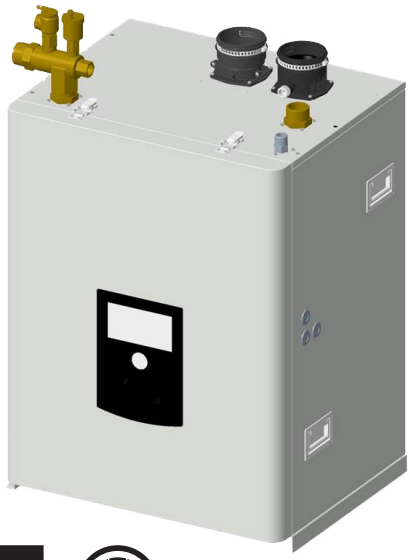


Installation and Cascade Instruction Manual

FT SERIES

Wall-hung Modulating Condensing Gas Boiler (includes optional Floor stand Accessory Information)

Models: FTHW399NX, FTHW301NX

- Natural Gas (NG) Factory Configuration
- Propane Gas (LP) Field-Convertible

FOR YOUR SAFETY: This product must be installed and serviced by a professional service technician, qualified in hot water boiler installation and maintenance. Improper installation and/or operation could create carbon monoxide gas in flue gases which could cause serious injury, property damage, or death. Improper installation and/or operation will void the warranty.

⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- **Do not try to light any appliance.**
- **Do not touch any electrical switch; do not use any phone in your building.**
- **Immediately call your gas supplier from a nearby phone. Follow the gas supplier's instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

Installation and service must be performed by a qualified installer, service agency, or gas supplier.

⚠ AVERTISSEMENT

Assurez-vous de bien suivres les instructions données dans cette notice pour réduire au minimum le risque d'incendie ou d'explosion ou pour éviter tout dommage matériel, toute blessure ou la mort.

Ne pas entreposer ni utiliser d'essence ou ni d'autres vapeurs ou liquides inflammables dans le à proximité de cet appareil ou de tout autre appareil.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- **Ne pas tenter d'allumer d'appareils.**
- **Ne touchez à aucun interrupteur. Ne pas vous servir des téléphones dans le bâtiment où vous vous trovez.**
- **Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.**
- **Si vous ne pouvez rejoindre le fournisseur de gaz, appelez le sservice des incendies.**

L'installation et l'entretien doivent être assurés par un installateur ou un service d'entretien qualifié ou par le fournisseur de gaz.

Table of Contents

SECTION 1 General Information.

Multiple FTHW Series boilers can be connected via a cascade communication cable to create a bank of boilers that work in tandem. Up to 4 boilers can be controlled by a "Leader" FTHW Series boiler with the others acting as "Followers".

> ⚠ **WARNING**
>
> Do not use FTHW Series units on common vents. Each unit must have its own supply and exhaust vents.

1.A General Plumbing Connection Guidelines

- Pipe material must be suitable to meet local codes and industry standards.
- The pipe must be cleaned and without blemish before any connections are made.
- Do not apply a torch within 12" of the top or bottom connections of the boiler. Doing so could damage the boiler. Such damages ARE NOT covered by product warranty.
- Isolation (shutoff valves) should be used to ease future service.
- All piping should be insulated.

1.B Pipe Sizing for system and common supply & return headers in Cascade Systems

> ⚠ **CAUTION**
>
> Use piping diameters as per Table based on your maximum design delta T. Non-adherence to these sizing guidelines may result in premature boiler failure and resulting problems are NOT covered by product warranty.

Use both thread tape and pipe dope to connect to the 1½" or 2" CH supply and return.

No of Boiler	301	399	ΔT=25F default	ΔT=35F	ΔT=45F
2	2	0	2-1/2"	2"	2"
	1	1	3"	2-1/2"	2"
	0	2	3"	2-1/2"	2"
3	3	0	3"	2-1/2"	2"
	2	1	3"	2-1/2"	2"
	1	2	3-1/2"	3"	2-1/2"
	0	3	3-1/2"	3"	2-1/2"
4	4	0	3-1/2"	3"	3"
	3	1	3-1/2"	3"	3"
	2	2	3-1/2"	3"	3"
	1	3	4"	3-1/2"	3"
	0	4	4"	3-1/2"	3"

NOTES: Use piping diameters as per Table based on your maximum design delta T. Non-adherence to these sizing guidelines may result in premature boiler failure and resulting problems are NOT covered by product warranty.

For FTHW301/399NX boilers, use 1-1/2" near boiler piping with a combined equivalent length not to exceed 10ft to the supply & return headers. Use 2" piping for longer runs.
An optional purge station is not needed for FTHW301/399NX models if the system piping is above the boilers.

1.C Product Flow Paths and Characteristics

1.C.1 Central Heating flow. Boiler Heating Mode.

This boiler has top and bottom return and supply water connections. Place the combo brass adaptor fitting on the upper left supply connection. Use at least one of the CH return and CH supply connections. Cap off any other connections that will not be used. Refer to Boiler Installation Manual for detailed boiler installation instructions. Note that the boiler has top and bottom gas connections. Make sure to install a cap on the opposite gas connection when installing the gas line to the appliance.

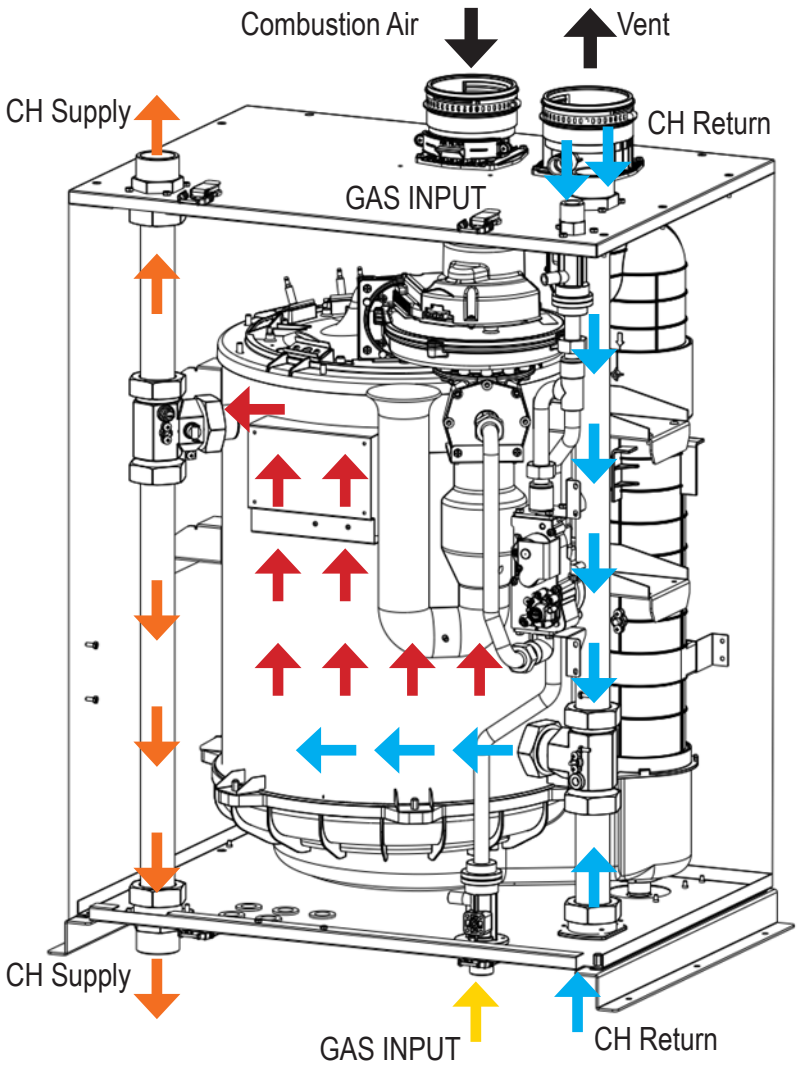


Figure 1 - CH circulation

1.D Miscellaneous Wiring

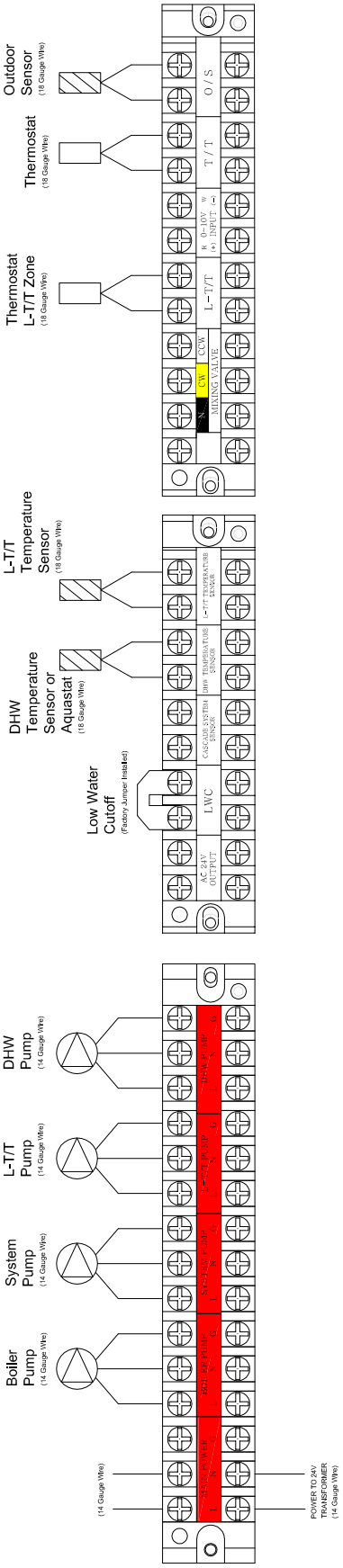


Figure 2 - Field Connections for boiler

SECTION 2 Piping and Wiring Diagrams

2.A Piping and Wiring Diagrams for FTHW301/399NX boilers

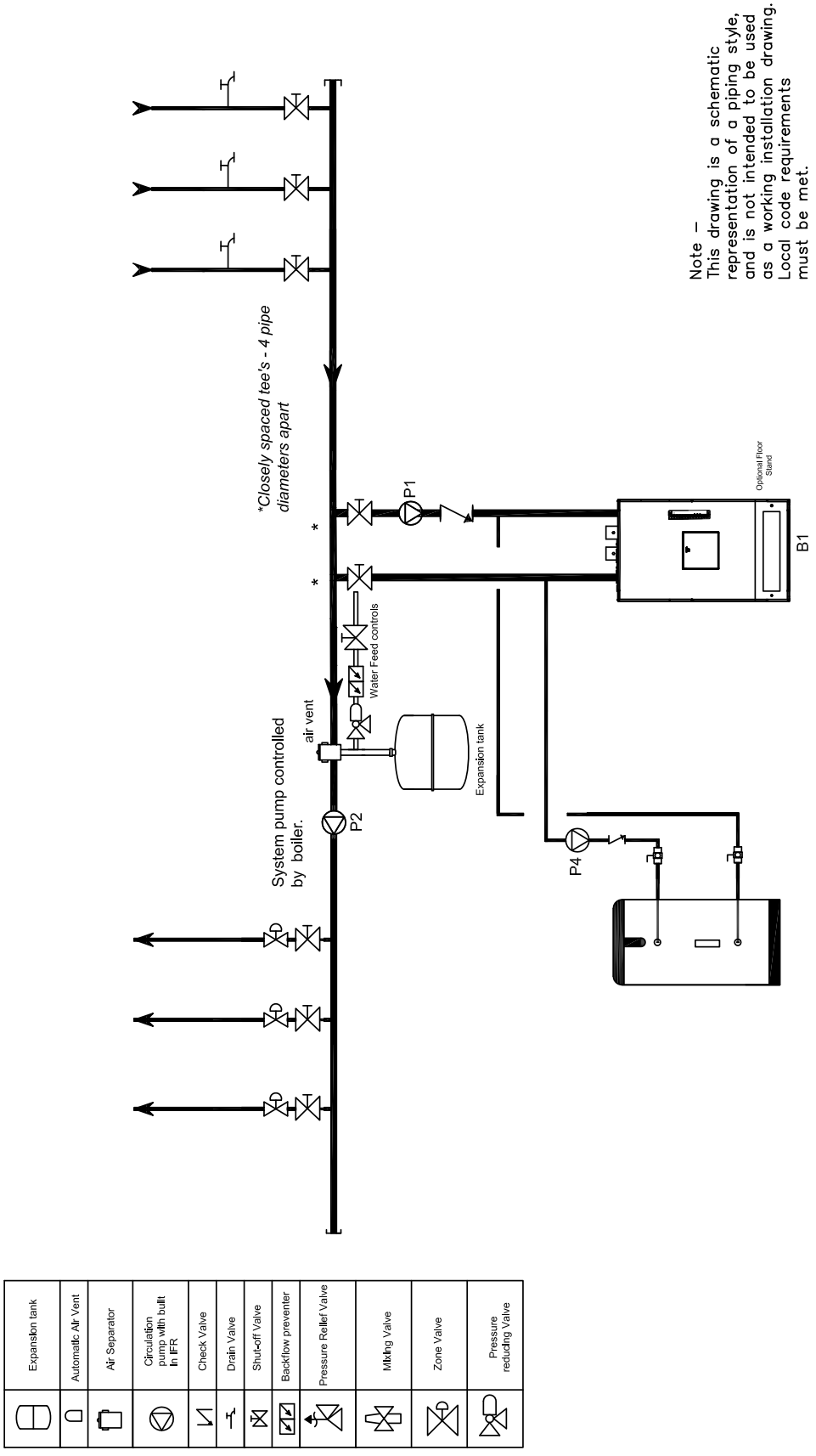
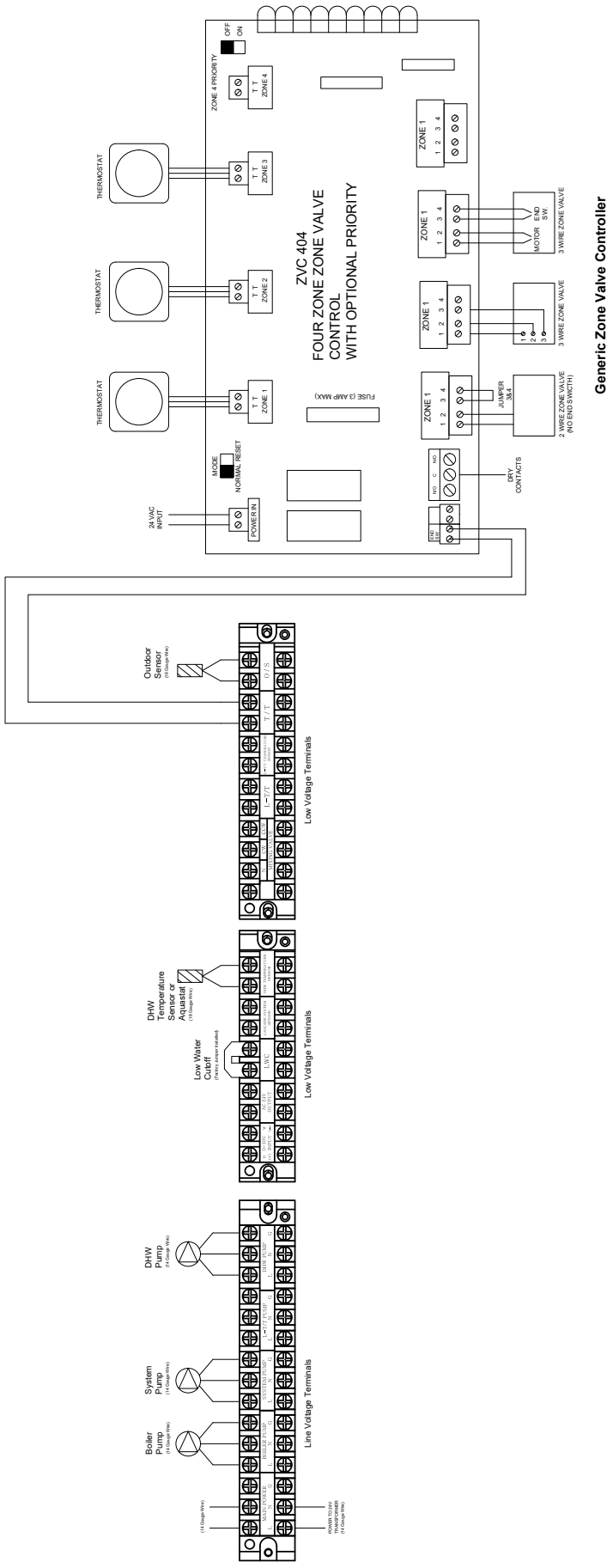


Figure 3 - FT-301/399 Primary Secondary with zone valves and indirect


ZVC 404
FOUR ZONE ZONE VALVE
CONTROL
WITH OPTIONAL PRIORITY
ZONE 4 PRIORITY
OFF
ON
THERMOSTAT
THERMOSTAT
THERMOSTAT
T T ZONE 4
T T ZONE 3
T T ZONE 2
T T ZONE 1
FUSE (3 AMP MAX)
MODE
NORMAL RESET
24 VAC 24 VAC NOT T
POWER IN
ZONE 1
1 2 3 4
MOTOR END SW
3 WIRE ZONE VALVE
3 WIRE ZONE VALVE
JUMPER 3&4
2 WIRE ZONE VALVE (NO END SWITCH)
DRY CONTACTS
NO C NO
END SWITCH
Generic Zone Valve Controller
Outdoor Sensor
DHW Temperature Sensor or Aquastat
Low Water Cutoff
Low Voltage Terminals
Low Voltage Terminals
DHW Pump
System Pump
Boiler Pump
Line Voltage Terminals

2.A Piping and Wiring Diagrams for FTHW301/399NX boilers

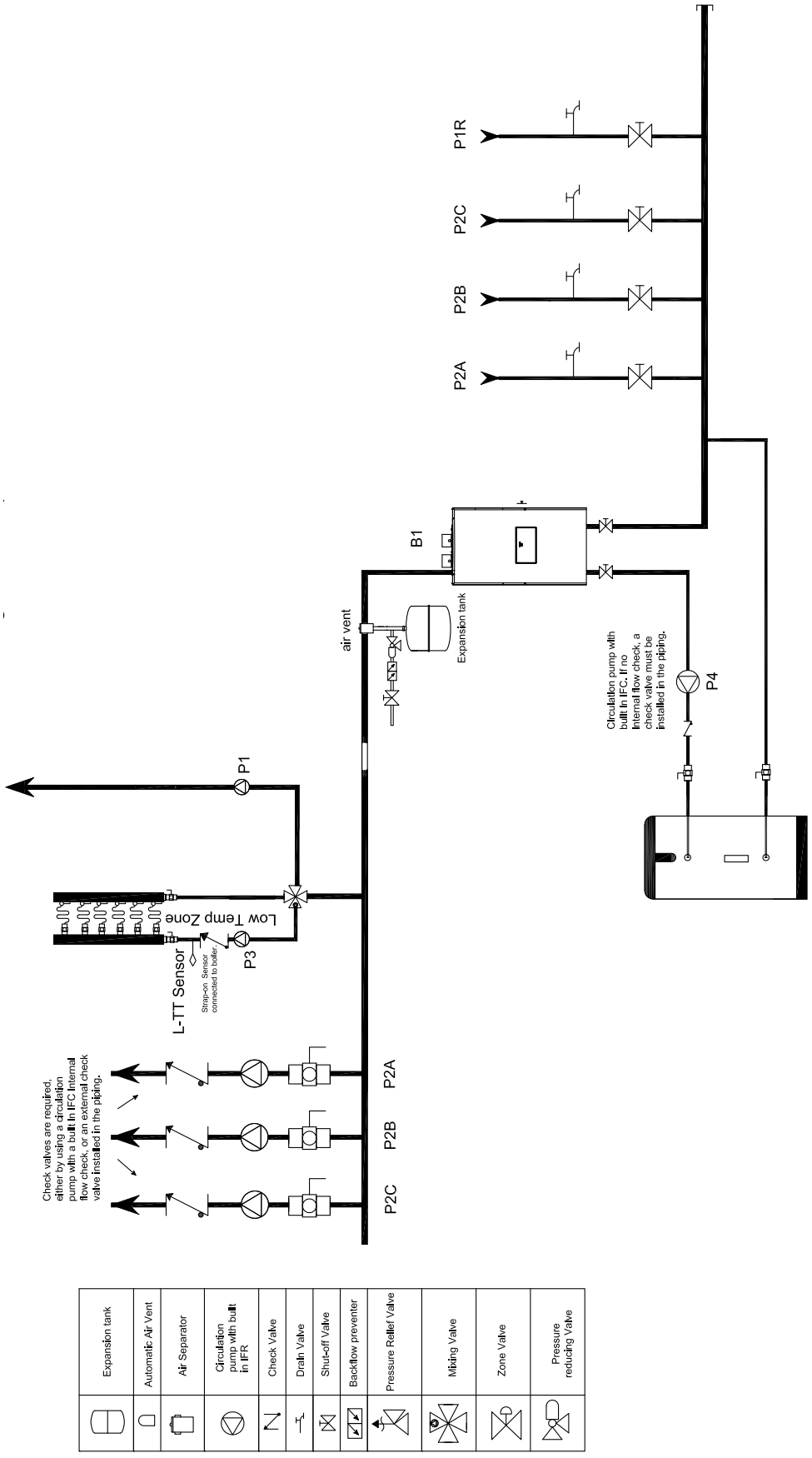
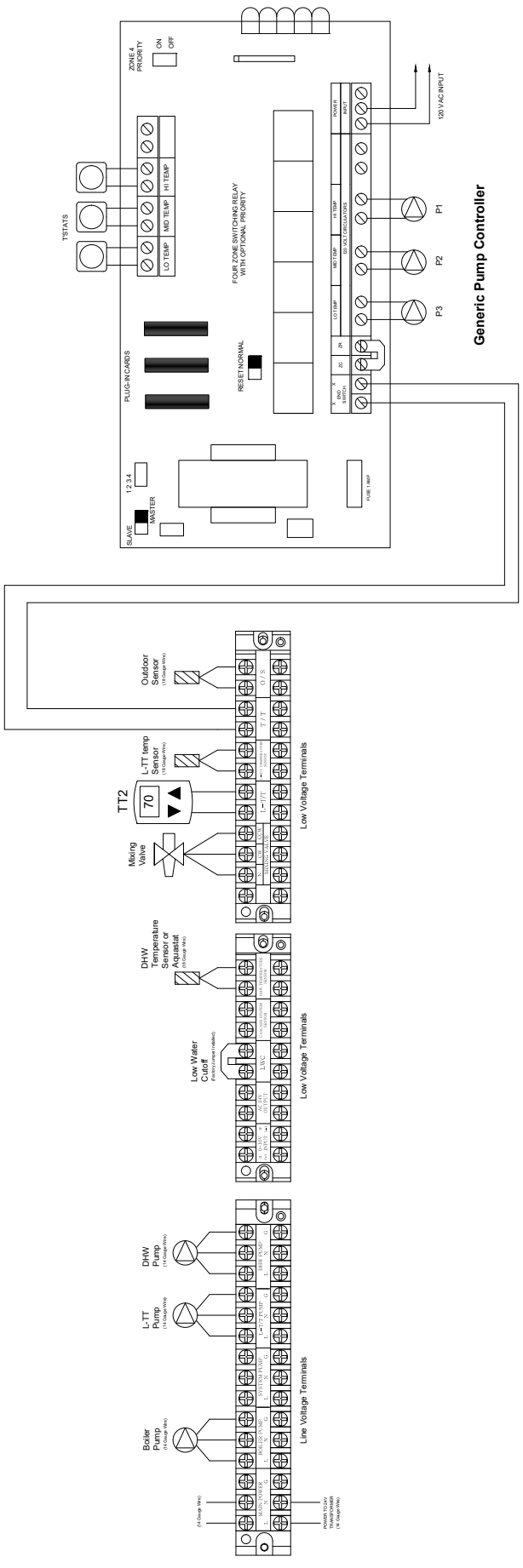
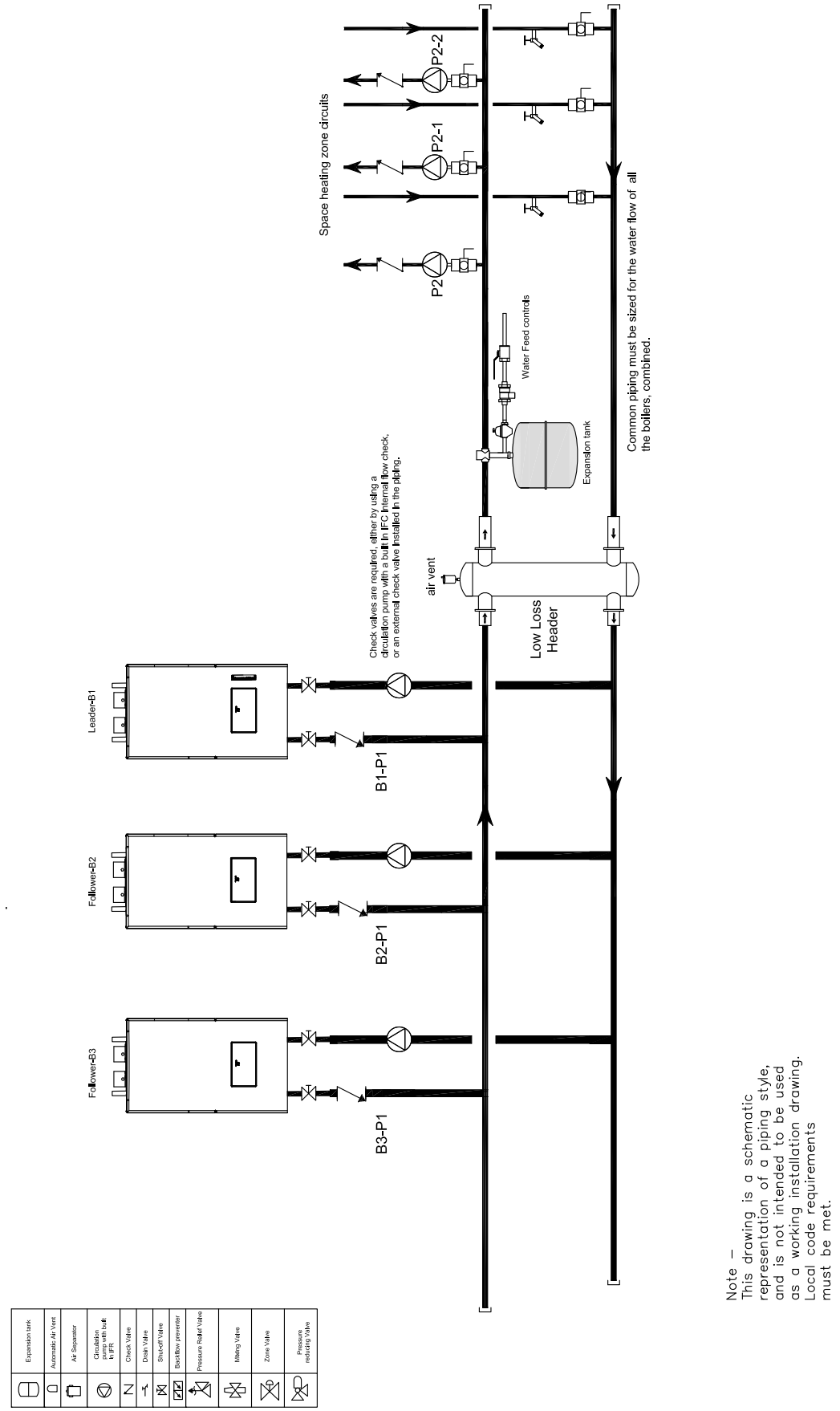


Figure 4 - FT-301/399 with indirect and high / low temp zones


Generic Pump Controller
TSTATS
LO TEMP
MID TEMP
HI TEMP
ZONE 4 PRIORITY
ON
OFF
FOUR ZONE SWITCHING RELAY WITH OPTIONAL PRIORITY
PLUG-IN CARDS
RESET/NORMAL
SLAVE
MASTER
1 2 3 4
FUSE 1 AMP
POWER INPUT
120 V AC INPUT
P1
P2
P3
Outdoor Sensor
L-TT temp Sensor
TT2
Mixing Valve
DHW Temperature Sensor or Aquastat
Low Water Cutoff
DHW Pump
L-TT Pump
Boiler Pump
Low Voltage Terminals
Line Voltage Terminals

2.A Piping and Wiring Diagrams for FTHW301/399NX boilers



Note –
This drawing is a schematic representation of a piping style, and is not intended to be used as a working installation drawing. Local code requirements must be met.

Figure 5 - Multiple - FT-301/399 with Low Loss Header

Generic Pump Controller
TSTATS
ZONE 4 PRIORITY
ON
OFF
LO TEMP
MID TEMP
HI TEMP
PLUG-IN CARDS
RESET NORMAL
FOUR ZONE SWITCHING RELAY WITH OPTIONAL PRIORITY
SLAVE
MASTER
1 2 3 4
FUSE 1 AMP
120 VAC INPUT
P2
P2-1
P2-2
Outdoor Sensor
Cascade System Sensor
Low Water Cutoff
Low Voltage Terminals
Line Voltage Terminals
Boiler Pump
Boiler 1 (Lead)
Boiler 2 (Follow)
Boiler 3 (Follow)

2.A Piping and Wiring Diagrams for FTHW301/399NX boilers

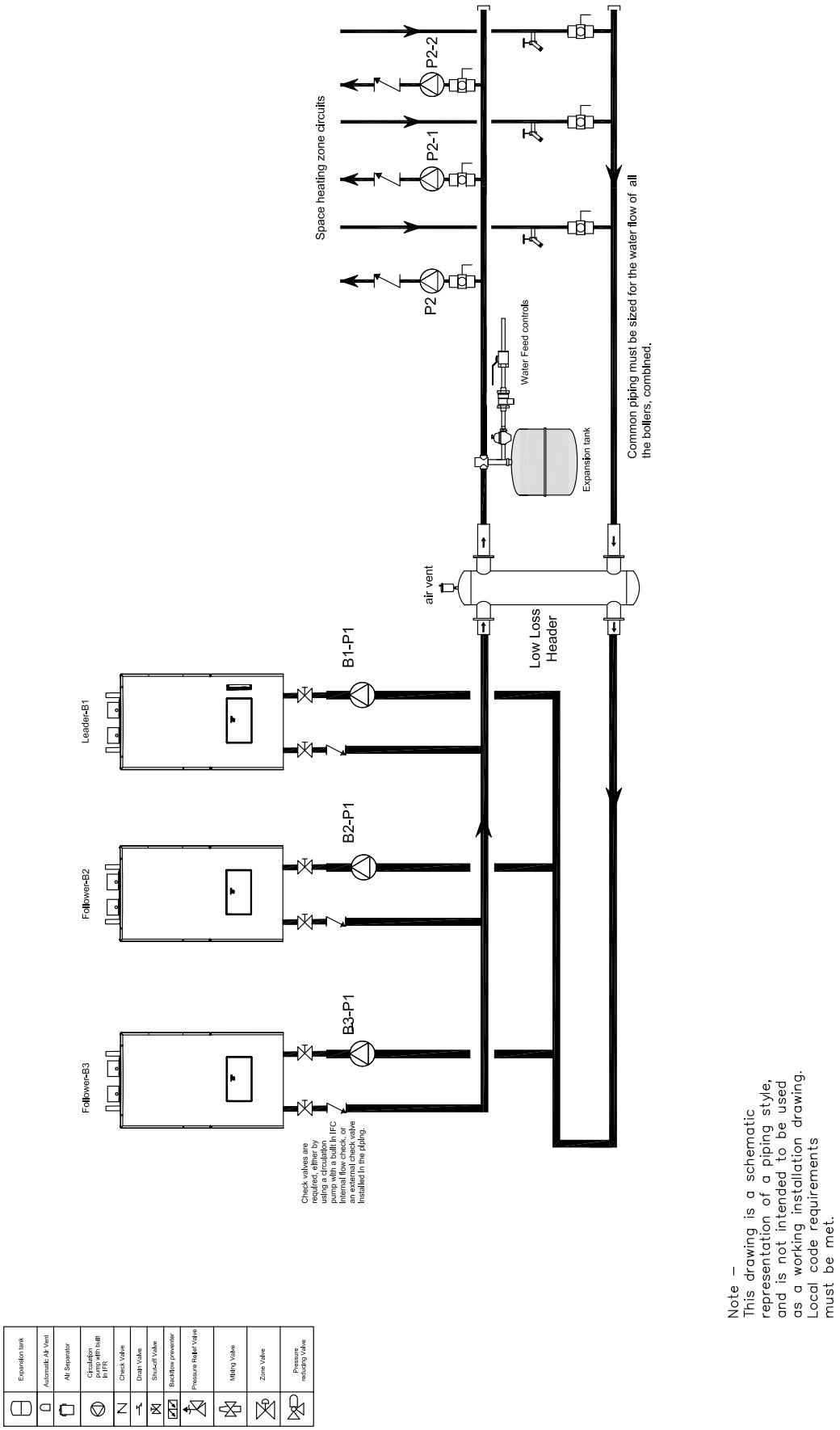
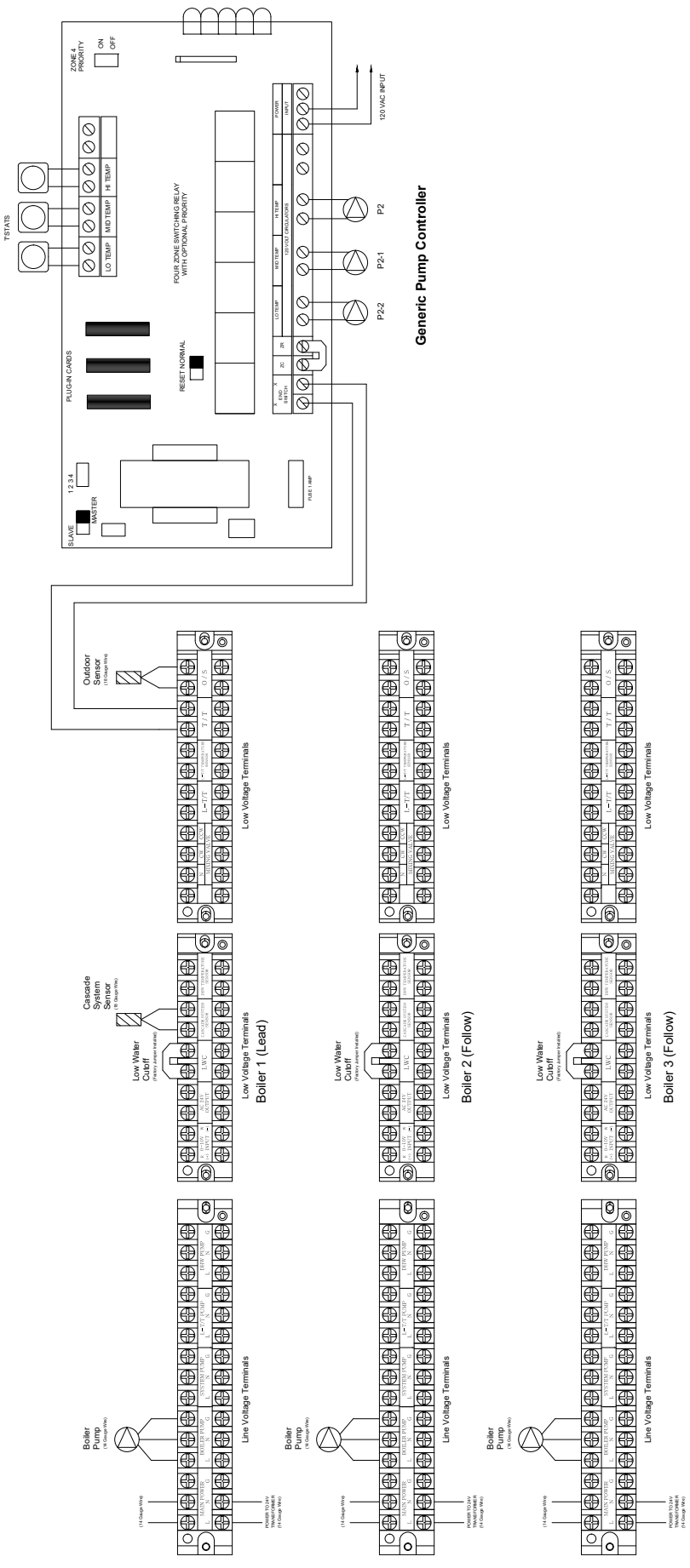


Figure 6 - Three FT-301/399s Heating Only models, cascaded, Retro replacement


Generic Pump Controller
TSTATS
ZONE 4 PRIORITY
ON
OFF
HI TEMP
MID TEMP
LO TEMP
PLUG-IN CARDS
RESET NORMAL
FOUR ZONE SWITCHING RELAY WITH OPTIONAL PRIORITY
SLAVE
MASTER
1 2 3 4
FUSE 1 AMP
POWER INPUT
120 VAC INPUT
P2
P2-1
P2-2
Outdoor Sensor
Cascade System Sensor
Low Water Cutoff
Low Voltage Terminals
Line Voltage Terminals
Boiler Pump
Boiler 1 (Lead)
Boiler 2 (Follow)
Boiler 3 (Follow)

2.A Piping and Wiring Diagrams for FTHW301/399NX boilers

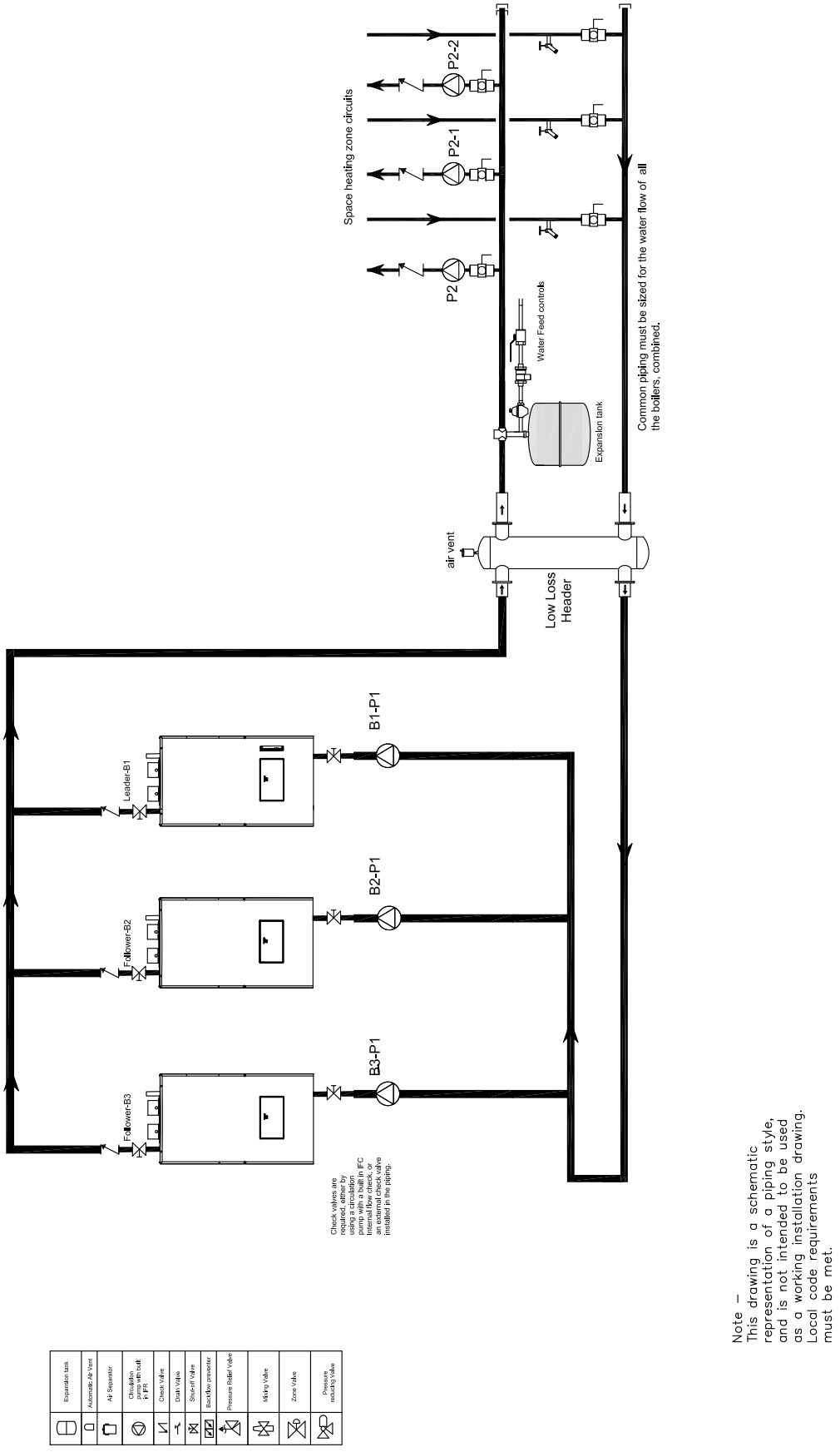


Figure 7 - Three FT-301/399s Heating Only models, cascaded, Retro Replacement Option 2

Generic Pump Controller
TSTATS
ZONE 4 PRIORITY
ON
OFF
HI TEMP
MID TEMP
LO TEMP
PLUG-IN CARDS
RESET NORMAL
FOUR ZONE SWITCHING RELAY WITH OPTIONAL PRIORITY
SLAVE
MASTER
1 2 3 4
FUSE 1 AMP
POWER INPUT
120 VAC INPUT
LO TEMP
MID TEMP
HI TEMP
120VAC CIRCULATORS
P2
P2-1
P2-2
Outdoor Sensor
Cascade System Sensor
Low Water Cutoff
Low Voltage Terminals
Line Voltage Terminals
Boiler Pump
Boiler 1 (Lead)
Boiler 2 (Follow)
Boiler 3 (Follow)

2.A Piping and Wiring Diagrams for FTHW301/399NX boilers

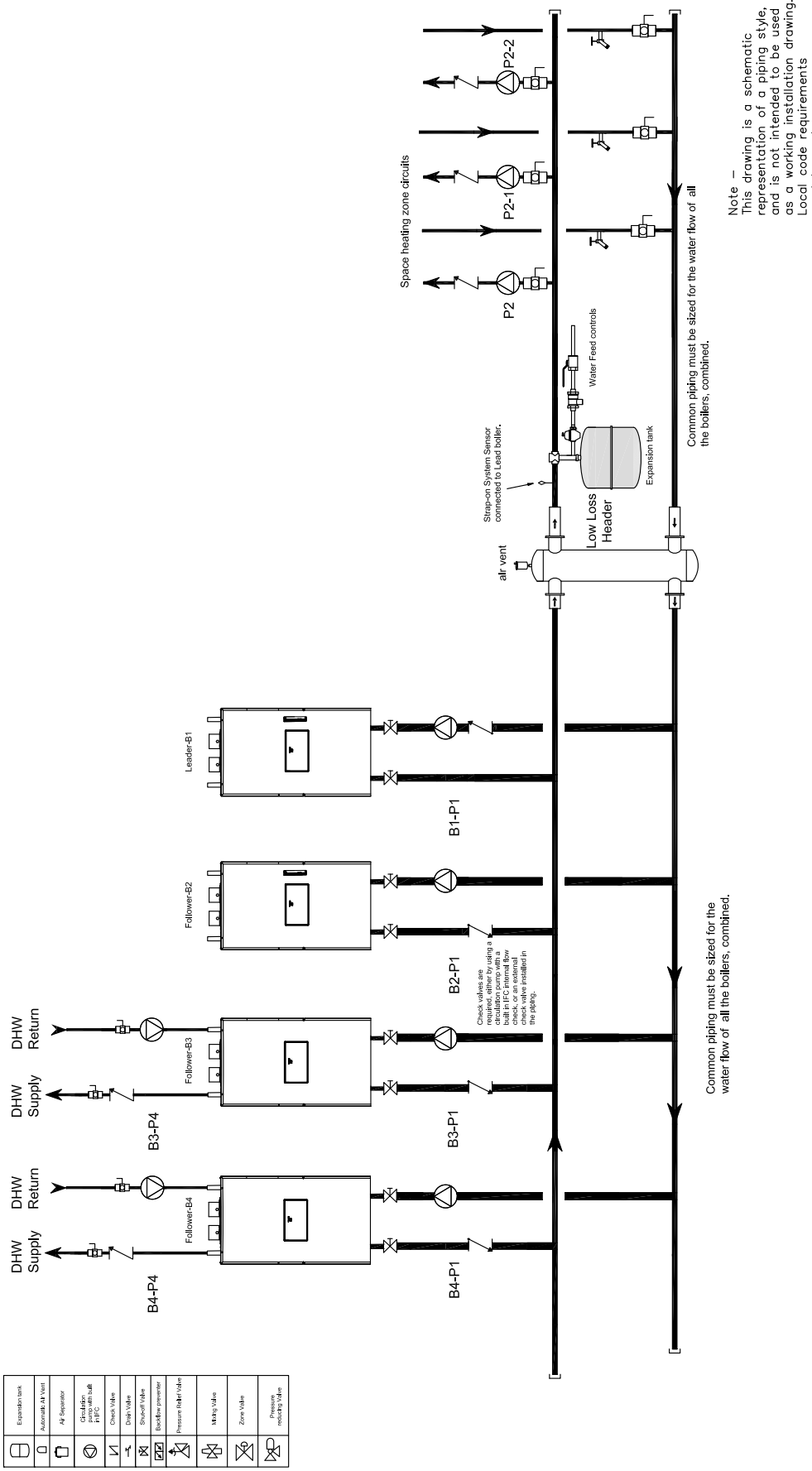
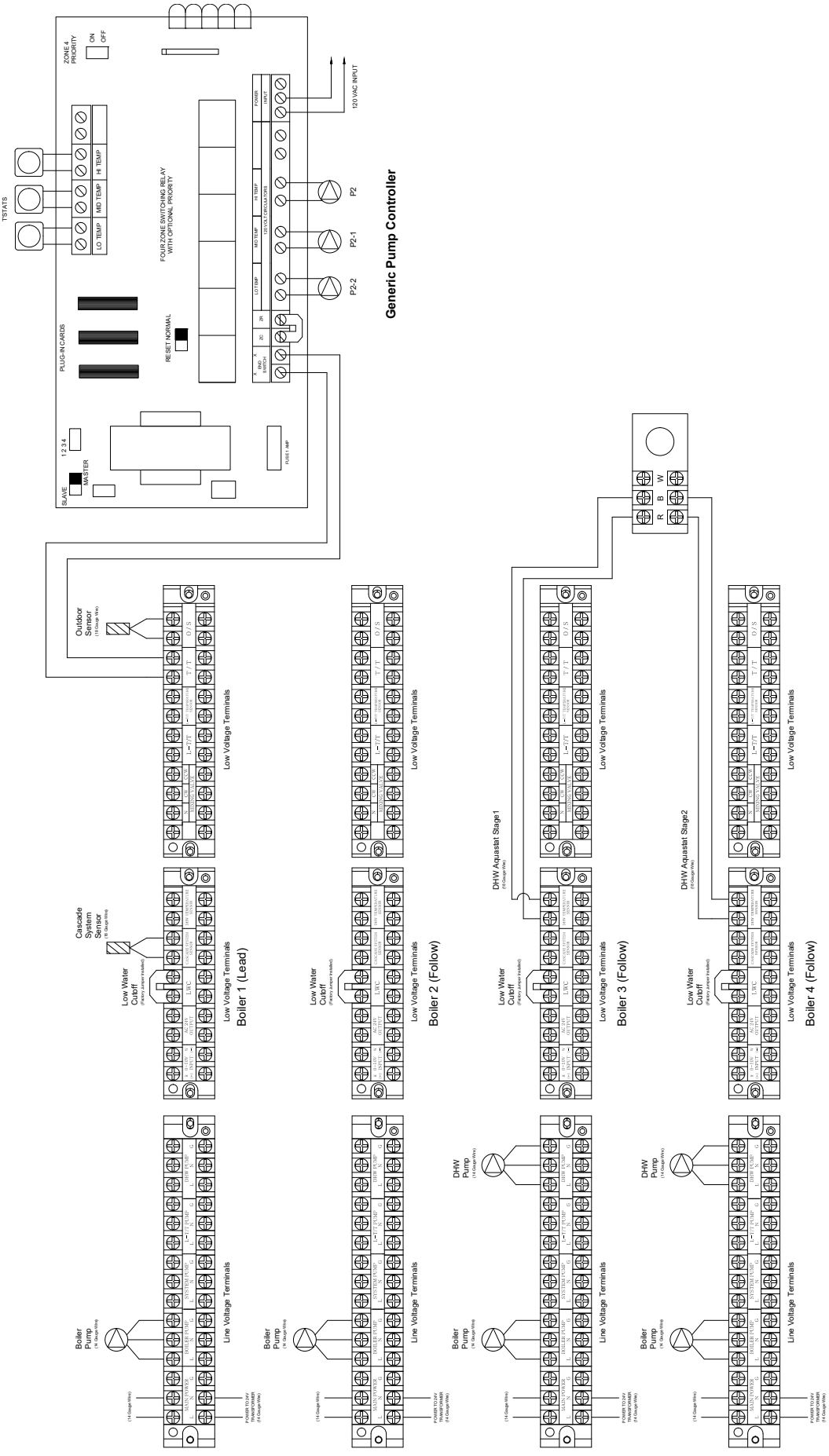


Figure 8 -


Generic Pump Controller
TSTATS
LO TEMP
MID TEMP
HI TEMP
ZONE 4 PRIORITY
ON
OFF
PLUG-IN CARDS
RESET NORMAL
FOUR ZONE SWITCHING RELAY WITH OPTIONAL PRIORITY
120 VAC INPUT
P2
P2-1
P2-2
SLAVE
MASTER
1 2 3 4
Outdoor Sensor
Cascade System Sensor
Low Water Cutoff
DHW Aquastat Stage1
DHW Aquastat Stage2
Boiler Pump
DHW Pump
Low Voltage Terminals
Line Voltage Terminals
Boiler 1 (Lead)
Boiler 2 (Follow)
Boiler 3 (Follow)
Boiler 4 (Follow)

2.A Piping and Wiring Diagrams for FTHW301/399NX boilers

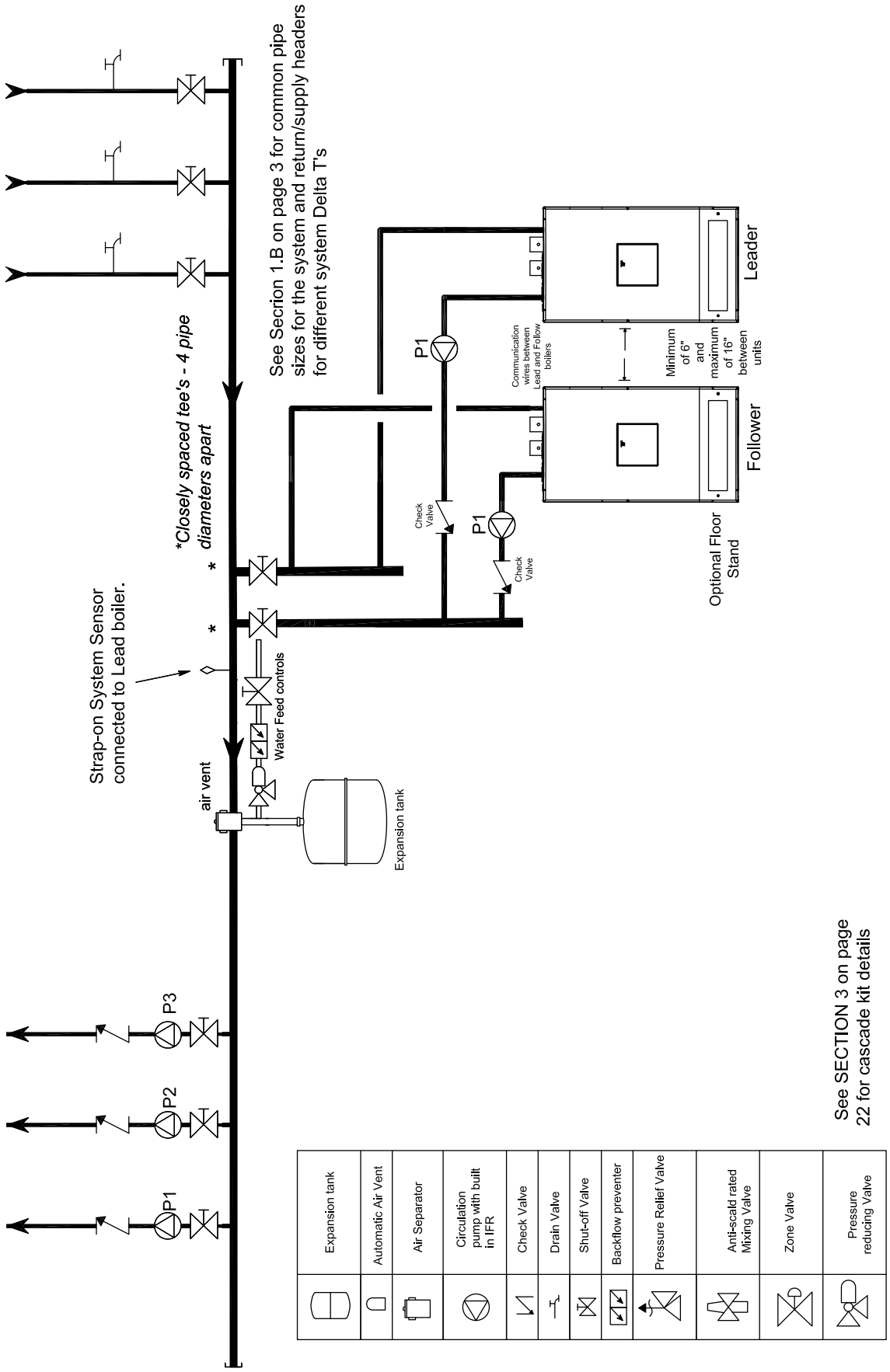
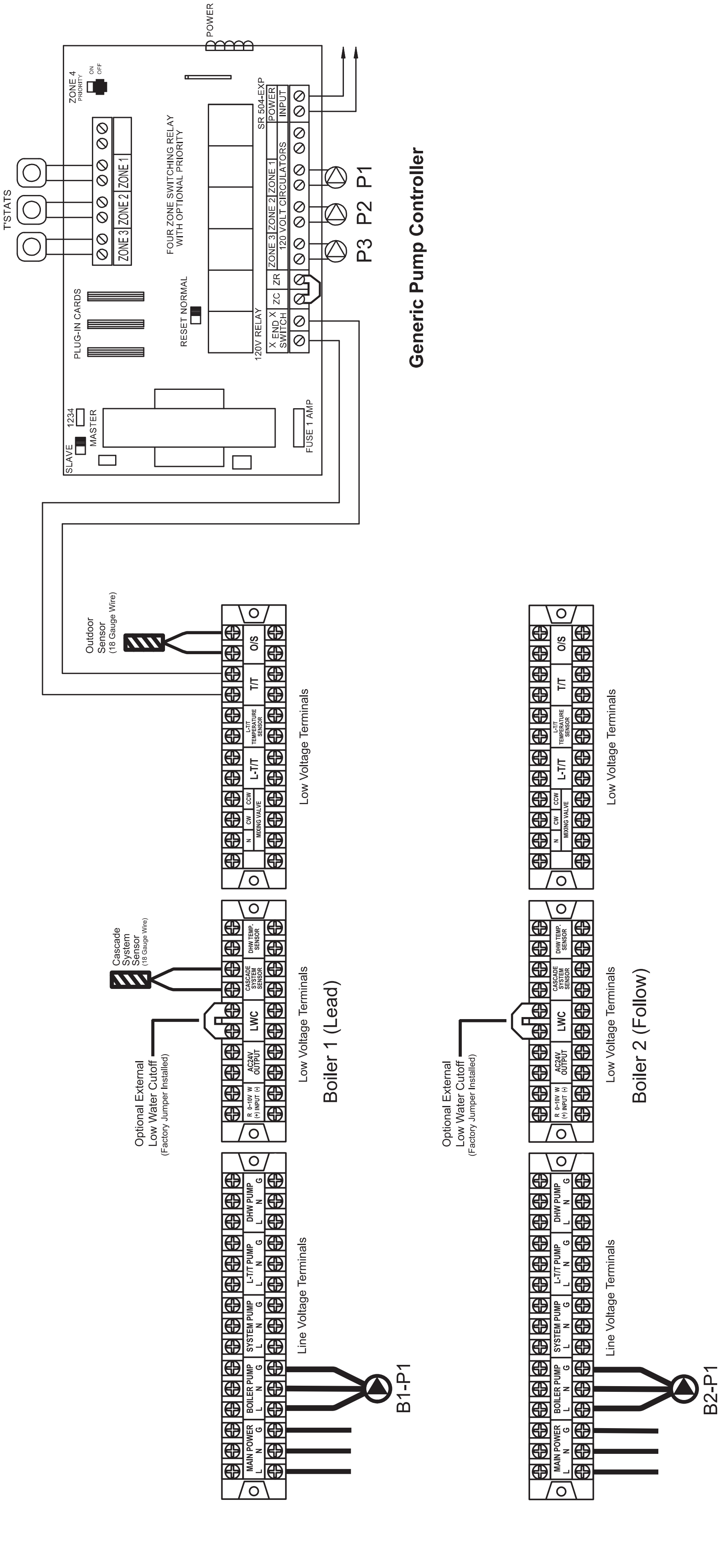


Figure 9 - Two FT-301/399s Heating Only models, cascaded with pumps



POWER
T'STATS
ZONE 4 PRIORITY
ON OFF
ZONE 3
ZONE 2
ZONE 1
PLUG-IN CARDS
FOUR ZONE SWITCHING RELAY WITH OPTIONAL PRIORITY
RESET NORMAL
SR 504-EXP
POWER INPUT
120 VOLT CIRCULATORS
X END X SWITCH
ZC
ZR
120V RELAY
SLAVE
MASTER
1234
FUSE 1 AMP
P3 P2 P1
Generic Pump Controller
Outdoor Sensor (18 Gauge Wire)
Cascade System Sensor (18 Gauge Wire)
Optional External Low Water Cutoff (Factory Jumper Installed)
Low Voltage Terminals
Line Voltage Terminals
Boiler 1 (Lead)
Boiler 2 (Follow)
B1-P1
B2-P1
MAIN POWER
BOILER PUMP
SYSTEM PUMP
L-T/T PUMP
DHW PUMP
LWC
CASCADE SYSTEM SENSOR
DHW TEMP. SENSOR
AC24V OUTPUT
L-T/T
T/T
O/S
MIXING VALVE

2.A Piping and Wiring Diagrams for FTHW301/399NX boilers

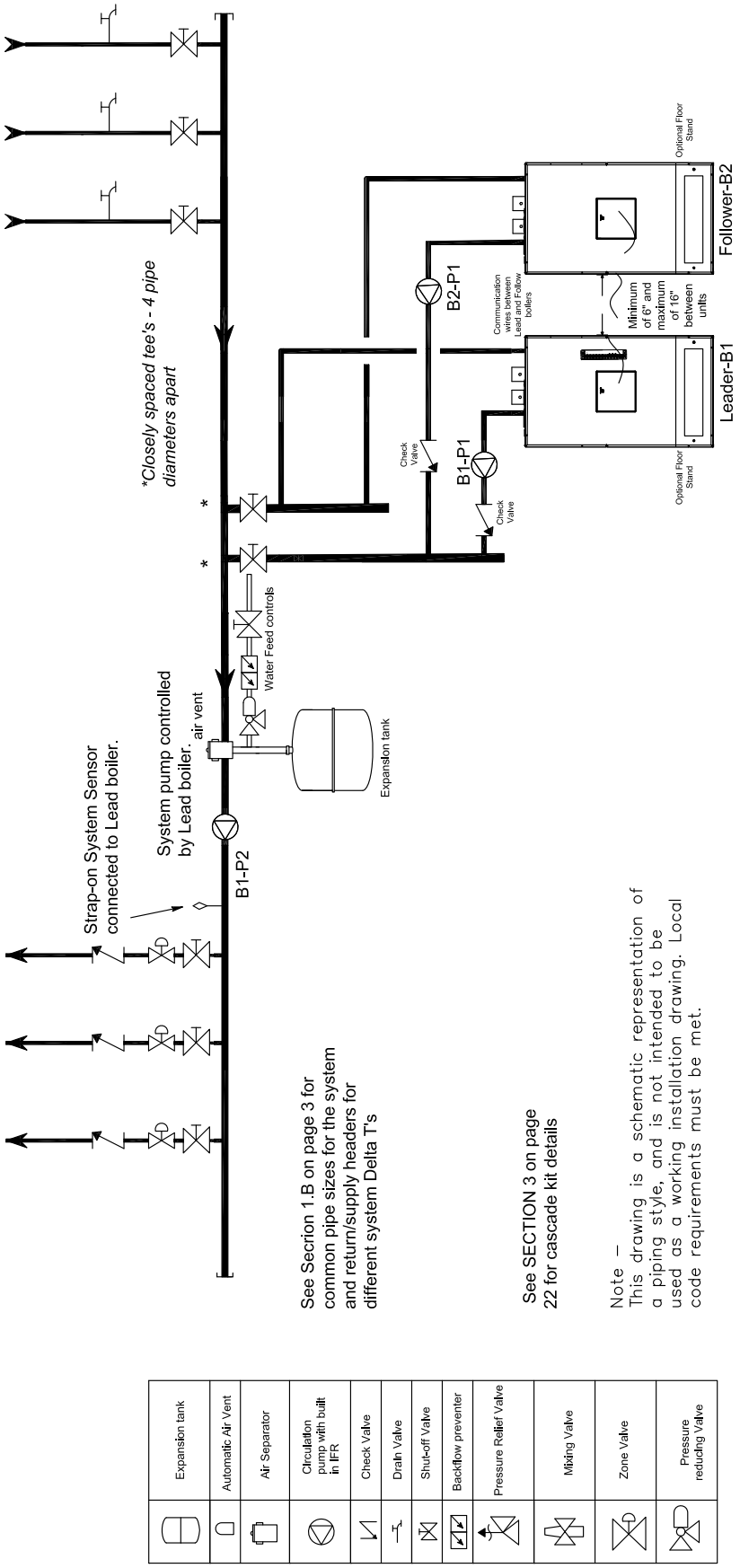
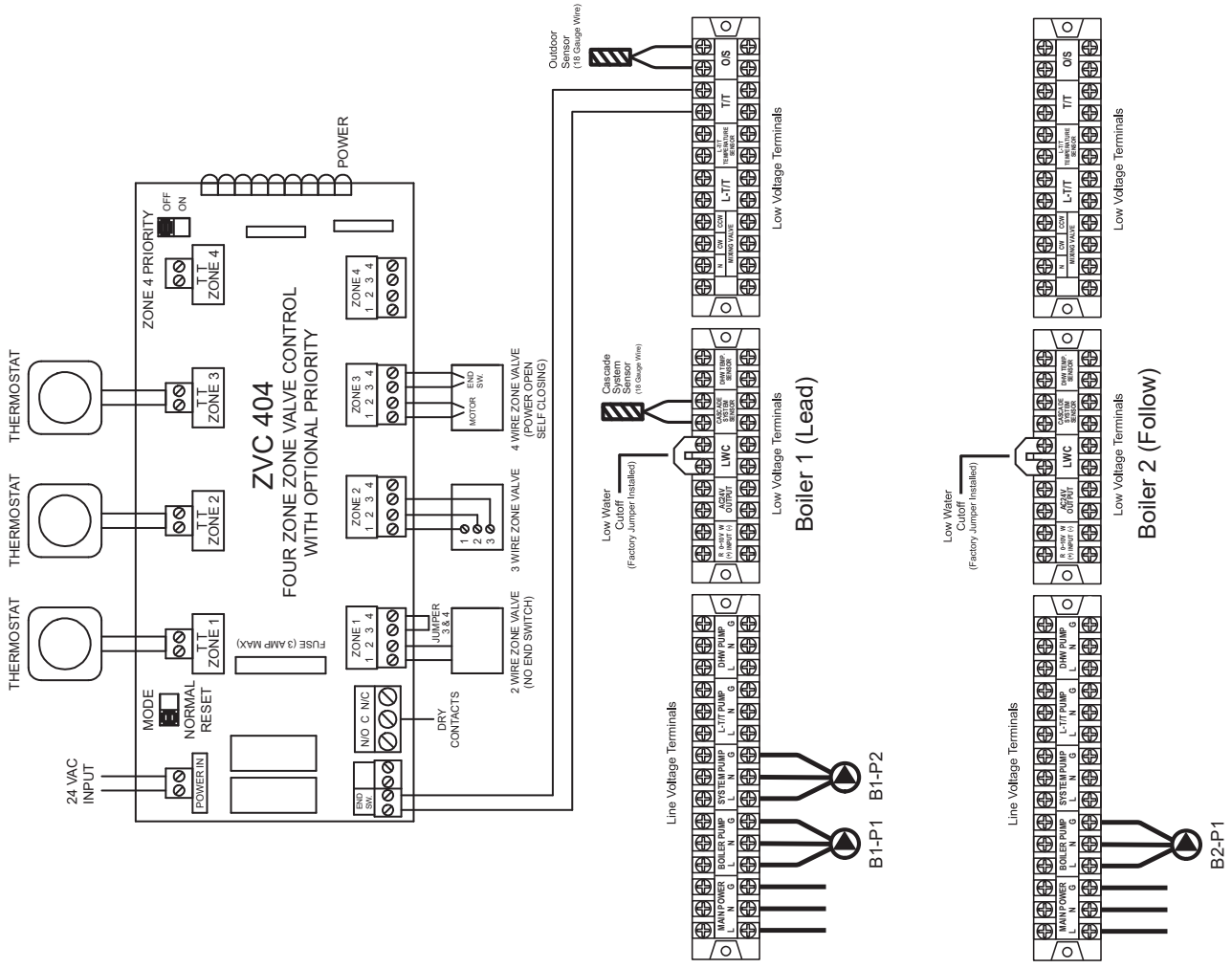


Figure 10 - Multiple - FT-301/399 with Floor Stand


ZVC 404
FOUR ZONE ZONE VALVE CONTROL
WITH OPTIONAL PRIORITY
THERMOSTAT
THERMOSTAT
THERMOSTAT
ZONE 4 PRIORITY
OFF
ON
POWER
MODE
NORMAL
RESET
24 VAC
INPUT
POWER IN
ZONE 1
ZONE 2
ZONE 3
ZONE 4
FUSE (3 AMP MAX)
JUMPER
3 & 4
DRY
CONTACTS
N/O C N/C
END SW.
2 WIRE ZONE VALVE
(NO END SWITCH)
3 WIRE ZONE VALVE
4 WIRE ZONE VALVE
(POWER OPEN
SELF CLOSING)
MOTOR
END SW.
Outdoor
Sensor
(18 Gauge Wire)
Cascade
System
Sensor
(18 Gauge Wire)
Low Water
Cutoff
(Factory Jumper Installed)
Low Voltage Terminals
Boiler 1 (Lead)
Line Voltage Terminals
B1-P1
B1-P2
Low Water
Cutoff
(Factory Jumper Installed)
Low Voltage Terminals
Boiler 2 (Follow)
Line Voltage Terminals
B2-P1

2.A Piping and Wiring Diagrams for FTHW301/399NX boilers

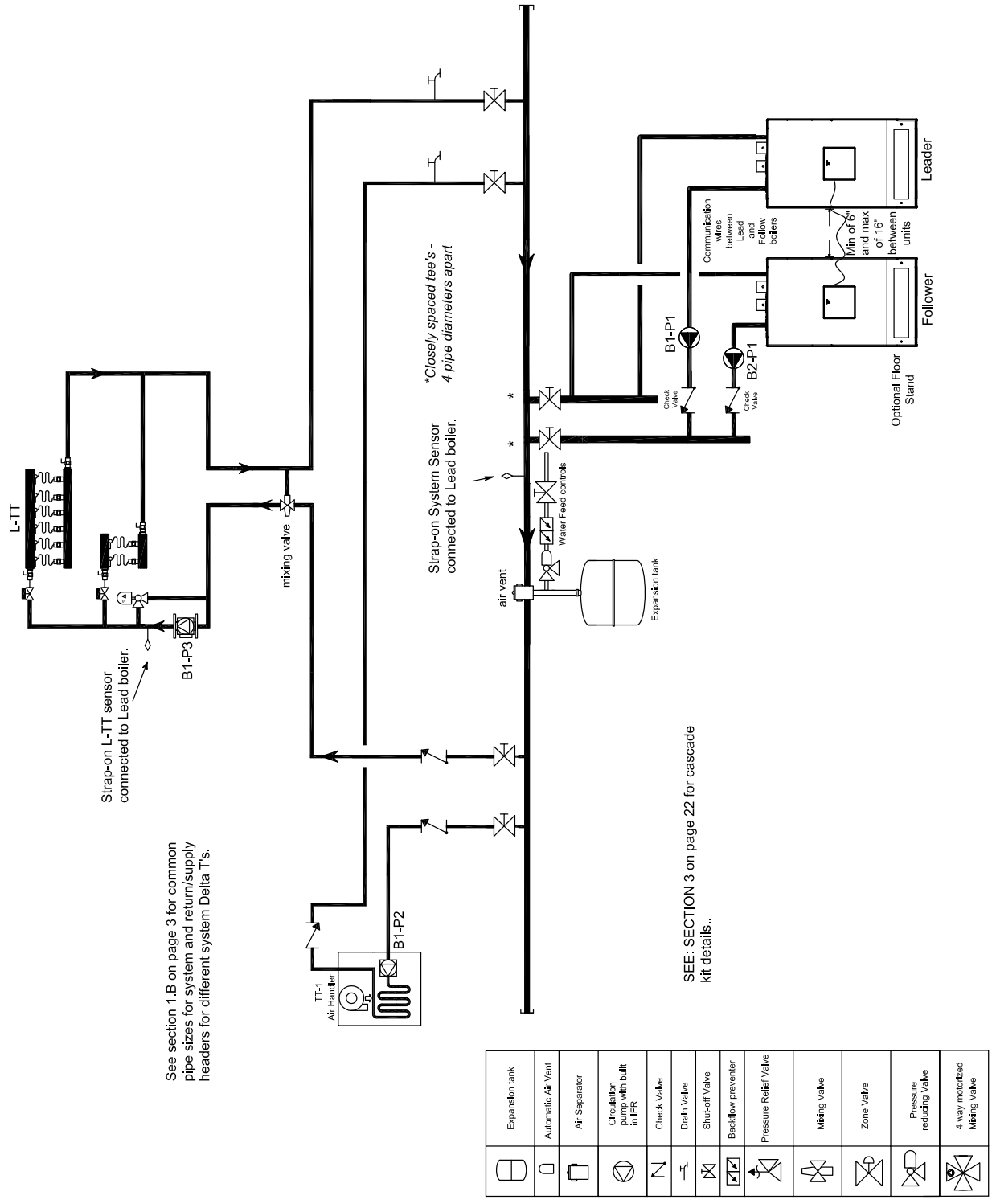
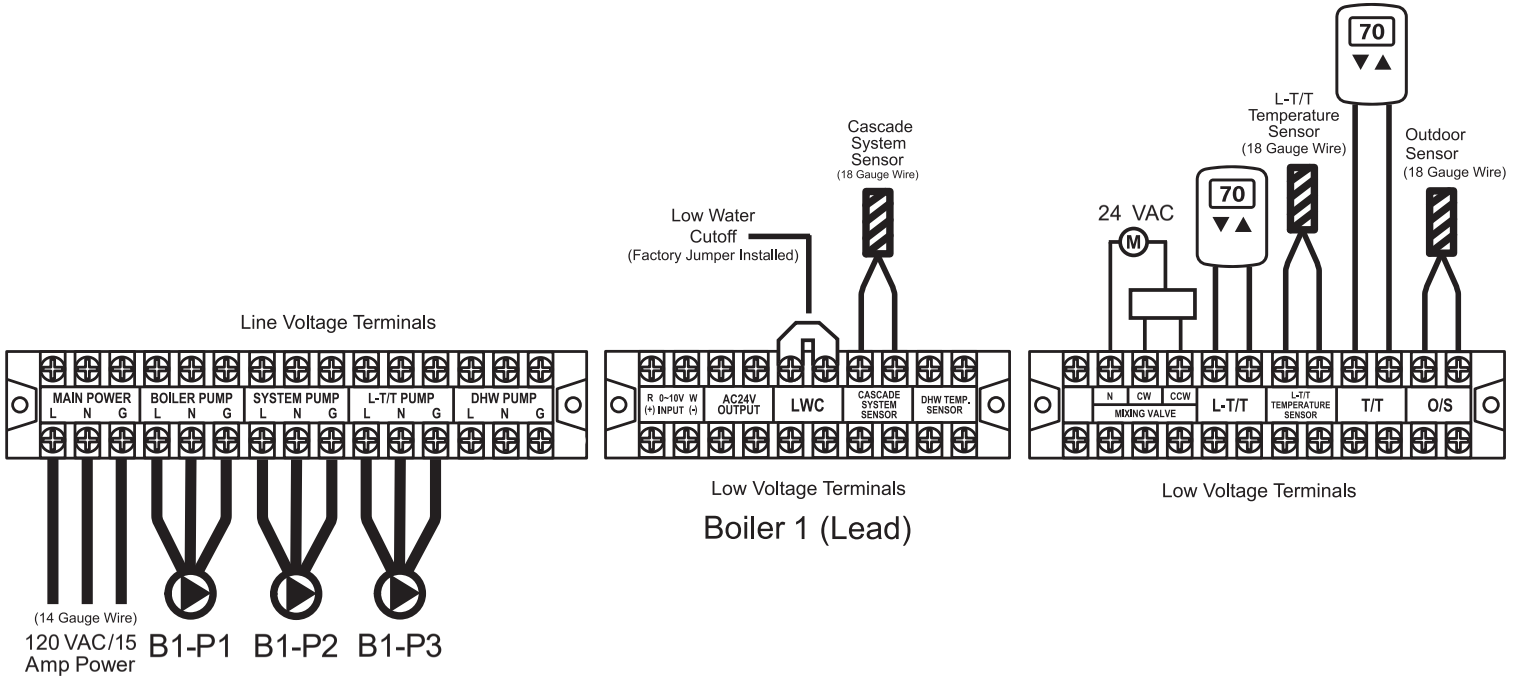
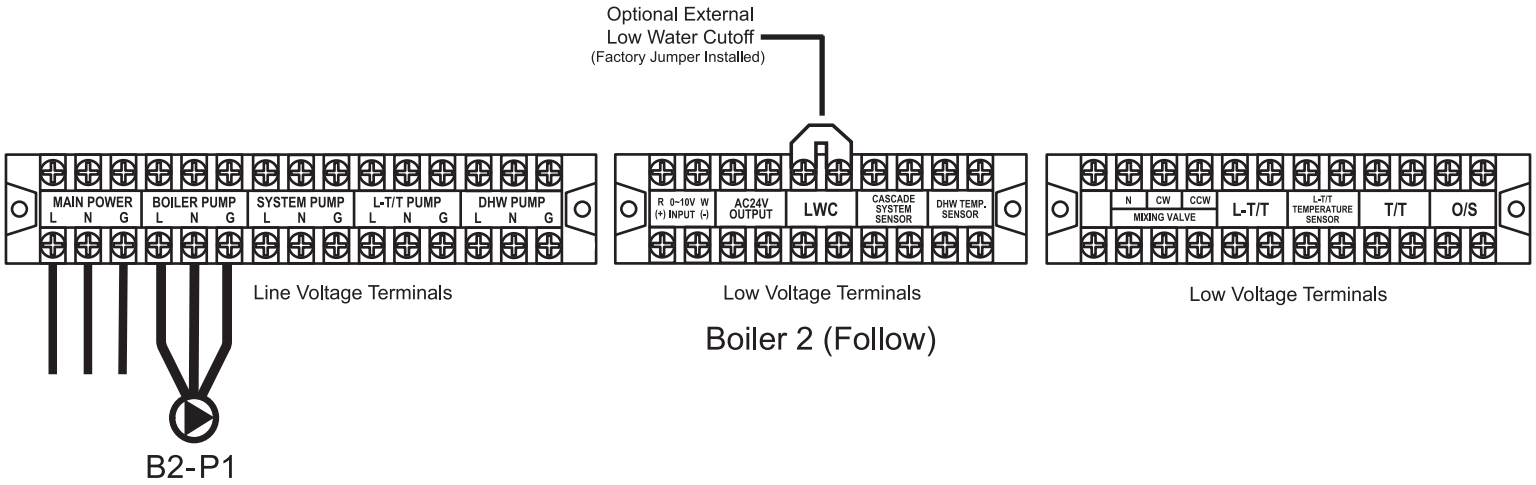


Figure 11 - Two FT-301/399s Heating Only models, cascaded with low temp zones and air handlers


Line Voltage Terminals
MAIN POWER L N G
BOILER PUMP L N G
SYSTEM PUMP L N G
L-T/T PUMP L N G
DHW PUMP L N G
(14 Gauge Wire)
120 VAC/15 Amp Power
B1-P1
B1-P2
B1-P3
Low Water Cutoff
(Factory Jumper Installed)
Cascade System Sensor
(18 Gauge Wire)
R 0~10V W (+) INPUT (-)
AC24V OUTPUT
LWC
CASCADE SYSTEM SENSOR
DHW TEMP. SENSOR
Low Voltage Terminals
Boiler 1 (Lead)
24 VAC
M
70
L-T/T Temperature Sensor
(18 Gauge Wire)
Outdoor Sensor
(18 Gauge Wire)
N CW CCW
MIXING VALVE
L-T/T
L-T/T TEMPERATURE SENSOR
T/T
O/S
Low Voltage Terminals


Optional External Low Water Cutoff
(Factory Jumper Installed)
MAIN POWER L N G
BOILER PUMP L N G
SYSTEM PUMP L N G
L-T/T PUMP L N G
DHW PUMP L N G
Line Voltage Terminals
B2-P1
R 0~10V W (+) INPUT (-)
AC24V OUTPUT
LWC
CASCADE SYSTEM SENSOR
DHW TEMP. SENSOR
Low Voltage Terminals
Boiler 2 (Follow)
N CW CCW
MIXING VALVE
L-T/T
L-T/T TEMPERATURE SENSOR
T/T
O/S
Low Voltage Terminals

2.A Piping and Wiring Diagrams for FTHW301/399NX boilers

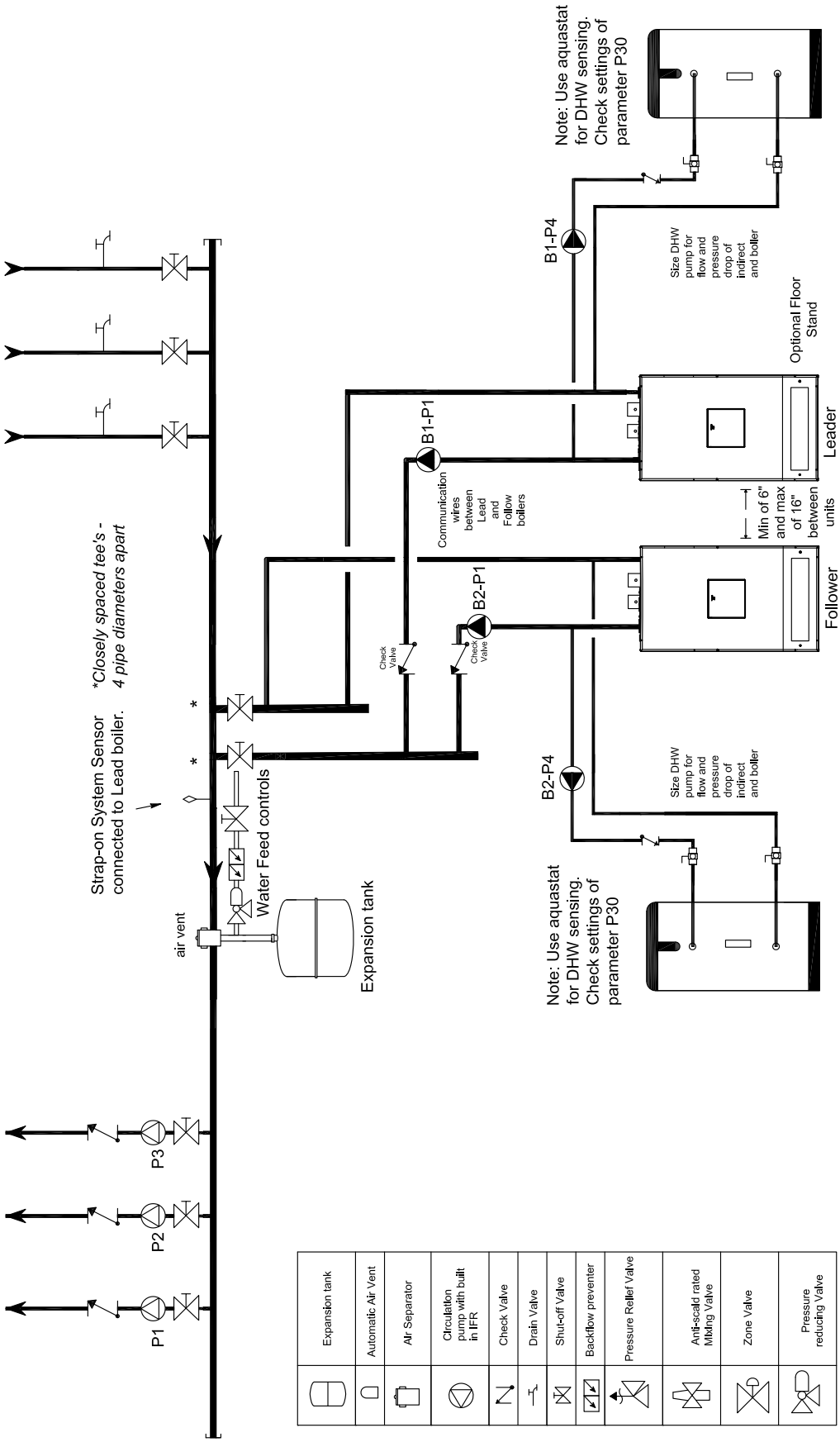
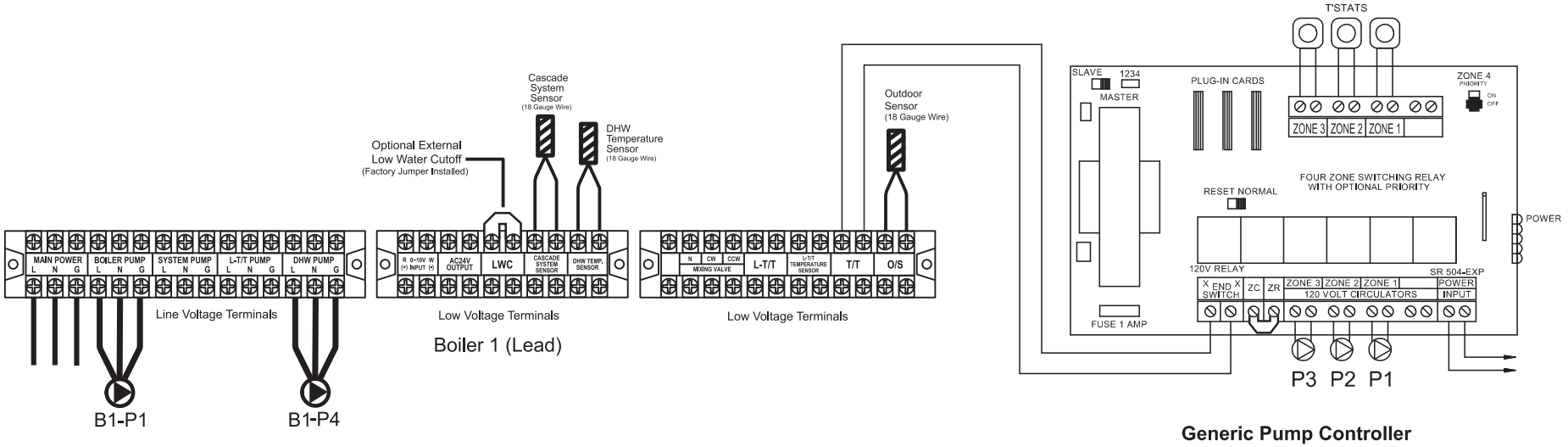
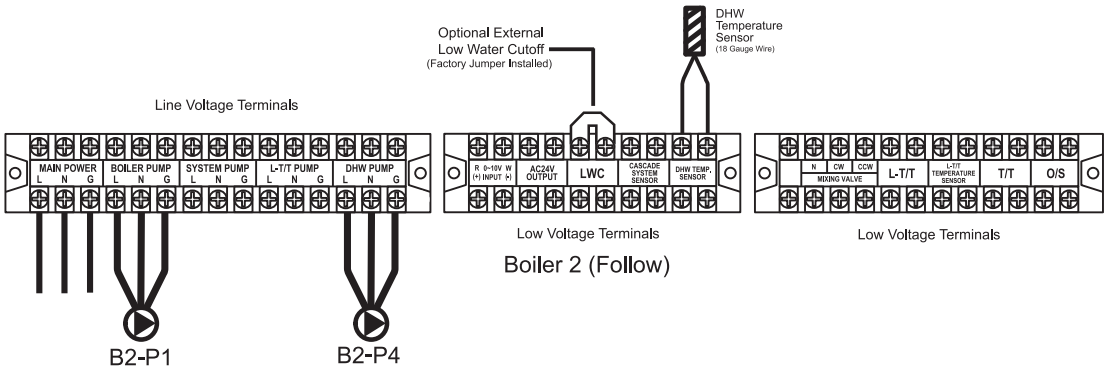


Figure 12 - Two FT-301/399s Heating Only models, cascaded with pumps and two Indirects


Cascade System Sensor (18 Gauge Wire)
Optional External Low Water Cutoff (Factory Jumper Installed)
DHW Temperature Sensor (18 Gauge Wire)
Outdoor Sensor (18 Gauge Wire)
MAIN POWER
BOILER PUMP
SYSTEM PUMP
L-T/T PUMP
DHW PUMP
LWC
CASCADE SYSTEM SENSOR
DHW TEMP. SENSOR
MIXING VALVE
L-T/T
T/T
O/S
Line Voltage Terminals
Low Voltage Terminals
Boiler 1 (Lead)
B1-P1
B1-P4
T'STATS
SLAVE
MASTER
PLUG-IN CARDS
ZONE 4
ZONE 3
ZONE 2
ZONE 1
RESET NORMAL
FOUR ZONE SWITCHING RELAY WITH OPTIONAL PRIORITY
POWER
120V RELAY
SR 504-EXP
END SWITCH
ZC
ZR
120 VOLT CIRCULATORS
INPUT
FUSE 1 AMP
P3 P2 P1
Generic Pump Controller


Optional External Low Water Cutoff (Factory Jumper Installed)
DHW Temperature Sensor (18 Gauge Wire)
Line Voltage Terminals
MAIN POWER
BOILER PUMP
SYSTEM PUMP
L-T/T PUMP
DHW PUMP
LWC
CASCADE SYSTEM SENSOR
DHW TEMP. SENSOR
MIXING VALVE
L-T/T
T/T
O/S
Low Voltage Terminals
Boiler 2 (Follow)
B2-P1
B2-P4

SECTION 3 Cascade Communications (cascade cable)

3.A Cascade Kit Content and Instructions

Item #	Description	Part #	CA017502 2 Boilers	CA017503 3 Boilers	CA017504 4 Boilers
1	FT Cascade Instructions	H2384200	1	1	1
2	Cascade System Sensor	FT1868	1	1	1
3	FT Cascade Communication Cable w/ ending resistor	FT1861	2	3	4
4	Cable Tie, Plastic, 4"	E0007501	4	6	8

Table 1: Cascade Kit Components

NOTES: Perform start-up and combustion calibration of individual FTHW301/399 boilers BEFORE configuring the cascade system. Refer to Section 4 of the FTHW301/399 Series Installation and Operation Instructions for details.

A system sensor must be connected to the leader boiler in order to provide feedback for set point temperature reference and therefore properly control the bank of cascaded boilers.

In order for the system to work properly, the thermostat, 0-10V signal, and/or outdoor sensor must be connected to the leader boiler only. Following boilers will run based on the Leader boiler's controls.

Reference Section 5 of the FTHW301/399 Series Installation and Operation manual (Doc # 1538) to set the Leader boiler's temperature set point based on an outdoor sensor, 0-10V signal or a fixed temperature set point and the cascade programming for all units.

Make sure that power is disconnected (OFF) at boiler before continuing with these instructions.

3.B Wiring Connections for Cascade

Components Needed : (included in cascade kit)

FT1868 : System Sensor (need only 1).

FT1861 : FT Series Cascade Communication Cable (1 per unit) with Ending Resistor.

Example. If you are cascading 4 units, you will need **4X FT1861**'s and you will not use 5 of the resistors.

NOTE: The control boards for the FTHW301/399NX are different and can NOT be interchanged. With the control boards for the residential FT Floor and FT Wall boilers.

The FTHW301/399NX boilers can be controlled by only the cascade system sensor, either with or without the outdoor sensor.

The cascade system sensor (FT1868) must be connected to the Leader boiler in order to provide feedback for the system set point reference and therefore properly control the cascaded boilers.

Refer back to piping diagrams on page 5 through 15 for the proper location of the cascade sensor. Strap the sensor to the piping and thoroughly insulate the sensor and piping. Connect the sensor leads to terminals marked Cascade System Sensor terminals on the Leader boiler.

If outdoor reset operation is desired, install the outdoor sensor on the northern side of the building away from direct sunlight or other heat sources. Route the control wiring back to the O/S terminals on the Leader boiler. Avoid running this control wiring parallel to 120 V lines.

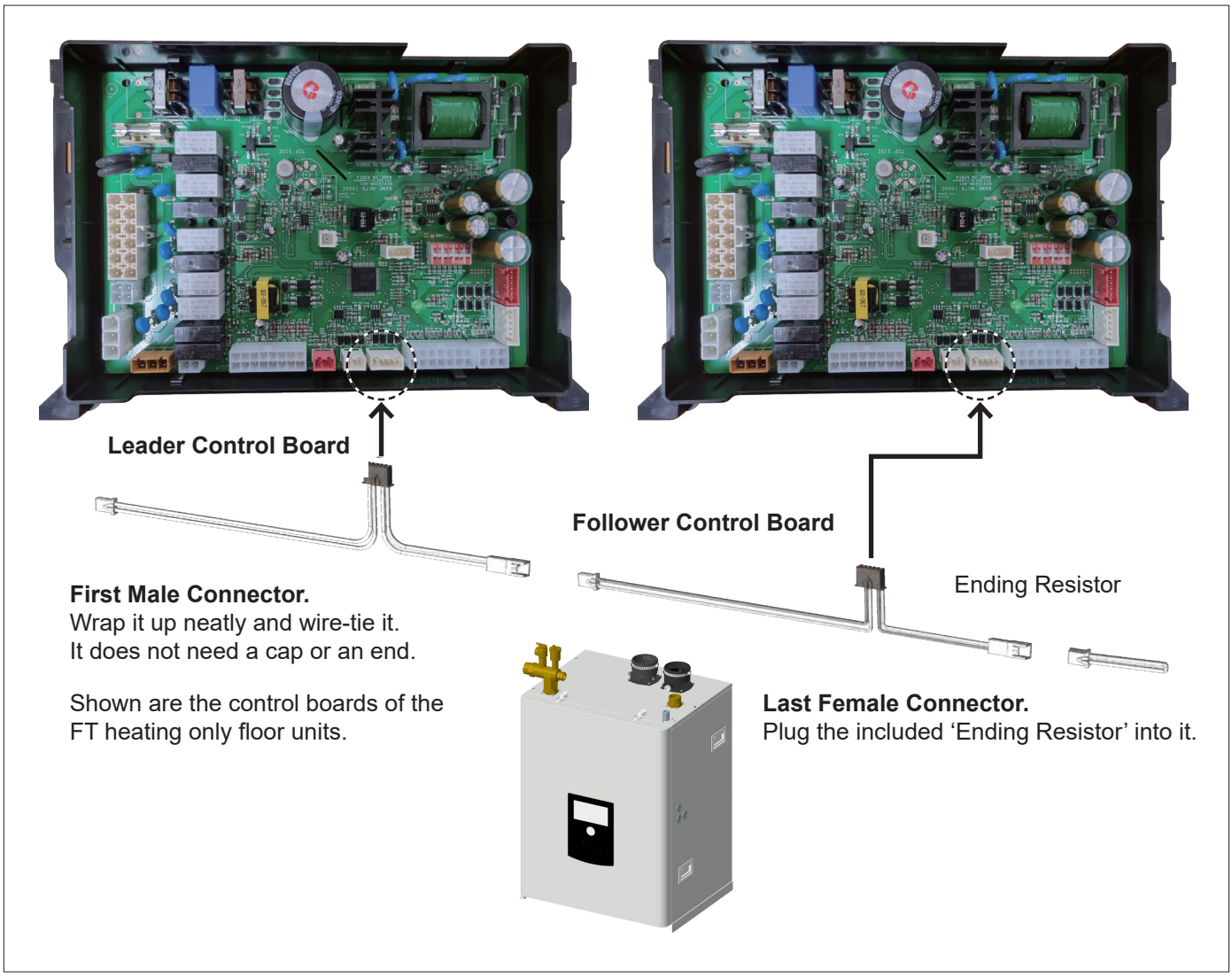


Figure 13 - Cascade wiring for FT models

NOTE: Smart Priority is set on a boiler connected to a DHW load by setting its dip switch #3 to ON. Refer to the FTHW301/399 Boiler installation Manual in Section 4.20.

3.B Wiring Connections for Cascade (continued)

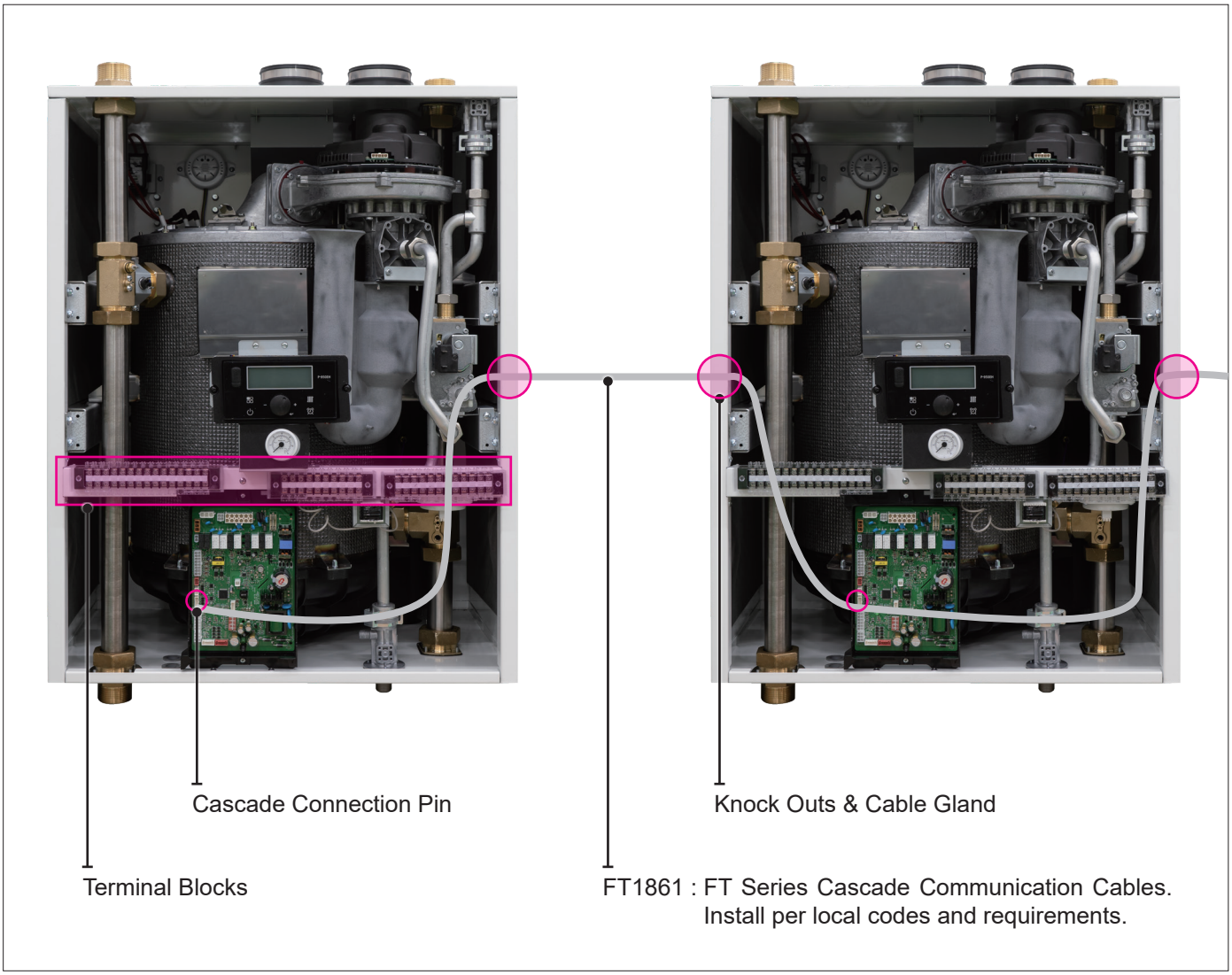


Figure 14 - Using the available 'Knock Outs'.

NOTES: The cascading communications cable is 60" long. Routing for the FTHW301/399NX models can be via the side floor plastic knock-outs provided. Place boilers within 16" from each other.

Routing for the wall-mounted units can be via the bottom or back side knock-outs. Place unit within 12" from each other. Follow local codes for both systems.

Multiple Cascade Communication cables can be connected for longer distances between boilers. But, each additional Cascade Cable reduces the maximum number of boilers that can be cascaded by one unit.

The cascade system can be activated by a dry contact thermostat (T/T connections on Leader boiler) or by an external 0-10V signal (on the Leader boiler).

In order for the space heating portion of the system to operate properly, the thermostat, 0-10V signal, and/or outdoor sensor MUST be connected to the Leader boiler only. The follower boilers will run based on Leader boiler's controls.

NOTE: The temperature sensor for the indirect water heater and L-tt temperature sensor must be wired directly to the boiler that is piped to the indirect water heater or mixing valve controlled by that boiler. If multiple boilers are needed use an aquastat and wire it in parallel with "DHW Temp Sensor" contacts on the boilers to be used for DHW. Ensure the DHW circulator is wired to the "DHW Pump" contacts on a boiler that is piped to the indirect water heater. Ensure the L-tt circulator is wired to the "L-tt Pump" contacts on a boiler that is piped to the L-tt circuit. If there is an active call for Heat and a simultaneous call for DHW, the boiler(s) receiving the DHW call will operate with "Smart Priority" function. While the remaining boilers in the cascade will continue to attempt to satisfy the call for Heat.

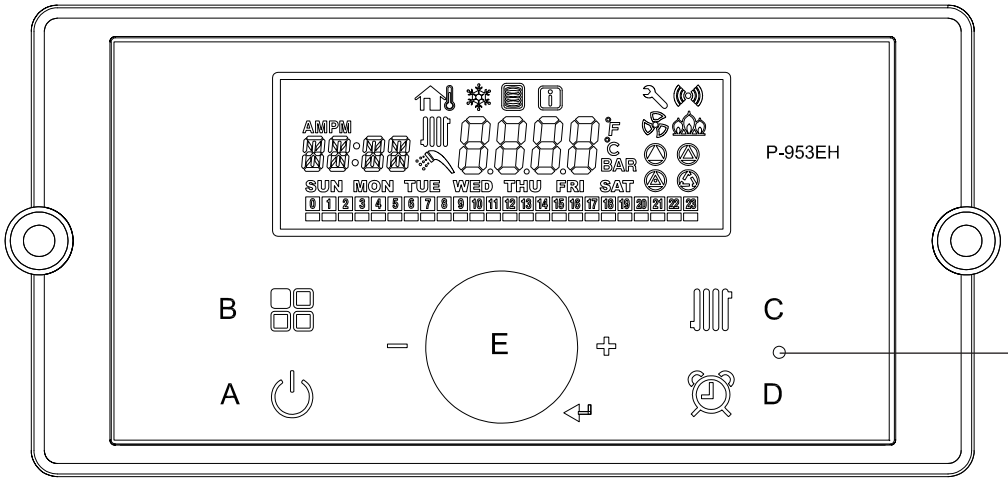
Reference the FTHW301/399NX Installation and Operation Manual to set the Leader's boiler temperature set point based on an outdoor sensor, 0-10 Volt signal or a fixed temperature setpoint.

In case one desires to shut down certain space heating pumps on a call for DHW, the L leg of the CH pump terminals on the Leader boiler can be used to temporarily interrupt a multi-zone relay panel during priority call for DHW. Please consult the relay panel manufacturer for detailed instructions.

Smart Priority is activated by setting dip switch #3 to the ON position for boiler(s) connected to control a DHW load via a DHW sensor or aquastat. During "Smart" priority, the boiler can supply heat to both CH and DHW loads unless the firing rate exceeds a pre-set level. DHW will be prioritized by shutting down of the boiler pump until 1) the call for DHW is satisfied, or 2) the boiler firing rate drops below a much lower pre-set level. "Smart" priority is designed to reduce rapid burner cycling and reduce operation at maximum firing rate.

SECTION 4 The Control Display

4.A The Control Display



The Control Display has a Control Dial (E), 4 Buttons (A,B,C,D), and a Liquid Crystal Display (with 72 back lit segments). This section of this manual gives instructiuon on how to navigate into the many functions of the Boiler and to change temperature set points, set system variables and controller parameters.

Buttons			Functionality	
			PRESS (Tap)	PRESS and HOLD (5 seconds)
A		Display Power	Turns Control Display **ON / OFF**	
B		Modes	Tap to return to menu	(If Display Power was On) **Status Display Mode** (If Display Power was Off) **Installer Mode**
C		Heating Water	CH set-point change mode (Maxium 82°C(180°F))	
D		Time / Date Set	No Change	To SET: Year / Month / Week / Day / Time / Min
E		Scroll / Select	Menu select or value up(+) / down(-) or setting dial.	

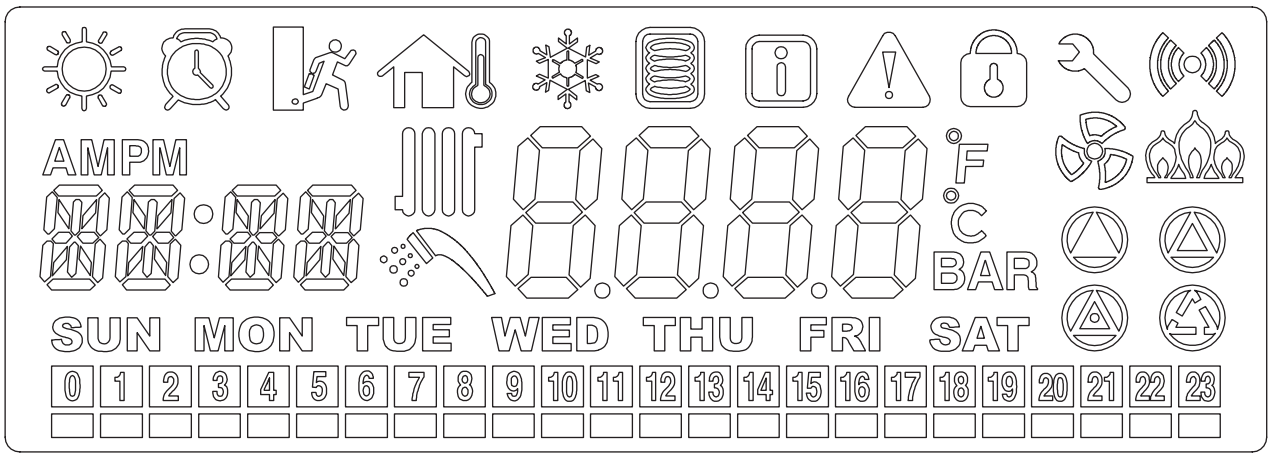
Table 2: Controls

- **Temperature Specifications**
  Operating ambient Temperature Range : -10 to 60°C.
  Operating Relative Humidity up to: 90% at 40°C.
  Shipping & Storage Temperature Range of : -20 to 80°C.

⚠ WARNING

Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control that may have been under water.

4.B The LCD



Symbol	Name	Description
	Service Reminder mode	Service Reminder mode indication
	Outside Temperature Mode	Outside Temp setting indication
	Anti-freeze mode	Anti-freeze mode indication
	Storage mode	Storage mode indication
	Information mode	Information mode indication
	Communication state	Communication state indication
AMPM 88:88	Time setting mode	Time / Display / Install mode indication
	Fan operating mode	Fan operating mode indication
	Flame signal	Flame Signal indication
	System Pump mode	System Pump indication
	DHW Pump mode	DHW Pump indication
	Boiler Pump mode	Boiler Pump mode indication
	L-TT Pump mode	L-TT pump mode indication
°C	Celsius mode	Indicated as Celsius temperature
°F	Fahrenheit mode	Indicated as Fahrenheit temperature
	Heat demand mode	Heat demand mode indication
TUE	DAY mode	Current day mode indication
17	Cascade System connecting mode	Cascade System connecting mode indication
	Cascade System operating mode	Cascade System operating mode indication

The LCD will illuminate when a user action is detected (a button is pressed) and will turn back off after 20 seconds.

SECTION 5 Cascade Programming

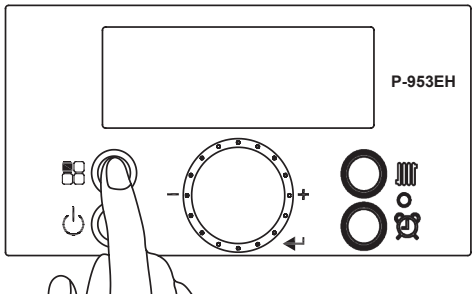
5.A Programming a Cascade System

Before connecting the cascading cables to the boiler, there are 2 items that need to be programmed on all units. Start with the Lead Unit and then Repeat on all Following Units, make sure to power down each unit after completing steps 1 thru 6 below. Once completing steps 1 thru 6 on all boilers, connect the boilers using the cascade cables and power up all boilers.

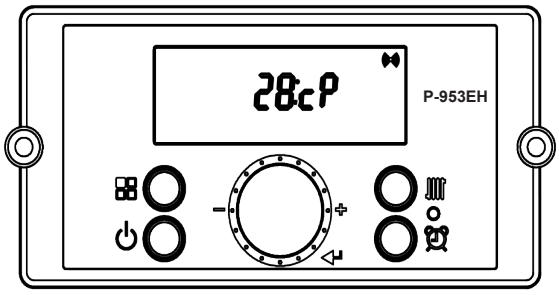
28: cP – (**PARAMETER**) The TOTAL **NUMBER** of units cascaded. Range: 01 - 20,

27: cn – (**NUMBER**) This is each unit's ASSIGNED NUMBER. Default 00. Range: 00 - 19 with 00 as the Leader, 01 (follower 1), 02 (follower 2), etc.

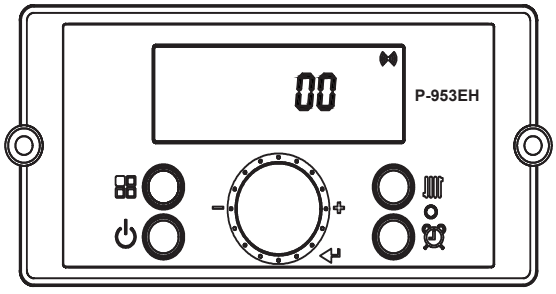
1. **START** by turning OFF the Power ⏻ to the Display Control.
2. Then, with the power OFF, Press and HOLD (5 seconds) the ⊞ button to get into the Installer Mode.



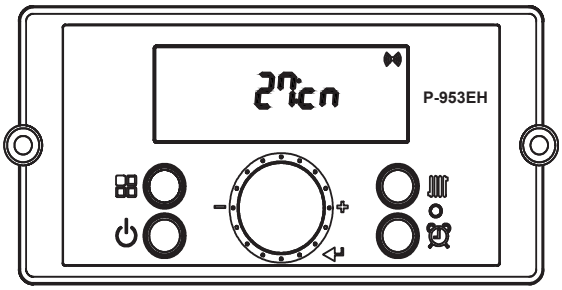
3. Rotate the Dial until you get to 28cP. Tap Dial E to enter into that Parameter.



4. Adjust to the Total Number of Units in the Cascaded System. Range is Default at 01 and goes up to 20 units. then press (tap) the Dial to save and to Exit.



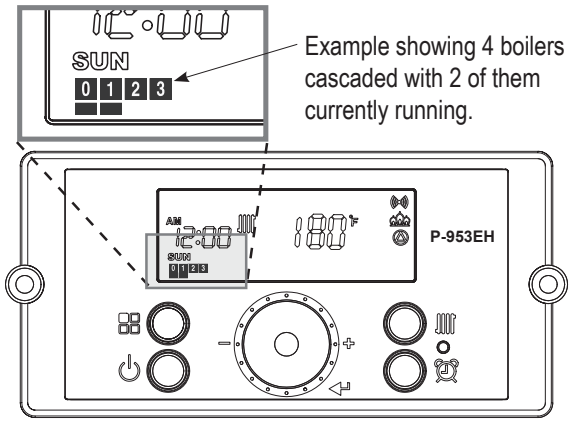
5. Then turn the dial to 27:Cn – Set the Number to 00. The Leader unit should always be addressed to 00. The Following units will then start at 01 and go sequentially from there.



6. Finish by pressing the ⊞ button
7. REPEAT steps 1 thru 6 with all following units in sequence.

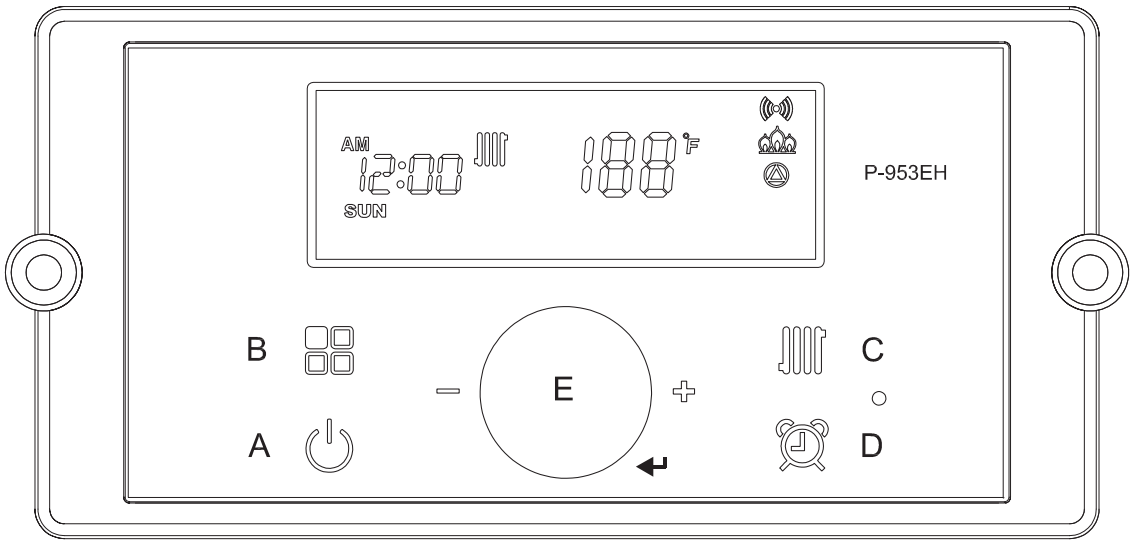
NOTE: Do NOT change 29:Eh (Common Vent).
This Installer Parameter must always be set to 'Off'.

8. When returning to the home screen, you will see properly addressed cascade units displayed in the bottom left corner. The address of each boiler is displayed in a box and a line underneath it indicates that it is firing. If there is no line under it, then it is not firing.



5.B The Cascade CH Function for Set Point Operation

- CH set point Change Mode (This mode is only functional when the outdoor sensor (O/S) is not connected.)
- In accordance with the United States Energy Policy and Conservation Act, this boiler is equipped with outdoor reset capability, a feature that saves energy by reducing boiler water temperature as heating load decreases Refer to Section 5.9 in the FTHW301/399NX Boiler Installation Manual regarding the O/S details.



To change the high temperature CH Setpoint:
• Press the C button once: The CH icon, 1:Ht and its current setpoint value will appear.
• Turn dial E clockwise to increase, and counterclockwise to decrease it value to reach desired set point.
• Press dial E to save the value and exit.

To change the low temperature CH Setpoint (if applicable):
• Press the C button twice: The CH icon, 2:Lt and its current setpoint value will appear.
• Turn dial E clockwise to increase, and counterclockwise to decrease it value to reach desired set point.
• Press dial E to save the value and exit.

Indicate	Indicator
Current CH Temperature Set point	180°F
Celsius or Fahrenheit	°C or °F
If Communication state is activated	
If flame is detected	
Date and Time indicator	AMPM 00:00
If CH pump is operating	
If there currently a Demand for Central Heat (CH)	

Default value for CH 1:Ht is 140°F (60°C). Factory set range is 130°F to 180°F (54°C - 82°C).
If applicable, default value for CH 2:Lt is 86°F (20°C). Factory set range is 40°F to 180°F (45°C - 82°C).

Index Numbers		Parameter	Description
17: bo		Set differential temperature to turn burner “ON”	When set, the appliance will operate to heat CH water when water temperature falls below a differential setting. Example: If set point is 180°F and differential is 27°F, the appliance will turn on when CH water temperature falls below 153°F. Range: 5°F - 30°F, Default 30°F
30:Cr	Cr:at	Automatic rotation (default)	The first unit to operate when there is a T/T call is the unit that ran the least amount of time during the prior heat calls (burner ON time). Default auto
	Cr:Ct	Cascade Rotation time	Cascade Rotation time, Range: 0-240 Hours, Default 48Hours
31: Ct		Cascade System temperature	Cascade System temperature: Range: 95°F – 180°F, Default 180°F
32: Cd		Cascade System Temperature Differential (burner ON)	Cascade System Temperature Differential (burner ON) Range: 5-30°F, Default 10°F

5.C Outdoor Reset Operation:

It is required to connect the cascade sensor for cascade operation, and outdoor sensor for outdoor reset operation. Once connected, the Lead boiler will communicate the values automatically to the Follower boiler(s). If the outdoor sensor is NOT used, set Parameter 31 to desired cascade temperature.
Follow the instructions in the FTHW301/399NX Installation and Operation Manual (Section 5.7) to program the Lead boiler to set up the desired heating curve.

5.D Domestic Hot Water ‘Storage Mode’ for Cascade System.

The boiler cascade system can be set up for Domestic Hot Water by using either a DHW Sensor or DHW Aquastats with a tank. Note that they are setup differently.

The default DHW priority time is 30 minutes and can be adjusted from 0 to 60 minutes using parameter 24: dP, see parameter table below.

Using an Aquastat
When using a DHW aquastat, the aquastat monitors the temperature of the indirect water heater. Connect the DHW aquastat to the “DHW Temp Sensor” terminals of the boiler piped to the indirect water heater. When using a DHW aquastat, Parameter # 39 (39:SA) must be set to “AquA”. The boiler setpoint temperature during a DHW demand is determined by Parameter #25 (25:ST). Connect the DHW Pump to the “DHW Pump” terminals of the boiler piped to the indirect water heater. A relay is required if the DHW pump draws more than 2 amps. Confirm the aquastat is fully inserted in the tank well to ensure accurate temperature readings.
If the DHW load exceeds the capacity of one boiler in a multi-boiler cascade system, multiple boilers can be configured to respond to the DHW demand using the following steps:
- Confirm the indirect water heater, DHW pump, and piping between the boilers and the indirect water heater are all properly sized for the combined flow and output of the boilers.
- Wire the aquastat in parallel to the “DHW Sensor” terminals of each of the boilers selected to respond to a DHW demand.
- Wire the DHW pump to the “DHW Pump” terminals of the first among the boilers selected to handle the DHW load. A relay is required if the DHW pump draws more than 2 amps.
  The boiler(s) to which the aquastat is connected will switch to DHW production, allow the burner to ramp up in modulation and increase the output temperature in response to a DHW demand. In addition, each of these boilers will switch power to their respective DWH Pump terminals. Boilers that are NOT connected to the aquastat will continue to operate for space heating and try to maintain cascade system temperature.

5.D Domestic Hot Water 'Storage Mode' for Cascade System (continued)

Using a DHW Sensor (thermistor type)
When using a DHW sensor, the boiler monitors the temperature of the indirect water heater. Connect the sensor to the "DHW Temp Sensor" terminals of the boiler piped to the indirect water heater. When using a DHW sensor, Parameter # 39 (39:SA) must be set to "SEnS". The temperature of the DHW in the indirect water heater is determined by Parameter #21 (21:dh) in the table below. The sensor differential is determined by parameter #22 (22:dd) in the table below. The boiler setpoint temperature during a DHW demand is determined by Parameter #25 (25:st) in the table below. Connect the DHW Pump to the "DHW Pump" terminals of the boiler piped to the indirect water heater. A relay is required if the DHW pump draws more than 2 amps.
Confirm the sensor is fully inserted in the tank well to ensure accurate temperature readings.

Domestic Hot Water Parameters
For a complete list of parameters, reference the FTHW301/399NX Series Installation and Operation Manual 1538.

Index Numbers	Parameter	Description
21: dH	Indirect Storage Tank Temperature Set Point	Sets Maximum Indirect storage tank Temperature Range: 95 - 180°F, Default 120°F
22: dd	Indirect Storage Tank Differential Set Point	DHW Differential Set Point Range: 5°F-30°F, Default 7°F
23: Pr	DHW Pump Post Run Time	DHW Pump Post Run Time Range: 0-10 Min, Default 1 Min
24: dP	DHW Priority Timer	DHW Priority Timer Range: 0 – 60 Min, Default 30 Min
25: St	Boiler Set-point Temperature for DHW Demand	Boiler Set-point Temperature for DHW Demand, Range: 120°F– 180°F, Default 180°F

Table 3: Index Parameters.

5.E 'L-TT or motorized mixing valve Mode' for Cascade System.

The boiler cascade system can be set up for L-TT circuit by using both a L-TT Sensor, 24V motorized mixing valve and L-TT pump.
When using a L-tt temp sensor, the L-tt temp sensor monitors the temperature of the mixed water.
Connect the L-tt temp sensor to the "L-tt Temp Sensor" terminals of the boiler piped to the L-tt circuit. When using this mixing valve functionality, Parameter # 42 (42:MI) must be set to "ON". Connect the L-tt Pump to the "L-TT Pump" terminals of the boiler piped to the L-tt circuit. A relay is required if the L-tt pump draws more than 2 amps.
Confirm the L-tt temp sensor is fully attached on the pipe surface to ensure accurate temperature readings.
Boilers that are NOT connected to the L-tt circuit will continue to operate for space heating and try to maintain cascade system temperature.

L-TT Parameters
For a complete list of parameters, reference the FTHW301/399NX Series Installation and Operation Manual

Index Numbers		Default	Parameter	Description
P40:LH	180°F (82°C)	180°F (82°C)	L-T/T Maximum Supply Temperature	Sets the maximum supply temperature for the L-T/T curve based on minimum outdoor temperature. Range: (Minimum supply temperature - 9°F) to 180°F.
P41:LL	130°F (54°C)	40°F (4.5°C)	L-T/T Minimum Supply Temperature	Sets the minimum supply temperature for the L-T/T curve based on maximum outdoor temperature. Range: 40°F to (Maximum supply temperature - 9°F).
42 : MI		Off	Mixing Valve	Mixing valve on/off set, Range: ON ~ OFF
43 : LT		7°F (4°C)	L-T/T Differential Set Point	L-T/T Differential Set Point, Range: 5-30°F

5.F Cascade System Error Codes

For a complete list of error codes, reference the FT Series Installation and Operation Manual 1342.

Er:30	System Sensor Short	**NOTE:** This error will only appear if the boiler is used in a cascaded system. This Error Code will go away when system sensor is repaired or replaced. 1. Check system temperature sensor. Ensure connections are secure. 2. Check system sensor resistance. If resistance is zero, replace the sensor. 3. If the problem persists, replace the main control. **NOTE:** During the error state the units will continue to operate. Boiler setpoint will be the same as the system sensor setpoint until the issue is remedied. During normal operation boiler setpoint is defaulted to 20°F higher than the system setpoint to a maximum of 180°F setting.
Er:78	Cascade Communication Error	**NOTE:** This error will only appear in a cascaded system. 1. Turn power OFF and ON at the boiler display panel. 2. If error reappears, ensure all cascaded boilers are powered ON. 3. If error reappears, check Installer Mode parameter 28 at the Leader boiler. Ensure the number of cascaded units chosen in this parameter matches the number of cascaded units in the system. 4. If error reappears, check Installer Mode parameter 27 at all cascaded boilers. Ensure the address number matches that of the connected boiler (00 for Leader, 01 for Follower 1, etc.) and that no numbers are skipped or repeated. 5. Ensure every unit in the cascade system is connected properly. Inspect the cascade cables and ensure all are connected without damage or defect. Repair or replace any damaged cables. 6. If the problem persists, contact technical support.

Notes: