US Patents 6,904,800, 7,243,540, and 7,317,993
Other Patents Pending

#5401163-REV H PLANT ID 001-3908

SUPERSEDES: REVISION G DATED December 22, 2008
EFFECTIVE: April 27, 2009

Instruction Sheet
Foam Compensating Low Water Cutoff with Test Button and DualVision™ Technology

Contact Ratings

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Motor Switch Rating</th>
<th>Pilot Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full Load</td>
<td>Locked Rotor</td>
</tr>
<tr>
<td>24 VAC</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>120 VAC</td>
<td>7.5 A</td>
<td>43.2 A</td>
</tr>
<tr>
<td>240 VAC</td>
<td>3.75 A</td>
<td>21.6 A</td>
</tr>
</tbody>
</table>

Installations must be performed by qualified personnel and in accordance with all national and local codes and ordinances.

Read all instructions carefully and understand them before starting installation. Save instructions for future use.

Instruct user how to test and operate this cutoff device as described in these instructions.

Shock Hazard. Disconnect power source before servicing. Serious injury or death could result.

Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

The LWCO device must be installed in series ahead of other limit and operating controls installed on the boiler. When installations are complete, check for correct operation of ALL limit and operating controls.

Wire insulation must be rated at 167°F (75°C) or greater, over copper conductors only. Use of other wire or insulation types could result in fire causing property damage, serious injury, and death.

Foam in boiler or piping can cause improper operation. If the boiler is foaming, shutdown the boiler and clean it per the manufacturer's recommendations to eliminate foaming. Failure to do so could result in damage to the equipment and property or could cause an explosion resulting in serious injury or death.

Use only the probe that is supplied with this control or replacement probe P3S-1. Failure to do so could result in improper operation, damage to the equipment and property, or could cause an explosion resulting in serious injury or death.

Hot or pressurized boiler systems can discharge steam and hot water. Cool boiler system to 80°F (27°C) and to 0 psi (0 bar) before servicing. Failure to do so could result in serious burns.

WARNING
**CAUTION**

- Do not tighten by grasping the device enclosure. Use wrenching flats on the probe bushing only. Failure to install properly could damage the device and cause improper operation resulting in damage to equipment and property.
- Do not use manual reset low water cutoffs with automatic water feeders. Flooding, equipment damage, and property damage can result. Only use automatic water feeders with automatic reset low water cutoffs.

**LWCO**

**FIG. 3**

**CONTROL UNIT MOUNTED ON PROBE**

**FIG. 2**

**PROBE SPACING REQUIREMENTS**

**FIG. 1**

- Do not mount device with probe angled upward or deposits can accumulate in the probe. Mount only with probe facing horizontally or vertically downward and maintain 1/4" minimum clearance from electrode and pipe wall. Failure to install probe as directed can cause improper operation and damage to equipment and property.

**LED Indicators**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Status LED</th>
<th>Service LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Green</td>
<td>Off</td>
</tr>
<tr>
<td>Low Water</td>
<td>Red</td>
<td>Off</td>
</tr>
<tr>
<td>Foam Detected, Safe Water Level</td>
<td>Green</td>
<td>Blinking Amber</td>
</tr>
<tr>
<td>Foam Detected and Low Water</td>
<td>Red</td>
<td>Blinking Amber</td>
</tr>
<tr>
<td>Fouled Probe, Service Soon</td>
<td>Green</td>
<td>Amber</td>
</tr>
<tr>
<td>Fouled Probe, Unsafe to Operate</td>
<td>Red</td>
<td>Amber</td>
</tr>
<tr>
<td>Control Failure Detected</td>
<td>Blinking Red</td>
<td>Off</td>
</tr>
<tr>
<td>Power Off</td>
<td>Off</td>
<td>Off</td>
</tr>
</tbody>
</table>

**CONTROL UNIT OUTLINE DWG.**

**FIG. 4**

- Do not tighten by grasping the device enclosure. Use wrenching flats on the probe bushing only. Failure to install properly could damage the device and cause improper operation resulting in damage to equipment and property.
Important Notes for All Probe Installations:

1. Be sure the probe is installed above the minimum safe water level, as determined from the boiler manufacturer’s literature.
2. Be sure the probe extends into the boiler cavity so that contact with the water is made.
3. Be sure the exposed portion of the stainless steel probe is a minimum of 1/4” from any grounding surface inside the boiler to prevent the probe from shorting (see Fig. 1).

Control Unit Mounting onto Probe (See Fig. 2):
1. Tighten the probe into the tapped location of the boiler with a wrench, using bushing flats provided.
2. Make sure the heads of the two mounting screws in the probe bushing are loosened approximately 1/8” from the bushing surface.
3. Remove the first lock washer/nut from the probe threads.
4. Orient the slotted holes in the control unit over the heads of the mounting screws of the probe and turn control unit counter-clockwise so that the ends of the slots are fully under the mounting screw heads. Tighten mounting screws.
5. Replace the lock washer/nut onto probe and tighten

**NOTE:** For 24 VAC models, LFx0243S, 24 VAC to be supplied by an EXTERNAL Class 2 power source to terminals H and N. For 120 VAC models, LFx1203S, 120 VAC is supplied by an external circuit to terminals H and N.

Control Unit Wiring Using the Burner Circuit Power Source (See Fig. 5):
1. Connect the hot lead wire from the power source to terminal H.
2. Connect the neutral lead wire from the power source to terminal N.
3. Verify that factory installed jumper is present or connect an 18 AWG (min.) jumper wire from terminal H to terminal COM.

Control Unit Wiring Using a Power Source Other than Burner Circuit (See Fig. 8):
1. Remove factory installed jumper.
2. Connect the hot lead wire from the separate power source to terminal H.
3. Connect the neutral lead wire from the separate power source to terminal N.
4. Connect the hot lead wire from the burner circuit power source to terminal COM.
5. Connect the neutral wire of the burner circuit power source to the neutral side of the water feeder or alarm. Connect wire from the hot side of the water feeder or alarm to terminal NO.

Control Unit Wiring Using Harness Connection:
On 24 VAC models, a 3-pin connection is provided for connecting the boiler wiring harness. When using the boiler harness connection, be sure the factory installed jumper from H to COM is installed. See Fig. 3 for location.

Replace cover on Control Unit and securely tighten.
Test For Proper Function:

1. **DO NOT** fill boiler. Set thermostat to lowest possible setting and turn on electric power to the boiler. On initial start-up, the LWCO indicates low water condition, which indicates proper function. The "SERVICE" LED on the control unit illuminates RED. The burner **should not** operate without water in the system. During the testing process, the "SERVICE" LED should not be illuminated.

2. Fill boiler with water. Once water covers the probe the "STATUS" LED on the control unit turns from RED to GREEN. You must press the reset button on manual reset models (FM models) before the control will reset.

3. Set the thermostat to call for heat, and verify that the burner ignites.

4. Press and hold the **test switch** while observing the LED's on the control unit. The "STATUS" LED illuminates RED and the burner should turn off.

5. Testing the burner circuit wiring:
   a. With the burner aflame, press the **test switch** and observe the burner.
   b. The burner should **cutoff** when the **test switch** is held. This indicates the burner circuit is wired properly. When test switch is released, the burner ignites and continues functioning (provided water covers the probe). You must press the reset button on manual reset models (FM models) before the control will reset. If burner fails to cutoff or relight, see the Troubleshooting section for details.

6. Set the thermostat to its normal setting.

Once correct operation of the LWCO has been tested, test **ALL** other safety, limit and control devices before finalizing system operation.

**Troubleshooting:**

1. If the "SERVICE" LED **blinks** AMBER and the "LOW WATER" LED illuminates RED, the LFA has detected excessive foaming in the boiler, resulting in a low water condition. Some foaming is common in certain boilers. If foaming occurs with priming or surging, (usually visible in the gauge glass), this indicates a problem, and that the boiler and piping may be dirty. Refer to the boiler manufacturer's recommendations for cleaning the boiler and piping.

2. If the "SERVICE" LED illuminates AMBER, the probe signal is weak and needs to be cleaned. Scale, oils, or fluxes coating the probe's electrode are insulating the electrode from the LWCO's electrical signals. Remove the probe and thoroughly wipe it with a clean rag. Refill the system and test for proper function.

3. If LWCO fails to cutoff burner during testing:
   a. Drain the water level in the boiler below the probe.
   b. Turn off electrical power to the boiler and the LWCO.
   c. Using an Ohmmeter, measure the resistance between the probe's brass bushing and the nut connection to the probe on the LWCO, (see Fig. 3 for location). If the resistance is less than 5,000 Ohms, then the probe is shorted. The shorted probe must be replaced.

4. If the LWCO fails to function normally, perform the following steps to verify the proper installation:
   a. Make sure the water level covers the probe.
   b. Verify **ALL** LWCO wiring and that probe is secured with locknut.
   c. If Teflon tape was used on the threads of the brass bushing for the probe, remove the tape and install with a small amount of pipe sealant.
   d. Water treatment may be required.

5. If the "STATUS" LED blinks RED, the safety circuits in the LWCO have detected a failure in the control and the LWCO will remain in a low water condition. To clear any temporary condition:
   a. Remove power to the LWCO for 30 seconds.
   b. Re-connect power to the LWCO.
   c. If the "STATUS" LED continues to blink RED, the safety circuits in the LWCO have found a failure that cannot be corrected. **The control must be replaced.**

6. If water covers the probe and the "STATUS" LED illuminates RED, indicating a low water condition, the probe may be coated with a flux or oils, (the "SERVICE" LED will illuminate AMBER). Add a cleaning solution, (water and trisodium phosphate or consult the boiler manufacturer), to the system. Heat and circulate this solution for at least one hour before draining and completely flushing the system with clean water. Remove the probe and thoroughly wipe it with a clean rag. Refill the system and test for proper function.

**Cleaning, Maintenance, and Replacement:**

Test the operation of the LWCO annually, or more frequently, by pressing the "TEST" button. The "STATUS" LED should turn RED and the boiler should shut down. Probe must be inspected every 5 years (or sooner if "SERVICE" LED turns on) for scale build-up or coating. Clean all oils, fluxes, and scale from probe with a clean rag.

Probe should be replaced every 10 years. Replace more often if used in areas where heavy water treatment is required, when cleaning is needed more frequent than annually, and/or boiler demands for make-up water are high.

The control unit should be replaced every 15 years. In areas of high humidity and heavy dust or other airborne contaminants more frequent replacement may be required.

**PROBE CLEANING**

**FIG. 10**

![Diagram of LWCO cleaning](image)
### LF SERIES WIRING CROSS REFERENCE

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Device or Series</th>
<th>Power Connections</th>
<th>Output Contacts</th>
<th>Remote Probes</th>
<th>Probe Styles</th>
<th>Probe Reference</th>
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<tbody>
<tr>
<td>Taco</td>
<td>LF &amp; LT Series</td>
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<td></td>
<td></td>
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<tr>
<td>McDonnell &amp; Miller</td>
<td>PS-801/851</td>
<td>H 1</td>
<td>2  3</td>
<td>5  4</td>
<td>P or J2</td>
<td>Chassis GND</td>
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<td>McDonnell &amp; Miller</td>
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<td>Chassis GND</td>
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<tr>
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<td>PS-802/852</td>
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<td>2  3</td>
<td>5  4</td>
<td>P or J2</td>
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<td>P or J2</td>
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<td>N (White Wire)</td>
<td>C (Yellow Wire)</td>
<td>B (Yellow Wire)</td>
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<td>Orange Wire</td>
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<td>H 1</td>
<td>GN P1</td>
<td>P2 A</td>
<td>-</td>
<td>-</td>
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<tr>
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<td>1  2</td>
<td>P1</td>
<td>P2 A</td>
<td>H3</td>
<td>Chassis GND</td>
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<tr>
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<td>RW700 Series</td>
<td>L1 L2</td>
<td>2 Red Wires</td>
<td>A</td>
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<td>Green Wire</td>
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<tr>
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<td>RW700A1098</td>
<td>T1 T2</td>
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**Notes:**
- **Probe Styles:**
  - S: Standard
  - R: Remote (Probe w/ NEMA 4 Enclosure)
  - F: Foam Compensating-Testable
- **Process Connection:**
  - 3/4" NPT
  - 1/2" NPT
- **Input Power:**
  - 120V - 240VAC
- **Input Power:**
  - 120 VAC - 240VAC
- **Reset Type:**
  - A: Automatic Reset
  - M: Manual Reset
- **Low Water Cutoff**

### LWCO Ordering

**Revision:**

- **Probe Styles:**
  - S: Standard
  - R: Remote (Probe w/ NEMA 4 Enclosure)
  - F: Foam Compensating-Testable
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  - 1/2" NPT
- **Input Power:**
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- **Reset Type:**
  - A: Automatic Reset
  - M: Manual Reset
  - F: Foam Compensating-Testable
- **Low Water Cutoff**

**Probe Only Ordering:**

**Revision:**

- **Probe Styles:**
  - S: Standard
  - R: Remote (Probe w/ NEMA 4 Enclosure)
  - F: Foam Compensating-Testable
- **Process Connection:**
  - 3/4" NPT
  - 1/2" NPT
  - Probe-LWCO
Limited Warranty Statement

Taco, Inc. will repair or replace without charge (at the company’s option) any product or part which is proven defective under normal use within one (1) year from the date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the local Taco stocking distributor or Taco in writing and promptly deliver the subject product or part, delivery prepaid, to the stocking distributor. For assistance on warranty returns, the purchaser may either contact the local Taco stocking distributor or Taco. If the subject product or part contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any Taco product or part not installed or operated in conformity with Taco instructions or which has been subject to misuse, misapplication, the addition of petroleum-based fluids or certain chemical additives to the systems, or other abuse, will not be covered by this warranty.

If in doubt as to whether a particular substance is suitable for use with a Taco product or part, or for any application restrictions, consult the applicable Taco instruction sheets or contact Taco at [401-942-8000]. Taco reserves the right to provide replacement products and parts which are substantially similar in design and functionally equivalent to the defective product or part. Taco reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

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