

Electric Mini-Boiler™

- 120V Model -

Installation & Operating Instructions

Model EMB-2	2.5 kW	2 GPM minimum flow
Model EMB-4	5 kW	3 GPM minimum flow
Model EMB-1	1.1 kW	Display or Demo

Application - Low temperature, low pressure, radiant underfloor heating systems.

Comment - If this application is for traditional hydronics heating requiring temperatures greater than 140° and capacities larger than shown above, contact factory for other Electro-Boiler product series.

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

Drawings: **BX301**
BH309
BS310
BL001



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Note: EMB-1 is for display only with plug-in cord. This has special wiring and 240 elements in series. The drawings above do not apply. Also transformer must have “120V” decal.

GENERAL

As stated, this product series applies to underfloor hydronics heating. The basic **components** for an electric energy heating system typically includes:

1. Electric Mini-Boiler itself – covered by this manual
2. Thermostat control – covered by this manual
3. Plumbing kit or piping material at the boiler itself - Can be ordered as a kit, reference catalog number EMB-PK.
 - These items are shown on plumbing installation drawing BX301.
4. Circulating pump - Typically sized for head pressure and system flow requirement, typical catalog number EMB-P2.
5. The underfloor circulating tubes and manifolds - Provided and manufactured by others, not covered in this manual.

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 (ie. Heating PEX).

SYSTEM OR WATER FLOW

In order to prevent hi-limiting and assure full 20 year parts life, the piping system/basic plumbing/circulator pump must be arranged to provide flow greater than minimum GPM shown on the cover sheet.

If zoned system, this applies when the smallest zone is operating. If zoned system is under 600 feet consider WarmFlo model (EMB-W-9).

ROOM THERMOSTAT PLACEMENT

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

- **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 such as Electro Industries' ES-24-SRO. This type of device only requires a ¼" hole drilled in the concrete at some center wall location.
- **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.
- **Radiant heat control systems, wall stat or slab stat, with added in-line aquastat** - These systems are typically made up by the tube/pipe manufacturer/representative and include system controlling features. The system controlling device is connected to "R" and "W" terminals and must be the main boiler control. If there is a mixture of zones, an optional aquastat can be used in case flow does not adequately maintain the loop temperature below approximate 100°. Also the thermostat terminals control the pump. The best connection for the optional aquastat is controlling the electric boiler element 2. Locate the white/blue jumper on the inside circuit board, cut and install the aquastat switch. Procedure BD002 provides additional information for strap-on aquastats.

ZONE CONTROLLER

If automatic zones and zoning thermostats are part of this system, suggest adding a zone controller which has the ability to shed stages when the system is operating with smaller zones. If not using a stage shedding zone controller, a strap-on aquastat may be required to keep the boiler at a reasonable upper temperature, see next section.

If you only have 2 to 3 zones, the original multi-zone interlock, EB-5415A is still available. This was recently updated to include 40VA transformer and additional wiring space. In a simple 2-zone arrangement, this controller will shed stage 2 if only 1 zone is calling (drawing BH013).

If the zoning system is more complex and you need zone controller shown on the accessories sheet, select the appropriate model and when ordering specify Mini-Boiler application.

AVAILABLE, ELECTRO INDUSTRIES, INSTALL PARTS OR KITS

EMB-BK	BOILER MINI PLUMBING KIT BASIC
EMB-P2	PUMP KIT 1/25HP BOILER
ES-24-SRO	STAT DIG SLAB/ROOM/ROOM 24VAC
5616	TRANSFORMER HTR 4X4 PLATE 40VA 24VAC
5576	AIR ELIMINATOR 3/4" ROLLAIRTROL
5456A	GAUGE PRES/TEMP 75 PSI/320DG F .25"
5453	VALVE RELIEF 30 PSIG .75' NPT MALE
5590	EXPANSION TANK 40K BTU 2.1 GAL.
EMB-PK	BOILER MINI INSTALL KIT PREFERRED
EB-5415A	ZONE CONTROLLER

OPTIONAL AQUASTAT, TYPICAL STRAP-ON

If zones or reduced radiation require an external temperature control device to prevent boiler hi-limiting, there are two recommended electrical connections.

- **Two unbalanced zones, of the EMB-4 will carry the smallest zones** – in this case use the aquastat to “stage” the boiler or remove the second element when the temperature rises. Reference hookup diagram (BH302 P.1) note 5. Remove white/blue jumper and install an open with temperature rise aquastat contact in place of this jumper.
- **Two unbalanced zones, smallest zone requires less than 1/2 of the boiler capacity** – in this case the temperature controlling aquastat must turn off both elements. Cut one of the red/white wires going to the 160° screw-in hi-limit and electrically insert an open with temperature rise aquastat switch contact. Set the aquastat below the 160° limit value which allows the aquastat to turn off both elements.
- **Note:** Aquastat setting – suggest aquastat settings be approximately 5° higher than designed outlet temperature for the system.
- **Other options** – request procedure BD002.

TEMPERATURE CONTROL

The limits or temperature sensing components within this unit are for safety purposes only. The system installation must have a proper responding slab sensing thermostat (or zone controlling device) to properly turn the boiler on and off. If the water flow is greater than the minimum GPM specified, this boiler should not reach hi-limit and the hydronics loop should continue to flow in the normal heating pattern until the operating thermostat is satisfied. If hi-limiting is experienced prior to satisfying the operating thermostat, there is possibly a water flow problem.

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.

$$\text{GPM} = \frac{\text{Volts} \times \text{Amps} \times 3.4}{500 \times \text{Temp. rise}} \quad \text{Example: } \frac{240 \text{ volts} \times 36 \text{ amps} \times 3.4}{500 \times 12 \text{ degree rise}} = \frac{29376}{6000} = 4.9 \text{ gpm}$$

INSTALLATION REQUIREMENTS

1. All installation work must be performed by trained, qualified contractors or technicians. Electro Industries, Inc., sponsors installation and service schools to assist the installer. **Visit our web site 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 CSA/us certification label, and manufacturer product liability. Electro Industries, Inc., 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.

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.

MECHANICAL INSTALLATION

CAUTION

Electro Industries Inc. 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 BX301

The plumbing components and piping layout shown on drawing BX301 have been very carefully picked 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. The arrangement of these components guarantees installation and initial operating success.

The key mechanical components required include:

- **Boiler/Plumbing Kit Placement** – This model series is wall hung and the vessel must be vertical.
 - The plumbing kit items are located adjacent to the boiler housing itself as shown on drawing BX3Ø1.
 - For future servicing, the unit itself must be installed a minimum of 18” above the floor. The elements are screwed in from the bottom.
 - Allow adequate space for cover removal and maintenance.
- **Expansion Tank** - As a closed loop hydronic heating system, a minimal expansion tank is required. This can be an air diaphragm tank as provided in the plumbing kit or a basic “empty” tank where air is compressed at the tank top.
- **Temperature/Pressure Gauge** - Recommended to observe the operation of the system. Actually a temperature gauge at the inlet and outlet is desirable.
- **Pressure Safety Valve** - This is required at the hot outlet and is furnished as a **loose** component with the boiler unit itself. Failure to install the provided, 30 PSI, pressure relief valve as shown void warranty and the CSA product listing.

Add the necessary pipe extension from the relief valve to the floor 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 loop resistance (feet of head), the proper circulating pump is required to guarantee the minimum GPM flow as specified on the cover sheet.
- **Comment:** Circulator pump can be in the outlet or inlet. Newer, higher quality pumps seem to work better in the supply line.
- **Air Vent Relief** - Whenever there is a plumbing point higher than any of the components shown or an adjacent line (any vertical “U” trap), an air vent valve should be provided.
- **Building Water Supply Connection** – The intent of this connection is temporary and for fill purposes only. The installer has the responsibility of complying with local building codes. Local codes may require a backflow preventor when the domestic water supply line is fixed to the boiler mechanical piping.

WATER ADDITIVES

1. Unless the source water is unusually poor and/or rust elements, additives are not required. It is recommended the water source as shown on drawing BX3Ø1 comes through the household water softener.
2. Impurities within a closed loop hydronics boiler are considerably less damaging than the typical domestic water heater. In a closed loop electric boiler, the water impurities “boil out” and the system essentially reverts to pure water. As a closed system, this “pure water” becomes the operating mode. In the case of domestic water tank, there is always new water entering with new impurities.
3. However, if additives are required, use the recommendations and source from your local professional plumber, specializing in hydronics heating systems.

WATER FILL PROCEDURE

This procedure applies to the prepackaged plumbing kit, referred to as EMB-PK, and/or when the system is plumbed exactly as shown on drawing BX301, revision O. It is the installer’s responsibility to adhere to any local plumbing codes.

Caution: If the building supply pressure is connected directly to supply water ball valve without pressure reducing regulator (reference drawing page 2 example), 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 will take care of this. Also at step 8 use caution to make sure the building water supply pressure does not “spike” the system.

1. Connect drain hose to lower hose bib drain valve (open valve).
2. Adapt water supply line to ¾” female iron pipe at the supply water ball valve.
3. Close ball valve at the boiler inlet return piping.

4. Open ball valve at the boiler outlet supply piping.
5. Open “cold water supply” ball valve and allow the system to drain for 5 to 10 minutes.
6. The expansion tank comes factory set at 12 PSIG. If this pressure is not changed (make sure to check pressure at tank) the system pressure should match the expansion tank pressure at 12 PSIG.
7. Close the cold water supply ball valve.
8. Allow pressure to stabilize at 12 PSIG and close hose bib drain valve.
9. Open ball valve at boiler inlet piping.
10. Disconnect “cold water supply line”.

ELECTRICAL HOOKUP

Reference hookup drawing (BH309).

1. Model EMB-1 has 120V cord for direct plug-in.
2. **120 Volt Power Source** – route and install the proper current carrying conductors, suggested by local codes, from service panel fuse or circuit breaker. Nameplate shows current & KW rating.

The source is either from the standard service panel or may be part of an off-peak separately metered panel/CT metered enclosure. Consult with local utility if questions on off-peak installations.

Since this unit is less than 10 kW, no fusing or circuit breaker at the boiler itself is required. The 120-volt (L1, L2) is connected directly to the left bottom terminal block.

- *Only copper wire is allowed.*

3. **Circulating Pump** – the two screw terminals (orange wires) represent a switch closure (see drawing – 10-amp maximum) to operate the circulating pump motor. **Voltage for the pump must come from its own source.** Wiring entrance must be left KO, do not combine with thermostat cable or other control wiring.
4. **Operating Thermostat** – zone valve dry contact end switch is an operating contact, direct wired thermostats include:
 - **Standard Mechanical** – connect to control board “R” and “W”. **Important!** -Set thermostat internal heat anticipator to Ø.2.
 - **Electro-Stat** - (ES-24-SRO) 4 wire connection required. This is an electronic remote sensing device, remote sensor can be up to 50 feet, cut and splice as required. Use only stranded wire, shielded cable not required. The primary advantages include the capability for longer sensor and the sensor itself is less than ¼”. This means it can be installed after the slab is complete by simply drilling a ¼” hole, 1/8” slot, etc. slightly out from an inside wall.
 - * R to R, W to W, C to C, green to ground
5. **Load Management Interrupt Control** – this Mini-Boiler product has been pre-wired and designed for a power company load management receiver connection. This should not be altered in any manner!
 - A. Remove blue jumper wire
 - B. Extend or connect the two terminal screw points to the power company 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 leave the blue wire jumper connected as shipped from manufacturer.

WARNING: Voltage separation is required. The 12Ø power and pump wiring must remain left of the bottom pipe. The thermostat wires and load control wiring (blue & blue/wht) must exit and remain on the right side of the bottom pipe.

6. **Zone Valve** – see hookup page 2 showing suggested wiring for two zones. Other slab stat can be used, slab stat simply operates its own motor. Do **not** power zone valves and external control devices from Mini-Boiler internal transformer. Contractor needs to install separate 24VAC transformer to operate zone valves.

Note: Two zones only are shown because this boiler does not have internal temperature control and the zone radiation must adequately handle the full boiler capacity. Do not use this simple two-zone scheme for unbalanced zones or more than two. The WarmFlo series product (EMB-W-9) is specifically designed for unbalanced or multi-zone applications.

7. **Inspection/final check** – Verify all electrical connections are tight (including factory connections), verify there is proper spacing between all power and electrical wire/terminals, and verify top high limit manual reset is “in”. During shipping freight vibration there are times when the boiler vessel top manual reset high limit is “popped out”.

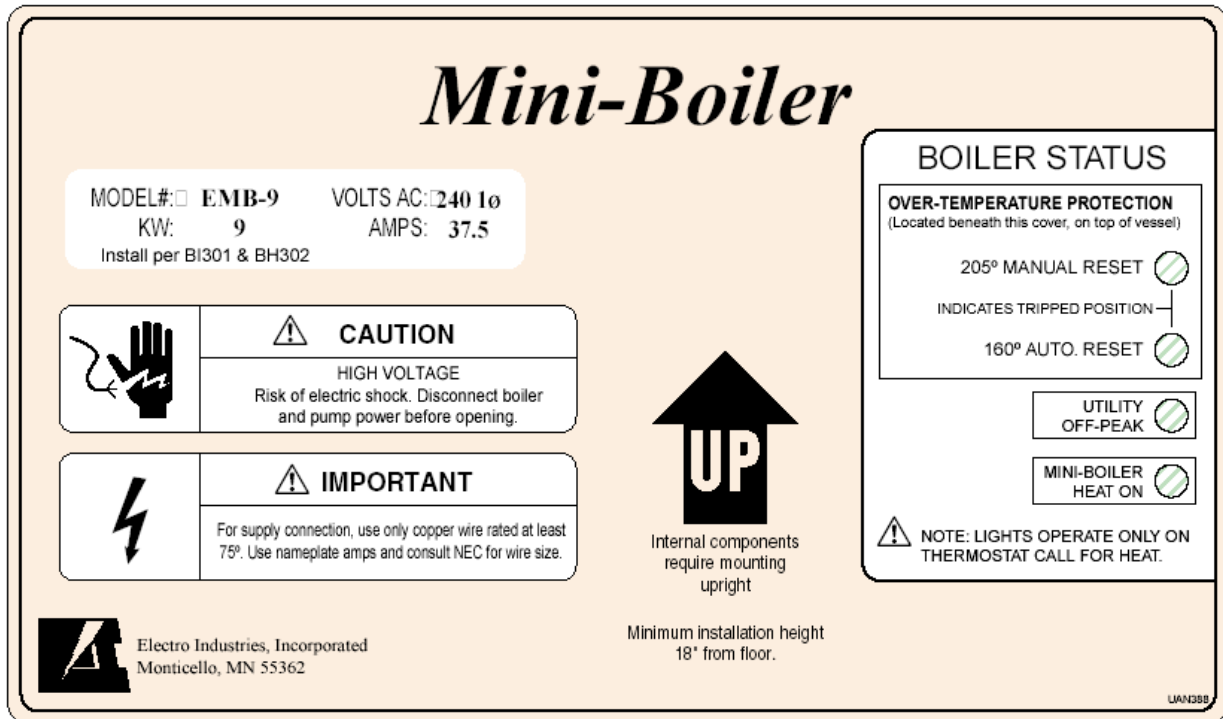
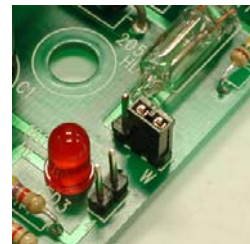


Figure 1

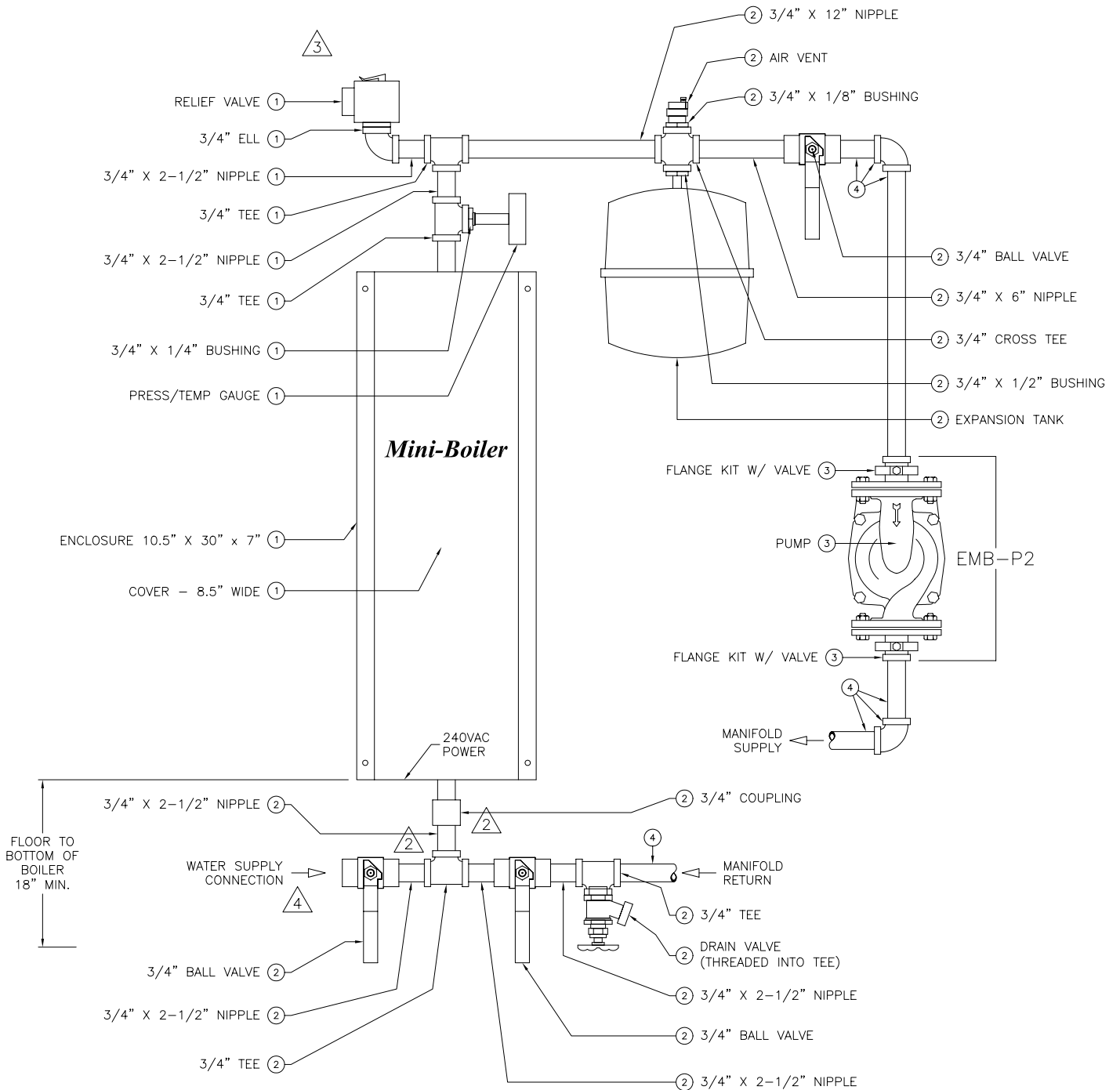
OPERATIONAL TIPS

1. Indicator lights – there is a set of four indicator lights on the lower right corner of the front cover with an identical set of four indicator lights on the internal circuit board itself. Figure 1 is a reproduction of the front decal giving definition and information for using these indicator lights. Note the statement that there must be a call for heat before attempting to interpret the indicator lights.
2. The 160° hi-limit is automatic reset.
3. The 205° hi-limit is manual reset and under the cover, located on the vessel top, left.

Warning: This 205° manual reset controls the 240 power to the elements. Therefore, open the boiler disconnect prior to removing cover and prior to attempting to reset this limit.
4. Via a small pin jumper arrangement on the control board, the circulator pump can be a direct function of the “W” input **or** interrupted by the load control device (even though there is a W input). This diagram illustrates this pin jumper arrangement. This unit is factory setup in the “W” position meaning the pump will always run as a direct function of “R” to “W” operating thermostat. By simply moving this black 2-position jumper to the “L” the pump will be turned off during load control interrupt.
5. At outlet temperatures of approximately 120°, the maximum system pressure should be approximately 18 PSI. If the PSI increase from cold water to operating hot water is more than approximately 3 to 4 PSI, the expansion tank is too small.
6. Check for water leaks and repair as required.
7. If flow seems to be a concern, determine both inlet and outlet water temperature and apply GPM formula detailed in previous section “Information/Water Flow Calculations”.



"BASIC" MECHANICAL PIPING DIAGRAM



LEGEND

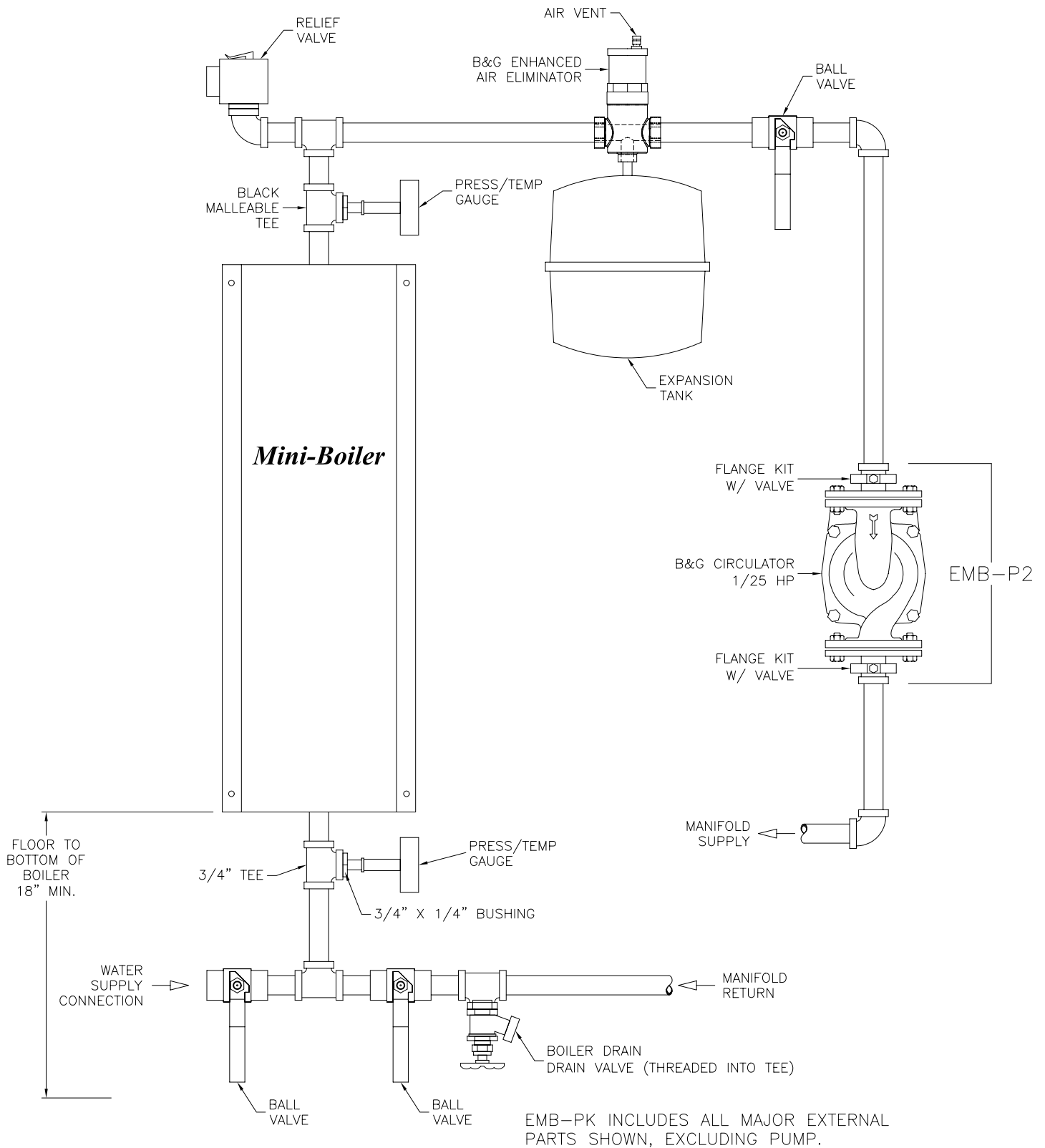
- ① COMPONENTS INCLUDED WITH EMB-1, EMB-2, EMB-4, EMB-5, EMB-9, EMB-45 AND EMB-90
- ② COMPONENTS INCLUDED WITH EMB-BK KIT
- ③ COMPONENTS INCLUDED WITH EMB-P2 (PUMP) KIT
- ④ COMPONENTS NOT INCLUDED, SHOWN FOR REFERENCE ONLY

NOTES:

1. INSTALLATION KIT (PART NUMBER EMB-BK) INCLUDES ALL PIPING PARTS (LESS PUMP & FLANGES) EXTERNAL TO THE 9.5" X 30" X 7" ENCLOSURE.
2. 3/4" COUPLING AND 2-1/2" X 3/4" NIPPLE VERY IMPORTANT. BOTTOM KNOCKOUT ACCESS REQUIRED FOR ELECTRICIAN.
3. ADD NECESSARY DRAIN PIPE.
4. SEE INSTRUCTION MANUAL FOR PRESSURE CONCERNS AND MAY NEED BACKFLOW PREVENTER.
5. SLAB STAT, ORDER NUMBER: ES-24-SRO.



"PREFERRED" MECHANICAL PIPING DIAGRAM

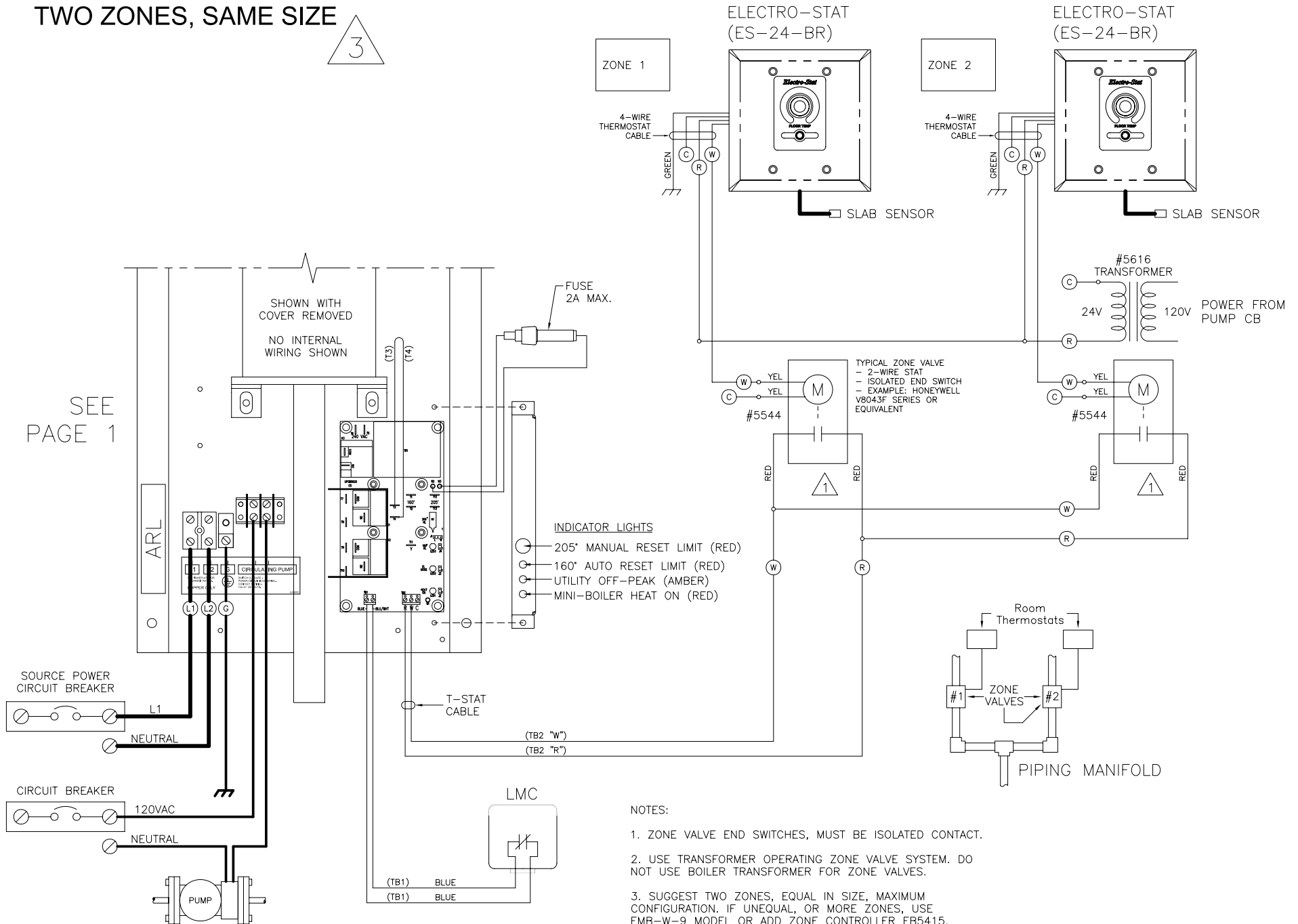


MINI-BOILER HOOKUP (EMB-2, EMB-4)

TWO ZONES, SAME SIZE

3

SEE
PAGE 1



NOTES:

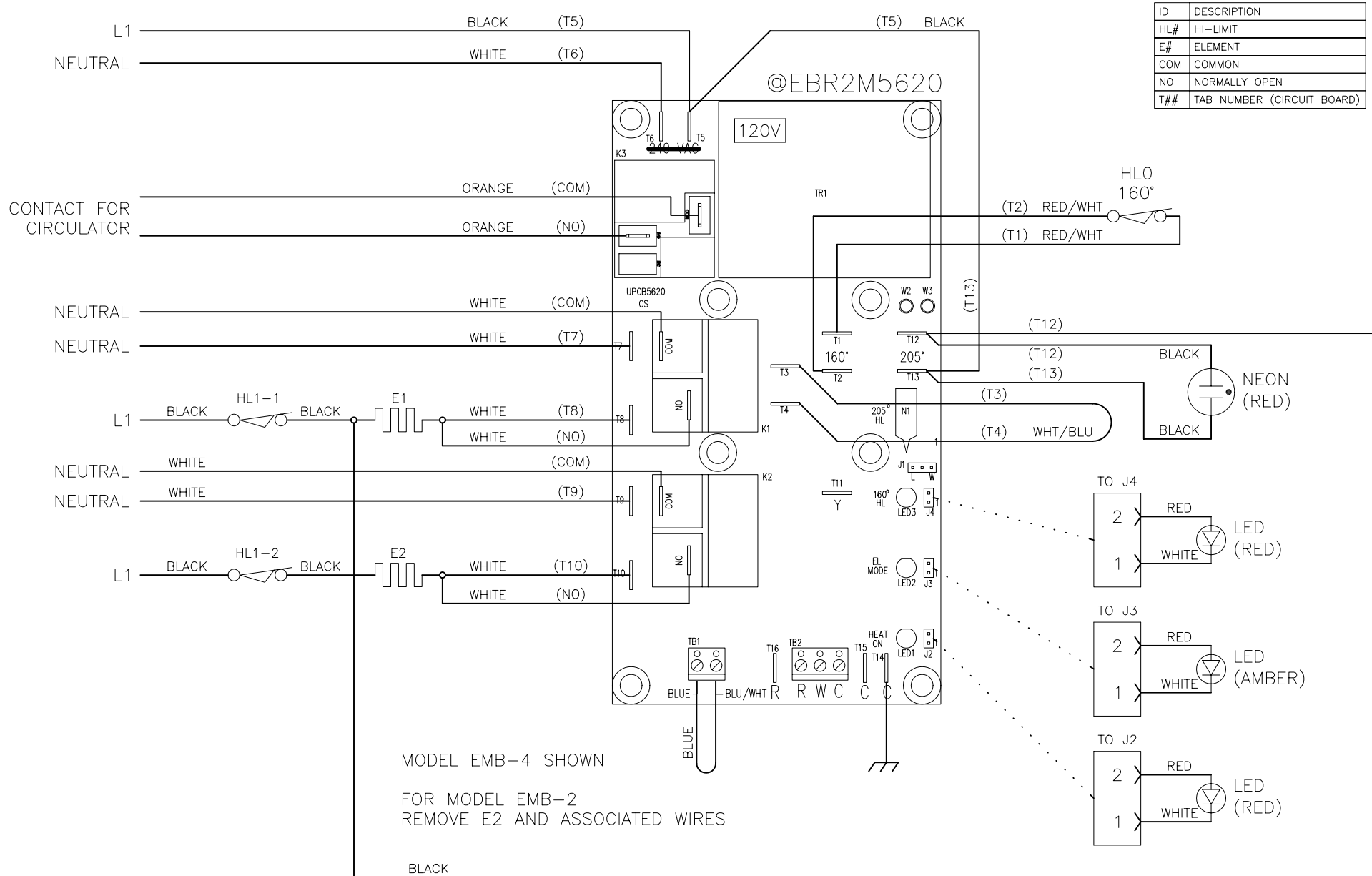
1. ZONE VALVE END SWITCHES, MUST BE ISOLATED CONTACT.
2. USE TRANSFORMER OPERATING ZONE VALVE SYSTEM. DO NOT USE BOILER TRANSFORMER FOR ZONE VALVES.
3. SUGGEST TWO ZONES, EQUAL IN SIZE, MAXIMUM CONFIGURATION. IF UNEQUAL, OR MORE ZONES, USE EMB-W-9 MODEL OR ADD ZONE CONTROLLER EB5415. REQUEST DRAWINGS BH004 & BH005.



ELECTRO INDUSTRIES, INC.
MONTICELLO, MN 55362

BH309 P.2
Rev.A 03-06-07

MINI-BOILER (EMB-2, EMB-4) WIRING SCHEMATIC



BOILER ACCESSORIES

ZONE CONTROLLER

This will simplify your wiring and make zoning applications much easier. In addition, enhanced communicating features have the ability to stage the electric boiler based upon the connected zone capacity.

Standard Features

- **Utility load control**
- Terminal block wiring, visual wiring layout
- Indicator lights showing zone operation
- 24-volt, 40VA transformer 120/208/240 connection
- Fuse protection
- Priority option
- Dual temperature operation
- Applies to digital or standard thermostats
- Dial switch, select each zone capacity



Pumps, Actuators, Valves

- EB-ZTA-1 - install within boiler cabinet
- EB-ZEA-1 - with enclosure and 40VA transformer
- EB-ZEA-2 - add additional 4, enclosure and 40VA

Pumps

- EB-Z2P - two pumps with priority and dual temp.

Zone Valves

- EB-ZTS-1 - install within boiler cabinet, encl. option
- EB-ZTS-2 - add additional 4, enclosure and 40VA

All Others

- EB-ZXA-1 - universal, pumps or valves, non-communicating, for any boiler
- EB-ZS-4 - automatic staging system for Brand X boilers or dual EB-R, -L, -E Series
- EB-ZC-4 - wiring and convenience interface, isolated boiler end switch
- EB-5415A - low cost, 2 or 3 zones, sheds one boiler stage (Mini-Boiler enhancement)

SLAB STAT

Sensing and controlling the system based upon radiant floor surface temperature or the concrete mass has very positive benefits. Radiant floor air stat in the same area as a forced air roomstat presents serious control problems. A remote sensing slab stat for the radiant floor removes this issue.

Remote sensing slab stat is required for storage applications.



ES-24-BR

SWITCHING RELAY - EE-5051

This DPDT 24-volt switching relay provides a convenient solution to any AC or DC application.



- **Ideal for zone pumps**
- 24V coil
- 120V, 10A, contact sets
- Easy to wire and nicely packaged

MULTI-BOILER - EB-C-STG5

Electrically connects between 2nd and 3rd, 3rd and 4th, etc.

OTHER OPTIONS

- SOT-1 Switchover to standby, total run time
- 5701 Single feed bus for 2 CB's (SQ-D CB)
- 5702 Single feed bus for 3 CB's (SQ-D CB)
- EB-S-SB Dual boiler option for EB-S Series
- WF-ANZ* WarmFlo Analyzer, now applicable to WO and WA Series

Specifications subject to change without notice, all rights reserved.



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TWO SUPPLY WATER TEMPERATURE REQUIREMENT

- Handled as the priority zone on multi-zone (EB-ZEA-1) or two pump (EB-Z2P) controllers
- Priority switch on, zone 1 active - TS boiler automatically changes to 150° (or selection 176°) supply water setting
- All other zones are held off
- With zone 1 satisfied or 60-minute timeout, the boiler automatically returns to the preset temperature and reacts to the other zones

Low Temp	High Temp
Radiant, slab	Radiant, staple up
Radiant, slab	Baseboard
Radiant, slab	Fan coil
Radiant, slab	Water heater, side arm
Radiant, slab	Hanging unit heater (garage, shop, etc.)

INSTALLATION PLUMBING KITS

These installation kits provide the critical plumbing components needed for easy installation of the Electro-Boiler. **In addition** to the items shown in the matrix below, each kit includes all necessary ball valves, drain valve, tees, elbows, nipples, bushings, couplings, etc. for direct connection to circulator pump and/or manifold.

Electro Industries' boilers come standard equipped with outlet temperature/pressure gauge, pressure relief safety valve, and when applicable, the WarmFlo™ electronic control sensors. These kits provide the additional components for easy installation:

Model	Application	Return Gauge	Expansion Tank	Air Vent
EMB-BK	All EMB Series		2.1 gal. (7.9 L), 40,000 Btu/h	Basic float type
EMB-PK	All EMB Series	✓	2.1 gal. (7.9 L), 40,000 Btu/h	Enhanced air separator, EAS
EB-PK-M	EB-MS, -MA, -MO Series	✓	4.5 gal. (17 L), 135,000 Btu/h	Enhanced air separator, EAS
EB-BK-TS	EB-S, -WA, -WO Series		4.5 gal. (17 L), 135,000 Btu/h	Basic float type
EB-PK-TS	EB-S, -WA, -WO Series	✓	4.5 gal. (17 L), 135,000 Btu/h	Enhanced air separator, EAS

CIRCULATING PUMPS



5585 - Mini-Boiler & 10 kW TS Series

- 120V, 1/25 HP, maintenance-free wet rotor circulator
- Pump curve example - 5 GPM (19 L) @ 11 ft. of head (32.9 kPa)



5586 - TS Series, Standard

- 120V, 1/6 HP, maintenance-free oil lubricated circulator
- Pump curve example - 10 GPM (37.8 L) @ 20 ft. of head (50.8 kPa)



**5578 - 3/4" Pipe
5582 - 1" Pipe
5579 - 1-1/4" Pipe**

- Two flanges, with isolation valve

Electro Industries, Inc.

Limited Product Warranty

Effective February 5, 2009

Electro Industries, Inc. warrants to the original owner, at the original installation site, for a period of two (2) years from date of installation, 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 the 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 reasonable labor costs to repair defective product or product parts for ninety (90) days after installation.

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

Electro Industries, Inc. 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 installation. 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, Inc. warrants that the spin fin elements of its products are free from defects in materials and workmanship through the twentieth year following date of installation. 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, Inc. warrants that the open wire elements of its products are free from defects in materials and workmanship through the fifth year following date of installation. 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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THESE WARRANTIES DO NOT COVER:

1. Costs for labor for removal and reinstallation of an alleged defective product or product parts, 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 that has been damaged as a result of being improperly serviced or operated, including, but not limited to, the following: operated with insufficient water or airflow, allowed to freeze, subjected to flood conditions, subjected to improper voltages or power supplies, operated with airflow 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 that has been damaged as a result of natural disasters, including, but not limited to, the following: lightning, fire, earthquake, hurricanes, tornadoes or floods.
4. Any product 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 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. This warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation.
7. Transportation charges for any replacement part or component, service calls, normal maintenance; replacement of fuses, filters, refrigerant, etc.

CONDITIONS AND LIMITATIONS:

1. 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 thirty (30) days after the date of manufacture and **NOT** the date of installation.
2. The product must have been sold and installed by a licensed electrical contractor, a licensed plumbing contractor, or a licensed heating contractor.
3. 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 and federal codes and statutes. If not, the warranty will be null and void.
4. 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.
5. All related heating components must be maintained in good operating condition.
6. All lines must be checked to confirm that all condensation drains properly from the unit.
7. Replacement of a product or product part under this limited warranty does not extend the warranty term or period.
8. 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.
9. 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.

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, INC. 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 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 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.