



**GRANBY**  
HEATING PRODUCTS



**CONFORTO**



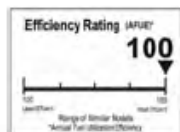
# AT Series Electric Boiler

Technical Presentation



- **100% Efficient electric heat**
- Compact Wall Hung Design
- **Zero Emissions - Green Alternative**
- Ideal for radiant systems and for use as a backup heat source for solar applications
- Advanced Microprocessor Control
- Advanced Load Managing Controller:
  - Offers an option to allow your electric utility or co-op to remotely control the boiler reducing peak demands
- Proven one piece cast iron heat exchanger

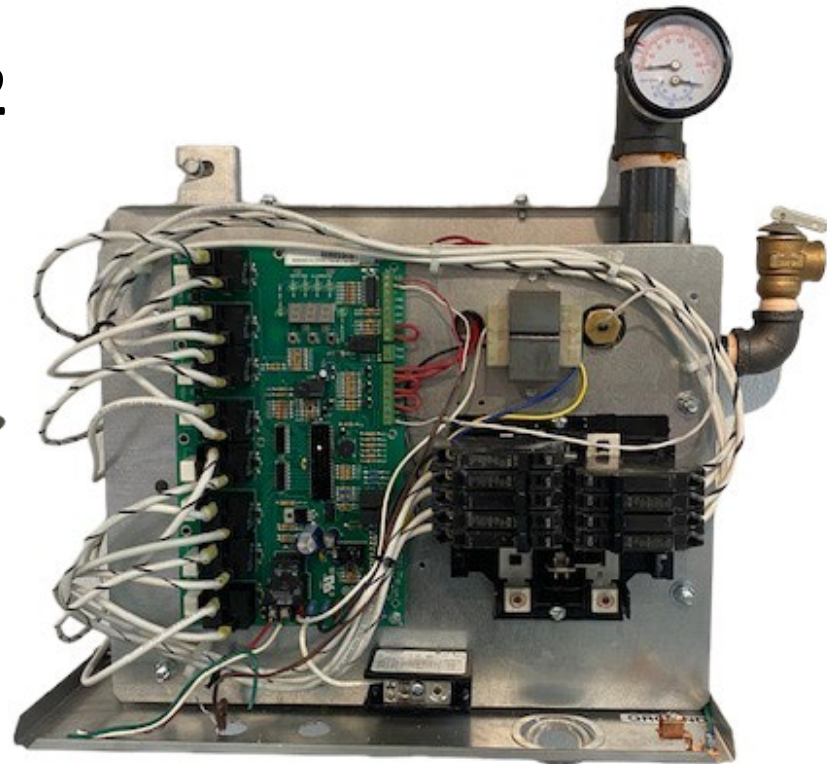
20,500 Btu/h – 136,400 Btu/h  
(6KW – 40 KW)



**4 Element  
Element**

**OR**

**2**



**AT Series: 2-Element Boiler**

Item #	Boiler Size Nominal (kW)	Operating Voltage (AC)*	New Heat Output BTU/hr	Power Input Watts	Total Heating Element Amps	Number of Elements	Element Size (Watts)	Minimum Circuit Ampacity	Suggested Breaker (Amps)
AT062310C15	6	240	20,500	6,000	25	2	3,000	38.8	40
AT082410C15	8	240	27,300	8,000	33.3	2	4,000	49.2	50
AT102510C15	10	240	34,100	10,000	41.7	2	5,000	59.6	60
AT122610C15	12	240	41,000	12,000	50	2	6,000	70	70

**AT Series: 4-Element Boiler**

AT124310C15	12	240	41,000	12,000	50	4	3,000	70	70
AT164410C15	16	240	54,600	16,000	66.7	4	4,000	90.8	100
AT204510C15	20	240	68,200	20,000	83.3	4	5,000	111.7	125
AT244610C15	24	240	82,000	24,000	100	4	6,000	132.5	150

**AT Series: 4-Element Boiler**

AT280010C15 (A)	28	240	95,600*	-	-	-	-	-	-
AT320010C15 (B)	32	240	109,200*	-	-	-	-	-	-
AT400010C15 (C)	40	240	136,400*	-	-	-	-	-	-

\*NOTE: Ratings are based on 240V operating voltage. Refer to the IOM for reduced ratings based on 208V operating voltage.

**AT Series: 4-Element Boiler**

AT280010C15 (A)	28	240	95,600*	-	-	-	-	-	-
AT320010C15 (B)	32	240	109,200*	-	-	-	-	-	-
AT400010C15 (C)	40	240	136,400*	-	-	-	-	-	-

**\* 2 Piece Boiler System** Ratings are combined system values. Reference individual boiler specifications.

(A) 2 Piece Boiler System consisting of (1) AT1243 & (1) AT1644

(B) 2 Piece Boiler System consisting of (2) AT1644

(C) 2 Piece Boiler System consisting of (2) AT2045

- Three-character LED display
- Three button User Interface
- Error code display
- Element Staging and Rotation
- Dual set points for comfort heating and domestic hot water
- Setting for Fahrenheit or Centigrade temperature scales
- Water temperature heating range 90°-180°F (32-82°C)
- Dry fire protection
- Connections for flow sensor and low water cutoff
- Load management control connection with auxiliary heat source connection
- Freeze protection
- Circulator pump terminals
- 40VA transformer
- Three wire thermostat connection
- Audible alarm
- Pump exercising
- Post Pumping
- Relay contact monitoring
- Non-Volatile memory



- On a call for heat
  - Pump is powered for 30 seconds (Pre-Purge)
  - Control will energize heating elements (2 or 4 depending on boiler size) in sequence based on temperature rise and target time of 5 minutes to reach setpoint
  - As water temperature approaches setpoint the control will begin to de-energize heating elements to prevent water temperatures from exceeding setpoint temperature
  - Control will then cycle heating elements on-off to maintain but not exceed set point temperature
  - Once call for heat is satisfied the control will de-energize all elements, the circulator will remain powered for 3-minutes (Post Pump operation)
  - At start of each subsequent heating cycle the lead element to energize will rotate to allow for even duty cycle time over all elements.

- Dry Fire Test detects lack of water in the boiler and prevent elements from energizing if dry condition exists.
- Dry Fire Test Mode must be ON and configuration setting for dFt must be set to Y.
- Dry Fire test is initiated following power outage and can take from 5 to 10 minutes to complete.
- During Dry Fire Test pump is energized and first heating element is pulsed while supply temperature sensor is monitored to determine if water is present in the boiler.
- If failure occurs, “DFF” is displayed and a re-try takes place.
- After three consecutive failures an audible alarm will sound and pump will stop. Power must be removed and dry condition corrected to clear fault code.
- Dry Fire is not a substitute for a low water cutoff sensor control.





# CONFORTO Load management connection

- The Load Management Control feature (LMC) can be used to temporarily deactivate the boiler and place it in stand-by mode. Some utility companies use this feature during peak demand times to load trim the utility's power grid.
- While the load management terminals (LMC) are open the heating elements are prevented from energizing and "LdC" is displayed.
- LMC terminals on boiler are intended to be connected to low volt, normally closed dry contacts of the utility LMC unit.
- Control is equipped with auxiliary set of contacts (T Aux) which can be used to connect a secondary heating appliance.
- The call for heat on TT or DHW terminals is then diverted to the T Aux terminals to energize a secondary heating appliance.

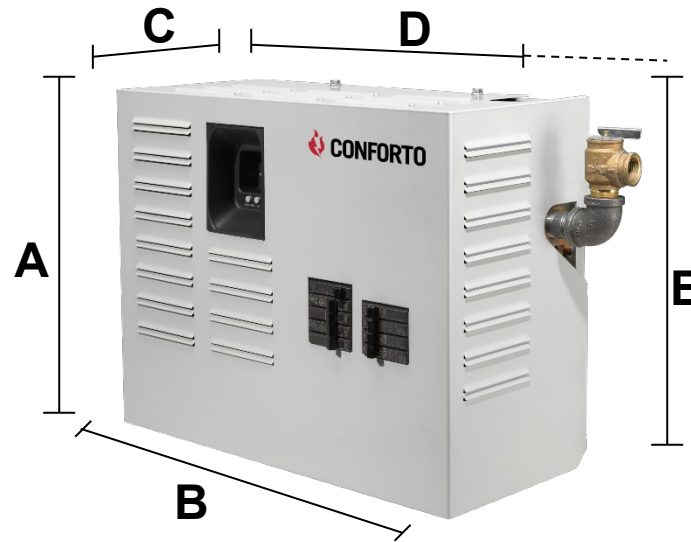
- Freeze Protection
  - If the water temperature falls below 45° F (7° C) the control will automatically initiate a heat call sequence RW (TT) until the water temperature reaches 55° F (13° C). Boiler must be in ON mode for freeze protection to occur.
- Pump Exercising
  - After 24 hours of pump inactivity, the pump will turn on for 60 seconds. Boiler must be in ON mode for pump exercising to occur.

- The control monitors each relay for its' correct status.
- If Relay fails to open or is stuck closed, the control will sound an alarm

- 240 or 208 Volt
  - 208 V Ratings  
25% reduction  
in output

<b>Table 1 -AT Boiler Electrical Specifications</b>														
<b>Operating at 240 Vac</b>														
<b>"AT" Series - 2 Element Boiler</b>														
Model	Boiler Size Nominal kW	Voltage (ac)	Output Power (Watts)	Output Power Btu/h	Amperage 240 Vac	Element Size (Watts) at 240 Vac	Number Elements	Accessory Load (A)	Total Amps	MCA	MOP	<b>*Recommended Wire</b>		
												60°C (140°F) AWG	75°C (167°F) AWG	90°C (194°F) AWG
AT0623	6	240	6,000	20,500	25.0	3,000	2	6	31.0	38.8	40.0	8	8	10
AT0824	8	240	8,000	27,300	33.3	4,000	2	6	39.3	49.2	50.0	6	8	8
AT1025	10	240	10,000	34,100	41.7	5,000	2	6	47.7	59.6	60.0	4	6	6
AT1226	12	240	12,000	41,000	50.0	6,000	2	6	56.0	70.0	70.0	4	4	6
<b>"AT" Series - 4 Element Boiler</b>														
AT1243	12	240	12,000	41,000	50.0	3,000	4	6	56.0	70.0	70.0	4	4	6
AT1644	16	240	16,000	54,600	66.7	4,000	4	6	72.7	90.8	100.0	2	3	4
AT2045	20	240	20,000	68,200	83.3	5,000	4	6	89.3	111.7	125.0	1/0	2	2
AT2446	24	240	24,000	82,000	100.0	6,000	4	6	106.0	132.5	150.0	2/0	1/0	1
<b>Operating at 208 Vac</b>														
<b>"AT" Series - 2 Element Boiler</b>														
Model	Boiler Size Nominal kW	Voltage (ac)	Output Power (Watts)	Output Power Btu/h	Amperage 240 Vac	Element Size (Watts) at 240 Vac	Number Elements	Accessory Load (A)	Total Amps	MCA	MOP	<b>*Recommended Wire</b>		
												60°C (140°F) AWG	75°C (167°F) AWG	90°C (194°F) AWG
AT0623	6	208	4,507	15,400	21.7	3,000	2	6	27.7	34.6	35.0	8	10	10
AT0824	8	208	6,009	20,500	28.9	4,000	2	6	34.9	43.6	45.0	6	8	8
AT1025	10	208	7,511	25,600	36.1	5,000	2	6	42.1	52.6	60.0	6	6	8
AT1226	12	208	9,013	30,800	43.3	6,000	2	6	49.3	61.7	70.0	4	6	6
<b>"AT" Series - 4 Element Boiler</b>														
AT1243	12	208	9,013	30,800	43.3	3,000	4	6	49.3	61.7	70.0	4	6	6
AT1644	16	208	12,018	41,000	57.8	4,000	4	6	63.8	79.7	80.0	3	4	4
AT2045	20	208	15,200	51,200	72.2	5,000	4	6	78.2	97.8	100.0	1	3	3
AT2446	24	208	18,027	61,600	86.7	6,000	4	6	92.7	115.8	125.0	1/0	1	2

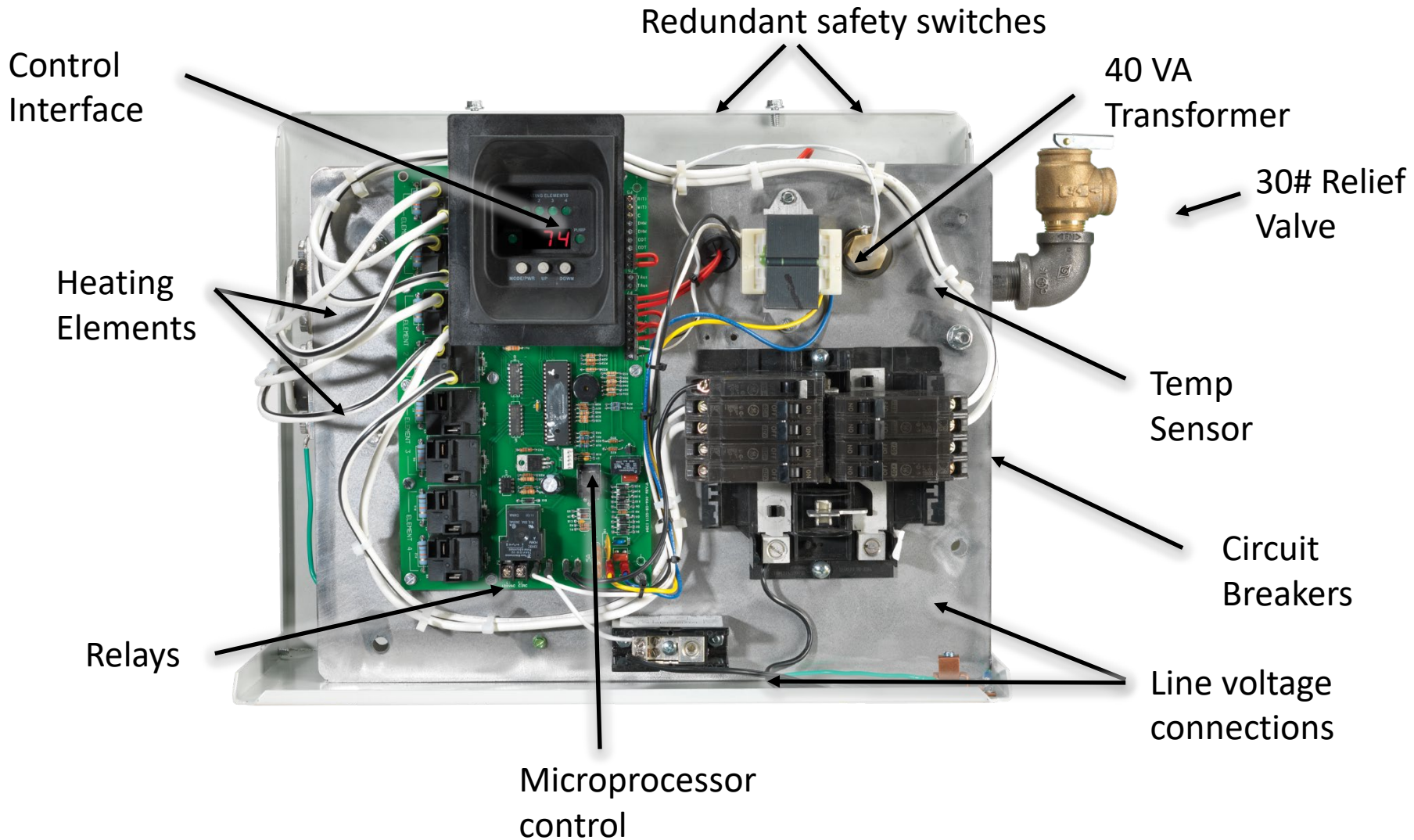
Same “Footprint” for all Output sizes...!



*DIMENSIONS*

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>14-5/8"</b>	<b>18-5/8"</b>	<b>9-1/32"</b>	<b>14-3/8"</b>	<b>16-15/32"</b>
37.1cm	47.3cm	22.9cm	36.5cm	41.8cm

Shipping Weight approx.: 62, 70  
(2 & 4 Element)



# CONFORTO AT Series Boiler Control Panel



## Heating Element LED Indicators 1-4

- Lights when heating element is operating

## Heating Demand LED Indicator

- Lights when there is a demand for central heating or domestic hot water

## Pump LED Indicator

- Lights when boiler pump is operating

## LED Display

- Indicates water temperature in °F or °C, set point, mode and diagnostic codes

## Up/Down Adjustment Buttons

- Used to select set point and configure boiler

## Mode/Power Button

- Turns boiler on and off, selects mode and configuration settings



## One piece block casting

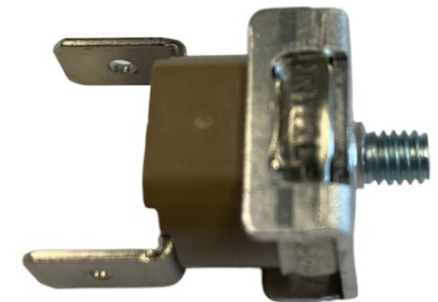


## Durable foil-faced insulation

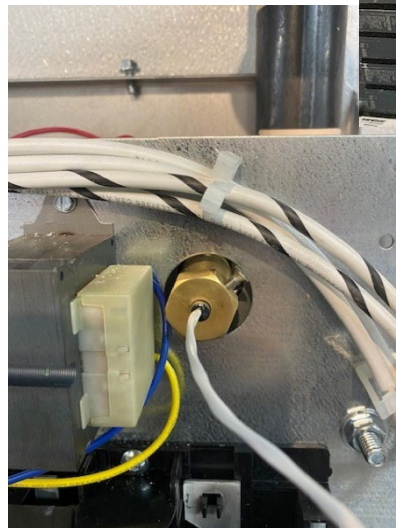
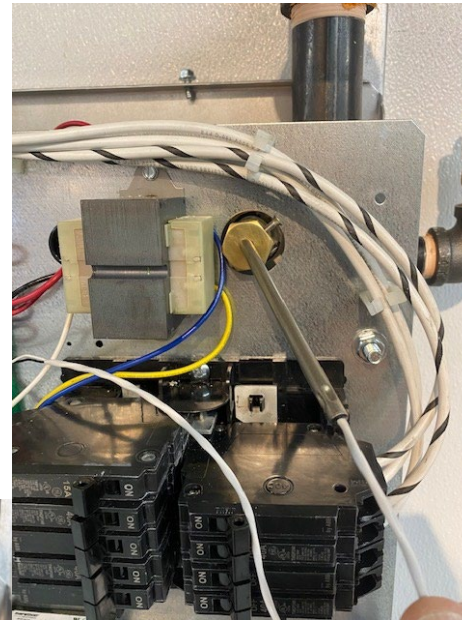




- Fixed to top of HEX
- Qty: 2
  - Redundant safety
- Fixed Setting: 200 F (96 C)
- Auto-reset
  - ~ 20-degree F
- Screw in replacement
- Surface mount
  - Not in direct contact with water

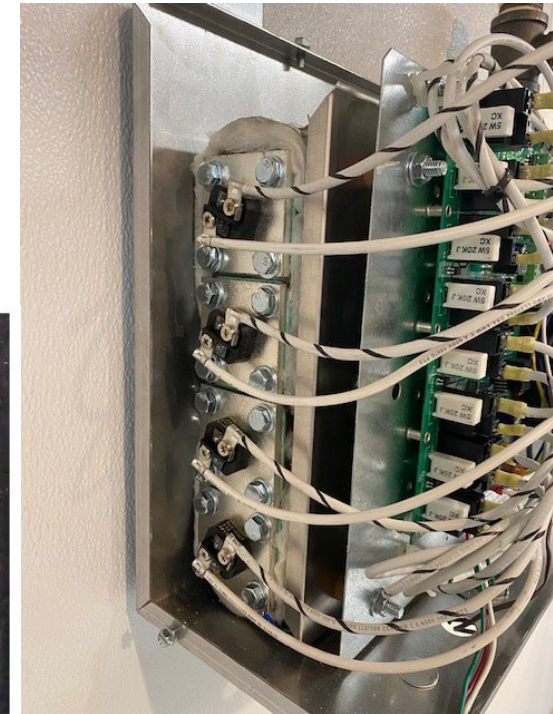
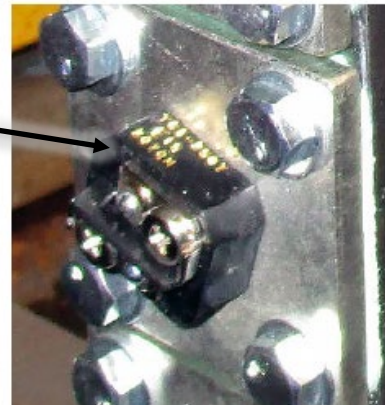


- Water Temp Sensor
  - 10K NTC sensor
- Connects to HL terminals on control board



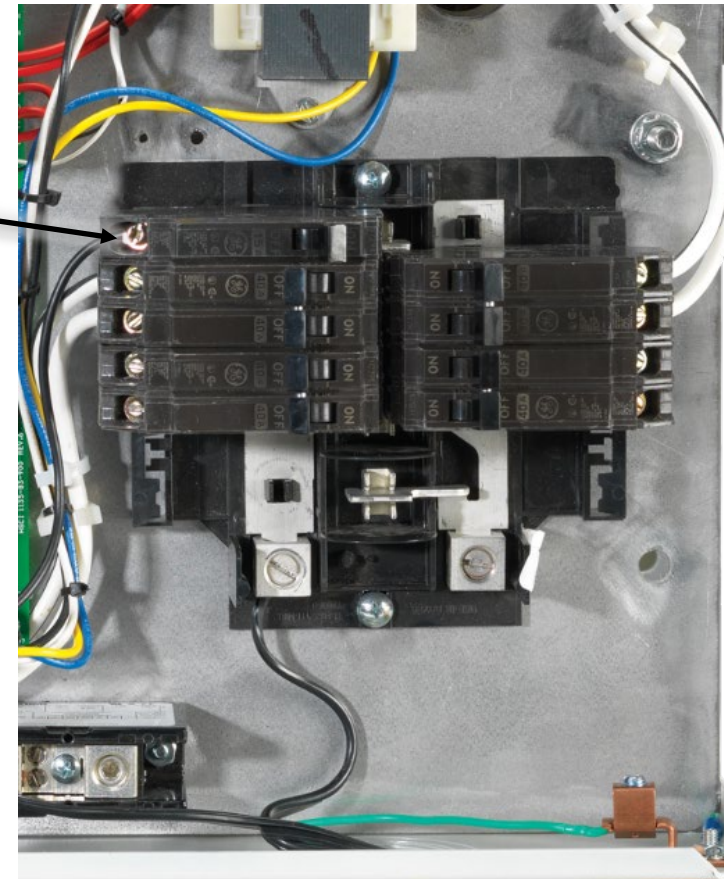
Temp (°C)	Temp (°F)	Ohms ( $\Omega$ )
0	32.0	32,650
5	41.0	25,392
10	50.0	19,901
15	59.0	15,712
20	68.0	12,493
25	77.0	10,000
30	86.0	8,057
35	95.0	6,531
40	104.0	5,326
45	113.0	4,368
50	122.0	3,602
55	131.0	2,986
60	140.0	2,488
65	149.0	2,083
70	158.0	1,752
75	167.0	1,480
80	176.0	1,255
85	185.0	1,070
90	194.0	916
95	203.0	787
100	212.0	679

- 4 sizes
  - 3, 4, 5, & 6 kw (240V)
- Not proprietary but not a off-the-shelf part
- NOTE: When replacing position with markings on top



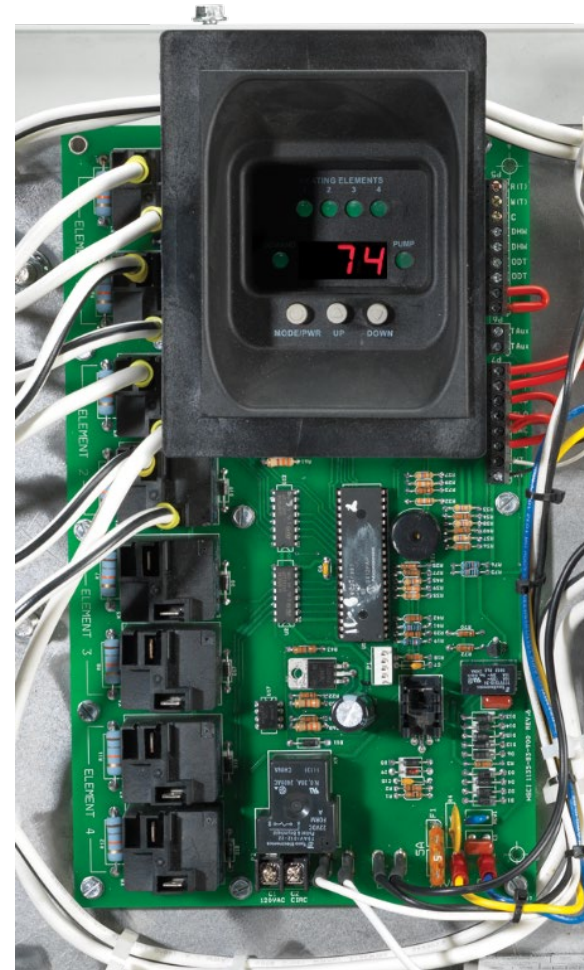
- 15A breaker for control board power
- 40A double pole breakers to heating elements relays on control board

15A, 110 V to control board

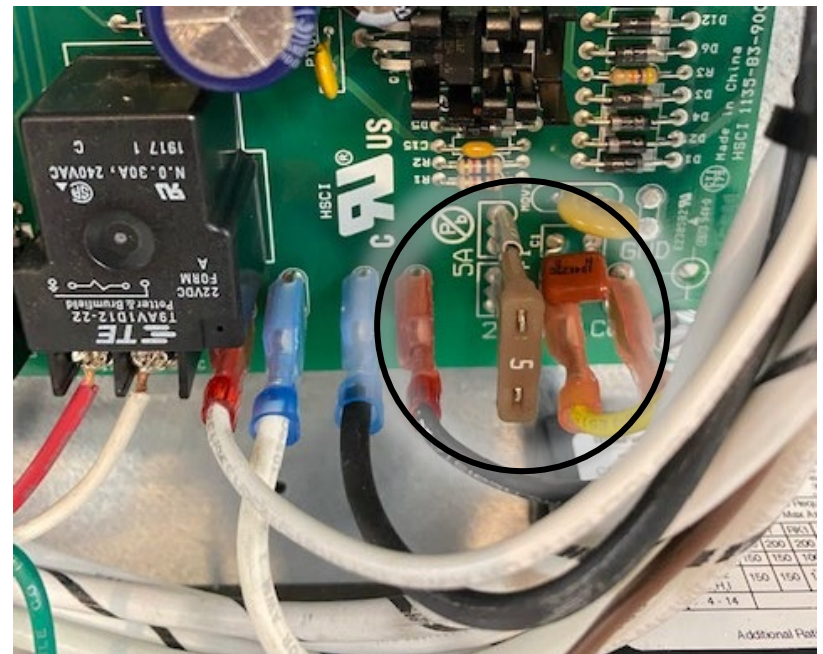




- Two sizes
  - 2 element
  - 4 element
- Replacement kits include wires

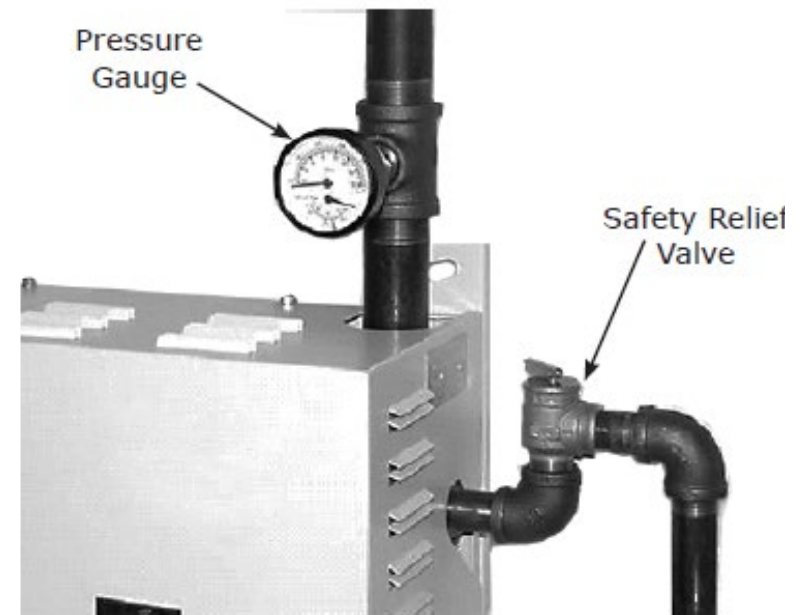


- Protects Control board
  - Activate due to shorts on low volt (24v) side.
  - Protect Transformer
  - Helps protect circuit board
- Standard 5 amp fuse



# CONFORTO Temperature & Pressure Gauge

- Comes with boiler
  - T & P Gauge
    - 1-1/4" x 6" Supply nipple
  - 30# Relief Valve
    - 3/4" x 2" pipe nipple
    - 3/4" Elbow



The AT Series boiler is intended to be wall mounted and has integral wall mount brackets.



### Key points:

- System water pressure – 15 to 25 psig
- Propylene glycol – max 40%
- Operate boiler with maximum output temperature of 180 degrees F or less and a temperature rise across the unit of 20 degrees F

**The AT Series boiler is required to be installed as a primary/secondary system**

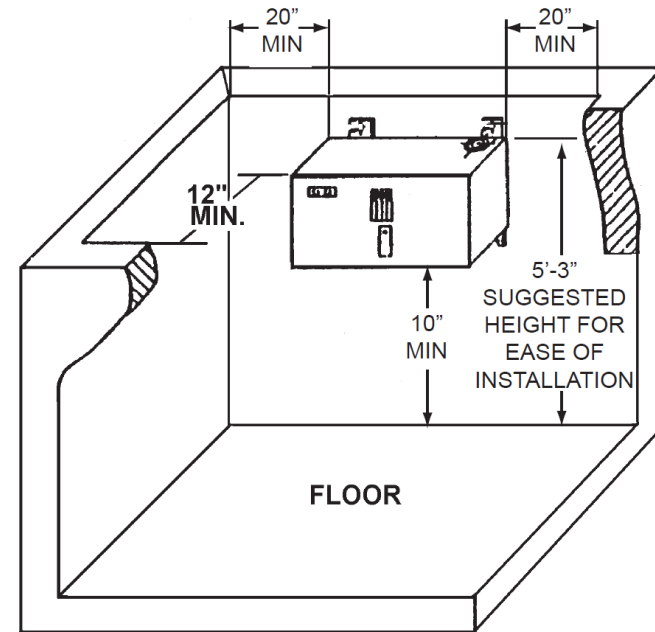


Minimum Clearances to combustible constructions are:

Top.....	16 in
Front.....	12 in
Left Side.....	20 in
Right Side.....	20 in
Rear.....	0 in
Bottom.....	10 in

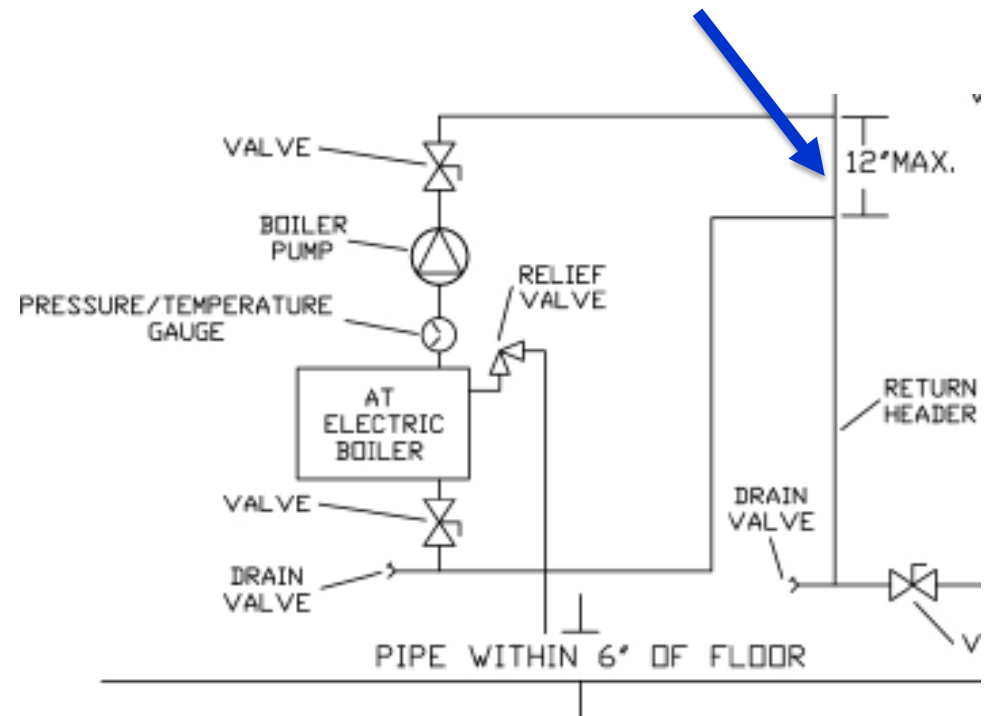


## BOILER LOCATION & CLEARANCE DIMENSIONS

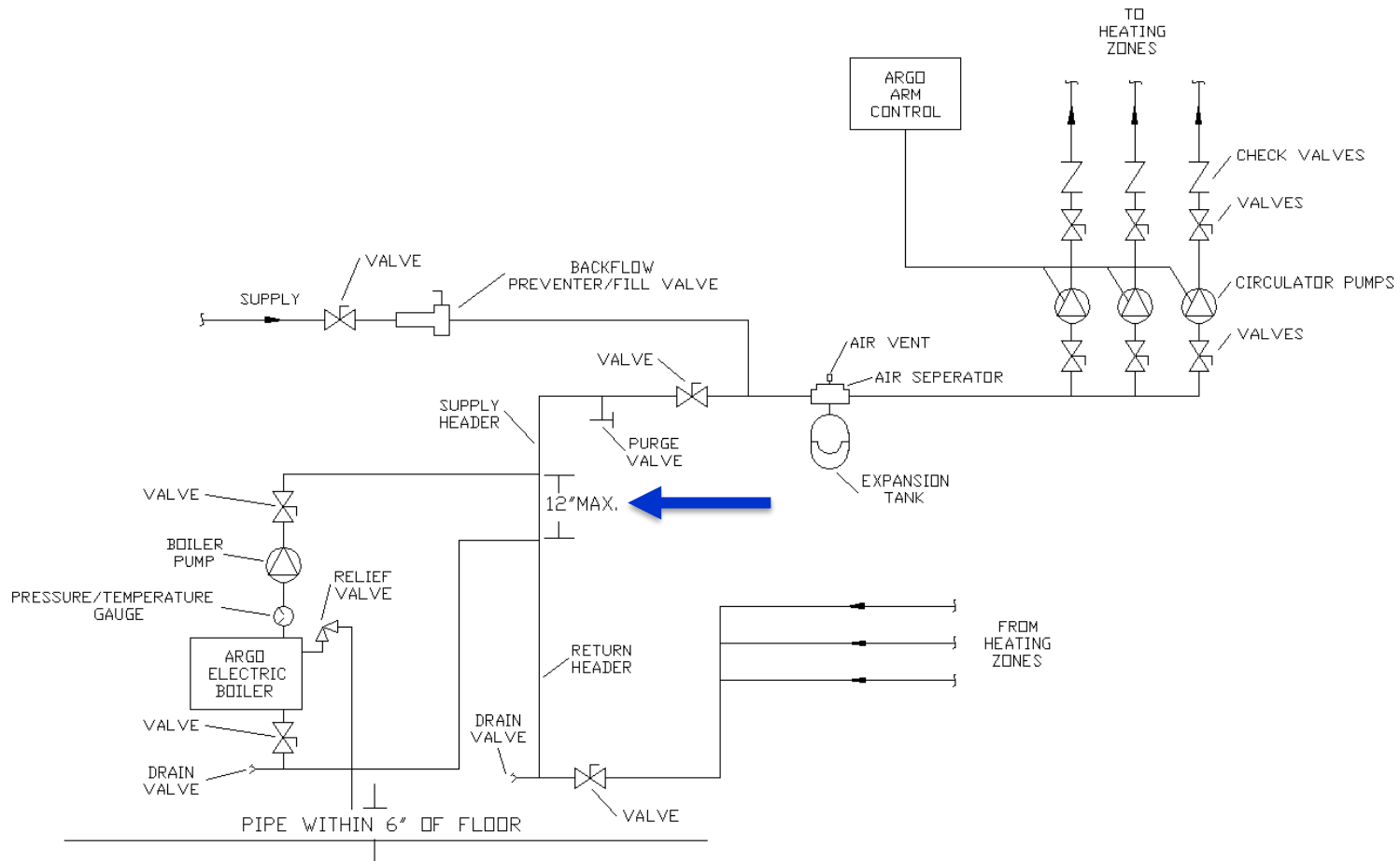


**NOTE:** Greater clearances for access should supersede fire protection clearance.

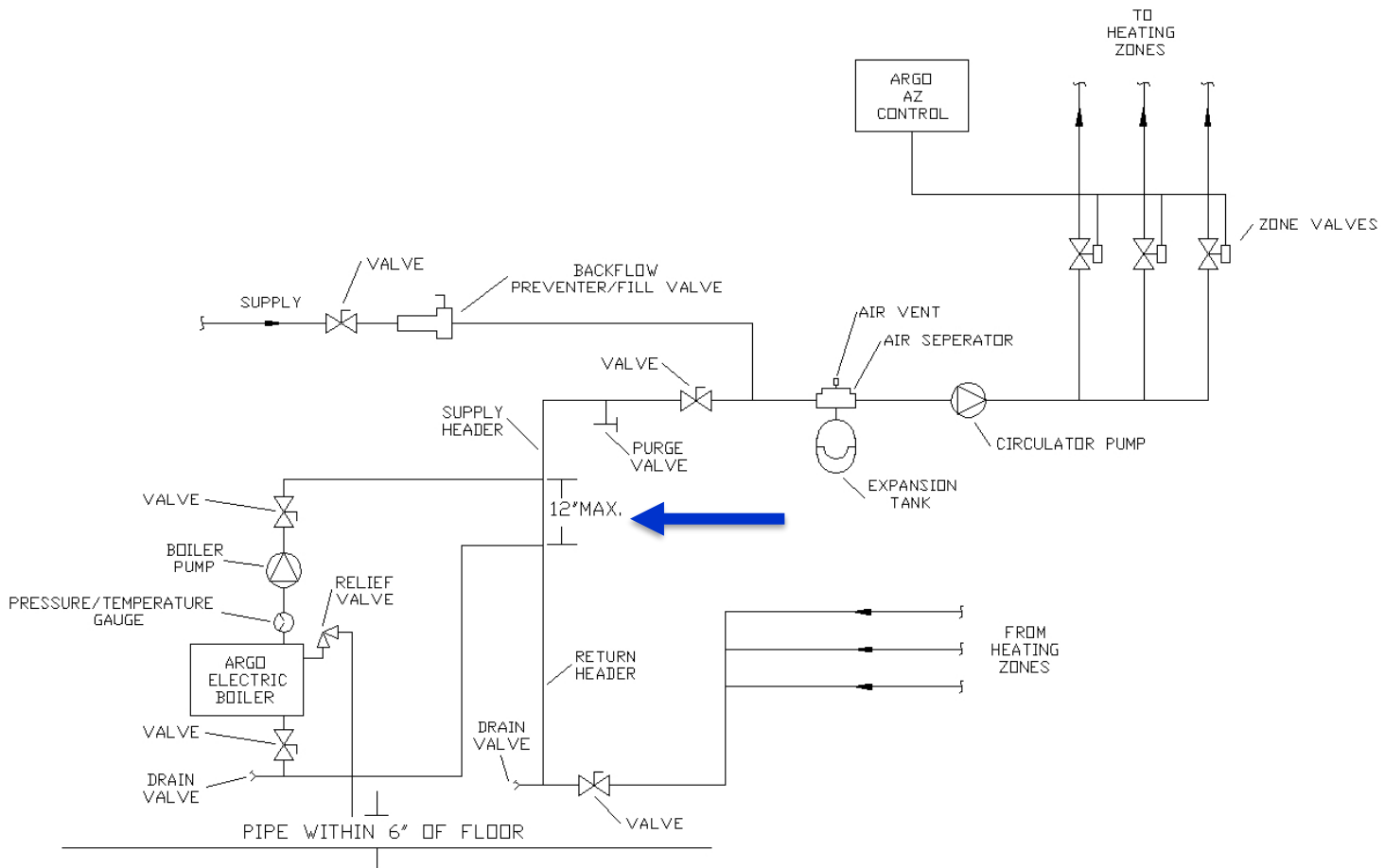
- Post pump operation extends the life of the heating elements
  - Requires a pump be wired to the boiler
  - Requires flow through piping after call for heat
- Pump exercising to extend life of pump
- Primary-Secondary piping required



## PRIMARY/SECONDARY PIPING FOR MULTIPLE ZONING WITH CIRCULATORS



## PRIMARY/SECONDARY PIPING FOR MULTIPLE ZONING WITH ZONE VALVES



Boiler connection  
piping is: 1 1/4"

"AT" Series - 2 Element Boiler	
kW Capacity	Minimum Flow Rate (gpm)*
6	2.0
8	2.7
10	3.4
12	4.1

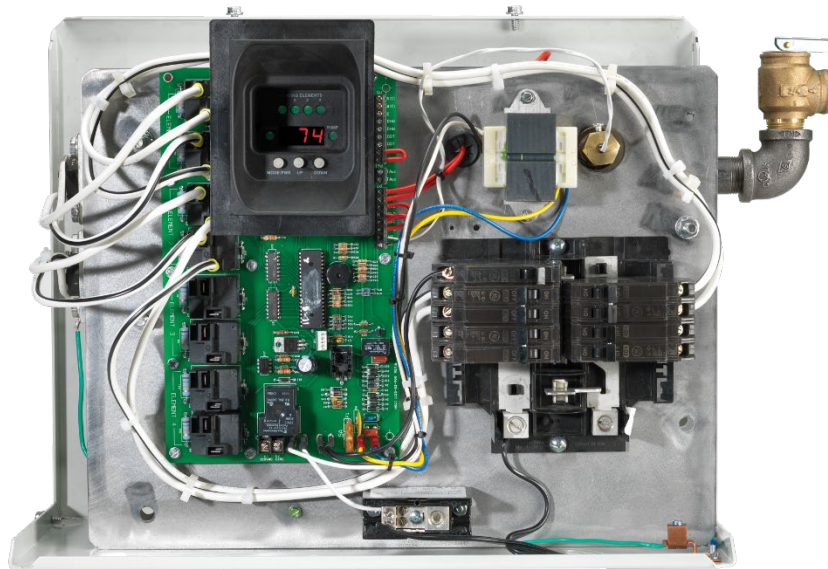
"AT" Series - 4 Element Boiler	
kW Capacity	Minimum Flow Rate (gpm)*
12	4.1
16	5.5
20	6.8
24	8.2

\* Flow rate based on 20°ΔT

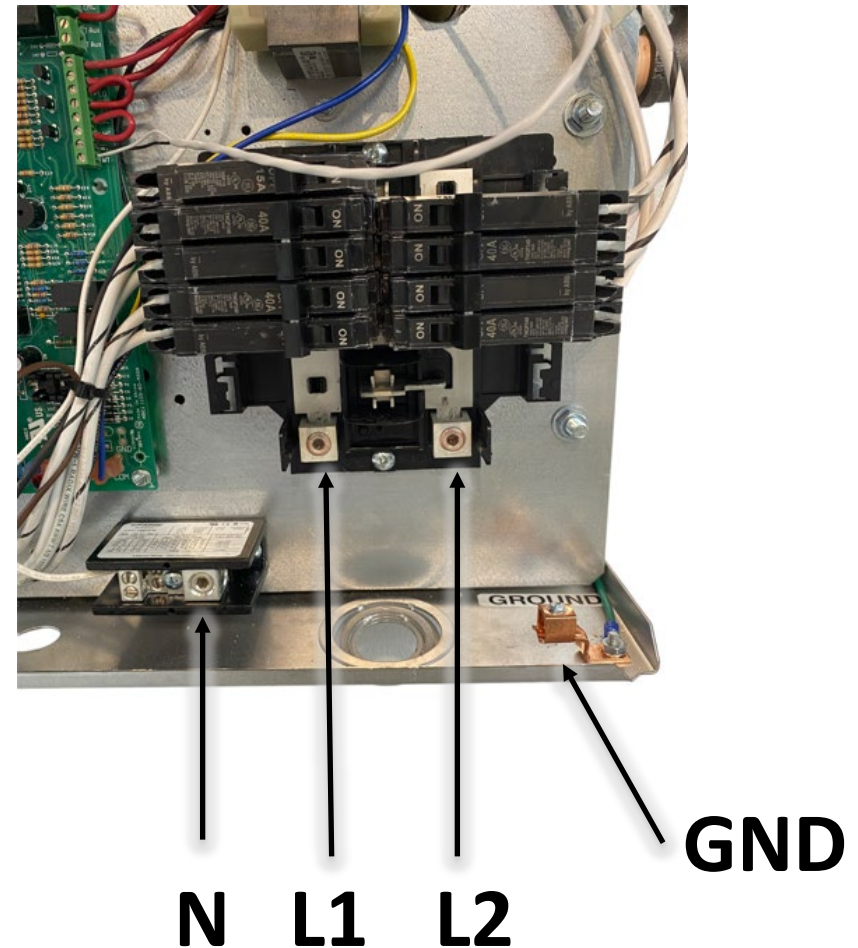
**Note:** See Figure 18, pg. 27 for typical pump curve

**⚠ WARNING**

Electrical shock hazard. Turn OFF electrical power supply at main power switch before servicing unit. Service shall be preformed by a qualified service agent. Failure to do so could result in death or serious injury.



- Copper Conductors Only.  
Never Use Aluminum Wire.
  - Note: Aluminum wire may be used to bring power to a sub panel located near the boiler, then use copper to connect the sub panel to the boiler.
- 240 or 208 volt
- See spec sheet for main breaker size (40 – 150a)



AT Series – 2 Element Boilers					
Model	Size- KW	Voltage	60°C -AWG	75°C -AWG	90°C -AWG
AT0623	6	240	8	8	10
AT0824	8	240	6	8	8
AT1025	10	240	4	6	6
AT1226	12	240	4	4	6

AT Series – 4 Element Boilers					
Model	Size- KW	Voltage	60°C -AWG	75°C -AWG	90°C -AWG
AT1243	12	240	4	4	6
AT1644	16	240	2	3	4
AT2045	20	240	1/0	2	2
AT2446	24	240	2/0	1/0	1

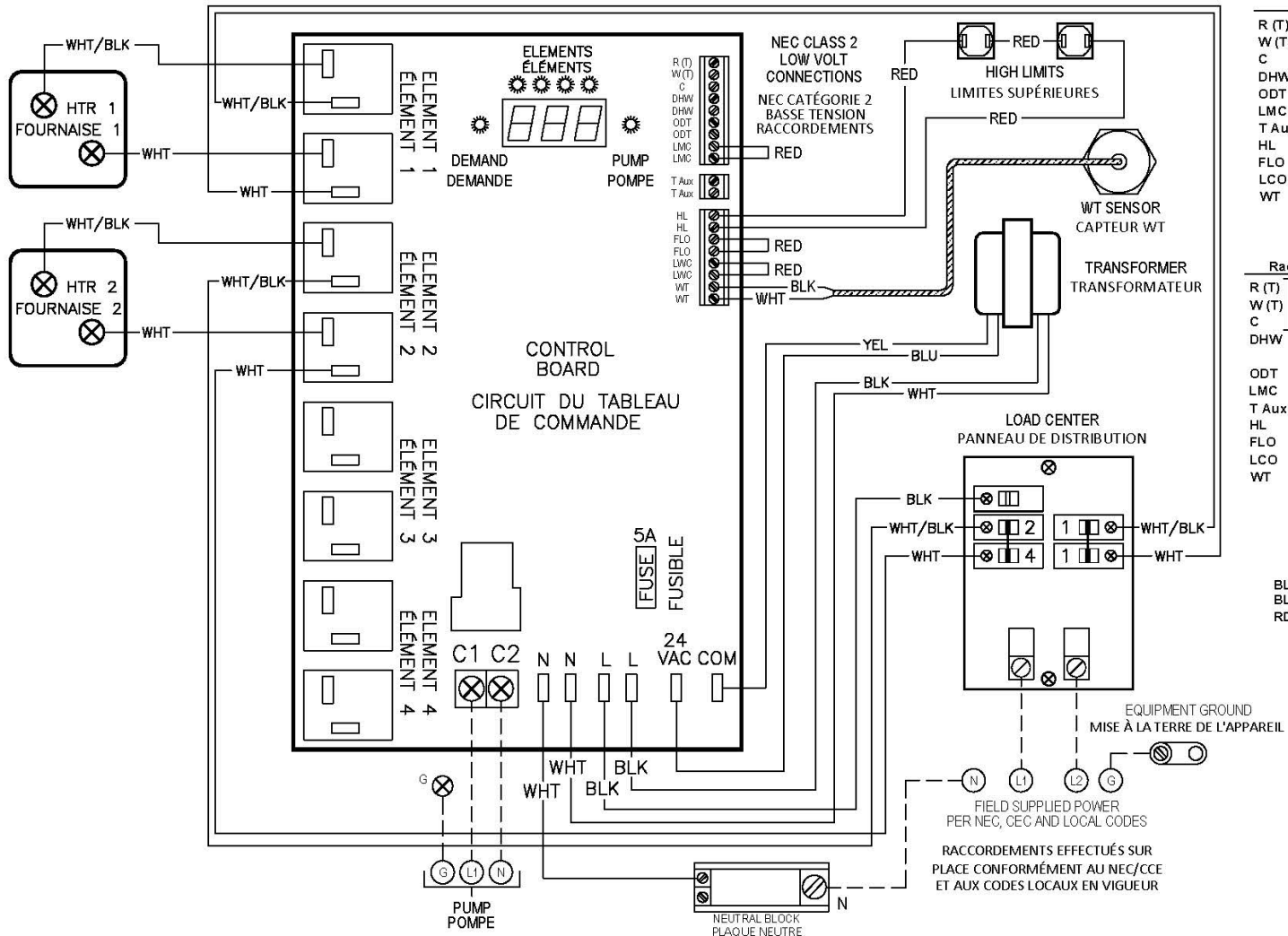


AT Series – 2 Element Boilers					
Model	Size- KW	Voltage	60°C -AWG	75°C -AWG	90°C -AWG
AT0623	6	208	8	10	10
AT0824	8	208	6	8	8
AT1025	10	208	6	6	8
AT1226	12	208	4	6	6

AT Series – 4 Element Boilers					
AT1243	12	208	4	6	6
AT1644	16	208	3	4	4
AT2045	20	208	1	3	3
AT2446	24	208	1/0	1	2

## 2-ELEMENT BOILER



### Low Volt Connections

R (T)	}	Comfort Heating Thermostat
W (T)		
C	}	Domestic Hot Water Thermostat
DHW		
ODT	}	Not Used
LMC		
T Aux	}	Load Management Control
HL		
FLO	}	Auxiliary Appliance
LCO		
WT	}	High Limit
	}	Flow Alarm
	}	Low Water Alarm
	}	Water Temperature Sensor

### Raccordements de basse tension

R (T)	}	Thermostat de chauffage tout confort
W (T)		
C	}	Thermostat à eau chaude domestique
DHW		
ODT	}	Inutilisé
LMC		
T Aux	}	Commande de gestion de charge
HL		
FLO	}	Appareil auxiliaire
LCO		
WT	}	Limite supérieure
	}	Alarme de débit
	}	Alarme de manque d'eau
	}	Capteur de la température de l'eau

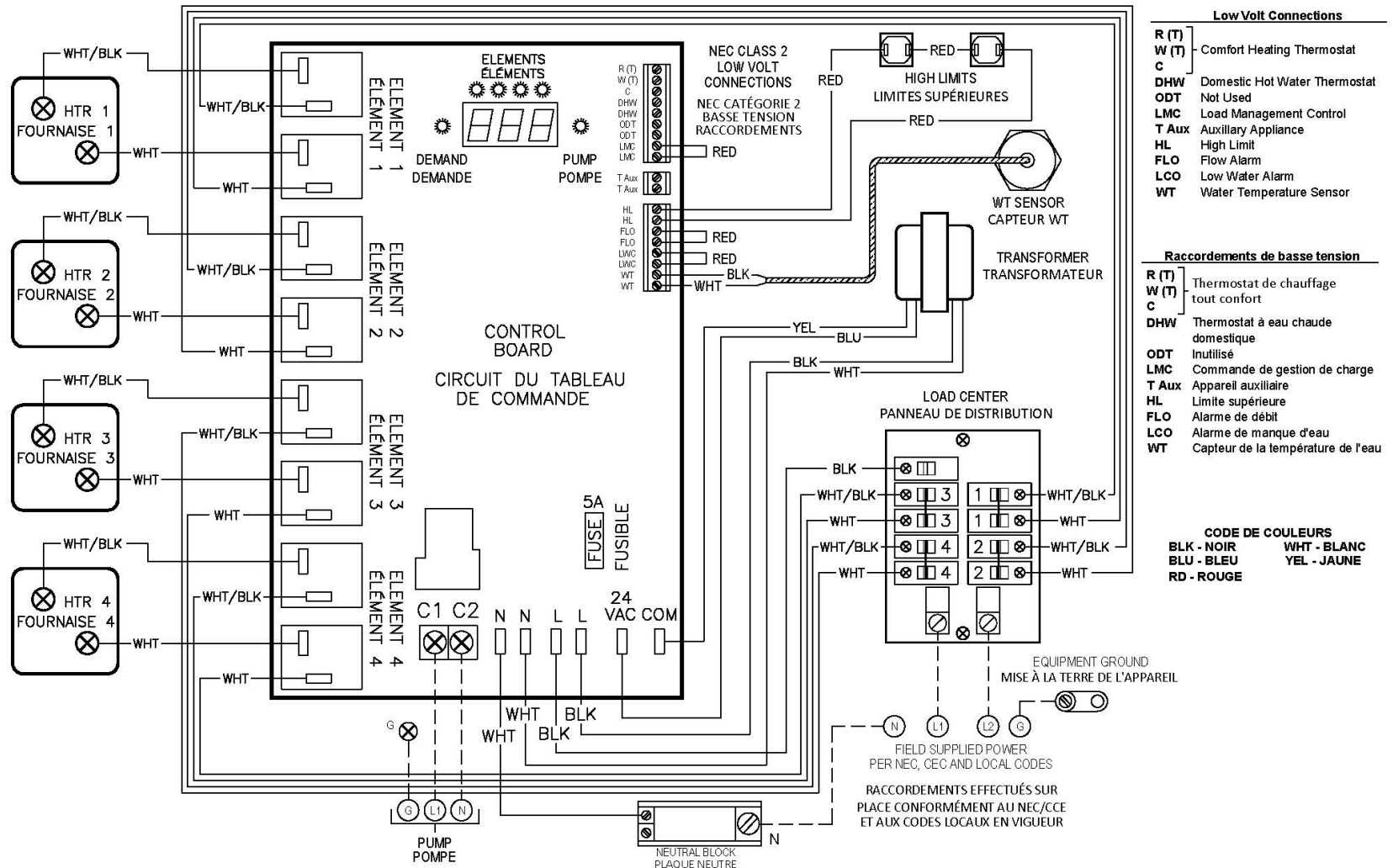
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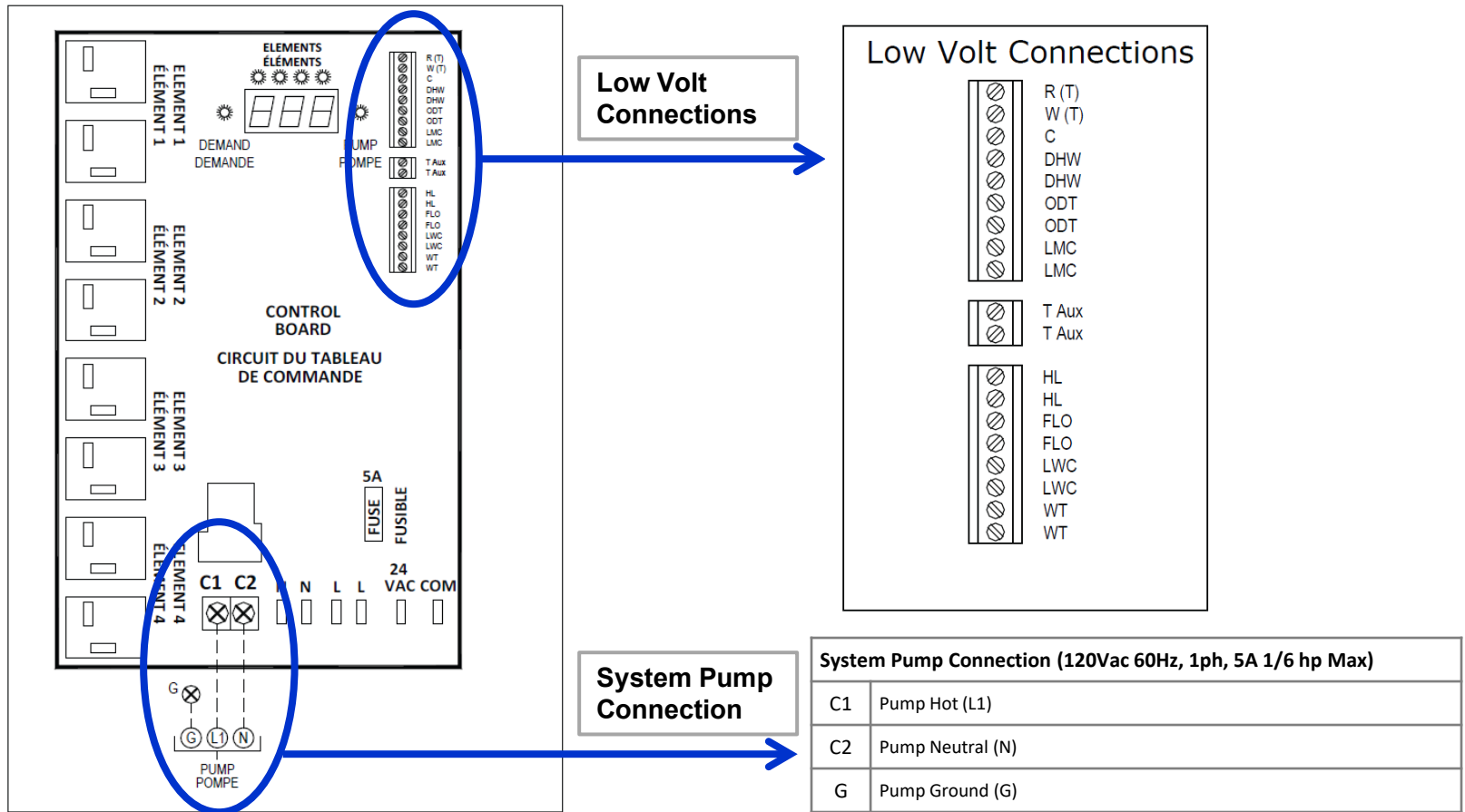
BLK - NOIR	WHT - BLANC
BLU - BLEU	YEL - JAUNE
RD - ROUGE	

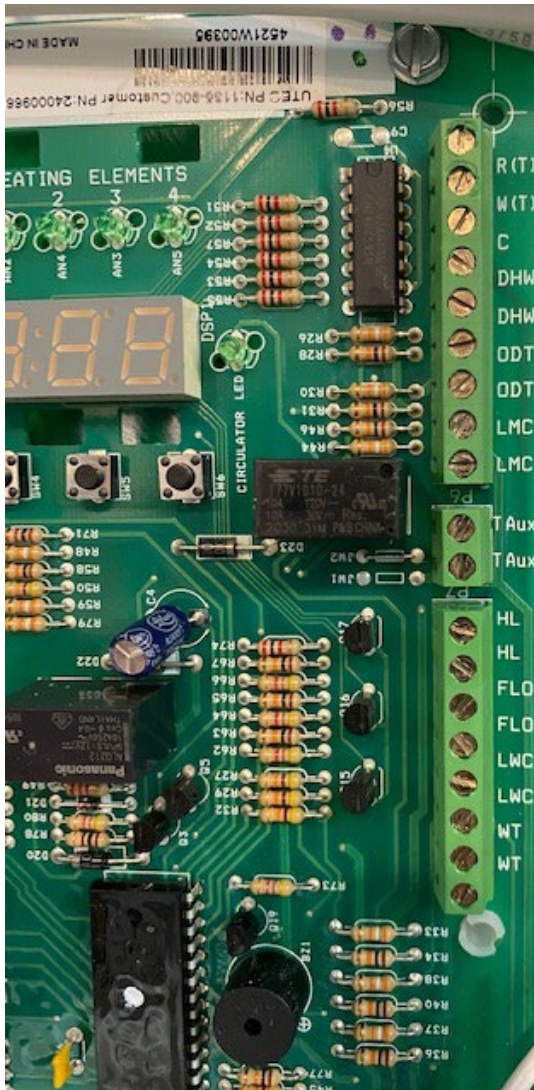
FIELD SUPPLIED POWER  
PER NEC, CEC AND LOCAL CODES

RACCORDEMENTS EFFECTUÉS SUR  
PLACE CONFORMÉMENT AU NEC/CCE  
ET AUX CODES LOCAUX EN VIGUEUR

## 4-ELEMENT BOILER



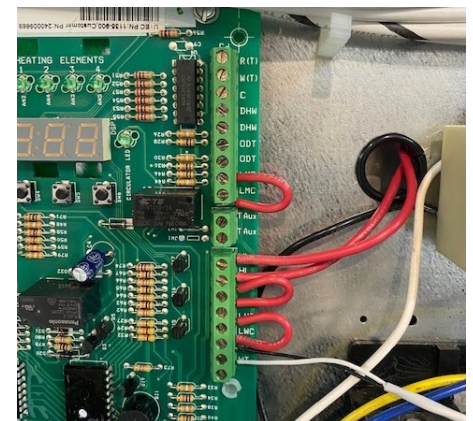




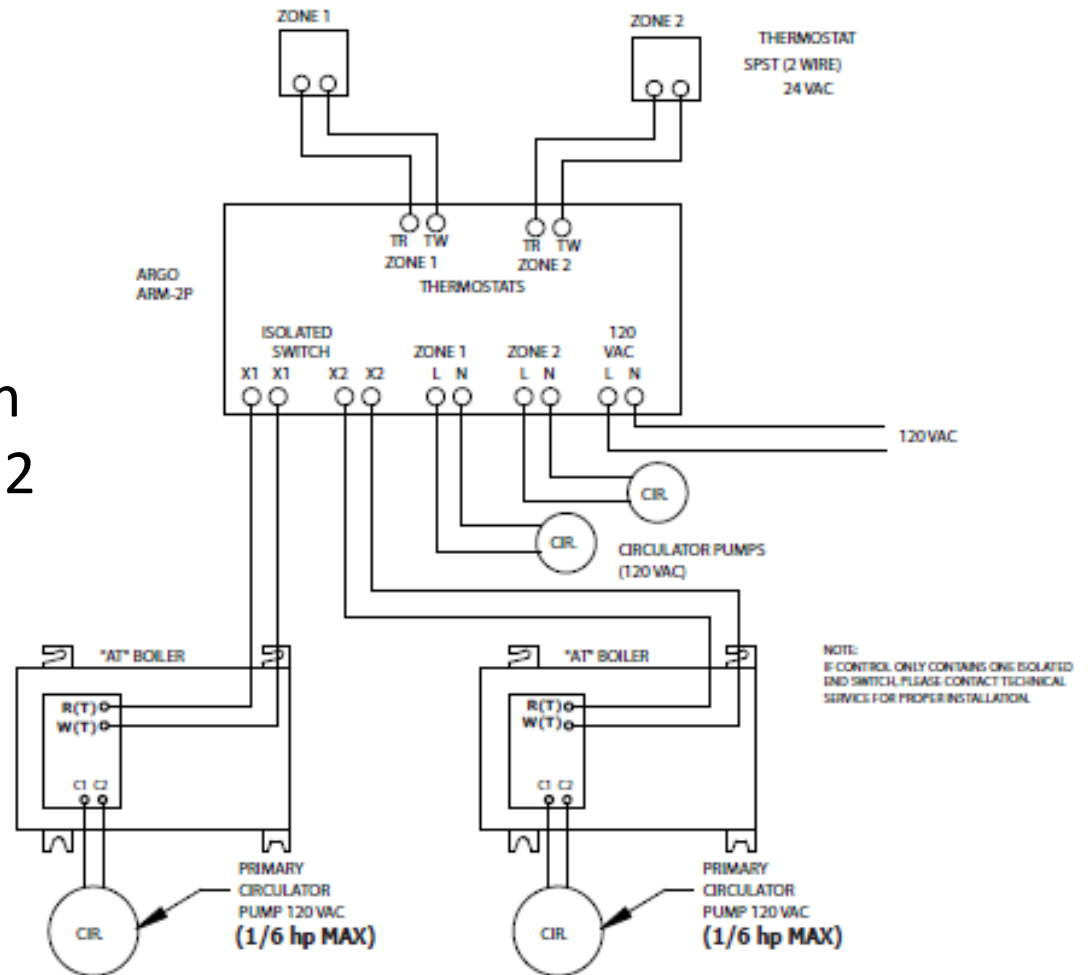
- } R-W-C: CH T-stat
- } DHW T-stat
- } ODT: Not Used
- } LMC\*: Load Management Control Input  
(Dry NC contact)
- } TAux: Auxiliary appliance T-stat
- } HL: Safety High Limits
- } FLO\*: Optional Flow switch
- } LWC\*: Optional LWCO
- } WT: Water Temp sensor

\* Factory Jumped

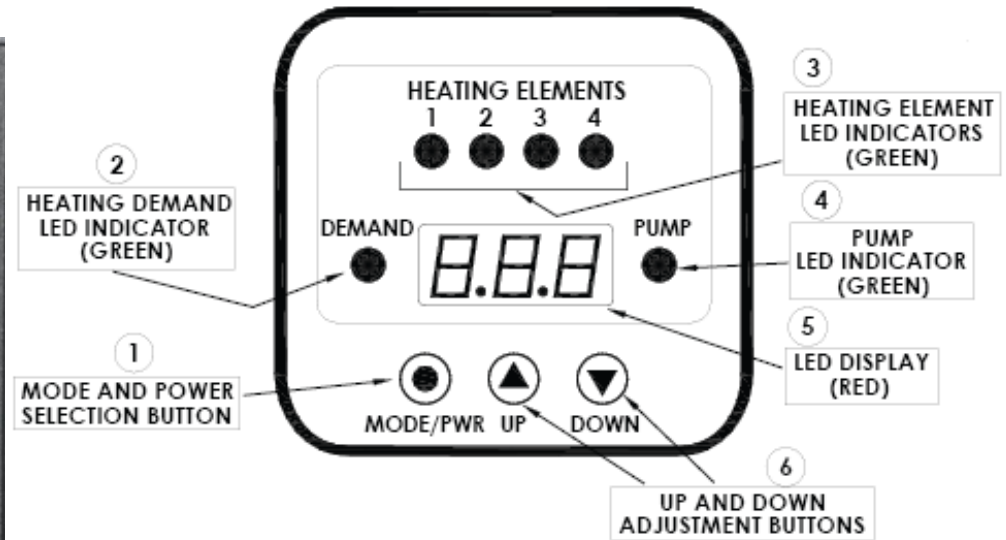
## Factory Wiring



- Utilize Argo ARM 2P control for two-boiler operation
  - Multiple ARM or AZ controls can be used in conjunction with ARM2







1	Mode and Power Selection Button – Turns the boiler on and off, selects mode and configuration settings
2	Heating Demand LED Indicator – Energized when there is call for comfort heating or domestic hot water
3	Heating element LED Indicators – Energized with corresponding heating element
4	Pump LED Indicator – Energized with boiler pump relay
5	LED Display – Indicates water temperature, set point, mode, and error codes
6	Up and Down Adjustment Buttons – Used to select temperature set point for comfort heating, domestic hot water and configuration selections.

Display	Description	Range	Note
On	Boiler in On mode		
Off	Boiler in Off mode		
CHS	Comfort Heating Setting	90-180°F (32-82°C)	Control prevents setting from being higher than Domestic Hot Water setting
dHS	Domestic Hot Water Setting	90-180°F (32-82°C)	Control prevents setting from being lower than Comfort Heating setting
dFS	Differential Setting	4-20°F (2-11°C)	Applies to CHS & dHS
DEG	Degrees Temperature scale	F or C	
Stg	Heating Element Stages	2 or 4	
EL	Active Elements	1-2 or 3-4	Only available if Stage is 2
dFt	Dry Fire Test		Displayed when power initially applied
LdC	Load Management	Displayed when LMC terminals open	De-activates heating elements. Diverts TT to TT-Aux for secondary appliance
F	Degrees Fahrenheit		
C	Degrees Centigrade		
1 - 2	Elements 1 & 2 Active	Two element boiler only	
3 - 4	Elements 3 & 4 Active	Four element boiler only	



User Settings	Display	Possible Value	Factory Setting	Overview
On/Off Mode	ON	ON	OFF	Press and hold the MODE/PWR button for 2 seconds to turn the unit On or Off.
	OFF	OFF		
<p>Note: When electrical power has been removed and re-applied, when the unit is turned on it will automatically enter a dry fire test mode (if dFt is on, see Configuration). The display will flash dFt. To bypass the test, Press and hold the up▲ or down▼ arrow buttons for 2 seconds.</p>				
<p>To access the following: Unit must be in the "ON" Mode. Press the MODE/PWR button to select setting.</p>				
<p>Press the up▲ or down▼ arrow buttons to change setting.</p>				
<p>Press the MODE/PWR button to save setting. Display will flash three times to confirm setting is saved</p>				
<p>Automatically exits and saves after 5 seconds.</p>				
CHS – Comfort Heating	CHS	90-180°F 32-82°C	150°F	Press the MODE/PWR button to select setting. Press the up▲ or down▼ arrow buttons to change setting. Hold the button to scroll rapidly
DHW – Domestic Hot Water	dHW		170°F	
DFS – Differential Setting	dFS	4-20°F	10°	
		2-11°C		

## To access the configuration mode:

- Unit must be in “OFF” Mode
- Press and hold Up & Down arrow buttons for 10 seconds
- Press Up or Down arrows to choose selection
- Press Mode/Power to enter selection; press Up or Down to change setting then press Mode/Power to save it.
- To exit press and hold Up & Down buttons for 2 seconds. Control automatically saves and exits after 10 seconds.

DEG – Temperature Scale	C	C	F	Press the Up ▲ or Down ▼ arrow buttons to change setting
	F	F		
STG – Number of Heater Elements	2	2	2 or 4	Press the Up ▲ or Down ▼ arrow buttons to change setting
	4	4		
EL – Active Elements	1-2	1-2	1-2	Available only if STG is 2. Press the Up ▲ or Down ▼ arrow buttons to change setting.
	3-4	3-4		
DFT – Dry Fire Test Active/ Inactive	On/Off	On	On	Press the Up ▲ or Down ▼ arrow buttons to change setting
		Off		

## Flow Sensor

- A flow sensor can be installed to deactivate the boiler if water is not flowing correctly. Connect the sensor to the FLO terminals on the board. When the control contacts open the heating elements are prevented from energizing and “FLO” is displayed. The flow sensor input is not active during pre and post purge modes. The sensor contacts should be low voltage dry contact.

## Low Water Cutoff

- A low water cutoff device can be wired to the LCO terminals to deactivate the boiler if water is not present at the sensor. When the LWCO contacts open, the heating elements are prevented from energizing and “LCO” is displayed. The LCO input is active only when the boiler is attempting to energize the elements, and is NOT active during the pre and post purge modes.

## **Anti Short Cycle Timer – Heating Call Satisfied**

- After the completion of a comfort heating or domestic hot water cycle, the heating elements shall remain off for a minimum of three (3) minutes. The ASCT time begins when the last heating element de-energizes. The pump shall be allowed to run during the ASCT period.

## **Anti-Short Cycle Timer - Water Temperature Satisfied**

- While a heating call exists (TT or DHW-TT closed) and an element cycles off to maintain setpoint temperature, it will not re-energize for 90 seconds.

## **Non Volatile Memory**

- If power is lost, after it is restored the unit will return to the mode it was in prior to power loss. All user settings shall be retained and restored.

## Test Mode

- Test mode is intended for installer verification of T Boiler control. It is used to reduce time required to conduct comprehensive function test of the unit. Initiation of test mode can be accessed through the user interface and is not intended for unauthorized personnel.
- To enter test mode unit must be energized and in OFF mode. Press and hold ▲ up arrow button for 4 seconds. The firmware version is displayed for 3 seconds then element configuration (“2” or “4”) is displayed. Pressing either ▲ up or ▼ down arrow buttons change the element configuration (2 or 4). Select configuration that coincides with boiler.
- Press MODE/PWR button, display will illuminate all segments 8.8.8 along with demand LED (TT).
- Pressing MODE/PWR button again, “tSt” is displayed. Check is made of Flow Sensor circuit, Low water cutoff sensor circuit, High limit circuit, Load management circuit and water temperature sensor. If any circuit is open or temperature sensor is shorted the display will indicate an error code (FLO, LCO, HL, LdC, tSO, tSS) and audible alarm will sound.
- Pressing MODE/PWR button again enters element check sequence. Each element heating circuit is checked for power. If the element does not have power error is displayed (“r1”, “r2”, “r3”, “r4”) and audible alarm will sound.
- When test is completed “On” is displayed. Pressing MODE/PWR button will repeat the test. Pressing ▲ up arrow button exits test mode and returns to off mode. Control automatically exits test after 4m. Removing power exits test mode.

Display	Failure	Alarm	Boiler state	Action Required
r1	Element-1 relay failure	Audible Alarm	ON	Check all circuit breakers. Reset power by cycling pump circuit breaker (15A) or pressing and holding MODE/PWR button for 2 seconds. Call for service if problem persists
r2	Element-2 relay failure	Audible Alarm	ON	
r3	Element-3 relay failure	Audible Alarm	ON	
r4	Element-4 relay failure	Audible Alarm	ON	
dFF	Dry Fire Failure	Audible Alarm after 3 attempts	ON	Correct fault, reset power
tSO	Temperature sensor open	Audible Alarm	ON	Replace temperature sensor
tSS	Temperature sensor shorted	Audible Alarm	ON	
AbP	Abnormal Power	Audible Alarm	Control voltage outside the range of 18-30Vac	Verify all circuit breakers are on. Call for service if problem persists
FLO	Flow Switch Open	Audible Alarm	Flow switch open (Installer item)	Check water flow
LCO	Low Water Cutoff Open	Audible Alarm	Low Water Cutoff open (Installer item)	Check water level
HL	High limit(s)	Audible Alarm	High Limit(s) Open	Auto Reset, Call for service
CHF	Control Hardware	Audible Alarm	Control Hardware Failure	Call For Service
FP	Freeze Protection	No Audible Alarm	Water temperature below 45°F (27°C)	Control energizes pump and heating mode until WT reaches 55°F

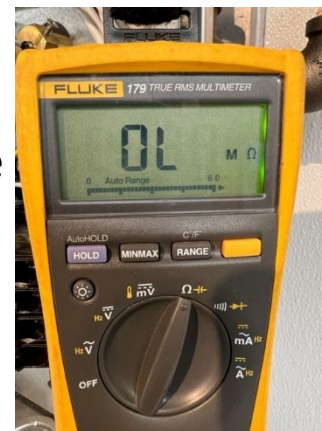
**HL Error code** - Checking Block Hi-Limit sensor string (top of boiler block)  
Snap-Disc –trips at 200 degrees F (resets at 170 degrees F)




Limit string  
“Closed”



Limit string  
“Open” –  
evaluate issue

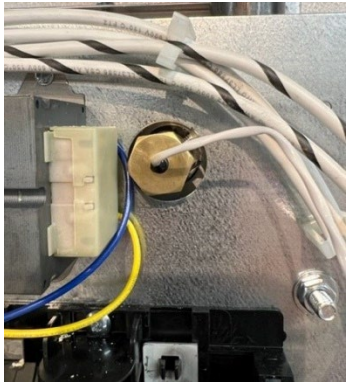


Fault	Possible Cause	Corrective Action
<b>HL</b> High Limit Trip  2- top of block  	Is Circulator pump functional	Replace pump if bad
	Check Temperature Rise across boiler	If > 20F- increase flow rate; larger pump/pipe size
	Check for temp overshoot after heat call ends	If greater than 10F increase differential
	Check that HL screw terminals on board are tight	
	Are HL Switches open while water temp <200F	Check limit switches with OHM meter. Replace if open.
	Is heat load too small	Check heat load calculations
<b>AbP</b> - Abnormal Power	Power too high or too low	Check that incoming power is between 197 vac & 240 vac. If not correct the power supply.
	Power is ok when unit is off but drops when unit is on	Check for correct wire and breaker size.
Water temp overshoots set point	A small overshoot is normal, however if overshoot is greater than 10°F (OS > 10°F) then check the following.	Check temperature rise across boiler is less than 20°F. If too high then increase flowrate through boiler, use larger boiler pump if necessary.
	Boiler is oversized for heating zone?	Check heat load calculations.
	Differential is too low?	Increase differential temperature setting.
<b>DDF</b> - Dry Failure Alarm	Air in boiler?	Purge boiler until all air is removed.
		Check that adequate air vents located in critical system high points. Add vents as necessary.



Fault	Possible Cause	Corrective Action
<b>tSO, tSS</b> - Temperature sensor failure.	Check resistance value of sensor using R/T chart.	Good - Check for loose WT terminals on control board.
		Bad - Replace Sensor.
<b>CHF</b> Control Hardware Failure	Check all wiring for damage or loose connections.	Bad - Tighten any loose terminals. Replace Damaged Wiring.
		Good - Replace Control.
Circuit Breakers Trip	Inspect wiring for damage or short circuits.	Bad-Tighten any loose terminals. Replace damaged wiring.
	Inspect heating elements, Check element resistance value is between 9-20Ω (Ohms).	Bad - Replace heating element(s).
	Is current draw between 12 and 25A (Amps) per element?	Bad - Replace heating element(s).
<b>r1, r2, r3, r4</b> Relay failure code	Is heating element wiring loose or damaged?	Bad-Tighten any loose terminals. Replace Damaged Wiring.
	Is heat relay stuck closed?	With power removed check relay contacts with an Ohm meter. Replace control if relay is stuck closed.

## Evaluating Block Temperature Sensor



Resistance Vs. Temperature Table		
Temp (°C)	Temp (°F)	Ohms (Ω)
0	32.0	32,650
5	41.0	25,392
10	50.0	19,901
15	59.0	15,712
20	68.0	12,493
25	77.0	10,000
30	86.0	8,057
35	95.0	6,531
40	104.0	5,326
45	113.0	4,368
50	122.0	3,602
55	131.0	2,986
60	140.0	2,488
65	149.0	2,083
70	158.0	1,752
75	167.0	1,480
80	176.0	1,255
85	185.0	1,070
90	194.0	916
95	203.0	787
100	212.0	679

Fault	Possible Cause	Corrective Action
tSO, tSS - Temperature sensor failure.	Check resistance value of sensor using R/T chart.	Good - Check for loose WT terminals on control board.
		Bad - Replace Sensor.
CHF Control Hardware Failure	Check all wiring for damage or loose connections.	Bad - Tighten any loose terminals. Replace Damaged Wiring.
		Good - Replace Control.
Circuit Breakers Trip	Inspect wiring for damage or short circuits.	Bad-Tighten any loose terminals. Replace damaged wiring.
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	Is current draw between 12 and 25A (Amps) per element?	Bad - Replace heating element(s).
r1, r2, r3, r4 Relay failure code	Is heating element wiring loose or damaged?	Bad-Tighten any loose terminals. Replace Damaged Wiring.
	Is heat relay stuck closed?	With power removed check relay contacts with an Ohm meter. Replace control if relay is stuck closed.

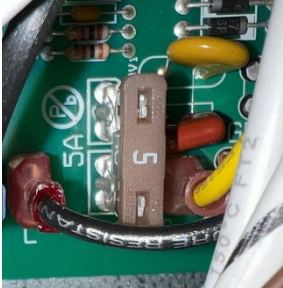
## Evaluating the control board - heating element relays



**OL** – on your meter is an **“open”** relay



Fault	Possible Cause	Corrective Action
FLO Flow Switch Alarm	Is flow switch installed	N - Check control board jumper is in place and secure. Tighten FLO screws if needed.
		Y - System air locked - Purge system and add venting as needed.
		Y - Check that flow switch is functioning properly. Conduct self test on flow switch(Consult manufactures instructions).
LWC Low Water Cutoff Alarm	Is LWCO Installed?	N - Check control board jumper is in place and secure. Tighten LWC screws if needed.
		Y - System air locked - Purge system, add venting as needed.
		Y - System low on water - Check water feed to boiler, check for leaks. Repair as needed.
		Y - check that LWCO is functioning properly. Conduct self test on LWCO switch (Consult manufactures instructions).

Fault	Possible Cause	Corrective Action
	Is electrical power applied to unit?	Check Incoming power is between 197Vac and 240Vac (197 < IP < 240Vac). If power outside range, contact electrician to have power corrected.
	Field Service circuit breakers tripped?	<p>Check for loose or damaged wiring. Replace wiring if damaged.</p> <p>Check heating element resistance within 9-20Ω (Ohms). Replace element if outside range.</p>
	AT boiler 15A breaker tripped?	<p>Inspect control and all wiring for damage. Replace any damaged components or wiring.</p> <p>Inspect field installed thermostat and wiring for damage. Repair and replace as necessary.</p>
	Is control transformer functioning?	<p>Check for 24Vac on R and C terminals of control board. If less than 18Vac on R &amp; C with primary side between 104 and 130Vac then replace transformer.</p> <p>With power removed check control transformer primary and secondary windings for open or short. If windings are open or short, replace transformer.</p> <p>With power removed check 5A fuse on control board. If bad replace fuse.</p>
	Is wiring loose or damaged?	Inspect all thermostat wiring for damage loose connections or damage. Replace wiring if necessary.

Fault	Possible Cause	Corrective Action
Control functions correctly but boiler doesn't heat water	Heating element(s) failed?	Check heating element resistance within 9-20Ω (Ohms). Replace element if outside range.
	AT boiler 40A breakers tripped?	Check for loose or damaged wiring. Replace wiring if damaged.
		Check heating element resistance within 9-20Ω (Ohms). Replace element if outside range.
		Check control board for damaged heat relay(s).
Check boiler pump is operational. Replace if necessary.		



Checking the heating elements..

Good: 9 to 20 Ohms



## Yearly & mid-season - conduct a general examination:

- Check for boiler and system water leaks
- Proper water pressure
- Keep area around the boiler clear of storage and materials
- Drain boiler water during extended cold weather shutdown and in the event of disruption of electrical service
- Test pressure relief valve
- Check field entrance wire to unit for any signs of looseness or over heating.

 **WARNING**

Electrical shock hazard. Turn OFF electrical power supply at main power switch before servicing unit. Service shall be performed by a qualified service agent. Failure to do so could result in death or serious injury.

Yearly & mid-season - conduct a general examination:

- Verify wire lugs are securely tightened. **(ensure electrical power is disconnected for this inspection)**
- Check all heating element wiring for signs of dark or damaged connections – replace if any signs of failure exists.
- Ensure all wire connections are tight on connection accessory bar
- Always refer to the product IO manual for further information.

 **WARNING**

Electrical shock hazard. Turn OFF electrical power supply at main power switch before servicing unit. Service shall be performed by a qualified service agent. Failure to do so could result in death or serious injury.



**GRANBY**  
HEATING PRODUCTS



**Thank You**