

Electro Mini EZBoiler® R1 Series

INSTALLATION & OPERATING INSTRUCTIONS

Models: EZB-R1-01-120-1
EZB-R1-03-120-1
EZB-R1-05-240-1
EZB-R1-07-240-1
EZB-R1-09-240-1

APPLICATION: The Mini EZBoiler is a packaged system complete with boiler vessel, expansion tank, air eliminator and circulating pump. It is designed to be used in low temperature radiant heat applications.

This series is equipped for load management interrupt with backup boiler output.

IMPORTANT: The included expansion tank is shipped loose within the Mini EZBoiler enclosure. The expansion tank must be installed prior to filling the system. See Mechanical Installation section.

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.



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INTRODUCTION

The Mini EZBoiler has been designed to be the complete system package for radiant heat applications. When properly sized, the Mini EZBoiler will provide the needed hot water to properly heat a space in a single zone or multiple zone application. Proper design of the radiant system is required to assure minimum required water flow (GPM) through the boiler.

BOILER CONTROL

The Mini EZBoiler can be operated with a single thermostat or multiple thermostats connected to the Zone 1 R-W terminal. It can also be controlled by a zone control panel end switch or zone valve end switches.

Do not jumper the R-W terminals for hot boiler application. This can cause unpredictable results and possible high limit lockout of the boiler elements resulting in no heat output.

The Mini EZBoiler can be used in dual heat/dual fuel applications. Existing components should be evaluated for removal as the Mini EZBoiler contains components that can be used by both systems. If you are considering adding an electric boiler to relatively new existing gas boiler system, contact the factory for additional information.

NOTE: This model series is 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 the 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 below. If zoned system, this applies when the smallest zone is operating.

TABLE 1 - MINI EZBOILER SPECIFICATION

Model	Volts	Phase	Watts	Btu/h	Amps	CB	GPM
							MIN
EZB-R1-01-120-1	120	1-60Hz	1,100	3,700	10	N/A	1.0
EZB-R1-03-120-1	120	1-60Hz	2,500	8,500	21	N/A	1.0
EZB-R1-05-240-1	240/208	1-60 Hz	5,000	17,000	21A/18A	30A	1.0
EZB-R1-07-240-1	240/208	1-60 Hz	7,000	23,800	30A/25A	45A	1.0
EZB-R1-09-240-1	240/208	1-60 Hz	9,000	30,700	38/32.5	60A	

Circulating Pump, all boiler models	120V 60 Hz	0.54 Amps	10A CB
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MULTIPLE ZONES AND RADIANT TEMPERATURES

The Mini EZBoiler R1 Series can be used in a single zone or multi zone application using a zone control panel or multiple zone valve end switch connections. It is designed to output one water temperature. If two temperatures are needed, thermostatic mixing valves can be used or consider using the Mini EZBoiler R1 Series.

ZONE VALVES/CIRCULATORS

It is recommended to use zone valves in multi-zone applications with the Mini EZBoiler R1 Series. If zone pumps are used, pipe the EZ boiler in a primary/ secondary loop configuration.

ROOM THERMOSTAT PLACEMENT

Floor radiant – comfort 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 ¾" 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.

BOILER/PIPING PLACEMENT

This model series is wall hung and the vessel must be vertical, drawing BX603.

Additional plumbing items are located below the boiler housing itself as shown on drawing BX603.

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 should be performed by trained, qualified contractors or technicians. Anyone installing this boiler should carefully study this manual prior to installation to get familiar with and plan how the boiler will be installed.

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 Mini EZBoiler products relate only to the addition of the Mini EZBoiler to the hydronic system. The owner/ installer assumes all responsibility and/or liability associated with any needed installation of the gas/oil boiler, pump, plumbing, system design, hydronic 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		SUGGESTED MINIMUM SERVICE CLEARANCE	
LEFT	2 INCHES	51 MM	12 INCHES	305 MM
RIGHT	1 INCH	26 MM	12 INCHES	305 MM
BACK	0 INCHES	0 MM	0 INCHES	0 MM
FRONT	1 INCH	26MM	21 INCHES	534 MM
TOP	5 INCHES	127 MM	14 INCHES	356 MM
BOTTOM	1 INCH	26 MM	14 INCHES	356 MM
SURROUNDING AMBIENT TEMPERATURE MUST NOT EXCEED 90° F/32° C				

CAUTION

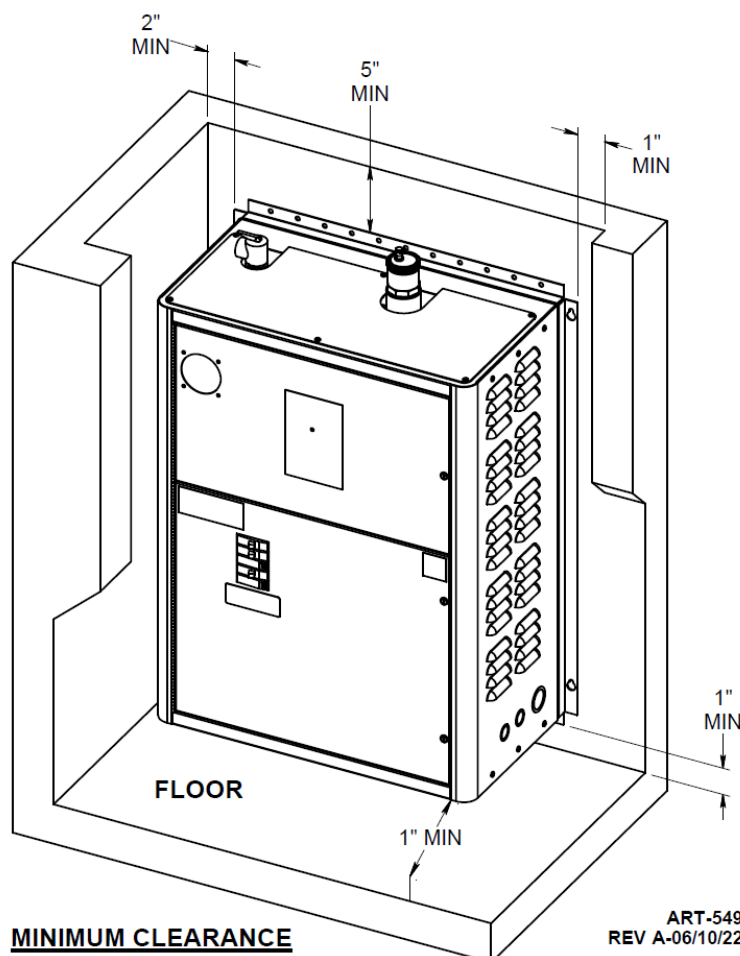
For all installations, whether in a room or enclosed space, adequate ventilation must be provided so this boiler's surrounding ambient temperature **does not** exceed 90° F/32° C.

WARNING

FOR SAFETY REASONS ALL COMBUSTIBLE AND NON-COMBUSTIBLE MATERIALS MUST BE KEPT AT LEAST ONE INCH AWAY FROM ANY SURFACE OF THIS BOILER.

CAUTION

This electric boiler is **ONLY** designed for indoor installation. It is **NOT** designed for outdoor installation.



MECHANICAL INSTALLATION

CAUTION

Electro Industries requires the use of dielectric isolation between the boiler 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 BX603

1. Unpack the Mini EZBoiler. Shipped loose from the boiler are pump check valve and mounting assist bracket.
2. The mounting assist bracket is used to hold the boiler in place during installation. Locate where the bottom of the boiler will be on the wall. Securely fasten the mounting assist bracket to the wall with the bent flange sticking out. This will allow you to “rest” the boiler between the flange and the wall while the boiler is secured to the wall installing mounting bolts through side and top boiler flanges.
Do not remove the mounting assist bracket until you have securely bolted the boiler to the wall. The unit 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.
3. **Expansion tank installation** – the expansion tank is included but shipped loose within the Mini EZBoiler, and must be installed prior to filling the boiler and system with fluid.

CAUTION

Use proper tools to install expansion tank. Attempting to tighten by hand will result in damage to the expansion tank.

- a. Remove and unpack the expansion tank from within the Mini EZBoiler enclosure.
 - b. To prevent water leaks, apply Teflon tape or suitable thread sealant (not included) to the threaded nipple of the expansion tank.
 - c. Thread the expansion tank into the designated shutoff fitting located at the bottom of the air eliminator assembly. Use a 7/8” wrench to tighten the expansion tank at the designated fitting on the expansion tank. **DO NOT ATTEMPT TO TIGHTEN BY HAND.**
 - d. Open the shutoff valve between the expansion tank and air eliminator assembly. Failure to open the valve will create problems when pressurizing the system during fill procedures.
4. The key mechanical components included with the Mini EZBoiler are:
 - **Expansion Tank** – provides constant system pressure. The expansion tank is pre-charged to 12psi.
 - **Air Vent/Inline Air Separator** – provides a means to trap and remove air from the hydronic system. Loosen small cap on top of air eliminator to allow air to purge. Tighten cap to finger tight only after system has been sufficiently purged of all air. This can take several days.
 - **Pressure Safety Valve** – 30psi pressure relief valve will release water when system pressure exceeds 30psi. 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.
 - **Circulating Pump** – the included pump provides water flow throughout the hydronic system. This is a 3-speed pump, shipped from the factory set to high speed. The pump speed may be adjusted as needed for ideal system temperature rise. Electro recommends allowing your hydronic system to warm to desired temperature before adjusting pump speed. A pump check valve is shipped loose. For single pump systems it is not required. If the Mini EZBoiler is piped in conjunction with a fossil fuel boiler with internal pump, the check valve may need to be installed. Contact the factory for more information.

5. Piping between the Mini EZBoiler and hydronic system manifolds is shown on drawing BX603. 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. Material used for piping between the Mini Boiler and the manifolds may include copper, black iron or oxygen barrier PEX tubing rated for hydronic heating.
6. When connecting pipe of dissimilar metal to the inlet and outlet of the boiler, dielectric unions must be used.
7. To ensure safe boiler operation, adequate system pressure must be maintained. Once all the air is purged from the system, adding additional water may be required to bring the system up to operating pressure, 12psi.
8. Depending upon water conditions, determine whether water additives are necessary.
9. 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.
10. Purge each loop individually, one at a time.
11. Check for leaks.

ELECTRICAL HOOKUP

Reference drawing BH604

1. **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 is highest priority stage.
 2. **Grounding** – copper conductor is required, size per NEC code relating to the current of each feed.
 3. **120-Volt Circulating Pump Power** – route and install the proper current carrying conductors from service panel fuse or circuit breaker, 10-amp maximum. These models contain a built-in 10A circuit breaker. Wire connection is at the circuit breaker and neutral/ground terminals.
 - Only copper wire is allowed.
 4. **Operating Thermostat** – Connection is at the top of the control board Zone 1. The heat call signal is connected to the R-W terminals. The C terminal can also be connected for thermostat requiring 24VAC power.
 - If needed, you can connect thermostat C to boiler C.
 - The Zone 2 terminal is disabled on this model.
- 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.
5. **Load Management Interrupt Control (LMC)** – this Mini EZBoiler series has been pre-wired and designed for an external utility load management receiver connection. The control board terminal block marked Load Man represents the connection point for the utility load control device wires. 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.
 6. **Zone 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 MINI EZBOILER PRODUCT. ONCE THIS HAS BEEN DETERMINED, ALL END SWITCHES ARE SIMPLY PARALLELED WITH THE TWO WIRES GOING TO R AND W.

7. **Low Water Cutoff** – a low water cutoff is not included or factory required for the boiler. However, one can be added to the LMC circuit. Simply place the field provided flow switch in series with this circuit.
8. **Flow Switch** – a flow switch is not included or factory required for the boiler. However, one can be added to the LMC circuit. Simply place the field provided flow switch in series with this circuit.

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 and prepackaged plumbing kit and/or when the system is plumbed exactly as shown on drawing BX603.

CAUTION

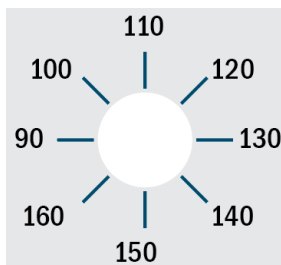
If the building supply pressure is connected directly to supply water ball valve without pressure reducing regulator, user needs to make sure the pressure within the boiler loop does not exceed 30 PSI. Careful control of the supply water ball valve opening can take care of this. Also at steps 6 and 10,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

1. Do not apply 240/208-volt heating power during water fill sequence.
2. Connect the temporary household 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** ball valve (between drain valve and boiler). This will ensure water flushes in one direction through the system.
5. Verify any hydronic manifold valves are **open**.
6. **Open** water supply valve and **open** household water supply source.
7. Allow water to circulate, discharging through drain valve, for at least 15 minutes.
8. **Close** both the inlet and drain valves.
9. Slowly **open** the inlet valve until the cold system pressure at the gauge reads 12 to 20 PSI, then **close** the valve.
10. Loosen the air bleed cap on top of the air eliminator.
11. Optional – to purge any remaining air in the system, energize the circulating pump by inserting a jumper across the R-W terminals on the boiler control board. Temporarily removing the blue jumper at the blue-blu/wht terminal will prevent elements from activating during this process.
Run pump for 30 minutes. If a significant amount of air is removed and the boiler pressure drops below 10 PSI, slowly open the water inlet valve to build water pressure to 12 to 20 PSI.
12. Once the boiler pressure is stable, disconnect the water supply.

COMMENT: Purge one loop at a time.

WATER TEMPERATURE CONTROL

Determine the design or required outlet water temperature. If this is a radiant floor system this typically could be as low as 110°. If it is staple-up or water coil, satisfactory operation may be at 140° to 160°. The front temperature set point is selected by a small screwdriver dial switch



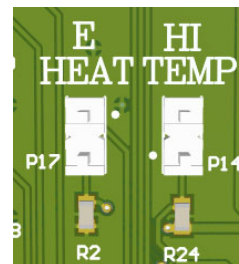
Adding a jumper on the header marked “HI TEMP” on the control board automatically shifts each temperature setpoint up 20° F as follows:

90°F → 110°F	130°F → 150°F
100°F → 120°F	140°F → 160°F
110°F → 130°F	150°F → 170°F
120°F → 140°F	160°F → 180°F

Note: Basic 24V power must be present for this control board function to work.

HI TEMPERATURE MODE & EMERGENCY HEAT

For testing purposes only, adding a jumper on the header marked “Test Only” on the control board automatically sets the temperature setpoint to maximum 180° F. See image to the right. Note: You must have a thermostat Zone Call when using the “Test Only” jumper to keep the system circulator pump running.



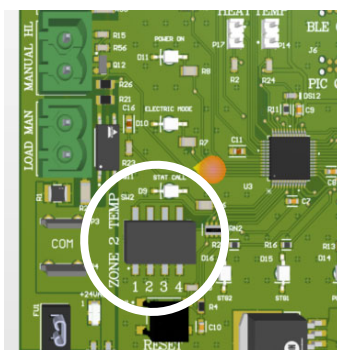
While in test mode, the “Electric Mode” led will continuously flash.

⚠ CAUTION

FAILURE TO REMOVE THE “TEST ONLY” HEAT JUMPER AFTER TESTING WILL CAUSE THE BOILER TO OVERHEAT AND TRIP THE MANUAL HIGH LIMITS.

ZONE 2 TEMP DIP SWITCHES

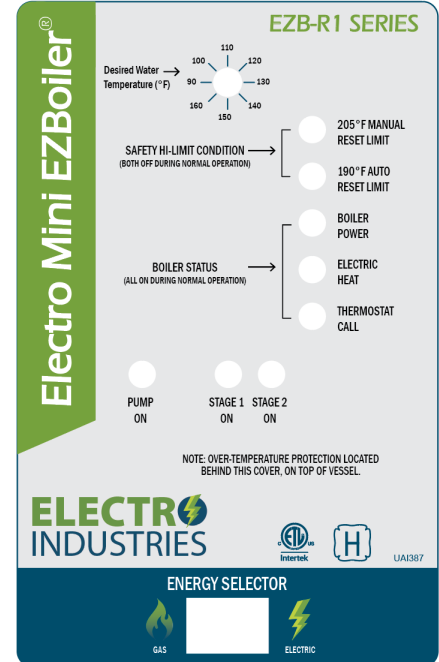
On this EZB-R1 series, Zone 2 is disabled and the temperature dip switches are not used. However, switch number 4 **must** be in the “off” position. If you find switch 4 in the “on” position, power down the boiler, turn the switch off and restart the boiler. Prolonged operation with the switch in the on position will result in premature failure of the element relays.



OPERATIONAL TIPS

Front Panel Monitor Lights (see troubleshooting section for more details)

- **205°F MANUAL RESET LIMIT**, red – this will **only** illuminate when the vessel hi-limit opens due to boiler plate reaching 205°F. This is a manual reset limit, See page 12 for limit resetting instructions and cautions,
- **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** – for the R1 series this led indicates the following:
 - Solid green – sensors okay
 - Flashing red – faulty supply sensor
 - Flashing blue – faulty outdoor sensor
- **ELECTRIC MODE**, yellow – indicates the following conditions:
 - Solid yellow – Load Man circuit closed normal operation
 - Off – Load Man circuit is open or energy selector switch is set to “Gas”. Electric heat is disabled.
 - Flashing Yellow – “Test only” mode is active
- **THERMOSTAT CALL**, red – indicates a remote switch closure (thermostat or zoning end switch) is closed between terminals R and W. PUMP 1 ON, green. Indicates pump for Zone 1 is active.
- **STAGE 1-2 ON**, green. Indicates when boiler stages are active.



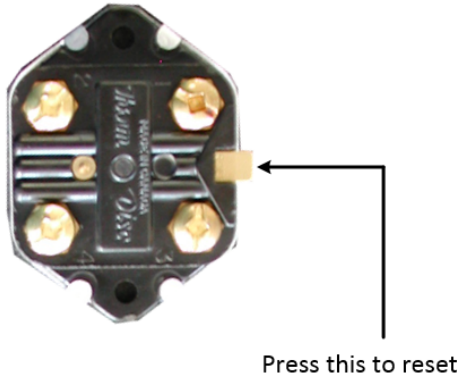
Manual Reset Hi-Limit

At the top of the vessel there will be either two or three surface mount hi-limits preset at 205° F. These 205° F safety limits break the L2 current carrying 240/208-volt wire going to the elements. 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



⚠ 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, the expansion tank is too small or there is a problem with the expansion tank piping, expansion tank itself.

Replacement Parts

EMBRM5625	Control Board
UFUSE0443	2-amp, fast blow fuse
5128C	Heating relay
5402KIT	Thermistor supply temp
5535	Safety hi-limit, manual reset, 205° F
5512-190	Safety hi-limit, auto reset, 190° F
5453	Relief valve, 30 PSIG
5456A	Pressure/temperature gauge
5652SM	60A Siemens circuit breaker
5651SM	45A Siemens circuit breaker
5650SM	30A Siemens circuit breaker
5680S	10A Siemens circuit breaker
EB5526	Electric element, 240V, 5 kW
EB5520	Electric element, 240V, 4.5 kW
EB5523	Electric element, 240V, 2.5 kW
5541	Transformer, 24V, 40VA
5585TKIT	Circulating Pump, 120V
5590	Expansion tank, 2.1 gal.
5596	Air eliminator

OPERATING & TROUBLESHOOTING

Normal heating operation – when there is a heat call from the thermostat (24VAC present on the control board W-C terminals) the boiler pump will start and indicator lights will illuminate on the front of the Mini EZBoiler.

- Boiler Power, steady pulse
- Electric Mode, steady yellow
- Thermostat Call, steady red
- Pump 1

After a short delay of one minute or less, the Mini EZBoiler will begin to stage up elements as indicated by the STAGE 1 ON and STAGE 2 ON LED's on the front panel. The Mini EZBoiler will use one or both in order to reach the desired supply water temperature. Zone 1 desired water temperature is set on the front dial or is determined using the front dial and the outdoor reset curve when the outdoor sensor is connected

As the Mini EZBoiler reaches its set point water temperature you may see the boiler stage lights stage off and on at a slow rate. This is normal operation for the built-in WarmFlo controller as it works to maintain constant water temperature as efficiently as possible.

1. This WarmFlo controller contains several interference suppression components, but as an electronic logic product, 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. Faulty Temperature Sensor – if the main control board detects a faulty temp sensor the boiler power LED will flash the following codes:
 - Solid Green – Sensors Okay
 - Flashing Red – Faulty Supply Sensor
 - Flashing Blue – Faulty Outdoor Sensor

Sensors are 10K ohm thermistor type. If you suspect a failed sensor, or want to check accuracy, disconnect the sensor from the control board and use an ohm meter to verify approximate resistance, see Table 2.

Table 2

°C	°F	kΩ	°C	°F	kΩ	°C	°F	kΩ	°C	°F	kΩ	°C	°F	kΩ	°C	°F	kΩ
-23	-9.4	127.07	14	57.2	16.61	51	123.8	3.45	-4	24.8	41.68	33	91.4	7.07	70	158	1.76
-22	-7.6	119.32	15	59	15.83	52	125.6	3.32	-3	26.6	39.47	34	93.2	6.78	71	159.8	1.7
-21	-5.8	112.11	16	60.8	15.1	53	127.4	3.2	-2	28.4	37.4	35	95	6.5	72	161.6	1.64
-20	-4	105.38	17	62.6	14.4	54	129.2	3.09	-1	30.2	35.45	36	96.8	6.24	73	163.4	1.59
-19	-2.2	99.1	18	64.4	13.75	55	131	2.97	0	32	33.62	37	98.6	5.98	74	165.2	1.54
-18	-0.4	93.25	19	66.2	13.12	56	132.8	2.87	1	33.8	31.89	38	100.4	5.74	75	167	1.49
-17	1.4	87.78	20	68	12.53	57	134.6	2.76	2	35.6	30.26	39	102.2	5.52	76	168.8	1.44
-16	3.2	82.67	21	69.8	11.97	58	136.4	2.67	3	37.4	28.73	40	104	5.3	77	170.6	1.39
-15	5	77.89	22	71.6	11.44	59	138.2	2.57	4	39.2	27.28	41	105.8	5.09	78	172.4	1.35
-14	6.8	73.43	23	73.4	10.93	60	140	2.48	5	41	25.92	42	107.6	4.89	79	174.2	1.31
-13	8.6	69.25	24	75.2	10.45	61	141.8	2.39	6	42.8	24.63	43	109.4	4.7	80	176	1.27
-12	10.4	65.34	25	77	10	62	143.6	2.31	7	44.6	23.42	44	111.2	4.52	81	177.8	1.23
-11	12.2	61.67	26	78.8	9.56	63	145.4	2.23	8	46.4	22.27	45	113	4.34	82	179.6	1.19
-10	14	58.24	27	80.6	9.15	64	147.2	2.16	9	48.2	21.19	46	114.8	4.18	83	181.4	1.15
-9	15.8	55.02	28	82.4	8.76	65	149	2.08	10	50	20.17	47	116.6	4.02	84	183.2	1.12
-8	17.6	52.01	29	84.2	8.39	66	150.8	2.01	11	51.8	19.2	48	118.4	3.87	85	185	1.08
-7	19.4	49.17	30	86	8.03	67	152.6	1.94	12	53.6	18.29	49	120.2	3.72	86	186.8	1.05
-6	21.2	46.52	31	87.8	7.7	68	154.4	1.88	13	55.4	17.43	50	122	3.58	87	188.6	1.02
-5	23	44.02	32	89.6	7.37	69	156.2	1.82									

3. Temperature sensing bypass – the inside control board, left side, contains jumper labeled “Test Only” which can be used to directly step in the heating stages and in essence bypass the temperature sensing and control functions. The “test Only” jumper has the highest priority and overrides all temperature sensor functions. **Note:** Verify pump is operating prior to using the “Test only” jumper. Since activating this function causes full electric element output, this function should only be used to verify all stages or troubleshoot proper 240Ø current at each element.

Boiler Element Testing

CAUTION

THE WIRES AND SCREWS OF THE ELEMENTS HAVE 240/208-VOLT POTENTIAL AND CAN BE DANGEROUS. USE EXTREME CAUTION WHEN CHECKING VOLTAGE OR RESISTANCE AT THE ELEMENTS

Element resistance test – to access the elements, shut off the 240V power, remove the lower front cover and the boiler bottom panel. Disconnect one wire from each element. Using an ohm meter, measure resistance across the two element screws (not to ground). Resistance value will be between 6 and 13ohms depending on the watt size of the element you are testing. An element that reads O.L is bad. If the element reads normal ohms, reconnect the wires.

You can also test for voltage and amperage at the elements to verify correct operation. While the covers remain off, restore power to the boiler and initiate a heat call so that the indicator LEDs show all elements on. With your voltmeter, very carefully check for 240V across the two screws of each element (not ground). If there is 240V at the element and it has normal resistance the element is good. You can also use a clamp on amp meter to confirm amperage off one wire to each element. Normal reading will be 18-38amps depending on the watt rating of the element. If you do not read 240V across the element, but do find 120V to ground on each element screw further investigation of the control circuitry is required. See manual and auto high limit operation in the next section.

Boiler water temperature – with a thermostat heat call, the Mini EZBoiler will try and achieve a temperature set point. The time it takes to reach set point will vary depending on conditions of the system. When operating at the recommended flow rate (GPM per kW) you should see an approximate 20° difference between return water and supply water temperature. On a cold start up with return water temps below 60° F, it could take a few hours for the boiler to reach a set point above 80° F. Adjusting the set point dial to a higher temperature during a cold startup will have little or no effect since the boiler cannot exceed a 20° increase in temperature from return to discharge.

Once the return water temperature starts to increase you will start to see an increase in outlet temperature. This will continue until the outlet temperature reaches the desired set point, at which point the WarmFlo control will stage and modulate elements to hold that temperature.

190° auto reset high limit – under normal operating conditions the 190° auto reset LED should not come on. The built-in WarmFlo control of the Mini EZBoiler should prevent this. However, on a system with very low water flow or trapped air you will see the 190° auto reset activate. The water within the boiler vessel must cool by 30° F before the high limit will self-reset. The 190° interrupts control power to the boiler element relays, not allowing the full 240V to be present at the elements.

If you experience auto reset limit trips at initial startup of the Mini EZBoiler the following items should be checked:

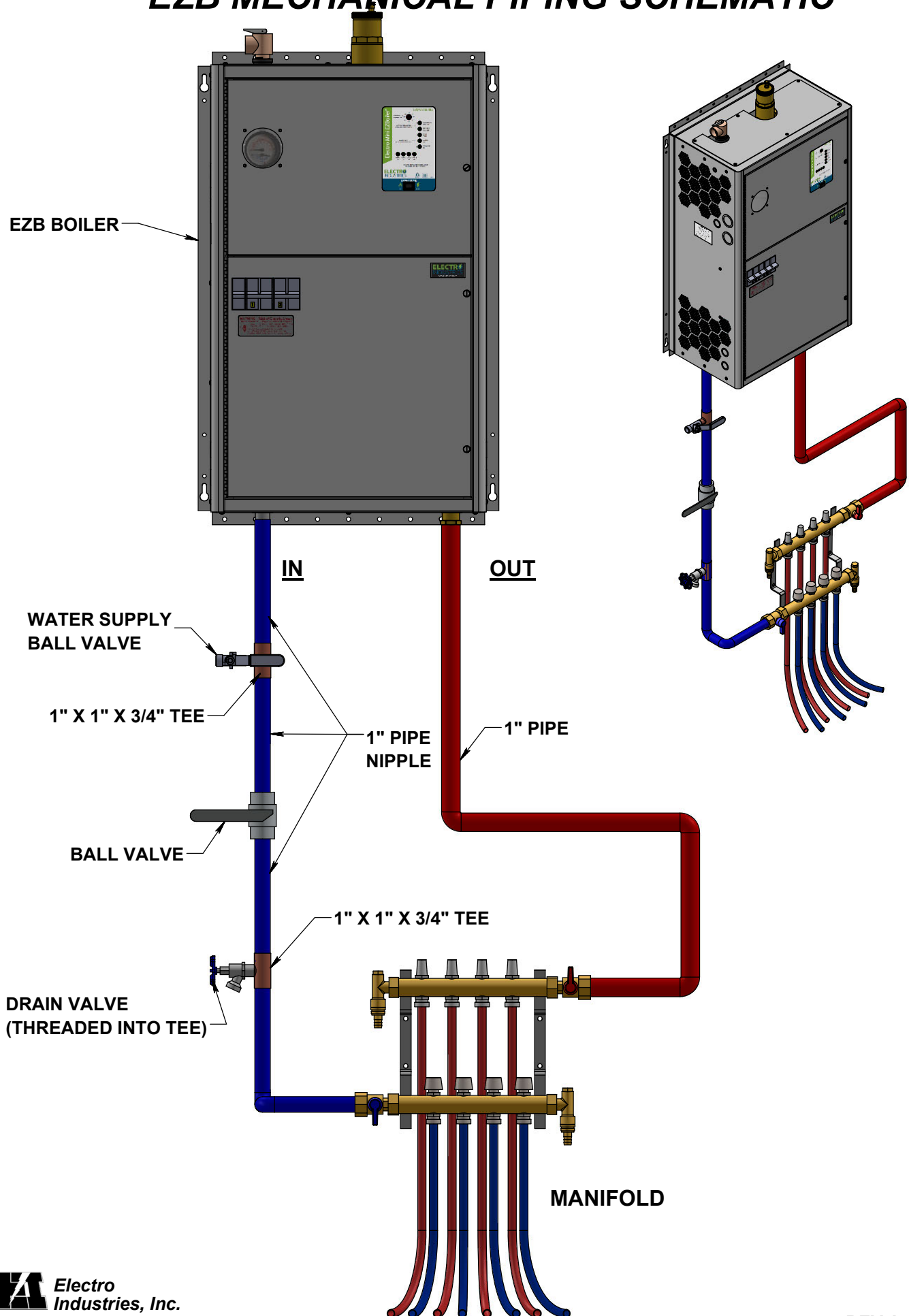
- System pressure 12 to 20 PSI on boiler gauge
- All ball valves and manifold valves are in the “on” position
- Boiler and system are purged of any trapped air. Loosen air bleed cap on the top of the air eliminator.

205° Manual high limit reset- under normal operating conditions the 205° manual reset should not trip. The built-in WarmFlo control of the Mini EZBoiler should prevent this. However, on a system with very low water flow or trapped air you might see the 205° manual reset trip open. The water within the boiler vessel must cool by 30° F before the high limit reset tab can be manually reset. If this limit trips during initial boiler start up, verify there is no trapped air in the system and the circulator pump is working properly with a heat call. The manual high limit will interrupt one leg of the 240V power going to the elements.

Potential causes of 205° manual high limit reset:

- Not enough water in the system
- Little or no system pressure
- Circulator pump is not actively moving water through the boiler
- Element relay stuck “closed” allowing element to heat with no pump running
 - Verify 0 volts across element terminals with no heat call active. If 240VAC is present on the element with no active heat call, element relay is likely stuck closed and should be replaced

EZB MECHANICAL PIPING SCHEMATIC



MINI-EZB BASIC HOOKUP (EZB-R1)

NOTES:

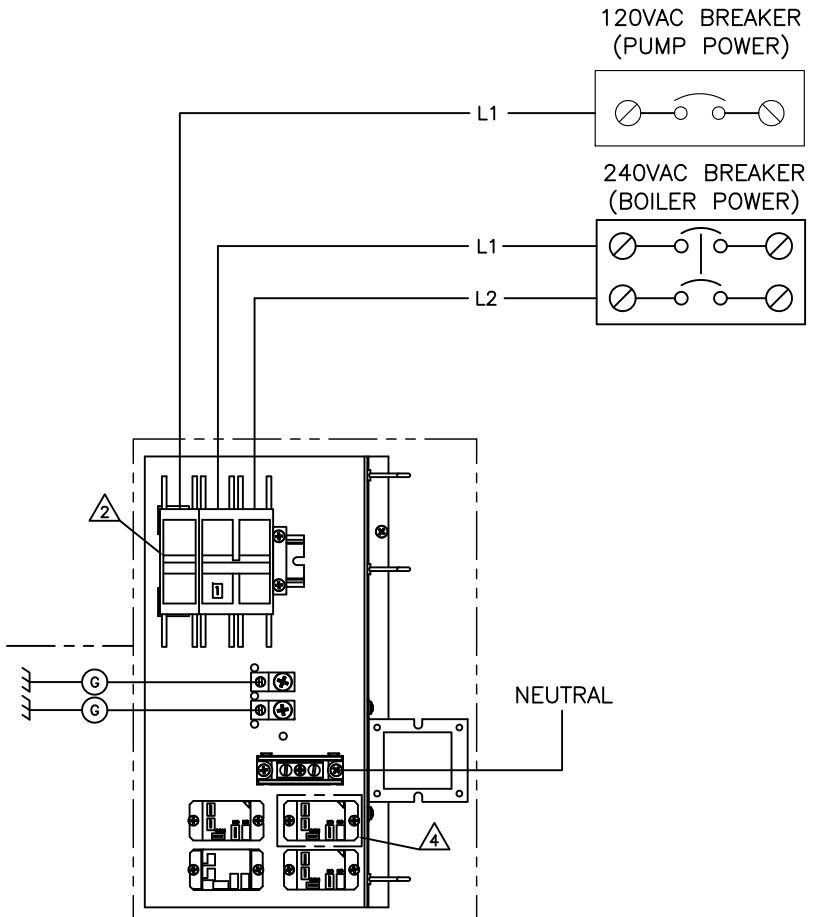
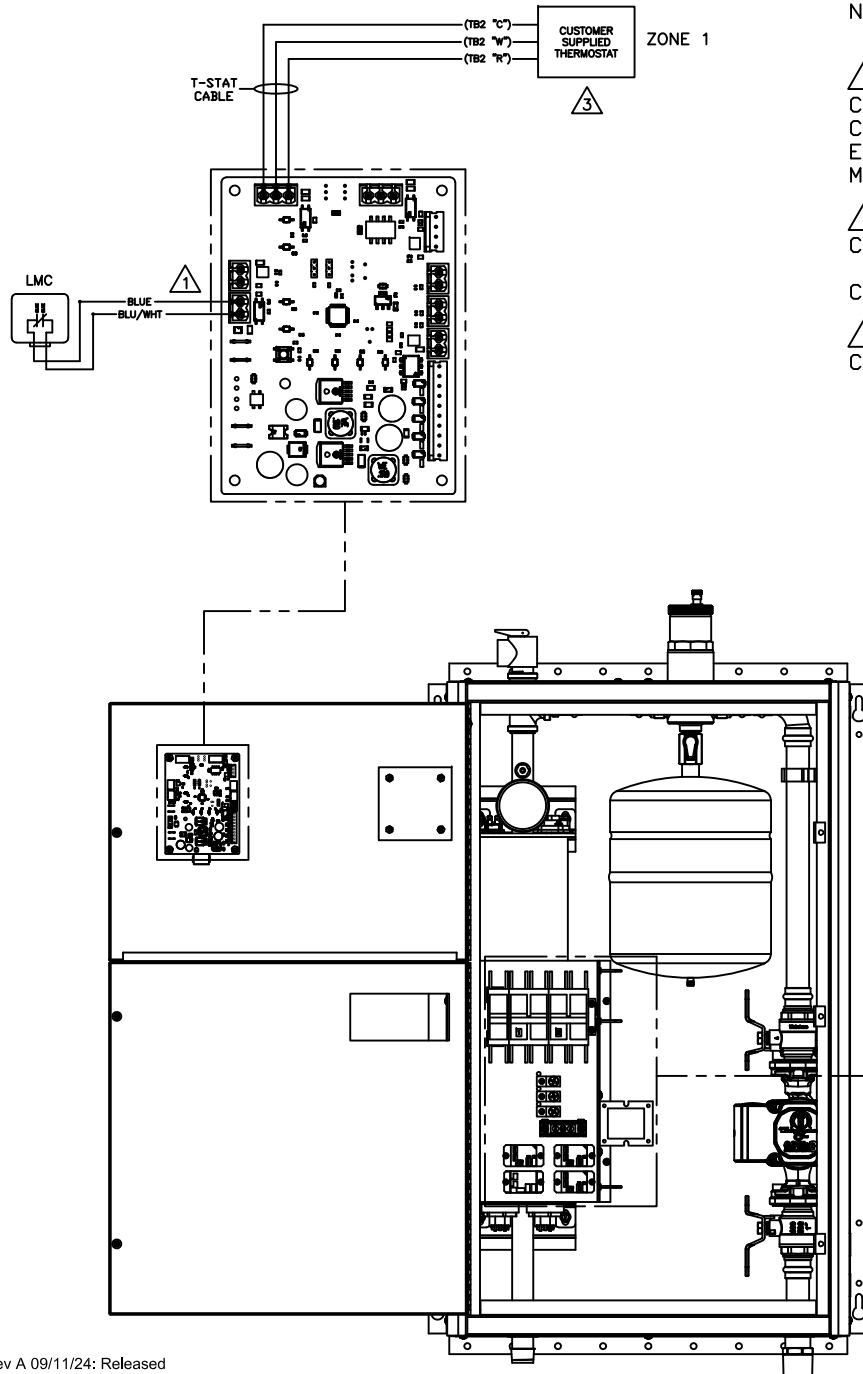
1 AS SHIPPED THE UTILITY LOAD CONTROL CIRCUIT IS WIRE NUTTED OR JUMPED CLOSED. IF REQUIRED, CONNECT WIRES FROM EXTERNAL NORMALLY CLOSED "LOAD MANAGEMENT CONTROLLER" TO THIS CIRCUIT

2 CONNECT POWER SOURCE AT INTERNAL CB, USE COPPER WIRE ONLY.
 NOTE - 120V MODELS DO NOT HAVE CB, CONNECT TO PROVIDED TERMINAL BLOCK

3 ANY 2-WIRE STAT OR END SWITCH CONTACT CAN BE USED TO OPERATE R & W

4 DEPENDANT ON MODEL

5. HIGH VOLTAGE & LOW VOLTAGE WIRING MUST HAVE MINIMUM 1" (2.5CM) SPACING



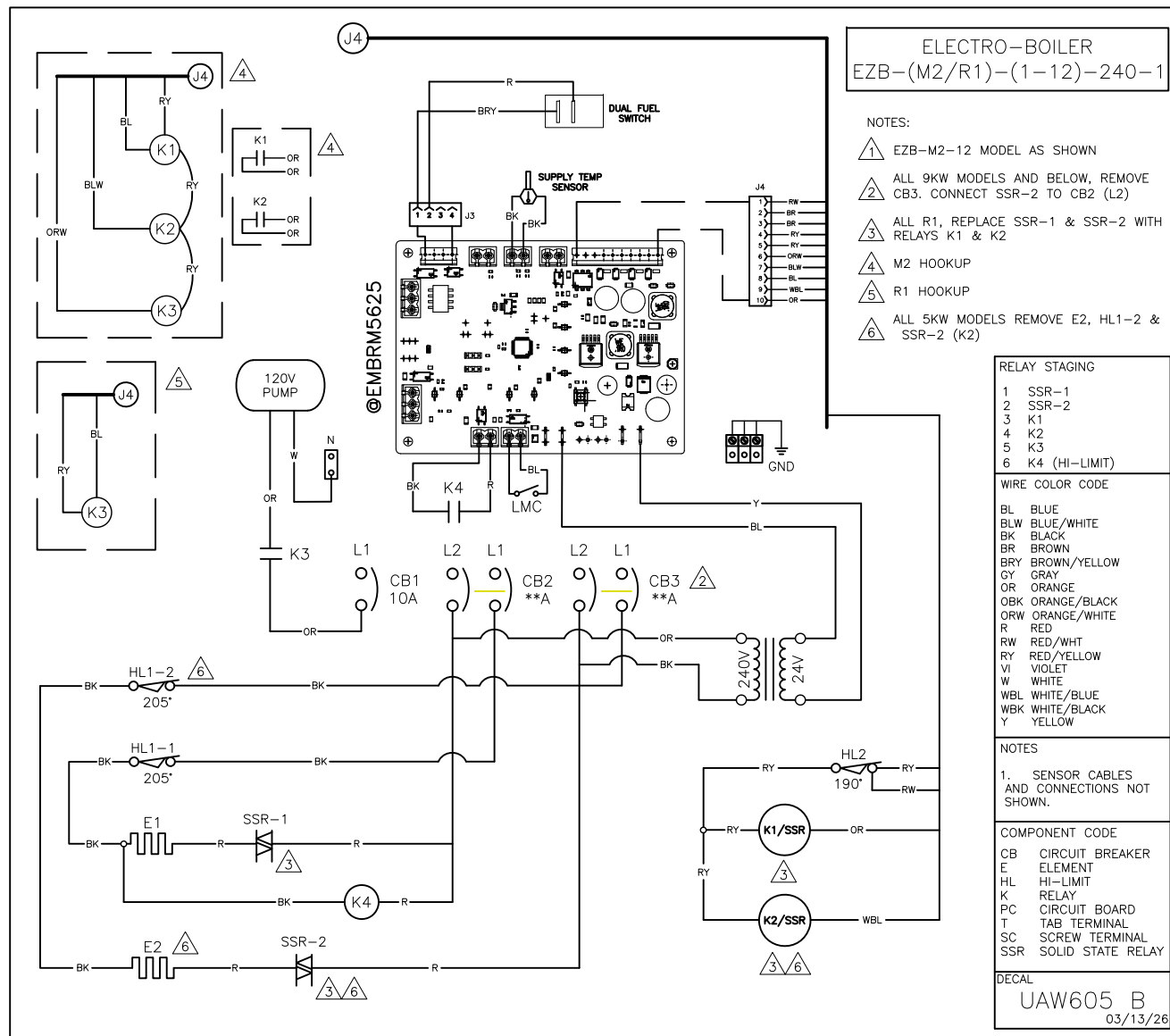
Rev A 09/11/24: Released



ELECTRO INDUSTRIES, INC.
 MONTICELLO, MN 55362

5

5.5



NOTES:

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



ELECTRO INDUSTRIES, INC.
MONTICELLO, MN 55362

UAW605
REV. A 08/21/24
REV. B 03/13/26

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.