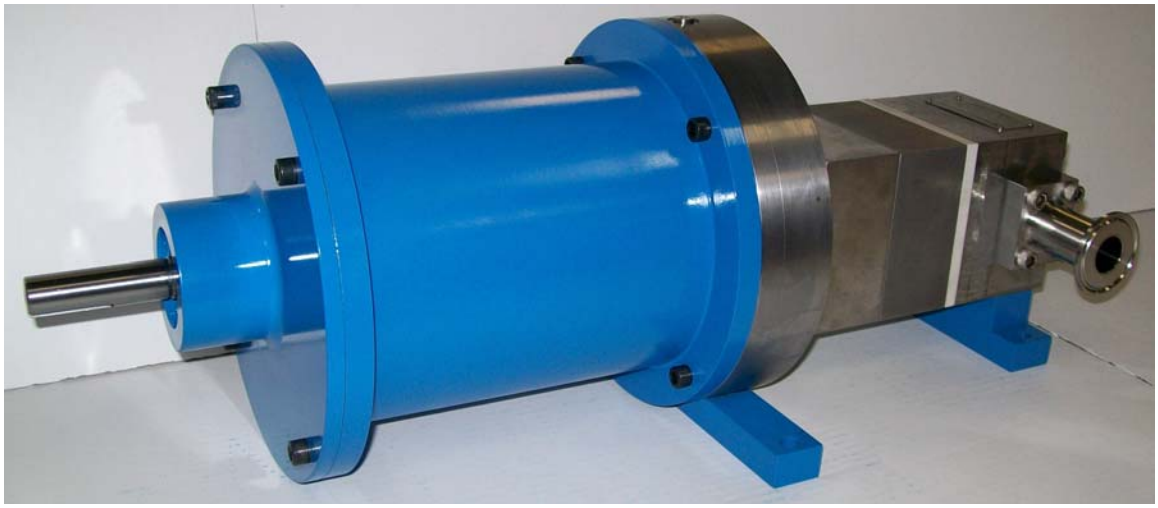
Operation Manual

Northern Magnetic Drive
4400 and 4600 Series



NORTHERN® PUMP

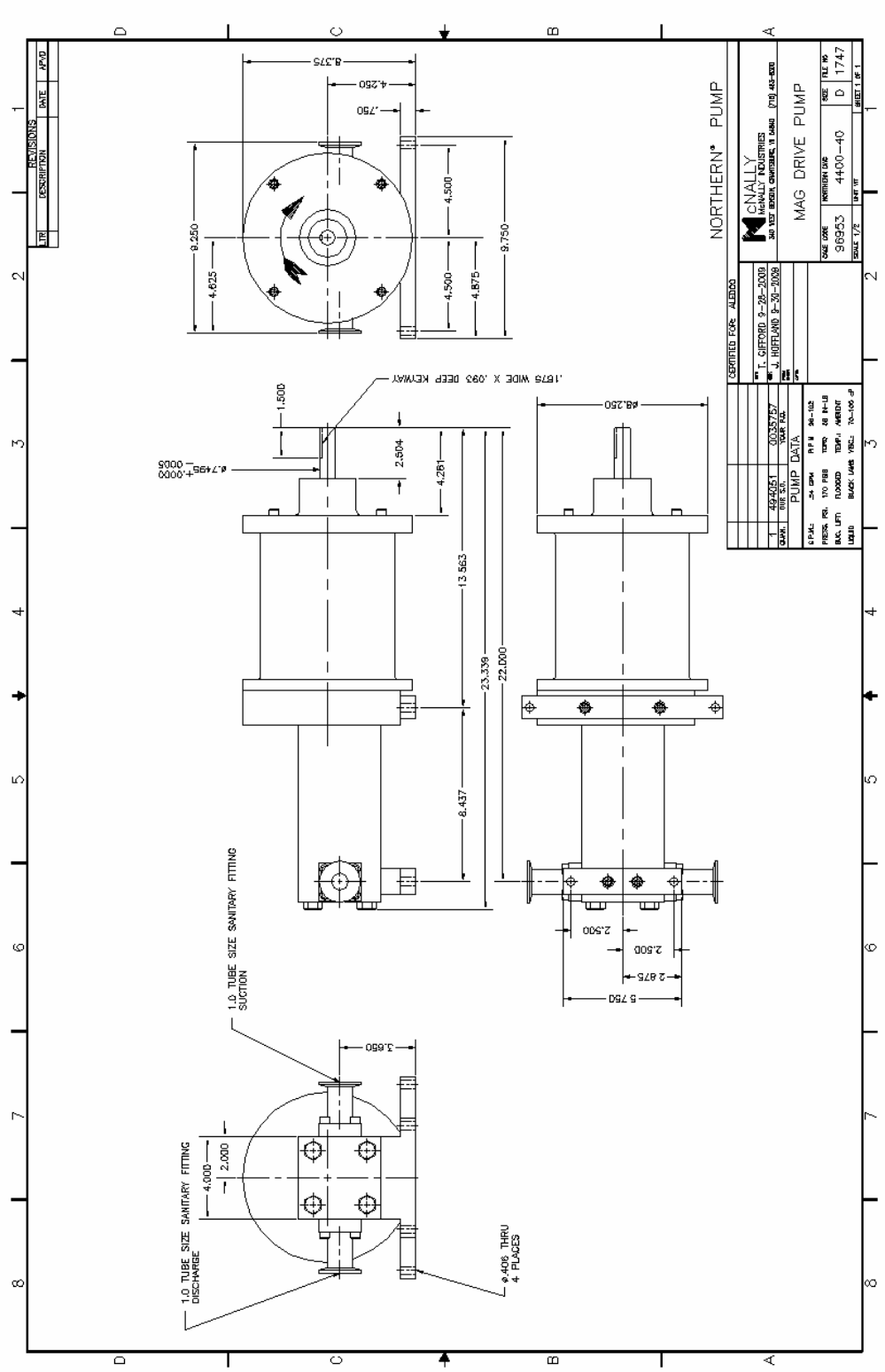
340 West Benson Avenue
Grantsburg, WI 54840
Telephone: 1-800-366-1410
715-463-5177
www.northern-pump.com

Table of Contents

Cautionary Statements

Failure to heed these cautionary statements may result in personal injury and/or damage to equipment.

1. Disable and lock-out the drive system before any work is done to maintain or remove the pump.
2. Fully depressurize the entire system.
3. Close the valve closest to the pump in both the suction and discharge pipe.
4. Wear protective eyewear.
5. When handling corrosive, caustic, toxic, or hazardous liquids, wear protective clothing to prevent contact with skin.
6. Wear protective footwear such as safety shoes.
7. When handling liquids with toxic vapors, wear a properly rated breathing mask.
8. Work area must be properly ventilated.
9. Work area must be properly grounded.
10. Do not work alone.
11. Clean up any spilled liquid immediately.



Outline Drawing

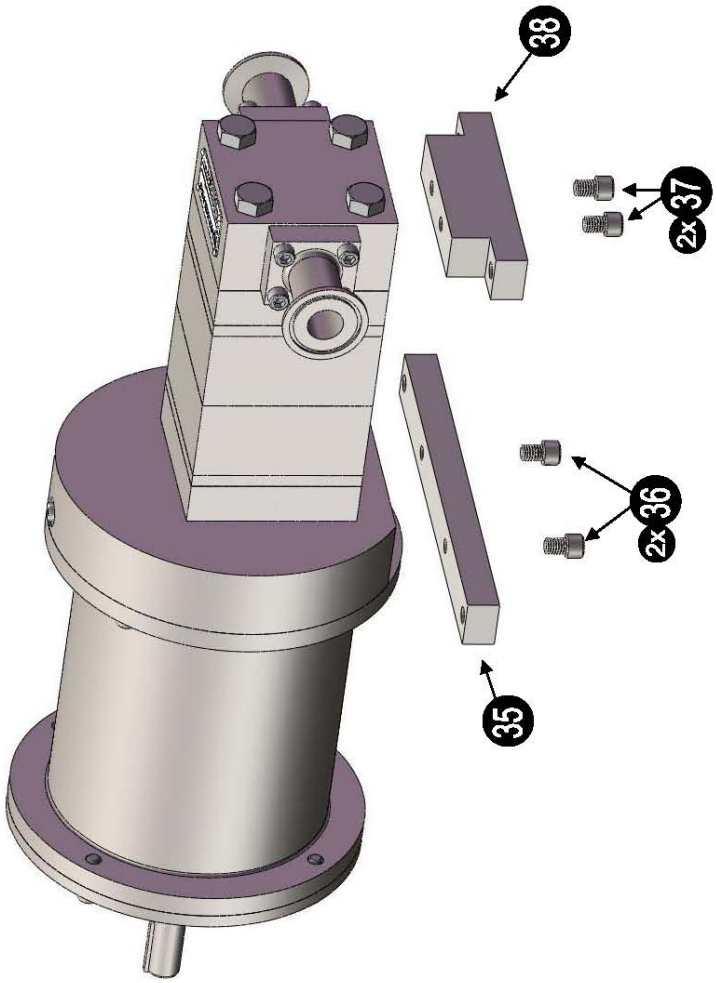


Figure 1

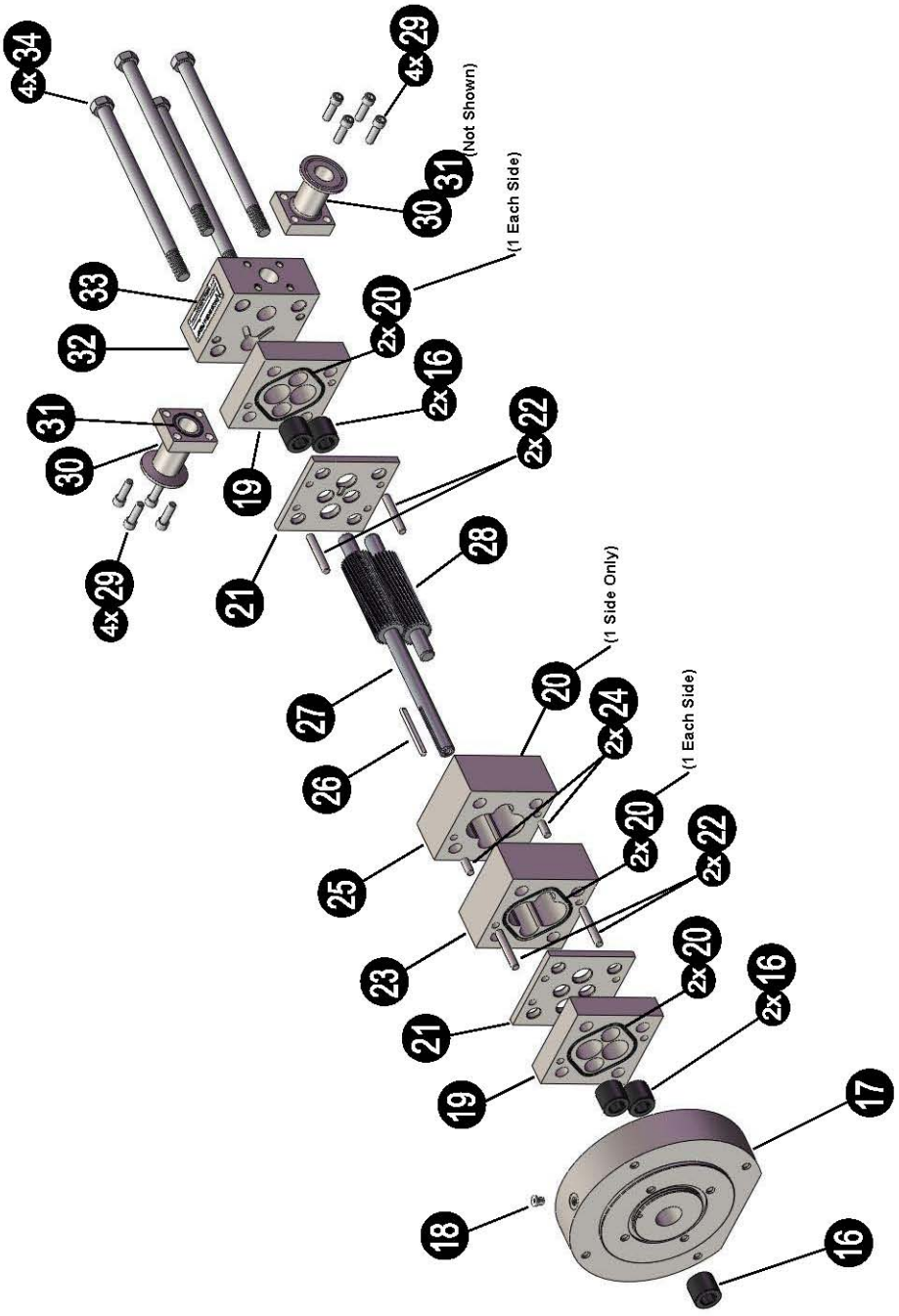

4x 34
4x 29
(Not Shown)
30
31
(1 Each Side)
20
33
2x
32
16
2x
31
22
2x
30
19
28
4x 29
21
(1 Side Only)
20
27
24
2x
(1 Each Side)
26
20
2x
22
2x
25
20
2x
16
2x
23
21
19
17
18
16

Figure 2

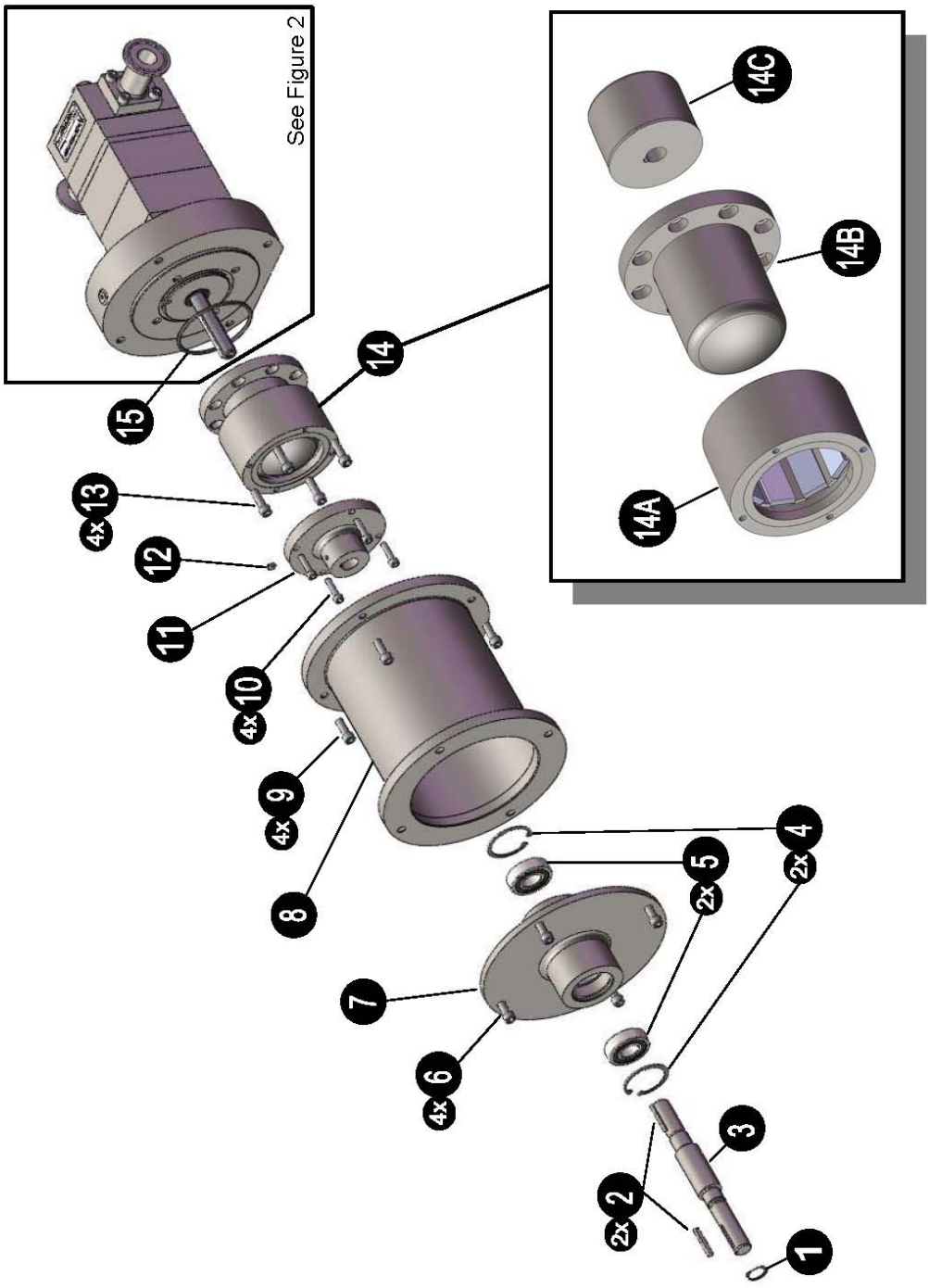

See Figure 2
14C
14B
14A
14
15
4x 13
12
11
4x 10
4x 9
8
2x 4
2x 5
7
4x 6
3
2x 2
1

Figure 3

Installation

1. Install the drive shaft end key (2), Figure 3, into the input shaft (3) keyway.

2. Install the coupling hub on to the input shaft. The coupling hub must slide freely on to the drive shaft. If it does not, locate the problem, correct it, and re-install the coupling hub. The coupling hub is normally positioned so that the end of the drive shaft is flush with the solid part of the coupling hub. Tighten the set screw over the drive shaft key snugly.

3. Install the pump.

4. Assemble the pump and motor shaft coupling in accordance with the requirements of the coupling manufacturer.

5. Tighten the mounting cap screws snugly. Recheck the coupling alignment. Verify that the coupling hub set screws are properly tightened.

6. Put a small volume of liquid known to be compatible with the liquid to be pumped into the suction port to lubricate to the pump gears during startup. This will also help the pump to prime.

7. Connect the suction and discharge lines to the port adapters.

8. Open the suction and discharge valves.

9. Operate pump at moderate speed until pump has primed and air is purged from the pump.

10. Open the air bleed plug (18), Figure 2, to bleed the air from the magnetic coupling containment can. The magnetic coupling is cooled by the flow of liquid through the containment can. It is important that the containment can be free of air.

Startup

1. Inspect all fasteners used to secure the pump and all drive components to the supporting structure. Tighten as necessary.

2. Inspect all fasteners and fittings in the suction and discharge lines. Tighten as necessary.

3. Inspect the input shaft coupling for proper alignment and correct as necessary. Refer to the coupling manufacturer's specifications for the appropriate alignment criteria. A good rule of thumb to use is to install the coupling using 25% of the coupling manufacturer's maximum allowable misalignments.

4. Open the discharge and suction valves to allow for free flow of liquid to and from the pump.

5. Loosen, and remove if necessary, the plug in the top of the seal adapter plate and bleed all air from the magnetic coupling containment can. Tighten the plug snugly when the air bleeding process has been completed.

6. Start the drive at low speed, or jog drive if not variable speed, and determine that the pump rotation is correct as shown on the nameplate.

7. Operate the pump at moderate speed and verify that it has primed and that the flow rate is normal.

8. Verify the suction and discharge pressures to ensure that the pump is not drawing an abnormally high suction vacuum or the pump is being required to develop an abnormally high discharge pressure.

9. Observe all suction and discharge fittings and joints for leaks and correct as necessary.

10. Observe the pump for any sign of abnormal noise or vibration. Intermittent popping noises or a gravelly rumbling noise is an indication of cavitation or air entrainment from a loose suction fitting. Correct these problems before placing the pump into normal service.

Example Operating Limits

The pump may be operated under any conditions that allow for reliable operation. The parameters listed here are to be taken individually. Operating under all of the maximum conditions simultaneously may not be possible.

Pump Speed:	350 RPM
Viscosity:	2000 cP
Temperature:	125 °F
Inlet Pressure:	150 PSI
Inlet Vacuum:	15 Inches HG
Discharge Pressure:	250 PSI

Performance Considerations

1. Viscosity

    1.1 Viscosity below 20 cP will cause the pump's slippage to increase. A decrease in flow rate will be observed. This problem will be more acute when pumping at high discharge pressure.

    1.2 Viscosity above 2000 cP will noticeably increase the torque required to drive the pump. If the torque exceeds 200 in-lb, the magnetic coupling will disengage and the pump will cease to pump liquid. Shut down the drive immediately to protect the magnetic coupling from damage.

2. Temperature

    2.1 The magnetic coupling will begin to lose its torque capacity when its temperature goes above 120 °F. At 210 °F its torque capacity is 94% of its rating. At 300 °F its torque capacity is 85% of its rating.

    2.2 The pump uses ceramic wear plates that are clamped between the bearing plates and the cylinder of the pump. There is a significant difference in the coefficient of linear expansion between these parts. Operating the pump with liquid temperature exceeding 125 °F is not recommended since there is a risk of cracking the ceramic liner plate due to differential expansion of the parts in the pump.

    2.3 The pumped liquid will have a decreased viscosity with increased temperature (see Viscosity section).

3. Pressure

    3.1 The internal slippage in the pump will increase in direct proportion to the differential pressure across the pump. If the differential pressure doubles, the slippage will double. This can be a serious matter when pumping low viscosity liquids.

    3.2 High suction vacuum can lead to cavitation. Cavitation will make the pump noisy, reduce its output, and shorten its life.

    3.3 High differential pressure will increase the torque required to drive the pump. Since the magnetic coupling has limited torque capacity,

attempting to operate at high differential pressure can lead to disengagement of the coupling.

4. Abrasive content in the pumped liquid

   4.1 Pumping liquids with abrasive content will lead to accelerated wear in the pump.

   4.2 Abrasive content that is magnetic in nature will be attracted to the inner rotor magnets. In extreme cases, this can either jam the coupling or lead to wear between the inner rotor and the containment can.

   4.3 The metal components of the pump are magnetic in nature. Pumping liquids with abrasive content will lead to magnetic material being removed from these parts. This material will be attracted to the inner rotor magnets. In extreme cases, this can either jam the coupling or lead to wear between the inner rotor and the containment can.

Lubrication and Preventative Maintenance

The pump is fully lubricated by the pumped liquid. Dry running must be avoided.

It is recommended that a very small amount of a liquid compatible with the liquid to be pumped be put into the pump at startup. This will lubricate the pump during the startup period and make the pump much easier to prime.

There is no preventative maintenance routine to follow for this pump as there are no manual adjustments or other actions required for normal operation.

It is required that the coupling be a slip fit on the pump shaft. Do not force the coupling and shaft together.

When attaching the suction and discharge lines to the pump adapters, make sure that the attached lines mate with the pump adapters naturally without being forced into position. Do not expect the pump to accept significant forces from the attached suction and discharge lines.

Trouble Shooting Guide

Problem	Solution
Key will not fit into keyway in drive shaft	Check for burrs and nicks in the keyway and on the key. Remove as required. Measure width of key and keyway, if an interference fit is found, reduce the width of the key.
Motor shaft turns but pump shaft does not	Verify that the coupling has been properly installed with the correct key in each hub. Verify that the set screws are properly tightened in each coupling hub.
Pump will not prime	Check for air leaks in the suction line. Check for correct rotation of the pump shaft -- CW when facing the shaft end of the pump. "Wet" the internals of the pump with the liquid to be pumped to provide a liquid seal in the pumping chamber. Make sure that all suction and discharge line valves are open. Make sure that the suction and discharge lines are free of obstructions.

Problem	Solution
Pump requires too much torque	Make sure that the viscosity of the liquid being pumped is not abnormally high.
Pumped liquid has entrained air	Check for air leaks in suction line.
Flow rate is too low	Make sure that the viscosity of the liquid being pumped is not abnormally low. Make sure that the discharge pressure is not abnormally high. Make sure that there are no air leaks in the suction line. Verify that the rotational speed is correct. Disassemble pump and verify that the internal clearances are within specification.

Removal from Installation

1. Turn off and lock out the drive mechanism.
2. Fully depressurize both the suction and discharge lines to the pump.
3. Close the valve in the suction and discharge lines closest to the pump.
4. Place a pan or other liquid collecting device under the pump to collect the liquid that will drain from the pump and the suction and discharge lines when the suction and discharge lines are disconnected from the pump.
5. Disconnect the suction and discharge lines at the union or flange closest to the pump. Position the removed lines so that liquid is not spilled.
6. If required, prepare the shaft coupling for disassembly and removal of the pump.
7. Remove the cap screws holding the pump's mounting brackets in place.
8. Remove the pump from its mounting.
9. Loosen the setscrew in the coupling hub on the pump's drive shaft and remove it. If it does not slide off easily, use a puller to remove it. Do not drive it off with a hammer of force it off with a pry bar.
10. Clean up any spilled liquid.
11. Recycle or dispose of spilled liquid as approved by owner's regulations.