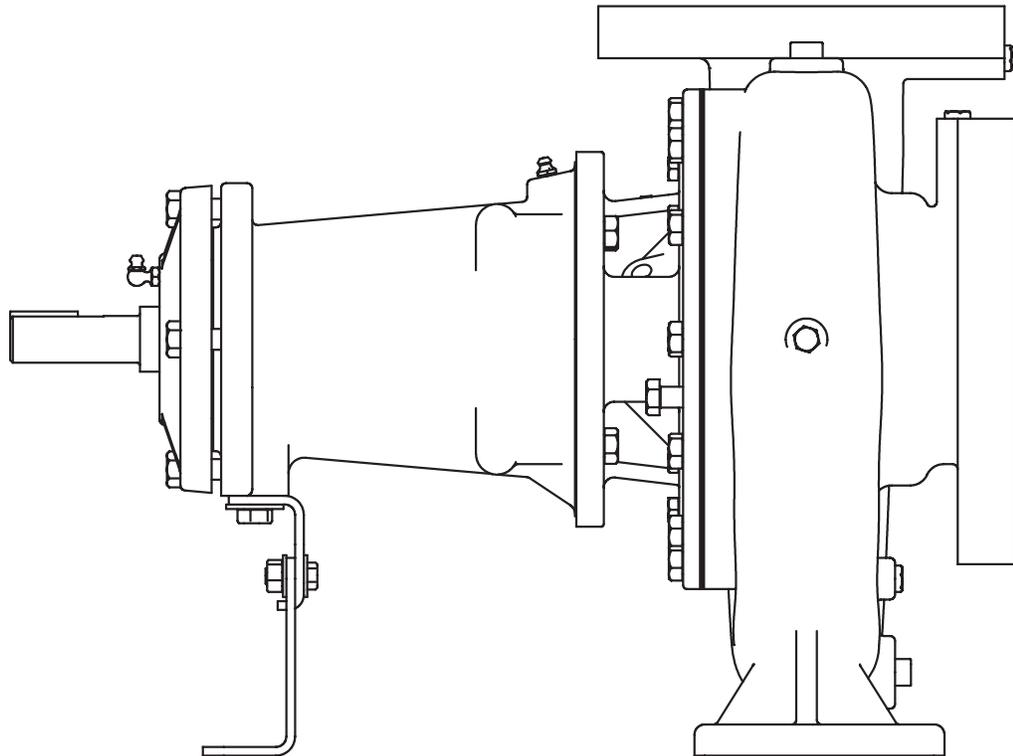




FAIRBANKS NIJHUIS™



1600 SERIES MODELS 1620 AND 1650 **END SUCTION PUMPS**

INSTRUCTION AND REPAIR MANUAL

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

IMPORTANT NOTE TO INSTALLER:

This manual contains important information about the installation, operation and safe use of this product. This information should be given to the owner/operator of this equipment.

CALIFORNIA PROPOSITION 65 WARNING:**WARNING:**

This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

APPLICATIONS:

The 1600 Series pumps are frame mounted or close coupled. They feature high efficiency, rugged construction, foot mounted volutes with back pullout power frames, center drop-out spacer coupling (optional) and regreaseable ball bearings. The pump's stainless steel fitted construction is suitable for unheated domestic and fresh water, condensate, boiler feed water, pressure boosting and hydronic coiling and/or heating.

ATTENTION: SAFETY WARNINGS:

Read and understand all warnings before installation or servicing pump.

OPERATIONAL LIMITS:*

Maximum Operating Pressure: 175 psi at temperatures to 150°F (65.6°C)

Maximum Operating Temperature: 225°F (107°C)

*See ASTM A126/ANSI B16.1 for pressure/temperature ratings of flanges.

ELECTRICAL SAFETY:**WARNING: Electrical Shock Hazard**

All electrical connections are to be made by a qualified electrician in accordance with all codes and ordinances. Failure to follow these instructions could result in serious personal injury, death or property damage.

WARNING: Electrical Overload Hazard

Ensure all motors have properly sized overload protection. Failure to follow these instructions could result in serious personal injury, death or property damage.

WARNING: Sudden Start-Up Hazard

Disconnect and lock out power source before servicing. Failure to follow these instructions could result in serious personal injury, death or property damage.

HIGH TEMPERATURE SAFETY:**WARNING: Hot Surface Hazard**

If pumping hot water, ensure guards or proper insulation is installed to protect against skin contact with hot piping or pump components. Failure to follow these instructions could result in serious personal injury, death or property damage.

WARNING: Spraying Water Hazard

When servicing pump replace all gaskets and seals. Do not reuse old gaskets or seals. Failure to follow these instructions could result in serious personal injury, death or property damage.

HIGH PRESSURE SAFETY:

WARNING: High Pressure Hazard

The pump is rated at a maximum of 175 psi at 150°F. Do not exceed this pressure. Install properly sized pressure relief valves in system. Failure to follow these instructions could result in serious personal injury, death or property damage.

WARNING: Expansion Hazard

Water expands when heated. Install properly sized thermal expansion tanks and relief valves. Failure to follow these instructions could result in serious personal injury, death or property damage.

INSTALLATION:

Read and understand all safety warnings at the beginning of the manual before beginning installation or any repair work.

PUMP LOCATION. You probably have spent considerable time planning where your pump will be located. However, you may have overlooked some factor that may affect pump operation or efficiency.

The pump should be located as close to the liquid source as possible so that the suction line can be short and direct. It should be located in a clean, open area, where it is easily accessible for inspection, disassembly and repair. Pumps installed in dark, dirty areas or in cramped locations are often neglected, which can result in premature failure of both the pump and the driver.

The Fairbanks Nijhuis pump must be installed horizontally. Install isolating valves on each side of pump so pump maintenance can be performed without draining the system. Special mounting requirements may be required if the pump is to be mounted near a noise or vibration sensitive area.

The installation must be evaluated to ensure that the net positive suction head available (NPSHA) meets or exceeds the net positive suction head required (NPSHR), as stated by the pump performance curve.

FOUNDATION. The foundation for your pump must be sufficiently rigid to absorb any vibration and stress encountered during pump operation. A raised foundation of concrete is preferable for most floor mounted pumps. The raised foundation assures a satisfactory base, protects against flooding, simplifies moisture drainage, and facilitates keeping the area clean.

Your pump should be firmly bolted to the foundation, whether it is a raised concrete base, steelwork wall, or structural member. The mounting bolts or lag screws should be accurately located per the applicable Fairbanks Nijhuis dimension sheet. *Refer to Fig. 1.*

LEVELING THE PUMP. Leveling the pump will require enough shims to support the base plate near the foundation bolts and at any points of the base plate carrying a substantial weight load. The shims should be large enough to allow a gap of 3/4" to 1-1/2" between the base plate and foundation for grouting.

IMPORTANT: The pump base must be set level to avoid any mechanical difficulties with the pump or motor. The 1600 pump was properly aligned, if supplied with a motor, at the factory. However, since the pump base is flexible, it may spring and twist during shipment. Do not pipe the pump until it is realigned. Realign the base after piping is completed and after the pump is grouted in and bolted down. **NOTE:** It may be necessary to readjust the alignment from time to time while the unit and foundation are new. Realignment will prevent premature bearing failure, excessive vibration or shaft failure.

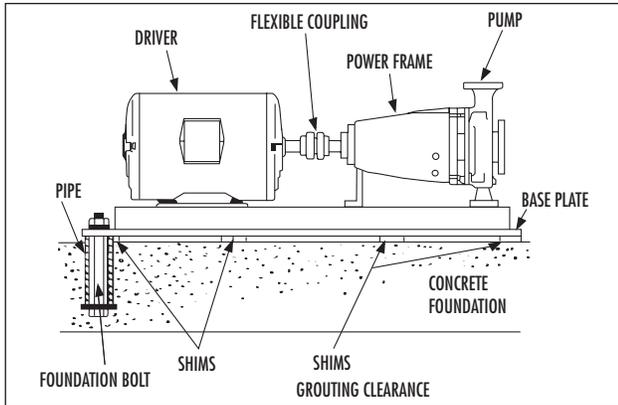


Figure 1. Foundation for Frame Mounted Pumps.

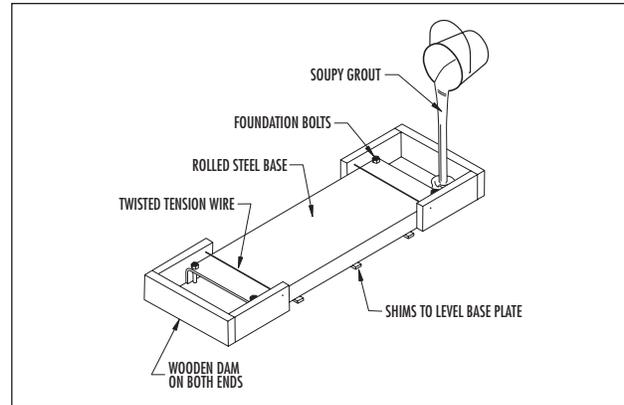


Figure 2. Grouting the Base for Frame Mounted Pumps.

Ensure that proper hydronic accessories such as pressure relief valves, thermal expansion tanks and flow/pressure control devices are installed in the system. Consult the responsible party for your system to ensure these devices are installed and of the proper size.

GROUTING THE INSTALLATION. Grouting the base plate prevents lateral movement of the base plate, and improves the vibration absorbing characteristics of the foundation by increasing its mass. A wooden dam should be constructed around the base plate to contain the grout while it is being poured. The dam can be built tight against the base plate, or slightly removed from it as desired. *Refer to Fig. 2.* The entire base plate should be completely filled with nonshrinkable type grout. The grout should be puddled frequently to remove any air bubbles from the grout.

ROTATION. Pump rotation is clockwise when viewed from the back of the motor. An arrow is also located on the pump to show the direction of rotation.

WARNING: Sudden Start-Up Hazard

Disconnect and lock out power source before servicing. Failure to follow these instructions could result in serious personal injury, death or property damage.

INITIAL ALIGNMENT OF THE FLEXIBLE COUPLING. The pump and driver were accurately aligned at the factory. However, it is impossible to maintain this alignment during shipping and handling. Therefore it will be necessary for you to realign the pump and driver. Flexible couplings are not universal joints. They should not be used to compensate for misalignment of the pump and motor shafts. Their function is to transmit power from the driver to the pump while compensating for thermal expansion and shaft end movement. The coupling faces should be far enough apart so that they do not make contact when the motor shaft is forced to the limit of the bearing clearance toward the pump shaft.

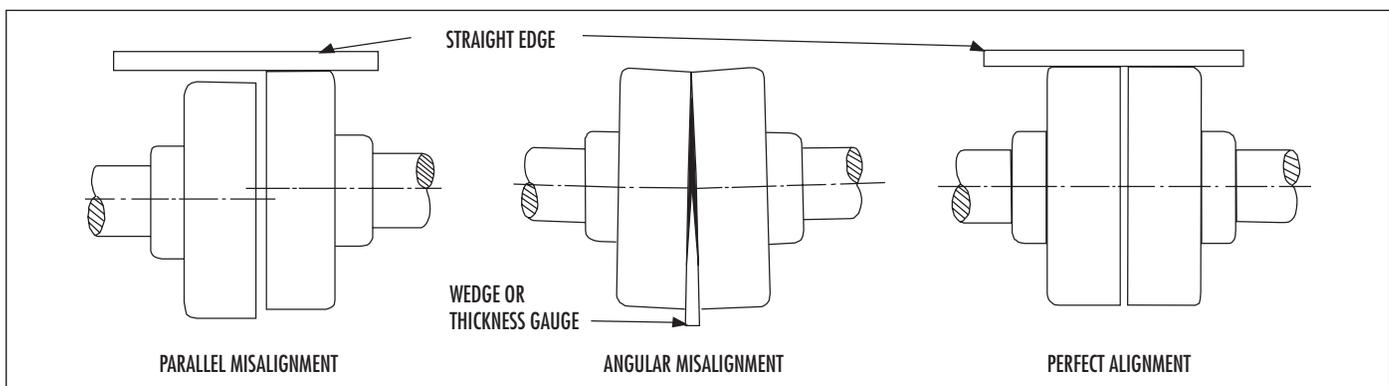


Figure 3. Flexible Coupling Alignment.

In order to properly align the coupling, you will need a taper gauge or set of feeler gauges, and a straight edge.

There are two types of misalignment encountered with flexible couplings: angular misalignment, in which the shafts are not parallel, and parallel misalignment where the shafts are parallel but not on the same axis.

To check angular alignment, insert a feeler gauge or taper gauge at any four places 90° apart around the coupling halves. Insert shims under the driver feet until the same reading is obtained at all four check points. The pump and driver will then be in angular alignment.

To check parallel alignment, a straight edge should be held against the edges of the coupling halves at any four places 90° apart around the coupling. The straight edge should be parallel to the pump and driver shafts at all times. Insert shims until the straight edge lies flat against both coupling halves at all four checkpoints. The pump and driver will then be in proper parallel alignment. *Refer to Fig. 3.*

For fine alignment, 3500 RPM operation, for all other coupler types.

A dial indicator should be used when greater alignment accuracy is required. Use the following alignment tolerances unless specified otherwise by the coupling manufacturer. On sleeve type couplings make sure there is at least 1/8" end clearance between the sleeve and the two coupling halves.

To check angular misalignments, mount the dial indicator base to the coupling half, and position the dial indicator button on the front or rear face of the opposite coupling half. Set the dial to zero, rotate both coupling halves together, making sure the indicator button always indicates off the same spot. Misalignment values within 0.004 inches TIR per inch of coupler radius is permissible.

To check parallel misalignment, mount the dial indicator base to one coupling half, or shaft and position the dial indicator button on the outside diameter of the opposite coupling half. Set the dial to zero. Rotate both coupling halves together, making sure the indicator button always indicates off the same spot. Misalignment within 0.004 inches TIR is permissible.

PIPING:

SUCTION PIPING. The suction piping should be short, but no less than ten pipe diameters in length, and direct with as few elbows and fittings as possible to keep head loss from friction at a minimum. However, the suction pipe should provide a minimum uninterrupted length, equal to ten pipe diameters, to the pump suction flange. A horizontal suction line should have a gradual rise to the pump, and pass under any interfering piping.

The suction pipe diameter should be at least the same diameter as the suction nozzle on the pump, and preferably larger. Use of a smaller diameter pipe will result in loss of head due to friction. All joints must be tight to maintain prime on the pump.

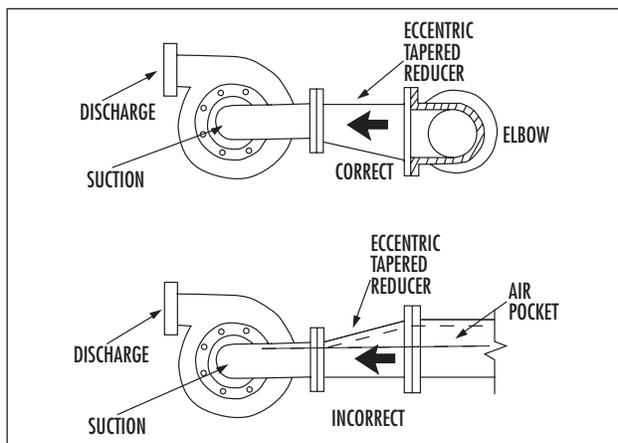


Figure 4. Installation of Tapered Reducers.

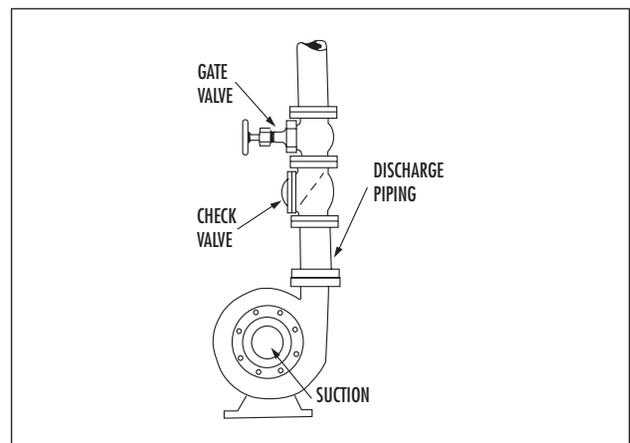


Figure 5. Gate Valve and Check Valve.

REDUCERS. Eccentric reducers should be installed directly at the suction nozzle, with the taper at the bottom to prevent air pockets from forming. Straight taper reducers should never be used in a horizontal suction line because of the air pocket that is formed at the leg of the reducer and the pipe. *Refer to Fig. 4.*

DISCHARGE PIPING. Discharge piping should also be short and direct as possible, with few elbows and fittings, to reduce head loss from friction.

PIPE. The discharge pipe diameter should be the same as, or larger than, the discharge nozzle diameter.

DISCHARGE VALVES. The discharge piping should include a check valve and a gate valve. The check valve should be located between the gate valve and the pump. If an increaser is used in the discharge piping, the increaser should be installed between the pump nozzle and the check valve. The check valve protects against a reverse flow of the liquid if the driver fails. *Refer to Fig. 5.*

The gate valve is used in the priming operation as a throttling valve to control pump volume, and to shut down the pump for inspection and maintenance.

LUBRICATION:

In dry locations, each bearing will need lubrication at least after every 4,000 hours of running time or 6 to 12 months, whichever is more frequent. In wet locations (exposed to dripping water, to the weather or to heavy condensation found in unheated or poorly ventilated underground locations) every 2,000 hours or every 3 to 6 months, whichever is more frequent.

Use Chevron SRI, NLGI2.

Lubricate motor per motor manufacturer's instructions.

GENERAL INSTRUCTIONS:

1. Keep this pump and motor properly lubricated.
2. When there is a danger of freezing, drain the pump.
3. Inspect the pump regularly for leaky seals of gaskets and loose or damaged components. Replace or repair as required.

ELECTRICAL WIRING. Normally, your pump will be supplied with an attached drive motor. The motor should be wired in accordance with the wiring diagram found on the motor nameplate. Be sure the voltage, frequency, and phase of your power supply corresponds with the nameplate data. It is advisable to provide a separate switch and overload protection for your pump motor to protect against power failure in some other area. Conversely, if the pump motor develops electrical problems, it will be isolated from other equipment.

PRESTARTING INSTRUCTION. The coupling halves should be connected. Prior to connection, however, the drive motor should be started to make sure the direction of rotation is the same as the direction indicated by the arrow on the pump casing.

PUMP DISASSEMBLY:

For frame mounted pumps, model 1620 and close coupled pumps 1650.

WARNING: Sudden Start-Up Hazard

Disconnect and lock out power source before servicing. Failure to follow these instructions could result in serious personal injury, death or property damage.

Read and understand all safety warnings at the beginning of the manual before beginning installation or any repair work.

1. Ensure the electrical power is locked out, the system pressure has been lowered to 0 psi and temperature of the unit is at a safe level before beginning any disassembly of the pump.
2. Isolate the pump from the system by closing the valves that should be located on both the suction and discharge of the pump. Loosen the drain plug at the bottom of the casing and drain the pump.

Inspect removed parts at disassembly to determine if they can be reused. Ball bearings that turn roughly or show wear should be replaced. Cracked castings should never be reused. Scored or worn pump shafts should be replaced. Gaskets should be replaced at reassembly simply as a matter of economy. They are much less expensive to replace routinely than to replace singly as the need arises.

WARNING: Hot Surface Hazard

If pumping hot water, ensure guards or proper insulation is installed to protect against skin contact with hot piping or pump components. Failure to follow these instructions could result in serious personal injury, death or property damage.

WARNING: High Pressure Hazard

The pump is rated at a maximum of 175 psi at 150°F. Do not exceed this pressure. Install properly sized pressure relief valves in system. Failure to follow these instructions could result in serious personal injury, death or property damage.

WARNING: Spraying Water Hazard

When servicing pump replace all gaskets and seals. Do not reuse old gaskets or seals. Failure to follow these instructions could result in serious personal injury, death or property damage.

3. For 1620 pumps, remove the coupling guard (not shown).
4. For 1620 pumps, loosen the set screws in both coupling halves (not shown) and slide each half back as far as possible on its shaft. Then, remove the coupling sleeve (not shown).

WARNING: High Pressure Hazard

Make certain that the internal pressure of the pump is relieved before continuing. Failure to follow the instructions could result in serious person injury, death, or property damage.

5. Remove the two foot support capscrews. Loosen, but do not remove the volute capscrews (5). Use capscrew in the jack screw holes to loosen the pump assembly from the volute.
6. Now remove the volute capscrews (5) and remove the pump assembly from the volute.
7. Remove the impeller capscrew (9), lockwasher (9A) and impeller washer gasket (9B). Remove impeller (11).
8. Remove impeller key (12).
9. Remove the O-ring (10).

10. Remove the rotating portion of the mechanical seal (head). *Refer to Fig. 6.*
11. Remove the stationary portion of seal insert along with the insert gasket and retainer (if used).

| CAPSCREW TORQUE FOR COMMON BOLT DIAMETERS | | | | | | | | |
|---|---|-----------|-------|------|-------------|------|------|------|
| CAPSCREW TYPE | HEAD MARKING | IN-POUNDS | | | FOOT-POUNDS | | | |
| | | 1/4" | 5/16" | 3/8" | 7/16" | 1/2" | 5/8" | 3/4" |
| SAE Grade 5 |  | 85 | 180 | 27 | 43 | 65 | 130 | 230 |

Table 1. Torque Chart

REASSEMBLE:

1. Thoroughly clean the shaft sleeve and seal plate seal cavity. Replace the shaft sleeve (25) or seal plate (35A) if there is evidence of surface damage like pitting, corrosion, nicks or scratches.
2. Lubricate the shaft sleeve and seal plate with soap and water or P-80 rubber emulsion. Do not use petroleum lubricant. Install a new insert gasket and a new seal insert down into the seal plate.
3. Slide a new rotating seal assembly (27) onto the shaft sleeve. With a screwdriver, push the top of the compression ring until the seal is tight against the seal insert. Install seal spring.

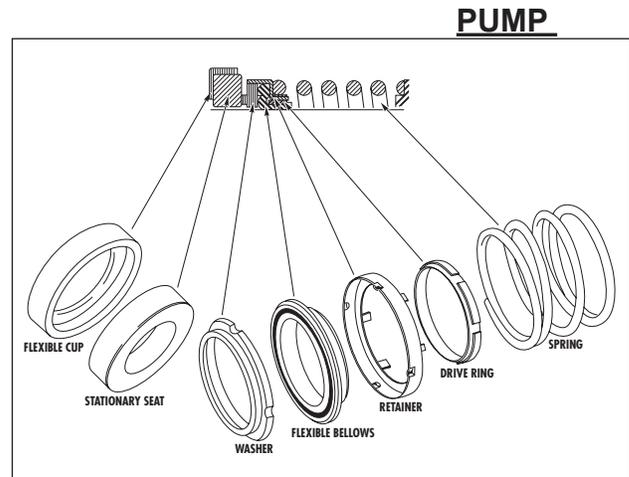


Figure 6. Mechanical Seal.

CAUTION

The mechanical seal (see Fig. 6) (27) is a precision product and must be treated as such. During installation, great care must be taken to avoid dropping any part of the seal. Take particular care not to scratch the lapped faces on the washer or the sealing seat.

4. Install O-ring (10).
5. Install a new impeller key (12).
6. Install impeller, impeller washer (9A), new impeller washer gasket (9B), lock washer (9C), and capscrew (9). Tighten capscrew per torque chart (see Table 1).
7. Install new casing gasket (8). Then install the pump assembly into the volute.
8. Tighten volute capscrews (5) per torque chart (see Table 1).
9. Install foot support capscrews (62) and tighten per torque chart (see Table 1).
10. Install coupling and align.
11. Install drain plugs, close drain valve.
12. Reinstall the coupling guard.

WARNING: Sudden Start-Up Hazard

Disconnect and lock out power source before servicing. Failure to follow these instructions could result in serious personal injury, death or property damage.

13. Open isolation valves and inspect pump for leaks.
14. Return pump to service.

POWER FRAME OR PUMP SHAFT DISASSEMBLY/REPLACEMENT:

Read and understand all safety warnings at the beginning of the manual before beginning installation or any repair work.

Follow steps 1–11 from main pump disassembly procedure.

12. Remove the Seal Plate (35A) capscrews (5B) from the bracket (35B).
13. Remove the power frame capscrews (5) and washers (5A) from the bracket (35B). If the power frame assembly is being replaced, skip to reassembly step 5 after replacement. If replacing the shaft (55), continue to step 14.
14. Remove the grease fittings (43) from the power frame.
15. Unscrew capscrews (48) and remove bearing cap (49). Remove O-ring (oil lubed only) and retainer ring (52).
16. Slide out shaft (55) and bearings (53 and 54). Since bearings (53 and 54) are press fitted on the shaft, they will have to be pulled or pressed off the shaft. Remove grease seals (51) from frame (57) and bearing cap (49).
17. Thoroughly clean the shaft (55), removing any oil or dirt.

POWER FRAME REASSEMBLE:

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your particular repair program.

1. Press grease seals (51/51A) into frame (57) and bearing cap (49).
2. Press bearings (53 and 54) onto shaft (55). Snap retainer ring (52) into place.
3. Slide shaft (55) and bearings (53 and 54) into frame (57).
4. Fasten bearing cap (49) in position with capscrews (48). Position slingers (47) on the shaft.
5. Position the bracket (35B) on the frame (57) and secure with capscrews (5) and washers (5A). Tighten screws evenly to assure proper alignment.
6. Position the Seal Plate (35A) on the bracket (35B) and secure with capscrews (5B). Tighten screws evenly to assure proper alignment.

Follow steps 1 through 14 from Pump Reassemble procedure to complete pump assembly.

Do not start pump until all air and vapor has been bled and until making sure that there is liquid in the pump to provide the necessary lubrication for the mechanical seal.

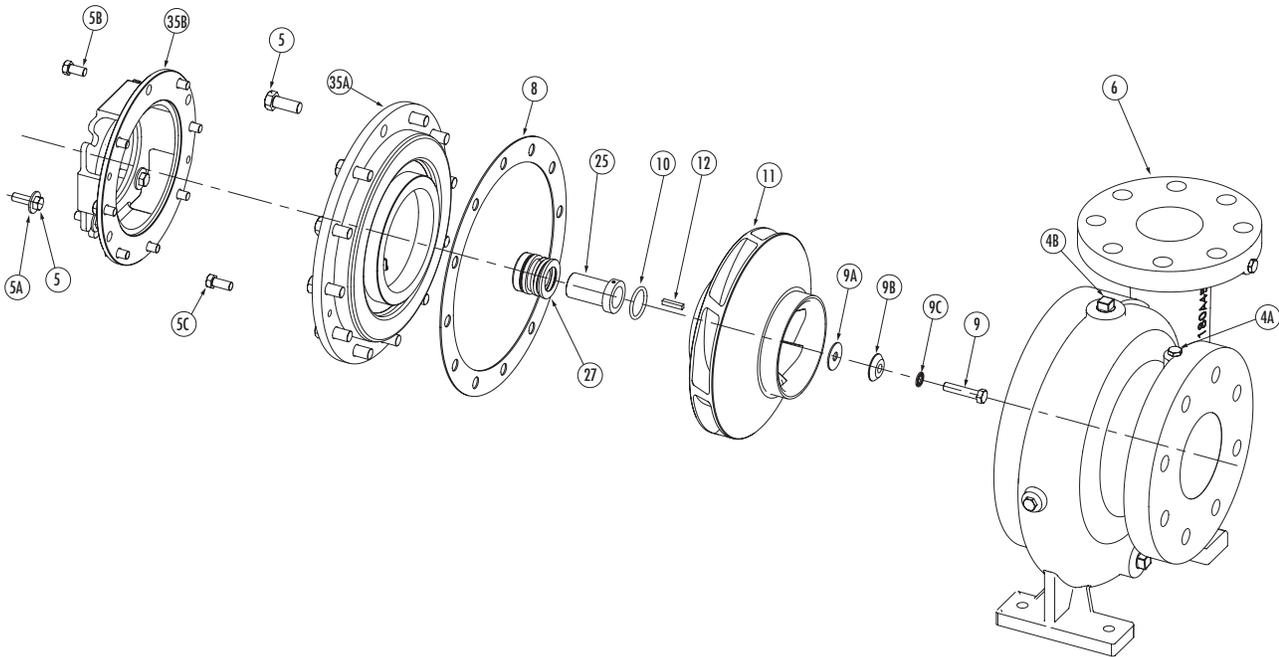


Figure 7. Model 1650.

Models 1620 & 1650 List of Parts

| | | | | | |
|-------|-----------------|------|----------------|--------|----------------|
| 4. | Pipe Plug | 12. | Impeller Key | 49. | Bearing Cap |
| 4A/B. | Capscrew | 25. | Sleeve | 52. | Retaining Ring |
| 5A. | Capscrew Washer | 27. | Seal | 53. | Bearing |
| 5B. | Capscrew | 32. | Capscrew | 54. | Bearing |
| 6. | Casing | 33. | Screw | 55. | Shaft |
| 8. | Gasket | 34. | Nameplate | 57. | Frame |
| 9. | Impeller Screw | 35A. | Seal Plate | 62. | Capscrew |
| 9A. | Washer | 35B. | Motor Bracket | 63. | Washer |
| 9B. | Gasket | 42. | Key | 64A/B. | Foot Support |
| 9C. | Capscrew Seal | 43. | Grease Fitting | | |
| 10. | O-Ring | 47. | Slinger | | |
| 11. | Impeller | 48. | Capscrew | | |

FAIRBANKS NIJHUIS RESERVES THE RIGHT TO SUBSTITUTE MATERIALS WITHOUT NOTICE.

NOTE: WHEN ORDERING SPARE PARTS ALWAYS INCLUDE THE PUMP TYPE, SIZE, SERIAL NUMBER, AND THE PIECE NUMBER FROM THE EXPLODED VIEW IN THIS MANUAL. ORDER ALL PARTS FROM YOUR LOCAL AUTHORIZED DISTRIBUTOR, OR THE FACTORY AT NORTH AURORA, ILLINOIS.

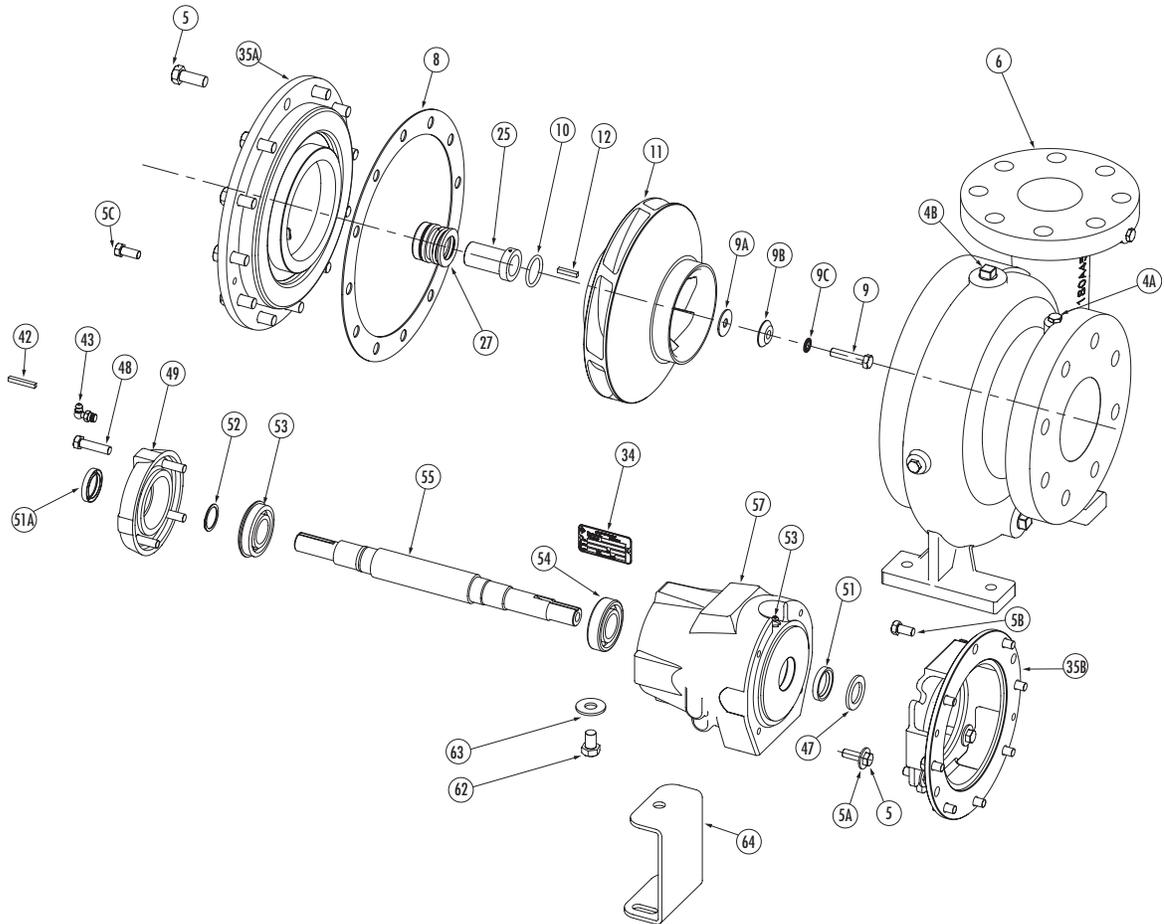


Figure 7. Model 1620.

THIS PAGE INTENTIONALLY LEFT BLANK