spection

Engine Disassembly and Component Inspection

Brookhaven College

Engine Wear

- engine performance is adversely affected by component wear
- you should carefully clean, inspect and measure all engine components during disassembly
- suspect components should be replaced or serviced

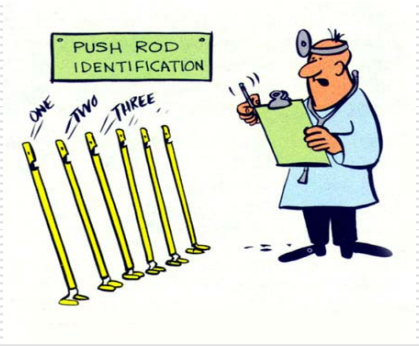
spection

Engine Oil and Coolant

- Drain and inspect engine oil
  - condition of oil
  - evidence coolant
  - evidence of metal
- Drain and inspect coolant
  - condition of coolant
  - evidence of oil

Identifying Components

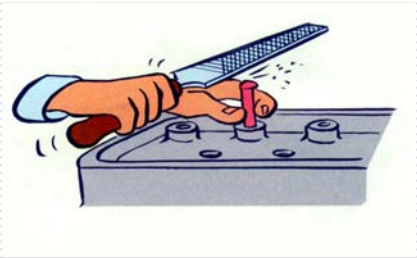
- carefully identify all components for reassembly
- valve train components, lifters, pistons, rods, bearing caps, etc. should be reinstalled in their original location if the parts are reused without machining
- remember to maintain the order during cleaning and inspection



spection

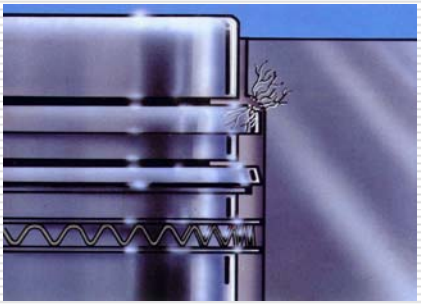
Disassembling Cylinder Head

- compress the valve spring and remove the keeper hardware
- mushroomed valve stem tips dressed with a file to prevent valve guide damage
- carefully inspect the valve face and seats for evidence of burning or damage



Ring Ridge Removal

- wear will create a lip at the top of the cylinder where the upper compression ring's travel reaches TDC
- a ridge reamer must be used to cut away the ridge or lip before the piston can be removed



spection

Cleaning Components

- Block and Cylinder Heads
  - remove core and oil galley plugs
  - remove bearings
  - cast iron components may be cleaned in hot tanks
  - aluminum components may be cleaned in cold tanks or special high pressure parts washers
- Camshafts and Crankshafts
  - hand clean in solvent tanks with soft brushes
- Pistons
  - carbon may be removed by carefully scraping components

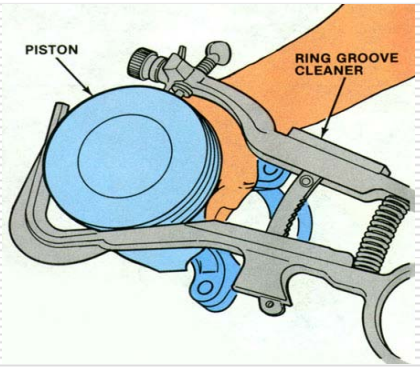
Removing Old Gasket Material

- Old gaskets may be removed
  - by carefully scraping
  - with special solvents
  - wire brushes (not for use on aluminum or soft components)
  - with special pads and die-grinders

spection

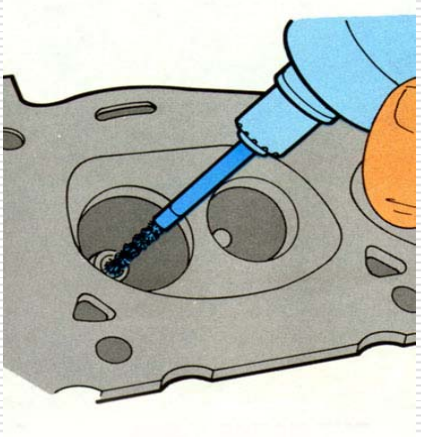
Cleaning Ring Grooves

- Carbon can be cleaned from the ring grooves
  - with a ring groove cleaner
  - by carefully scraping the groove with a piece of the old wing or small picks



Cleaning Valve Guides

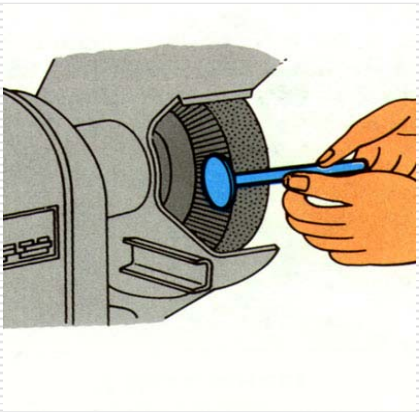
- valve guides must be cleaned before measuring
- a drill operated wire brush and solvent will remove varnish and carbon buildup



spection

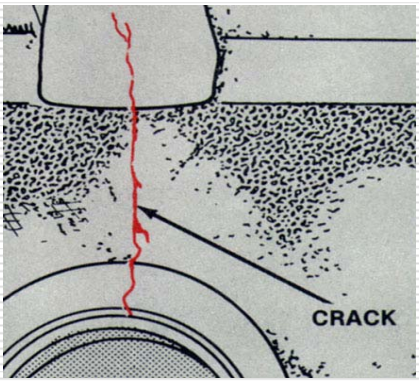
Cleaning Valves

- carbon buildup on the valve head and stems should be removed with a wire wheel mounted on a bench grinder
- solvent can be used to remove varnish buildup on the valve stem



Crack Detection

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



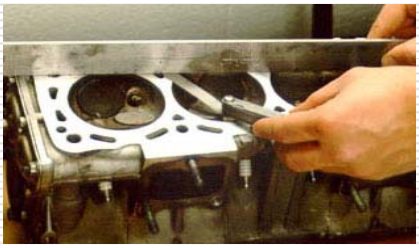
spection

Measuring

- accurate measurements are critical in proper diagnosis and repair of engines
- be certain your tools are accurate and you know how to use them

Checking Flatness

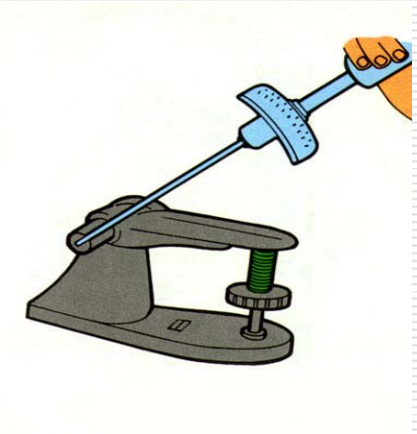
- Both the block and cylinder heads should be checked for flatness. Warpage should not exceed factory specifications.
- 3 cylinder and V6 engines
  - .003" in length and .002" across
- 4 cylinder and V8 engines
  - .004" in length and .002" across
- 6 cylinder engines
  - .005" in length and .002" across



spection

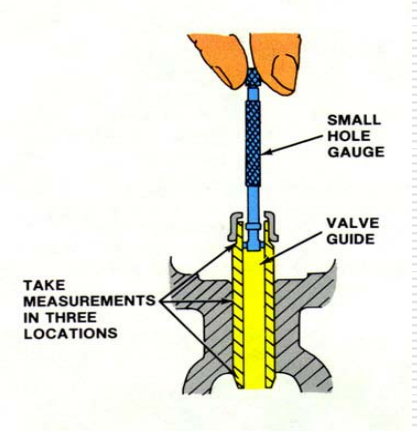
Valve Spring Inspection

- Valve springs should be checked for
  - knicks, cracks, corrosion
  - squareness
  - free height
  - proper pressure at specified lengths



Measuring Valve Guides

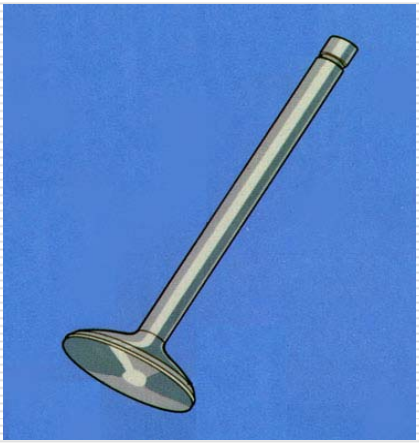
- valve guides should be measured to check for wear and to determine valve stem to guide clearance
- wear will be greatest at the top and bottom of the guide



spection

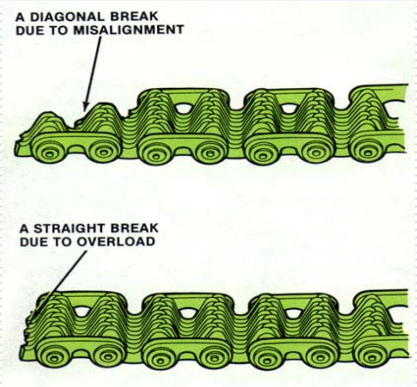
Valve Inspection

- valve stems should be measured to check for wear and to determine valve stem to guide clearance
- measure the margin
  - if the valve's margin is too narrow the valve will not be able to cool properly
- check the keeper grooves and hardware



Timing Chain and Gears

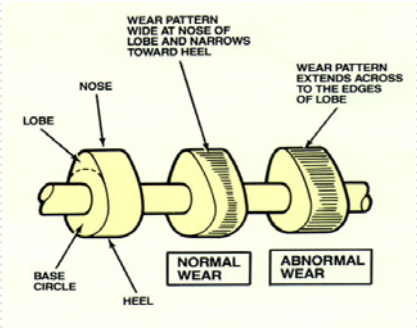
- timing chains should be checked for stretching during disassembly by measuring timing chain deflection
- the timing gears should be checked for excessive wear



spection

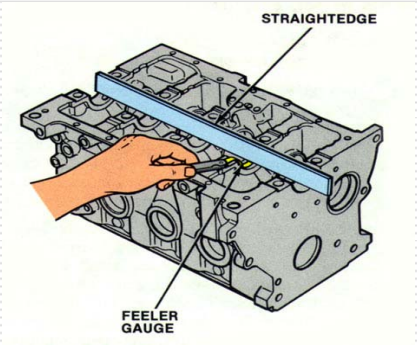
Camshaft Inspection

- check journals for wear, pits and grooving
- check lobes for galling, chipping, scoring and abnormal wear
- measure lift
- check the condition of lifters and push-rods



Block Inspection

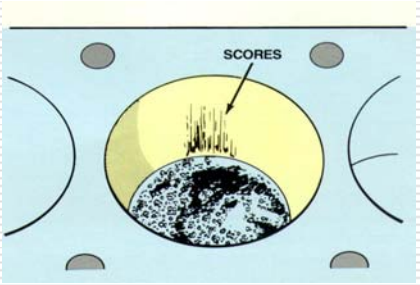
- main journal bearing bore misalignment should not exceed .0015” on most engines
- the journal bores should also be checked to see if they are within out of round specifications



spection

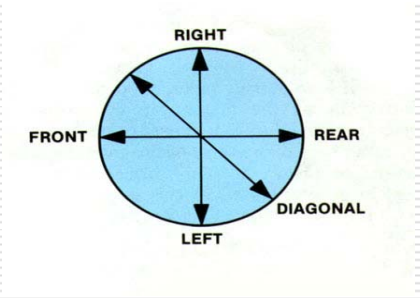
Cylinder Inspection

- check for cylinder scoring, scuffing, cracking, pitting or discoloration
- minor damage can be corrected with honing and new rings
- major damage may require boring the cylinder oversize



Cylinder Out of Round

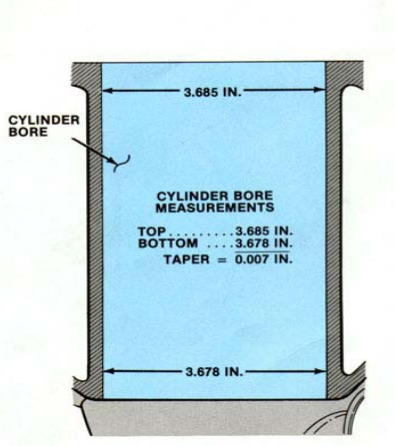
- the cylinders should be checked to see if they are within out of round specifications
- the difference between the largest and smallest diameters equals the out of round



spection

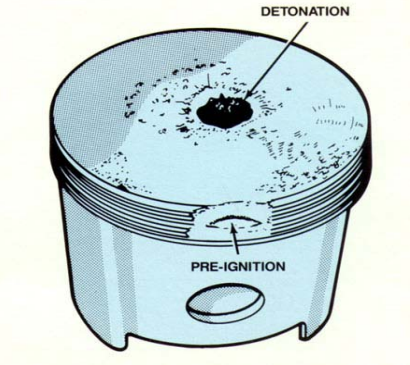
Cylinder Taper

- cylinders must be checked for taper by measuring the the ring's travel at TDC and the ring's travel at BDC
- the cylinder's wear will be greatest at the top of the cylinder



Piston Inspection

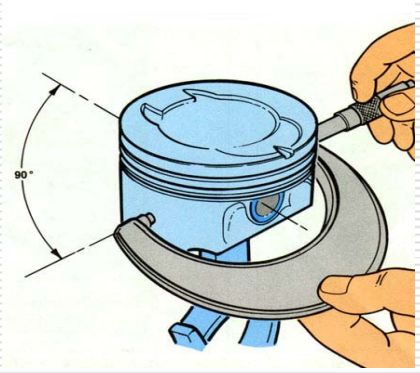
- piston head deposits
- ring groove wear
- excessive piston to cylinder wall clearance
- abnormal combustion
- scoring, scuffing or cracks
- diagonal wear patterns indicating connecting rod misalignment
- most pistons are marked with a notch or an arrow that points toward the timing chain or belt



spection

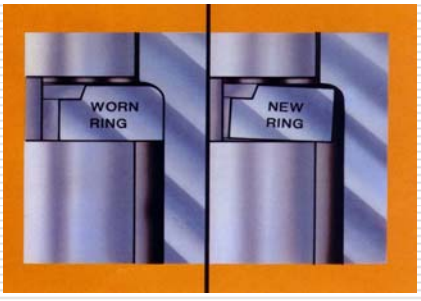
Measuring Piston Diameter

- piston diameter is measured at 90 degrees to the piston pin on the piston skirt
- check the service manual the specific engine you working with



Ring Wear

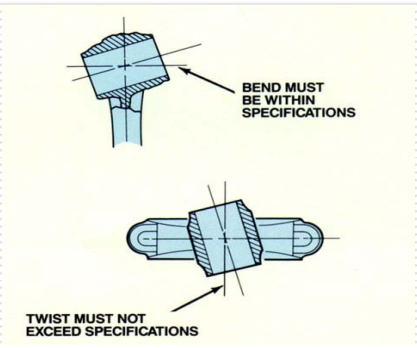
- piston rings should be inspected for abnormal wear and are normally replaced any time the piston is removed
- the piston's ring grooves should also be checked for proper side clearance



spection

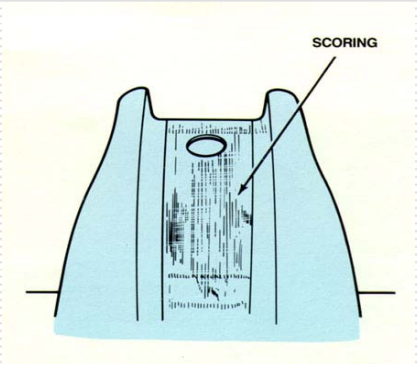
Connecting Rod Inspection

- fractures
- bent rods
- carefully inspect the piston and connecting rod bearing for signs of rod misalignment
- bearing bore out of round and taper
- rod nut and bolt damage
- check the piston pin for scoring and excessive wear



Crankshaft Inspection

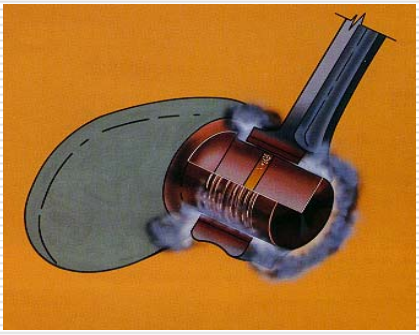
- cracks
- grooves caused by oil seals
- crankshaft key-way condition
- check all threaded bolt holes
- check journals for nicks, burrs, grooves and scoring
- check journals for taper and out of round



spection

Bearing Damage

- Causes of bearing damage in order of frequency
  - dirt
  - misassembly
  - misalignment
  - insufficient lubrication
  - overloading
  - stress



Bearing Inspection

- Foreign particles embedded in babbit
- Foreign particles in back on the back of the bearing
- Surface fatigue
- Bearing cap shift
- Bent or twisted connecting rod
- Out of round bearing bore
- Misshaped Journal
- Misaligned (bent) crankshaft
- Main bearing bore misalignment
- Excessive journal fillets
- Insufficient bearing crush
- Excessive crush
- Insufficient Lubrication
- Excessive heat
- Cavitation

spection

Oil Pump Inspection

- cover wear
- housing wear
- inner rotor
- outer rotor
- check relief valve spring tension
- normally replaced as a unit and not serviced