

OVERHAUL

CYLINDER HEAD

1. Clean head gasket mating surface. Clean carbon from combustion chambers. Use care not to damage surfaces. Check cylinder head for cracks, burrs, nicks and warpage.
2. **DO NOT** machine more than .010" (.25 mm) from original cylinder head surface to correct warpage. Replace cylinder head as necessary. See CYLINDER HEAD table under ENGINE SPECIFICATIONS at end of article.

VALVE SPRINGS

1. Measure valve spring installed height from top of spring seat to underside of spring retainer. Ensure installed height is within specification. See VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS at end of article.
2. If installed height is not within specification, a .03" (.8 mm) shim can be installed between cylinder head and valve spring to obtain correct height. Inspect valve spring free length and pressure. Replace valve spring if free length and pressure are not within specification. See VALVES & VALVE SPRINGS table.

CAUTION: DO NOT install valve spring spacers unless necessary. Using more spacers than required can result in spring breakage or worn camshaft lobes.

VALVE STEM OIL SEALS

Intake and exhaust valve stems are not interchangeable. Use a 5/8" deep socket to install new valve stem seals.

VALVE GUIDES

1. Valve guides must be reamed for an oversized valve if valve stem oil clearance exceeds specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS at end of article. Valve guides are available in .015" (.38 mm) and .030" (.76 mm) oversize.
2. If oversized valves or oversized valve stem oil seals are not available, valve guide may be bored out to use a service bushing. Always use reamers in proper sequence (smallest first).

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

VALVE SEAT

Ensure valve seat angle, seat width and seat runout are within specification. See CYLINDER HEAD table under ENGINE SPECIFICATIONS at end of article. Valve seats must be ground when valve guide is reamed or replaced. Replacement information is not available from manufacturer.

VALVES

Ensure head diameter, valve face runout, stem diameter and valve margin are within specification. See

VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS at end of article.

CAUTION: DO NOT remove more than .010" (.25 mm) from end of valve stem when resurfacing tip of valve.

SEAT CORRECTION ANGLES

Grind valve seat to a true 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. See **CYLINDER HEAD** table under ENGINE SPECIFICATIONS at end of article.

PISTON & ROD ASSEMBLY

Install piston on connecting rod, with piston notch on the same side as the button on connecting rod. See **Fig. 8**. Install piston and connecting rod in engine, with notch on top of piston toward front of engine.

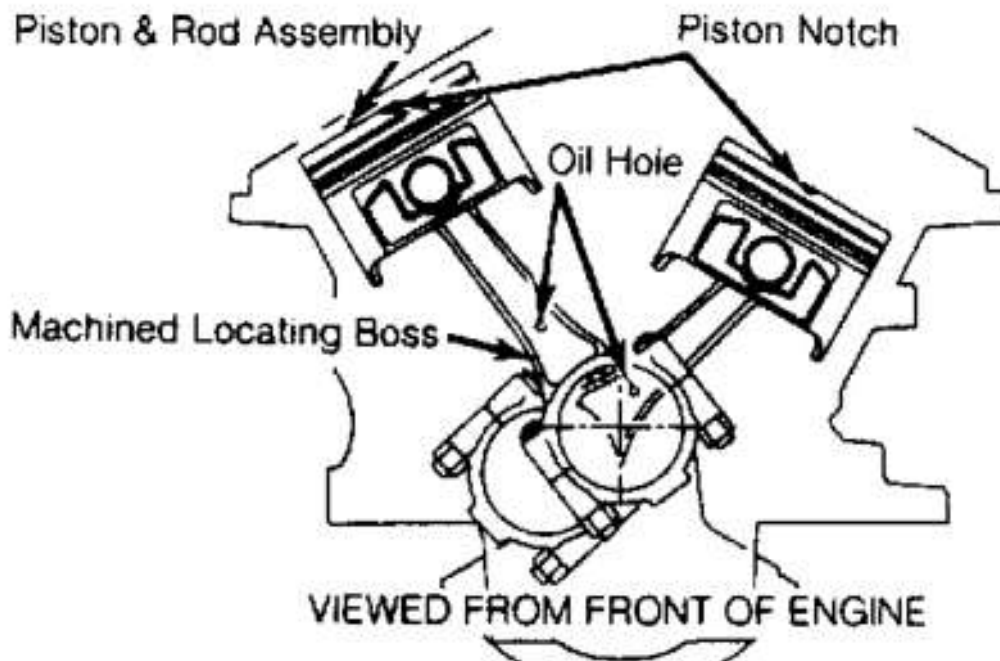


Fig. 8: Positioning Piston & Connecting Rod
Courtesy of FORD MOTOR CO.

FITTING PISTONS

1. Check piston-to-bore clearance. See **PISTONS PINS & RINGS** table under ENGINE SPECIFICATIONS at end of article. Standard size pistons are color-coded Red, Blue or Yellow on the piston dome. See **PISTONS PINS & RINGS** table. Oversize pistons are also available.

- 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 Yellow coded piston. Use proper size piston to obtain specified clearance. See PISTON SELECTION table.

PISTON SELECTION

Cylinder Bore Diameter: In. (mm)	Piston Color Code
3.5043-3.5053 (89.009-89.035)	Red
3.5053-3.5063 (89.035-89.060)	Blue
3.5063-3.5073 (89.060-89.085)	Yellow

PISTON RINGS

- Select rings for bore diameter. Place ring in cylinder bore in which it will be installed. Use piston to square ring in bore and place ring below normal ring wear area. Measure ring end gap. If ring gap is not within specification, try another ring set. See **PISTONS PINS & RINGS** table under ENGINE SPECIFICATIONS at end of article.
- 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 as specified. See **PISTONS PINS & RINGS** table under ENGINE SPECIFICATIONS. Ensure rings are properly spaced on piston before installing pistons into cylinder. See **Fig. 9**.

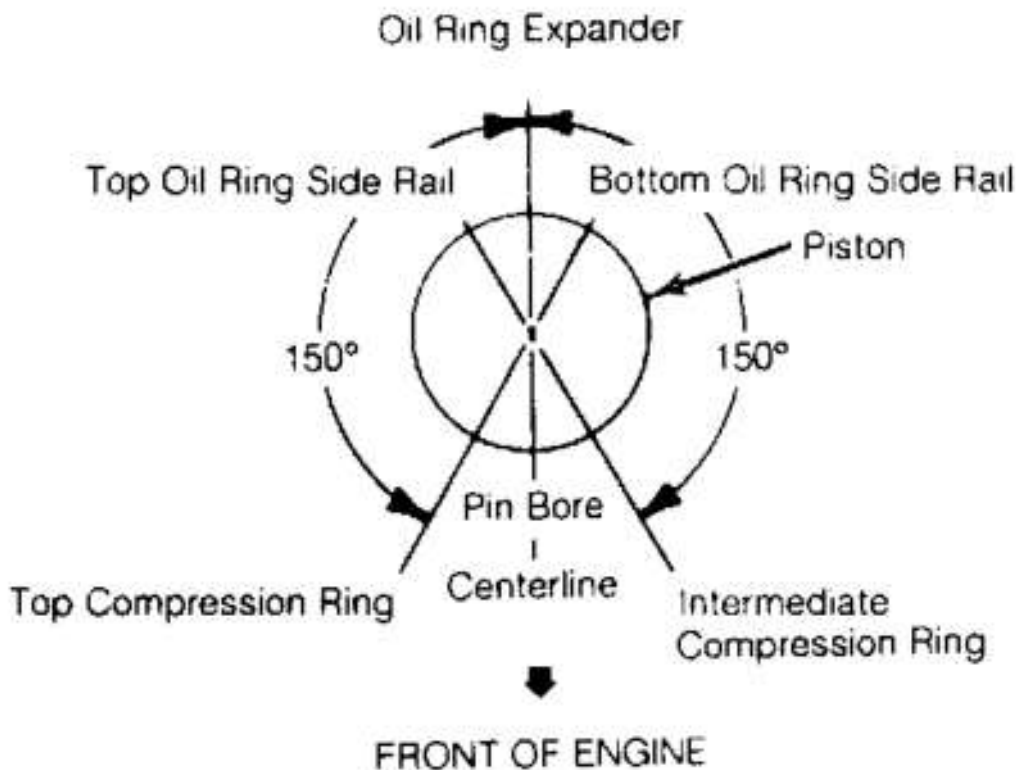


Fig. 9: Positioning Piston Ring End Gaps
 Courtesy of FORD MOTOR CO.

ROD BEARINGS

1. Use Plastigage method and check rod bearing clearance. If proper oil clearance cannot be obtained with standard bearings, try a combination of undersize bearings. DO NOT use any other bearing combination other than what is listed. See UNDERSIZE MAIN & ROD BEARING COMBINATIONS table.
2. If use of bearing combinations does not bring clearance within specification, machine or replace crankshaft as necessary. Always replace bearings in pairs. See MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS at end of article.

UNDERSIZE MAIN & ROD BEARING COMBINATIONS ⁽¹⁾

Excess Bearing Clearance: In. (mm)	Use Upper Bearing: In. (mm)	Use Lower Bearing: In. (mm)
.0-.0005 (.0-.013)	.001 (.025)	(2)
.0005-.0010 (.013-.026)	.001 (.025)	.001 (.025)
.0010-.0015 (.026-.039)	.002 (.050)	.001 (.025)
.0015-.0020 (.039-.052)	.002 (.050)	.002 (.050)

(1) DO NOT use any other bearing combination other than what is 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 and check main bearing clearance. If proper oil clearance cannot be obtained with standard bearings, try a combination of undersize bearings. DO NOT use any other bearing combination other than what is listed. See, in this article, 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 MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS at end of article.
4. Tighten main bearing cap bolts finger tight. Pry crankshaft forward and tighten bearing caps to specification. See TORQUE SPECIFICATIONS table at end of article.
5. Check crankshaft end play. Replace thrust bearing if end play is not within specification. Thrust bearing is No. 3 (from front) main bearing in block. See MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.

CYLINDER BLOCK

1. Using a feeler gauge and straightedge, check cylinder block head gasket surface for warpage. Check cylinder bore for wear, taper, out-of-round and piston fit. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS at end of article.

CAUTION: DO NOT machine more than .010" (.25 mm) of material from original cylinder block head surface.

2. Install all main bearing caps and tighten to specification before honing cylinder bore. Ensure bearing caps are installed in their original location, with arrow on cap pointing toward front of engine.
3. Use ONLY a spring-loaded type cylinder hone. After honing, thoroughly clean bore with detergent and water solution. Rinse solution from bore thoroughly with clean water. Wipe bore clean with lint free cloth. Lubricate cylinder bores with engine oil.