TRANE®

General
Service Bulletin

Extended Capacity Chillers - Thrust Bearing Installation

Order Number: CTV-SVB22B-EN DATE: September 2006

Introduction

The purpose of this service bulletin is to advise service and maintenance persons of design and service parts changes that were made to the Extended Capacity CenTraVac thrust bearing. Changes where made to enhance the thrust bearing system robustness. This bulletin also provides the proper procedures and tools to use when installing new thrust bearings into an Extended Capacity chiller. This bulletin is informational only.

NOTICE: Warnings and Cautions appear at appropriate sections throughout this literature. Read these carefully.

⚠ **WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION: Indicates a situation that may result in equipment or property-damage only accidents.

Units Affected

CVHF chillers of 1470 NTON or greater, manufactured before Dec. 1, 2005.

Discussion

Beginning December 1st, 2005 production and service parts where changed to the new design.

Application of the new parts lowers bearing stress and eliminates bearing distortion that could occur due to the old bearing axial claiming system. This was accomplished by making a bearing design change, a change to the clamp ring, addition of a crush ring (that evenly distributes the load of the clamp ring), and a change to the motor cover so the clamp ring is more precisely positioned in respect to the bearing race.

An easy way to physically distinguish the old clamp design from the new design is that the new clamp ring is thicker and has a groove in it to allow proper positioning of the crush ring onto the bearing. There is no easy way to physically distinguish the new motor cover or new bearing from the old design but, there are subtle design differences and these parts are needed as part of the package to improve bearing robustness.

It is **very important** that you verify the oil feed orifice for the thrust bearing has been retrofitted to the 0.116" diameter to allow the new bearing design to function properly (reference service bulletin CTV-SVB11C-EN). Making part changes per this service bulletin with out verifying a 0.116" oil orifice would shorten bearing life since the new bearing requires more oil to function properly.

Note: If you are installing a new thrust bearing in a CVHF of 1470 NTON or greater, manufactured before December 1st 2005, it is strongly recommended that you discard the old parts and order the new parts.

Note: If your chiller utilizes an Adaptive Frequency Drive (AFD) please contact a Trane technical team member for additional special directions

Note: Beginning September 1st 2006, the inner bearing cap seal design was changed to allow for easier installation of the seal into the motor cover. If the seal presently in the unit dates to before September 2006, then it is recommended that the seal be replaced. The updated seal part # is RNG01677.

Application

Assembly procedure

Bearing removal. When removing the extended capacity thrust bearing, the use of the proper pulling fixture can make the job easier and safer. See Figure 17 for a drawing of a typical pulling fixture for extended capacity bearings. This pulling fixture can be locally fabricated, and it would be used with your common bearing pulling tools.

1. View the original parts on the chiller. If the old style (thin) axial clamp ring is present, the following parts should be discarded and replaced with new parts that represent the new design: Clamp ring, crush ring, inner bearing cap seal, motor cover (bearing bracket), and bearing.
2. If the chiller already has the new style axial clamp ring and crush ring, and/or the chiller was assembled after Dec. 1st 2005, then only a new crush ring and bearing are needed. Note: gaskets and o-rings will be needed in either case. Also replace the inner bearing cap if it has been damaged.
3. Verify the oil orifice has been retrofitted to the 0.116" diameter per previous service bulletin CTV-SVB11C-EN.
4. Verify the crush ring is not damaged or pre-crushed. The crush ring and bearing are non-reusable parts. A new and unused crush ring will have a thickness of 0.280" to 0.300". A used crush ring will have a thickness of 0.210" to 0.240". Discard any crush ring that has been used.
5. Place the new inner bearing cap onto the motor shaft. Position the cap correctly. Vent slots in the cap will match with vent ports in the motor cover. See Figure 1.

6 Install the new bearing with the use of the hydraulic nut.

- Install only matched bearing sets.
- The new bearings should not be washed unless absolutely necessary. If the bearings are washed then great care must be taken to ensure the cleanliness of the solvent and of the washing container.
- The bearing set should be heated uniformly to a final temperature of 240°F to 260°F (115.5°C to 126.6°C). If an induction heater is used, the bearings should be de-magnetized before installation onto the shaft. A maximum of 5 gauss magnetism is allowable. A hand held gauss meter can be used to determine residual magnetism.
- Place the heated bearings onto the shaft.

Note: Maintaining total bearing cleanliness during installation is critical to the success of the bearing replacement. Take every possible measure to ensure cleanliness. For example, use only clean/new high temp mitts or gloves when handling hot bearings

a The bearing set must be mounted onto the shaft in a back-to-back arrangement.

b The new bearing set will have alignment marks, one half of a "V" has been scribed on the O.D. of the outer race, and a line has been scribed on the I.D of the inner race, of each bearing. When the bearing halves have been properly arranged on the shaft, the halves of the "V" on the O.D. of the outer races will line up to form a complete "V", and the lines on the I.D. of the inner races will also line up.

⚠ Caution
Hot Surfaces!

Bearing temperatures will be as high as 260°F (126.6°C). Contact of bare skin on hot surfaces may result in minor to severe burns.

c Remove the first half of the bearing set from the heater. Note the location of the scribed line on the I.D of the inner race, you should align the scribed line with the keyway on the shaft. Install the first half the bearing set onto the motor shaft with the thin side of the outer race facing the rotor, the oil feed slots in the outer race will be facing towards the installer. Allow the bearing to seat against the shoulder on the shaft. See Figure 2.

d Rotate the outer race of the installed bearing half until its "V" lines up with the inscribed line in the inner race and with the keyway.

e Remove the second half of the bearing set from the heater. Prior to installing the second bearing onto the shaft, line up the scribed line in the I.D of the inner race with the half "V" on its outer race. Install the bearing with the thin side of the outer race facing out from the rotor, the oil feed slots in the outer race will be facing away from the installer. Both alignment marks should line up with the alignment marks on the first bearing. The oil feed slots should be in the center of the bearing assembly. See Figure 3 and Figure 4.

f Hold the inner race of the outer bearing against the inner bearing half until the bearing tightens onto the shaft.

- Seat the bearings.

Note: Using the hydraulic nut to properly seat the bearing assembly is critical. As the bearings cool they can actually shrink away from the shaft shoulder and from each other, and because of the tight interference fit of the center races onto the shaft, the center bolt may not be able to draw the bearings back into position. The end result could be a

bearing set with inadequate pre-load. To properly use the hydraulic nut (NUT0730) with the extended capacity chiller will require the use of TOL01550. See figure 5.

a Allow the bearing set to cool to 100F (37.7C) or less.

b Install the threaded shaft extension from TOL01550 onto the shaft using the long cap screw and hardened washer included with the tool. Tighten the cap screw using an impact wrench. Refer to figure 6 and figure 7.

c Place the hardened spacer ring from TOL01550 onto the threaded shaft extension, placing the raised face of the ring against the bearing inner race. Refer to figure 8 and figure 9.

d Install the hydraulic assembly nut (NUT0730) onto the threaded shaft extension and hand tighten it against the spacer ring. Ensure the spacer ring is still properly seated against the inner bearing race. Refer to figure 10 and figure 11.

e Attach the hose from the hydraulic pump to the hydraulic nut, bleed any air from the system, then pressurize the hydraulic nut to 2,700 to 2,800 psi to firmly re-seat the bearings against the shaft shoulder. Refer to figure 12.

Note: While applying hydraulic pressure to the nut, briskly rotate the bearing outer races. Maintain the alignment of the races to each other, do not disturb the "V" mark alignment on the outer races. Rotating the outer races while applying pressure will help the balls assume the correct contact angle within the bearings.

f Relieve the pressure, then rotate the outer race several times (do not disturb the "V' mark alignment on the outer race). Re-tighten the hydraulic nut against the spacer ring, then re-apply 2,700 to 2,800 psi. Repeat this step three times.

g Verify there is no gap between the shaft shoulder and the bearing. A properly seated bearing will have a 0.000" clearance.

h Relieve the hydraulic pressure from the nut, then remove the nut, spacer ring, and threaded shaft extension.

– Assemble the Extended Capacity thrust bearing inner race retention. Also refer to Service Alert CTV-SVA13A-EN

i Grasp the outer races of the bearings and attempt to spin them in opposite directions. They should be locked together. If you can spin them in opposite directions then the pre-load on the bearing set is still too small and you would need to repeat step f.

Note: If an old style bolt and Direct Tension Indicator is found with the chiller, then per Service Alert CTV-SVA13A-EN they should be discarded and replaced with a new 5/8" bolt, hardened washer, and Belleville washer. KIT09598

See figure 13.

a Clean the bolt threads.

b Place the hardened washer onto the bolt.

c Place the Belleville washer onto the bolt, with the convex or curved side towards the bolt head.

d Place the bolt through the large steel retaining washer which bolts to the end of the shaft and retains the thrust bearing.

Note: The proper retaining washer for the extended capacity bearing set will have sharp corners. If the retaining washer received is found to have 1/4" chamfered edges, then the incorrect washer has been received. Use of the incorrect washer could cause additional bearing stresses.

e Apply one to two drops of Loctite 242 to the bolt threads, then mount the assembly to the motor shaft.

f A final torque of 60-80 ft-lbs should be applied to the bolt with a calibrated torque wrench.

g Use a clean rag to remove any Loctite that may have squeezed out during assembly.

h Rotate the outer race of the bearing set to check for free turning of the assembly.

7 Install 3/8”-16 threaded rod into the opposite drive end bearing seal. Align the seal properly. Also install guide pins for the bearing bracket into the motor housing. See figure 14.

8 Inspect and verify that the new opposite drive end motor cover (bearing bracket), including **all of it's oil passages and galleries**, is **clean**. Inform tech service if debris is found on or in the part.

9 Install the opposite drive end bearing bracket o-ring (if used) using Loctite 515 “Gasket Eliminator”. Lift the bearing bracket using a chain hoist

Note: Applying a small amount of heat to the center area of the bearing bracket, especially if the bearing bracket has been stored in a cold location (concrete floor etc.), can be helpful in allowing the bracket to fit over the bearings and in allowing the seal to fit correctly into the bracket. If you do this, heat the center section of the bracket evenly, do not apply any heat source directly to the inside bore of the bracket, and do not heat the bracket to a temperature above 150°F (65.5°C).

10 Position the bearing bracket onto the guide pins. When positioning the bracket, the threaded rod connecting to the inner seal must pass through the bolt holes in the bearing bracket. Ensure the bearing seal remains properly aligned. Work the bearing bracket into place over the bearings and secure it with several bolts. The bearing bracket should slide over the bearings with minimal force.

11 Install the remaining bearing bracket bolts. Torque the bolts to 120 to 165 ft-lbs. Note the old motor cover was pegged in the factory, the new motor cover obviously is not. Attempt to bias the new motor cover so it is positioned half way in the rabbit joint gap. Do not peg the motor cover at this time.

12 Set the inner seal into the bearing bracket by using the threaded rod to pull the seal into the bracket. See figure 15. Take care to ensure the seal is positioned correctly into the bracket. Install several of the socket head capscrews to hold the seal in position, then remove the threaded rods. Install the remaining capscrews and torque to 24 ft-lbs.

Note: When the seal is properly positioned the outer race of correctly installed extended capacity bearings will extend from 0.0226" to 0.0533" beyond the bearing bracket. If the result is not within this range, then recheck the installation of the bearings and the seal.

13 Check the motor shaft for rotation. A failure to rotate freely may indicate a seal that is not correctly seated or a bearing bracket that is not centered.

14 Verify the crush ring has a laser etched four digit number on it next to the weld. If you do not see a number then discard this wrong crush ring and order a new crush ring. The correct crush ring applies the correct spring force to evenly distribute the clamp load, which prevents bearing distortion. See figure 16.

15 Install the crush ring into the outer bearing clamp ring. Hold the top portion of this subassembly slightly tilted back so the crush ring does not fall out of the groove as this subassembly is placed into the motor cover to engage the bearing.

Caution

Do NOT use any Vaseline or grease to hold the crush ring in the clamp ring groove.

Caution

The crush ring is NOT reusable. If the crush ring is damaged or pre-crushed, discard the crush ring and order a new crush ring.

Caution

The old bearing bracket/motor cover had a loosely toleranced pilot diameter for the clamp ring. If the new bearing bracket/motor cover is not applied the crush ring may not fully engage the bearing or the clamp ring may edge load the bearing.

16 Carefully place the clamp ring onto the bearing bracket and against the bearing outer race, being careful to ensure that the crush ring does not fall out of position. Insert and hand tighten the bolts that retain the clamp ring.

17 Verify, by looking through the peek hole in the clamp ring, that the crush ring is properly in the groove and has not become dislodged during assembly.

18 Using a star pattern, tighten the clamp ring bolts to 14 ft-lbs of torque. Then repeat the pattern and tighten the bolts to a final torque of 25-30 ft-lbs.

19 Wait 5 minutes, then re-torque the clamp ring bolts to 25-30 ft-lbs. The crush ring may have relaxed after the initial torque.

20 Again verify, by looking through the peek hole in the clamp ring, that the crush ring is in the groove and has not fallen out of the groove and become pinched during assembly.

21 Re-install the inspection cover.

22 After running the chiller and verifying it operates smoothly, you may peg the bearing bracket to the motor housing.

Material Authorization

No material authorized.

Labor and Travel Authorization

No labor or travel authorized.

Parts Identification

5000-Frame motors

- COV03712 COVER; MOTOR BEARING, 5000 FRAME This part precisely locates the clamp ring and the crush ring to the bearing outer race. (Do not order this part if the unit was manufactured after Dec. 1st 2005).

- RNG01882 RING; OUTER RACE CLAMP, (which comes with the new bolts). Note this part is thicker than the old clamp ring and this part has a groove to hold the crush ring. (Do not order this part if the unit was manufactured after Dec. 1st 2005).
- SPG01009 SPRING; LOAD RING, BEARING OUTER RACE, 7.62 OD, ONE TIME USE ITEM.
- BRG01542 BEARING; DOUBLE ROW RADIAL CONTACT, 7.87 OD X 3.54 WIDE, DBA PRELOAD
- RNG01677, RING; SEAL, MOTOR BEARING, the design changed Sept 2006 in order to allow easier field installation of the seal into the motor cover.
- Also replace the motor cover o-ring and the gasket for the bearing oil return line. Any needed parts can be identified by your Trane parts team.

5800L-Frame Motors

- COV03713 COVER; MOTOR BEARING, 5000 FRAME This part precisely locates the clamp ring and the crush ring to the bearing outer race. (Do not order this part if the unit was manufactured after Dec. 1st 2005).
- RNG01882 RING; OUTER RACE CLAMP, (which comes with the new bolts). Note this part is thicker than the old clamp ring and this part has a groove to hold the crush ring. (Do not order this part if the unit was manufactured after Dec. 1st 2005).
- SPG01009 SPRING; LOAD RING, BEARING OUTER RACE, 7.62 OD, ONE TIME USE ITEM (this part is the crush ring)
- BRG01542 BEARING; DOUBLE ROW RADIAL CONTACT, 7.87 OD X 3.54 WIDE, DBA PRELOAD
- RNG01677, RING; SEAL, MOTOR BEARING, the design changed Sept 2006 in order to allow easier field installation of the seal into the motor cover
- Also replace the motor cover o-ring and the gasket for the bearing oil return line. Any needed parts can be identified by your Trane parts team.

Figure 1: CVHF 1470 or 1720 with thrust bearings removed. The bearing cap seal is shown in place in preparation for a new thrust bearing installation. Note: A gasket is not used on the bearing cap.

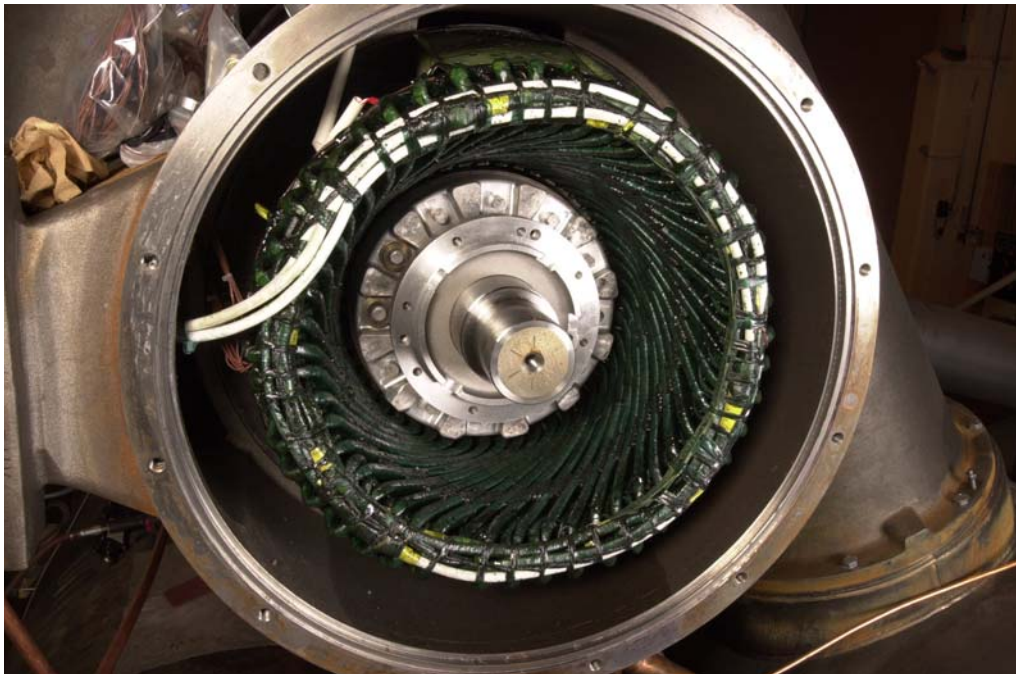


Figure 2: After heating the bearing, slide the first half onto the shaft as shown. Note the center feed grooves in the outer race which provide oil feed to the bearings.

Figure 3: Remove the second bearing from the heater and install it onto the shaft. Note: The oil grooves on the outer race of each bearing must face one another, but do not have to align with each other.

Figure 4: The outer race alignment markings should form a complete “V

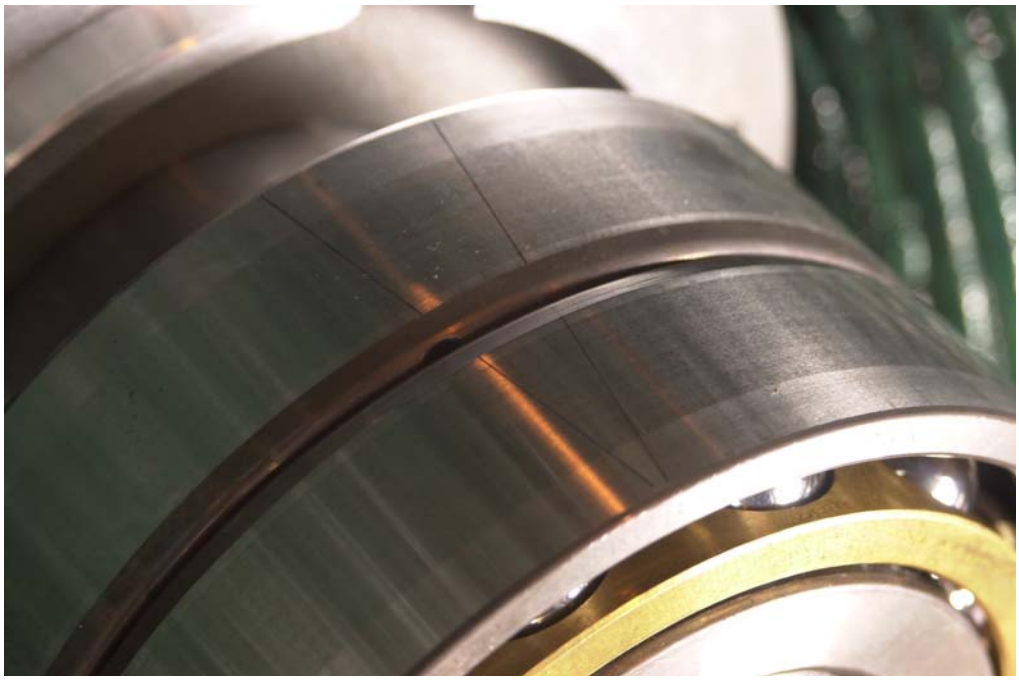


Figure 5: TOL01550 - REQUIRED for servicing the thrust bearings on CVHF1470 and CVHF1720 compressors. This tool contains the hardened spacer, threaded shaft extension, hardened washer, and cap screw

Figure 6: Using TOL01550, install the threaded shaft extension on the shaft using the long cap screw and hardened washer as shown

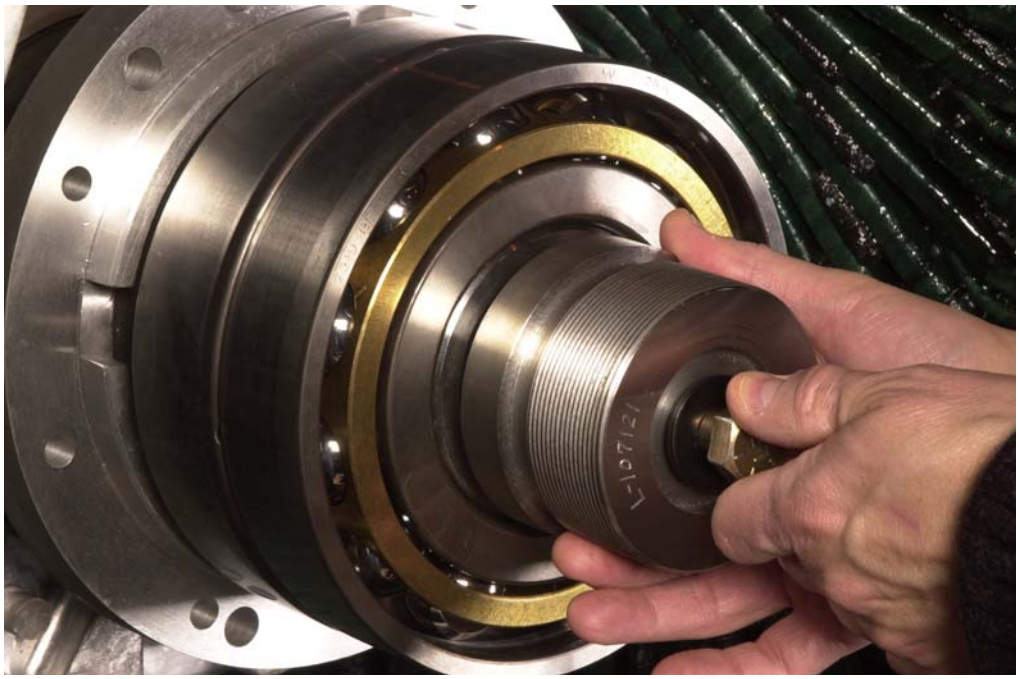


Figure 7: Use an impact wrench to tighten the cap screw on the shaft extension. Torque to 150-200 ft-lbs

Figure 8: Install the hardened spacer ring from TOL01550 with the raised face toward the bearing

Figure 9: Install the hardened spacer ring as shown. The raised face of the ring goes against the bearing inner race

Figure 10: Install the hydraulic assembly nut (NUT0730) onto the threaded extension

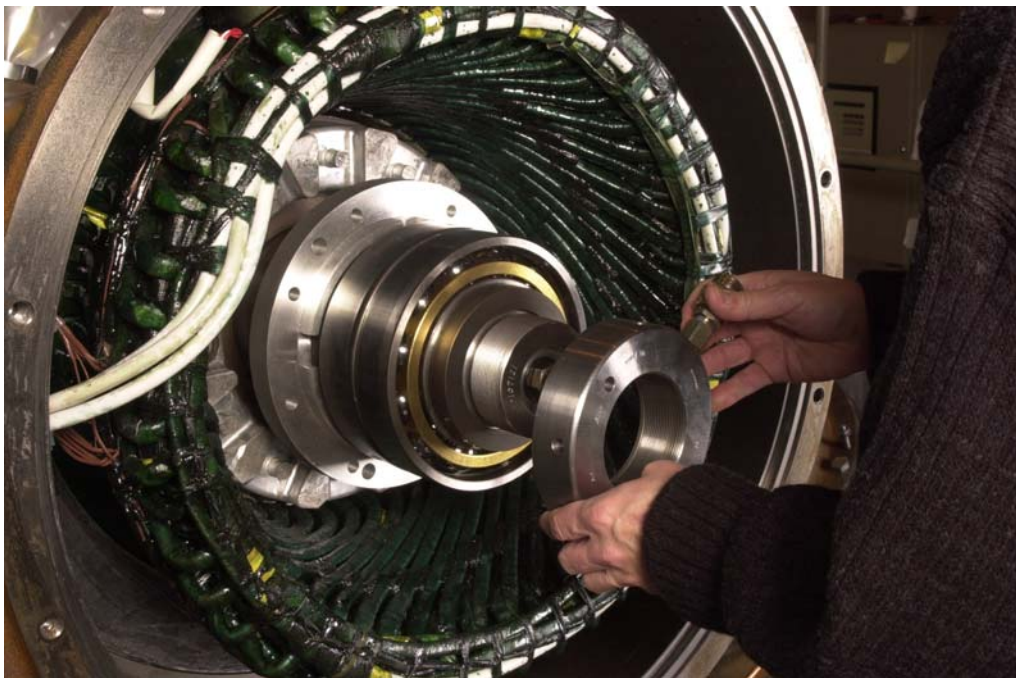


Figure 11: Tighten the hydraulic assembly nut using the rod provided with the nut

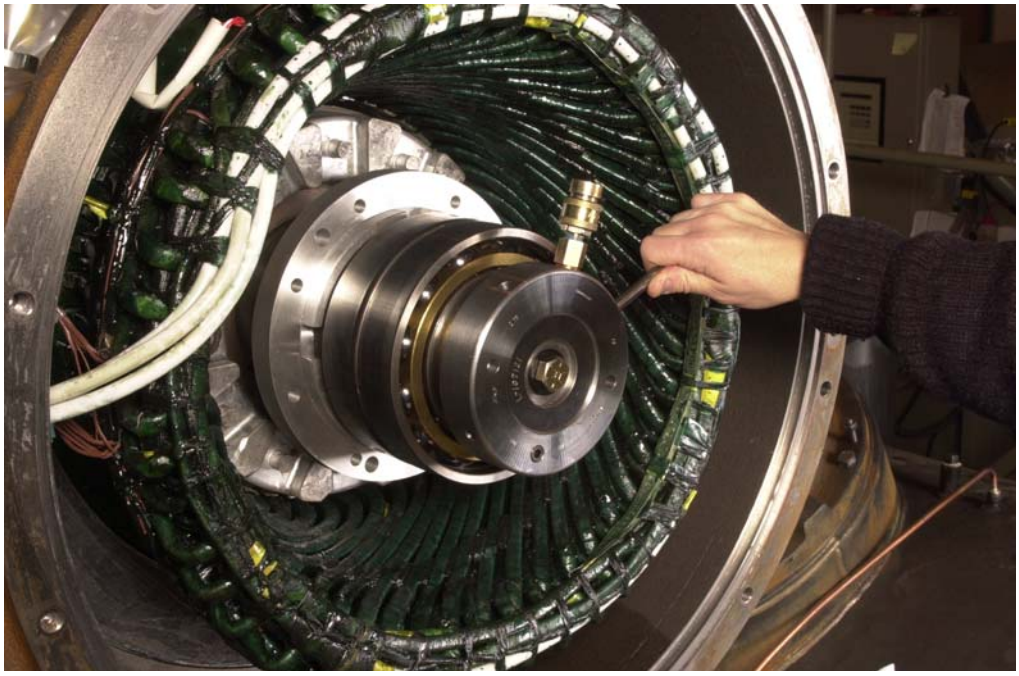


Figure 12: Bleed the assembly and then pressurize the assembly nut to 2700 to 2800 psi

Figure 13: Extended Capacity center race retention

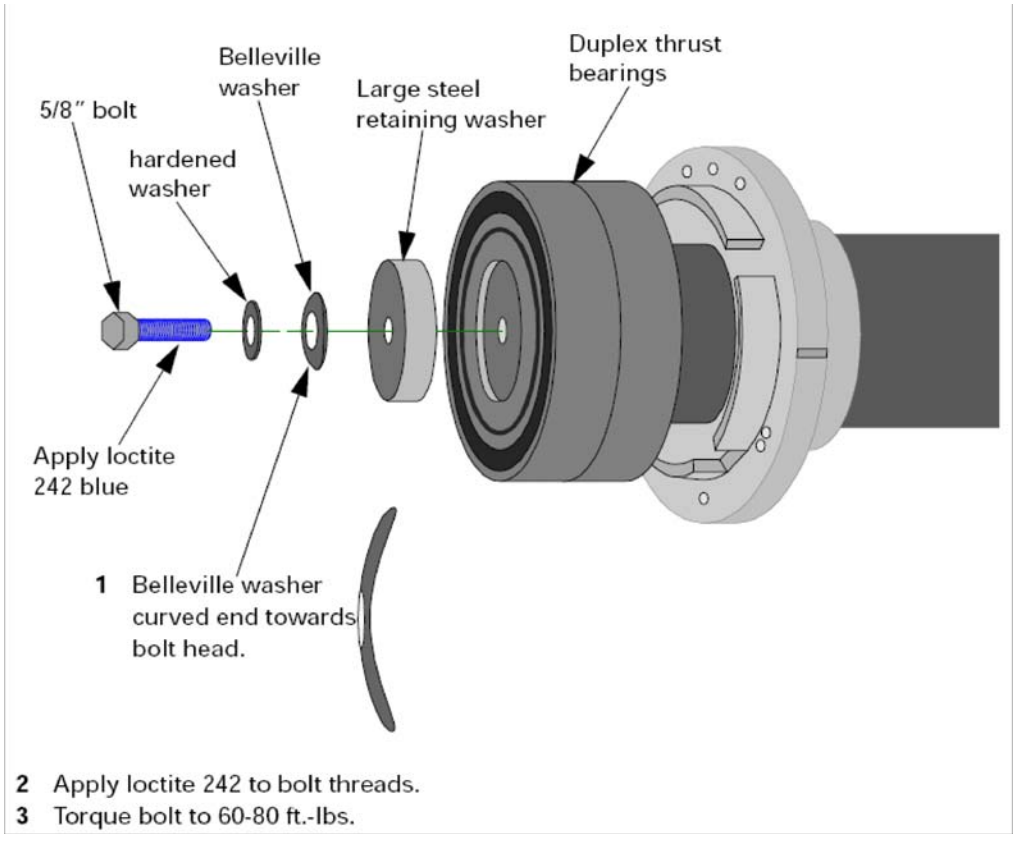


Figure 14: Install all-thread into the bearing seal (Note, on extended capacity chillers the gasket will NOT be present)

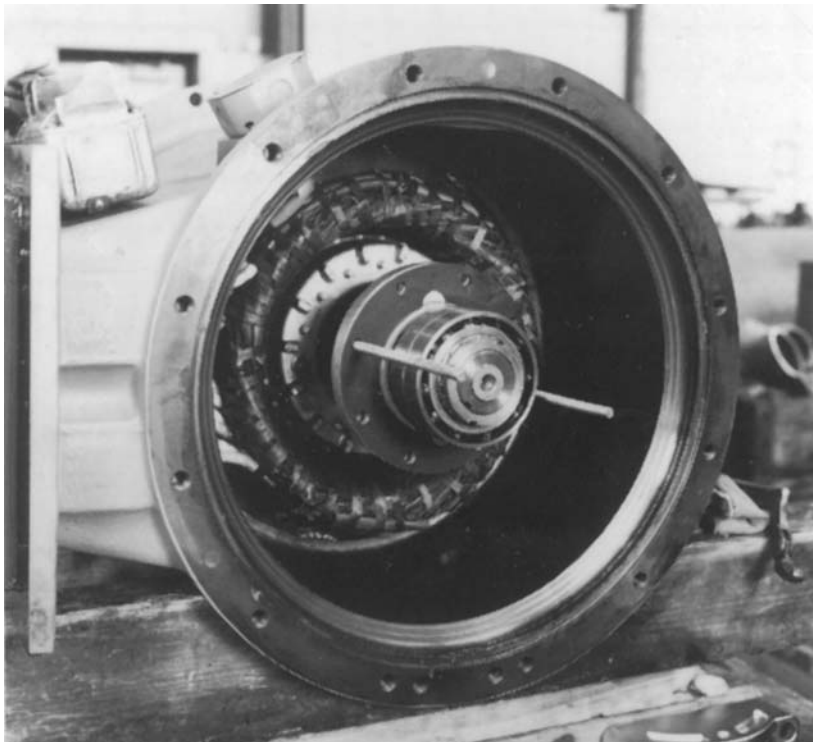


Figure 15: Seating the bearing seal into the bearing bracket

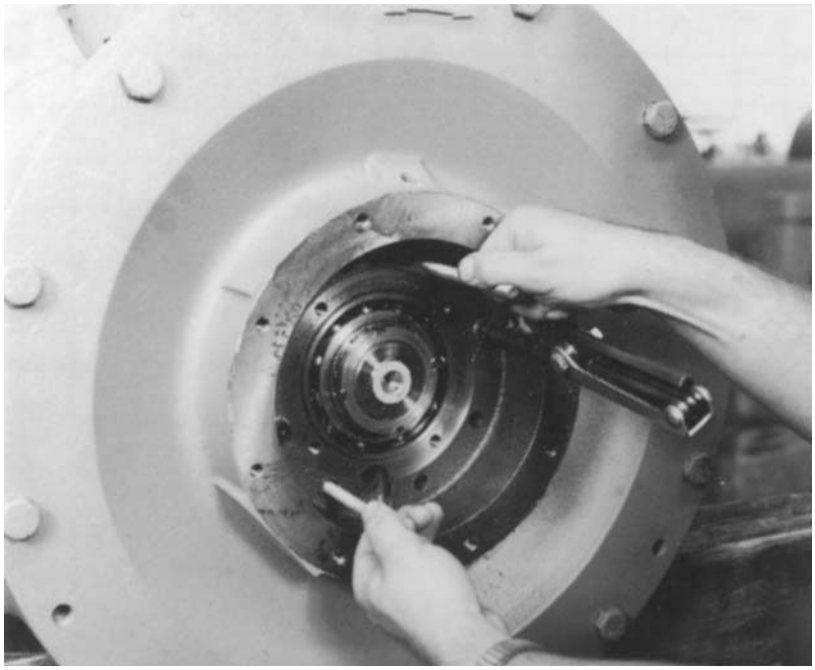
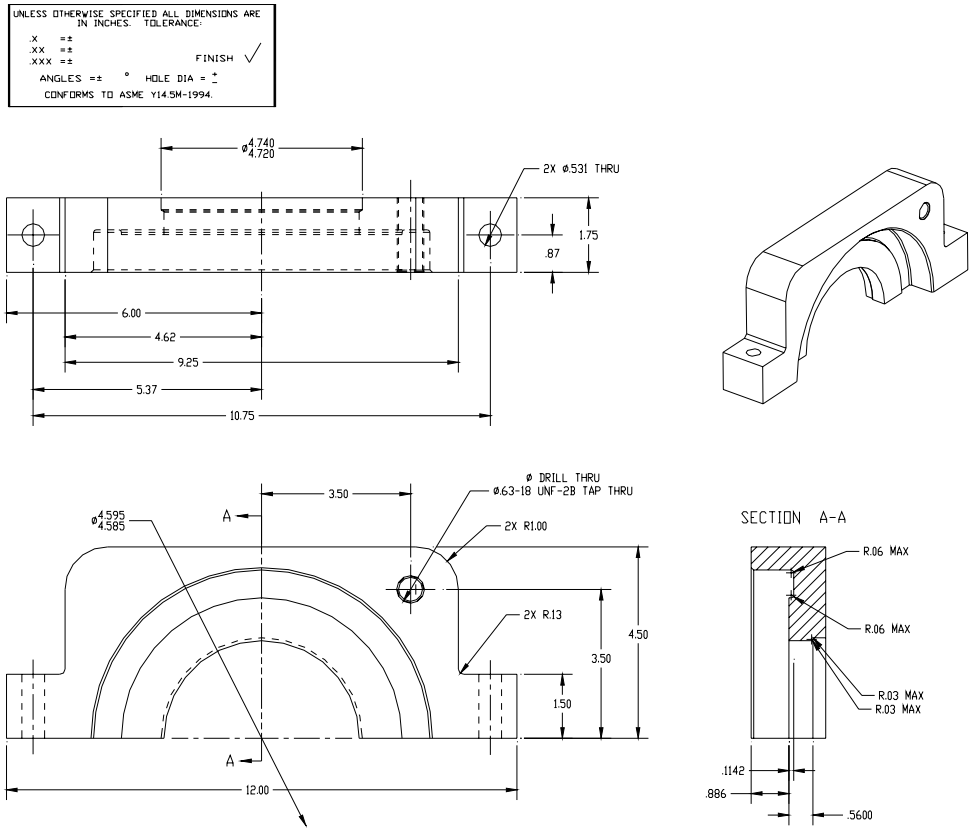


Figure 16: Photo of crush ring showing the laser-etched four-digit number

Figure 17: Bearing Removal Tool



Questions

For general questions contact the Product Technical Service department in La Crosse at 608-787-3943 or e-mail at TechService@Trane.com

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