

ELECTRO-BOILER®

INSTALLATION & OPERATING INSTRUCTIONS

Model: EDB-T1 Series

APPLICATION: This Electro-Boiler is factory equipped with **WarmFlo** smart controller. **WarmFlo** automatically regulates outlet water temperature based on a desired output temperature set point.

Primary application is radiant floor heat, baseboard heat, staple up, fan coil and other hydronic heat applications such as domestic hot water using an indirect heat exchange water heater tank. This series can also be used in conjunction with a gas boiler for dual fuel heating.

Note: If this installation does not include dual heat standby boiler, the front panel switch must always be in the “normal” position.

ACCESSORIES: Various accessory or option items which are not part of basic Electro-Boiler® are available, contact factory.

Note: This product meets the requirements of the ASME Boiler and Pressure Vessel Code.

Conforms to: UL STD.UL834
Certified to: CSA STD.C22.2#165

DO NOT DESTROY THIS MANUAL. PLEASE READ CAREFULLY AND KEEP IN A SAFE PLACE FOR FUTURE REFERENCE BY A SERVICE TECHNICIAN.



ELECTRO
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INTRODUCTION

With this WarmFlo configuration, the electric heating elements are automatically staged/modulated and controlled to establish a fixed outlet water temperature. This outlet temperature is sensed by the WarmFlo controller and is controlled to achieve and maintain the boiler's set point temperature.

Even though this WarmFlo configured unit adjusts outlet temperature independent of water flow and prevents high limiting even with marginal water flow, it is still very important that the hydronic system be correctly designed for the building, the total heat loss requirement, and proper hydronics design and installation practices. This boiler is the energy **source** for the water flow and radiation system. If the water flow and radiation systems are not adequate for the Btu/h heat loss of the building, installing the Electro-Boiler with WarmFlo will not necessarily supply the comfort and heating for the building.

Hot boiler notation – DO NOT, under any circumstances, simply jumper R and W and allow the temperature sensing controller to operate this Electro-Boiler as a hot boiler.

In the case of **new** installation (floor radiant or baseboard), use standard hydronics water heating practices for the necessary expansion tank, air bleeder, valving, water pump, etc., sized for the total capacity of the system.

NOTE: Some models in this series are designed and equipped for 240-volt residential single phase. If this unit is used on 208-volt, energy capacity is reduced by approximately 25%. The installed transformer has a primary tap for 208-volt. Rewire internal transformer so the boiler is using this primary tap for 208-volt applications.

APPROVED TUBING/PIPING

When plumbing this boiler and its peripheral parts to the loop system, all plumbing parts and/or tubing must be sealed to prevent entrance of oxygen.

Use only tubing or polyethylene tubing with oxygen Diffusion Barrier.

SYSTEM OR WATER FLOW

In order to prevent hi-limiting and assure full 20+ years parts life, the piping system/basic plumbing/circulator pump must be arranged to provide flow greater than minimum GPM shown in Table 1. If zoned system, this applies when the smallest zone is operating.

NOTE: Since this is an automatic temperature sensing system, both supply sensor and complete control wiring are required before using or turning on this Electro-Boiler.

TABLE 1 - ELECTRO-BOILER SPECIFICATIONS

240V 1PH Models	Volts	Phase	Watts	Btu/h	Amps	CB	Min GPM
EDB-T1-20-240-1	240/208	1 60Hz	20,000/15,000	68,242/51,182	84A/73A	60A/60A	2
EDB-T1-24-240-1	240/208	1 60Hz	24,000/18,000	81,888/61,416	110A/86A	80A/60A	2
EDB-T1-28-240-1	240/208	1 60Hz	28,000/21,000	95,536/71,652	117A/100A	80A/80A	2
EDB-T1-32-240-1	240/208	1 60Hz	32,000/24,000	109,184/81,888	134A/115A	100A/80A	4
EDB-T1-36-240-1	240/208	1 60Hz	36,000/27,000	122,832/92,124	150A/130A	100A/100A	4

240V 3PH Models	Volts	Phase	Watts	Btu/h	Amps	CB	Min GPM
EDB-T1-18-240-3	240	3 60Hz	18,000	61,434	43	60A	2
EDB-T1-23-240-3	240	3 60Hz	23,000	78,499	58	80A	2
EDB-T1-28-240-3	240	3 60Hz	28,000	95,564	67	90A	2
EDB-T1-32-240-3	240	3 60Hz	32,000	109,000	77	100A	4
EDB-T1-36-240-3	240	3 60Hz	36,000	123,000	87	110A	4

208V 3PH Models	Volts	Phase	Watts	Btu/h	Amps	CB	Min GPM
EDB-T1-18-208-3	208	3 60Hz	18,000	61,434	50	70A	2
EDB-T1-23-208-3	208	3 60Hz	23,000	78,499	62	80A	2
EDB-T1-28-208-3	208	3 60Hz	28,000	92,000	75	100A	2
EDB-T1-32-208-3	208	3 60Hz	32,000	107,000	87	110A	4
EDB-T1-36-208-3	208	3 60Hz	36,000	123,000	100	125A	4

480V 3PH Models	Volts	Phase	Watts	Btu/h	Amps	CB	Min GPM
EDB-T1-18-480-3	480	3 60Hz	18,000	61,000	22	30A	2
EDB-T1-24-480-3	480	3 60Hz	24,000	82,000	29	40A	2
EDB-T1-28-480-3	480	3 60Hz	28,000	92,000	32	45A	2
EDB-T1-30-480-3	480	3 60Hz	30,000	102,000	36	50A	4
EDB-T1-36-480-3	480	3 60Hz	36,000	123,000	43	60A	4

ZONING AND RADIANT TEMPERATURES

Single Zone: This boiler has the ability to maintain a constant outlet water temperature as set on the front panel dial switch or using outdoor reset and there is no minimum return temperature. This means the boiler can be piped directly to and from hydronic manifolds, radiators, baseboards etc. Primary secondary piping is not required as long as minimum flow rate can be maintained.

Multiple Zones: This boiler has the ability to maintain a constant outlet water temperature as set on the front panel dial switch or using outdoor reset and there is no minimum return temperature. This means the boiler can be piped directly to and from multiple hydronic manifolds, radiators, baseboards etc. Primary secondary piping is not required as long as minimum flow rate can be maintained on the smallest zone. If minimum flow rate cannot be achieved a primary/secondary piping arrangement should be used.

Two temperature systems: For heating systems requiring two different temperatures a common method is to use thermostatic mixing valves to reduce water temperature for lower temp zones. A better solution would be to use an Electro Industries zone control panel compatible with this series boiler

Electro Industries' Zone Controllers – the Electro Industries' zone controller has many unique features that enhance the performance and operating efficiency of the EDB-T1 boiler. Two way communication between the boiler and zone board provides instant, seamless response to changing zone calls from different size zones, even two different water temperature requirements.

ZONE CONTROLLER features for use with EDB-T1 Boiler

1. **Zone wiring and troubleshooting convenience** – the addition of the zone board allows for easy terminal block and point to point wiring for each zone thermostat and each zone valve. Also there are LED's associated with the thermostat action and the zone valve action. This greatly simplifies wiring and future troubleshooting with a neat terminal block wiring arrangement and the onboard LED's.
2. **BTU output adjust** – the zone board has a dial switch for each zone and the installer selects one of four zone BTU capacity sizes. When a smaller BTU zone is calling, the boiler will “lock-out” element stages to prevent any chance of temperature overshoot. When multiple zones are calling the boiler will calculate the number of elements needed to meet the demand and respond accordingly.
3. **Two temperature system with high temp priority** – if the application includes one zone requiring high temperature water 150-180 for fin tube, air handler, indirect domestic water heater, etc. and the remaining zones are radiant floor low temperature, this zone controller will automatically raise the output of the high temperature zone. This is a priority arrangement, zone 1 holds off the other zones while the high temperature output is heating. If at the end of the high temperature zone there is a call on any of the low temperature zones, there will be a pump only function until the outlet temperature drops below the front panel dial setting.



ZONE VALVES AND ZONE PUMPS

Zone valves and zone pumps can be used where an Electro-Boiler is the primary heat source. Electro zone controllers can be compatible with zone valves only and some models are compatible with both zone valves and zone pumps.

THERMOSTATS

Electro boilers are compatible with most any type of thermostat. Common applications include:

Fin tube radiation, fan coil, etc. – heat only wall t-stat, connected to operate zone valves (see previous section) or for single zone the t-stat is connected directly to Electro-Boiler R and W.

Floor radiant – comfortable and proper space heating response is a direct relationship to the thermostat type and the placement of the thermostat sensing bulb. Typically, an under floor heating system can be broken down into three categories.

- A. **Energy storage, water tubing is under the concrete or within the sand base** – the controlling thermostat must have a remote bulb, and this remote bulb must sense the concrete slab temperature (slab stat). Coordinated with the concrete pour, install a 3/4" PVC, minimum bend radius of 7 inches, and locate at approximately center (vertical) of the concrete slab. The thermostat sensing bulb can later be pushed down this PVC conduit. If the slab is already poured without conduit for slab stat, use electronic remote sensing thermostat.
- B. **Floor covering, medium to high insulation** – use slab stat as described in paragraph A above.
- C. **Quick response, hydronic tubing just under the concrete surface, no flooring material over the concrete** – in this case, heated water can directly radiate into the room, a standard wall mount room thermostat is adequate. Mount room thermostat on an inside wall similar to most heating systems.

MULTIPLE BOILERS

This boiler series includes a method for automatically staging any number of parallel-plumbed Electro EDB-T1 boilers. Order plug-in relay EB-C-STG5.

The thermostat is connected only to the first boiler, when all stages are on for more than 5 minutes, this plug-in relay module turns on the next boiler through (R and W), and a second EB-C-STG5 could be used to turn on the third, etc.



Outdoor Reset Option

The EDB-T1 boiler comes equipped with an outdoor sensor (part number WFS25F, shipped loose). This sensor can be connected to the board to allow for outdoor reset function.

What is Outdoor Reset?

Outdoor reset is where the Electro Boiler DT (desired water temperature) shifts up and down based on the outdoor temperature. The water temperature coming out of the boiler will be higher when it's cold outside and lower when it's warmer outside. The idea is to have the boiler work with the building heat loss to maintain a more even BTU delivery to the space. This helps with overall system efficiency as well.

Outdoor Reset Activation

If it is determined that outdoor reset is required for this application, it needs to be activated.

Follow this sequence to activate outdoor reset:

Step 1: Power down the Electro-Boiler

Step 2: Connect the outdoor sensor

- Red wire to RED
- Black wire to OT
- White wire to COM

Step 3: Power up the Electro-Boiler

See: CONTROLLER SETUP for more information on outdoor reset.

BOILER PLACEMENT

This model series is wall hung and the vessel must be vertical, drawing BX101.

For future servicing, the unit itself **must be installed 18"** or more above the floor, the elements are screwed in from the bottom.

INFORMATION/WATER FLOW CALCULATIONS

Water flow, GPM, can easily be calculated if the temperature rise across the electric boiler can be measured.

The formula below can only be used when the temperature rise is stable and the boiler is not hi-limiting. In other words, verify constant current draw and stable outlet temperatures for at least 15 minutes.

$$\text{GPM} = \frac{\text{Volts} \times \text{Amps} \times 3.4}{500 \times \text{Temp. rise}}$$

INSTALLATION REQUIREMENTS

1. All installation work must be performed by trained, qualified contractors or technicians. Electro Industries sponsors installation and service schools to assist the installer. **Visit our Website at electromn.com for upcoming service schools.**

WARNING

ALL ELECTRICAL WIRING MUST BE IN ACCORDANCE WITH NATIONAL ELECTRIC CODE AND LOCAL ELECTRIC CODES, ORDINANCES, AND REGULATIONS.

WARNING

OBSERVE ELECTRIC POLARITY AND WIRING COLORS. FAILURE TO OBSERVE COULD CAUSE ELECTRIC SHOCK AND/OR DAMAGE TO THE EQUIPMENT.

CAUTION

This unit can only be used for its intended design as described in this manual. Any internal wiring changes, modifications to the circuit board, modifications or bypass of any controls, or installation practices not according to the details of this manual will void the product warranty, the ETL/Intertek certification, and manufacturer product liability. Electro Industries cannot be held responsible for field modifications, incorrect installations, and conditions which may bypass or compromise the built-in safety features and controls.

2. This installation manual and Electro-Boiler products relate only to the addition of the Electro-Boiler to the hydronics system. The owner/ installer assumes all responsibility and/or liability associated with any needed installation of the gas/oil boiler, pump, plumbing, system design, hydronics systems or backup gas/oil boiler, etc. Any instructions or comments made within this manual (or factory phone assistance) relating to the gas/oil furnace are provided as comments of assistance and helps only.

CAUTION

Hazards or unsafe practices could result in property damage, product damage, severe personal injury and/or death.

3. Remember, safety is the installer's responsibility, and the installer must know this product well enough to instruct the end user on its safe use.

Safety is a matter of common sense - - a matter of thinking before acting. Professional installers have training and experienced practices for handling electrical, sheet metal, and material handling processes. Use them.

CLEARANCES

	MINIMUM CLEARANCE FROM COMBUSTIBLE SURFACES		SUGGESTED MINIMUM SERVICE CLEARANCE	
BACK	0 INCH	0 MM	0 INCH	0 MM
LEFT	1 INCH	25 MM	12 INCHES	305 MM
RIGHT	1 INCH	25 MM	12 INCHES	305 MM
FRONT	1 INCH	25 MM	24 INCHES	610 MM
TOP	1 INCH	25 MM	24 INCHES	610 MM
BOTTOM	REQUIRED CLEARANCE – 18 INCHES/457 MM			

MECHANICAL INSTALLATION – UNDER-FLOOR RADIATION

CAUTION

Electro Industries requires the use of dielectric isolation between the boiler vessel supply and return piping when the boiler is plumbed using copper or any other dissimilar metal. Damage to the vessel caused by galvanic corrosion voids Electro Industries' warranty.

Reference drawing BX101

1. With the typical radiant floor system, a dual heat backup boiler is uncommon. If a backup boiler is required, please reference “Mechanical Installation – Dual Heat” section.
2. Unpack the Electro-Boiler, the safety relief and pipe fittings are packed within a small carton. The safety relief is plumbed to the ¾” bushing as shown on BX101.
3. The Electro-Boiler must be positioned with the vessel **vertical**. The unit will not function properly with the vessel in a horizontal position.

NOTE: Mount **at least 18 inches above the floor** to allow element removal and service at the bottom.

4. The plumbing components and plumbing layout shown on drawing BX101 have been very carefully chosen and should be plumbed as shown. When following this diagram, the water fill procedure becomes very simple and almost guarantees the removal of all air or prevents air locking problems. Experienced hydronic heating installers may be able to eliminate some components but the inclusion of these components guarantees installation and initial operating success.
5. The key mechanical components required include:
 - **Expansion Tank** – as a closed loop hydronic heating system, a properly sized expansion tank is required.
 - **Inlet Temperature Gauge** – recommended to observe the operation of the system.
 - **Air Eliminator** – install as shown on drawing.
 - **Pressure Relief/Safety Valve** – this is required and is furnished as a **loose** component with the boiler unit itself. Failure to install the provided, 30 PSI, pressure relief valve as shown voids warranty and the product listing. During purging there is a requirement to bleed out the initial air within this 1” pipe leg by manually holding open the relief valve. Add the necessary pipe extension to the relief valve to prevent water damage on this unit or surrounding area.
 - **Gate Valve/Drain Valve** – these are for servicing and easy fill purposes.
 - **Circulating Pump** – depending upon system lift and system loop resistance, the proper circulating pump is required to guarantee the minimum GPM flow as specified in Specification Table.

Comment: Circulator pump pumping away from the expansion tank is preferred.

6. To ensure safe boiler operation adequate system pressure must be maintained to a minimum 12psi.
7. Depending upon water conditions, determine whether water additives are necessary. See Water Quality Additives/Treatment section.
8. Purge and fill water system. Do not allow the electric element to come on until the system is purged and you have verified proper water circulation. If the pump is needed, jumper the two orange wires in order to operate the pump directly from its own 120 volt source.
9. Purge each loop individually, one at a time.
10. Check for leaks.

MECHANICAL INSTALLATION – DUAL HEAT

CAUTION

Electro Industries requires the use of dielectric isolation between the boiler vessel supply and return piping when the boiler is plumbed using copper or any other dissimilar metal. Damage to the vessel caused by galvanic corrosion voids Electro Industries' warranty.

Reference drawing BX102

1. Unpack the Electro-Boiler. The safety relief and pipe fittings are packed within a small carton.
2. In most **dual heat** installations this Electro-Boiler is plumbed in parallel with an existing oil, gas, or wood boiler. If piped in series, the Electro-Boiler is generally at the gas/oil outlet; but for wood boiler systems, the Electro-Boiler must be on the inlet sides. The standby boiler cannot be operated as hot boiler. This will defeat the Electro-Boiler. Rewire as required using the included standby boiler interface (brown wires).
3. Standard hydronic hot water heating practices apply. This procedure assumes adequate piping size to meet the flow requirements of the specific boiler model, expansion tank, pump, zones, etc. are properly designed and installed.
4. The Electro-Boiler must be positioned with the vessel **vertical**. The unit will not function properly with the vessel in a horizontal position.
NOTE: Mount **at least 18 inches above the floor** to allow element removal and service at the bottom.
5. Typically, this unit is wall hung next to the existing boiler.
6. Use the ¾" pipe fittings to install the safety relief valve and air vent. Add the necessary piping to the safety relief valve so that water damage does not occur in the surrounding area.
7. Pipe the Electro-Boiler into the existing boiler primary loop.
8. If piping contains any U bend, an air vent may be required at the top.
9. When possible, isolating ball valves are recommended for easy servicing.
10. To ensure safe boiler operation and prevent element damage, the system should contain a pressure regulator and an automatic water fill valve.
11. Depending on water conditions, determine whether water additives are necessary (see water quality statement).
12. Purge and fill water system. Do not allow the electric element to come on until the system is purged and you have verified proper water circulation. If the pump is needed, short out the two orange wires in order to operate the pump directly from its own 120 volt source.
13. Check for leaks.

ELECTRICAL HOOKUP

Reference drawing BH102

1. **480/240/208-Volt Heating Power** – route and install the proper current carrying conductors from service panel fuse or circuit breaker. See Specification Table and/or product nameplate for ratings. These models contain built-in circuit breakers and meet the requirement for local disconnect for appliances greater than 10 kW. Connection is at the circuit breaker terminals.
 - Only copper wire is allowed.
 - Circuit Breaker 1 provides power to the control transformer.
 - **Grounding** – copper conductor is required, size per NEC code relating to the current of each feed.
2. **Circulating Pump** – the two orange wires connected to a relay on the control board represent a switch closure (10-amp maximum) to operate an external circulating pump motor. **Voltage (120VAC) for the pump must come from a separate source.**
 - The pump is controlled as a direct function of the R and W input.
 - For dual fuel systems, electric and gas boiler piped together, the pump wired to the EDB-T1 boiler can be selected to run or shut off during gas boiler operation. On the boiler control board locate jumper J3. When the black jumper connects center pin and “L” the pump will shut off during gas boiler back up operation.
3. **Operating Thermostat** – two types can be used. Connection is at the control board bottom.
 - **Standard Mechanical** – connect to R and W, bottom right. Set thermostat internal heat anticipator to 0.2.
 - **Floor Sensing Stat** – connect to R and W, bottom right. Place slab sensor in the slab.
 - If needed, can connect thermostat C to boiler C.

NOTE: Power robbing/power stealing thermostat – if you have a power robbing or power stealing thermostat, you must use the resistor included with the thermostat. Place this jumper between boiler W and boiler C. If resistor is not used, intermittent boiler operation can be expected.

Comment: If zone valve or zone pumps are being used, see appropriate sections.
4. **Load Management Interrupt Control (LMC)** – this Electro-Boiler series has been pre-wired and designed for an external utility load management receiver connection. The control board lower left terminal block marked BLU and BLU/WHT represent the two contact points, extend these wires to the utility load control device. As shipped, this unit is only equipped for off-peak = N.C. logic. If reversed logic is required, contact the factory for modification.
 - Optional – if load management is not used, simply keep the blue jumper in place.
 - Optional – if the power company disconnects 240V for load control, contact factory for drawing BH029 for special wiring requirements.
5. **Outdoor Sensor** – the loose OT sensor needs to sense true outdoor temperature. Mount on an outside wall position that will represent the most accurate outdoor temperature. If possible, shade from direct sun rays.
 - If you choose not to use the outdoor sensor, completely disconnect the wire from the control board. Do not leave the outdoor sensor connected and hanging near the boiler.
6. **Valves or Zone Pumps** – see Zone Controller section for options.

WARNING

THE END SWITCHES FROM THE ZONE VALVES **MUST BE** AN ISOLATED CONTACT WITH NO VOLTAGE PRESENT ON THESE WIRES OR SCREW TERMINALS. THIS IS VERY IMPORTANT TO MAKE SURE THERE ISN'T ANY INTERFERENCE OR FEEDBACK BETWEEN THE TRANSFORMER OPERATING THE ZONE VALVE SYSTEM AND THE TRANSFORMER WITHIN THIS ELECTRO-BOILER PRODUCT. ONCE THIS HAS BEEN DETERMINED, ALL END SWITCHES ARE SIMPLY PARALLELED WITH THE TWO WIRES GOING TO R AND W.

7. If this is a **dual heat** application with **standby boiler**, the 2 brown wires connect to the standby boiler R and W or T and T. These 2 brown wires represent a contact closure to activate the standby boiler during load control or when the front panel switch is in the STANDBY position.
8. **Flow Switch** – a flow switch is **not** included with the boiler. However, one can be added to the LMC circuit. Simply place the field provided flow switch in series with this circuit.
NOTE: The L/W (J3) jumper must be in the W position.

WATER QUALITY – ADDITIVES/TREATMENT

Water treatment is strongly suggested to prevent scale deposits, corrosion from acids, oxygen, and other harmful elements within the specific water supply. It is the installer or user's responsibility to verify water quality and maintain acceptable water quality throughout the life of this product. Failure to maintain suggested water quality could result in vessel or element failure not covered under the 20 year warranty

As a minimum the following water properties must be considered:

- Hardness (ppm): 0-10
- pH: 7.5-10
- Iron Content (ppm): 0-20
- Oxygen Content (ppm): 0
- Total Dissolved Solids: 0-5000

Up to a 50/50 propylene glycol mixture is acceptable for use in these boilers

WATER FILL PROCEDURE

The following procedure applies to non-glycol or antifreeze applications. When referring to BX101 it is assumed filling and flushing will be done through ports on the hydronic manifolds. Separate flush and fill ports may be added to the boiler piping for convenience.

CAUTION

If the building supply pressure is connected directly to supply water ball valve without pressure reducing regulator, user needs to make sure the pressure within the boiler loop does not exceed 30 PSI. Careful control of the supply water ball valve opening can take care of this. Also, at steps 6 and 10, use caution to make sure the building water supply pressure does not spike the system.

1. Do not apply 480/240/208-volt heating power during water fill sequence.
2. Connect the temporary water supply source (probably hose connection) to the water supply connection input.
NOTE: If water supply connection is permanent, some local building codes may require special anti-siphon check valve, RPZ check valve, or equivalent between the boiler fill regulator and the domestic water source or the city water connection.
3. Connect a drain hose to hose bib, drain valve.
4. **Open** drain valve and **close** inlet gate valve (between drain valve and boiler inlet).
5. Verify top gate valve is **open**.
6. **Open** water supply valve and **open** household water supply source.
7. Allow system to circulate, discharging through drain valve, for at least 15 minutes.
8. Put your ear against the metal pipe and listen for air bubbles. If the water flow is consistent and quiet, the system is probably purged and water filled.
9. **Close** the drain valve. **Open** the inlet gate valve.
10. The cold system pressure at the gauge should be approximately 10 to 14 PSI.
11. **Close** water supply valve and disconnect water supply.
12. Optional – energize circulating pump during this fill operation. The water pressure from the household system and as plumbed should typically flow through the circulating pump without the pump running.

COMMENT: Purge one loop at a time.

CONTROLLER SETUP

Front Dial

Non-Outdoor Reset – simply set the knob to the desired outlet temperature on the front panel decal.

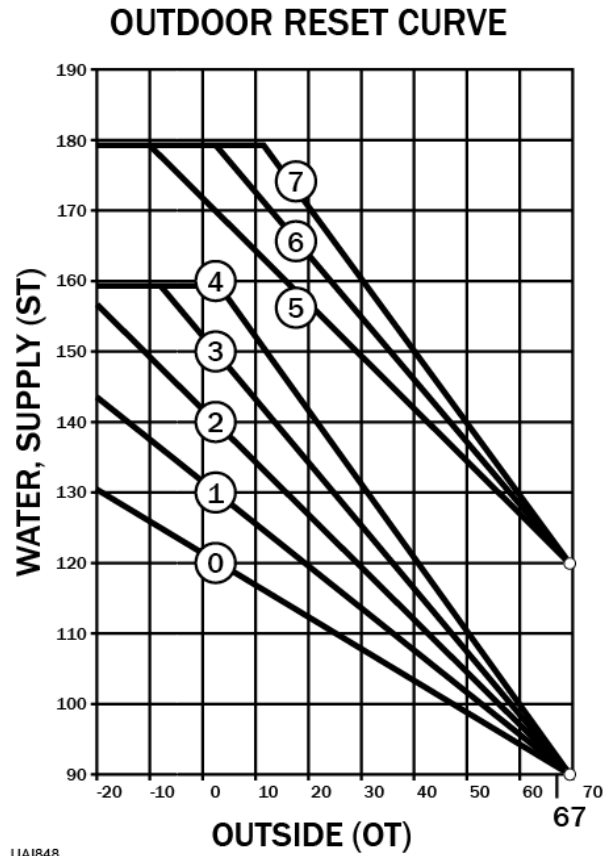
This control strategy is accomplished via disconnecting the outdoor sensor and performing a power reset to the boiler (low voltage power cycle).

Outdoor Reset – the temperature decal will relate to the OT 0° F set point and the knob numbers coincide with the curves below. High and low mass also relate to the ramp-up water temperature starting point, as shown. Select the high or low mass with the rate of temperature rise based on outdoor temp (OT).

Comment: The WF-ANZ* test set allows field change of the base temperature start point.

This control strategy is accomplished via connecting the outdoor sensor and performing a power reset to the boiler (low voltage power cycle).

The front panel temperature selection number coincides to the curves below. This temperature value shown on the front decal is actually the supply water at 0° F outside.



Staging/Modulating Jumper

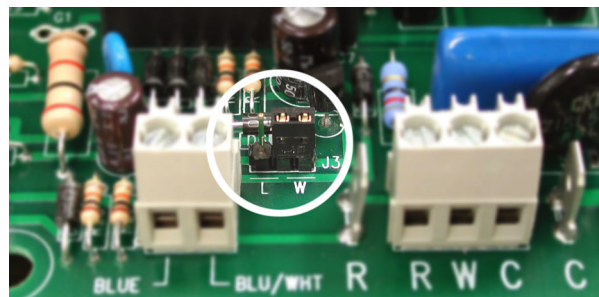
The control board on the EDB-T1 boiler is a universal controller with the capability of interfacing with many different models of TS Electro-Boilers.

If you are working with an EDB-T1 this should be set to MODULATE.



Circulator pump mode – as factory set, the circulator pump is controlled directly from the W input terminal. In this setup the circulator pump continues during load control interrupt (or optional remote standby switch). There is a provision within the controller board (inside) to allow the circulator pump to not operate during load control interrupt.

On the inside control board, just above the two bottom terminal blocks, is a small pin jumper arrangement. The black jumper sets up the pump mode. Just below this pin jumper arrangement are L and W lettering. When the two pin shorting device is in the W position, the pump is a direct function of R to W input. When the two pin jumper is in the L position, the pump is interrupted during a load control.



⚠ WARNING

THIS SHORTING DEVICE MUST BE IN ONE OF THE TWO POSITIONS FOR THE CIRCULATOR PUMP TO PROPERLY OPERATE.

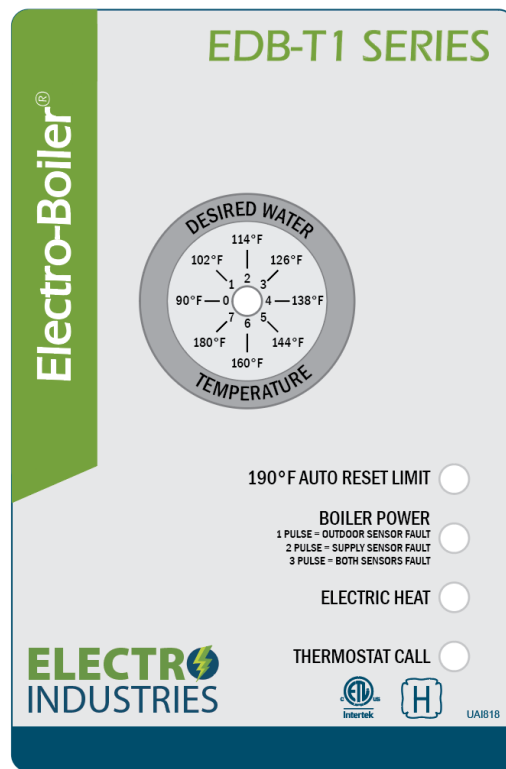
OPERATIONAL TIPS

Front Panel Monitor Lights

- **190°F AUTO RESET LIMIT**, red – this will **only** illuminate when the vessel hi-limit opens due to excessive high water temperature. This hi-limit is self-resetting.
- **BOILER POWER**, green – basically this is illuminated at all times. It represents 24-volt power source, good fuse, controller logic is operational, and a good outlet sensor. If the outlet sensor is inoperative, incorrectly wired, or malfunctioning; this green monitor LED should be pulsing (see Troubleshooting section).
- **ELECTRIC MODE**, yellow – when illuminated the system is in the electric mode. If it is not illuminated the utility load control receiver is in the interrupt or on-peak mode. If there is an optional or remote standby switch, the status of the standby switch is also monitored by this yellow LED.
- **THERMOSTAT CALL**, red – indicates a remote switch closure (thermostat or zoning end switch) is closed between terminals R and W.

Inside Control Board Monitor Lights

STAGES, red – these four LED's indicate which electric element stages are on and active.



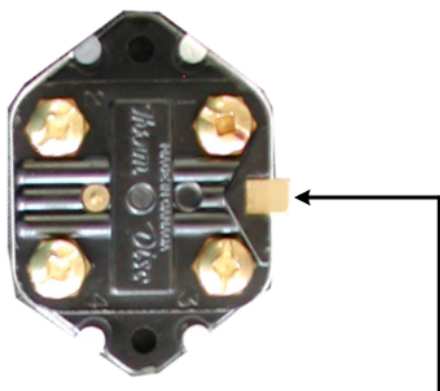
Manual Reset Hi-Limit

At the top of the vessel there will be either two or three surface mount hi-limits preset at 205° F. There is no light indicator associated with these safety hi-limits. These 205° F safety limits break the L2 current carrying 240/208-volt wire going to the elements, use caution when troubleshooting or resetting. Reset involves locating a small shiny lever or metal tab protruding on the side of the black safety limit base. This small tab is pressed inward approximately 1/8" to snap in the contacts.

CAUTION

The wires and screws have 240/208-volt potential and can be dangerous. Turn off circuit breakers before investigating or attempting to reset the 205° F safety limits.

205°F Manual Reset



Press this to reset

WARNING – HIGH VOLTAGE

MUST SHUT OFF HIGH VOLTAGE BEFORE ATTEMPTING TO RESET.

Internal Fuse

The fuse on the controller board protects the transformer secondary, external items connected to R, and the circuit board itself. Replace with 2-amp, fast blow fuse or equivalent.

System Pressure

The side press/temperature gauge should be at approximately 10 to 14 PSI at room temperature water and should not rise more than approximately 4 PSI at the operating or hot water temperature. If the pressure change is more than approximately 4 PSI there may still be excessive air in the system, the expansion tank is too small or there is a problem with the expansion tank piping, expansion tank itself.

Cold slab, outdoor reset and temperature sensing prevent full boiler on – by adding a **temporary** jumper between the lower W screw terminal and the upper left E tab, all temperature sensing functions are bypassed and the control board will step in all the stages.

CAUTION

This jumper shall not be a permanent function, jumper needs to be removed after slab is approaching normal temperature.

Standby Switchover, SOT Timer

This plug-in option device allows a selection from 40 to 80 minute thermostat operating time for automatic switchover to standby boiler. Order part number SOT-1.

Replacement Parts

WFSB	Water sensor (ST), 5 ft.
WFS25F	Outdoor sensor (OT), 25 ft.
EB5623	Control board
UFUSE0443	2-amp, fast blow fuse
4038-75	75-amp triac SSR
5128C	Heating relay
5535	Safety hi-limit, manual, 205° F
5512-190	First hi-limit, 190° F
5453	Relief valve, 30 PSIG
5456A	Gauge press/temperature
5652SM	60A Siemens circuit breaker
5653SM	80A Siemens circuit breaker
5643SM	100A Siemens circuit breaker
EB5520-06	Electric element 240V, 6kW
EB5520-09	Electric element 240V, 9kW
EB5526	Electric element, 240, 5 kW
5574	Element gasket
5541	Transformer, 24V, 40VA
VLUG3632	Wire terminal block

TROUBLESHOOTING/REPAIR HELPS

1. This WarmFlo controller contains several interference suppression components, but as an electronic control, unpredictable and unusual transients or interference may sometimes cause strange results. If the WarmFlo controller is acting strange, one immediate step would be power down reset. Simply turn off boiler power or breaker number 1, when the green LED goes out, count to 10, and re-energize power supply.
2. Inoperative temperature sensor, if the internal program can detect a bad sensor (shorted, open wire, etc. – not necessarily bad value) the front panel green LED will be pulsing. By checking the pulsing pattern, the appropriate sensor can be identified.
 - OT sensor – 1 blink every second
 - ST sensor – 2 blinks every second
 - Both bad – 3 blinks every second
3. The temperature sensor can be further evaluated with diagnostic program from standard PC or WF Analyzer software. This includes the ability to fool the sensor or set in an offset for various troubleshooting purposes. This software disk comes with a special cable needed for PC or Palm hookup.
 - WF-ANZ* – Handheld/Analyzer
 - ET-SOFT-HTG – PC software disk and cable
4. The terminal blocks for control wire hook-up are designed for a wire insertion and screw clamp down. If there is no wire connected and the screw is loose, the screw may not necessarily make a good electrical contact to the inside components. Example – if you are jumpering the thermostat terminals without thermostat wire connection or if you are attempting to measure voltage on the screw head, you may get erroneous or unpredictable results if the screw is not tightened down.
5. The outdoor sensor (OT) must be sensing the actual outside temperature for this controller to correctly operate (if you're using the outdoor reset configuration). Do not simply leave the outdoor sensor hang in the room and attempt to run this system.
6. Temperature sensing bypass – the inside control board, left side, contains a E tab which can be used to directly step in the heating stages and in essence bypass the temperature sensing and control functions. The E tab has the highest priority and overrides all temperature sensor functions. In other words, when jumpering from W to E all four stages are hard on. **Note:** Verify pump is operating prior to using the E terminal. Since activating this E terminal causes full electric element output, this function should only be used to verify all stages or troubleshoot proper 24Ø current at each element.

Sensor Temperature Calibration - Both remote sensors are digital electronic and factory calibrated. Normally these do not require field calibration or verification. However, if sensor temperature error is determined, there are two field calibration techniques. Proceed with extreme caution.

1. The outdoor sensor (OT) can be calibrated with ice (32°F). This is not a checking temperature situation. If you proceed with this function, the sensor automatically goes to 32°F. Notice a small push button next to the sensor terminal block, with the sensor at 32°F, push and hold for approximately ten seconds. When the green LED next to the fuse blinks at you, release and now the outdoor sensor is set at 32°F.
2. Use PC software or WF-ANZ7 analyzer to calibrate sensor.

OPERATIONAL INFORMATION

In order for the installer to completely understand the EDB-T1 functions and operational sequence it is recommended to thoroughly read and understand the information below. This knowledge can help in determining settings that can be set according to the end customer's needs.

WarmFlo Analyzer (WF-ANZ*) or PC software (ET-SOFT-HTG) – can be used to verify temperatures.

WARNING

FIELD REPROGRAMMING – ANY CHANGES MADE WITH THE WF-ANZ7 OR PC SOFTWARE ARE PERMANENT AND CAN ONLY BE ERASED USING THOSE TOOLS.

Normal Heating Operation – whenever the WarmFlo screw terminal W is at 24 volt (with reference to C), the WarmFlo controller begins turning on the elements and automatically controls the water temperature as sampled by the ST sensor. However, if added heat is **not** required, no element power is used.

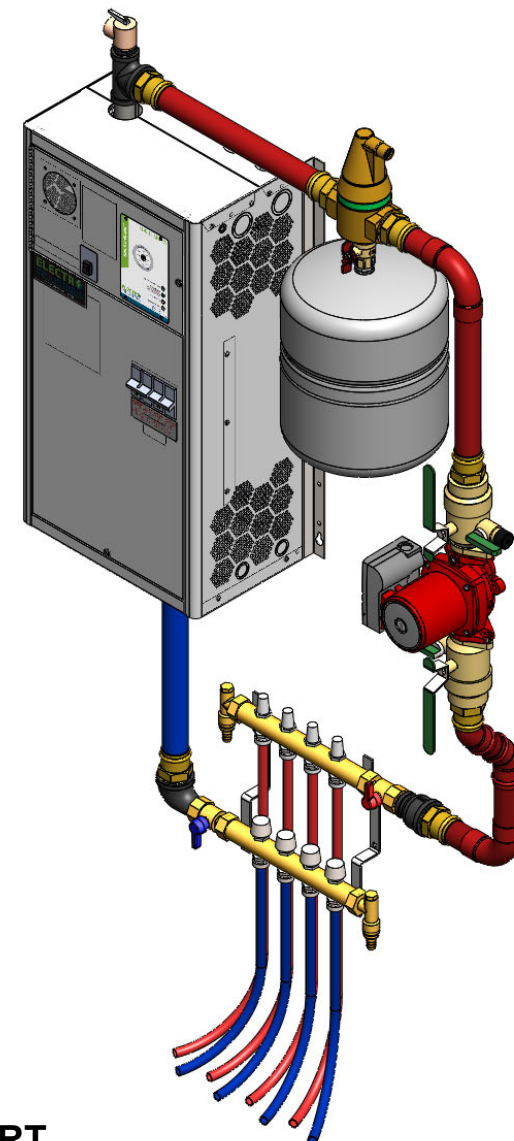
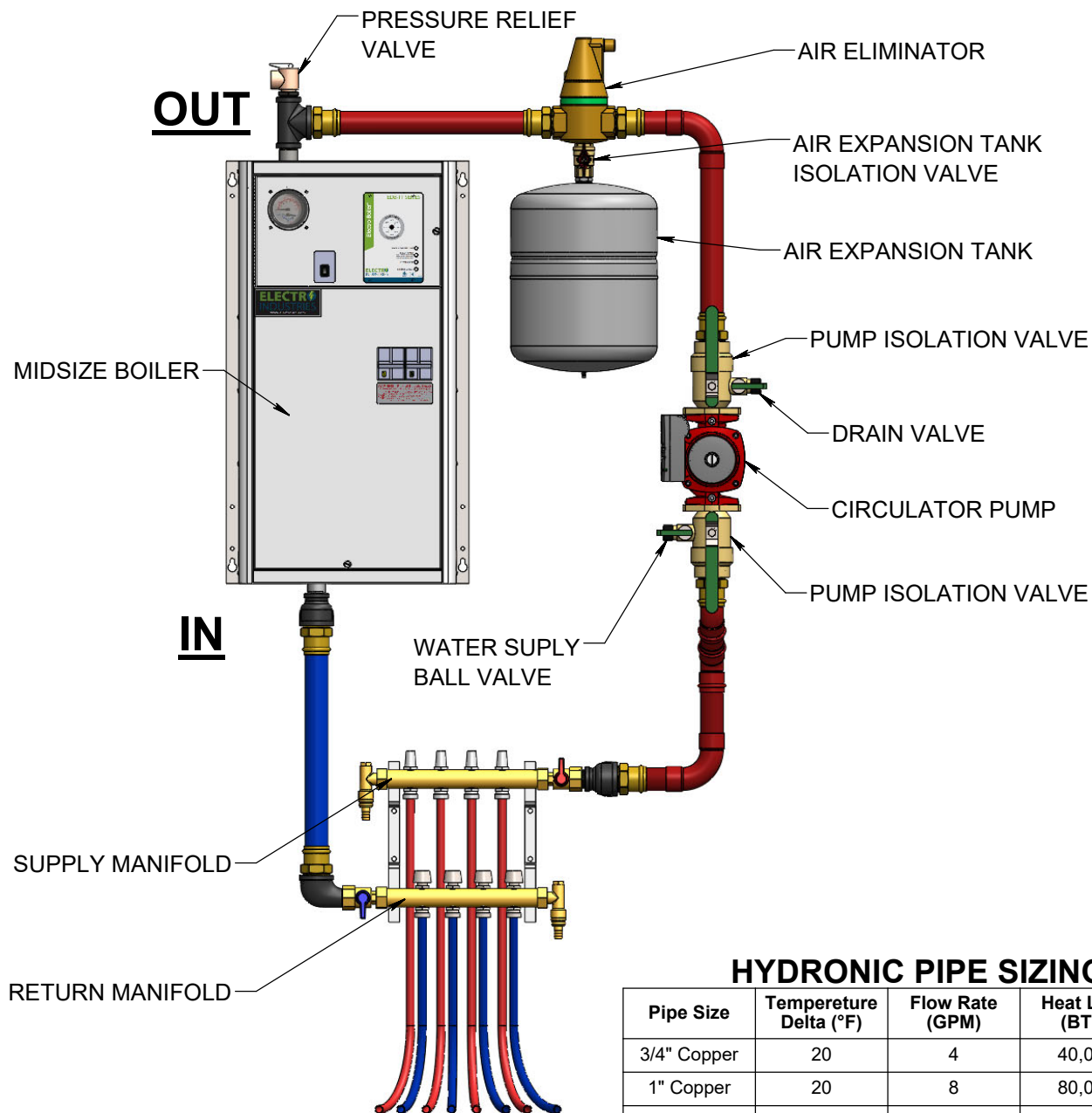
Depending upon the Electro-Boiler model, there will be various electrical stages, all under the control of WarmFlo. Except for the first 4.5 kW element, the remaining stages operate as steps 2, 3, and 4 from the WarmFlo controller.

MODULATE Setting (J8) Description: Step 1 (first 4.5 kW) is pulse modulated through the triac (approximate 1Ø second cycle) based upon the WarmFlo controller automatic requirement. Steps 2, 3, and 4 are turned on and off with relays. However, steps 2, 3, and 4 are only used when required by the WarmFlo water temperature calculations. Stage 1 may not necessarily remain at 100%, but is modulated downward to meet the requirements of the water sensor, etc.

STAGING Setting (J8) Description: Steps 1, 2, 3, and 4 are turned on and off with relays. Steps 1, 2, 3, and 4 are only used when required by the WarmFlo water temperature calculations.

The time between stage turn on depends upon where the controller logic memory was after the last thermostat call or following a power up reset condition. The longest time between staging is from the power up condition because the logic does not have a history of previous thermostat calls. Once the history of several thermostat calls has been established within memory, it automatically returns to the last active stages, with an approximate 5 seconds between stage turn on.

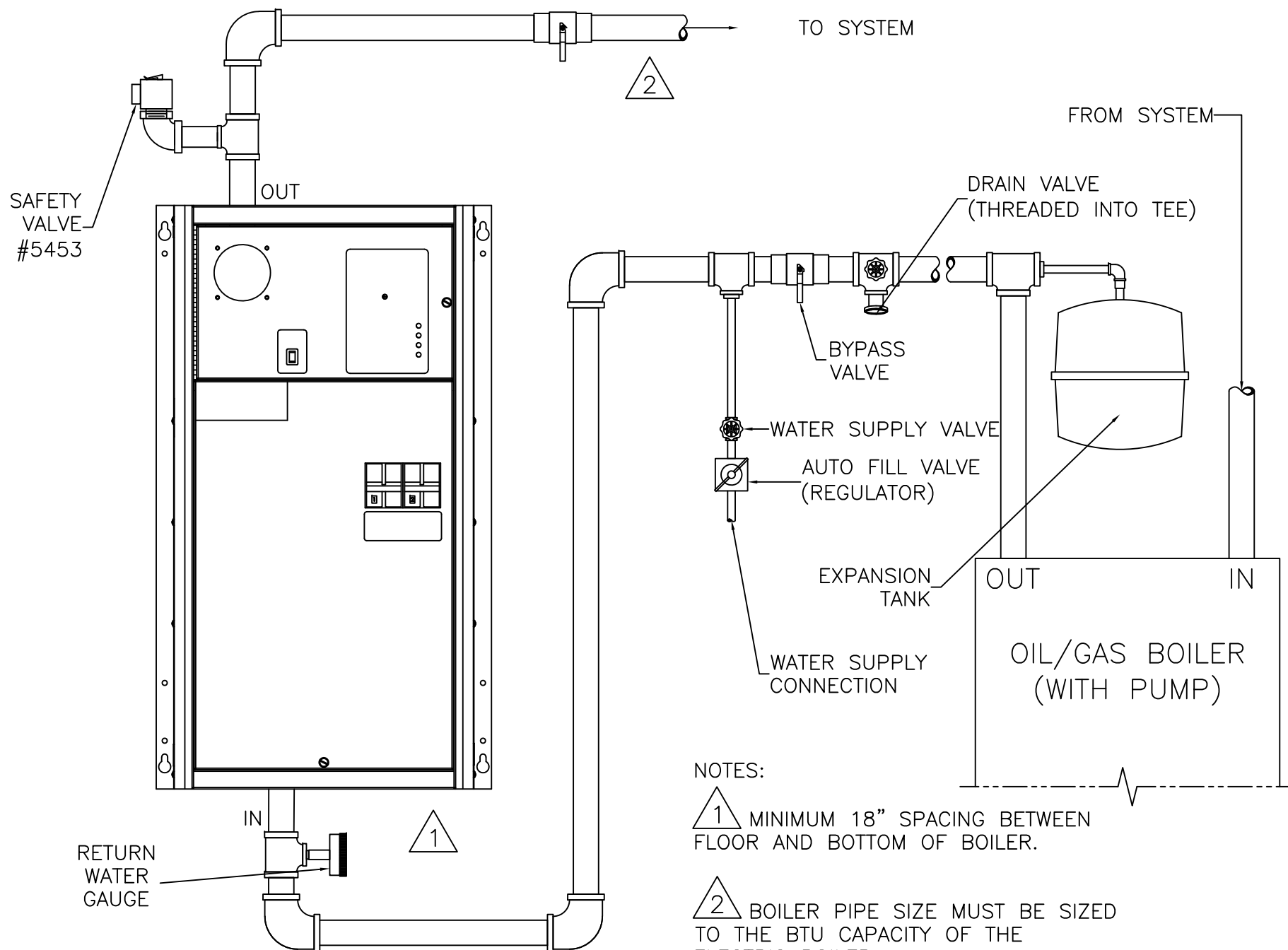
Delay, transfer from standby to electric – if the unit was operating in SB for more than 1 minute, the follow-up transfer back to electric engages a 2-minute delay before any of the electric stages are activated. The pump will react to the call for heat, but the elements will stay off for 2 minutes in order for the pump to cool down the standby boiler vessel.



HYDRONIC PIPE SIZING CHART

Pipe Size	Temperature Delta (°F)	Flow Rate (GPM)	Heat Load (BTU)	Power (kW)
3/4" Copper	20	4	40,000	12
1" Copper	20	8	80,000	24
1-1/4" Copper	20	14	140,000	41
1-1/4" Steel	20	17	170,000	50
1-1/2" Copper	20	22	220,000	64
1-1/2" Steel	20	25	250,000	73

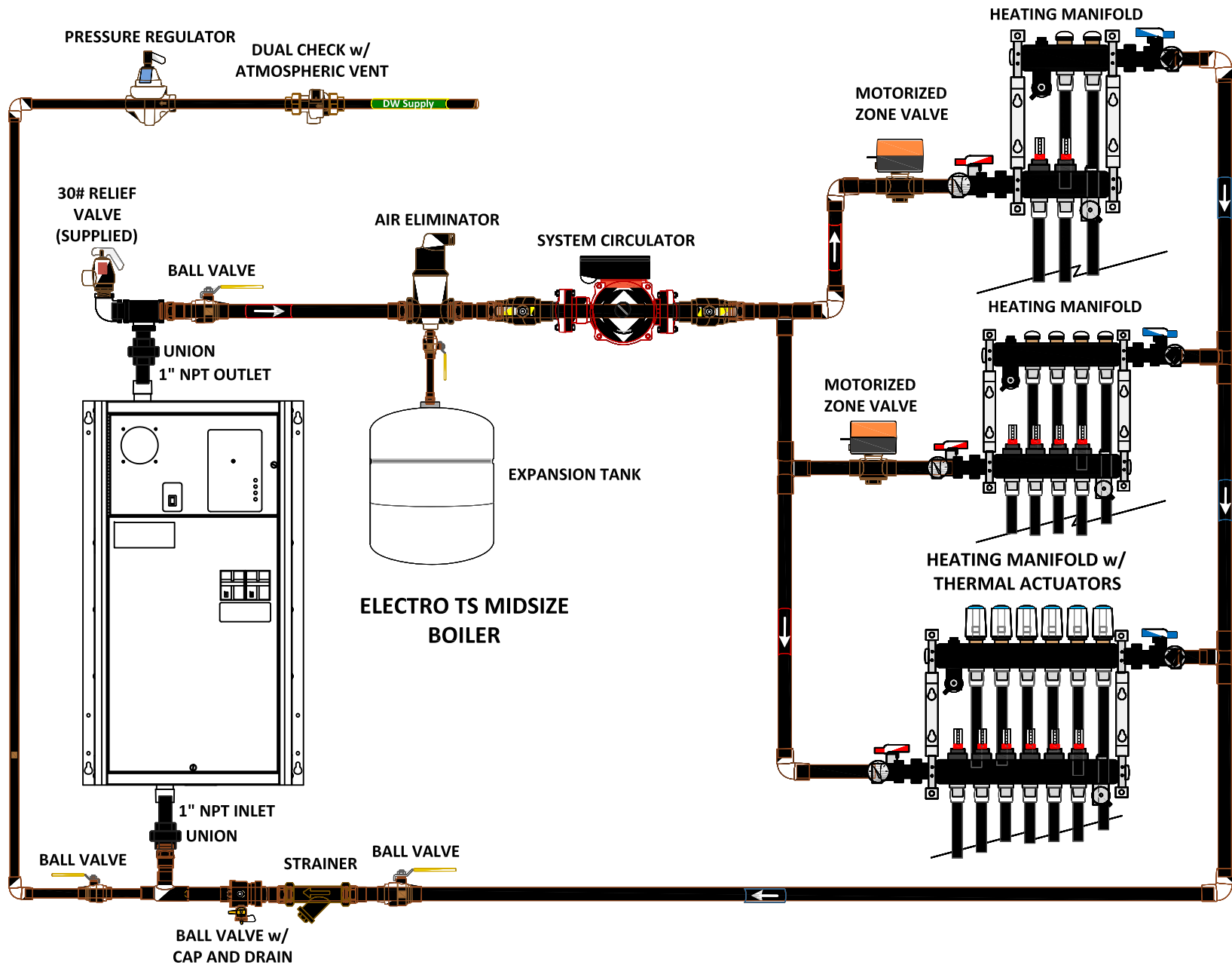
ELECTRO-BOILER (EDB-T1-**) DUAL HEAT PIPING DIAGRAM

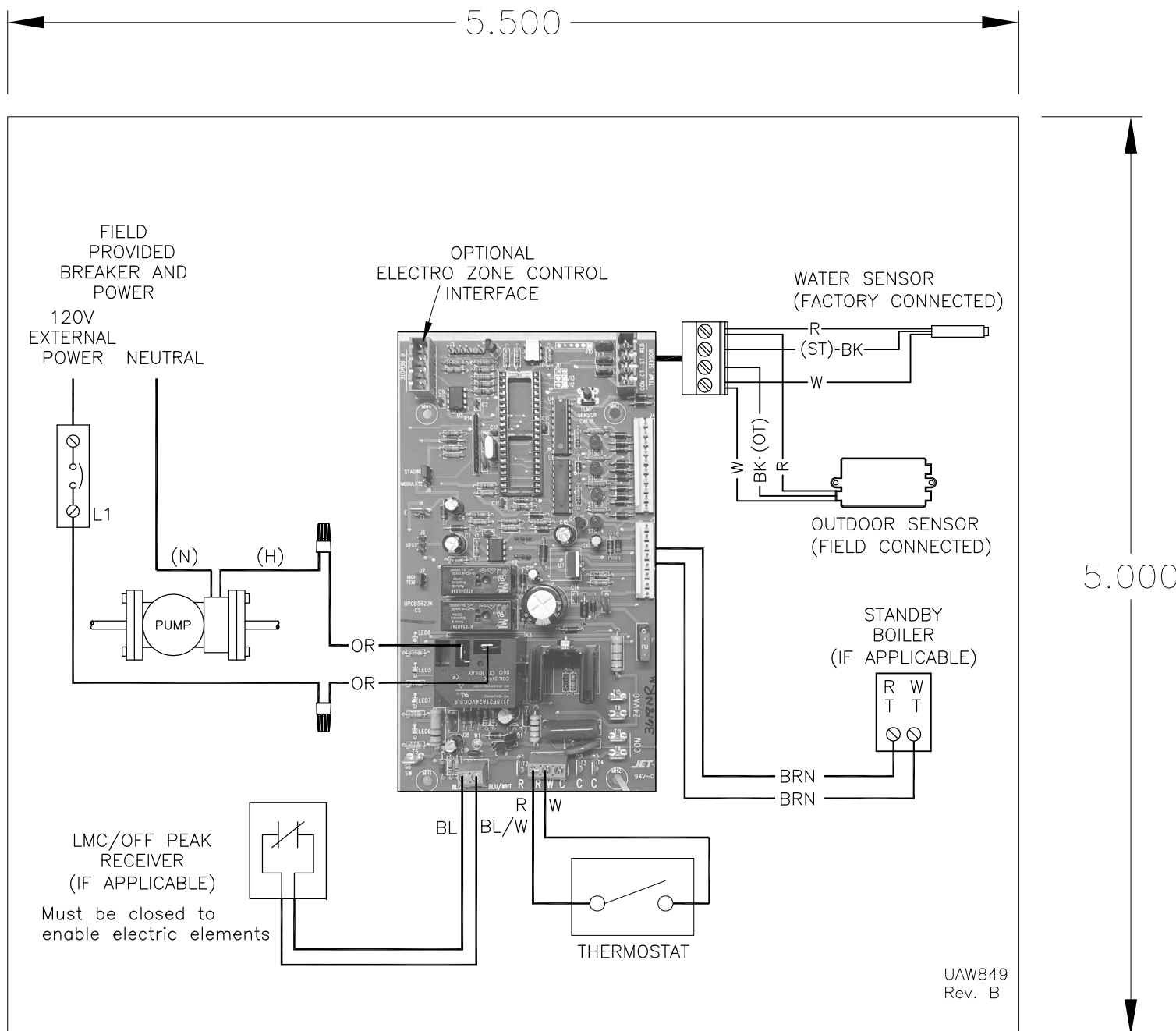


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BX102
Rev.A 08-16-2024

EDB-T1-** APPLICATION PIPING





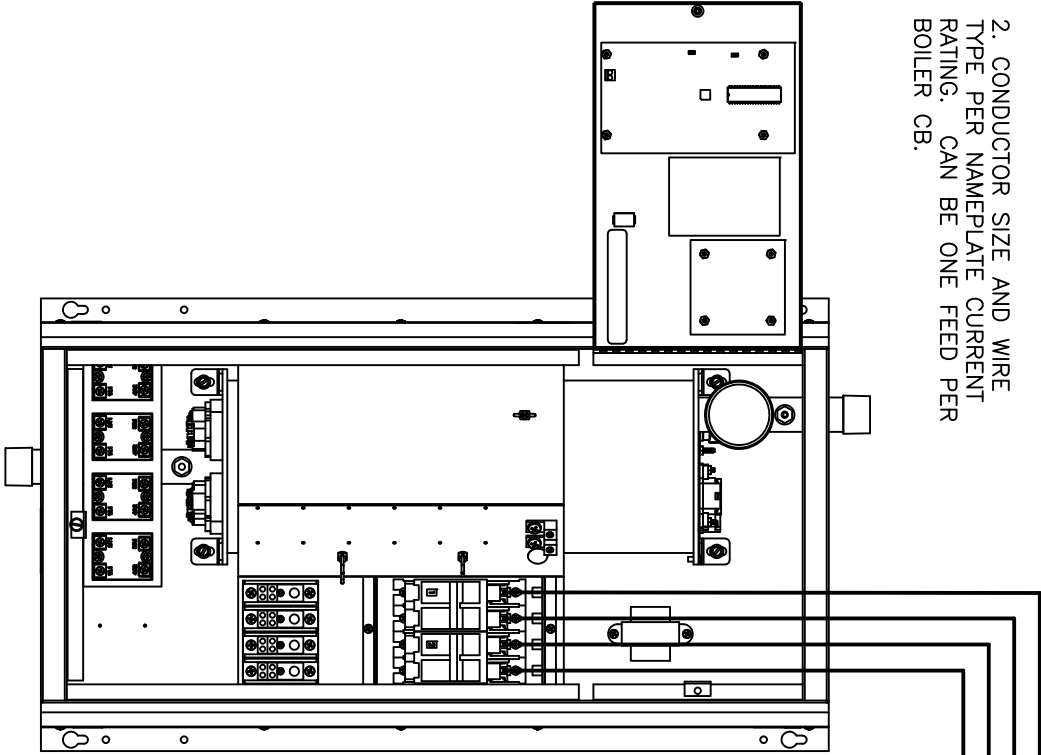
- Notes:
1. Material - Vinyl with adhesive and laminate
 2. Color - Black on White
 3. Size - 5.00" x 5.50"



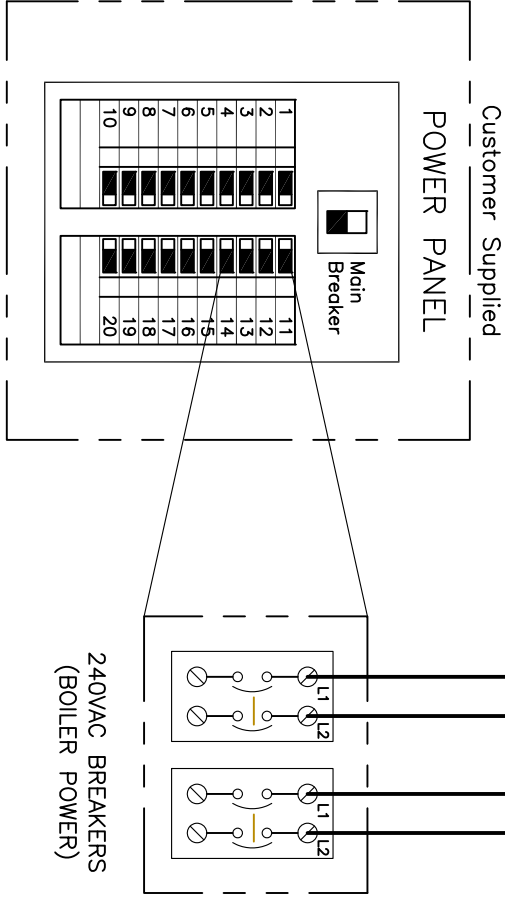
SINGLE PHASE EDB-T1-** BOILER HOOKUP

NOTES:

1. GROUNDING AND BONDING NOT SHOWN
2. CONDUCTOR SIZE AND WIRE TYPE PER NAMEPLATE CURRENT RATING. CAN BE ONE FEED PER BOILER CB.



BOILER POWER



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BH102

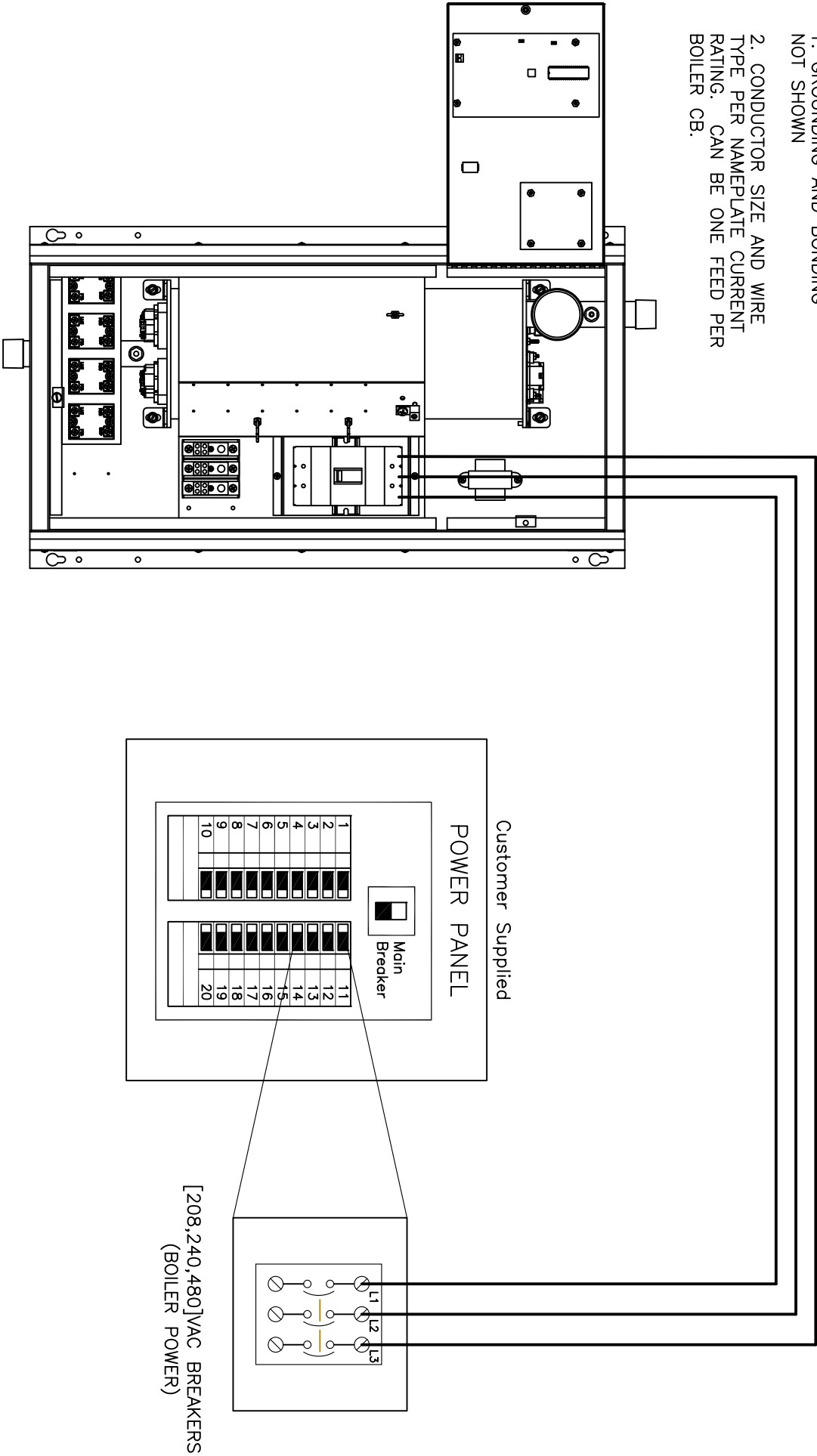
Rev.A 08/16/24: Released

Rev.B 11/22/24: Added 3-Phase Hookup

THREE PHASE EDB-T1-** BOILER HOOKUP

NOTES:

- 1. GROUNDING AND BONDING NOT SHOWN
- 2. CONDUCTOR SIZE AND WIRE TYPE PER NAMEPLATE CURRENT RATING. CAN BE ONE FEED PER BOILER CB.

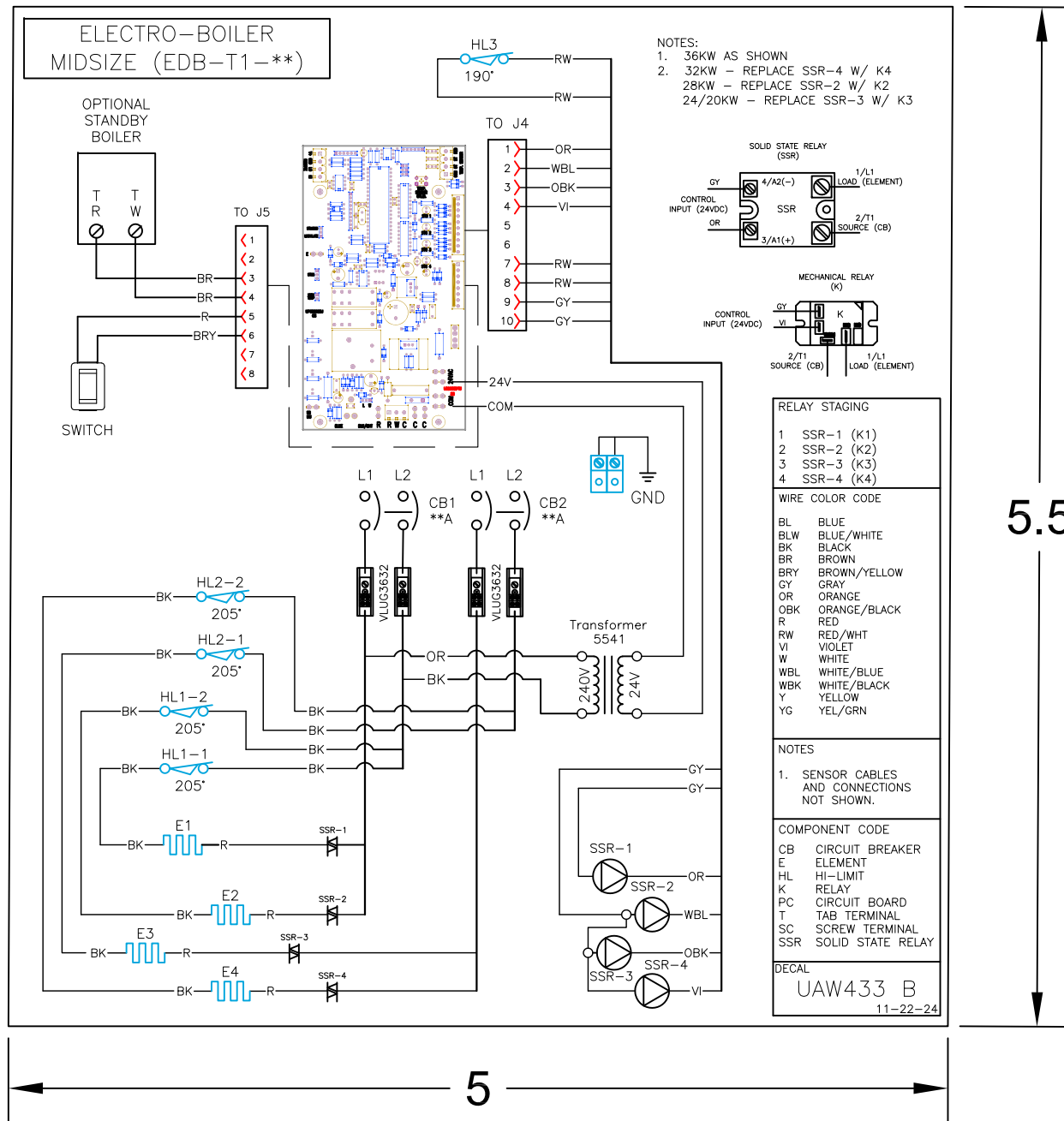


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BH102

Rev.A 08/16/24: Released

Rev.B 11/22/24: Added 3-Phase Hookup



- NOTES:
1. SIZE = 5" X 5.5"
 2. COLOR = BLACK ON WHITE
 3. MATERIAL = POLY WITH ADHESIVE AND LAMINATE.

Electro Industries Residential Limited Product Warranty

Effective November 1, 2009

Electro Industries warrants to the original owner, at the original installation site, for a period of two (2) years from date of original purchase, that the product and product parts manufactured by Electro Industries are free from manufacturing defects in materials and workmanship, when used under normal conditions and when such product has not been modified or changed in any manner after leaving the plant of Electro Industries. If any product or product parts manufactured by Electro Industries are found to have manufacturing defects in materials or workmanship, such will be repaired or replaced by Electro Industries. Electro Industries, shall have the opportunity to directly, or through its authorized representative, examine and inspect the alleged defective product or product parts. Electro Industries may request that the materials be returned to Electro Industries at owner's expense for factory inspection. The determination as to whether product or product parts shall be repaired, or in the alternative, replaced, shall be made by Electro Industries or its authorized representative.

Electro Industries will cover labor costs according to the Repair / Replacement Labor Allowance Schedule for a period of ninety (90) days from the date of original purchase, to the original owner, at the original installation site. The Repair / Replacement Labor Allowance is designed to reduce the cost of repairs. This Repair / Replacement Labor Allowance may not cover the entire labor fee charged by your dealer / contractor.

TWENTY YEAR (20) LIMITED WARRANTY ON BOILER ELEMENTS AND VESSELS

Electro Industries warrants that the boiler elements and vessels of its products are free from defects in materials and workmanship through the twentieth year following date of original purchase. If any boiler elements or vessels are found to have a manufacturing defect in materials or workmanship, Electro Industries will replace them.

TWENTY YEAR (20) LIMITED WARRANTY ON SPIN FIN ELEMENTS

Electro Industries warrants that the spin fin elements of its products are free from defects in materials and workmanship through the twentieth year following date of original purchase. If any spin fin elements are found to have a manufacturing defect in materials or workmanship, Electro Industries will replace them.

FIVE YEAR (5) LIMITED WARRANTY ON OPEN WIRE ELEMENTS

Electro Industries warrants that the open wire elements of its products are free from defects in materials and workmanship through the fifth year following date of original purchase. If any open wire elements are found to have a manufacturing defect in materials or workmanship, Electro Industries will replace them.



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CONDITIONS AND LIMITATIONS:

1. This warranty is limited to residential, single family dwelling installations only. Any commercial or multi-unit dwelling installations fall under the Electro Industries Commercial Limited Product Warranty.
2. Electro Industries shall not be liable for performance related issues resulting from improper installation, improper sizing, improper duct or distribution system, or any other installation deficiencies.
3. If at the time of a request for service the original owner cannot provide an original sales receipt or a warranty card registration then the warranty period for the product will have deemed to begin the date the product is shipped from the factory and **NOT** the date of original purchase.
4. The product must have been sold and installed by a licensed electrician, plumbing, or heating contractor.
5. The application and installation of the product must be in compliance with Electro Industries specifications, as stated in the installation and instruction manual, and all state, provincial and federal codes and statutes. If not, the warranty will be null and void.
6. The purchaser shall have maintained the product in accordance with the manual that accompanies the unit. Annually, a qualified and licensed contractor must inspect the product to assure it is in proper working condition.
7. All related heating components must be maintained in good operating condition.
8. All lines must be checked to confirm that all condensation drains properly from the unit.
9. Replacement of a product or product part under this limited warranty does not extend the warranty term or period.
10. Replacement product parts are warranted to be free from defects in material and workmanship for ninety (90) days from the date of installation. All exclusions, conditions, and limitations expressed in this warranty apply.
11. Before warranty claims will be honored, Electro Industries shall have the opportunity to directly, or through its authorized representative, examine and inspect the alleged defective product or product parts. Remedies under this warranty are limited to repairing or replacing alleged defective product or product parts. The decision whether to repair or, in the alternative, replace products or product parts shall be made by Electro Industries or its authorized representative.

THIS WARRANTY DOES NOT COVER:

1. Costs for labor for diagnosis, removal or reinstallation of an alleged defective product or product part, transportation to Electro Industries, and any other materials necessary to perform the exchange, except as stated in this warranty. Replacement material will be invoiced to the distributor in the usual manner and will be subject to adjustment upon verification of defect.
2. Any product or product part that has been damaged as a result of being improperly serviced or operated, including, but not limited to, the following: operated during construction phase, with insufficient water or air flow; allowed to freeze; subjected to flood conditions; subjected to improper voltages or power supplies; operated with air flow or water conditions and/or fuels or additives which cause unusual deposits or corrosion in or on the product; chemical or galvanic erosion; improper maintenance or subject to any other abuse or negligence.
3. Any product or product part that has been damaged as a result of natural disasters, including, but not limited to, lightning, fire, earthquake, hurricanes, tornadoes or floods.
4. Any product or product part that has been damaged as a result of shipment or handling by the freight carrier. It is the receiver's responsibility to claim and process freight damage with the carrier.
5. Any product or product part that has been defaced, abused or suffered unusual wear and tear as determined by Electro Industries or its authorized representative.
6. Workmanship of any installer of the product or product part. This warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation.
7. Transportation charges for any replacement product, product part or component, service calls, normal maintenance; replacement of fuses, filters, refrigerant, etc.

THESE WARRANTIES DO NOT EXTEND TO ANYONE EXCEPT THE ORIGINAL PURCHASER AT RETAIL AND ONLY WHEN THE PRODUCT IS IN THE ORIGINAL INSTALLATION SITE. THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE.

ALL IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED WITH RESPECT TO ALL PURCHASERS OR OWNERS. ELECTRO INDUSTRIES IS NOT BOUND BY PROMISES MADE BY OTHERS BEYOND THE TERMS OF THESE WARRANTIES. FAILURE TO RETURN THE WARRANTY CARD SHALL HAVE NO EFFECT ON THE DISCLAIMER OF THESE IMPLIED WARRANTIES.

ALL EXPRESS WARRANTIES SHALL BE LIMITED TO THE DURATION OF THIS EXPRESS LIMITED WARRANTIES SET FORTH HEREIN AND EXCLUDE ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES RESULTING FROM THE BREACH THEREOF. SOME STATES OR PROVINCES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY. PRODUCTS OR PARTS OF OTHER MANUFACTURERS ATTACHED ARE SPECIFICALLY EXCLUDED FROM THE WARRANTY.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY HAVE OTHER RIGHTS WHICH VARY UNDER THE LAWS OF EACH STATE. IF ANY PROVISION OF THIS WARRANTY IS PROHIBITED OR INVALID UNDER APPLICABLE STATE OR PROVINCIAL LAW, THAT PROVISION SHALL BE INEFFECTIVE TO THE EXTENT OF THE PROHIBITION OR INVALIDITY WITHOUT INVALIDATING THE REMAINDER OF THE AFFECTED PROVISION OR THE OTHER PROVISIONS OF THIS WARRANTY.