

installation, operation and service instructions

THIS INSTRUCTION MANUAL COVERS SKIDMORE

HPC CONDENSATE RETURN SYSTEM
HPM BOILER FEED SYSTEM
HPB BASE MOUNTED CENTRIFUGAL
HP PUMP UNIT ONLY

installation

LOCATING PUMP: Install unit in a clean, dry, well-ventilated and drained location for inspection and care. **CAUTION:** (Be sure the pump foundation is level before unit is bolted down so that there will be no misalignment of pump and motor shaft. A slight misalignment will immediately cause the flexible insert of the coupling to wear and disintegrate on HP and HPM units.) The top of the pump receiver should be below the lowest return since it is best to keep the return lines dry. **This unit must be placed so the condensate flows into the receiver by gravity,** otherwise returns will be wet and the system will not free itself of air.

PIPING: Connect returns to inlet of receiver with a gate valve in each return and with a union or flange joint next to the receiver. Provide a drain to sewer from each return. Connect discharge of pump to boiler with a union, swing check valve and a gate valve; with the swing check valve as close to the pump as is possible. If discharge pipe is longer than 50 feet, increase piping to next size larger. **Piping must be of correct length to prevent any pipe strain upon the unit.**

WIRING: The electrical connections between the motor, float switch and automatic starter (if furnished) are made at the factory. Connect the electric service to the float switch or automatic starter using conduit and wire sizes as required by local power companies. Provide a fused main line switch in motor circuit.

CAUTION: Be sure Electric Power Supply available corresponds to the characteristics of the motor furnished with pump.

Connect the Power Supply to the pump motor, using either a Manual Starter or a Magnetic Starter with overload protection. **WITH POLYPHASE MOTORS,** always use Magnetic Starters.

operation

CAUTION: New or repaired heating systems should be operated several days with the returns open to sewer until water appears clear, in order to thoroughly flush and clean the lines and prevent clogging of the pump when it is put in operation. This may take from a few days to two weeks.

INITIAL LUBRICATION: Do not fail to lubricate motor before starting. Sleeve bearing motors should be lubricated with a light oil (SAE No. 10) before motor is started. Ball bearing motors are usually packed with grease when shipped from the factory and may not need lubrication until after several weeks of service. Nevertheless, it would be well to check bearings before motor is started. Always be careful to avoid overlubrication which may result in damage to commutator or armature windings. Use Lithium 2 or equal.

INSPECTION BEFORE STARTING UNIT FOR FIRST TIME:

CAUTION - DO NOT RUN PUMP DRY: Should the pump lose its prime, do not run it dry, as the Mechanical Shaft Seal, which is lubricated only by the liquid being pumped, will be damaged and ruined.

- 1 - Be sure motor bearings are lubricated with either oil or grease as recommended by motor manufacturer. Use oil for sleeve bearing construction and grease for ball bearing construction.
- 2 - Turn shaft and see that it rotates freely by hand. Failure of shaft to turn freely may be caused by motor bearings too tight or not lubricated, dirt clogging pump or becoming lodged in motor, or shaft coupling out of line.
- 3 - Be sure flexible coupling is in perfect alignment. This can be checked by placing a straight edge or scale across the top and sides of the coupling flanges.
- 4 - Be sure current characteristics of voltage, phase and frequency on motor nameplate are the same as the service available. Also be sure that wires are connected to motor as per motor manufacturer's instructions for voltage and phase used, and that the correct size fuses and thermal cut-outs are installed.
- 5 - Be sure that piping connections have been made as per instructions, and that the air vent pipe leading from receiver is open to atmosphere.
- 6 - Be sure that the engineering characteristics of the complete pumping unit are identical to the capacity, discharge pressure, and other requirements of the heating system.
- 7 - Be sure that the float in the receiver is free to operate float switch.

STARTING: Open valves in discharge and return lines, close valve on drains and throw in fused knife switch. If an automatic starter with selector switch is installed, be sure selector switch button is in "Automatic" position. Open plug on top of pump housing to vent air and allow pump to become primed. When water appears close plug.

AFTER STARTING:

- 1 - With vent pipe open to atmosphere, air and vapor can escape as fast as condensation flows into the receiver. If vent is restricted or clogged receiver will not fill.
- 2 - Be sure pump and motor rotate in proper direction as indicated by arrow on pump casing or dimension print. If rotation is reversed the trouble may be corrected in polyphase motors by simply reversing any pair of leads. If motor is single phase adjust brush setting. (See motor instructions card.) If motor is D.C. reverse armature leads.
- 3 - Be sure bearings of motor do not overheat.
- 4 - Be sure float switch closes and opens properly as receiver fills and is emptied by the pump. Normally this need not be touched. If required, however, refer to float switch instruction card.
- 5 - Be sure all connections are tight.
- 6 - Observe operation of unit closely for approximately three hours after starting and at regular intervals for ten days. A new unit if frequently stiff and bearings are tight, and therefore should be watched to note performance.

service and maintenance

- 1 - **INSPECTION** - To insure the best operation of the unit, make a systematic inspection at least once a week.
- 2 - **CLEANLINESS** - Keep the interior and exterior of motor and automatic switches free from moisture, oil and dirt. When necessary blow out the interiors with compressed air or a bellows. Occasionally drain and flush receiver to remove sediment and scale, frequency depending upon operating conditions.
- 3 - **BEARINGS** - Prevent excessive heating and wear of bearings by proper lubrication at regular intervals, depending upon the type of pump service and cleanliness of location. Avoid over lubrication, which also causes bearings to heat up and produce excessive wear. When bearings are worn and unit is noisy, replace immediately with new bearings so as not to injure the other rotating parts.
- 4 - **AUTOMATIC SWITCHES** - Occasionally examine contacts of automatic switches and see that they make a full firm contact and break the circuit quickly. See that all terminal connections are tight.
- 5 - **MECHANICAL SHAFT SEAL** - Occasionally examine water slinger No. 5 on motor shaft and look for water leakage. Any leakage will also be visible on No. 7 Pedestal. Leakage indicates that the seal surfaces are worn and Parts No. 23 & 23A will need replacing. (For proper procedure in replacing seal, refer to instructions under REPLACING MECHANICAL SHAFT SEAL AND RE-ASSEMBLING PUMP.)
- 6 - **SHUTTING DOWN** - At the end of the heating season open main line switch, close valves on return and discharge, and drain receiver and pump. Cover motor and automatic switches to protect them against dirt, etc.
- 7 - **CAUTION - NEVER OPERATE PUMP WHEN IT IS DRY, BECAUSE THE MECHANICAL SHAFT SEAL WILL BE DAMAGED. NEVER EXPOSE PUMP TO FREEZING TEMPERATURES WHEN FULL OF WATER.**

REMOVING PUMP FROM BASE

- 1 - Disconnect union in pump discharge line.
- 2 - Loosen set screw in No. 11 pump shaft coupling and slide coupling back 1/2" on shaft.
- 3 - Remove No. 26 suction flange bolts and pry flanges apart.
- 4 - Remove 4 cap screws holding pump to base and remove pump unit.

DISMANTLING PUMP (See Figure 1)

- 1 - Remove hex nuts no. 3 and remove volute no. 1
- 2 - Holding coupling rigid to keep shaft from turning, remove impeller capscrew no. 2, impeller lockwasher no. 19, and impeller retaining washer no. 21.
- 3 - Remove impeller no. 22. Watch for impeller key no. 10.
- 4 - Remove seal plate no. 4 and mechanical shaft seal no. 23.
- 5 - Remove water slinger no. 5 from shaft.
- 6 - Holding coupling again, loosen set screws (2) in ball bearing collar and rotate collar 90° clockwise to disengage locking action on inner race of ball bearing to release the shaft.
- 7 - Remove pump coupling half no. 11 from shaft watching for key no. 10.
- 8 - Slide shaft no. 9 forward and remove from pump pedestal no. 7 from impeller end. Inboard bearing will remain on shaft.
- 9 - Remove outboard bearing no. 8 from pedestal no. 7.
- 10 - Remove inboard bearing no. 8 from shaft no. 9 as in step 6 above holding shaft by replacing coupling half and key.

RE-ASSEMBLING PUMP

- 1 - Replace inboard ball bearing no. 8 to shaft no. 9. Locate bearing on shaft holding dimensions as shown in Fig. 1. Lock bearing in place by turning bearing collar counterclockwise and setting with the aid of a spanner wrench. Tighten set screws in bearing collar.
- 2 - Replace shaft and inboard bearing in pedestal no. 7 from impeller end.
- 3 - Install outboard bearing no. 8 and set in place as in step one above.
- 4 - Replace pump coupling half no. 11 and key no. 10 on shaft.
- 5 - Replace water slinger no. 5 on pump shaft.
- 6 - Replace seal plate no. 4 and mechanical shaft seal no. 23.
- 7 - Replace impeller key no. 10 and impeller no. 22 on shaft.
- 8 - Replace impeller retaining washer no. 21, impeller lockwasher no. 19, and impeller capscrew no. 20. Tighten capscrew while holding coupling half to keep shaft from turning.
- 9 - Replace volute no. 1 and hex nuts no. 3 and tighten.

REPLACING MECHANICAL SHAFT SEAL

- 1 - Follow steps 1 thru 5 for "Dismantling Pump".
- 2 - Remove shaft seal seat no. 23A from seal plate no. 4.
- 3 - Use a light oil on the entire diameter of ceramic seal seat and press it into the machined bore of the seal plate no. 4 with the ceramic seat out. Press in as far as it will go making sure that the seat surface is at a perfect right angle in respect to the pump shaft. Use CAUTION so as NOT TO SCRATCH OR MAR lapped surface of ceramic seat.
- 4 - Follow steps 5 thru 9 for "Re-Assembling Pump".

ORDERING PARTS

When ordering parts always furnish pump serial number indicated on nameplate, which may be attached to receiver, pump or base depending upon convenience. State quantity, name or description and part number if a casting.

PARTS IDENTIFICATION See Figure 1

FURNISH PUMP SERIAL NUMBER WHEN ORDERING PARTS

trouble chart

Should trouble develop with the unit, the information given below may enable the operator to locate it and correct it without the aid of a factory service technician.

NO CONDENSATE DISCHARGE

- 1 - Not enough condensate in return line to prime pump.
- 2 - Speed too low.
- 3 - Discharge head too high.
- 4 - Impeller loose on shaft, plugged or worn.
- 5 - Wrong direction of rotation.

PUMP DOES NOT START

- 1 - Motor lead connections may be wired wrong.
- 2 - Blown fuses in disconnect switch.
- 3 - Bad coil in starter.
- 4 - Loose connection in switches or motor leads.
- 5 - Overload protection in starter or motor damaged or not Re-Set.
- 6 - Rotating assembly is bound. Try turning pump and motor shaft by gripping Flexible coupling.

INSUFFICIENT CONDENSATE DISCHARGE

- 1 - Air or water leak at pump stuffing box or gasket.
- 2 - Plugged vent cock.
- 3 - Speed too low.
- 4 - Discharge head higher than anticipated.
- 5 - Impeller loose on shaft, plugged or worn.
- 6 - Wrong direction of rotation.

EXCESSIVE POWER CONSUMPTION

- 1 - Speed too high.
- 2 - Loose wiring connections.
- 3 - Mechanical defects:
 - (a) Motor shaft bent.
 - (b) Rotating element binds.
 - (c) Foreign elements between impeller and volute.

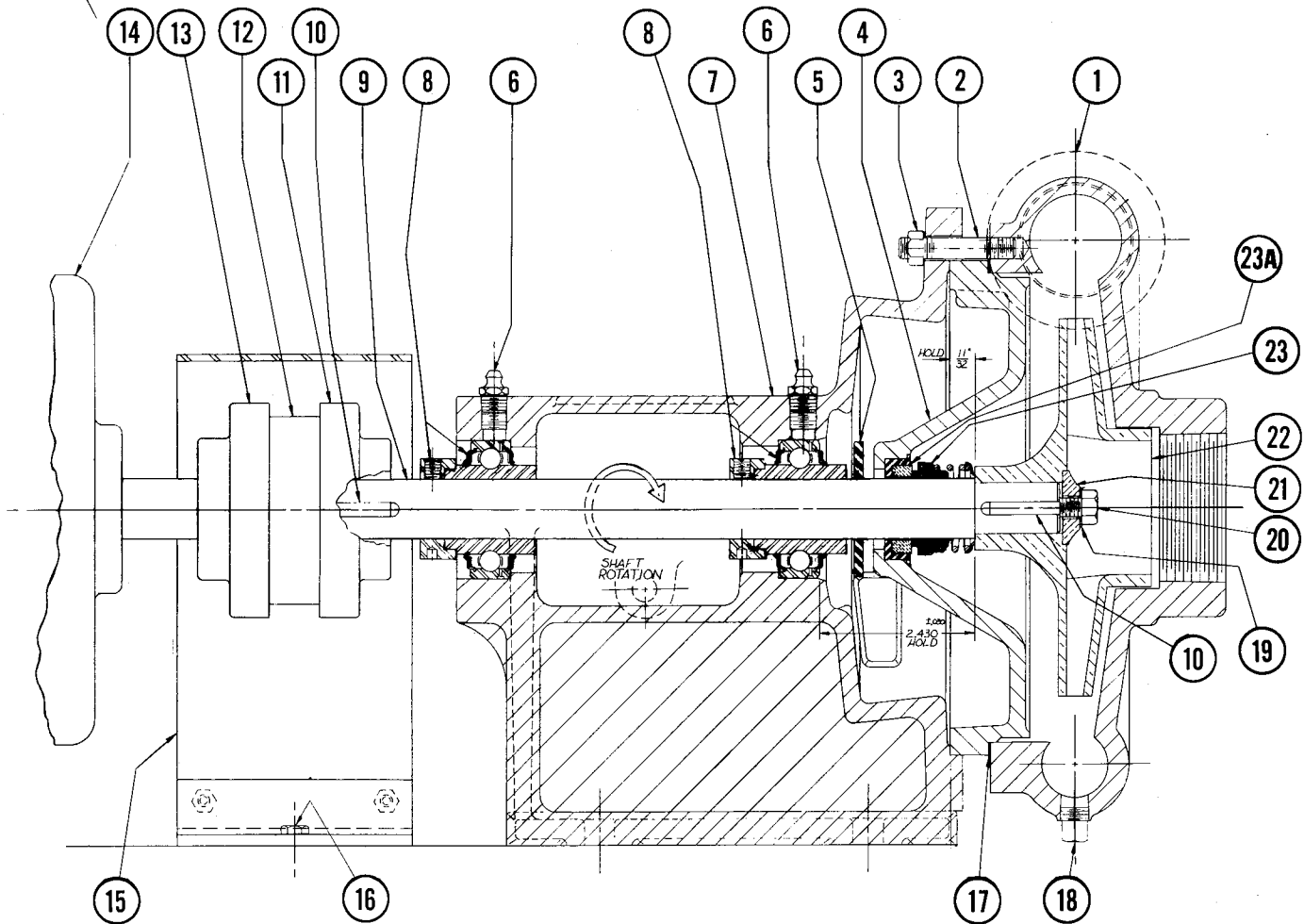
PUMP IS NOISY

- 1 - Bearings are bad — In either electric motor or pump.
- 2 - Pump may be operating at a low enough head to be in cavitation range. Cavitation sounds like pebbles rattling in a pail. Throttle discharge valve to correct pressure and lock. (If cavitation noise disappears it may be wise to install a smaller diameter impeller, reduce speed, or install an orifice or venturi on discharge.)
- 3 - Pump is operating too near shut-off head. Check discharge piping to lower the head. If this cannot be accomplished, contact factory.
- 4 - Internal parts rubbing.
- 5 - Motor has magnetic hum or high windage noises. Check with motor manufacturer.

LOSS OF SUCTION FOLLOWING PERIOD OF SATISFACTORY OPERATION

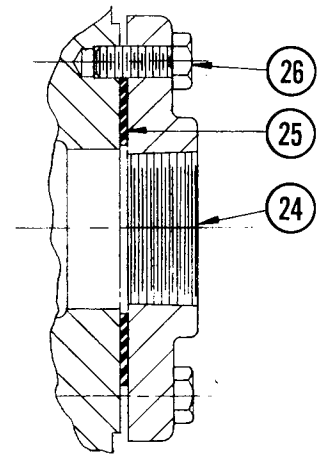
- 1 - Air leak at pump gasket.
- 2 - Pump vent cock plugged, so that air would not be expelled to prime the pump unit.
- 3 - Air or gasses in condensate or condensate too hot.

figure 1 - HP, HPC, HPB & HPM pumps



PARTS LIST

- 1 - Volute
- 2 - Stud - Volute, 5/16-18 × 2-1/4" long 8 required
- 3 - Nut - Volute Stud, 5/16-18 Hex 8 required
- 4 - Seal Plate
- 5 - Water Slinger, Rubber
- 6 - Grease Fitting, 1/8" NPT (on pumps mfg prior to 1983) 2 required
- 7 - Pedestal, Cast Iron
- 8 - Ball Bearing 2 required
- 9 - Shaft, Stainless Steel
- 10 - Key - Shaft, 3/16 2 required
- 11 - Coupling Half-Pump
- 12 - Insert - Coupling
- 13 - Coupling Half-Motor
- 14 - Motor
- 15 - Coupling Guard
- 16 - Cap Screws - Coupling Guard 2 required
- 17 - Gasket - Volute, Fiber
- 18 - Plug - Volute Drain
- 19 - Lockwasher - Impeller, 5/16 External Tooth, Bronze
- 20 - Capscrew - Impeller, 5/16-18 × 3/4" long, Stainless Steel
- 21 - Retaining Washer - Impeller, Bronze
- 22 - Impeller, Bronze
- 23 - Mechanical Shaft Seal
- 23A - Ceramic Shaft Seal Seat - included with #23. Not sold separately
- 24 - Companion Flange, NPT, Cast Iron
- 25 - Gasket - Companion Flange, Fiber
- 26 - Cap Screw - Companion Flange, 1/2-13 × 1-1/4" long 4 required



PUMPS WITH 2" DISCHARGE OR LARGER

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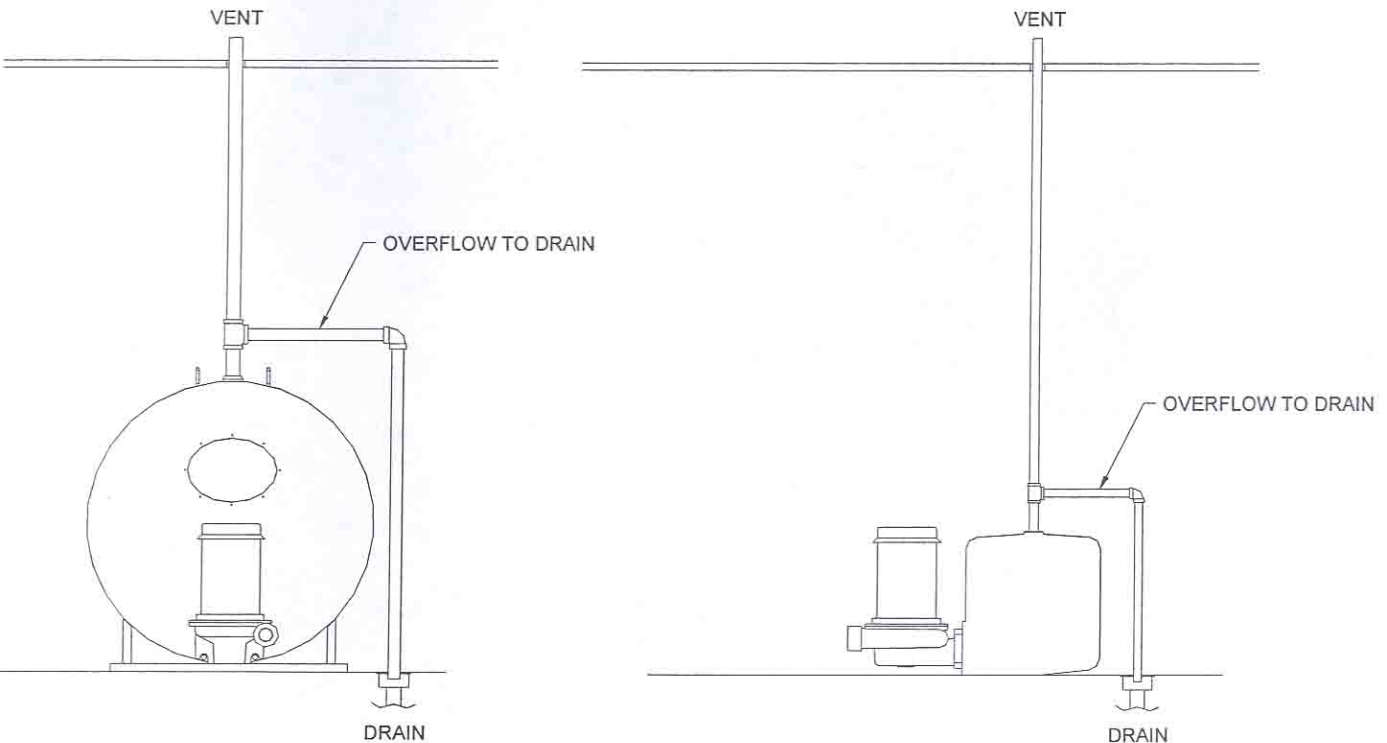
Overflows and Vents

Proper installation of overflow and vent piping is critical to the success of your installation. The tank you have purchased is not a pressure vessel and properly locating the overflow and vent piping will help prevent damage to the tank.

The purpose of the **overflow** is to provide a path for the tank contents to escape the tank in the event of flooding caused by mechanical or electrical failure. An overflow should extend no higher than one foot above the top of the tank, because each additional foot of height in the overflow adds about 1/2 psi to the pressure in the vessel. Overflows typically are directed into floor drains.

The purpose of the **vent** is to maintain atmospheric pressure on top of the liquid in the tank (that is, to prevent pressurization by the process). There is no limit to the height of the vent, since it is only carrying air at low velocity. Tall vents should be supported from above to ensure stability and to reduce weight load on the tank.

Some tanks have separate vent and overflow ports, while others have a single port that must serve both purposes. See the figure below for the proper method for plumbing vent and overflow to a single port. **Never reduce pipe size on vent or overflow lines.**



Return Line Strainer

Use of a strainer in the return to the receiver is recommended. The strainer collects solids of a certain size, and removes them from the condensate. Strainers typically have access covers that allow removal of the strainer basket or screen for cleaning. The proper location of the strainer is in the condensate return line near its entry point to the tank.