CMI SB00-3A

Service Bulletin Excerpt

Courtesy information related to O-200 connecting rod bolt selection.

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CONNECTING ROD INSPECTION AND REPAIR

CLEANING:

Thoroughly clean connecting rods using an approved solvent or degreaser. Insure all surfaces are free of varnish, oil and residue that will affect reliability of visual, dimensional and magnetic particle inspection.

INITIAL INSPECTION:

Perform the following visual and dimensional inspections.

Insure that connecting rod and cap mate marks are adjacent to each other and that the position numbers stamped on or adjacent to the bolt boss match. **Scrap connecting rods and caps that do not meet this criteria.**

Visually inspect connecting rod for corrosion pitting, rust, discoloration (bluing), galling, impact damage, nicks, bending and twisting. **Scrap connecting rods with any of these indications.**

Remove nuts and bolts from connecting rod and separate rod and cap. Visually inspect connecting rod and cap parting surface. Contact signatures resulting from assembly forces are normal and acceptable. However, connecting rods exhibiting fretting signatures that have resulted in the loss of metal as indicated by removal of the original machining marks, either locally or over the entire surface, are not acceptable for continued service. **Scrap connecting rods with fretting at the parting surfaces, *DO NOT REWORK.***

Visually inspect nut seat area. Excessive fretting signatures indicating loss of material or signatures of edge loading of the bolt under head surface contact area is cause for rejection and scrap.

Visually inspect dowel surfaces at rod and cap bolt holes. Indications of distortion or scoring are cause for rejection and scrap.

Insuring that the mate marks are adjacent to each other and the position numbers match, assemble the connecting rod and cap by installing one bolt through cap and rod. With the cap seated firmly against the rod, you must be able to install the remaining bolt using hand pressure only. **Scrap connecting rods not meeting this criteria.**

Lubricate connecting rod bolt and nut threads with clean 50 weight aviation oil. Torque nuts to the value specified in the latest revision of TCM Service Bulletin SB96-7.

NOTE

The new design Spiralock nuts are free running during installation. Locking is achieved through thread design when the nut is properly torqued.

Inspect the inside diameter joint of the rod to cap with both bolts and nuts installed and torqued. Mismatch (or a step) of more than 0.001 inch is not acceptable. An acceptable method of checking mismatch is to use a dial indicator as follows:

Place the rod on a surface plate so that the splitline is at the 6 and 12 o clock position. Use vee blocks to hold the rod in place. Using a dial indicator mounted on a height gauge, zero out on one side of the splitline. Move the indicator across the splitline. There must be no more than 0.001 indicator movement.

Warning

Removing and installing the connecting rod pin bushing with makeshift tools can damage connecting rods resulting in subsequent failure.

Remove piston pin bushing from connecting rod using Borrough s part number 8098, or equivalent, Connecting rod Bushing Removal/ Installation Set and an arbor press.

Inspect piston pin bushing bore and surrounding area for nicks, gouges and mechanical damage. **Scrap connecting rods with any of these indications.**

Using precision measuring equipment, such as dial bore gauge or air gauge, verify that the connecting rod meets the dimensional specifications provided in Table 5. Reference Figure 7. Measure D diameter 15 to 30 degrees either side of connecting rod split line and 90 from the first measurement. Difference between the two measurements must not exceed .0015. **Connecting rods and caps not meeting these specifications must be scrapped.**

Inspect the rod channel rails for damage such as nicks, gouges or mechanical damage. Scrap rods with any of these indications.

NOTE: *Connecting Rods with forging number 626119 must also meet the inspection criteria specified in TCM CSB96-13*

MAGNETIC PARTICLE INSPECTION:

Parts must be clean and free of rust, scale, oil or other residue that may affect reliability of magnetic particle inspection Connecting rods will be inspected using both the circular and longitudinal method of magnetization. Use florescent method, wet continuous procedure, Refer to the latest revision of ASTM E 1444 for specific methods and procedures based on type of inspection being performed.

Acceptable indications must be associated with steel inclusions or shallow imperfections on the forging surface. Accept light indications running parallel to the rod axis or around the pin boss and cap ends less than 1/2 inch in length.

Indications associated with forging laps or with heat treatment are deemed cracks and are not acceptable.

The area of blend between the piston pin boss extending one inch into the channel section of the connecting rod, the bolt spotface areas and the channel rail edges are critical and must be free of any indications.

Any indication transverse to the rod axis is not acceptable.

Reject and scrap connecting rods exhibiting unacceptable indications.

CONNECTING ROD PISTON PIN BUSHING INSTALLATION:

Warning

Removing and installing the connecting rod pin bushing with makeshift tools can damage connecting rods resulting in subsequent failure.

Verify that the piston pin bushing being installed is the correct part number for the application.

The piston pin bushing may be chilled slightly to aid installation.

Using Borroughs Tool Part Number 8098, Connecting Rod Bushing Removal and Installation set, or equivalent, and an arbor press install the piston pin bushing as follows.

1. Position connecting rod over the pilot so the mate marks and piston pin bore chamfer are facing up.
2. Place the bushing on the pilot so that the bushing split is located 45 degrees from the center line of the connecting rod, facing the crankpin end.
3. Position the ram onto the pilot.
4. Using the arbor press, carefully press the bushing flush with the piston pin bore.
5. Visually inspect connecting rod for nicks or damage that may have occurred during bushing installation. **Scrap connecting rods exhibiting these conditions.**
6. Verify the piston pin bushing split is correctly positioned. Reference Figure 7.

PISTON PIN BUSHING BORING

Boring of the piston pin bushing requires the following equipment:

1. Borough s Tool Part Number 8111A, or equivalent.
2. Adapter Kit Part Number 8042C (E-series, 470 and 520) or Part Number 8072C (O-200, IO-240, 300 series and 360 series) or equivalent.
3. Vertical mill, or equivalent, capable of maintaining 1750 R.P.M.
4. Boring tool of the correct sizes.

Bore bushing as follows.

1. Place the connecting rod on the base plate and secure with retainers provided.
2. Select the correct adapter kit and boring tool for the connecting rod.
3. Using a vertical mill, or equivalent, bore the connecting rod bushing to size. Maintain 1750 RPM during boring process.

POST INSTALLATION INSPECTION:

Using a Maar-Federal Tool and Supply Co. Inc., Dimension Air D-2500 or D-4000 Air Plug Gauge, the correct size Setting Ring and Air Plug for diameter being measured verify that the piston pin bushing is within the minimum and maximum limits for the connecting rod as specified in Table 5.

If the piston pin bushing does not meet dimensional specifications, the bushing will have to be removed and a new bushing installed and bored to size.

Using a profilometer check piston pin bushing surface finish. Surface finish must not exceed 16 R_a.

Check connecting rod bushing for alignment and twist after bushing installation using Borrough s tool number 8111A, or equivalent. An alternate method would be to use a surface plate, matched vee blocks, precision machined press to fit arbors at least eight inches in length for the pin and crank end of the rod, and two calibrated parallel blocks of flat machined steel at least eight inches long, one half inch wide, and two and one half inches high.

To check connecting rod twist, insert the push to fit arbors into the pin and crank end of the rod. Place the connecting rod crank pin end onto the vee blocks. Place the pin end arbor on the two machined parallel steel blocks spaced equal distance from the center line of the rod, but not less than six inches apart

Use flat feeler stock to detect clearance between the machined steel blocks and the pin end arbor. Refer to Figure 7 for specified limits. To check connecting rod alignment, rotate the pin end of the connecting rod to a vertical position with the arbor resting against a positive stop. Using a dial indicator mounted on a vertical stand resting on the surface plate, measure the vertical distance of the pin end arbor from the surface plate at points equal distance from the centerline of the connecting rod. Refer to Figure 7 for the specified limits. **Connecting rods exceeding the limits specified in Figure 7 must have the piston pin bushing replaced and reamed or the connecting rod must be scrapped.**

TOOLS AND EQUIPMENT:

Tools referred to in this Service Bulletin may be purchased from:

Borrough s Tools available from: Kent - Moore 29784 Little Mack Roseville, MI 48066-2298 Phone:1-800-253-0138
Maar-Federal Tool and Supply Co. Inc. 1144 Eddy Street Providence, RI 02940 Phone: 1-800-343-2050

WARNING

FAILURE TO COMPLY WITH THESE SPECIFICATIONS AND INSTRUCTIONS WILL RESULT IN ENGINE MALFUNCTION AND STOPPAGE.

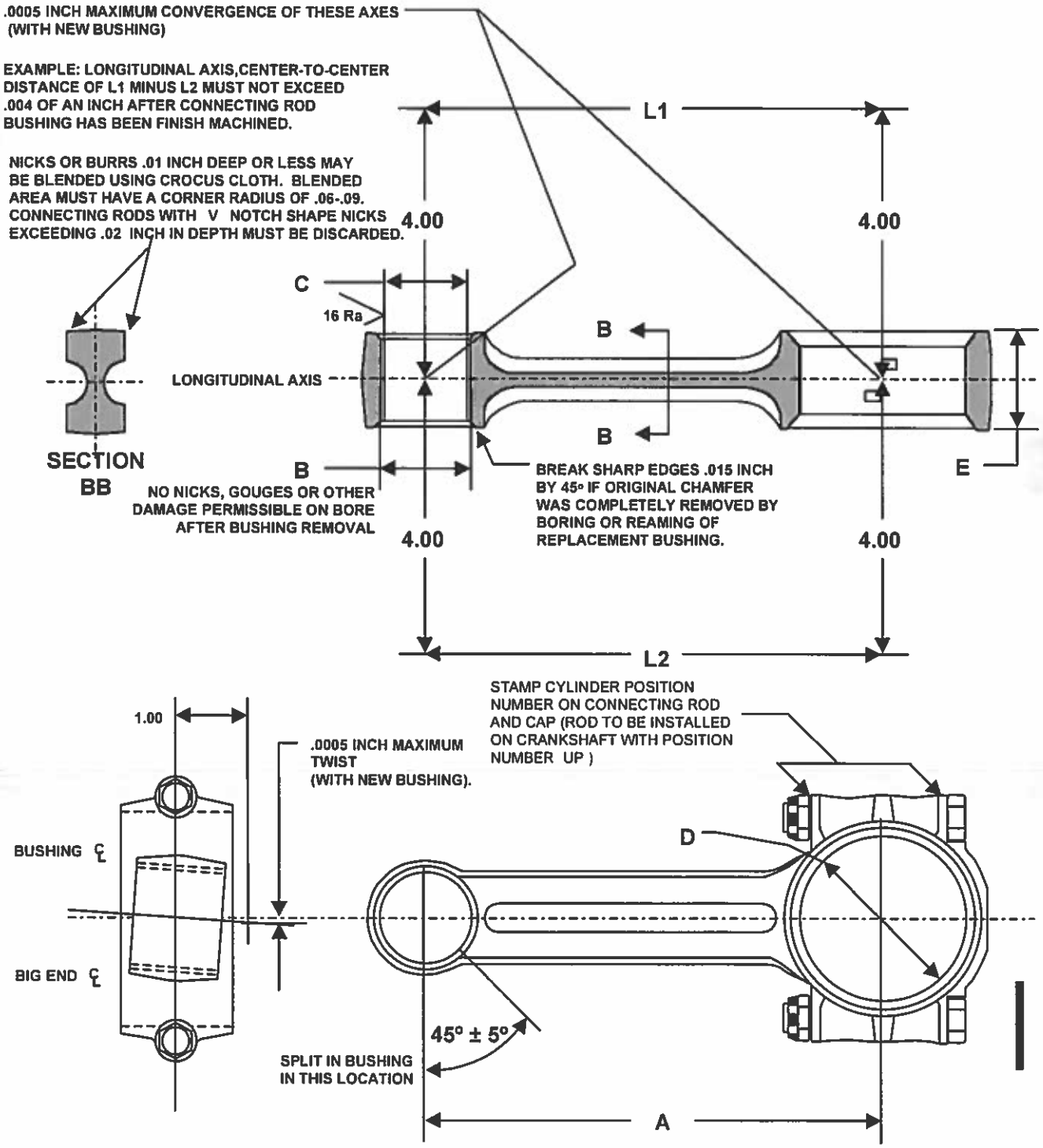

FIGURE 7. CONNECTING ROD AND BUSHING DIMENSIONS

TABLE 5. CONNECTING ROD SPECIFICATIONS

Engine Model	Con-Rod Part Number	Forging Part Number	②④ Nut P/N Bolt P/N	Connecting Rod Bores Centerline Distance A	Pin end I.D. No Bushing B	Bushing I.D. Bushing P/N C	Crankpin Bore I.D. D	C/S end width E
O / IO / TSIO-470 S Small Bore IO & TSIO-520 s IO-346	655910① Superceded 655000 655004 654999 646778	646126 Superseded 632041	654490 Nut 655958 Bolt	6.6230 6.6270	1.2340 1.2350	1.1267 1.1269 530658	2.3755 2.3760	1.521 1.525
E-Series O-470-2,4,11,13A,15 IO-470-C,G,J,K,P,R	654796 ①③ Superseded 646478 A36121 ⑦	646126 Superseded 632041	654487 Nut 655960 Bolt	6.6230 6.6270	1.2340 1.2350	1.1263 1.1265 530658	2.3755 2.3760	1.583 1.587
360 Large Bore IO-240-A&B	654793 ①③ Superseded 646320 642268	646116 Superseded 626119	654487 Nut 655959 Bolt	6.3730 6.3770	1.0620 1.0630	1.0000 1.0005 538684	2.0615 2.0620	1.2215 1.2255
360 Small Bore GO-300	654794 ①③ Superseded 646321 626128	646116 Superseded 626119	654487 Nut 655959 Bolt	6.3730 6.3770	1.0620 1.0630	1.0000- 1.0005 538684	2.0615 2.0620	1.3015 1.3055
O-200 / O-300 C-90 / C-145	654795 ①③ Superseded 646322 530184 ⑥ 5561⑥	646116 Superseded 626119 530186⑥	654487 Nut 655959 Bolt	6.3730 6.3770	1.0620 1.0630	.9230-.9235 530192	2.0615 2.0620	1.3015 1.3055
IO / TSIO520 Large Bore TSIO-520-BE	655911① Superseded 655005 ③ 646476 646475	646126 Superseded 632041	654490 Nut 655958 Bolt	6.6230 6.6270	1.2340 1.2350	1.1267 1.1269 530658	2.3755 2.3760	1.461 1.465
L / TSIO-520-AE	655910 ① Superseded 655000 ③ 646480 643166	646126 Superseded 632041	654490 Nut 655958 Bolt	6.6230 6.6270	1.2340 1.2350	1.1267 1.1269 530658	2.3755 2.3760	1.521 1.525
TSIO-520-CE IO / TSIO-550 s TSIOL-550 s	655911 ① Superseded 655001 646482	646126 Superseded 632041	654490 Nut 655928 Bolt	6.6230 6.6270	1.2340 1.2350	1.1267 1.1269 530658	2.3755 2.3760	1.461 1.465
I0-550-B29, B33, B37, C25, C29, C30 TSIO-520-UB17	655911 ①⑥ Superseded 655001 654440	646126 Superseded 632041	654490 Nut 655928 Bolt	6.6230 6.6270	1.2340 1.2350	1.1267 1.1269 530658	2.3755 2.3760	1.461 1.465
GTSIO-520 s	655910 ① Superceded 655004	626126 Superseded 632041	654490 Nut 655958 Bolt	6.6230 6.6270	1.2340 1.2350	1.1267 1.1269 530658	2.3755 2.3760	1.521 1.525

① Connecting Rod Assembly must utilize correspondingly identified bolt and nut from Table 5.

② The most current part number connecting rod nuts and bolts must not be used on or with superceded part number nuts and bolts.

③ Current part number (serviceable) connecting rods must use the most current part number connecting rod new nuts and bolts. The most current connecting rod new nut and bolt part numbers can be used with old (serviceable) connecting rods of the same style. (Hex head rod bolts must replace hex head rod bolts, contour head rod bolts must replace contour head rod bolts.)

④ See the most recent revision of TCM Service Bulletin SB96-7 for connecting rod nut torque specifications.

⑤ Used in balanced set P/N 655913.

⑥ P/N 530184 connecting rod (identified by forging number 530186), A35159 (Identified by forging number 5561) and A35160 (Also identified by forging number 5561) must be serviced as follows:

a) P/N 530213 bolt, P/N 24804 or P/N 626140 nut and P/N 639292 cotter pin, torqued to value specified in latest revision of TCM SB96-7

⑦ P/N A36121 connecting rod assemblies utilizing the P/N 632041 forging must be serviced in accordance with Table 5 of this bulletin. P/N A36121 Connecting rod assemblies utilizing the P/N 40742 forging must be serviced as follows:

a) P/N 35972 connecting rod bolt, P/N 24804 nut and P/N MS24665-132 cotter pin, torqued to the value specified in the latest revision of TCM SB96-7.

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Warning

If the hardware listed in (a) of note 6 or note 7 is not available, the connecting rod must be changed to a serviceable later configuration rod with the appropriate P/N hardware.