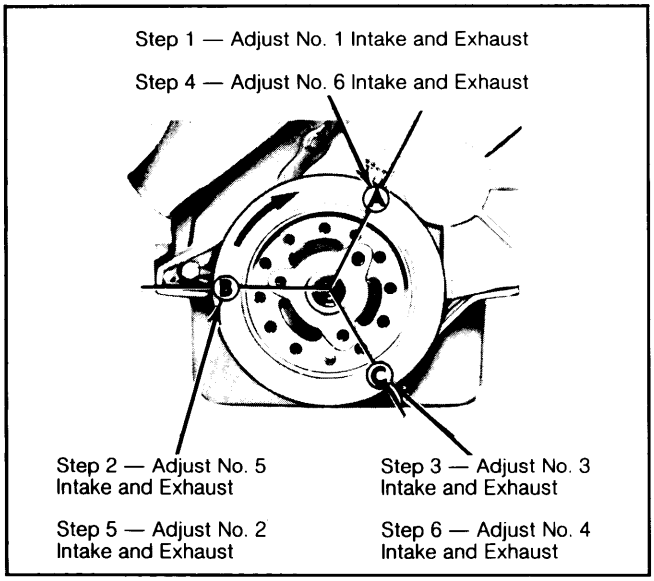
4.9 LITER 6-CYLINDER (Cont.)

valve clearance, install a .060" (1.524 mm) undersize or .060" (1.524 mm) oversize push rod.

1) With ignition switch "OFF," use a remote starter switch to turn crankshaft. Rotate crankshaft until No. 1 piston is at TDC at end of compression stroke. Using timing notch on vibration damper as a reference, make 2 chalk marks on vibration damper, spaced approximately 120° apart. *See Fig. 10.*

Fig. 10: Marking Vibration Damper for Valve Clearance Adjustment



Space marks approximately 120° apart.

2) Prior to checking adjustment, all valve components must be in good repair and installed and tightened properly. Inspect each stud nut and stud for worn condition prior to adjustment procedure, and replace as necessary.

3) Place No. 1 piston on TDC at end of compression stroke. Slowly collapse lifter plunger until completely bottomed, using lifter compressor tool (T70P-6513-A or equivalent). Holding pressure on lifter, use a feeler gauge to check clearance between rocker arm and valve stem tip. Desired clearance is .125-.175" (3.18-4.45 mm).

4) If clearance is less than specifications, install a shorter push rod. If clearance is greater than specifications, install a longer push rod. Repeat procedure for remaining valves, rotating the crankshaft 120° at a time in direction of rotation. Adjust valves in firing order sequence of 1-5-3-6-2-4.

PISTONS, PINS & RINGS

OIL PAN

See Oil Pan Removal at end of ENGINE Section.

PISTON & ROD ASSEMBLY

Removal

1) Remove cylinder head, oil pan and oil pump. Turn crankshaft until piston to be removed is at bottom of stroke. Place cloth over piston to collect metal cuttings. Using ridge cutter, remove ridge and deposits from upper end of cylinder bore.

CAUTION: Never cut into ring travel area in excess of 1/32" (.8 mm) when removing ridge.

2) Make sure all connecting rod caps are marked for identification. Remove connecting rod cap.

3) Using hammer handle, push connecting rod and piston out top of cylinder. Avoid damage to crankshaft journal or cylinder wall, when removing piston and rod.

Installation

1) Properly install piston rings. Oil piston and rings and cylinder wall with light engine oil. Install ring compressor on piston, ensuring ring location does not change. Rotate crankshaft journal to bottom of its stroke.

2) Place piston into cylinder bore, with notch on top of piston towards front of engine. Tap piston into cylinder bore, using wooden hammer handle. Carefully guide rod over crankshaft journal, until it seats on journal. Install and tighten rod cap.

FITTING PISTONS

NOTE: Take measurements at normal room temperature (70°F, 21°C).

1) Measure piston at centerline of piston pin, and at 90° to piston pin axis. Measure cylinder bore 90° to crankshaft centerline, at top, middle and bottom of bore. Use measurements to determine piston-to-cylinder bore clearance.

2) Measure cylinder bore 90° to crankshaft centerline at top of bore (below ring travel) and at bottom of bore (above ring travel). Taper is the difference between the 2 measurements, and must not exceed .010" (.254 mm).

3) Measure cylinder bore at center of piston travel, 90° to crankshaft centerline. Measure bore at center of piston travel, in line with crankshaft centerline. Out-of-round is the difference between the 2 measurements, and must not exceed .005" (.127 mm).

4) If taper or out-of-round are not within limits or cylinder walls are deeply scored, hone or bore cylinders for installation of new pistons. Check Piston Size Code Chart.

PISTON SIZE CODE CHART

Size Code	Size in In.	(mm)
Red	3.9982-3.9988	(101.554-101.570)
Blue	3.9994-4.0000	(101.585-101.600)
.003" Oversize	4.0008-4.0014	(101.620-101.636)

PISTON PINS

Removal

Using arbor press and pin removal tool (T81P-6135A or equivalent), press piston pin from piston and connecting rod.

Installation

1) Lightly coat parts to be assembled with engine oil. Position piston and connecting rod as shown in *Fig. 11.* When properly assembled, notch on piston head will face toward front of engine, and bearing tang side of connecting rod will be positioned toward camshaft side of engine.

2) Start piston pin in piston and connecting rod. Using arbor press and pin installing tool (T68P-6135-A or equivalent), press piston pin through piston until pin is centered in the connecting rod.

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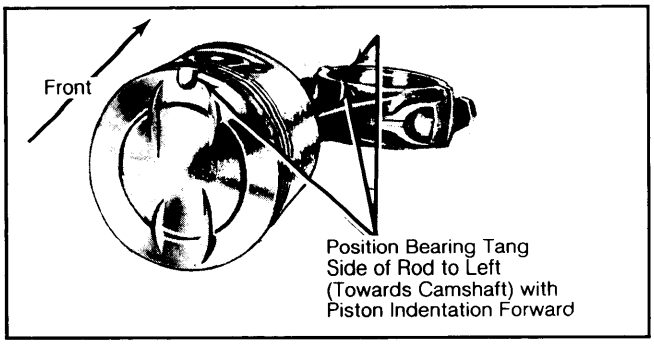
4.9 LITER 6-CYLINDER (Cont.)

Fig. 11: Positioning Piston to Connecting Rod



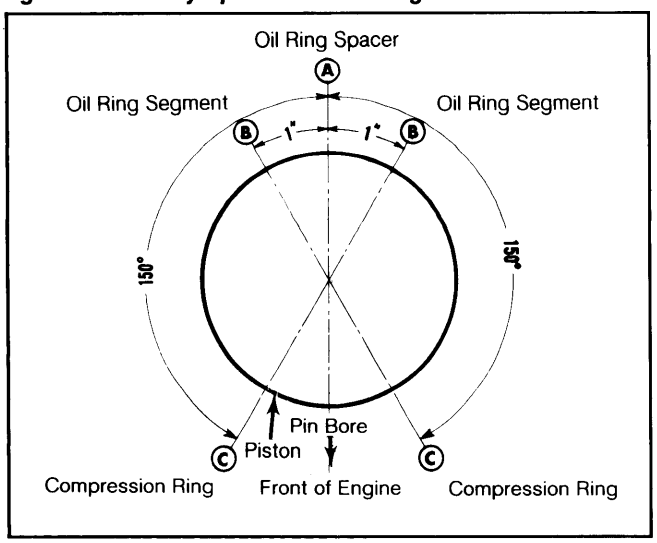
Press in piston pin until centered in connecting rod.

FITTING RINGS

1) Position ring in cylinder bore at a point where normal ring wear is not present. Exercise care not to damage ring or cylinder bore. Ring must be square in bore. Check ring end gap with a feeler gauge.

2) Check side clearance of compression rings, with feeler gauge inserted between ring and its lower land. Feeler gauge should slide freely around entire circumference of piston without binding.

Fig. 12: Correctly Spaced Piston Rings



Space oil ring segments 1" (25.4 mm) from oil ring spacer.

CRANKSHAFT & ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

NOTE: Use Plastigage method for checking bearing clearances. Following procedures are performed with oil pan and oil pump removed, and oil film removed from surfaces to be checked.

Connecting Rod Bearings

1) Ensure rod caps are marked for cylinder identification. Place crankshaft journal of cylinder to be checked at bottom of stroke and remove rod cap.

2) Place strip of Plastigage on bearing surface over full width of cap about ¼" (6 mm) off center, and away from oil holes. Install cap and tighten to 40-45 ft. lbs. (54-61 N.m). Do not allow crankshaft to turn.

3) Remove cap and measure width of Plastigage with scale furnished. A standard bearing may be used in combination with a .001" (.025 mm) or .002" (.051 mm) undersize bearing to obtain proper bearing clearance.

Main Bearings

1) Fit main bearings 1 at a time, while leaving other bearings securely fastened. Make sure main bearing caps are marked for identification. Remove main bearing cap. Support crankshaft weight with a jack placed under counterweight next to bearing being checked.

2) Use Plastigage method as explained in Connecting Rod Bearings to measure clearance. Main bearing caps are tightened to 60-70 ft. lbs. (81-95 N.m).

3) Standard size bearings may be used in combination with a .001" (.025 mm) or .002" (.051 mm) undersize bearing. If .002" (.051 mm) undersize main bearings are used on more than 1 journal, bearings must be installed in cylinder block side of crankshaft journal.

NOTE: Rear main bearing replacement must be accomplished with engine removed from vehicle.

4) Replace 1 main bearing set at a time. Loosen all main bearing caps until they are finger tight. Remove bearing cap to which new bearings are to be installed.

5) Insert upper bearing remover/installer tool (6331-E) into crankshaft journal oil hole. Turn crankshaft in direction of engine rotation, forcing upper bearing out of block.

NOTE: Upper and lower bearing halves are not interchangeable. Upper half is drilled and grooved to provide entry of oil.

6) Lightly oil bearing and journal surfaces. Partially install plain end of upper bearing in place. Insert tool (6331-E) into journal oil hole. Turn crankshaft slowly in opposite direction of engine rotation until bearing is seated. Remove tool. Install and tighten main bearing cap.

THRUST BEARING ALIGNMENT

Install thrust bearing cap after all other main caps have been tightened. Install thrust bearing cap bolts finger tight. Pry crankshaft forward against thrust surface of upper half of bearing. Hold crankshaft forward, and pry thrust bearing cap to rear. Tighten cap bolts, while retaining forward pressure on crankshaft. *See Fig. 13.*

REAR MAIN BEARING OIL SEAL

NOTE: The seal may be replaced without removing crankshaft from engine.

Removal

1) Remove starter and transmission. Remove pressure plate and clutch disc (if equipped). Remove flywheel and engine rear cover plate. Using an awl, punch 2 holes in oil seal on opposite sides of crankshaft, just above bearing cap-to-cylinder block split line.

2) Install sheet metal screws in holes. Use small wood blocks as a fulcrum for pry bars. Pry against

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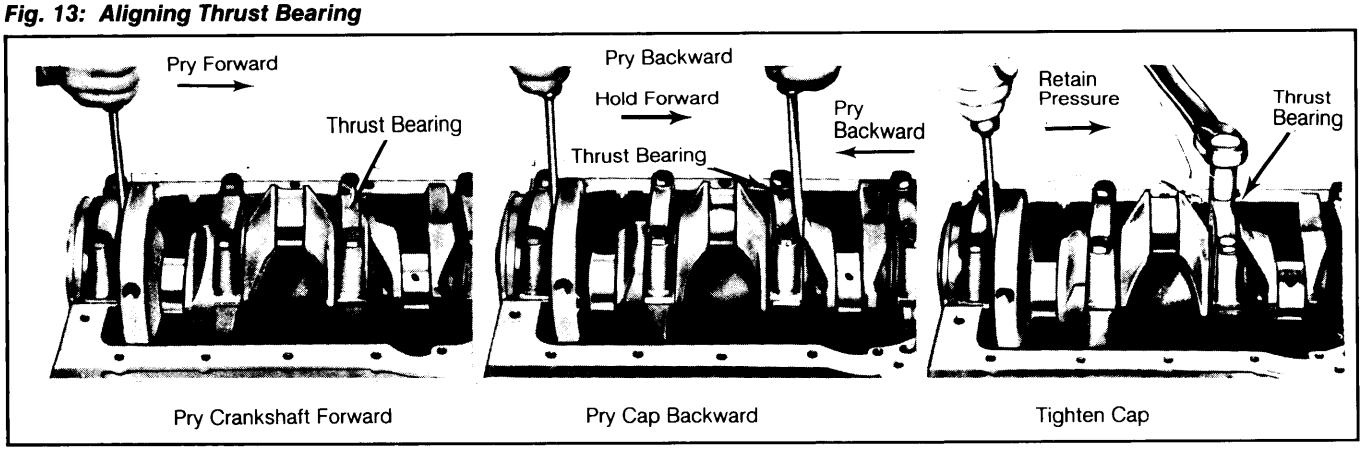
Fig. 13: Aligning Thrust Bearing



Align thrust bearing after all other main bearing caps have been tightened.

screws at same time to remove seal. Do not damage crankshaft oil seal surface.

Installation

1) Inspect and clean crankshaft surface. Lightly coat crankshaft and new oil seal with engine oil. Start seal in place, with lip facing forward. Use seal installing tool (T65P-6701-A or equivalent) to drive in seal.

2) Seal is properly installed when tool contacts cylinder block. Reverse removal procedure to complete installation.

CAMSHAFT

ENGINE FRONT COVER

Removal

Drain crankcase and cooling system. Remove radiator and shroud. Remove alternator adjusting arm bolt, and swing arm to side. Remove fan, drive belts, spacer and pulleys. Remove vibration damper. Remove oil pan front bolts and front cover attaching bolts. Remove front cover and gasket.

Installation

1) Cut front oil pan seal flush with cylinder block/pan junction. Remove seal. Clean all gasket mating surfaces. Cut and fit new pan seal. Seal must fit flush with cylinder block/pan junction. Coat cylinder block and front cover gasket surfaces with oil resistant sealer. Install front cover gasket.

2) Apply silicone sealer to junction of block and pan. Lubricate front cover oil seal. Position front cover in place. Start front cover and pan attaching bolts. Slide front cover alignment tool (T68P-6019-A or equivalent) over crankshaft and into seal bore.

3) Install alternator adjusting arm. Tighten oil pan bolts first, then tighten front cover bolts. Remove alignment tool. Reverse removal procedure to install remaining components.

FRONT COVER OIL SEAL

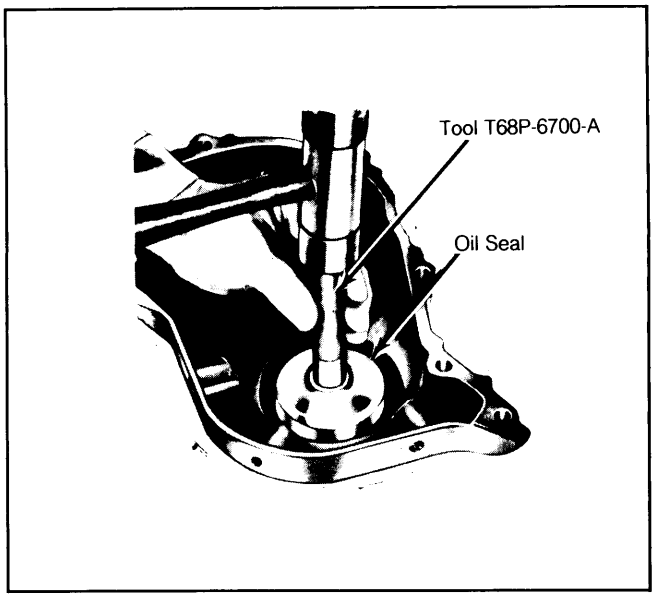
Removal

With front cover removed from engine, drive oil seal out of cover using pin punch. Clean out recess in cover.

Installation

Lubricate new seal. Drive in seal with installing tool (T68P-6700-A or equivalent), until seal is fully seated in front cover recess. Check seal after installation to ensure spring is properly positioned in seal. Install front cover. *See Fig. 14.*

Fig. 14: Installing Front Cover Oil Seal



Fully seat seal in front cover recess.

TIMING GEARS

CAUTION: To avoid possible damage to camshaft lobes, do not rotate camshaft or crankshaft unless timing gears are installed.

Removal

Drain cooling system and crankcase. Remove engine front cover and oil slinger. Align camshaft and crankshaft gear timing marks. *See Fig. 15.* Use gear puller to remove camshaft and crankshaft gears.

Installation

Ensure camshaft key spacer and thrust plate are correctly installed. Align both gear keyways with respective keys, and press on gears using gear installing tool (T65L-6306-A or equivalent). Check that camshaft and crankshaft timing marks are aligned. Install front cover and related components.

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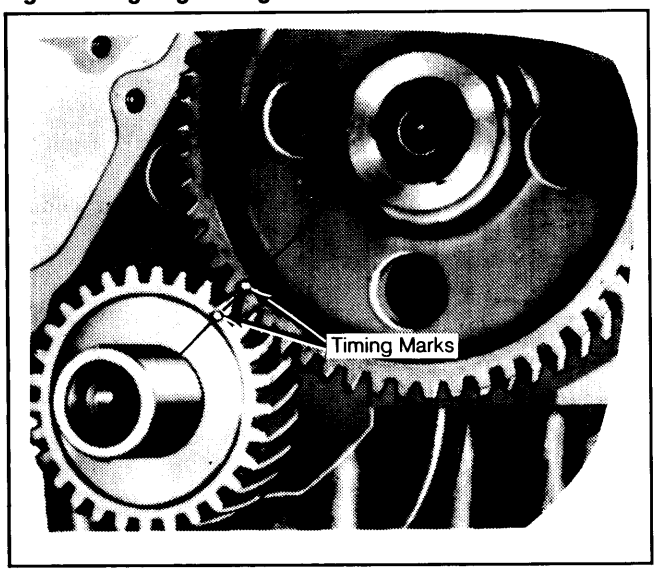
Fig. 15: Aligning Timing Marks



Use gear puller to remove gears.

CAMSHAFT

Removal

1) Drain cooling system and crankcase. Remove radiator and shroud. Identify lifters for reassembly, and remove lifters. Remove front cover. Disconnect fuel lines at fuel pump and remove pump. Disconnect vacuum hose and wires to distributor, and remove distributor.

2) Turn crankshaft to align gear timing marks. Remove camshaft thrust plate bolts, gear, key, thrust plate and spacer. Remove camshaft, taking care not to damage camshaft lobes or bearings.

Installation

1) Coat camshaft lobes with polyethelene grease (or equivalent) and coat journals with engine oil. Assemble key, spacer and thrust plate to camshaft. Align gear keyway with key and install gear.

2) Install camshaft, gear and thrust plate as an assembly. With timing marks aligned, tighten thrust plate attaching bolts. Replace front cover oil seal. Reverse removal procedures to install remaining components, using new gaskets.

CAMSHAFT BEARINGS

Removal

Remove engine from vehicle and remove flywheel. Remove camshaft and rear cam bearing plug. Remove crankshaft. Push pistons to top of cylinders. Using a camshaft bearing installer/remover tool, drive out camshaft bearings.

Installation

Install new bearings into place while noting the following: Oil holes in bearings must be aligned with oil holes in cylinder block. Front bearing must be installed below front face of cylinder block at distance of .020-.035" (.51-.64 mm).

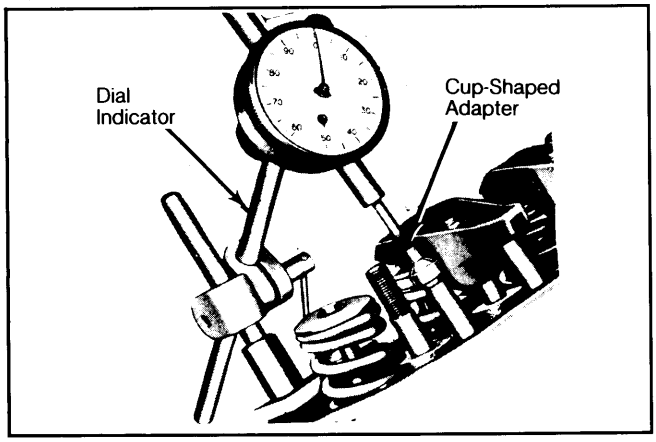
CAMSHAFT END THRUST

Remove engine front cover. Push camshaft rearward into engine. Install dial indicator with point positioned on camshaft gear retaining bolt. Zero dial indicator. Place large screwdriver between camshaft gear and block. Pull camshaft forward and then release. Replace thrust plate if dial indicator reading is not within limits.

CAM LOBE LIFT

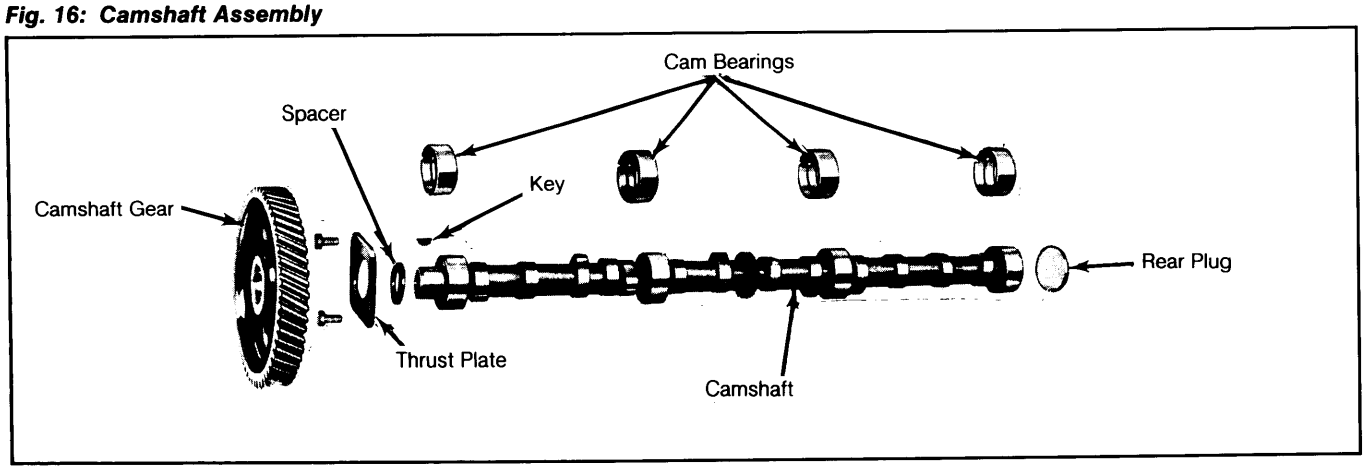
1) Remove rocker arm cover, stud nut, fulcrum seat and rocker arm. Make sure push rod end is in valve

Fig. 17: Checking Camshaft Lobe Lift



Make sure push rod is in valve lifter socket.

Fig. 16: Camshaft Assembly



Install camshaft, gear and thrust plate as an assembly.

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4.9 LITER 6-CYLINDER (Cont.)

lifter socket. Install a remote starter switch. Use a dial indicator to check lobe lift in consecutive order.

2) Position dial indicator and cup-shaped adapter on end of push rod (in same plane as push rod movement). *See Fig. 17.*

3) Rotate crankshaft until lifter and push rod are at lowest position. Zero dial indicator. Rotate crankshaft slowly until push rod is in fully raised position. Record dial indicator reading and compare with specifications.

4) Maximum allowable lift loss is .005" (.127 mm). If lift on any lobe is below specifications, replace camshaft and valve lifter operating on worn lobe(s).

ENGINE OILING

Crankcase Capacity

Capacity is 5 quarts (4.75L). Add 1 quart (.95L) with filter change.

Oil Filter

Full-flow filter has an integral by-pass valve. An anti-drain back feature prevents reverse flow of oil when the engine is shut down. Replace filter at first oil change, then every second oil change thereafter.

Normal Oil Pressure

40-60 psi (2.8-4.2 kg/cm^2) at 2000 RPM.

Pressure Regulator Valve

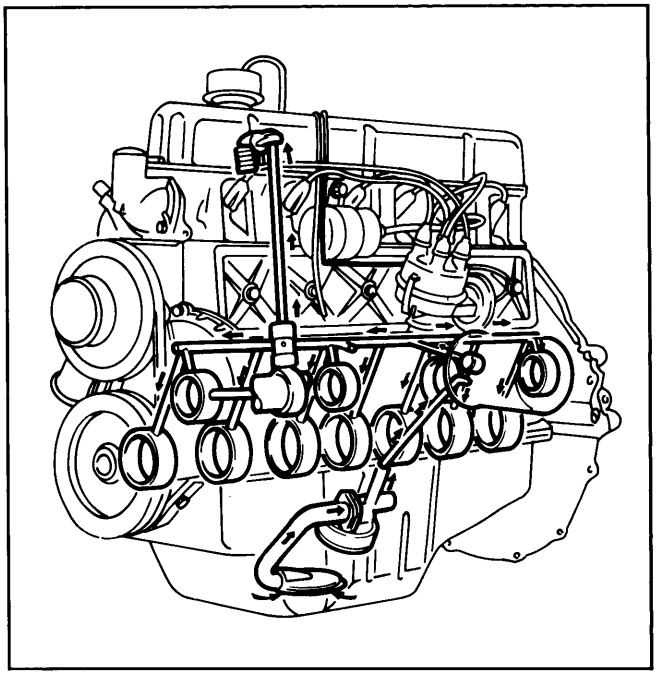
Valve located in pump body, not adjustable.

ENGINE OILING SYSTEM

Oil supply from pan is forced through lubrication system by a rotor-type oil pump. Oil flows through the full-flow oil filter, which routes oil into the main oil gallery.

The oil gallery supplies oil to all internal engine bearings and lifters. Oil from lifters is forced through the push rods to lubricate the upper valve train area. Timing gears and chain are lubricated by splash method. *See Fig. 18.*

Fig. 18: Engine Oiling System



OIL PUMP

Removal

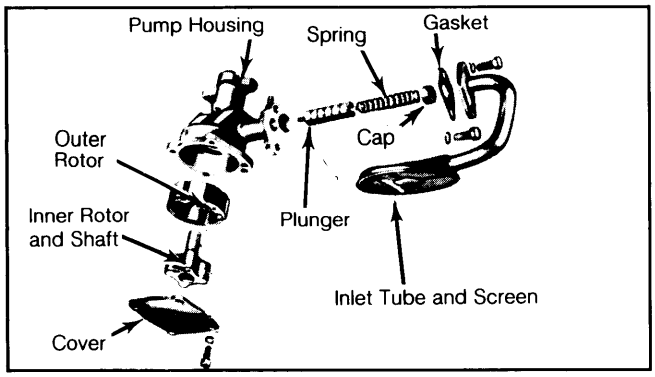
Remove oil pan. Remove nut securing oil pump inlet tube bracket to engine, and remove oil pump attaching bolts. Remove oil pump assembly.

Disassembly

1) Remove oil inlet tube. Remove cover attaching bolts and cover. Remove inner rotor and shaft and outer rotor.

2) Drill small hole into oil pressure relief valve cap. Insert self-threading sheet metal screw into cap, and pull cap from chamber. Remove spring and plunger. *See Fig. 19.*

Fig. 19: Oil Pump Assembly



Oil pump cannot be repaired.

NOTE: If any part of the oil pump requires replacement, the complete pump assembly must be replaced.

Inspection

1) Wash all parts thoroughly, and dry with compressed air. Check inside of pump housing, outer rotor and inner rotor and shaft for damage, scoring or excessive wear. Check mating surface of pump cover for wear, scoring or grooved condition.

2) Remove rotor assembly from pump housing. Using feeler gauge, measure inner to outer rotor tip clearance. Install rotor assembly in pump housing. Lay a straightedge over rotor assembly and housing. Insert feeler gauge between straightedge and housing to measure rotor end play.

3) Measure outer rotor-to-housing clearance using feeler gauge. Measure the shaft outside diameter and the housing bearing inside diameter. Difference between readings is the shaft-to-housing bearing clearance.

4) Relief valve spring should test to 20.6-22.6 lbs. (9-10 kg) at 2.49" (63.2 mm). Inspect relief valve spring for worn or collapsed condition. Check relief valve plunger for scores and free operation in bore. Check clearance between relief valve plunger and bore.

Reassembly

Clean and oil all parts thoroughly. Install relief valve plunger, spring and new cap. Stake cap into position. Reassemble remaining components in reverse order of disassembly, using new gasket for oil inlet tube.

Installation

Prime oil pump by filling inlet opening with oil and rotating pump shaft until oil emerges from outlet opening. Install and tighten oil pump on cylinder block.

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Ford 6 Engines

4.9 LITER 6-CYLINDER (Cont.)

OIL PUMP SPECIFICATIONS

Application	Specification In. (mm)
Rotor Tip Clearance	.012 (.30)
Rotor End Play	.004 (.10) Max.
Outer Rotor-to-Housing Clearance	.001-.013 (.03-.33)
Shaft-to-Housing Clearance	.0015-.0030 (.038-.076)
Relief Valve-to-Bore Clearance	.0015-.0030 (.038-.076)

ENGINE COOLING

WATER PUMP

Removal

Drain cooling system. Remove alternator drive belt. On A/C equipped vehicles, remove air compressor drive belt. Remove fan, spacer and pulley. Disconnect heater hose, lower radiator hose, and radiator supply line at water pump. Remove water pump.

Installation

Clean all gasket mating surfaces. Transfer fittings to new pump. Coat new gasket on both sides with gasket sealer, and position on water pump. Install water pump and tighten attaching bolts. Reverse removal procedure to install remaining components.

NOTE: For further information on cooling system capacities and other cooling system components, see appropriate article in "Engine Cooling Systems" at end of ENGINE Section.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Camshaft Thrust Plate Bolt	9-12 (12-16)
Connecting Rod Cap Nut	40-45 (54-61)
Cylinder Head Bolt	
Step 1	55 (75)
Step 2	65 (88)
Step 3	85 (115)
Engine Front Cover Bolt	12-18 (16-24)
Flywheel Bolt	75-85 (102-115)
Intake-to-Exhaust Manifold Nut	28-33 (38-45)
Main Bearing Cap Bolt	60-70 (81-95)
Manifold-to-Head Nut or Bolt	22-32 (30-45)
Oil Pump Attaching Bolt	10-15 (14-20)
Rocker Arm Nut	17-23 (23-31)
Vibration Damper Bolt	130-150 (176-203)
Water Pump Bolt	12-18 (16-24)

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	Displ. cu. ins.	Displ. liters	Carburetor	HP at RPM	Torque Ft. Lbs.@RPM	Compr. Ratio	Bore in.	Bore mm	Stoke in.	Stoke mm
1982	300	4.9	1-Bbl.	.....	.....	.....	4.00	101.6	3.98	101.1

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)
4.9L							
Int.	1.769-1.793 (44.93-45.54)	44°	45°	.066-.080 (1.52-2.03)	.3416-.3423 (8.68-8.69)	.0010-.0027 (.025-.069)	.....
Exh.	1.551-1.569 (39.40-39.85)	44°	45°	.070-.090 (1.78-2.29)	.3416-.3423 (8.68-8.69)	.0010-.0027 (.025-.069)	.....

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)
4.9L	.0014-.0022 (.036-.056)	.0002-.0004 (.005-.010)	Press Fit	1	.010-.020 (.25-.51)	.0019-.0036 (.048-.091)
				2	.010-.020 (.25-.51)	.002-.004 (.05-.10)
				3	.010-.035 (.25-.89)	Snug

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4.9 LITER 6-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)
4.9L	2.3982-2.3990 (60.914-60.934)	.0008-.0015 (.020-.038)	No. 5	.004-.008 (.10-.20)	2.1228-2.1236 (53.919-53.939)	.0008-.0015 (.020-.038)	.006-.013 (.15-.33)

CAMSHAFT

Engine	Journal In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
4.9L [1]	2.017-2.018 (51.23-51.26)	.001-.003 (.03-.08)	.249 (6.32) [2] .247 (6.27)

[1] — End play is .001-.007" (.03-.18 mm).
[2] — F-100 & F-150 4x2 with 2.47:1 or 2.75:1 axle ratio; and F-150 4x4 & Bronco with 3.00:1 axle ratio and Man. Trans. (except Calif.)

VALVE SPRINGS

Engine	Free. Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
4.9L			
Int.	1.99 (50.5)	76-84@1.70 (34-38@43.2)	187-207@1.30 (85-94@33.0)
Exh.	1.87 (47.5)	77-85@1.58 (35-39@40.1)	182-202@1.18 (83-92@30.0)

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