

## installation and operating instructions

**multiplex boiler feed and  
condensate return units**

### **KEEP THESE INSTRUCTIONS NEAR THE PUMP FOR USE OF OPERATOR**

#### **INSTALLATION INSTRUCTIONS**

**Locating Unit:** Unit should be located on a concrete floor or raised foundation and must be level. Its location should allow it to be drained to a floor drain or other sewer connection. Unit can accept pumped condensate and 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 from each return to the sewer. Discharge piping from every pump shall have a gate valve and check valve arranged to allow pump to be removed from system without disturbing discharge piping. Discharge piping shall be arranged so it does not create a strain upon the pump units. If discharge pipe is longer than 50 feet, increase piping to next larger size.

**Receiver:** Receiver will be of the capacity indicated and will be of one of the following standard sizes: 200, 260, 360, 500, 630, 750 or 1000 gallon. If receiver is of a special capacity, it will be indicated on the drawings. Each receiver will be equipped as follows: drain connection, gauge glass, make-up water connection with reverse-acting float switch, solenoid water make-up valve, all openings such as vent, returns and pump suction connections. A control box will be mounted on the side of the receiver and its sequence of control will be described in the control specifications, along with wiring instructions.

#### **OPERATING INSTRUCTIONS**

##### **INSPECTION BEFORE STARTING UNIT FOR FIRST TIME**

1. Check motor shaft and be sure it rotates freely. If shaft is tight, inspect pump end and motor for foreign matter clogging pump or lodging in motor.
2. Check voltage supply and be sure it is same as motor on pump, or same as wiring connections made at factory.
3. Be sure piping connections to pump have been made per instructions and that air vent pipe from receiver is open to atmosphere.
4. Be sure that the engineering characteristics of the complete pump are identical to the capacity, discharge pressure and other requirements of the system.
5. Be sure that the float in the receiver is free to operate float switch.

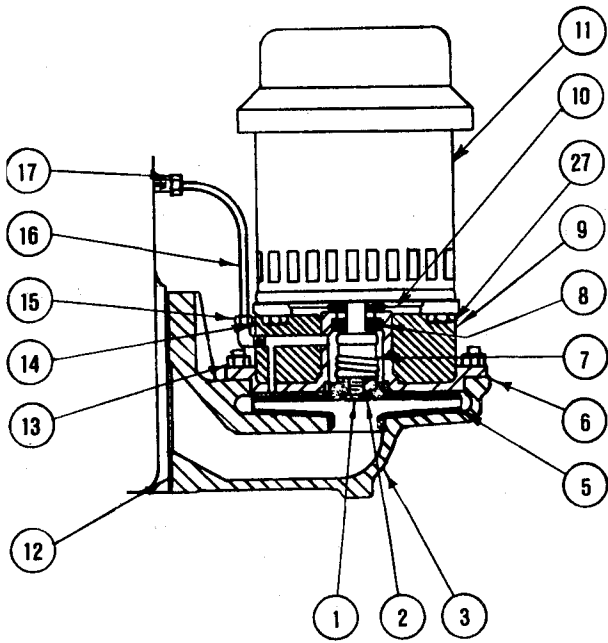
**Starting:** Open valves in discharge and return lines, close valves in drain lines and close fused knife switch. If an automatic starter with selector switch is installed, be sure selector switch button is in "Auto" position.

**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.

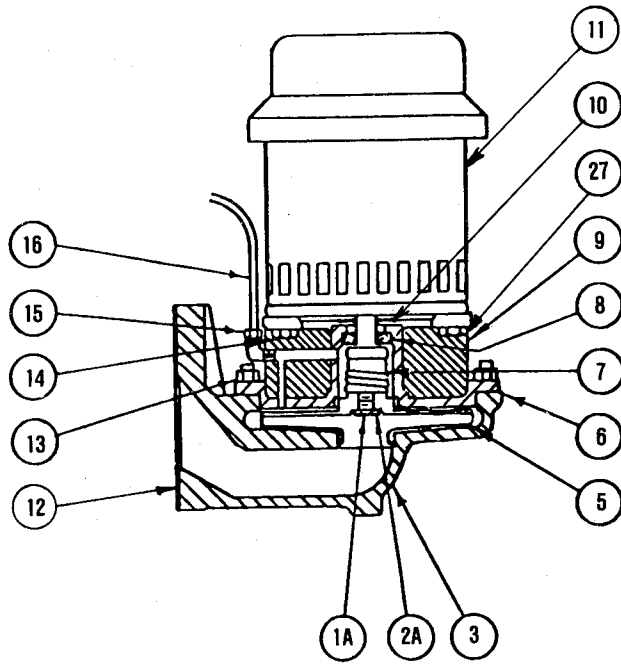
This pump is equipped with a mechanical shaft seal instead of the conventional type of packing. Be sure, therefore, that pump receiver is filled with water or condensate before starting, because the mechanical seal will be damaged if run dry.

# Skidmore®

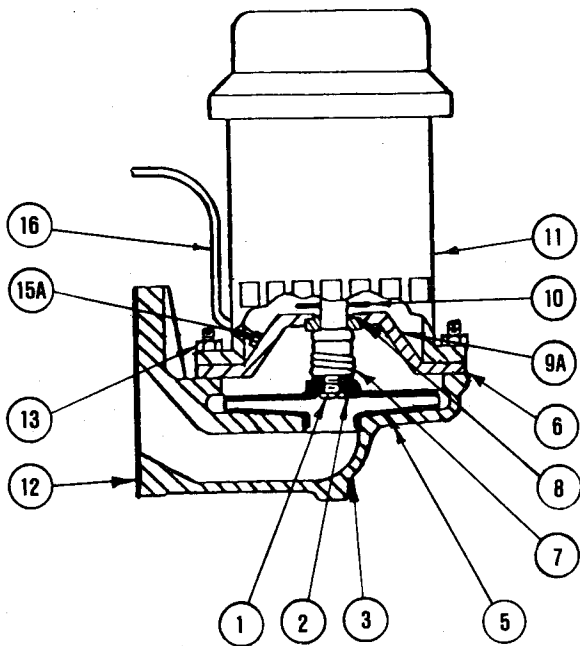
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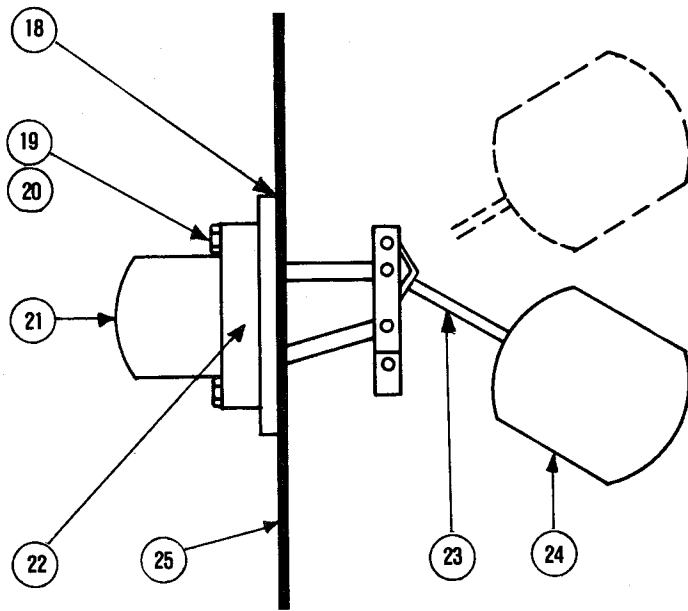
**Fig. No. 1**  
**VCS Detail of Pump Section with**  
**Fractional Horsepower Motor Sizes**



**Fig. No. 2**  
**VCS Detail of Pump Section with**  
**Integral Horsepower Motor Sizes**



**Fig. No. 3**  
**Detail of Pump Section**  
**VJS All Sizes**



**Fig. No. 4**  
**Reverse Action Contacts Close on**  
**Falling Level (Boiler Feed)**

## PARTS LIST

- |   |  |
|---|--|
| 1 - Impeller Lock Nut — Bronze 30             | 15 - Vent Line Fitting — Elbow                                       |
| 1A - Impeller Lock Screw — Stainless Steel 10 | 15A - Vent Line Fitting (Seal Plate)                                 |
| 2 - Impeller Lockwasher — Bronze              | 16 - Pump Vent Line  |
| 2A - Impeller Retaining Collar — Bronze       | 17 - Vent  |
| 3 - Pump Housing — C.I.                       | 18 - Gasket — Float Switch   |
| 5 - Centrifugal Impeller                      | 19* - Hex Head Cap Screw (C.I. Only) 4 Reg.                          |
| 6 - Gasket — Pump Housing                     | 20* - Hex Nut — Float Switch (Steel Only) 4 Reg.                     |
| 7 - Rotating Seal Assembly with S.S. Spring   | 21 - Float Switch Only   |
| 8 - Ceramic Seal Seat and Vibration Ring      | 22 - Float Switch and Linkage Assembly<br>Complete with Ball and Rod |
| 9 - Motor Bracket — C.I.                      | 23 - Float Rod   |
| 9A - Seal Plate                               | 24 - Float Ball  |
| 10 - Water Slinger — Neoprene                 | 25 - Receiver (Side Wall)  |
| 11 - Electric Motor                           | 26 - Solenoid Make-Up Valve — Not Shown                              |
| 12 - Gasket — Receiver to Pump Housing        | 27 - Hex Head Cap Screw  |
| 13* - Hex Nut and Stud Bolt                   |  |
| 14* - Hex Head Cap Screw                      |  |

\*May be purchased locally

## REMOVING PUMP AND MOTOR UNIT

No return piping or pump discharge piping need be disturbed to remove pump and motor unit, simply proceed as follows:

- 1 - Loosen and remove hexagon nut from vent line fitting Part No. 17 and swing copper tube vent line away from receiver.
- 2 - Disconnect wiring and flexible conduit at motor terminal box and swing away from pump.
- 3 - Remove stud nuts No. 13 and lift motor and pump unit from pump housing No. 3 for inspection or repair.

## DISMANTLING PUMP AND MOTOR UNIT

FOR PUMP UNIT WITH FRACTIONAL H.P. ELECTRIC MOTOR, Proceed as follows:

- 1 - Remove drip cover from top end of motor and receiver plug from center of motor top end-bell. Note slot in top end of motor shaft (or two flats on motor shaft if it extends above end-bell.). Use either a heavy wide blade screwdriver, or open end wrench, to hold motor shaft securely.
- 2 - Remove No. 1 impeller locknut with socket head wrench by turning locknut COUNTER-CLOCKWISE. Also remove bronze lockwasher No. 2.
- 3 - Still holding motor shaft securely, remove No. 5 impeller by turning COUNTER-CLOCKWISE. Impeller hub is threaded and screws onto threaded motor shaft.
- 4 - Remove No. 7 rotating seal assembly with spring by sliding along motor shaft. Spring seats against impeller hub.
- 5 - Remove No. 27 hex. cap screws, holding No. 9 bracket to motor, and remove bracket from motor. Water slinger No. 10 is now visible and can be removed.

FOR PUMP UNIT WITH INTEGRAL H.P. ELECTRIC MOTOR, Proceed as follows:

- 1 - Insert blade of screwdriver in one of the peripheral vane openings of impeller to keep shaft from turning. With another screwdriver or socket wrench remove No. 1A impeller lock screw by turning COUNTER-CLOCKWISE. Impeller lock screw may be slotted round head type or hexagon head type.
- 2 - Remove No. 2A impeller retaining collar and with two (2) screwdriver blades 180° apart and between impeller No. 5 and bracket No. 9, pry impeller from motor shaft. The impeller hub has a straight bore and motor shaft is straight with a key and keyway.
- 3 - Remove No. 7 rotating seal assembly with spring by sliding along motor shaft. Spring seats against impeller hub.
- 4 - Remove No. 27 hex. cap screws, holding bracket to motor, and remove bracket No. 9 from motor. Water slinger No. 10 is now visible and can be removed.

## REPLACING MECHANICAL SHAFT SEAL AND REASSEMBLING PUMP

- 1 - Pump and motor unit must be completely dismantled as indicated above.
- 2 - Remove No. 8 Ceramic stationary seal seat and vibration ring from bracket No. 9.
- 3 - Be sure counter-bore in bracket No. 9 is perfectly clean before inserting new ceramic seat and ring.
- 4 - Use a light oil on the entire diameter of vibration ring and press it together with the ceramic seat into the machined bore of bracket No. 9. Press as far as it will go and be sure it is in proper place with seat surface at a perfect 90° angle with respect to motor shaft. Use caution so as NOT to SCRATCH or MAR lapped surfaces of ceramic seat.
- 5 - Attach No. 9 bracket to motor and replace screws No. 27.
- 6 - Use light oil on lower end of motor shaft and slip rotating seal assembly No. 13 onto motor shaft as far as it will go. CAUTION: Be careful not to SCRATCH or MAR lapped surface of carbon ring.
- 7 - Insert seal spring and be sure it seats properly against shaft seal.
- 8 - FRACTIONAL H.P. MOTORS: Hold top end of motor shaft with screwdriver or open end wrench and screw impeller No. 5 CLOCKWISE onto motor shaft until it is tight. The seal spring will center itself on hub of impeller and it will be properly compressed for seal tension.
- 9 - Replace lockwasher No. 2 and locknut No. 1 and turn locknut CLOCKWISE until tight.
- 8A - INTEGRAL H.P. MOTORS: Replace impeller key in motor shaft and replace impeller on shaft. With impeller in proper place, the inside hub will be almost flush with end of motor shaft and seal spring will have proper compression.
- 9A - Insert screwdriver blade in one of the impeller peripheral openings to keep it from turning, and replace No. 2-A retaining collar and No. 1-A locking screw. Tighten locking screw by turning CLOCKWISE.
- 10 - Replace gasket No. 6 and set pump and motor unit onto pump housing No. 3 and replace stud nuts No. 13 and tighten securely.
- 11 - Replace copper tube vent line No. 14 and tighten hex. nuts on fitting No. 17.
- 12 - Reconnect wiring and flexible conduit at motor terminal box and unit is now ready for operation. (Check rotation.)
- 13 - CAUTION: NEVER RUN PUMP WITH RECEIVER EMPTY, BECAUSE BOTH ELEMENTS OF MECHANICAL SHAFT SEAL WILL BE DAMAGED.

### INSPECTION AFTER STARTING

1. With vent pipe open to atmosphere, air and vapor can escape as fast as condensation flows into receiver. If vent is not open, or restricted, receiver will not fill.
2. Be sure pump and motor rotate in proper direction. Correct direction of rotation is CLOCKWISE when looking at top of motor. (If rotation is reversed, refer to motor instruction card and change proper leads.)
3. Check motor bearings for overheating.
4. Check float switch to see that it opens and closes solenoid valve.
5. Check all piping connections for leaks.
6. Observe operation of unit closely for several hours after first starting and at regular intervals for several days. A new unit is frequently stiff and bearings are tight and therefore should be watched to check performance.

### SERVICE AND CARE OF UNIT

1. Inspection: To insure best operation of 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. If necessary, use compressed air for blowing out dirt. Occasionally drain and flush pump receiver to remove sediment and pipe scale.
3. Motor Bearings: Prevent excessive heating and wear of ball bearings by proper lubrication, frequency depending upon service pump is subjected to and cleanliness of location. Normal lubrication — at the start of each heating season or every 1500 hours of operation. — See Lubrication item 8.
4. Automatic Switches: Occasionally examine contacts of automatic switches and see that they make a full firm contact and break the circuit quickly. Be sure all terminal connections are tight and not corroded.
5. Mechanical Shaft Seal: Occasionally examine water slinger Part No. 10 on motor shaft and look for water leakage. Any leakage will also be visible on Part No. 9 motor bracket. Leakage indicates that the seal surfaces are worn and Parts No. 7 and 8 will need replacing. (For proper procedure in replacing these parts, refer to instructions under Disassembly of Pump.) CAUTION: NEVER OPERATE PUMP WHEN RECEIVER IS EMPTY, BECAUSE THE SEAL WILL BE DAMAGED IF RUN DRY.
6. Shutting Down: At end of heating season, open main line switch, close valves in return line and discharge piping, and drain receiver and pump. If necessary, cover electric motor and automatic switches to protect them against dirt, oil and moisture.
7. Caution: Never operate pump when receiver is empty or expose it to freezing temperature when filled with water.
8. Lubrication: None required for pump proper. However, the vertical motor is ball bearing type with pre-sealed and lubricated bearings, and no immediate lubrication is necessary. Required lubrication depends upon service pump is subjected to and cleanliness of location. Normal lubrication — at the start of each heating season or every 1500 hours of operation whichever comes first. Do NOT over lubricate. Use CITCO Premium Lithium #2 or equal.

## 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 Page 3.**

### **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 man.

### 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 - Wearing Rings worn.
- 7 - 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 wearing ring.

### 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 stuffing box or 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.

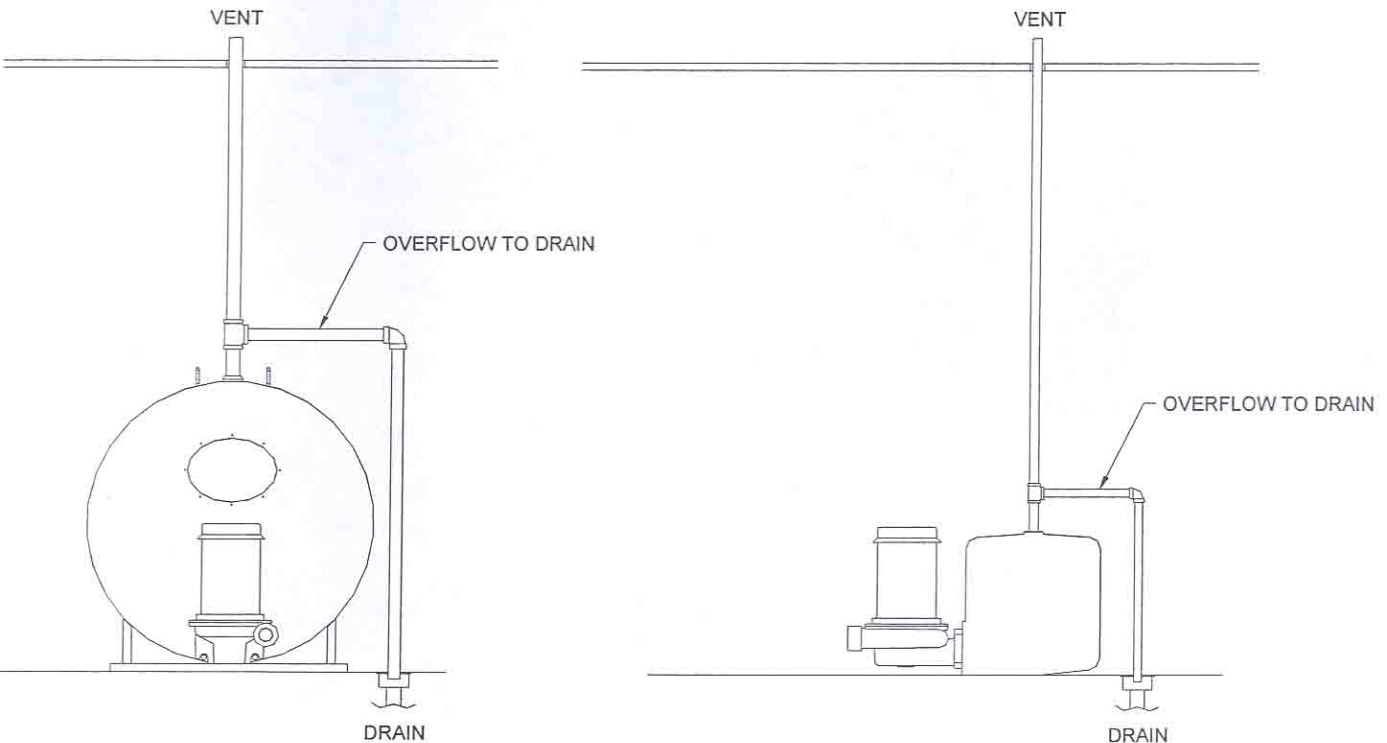
## Overflows and Vents

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.