

BLACKMER TRUCK PUMPS

INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

MODEL: TXH3A

Discontinued Model, parts availability may be limited.

961810

INSTRUCTIONS NO. 285/H _jan97

Section

200

Effective

January 1997

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SAFETY DATA



This is a SAFETY ALERT SYMBOL.

When you see this symbol on the product, or in the manual, look for one of the following signal words and be alert to the potential for personal injury, death or major property damage.

▲ DANGER

Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

▲ WARNING

Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

▲ CAUTION

Warns of hazards that **CAN** cause personal injury or property damage.

NOTICE:

Indicates special instructions which are very important and must be followed.

NOTICE:

Blackmer truck pumps **MUST** only be installed in systems which have been designed by qualified engineering personnel. The system **MUST** conform to all applicable local and national regulations and safety standards.

This manual is intended to assist in the installation and operation of the Blackmer truck pumps, and **MUST** be kept with the pump.

Blackmer truck pump service shall be performed by qualified technicians **ONLY**. Service shall conform to all applicable local and national regulations and safety standards.

Thoroughly review this manual, all instructions and hazard warnings, **BEFORE** performing any work on the Blackmer truck pumps.

Maintain **ALL** system and Blackmer truck pump operation and hazard warning decals.

NOTE: Numbers in parentheses following individual parts indicate reference numbers on the corresponding Blackmer Parts Lists.

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SAFETY DATA

▲WARNING



Hazardous machinery can cause severe personal injury or property damage.

FAILURE TO SET THE VEHICLE EMERGENCY BRAKE AND CHOCK WHEELS BEFORE PERFORMING SERVICE CAN CAUSE SEVERE PERSONAL INJURY OR PROPERTY DAMAGE.

▲CAUTION



Hazardous pressure can cause personal injury or property damage.

FAILURE TO RELIEVE SYSTEM PRESSURE PRIOR TO PERFORMING PUMP SERVICE OR MAINTENANCE CAN CAUSE PERSONAL INJURY OR PROPERTY DAMAGE.

▲WARNING



Hazardous or toxic fluids can cause serious injury.

IF PUMPING HAZARDOUS FLUIDS SYSTEM MUST BE FLUSHED PRIOR TO PERFORMING SERVICE.

PUMP DATA

TECHNICAL DATA

	TXH3A
Maximum Temperature*	300°F (149°C)
Maximum Pump Speed	1200 RPM
Maximum Viscosity*	20,000 SSU (4,250 cSt)
Maximum Differential Pressure	125 psi (862 kPa)
Maximum Working Pressure (Inlet Pressure + Differential Pressure)	175 psi (1207 kPa)

* Optional materials of construction may be required to meet the operating limits listed above. Refer to Blackmer Material Specs 201/120 for TXH3A models.

INITIAL START UP INFORMATION

Model No. _____

Serial No. _____

Date of Installation: _____

Pressure Gauge Reading: _____

Vacuum Gauge Reading: _____

Flow Rate: _____

INSTALLATION

NOTICE:

BLACKMER TRUCK PUMPS MUST ONLY BE INSTALLED IN SYSTEMS DESIGNED BY QUALIFIED ENGINEERING PERSONNEL. SYSTEM DESIGN MUST CONFORM WITH ALL APPLICABLE REGULATIONS AND CODES AND PROVIDE WARNING OF ALL SYSTEM HAZARDS.



FAILURE TO SET THE VEHICLE EMERGENCY BRAKE AND CHOCK WHEELS BEFORE PERFORMING SERVICE CAN CAUSE SEVERE PERSONAL INJURY OR PROPERTY DAMAGE.

PRE-INSTALLATION CLEANING

Foreign matter entering the pump WILL cause extensive damage. The supply tank and intake piping MUST be cleaned and flushed prior to pump installation and operation.

LOCATION AND PIPING

An improperly designed piping system or unit installation WILL significantly reduce pump performance and life. Blackmer recommends the following piping system layout and unit installation.

1. To minimize intake losses, locate the pump as close as possible to the source of supply.
2. Piping MUST be properly supported to prevent any piping loads from being placed on the pump.
3. Intake piping and fittings MUST be at least as large in diameter as the pump intake connection.
4. Minimize the number of intake line fittings (valves, elbows, etc.) and piping turns or bends.
5. Temporarily install vacuum and pressure gauges in the 1/4" NPT intake and discharge ports located on the pump cylinder to check pump at start-up.
6. Install a strainer in the inlet line to protect the pump from

foreign matter. Placement of intake strainers should facilitate frequent cleaning.

7. Intake and discharge piping MUST be free of all leaks.

TRUCK MOUNTING

The pump will operate satisfactorily in any position. Consult Blackmer factory for vertical shaft mounts. The pump can be bolted to the truck frame or on a saddle hung below the frame, and MUST be adequately supported.

PUMP DRIVE

The pump may be driven by a power take-off through universal joints. When using universal joints, a splined slip joint, properly lubricated, must be used on the connecting jack shaft to prevent end thrust on the pump shaft.

It is very important to install a proper drive line to avoid excessive wear, vibration and noise (see Fig. 1 and Table 1).

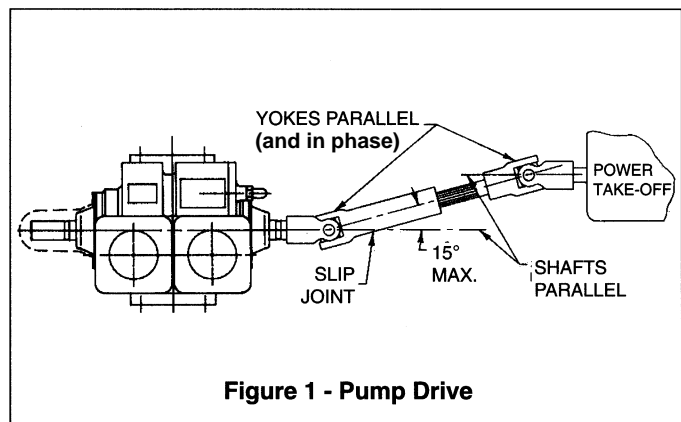


Figure 1 - Pump Drive

Angle of Drive Shaft		
1° through 5°	6° through 10°	11° through 15°
Very Good	Good	Fair

Table 1

INSTALLATION

General guidelines to follow for proper pump drive:

1. Square slip joints are not recommended.
2. Use the least number of jack shafts as is practical.
3. Use an even number of universal joints.
4. The pump shaft and power take-off shaft should be parallel in all respects. It is recommended that an angular level measuring device be used to ensure the PTO and pump shaft are parallel to each other. If necessary, the pump can be shimmed to correct any misalignment. The PTO shaft coming off at the transmission does not need to be perfectly horizontal as long as the pump is shimmed to have its shaft parallel in all respects to the PTO shaft.
5. The yokes of the universals at both ends of the jack shaft should be parallel, and in phase.
6. The maximum recommended angle between the jack shaft and the pump shaft is 15 degrees. Refer to Table 1.

Failure to follow any of these guidelines may result in a gallop or uneven turning of the pump rotor, which will in turn cause a surging vibration to the liquid stream and piping system. Contact the supplier of the drive line components for specific design assistance.

PUMP ROTATION

NOTICE:

CONFIRM CORRECT PUMP ROTATION BY CHECKING THE PUMP ROTATION ARROWS RESPECTIVE TO PUMP DRIVER ROTATION.

TO CHANGE PUMP ROTATION

The TXH3A pump models is equipped with a double ended rotor and shaft, enabling them to be driven from either shaft end. To change rotation, rotate the pump 180 degrees so that the opposite shaft becomes the driven shaft. The shaft protector (186) MUST be mounted over the non-driven shaft end.



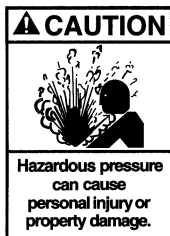
OPERATION WITHOUT SHAFT PROTECTOR CAN CAUSE SERIOUS PERSONAL INJURY, MAJOR PROPERTY DAMAGE, OR DEATH.

OPERATION

PRE-START UP CHECK LIST

1. Check the alignment of the pipes to the pump. Pipes should be supported so that they do not spring away or drop down when the pump flanges or union joints are disconnected.
2. Temporarily install vacuum and pressure gauges in the 1/4" NPT ports located on the pump cylinder. These can be used to check the actual suction and discharge conditions after pump start-up.
3. Inspect complete piping system to ensure that no piping loads are being placed on the pump.
4. Secure appropriate hose connections.

START UP PROCEDURES



PUMP OPERATING AGAINST A CLOSED VALVE CAN CAUSE SYSTEM COMPONENT FAILURE, PERSONAL INJURY AND PROPERTY DAMAGE.

NOTICE:

CONSULT THE "GENERAL PUMP TROUBLESHOOTING" SECTION OF THIS MANUAL IF DIFFICULTIES DURING START UP ARE EXPERIENCED.

1. Start the pump. Priming should occur within one minute.
2. Check the vacuum and pressure gauges to ensure the system is operating within expected parameters. Record

the gauge readings in the "Initial Start Up Information" section of this manual for future reference.

3. Inspect piping, fittings, and associated system equipment for leaks, noise, vibration and overheating.
4. If possible, check the flow rate to ensure the pump is operating within the expected parameters.
5. Check the pressure setting of the relief valve by momentarily closing a valve in the discharge line and reading the pressure gauge. This pressure should be 15 - 20 psi (103 - 138 kPa) higher than the maximum system operating pressure, or the external bypass valve setting (if equipped). **DO NOT operate the pump against a closed discharge valve for more than 15 seconds.** If adjustments need to be made, refer to the "Relief Valve Setting and Adjustment" section of this manual.

PUMP SPEED

PTO driven units MUST contain speed control devices to prevent pump speeds above the maximum RPM specifications, regardless of the truck engine unloading speeds. Should fluid delivery be appreciably less than expected, see the "General Pump Troubleshooting" section.

REVERSE ROTATION

NOTICE:

PUMPS SHOULD BE OPERATED IN REVERSE ONLY WHEN A SEPARATE PRESSURE RELIEF VALVE IS INSTALLED TO PROTECT THE PUMP FROM EXCESSIVE PRESSURE.

It may be desirable to run the pump in reverse rotation for system maintenance. The pump will operate satisfactorily in reverse rotation for a LIMITED time, at a reduced performance level. When operating the pump in reverse, a separate bypass valve MUST be installed to protect the pump from excessive pressure.

OPERATION

FLUSHING THE PUMP

NOTICE:

IF FLUSHING FLUID IS TO BE LEFT IN THE PUMP FOR AN EXTENDED TIME, IT MUST BE A LUBRICATING, NON-CORROSIVE FLUID. IF A CORROSIVE FLUID IS USED, IT MUST BE FLUSHED FROM THE PUMP IMMEDIATELY.

To flush the pump, use the following procedure:

1. Allow the pump to evacuate as much fluid as possible.
2. Run cleaning fluid through the pump intake. The cleaning fluid should be compatible with the pump O-rings and vane material. When handling "sticky" fluids that solidify within the pump (i.e., waxes, adhesives, resins, asphalts, etc.), use a fluid that will prevent solidification of the fluid being transferred and facilitate flushing.
3. Operate the pump against a closed discharge for 15 seconds to allow the cleaning fluid to recirculate through the internal relief valve.

RELIEF VALVE

NOTICE:

THE PUMP INTERNAL RELIEF VALVE IS DESIGNED TO PROTECT THE PUMP FROM EXCESSIVE PRESSURE AND MUST NOT BE USED AS A SYSTEM PRESSURE CONTROL VALVE.

Pumping volatile liquids under suction lift may cause cavitation. Partial closing of the discharge valve WILL result in internal relief valve chatter and is NOT recommended. For these applications, install an external bypass valve, and pipe

back to the storage tank. This bypass system is also recommended when pump is operated for extended periods (more than 1 minute) against a closed discharge valve.

RELIEF VALVE SETTING AND ADJUSTMENT

The relief valve pressure setting is marked on a metal tag attached to the valve cover. Generally, the relief valve should be set at least 15 - 20 psi (103-138 kPa) higher than the operating pressure, or the external bypass valve setting (if equipped).



INCORRECT SETTINGS OF THE PRESSURE RELIEF VALVE CAN CAUSE SYSTEM COMPONENT FAILURE, PERSONAL INJURY AND PROPERTY DAMAGE.

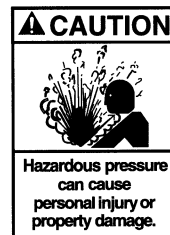
1. **To INCREASE the pressure setting**, remove the relief valve cap (1) and turn the adjusting screw (2) *inward*, or clockwise. Replace the valve cap.
2. **To DECREASE the pressure setting**, remove the relief valve cap (1) and turn the adjusting screw (2) *outward*, or counterclockwise. Replace the valve cap.

Refer to the individual Blackmer pump parts lists for various spring pressure ranges. The pumps are supplied from the factory with the relief valve adjusted to the mid-point of the spring range. If the pump is equipped with a Blackmer air valve, refer to setting and adjustment procedures covered in Blackmer Air Valve Instructions and Parts List No. 286/F.

MAINTENANCE



FAILURE TO SET THE VEHICLE EMERGENCY BRAKE AND CHOCK WHEELS BEFORE PERFORMING SERVICE CAN CAUSE SEVERE PERSONAL INJURY OR PROPERTY DAMAGE.



FAILURE TO RELIEVE SYSTEM PRESSURE PRIOR TO PERFORMING PUMP SERVICE OR MAINTENANCE CAN CAUSE PERSONAL INJURY OR PROPERTY DAMAGE.



IF PUMPING HAZARDOUS FLUIDS SYSTEM MUST BE FLUSHED PRIOR TO PERFORMING SERVICE.

NOTICE:

MAINTENANCE SHALL BE PERFORMED BY QUALIFIED TECHNICIANS ONLY, FOLLOWING THE APPROPRIATE PROCEDURES AND WARNINGS AS PRESENTED IN THIS MANUAL.

LUBRICATION

Blackmer recommends lubricating the ball bearings every three months at a minimum.

Recommended Grease:

Amoco® - Amolith All Weather Grease, or equivalent.

Greasing Procedure:

1. Remove the grease relief fittings (76A) from the bearing covers (27).
2. Apply grease with a hand gun until grease begins to escape from the grease relief fitting port.
3. Replace the grease relief fittings (76A).

DO NOT overgrease pump bearings. While it is normal for some grease to escape from the grease tell-tale hole after lubrication, excessive grease will cause seal failure.

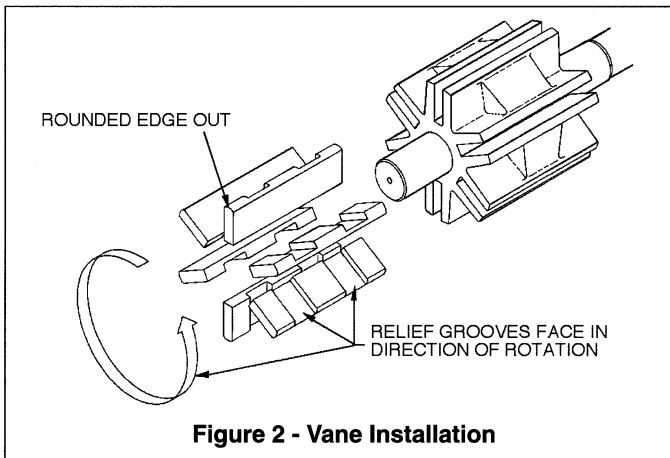
MAINTENANCE

VANE REPLACEMENT

NOTICE:

MAINTENANCE SHALL BE PERFORMED BY QUALIFIED TECHNICIANS ONLY, FOLLOWING THE APPROPRIATE PROCEDURES AND WARNINGS AS PRESENTED IN THIS MANUAL.

1. Remove the head assembly from the non-drive side of the pump according to steps 2 - 5 in the "Pump Disassembly" section of this manual.
2. Turn the shaft by hand until a vane comes to the top (12 o'clock) position of the rotor. Remove the vane.
3. Install a new vane, ensuring that the rounded edge is UP, and the relief grooves are facing towards the direction of rotation. See Figure 2.
4. Repeat steps 2 and 3 until all vanes have been replaced.
5. Reassemble the pump according to steps 2 - 6 and 11 - 15 of the "Pump Assembly." section of this manual.



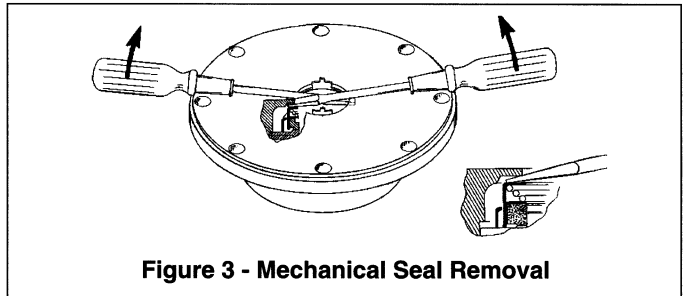
PUMP DISASSEMBLY

NOTICE:

FOLLOW ALL HAZARD WARNINGS AND INSTRUCTIONS PROVIDED IN THE "MAINTENANCE" SECTION OF THIS MANUAL.

1. Starting on the drive end of the pump, clean the pump shaft thoroughly, making sure the shaft is free of nicks and burrs. This will prevent damage to the mechanical seal when the drive side head assembly is removed.
2. Remove the drive side bearing cover capscrews (28) and slide the bearing cover (27) and gasket (26) off the shaft. Discard the bearing cover gasket. The dirt shield (123A) will come off with the bearing cover.
3. Remove the non-drive bearing cover capscrews (28) and slide the bearing cover (27) and gasket (26) off the shaft. Discard the bearing cover gasket.
4. To remove locknuts and lockwashers (24A and 24B):
 - a. Bend up the engaged lockwasher tang, loosen setscrew (24C) in locknut and rotate the locknut counterclockwise to remove it from the shaft.
 - b. Slide the lockwasher off the shaft. Inspect the lockwasher for damage and replace as required.
 - c. Repeat steps a and b on the opposite shaft end.

5. Remove the head capscrews (21) and carefully pry the head (20) away from the cylinder.
6. Slide the head off the shaft. The head O-ring (72), bearing (24), and mechanical seal (153) will come off with the head assembly. Remove and discard the head O-ring.
 - a. Pull the bearing (24) from the housing in the head.
 - b. To remove the mechanical seal (153), use two screw drivers to gently push the backside of the seal jacket to push the seal from the head (see Figure 3, below). Use care when placing the screw drivers to prevent damage to the seal faces. Remove and discard mechanical seal O-rings.

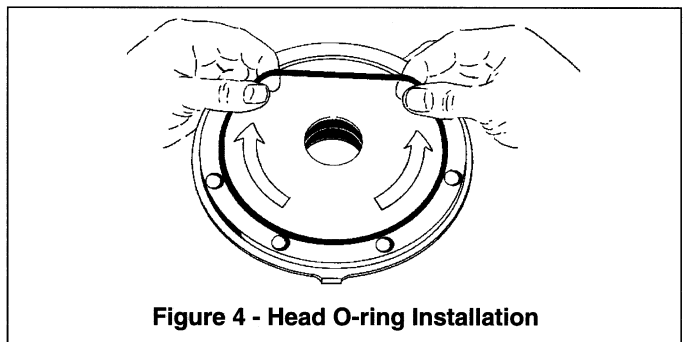


7. Pull the rotor and shaft (13) from the cylinder. While one hand is pulling the shaft, the other hand should be cupped underneath the rotor to prevent the vanes (14) and push rods (77) from falling out. Carefully set the rotor and shaft aside for future vane replacement and reassembly.
8. Remove the remaining components from the non-drive side of the pump, as instructed in steps 5 and 6 above.

PUMP ASSEMBLY

Before reassembling the pump, inspect all component parts for wear or damage, and replace as required. Wash out the bearing/seal recess of the head and remove any burrs or nicks from the rotor and shaft.

1. Reassemble the **NON-DRIVE** side of the pump first:
2. Install a new head O-ring (72) in the groove on the inside face of the head. Lay the O-ring flat and start in on one side of the groove, stretching ahead with the fingers, as shown in Figure 4.



3. Install the head (20) on the non-drive side of the cylinder. Install and uniformly tighten four head capscrews (21) 90° apart, torquing to 25 lbs ft (34 Nm).
4. **MECHANICAL SEAL**
Apply a small amount of motor oil in the head recess. Push the mechanical seal assembly (153) into the recess of the head with seal jacket drive tangs inward. The pin in the stationary seat must be between the lugs in the back of the head recess.

MAINTENANCE

5. Hand pack the ball bearing (24) with grease. Refer to the "Lubrication" section for the recommended grease.
6. Install the bearing into the head recess. The bearing balls should face outward, with the grease shield inward. Ensure the bearing is fully and squarely seated against the mechanical seal. (Installation tip: Install two 3/8" (10 mm) washers and two bearing cover capscrews (28) to clamp the bearing and compress the mechanical seal for proper bearing locknut adjustment (see Figure 5). The washers and capscrews will be removed after the locknuts are adjusted.)
7. Turn the pump cylinder around and begin assembly on the opposite, drive end.

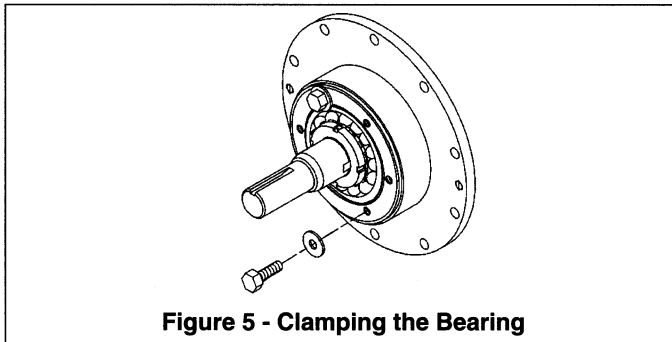


Figure 5 - Clamping the Bearing

8. Remove the vanes (14) and push rods (77) from the rotor and shaft assembly. Inspect for wear and damage, and replace as follows:
 - a. Partially install the non-driven end of the rotor and shaft (13) into the open side of the pump cylinder.
 - b. Leave part of the rotor outside of the cylinder so that the bottom vanes can be installed and held in place as the push rods are installed in the push rod holes of the rotor. Insert the new vanes into the rotor slots with the rounded edges outward, and the vane relief grooves facing TOWARDS the direction of rotation. Refer to Figure 2.
 - c. After the bottom vanes and push rods are installed, insert the rotor and shaft fully into the cylinder.
 - d. Install the remaining vanes into the top positions of the rotor. **Rotate the shaft by hand to engage the drive tangs of the seal jacket in the rotor slots.**
9. Install the drive side head, mechanical seal, and bearing as instructed in steps 2 through 6. Apply a thin coating of motor oil on the drive shaft to aid installation.
10. Rotate the shaft by hand to engage the mechanical seal drive tangs, and to test for binding or tight spots. If the rotor does not turn freely, lightly tap the rims of the heads with a soft faced mallet until the correct position is found. Install all of the remaining head capscrews for each head and uniformly torque to 25 lbs ft (34 Nm).

11. LOCKNUT INSTALLATION

It is important that the bearing locknuts (24A) and lockwashers (24B) be installed and adjusted properly. Overtightening locknuts can cause bearing failure or a broken lockwasher tang. Loose locknuts will allow the rotor to shift against the heads, causing wear. See Figure 6.

- a. On both ends of the pump shaft, install a lockwasher (24B) with the tangs facing outward, followed by a locknut (24A) with the tapered end inward. Ensure the inner tang "A" of the lockwasher is located in the slot in the shaft threads, bending it slightly, if necessary.
- b. Tighten both locknuts to ensure that the bearings are bottomed in the head recess. **DO NOT** overtighten and bend or shear the lockwasher inner tang.
- c. Loosen both locknuts one complete turn.
- d. Tighten one locknut until a slight rotor drag is felt when turning the shaft by hand.
- e. Back off the nut the width of one lockwasher tang "B". Secure the nut by bending the closest aligned lockwasher tang into the slot in the locknut. The pump should turn freely when rotated by hand.
- f. Tighten the opposite locknut by hand until it is snug against the bearing. Then, using a spanner wrench, tighten the nut the width of one lockwasher tang. Tighten just past the desired tang, then back off the nut to align the tang with the locknut slot. Secure the nut by bending the aligned lockwasher tang into the slot in the locknut. The pump should continue to turn freely when rotated by hand.
- g. To check adjustment, grasp the nut and washer with fingers and rotate back and forth. If this cannot be done, one or both locknuts are too tight and should be alternately loosened one stop at a time (.001"). Begin by loosening the locknut adjusted last.
- h. Tighten locknut set screw (24C)
- i. After adjustment is complete, remove the bearing cover capscrews and 3/8" washers from both ends of the pump.

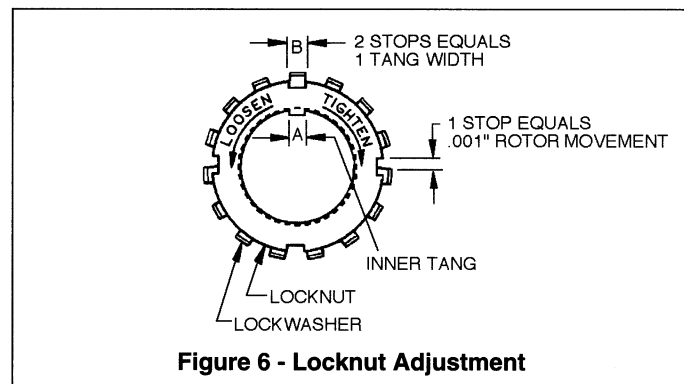


Figure 6 - Locknut Adjustment

12. Inspect the grease seal (104) for wear or damage and replace as required. Grease the outside diameter of the grease seal and push it into the bearing cover (27) with the lip of the seal inward. The lip will face outward when the bearing cover is installed on the head.
13. Attach a new bearing cover gasket (26) and the bearing cover to the head. Install and torque the bearing cover capscrews (28) to 15 lbs ft (20 Nm).
14. Follow steps 12 and 13 to install the grease seal (104) and bearing cover (27) on the opposite side of the pump.
15. Push the dirt shield (123A) over the inboard shaft and firmly against the bearing cover.
16. Attach the shaft protector (186) on the non-driven shaft end.

GENERAL PUMP TROUBLESHOOTING

NOTICE:
MAINTENANCE SHALL BE PERFORMED BY QUALIFIED TECHNICIANS ONLY, FOLLOWING THE APPROPRIATE PROCEDURES AND WARNINGS AS PRESENTED IN THIS MANUAL.

SYMPTOM	PROBABLE CAUSE
Pump Not Priming	<ol style="list-style-type: none"> 1. Pump not wetted. 2. Worn vanes. 3. Suction valve closed. 4. Air leaks in the suction line. 5. Strainer clogged. 6. Suction line or valves clogged or too restrictive. 7. Broken drive train. 8. Pump vapor-locked. 9. Pump speed too low for priming. 10. Relief valve partially open, worn or not seating properly.
Reduced Capacity	<ol style="list-style-type: none"> 1. Pump speed too low. 2. Suction valves not fully open. 3. Air leaks in the suction line. 4. Excessive restriction in the suction line (i.e.: undersized piping, too many elbows & fittings, clogged strainer, etc.). 5. Damaged or worn parts. 6. Excessive restriction in discharge line causing partial flow through the relief valve. 7. Relief Valve worn, set too low, or not seating properly. 8. Vanes installed incorrectly (see "Vane Replacement").
Noise	<ol style="list-style-type: none"> 1. Excessive vacuum on the pump due to: <ol style="list-style-type: none"> a. Undersized or restricted fittings in the suction line. b. Pump speed too fast for the viscosity or volatility of the liquid. c. Pump too far from fluid source. 2. Running the pump for extended periods with a closed discharge line. 3. Pump not securely mounted. 4. Improper drive line (see "Pump Drive"). 5. Bearings worn or damaged. 6. Vibration from improperly anchored piping. 7. Bent shaft, or drive coupling misaligned. 8. Excessively worn rotor. 9. Malfunctioning valve in the system. 10. Relief valve setting too low. 11. Damaged vanes (see following category).
Damaged Vanes	<ol style="list-style-type: none"> 1. Foreign objects entering the pump. 2. Running the pump dry for extended periods of time. 3. Cavitation. 4. Viscosity too high for the vanes and/or the pump speed. 5. Incompatibility with the liquids pumped. 6. Excessive heat. 7. Worn or bent push rods, or worn push rod holes. 8. Settled or solidified material in the pump at start-up. 9. Hydraulic hammer - pressure spikes. 10. Vanes installed incorrectly (see "Vane Replacement").
Broken Shaft	<ol style="list-style-type: none"> 1. Foreign objects entering the pump. 2. Viscosity too high for the pump speed. 3. Relief valve not opening. 4. Hydraulic hammer - pressure spikes. 5. Pump/driver misalignment. 6. Excessively worn vanes or vane slots. 7. Settled or solidified material in the pump at start-up.
Mechanical Seal Leakage	<ol style="list-style-type: none"> 1. O-rings not compatible with the liquids pumped. 2. O-rings nicked, cut or twisted. 3. Shaft at seal area damaged, worn or dirty. 4. Ball bearings overgreased. 5. Excessive cavitation. 6. Mechanical seal faces cracked, scratched, pitted or dirty.

blackmer

A **DOVER** RESOURCES COMPANY

1809 Century Avenue, Grand Rapids, Michigan 49509 U.S.A.
Telephone: (616) 241-1611 • Fax: (616) 241-3752