

# Model 407D

## Liquid Level Controller



- Three pump operation
- Three run-time meters
- Selectable lead or automatic alternation
- Five sensing levels
- Alarm outputs
- Hand-Off-Auto controls (HOA)

### SPECIFICATIONS

| Model                  | 407D                                                                              |
|------------------------|-----------------------------------------------------------------------------------|
| Input voltage          | 100—240 VAC                                                                       |
| Input frequency        | 50/60 Hz                                                                          |
| Power consumption      | 10 Watts max.                                                                     |
| Contacts               | SPST relay                                                                        |
| Contact rating         | 10A at 240 VAC resistive                                                          |
| Float switch potential | 12 VDC at 1mA                                                                     |
| Transient protection   | 2500 V for 10 msec                                                                |
| Operating temperature  | -10 to +140 °F                                                                    |
| Display                | To 9,999.9 resettable                                                             |
| Humidity tolerance     | 0—97% without condensation                                                        |
| Expected relay life    | Mechanical: 10 million operations<br>Electrical: 100,000 operations at rated load |
| Case material          | 20 gauge steel                                                                    |
| Termination            | Removable terminal strip                                                          |
| Weight                 | 6.1 lbs                                                                           |

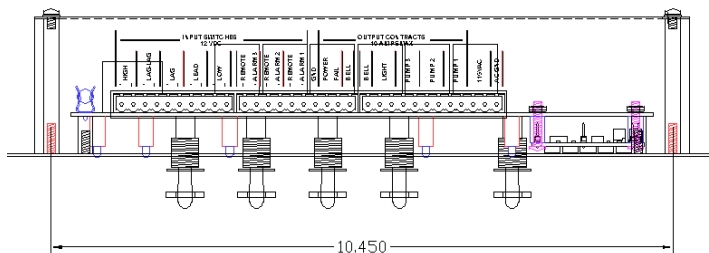
### DESCRIPTION

The **Model 407D Liquid Level Controller** provides central control of triplex pumping systems. The Model 407D includes pump alternating, visual run-time meters, hand-off-auto (HOA) controls and alarm outputs.

Five level-sense inputs interface with float switches, pressure switches, or other level sensing devices which can provide a contact closure.

A SPST, normally-closed internal power-fail contact opens when AC power (120 VAC) is connected to the controller, and closes if power is lost or removed. Connections for external remote alarm contacts, which must remain closed for normal operation (or jumpered if not required), are supplied for each pump. If either circuit opens, the corresponding pump will be locked out until the problem is corrected and the 'Alarm reset' switch is activated.

### DIMENSIONS



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**READ ALL INSTRUCTIONS BEFORE INSTALLING, OPERATING OR SERVICING THIS DEVICE. KEEP THIS DATA SHEET FOR FUTURE REFERENCE.**

## GENERAL SAFETY

**POTENTIALLY HAZARDOUS VOLTAGES ARE PRESENT AT THE TERMINALS OF THE MODEL 407D. ALL ELECTRICAL POWER SHOULD BE REMOVED WHEN CONNECTING OR DISCONNECTING WIRING. DO NOT EXCEED THE OUTPUT OR INPUT RATINGS, AS STATED IN THE SPECIFICATIONS. PROTECT THE UNIT WITH PROPERLY RATED FUSES. DO NOT INSTALL IN DAMP OR MOIST AREAS.**

**THIS DEVICE SHOULD BE INSTALLED AND SERVICED BY QUALIFIED PERSONNEL.**

## Installation Instructions

### INSTALLATION

Mount the controller in a suitable enclosure. Unplug the terminal connectors from the controller.

Referring to the terminal block decal on the controller and the illustration on this page, make the following connections.

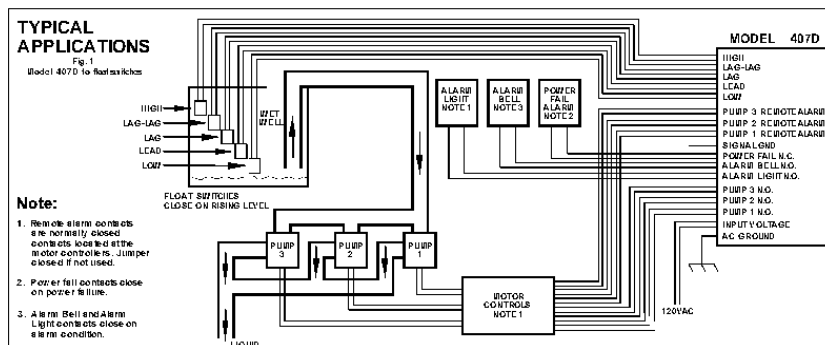
1. Connect a chassis ground to the terminals marked AC GND.
2. Connect 115 VAC operating power to the terminals marked 115 VAC.
3. Connect the LOW float switch to the LOW terminals. Polarity is not critical.
4. Repeat step 3 for LEAD, LAG, LAG-LAG, and HIGH terminals.
5. The SIGNAL GROUND connection is a common between the controller and a Liquid Level Sensor, no connection is necessary if the sensor is not used.
6. The PUMP 1, 2, & 3 REMOTE ALARM terminals should be connected to normally closed (NC) alarm contacts in the motors. If none exist it is still necessary to install a jumper connection at the Pump 1, Pump 2, & Pump 3 REMOTE ALARM terminals.
7. The POWER FAIL, ALARM BELL, & ALARM LIGHT are not required for proper operation, but are provided for your convenience. If used, connect an audible/visual

alarm across the terminals. The POWER FAIL contact is open while power is applied and closes on loss of power. Connect audible and visual alarms across the ALARM BELL and ALARM Light terminals respectively. These contacts are normally open and will close on a fault (high or remote alarm) condition. The ALARM BELL output may be silenced with the front panel switch, while the ALARM Light cannot be.

8. Connect the PUMP 1, PUMP 2, & PUMP 3 contacts to the appropriate motor control circuits. These contacts start and stop the pump motors during operation.

Set the HOA (Hand-Off-Auto) switches and the LEAD PUMP selector switch as required. To change the LEAD PUMP, hold the switch for approximately 3 seconds, it will cycle the choices for as long as the switch is held (every 3 seconds). The controller will store the selection and recall it in the event of power failure. In the event of power failure in alternating mode, the controller will store the last LEAD pump and will switch to the next upon power restoration.

Apply operating power. Test alarm LEDs and bells by pressing the ALARM TEST switch.



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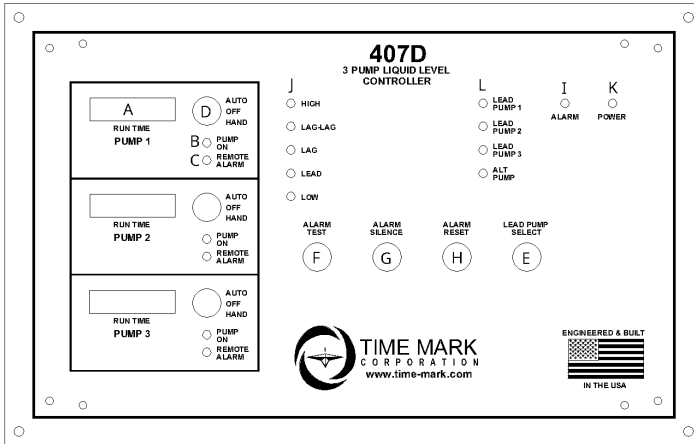


**TIME MARK**  
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## Model 407D Panel



### Panel Layout

- A. Pump run time meter to 9,999.9 hours, resettable.  
B. LED indicators illuminate when pumps are running.  
C. LED Indicators illuminate when pump is stopped because the remote alarm circuit is open.  
D. Hand-off-Auto switch to manually or automatically control the pumps.  
(NOTE: Items A-D are duplicated for each pump.)  
E. Lead pump selector switch alternates lead pump selection or a fixed lead pump operation of pump 1, 2, or 3.  
F. Momentary switch tests remote alarm bell, light, and illuminates alarm light.  
G. Momentary switch silences alarm bell until problem is corrected.  
H. Momentary switch resets all alarm indicators to return to normal operation.  
I. Alarm light stays lit until alarm reset switch is pressed.  
J. LED Indicators show which level switches are closed.  
K. LED Indicators illuminate when primary power is applied.  
L. LED Indicators show which pump is the LEAD pump.

### OPERATION

The Liquid Level controller can be used in either pump-down applications (with sump pumps) or in pump-up applications (to fill water tanks or reservoirs). The type of application is determined by the type of level switch used, normally-open or normally-closed. In typical applications, as shown on page 2, (Lead Pump Select set to ALT) pumps are used to remove water from a wet well when the water level activates the float switches. Activating the first switch (LOW) prepares the controller for operation. No pump is started. The second level switch (LEAD) starts the first pump.  
Which pump actually starts is determined by the LEAD PUMP selector switch. The third and fourth switch (LAG and LAG-LAG) starts the second and third pumps. The final

level switch (HIGH) illuminates the alarm indicator and closes the alarm bell and alarm light outputs.  
As the level switches are opened (in reverse order) all operating pumps remain on until the LOW switch is opened. All pumps are then turned off and the internal alternator is triggered. On the next operating cycle the next pump depending which was on before (either 1, 2, or 3) will become the lead pump.

If the HIGH level is triggered an alarm light and alarm bell circuit are activated, plus an LED on the controller illuminates to warn of the problem.

Should this occur, an 'Alarm Silence' switch on the controller breaks the alarm bell contacts, but leaves the LED alarm indicator on.

When the alarm condition is corrected, an alarm reset switch returns the controller to its normal operating Mode.

- Consult factory to reset run-time meters

### TROUBLESHOOTING

Problem: Remote alarm LEDs will not extinguish

- Causes: 1. Remote alarm inputs not jumpered closed  
2. Motor circuit to close jumpers is open

- Solutions: 1. Install jumpers  
2. Close circuit

Problem: Remote alarm LED's come on for no apparent reason and inputs are jumpered closed.

Causes: Externally generated noise. Noise can be generated from faulty circuit breakers, contacts and motors. It can also be induced from the source being too close to the controller with little or no shielding.

Solutions: Replace faulty components; install noise suppression devices; shield wiring.

**Note:** This device is not a field repairable unit. Should the unit not operate properly during installation or testing, insure that all electrical, ground, and physical connections are correct. Verify that the proper voltage is applied and check all fuses. Check all motor control circuits, and insure that, if the REMOTE ALARM contacts are not used, they are jumpered. If everything is correct and the device still fails to operate, contact the factory. Should the controller fail during use, contact the factory for instructions on returning the device for Repair.

### WARRANTY

The Model 407D Liquid Level Controller is warranted to be free from defects in materials and workmanship for one year. Should this device fail to operate, we will repair or replace it for one year from the date of purchase. Contact the Time Mark Sales department, Monday through Friday; 8 a.m. to 5 p.m., CST, for further details.

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