



# Instruction Sheet

## LTR - Low Water Cutoff for Hot Water Boilers

102-338

SUPERSEDES: Revision D Dated January 6, 2009

EFFECTIVE: December 2, 2009

#5401179-REV E

PLANT ID 001-3907

### Listings/Approvals:

- UL GUIDE (MBPR) for Limit Controls per UL Standard 353 Limit Controls
- UL GUIDE (MBPR7) Controls, Limit Certified for Canada CSA Standard C22.2



### Maximum Probe Ratings:

Hot water only - 160 psi (11.2kg/cm<sup>2</sup>) at 250°F (121°C)

**Probe Sensitivity:** 20K Ohms. Extended operation to 40K Ohms.

**Ambient Temperature:** 32°F - 120°F (0°C to 49°C)

**Enclosure Rating:** NEMA 1 for indoor use only

**Input Power:** 1.5 VA @ 24 VAC supplied by a Class 2 power source

**Output Contact:** Form B Relay, normally closed (water detected)  
5A @ 24 VAC maximum load,  
50 VA @ 24 VAC switching

**Reset:** Automatic reset when water level returns to safe level

**Testing:** Integrated test switch for testing safety shutdown



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

### General:

The Residential Low Water Cutoff (LTR) is a microprocessor based low water cutoff for detecting the presence to water in a boiler. The LTR uses advanced signal processing to identify when the probe signal levels have decreased due to possible fouling. These advanced technologies permit extended operation for probe impedance up to 40K Ohms. The LTR functions longer without requiring probe cleaning, and it functions normally under non-ideal installation conditions. The LTR is designed for use with hot water boilers and hot water heating boilers.

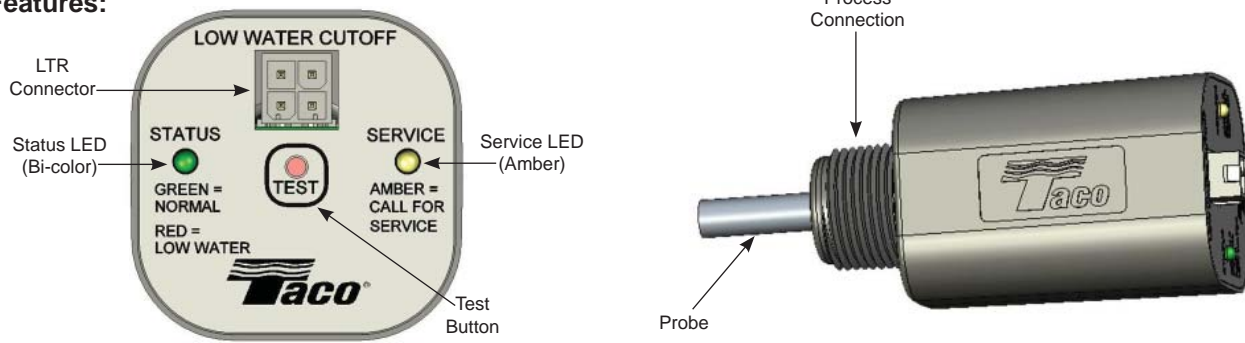
(See each boiler manufacturers' specifications for recommended minimum safe water levels.)

During a low water condition, the "Status" LED will illuminate RED. Under normal conditions, it will illuminate GREEN. See "Status LED States" table for details.

## WARNING

- Installation 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.
- 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.
- For use with hot water boilers and hot water heating boilers only. Use on steam boilers could cause improper operation resulting in property damage serious injury, and death.
- Shock Hazard. Disconnect power source before servicing. Serious injury or death could result.
- Use only the wiring harness supplied with the control or factory supplied alternates. Use of other wire harness or insulation types could result in fire causing property damage, 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.

**LTR Features:**



Item	Description
Status LED	Bi-color LED status indicator. See "LED States" table for details.
Service LED	Amber LED indicator that service is needed on LTR or system.
Test Button	Push button switch for testing safety shutdown of boiler controls.
LTR Connector	Power and relay contact connector.

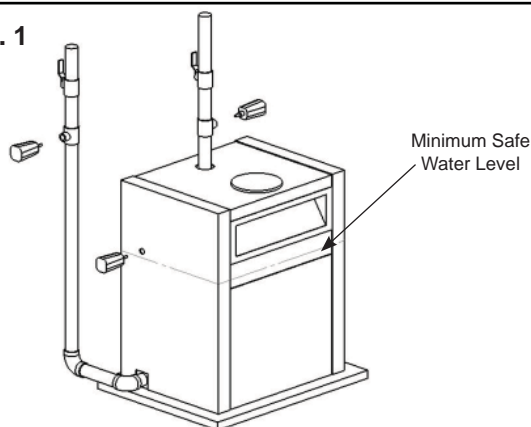
**LED States:**

Status LED	Service LED	Contacts	Meaning
Green	Off	Closed	Normal
Green	Amber	Closed	Safe water level, weak probe signal - Service soon.
Red	Off	Open	Low water condition, (LW)
Red	Amber	Open	Probe signal too weak, LW condition - Service <i>now</i> .
Blinking Red	Off	Open	Control failure. Lockout in LW condition.
Off	Off	Open	No power to LWCO.

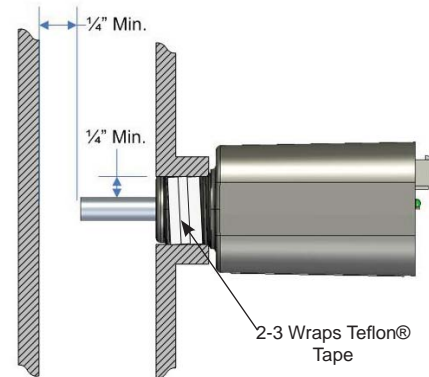
**Installation:**

1. Install the probe above the minimum safe water level, as determined from the boiler manufacturer's literature. (See Fig. 1)  
NOTE: This may be in a tapping on the boiler or in the boiler supply or return piping.
2. Install the probe to extend into the boiler cavity or piping to make contact with the water.
3. Install the probe so that the exposed portion of the stainless steel is a minimum of 1/4" from any grounding surface inside the boiler (to prevent the probe from shorting). (See Fig. 2)
4. Hand tighten the LTR into the process connection. Do not cross-thread. Do not use a wrench or other tools to tighten the control.

**Fig. 1**



**Fig. 2**



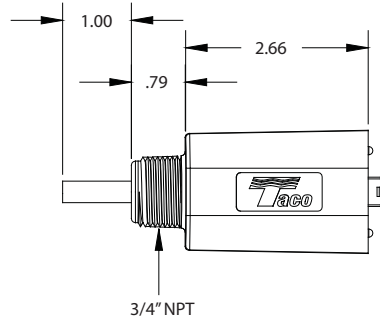
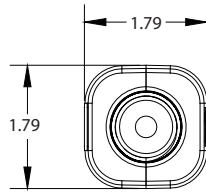
**CAUTION**

- Do not mount device with probe angled upward or deposits can accumulate on 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.

**CAUTION**

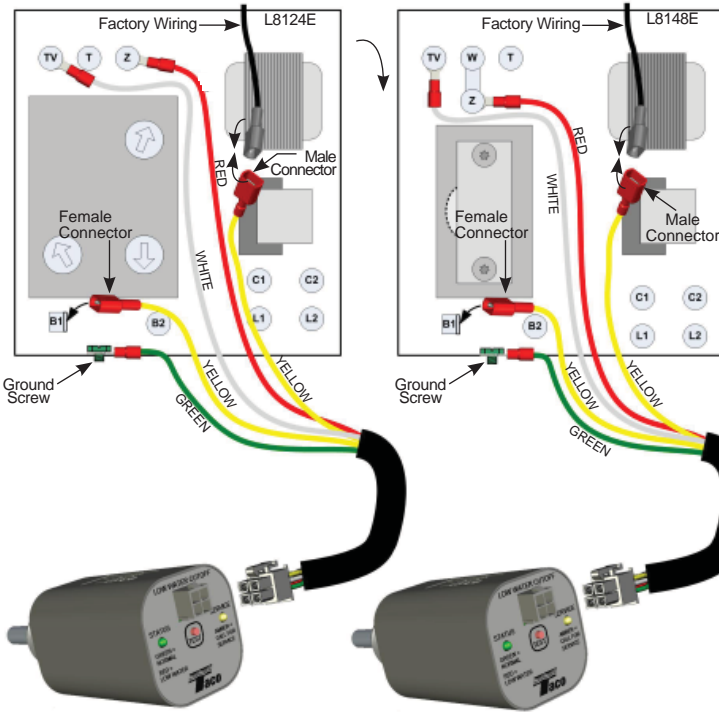
- Apply Teflon® tape only to the threads of the LTR. Do not use pipe dope or other thread sealants. Damage to the control may occur and result in improper operation.
- Hand tighten the LTR into the process connection being careful to not cross-thread. Do not use a wrench or other tools to tighten the control. Damage to the control may occur and result in improper operation.

**Fig. 3**



DWG# 1179-1

**Wiring for Boilers with Honeywell Aquastat Models L8124E or L8148E or Equivalent:**



**⚠ WARNING**

- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Only use the wiring harness supplied with the control or factory supplied alternates. Use of other wire harnesses or insulation types could result in fire causing property damage, serious injury, and death.

**Wiring Instructions**

1. Connect the WHITE wire to the Aquastat's TV terminal.
2. Connect the RED wire to the Aquastat's Z terminal.
3. Connect the GREEN wire to a ground source that is electrically common to the boiler ground.
4. Unplug the factory wired quick connector from terminal B1.
5. Plug the male quick connector on the YELLOW wire into the female factory wired quick connector.
6. Plug the female quick connector on the YELLOW wire into terminal B1.

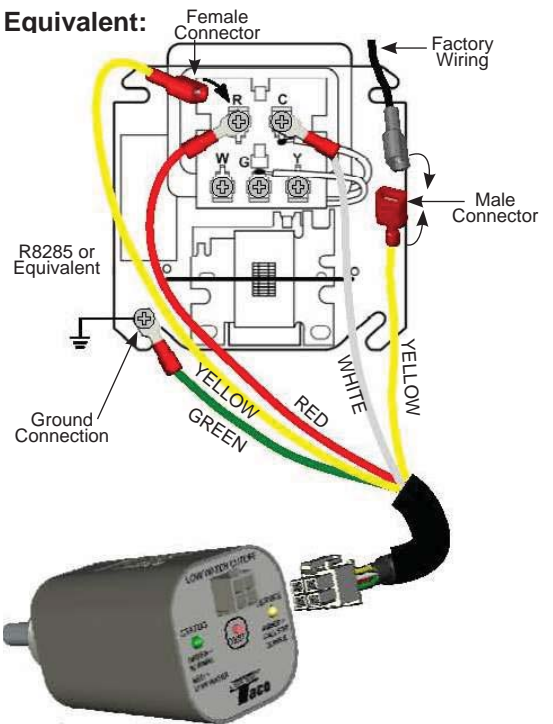
**Wiring for Boilers with Honeywell Control Center Model R8285 or Equivalent:**

**⚠ WARNING**

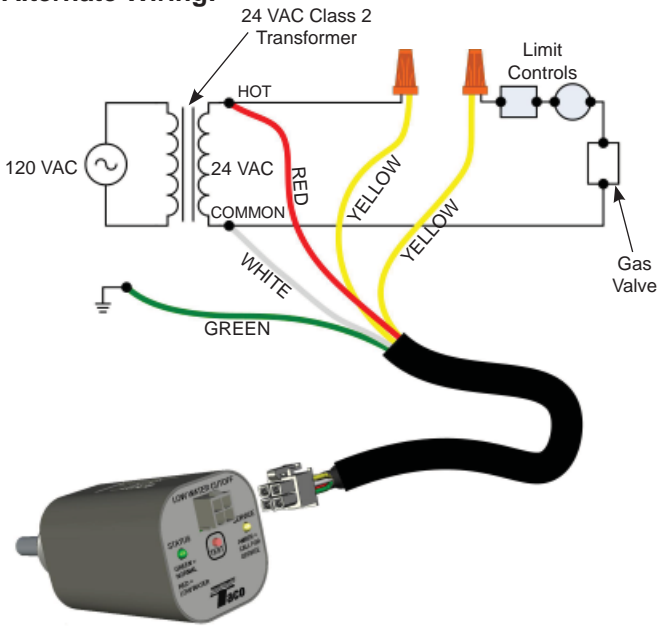
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Only use the wiring harness supplied with the control or factory supplied alternates. Use of other wire harnesses or insulation types could result in fire causing property damage, serious injury, and death.

**Wiring Instructions**

1. Connect the WHITE wire to the C terminal.
2. Connect the RED wire to the R terminal.
3. Connect the GREEN wire to a ground source that is electrically common to the boiler ground.
4. Unplug the factory wired quick connector from the R terminal.
5. Plug the male quick connector on the YELLOW wire into the female factory wired quick connector.
6. Plug the female quick connector on the yellow wire onto the R terminal.



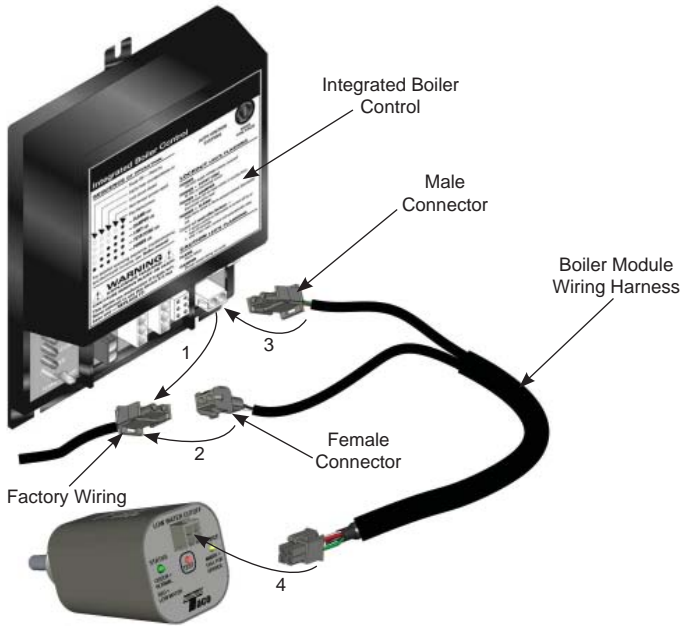
### Alternate Wiring:



### Wiring Instructions

1. Connect the WHITE wire to the transformer's common connection.
2. Connect the RED wire to the transformer's hot output.
3. Connect the GREEN wire to a ground source that is electrically common to the boiler ground.
4. Cut off the quick connectors from both YELLOW wires and strip the wire ends.
5. Open the 24 VAC hot connection to the other limit controls ahead of the first limit control.
6. Wire the YELLOW leads as shown to connect the LTR's relay in series and ahead of all other limit controls.

### Wiring Boilers with an Integrated Control Module:



On boilers equipped with a United Technologies integrated boiler control module, Taco recommends the use of the "Boiler Module Wiring Harness". This harness is standard on the LTR0243U-1 controls or is available from Taco.

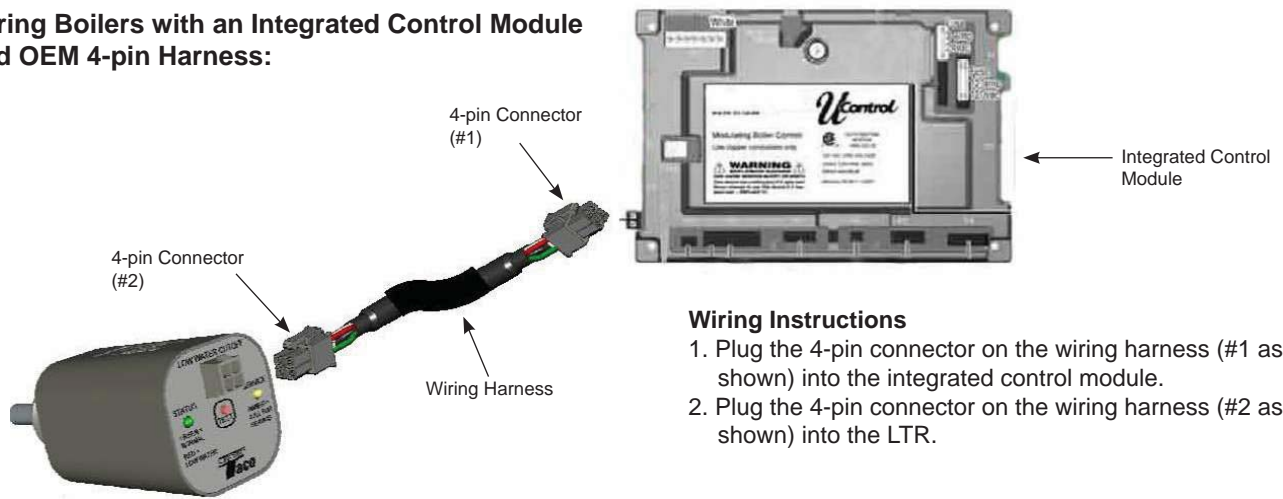
### Wiring Instructions

1. Disconnect the boiler wire harness from the integrated control module.
2. Plug the boiler wire harness connector into the female connector on the LTR wiring harness.
3. Plug the male connector on the LTR wiring harness into the integrated control module.
4. Plug boiler module module wiring harness into LTR.

## WARNING

- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Only use the wiring harness supplied with the control or factory supplied alternates. Use of other wire harnesses or insulation types could result in fire causing property damage, serious injury, and death.

## Wiring Boilers with an Integrated Control Module and OEM 4-pin Harness:



### Wiring Instructions

1. Plug the 4-pin connector on the wiring harness (#1 as shown) into the integrated control module.
2. Plug the 4-pin connector on the wiring harness (#2 as shown) into the LTR.

### Testing:

1. DO NOT fill the boiler. Set the thermostat to lowest possible setting and turn on electric power to the boiler. On initial start-up, the LTR indicates a low water condition, which indicates proper function. The "STATUS" LED on the control unit illuminates RED. The burner should not operate without water in the system.
2. Fill boiler with water. Once water covers the probe, the "STATUS" LED on the control turns from RED to GREEN.
3. Set the thermostat to call for heat. Verify that the burner ignites.
4. With the burner aflame, press and hold the test switch while observing the burner and the "STATUS" LED on the LTR. After the "STATUS" LED illuminates RED, the burner turns off.
5. Release the test switch and verify that the burner ignites (provided water covers the probe). The "STATUS" LED on the control unit turns from RED to GREEN.
6. If burner fails to cutoff or relight, see the Troubleshooting section for details. Otherwise, set the thermostat to its normal setting.

NOTE: Once correct operation of the LTR has been tested, test all other safety, limit, and control devices before finalizing system operation.

### Cleaning, Maintenance, and Replacemet:

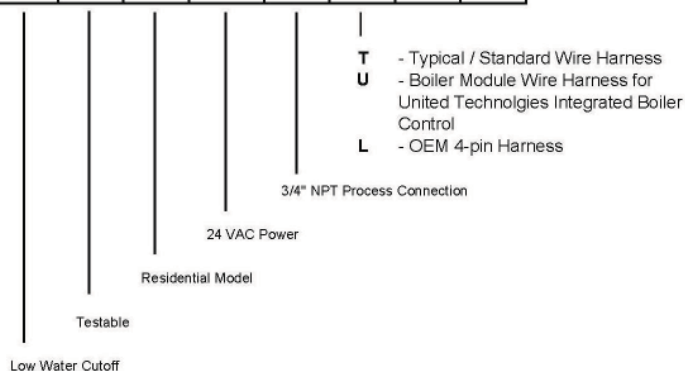
Test the operation of the LTR annually, or more frequently, by pressing the "TEST" button. The "STATUS" LED should turn RED and the boiler should shut down.

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.

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

### Ordering Information:

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### Replacement Cables:

- 9300-2714RP - Standard Wire Harness
- 9300-2715RP - Wire Harness for United Technologies Integrated Boiler Control
- 9300-2774RP - OEM 4-pin Harness

## Troubleshooting:

Symptom	Possible Cause	Remedy
Boiler will not fire	No power to LTR	Verify that the LTR wiring harness is plugged into the LTR and wiring is correct. Be sure power to boiler is turned on.
	Low water level	Make sure that the water level has reached the LTR probe.
	Air pocket at LTR probe	Turn off power to the boiler and slowly loosen, but do not remove the LTR. Allow any air to escape until water seeps past the LTR's threads. Promptly re-tighten the LTR and apply power to the boiler.
	Dirty probe	Fluxes or oils used during the construction of the boiler or installation of system piping can coat the LTR probe, preventing signals from being received by the LTR. Add a cleaning solution, (such as 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 LTR and thoroughly wipe it with a clean rag. Refill the system and test for proper operation.
	Improper ground	Make sure the green ground wire is electrically common to the boiler. Install the green ground wire to an unpainted/uncoated surface.
	Improper wiring	Check all wiring to the LTR and refer to the wiring diagrams. Using a multi-meter, verify that incoming power is 24 VAC.
	Failed control	If the "STATUS" LED blinks RED, the safety circuits in the LTR have detected a failure in the control. To remove any temporary conditions, unplug the LTR connector. After 30 seconds, plug in the LTR connector. If the "STATUS" LED continues to blink RED, the control must be replaced.
Boiler will not shutdown	Shorted probe	Turn off power to the boiler and remove the LTR. Verify that there is at least 1/4" clearance from all metal surfaces to the metal probe on the LTR. Metal from the boiler or piping must not come in contact with the metal probe on the LTR.
	Improper wiring	Check all wiring to the LTR and refer to the wiring diagrams. Using a multi-meter, verify that incoming power is 24 VAC.
Amber "SERVICE" LED is on	Dirty probe	Deposits form over time in the system and can coat the LTR probe, preventing signals from being received by the LTR. Remove the LTR and thoroughly wipe it with a clean rag. Refill the system and test for proper operation. It may be necessary to clean the boiler and piping as noted above.

### 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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