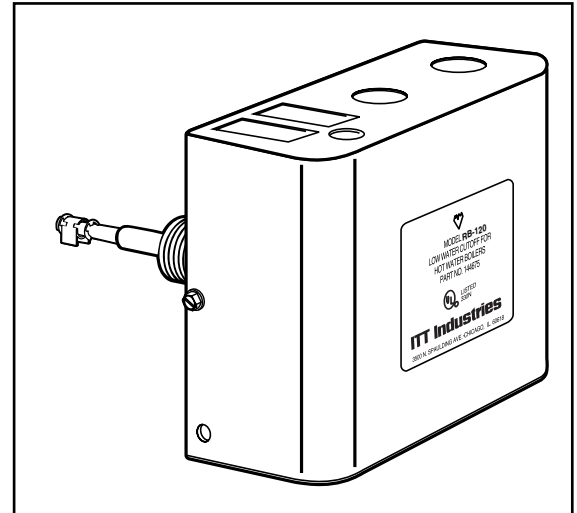




McDonnell & Miller
 Installation & Maintenance
 Instructions
 MM-215(E)

Model RB-120
Conductance Type
Low Water Cut-Offs
 For Residential and Commercial
 120 VAC Hot Water Boilers
OPERATION



IMPORTANT: The RB-120 low water cut-off is manufactured with a 3/4" (20mm) NPT adapter, designed to mate with a standard 3/4" (20mm) NPT boiler coupling.

Maximum Pressure: 160 psi (11 kg/cm²)
Maximum Water Temperature: 250°F (121°C)

Water Specifications

Boiler compound is required for water with a resistance level greater than 50,000 ohms/cm such as demineralized or distilled water.

Electrical Ratings

Voltage	Pump Circuit Rating (Amperes)		Pilot Duty
	Full Load	Locked Rotor	
120 VAC	5.8	34.8	125 VA at 120 or 240 VAC
240 VAC	2.9	17.4	

⚠ 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 HVAC systems in accordance with all applicable codes and ordinances.



- To prevent serious burns, the boiler must be cooled to 80°F (27°C) and the pressure must be 0 psi (0 bar) before servicing.
- To prevent electrical shock, do not touch or make contact with probe ends while the system is energized or activated.
- To prevent dry fire, which could cause a fire, there must be a 2" (51mm) minimum width in the boiler section or 1¼" (32mm) pipe inner diameter for probe installation and operation.
- To prevent mixed voltages, which could cause an electrical fire, the probe control must be connected in series with all other boiler operating and safety controls.
- To prevent mixed voltages, which could cause an electrical fire, do not use a jumper wire between terminals 1 and 3 with a 24 volt AC boiler burner circuit.



- To prevent a fire, the boiler system's Low Water Indicator Alarm must have an electrical rating of 120 volts AC and it must be connected to terminal 5 of the probe control.
 - We recommend that secondary (redundant) Low Water Cut-Off controls be installed on all steam boilers with heat input greater than 400,000 BTU/hour or operating above 15 psi steam pressure. At least two controls should be connected in series with the burner control circuit to provide safety redundancy protection should the boiler experience a low-water condition. Moreover, at each annual outage, the low water cutoffs should be dismantled, inspected, cleaned, and checked for proper calibration and performance.
- Failure to follow this warning could cause property damage, personal injury or death.

INSTALLATION –

STEP 1 - Where to Install the Probe Control

Determine where to install the probe control based on the following requirements:

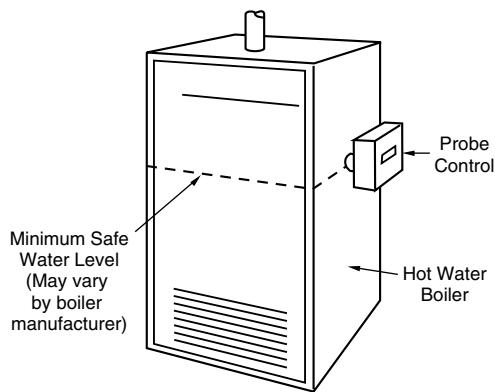
a. If tappings are provided on the boiler, install the probe control in one that is above the minimum safe water level, as specified by the boiler manufacturer. If no specified mini-

imum safe water level is designated, contact the boiler manufacturer.

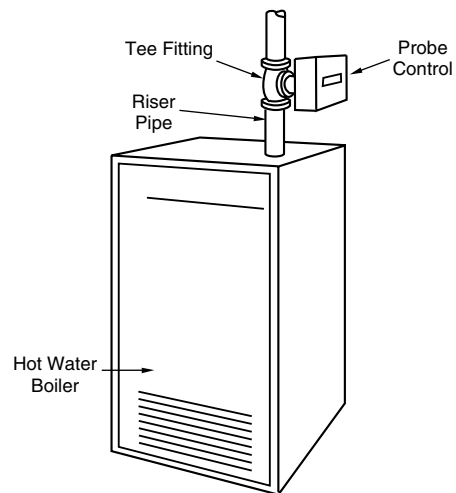
b. If no tapping is provided on the boiler, install the probe control in a header or riser pipe above the boiler. Refer to the Typical Installation Diagrams below.

TYPICAL INSTALLATION DIAGRAMS

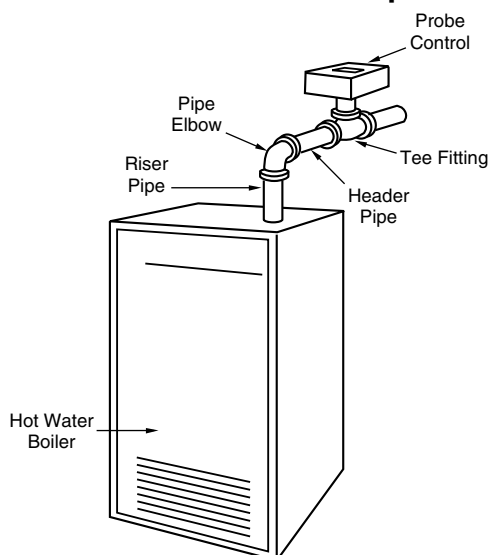
Horizontal in Boiler Side



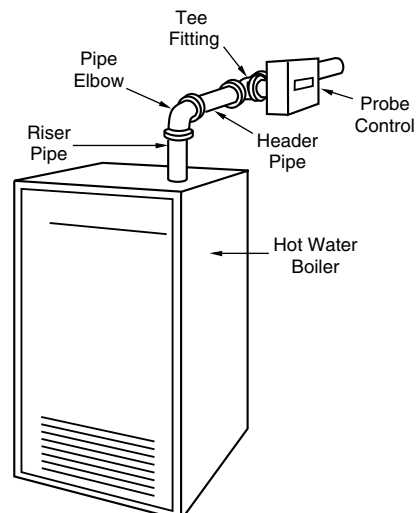
Horizontal in Riser Pipe



Vertical in Header Pipe



Horizontal in Header Pipe

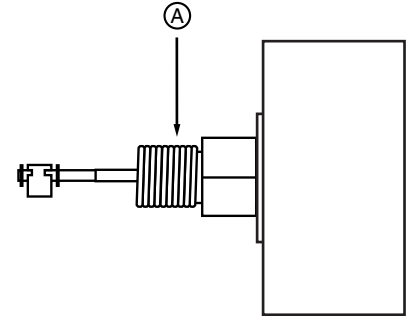


STEP 2 - Install Probe Control

If you are installing it: **HORIZONTAL IN A BOILER**

- a. Apply pipe sealing compound on the probe threads (A).

IMPORTANT: DO NOT use Teflon® tape. Only use pipe sealant.



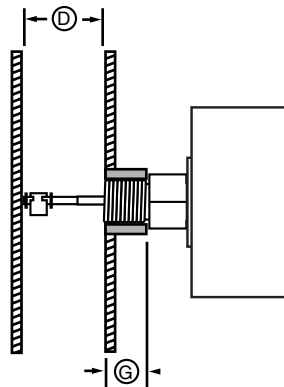
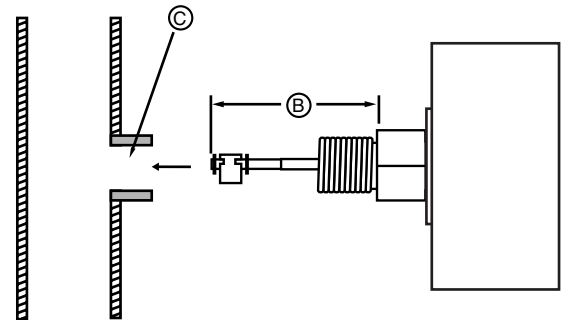
- b. Insert the probe portion (B) of the probe control into the 3/4" (20mm) NPT boiler coupling (C), above the **minimum safe water level**, as specified by the boiler manufacturer.

WARNING



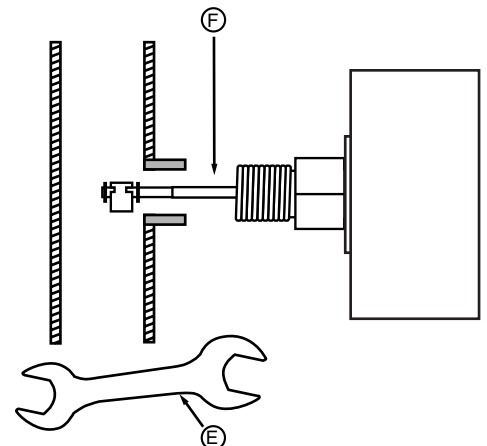
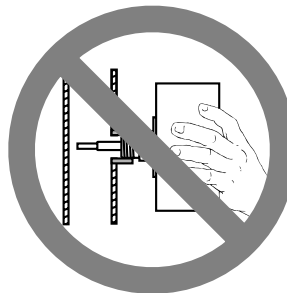
To prevent dry fire, which could cause a fire, there must be a 2" (51mm) minimum width in the boiler section (D) and the 3/4" (20mm) NPT coupling must be 1/2" (12.7mm) in length (G) for probe installation and operation.

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



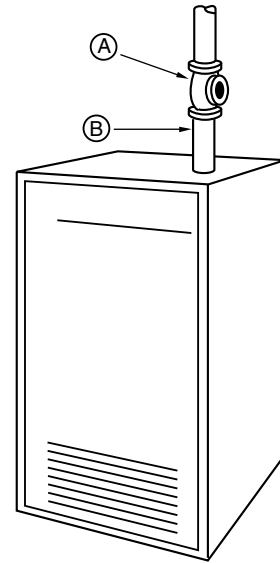
- c. **IMPORTANT: DO NOT** turn the housing cover to tighten the probe control or damage will result.

Using a 1-3/8" (35mm) open end wrench (E) tighten the brass hex adaptor (F).



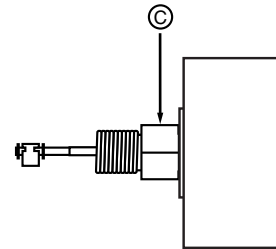
If you are installing it: HORIZONTAL IN A RISER

- a. Install a 1-1/4" x 1-1/4" x 3/4" (32mm x 32mm x 20mm) reducing tee (A) in the riser (B).

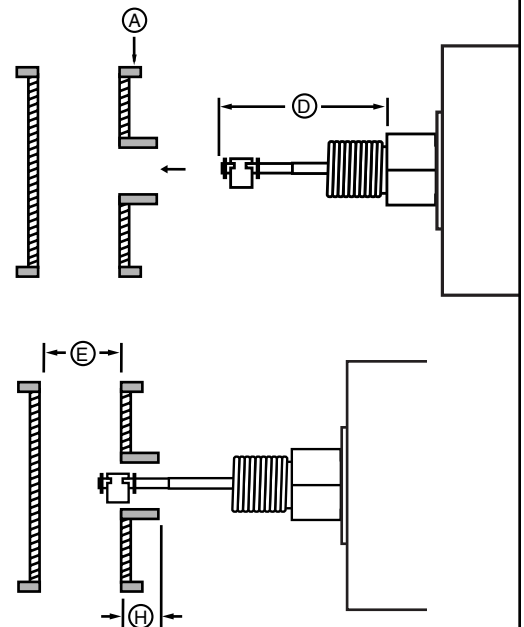


- b. Apply pipe sealing compound on the probe threads (C).

IMPORTANT: DO NOT use Teflon[®] tape. Only use pipe sealant.



- c. Insert the probe portion (D) of the probe control into the reducing tee (A).



⚠ WARNING

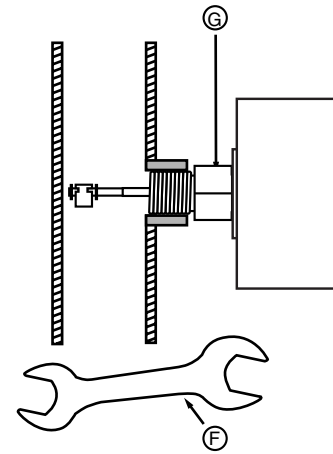
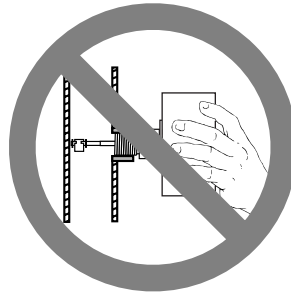


To prevent dry fire which could cause a fire, there must be a 1/4" (32mm) minimum width in the pipe inner diameter (E) and the 3/4" (20mm) NPT coupling must be 1/2" (12.7mm) in length (H) for probe installation and operation.

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

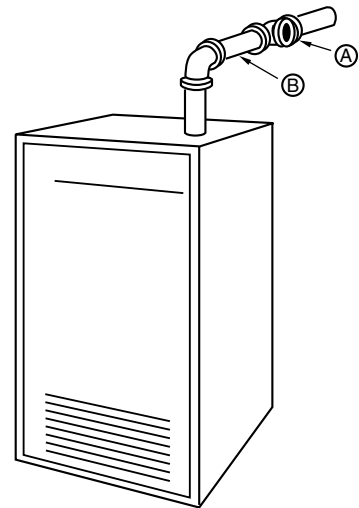
- d. **IMPORTANT: DO NOT** turn the housing cover to tighten the probe control or damage will result.

Using a 1-3/8" (35mm) open end wrench (F) tighten the brass hex adaptor (G).

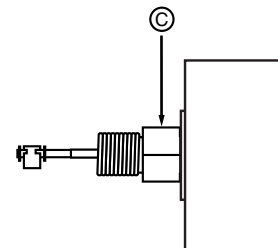


If you are installing it: HORIZONTAL IN A HEADER

- a. Install a 1-1/4" x 1-1/4" x 3/4" (32mm x 32mm x 20mm) reducing tee (A) in the header pipe (B).

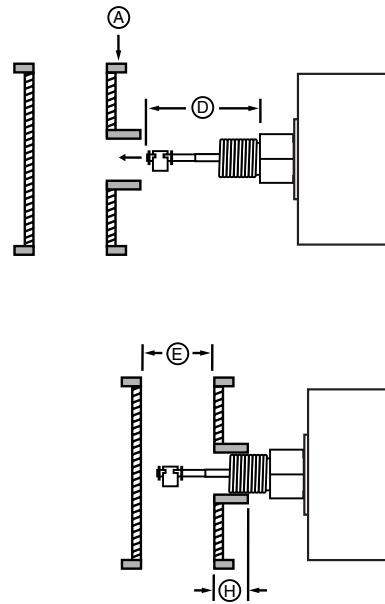


- b. Apply pipe sealing compound on the probe threads (C).



IMPORTANT: DO NOT use Teflon® tape. Only use pipe sealant.

- c. Insert the probe portion (D) of the probe control into the reducing tee (A).



WARNING

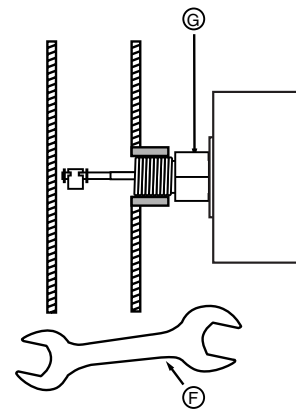
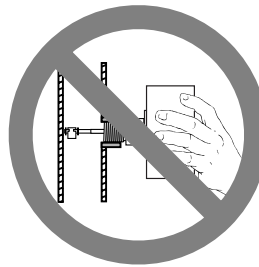


To prevent dry fire which could cause a fire, there must be a 1¼" (32mm) minimum width in the pipe inner diameter (E) and the ¾" (20mm) NPT coupling must be ½" (12.7mm) in length (H) for probe installation and operation.

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

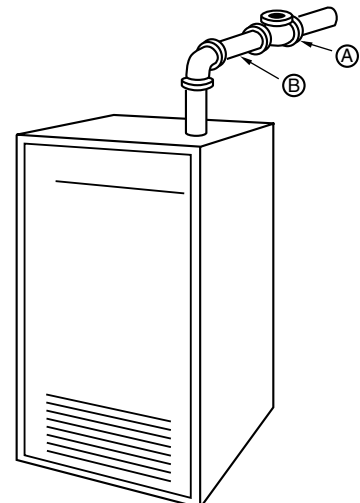
- d. **IMPORTANT: DO NOT** turn the housing cover to tighten the probe control or damage will result.

Using a 1-3/8" (35mm) open end wrench (F) tighten the brass hex adaptor (G).



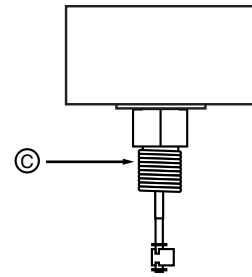
If you are installing it: VERTICAL IN A HEADER

- a. Install a 1-1/4" x 1-1/4" x 3/4" (32mm x 32mm x 20mm) reducing tee (A) in the header pipe (B).



b. Apply pipe sealing compound on the probe threads (C).

IMPORTANT: DO NOT use Teflon® tape. Only use pipe sealant.



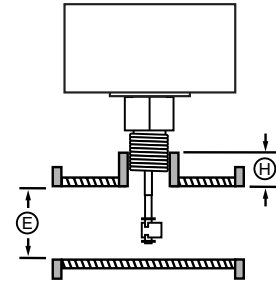
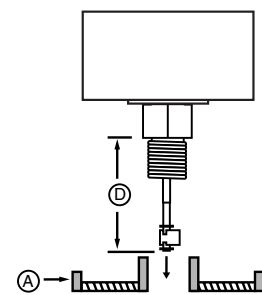
c. Insert the probe portion (D) of the probe control into the reducing tee (A).

WARNING



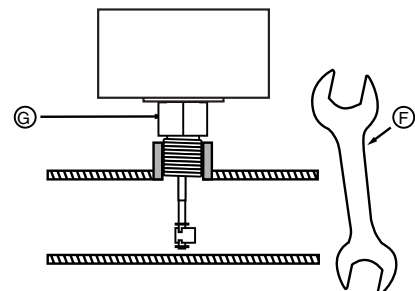
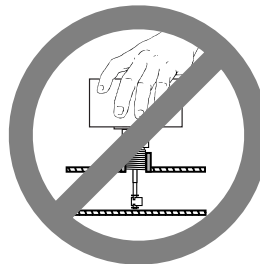
To prevent dry fire which could cause a fire, there must be a 1¼" (32mm) minimum width in the pipe inner diameter (E) and the ¾" (20mm) NPT coupling must be ½" (12.7mm) in length (H) for probe installation and operation.

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



d. **IMPORTANT: DO NOT** turn the housing cover to tighten the probe control or damage will result.

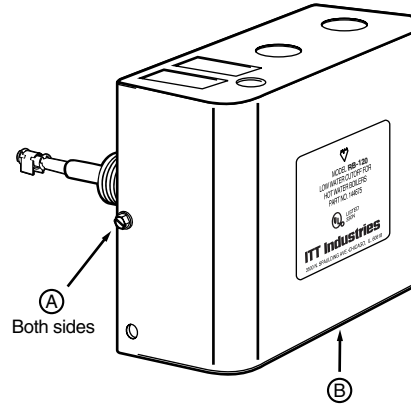
Using a 1-3/8" (35mm) open end wrench (F) tighten the brass hex adaptor (G).



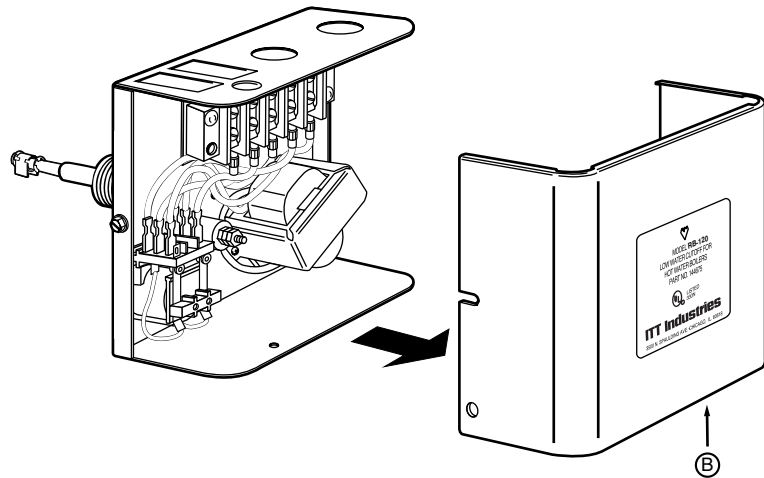
STEP 3 - Electrical Wiring

IMPORTANT: Copper wire, suitable for a minimum of 75°F (24°C), must be used.

- a. Loosen the (2) two screws (A) from the housing cover (B).



- b. Remove the housing cover (B).



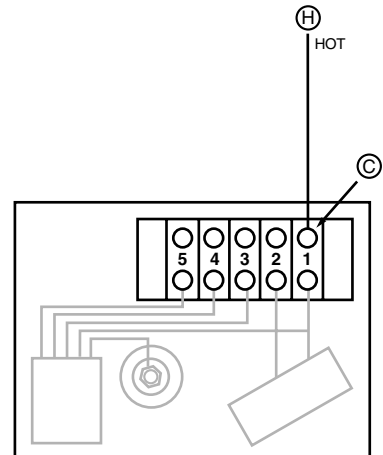
If you are connecting to a: Boiler Burner Circuit Voltage of 120 Volts AC

⚠ WARNING



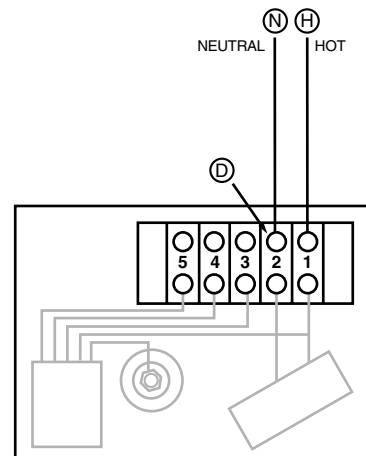
To prevent mixed voltages, which could cause an electrical fire, the probe control must be connected in series with all other boiler operating and safety controls. Failure to follow this warning could cause property damage, personal injury, or death.

c. Connect the hot wire (H) to the top row, terminal 1 (C).



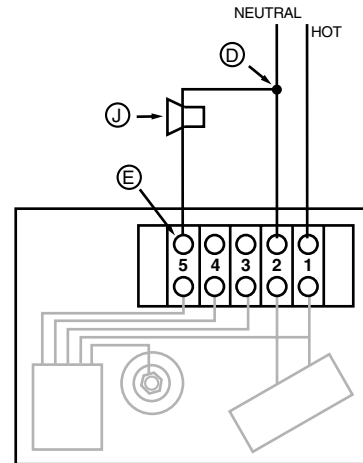
For a Boiler Burner Circuit Voltage of 120 Volts AC

d. Connect the neutral (N) wire to the top row, terminal 2 (D) .



For a Boiler Burner Circuit Voltage of 120 Volts AC

e. Connect the boiler system's Low Water Indicator Alarm (J) (**only if its electrical rating is 120 Volts AC**) to the neutral wire (D). Connect the Low Water Indicator Alarm to the top row, terminal 5 (E).



**For a Boiler Burner Circuit
Voltage of 120 Volts AC**

⚠ WARNING



To prevent a fire, the boiler system's Low Water Indicator Alarm must have an electrical rating of 120 volts AC and it must be connected to terminal 5 of the probe control.

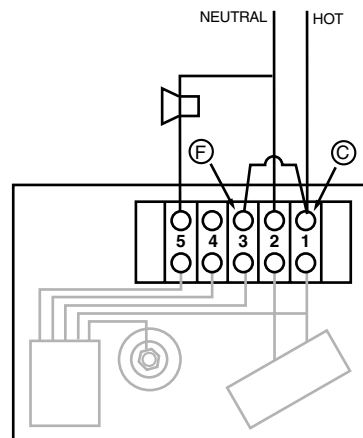
Failure to follow this warning could cause property damage, personal injury, or death.

⚠ WARNING



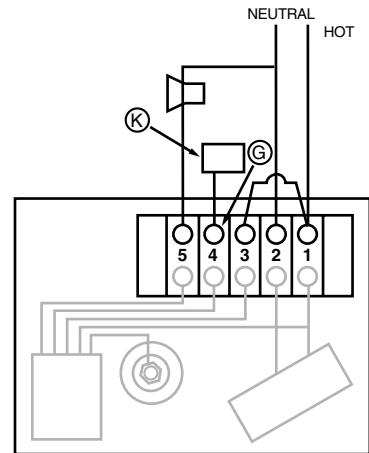
To prevent mixed voltages, which could cause an electrical fire, the probe control must be connected in series with all other boiler operating and safety controls. Failure to follow this warning could cause property damage, personal injury, or death.

f. Connect a jumper wire to the top row, terminal 3 (F) and into the top row, terminal 1 (C).



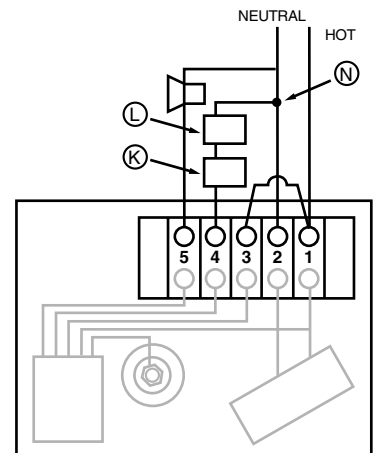
**For a Boiler Burner Circuit
Voltage of 120 Volts AC**

g. Connect the burner circuit (K) to the top row, terminal 4 (G).



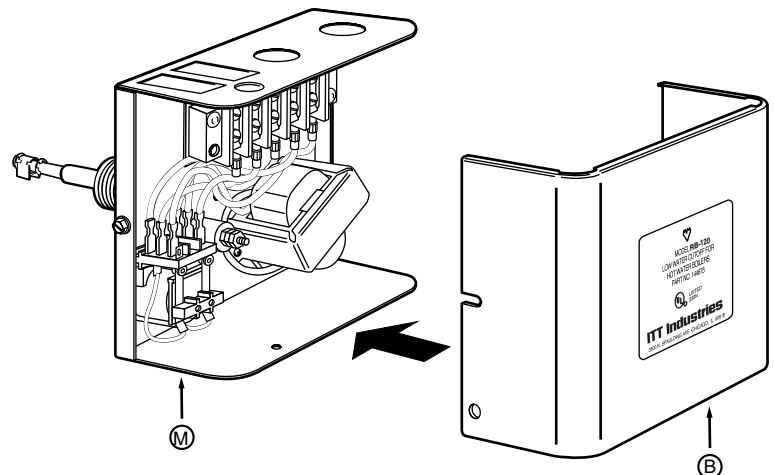
**For a Boiler Burner Circuit
Voltage of 120 Volts AC**

h. Connect the burner circuit (K) to all other boiler operating and safety controls (L) and to the neutral wire (N).

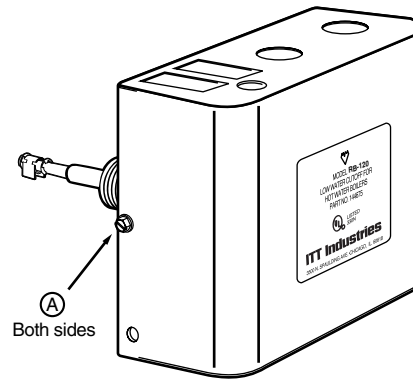


**For a Boiler Burner Circuit
Voltage of 120 Volts AC**

i. Place the probe control's housing cover (B) over the housing (M).



j. Tighten the (2) screws (A).



PROCEED TO STEP 4

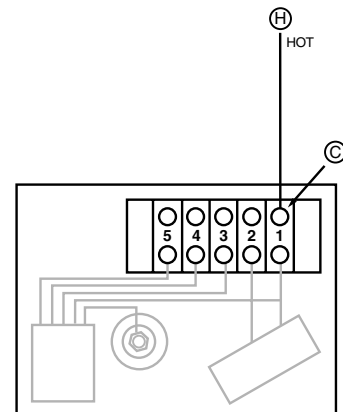
If you are connecting to a: Boiler Burner Circuit Voltage of 24 Volts AC

⚠ WARNING



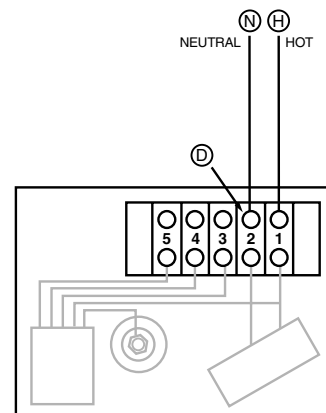
To prevent mixed voltages, which could cause an electrical fire, the probe control must be connected in series with all other boiler operating and safety controls.
Failure to follow this warning could cause property damage, personal injury, or death.

c. Connect the hot wire (H) to the top row, terminal 1 (C).



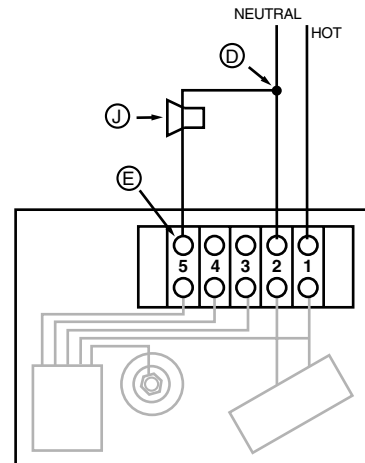
For a Boiler Burner Circuit Voltage of 24 Volts AC

d. Connect the neutral wire (N) to the top row, terminal 2 (D).



For a Boiler Burner Circuit Voltage of 24 Volts AC

e. Connect the boiler system's Low Water Indicator Alarm (J) (**only if its electrical rating is 120 Volts AC**) to the neutral wire (D). Connect the Low Water Indicator Alarm to the top row, terminal 5 (E).



For a Boiler Burner Circuit Voltage of 24 Volts AC

WARNING



To prevent a fire, the boiler system's Low Water Indicator Alarm must have an electrical rating of 120 volts AC and it must be connected to terminal 5 of the probe control.

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

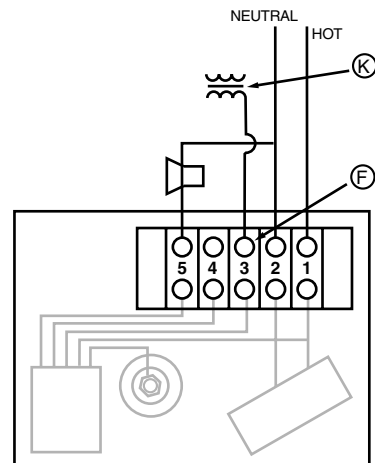
WARNING



To prevent mixed voltages, which could cause an electrical fire, the probe control must be connected in series with all other boiler operating and safety controls.

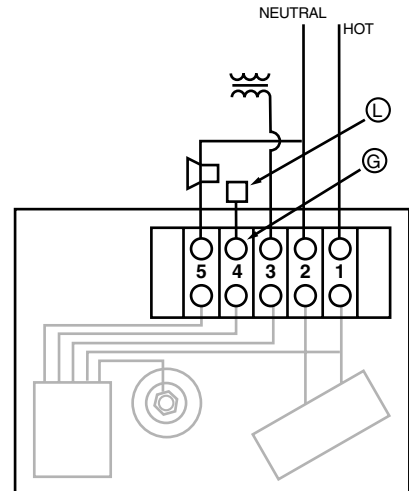
Failure to follow this warning could cause property damage, personal injury, or death.

f. Connect the wire from the 24 Volt AC Transformer (K) to the top row, terminal 3 (F).



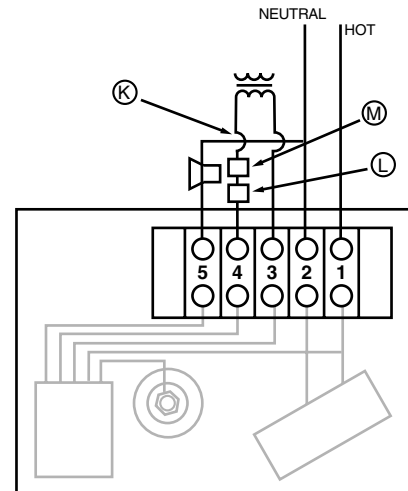
For a Boiler Burner Circuit Voltage of 24 Volts AC

g. Connect the burner circuit (L) to the top row, terminal 4 (G).



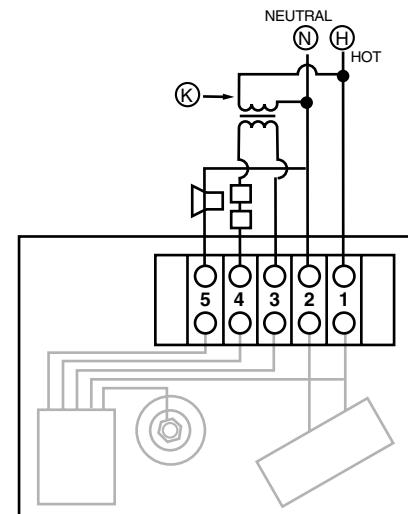
**For a Boiler Burner Circuit
Voltage of 24 Volts AC**

h. Connect the burner circuit (L) to all other boiler operating and safety controls (M) and then to the transformer (K).



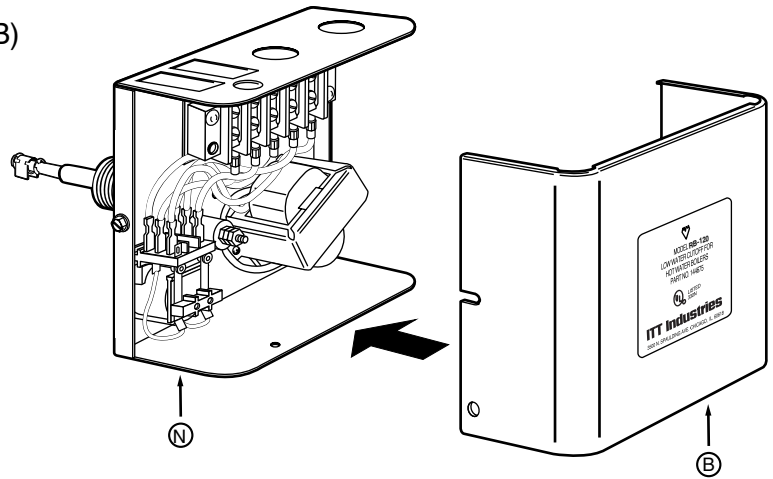
**For a Boiler Burner Circuit
Voltage of 24 Volts AC**

i. Connect the transformer (K) to the hot wire (H) and to the neutral wire (N).

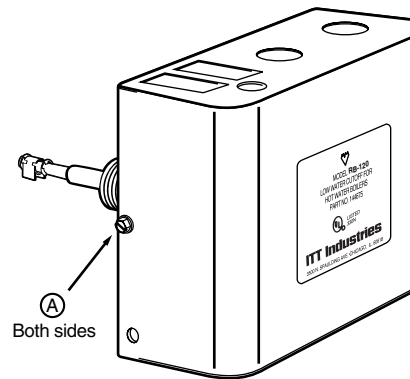


**For a Boiler Burner Circuit
Voltage of 24 Volts AC**

j. Place the probe control's housing cover (B) over the housing (N).



k. Tighten the (2) screws (A).



STEP 4 - Testing

IMPORTANT: Complete this procedure **before leaving** installation site.

- a. Inspect the low water cut-off burner contacts to make certain that they are open (burner off).
- b. Fill the boiler system with water.

- c. Inspect burner contacts to make certain they are closed (burner on) when the thermostat calls for heat and the probe is covered by water.
- d. If the test fails, follow the "Troubleshooting" procedure on page 16.



INSTALLATION COMPLETE

MAINTENANCE

SCHEDULE:

- Test the low water cut-off annually or more frequently.
- Remove and inspect the self-cleaning probe every 5 years.
- Replace probe every 10 years.
- Replace the low water cut-off every 15 years.

TROUBLESHOOTING

 WARNING	
	<p>To prevent electrical shock, do not touch or make contact with probe ends while the system is energized or activated.</p> <p>Failure to follow this warning could cause property damage, personal injury, or death.</p>

Problem:

Refer to Step 1 on page 2.

1. Failure to Operate

- a. **Cause:** No voltage is being supplied to the probe control.

Test: Using a voltage meter, verify that voltage is being sent to terminals 1 and 2 of the probe control.

Solution: If no voltage is being supplied, make necessary electrical modifications.

If voltage is supplied to the probe control but not the probe, verify that the electrical wiring connections are correct according to the instructions, pages 8–15.

If these solutions do not resolve the problem, replace the probe control.

- b. **Cause:** The probe end is making contact with the boiler or pipe wall.

Test: Remove the probe control. Using a ruler, verify that a 2" (51mm) minimum width in the boiler section or 1¼" (32mm) pipe inner diameter is provided for probe installation and operation.

Solution: Install the probe control where a 2" (51mm) width in the boiler section or 1¼" (32mm) pipe inner diameter exists.

- c. **Cause:** Teflon® tape was used on the probe.

Test: Remove the probe control and inspect probe threads.

Solution: Remove Teflon® tape. Apply pipe sealing compound on the probe threads.

- d. **Cause:** Air Pocket Surrounding Probe.

Solution: Remove the probe control, purge air from the system by opening the water feed valve until water flows from the tapping. Reinstall the probe control and shut off the water feed valve.

- e. **Cause:** Other system electrical wiring and/or operating control problems.

Solution: Determine cause and resolve problems.