

Engine Repair

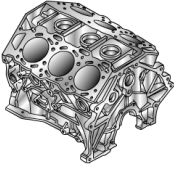
Short Block Service

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Engine Repair

Block Construction

- Cast Iron
 - nickel is often added to improve durability and strength
- Aluminum
 - iron cylinder liners
 - light weight
 - improved heat dissipation



Engine Repair


Crack Detection

- Magnafluxing
- Magnetic Fluorescent Inspection
 - iron powder is applied within a liquid
 - cracks appear as white streaks under black lights
- Dye Penetrant
 - cleaner, dye and developer

Engine Repair

Cylinder Block Warpage

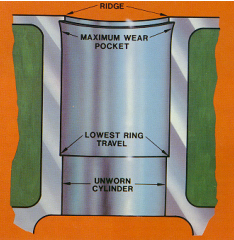
- Inspect Deck Flatness
 - head gasket failure may be due to block warpage
 - aluminum blocks may have greater warpage limits than cast iron blocks of similar designs
- Check Main Bearing Bore Alignment
 - .0015"



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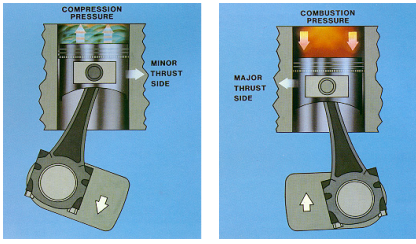
Cylinder Wear

- Use a bright light to conduct a thorough visual inspection before measuring
- Inspect and measure the worst cylinder first
- Measuring Cylinders
 - Inside Micrometers
 - Outside Micrometers with Telescoping Gauges
 - Bore Gauges



Engine Repair

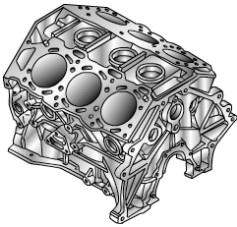
Cylinder Thrust Surfaces



Engine Repair

Cylinder Repair

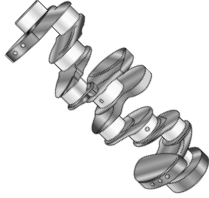
- Cylinder Deglazing
 - crosshatch pattern holds oil and promotes ring seating during break-in
- Cylinder Honing
 - honing is used to correct damage up to .010"
- Cylinder Boring
 - performed by machine shops



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Crankshaft Inspection

- Seal Scoring
- Crack Detection
 - Magnaglo - a fluorescent paste containing iron particles is mixed with oil and sprayed on the component
- Journal Inspection
 - obvious scoring or damage
 - taper
 - out of round



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Piston Inspection

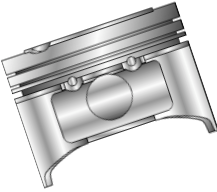
- cracks
- ring groove condition
- piston pin noise
 - a sharp double knock that increases under load
- piston slap
 - most noticeable when the engine is cold, at part throttle and under light acceleration



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Piston Fit

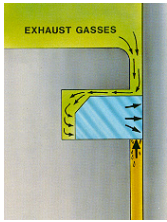
- pistons are not round
 - the top is smaller in diameter than the skirt
 - piston diameter is measured on the skirt at 90 degrees from the piston pin
- pistons are available in different sizes to allow for selective fit to the bore



Engine Repair

Piston Rings

- seals compression
- prevents blow-by
- prevents excess oil from entering the combustion chamber
- top compression ring
 - barrel shaped
 - chrome or moly coating
- second compression ring
- oil control ring



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Piston Ring Installation

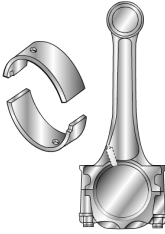
- end gap
 - excessive end gap allows compression to escape
 - insufficient end gap can cause ring to break
 - ring end gaps should not be in a line
 - ring end gaps should not be installed on cylinder thrust surfaces
- side clearance
 - follow piston ring manufacturer instructions carefully



Engine Repair

Connecting Rods

- milled cap design
- cracked rod design
- oil squirt holes
- number rods before disassembly
- inspect for scratches and knicks
- twist tolerances are usually less than .001"
- crank journal end tolerances usually within .0003"
- rod noise - light metallic knock that is most audible on acceleration/deceleration



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Insert Bearings

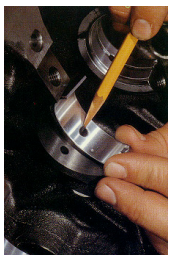
- replaceable
 - soft surface material allows foreign particles to be embedded in the bearing surface
- bearing construction
 - steel backing
 - copper/lead lining
 - babbitt surface
- solid aluminum



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Bearing Lubrication

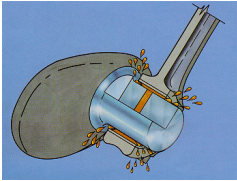
- oil is fed from the low load side of bearing
- a cross drilled crankshaft or bearing groove distributes oil
- hydrodynamic lubrication efficiency decreases rapidly with increased bearing clearances
 - a minimum lubrication film of .000040" is required to prevent damage



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Bearing Clearance

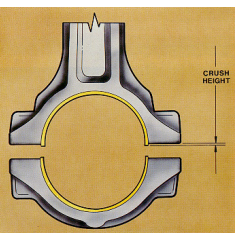
- doubling bearing clearance increases oil leakage at the bearing by a factor of five
- excessive clearance can cause
 - low oil pressure
 - oil consumption
 - knocking



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Bearing Crush

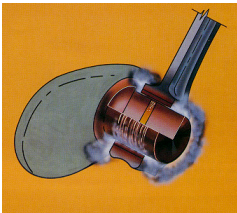
- the bearing shell extends beyond the parting surfaces by approximately .001"
- prevents bearing from spinning
- assure good heat dissipation



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Bearing Failure

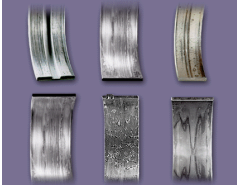
- dirt
- misassembly
- misalignment
- insufficient lubrication
- overloading or stress
- corrosion



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Bearing Damage

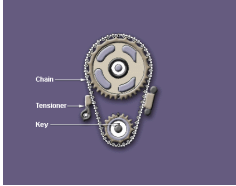
- material behind bearing
- surface fatigue
- bearing cap shift
- bent or twisted connecting rod
- out of round bearing bore
- misshaped journal
- misaligned rod, crankshaft or main bore
- excessive journal fillets
- improper bearing crush
- insufficient lubrication
- excessive heat cavitation



Engine Repair

Timing Chain and Gears

- Timing Chain/Gears
 - deflection - no more than 1/2"
- Timing Gears
 - backlash is checked with a dial indicator
 - gear whine - decreases as engine speed increases



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Timing Belt

- timing belts do not stretch like chains
- timing belts usually have replacement intervals of 50,000 to 60,000 miles
- timing belt whine or warble is centered near the front of the engine and varies with engine speed

