Modern Automotive Technology
Chapter 50
Engine Bottom End Service
Learning Objectives

- Explain how to measure cylinder bore
- Hone cylinder walls
- Measure block, heads, etc
- Measure piston, bearing and ring wear
- Explain how to assemble a rod and piston
- Check ring-gap
Cut-Away of an Engine Block
Engine Bottom End

Worn cylinders
Warped cylinder block deck
Rear oil seal retainer
Leaking rear oil seal
Rusted core plugs
Misaligned main bore
Worn main bearings
Worn crankshaft
Leaking gasket
Bent oil pan

Engine Parts That May Need Servicing
Chapter 50

1. If the OVERBORE LIMIT is exceeded, the cylinder wall can become too thin.

2. CYLINDER TAPRER is caused by less lubricating oil at the top of the cylinder.
Cylinder Taper

More wear at the top of the cylinder
Cylinder Measurements

Measuring taper and out-of-round
Chapter 50

3. PISTON KNURLING can be used to increase the diameter of the skirt a few thousandths of an inch

4. UNDERSIZE BEARING are needed after the crankshaft has been turned
Piston Knurling

Knurling a Piston

Increases skirt diameter by squeezing metal outward around small dents
Engine Crankshaft Bearings

Undersize Bearings

These bearings are .010” undersize
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5. ENGINE BALANCING may be needed when the weight of the pistons, connecting rods, or crankshaft is altered by machining.

6. CYLINDER SLEEVEVING is needed when the damage to the cylinder wall is too severe to clean up with boring.
Piston and Rod Balancing

- Pistons, rings, piston pins, connecting rods and bearings are weighed on an accurate scale.
- Material is machined or ground off the pistons and rods until all pistons weigh the same and all rods weigh the same.
- All rod big ends and rod small ends should weigh the same.
Piston Connecting Rods

“Small-End”

“Large-End”

Connecting Rod

- Rod small end
- Rod bushing
- I-beam
- Rod bolt
- Rod cap
- Rod nut
- Rod bearing inserts
Crankshaft

Crankshaft Parts

Counterweight offsets the weight of the piston and rod to prevent vibration
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7. Machining cylinders larger in diameter to make the cylinder walls perfectly smooth and straight is known as CYLINDER BORING

8. The piston groove is machined wider to accept SPACERS
Measuring Cylinder Wear

Cylinder Bore Gauge

- Slide gauge up and down the cylinder
- Indicator movement indicates differences in diameter
Piston Ring Side Clearance

Measuring Piston Ring Side Clearance

Diagram showing how to measure piston ring side clearance with a feeler gauge.
9. A FEELER GAUGE is a clearance measuring device

10. A CYLINDER HONE produces a precisely textured, crosshatched pattern on the cylinder wall to help piston rings seat easier and quicker
Measuring Piston Ring Gap

Measure ring gap clearance with ring positioned at bottom ring travel as shown.
Cylinder Honing

Honing restores cylinder surface. Mover hone up and down fast enough to produce a $50^\circ - 60^\circ$ cross-hatch pattern.
Use a “Torque-Angle” Meter when installing “Torque-to-Yield” bolts.
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