



# COLLECTION AND PUMPING STATIONS

Refer to Bulletin P-624.

## **! SAFETY PRECAUTIONS**

1. Read pump operating instructions and instructions supplied with chemicals to be used.
2. Refer to a chemical resistance data chart for compatibility of materials with solution to be used.
3. Note: If liquid temperature is elevated, outside of tank must be supported.
4. Operating personnel should always wear suitable protective clothing: face mask or goggles, apron and gloves.
5. All piping must be supported and aligned independently.
6. Always close valves slowly to avoid hydraulic shock.
7. Ensure that all fittings and connections are properly tightened.

**! CAUTION:** The pump and motor are always energized or in automatic control mode if the switch is on or the green pilot light is on. Disconnect all power before servicing.

## **BEFORE CHANGING APPLICATIONS OR PERFORMING MAINTENANCE**

1. Wear protective clothing as described in item 4 above.
2. Flush pump and tank thoroughly with a neutralizing solution to prevent possible harm to personnel.
3. Shut off power to motor at disconnect switch.

## **PRINCIPLE OF OPERATION**

### **INDUCTION RELAY**

Collection and pumping stations are self-contained automatic units controlled by a liquid conductivity based level control consisting of a 1500-C relay of proper secondary voltage, corrosion resistant electrodes, and a holder to support the electrodes. The relay utilizes the liquid as an electrical conductor to complete the secondary circuit between the upper and lower electrodes. When the liquid contacts the upper electrode, the pump will start. The ground electrode acts as a holding circuit to maintain the relay in its closed position. When the liquid falls below the lower electrode, the pump will stop. The electrode circuit voltage being generated within the relay has no connection with the power line. The flow of current through the low energy secondary circuit is very small and varies with voltage of the secondary coil. The secondary coil is selected to operate over the resistance of the liquid being pumped. There is a wide range of secondary coil voltages to choose from. It is important to choose the right coil voltage for the nature of the liquid being used. Float sensors are available for non-conductive solutions such as D.I. water.

When a second relay, 1500-A, accompanied with another electrode is added, an additional normally open contact is provided to permit the use of many different types of signal devices, such as sonic or visual devices, solenoid valves, etc., to control/warn of high level or low level situations. Secondary coil voltage for all standard units is 220 VAC. This is suitable for most water solutions except very soft water or for water soluble oil.

## **SOLID STATE CONTROLS**

Solid state controls work on the same principle and has the same options as the induction type relay but have certain advantages over electromechanical relays. Separate secondary circuits are used to sense current flow in the liquid, compare it to the current flow through a fixed set point resistor, and energize the relay. When the current of the sensing circuit exceeds that of the fixed resistor, the circuit activates a solid state switch which allows current to flow through the relay coil. Since higher voltages are not necessary to push the current through both the liquid and the coil relay, solid controls can function with much lower electrode voltages, allowing a greater range of use on liquids, even those of slight conductivity.

Solid state alternators are standard on all alternating duplex models. This alternation provides near equal wear on both pieces of equipment thus reducing maintenance costs.

When the Series -16SF (single function) or the Series -16DF (dual function) solid state open circuit board is used in conjunction with the solid state alternator board, a normally open or a normally closed contact is added for applications, such as high level/low level warning devices.

## **WIRING**

All units are pre-wired and completely tested at the factory. Standard motors and relays are 115 volt, single phase, 60 Hz, supplied with a line cord. Starters supplied with single phase units have no line cord. Power needs to be supplied to L1 & L3 on the coil of the starters. Power for the level controls is supplied by the incoming power source.

## **THREE PHASE OPERATION**

Electrical power will need to be connected to L1, L2, and L3 on the coil of the starters. Starters supplied on 3 phase units have 24 volt control transformers. Level controls are 115 volt. A line cord is provided to supply power for the controls.

## **ALARM RELAYS**

If the CPS unit was purchased with the audible alarm option installed, no wiring is required. If the CPS unit was purchased without the audible alarm option, a signal device with proper voltage will have to be supplied.

## **INDUCTION TYPE**

Contact design is a normally open, non-powered contact located on #5 and #6 of the 1500-A relay. Contact rating is 25A @ 120/240/480 VAC resistive, standard pilot duty to 600 VAC, 1HP @ 120/240 VAC.

## **SOLID STATE**

Contact design is an SPDT (1 form C): one normally open (N.O. #9) and one normally closed (N.C. #10), non-powered contacts located on #6, #7 and #8 (common #11) of the series 16 PC board. Contact rating is 10A @ 120/240VAC resistive (120°F), 1A @ 120/240 VAC resistive (150°F), 1/3 HP @ 120/240 VAC (120°F).

**⚠ WARNING**  
**READ BEFORE USING YOUR TANK**

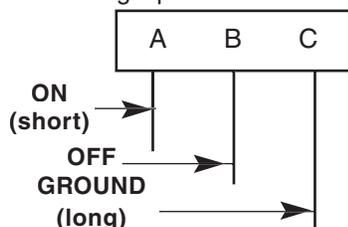
1. Fill tank with water prior to use to prevent material loss through unsecured fittings, shipping damage, or manufacturing defects. Manufacturer is not responsible for loss of materials.
2. Use only with compatible chemicals as listed as in the material suppliers' current catalogs and at temperatures recommended: high density polyethylene 140°F maximum, polypropylene 212°F.
3. Use only for storage of chemicals at atmospheric pressure, never for vacuum or pressurized applications.
4. Support bottom of tank firmly and completely.
5. Support sides of rectangular tanks. In general, tanks with depths greater than 18" must be supported. Smaller tanks containing liquids that have a high specific gravity and/or are at elevated temperatures must be supported.
6. Do not mount heavy equipment on tank sides.
7. Do not allow weight on tank fittings. Support pipes and valves independent of the tank.
8. Use expansion joints to prevent damage at fittings from differential expansion and contraction of piping and tank.
9. Protect tank from impact, especially at temperatures below 40°F.
10. Operating personnel should wear suitable protective clothing when operating and/or servicing equipment.
11. Disconnect power before servicing unit.
12. Before changing applications or performing maintenance, flush pump and tank with a neutralizing solution.

**⚠ CAUTION:** Disconnect relay control power before servicing electrodes or electrode holders.

Note: Actual performance of tanks may vary due to mechanical stress, temperatures, weight of contents, types of chemicals and other factors. Manufacturer is not responsible for loss of materials.

**INSTALLATION**

1. Electrodes are shipped uninstalled to prevent damage to holder and electrodes. Lift cover plate assembly from tank and match corresponding numbers on holder and electrodes. Electrodes are pre-cut at the factory in lengths necessary for minimum solution level required for pump operation. If greater solution depth in the tank is needed, cut off desired length and remove 1" of the insulation from the tip of the electrode that turns the pump on. Do not alter the ground or the off electrode. (See Figure below)
2. Install a strainer on the supply line or the pump inlet if the incoming liquid contains solids or other substances



that could cause damage to the pump.

3. Secure cover plate assembly back on the lip of the tank with the bolts and nuts.
4. Use Teflon tape on all pipe connections. Attach the supply line to the bulkhead on the side of the tank.
5. Attach discharge line to pump on top of unit.
6. Plug unit into a ground faulted protected receptacle. If unit was supplied with starters, a qualified electrician should connect the required power supply.
7. Turn unit on. If supplied with starter, turn selector switch to the auto position.
8. Open supply line valve to unit. When the liquid level of the tank rises and comes into contact with the on electrode, the pump will start automatically. Unit will automatically stop when the liquid level falls below the off electrode.

**SERVICE INSTRUCTIONS**

**INDUCTIVE TYPE**

1. If pump does not start, check for blown fuse, an open switch, corroded connections, etc. Check voltage at motor starter, line terminals and overload heaters on motor starter to be sure they have not tripped.
2. Relay coils rarely fail unless struck by lightning or subjected to some severe over-voltage condition. To check coil relays, apply line voltage to the primary coil. Touch both ends of the secondary coil (#7 & #8) with an insulated jumper wire. Relay should pull in when the jumper is connected, and fall out when the jumper is removed. Failure to do so indicates one of the coils is open.
3. Relay will not function unless a good, dependable ground connection is made to complete the secondary circuit from one end of the secondary coil, through the electrode and liquid, and back through the ground to the other side of the secondary coil.
4. If the secondary coil voltage is too low for the resistance or conductivity of the liquid being controlled, the relay will not pull in or it will buzz or chatter before pulling in.
5. Accumulation of dirt, grease or other deposits on the upper electrode will insulate it and prevent relay from pulling in. The electrodes should be inspected and cleaned at regular intervals. The holding circuit carries a small current; a slight film of grease or dirt can prevent proper closure. Do not use sandpaper or emery cloth to clean electrodes.
6. Check to make sure that the proper electrode lengths are provided. If the upper electrode is suspended at a point where the liquid cannot make contact, pump will not start.
7. If relay operates at one level only (starting and stopping at one electrode), check the following:
  - a. Check continuity from the electrode to the proper terminal of the relay (see wiring diagram) to verify proper installation of electrodes to electrode holder.
  - b. Poor ground connection will prevent holding circuit from functioning and cause relay to operate from the upper electrode only.

- c. A ground in the lead wire from relay to lower electrode will prevent relay from dropping out. The best way to check for a ground is to connect a replacement wire from relay to the electrode holder outside the conduit and test the relay for operation. If it drops out properly, it is likely that a ground exists in the original lower lead wire.
- d. Excessive dirt or moisture over insulation at electrode holder or electrodes can cause faulty relay operation. Interior of electrode holder and its underside should never come in contact with the liquid. Electrodes should be checked periodically.
- 4. Sensitivity can be adjusted from 1-kohm to 26-kohm by turning potentiometer to the right or left using a small standard screwdriver.
- 5. No preventative maintenance of any nature is required for the printed circuit board. No replacement parts except the board itself is available. Keep the enclosure covers on at all times to prevent airborne dirt and moisture from accumulating on the devices therein.

#### SOLID STATE CONTROLS (Duplex Models)

- 1. If pump does not start, check for blown fuse, an open switch, corroded connections, etc. Check voltage at motor starter, line terminals and overload heaters on motor starter to be sure they have not tripped.
- 2. Lights on printed circuit board indicate when contacts have closed. Apply line voltage to circuit board. With an insulated jumper wire, touch the common terminal to the off terminal, then another jumper to the lead terminal. A green light on the circuit board should light. Remove the wire from the lead terminal and touch it again. The other green light should light. Remove the wire from the lead terminal and touch the lag terminal. Both green lights should light. Failure to do so indicates printed circuit board needs to be replaced.
- 3. Electrodes and holder should be kept clean and free of dirt or grease. Check them periodically to make sure they do not become fouled with floating debris or insulating deposits. Do not use sandpaper or emery cloth to clean electrodes.



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