

# Warrick<sup>®</sup> Dual Function Control Installation and Operation Bulletin

This bulletin should be used by experienced personnel as a guide to the installation of Dual Function Controls. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Gems Sensors or a representative if further information is required.

## Specifications

**Control Design:** Open-board design (no housing)

**Contact Design:**

Limit Control -1 SPDT (1 form C), dry contacts

Level Control -1 SPDT (1 form C), dry contacts

**Contact Ratings:** 10A @ 120/240-VAC resistive (120°F),  
1A @ 120, 208/240, 240 resistive (150°F), 1/3 Hp @ 120,  
208/240, 240 VAC

**Contact Life:** Mechanical - 5 million operations  
Electrical -100,000 operations minimum at rated load

**Supply Voltage:** 24, 120, 220, or 240 VAC models, +10%/-15%,  
50/60 Hz. **208/240 Model:** 187V Min to 242V Max, VAC 50/60 Hz

**Power Consumption:** 24/120/220/240-VAC with both relays energized  
~ 4.4 VA.

**Secondary Circuit:** 2.3 VAC RMS voltage on probes,  
< 1 milliampere source capability.

**Sensitivity:** Factory programmed to 4.7K, 10K, 26K, 50K, or 100K Ohms

**Operating Ambient Temperature Range:** -40°F to +150°F  
(-40°C to +65°C)

**Terminals:** Probe connections 3/16" male quick connects, Line and  
Power connections 1/4" male quick connects

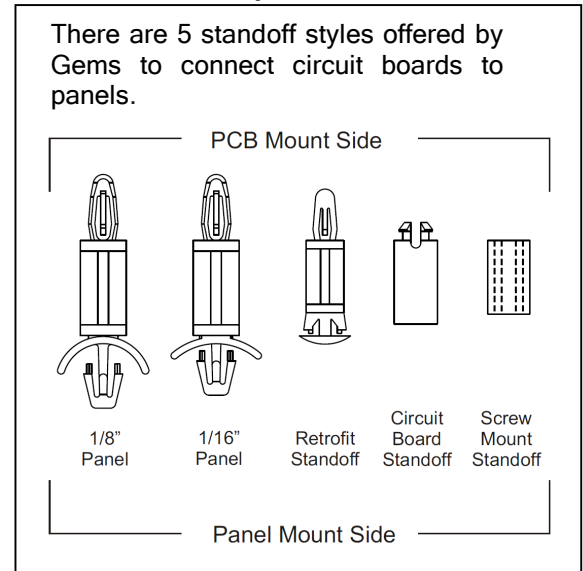
**Time Delays:** Standard, 0.5 seconds rising level, LLCO probe,  
3 seconds lowering level.

**Listings:** Entire control carries U.L. Limit Control Listing (UL-353) for  
supply voltages of 120-VAC and below.

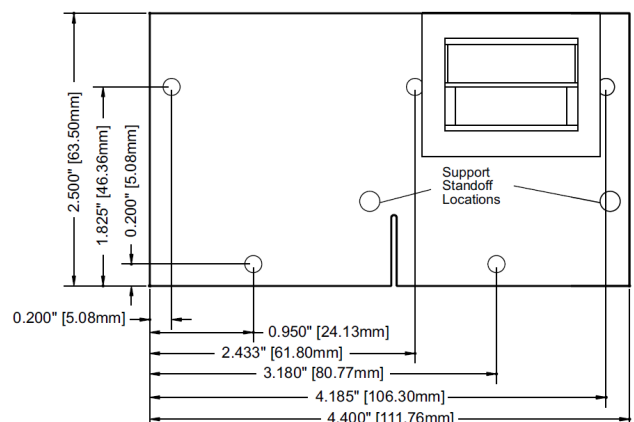
## Installation

1. Drill five 0.187" holes in customer supplied back plate using stick on template supplied with control. Standard standoffs are designed for back plate thickness of 0.062 (1/16"). Standoffs are available for back plates of 0.125 (1/8") nominal thickness. If retrofit plate standoffs are used, drill 5 (five) 0.250 dia. Holes in proper locations.
2. Install five standoffs into back plate. Install two support standoffs into circuit board. **CAUTION:** Be careful not to bend or flex the circuit board during installation as this can damage the control. Do not push down on transformer or relays during installation. Install circuit board onto standoffs by gently pushing down on circuit board at board edges near standoff locations until board is fully seated. See sketch for proper installation. Install control in appropriate enclosure.
3. Wire controls per wiring diagram, following N.E.C. and local codes. Use appropriately sized spade terminals.

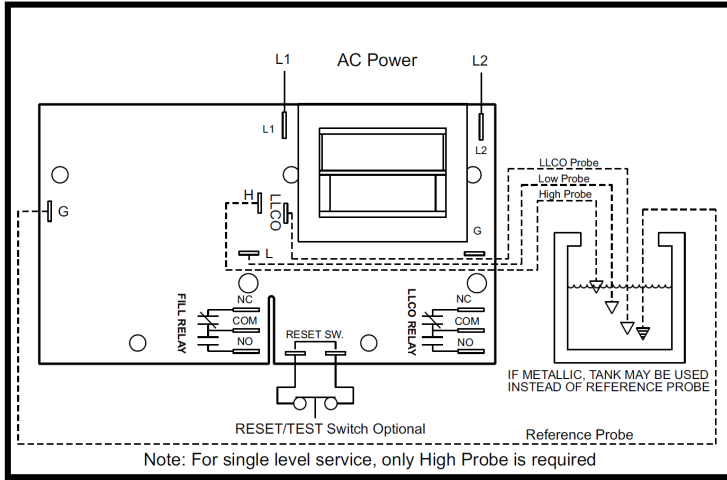
## Standoff Options



## Dimensional Drawing



# Wiring Diagram



## Operation

### DIRECT MODE BOTH FUNCTIONS

**AUTOMATIC RESET** (Reset Switch terminals not wired) When the liquid rises to the electrode on terminal LLCO, the control energizes, changing state of the load contacts. (LED will be lit) The control remains energized until the liquid level recedes below electrode on terminal LLCO. The control then de-energizes, (LED will not be lit) returning load contacts to original state. Unless otherwise specified, there is a three second time delay on decreasing level. Liquid must be below probe on terminal LLCO for a full three seconds before control de-energizes.

**MANUAL RESET** (Normally closed pushbutton installed across reset terminals) When the liquid rises to the electrode on terminal LLCO, the control will remain de-energized until the pushbutton is depressed. Upon Reset Switch activation, the control will energize, (LED will be lit) changing the state of the contacts. The control remains energized until the liquid level recedes below electrode on terminal LLCO. The control then de-energizes, (LED will not be lit) returning load contacts to their original state. Unless otherwise specified, there is a three second time delay on decreasing level. Liquid must be below probe on terminal LLCO for full three seconds before control de-energizes. **Operator to wait 5 full seconds after power is applied before pressing reset switch (if manual reset is used).**

**H-L Function:** When the liquid rises to the electrode on terminal H, the associated relay energizes, changing the state of the load contacts. (LED will be lit). The relay remains energized until the liquid level recedes below electrode on terminal L. The associated relay then de-energizes, (LED will not be lit) returning load contacts to original state. Unless otherwise specified, there is a one half second time delay on increasing level. Liquid must be in contact with probe on terminal H for a full half-

second before control energizes. This function can be wired for single level service by using only the H terminal.

### INVERSE MODE

**LLCO Function:** LLCO always functions in direct mode only see above for operation.

**H-L Function:** Associated relay energizes with power, (LED will be lit) changing the state of the load contacts. When the liquid rises to the electrode on terminal H, the relay de-energizes, returning load contacts to shelf state. (LED will not be lit). The associated relay remains de-energized until the liquid level recedes below electrode on terminal L. The relay then energizes.

### TEST FEATURE

Allows LLCO circuit to be tested without the need to drop the water level in the boiler to create a dry probe condition. Holding down the reset button for 3 seconds will allow the LLCO circuit to trip, simulating a dry probe. The controller will return to normal operation once the reset button is pressed a second time.

**LED Status Indicator** In normal operation, the LED on the control will either be on or off depending on the controller state. On-board microprocessors continuously monitor for fault conditions. In the event a fault is detected, the LED will blink a pattern indicating the fault type. If you experience an inoperable control and the LED is blinking, attempt to leave the control in the blinking state and contact the factory for assistance.

### Options

**Manual Reset with optional Power Outage Feature:** The Power Outage option, used in conjunction with the Manual Reset option, eliminates the need for a manual reset in the event of a power outage during normal boiler operation. With the Power Outage option, if there is a loss of power with liquid present on the LLCO probe, the control will self-reset (energize) IF liquid is still present on the LLCO probe at the time when power is re-established. If the control did not have liquid on the LLCO probe at the time of the power outage, or if there is no liquid present at the time power is re-established, the control will de-energize and remain so until liquid again rises to the LLCO probe and the Manual Reset pushbutton is depressed.

**Time Delays associated with terminals H and L :** With time delay on increasing level, the liquid must be in contact with the high electrode for the full duration of the time delay before control will operate. With delay on decreasing level, the liquid must be below the low electrode for the full duration of the time delay before control will operate.

**Time Delays associated with terminal LLCO:** 3 Second time delay on decreasing level is standard.

DF XXXXX-XX-XX-XX

- Time Delay: (Decreasing Level) LLCO level function 3 sec. Standard.
- Time Delay: (Decreasing Level) H-L level function 1-20 sec.
- Time Delay: (Increasing Level) H-L level function 1-20 sec.
- Optional Character: see Chart
- Enclosure: 0-none, 1-NEMA 1, 4-NEMA 4, 7-NEMA 7, 12-NEMA
- Standoff Style: A-1/16" panel, B-1/8" panel, C-screw mount, D-retrofit
- Supply Voltage: 1-120VAC (+10%/-15%), 2-240VAC (+10%/-15%), 3-24VAC (+10%/-15%), 5-220VAC (+10%/-15%), 8-208/240VAC (187 to 242 VAC Absolute Range)
- Mode/Sensitivity: LLCO, H/L-Direct A-4.7K, B-10K, C-26K, D-50K, E-100K --- LLCO, H/L-Inverse K-4.7K, L-10K, M-26K, N-50K, P-100K

	Reset Function	N.C. Pushbutton	Power Outage	Retrofit Plate	Test Feature
D	X				
G	X	X	X		
J	X	X	X	X	
K	X		X		
L	X		X	X	
R				X	
S	X				
T	X			X	
W	X			X	
B	X				X
Y	X	X			X
Z			X		X
A	X	X	X		X