INSTRUCTION MANUAL
AND
PARTS LIST FOR

SERIES 8L-630J AND 630M

WARNING

This Instruction Manual and General Instructions Manual, SRM00046, should be read thoroughly prior to pump installation, operation or maintenance of Pump.

SRM00032	**Rev. 03 (20-0287)**	**December 2020**

The instructions given herein cover generally the operation and maintenance of subject equipment. Should any questions arise which may not be answered specifically by these instruction, they should be referred to the Imo Pump for further detailed information and technical assistance.

This manual cannot possibly cover every situation connected with the operation, adjustment, inspection, test, overhaul and maintenance of the equipment furnished. Every effort is made to prepare the text of the manual so that engineering and design data is transformed into the most easily understood wording. Imo Pump, in furnishing this equipment and this manual, must presume that the operating and maintenance personal assigned thereto have sufficient technical knowledge and experience to apply sound safety and operational practices which may not be other- wise covered herein.

In application where the Imo Pump furnished equipment is to be integrated with a process or other machinery, these instructions should be thoroughly reviewed to determine the proper integration of the equipment into the overall plant operational procedures.

FOREWORD

This instruction manual covers the 8L-630J and 8L-630M series Imo pumps. The 8L-630 series has been designed to meet the requirements of crude oil and high pressure applications. Because of the large number of operating conditions, it is necessary to have different constructions and material combinations in order to provide the proper pump to match specific job specifications. The model of each particular pump is identified on the pump nameplate.

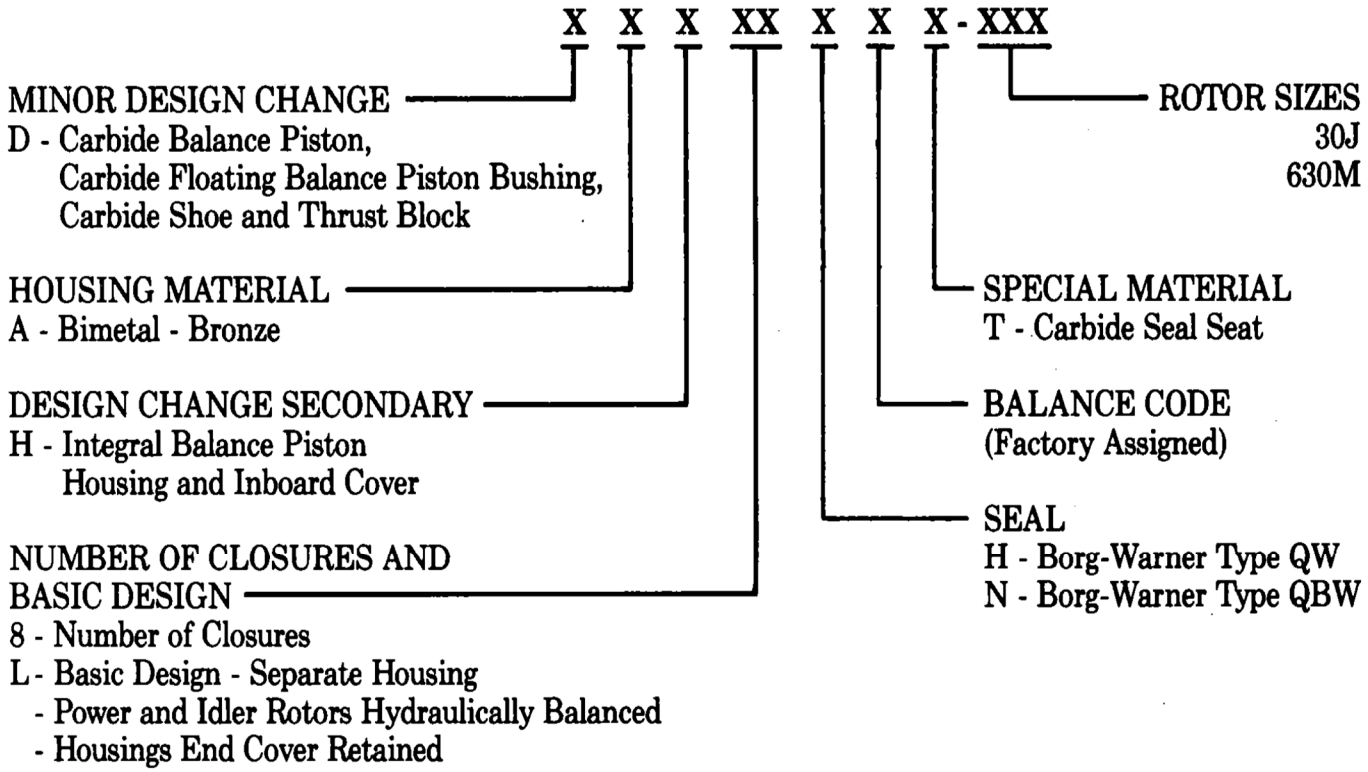


FIGURE 1. Definitions of Model Designator of 8L-630 Series Pumps

ORDERING INSTRUCTIONS

All correspondence pertaining to renewal parts for 8L-630 series pumps must refer to this instruction manual number and should be addressed to the nearest Imo Pump representative listed in Manual CA-I.

The following directions should be followed for renewal part orders:

1. Give the number of this instruction manual.

2. Give the pump type and serial number of the pump for which part(s) is ordered.

3. Give part(s) name and item number(s) from this manual when identifying part(s) ordered.

STRUCTURAL LIMITS

Operating conditions such as speed, fluid viscosity, inlet pressure, temperature, filtration, duty cycle, mounting, drive type, etc. are interrelated. Due to variable conditions, specific application limitations may vary from structural limitations. This equipment must not be operated without verification that operating requirements are within published capabilities as.shown in the appropriate pump brochures (available from local Imo Pump offices and representatives listed in Manual CA-I).

Under no circumstances are the following structural design limits to be exceeded.

DISCHARGE PRESSURE - 1800 PSIG Standard Pump

INLET PRESSURE- 150 PSIG Maximum (Modification to some basic design pumps allows inlet pressures up to 400 PSIG.)

SPEED LIMITS - 1200 RPM Maximum

VISCOSITY - 100 SSU Minimum. Pump brochure should be consulted for each pump type minimum viscosity with relation to specific speed and pressure.

TEMPERATURE - 250 degrees F (Standard Pump)

ROTATION - Clockwise rotation only, facing pump shaft

DRIVE - Direct only

MOUNTING - Foot mounted

DESCRIPTION

Balance

By design, all rotor sets are hydraulically balanced in the radial direction. Idler rotors (19 and 23) are balanced axially by internally transferring high pressure oil from the pump discharge end to the pump inlet end (thrust end). The high pressure oil is transferred to the pump inlet end through bores that have been gun drilled axially through the idler rotors (19 and 23).

In order to provide axial hydraulic balance on the power rotor (11), a balance piston (17) is provided. The size of the balance piston (17) and the balance piston bushing (18) in which it rotates is selected to produce minimum axial thrust loads on the anti-friction ball bearings (7) under the conditions of operation that are "normal" for the application.

WARNING

When a unit is purchased, if no inlet conditions are specified, the power rotor will be provided with standard balance. If a unit with standard balance is installed on an operation with high inlet pressure, both the ball bearings (7) and the mechanical seal (51) may be over- loaded. If the unit has been fitted to operate with high inlet pressure, operation on low inlet pressure can over- load the ball bearings. Do not change inlet pressure radically without approval from IMO Pump Division.

Ball Bearing

8L-630 pumps are equipped with duplex angular contact ball bearings lubricated with Mobil SHC 32 or equivalent grease. Normal grease interval is every 4500 hours of pump operation. Grease quantity is about 2-2½ (12.5 oz.) tubes for first time bearing is re-greased and about 2 (12.5 oz.) tubes each time thereafter for bearing operating temperatures up to 180 °F. For every 15 °F rise in temperature above 180 °F, re-greasing interval should be cut in half. To re-grease ball bearings, remove pipe plug from vented reducer bushing located several inches closer to coupling end of drive shaft. Insert grease gun nozzle onto grease fitting and pump grease into fitting until at least a couple of ounces of grease emerges from fitting or lip seal. Wipe off excess grease. Run pump at normal operating conditions for at least 30 minutes to allow any excess grease to purge from vented reducer bushing or lip seal. Replace pipe plug to vented reducer bushing. During purging process, bearing temperature may increase beyond normal values.

CAUTION

Any questions regarding re-greasing cycles should be directed to IMO Pump Division.

Mechanical Seals

8L-630 series pumps are equipped with a positive drive mechanical seal which can be supplied with balanced or unbalanced characteristics, depending upon suction pressure. Refer to mechanical seal drawing, figure 3, for material construction.

When ordering new mechanical seals, it is important that the pump designator and/or serial number be given. When pump designator and/or serial number cannot be ascertained, operating conditions should be listed so that proper mechanical seal can be supplied.

INSTALLATION

8L-630 series pumps are designed for horizontal foot mounting. The pump case (32) has four feet. The two inboard feet are drilled to receive two tie-down or mounting bolts and the rear or outboard feet are drilled to receive one bolt each. The double bolting on the inboard end is designed to provide rigid location of the front end of the pump. The length of the pump and the normal variations in temperature require that allowance be made for thermal growth. The rigidity of the pump case (32) is usually several times that of the bedplate. If relative movement cannot take place between the outboard feet and the base, thermal movement can distort the bedplate and produce misalignment between pump and driver.

Inlet Position

The inlet head (27) may be positioned to permit fluid to enter the pump from the top or either side. The inlet head may be rotated in 90 degree increments.

To change position of inlet head (27), disconnect bleed tube (54) by loosening flareless connection (55).

Install an eyebolt in %-inch tapped bore in cover (66) to aid in support of cover during removal. (Approximate weight of cover is 177 pounds.) Remove bolts (62) and cover (66) using caution to avoid damage to 0-ring (30).

Place a sling or lifting hooks on inlet head (27). (Approximate weight of inlet head is 539 pounds.) Remove ferry capscrews (53). Break inlet head (27) free from case (32).

Rotate inlet head (27) so that inlet flange is in desired position, using care to avoid damage to 0-ring (30). Iinstall ferry capscrews (53) and tighten capscrews to a torque value of 700 lbs. ft. (± 35 lbs. ft.).

Remove plug (59) which is now on the underside of inlet head (27) and aligned with bleed tube (54). Remove nipple (57) which will also remove tee (58), plug (59), bushing (56) and flareless connection (55). Install nipple assembly (57) using either pipe compound or teflon tape on threads to ensure an airtight seal. Connect bleed tube (54) using flareless connection (55). Install plug (59) in tapped opening from which nipple (57) assembly was removed, using thread compound or teflon tape to ensure airtight seal.

Install cover (66), ensuring that 0-ring (30) is properly seated and not damaged. Install bolts (62) and tighten bolts to a torque value of 300 lbs. ft. (± 15 lbs. ft.).

MAINTENANCE

Servicing Mechanical Seal and/or Ball Bearings

1. Close inlet and outlet valves. Vent pressure from pump. Remove spacer member from coupling.

2. Install two (2) bolts or studs in bolt holes of coupling hub. Position a metal bar approximately 30 inches long between the two studs or bolts, and brace the opposite end of bar against pump bedplate to lock power rotor in place to prevent rotation when loosening bearing locknut (46) and checknut (47).

3. Using a spanner wrench, loosen bearing locknut (46) and checknut (47). Remove metal locking bar and bolts or studs which were installed in coupling hub. Loosen setscrew (45) and remove checknut (44) from power rotor (11) shaft. Remove coupling hub from pump shaft. Remove key (10) from power rotor (11) shaft.

NOTE

8L-630 series pumps are normally installed with a spacer type coupling between the pump and driver. Removal of coupling spacer provides sufficient space for removal of coupling hub and for servicing of ball bearings and mechanical seal.

4. Remove bearing locknut (46), bearing lockwasher (43) and checknut (47) from power rotor shaft.

5. Remove bolts (9) and bearing retainer (48).

6. Cut two 3/4-10 continuous thread studs long enough to thread 13/8 inches into inboard cover (40) and extend one inch past end of power rotor (11) shaft. Install studs in inboard cover located 180 degrees apart. Thread a nut on each stud to lock stud in position.

7. Pull power rotor (11) assembly forward from pump until seat adapter (15) extends from pump. Refer to figure 2 and cut a 1 1/2-inch thick metal plate approximately 13/8 inches long and 2 3/4 inches wide. Drill two 13/16-inch holes, 9/2 inches apart in the metal plate. Place drilled flat metal plate over end of power rotor (11) shaft with studs fitting in drilled holes. Install nuts on ends of both studs.

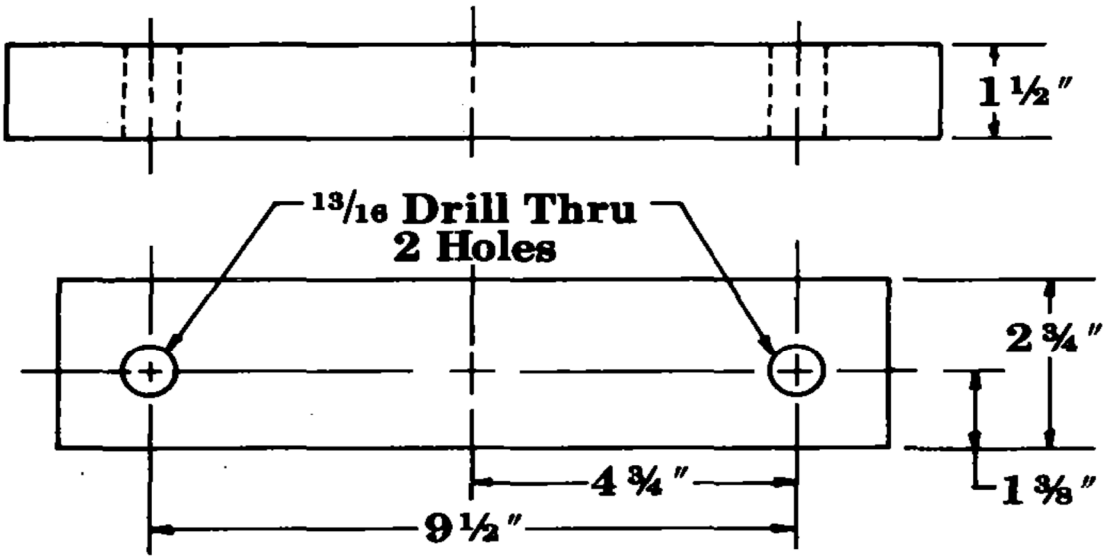


FIGURE 2. Bearing Puller

8. Slide key stock or other strong steel plate in at least three or four locations behind seat adapter subassembly (15) to ensure equal pressure applied to ball bearings (7) during removal.

9. Tighten nuts installed on both studs evenly to press power rotor (11) shaft back into pump and through ball bearings (7) to remove both bearings. Spacer (49) with 0-ring (12) and lip seal (8) and outer spacer (13) will be unseated as ball bearings (7) are removed. Ensure that spacers (49 and 13) and lip seal (8) are not permitted to drop as they are unseated. After power rotor (11) is pressed through both ball bearings, remove metal plate. Remove key stock or steel plate from seat adapter subassembly (15). Remove studs from bores of inboard cover (40).

10. Remove 0-ring (12) from groove of spacer (49) and remove lip seal (8).

NOTE

If mechanical seal (51) does not require replacement, proceed to step 23. **If** mechanical seal (51) does require replacement, proceed as follows:

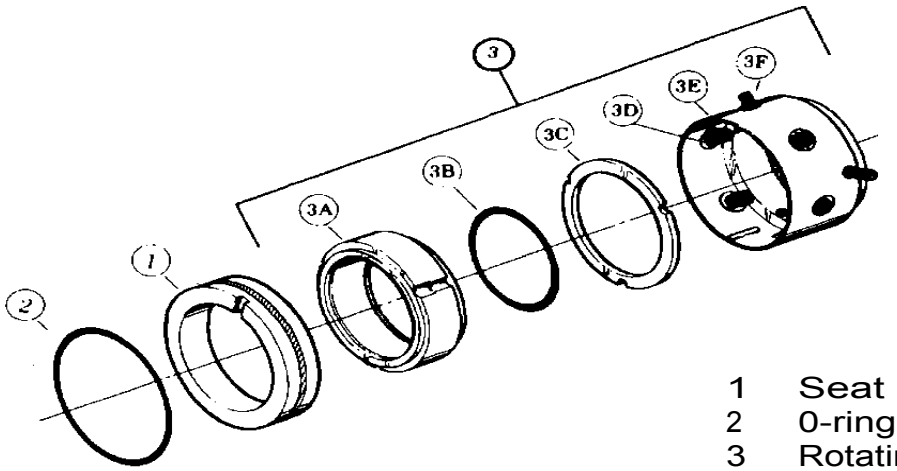
11. Pull power rotor (11) assembly forward from pump to expose mechanical seal (51) assembly which is mounted on shaft sleeve (16).

12. Remove inner spacer (13).

13. Remove shaft sleeve (16) from power rotor (11) shaft. Removal of shaft sleeve (16) will also remove mechanical seal (51), seat adapter subassembly (15), lip seal (6), 0-rings (38), seat retainer (5), capscrews (4), and spiral ring (14).

14. Remove spiral ring (14) from groove of shaft sleeve (16).

15. Remove seat adapter subassembly (15) with 0-rings (38) and lip seal (6), seat retainer (5), capscrews (4) and mechanical seal stationary seat (1, figure 3) with 0-ring (2, figure 3) from shaft sleeve (16). Remove capscrews (4) and seat retainer (5) from seat adapter subassembly (15). Remove mechanical seal stationary seat (1, figure 3) with 0-ring (2, figure 3) from seat adapter subassembly (15). Remove 0-rings (38) from grooves of seat adapter subassembly (15). Remove lip seal (6) from counterbore of seat adapter subassembly (15).



1 Seat
2 0-ring
3 Rotating Assembly
3A Rotating Face
38 Rotating Face 0-ring
3C Retaining Ring
3D Spring
3E Spring Holder
3F Setscrew

FIGURE 3. Mechanical Seal

16. Loosen setscrews (3F, figure 3) and slide mechanical seal (51) rotating assembly (3, figure 3) from shaft sleeve (16).

17. Remove 0-ring (36) from groove of power rotor (11) shaft.

18. Inspect power rotor (11) shaft and shaft sleeve (16) and remove any nicks or burrs which are present. Polish power rotor shaft to remove any rust or oxidants that may be present under shaft sleeve. The manufacturer recommends replacement of lip seals (6 and 8), ball bearings (7), mechanical seal (51), and 0-rings (12, 36 and 38) when these parts are disturbed from their original installed position. All parts should be coated with light lubricating oil to assist in assembly.

19. Install 0-ring (36) in groove of power rotor (11) shaft.

20. Install rotating assembly (3, figure 3) of mechanical seal (51) on shaft sleeve (16) with spring holder (3E, figure 3) positioned against shoulder of shaft sleeve (16). Tighten setscrews (3F, figure 3). Install 0-ring (2, figure 3) on stationary seat (1, figure 3). Install assembled stationary seat (1, figure 3) on seat adapter subassembly, ensuring that lock pin engages slot of stationary seat. Install seat retainer (5) using capscrews (4). Tighten capscrews (4) to a torque value of 30 lbs. inch (± 2 lbs. inch). Install 0-rings (38) in grooves of seat adapter subassembly (15). Install lip seal (6) in counterbore of seat adapter subassembly (15). Install assembled seat adapter subassembly (15) on shaft sleeve (16) next to installed mechanical seal rotating assembly, using caution to avoid damage to stationary seat and 0-ring (1and 2, figure 3) and 0-rings (38).

21. Compress mechanical seal enough to expose spiral ring groove and install spiral ring (14) in shaft sleeve (16) to lock mechanical seal (51) assembly into place.

22. Install assembled shaft sleeve (16) on power rotor (11) shaft until it rests against balance piston (17). Use caution when installing shaft sleeve (16) to avoid damage to installed 0-ring (36).

23. Install inner spacer (13) on power rotor (11) shaft.

24. Slide ball bearings (7) on power rotor (11) shaft.

25. Slide outer spacer (13) on power rotor (11) shaft.

26. Install 0-ring (12) in groove of spacer (49). Install lip seal (8) on spacer (49), and slide spacer (49) on power rotor (11) shaft.

27. Slide checknut (47) on power rotor (11) shaft. Thread checkout (47) onto power rotor (11) shaft. As checknut is tightened onto power rotor, it will push ball bearings (7) and outer spacer (13) into proper position on power rotor shaft.

28. Slide lock washer (43) and bearing locknut (46) on power rotor (11) shaft.

29. Install assembled power rotor (11) into pump, ensuring that each part is centered as it enters inboard cover (40) and is properly seated.

30. Install bearing retainer (48) using bolts (9). Tighten bolts (9) to a torque value of 105lbs. ft. (± 10 lbs. ft.).

31. Install key (10) and coupling hub.

32. Using the power rotor locking device as described in step 2, lock power rotor in place and tighten bearing locknut (46) on power rotor (11) shaft. Tighten checknut (47) to a torque value of 600 lbs. (± 20 lbs. ft.). Remove locking bar and studs or bolts from coupling hub.

33. Install checknut (44) and setscrew (45). Install coupling spacer.

Pump Disassembly

Due to size and weight of individual parts of the pump, it is recommended that a crane and/or block and tackle be available when complete disassembly of pump is required.

1. Close inlet and outlet valves. Vent pressure from pump and drain pump prior to disconnecting inlet and outlet piping. Remove plugs (59) to drain pump fluid from inlet end. Fluid in the outlet end of pump can be pumped to inlet chamber by rotating pump power rotor counterclockwise. Remove bleed tube (54) by loosening flareless connections (37 and 55).

NOTE

8L-630 series pumps incorporate highly finished precision parts which must be handled carefully to avoid damage to critical machined surfaces. Parts should be tagged for identification and exact position so that all parts are properly installed during assembly.

2. Remove coupling spacer. Disconnect inlet and outlet flanges. Remove pump from bedplate.

WARNING

Approximate weight of pump is 6351pounds.

3. Install an eyebolt in %-inch tapped bore of cover (66). (Weight of cover (66) is approximately 177 pounds.) Support weight of cover using installed eyebolt, and remove bolts (62) and cover (66). Remove 0-ring (30) from groove of cover (66).

4. Remove nuts (61), lockwashers (60) and washers (70) from studs (63). Remove thrust plate (65) with installed thrust blocks (25) and spacer (26) from housing (28). (Combined weight of plate (65) and spacer (26) is approximately 114 pounds.) Remove studs (63). Use a standard cleaning solvent, and remove Loctite compound from studs (63).

NOTE

Thrust assembly [thrust plate (65), thrust blocks (25), and spacer (26)] should not be disassembled unless thrust blocks (25) must be replaced.

5. If thrust blocks require replacement, remove capscrews (71) and washers (69), and remove spacer (26) from thrust plate (65). Remove capscrews (24) and thrust blocks (25) from thrust plate (65).

6. Remove idler rotor subassemblies (23) from bores of rotor housings (28) by rotating idlers in a counterclockwise direction. Rotate power rotor (11) in a counterclockwise direction to remove idler rotors (19) from outboard end of rotor housings (28). Use extreme caution to avoid dropping idler rotors as they emerge from housings (28). (Approximate weight of each idler rotor subassembly (23) is 56 pounds and of each idler rotor (19) is 40 pounds.)

7. Loosen setscrew (45) and remove checkout (44). Remove coupling hub and key (10) from power rotor(11) shaft.

8. Remove bolts (9) and bearing retainer (48) from inboard cover (40).

9. Grasp power rotor (11) shaft and pull assembled power rotor from pump.

CAUTION

Assembled power rotor weighs approximately 465 pounds and should be supported by slings during removal from pump.

NOTE

Removal of power rotor (11) will also remove bearing locknut (46), bearing lock washer (43), checkout (47), spacer (49), 0-ring (12), lip seal (8), spacers (13), ball bearings (7), lip seal (6), spiral ring (14), seat adapter subassembly (15), seat retainer (5), capscrews (4),0-rings (38), mechanical seal (51), shaft sleeve (16),0-ring (36), balance piston (17), and 0-ring (35).

10. For disassembly of power rotor (11), support power rotor in lead lined jaws of a bench vice. Use extreme caution in handling power rotor (11) to avoid damage to machined surface. Avoid dropping of any parts as power rotor is disassembled.

11. Using a spanner wrench, remove bearing locknut (46) and bearing lockwasher (43). Remove checknut (47).

12. Remove spacer (49) with 0-ring (12) and lip seal (8) and outer spacer (13). Remove 0-ring (12) from groove of spacer (49). Remove lip seal (8) from counterbore of spacer (49).

13. Using a bearing puller, remove ball bearings (7).

14. Perform procedures outlined in stops 12 through 17 of Servicing Mechanical Seal and/or Ball Bearings.

15. Remove balance piston (17). Remove 0-ring (35) from groove of power rotor (11) shaft.

16. Using eyebolt (29), support weight of inlet head (27). (Weight of inlet head is approximately 540 pounds.) Remove ferry capscrews (53) and inlet head (27) from pump case (32). Remove 0-ring (30) from groove of inlet head (27).

17. Using eyebolts (29), support weight of inboard cover (40). (Approximate weight of assembled inboard cover is 555 pounds.) Remove ferry capscsrews (50). Using jacking bolts provided, remove assembled inboard cover (40). Removal of inboard cover (40) also removes 0-ring (3), balance piston bushing (18), stop subassembly (34), and capscrews (52).

18. Remove 0-ring (3) from groove of inboard cover (40). Remove capscrews (52) and stop subassembly (34) from inboard cover (40). Remove balance piston bushing (18) from inboard cover (40).

19. Remove stop pin plug (22) with 0-ring (21). Insert a 3/8-16 inch bolt into threaded bore of stop pin (20) and remove stop pin (20).

CAUTION

Housings (28) are bolted together and must be removed as a single unit. Combined weight of housings (28) is approximately 1485 pounds. Use slings to support weight of housings as they emerge from pump case, ensuring that area where housings are bolted together is supported to avoid damage to either housing.

20. Refer to figure 4 (Housing Tool) and cut a 11f2-inch thick metal plate 14 inches long and 2% inches wide. Drill two 1 1/s-inch holes, 10 3.4 inches apart in the metal plate for fastening to housing flange. Drill a 1%2-inch hole in the center of the metal plate. Tap center hole to 1 1.4-7 for use of threaded rod. Bolt housing tool to outlet end of housing (28).

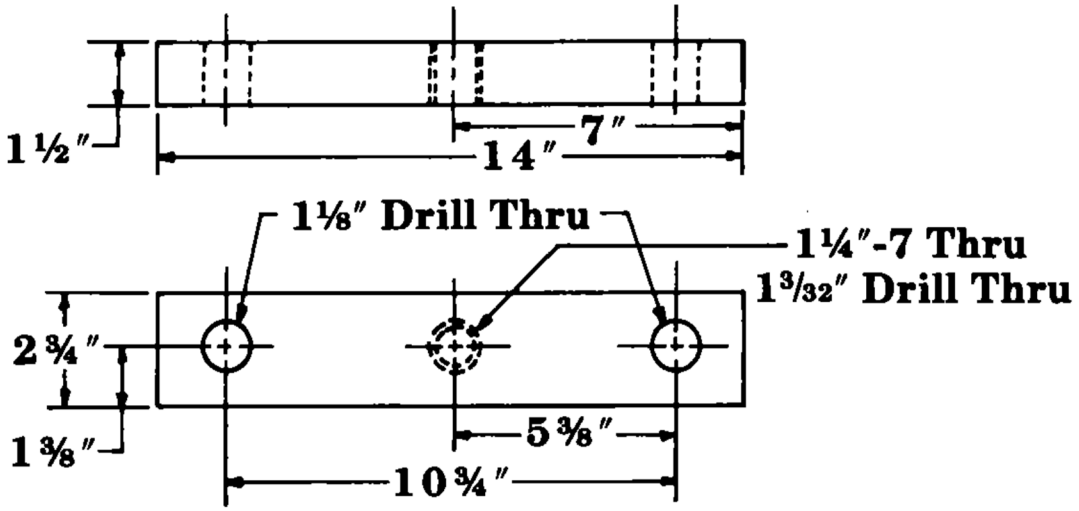


FIGURE 4. Housing Tool

21. Cut a P-4-7 continuous thread rod 43 inches long. Thread rod through center bore housing tool. Install 1 1/4-7 nut on threaded rod to outside (outlet end) of housing tool and tighten.

22. Refer to figure 5 (Case Tool) and cut a 11f2-inch thick metal plate 21 inches long and 2 3.4 inches wide. Drill two 1%-inch holes, 18 inches apart in the metal plate for fastening to case flange. Drill a 1%-inch hole in the center of the metal plate. Install a 1 1.4-7 nut on threaded rod so that nut will be on inside (inlet end) of case tool when installed. Bolt case tool to outlet end of pump case (32) with threaded rod extending through center bore.

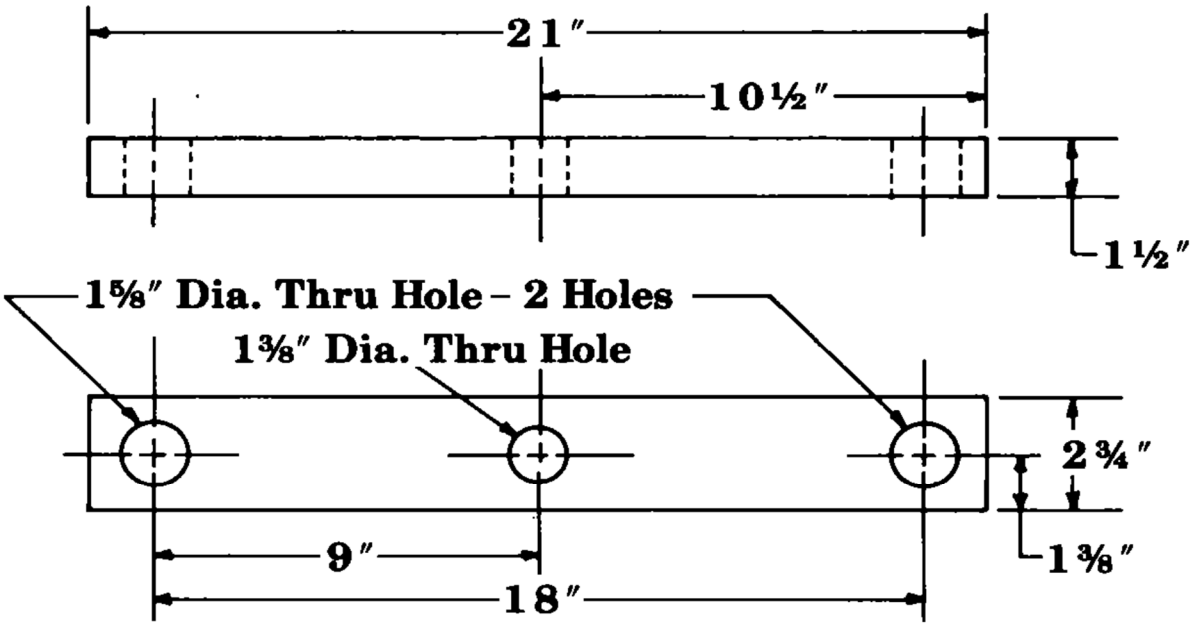


FIGURE 5. Case Tool

23. Tighten nut on inside of case tool (located toward inlet end) in order to thread rod through case tool, pushing housings (28) from inlet end of case (32). Ensure that slings are used to prevent housings from dropping as they emerge from pump case.

NOTE

If housings are to be separated, remove nuts and rod from case tool and housing tool. If housings are being replaced, remove housing tool from outlet end of housing (28). If housings are not being replaced, housing tool and case tool should not be removed in order to use threaded rod to install (pull) housing assembly into pump case during pump assembly.

24. If necessary, remove nuts (2) and studs (1) to separate housings (28). Use a standard cleaning solvent, and remove Loctite compound from studs (1) and bores of housings (28). Remove vent pins (31) from bores of housings (28). Remove 0-ring (30) from groove of outlet housing (28).

Pump Assembly

Prior to assembly of the pump, all parts should be cleaned and inspected for nicks and burrs. All worn or damaged parts should be replaced. Imo Pump recommends automatic replacement of 0-rings (3, 12, 21, 30,35, 36, 38), lip seals (6, 8), ball bearings (7), mechanical seal (51) and spiral ring (14) when these parts are disturbed from their previous installed position. Wipe all parts with light lubricating oil prior to assembly. Do not permit removed parts to stand with machined surfaces exposed for extended periods of time. Check all oil passages to ensure that they are clean and free of any debris. Rotate power rotor frequently by hand during assembly to ensure freedom of rotation.

1. If housings (28) were separated during pump disassembly, install vent pins (31) in bores of outlet housing (28). Using slings to support each housing (approximately 742 pounds each), align and join housings, ensuring that installed vent pins engage slots of inlet housing. Coat studs (1) with Loctite 242 compound and install studs (1) in housing (28) bores to lock housings. Install nuts (2) on studs (1), and tighten nuts (2) to a torque value of 100 lbs. inch (± 10 lbs. inch). Install 0-ring (30) in groove of outlet housing (28).

2. Using slings for support, position housings (28) assembly (approximately 1485 pounds) for installation into pump case (32) from inlet end of case. Using housing tool and case tool (figures 4 and 5) and threaded rod installed in steps 20 thru 22 of Pump Disassembly, tighten nut on outside (outlet end) of case tool to install (pull) housings (28) into pump case (32). Use extreme caution when installing housings to avoid damage to 0-ring (30) and to ensure that housings remain joined by vent pins and studs. Position housings so that slot in housing (28) flange aligns with stop pin (20) bore in case (32).

3. Install stop pin (20) in bore of case (32). Install 0-ring (21) and plug (22).

4. Remove nuts, threaded rod, housing tool and case tool.

5. Install bushing (18) on inboard cover (40). Install stop subassembly (34) on inboard cover (40), ensuring that spring pin engages slot in installed bushing (18). Install capscrews (52), and tighten capscrews to a torque value of 30 lbs. ft. (± 2 lbs. ft.). Install 0-ring (3) in groove of inboard cover.

6. Using eyebolts (29) to support weight of assembled inboard cover (40), install inboard cover (40) on case (32), using caution to avoid damage to 0-ring (3) and ensuring that stop subassembly is properly positioned with idler rotor bores of housing (28). Install ferry capscrews (50), and tighten capscrews to a torque value of 1600 lbs. ft. (± 15 lbs. ft.).

7. Install 0-ring (35) in groove of power rotor (11) shaft. Install balance piston (17) on power rotor (11) shaft using caution to avoid damage to installed 0-ring (35).

8. Support power rotor (11) in lead lined jaws of bench vise, using extreme caution to avoid damage to power rotor. Assemble power rotor (11) as outlined in steps 19 through 28 of Servicing Mechanical Seal and/or Ball Bearing.

NOTE

If oven is available, ball bearings (7) can be heated to approximately 200 degrees F for ease of installation on power rotor (11) shaft.

9. Tighten checknut (47) to a torque value of 600 lbs. ft. (± 20 lbs. ft.). Tighten bearing locknut (46) with lockwasher (43) on power rotor (11) shaft to a torque value of 12 lbs. ft. (± 2 lbs. ft.).

10. Install assembled power rotor (11) into pump, ensuring that each part is centered as it enters inboard cover (40) and is properly seated.

11. Install bearing retainer (48) using bolts (9). Tighten bolts (9) to a torque value of 125 lbs. ft. (± 5 lbs. ft.).

12. Install idler rotors (19), tapered end first, into inlet end of housings (28). Mesh threads of idler rotors (19) with installed power rotor (11) and rotate power rotor (11) by hand in a clockwise direction to draw idlers into proper position. Install idler rotor subassemblies (23) into inlet end of rotor housings (28) with shoes positioned toward inlet end. Mesh threads of idler rotors (23) with threads of power rotor (11), and rotate power rotor (11) by hand in a clockwise direction to draw idlers into proper position.

13. Install 0-ring (30) in groove of inlet head (27). Using eyebolt (29) for support, install inlet head (27) on case (32). (Approximate weight of inlet head is 540 pounds.) Use caution during installation of inlet head to avoid damage to 0-ring (30). Install ferry capscrews (53), and tighten capscrews (53) to a torque value of 700 lbs. ft. (± 35 lbs. ft.).

14. **If** thrust assembly was disassembled for replacement of thrust blocks (25) during disassembly of pump, install thrust blocks (25) on thrust plate (65) using capscrews (24). Tighten capscrews (24) to a torque value of 130 lbs. inch (± 10 lbs. inch). Install assembled thrust plate (65) on spacer (26) using washers (69) and capscrews (71). Install thrust assembly [thrust plate (65), thrust blocks (25), and spacer (26)] on housing (28) using studs (63), coated with Loctite 242 compound, and washers (70), lockwashers (60) and nuts (61). Tighten nuts (61) to a torque value of 300 lbs. ft. (± 15 lbs. ft.).

15. Install 0-ring (30) in groove of cover (66). Install an eyebolt in Vs-inch tapped bore of cover (66). Support weight of cover (66) (approximately 177 pounds) using eyebolt, and install cover (66) on inlet head (27) using·bolts (62). Use caution during installation of cover (66) to avoid damage to installed 0-ring (30). Tighten bolts (62) to a torque value of 300 lbs. ft. (± 15 lbs. ft.).

16. Install bleed tube (54) using flareless connections (55 and 37). **If** removed, install plugs (59) in inlet head (27).

17. Install key (10) in slot of power rotor (11) shaft. Mount pump hub of coupling. Lock coupling hub to power rotor (11) shaft by installing checknut (44) and setscrew (45).

18. Mount assembled pump (approximately 6351 pounds) on bedplate. Verify pump and driver alignment as outlined in Manual CA-1.

Figure 4 Superbolt Instructions

SUPERBOLT®

Installation and Removal Instructions

(excludes piston end, crosshead, mill motor & bearing lock nuts)

Air Impact Tool Selection 90 psi air pressure *(Call Superbolt for additional help with air tool selection)*

NOTE: *The jackbolt torque actually achieved by an air impact wrench is usually only 30 - 50% of its rated output. For minimum hand work, use an air impact with an output of 110% - 120% target torque. For maximum power, use the largest air line fitting.*

Up to 70 ft-lbs: For 15 - 35 ft-lbs use a right angle ratchet or light duty 3/8" impact. For 35 - 70 ft-lbs use a heavy duty 3/8" impact.
70 - 100 ft-lbs: Use a light duty 1/2" impact at a reduced pressure or setting. (Be careful not to overtighten! Calibrate the impact before starting.)
100 - 170 ft-lbs: For 100 - 130 ft-lbs use a light duty 1/2" impact. For 130 - 170 ft-lbs use a heavy duty 1/2" impact.
170 - 200 ft-lbs: Use a light duty 3/4" impact on low setting. Some heavy duty 1/2" impacts will also reach this range.
Over 200 ft-lbs: For 200 - 300 ft-lbs, use a light to medium duty 3/4" impact. Over 300 ft-lbs, use a heavy duty 3/4" impact.

Calibrating an air impact wrench: Tighten one jackbolt until the socket rotation stops and check the jackbolt with a torque wrench. The torque required to move the jackbolt further is the output of the impact as measured on Superbolt tensioners.

Helpful Tips

Prior to Tightening:

1) Check threads of main stud: If possible, verify that the tensioners spin on prior to the installation date. If a tensioner is tight or will not thread on, try using lapping compound on the main thread and work the tensioner in a back and forth motion making small advances when the thread loosens up. If necessary, chase the studs with a die.

2) Use of spacers: Tensioners should be positioned at the ends of the studs to minimize exposed threads and facilitate easy access to the jackbolts. A spacer (or stacked washers) can be used beneath the special hardened washer to accomplish this. A spacer will also "step over" a damaged area on a stud where years of bolting have deformed the first few threads.

3) Back the tensioner off before tightening to provide 1/16" to 1/8" gap: The additional jackbolt extension provides easy access for oiling the jackbolt tips prior to removal. This is especially beneficial for oiling when the tensioners are inverted. Note: There may be insufficient jackbolt stroke to allow this step when tensioning exceptionally long bolts or tie rods, or when closing a gap between flanges.

4) For spinning the tensioner on and off the stud: Custom "sockets" which grip the tensioner are available. Also, two deep well sockets inserted over two jackbolt hex's at 180° apart can serve as "handles" for spinning the tensioners on and off the studs.

For Tightening:

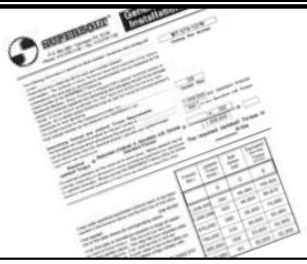
5) To improve efficiency when using impacts: Don't wait for the socket to stall completely on a specific jackbolt before advancing to the next jackbolt. It is faster, overall, to move quickly between jackbolts.

6) Overshooting the target torque: You may want to use 110 - 120% of the target torque for Step 3, Step 4, and for 1-2 rounds of Step 5. This may eliminate a tightening round. Be careful not to stabilize all of the jackbolts at this torque however. For long bolts or tie rods, you may want to experiment using even higher torque values. Call Superbolt before using more than 120% target torque.

7) For gasketed joints: During gasket compression, the load is transferred to the jackbolts (i.e. stud) being tightened. Don't be concerned if some jackbolts (or tensioners) become loose during the procedure. Continue following the procedure. Don't spin down tensioners that become loose during gasket compression.

For Removal:
9) 1/4 turn or less!: Removing the jackbolts more than a 1/4 turn will increase the removal torque of the remaining jackbolts and you may get stuck. If this happens, you will have to retighten and start again. **10) Stuck jackbolt removal:** If a jackbolt will not turn, remove, re-lube, and retighten a neighboring jackbolt and then try to turn it.

Installation Preparation:

		
Superbolt® Product: Confirm jackbolts are lubricated with correct Superbolt® lubricant (JL-G or JL-M). New product is lubricated at the factory. Make sure the jackbolt tips are flush (or recessed) with the bottom of the nut body.	**Torque Wrenches:** Select appropriate hand tools, depending on your target torque.	**Sockets:** High hex stresses require the use of quality six-point impact sockets. Have several spares handy for each job and replace them at the first sign of wear. Special Superbolt® sockets may be required when using a 3/4" impact or torque wrench and jackbolt spacing is close.
		
Installation Sheet *(shipped with product)*. Determine the target jackbolt torque. NOTE: The jackbolt torque stamped on the tensioner is a standard value for that part and may not be correct for your application. If you are unsure, contact Superbolt®.	**Air Impacts:** If using air impacts, select a tool with an output of about 100% - 110% of the target torque. See "Air Impact Tool Selection" on page 4.	**Lubricants:** Jackbolts are pre-lubricated from the factory with either JL-G or JL-M lubricant. For the main stud any standard anti-seize lubricant can be used. For reuse after temperature service, remove, clean, and re-lubricate the jackbolts with the correct Superbolt® lubricant.

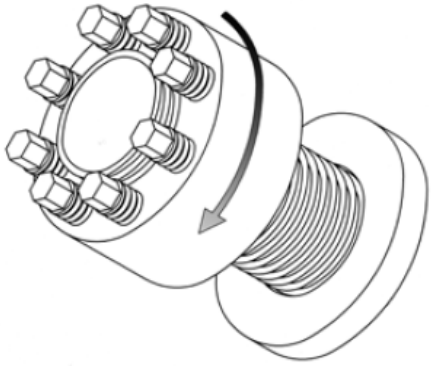
Washers: Apply the correct Superbolt® lubricant to the washer face or to the jackbolt tips.

Further Preparation Steps:
1) Lubricate the thread of the main stud. 2) Slide the hardened washer onto the stud. 3) Lubricate the washer face or jackbolt tips with the correct Superbolt lubricant (JL-G or JL-M).

For flanges: To speed up installation, use two workers at 180° apart, following OEM pattern for tightening.

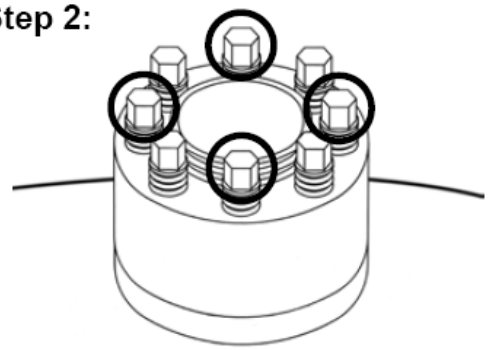
Installation

Step 1:



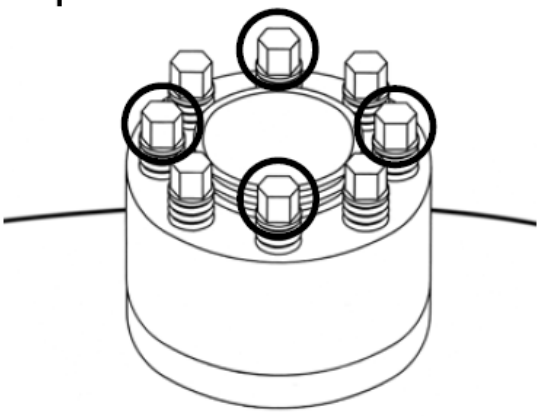
Spin the tensioner onto the main thread until it seats against the washer. You may want to back off the tensioner slightly as mentioned in Helpful Tip #3 on page 4.

Step 2:



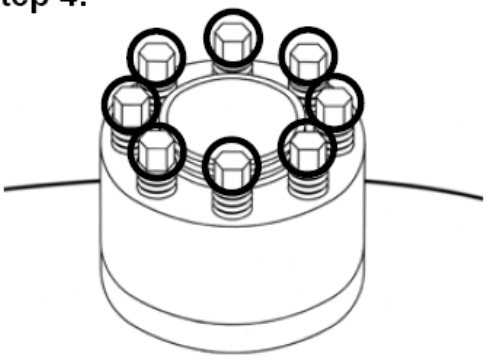
Tighten (4) jackbolts at 90° apart (12:00, 6:00, 9:00, and 3:00) on all studs with a partial torque (30-70%). This serves to seat the flange. If using an air impact, use a reduced setting or lightly pulse the trigger at the full setting.

Step 3:



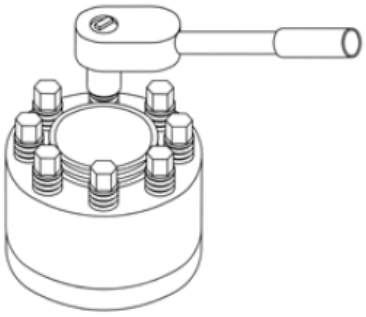
At 100% target torque, tighten the same (4) jackbolts on all studs.

Step 4:



At 100% target torque, tighten all jackbolts in a circular pattern. Do this for all studs (1 round only). See Helpful Tip #7 about using up to 120% torque.

Step 5:



Repeat "STEP 4" until all jackbolts are stabilized (less than 10º rotation). This usually requires 2-4 additional passes. If using air tools, switch to a torque wrench when socket rotation is small. Use the torque wrench to stabilize at the target torque.

NOTE: Product with 4 or 6 jackbolts - use a star pattern for all steps.

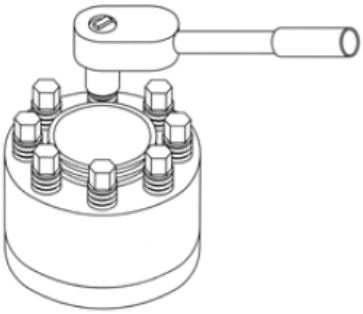
Removal

CAUTION! Jackbolts must be unloaded gradually. If some jackbolts are fully unloaded prematurely, the remaining jackbolts will carry the entire load and may be hard to turn. With extreme abuse, a jackbolt tip can deform, making removal difficult.

Service Under 250ºF

Preparation: Spray jackbolts with penetrating oil or hydraulic oil prior to start (especially if product is in corrosive environment).

Step 1:



Loosen each jackbolt 1/8 turn following a circular pattern around the tensioner (1 round only). As you move around and get back to the first jackbolt, it will be tight again. Do this for all studs on the joint prior to the next step.

Step 2: Repeat a 2nd round as above for all studs, now loosening each jackbolt 1/4 turn in a circular pattern.

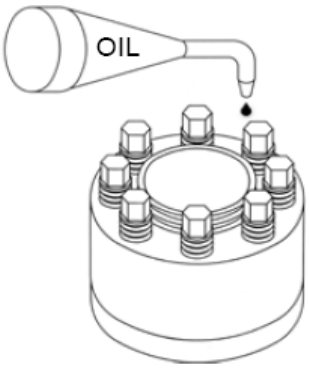
Step 3: Continue loosening 1/4 turn for 3rd and successive rounds until all jackbolts are loose. *NOTE: Usually after the 3rd or 4th round, an impact can be used to completely extract the jackbolts, one by one. For long bolts or tie rods, additional rounds may be required before removing the jackbolts with an impact tool.*

Step 4: Remove, clean and relubricate the jackbolts prior to next use with correct Superbolt lubricant (JL-G or JL-M).

Service Over 250ºF

Preparation: Above 300ºF the petroleum base of the lubricant burns off. Oil per "STEP 1" below to reduce the removal torque.

Step 1:

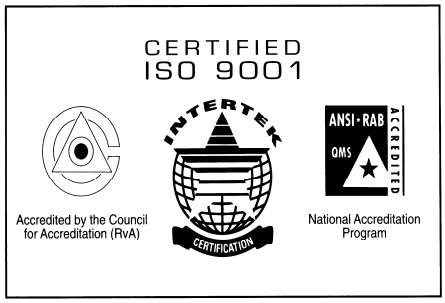


As the equipment is cooling down (around 300ºF), apply hydraulic oil to the jackbolts and washer and let sit for several hours. Thoroughly "wet-down" all components and re-apply during equipment cool down period. If the tensioner is inverted, squirt oil in the gap between the nut body and the washer. Synthetic oil can be used for oiling above 300ºF.

Step 2: Wait for tensioners to cool below 200ºF. Using a circular pattern, "crack" each jackbolt only enough to ensure movement. Do not turn beyond the break loose point. Do this for all studs.

Step 3: Now begin with "STEP 1" of the procedure for service under 250ºF.

NOTE: Heating Rods can be used to reduce the removal torque required.



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