ITT

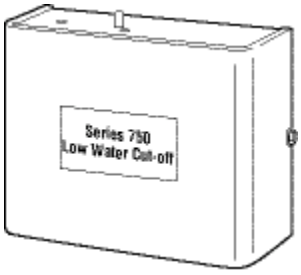
McDonnell & Miller

Installation & Maintenance Instructions
MM-213(G)

GUARDDOG®

Series 750
Low Water Cut-Off
For Use With with Remote Sensors

c UL us LISTED CSA® FM APPROVED



Series 750

Applications:

– Primary conductance type control for commercial or industrial hot water boilers where remote level sensing is required.
– Secondary control for commercial or industrial steam boilers.

⚠ WARNING



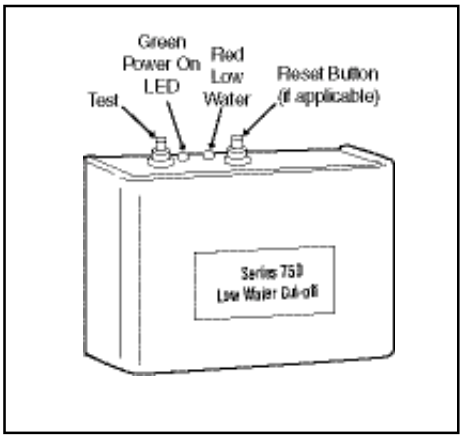


- Before using product, read and understand instructions.
- Save these instructions for future reference.
- All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of plumbing and electrical equipment and/or systems in accordance with all applicable codes and ordinances.
- Boiler manufacturer schematics should always be followed. In the event that the boiler manufacturer's schematic does not exist, or is not available from the boiler manufacturer, refer to the schematics provided in this document.
- To prevent serious burns, allow the control and surrounding equipment to cool to 80˚F (27˚C) and allow pressure to release to 0 psi (0 bar) before servicing.
- To prevent an electrical fire or equipment damage, electrical wiring insulation must have a rating of 167˚F (75˚C) if the liquid's temperature exceeds 180˚F (82˚C).
- This low water cut-off must be installed in series with all other limit and operating controls installed on the boiler. After installation, check for proper operation of all the limit and operating controls, before leaving the site.
- When using mixed voltages, do not jumper from terminal 1 to terminal 3.
- To prevent electrocution, when the electrical power is connected to the control, do not touch the terminals, or electrical wires.
- To prevent electrical shock, turn off the electrical power before making electrical connections.

Failure to follow this warning could cause property damage, personal injury or death.

SPECIFICATIONS

The Series 750 control box connected to a remote sensor provides protection against low water conditions for commercial and industrial applications. The Series 750 control box is fully CSD-1 compliant and can be used as the primary LWCO on hot water boilers and as the secondary LWCO (manual reset) on steam boilers.



Automatic Reset Models
Whenever water is below the level of the probe, the control will go into a low water condition. When the water level has been restored, the control will automatically return to a run condition.

Manual Reset Models
If a low water condition occurs (water off probe), the manual reset button must be pressed once the water level is restored to a level above the probe.

CSD-1 Code Compliance
On Manual Reset units, if the control is in a low water condition (water off probe) when there is an interruption of power, the control will remain in a low water condition when power is restored. The reset button will need to be pressed when the water level is restored to a level above the probe.

Control Unit

Temperature Ratings:
Storage: -40˚F to 135˚F (-40˚C to 57˚C)
Ambient: 32˚F to 135˚F (0˚C to 57˚C)

Humidity: 85% (non-condensing)

Electrical Enclosure Rating: NEMA 1 General Purpose

Electrical Specifications

Model	Control Voltage	Switch Contact Rating (Pilot Duty)
750-MT-24	24VAC	50VA@24VAC Or 125VA@120VAC
750-T-24		
750-MT-120	120VAC	
750-T-120		

Hz: 50/60
Control Power Consumption: 3 VA (max.)
Probe Sensitivity: 20,000 ohm
(water/glycol mixtures up to 50% concentration may be used)

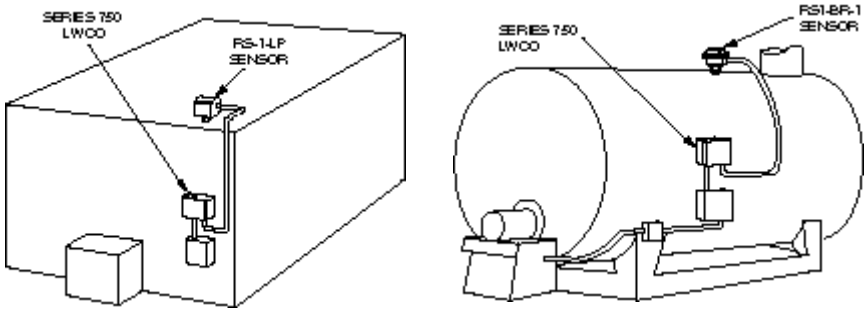
STEP 1 - Where to Install the Remote Sensors

Determine where to install the remote sensor based on the following requirements:

a. The tip of the probe or extension **must be installed above the minimum safe water level,** as determined by the boiler manufacturer.

b. Probes must be installed vertically if they are more than 5" (127mm) long.

c. There must be a minimum 1/4" (6.4mm) clearance between the probe and any grounding surface inside the boiler.



IMPORTANT: Remote sensors MUST be installed in a tapping on the boiler.

Table 2. Remote Sensors

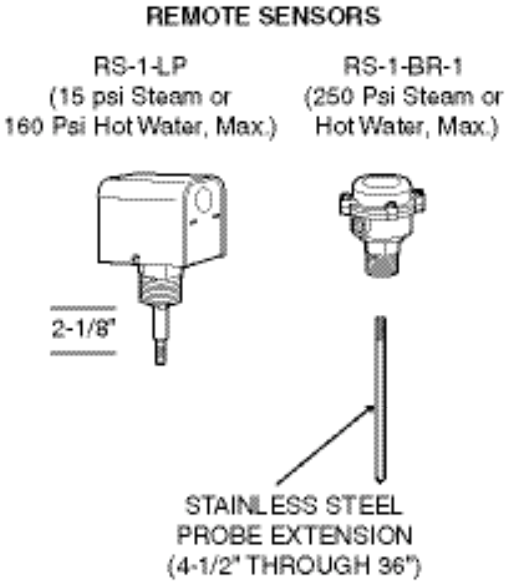
Catalog No.	Part No.	Sensor Boiler Tapping	Sensor Housing	Sensor Pressure Rating (psig)	Sensor Temp. Rating °F
RS-1-LP	176203	3/4" NPT	NEMA 1	160 (water)/15 (steam)	250°
RS-1-BR-1*	179524	1" NPT	NEMA 4X	250 (water & steam)	406°

* Requires probe extension (See table 3).

Table 3. Stainless Steel Probe Extensions*

Catalog No.	Part No.	Length, Inches
RS-1/3-SS	176208	4-1/2
PS-1-SS	179530	12
G-2-SS	179156	24
G-3-SS	179157	36

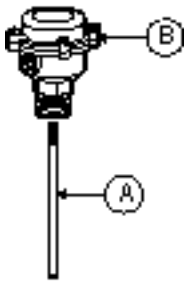
* To be used with remote sensor (RS-1-BR-1) mounted in vertical position only.



STEP 2 - Installing the Remote Sensor

For the Model RS-1-BR-1 sensors, only:

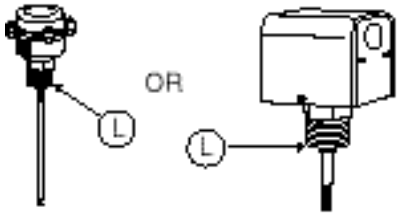
a. Cut the probe to desired length. Screw, clockwise, the threaded stainless steel probe extension (A) into the remote sensor (B). Carefully tighten the locking nut to approximately 1 ft•lb (1.7 N•m). Do not cut the clear plastic protective tube.



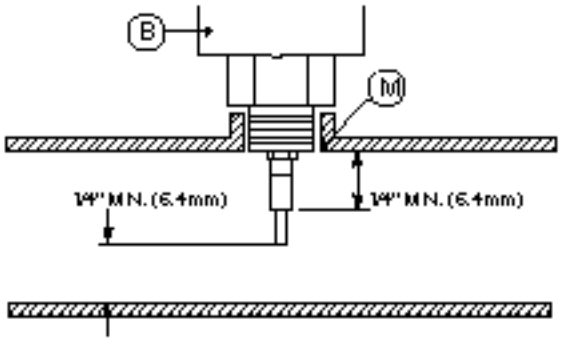
For All Remote Sensors

b. Apply a small amount of pipe dope to the first threads (L) of the remote sensor.

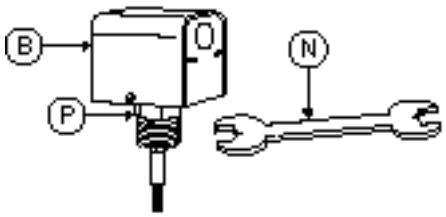
IMPORTANT: Do not use Teflon® tape or thread sealant.



c. Insert the remote sensor (B) into the boiler tapping (M) as determined in Step 1.

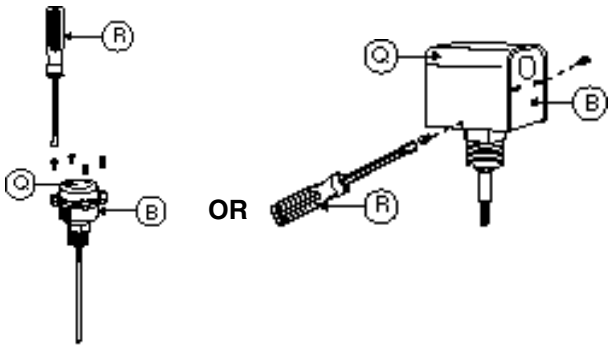


d. Using the adjustable wrench (N), tighten the brass hex adapter (P) on the remote sensor (B) to approximately 63 ft•lb (85 N•m). DO NOT TIGHTEN BY TURNING THE SENSOR HOUSING.



a. Remove the sensor housing cover (Q).

1. ***For Model RS-1-BR-1,*** using a flathead screwdriver (R), remove the four (4) screws and separate the housing cover (Q) from the sensor (B).
2. ***For Model RS-1-LP,*** using a flathead screwdriver or nut driver (R), loosen the two (2) screws and separate the housing cover (Q) from the sensor (B).

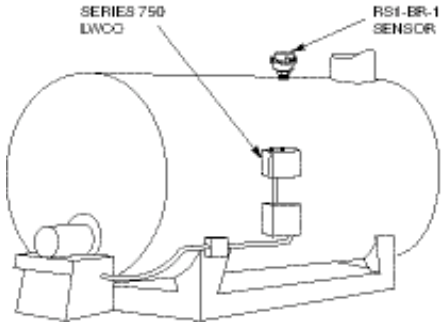


Model RS-1-BR-1 **Model RS-1-LP**

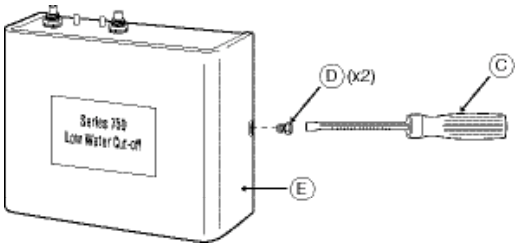
STEP 3 - Installing the Control Box

- Mount **Control Box** in a suitable location near the boiler's main electrical panel.

NOTE
When installed as secondary LWCO on steam boilers, the boiler sight glass must be visible from the location of the control box.

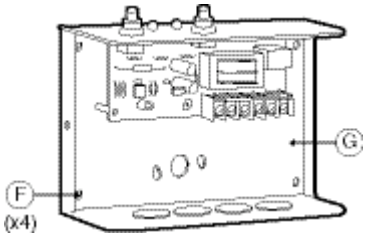


a. Using the flatblade screwdriver or nut driver (C), loosen the two (2) screws (D) and remove cover (E).



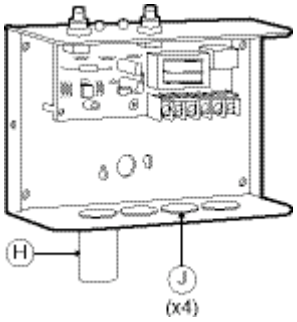
b. Using the four (4) 3/16" (4.8mm) mounting holes (F), attach the control (G) to the boiler jacket, entry plate, or other suitable location.

NOTE: Mounting hardware is not included.



c. Install an electrical conduit (H) to the conduit knockouts (J). Wire-ways should be able to accommodate the 120VAC supply circuit, the remote probe circuit, alarm feeder circuit, and burner circuit.

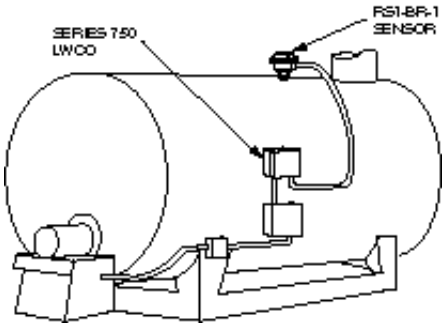
NOTE
Refer to and follow local codes and standards when selecting conduit and electrical fittings. Wires from Probe Housing and Control Box must be in their own conduit. If they are run in conduit with other wires, there may be interference that can affect the performance of the control.



- Install electrical conduit between **Probe Housing** and **Control Box.**

NOTE
Wire must be 18 AWG stranded with glass braided silicone jacket (UL 3071) suitable for high temperature (200˚C) service.

NOTE
Refer to and follow local codes and standards when selecting conduit and electrical fittings. Wires from Probe Housing and Control Box must be in their own conduit. If they are run in conduit with other wires, there may be interference that can affect the performance of the control.



STEP 4 - Electrical Wiring

⚠ WARNING

To prevent electrical fire or equipment damage, electrical wiring must have a rating of 167°F (75°C) if the liquid's temperature exceeds 180°F (82°C).
Failure to follow this warning could cause property damage, personal injury or death.

⚠ IMPORTANT

Boiler manufacturer schematics should always be followed. In the event that the boiler manufacturer's schematic does not exist, or is not available from the boiler manufacturer, refer to the schematics provided in this document.

NOTE

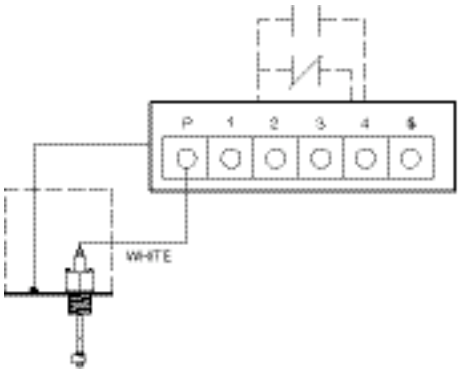
Probe wires should be minimum 18 AWG stranded with glass braided Silicone jacket (UL 3071) suitable for high temperature (200°C) service.

Wiring Diagram Legends

1. Bold lines indicate action to be taken in Step shown.
2. Dotted black lines indicate internal wiring.

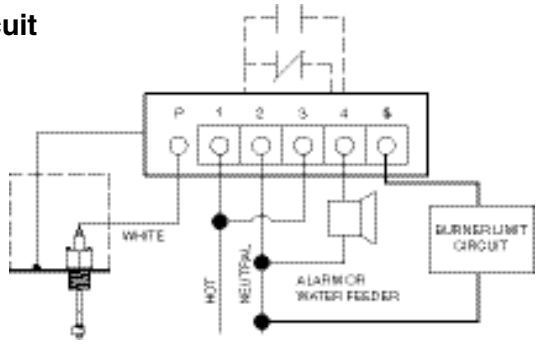
Remote Sensor Wiring:

- Connect wire from probe end to Terminal 'P'.
- Connect wire from remote sensor green ground screw to chassis green ground screw



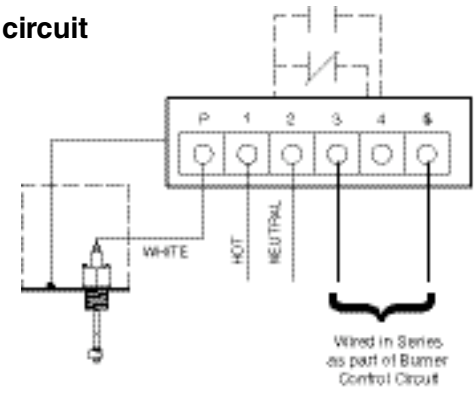
Control Wiring: Same voltage for control and burner circuit

- Connect hot wire to terminal 1
- Connect neutral wire to terminal 2
- Connect jumper wire from Terminal 1 to Terminal 3
- Connect wire from beginning of Burner circuit (thermostat, gas valve, limits, etc.) to terminal 5
- Connect wire from end of Burner circuit to terminal 2



Control Wiring: Different voltage for control and burner circuit

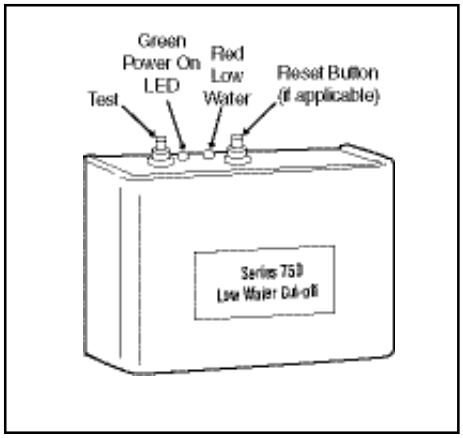
- Connect hot wire to terminal 1
- Connect neutral wire to terminal 2
- Locate Boiler Burner Safety Circuit and connect wires to Terminals 3 & 5 as shown to interrupt circuit



STEP 5 - Testing and Diagnostic Procedures

Series 750 LWCO with Green Power On LED and Red Low Water LED

Start-Up



a. Before filling the system, turn on the electric power to the boiler.

1. Upon initial power up, the Green and Red lights will flash simultaneously 4 times.

2. The Green and Red lights will turn "ON".

3. The burner will never turn "ON" during power up, If water is off the probe.

b. Now fill the boiler with water.

(auto reset units only)

1. When water touches the probe, the Green light will remain "ON".

2. The Red light will turn "OFF" and the burner will turn "ON" as long as there is water on the probe.

(manual reset units only)

(When water returns to the probe, nothing will happen until the manual reset button is depressed.)

1. After depressing manual reset button, the Green and Red lights will flash simultaneously 4 times.

2. Then the Green light will turn "ON" and the Red light will turn "OFF".

3. The burner will turn "ON" as long as there is water in the probe.

Manually Testing Control

c. Slowly drain the boiler of water.

(both auto and manual reset units)

1. When the water drops off the probe, the Green light will remain "ON".

2. The Red light will turn "ON" and the burner will turn "OFF", if water is off the probe.

Testing Control Using "Test Button"

d. Depressing the test button with "water on probe" (auto reset units only):

(Must depress and hold test button to activate test cycle.)

1. When test cycle is activated the Red and Green lights will flash simultaneously 3 times.

2. The Red light will turn "ON"

3. The burner will turn "OFF".

4. The Green light will continue flashing as long as the test button is depressed.

(Release test button, if water is still on probe.)

5. The Green lights will stop flashing and turn "ON".

6. Then Red light will turn "OFF".

7. The burner will turn "ON" as long as there is water in the probe.

e. Depressing the test button with "water on probe" (manual resets units only):

(Must depress and hold test button to activate test cycle.)

1. When test cycle is activated the Red and Green lights will flash simultaneously 3 times.

2. The Red light will turn "ON"

3. The burner will turn "OFF".

4. The Green light will continue flashing as long as the test button is depressed.

(Release test button. You must depress the manual reset button to unlock the low water cut-off.)

5. After depressing manual reset button, the Green and Red lights will flash simultaneously 4 times.

6. Then the Green light will turn "ON" and the Red light will turn "OFF".

7. The burner will turn "ON" as long as there is water in the probe.

f. Depressing the test button with "water off probe" (both auto and manual reset units):

(Since control is in "low water" the Green light will flash and the Red light will remain "ON". The burner will remain "OFF".

CSD-1 Compliance

On manual Reset units, if the control is in a low water condition (water off probe) when there is an interruption of power, the control will remain in a low water condition when power is restored. The reset button will need to be pressed when the water level is restored to a level above the probe.

If control fails to operate, perform the following diagnostic checks.

1. Check to be sure the water level in the boiler is at or above the level of the probe.
2. Re-check all wiring to ensure proper connections as specified in boiler manufacturers wiring diagrams or these instructions.
3. Check to ensure that Teflon® tape has not been used on the threaded connection of the electrode to the boiler.
4. Re-check the electrical ground connection for the remote sensor and control unit.
5. Check the quality of the boiler water to ensure adequate conductance.

MAINTENANCE

SCHEDULE:

- **Inspect probe annually or more frequently for scale build-up and clean or replace if necessary.** Make certain there is no scale or build-up on the probe or it's white Teflon® insulator. Be careful not to damage the Teflon® insulator.
- **Test the low water cut-off annually or more frequently, if required by code.**

⚠ CAUTION

Replace Probe if:
- **Teflon® insulator is cracked or worn.**
- **Probe is loose.**

Failure to follow this caution could cause property damage, personal injury or death.

- **Replace probe every 10 years.** More frequent replacement of the probe is required if it is used in locales where significant water treatment is required, or in applications with high make-up water requirements
- **Replace the low water cut-off every 15 years.**

NOTE

Clean probe by wiping with non-abrasive cloth and rinsing with clean water. DO NOT use sharp instruments to remove any accumulations of rust or scale.

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Printed in U.S.A. 3-10 210210