

# OVERHAUL

## CYLINDER HEAD

### Cylinder Head

Inspect cylinder head for warpage. Resurface cylinder head if warpage exceeds specification. DO NOT machine more than .010" (.25 mm) from original cylinder head thickness. See **CYLINDER HEAD SPECIFICATIONS** table under ENGINE SPECIFICATIONS.

### Valve Springs

1. Check valve spring installed height from top spring coil to spring seat of cylinder head. If installed height is greater than specification, spacer(s) may be installed between cylinder head and valve spring to obtain correct installed height. See **VALVES & VALVE SPRINGS SPECIFICATIONS** table under ENGINE SPECIFICATIONS.

**CAUTION: DO NOT install spacers unless necessary. Use of excess spacers will cause premature component failure.**

2. With spring(s) removed, measure spring out-of-square, free length and pressure at specified length. If measurements are not within specification, replace spring(s). See **VALVES & VALVE SPRINGS SPECIFICATIONS** table.

### Valve Stem Oil Seals

To install valve stem oil seals, use Valve Stem Oil Seal Installer (T87L 6571-AH). Install seal until it bottoms on valve guide. Oversize seals must be used on guides that have been reamed for oversize valves.

### Valve Guides

Valve guides must be reamed for an oversized valve if valve stem oil clearance is not within specification. See **CYLINDER HEAD SPECIFICATIONS** table under ENGINE SPECIFICATIONS. Always use reamers in proper sequence (smallest first). If oversized valve or valve stem seal is not available, valve guide may be bored out to use a service bushing.

**NOTE: Always grind valve seat after valve guide has been reamed or service bushing has been installed.**

### Valve Seat

Grind valve seat to a 45-degree angle. If seat width is too wide after grinding, use a 30-degree stone to lower seat or a 60-degree stone to raise seat.

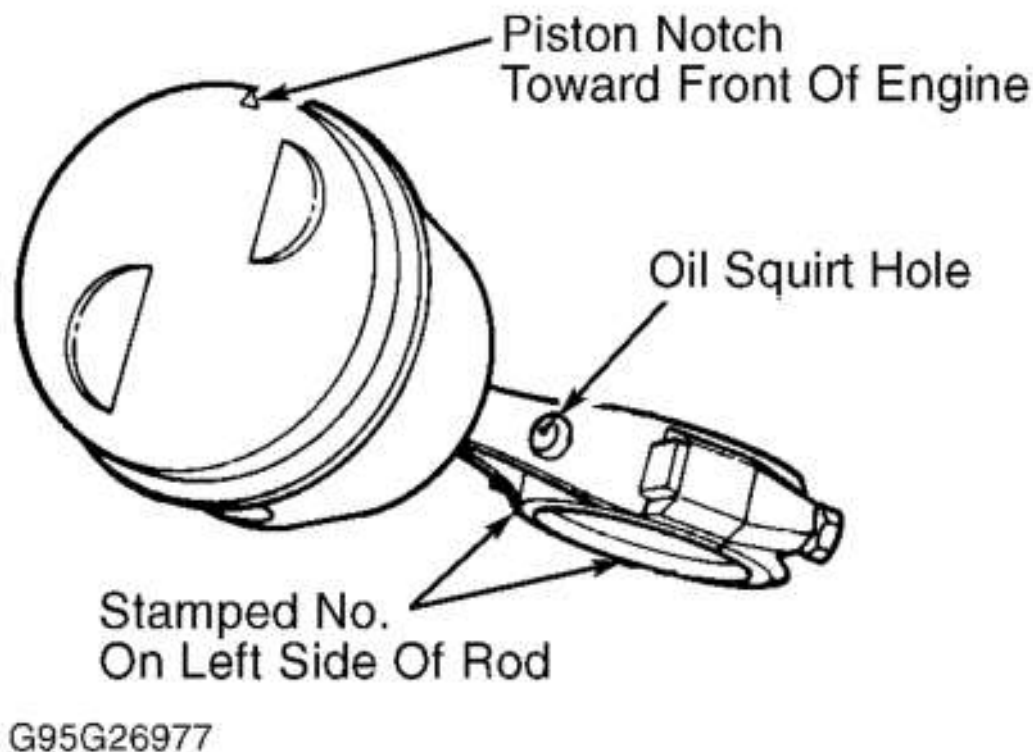
### Valves

Check valve stem diameter and stem clearance. During valve grinding, DO NOT remove more than .010" (.25 mm) from end of valve stem. After grinding, ensure margin is within specifications.

## CYLINDER BLOCK ASSEMBLY

## Piston & Rod Assembly

Install piston on connecting rod in correct direction. See **Fig. 12** . Install piston and connecting rod in engine, with notch or arrow on top of piston pointing toward front of engine.



**Fig. 12: Positioning Piston On Connecting Rod**  
Courtesy of FORD MOTOR CO.

### Fitting Pistons

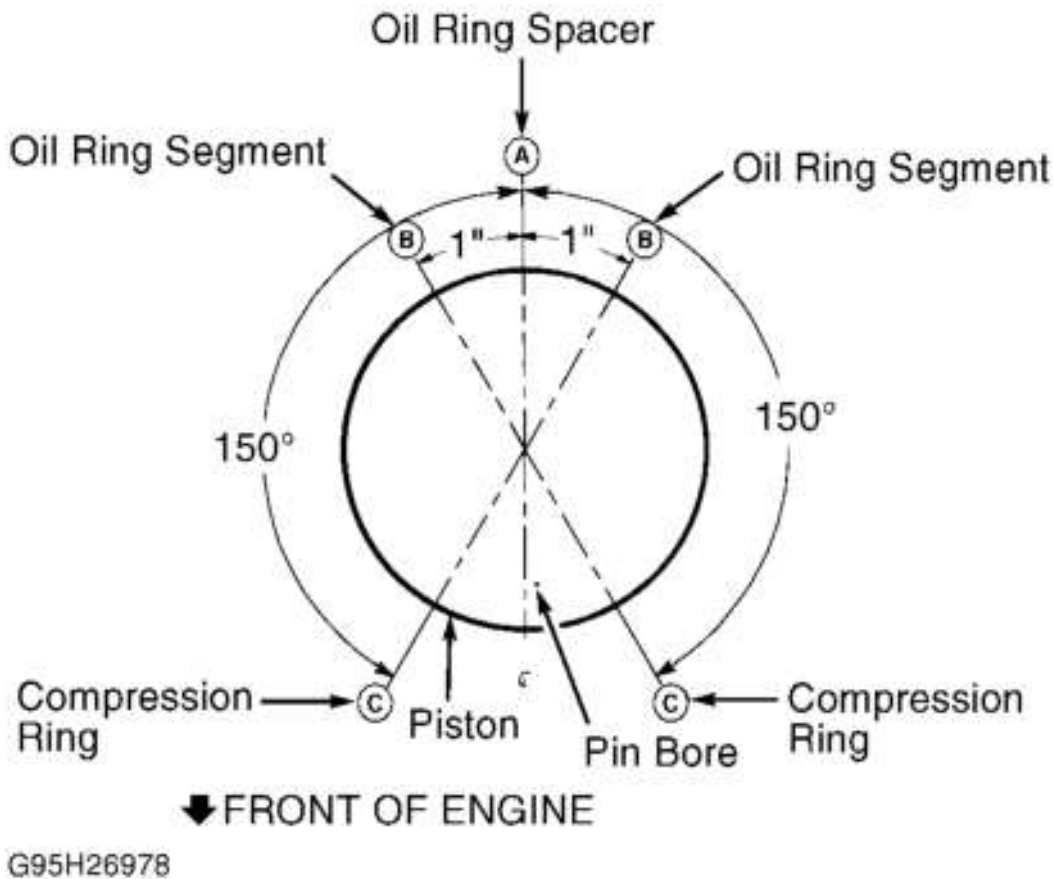
1. Check piston-to-bore clearance. See **PISTONS, PINS & RINGS SPECIFICATIONS** table under ENGINE SPECIFICATIONS. Standard size pistons are color-coded Red, Blue or Yellow on piston dome. See **PISTON SELECTION** table. Oversize pistons are also available.
2. If bore diameter is in lower one-third of specification, use a Red-coded piston. If bore diameter is in middle one-third of specification, use a Blue-coded piston. If bore diameter is in upper one-third of specification, use a Yellow-coded piston. Use proper size piston to obtain specified clearance.

### PISTON SELECTION

Cylinder Bore Diameter - In. (mm)	Piston Color Code
3.7780-3.7785 (95.961-95.974)	Red
3.7785-3.7790 (95.974-95.987)	Blue
3.7790-3.7795 (95.987-95.999)	Yellow

### Piston Rings

1. Select proper ring set for bore diameter. Place ring in cylinder bore in which it will be installed. Use inverted piston to square ring and place ring below normal ring wear area. Measure ring end gap. If ring end gap is too small, remove material from end of ring. If gap exceeds specification, try another ring set. See **PISTONS, PINS & RINGS SPECIFICATIONS** table under ENGINE SPECIFICATIONS.
2. Check side clearance of rings after installing on piston. Ensure clearance is within specification around entire circumference. Replace piston and/or rings if clearance is not within specification. See **PISTONS, PINS & RINGS SPECIFICATIONS** table. Ensure rings are properly spaced on piston before installing piston into cylinder. See **Fig. 13**.



**Fig. 13: Positioning Rings On Piston**  
 Courtesy of FORD MOTOR CO.

### Rod Bearings

1. Ensure oil squirt hole in connecting rod is properly positioned with arrow on top of piston. See **Fig. 12**. Use Plastigage method to check rod bearing clearance.
2. If proper oil clearance cannot be obtained using standard bearings, try a combination of undersize bearings. DO NOT use bearing combinations other than what is listed. See **UNDERSIZE MAIN & ROD BEARING COMBINATIONS** table.
3. If use of bearing combinations does not bring clearance within specification, machine or replace

crankshaft as necessary. Always replace bearings in pairs. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS** table under ENGINE SPECIFICATIONS.

### UNDERSIZE MAIN & ROD BEARING COMBINATIONS <sup>(1)</sup>

Bearing Clearance - In. (mm)	Bearing - In. (mm)	Bearing - In. (mm)
.0 - .0005 (.0 - .013)	.001 (.025)	(2)
.0005 - .0010 (.013 - .026)	.001 (.025)	.001 (.025)
.0010 - .0015 (.026 - .039)	.002 (.05)	.001 (.025)
.0015 - .0020 (.039 - .052)	.002 (.05)	.002 (.05)

(1) DO NOT use any bearing combination other than listed. If use of bearing combinations does not bring clearance within specification, machine or replace crankshaft as necessary.

(2) Use standard bearing.

### Crankshaft & Main Bearings

1. When checking main bearing clearance in vehicle, position a jack under adjoining bearing counterweight being checked. Remove only one main bearing cap at a time.
2. Use Plastigage method to check main bearing clearance. If clearance is not within specification, replace bearings. Machine or replace crankshaft as necessary. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS** table under ENGINE SPECIFICATIONS.
3. If proper oil clearance cannot be obtained using standard bearings, try a combination of undersize bearings. DO NOT use bearing combinations other than what is listed. See **UNDERSIZE MAIN & ROD BEARING COMBINATIONS** table.
4. If use of bearing combinations does not bring clearance within specification, machine or replace crankshaft as necessary. Always replace bearings in pairs. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS** table under ENGINE SPECIFICATIONS.
5. Tighten main bearing cap bolts finger tight. Pry crankshaft forward and tighten bearing caps to specification. See **TORQUE SPECIFICATIONS** . Check crankshaft end play.
6. Replace thrust bearing if end play is not within specification. Thrust bearing is No. 3 (from front) main bearing in block. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS** table under ENGINE SPECIFICATIONS.

### Cylinder Block

1. Using a feeler gauge and straightedge, check cylinder block head gasket surface for warpage. If warpage exceeds specification, DO NOT machine more than .010" (.25 mm) from original gasket surface. Check cylinder bore for wear, taper, out-of-round and piston fit. Repair or replace as necessary. See **CYLINDER BLOCK SPECIFICATIONS** table under ENGINE SPECIFICATIONS.
2. Install all main bearing caps and tighten to specification before honing cylinder bore. See **TORQUE SPECIFICATIONS** . Use ONLY a spring-loaded type cylinder hone. After honing, thoroughly clean bore with detergent and water solution. Thoroughly rinse solution from bore with clean water. Wipe bore clean with lint-free cloth. Lubricate cylinder bores with engine oil.