



# PLUS LINE

## ***Indirect-Fired Water Heaters***

### ***Instruction Manual Supplement PLUS & Ultra PLUS water heaters with Ultra Gas-fired Water Boilers***



***Ultra***  
with **PhD** PRECISION  
HYDRONIC  
DATA *technology*

**WARNING**

This manual must only be used by a qualified heating installer/service technician. Read all instructions, including the Boiler Manual and other supplements, before installing. Install PLUS or Ultra PLUS indirect-fired water heater as explained in the PLUS Line Manual. Install Ultra boiler as explained in the Ultra Boiler Manual. Perform steps in the order given. Failure to comply could result in severe personal injury, death or substantial property damage.

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## Please read before proceeding

### Installer

- WARNING** Read all instructions before installing. Follow all instructions in proper order to prevent personal injury or death.
- This document is intended only as a supplement to the Ultra Boiler Manual and PLUS Line manual. It's purpose is for connection of an Ultra boiler to a PLUS Line water heater.

### User

- This document is for use only by your qualified heating installer/service technician.
- Please refer to the Ultra Boiler User's Information Manual for your reference.
- Keep this supplement near the boiler for use by your installer or technician.

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**WARNING** Follow the PLUS Line manual to install the PLUS water heater. Ultra boilers must be installed as directed in the Ultra Boiler Manual and supplements. Failure to adhere to these guidelines can result in severe personal injury, death or substantial property damage.

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## Hazard definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.

**DANGER** Indicates presence of hazards that will cause severe personal injury, death or substantial property damage.

**WARNING** Indicates presence of hazards that can cause severe personal injury, death or substantial property damage.

**CAUTION** Indicates presence of hazards that will or can cause minor personal injury or property damage.

**NOTICE** Indicates special instructions on installation, operation or maintenance that are important but not related to personal injury or property damage.

# 1 Install system water piping (space heating)

## System water piping methods

**NOTICE**

All piping methods shown in this manual use primary/secondary connection to the boiler loop. These designs ensure proper flow through the Ultra boiler, for the most efficient and reliable operation of the boiler and the heating system. For other piping methods, consult your local Weil-McLain representative or refer to separate Ultra boiler piping guides.

Wall-mounted boilers — Piping can exit bottom of boiler enclosure. See separate wall-mounting instructions for details.

## Expansion tank and make-up water

1. Ensure expansion tank size will handle boiler and system water volume and temperature. Allow 3 gallons for boiler and its piping.

**CAUTION**

Undersized expansion tanks cause system water to be lost from relief valve and make-up water to be added through fill valve. Eventual boiler failure can result due to excessive make-up water addition.

2. Tank must be located as shown in this supplement, or following recognized design methods. See tank manufacturer's instructions for details.
3. Connect the expansion tank to the air separator only if the separator is on the suction side of the system circulator. Always install the system fill connection at the same point as the expansion tank connection to the system.
4. The piping drawings in this supplement show diaphragm expansion tanks. See Figure 1 for piping from air separator to expansion tank and make-up water line using a closed-type expansion tank.
5. Refer to Ultra Boiler Manual for other system piping examples.

### Diaphragm (or bladder) expansion tank

1. Always install an automatic air vent on top of the air separator to remove residual air from the system.

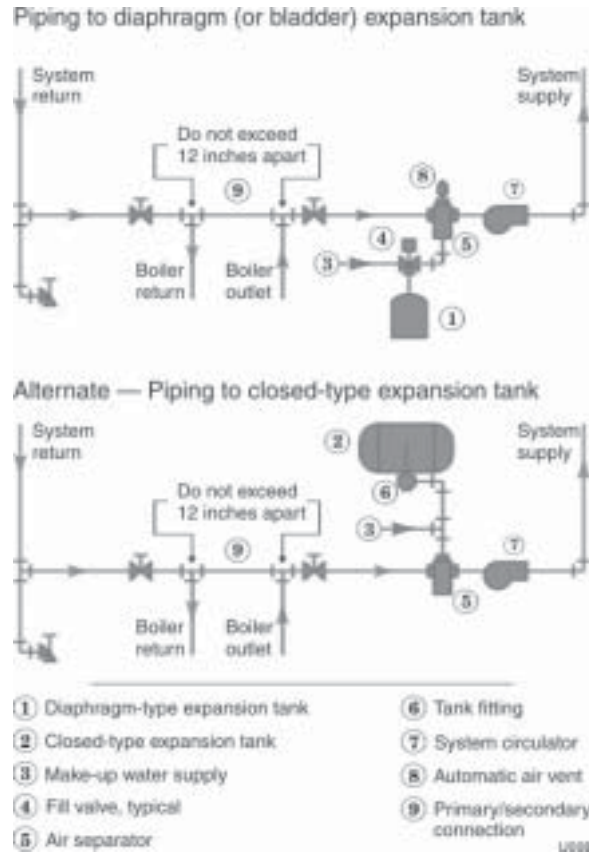
### Closed-type expansion tank

1. See Figure 1 for piping connections when using a closed-type expansion tank.
2. Pitch any horizontal piping up towards tank 1 inch per 5 feet of piping. Connect to tank with at least 3/4" piping to allow room for air to rise.

**CAUTION**

DO NOT install automatic air vents on closed-type expansion tank systems. Air must remain in the system and return to the tank to provide its air cushion. An automatic air vent would cause air to leave system, resulting in water-logging the expansion tank.

**Figure 1** Expansion tank piping



## Boiler circulator

The boiler circulator is shipped loose. It must be located in either the return or supply piping, as shown in the appropriate piping diagram in this supplement or the Boiler Manual.

**WARNING**

DO NOT use the boiler circulator in any location other than those shown. The boiler circulator is selected to ensure adequate flow through the Ultra boiler. Failure to comply could result in unreliable performance and nuisance shutdowns from insufficient flow.

## Sizing space heat system piping

1. See Figures 2 and 3, pages 4 and 5, or the Ultra Boiler Manual for recommended piping. In all diagrams, the space heating system is isolated from the boiler loop by the primary/secondary connection.
2. Size the piping and components in the space heating system using recognized design methods.

# 1

## Install system water piping (space heating) (continued)

### Zoning with zone valves

1. Connect boiler to system as shown in Figure 2 when zone valve zoning. The primary/secondary piping shown ensures the boiler loop will have sufficient flow. It also avoids applying the high head of the boiler circulator to the zone valves.
2. When using a closed-type expansion tank, connect the expansion tank and make-up water piping as shown in Figure 1, page 3.
3. Connect water heater (domestic hot water) piping to indirect storage water heater as shown.

**NOTICE**

The *Ultra* PhD Control Module turns off space heating during water heater heating. The boiler circulator will turn off, preventing hot water from circulating to the system. The flow/check valve shown on the boiler outlet piping prevents gravity circulation in the boiler loop during water heater heating.

4. Controlling the system circulator
  - a. To cycle the system circulator from the Ultra PhD control module, add a circulator relay wired to the boiler circulator terminals as shown on page 8.

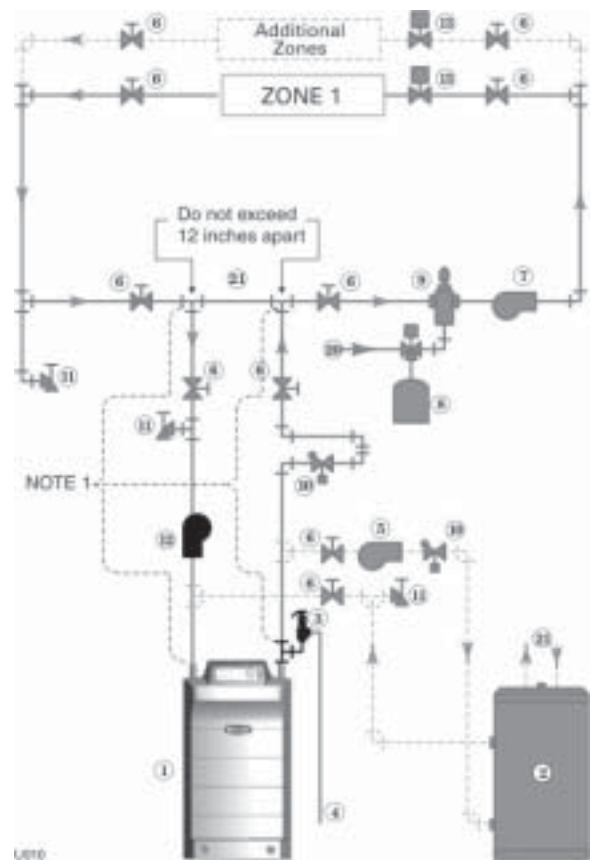
NOTE 1: To ensure adequate flow rate through the boiler, use the following pipe size on all boiler loop piping (connecting boiler to and from the primary/secondary connection, item 21):

- Ultra-80 or Ultra-105 – 1" or larger.
- Ultra-155 or Ultra-230 – 1¼" or larger.
- Ultra-310 – 1½" or larger.

**WARNING**

Use at least the minimum piping size above and pipe the boiler using only primary/secondary piping as shown. Failure to follow these guidelines could result in system problems.

Figure 2 Zone valve zoning plus optional water heater piping



**Legend** Figure 2

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1 Ultra boiler</li> <li>2 Indirect water heater (water heater), if used</li> <li>3 Boiler relief valve (see boiler manual for piping details)</li> <li>4 Relief valve discharge piping (see boiler manual for details)</li> <li>5 Water heater circulator (see page 7 for suggested sizing)</li> <li>6 Isolation valves</li> <li>7 System circulator</li> <li>8 Diaphragm (or bladder) type expansion tank (see page 3 for piping of closed-type expansion tank, if used)</li> <li>9 Air separator [with automatic air vent only on systems using diaphragm (or bladder) type expansion tank]</li> </ul> | <ul style="list-style-type: none"> <li>10 Flow/check valves (with weighted seats to prevent gravity circulation)</li> <li>11 Purge/drain valves</li> <li>12 Boiler circulator</li> <li>13 Zone valves, typical</li> <li>20 Make-up water supply</li> <li>21 Primary/secondary connection</li> </ul> <p>■ — Supplied with boiler<br/>             ■ — By others (not included with boiler)</p> |
|---|---|

# 1 Install system water piping (space heating) *(continued)*

## Zoning with circulators

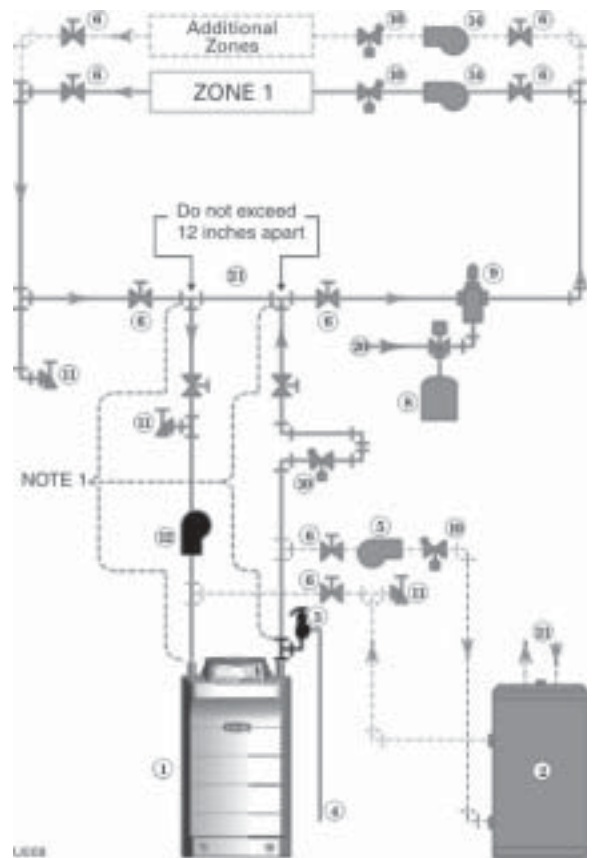
1. Connect boiler to system as shown in Figure 3 when circulator zoning. The boiler circulator cannot be used for a zone. It must supply only the boiler loop.
2. Install a separate circulator for each zone.
3. When using a closed-type expansion tank, connect the expansion tank and make-up water piping as shown in Figure 1, page 3.
4. Connect water heater (domestic hot water) piping to indirect storage water heater as shown.

**NOTICE** The *Ultra* PhD Control Module turns off space heating during water heater heating. The boiler circulator will turn off, preventing hot water from circulating to the system. The flow/check valve shown on the boiler outlet piping prevents gravity circulation in the boiler loop during water heater heating.

**NOTE 1:** To ensure adequate flow rate through the boiler, use the following pipe size on all boiler loop piping (connecting boiler to and from the primary/secondary connection, item 21):  
 Ultra-80 or Ultra-105 – 1" or larger.  
 Ultra-155 or Ultra-230 – 1¼" or larger.  
 Ultra-310 – 1½" or larger.

**WARNING** Use at least the minimum piping size above and pipe the boiler using only primary/secondary piping as shown. Failure to follow these guidelines could result in system problems.

**Figure 3** Circulator zoning plus optional water heater piping



### Legend Figure 3

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1 Ultra boiler</li> <li>2 Indirect water heater (water heater), if used</li> <li>3 Boiler relief valve (see boiler manual for piping details)</li> <li>4 Relief valve discharge piping (see boiler manual for details)</li> <li>5 Water heater circulator (see page 7 for suggested sizing)</li> <li>6 Isolation valves</li> <li>7 System circulator</li> <li>8 Diaphragm (or bladder) type expansion tank (see page 3 for piping of closed-type expansion tank, if used)</li> <li>9 Air separator [with automatic air vent only on systems using diaphragm (or bladder) type expansion tank]</li> </ul> | <ul style="list-style-type: none"> <li>10 Flow/check valves (with weighted seats to prevent gravity circulation)</li> <li>11 Purge/drain valves</li> <li>12 Boiler circulator</li> <li>14 Zone circulators, typical</li> <li>20 Make-up water supply</li> <li>21 Primary/secondary connection</li> <li>■ — Supplied with boiler</li> <li>■ — By others (not included with boiler)</li> </ul> |
|---|--|

## 2 Install boiler-to-water heater piping

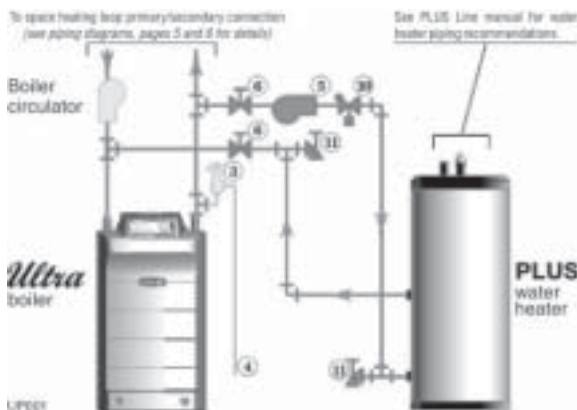
### Combined space heating/water heating applications

- Figure 4 shows recommended piping between Ultra Boiler and PLUS water heater. All show direct connection of the water heater piping to the boiler because the boiler circulator shuts down during water heater operation.
- Table 1, page 7, uses the recommended flow rates for the Ultra PLUS water heater and minimum flow rates for the Ultra boiler to provide recommended water heater piping and circulator sizing. If using another circulator, verify it is at least equal to the Taco selection given in Table 1. For general information on head loss through boiler and boiler-to-water heater piping, refer to the Ultra Boiler Manual.
- Procedure:**
  - Step 1:** Select Ultra Boiler model and PLUS water heater model in Table 1.
  - Step 2:** Read recommended minimum flow rate, GPM, in table.
  - Step 3:** Read across to find recommended minimum pipe size for boiler-to-water heater piping.
  - Step 4:** Read across to find recommended Taco circulator model. Use a circulator with a pump curve at least equal to the Taco circulator shown. See Figure 6, page 7 for pump curves of typical Taco circulators.

### Dedicated water-heating only applications

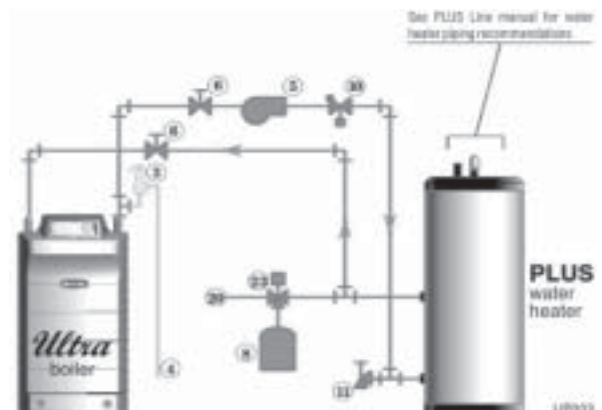
- Figure 5 shows recommended piping between Ultra Plus Boiler and PLUS water heater for dedicated water-heating only applications.
- Pipe sizing:**  
Table 2, page 7, provides the recommended minimum pipe size for boiler-to-water heater piping.
- Circulator:**  
Use the circulator recommended in Table 2, page 7. Install the circulator as shown in Figure 5.
- Procedure:**
  - Step 1:** Select Ultra Boiler model and PLUS water heater model in Table 1, page 7.
  - Step 2:** Read flow rate expected using the circulator specified in the last column.
  - Step 3:** Size connecting piping as listed under "Boiler piping" in the table.

**Figure 4** Boiler-to-water heater piping: Combined space heating/water heating application



- Boiler relief valve (see Boiler Manual for piping details)
- Relief valve discharge piping (see Boiler Manual for details)
- Water heater circulator — must be at least equal in capacity to circulator recommended in Table 1, page 7
- Isolation valves
- Flow/check valve (with weighted seat to prevent gravity circulation)
- Purge/drain valves

**Figure 5** Boiler-to-water heater piping: Dedicated water-heating only application



- Boiler relief valve (see Boiler Manual for piping details)
- Relief valve discharge piping (see Boiler Manual for details)
- Water heater circulator — (see Table 2, page 7)
- Expansion tank (diaphragm or bladder type)
- Isolation valves
- Flow/check valve (with weighted seat)
- Purge/drain valve
- Fill line to fill valve (item 23)

# 2

## Install boiler-to-water heater piping *(continued)*

**Table 1** Combined space heating/water heating applications (see Notes)

Boiler	Water heater	1st Hour rating, GPH		Boiler piping		Head losses, Feet w.c.				DHW Circulator
		115°F	140°F	GPM	Rec. size	Boiler	Heater	Piping	TOTAL	
Ultra-80	Plus 40	160	124	6.6	1"	5.8	1.0	2.4	9.2	007
	Plus 60	168	132							
	Plus 80	176	140							
Ultra-105	Plus 40	203	141	6.4	1"	5.9	1.0	2.3	9.3	007
	Plus 60	211	162							
	Plus 80	219	170							
Ultra-155	Plus 40	238	153	8.7	1"	5.7	1.0	3.9	10.6	0010
	Plus 60	294	190	9.6	1½"	7.1	1.0	2.3	10.5	0010
	Plus 80	302	230	10.8	1½"	9.0	1.0	2.8	12.8	0012
Ultra-230	Plus 40	248	160	12.0	1½"	8.2	1.0	3.4	12.6	0012
	Plus 60	330	196							
	Plus 80	411	305							
Ultra-310	Plus 40	254	164	15.0	1½"	6.0	1.0	5.1	12.1	0012
	Plus 60	351	208	18.6	1½"	8.5	1.0	3.3	12.8	0011
	Plus 80	579	373	22.0	1½"	11.2	1.0	4.5	16.6	0013

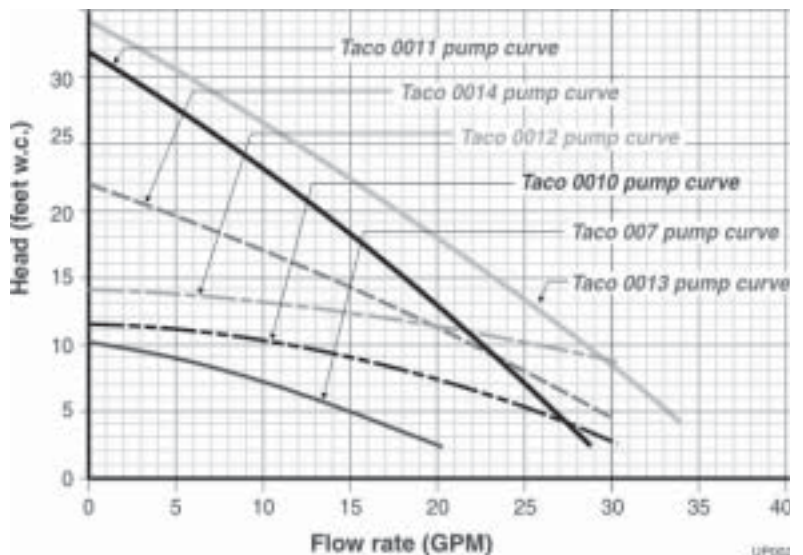
**Table 2** Dedicated water-heating only systems (using circulator supplied with boiler) (see Notes)

Boiler	Water heater	1st Hour rating, GPH		Boiler piping		Head losses, Feet w.c.				Circulator <small>(shipped with boiler)</small>
		115°F	140°F	GPM	Rec. size	Boiler	Heater	Piping	TOTAL	
Ultra-80	Plus 40	160	124	6.6	1"	5.8	1.0	2.4	9.2	007
	Plus 60	168	132							
	Plus 80	176	140							
Ultra-105	Plus 40	203	141	6.4	1"	5.9	1.0	2.3	9.2	007
	Plus 60	211	162							
	Plus 80	219	170							
Ultra-155	Plus 40	248	160	12.3	1"	11.9	1.0	7.3	20.2	0011
	Plus 60	294	196							
	Plus 80	302	230							
Ultra-230	Plus 40	250	162	13.3	1"	9.8	1.0	8.3	19.1	0011
	Plus 60	334	198							
	Plus 80	427	321							
Ultra-310	Plus 40	259	168	18.6	1½"	8.5	1.0	3.3	12.8	0011
	Plus 60	349	207							
	Plus 80	579	362							

**Notes** Tables 1 and 2

- First hour ratings in Tables 1 and 2 are based on:
  - 115°F or 140°F domestic outlet water supply temperature from water heater.
  - 50°F domestic water inlet temperature.
  - 190°F boiler water temperature leaving Ultra boiler.
  - Circulator and pipe sizes as given in the Tables.
- If the net Btu/hr rating of the boiler is close to the space heating load (for combined systems) — or if there is an unusually large demand for domestic water — increased boiler capacity may be required.

**Figure 6** Pump curves for Taco circulators



# 3 Field wiring

**WARNING** ELECTRICAL SHOCK HAZARD — For your safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

**NOTICE** Wiring must be N.E.C. Class 1.  
If original wiring as supplied with boiler must be replaced, use only type 105 °C wire or equivalent.  
Boiler must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 – latest edition.

## Installation must comply with:

1. National Electrical Code and any other national, state, provincial or local codes or regulations.
2. In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.

## Line voltage connections

1. Connect 120 VAC power wiring to line voltage terminal strip in left compartment of electrical entrance, as shown in Figure 7, item 1.
2. Provide and install a fused disconnect or service switch (15 amp. recommended) as required by the code. (See Figure 7, item 2)

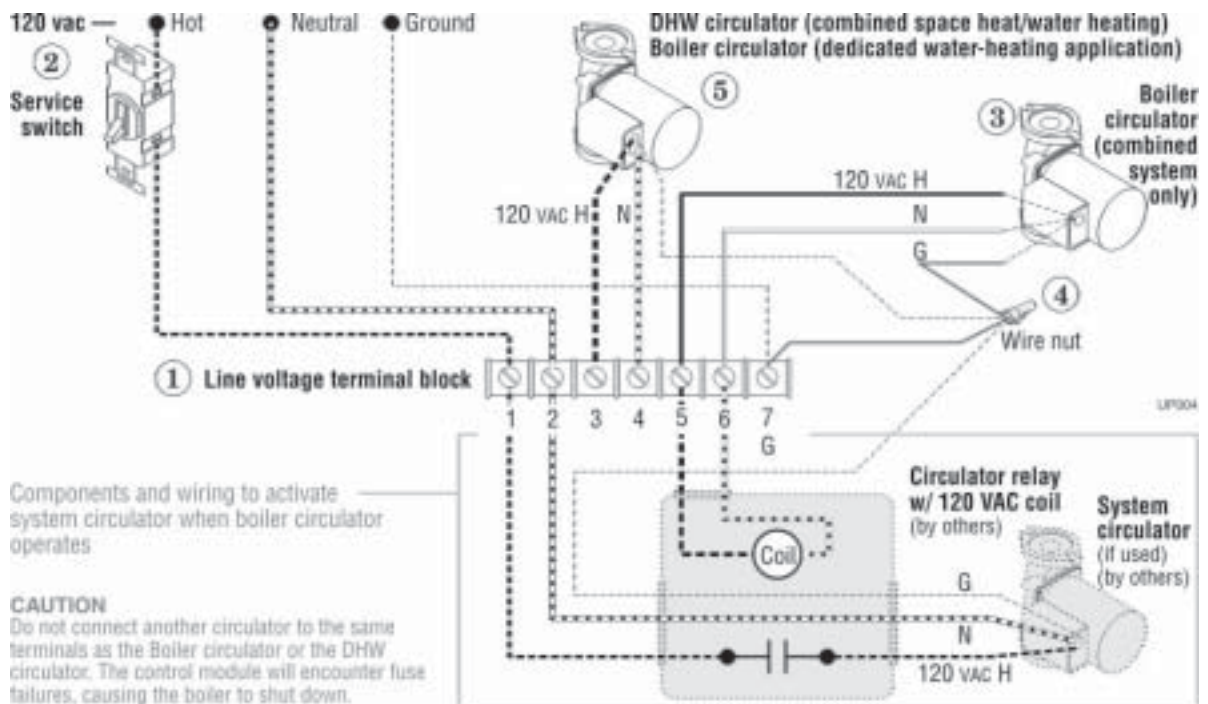
## Wiring boiler circulator

1. The Taco 0011 circulator supplied with the boiler is wired one of two locations, depending on whether system is combined space heating/water heating or dedicated water-heating only. Boiler circulator is shipped loose. Wire Boiler circulator to terminals (refer to Figure 7):
  - a. Combined system: terminals 5, 6, and 7 (installed as Figure 7, item 3).
  - b. Dedicated system: terminals 3, 4, and ground wire nut (installed as Figure 7, item 5).

## Wiring PLUS circulator

1. For combined systems, connect water heater circulator to line voltage terminal strip terminals 3, 4 and ground wire nut. See Figure 7.

**Figure 7** Line voltage field wiring connections (service switch provided by installer)



### 3 Field wiring *(continued)*

#### Wiring a system circulator

1. For combined systems, to activate a system circulator when the Boiler circulator operates, wire as shown at bottom of Figure 7, page 8.
2. You must install a relay as shown. DO NOT wire in parallel with the Boiler circulator. See CAUTION in Figure 7.

#### Routing line voltage wiring

1. Route line voltage connections to the jacket openings shown in Figure 8.

#### Low voltage connections (Fig. 9)

1. Connect low voltage wiring to low voltage terminal strip (Figure 9, item 1) as shown in Figure 9 and the boiler wiring diagram.
2. Route all low voltage wires through grommets jacket opening to right of low voltage terminal strip, as shown in Figure 8.

#### Room thermostat (space heating)

1. For combined space heating/water heating systems, connect Figure 9, item 2, room thermostat or end switch (isolated contact only) between terminals 5 and 6.
2. Install thermostat on inside wall away from influences of drafts, hot or cold water pipes, lighting fixtures, television, sunrays, or fireplaces.
3. Thermostat anticipator (if applicable):
  - a. If connected directly to boiler, set for 0.1 amps.
  - b. If connected to relays or other devices, set to match total electrical power requirements of connected devices. See device manufacturers' specifications and thermostat instructions for details.

#### Outdoor temperature sensor

1. Outdoor reset operation applies only to combined space heating/water heating systems.
2. Connect outdoor temperature sensor (Figure 9, item 6) between terminals 1 and 2 to enable outdoor reset operation of the Ultra boiler. If fixed-temperature operation is required, do not install outdoor sensor.
3. Mount sensor on exterior wall, shielded from direct sunlight or flow of heat or cooling from other sources.
4. Install a summer/winter switch (Figure 9, item 7) across terminals 1 and 2 to force fixed-temperature operation during summer months. (When the

switch is closed, boiler will attempt to maintain constant temperature.)

5. Route sensor wires through the grommets hole at right of the electrical entrance (see Figure 8).

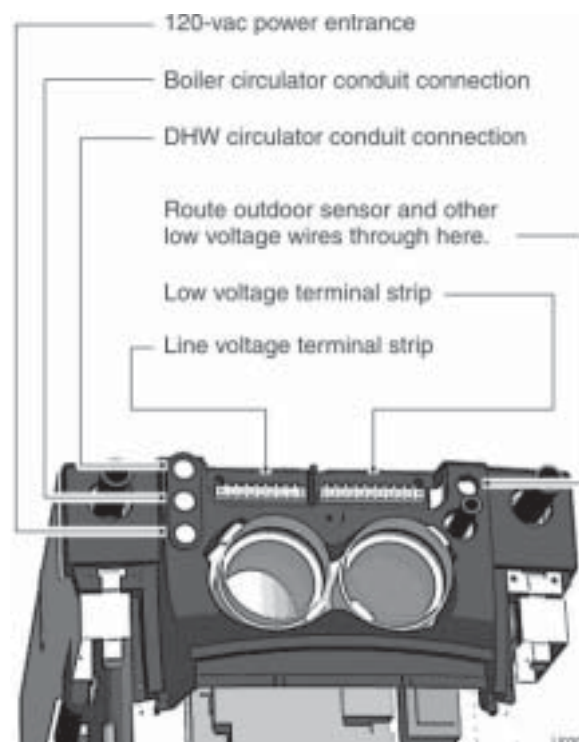
#### PLUS water heater thermostat

1. Connect PLUS water heater aquastat terminals "C" and "1" to Ultra Boiler low voltage terminal strip between terminals 3 and 4 (Figure 9, item 3).

#### Additional limits

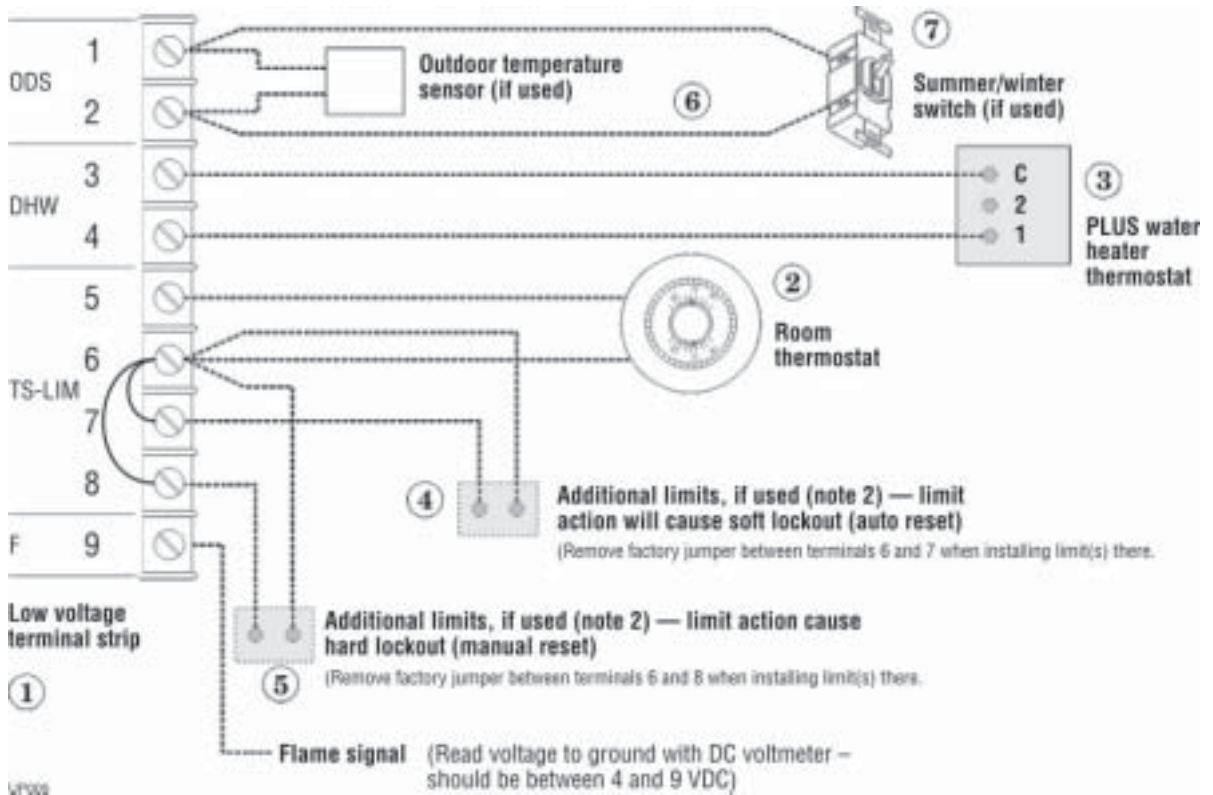
1. Connect additional limit controls and interlocks between the terminals shown in Figure 9.
2. Controls connected between terminals 6 and 7 (see Figure 9, item 4) will cause a soft lockout (automatic reset). When limit(s) closes, boiler will resume normal operation.
3. Controls connected between terminals 6 and 8 (see Figure 9, item 5.) will cause a hard lockout (manual reset). The boiler will only restart after the Ultra display panel RESET switch is pressed.

**Figure 8** Routing field wiring



# 3 Field wiring *(continued)*

**Figure 9** Low voltage field wiring connections



**NOTICE** Summer/winter switch (item 7) — Install a summer/winter switch, if desired, to disable the boiler (space heating) circulator during non-heating months. Connect switch across the outdoor sensor terminals. When switch closes, the boiler circulator is disabled and the boiler operates only on call for DHW heating.

# 4 Start-up

## Follow Boiler Manual procedures

1. Follow all procedures in the boiler manual to start up and verify operation of the boiler.

## Set space heating operation

### Verify space heating mode

1. Press the “Mode” button until the display shows “Para.” This is the parameter mode.
2. Press the “Step” button until the display first digit shows “3.”
3. The last digit must show “1.” If any other number displays, press the “+” button until “1” shows in the right-hand digit. Press the “Store” button to save this setting.

### Set space heating target temperature

1. Press the Ultra control panel “Step” button until the display first digit shows “4.” The right 3 digits show the outlet water temperature setting.
2. Press the “+” or “-” button to change the setting to the desired outlet water temperature. (The factory default setting is 190 °F.)
  - a. Outdoor sensor installed — Setting is the target temperature for outdoor temperature at or below 32 °F. At higher outside temperatures, the Ultra PhD control module calculates the target temperature. (See Ultra Control Supplement for detailed discussion of outdoor reset.)  
When a summer/winter switch is used, closing the switch will disable the boiler (space heating) circulator during summer operation.
  - b. Outdoor sensor not installed — Setting is the target temperature at all times.
3. Press the “Store” button to save the setting.

## PLUS water heater operation

1. The PLUS water heater thermostat must be connected to low voltage terminal strip terminals 3 and 4 as shown on page 10.
2. When the water heater thermostat calls for heat, the module shuts down the boiler circulator, activates the water heater circulator and immediately sets target outlet water temperature to 190°F. This provides automatic priority heat allocation to the indirect water heater for maximum response and recovery.
3. The water heater circulator continues for 30 seconds after the heating cycle to deliver the most possible heat.

## Check PLUS operation setup

1. Go to step 2 if the control is in Parameter mode already. Press the “Mode” button until the display shows “Para” (parameter mode).
2. Press the “Step” button until the display first digit shows “2.”
3. The last digit must show “1.” If any other number displays, press the “+” button until “1” shows in the right-hand digit. Press the “Store” button to save this setting.
4. The Ultra PhD control module turns on the PLUS circulator when the indirect water heater operating control closes. The control module shuts off the boiler circulator (stops space heating) during calls for DHW heating.

## Verify operation — space heating

**NOTE:** “[ \_ \_ \_ ]” in the following indicates the characters that should show on the Ultra display panel. “180” in the right 3 places means the display shows the measured boiler water temperature. The number shown will not necessarily be 180.

1. Turn down aquastat on PLUS tank. If necessary, turn off power and remove one of the PLUS aquastat wires to ensure boiler will not receive a DHW heat call.
2. Turn off power to boiler at service switch.
3. Wait a few seconds, then turn on power to boiler.
  - [R:80] (*self-check* on power-up, for a few seconds)
  - [0:80] (*no call for heat*)
4. Raise room thermostat to call for heat.
  - [5:80] (*blower/circulator on*) The blower and boiler circulator energize and the control checks for air flow.
  - [1:80] (*prepurge*) After a few seconds delay (control self-check), blower speed will increase to ignition speed. The blower will run in prepurge for 10 seconds.
  - [2:80] (*ignition*) After prepurge, the control module opens the gas valve and starts ignition spark.
    - a. If burner flame proves within 4.5 seconds, burner continues to fire. Burner will fire at start-up rate — 50% of maximum input — for about 10 seconds to allow flame to stabilize.
    - b. If burner flame does not prove within 4.5 seconds, control module attempts ignition sequence again. Flame must prove within 5 attempts or control will lockout (display will show [E 02]).
    - c. Verify flame failure operation by closing boiler manual gas cock to prevent gas flow. Open manual gas valve after testing.

# 4 Start-up *(continued)*

- [3:00] (*burner on, space heating*) Once flame is proven and stable, the burner turns down to low fire for approximately 2 minutes.
- After this low fire period, the burner is allowed to modulate. Firing rate depends on actual outlet water temperature versus target temperature.
- Allow boiler to bring water temperature to target temperature.
 

[5:00] (*target temperature reached*) The burner will shut down. The blower will run in postpurge (see below), then turn off. The boiler circulator continues to run as long as there is a call for heat.
  - Lower room thermostat to stop call for heat.
 

[1:00] (*postpurge*) When the room thermostat is satisfied (call for heat ended), the burner turns off. The blower will continue for a 15-second postpurge, then turn off. (If another call for heat occurs, the boiler will remain off for one minute before starting again, and the display will show [6:00].)

[0:00] (*no call for heat*) Boiler is now in standby mode (waiting for heat call).
  - Repeat above steps several times to verify operation.
  - Return the room thermostat to normal setting.

## Verify operation — PLUS water heater

- Reconnect PLUS aquastat wiring to boiler if necessary.
- Turn off power to boiler at service switch.
- Wait a few seconds, then turn on power to boiler.
 

[R:00] (*self-check* on power-up, for a few seconds)

[0:00] (*no call for heat*)
- Raise PLUS aquastat above tank temperature, to call for heat.
 

[5:00] (*blower/circulator on*) The blower and PLUS circulator energize and the control checks for air flow.

[1:00] (*prepurge*) Blower speed will increase to ignition speed. The blower will run in prepurge for 10 seconds.

[2:00] (*ignition*) After prepurge, the control module opens the gas valve and starts ignition spark.
 
  - If burner flame proves within 4.5 seconds, burner continues to fire. Burner will fire at start-up rate — 50% of maximum input — for about 10 seconds to allow flame to stabilize.
  - If burner flame does not prove within 4.5 seconds, control module attempts ignition sequence again. Flame must prove within 5 attempts or control will lockout (display will show [E 02]).

- Verify flame failure operation by closing boiler manual gas valve to prevent gas flow. Open gas cock after testing.
- [4:00] (*burner on, PLUS*) Once flame is proven and stable, the burner is allowed to modulate. Firing rate depends on actual outlet water temperature versus target temperature.
- Allow boiler to bring water temperature to target temperature.
 

[6:00] (*target temperature reached*) The burner will shut down. The blower will run in postpurge (see below), then turn off. The PLUS circulator continues to run as long as there is a call for PLUS heating.
  - Lower PLUS aquastat to stop call for heat.
 

[1:00] (*postpurge*) When the room thermostat is satisfied (call for heat ended), the burner turns off. The blower will continue for a 15-second postpurge, then turn off. (If another PLUS call for heat occurs, the boiler will begin the heating cycle immediately.)

[8:00] (*PLUS circulator run-on*) The PLUS circulator continues to run for 30 seconds.

[0:00] (*no call for heat*) Boiler is now in standby mode (waiting for heat call).
  - Repeat above steps several times to verify operation.
  - Return the PLUS aquastat to normal setting.

## Operating information

- To check operating conditions (actual and target temperatures, for example), see page 40 in Ultra Boiler Manual for an explanation of the Ultra control module Information mode.
- During normal operation (no shutdown or lockout), the right 3 display digits show actual boiler outlet water temperature.

## Replace boiler jacket front door

- WARNING** Replace boiler jacket front door after installation or servicing. The boiler front door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances. Failure to keep the door securely fastened could result in severe personal injury or death.