service bulletin

mercruiser

STERN DRIVES/INBOARD ENGINES

NUMBER: 81-30

DATE: 11/25/81

Procedure for Replacing Cylinder Head Gasket; Checking Valve Clearance; Torquing Cylinder Head Bolts and Torquing Rocker Arm Bolts - MCM/MIE 470, MCM 485.

CIRCULATE TO:
SERVICE MANAGER
PARTS MANAGER
MECHANICS

DISASSEMBLY

1. Drain seawater and closed cooling section of engine cooling system.
2. Remove any component that would interfere with the removal of the cylinder head.
3. Remove rocker arm cover and gasket. Keep old gasket for use later.

IMPORTANT: Place rocker arms, rocker arm fulcrums and push rods in a rack or container so that all pieces from each valve can be kept together. If this is not done, damage could occur to valve train components upon reassembly.

4. Remove rocker arm attaching bolts, rocker arms, fulcrums and push rods.
5. Remove cylinder head bolts. Remove cylinder head and gasket. Discard gasket.

CLEANING and INSPECTION

- Clean all gasket surfaces on cylinder head, cylinder block, intake and exhaust manifolds.
- Clean sealer from cylinder head bolts, using a wire brush or suitable solvent.

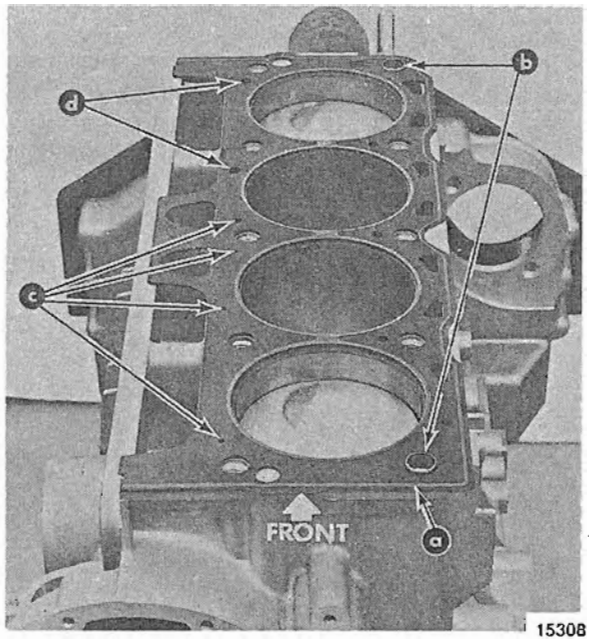
IMPORTANT: Cylinder head bolt holes (located in cylinder block) must be free of water and oil to prevent cylinder block failure from hydraulic pressure buildup while torquing cylinder head bolts.

- Clean threaded cylinder head bolt holes in cylinder block.
- Clean both cylinder head and cylinder block. Be sure all oil, grease, water and anti-freeze is removed.
- Inspect cylinder head/cylinder block for warpage.

REASSEMBLY

IMPORTANT: DO NOT use any gasket cement or sealer on Head Gasket, Cylinder Head or Cylinder Block.

1. Position new cylinder head gasket on cylinder block with the word FRONT (stamped on gasket) toward front of engine and facing DOWN toward cylinder block (Figure 1). Make sure alignment dowel pins ("b" Figure 1) are through correct holes in head gasket.
2. Place cylinder head on gasket. Make sure alignment dowel pins ("b" in Figure 1 in cylinder block) go into holes in cylinder head.
3. Coat underside of cylinder head bolt heads and threads of cylinder head bolts with Perfect Seal and install. DO NOT tighten bolts at this time.



a - Cylinder Head Gasket
b - Alignment Dowel Pins
c - Small Water Passage Holes
d - Large Water Passage Holes

Figure 1. Cylinder Head Gasket Installation

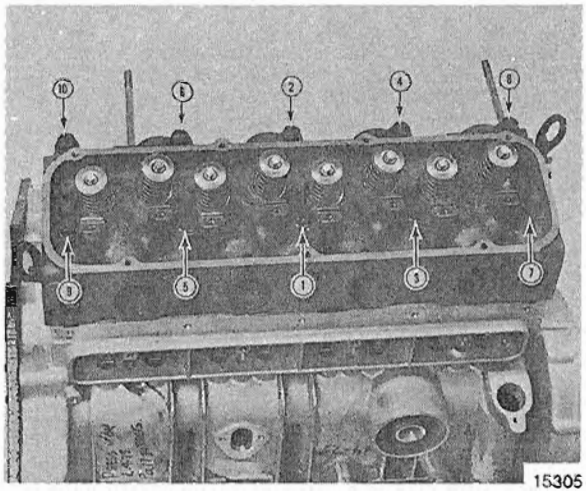


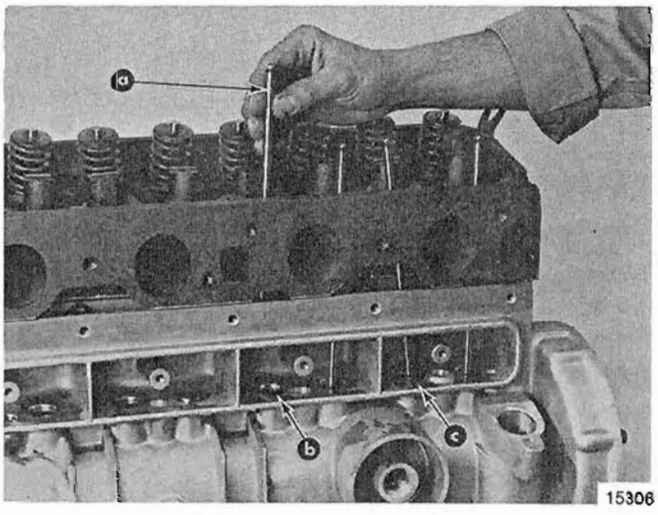
Figure 2. Cylinder Head Bolt Torquing Sequence

IMPORTANT: Failure to properly torque cylinder head bolts can cause cylinder head gasket failure.

4. Follow torquing sequence shown in Figure 2. Torque cylinder head bolts in three steps:
   - 55 lbs. ft. (74.6 N.m)
   - 90 lbs. ft. (122.0 N.m)
   - 130 lbs. ft. (176.3 N.m)

IMPORTANT: To prevent bending a push rod, and to avoid a false torque reading, it is very important that rocker arms, rocker arm fulcrums and push rods be reinstalled in EXACTLY the same place they were removed from. Follow steps below.

5. Install each push rod into lifter it was removed from. Be sure push rod end seats INTO lifter socket. (Figure 3)



a - Push Rod
b - Lifter (Note Socket)
c - Push Rod Installed into Lifter Socket

Figure 3. Installing Push Rod (Side Cover Removed for Visibility

6. Install each rocker arm fulcrum, rocker arm and rocker arm attaching bolt into the position it was removed from. DO NOT tighten rocker arm attaching bolts at this time.

TORQUING ROCKER ARM BOLTS

IMPORTANT: Torquing of rocker arm attaching bolt must be done with valve in closed position. Failure to do this can result in bent push rod.

1. Set #1 piston at TDC (firing) and torque the following rocker arm attaching bolts to 20 lbs. ft. (27.1 N.m). (Figure 4)
   - #1 - Intake and Exhaust
   - #2 - Intake
   - #3 - Exhaust
   - #4 - Intake

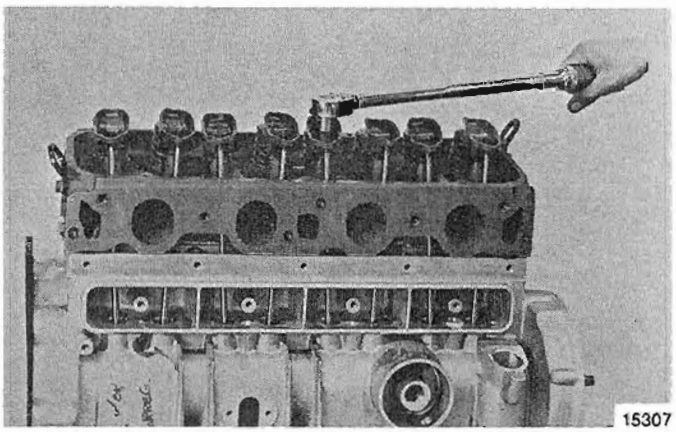


Figure 4. Torquing Rocker Arm Attaching Bolts

2. Rotate the crankshaft 360° (1 complete revolution) and torque the following rocker arm attaching bolts to 20 lbs. ft. (27.1 N.m).
   - #2 - Exhaust
   - #3 - Intake
   - #4 - Exhaust

CHECKING VALVE CLEARANCE

IMPORTANT: Valve clearance is not adjustable. If clearance is not correct, it will be necessary to change the push rod to one of the correct length so that proper clearance can be achieved. Read the following instructions COMPLETELY BEFORE checking clearance.

T71P-6513-A

Valve Lifter Collapsing Tool - ~~T711P-6513A~~
Available From: Owatonna Tools, Inc.
2013 Fourth Street N.W.
Industrial Park Warehouse
Owatonna, MN 55060

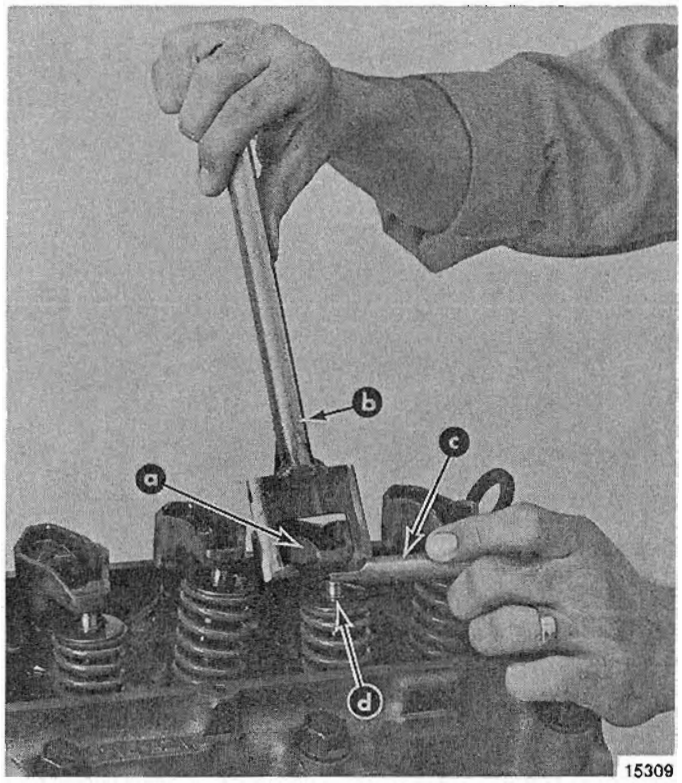
1. With #1 piston at TDC (firing), check clearance of following valves:
   - #1 - Intake and Exhaust
   - #2 - Intake
   - #3 - Exhaust
   - #4 - Intake

   a. Install valve lifter collapsing tool as shown in Figure 5. Firmly push on handle until lifter is completely collapsed.

CAUTION: Excess pressure on valve lifter collapsing tool may bend push rod.

b. The correct clearance (distance between end of valve stem and face of rocker arm) is .075" - .175" (1.905 - 4.445mm).

c. Using feeler gauge, drill rod or appropriate tool, check clearance between rocker arm face and valve stem end (Figure 5).
If clearance is less than .075" (1.905mm), install a shorter push rod than was originally in engine.
If clearance is more than .175" (4.445mm), install a longer push rod. Select correct push rod from chart.



a - Rocker Arm
b - Valve Lifter Collapsing Tool
c - Tool to Measure Clearance
d - Valve Stem

Figure 5. Checking Valve Clearance

MERCRUISER 470 TYPE ENGINE PUSH RODS LENGTHS

Mercury Marine Part Number	Lengths	Color Code
67502-3	8.595" - 8.625" (217.313 - 219.075mm)	~~None~~ Red
67502-4	8.655" - 8.685" (219.837 - 220.599mm)	Blue
67502-5	8.625" - 8.655" (219.075 - 219.837mm)	None
67502-6	8.685" - 8.715" (220.599 - 221.361mm)	Yellow

2. Rotate crankshaft 360° (1 complete revolution) and check clearance of following valves:
   - #2 - Exhaust
   - #3 - Intake
   - #4 - Exhaust

After installing new push rod, recheck valve clearance to be sure it is within specifications.

REASSEMBLY - CONTINUED

1. Install rocker arm cover using old gasket.

CAUTION: Cylinder head bolts MUST be retorqued after engine has been brought to normal operating temperature. Failure to do this can cause head gasket failure.

2. Reinstall all components that were removed during disassembly.
3. Fill closed cooling system following instructions in "Operation and Maintenance Manual".

RETORQUE CYLINDER HEAD BOLTS

CAUTION: Cylinder head bolts MUST be retorqued after engine has been brought to normal operating temperature. Failure to do this can result in head gasket failure.

1. Supply water to water intake holes in gear housing and start engine. After normal operating temperature has been reached, shut engine off.
2. Remove rocker arm cover and gasket. Discard gasket.
3. Torque cylinder head bolts to 130 lbs. ft. (176.3 N.m) following tightening sequence shown in Figure 3.
4. Install rocker arm cover with new gasket and torque bolts to 90 lbs. in. (10.2 N.m).
5. Run engine and carefully inspect for leaks.