

OPERATING INSTRUCTION MANUAL

Manual No. 313 Revision 2-584

MODEL 11 LIQUID LEVEL CONTROL SYSTEMS

Milwaukee, Wisconsin 53224

Phone: [414] 355-3601 Fax: [414] 355-8346

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SECTION 1 - GENERAL INFORMATION

- 1.1 The Model IIL controller operates on low voltages. A maximum of 18 volts is impressed across the electrodes, making them completely safe. In addition, a high resistance is in series with the electrode terminals to limit the current if electrodes are shorted.
- 1.2 The Model IIL controller is contained on a single printed circuit board. One of four configurations is provided: no enclosure, a NEMA I steel enclosure, a NEMA I plastic enclosure with exposed terminal strip and a NEMA 4 cast aluminum enclosure. Relay contacts are rated 10 amperes resistive. A built-in sensitivity adjustment enables the controller to be used in any liquid with a conductivity as low as one microSiemen/cm. The controller may be located up to 100 feet from the electrodes.
- 1.3 The electrode fittings, constructed of stainless steel and Teflon, are suitable for most water-based solutions. A 3/8" NPT thread accepts 1/4" diameter electrodes. The fittings are rated at 1000 psig up to 400°F or 100 psi steam. The electrodes are supplied in any desired length which is specified.

Model IIL liquid level controllers operate on the principle of a liquid's ability to conduct electricity. Some liquids such as salt water are quite conductive whereas others such as oil are practically non-conductive. Model IIL solid-state controllers can control the level of most any liquid other than a perfect insulator. By passing a small electrical current through the liquid, a change in voltage is generated and amplified by transistors in the controller to operate a relay. This design provides the reliability and sensitivity of solid-state electronics and the simplicity and ruggedness of a mechanical relay.

3.1 CONTROLLER

- 3.1.1 Mount in as clean and dry a location as possible where minimal mechanical vibration exists. Avoid locations where corrosive fluids may fall on the controller.
- 3.1.2 Refer to Figure 3-1, 3-2, 3-3 or 3-4 for enclosure and mounting dimension details. Surface mount the controller on any reasonably flat surface located within 100 feet from the electrode(s).
- 3.1.3 When the controller is housed in an enclosure, use conduit hubs or cable feed-thru fittings where cables enter. Holes not used for cable entry should be sealed with a plug.

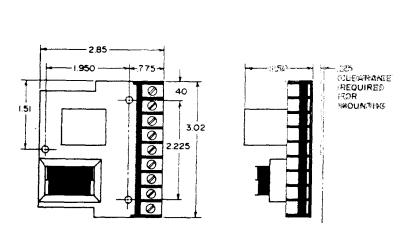


FIGURE 3-1 Controller Outline -No Enclosure

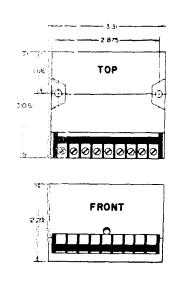


FIGURE 3-2 Controller Outline -Plastic Enclosure

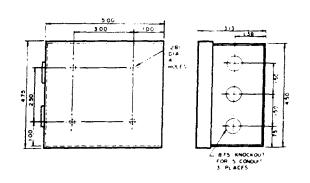


FIGURE 3-3 Controller Outline - Steel Enclosure

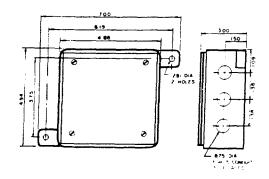


FIGURE 3-4 Controller Outline - Cast Aluminum Enclosure

3.2 ELECTRODES

- It is recommended to install the electrodes vertically. It is possible to install electrodes in the side of a tank, but it may be impractical since the tank must be drained to a level below the electrode to remove the electrode.
- 3.2.2 Each electrode is mounted with a Teflon-insulated, stainless steel electrode holder (see Figure 4-5). When an optional cast aluminum electrode mounting hardware enclosure is supplied, the electrode holder(s) is factory-installed.

To install an electrode holder directly into a tank, drill an 11/16" dia. clearance hole, insert the electrode holder and fasten it

with a 3/8"-18 NPT nut.

NOTE: If a pressure seal is required, it is recommended to use Teflon tape on the mounting threads.

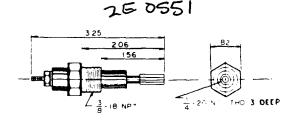


FIGURE 3-5 Electrode Holder

3.2.3 Connect the threaded end of the 1/4" diameter electrode to the 1/4" female tip of the electrode holder. Tighten the electrode with pliers to insure that it will not vibrate loose when in operation.

NOTE: Long electrodes may be shipped in two or more sections.

These must be assembled following the directions and identifications attached to the electrodes.

3.2.4 When installing more than one long electrode, make sure the electrodes cannot touch each other (shorting results in improper operation). It may be necessary to separate the long electrodes with non-conductive spacers.

4.1 Line power and load wiring should conform with local electrical codes. Since the controller-to-electrode wiring is low voltage, it does not usually concern local electrical authorities but should be carefully done for optimum performance.

CAUTION: Do not exceed the controller's load contact rating of 10 amps non-inductive, at 115 VAC (5 amps for 230 VAC service). For example, if the load is a pump motor, a motor starter instead of the motor itself should be connected across the load contacts.

4.2 Refer to the appropriate external wiring diagram on page 6 that matches your application requirements and make the electrical connections as described. Practically any wire may be used (No. 18 gauge wire is recommended) but it should be well insulated to prevent a conductive path between electrode wires or to ground, particularly under damp or wet conditions.

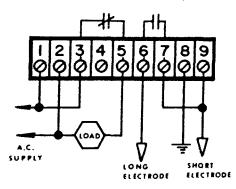
NOTE: Do not run electrode wires in the same conduit with line power or adjacent to a conduit containing high voltage wiring.

The wiring diagrams assume the tank or vessel to be metallic and grounded. If not, an additional electrode is required to be connected to Terminal 8 on the controller. This "ground" electrode must be longer than all other electrodes and must be immersed in the liquid at all times. A metal tank or vessel may not necessarily be grounded. If in doubt, run a separate wire from the metallic tank to Terminal 8 on the controller. If this is done, Terminal 8 need not be connected to earth ground, but simply to the tank. In some localities this extra wire is mandatory to conform to local regulations.

EXTERNAL WIRING DIAGRAMS

DIAGRAM A

Differential level Service, Pump up.

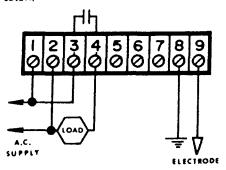


Load contacts 3-5 open when the level rises to the short electrode connected to terminal 9, They close when the level recedes below the long electrode connected to terminal 6.

Terminal 8 is grounded and tank is assumed metallic and grounded. If tank is insulated a third electrode is required and is connected to terminal 8. This electrode must be immersed at

DIAGRAM C

Single level service, High level alarm or low level cutoff.

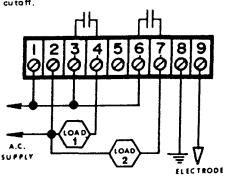


Load contacts 3-4 close when level reaches the electrode and open when level drops below the electrode.

Terminal 8 is grounded and tank is assumed metallic and grounded. If tank is insulated a second electrode is required and is connected to terminal 8. This electrode must be immersed at all times.

DIAGRAM E

Single level service, High level atarm or low level cutoff.

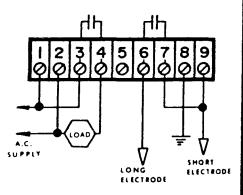


Load contacts 3-4 and 6-7 close when level reaches electrode, They open when level drops below the electrode.

Terminal 8 is grounded and tank is assumed metallic and grounded. If tank is insulated a second electrode is required and is connected to terminal 8. This electrode must be immersed at all times.

DIAGRAM B

Differential level service, Pump down.

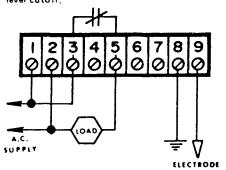


Load contacts 3-4 close when the level rises to the short electrode connected to terminal 9. They open when the level drops below the long electrode connected to terminal 6.

Terminal 8 is grounded and tank is assumed metallic and grounded. If tank is insulated a third electrode is required and is connected to terminal 8. This electrode must be immersed at

DIAGRAM D

Single level service. Low level alarm or high level cutoff

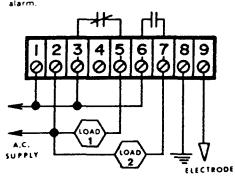


Load contacts 3-5 open when level reaches the electrode and close when level drops below the electrode

Terminal 8 is grounded and tank is assumed metallic and grounded. If tank is insulated a second electrode is required and is connected to terminal 8. This electrode must be immersed at all times.

DIAGRAM F

Single level service, High or low level cutoff alarm



Load contacts 3-5 open when level reaches electrode and load contacts 6-7 close when level reaches electrode, Load contacts 3-5 close when level drops below electrode and load contacts 6-7 open.

Terminal 8 is grounded and tank is assumed metallic and grounded. If tank is insulated a second electrode is required and is connected to terminal 8. This electrode must be immersed at all times.

5.1 Check that all wiring connections are sound and in accordance with the diagrams. Apply power to the controller. Insure that the electrode(s) is immersed at least 1/8 inch below the surface of the liquid. Use a small screwdriver to slowly turn the sensitivity control clockwise until the internal relay operates with a firm click. In some applications, the internal relay may initially oscillate during this adjustment. To overcome this, continue to increase the sensitivity setting until the oscillation stops. For the most reliable operation, set the sensitivity control at a point just above that which gives positive relay operation.

CAUTION: If sensitivity control is fully counterclockwise, the controller will not function properly.

5.2 The liquid level control system should be checked through two or three cycles of operation to insure that it operates as intended. For further testing, a "tank empty" condition can be simulated by disconnecting the electrode wires (usually at the controller). A "tank full" condition can be simulated by shorting the electrode terminals on the controller.

Dirty or pitted electrodes can cause the controller to malfunction. Sometimes this problem can be compensated for by increasing the sensitivity control. It should be noted, however, that this is not recommended as a substitute for periodic electrode cleaning.